PRELIMINARY SPECIFICATIONS SUBJECT TO CHANGE

160MHz, 1.5nV/√Hz, Operational Amplifier

■ FEATURES (V^+ = 5V, V^- = 0V, Typical value)

● GBW	160MHz
● Low Noise (f = 100kHz)	1.5nV/√Hz
● Input Offset Voltage	1mV max
● Supply Voltage	4V to 10V
● Common-Mode Input Voltage Range	1.5V to 4V
● High-level Output Voltage (R_L = 1kΩ)	1.3V to 3.5V
● Supply Current	4mA/ch
● Operating Temperature	-40°C to 125°C
● Slew Rate	15V/μs
● Stable Gain ≥ 2	
● Package	SOP8
	VSP8

■ APPLICATIONS

- Low Noise Instrumentation Front End
- Ultrasound Preamp
- High Speed Low Noise Active Filter
- ADC Input Buffer Amplifier
- Sensor Interface

■ DESCRIPTION

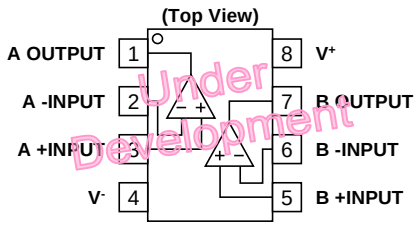
The NJM2725 is a dual high speed voltage feedback operational amplifier designed for ease of use in a high speed and low noise applications.

The combination of 1.5nV/√Hz voltage noise and 160MHz bandwidth makes the NJM2725 suitable for ultra-small signal and high frequency applications such as high speed photosensors, ultrasound sensors, active filters and other wideband applications. NJM2725 can be easily configured as a low noise amplifier, and it can also be used as a high performance ADC front end in combination with rail-to-rail op amps.

NJM2725 is stable for Gain ≥ 2 or Gain ≤ -1. Packages for this device is the 8pin SOP and the 8pin MSOP8 (VSP8) and is offered in the extended industrial temperature grade of -40°C to 125°C.

PRELIMINARY SPECIFICATIONS SUBJECT TO CHANGE

■ PIN CONFIGURATIONS

PRODUCT NAME	NJM2725G	NJM2725R
Package	SOP8	VSP8
Pin Functions		

■ PRODUCT NAME INFORMATION

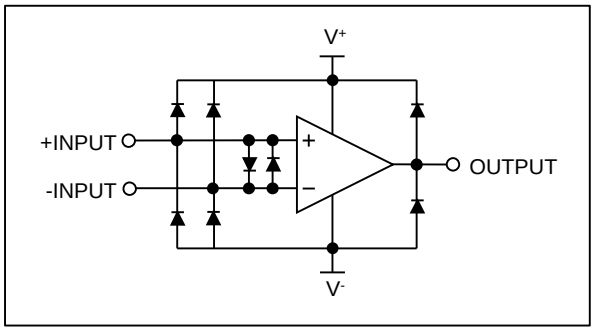
NJM2725 R (TE1)

Part Number — Package — Taping Form

■ ORDERING INFORMATION

PRODUCT NAME	PACKAGE	RoHS	HALOGEN-FREE	TERMINAL FINISH	MARKING	WEIGHT (mg)	MOQ (pcs)
NJM2725G (TE2)	SOP8	Yes	Yes	Pure Sn	2725	88	2500
NJM2725R (TE1)	MSOP8 (VSP8)	Yes	Yes	Sn2Bi	2725	21	2000

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATINGS

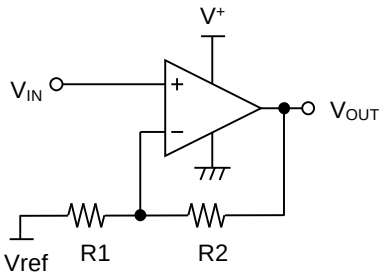
PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	$V^+ - V^-$	11	V
Input Voltage (1)	V_{IN}	$V^- - 0.3$ to $V^+ + 0.3$	V
Input Current (1)	I_{IN}	1	mA
Differential Input Voltage (2)	V_{ID}	±1.2	V
Output Short-Circuit Duration (3)		Continuous	
Power Dissipation (T_a = 25°C) SOP8 MSOP8 (VSP8)	P_D	2-Layer / 4-Layer (4) 690 / 1000 500 / 660	mW
Storage Temperature	T_{stg}	-65 to 150	°C
Junction Temperature	T_j	150	°C

(1) Input voltages outside the supply voltage will be clamped by ESD protection diodes. If the input voltage exceeds the supply voltage, the input current must be limited 1 mA or less by using a restriction resistance.
(2) Differential voltage is the voltage difference between +INPUT and −INPUT.
(3) Short-circuit can cause excessive heating and destructive dissipation.
(4) 2-Layer: Mounted on glass epoxy board (76.2 mm × 114.3 mm × 1.6 mm: based on EIA/JEDEC standard, 2-layer FR-4).
4-Layer: Mounted on glass epoxy board (76.2 mm × 114.3 mm × 1.6 mm: based on EIA/JEDEC standard, 4-layer FR-4), internal Cu area: 74.2 mm × 74.2 mm.

■ RECOMMENDED OPERATING CONDITIONS

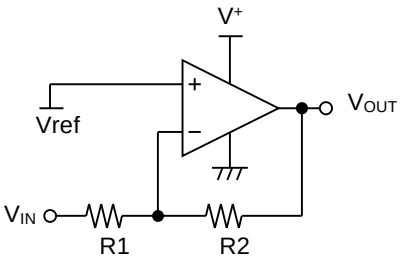
PARAMETER	SYMBOL	CONDITIONS	VALUE	UNIT
Supply Voltage	$V^+ - V^-$		4 to 10	V
Operating Temperature	T_{opr}		-40 to 125	°C

■ TYPICAL APPLICATIONS



Non-inverting amplifier

Stable Gain ≥ 2



Inverting amplifier

Stable Gain ≤ -1

■ ELECTRICAL CHARACTERISTICS

(V^+ = 5V, V^- = 0V, V_{COM} = V^+ / 2, R_L = 5kΩ to V_{COM}, T_a = 25°C, unless otherwise noted.)

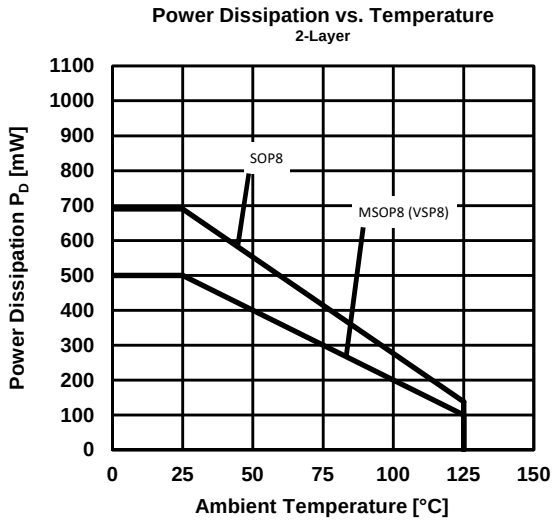
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
INPUT CHARACTERISTICS						
Input Offset Voltage	V_{IO}		-	0.5	1	mV
Input Bias Current	I_B		-	4.6	10	μA
Input Offset Current	I_{IO}		-	0.5	5	μA
Input Offset Voltage Drift	$\Delta V_{IO}/\Delta T$		-	1	-	μV/°C
Input Resistance	R_{IN}		-	TBD	-	Ω
Input Capacitance	C_{IN}		-	TBD	-	pF
Open-Loop Voltage Gain	A_V	V_O = 1.5V to 3.5V	90	105	-	dB
Common-Mode Rejection Ratio	CMR	V_{COM} = V_{ICM} min to V_{ICM} max	70	90	-	dB
Common-Mode Input Voltage Range	V_{ICM}	CMR ≥ CMR min	(V^-) + 1.5	-	(V^+) - 1	V
OUTPUT CHARACTERISTICS						
High-level Output Voltage	V_{OH}	R_L = 1kΩ to V^+ / 2	(V^+) - 1.5	TBD	-	V
Low-level Output Voltage	V_{OL}	R_L = 1kΩ to V^+ / 2	-	TBD	(V^-) + 1.3	V
Output Current	I_O	Sourcing, V_O = 3.5V	-	30	-	mA
		Sinking, V_O = 1.5V	-	30	-	mA
POWER SUPPLY						
Supply Current per Amplifier	I_{SUPPLY}	No signal	-	4	5.8	mA
Supply Voltage Rejection Ratio	SVR	V^+ = 4 to 10V	80	95	-	dB
AC CHARACTERISTICS (Gain = 2)						
Slew Rate	SR		-	15	-	V/μs
Gain Bandwidth Product	GBW	f = 1MHz	-	160	-	MHz
Settling Time 0.1%	t_s		-	TBD	-	μs
Gain Margin	G_M	C_L = 50pF	-	10	-	dB
Phase Margin	Φ_M	C_L = 50pF	-	60	-	deg
Total Harmonic Distortion + Noise	THD+N		-	TBD	-	%
Equivalent Input Noise Voltage	e_n	f = 100kHz	-	1.5	-	nV/√Hz
Equivalent Input Noise Current	In	f = 100kHz	-	1.5	-	pA/√Hz
Channel Separation	CS	f = 1MHz	-	TBD	-	dB

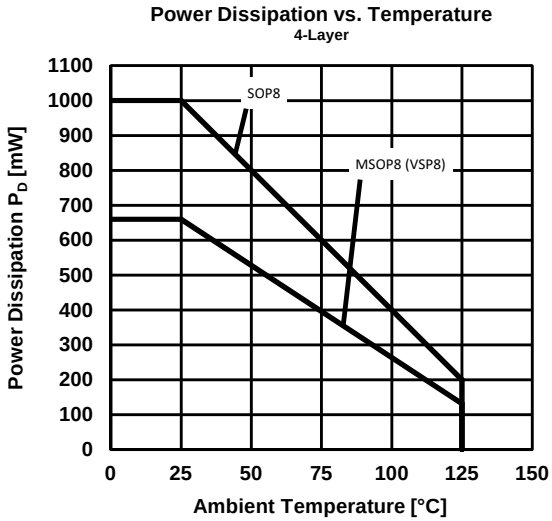
■ THERMAL CHARACTERISTICS

PACKAGE	SYMBOL	VALUE	UNIT
Junction-to-Ambient Thermal Resistance	θ_{ja}	2-Layer / 4-Layer (4)	°C/W
SOP8		181 / 125	
MSOP8 (VSP8)		250 / 189	
Junction-to-Top of Package Characterization Parameter	Ψ_{jt}	2-Layer / 4-Layer (4)	°C/W
SOP8		49 / 43	
MSOP8 (VSP8)		62 / 53	

(4) 2-Layer: Mounted on glass epoxy board (76.2 mm × 114.3 mm × 1.6 mm: based on EIA/JEDEC standard, 2-layer FR-4).
4-Layer: Mounted on glass epoxy board (76.2 mm × 114.3 mm × 1.6 mm: based on EIA/JEDEC standard, 4-layer FR-4), internal Cu area: 74.2 mm × 74.2 mm.

■ POWER DISSIPATION vs. AMBIENT TEMPERATURE



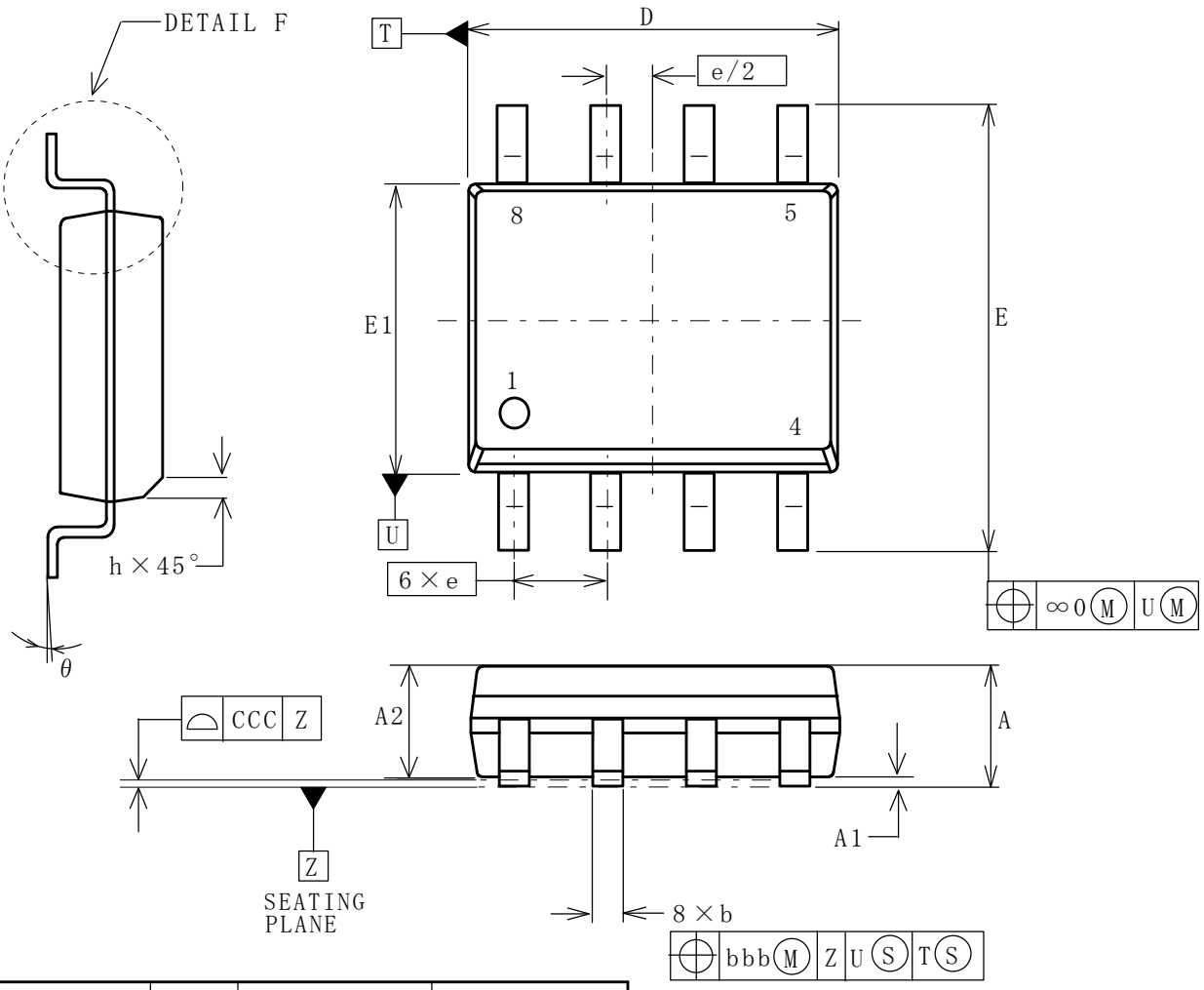


SOP8

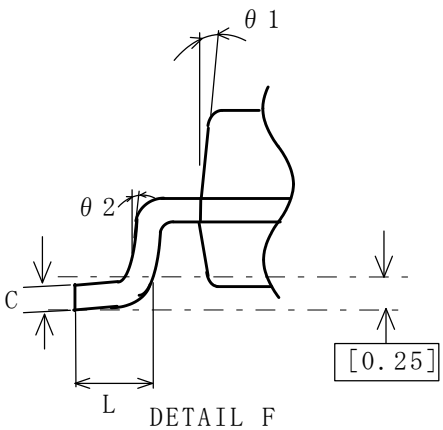
PRELIMINARY SPECIFICATIONS SUBJECT TO CHANGE

Unit: mm

■ PACKAGE DIMENSIONS



DESCRIPTION	SYMBOL	INCH			MILLIMETER		
		MIN	NOM	MAX	MIN	NOM	MAX
TOTAL THICKNESS	A	.053		.069	1.35		1.75
STAND OFF	A1	.004		.010	0.10		0.25
MOLD THICKNESS	A2	.049		-	1.25		-
LEAD WIDTH	b	.014		.019	0.35		0.49
L/F THICKNESS	C	.007		.010	0.19		0.25
BODY SIZE	D	.189		.197	4.80		5.00
	E1	.150		.157	3.80		4.00
	E	.228		.244	5.80		6.20
LEAD PITCH	e	.050 BSC			1.27 BSC		
	L	.015		.049	0.40		1.25
	h	.010		.020	0.25		0.50
	θ	0°		7°	0°		7°
	θ1	5°		15°	5°		15°
	θ2	2°	7°	12°	2°	7°	12°
LEAD EDGE OFFSET	∞0	.010			0.25		
LEAD OFFSET	bbb	.010			0.25		
COPLANARITY	CCC	.004			0.10		

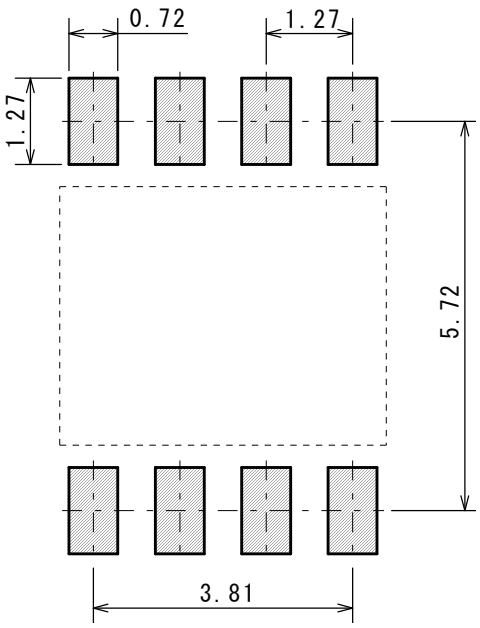


SOP8

PRELIMINARY SPECIFICATIONS SUBJECT TO CHANGE

Unit: mm

■ EXAMPLE OF SOLDER PADS DIMENSIONS

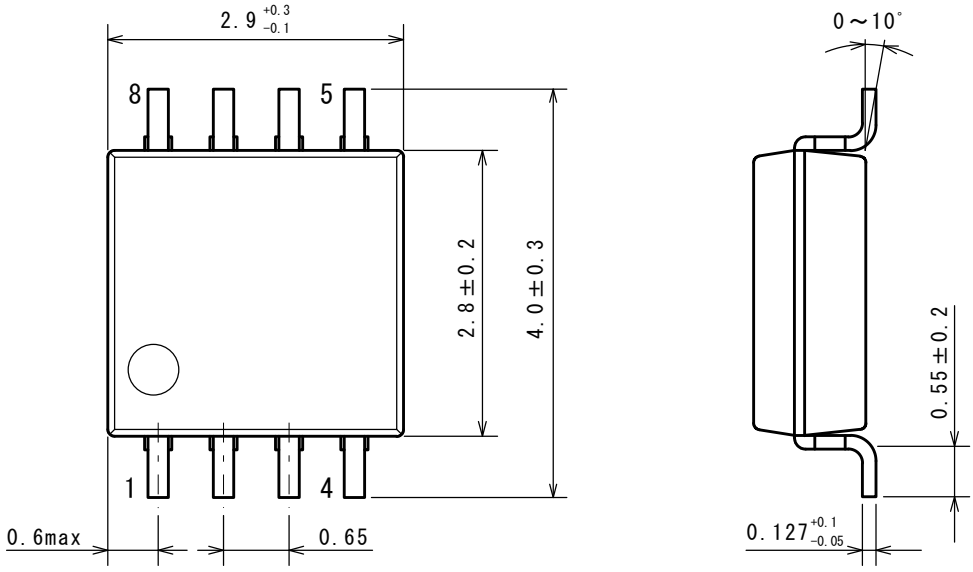


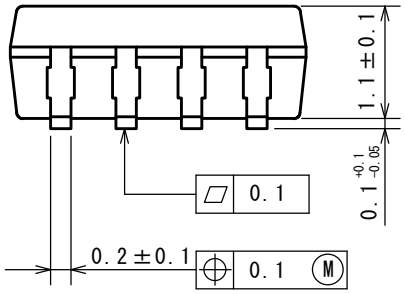
MSOP8 (VSP8) JEDEC MO-187-DA

PRELIMINARY SPECIFICATIONS SUBJECT TO CHANGE

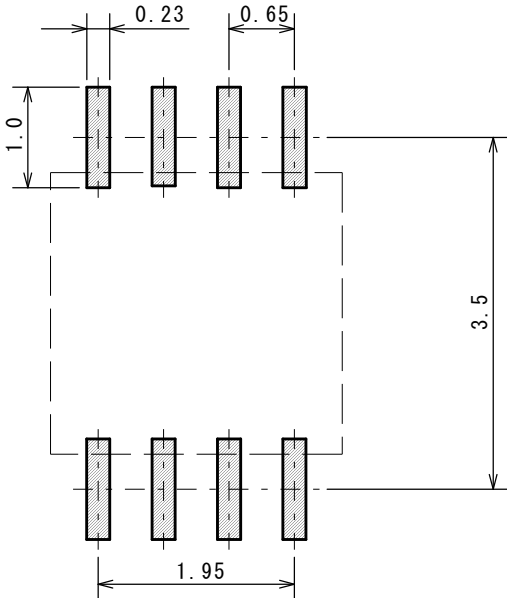
Unit: mm

■ PACKAGE DIMENSIONS





■ EXAMPLE OF SOLDER PADS DIMENSIONS



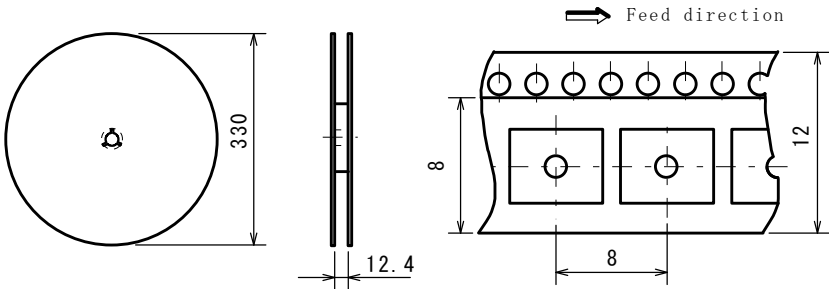
PRELIMINARY SPECIFICATIONS SUBJECT TO CHANGE

SOP8

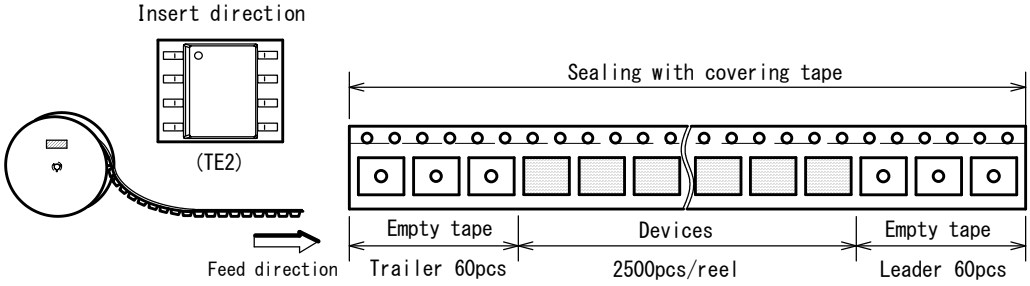
Unit: mm

■ PACKING SPEC

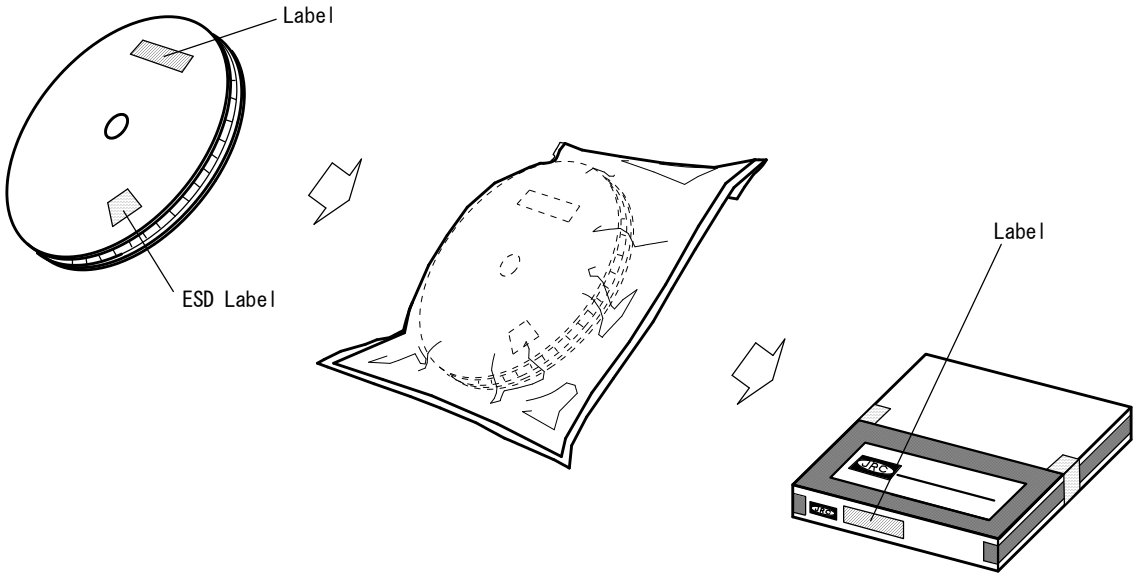
REEL DIMENSIONS / TAPING DIMENSIONS



TAPING STATE



PACKING STATE



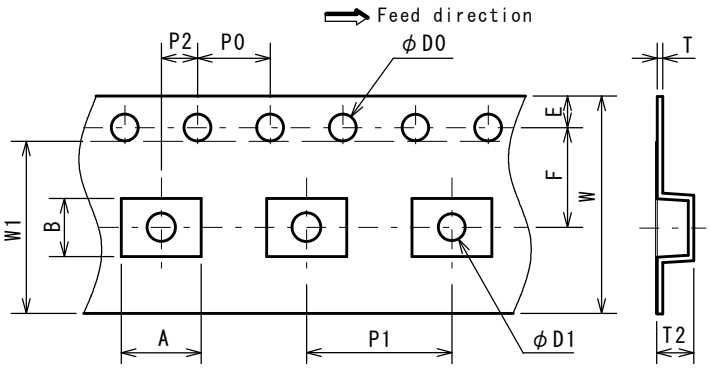
MSOP8 (VSP8) MEET JEDEC MO-187-DA

PRELIMINARY SPECIFICATIONS SUBJECT TO CHANGE

Unit: mm

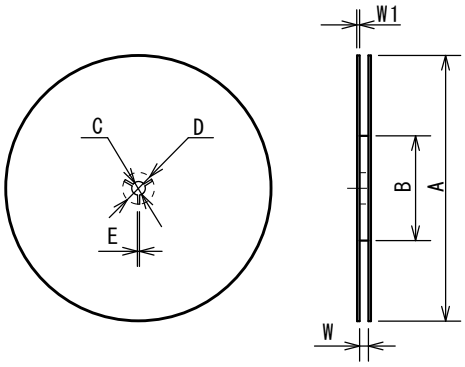
■ PACKING SPEC

TAPING DIMENSIONS



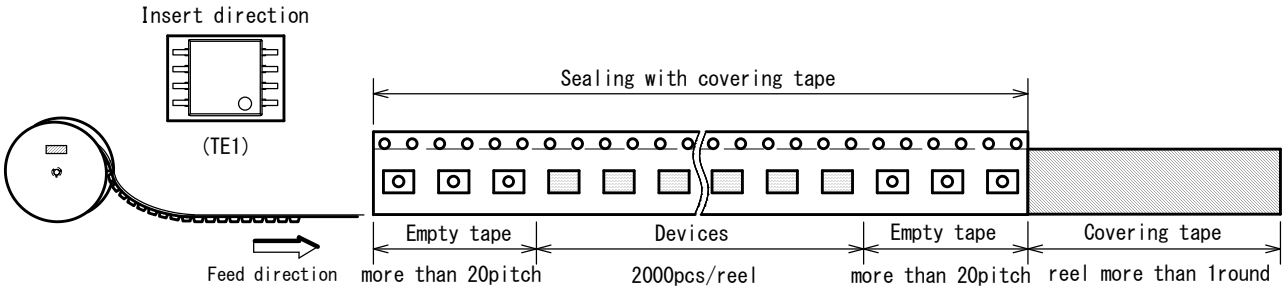
SYMBOL	DIMENSION	REMARKS
A	4.4	BOTTOM DIMENSION
B	3.2	BOTTOM DIMENSION
D0	$1.5^{+0.1}_{0}$	
D1	$1.5^{+0.1}_{0}$	
E	1.75±0.1	
F	5.5±0.05	
P0	4.0±0.1	
P1	8.0±0.1	
P2	2.0±0.05	
T	0.30±0.05	
T2	2.0 (MAX.)	
W	12.0±0.3	
W1	9.5	THICKNESS 0.1max

REEL DIMENSIONS

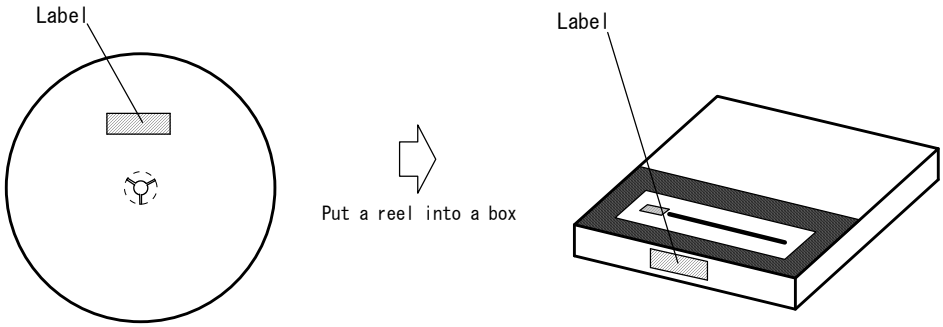


SYMBOL	DIMENSION
A	φ254±2
B	φ100±1
C	φ 13±0.2
D	φ 21±0.8
E	2±0.5
W	13.5±0.5
W1	2.0±0.2

TAPING STATE

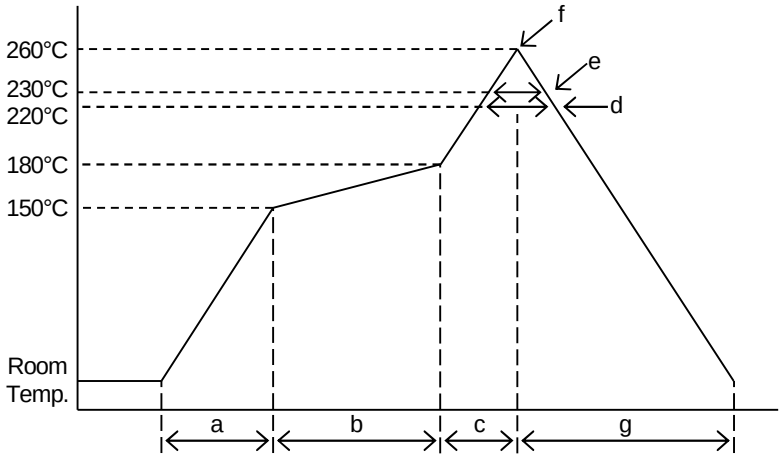


PACKING STATE



■ RECOMMENDED MOUNTING METHOD

INFRARED REFLOW SOLDERING PROFILE



a	Temperature ramping rate	1 to 4°C/s
b	Pre-heating temperature Pre-heating time	150 to 180°C 60 to 120s
c	Temperature ramp rate	1 to 4°C/s
d	220°C or higher time	shorter than 60s
e	230°C or higher time	shorter than 40s
f	Peak temperature	lower than 260°C
g	Temperature ramping rate	1 to 6°C/s

The temperature indicates at the surface of mold package.

DATE	REVISION	CHANGES
September 7, 2020	Ver.0.0	Initial Release
October 5, 2020	Ver.0.1	Corrected unit of supply current on Electrical Characteristics.
April 30, 2021	Ver.0.2	Added typical applications on Recommended Operating Conditions. Updated TBD of open-loop voltage gain and output current on Electrical Characteristics.

[CAUTION]

1. NJR strives to produce reliable and high quality semiconductors. NJR's semiconductors are intended for specific applications and require proper maintenance and handling. To enhance the performance and service of NJR's semiconductors, the devices, machinery or equipment into which they are integrated should undergo preventative maintenance and inspection at regularly scheduled intervals. Failure to properly maintain equipment and machinery incorporating these products can result in catastrophic system failures

2. The specifications on this datasheet are only given for information without any guarantee as regards either mistakes or omissions. The application circuits in this datasheet are described only to show representative usages of the product and not intended for the guarantee or permission of any right including the industrial property rights.
   All other trademarks mentioned herein are the property of their respective companies.

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   The introduction of external contaminants (e.g. dust, oil or cosmetics) can result in failures of semiconductor products.

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6. The products listed in this datasheet may not be appropriate for use in certain equipment where reliability is critical or where the products may be subjected to extreme conditions. You should consult our sales office before using the products in any of the following types of equipment.

   - 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 (Automobile, airplane, railroad, ship, etc.)
   - Various Safety Devices

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8. 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.

9. The product specifications and descriptions listed in this datasheet are subject to change at any time, without notice.