600mA Low Dropout Fast Response Positive Fixed 1.2V Regulator

Features

- **Guaranteed Output Voltage Accuracy within 2%**
- **Fast Transient Response**
- **Guaranteed Dropout Voltage at Multiple Currents**
- **Load Regulation : 0.4% Typ.**
- **Line Regulation : 1mV Typ.**
- **Low Dropout Voltage : 1.4V Typ. at I_{OUT} = 600mA**
- **Current Limit : 0.8A Min. at T_J=25°C**
- **On-Chip Thermal Limiting : 150°C Typ.**
- **Fixed Output : 1.2V**
- **Standard 3-pin, SOT-89 and SOT-223 Package**
- **Lead Free Available (RoHS Compliant)**

General Description

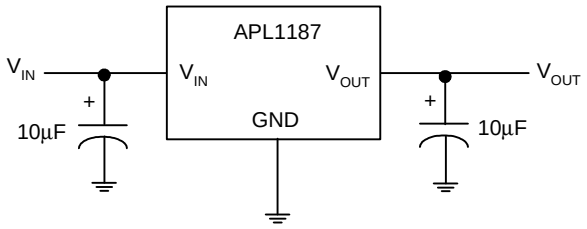
The APL1187 is a low dropout three-terminal adjustable regulators with 0.6A output current capability. In order to obtain lower dropout voltage and faster transient response, which is critical for low voltage applications, the APL1187 has been optimized.

The device is available in 1.2V with an input supply below 9V. Dropout voltage is guaranteed at a maximum of 1.55V at 0.6A.

Current limit is trimmed to ensure specified output current and controlled short-circuit current. On-chip thermal limiting provides protection against any combination of overload that would create excessive junction temperatures.

The APL1187 is available in the industry standard 3-pin, SOT-89 and SOT-223 package.

Typical Application Circuit



Applications

- **Voltage Regulator for CD-ROM Drivers**
- **Voltage Regulator for LAN Cards**
- **Voltage Regulator for mother Boards**
- **Wireless Communication Systems**
- **Portable Instrument**
- **Portable Consumer Equipment**
- **Low Voltage Systems**

Ordering and Marking Information

APL1187- □□-□□□

- Lead Free Code
- Handling Code
- Temperature Range
- Package Code

Package Code
D: SOT-89 V : SOT-223
Operating Ambient Temperature Range
E : -20 to 70°C
Handling Code
TU : Tube TR : Tape & Reel
Voltage Code
12 : 1.2V Blank : Adjustable Version
Lead Free Code
L : Lead Free Device Blank : Original Device

APL1187-12 D:	APL1187 XXXXX12	XXXXX - Date Code
APL1187-12 V:	APL1187 XXXXX12	XXXXX - Date Code

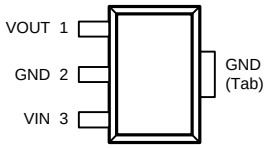
Note: ANPEC lead-free products contain molding compounds/die attach materials and 100% matte tin plate termination finish; which are fully compliant with RoHS and compatible with both SnPb and lead-free soldiering operations. ANPEC lead-free products meet or exceed the lead-free requirements of IPC/JEDEC J STD-020C for MSL classification at lead-free peak reflow temperature.

ANPEC 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.

Rev. A.2 - Nov., 2006

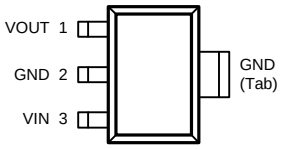
Pin Configurations

SOT-89 Top View



APL1187

SOT-223 Top View



APL1187

Absolute Maximum Ratings (Note 1,2)

Symbol	Parameter	Rating	Unit
V_I	Input Voltage	9	V
P_D	Power Dissipation, T_A=25°C	1.3	W
T_J	Operating Junction Temperature Range	0 to 150	°C
T_{STG}	Storage Temperature Range	-65 to +150	°C
T_L	Lead Temperature (Soldering, 10 second)	260	°C
θ_{JA}	Thermal Resistance from Junction to Ambient SOT-89 SOT-223	 130 75	°C/W
θ_{JC}	Thermal Resistance from Junction to Case SOT-89 SOT-223	 40 15	°C/W

Note 1: Stresses beyond the absolute maximum rating may damage the device and operating in the absolute maximum rating conditions may affect device reliability.

Note 2: The maximum allowable power dissipation at any T_A (ambient temperature) is calculated using: P_D (max) = (T_J – T_A) / θ_{JA}; T_J = 125°C. Exceeding the maximum allowable power dissipation will result in excessive die temperature.

Electrical Characteristics

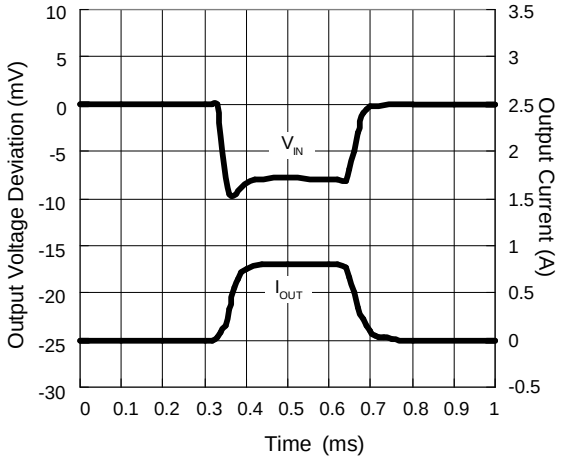
Symbol	Parameter	Test Conditions	APL1187			Unit
			Min	Typ	Max	
V_{OUT}	Output Voltage APL1187-12	T_J =0~125°C, 0≤ I_{OUT}≤ 0.6A, 2.8V≤V_{IN}≤9V,	1.176	1.200	1.224	V
V_{IN}	Input Voltage		2.8		9	V
REG_{LINE}	Line Regulation APL1087-12	T_J =0~125°C, I_{OUT}=0mA, 2.8V≤V_{IN}≤9V (note3)		1	6	mV
REG_{LOAD}	Load Regulation APL1187-12	T_J =0~125°C, V_{IN}=2.8V, 0≤ I_{OUT} ≤0.6A (note 3)		0.4	0.6	%
V_D	Dropout Voltage	I_{OUT}=0.6A, T_J =0~125°C		1.4	1.55	V
I_{LIMIT}	Current Limit	(V_{IN} -V_{OUT})=5V, T_J=25°C	800			mA
PSRR	Ripple Rejection	F_{RIPPLE}=120Hz, V_{RIPPLE}=1V_{P-P}, (V_{IN} -V_{OUT})=3V, T_J=0~125°C	60	75		dB
OT	Over Temperature Point			150		°C
	OTP Hysteresis			20		°C
I_Q	Quiescent Current APL1187-12	T_J=0~125°C, V_{IN}≤9V		5.5	10	mA

Note 3: See thermal regulation specifications for changes in output voltage due to heating effects. Load line regulations are measured at a constant junction temperature by low duty cycle pulse testing.

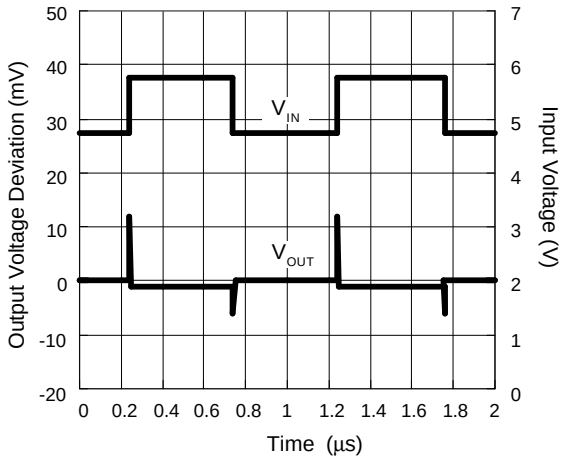
Note 4: Dropout voltage is specified over the full output current range of the device. Dropout voltage is defined as the minimum input/output differential measured at the specified output current. Test points and limits are also shown on the Dropout Voltage curve.

Typical Operating Characteristics

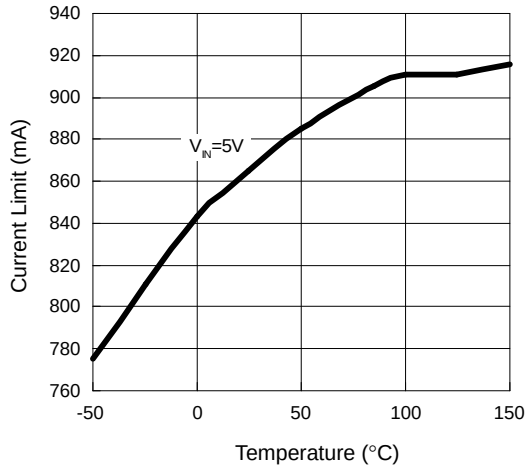
Load Transient Response



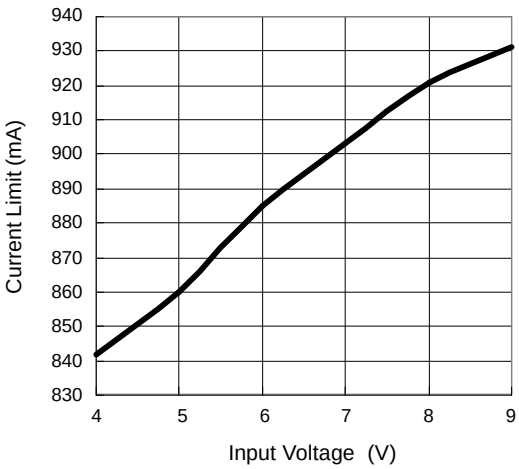
Line Transient Response



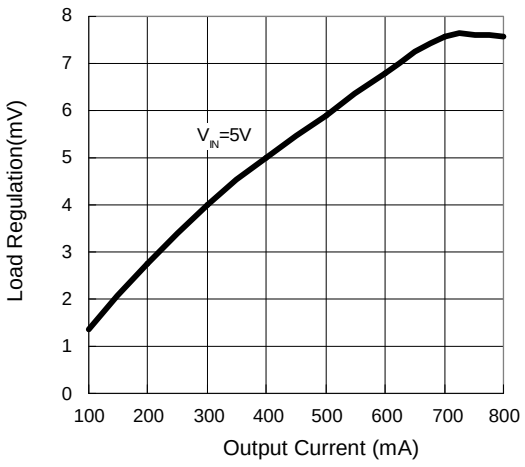
Current Limit vs. Temperature



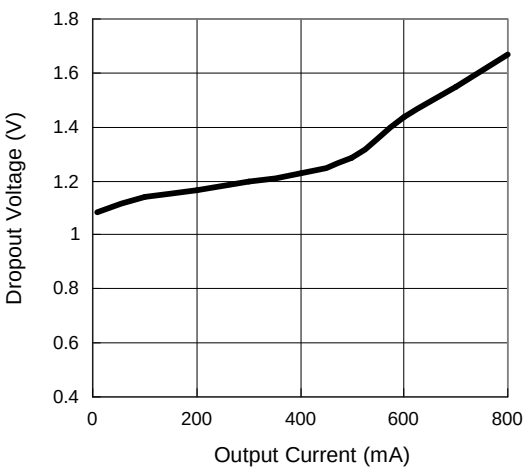
Current Limit vs. Input Voltage



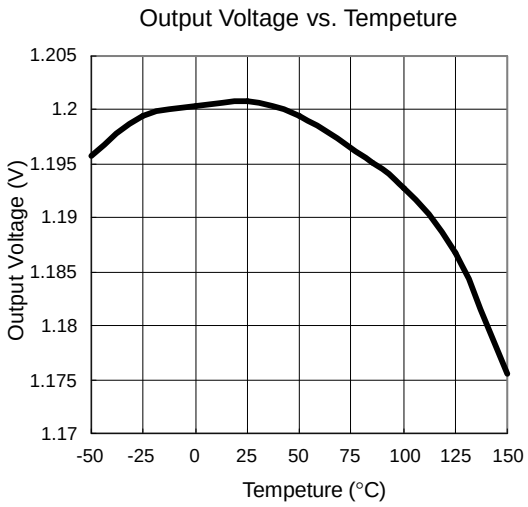
Load Regulation vs. Output Current



Dropout Voltage vs. Output Current

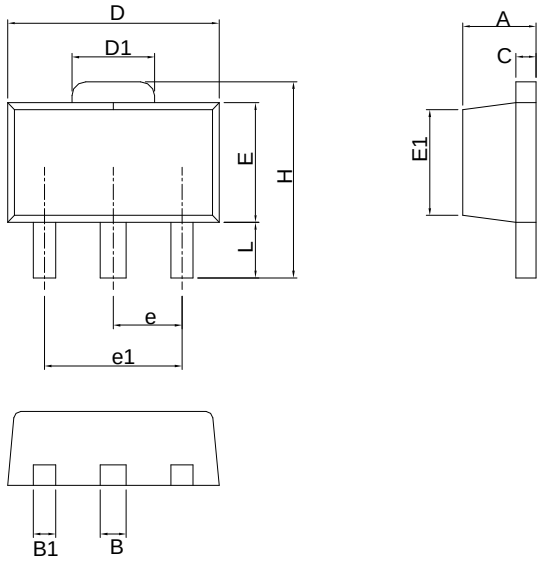


Typical Operating Characteristics (Cont.)



Packaging Information

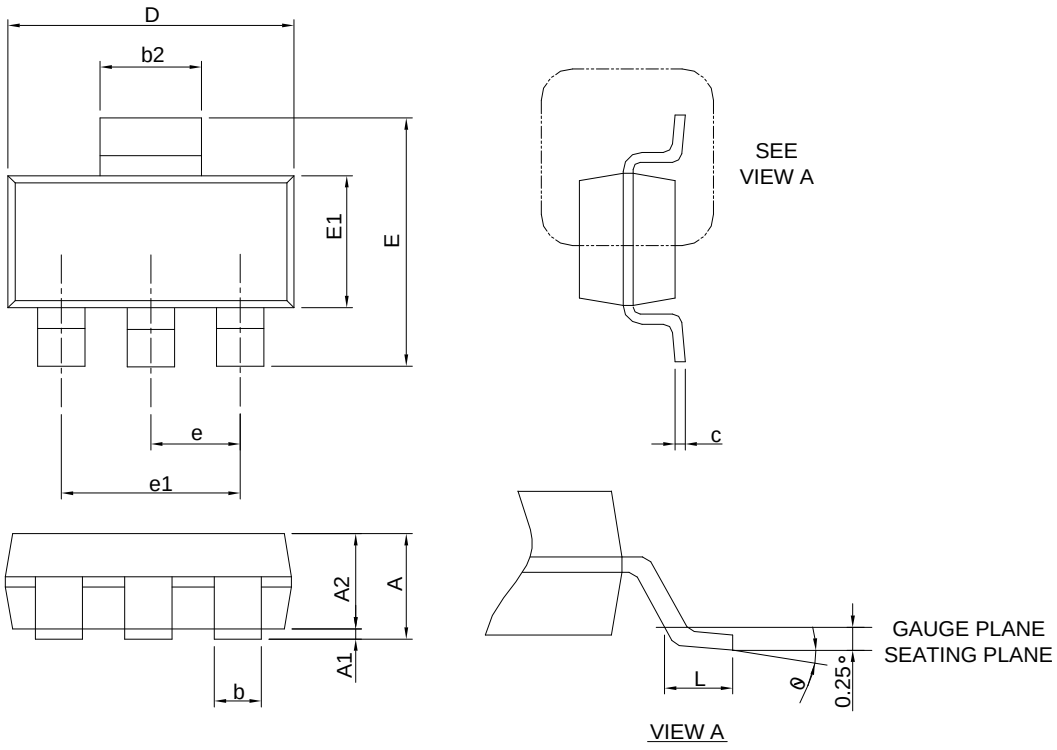
SOT89



SYMBOL	SOT89			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	1.40	1.60	0.055	0.063
B	0.44	0.56	0.017	0.022
B1	0.36	0.48	0.014	0.019
C	0.35	0.44	0.014	0.017
D	4.40	4.60	0.173	0.181
D1	1.62	1.83	0.064	0.072
E	2.29	2.60	0.090	0.102
E1	2.13	2.29	0.084	0.090
e	1.50 BSC		0.059 BSC	
e1	3..00 BSC		0.118 BSC	
H	3.94	4.25	0.155	0.167
L	0.89	1.20	0.035	0.047

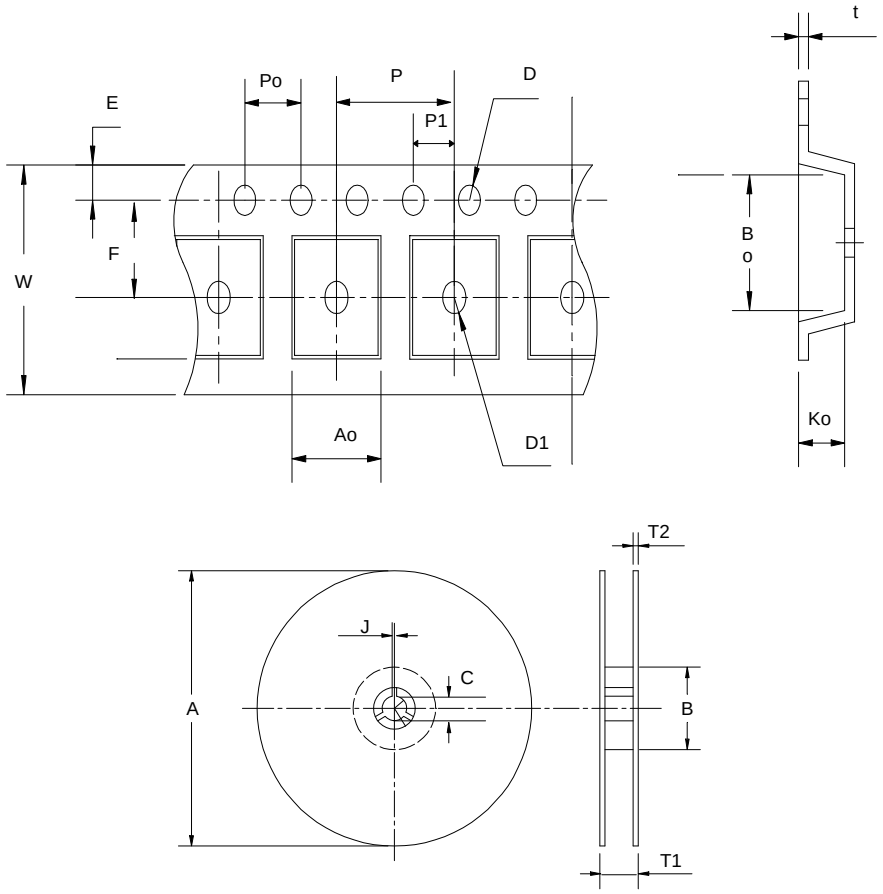
Packaging Information

SOT223



SYMBOL	SOT223			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A		1.80		0.071
A1	0.02	0.10	0.001	0.004
A2	1.50	1.70	0.059	0.067
b	0.66	0.84	0.026	0.033
b2	2.90	3.10	0.114	0.122
c	0.23	0.33	0.009	0.013
D	6.30	6.70	0.248	0.264
E	6.70	7.30	0.264	0.287
E1	3.30	3.70	0.130	0.146
e	2.30 BSC		0.091 BSC	
e1	4.60 BSC		0.181 BSC	
L	0.75		0.030	
θ	0°	10°	0°	10°

Carrier Tape & Reel Dimensions



Application	A	B	C	J	T1	T2	W	P	E
SOT-89	178 ±1	70 ± 2	13.5 ± 0.15	3 ± 0.15	14 ± 2	1.3 ± 0.3	12 + 0.3 12 - 0.1	8 ± 0.1	1.75± 0.1
	F	D	D1	Po	P1	Ao	Bo	Ko	T
	5.5 ± 0.05	1.5± 0.1	1.5± 0.1	4.0 ± 0.1	2.0 ± 0.1	4.8 ± 0.1	4.5± 0.1	1.80± 0.1	0.3±0.013
Application	A	B	C	J	T1	T2	W	P	E
SOT-223	330±1	62±1.5	12.75± 0.15	2 ± 0.6	12.4 +0.2	2± 0.2	12 ± 0.3	8 ± 0.1	1.75± 0.1
	F	D	D1	Po	P1	Ao	Bo	Ko	T
	5.5 ± 0.05	1.5+ 0.1	1.5+ 0.1	4.0 ± 0.1	2.0 ± 0.05	6.9 ± 0.1	7.5± 0.1	2.1± 0.1	0.3±0.05

(mm)

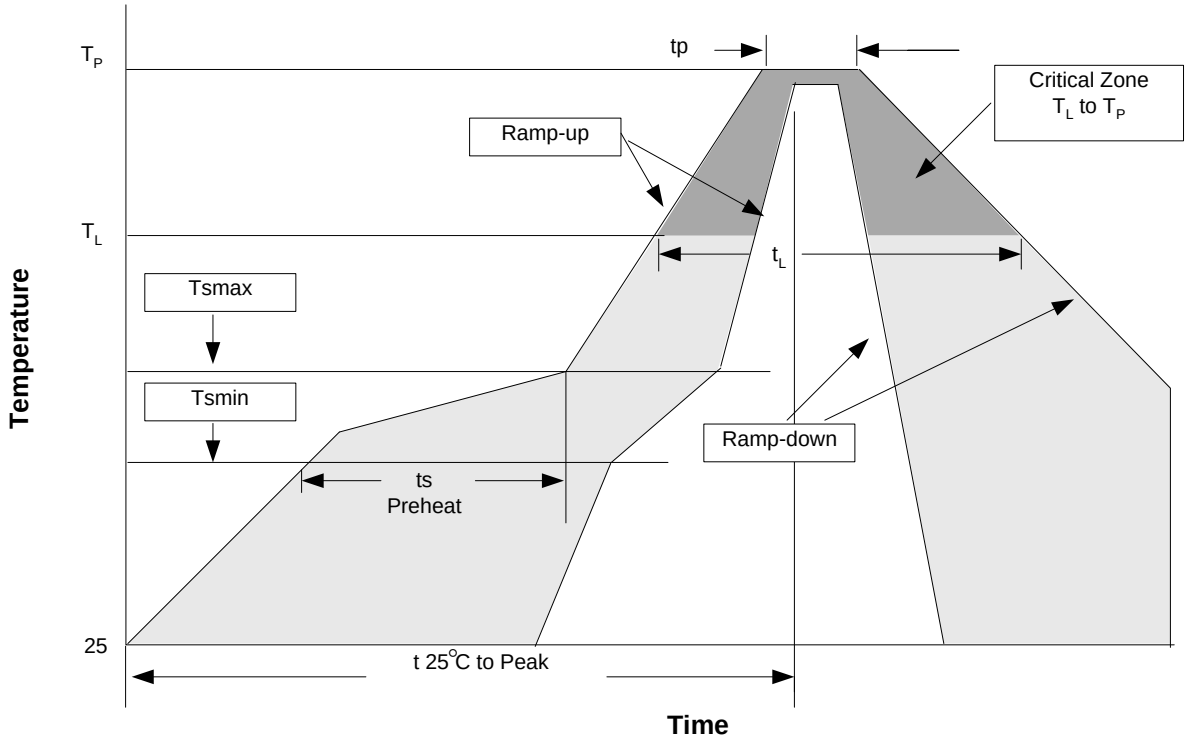
Cover Tape Dimensions

Application	Carrier Width	Cover Tape Width	Devices Per Reel
SOT- 89	12	9.3	1000
SOT- 223	12	9.3	2500

Physical Specifications

Terminal Material	Solder-Plated Copper (Solder Material: 90/10 or 63/37 SnPb), 100%Sn
Lead Solderability	Meets EIA Specification RSI86-91, ANSI/J-STD-002 Category 3.

Reflow Condition (IR/Convection or VPR Reflow)



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 (Tsmin) - Temperature Max (Tsmax) - Time (min to max) (ts)	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/Classificatioon Temperature (Tp)	See table 1	See table 2
Time within 5°C of actual Peak Temperature (tp)	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.

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

Classification Reflow Profiles (Cont.)

Table 1. SnPb Entectic Process – Package Peak Reflow Temperatures

Package Thickness	Volume mm^3 <350	Volume mm^3 ³350
<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.			

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

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