

Hitachi Semiconductor Package DATA BOOK

HITACHI®

ADE 410-001A

Introduction

Thank you for using Hitachi's semiconductor devices.

The growing market for electronic equipment requires mounting semiconductor devices with higher functional capacity and higher density and developing packages for housing them.

As we deal with the contradictory aims of enlarging chip sizes and making packages smaller, the concerted efforts of the entire company are focused on advances being made in development of packaging materials, stress analysis simulation and development of mounting technology.

As the packages we develop are used throughout the world, we have pursued international standardization through package outline and materials standardization organizations in Japan and abroad.

Our catalog of packages was first published in Japan in 1984. There have since been five editions. During this period, they were carefully evaluated from various aspects. From this point on, the format is being changed to a data book format and the contents have been made more substantial. We hope you will use it on a regular basis when using our semiconductor devices. In addition, we would appreciate your comments.

These descriptions attempt to make accurate and clear explanations and to include the most recent information. However, there may be points that have not been thoroughly presented. If you notice any such points, please send us your comments.

This data book is concerned primarily with general topics. Please consult with our Semiconductor Division for details about individual data.

March 1994
Semiconductor & Integrated Circuit Division,
Hitachi, Ltd.

The contents recorded in this document consist of technological information concerning semiconductor packages. Although we believe the data are accurate, there are restrictions in respect to such legal aspects as patents, contracts and guarantees.

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Section 1 Introduction of Packages

1.1 Types of Packages and Advantages

1.1.1 Types of Packages

The packages are classified as indicated in figure 1-1 through figure 1-3 on the basis of their mounting characteristics on printed circuit boards and their shapes.

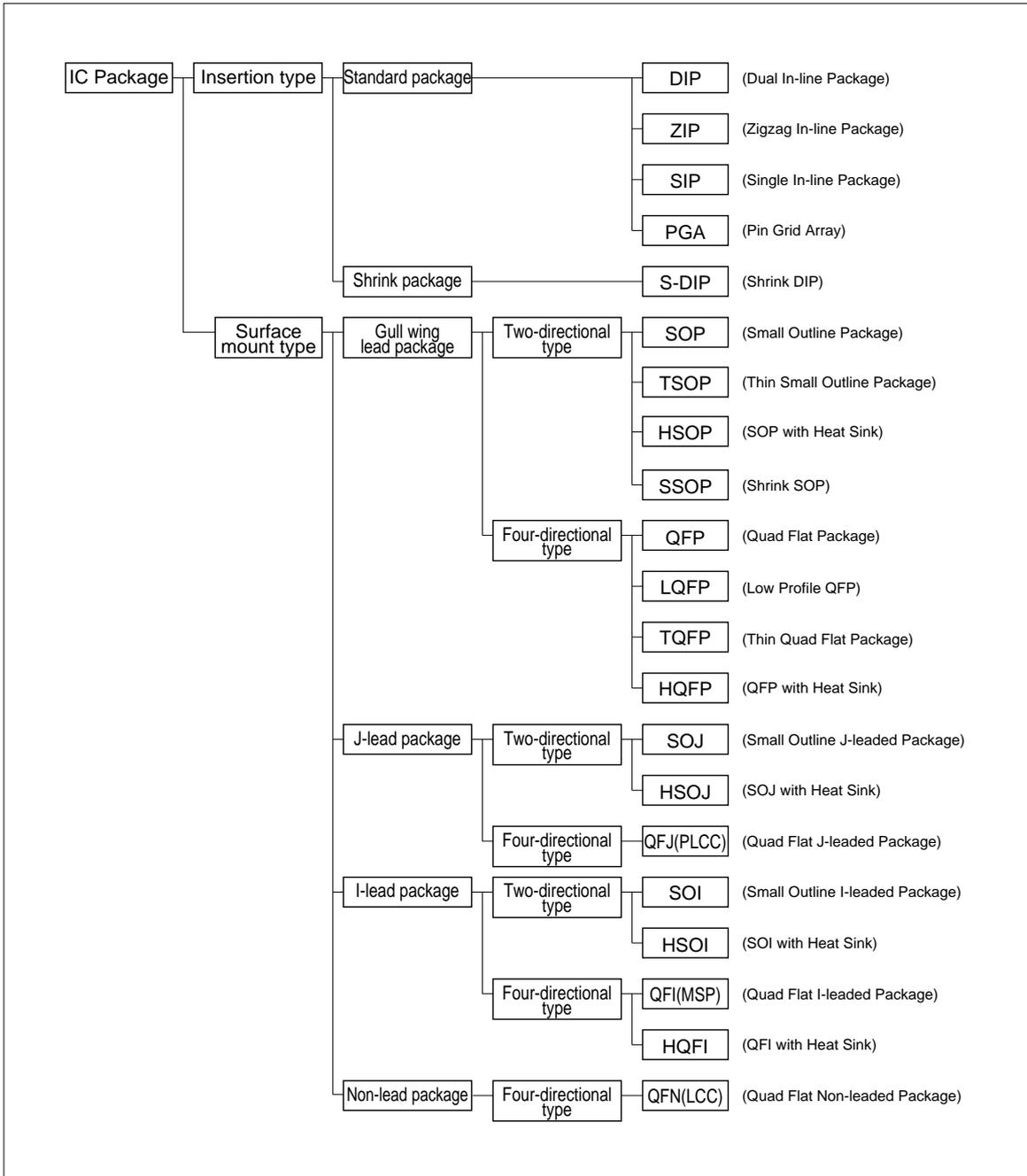


Figure 1-1 Classification of IC Package

Introduction of Packages

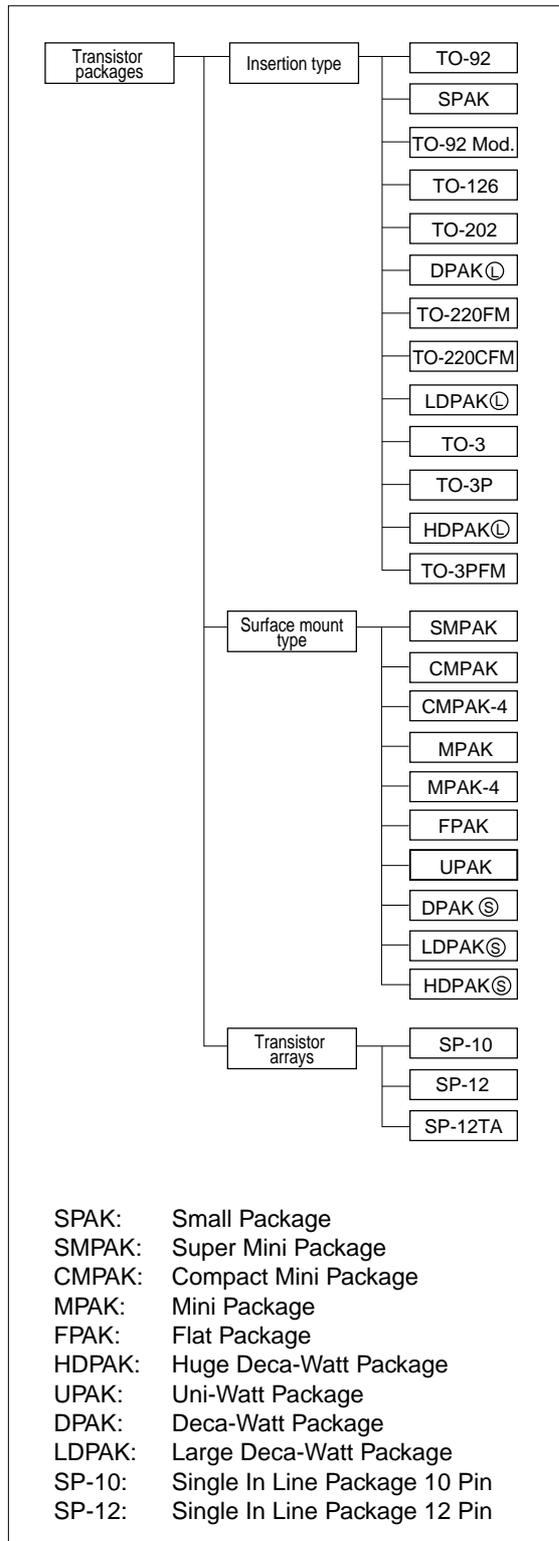


Figure 1-2 Transistor Classification

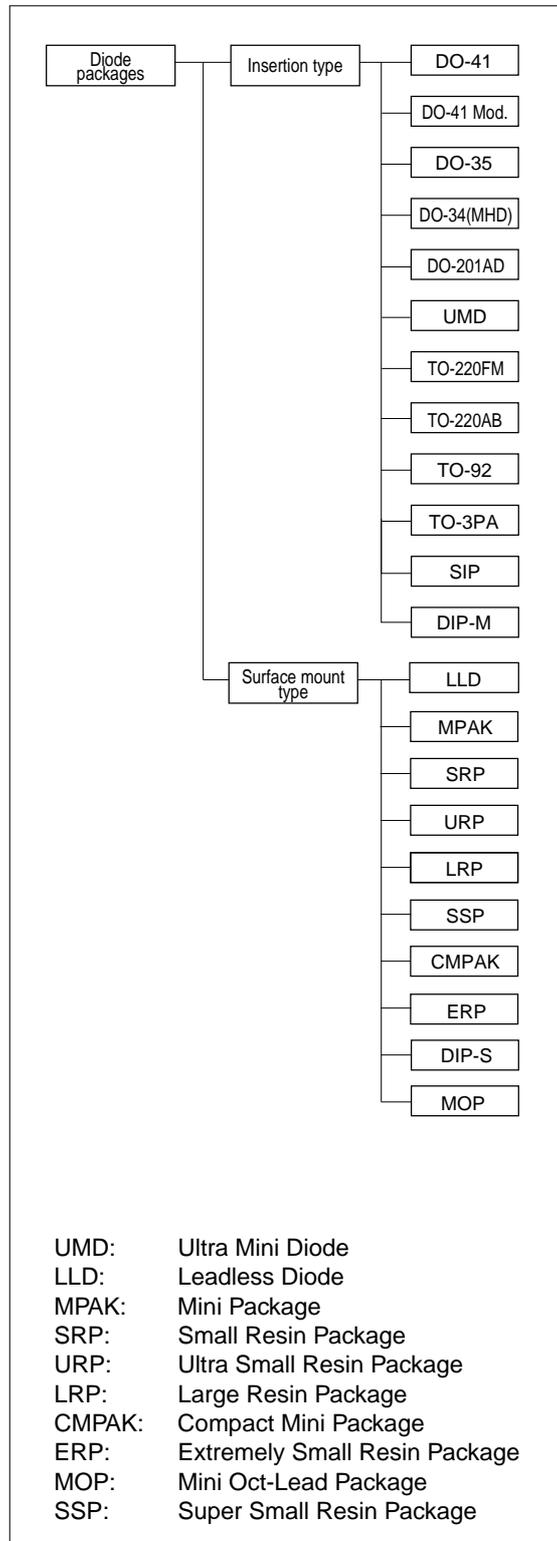


Figure 1-3 Diode Classification

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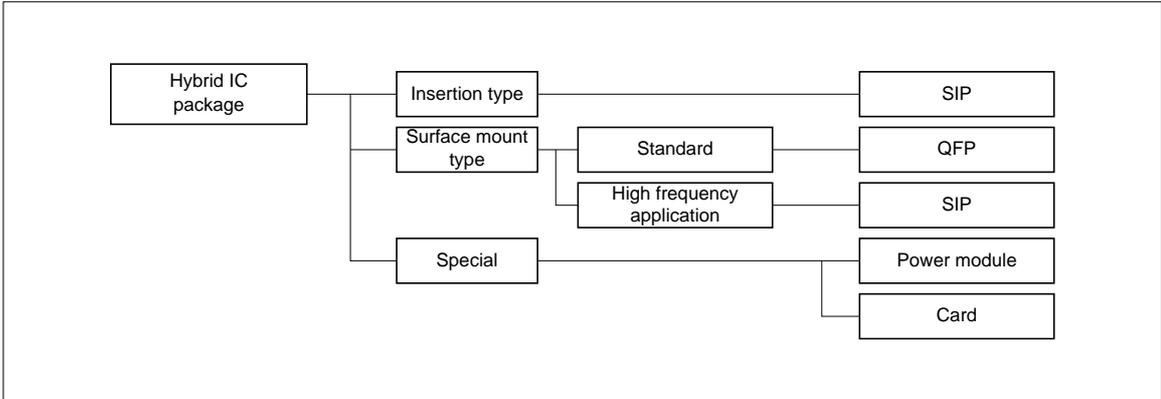
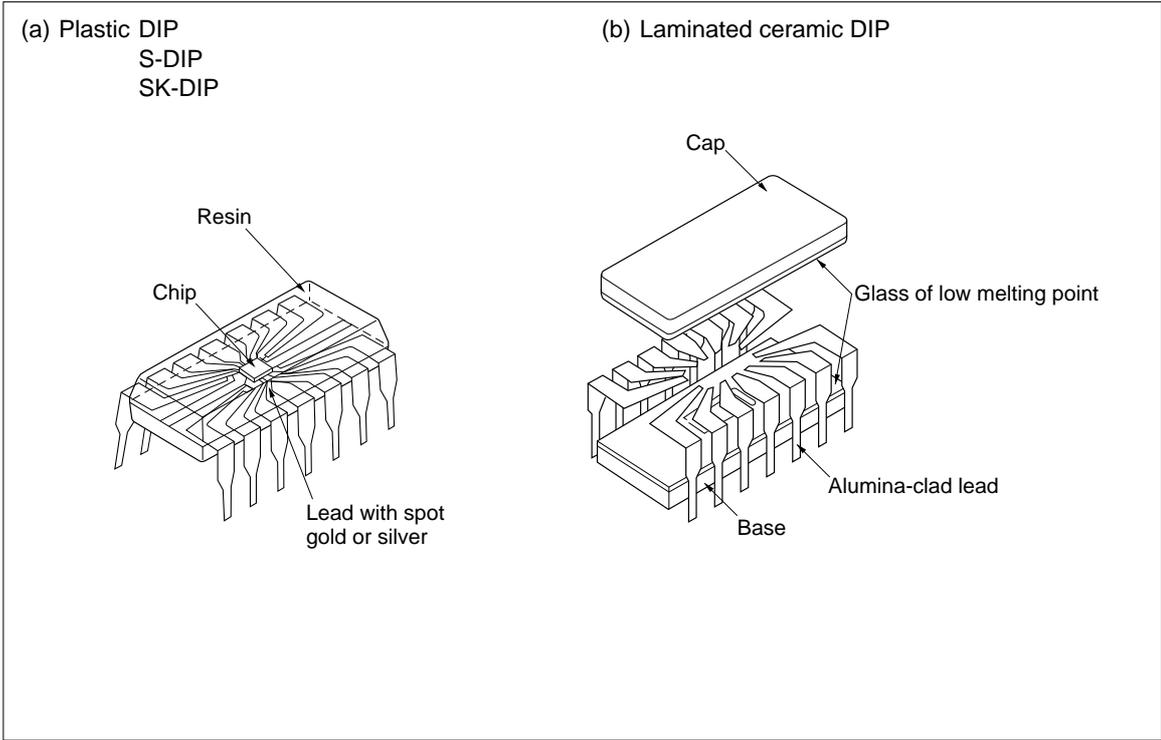


Figure 1-4 Hybrid IC Classification

1.1.2 Package Structures

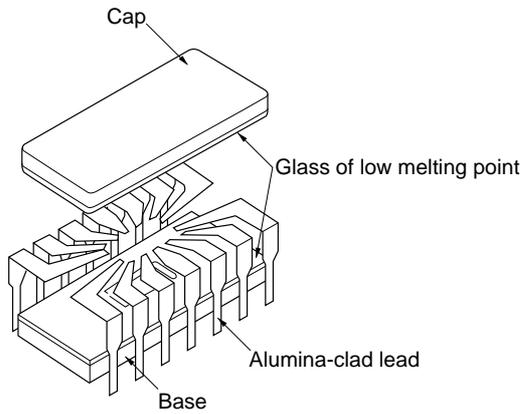
The standard structure of representatives of each type of package is shown below.

(1) Structure and Materials of Representative Insert-Type Packages

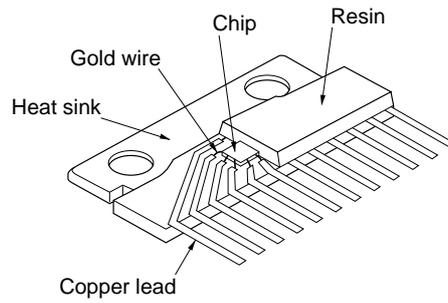


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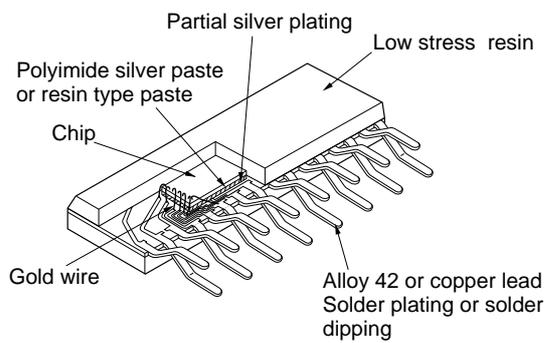
(c) Cerdip



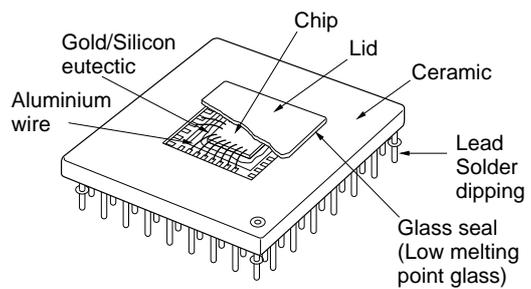
(d) Plastic SIP



(e) ZIP

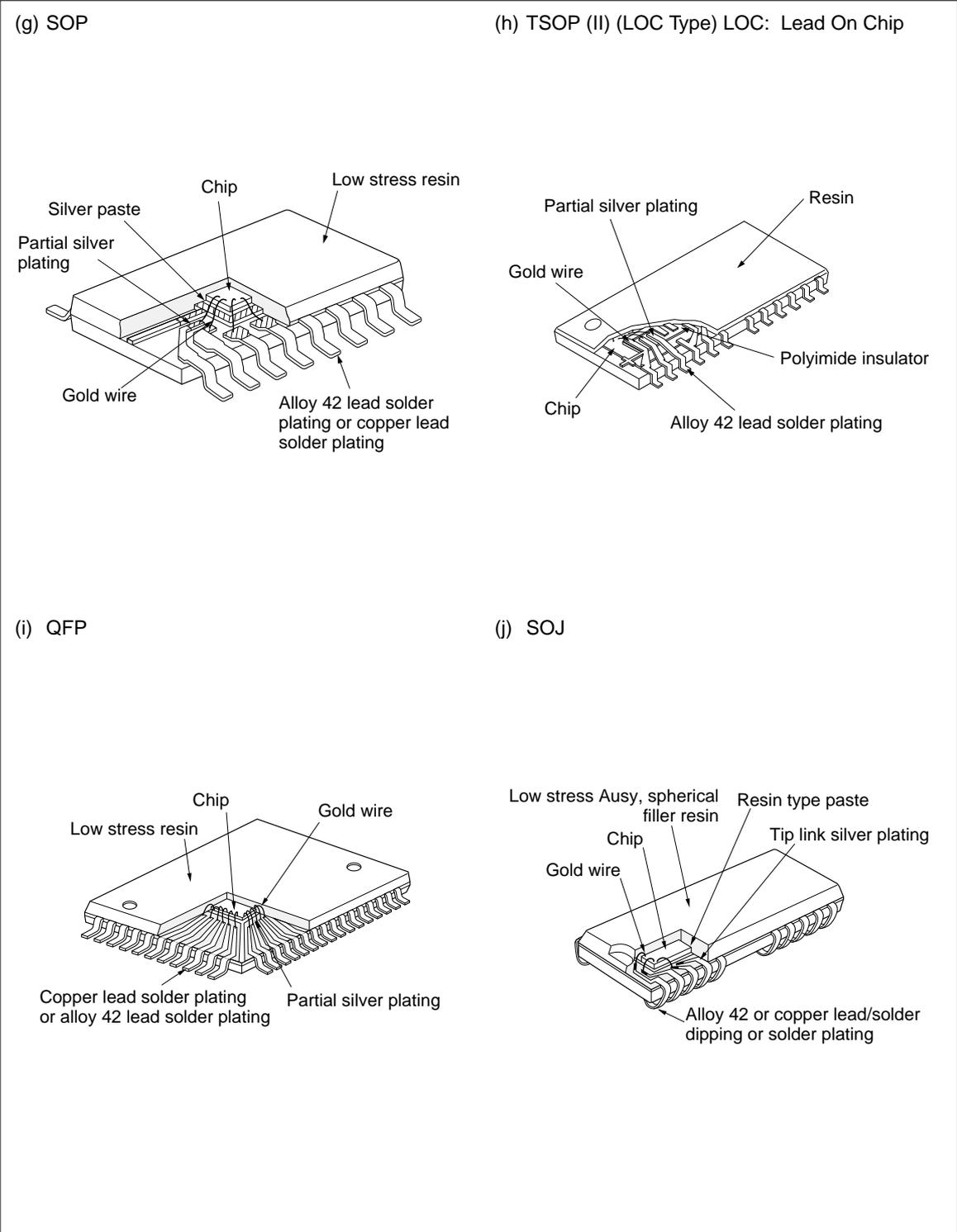


(f) Ceramic PGA



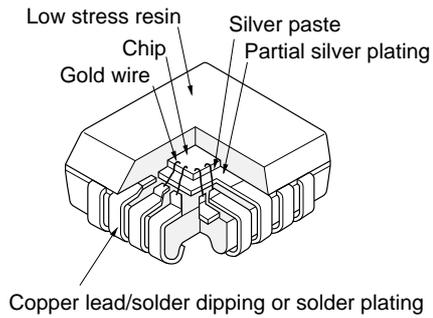
Introduction of Packages

(2) Structure and Materials of Representative Surface Mount Type Packages

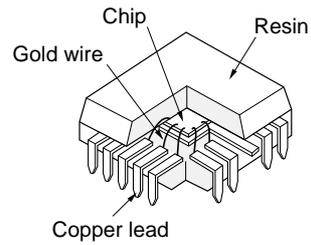


Introduction of Packages

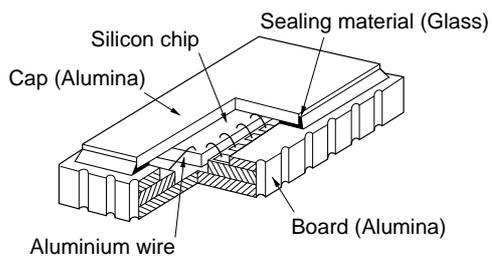
(k) QFJ (PLCC)



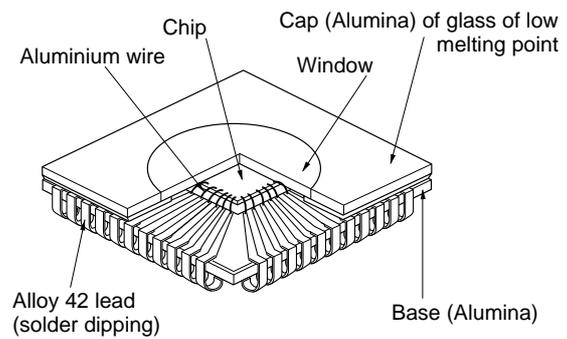
(l) QFI (MSP)



(m) QFN (LCC)

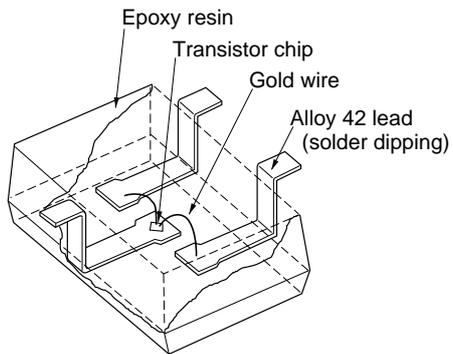


(n) QFJ-G

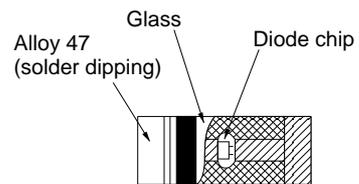


Introduction of Packages

(o) MPAK

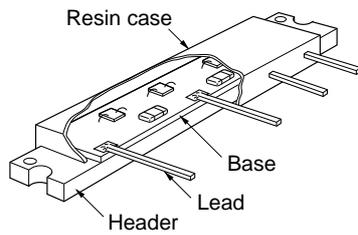


(p) LLD

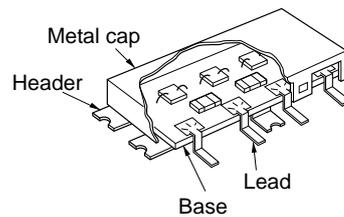


(3) Structure of Hybrid Package

(q) High Frequency Module

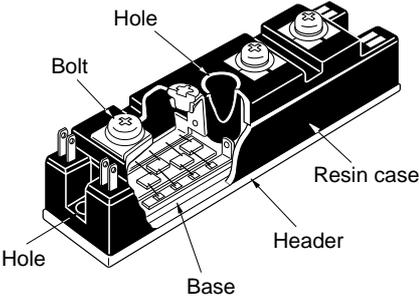


(r) High Frequency Module

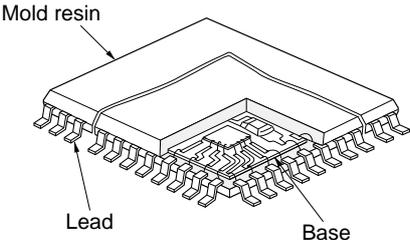


Introduction of Packages

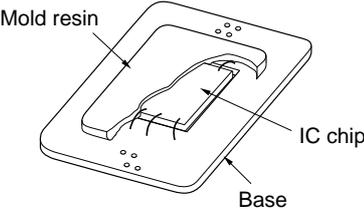
(s) Low Frequency Power Module (C Type)



(t) TA-CHIP



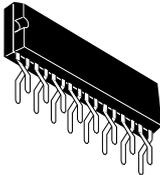
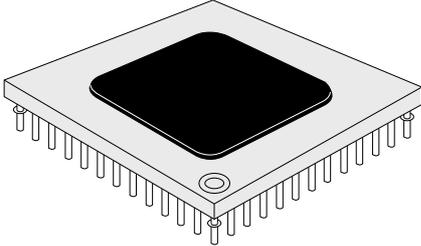
(u) COB



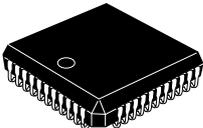
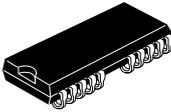
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1.1.3 Advantages of Major Packages

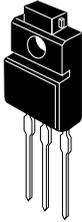
The forms of packages of semiconductor devices have rapidly been shifting toward larger numbers of pins and smaller and thinner forms as electronics equipment has become more diversified in function and smaller.

<p>ZIP Zigzag In-line Package</p>	<p>PGA Pin Grid Array</p>
<div style="text-align: center;">  </div> <ul style="list-style-type: none"> • Lead form of the package is formed in a zigzag pattern. • Lead pitch is 100 mil (standard) <p>Major devices to which applied: Dynamic RAM</p>	<div style="text-align: center;">  </div> <ul style="list-style-type: none"> • A package in which the lead pins emerge in a perpendicular pattern. • Lead pitch is 100 mil (standard) • Used primarily in LSIs with more than 50 pins • Also called plug-in <p>Major devices to which applied: Gate arrays and processors</p>
<p>SOP Small Outline Package</p>	<p>QFI Quad Flat I-leaded Package (MSP) (Mini-Square Package)</p>
<div style="text-align: center;">  </div> <ul style="list-style-type: none"> • A gull-wing type surface mount package in which the lead pins emerge in two directions. • Lead pitch is 50 mil • Also called DFP (dual flat package) <p>Major devices to which applied: IC memories, standard logic, standard linear ICs</p>	<div style="text-align: center;">  </div> <ul style="list-style-type: none"> • A package with butt type lead shapes • Lead pins emerge in four directions and the shape of the package is square or rectangular • Lead pin pitches are 50 mil, 40 mil, and 30 mil <p>Major devices to which applied: Linear ICs</p>

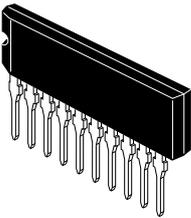
Introduction of Packages

<p>QFJ Quad Flat J-leaded Package (PLCC) (Plastic Leaded Chip Carrier)</p>  <ul style="list-style-type: none"> • A package with the lead shape formed as a J shape • Lead pins emerge in four directions and the shape of the package is square or rectangular • Lead pin pitch is 50 mil • Leads are protected by the package body, so it is easily handled <p>Major devices to which applied: Microcomputers, gate arrays and IC memories</p>	<p>SOJ Small Outline J-bend Package</p>  <ul style="list-style-type: none"> • A package with the lead shapes formed in a J shape • Lead pins emerge in two directions • Lead pin pitch is 50 mil <p>Major devices to which applied: Dynamic RAM</p>
<p>TSOP (I) Thin Small Outline Package (Type I)</p>  <ul style="list-style-type: none"> • The package installation height of the ultra-thin SOP is less than 1.20 mm • Lead pitch is 0.05 mm • Corresponds to IC card <p>Major devices to which applied: IC memories</p>	<p>TSOP (II) This Small Outline Package (Type II)</p>  <ul style="list-style-type: none"> • The package installation height of the ultra-thin SOP is less than 1.20 mm • Lead pitches are 1.27 mm and 0.80 mm <p>Major devices to which applied: IC memories</p>

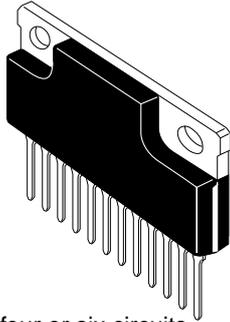
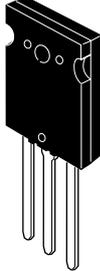
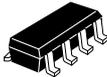
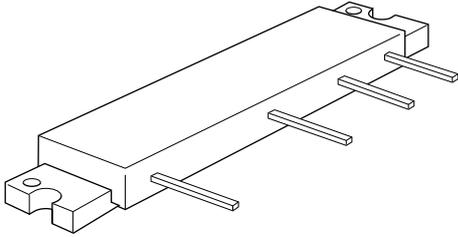
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<p>TQFP Thin Quad Flat Package</p>	<p>QFP Quad Flat Package (FP) (Fine Pitch)</p>
<div style="text-align: center;">  </div> <ul style="list-style-type: none"> • Ultra-thin QFP with a package installation height of less than 1.20 mm • Lead pitches of 0.80 mm, 0.65 mm, and 0.50 mm <p>Major devices to which applied: Mask ROM, gate arrays, microcomputers, LCD drivers</p>	<div style="text-align: center;">  </div> <ul style="list-style-type: none"> • Lead pitch of less than 0.50 mm <p>Major devices to which applied: Gate arrays, LCD drivers</p>
<p>TO-220FM</p>	<p>LDBPAK Large Deca-watt Package</p>
<div style="text-align: center;">  </div> <ul style="list-style-type: none"> • An insulated type in which surface resin molding is attached to a conventional TO-220 heat radiation fin When the heat sink is installed, an insulator (spacer, washer, etc.) is not necessary <p>Major devices to which applied: Power transistors</p>	<div style="text-align: center;">  </div> <ul style="list-style-type: none"> • A large area mounting package that assures characteristics equal to those of a TO-220AB resin power transistor • Surface mounting allows high-density mounting and automatic assembly <p>Major devices to which applied: Power transistors</p>

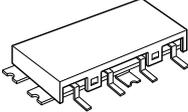
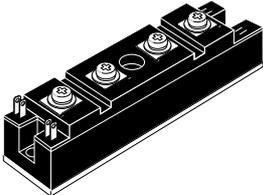
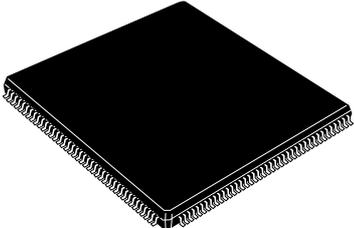
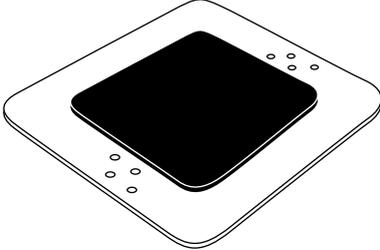
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<p>SP-10 Single in Line Package 10pin</p>	<p>CMPAK-4 Compact Mini Package-4 leads</p>
<div style="text-align: right;">(Scale : 4/1)</div>  <ul style="list-style-type: none"> • Can contain two or four circuits • Allows high density mounting <p>Major devices to which applied: Power transistor arrays</p>	 <ul style="list-style-type: none"> • The transistor with the smallest external shape in this series, even smaller than the previous MPAK-4 (Its circuit board area is approximately 60% of the MPAK's) • Primarily for VHF/UHF high-frequency transistors • Ideal for use in ultra-small tuners such as liquid crystal televisions <p>Major devices to which applied: Transistors for VHF/UHF-band high frequencies, FET</p>
<p>ERP Extremely Small Resin Package</p>	<p>LRP Large Resin Package</p>
<div style="text-align: right;">(Scale : 4/1)</div>  <ul style="list-style-type: none"> • Extremely small reactance component • Simple circuit design for ultra-high frequency uses <p>Major devices to which applied: Diodes (SHF band mixer diodes and others)</p>	<div style="text-align: right;">(Scale : 4/1)</div>  <ul style="list-style-type: none"> • Highest output (power dissipation: 1 W) obtainable in a two-terminal surface mount package. <p>Major devices to which applied: Diodes (1-W zener diodes and others)</p>

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<p>SP-12TA Single In-line Package 12pin</p>	<p>TO-3PL</p>
<div style="text-align: center;">  </div> <ul style="list-style-type: none"> • Can contain four or six circuits • Allows high density mounting • Higher output possible with installation of heat sink <p>Major devices to which applied: Power transistor arrays</p>	<div style="text-align: center;">  </div> <ul style="list-style-type: none"> • Small high current type (module) • Low thermal resistance <p>Major devices to which applied: Power transistors</p>
<p>MOP Mini Oct-lead Package</p>	<p>RF-B1 Radio Frequency</p>
<div style="text-align: center;">  </div> <ul style="list-style-type: none"> • Permits high-density mounting of multiple chips • Double-balanced type with low reactance, simplifying high-frequency circuit designs <p>Major devices to which applied: Diodes (double-balanced mixer diodes etc.)</p>	<div style="text-align: center;">  </div> <ul style="list-style-type: none"> • High-output package with headers • Slim, compact type <p>Major devices to which applied: RF power modules for automobile telephones</p>

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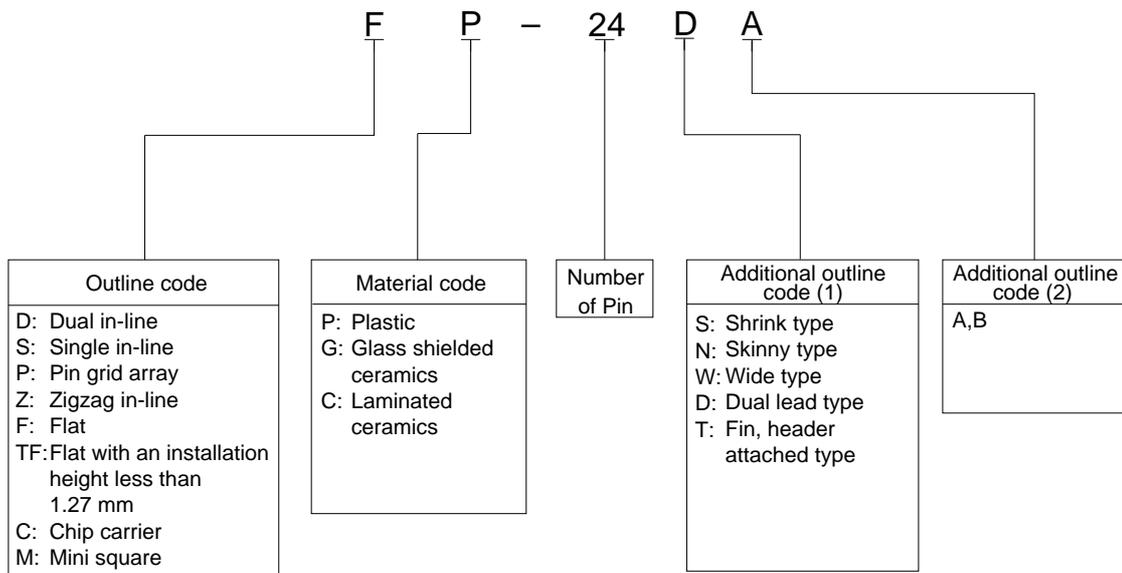
<p>RF-E Radio Frequency</p>	<p>LF-C Low Frequency</p>
<div style="text-align: center;">  </div> <ul style="list-style-type: none"> • Ultra-compact, lightweight surface-mount package (1 cc, 3 g) • All-metal case shuts out noise <p>Major devices to which applied: RF power modules for portable telephones</p>	<div style="text-align: center;">  </div> <ul style="list-style-type: none"> • High current, output, and breakdown voltage ratings (50 V, 500V) <p>Major devices to which applied: Power-transistor modules</p>
<p>QFP Quad Flat Package (FP) (Fine Pitch)</p>	<p>COB Chip On Board</p>
<div style="text-align: center;">  </div> <ul style="list-style-type: none"> • Enables a system to be integrated into a multichip module • Permits high-density mounting and automated assembly <p>Major devices to which applied: TA CHIP (multichip module)</p>	<div style="text-align: center;">  </div> <ul style="list-style-type: none"> • For ISO-compliant smart cards • Only 0.6 mm thick • Customizable electrode-pad pattern <p>Major devices to which applied: Smart cards</p>

1.2 IC Package Names and Code Designations

The IC package name assigned by the company is a package code indicating the shape of the package, the package material, and the number of pins.

Table 1-1 shows the content of the code designation.

Table 1-1 IC Package Code Designation



Additional outline code (2) is used when additional outline code (1) is not used. The skinny type with a dual lead is designated as DN.

Introduction of Packages

1.3 Method of Indicating Package Designations

The outline drawings recorded in this data book have been prepared by reference to the standards issued by domestic and foreign standardization organizations. The standards relating to the major packages are listed below.

- EIAJ Standards (Standards of Electronic Industries Association of Japan)

Standards specifying external outlines, characteristics, ratings, and test methods for systems, equipment and components that have been formulated and issued by the Electronic Industries Association of Japan. The standards for the package outline of semiconductors are as follows:

ED-7400	Standard package outline drawings of semiconductor devices (integrated circuits)
ED-7400-1	Standard package outline drawings of semiconductor devices (integrated circuits)
ED-7402-1	(Formulated in February 1989) Small outline package (SOP)
ED-7402-2	(Formulated in February 1990) Shrink small outline package (SSOP)
ED-7402-3	(Formulated in April 1991) Thin small outline package (Type I) (TSOP (I))
ED-7402-4	(Formulated in February 1990) Thin small outline package (Type II) (TSOP (II))
ED-7403-1	(Formulated in April 1988) Plastic dual in-line package
ED-7404	(Formulated in January 1990) Quad flat package (QFP)
ED-7404-1	(Formulated in January 1989) Quad flat package (fine pitch)
ED-7405-1	(Formulated in March 1990) Shrink zigzag in-line package (SZIP)
ED-7406	(Formulated in May 1988) Small outline J-leaded package (SOJ)
ED-7407	(Formulated in June 1988) Quad flat J-leaded package (QFJ)
ED-7408	(Formulated in October 1988) Pin grid array package (PGA)
ED-7409	(Formulated in June 1988) Quad flat I-leaded package (QFI)
ED-7410	(Formulated in June 1988) Small outline I-leaded package (SOI)
ED-7411	(Formulated in February 1989) Package names and codes
ED-7412	(Formulated in November 1988) Quad flat leadless package (QFN)
ED-7413	(Formulated in January 1989) Single in-line package (SIP)
ED-7414	(Formulated in November 1989) Guard ring quad flat package (GQFP)
ED-7415	(Formulated in November 1989) Heat sink equipped small outline package (HSOP)
ED-7417	(Formulated in February 1990) Bumpered quad flat package (BQFP)

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- ED-7418 (Formulated in July 1990) Glass shield quad flat package (QFP-G)
- ED-7419 (Formulated in September 1990) Glass shield dual in-line package (DIP-G)
- ED-7500 Standard package outline for semiconductor devices (Discrete devices)
- IEC Standards (International Electrotechnical Commission Standards)
Designations of recommended standards or published documents regarding equipment, systems and components that are set by the International Electrotechnical Commission.
- IEC Publication 148 (Character Symbols for Discrete Devices and Integrated Circuits)
- IEC Publication 191 (Package outline of Discrete Devices and Integrated Circuits)
- IEC Publication 747 (Methods of Determining Ratings and Characteristics of Semiconductors)
- IEC Publication 286.3 (Methods of Packaging Components in Automated Mounting)
- JEDEC Standards (Joint Electron Device Engineering Council standards) Package outline given package names by the Joint Electron Device Engineering Council (JEDEC), which is a subsidiary of the Electronic Industries Association (EIA).
- Publication 95 (Registered Standard Package of Semiconductor Devices)

1.3.1 Definitions of Package Dimension Reference Characters

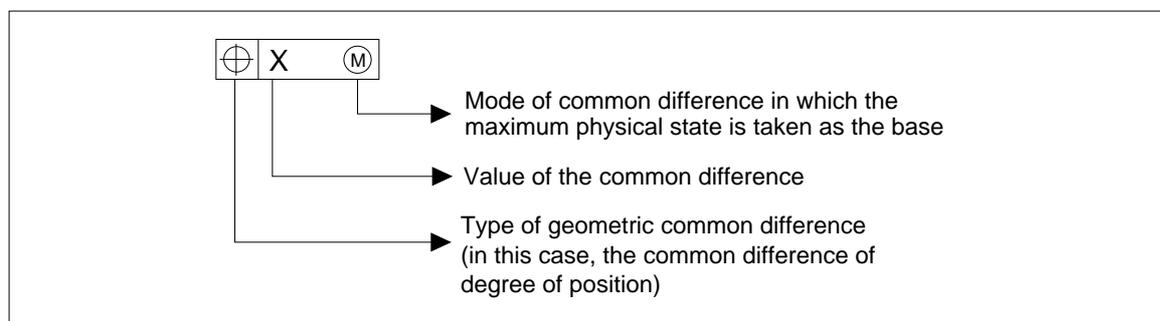
Reference Character	Terminology	Definition
—	Mounting surface (seating plane)	The face that is determined when the IC is placed on the mount pad of a printed board
A	Seated height	Distance from the seating plane to the highest point of the package
A1	Stand-off height	Distance between the seating plane and the base plane
A2	Package height	Distance from the base plane to the highest point of the package
b	Terminal width	Major dimension of the cross - section of a terminal
b1, b2	Terminal widths	Largest dimensions of terminal width (including cut remnant of the tie bar)
c	Terminal thickness	Minor dimension of the cross-section of a terminal
D	Package length	Major dimension of the package excluding terminals, measured in a plane parallel to the seating plane
D1	Other package length	Other package length usually smaller than D

Introduction of Packages

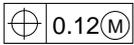
Definitions of Package Dimension Reference Characters (cont)

Reference Character	Terminology	Definition
D2	Terminal linear interval	Linear interval at the center of the terminal bend
E	Package width	Minor dimension of the package excluding terminals measured in a plane parallel to the seating plane
E1	Other package width	Other package width, usually smaller than E
E2	Terminal linear interval	Linear interval at the center of the terminal bend
e	Terminal spacing, linear	Linear spacing between true positions of terminal centers
H _D	Overall length	Largest overall dimension, including package length, of peripheral terminals which are presented for mounting in the length direction
H _E	Overall width	Largest overall dimension, including package width, of peripheral terminals which are presented for mounting in the width direction
L	Terminal length	Length of terminal available for mounting, measured from the seating plane
θ	Terminal spread, angular	Angle between the terminal and a line perpendicular to the seating plane
y	Terminal precision (coplanarity)	Uniformity of the bottom-most surface of the terminal relative to the mounting surface
Z	Package overhang	Distance from the end of terminal true position to the extremity of the package

Indication of Geometric Common Difference



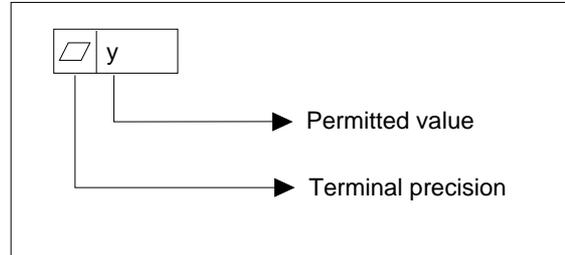
Example

b 

When the terminal width b is the maximum dimension, it indicates that a divergence from the true position of the center position of up to 0.12 mm is permitted.

If b is smaller than the maximum dimension, the common difference corresponding to b can be extended.

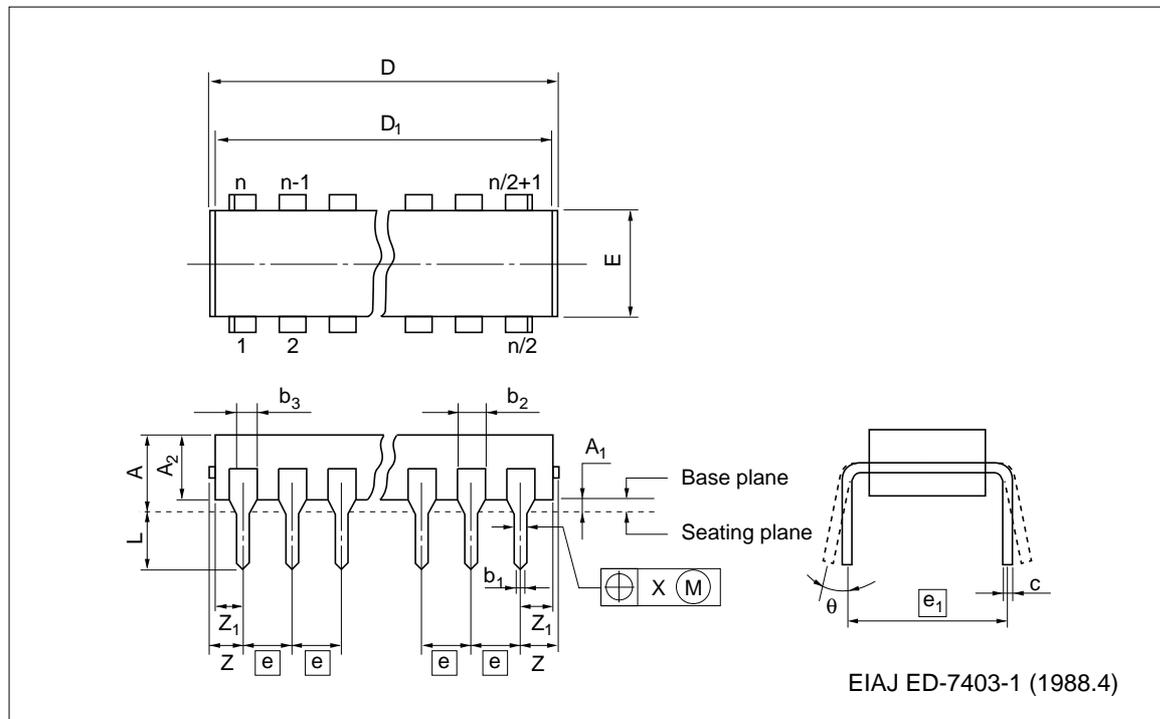
Indication of Terminal Precision "y"



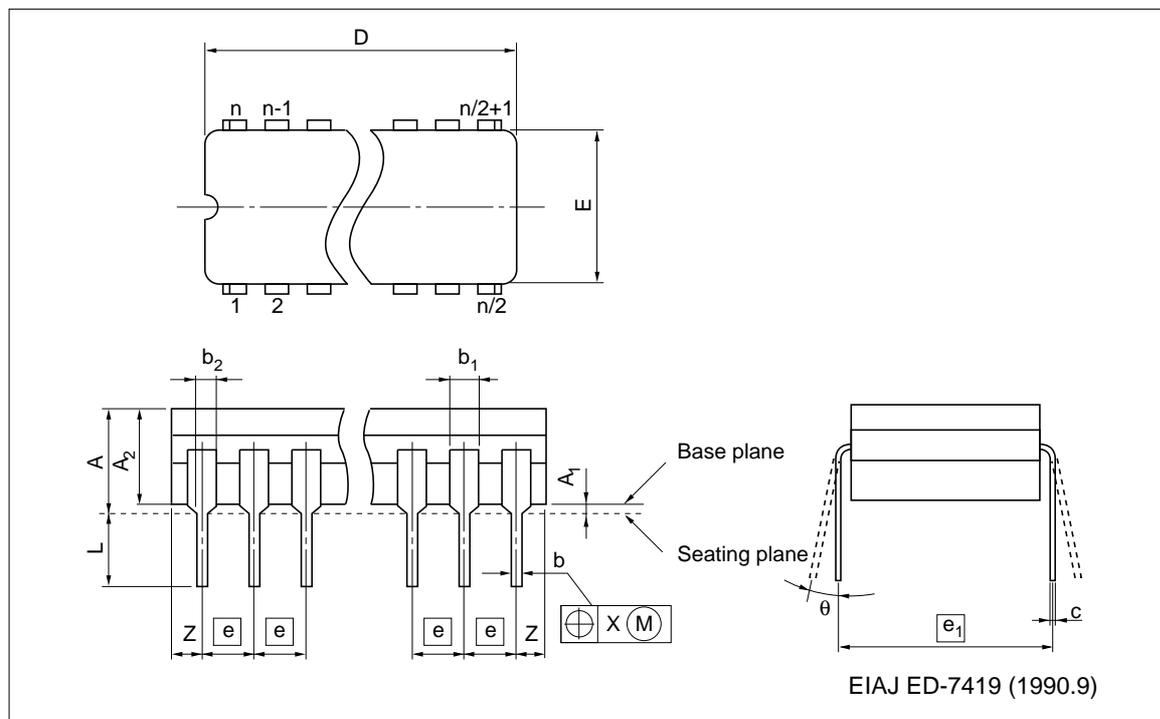
Introduction of Packages

1.3.2 Examples of Indications of Dimensions in Terms of External

(1) DIP

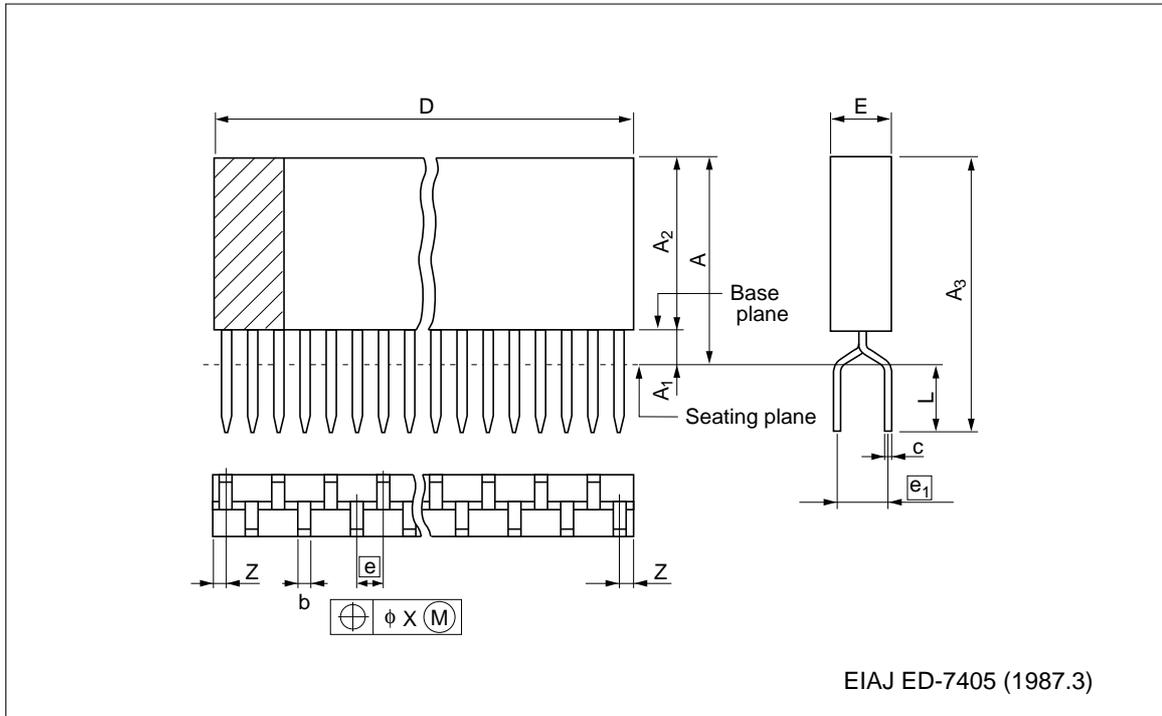


(2) DIP-G

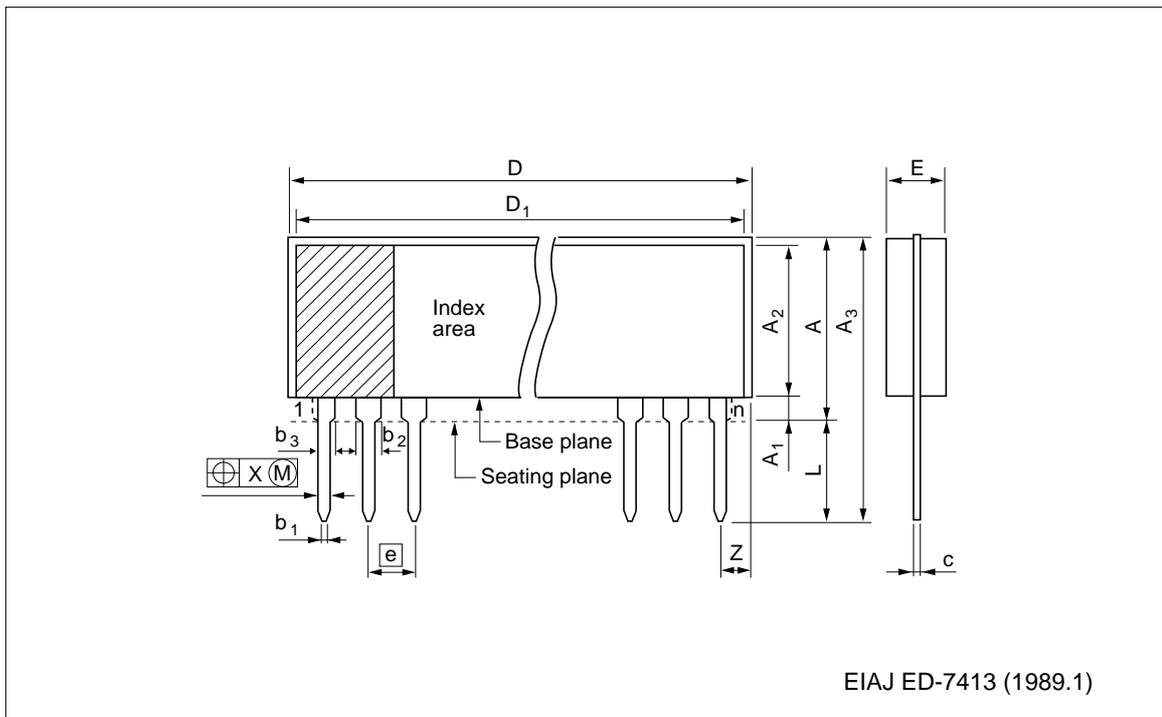


Introduction of Packages

(3) ZIP

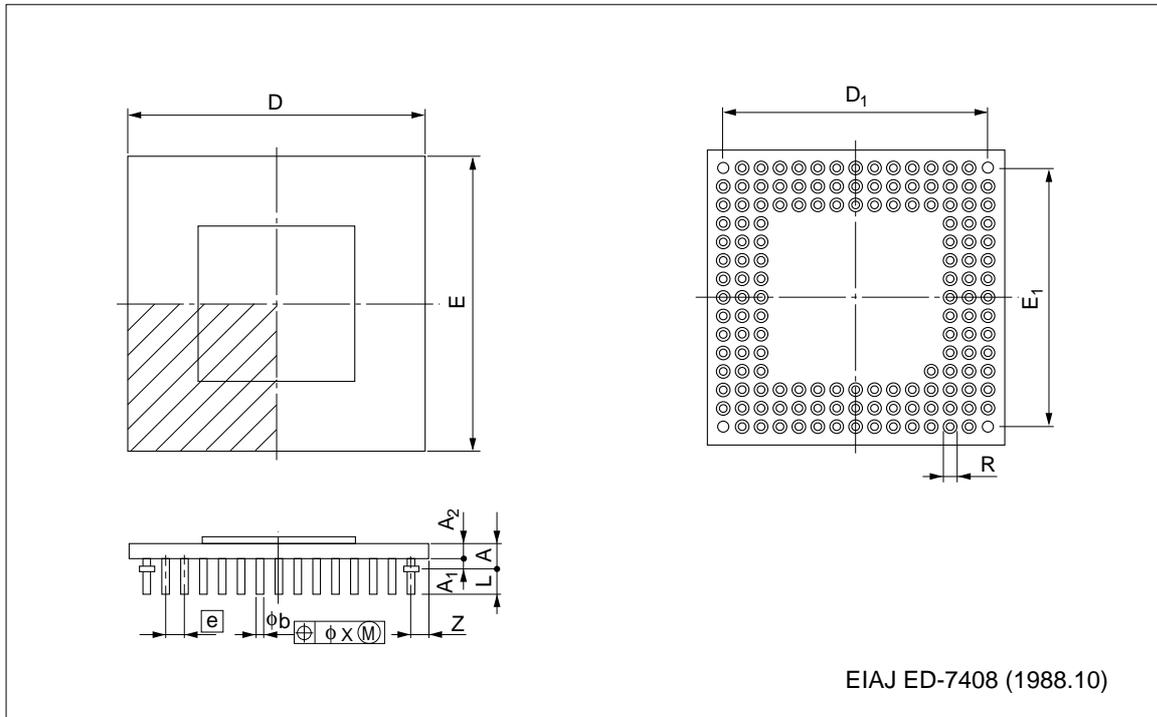


(4) SIP

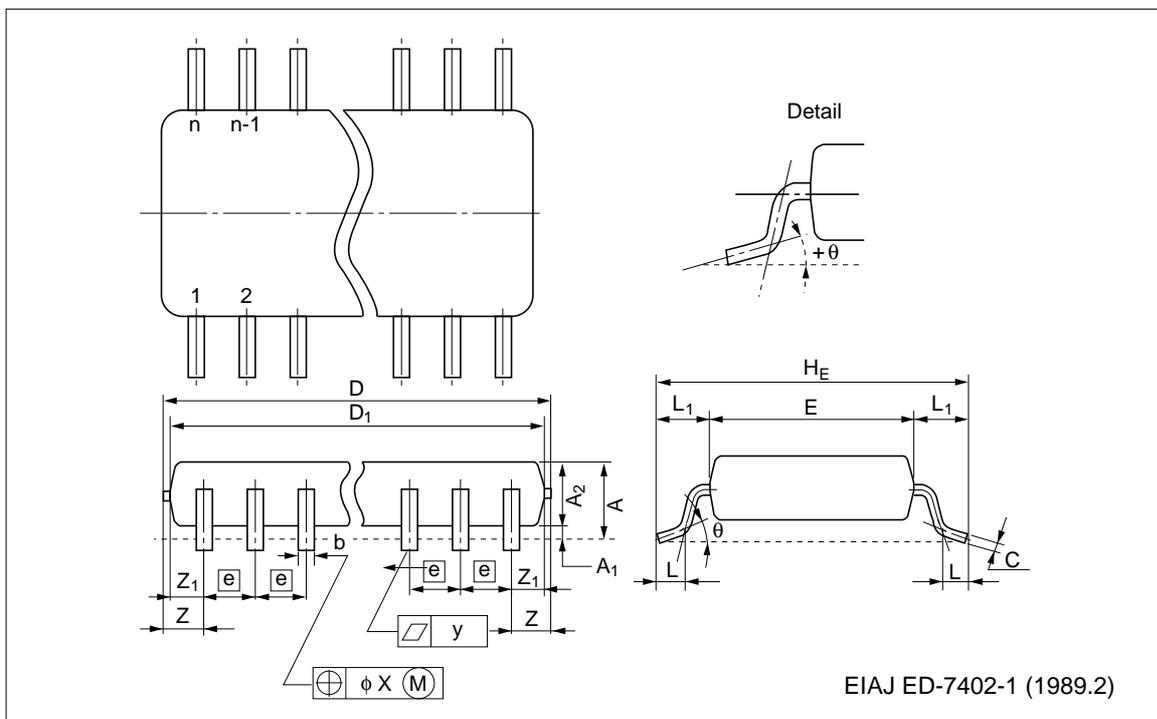


Introduction of Packages

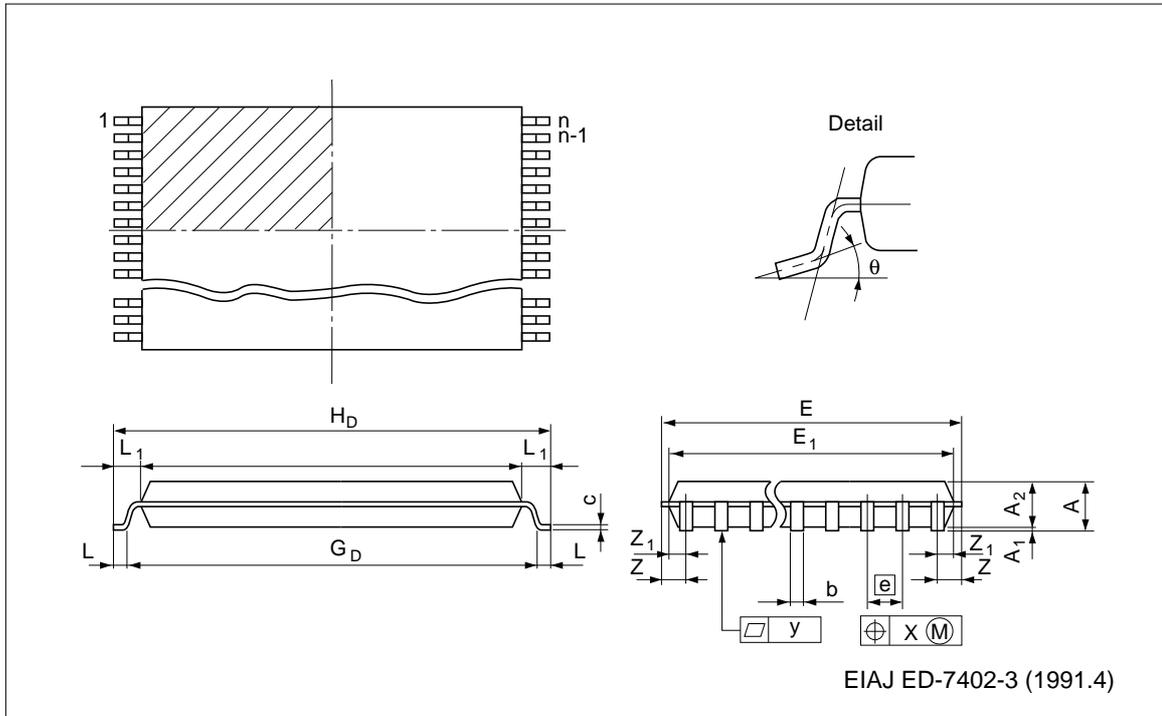
(5) PGA



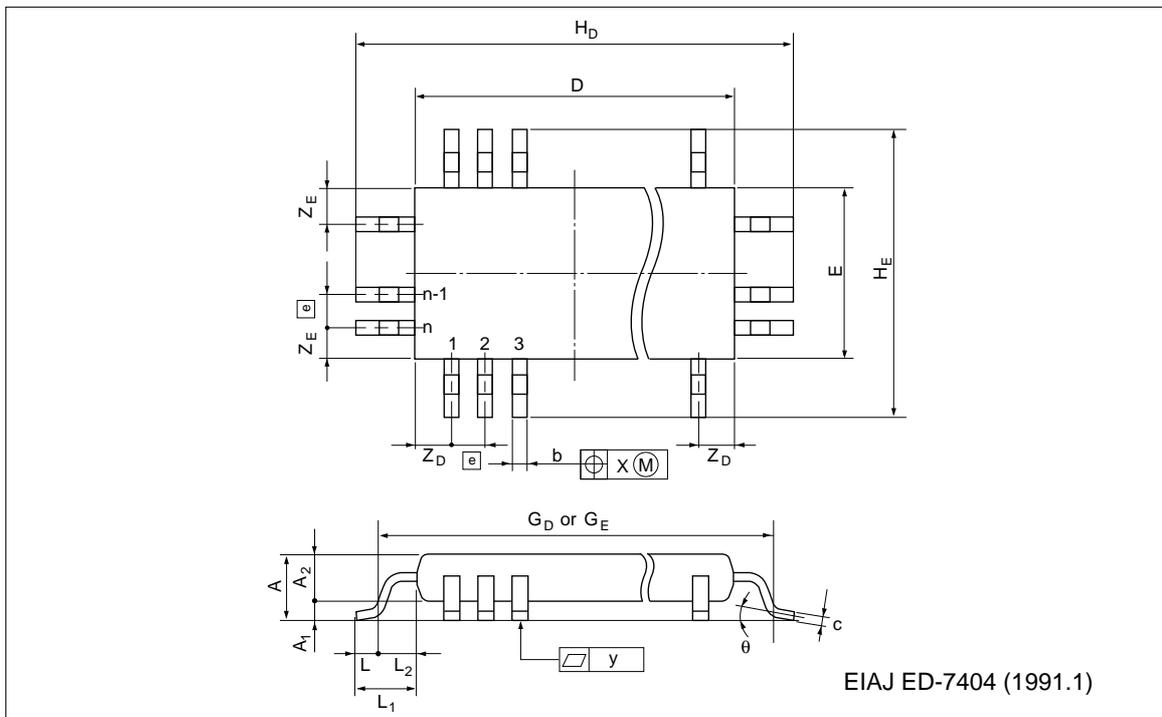
(6) SOP



(7) TSOP (I)

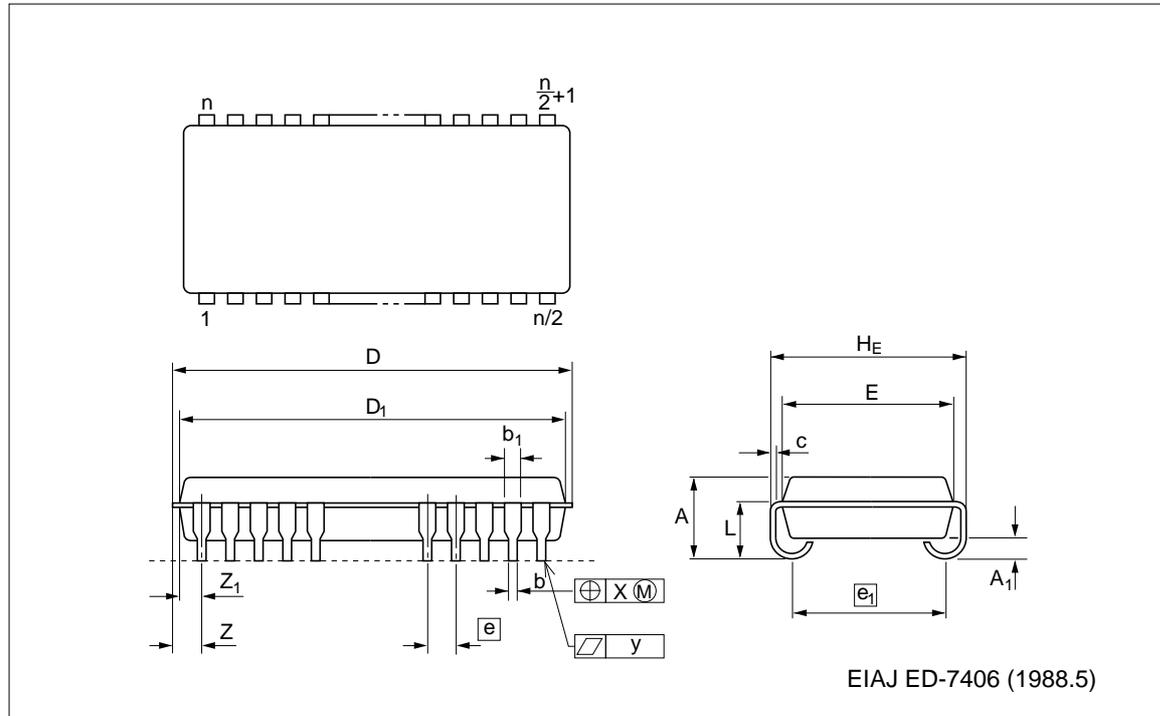


(8) QFP

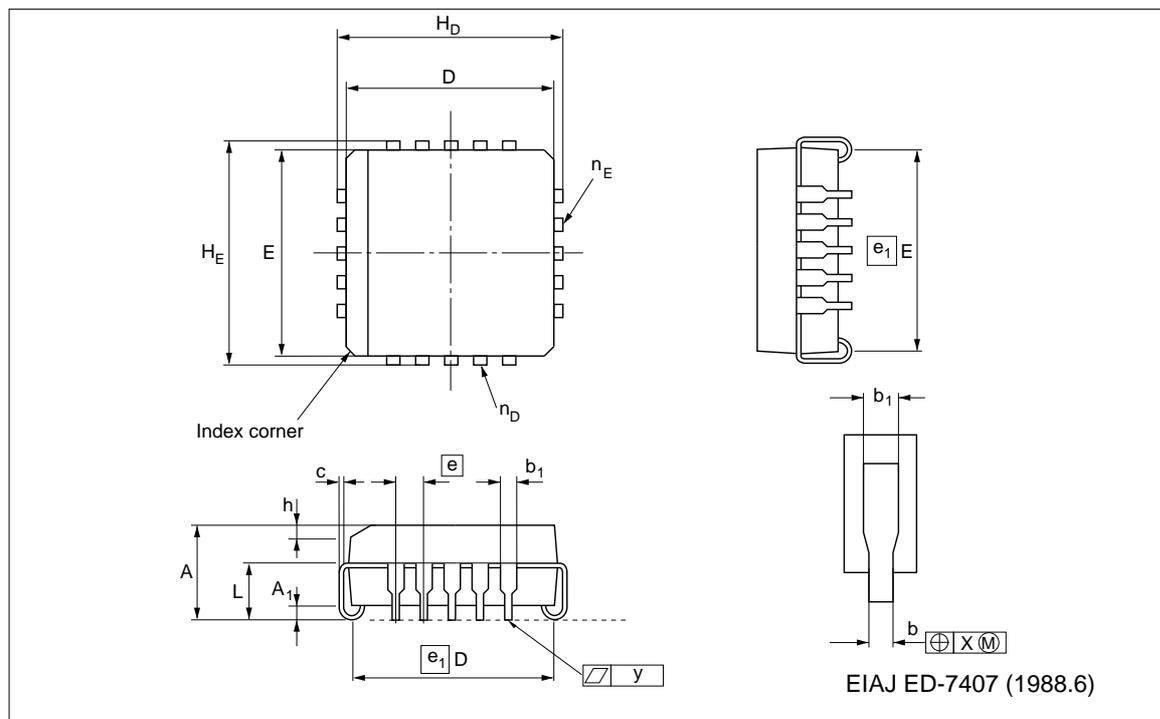


Introduction of Packages

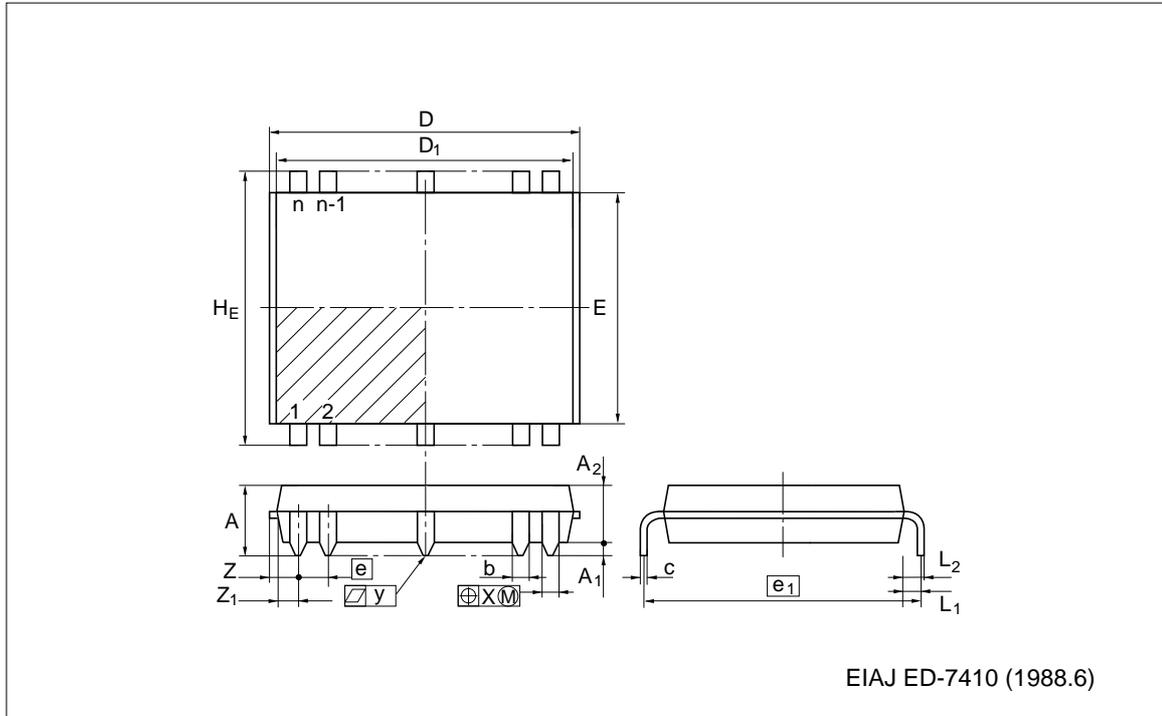
(9) SOJ



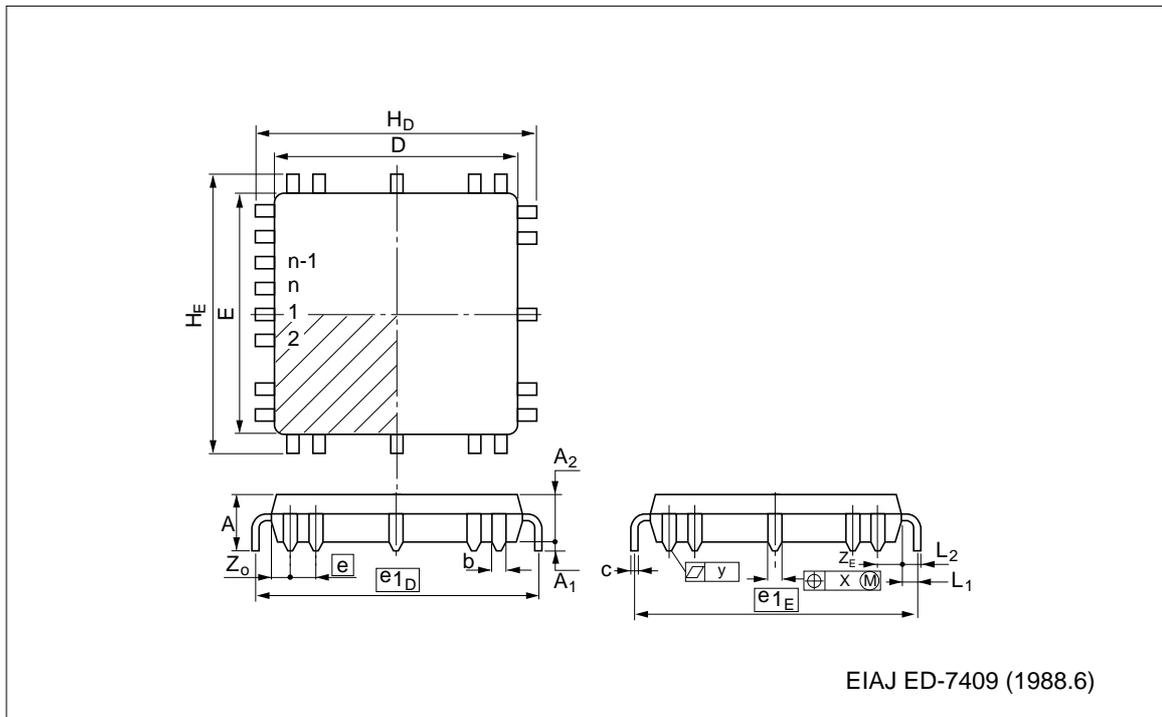
(10) QFJ (PLCC)



(11) SOI

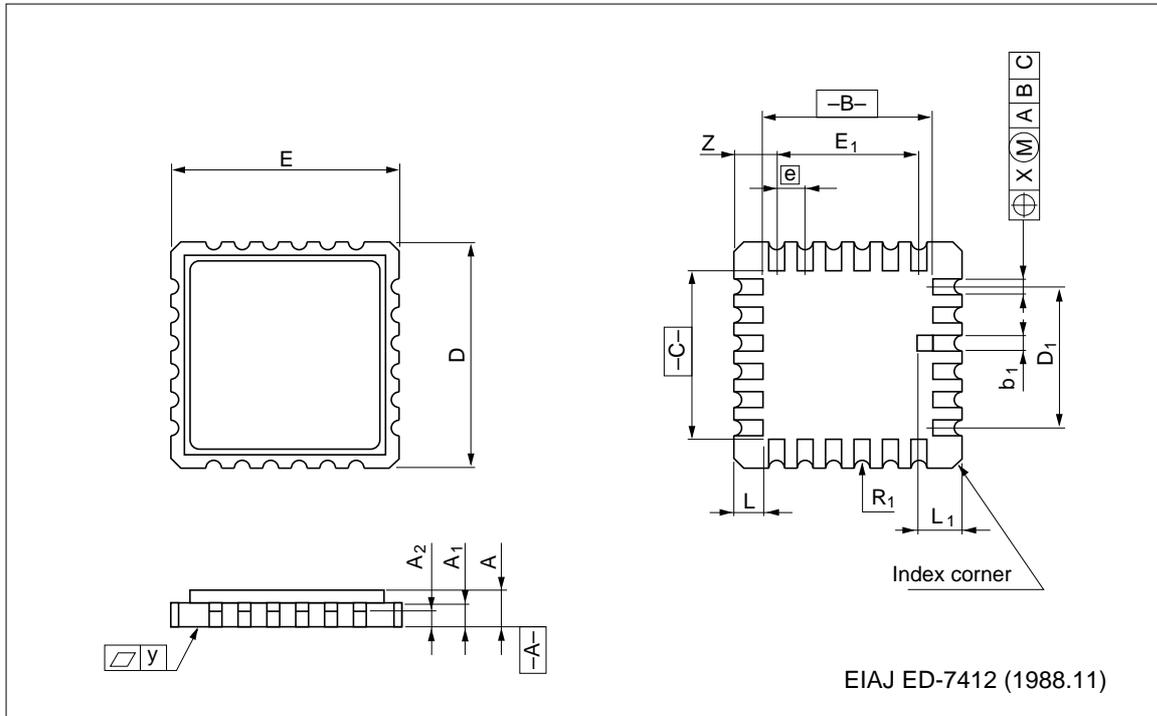


(12) QFI (MSP)



Introduction of Packages

(13) QFN (LCC)



1.4 Lineups in Terms of Shapes and Materials

1.4.1 IC Package

(1) Plastic DIP

Package Name	Nominal Size mm	Lead Pitch mm	Number of Pins																
			8	14	16	18	20	22	24	28	30	32	36	40	42	48	56	64	90
DIP	7.62	2.54	●	●	●	●	●	●	●	●	○								
	10.16					●	●	●	●										
	15.24					●		●	●		●	●	●	●	●				
	22.86																	●	
SDIP	7.62	1.778					●												
	10.16							●	●	●									
	15.24													●		●			
	19.05																●		
	22.86																	●	

(2) Cerdip

Package Name	Nominal Size mm	Lead Pitch mm	Number of Pins										
			8	14	16	18	20	22	24	28	32	40	42
DIP-G	7.62	2.54	●	●	●	●	●	●					
	10.16							●	●				
	15.24							●	●	●	●	●	

(3) Ceramic DIP

Package Name	Nominal Size mm	Lead Pitch mm	Number of Pins					
			24	28	40	42	48	64
DIP-C	15.24	2.54	●	●	●	●	●	
	22.86						●	
	19.05	1.778					●	

Note : ● Under mass production, ○ Under development

Introduction of Packages

(4) ZIP

Package Name	Nominal Size mm (mil)	Lead Pitch mm	Number of Pins							
			16	20	21	24	28	32	40	
ZIP	(325)	1.27	●							
		0.635		●						
	(350)	1.50	●							
	(400)	1.27		●	●	●	●			
	(475)	1.27				○		●	●	
		0.635								○

(5) SIP

Package Name	Nominal Size mm	Lead Pitch mm	Number of Pins								
			3	5	7	8	12	15	16	23	
SIP	—	2.54	●		●	●	●				
		1.778							●		
		1.70		●				●			
		1.50							●		
		1.27						●		●	

(6) Ceramic PGA

Package name	Cavity Direction	Nominal Size (mm)	Lead Pitch (mm)	Number of Pins										
				68	72	120	121	135	179	240	257	299	401	
PGA Conventional type	Upward	—	2.54	●	●	●	●	●	●	●				
	Downward	—	2.54			●		○			●	●		
				2.54 (Stagger)										●
Low thermal resistant type	Downward	—	2.54										○	
			2.54 (Stagger)											○

- Heat sink can be attached to standard and cavity down type PGA.
- Metal heat spreaders are built in low thermal resistant type PGA to reduce the thermal resistance.

Note : ● Under mass production, ○ Under development

Introduction of Packages

(7) SOP

Package name	Nominal Size (mm)	Mounting Height (mm)	Lead Pitch (mm)	Number of Pins															
				8	14	16	18	20	24	26	28	30	32	36	40	44	48	56	64
SOP	(*150)	1.75	1.27		●	●													
	(225)	2.03		●															
	(300)	2.20			●	●		●											
	(*300)	2.65						●											
	(375)	2.40					●	●											
	(450)	3.0								●									
	(*330)	2.50							●	●									
	(525)	3.0										●		●					
	(600)														●				
	HSOP	(300)	2.20	1.27			●		●										
(375)		3.0	0.8							●									
SSOP	(225)	1.10	0.65		●	●		●	●										
			0.5					○											
	(300)	1.20	0.5												○	○			
	(*300)	2.65	0.635													●	●		
	(375)	2.0	0.65									●							
	(525)	3.0	0.8												○		●		
	(600)																●		
(675)																●			
TSOP (I)	6 × 16	1.20	0.5					●											
	8 × 14											●							
	8 × 20							●				●							
TSOP (II)	(300)	1.20	1.27					●	○										
	(400)		1.27					●		●		●	○						
			0.8											●	●	○			
	(550)		0.8													●			

*: JEDEC

Note : ● Under mass production, ○ Under development

Introduction of Packages

(8) QFP

Package name	Body Size (mm)	Mounting Height (mm)	Lead Pitch (mm)	Number of Pins																											
				28	40	44	48	54	56	60	64	80	88	100	112	120	136	144	160	168	176	208	232	256	296	304	384				
QFP	7×7	1.70	0.65	●																											
			0.5		●																										
	10×10	2.54	0.65				●																								
			2.50							●																					
			1.70							●																					
	14×14	3.05	0.8		●					●																					
			0.65								●																				
			0.5										●																		
	14×20	3.10	1.0			●		●	●																						
			0.8								●																				
			0.65										●																		
	20×20	3.05	0.8								●																				
0.65													●																		
1.70																●															
0.4																											○				
24×24		0.5																								○					
28×28	3.56	0.8												●																	
		0.65																			●										
		0.5																				●									
		0.4																									○				
32×32		0.4																								○					
		0.3																									○				
28×40		0.5																								●					
40×40	4.36	0.65																													
		0.5																										○			
TQFP	12×12	1.20	0.5									●																			
	14×14		0.8		●								○																		
			0.65											●																	
			0.5												●																
			0.4																									○			
			0.3																									○			

Note : ● Under mass production, ○ Under development

Introduction of Packages

(8) QFP (cont)

Package name	Body Size (mm)	Mounting Height (mm)	Lead Pitch (mm)	Number of Pins																												
				28	40	44	48	54	56	60	64	80	88	100	112	120	136	144	160	168	176	208	232	256	296	304	384					
HQFP	7×7	1.70	0.65	●																												
	10×10	2.54	0.65						●																							
	14×14	3.05	0.65								●																					
				0.5										●																		
				1.20											●																	
	14×20	3.10	1.0								●																					
			0.8										●																			
	26×28	3.56	0.8																													
				0.65																												
				0.5																												
0.5																																
28×40		0.5																														

(9) SOJ Package

Package name	Body Size (mm)	Mounting Height (mm)	Lead Pitch (mm)	Number of Pins								
				20	24	28	30	32	36	40	44	
SOJ	(300)	3.76	1.27	●	●	●	○	○				
	(350)			●								
	(400)				●	●		●	○	●	○	

(10) QFJ (PLCC) Package

Package name	Body Size (mm)	Mounting Height (mm)	Lead Pitch (mm)	Number of Pins						
				18	32	44	52	68	84	
QFJ (PLCC)	Rectangle	3.56	1.27	●	●					
	Square	4.40				●	●	●	●	

Note : ● Under mass production, ○ Under development

Introduction of Packages

(11) SOI Package

Package name	Body Size (mm)	Mounting Height (mm)	Lead Pitch (mm)	Number of Pins	
				26	44
SOI	(375)	3.0	0.8		○
HSOI				●	

(12) QFI (MSP) Package

Package name	Body Size (mm)	Mounting Height (mm)	Lead Pitch (mm)	Number of Pins				
				18	28	44	56	68
QFI (MSP)	(300 × 300)	2.92	1.27	●				
		2.58		●				
	(430 × 460)	2.92	1.27		●			
		2.58			●			
			0.762			●		
	(500 × 600)	2.92	1.016			●		
			0.762				●	
	(800 × 800)	3.58	1.016					●
HQFI	(300 × 300)	2.92	1.27	●				
	(430 × 460)				●			
	(500 × 600)		1.016			●		

(13) Ceramic Surface-Mount Package

Package name	Body Size (mm)	Mounting Height (mm)	Lead Pitch (mm)	Number of Pins										
				20	22	24	28	40	44	64	68	80	84	132
QFP-G	14 × 20	3.10	1.0							●				
			0.8								●			
	24 × 24	4.0	0.635											●
QFJ-G	Square	4.80	1.27						●					
		4.68									○		○	

Note : ● Under mass production, ○ Under development

Introduction of Packages

(14) QFN (LCC) Package

Package name	Body Size (mm)	Mounting Height (mm)	Lead Pitch (mm)	Number of Pins													
				20	22	24	28	40	44	64	68	80	84	132			
QFN	—	4.03	1.27													●	
		2.45					●										
		2.25					●										
		2.20		●													
		2.11					●										
		2.35		1.016					●								

Note : ● Under mass production, ○ Under development

Definitions of Nominal Size

Package	Definition	Unit	Package	Definition	Unit
SOP	Distance between centers of pads used to mount the package (EIAJ)	mil	SOJ	Width of package body	mil
HSOP			HSOJ		
	Width of package body (JEDEC)				
TSOP(I)	Width of package body × Length of package body	mm	QFI	Distance between centers of lead rows	mil
TSOP(II)	Width of package body	mil	SOI	Distance between centers of lead rows	mil
QFP	Width of package body × Length of package body	mm	QFI		
TQFP					

Introduction of Packages

1.4.2 Transistors

The various surface mount transistor packages provided by Hitachi are listed below.

(1) Low-Frequency Transistors

Package	Max. Current Rating (A)										
	0.02	0.05	0.1	0.2	0.5	1	2	5	10	20	50
CMPAK	●	●	●	●							
MPAK	●	●	●	●	●	●					
UPAK		●	●			●	●				
DPAK			●			●	●	●	●		
LDDPAK							●	●	●	●	●
HDDPAK								○		●	

Note : ● Under mass production, ○ Under development

(2) High-Frequency Transistors

Package	Operation Frequency or Transition Frequency (GHz)							
	0.1	0.2	0.5	1	2	5	10	20
CMPAK		●	●	●	●	●	●	●
MPAK		●	●	●	●	●	●	●
MPAK-4			●	●	●		●	●
UPAK						●	●	●
FPAK			●	●	●	●	●	●

Note : ● Under mass production

Introduction of Packages

1.5 Package List

1.5.1 IC Package

Package Name	Material	Nominal Size mm (mil)	Number of Pins	Lead Pitch mm	Package Code	Ref. Page
DIP	Plastic	7.62	8	2.54	DP-8	53
			14		DP-14	54
					DP-14T	54
			16		DP-16	55
					DP-16A	56
					DP-16B	56
					DP-16C	57
			18		DP-16-2	55
					DP-18	57
					DP-18A	58
					DP-18B	58
					DP-18C	59
			20		DP-20N	60
					DP-20NA	60
			22		DP-22N	62
					DP-22NA	62
					DP-22NB	63
			24		DP-24N	65
					DP-24NA	65
					DP-24NC	66
			28		DP-28N	68
					DP-28NA	68
			10.16		DP-20	59
					DP-22	61
					DP-24A	64
					DP-28C	67
			15.24		DP-20T	61

Introduction of Packages

IC Package (cont)

Package Name	Material	Nominal Size mm (mil)	Number of Pins	Lead Pitch mm	Package Code	Ref. Page
DIP	Plastic	15.24	24	2.54	DP-24	64
			28		DP-28	67
			32		DP-32	70
			36		DP-36	70
			40		DP-40	71
			42		DP-42	71
			48		DP-48	73
			22.86		DP-64	74
SDIP	Plastic	7.62	22	1.778	DP-22NS	63
		10.16	24		DP-24TS	66
			28		DP-28S	69
			30		DP-30S	69
		15.24	42		DP-42S	72
					DP-42SA	72
			56		DP-56S	73
		19.05	64		DP-64S	75
22.86	90	1.78	DP-90S	76		
DIP-G	Ceramic	7.62	8	2.54	DG-8	77
			14		DG-14	77
					DG-14A	78
			16		DG-16	78
					DG-16A	79
					DG-16B	79
					DG-16C	80
			18		DG-18	80
			20		DG-20N	81
					DG-20NA	81
22	DG-22N	82				

Introduction of Packages

IC Package (cont)

Package Name	Material	Nominal Size mm (mil)	Number of Pins	Lead Pitch mm	Package Code	Ref. Page
DIP-G	Ceramic	7.62	24	2.54	DG-24V	85
			24		DG-24N	84
		10.16	28	DG-24NA	85	
			24	DG-28N	87	
		15.24	24	DG-24	82	
				DG-24A	83	
				DG-24B	83	
				DG-24C	84	
			28	DG-28	86	
				DG-28B	86	
			32	DG-32	87	
				DG-32A	88	
			40	DG-40	88	
				DG-40A	89	
			DG-40B	89		
			42	DG-42	90	
DIP-C	Ceramic	15.24	24	2.54	DC-24	91
			28		DC-28	91
			40		DC-40	92
					DC-40A	92
					DC-40P	93
			42		DC-42	93
					DC-42P	94
			48		DC-48	94
22.86	64	DC-64	95			
SDIP-C	Ceramic	19.05	64	1.778	DC-64S	96
					DC-64SP	96
ZIP	Plastic	(325)	16	1.27	ZP-16	97

Introduction of Packages

IC Package (cont)

Package Name	Material	Nominal Size mm (mil)	Number of Pins	Lead Pitch mm	Package Code	Ref. Page
ZIP	Plastic	(400)	20	1.27	ZP-20	97
				0.635	ZP-20ST	98
		(475)	21	1.27	ZP-21	98
			24		ZP-24	99
			28		ZP-28	100
			24		ZP-24A	99
			32		ZP-32	100
			40		ZP-40	101
SIP	Plastic	—	3	2.54	SP-3T	102
			5	1.7	SP-5T	102
					SP-5TA	103
			7	2.54	SP-7	103
			8		SP-8	104
			12		SP-12T	104
			15	1.27	SP-15TA	105
					SP-15TB	105
					SP-15TC	106
			16	1.5	SP-16	106
				1.778	SP-16TA	107
			23	1.27	SP-23TA	107
					SP-23TB	108
					SP-23TC	108
SP-23TD	109					
PGA	Ceramic	—	68	2.54	PC-68	110
			72		PC-72	110
			120		PC-120	111
			121		PC-121	111
			135		PC-135	112

Introduction of Packages

IC Package (cont)

Package Name	Material	Nominal Size mm (mil)	Number of Pins	Lead Pitch mm	Package Code	Ref. Page
PGA	Ceramic	—	179	2.54	PC-179	112
			240		PC-240	113
			257		PC-257	114
			299		PC-299	115
					PC-299A	116
					PC-299AT	117
			401		PC-401	118
SOP	Plastic	(150)*1	14	1.27	FP-14DN	120
			16		FP-16DN	121
			(225)		FP-8D	119
			(300)		FP-14DA	119
			16		FP-16DA	120
			20		FP-20DA	121
			24		FP-24DA	123
					FP-24DS	123
			(375)		FP-20DB	122
			(450)		FP-24D	122
			28		FP-28D	124
					FP-28DA	125
			(525)		FP-32D	126
			40		FP-40D	127
			(600)		FP-44D	127
SSOP	Plastic	(225)	14	0.65	TTP-14D	134
			16		TTP-16DA	135
			20		TTP-20DA	136
			24		TTP-24DB	138

Note: 1. JEDEC

Introduction of Packages

IC Package (cont)

Package Name	Material	Nominal Size mm (mil)	Number of Pins	Lead Pitch mm	Package Code	Ref. Page
SSOP	Plastic	(375)	30	0.65	FP-30D	125
					FP-30DB	126
		(400)	48	0.635	FP-48DSA	129
					FP-56DS	129
		(450)	26	0.8	FP-26DT	124
		(500)	64		FP-64DS	130
		(600)	48		FP-48DA	128
		(675)			FP-48D	128
TSOP(I)	Plastic	6×16	20	0.5	TFP-20D/DR	130
		8×14	32		TFP-32DA/DAR	133
		8×20	20		TFP-20DA/DAR	131
		8×20	32		TFP-32D/DR	132
TSOP(II)	Plastic	(300)	20	1.27	TTP-20D/DR	135
			24		TTP-24DA	137
		(400)	24	TTP-24D/DR	137	
			28	TTP-28D/DR	138	
				TTP-28DA	139	
			32	TTP-32D/DR	140	
				TTP-32DA	141	
				TTP-32DB	141	
			36	TTP-36D	142	
				TTP-36DA	142	
			40	0.8	TTP-40DA/DAR	143
					TTP-40DB	144
			44		TTP-44D	144
					TTP-44DB/DBR	145
			TTP-44DC	146		
			TTP-44DE	146		

Introduction of Packages

IC Package (cont)

Package Name	Material	Nominal Size mm (mil)	Number of Pins	Lead Pitch mm	Package Code	Ref. Page
TSOP(II)	Plastic	(400)	50	0.8	TTP-50D	147
		(550)	48		TTP-48D	147
QFP	Plastic	7×7	40	0.65	FP-40	148
			48	0.5	FP-48	149
		10×10	56	0.65	FP-56	151
			64	0.5	FP-64C	154
					FP-64E	154
		14×14	44	0.8	FP-44A	149
			64		FP-64A	153
			80	0.65	FP-80A	155
			100	0.5	FP-100B	158
		14×20	54	1.0	FP-54	150
					FP-54A	150
			60		FP-60	151
					FP-60A	151
			64		FP-64	152
					FP-64B	153
			80	0.8	FP-80	155
					FP-80B	156
			100	0.65	FP-100	157
					FP-100A	157
		20×20	128	0.50	FP-128	159
88	0.8		FP-88	156		
112	0.65		FP-112	158		
24×24	144	0.5	FP-144A	160		
	176		FP-176	162		
28×28	136	0.8	FP-136	159		
			FP-136A	160		

Introduction of Packages

IC Package (cont)

Package Name	Material	Nominal Size mm (mil)	Number of Pins	Lead Pitch mm	Package Code	Ref. Page
QFP	Plastic	28×28	160	0.65	FP-160A	161
			168		FP-168	161
			208	0.5	FP-208	162
			256	0.4	FP-256C	164
		28×40	256	0.5	FP-256	163
		32×32	296	0.4	FP-296	165
			384	0.3	FP-384	166
		40×40	232	0.65	FP-232	163
			304	0.5	FP-304	165
		TQFP	Plastic	12×12	80	0.5
TFP-80C	168					
14×14	44			0.8	TFP-44	166
	64				TFP-64	167
	80			0.65	TFP-80	167
					TFP-80F	169
	100			0.5	TFP-100	169
					TFP-100B	170
	120			0.4	TFP-120	170
	168			0.3	TFP-168	171
HQFP	Plastic	7×7	28	0.65	FP-28T	148
		28×40	256	0.5	FP-256T	164
SOJ	Plastic	(300)	20	1.27	CP-20D	172
			24		CP-24D	173
					CP-24DB	174
			28		CP-28DN	175
			32		CP-32DN	177
		(350)	20		CP-20DA	172
		(400)	24		CP-24DA	173

Introduction of Packages

IC Package (cont)

Package Name	Material	Nominal Size mm (mil)	Number of Pins	Lead Pitch mm	Package Code	Ref. Page	
SOJ	Plastic	(400)	28	1.27	CP-28D	174	
					CP-28DA	175	
			32		CP-32D	176	
					CP-32DB	176	
			36		CP-36D	177	
			40		CP-40D	178	
					CP-40DA	178	
			42		CP-42D	179	
			44		CP-44D	179	
			QFJ		Plastic	—	18
32	CP-32	180					
44	CP-44	181					
52	CP-52	181					
68	CP-68	182					
84	CP-84	182					
Ceramic	44	CC-44		183			
	68	CC-68		183			
	84	CC-84		184			
	SOI	Plastic		(375)	26		0.8
	QFI	Plastic	(300×300)	18	1.27	MP-18	186
				MP-18A		186	
(430×460)			28		MP-28	187	
				MP-28A	187		
44			0.762	MP-44S	189		
(500×600)			1.016	MP-44T	188		
56	0.762	MP-56S	189				
HQFI	Plastic	(300×300)	18	1.27	MP-18T	186	
		(430×460)	28		MP-28T	188	

Introduction of Packages

IC Package (cont)

Package Name	Material	Nominal Size mm (mil)	Number of Pins	Lead Pitch mm	Package Code	Ref. Page		
DFP	Ceramic	—	20	1.27	FG-20D	190		
			28		FG-28D	192		
			22	0.762	FG-22D	190		
			24		FG-24D	191		
			28		FG-28DA	192		
							FG-28DB	193
					32		FG-32D	193
FPG	Ceramic	—	24	1.27	FG-24	191		
			14×20	64	1.0	FG-64B	194	
			14×20	80	0.8	FG-80A	194	
			24×24	132	0.635	FG-132	195	
QFN	Ceramic	7.37×10.8	20	1.27	CG-20	196		
		7.39×12.45	22		CG-22A	196		
		7.62×10.16	24	CG-24	197			
		8.6×11.8	28	CG-28	197			
		9.45×12.65		CG-28A	198			
		9.55×15.35		CG-28B	198			
		12.19×12.19	40	1.016	CG-40	199		
		29.2×29.2	84	1.27	CG-84/84A	199		

1.5.2 Pin Insertion Type Discrete Package

Package Classification	Package Material	Package Code	Ref. Page
Transistor	Plastic	TO-3P	200
		TO-3PFM	201
		SPAK	202
		TO-92 (1)	202
		TO-92 (2)	203
		TO-92Mod	203

1.5.2 Pin Insertion Type Discrete Package (cont)

Package Classification	Package Material	Package Code	Ref. Page
Transistor	Plastic	TO-126FM	204
		TO-126Mod	204
		TO-220AB	205
		TO-220FM	205
	Can	RFAK-A	206
		RFAK-B	206
Transistor Array	Plastic	SP-10	249
		SP-12	249
		SP-12TA	250
Diode	Plastic	SIP	221
		DIP-M	222
		DO-201AD	220
		TO-220AB	205
		TO-220FM	205
	Glass	DO-41	217
		DO-41Mod	217
		DO-35	216
		DO-34 (MHD)	216
	UMD	216	

1.5.3 Surface Mount Type Discrete Package

Package Classification	Package Material	Package Code	Ref. Page
Transistor	Plastic	CMPAK	207
		CMPAK-4	207
		MPAK (2)	208
		MPAK-4	208
		UPAK	209

Introduction of Packages

1.5.3 Surface Mount Type Discrete Package (cont)

Package Classification	Package Material	Package Code	Ref. Page
Transistor	Plastic	LDBAK (L)	209
		LDBAK (S)	210
		DPAK (L)	210
		DPAK-2(L)	211
		DPAK (S)	211
		FPAK	212
		μFPAK (L)	213
		μFPAK (S)	213
		CFPAK (L)	214
		CFPAK (S)	214
		HDBAK(L)	215
		HDBAK(S)	215
		Diode	Plastic
CMPAK	221		
MOP	219		
LRP	220		
SRP	218		
URP	218		
ERP	218		
DIP-S	222		
SSP	219		
Glass	LLD		217

Introduction of Packages

1.5.4 Hybrid IC Package

Package Name	Material	Nominal Size mm (mil)	Number of Pins	Lead Pitch mm	Package Code	Ref. Page
SIP	Plastic	—	6	Special	RF-A	242
			4		RF-B	243
			4		RF-B1	243
			4		RF-B2	244
			4		RF-B3	244
			5		RF-C	245
	Metal Cap	4	RF-E	245		
	Plastic	5	RF-F	246		
	Metal Cap	5	RF-G	246		
Power Module	Plastic	—	8	Special	LF-C	247
			8		LF-F	247
			7		LF-J	248
			7		LF-K	248
QFP	Plastic	28 × 28	160	0.65	FP-160	251
			208	0.5	FP-208	251
COB		—	8	(ISO)	—	252

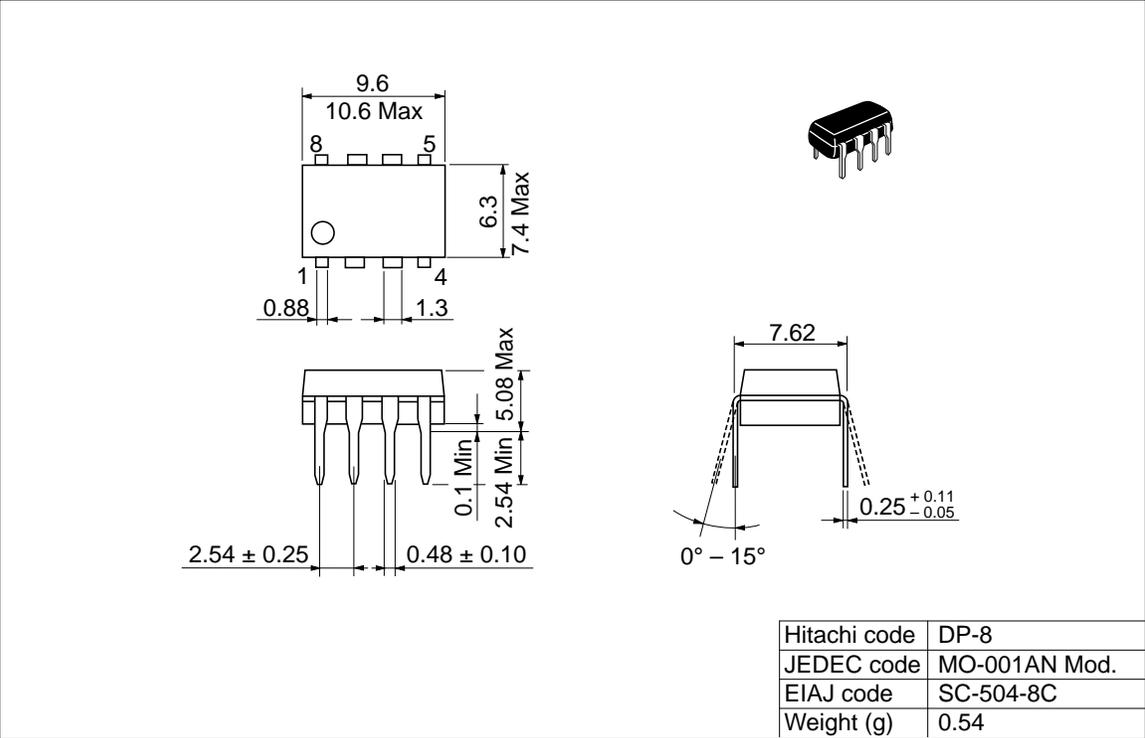
Section 2 Package Outline Dimensions

2.1 IC Package

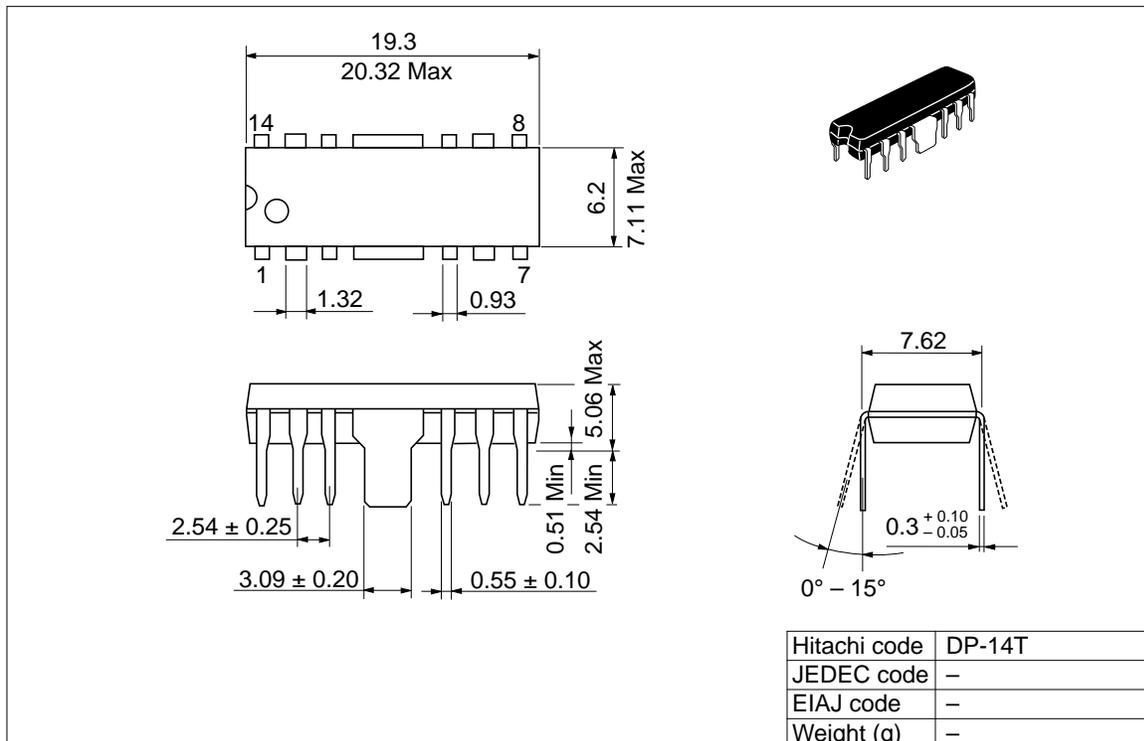
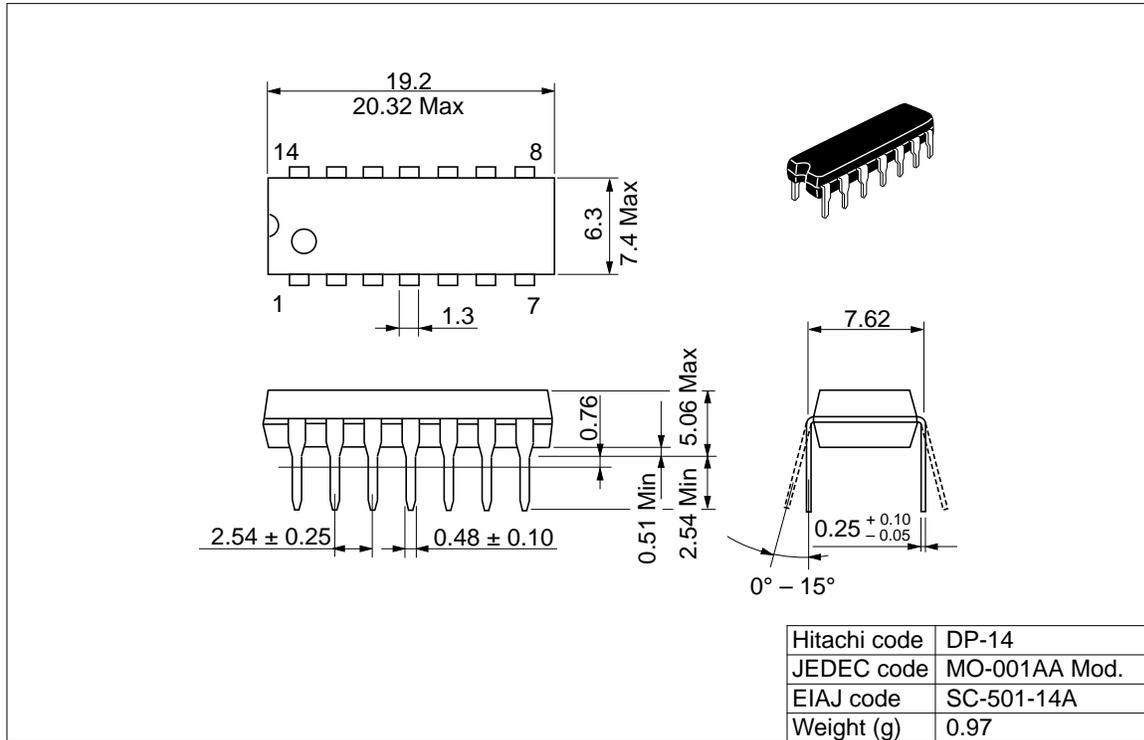
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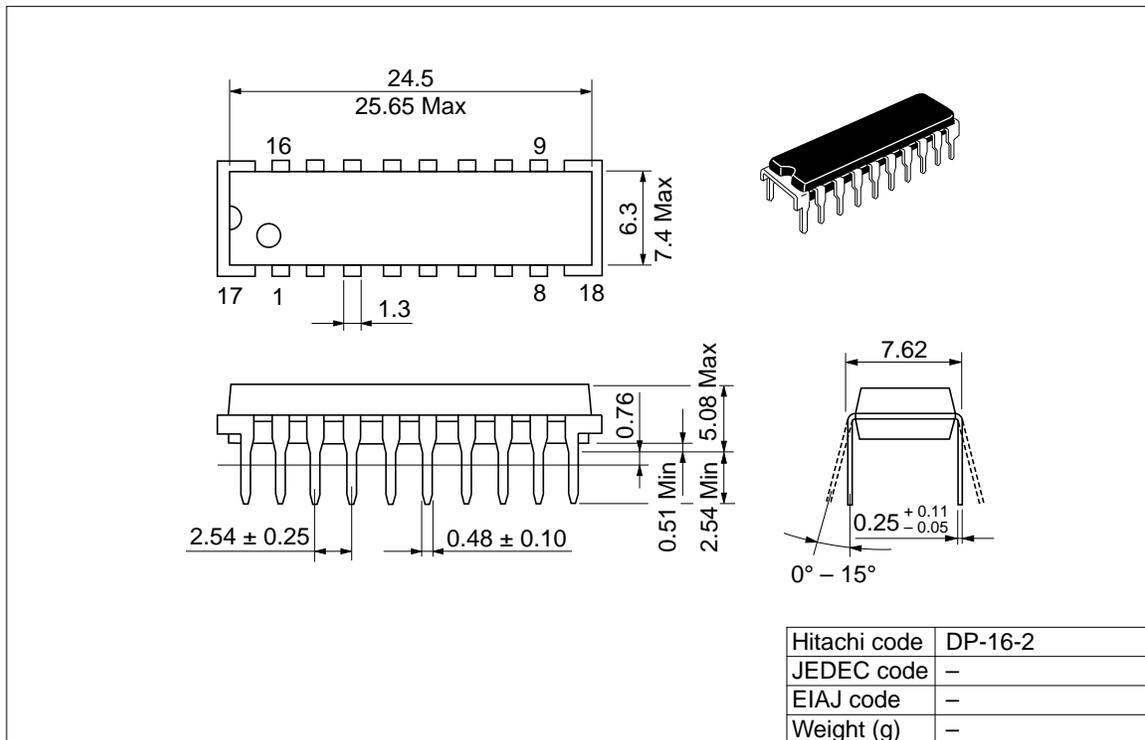
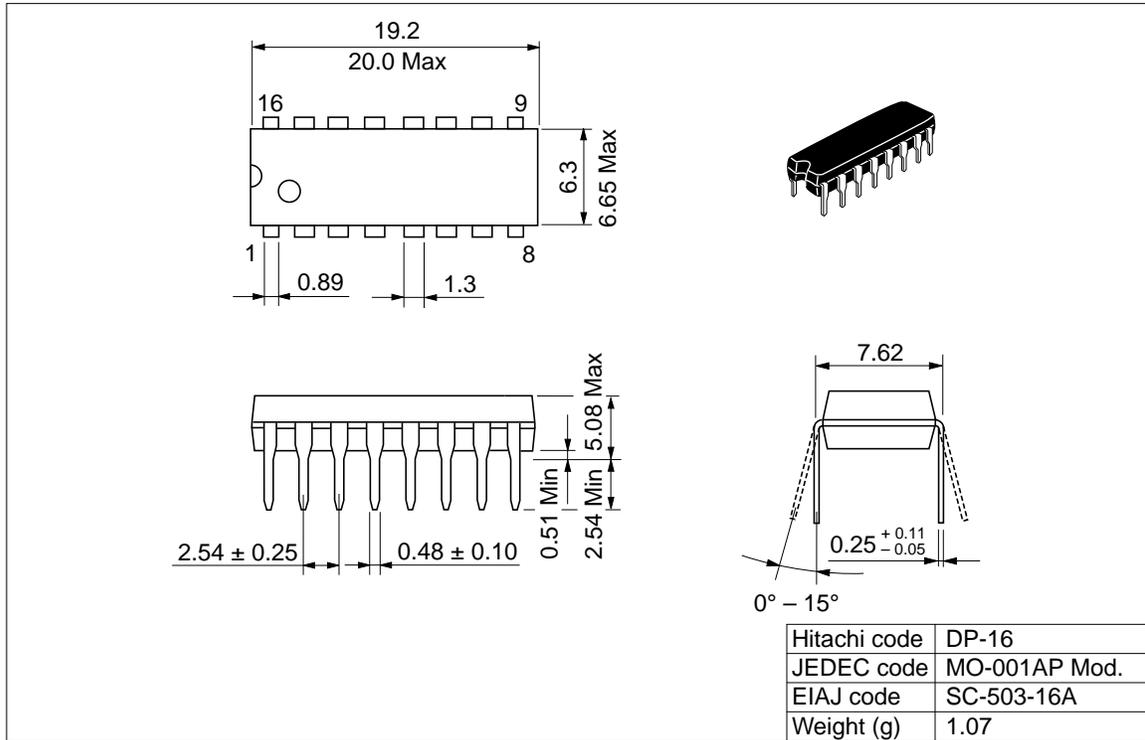
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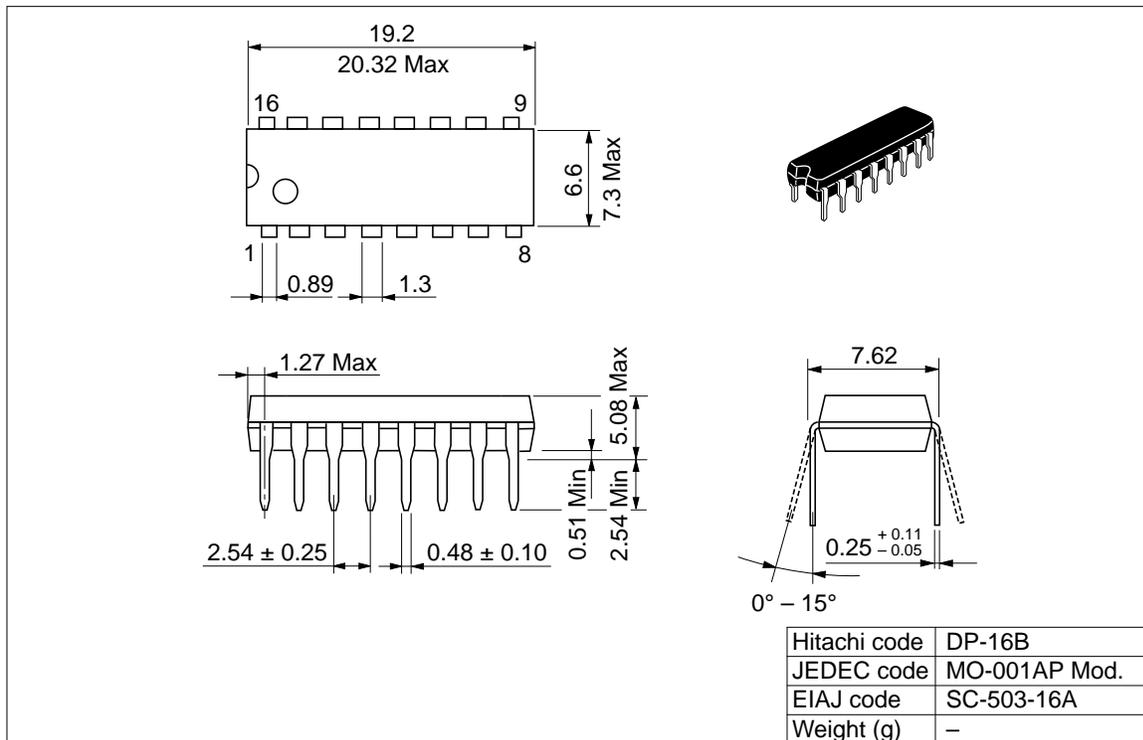
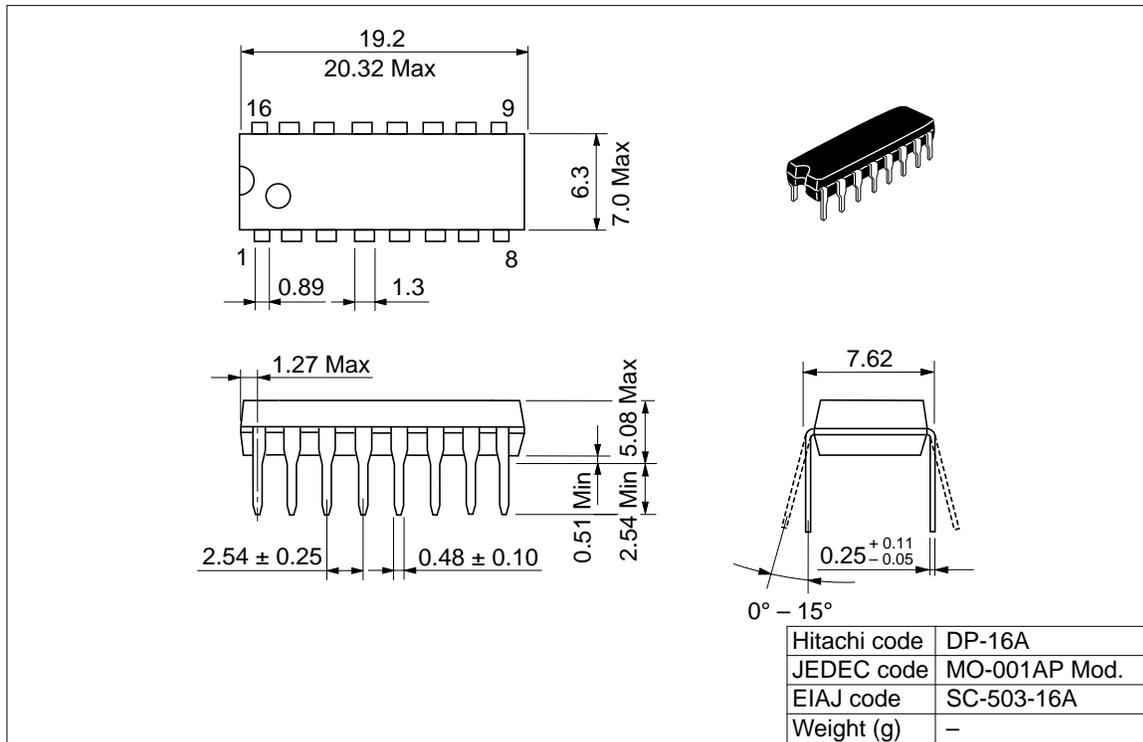
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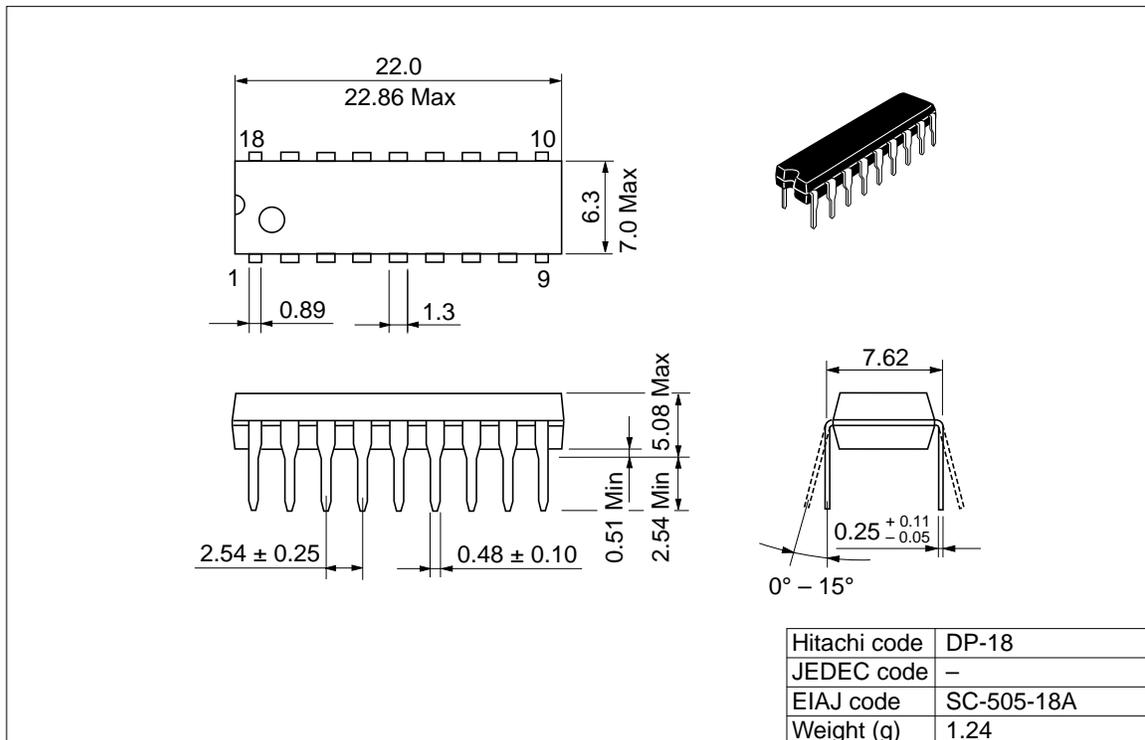
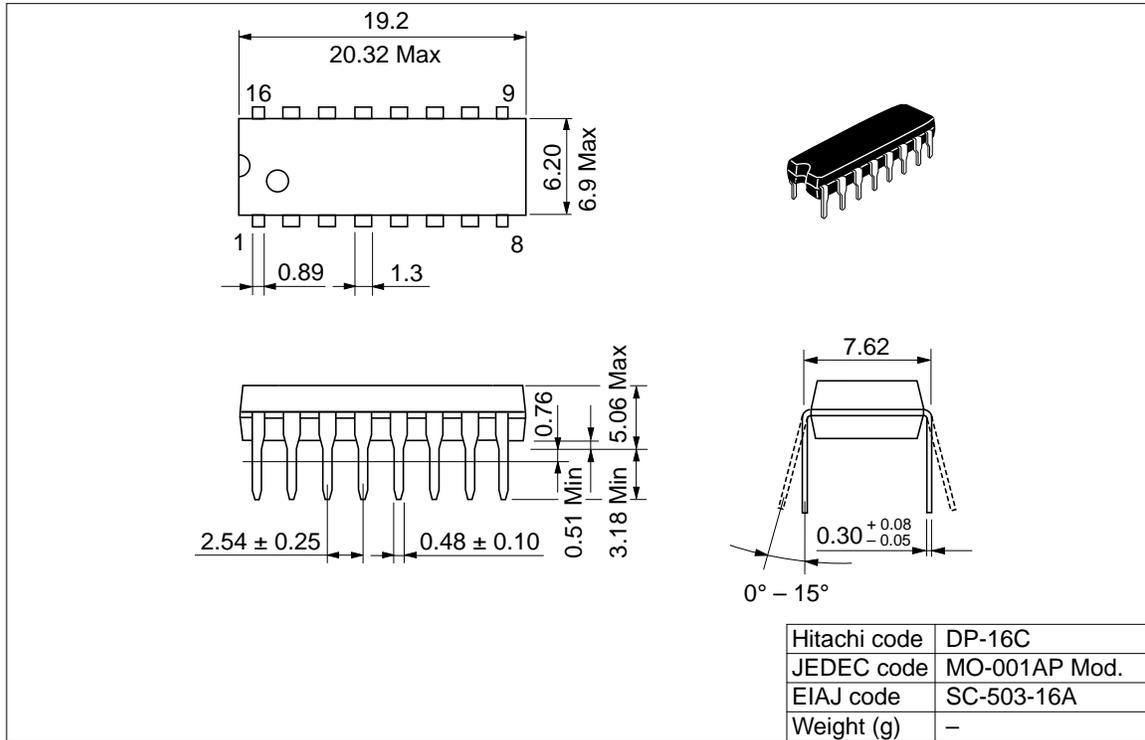
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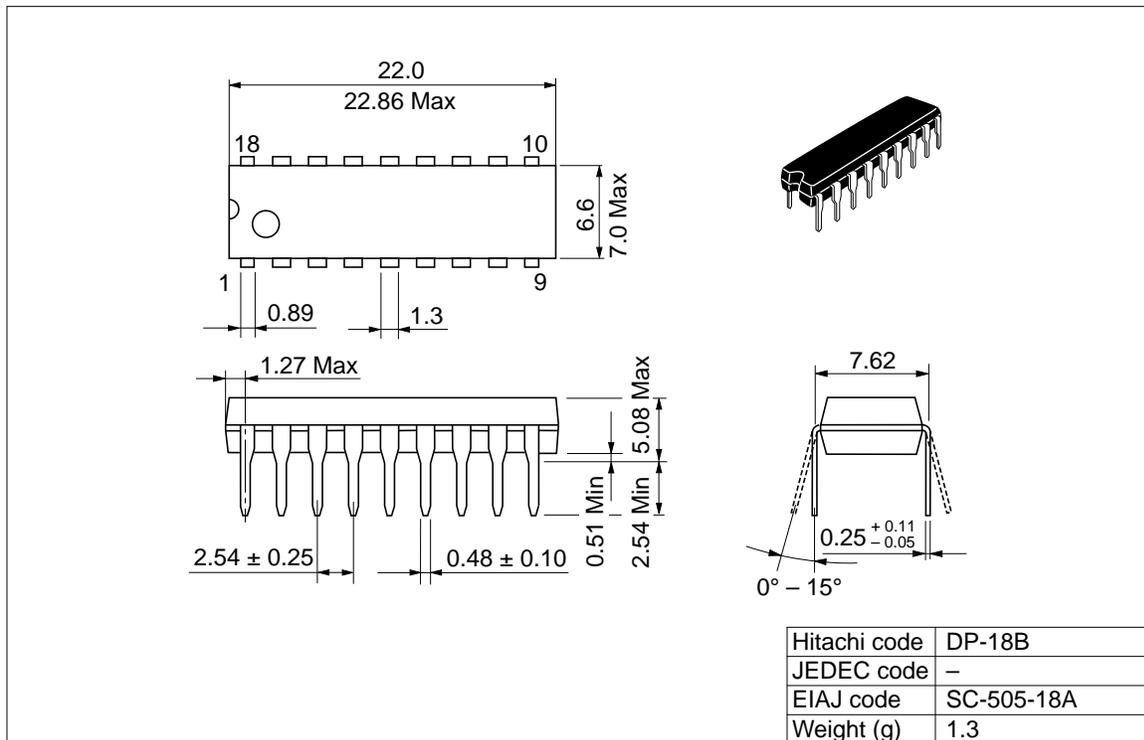
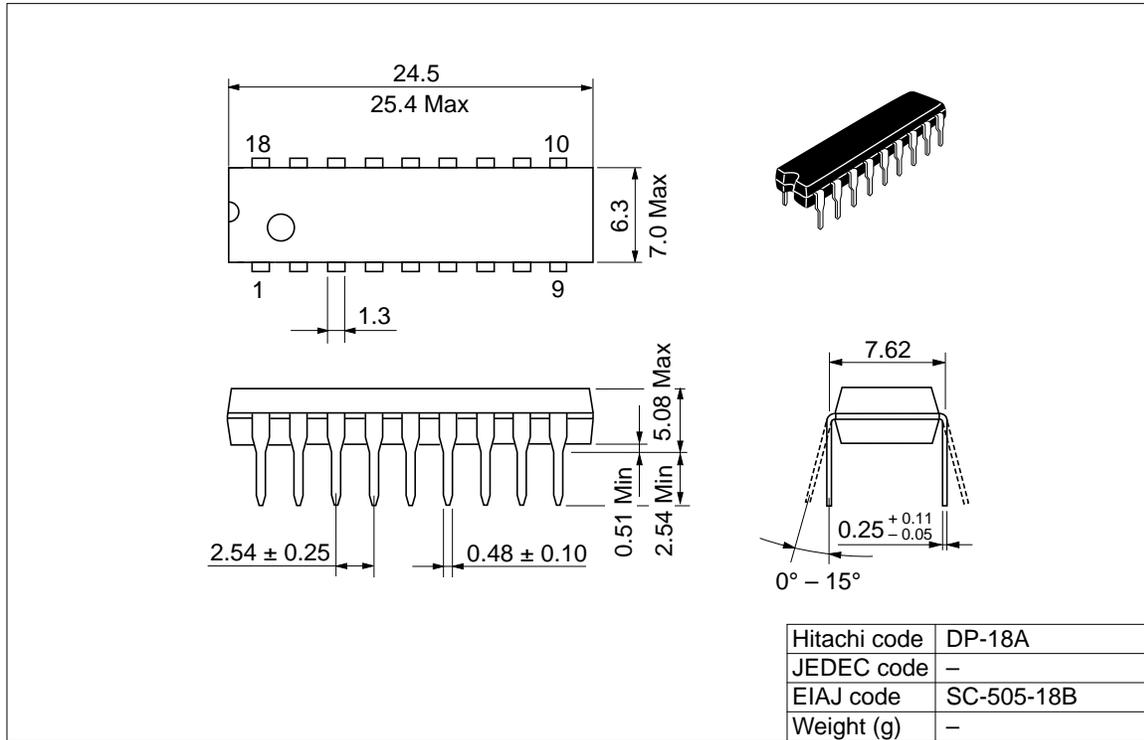
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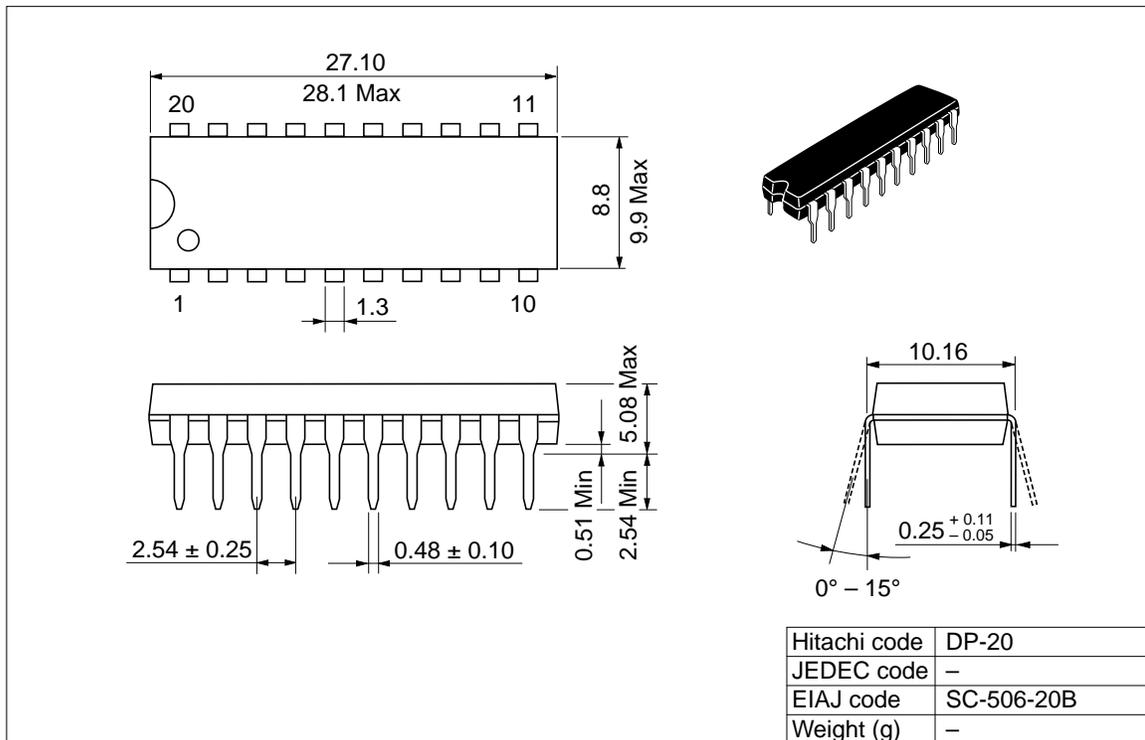
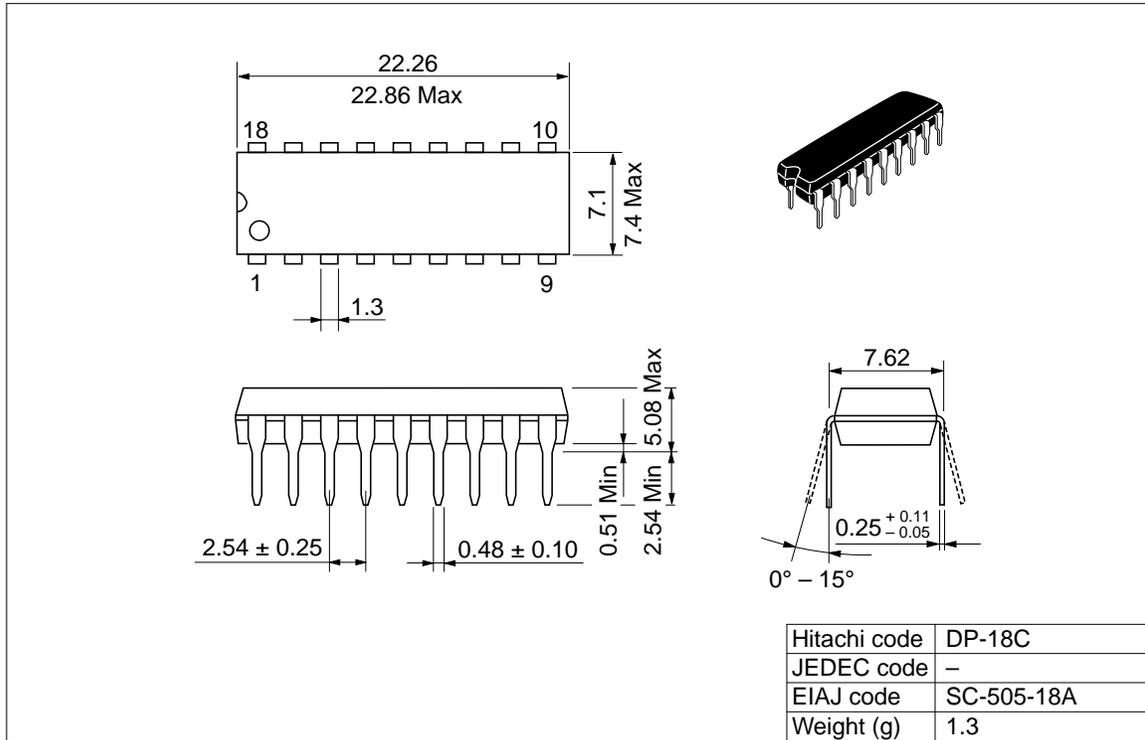
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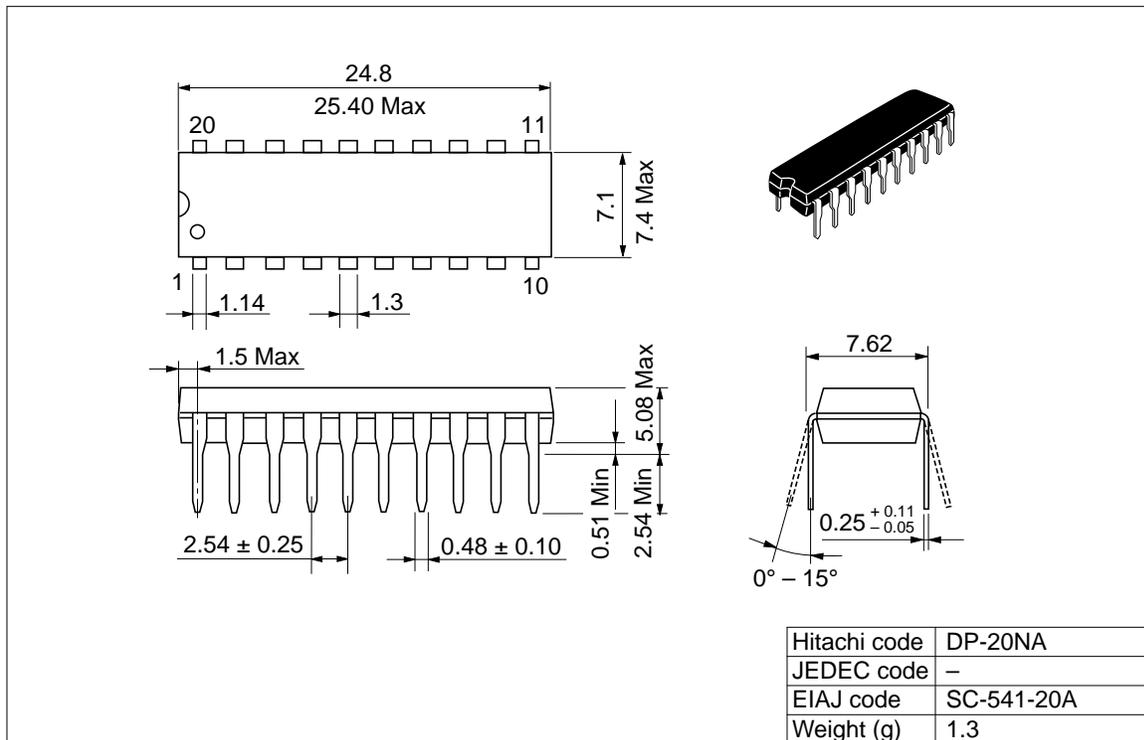
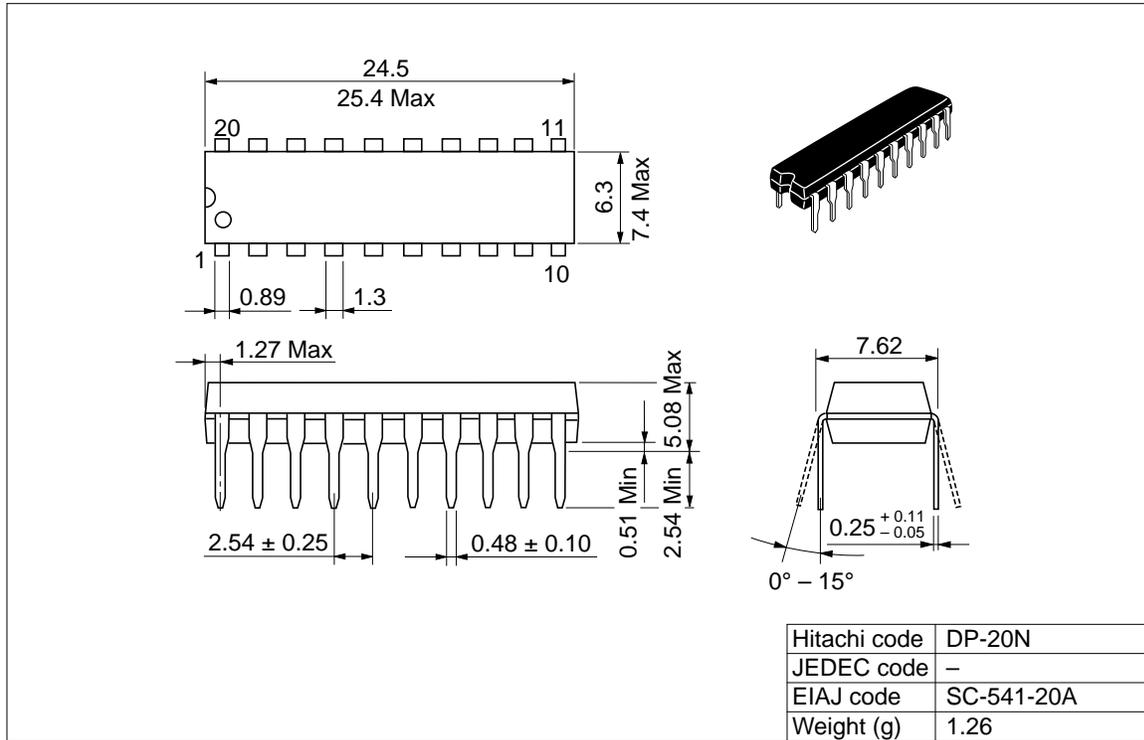
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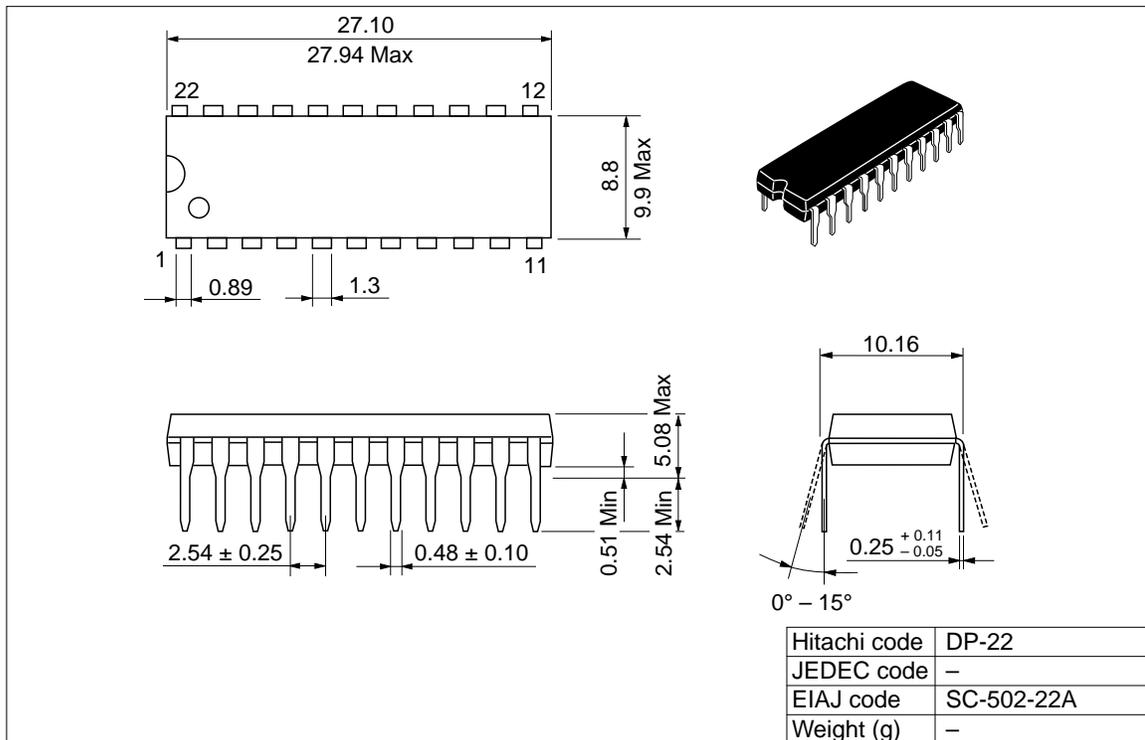
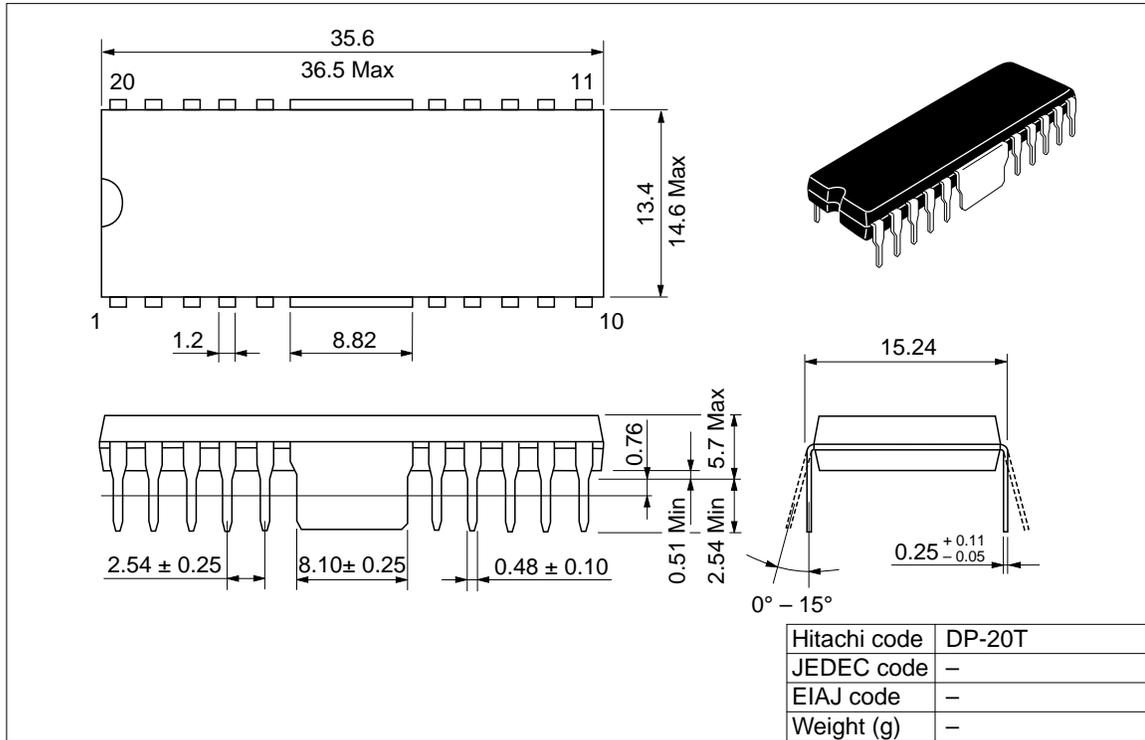
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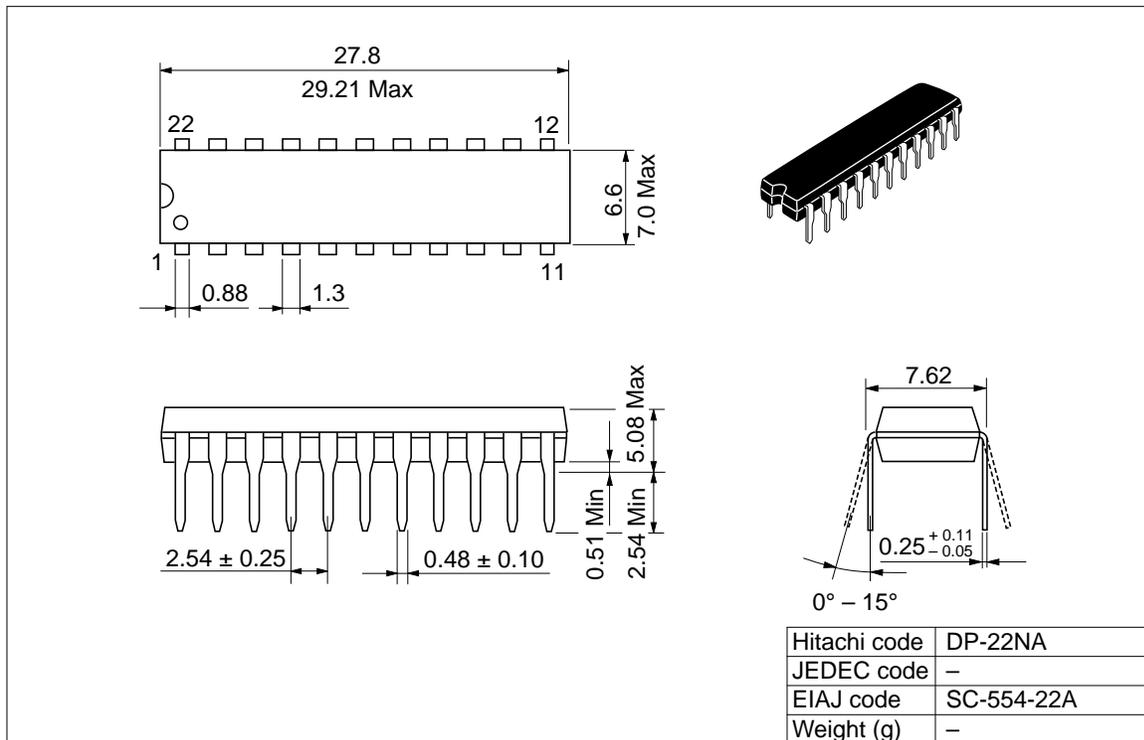
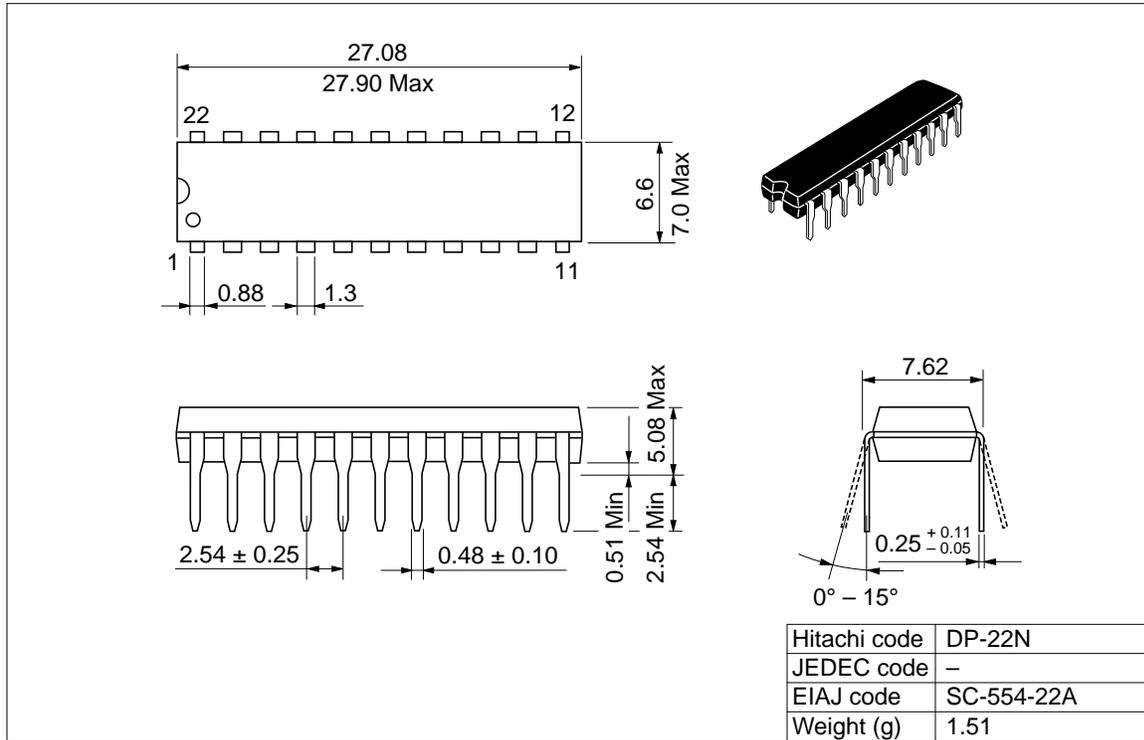
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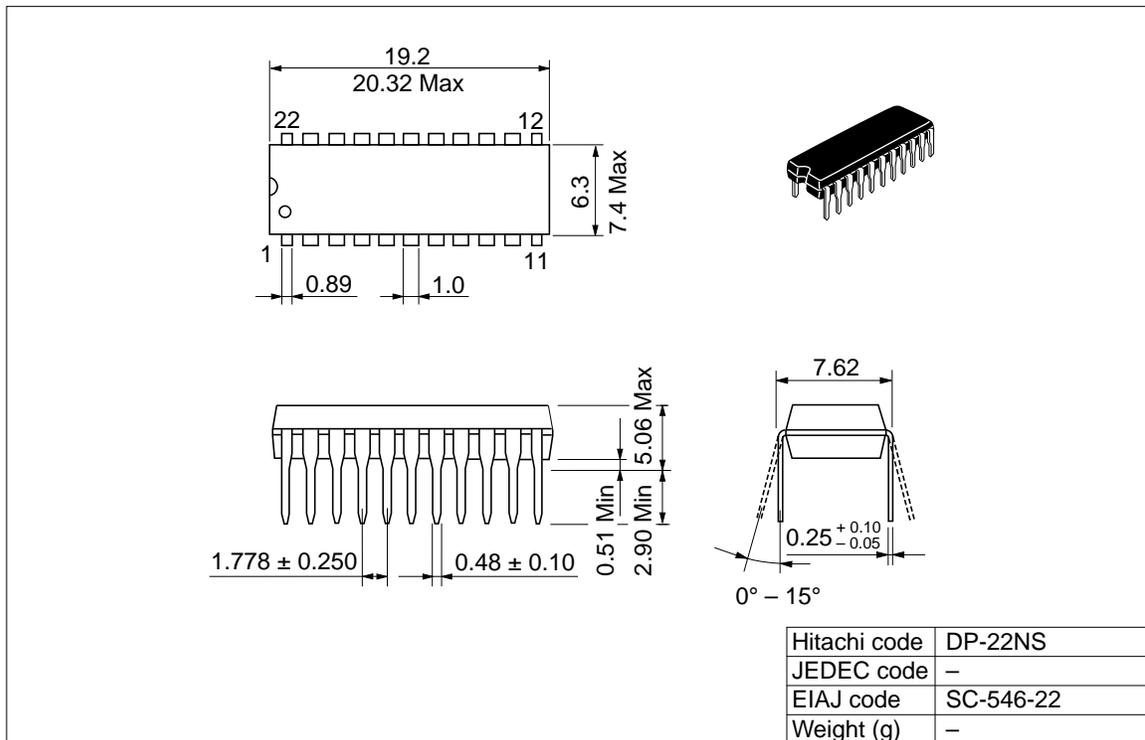
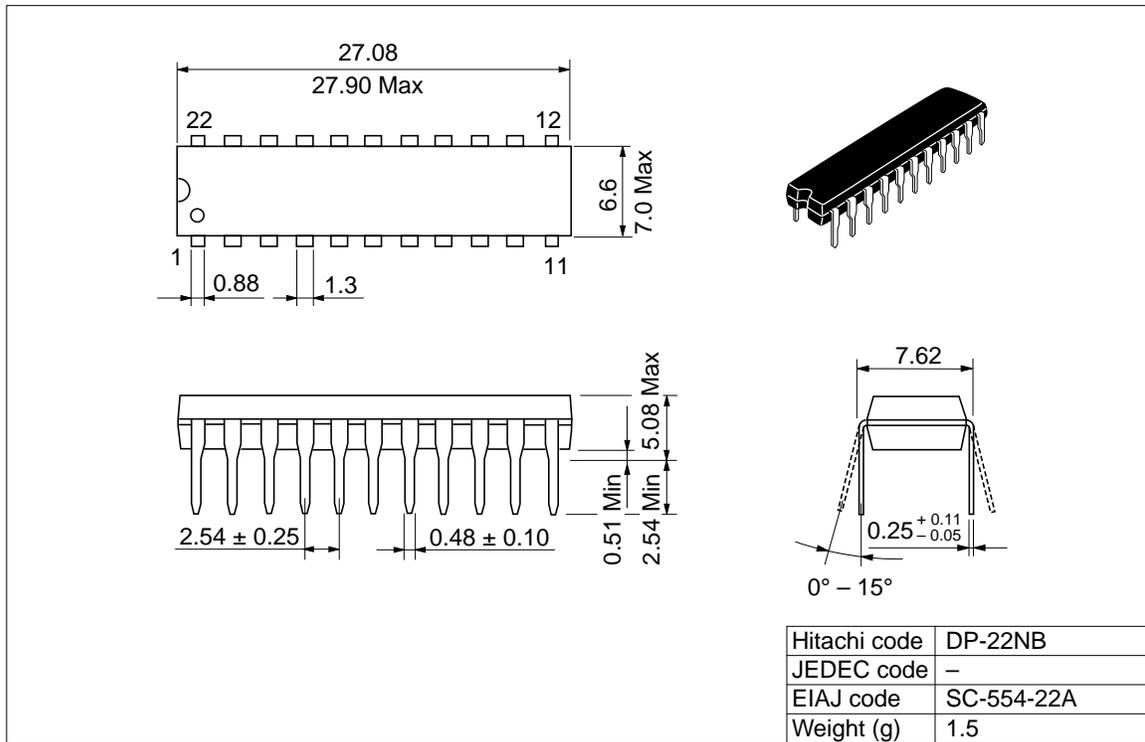
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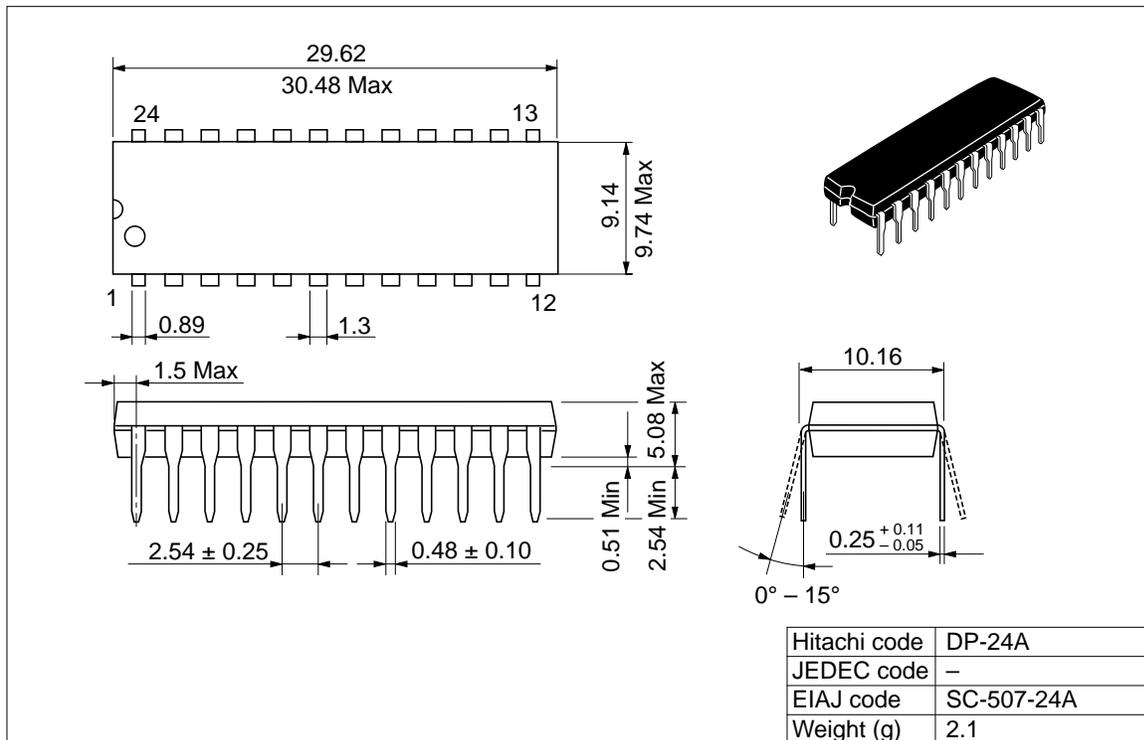
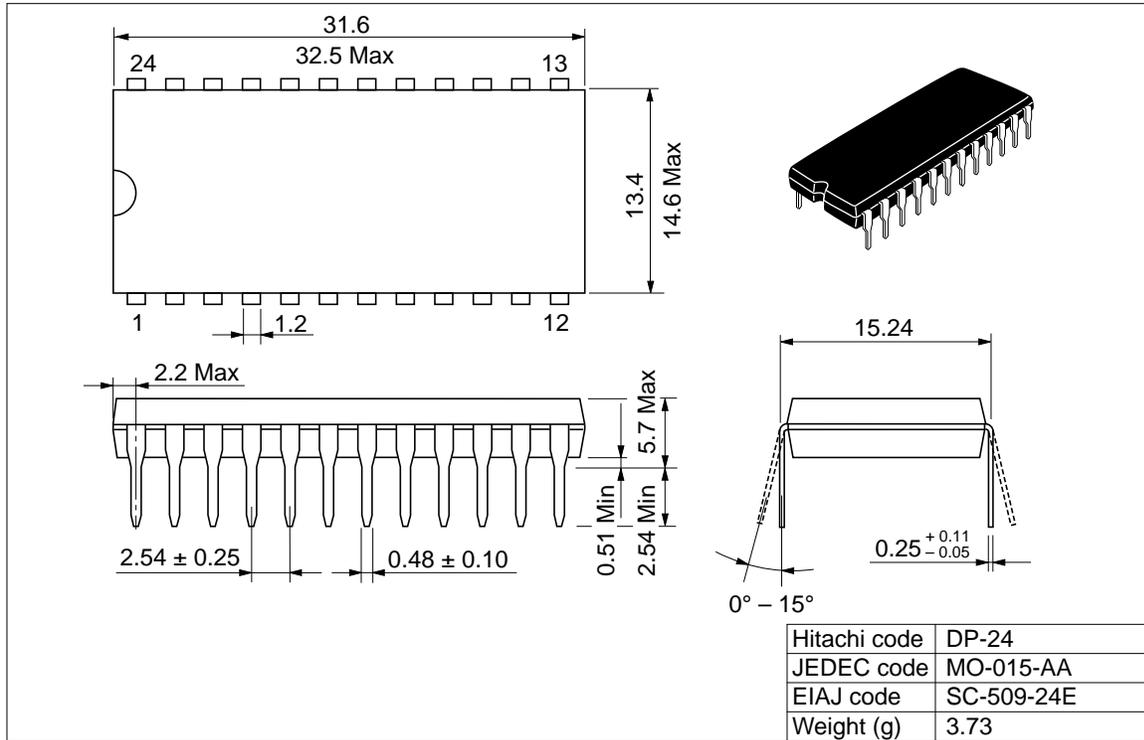
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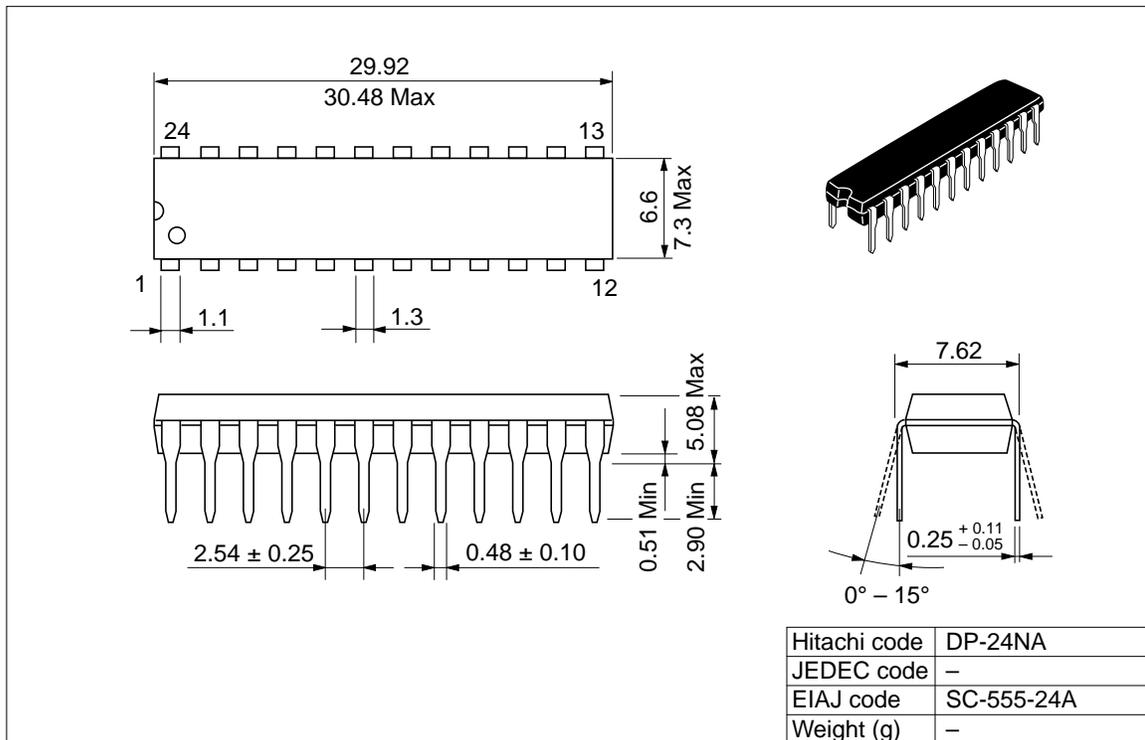
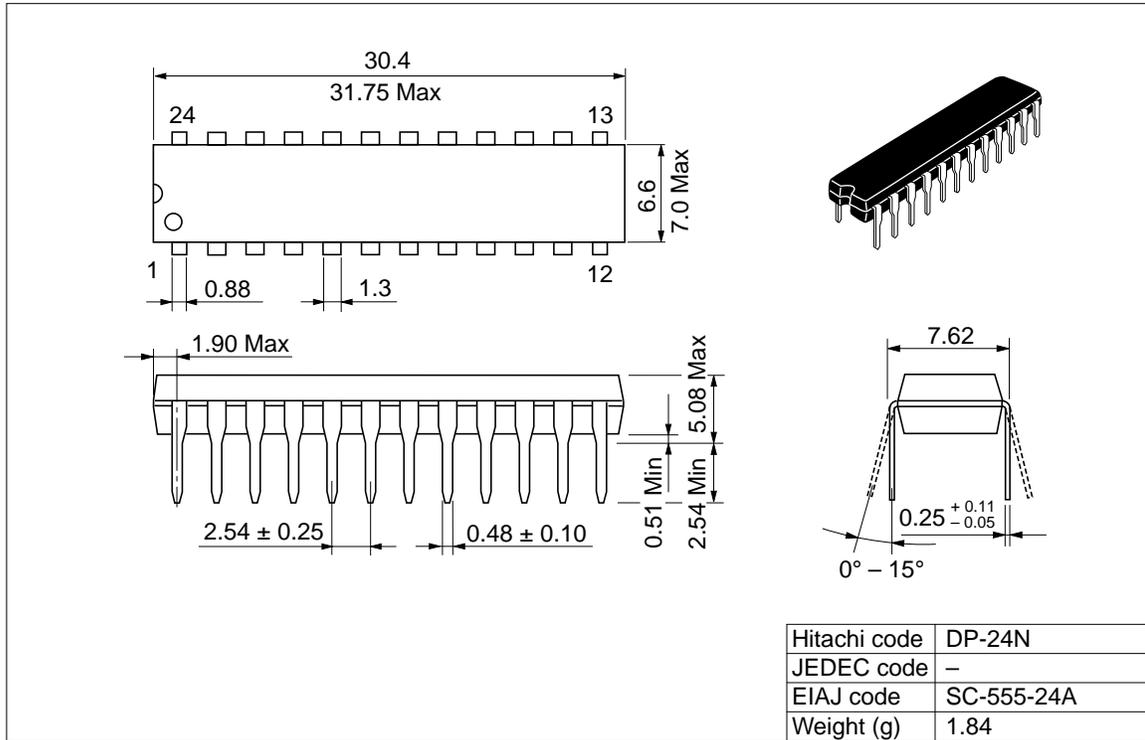
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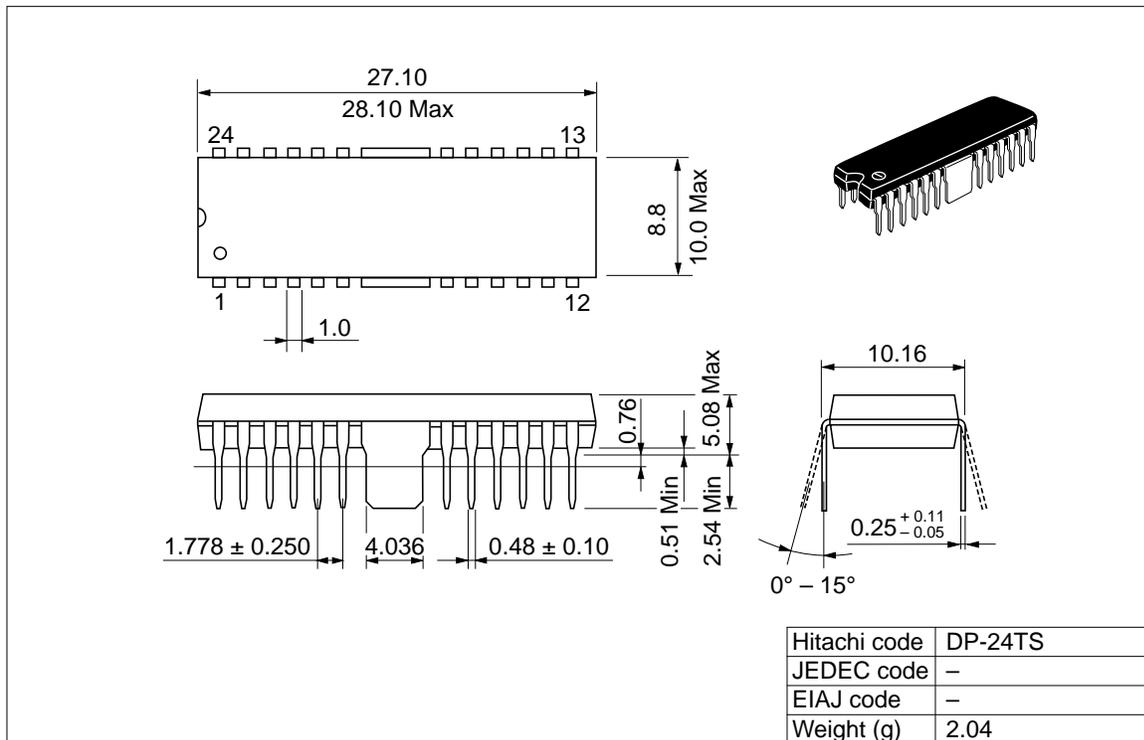
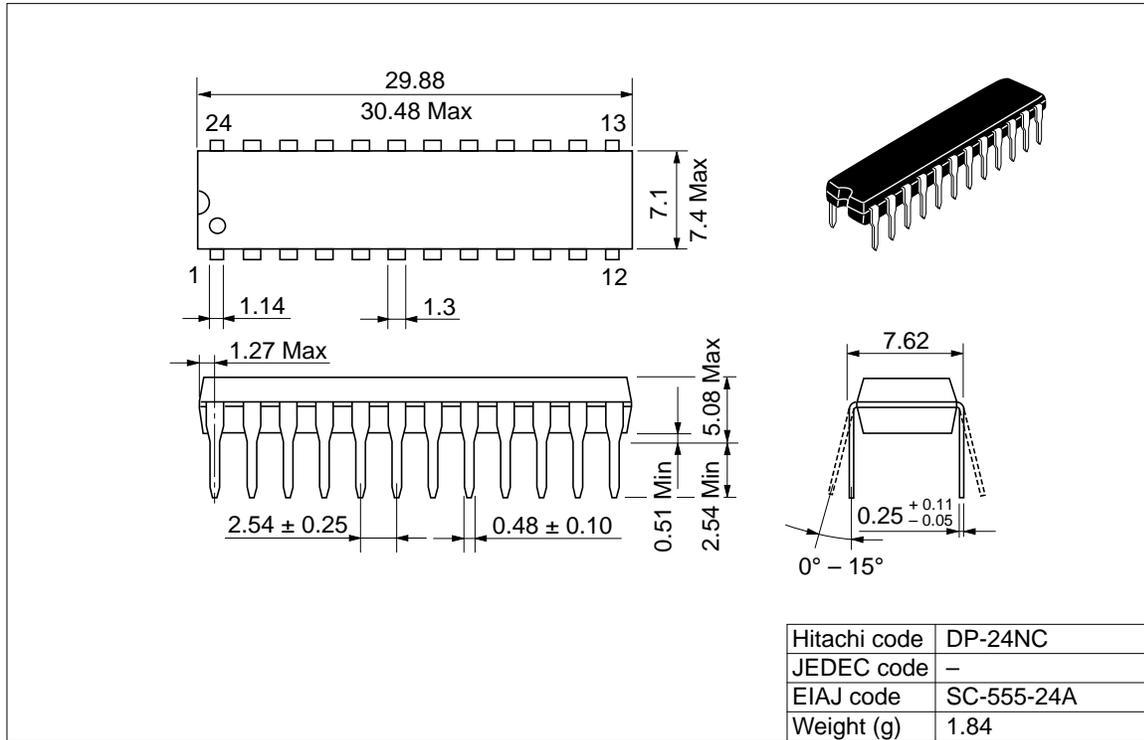
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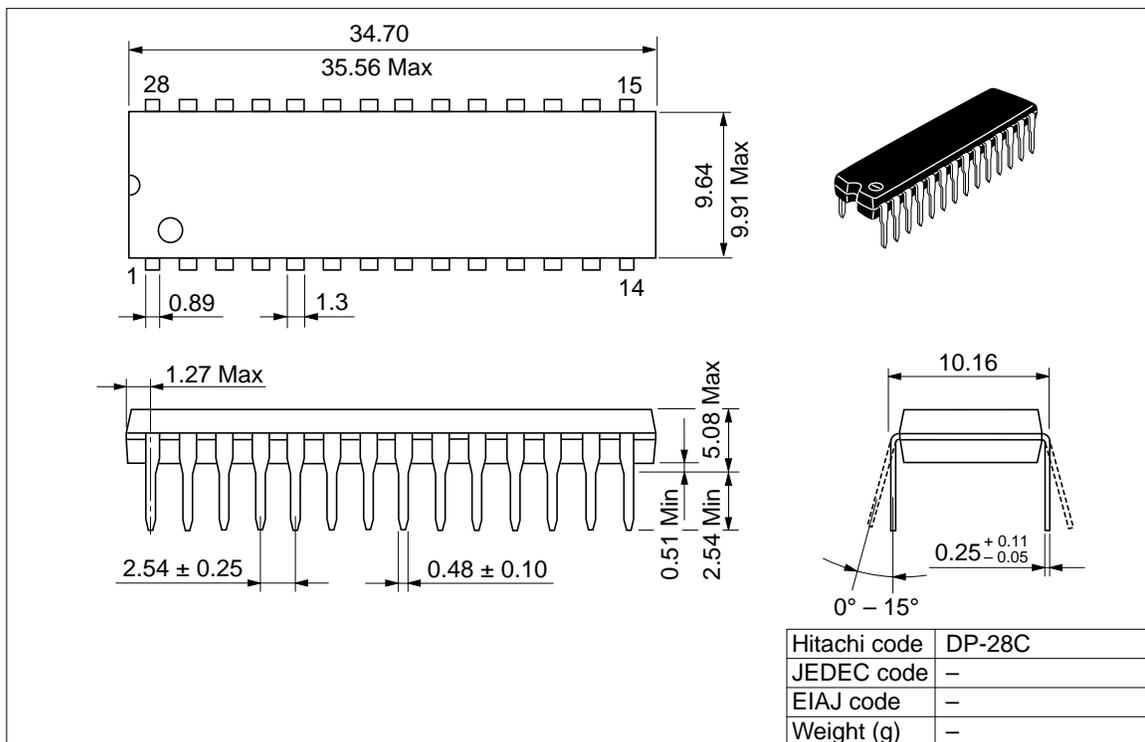
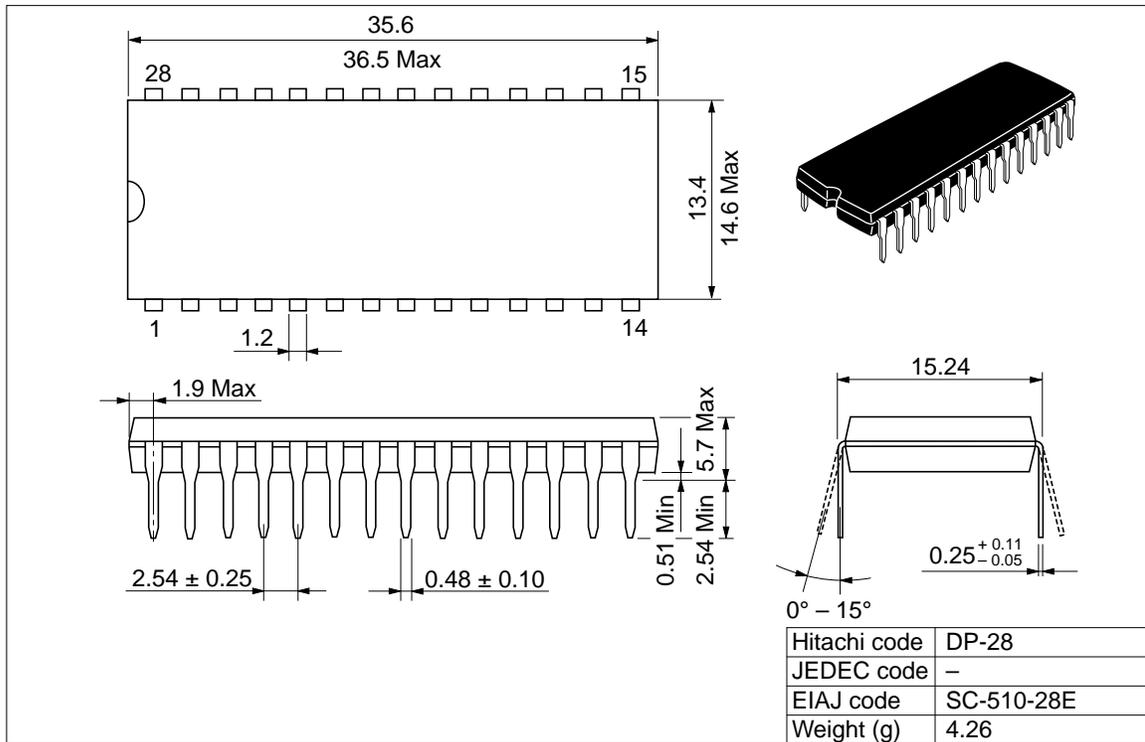
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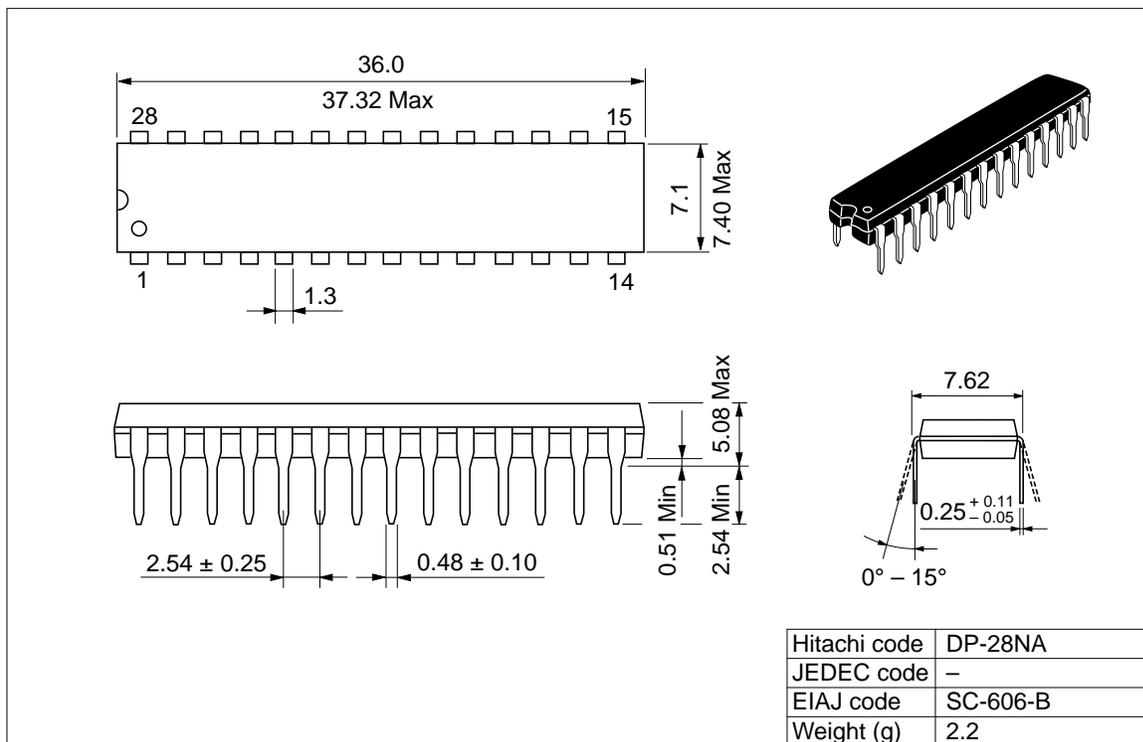
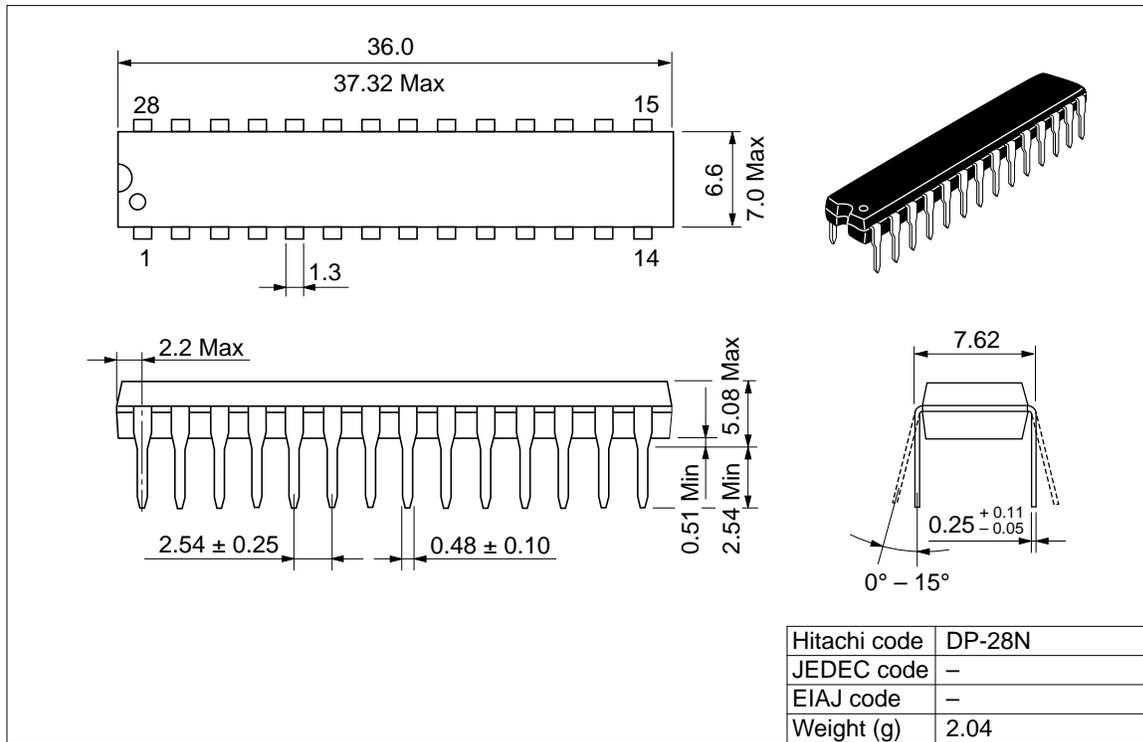
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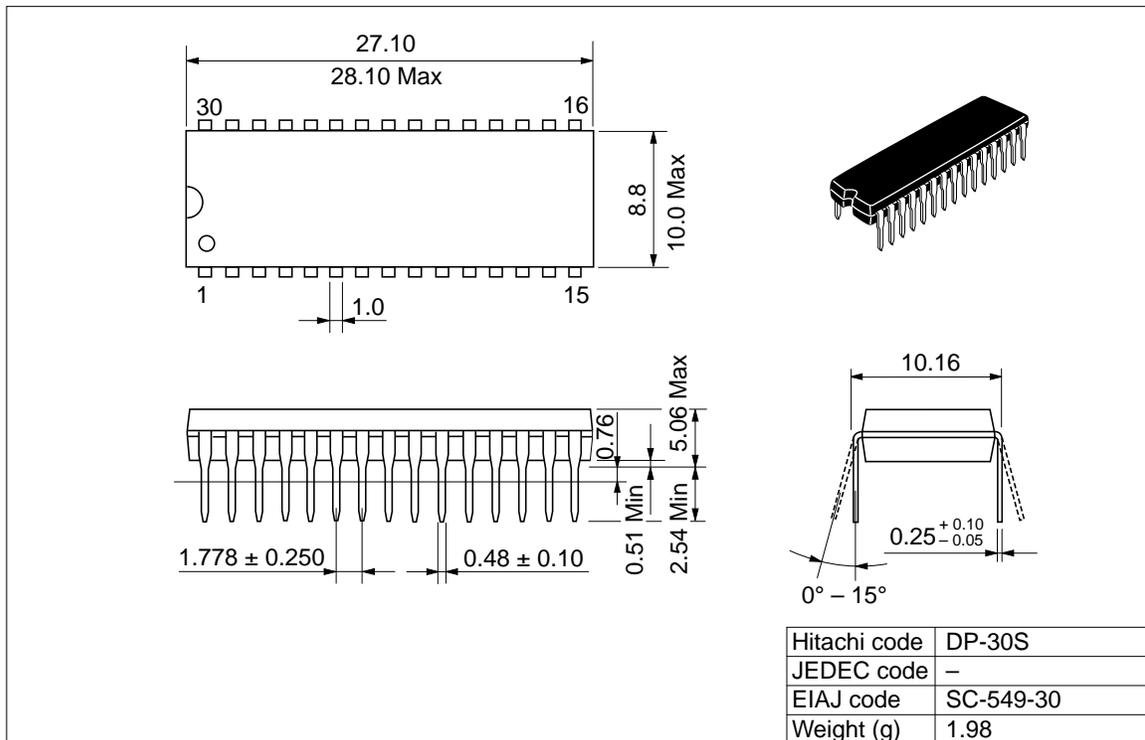
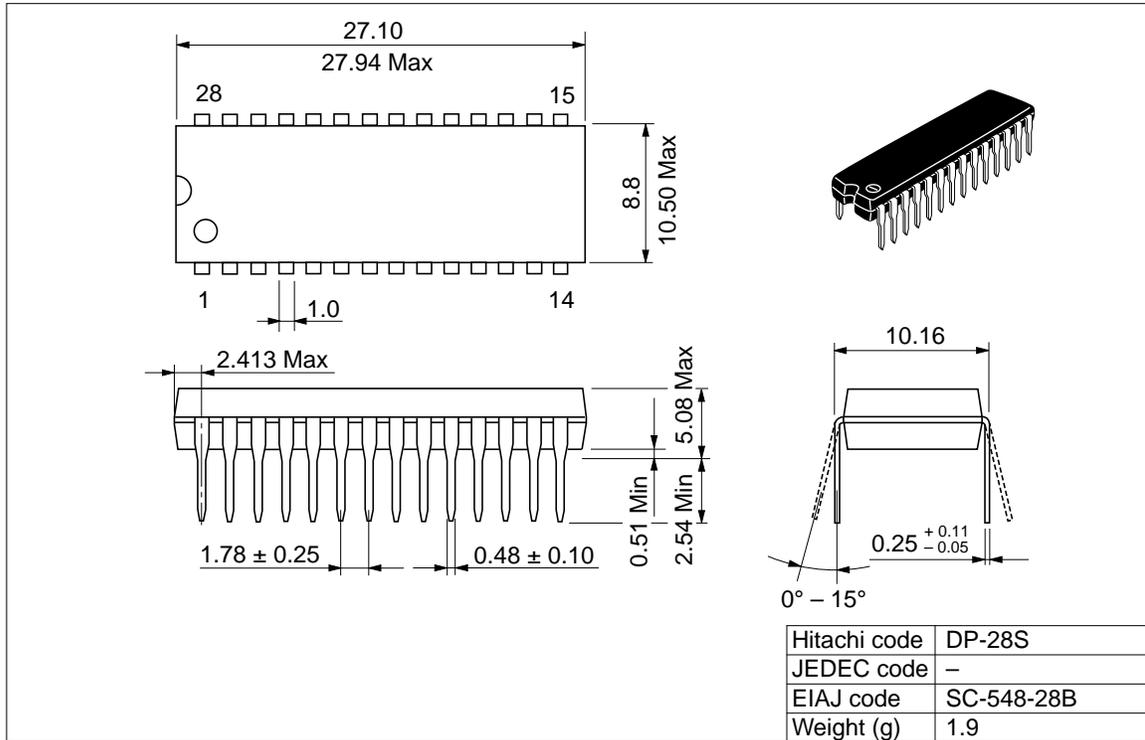
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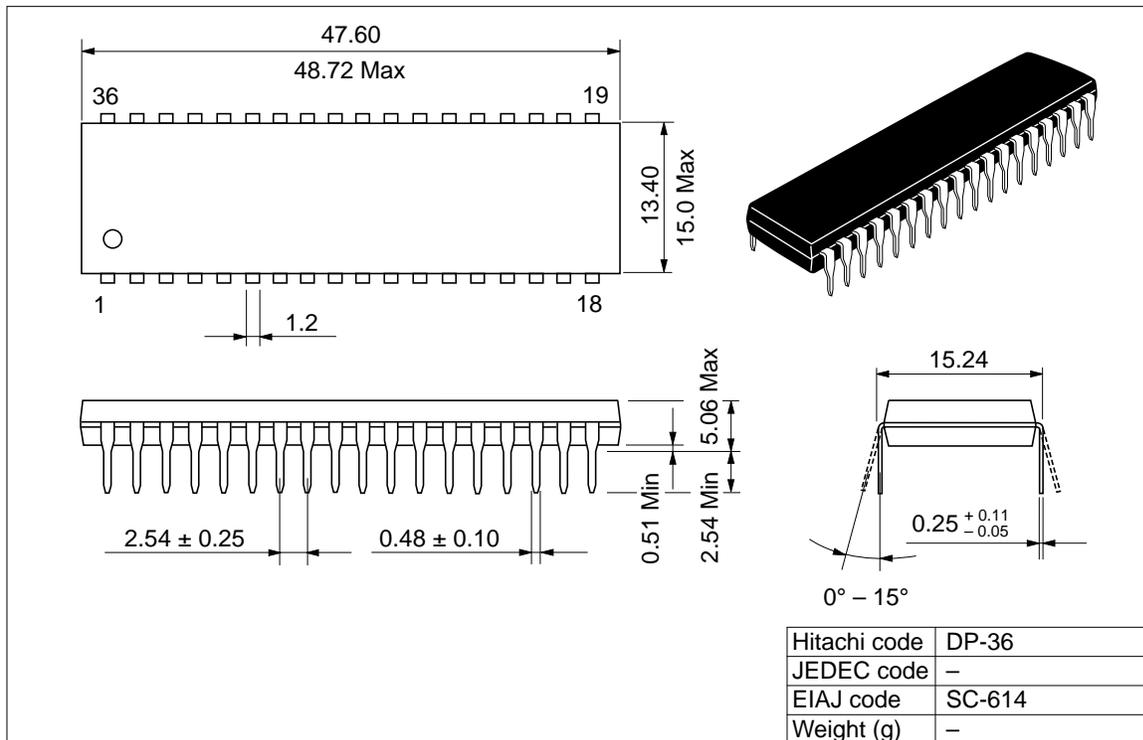
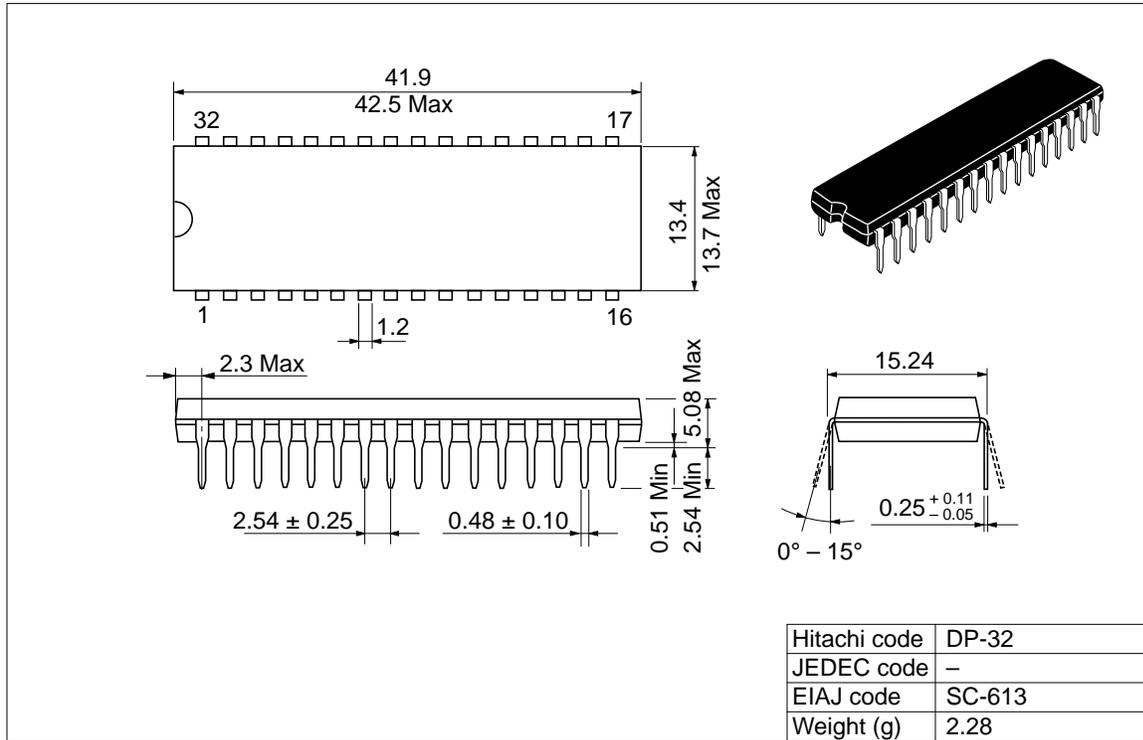
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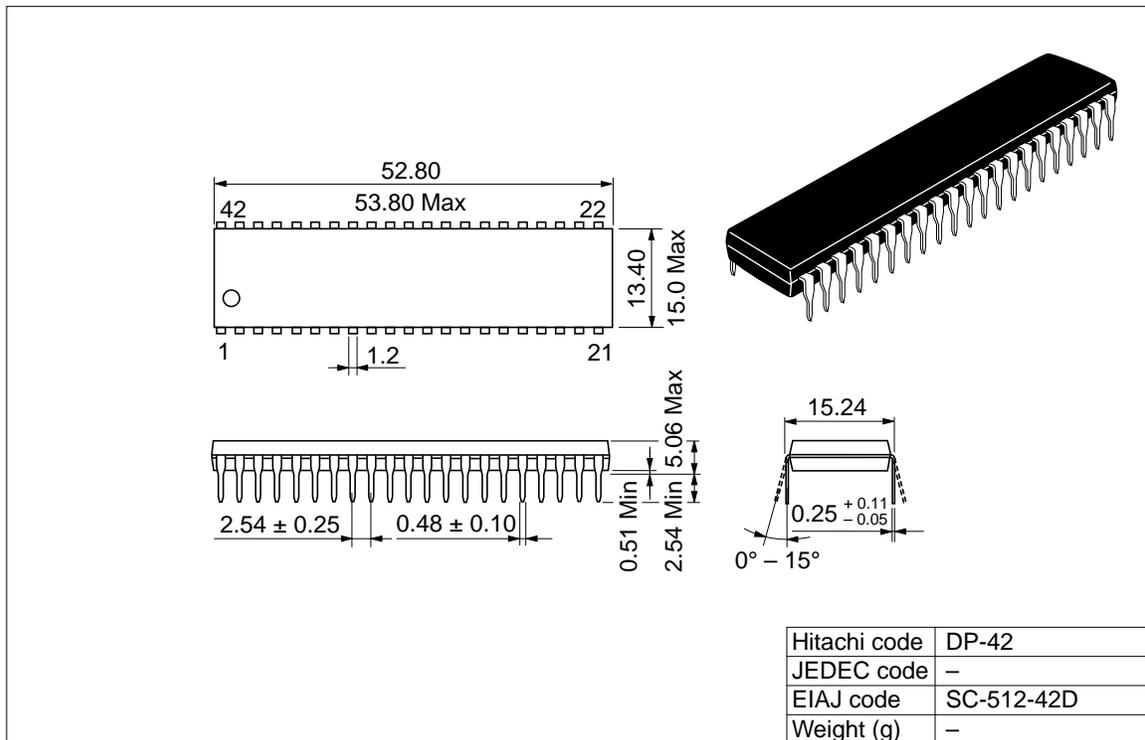
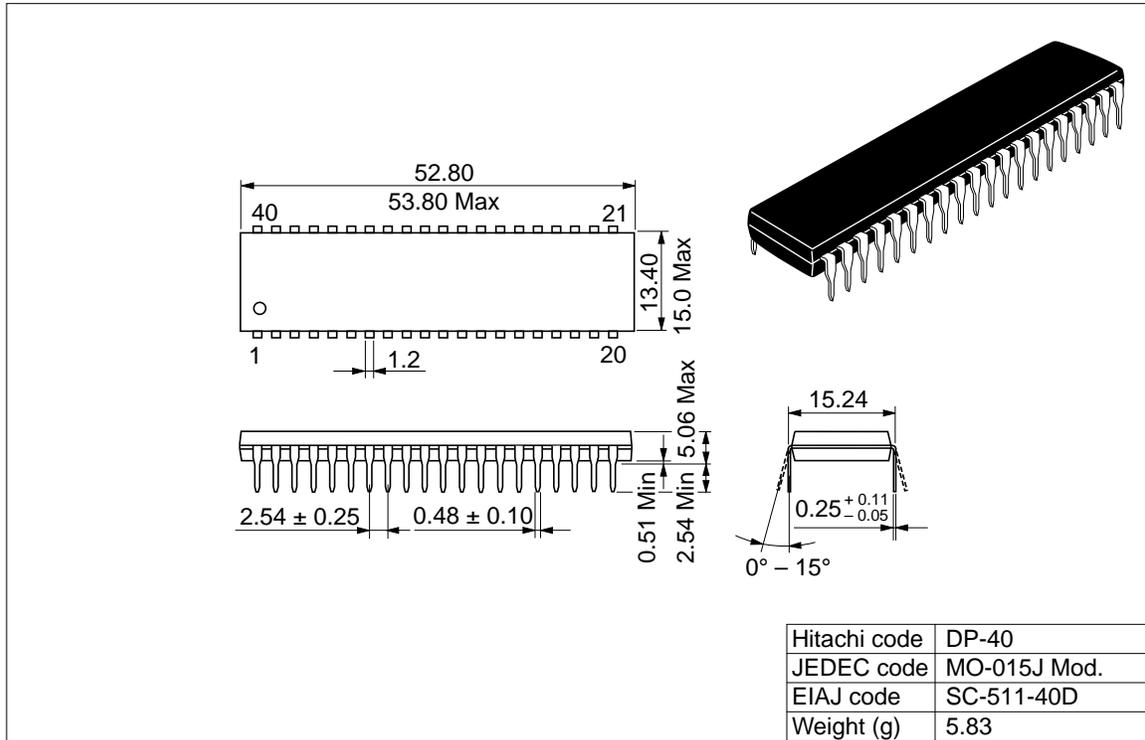
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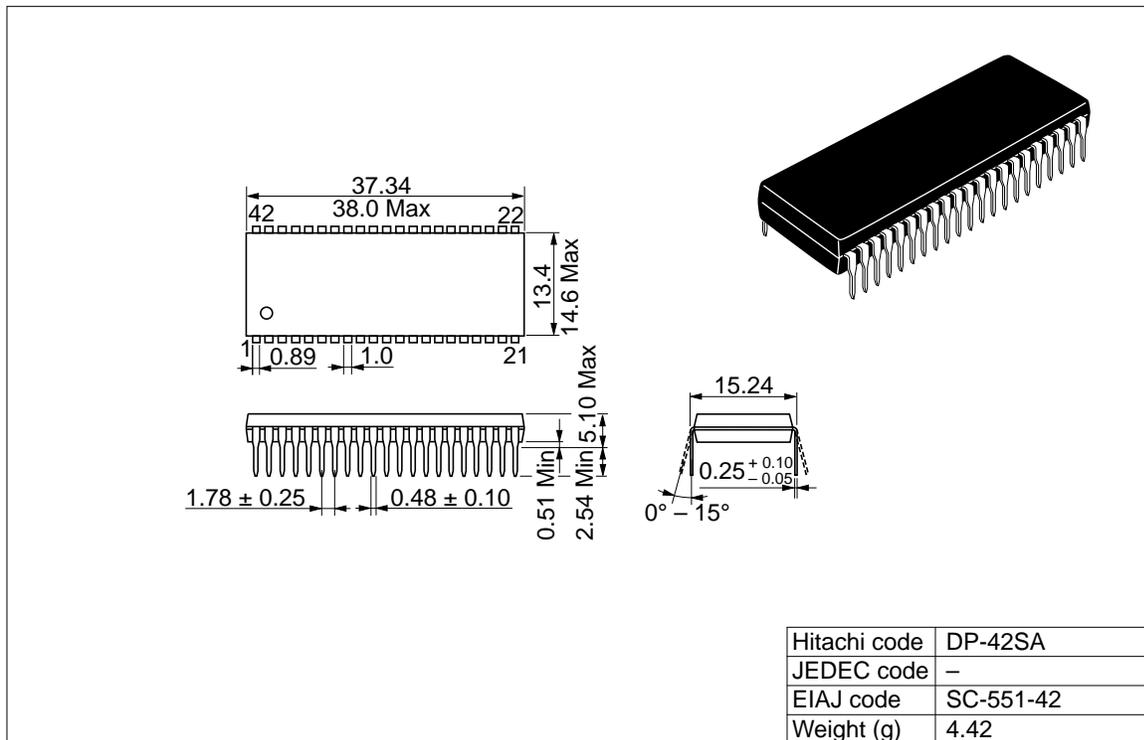
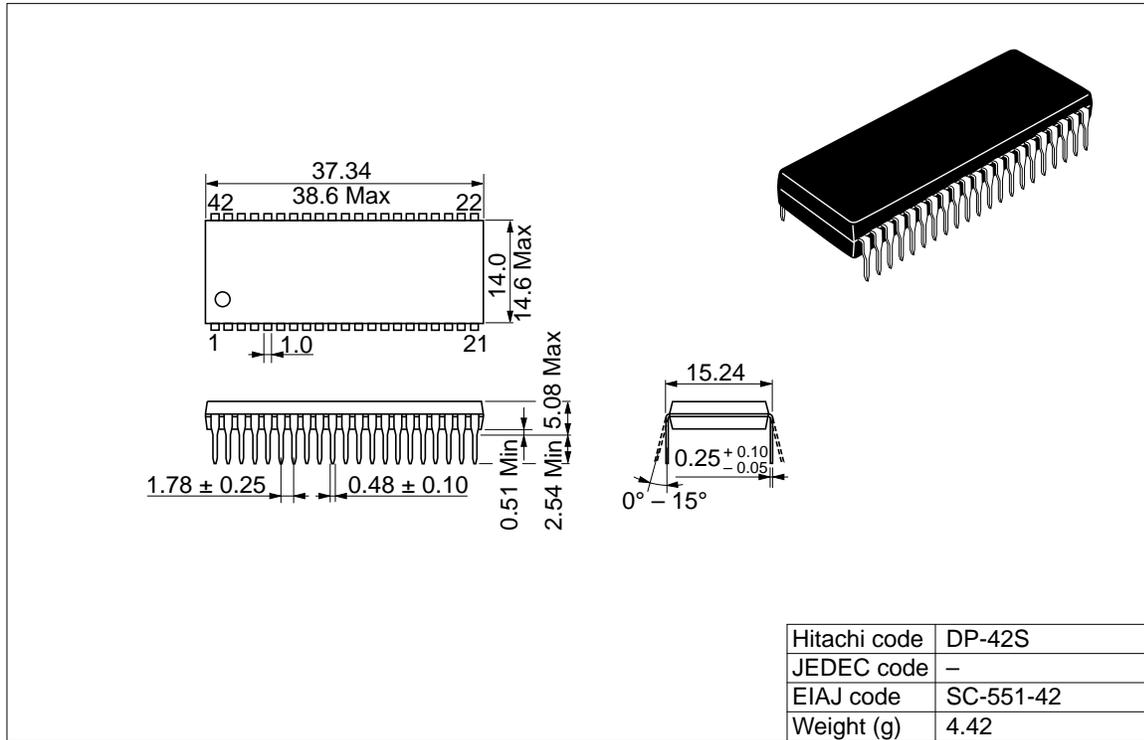
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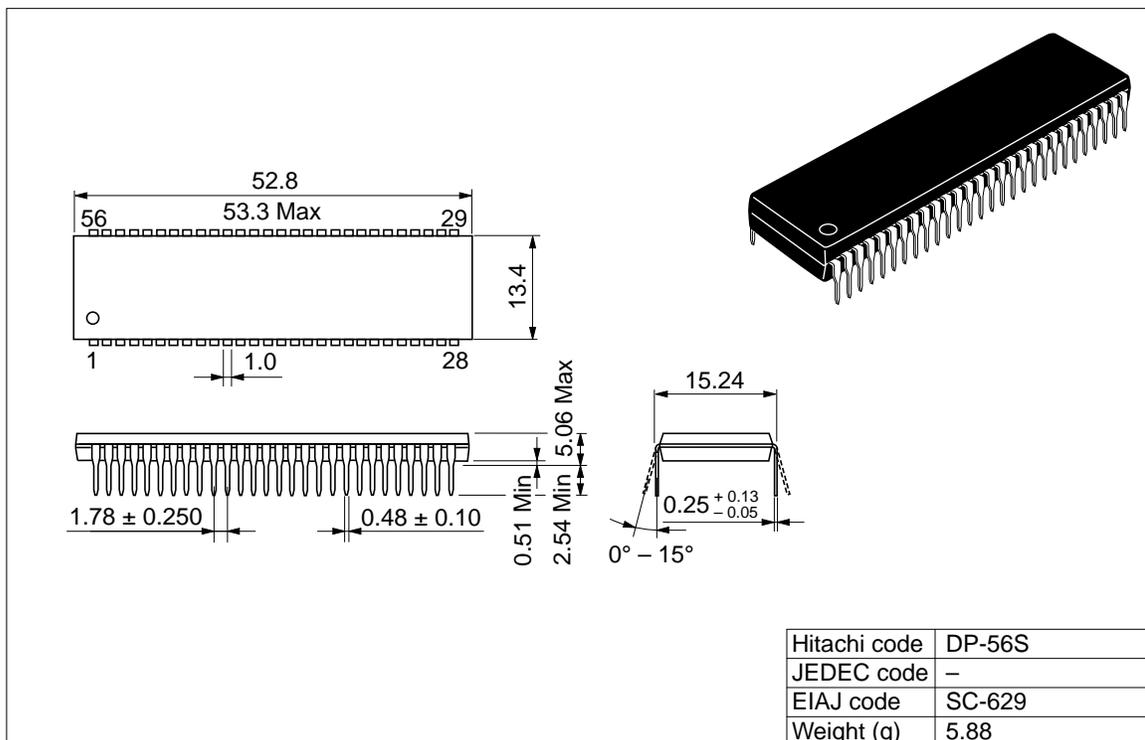
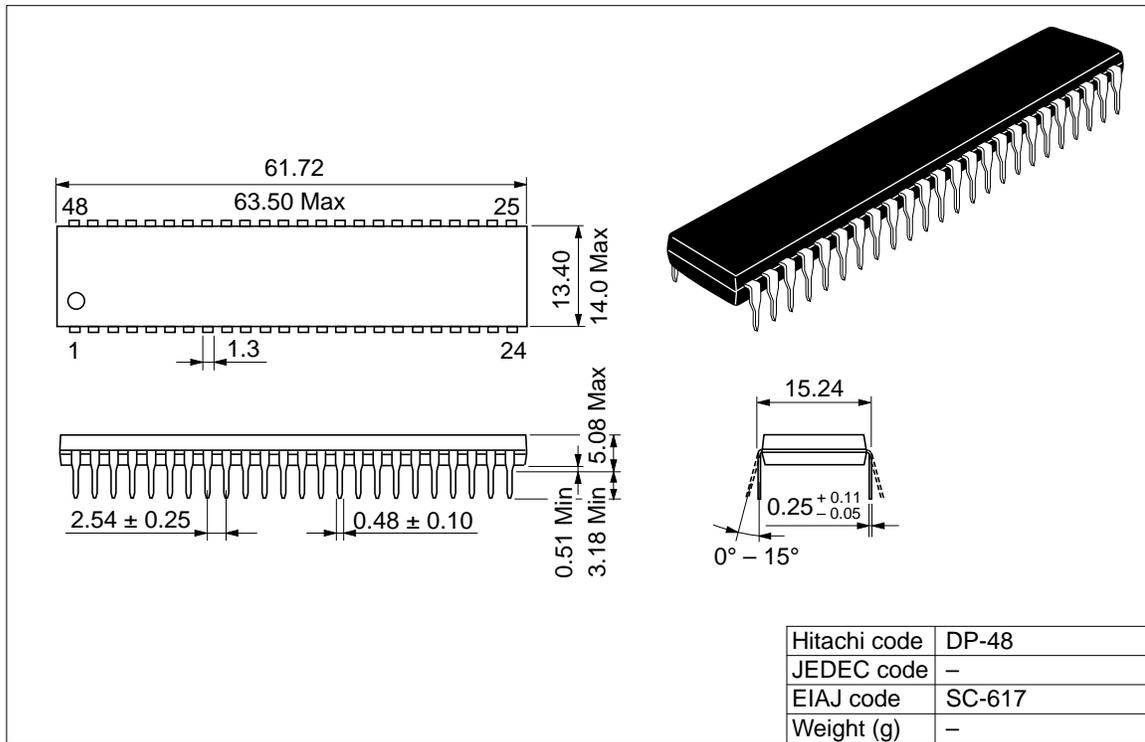
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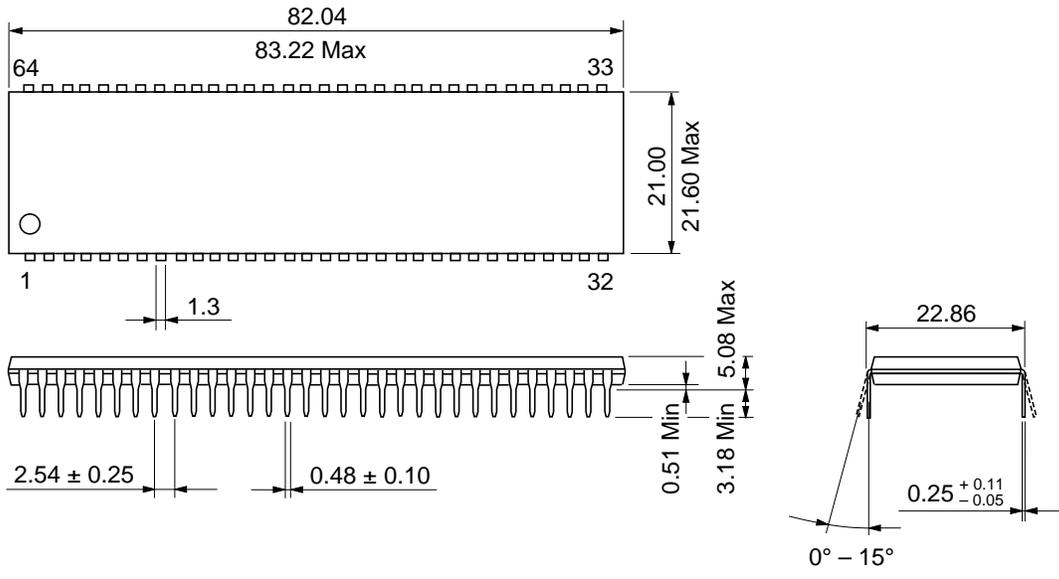
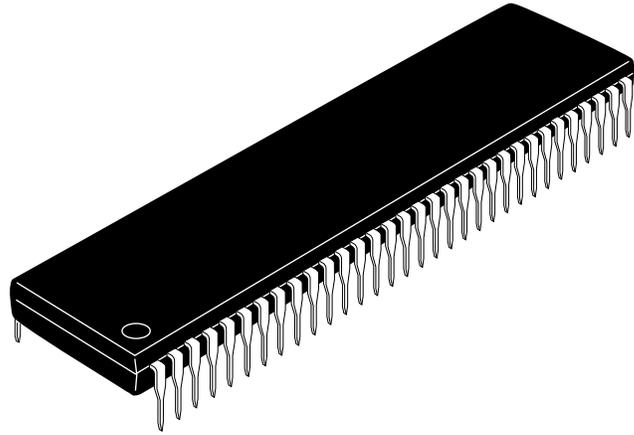
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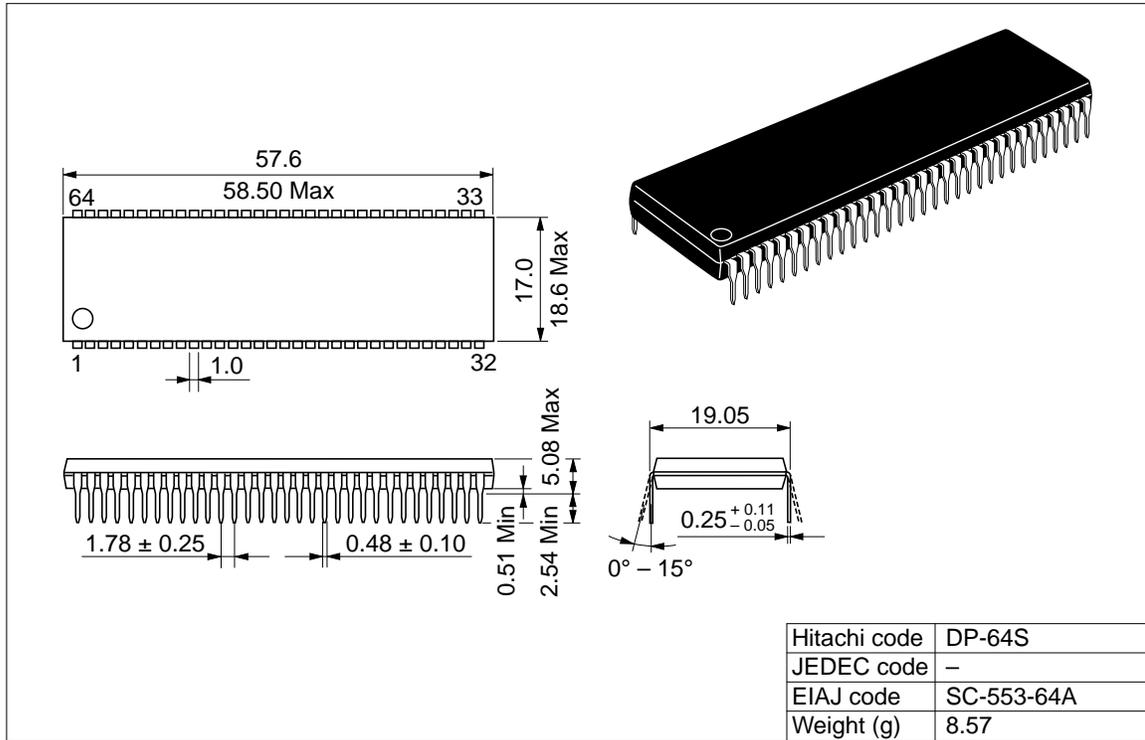


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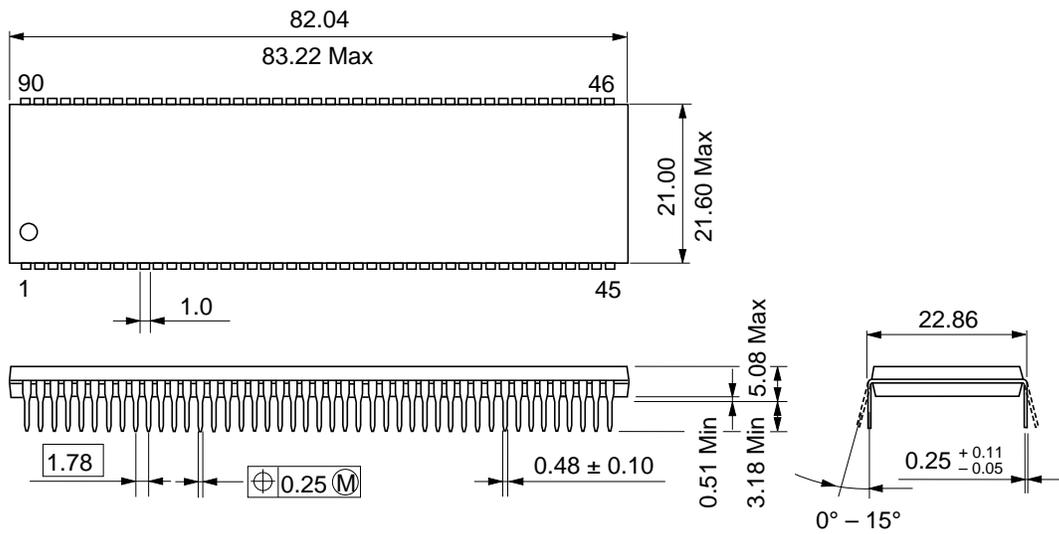
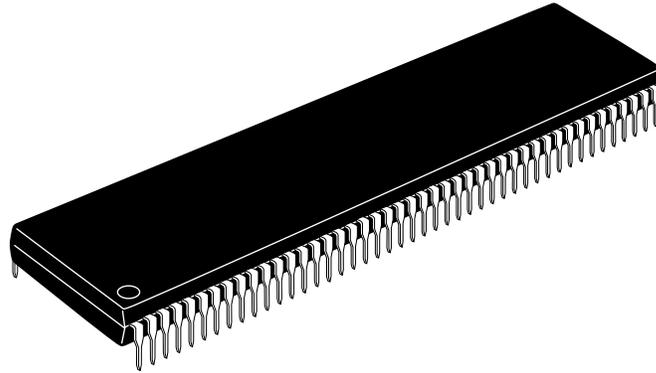


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EIAJ code	SC-619
Weight (g)	-

Package Outline Dimensions



Package Outline Dimensions

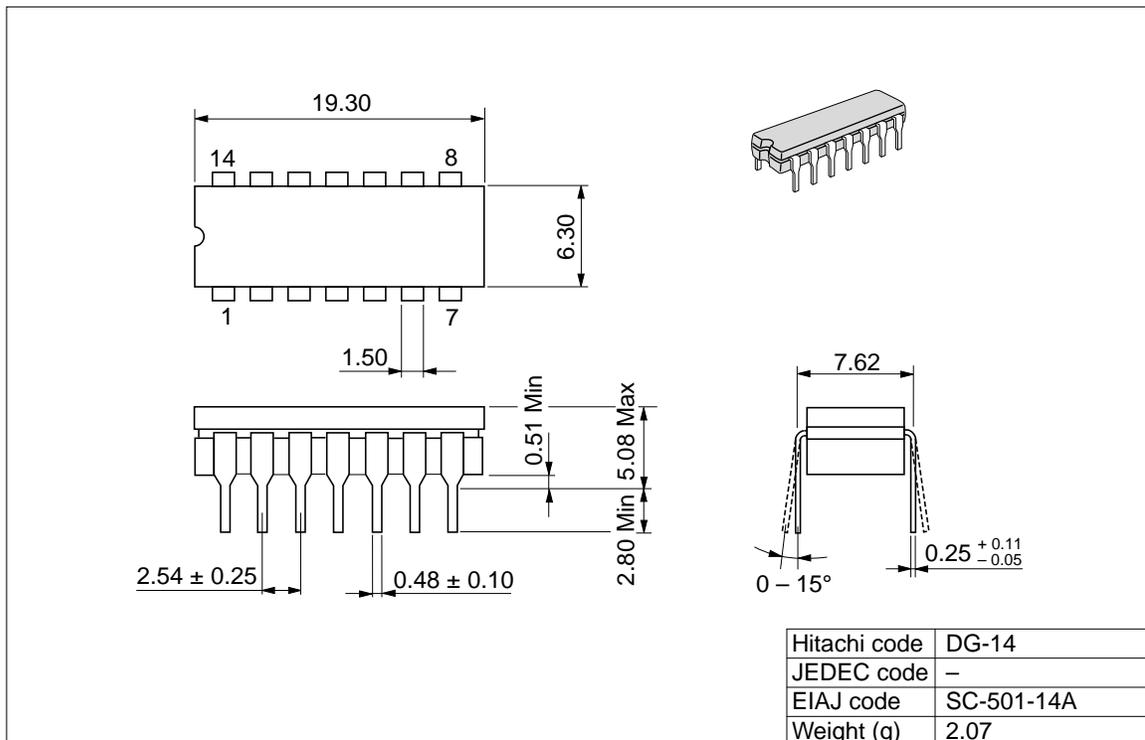
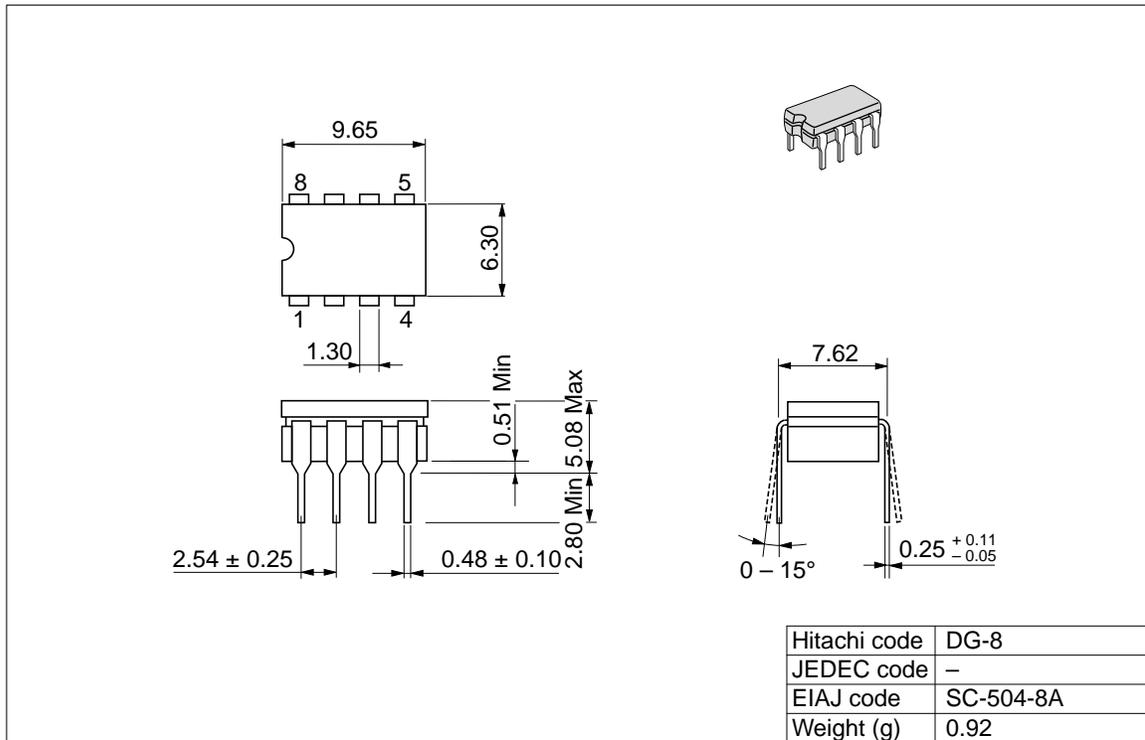


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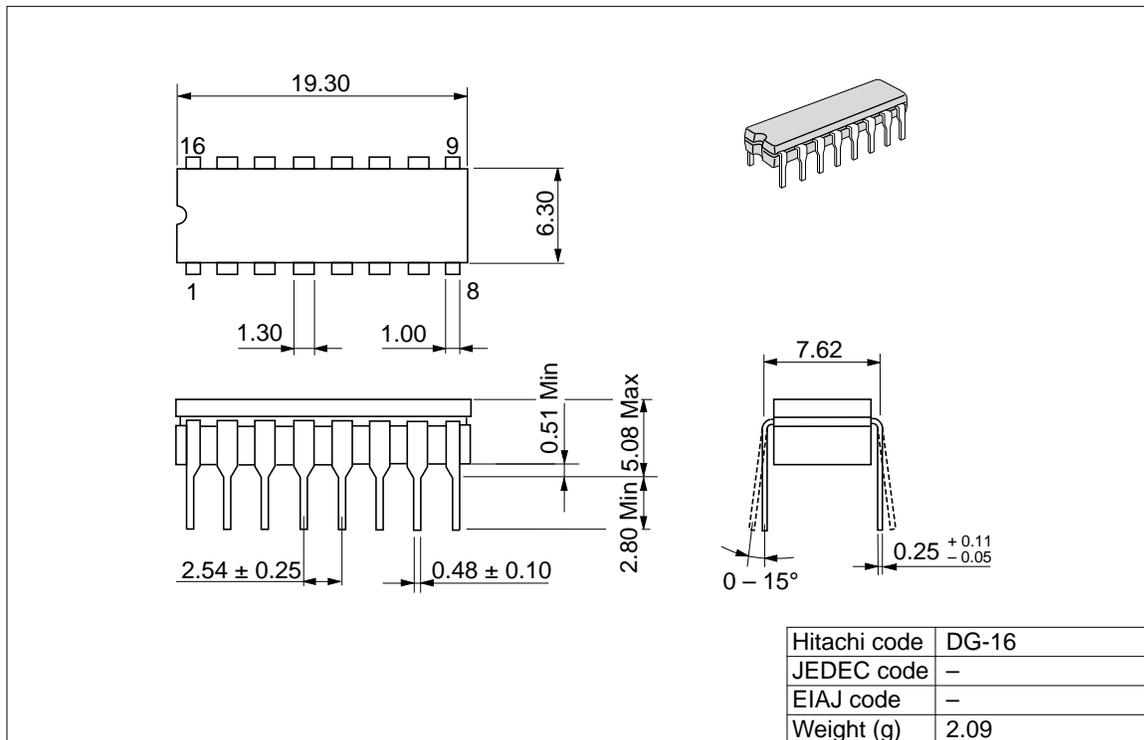
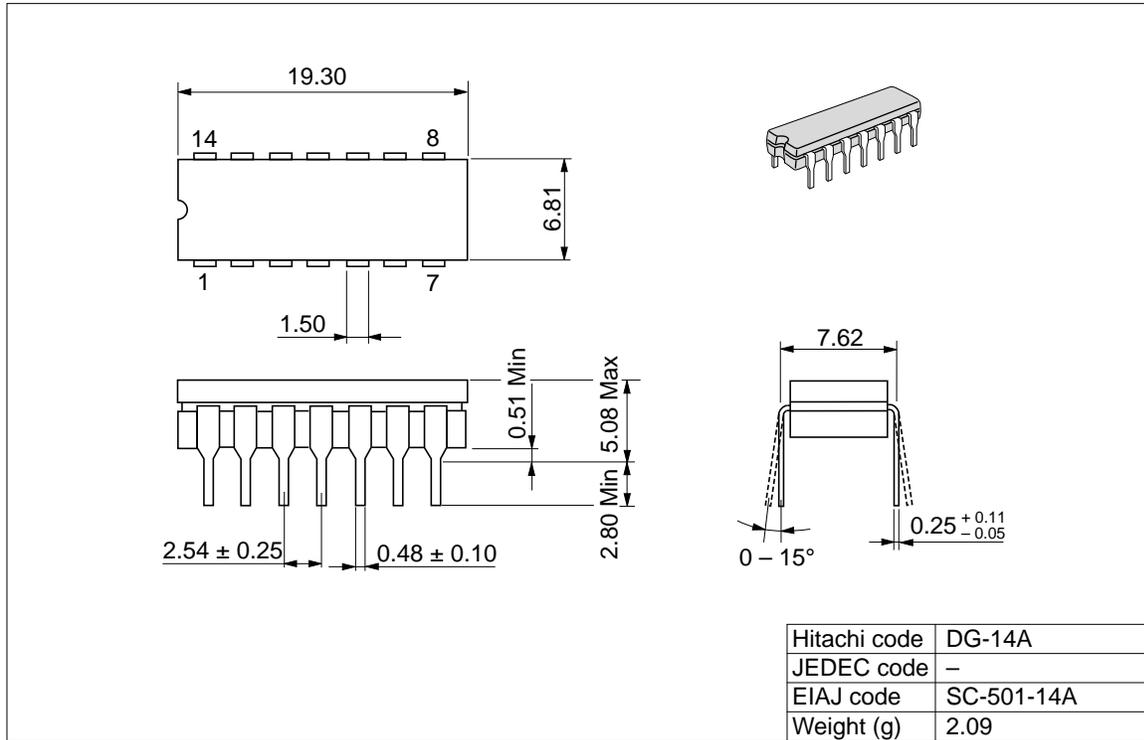
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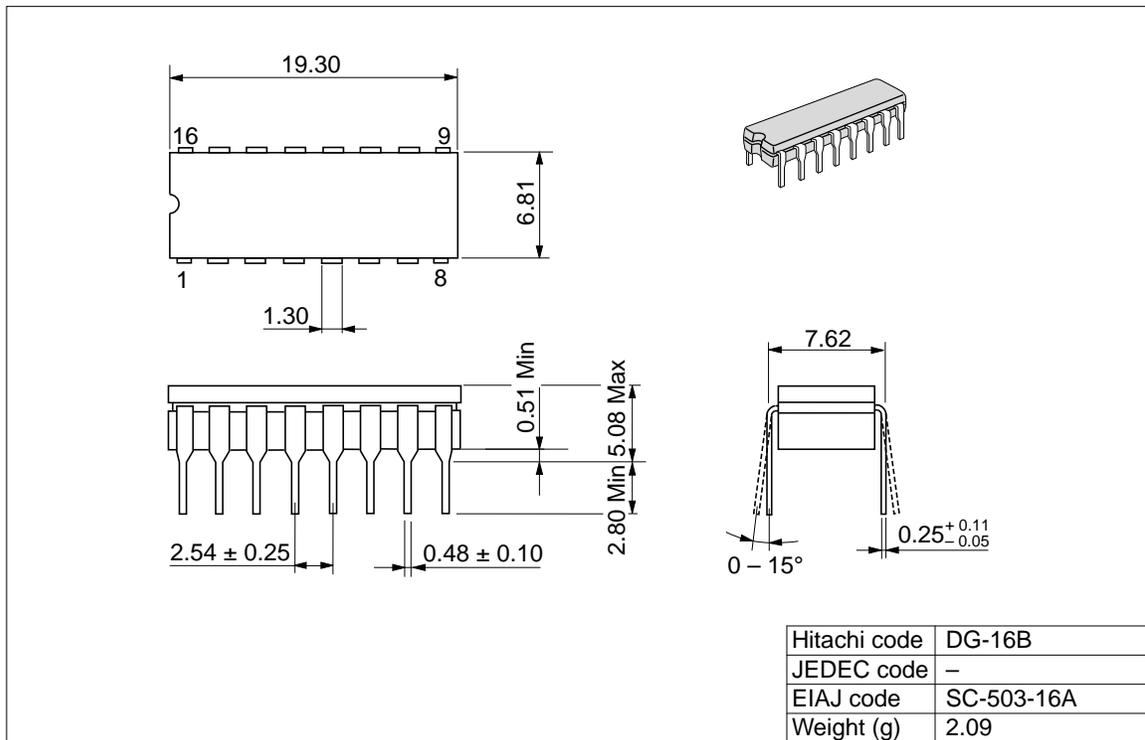
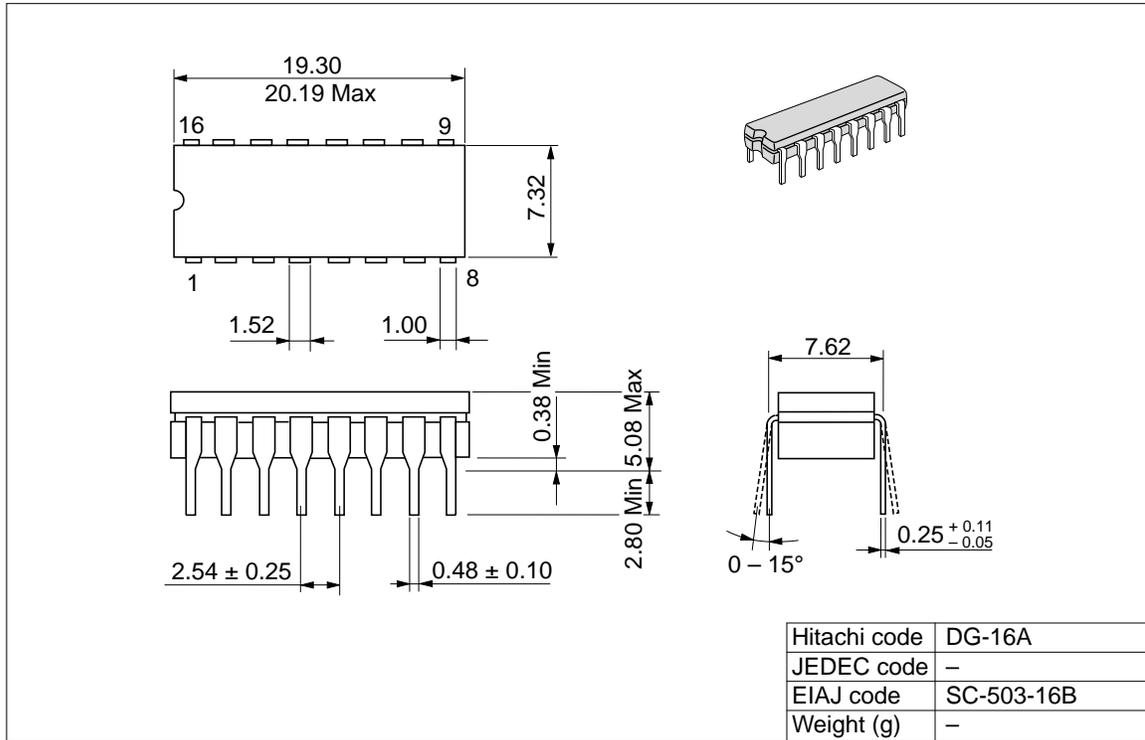
Unit: mm



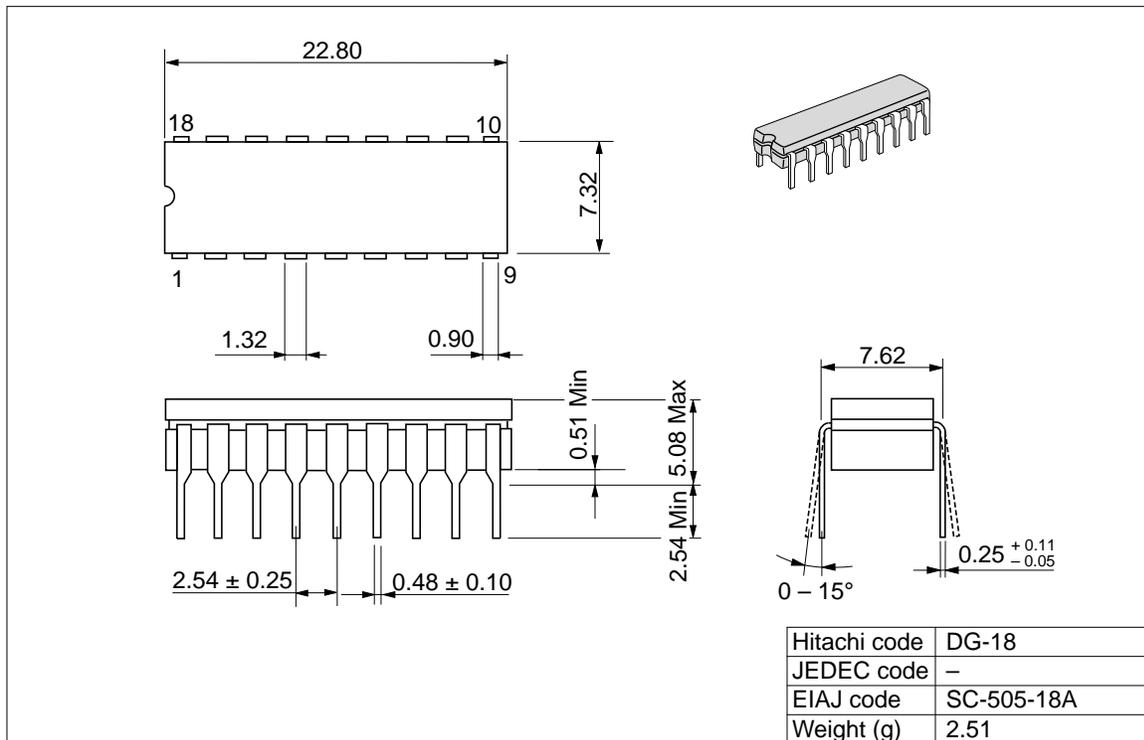
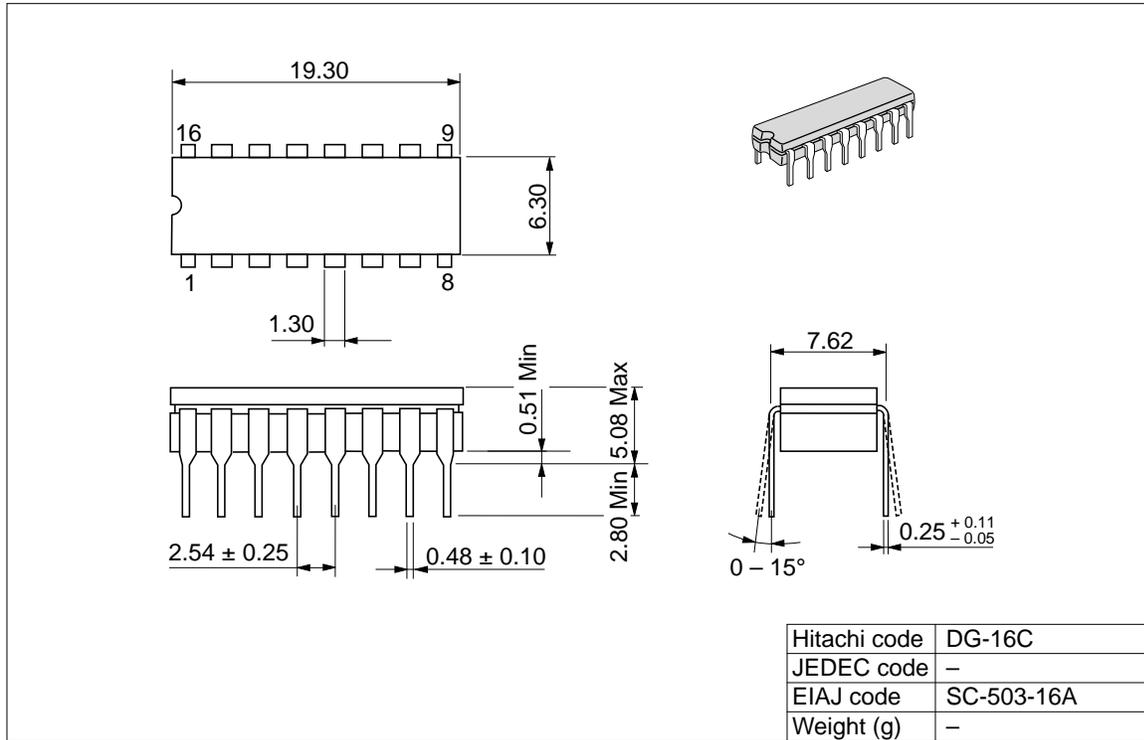
Package Outline Dimensions



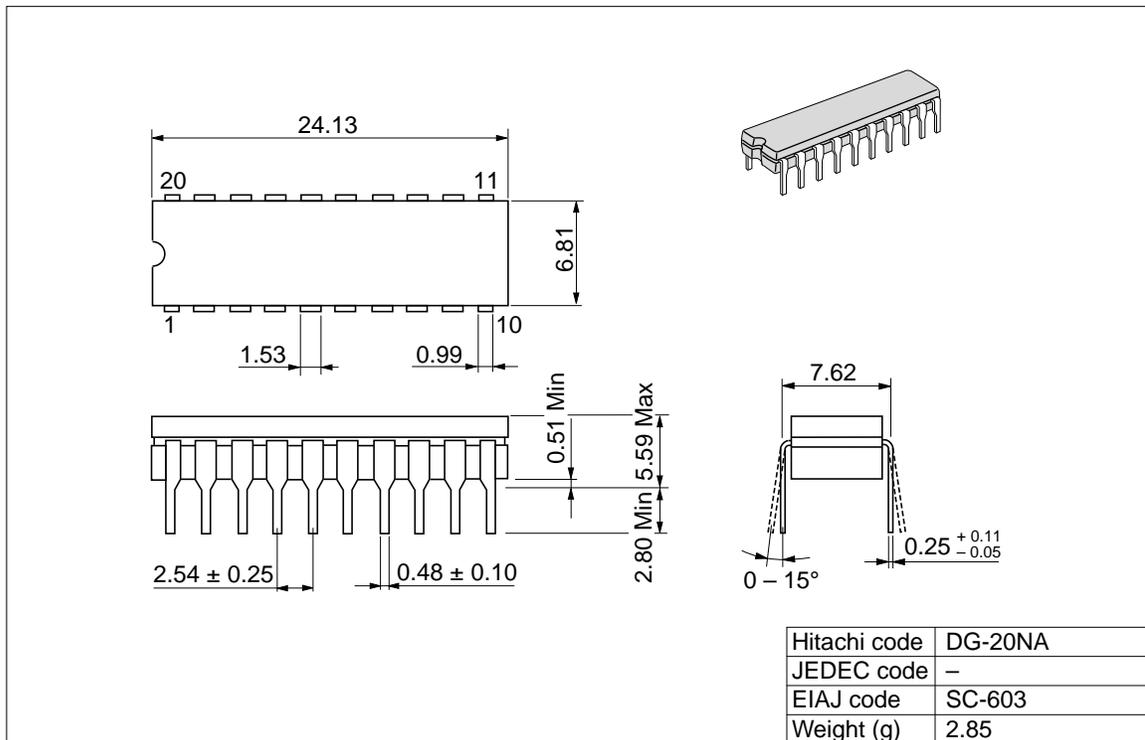
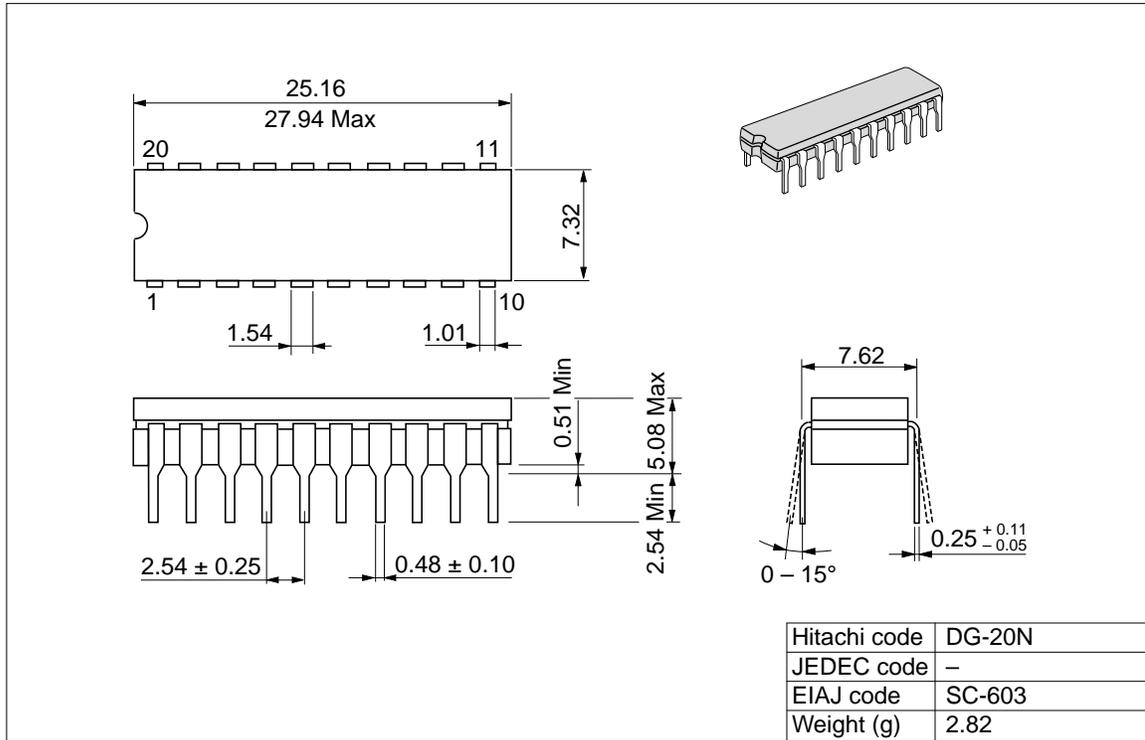
Package Outline Dimensions



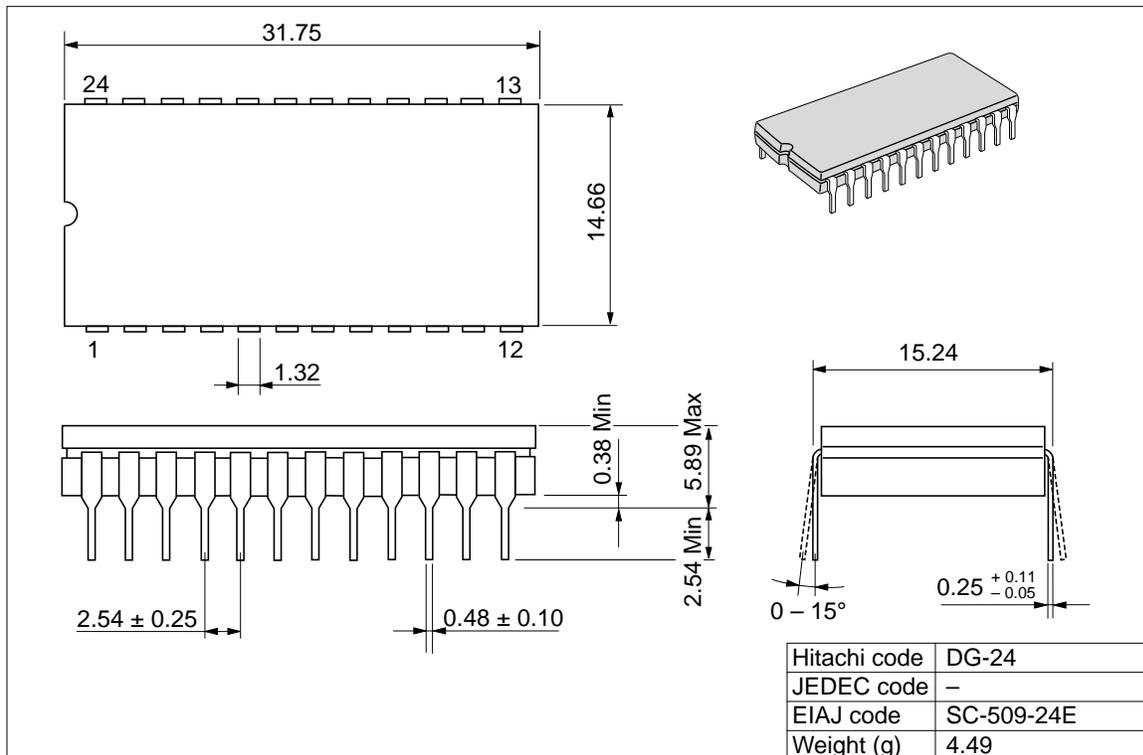
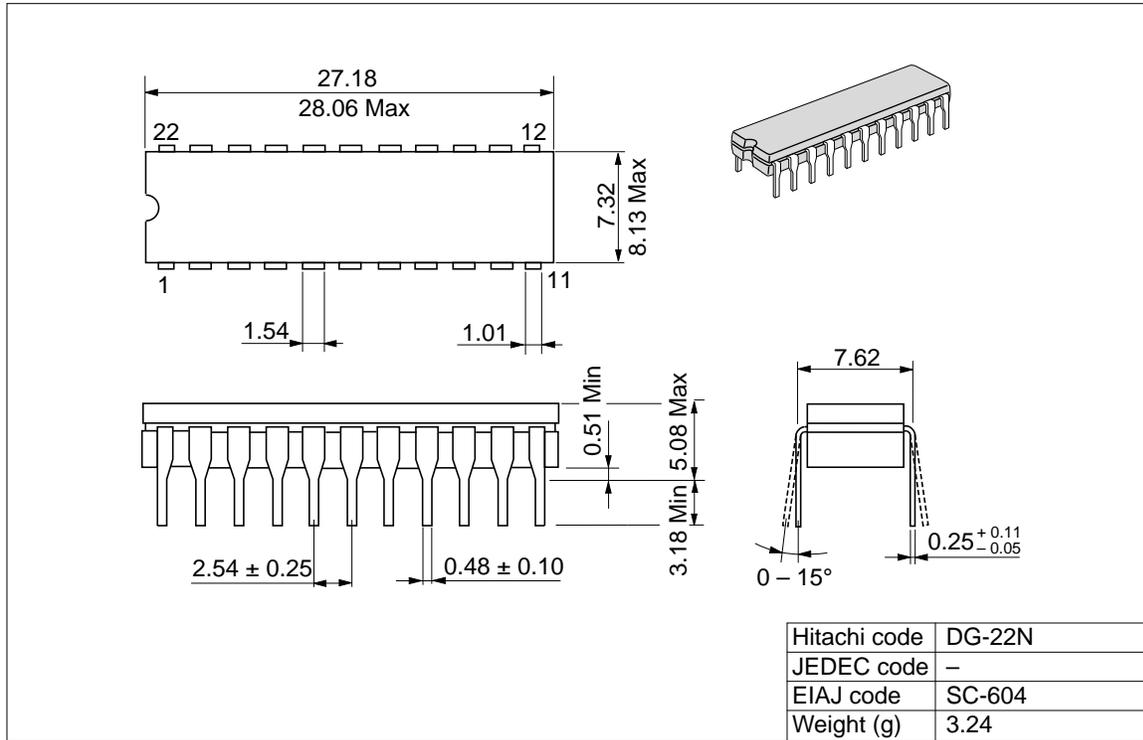
Package Outline Dimensions



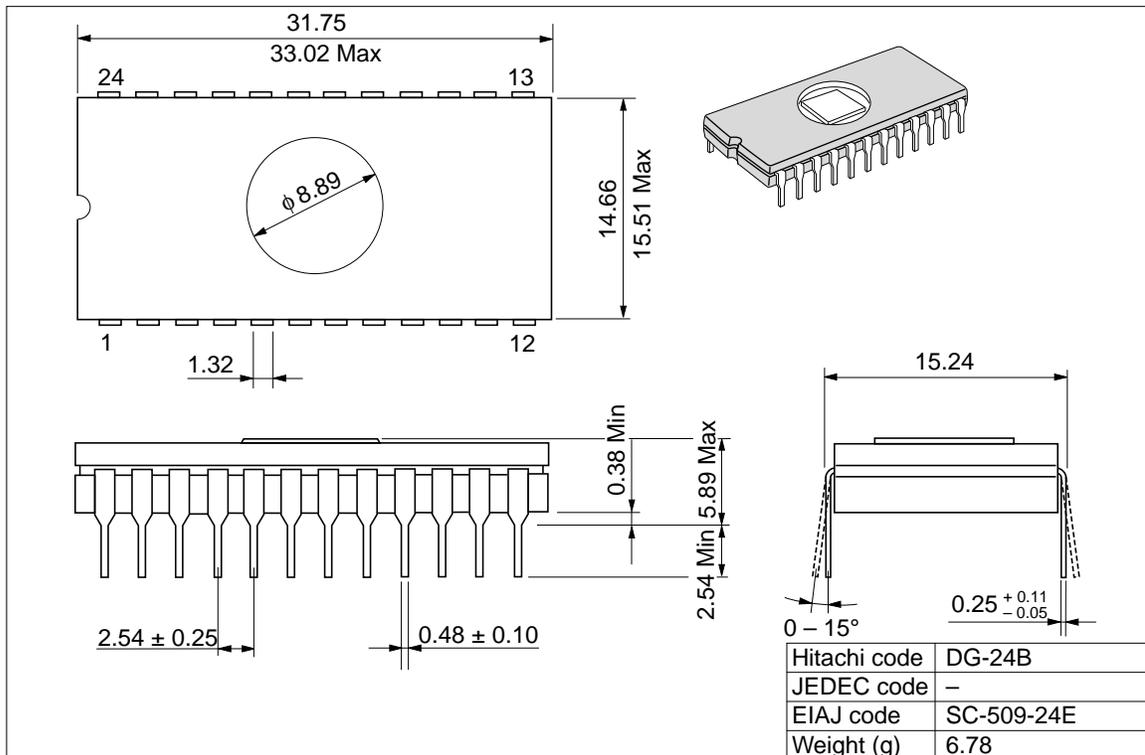
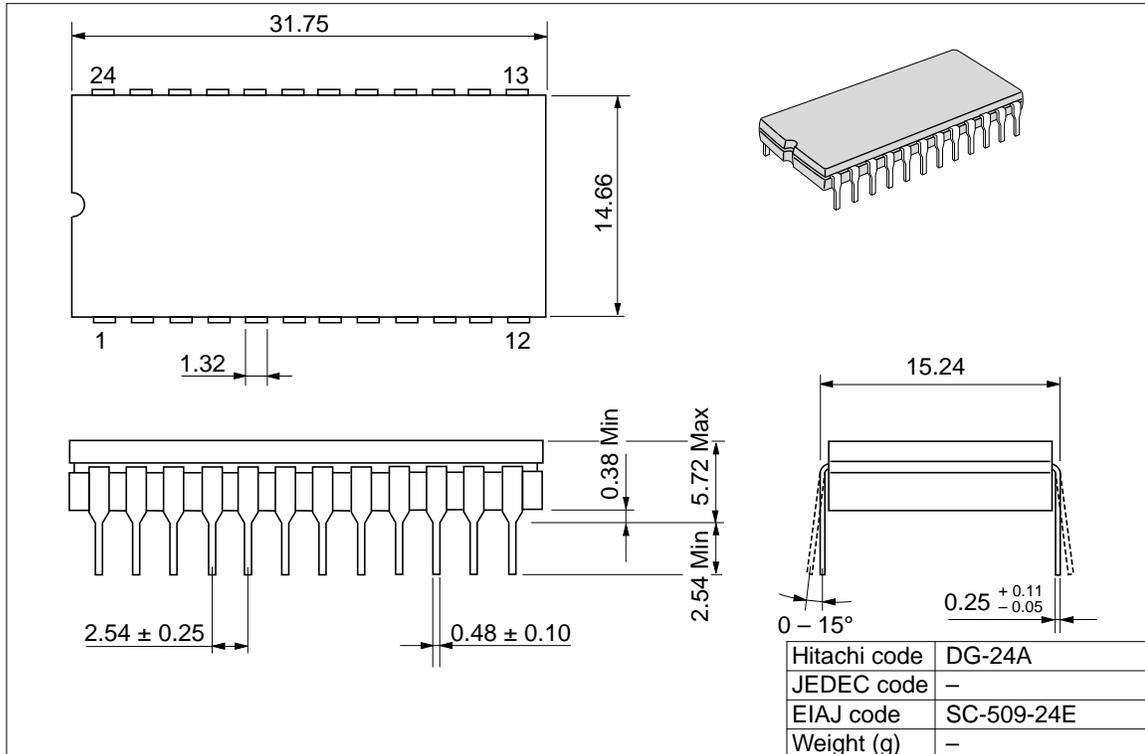
Package Outline Dimensions



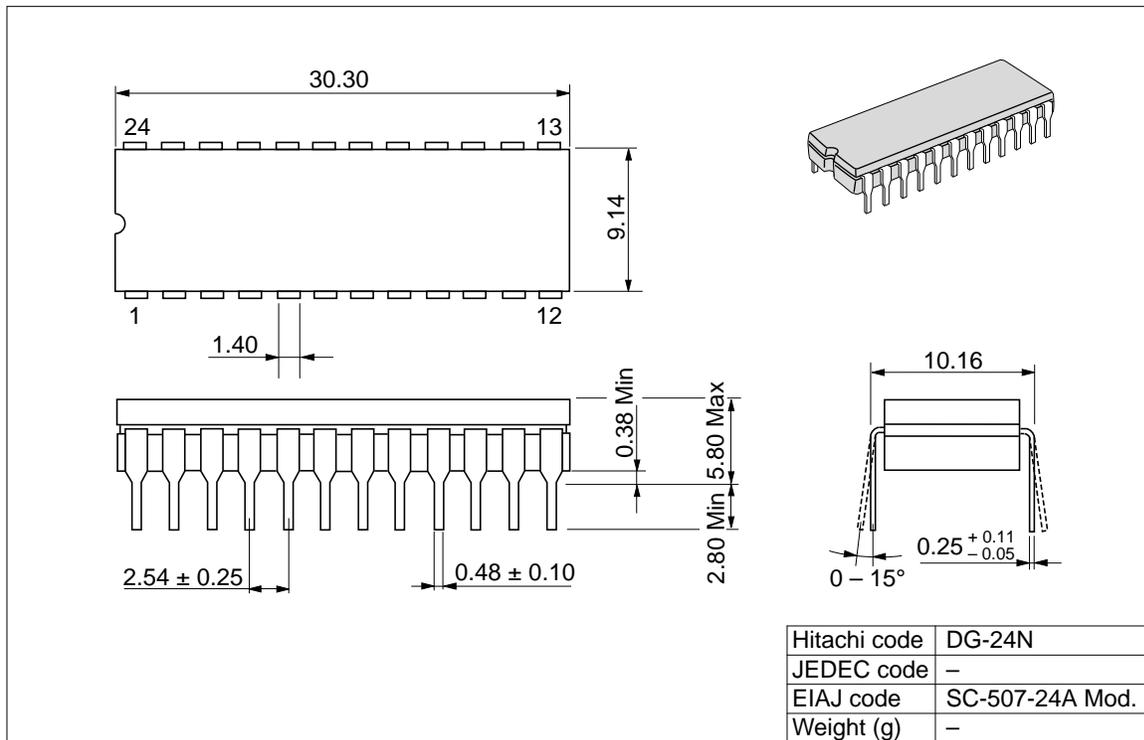
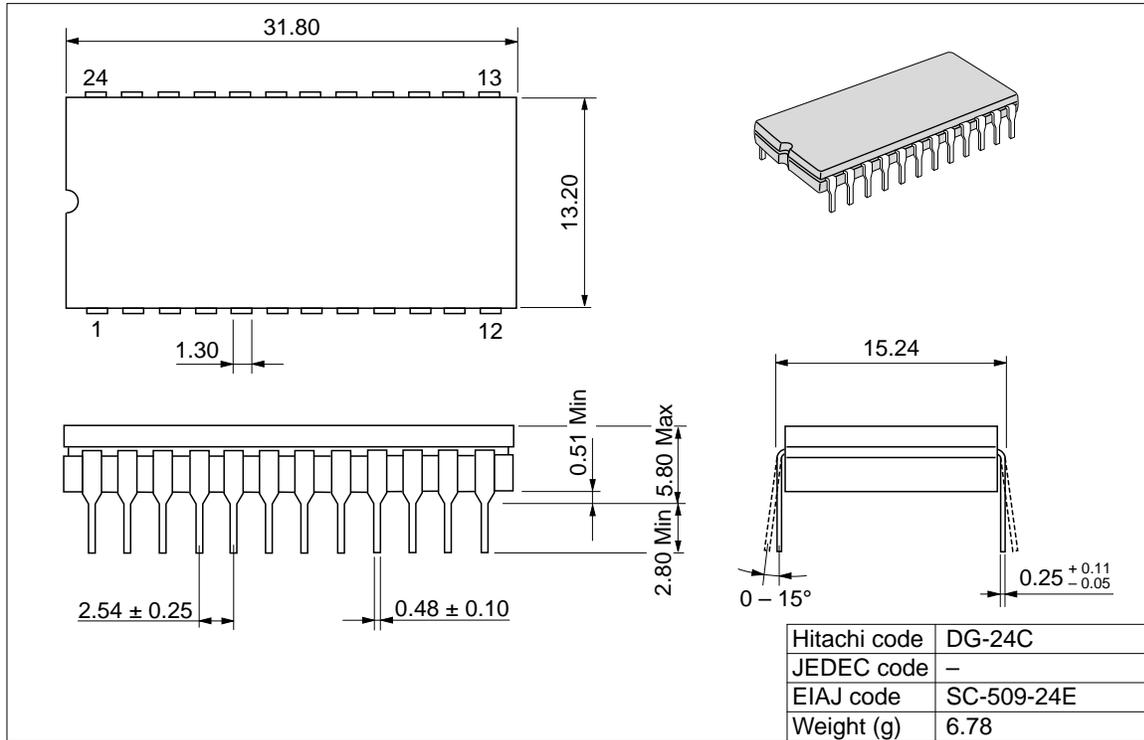
Package Outline Dimensions



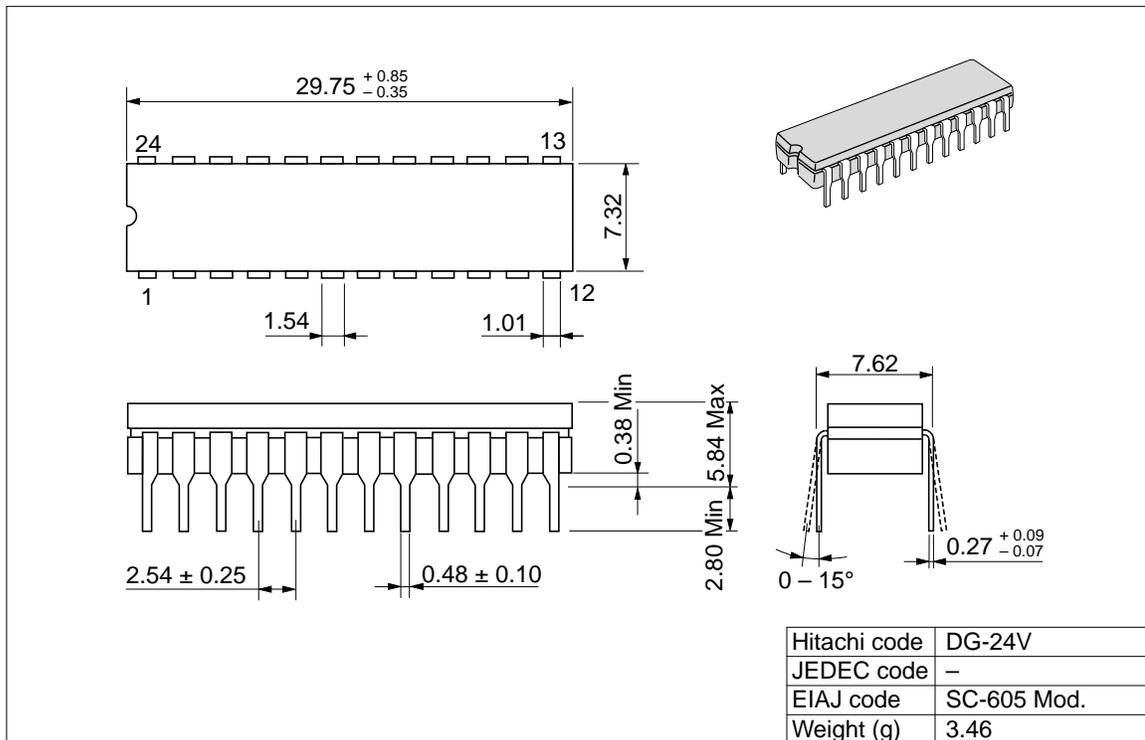
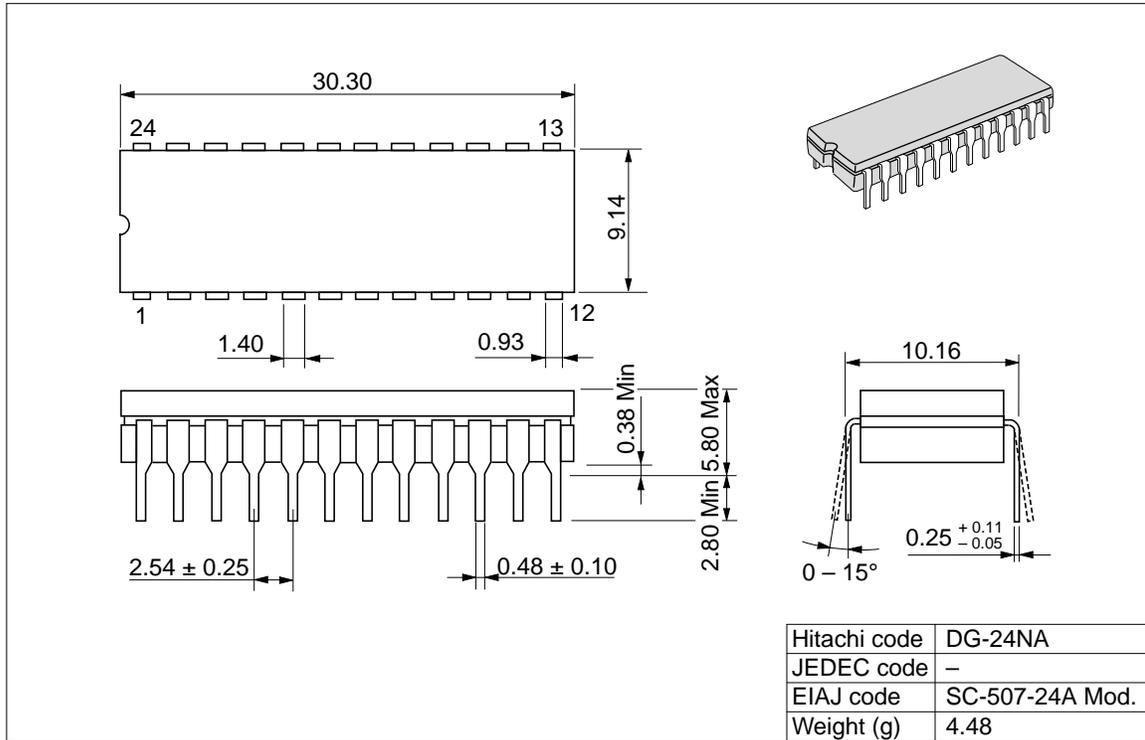
Package Outline Dimensions



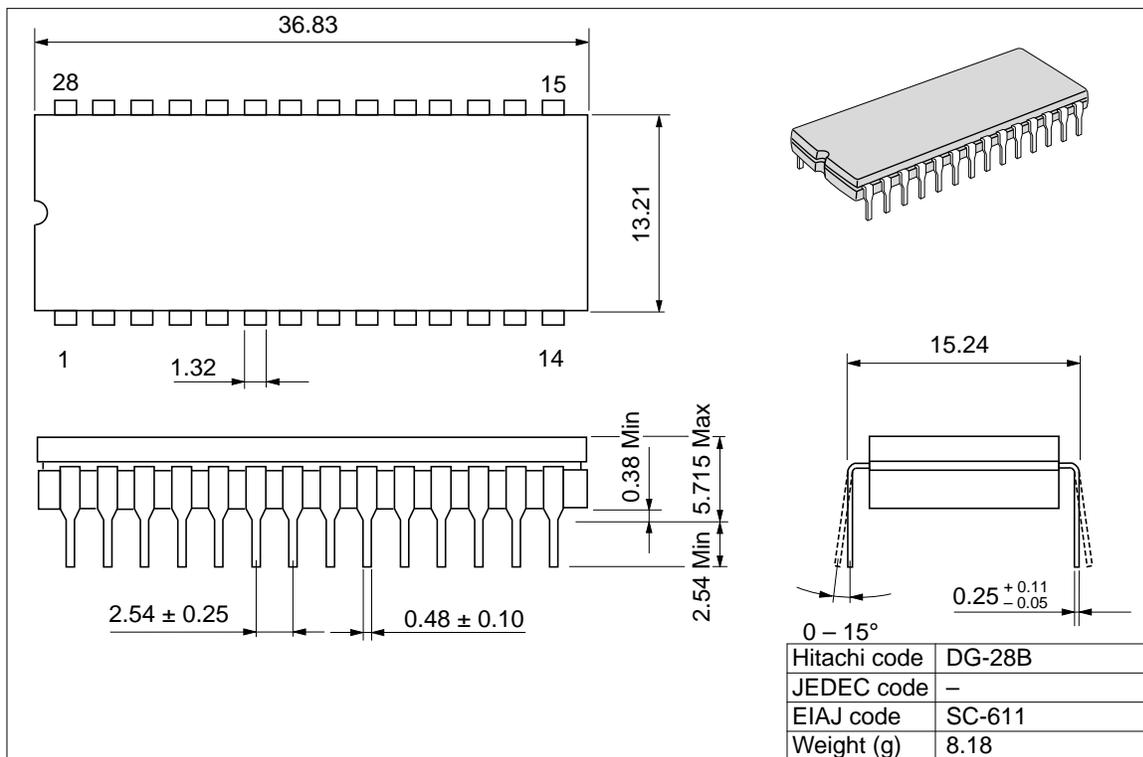
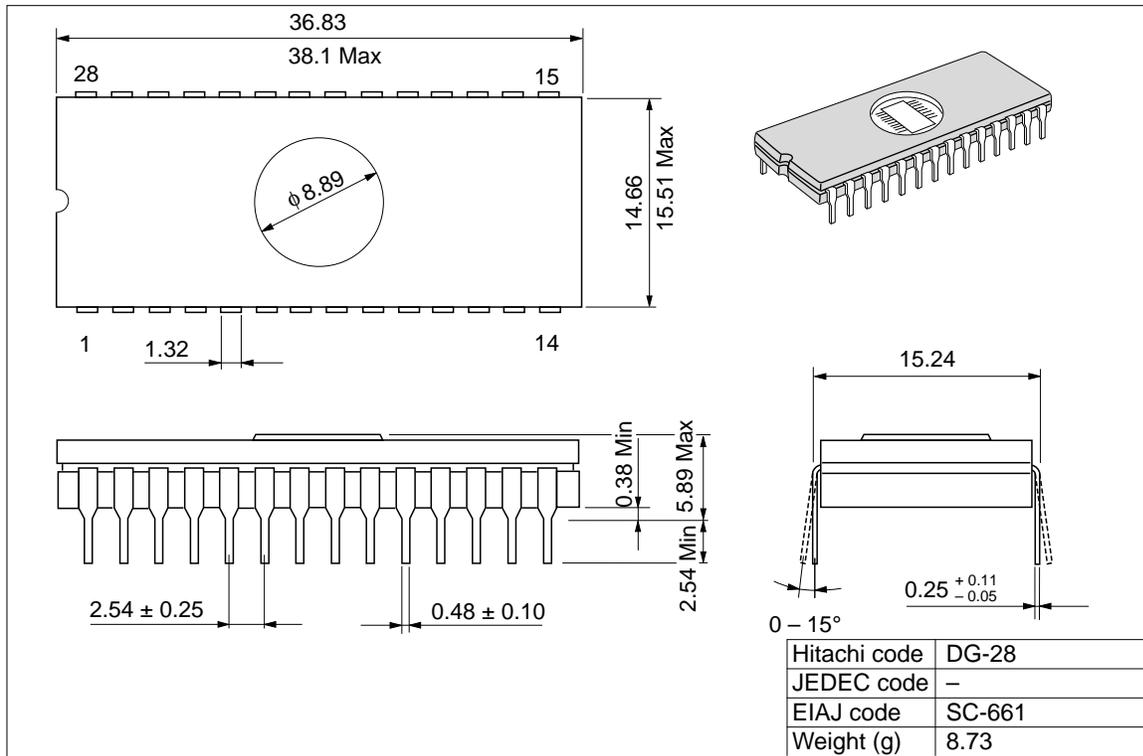
Package Outline Dimensions



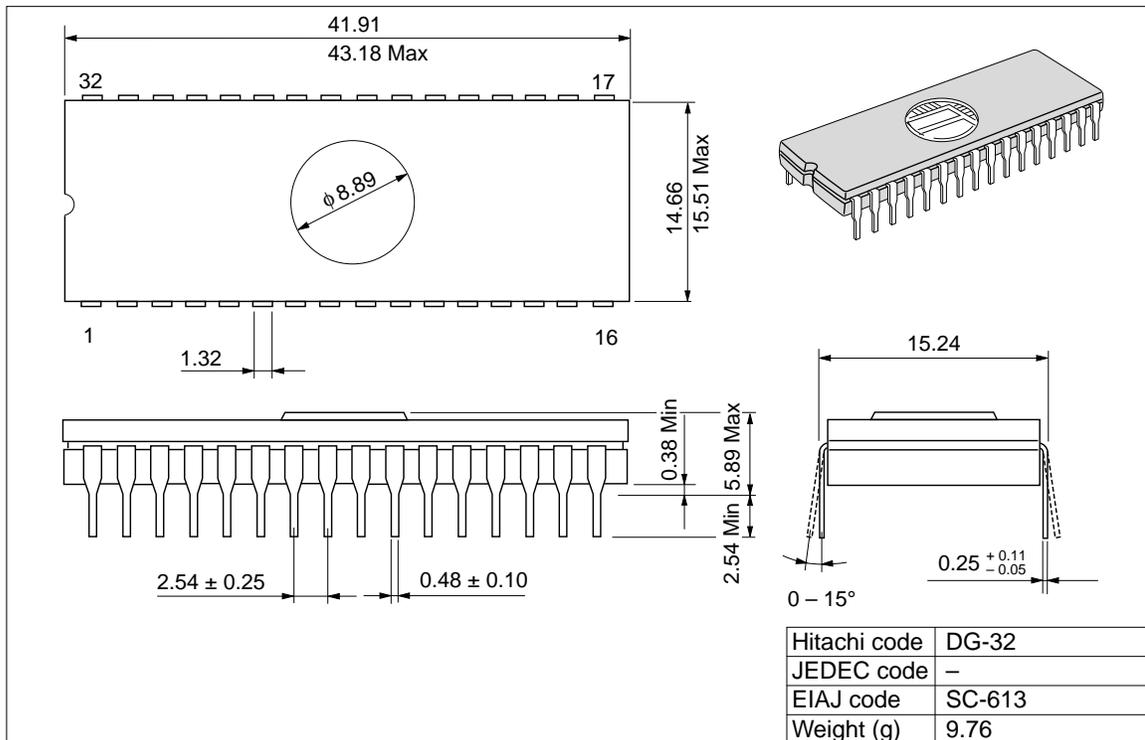
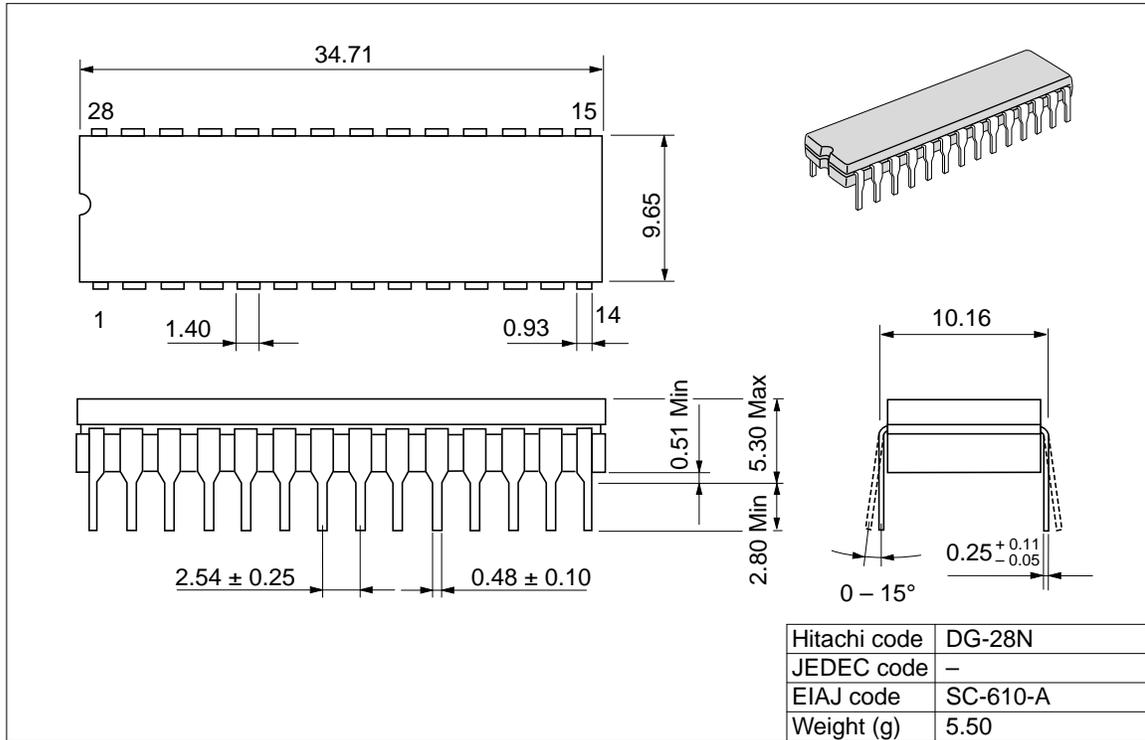
Package Outline Dimensions



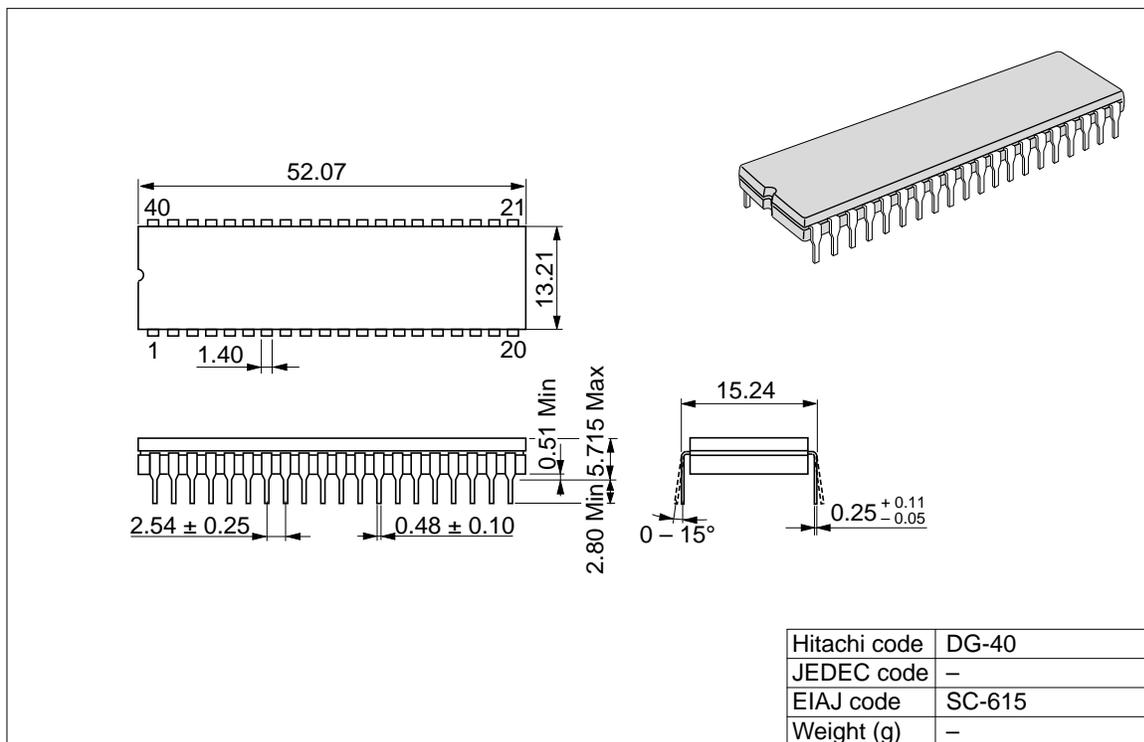
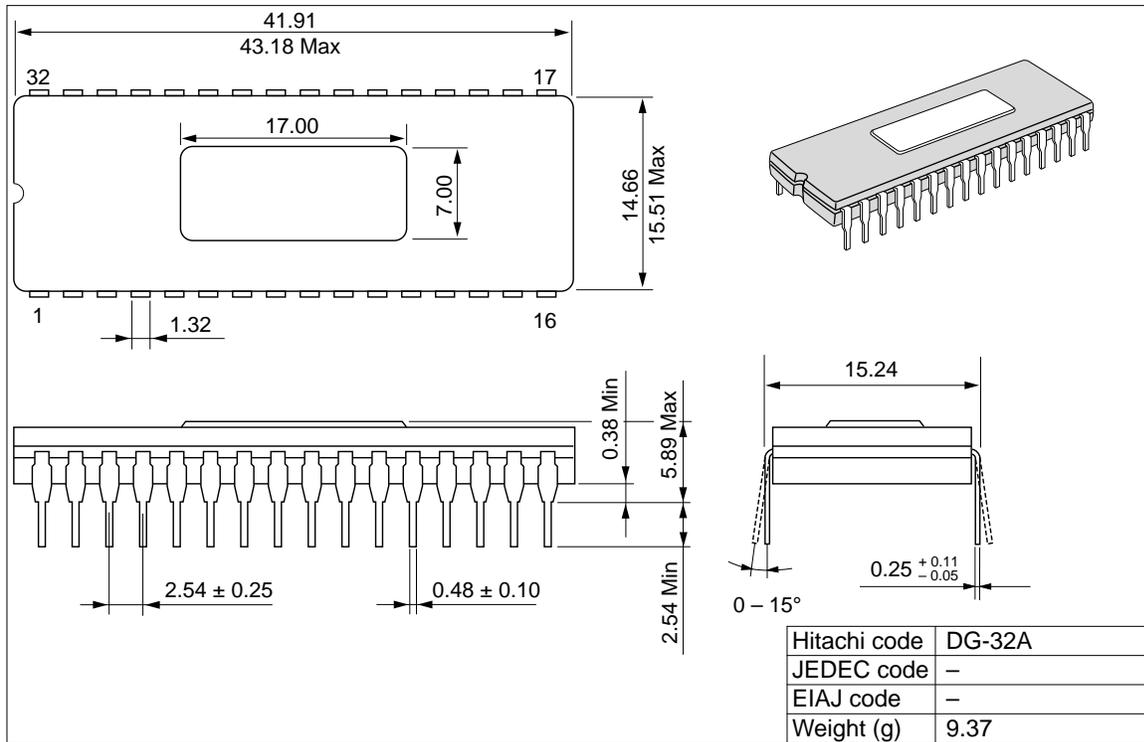
Package Outline Dimensions



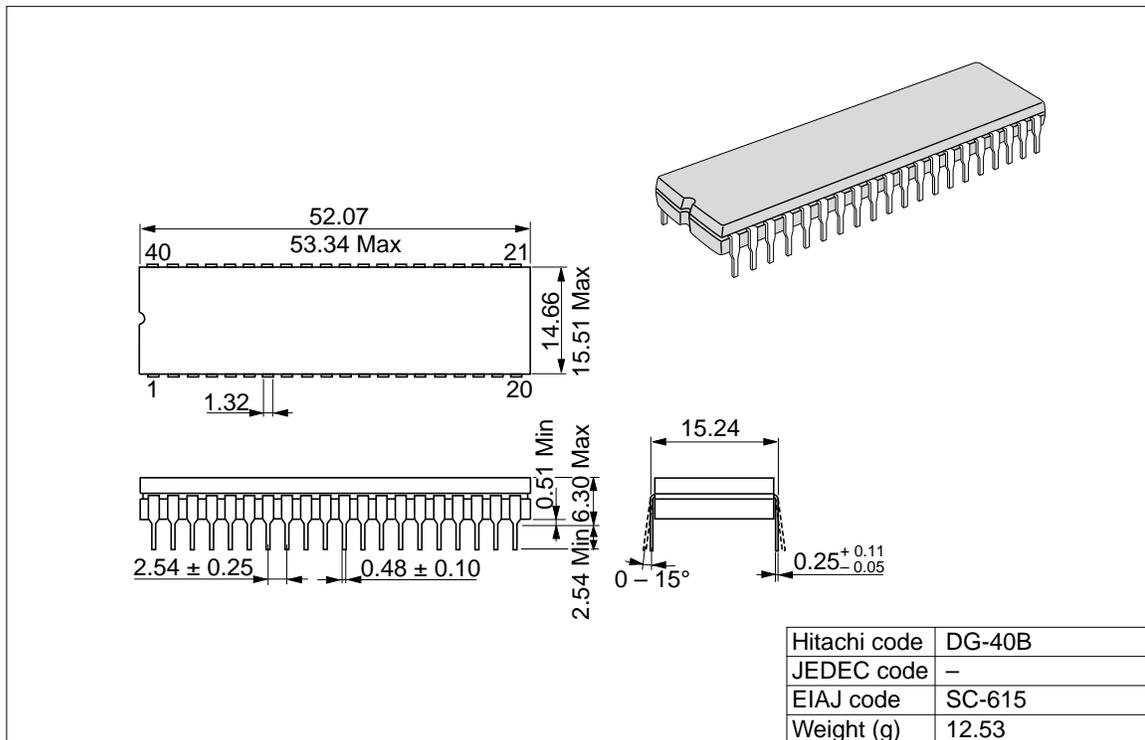
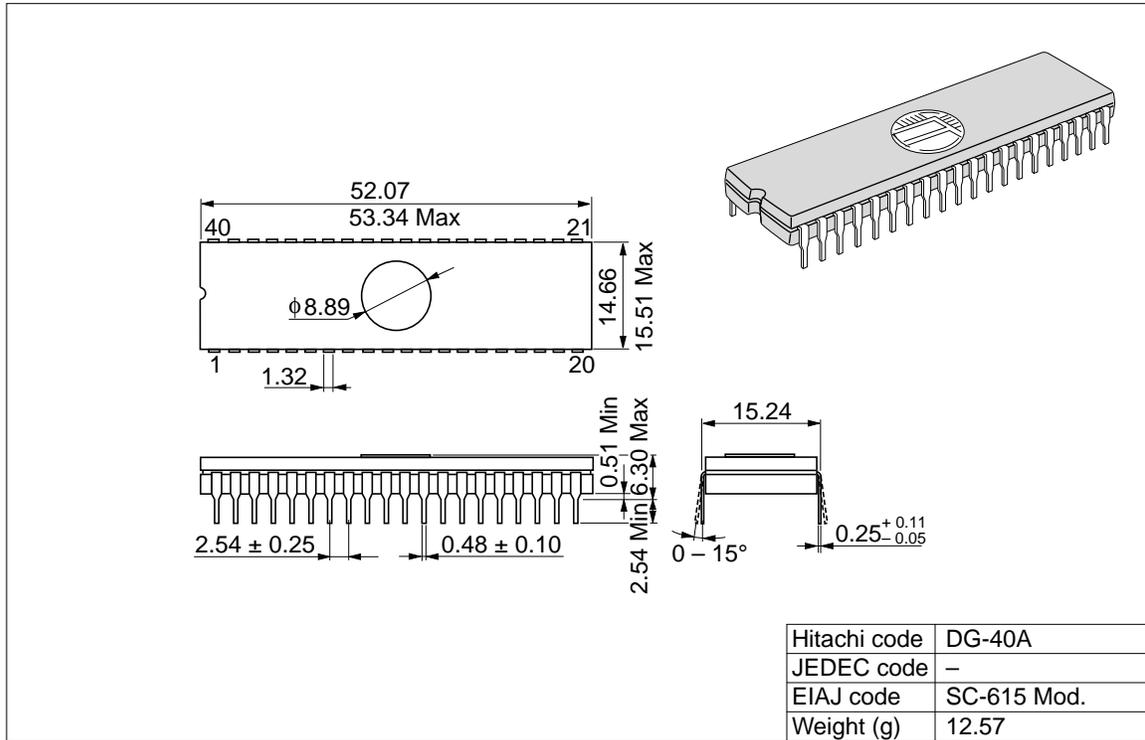
Package Outline Dimensions



Package Outline Dimensions

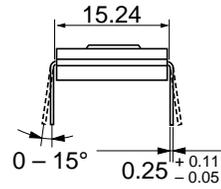
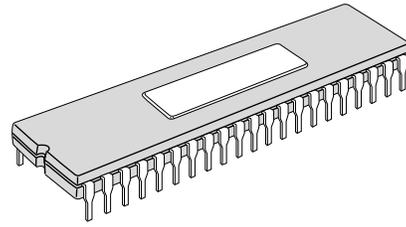
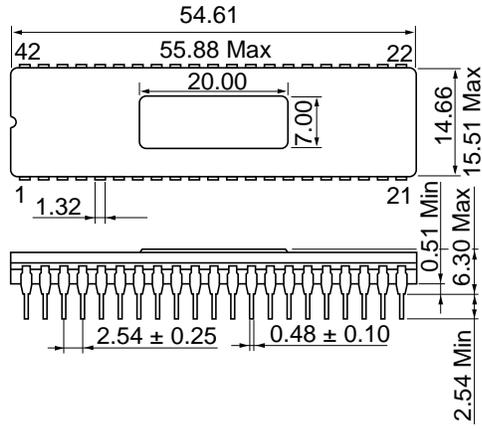


Package Outline Dimensions



Package Outline Dimensions

Under development

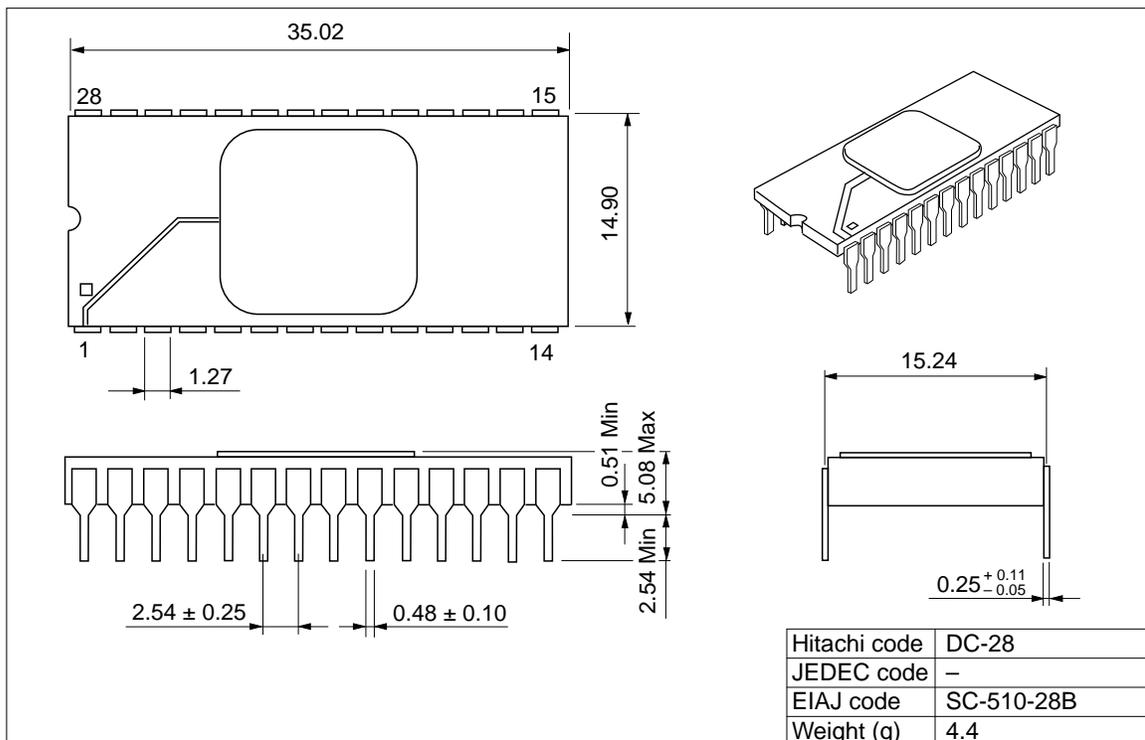
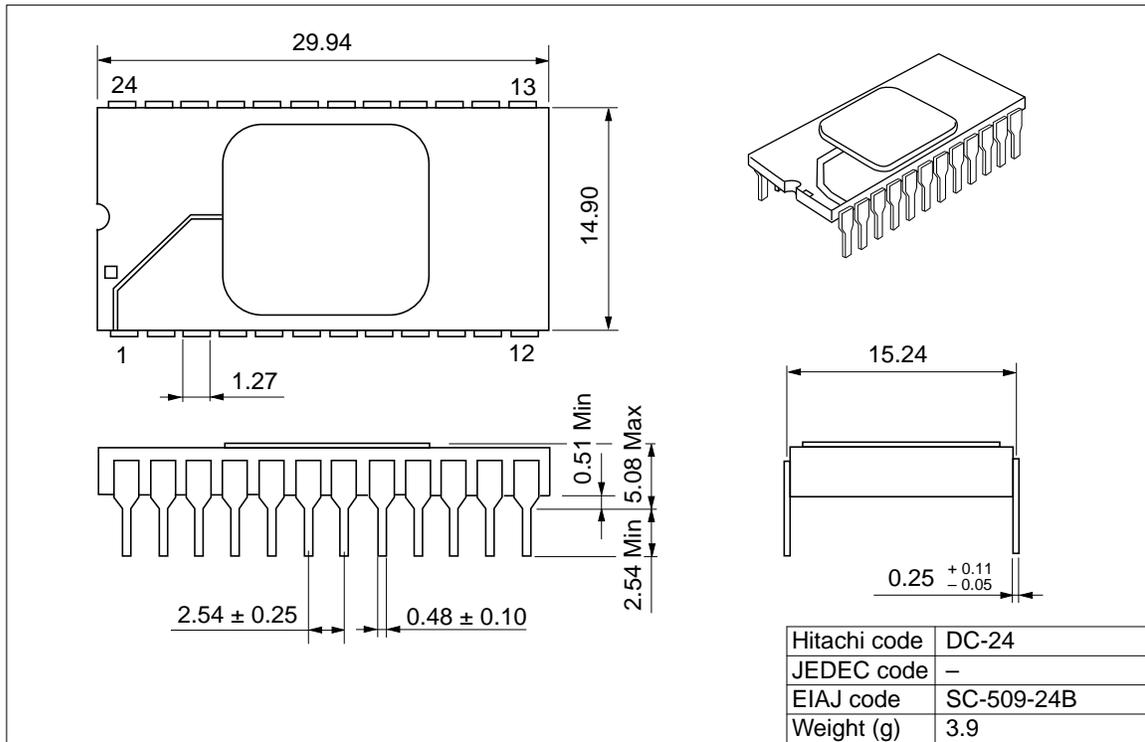


Hitachi code	DG-42
JEDEC code	-
EIAJ code	-
Weight (g)	12.51

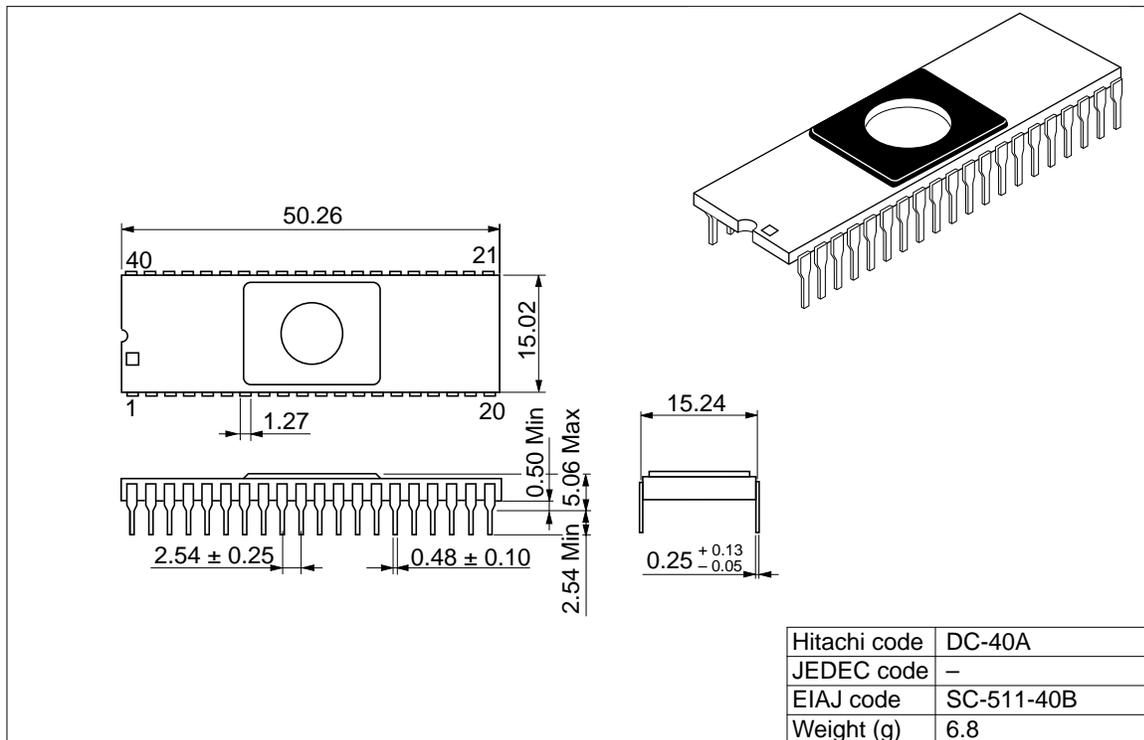
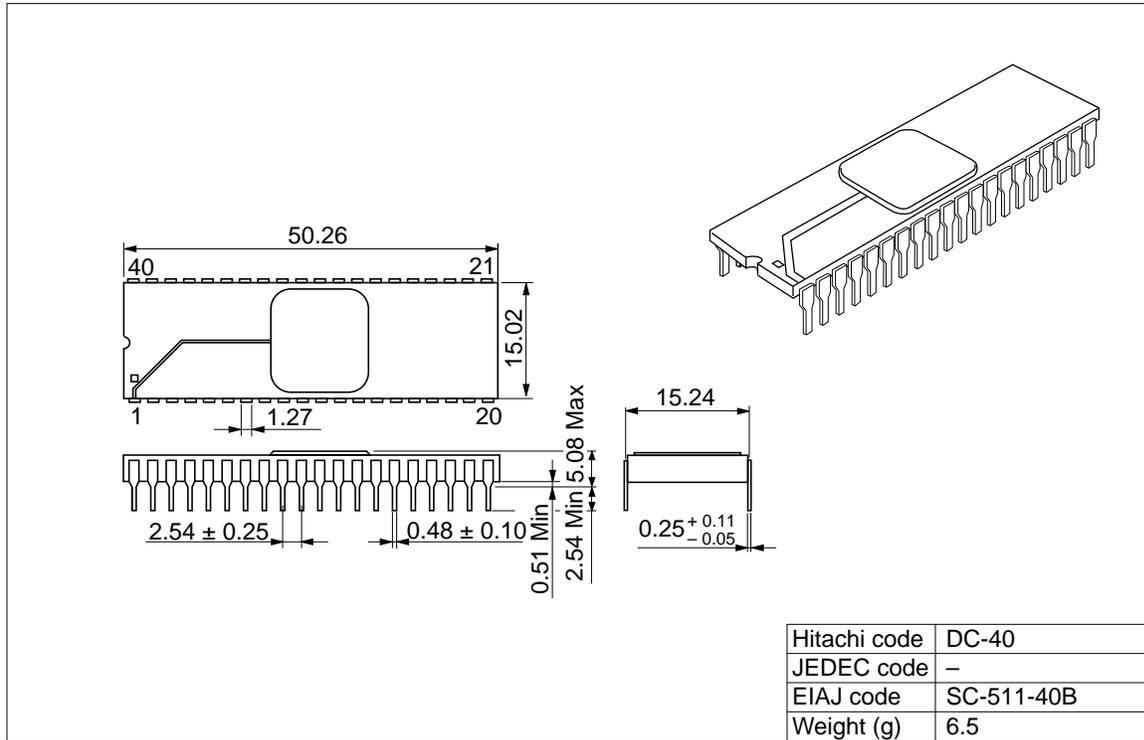
Package Outline Dimensions

(3) Ceramic DIP

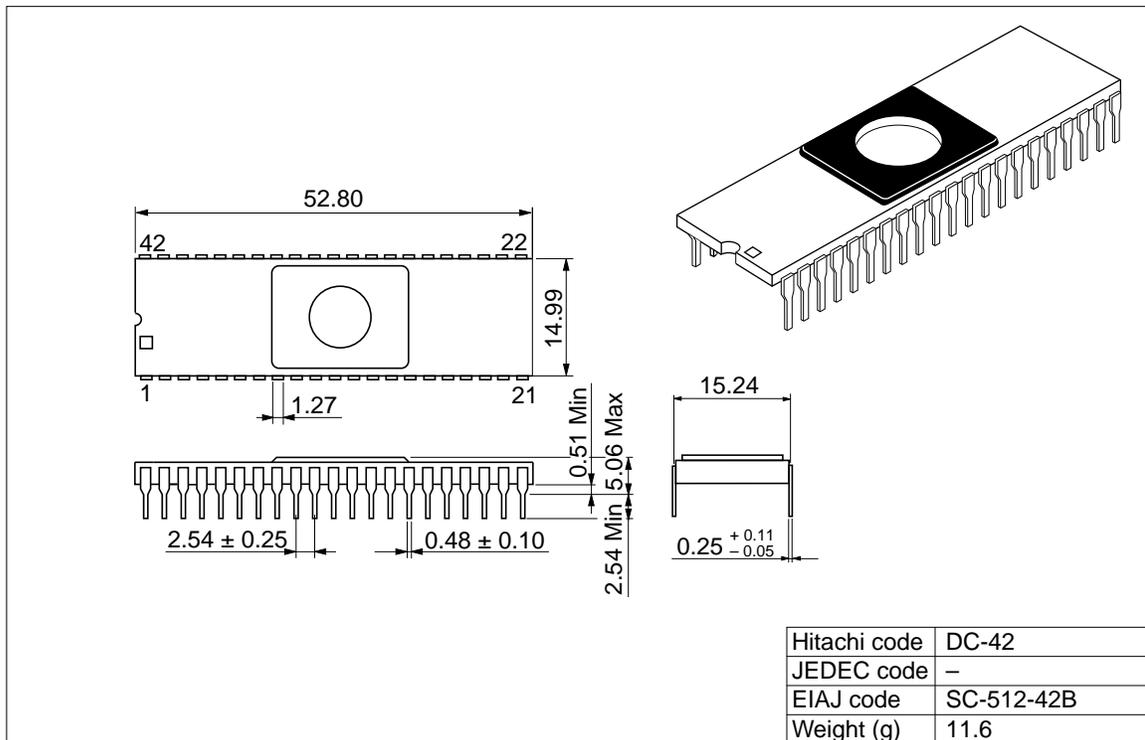
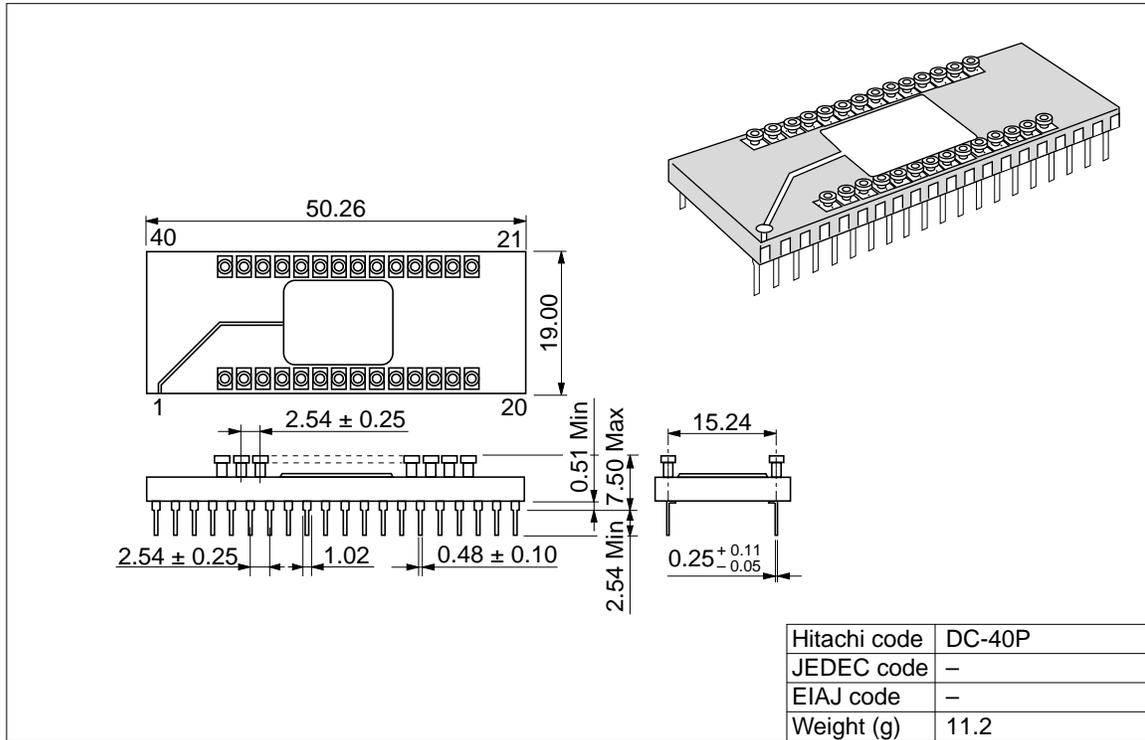
Unit: mm



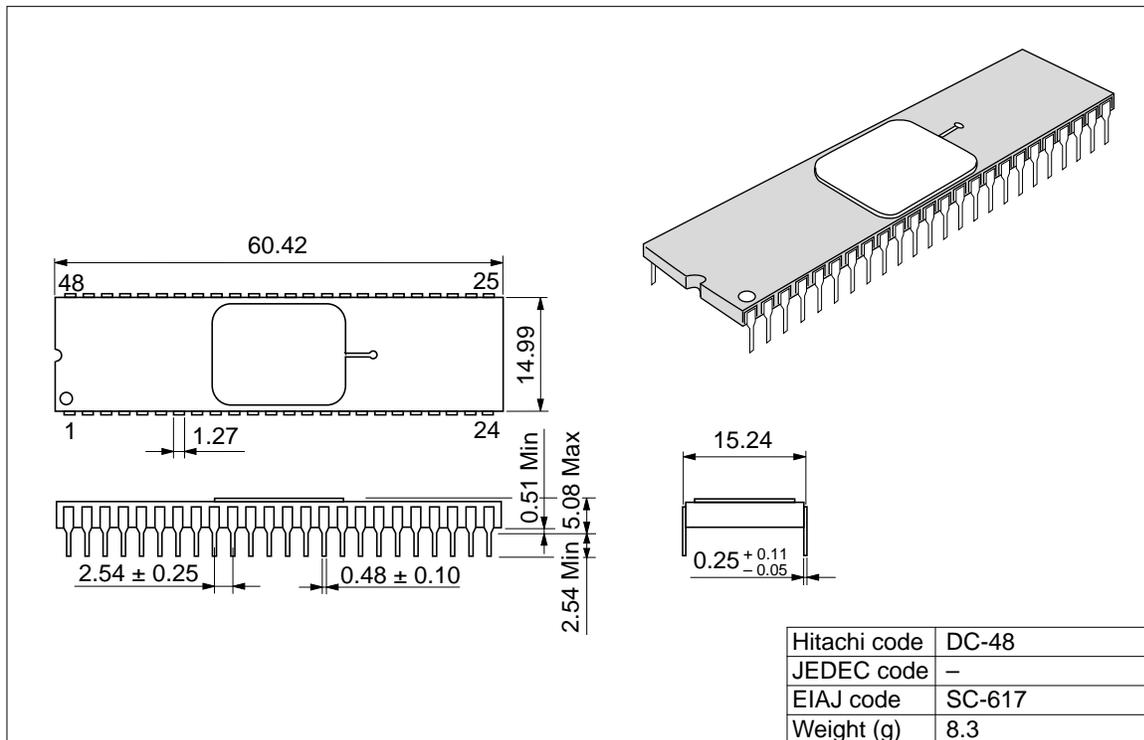
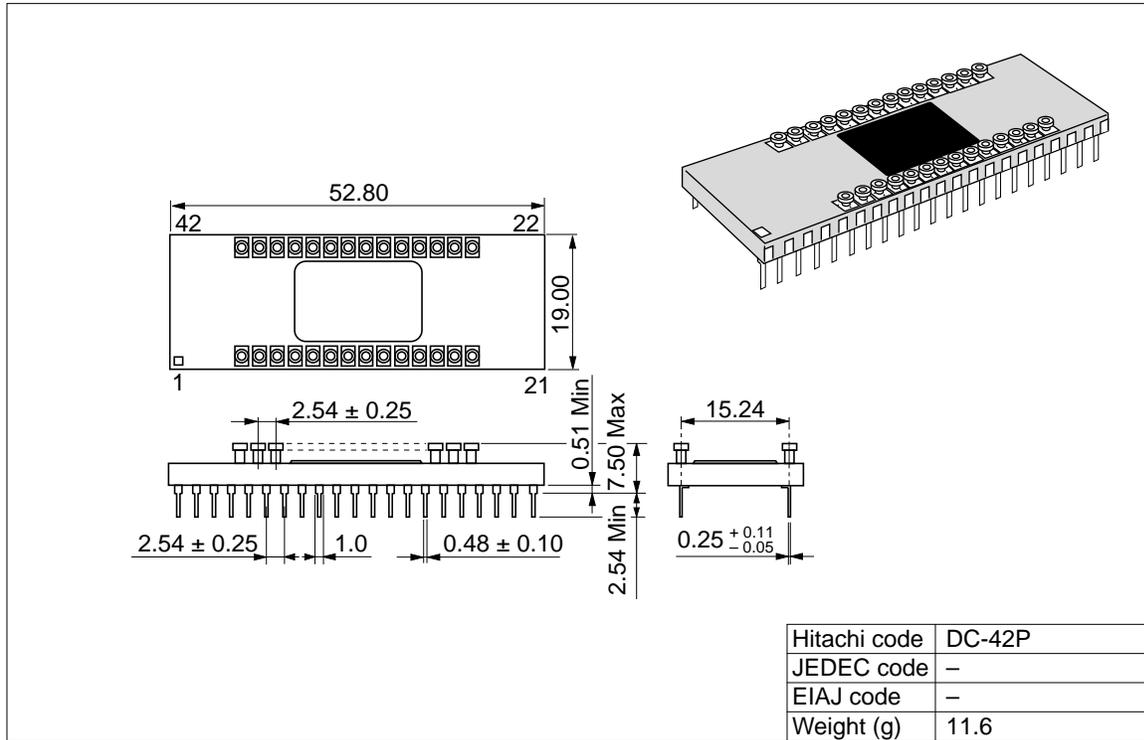
Package Outline Dimensions



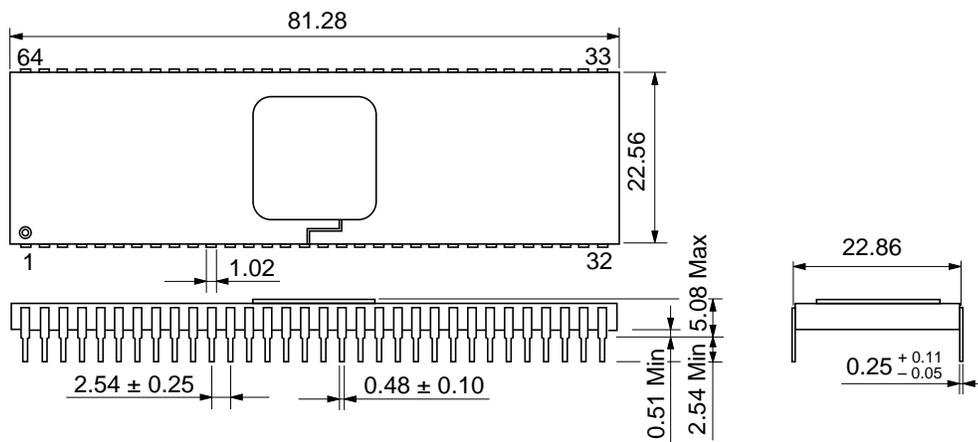
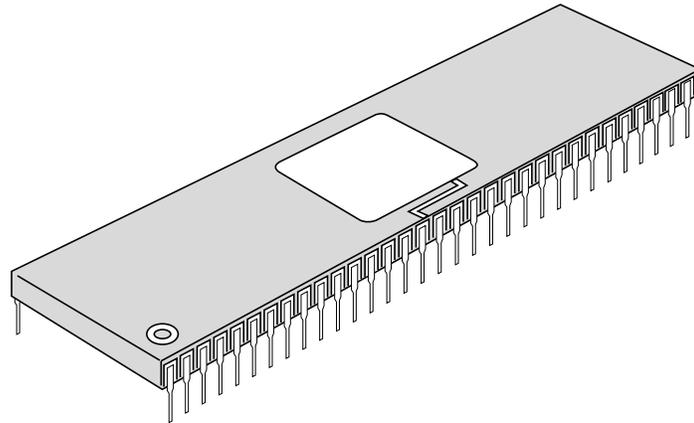
Package Outline Dimensions



Package Outline Dimensions

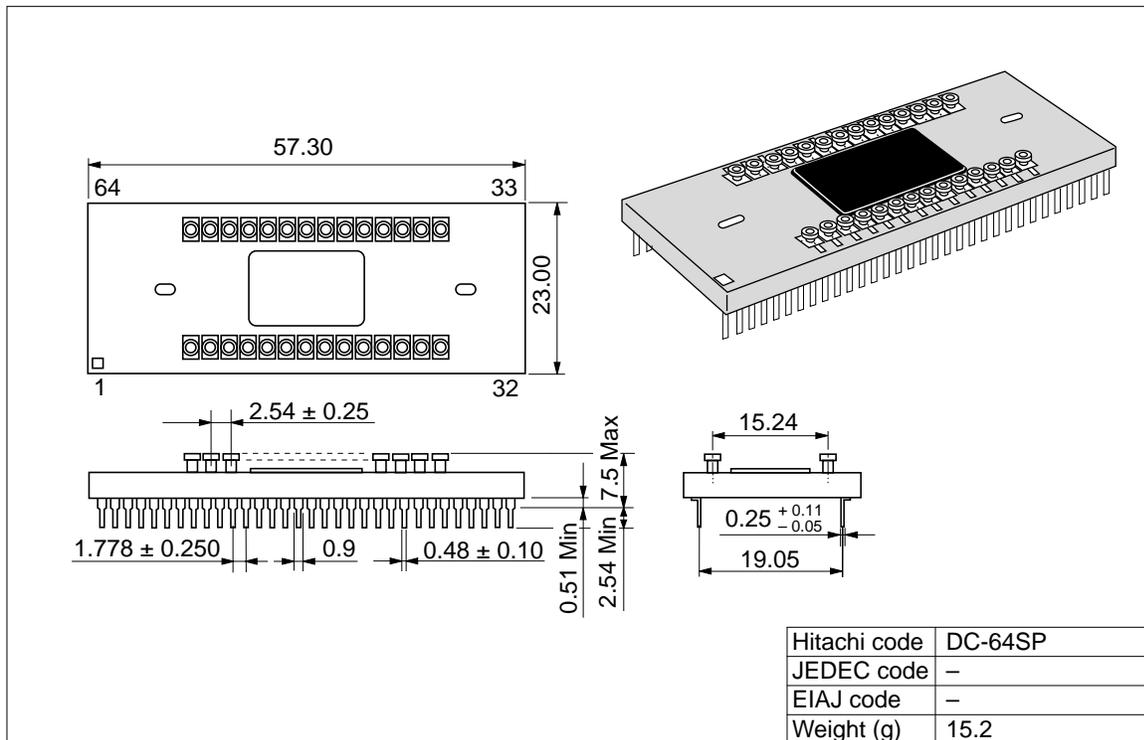
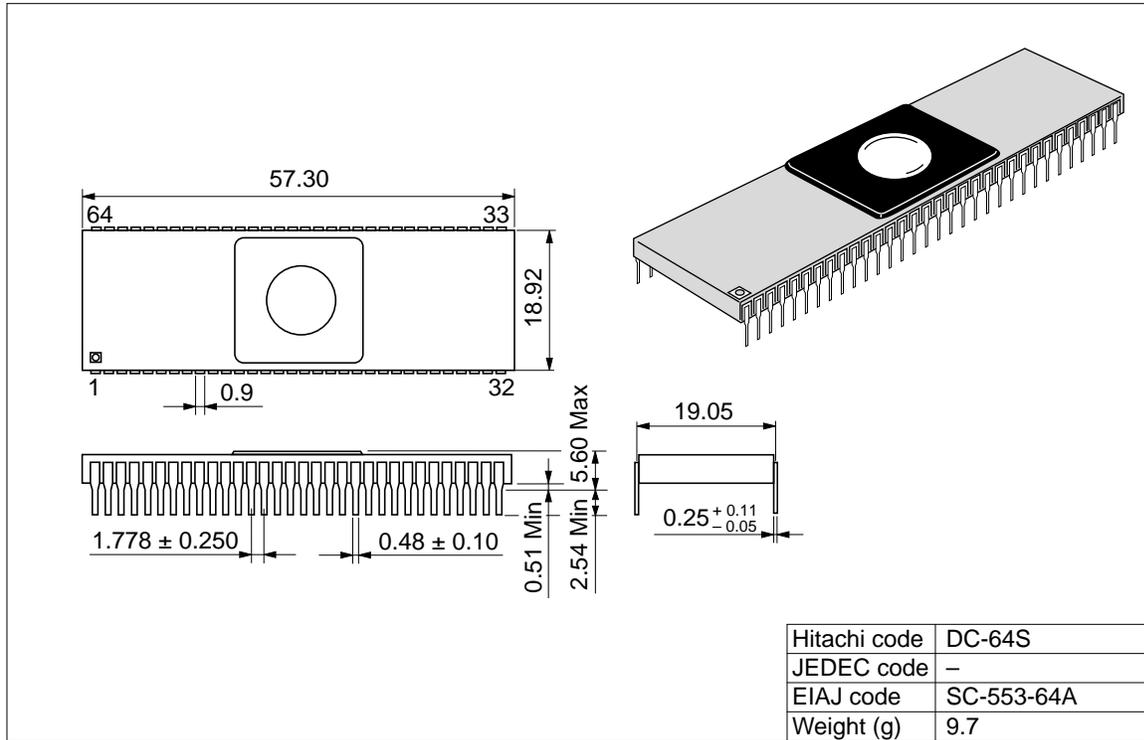


Package Outline Dimensions



Hitachi code	DC-64
JEDEC code	-
EIAJ code	SC-619
Weight (g)	15.4

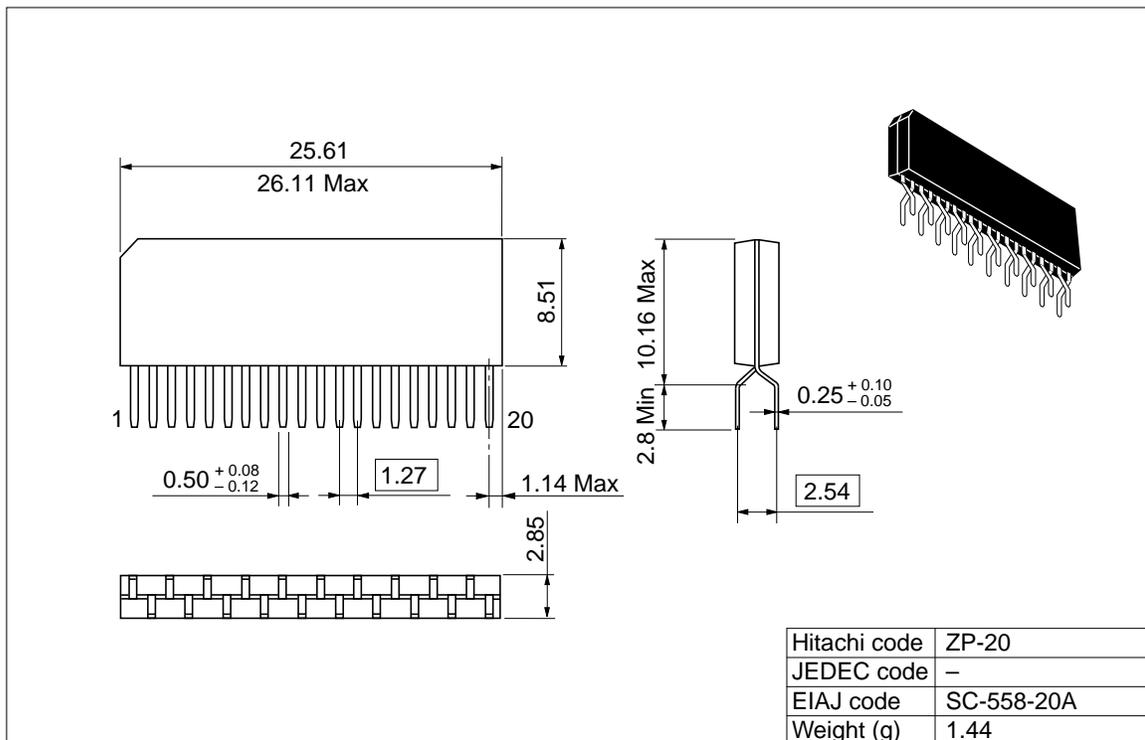
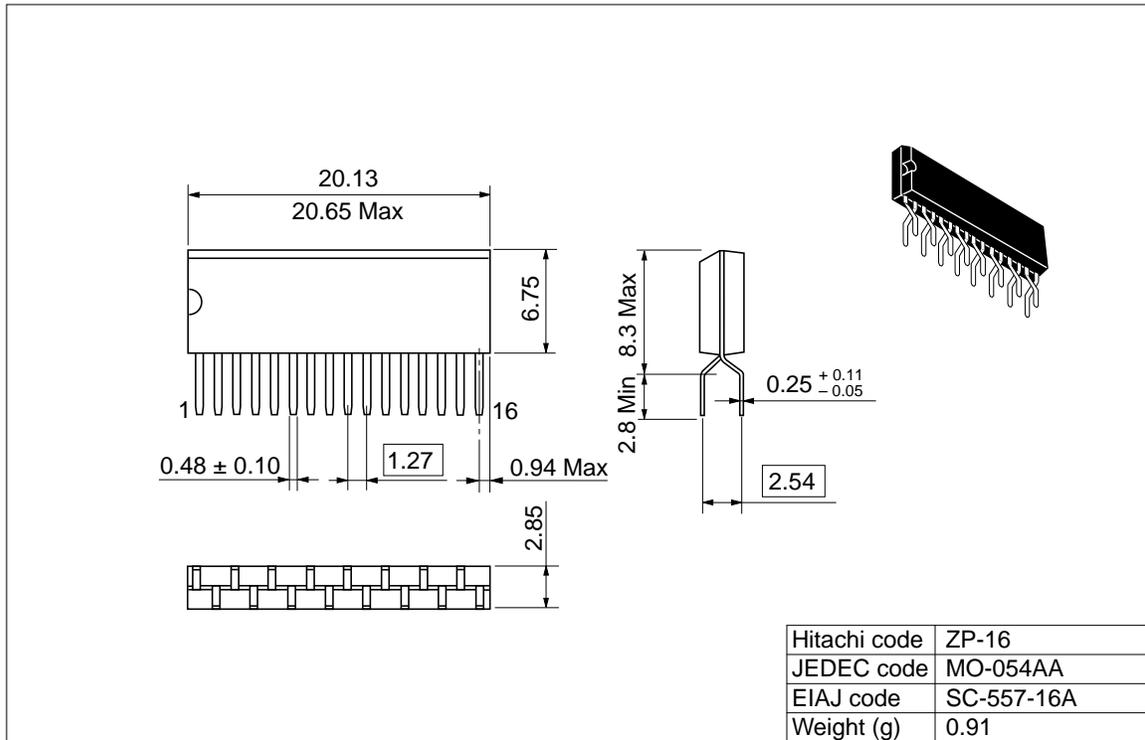
Package Outline Dimensions



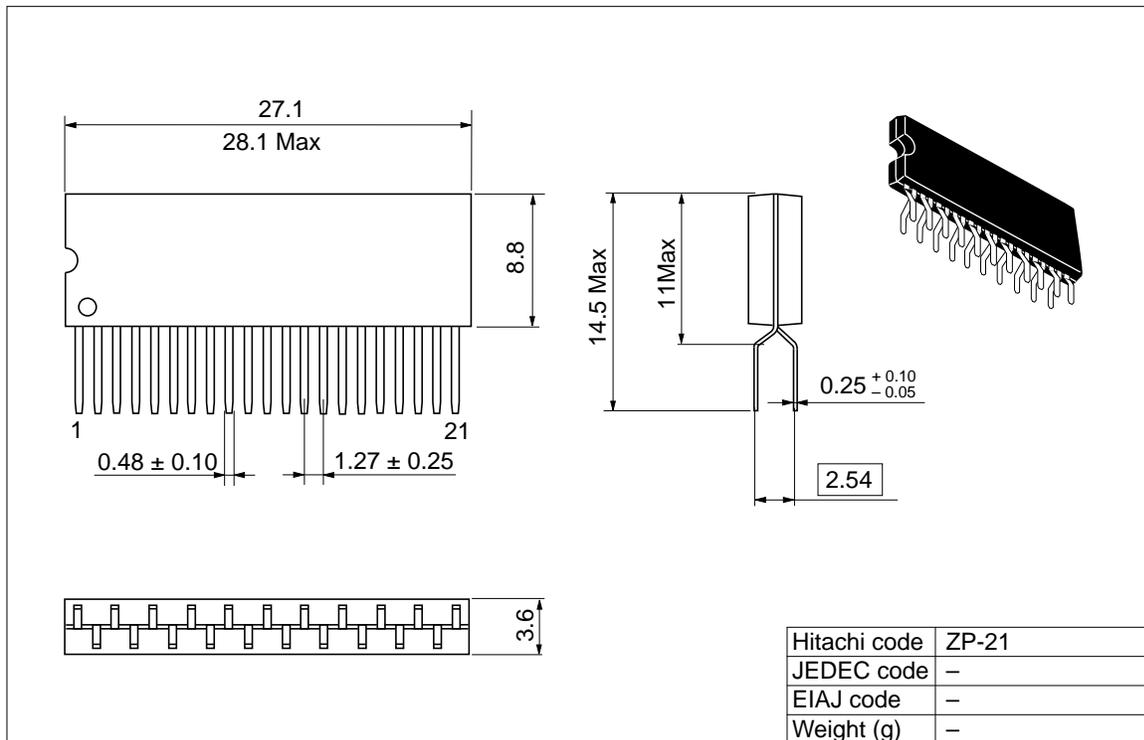
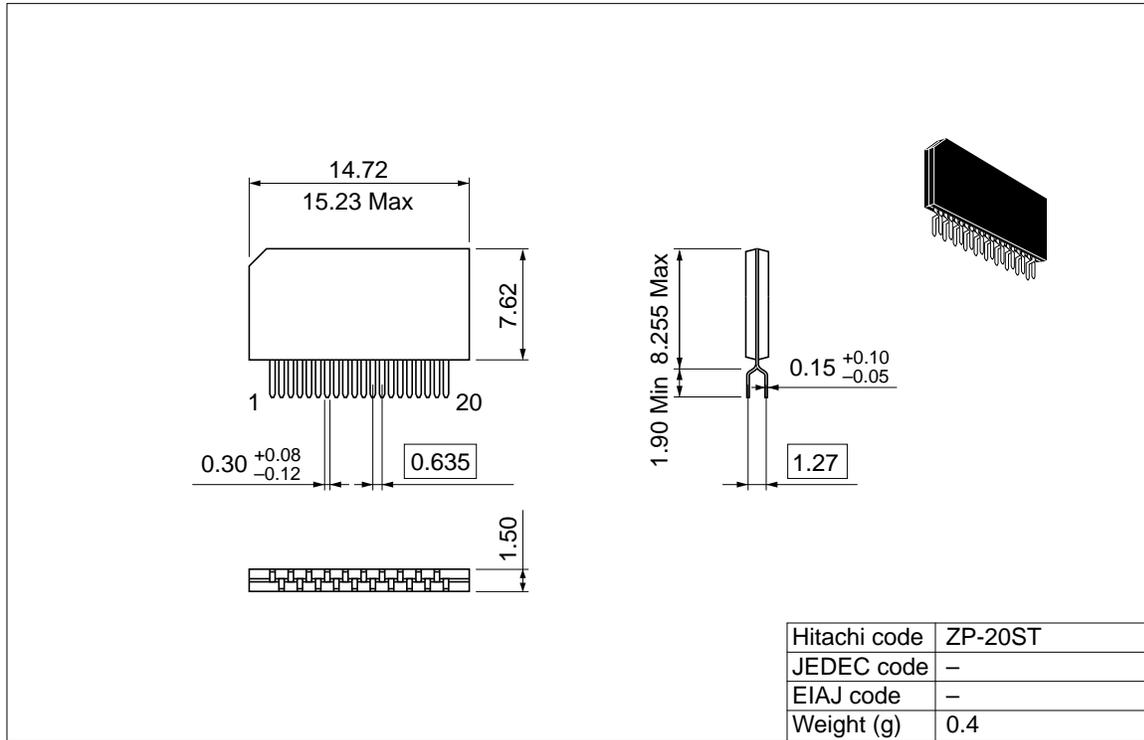
Package Outline Dimensions

(4) Plastic ZIP

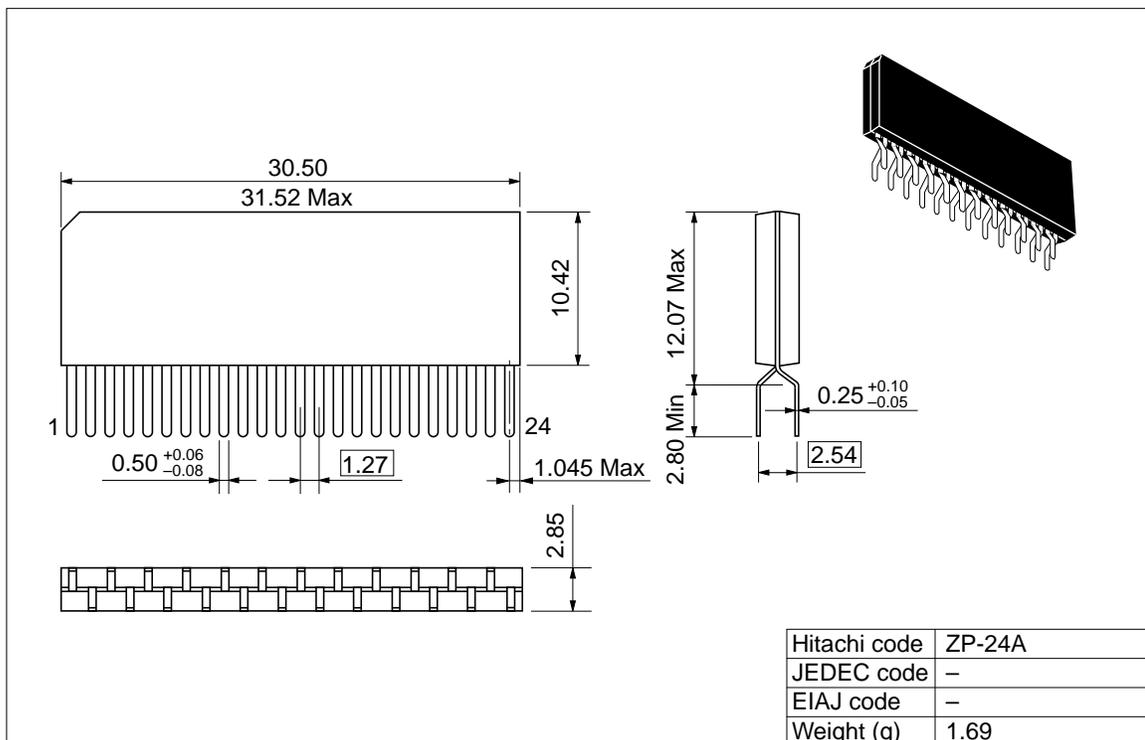
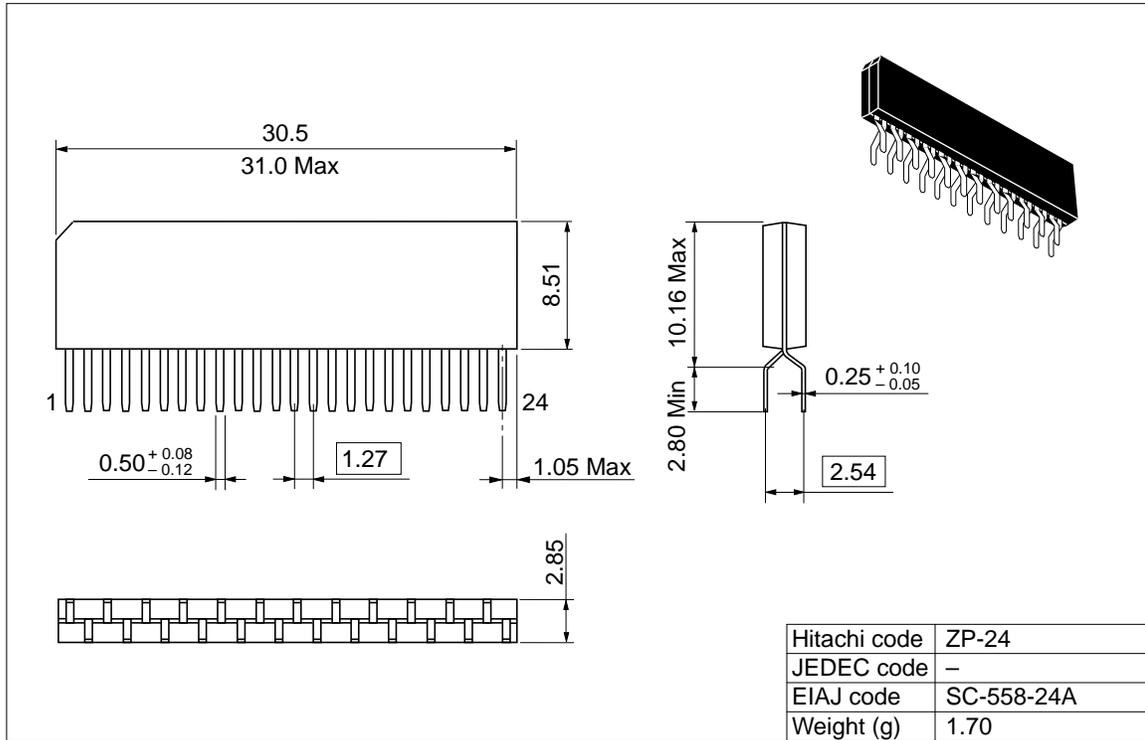
Unit: mm



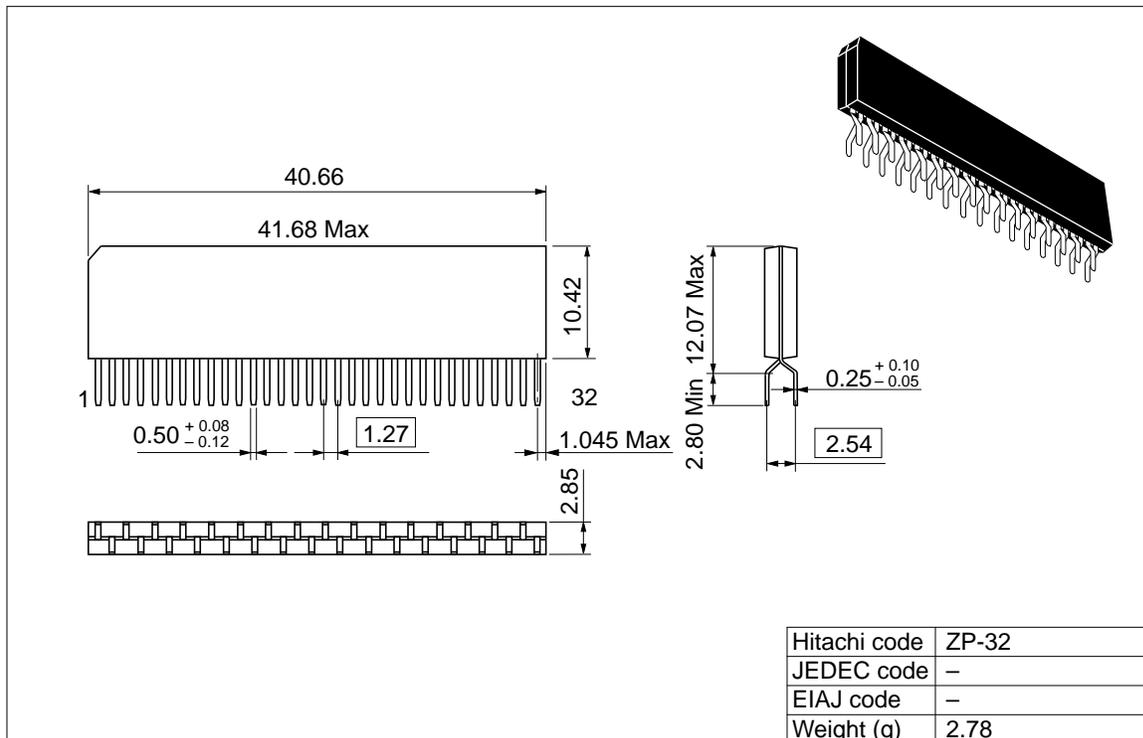
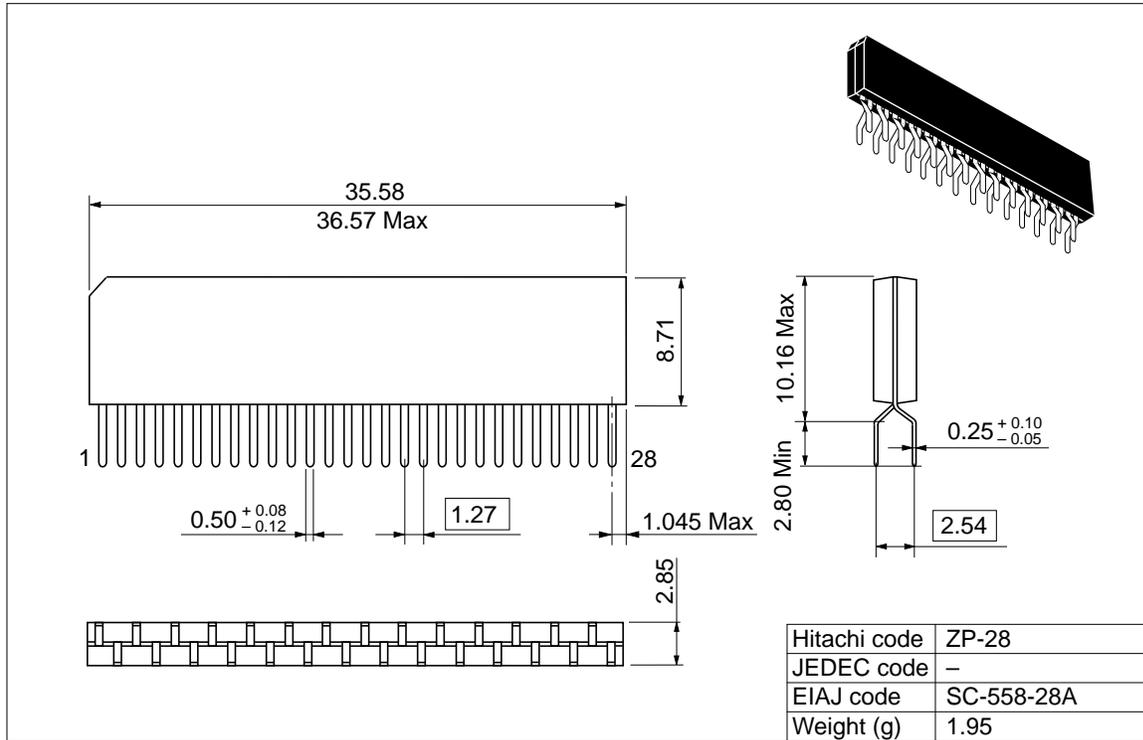
Package Outline Dimensions



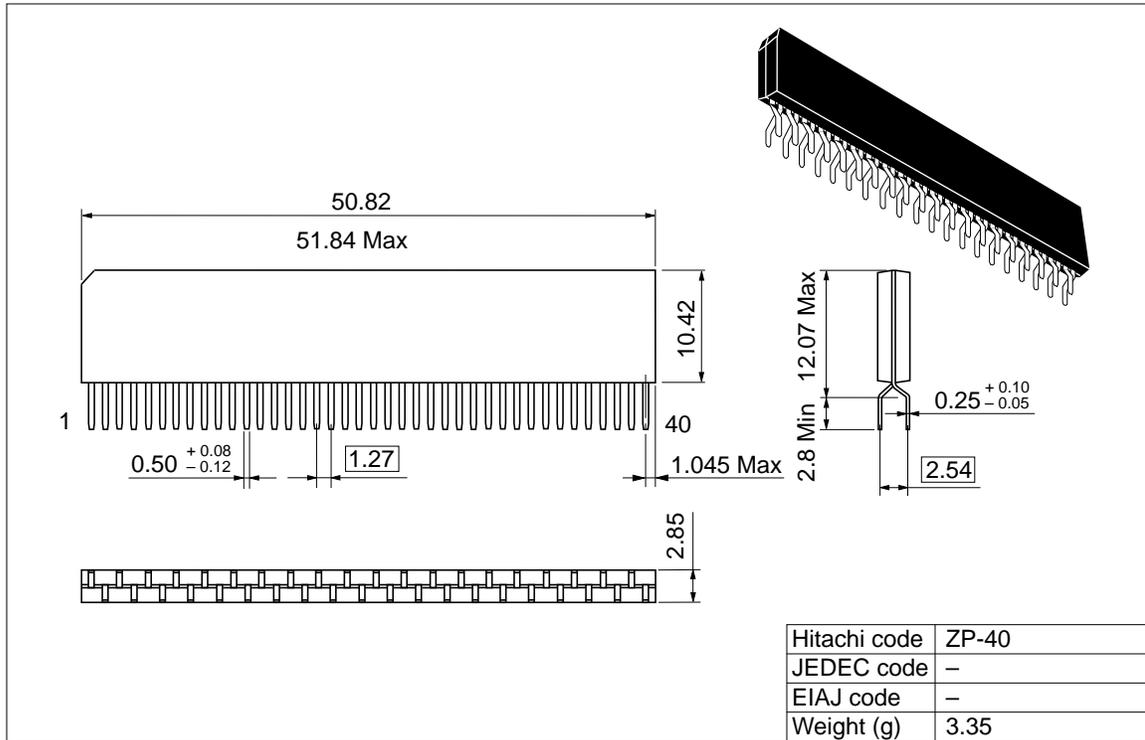
Package Outline Dimensions



Package Outline Dimensions



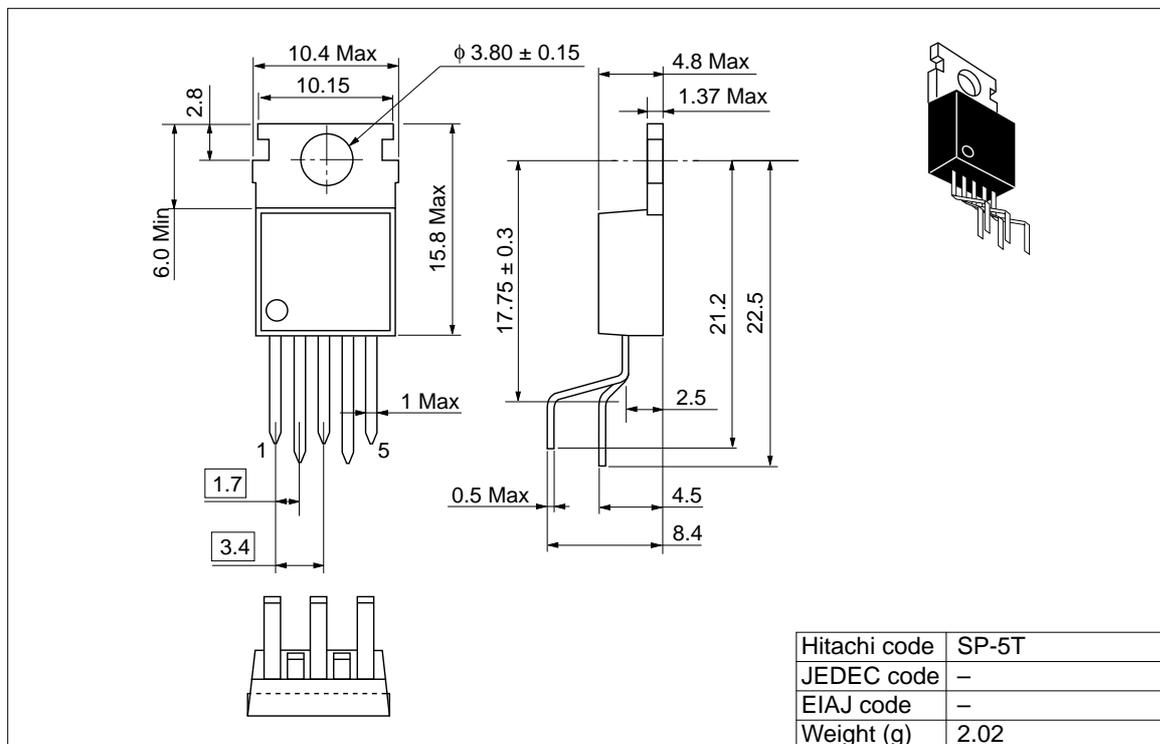
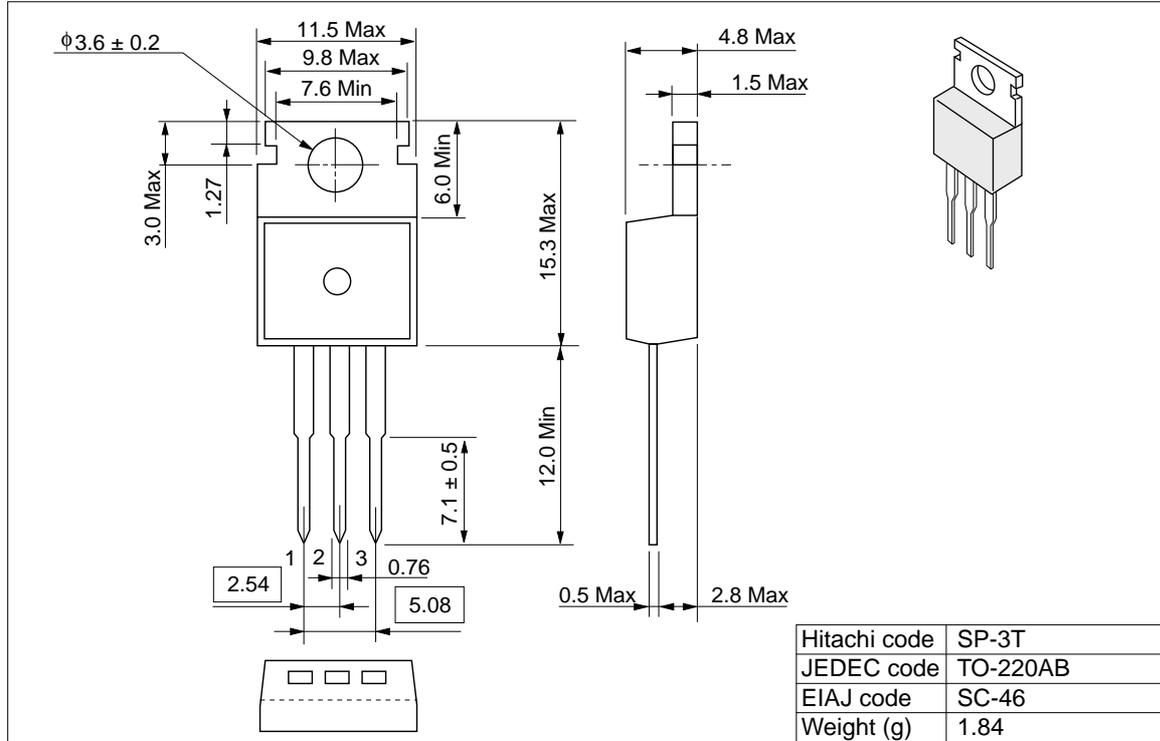
Package Outline Dimensions



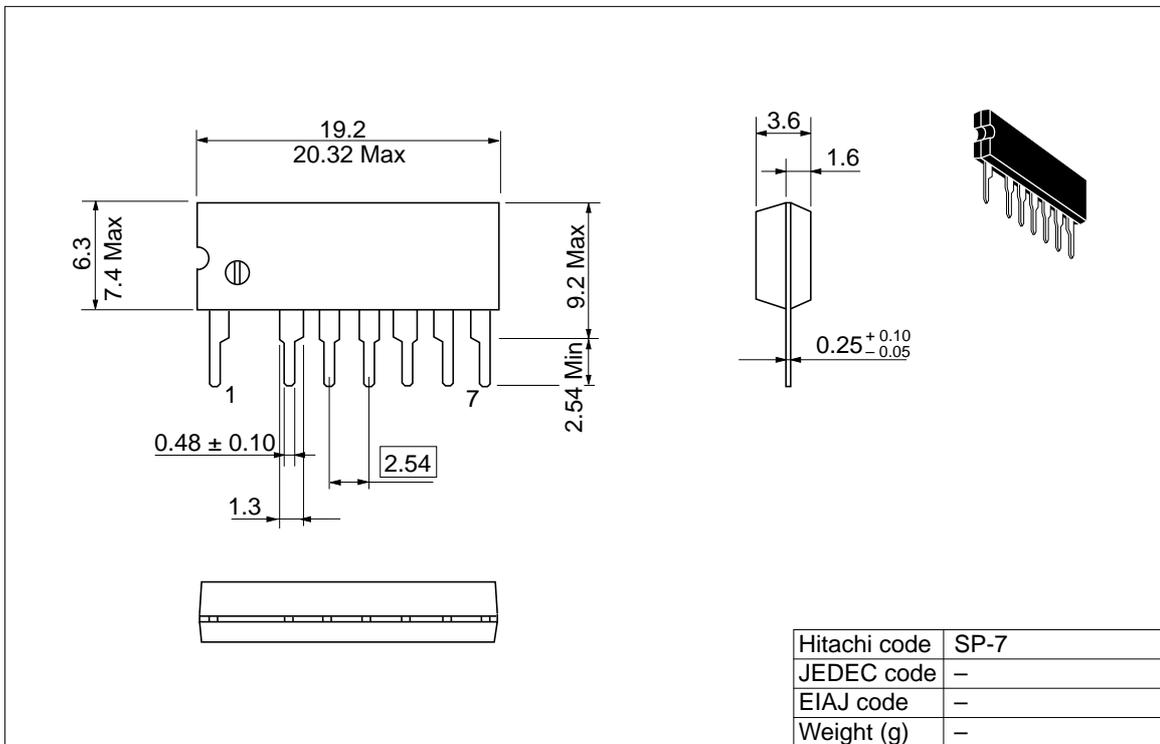
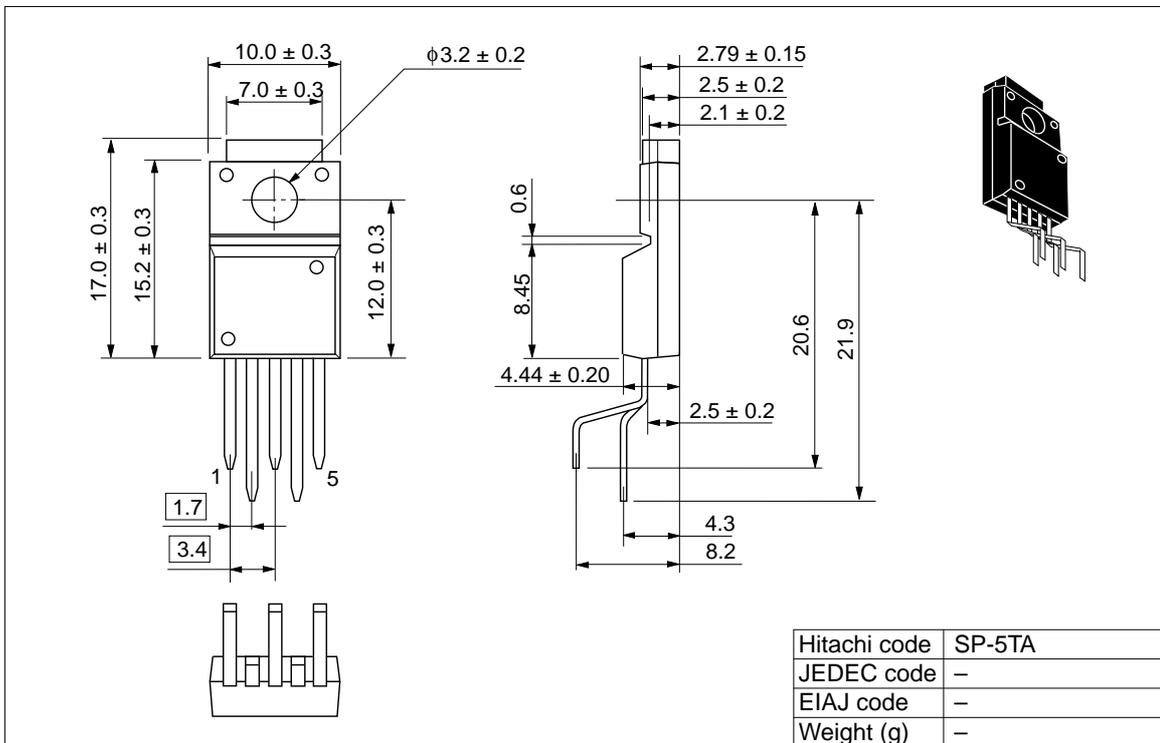
Package Outline Dimensions

(5) Plastic SIP

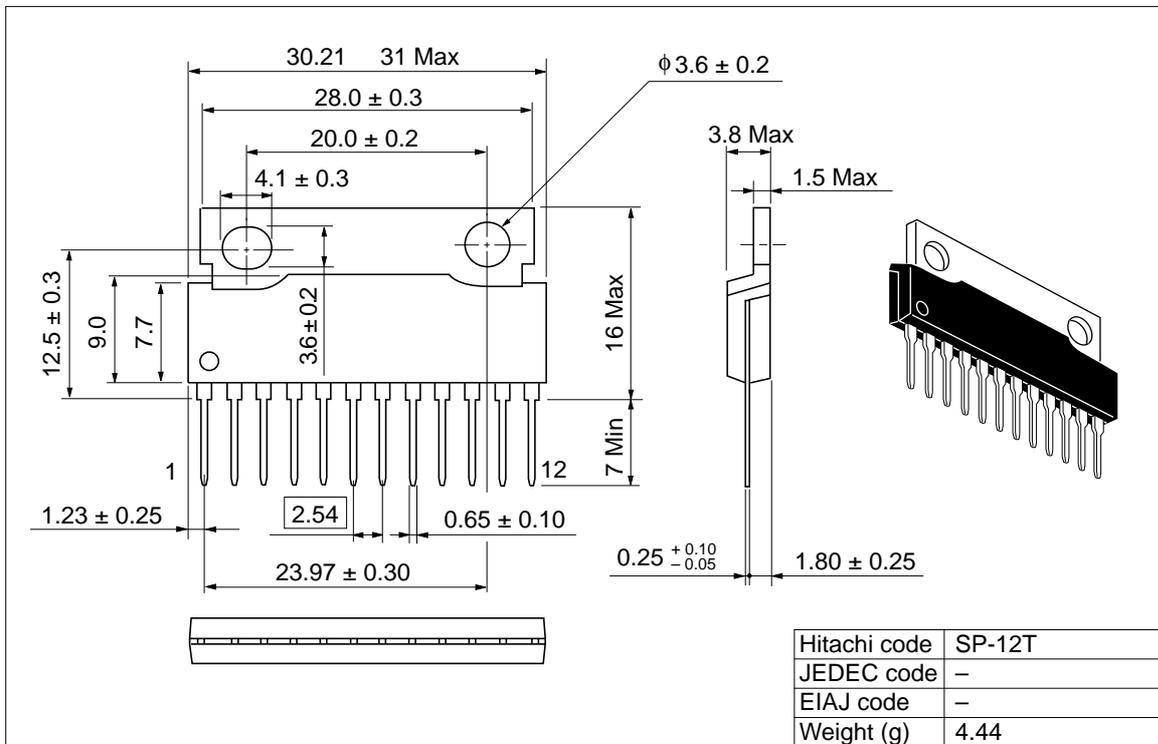
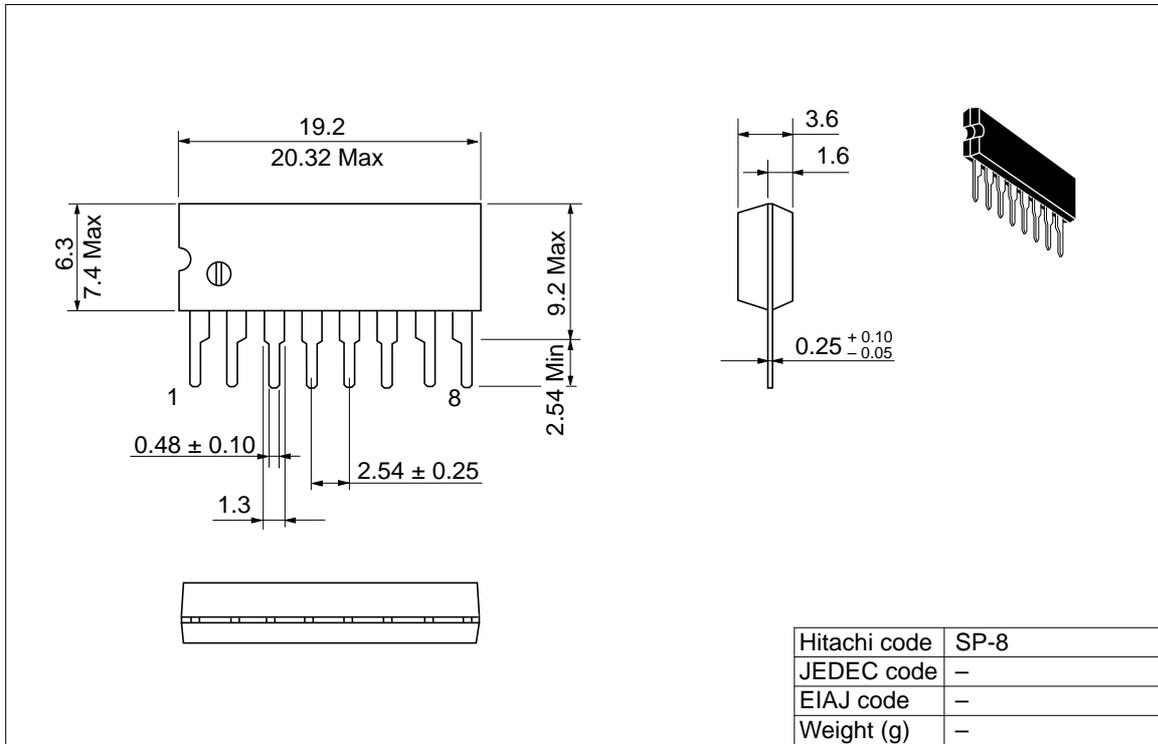
Unit: mm



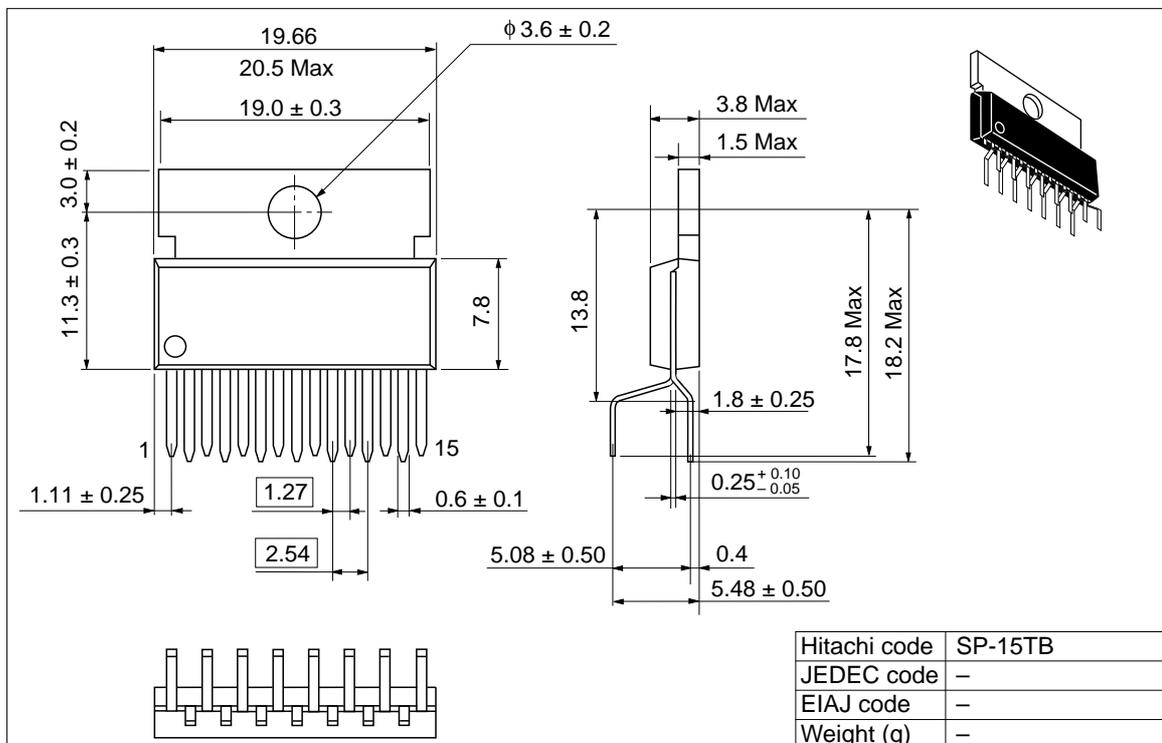
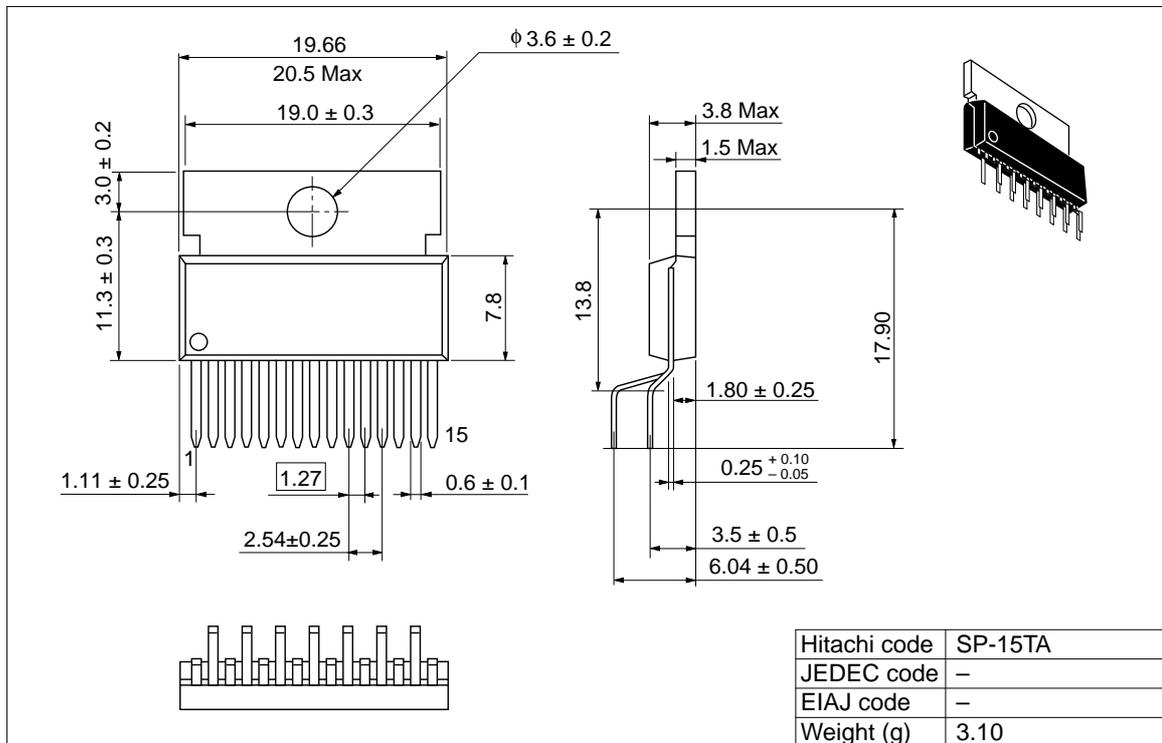
Package Outline Dimensions



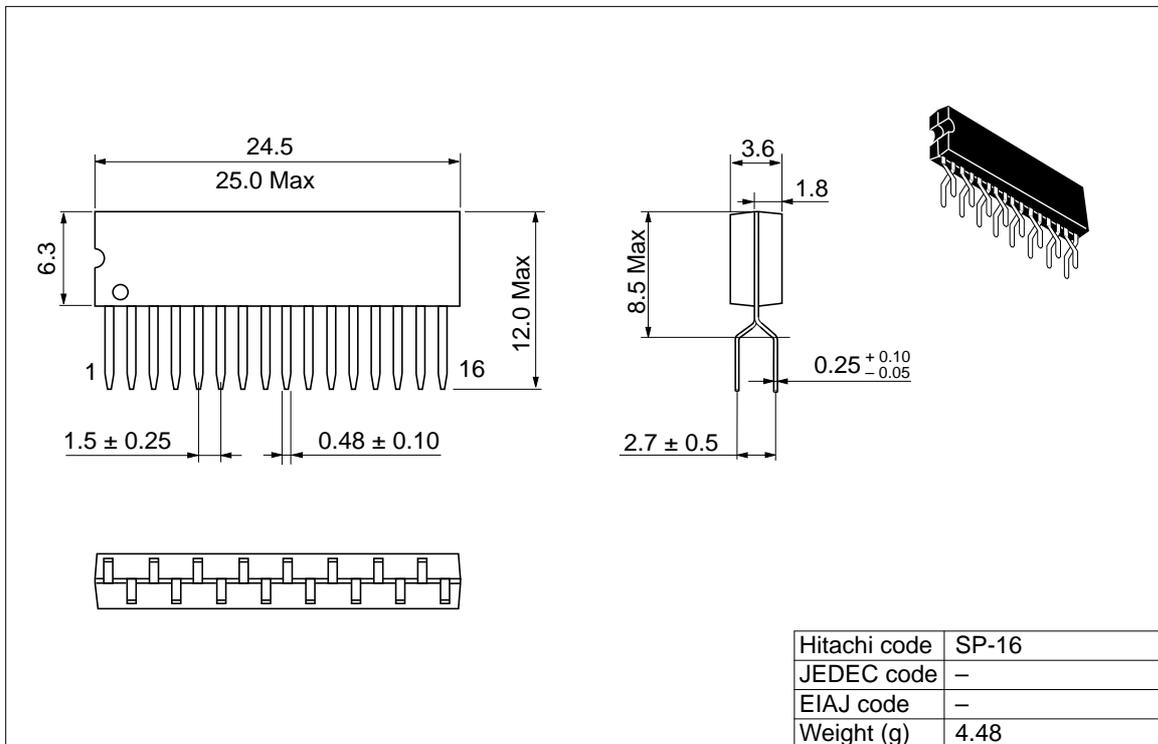
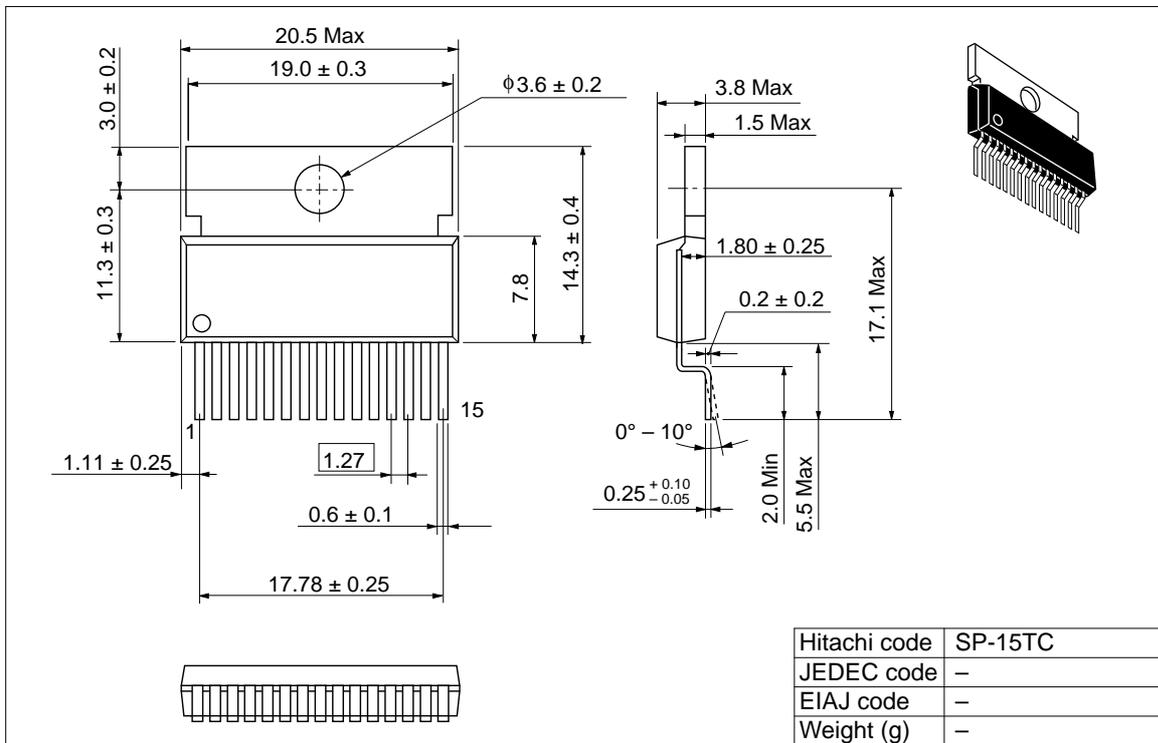
Package Outline Dimensions



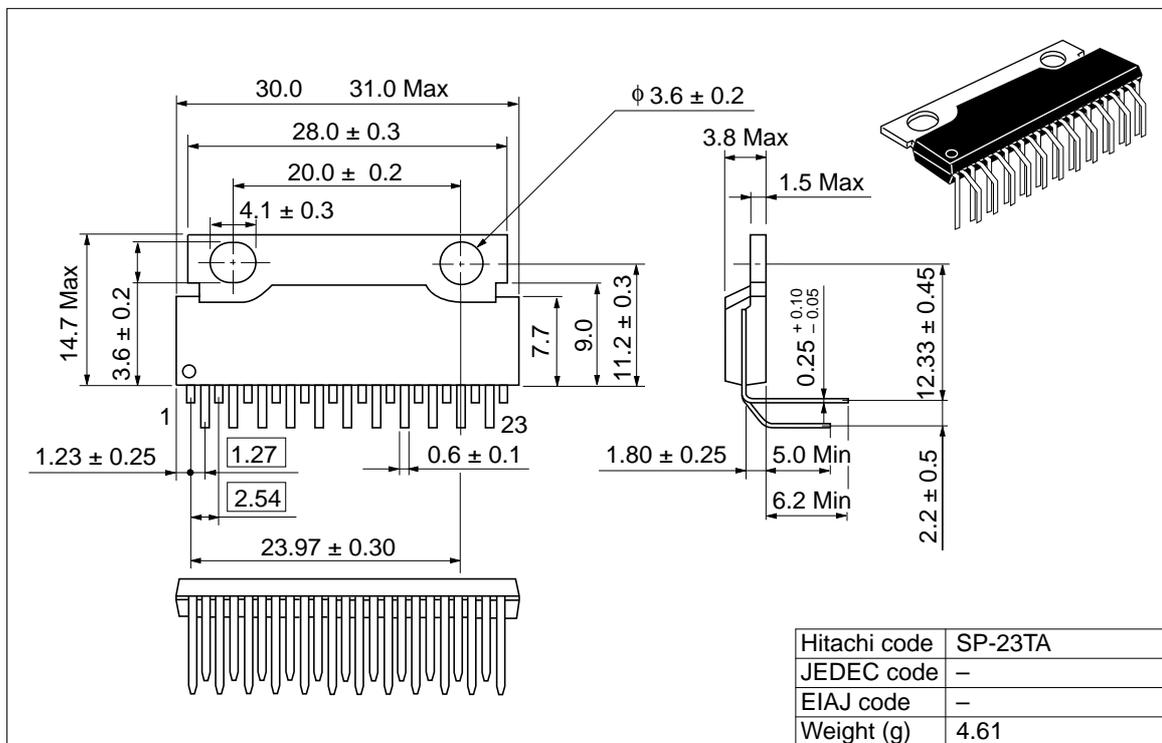
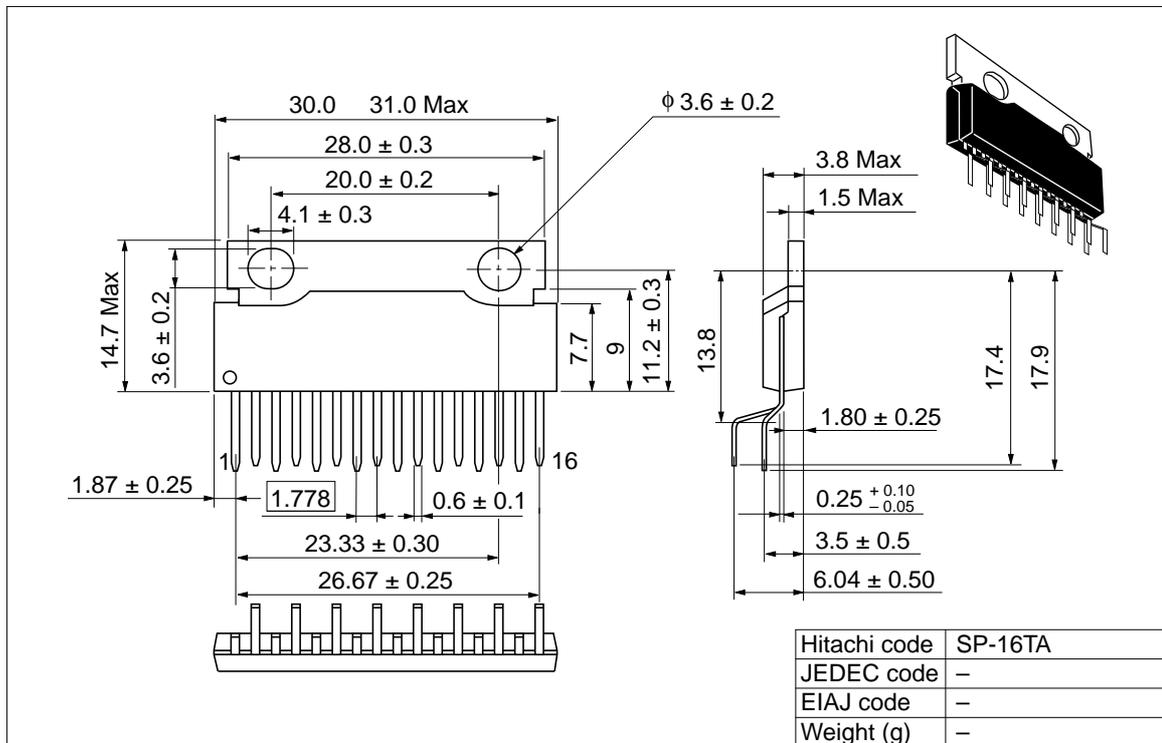
Package Outline Dimensions



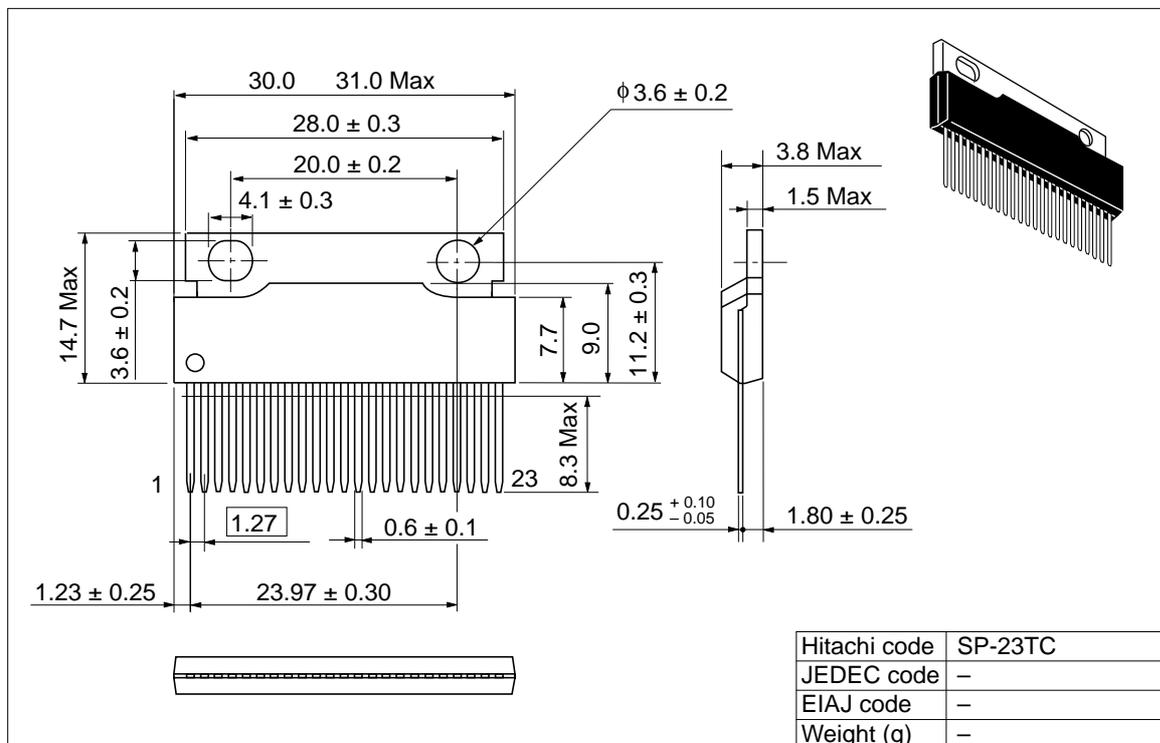
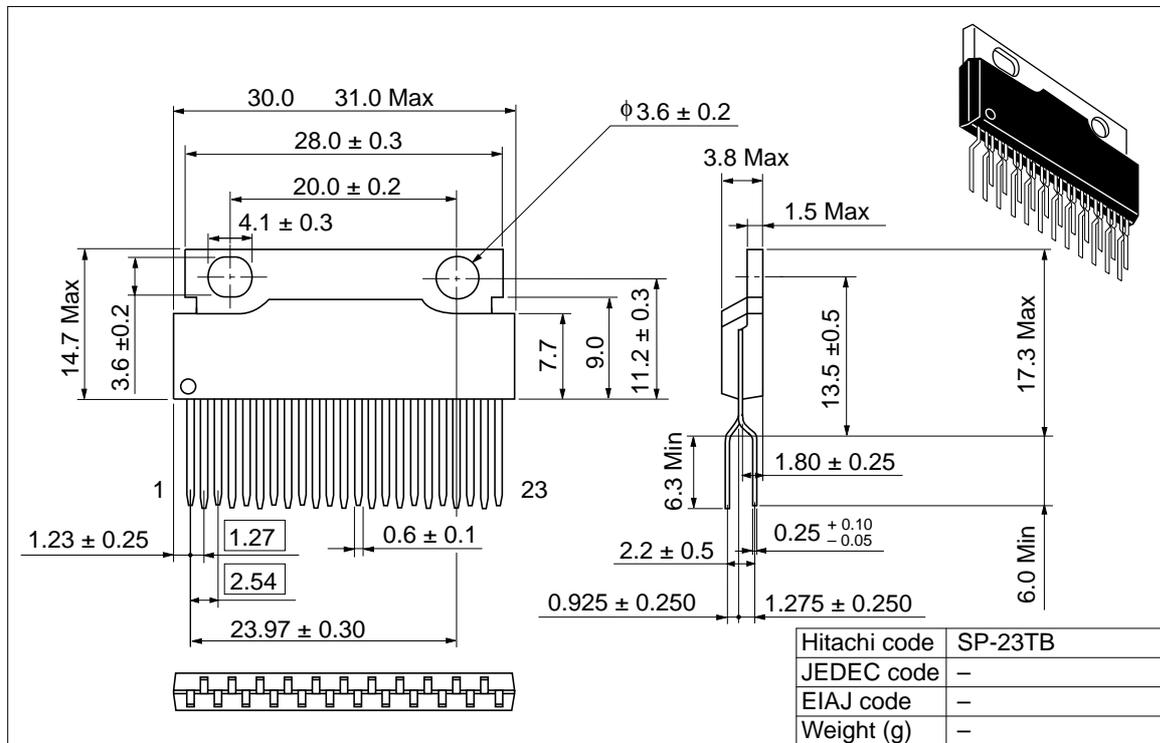
Package Outline Dimensions



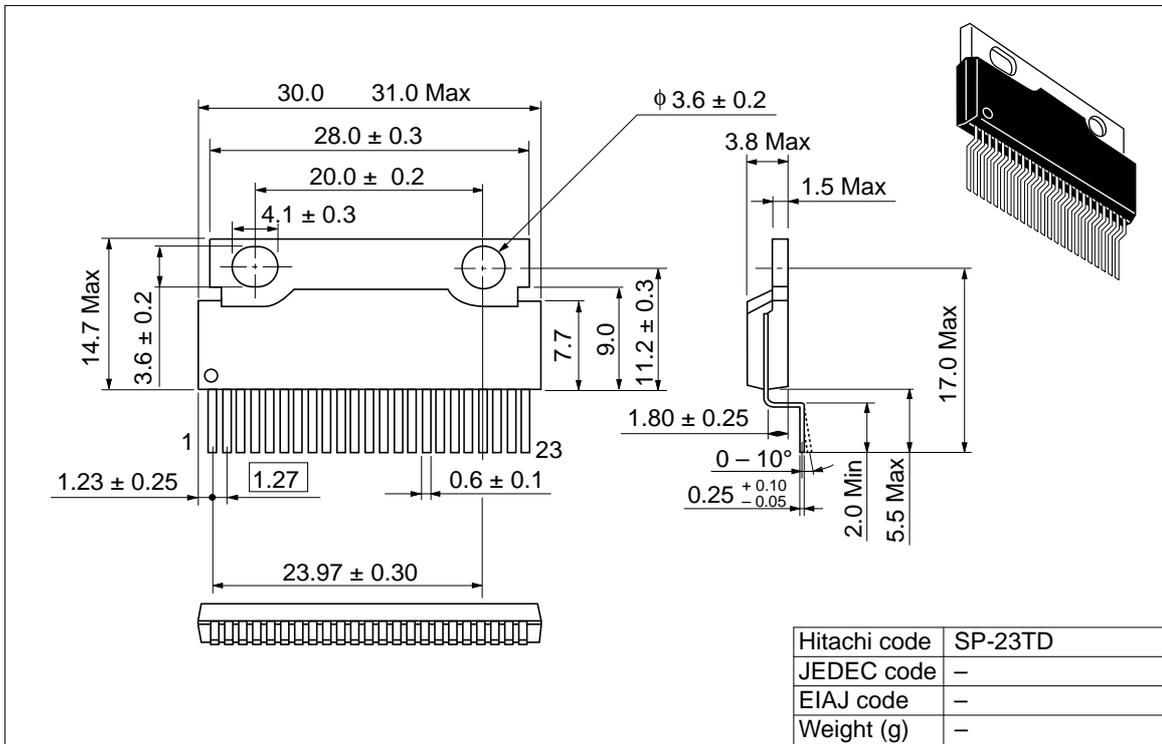
Package Outline Dimensions



Package Outline Dimensions



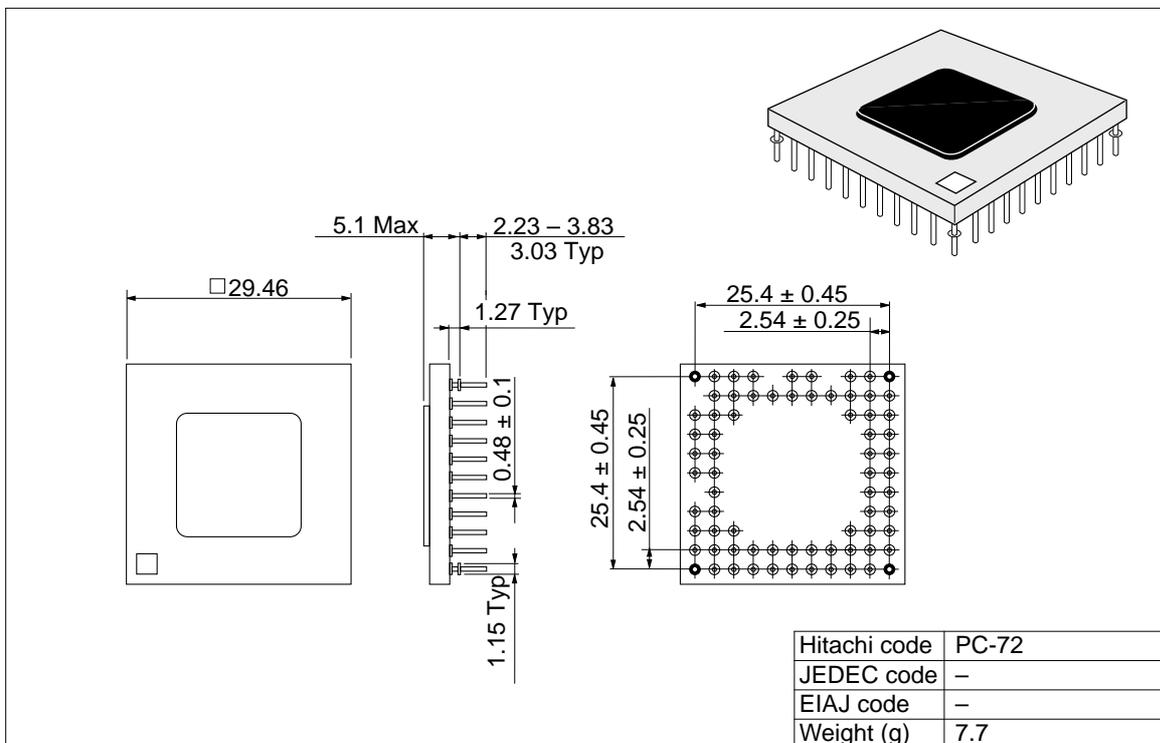
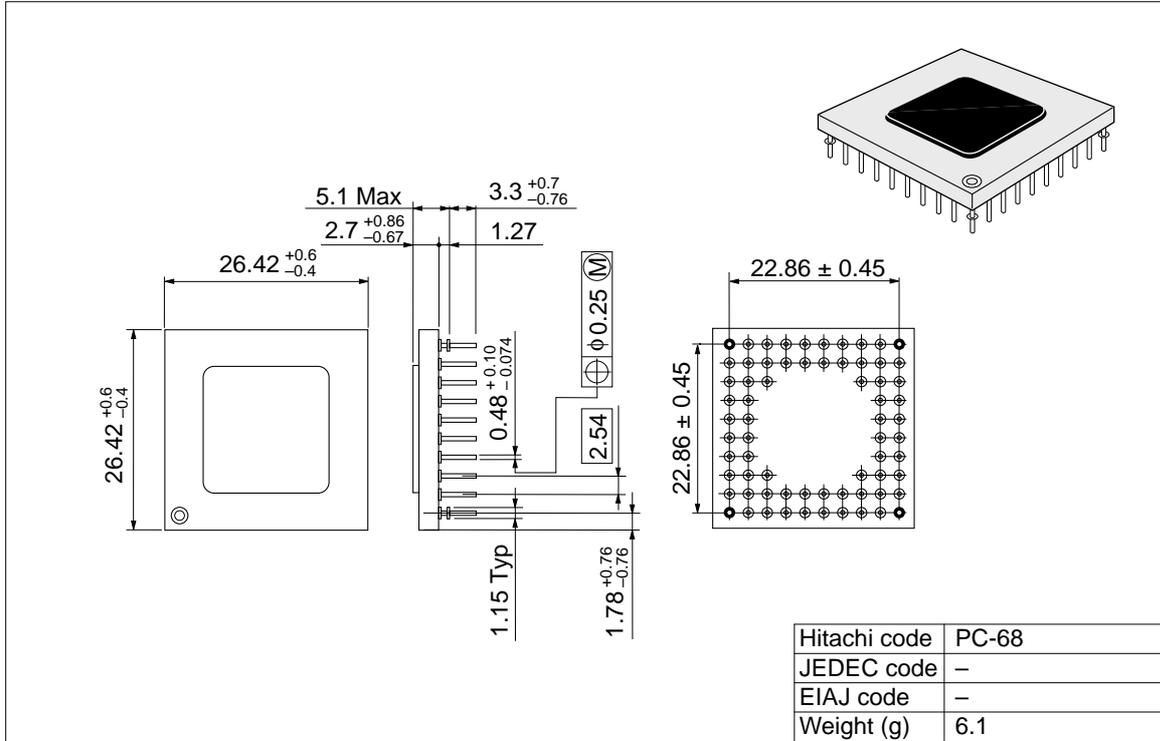
Package Outline Dimensions



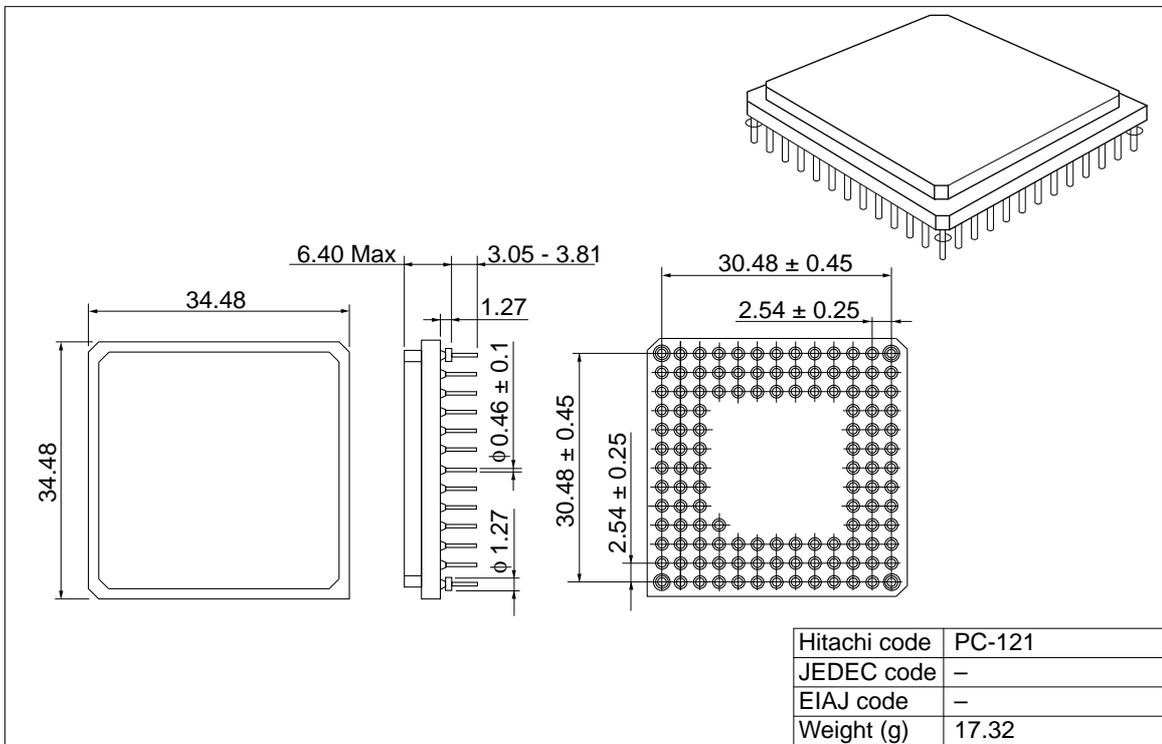
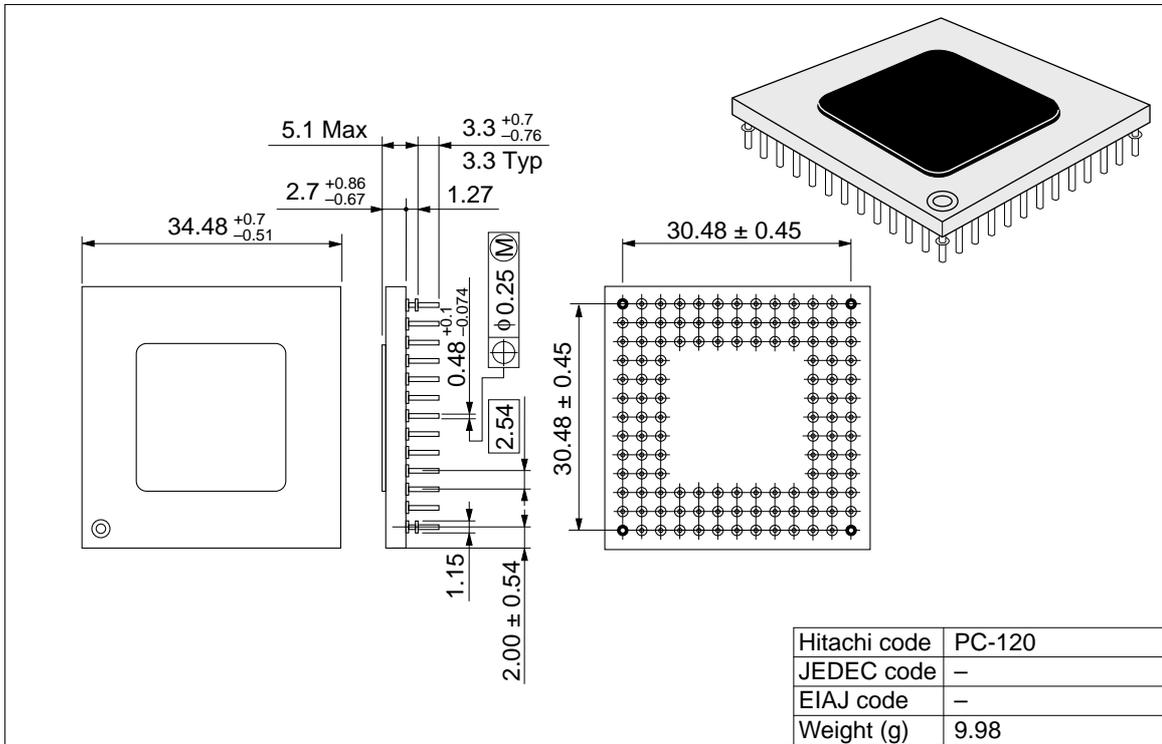
Package Outline Dimensions

(6) Ceramic PGA

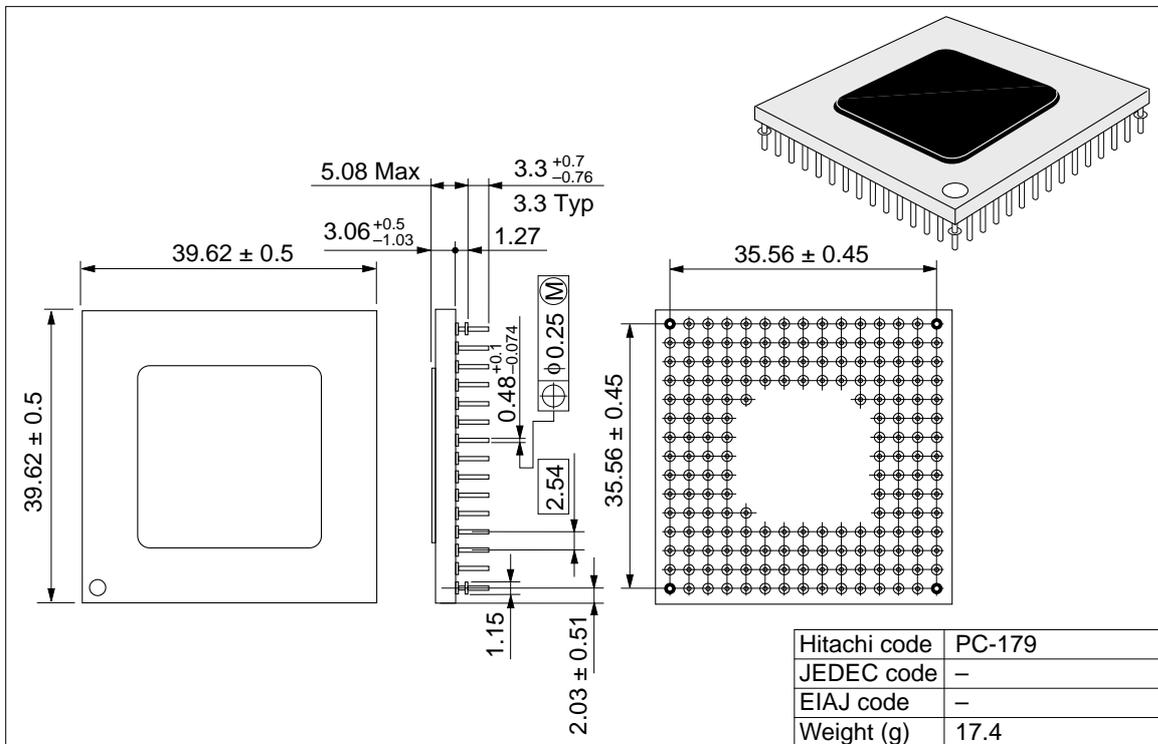
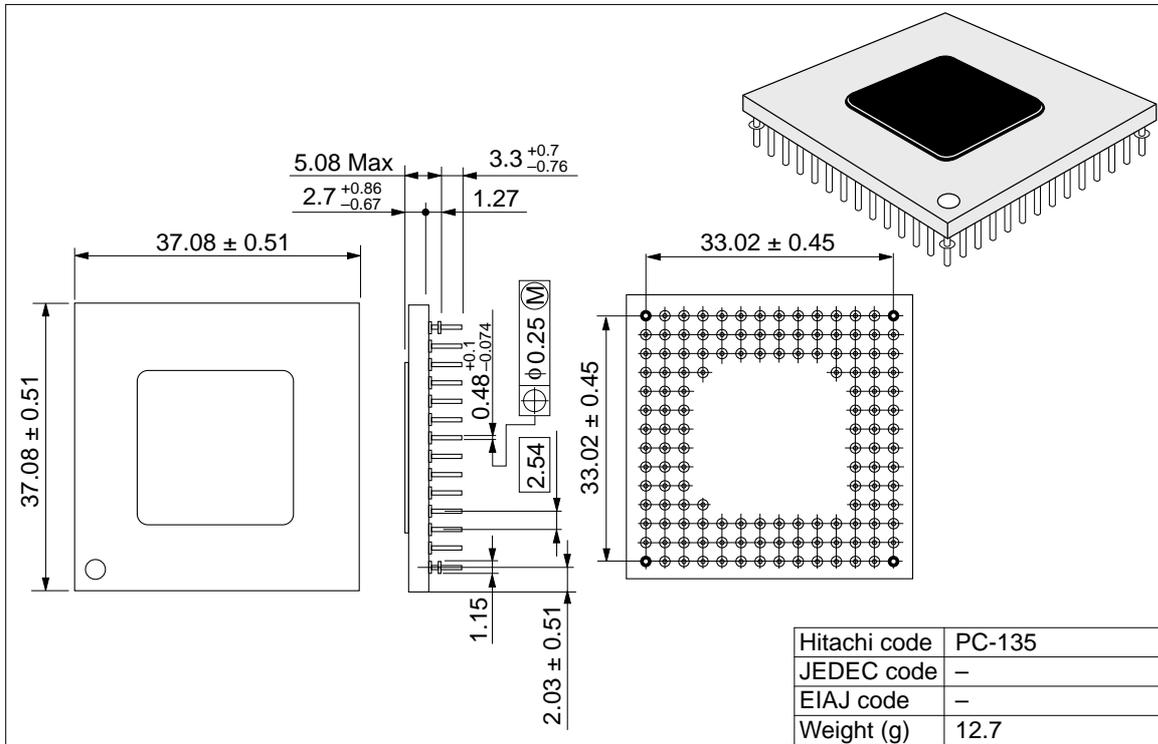
Unit:mm



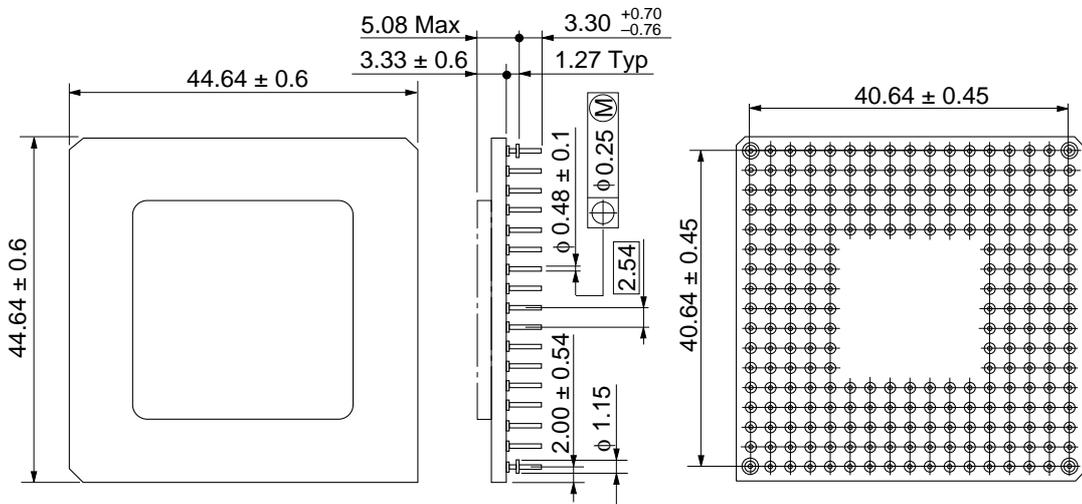
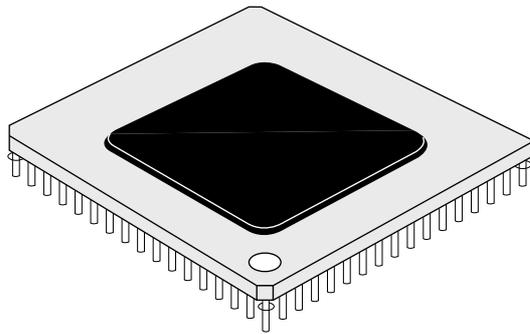
Package Outline Dimensions



Package Outline Dimensions

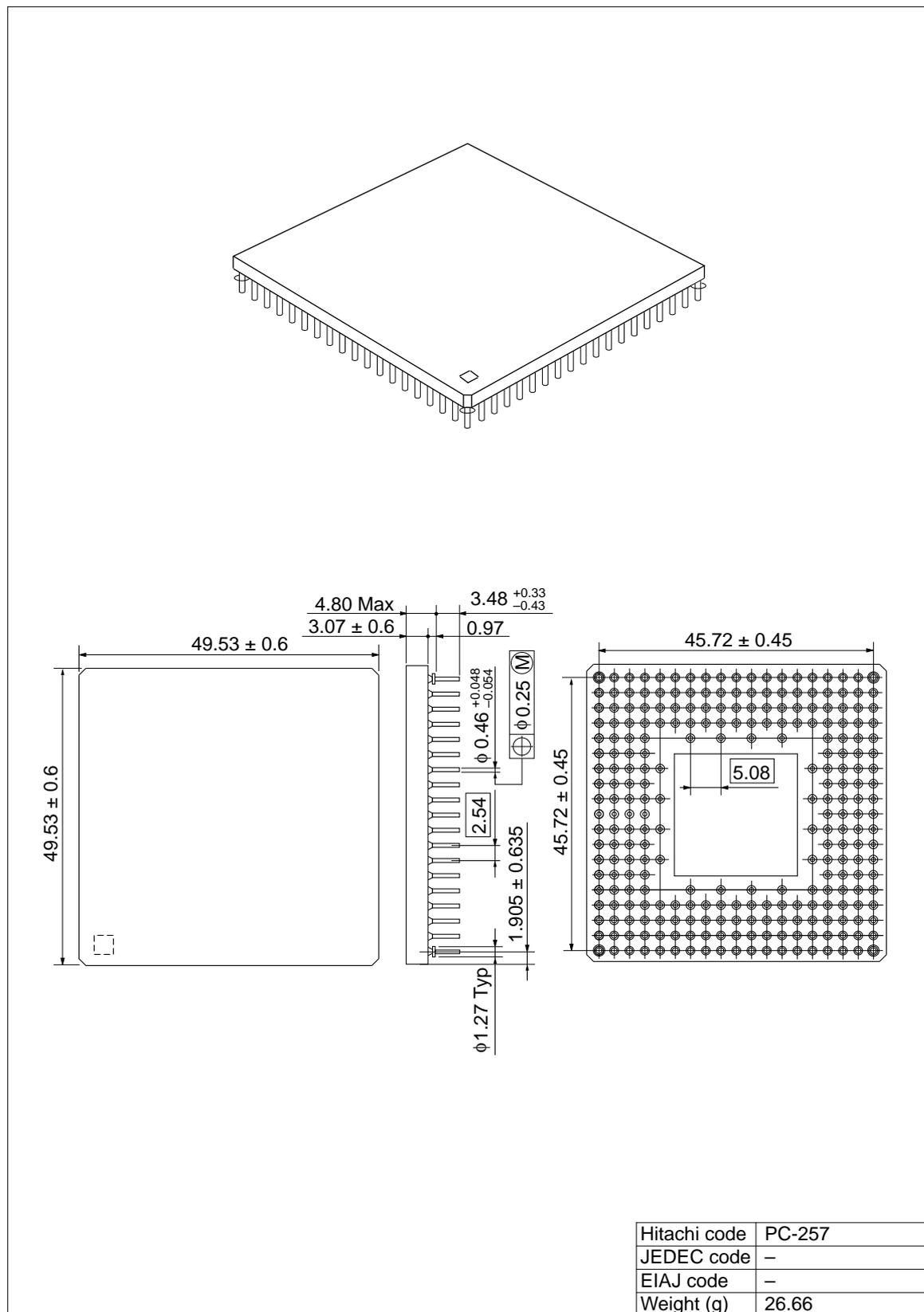


Package Outline Dimensions

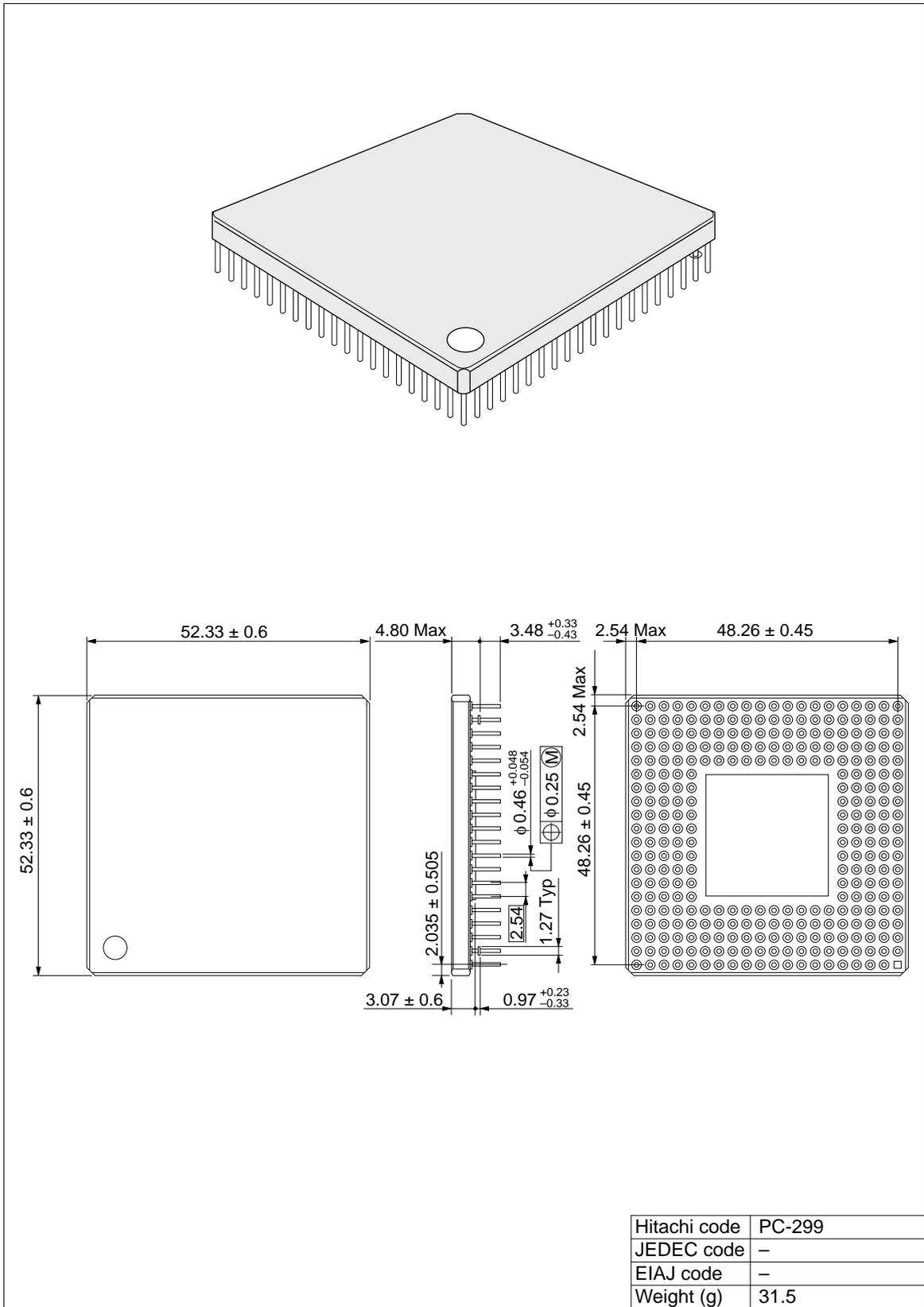


Hitachi code	PC-240
JEDEC code	-
EIAJ code	-
Weight (g)	22.0

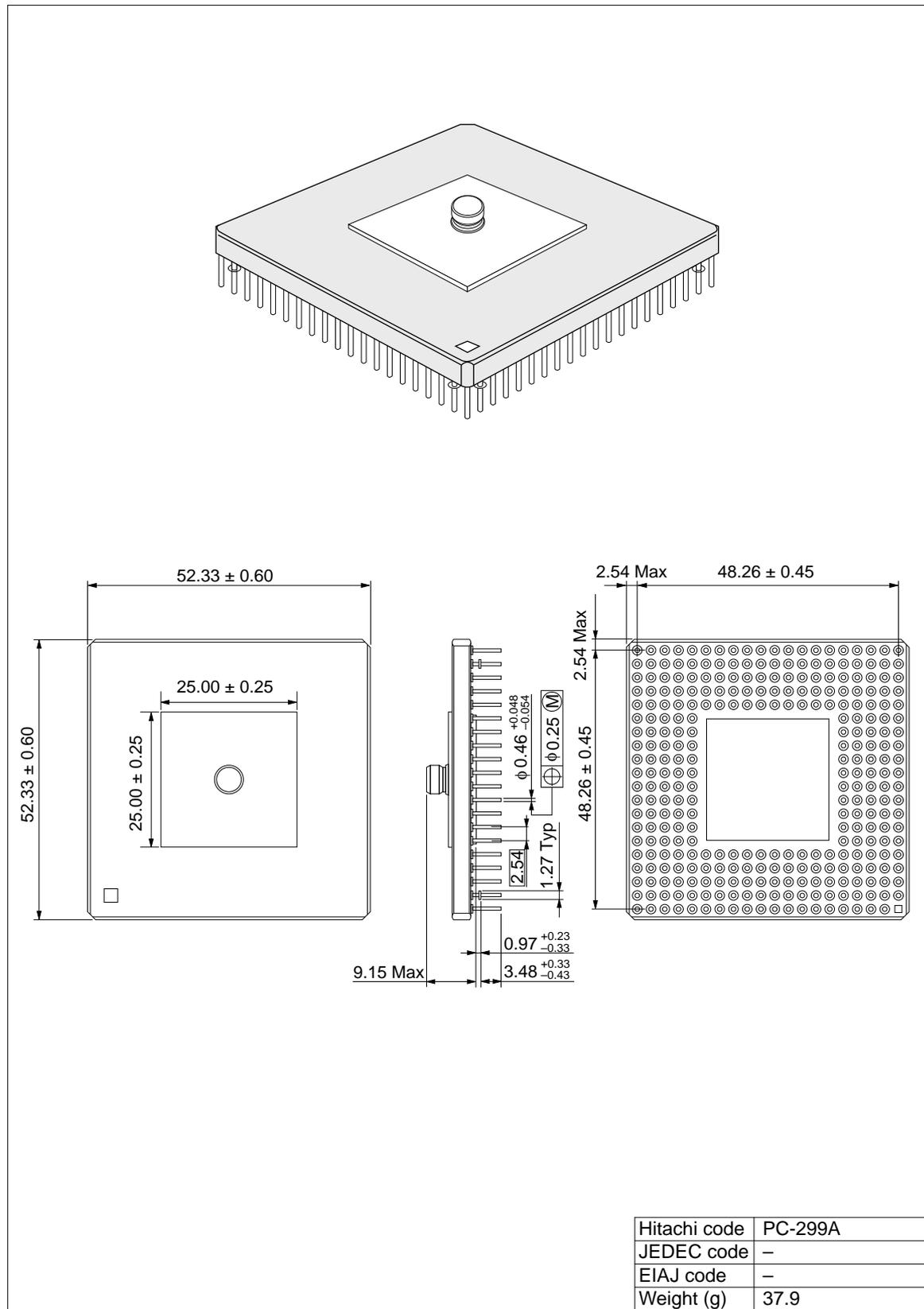
Package Outline Dimensions



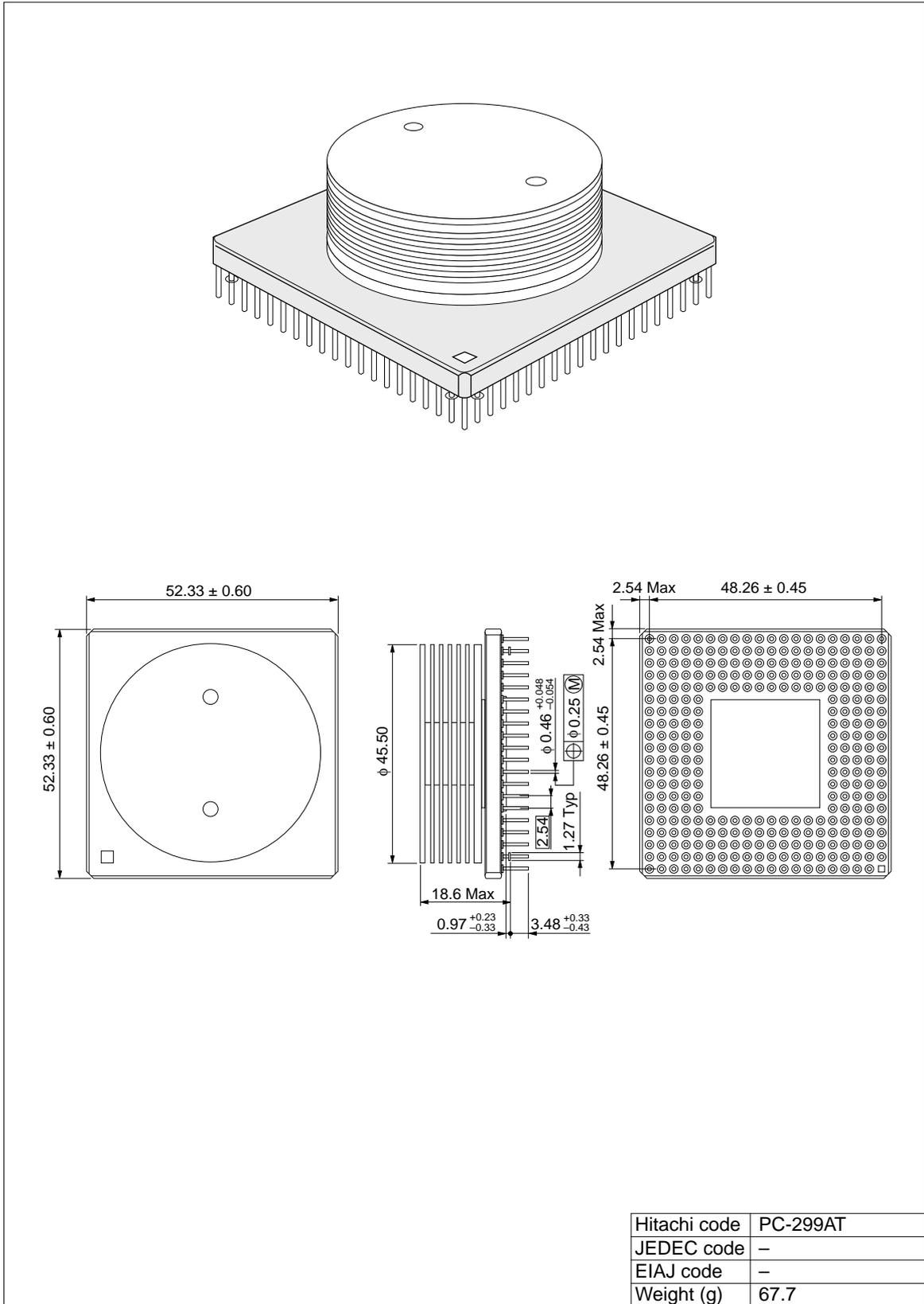
Package Outline Dimensions



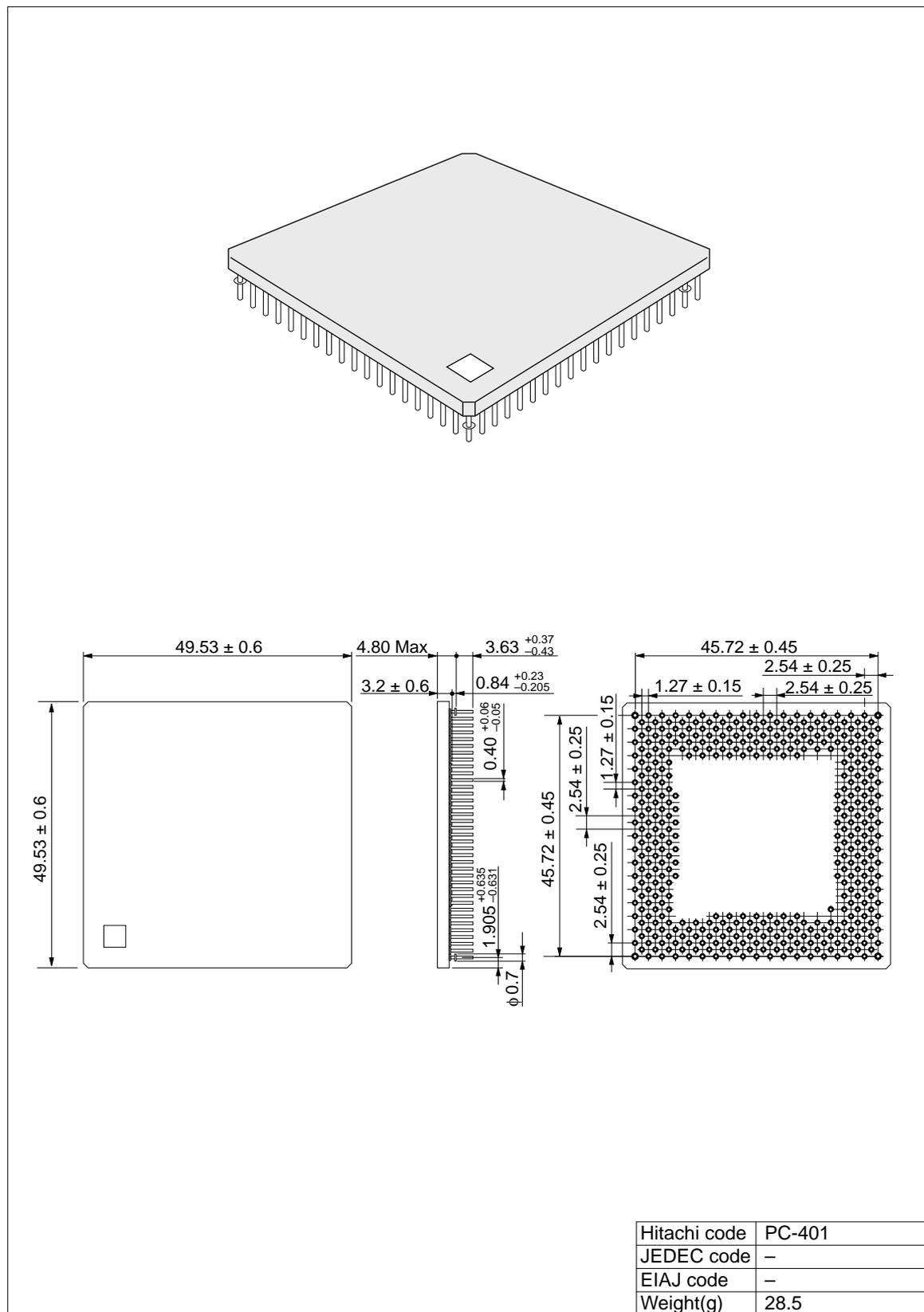
Package Outline Dimensions



Package Outline Dimensions



Package Outline Dimensions

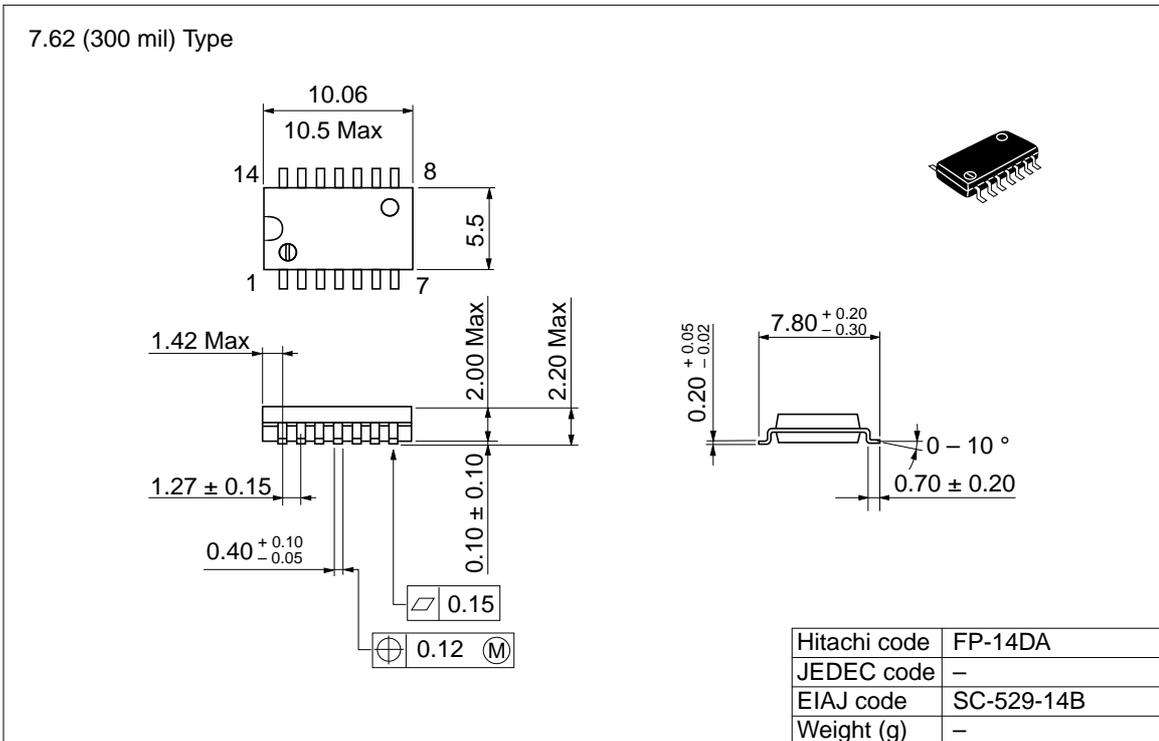
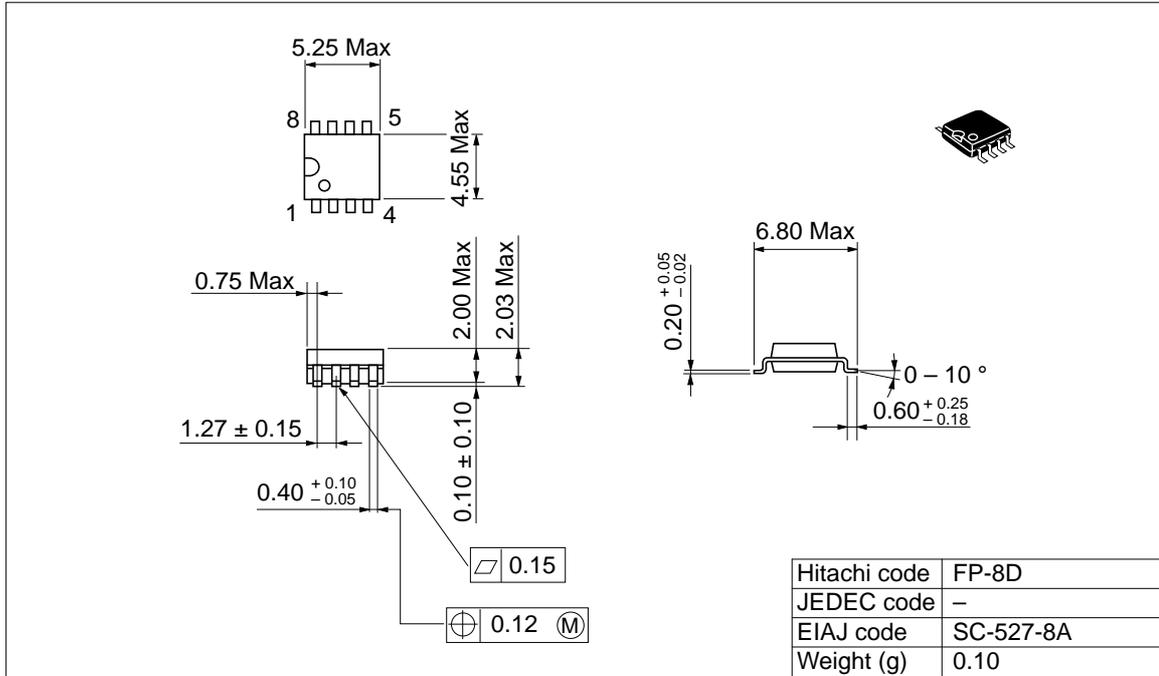


Package Outline Dimensions

2.1.2 Surface Mount Package

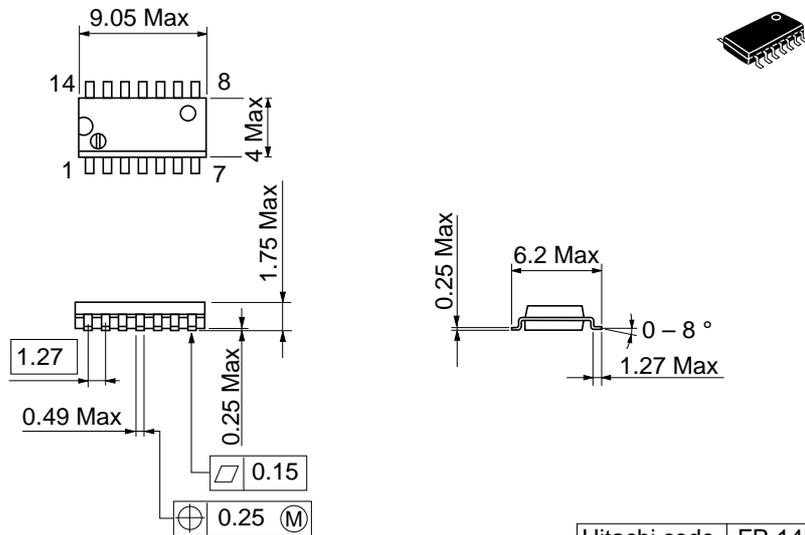
(1) Plastic SOP

Unit: mm



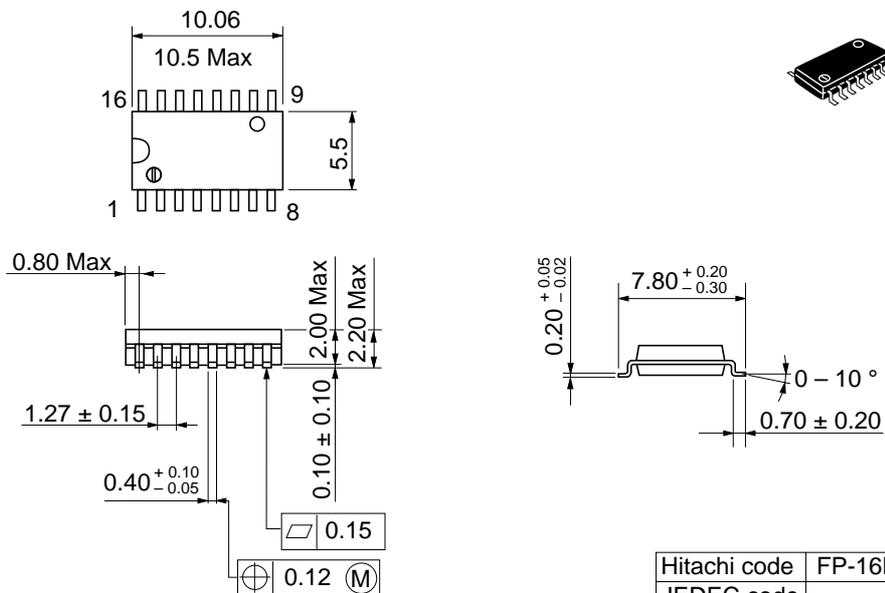
Package Outline Dimensions

5.72 (225 mil) Type



Hitachi code	FP-14DN
JEDEC code	MS-012AB
EIAJ code	SC-529-14A
Weight (g)	0.13

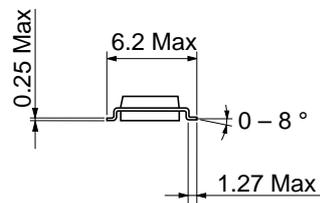
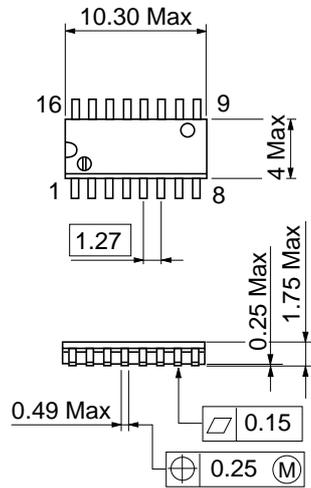
7.62 (300 mil) Type



Hitachi code	FP-16DA
JEDEC code	-
EIAJ code	SC-530-16C
Weight (g)	-

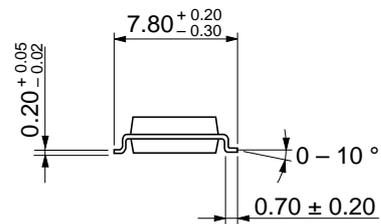
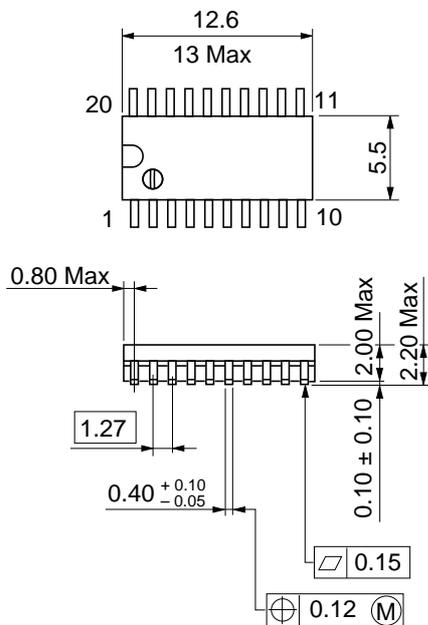
Package Outline Dimensions

5.72 (225 mil) Type



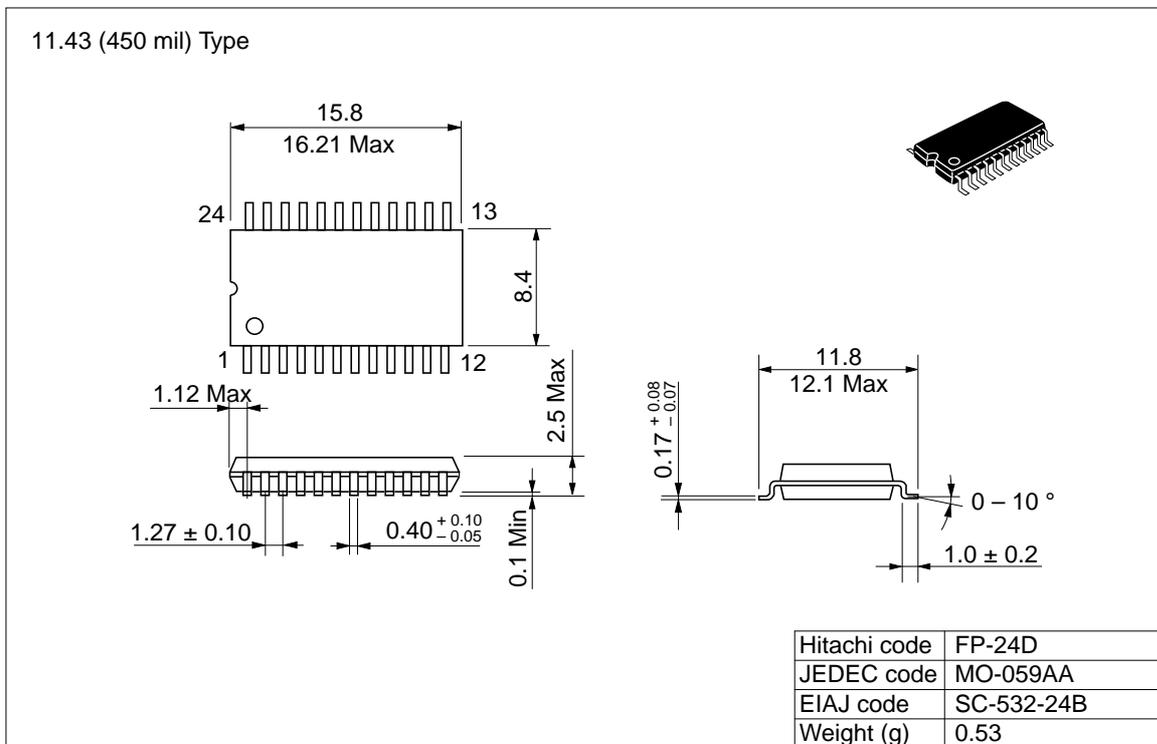
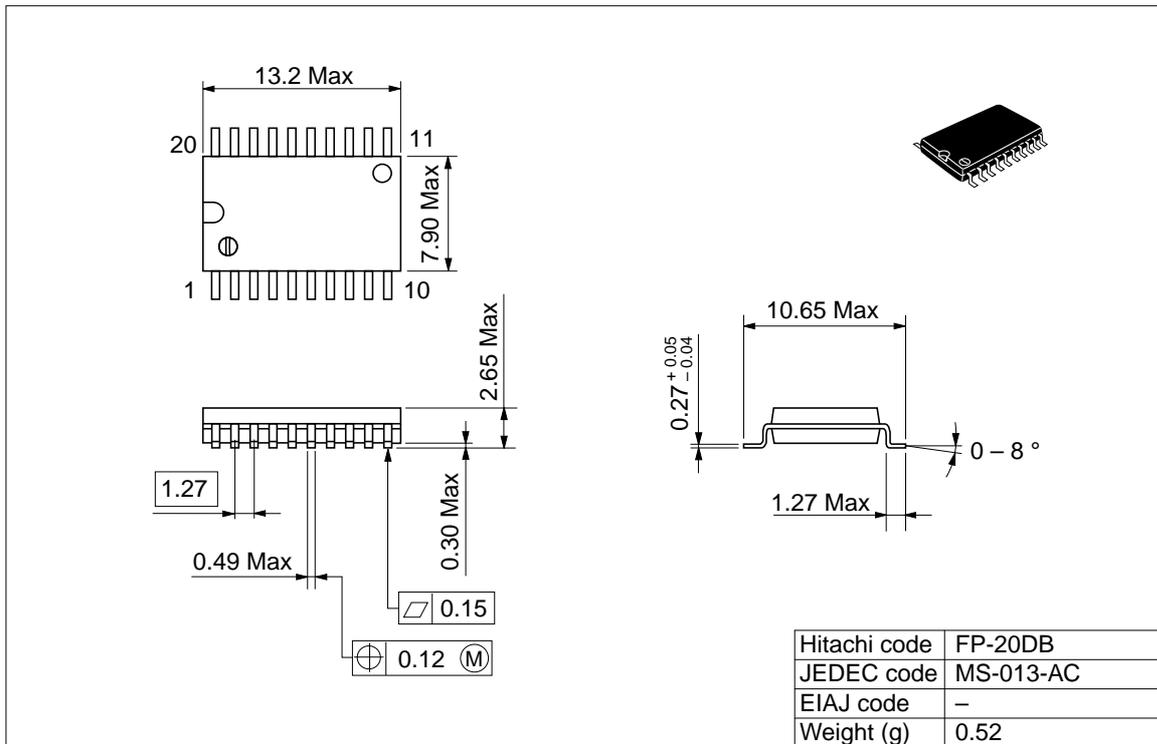
Hitachi code	FP-16DN
JEDEC code	MS-012AC
EIAJ code	SC-530-16A
Weight (g)	0.15

7.62 (300 mil) Type

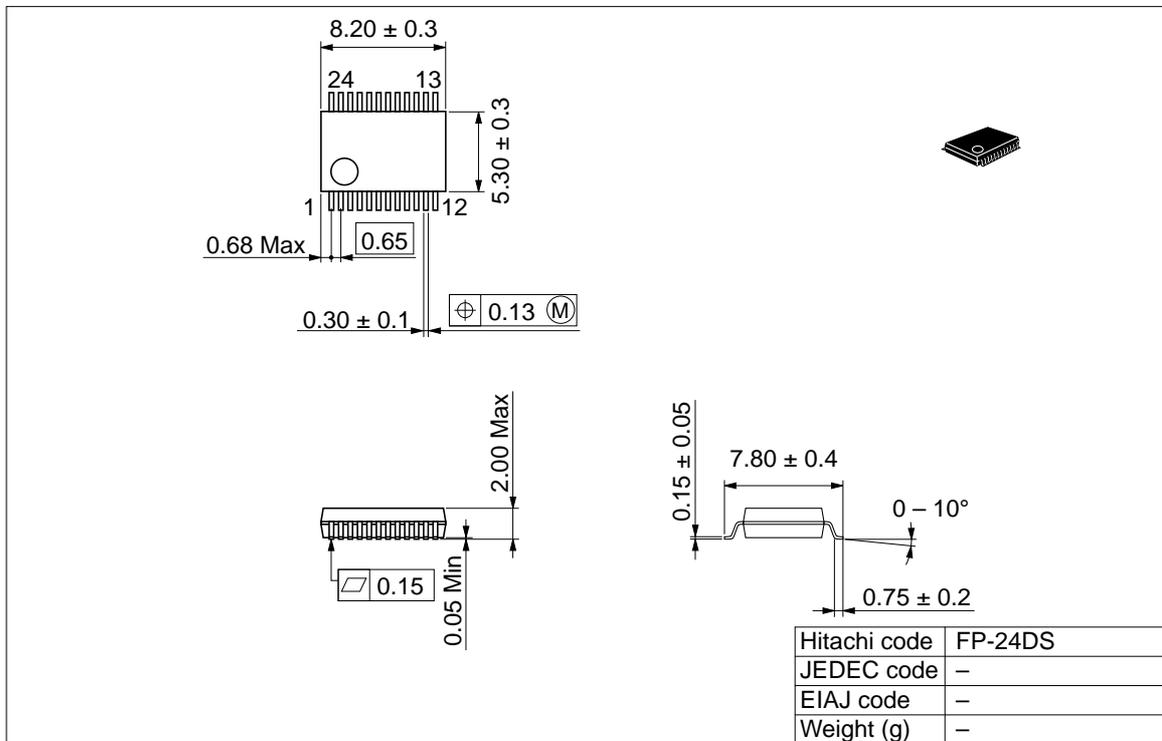
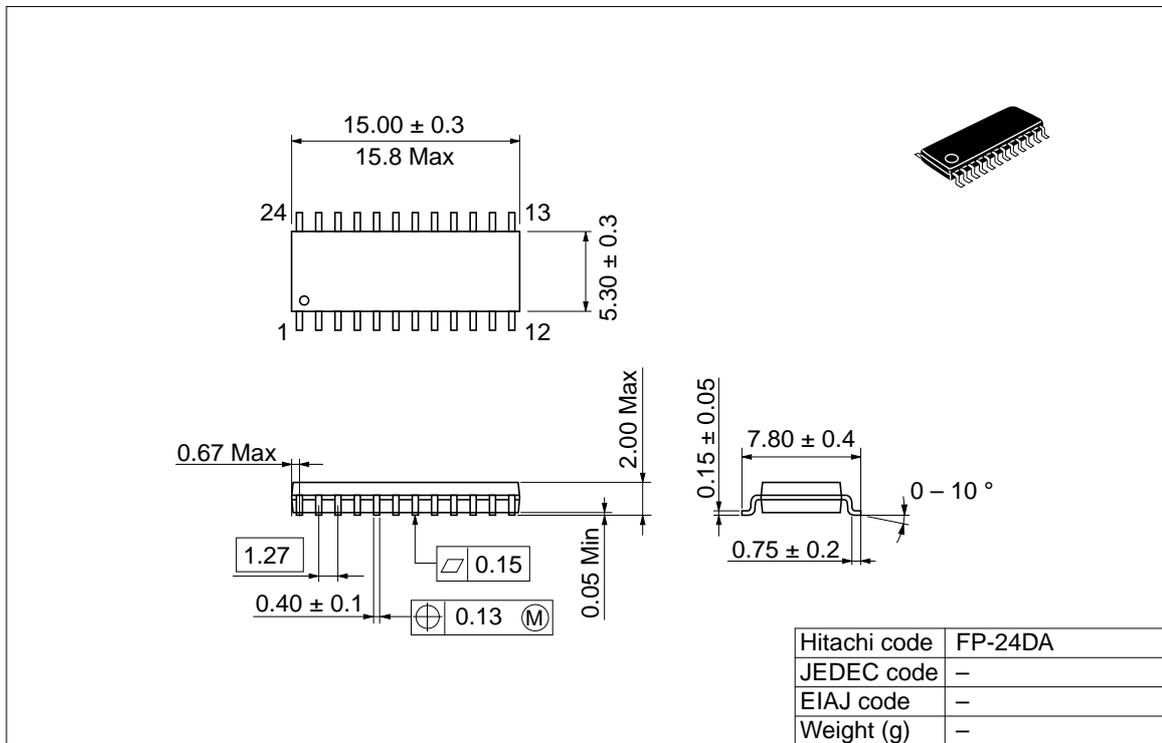


Hitachi code	FP-20DA
JEDEC code	—
EIAJ code	SC-531-20
Weight (g)	0.31

Package Outline Dimensions

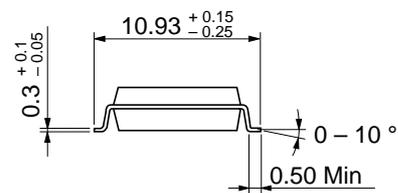
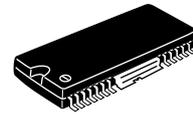
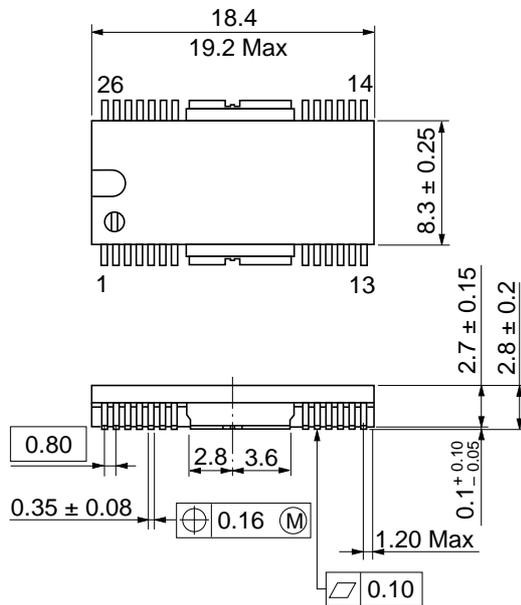


Package Outline Dimensions



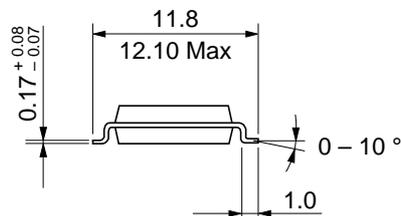
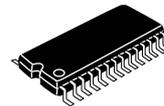
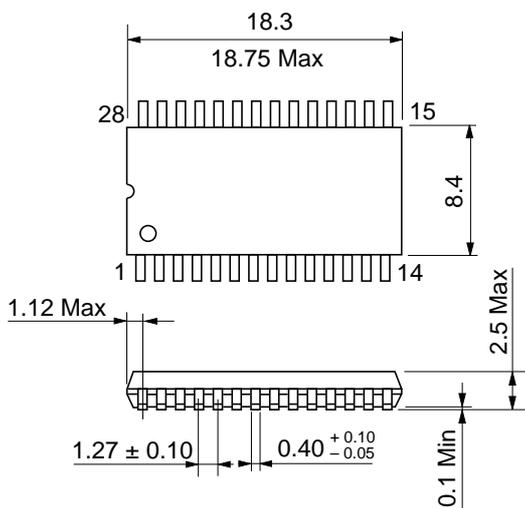
Package Outline Dimensions

11.43 mm (450 mil) Type



Hitachi code	FP-26DT
JEDEC code	-
EIAJ code	-
Weight (g)	-

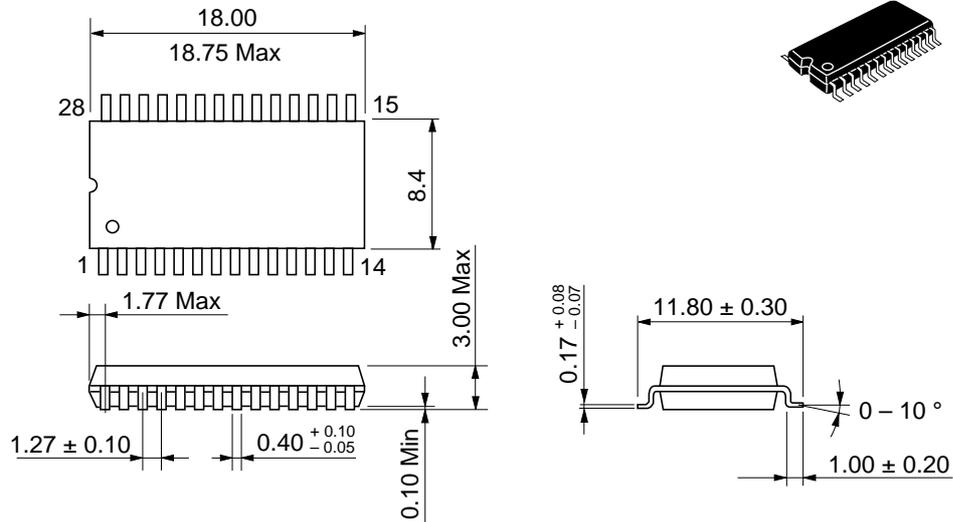
11.43 mm (450 mil) Type



Hitachi code	FP-28D
JEDEC code	MO-059AC
EIAJ code	SC-533-28C
Weight (g)	0.63

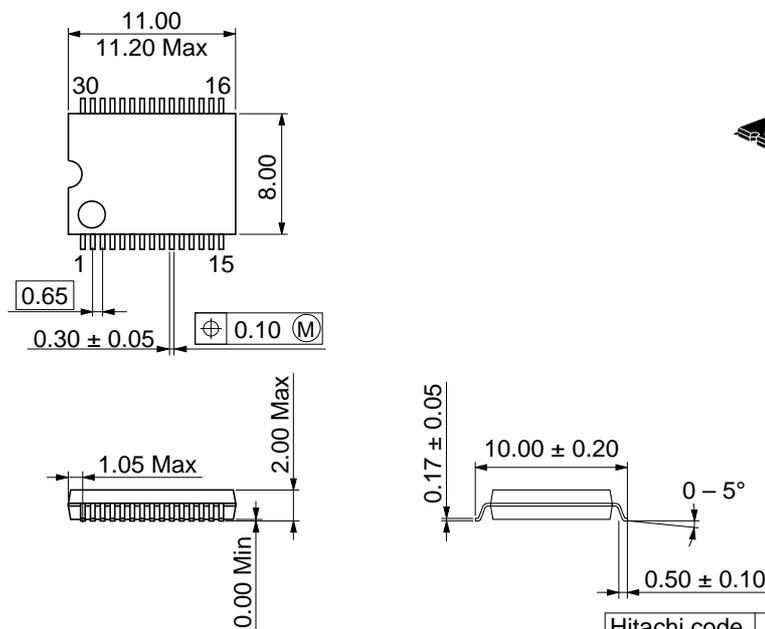
Package Outline Dimensions

11.43 mm (450 mil) Type



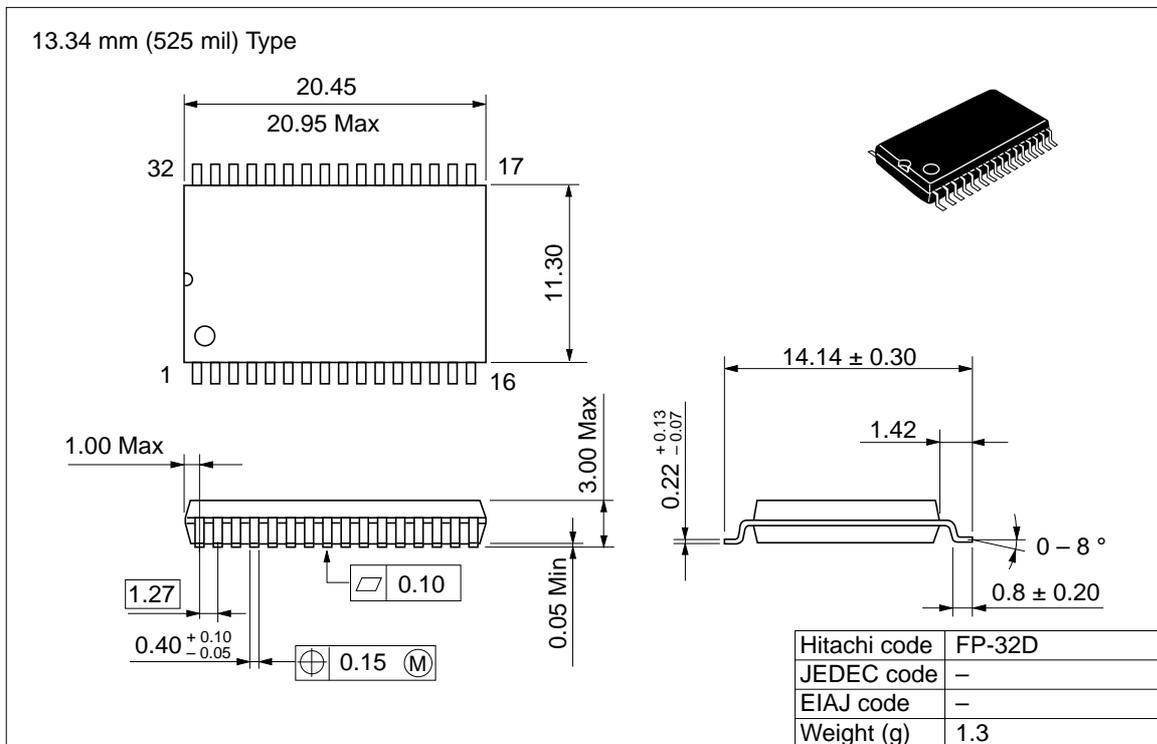
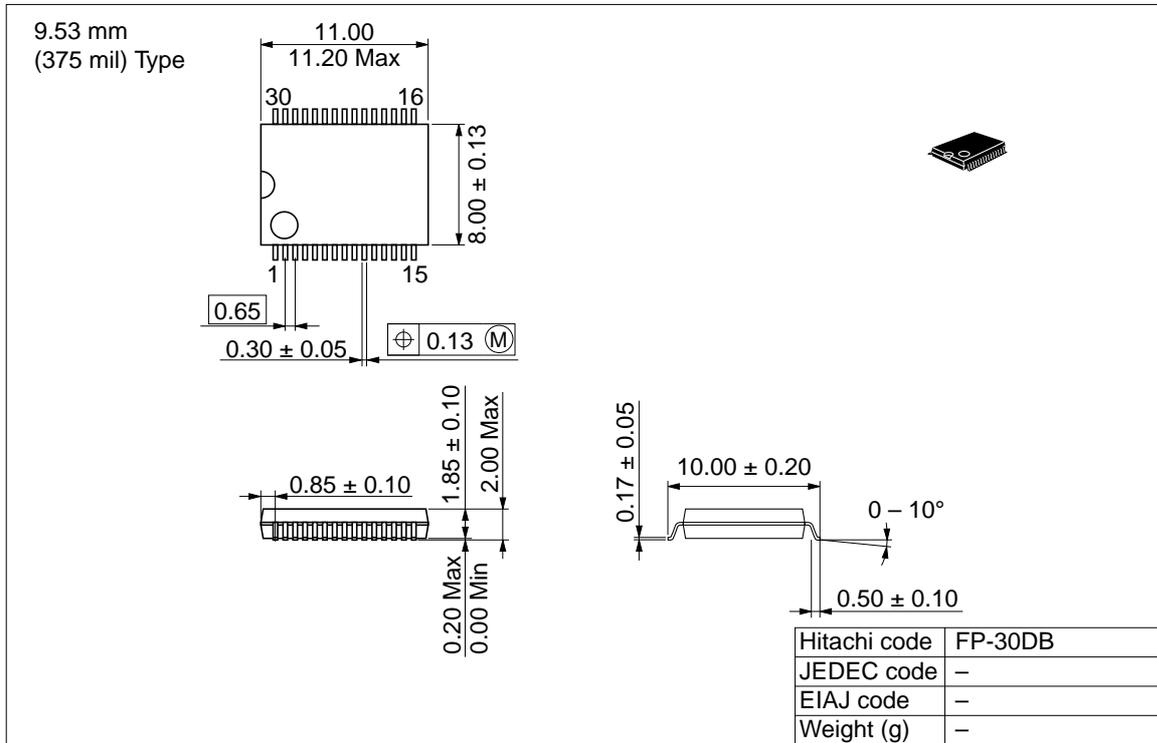
Hitachi code	FP-28DA
JEDEC code	MO-059AD
EIAJ code	SC-533-28C
Weight (g)	0.82

9.53 mm
(375 mil) Type



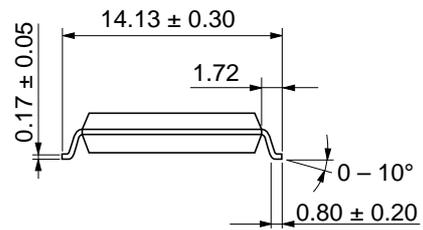
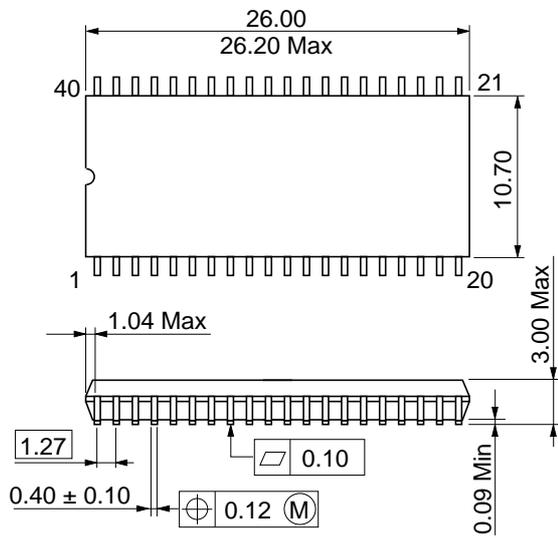
Hitachi code	FP-30D
JEDEC code	-
EIAJ code	-
Weight (g)	-

Package Outline Dimensions



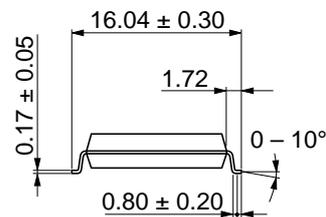
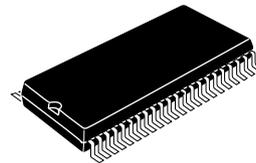
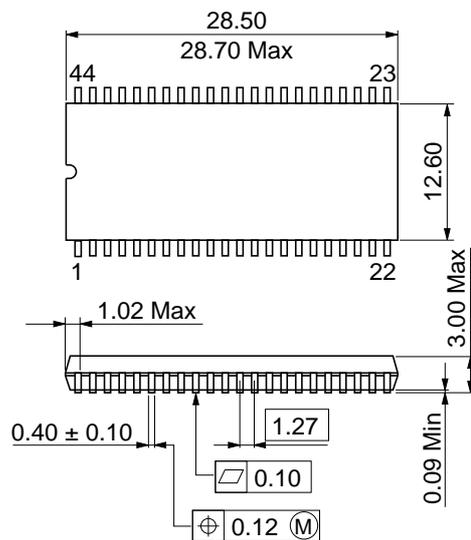
Package Outline Dimensions

13.34 mm (525 mil) Type



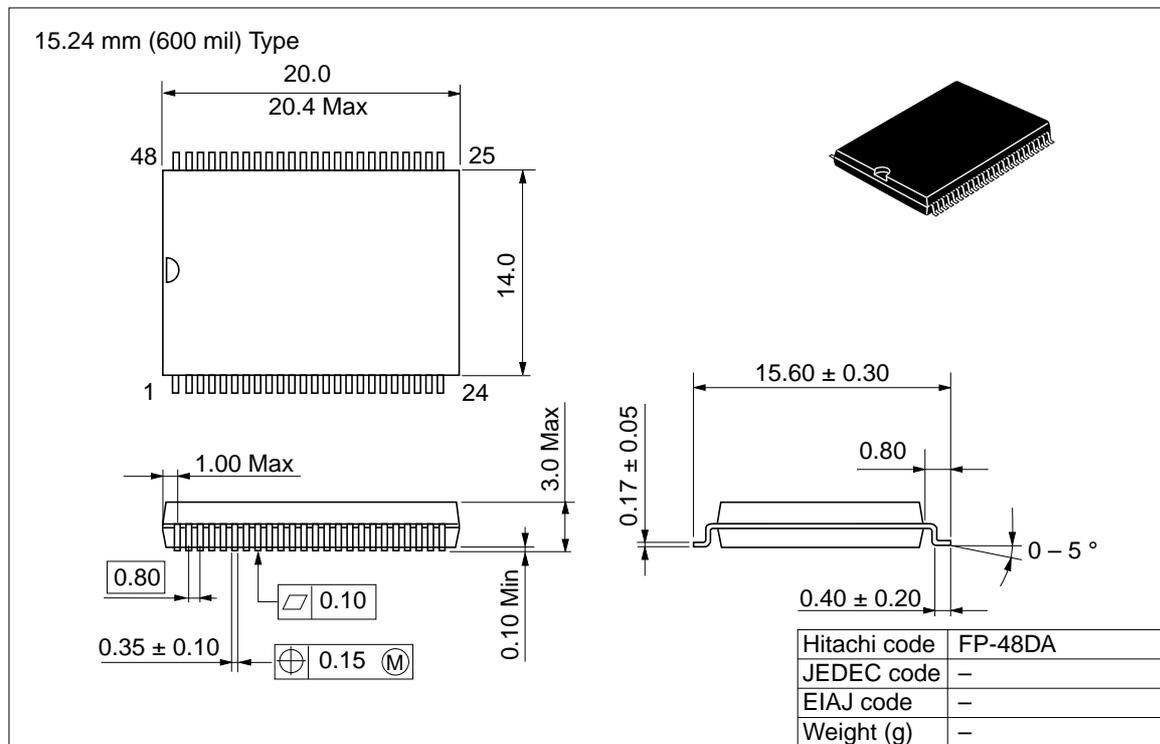
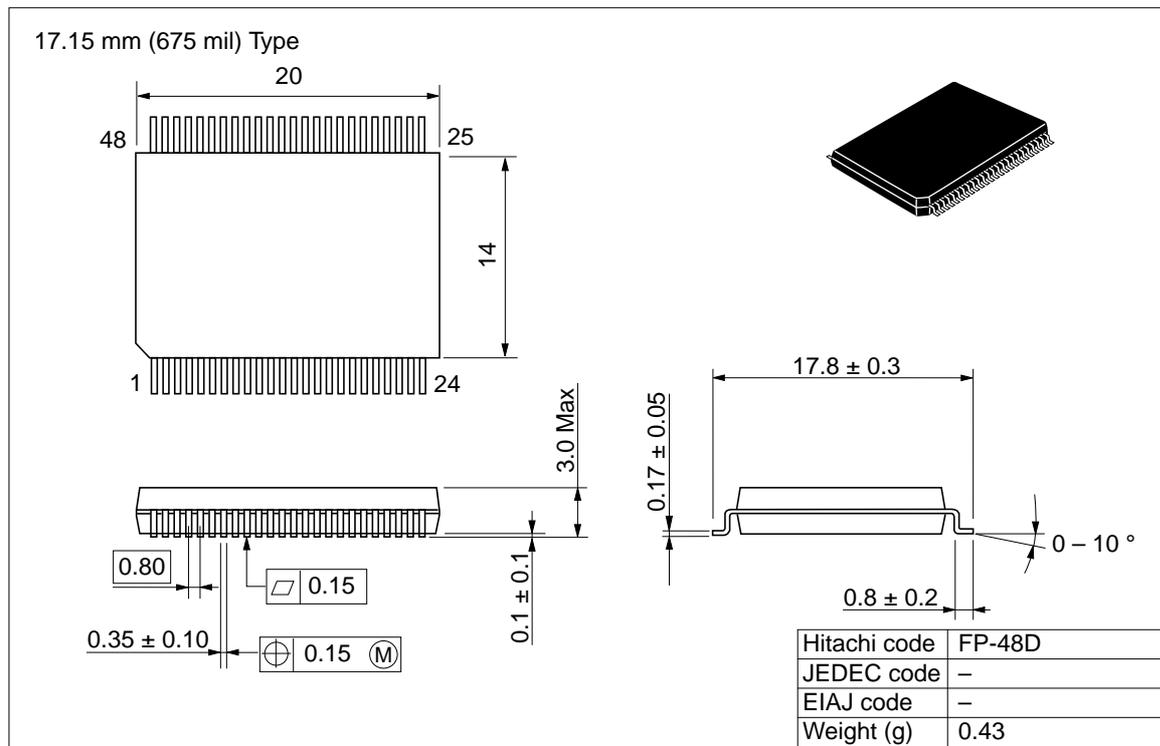
Hitachi code	FP-40D
JEDEC code	-
EIAJ code	-
Weight (g)	1.37

15.24 mm (600 mil) Type



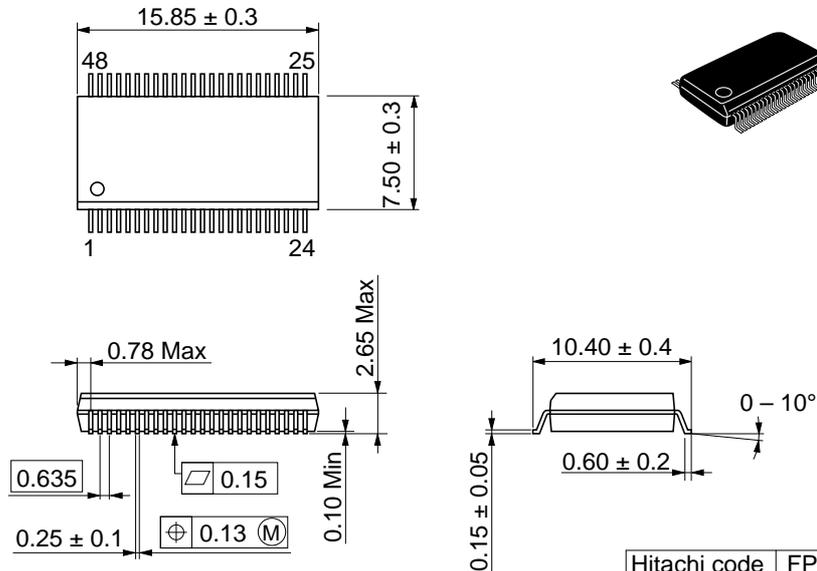
Hitachi code	FP-44D
JEDEC code	-
EIAJ code	-
Weight (g)	-

Package Outline Dimensions



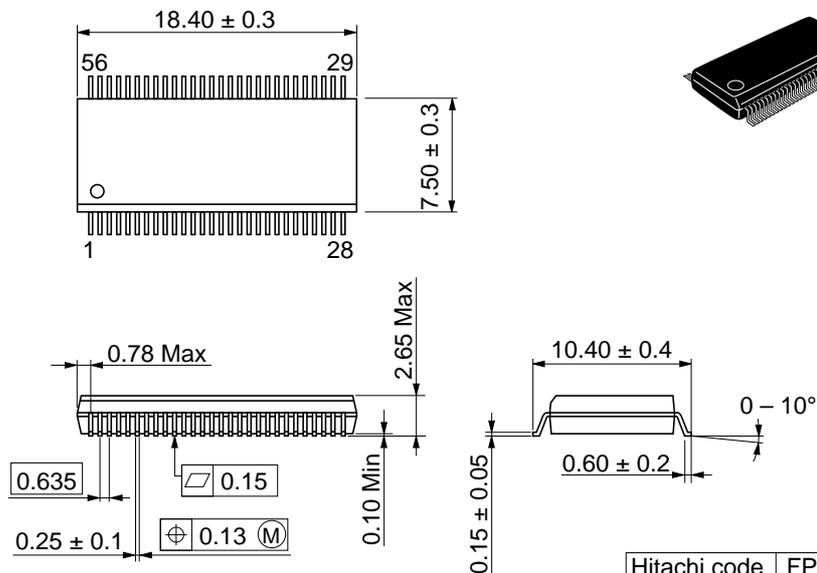
Package Outline Dimensions

10.16 mm (400 mil) Type



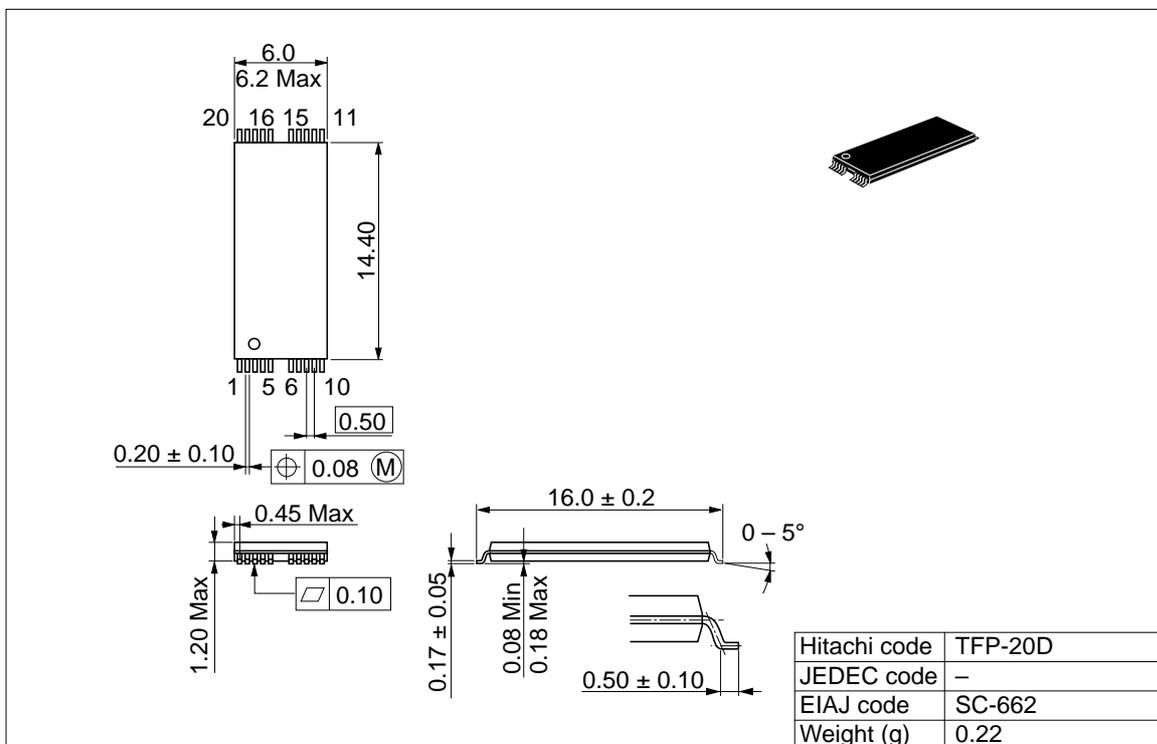
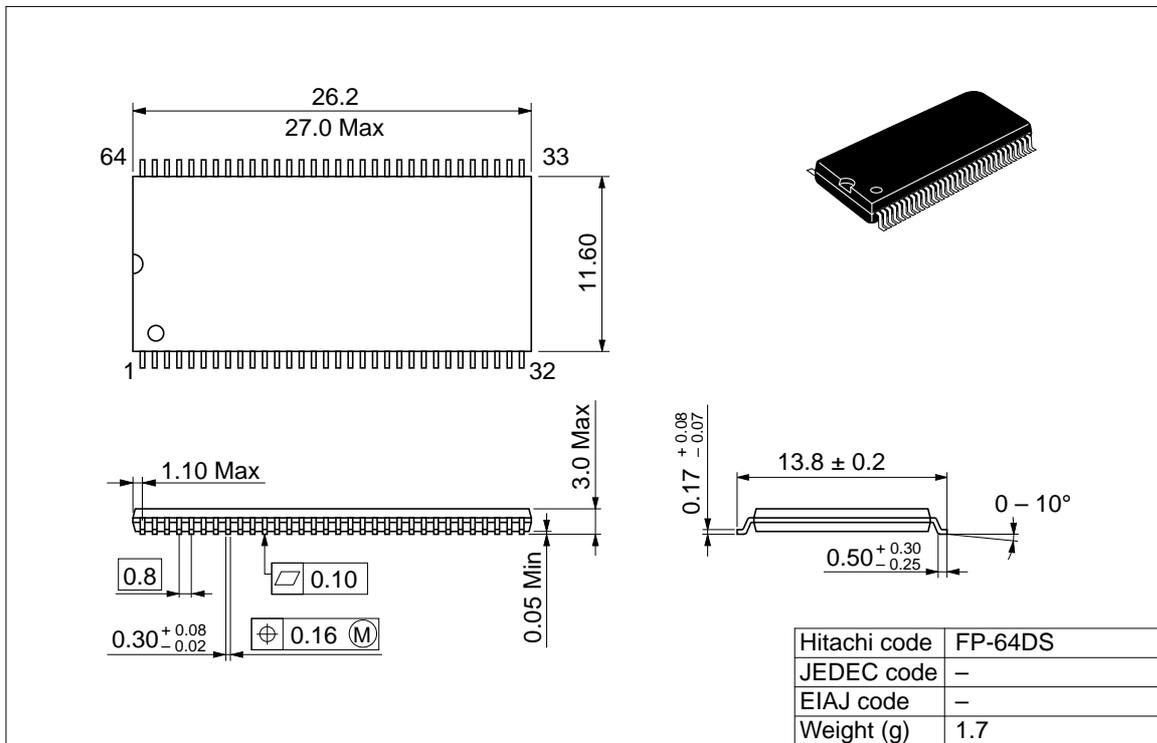
Hitachi code	FP-48DSA
JEDEC code	-
EIAJ code	-
Weight (g)	-

10.16 mm (400 mil) Type

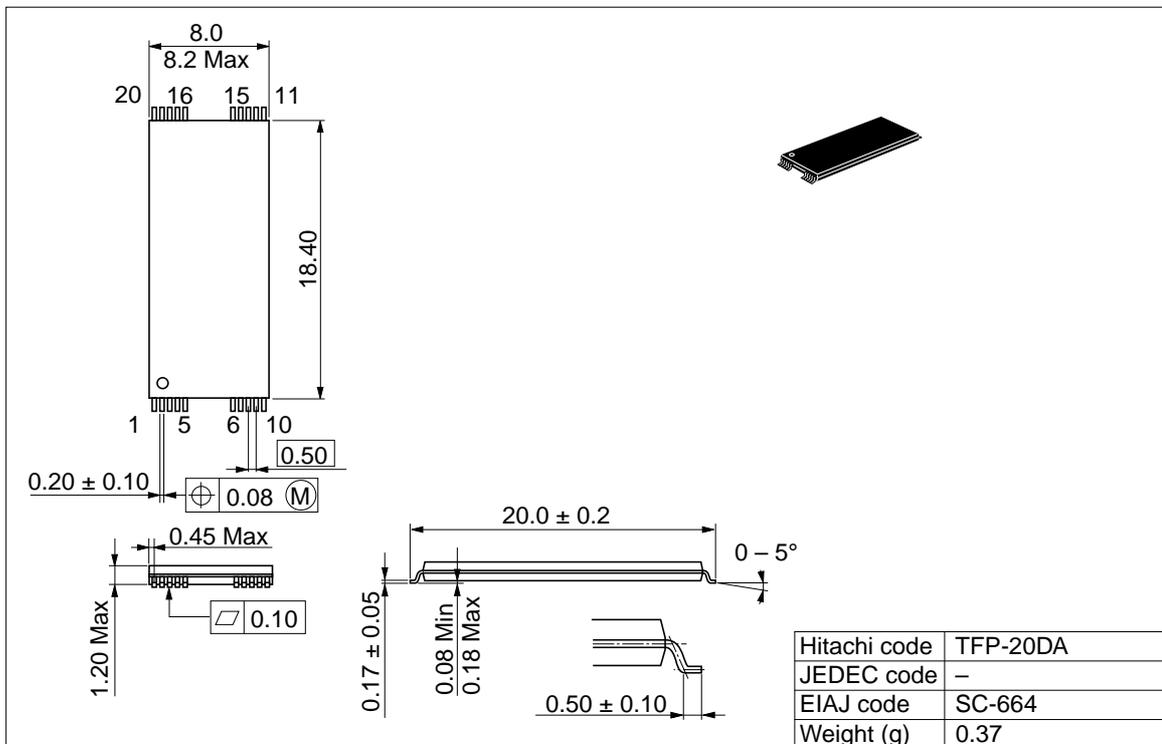
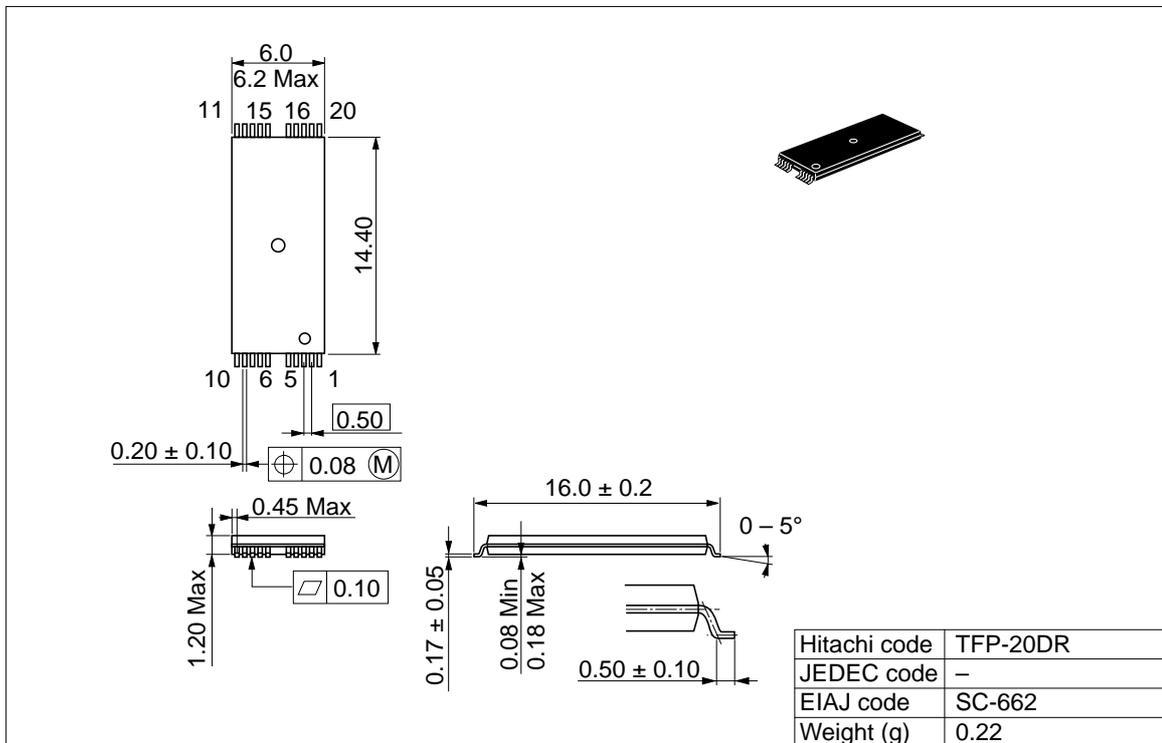


Hitachi code	FP-56DS
JEDEC code	-
EIAJ code	-
Weight (g)	-

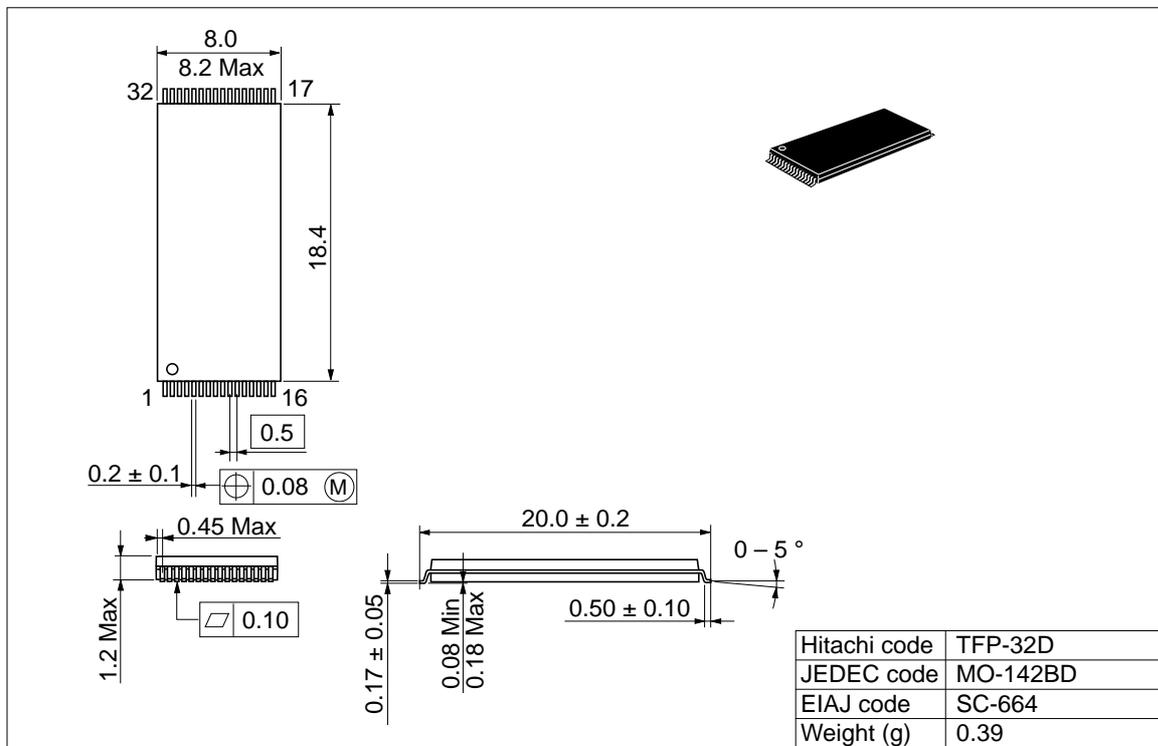
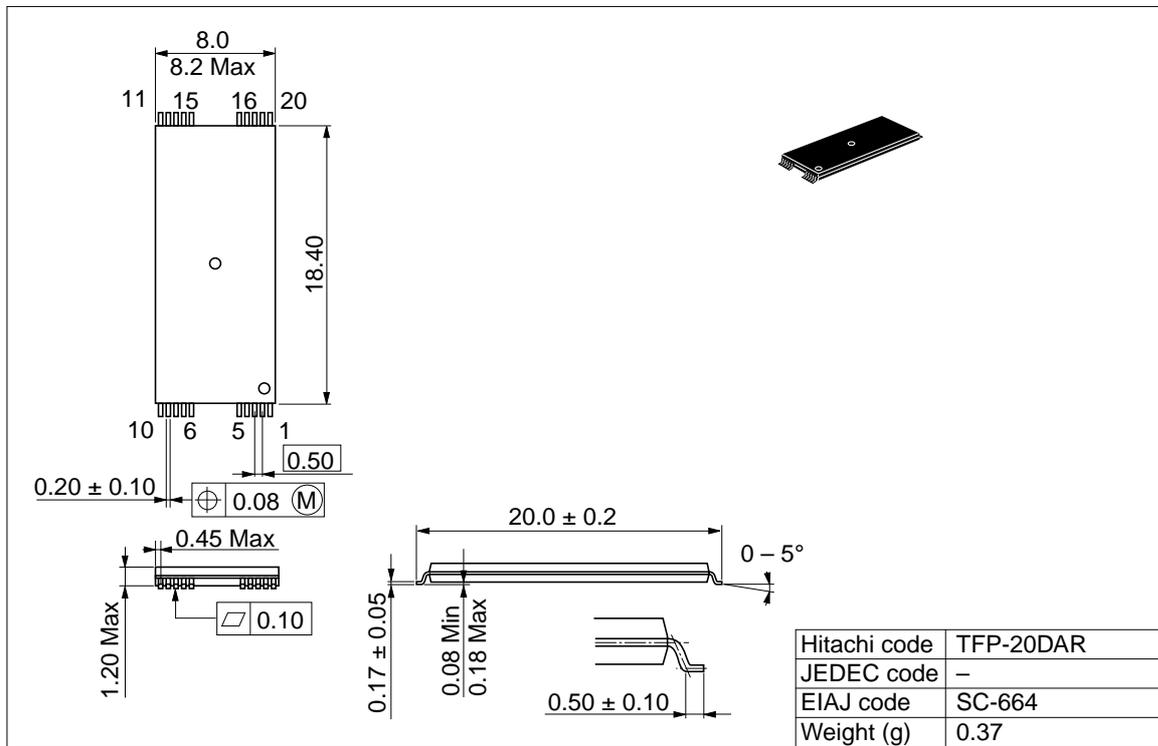
Package Outline Dimensions



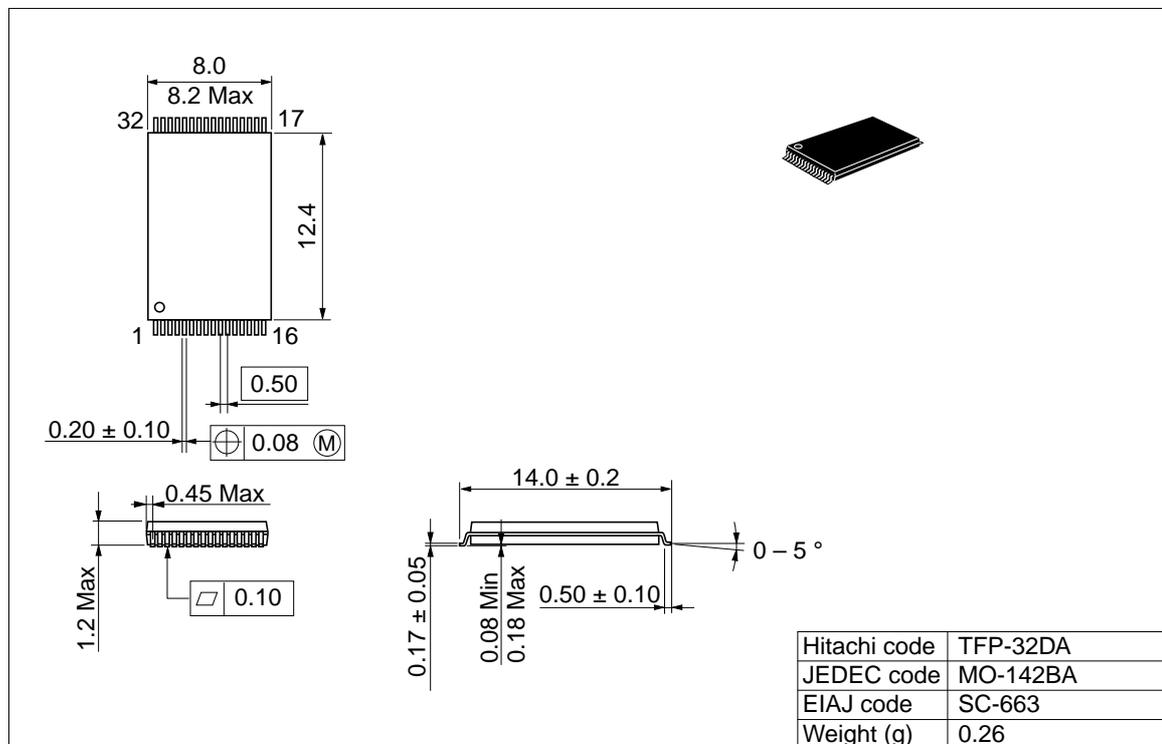
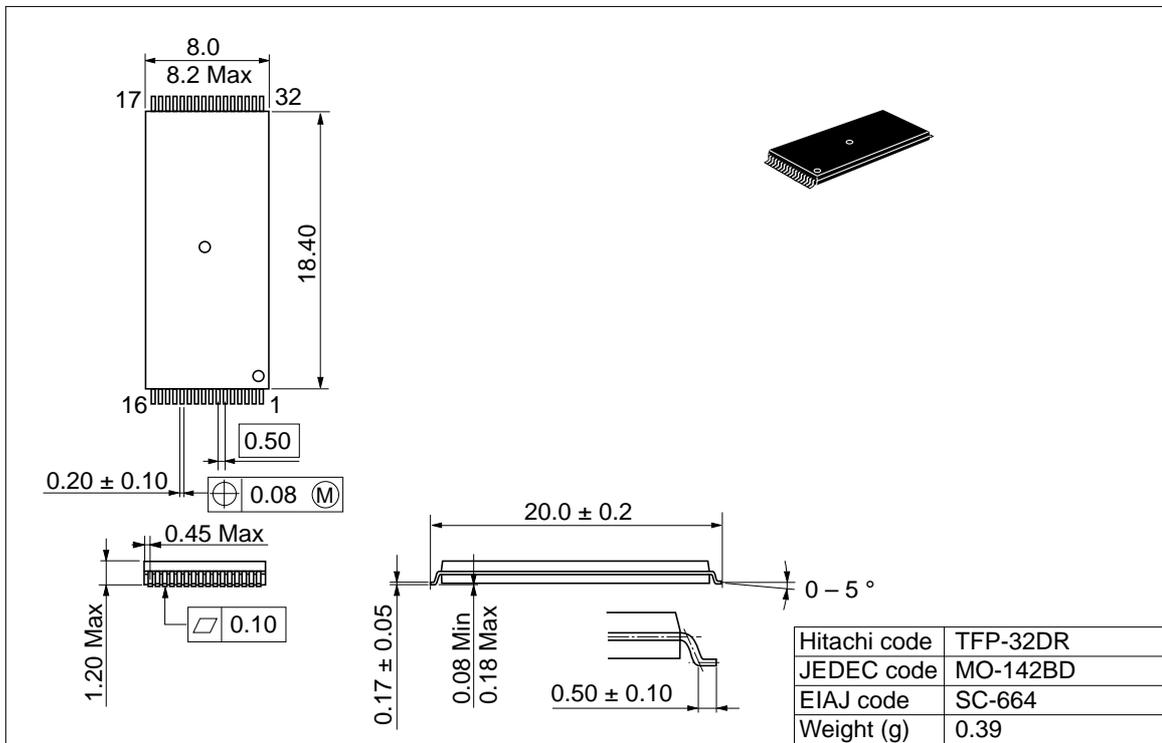
Package Outline Dimensions



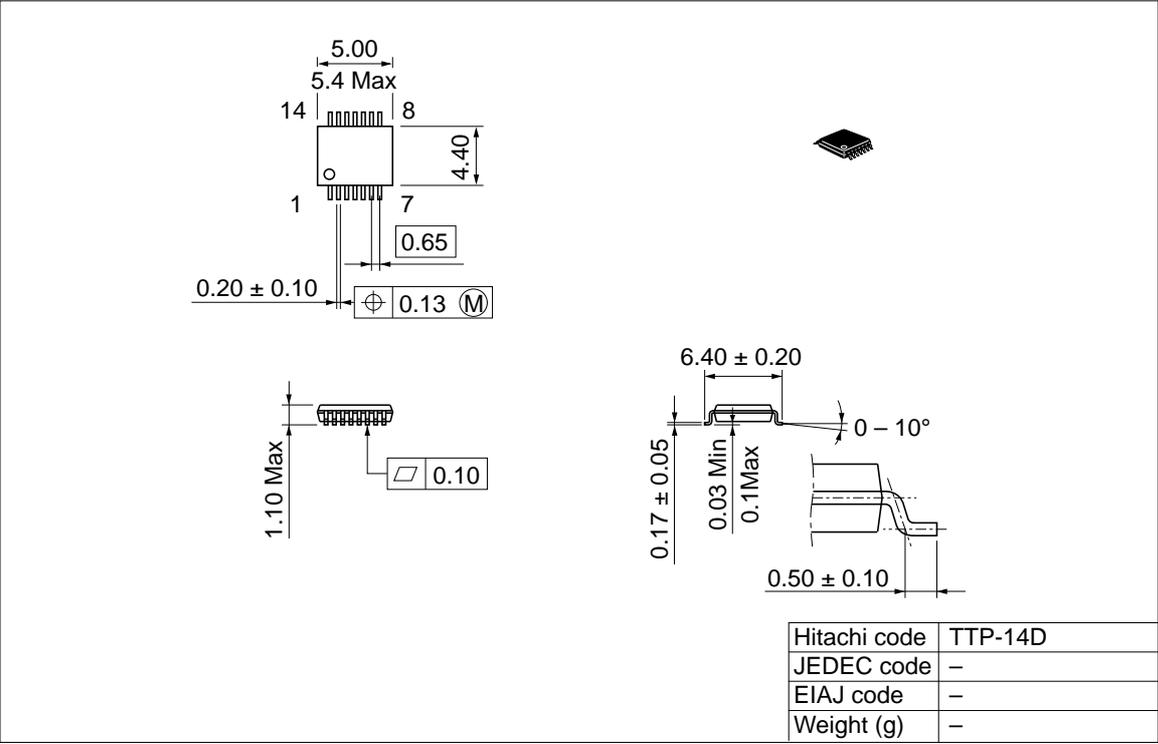
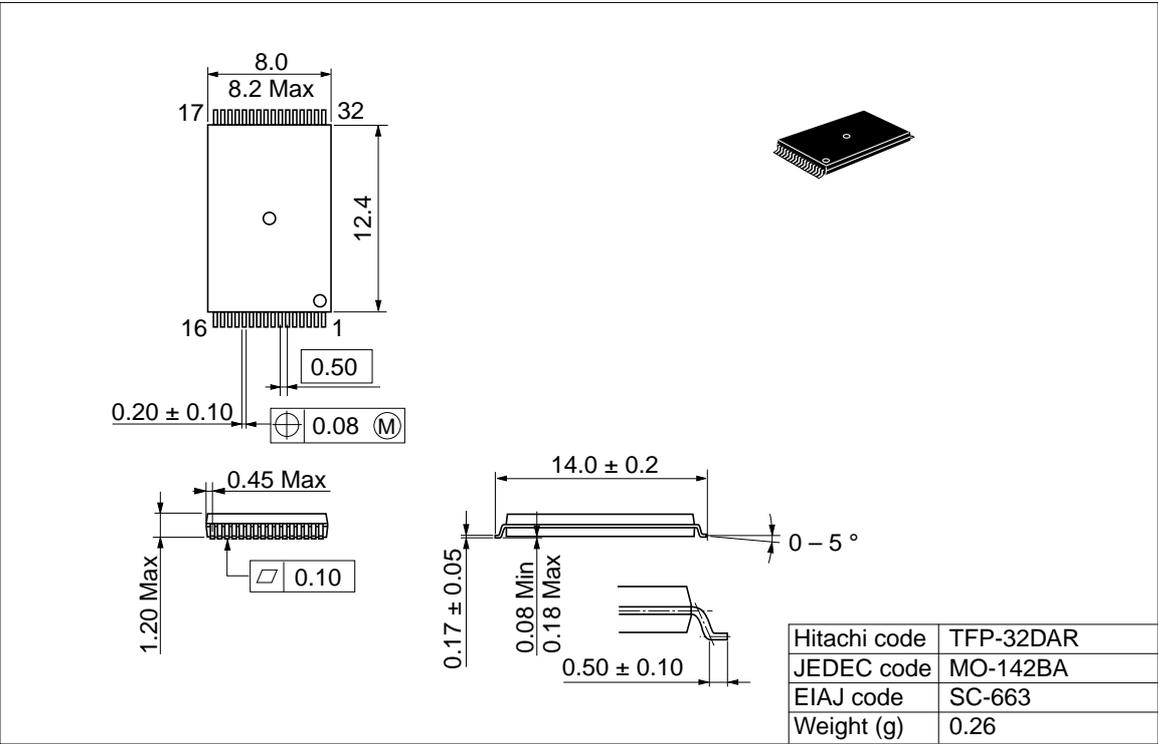
Package Outline Dimensions



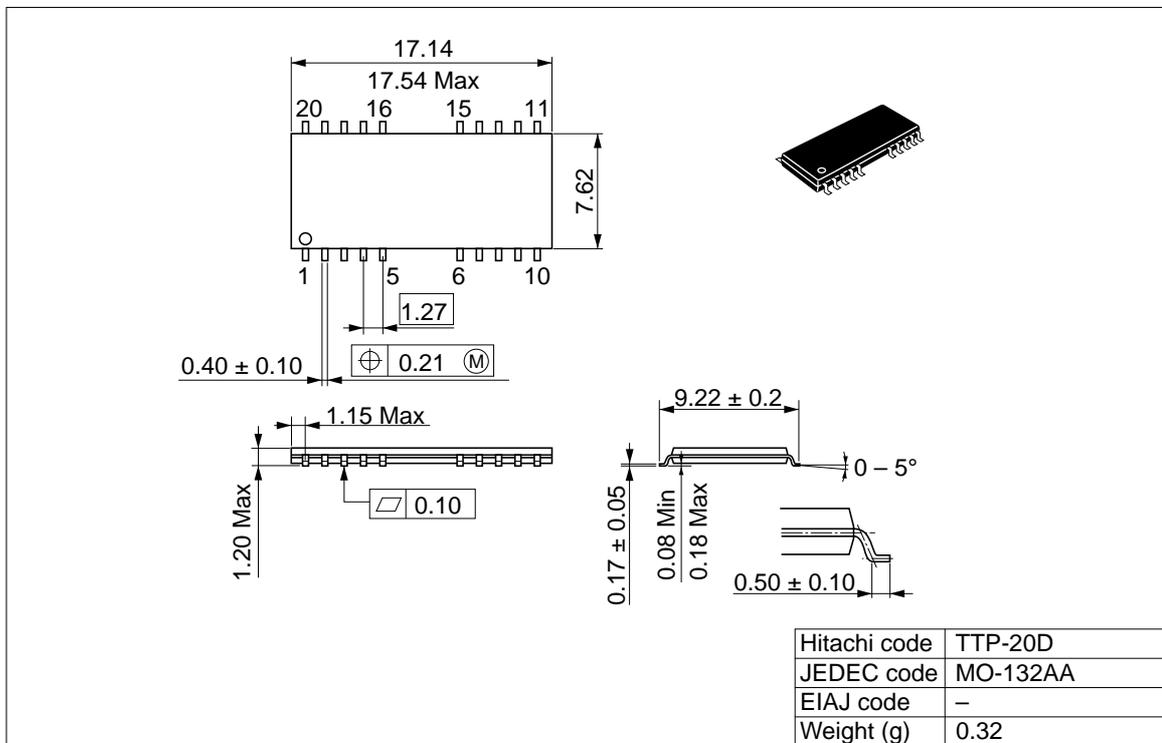
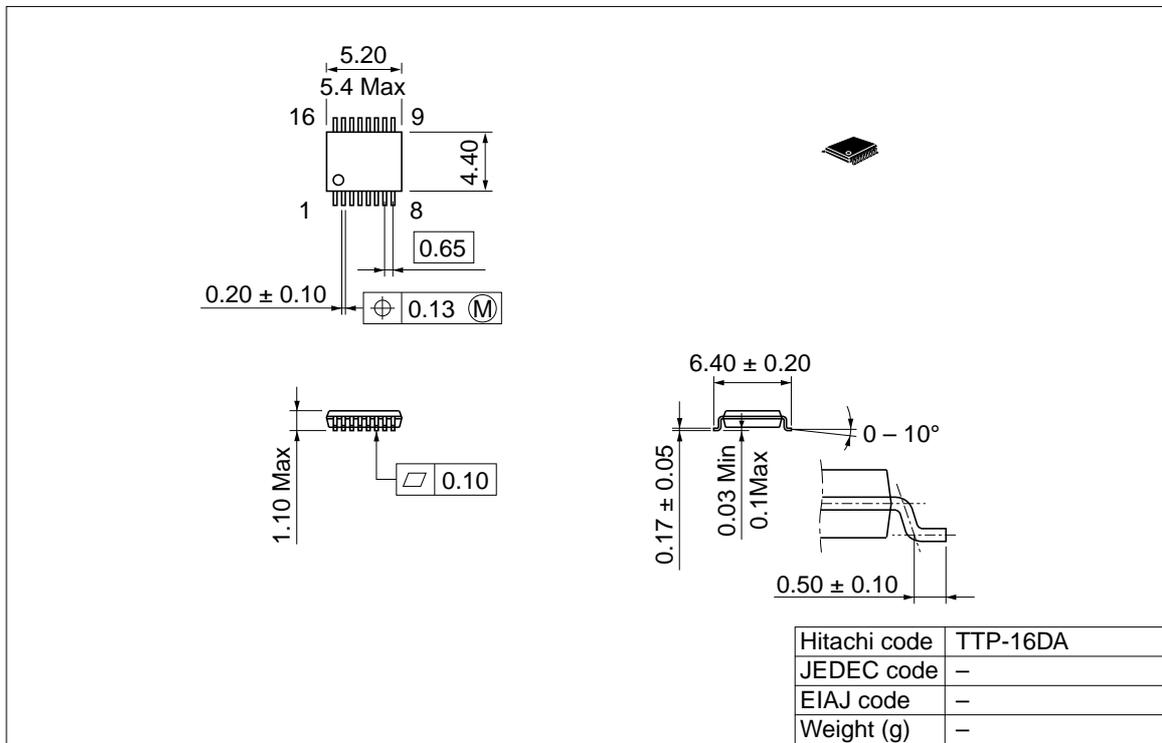
Package Outline Dimensions



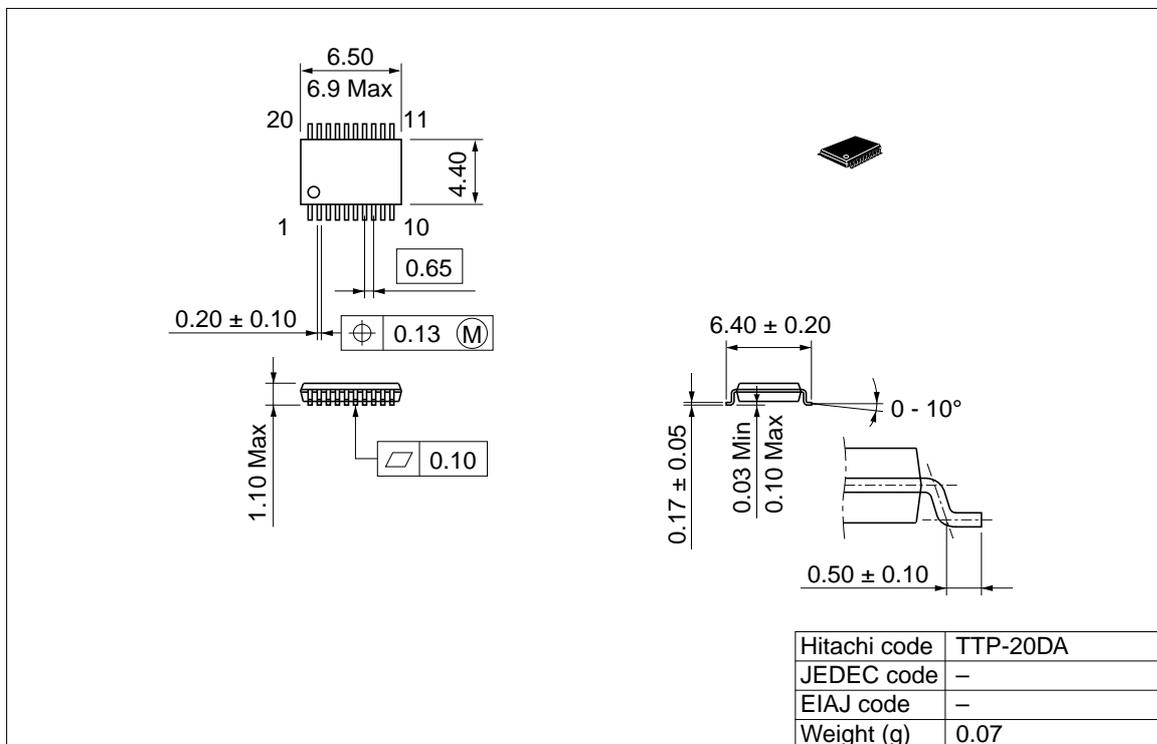
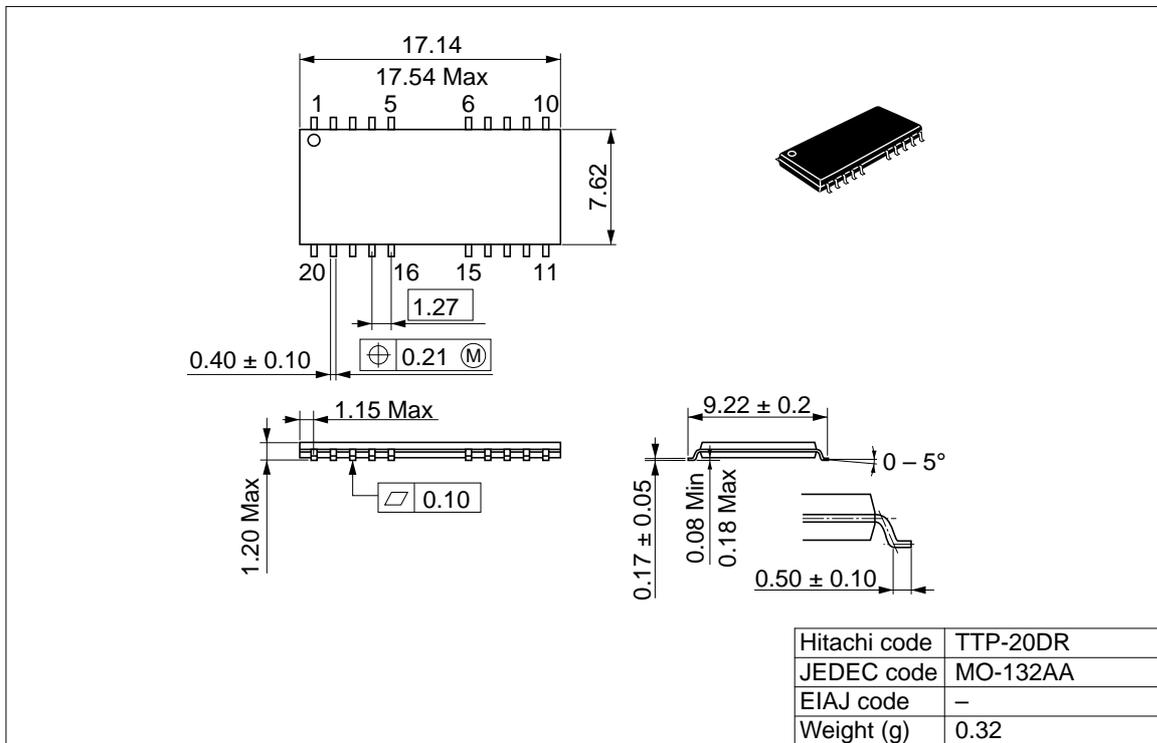
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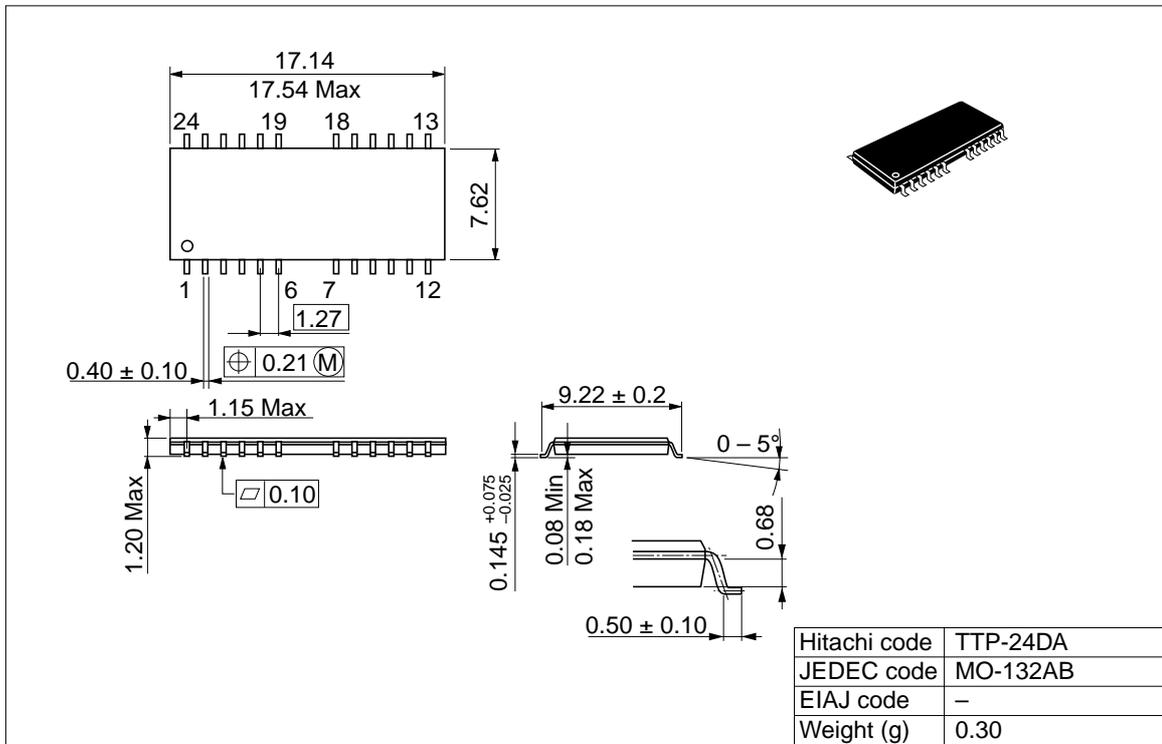
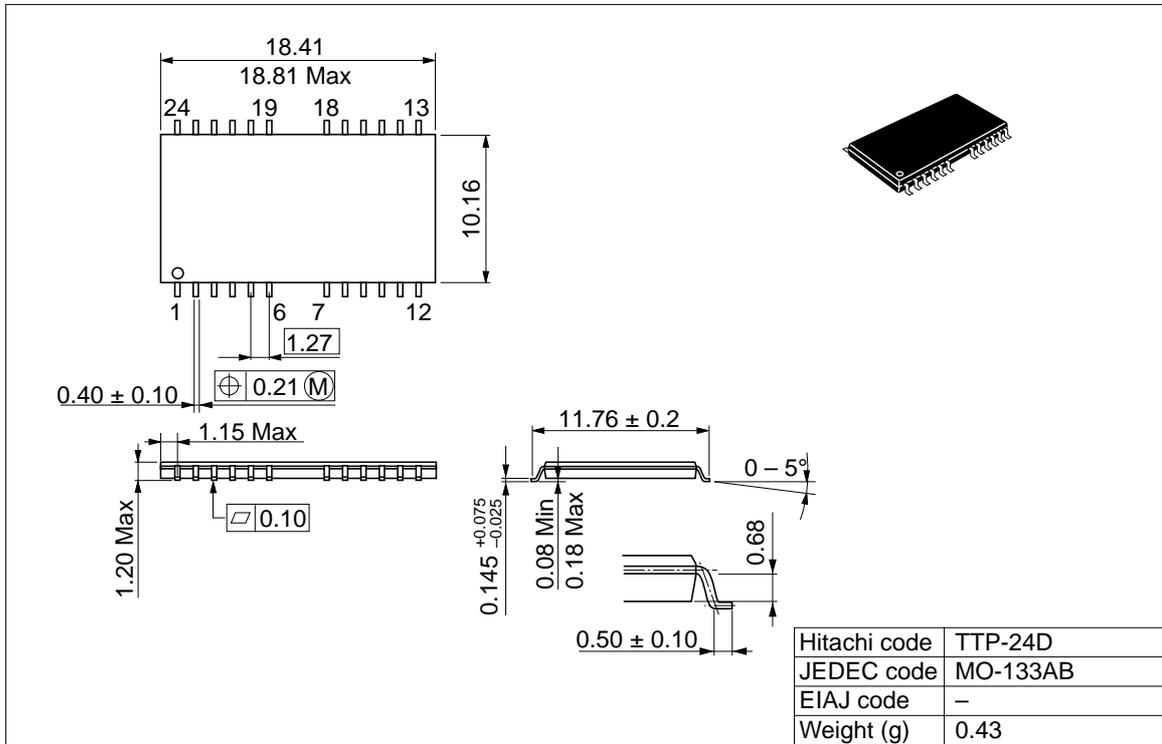
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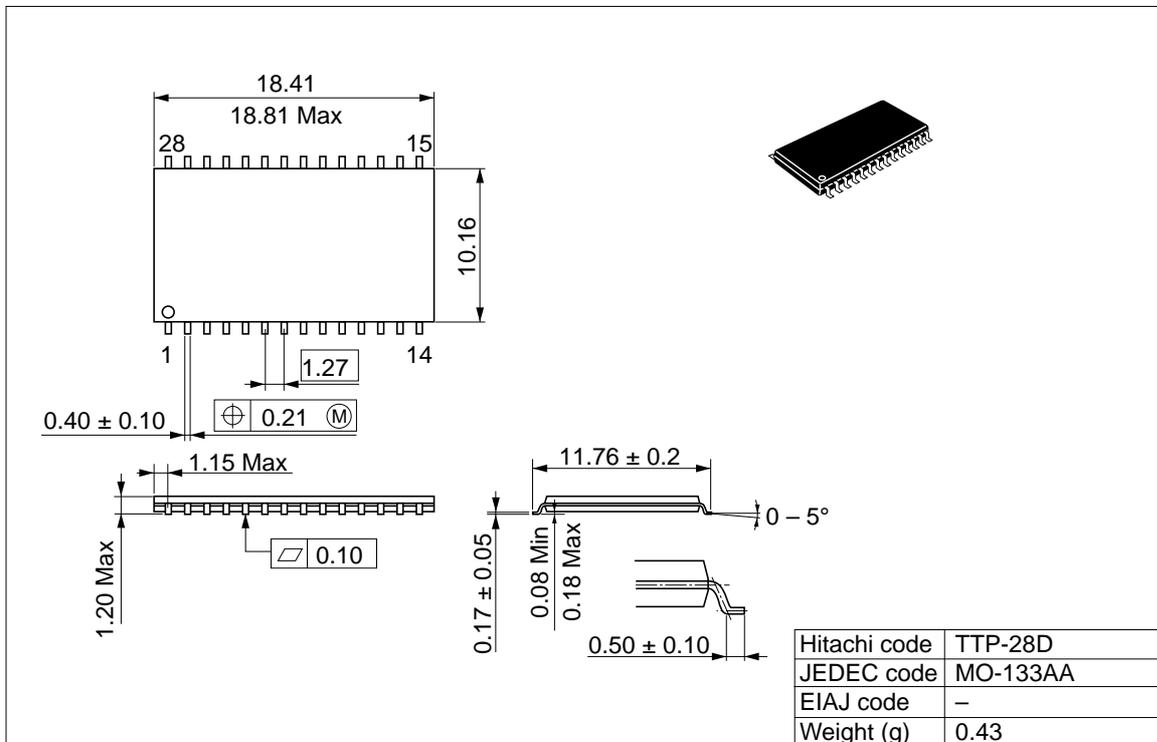
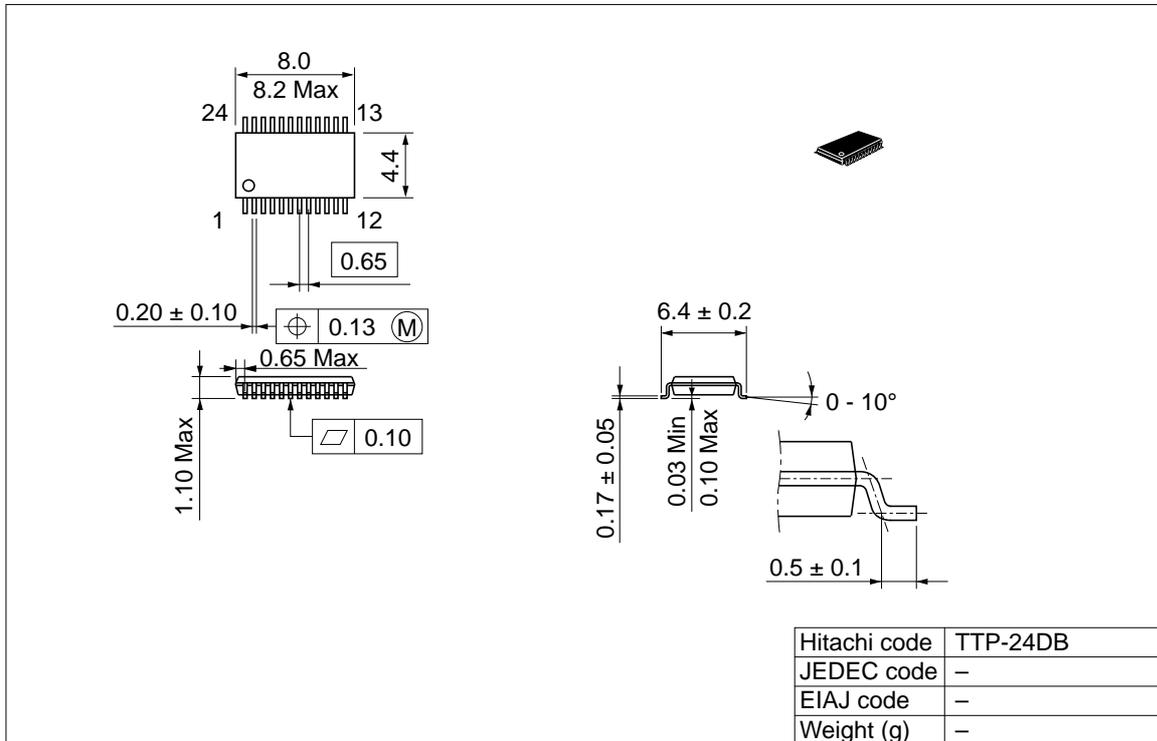
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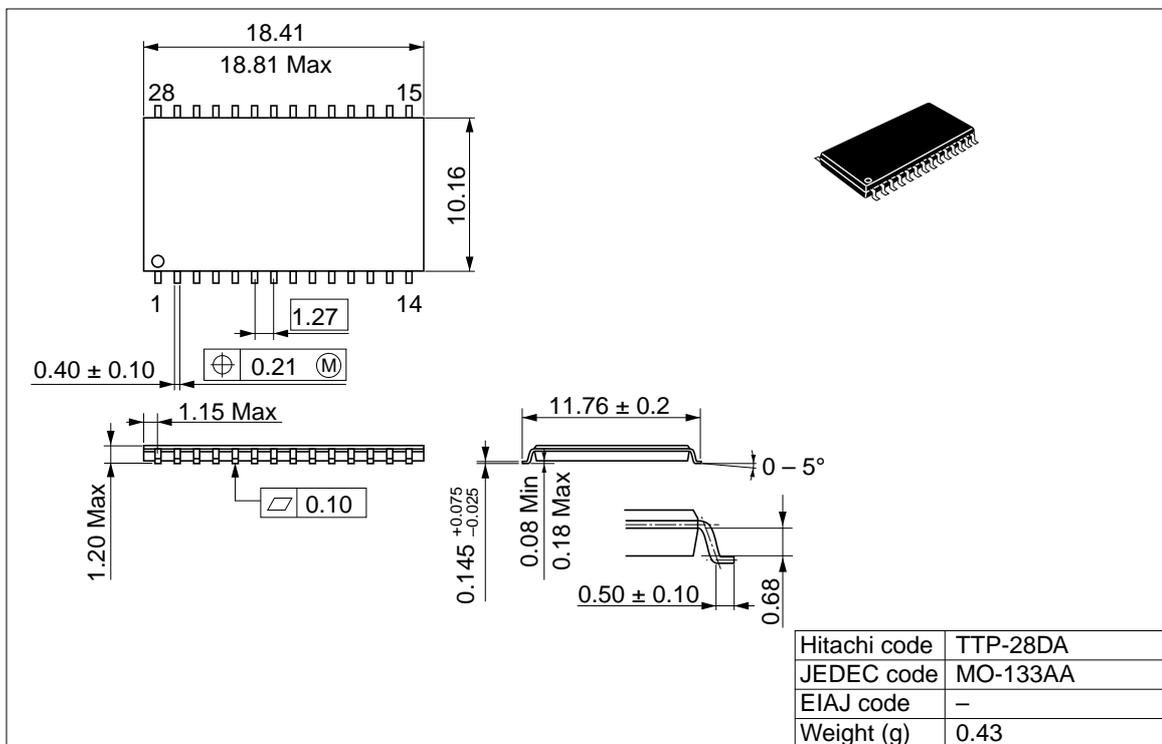
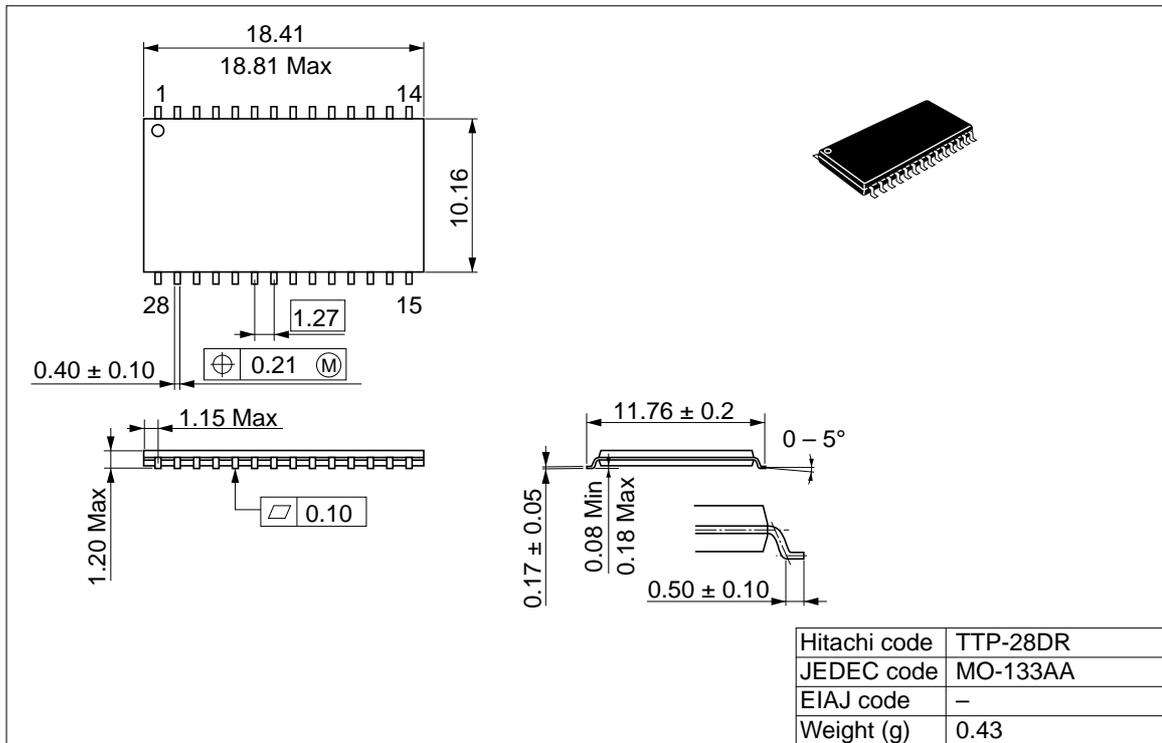
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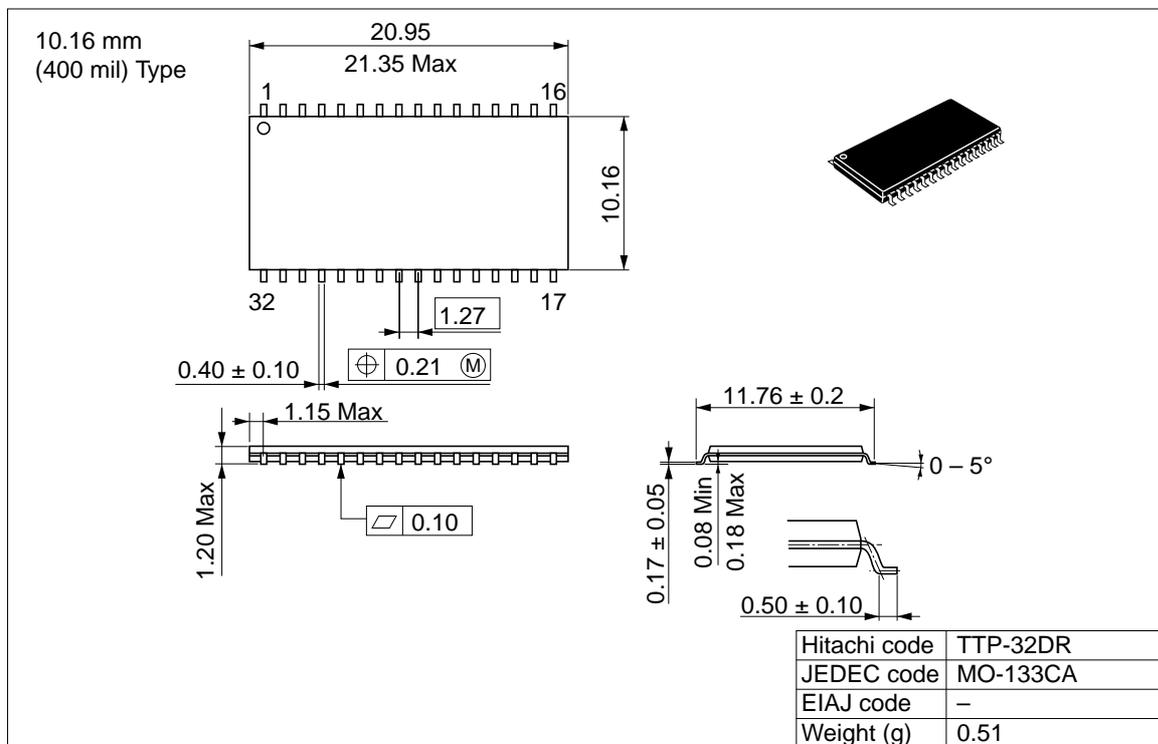
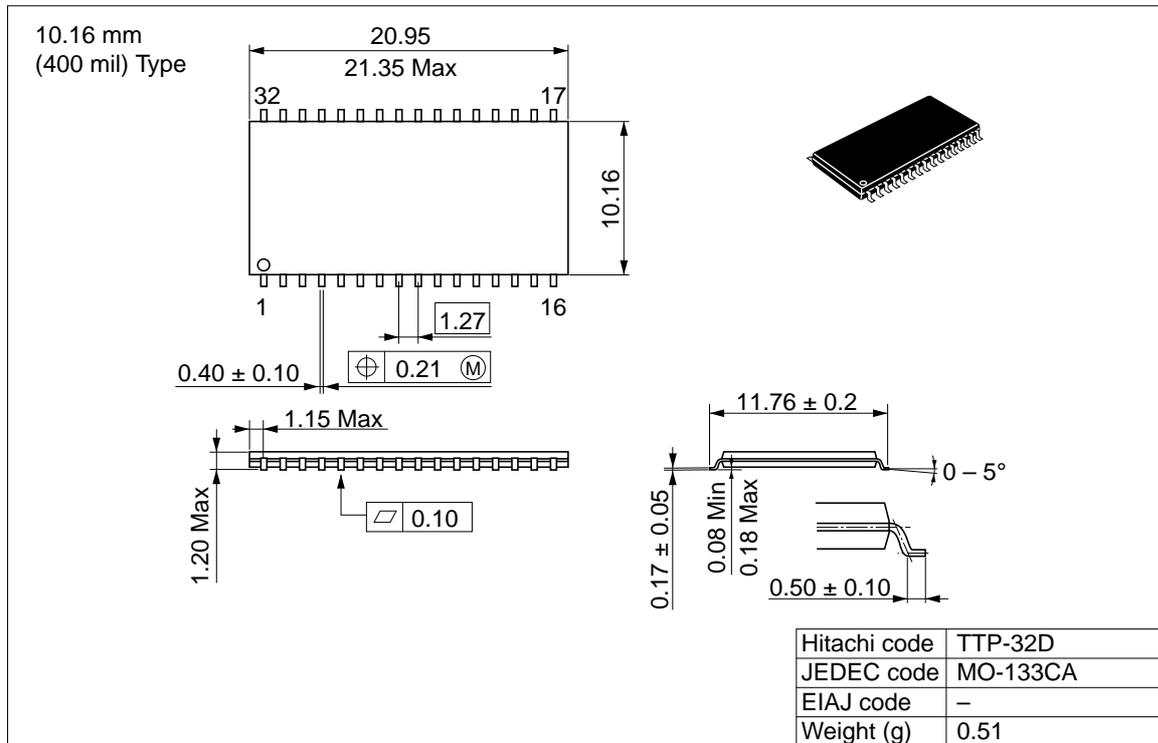
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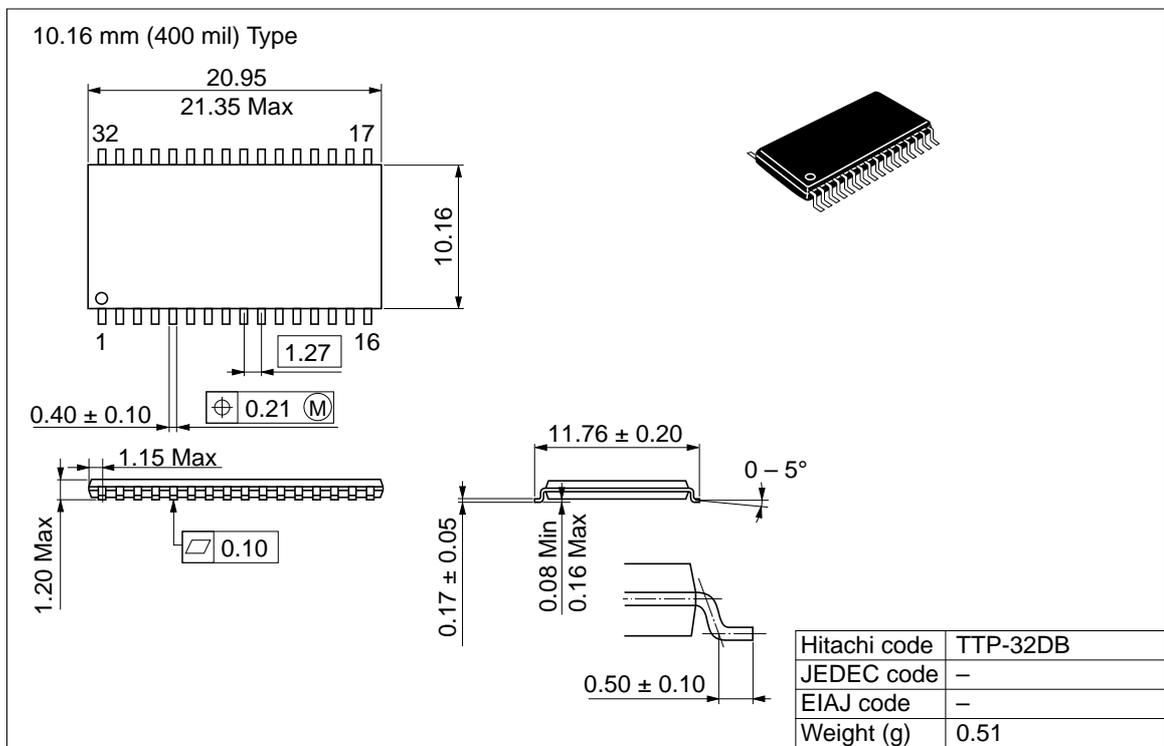
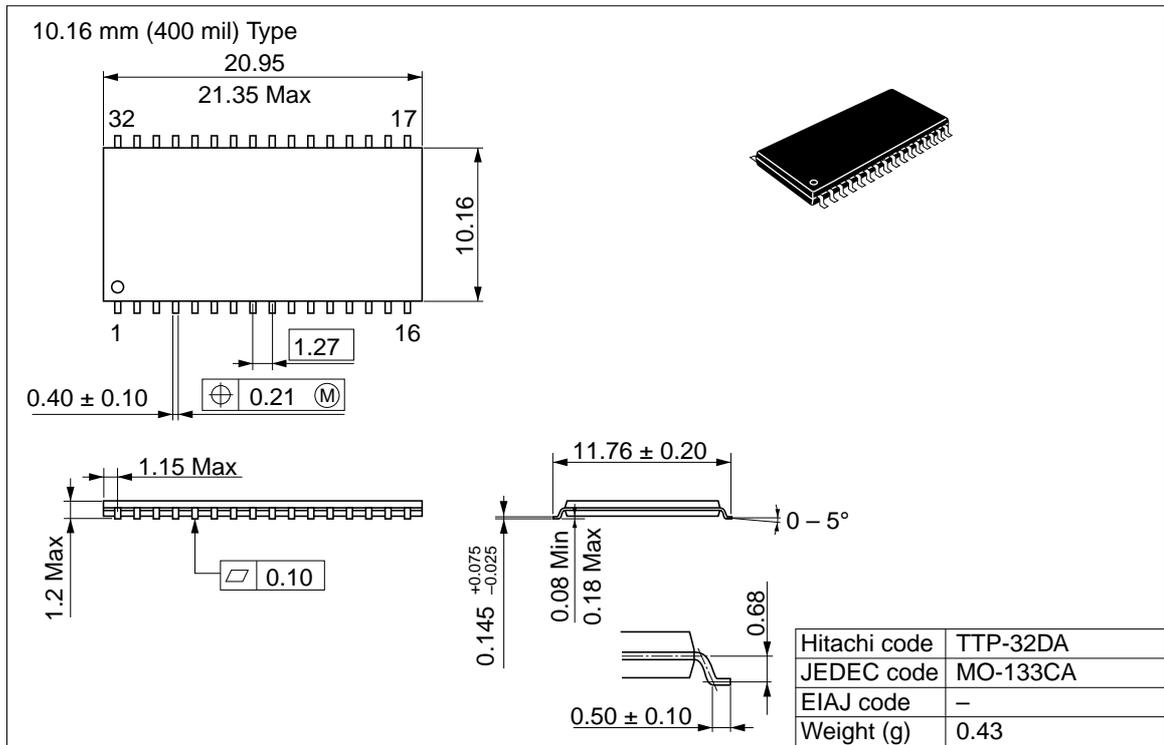
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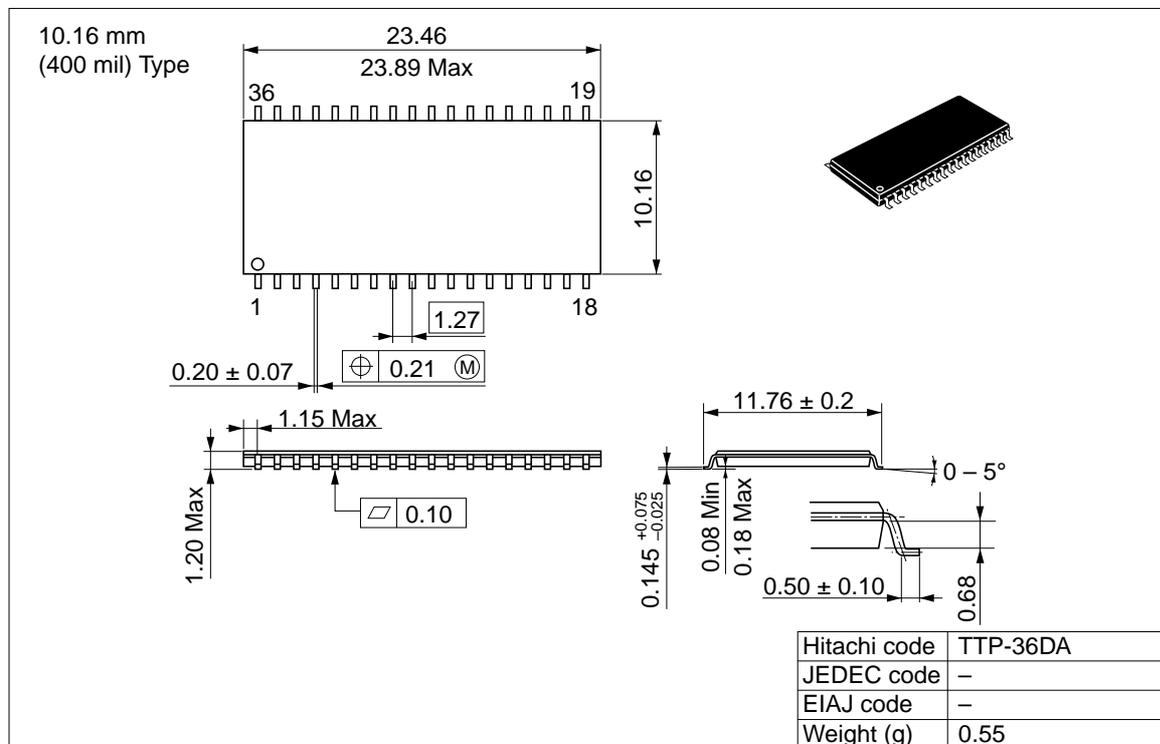
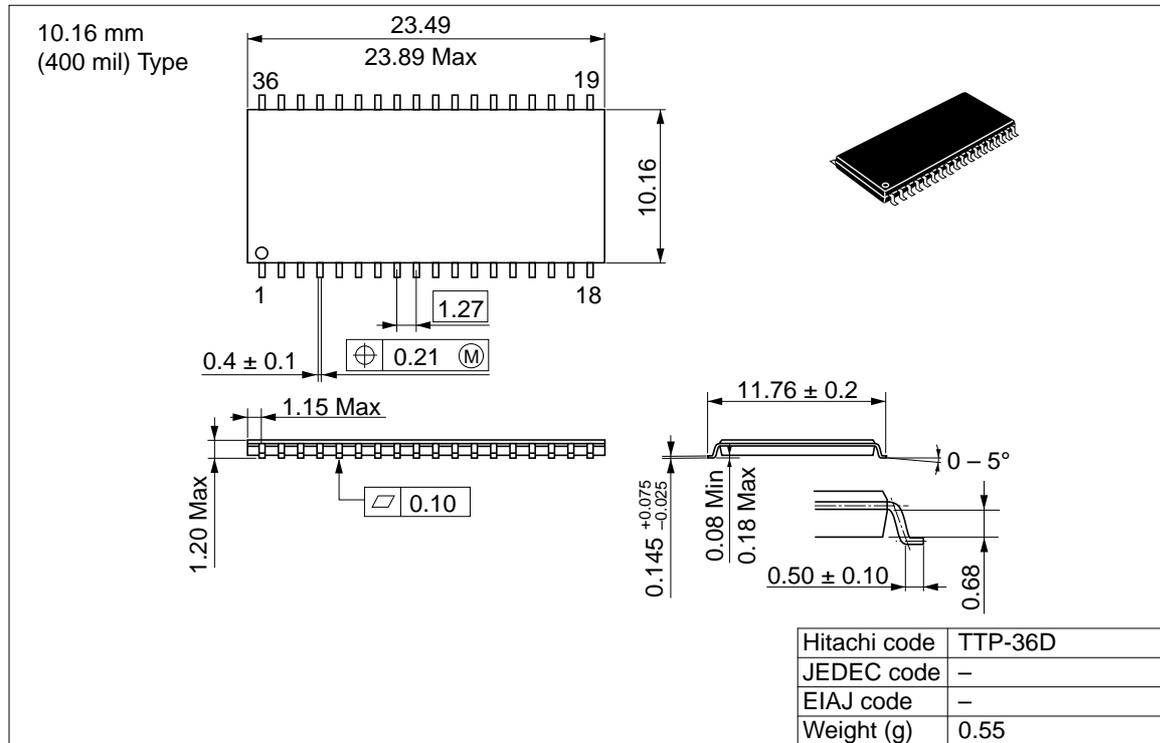
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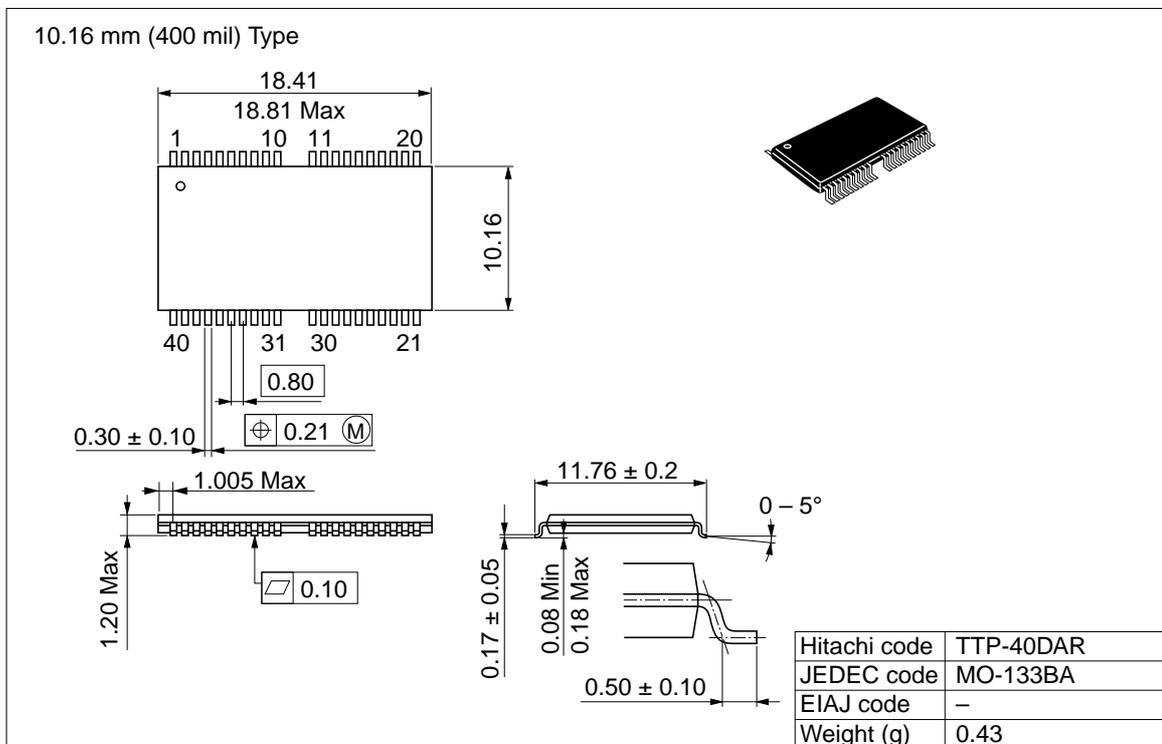
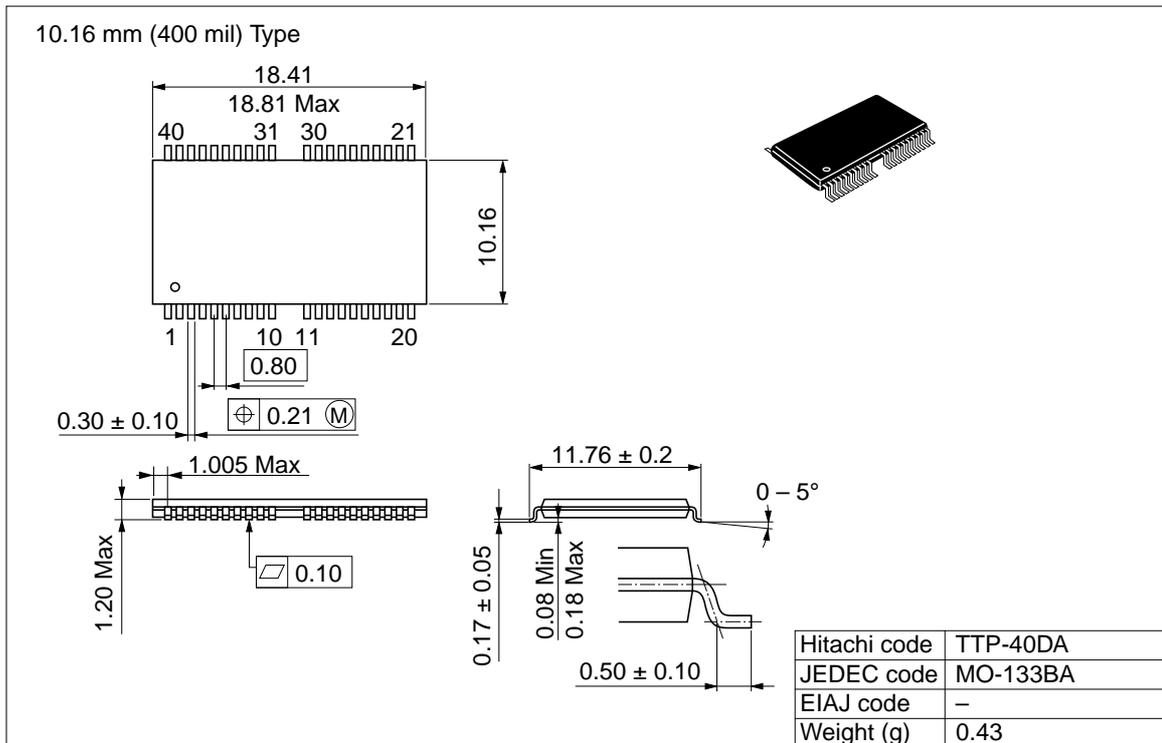
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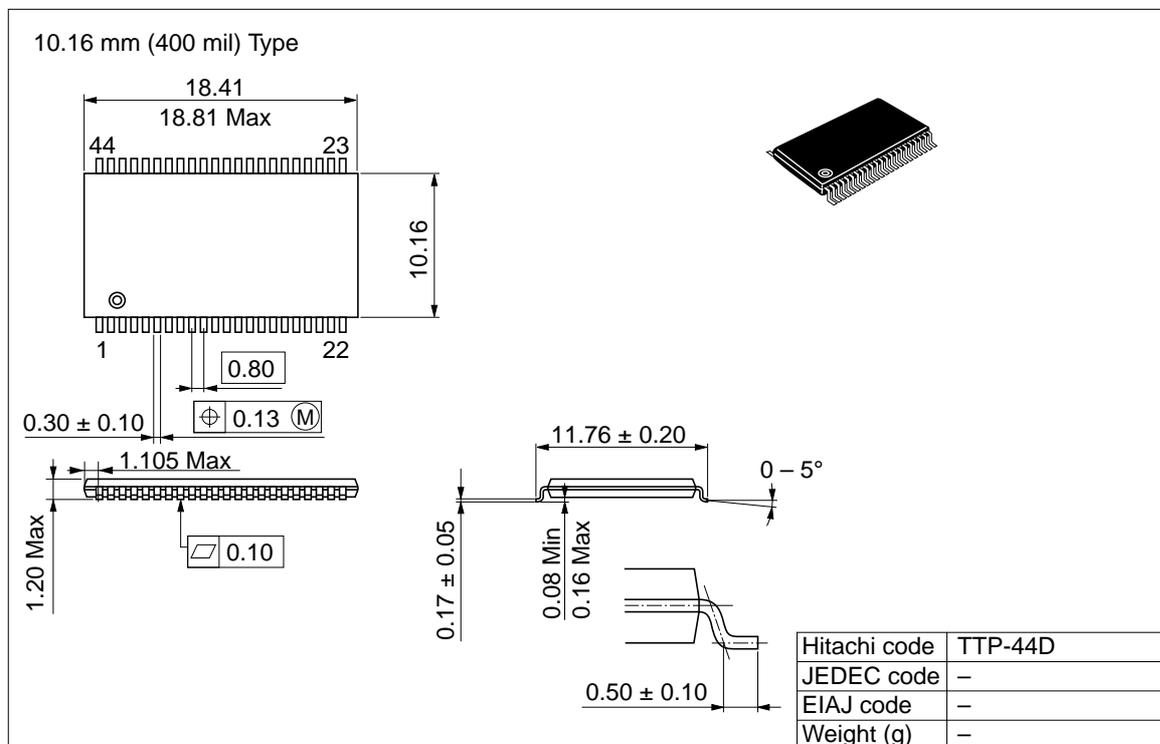
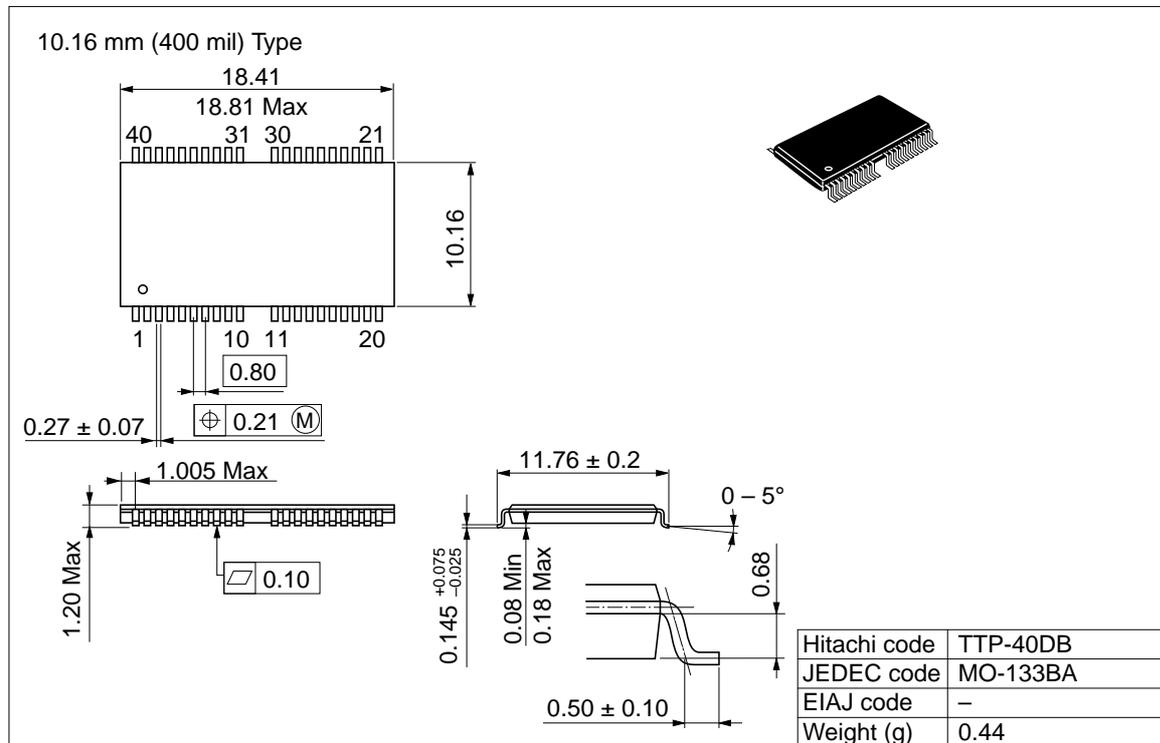
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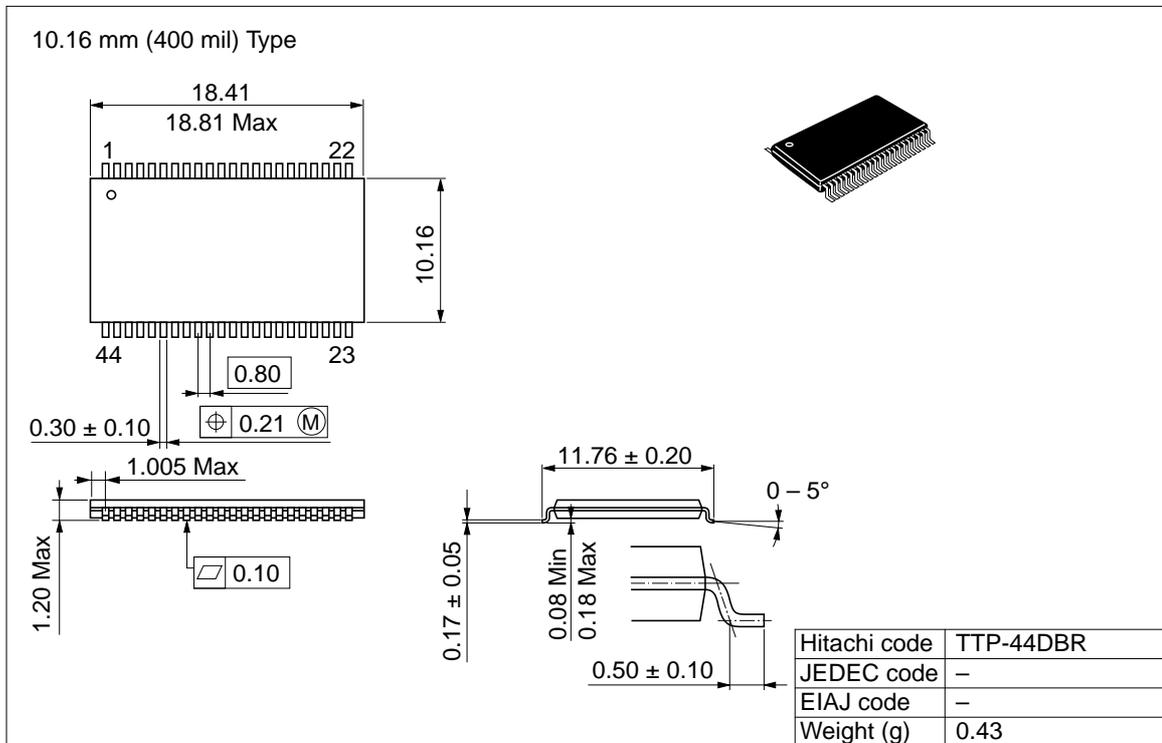
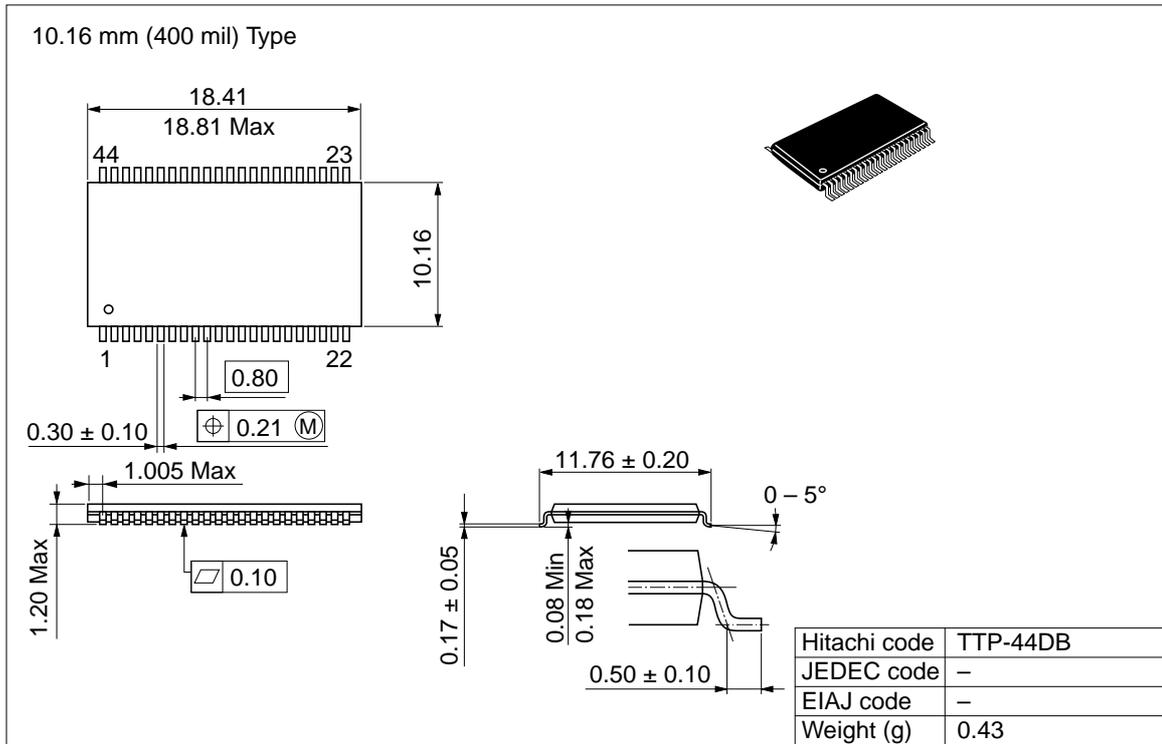
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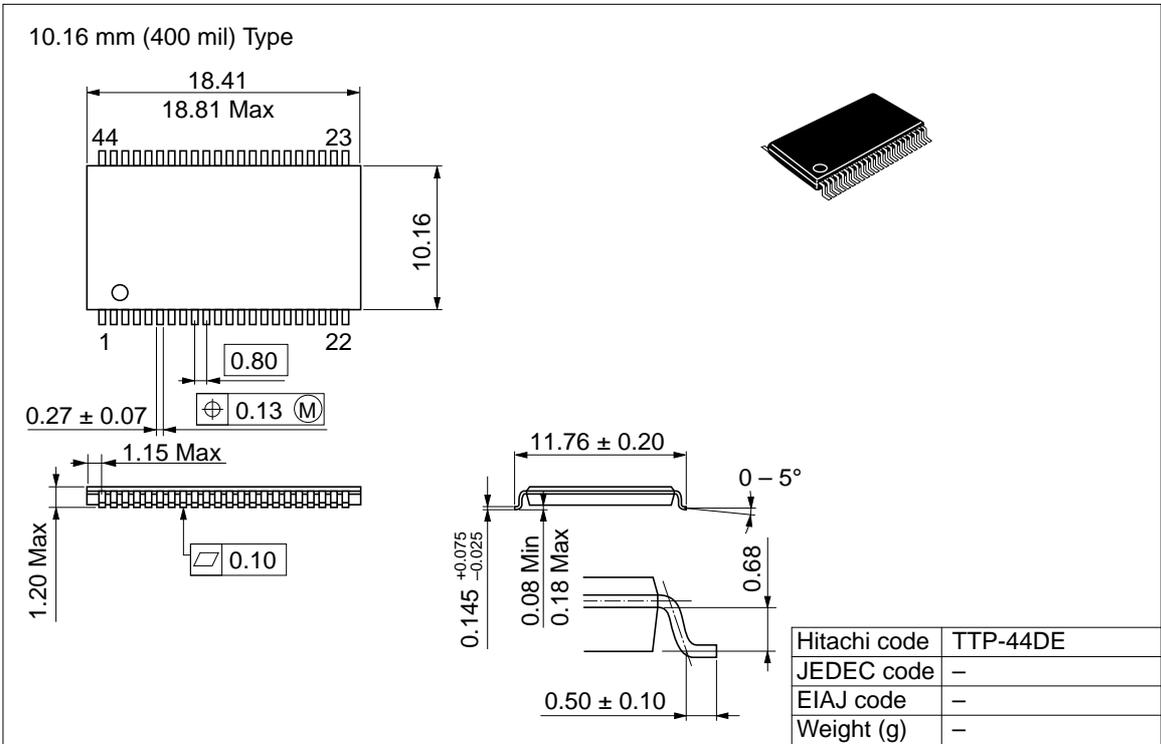
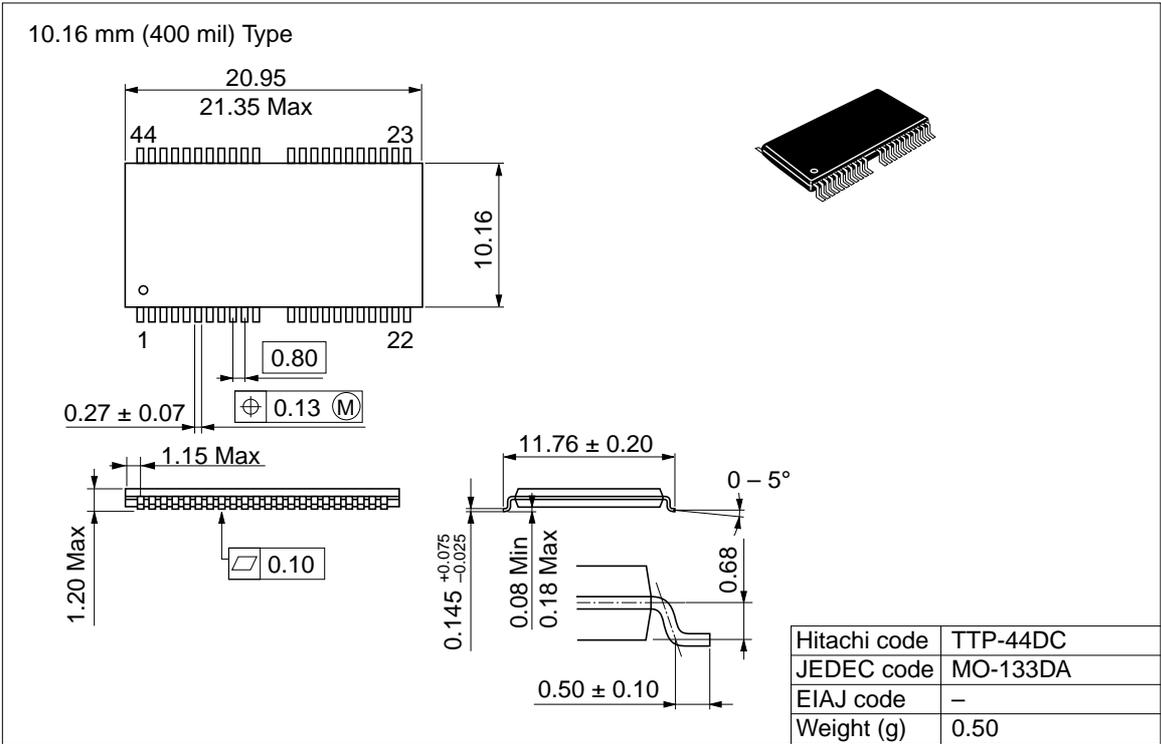
Package Outline Dimensions



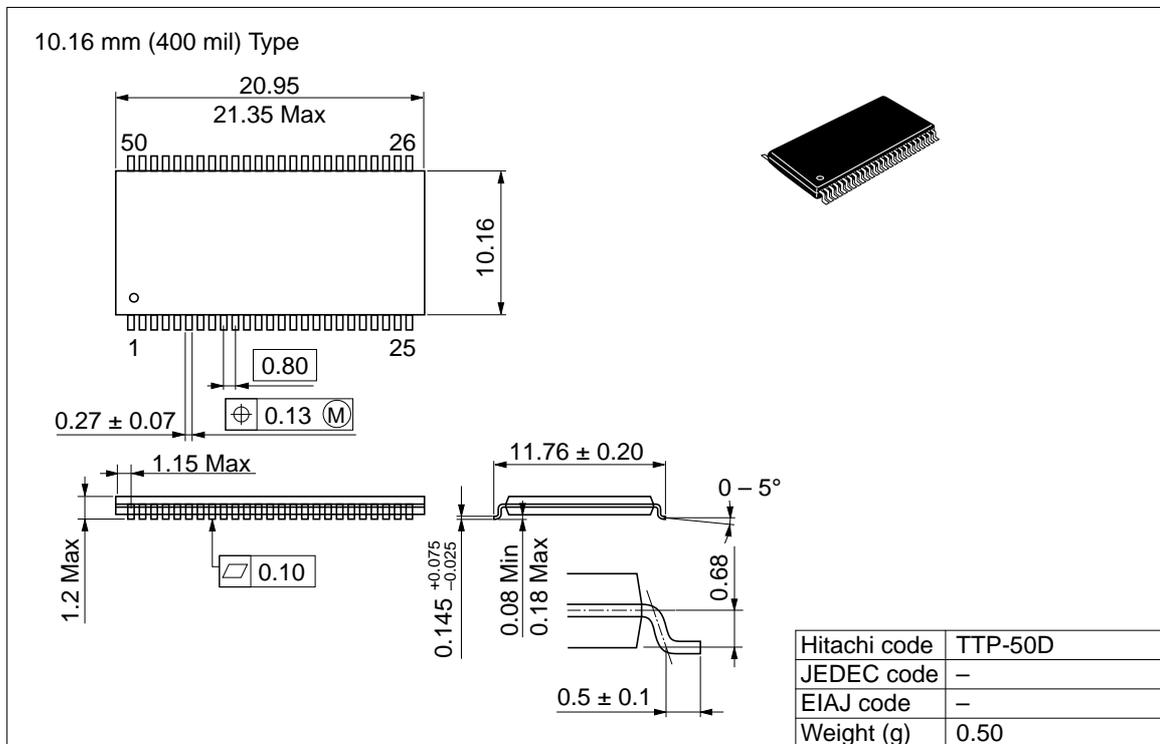
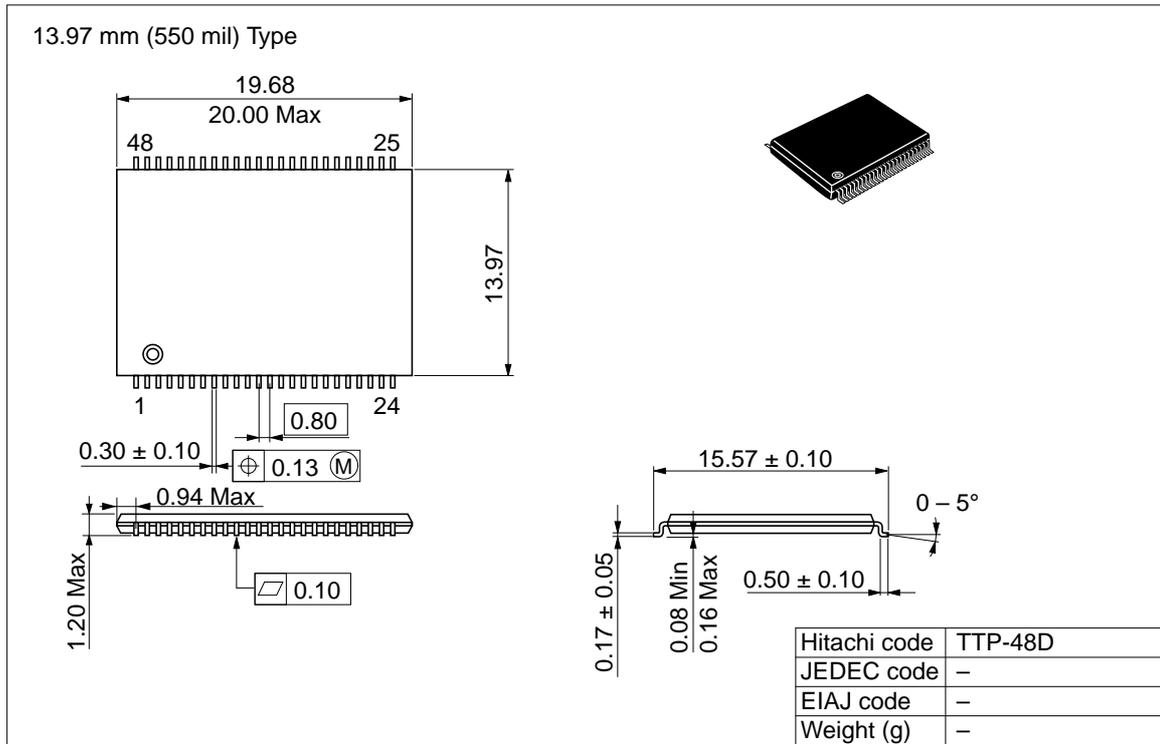
Package Outline Dimensions



Package Outline Dimensions



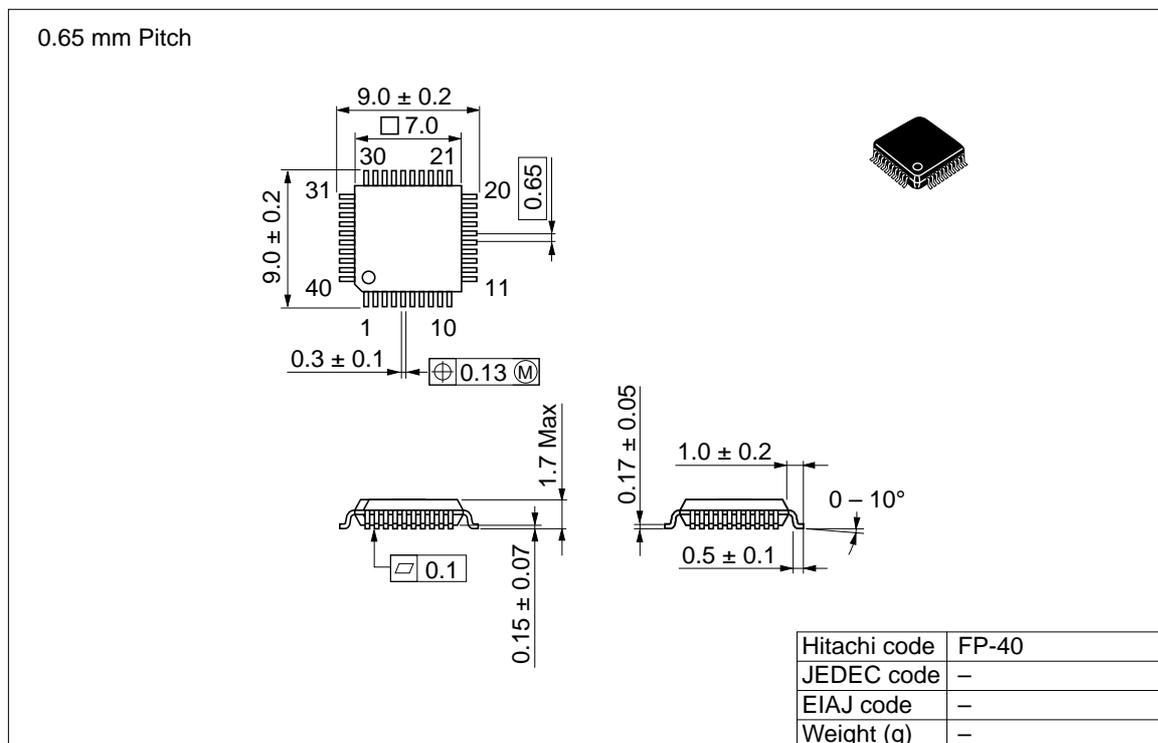
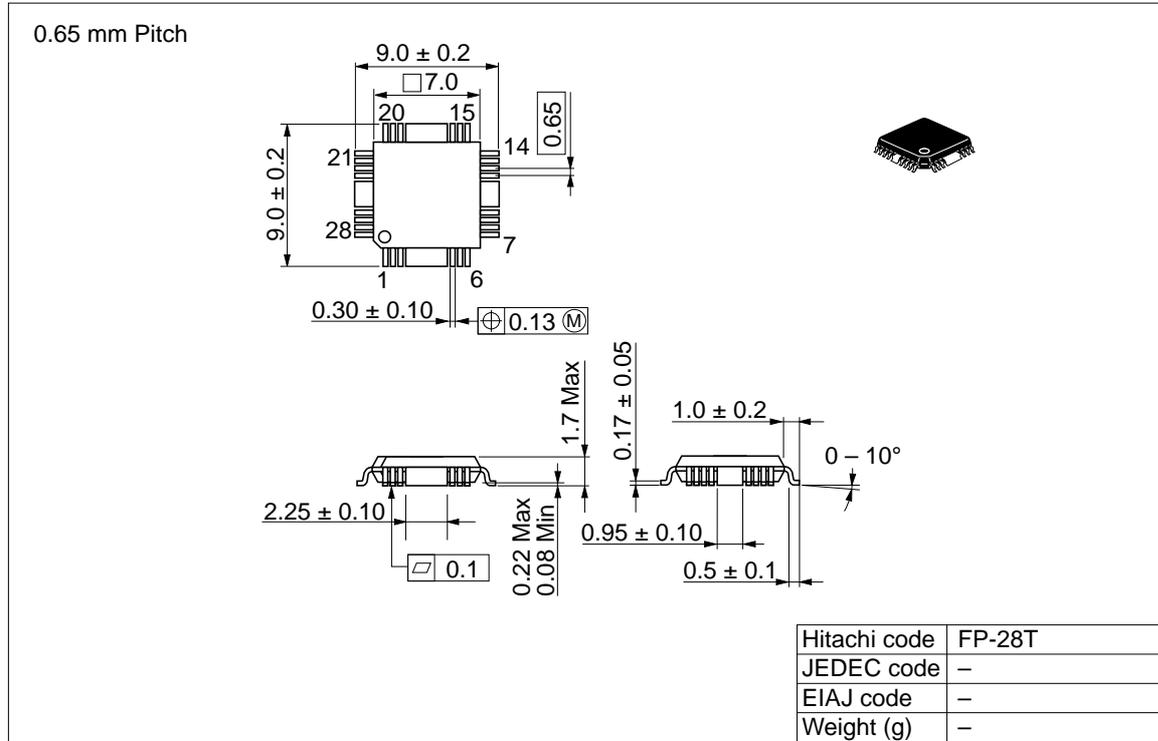
Package Outline Dimensions



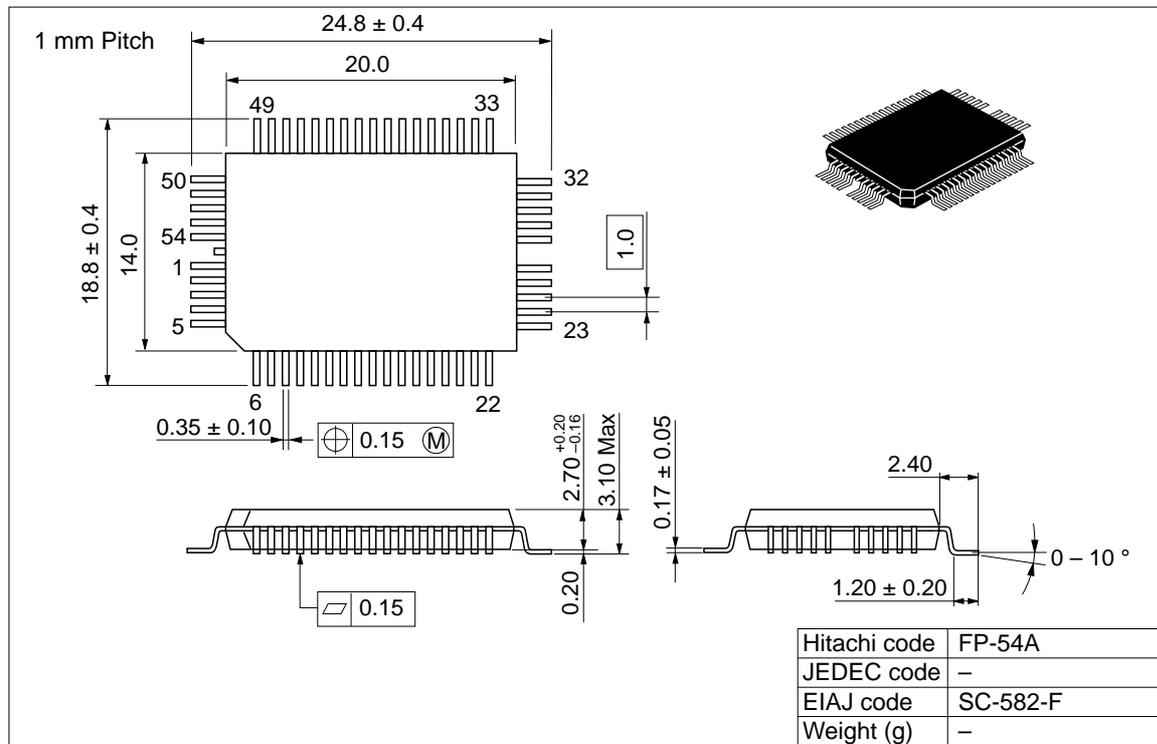
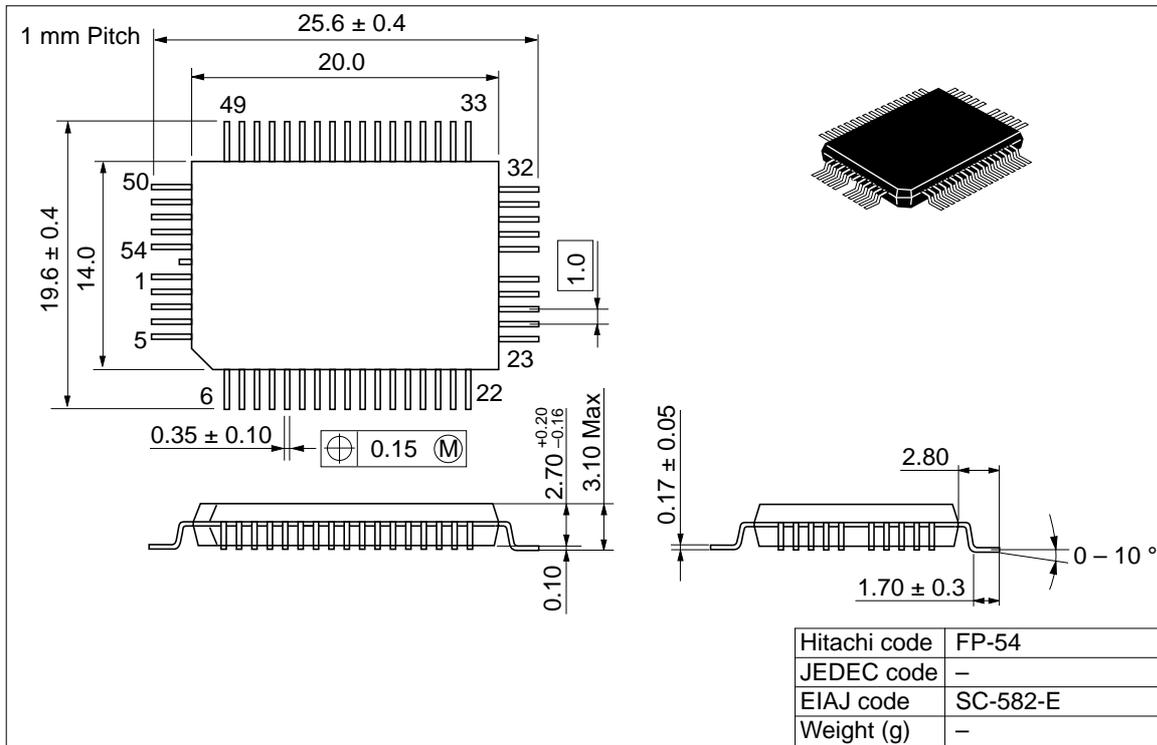
Package Outline Dimensions

(2) Plastic QFP

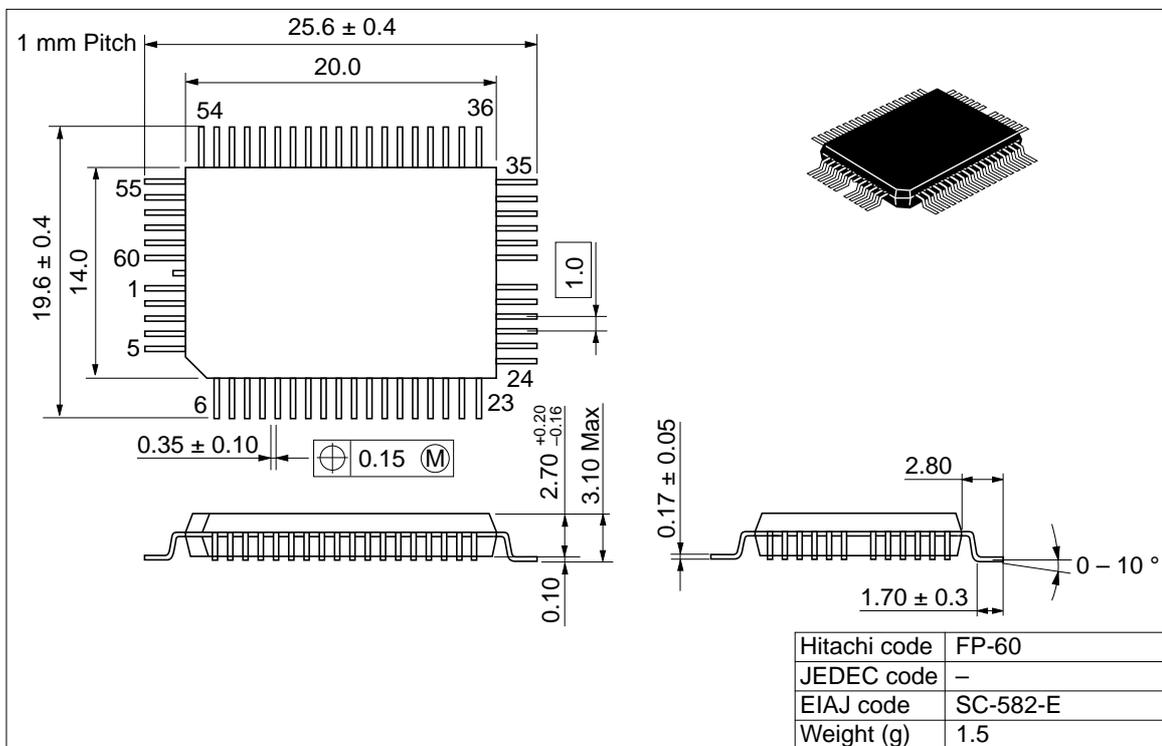
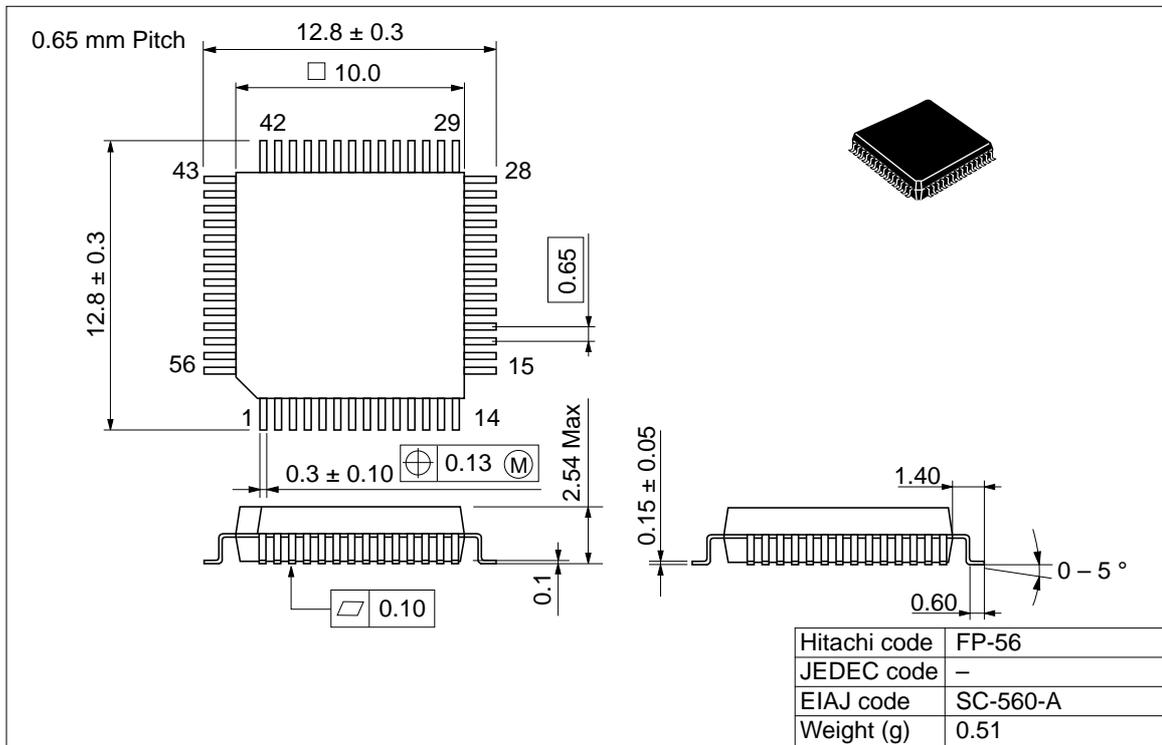
Unit: mm



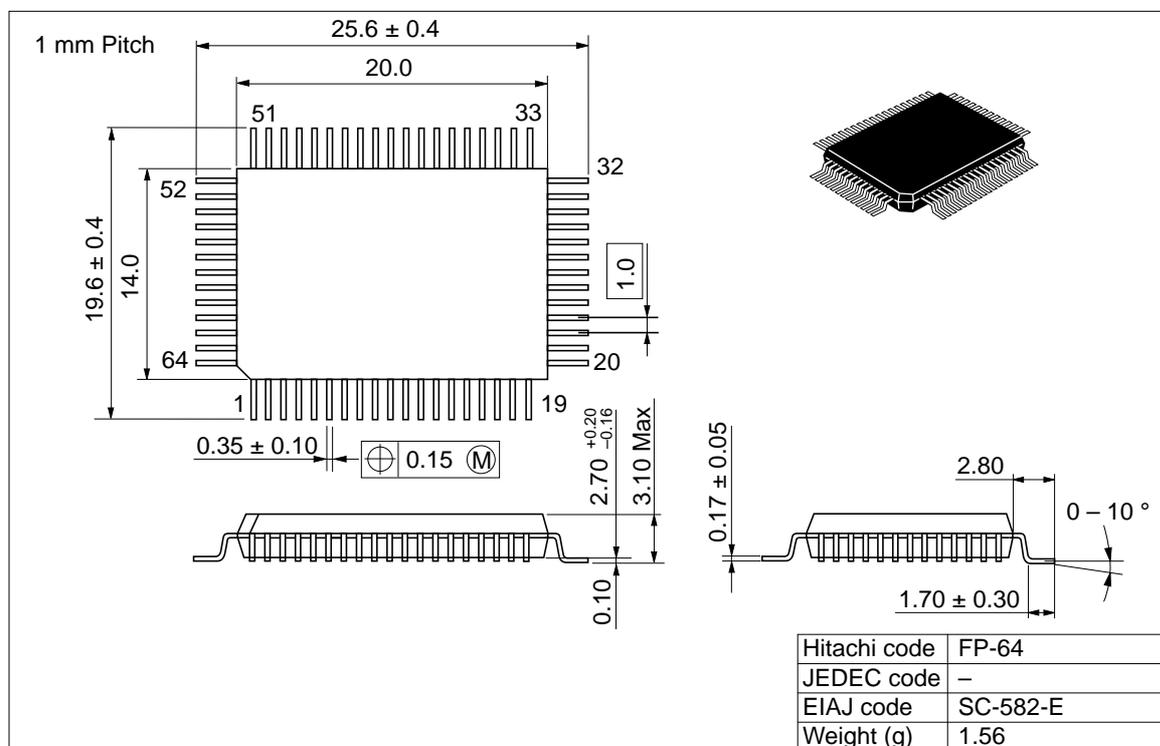
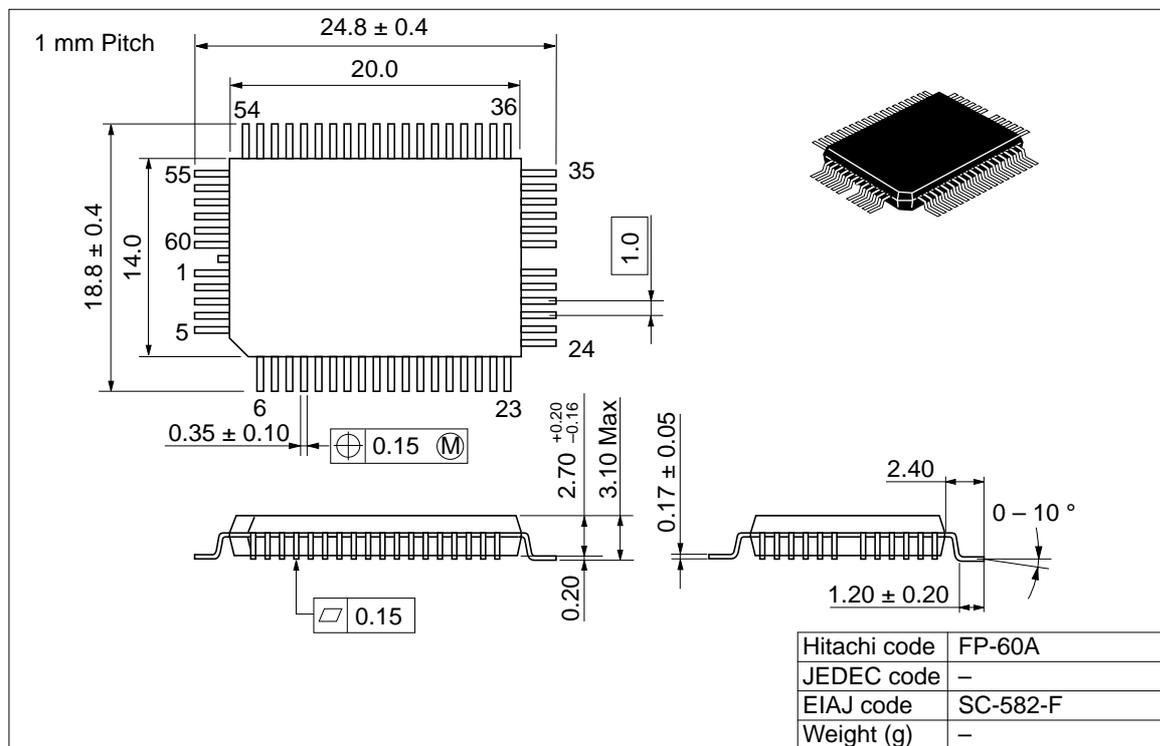
Package Outline Dimensions



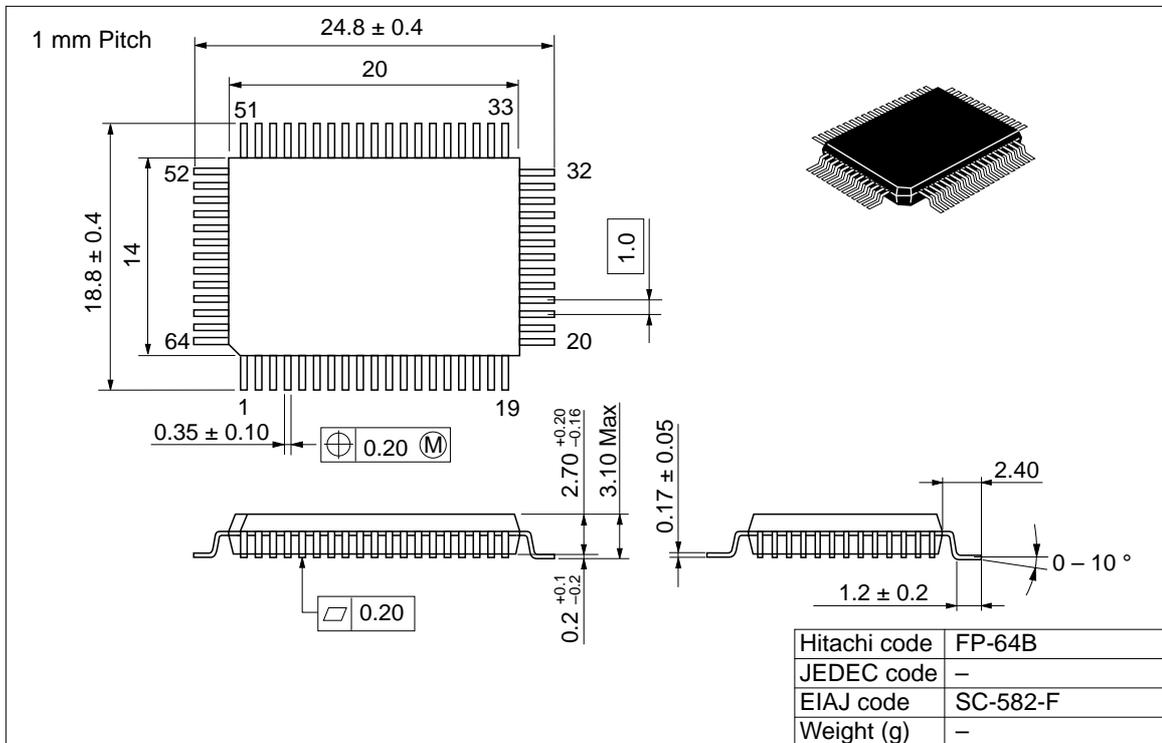
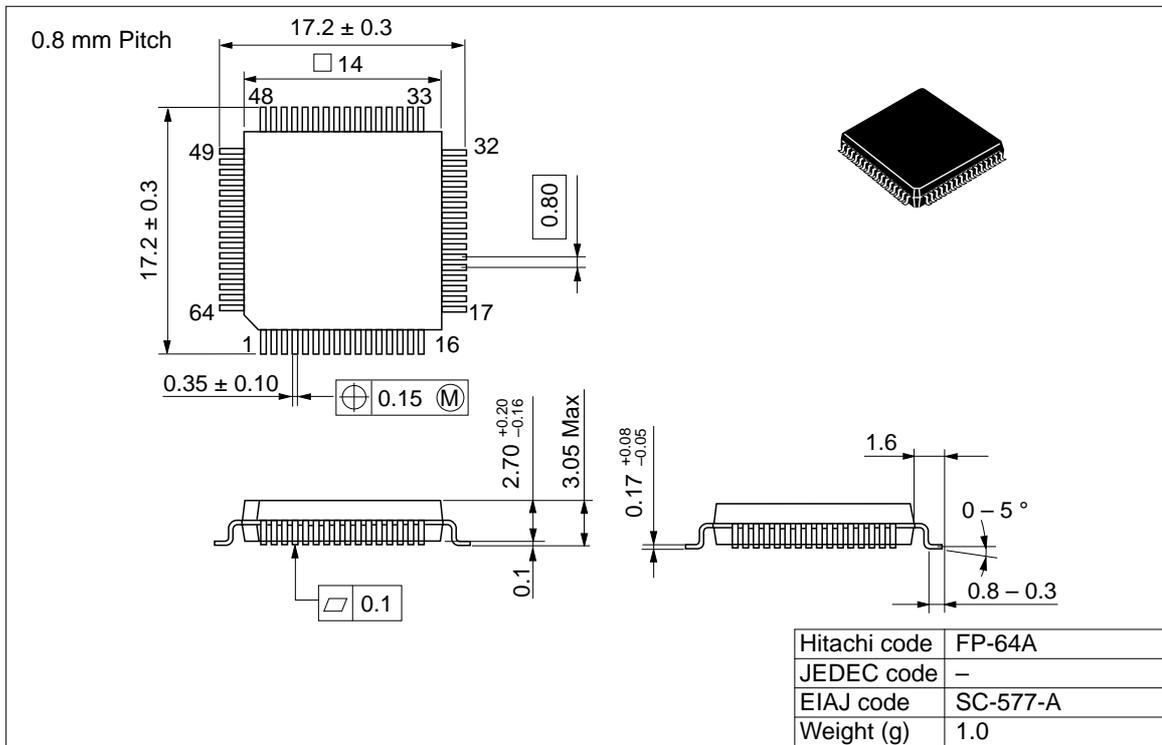
Package Outline Dimensions



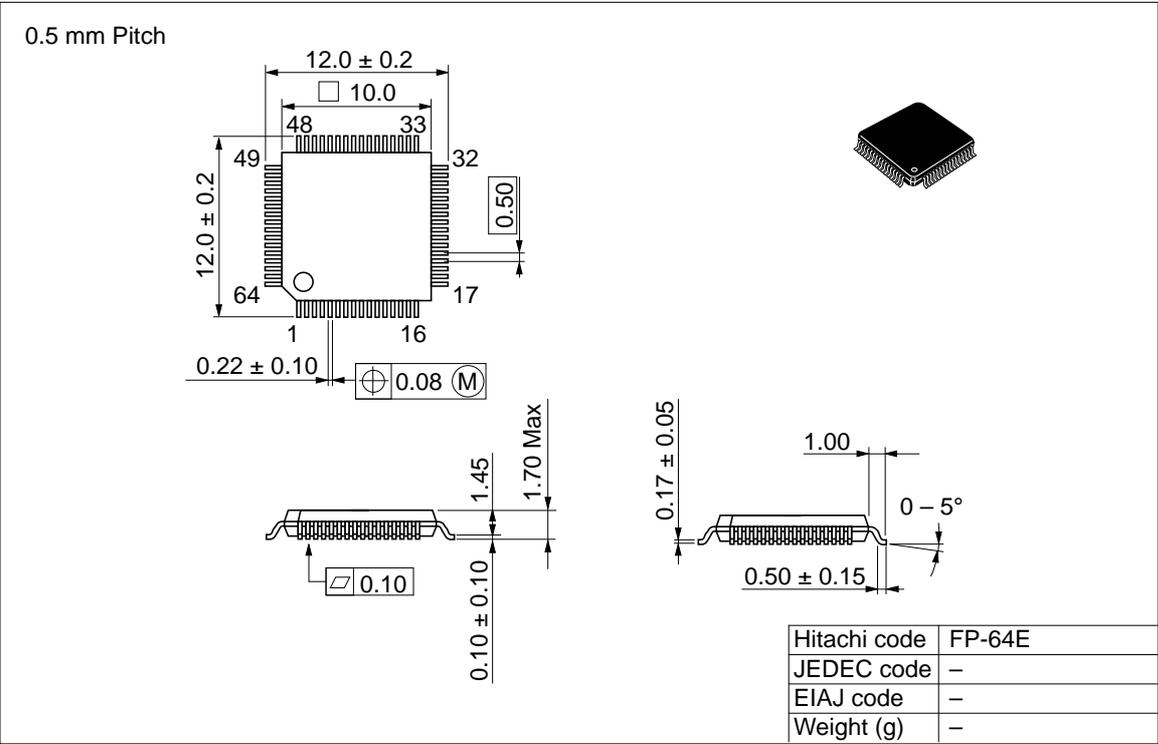
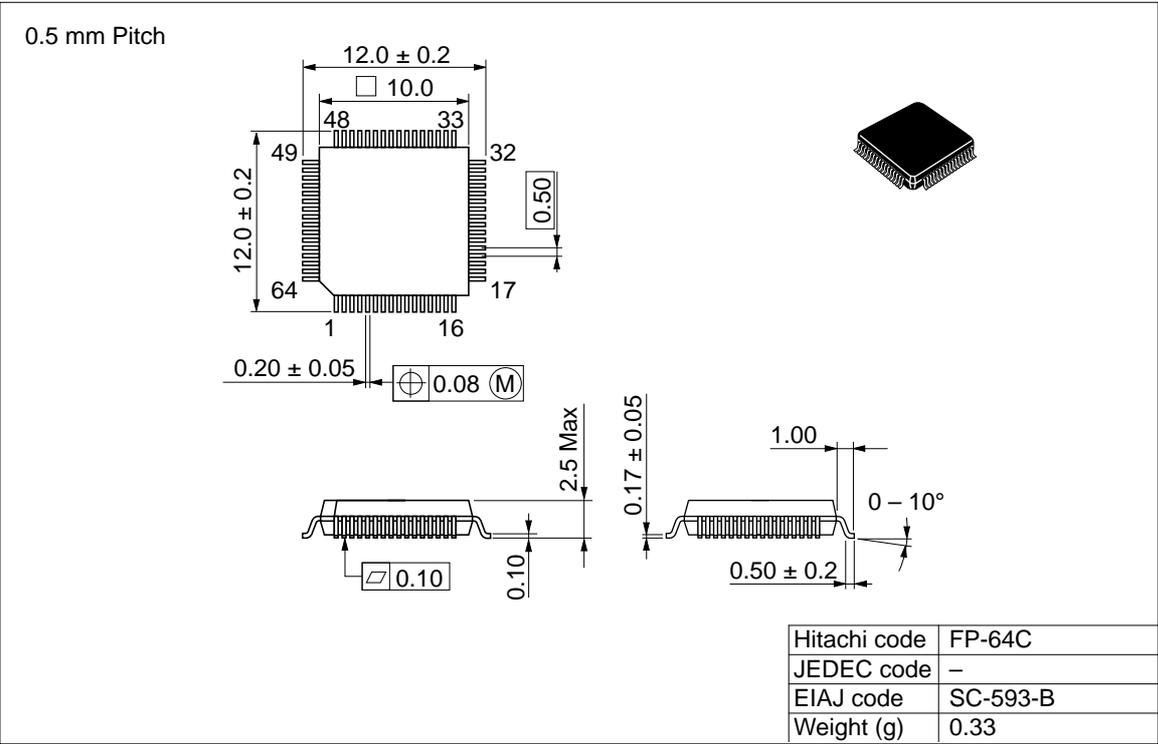
Package Outline Dimensions



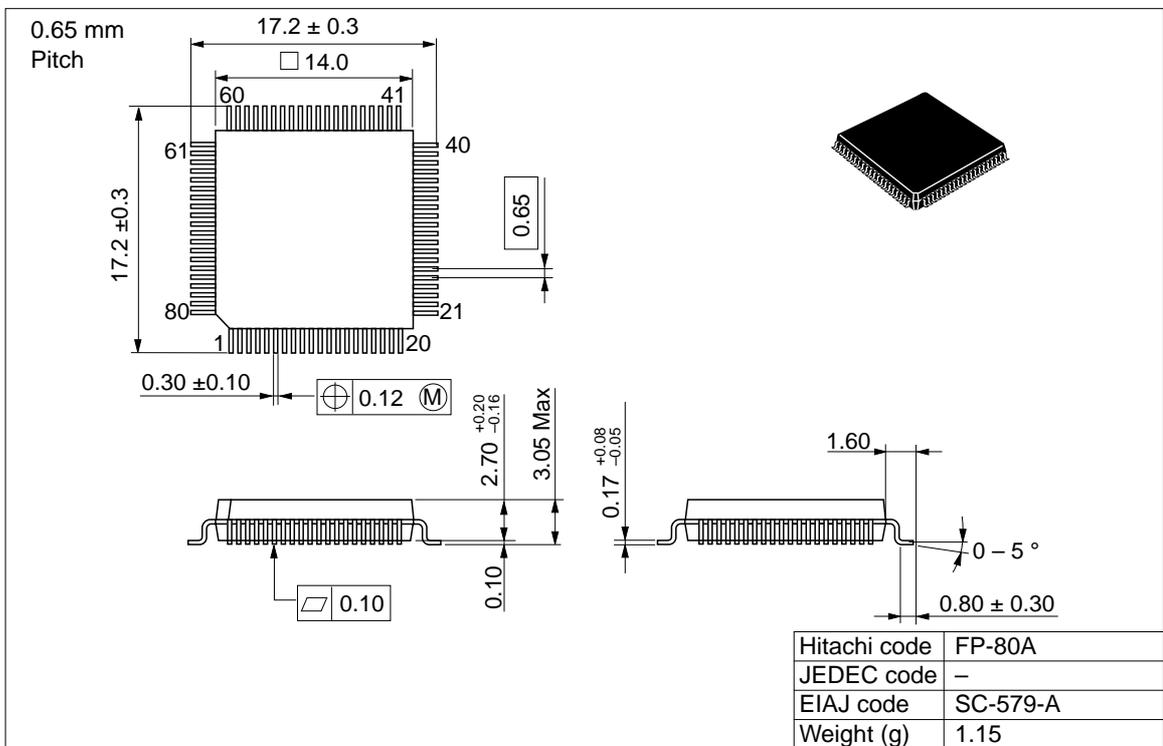
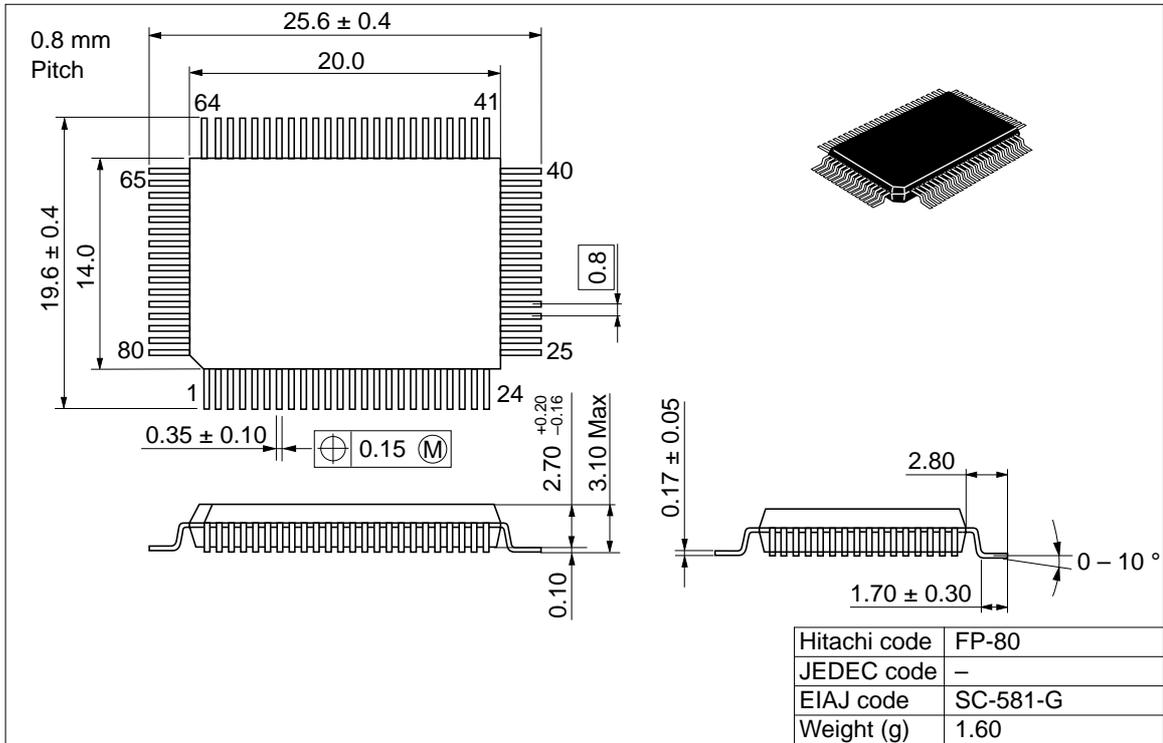
Package Outline Dimensions



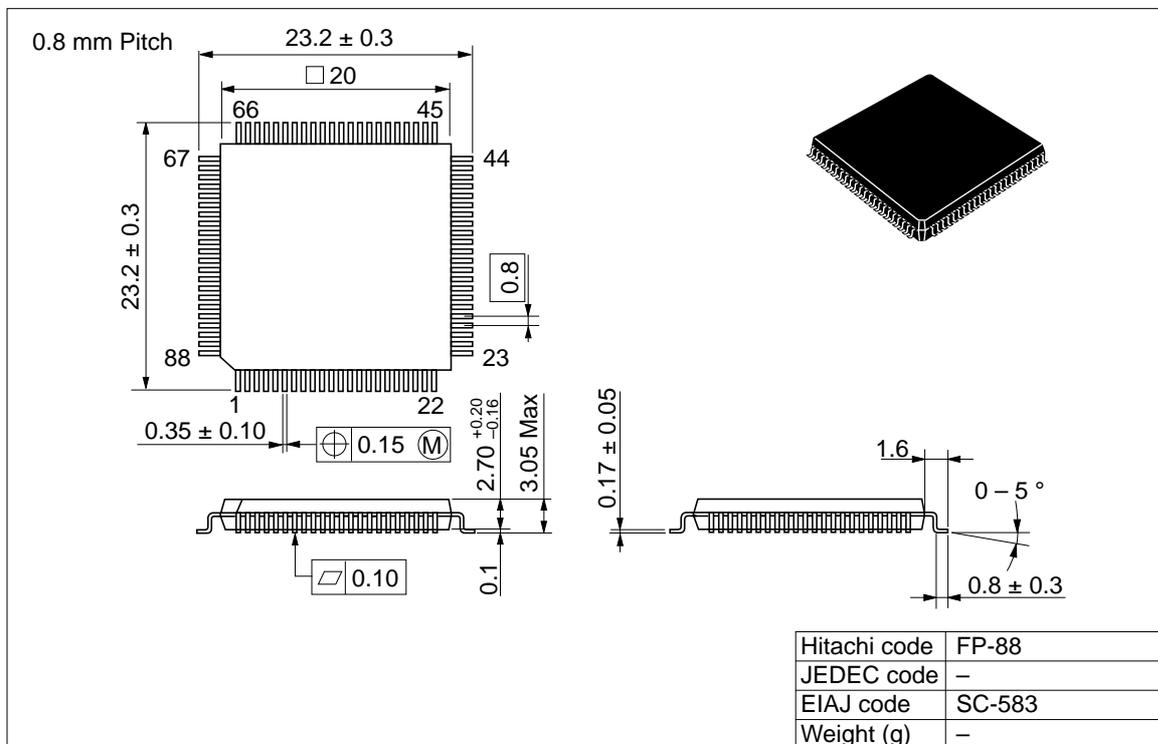
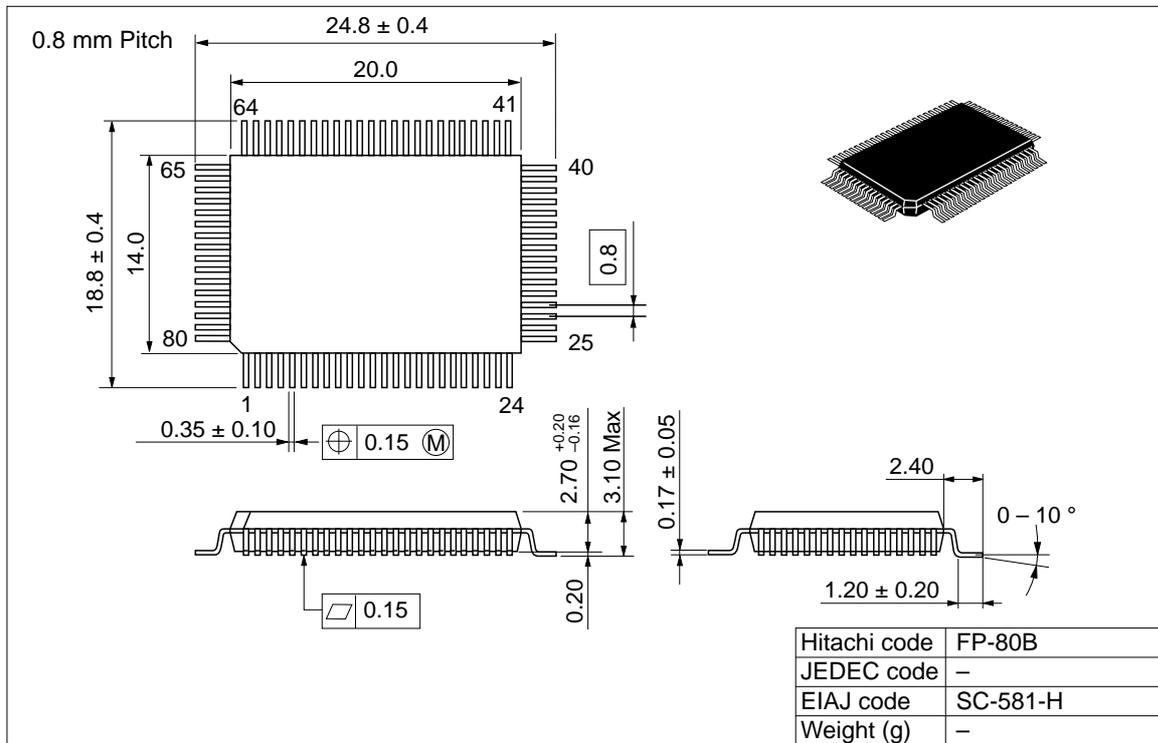
Package Outline Dimensions



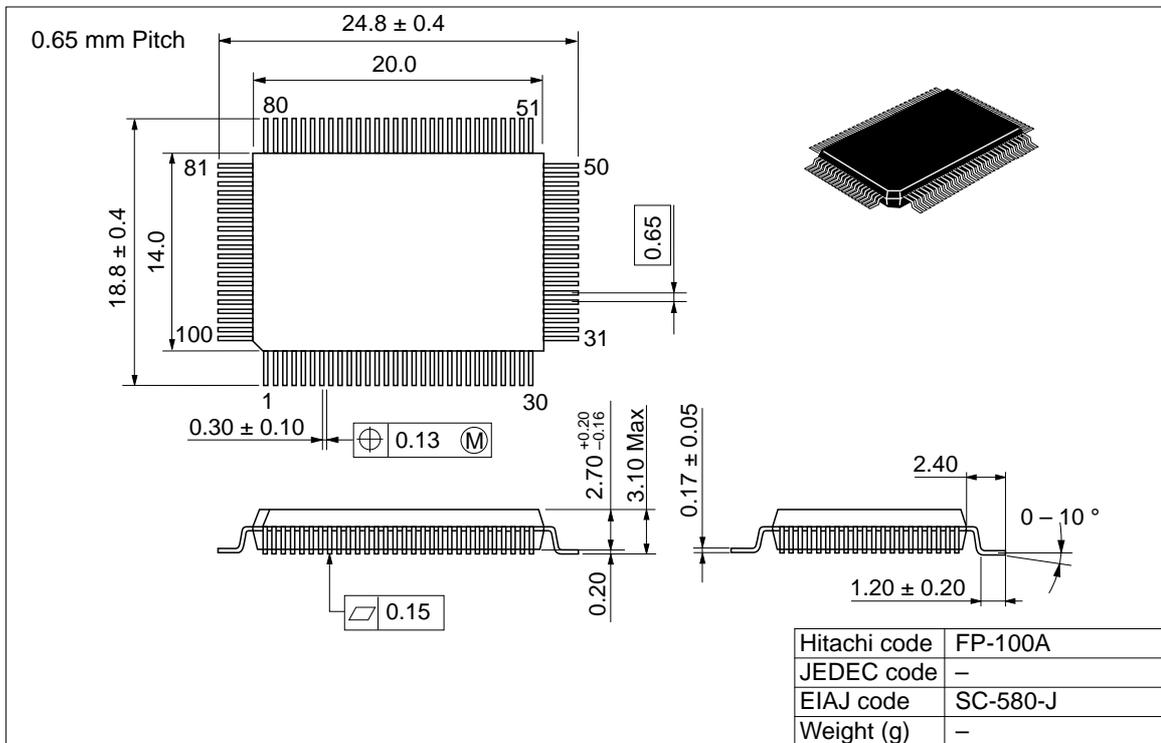
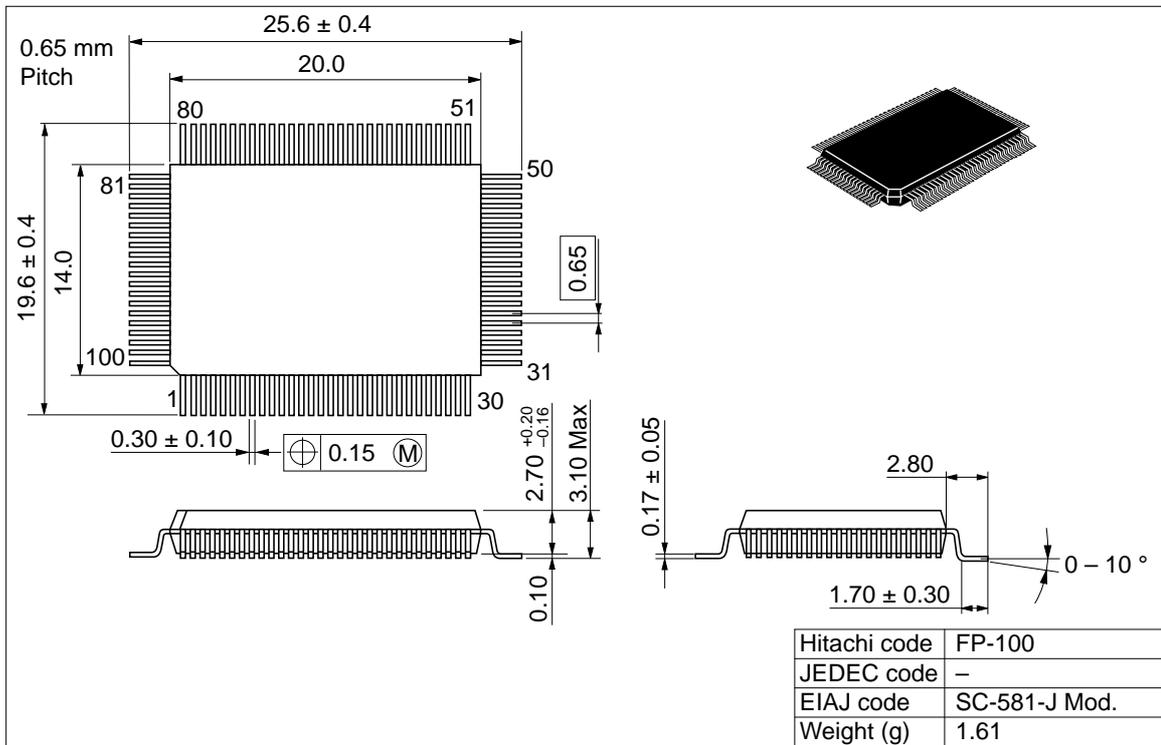
Package Outline Dimensions



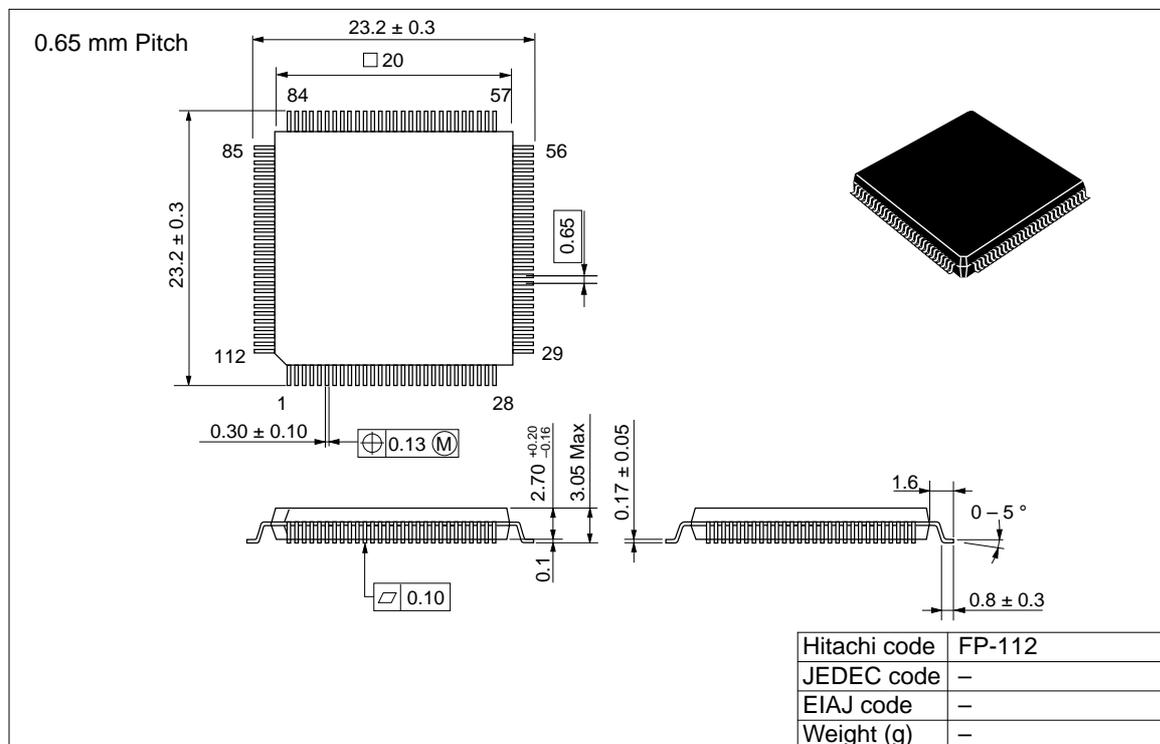
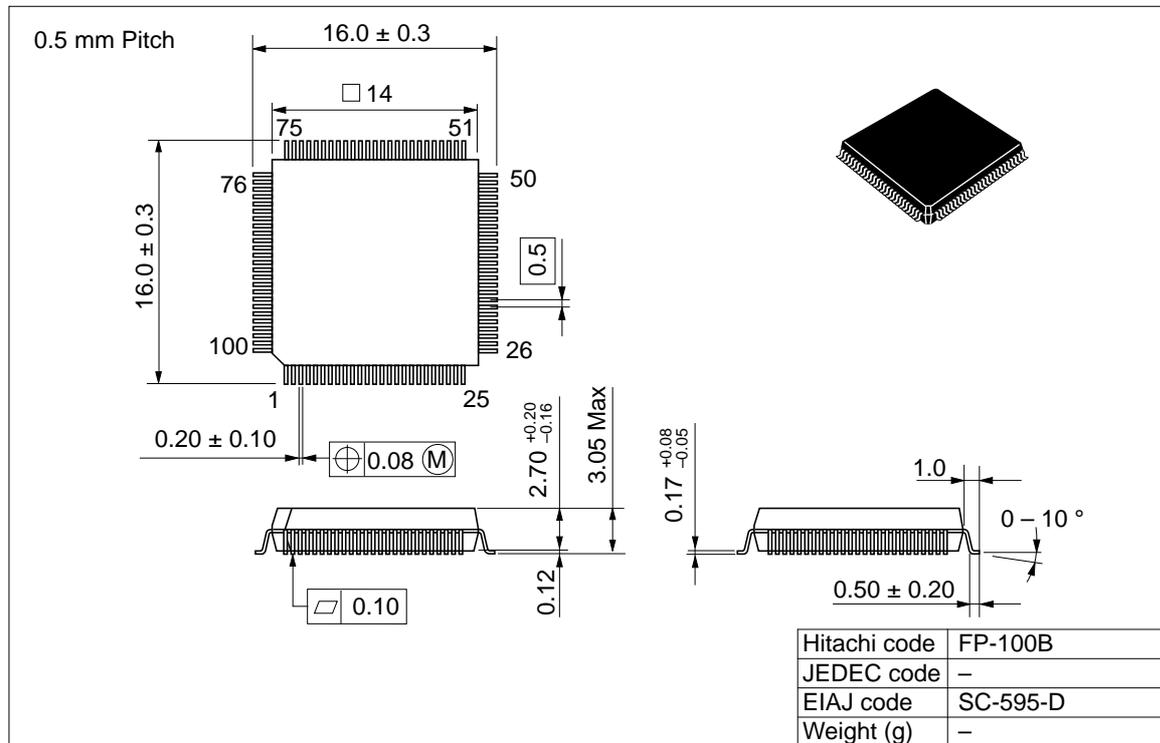
Package Outline Dimensions



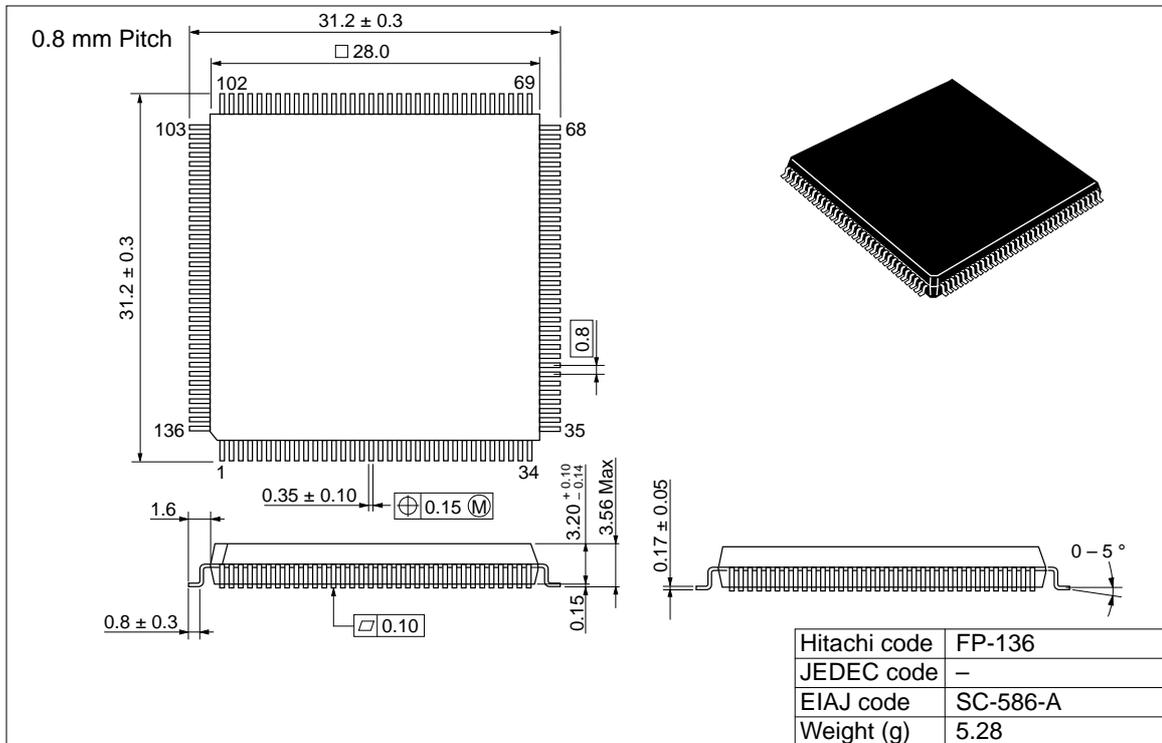
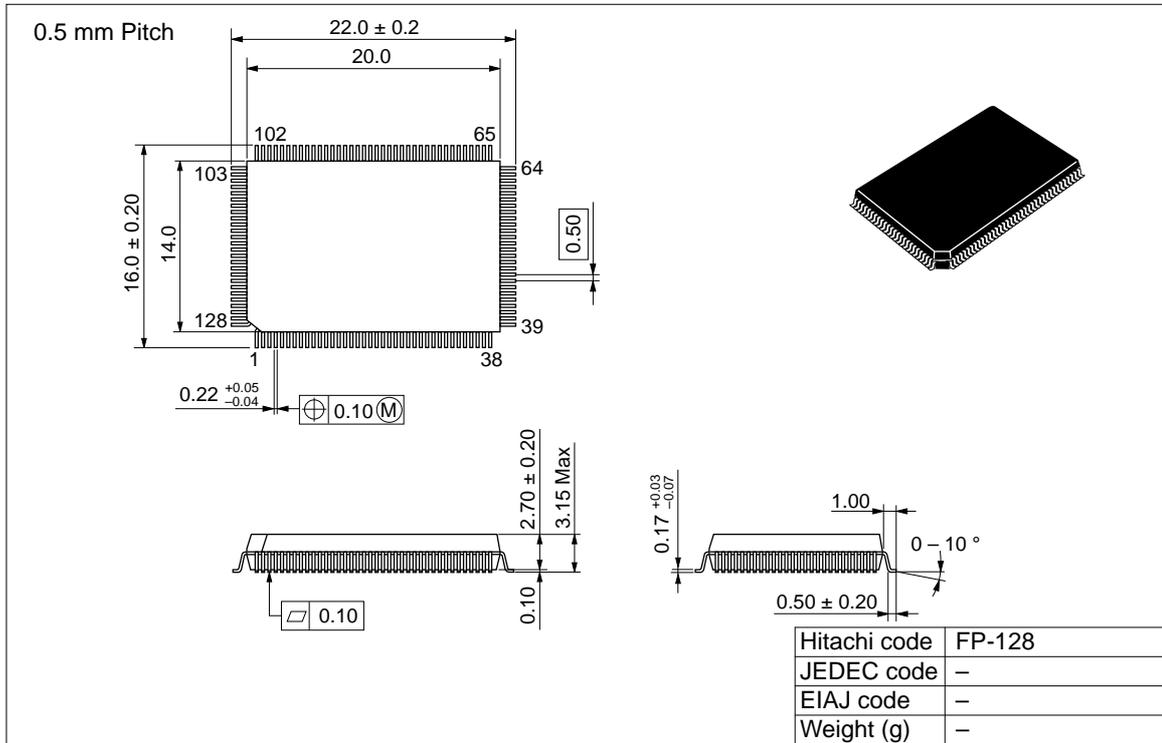
Package Outline Dimensions



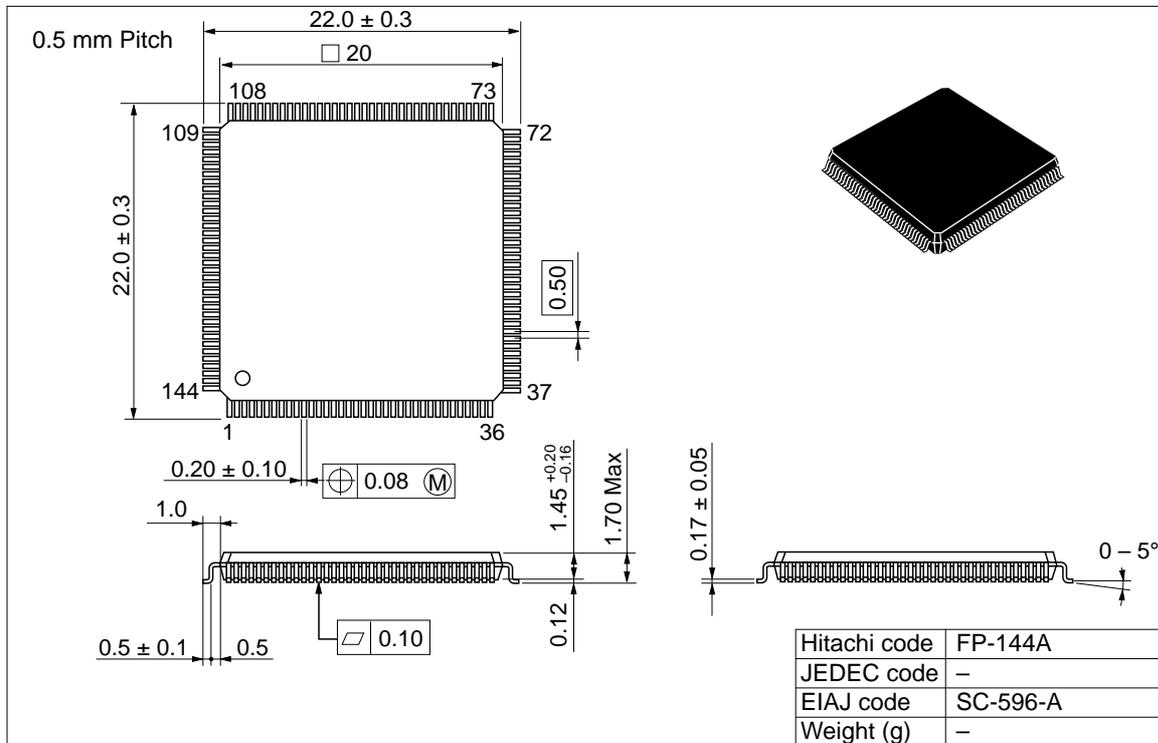
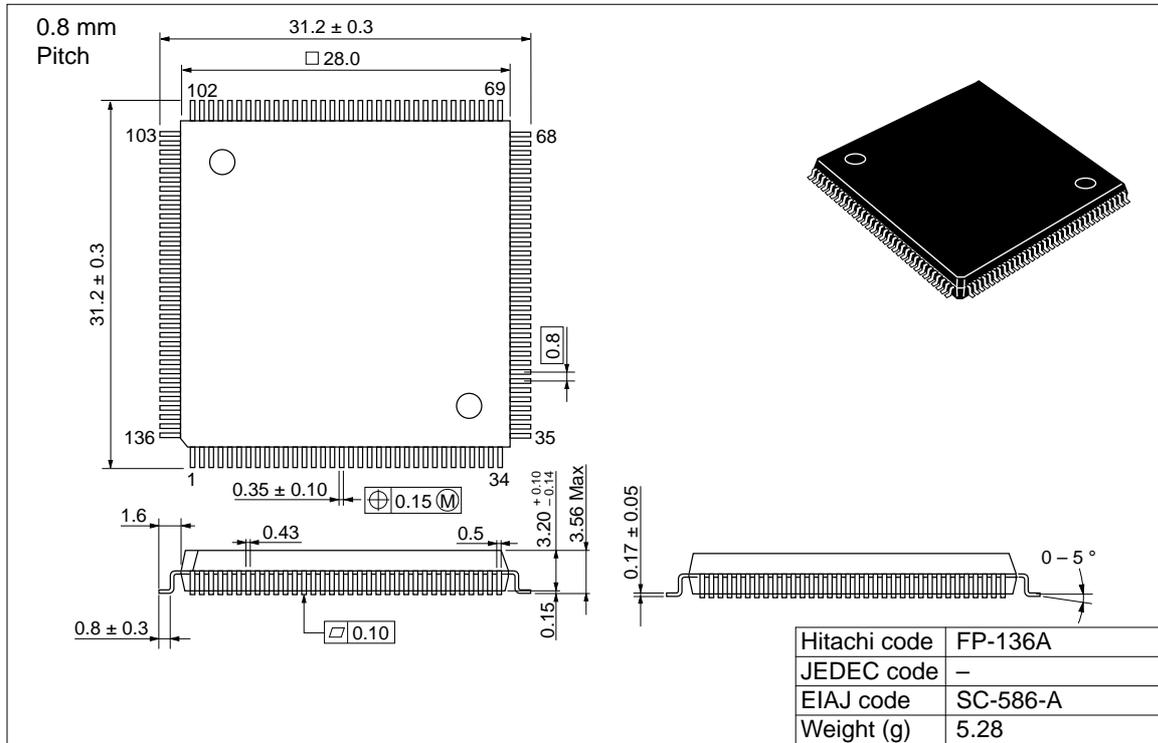
Package Outline Dimensions



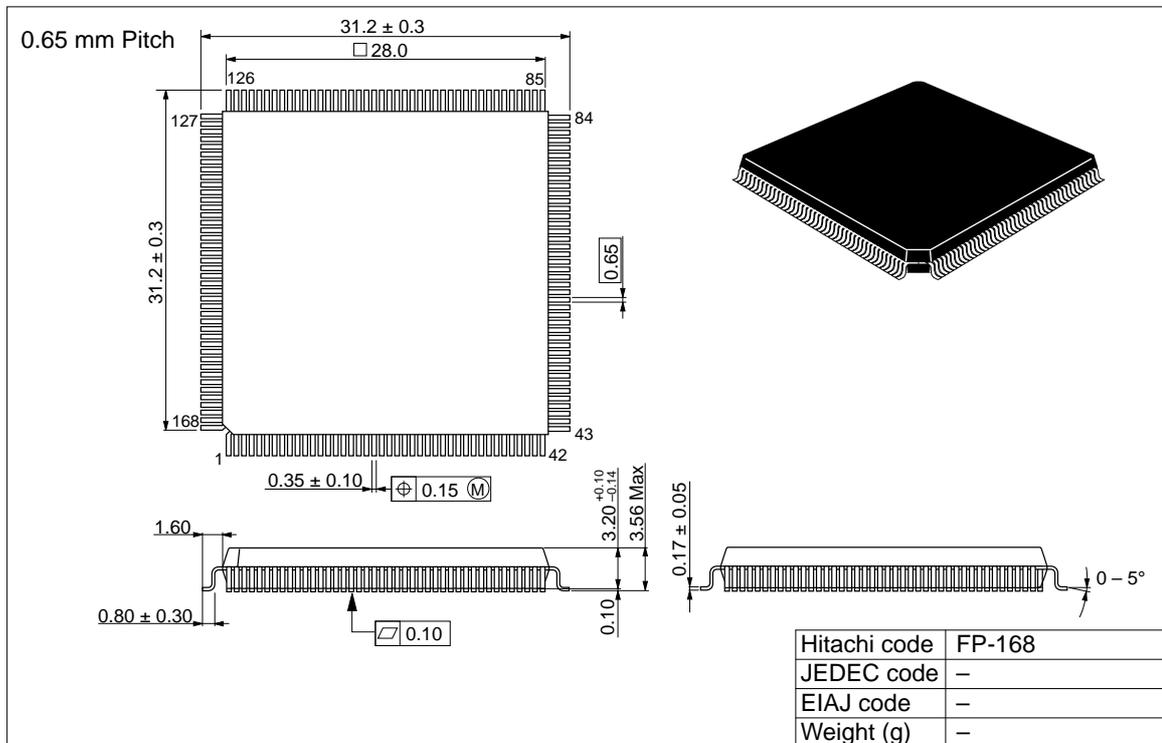
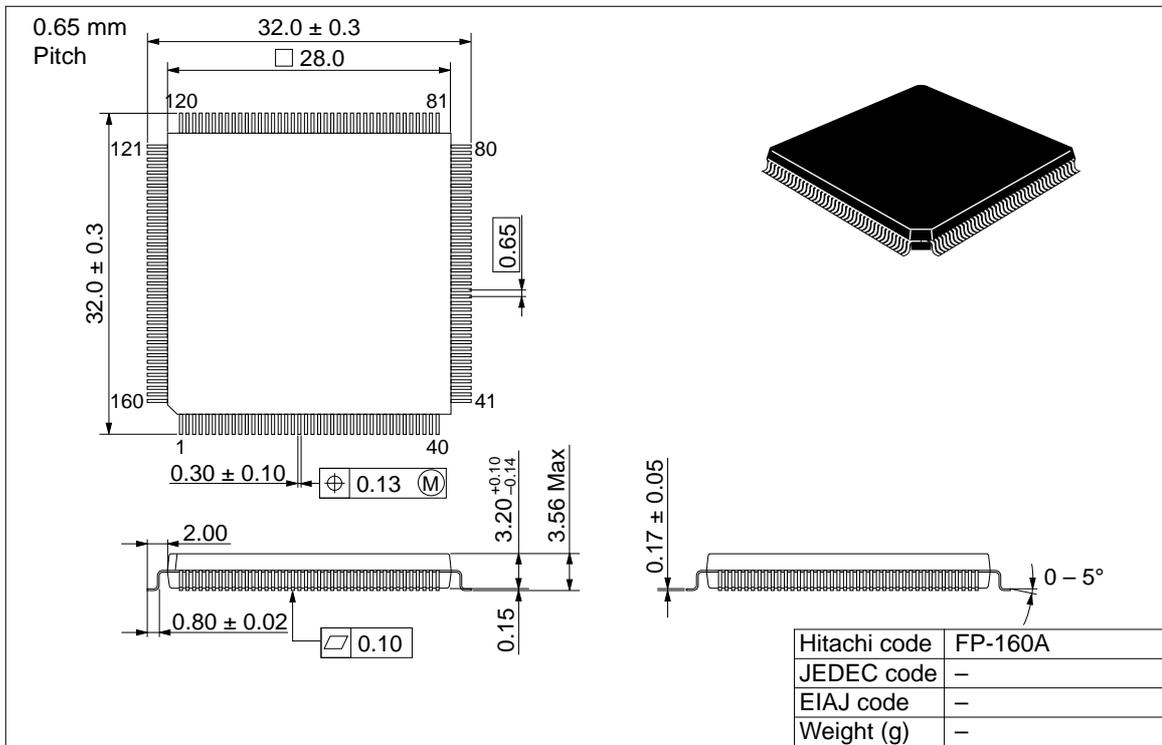
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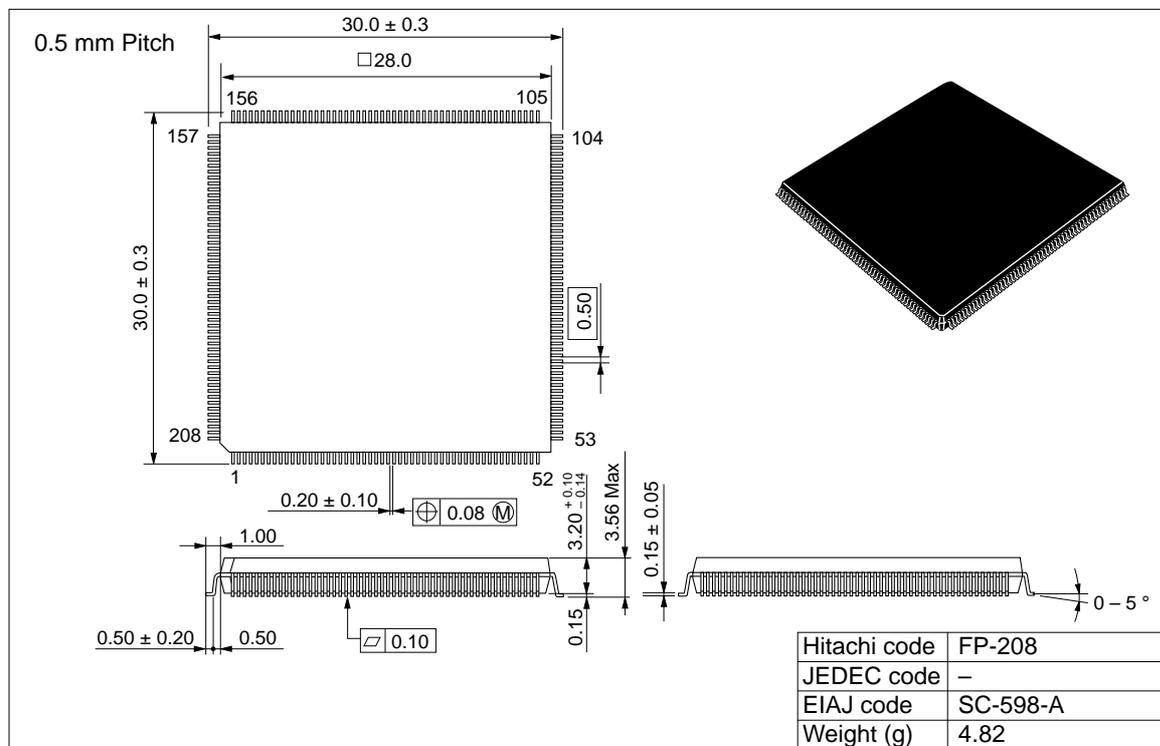
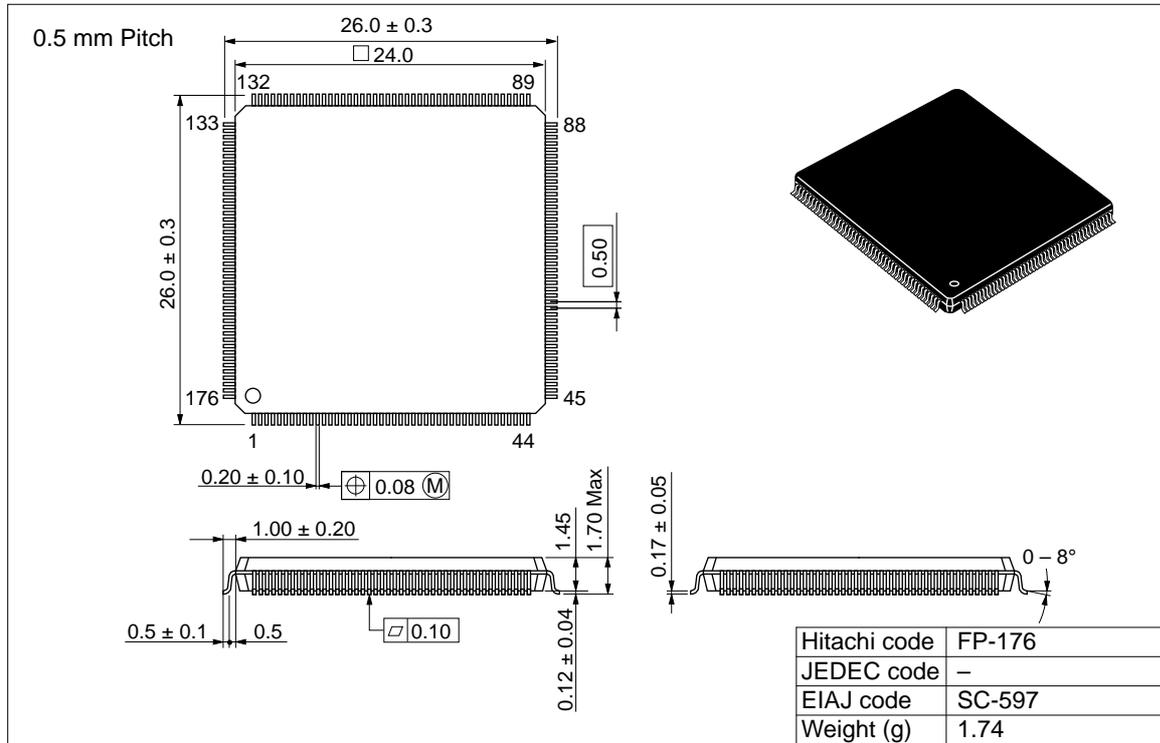
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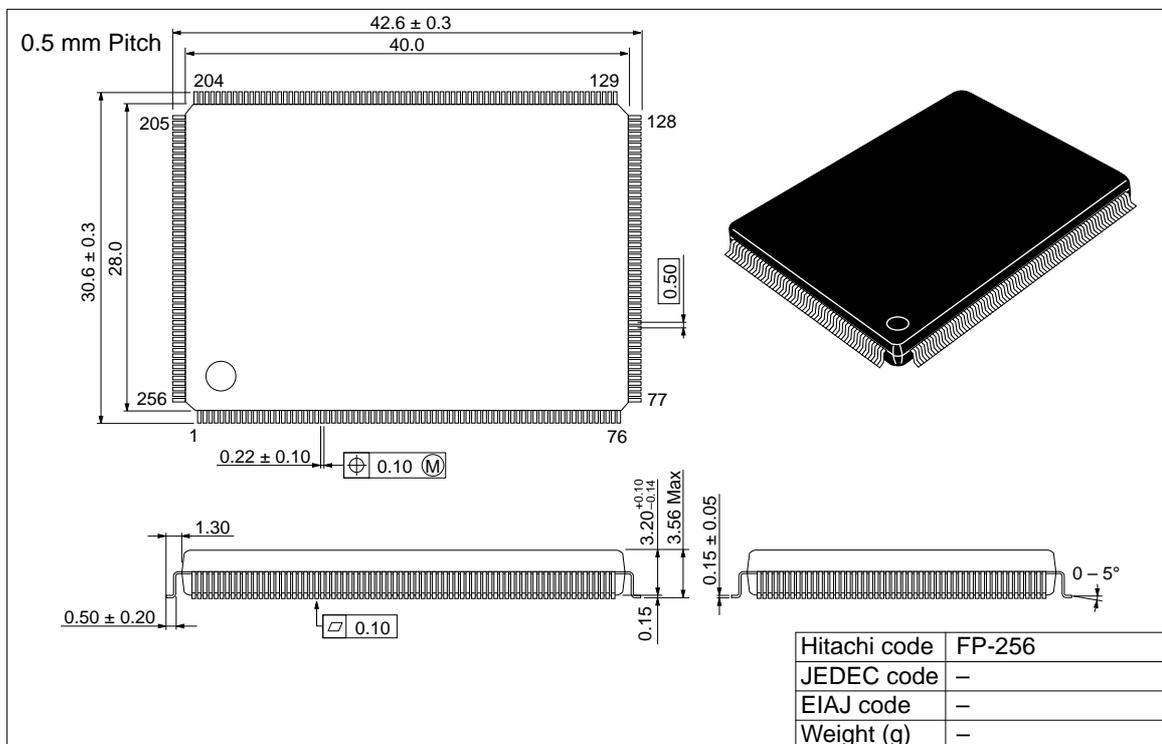
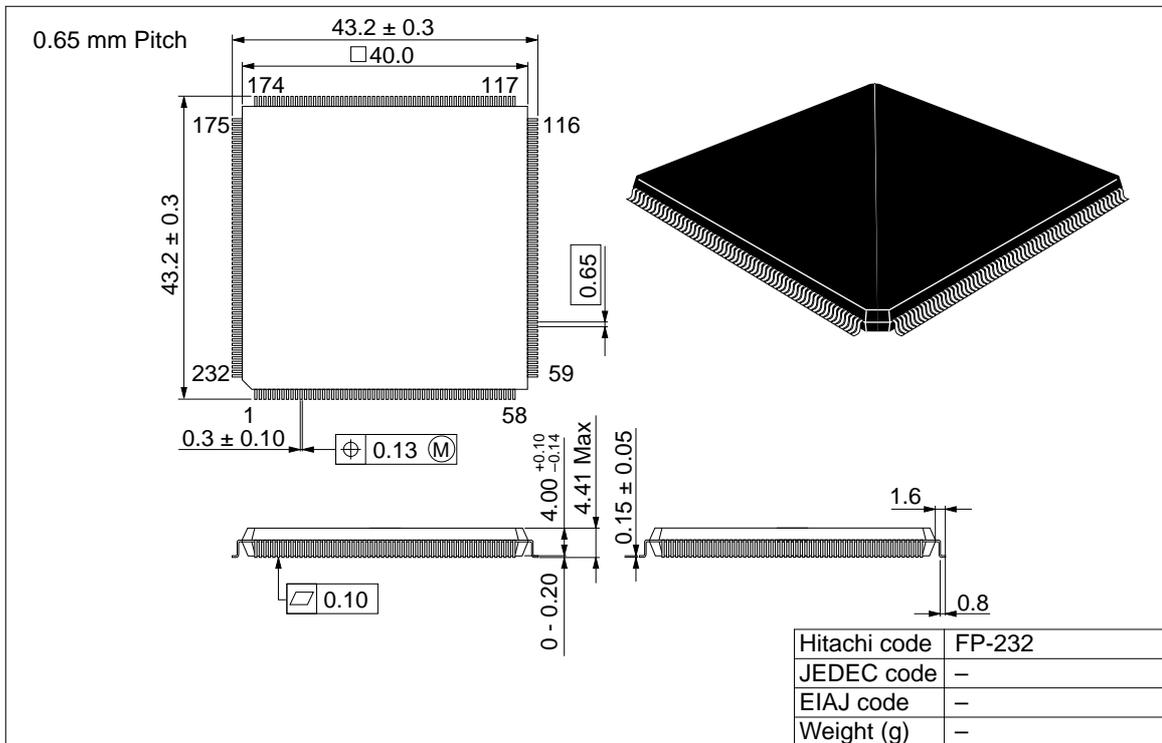
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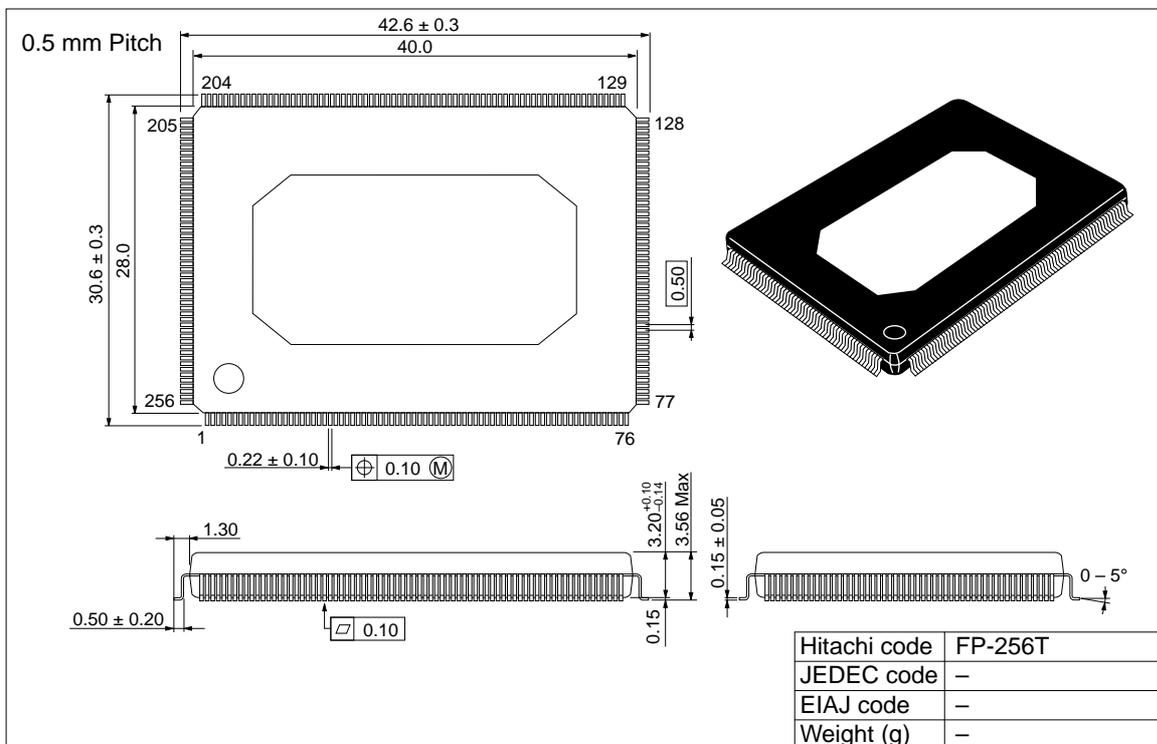
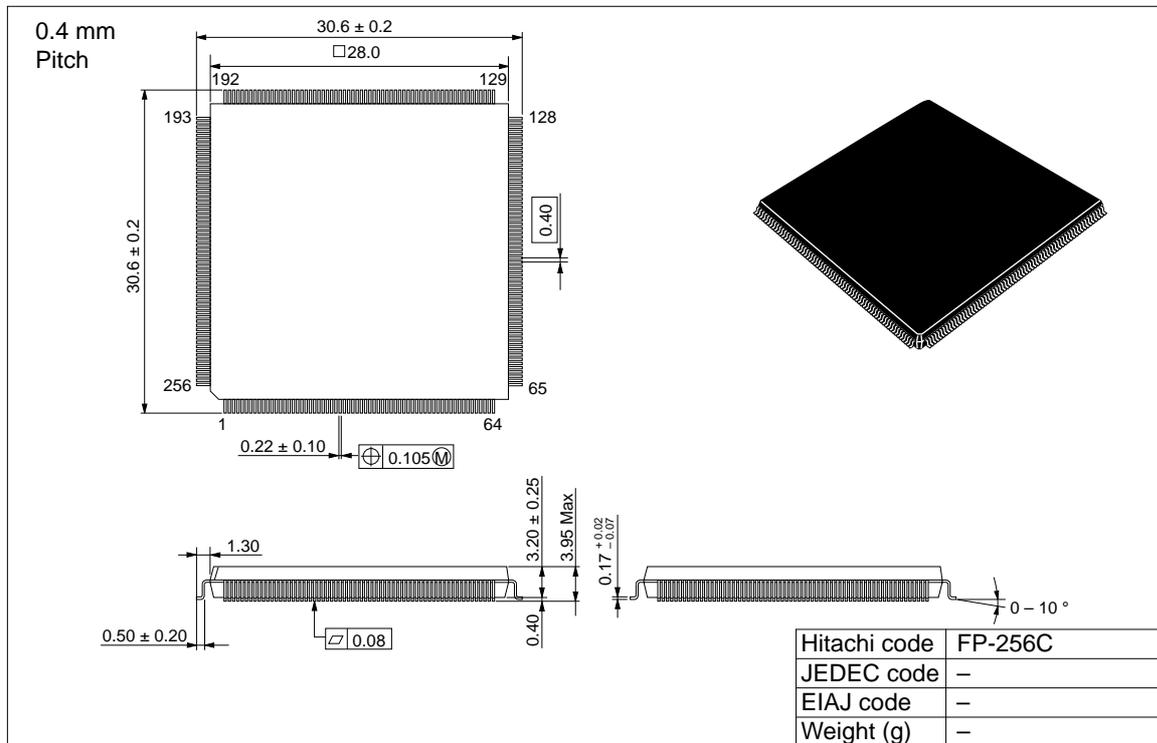
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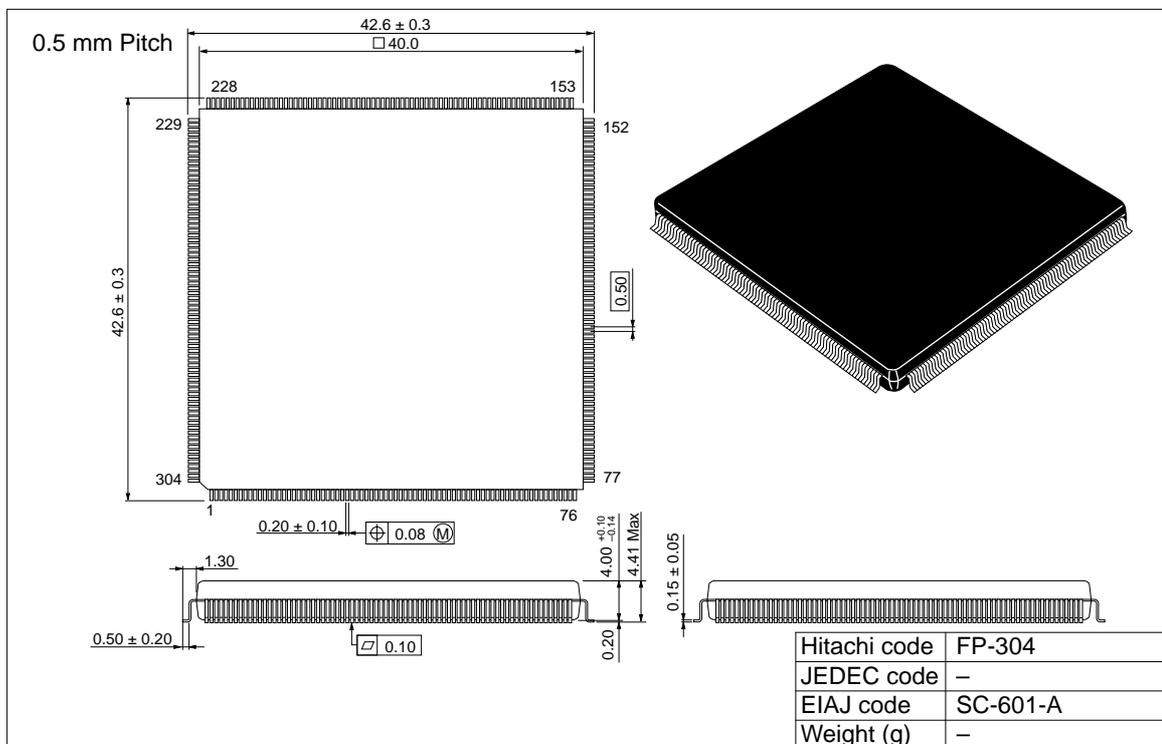
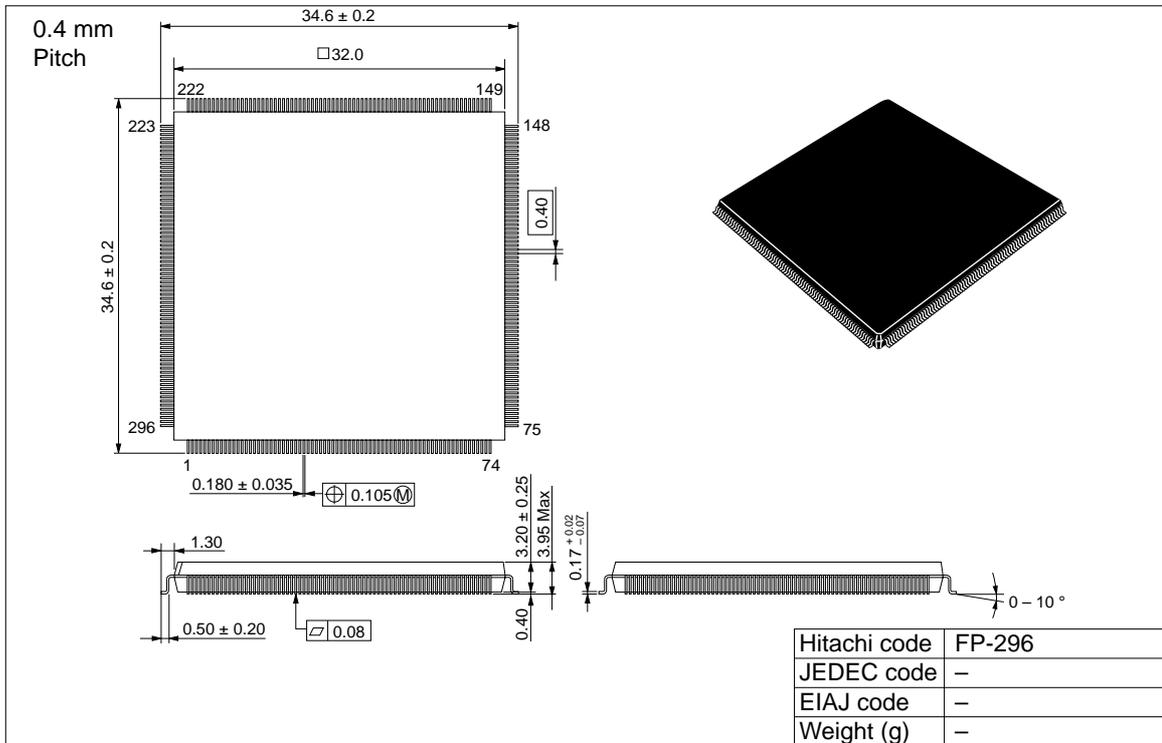
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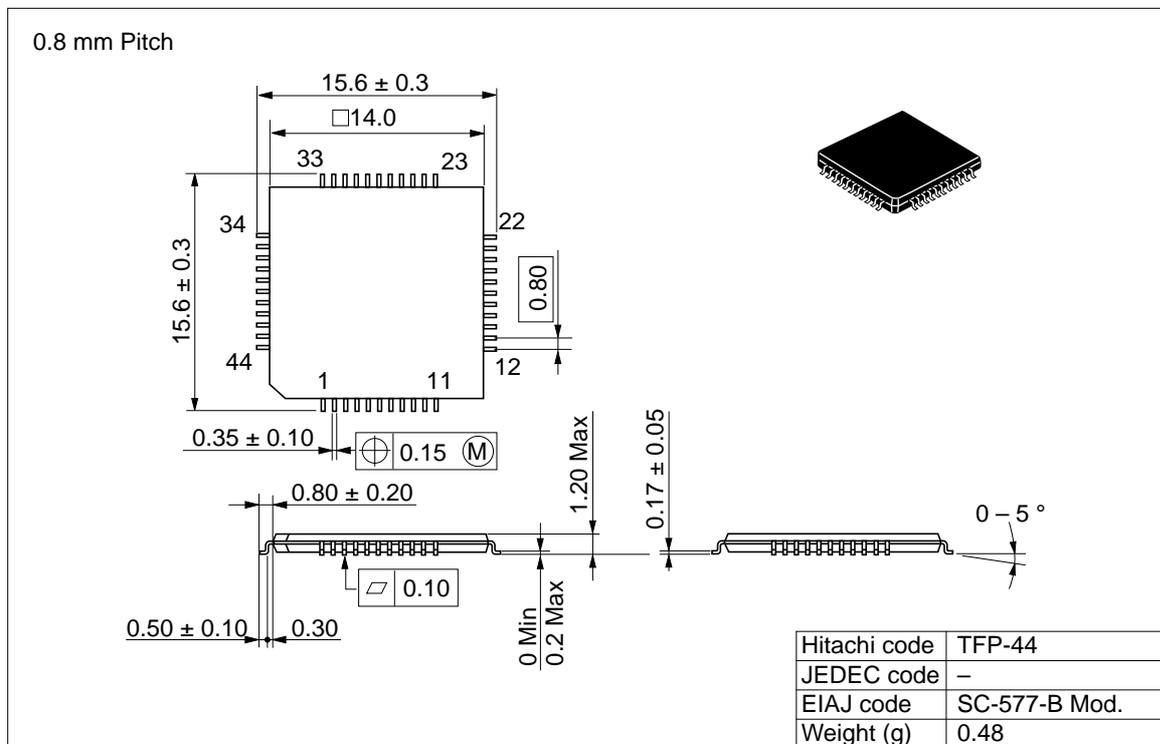
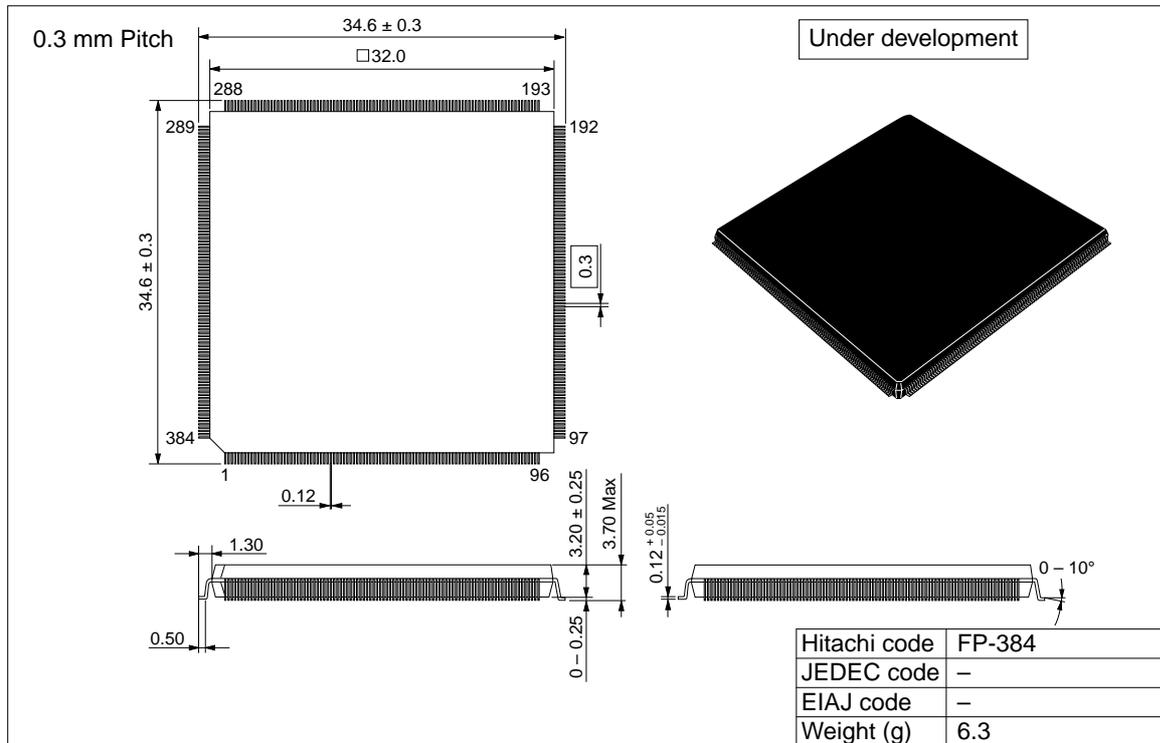
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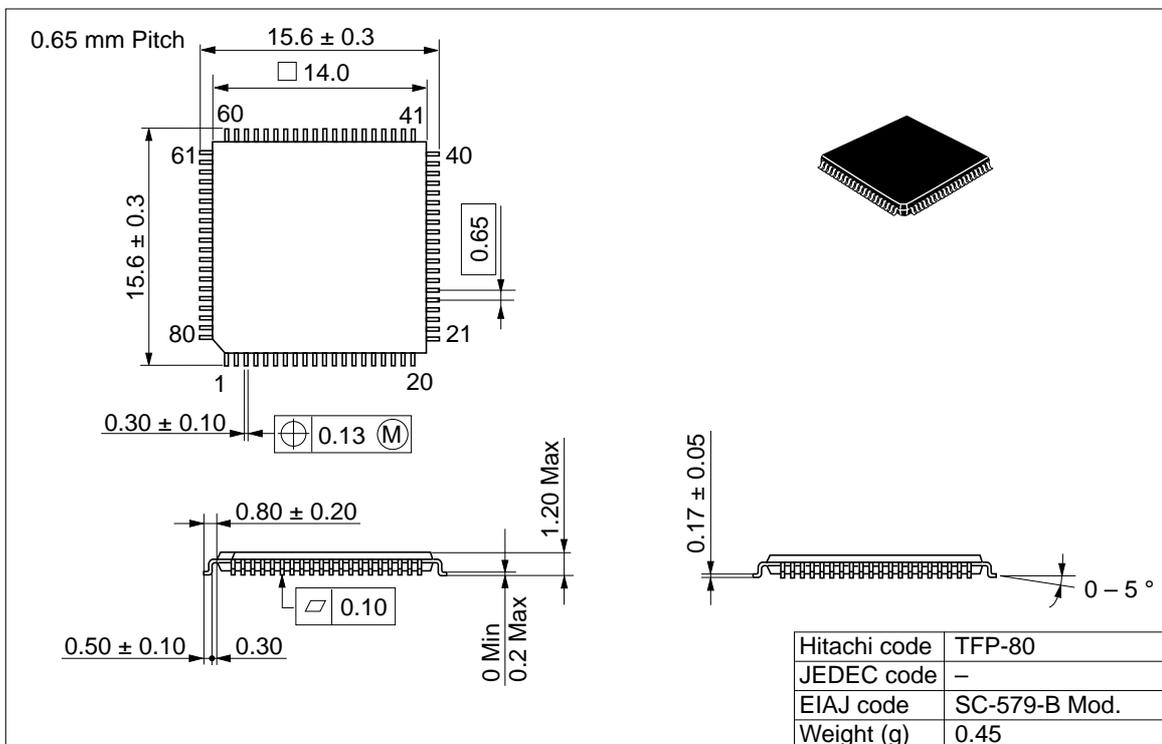
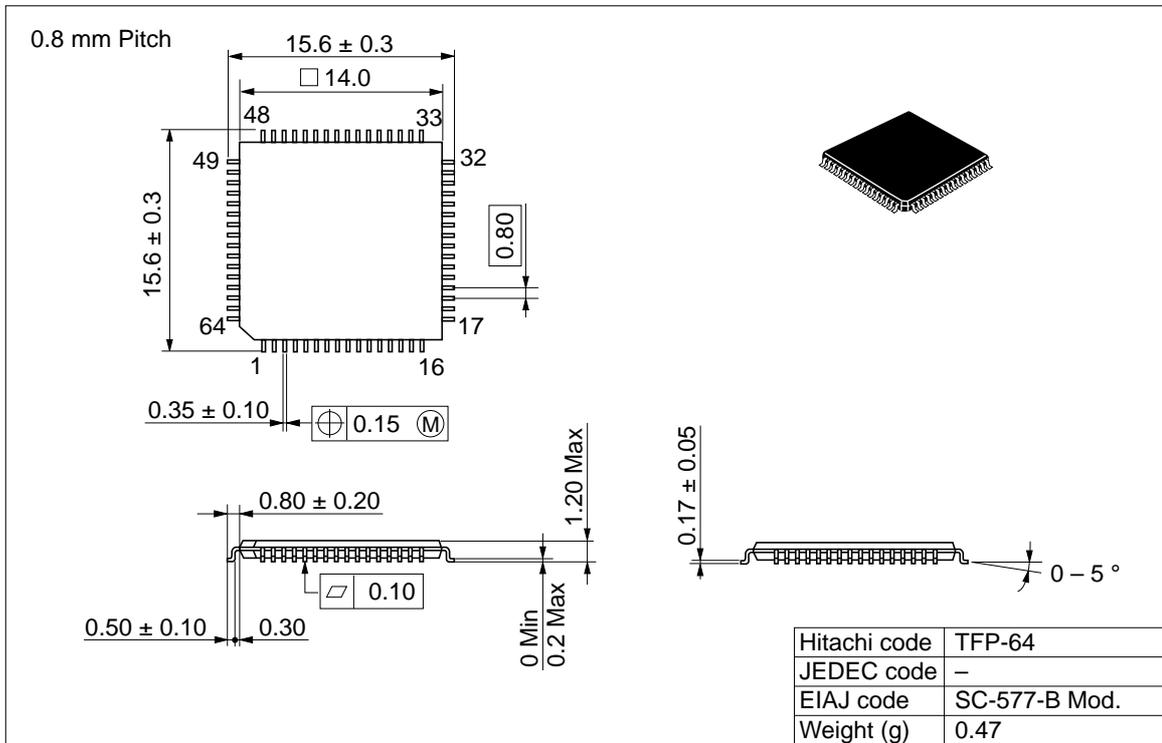
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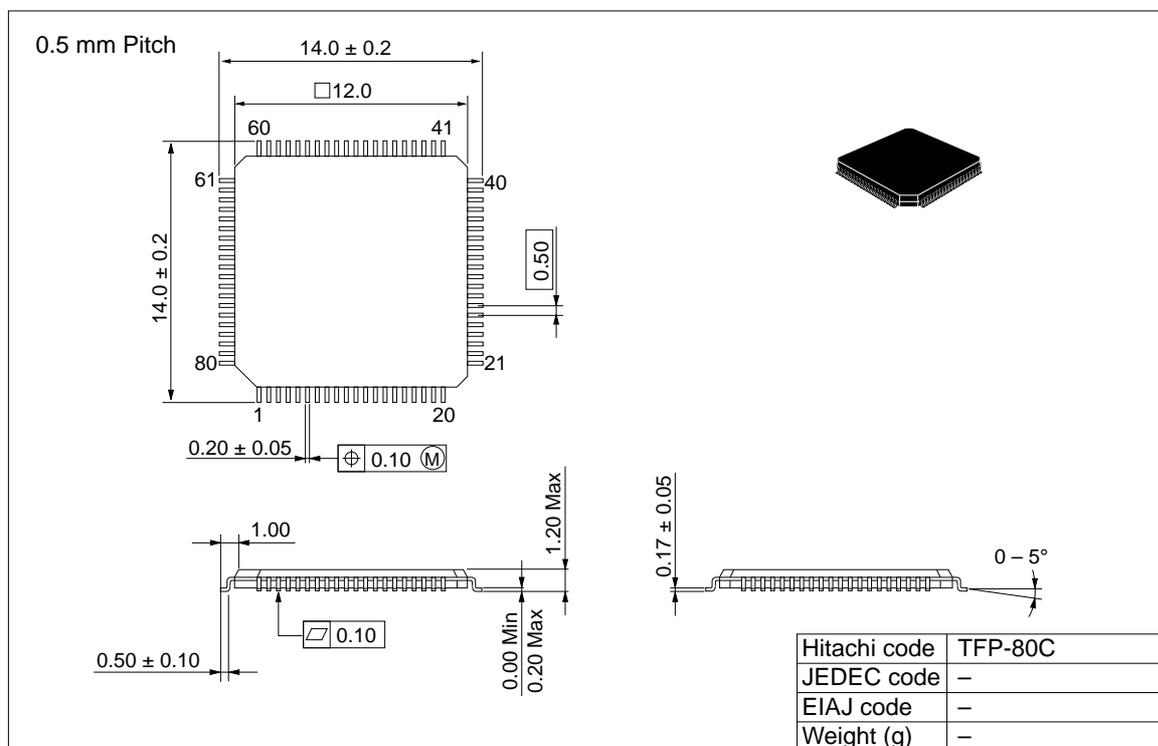
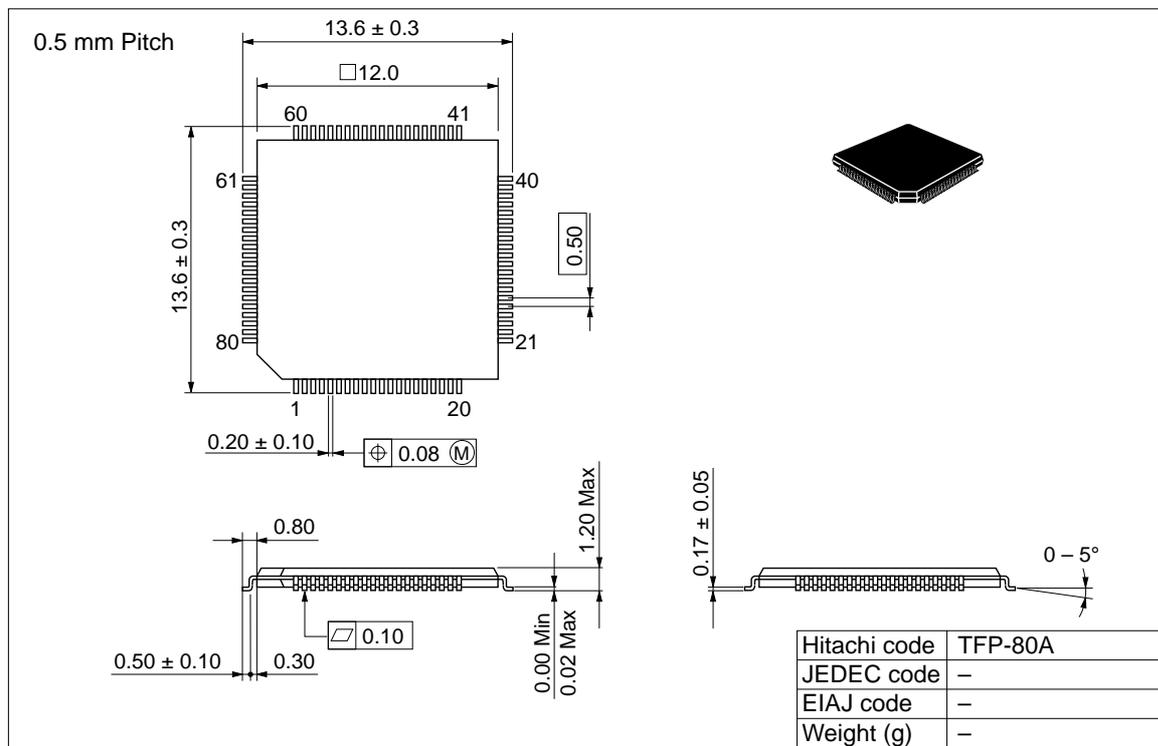
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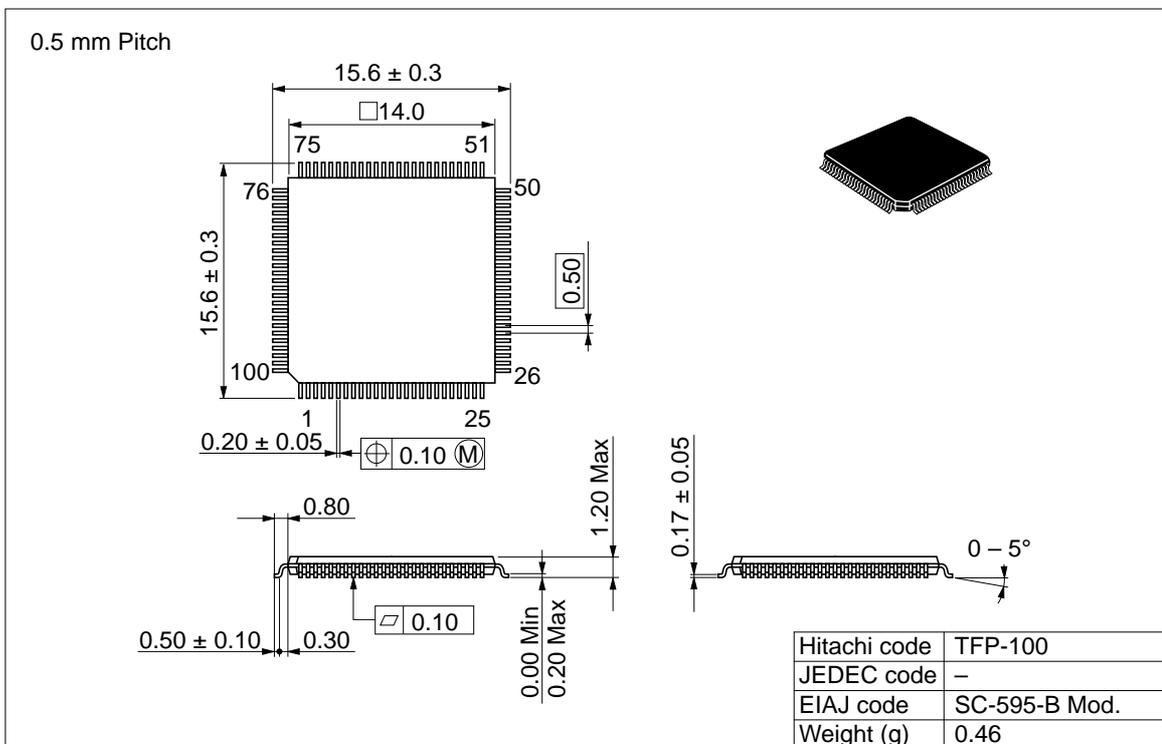
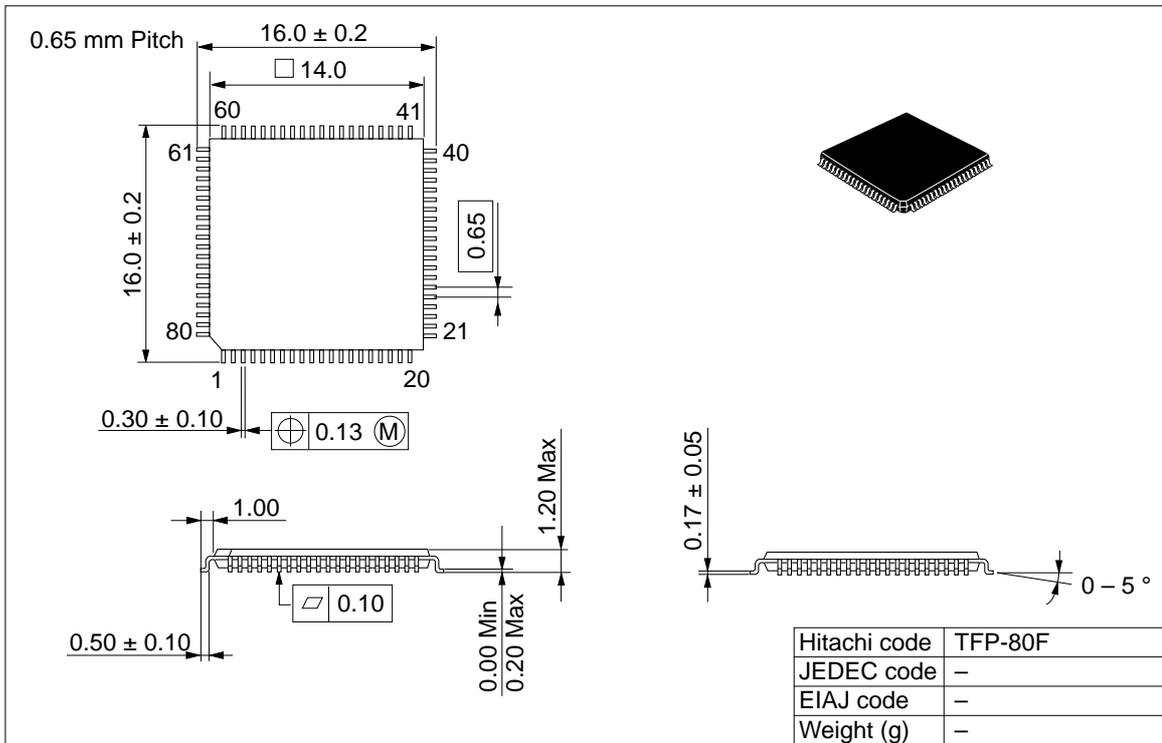
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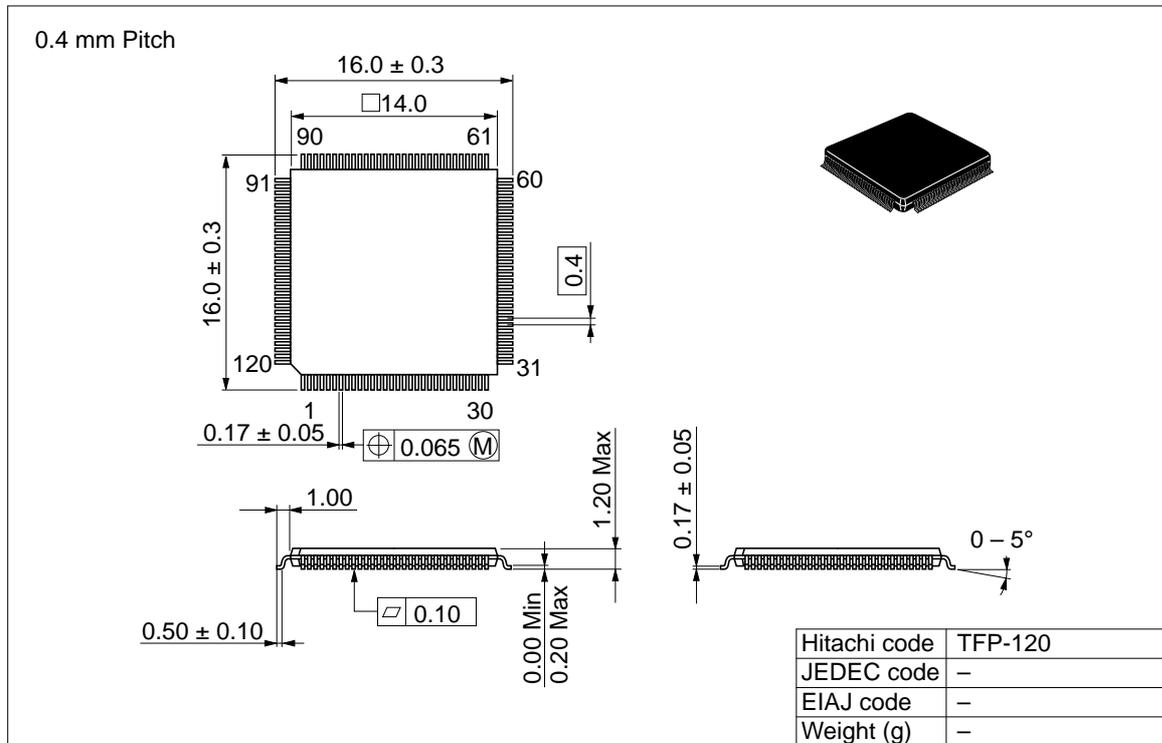
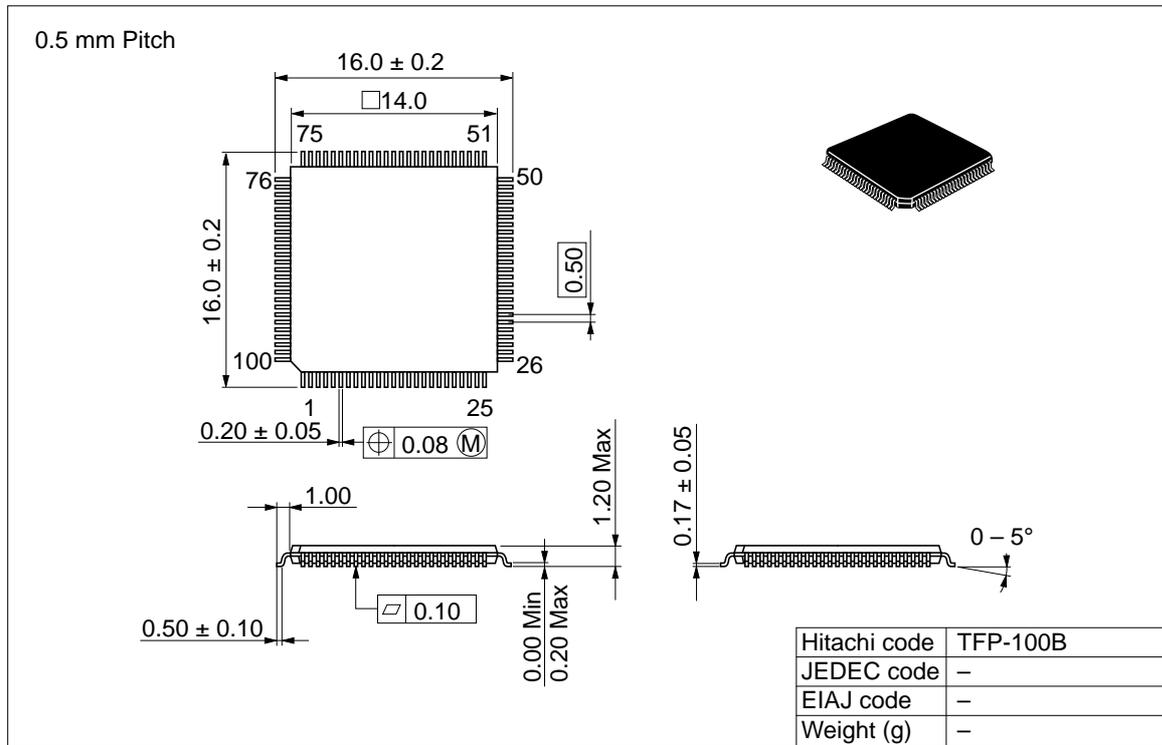
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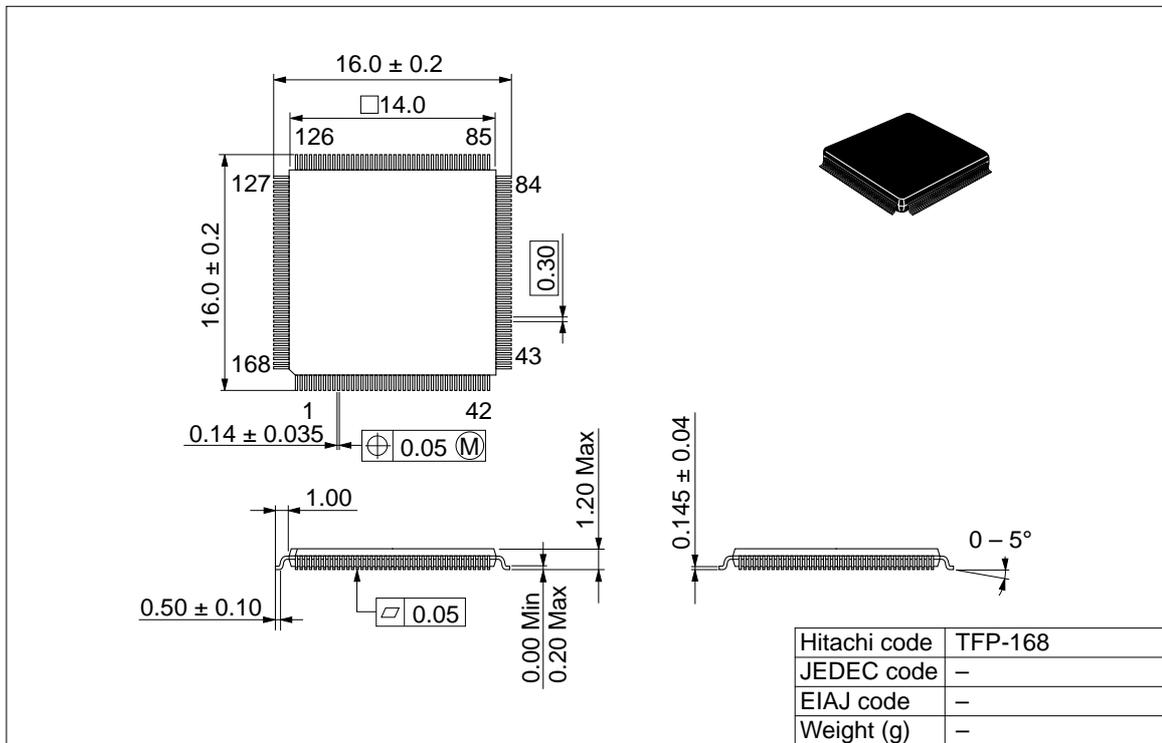
Package Outline Dimensions



Package Outline Dimensions



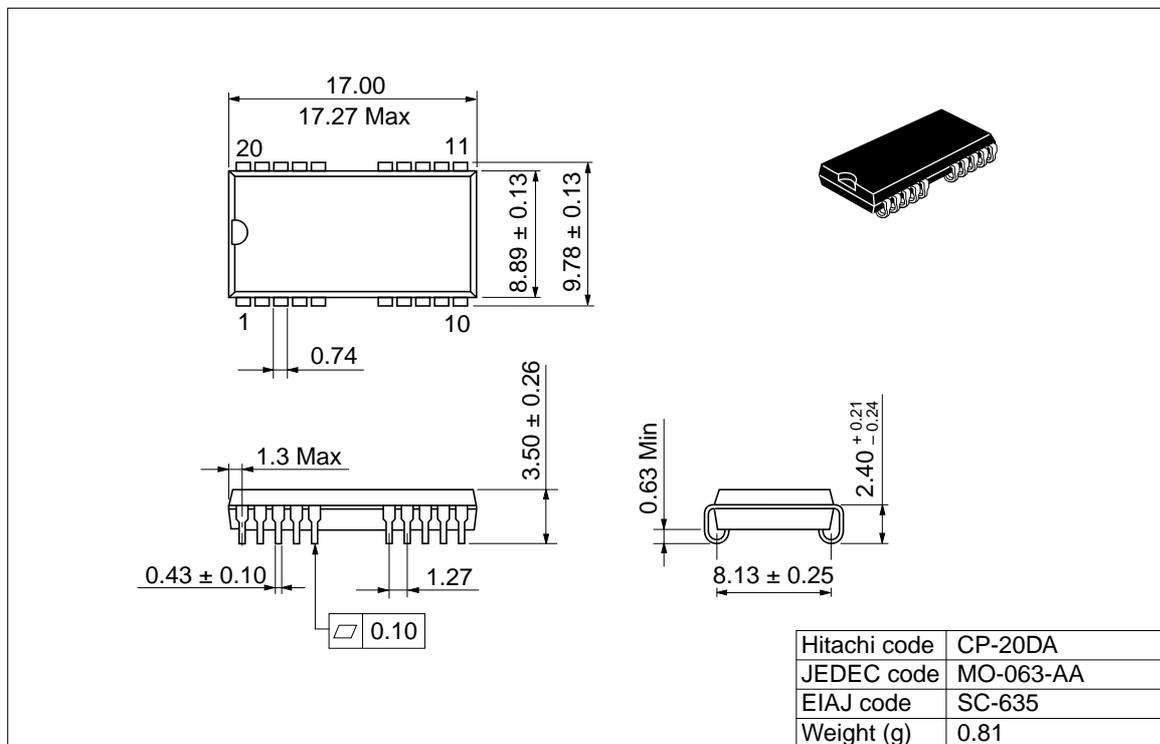
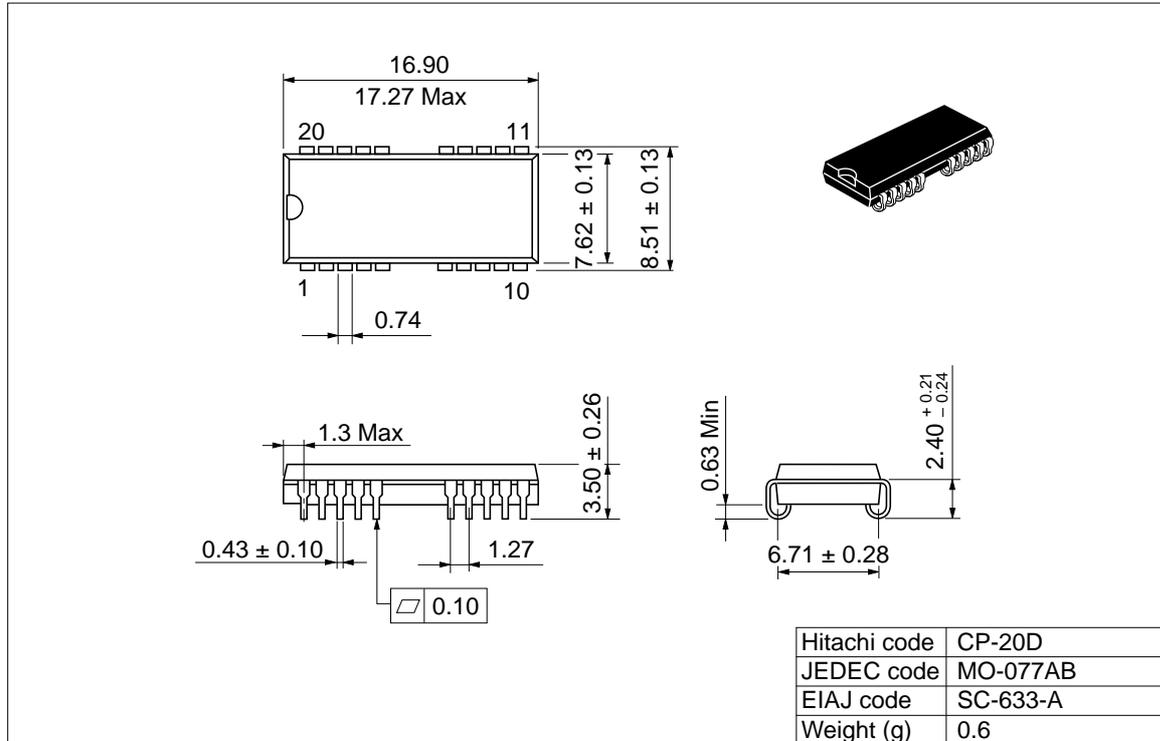
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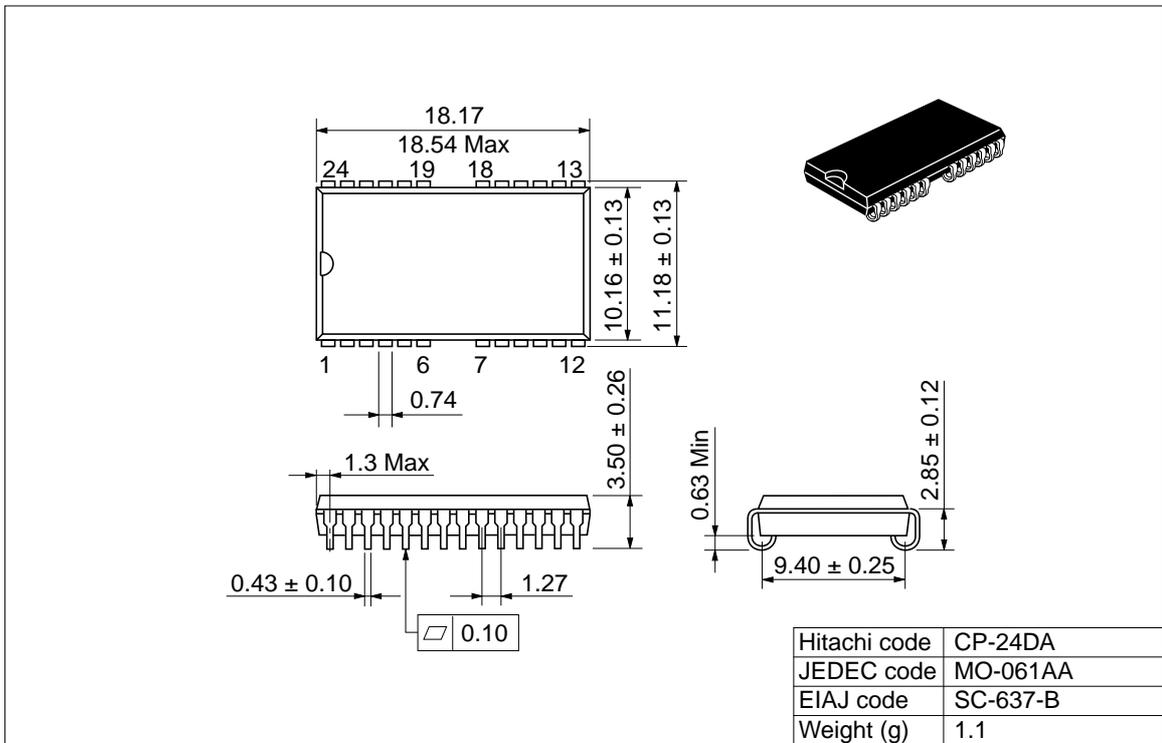
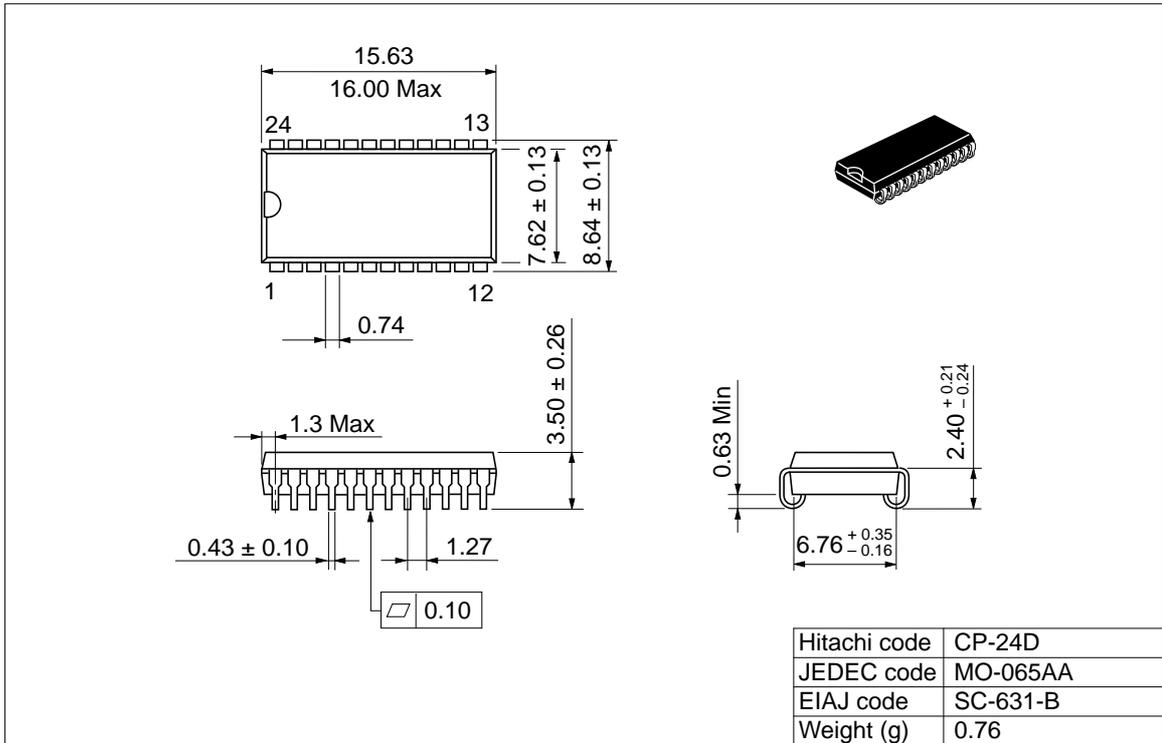
Package Outline Dimensions

(3) Plastic SOJ

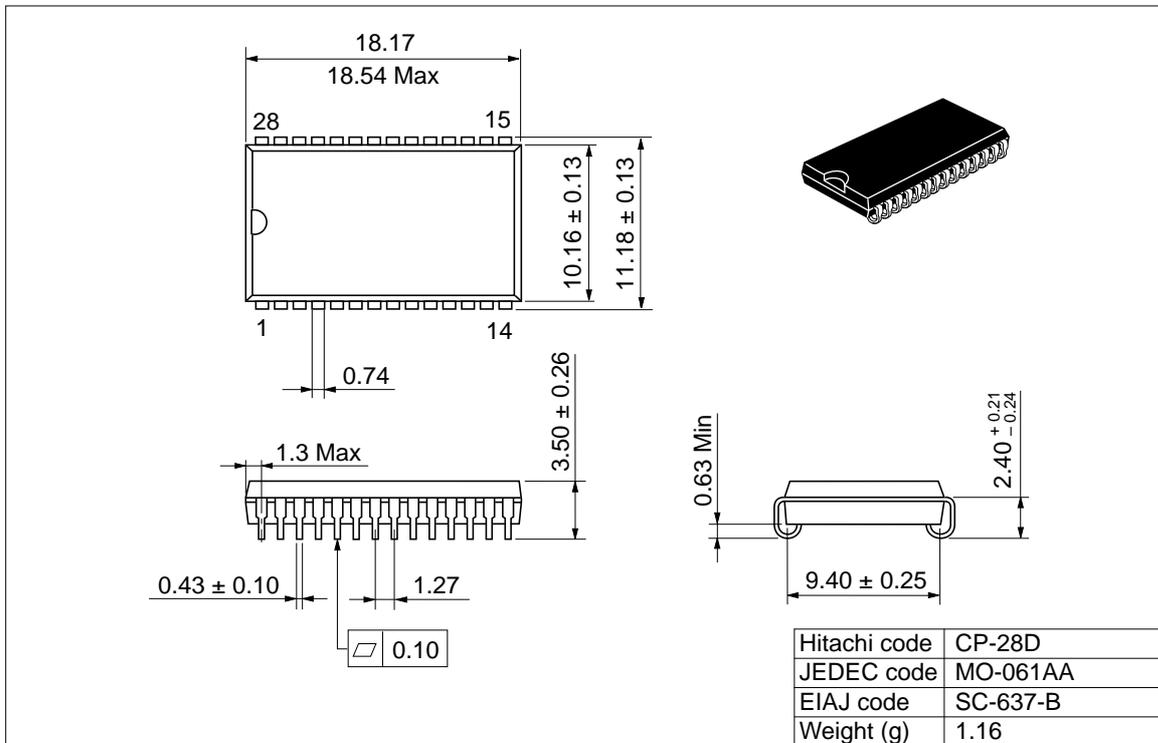
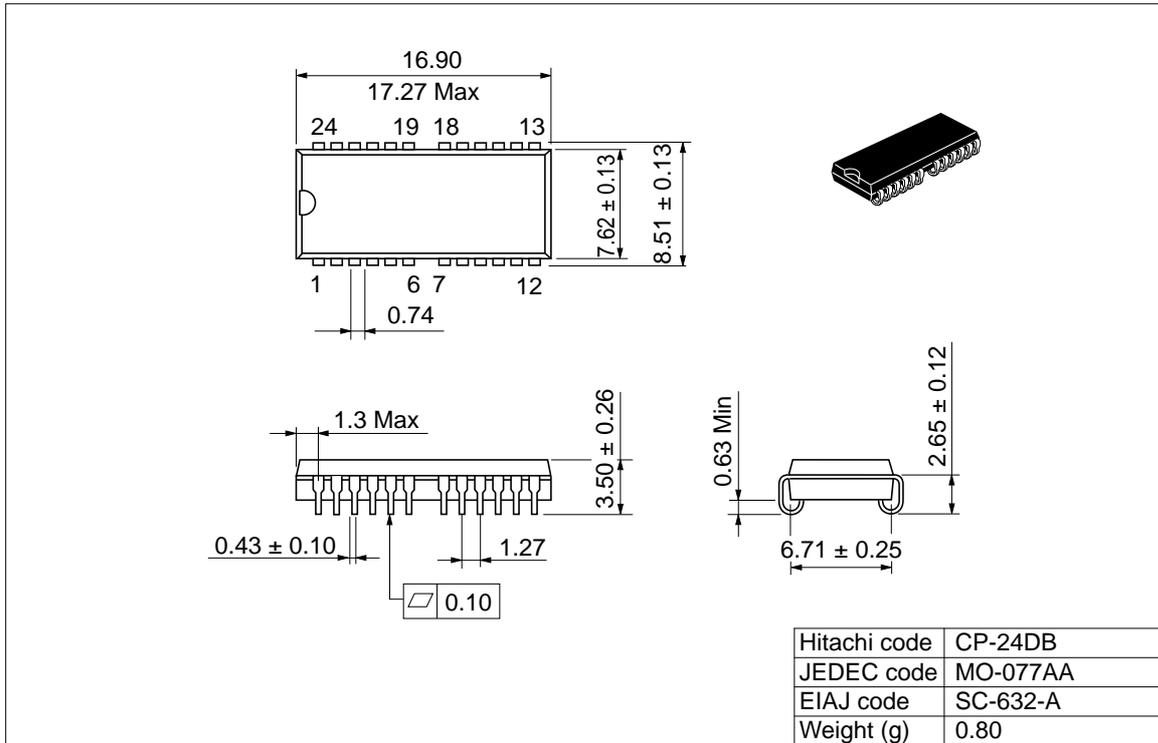
Unit: mm



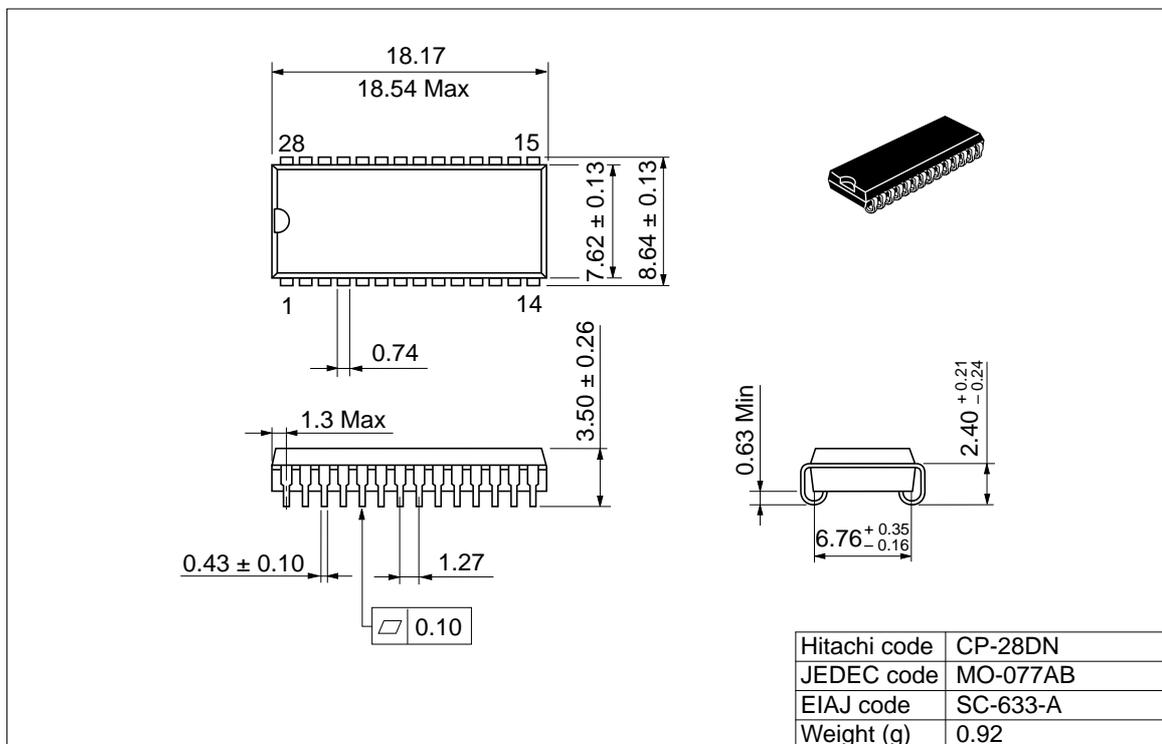
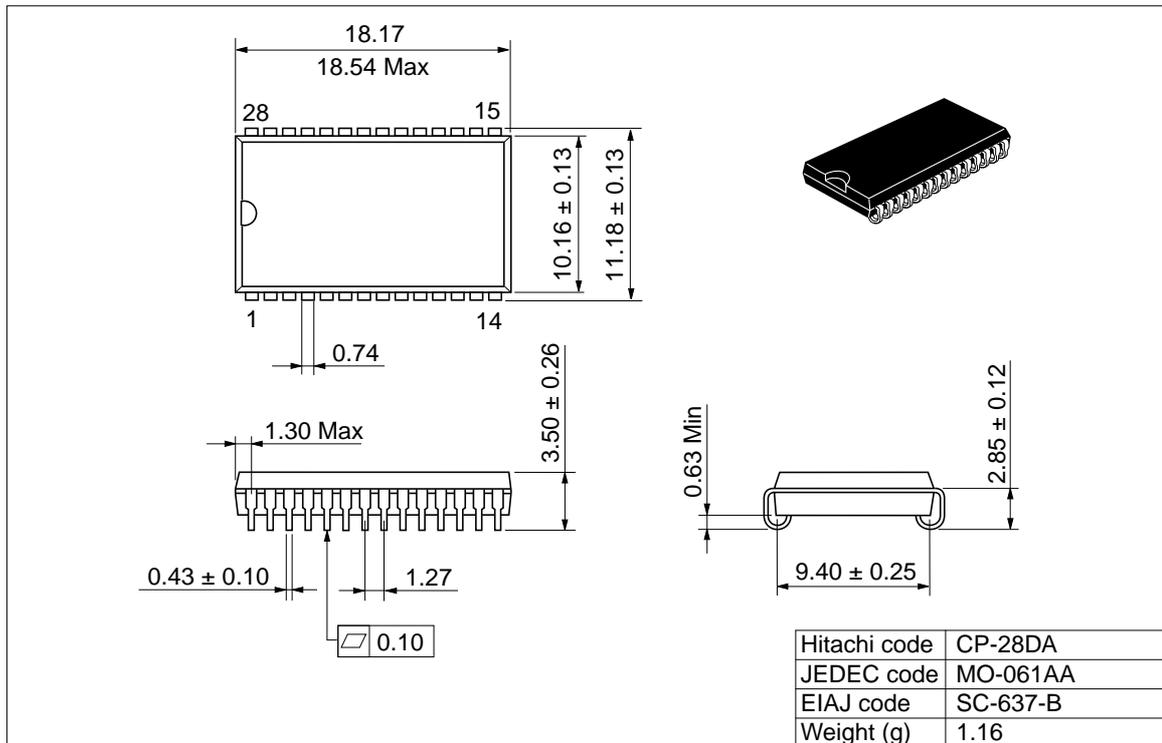
Package Outline Dimensions



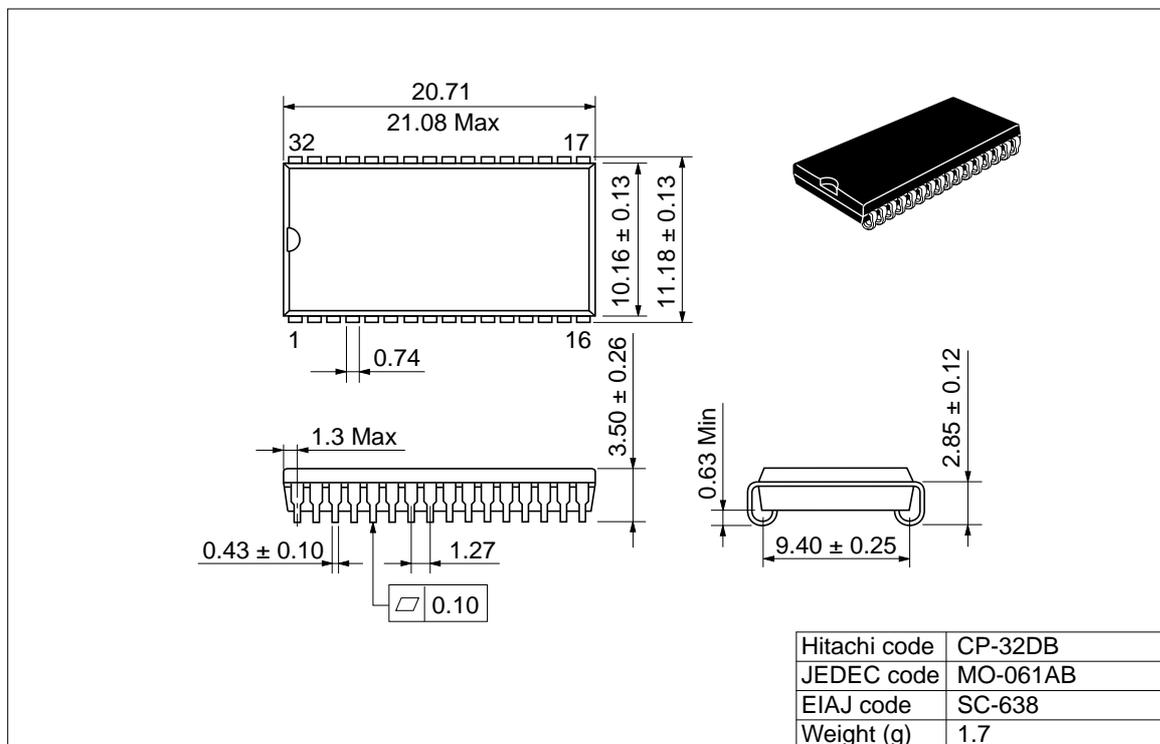
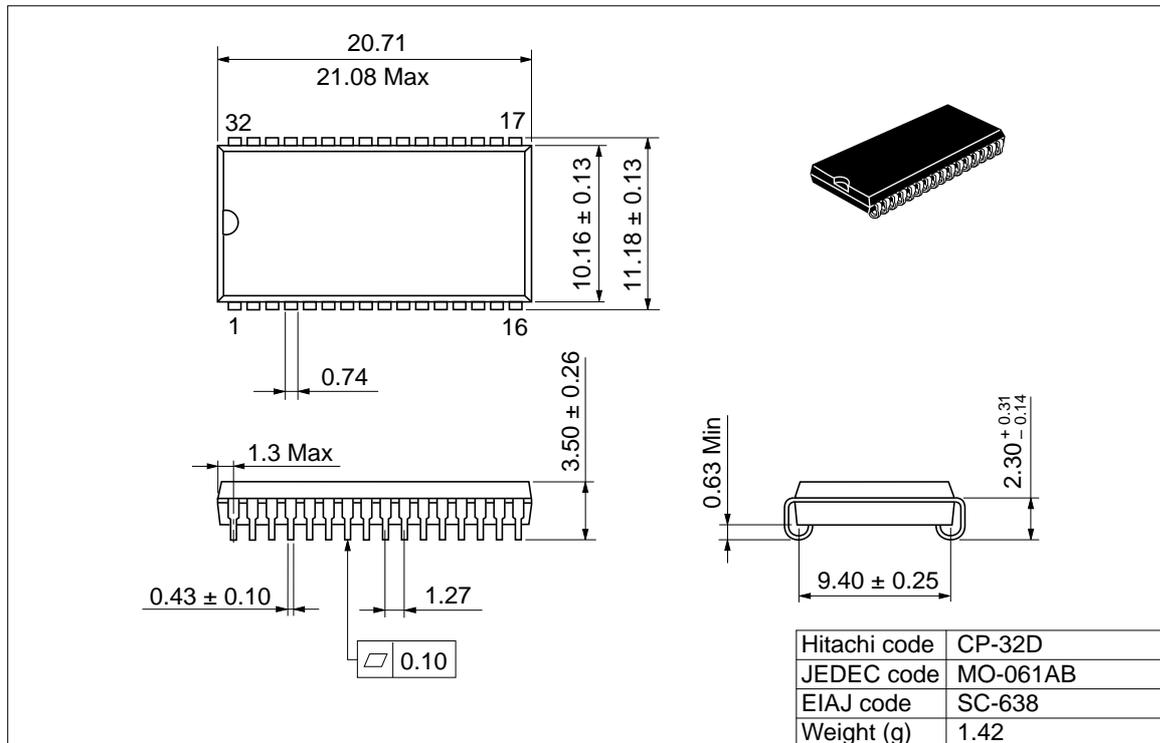
Package Outline Dimensions



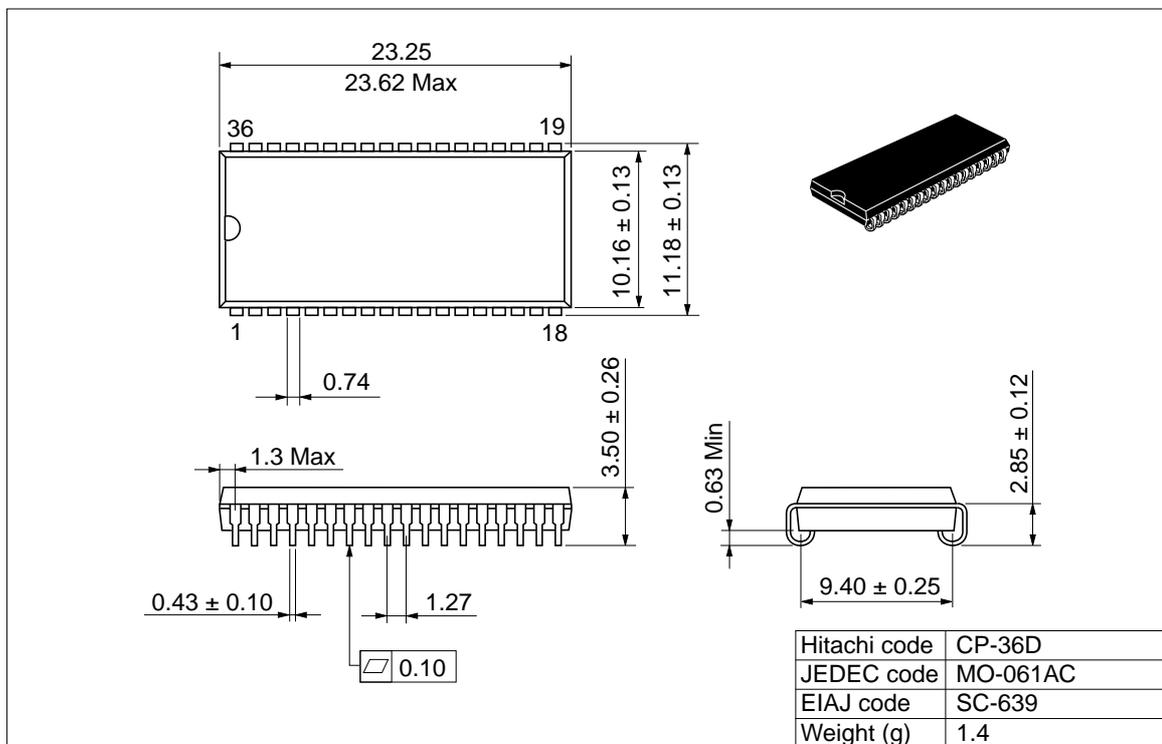
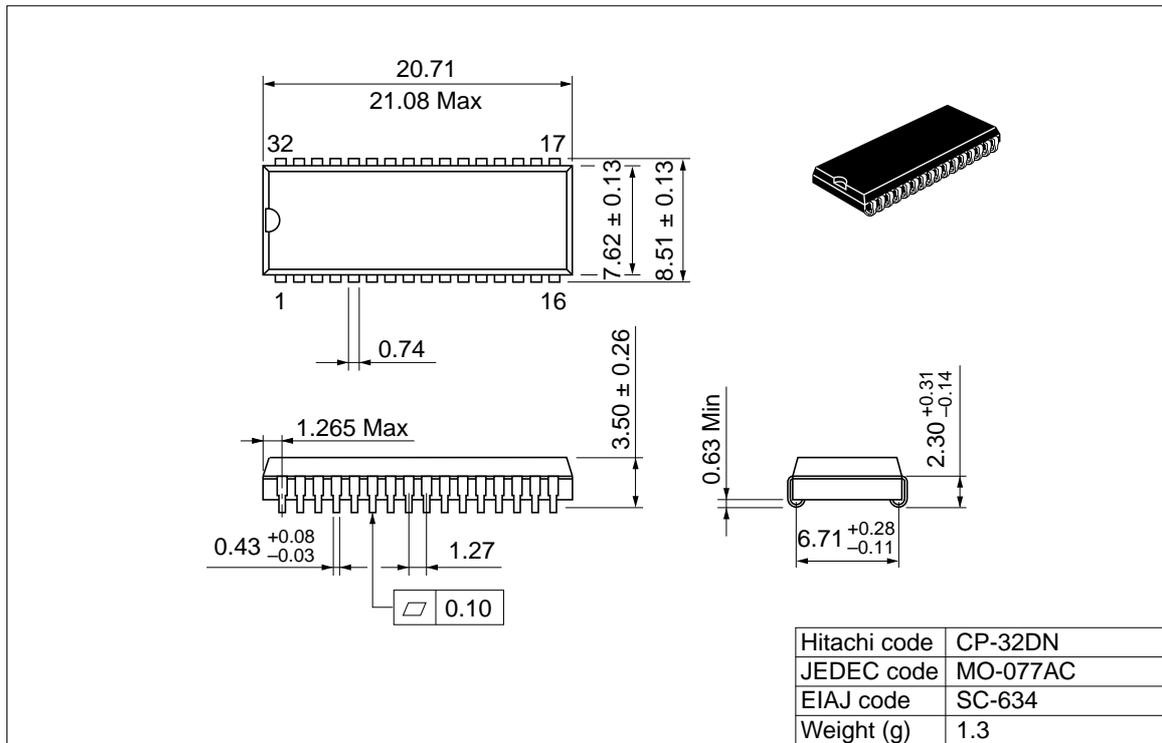
Package Outline Dimensions



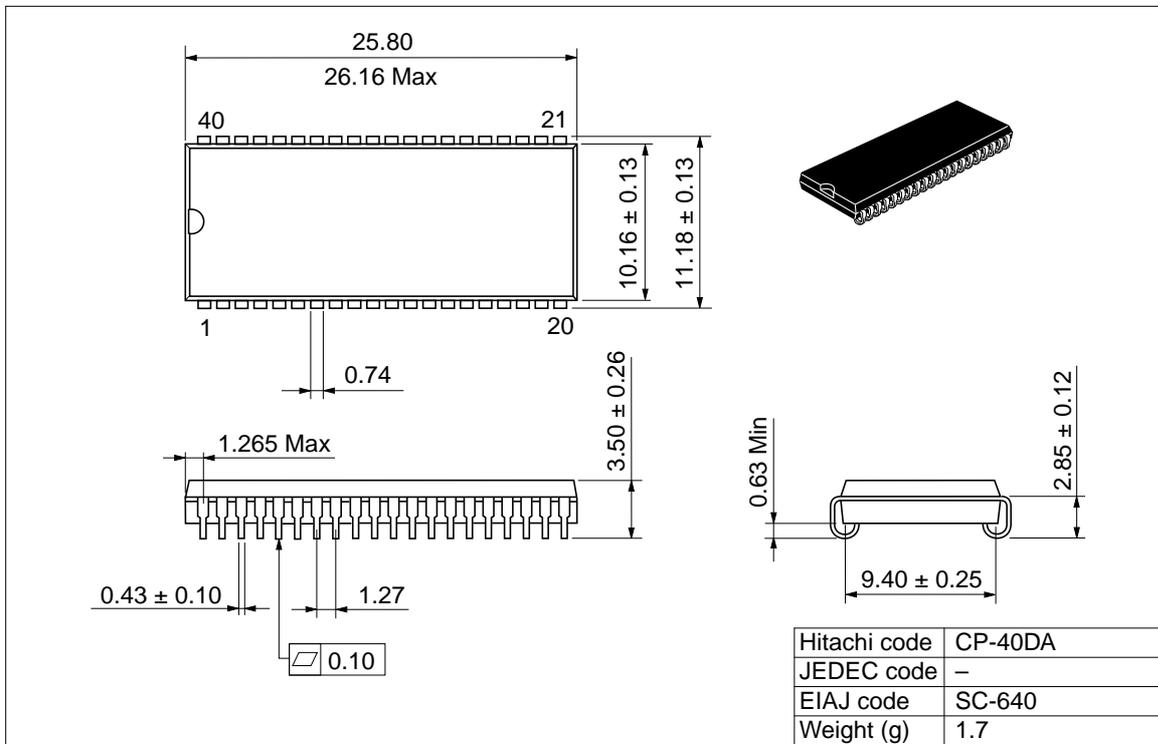
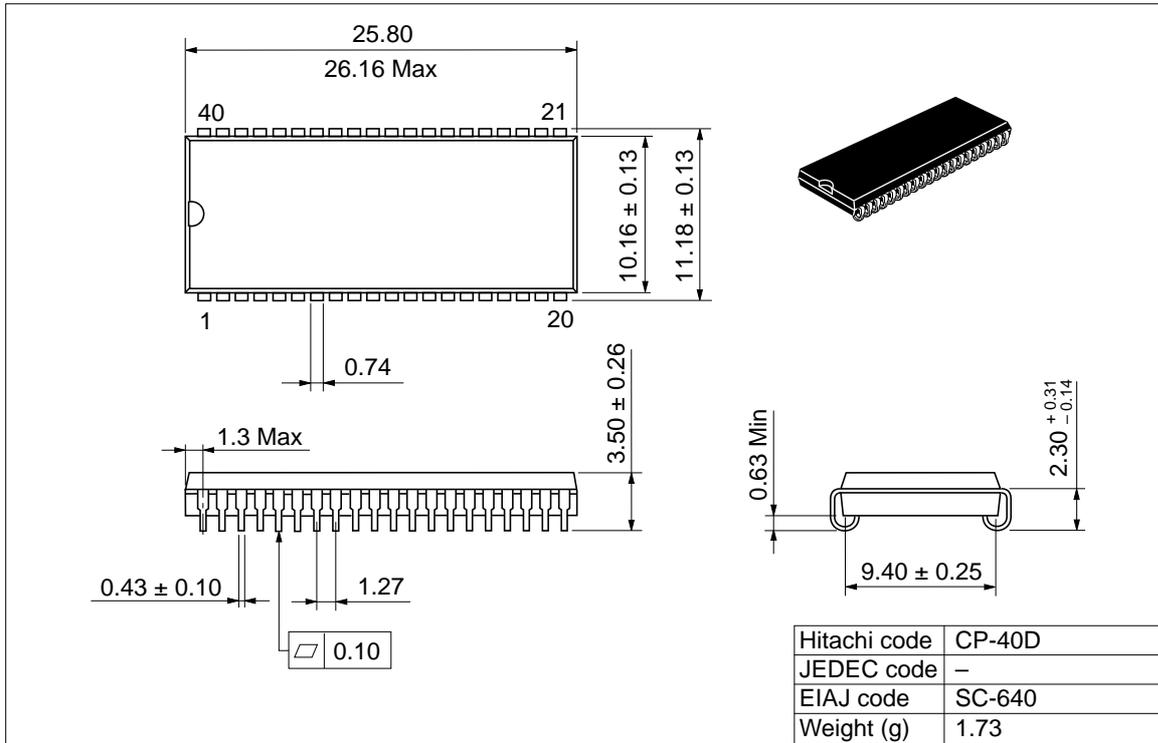
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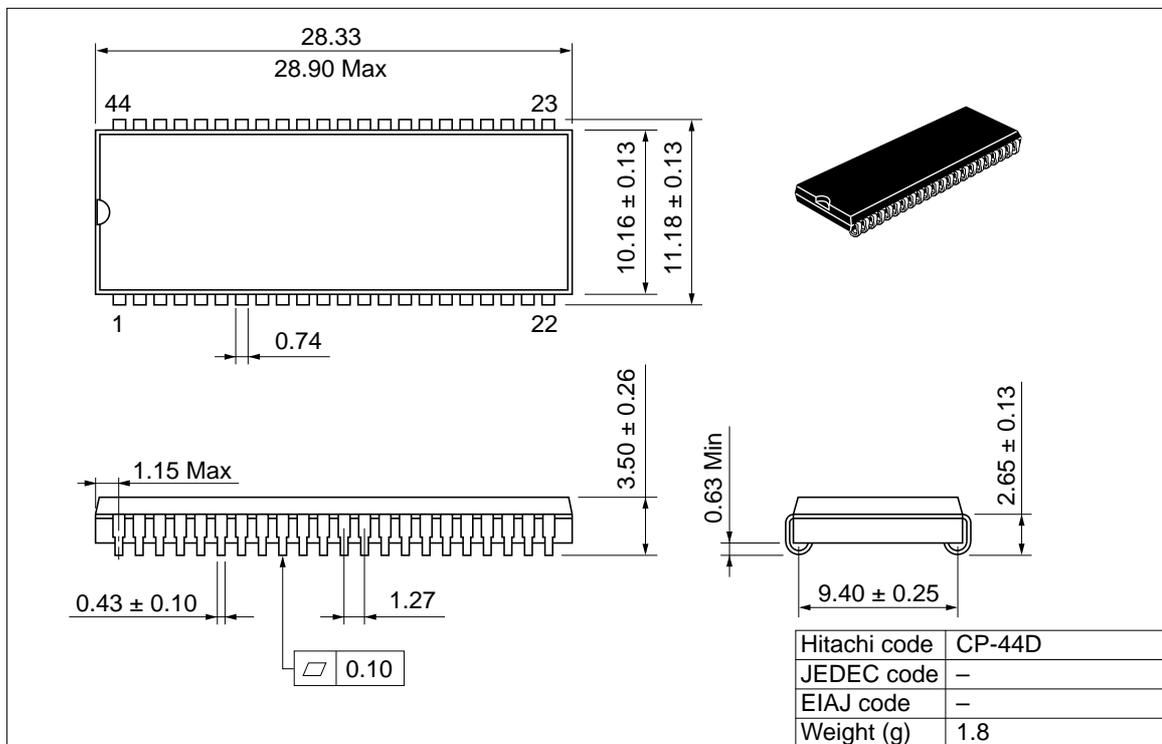
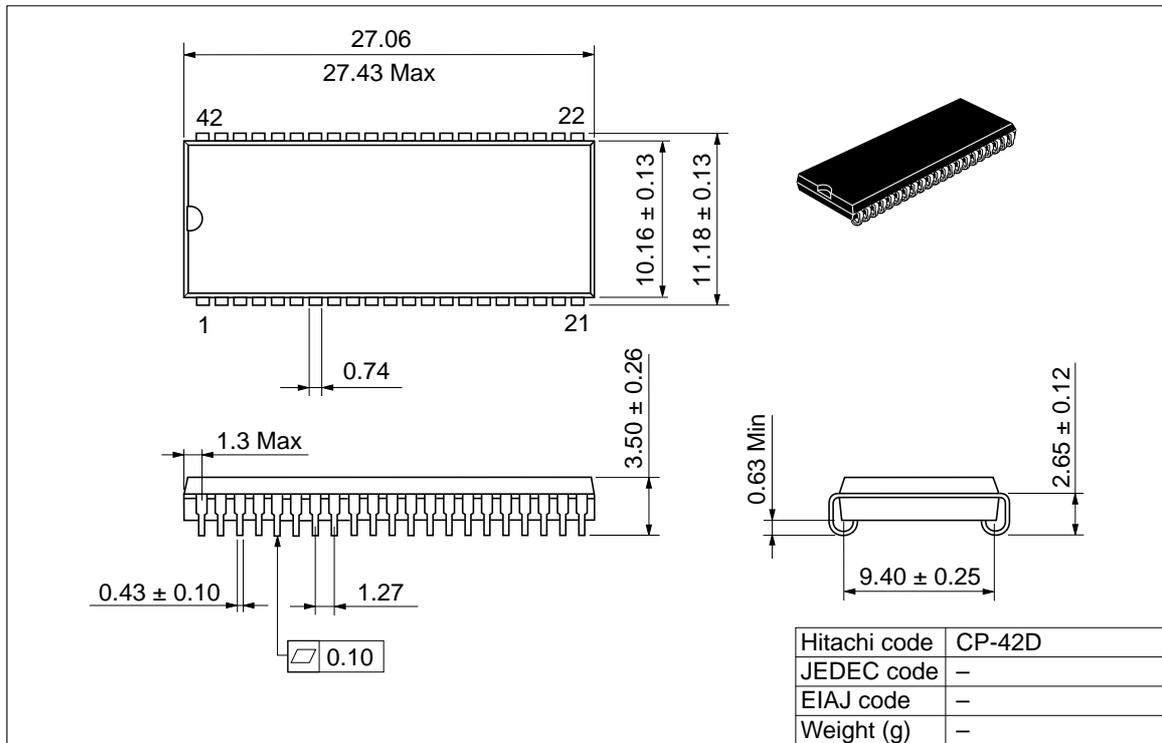
Package Outline Dimensions



Package Outline Dimensions



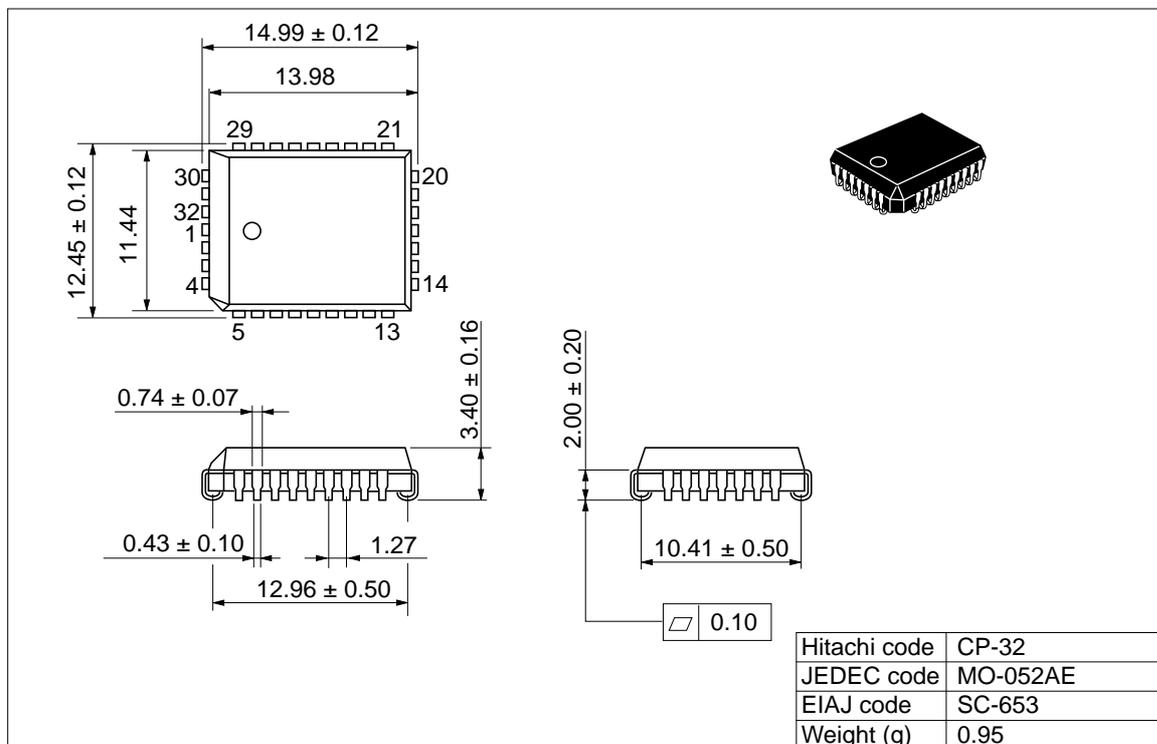
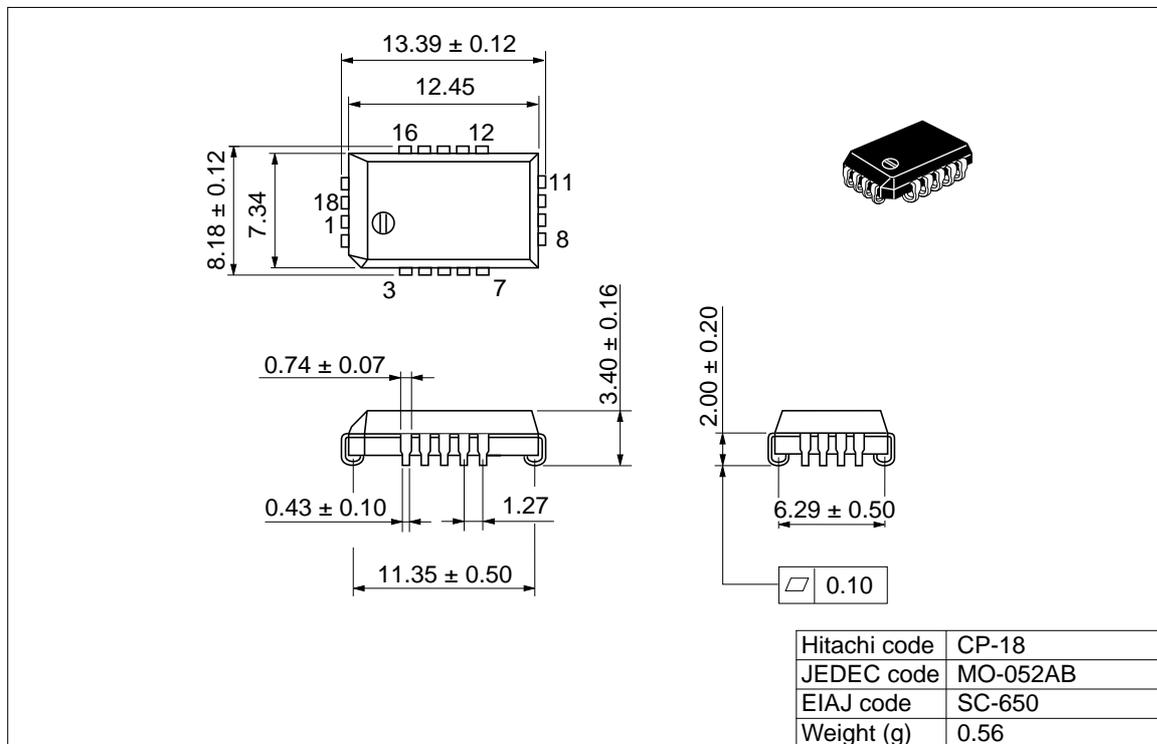
Package Outline Dimensions



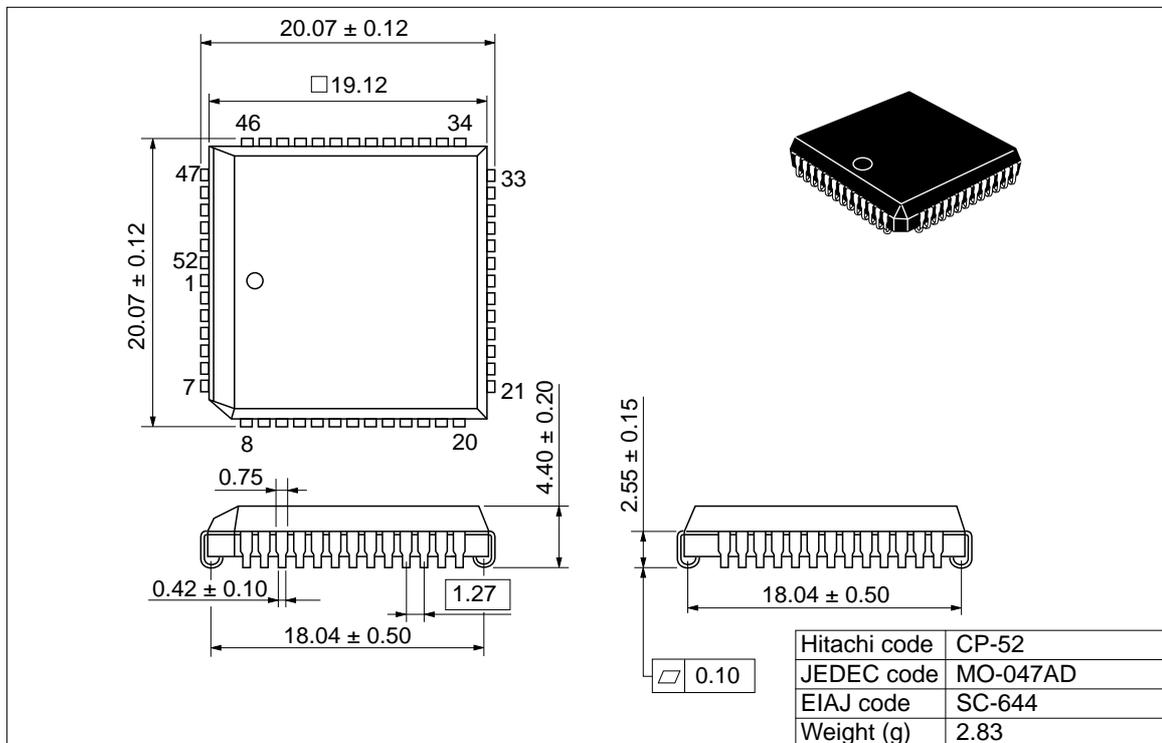
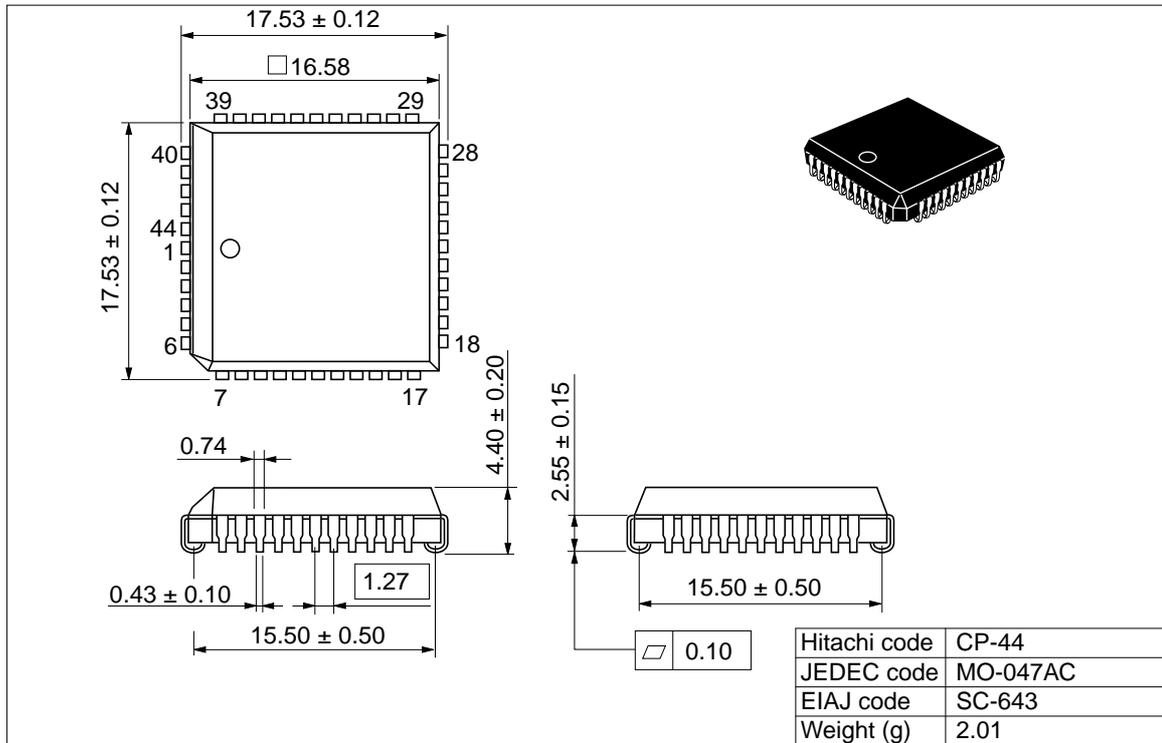
Package Outline Dimensions

(4) QFJ (PLCC)

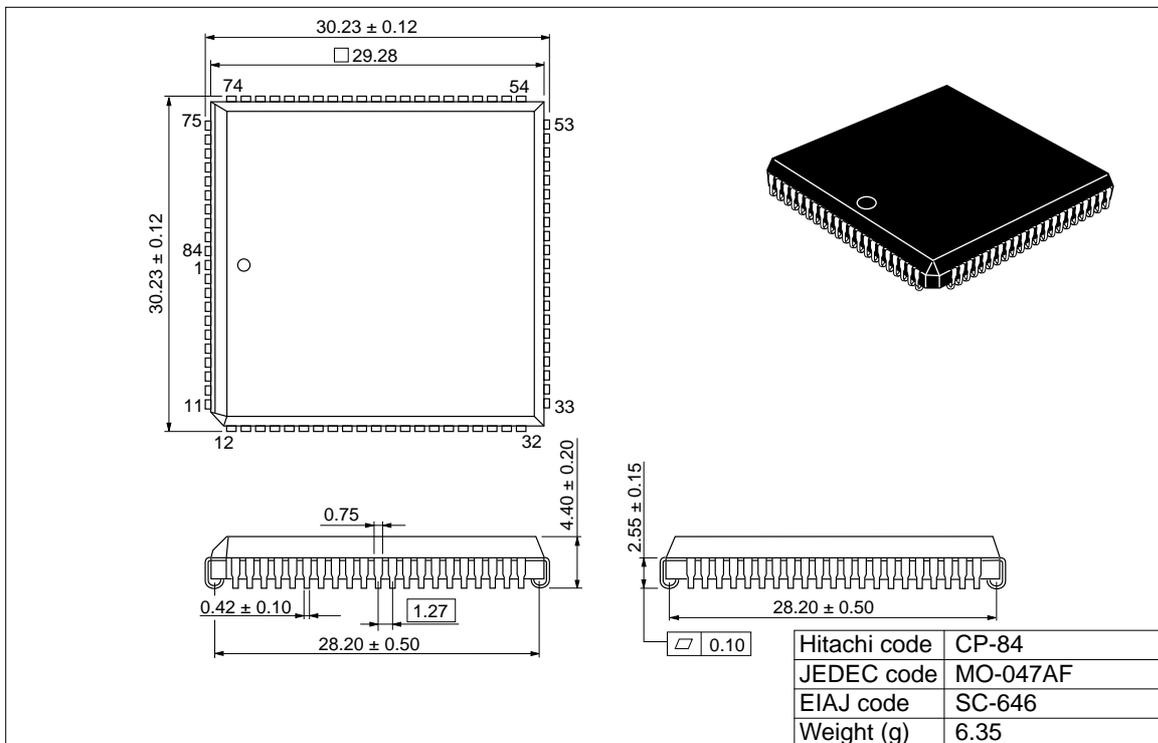
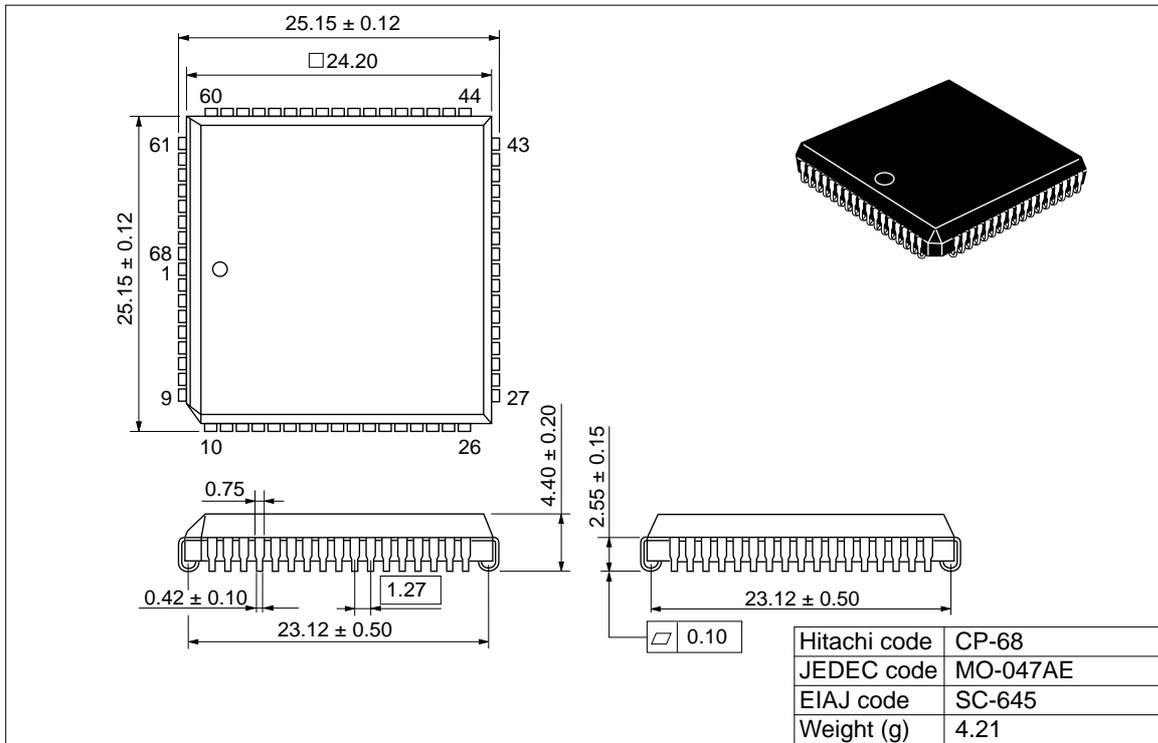
Unit: mm



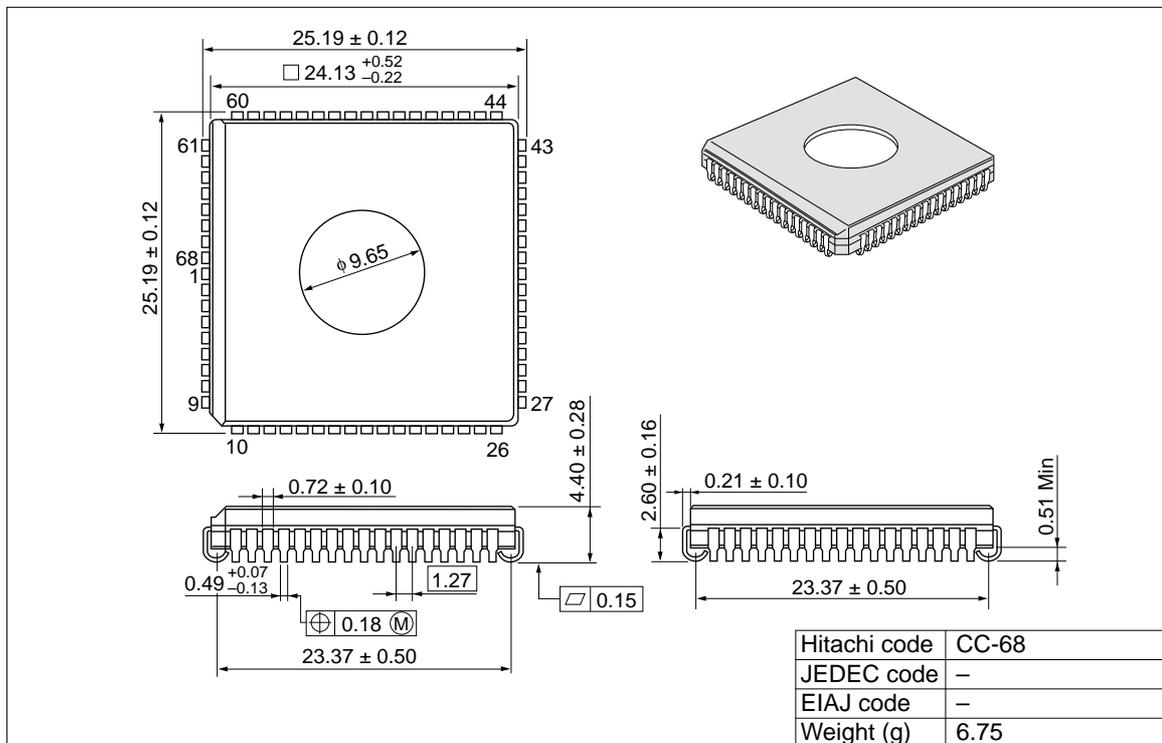
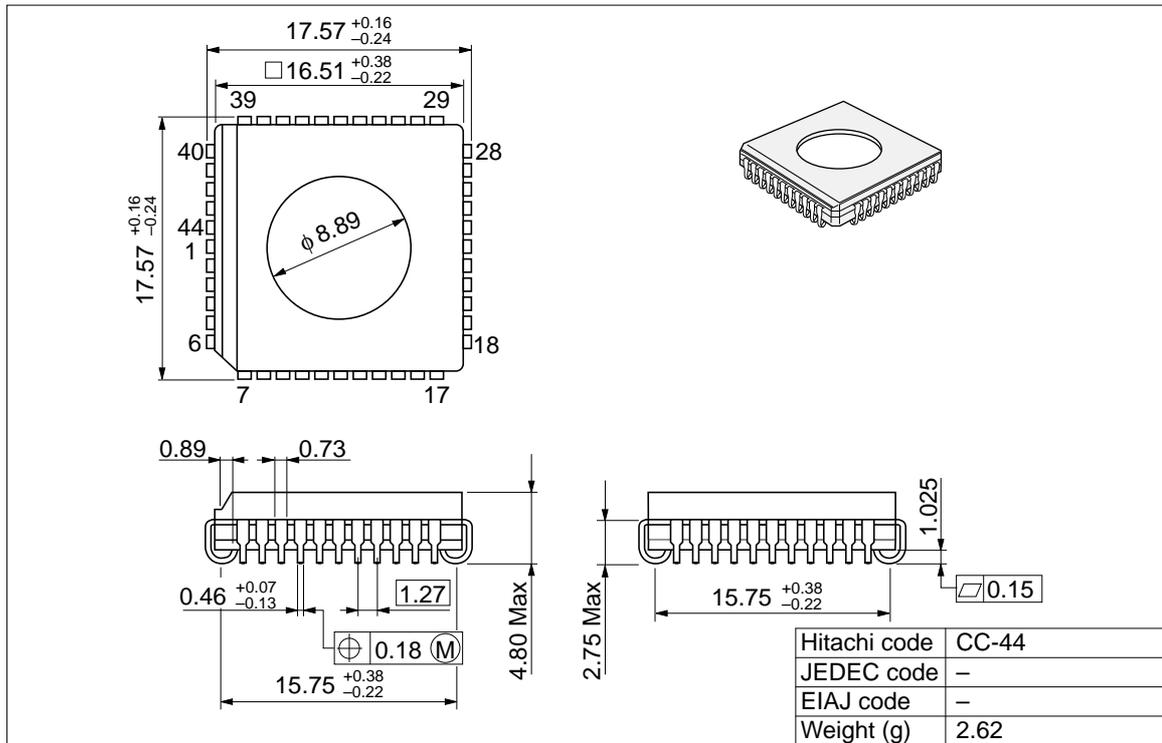
Package Outline Dimensions



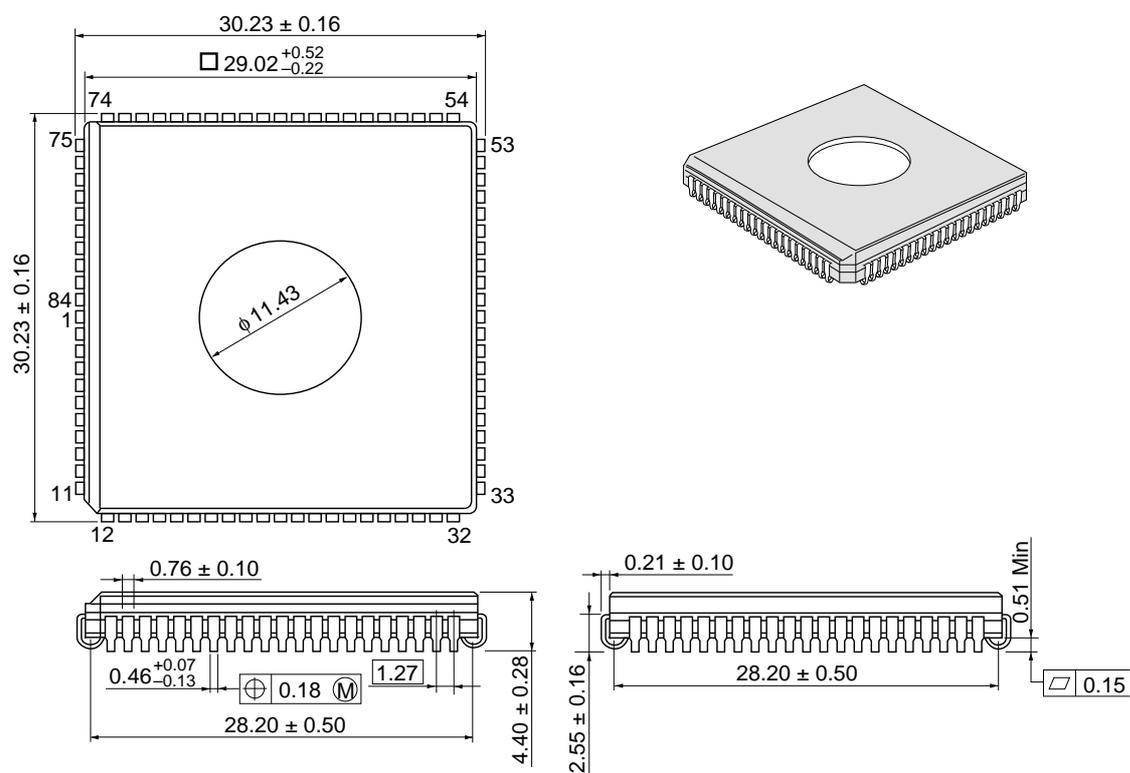
Package Outline Dimensions



Package Outline Dimensions



Package Outline Dimensions

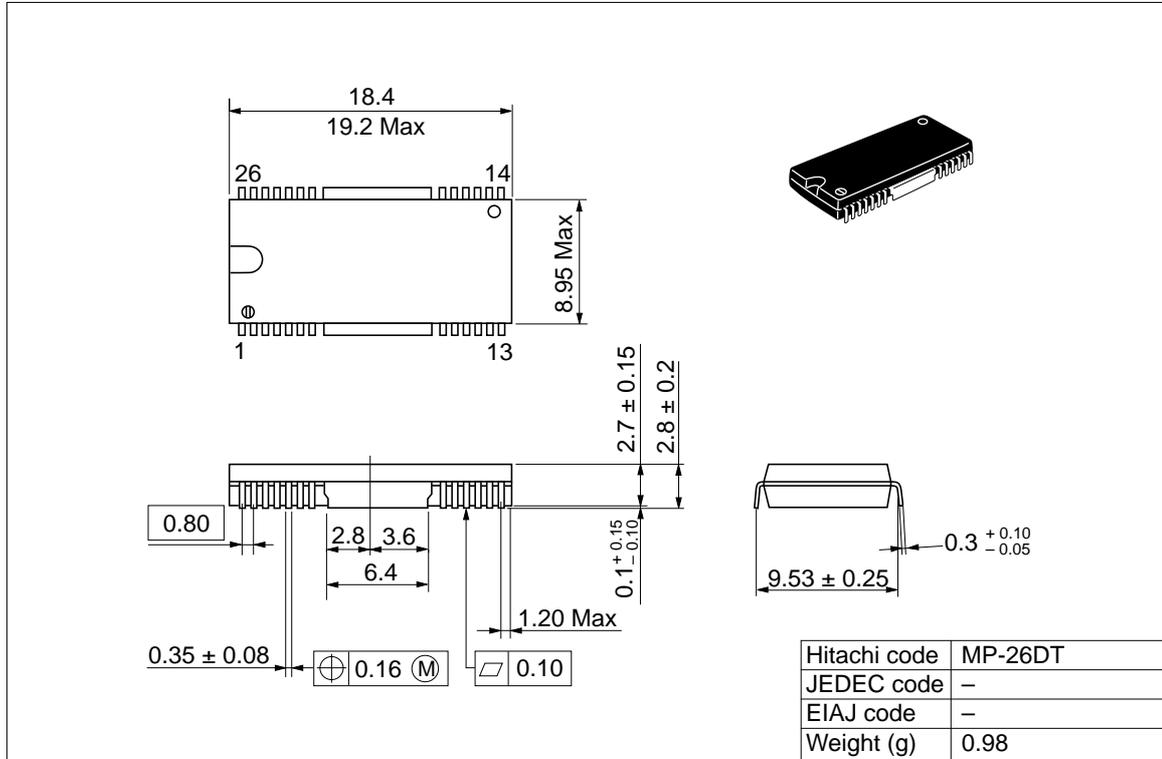


Hitachi code	CC-84
JEDEC code	-
EIAJ code	-
Weight (g)	10.39

Package Outline Dimensions

(5) SOI

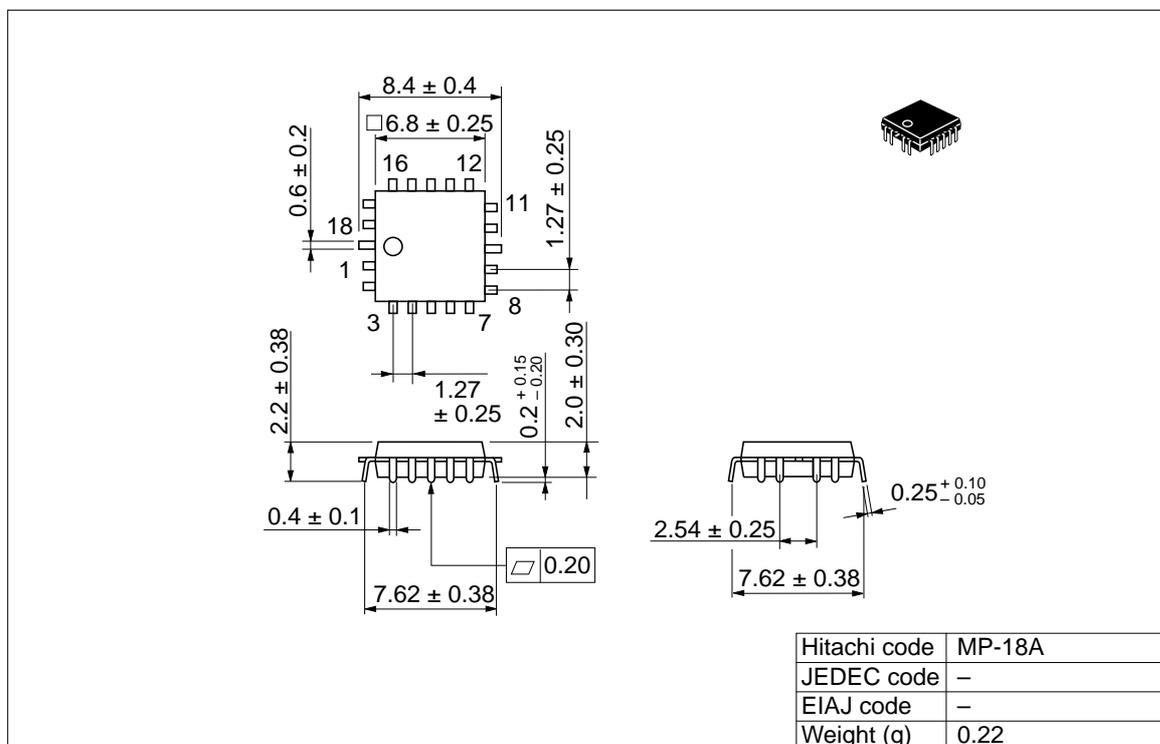
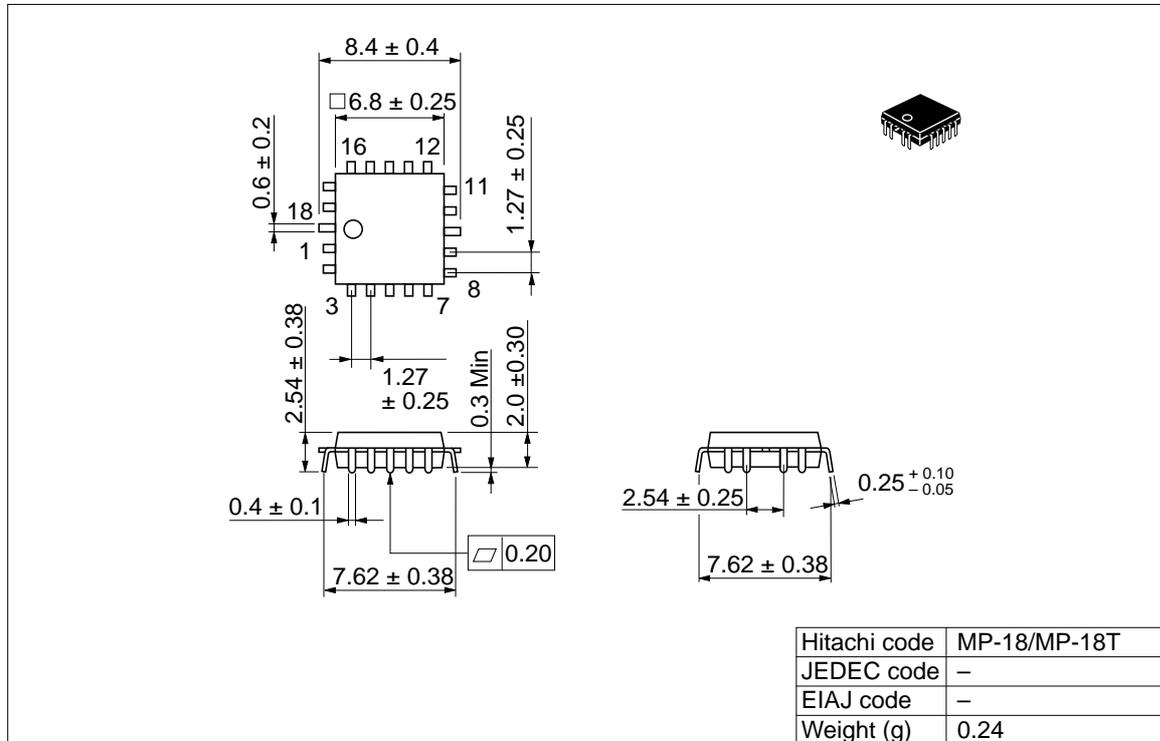
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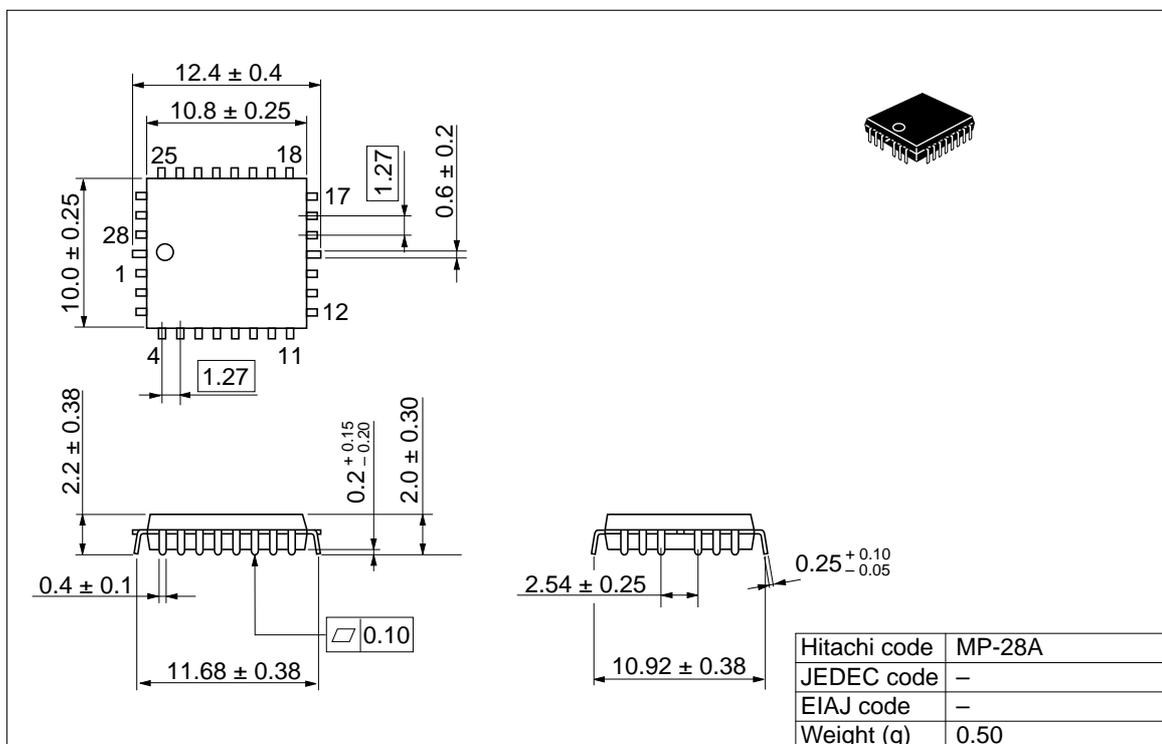
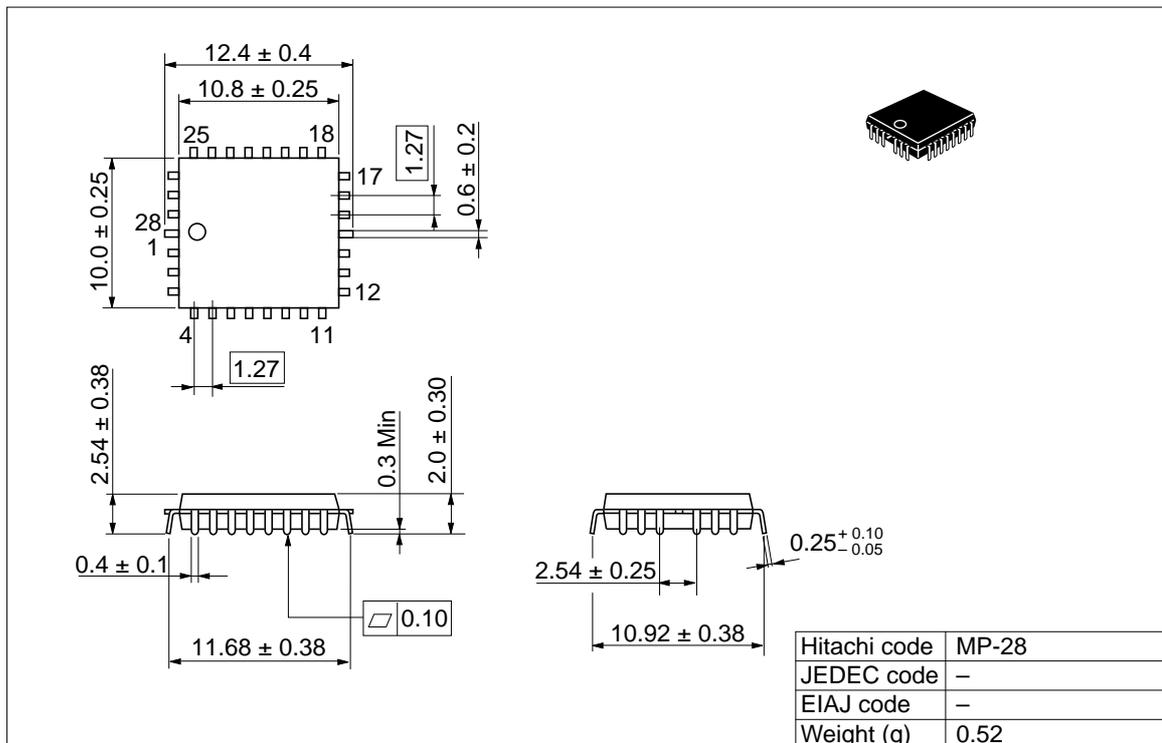
Package Outline Dimensions

(6) Plastic QFI

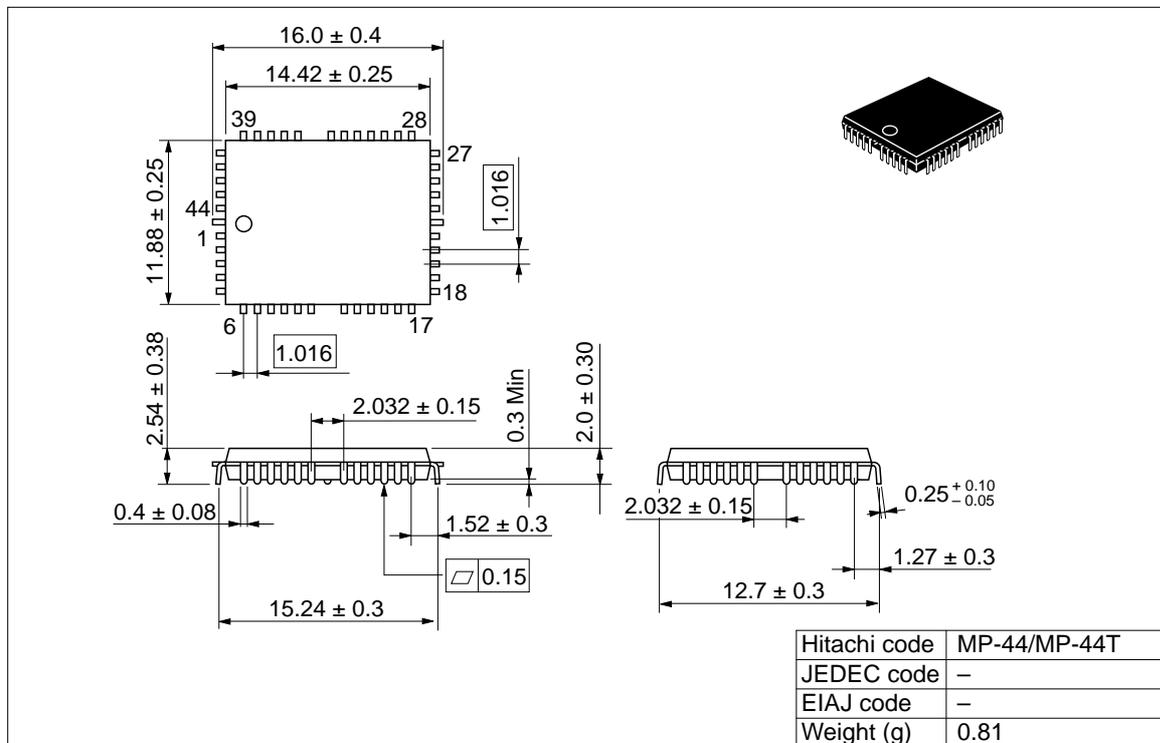
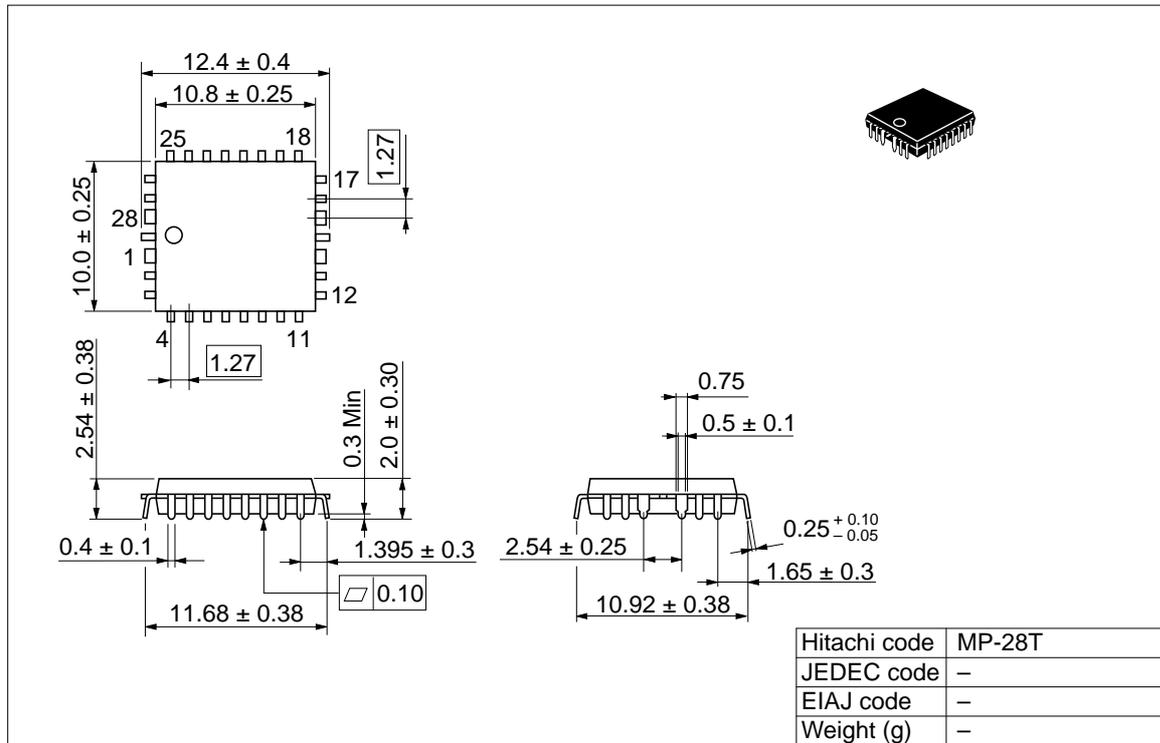
Unit: mm



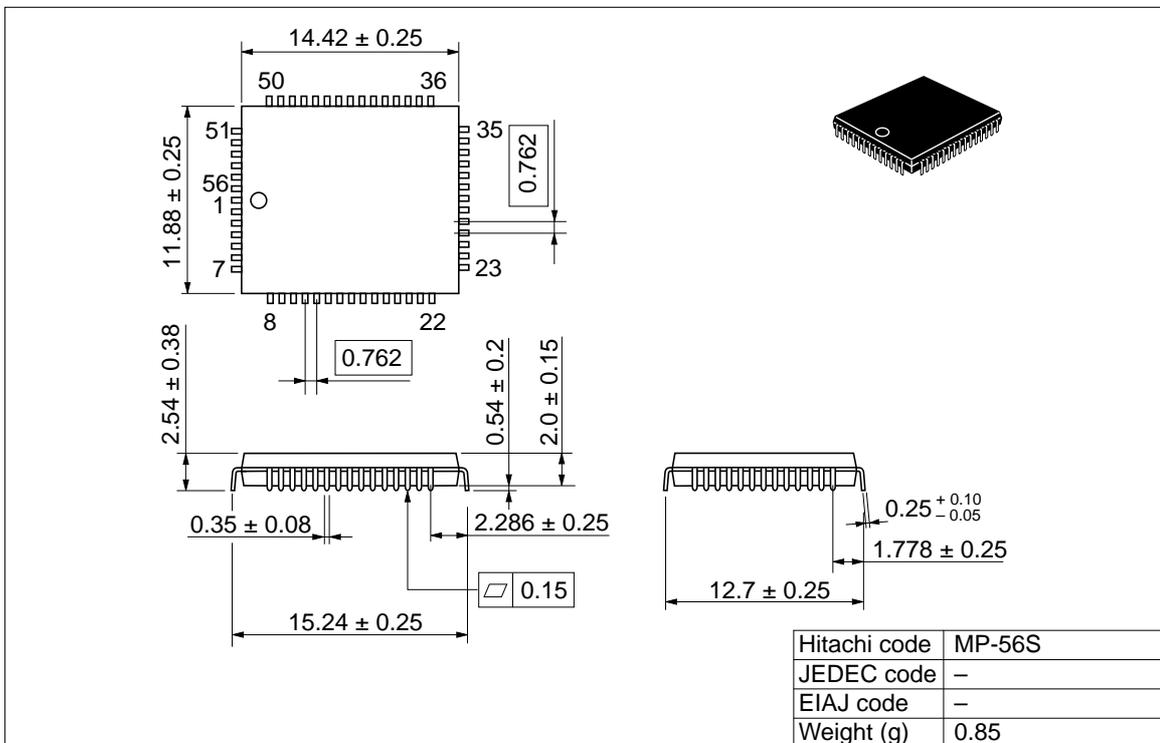
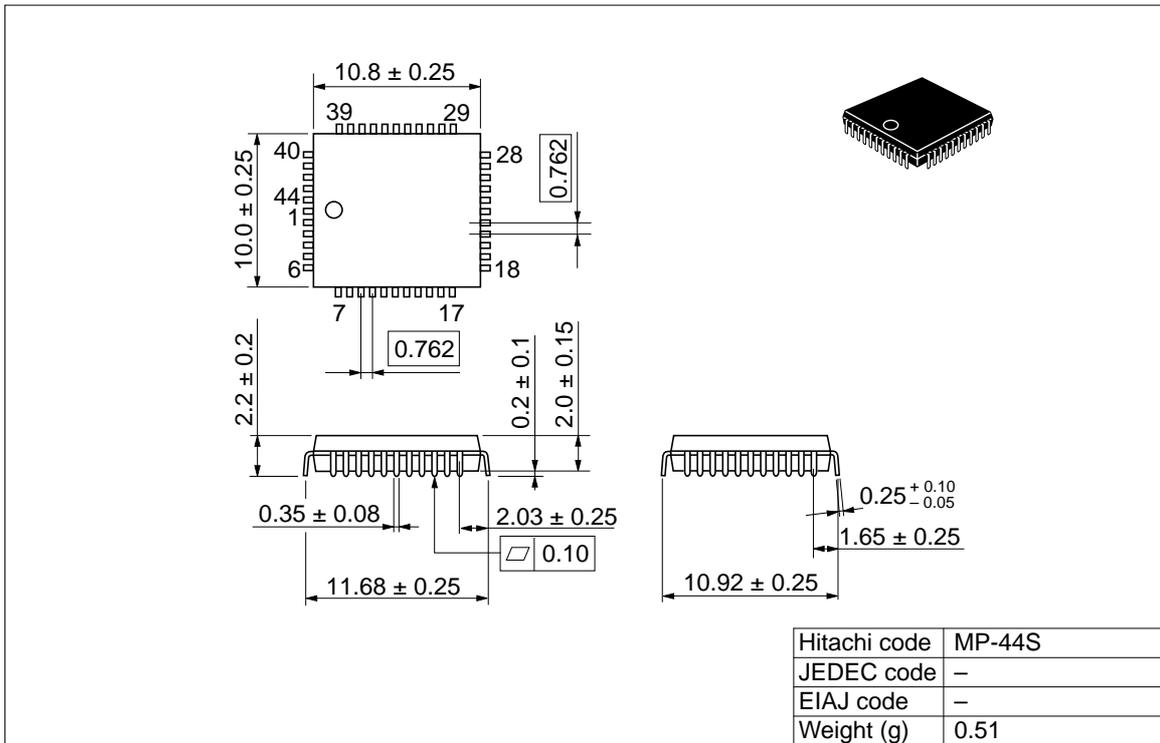
Package Outline Dimensions



Package Outline Dimensions



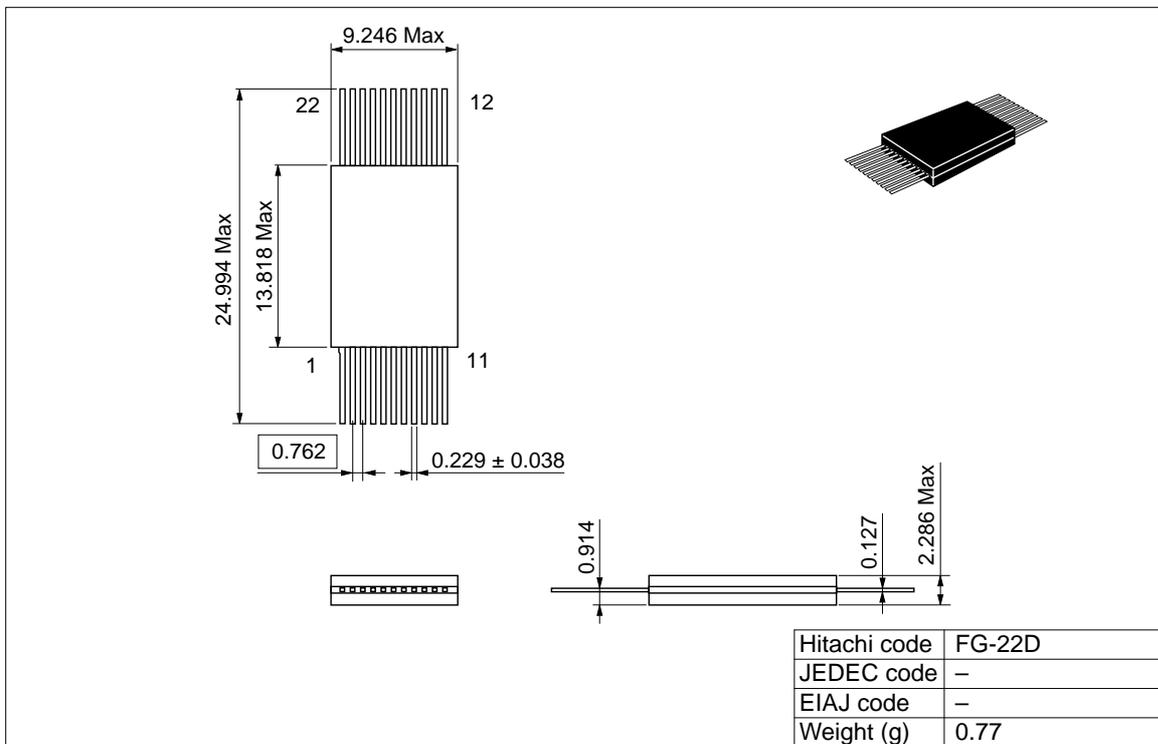
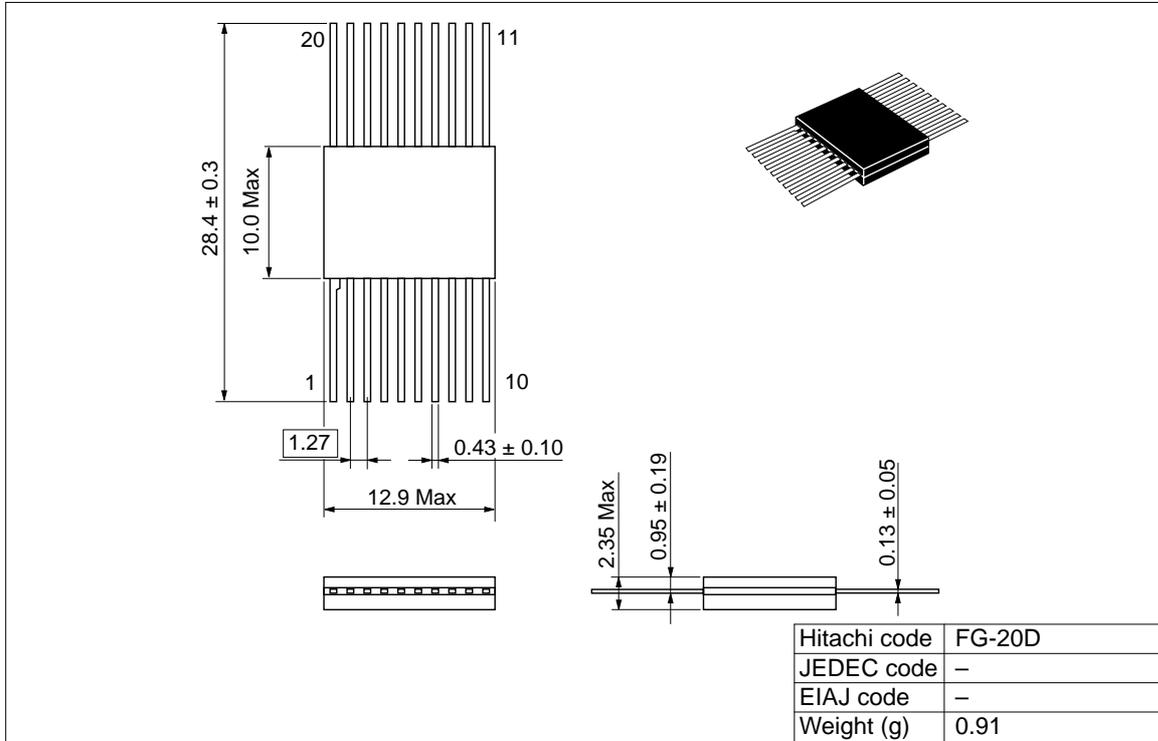
Package Outline Dimensions



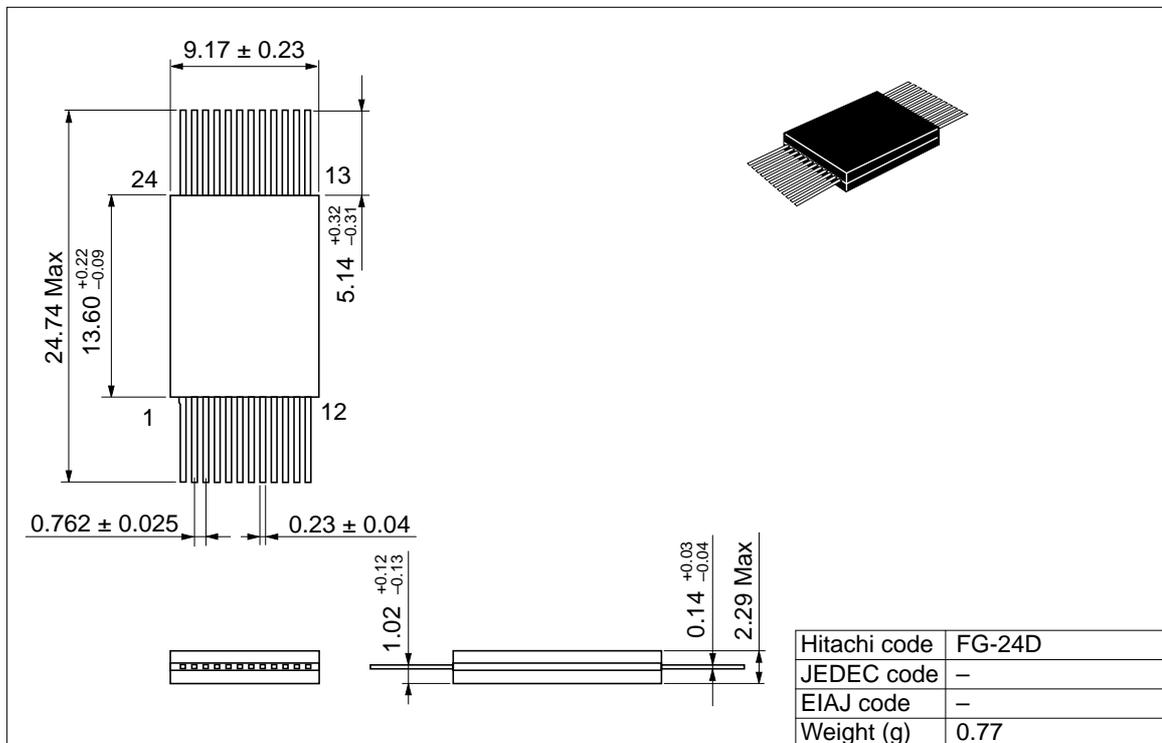
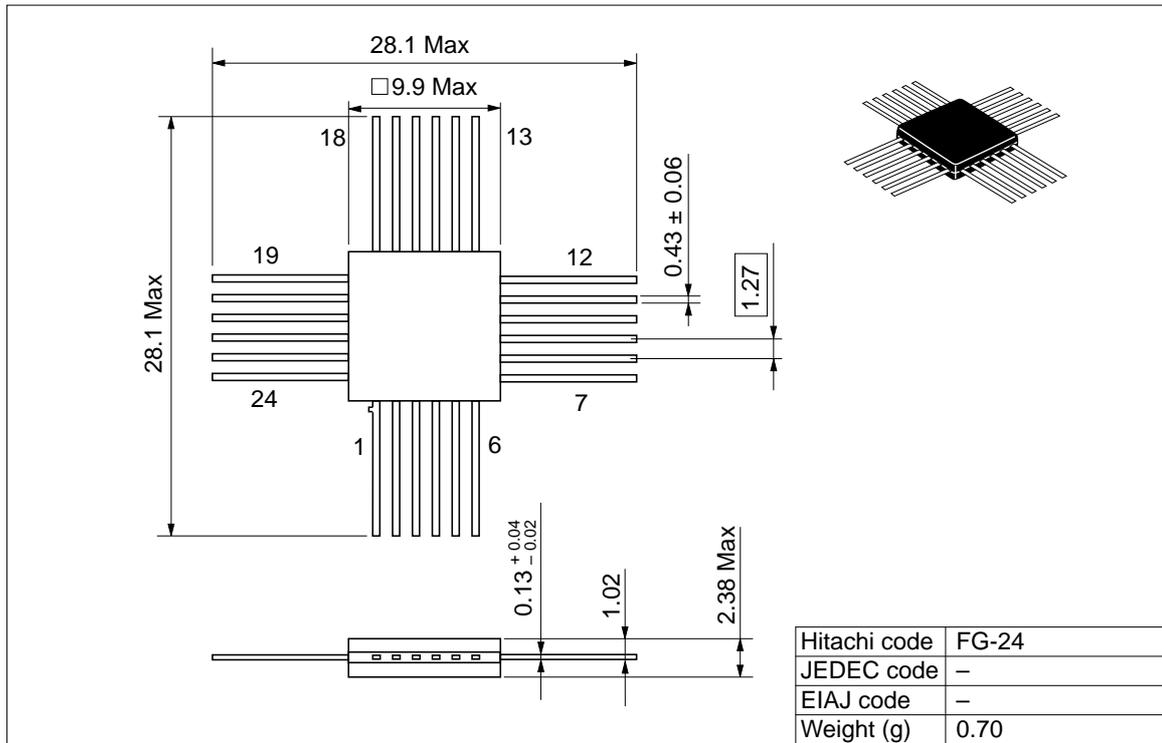
Package Outline Dimensions

(7) Ceramic Flat Package

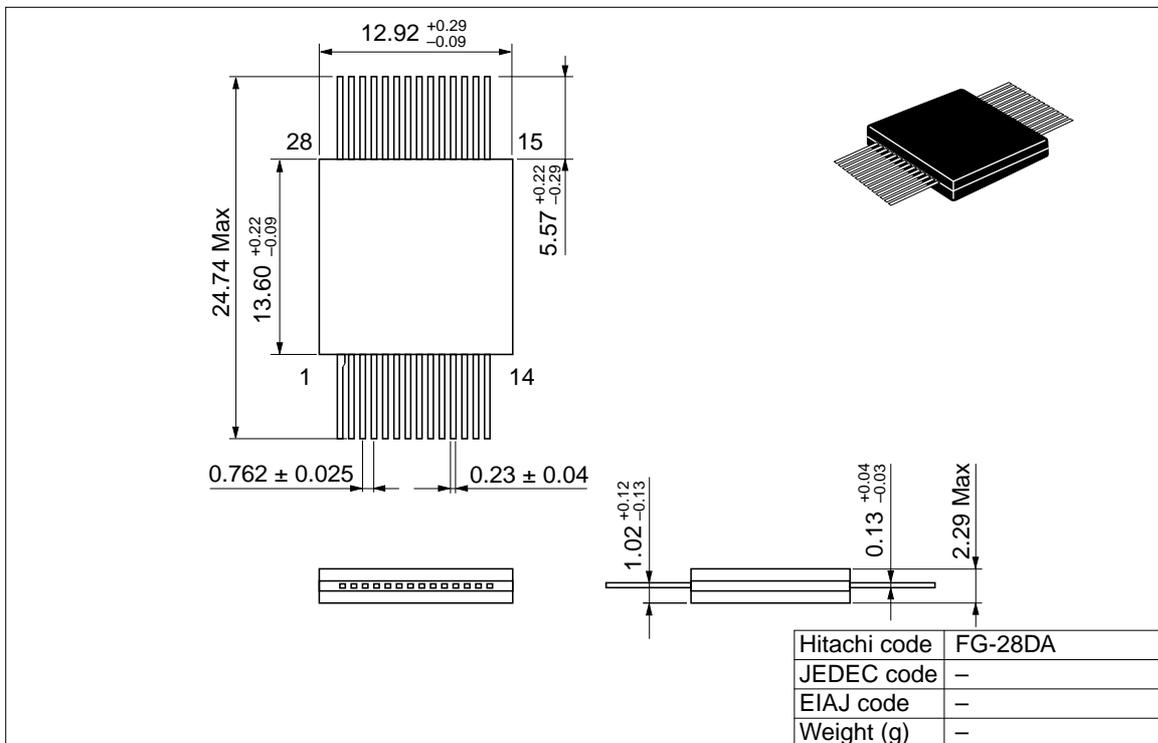
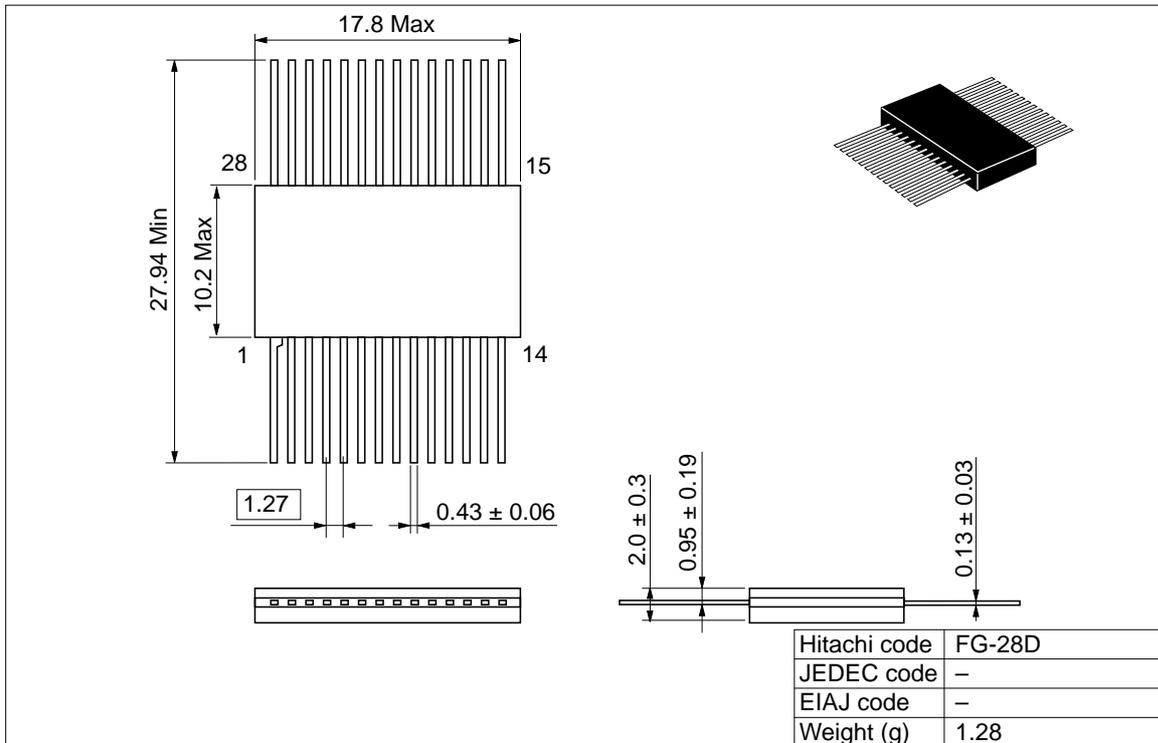
Unit: mm



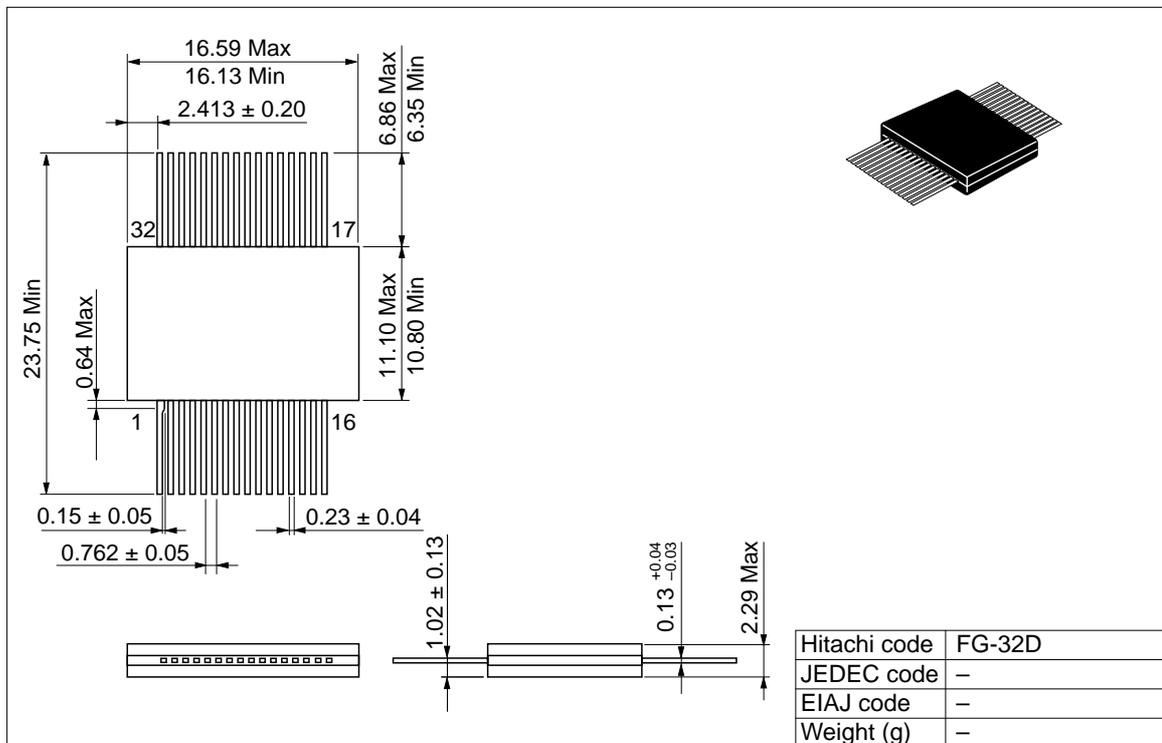
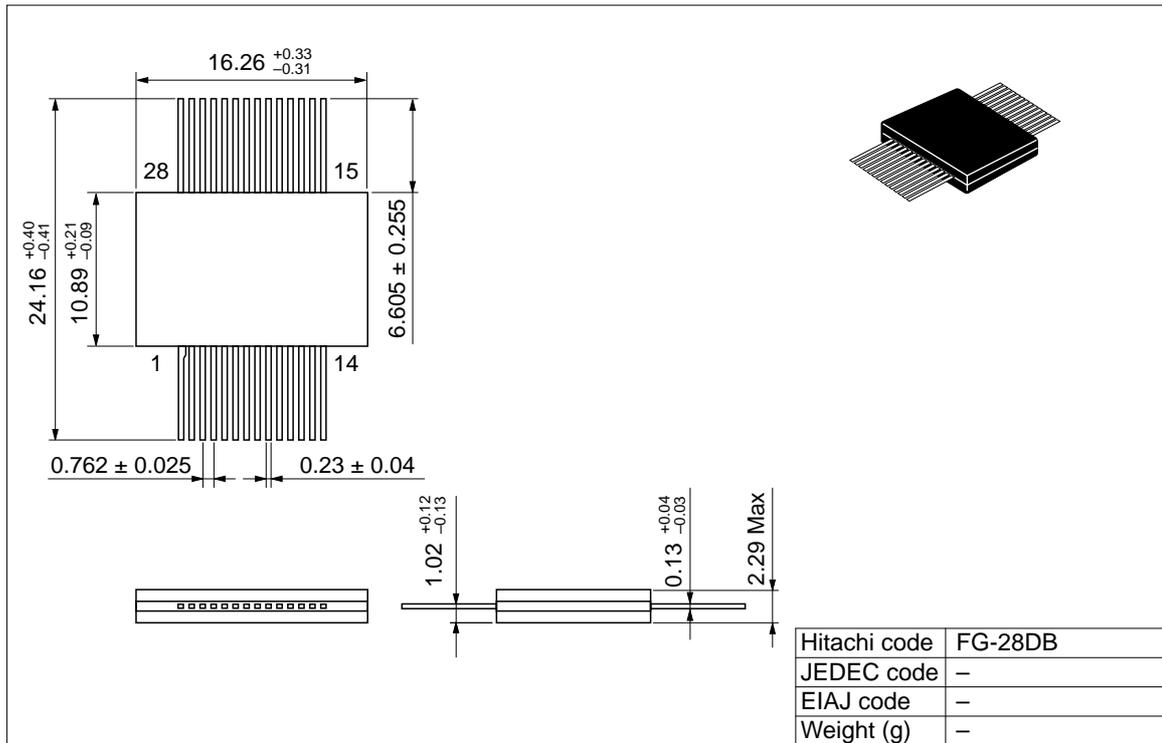
Package Outline Dimensions



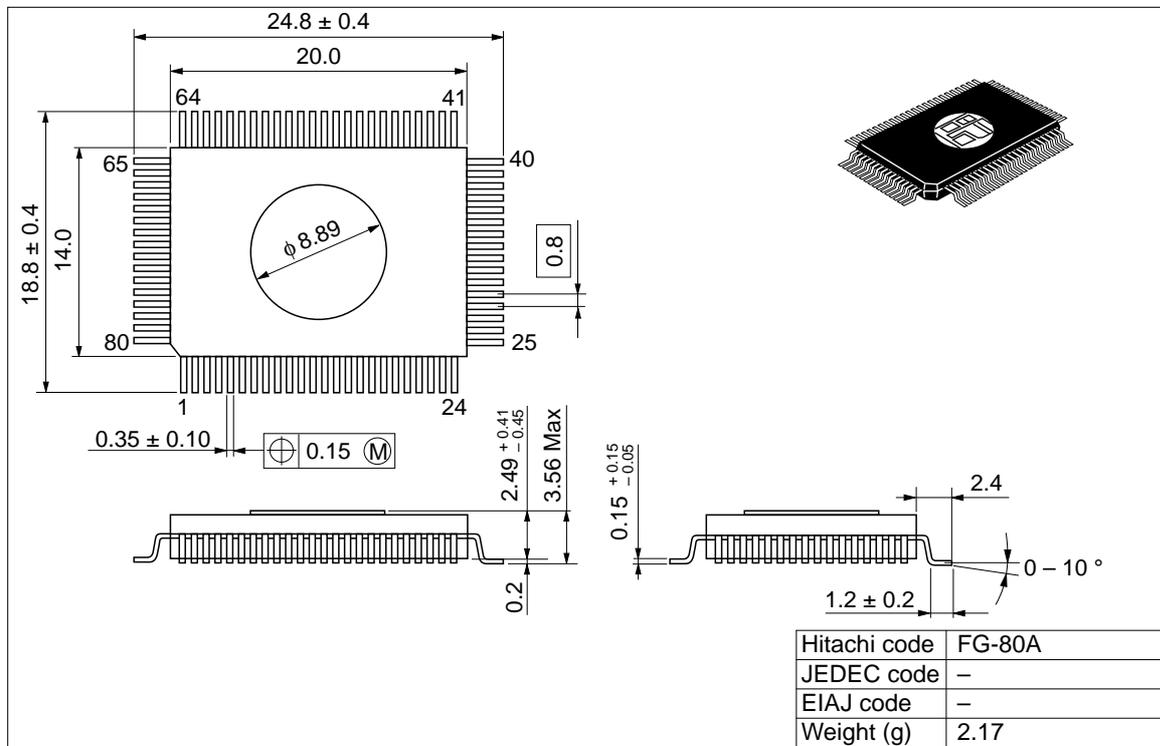
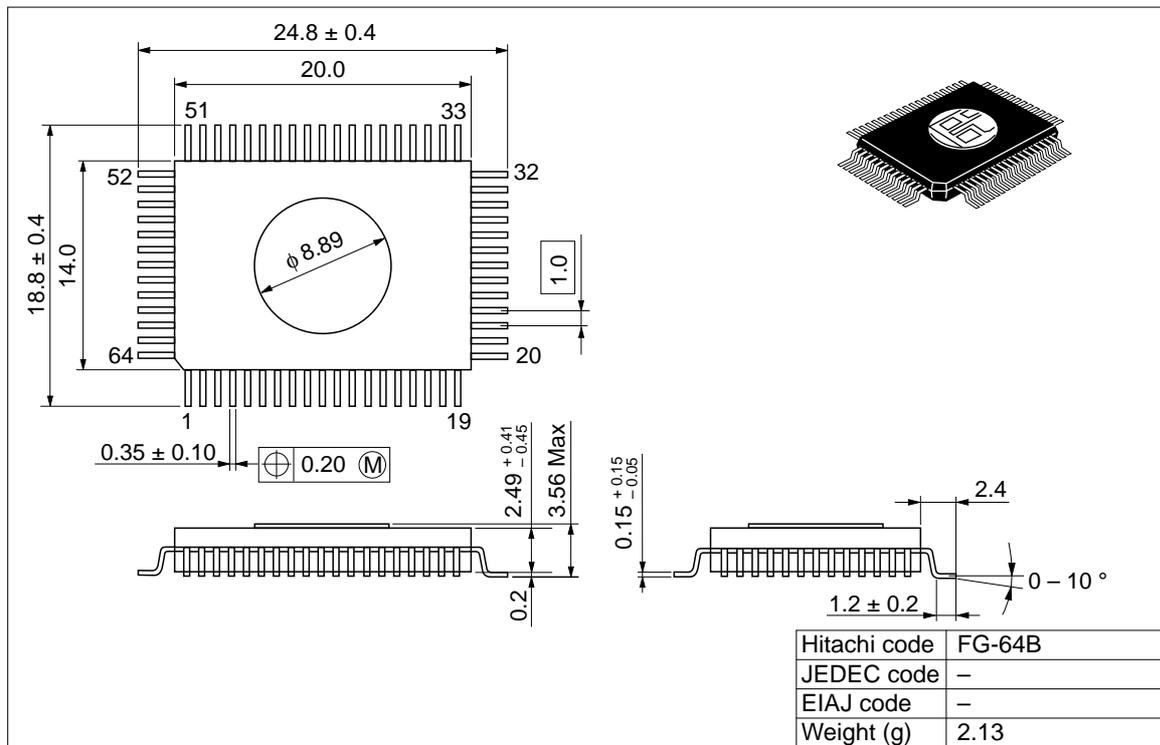
Package Outline Dimensions



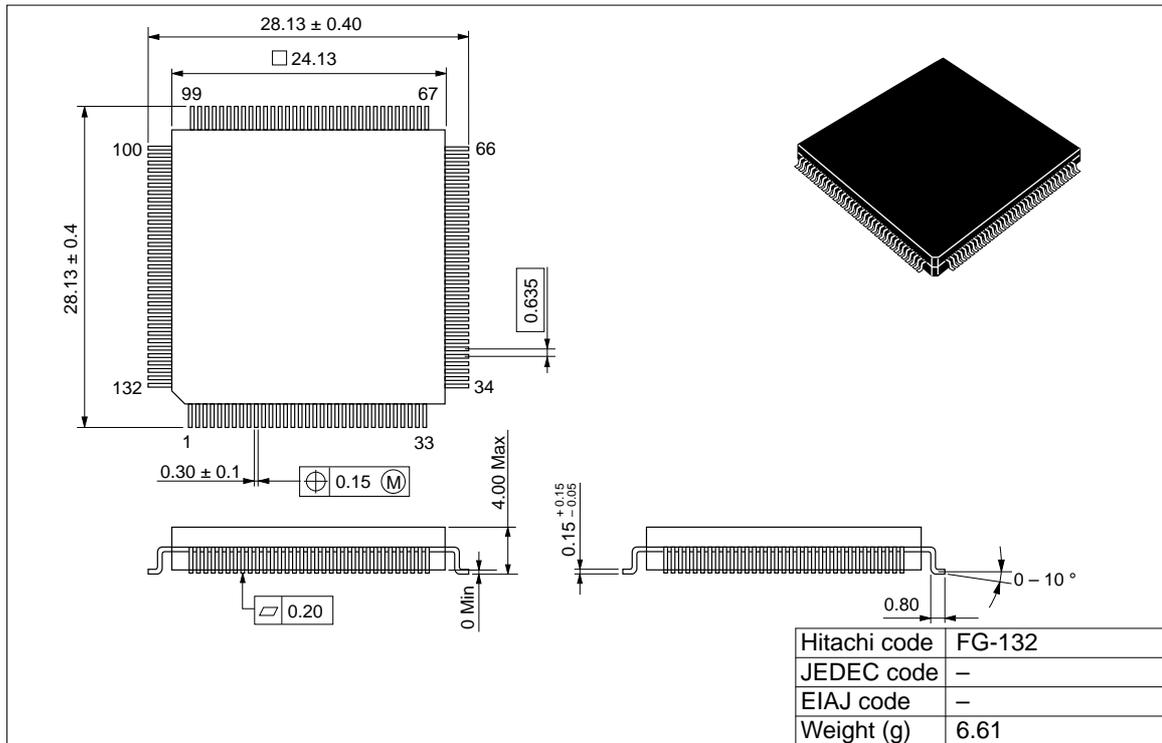
Package Outline Dimensions



Package Outline Dimensions



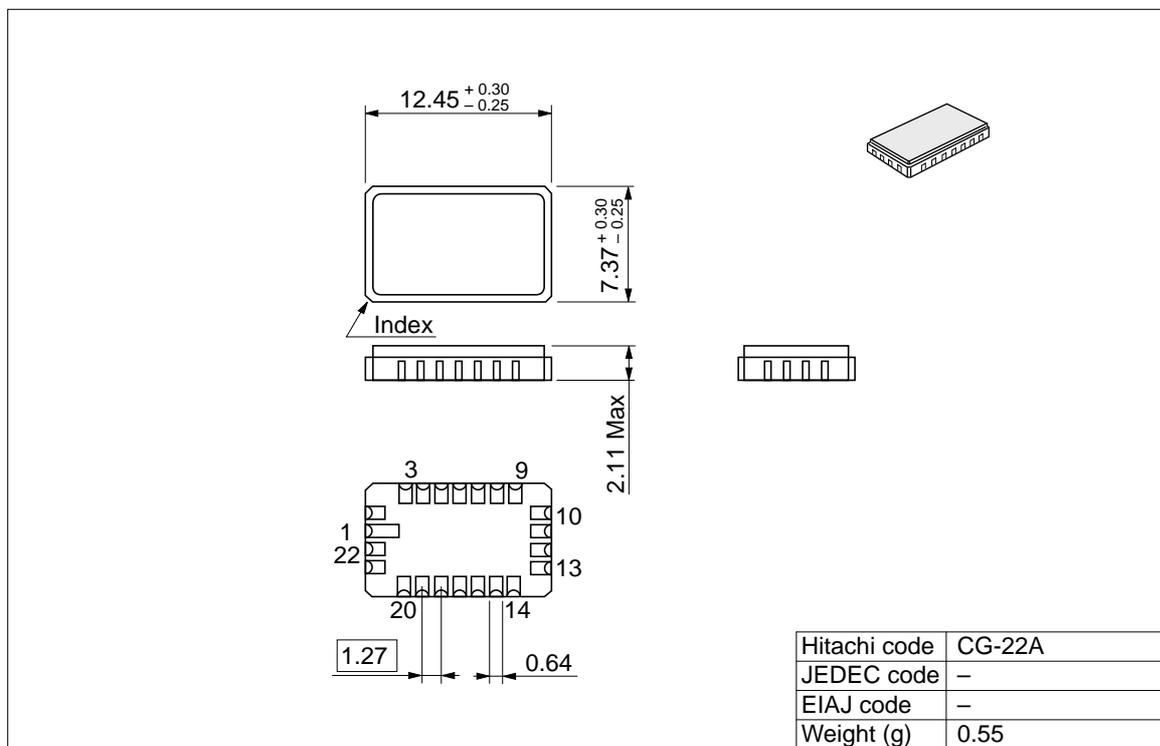
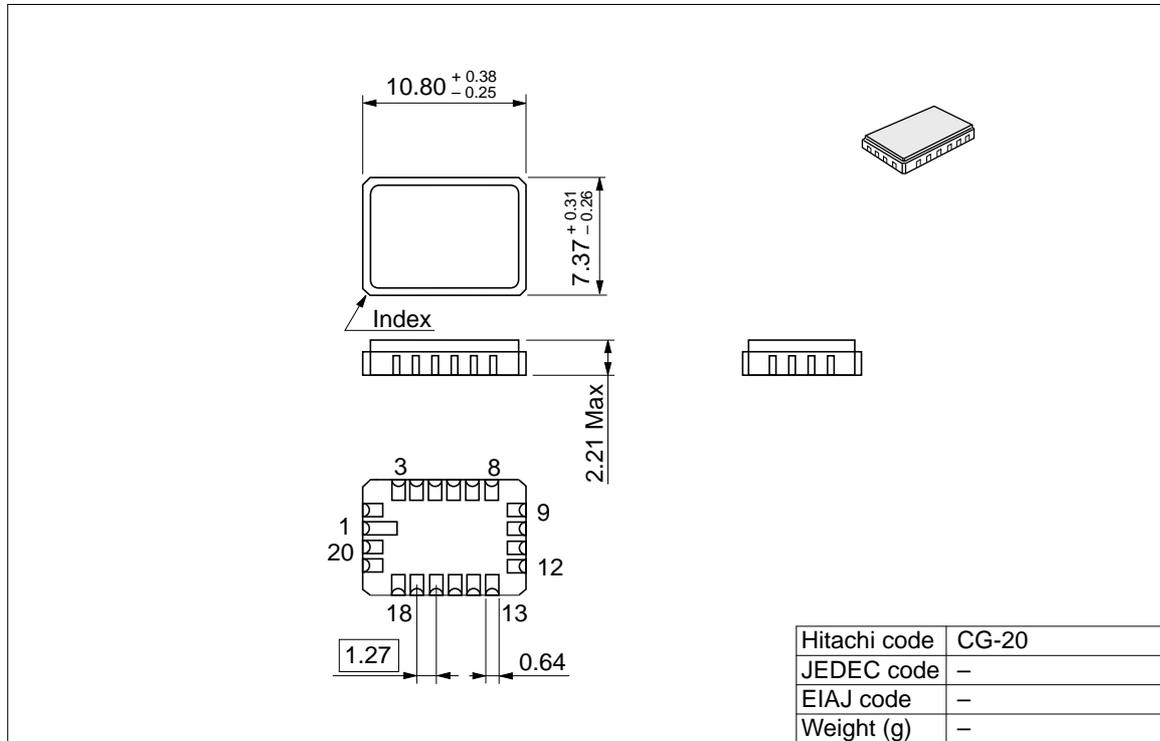
Package Outline Dimensions



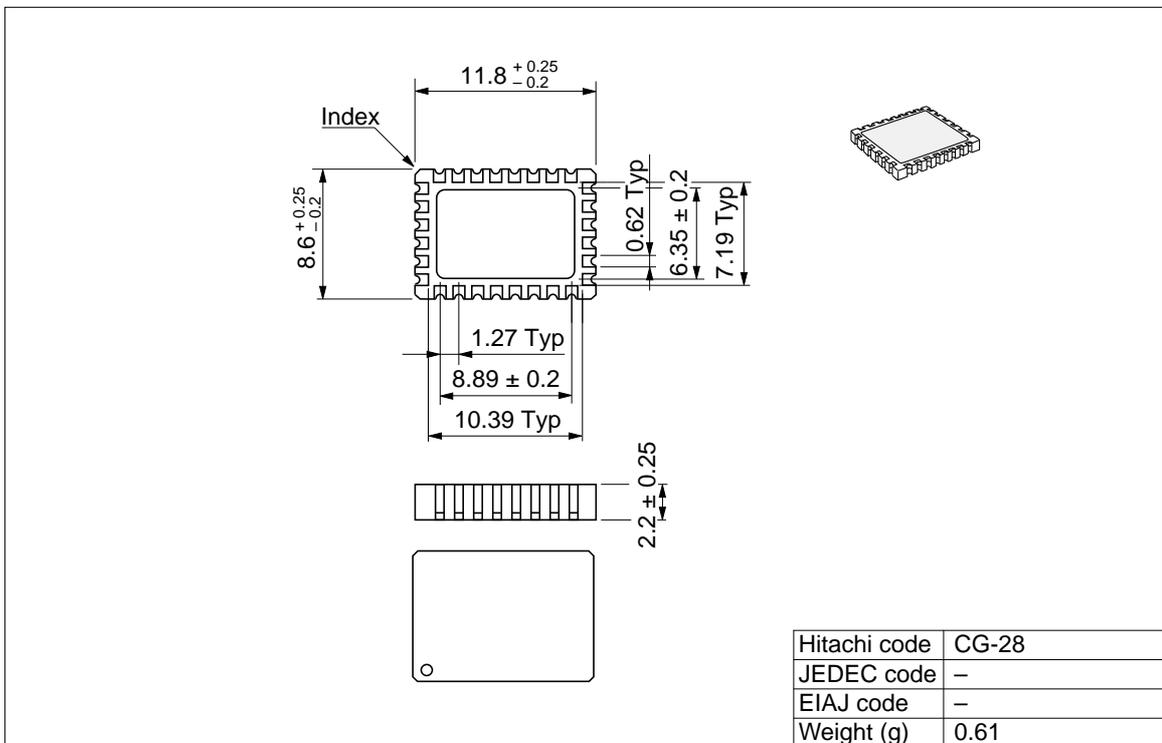
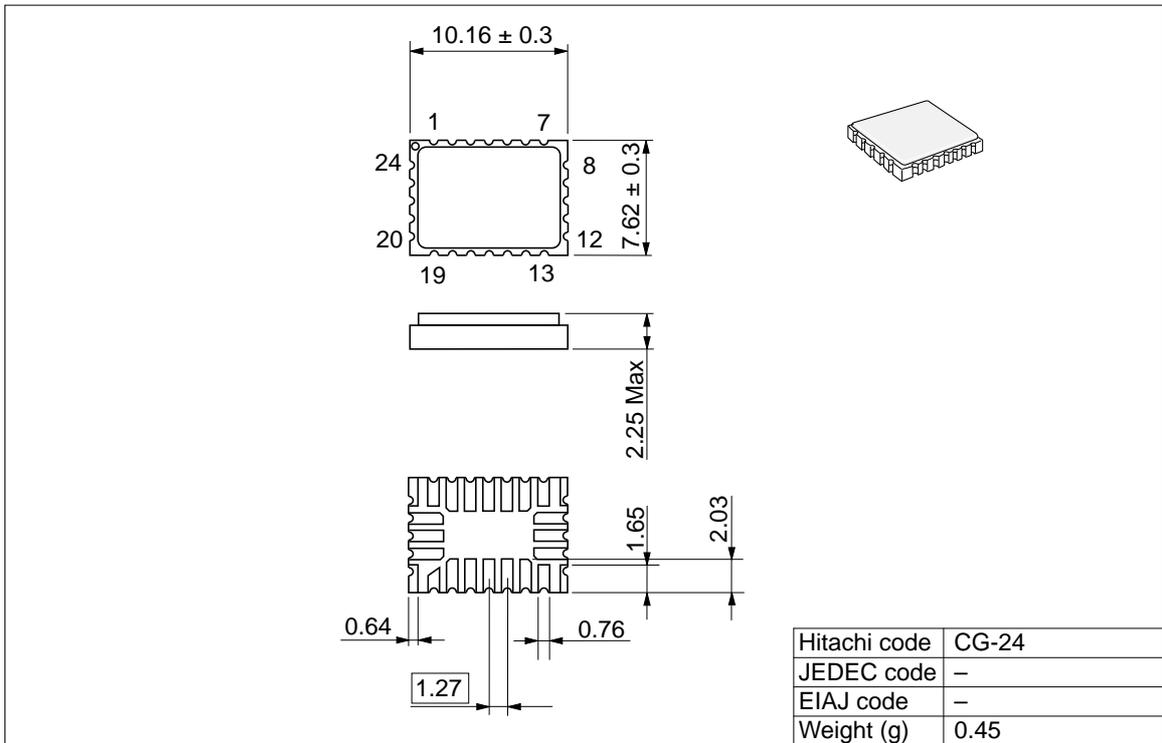
Package Outline Dimensions

(8) Ceramic QFN

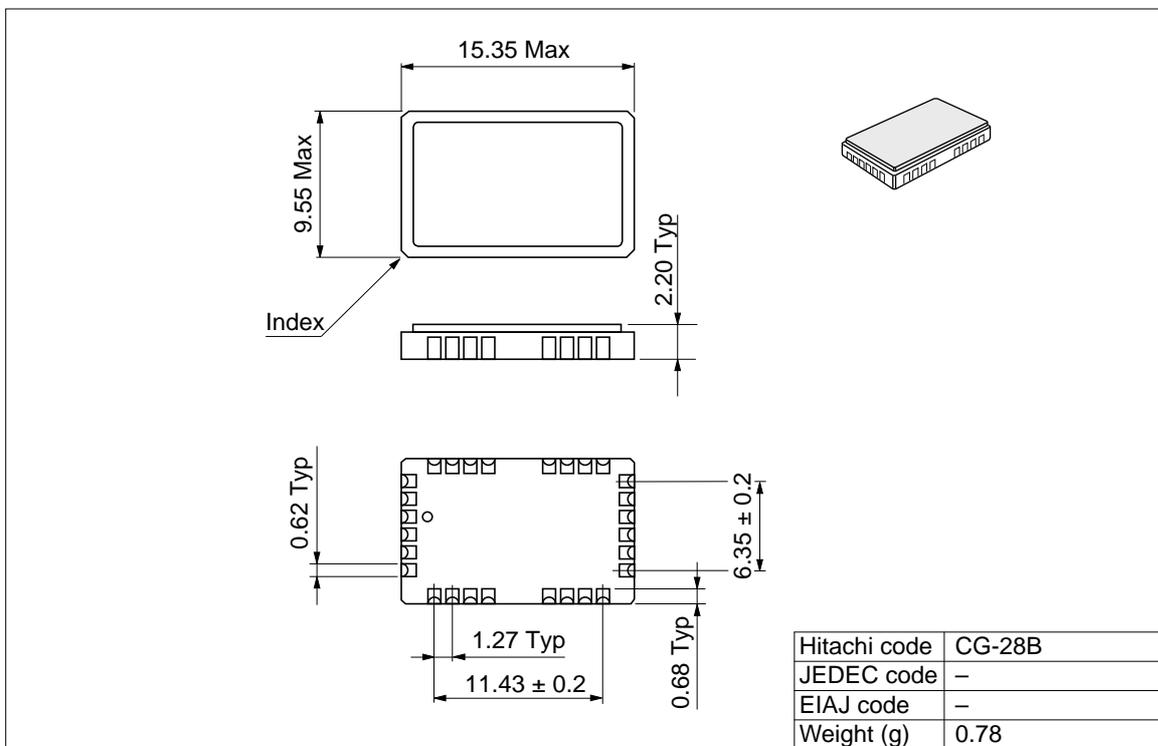
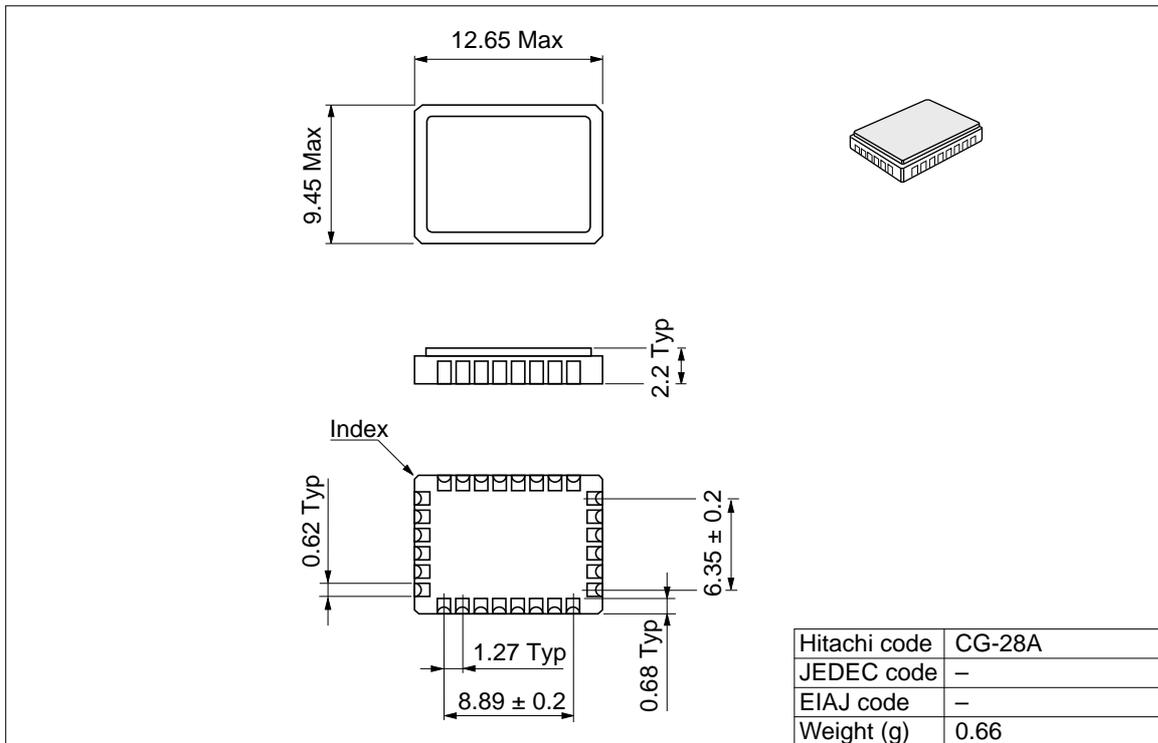
Unit: mm



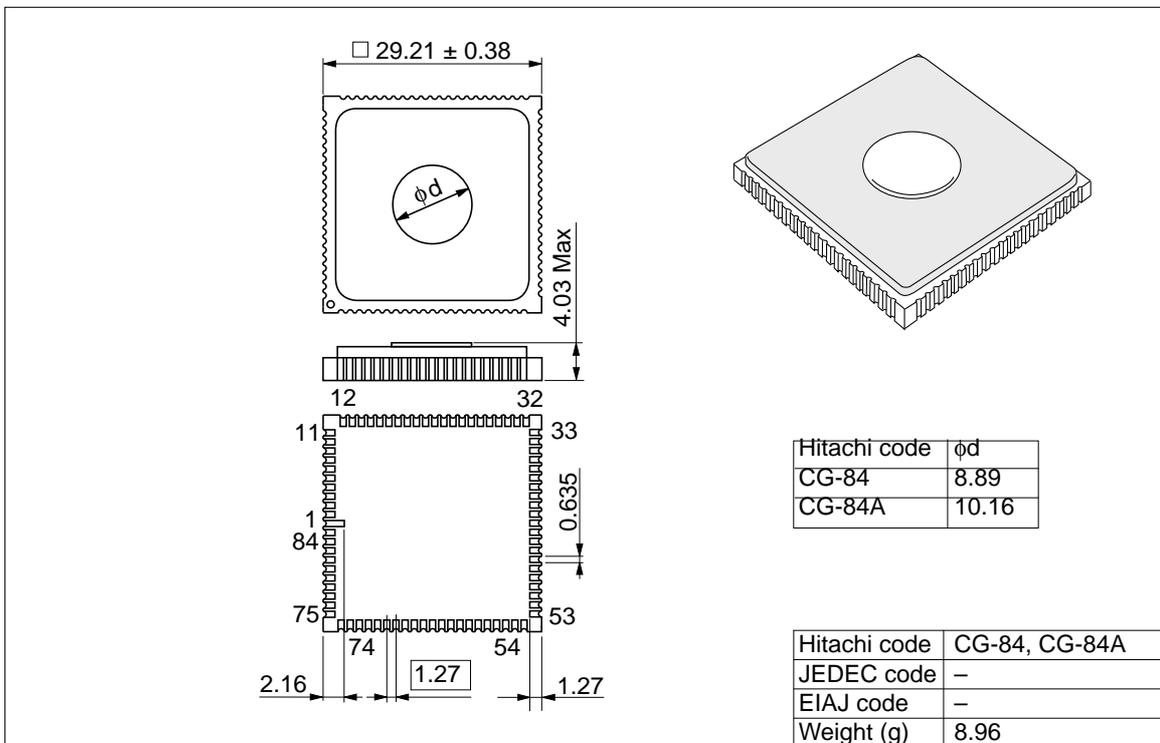
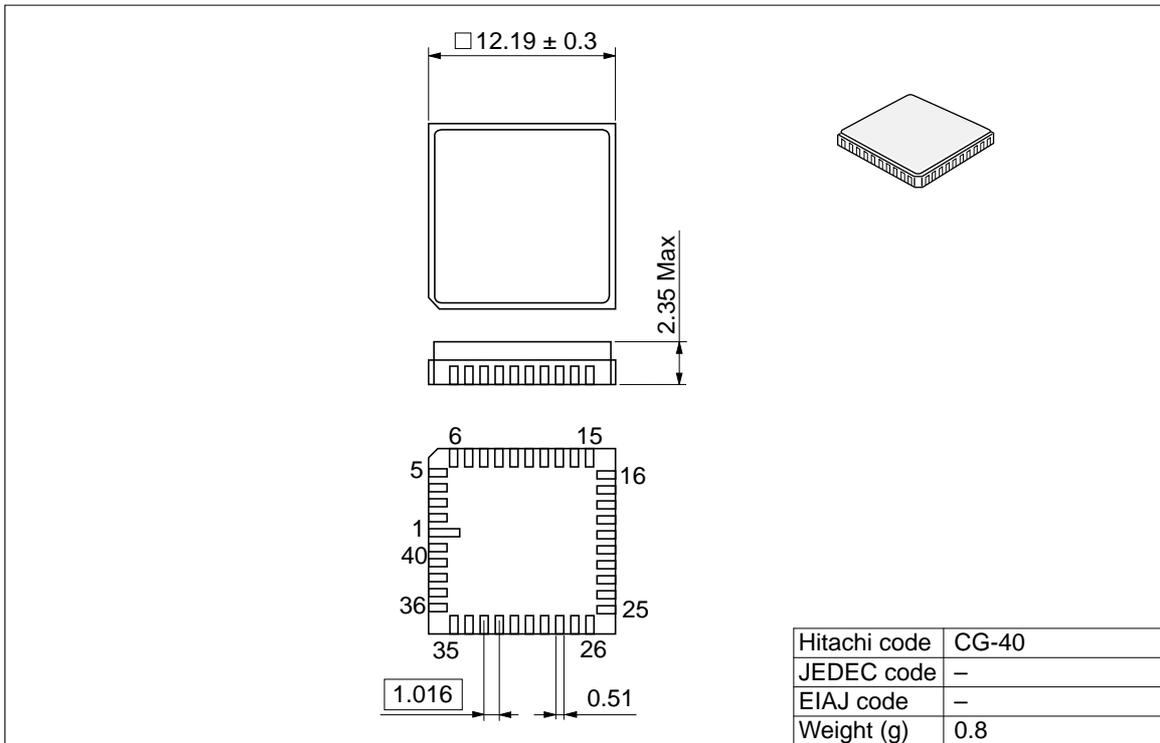
Package Outline Dimensions



Package Outline Dimensions



Package Outline Dimensions

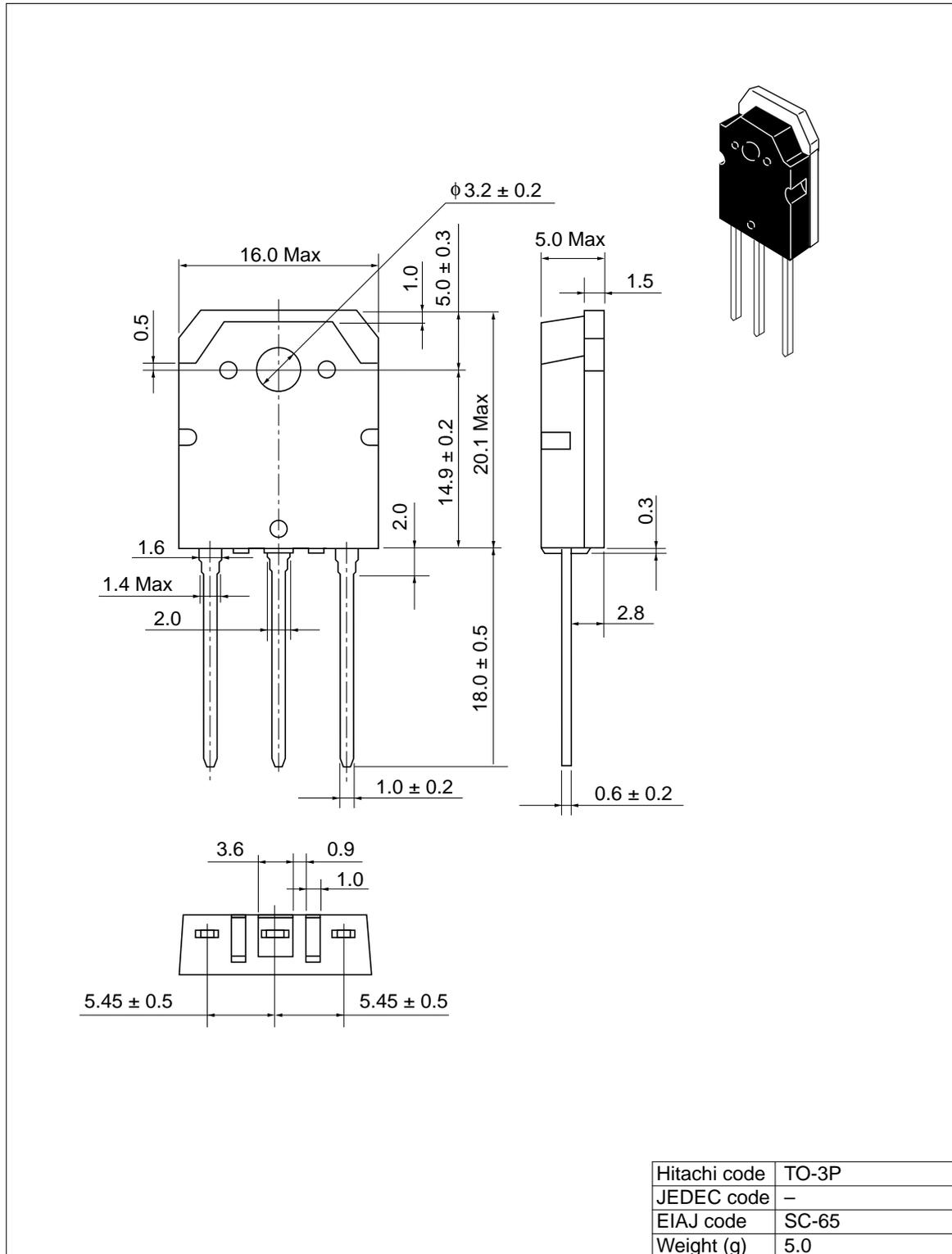


Package Outline Dimensions

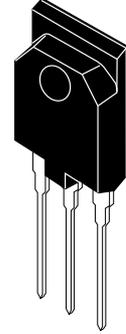
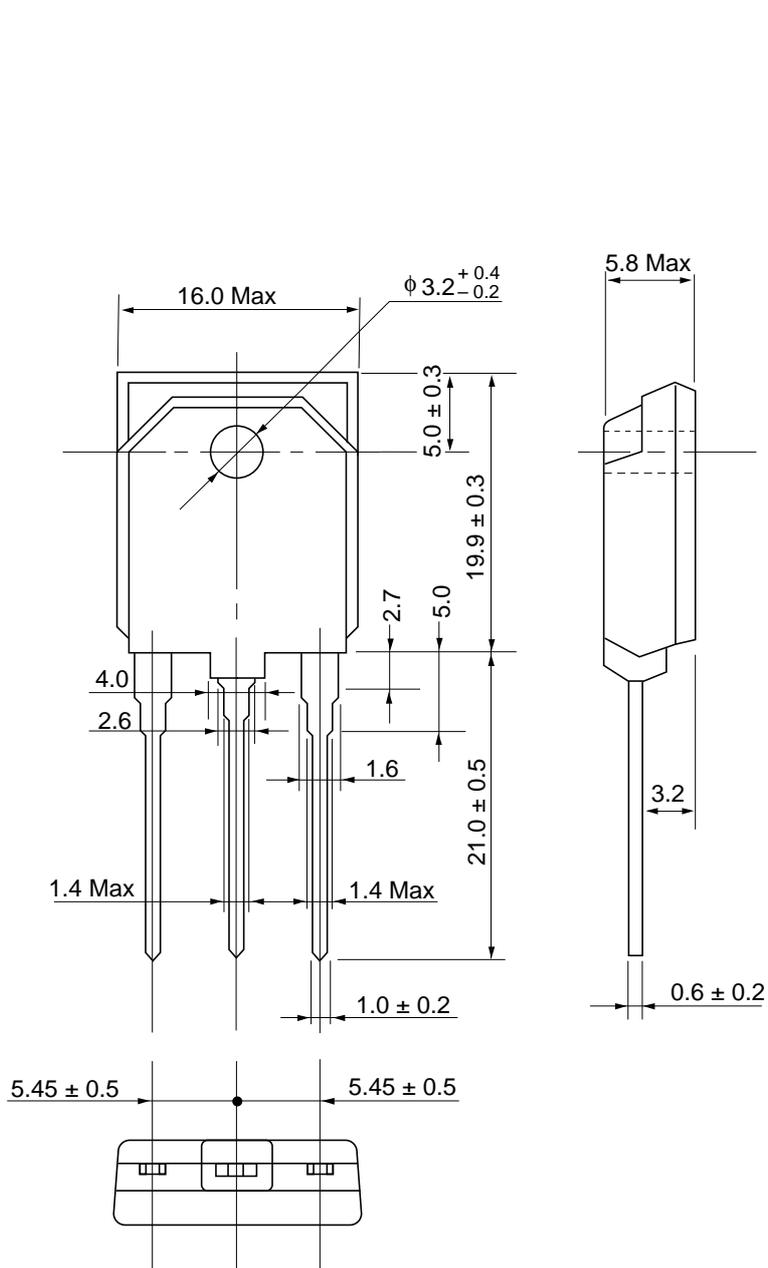
2.2 Transistor Packages

2.2.1 Pin Insertion Packages

Unit: mm

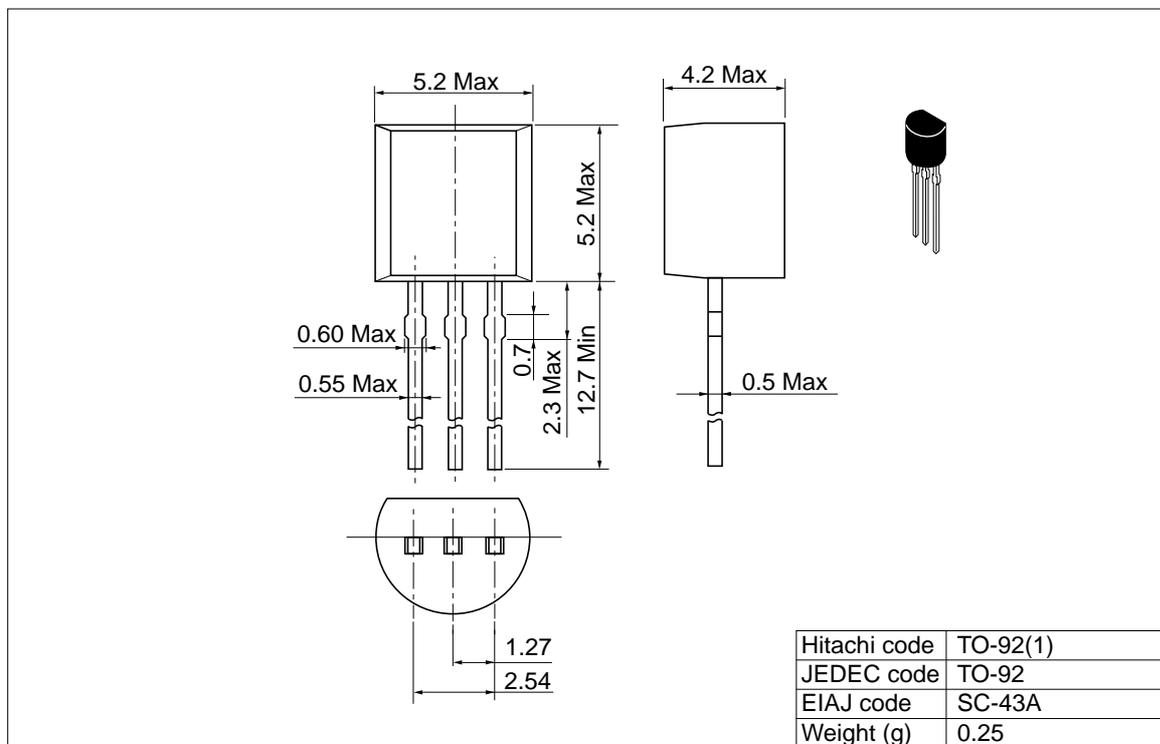
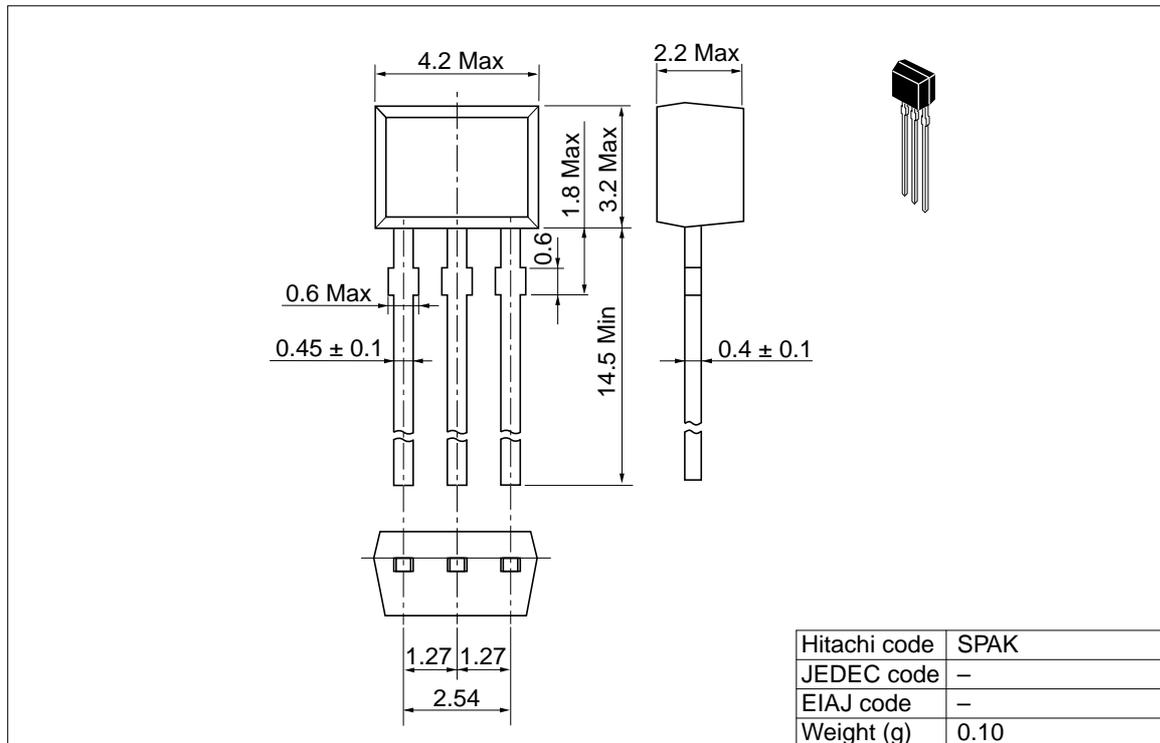


Package Outline Dimensions

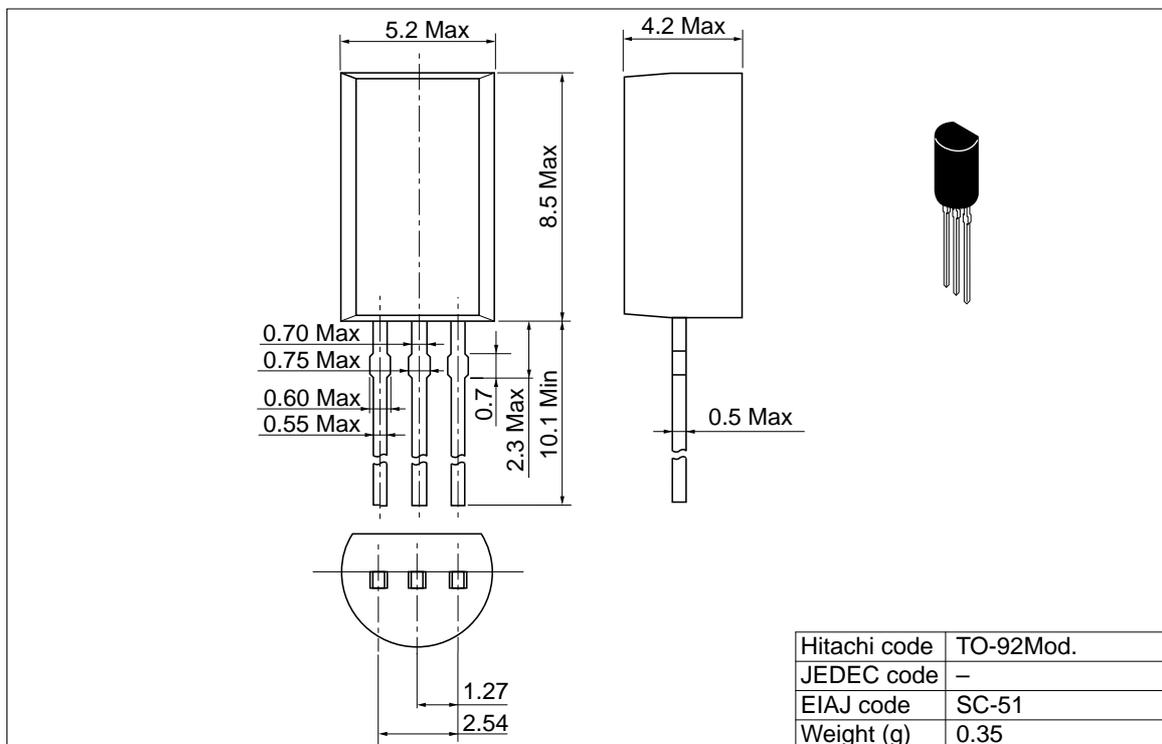
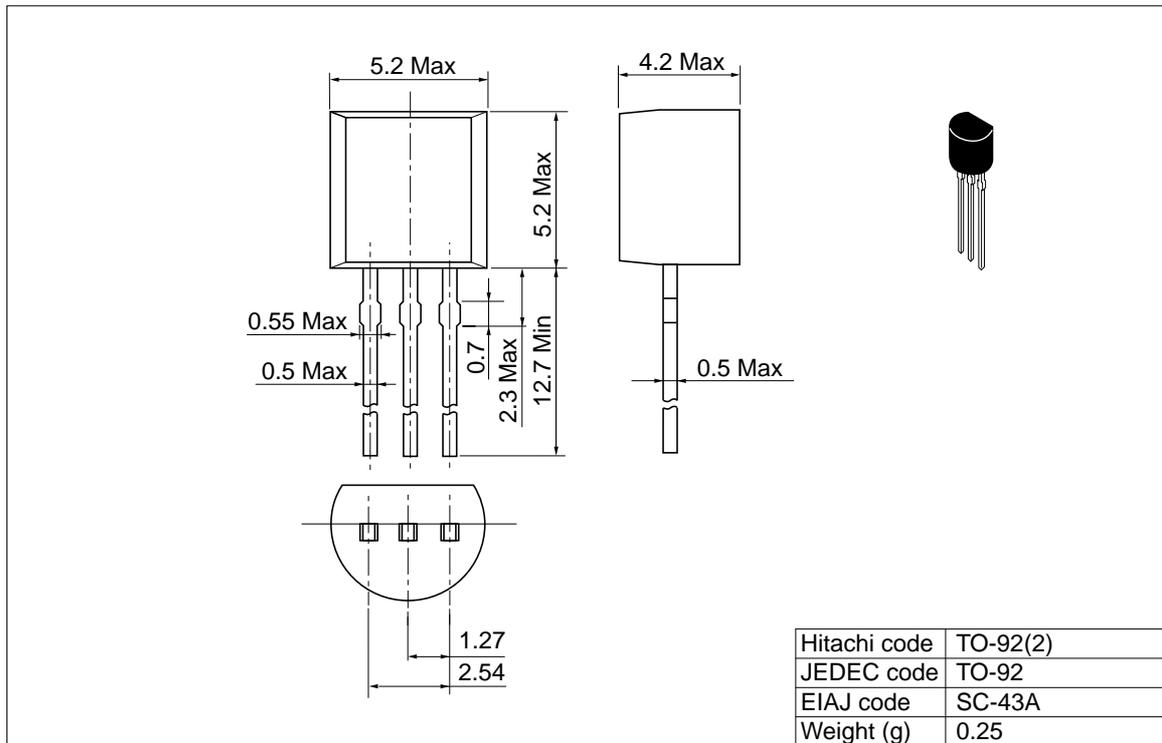


Hitachi code	TO-3PFM
JEDEC code	-
EIAJ code	-
Weight (g)	5.6

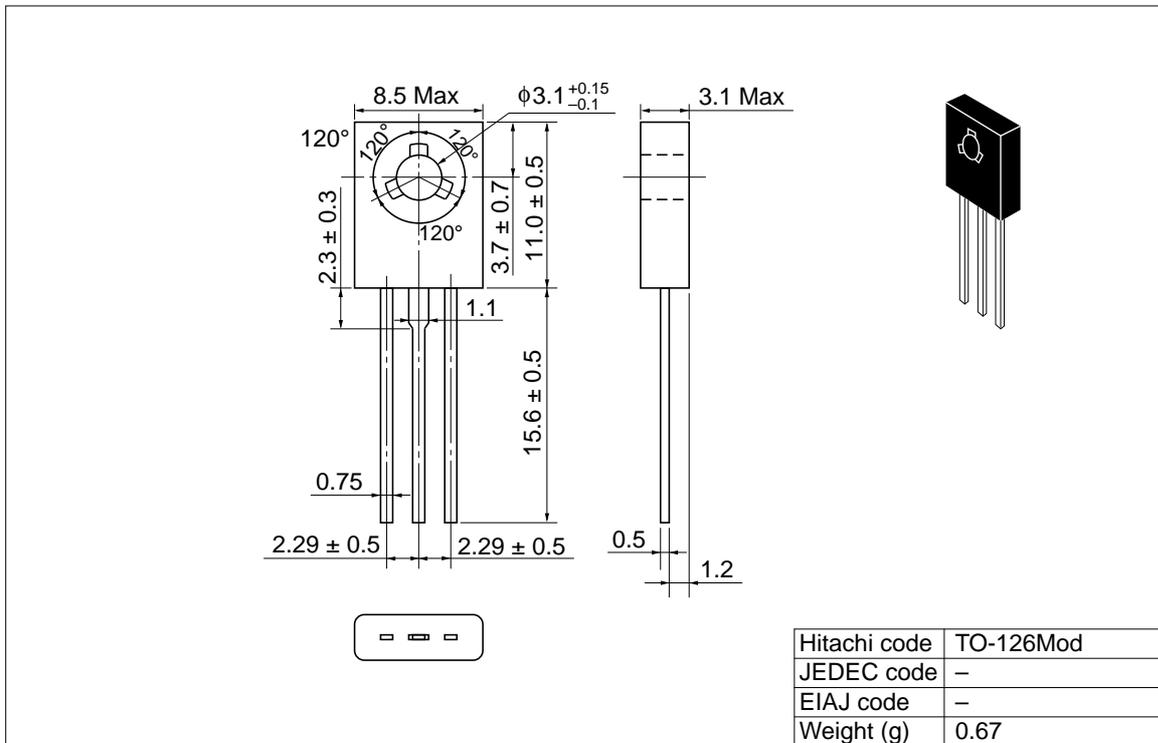
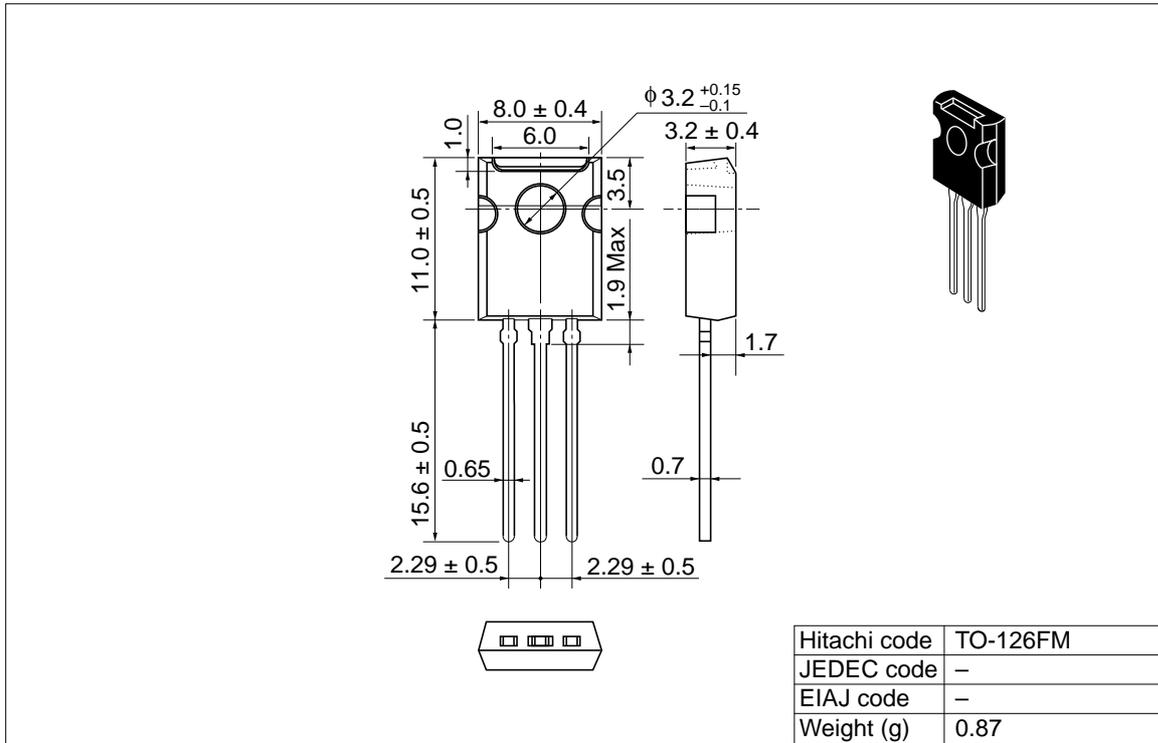
Package Outline Dimensions



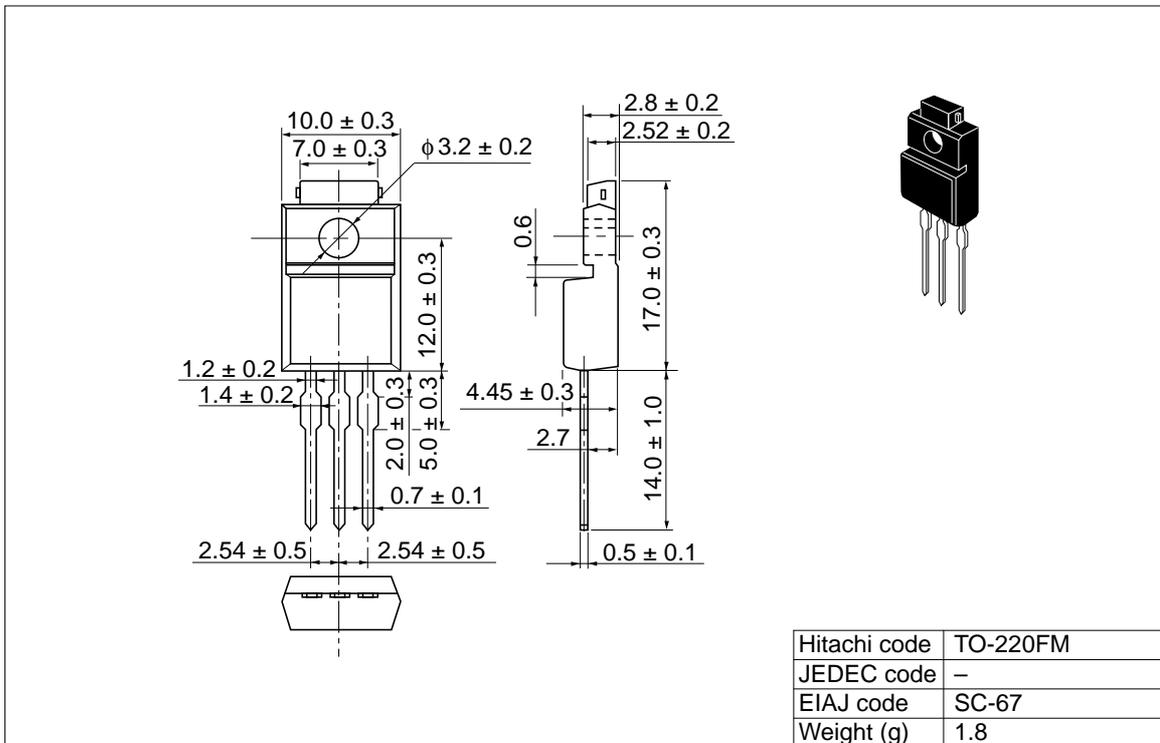
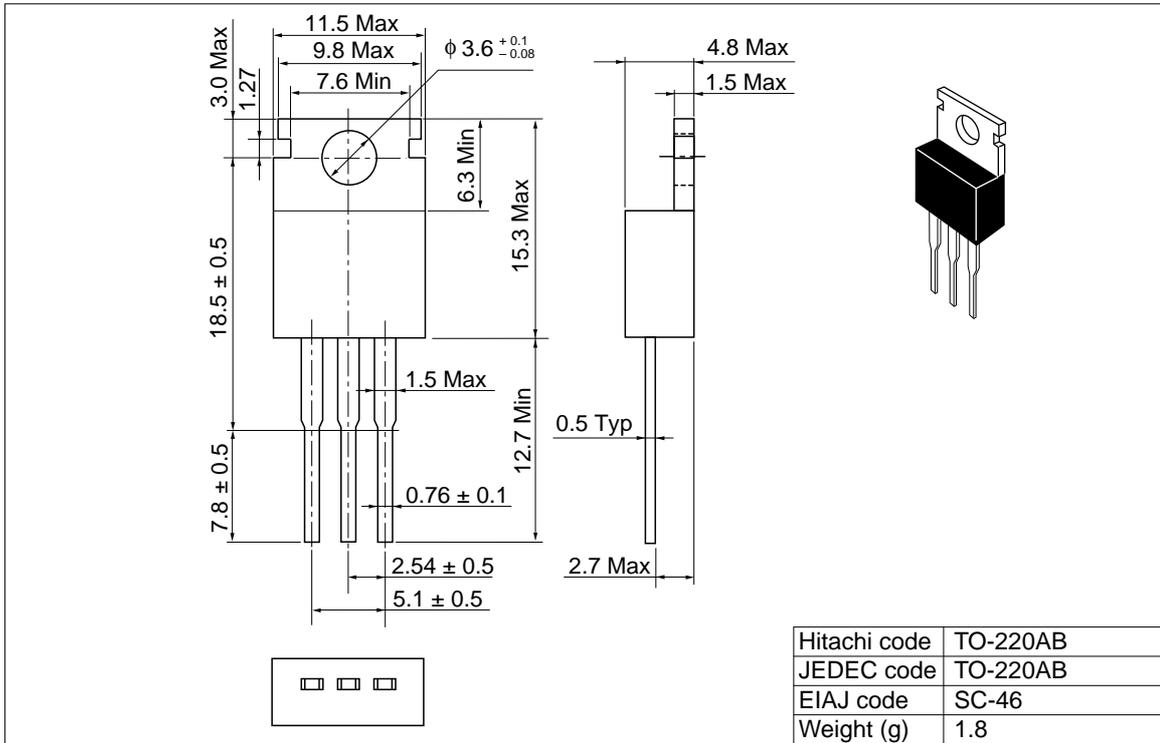
Package Outline Dimensions



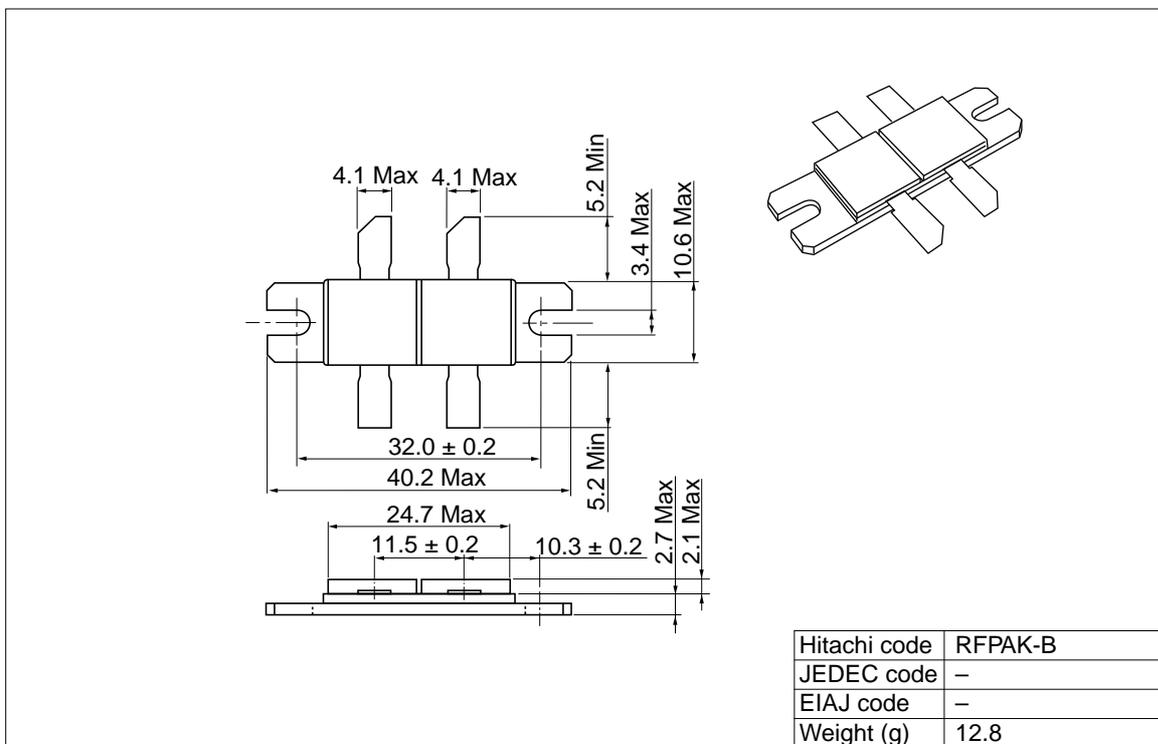
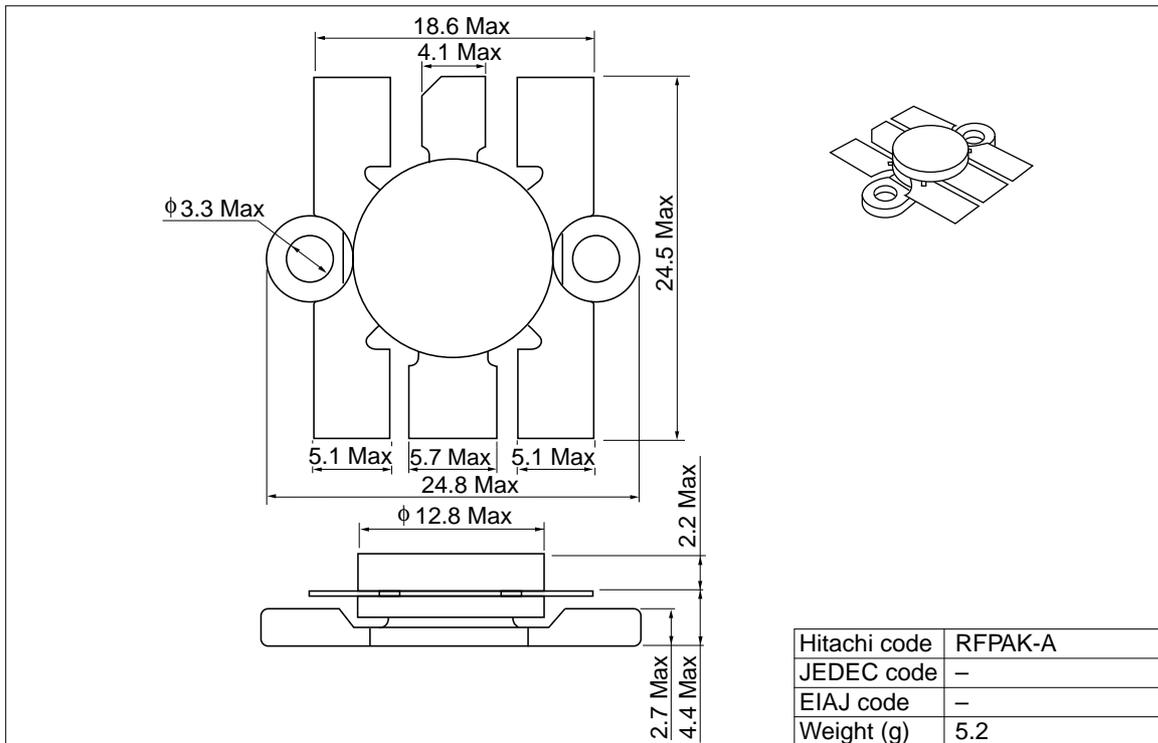
Package Outline Dimensions



Package Outline Dimensions



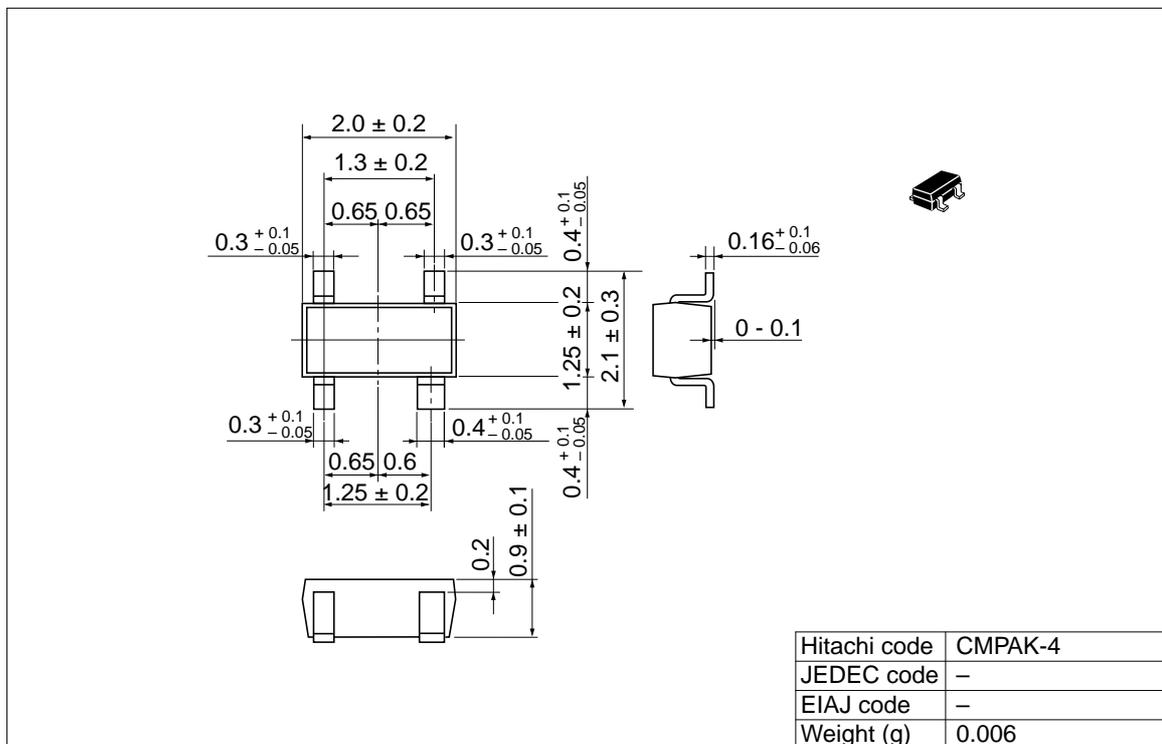
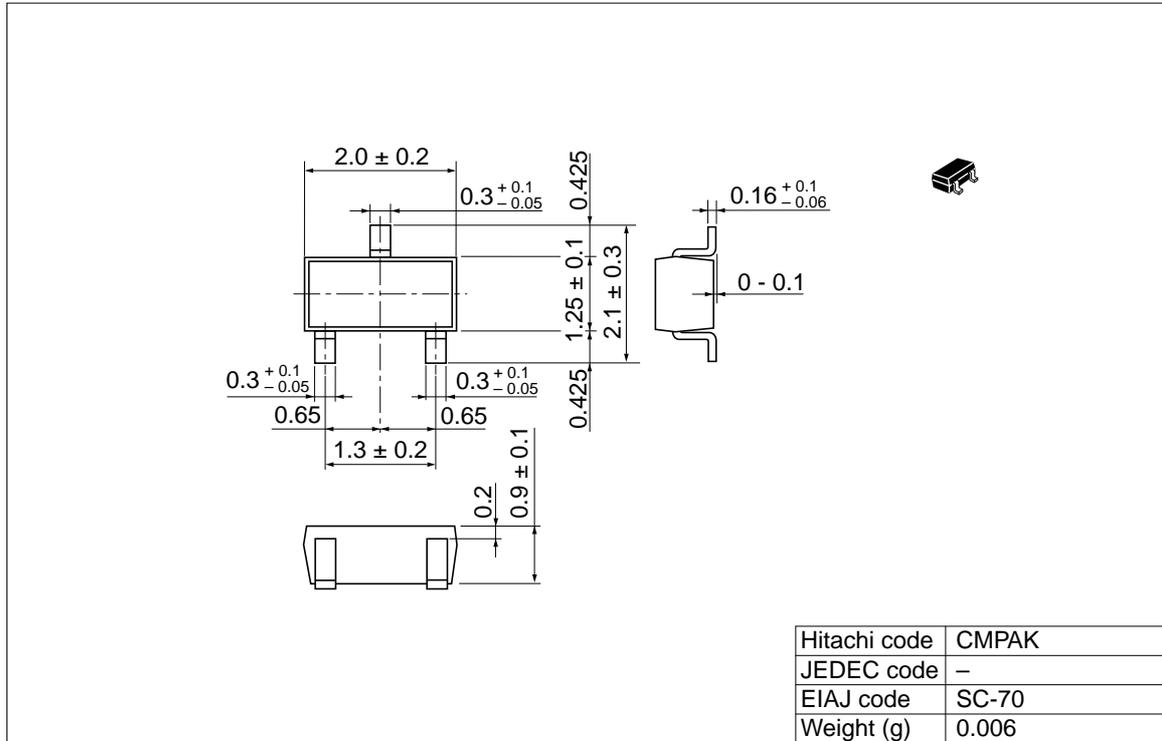
Package Outline Dimensions



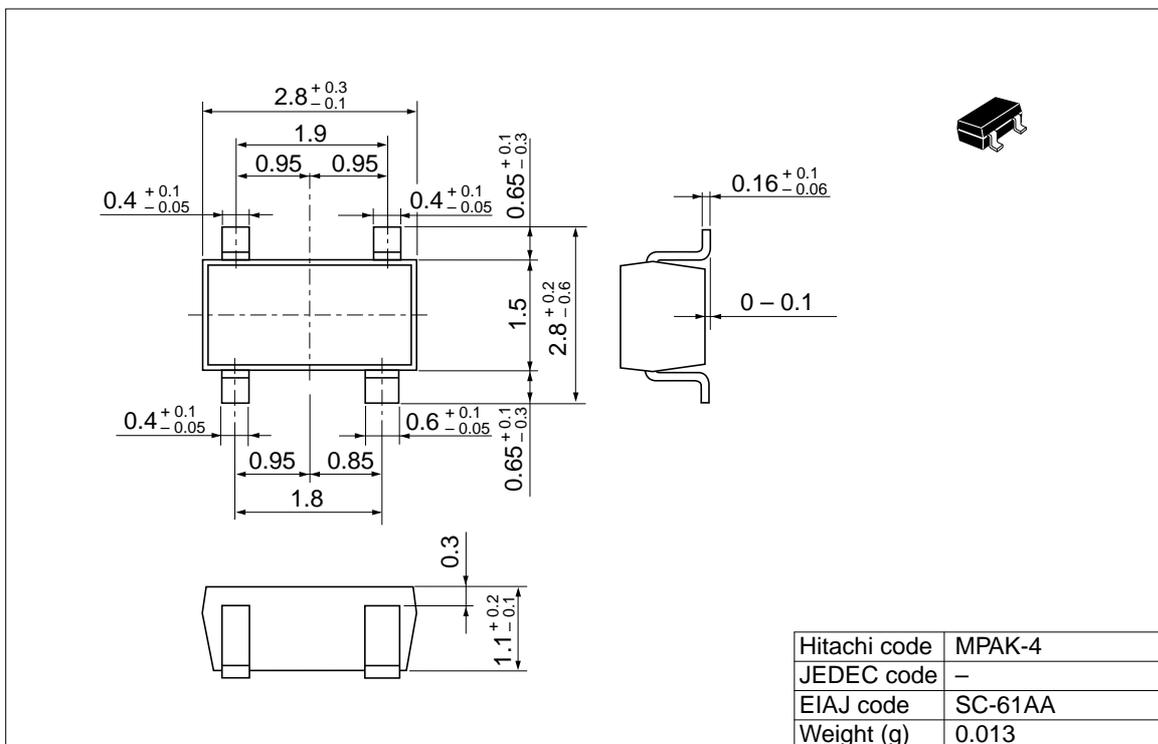
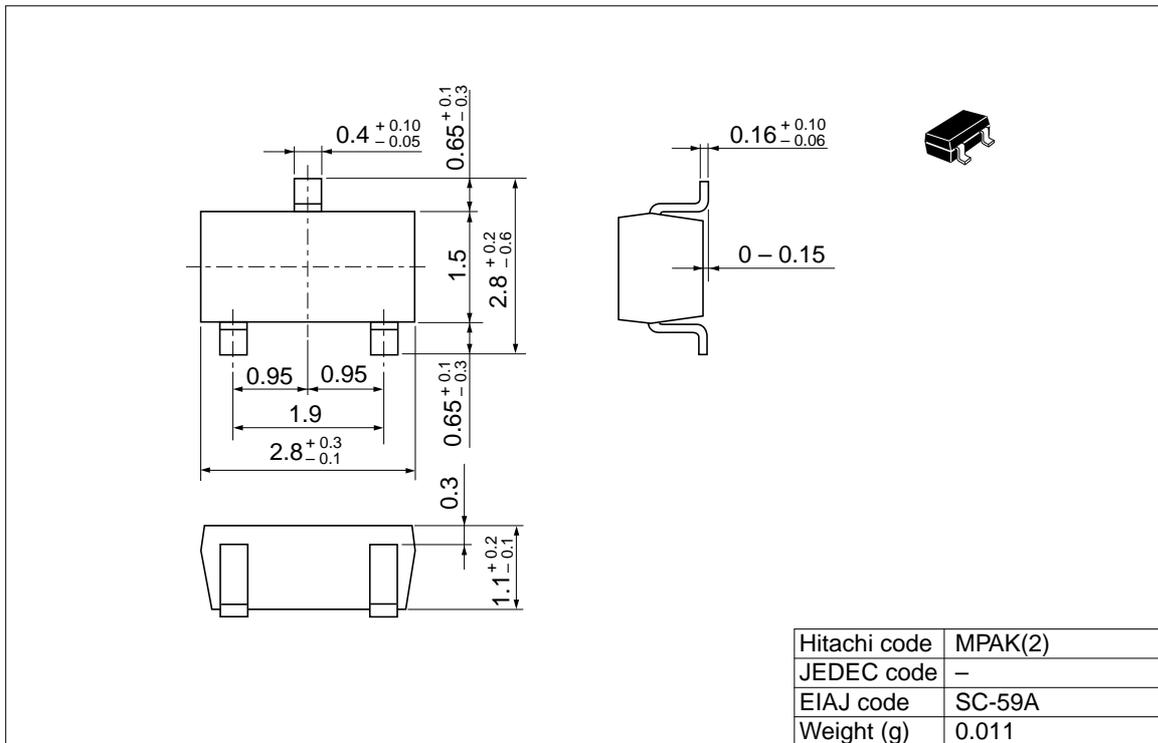
Package Outline Dimensions

2.2.2 Surface Mount Packages

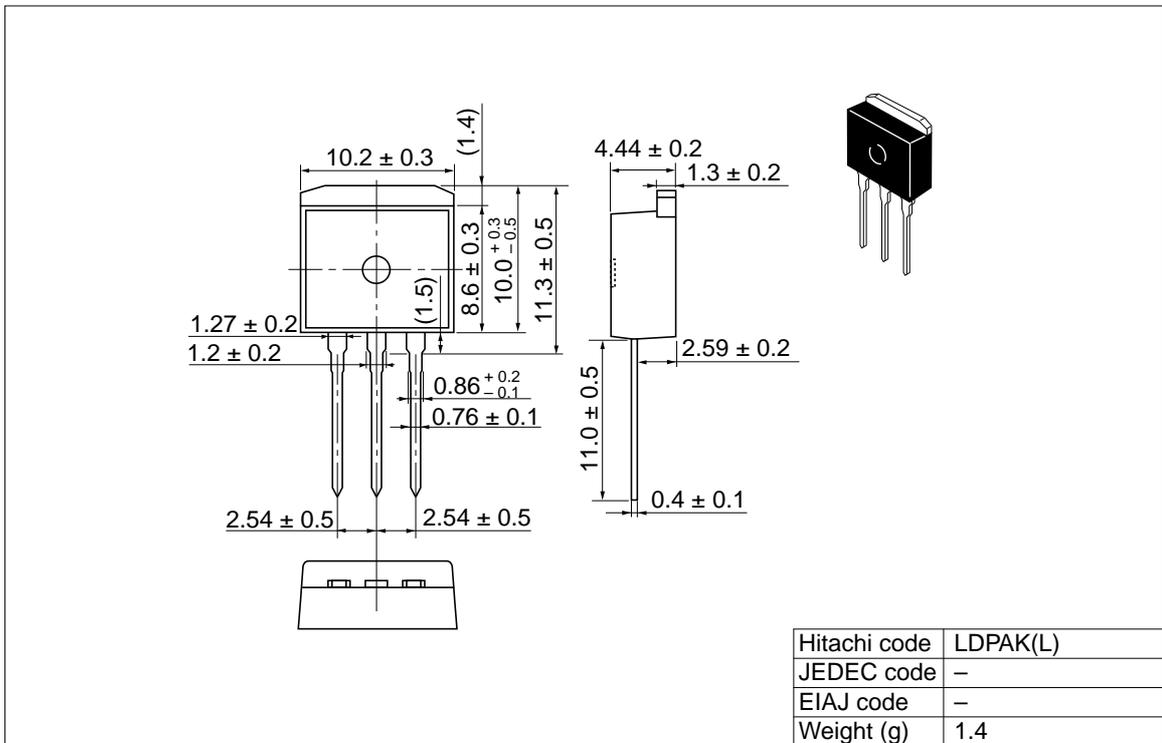
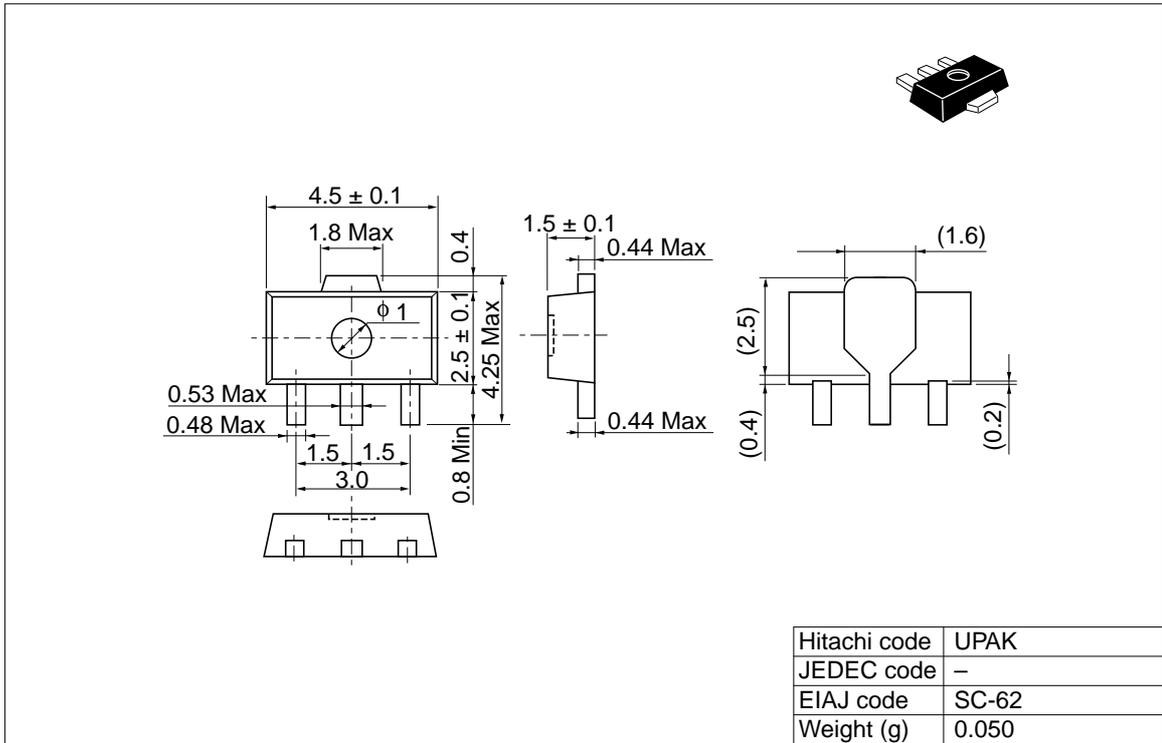
Unit: mm



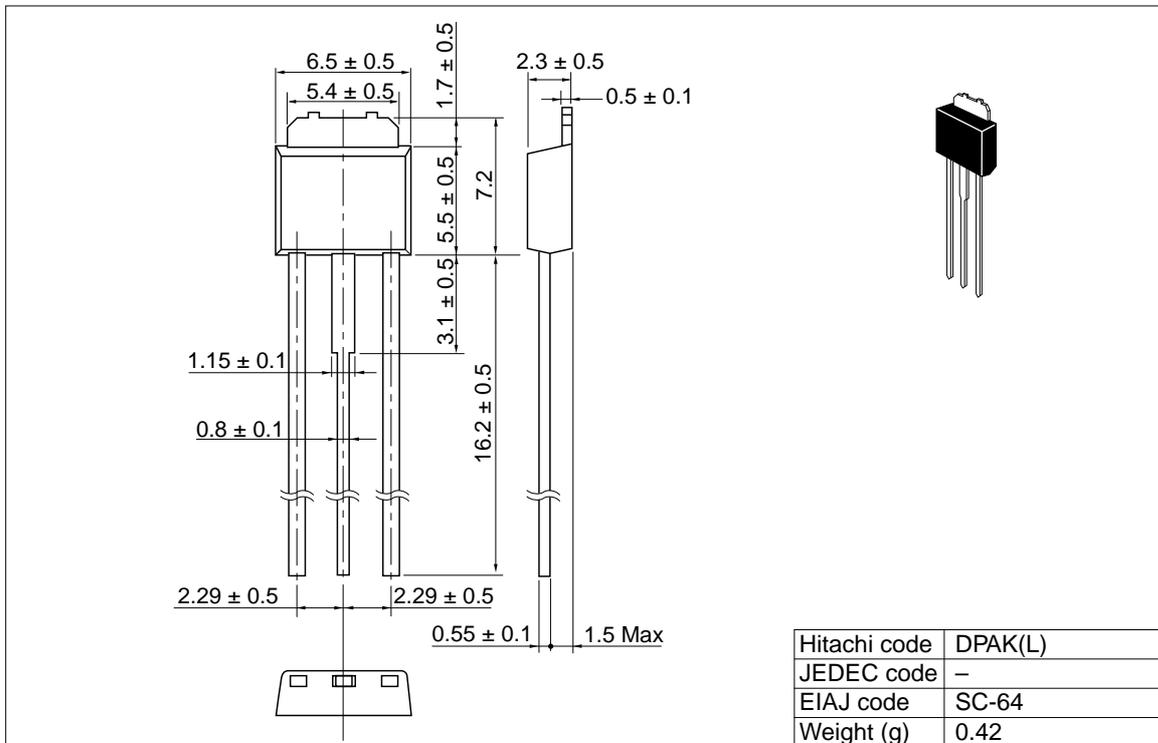
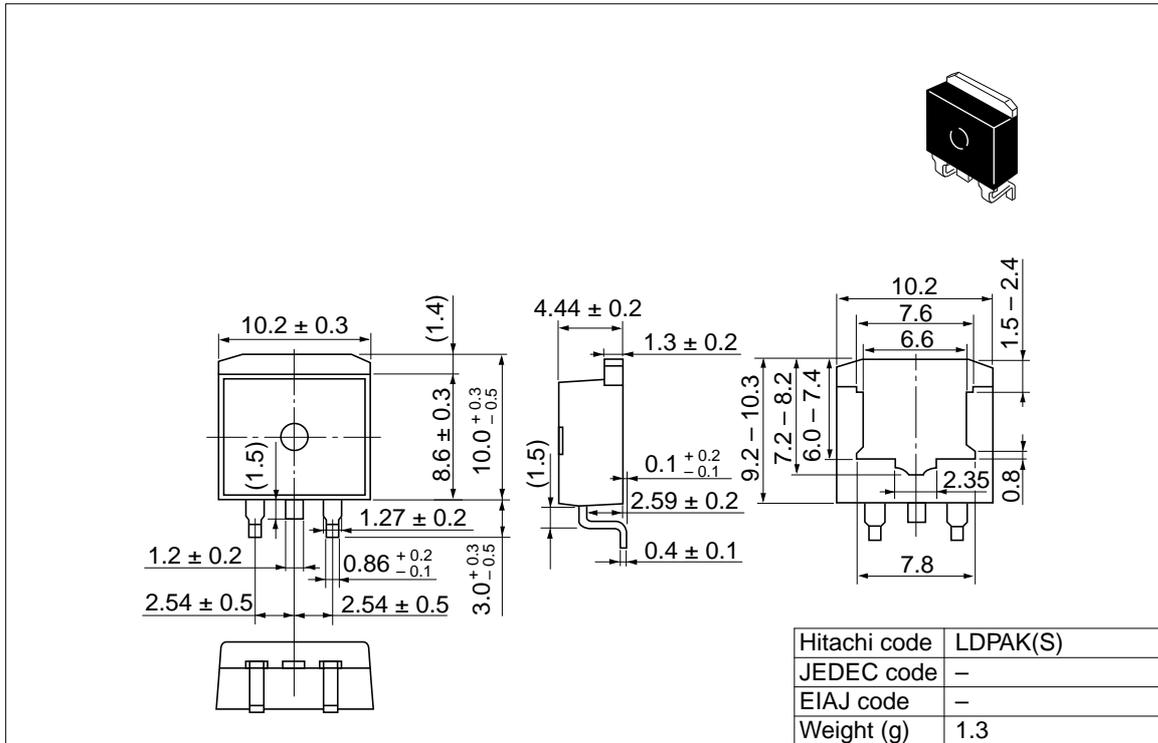
Package Outline Dimensions



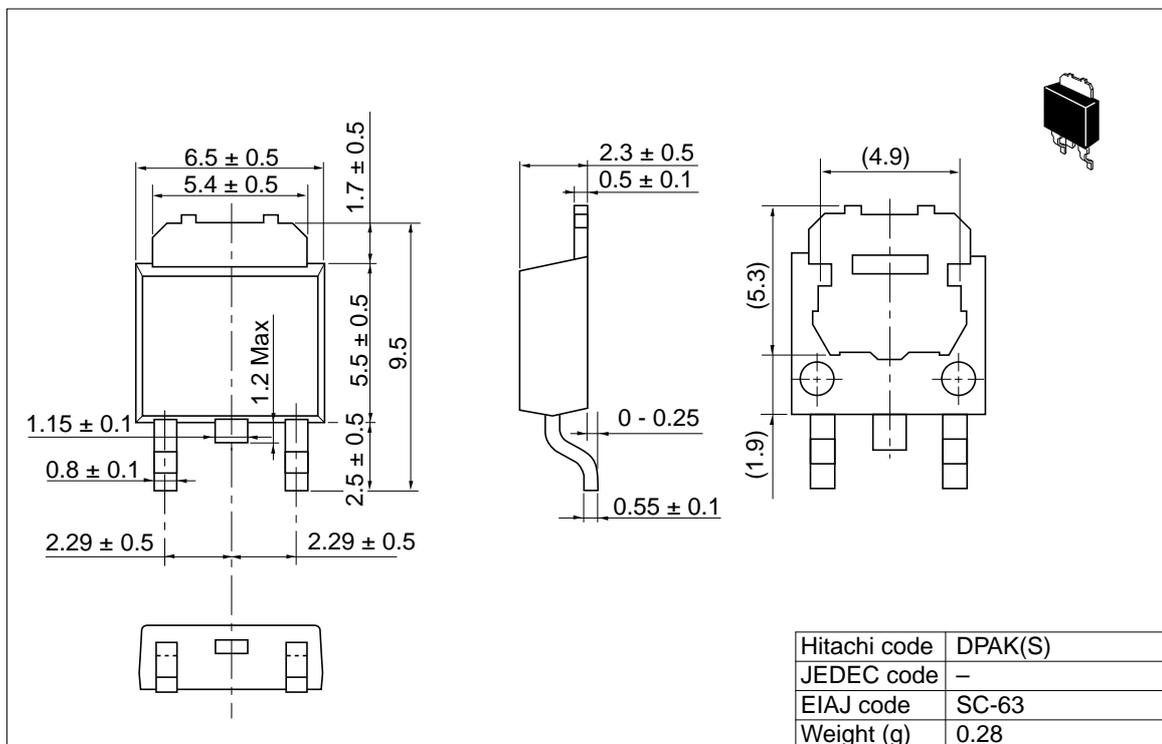
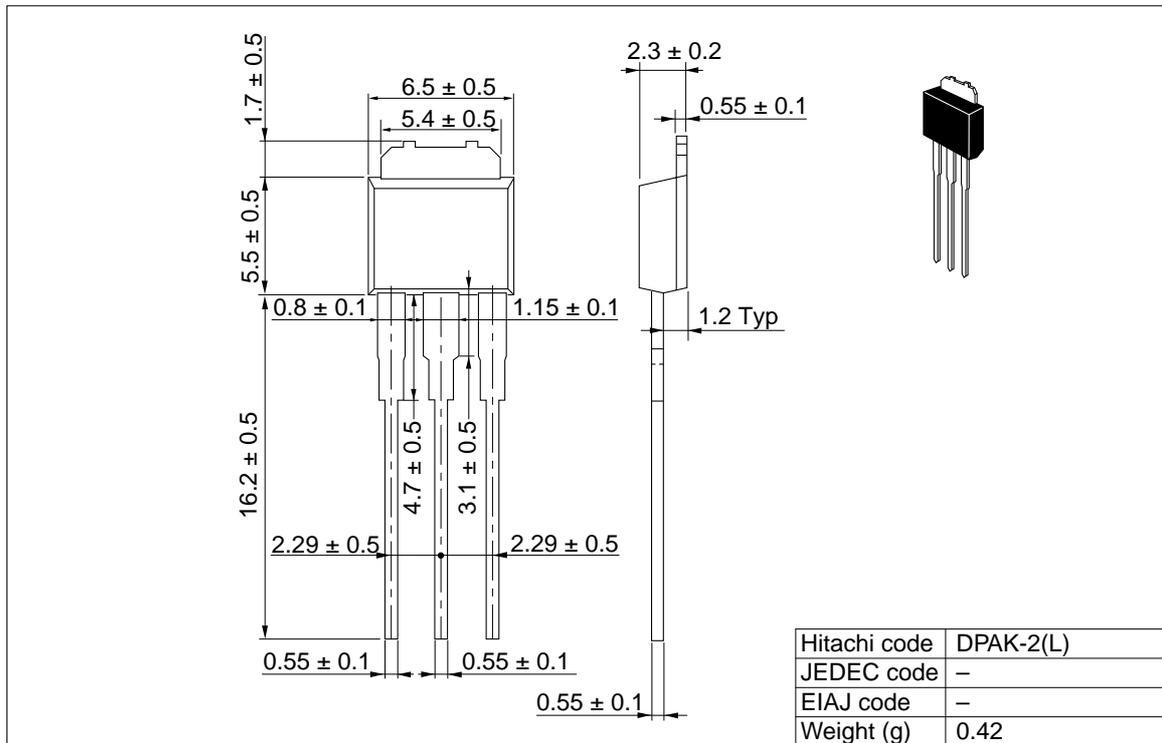
Package Outline Dimensions



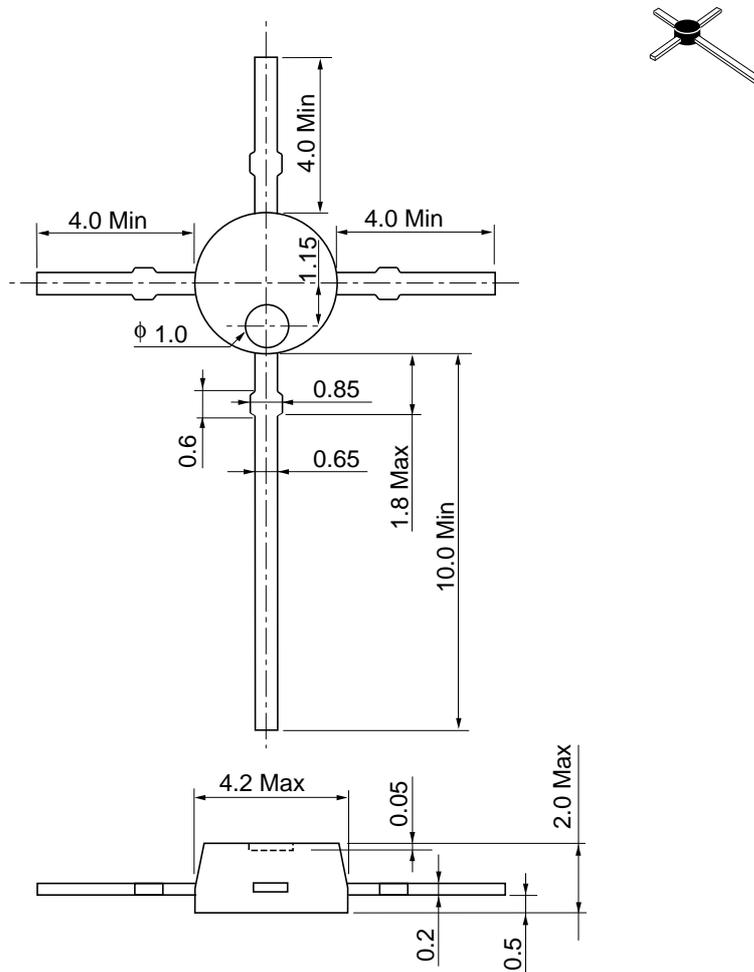
Package Outline Dimensions



Package Outline Dimensions

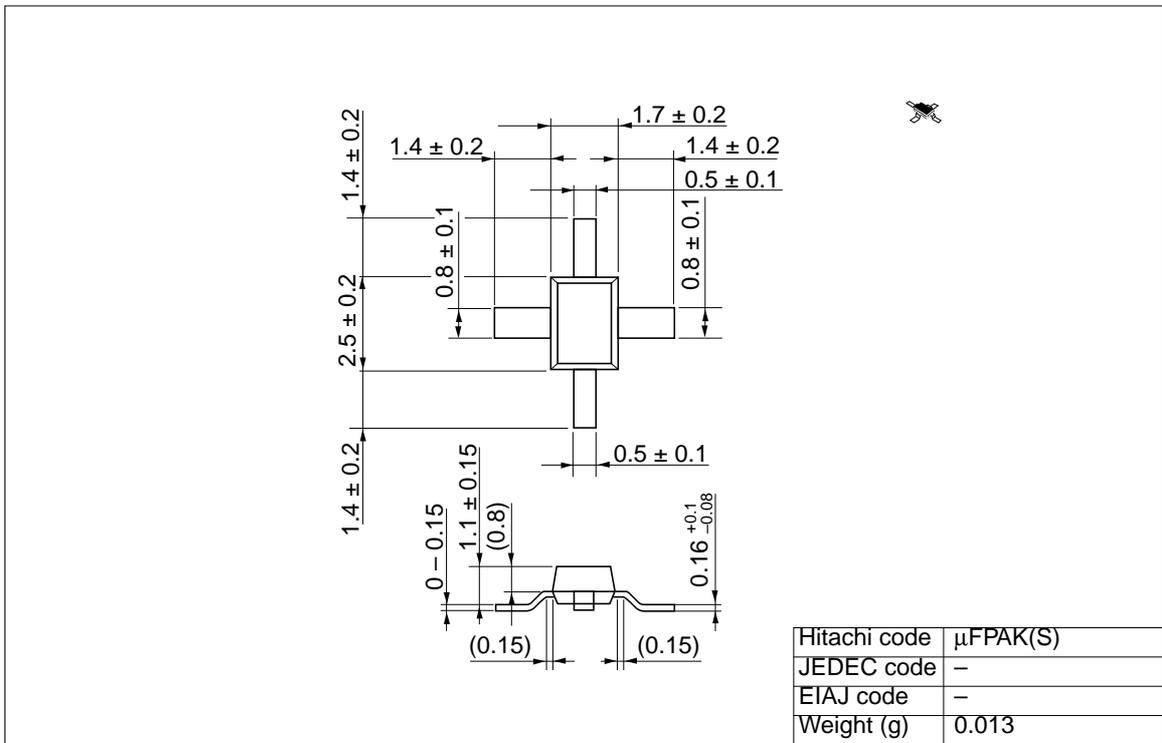
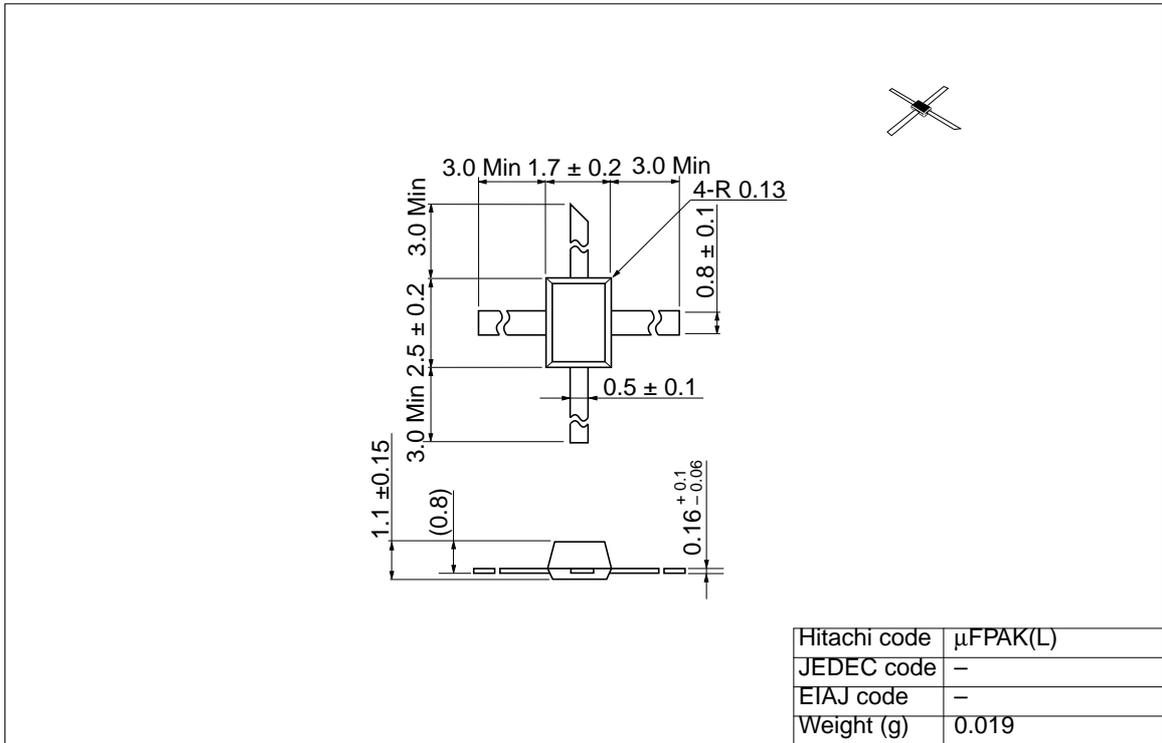


Package Outline Dimensions

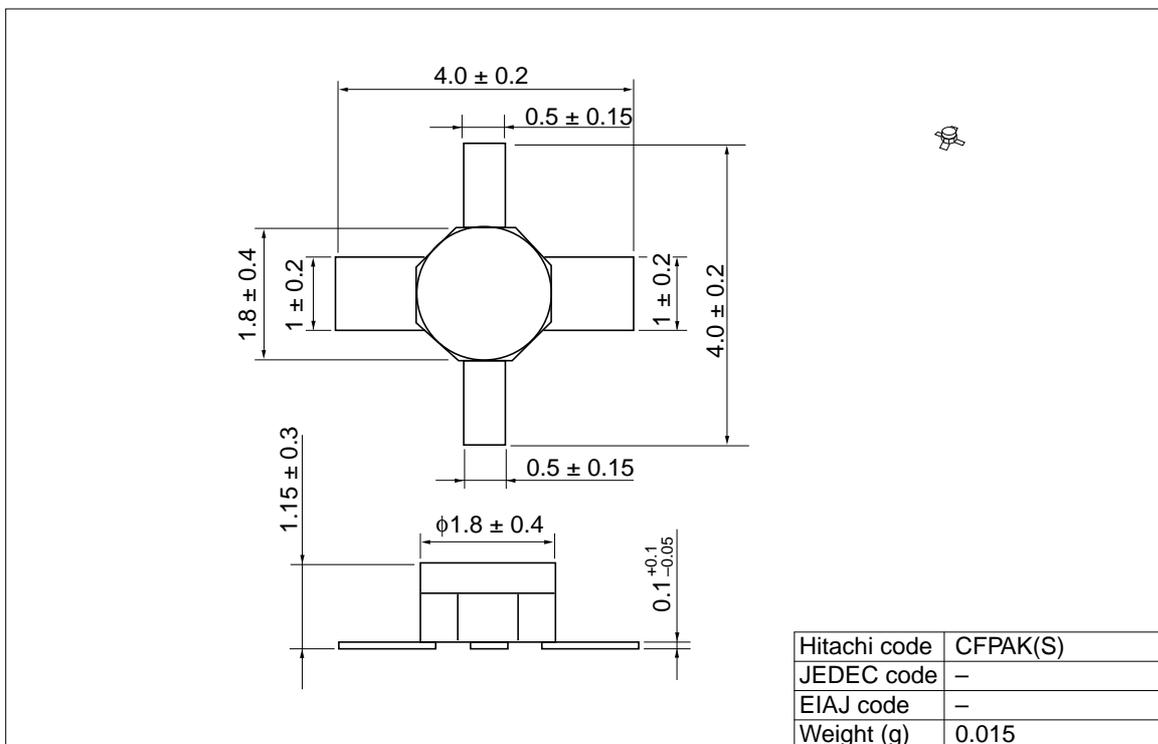
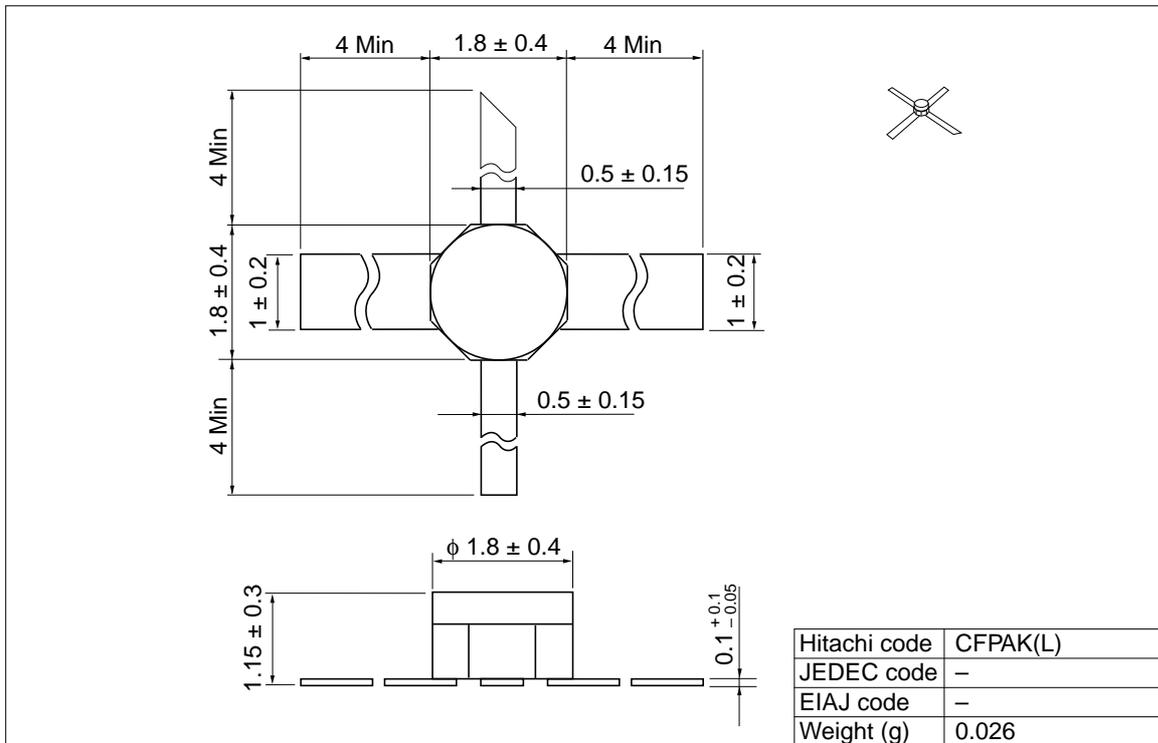


Hitachi code	FPAK
JEDEC code	-
EIAJ code	-
Weight (g)	0.07

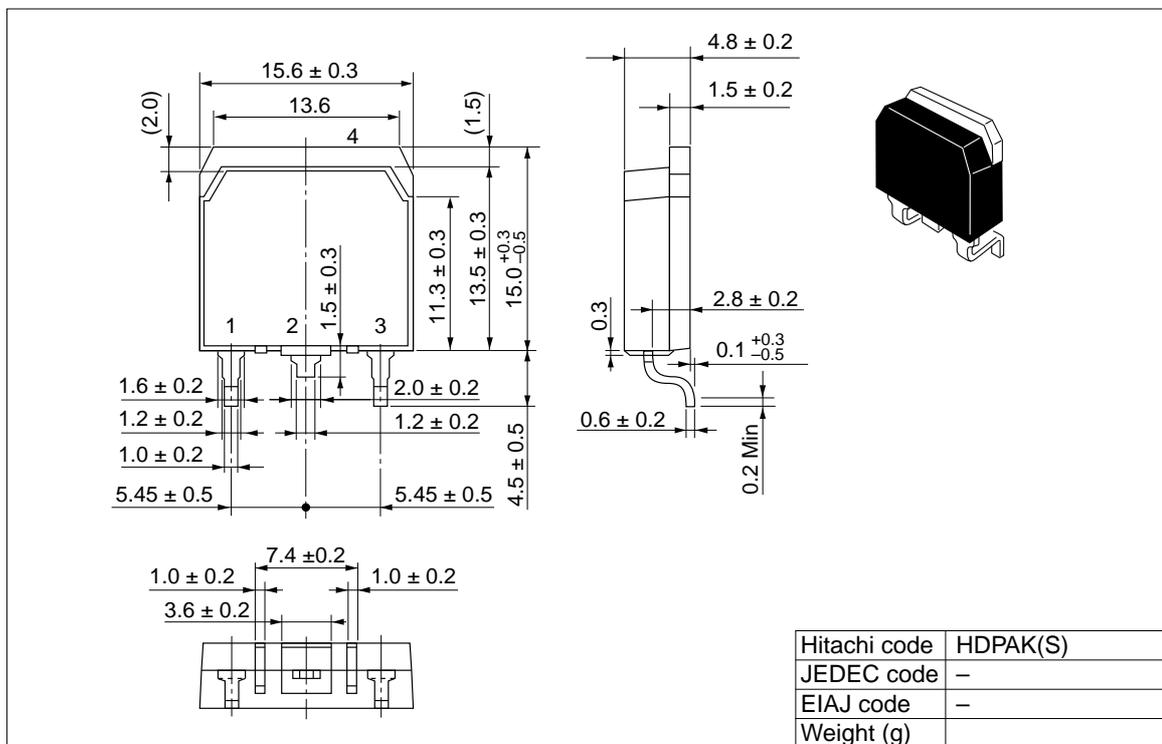
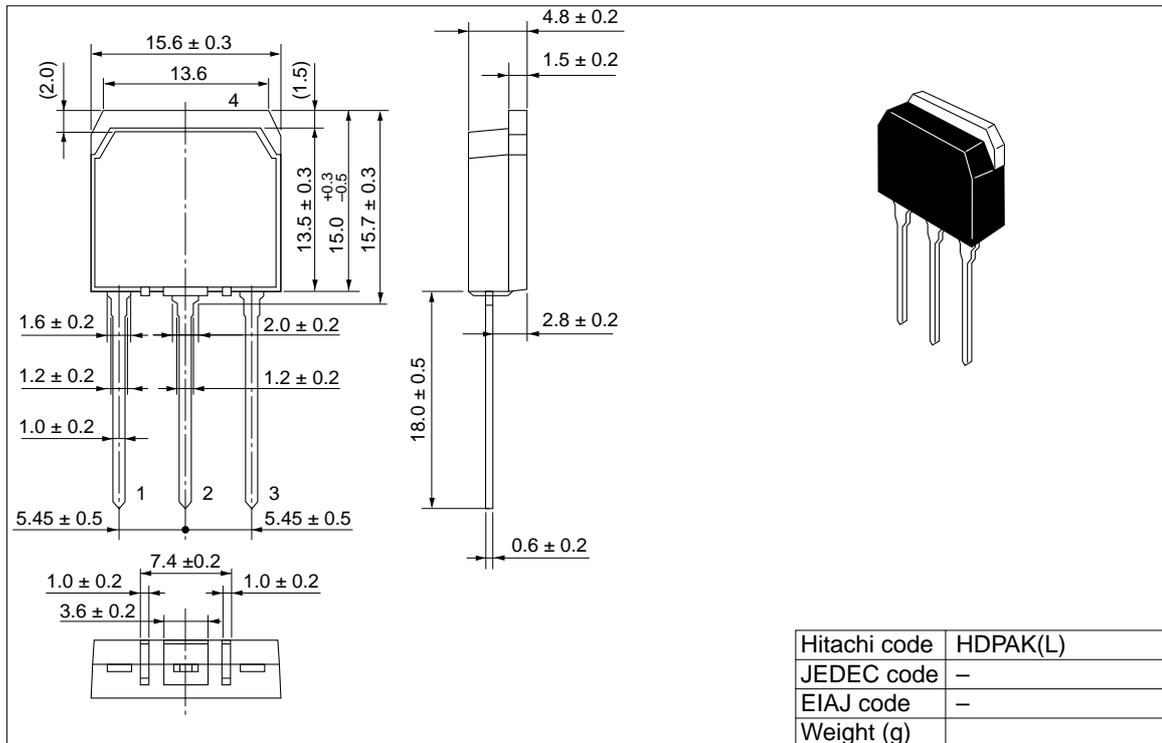
Package Outline Dimensions



Package Outline Dimensions



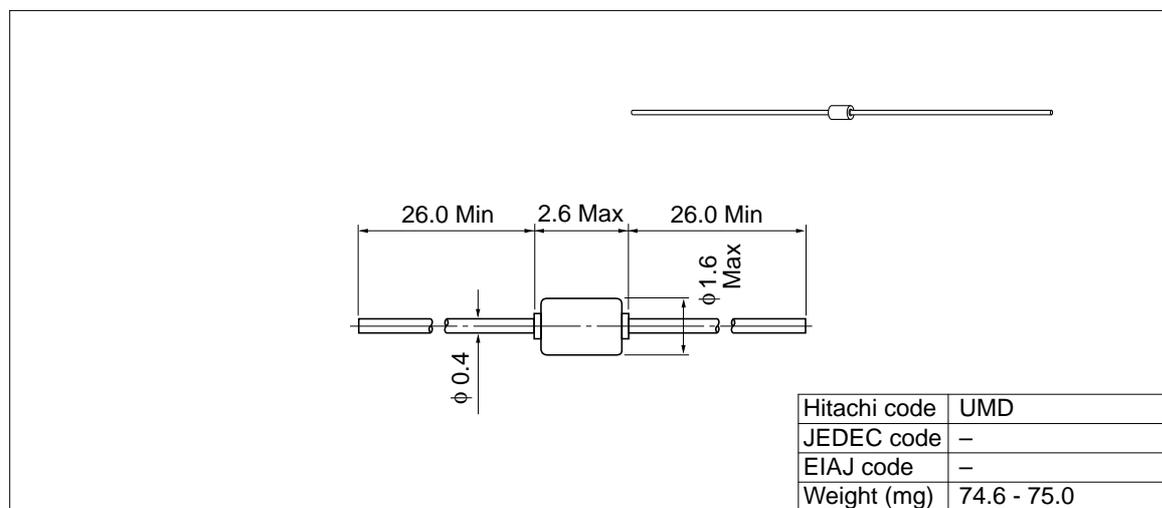
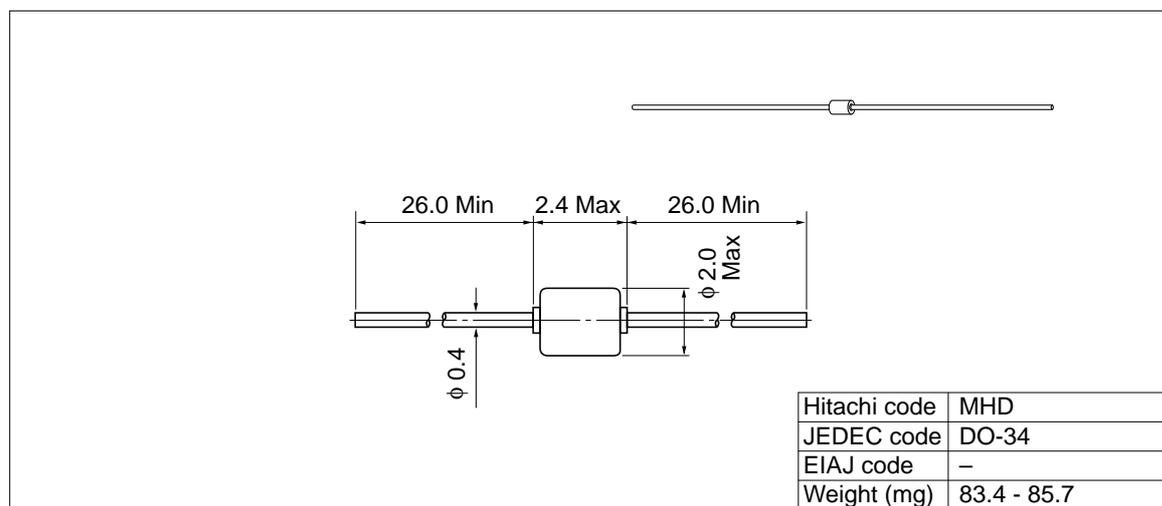
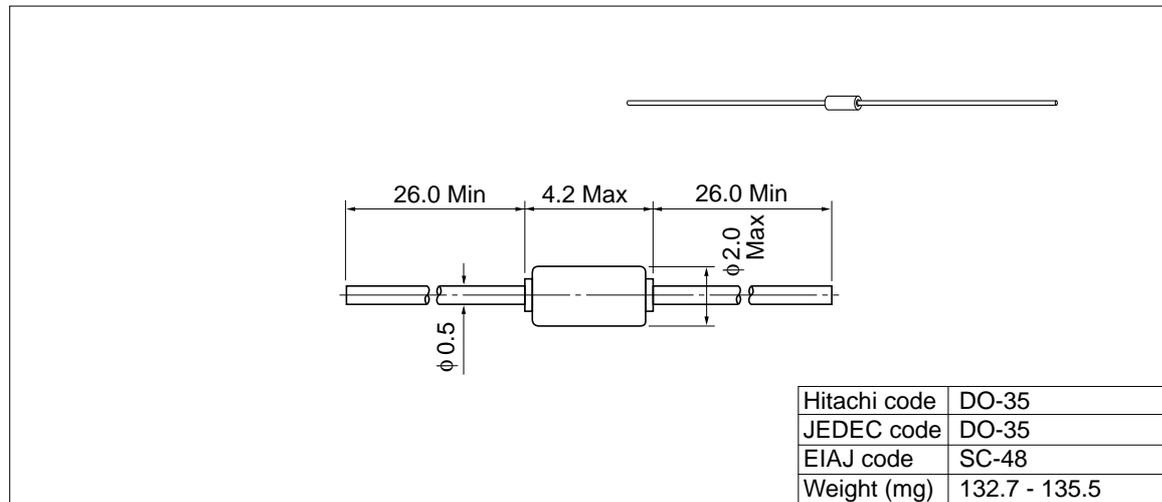
Package Outline Dimensions



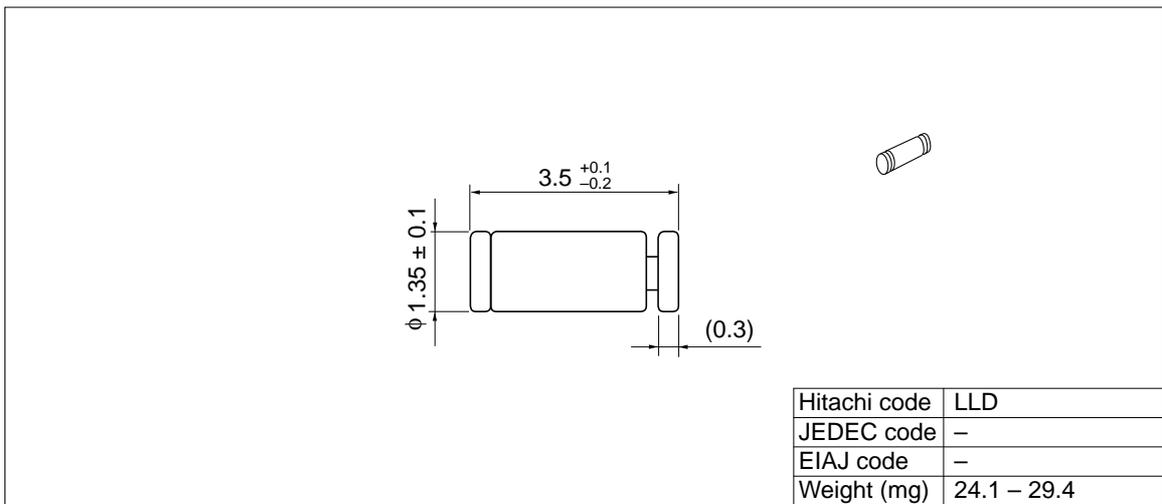
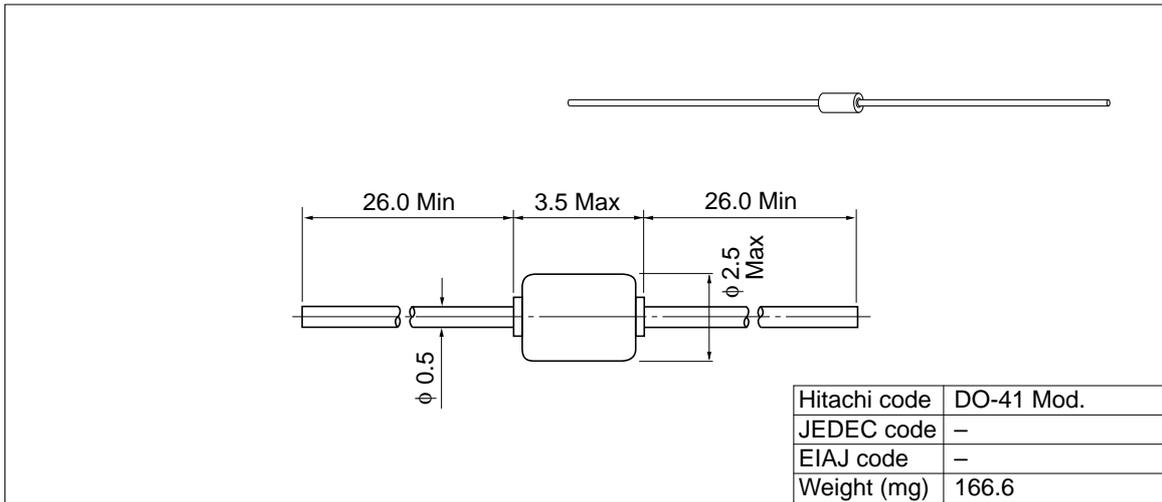
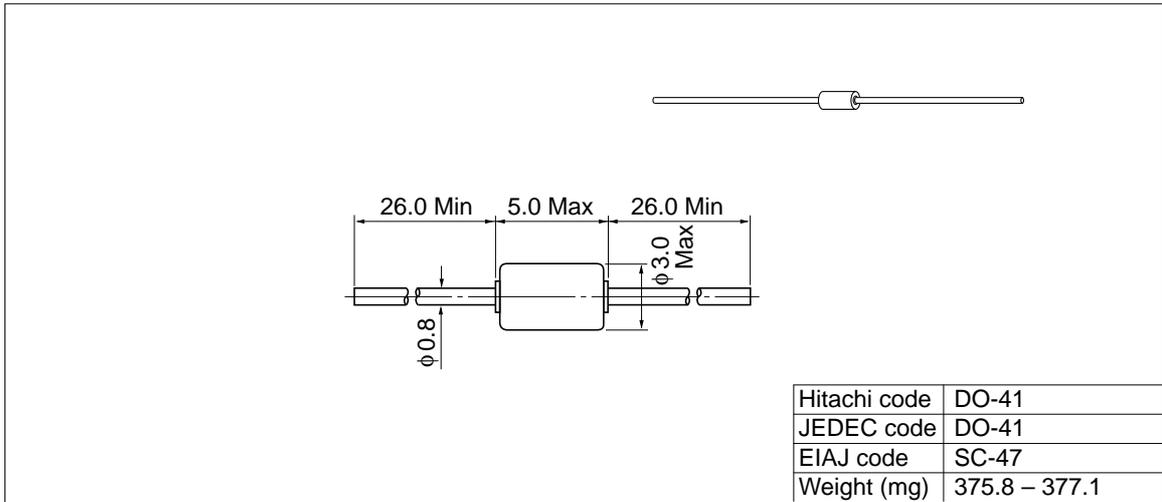
Package Outline Dimensions

2.3 Diode Packages

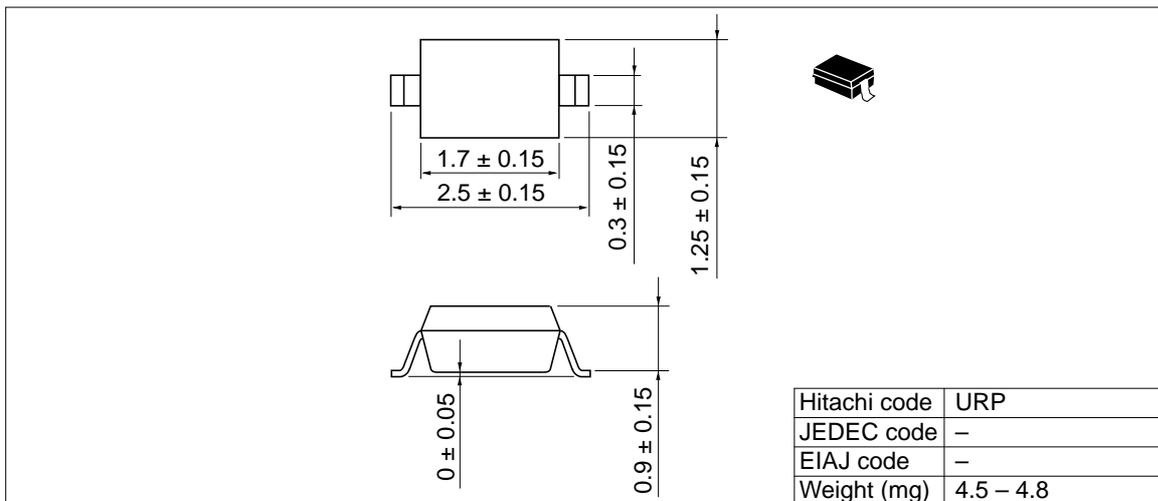
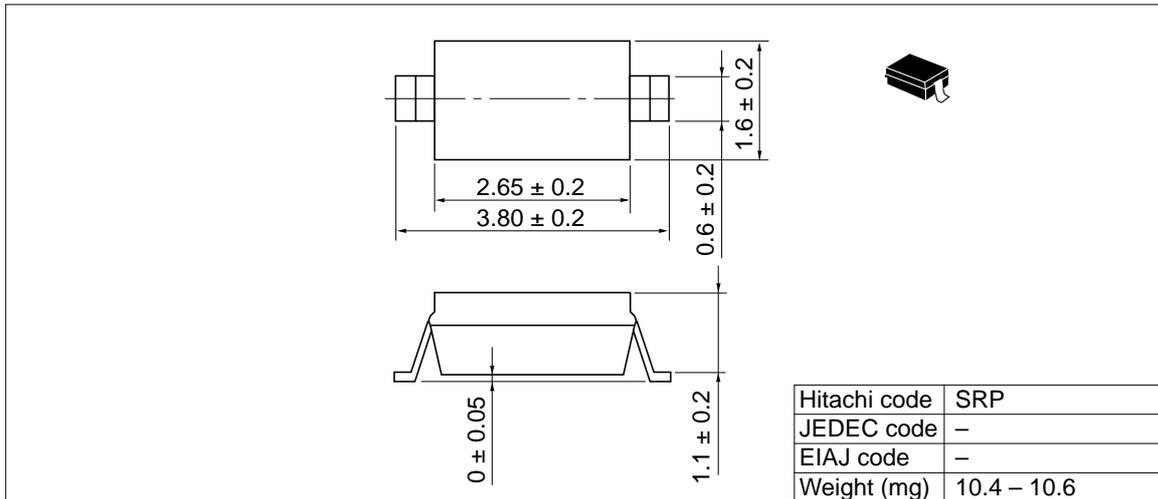
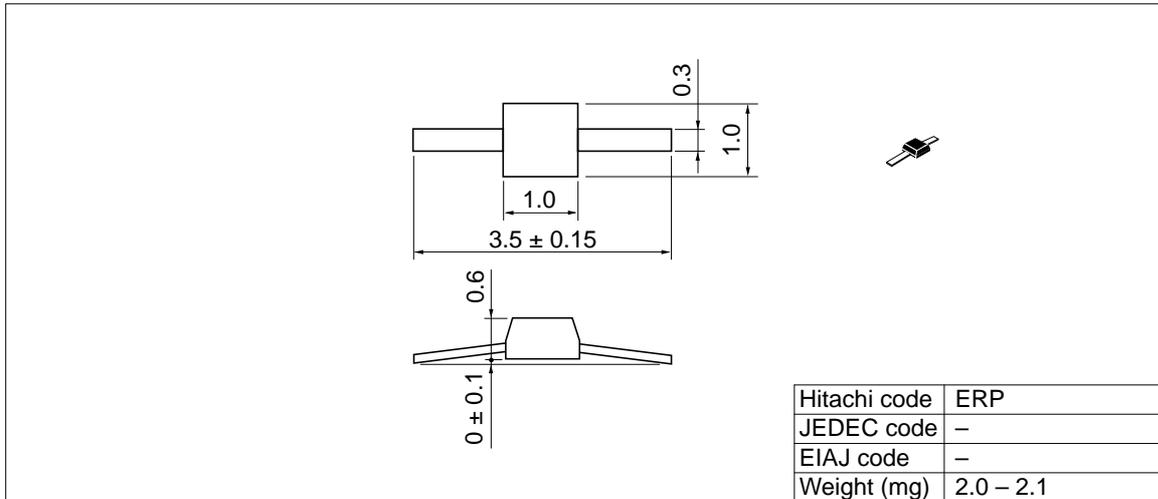
Unit: mm



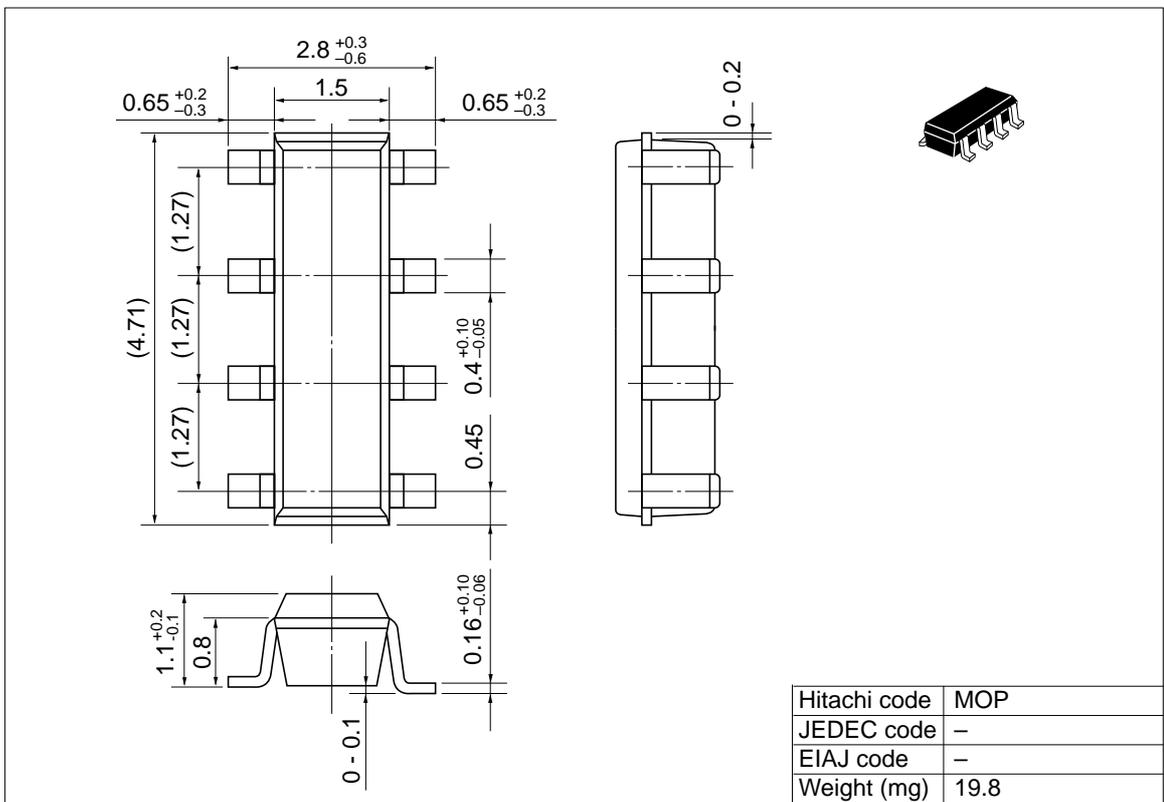
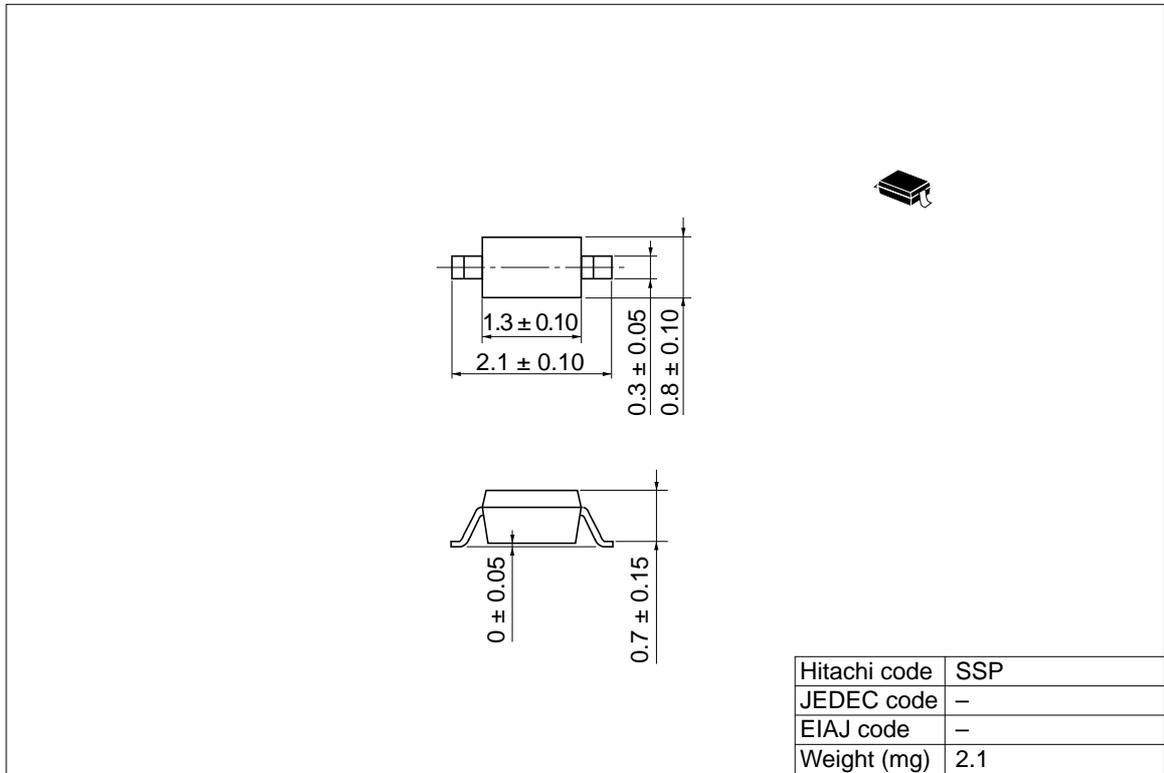
Package Outline Dimensions



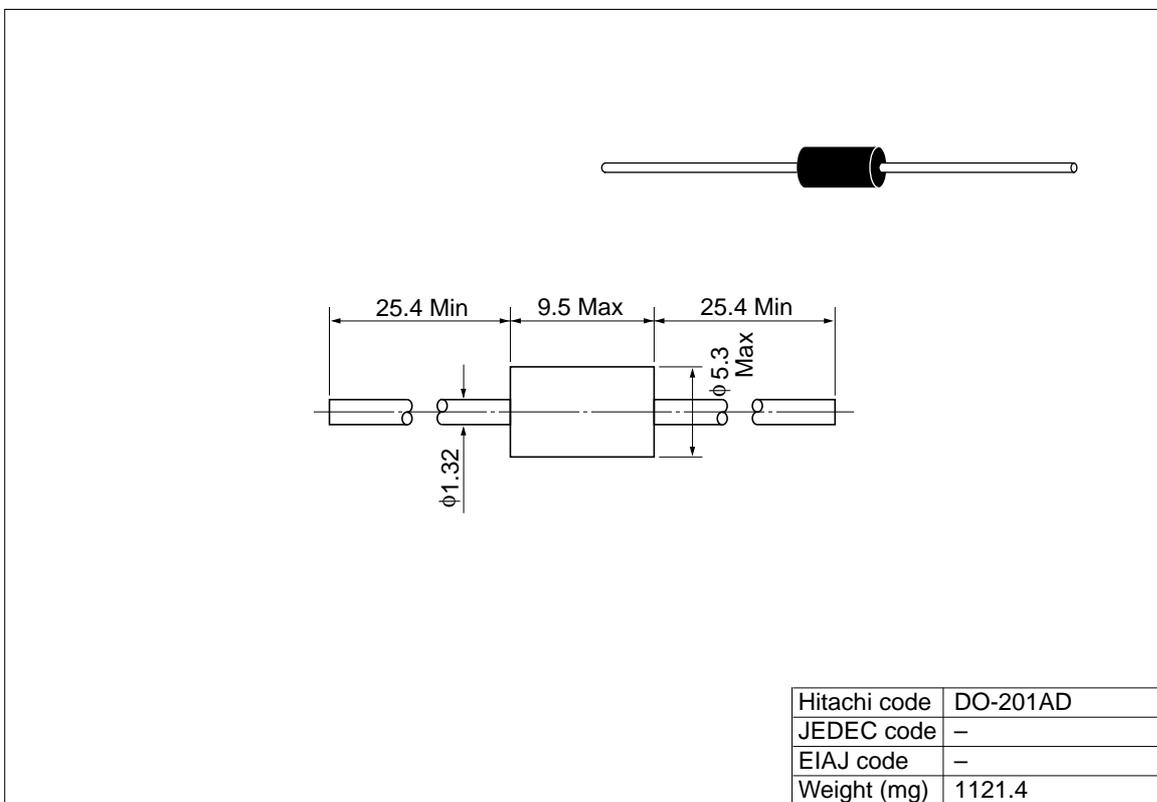
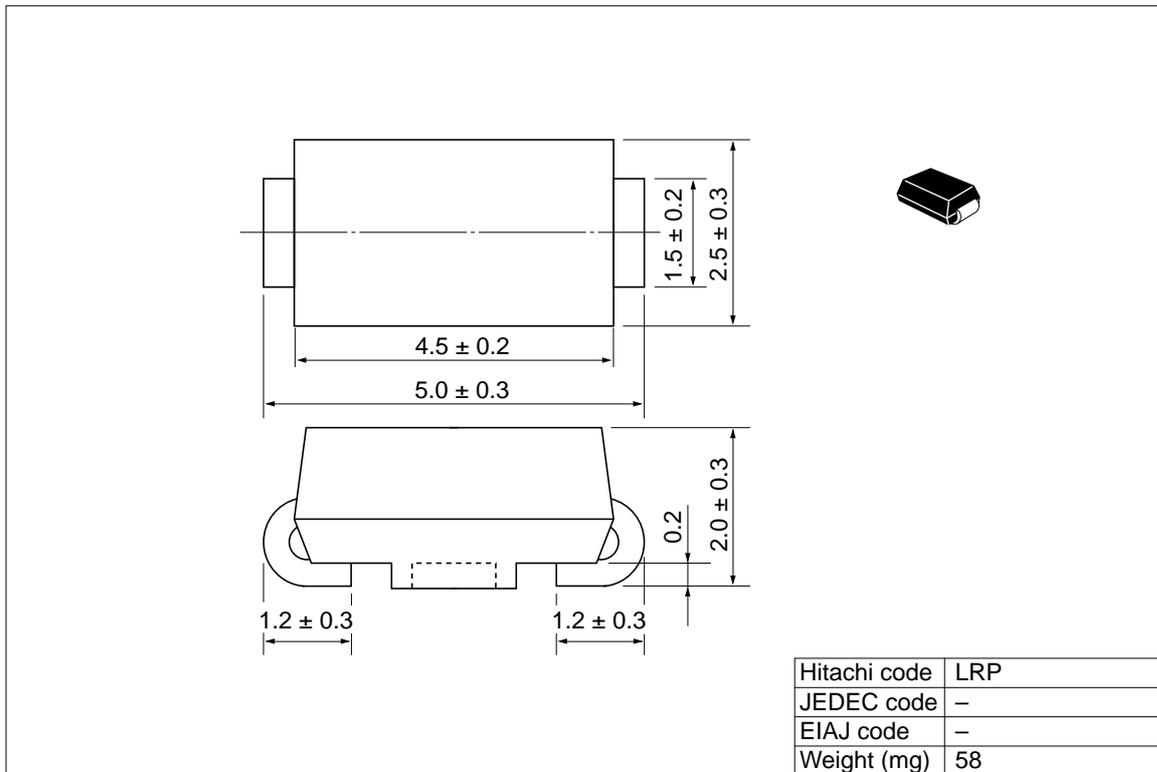
Package Outline Dimensions



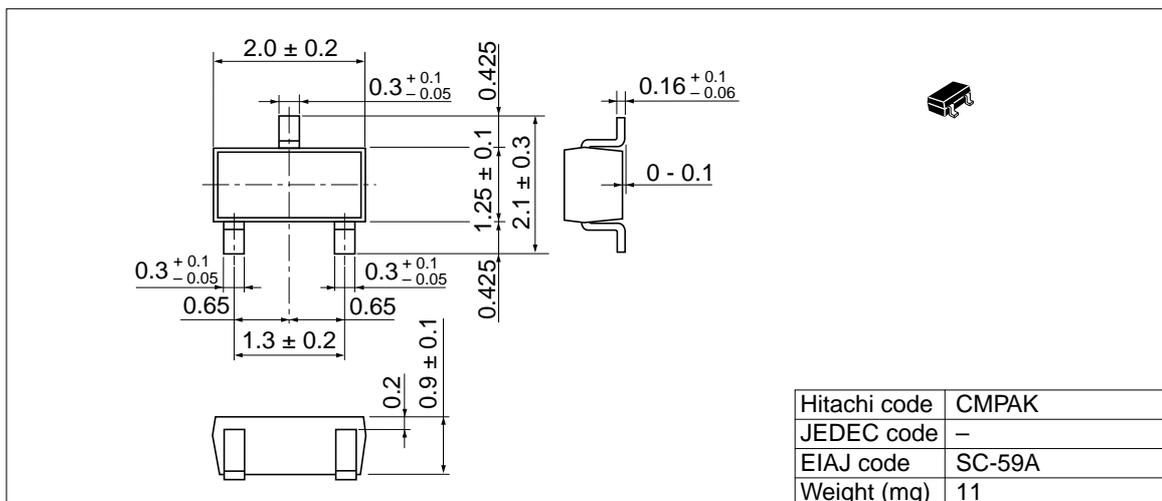
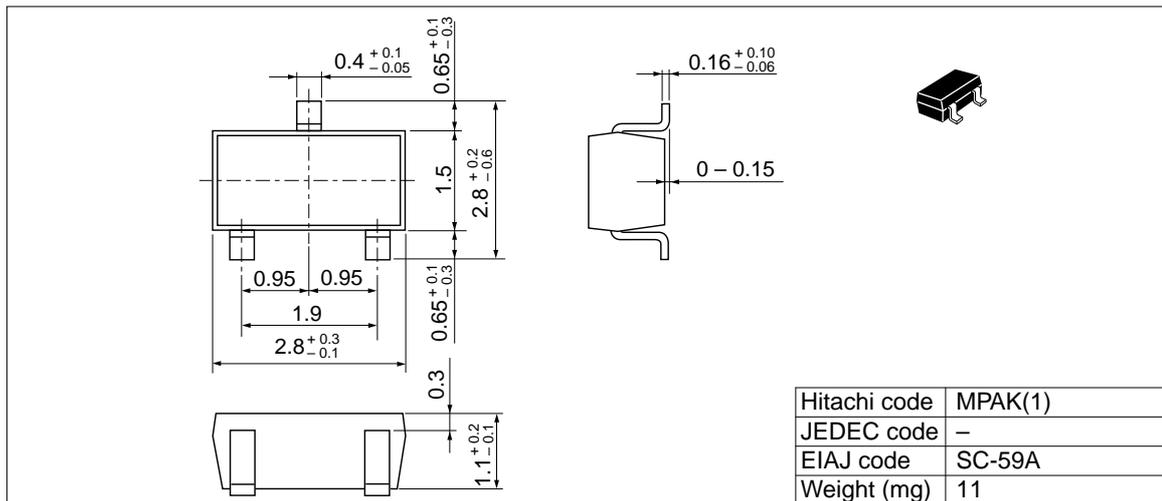
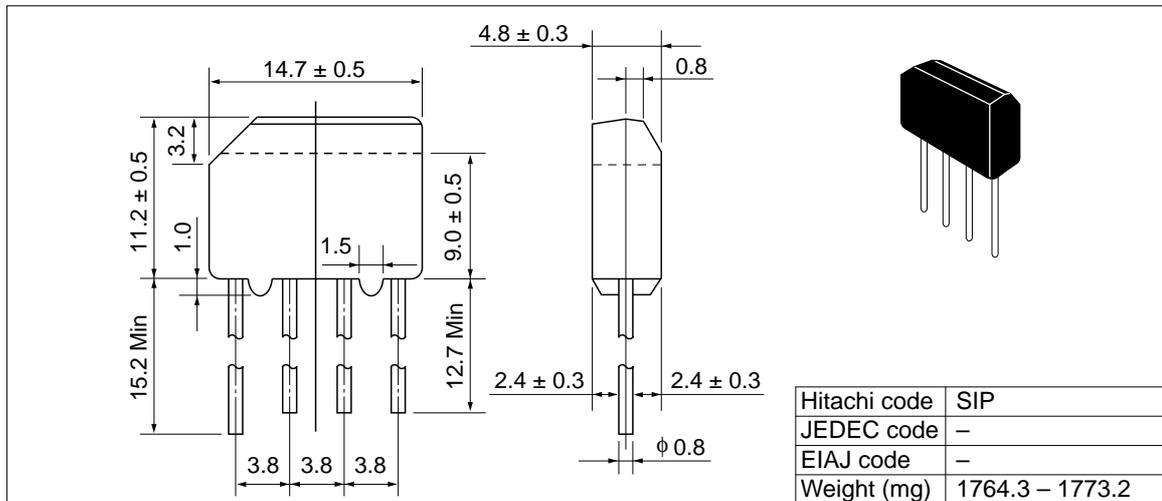
Package Outline Dimensions



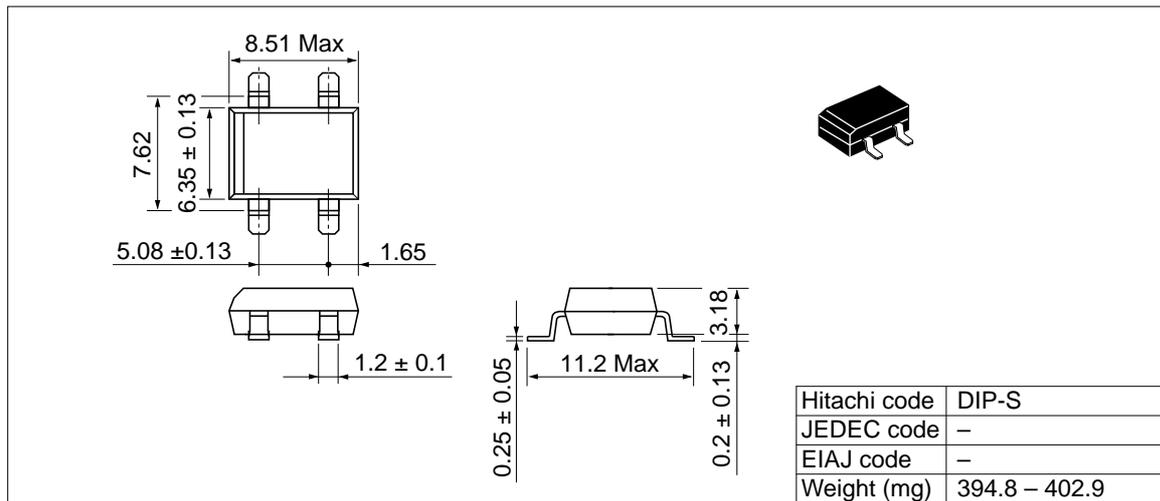
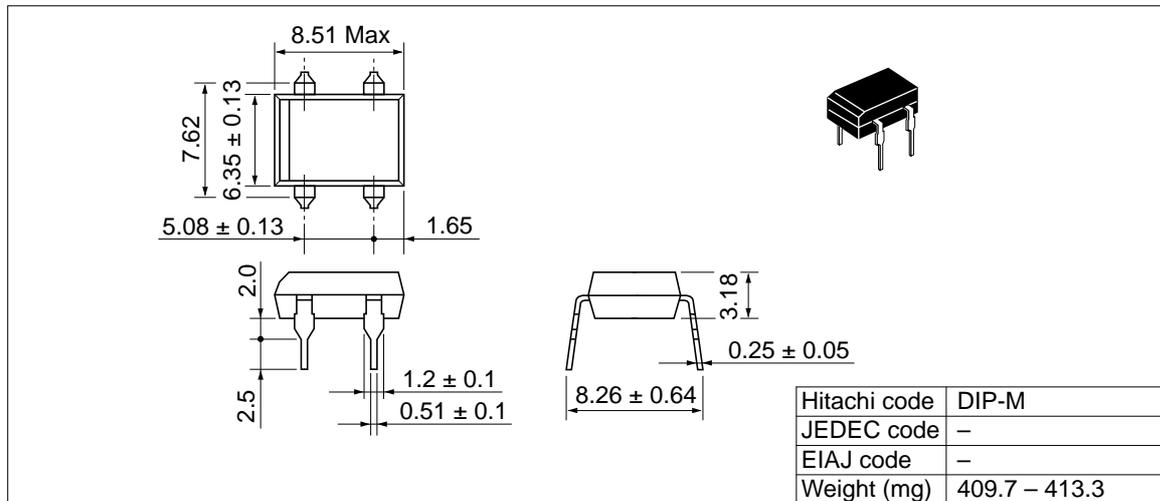
Package Outline Dimensions



Package Outline Dimensions



Package Outline Dimensions

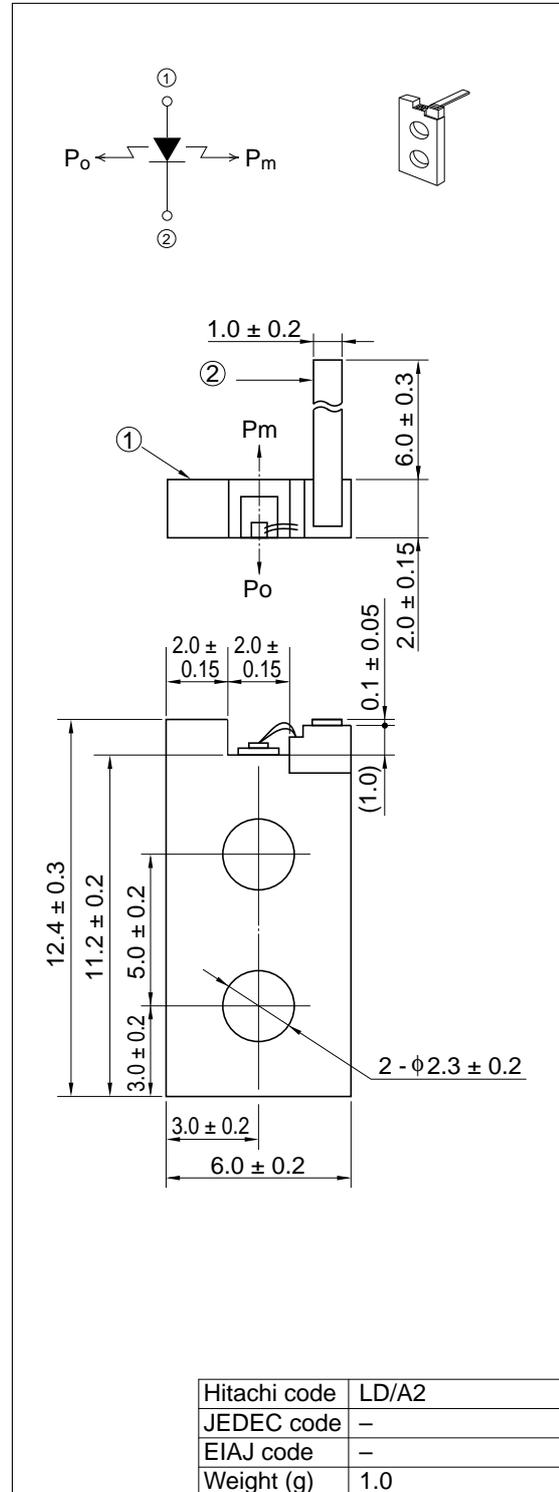
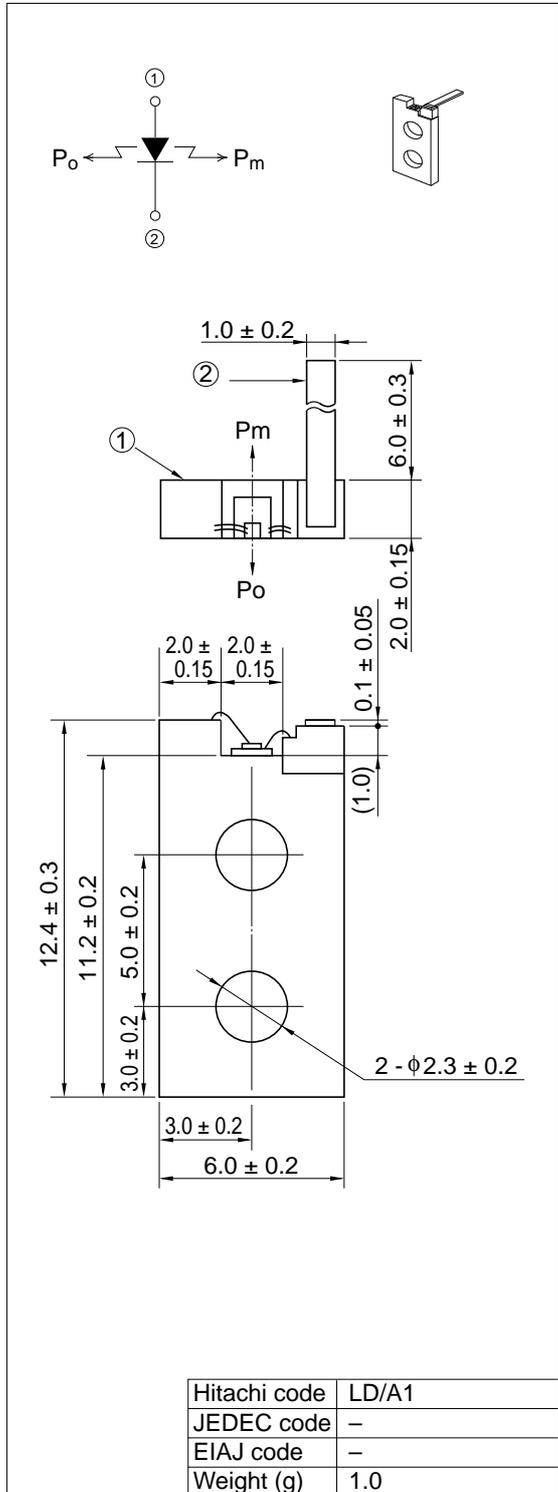


Package Outline Dimensions

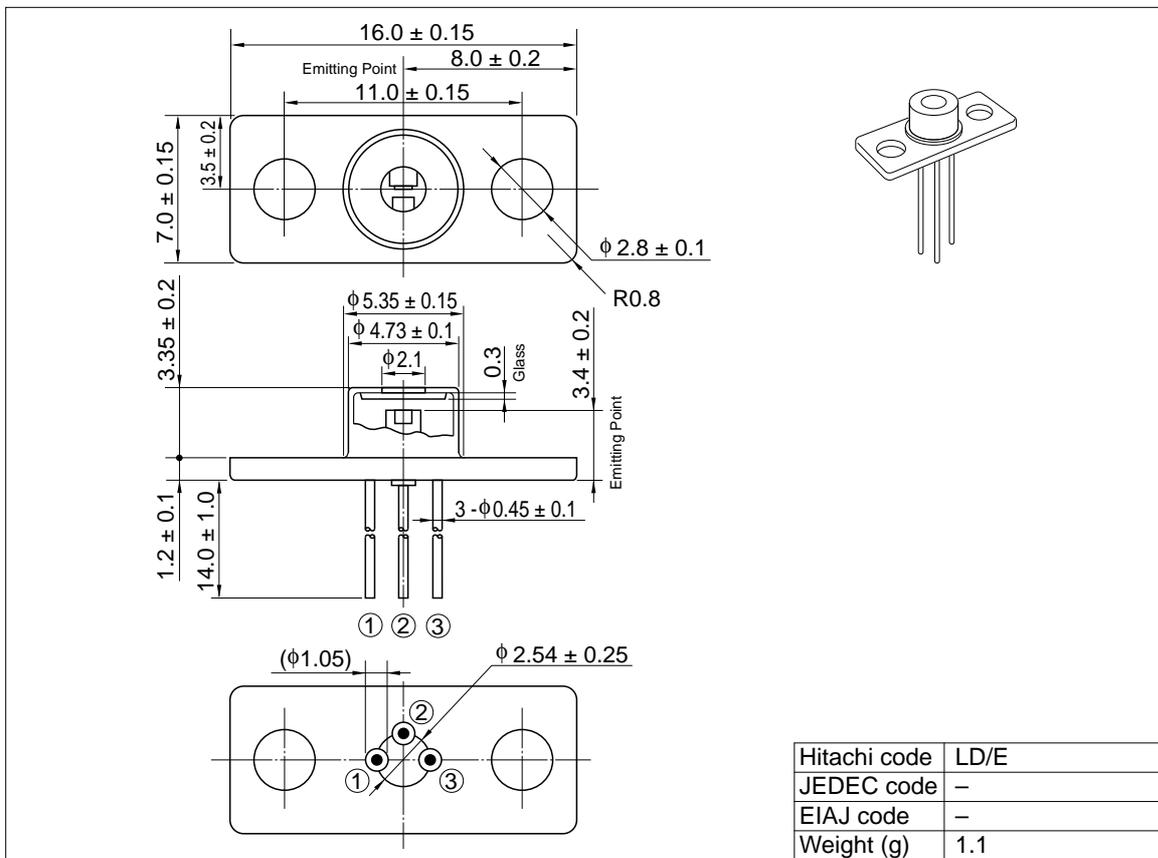
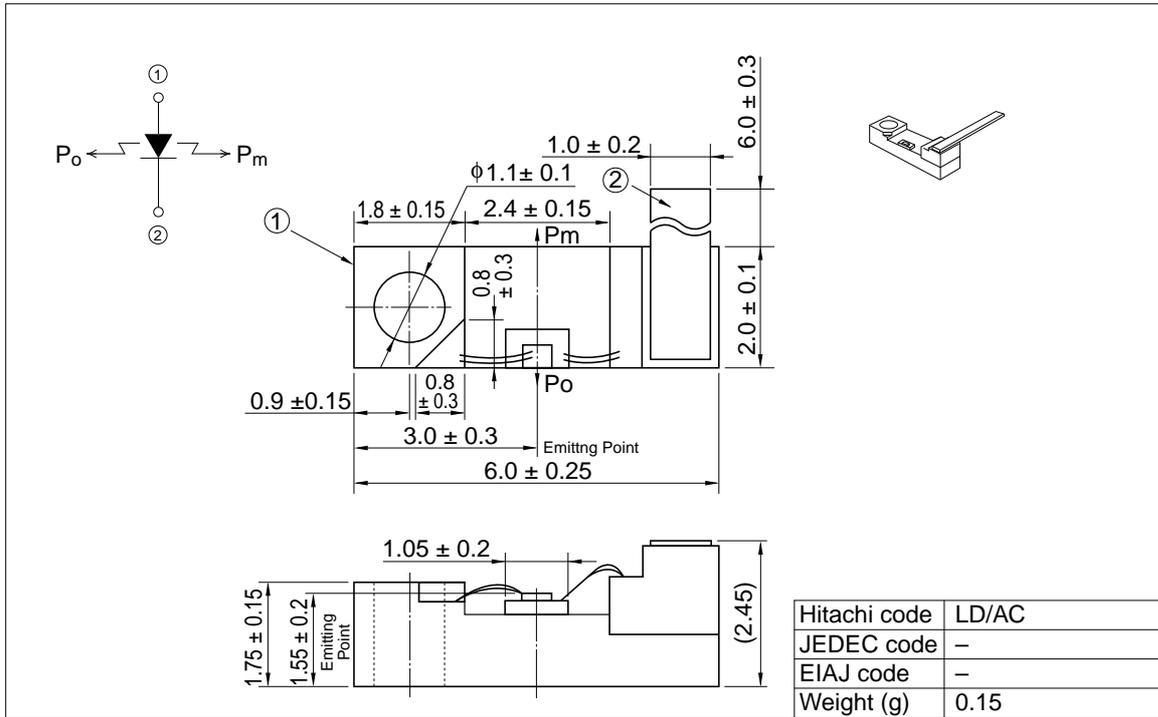
2.4 Optodevice Packages

2.4.1 Laser Diode Packages

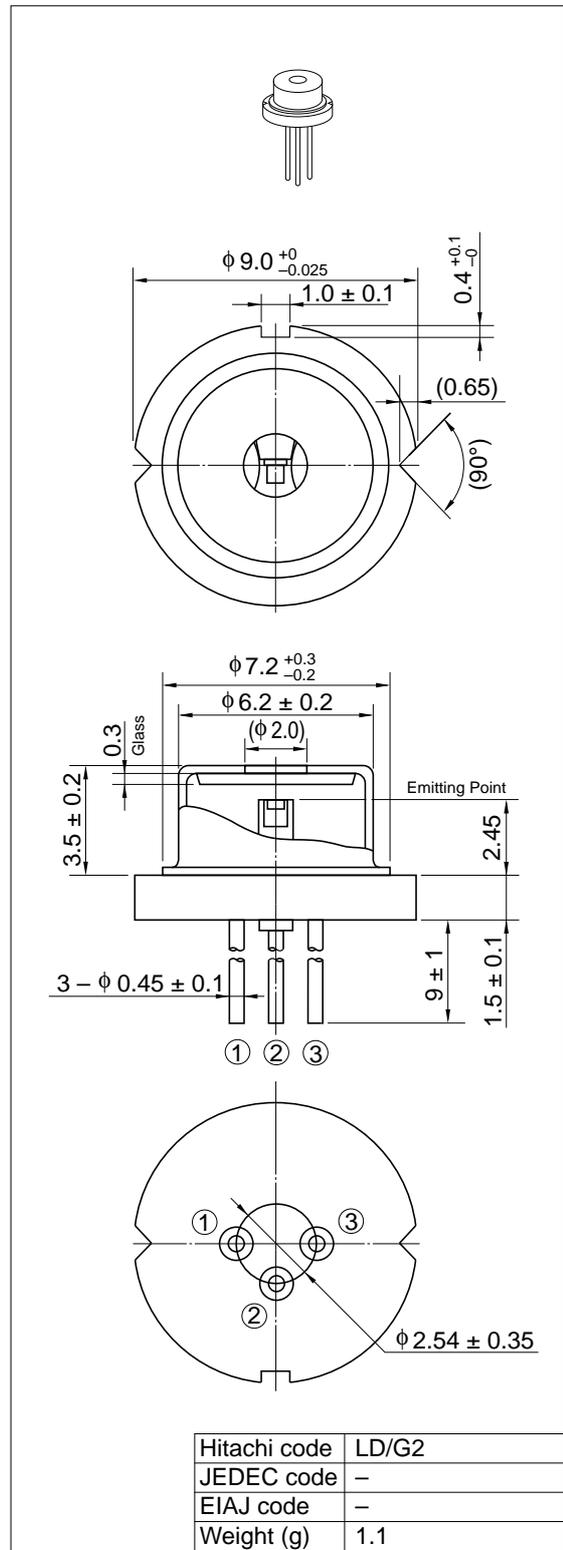
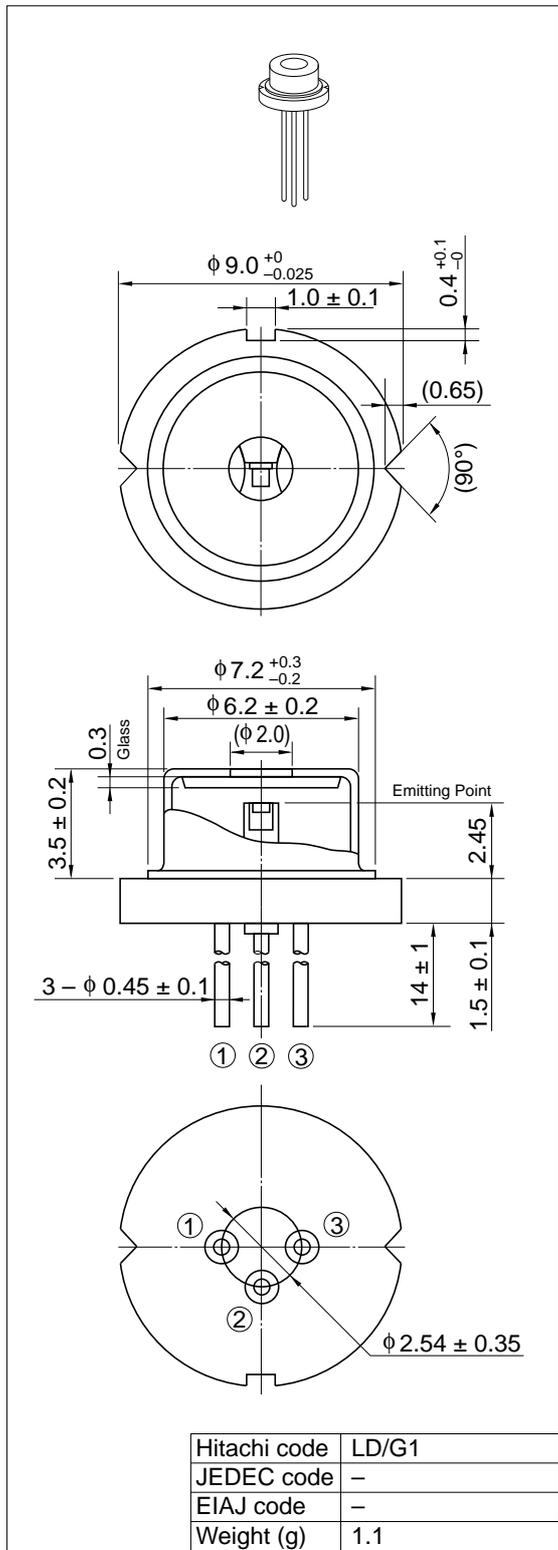
Unit: mm



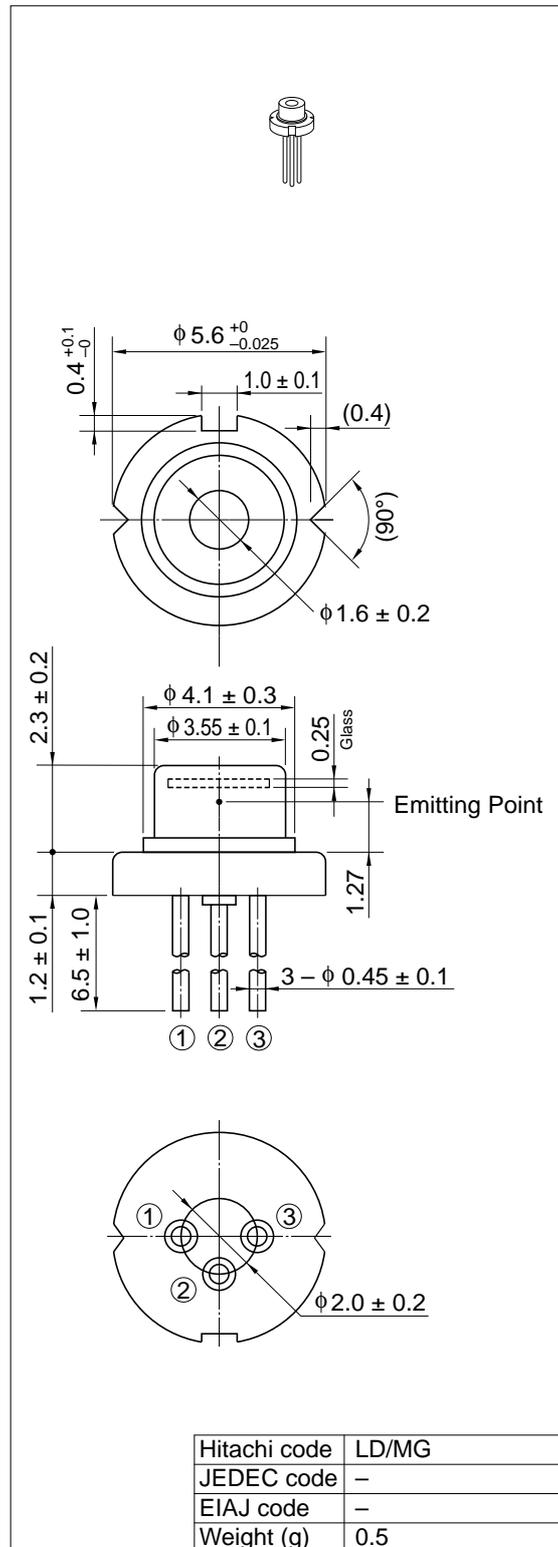
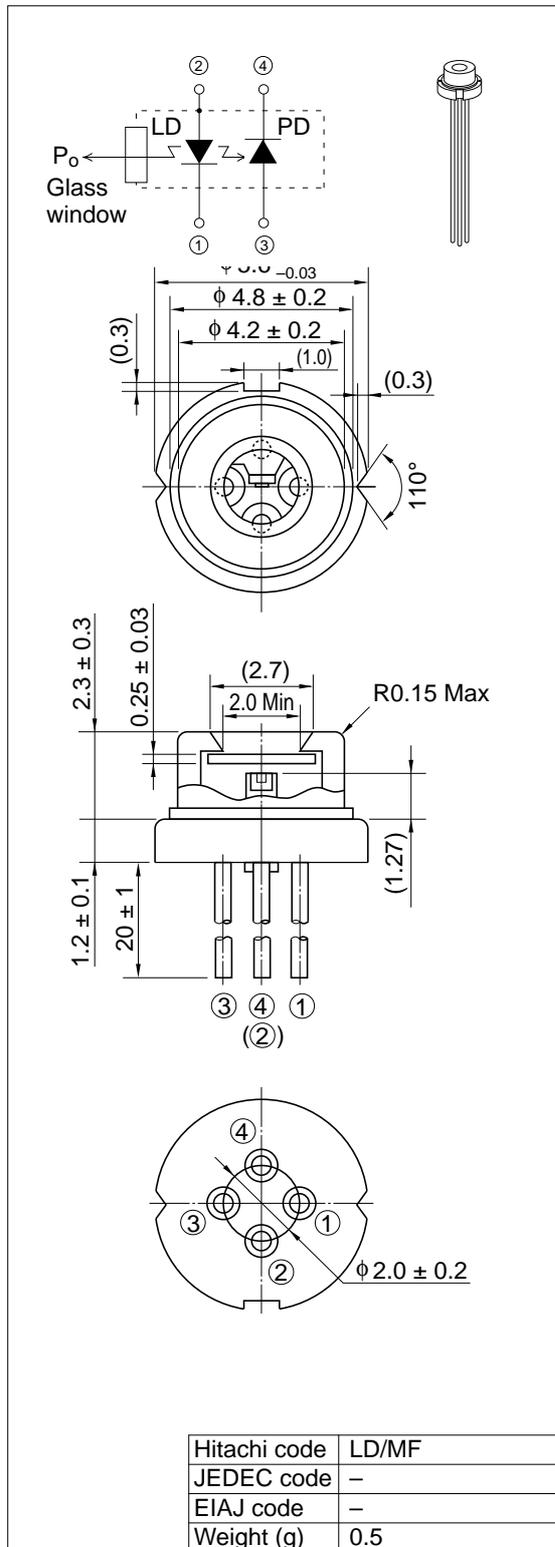
Package Outline Dimensions



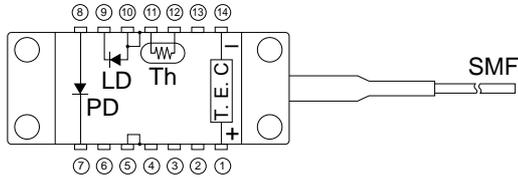
Package Outline Dimensions



Package Outline Dimensions

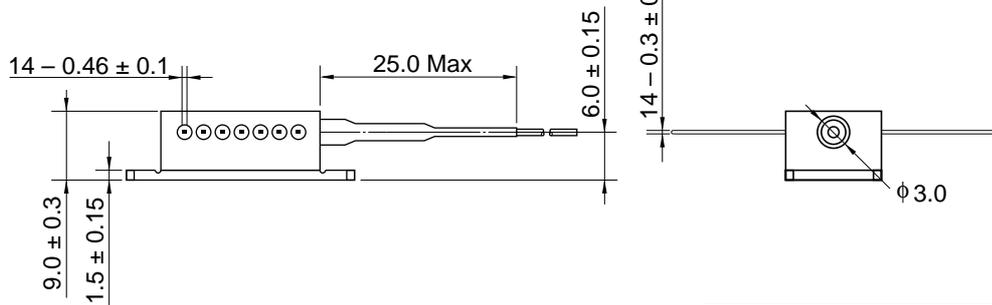
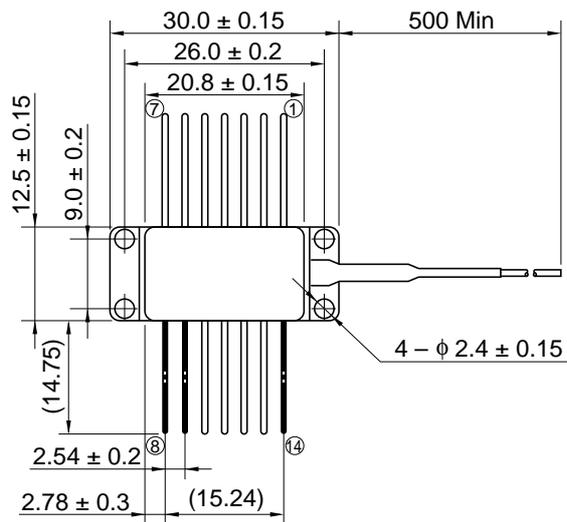
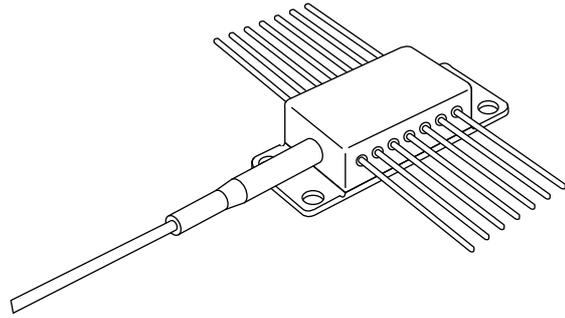


Package Outline Dimensions



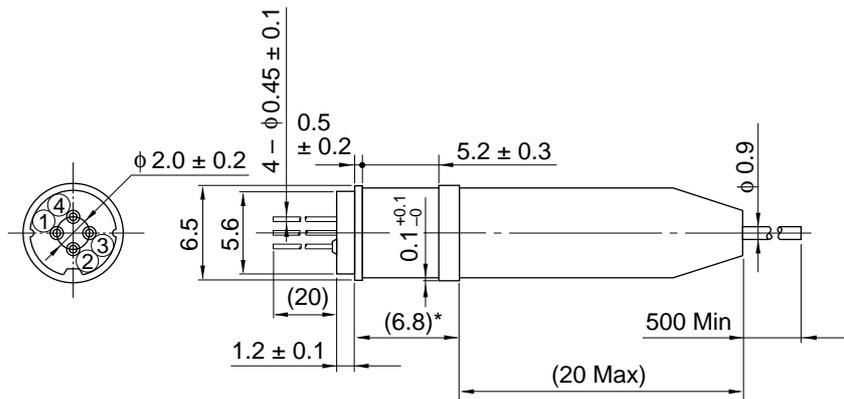
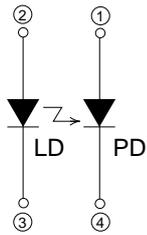
LD: Laser diode T. E. C.: T. E. cooler
 PD: Photodiode SMF: Single-mode fiber
 Th: Thermistor

- | | |
|----------------|--------------------|
| ① T.E.C. anode | ⑧ PD anode |
| ② N. C. | ⑨ LD cathode |
| ③ N. C. | ⑩ LD anode (case) |
| ④ N. C. | ⑪ Thermistor |
| ⑤ Case | ⑫ Thermistor |
| ⑥ N. C. | ⑬ N. C. |
| ⑦ PD cathode | ⑭ T. E. C. cathode |



Hitachi code	LD/BF
JEDEC code	-
EIAJ code	-
Weight (g)	15.0

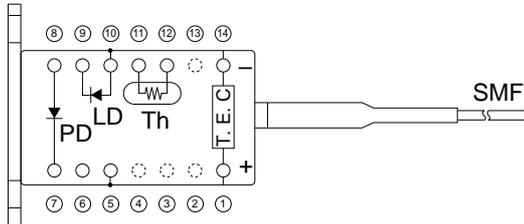
Package Outline Dimensions



* HL1325CF : (6.8)
 HL1324CF : (10.2)

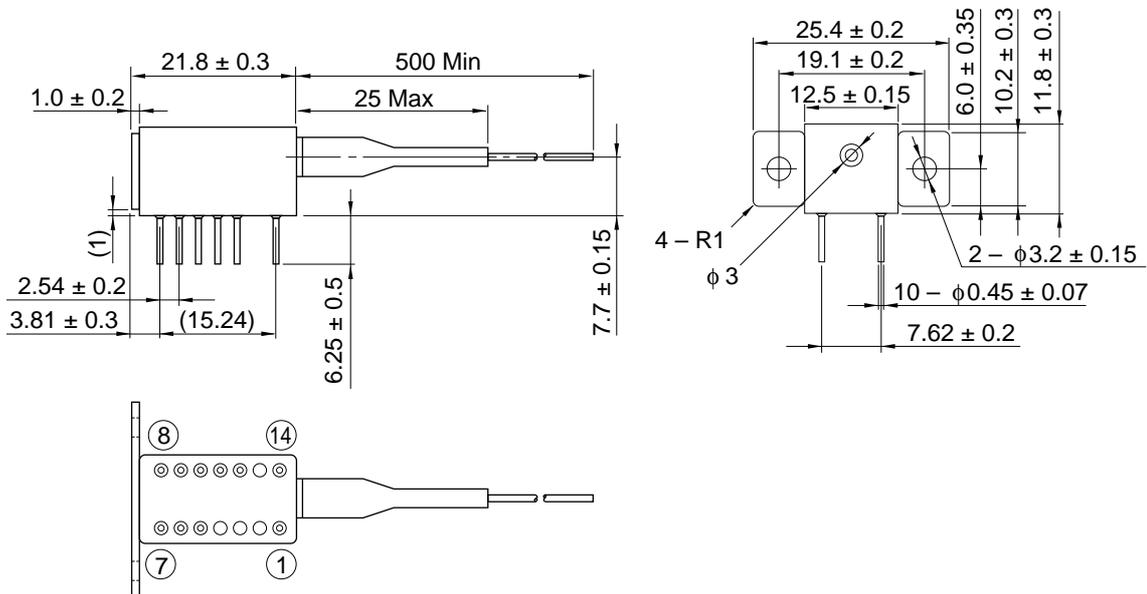
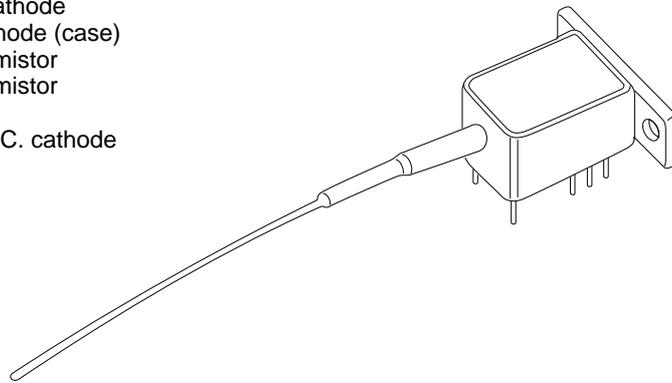
Hitachi code	LD/CF
JEDEC code	-
EIAJ code	-
Weight (g)	3.8

Package Outline Dimensions



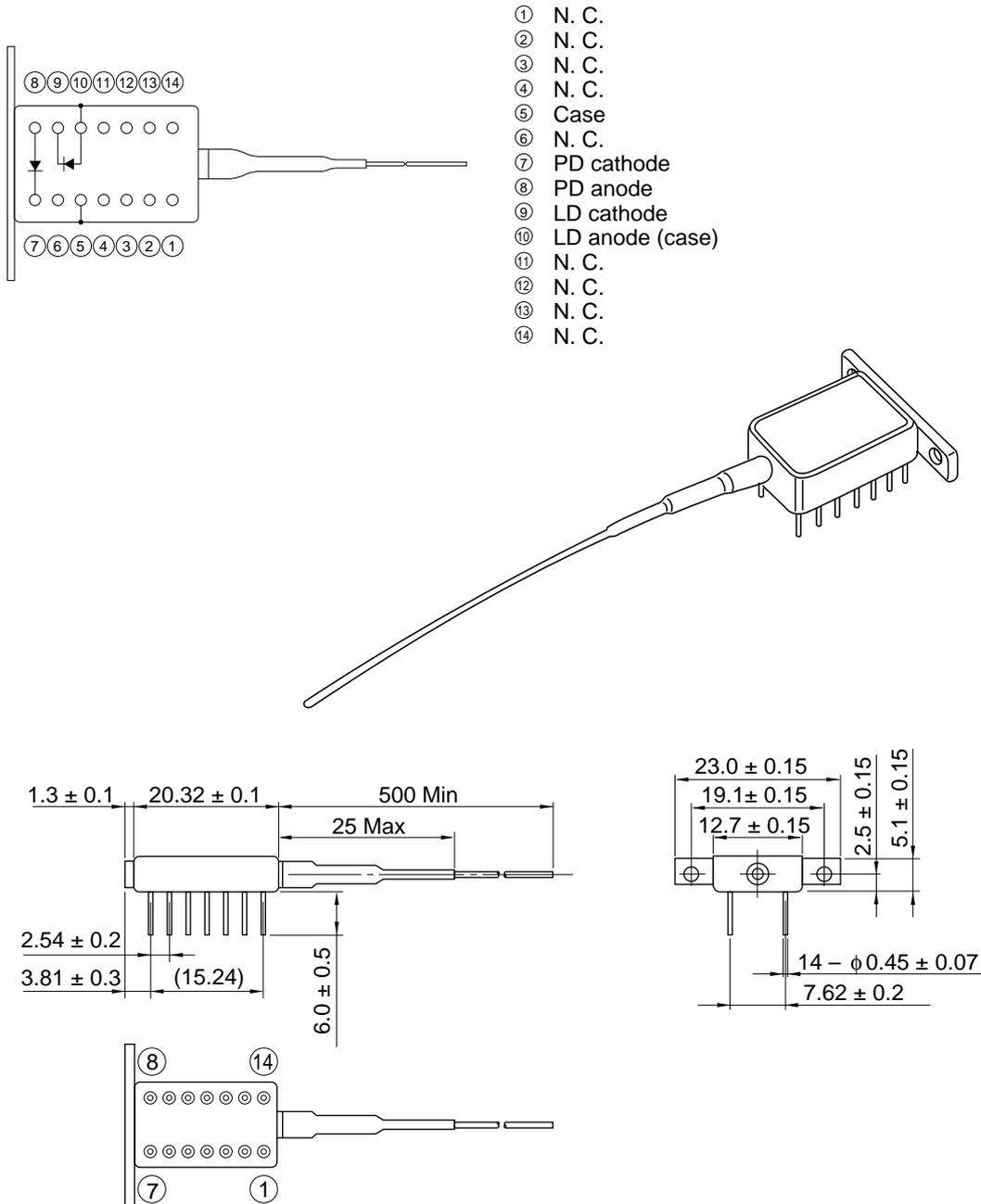
LD: Laser diode T. E. C.: T. E. cooler
 PD: Photodiode SMF: Single-mode fiber
 Th: Thermistor

- | | |
|----------------|--------------------|
| ① T.E.C. anode | ⑧ PD anode |
| ② — | ⑨ LD cathode |
| ③ — | ⑩ LD anode (case) |
| ④ — | ⑪ Thermistor |
| ⑤ Case | ⑫ Thermistor |
| ⑥ N. C. | ⑬ — |
| ⑦ PD cathode | ⑭ T. E. C. cathode |



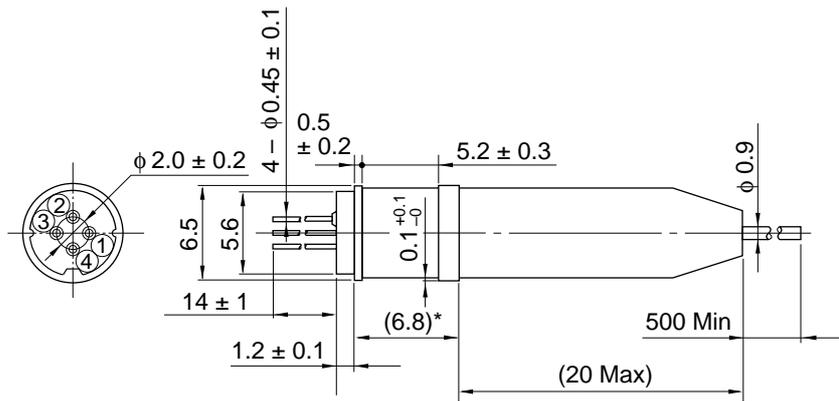
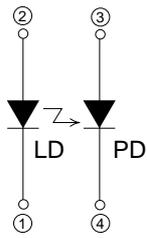
Hitachi code	LD/DL
JEDEC code	—
EIAJ code	—
Weight (g)	13.4

Package Outline Dimensions



Hitachi code	LD/DM
JEDEC code	-
EIAJ code	-
Weight (g)	10.0

Package Outline Dimensions



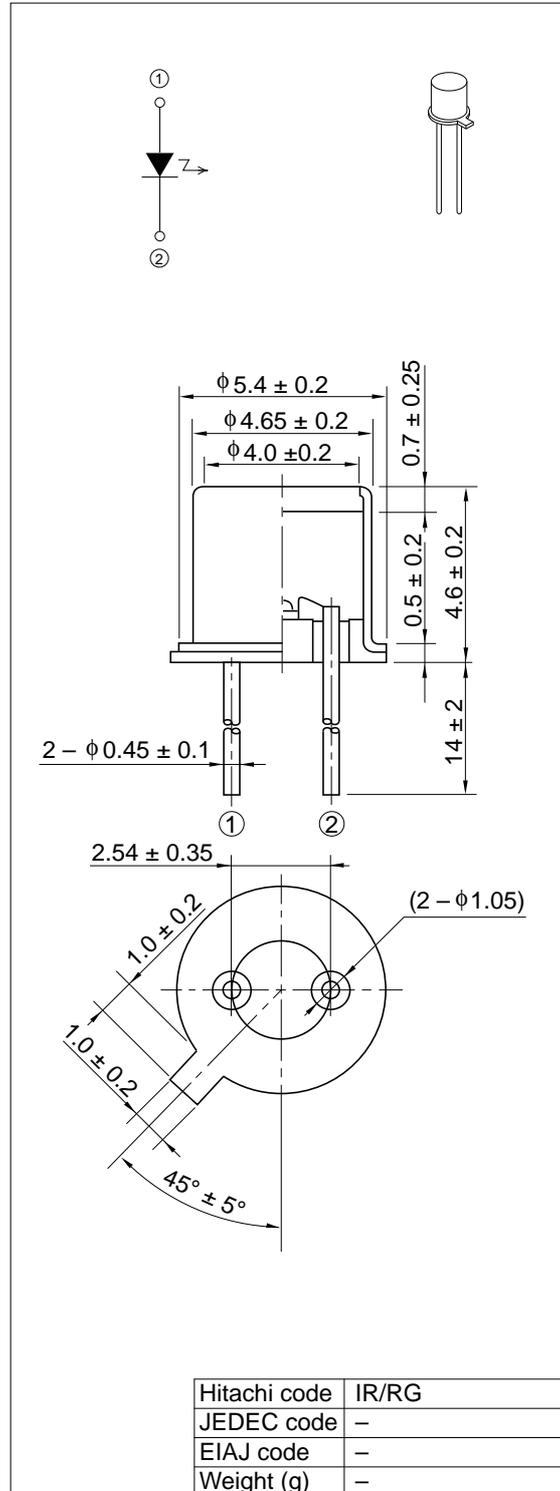
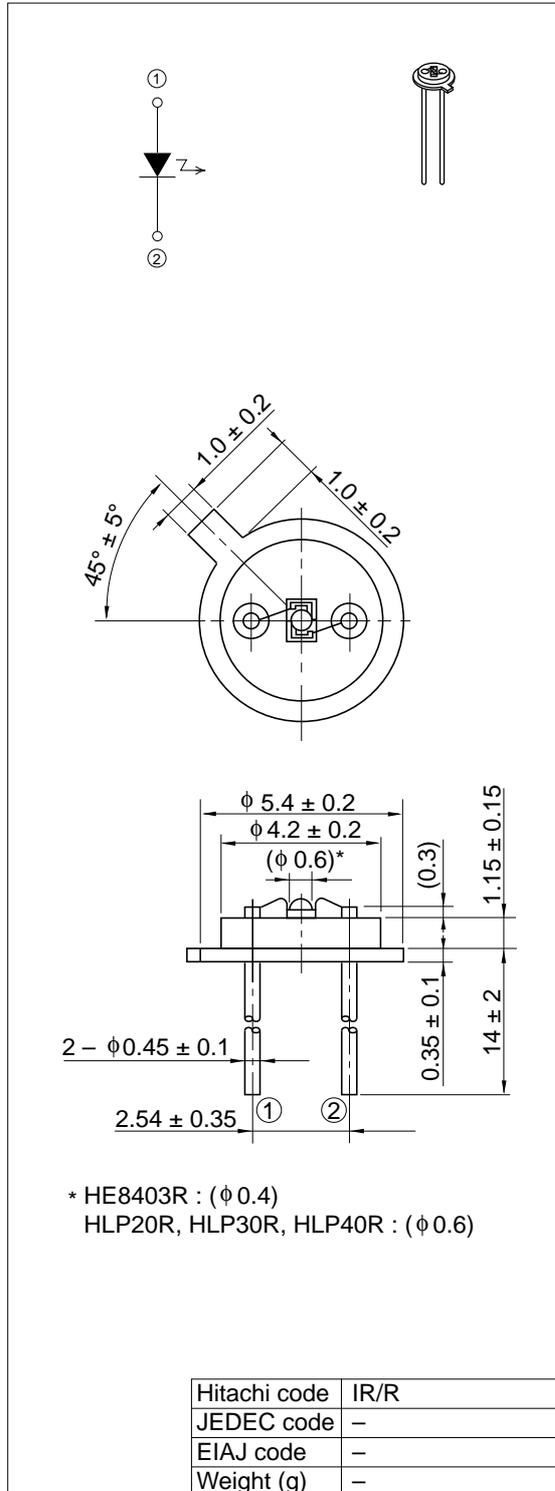
* HL1326/1352 : (10.2)
HL1327 : (6.8)

Hitachi code	CN
JEDEC code	-
EIAJ code	-
Weight (g)	-

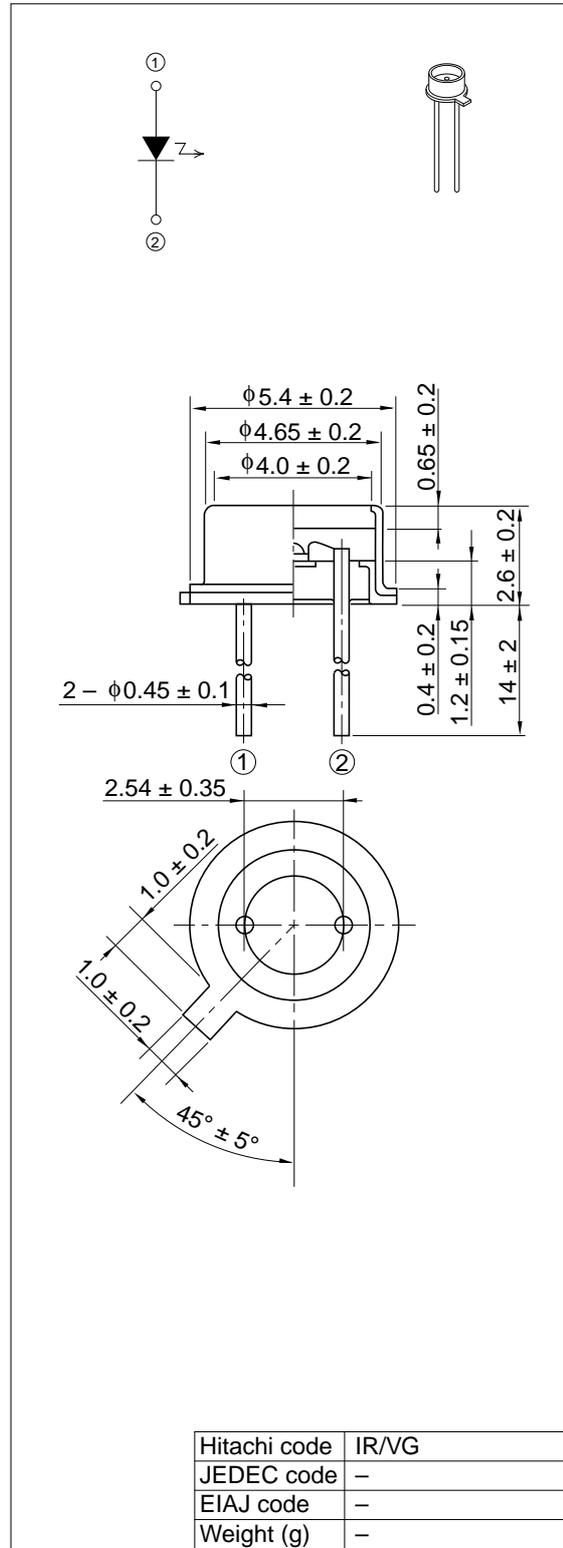
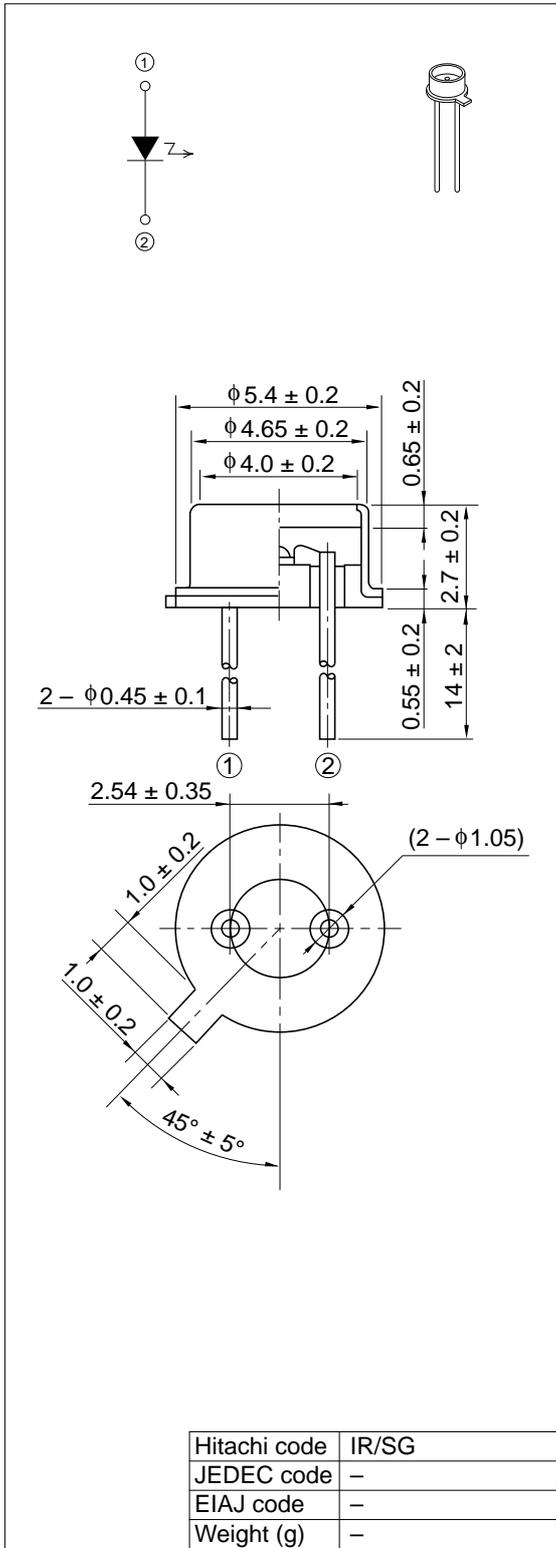
Package Outline Dimensions

2.4.2 IRED Packages

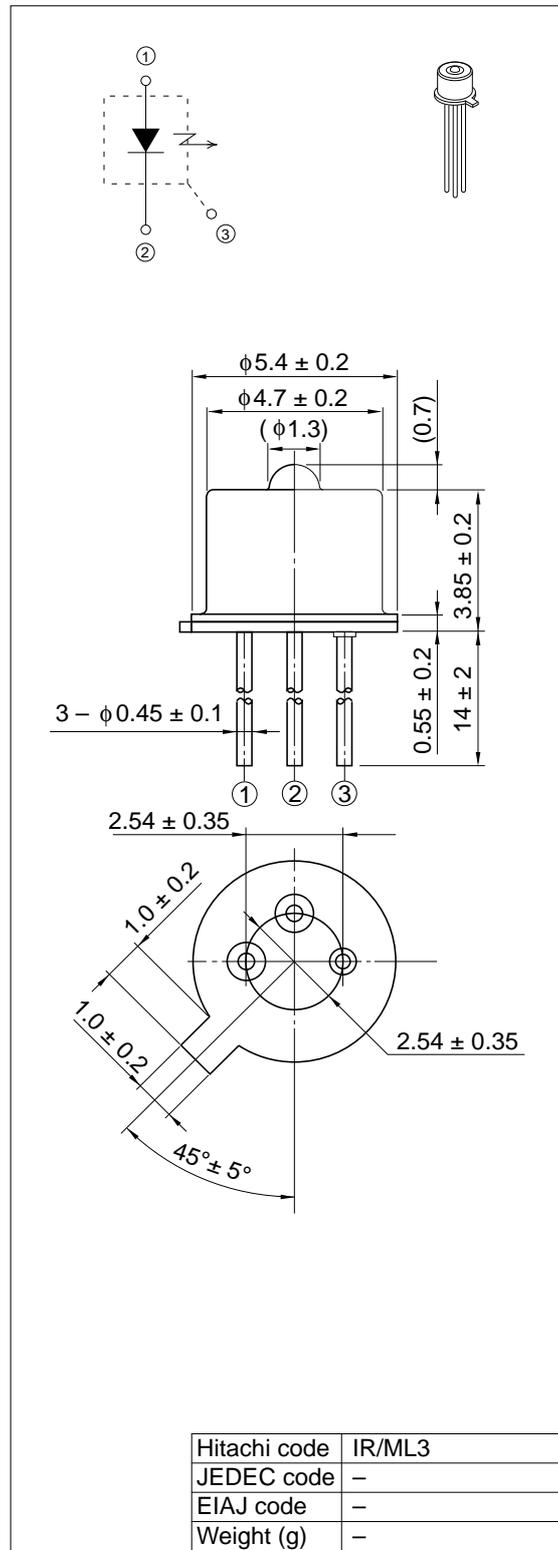
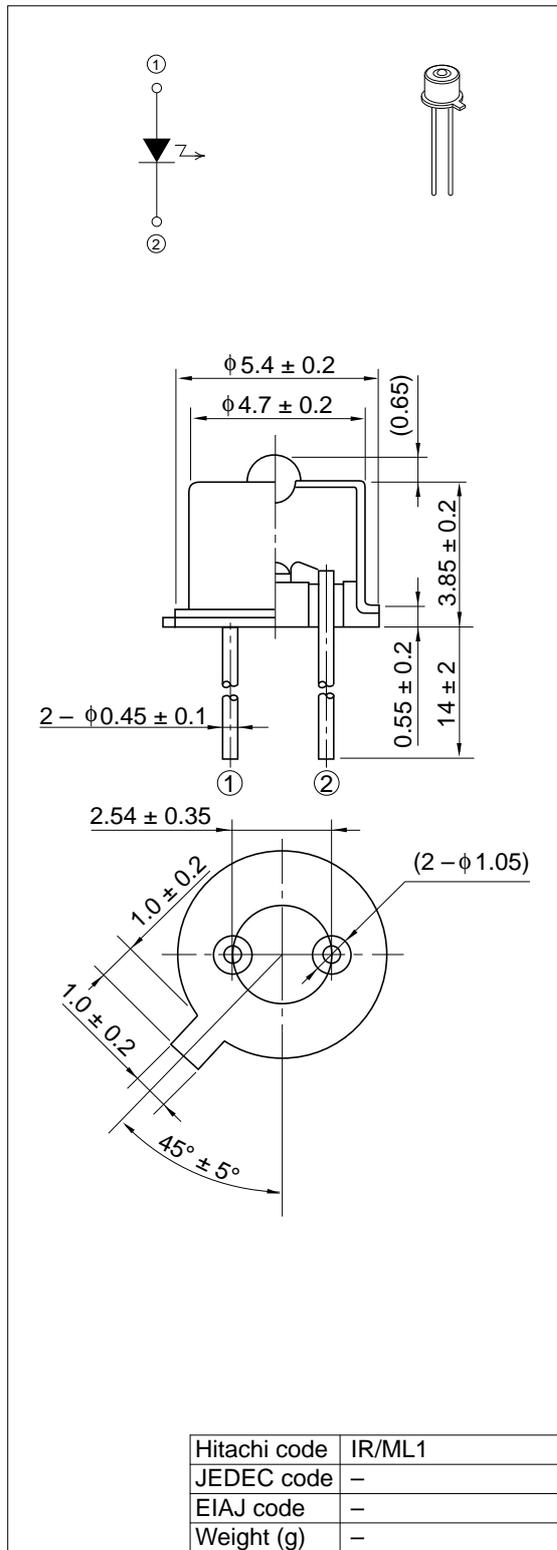
Unit: mm



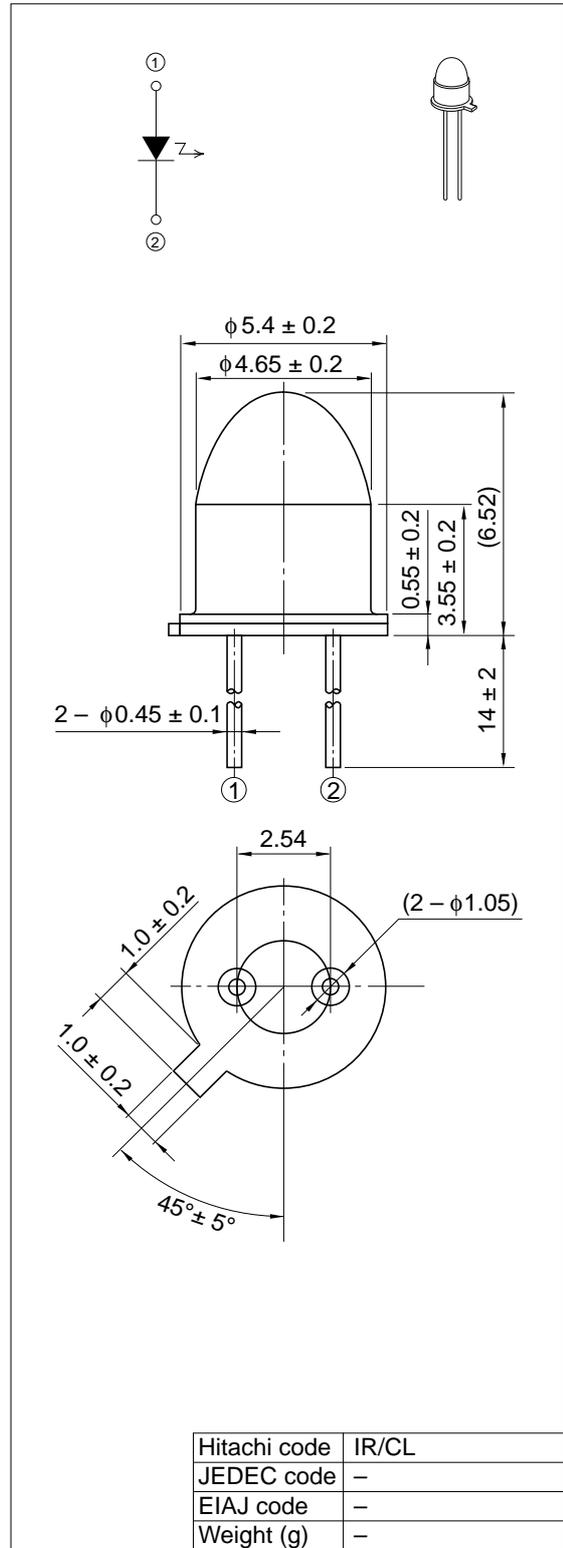
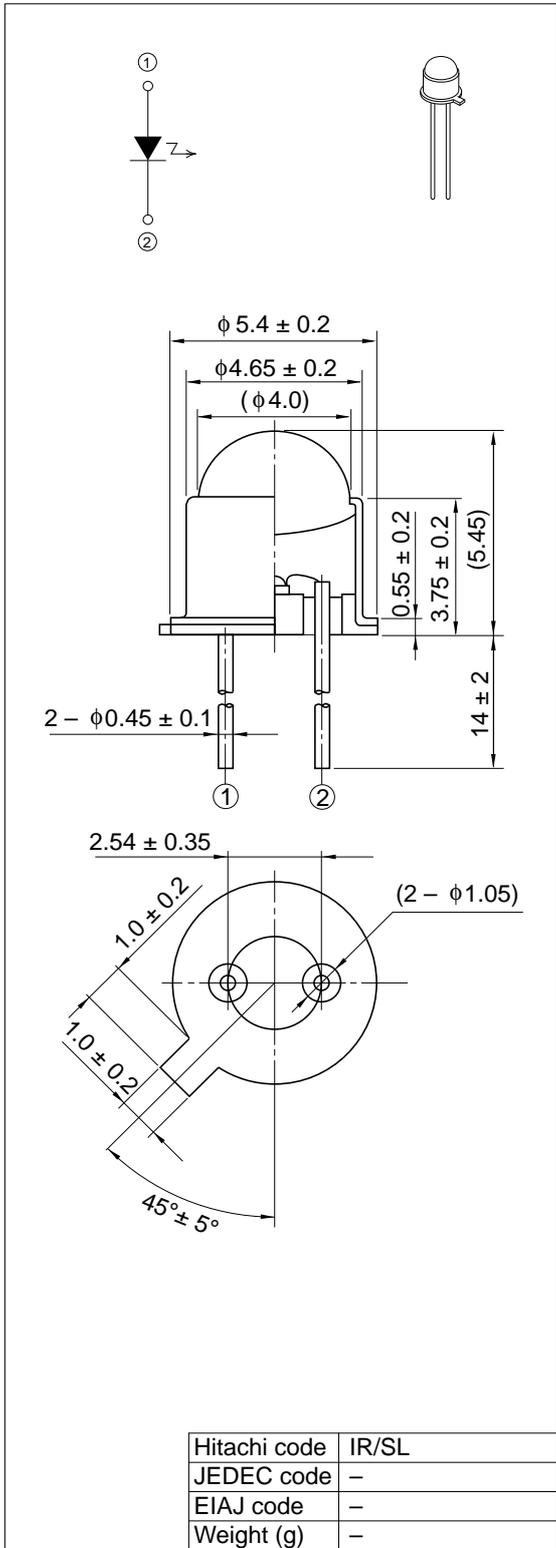
Package Outline Dimensions



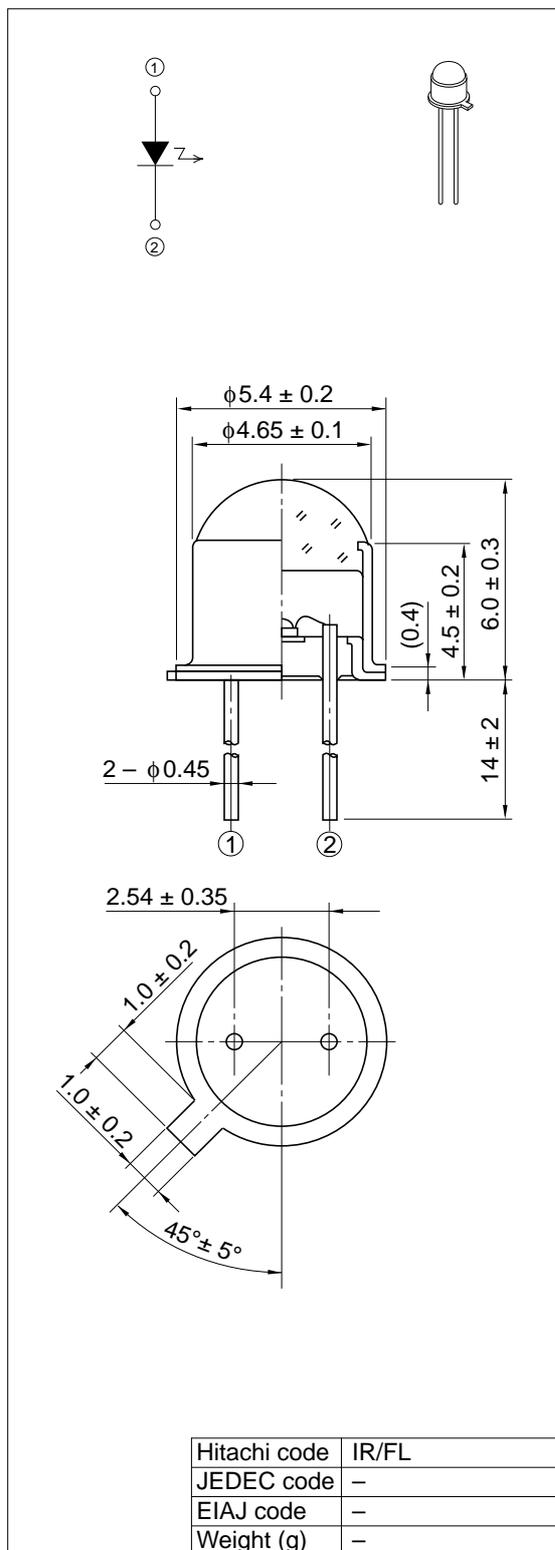
Package Outline Dimensions



Package Outline Dimensions



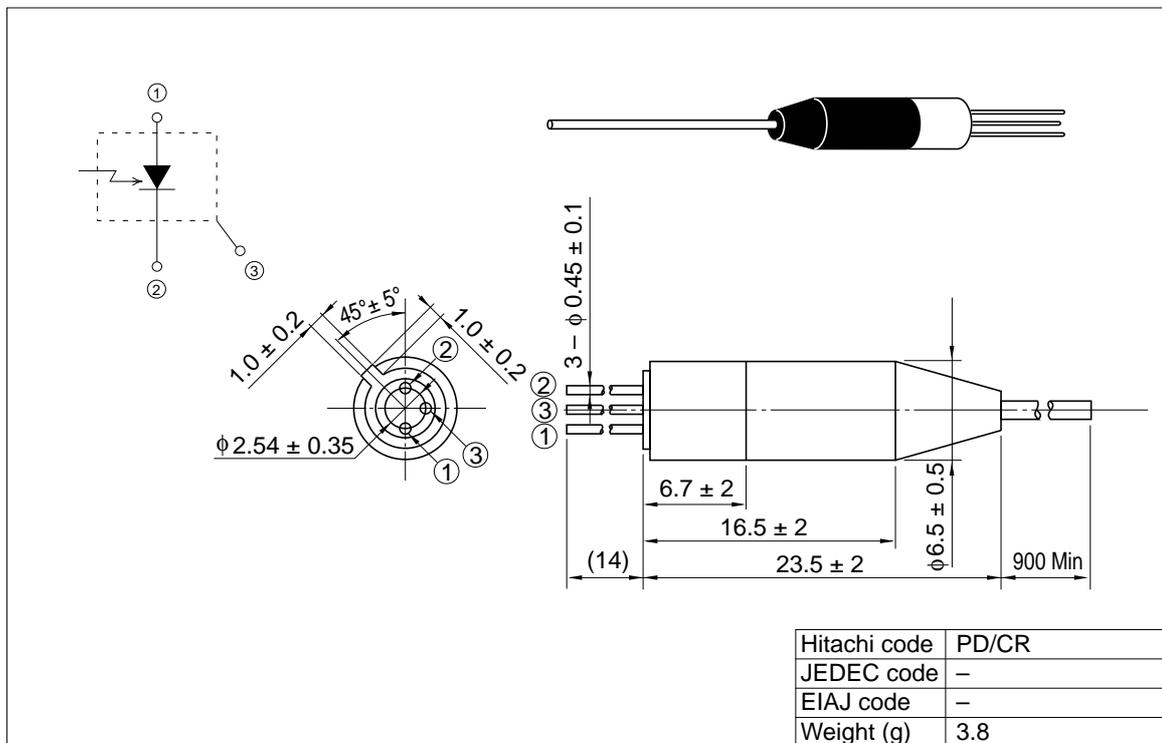
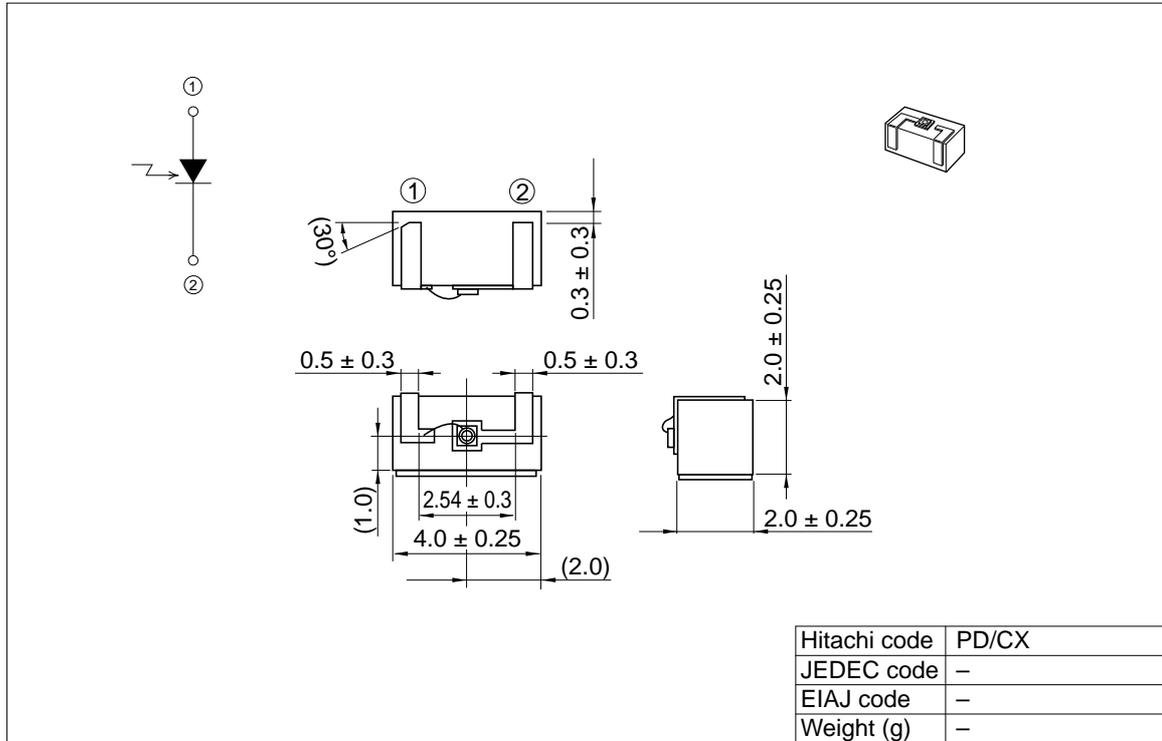
Package Outline Dimensions



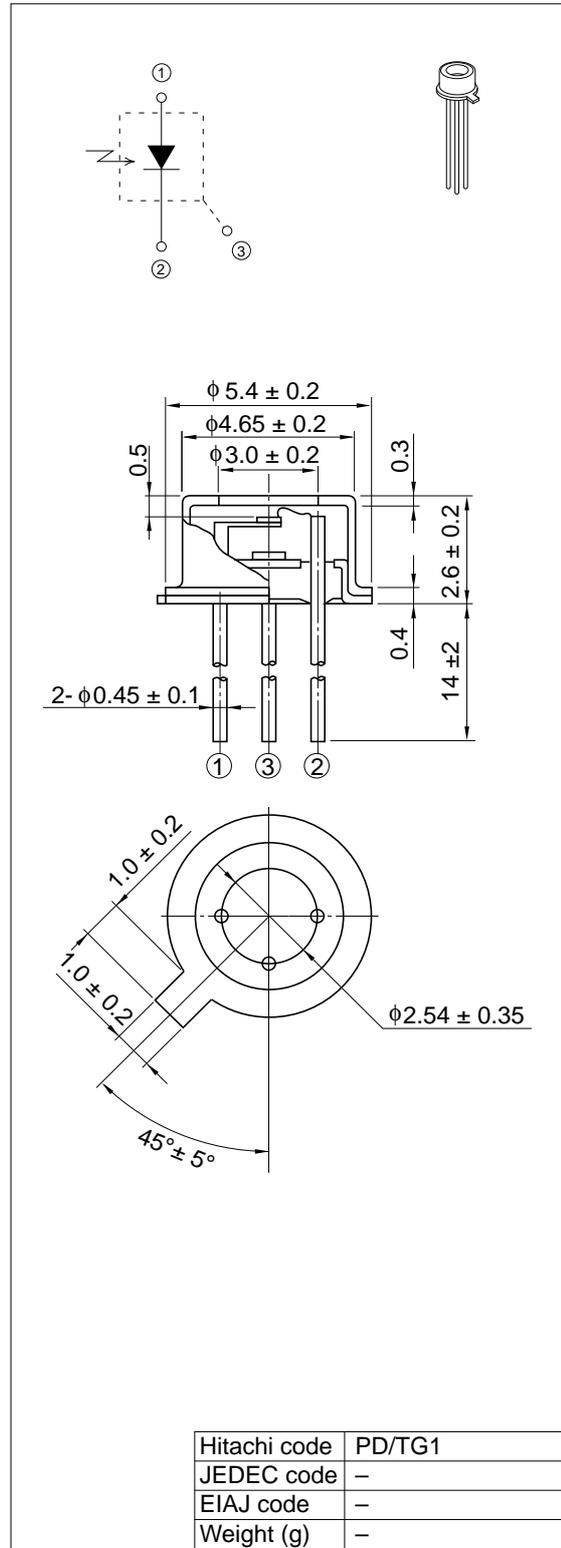
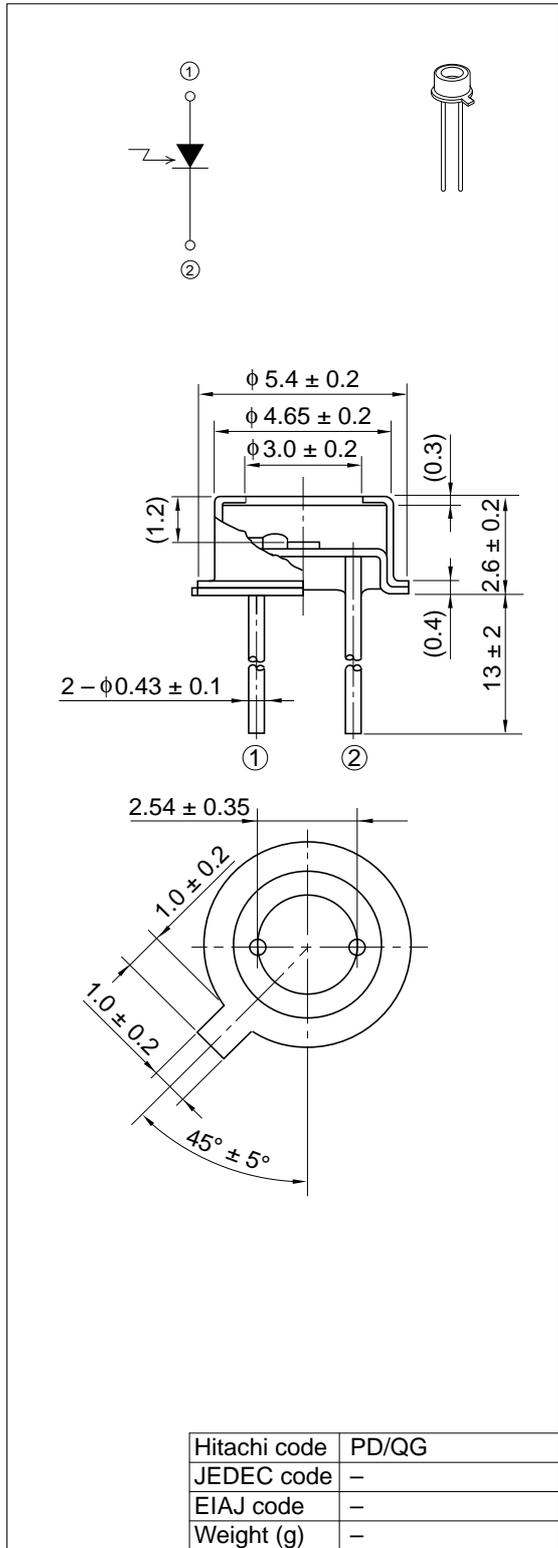
Package Outline Dimensions

2.4.3 Photo Diode Packages

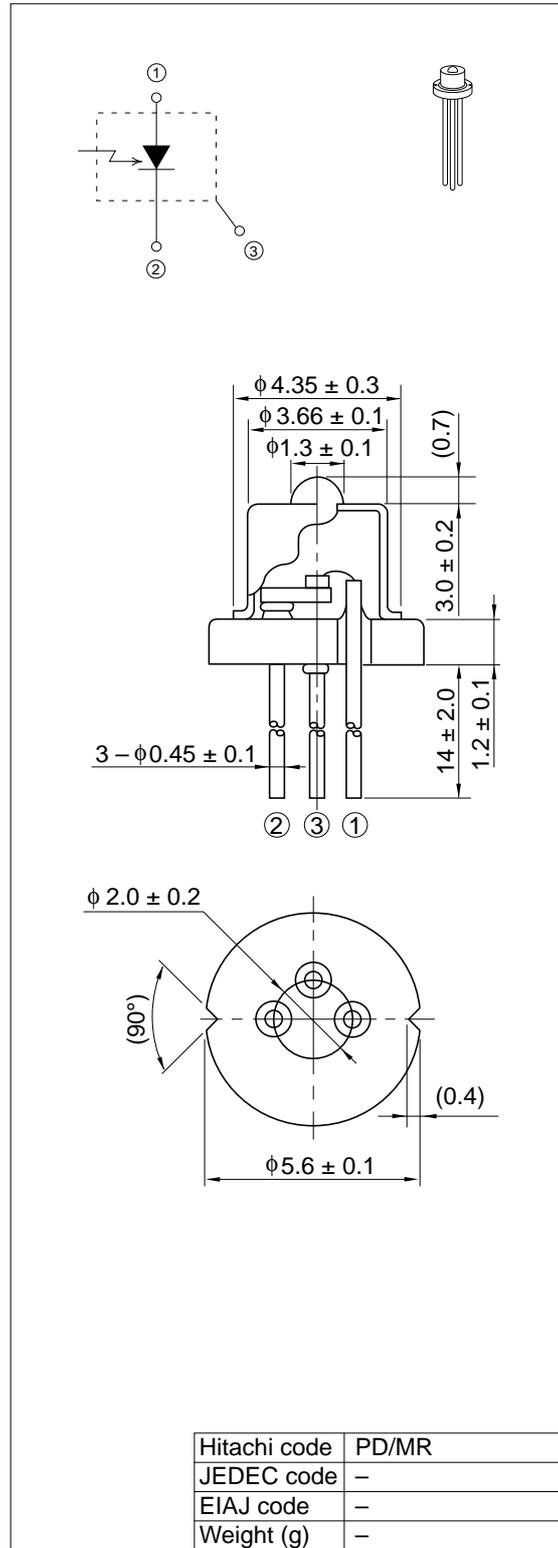
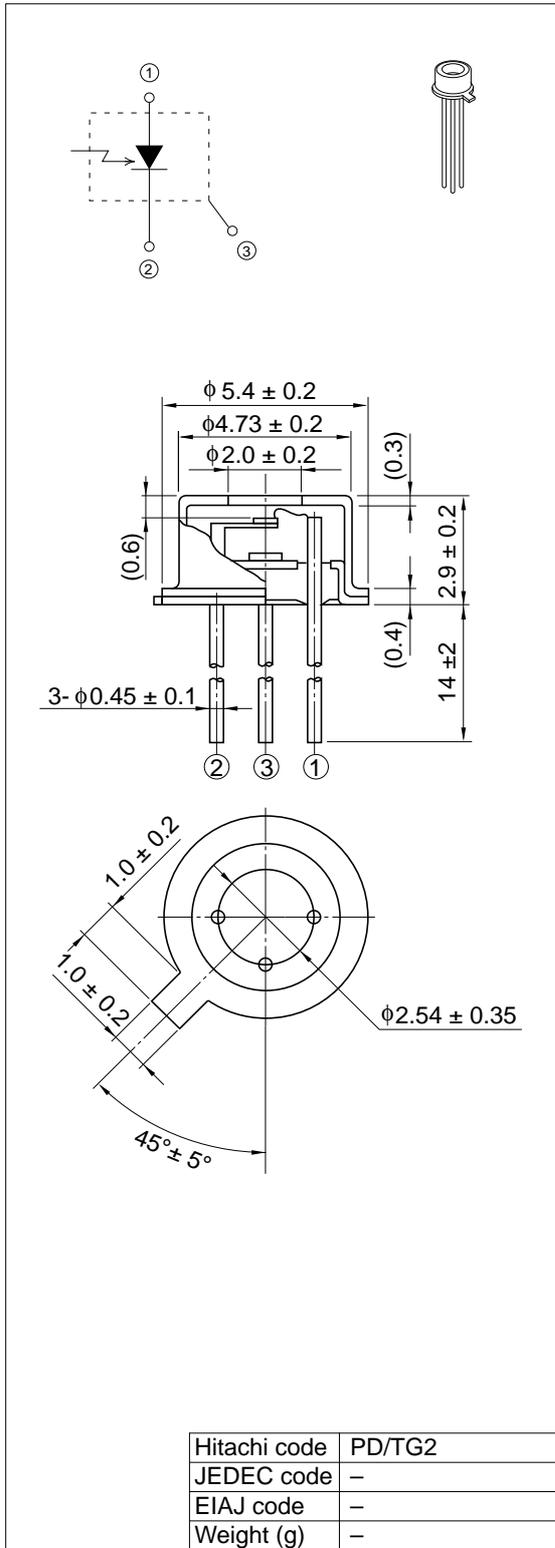
Unit: mm



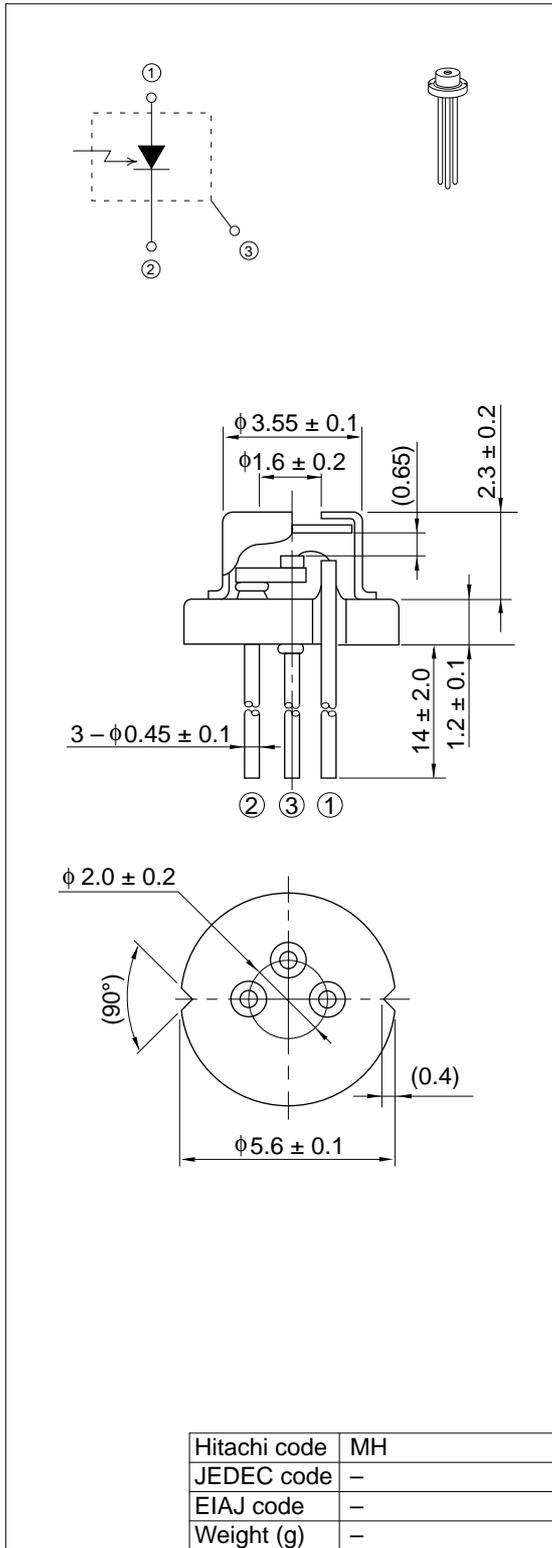
Package Outline Dimensions



Package Outline Dimensions



Package Outline Dimensions

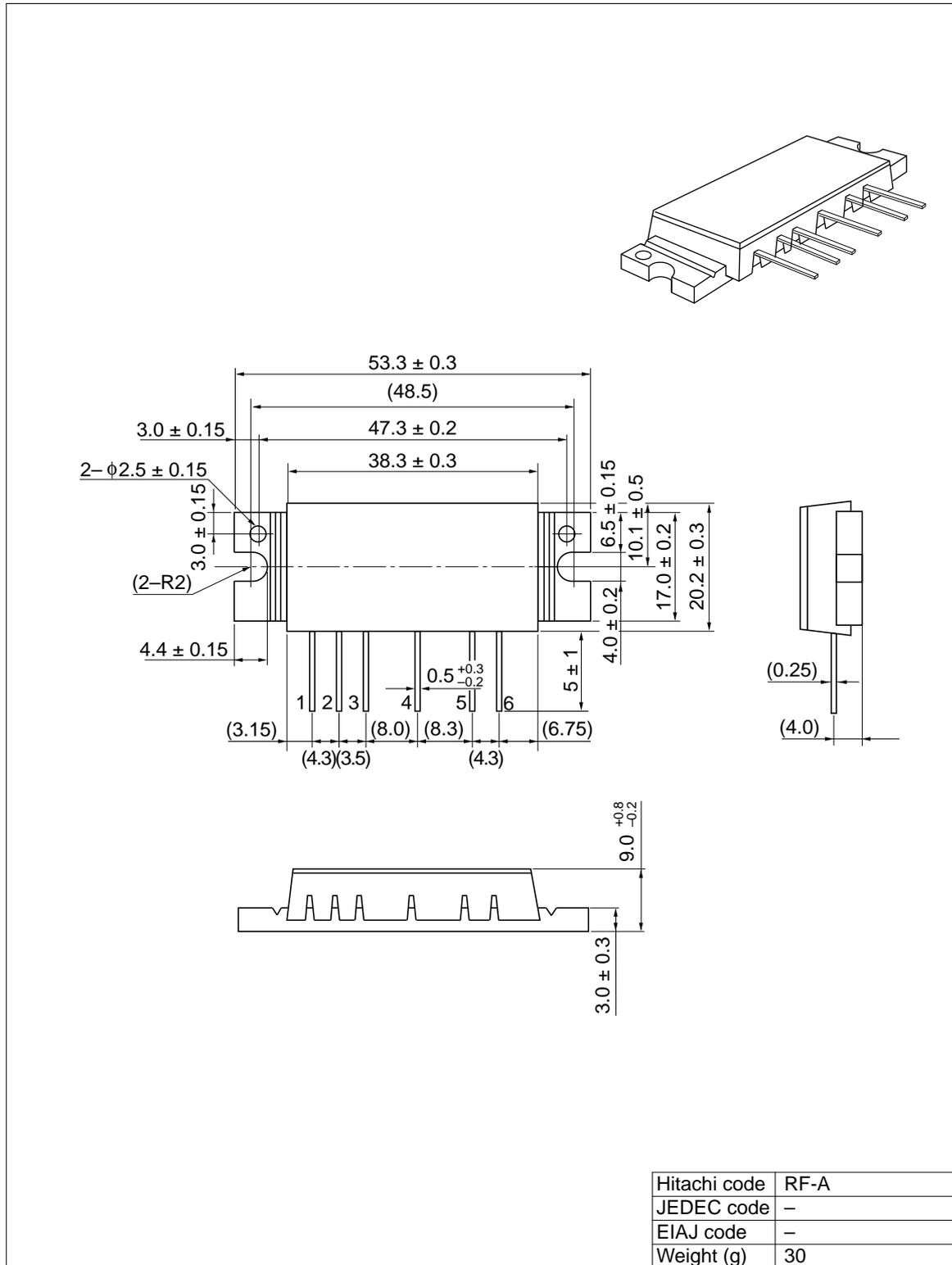


Package Outline Dimensions

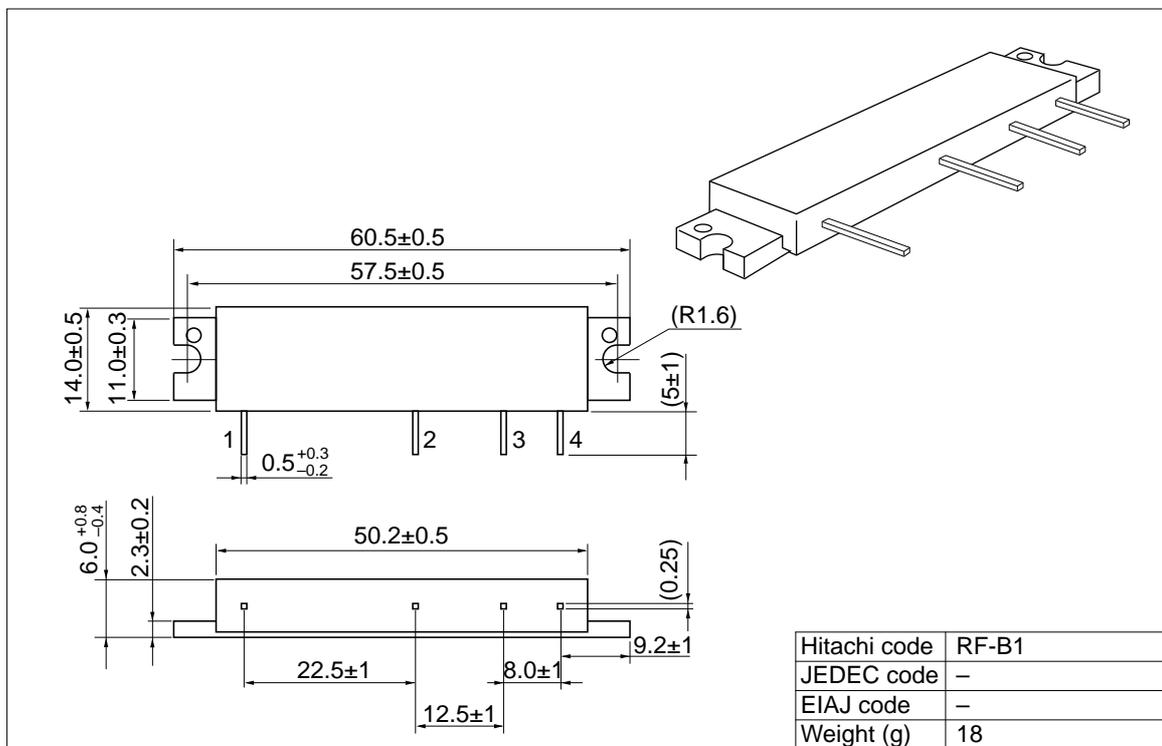
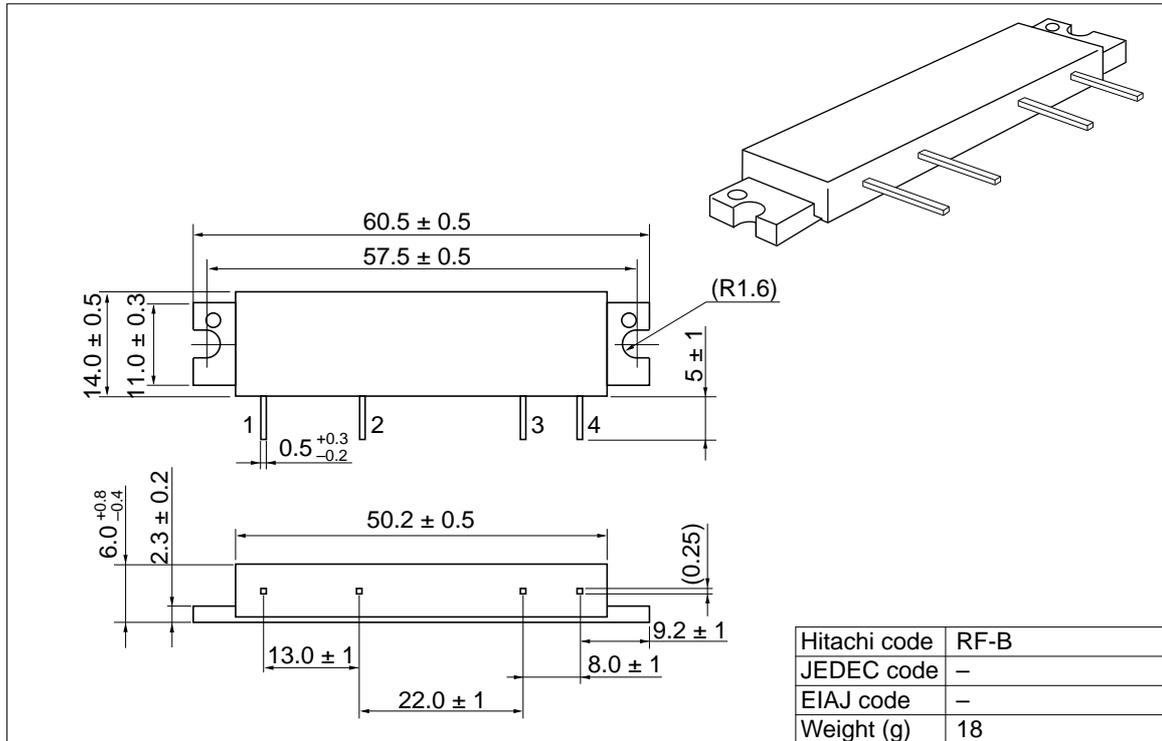
2.5 Module and Array Packages

2.5.1 Modules

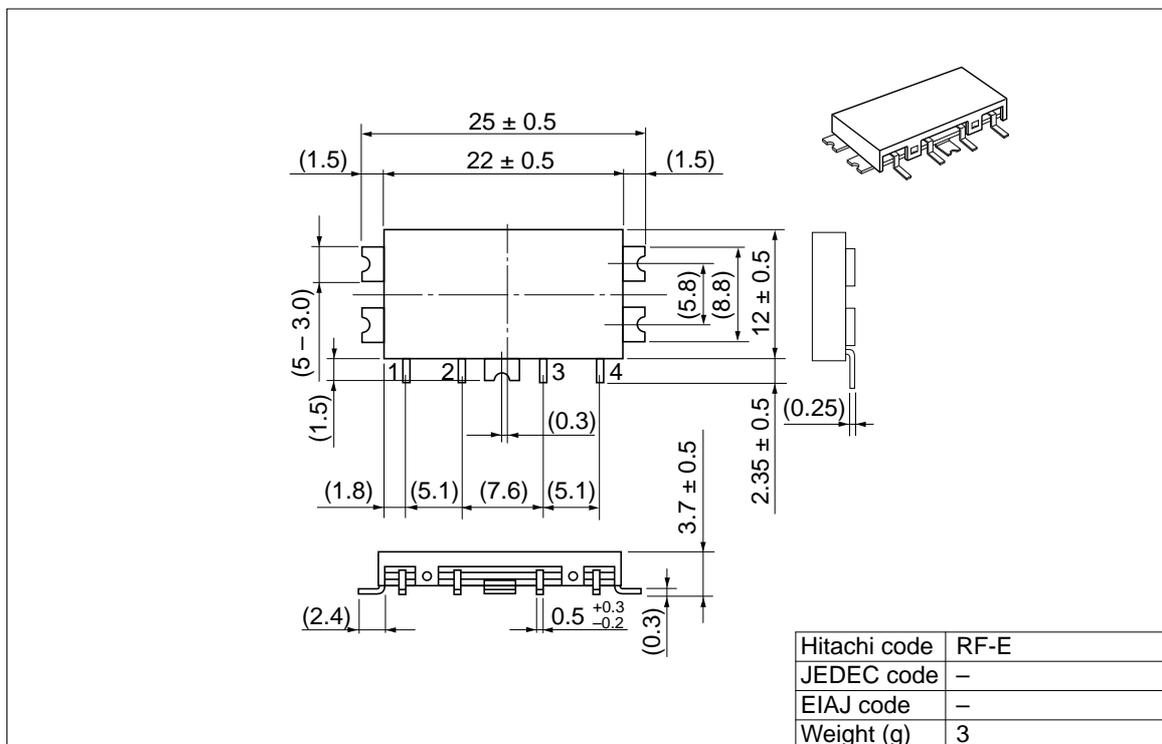
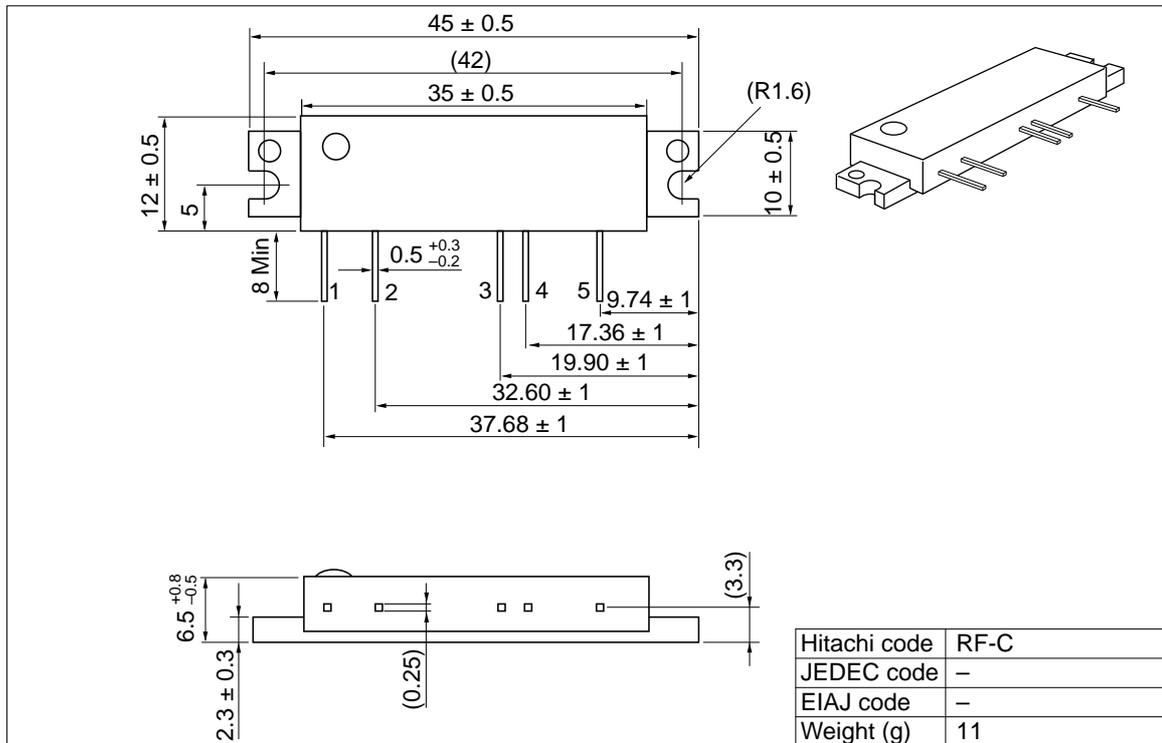
Unit: mm



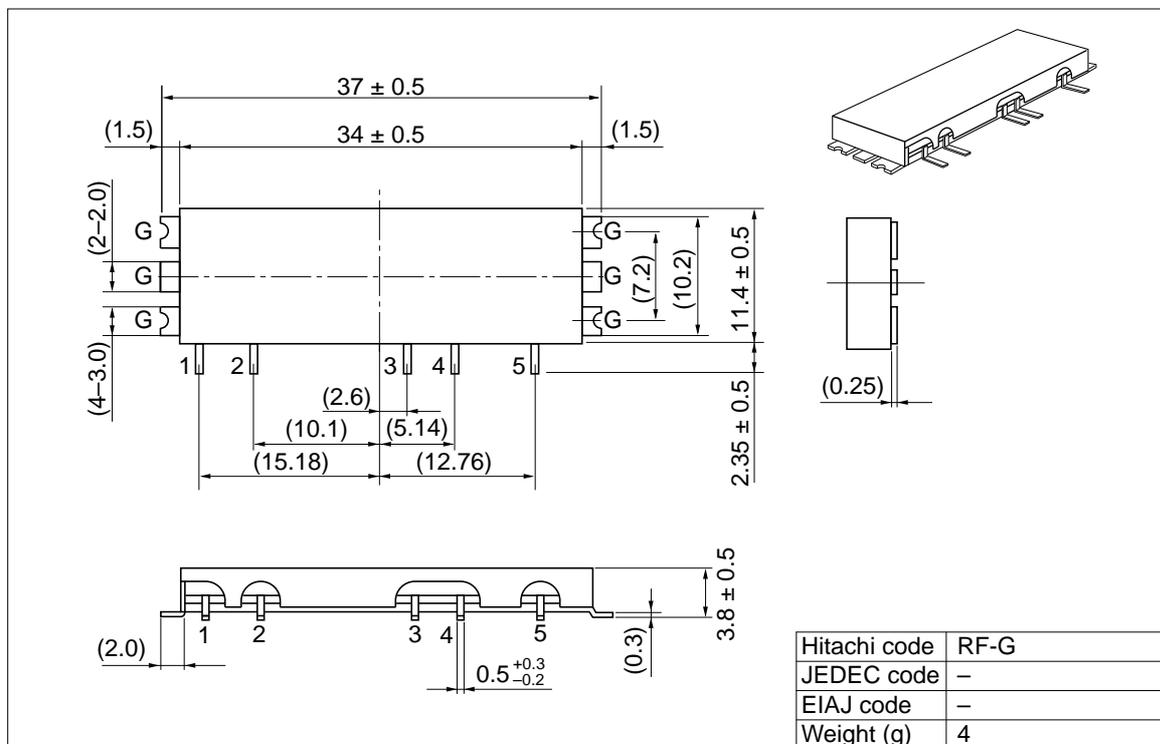
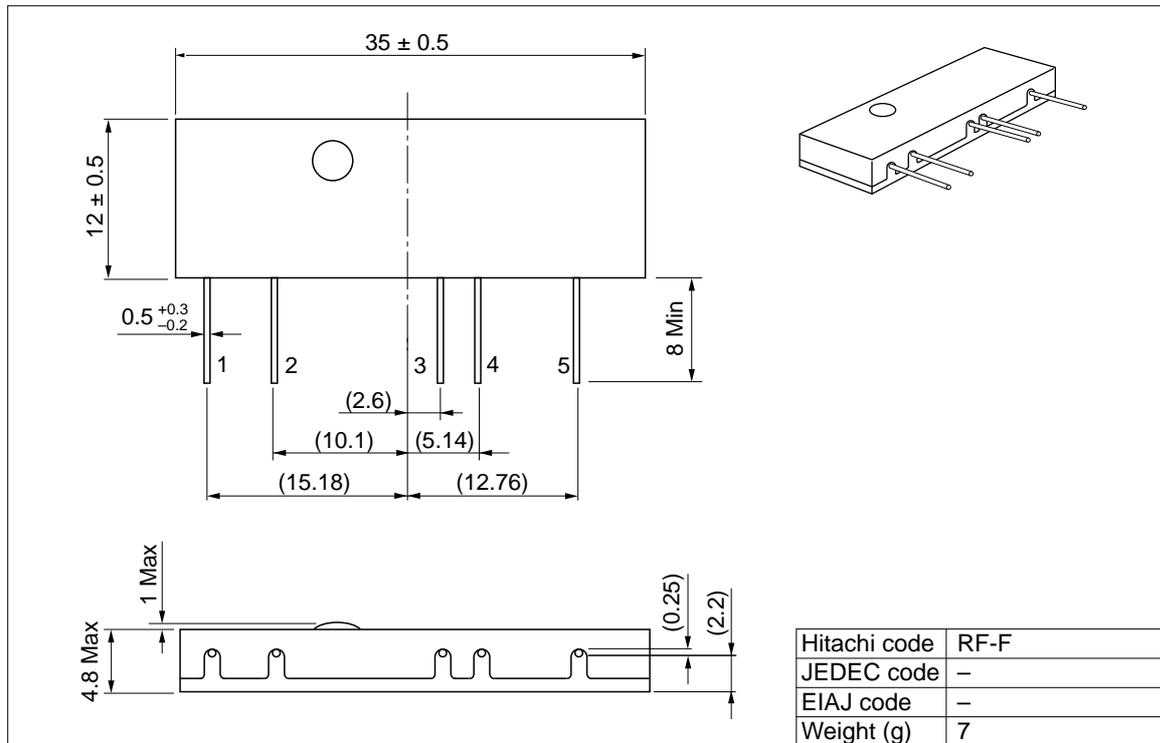
Package Outline Dimensions



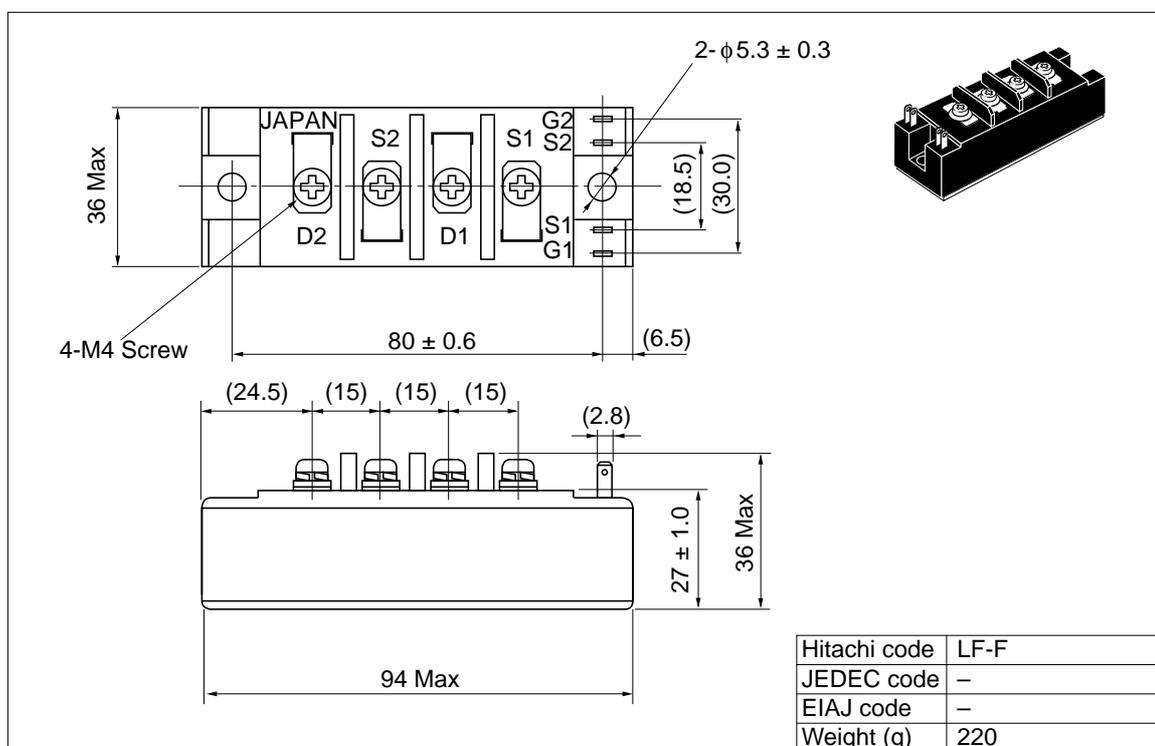
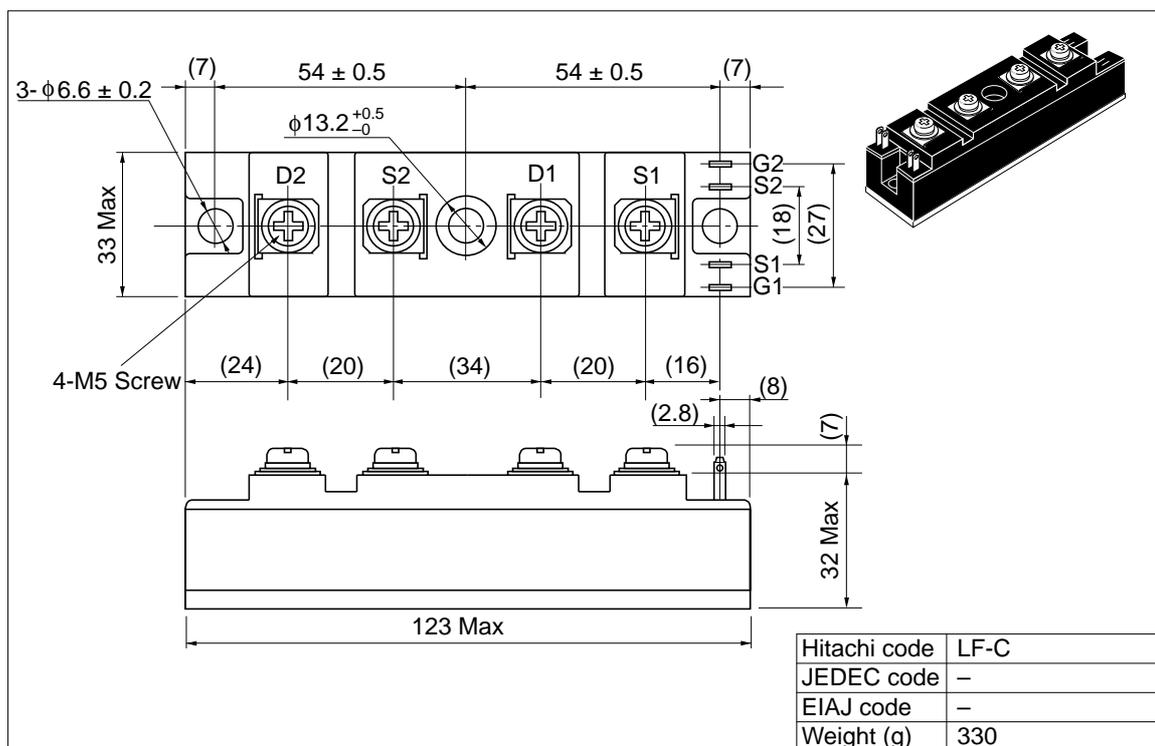
Package Outline Dimensions



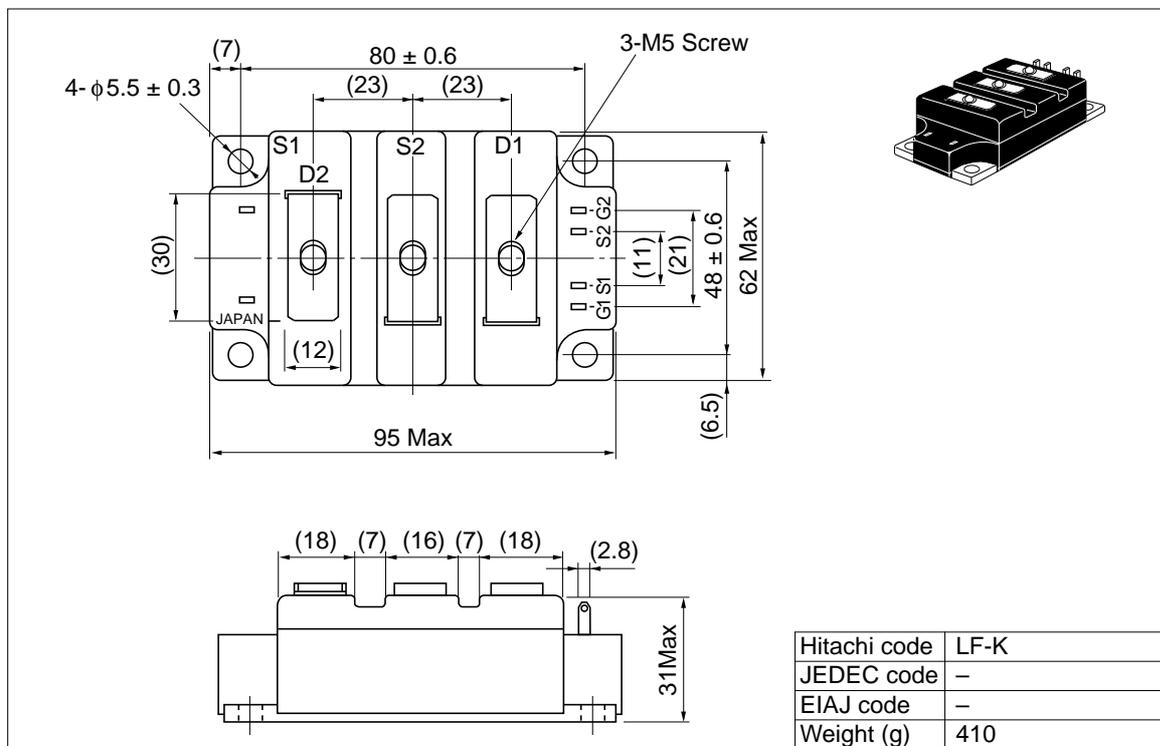
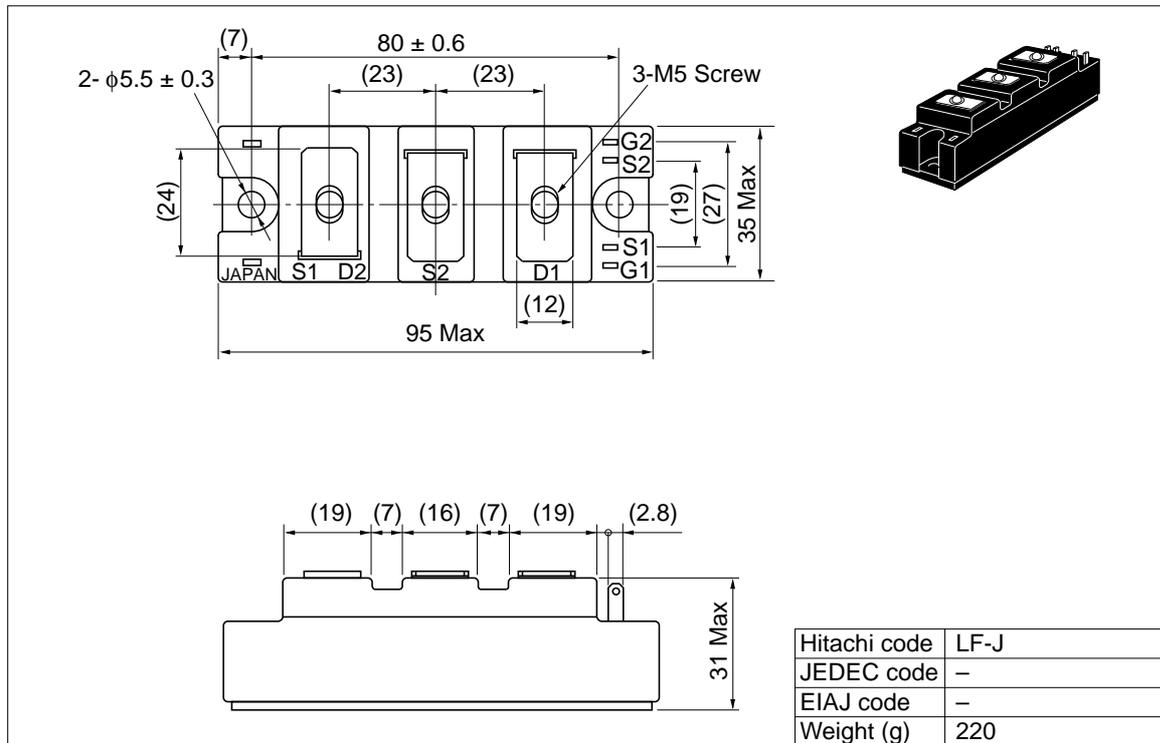
Package Outline Dimensions



Package Outline Dimensions



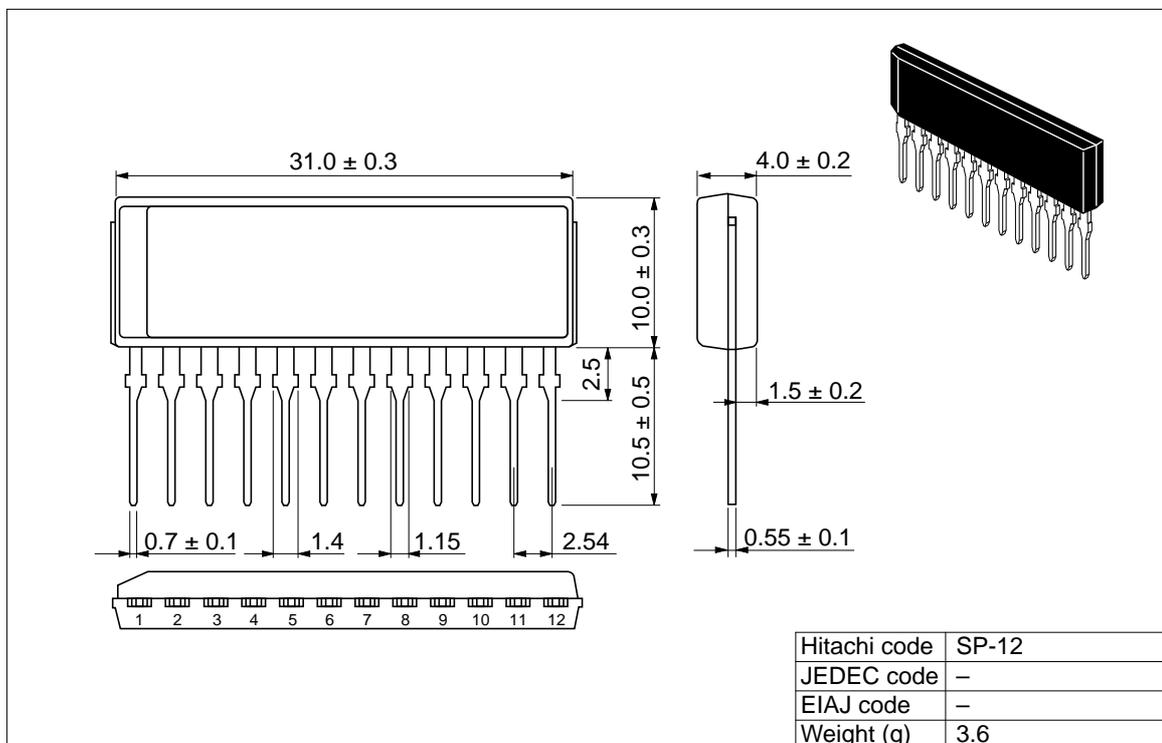
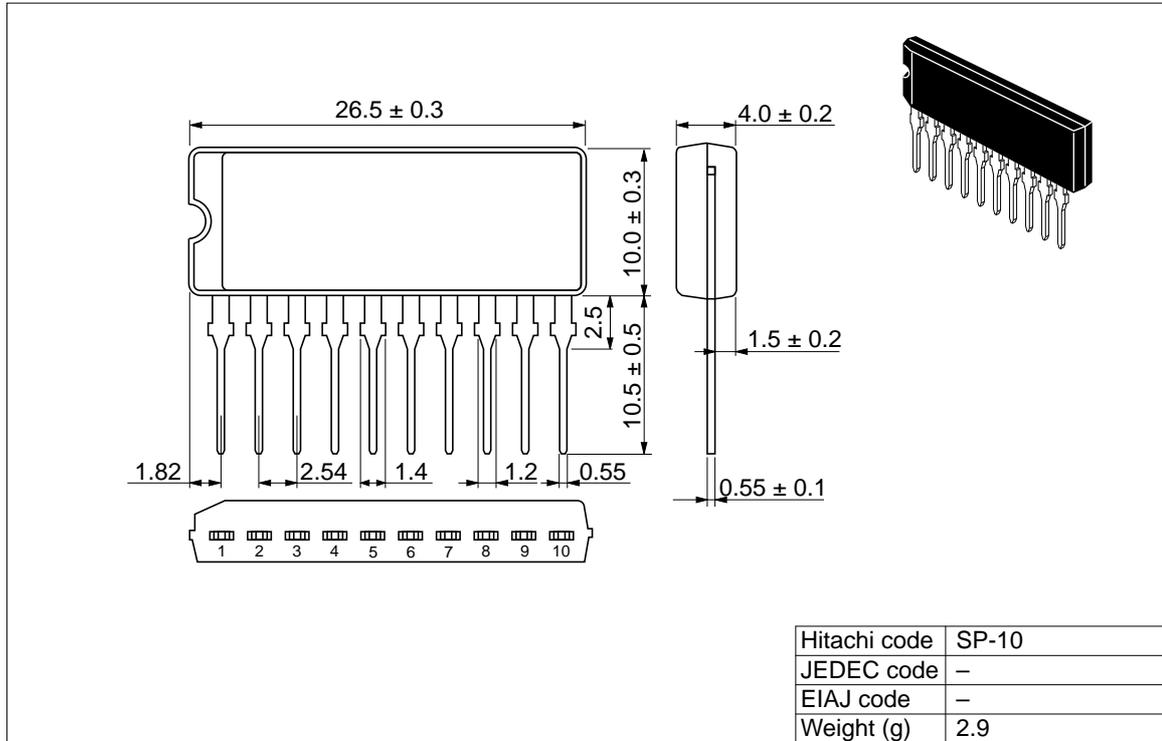
Package Outline Dimensions



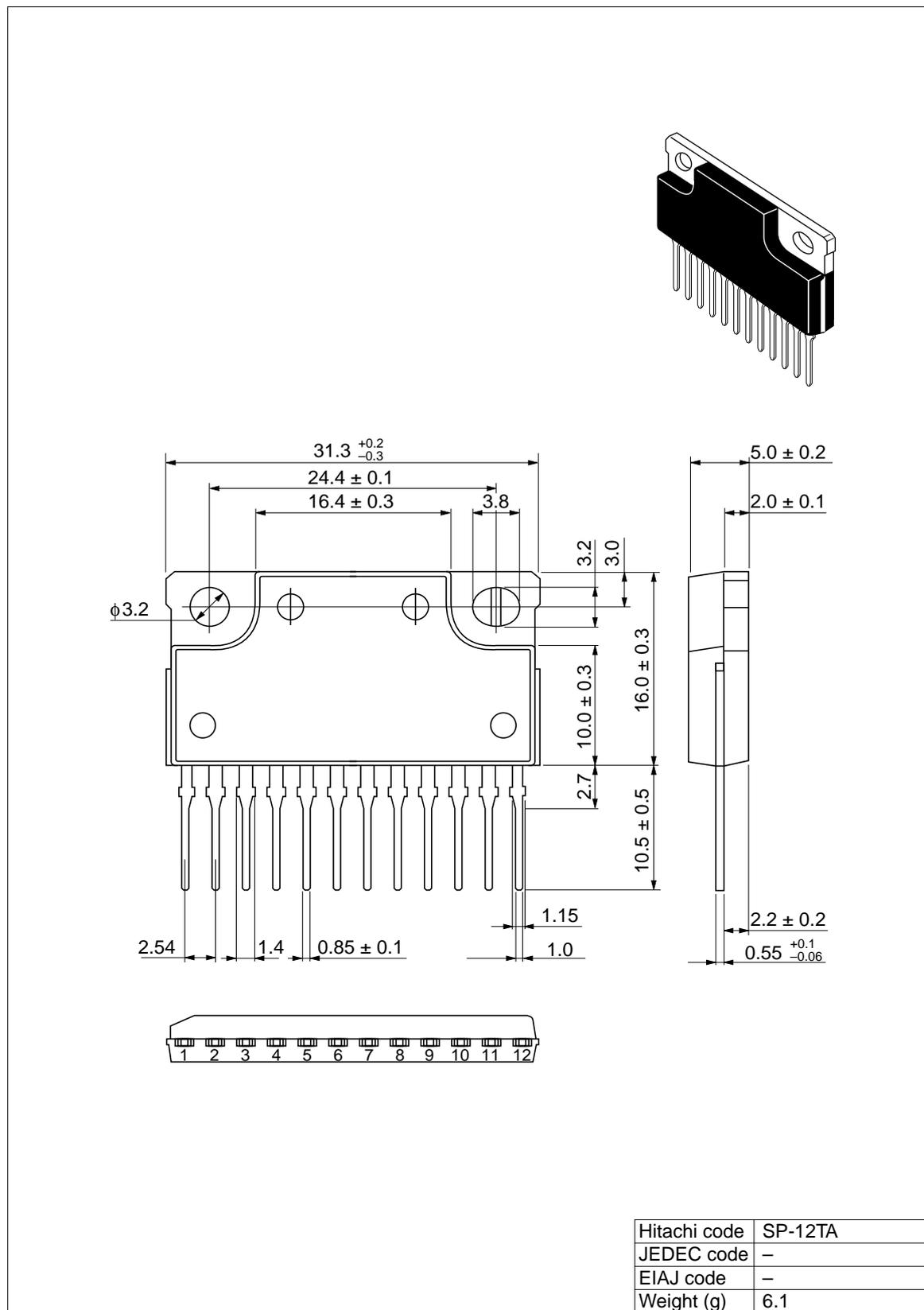
Package Outline Dimensions

2.5.2 Array Packages

Unit: mm



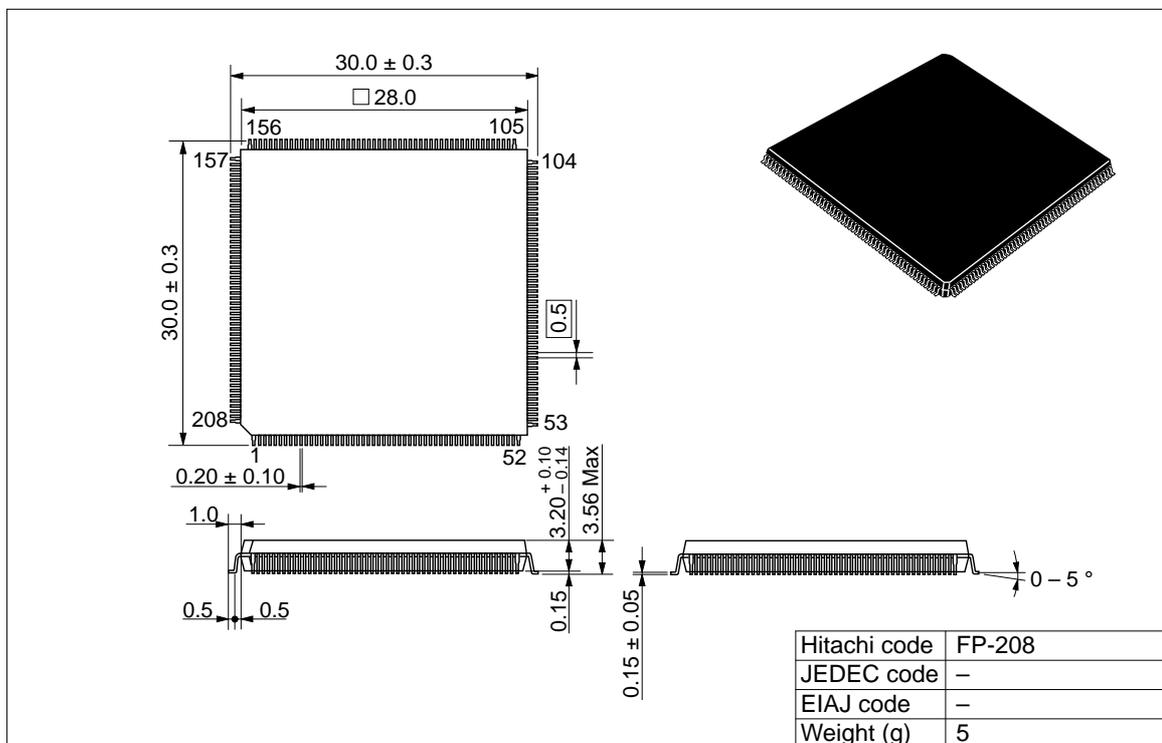
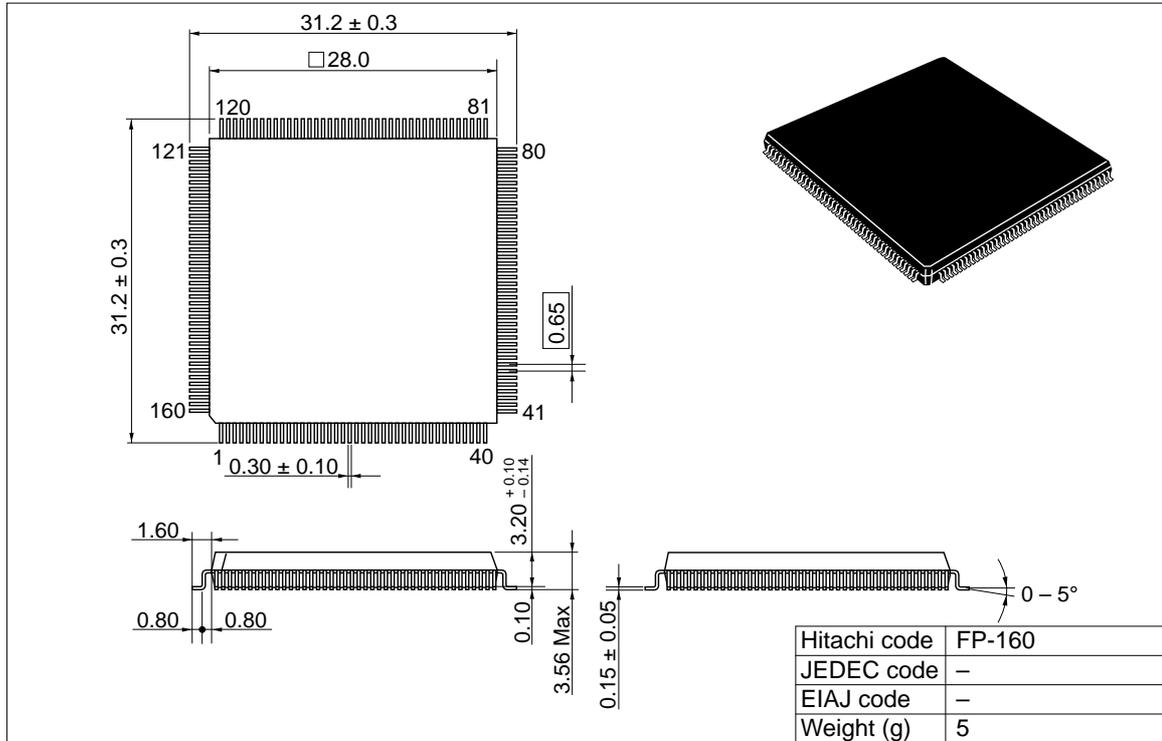
Package Outline Dimensions



Package Outline Dimensions

2.6 Standard Packages for Hybrid IC

Unit: mm



Section 3 Thermal Resistance of IC Packages

3.1 Thermal Resistance

Semiconductor devices are sensitive to temperature. When the temperature is above the junction temperature of the semiconductor, the device does not operate normally. The maximum permitted temperature of silicon is on the order of 100°C to 125°C. The device failure rate changes abruptly as junction temperature rises (figure 3-1). For this reason, it is necessary to perform thermal design for mounting to lower the junction temperature.

When carrying out heat sink design of a package, thermal resistance is the parameter that indicates the heat sink capacity of the package.

$$\theta_j = \frac{T_j - T_r}{P_d} \text{ (}^\circ\text{C/W)}$$

Pd: Power dissipation per device
 Tj: Junction temperature
 Tr: Standard temperature

θ_{ja} , the junction to ambient thermal resistance, and θ_{jc} , the junction to case thermal resistance, are the most generally used factors. Ambient temperature (T_a) and case temperature (T_c) are taken as the standard temperatures. Figure 3-2 shows package temperatures and thermal resistance.

Here, θ_{ca} indicates the case to ambient thermal resistance. The relationship:

$$\theta_{ja} = \theta_{jc} + \theta_{ca}$$

is established between them.

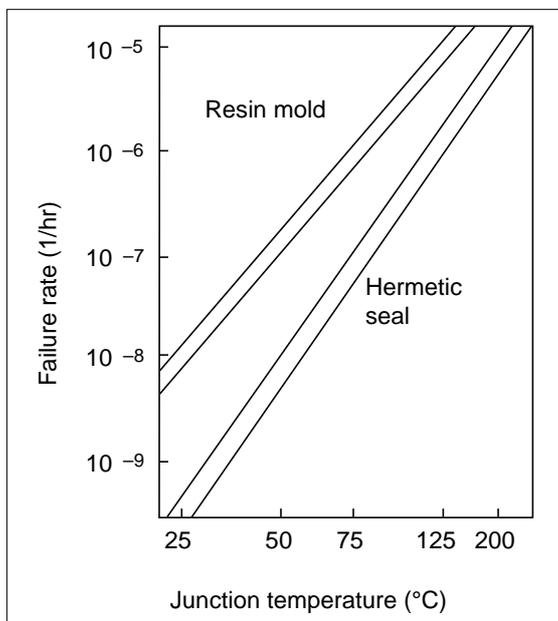


Figure 3-1 IC Junction Temperatures and Failure Rates

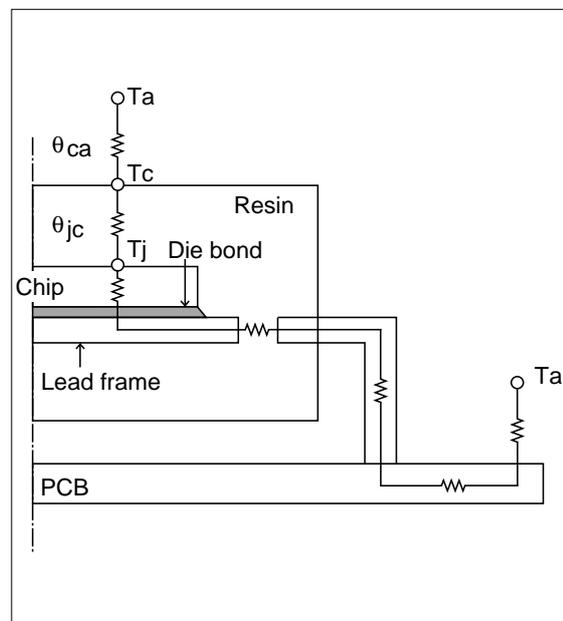


Figure 3-2 Thermal Resistance of Packages

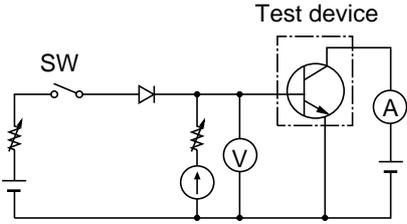
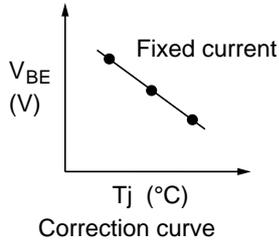
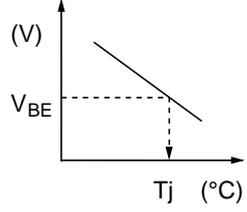
Thermal Resistance of IC Packages

3.2 Thermal Resistance Testing Method

Thermal resistance test is essentially junction temperature test. The power dissipation per device (P_d) and the ambient temperature (T_a) can be directly tested. However, junction temperature (T_j) cannot be tested directly. For this reason, junction temperature is tested indirectly making use of electrical parameters that are sensitive to temperature, such as the base to emitter voltage of the transistor and the forward voltage of the diode.

Table 3-1 shows an outline of the test system and of the principles of test. As error in the thermal resistance test is decreased by increasing the power dissipation per device and by sufficiently rising junction temperature, tests are made using power transistors. This method is based on MIL-STD-883C, which is a standard method.

Table 3-1 Outline of Test Method and Principles of Test

Item	Details
Outline of test system	
Principles	<p>STEP 1. Correction Temperature characteristics of base to emitter voltage (correction curve) are found.</p>  <p>STEP 2. Power impression test. The base to emitter voltage (V_{BE}) is tested when the power dissipation P_d is added. T_j is found from the V_{BE} that has been tested.</p> <p>STEP 3. Calculation of thermal resistance Thermal resistance is found by the following</p> $\theta_{ja} = \frac{T_j - T_a}{P_d}$ 

Thermal Resistance of IC Packages

3.3 Thermal Resistance of Various Packages

Table 3-2 shows examples of thermal resistance of surface mount packages.

θ_{ja} indicates thermal resistance tested in a natural convection state with the package suspended as a unit and thermal resistance tested in a natural convection state with the package mounted on a glass epoxy board. In each case, the lead frame material, the chip size and the board area are different. Because θ_{ja} varies depending on the lead frame material and chip size, the data must be handled taking the test conditions into consideration. θ_{jc} indicates thermal resistance between the junction and the case when the surface temperature of the main body of the package is taken as the case temperature, T_c . The heat sink temperature is taken as the case temperature for packages in the shape of a heat sink. θ_{jc} is obtained by applying silicone grease to reduce contact thermal resistance to the upper surface of the package or to the heat sink and by testing thermal resistance in a state in which the grease is in contact with a water-cooled heat sink of a copper plate.

Table 3-2 Test Examples of Thermal Resistance for Various Package

Package name	Appliacation package	Lead frame material (Ceramic material)	Chip size (mm)	Applicable board	θ_{ja} (°C/W)		
					Unit	Board mountin	θ_{jc} (°C/W)
SOP	FP-8D	Cu alloy	1.16 × 1.44	1	258	169	72
	FP-14D	Cu alloy	1.16 × 1.44	1	234	163	99
	FP-16D	Cu alloy	1.16 × 1.44	1	230	158	99
	FP-18D	Cu alloy	1.16 × 1.44	1	190	135	
	FP-20DN	Cu alloy	1.16 × 1.44	1	193	144	95
	FP-24D	42% Ni alloy	4.5 × 4.5	4	159	94	40
	FP-28D	42% Ni alloy	4.5 × 9.0	4	121	84	40
	FP-32D	Cu alloy	6.0 × 6.0	3	102	66	19
QFP	FP-28T	Cu alloy	2.76 × 2.4	6	168	55	
	FP-44A	42% Ni alloy	6.0 × 6.0	5	121	102	34
	FP-64A	42% Ni alloy	6.0 × 6.0	5	118	103	34
	FP-80A	42% Ni alloy	6.0 × 6.0	5	115	99	–
	FP-136	42% Ni alloy	6.0 × 6.0	5	88	73	
	FP-136A	Cu alloy	5.5 × 5.5	6	–	40	
	FP-56	Cu alloy	6.0 × 6.0	6	–	70	
	FP-64	42% Ni alloy	6.0 × 6.0	5	111	87	22
	FP-80	42% Ni alloy	6.0 × 6.0	5	98	88	
	FP-80C	Cu alloy	6.0 × 6.0	2	85	78	37

Thermal Resistance of IC Packages

Test examples of Thermal Resistance for Various Package (cont)

Package name	Application package	Lead frame material (Ceramic material)	Chip size (mm)	Applicable board	θ_{ja} (°C/W)		
					Unit	Board mountin	θ_{jc} (°C/W)
QFP	FP-100	42% Ni alloy	6.0 × 6.0	5	97	88	24
	FP-100C	Cu alloy	6.0 × 6.0	2	84	76	33
SOJ	CP-20D	Cu alloy	4.5 × 9.0	5	119	72	30
	CP-24D	Cu alloy	6.0 × 6.0	5	131	76	30
	CP-28D	Cu alloy	6.0 × 6.0	5	101	64	15
	CP-28DN	Cu alloy	4.5 × 9.0	5	110	76	20
QFJ (PLCC)	CP-44	Cu alloy	6.0 × 6.0	3	85	60	
	CP-52	Cu alloy	6.0 × 6.0	3	72	57	
	CP-68	Cu alloy	6.0 × 6.0	5	62	54	19
QFJ-G	CC-44	(Al ₂ O ₃)	8.4 × 8.4	5	79	–	12
QFI (MSP)	MP-18	Cu alloy	2.76 × 2.4	1	200	106	35
	MP-18T	Cu alloy	2.76 × 2.4	1	186	97	–
	MP-28	Cu alloy	2.76 × 2.4	1	140	92	
	MP-28T	Cu alloy	2.76 × 2.4	1	130	83	–
	MP-44	Cu alloy	2.76 × 2.4	1	107	77	
	MP-44T	Cu alloy	2.76 × 2.4	1	100	64	–
	MP-68	Cu alloy	2.76 × 2.4	1	67	54	
QFN(LCC)	CG-28B	(Al ₂ O ₃)		1	111	99	
FPG	FG-28B	Cu alloy		1	109	68	
	FG-132	Cu alloy		1	52	41	
PGA	PC-135	(Al ₂ O ₃)	12.6 × 12.6	–	26	–	–
	PC-179	(Al ₂ O ₃)	10.5 × 10.5	–	26	–	–
	PC-240	(Al ₂ O ₃)	10.5 × 10.5	–	24	–	–
	PC-257	(Al ₂ O ₃)	10.5 × 10.5	–	23	–	–
	PC-299	(Al ₂ O ₃)	10.5 × 10.5	–	20	–	–

Thermal Resistance of IC Packages

Test examples of Thermal Resistance for Various Package (cont)

Package name	Appliacation package	Lead frame material (Ceramic material)	Chip size (mm)	Applicable board	θ_{ja} (°C/W)	
					Unit	Board mountin θ_{jc} (°C/W)
PGA	PC-401	(Al ₂ O ₃)	10.5 × 10.5	–	23	–
DIP-G	DG-28	42% Ni alloy	6.3 × 6.3	–	56	14
	DG-32A	42% Ni alloy	10.5 × 4.2	–	57	8
	DG-32	42% Ni alloy	6.3 × 6.3	–	70	28
	DG-40A	42% Ni alloy	6.3 × 6.3	–	53	11

Test conditions:

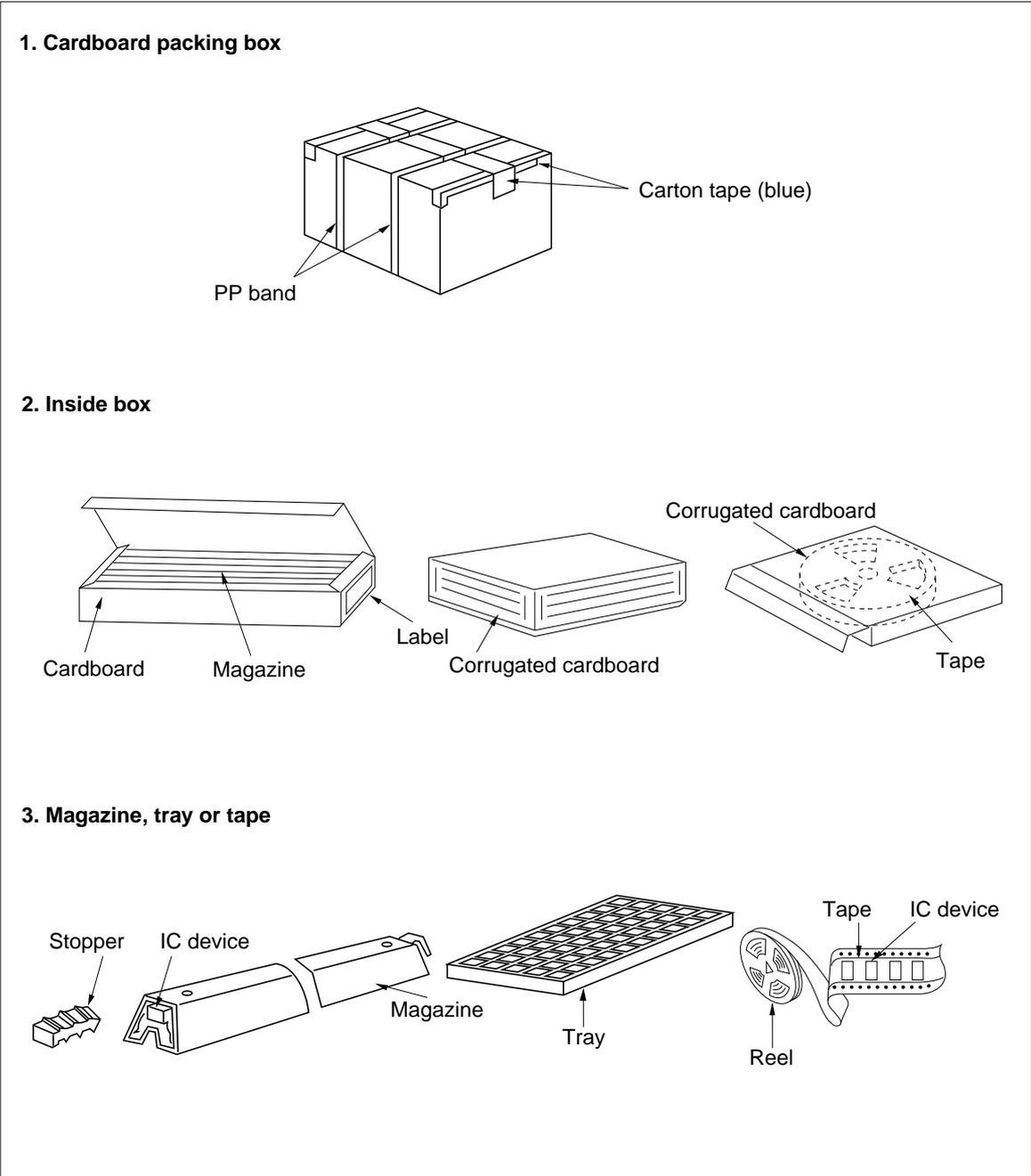
- Natural convection state
- Ta: room temperature
- Board material: glass epoxy
- Board area: (mm)
 1. 40 × 40 × 1.6 (Wiring density, 10%)
 2. 55 × 45 × 1.6 (Wiring density, 10%)
 3. 67 × 58.5 × 1.6 (Wiring density, less than 15%)
 4. 120 × 21 × 1.6 (Wiring density, 30%)
 5. 140 × 50 × 1.6 (Wiring density, 30%)
 6. 40 × 40 × 1.6 (Wiring density, 200%)

Section 4 Packing Specifications

4.1 Forms of Package Packing

The forms of IC delivery include, as shown below, leaving the IC unsealed in a packing box and using an inside box in which there is a magazine, a tray, or tape, with the IC being housed inside. In the unsealed mode, the order of operations should be (1) corrugated cardboard packing box → (2) inside box → (3) magazine (or tray or tape) .

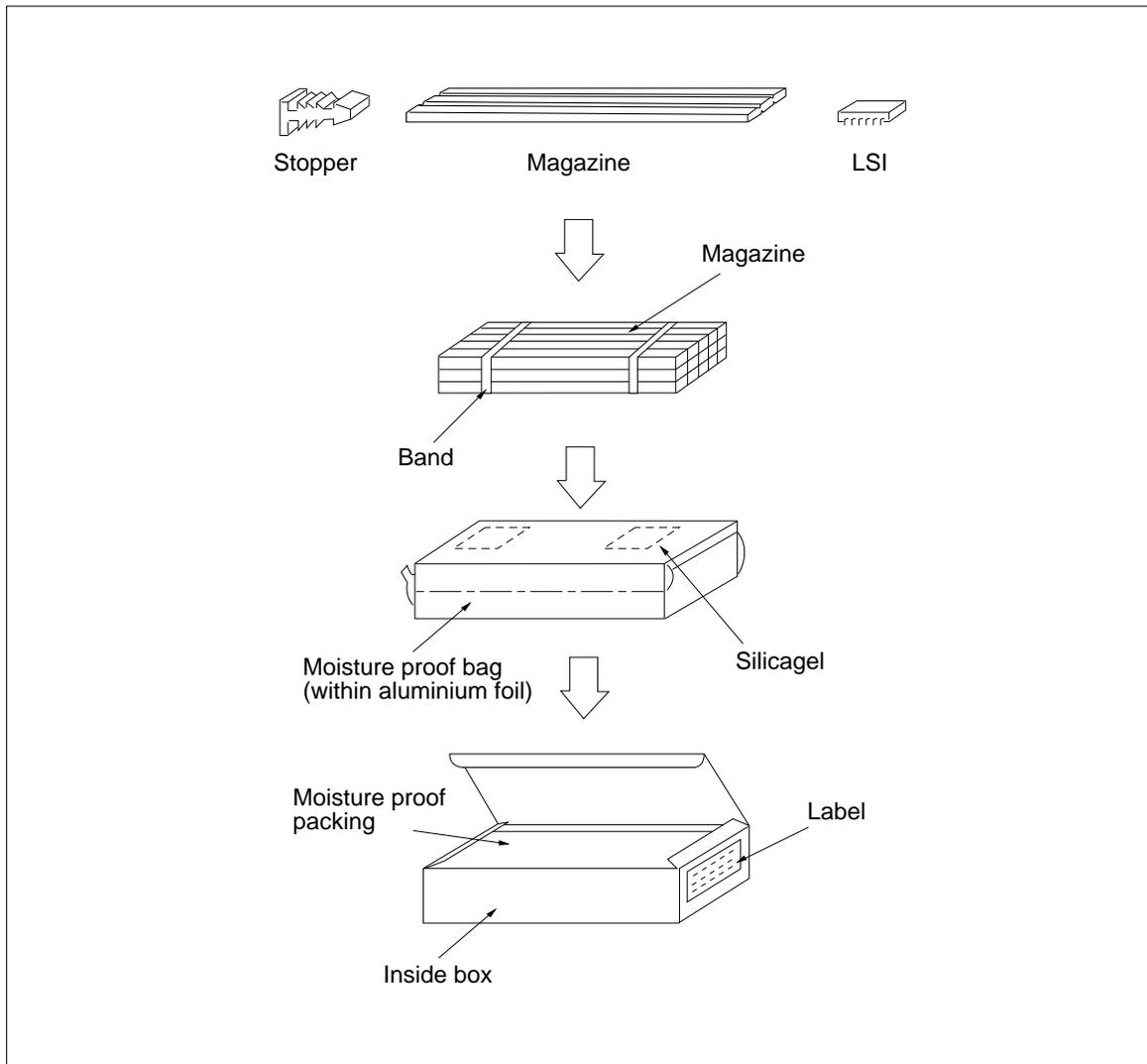
The magazine, tray, or tape is designed so that the package is not subjected to damage during transport. When the seal is opened, the package should be handled with great care so that it is not damaged.



Packing Specifications

4.2 Moistureproof Packing

When a surface mount product is subjected to solder reflow mounting after the package has absorbed moisture, cracking of the package occurs during mounting. For this reason, moistureproof packing is carried out for plastic surface mount packages which carry large chips for the purpose of preventing moisture absorption during transport and storage. The specifications are shown below.



Packing Specifications

4.3 Surface Mount IC Package Specifications

- * : JEDEC
- ** : Limited availability-please inquire
- *** : Partly under development
- ☐ : Not applicable to all products

Abbreviation	Nominal Dimensions	Number of Pins	Magazine	Tray			Taping															
				Soft	Hard		Adhesive	Embossed														
					Not Heat-Resistant	Heat-Resistant																
SOP	150 mil*	14	—	—	—	—	—	In volume production														
		16						In volume production	In volume production	☐												
	225 mil	8	In volume production				—			—	—	In volume production	☐									
		300 mil*						14	In volume production				In volume production	☐								
								16						In volume production	☐							
								20							—	☐						
	375 mil	24						In volume production	In volume production			In volume production	☐									
		18											In volume production	In volume production	In volume production	☐						
	450 mil	20						In volume production	—			—				—	In volume production	☐				
		28											In volume production	In volume production	In volume production			☐				
	525 mil	32															In volume production	In volume production	In volume production	In volume production	☐	
		40											In volume production	In volume production	In volume production						☐	
600 mil	44	In volume production		—	—	—											In volume production	☐				
	48												In volume production	In volume production	In volume production			In volume production	☐			
675 mil	32		In volume production				In volume production			In volume production	In volume production						In volume production		☐			
	40												In volume production	In volume production	In volume production			In volume production	In volume production	☐		
SSOP	225 mil		14				—			—	—						In volume production			—	In volume production	
			16										In volume production	In volume production	In volume production			In volume production	In volume production			
20			Under development																		—	—
24																						
400 mil	48		In volume production				In volume production	Under development														
	56											In volume production	—									
TOSP (I)	6 × 16 mm		48				—	—	—	In volume production	—							—				
			8 × 14 mm									32	In volume production	In volume production	In volume production							
		8 × 20 mm	20	In volume production	In volume production	In volume production																
32	In volume production		In volume production				In volume production															
TOSP (II)		300 mil		20	—	—		—	In volume production	—	Under development											
	400 mil	24	In volume production	In volume production			In volume production				In volume production	—										

Packing Specifications

Surface Mount IC Package Specifications (cont)

Abbreviation	Nominal Dimensions	Number of Pins	Magazine	Tray			Taping			
				Soft	Hard		Adhesive	Embossed		
					Not Heat-Resistant	Heat-Resistant				
TOSP (II)	400 mil	28	—	—	—	In volume production	—	In volume production		
		32								
		40								
		44								
	550 mil	48								
SOI	550 mil	26	—	—	In volume production	—	—	In volume production		
QFP	7 × 7	48	—	—	—	In volume production	—	—		
		10 × 10						56	Under development	
	14 × 14							64	—	
		44						In volume production	In volume production**	
		64								
		80								
	100	Under development								
	14 × 20	54						In volume production	In volume production**	—
		60								
		64								
		80								
		100								
	20 × 20	88						—	—	In volume production
		112								
		144								
	24 × 24	176						—	—	In volume production
	28 × 28	136								
		168								
		208								
	28 × 40	256						—	—	In volume production
40 × 40	232									
	304	—								
QFP-G		24	In volume production	—	—	—	—	—		
		64	—						In volume production	
		80								

Packing Specifications

Surface Mount IC Package Specifications (cont)

Abbreviation	Nominal Dimensions	Number of Pins	Magazine	Tray			Taping		
				Soft	Hard		Adhesive	Embossed	
					Not Heat-Resistant	Heat-Resistant			
QFP-G		132	—	—	Under development	—	—	—	
HQFP	7 × 7	28	—	—	—	In volume production	—	In volume production	
TQFP	12 × 12 14 × 14	80	—	—	—	In volume production	—	—	
		44							
		64							
		80							
		100							
		120							
		160							
SOJ	300 mil	20	In volume production	—	—	—	—	In volume production	
		24							
		28							
		32							
	350 mil	20	In volume production					In volume production***	
	400 mil	28							
		32							
		36							
		40							
		42							
	44								
QFJ	—	18	In volume production	—	—	—	—	In volume production	
		32						—	
		44						In volume production	
		52							
		68							
		84							Under development
QFJ-G	—	44	—	—	—	—	—	In volume production	
		68						—***	Under development
		84						—	

Packing Specifications

Surface Mount IC Package Specifications (cont)

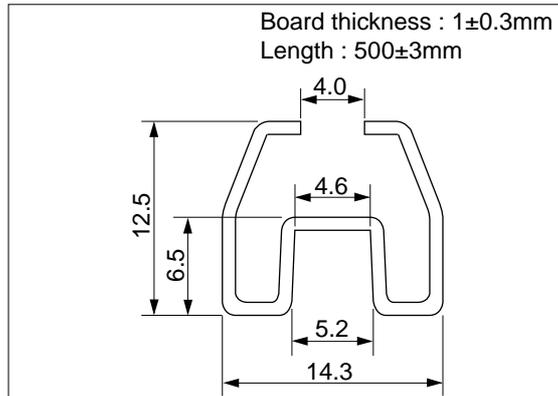
Abbreviation	Nominal Dimensions	Number of Pins	Magazine	Tray			Taping		
				Soft	Hard		Adhesive	Embossed	
					Not Heat-Resistant	Heat-Resistant			
QFI	(300 × 300)	18	In volume production	—	In volume production	—	—	In volume production	
	(430 × 460)	28							
		44							
	(500 × 600)	44			—				
	(800 × 800)	56			In volume production				
68		—							
HQFI	(300 × 300)	18	In volume production	—	In volume production	—	—	—	
	(430 × 460)	28							
QFN	7.37 × 10.8	20	In volume production	—	—	—	—	—	
	7.39 × 12.45	22							
	7.62 × 10.16	24							In volume production
	8.6 × 11.8	28							
	9.45 × 12.65	28							
	9.55 × 15.35	28							
	12.19 × 12.19	40							—
	29.92 × 29.92	84							

Packing Specifications

4.4 IC Packages

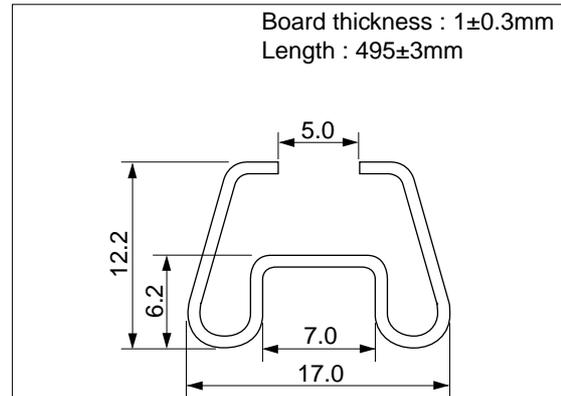
4.4.1 Magazines for IC

(1) DIP



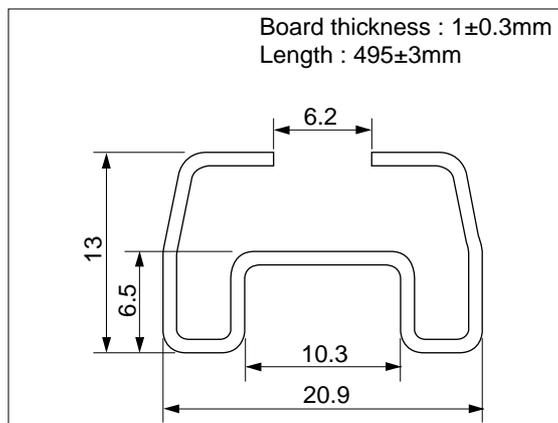
Package code **Maximum Storage No.**

DP-8	48 IC/Magazine
DP-16	25 IC/Magazine
DP-18	21 IC/Magazine



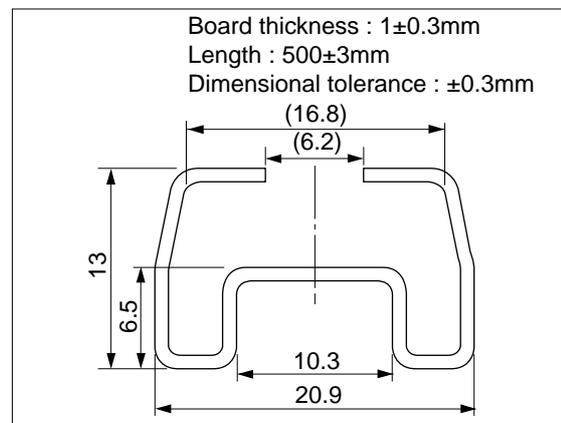
Package code **Maximum Storage No.**

DP-28S	17 IC/Magazine
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Package code **Maximum Storage No.**

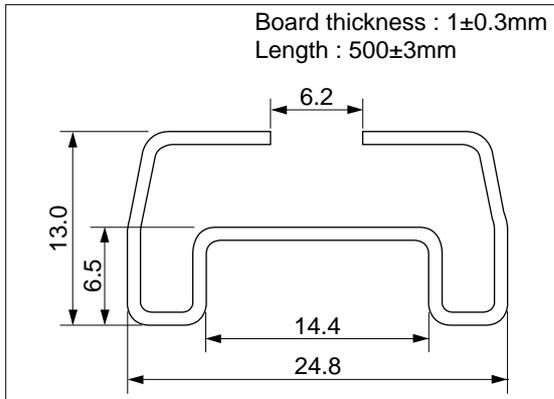
DP-24	15 IC/Magazine
DP-28	13 IC/Magazine
DP-32	11 IC/Magazine
DP-36	10 IC/Magazine
DP-40	9 IC/Magazine
DP-42	9 IC/Magazine
DP-42S	12 IC/Magazine



Package code **Maximum Storage No.**

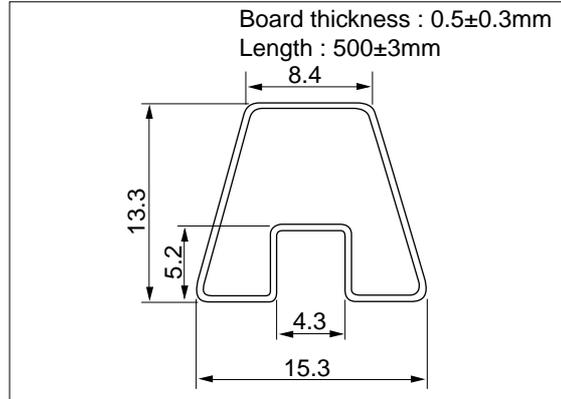
DP-56S	9 IC/Magazine
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Packing Specifications



Package code **Maximum Storage No.**

DP-64S 8 IC/Magazine



Package code **Maximum Storage No.**

DP-16 25 IC/Magazine

DP-18 20 IC/Magazine

DP-20N 18 IC/Magazine

DP-22N 16 IC/Magazine

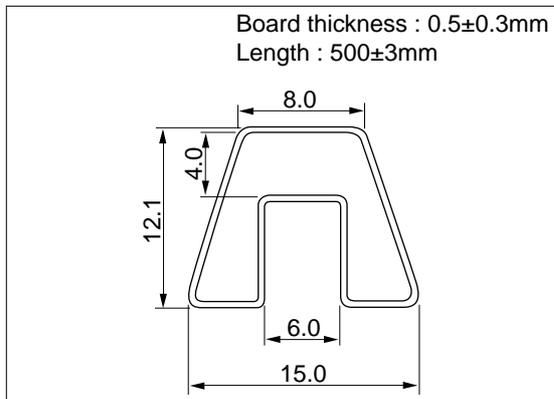
DP-24N 15 IC/Magazine

DP-28N 12 IC/Magazine

DG-16 25 IC/Magazine

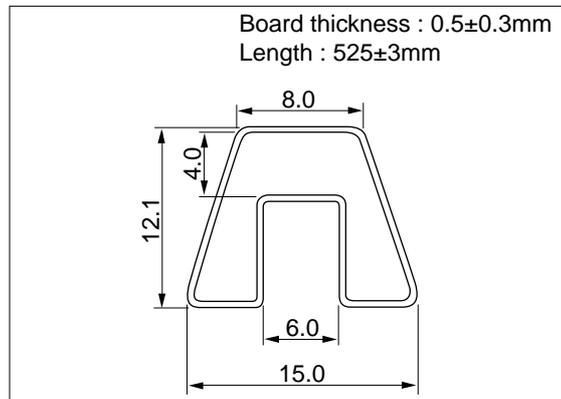
DG-18 20 IC/Magazine

DG-20N 18 IC/Magazine



Package code **Maximum Storage No.**

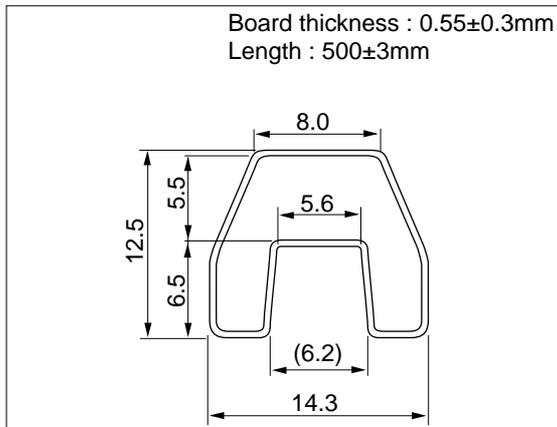
DP-18 25 IC/Magazine



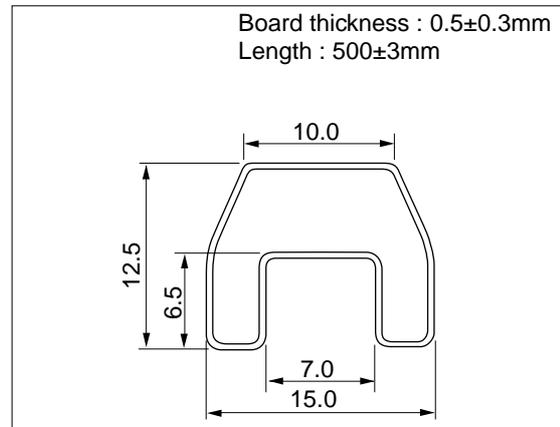
Package code **Maximum Storage No.**

DG-16 25 IC/Magazine

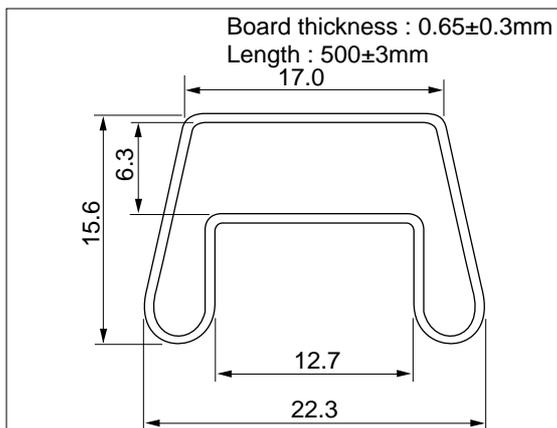
Packing Specifications



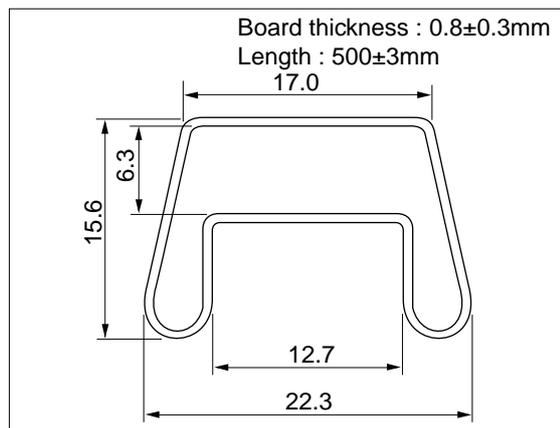
Package code	Maximum Storage No.
DP-16	25 IC/Magazine
DP-18	20 IC/Magazine
DP-20N	18 IC/Magazine
DP-22N	16 IC/Magazine
DP-24N	15 IC/Magazine
DP-28N	12 IC/Magazine
DG-16	25 IC/Magazine
DG-18	20 IC/Magazine
DG-20N	18 IC/Magazine
DG-22N	16 IC/Magazine



Package code	Maximum Storage No.
DP-24A	16 IC/Magazine
DP-28S	13 IC/Magazine

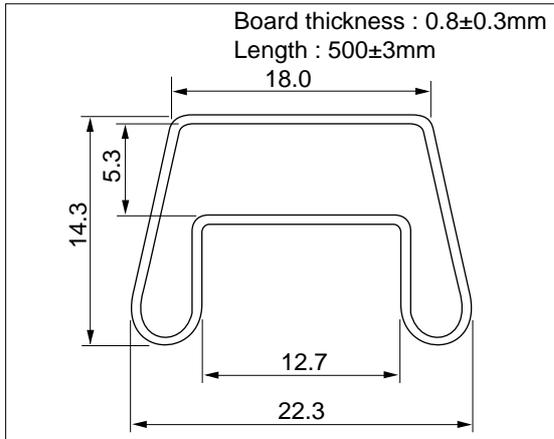


Package code	Maximum Storage No.
DP-24	15 IC/Magazine
DP-28	13 IC/Magazine
DP-32	11 IC/Magazine



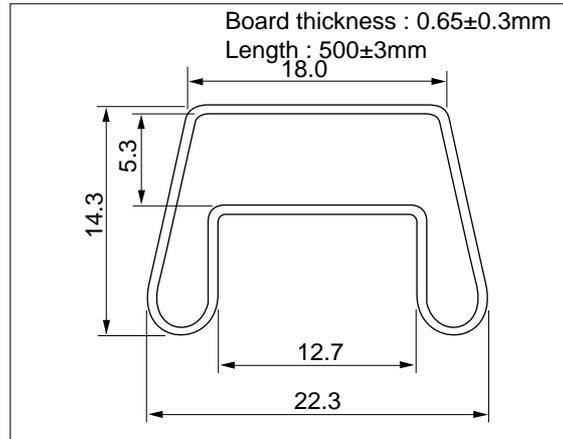
Package code	Maximum Storage No.
DP-24	15 IC/Magazine
DP-28	13 IC/Magazine
DP-40	9 IC/Magazine
DP-42	9 IC/Magazine

Packing Specifications



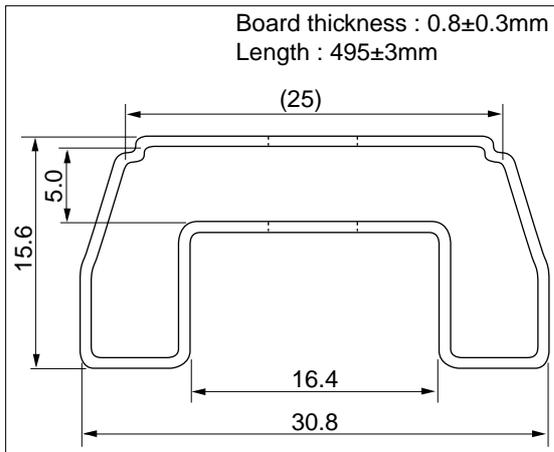
Package code **Maximum Storage No.**

DG-24	14 IC/Magazine
DG-28	12 IC/Magazine
DG-32	10 IC/Magazine
DG-40	8 IC/Magazine



Package code **Maximum Storage No.**

DG-28	12 IC/Magazine
DG-32	10 IC/Magazine
DG-40	8 IC/Magazine

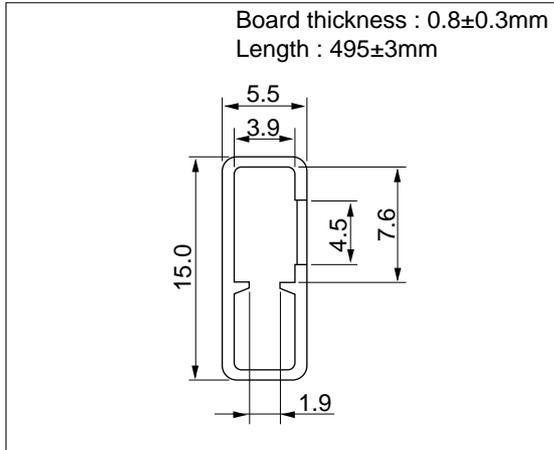


Package code **Maximum Storage No.**

DP-64	5 IC/Magazine
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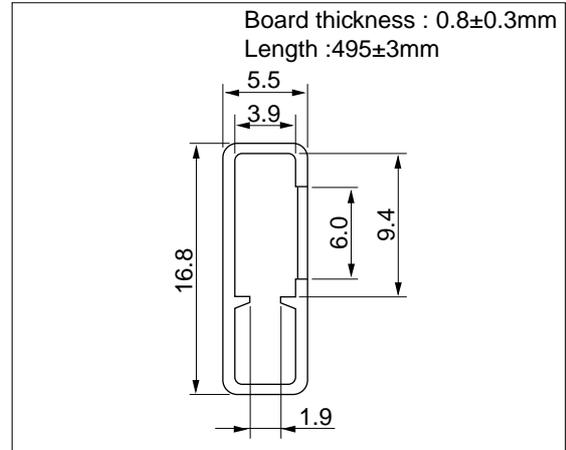
Packing Specifications

(2) ZIP



Package code **Maximum Storage No.**

ZP-16 23 IC/Magazine

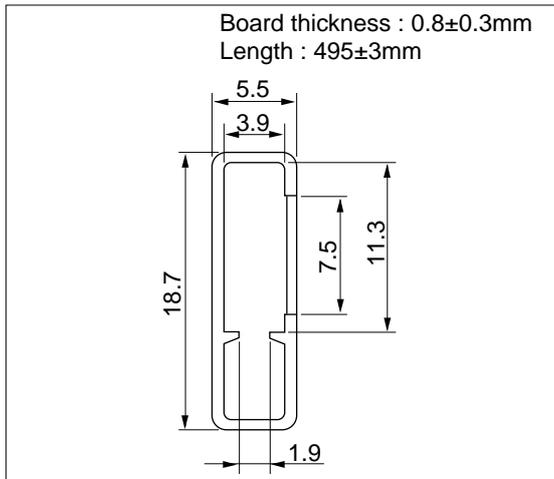


Package code **Maximum Storage No.**

ZP-20 18 IC/Magazine

ZP-24 15 IC/Magazine

ZP-28 13 IC/Magazine



Package code **Maximum Storage No.**

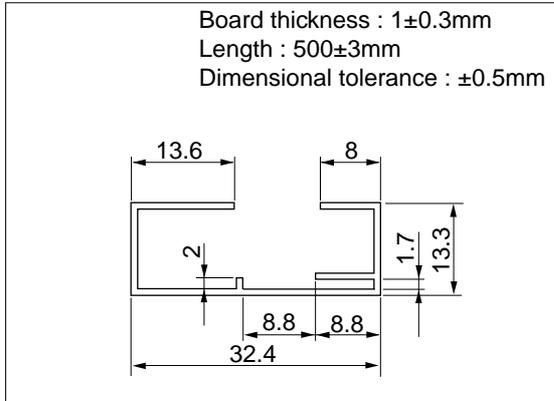
ZP-24A 15 IC/Magazine

ZP-32 11 IC/Magazine

ZP-40 9 IC/Magazine

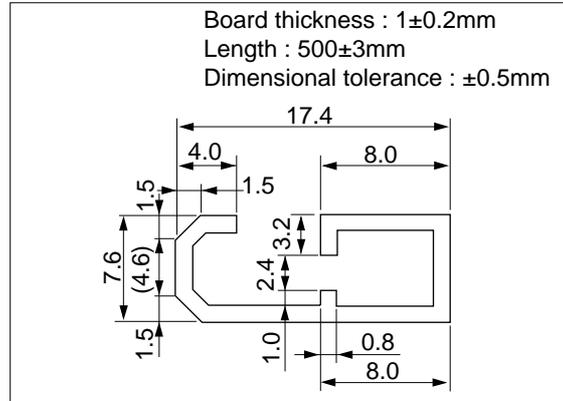
Packing Specifications

(3) SIP



Package code **Maximum Storage No.**

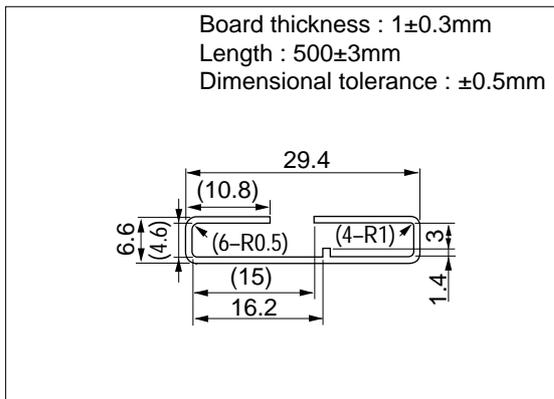
SP-5T 48 IC/Magazine



Package code **Maximum Storage No.**

SP-7 25 IC/Magazine

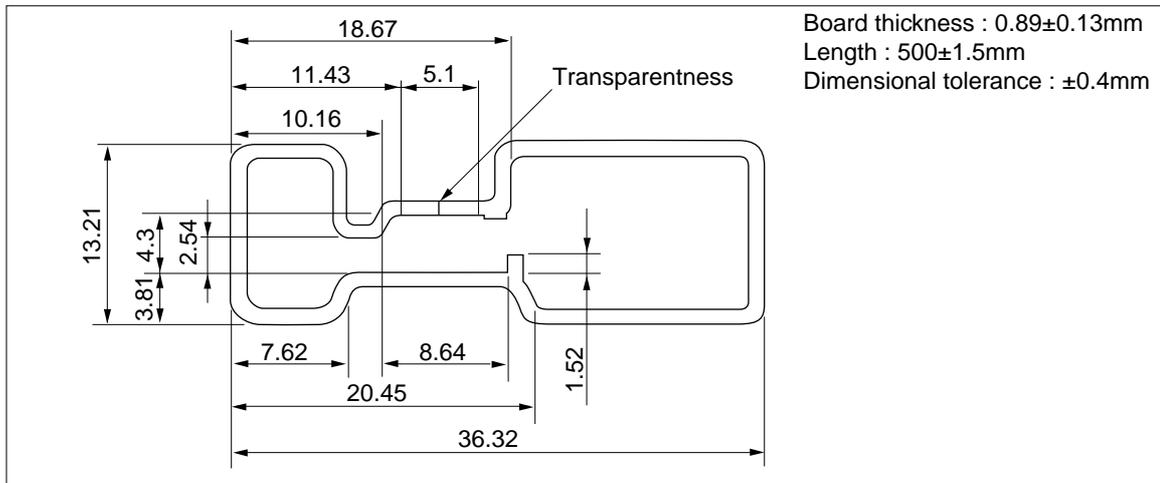
SP-8 25 IC/Magazine



Package code **Maximum Storage No.**

SP-12T 16 IC/Magazine

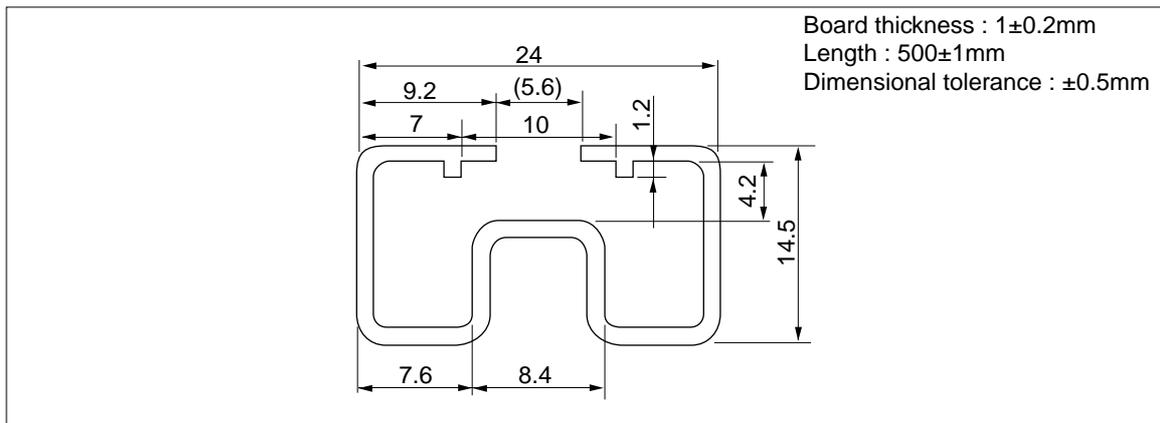
Packing Specifications



Package code	Maximum Storage No.
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SP-15TA	24 IC/Magazine
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SP-15TB	24 IC/Magazine
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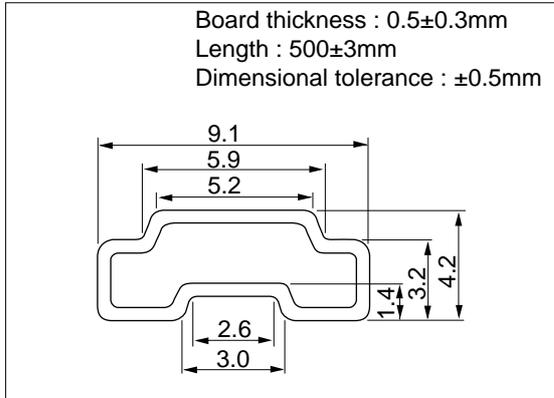


Package code	Maximum Storage No.
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SP-23TA	16 IC/Magazine
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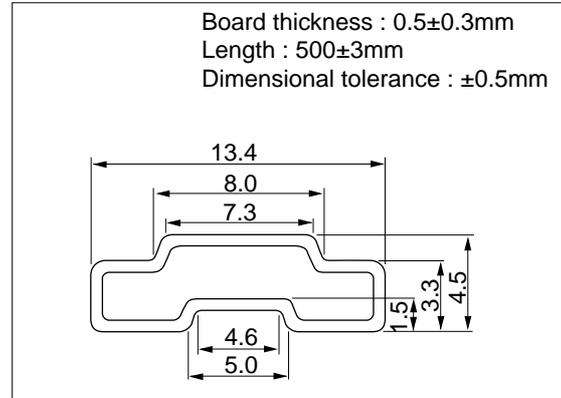
Packing Specifications

(4) SOP



Package code **Maximum Storage No.**

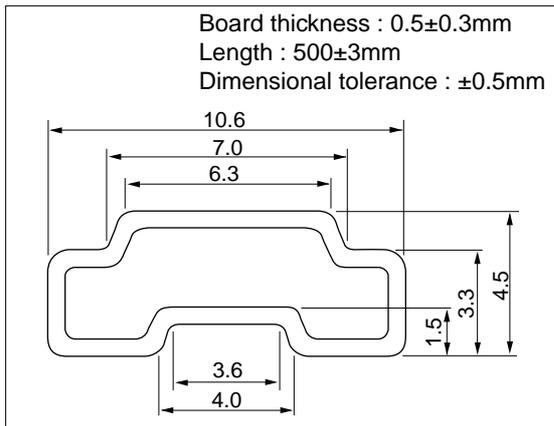
FP-8D 96 IC/Magazine



Package code **Maximum Storage No.**

FP-14D 47 IC/Magazine

FP-16D 47 IC/Magazine

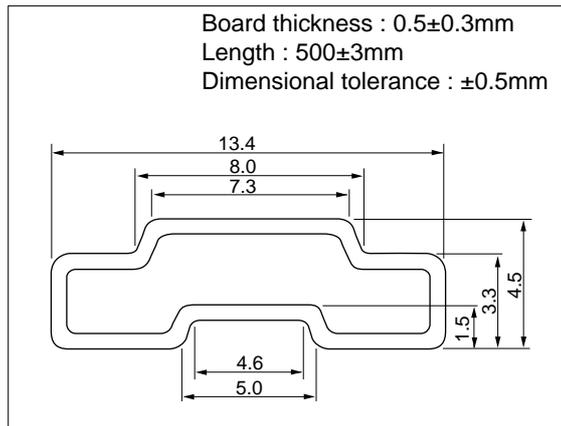


Package code **Maximum Storage No.**

FP-14DA 47 IC/Magazine

FP-16DA 47 IC/Magazine

FP-20DN 38 IC/Magazine

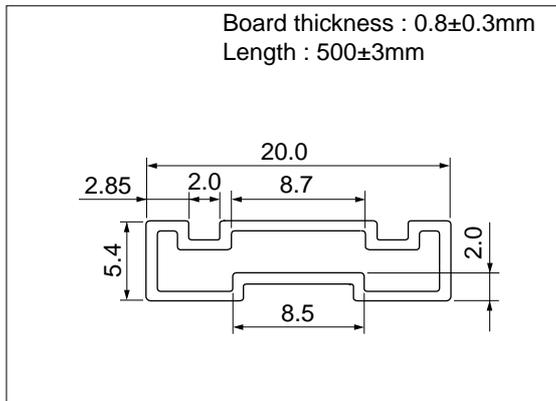


Package code **Maximum Storage No.**

FP-18D 38 IC/Magazine

FP-20D 38 IC/Magazine

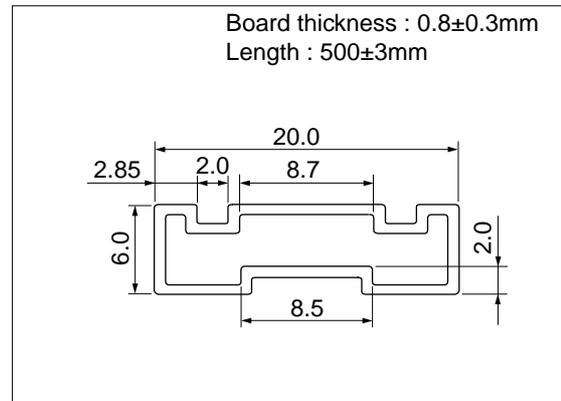
Packing Specifications



Package code **Maximum Storage No.**

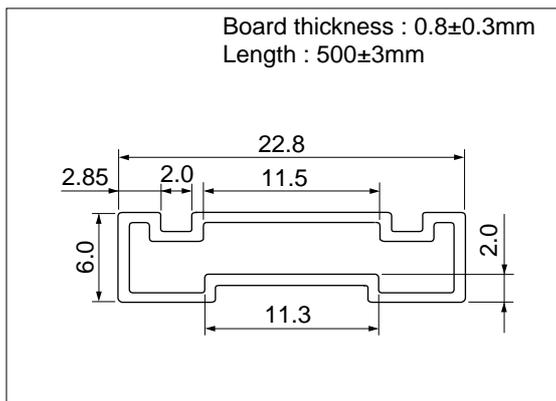
FP-24D 30 IC/Magazine

FP-28D 25 IC/Magazine



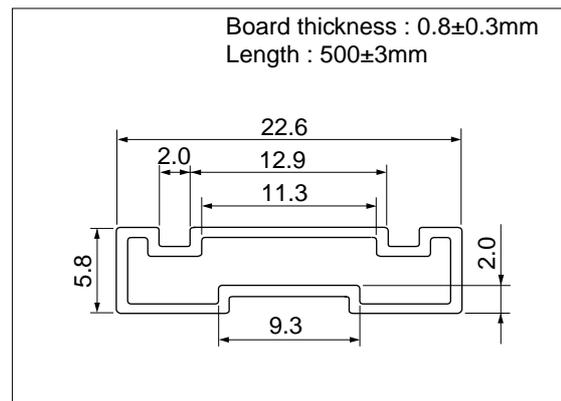
Package code **Maximum Storage No.**

FP-28DA 25 IC/Magazine



Package code **Maximum Storage No.**

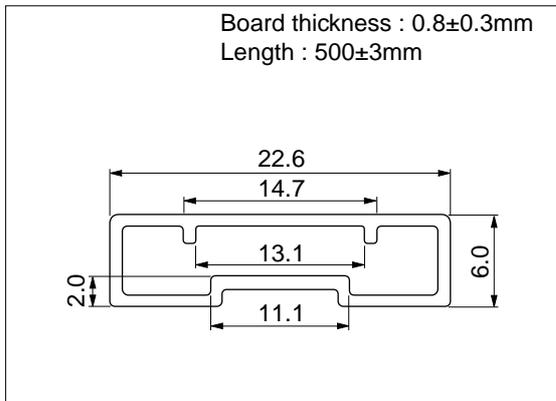
FP-32D 22 IC/Magazine



Package code **Maximum Storage No.**

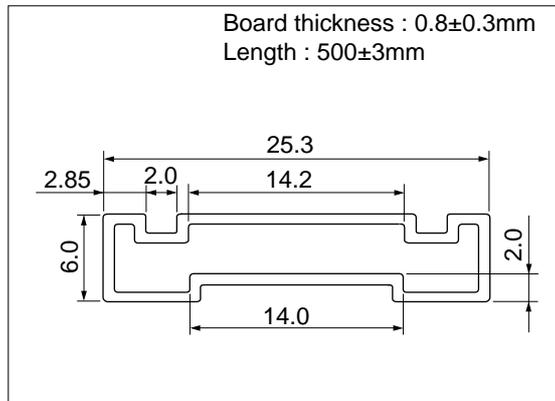
FP-40D 18 IC/Magazine

Packing Specifications



Package code **Maximum Storage No.**

FP-44D 16 IC/Magazine

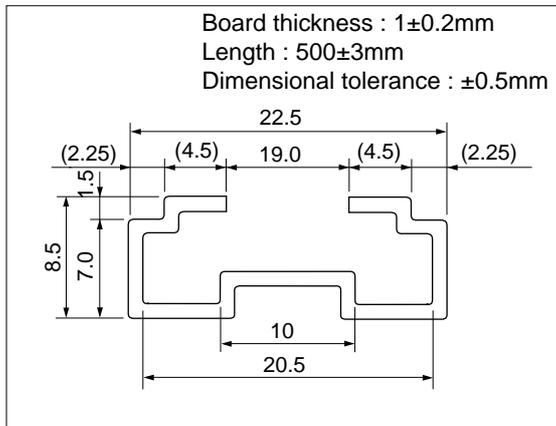


Package code **Maximum Storage No.**

FP-48D/48DA 22 IC/Magazine

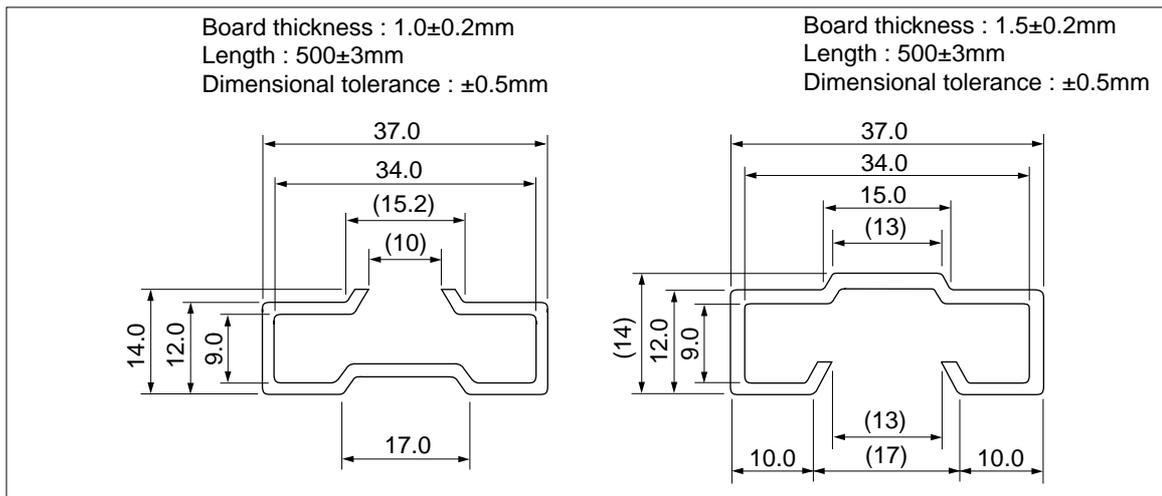
Packing Specifications

(5) FPG



Package code **Maximum Storage No.**

FG-20D 19 IC/Magazine



Package code **Maximum Storage No.**

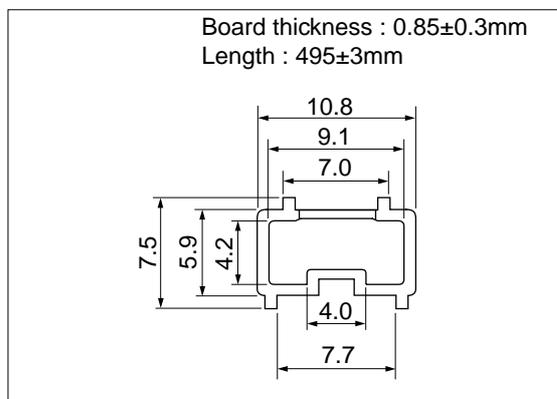
FG-24 15 IC/Magazine

Remarks

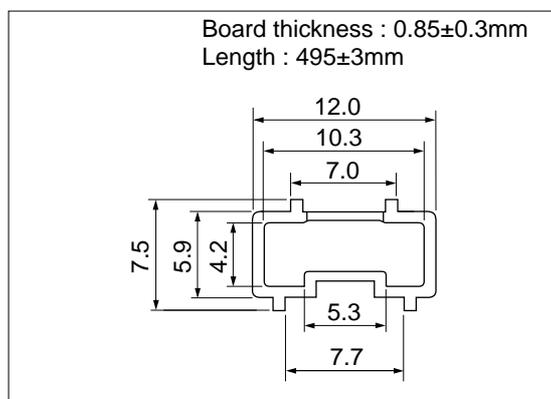
The FG-24 package is shipped in line up state after inserted in its carrier.

Packing Specifications

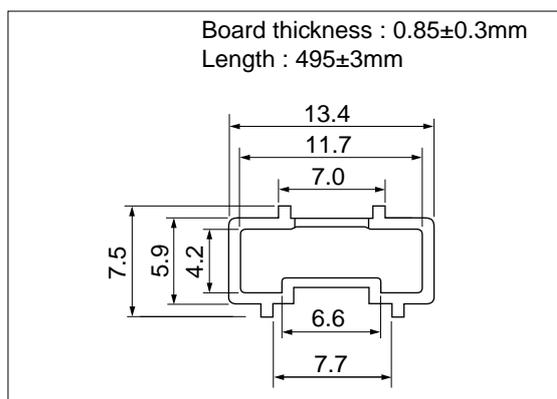
(6) SOJ



Package code	Maximum Storage No.
CP-20D	25 IC/Magazine
CP-24D	29 IC/Magazine
CP-28DN	25 IC/Magazine
CP-32DN	22 IC/Magazine



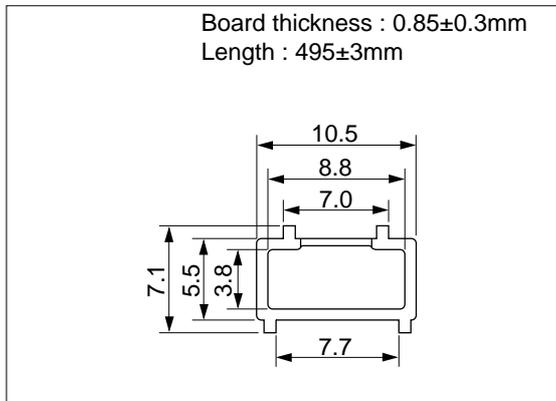
Package code	Maximum Storage No.
CP-20DA	27 IC/Magazine



Package code	Maximum Storage No.
CP-24DA	25 IC/Magazine
CP-28D/28DA	25 IC/Magazine
CP-32D/32DB	22 IC/Magazine
CP-36D	19 IC/Magazine
CP-40D	17 IC/Magazine
CP-44D	16 IC/Magazine

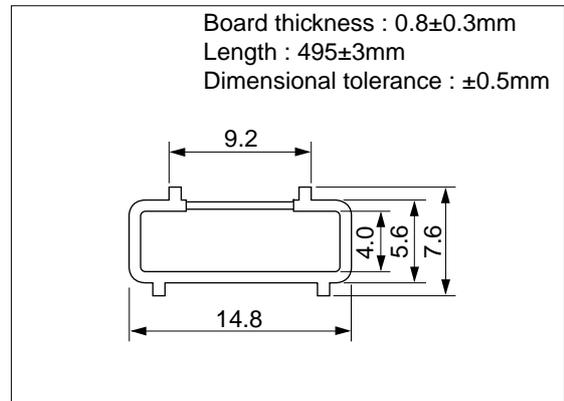
Packing Specifications

(7) QFJ



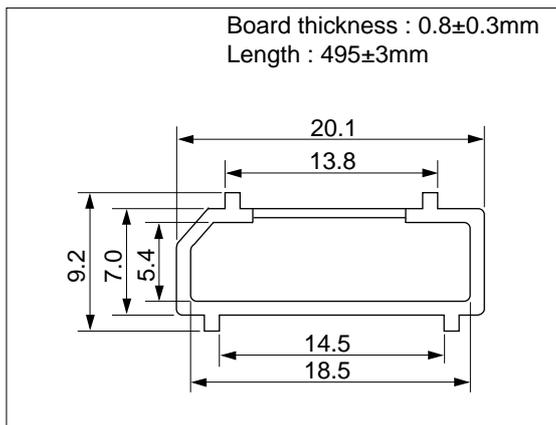
Package code **Maximum Storage No.**

CP-18 35 IC/Magazine



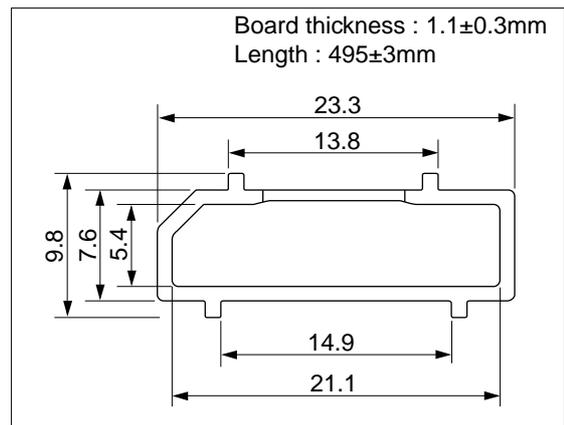
Package code **Maximum Storage No.**

CP-32 30 IC/Magazine



Package code **Maximum Storage No.**

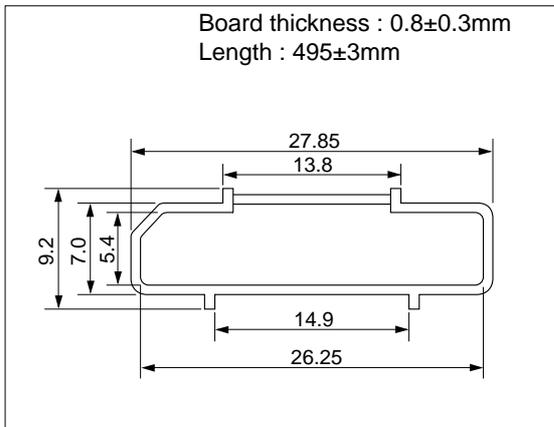
CP-44 26 IC/Magazine



Package code **Maximum Storage No.**

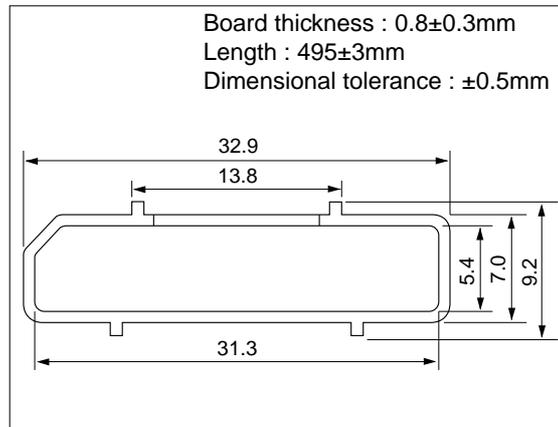
CP-52 23 IC/Magazine

Packing Specifications



Package code **Maximum Storage No.**

CP-68 18 IC/Magazine

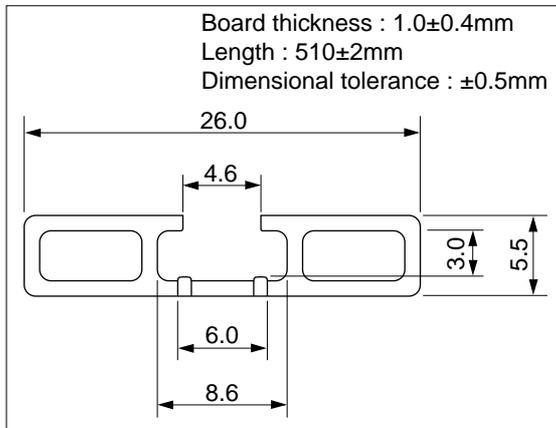


Package code **Maximum Storage No.**

CP-84 15 IC/Magazine

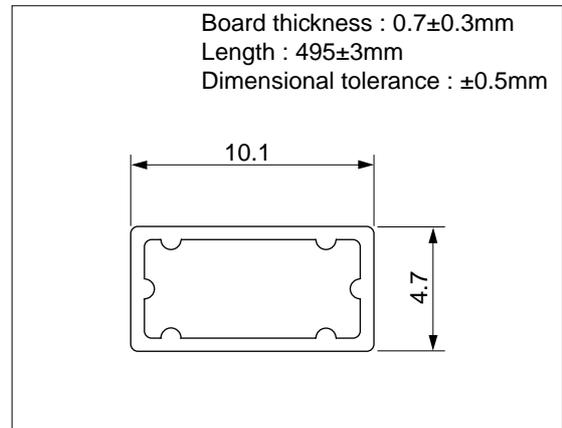
Packing Specifications

(8) QFN



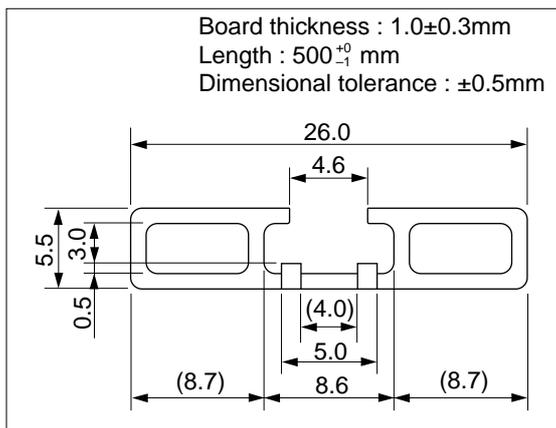
Package code **Maximum Storage No.**

CG-20 40 IC/Magazine



Package code **Maximum Storage No.**

CG-22A 38 IC/Magazine

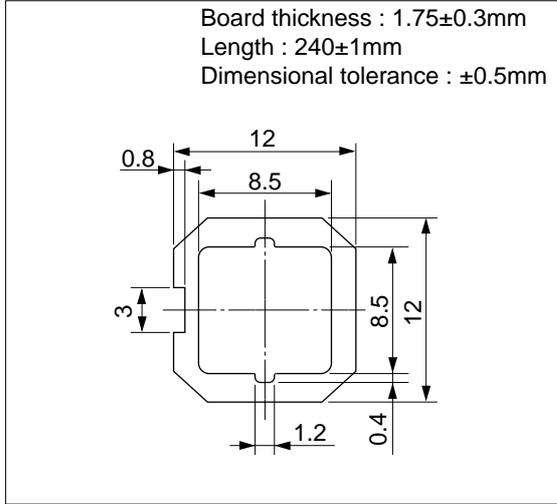


Package code **Maximum Storage No.**

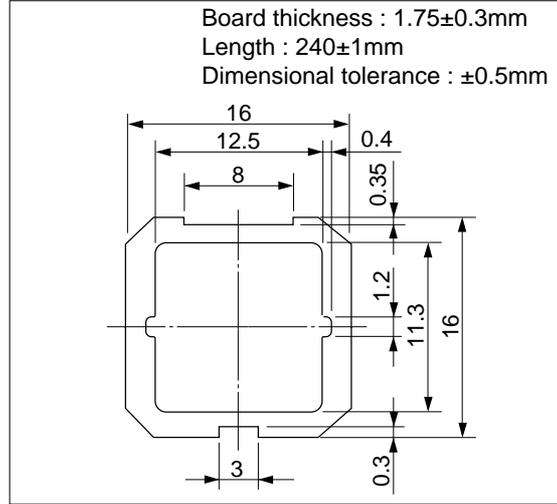
CG-24 47 IC/Magazine

Packing Specifications

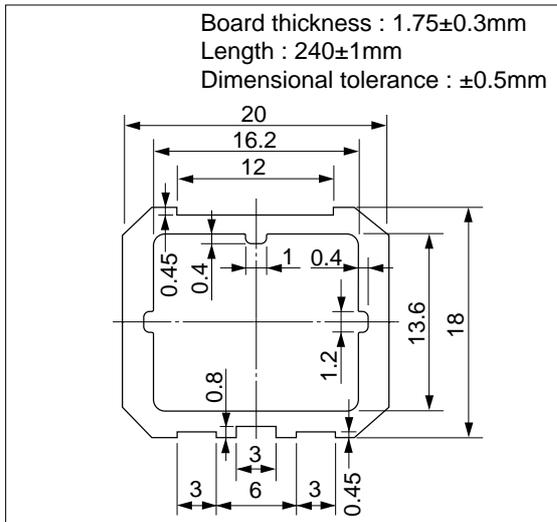
(9) QFI



Package code	Maximum Storage No.
MP-18, 18A	100 IC/Magazine
MP-18T	100 IC/Magazine



Package code	Maximum Storage No.
MP-28, 28A	100 IC/Magazine
MP-28T, 44S	100 IC/Magazine



Package code	Maximum Storage No.
MP-44, 44TA	100 IC/Magazine
MP-56S	100 IC/Magazine

Packing Specifications

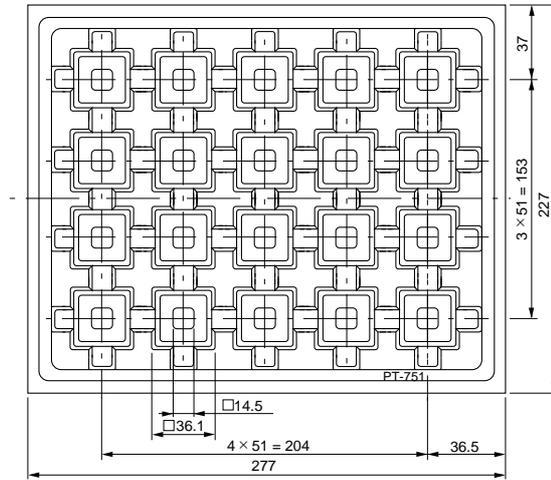
4.4.2 Trays for IC

(1) PGA

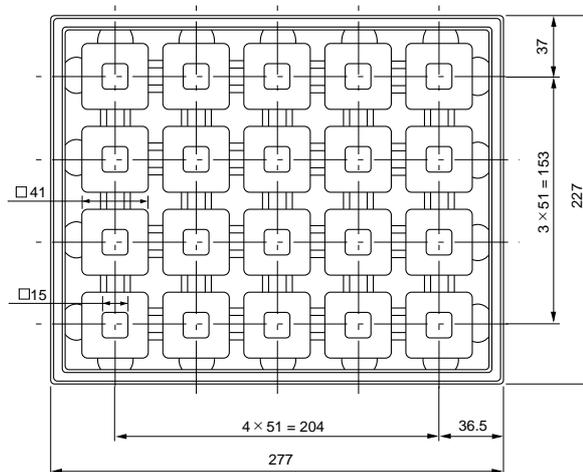
Tray type	: PT749	Package code	Maximum Storage No.
Material	: Carbon PVC	PC-68	30 IC/Tray 30 IC/Inside box
Thickness	: 0.7 mm		
Heat resistant temperature	: 40°C		
Surface resistance value	: less than $1 \times 10^{10}\Omega$		

Tray type	: PT750	Package code	Maximum Storage No.
Material	: Carbon PVC	PC-72	30 IC/Tray 30 IC/Inside box
Thickness	: 0.7 mm		
Heat resistant temperature	: 40°C		
Surface resistance value	: less than $1 \times 10^{10}\Omega$		

Packing Specifications

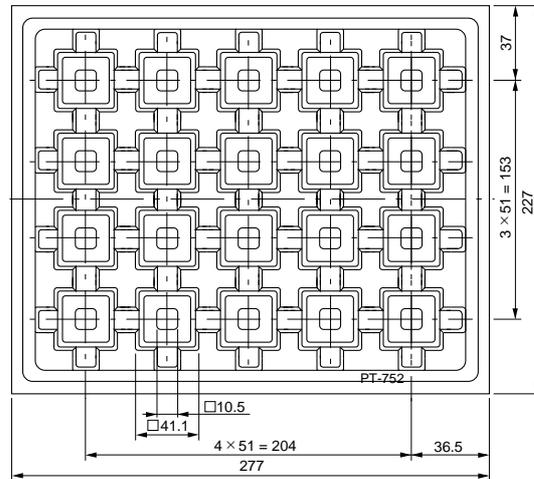


Tray type	: PT751	Package code	Maximum Storage No.
Material	: Carbon PVC	PC-120	20 IC/Tray 20 IC/Inside box
Thickness	: 0.7 mm		
Heat resistant temperature	: 40°C		
Surface resistance value	: less than $1 \times 10^{10}\Omega$		

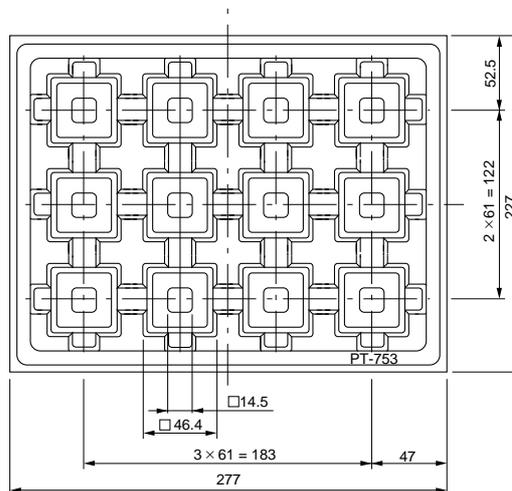


Tray type	: PT723	Package code	Maximum Storage No.
Material	: Carbon PVC	PC-135	20 IC/Tray 20 IC/Inside box
Thickness	: 0.7 mm		
Heat resistant temperature	: 40°C		
Surface resistance value	: less than $1 \times 10^{10}\Omega$		

Packing Specifications

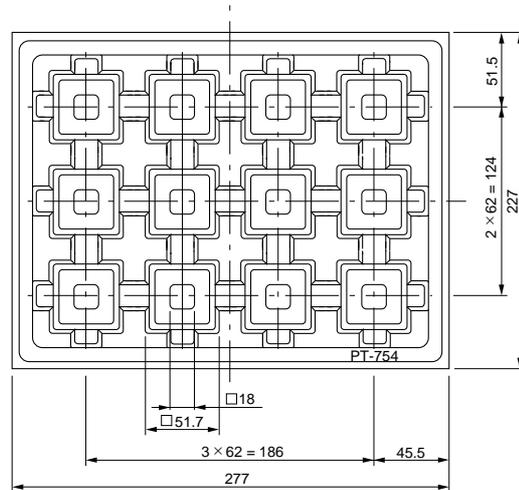


Tray type	: PT752	Package code	Maximum Storage No.
Material	: Carbon PVC	PC-179	20 IC/Tray 20 IC/Inside box
Thickness	: 0.7 mm		
Heat resistant temperature	: 40°C		
Surface resistance value	: less than $1 \times 10^{10}\Omega$		

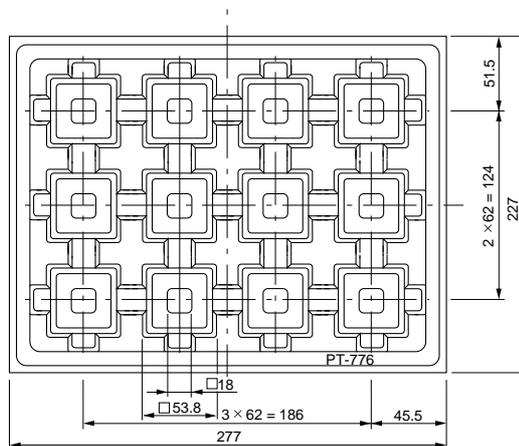


Tray type	: PT753	Package code	Maximum Storage No.
Material	: Carbon PVC	PC-240	12 IC/Tray 12 IC/Inside box
Thickness	: 0.7 mm		
Heat resistant temperature	: 40°C		
Surface resistance value	: less than $1 \times 10^{10}\Omega$		

Packing Specifications



Tray type	: PT754	Package code	Maximum Storage No.
Material	: Carbon PVC	PC-257 PC-401	12 IC/Tray 12 IC/Inside box
Thickness	: 0.7 mm		
Heat resistant temperature	: 40°C		
Surface resistance value	: less than $1 \times 10^{10}\Omega$		



Tray type	: PT776	Package code	Maximum Storage No.
Material	: Carbon PVC	PC-299	12 IC/Tray 12 IC/Inside box
Thickness	: 0.7 mm		
Heat resistant temperature	: 40°C		
Surface resistance value	: less than $1 \times 10^{10}\Omega$		

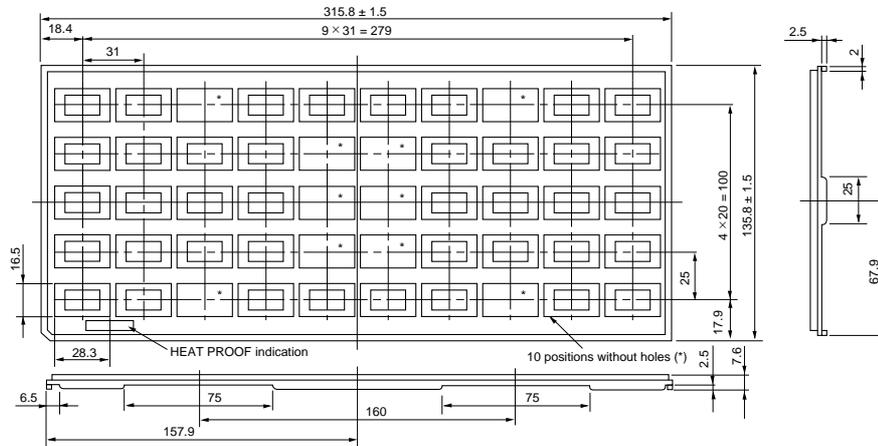
Packing Specifications

(2) SOP

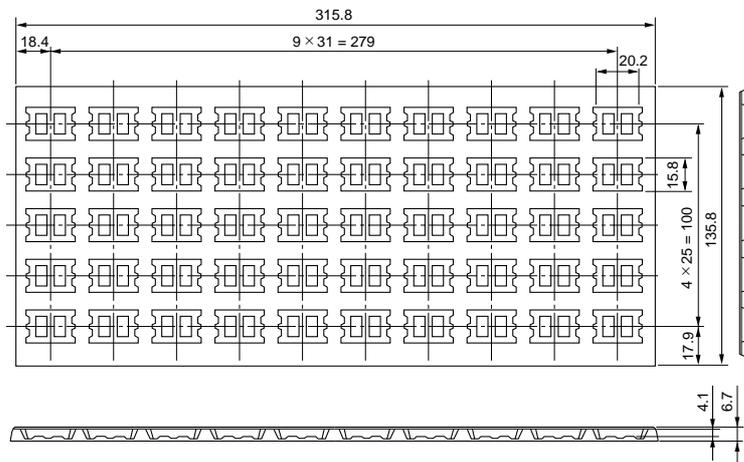
Tray type	: PT743B	Package code	Maximum Storage No.
Material	: Carbon PP	FP-20D	50 IC/Tray 500 IC/Inside box
Thickness	: 1.2 mm		
Heat resistant temperature	: 125°C, 24h		
Surface resistance value	: less than $1 \times 10^6 \Omega$		

Tray type	: PT783	Package code	Maximum Storage No.
Material	: Carbon PPE	FP-40D	50 IC/Tray 500 IC/Inside box
Thickness	: 1.8 mm		
Heat resistant temperature	: 125°C, 24h		
Surface resistance value	: less than $10^7 \Omega$		

Packing Specifications



Tray type	: PT784	Package code	Maximum Storage No.
Material	: Carbon PPE	FP-44D	50 IC/Tray 500 IC/Inside box
Thickness	: 1.8 mm		
Heat resistant temperature	: 125°C, 24h		
Surface resistance value	: less than 10 ⁷ Ω		



Tray type	: PT762	Package code	Maximum Storage No.
Material	: Carbon PVC	FP-48DA	50 IC/Tray 500 IC/Inside box
Thickness	: 0.7 mm		
Heat resistant temperature	: 40°C		
Surface resistance value	: less than 1 × 10 ⁶ Ω		

Packing Specifications

Tray type	: PT741	Package code
Material	: Carbon PP	TFP-20D/20DR
Thickness	: 1.2 mm	Maximum Storage No. 60 IC/Tray 600 IC/Inside box
Heat resistant temperature	: 125°C, 24h	
Surface resistance value	: less than $1 \times 10^6 \Omega$	

Tray type	: PT767	Package code
Material	: Carbon PP	TFP-20DA/20DAR
Thickness	: 1.2 mm	TFP-32D/32DR
Heat resistant temperature	: 125°C, 24h	Maximum Storage No. 60 IC/Tray 600 IC/Inside box
Surface resistance value	: less than $1 \times 10^6 \Omega$	

Packing Specifications

Tray type	: PT740	Package code	TFP-32DA/32DAR	Maximum Storage No.	60 IC/Tray 600 IC/Inside box
Material	: Carbon PP				
Thickness	: 1.2 mm				
Heat resistant temperature	: 125°C, 24h				
Surface resistance value	: less than $1 \times 10^6 \Omega$				

Tray type	: PT785	Package code	TTP-20D TTP-20DR	Maximum Storage No.	72 IC/Tray 720 IC/Inside box
Material	: Carbon PPO				
Thickness	: 1.5 mm				
Heat resistant temperature	: 125°C, 24h				
Surface resistance value	: less than $1 \times 10^6 \Omega$				

Packing Specifications

Tray type	: —	Package code	Maximum Storage No.
Material	: —	TTP-14DA	140 IC/Tray
Thickness	: —	TTP-16DA	
Heat resistant temperature	: —	TTP-20DA	
Surface resistance value	: —	TTP-24DB	

Tray type	: PT810	Package code	Maximum Storage No.
Material	: Carbon PP	TTP-32D	72 IC/Tray 720 IC/Inside box
Thickness	: 1.5 mm	TTP-32DR	
Heat resistant temperature	: 125°C, 24h	TTP-32DA	
Surface resistance value	: less than $1 \times 10^6 \Omega$		

Packing Specifications

Tray type	: PT809B	Package code	Maximum Storage No.
Material	: Carbon PP	TTP-24D, TTP-24DR	72 IC/Tray
Thickness	: 1.5 mm	TTP-28D, TTP-28DR	720 IC/Inside box
Heat resistant temperature	: 125°C	TTP-40DA, TTP-40DAR	
Surface resistance value	: less than $1 \times 10^6 \Omega$	TTP-44DA, TTP-44DB	
		TTP-44DBR	

(3) QFP

Tray type	: PT397B	Package code	Maximum Storage No.
Material	: Carbon PP	FP-44A	50 IC/Tray
Thickness	: 1.2 mm	FP-64A	500 IC/Inside box
Heat resistant temperature	: 125°C, 24h	FP-80A	
Surface resistance value	: less than $1 \times 10^8 \Omega$		

Packing Specifications

Tray type	: PT704A	Package code
Material	: Carbon PS	FP-44A
Thickness	: 1.2 mm	FP-64A
Heat resistant temperature	: 70°C	FP-80A
Surface resistance value	: less than $1 \times 10^6 \Omega$	Maximum Storage No.
		50 IC/Tray
		500 IC/Inside box

Tray type	: PM308	Package code
Material	: Carbon coated PVC	FP-54, FP-60
Thickness	: 0.7 mm	FP-64, FP-80
Heat resistant temperature	: 40°C	FP-100
Surface resistance value	: less than $1 \times 10^6 \Omega$	Maximum Storage No.
		50 IC/Tray
		500 IC/Inside box

Packing Specifications

Tray type	: PT308A	Package code	Maximum Storage No.
Material	: Carbon PS	FP-54, FP-54A	50 IC/Tray 500 IC/Inside box
Thickness	: 1.0 mm	FP-60, FP-60A	
Heat resistant temperature	: 70°C	FP-64, FP-64B	
Surface resistance value	: less than $1 \times 10^6 \Omega$	FP-80, FP-80B	
		FP-100, FP-100A	

Tray type	: PT308B	Package code	Maximum Storage No.
Material	: Carbon PC	FP-54, FP-54A	50 IC/Tray 500 IC/Inside box
Thickness	: 1.0 mm	FP-60, FP-60A	
Heat resistant temperature	: 125°C, 24h	FP-64, FP-64B	
Surface resistance value	: less than $1 \times 10^6 \Omega$	FP-80, FP-80B	
		FP-100, FP-100A	

Packing Specifications

Tray type	: PM308S	Package code	Maximum Storage No.
Material	: Carbon coated PVC	FP-54A, FP-60A FP-64B, FP-80B FP-100A	50 IC/Tray 500 IC/Inside box
Thickness	: 0.7 mm		
Heat resistant temperature	: 40°C		
Surface resistance value	: less than $1 \times 10^6 \Omega$		

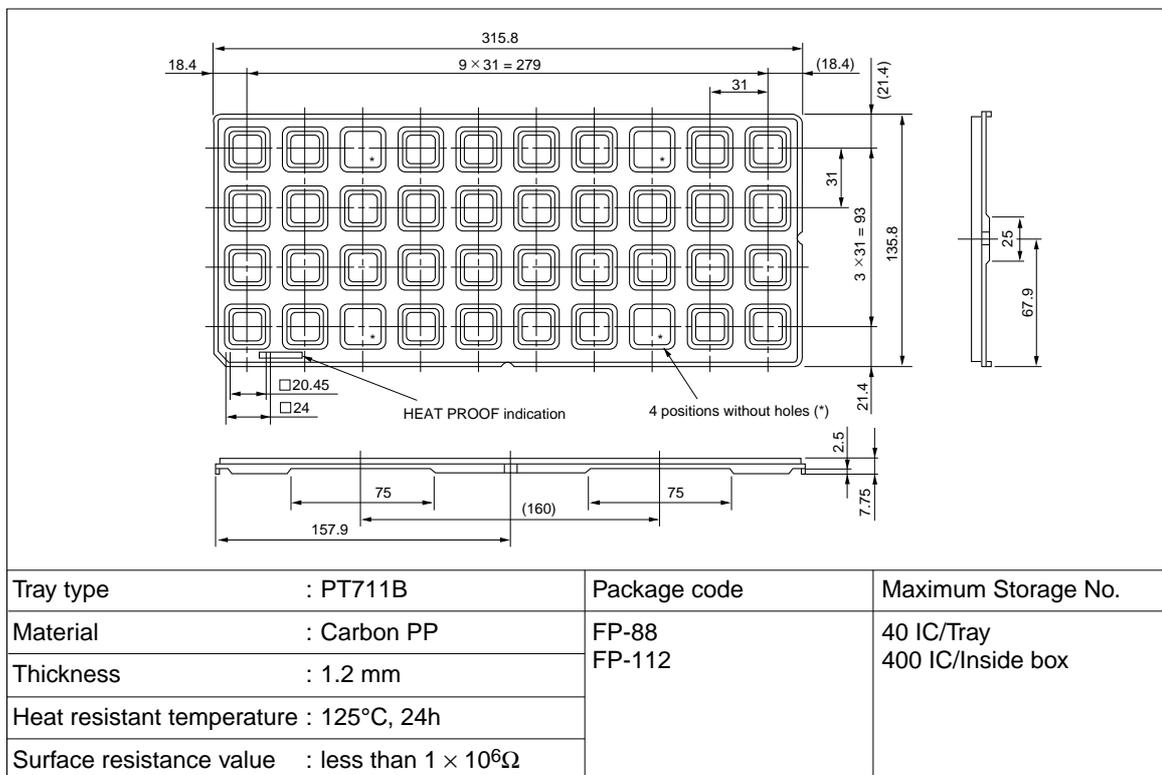
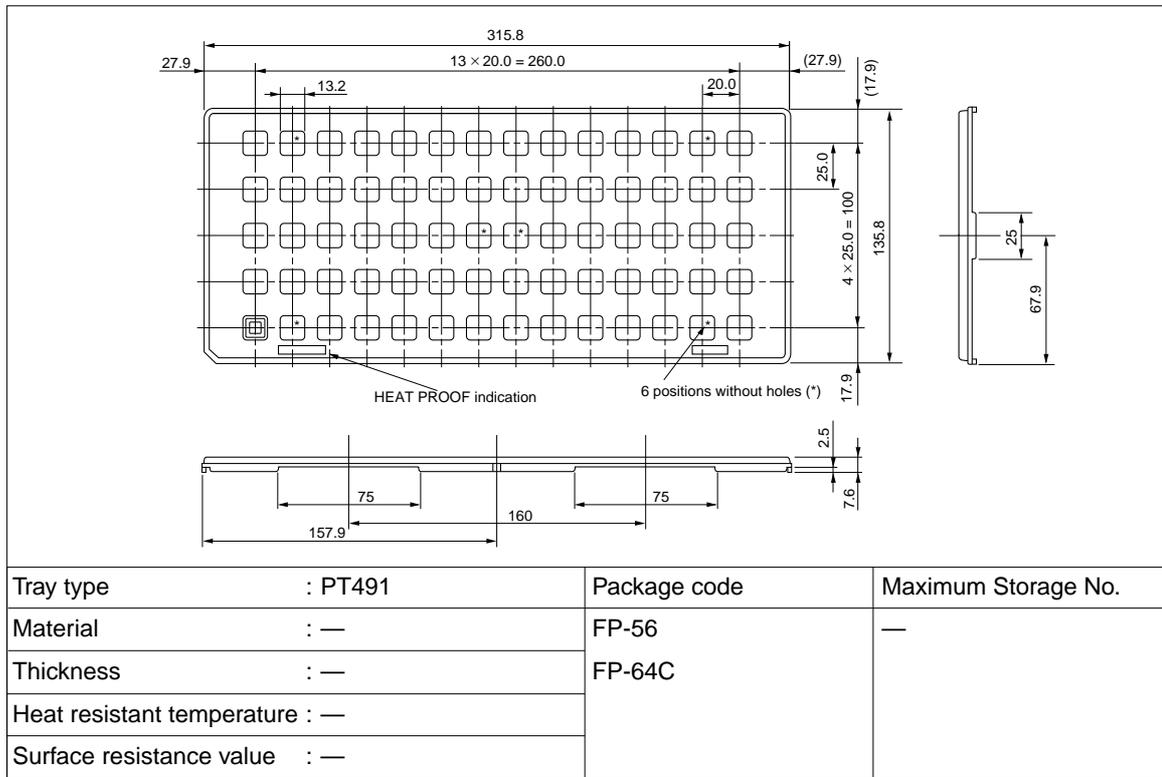
Tray type	: PT518B	Package code	Maximum Storage No.
Material	: Carbon PP	FP-64C	70 IC/Tray 700 IC/Inside box
Thickness	: 1.2 mm		
Heat resistant temperature	: 125°C, 24h		
Surface resistance value	: less than $10^6 \Omega$		

Packing Specifications

Tray type	: PT716A	Package code	Maximum Storage No. 50 IC/Tray 500 IC/Inside box
Material	: Carbon PS	FP-100B	
Thickness	: 1.2 mm		
Heat resistant temperature	: 70°C		
Surface resistance value	: less than $1 \times 10^6 \Omega$		

Tray type	: PT492C	Package code	Maximum Storage No. 50 IC/Tray 500 IC/Inside box
Material	: Carbon PPO	FP-100B	
Thickness	: 1.4 mm		
Heat resistant temperature	: 125°C, 24h		
Surface resistance value	: less than $1 \times 10^9 \Omega$		

Packing Specifications



Packing Specifications

Tray type	: PT766M	Package code	Maximum Storage No.
Material	: Carbon PC	FP-120	24 IC/Tray
Thickness	: 1.5 mm	FP-136	240 IC/Inside box
Heat resistant temperature	: 125°C, 24h	FP-160	
Surface resistance value	: less than $1 \times 10^6 \Omega$	FP-168	

Tray type	: PT761M	Package code	Maximum Storage No.
Material	: Carbon PP	FP-144A	40 IC/Tray
Thickness	: 1.5 mm		400 IC/Inside box
Heat resistant temperature	: 125°C, 24h		
Surface resistance value	: less than $1 \times 10^6 \Omega$		

Packing Specifications

Tray type	: PT772	Package code	Maximum Storage No.
Material	: Carbon PC	FP-176	24 IC/Tray 240 IC/Inside box
Thickness	: 1.5 mm		
Heat resistant temperature	: 125°C, 24h		
Surface resistance value	: less than $1 \times 10^6 \Omega$		

Tray type	: PT771M	Package code	Maximum Storage No.
Material	: Carbon PC	FP-208	24 IC/Tray 240 IC/Inside box
Thickness	: 1.5 mm		
Heat resistant temperature	: 125°C, 24h		
Surface resistance value	: less than $1 \times 10^6 \Omega$		

Packing Specifications

Tray type	: PT724B	Package code	FP-304	Maximum Storage No. 12 IC/Tray 120 IC/Inside box
Material	: Carbon PP			
Thickness	: 1.2 mm			
Heat resistant temperature	: 125°C, 24h			
Surface resistance value	: less than $1 \times 10^6 \Omega$			

Tray type	: PT790	Package code	FP-256	Maximum Storage No. 18 IC/Tray 180 IC/Inside box
Material	: Carbon PP			
Thickness	: 1.5 mm			
Heat resistant temperature	: 125°C			
Surface resistance value	: less than $1 \times 10^6 \Omega$			

Packing Specifications

(4) TQFP

Tray type	: PT773M	Package code	Maximum Storage No.
Material	: Carbon PC	TFP-44 TFP-64 TFP-80 TFP-100	50 IC/Tray 500 IC/Inside box
Thickness	: 1.0 mm		
Heat resistant temperature	: 125°C, 24h		
Surface resistance value	: less than $1 \times 10^6 \Omega$		

Tray type	: PT789	Package code	Maximum Storage No.
Material	: Carbon PS	TFP-80A	50 IC/Tray 500 IC/Inside box
Thickness	: 1.5 mm		
Heat resistant temperature	: 125°C, 24h		
Surface resistance value	: less than $1 \times 10^6 \Omega$		

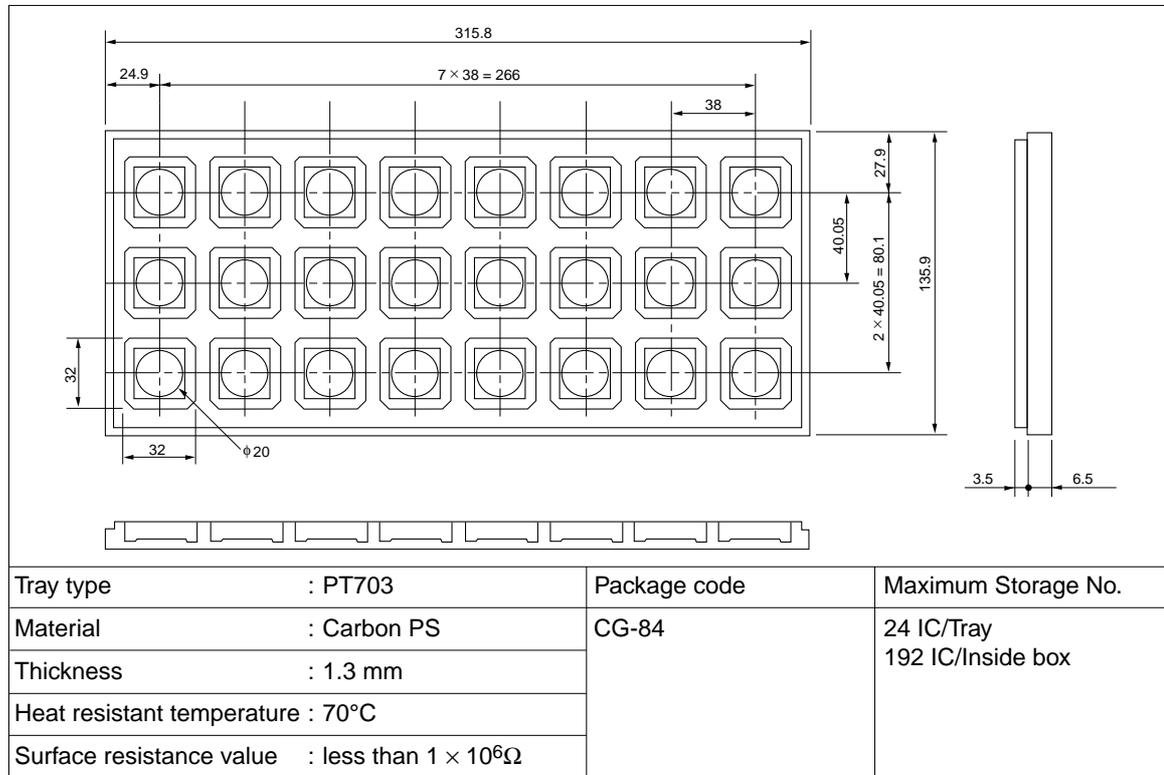
Packing Specifications

Tray type	: PT828B	Package code	Maximum Storage No.
Material	: Carbon PPE	TFP-80C	50 IC/Tray 500 IC/Inside box
Thickness	: 1.5 mm		
Heat resistant temperature	: 125°C		
Surface resistance value	: less than $1 \times 10^9 \Omega$		

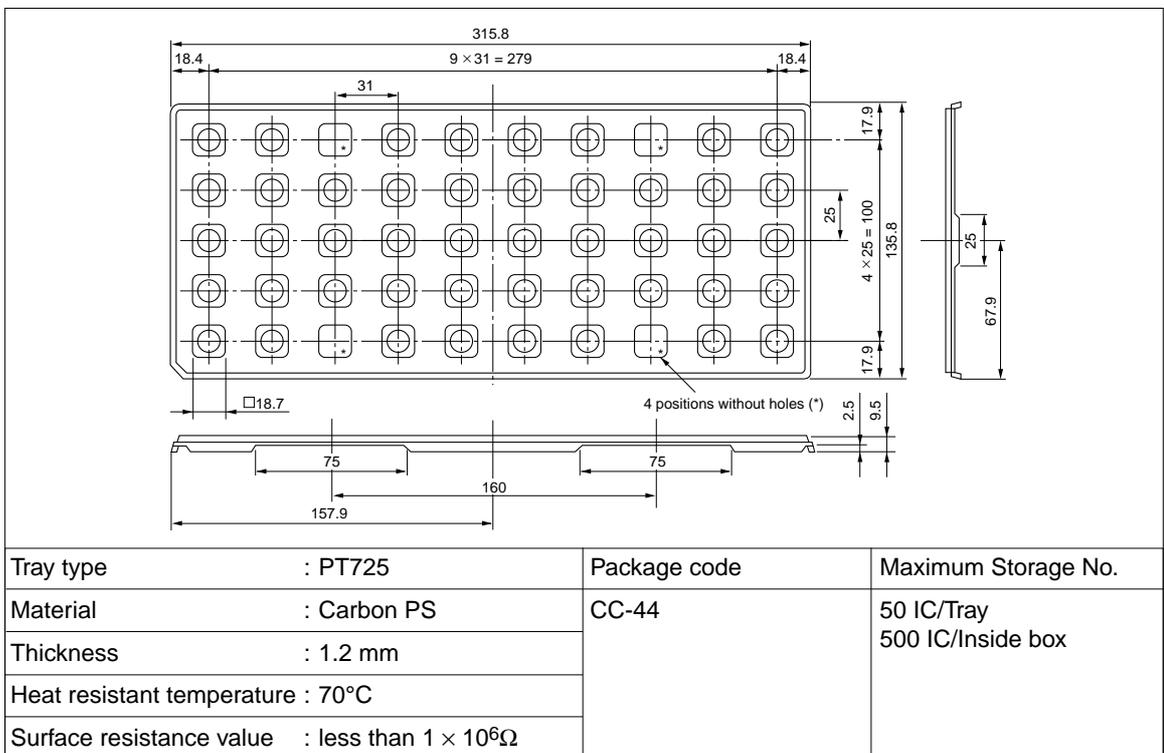
Tray type	: PT815B	Package code	Maximum Storage No.
Material	: Carbon PPE	TFP-80F TFP-100B	50 IC/Tray 500 IC/Inside box
Thickness	: 1.5 mm		
Heat resistant temperature	: 125°C		
Surface resistance value	: less than $1 \times 10^6 \Omega$		

Packing Specifications

(5) QFN

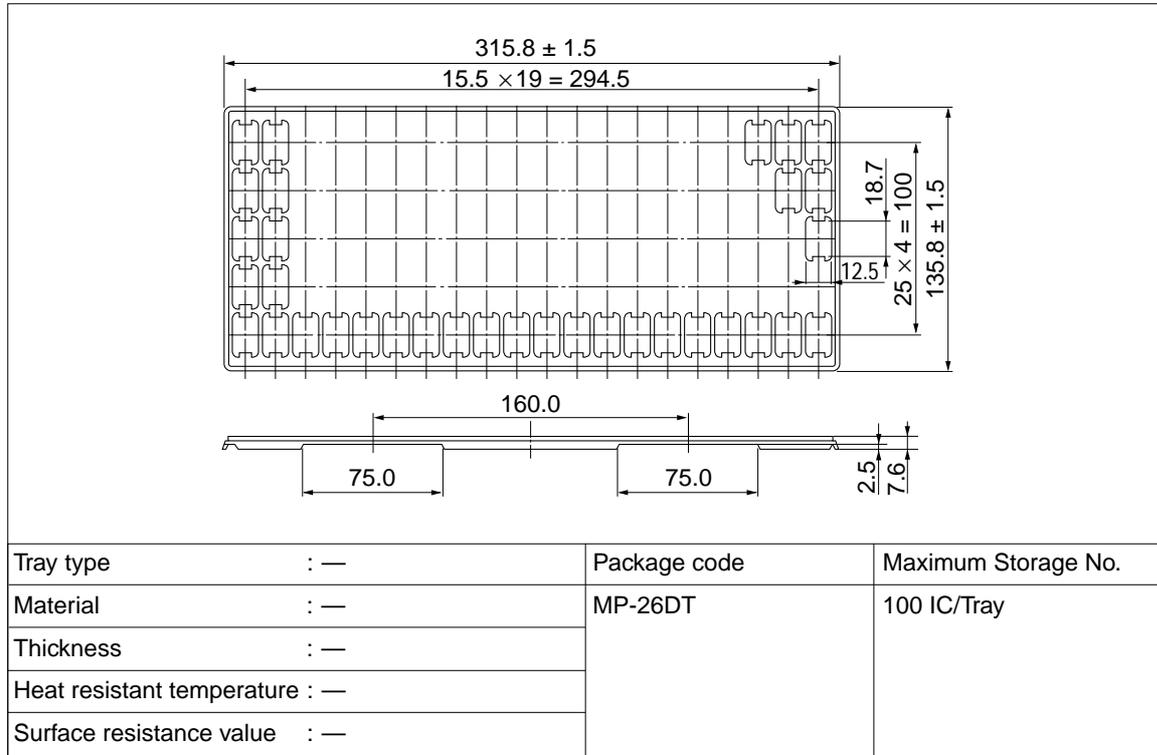


(6) QFJ-G

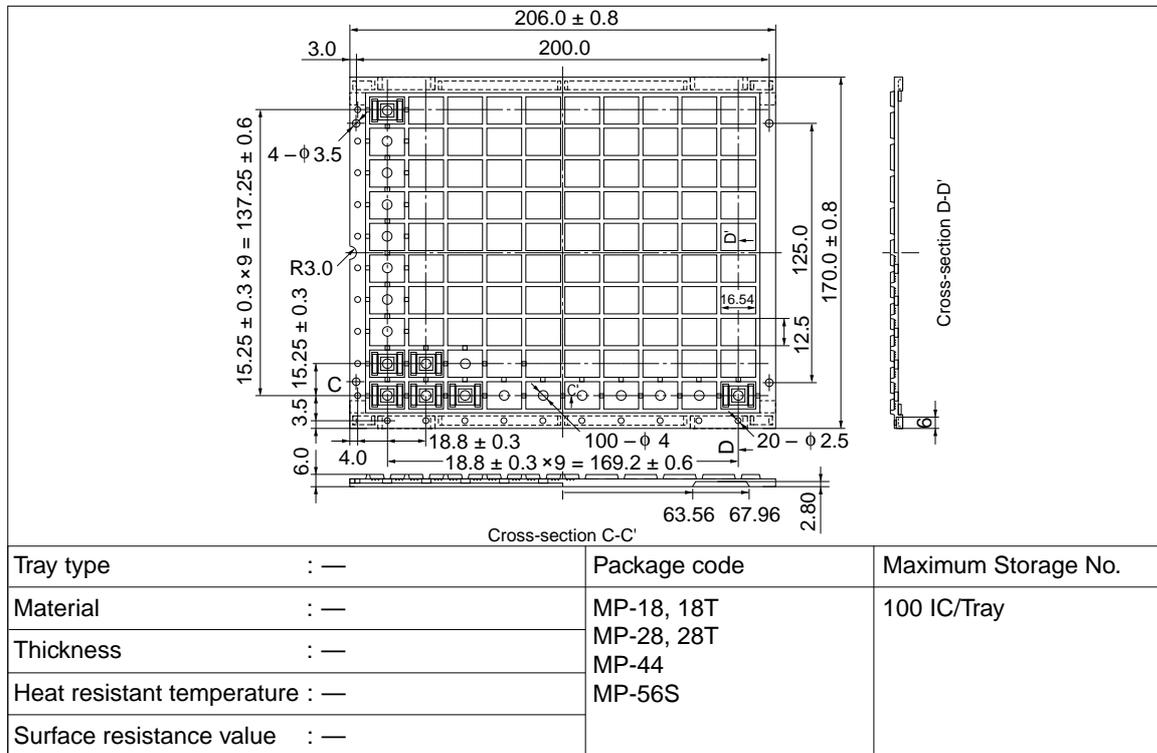


Packing Specifications

(7) SOI



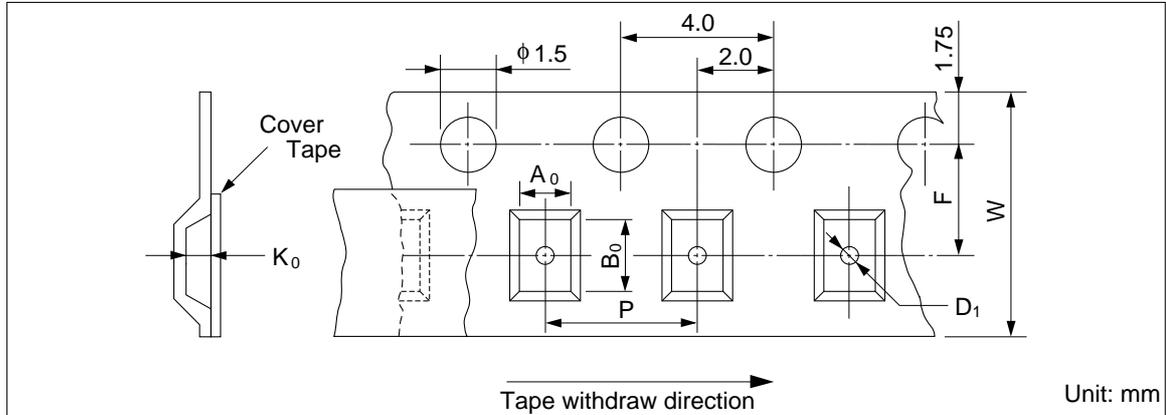
(8) QFI



Packing Specifications

4.4.3 Taping for IC

Emboss tape: Tape width 12 to 24 mm



Package Code	W	P	Ao	Bo	Ko	F	D ₁	Maximum Storage No.
FP-8D	12	8	6.9	5.3	2.3	5.5	1.5	2500 IC/reel
FP-14D	16	12	8.8	10.6	2.5	7.5	1.6	2000 IC/reel
FP-14DN	16	8	6.5	9.5	2.1	7.5	1.5	2500 IC/reel
FP-16D	16	12	8.8	10.6	2.5	7.5	1.6	2000 IC/reel
FP-16DN	16	8	6.5	10.3	2.1	7.5	1.5	2500 IC/reel
FP-18D, 20D	24	12	10.5	13.1	2.5	11.5	2.2	2000 IC/reel
FP-20DA	24	12	8.8	13.1	2.5	11.5	2.2	2000 IC/reel
FP-24D	24	16	12.5	16.3	3.2	11.5	2	1000 IC/reel
FP-28DA	24	16	12.4	18.5	3.1	11.5	2	1000 IC/reel
TFP-32D, 32DA	24	12	8.6	14.4	1.65	11.5	2.05	1000 IC/reel
TTP-14D, 16DA	16	8	6.8	5.4	2max	7.5	1.6min	2500 IC/reel
TTP-20D, 20DR, TTP-24DA	24	12	9.5	17.65	1.65	11.5	2.05	1000 IC/reel
TTP-20DA	16	12	6.9	10.6	2max	7.5	1.6min	2000 IC/reel
CP-18	24	12	8.5	13.8	3.6	11.5	1.5min	1000 IC/reel
CP-20D	24	12	8.8	17.8	3.7	11.5	2.05	1000 IC/reel
CP-20DA	24	12	10.35	17.7	4.3	11.5	2	1000 IC/reel
CP-24D	24	12	8.9	16.3	4.15	11.5	2	1000 IC/reel
CP-28DN	24	12	9.0	18.6	4.2	11.5	2	1000 IC/reel
CP-28D, 28DA	24	16	11.6	18.65	4.2	11.5	2.05	1000 IC/reel

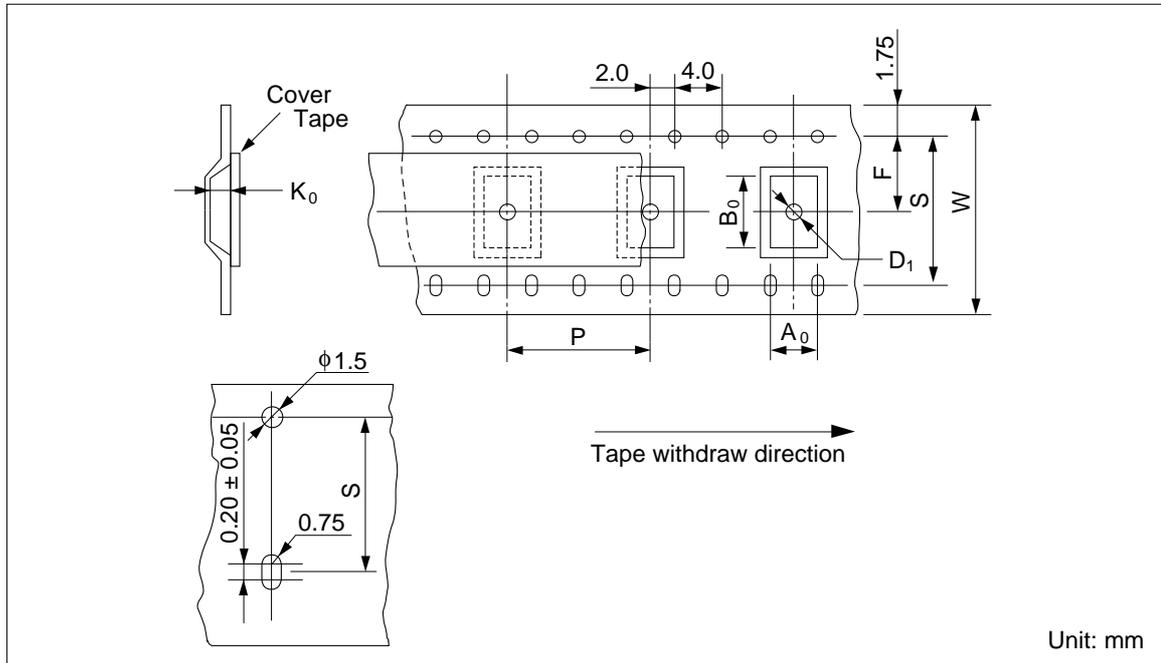
Packing Specifications

(cont)

Package Code	W	P	Ao	Bo	Ko	F	D₁	Maximum Storage No.
MP-18, 18A, 18T	16	12	8.5	9.0	2.9	7.5	2.0	1000 IC/reel
MP-28, 28A, 28T	24	16	11.8	13.0	2.9	11.5	2.0	1000 IC/reel
MP-44S	24	16	11.8	13.0	2.9	11.5	2.0	1000 IC/reel
MP-44, 44T	24	16	13.2	16.6	2.9	11.5	2.0	1000 IC/reel
MP-56S	24	16	13.2	16.6	2.9	11.5	2.0	1000 IC/reel

Packing Specifications

Emboss tape: Tape width 32 to 44 mm

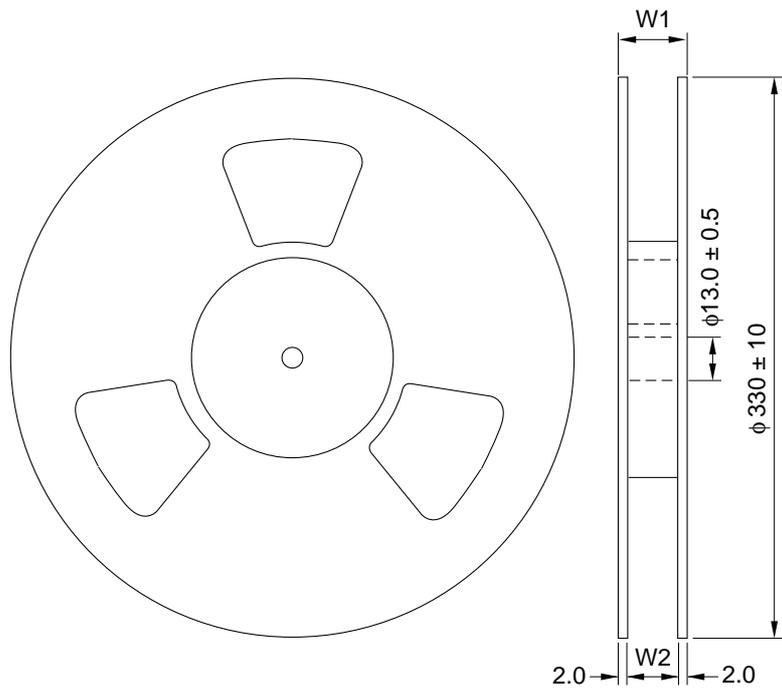


Package Code	W	P	Ao	Bo	Ko	F	S	D ₁	Maximum Storage No.
FP-32D	32	16	14.65	21.15	3.55	14.2	28.4	2.05	1000 IC/reel
FP-40D	44	24	14.7	26.3	3.1	20.2	40.4	2.0	750 IC/reel
FP-44D	44	24	16.6	28.8	3.5	20.2	40.4	2.0	750 IC/reel
CP-32D, 32DB	32	16	11.55	21.45	4.05	14.2	28.4	2.05	1000 IC/reel
CP-32DN	32	12	8.9	21.35	4.15	14.2	28.4	2.05	1000 IC/reel
CP-36D	32	16	11.55	23.85	4.15	14.2	28.4	2.05	1000 IC/reel
CP-40D	44	16	11.7	26.75	4.2	20.2	40.4	2.05	750 IC/reel
CP-44	32	24	17.85	17.85	4.95	14.2	28.4	2.05	500 IC/reel
CP-44D	44	16	11.65	29.2	4.05	20.2	40.4	2.05	750 IC/reel
CP-52	32	24	20.55	20.5	5.35	14.2	28.4	2.05	500 IC/reel
CP-68	44	32	26.0	25.9	4.9	20.2	40.4	2.05	250 IC/reel
CP-84	44	36	30.9	30.8	5.0	20.2	40.4	2.05	250 IC/reel
TFP-20DA/20DAR TFP-32D/32DR	32	12	8.5	20.4	1.75	14.2	28.4	2.05	1000 IC/reel

Packing Specifications

(cont)

Package Code	W	P	Ao	Bo	Ko	F	S	D ₁	Maximum Storage No.
TTP-24D TTP-28D/28DR TTP-28DA TTP-40DA/40DAR TTP-44D TTP-44DB/44DBR TTP-44DE	32	16	12.05	18.95	1.65	14.2	28.4	2.05	1000 IC/reel
TTP-32D/32DR TTP-32DB	32	16	12.2	21.75	1.85	14.2	28.4	2.05	1000 IC/reel
TTP-48D	32	24	15.95	20.30	1.65	14.2	28.4	2.05	1000 IC/reel



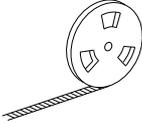
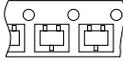
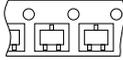
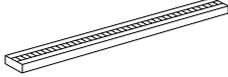
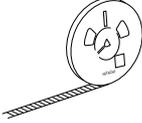
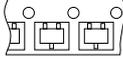
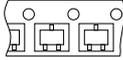
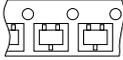
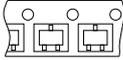
Tape width	W1	W2
24	28.4	24.4
32	36.4	32.4
44	48.4	44.4

Packing Specifications

4.5 Transistors and Diodes

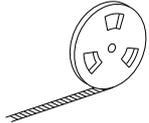
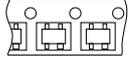
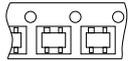
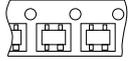
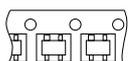
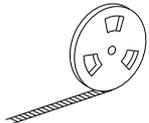
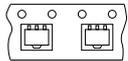
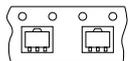
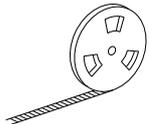
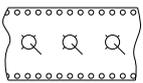
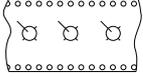
Hitachi discrete device packages are provided with various packing forms suited to automatic mounting. The forms of packing are classified by packing specification codes indicated by the final element in the product type number. (The product type number consists of the type number + the mark or grade + the packing specification code.)

Table 4-1 Packing Specifications of Discrete Device Packages

Package code	Form of packing	Packing unit	Packing specification code	Remarks
CMPAK	Taping 	3,000/reel	TR (Taping to <u>R</u> ight)	TR withdrawal direction→ 
			TL (Taping to <u>L</u> eft)	TL withdrawal direction→  (Mark face above)
MPAK	Horizontal magazine 	50/magazine	-01	(except diodes)
	Taping 	3,000/reel	TR (Taping to <u>R</u> ight)	TR withdrawal direction→ 
TL (Taping to <u>L</u> eft)			TL withdrawal direction→  (Mark face above)	
		12,000/reel	UR (<u>U</u> ltra taping to <u>R</u> ight)	TR withdrawal direction→ 
			UL (<u>U</u> ltra taping to <u>L</u> eft)	TL withdrawal direction→  (Mark face above)

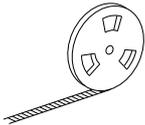
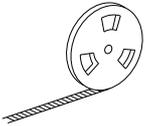
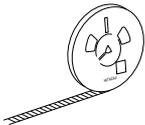
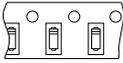
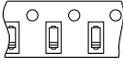
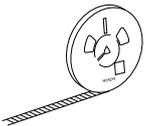
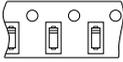
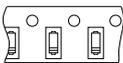
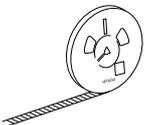
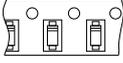
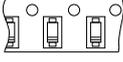
Packing Specifications

Table 4-1 Packing Specifications of Discrete Device Packages (cont)

Package code	Form of packing	Packing unit	Packing specification code	Remarks
MPAK-4		3,000/reel	TR (Taping to <u>R</u> ight)	TR withdrawal direction→ 
			TL (Taping to <u>L</u> eft)	TL withdrawal direction→  (Mark face above)
		12,000/reel	UR (Ultra taping to <u>R</u> ight)	TR withdrawal direction→ 
			UL (Ultra taping to <u>L</u> eft)	TL withdrawal direction→  (Mark face above)
		UPAK No partition code	Horizontal magazine	25/magazine —
		1,000/reel	Taping TR withdrawal direction→ (Taping to <u>R</u> ight)	TR 
withdrawal direction→			TL (Taping to <u>L</u> eft)	TL  (Mark face above)
FPAK		100/bag(small)	F4 (4 Lead forming)	
		(3 Lead forming)	500/bag(large)	F3  
	Taping	3,000/reel	TF4 (4 Lead forward taping) TR4	TR withdrawal direction→

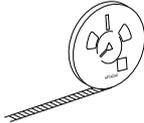
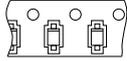
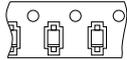
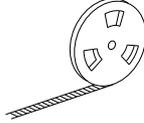
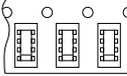
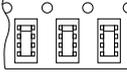
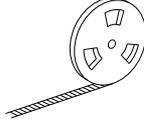
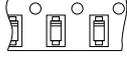
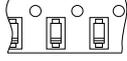
Packing Specifications

Table 4-1 Packing Specifications of Discrete Device Packages (cont)

Package code	Form of packing	Packing unit	Packing specification code	Remarks
DPAK	Bulk	100/bag	—	No classification code
	Taping 	3000/reel	TR (Taping to <u>R</u> ight) TL (Taping to <u>L</u> eft)	
LDPAK	Bulk	50/bag	—	
	Taping 	1,000/reel	TR (Taping to <u>R</u> ight) TL (Taping to <u>L</u> eft)	
LLD	Taping 	2,500/reel	TR (Taping to <u>R</u> ight)	TR withdrawal direction → 
			TL (Taping to <u>L</u> eft)	TL withdrawal direction → 
SRP	Taping 	3,000/reel	TR (Taping to <u>R</u> ight)	TR withdrawal direction → 
			TL (Taping to <u>L</u> eft)	TL withdrawal direction → 
URP	Taping 	3,000/reel	TR (Taping to <u>R</u> ight)	TR withdrawal direction → 
			TL (Taping to <u>L</u> eft)	TL withdrawal direction → 

Packing Specifications

Table 4-1 Packing Specifications of Discrete Device Packages (cont)

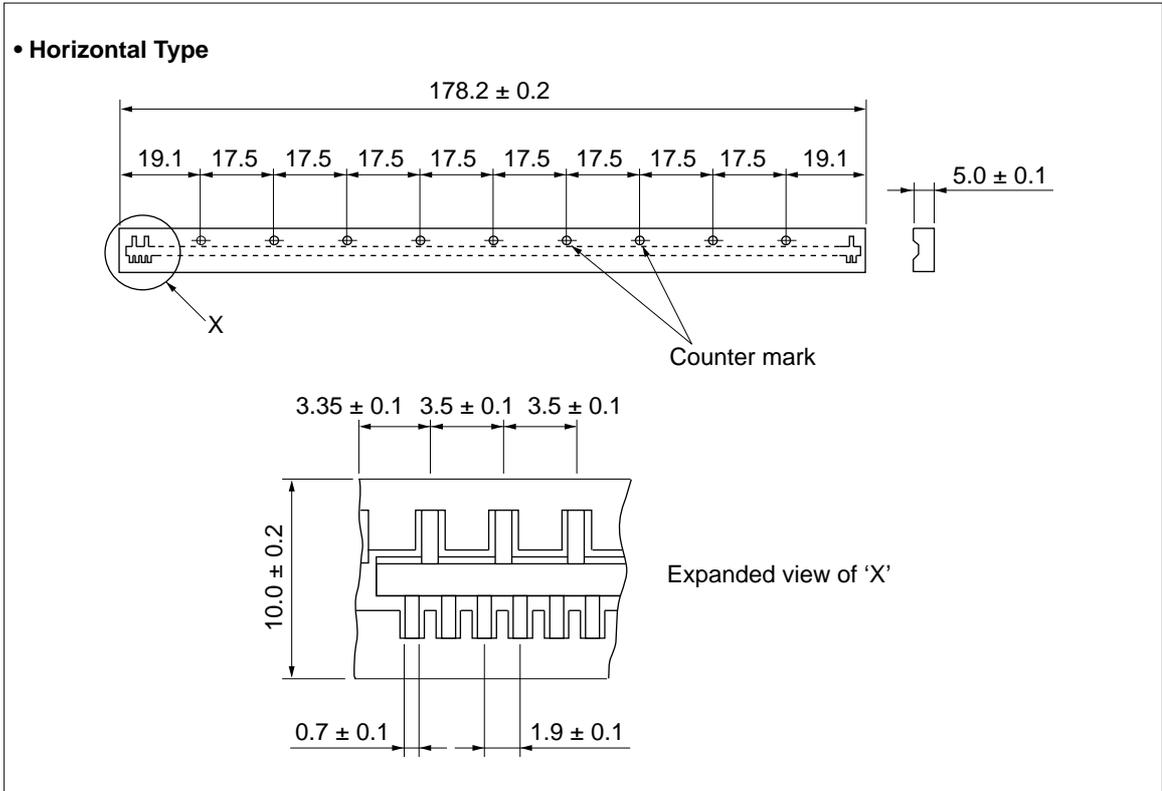
Package code	Form of packing	Packing unit	Packing specification code	Remarks
ERP	Taping 	4,000/reel	TR (Taping to <u>R</u> ight) TL (Taping to <u>L</u> eft)	TR withdrawal direction→  TL withdrawal direction→ 
MOP	Taping 	3,000/reel	TR (Taping to <u>R</u> ight) TL (Taping to <u>L</u> eft)	TR withdrawal direction→  TL withdrawal direction→ 
LRP	Taping 	1,500/reel	TR (Taping to <u>R</u> ight) TL (Taping to <u>L</u> eft)	TR withdrawal direction→  TL withdrawal direction→ 

Packing Specifications

4.5.1 Magazines for Transistors and Diodes

(1) MPAK

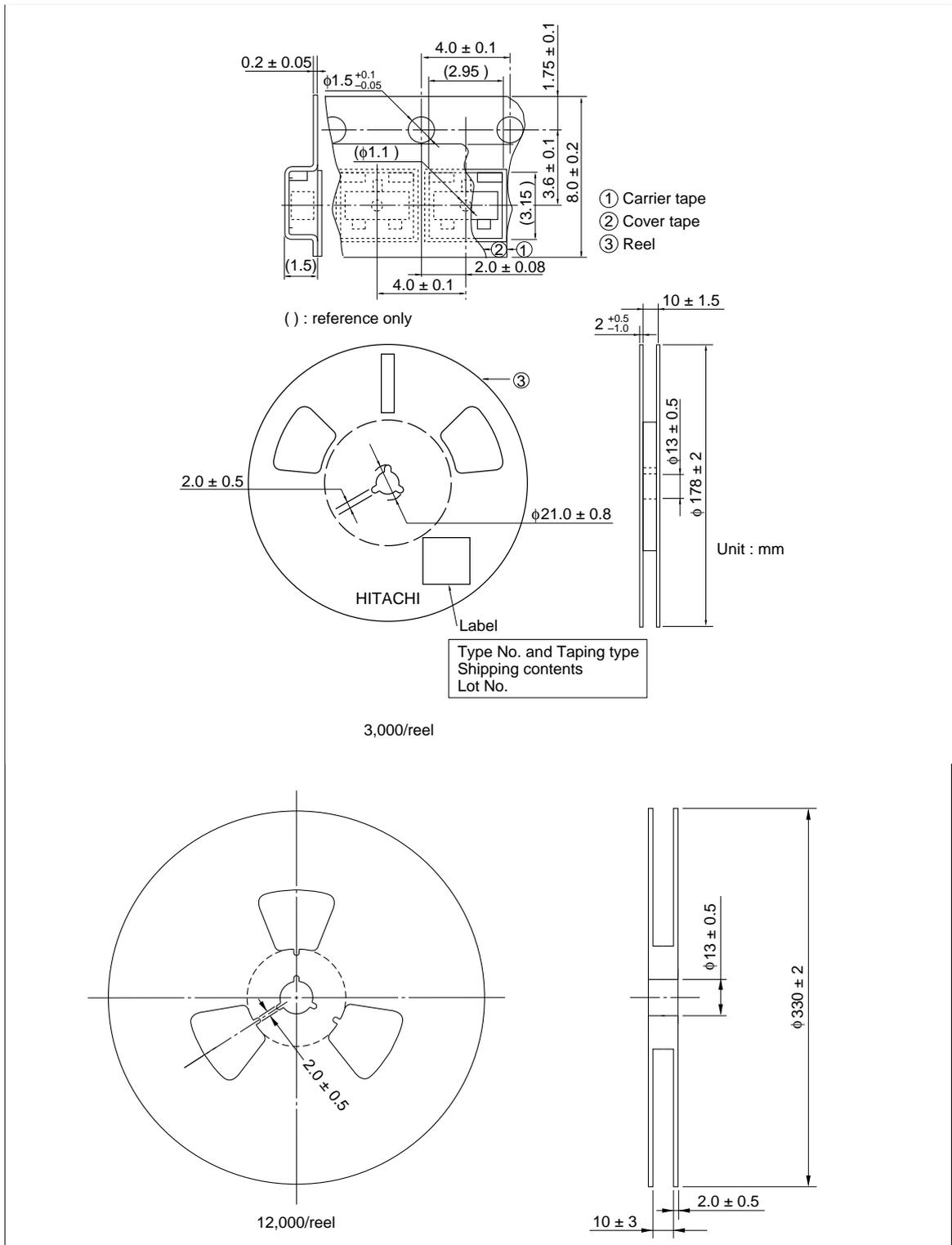
Unit: mm



Packing Specifications

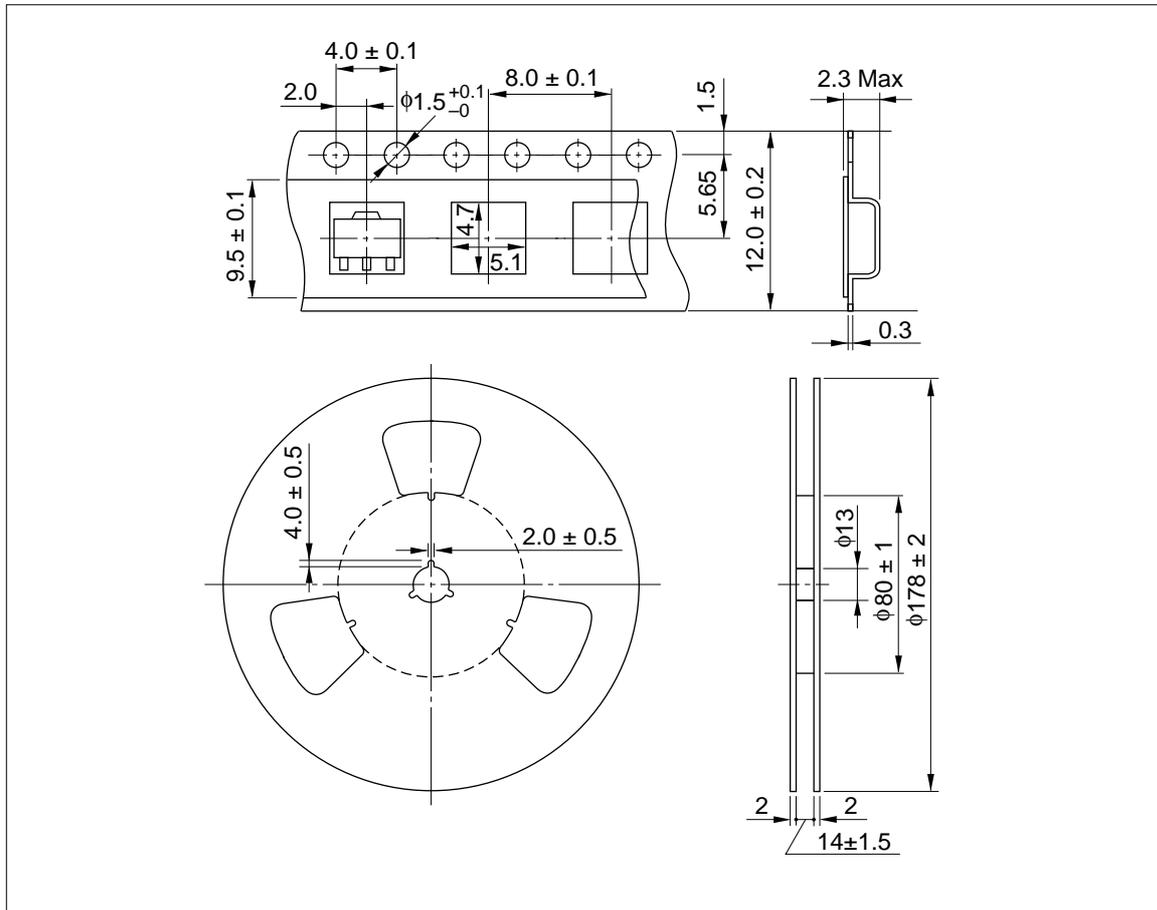
4.5.2 Taping for Transistors and Diodes

(1) Tapes and Reels for MPAK, MPAK-4



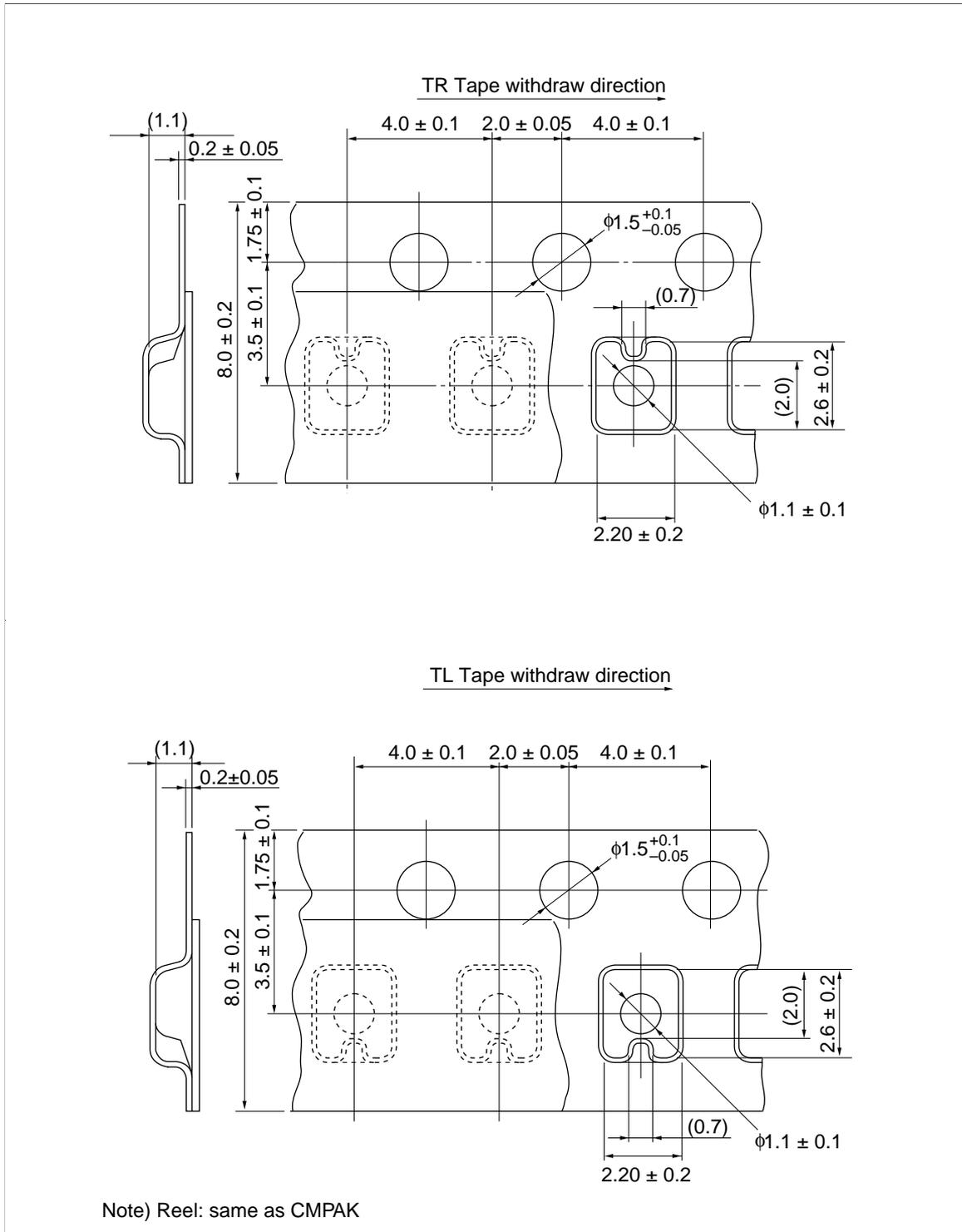
Packing Specifications

(2) Tapes and Reels for UPAK



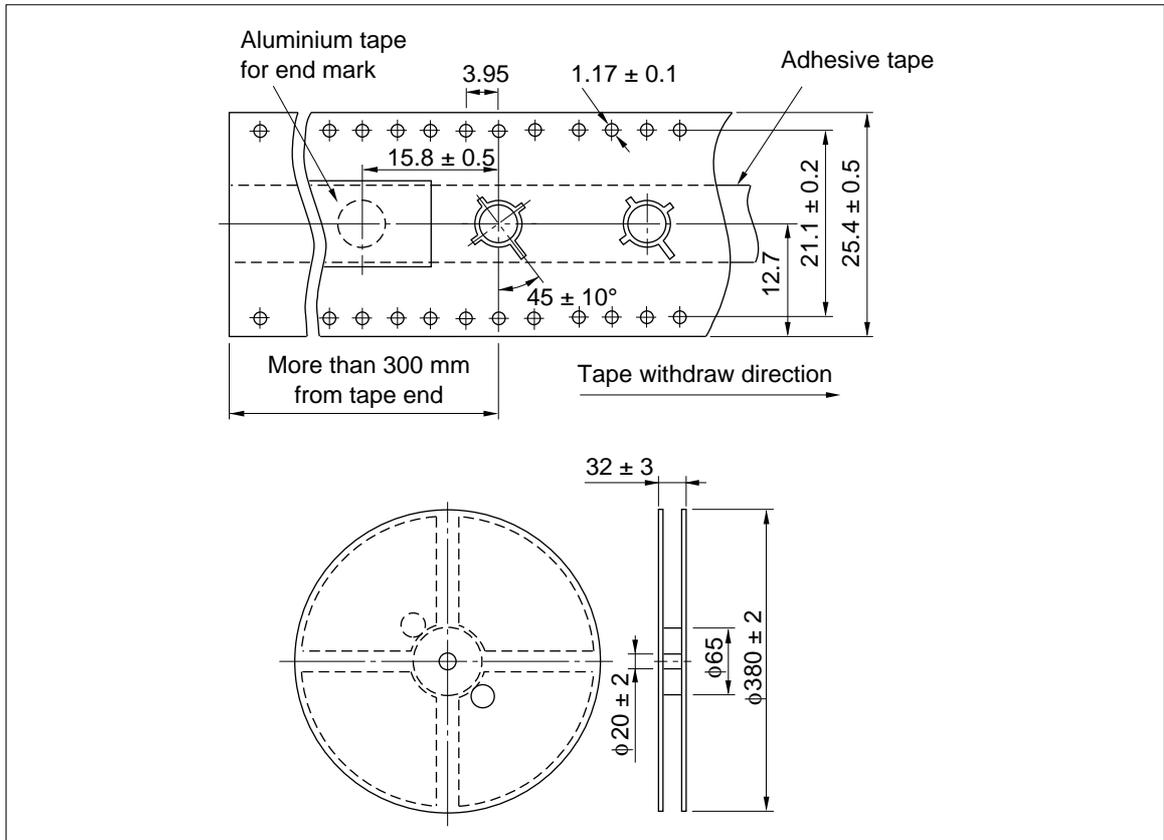
Packing Specifications

(4) Tapes and Reels for CMPAK-4



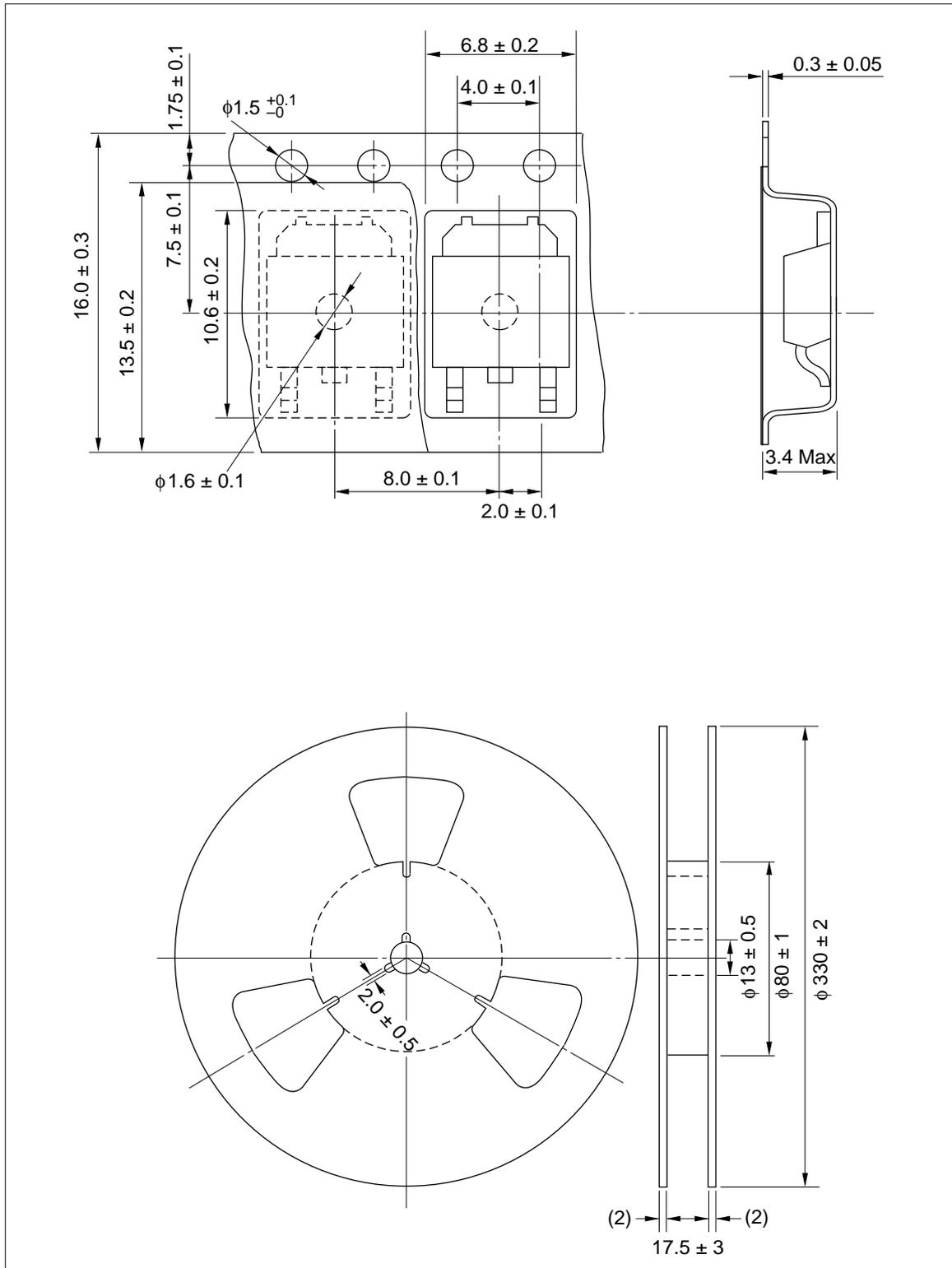
Packing Specifications

(5) Tapes and Reels for FPAK



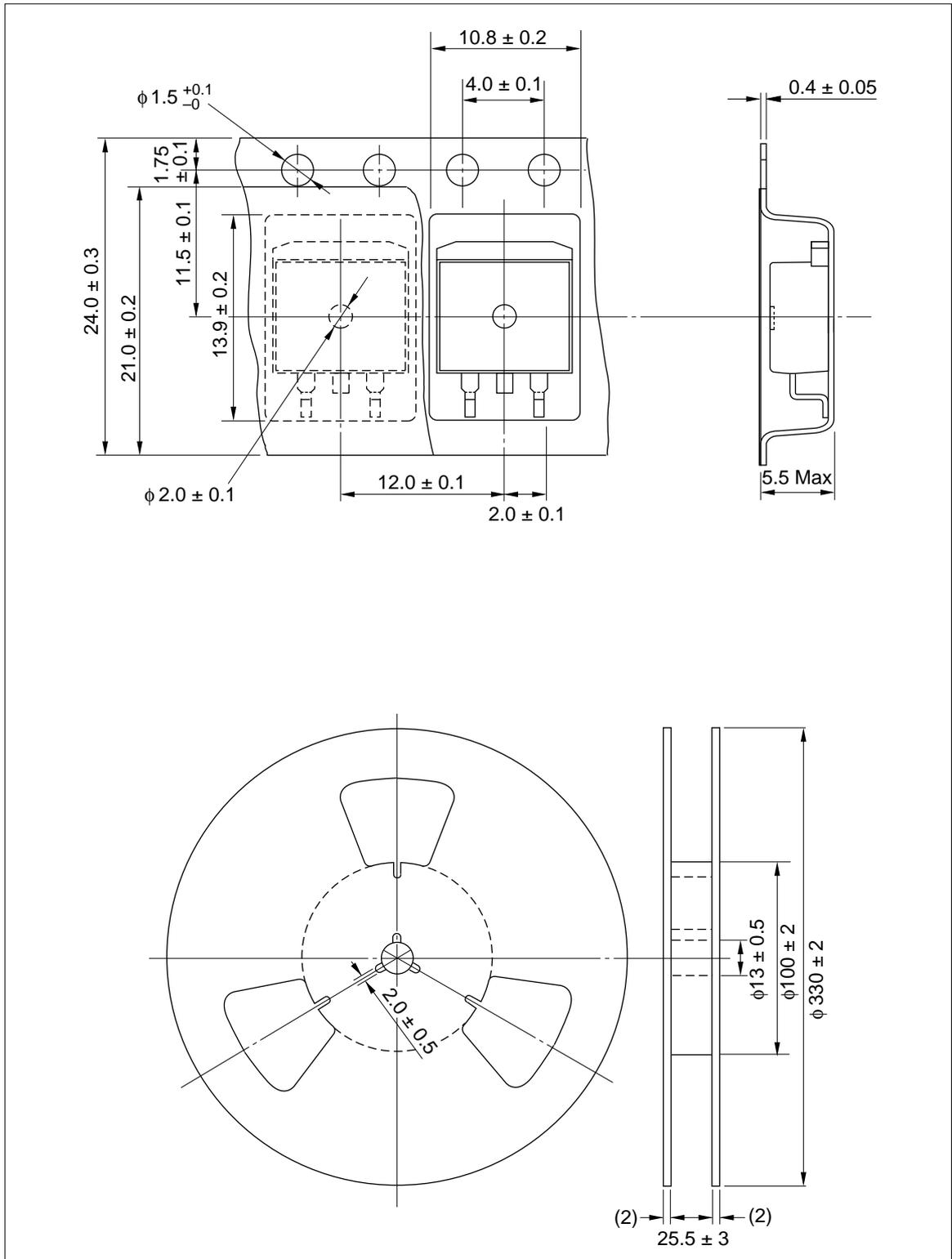
Packing Specifications

(6) Tapes and Reels for DPAK



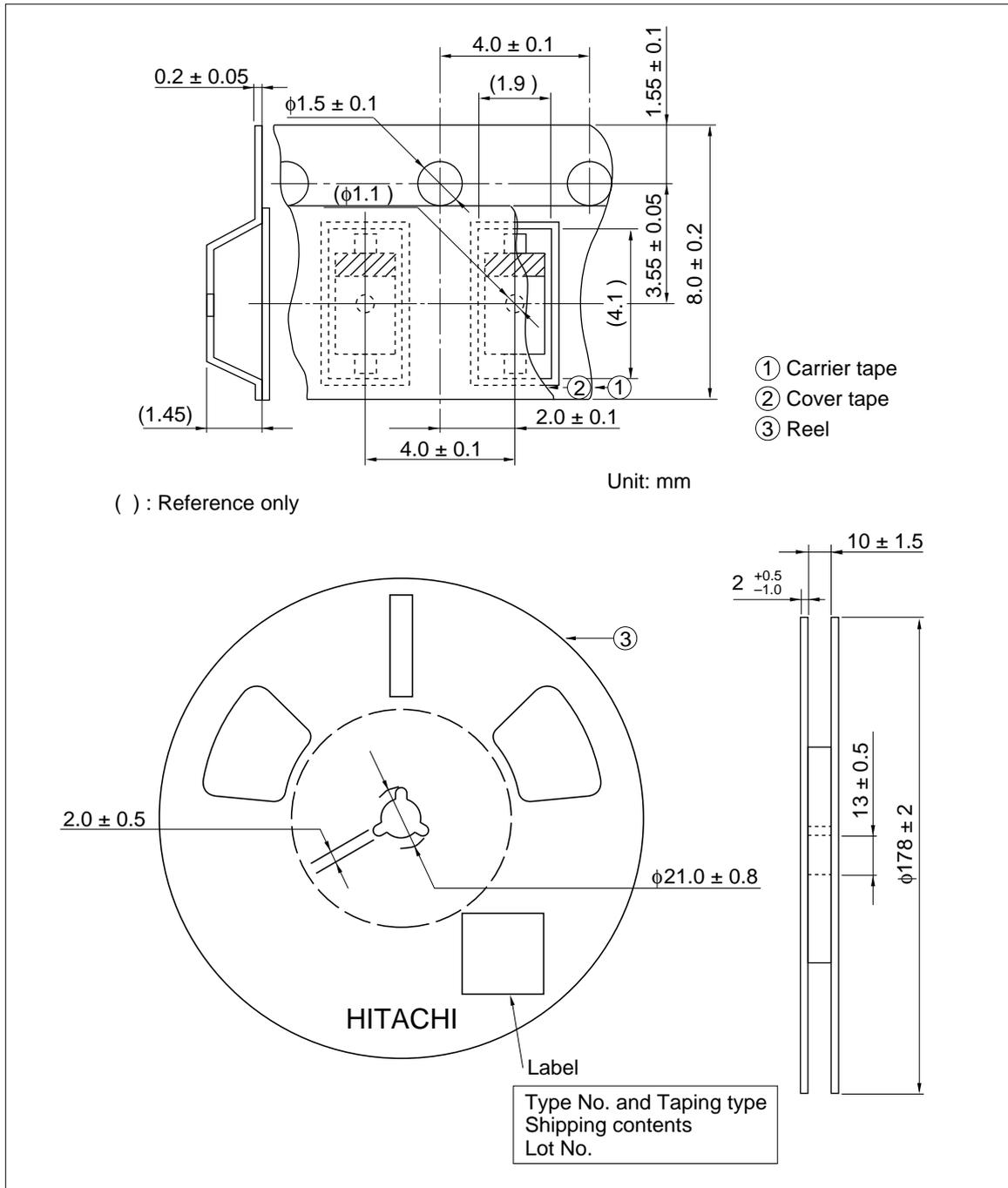
Packing Specifications

(7) Tapes and Reels for LDKPAK



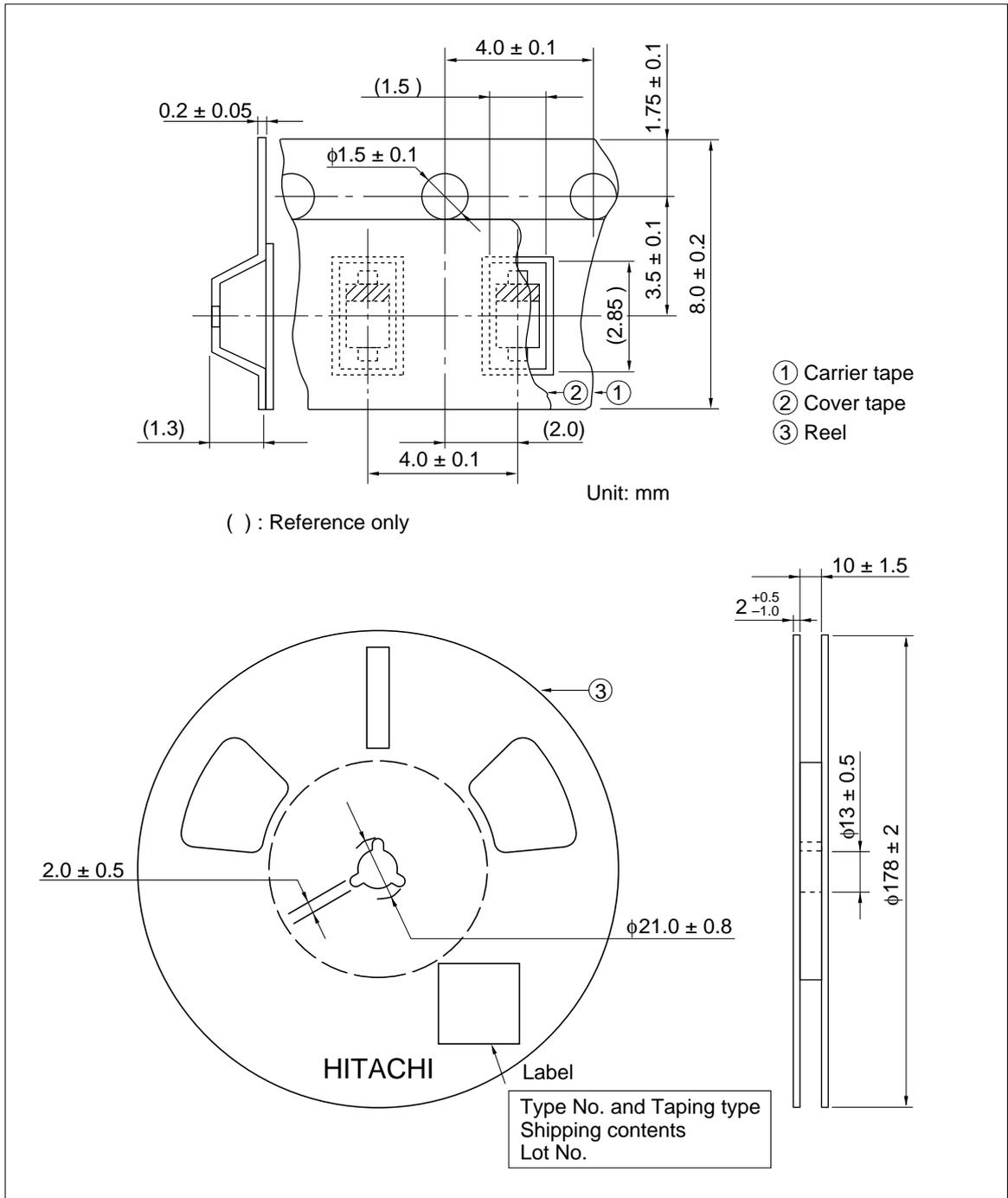
Packing Specifications

(8) Tapes and Reels for SRP



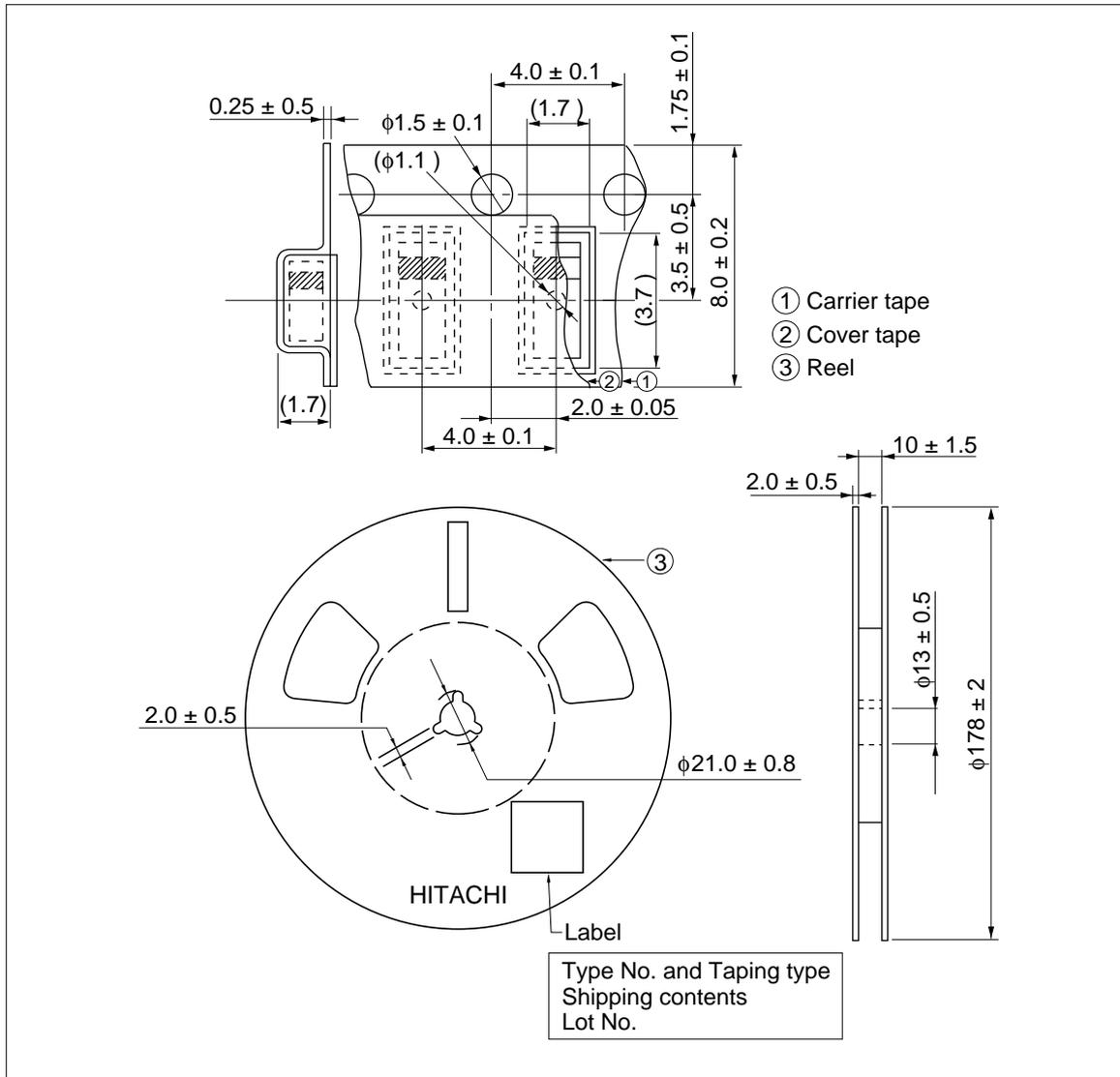
Packing Specifications

(9) Tapes and Reels for URP



Packing Specifications

(10) Tapes and Reels for LLD



Section 5 Sockets for Evaluation of Characteristics

The sockets indicated below have been prepared as evaluation sockets. Those wishing to know the details concerning the sockets for each package may contact the socket manufacturers.

5.1 Sockets for IC Packages

Package	Package code	Socket No.	Name of Maker
DIP	DP-8 DG-8	IC37F-0803-G4HT	Yamaichi
	DP-14 DG-14, DG-14A	IC-24-21 #2	
DP-16, DP-16A		IC37NRB-1603-G4	
		IC-31-8 #2	
		633-2160311	Welcon
DG-16, DG-16A		IC37NRB-1603-G4	Yamaichi
DP-18A		IC37NRB-1803-G4	
		CQT3718-21SA	Texas Instruments
		633-2180311	Welcon
DG-18		IC37NRB-1803-G4	Yamaichi
DP-16-2		IC37NRB-2003-G4	
		CQT3718-21SA	Texas Instruments
		633-2180311	Welcon
DP-20		IC37NRB-2004-G4	Yamaichi
		633-2200311	Welcon
DP-20N		CQT3720-21SA	Texas Instruments
		633-2200311	Welcon
		IC37NRB-2003-G4	Yamaichi
DG-20N		IC37NRB-2003-G4	Yamaichi
		633-2200311	Welcon
DP-22		IC37NRB-2204-G4	Yamaichi
		633-2220311	Welcon
DP-22N		IC37NRB-2203-G4	Yamaichi
		633-2220311	Welcon
DG-22N		IC37NRB-2203-G4	Yamaichi
		633-2220311	Welcon

Sockets for Evaluation of Characteristics

Sockets for IC Packages (cont)

Package	Package code	Socket No.	Name of Maker
DIP	DP-24	IC37NRB-2406-G4	Yamaichi
		633-8240311-001	Welcon
		CT3724-21SA	Texas Instruments
	DP-24A	CQT3724V-21SA	
		IC37NRB-2404-G4	Yamaichi
	DG-24, DG-24A, DG-24B DC-24	IC37NRB-2406-G4	Yamaichi
	DP-24N	IC37NRB-2403-G4	
		633-2240311	Welcon
	DG-24N	IC37NRB-2404-G4	Yamaichi
		633-2240311	Welcon
	DP-24TS	IC59-3004-G4	Yamaichi
		CQ3724V-22SA	Texas Instruments
	DP-28	IC37NRB-2806-G4	Yamaichi
		CT3728-21SA	Texas Instruments
		633-8280311-001	Welcon
	DG-28 DC-28	IC37NRB-2806-G4	Yamaichi
	DP-28N	633-2280311	Welcon
		CQT3728A-21SA	Texas Instruments
		IC37NRB-2803-G4	Yamaichi
	DG-28N	IC37NRB-2804-G4	Yamaichi
		633-2280311	Welcon
		CQT3728V-21SA	Texas Instruments
	DP-28S	IC-7620-2804-G4	Yamaichi
		623-1280316-004	Welcon
		CQT3728V-21SA	Texas Instruments
	DP-30S	IC59-3004-G4	Yamaichi
	DP-32	CT3732-21SA	Texas Instruments
		633-8320311-001	Welcon

Sockets for Evaluation of Characteristics

Sockets for IC Packages (cont)

Package	Package code	Socket No.	Name of Maker	
DIP	DP-32	IC37F-3206-G4HT	Yamaichi	
	DP-32N	CQT3732A-21SA	Texas Instruments	
	DP-36	IC37F-3606-G4HT	Yamaichi	
	DP-40		IC37NRB-4006-G4	
			633-8400311-001	Welcon
			CT3740-21SA	Texas Instruments
	DG-40 DC-40		IC37NRB-4006-G4	Yamaichi
	DP-42		IC37NRB-4206-G4	Yamaichi
			633-8420311-001	Welcon
			CT3742-21SA	Texas Instruments
	DC-42		IC37NRB-4206-G4	Yamaichi
	DP-42S		IC7620-4206-G4	
			623-7420316-004	Welcon
			CM3742-22SBN	Texas Instruments
	DP-48		633-8480311-001	Welcon
			IC37NRB-4806-G4	Yamaichi
	DP-56S		IC121-5606-G4	Yamaichi
	DP-64		IC8620-6409-G4	
	DC-64		IC8620-6409-G4	
	DP-64S		IC121-64075-G4	
			623-9640316-005	Welcon
CM3764-22SBN			Texas Instruments	
DP-90S		IC121-9009-G4	Yamaichi	
ZIP	ZP-16	IC39-1612-G4	Yamaichi	
		CB3716-22SD	Texas Instruments	
	ZP-20		CB3720-22SD	
			IC118-2002-G4	Yamaichi
			ZIP-20-2.54-04	Enplas

Sockets for Evaluation of Characteristics

Sockets for IC Packages (cont)

Package	Package code	Socket No.	Name of Maker
ZIP	ZP-24	CB3724-22SD	Texas Instruments
		IC118-2403-G4	Yamaichi
		ZIP-24-2.54-05	Enplas
	ZP-28	CB3728-22SD	Texas Instruments
		IC118-2804-G4	Yamaichi
		ZIP-28-2.54-01E	Enplas
	ZP-32	CB3732-22SD	Texas Instruments
	ZP-40	CB3740-22SD	
		IC118-4006-G4	Yamaichi
	SIP	SP-5TA	SMT-26320
SP-7		IC-66-7#2	
SP-8			
SP-12T		IC-125-1	
SP-15TA		IC39-1511-G4	
SP-15TB		IC39-1505-G4	
SOP		FP-8D	IC51-0162-272-2
	FP-14D, FP-14DA	CFPHO16-37-01	Texas Instruments
	FP-14DN	IC51-0162-272-3	Yamaichi
	FP-16D, FP-16DA	CFPHO16-37-01	Texas Instruments
	FP-16DN	IC51-0162-272-3	Yamaichi
	FP-18D	CFPHO20-37-01	Texas Instruments
	FP-20D		
	FP-20DN	IC51-0202-164	Yamaichi
	FP-24D	IC51-0282-153	
	FP-28D	FP-28-1.27-17	Enplas
		IC51-0282-153	Yamaichi
		CSP028-008	Texas Instruments
	FP-28DA	FP-28-1.27-17	Enplas

Sockets for Evaluation of Characteristics

Sockets for IC Packages (cont)

Package	Package code	Socket No.	Name of Maker	
SOP	FP-28DA	IC51-0282-153	Yamaichi	
		CSP028-008	Texas Instruments	
	FP-32D	FP-32-1.27-10	Enplas	
		IC51-0322-667-2	Yamaichi	
		CSP032-019	Texas Instruments	
	FP-40D	IC51-0402-1197	Yamaichi	
	FP-44D	IC51-0442-1208		
	FP-48D	FP-48-0.8-03	Enplas	
	FP-48DA	IC51-0482-1009-2	Yamaichi	
TSOP(I)	TFP-20D	IC51-0242-1006		
	TFP-28D	FP-28-0.5-01	Enplas	
	TFP-32DA	OTS-32-0.5-01		
	TFP-32D	IC174-0322-001N	Yamaichi	
		OTS-32-0.5-03	Enplas	
TSOP(II)	TTP-20D	IC162-0202-037N	Yamaichi	
		OTS-20(26)1.27-01A	Enplas	
	TTP-28D	IC162-0282-045N	Yamaichi	
		OTS-28-1.27-08A	Enplas	
	TTP-32D	IC162-0322-039N	Yamaichi	
		OTS-32-1.27-09A	Enplas	
	QFP	FP-28T	IC51-0404-1511	Yamaichi
		FP-44A	FPQ-44-0.8-09D	Enplas
IC51-0444-954-2			Yamaichi	
FP-54		IC51-0544-517-3		
FP-54A		IC51-0544-517-3		
FP-56		IC51-0564-680		
FP-60		IC51-0604-497-3		
FP-60A		IC51-0604-497-3		
FP-64		FPQ-64-1.0-08V	Enplas	

Sockets for Evaluation of Characteristics

Sockets for IC Packages (cont)

Package	Package code	Socket No.	Name of Maker
QFP	FP-64	IC51-0644-472-3	Yamaichi
	FP-64A	FPQ-64-0.8-10A	Enplas
		IC51-0644-692-3	Yamaichi
FP-64B		FPQ-64-1.0-08A	Enplas
		IC51-0644-472-3	Yamaichi
FP-80		FPQ-80-0.8-13A	Enplas
		IC51-0804-394-3	Yamaichi
FP-80A		FPQ-80-0.65-02A	Enplas
		IC51-0804-956-2	Yamaichi
FP-80B		FPQ-80-0.8-13A	Enplas
		IC51-0804-1200-2	Yamaichi
FP-88		FPQ-88-0.8-01A	Enplas
		IC51-0884-999-2	Yamaichi
FP-100		FPQ-100-0.65-11A	Enplas
		IC51-1004-552-2	Yamaichi
FP-100A		FPQ-100-0.65-11A	Enplas
		IC51-1004-552-2	Yamaichi
		CQF100-025	Nippon T.I
FP-100B		FPQ-100-0.5-01	Enplas
		IC51-1004-958-2	Yamaichi
FP-112		IC51-1124-1036-2	
FP-136		FPQ-136-0.8-02	Enplas
FP-136A		OTQ-136-0.8-02	
FP-144A		IC166-1414-006N	Yamaichi
FP-160		IC51-1604-845-4	
FP-168		FPQ-168-0.65-02	Enplas
FP-208		IC51-2084-1052-6	Yamaichi
FP-232		CQF-232-007	Texas Instruments
TQFP	TFP-44	IC51-0444-889-2	Yamaichi

Sockets for Evaluation of Characteristics

Sockets for IC Packages (cont)

Package	Package code	Socket No.	Name of Maker
TQFP	TFP-64	IC51-0644-1240-2	Yamaichi
	TFP-80	FPQ-80-0.65-05A	Enplas
		IC51-0804-1311-2	Yamaichi
	TFP-80F	FPQ-80-0.65-09A	Enplas
	TFP-80A	IC51-0804-808-5	Yamaichi
		OTQ-80-0.5-01	Enplas
		IC201-0804-020N	Yamaichi
	TFP-80C	IC51-0804-808-4	
		FPQ-80-0.5-04	Enplas
		IC201-0804-014N	Yamaichi
		OTQ-80-0.5-02	Enplas
	TFP-100	FPQ-100-0.5-03B	
	TFP-100B	FPQ-100-0.5-11	
		IC51-1004-809	Yamaichi
		OTQ-100-0.5-03	Enplas
IC201-1004-008N		Yamaichi	
TFP-120	IC51-1204-1657		
QFP-G	FG-20D	IC53-0202-075	Yamaichi
	FG-22D	FP-22-0.76-01	Enplas
	FG-24	IC53-0244-033	Yamaichi
	FG-28D	FP-28-1.27-12	Enplas
		FP-28-1.27-12A	
	FG-64	FPQ-64-1.0-08V	
	FG-80	FPQ-80-0.8-13V	
		IC51-0804-394-3	Yamaichi
FG-132	FPQ-132-0.635-04	Enplas	
SOJ	CP-20D	SOJ-20(26)1.27-02C	
		IC100-2603-20G	Yamaichi
		CSJT020-37-14	Texas Instruments

Sockets for Evaluation of Characteristics

Sockets for IC Packages (cont)

Package	Package code	Socket No.	Name of Maker
SOJ	CP-20DA	SOJ-20(26)1.27-03C	Enplas
		CSJT020A37-14	Texas Instruments
		IC100-26035-20G	Yamaichi
	CP-24D	SOJ-24-1.27-02	Enplas
		IC100-2403G	Yamaichi
		CSJT024-37-15B	Texas Instruments
	CP-28D	SOJ-28-1.27-02C	Enplas
		IC100-2804-G	Yamaichi
		CSJT028B37-04	Texas Instruments
	CP-28DN	SOJ-28-1.27-06AC	Enplas
		CSJT028-37-04	Texas Instruments
		IC100-2803-G	Yamaichi
CP-32D	SOJ-32-1.27-01C	Enplas	
	IC100-3204-G	Yamaichi	
	644-2320312	Welcon	
	CSJT032B37-04	Texas Instruments	
CP-40D	CSJT040B37-04		
	IC100-4004-G	Yamaichi	
	SOJ-40-1.27-03	Enplas	
QFJ (PLCC)	CP-18	PLCC18-1.27-04	Enplas
		IC51-0184-398	Yamaichi
		636-0181912-001	Welcon
	CP-32	PLCC32-1.27-02	Enplas
		IC51-0324-453	Yamaichi
		647-03201912	Welcon
	CP-44	PLCC44-1.27-04	Enplas
		IC51-0444-400-1	Yamaichi
		647-1441912	Welcon
		CPL044-004	Texas Instruments

Sockets for Evaluation of Characteristics

Sockets for IC Packages (cont)

Package	Package code	Socket No.	Name of Maker
QFJ (PLCC)	CP-52	PLCC52-1.27-01	Enplas
		IC51-0524-411-1	Yamaichi
		647-1521912	Welcon
		CPL0052-008B	Texas Instruments
	CP-68	PLCC68-1.27-04	Enplas
		IC51-0684-390-1	Yamaichi
		647-1681912	Welcon
		CPL068-006B	Texas Instruments
	CP-84	PLCC84-1.27-04	Enplas
		IC51-08844-401-1	Yamaichi
		647-1841912	Welcon
		CPL084-009B	Texas Instruments
QFJ-G	CC-44	IC51-0444-400	Yamaichi
		CPL044-004	Texas Instruments
SOI	MP-26DT	IC51-0442-1070	Yamaichi
QFI (MSP)	MP-18, MP-18T, MP-18A	MSPAK-18-1	Takachiho
		IC51-0184-1050	Yamaichi
	MP-28, MP-28T, MP-28A	MSPAK-28-1	Takachiho
		IC51-0284-1100	Yamaichi
	MP-44, MP-44T	FPQ-44-1.016-02	Enplas
		IC51-0444-550	Yamaichi
	MP-44S	FPQ-44-0.762-01	Enplas
		IC51-0444-739	Yamaichi
	MP-56S	FPQ-56-0.762-0	Enplas
		IC51-0564-1226-2	Yamaichi
PGA	PC-68	PPS68-AG2D	AUGAT
		NP89-10007-KS-8019	Yamaichi
	PC-72	NP35-11207G4-2BF	
		PPS72-AG2D	AUGAT

Thermal Resistance of IC Packages

Sockets for IC Packages (cont)

Package	Package code	Socket No.	Name of Maker
PGA	PC-120	NP35-16008-G4-2BF KS-5594	Yamaichi
		PPS-120-AG1D	AUGAT
QFN (LCC)	CG-20	IC53-0204-073	Yamaichi
	CG-22A	LCC-22-1.27-01	Enplas
		IC53-0224-132	Yamaichi
	CG-24	224-5315	TEXT TOOL
	CG-40	240-5084-00-1102	
	CG-84	IC51-0844-1005	Yamaichi
QFP	FP-64A	IC149-064-*08-*5	
	FP-80B	IC149-080-*12-*5	
	FP-80A	IC149-080-*17-*5	
QFJ-G	CC-44 (pin insertion type)	PCS-044A-1	AUGAT
		PCC05-044-3227	KEL
		244-7230-90-1157	Sumitomo 3M
	CC-44 (surface mount type)	PCS-044SMU-1	AUGAT

5.2 Sockets for Transistors

Package	Socket No.	Name of Maker
FPAK	SMT-7514	Yamaichi
DPAK	SMT-6012-HT	

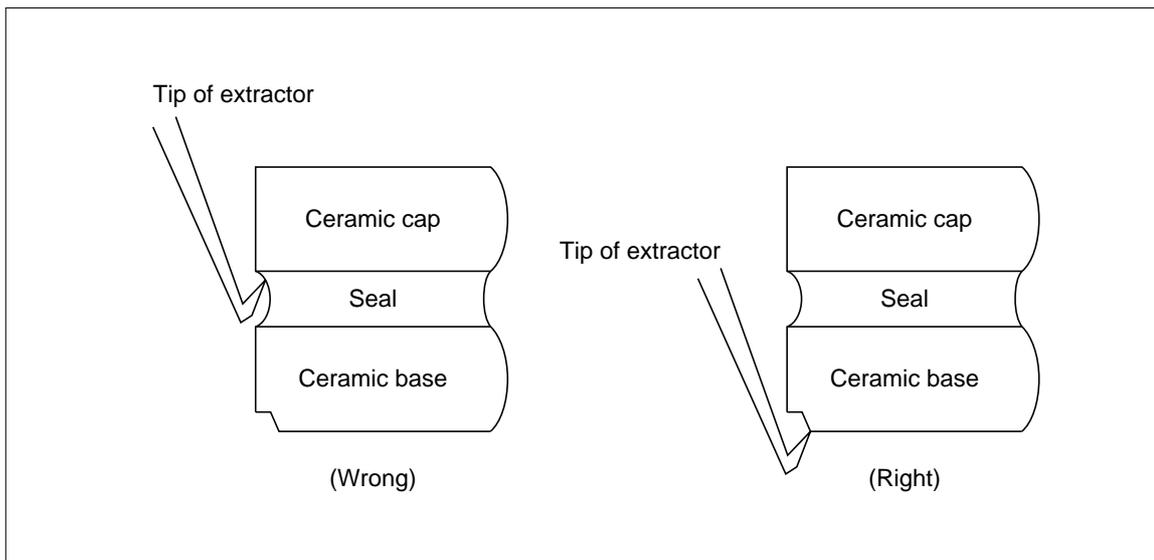
5.3 Precautions for Handling Sockets

1. The intervals of the leads of dual in-line packages extend depending on the board dimensions (300 mil, 400 mil, 600 mil, 900 mil) (except for ceramic DIP). Sometimes, the mouth of the socket and the tip of the lead do not conform and insertion is difficult. A suitable jig should be used for inserting ICs and for withdrawing them.
2. When soldering must be performed with the IC inserted in the IC socket, use a soldering iron with high insulation resistance. Caution should be exercised so that the IC is not damaged by the leakage current of the soldering iron.
3. The IC socket should be used within its heat resistance temperature (125°C).

Sockets for Evaluation of Characteristics

4. The QFJ-G mounting socket recommended by Hitachi, which is listed in the IC package socket table, may cause outer lead deformation, depending on the insert/extract method used by the customer and the number of insert/extract cycles. The socket should be evaluated in advance for the expected number of cycles, using the customer's insert/extract method.

Use an extractor to extract the IC from the socket. If the tip of the extractor is not inserted far enough into the socket groove, it may catch on the seal and pry the cap loose when the IC is extracted (see the drawing below). Choose an extractor that fits the socket, and when extracting the IC, make sure the tip of the extractor is fully inserted.



5.4 Methods of Purchasing Sockets

If you want more detailed information about each socket and the purchase of sockets, please inquire at one of the following agencies.

Contacts:

- | | |
|--------------------------------------|---|
| 1. Yamaichi Electronics Co., Ltd. | Tel: 03-3778-6121 (Japan)
Fax: 03-3778-6181 |
| 2. Enplas Corporation | Tel: 0482-25-7233 (Japan)
Fax: 0482-57-0191 |
| 3. General Bussan Co., Ltd. (T•I) | Tel: 03-3383-1711 (Japan)
Fax: 03-3383-1719 |
| 4. Wells Electronics, Inc., (Welcon) | Tel: 219-287-5941 (U.S.A.)
Fax: 219-287-0356 |
| 5. MMM Co., Ltd (Textool) | Tel: 800-328-7732 (U.S.A.) |
| 6. Takachiho Denki K.K | Tel: 0485-24-9900 (Japan) |
| 7. Augat Inc., | Tel: 617-222-2202 (U.S.A.) |