PRECISION, SINGLE SUPPLY, RAIL-TO-RAIL OUTPUT DUAL OPERATIONAL AMPLIFIER

FEATURES

- ●Supply Voltage 4V to 35V (±2V to ±17.5V)
- ●Input Offset Voltage 450μV max.
- ●Input Offset Voltage Drift 2μV/°C typ.
- ●Rail-to-Rail Output
- ●Ground Sensing
- ●Input Voltage Protection $V_{IN}=V^+ +20V$ (@$V^+ \leq 16V$)
- ●Integrated EMI Filter
- ●Operating Temperature Range -40 to 125°C
- ●Slew Rate 0.15V/μs
- ●Gain Bandwidth Product 300kHz
- ●Supply Current (All Amplifiers) 2mA max.
- ●Package DMP8

APPLICATIONS

- ●Load Cell and Bridge Transducer Amplifiers
- ●Current Sensor Amplifiers
- ●High Resolution Data Acquisition
- ●Power Line Monitoring

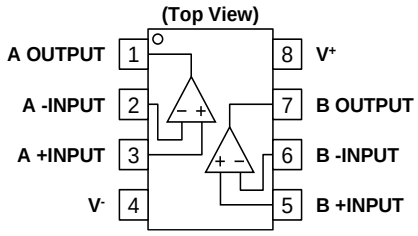
DESCRIPTION

The NJM8207 is a high-precision, rail-to-rail, dual operational amplifier featuring low offset voltage, low temperature drift and low input bias current. It is suitable for high-precision amplification circuit for measurement and sensor amplifier.

The NJM8207 operates from a single supply 4V to 35V, or a wide voltage from ±2V to ±17.5V for dual supply. Rail-to-rail output swing significantly increases voltage range and enhances the Op-Amp general purpose. Since the common-mode input voltage range includes V-, ground sensing is possible when it operates with a single supply.

The NJM8207 has high RF noise immunity and reduces malfunction due to high frequency influences of mobile phones and others. This is available in an 8-pin DMP package.

■ PIN CONFIGURATIONS

PRODUCT NAME	NJM8207M
Package	DMP8
Pin Functions	

■ PRODUCT NAME INFORMATION

NJM8207 M (TE2)

Part Number Package Taping Form ; (TE2) only

■ ORDER INFORMATION

PRODUCT NAME	PACKAGE	RoHS	HALOGEN-FREE	TERMINAL FINISH	MARKING	WEIGHT (mg)	Quantity (pcs/reel)
NJM8207M	DMP8	Yes	–	Sn2Bi	8207	95	2000

■ ABSOLUTE MAXIMUM RATINGS

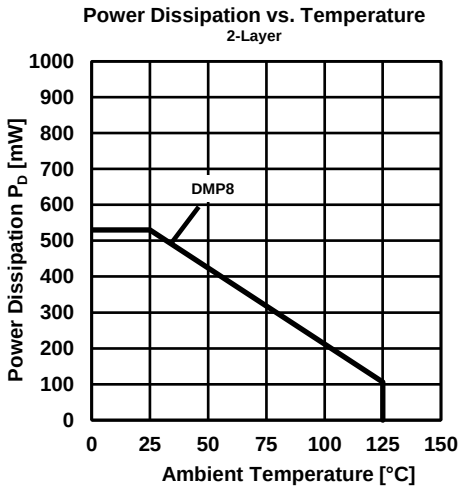
PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	$V^+ - V^-$	36 (±18)	V
Differential Input Voltage(1)	V_{ID}	±36	V
Input Voltage(2)	V_{IN}	V^--0.3 to V^-+36	V
Power Dissipation(3)	P_D	2-Layer / 4-Layer(4)	mW
DMP8		530 / 710	
Storage Temperature Range	T_{stg}	-50 to 150	°C
Maximum Junction Temperature	T_{jmax}	150	°C

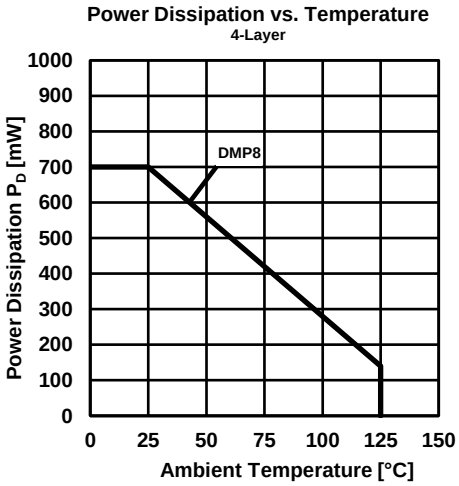
■ THERMAL CHARACTERISTICS

PACKAGE	SYMBOL	VALUE	UNIT
Junction-to-Ambient Thermal Resistance	Θja	2-Layer / 4-Layer(4)	ºC/W
DMP8		235 / 175	
Junction-to-Top of Package Characterization Parameter	Ψjt	2-Layer / 4-Layer(4)	ºC/W
DMP8		47 / 40	

(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 Ta=25°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 x 74.2 mm

■ POWER DISSIPATION vs. AMBIENT TEMPERATURE





■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	CONDITIONS	VALUE	UNIT
Supply Voltage	$V^+ - V^-$	Ta=25°C	4 to 35 (±2 to ±17.5)	V
Operating Temperature Range	T_{opr}		-40 to 125	°C

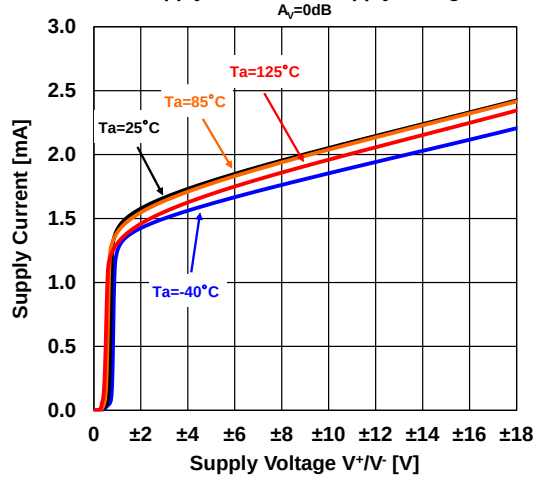
■ ELECTRICAL CHARACTERISTICS (V^+=5V, V^-=0V, Ta=25°C, unless otherwise noted.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
INPUT CHARACTERISTICS						
Input Offset Voltage	V_{IO}	R_S=50Ω, R_F=50kΩ	-	200	450	μV
Input Bias Current	I_B		-	120	500	nA
Input Offset Current	I_{IO}		-	5	20	nA
Input Offset Voltage Drift	$\Delta V_{IO}/\Delta T$	Ta=-40°C to 125°C	-	2	-	μV/°C
Open-Loop Voltage Gain	A_V	R_L=10kΩ to 2.5V, V_O=2.5V±2V	70	90	-	dB
Common-Mode Rejection Ratio	CMR	V_{COM}=0V to 3.5V	80	110	-	dB
Common-Mode Input Voltage Range	V_{ICM}	CMR≥80dB	0	-	3.5	V
OUTPUT CHARACTERISTICS						
Maximum Output Voltage1	V_{OH1}	R_L≥2kΩ to 2.5V	4.85	4.95	-	V
	V_{OL1}	R_L≥2kΩ to 2.5V	-	0.05	0.15	V
Maximum Output Voltage2	V_{OH2}	R_L≥2kΩ to GND	4.85	4.95	-	V
	V_{OL2}	R_L≥2kΩ to GND	-	0.05	0.15	V
Output Current	I_{OUT}	VOH≧4.75V, VOL≦0.25V	2	10	-	mA
POWER SUPPLY						
Supply Current (All Amplifiers)	I_{SUPPLY}	No Signal	-	1.4	2	mA
Supply Voltage Rejection Ratio	SVR	V^+/V^- = ±2V to ±8V	80	110	-	dB
AC CHARACTERISTICS						
Slew Rate	SR	A_V=1, V_{IN}=2V_{PP}, R_L=10kΩ to 2.5V, C_L=10pF, (5)	-	0.15	-	V/μs
Unity Gain Frequency	f_T	G_V=40dB, R_L=10kΩ, C_L=15pF	-	300	-	kHz
Phase Margin	Φ_M	G_V=40dB, R_L=10kΩ, C_L=15pF	-	50	-	deg
Gain Margin	G_M	G_V=40dB, R_L=10kΩ, C_L=15pF	-	12	-	dB
Channel Separation	CS	f=1kHz, G_V=40dB, R_L=10kΩ to 2.5V	-	120	-	dB

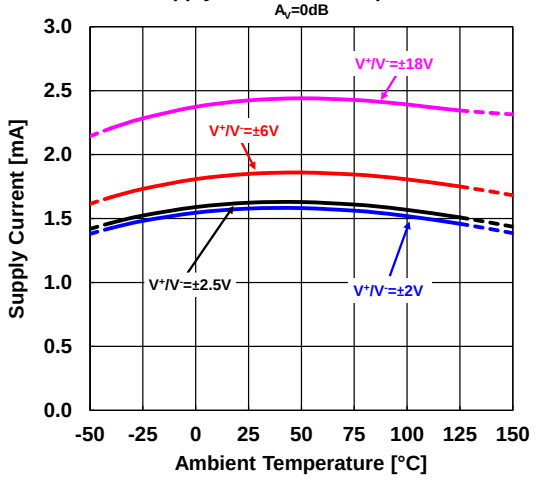
(5) Slew rate is defined by the lower value of the rise or fall.

■ TYPICAL CHARACTERISTICS

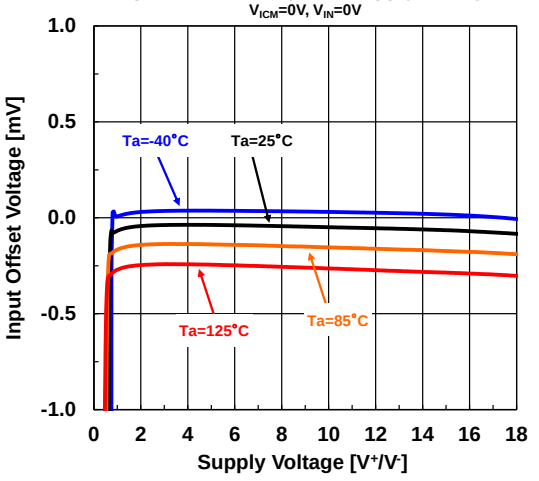
Supply Current vs. Supply Voltage
A_V=0dB



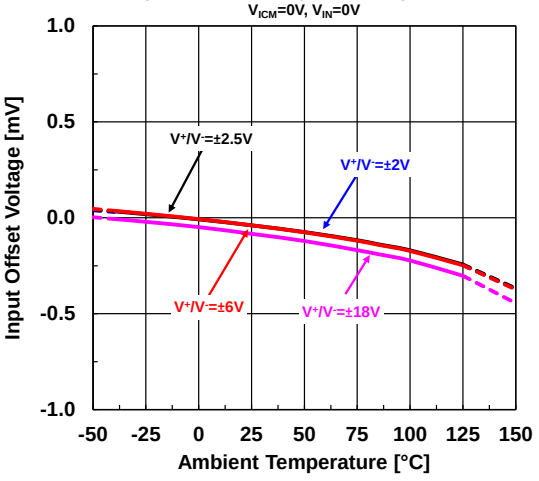
Supply Current vs. Temperature
A_V=0dB



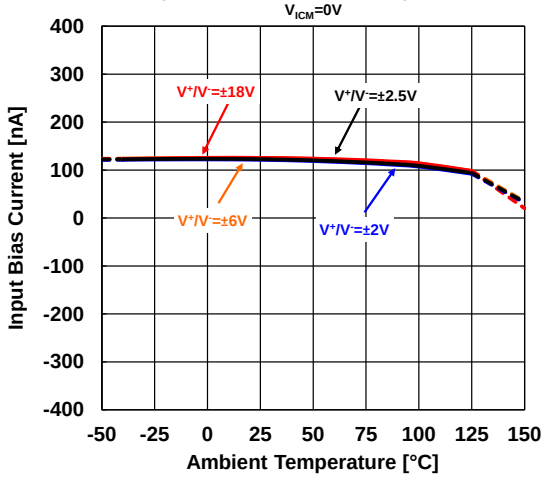
Input Offset Voltage vs. Supply Voltage
V_{ICM}=0V, V_{IN}=0V



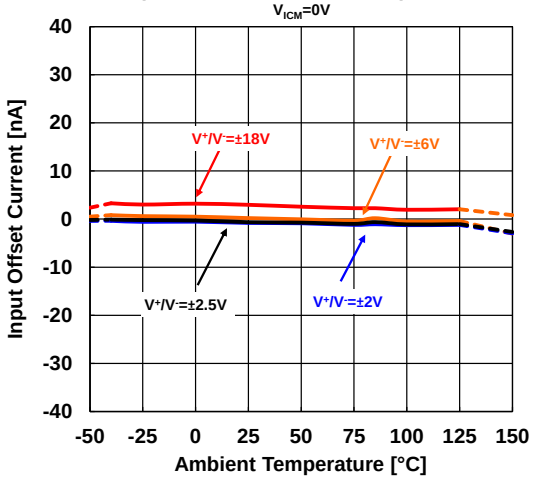
Input Offset Voltage vs. Temperature
V_{ICM}=0V, V_{IN}=0V



Input Bias Current vs. Temperature
V_{ICM}=0V

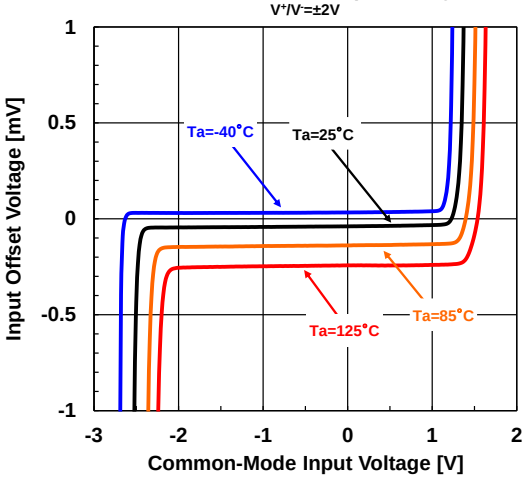


Input Offset Current vs. Temperature
V_{ICM}=0V

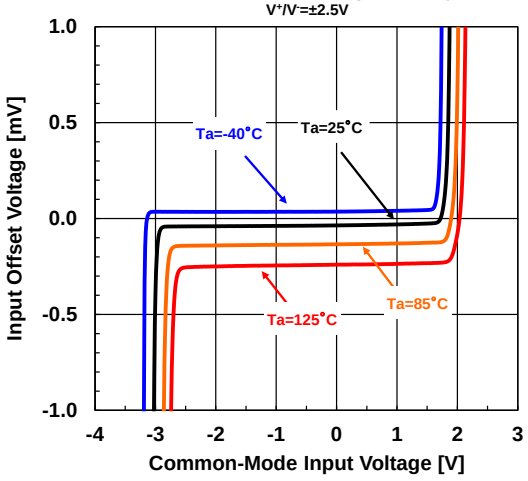


■ TYPICAL CHARACTERISTICS

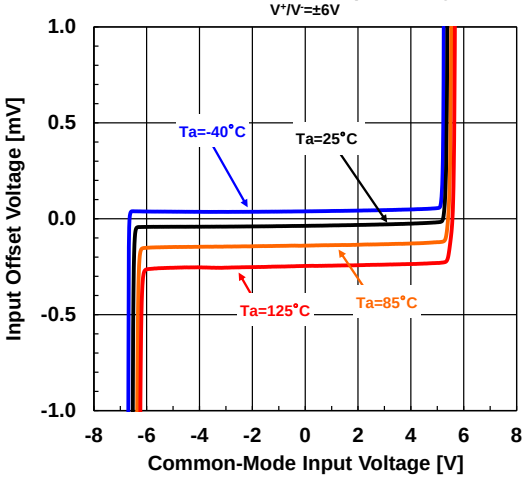
Input Offset Voltage vs. Common-Mode Input Voltage
V⁺/V⁻=±2V



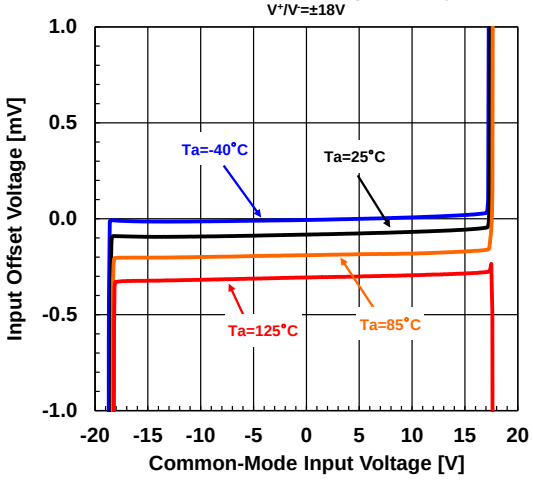
Input Offset Voltage vs. Common-Mode Input Voltage
V⁺/V⁻=±2.5V



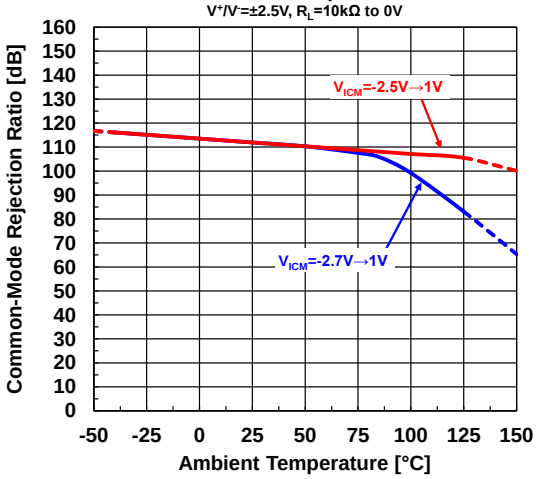
Input Offset Voltage vs. Common-Mode Input Voltage
V⁺/V⁻=±6V



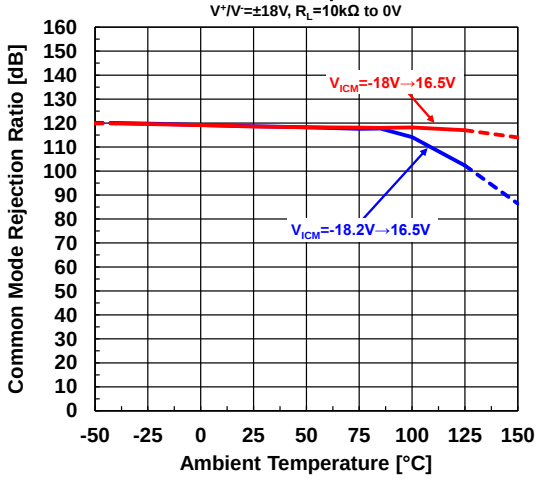
Input Offset Voltage vs. Common-Mode Input Voltage
V⁺/V⁻=±18V



CMR vs. Temperature
V⁺/V⁻=±2.5V, R_L=10kΩ to 0V

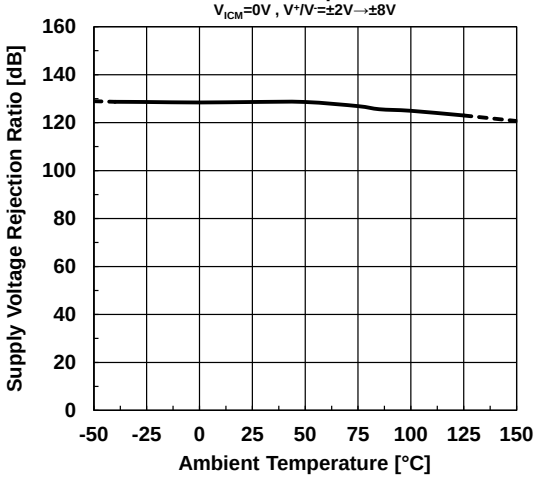


CMR vs. Temperature
V⁺/V⁻=±18V, R_L=10kΩ to 0V

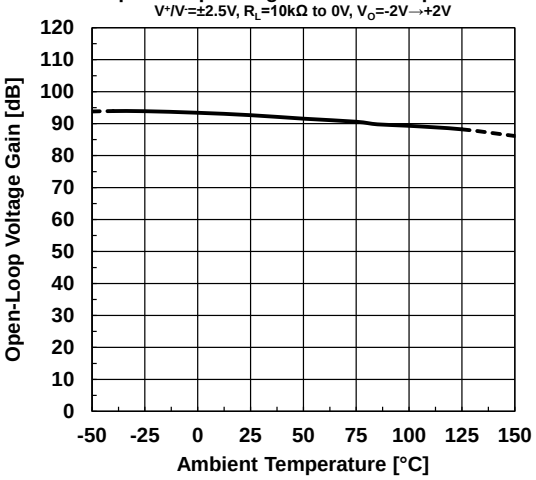


■ TYPICAL CHARACTERISTICS

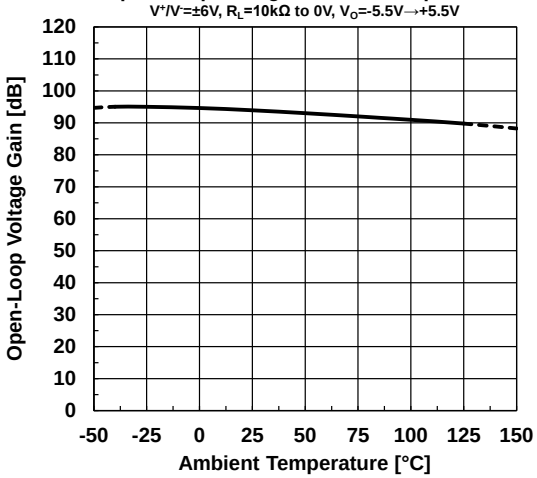
SVR vs. Temperature
V_{ICM}=0V , V^+/V^-=±2V→±8V



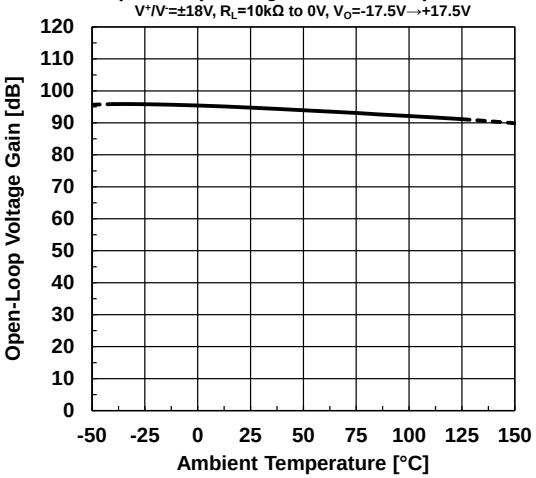
Open-Loop Voltage Gain vs. Temperature
V^+/V^-=±2.5V, R_L=10kΩ to 0V, V_O=-2V→+2V



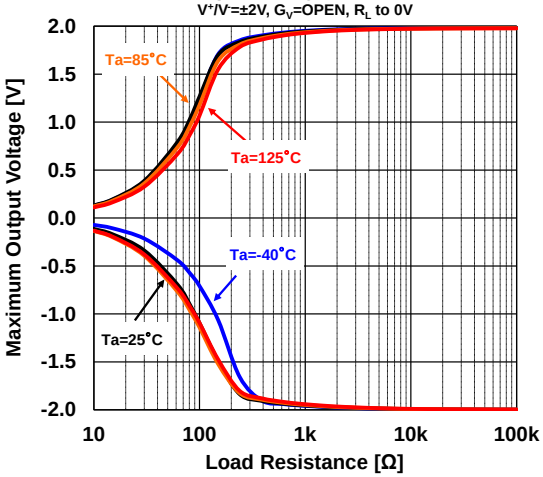
Open-Loop Voltage Gain vs. Temperature
V^+/V^-=±6V, R_L=10kΩ to 0V, V_O=-5.5V→+5.5V



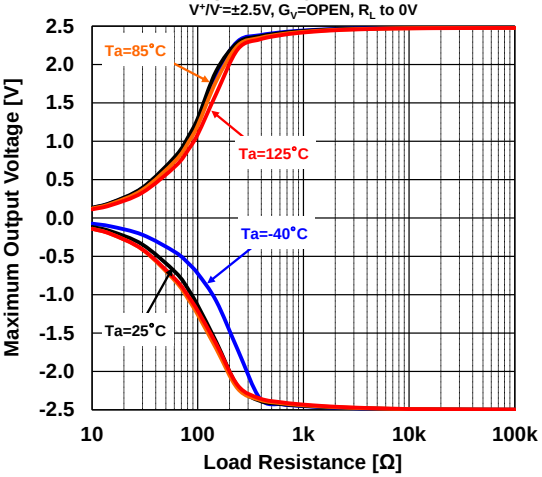
Open-Loop Voltage Gain vs. Temperature
V^+/V^-=±18V, R_L=10kΩ to 0V, V_O=-17.5V→+17.5V



Maximum Output Voltage vs. Load Resistance
V^+/V^-=±2V, G_V=OPEN, R_L to 0V

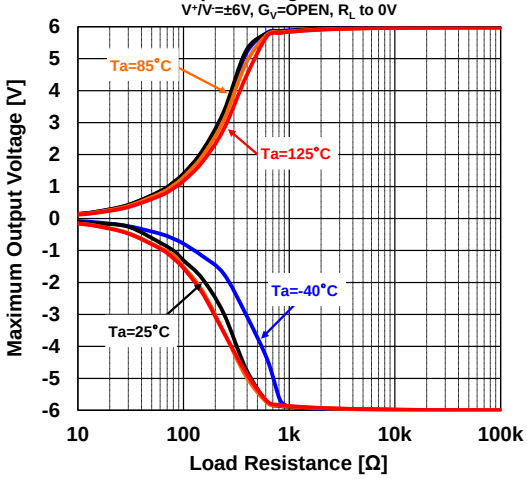


Maximum Output Voltage vs. Load Resistance
V^+/V^-=±2.5V, G_V=OPEN, R_L to 0V

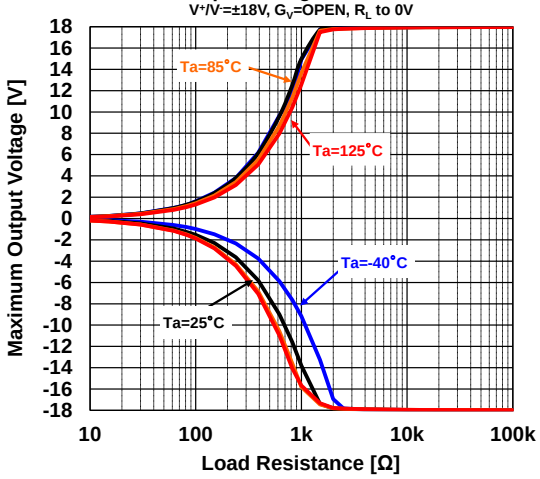


■ TYPICAL CHARACTERISTICS

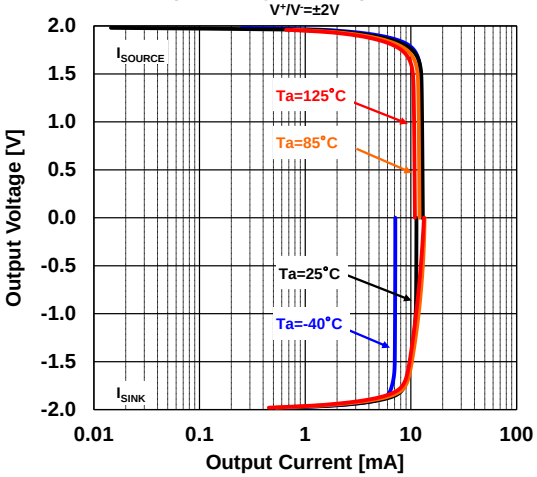
Maximum Output Voltage vs. Load Resistance
V⁺/V⁻=±6V, G_V=OPEN, R_L to 0V



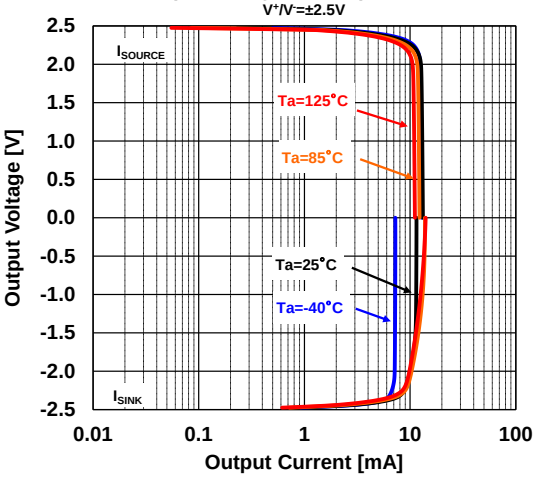
Maximum Output Voltage vs. Load Resistance
V⁺/V⁻=±18V, G_V=OPEN, R_L to 0V



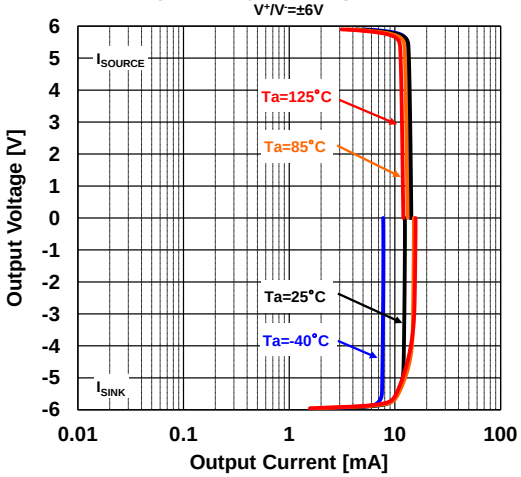
Output Voltage vs. Output Current
V⁺/V⁻=±2V



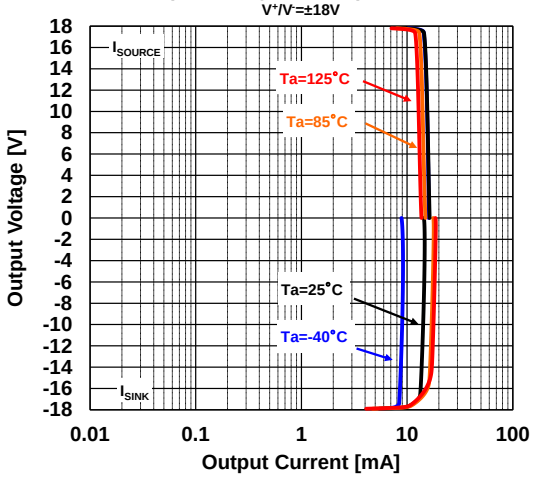
Output Voltage vs. Output Current
V⁺/V⁻=±2.5V



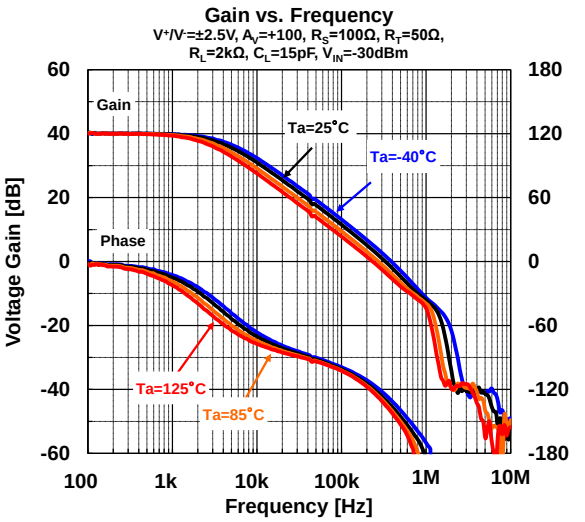
Output Voltage vs. Output Current
V⁺/V⁻=±6V

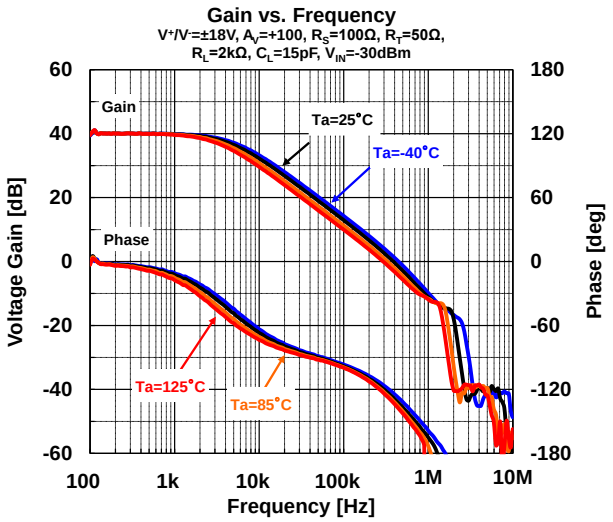


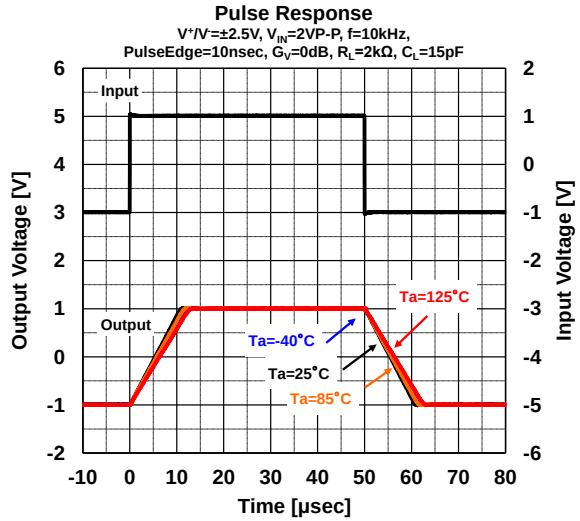
Output Voltage vs. Output Current
V⁺/V⁻=±18V

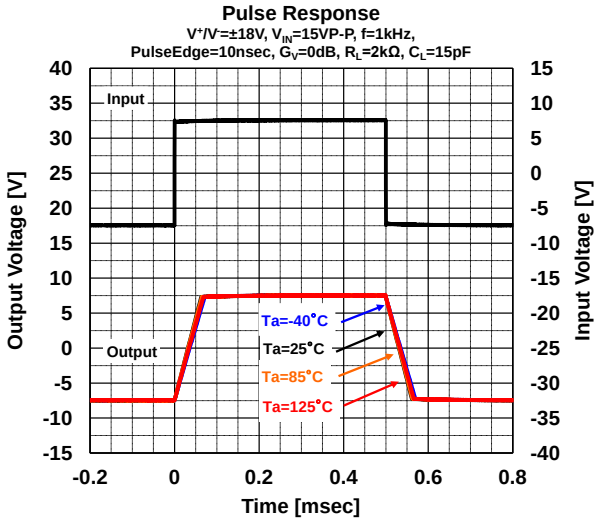


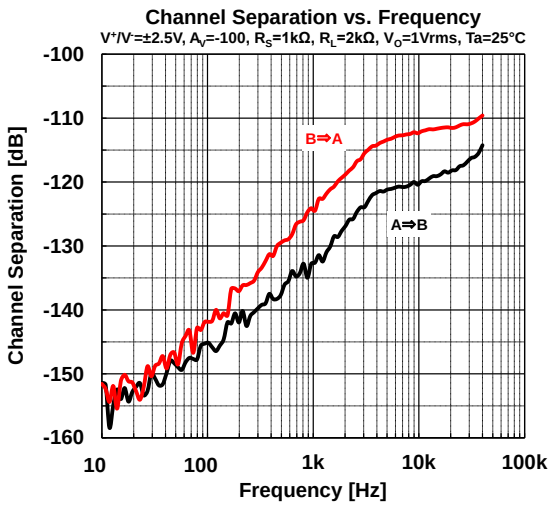
■ TYPICAL CHARACTERISTICS

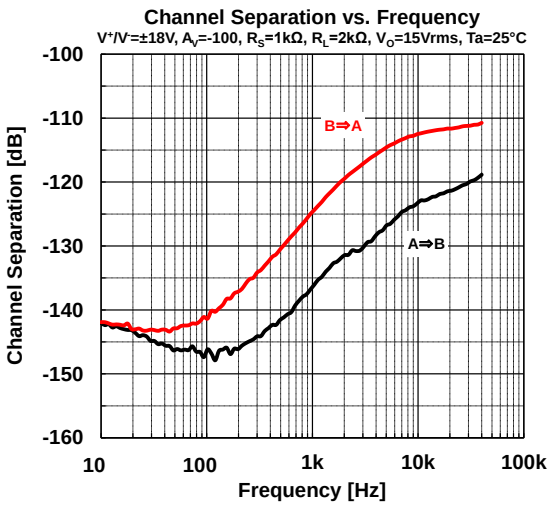




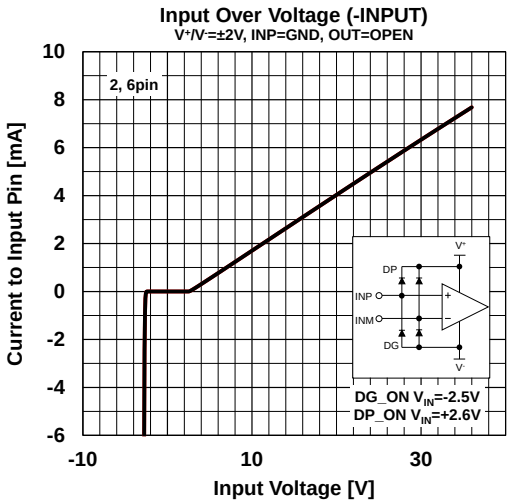


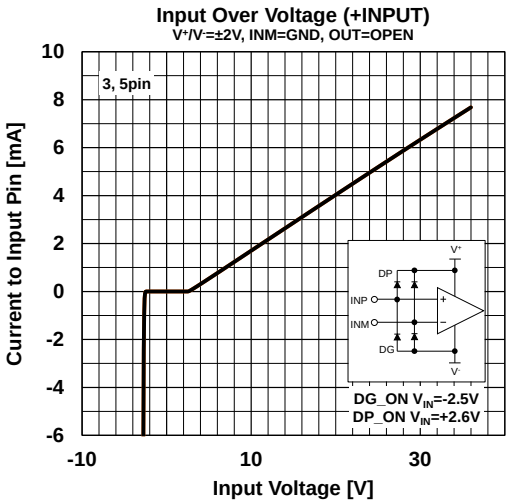






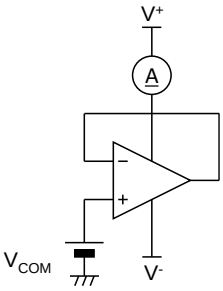
■ TYPICAL CHARACTERISTICS





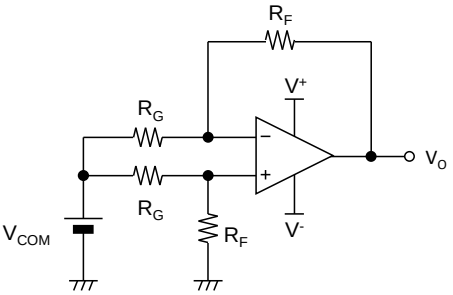
■ TEST CIRCUITS

● I_{SUPPLY}



● V_{IO}, CMR, SVR

R_G=50Ω, R_F=50kΩ



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

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

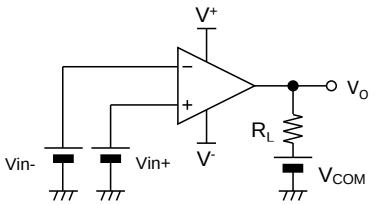
$$SVR=20\log\frac{\Delta V_S\left(1+\frac{R_F}{R_G}\right)}{\Delta V_O}$$

$V_S=V^+\text{-}V^-$

● V_{OH}, V_{OL}

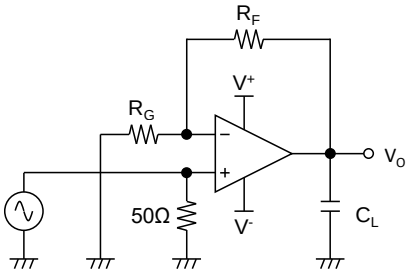
V_{OH}; Vin+ = 1V, Vin- = 0V, $V_{COM}=V^+/2$, V-

V_{OL}; Vin+ = 0V, Vin- = 1V, $V_{COM}=V^+/2$, V-

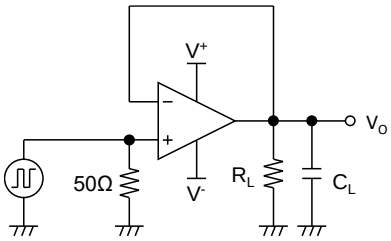


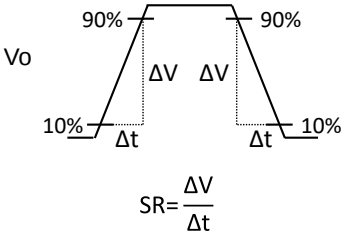
● GBW

R_G=100Ω, R_F=10kΩ



● SR





$$SR=\frac{\Delta V}{\Delta t}$$

■ APPLICATION NOTE

Single and Dual Supply Voltage Operation

The NJM8207 works with both single supply and dual supply when the voltage supplied is between V^+ and V^-. These amplifiers operate from single 4 to 35V supply and dual ±2V to ±17.5V supply.

Common-Mode Input Voltage Range

When the supply voltage does not meet the condition of electrical characteristics, the range of common-mode input voltage is as follows:

V_{ICM} (typ.) = V^- to V^+-1.5V (Ta = 25°C)

Difference of V_{ICM} when Temperature change, refer to typical characteristic graph.

During designing, consider variations in characteristics for use with allowance.

Maximum Output Voltage Range

When the supply voltage does not meet the condition of electrical characteristics, the range of the typ. value of the maximum output voltage is as follows:

V_{OM} (typ.) = V^-+0.15V to V^+-0.15V

(R_L=2kΩ to GND, Ta=25°C)

During designing, consider variations in characteristics and temperature characteristics for use with allowance. In addition, also note that the output voltage range becomes narrow as shown in typical characteristics graph when an output current increases.

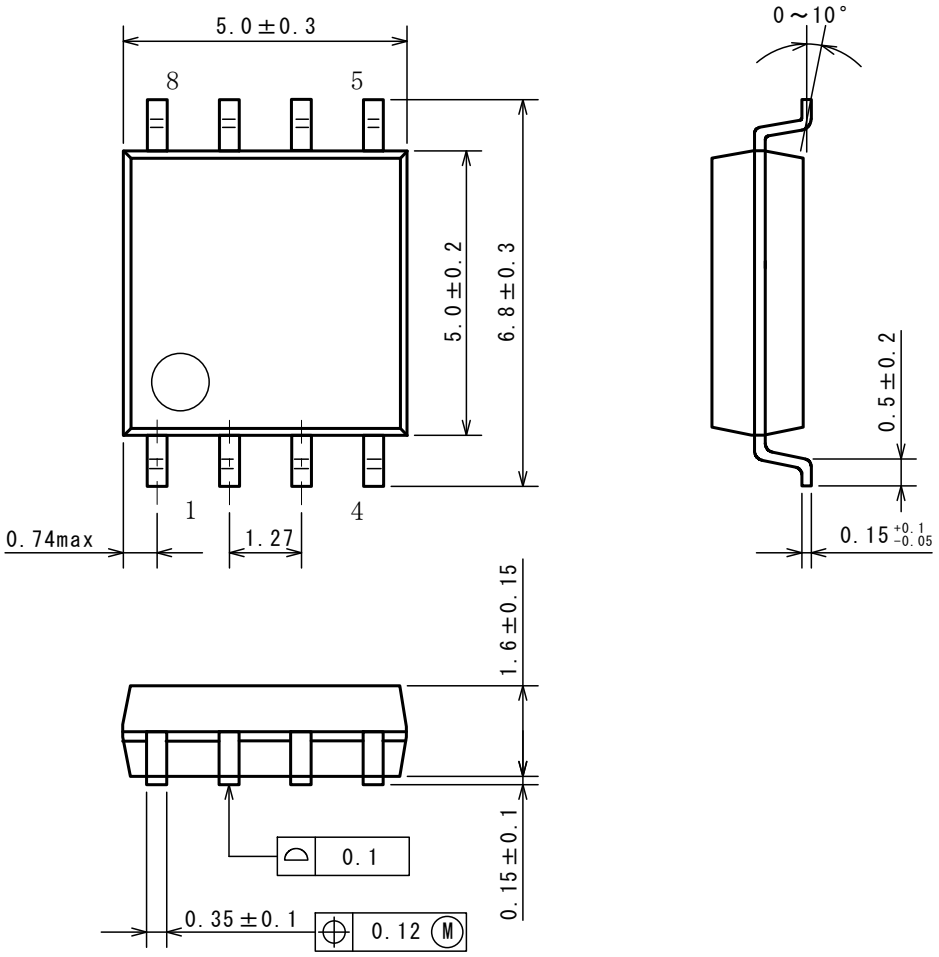
Nisshinbo Micro Devices Inc.

DMP8

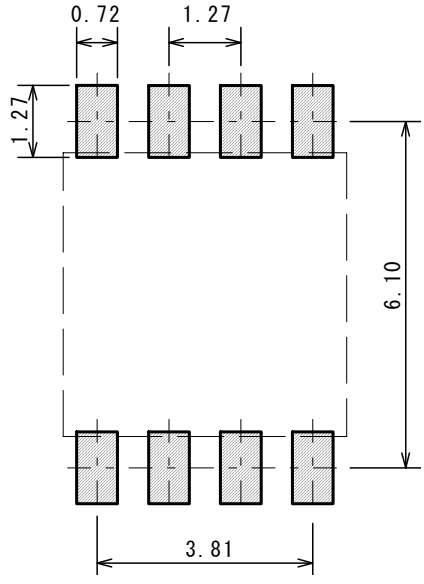
PI-DMP8-E-C

■ PACKAGE DIMENSIONS

UNIT: mm



■ EXAMPLE OF SOLDER PADS DIMENSIONS



Nisshinbo Micro Devices Inc.

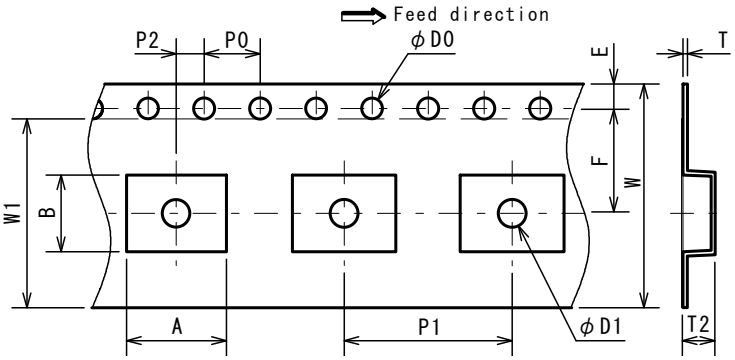
DMP8

PI-DMP8-E-C

■ PACKING SPEC

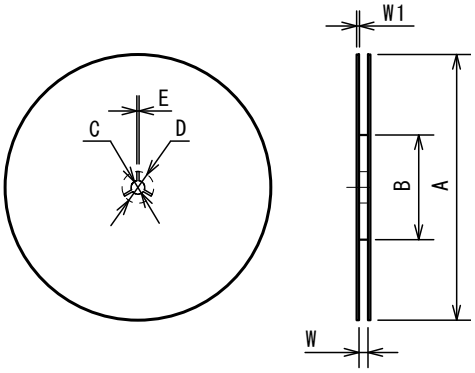
UNIT: mm

TAPING DIMENSIONS



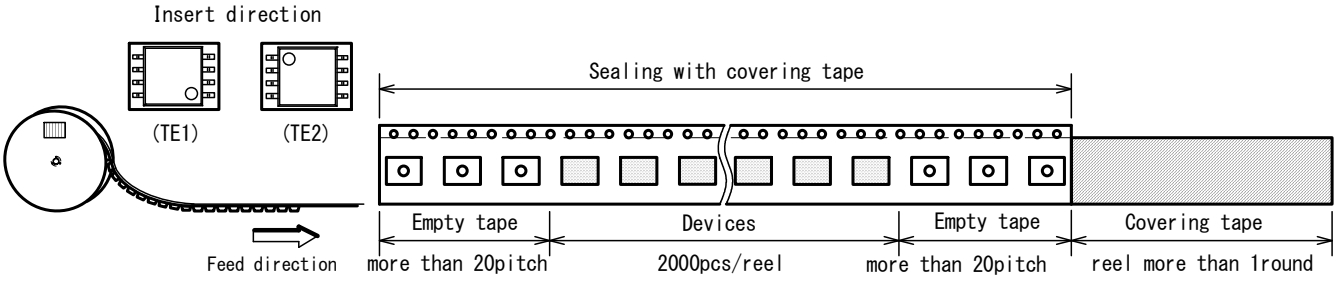
SYMBOL	DIMENSION	REMARKS
A	7.1	BOTTOM DIMENSION
B	5.4	BOTTOM DIMENSION
D0	1.55±0.05	
D1	2.05±0.1	
E	1.75±0.1	
F	7.5±0.1	
P0	4.0±0.1	
P1	12.0±0.1	
P2	2.0±0.1	
T	0.3±0.05	
T2	2.3	
W	16.0±0.3	
W1	13.5	THICKNESS 0.1max

REEL DIMENSIONS

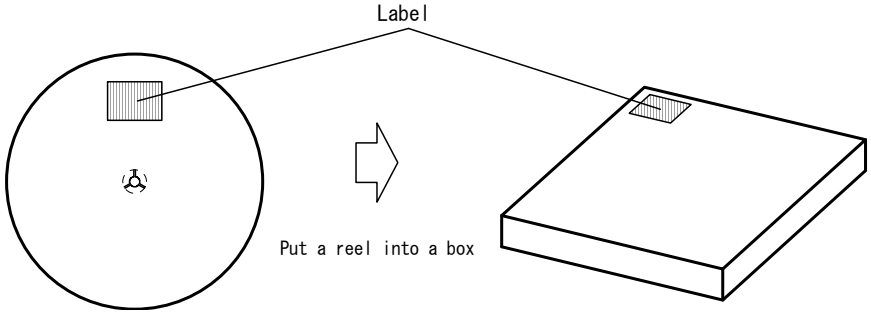


SYMBOL	DIMENSION
A	φ330±2
B	φ 80±1
C	φ 13±0.2
D	φ 21±0.8
E	2±0.5
W	17.5±0.5
W1	2±0.2

TAPING STATE

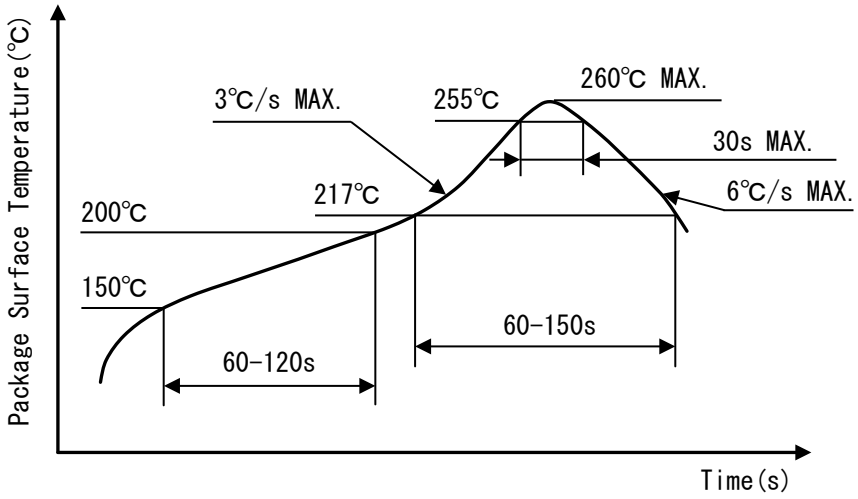


PACKING STATE



Reflow Profile

■ 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

Nisshinbo Micro Devices Inc.

Official website
https://www.nisshinbo-microdevices.co.jp/en/

Purchase information
https://www.nisshinbo-microdevices.co.jp/en/buy/