

Dual Operational Amplifier

Features

- **Power Supply Range :**
-Signal Supply : 3V to 20V
-Dual Supply : $\pm 1.5V$ to $\pm 10V$
- **Large DC Voltage Gain : 100dB**
- **Large Output Swing : $0V \sim V_{DD} - 1.5V$**
- **Bandwidth (Unity Gain) : 2MHz**
- **Internally Frequency Compensated for Unity Gain**
- **Low Input Offset Voltage : 1mV**
- **Lead Free and Green Devices Available (RoHS Compliant)**

General Description

The APC558 consists of two independent, high gain, internally frequency compensated operational amplifiers which were designed specifically to operate from a single power supply up to 20V. Operation from dual power supplies is also possible and the power supply current drain is essentially independent of the magnitude of the power supply voltage.

Application areas include transducer amplifiers, DC gain blocks and all the conventional OP amplifier circuits which can be more easily implemented in single power supply systems. (For example, the APC558 can be directly operated from the standard +5V power supply voltage which is normally used in digital systems.)

Applications

- **Amplifiers**
- **Filters**
- **Analog Circuit**

Ordering and Marking Information

APC558 □□-□□□ Assembly Material Handling Code Temperature Range Package Code	Package Code K : SOP-8 Temperature Range C : 0 to 70 °C Handling Code TR : Tape & Reel Assembly Material L : Lead Free Device G : Halogen and Lead Free Device
APC558 K : APC558 XXXXX ●	XXXXX - Date Code

Note: ANPEC lead-free products contain molding compounds/die attach materials and 100% matte tin plate termination finish; which are fully compliant with RoHS. ANPEC lead-free products meet or exceed the lead-free requirements of IPC/JEDEC J-STD-020C for MSL classification at lead-free peak reflow temperature. ANPEC defines "Green" to mean lead-free (RoHS compliant) and halogen free (Br or Cl does not exceed 900ppm by weight in homogeneous material and total of Br and Cl does not exceed 1500ppm by weight).

ANPEC reserves the right to make changes to improve reliability or manufacturability without notice, and advise customers to obtain the latest version of relevant information to verify before placing orders.

Absolute Maximum Ratings $T_A = 25^\circ\text{C}$ (Note 1)

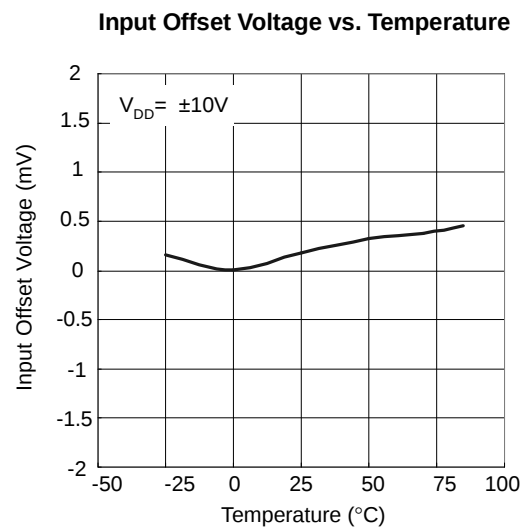
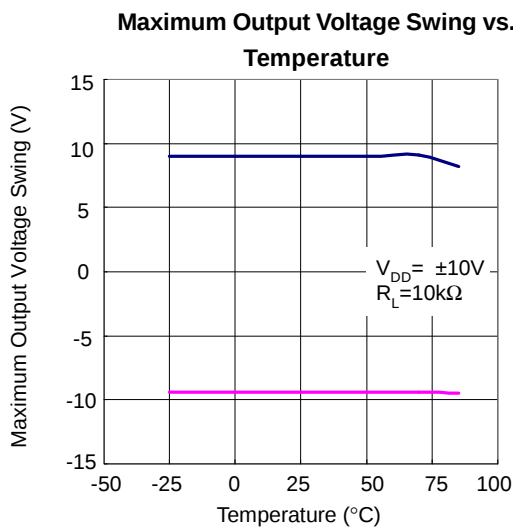
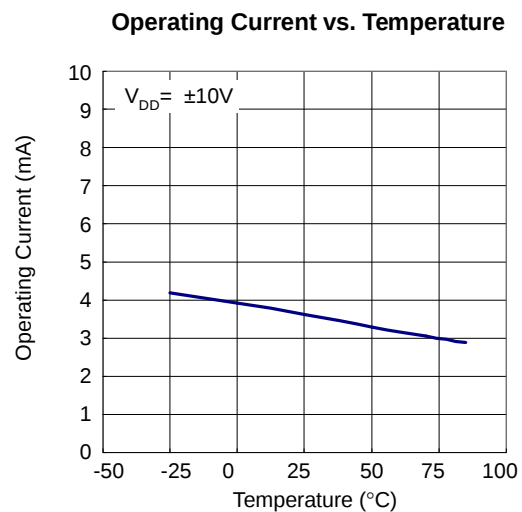
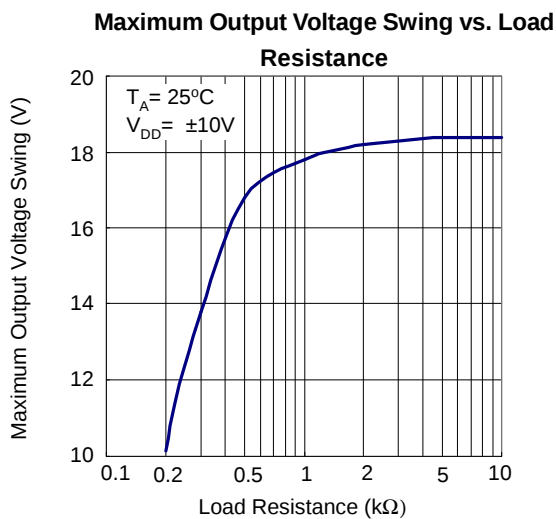
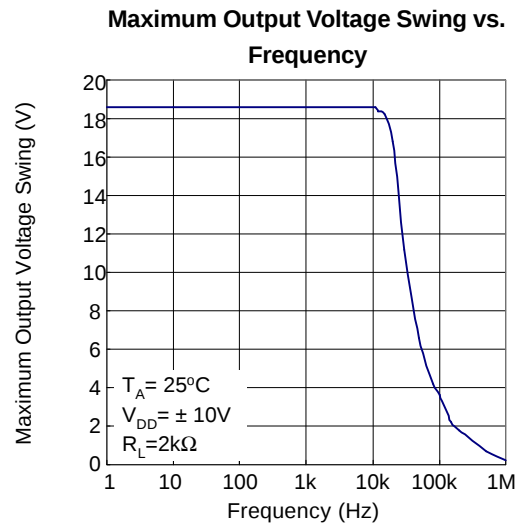
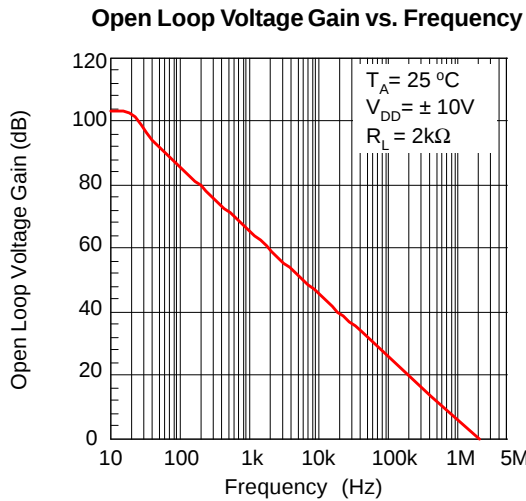
Symbol	Parameter	Rating	Unit
V_{DD}	Supply Voltage	20	V
V_{ID}	Differential Input Voltage	20	V
V_I	Input Voltage	-0.3V to +20V	V
P_D	Power Dissipation	500	mW
T_A	Operating Free-Air Temperature Range	0 to 70	$^\circ\text{C}$
T_{STG}	Storage Temperature Range	-40 to +150	$^\circ\text{C}$

Note 1: Absolute Maximum Ratings are those values beyond which the life of a device may be impaired. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

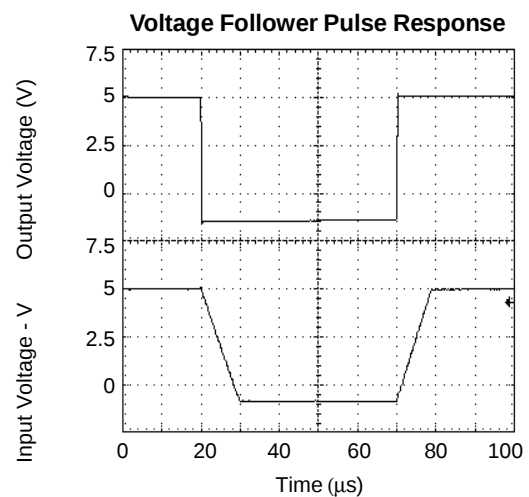
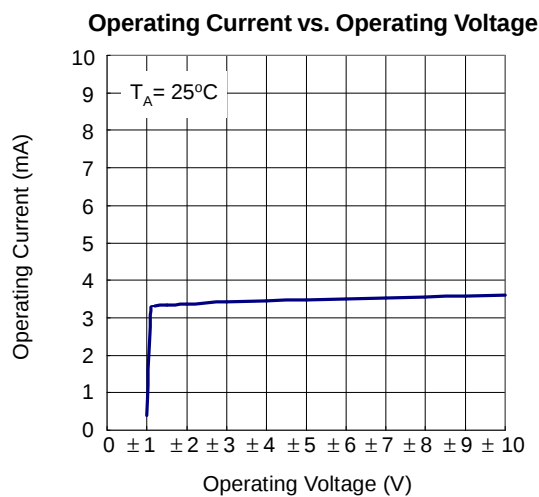
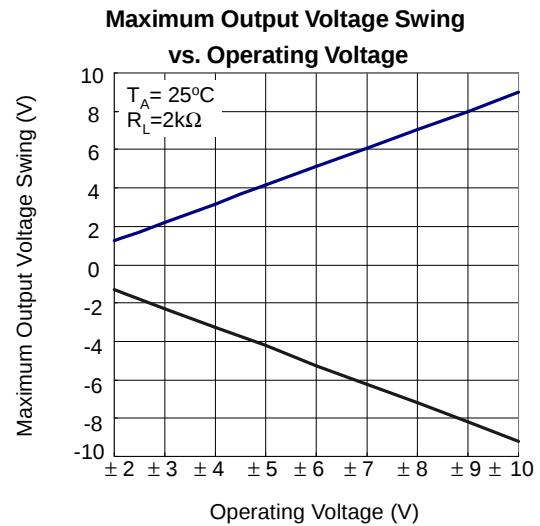
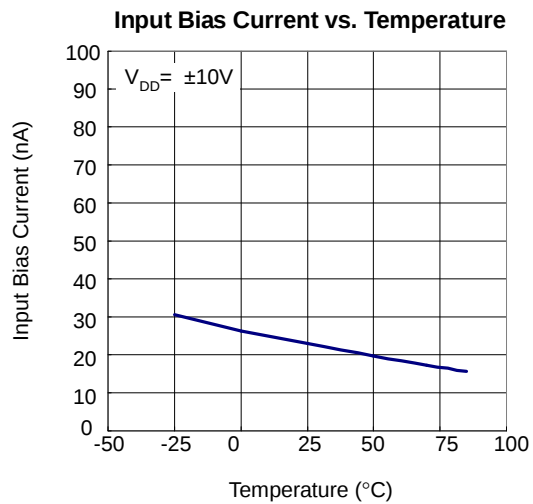
Electrical Characteristics $V_{DD} = \pm 10\text{V}$, $T_A = 25^\circ\text{C}$

Symbol	Parameter	Test Conditions	APC558			Unit
			Min.	Typ.	Max.	
V_{IO}	Input Offset Voltage	$R_S \leq 10\text{k}\Omega$	-	1	3	mV
I_{IO}	Input Offset Current		-	2	10	nA
I_{BIAS}	Input Bias Current		-	25	70	nA
R_{IN}	Input Resistance		0.3	5	-	$\text{M}\Omega$
A_V	Large Signal Voltage Gain	$R_L \geq 2\text{k}\Omega$, $V_O = \pm 10\text{V}$	86	100	-	dB
V_{OM1}	Maximum Output Voltage Swing 1	$R_L \geq 10\text{k}\Omega$	± 9	± 9.5	-	V
V_{OM2}	Maximum Output Voltage Swing 2	$R_L \geq 2\text{k}\Omega$	± 8.5	± 9.0	-	V
V_{ICM}	Input Common-mode Voltage Range		± 9	± 9.5	-	V
CMRR	Common-mode Rejection Ratio	$R_S \leq 10\text{k}\Omega$	-	90	-	dB
SVRR	Supply Voltage Rejection Ratio	$R_S \leq 10\text{k}\Omega$, $V_{P-P} = 100\text{mV}$, $f_{in} = 100\text{Hz}$	60	65	-	dB
I_{CC}	Operating Current		-	3.7	6	mA
V_{NI}	Equivalent Input Noise Voltage	RIAA, $R_S = 1\text{k}\Omega$, 30kHz, LPF	-	1.4	-	μV_{rms}
SR	Slew Rate		-	650	-	$\text{mV}/\mu\text{s}$
GBWP	Gain Bandwidth Product		-	2	-	MHz

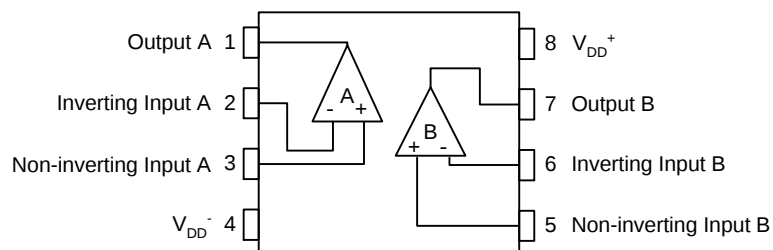
Typical Operating Characteristics



Typical Operating Characteristics (Cont.)

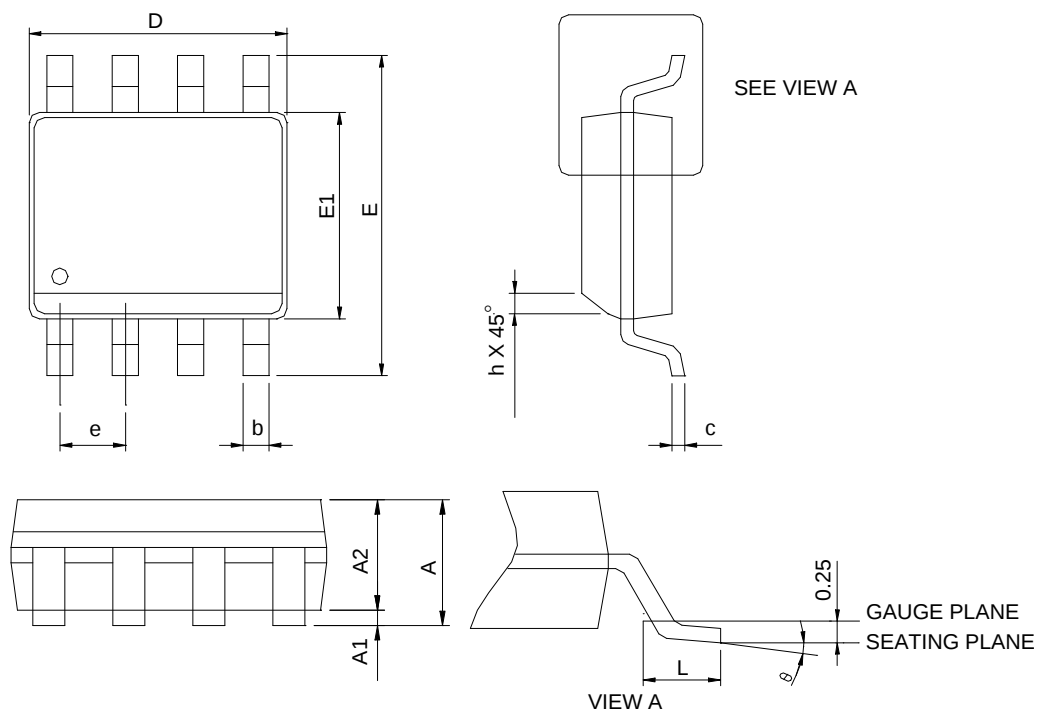


Block Diagram



Package Information

SOP-8



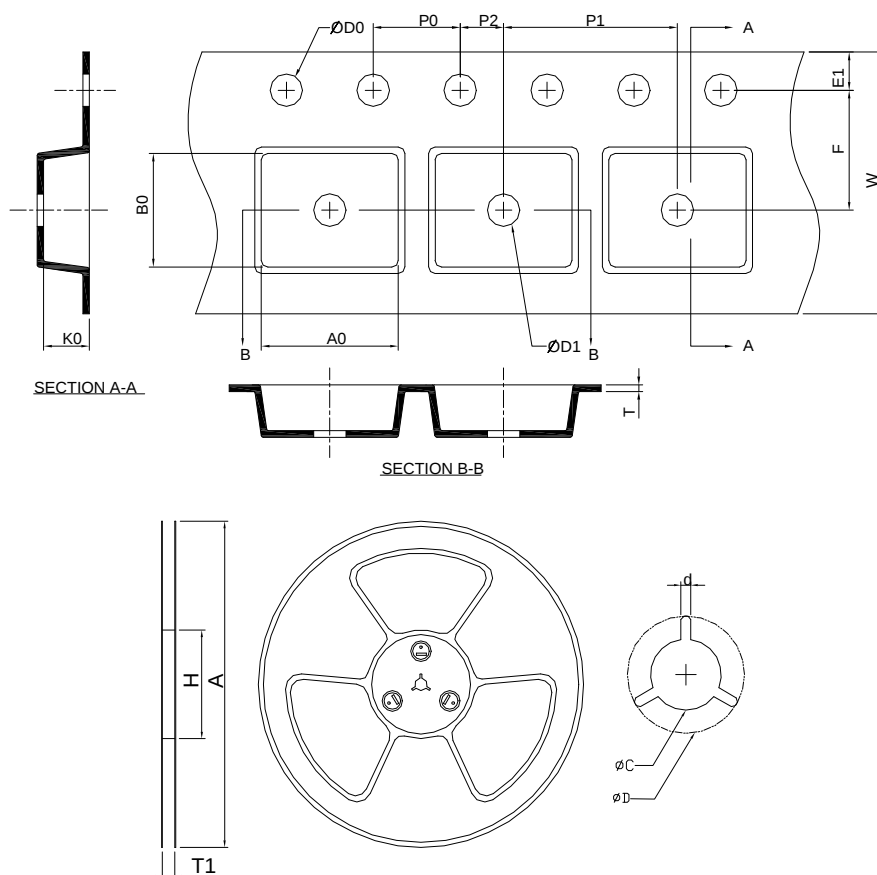
SYMBOL	SOP-8			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A		1.75		0.069
A1	0.10	0.25	0.004	0.010
A2	1.25		0.049	
b	0.31	0.51	0.012	0.020
c	0.17	0.25	0.007	0.010
D	4.80	5.00	0.189	0.197
E	5.80	6.20	0.228	0.244
E1	3.80	4.00	0.150	0.157
e	1.27 BSC		0.050 BSC	
h	0.25	0.50	0.010	0.020
L	0.40	1.27	0.016	0.050
θ	0°	8°	0°	8°

Note: 1. Follow JEDEC MS-012 AA.

2. Dimension "D" does not include mold flash, protrusions or gate burrs.
Mold flash, protrusion or gate burrs shall not exceed 6 mil per side.

3. Dimension "E" does not include inter-lead flash or protrusions.
Inter-lead flash and protrusions shall not exceed 10 mil per side.

Carrier Tape & Reel Dimensions



Application	A	H	T1	C	d	D	W	E1	F
SOP-8	330.0 ±0.00	50 MIN.	12.4+2.00 -0.00	13.0+0.50 -0.20	1.5 MIN.	20.2 MIN.	12.0 ±0.30	1.75 ±0.10	5.5 ±0.05
	P0	P1	P2	D0	D1	T	A0	B0	K0
	4.0 ±0.10	8.0 ±0.10	2.0 ±0.05	1.5+0.10 -0.00	1.5 MIN.	0.6+0.00 -0.40	6.40 ±0.20	5.20 ±0.20	2.10 ±0.20

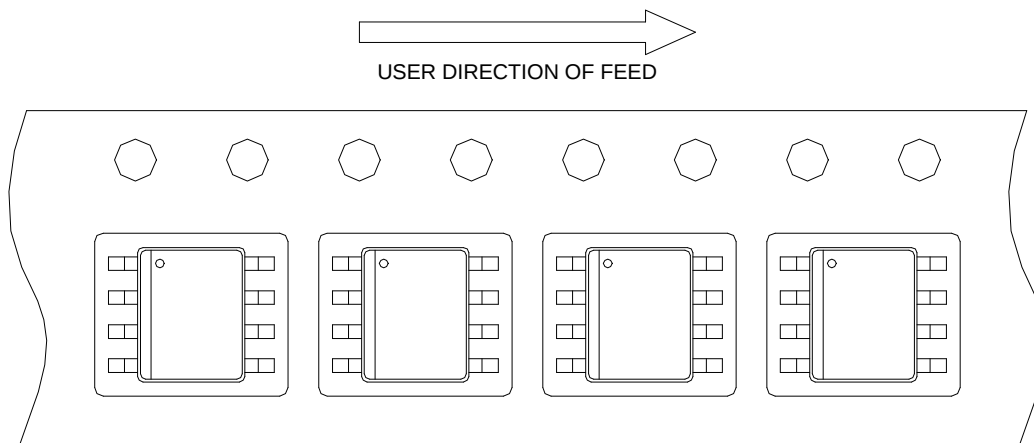
(mm)

Devices Per Unit

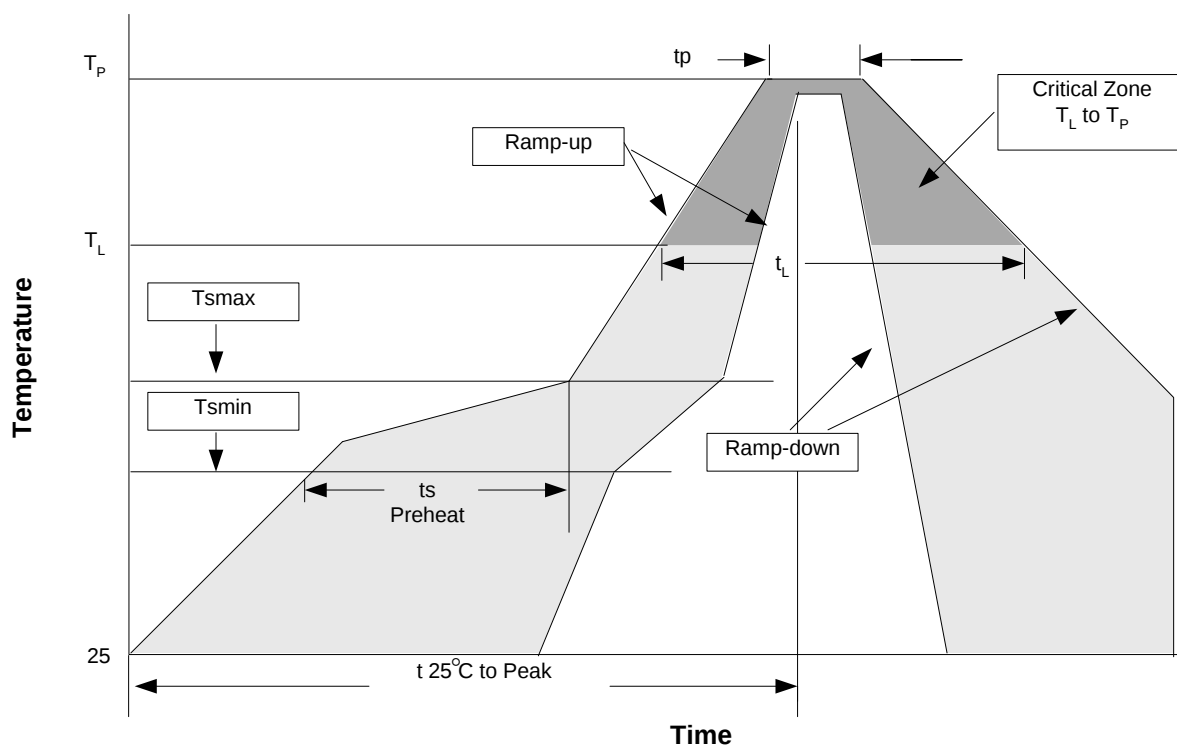
Package Type	Unit	Quantity
SOP-8	Tape & Reel	2500

Taping Direction Information

SOP-8



Reflow Condition (IR/Convection or VPR Reflow)



Reliability Test Program

Test item	Method	Description
SOLDERABILITY	MIL-STD-883D-2003	245°C, 5 sec
HOLT	MIL-STD-883D-1005.7	1000 Hrs Bias @125°C
PCT	JESD-22-B,A102	168 Hrs, 100%RH, 121°C
TST	MIL-STD-883D-1011.9	-65°C~150°C, 200 Cycles
ESD	MIL-STD-883D-3015.7	VHBM > 2KV, VMM > 200V
Latch-Up	JESD 78	10ms, 1 _{tr} > 100mA

Classification Reflow Profiles

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average ramp-up rate (T _L to T _P)	3°C/second max.	3°C/second max.
Preheat - Temperature Min (T_{smin}) - Temperature Max (T_{smax}) - Time (min to max) (t_s)	100°C 150°C 60-120 seconds	150°C 200°C 60-180 seconds
Time maintained above: - Temperature (T_L) - Time (t_L)	183°C 60-150 seconds	217°C 60-150 seconds
Peak/Classification Temperature (T _p)	See table 1	See table 2
Time within 5°C of actual Peak Temperature (t _p)	10-30 seconds	20-40 seconds
Ramp-down Rate	6°C/second max.	6°C/second max.
Time 25°C to Peak Temperature	6 minutes max.	8 minutes max.

Note: All temperatures refer to topside of the package. Measured on the body surface.

Table 1. SnPb Eutectic Process – Package Peak Reflow Temperatures

Package Thickness	Volume mm ³ <350	Volume mm ³ ≥350
<2.5 mm	240 +0/-5°C	225 +0/-5°C
≥2.5 mm	225 +0/-5°C	225 +0/-5°C

Table 2. Pb-free Process – Package Classification Reflow Temperatures

Package Thickness	Volume mm ³ <350	Volume mm ³ 350-2000	Volume mm ³ >2000
<1.6 mm	260 +0°C*	260 +0°C*	260 +0°C*
1.6 mm – 2.5 mm	260 +0°C*	250 +0°C*	245 +0°C*
≥2.5 mm	250 +0°C*	245 +0°C*	245 +0°C*

* Tolerance: The device manufacturer/supplier **shall** assure process compatibility up to and including the stated classification temperature (this means Peak reflow temperature +0°C. For example 260°C+0°C) at the rated MSL level.

Customer Service

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