APM4220KA

N-Channel Enhancement Mode MOSFET

Features

- 25V/16A,
  $R_{DS(ON)}$=7.5mΩ(typ.) @ V_{GS}=10V
  $R_{DS(ON)}$=10mΩ(typ.) @ V_{GS}=4.5V
- Super High Dense Cell Design
- Avalanche Rated
- Reliable and Rugged
- Thermal Pad Exposed with Standard SOP-8 Outline
- Lead Free Available (RoHS Compliant)

Applications

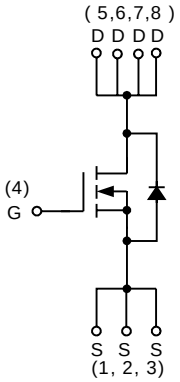
- Power Management in Notebook Computer, Portable Equipment and Battery Powered Systems

Pin Description



SOP – 8 Exposed

⬚ = Thermal Pad
(connected to Drain plane for better heat dissipation)



N-Channel MOSFET

Ordering and Marking Information

APM4220 □□-□□ □ Lead Free Code Handling Code Temp. Range Package Code	Package Code KA : SOP-8-P Operating Junction Temp. Range C : -55 to 150°C Handling Code TU : Tube TR : Tape & Reel Lead Free Code L : Lead Free Device Blank : Original Device
APM4220 KA : APM4220 XXXXX	XXXXX - Date Code

Note: ANPEC lead-free products contain molding compounds/die attach materials and 100% matte in 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.

Absolute Maximum Ratings

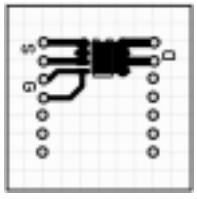
Symbol	Parameter		Rating	Unit
Common Ratings (T_A=25°C Unless Otherwise Noted)				
V_{DSS}	Drain-Source Voltage		25	V
V_{GSS}	Gate-Source Voltage		±20	
T_J	Maximum Junction Temperature		150	°C
T_{STG}	Storage Temperature Range		-55 to 150	°C
Mounted on Large Heat Sink				
P_D	Maximum Power Dissipation	T_C=25°C	50	W
		T_C=100°C	20	
$R_{\theta JC}$	Thermal Resistance-Junction to Case		2.5	°C/W
Mounted on PCB of 1in² Pad Area ①				
I_{DP}	300μs Pulse Drain Current Tested	T_A=25°C	50	A
		T_A=100°C	25	
I_D	Continuous Drain Current	T_A=25°C	16	A
		T_A=100°C	8	
P_D	Maximum Power Dissipation	T_A=25°C	3	W
		T_A=100°C	1.2	
$R_{\theta JA}$	Thermal Resistance-Junction to Ambient		40	°C/W
Mounted on PCB of Minimum Footprint ②				
I_{DP}	300μs Pulse Drain Current Tested	T_A=25°C	50	A
		T_A=100°C	25	
I_D	Continuous Drain Current	T_A=25°C	13	A
		T_A=100°C	6	
P_D	Maximum Power Dissipation	T_A=25°C	2.5	W
		T_A=100°C	1	
$R_{\theta JA}$	Thermal Resistance-Junction to Minimum Footprint		50	°C/W

Notes:

①.The value of $R_{\theta JA}$ is when the device mounted on 1in² pad with 2oz. Copper, t ≤ 10s.



②. The value of $R_{\theta JA}$ is when the device mounted on minimum pad with 2oz. Copper, t ≤ 10s.



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Electrical Characteristics (T_A = 25°C unless otherwise noted)

Symbol	Parameter	Test Condition	APM4220KA			Unit
			Min.	Typ.	Max.	
Drain-Source Avalanche Ratings						
E_{AS}	Avalanche Energy, Single Pulsed	I_D=15A, V_{DD}=15V			50	mJ
Static Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V, I_{DS}=250μA	25			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=20V, V_{GS}=0V			1	μA
		V_{DS}=20V, V_{GS}=0V, T_A=25°C			30	
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_{DS}=250μA	1.3	1.8	2.5	V
I_{GSS}	Gate Leakage Current	V_{GS}=±20V, V_{DS}=0V			±100	nA
$R_{DS(ON)}$ [a]	Drain-Source On-state Resistance	V_{GS}=10V, I_{DS}=16A		7.5	9	mΩ
		V_{GS}=4.5V, I_{DS}=14A		10	12	
V_{SD} [a]	Diode Forward Voltage	I_{SD}=3A, V_{GS}=0V		0.8	1.3	V
Gate Charge Characteristics [b]						
Q_g	Total Gate Charge	V_{DS}=10V, V_{GS}=4.5V, I_{DS}=12A		20	26	nC
Q_{gs}	Gate-Source Charge			4.8		
Q_{gd}	Gate-Drain Charge			8.4		
Dynamic Characteristics [b]						
R_G	Gate Resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		2		Ω
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=15V, Frequency=1.0MHz		1785		pF
C_{oss}	Output Capacitance			500		
C_{rss}	Reverse Transfer Capacitance			300		
$t_{d(ON)}$	Turn-on Delay Time	V_{DD}=15V, R_L=15Ω, I_{DS}=1A, V_{GEN}=10V, R_G=6Ω		10	19	ns
T_r	Turn-on Rise Time			7	13	
$t_{d(OFF)}$	Turn-off Delay Time			69	95	
T_f	Turn-off Fall Time			32	46	

Notes:

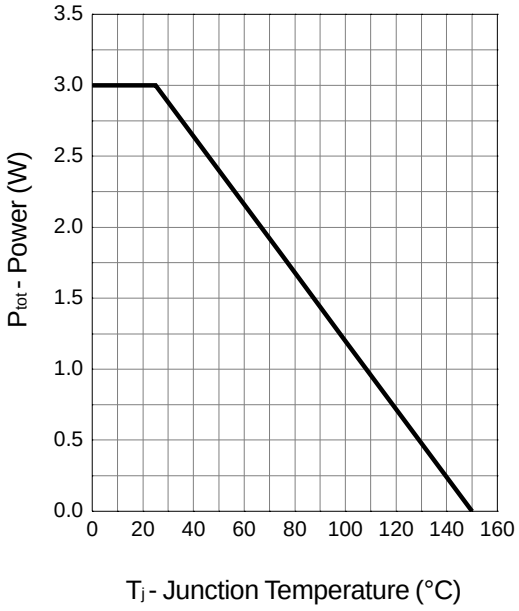
a: Pulse test ; pulse width ≤300μs, duty cycle ≤ 2%.

b: Guaranteed by design, not subject to production testing.

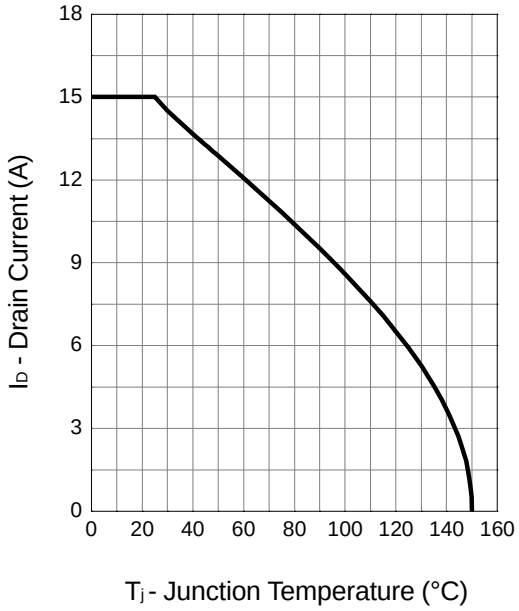
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Typical Characteristics

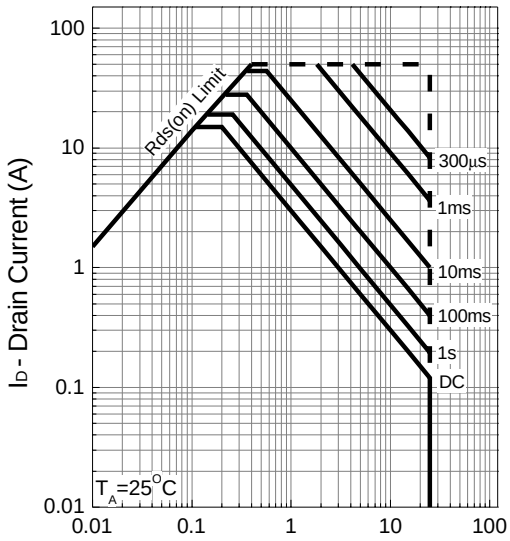
Power Dissipation



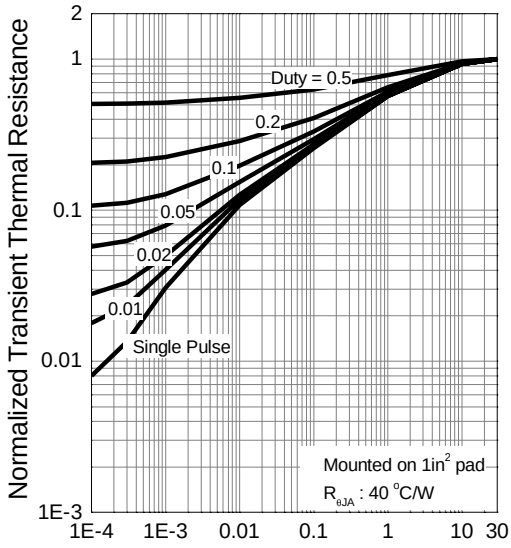
Drain Current



Safe Operation Area

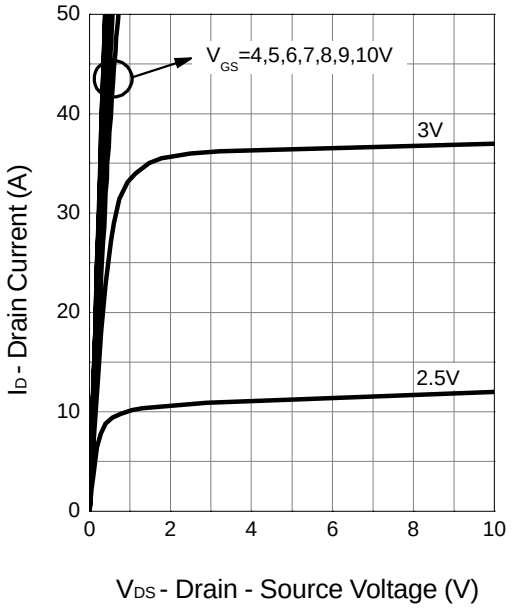


Thermal Transient Impedance

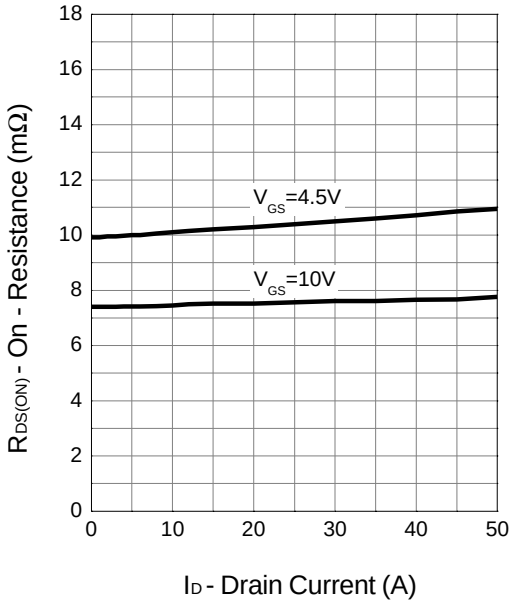


Typical Characteristics (Cont.)

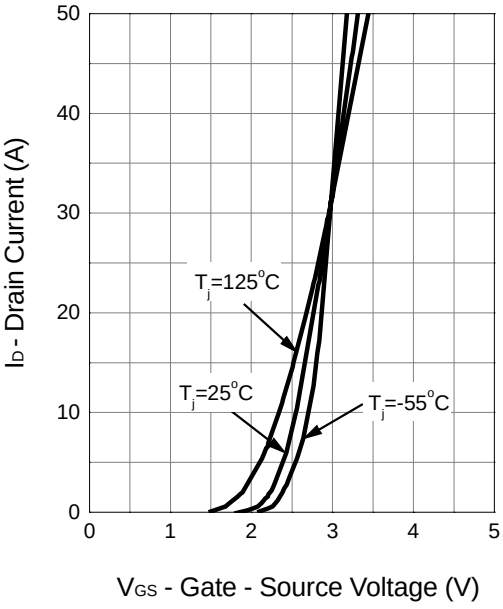
Output Characteristics



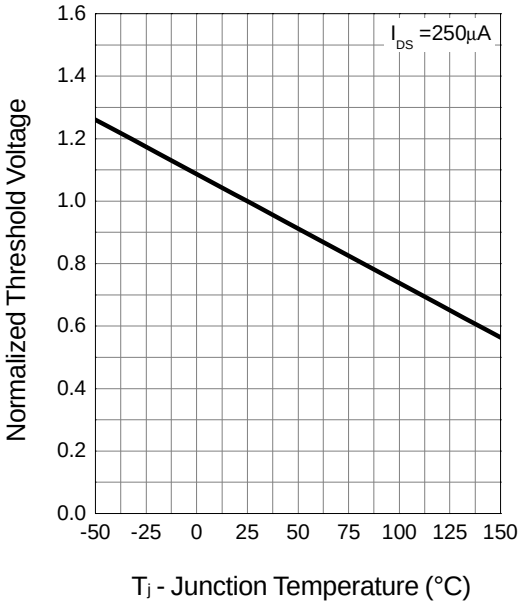
Drain-Source On Resistance



Transfer Characteristics



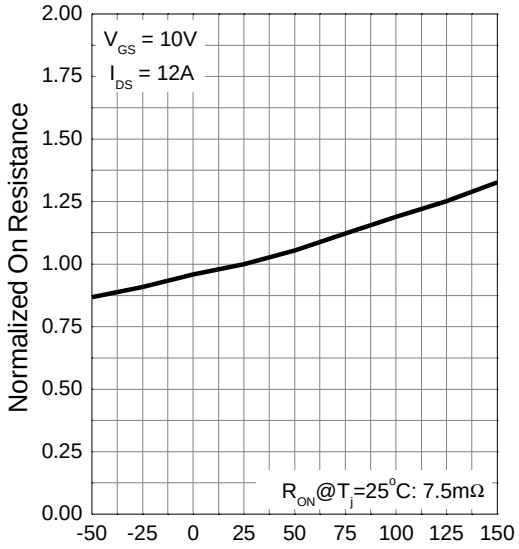
Gate Threshold Voltage



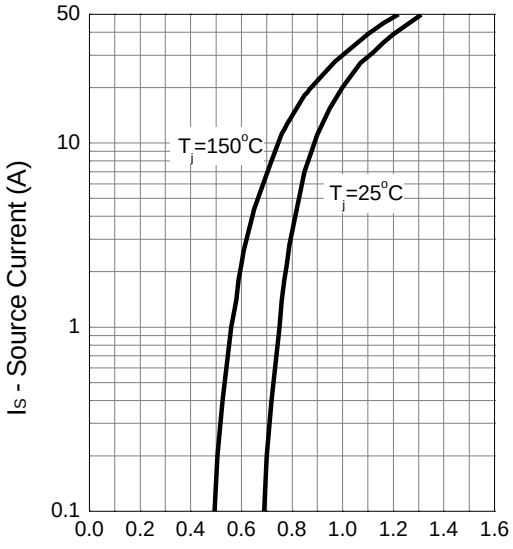
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Typical Characteristics (Cont.)

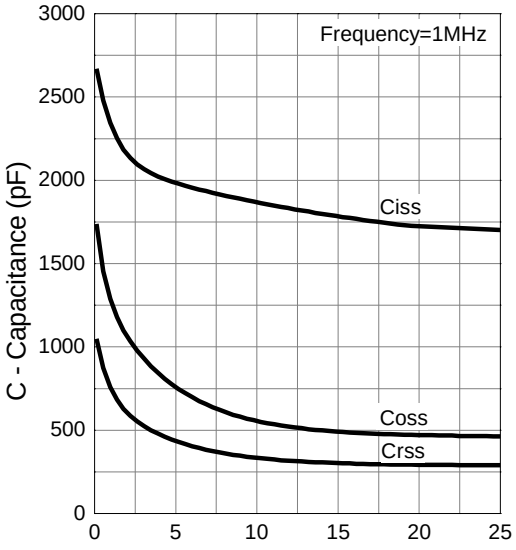
Drain-Source On Resistance



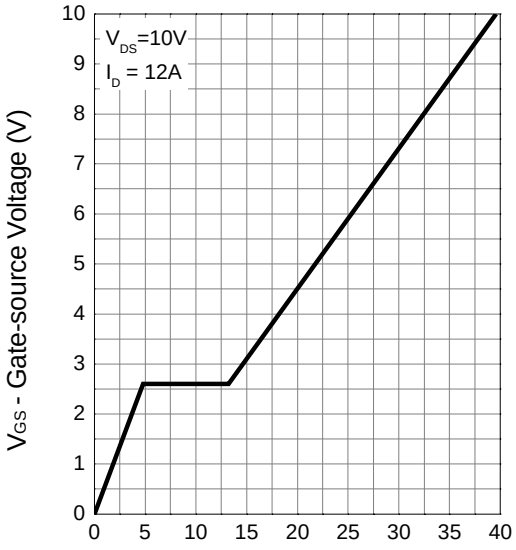
Source-Drain Diode Forward



Capacitance

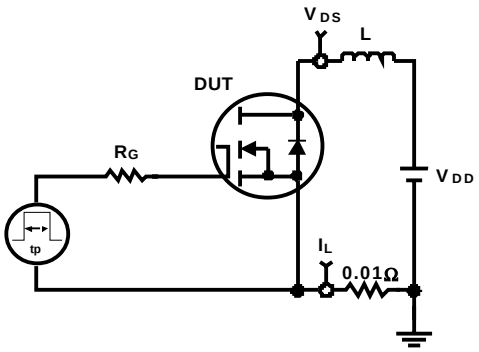


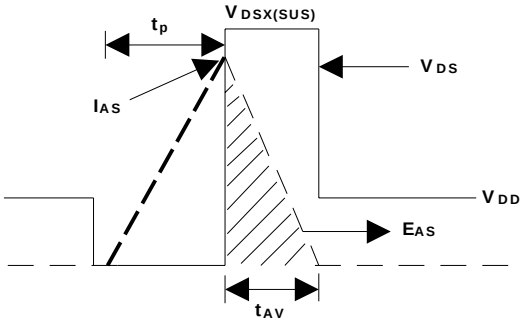
Gate Charge



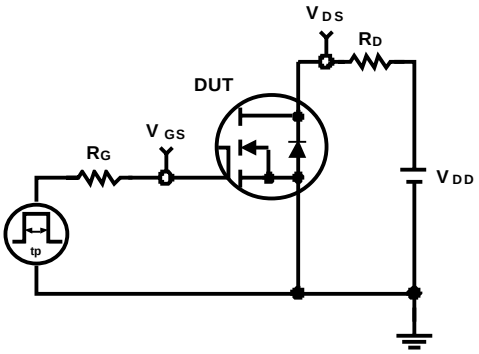
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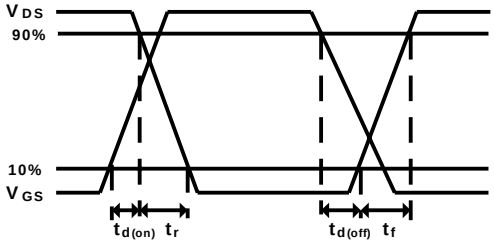
Avalanche Test Circuit and Waveforms





Switching Time Test Circuit and Waveforms

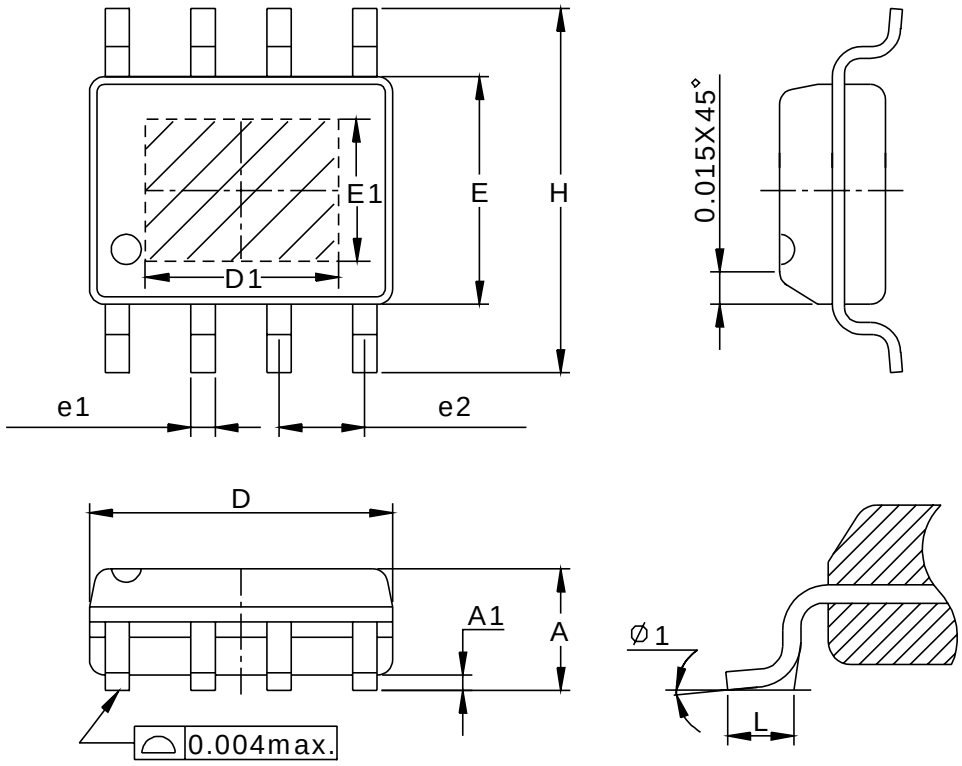




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Packaging Information

SOP-8-P pin (Reference JEDEC Registration MS-012)



Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	1.35	1.75	0.053	0.069
A1	0.10	0.25	0.004	0.010
D	4.80	5.00	0.189	0.197
D1*	3.34	3.84	0.132	0.151
E	3.80	4.00	0.150	0.157
E1*	2.23	2.68	0.088	0.106
H	5.80	6.20	0.228	0.244
L	0.40	1.27	0.016	0.050
e1	0.33	0.51	0.013	0.020
e2	1.27BSC		0.50BSC	
ϕ 1	8°		8°	

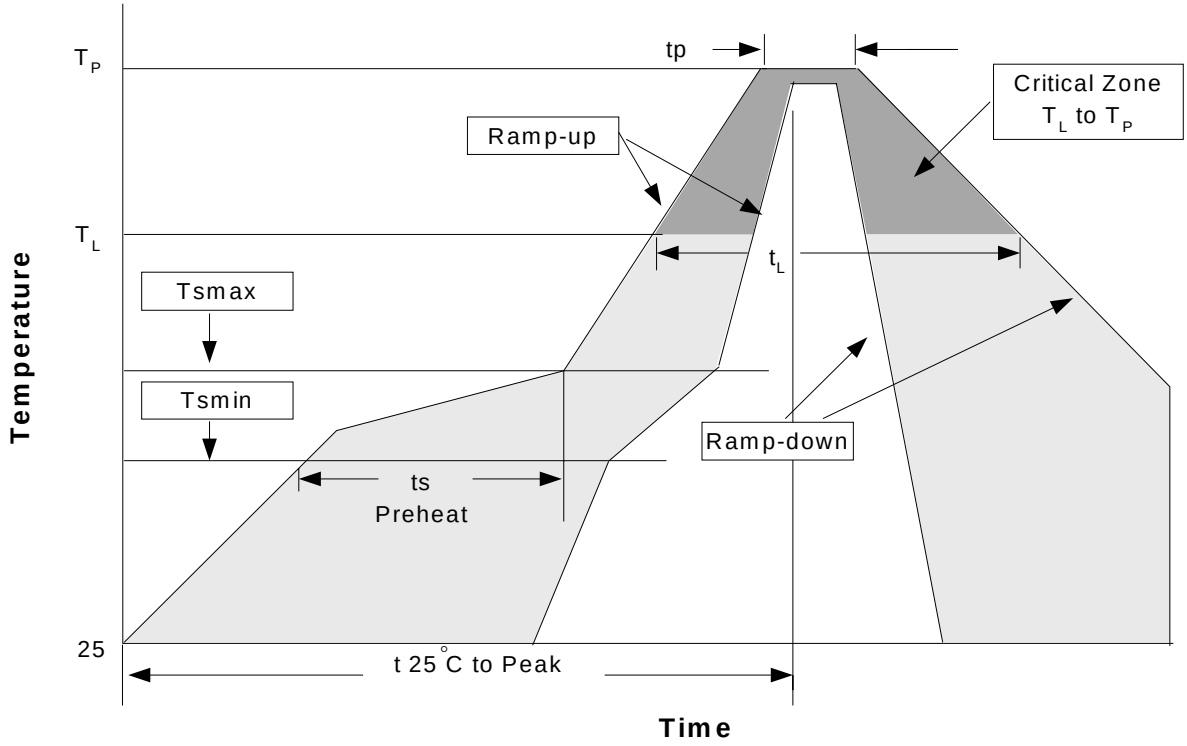
* Thermal pad dimension

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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.

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Classification Reflow Profiles(Cont.)

Table 1. SnPb Entectic 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

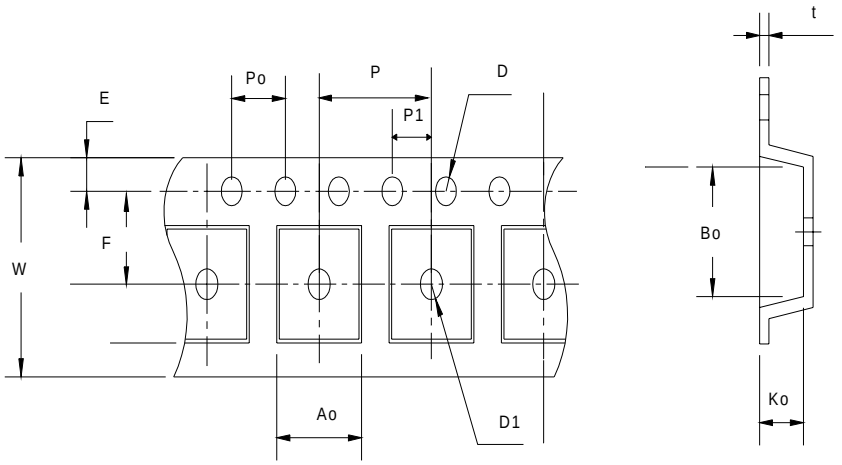
Table 2. Pb-free Process – Package Classification Reflow Temperatures

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.			

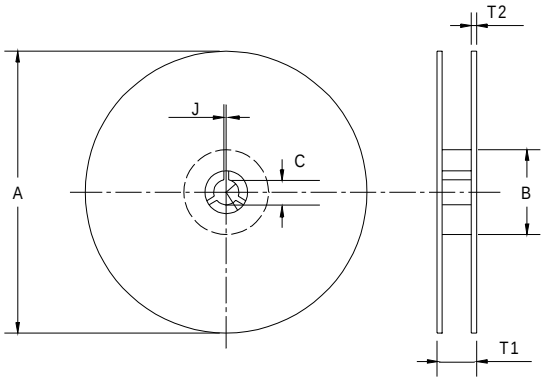
Reliability Test Program

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

Carrier Tape



Carrier Tape(Cont.)



Application	A	B	C	J	T1	T2	W	P	E
SOP- 8-P	330 ± 1	62 +1.5	12.75+ 0.15	2 ± 0.5	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± 1	1.55 +0.1	1.55+ 0.25	4.0 ± 0.1	2.0 ± 0.1	6.4 ± 0.1	5.2± 0. 1	2.1± 0.1	.3±0.013

(mm)

Cover Tape Dimensions

Application	Carrier Width	Cover Tape Width	Devices Per Reel
SOP- 8-P	12	9.3	2500

Customer Service

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