

DUAL OPERATIONAL AMPLIFIER

FEATURES

- Supply Voltage $\pm 4V$ to $\pm 18V$
- Wide Gain Bandwidth Product 10 MHz typ.
- Slew Rate $4V/\mu s$ typ.
- Package Outline SOP8
DMP8
MSOP8 (TVSP8)*
*meet JEDEC MO-187-DA / thin type
SSOP8
- Bipolar Technology
- Internal ESD Protection
Human Body Model (HBM) $\pm 2000V$ typ.
- Wide Temperature Range $-40^{\circ}C$ to $125^{\circ}C$

DESCRIPTION

The NJM8065 integrated circuit is a high-gain, wide bandwidth, dual operational amplifier.

The NJM8065 combines many of the features of the NJM4558 as well as providing the capability of wider bandwidth (10MHz typ.), and higher slew rate ($4V/\mu s$ typ.) make the NJM8065 ideal for active filters, data and telecommunications, and many instrumentation applications.

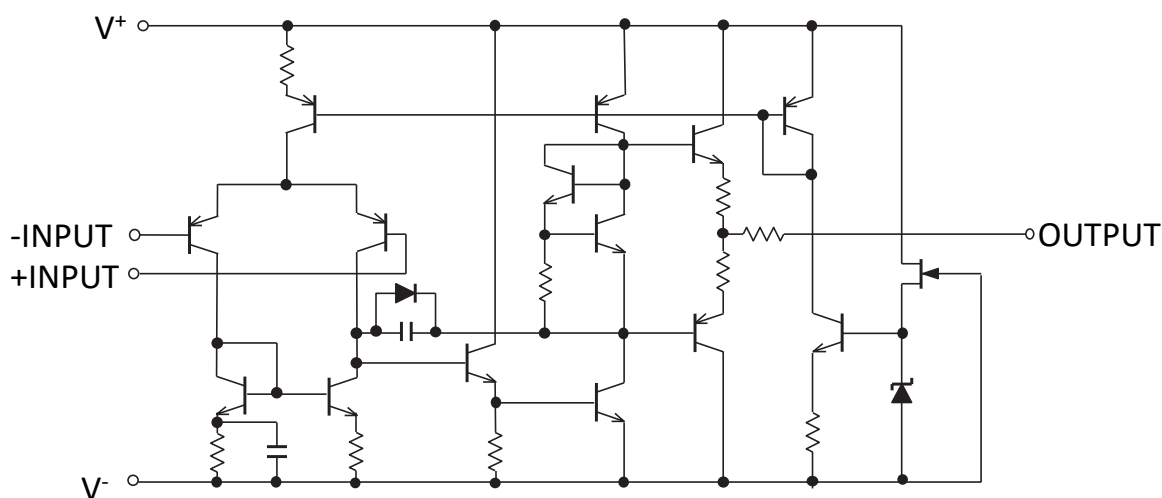
APPLICATIONS

- Audio
- Active Filters
- Servo Control Amplifiers
- Headphone Amplifiers

■ RELATED PRODUCTS

PRODUCT NAME	FEATURES
NJM8068	$3nV/\sqrt{Hz}$, 0.001%, $6.8V/\mu s$, 19M Hz (Low noise, low distortion audio Op-Amp)
NJM8080	$5nV/\sqrt{Hz}$, 0.0005%, $5V/\mu s$, 15M Hz (Low noise, low distortion audio Op-Amp)

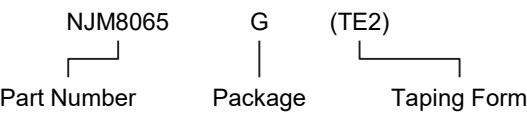
■ EQUIVALENT CIRCUIT



PIN CONFIGURATIONS

PRODUCT NAME	NJM8065G	NJM8065M	NJM8065RB1	NJM8065V
Package	SOP8	DMP8	MSOP8 (TVSP8)	SSOP8
Pin Functions	(Top View)			

PRODUCT NAME INFORMATION



ORDERING INFORMATION

PRODUCT NAME	PACKAGE	RoHS	HALOGEN-FREE	TERMINAL FINISH	MARKING	WEIGHT (mg)	Quantity (pcs/reel)
NJM8065G	SOP8	Yes	Yes	Pure Sn	8065	88	2500
NJM8065M	DMP8	Yes	Yes	Sn2Bi	8065	95	2000
NJM8065RB1	MSOP8 (TVSP8)	Yes	Yes	Sn2Bi	8065	18	2000
NJM8065V	SSOP8	Yes	Yes	Sn2Bi	8065	42	2000

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V ⁺ /V ⁻	±18	V
Differential Input Voltage ⁽¹⁾	V _{ID}	±36	V
Input Voltage ⁽²⁾	V _{IN}	V-0.3 to V ⁺ +36	V
Output Terminal Input Voltage	V _O	V-0.3 to V ⁺ +0.3	V
Power Dissipation ⁽³⁾ SOP8 DMP8 MSOP8 (TVSP8) SSOP8	P _D	2-Layer / 4-Layer ⁽⁴⁾ 690 / 1000 470 / 600 510 / 680 430 / 540	mW
Maximum Junction Temperature	T _j	150	°C
Storage Temperature Range	T _{stg}	-65 to 150	°C

■ THERMAL CHARACTERISTICS

PACKAGE	SYMBOL	VALUE	UNIT
Junction-to-Ambient Thermal Resistance		2-Layer / 4-Layer ⁽⁴⁾	
SOP8	Θ_{ja}	181 / 125	°C/W
DMP8		266 / 208	
MSOP8 (TVSP8)		245 / 184	
SSOP8		291 / 231	
Junction-to-Top of Package Characterization Parameter		2-Layer / 4-Layer ⁽⁴⁾	
SOP8	Ψ_{jt}	49 / 43	°C/W
DMP8		72 / 65	
MSOP8 (TVSP8)		51 / 45	
SSOP8		46 / 45	

(1) Differential voltage is the voltage difference between +INPUT and -INPUT.

(2) Input voltage is the voltage should be allowed to apply to the input terminal independent of the magnitude of V^+ .

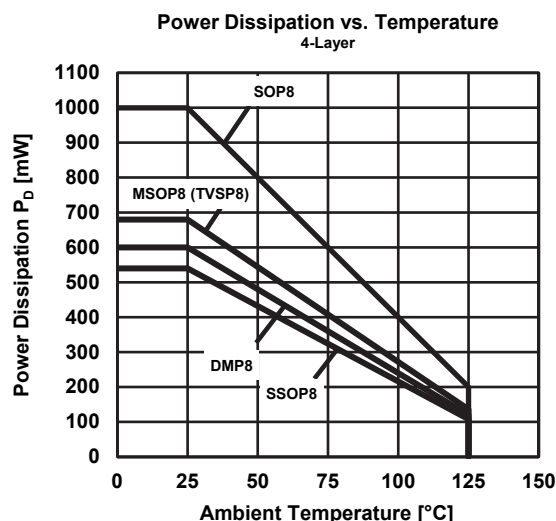
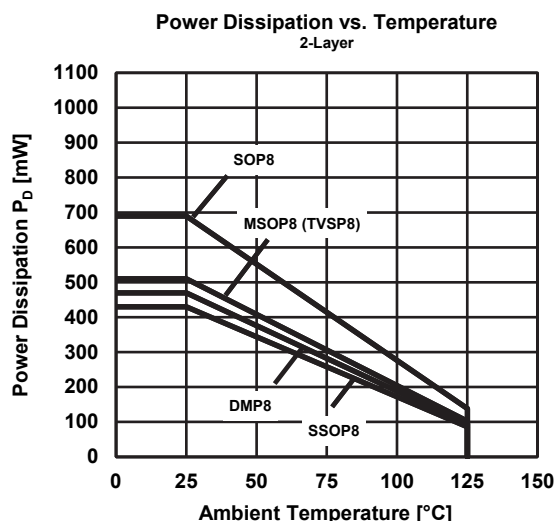
The normal operation will establish when any input is within the "Common-Mode Input Voltage Range" of electrical characteristics.

(3) Power dissipation is the power that can be consumed by the IC at $T_a=25^\circ\text{C}$, and is the typical measured value based on JEDEC condition.

(4) 2-Layer: Mounted on glass epoxy board. (76.2×114.3×1.6 mm: based on EIA/JDEC standard, 2-layer FR-4)

4-Layer: Mounted on glass epoxy board. (76.2×114.3×1.6 mm: based on EIA/JDEC standard, 4-layer FR-4), internal Cu area: 74.2×74.2 mm

■ POWER DISSIPATION vs. AMBIENT TEMPERATURE



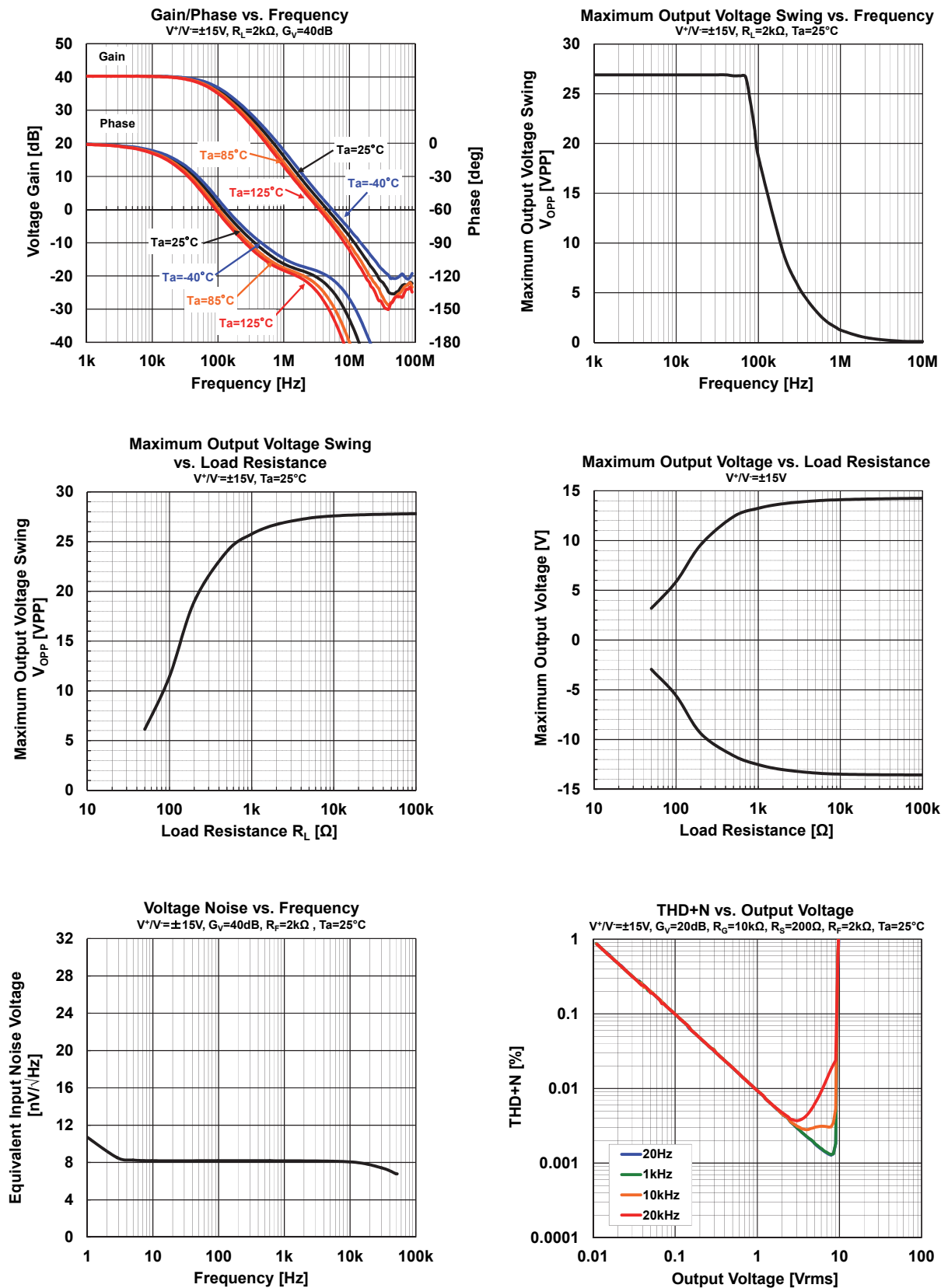
■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	CONDITIONS	VALUE	UNIT
Supply Voltage	V^+/V^-	$T_a=25^\circ\text{C}$	± 4 to ± 18	V
Operating Temperature Range	T_{opr}		-40 to 125	°C

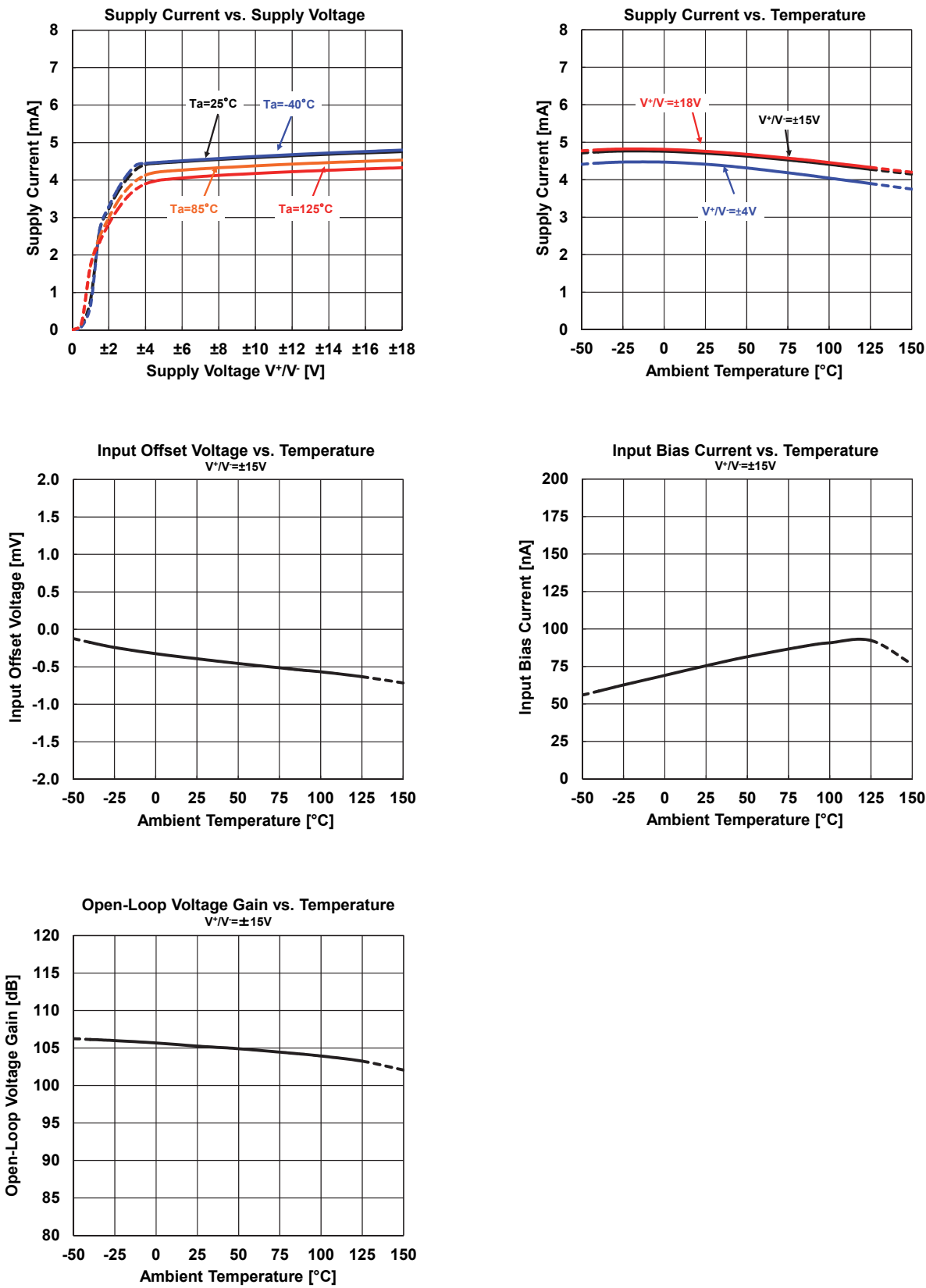
■ ELECTRICAL CHARACTERISTICS ($V^+/V^- = \pm 15$, $T_a = 25^\circ\text{C}$, unless otherwise noted.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
INPUT/OUTPUT CHARACTERISTICS						
Input Offset Voltage	V_{IO}	$R_S \leq 10\text{k}\Omega$	-	0.5	3	mV
Input Offset Current	I_{IO}		-	2	50	nA
Input Bias Current	I_B		-	50	200	nA
Input Resistance	R_{IN}		-	1	-	M Ω
Open-Loop Voltage Gain	A_V	$R_L \geq 2\text{k}\Omega$, $V_O = \pm 10\text{V}$	86	100	-	dB
Maximum Output Voltage1	V_{OM1}	$R_L \geq 2\text{k}\Omega$	± 12	± 14	-	V
Maximum Output Voltage2	V_{OM2}	$I_O = 25\text{mA}$	± 10	± 11.5	-	V
Common-Mode Input Voltage Range	V_{ICM}		± 12	± 14	-	V
Common-Mode Rejection Ratio	CMR	$R_S \leq 10\text{k}\Omega$	70	95	-	dB
POWER SUPPLY						
Supply Current	I_{SUPPLY}		-	4.5	7	mA
Supply Voltage Rejection Ratio	SVR	$R_S \leq 10\text{k}\Omega$	76.5	100	-	dB
AC PERFORMANCE						
Slew Rate	SR		-	4	-	V/ μs
Gain Bandwidth Product	GBW	$f = 10\text{kHz}$	-	10	-	MHz
Equivalent Input Noise Voltage	e_n	$f = 1\text{kHz}$	-	8	-	nV/ $\sqrt{\text{Hz}}$

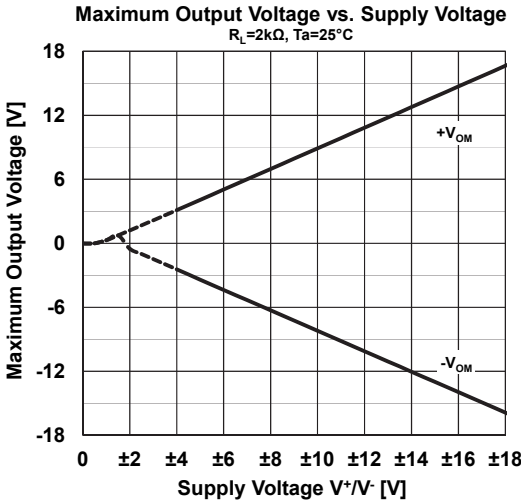
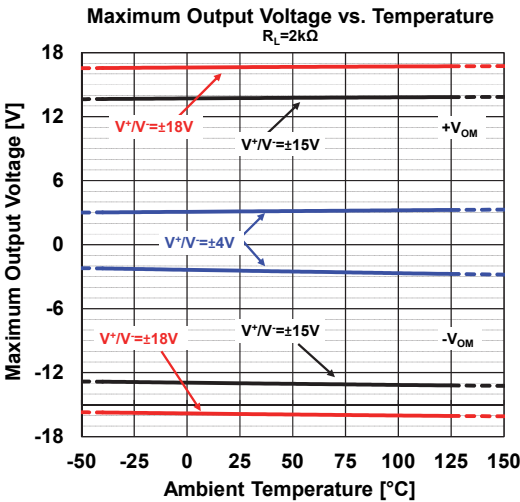
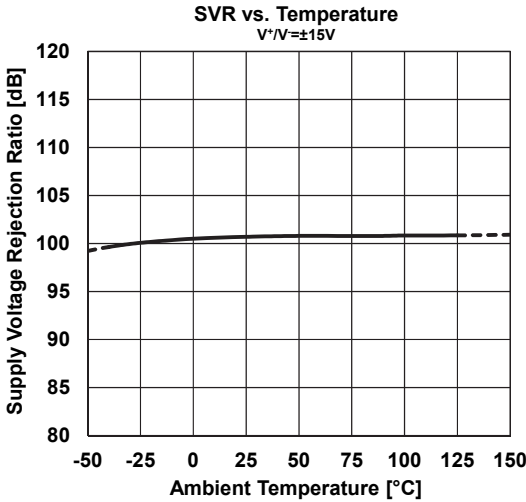
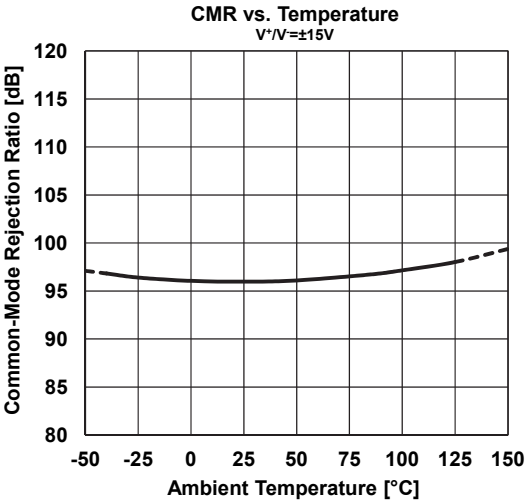
■ TYPICAL CHARACTERISTICS



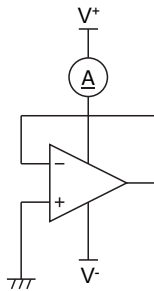
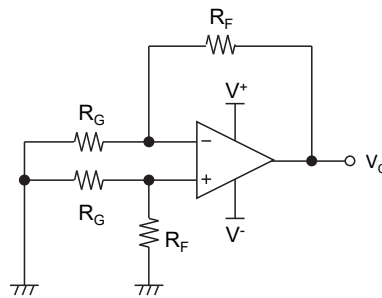
■ TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS



■ TEST CIRCUITS

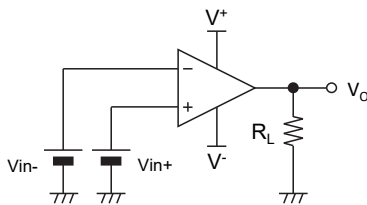
● I_{SUPPLY}● V_{IO}, CMR, SVRR_G=50Ω, R_F=50kΩ

$$V_{IO} = \frac{R_G}{(R_G + R_F)} \times V_O$$

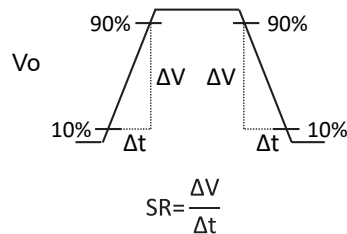
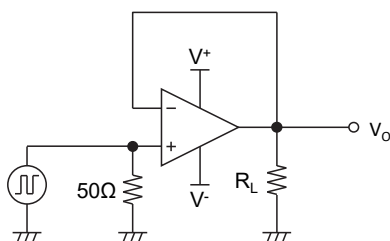
$$CMR = 20 \log \frac{\Delta V_{COM} \left(1 + \frac{R_F}{R_G} \right)}{\Delta V_O}$$

$$SVR = 20 \log \frac{\Delta V_S \left(1 + \frac{R_F}{R_G} \right)}{\Delta V_O}$$

$$V_S = V^+ - V^-$$

● V_{OM}+V_{OM}: V_{in+} = 1V, V_{in-} = -1V-V_{OM}: V_{in+} = -1V, V_{in-} = 1V

● SR

R_L=2kΩ

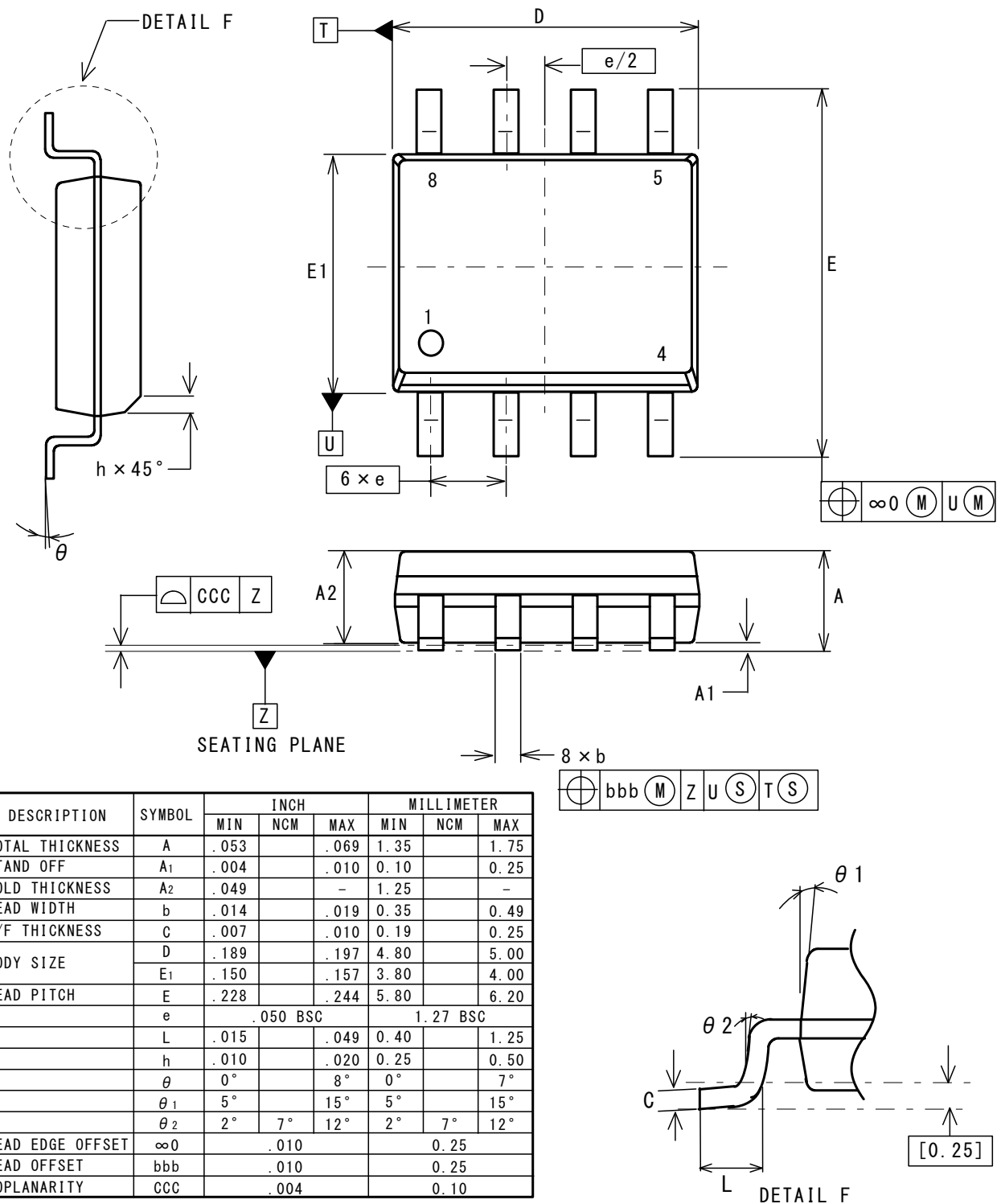
Nisshinbo Micro Devices Inc.

SOP8 JEDEC 150mil

PI-SOP8 JEDEC 150mil-E-B

■ PACKAGE DIMENSIONS

UNIT: mm



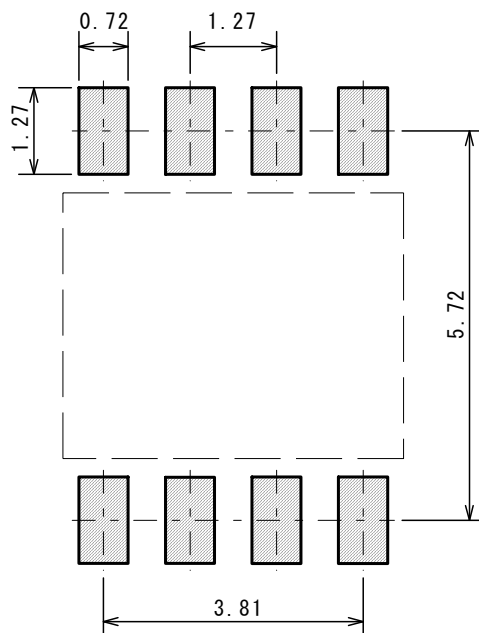
Nisshinbo Micro Devices Inc.

SOP8 JEDEC 150mil

PI-SOP8 JEDEC 150mil-E-B

■ EXAMPLE OF SOLDER PADS DIMENSIONS

UNIT: mm



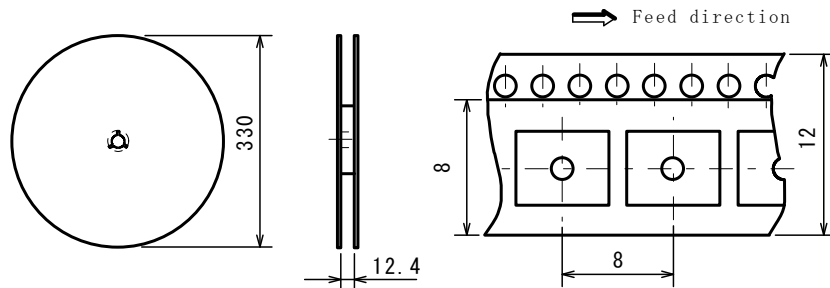
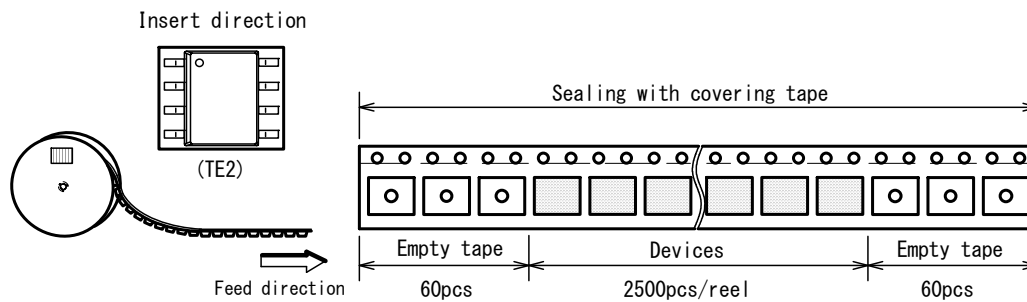
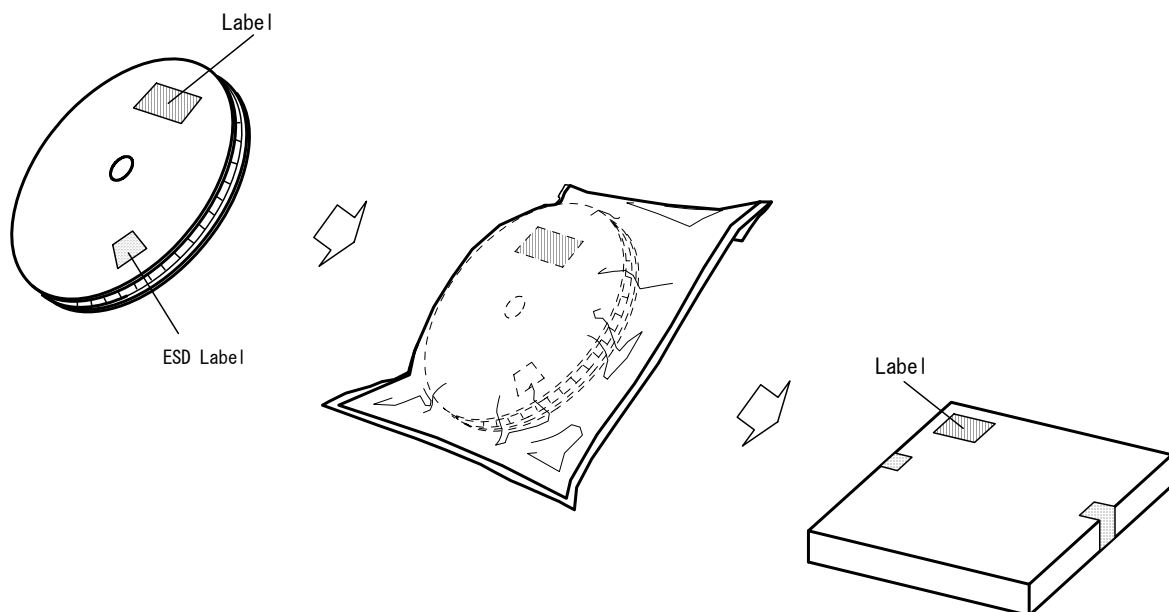
Nisshinbo Micro Devices Inc.

SOP8 JEDEC 150mil

PI-SOP8 JEDEC 150mil-E-B

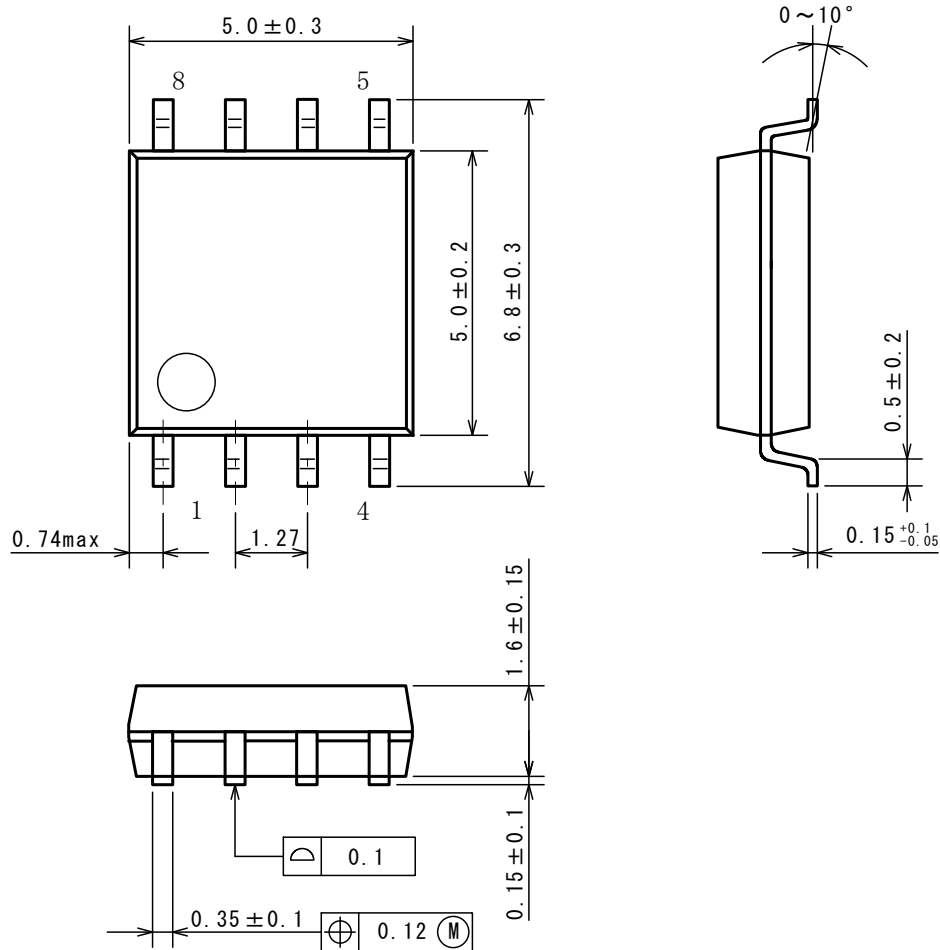
■ **PACKING SPEC**

UNIT: mm

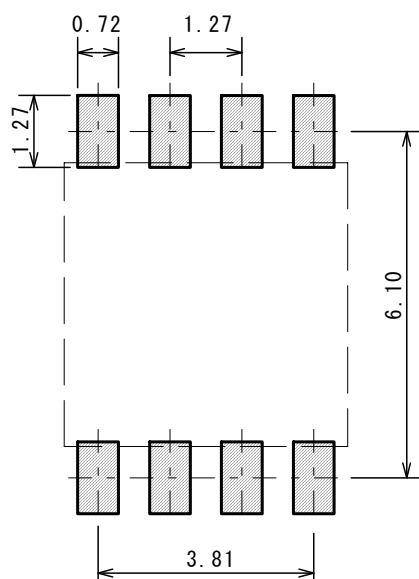
REEL DIMENSIONS / TAPING DIMENSIONS**TAPING STATE****PACKING STATE**

■ PACKAGE DIMENSIONS

UNIT: mm



■ EXAMPLE OF SOLDER PADS DIMENSIONS



Nisshinbo Micro Devices Inc.

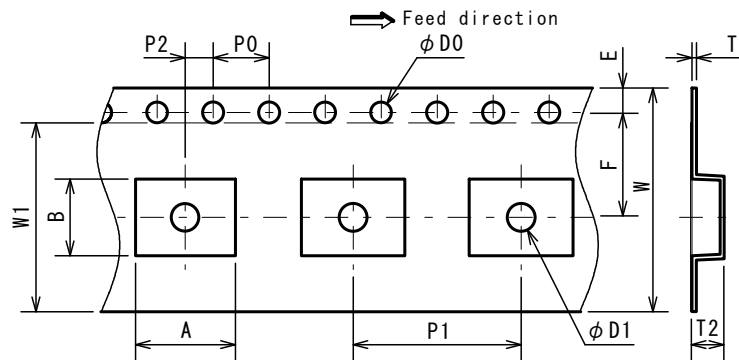
DMP8

PI-DMP8-E-D

PACKING SPEC

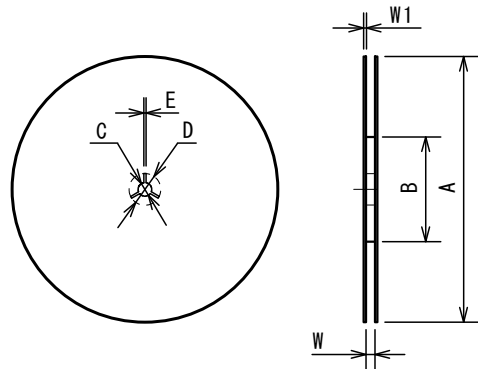
UNIT: mm

TAPING DIMENSIONS



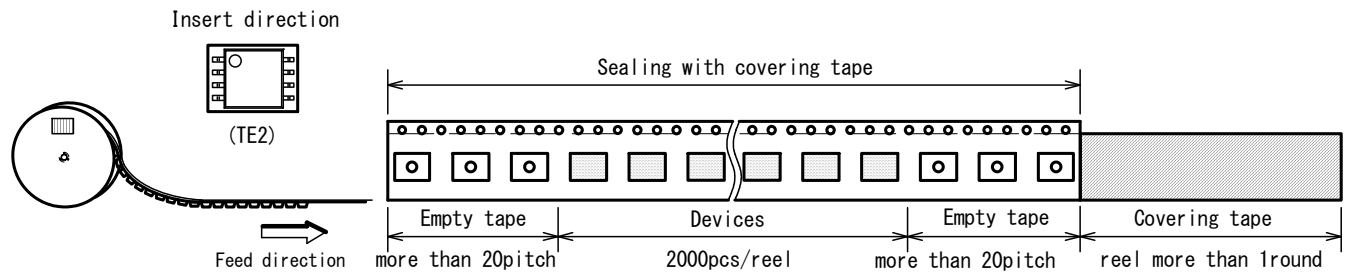
SYMBOL	DIMENSION	REMARKS
A	7.1	BOTTOM DIMENSION
B	5.4	BOTTOM DIMENSION
D0	1.55±0.05	
D1	2.05±0.1	
E	1.75±0.1	
F	7.5±0.1	
P0	4.0±0.1	
P1	12.0±0.1	
P2	2.0±0.1	
T	0.3±0.05	
T2	2.3	
W	16.0±0.3	
W1	13.5	THICKNESS 0.1max

REEL DIMENSIONS

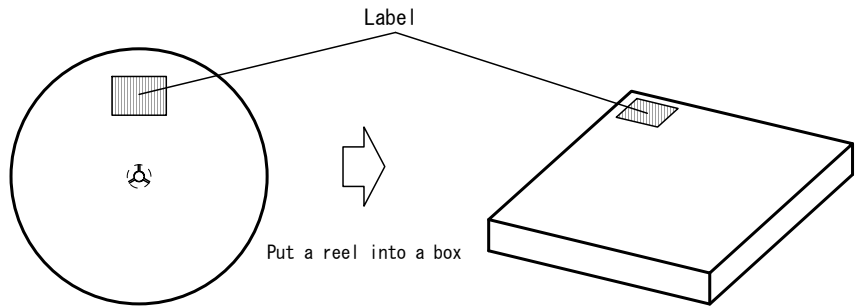


SYMBOL	DIMENSION
A	φ 330±2
B	φ 80±1
C	φ 13±0.2
D	φ 21±0.8
E	2±0.5
W	17.5±0.5
W1	2±0.2

TAPING STATE



PACKING STATE



Nisshinbo Micro Devices Inc.

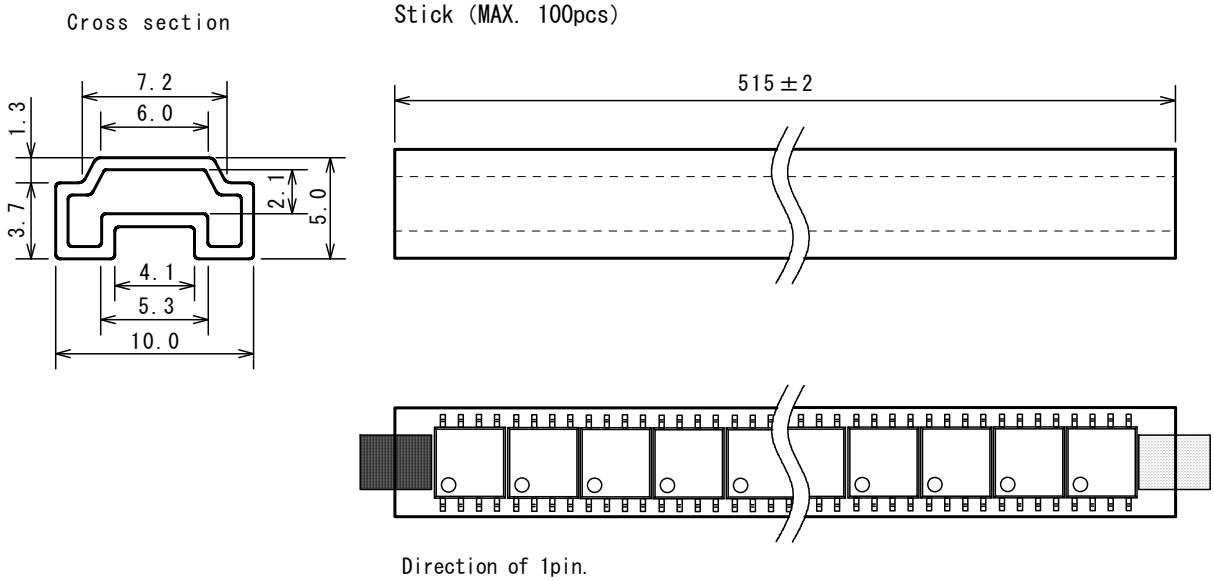
DMP8

PI-DMP8-E-D

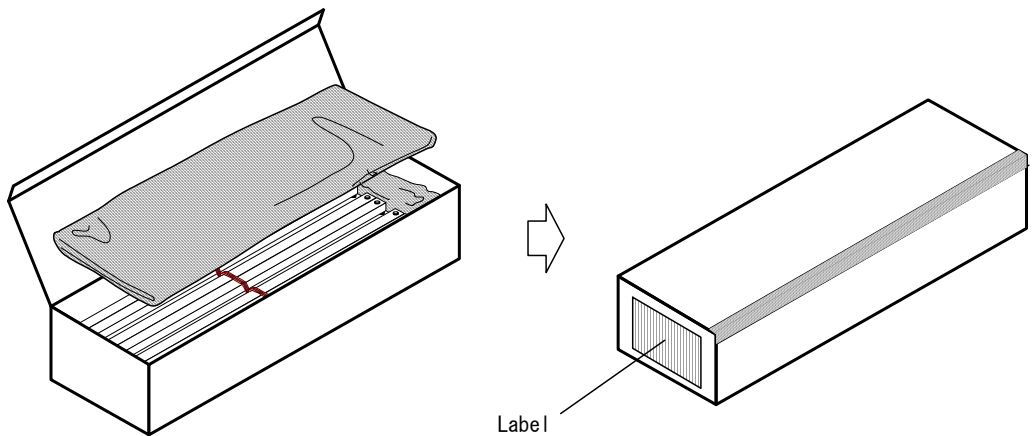
■ PACKING SPEC

UNIT: mm

STICK DIMENSIONS



PACKING STATE



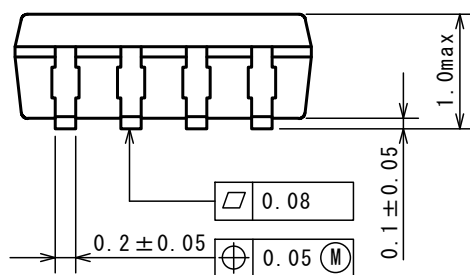
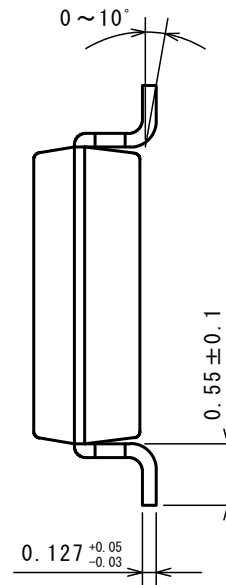
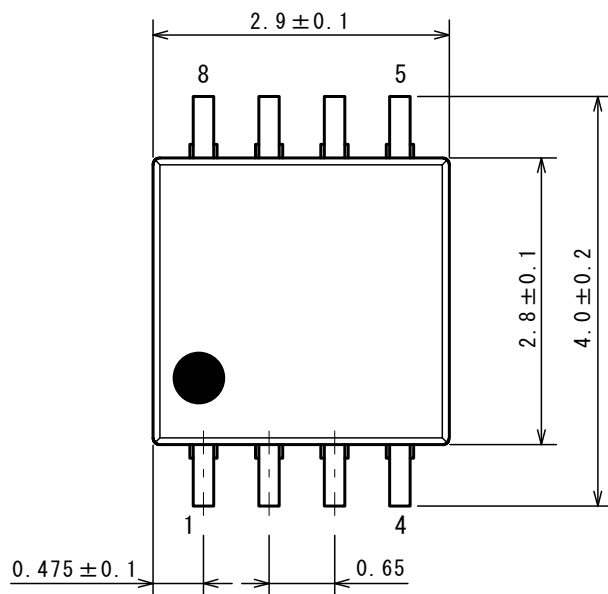
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MSOP8 MEET JEDEC MO-187-DA / THIN TYPE (TVSP8)

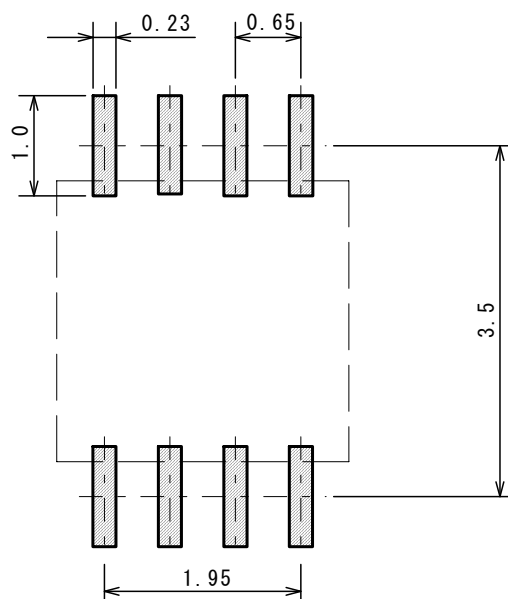
PI-MSOP8 / THIN TYPE-E-C

■ PACKAGE DIMENSIONS

UNIT: mm



■ EXAMPLE OF SOLDER PADS DIMENSIONS



Nisshinbo Micro Devices Inc.

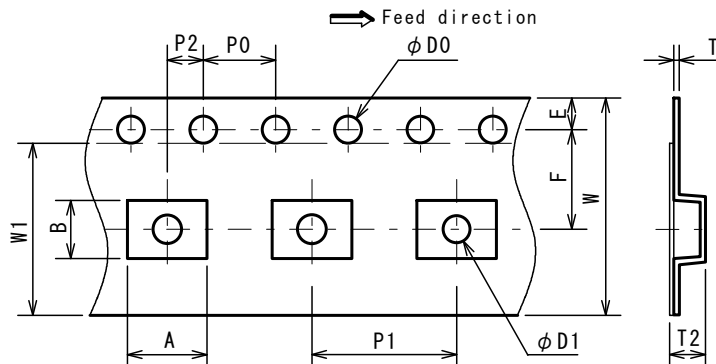
MSOP8 MEET JEDEC MO-187-DA / THIN TYPE (TVSP8)

PI-MSOP8 / THIN TYPE-E-C

■ PACKING SPEC

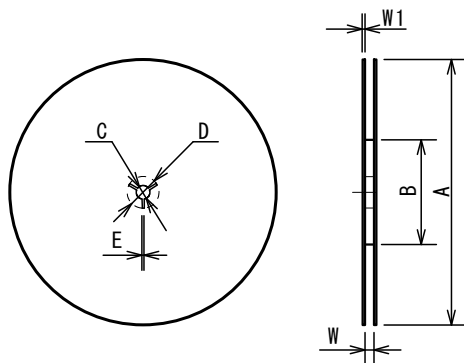
UNIT: mm

TAPING DIMENSIONS



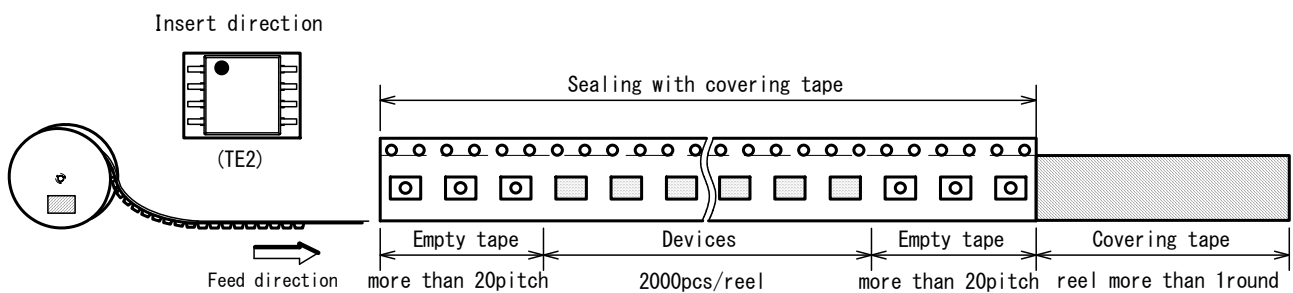
SYMBOL	DIMENSION	REMARKS
A	4.4	BOTTOM DIMENSION
B	3.2	BOTTOM DIMENSION
D0	1.5 ^{+0.1} ₀	
D1	1.5 ^{+0.1} ₀	
E	1.75±0.1	
F	5.5±0.05	
P0	4.0±0.1	
P1	8.0±0.1	
P2	2.0±0.05	
T	0.30±0.05	
T2	1.75 (MAX.)	
W	12.0±0.3	
W1	9.5	THICKNESS 0.1max

REEL DIMENSIONS

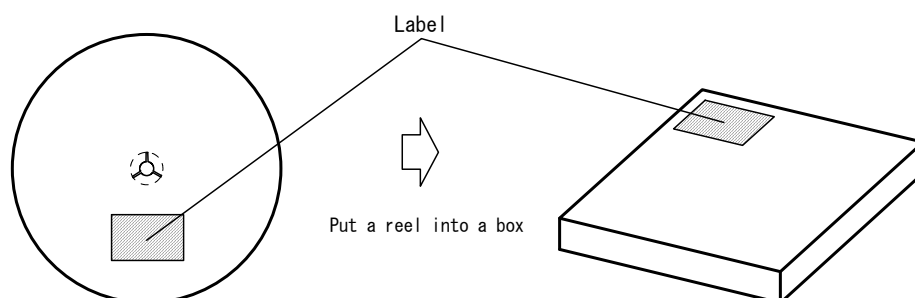


SYMBOL	DIMENSION
A	φ254±2
B	φ100±1
C	φ13±0.2
D	φ21±0.8
E	2±0.5
W	13.5±0.5
W1	2.0±0.2

TAPING STATE



PACKING STATE



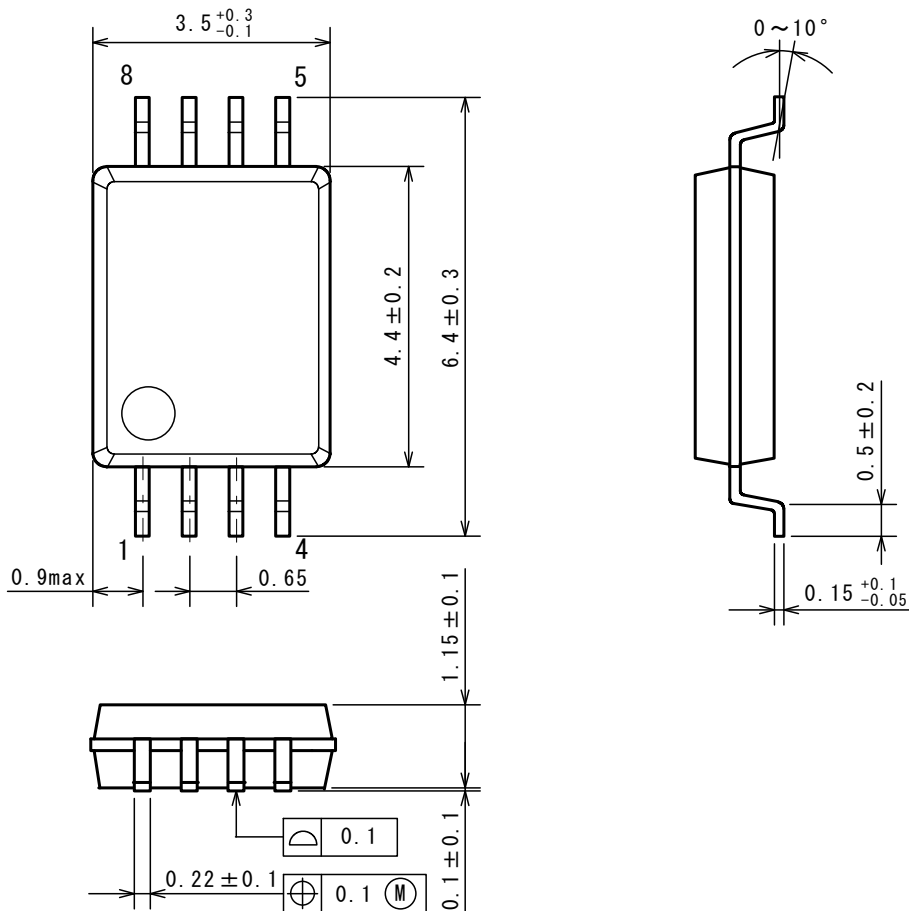
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SSOP8

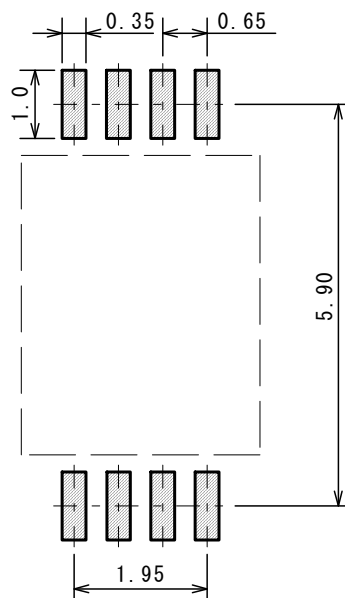
PI-SSOP8-E-C

■ PACKAGE DIMENSIONS

UNIT: mm



■ EXAMPLE OF SOLDER PADS DIMENSIONS



Nisshinbo Micro Devices Inc.

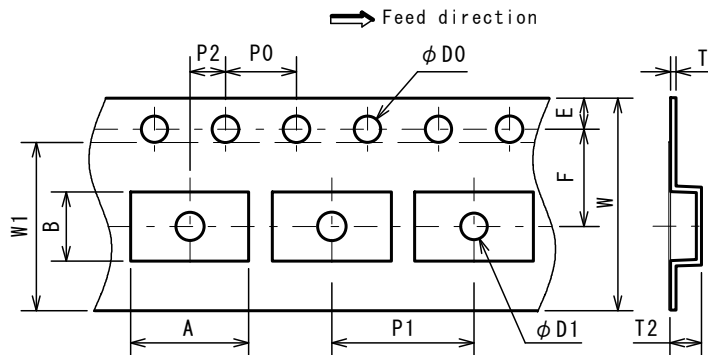
SSOP8

PI-SSOP8-E-C

■ PACKING SPEC

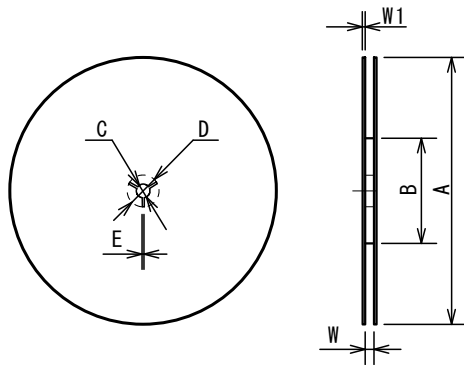
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TAPING DIMENSIONS



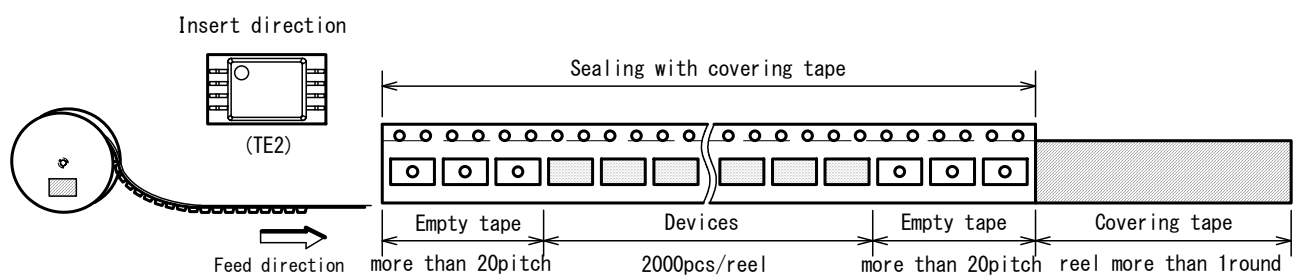
SYMBOL	DIMENSION	REMARKS
A	6.7	BOTTOM DIMENSION
B	3.9	BOTTOM DIMENSION
D0	1.55 ± 0.05	
D1	1.55 ± 0.1	
E	1.75 ± 0.1	
F	5.5 ± 0.05	
P0	4.0 ± 0.1	
P1	8.0 ± 0.1	
P2	2.0 ± 0.05	
T	0.3 ± 0.05	
T2	2.2	
W	12.0 ± 0.3	
W1	9.5	THICKNESS 0.1max

REEL DIMENSIONS

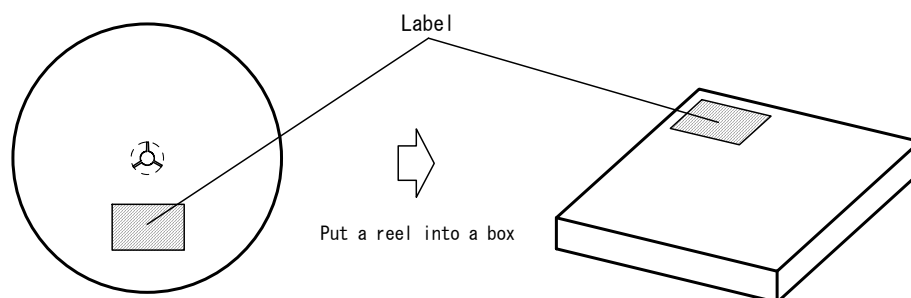


SYMBOL	DIMENSION
A	$\phi 254 \pm 2$
B	$\phi 100 \pm 1$
C	$\phi 13 \pm 0.2$
D	$\phi 21 \pm 0.8$
E	2 ± 0.5
W	13.5 ± 0.5
W1	2 ± 0.2

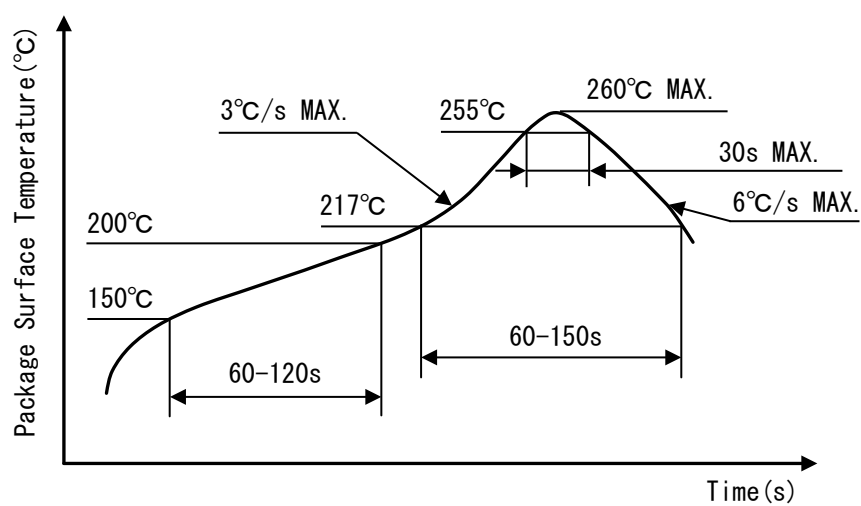
TAPING STATE



PACKING STATE



■ HEAT-RESISTANCE PROFILES



Reflow profile

1. The products and the product specifications described in this document are subject to change or discontinuation of production without notice for reasons such as improvement. Therefore, before deciding to use the products, please refer to our sales representatives for the latest information thereon.
2. The materials in this document may not be copied or otherwise reproduced in whole or in part without the prior written consent of us.
3. This product and any technical information relating thereto are subject to complementary export controls (so-called KNOW controls) under the Foreign Exchange and Foreign Trade Law, and related politics ministerial ordinance of the law. (Note that the complementary export controls are inapplicable to any application-specific products, except rockets and pilotless aircraft, that are insusceptible to design or program changes.) Accordingly, when exporting or carrying abroad this product, follow the Foreign Exchange and Foreign Trade Control Law and its related regulations with respect to the complementary export controls.
4. The technical information described in this document shows typical characteristics and example application circuits for the products. The release of such information is not to be construed as a warranty of or a grant of license under our or any third party's intellectual property rights or any other rights.
5. The products listed in this document are intended and designed for use as general electronic components in standard applications (office equipment, telecommunication equipment, measuring instruments, consumer electronic products, amusement equipment etc.). Those customers intending to use a product in an application requiring extreme quality and reliability, for example, in a highly specific application where the failure or misoperation of the product could result in human injury or death should first contact us.
 - Aerospace Equipment
 - Equipment Used in the Deep Sea
 - Power Generator Control Equipment (nuclear, steam, hydraulic, etc.)
 - Life Maintenance Medical Equipment
 - Fire Alarms / Intruder Detectors
 - Vehicle Control Equipment (automotive, airplane, railroad, ship, etc.)
 - Various Safety Devices
 - Traffic control system
 - Combustion equipment

In case your company desires to use this product for any applications other than general electronic equipment mentioned above, make sure to contact our company in advance. Note that the important requirements mentioned in this section are not applicable to cases where operation requirements such as application conditions are confirmed by our company in writing after consultation with your company.

6. We are making our continuous effort to improve the quality and reliability of our products, but semiconductor products are likely to fail with certain probability. In order to prevent any injury to persons or damages to property resulting from such failure, customers should be careful enough to incorporate safety measures in their design, such as redundancy feature, fire containment feature and fail-safe feature. We do not assume any liability or responsibility for any loss or damage arising from misuse or inappropriate use of the products.
7. The products have been designed and tested to function within controlled environmental conditions. Do not use products under conditions that deviate from methods or applications specified in this datasheet. Failure to employ the products in the proper applications can lead to deterioration, destruction or failure of the products. We shall not be responsible for any bodily injury, fires or accident, property damage or any consequential damages resulting from misuse or misapplication of the products.
8. **Quality Warranty**
 - 8-1. **Quality Warranty Period**

In the case of a product purchased through an authorized distributor or directly from us, the warranty period for this product shall be one (1) year after delivery to your company. For defective products that occurred during this period, we will take the quality warranty measures described in section 8-2. However, if there is an agreement on the warranty period in the basic transaction agreement, quality assurance agreement, delivery specifications, etc., it shall be followed.
 - 8-2. **Quality Warranty Remedies**

When it has been proved defective due to manufacturing factors as a result of defect analysis by us, we will either deliver a substitute for the defective product or refund the purchase price of the defective product.

Note that such delivery or refund is sole and exclusive remedies to your company for the defective product.
 - 8-3. **Remedies after Quality Warranty Period**

With respect to any defect of this product found after the quality warranty period, the defect will be analyzed by us. On the basis of the defect analysis results, the scope and amounts of damage shall be determined by mutual agreement of both parties. Then we will deal with upper limit in Section 8-2. This provision is not intended to limit any legal rights of your company.
9. Anti-radiation design is not implemented in the products described in this document.
10. The X-ray exposure can influence functions and characteristics of the products. Confirm the product functions and characteristics in the evaluation stage.
11. WLCSP products should be used in light shielded environments. The light exposure can influence functions and characteristics of the products under operation or storage.
12. Warning for handling Gallium and Arsenic (GaAs) products (Applying to GaAs MMIC, Photo Reflector). These products use Gallium (Ga) and Arsenic (As) which are specified as poisonous chemicals by law. For the prevention of a hazard, do not burn, destroy, or process chemically to make them as gas or power. When the product is disposed of, please follow the related regulation and do not mix this with general industrial waste or household waste.
13. Please contact our sales representatives should you have any questions or comments concerning the products or the technical information.



Nisshinbo Micro Devices Inc.

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