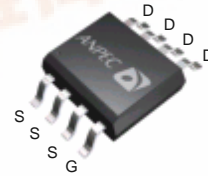
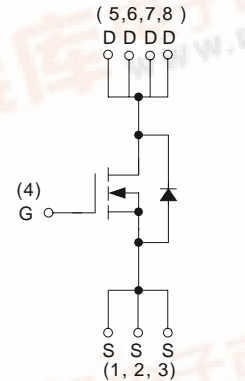


- 25V/13.5A,  
 $R_{DS(ON)}=6m\Omega(\text{typ.}) @ V_{GS}=10V$   
 $R_{DS(ON)}=7.5m\Omega(\text{typ.}) @ V_{GS}=4.5V$
- Super High Dense Cell Design
- Avalanche Rated
- Reliable and Rugged
- SOP-8 Package
- Lead Free Available (RoHS Compliant)



Top View of SOP – 8

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



N-Channel MOSFET

<p>APM4230 □□-□□□</p> <ul style="list-style-type: none"> <li>□□□ : Lead Free Code</li> <li>□□ : Handling Code</li> <li>□ : Temp. Range</li> <li>□ : Package Code</li> </ul>	<p>Package Code K : SOP-8</p> <p>Operating Junction Temp. Range C : -55 to 150°C</p> <p>Handling Code TU : Tube    TR : Tape &amp; Reel</p> <p>Lead Free Code L : Lead Free Device    Blank : Original Device</p>
<p>APM4230 K :    <span style="border: 1px solid black; padding: 2px;">APM4230 XXXXX</span></p>	<p>XXXXX - Date Code</p>

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 soldering 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.

( $T_A = 25^\circ\text{C}$  unless otherwise noted)

Symbol	Parameter	Rating	Unit	
$V_{DSS}$	Drain-Source Voltage	25	V	
$V_{GSS}$	Gate-Source Voltage	$\pm 20$		
$I_D^*$	Continuous Drain Current	$V_{GS}=10V$	A	
$I_{DM}^*$	300 $\mu\text{s}$ Pulsed Drain Current			13.5
$I_S^*$	Diode Continuous Forward Current	3	A	
$T_J$	Maximum Junction Temperature	150	$^\circ\text{C}$	
$T_{STG}$	Storage Temperature Range	-55 to 150		
$P_D^*$	Maximum Power Dissipation	$T_A=25^\circ\text{C}$	2	W
		$T_A=100^\circ\text{C}$	0.8	
$R_{\theta JA}^*$	Thermal Resistance-Junction to Ambient	62.5	$^\circ\text{C/W}$	

Note:

\*Surface Mounted on 1in<sup>2</sup> pad area,  $t \leq 10\text{sec}$ .

( $T_A = 25^\circ\text{C}$  unless otherwise noted)

Symbol	Parameter	Test Condition	APM4230K			Unit
			Min.	Typ.	Max.	
<b>Drain-Source Avalanche Ratings</b>						
$E_{AS}$	Avalanche Energy, Single Pulsed	$I_D=20A, V_{DD}=15V$			45	mJ
<b>Static Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_{DS}=250\mu A$	25			V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=20V, V_{GS}=0V$ $T_J=85^\circ\text{C}$			1	$\mu A$
					30	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_{DS}=250\mu A$	1.3	1.8	2.5	V
$I_{GSS}$	Gate Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$			$\pm 100$	nA
$R_{DS(on)}^a$	Drain-Source On-state Resistance	$V_{GS}=10V, I_{DS}=13.5A$ $V_{GS}=4.5V, I_{DS}=10A$ $V_{GS}=4.5V, I_{DS}=10A,$ $T_J=125^\circ\text{C}$		6	7.5	m $\Omega$
				7.5	10	
				9.5	13	
$V_{SD}^a$	Diode Forward Voltage	$I_{SD}=1A, V_{GS}=0V$		0.7	1.3	V
<b>Gate Charge Characteristics<sup>b</sup></b>						
$Q_g$	Total Gate Charge	$V_{DS}=10V, V_{GS}=4.5V,$ $I_{DS}=16A$		29	40	nC
$Q_{gs}$	Gate-Source Charge			3.6		
$Q_{gd}$	Gate-Drain Charge			12		

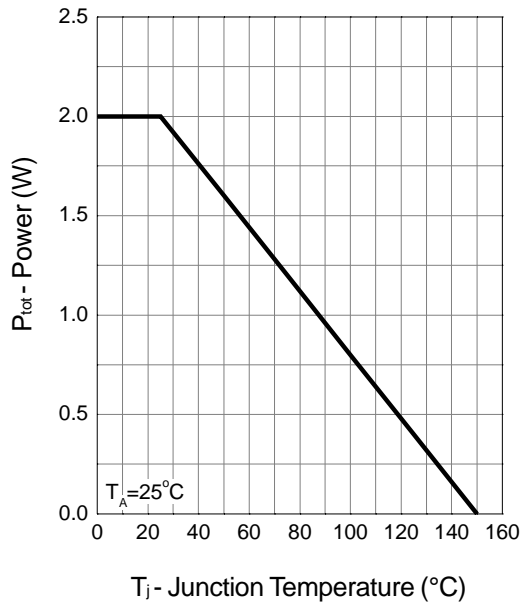
( $T_A = 25^\circ\text{C}$  unless otherwise noted)

Symbol	Parameter	Test Condition	APM4230K			Unit
			Min.	Typ.	Max.	
<b>Dynamic Characteristics<sup>b</sup></b>						
$R_G$	Gate Resistance	$V_{GS}=0V, V_{DS}=0V, F=1\text{MHz}$		2.3		$\Omega$
$C_{iss}$	Input Capacitance	$V_{GS}=0V,$ $V_{DS}=15V,$ Frequency=1.0MHz		3300		pF
$C_{oss}$	Output Capacitance			1180		
$C_{rss}$	Reverse Transfer Capacitance			790		
$t_{d(ON)}$	Turn-on Delay Time	$V_{DD}=15V, R_L=15\Omega,$ $I_{DS}=1A, V_{GEN}=10V,$ $R_G=6\Omega$		15	28	ns
$T_r$	Turn-on Rise Time			13	24	
$t_{d(OFF)}$	Turn-off Delay Time			122	170	
$T_f$	Turn-off Fall Time			53	75	

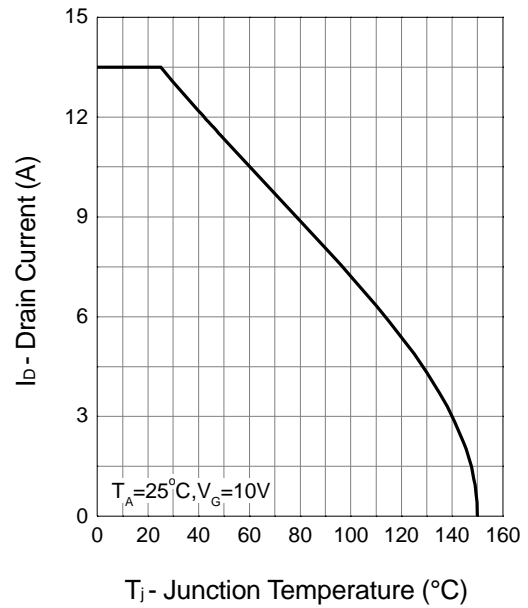
Notes:

- a : Pulse test ; pulse width $\leq 300\mu\text{s}$ , duty cycle $\leq 2\%$ .
- b : Guaranteed by design, not subject to production testing.

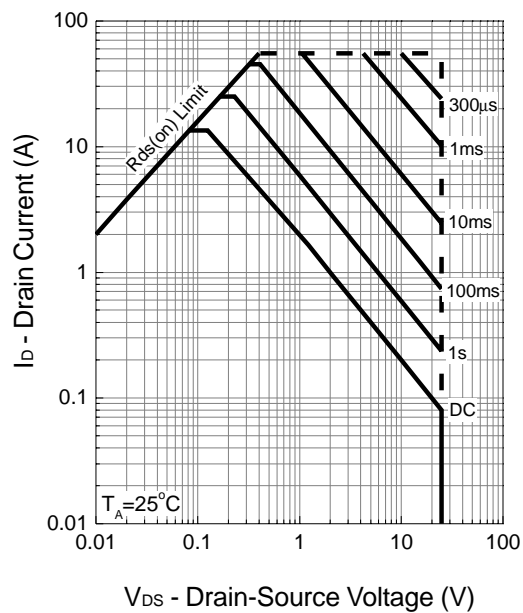
**Power Dissipation**



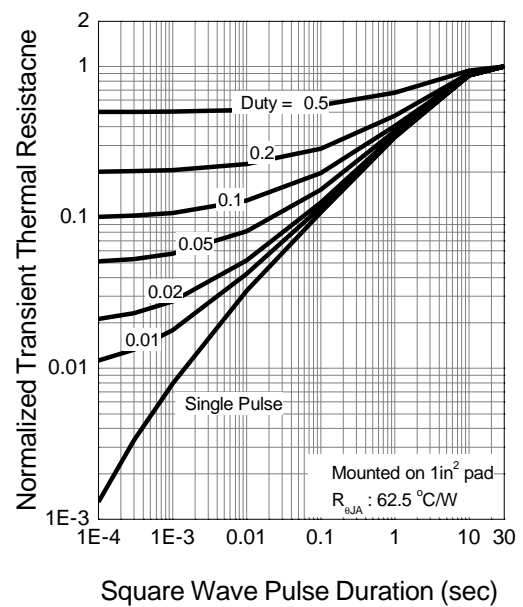
**Drain Current**



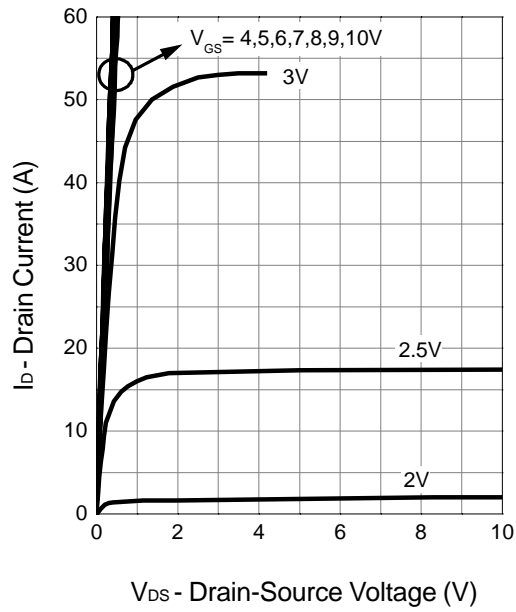
**Safe Operation Area**



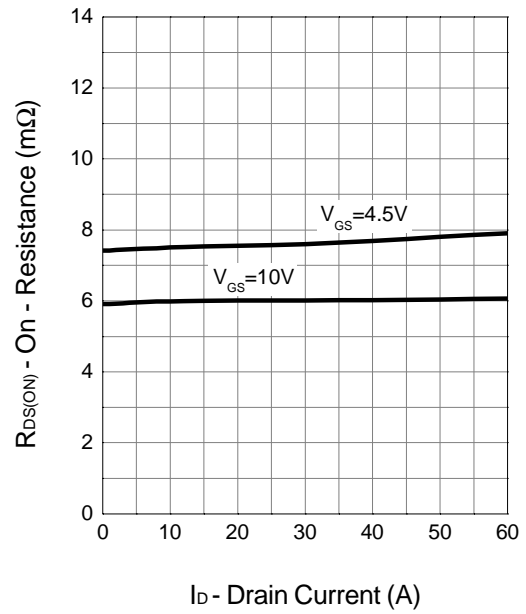
**Thermal Transient Impedance**



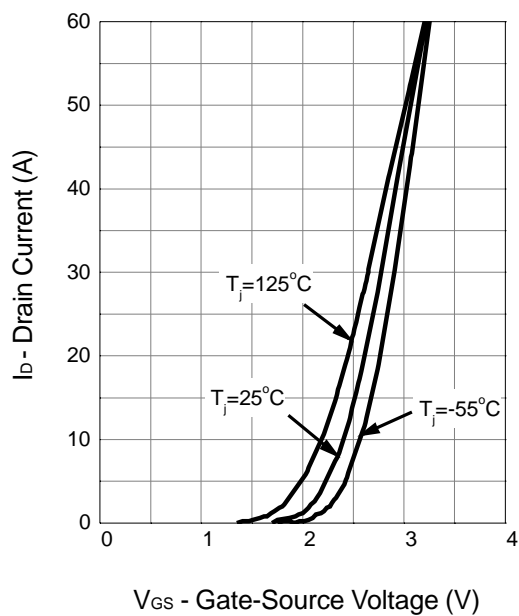
**Output Characteristics**



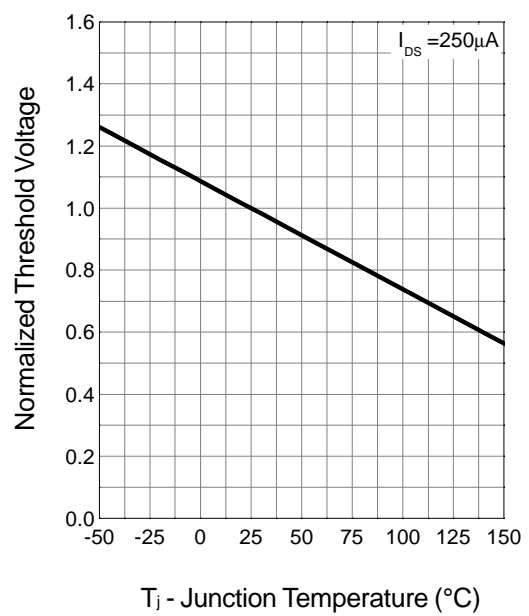
**Drain-Source On Resistance**



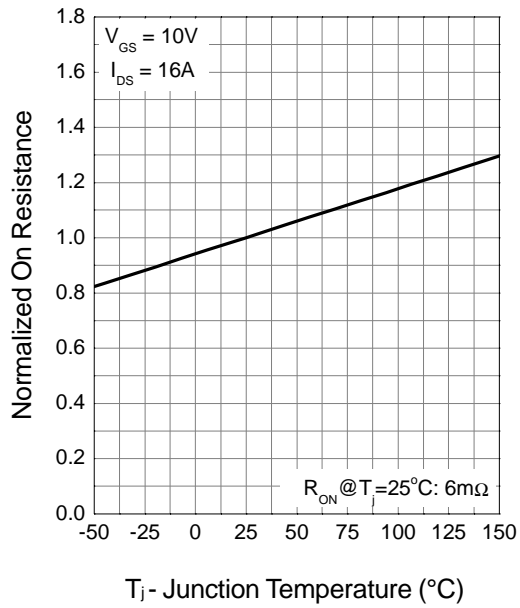
**Transfer Characteristics**



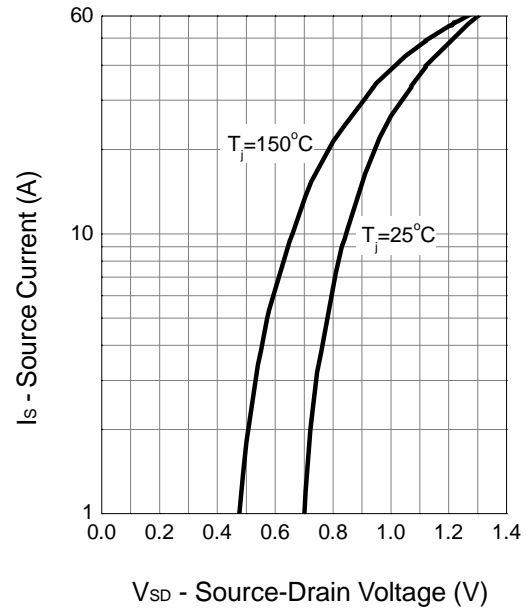
**Gate Threshold Voltage**



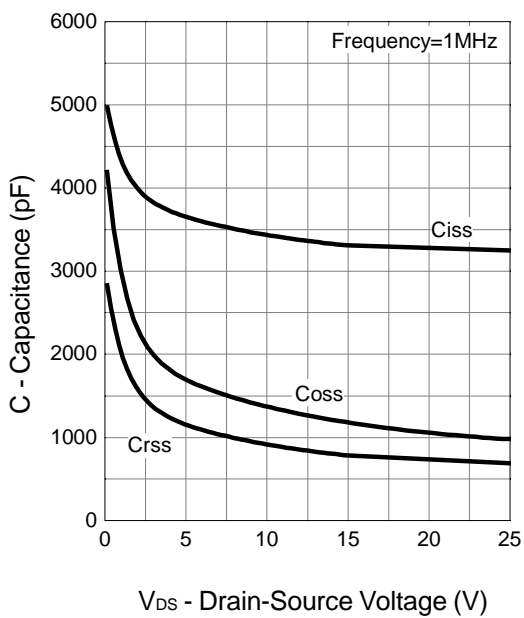
**Drain-Source On Resistance**



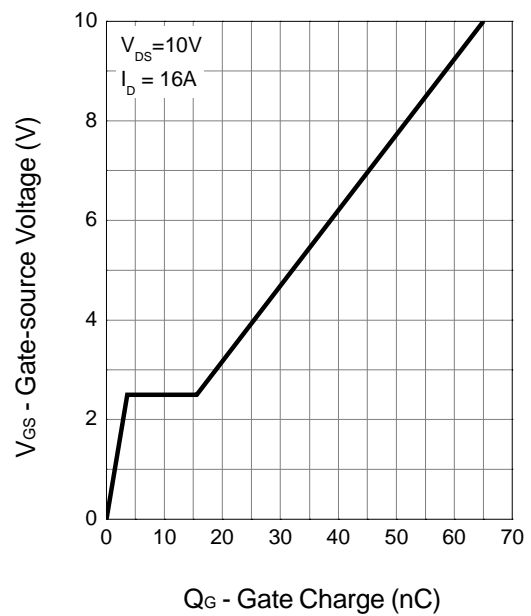
**Source-Drain Diode Forward**

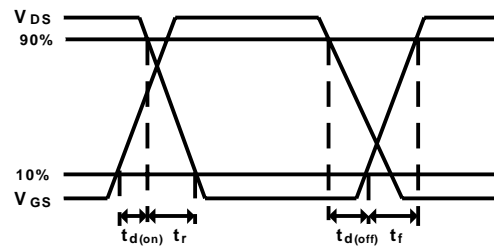
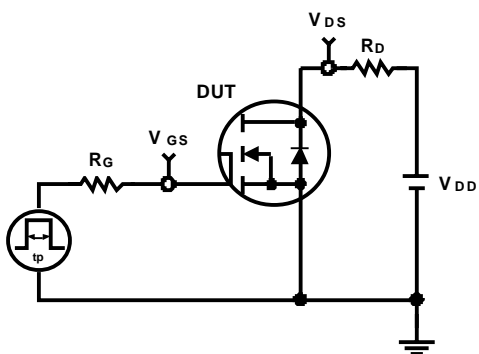
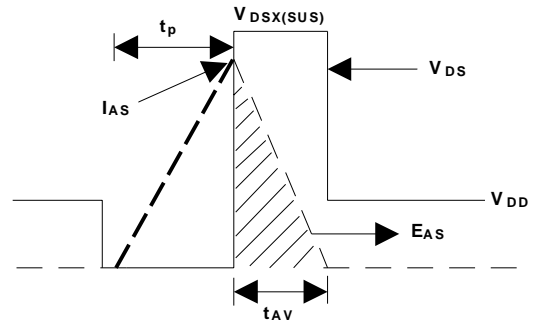
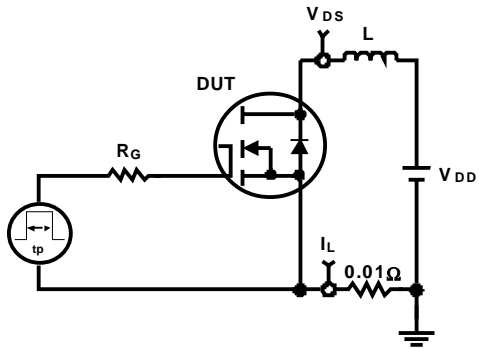


**Capacitance**

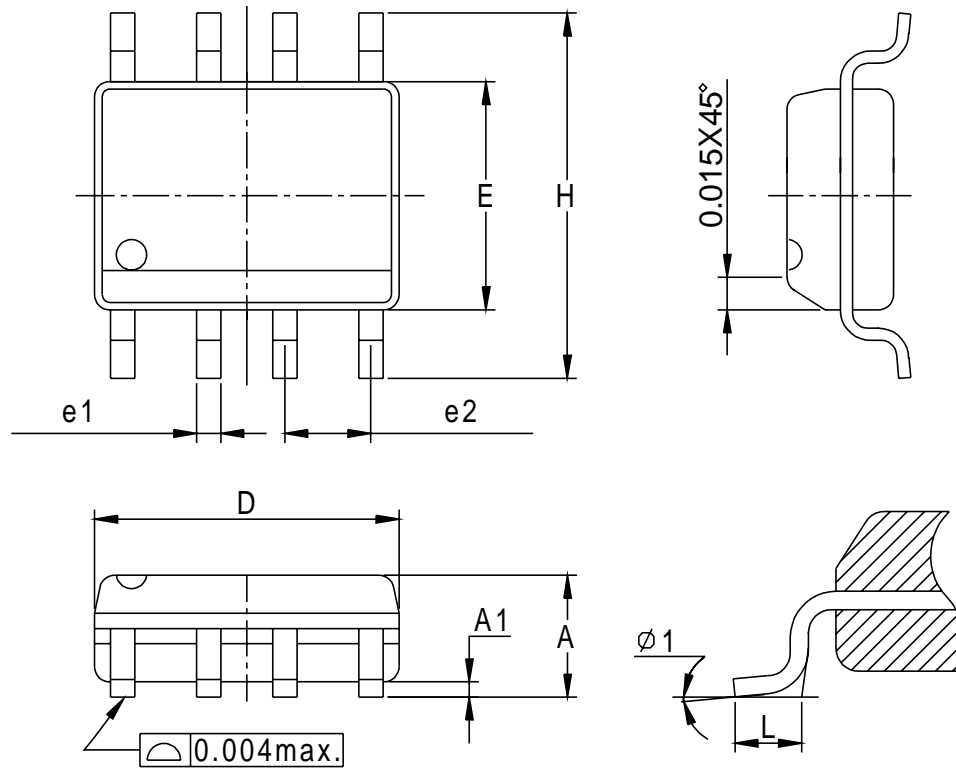


**Gate Charge**





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

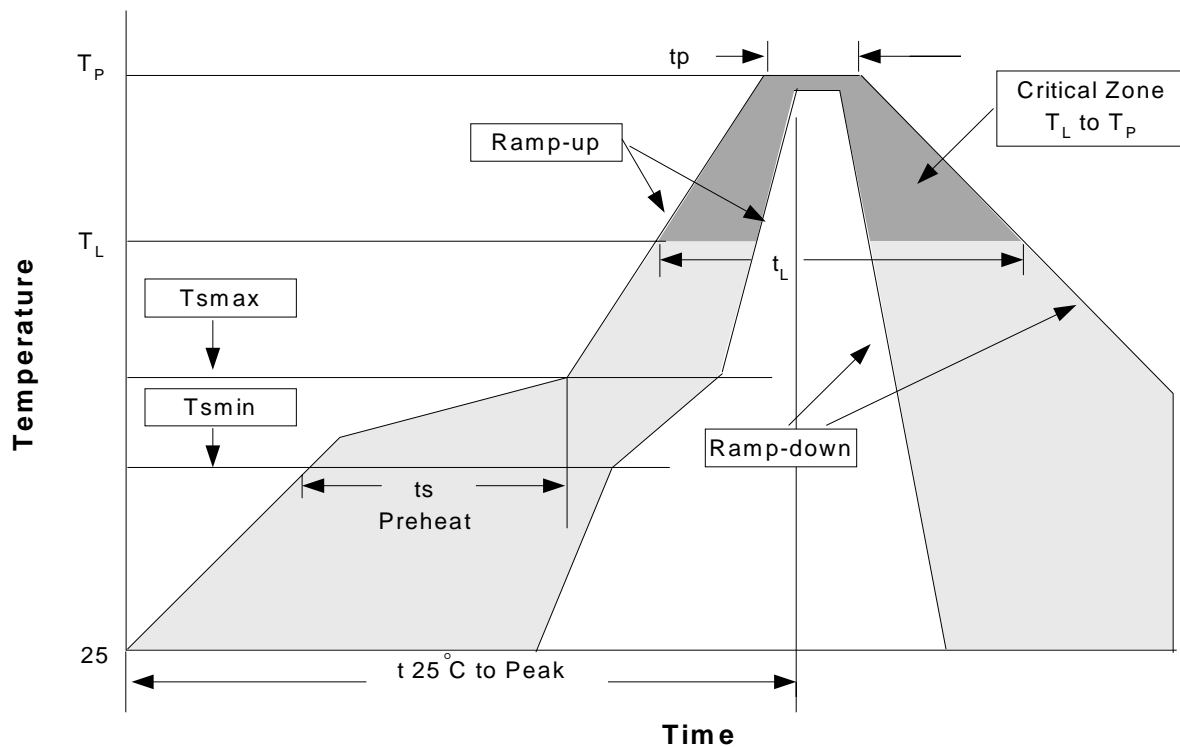


Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	1.35	1.75	0.053	0.069
A1	0.10	0.25	0.004	0.010
D	4.80	5.00	0.189	0.197
E	3.80	4.00	0.150	0.157
H	5.80	6.20	0.228	0.244
L	0.40	1.27	0.016	0.050
e1	0.33	0.51	0.013	0.020
e2	1.27BSC		0.50BSC	
$\phi 1$	8°		8°	



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.

(IR/Convection or VPR Reflow)



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 ( $T_{smin}$ )	100°C	150°C
Temperature Max ( $T_{smax}$ )	150°C	200°C
Time (min to max) ( $t_s$ )	60-120 seconds	60-180 seconds
Time maintained above:		
Temperature ( $T_L$ )	183°C	217°C
Time ( $t_L$ )	60-150 seconds	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.

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

Table 1. SnPb Eutectic Process – Package Peak Reflow Temperatures

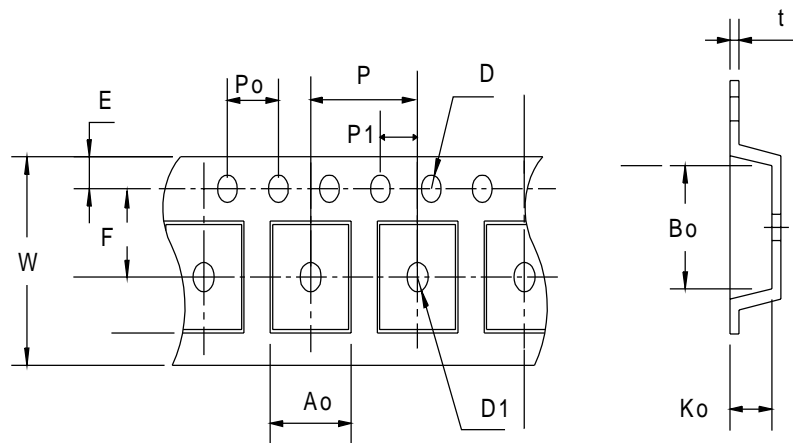
Package Thickness	Volume mm <sup>3</sup> <350	Volume mm <sup>3</sup> ≥350
<2.5 mm	240 +0/-5°C	225 +0/-5°C
≥2.5 mm	225 +0/-5°C	225 +0/-5°C

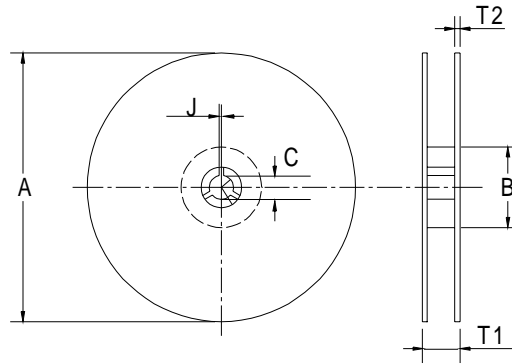
Table 2. Pb-free Process – Package Classification Reflow Temperatures

Package Thickness	Volume mm <sup>3</sup> <350	Volume mm <sup>3</sup> 350-2000	Volume mm <sup>3</sup> >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.

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





Application	A	B	C	J	T1	T2	W	P	E
SOP-8	330±1	62 ± 1.5	12.75 + 0.15	2 + 0.5	12.4 +0.2	2± 0.2	12 + 0.3 - 0.1	8± 0.1	1.75± 0.1
	F	D	D1	Po	P1	Ao	Bo	Ko	t
	5.5 ± 0.1	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	0.3±0.013

(mm)

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

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