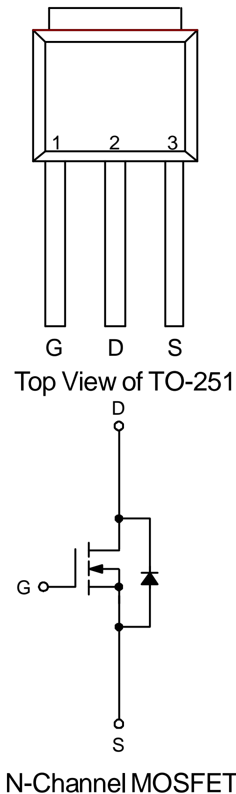
N-Channel Enhancement Mode MOSFET

Features

- 25V/60A ,
  $R_{DS(ON)}$=4.8mΩ(typ.) @ V_{GS}=10V
  $R_{DS(ON)}$=7mΩ(typ.) @ V_{GS}=4.5V
- Super High Dense Cell Design
- Avalanche Rated
- Reliable and Rugged
- Lead Free Available (RoHS Compliant)

Pin Description



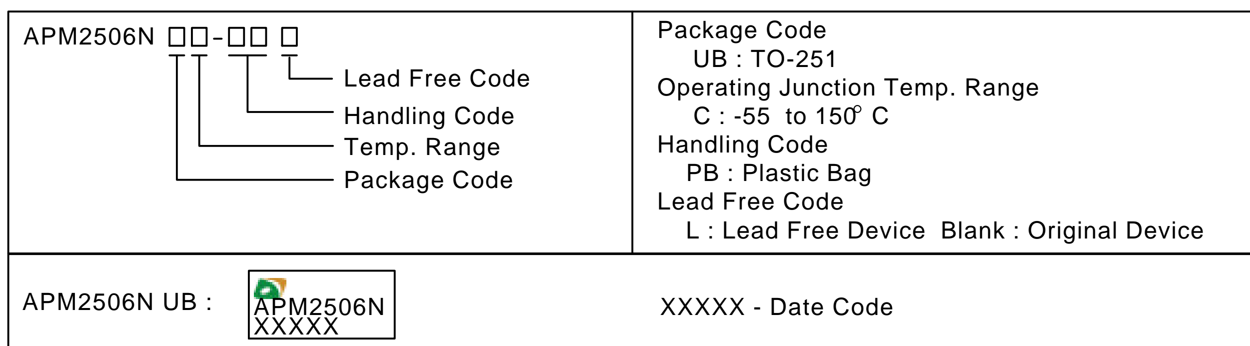
Top View of TO-251

N-Channel MOSFET

Applications

- Power Management in Desktop Computer or DC/DC Converters

Ordering and Marking Information



APM2506N □□-□□ □ Lead Free Code Handling Code Temp. Range Package Code	Package Code UB : TO-251 Operating Junction Temp. Range C : -55 to 150° C Handling Code PB : Plastic Bag Lead Free Code L : Lead Free Device Blank : Original Device
APM2506N UB : APM2506N 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 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.

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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
I_S	Diode Continuous Forward Current	T_C=25°C	40	A
Mounted on Large Heat Sink				
I_{DP}	300μs Pulse Drain Current Tested	T_C=25°C	150	A
		T_C=100°C	80	
I_D	Continuous Drain Current	T_C=25°C	60*	A
		T_C=100°C	50	
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 Minimum Footprint				
I_{DP}	300μs Pulse Drain Current Tested	T_A=25°C	150	A
		T_A=100°C	80	
I_D	Continuous Drain Current	T_A=25°C	12	A
		T_A=100°C	5.5	
P_D	Maximum Power Dissipation	T_A=25°C	1.25	W
		T_A=100°C	0.25	
$R_{\theta JA}$	Thermal Resistance-Junction to Ambient		100	°C/W

Note:
* Current limited by bond wire.

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

Symbol	Parameter	Test Condition	APM2506NUB			Unit
			Min.	Typ.	Max.	
Drain-Source Avalanche Ratings						
E_{AS}	Drain-Source Avalanche Energy	I_D=20A, L=0.5mH			100	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
$V_{GS(th)}$	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}=40A		4.8	6	mΩ
		V_{GS}=4.5V, I_{DS}=20A		7	9	
Diode Characteristics						
V_{SD} [a]	Diode Forward Voltage	I_{SD}=20A, V_{GS}=0V		0.7	1.1	V
t_{rr} [b]	Reverse Recovery Time	I_{SD}=10A, dI_{SD}/dt =100A/μs		30		ns
Q_{rr} [b]	Reverse Recovery Charge			14		nC
Dynamic Characteristics [b]						
R_G	Gate Resistance	V_{GS}=0V,V_{DS}=0V,F=1MHz		1.0	2.1	Ω
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=15V, Frequency=1.0MHz		3100		pF
C_{oss}	Output Capacitance			680		
C_{rss}	Reverse Transfer Capacitance			520		
$t_{d(ON)}$	Turn-on Delay Time	V_{DD}=15V, R_L=15Ω, I_{DS}=1A, V_{GEN}=10V, R_G=6Ω		19		ns
T_r	Turn-on Rise Time			20		
$t_{d(OFF)}$	Turn-off Delay Time			62		
T_f	Turn-off Fall Time			43		
Gate Charge Characteristics [b]						
Q_g	Total Gate Charge	V_{DS}=15V, V_{GS}=4.5V, I_{DS}=40A		37.5	56	nC
Q_{gs}	Gate-Source Charge			9.4		
Q_{gd}	Gate-Drain Charge			21		

Notes:

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

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

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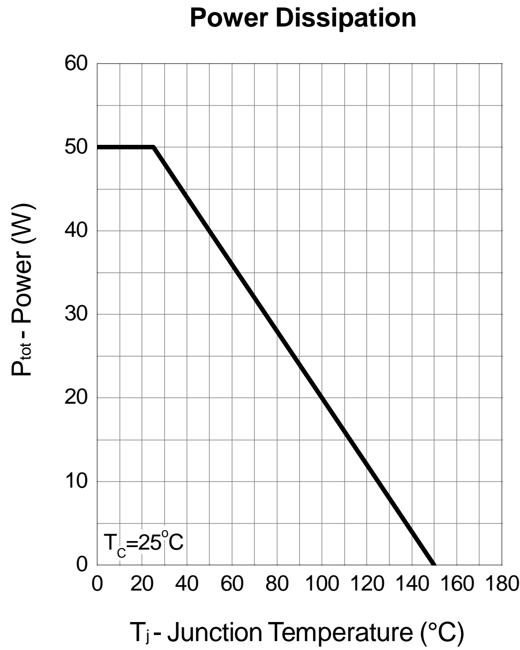
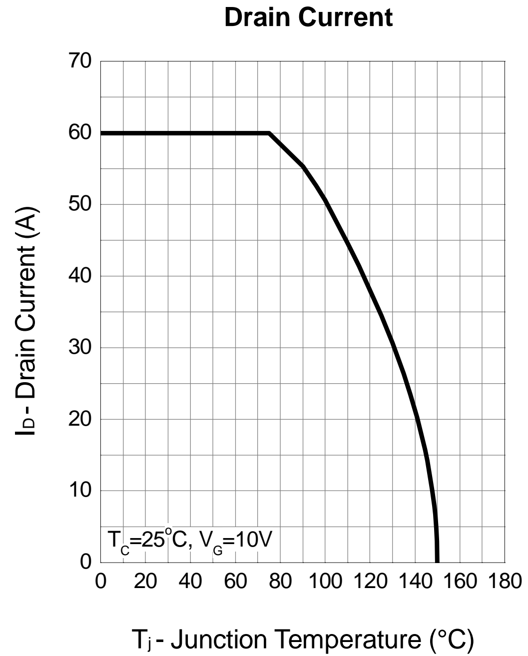
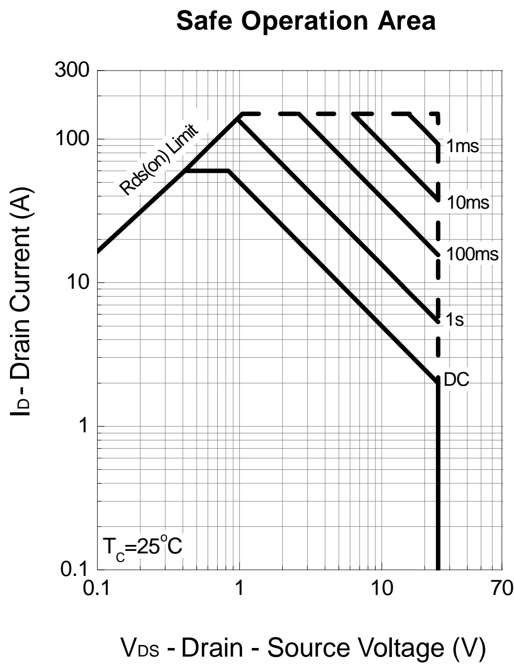
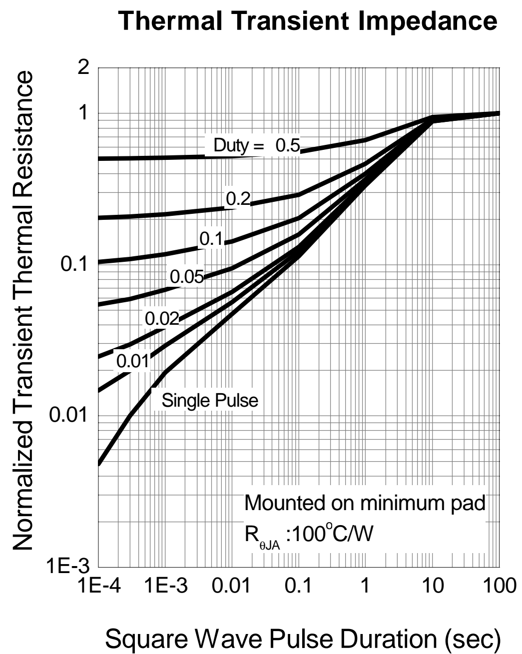
Typical Characteristics

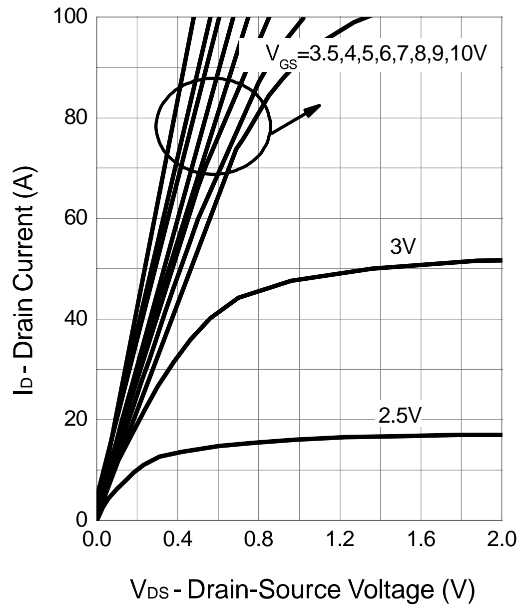


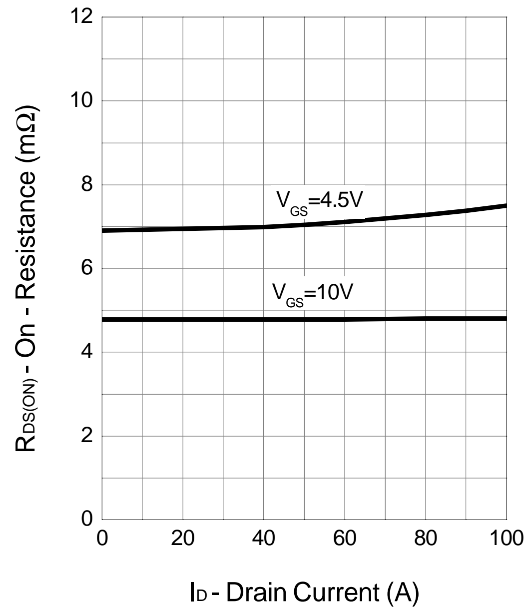


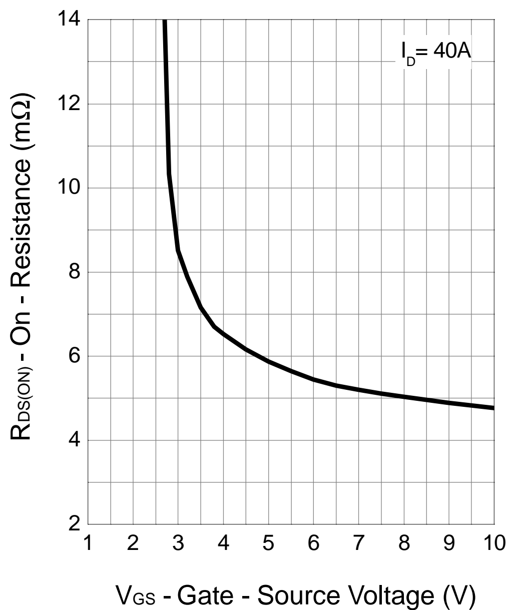


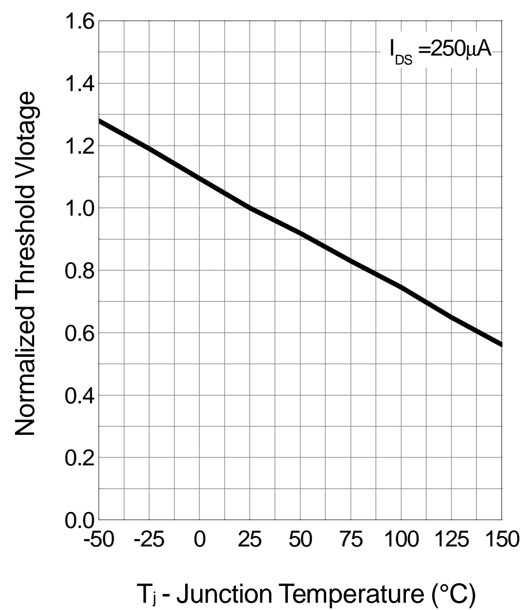


Typical Characteristics (Cont.)









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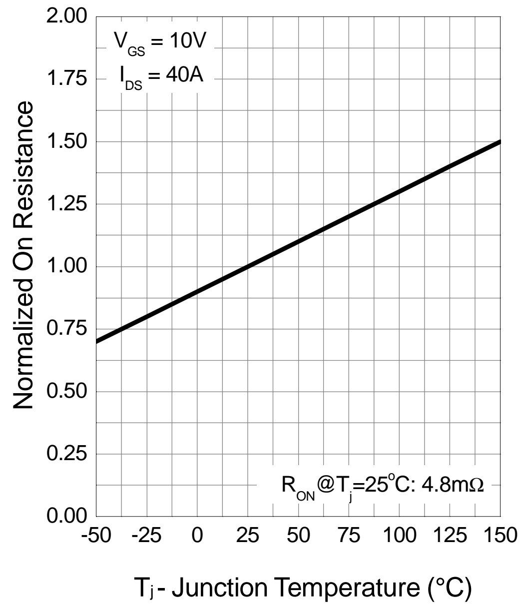
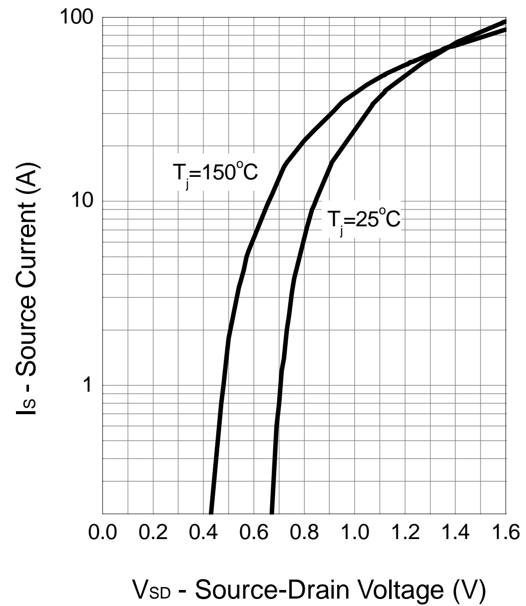
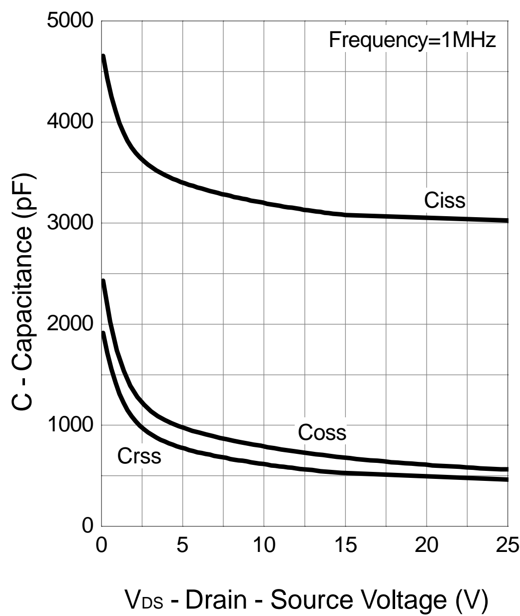
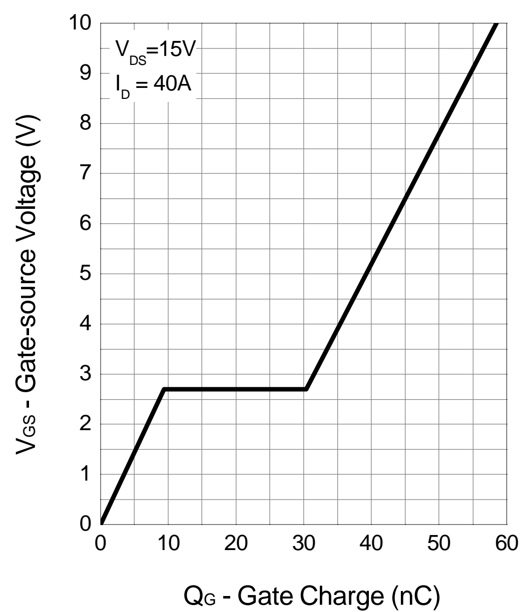
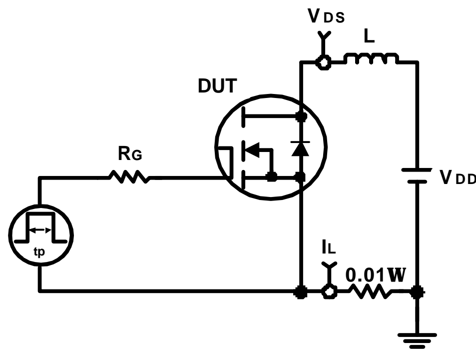


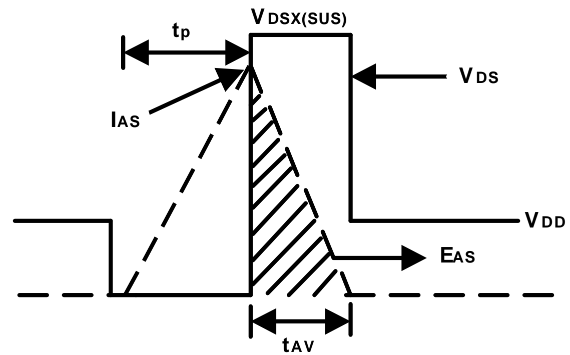




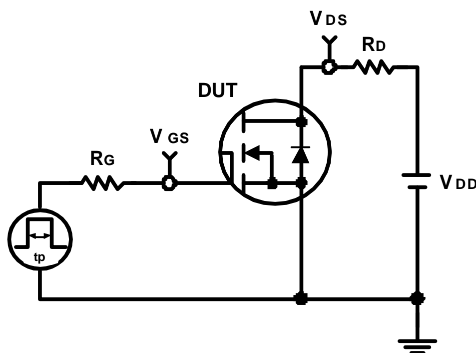


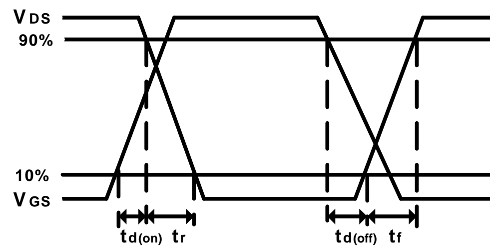
Avalanche Test Circuit and Waveforms





Switching Time Test Circuit and Waveforms





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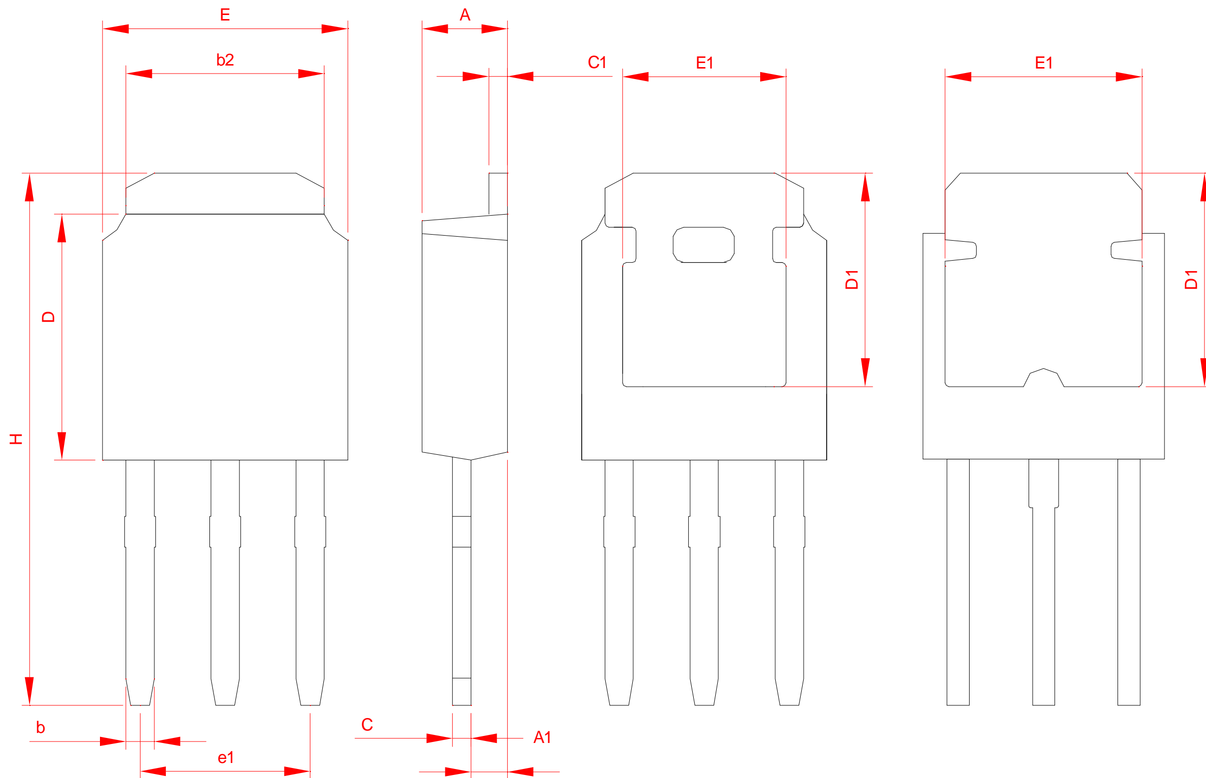
Packaging Information

TO-251

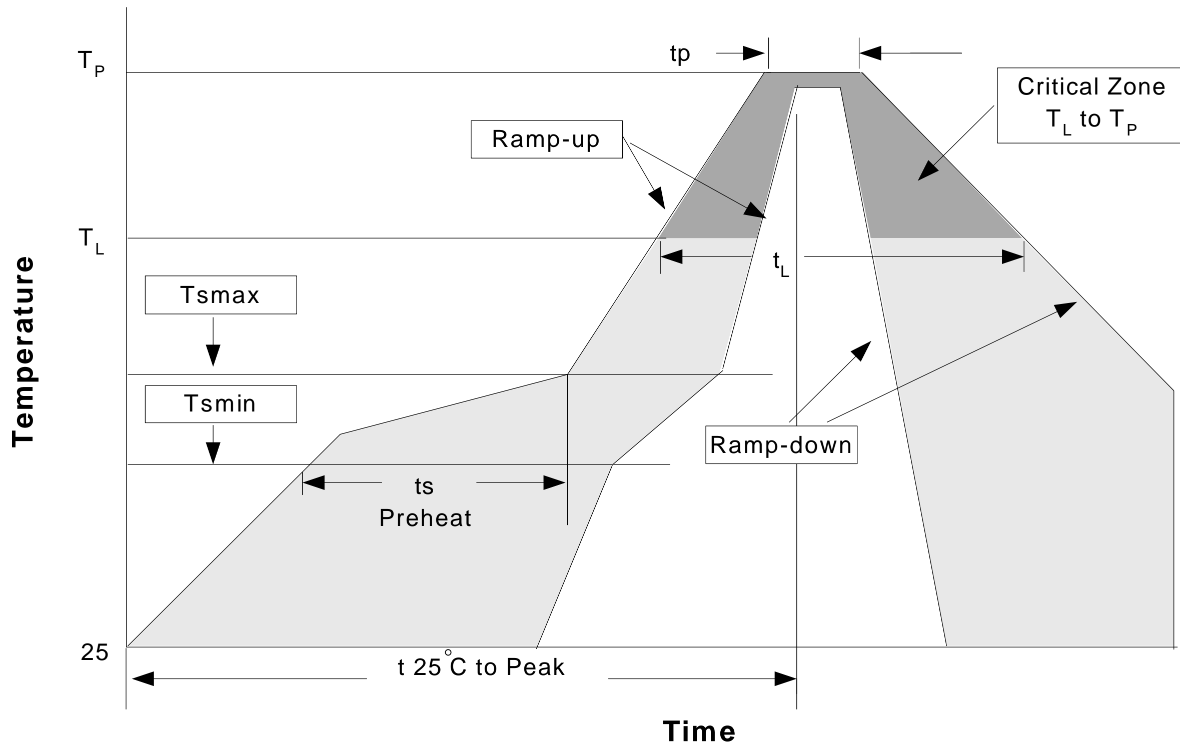


Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	2.20	2.40	0.087	0.094
A1	1.02	1.27	0.040	0.050
b	0.50	0.88	0.020	0.035
b2	5.20	5.46	0.205	0.215
C	0.40	0.60	0.016	0.024
C1	0.40	0.60	0.016	0.024
D	5.40	6.20	0.213	0.244
D1	5.30	--	0.209	--
E	6.35	6.70	0.250	0.264
E1	4.40	5.40	0.173	0.213
e1	4.50	4.70	0.177	0.185
H	12.90	15.25	0.508	0.600

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

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