

## DUAL AUDIO OPERATIONAL AMPLIFIER

### FEATURES

- Supply Voltage  $\pm 2V$  to  $\pm 18V$
  - Low Input Noise Voltage  $5nV/\sqrt{\text{Hz}}$  typ. at  $f=1\text{kHz}$
  - Wide Gain Bandwidth Product  $15\text{MHz}$  typ.
  - Low Distortion  $0.0005\%$  typ.
  - Slew Rate  $5V/\mu\text{s}$  typ.
  - Bipolar Technology
  - Package Outline
    - SOP8
    - MSOP8 (TVSP8)\*
- \*meet JEDEC MO-187-DA / thin type SSOP8
- Internal ESD Protection
    - Human Body Model (HBM)  $\pm 2000V$  typ.
  - Wide Temperature Range  $-40^\circ\text{C}$  to  $125^\circ\text{C}$

### DESCRIPTION

The NJM8080 is dual operational amplifier designed for audio applications. NJM8080 finely refines to every detail from Si-wafer to circuit layout, stick in a thorough improvement in sound quality. The NJM8080 features high resolution and crispy-clear high frequency sound, which can fully perform the digital sound source with loss-less.

NJM8080 features low noise, wide gain-bandwidth, low distortion and high output current, and various reliabilities and conveniences are improved. NJM8080 can widely be used as the standard audio operational amplifier.

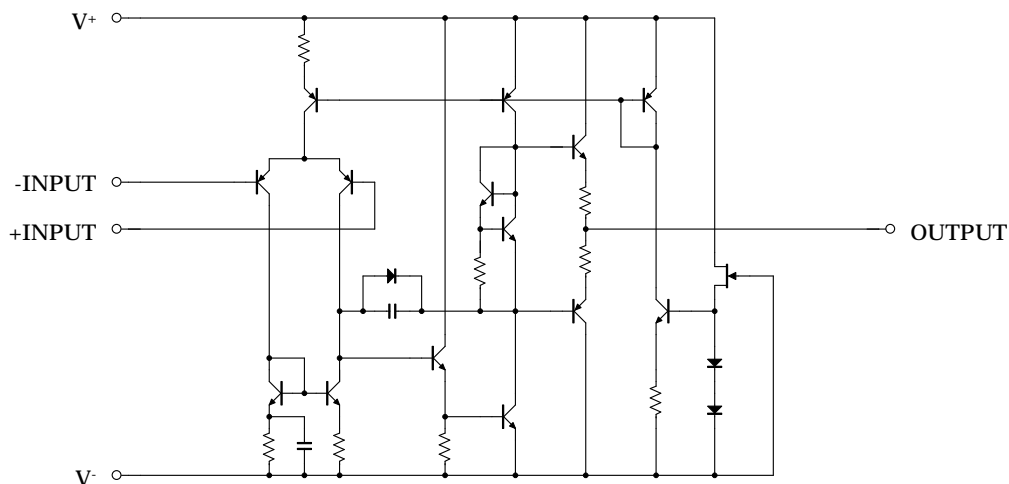
### APPLICATIONS

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

### RELATED PRODUCT

PRODUCT NAME	FEATURES
NJM8068	$3.5nV/\sqrt{\text{Hz}}$ , $0.001\%$ , $6.8V/\mu\text{s}$ , $19\text{MHz}$ (Low noise, low distortion audio Op-Amp)

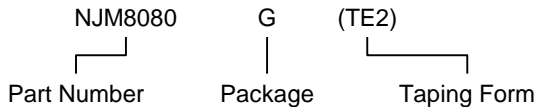
### EQUIVALENT CIRCUIT



## ■ PIN CONFIGURATIONS

PRODUCT NAME	NJM8080G	NJM8080RB1	NJM8080V
Package	SOP8	MSOP8 (TVSP8)	SSOP8
Pin Functions			

## ■ PRODUCT NAME INFORMATION



## ■ ORDER INFORMATION

PRODUCT NAME	PACKAGE	RoHS	HALOGEN-FREE	TERMINAL FINISH	MARKING	WEIGHT (mg)	MOQ (pcs)
NJM8080G	SOP8	Yes	Yes	Pure Sn	8080	88	2500
NJM8080RB1	MSOP8 (TVSP8)	Yes	Yes	Sn2Bi	8080	18	2000
NJM8080V	SSOP8	Yes	Yes	Sn2Bi	8080	42	2000

## ■ ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	$V^+ / V^-$	$\pm 18$	V
Differential Input Voltage <sup>(1)</sup>	$V_{ID}$	$\pm 36$	V
Input Voltage <sup>(2)</sup>	$V_{IN}$	$V^- - 0.3$ to $V^+ + 36$	V
Output Terminal Input Voltage	$V_O$	$V^- - 0.3$ to $V^+ + 0.3$	V
Power Dissipation <sup>(3)</sup>	$P_D$	2-Layer / 4-Layer <sup>(4)</sup>	
SOP8		690 / 1000	mW
MSOP8 (TVSP8)		510 / 680	
SSOP8	430 / 540		
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	$\Theta_{ja}$	2-Layer / 4-Layer <sup>(4)</sup>	
SOP8		181 / 125	°C/W
MSOP8 (TVSP8)		245 / 184	
SSOP8	291 / 231		
Junction-to-Top of Package Characterization Parameter	$\Psi_{jt}$	2-Layer / 4-Layer <sup>(4)</sup>	
SOP8		49 / 43	°C/W
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  $V^+$ .

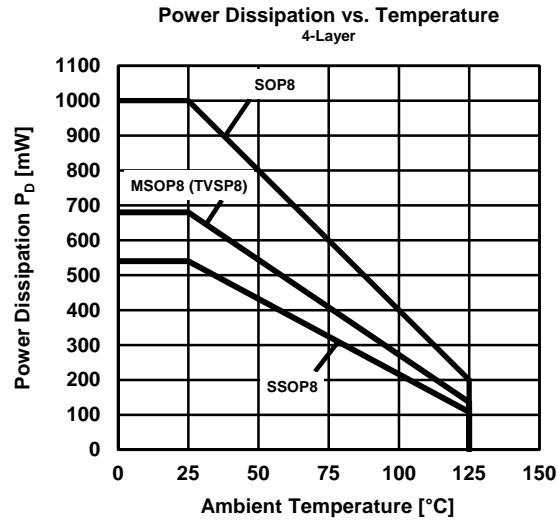
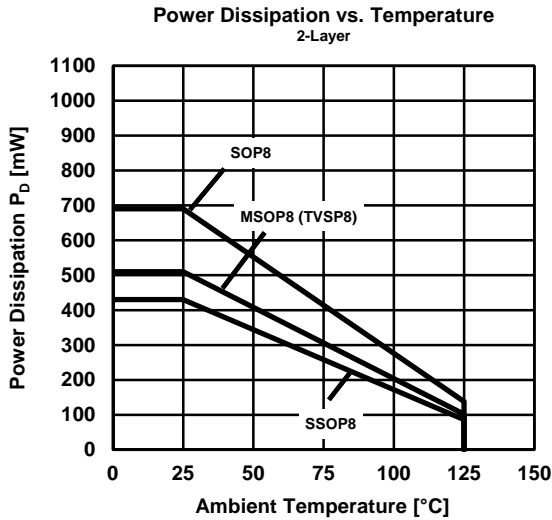
The normal operation will establish when any input is within the "Common-Mode Input Voltage Range" of electrical characteristics.

(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. (76.2x114.3x1.6 mm: based on EIA/JDEC standard, 2-layer FR-4)

4-Layer: Mounted on glass epoxy board. (76.2x114.3x1.6 mm: based on EIA/JDEC standard, 4-layer FR-4), internal Cu area: 74.2 x 74.2 mm

## ■ POWER DISSIPATION vs. AMBIENT TEMPERATURE



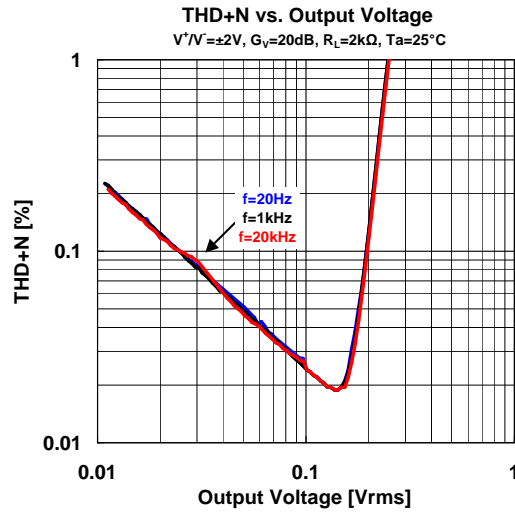
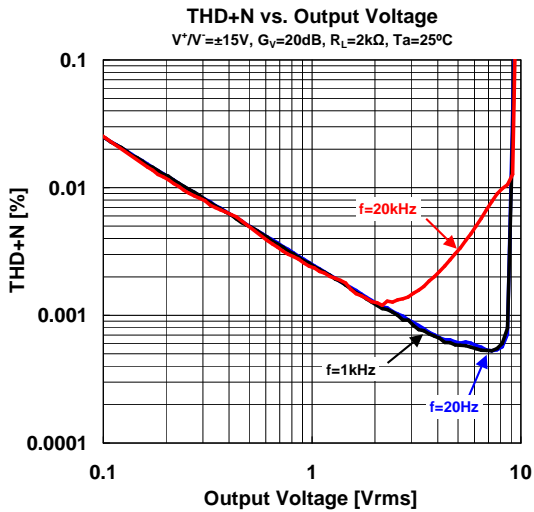
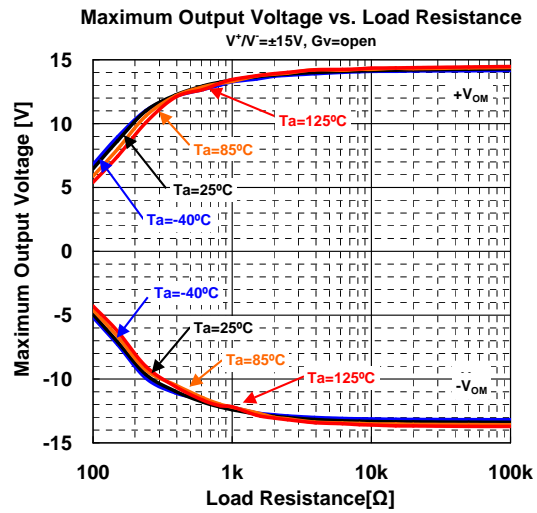
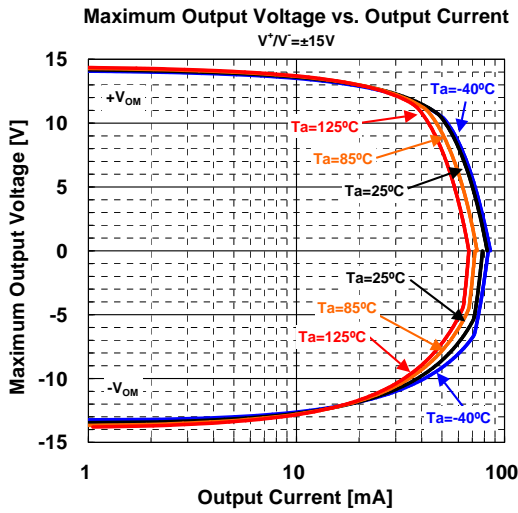
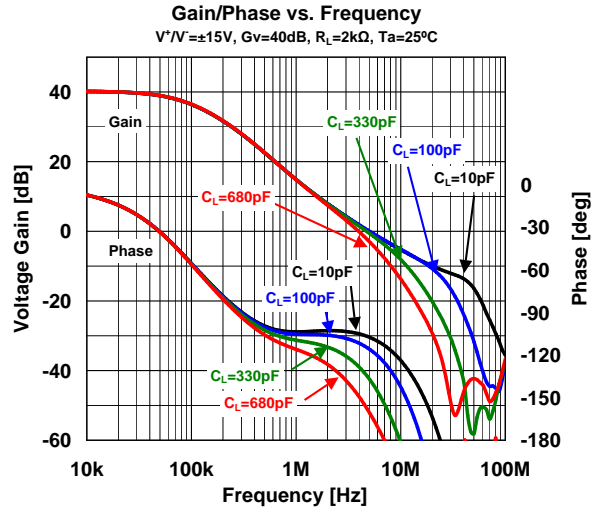
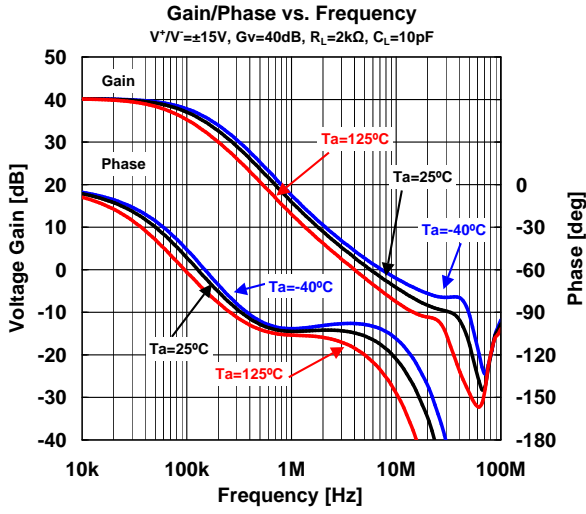
## RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	CONDITIONS	VALUE	UNIT
Supply Voltage	$V^+V^-$	$T_a=25^\circ\text{C}$	$\pm 2$ to $\pm 18$	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.)

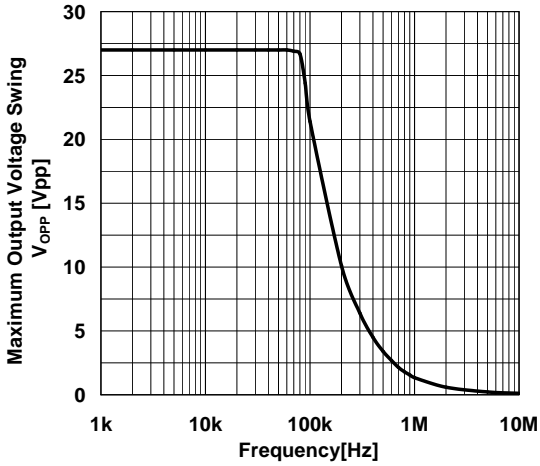
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>INPUT/OUTPUT CHARACTERISTICS</b>						
Input Offset Voltage	$V_{IO}$	$R_S \leq 10\text{k}\Omega$	-	0.3	3	mV
Input Bias Current	$I_B$		-	100	500	nA
Input Offset Current	$I_{IO}$		-	5	200	nA
Input Resistance	$R_{IN}$		-	0.5	-	M $\Omega$
Open-Loop Voltage Gain	$A_V$	$R_L \geq 2\text{k}\Omega, V_O = \pm 10\text{V}$	90	110	-	dB
Maximum Output Voltage	$V_{OM}$	$R_L \geq 2\text{k}\Omega$	$\pm 12$	$\pm 13.5$	-	V
Common-Mode Input Voltage Range	$V_{ICM}$		$\pm 12$	$\pm 13.5$	-	V
Common-Mode Rejection Ratio	CMR	$R_S \leq 10\text{k}\Omega$	80	110	-	dB
<b>POWER SUPPLY</b>						
Supply Voltage Rejection Ratio	SVR	$R_S \leq 10\text{k}\Omega$	80	110	-	dB
Supply Current	$I_{SUPPLY}$		-	6	9	mA
<b>AC CHARACTERISTICS</b>						
Slew Rate	SR	$R_L \geq 2\text{k}\Omega$	-	5	-	V/ $\mu\text{s}$
Gain Bandwidth Product	GBW	$f=10\text{kHz}$	-	15	-	MHz
Total Harmonic Distortion + Noise	THD+N	$A_V=20\text{dB}, V_O=5\text{V}, R_L=2\text{k}\Omega, f=1\text{kHz}$	-	0.0005	-	%
Equivalent Input Noise Voltage	$e_n$	$f=1\text{kHz}$	-	5	-	nV/ $\sqrt{\text{Hz}}$

## ■ TYPICAL CHARACTERISTICS

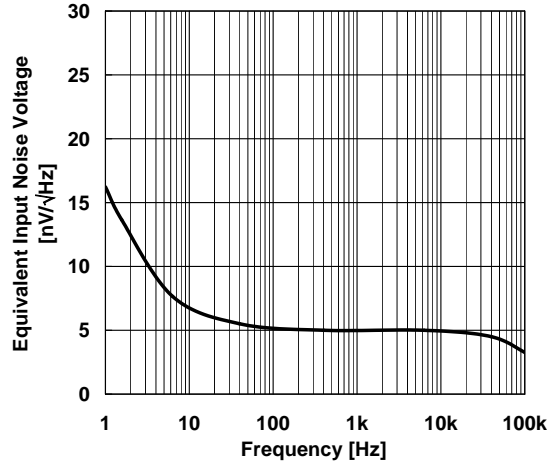


## ■ TYPICAL CHARACTERISTICS

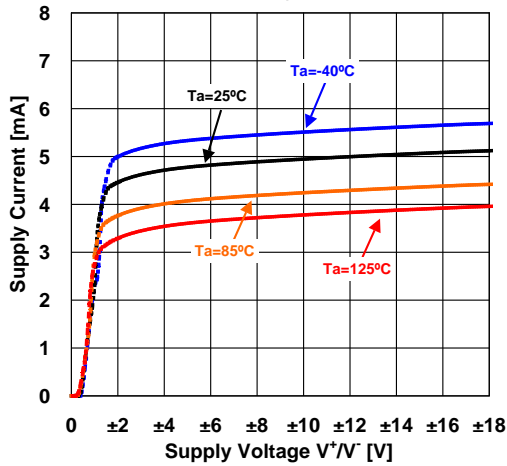
Maximum Output Voltage Swing vs. Frequency  
 $V^+V^- = \pm 15V$ ,  $R_L = 2k\Omega$ ,  $T_a = 25^\circ C$



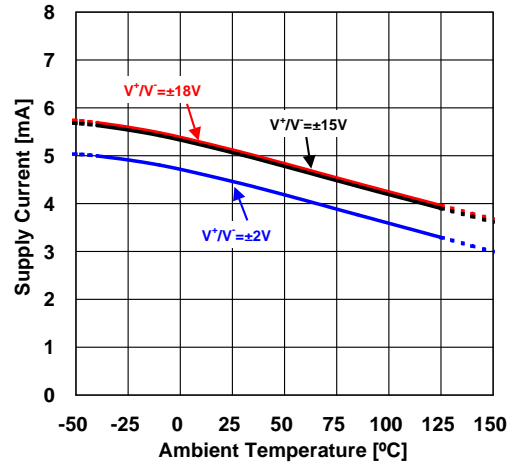
Voltage Noise vs. Frequency  
 $V^+V^- = \pm 15V$ ,  $G_v = 40dB$ ,  $R_F = 2k\Omega$ ,  $T_a = 25^\circ C$



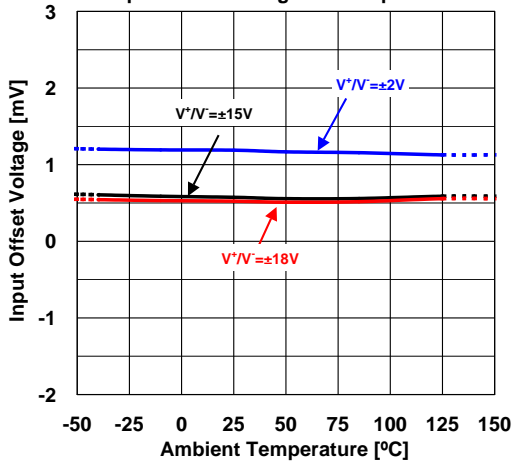
Supply Current vs. Supply Voltage  
 $R_L = open$



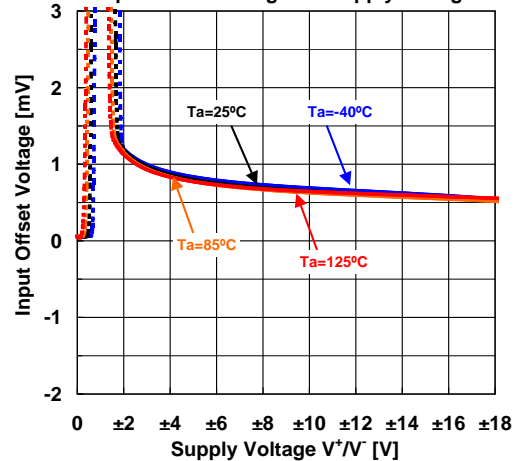
Supply Current vs. Temperature  
 $R_L = open$



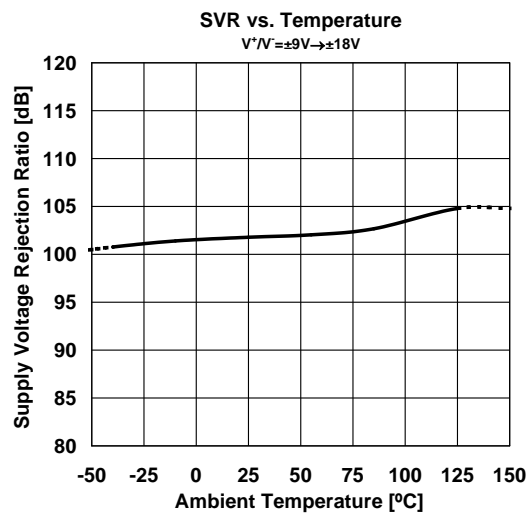
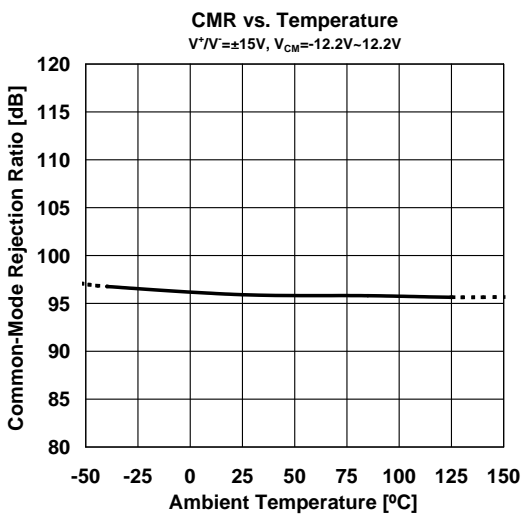
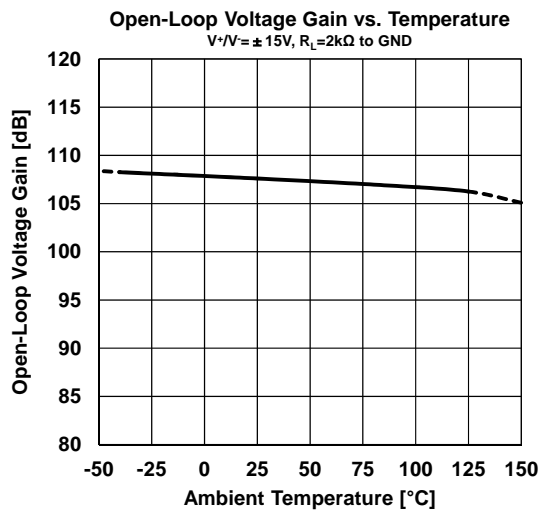
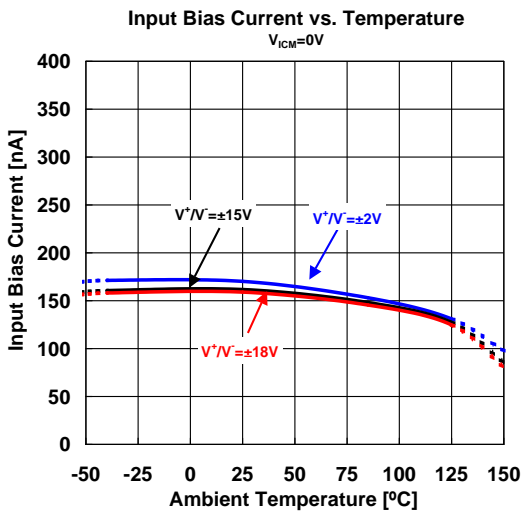
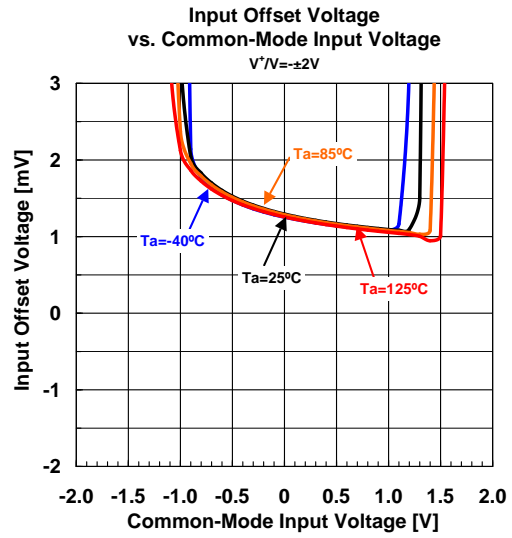
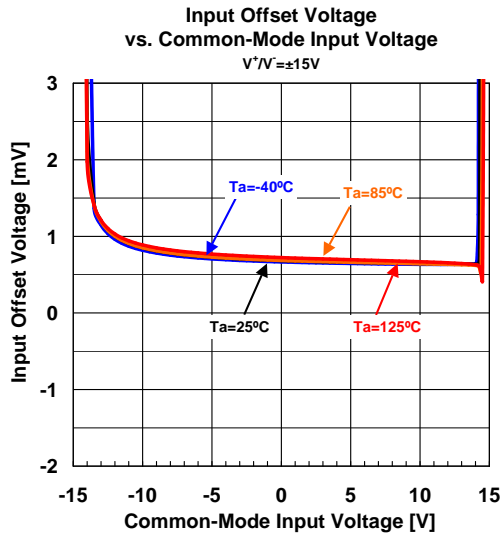
Input Offset Voltage vs. Temperature



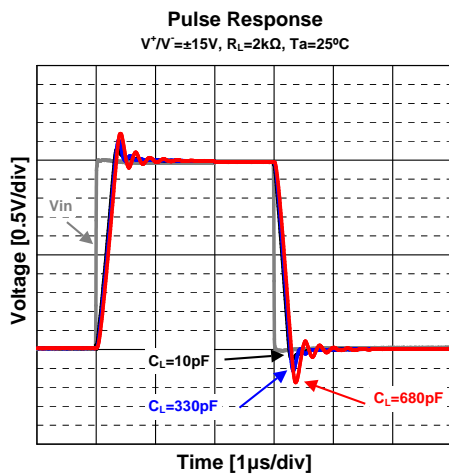
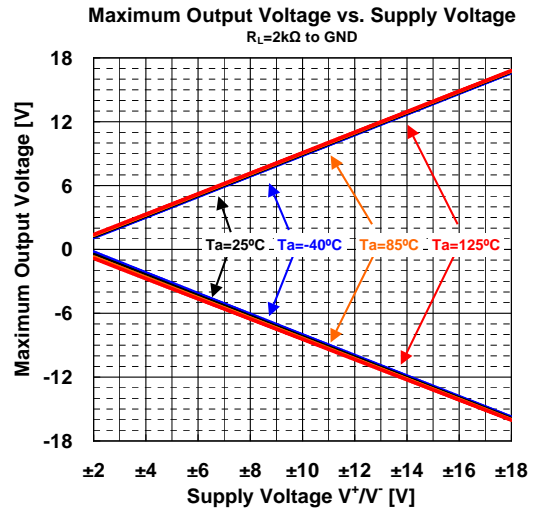
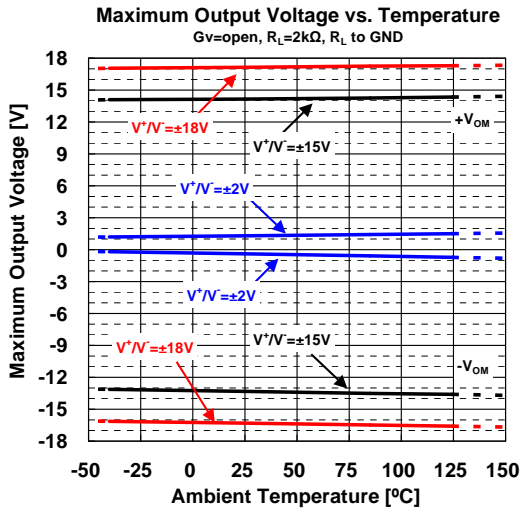
Input Offset Voltage vs. Supply Voltage



## ■ TYPICAL CHARACTERISTICS

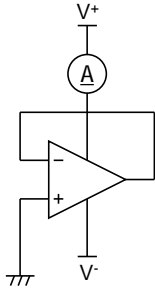


## ■ TYPICAL CHARACTERISTICS



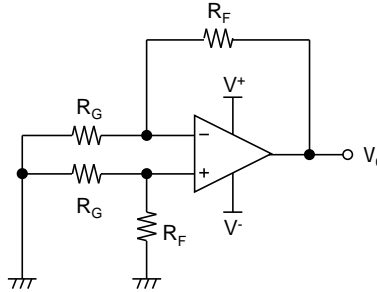
## ■ TEST CIRCUITS

- $I_{SUPPLY}$



- $V_{IO}, CMR, SVR$

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



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

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

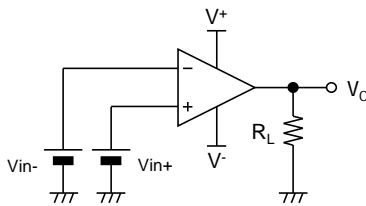
$$SVR = 20 \log \frac{\Delta V_S \left(1 + \frac{R_F}{R_G}\right)}{\Delta V_O}$$

$V_S = V^+ - V^-$

- $V_{OH}, V_{OL}$

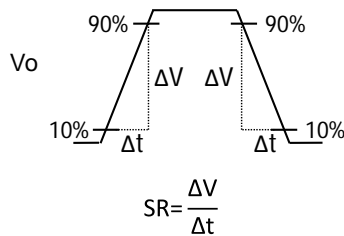
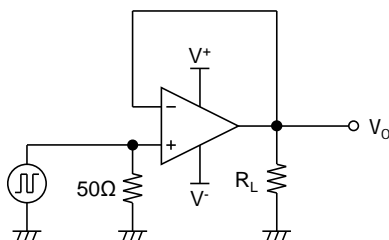
$V_{OH}: V_{in+} = 1V, V_{in-} = -1V$

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



- SR

$R_L=2k\Omega$

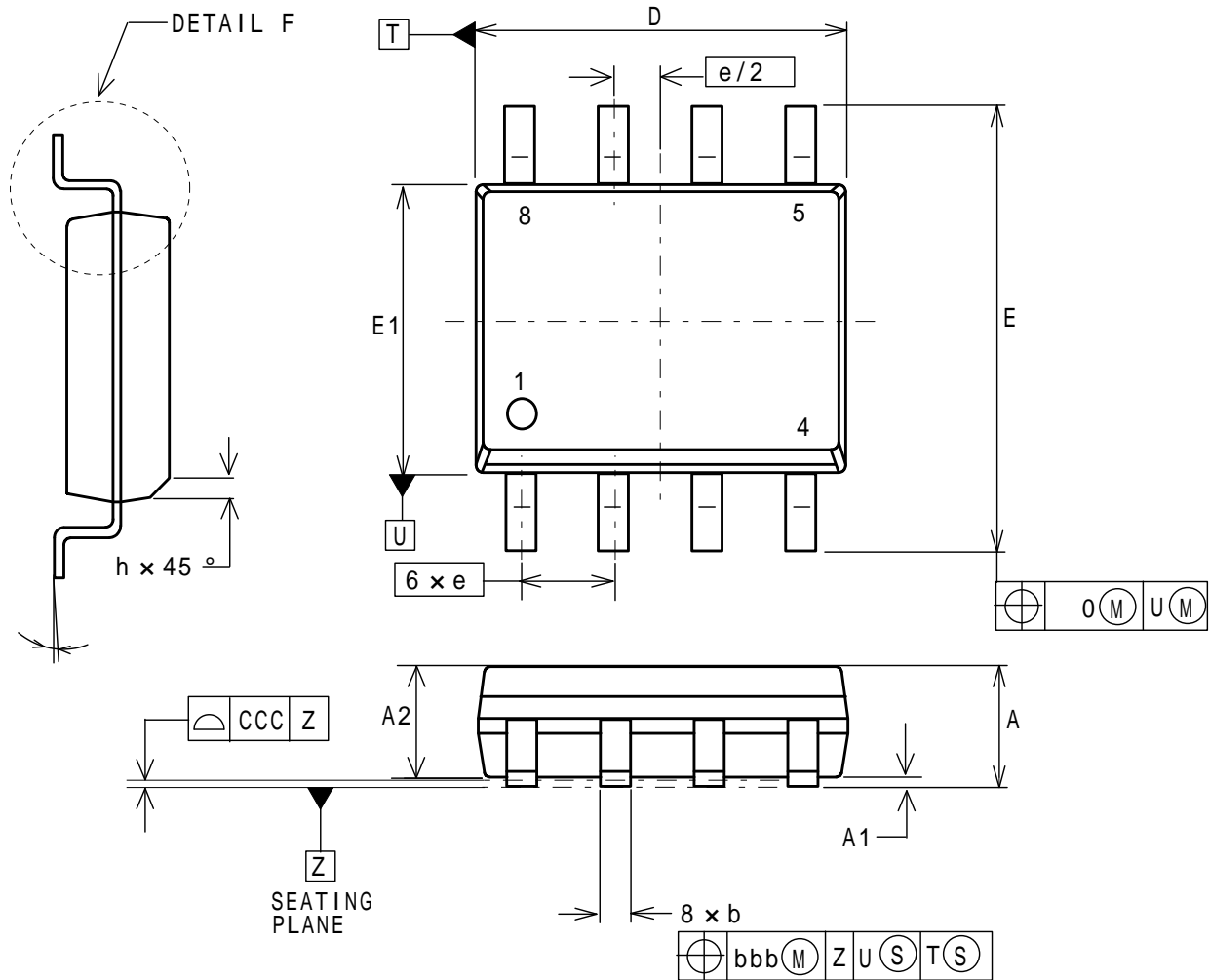




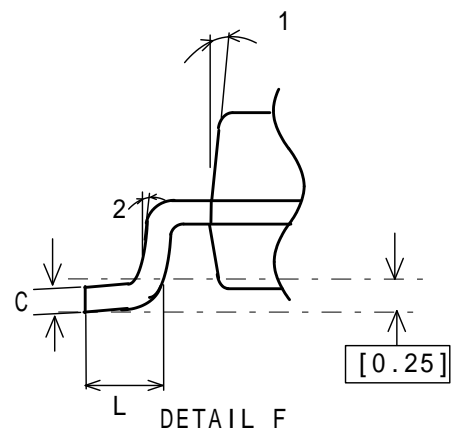
## SOP8

Unit: mm

### PACKAGE DIMENSIONS



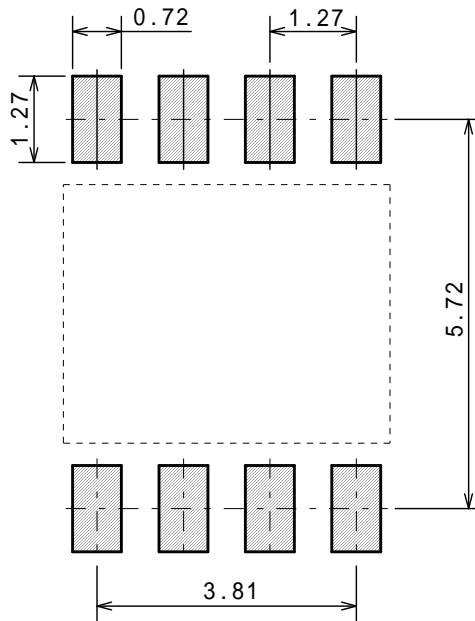
DESCRIPTION	SYMBOL	INCH			MILLIMETER		
		MIN	NCM	MAX	MIN	NCM	MAX
TOTAL THICKNESS	A	.053		.069	1.35		1.75
STAND OFF	A1	.004		.010	0.10		0.25
MOLD THICKNESS	A2	.049		-	1.25		-
LEAD WIDTH	b	.014		.019	0.35		0.49
L/F THICKNESS	C	.007		.010	0.19		0.25
BODY SIZE	D	.189		.197	4.80		5.00
	E1	.150		.157	3.80		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
		0°		7°	0°		7°
	1	5°		15°	5°		15°
	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

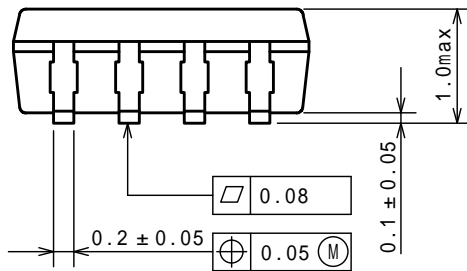
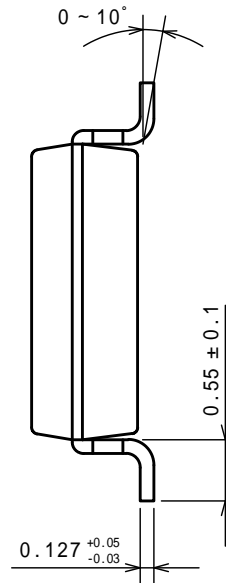
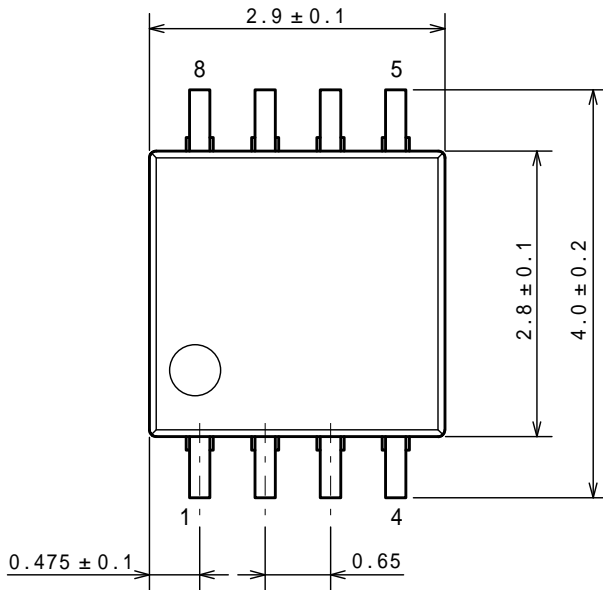
### ■ EXAMPLE OF SOLDER PADS DIMENSIONS



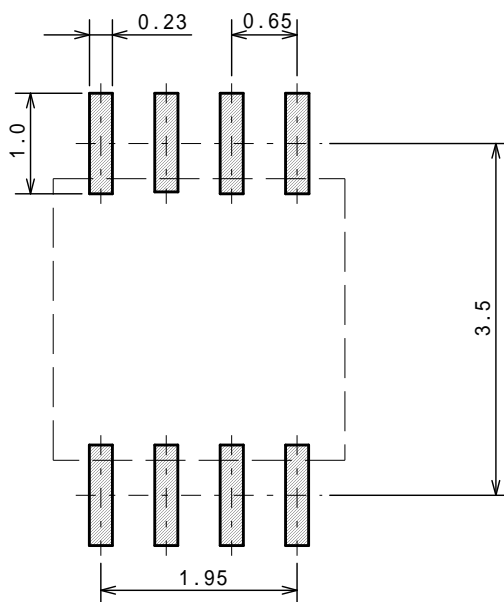
## MSOP8 (TVSP8) JEDEC MO-187-DA/THIN TYPE

Unit: mm

### ■ PACKAGE DIMENSIONS



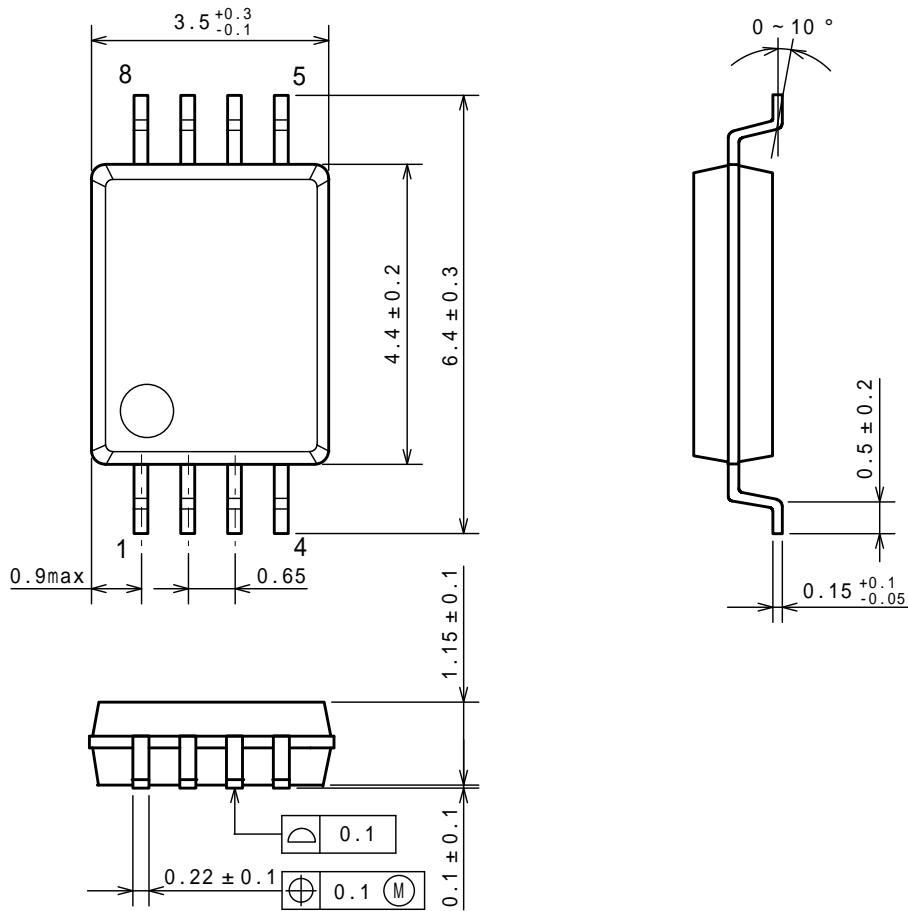
### ■ EXAMPLE OF SOLDER PADS DIMENSIONS



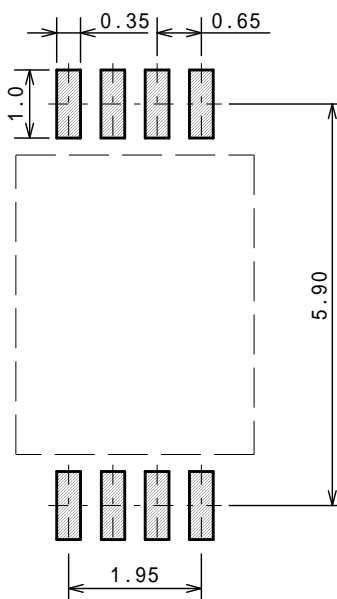
## SSOP8

Unit: mm

### ■ PACKAGE DIMENSIONS



### ■ EXAMPLE OF SOLDER PADS DIMENSIONS

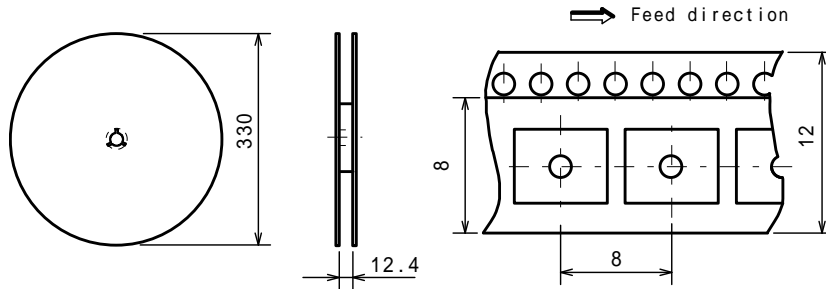


## SOP8

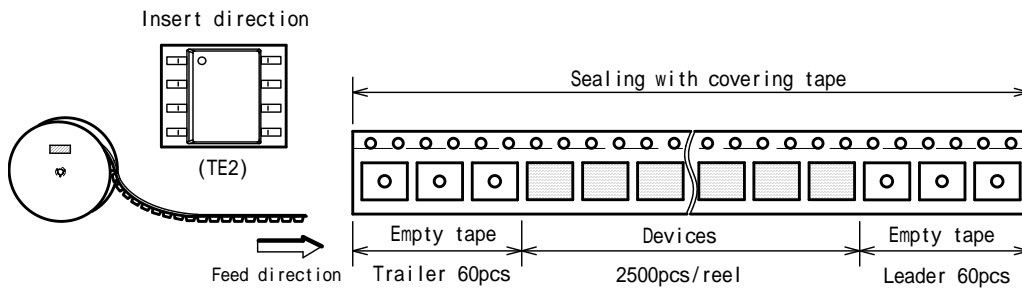
### PACKING SPEC

Unit: mm

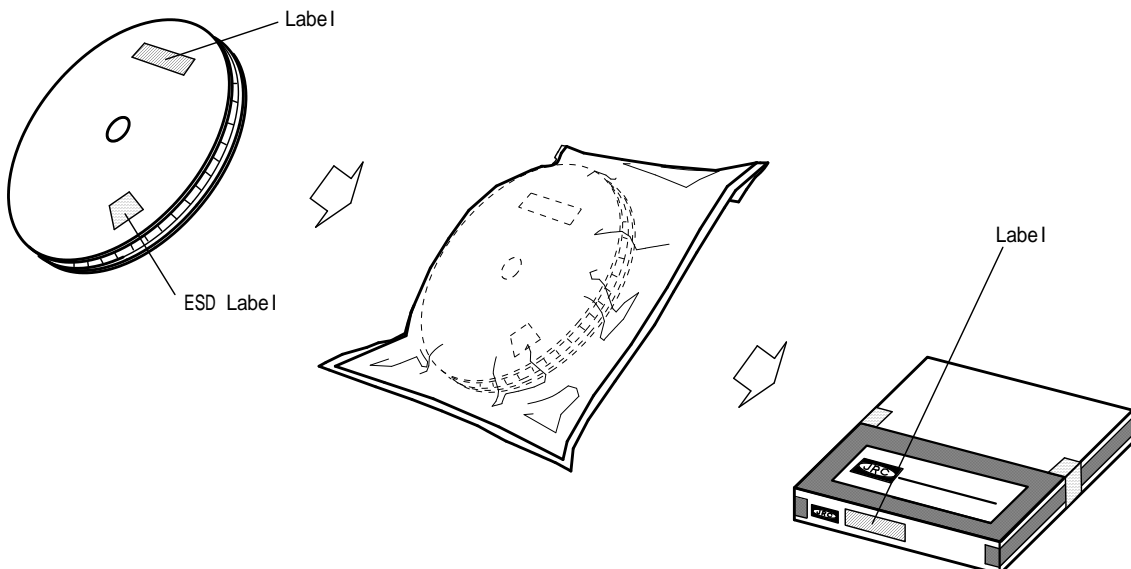
#### REEL DIMENSIONS / TAPING DIMENSIONS



#### TAPING STATE



#### PACKING STATE

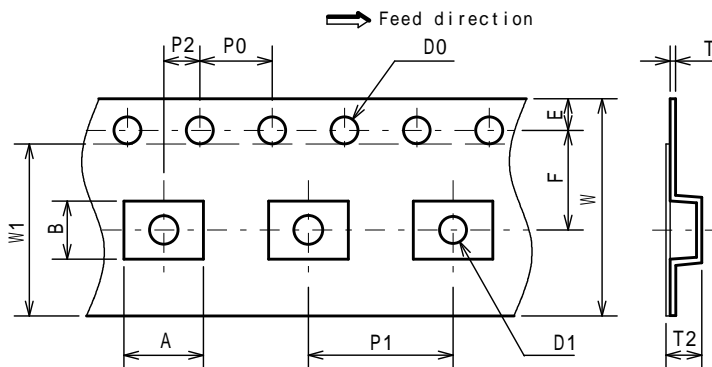


## MSOP8 (TVSP8) MEET JEDEC MO-187-DATHIN TYPE

### PACKING SPEC

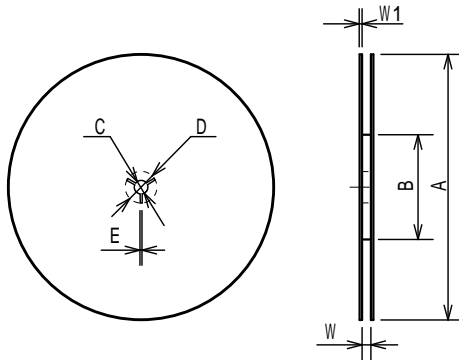
Unit: mm

#### TAPING DIMENSIONS



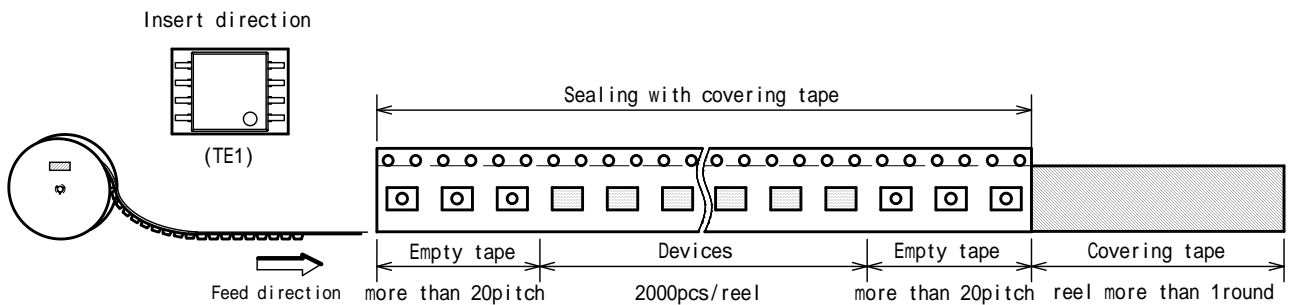
SYMBOL	DIMENSION	REMARKS
A	4.4	BOTTOM DIMENSION
B	3.2	BOTTOM DIMENSION
D0	1.5 <sup>+0.1</sup> <sub>0</sub>	
D1	1.5 <sup>+0.1</sup> <sub>0</sub>	
E	1.75 ± 0.1	
F	5.5 ± 0.05	
P0	4.0 ± 0.1	
P1	8.0 ± 0.1	
P2	2.0 ± 0.05	
T	0.30 ± 0.05	
T2	1.75 (MAX.)	
W	12.0 ± 0.3	
W1	9.5	THICKNESS 0.1max

#### REEL DIMENSIONS

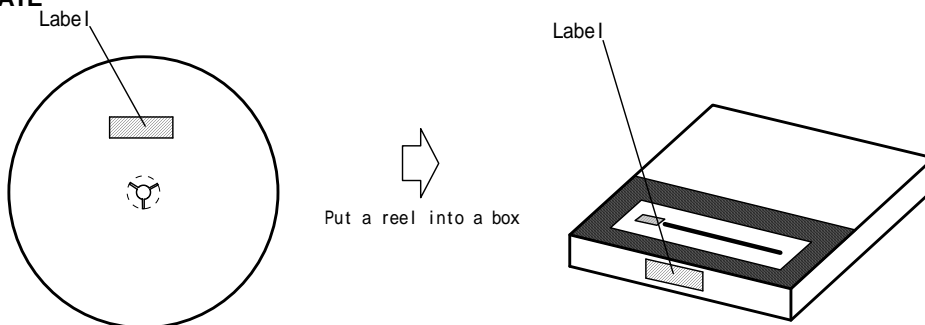


SYMBOL	DIMENSION
A	254 ± 2
B	100 ± 1
C	13 ± 0.2
D	21 ± 0.8
E	2 ± 0.5
W	13.5 ± 0.5
W1	2.0 ± 0.2

#### TAPING STATE



#### PACKING STATE

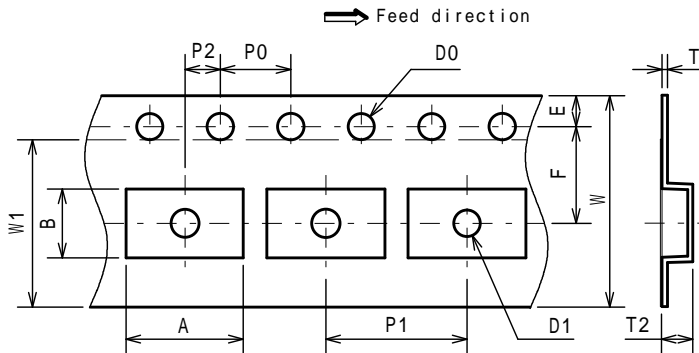


## SSOP8

### PACKING SPEC

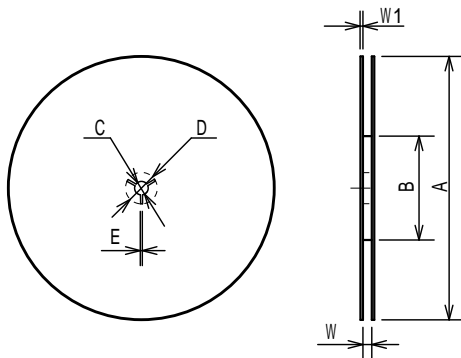
Unit: mm

#### TAPING DIMENSIONS



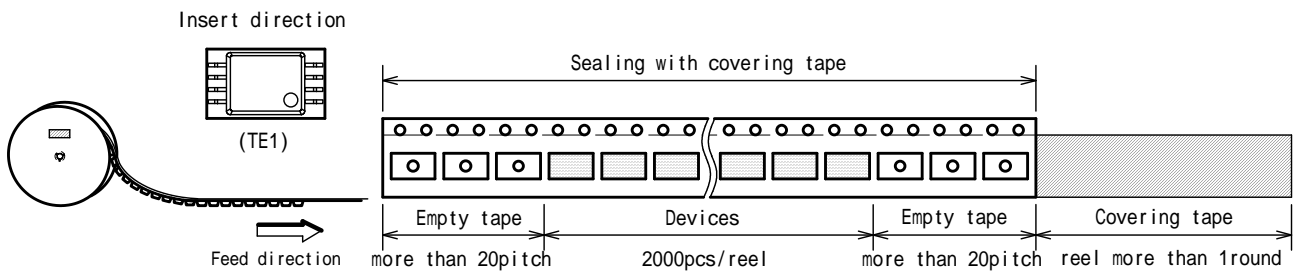
SYMBOL	DIMENSION	REMARKS
A	6.7	BOTTOM DIMENSION
B	3.9	BOTTOM DIMENSION
D0	1.55 ± 0.05	
D1	1.55 ± 0.1	
E	1.75 ± 0.1	
F	5.5 ± 0.05	
P0	4.0 ± 0.1	
P1	8.0 ± 0.1	
P2	2.0 ± 0.05	
T	0.3 ± 0.05	
T2	2.2	
W	12.0 ± 0.3	
W1	9.5	THICKNESS 0.1max

#### REEL DIMENSIONS

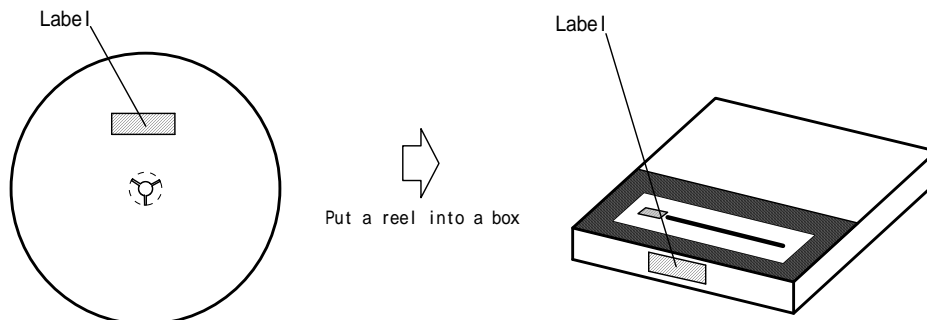


SYMBOL	DIMENSION
A	254 ± 2
B	100 ± 1
C	13 ± 0.2
D	21 ± 0.8
E	2 ± 0.5
W	13.5 ± 0.5
W1	2 ± 0.2

#### TAPING STATE

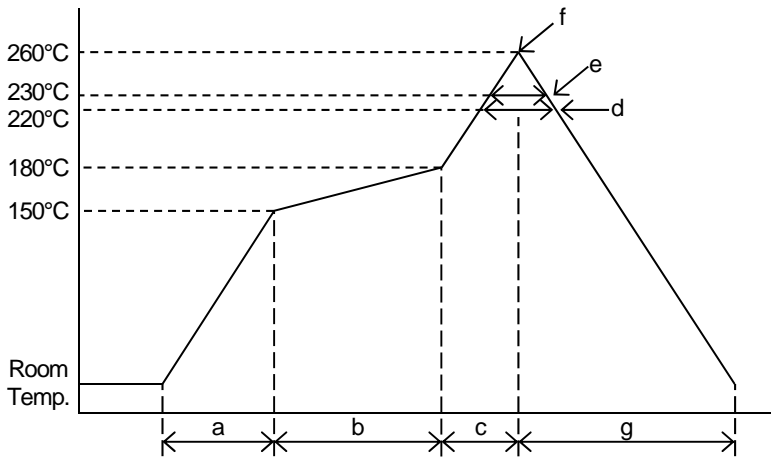


#### PACKING STATE



## ■ 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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