APM4008NG

N-Channel Enhancement Mode MOSFET

Features

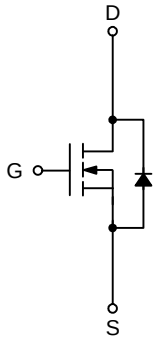
- 40V/60A,
  $R_{DS(ON)}$=6.5mΩ (typ.) @ V_{GS}=10V
  $R_{DS(ON)}$=10mΩ (typ.) @ V_{GS}=4.5V
- Super High Dense Cell Design
- Reliable and Rugged
- Lead Free and Green Devices Available (RoHS Compliant)

Applications

- Power Management in LCD monitor/TV

Pin Description

Top View of TO-263



N-Channel MOSFET

Ordering and Marking Information

APM4008N □□-□□□ Assembly Material Handling Code Temperature Range Package Code	Package Code G : TO-263 Operating Junction Temperature Range C : -55 to 150 °C Handling Code TR : Tape & Reel Assembly Material G : Halogen and Lead Free Device
APM4008N G : APM4008N 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).

Absolute Maximum Ratings

Symbol	Parameter		Rating	Unit
Common Ratings (T_A=25°C Unless Otherwise Noted)				
V_{DSS}	Drain-Source Voltage		40	V
BV_{DS} (Avalanche)*	Drain-Source Avalanche Voltage (maximum)		45	
V_{GSS}	Gate-Source Voltage		±20	V
T_J	Maximum Junction Temperature		150	°C
T_{STG}	Storage Temperature Range		-55 to 150	°C
I_S	Diode Continuous Forward Current		20	A
I_{DP}	300µs Pulse Drain Current Tested	T_C=25°C	150	A
		T_C=100°C	80	
E_{AS}**	Drain-Source Avalanche Energy		150	mJ
Mounted on Large Heat Sink				
I_D	Continuous Drain Current	T_C=25°C	60***	A
		T_C=100°C	45	
P_D	Maximum Power Dissipation	T_C=25°C	62.5	W
		T_C=100°C	25	
$R_{\theta JC}$	Thermal Resistance-Junction to Case		2	°C/W
Mounted on PCB of 1in^2 pad area				
I_D	Continuous Drain Current	T_A=25°C	15	A
		T_A=100°C	9.5	
P_D	Maximum Power Dissipation	T_A=25°C	2.8	W
		T_A=100°C	1.1	
$R_{\theta JA}$	Thermal Resistance-Junction to Ambient		45	°C/W
Mounted on PCB of Minimum Footprint				
I_D	Continuous Drain Current	T_A=25°C	13	A
		T_A=100°C	8	
P_D	Maximum Power Dissipation	T_A=25°C	2	W
		T_A=100°C	0.8	
$R_{\theta JA}$	Thermal Resistance-Junction to Ambient		62.5	°C/W

Notes:

* Avalanche single pulse test, and avalanche period time tav≤100µs, duty<1%.

** Avalanche test condition: T_J = 25°C, L=0.5mH, I_{AS}= 25A, V_{DD}=30V, and V_{GS}=10V.

*** Current is limited by bond wire.

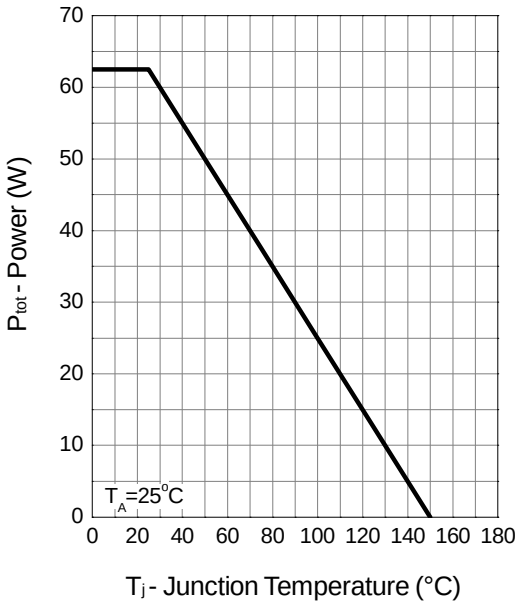
Electrical Characteristics (T_A = 25°C)

Symbol	Parameter	Test Conditions	APM4008NG			Unit
			Min.	Typ.	Max.	
Static Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V, I_{DS}=250μA	40	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=32V, V_{GS}=0V	-	-	1	μA
		T_J=85°C	-	-	30	
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_{DS}=250μA	1.3	2	3	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}=20A	-	6.5	8	mΩ
		V_{GS}=4.5V, I_{DS}=10A	-	10	13.5	
Diode Characteristics						
V_{SD} [a]	Diode Forward Voltage	I_{SD}=20A, V_{GS}=0V	-	0.7	1.1	V
Gate Charge Characteristics [b]						
Q_g	Total Gate Charge	V_{DS}=20V, V_{GS}=10V, I_{DS}=20A	-	51	71	nC
Q_{gs}	Gate-Source Charge		-	8	-	
Q_{gd}	Gate-Drain Charge		-	14	-	
Dynamic Characteristics [b]						
R_G	Gate Resistance	V_{GS}=0V,V_{DS}=0V,F=1MHz	-	1.3	-	Ω
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=20V, Frequency=1.0MHz	-	2600	-	pF
C_{oss}	Output Capacitance		-	260	-	
C_{rss}	Reverse Transfer Capacitance		-	210	-	
$t_{d(ON)}$	Turn-on Delay Time	V_{DD}=20V, R_L=20Ω, I_{DS}=1A, V_{GEN}=10V, R_G=6Ω	-	18	33	ns
t_r	Turn-on Rise Time		-	16	30	
$t_{d(OFF)}$	Turn-off Delay Time		-	57	104	
t_f	Turn-off Fall Time		-	18	33	
t_{rr}	Reverse Recovery Time	I_{DS}=20A, dI_{SD}/dt=100A/μs	-	32	-	ns
Q_{rr}	Reverse Recovery Charge		-	29	-	nC

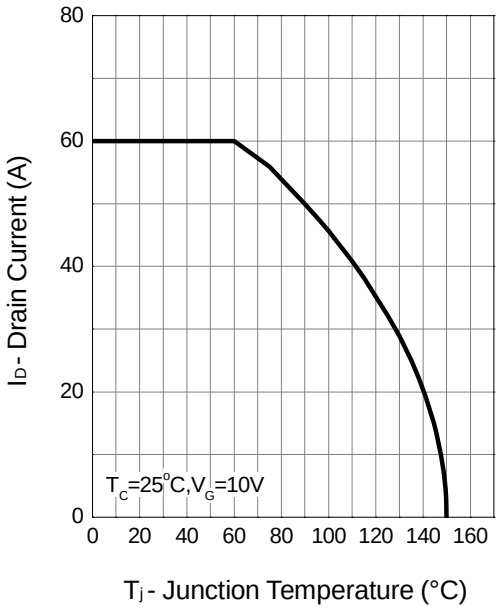
Note a : Pulse test ; pulse width≤300μs, duty cycle≤2%.
Note b : Guaranteed by design, not subject to production testing.

Typical Operating Characteristics

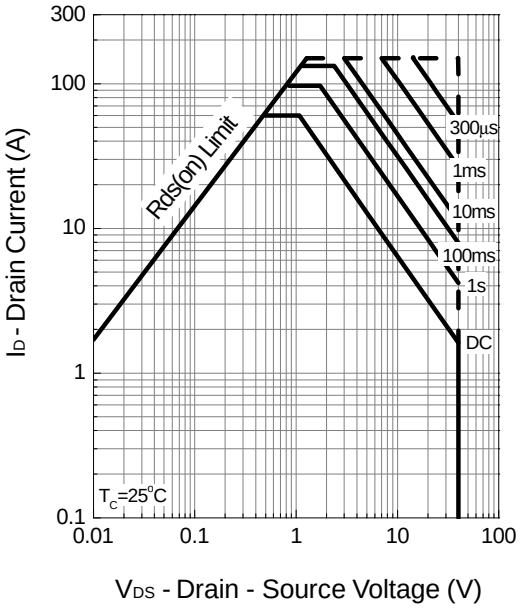
Power Dissipation



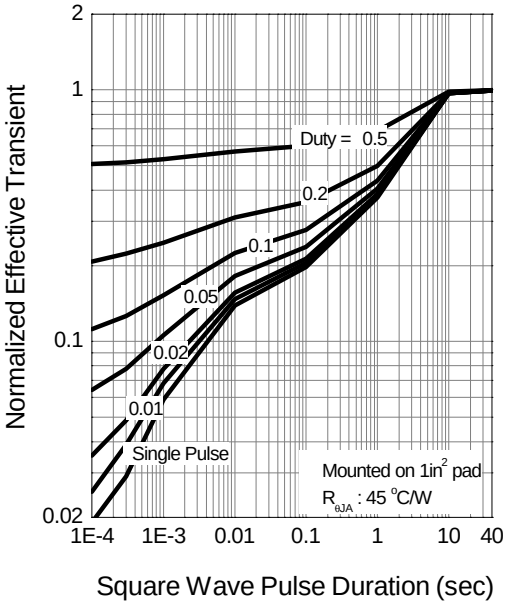
Drain Current



Safe Operation Area

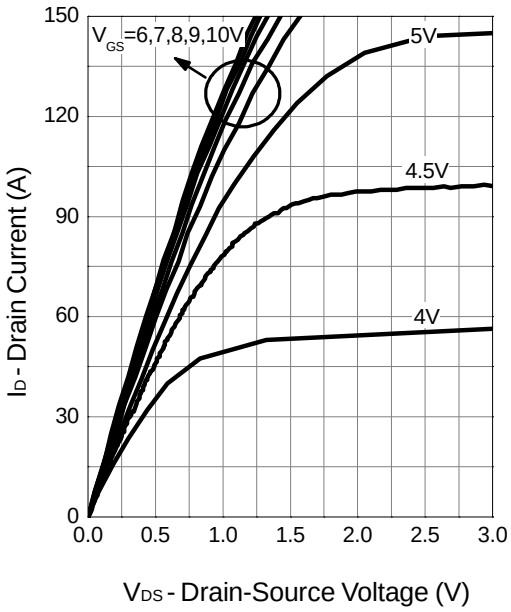


Thermal Transient Impedance

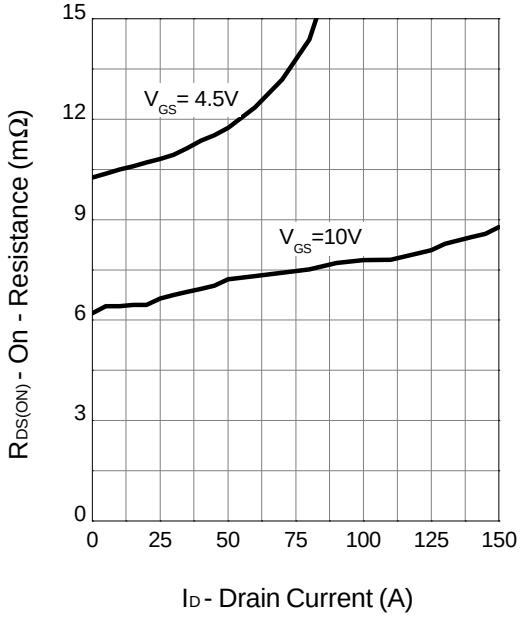


Typical Operating Characteristics (Cont.)

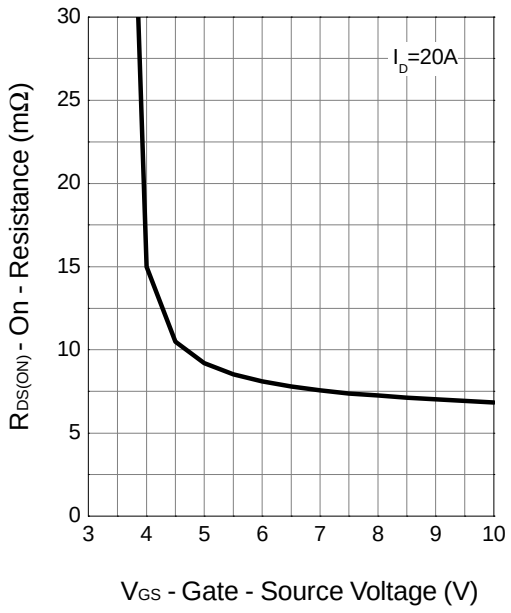
Output Characteristics



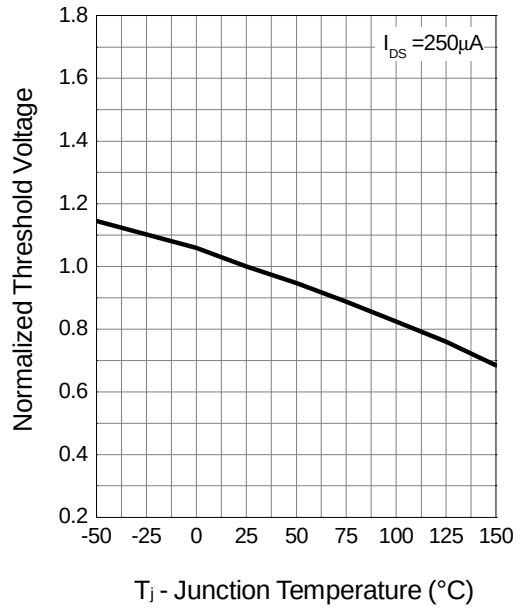
Drain-Source On Resistance



Drain-Source On Resistance

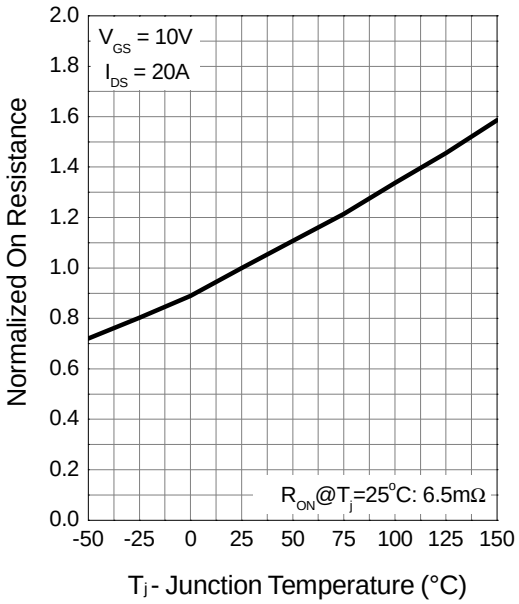


Gate Threshold Voltage

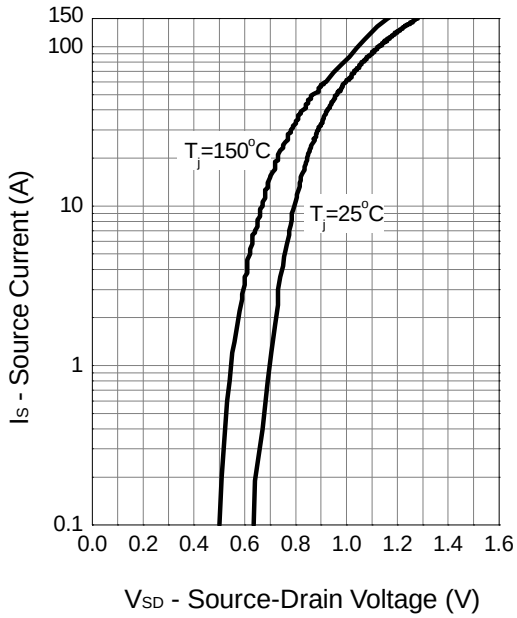


Typical Operating Characteristics (Cont.)

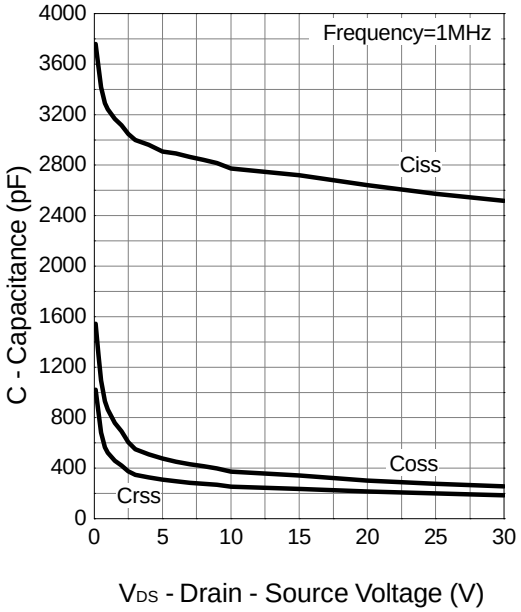
Drain-Source On Resistance



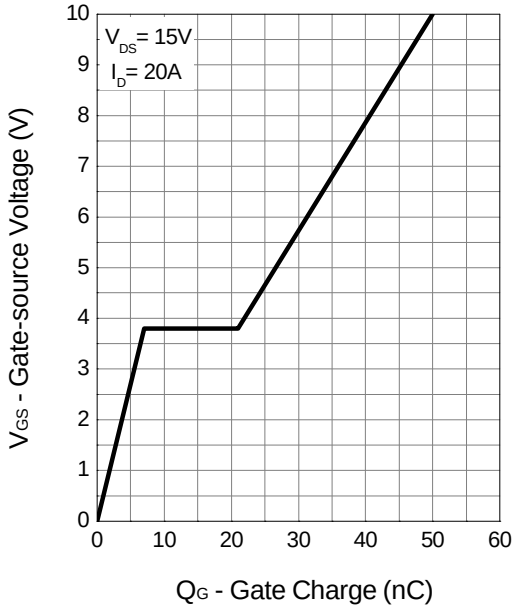
Source-Drain Diode Forward



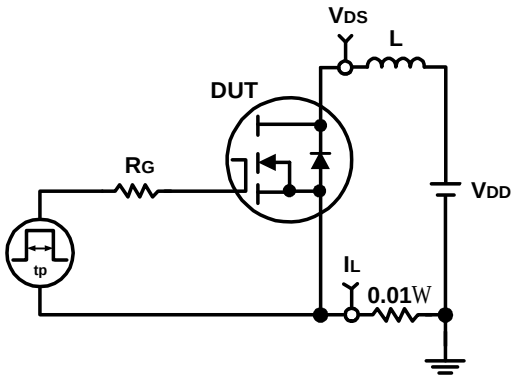
Capacitance

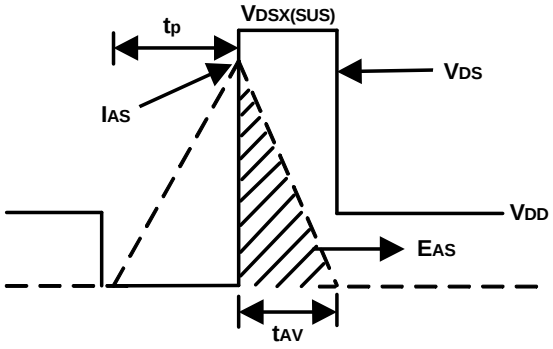


Gate Charge

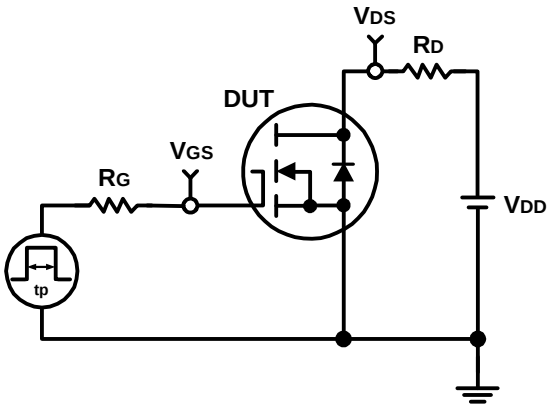


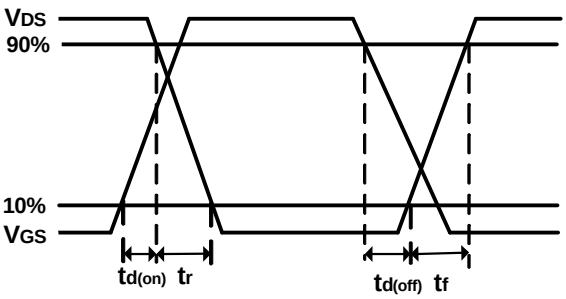
Avalanche Test Circuit and Waveforms





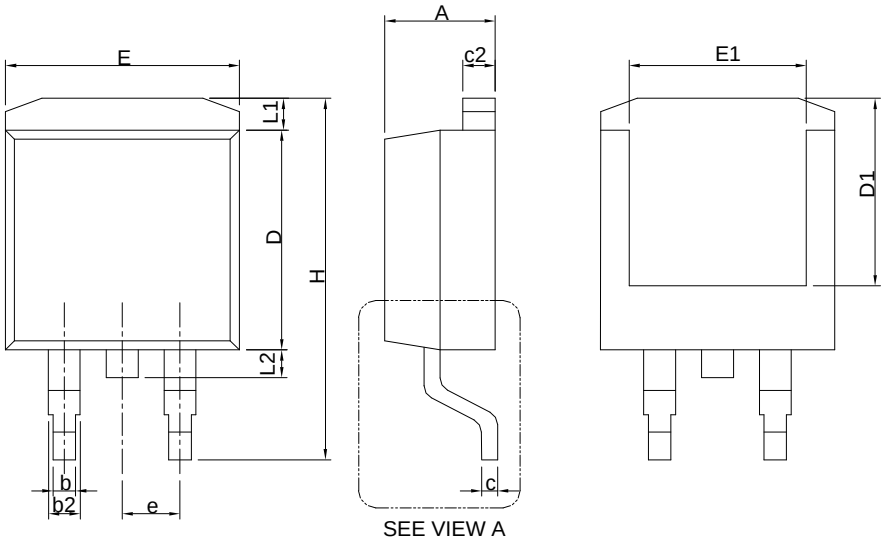
Avalanche Test Circuit and Waveforms

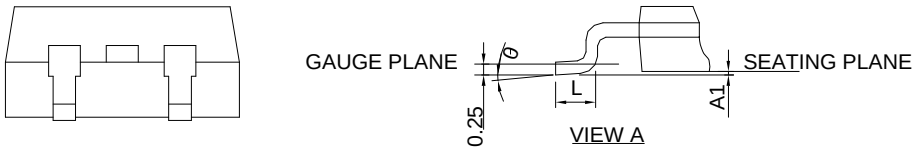




Package Information

TO-263

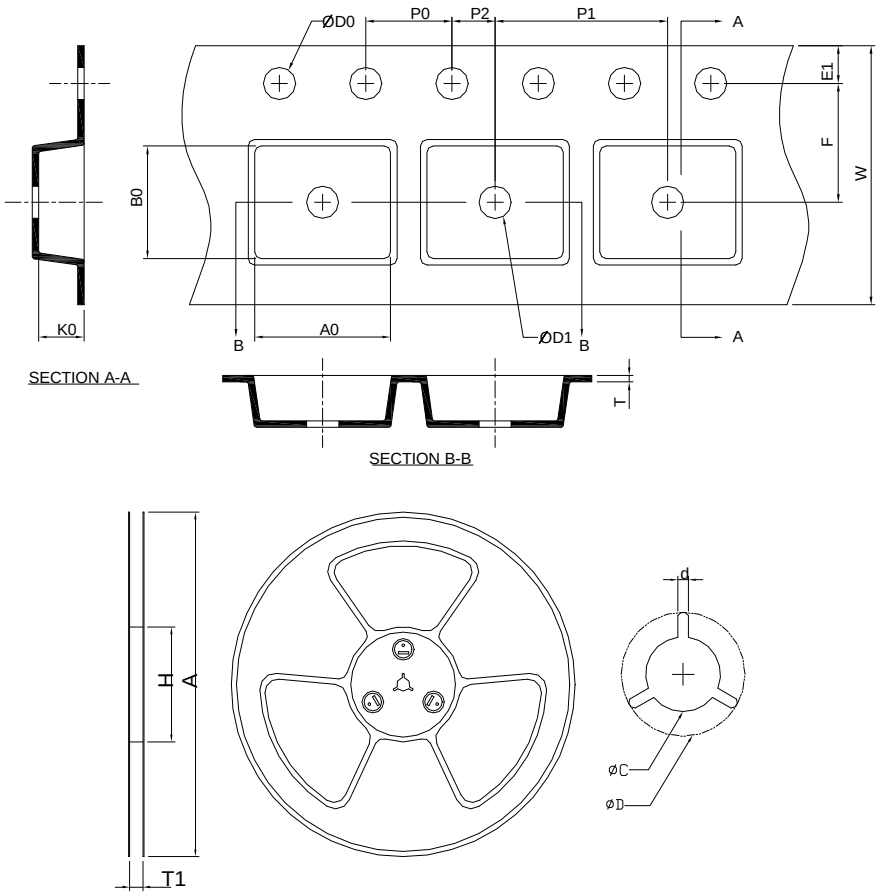




SYMBOL	TO-263			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.06	4.83	0.160	0.190
A1	0.00	0.25	0.000	0.010
b	0.51	0.99	0.020	0.039
b2	1.14	1.78	0.045	0.070
c	0.38	0.74	0.015	0.029
c2	1.14	1.65	0.045	0.065
D	8.38	9.65	0.330	0.380
D1	6.00	9.00	0.236	0.354
E	9.65	11.43	0.380	0.450
E1	6.22	9.00	0.245	0.354
e	2.54 BSC		0.100 BSC	
H	14.61	15.88	0.575	0.625
L	1.78	2.79	0.070	0.110
L1		1.68		0.066
L2		1.78		0.070
θ	0°	8°	0°	8°

Note : Follow JEDEC TO-263 AB.

Carrier Tape & Reel Dimensions



Application	A	H	T1	C	d	D	W	E1	F
TO-263	330.0±2.00	50 MIN.	24.4+2.00 -0.00	13.0+0.50 -0.20	1.5 MIN.	20.2 MIN.	24.0±0.30	1.75±0.10	11.5±0.10
	P0	**P1**	**P2**	**D0**	**D1**	**T**	**A0**	**B0**	**K0**
	4.0±0.10	16.0±0.10	2.0±0.10	1.5+0.10 -0.00	1.5 MIN.	0.6+0.00 -0.40	10.8±0.20	16.1±0.20	5.2±0.20

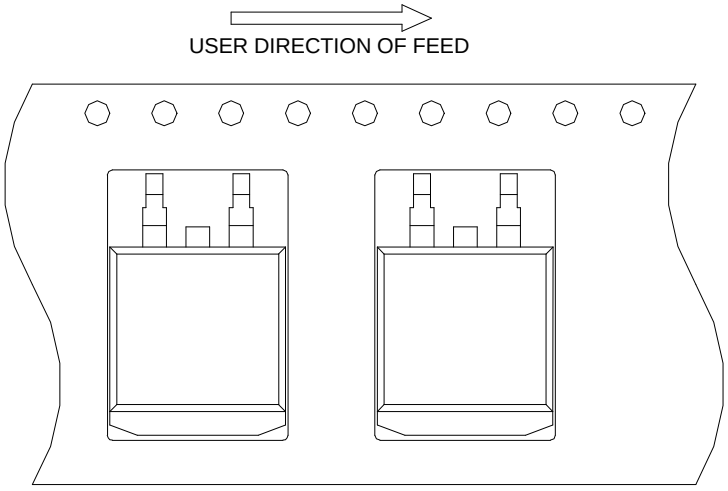
(mm)

Devices Per Unit

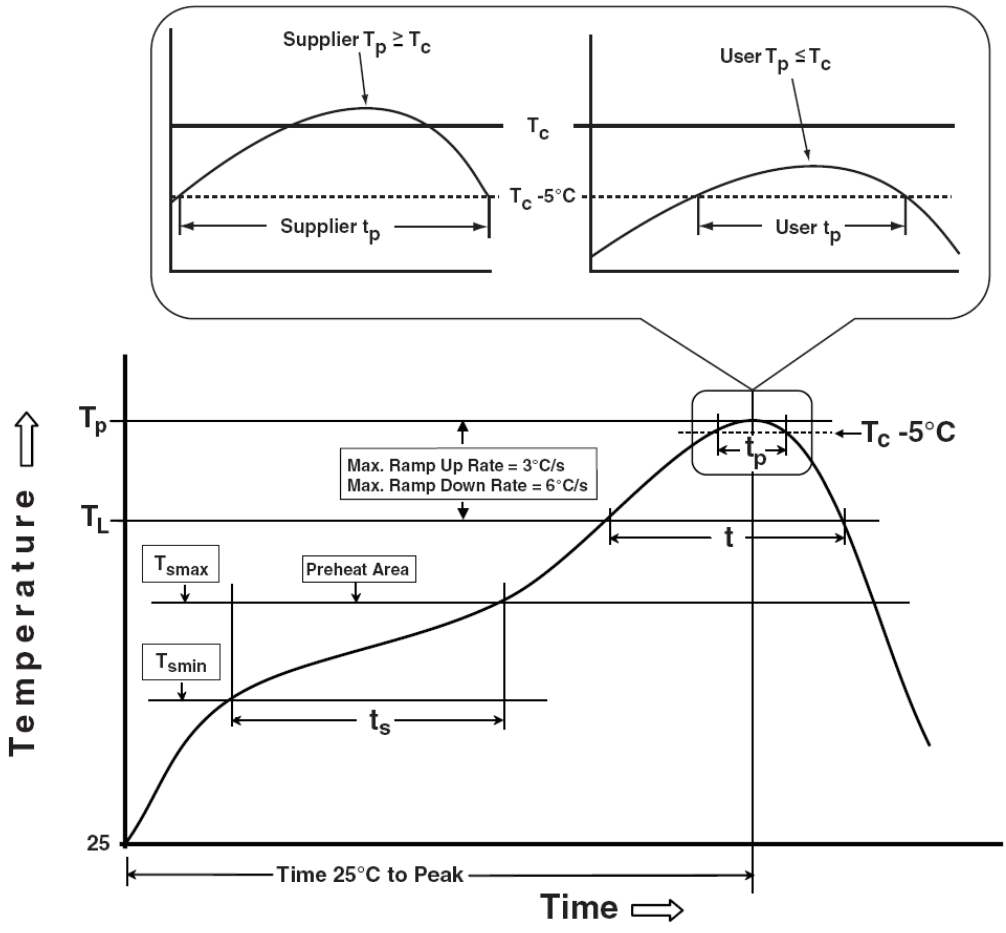
Package Type	Unit	Quantity
TO- 263	Tape & Reel	800

Taping Direction Information

TO-263



Classification Profile



Classification Reflow Profiles

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat & Soak Temperature min (T_{smin}) Temperature max (T_{smax}) Time (T_{smin} to T_{smax}) (t_s)	100 °C 150 °C 60-120 seconds	150 °C 200 °C 60-120 seconds
Average ramp-up rate (T_{smax} to T_P)	3 °C/second max.	3°C/second max.
Liquidous temperature (T_L) Time at liquidous (t_L)	183 °C 60-150 seconds	217 °C 60-150 seconds
Peak package body Temperature (T_p)*	See Classification Temp in table 1	See Classification Temp in table 2
Time (t_P)** within 5°C of the specified classification temperature (T_c)	20** seconds	30** seconds
Average ramp-down rate (T_p to T_{smax})	6 °C/second max.	6 °C/second max.
Time 25°C to peak temperature	6 minutes max.	8 minutes max.
* Tolerance for peak profile Temperature (T_p) is defined as a supplier minimum and a user maximum. ** Tolerance for time at peak profile temperature (t_p) is defined as a supplier minimum and a user maximum.		

Table 1. SnPb Eutectic Process – Classification Temperatures (Tc)

Package Thickness	Volume mm^3 <350	Volume mm^3 ³350
<2.5 mm	235 °C	220 °C
≥2.5 mm	220 °C	220 °C

Table 2. Pb-free Process – Classification Temperatures (Tc)

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

Reliability Test Program

Test item	Method	Description
SOLDERABILITY	JESD-22, B102	5 Sec, 245°C
HOLT	JESD-22, A108	1000 Hrs, Bias @ 125°C
PCT	JESD-22, A102	168 Hrs, 100%RH, 2atm, 121°C
TCT	JESD-22, A104	500 Cycles, -65°C~150°C

Customer Service

Anpec Electronics Corp.
Head Office :
No.6, Dusing 1st Road, SBIP,
Hsin-Chu, Taiwan, R.O.C.
Tel : 886-3-5642000
Fax : 886-3-5642050
Taipei Branch :
2F, No. 11, Lane 218, Sec 2 Jhongsing Rd.,
Sindain City, Taipei County 23146, Taiwan
Tel : 886-2-2910-3838
Fax : 886-2-2917-3838