

LOW NOISE, BIPOLAR INPUT DUAL AUDIO OPERATIONAL AMPLIFIER

FEATURES

- Designed for High-Quality Sound
 - Low Noise 3.5 nV/ $\sqrt{\text{Hz}}$ at 1kHz
 - Low Distortion 0.001%
 - Slew Rate 6.8V/ μs
 - Gain Bandwidth Product 19 MHz
 - Open-Loop Voltage Gain 120dB
 - Unity-Gain Stable
 - Bipolar Input
 - Supply Voltage $\pm 4\text{V}$ to $\pm 18\text{V}$
 - Operating Temperature -40°C to 125°C
 - Supply Current (All Amplifiers) 5 mA typ.
 - Package SOP8
MSOP8 (TVSP8)*
- * meet JEDEC MO-187-DA / thin type

DESCRIPTION

NJM8068 is a low noise bipolar input dual audio operational amplifier has 3.5 nV/ $\sqrt{\text{Hz}}$ at 1kHz.

The NJM8068 features Low distortion, high slew rate, wide bandwidth and high open-loop gain. In addition, unity-gain stable allows voltage-follower operation. These features make NJM8068 ideal for audio pre amplifier, microphone amplifier, line amplifier and other audio applications. NJM8068 operate over a wide temperature range of -40°C to 125°C , making this IC ideal for use in industrial measurement instruments

The NJM8068 is available in 8-pin SOP and MSOP (TVSP) packages.

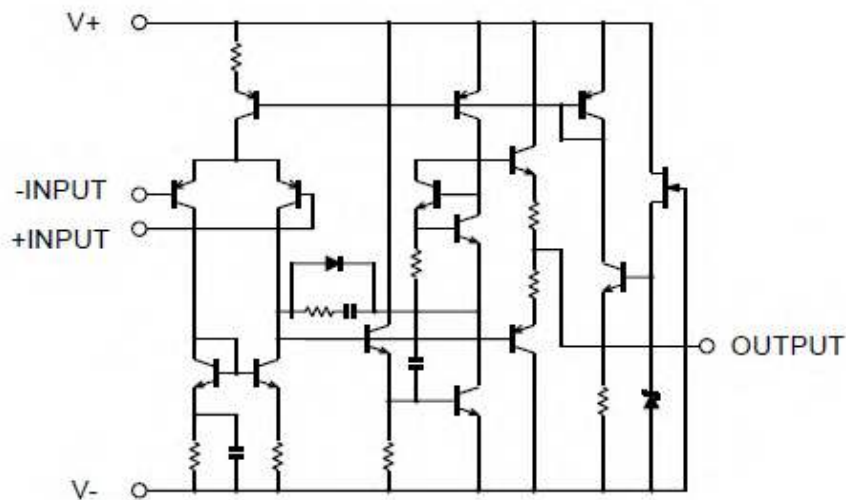
APPLICATIONS

- Professional Audio Sets
- Audio Pre / Microphone Amplifiers
- Analog / Digital Mixers
- AV Receivers
- Car Audio
- Industrial Measurement Instruments

RELATED PRODUCT

PRODUCT NAME	FEATURES
NJM8080	5nV/ $\sqrt{\text{Hz}}$, 0.0005%, 5V/ μs , 15MHz (Low noise, low distortion audio Op-Amp)

EQUIVALENT CIRCUIT



■ PIN CONFIGURATIONS

PRODUCT NAME	NJM8068G	NJM8068B1
Package	SOP8	MSOP8 (TVSP8)
Pin Functions		

■ PRODUCT NAME INFORMATION



■ ORDER INFORMATION

PRODUCT NAME	PACKAGE	RoHS	HALOGEN-FREE	TERMINAL FINISH	MARKING	WEIGHT (mg)	MOQ (pcs)
NJM8068G	SOP8	Yes	Yes	Pure Sn	8068	88	2500
NJM8068RB1	MSOP8 (TVSP8)	Yes	Yes	Sn2Bi	8068	18	2000

■ ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATING	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⁾	P_D	2-Layer / 4-Layer ⁽⁴⁾	
SOP8 MSOP8 (TVSP8)		690 / 1000 510 / 680	mW
Storage Temperature Range	T_{stg}	-65 to 150	°C
Maximum Junction Temperature	T_{jmax}	150	°C

■ THERMAL CHARACTERISTICS

PACKAGE	SYMBOL	VALUE	UNIT
Junction-to-Ambient Thermal Resistance	Θ_{ja}	2-Layer / 4-Layer ⁽⁴⁾	
SOP8		181 / 125	°C/W
MSOP8 (TVSP8)		245 / 184	
Junction-to-Top of Package Characterization Parameter	Ψ_{jt}	2-Layer / 4-Layer ⁽⁴⁾	
SOP8		49 / 43	°C/W
MSOP8 (TVSP8)		51 / 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^+ .

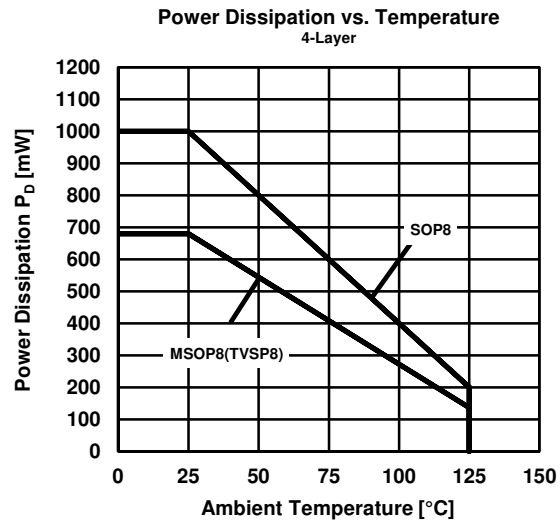
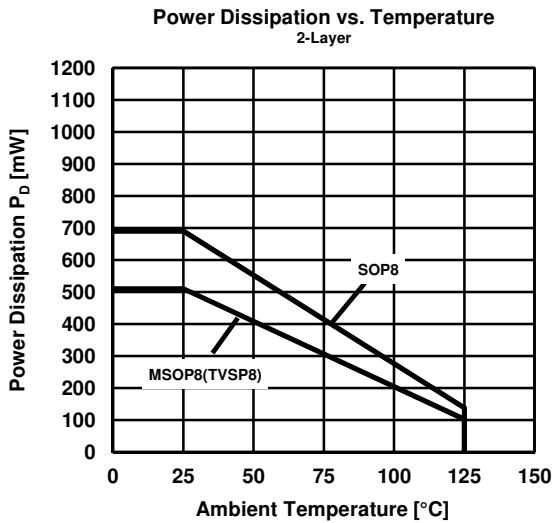
The normal operation will establish when any input is within the "Common-Mode Input Voltage Range" of electrical characteristics.

(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 x 74.2 mm

■ POWER DISSIPATION vs. AMBIENT TEMPERATURE



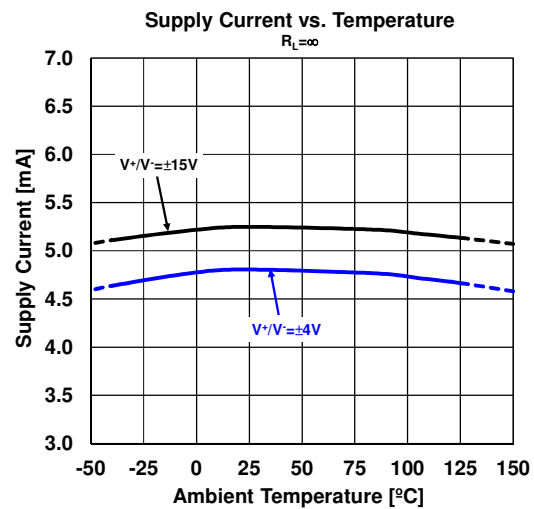
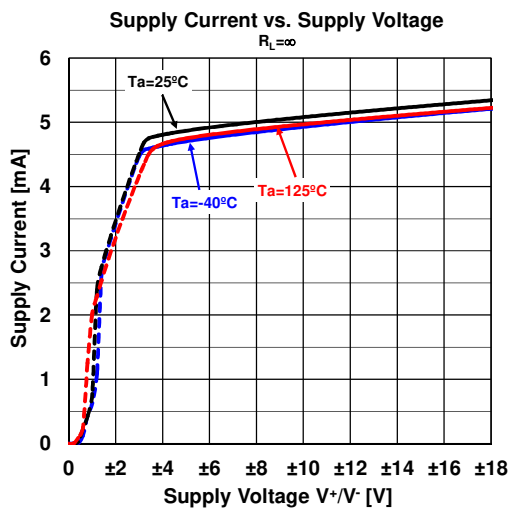
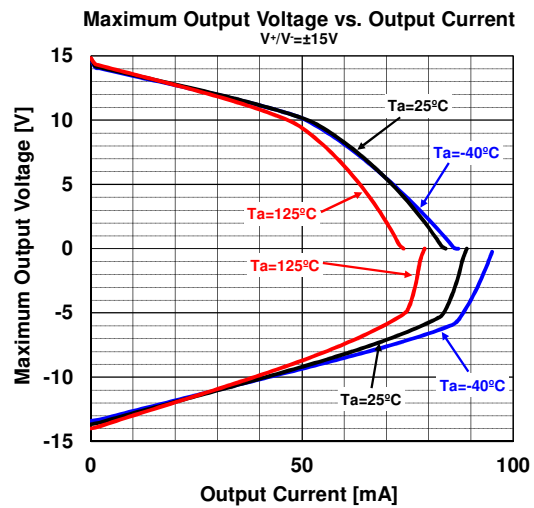
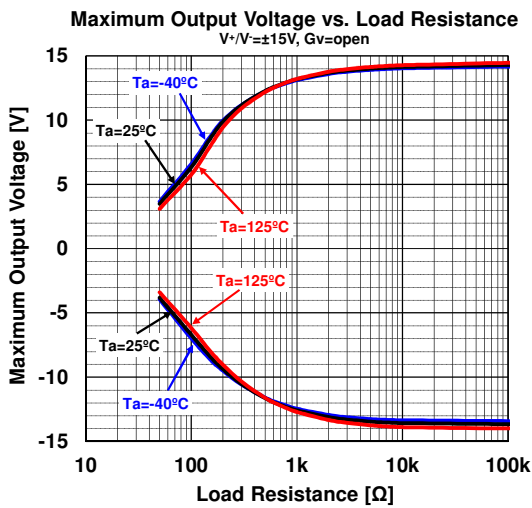
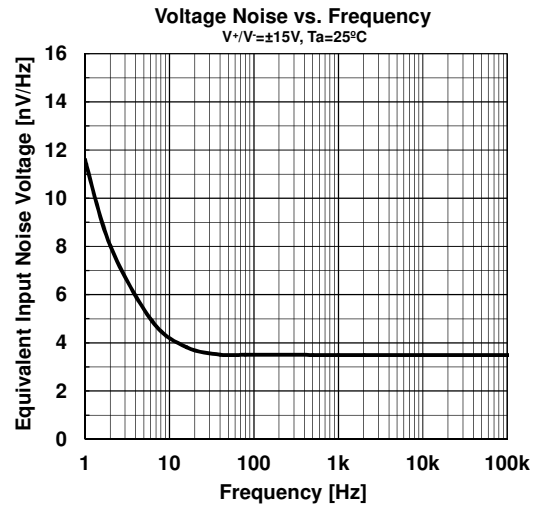
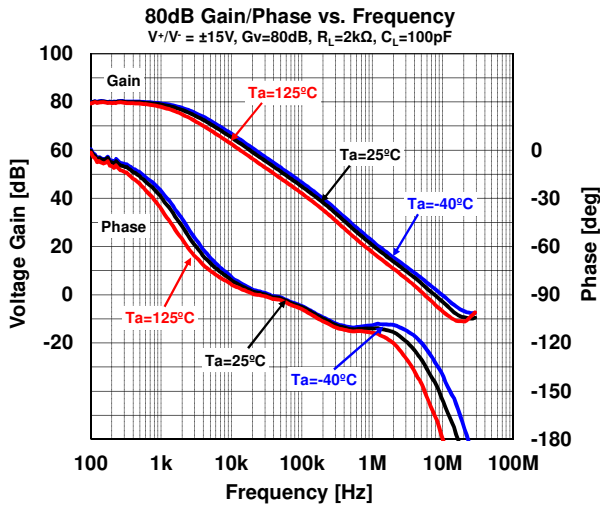
■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	CONDITIONS	VALUE	UNIT
Supply Voltage	V^+V^-	Ta=25°C	±4 to ±18	V
Operating Temperature Range	T _{opr}		-40 to 125	°C

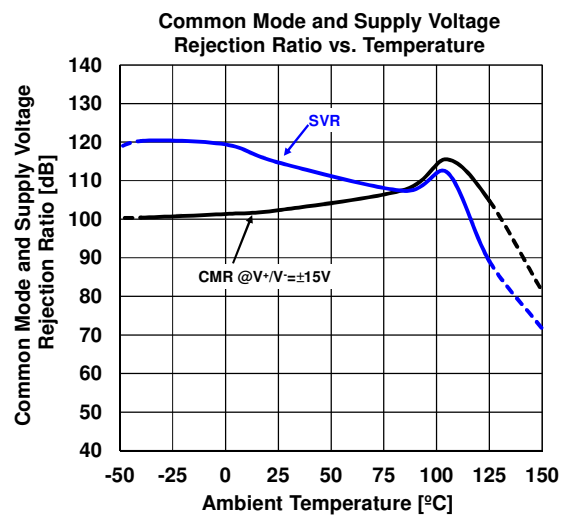
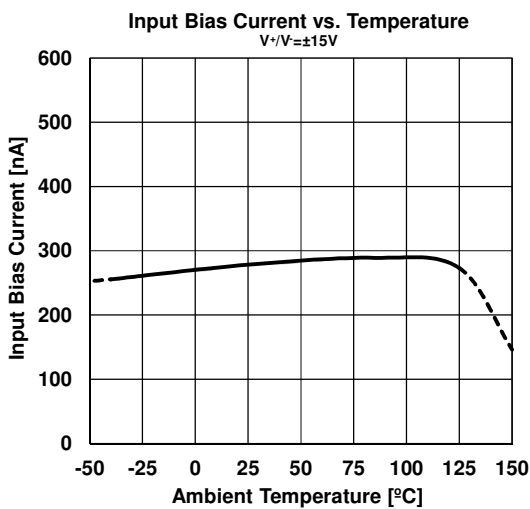
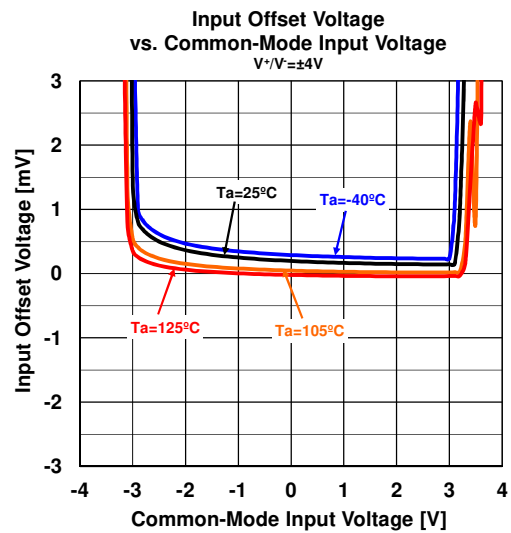
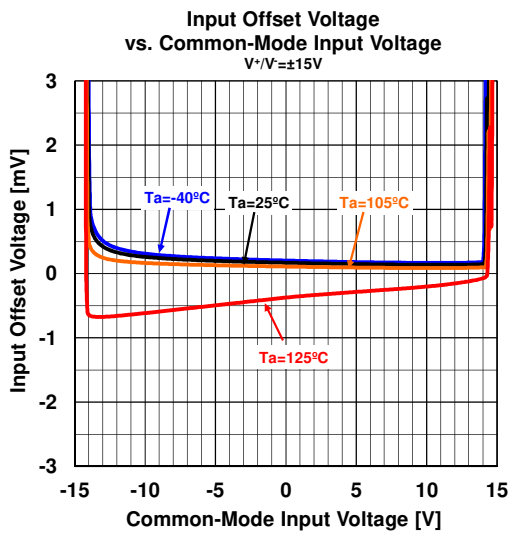
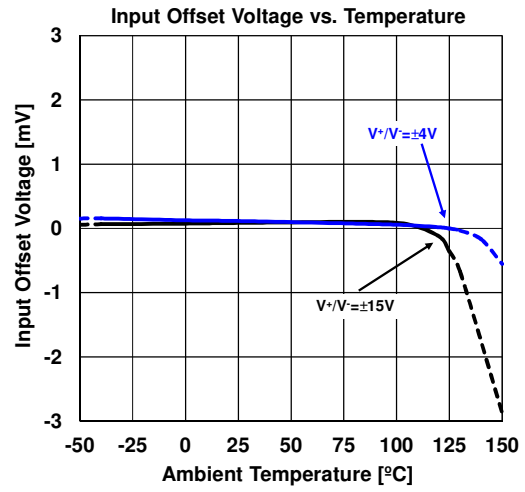
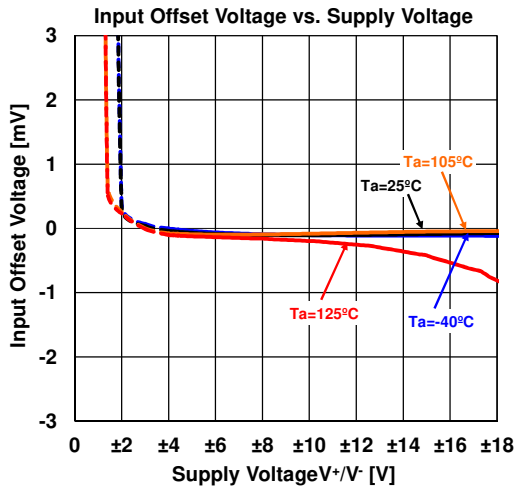
■ ELECTRICAL CHARACTERISTICS (V⁺V⁻=±15V, Ta=25°C, unless otherwise noted.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
INPUT/OUTPUT CHARACTERISTICS						
Input Offset Voltage	V _{IO}	R _S ≧0kΩ	-	0.3	3	mV
Input Bias Current	I _B		-	260	1000	nA
Input Offset Current	I _{IO}		-	5	200	nA
Open-Loop Voltage Gain	A _V	R _L =2kΩ, V _O =±10V	90	120	-	dB
Common-Mode Rejection Ratio	CMR		80	110	-	dB
Input Resistance	R _{IN}		50	300	-	kΩ
Common-Mode Input Voltage Range	V _{ICM}		±12	±13.5	-	V
Maximum Output Voltage	V _{OM}	R _L ≧kΩ	±12	±13.5	-	V
POWER SUPPLY						
Supply Current (All Amplifiers)	I _{SUPPLY}		-	5	8	mA
Supply Voltage Rejection Ratio	SVR		80	120	-	dB
AC CHARACTERISTICS						
Gain Bandwidth Product	GBW	f=100kHz	-	19	-	MHz
Unity Gain Frequency	f _T	G _V =0dB	-	7.5	-	MHz
Slew Rate	SR	R _L ≧kΩ	-	6.8	-	V/μs
Noise, Distortion						
Equivalent Input Noise Voltage	e _n	f=1kHz	-	3.5	-	nV/√Hz
		FLAT, f=20Hz to 20kHz	-	0.5	0.7	μVrms
Total Harmonic Distortion + Noise	THD+N		-	0.001	-	%
Channel Separation	CS		-	120	-	dB

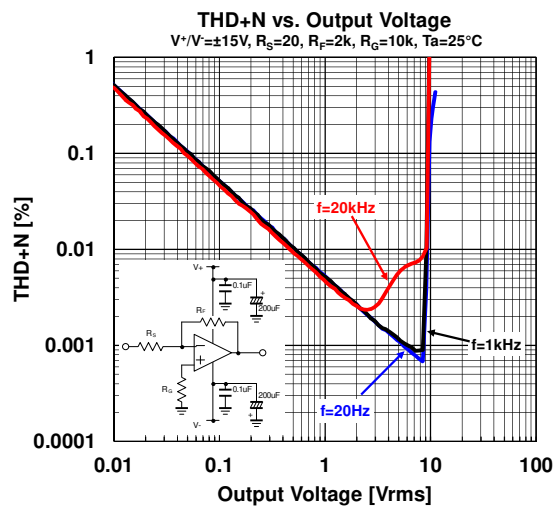
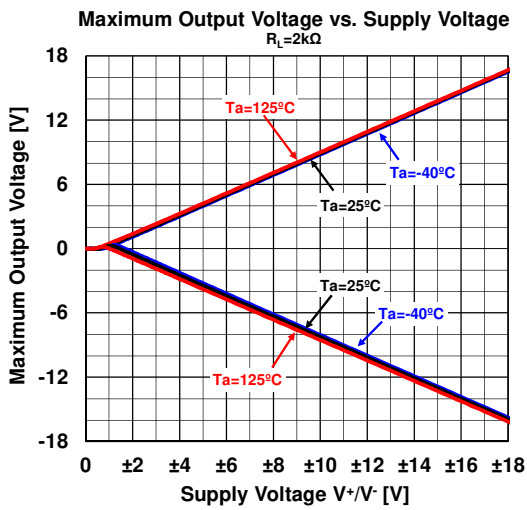
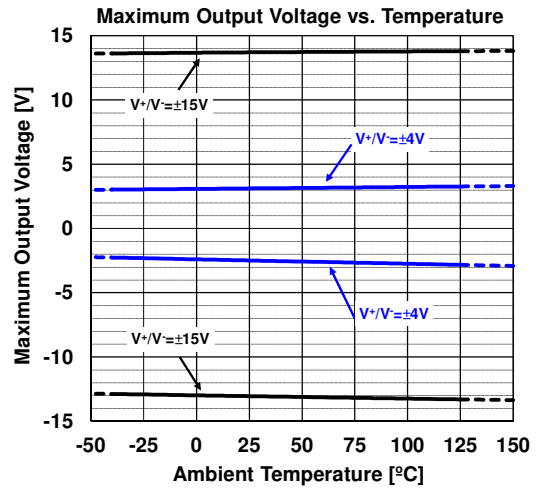
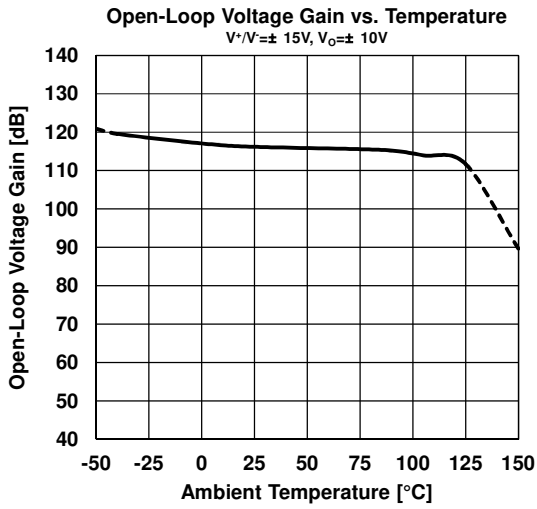
■ TYPICAL CHARACTERISTICS



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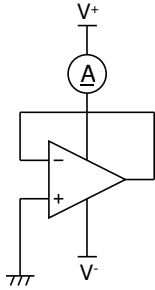


■ TYPICAL CHARACTERISTICS



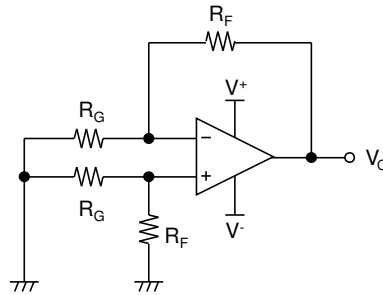
■ TEST CIRCUITS

- I_{SUPPLY}



- V_{IO}, CMR, SVR

$R_G=50\Omega, R_F=50k\Omega$



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

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

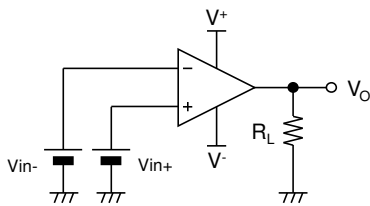
$$SVR = 20 \log \frac{\Delta V_s \left(1 + \frac{R_F}{R_G}\right)}{\Delta V_O}$$

$V_s = V^+ - V^-$

- V_{OH}, V_{OL}

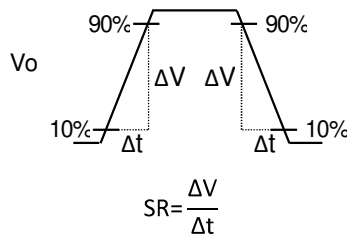
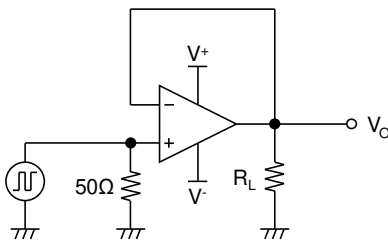
$V_{OH}: V_{in+} = 1V, V_{in-} = -1V$

$V_{OL}: V_{in+} = -1V, V_{in-} = 1V$



- SR

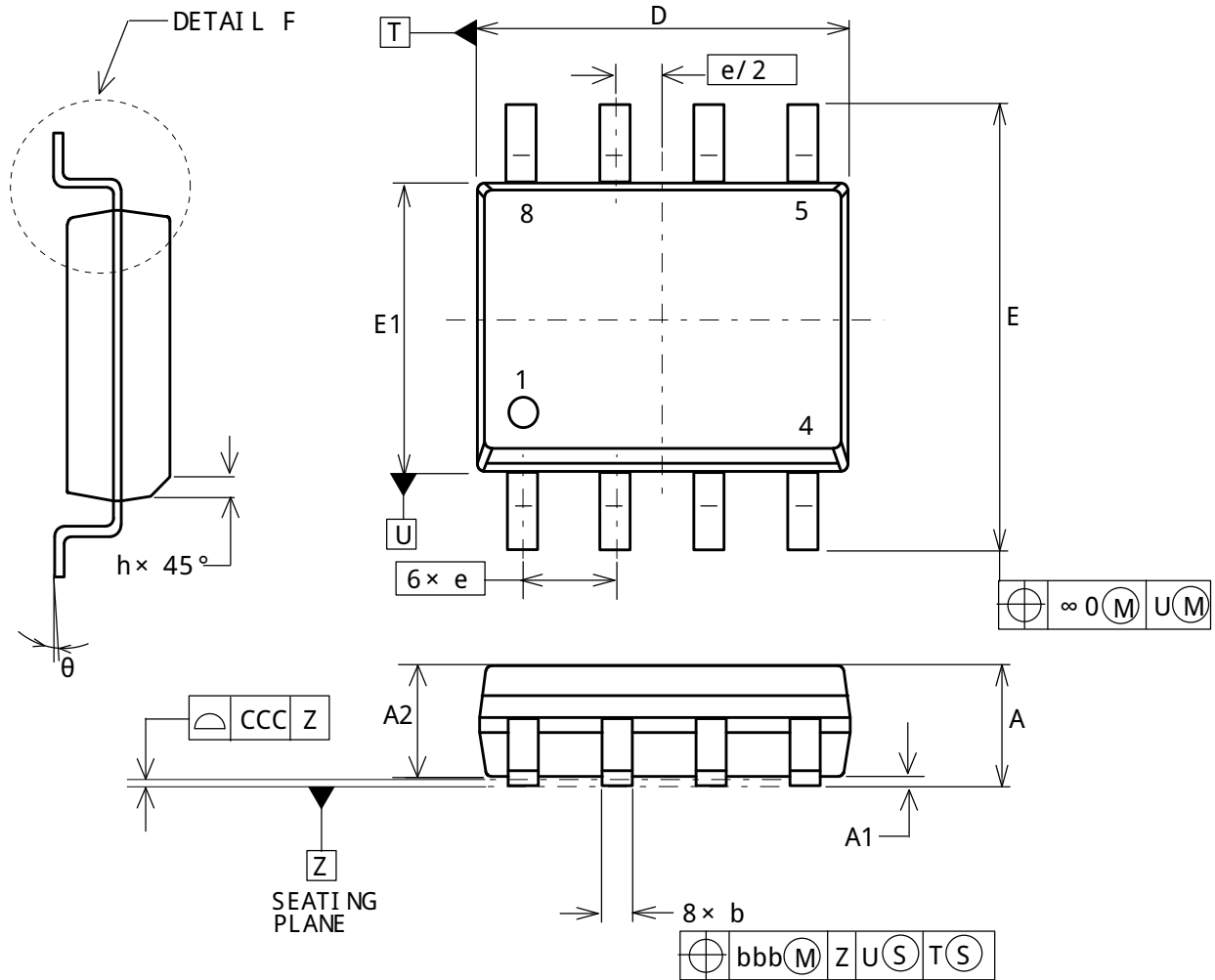
$R_L=2k\Omega$



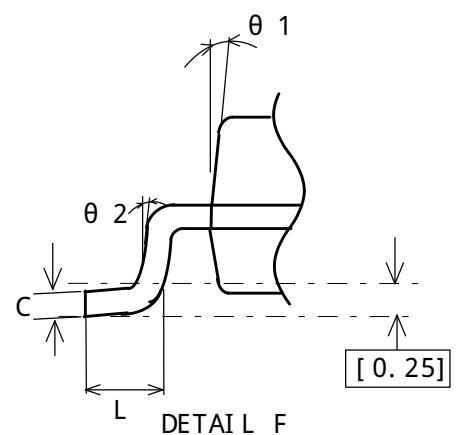
SOP8

Unit: mm

PACKAGE DIMENSIONS



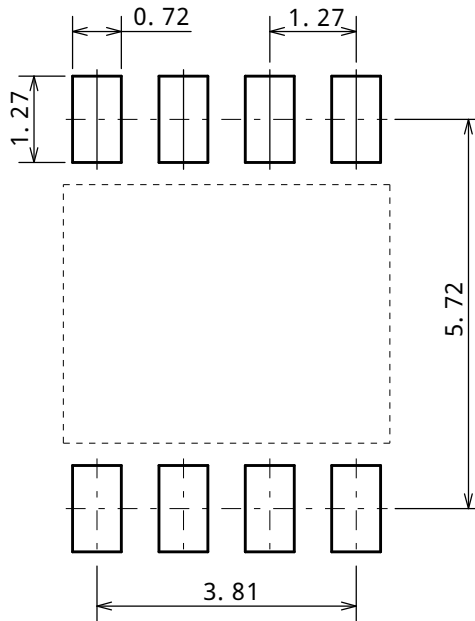
DESCRIPTION	SYMBOL	INCH			MILLIMETER		
		MIN	NCM	MAX	MIN	NCM	MAX
TOTAL THICKNESS	A	.053		.069	1.35		1.75
STAND OFF	A1	.004		.010	0.10		0.25
MOLD THICKNESS	A2	.049		-	1.25		-
LEAD WIDTH	b	.014		.019	0.35		0.49
L/F THICKNESS	C	.007		.010	0.19		0.25
BODY SIZE	D	.189		.197	4.80		5.00
	E1	.150		.157	3.80		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°
	θ 1	5°		15°	5°		15°
	θ 2	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

Unit: mm

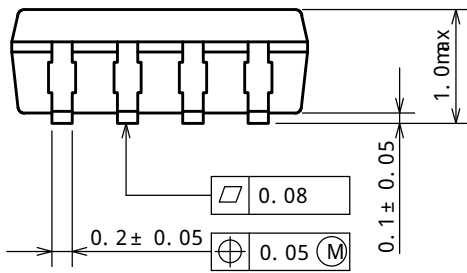
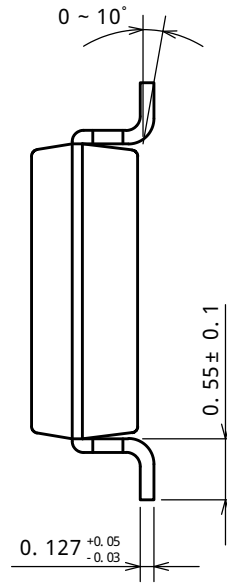
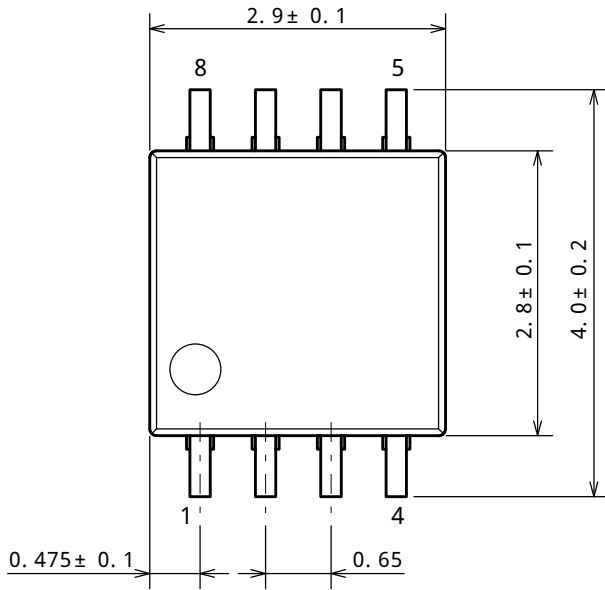
■ EXAMPLE OF SOLDER PADS DIMENSIONS



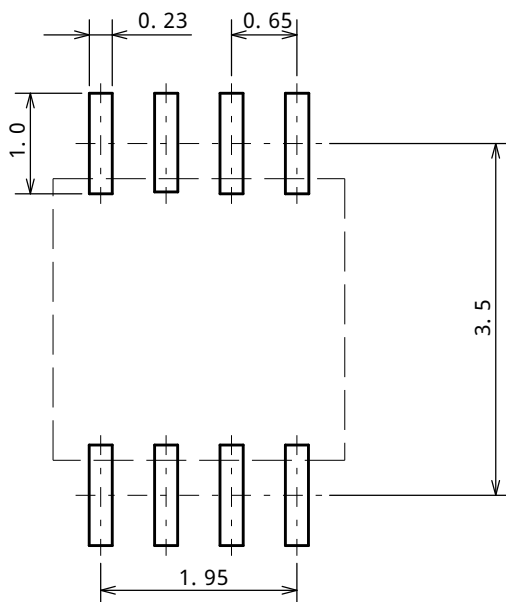
MSOP8 (TVSP8) JEDEC MO-187-DA/THIN TYPE

Unit: mm

■ PACKAGE DIMENSIONS



■ EXAMPLE OF SOLDER PADS DIMENSIONS

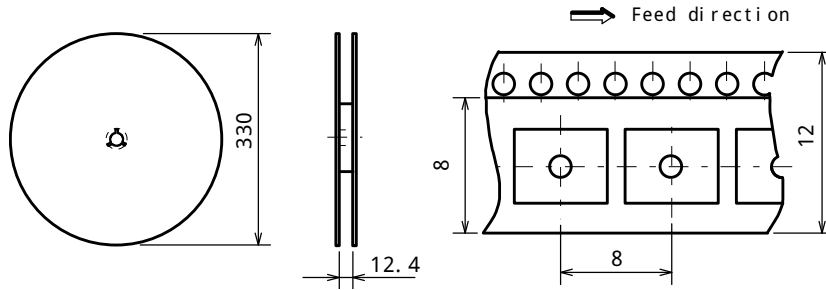


SOP8

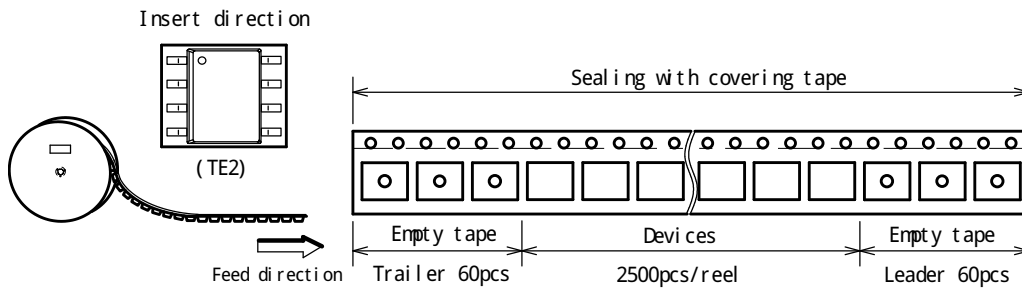
PACKING SPEC

Unit: mm

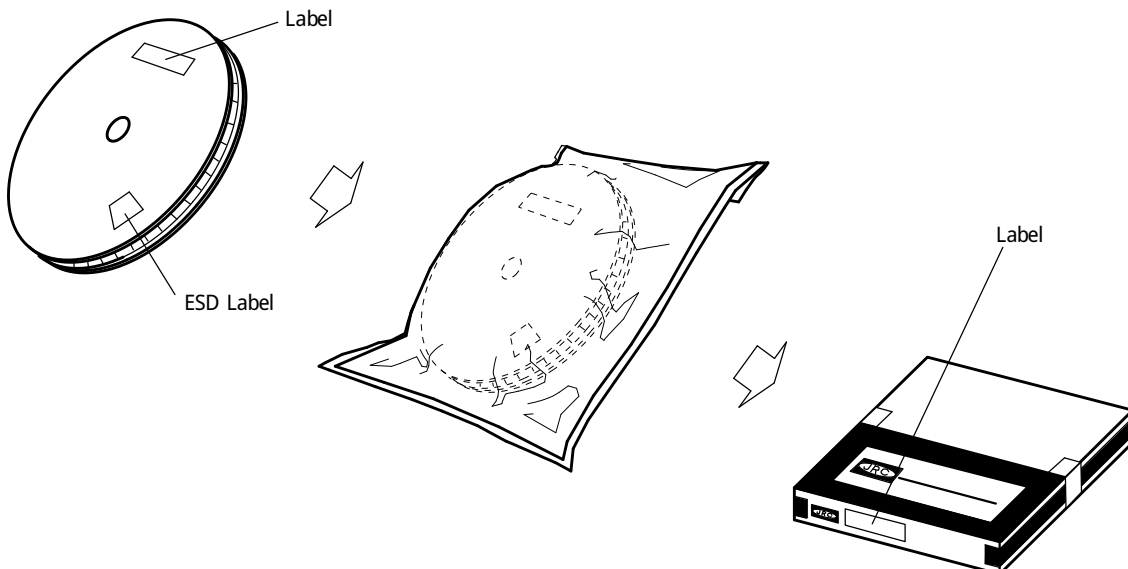
REEL DIMENSIONS / TAPING DIMENSIONS



TAPING STATE



PACKING STATE

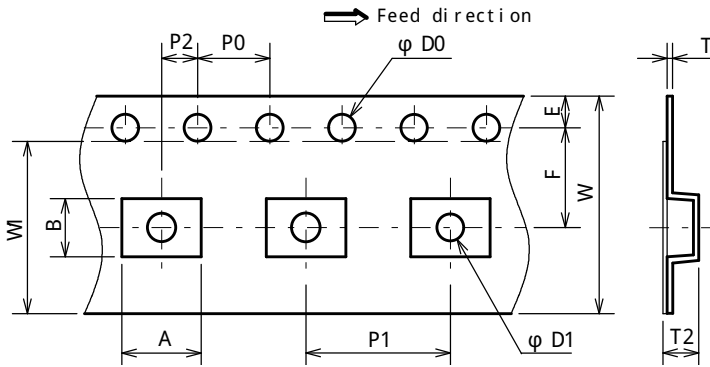


MSOP8 (TVSP8) MEET JEDEC MO-187-DATHIN TYPE

PACKING SPEC

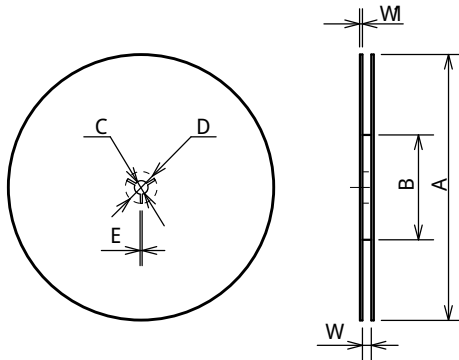
Unit: mm

TAPING DIMENSIONS



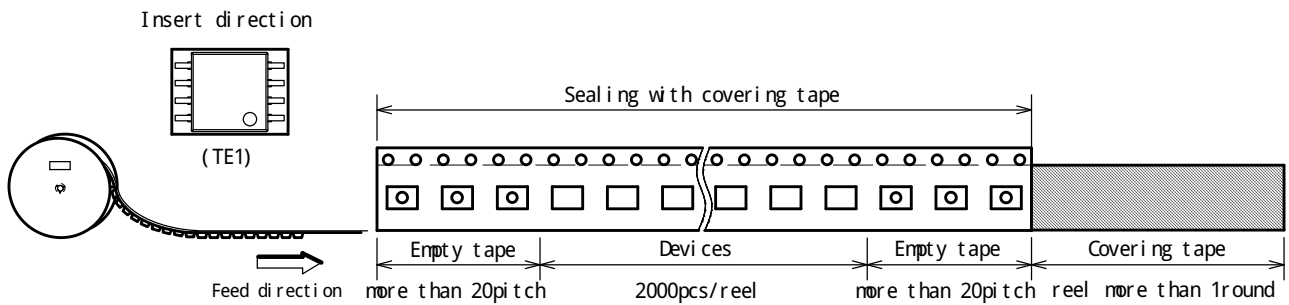
SYMBOL	DI MENSION	REMARKS
A	4.4	BOTTOM DI MENSION
B	3.2	BOTTOM DI MENSION
D0	1.5 ^{+0.1} ₀	
D1	1.5 ^{+0.1} ₀	
E	1.75± 0.1	
F	5.5± 0.05	
P0	4.0± 0.1	
P1	8.0± 0.1	
P2	2.0± 0.05	
T	0.30± 0.05	
T2	1.75 (MAX.)	
W	12.0± 0.3	
Wl	9.5	THICKNESS 0.1max

REEL DIMENSIONS

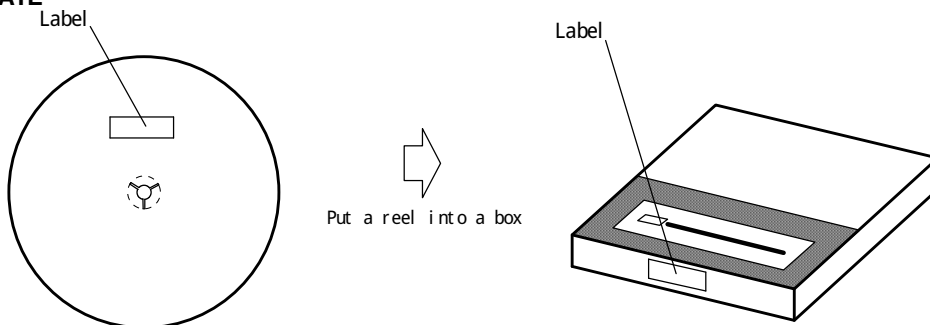


SYMBOL	DI MENSION
A	φ 254± 2
B	φ 100± 1
C	φ 13± 0.2
D	φ 21± 0.8
E	2± 0.5
W	13.5± 0.5
Wl	2.0± 0.2

TAPING STATE

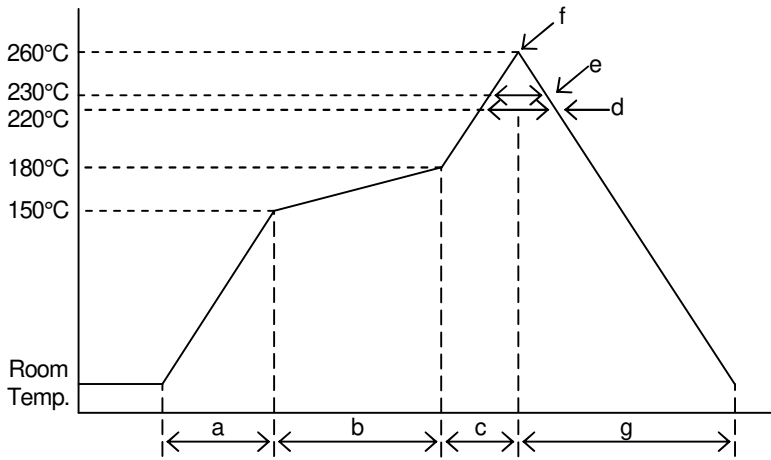


PACKING STATE



■ RECOMMENDED MOUNTING METHOD

INFRARED REFLOW SOLDERING PROFILE



a	Temperature ramping rate	1 to 4°C/s
b	Pre-heating temperature	150 to 180°C
	Pre-heating time	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.

[CAUTION]

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 - Fire Alarms / Intruder Detectors
 - Vehicle Control Equipment (Airplane, railroad, ship, etc.)
 - Various Safety Devices
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