

LOW NOISE, BIPOLAR INPUT DUAL AUDIO OPERATIONAL AMPLIFIER

FEATURES

- Designed for High-Quality Sound
 - Low Noise $3.5 \text{ nV}/\sqrt{\text{Hz}}$ at 1kHz
 - Low Distortion 0.001%
 - Slew Rate $6.8 \text{ V}/\mu\text{s}$
 - 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 $3.5 \text{ nV}/\sqrt{\text{Hz}}$ 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.

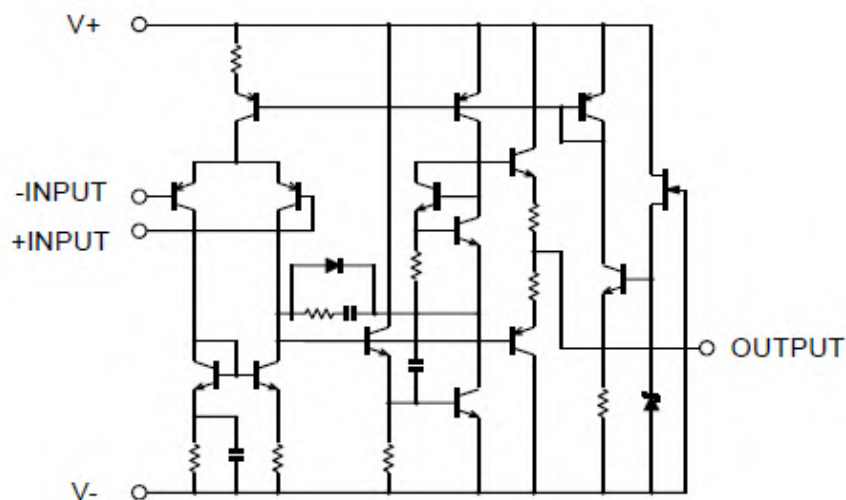
APPLICATIONS

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

■ RELATED PRODUCT

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

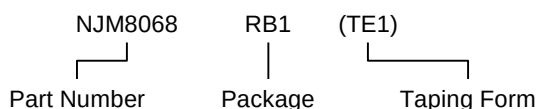
■ EQUIVALENT CIRCUIT



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⁾ 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 SOP8 MSOP8 (TVSP8)	Θ_{ja}	2-Layer / 4-Layer ⁽⁴⁾ 181 / 125 245 / 184	°C/W
Junction-to-Top of Package Characterization Parameter SOP8 MSOP8 (TVSP8)	Ψ_{jt}	2-Layer / 4-Layer ⁽⁴⁾ 49 / 43 51 / 45	°C/W

(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^+ .

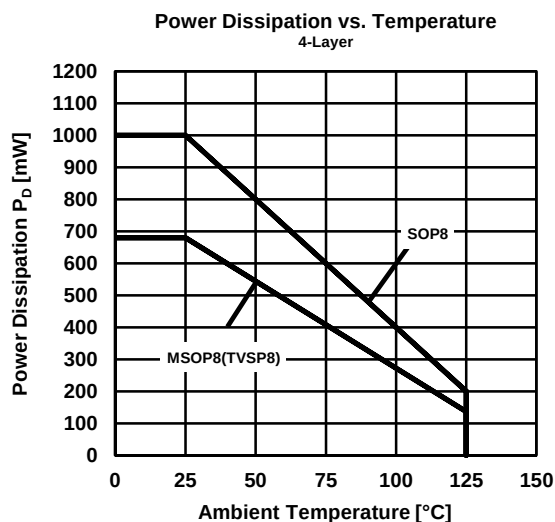
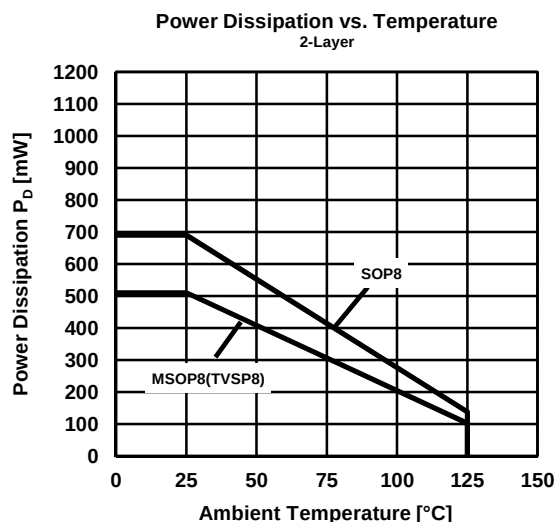
The normal operation will establish when any input is within the "Common-Mode Input Voltage Range" of electrical characteristics.

(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



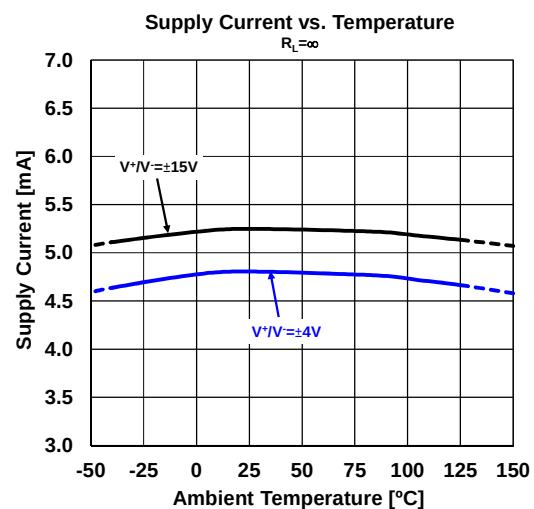
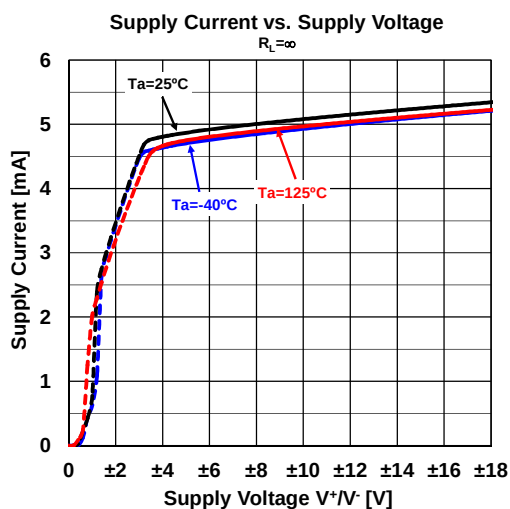
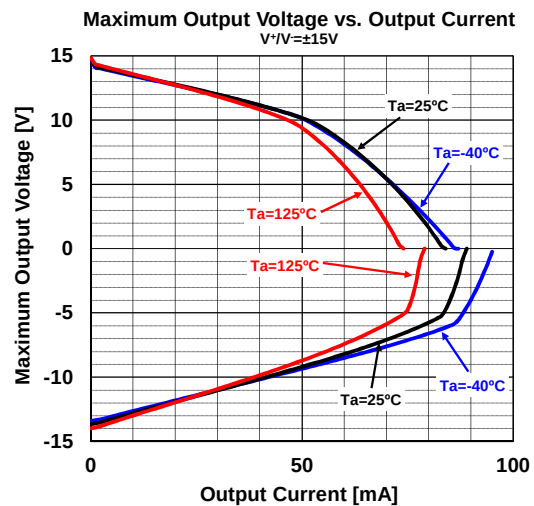
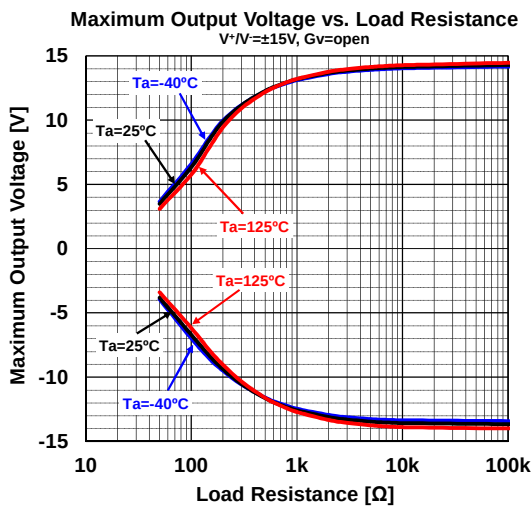
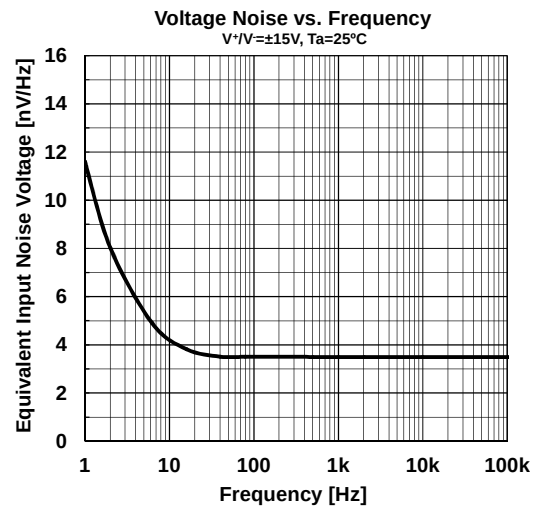
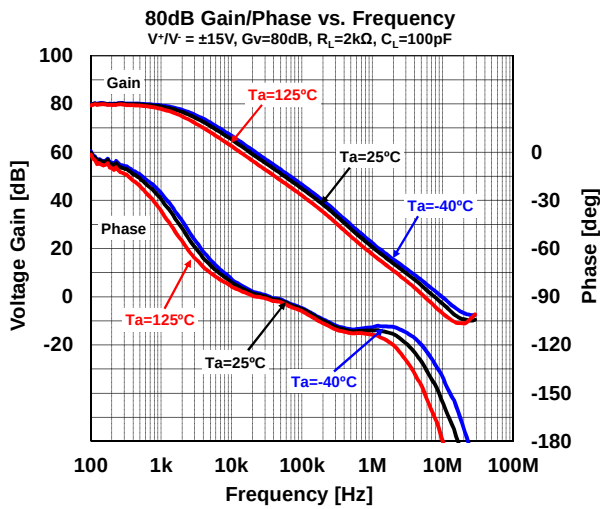
■ RECOMMENDED OPERATING CONDITIONS

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

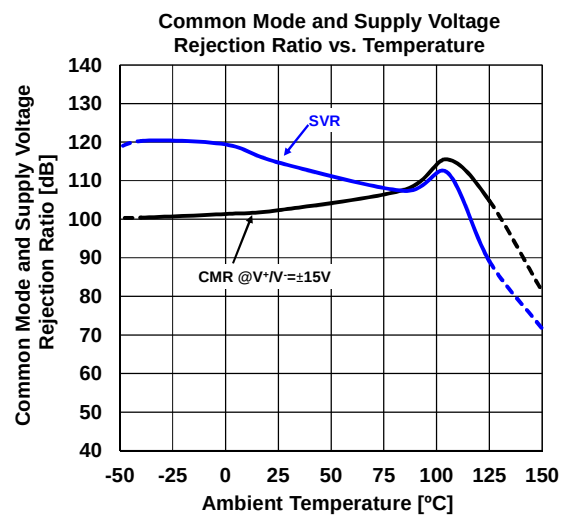
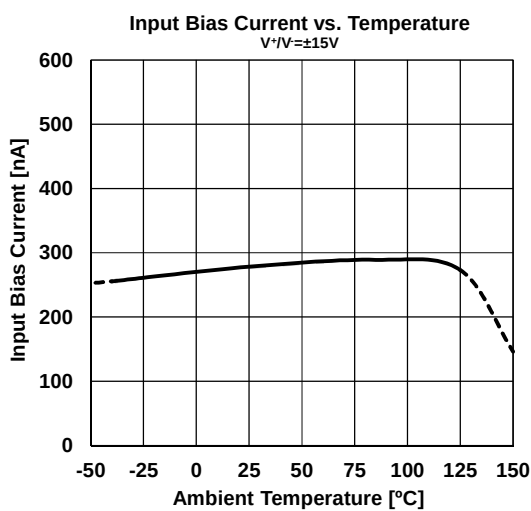
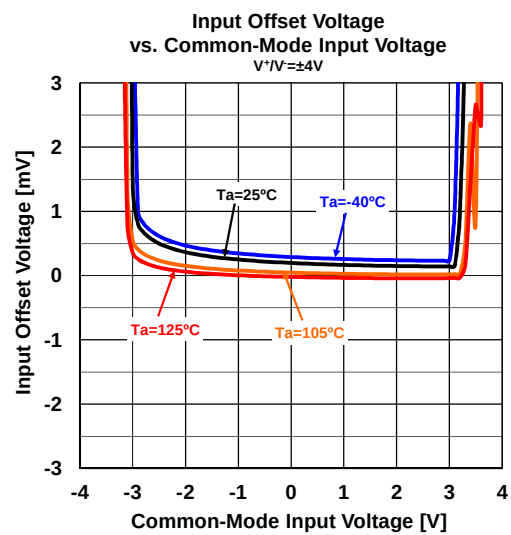
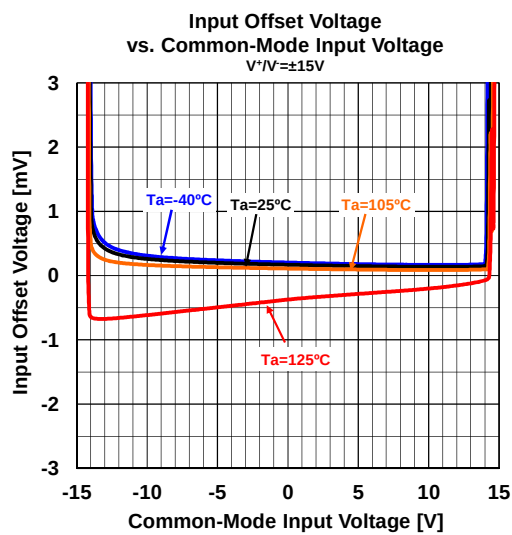
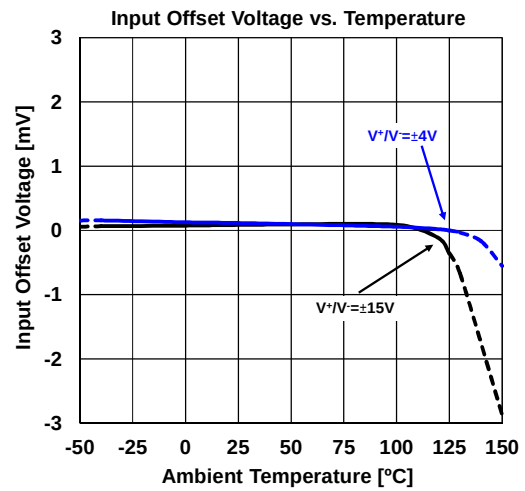
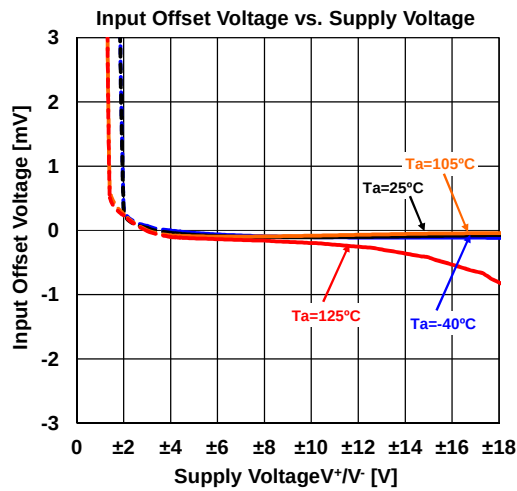
■ ELECTRICAL CHARACTERISTICS ($V^+V^-=\pm 15\text{V}$, $T_a=25^\circ\text{C}$, unless otherwise noted.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
INPUT/OUTPUT CHARACTERISTICS						
Input Offset Voltage	V_{IO}	$R_S \leq 10\text{k}\Omega$	-	0.3	3	mV
Input Bias Current	I_B		-	260	1000	nA
Input Offset Current	I_{IO}		-	5	200	nA
Open-Loop Voltage Gain	A_V	$R_L=2\text{k}\Omega$, $V_O=\pm 10\text{V}$	90	120	-	dB
Common-Mode Rejection Ratio	CMR		80	110	-	dB
Input Resistance	R_{IN}		50	300	-	$\text{k}\Omega$
Common-Mode Input Voltage Range	V_{ICM}		± 12	± 13.5	-	V
Maximum Output Voltage	V_{OM}	$R_L \geq 2\text{k}\Omega$	± 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	$f=100\text{kHz}$	-	19	-	MHz
Unity Gain Frequency	f_T	$G_V=0\text{dB}$	-	7.5	-	MHz
Slew Rate	SR	$R_L \geq 2\text{k}\Omega$	-	6.8	-	$\text{V}/\mu\text{s}$
Noise, Distortion						
Equivalent Input Noise Voltage	e_n	$f=1\text{kHz}$	-	3.5	-	$\text{nV}/\sqrt{\text{Hz}}$
		FLAT, $f=20\text{Hz}$ to 20kHz	-	0.5	0.7	μV_{rms}
Total Harmonic Distortion + Noise	THD+N		-	0.001	-	%
Channel Separation	CS		-	120	-	dB

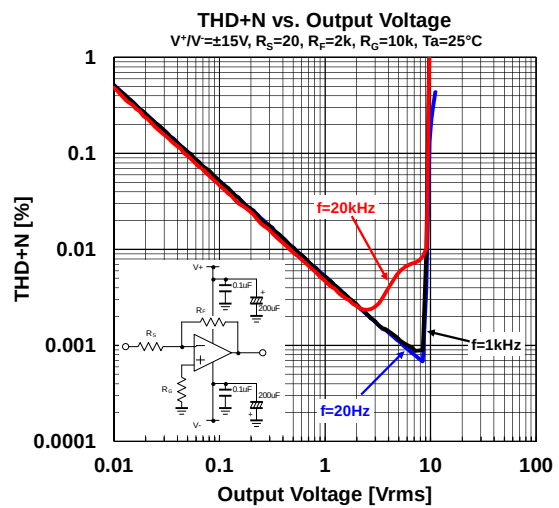
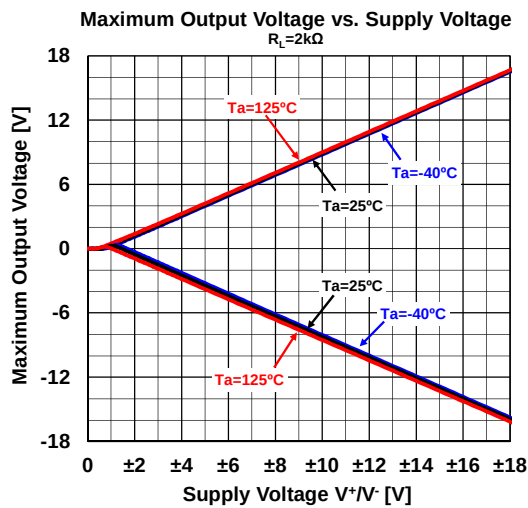
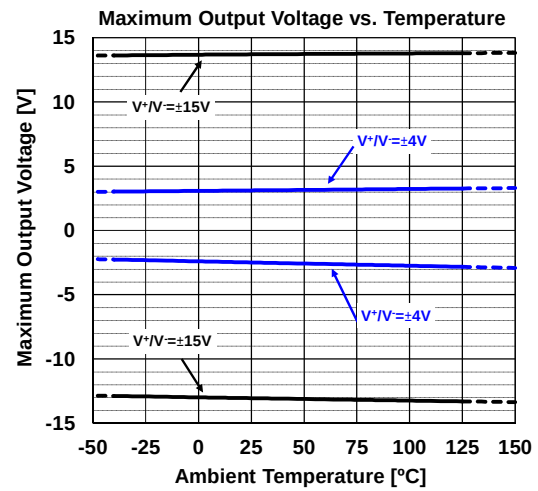
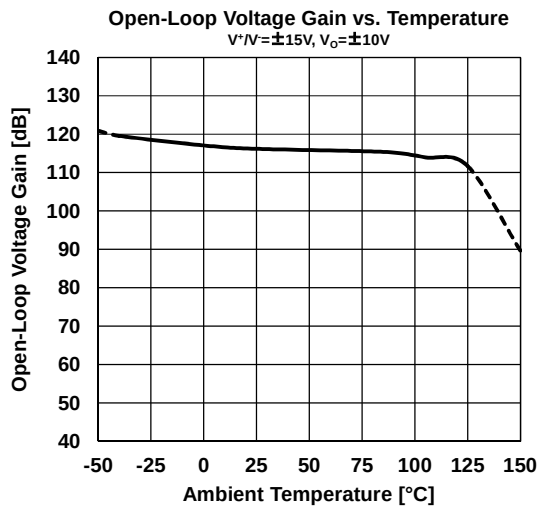
■ TYPICAL CHARACTERISTICS



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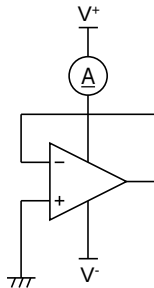


■ TYPICAL CHARACTERISTICS



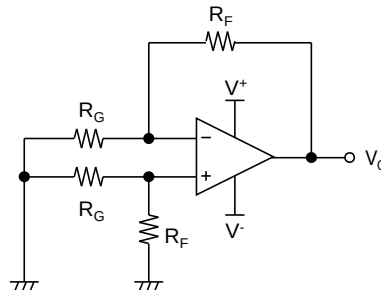
■ TEST CIRCUITS

- I_{SUPPLY}



- V_{IO} , CMR, SVR

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



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

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

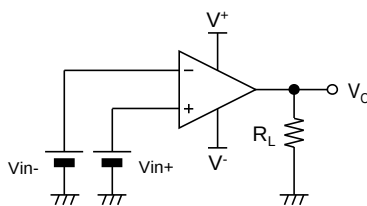
$$SVR = 20 \log \frac{\Delta V_S \left(1 + \frac{R_F}{R_G} \right)}{\Delta V_O}$$

$V_S = V^+ - V^-$

- V_{OH} , V_{OL}

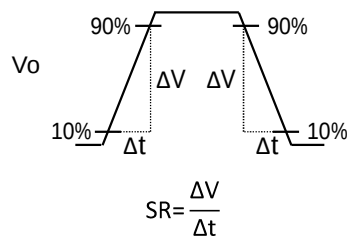
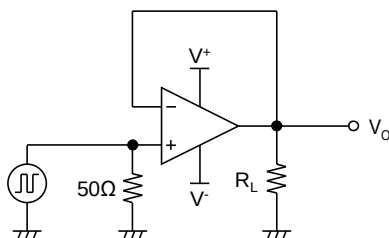
V_{OH} : $V_{in+} = 1V$, $V_{in-} = -1V$

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



- SR

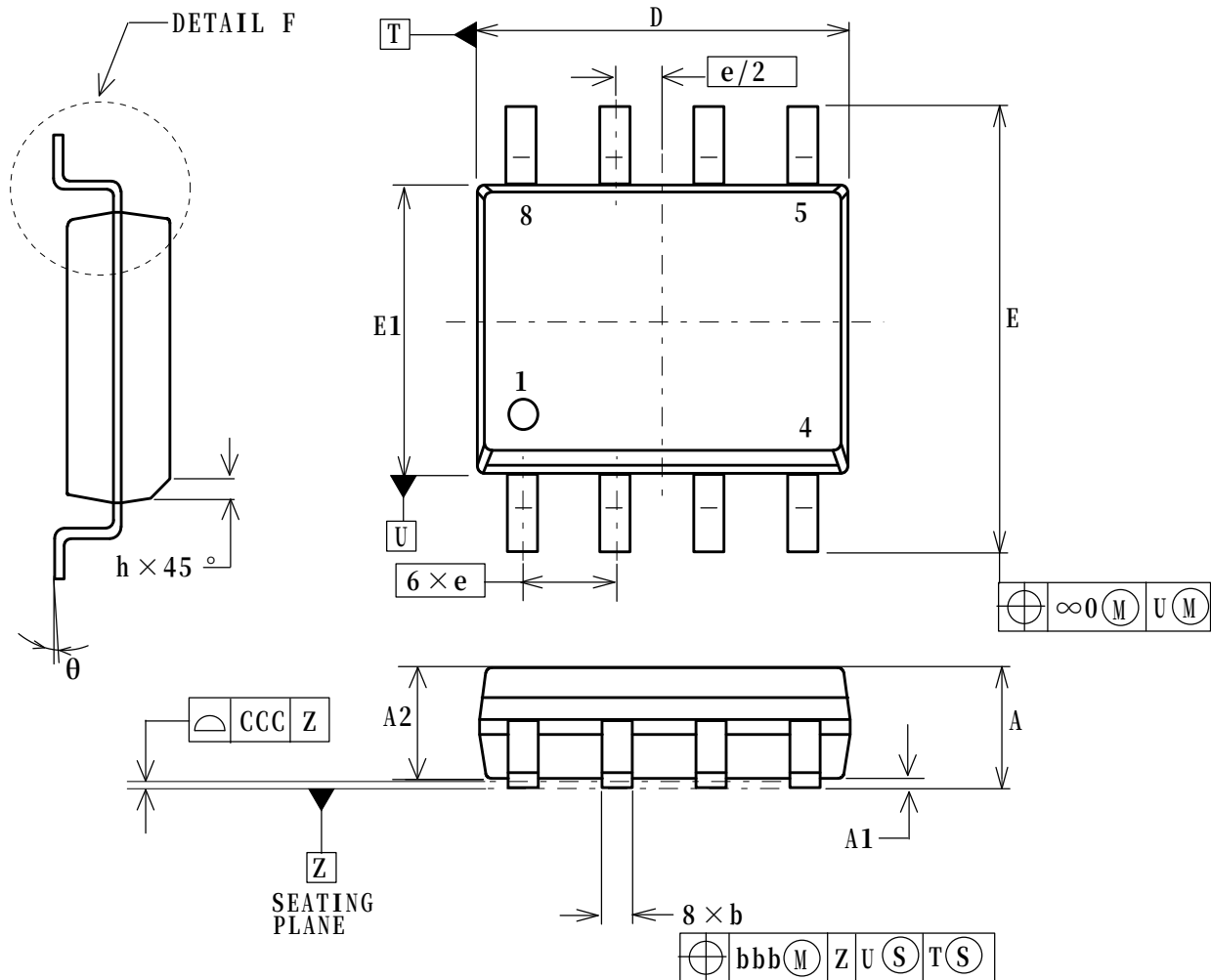
$R_L=2k\Omega$



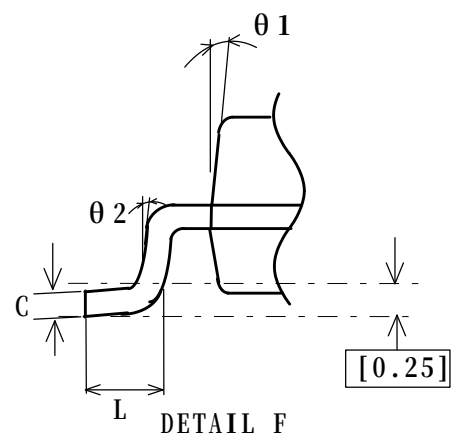
SOP8

Unit: mm

■ PACKAGE DIMENSIONS



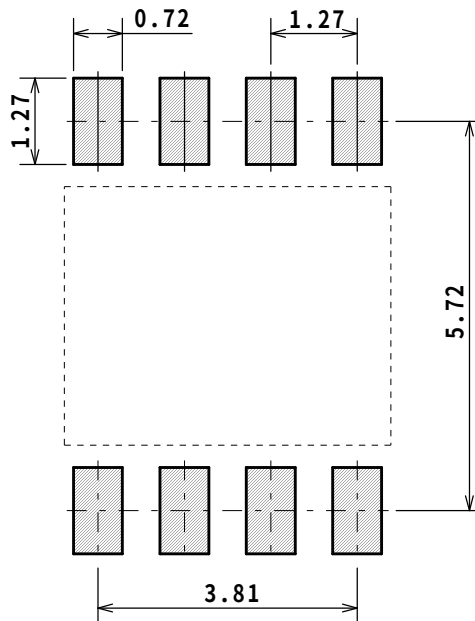
DESCRIPTION	SYMBOL	INCH			MILLIMETER		
		MIN	NCM	MAX	MIN	NCM	MAX
TOTAL THICKNESS	A	.053		.069	1.35		1.75
STAND OFF	A1	.004		.010	0.10		0.25
MOLD THICKNESS	A2	.049		-	1.25		-
LEAD WIDTH	b	.014		.019	0.35		0.49
L/F THICKNESS	C	.007		.010	0.19		0.25
BODY SIZE	D	.189		.197	4.80		5.00
	E1	.150		.157	3.80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

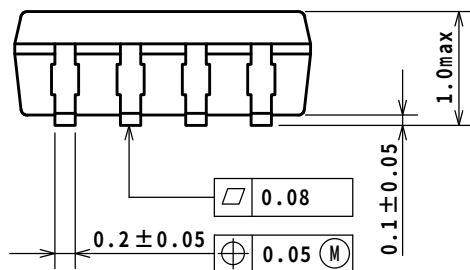
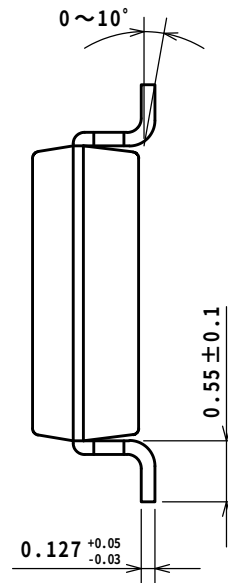
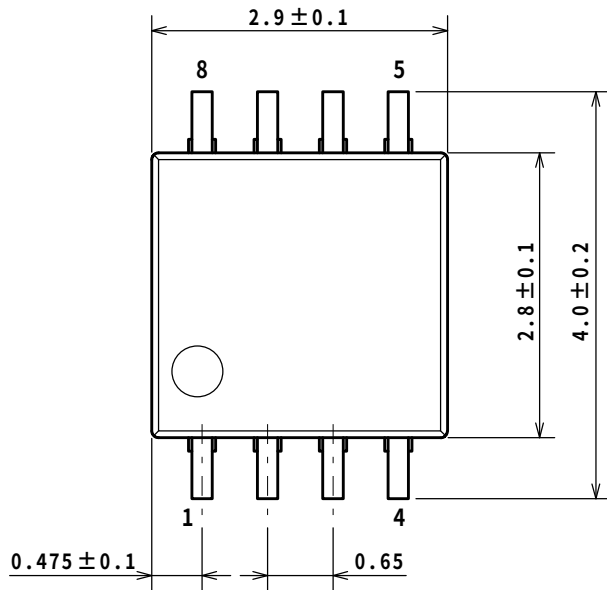
■ EXAMPLE OF SOLDER PADS DIMENSIONS



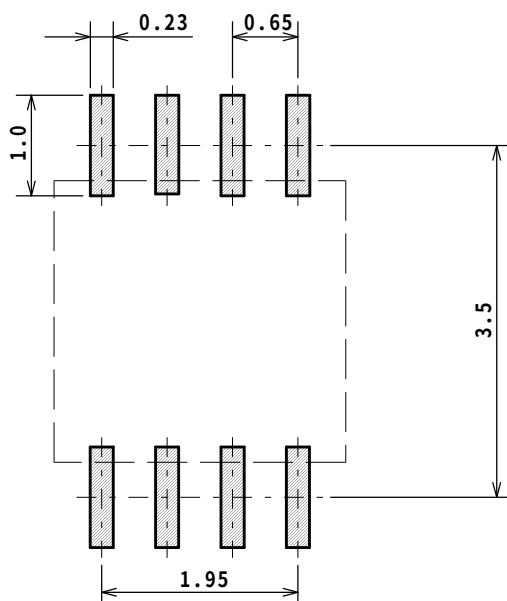
MSOP8 (TVSP8) JEDEC MO-187-DA/THIN TYPE

Unit: mm

■ PACKAGE DIMENSIONS



■ EXAMPLE OF SOLDER PADS DIMENSIONS

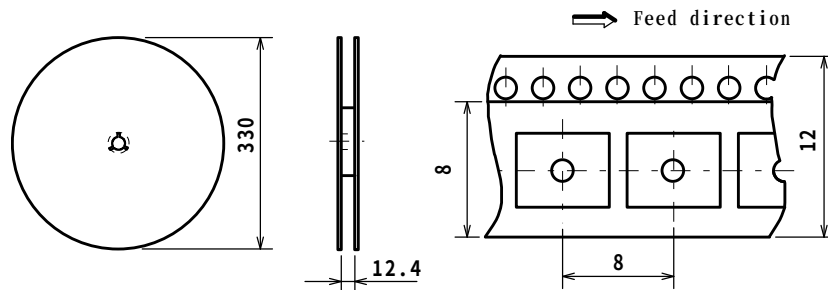


SOP8

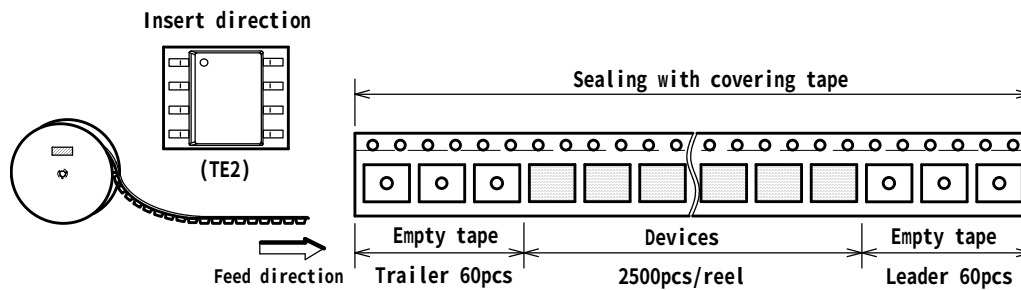
■ PACKING SPEC

Unit: mm

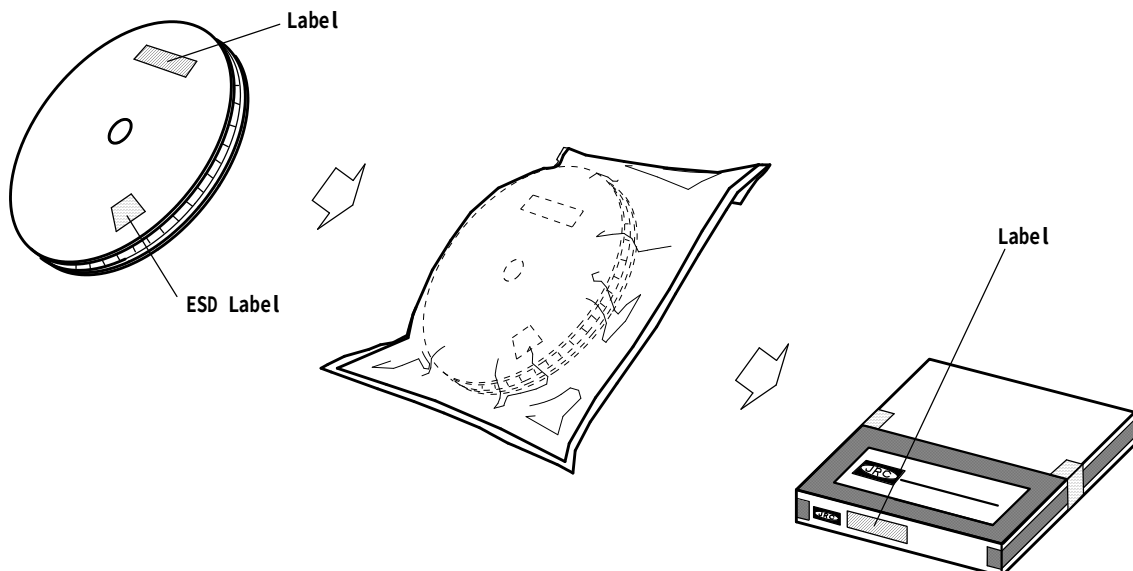
REEL DIMENSIONS / TAPING DIMENSIONS



TAPING STATE



PACKING STATE

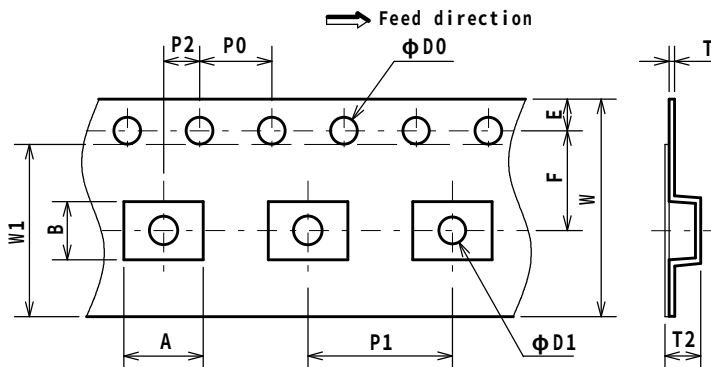


MSOP8 (TVSP8) MEET JEDEC MO-187-DA/THIN TYPE

PACKING SPEC

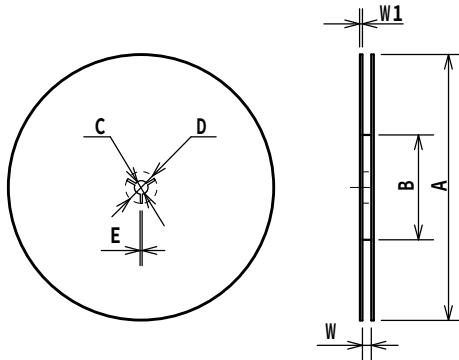
Unit: mm

TAPING DIMENSIONS



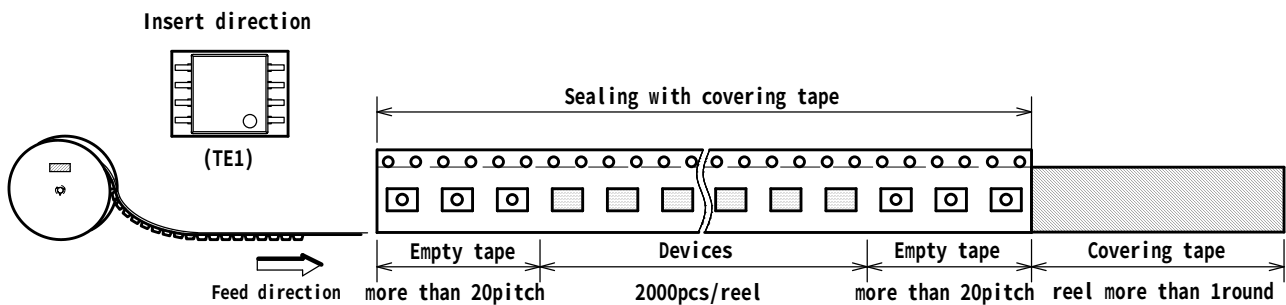
SYMBOL	DIMENSION	REMARKS
A	4.4	BOTTOM DIMENSION
B	3.2	BOTTOM DIMENSION
D0	$1.5^{+0.1}_0$	
D1	$1.5^{+0.1}_0$	
E	1.75 ± 0.1	
F	5.5 ± 0.05	
P0	4.0 ± 0.1	
P1	8.0 ± 0.1	
P2	2.0 ± 0.05	
T	0.30 ± 0.05	
T2	1.75 (MAX.)	
W	12.0 ± 0.3	
W1	9.5	THICKNESS 0.1max

REEL DIMENSIONS

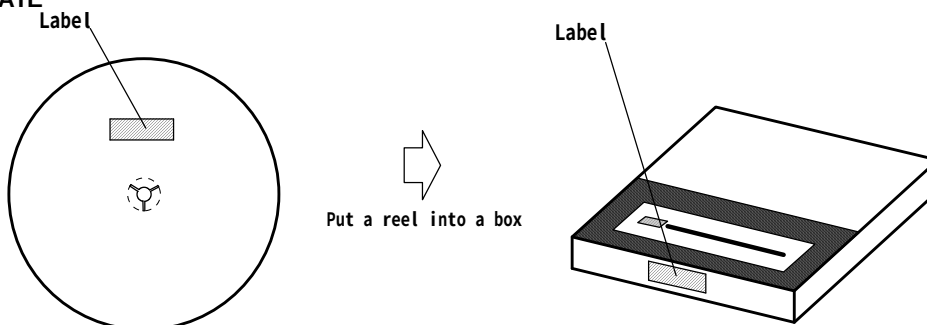


SYMBOL	DIMENSION
A	$\Phi 254 \pm 2$
B	$\Phi 100 \pm 1$
C	$\Phi 13 \pm 0.2$
D	$\Phi 21 \pm 0.8$
E	2 ± 0.5
W	13.5 ± 0.5
W1	2.0 ± 0.2

TAPING STATE

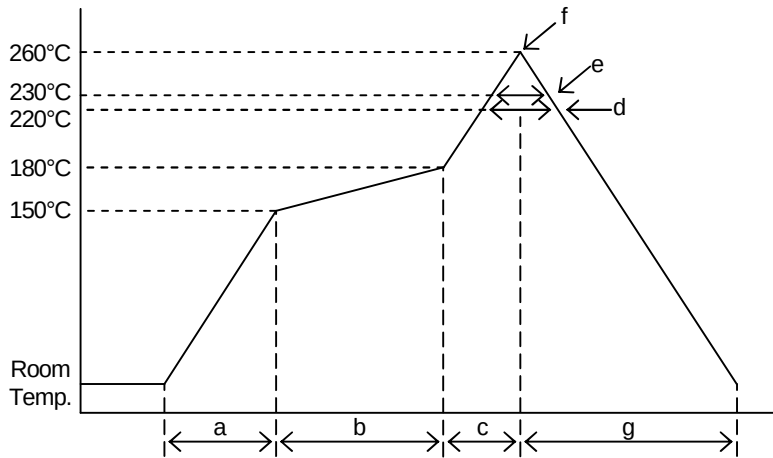


PACKING STATE



■ 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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