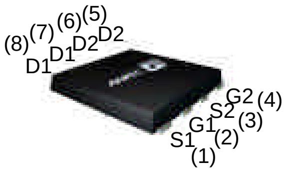
Dual N-Channel Enhancement Mode MOSFET

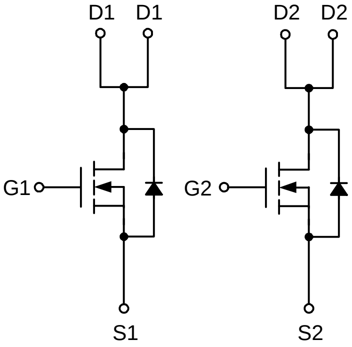
Features

- 30V/7.5A,
  $R_{DS(ON)}$ =24mΩ(Typ.) @ V_{GS} = 10V
  $R_{DS(ON)}$ =30mΩ(Typ.) @ V_{GS} = 4.5V
- Super High Dense Cell Design
- Reliable and Rugged
- Lead Free and Green Devices Available (RoHS Compliant)

Pin Description



DFN3x3-8B



N-Channel MOSFET

Applications

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

Ordering and Marking Information

APM3301 □□□-□□ □ Assembly Material Handling Code Temperature Range Package Code	Package Code QA : DFN3x3-8B Operating Junction Temperature Range C : -55 to 150 °C Handling Code TR : Tape & Reel Assembly Material G : Halogen and Lead Free Device
APM3301 QA : APM 3301 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 (T_A = 25°C Unless Otherwise Noted)

Symbol	Parameter		Rating	Unit
V_{DSS}	Drain-Source Voltage		30	V
V_{GSS}	Gate-Source Voltage		±20	
I_D [a]	Continuous Drain Current	T_A=25°C	7.5	A
		T_A=70°C	6	
I_{DM} [a]	300μs Pulsed Drain Current	V_{GS}=10V	30	
I_S [a]	Diode Continuous Forward Current		3	
I_{AS} [b]	Avalanche Current		12	
E_{AS} [b]	Repetitive Avalanche Energy (L=0.1mH)		8	mJ
T_J	Maximum Junction Temperature		150	°C
T_{STG}	Storage Temperature Range		-55 to 150	
P_D [a]	Maximum Power Dissipation	T_A=25°C	2.5	W
		T_A=70°C	1.6	
$R_{\theta JA}$ [a, c]	Thermal Resistance-Junction to Ambient	t≤10s	50	°C/W
$R_{\theta JL}$	Thermal Resistance-Junction to Lead	Steady State	20	

Note a : Surface Mounted on $1in^2$ pad area, t ≤ 10sec.
Note b : UIS tested and pulse width limited by maximum junction temperature 150°C (initial temperature T_J=25°C).
Note c : Maximum under Steady State conditions is 75°C/W.

Electrical Characteristics (T_A = 25°C Unless Otherwise Noted)

Symbol	Parameter	Test Conditions	APM3301QA			Unit
			Min.	Typ.	Max.	
Static Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V, I_{DS}=250μA	30	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=24V, V_{GS}=0V	-	-	1	μA
		T_J=85°C	-	-	30	
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_{DS}=250μA	1	1.5	2	V
I_{GSS}	Gate Leakage Current	V_{GS}=±20V, V_{DS}=0V	-	-	±100	nA
$R_{DS(ON)}$ [d]	Drain-Source On-state Resistance	V_{GS}=10V, I_{DS}=7.5A	-	24	30	mΩ
		V_{GS}=4.5V, I_{DS}=6A	-	30	44	
Diode Characteristics						
V_{SD} [d]	Diode Forward Voltage	I_{SD}=3A, V_{GS}=0V	-	0.8	1.3	V
t_{rr}	Reverse Recovery Time	I_{SD}=7.5A, dI_{SD}/dt=100A/μs	-	16	-	ns
Q_{rr}	Reverse Recovery Charge		-	8	-	nC

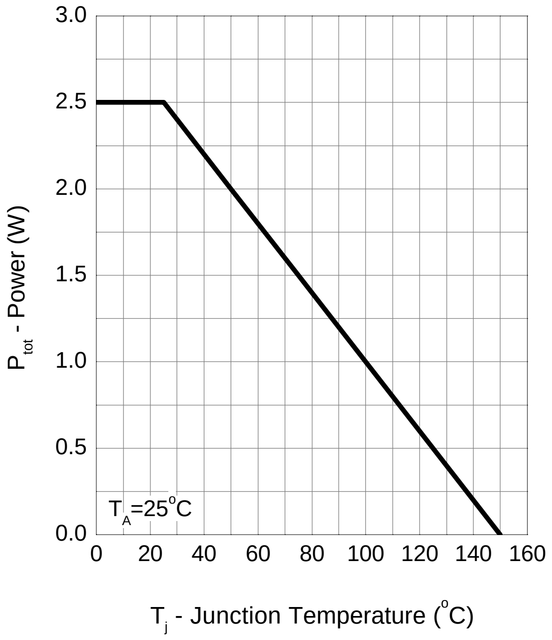
Electrical Characteristics (Cont.) (T_A = 25°C Unless Otherwise Noted)

Symbol	Parameter	Test Conditions	APM3301QA			Unit
			Min.	Typ.	Max.	
Dynamic Characteristics [e]						
R_G	Gate Resistance	V_{GS}=0V,V_{DS}=0V,F=1MHz	-	4.7	-	Ω
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=15V, Frequency=1.0MHz	-	615	-	pF
C_{oss}	Output Capacitance		-	84	-	
C_{rss}	Reverse Transfer Capacitance		-	57	-	
$t_{d(ON)}$	Turn-on Delay Time	V_{DD}=15V, R_L=15Ω, I_{DS}=1A, V_{GEN}=10V, R_G=6Ω	-	13	24	ns
T_r	Turn-on Rise Time		-	17	32	
$t_{d(OFF)}$	Turn-off Delay Time		-	30	55	
T_f	Turn-off Fall Time		-	4	8	
Gate Charge Characteristics [e]						
Q_g	Total Gate Charge	V_{DS}=15V, V_{GS}=10V, I_{DS}=7.5A	-	13	18	nC
Q_{gs}	Gate-Source Charge		-	1.5	-	
Q_{gd}	Gate-Drain Charge		-	2.4	-	

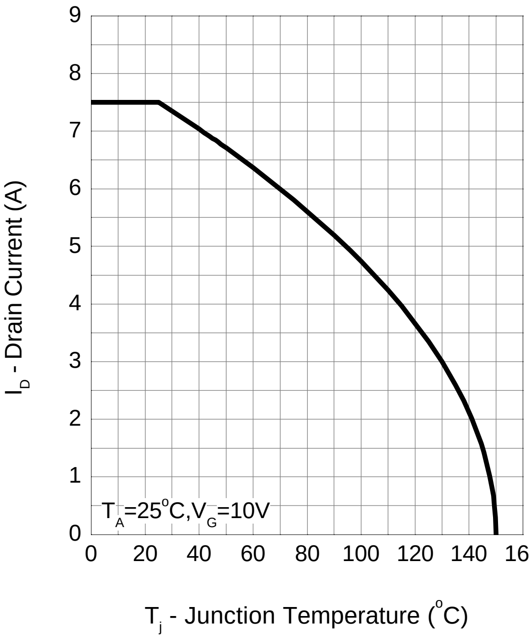
Note d : Pulse test ; pulse width≤300µs, duty cycle≤2%.
Note e : Guaranteed by design, not subject to production testing.

Typical Operating Characteristics

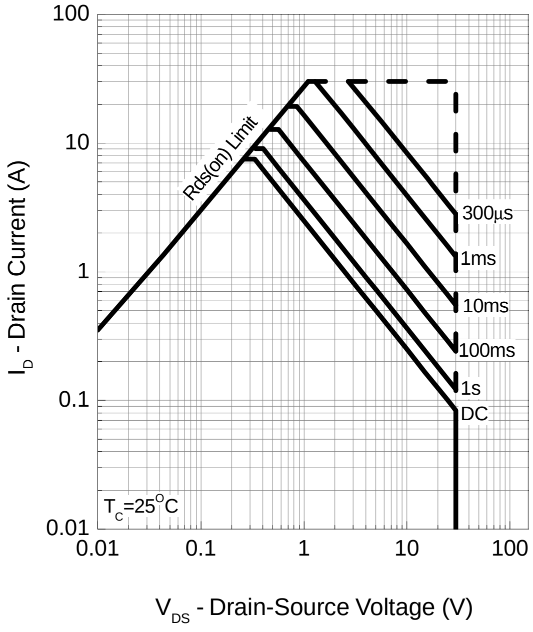
Power Dissipation



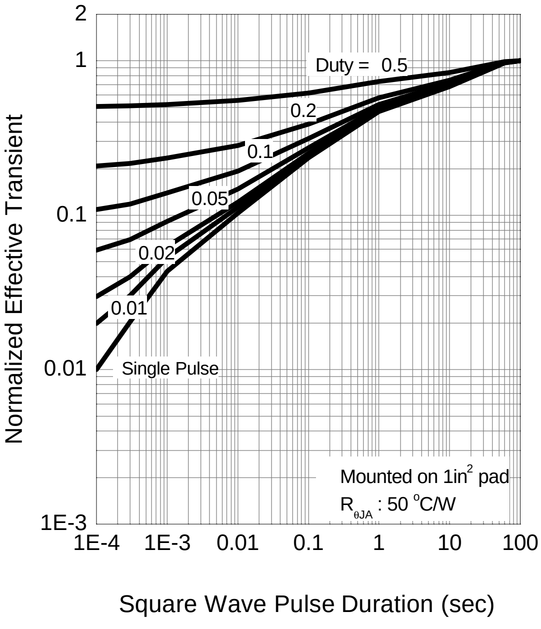
Drain Current



Safe Operation Area

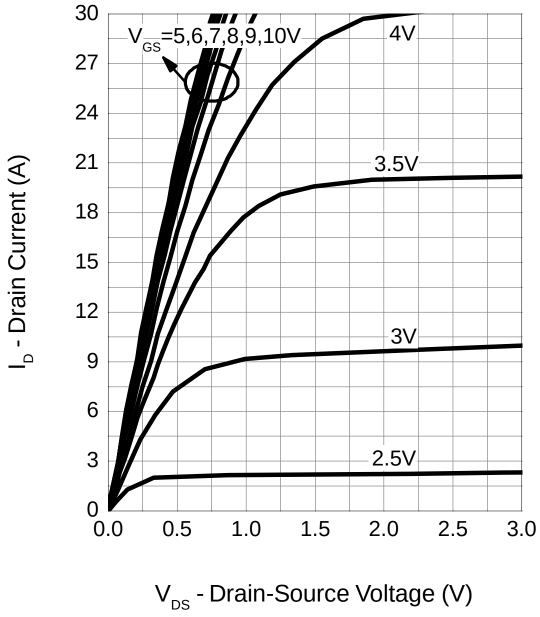


Thermal Transient Impedance

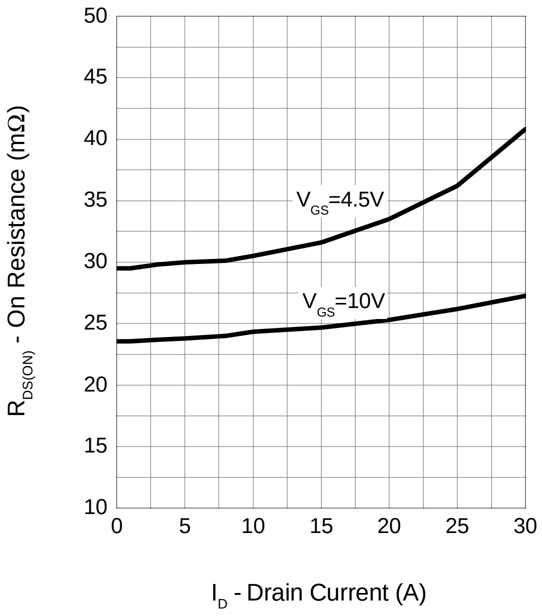


Typical Operating Characteristics (Cont.)

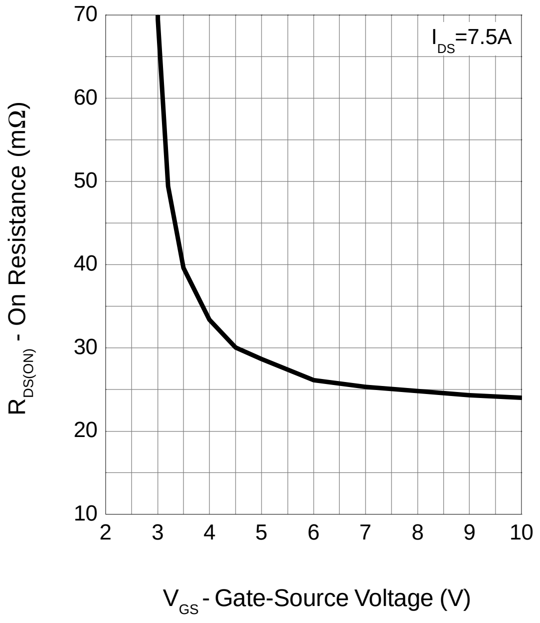
Output Characteristics



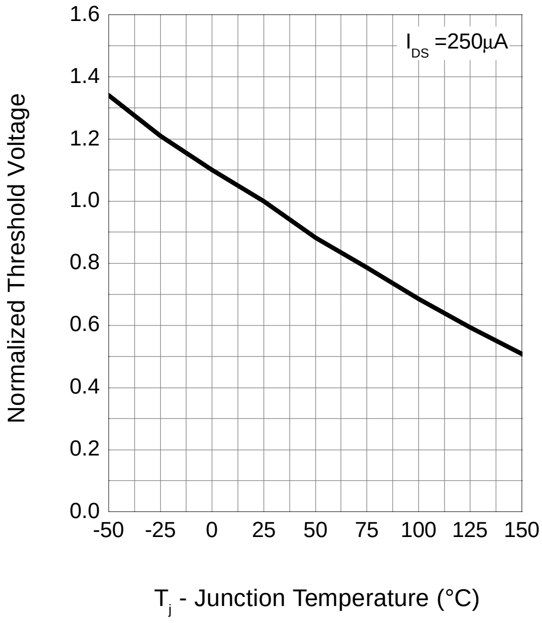
Drain-Source On Resistance



Gate-Source On Resistance

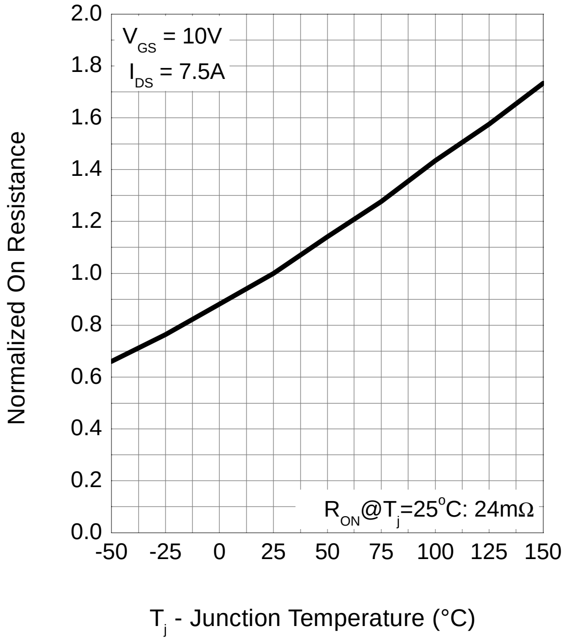


Gate Threshold Voltage

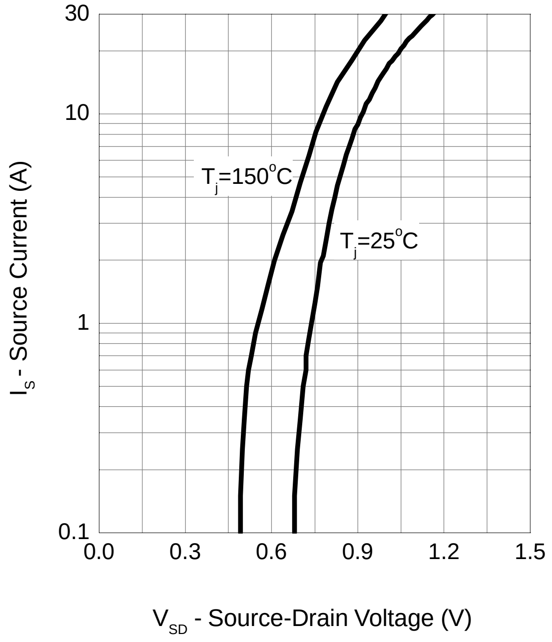


Typical Operating Characteristics (Cont.)

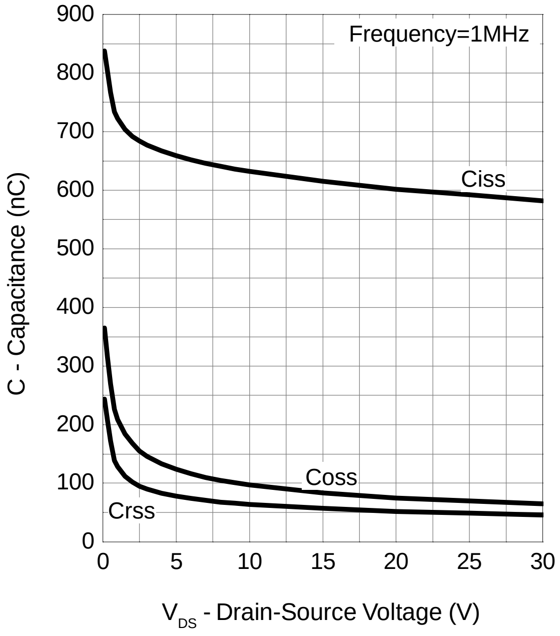
Drain-Source On Resistance



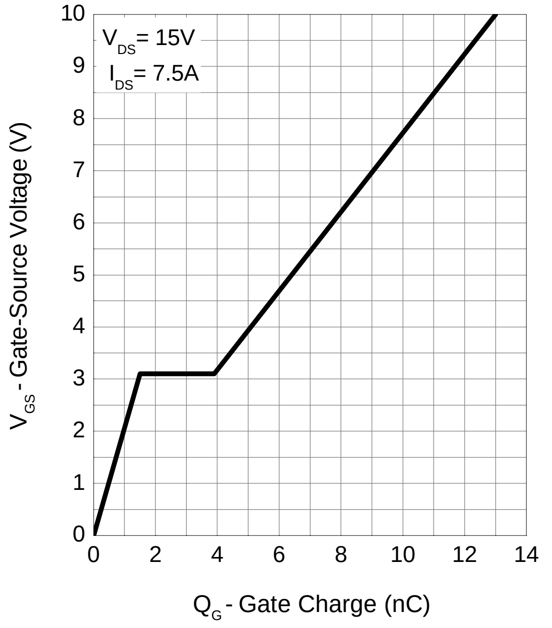
Source-Drain Diode Forward



Capacitance

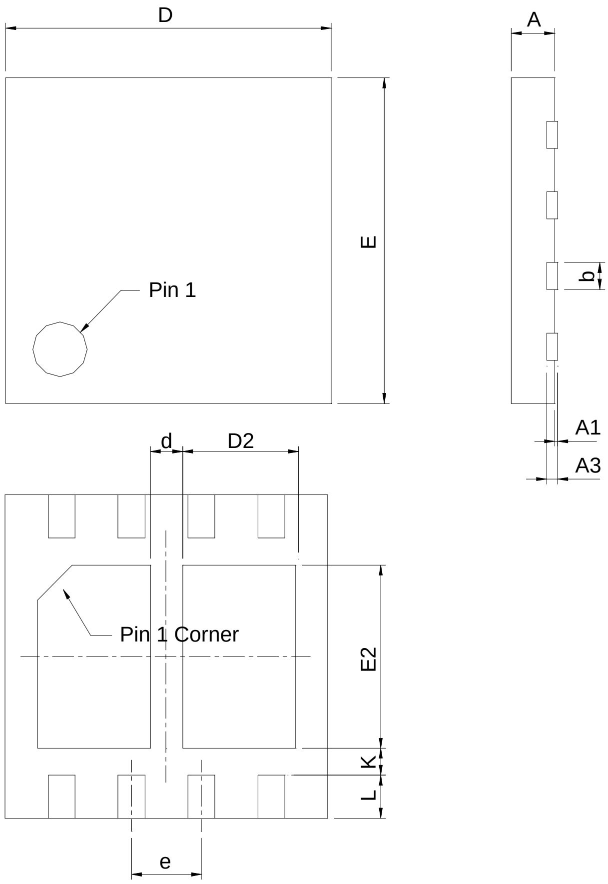


Gate Charge



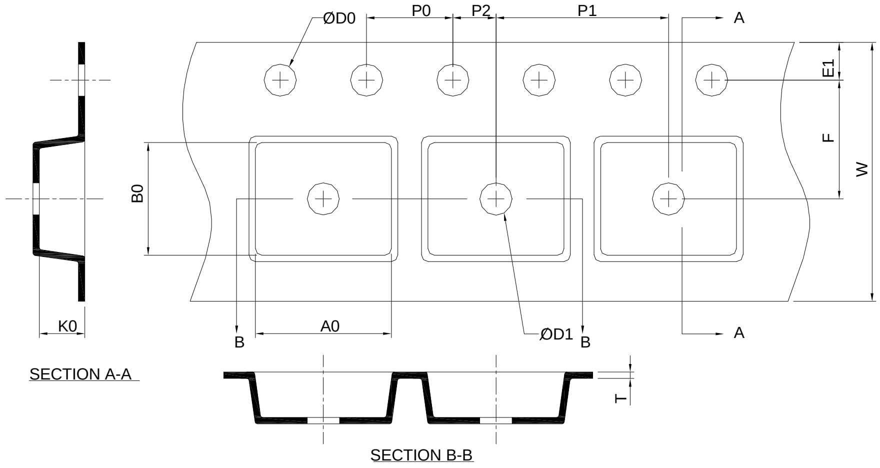
Package Information

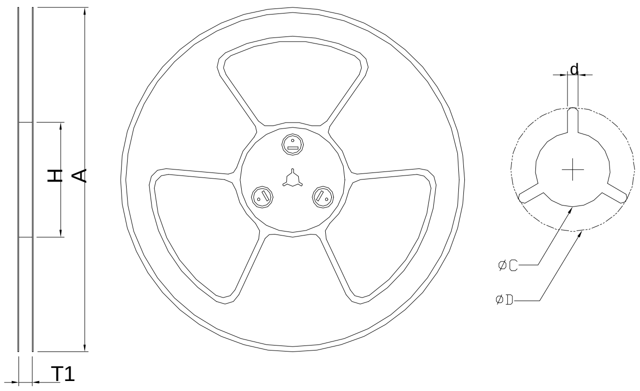
DFN3x3-8B



SYMBOL	DFN3x3-8B			
	MILLIMETERS		**INCHES**	
	MIN.	**MAX.**	**MIN.**	**MAX.**
A	0.80	1.00	0.031	0.039
A1	0.00	0.05	0.000	0.002
A3	0.20 REF		0.008 REF	
b	0.30	0.40	0.012	0.016
d	0.25 REF		0.010 REF	
D	2.90	3.10	0.114	0.122
D2	1.00	1.20	0.039	0.047
E	2.90	3.10	0.114	0.122
E2	1.50	1.80	0.059	0.071
e	0.65 BSC		0.026 BSC	
L	0.30	0.50	0.012	0.020
K	0.20		0.008	

Carrier Tape & Reel Dimensions





Application	A	H	T1	C	d	D	W	E1	F
DFN3x3-8B	178.0± 2.00	50 MIN.	8.4+2.00 -0.00	13.0+0.50 -0.20	1.5 MIN.	20.2 MIN.	8.0±0.20	1.75±0.10	3.5±0.05
	P0	**P1**	**P2**	**D0**	**D1**	**T**	**A0**	**B0**	**K0**
	4.0±0.10	4.0±0.10	2.0±0.05	1.5+0.10 -0.00	1.5 MIN.	0.6+0.00 -0.40	3.35±0.20	3.35±0.20	1.30±0.20

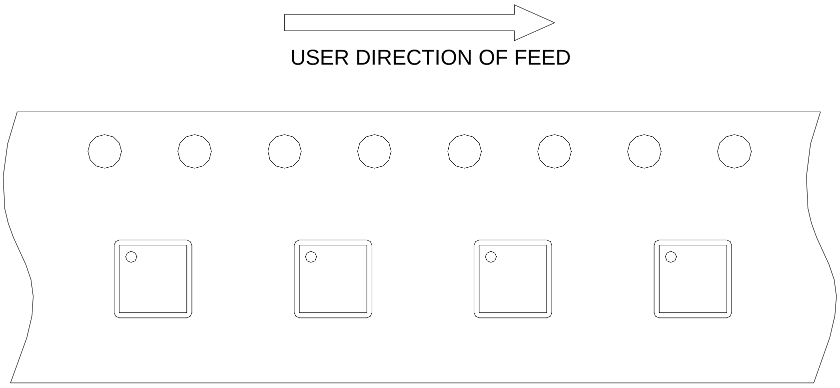
(mm)

Devices Per Unit

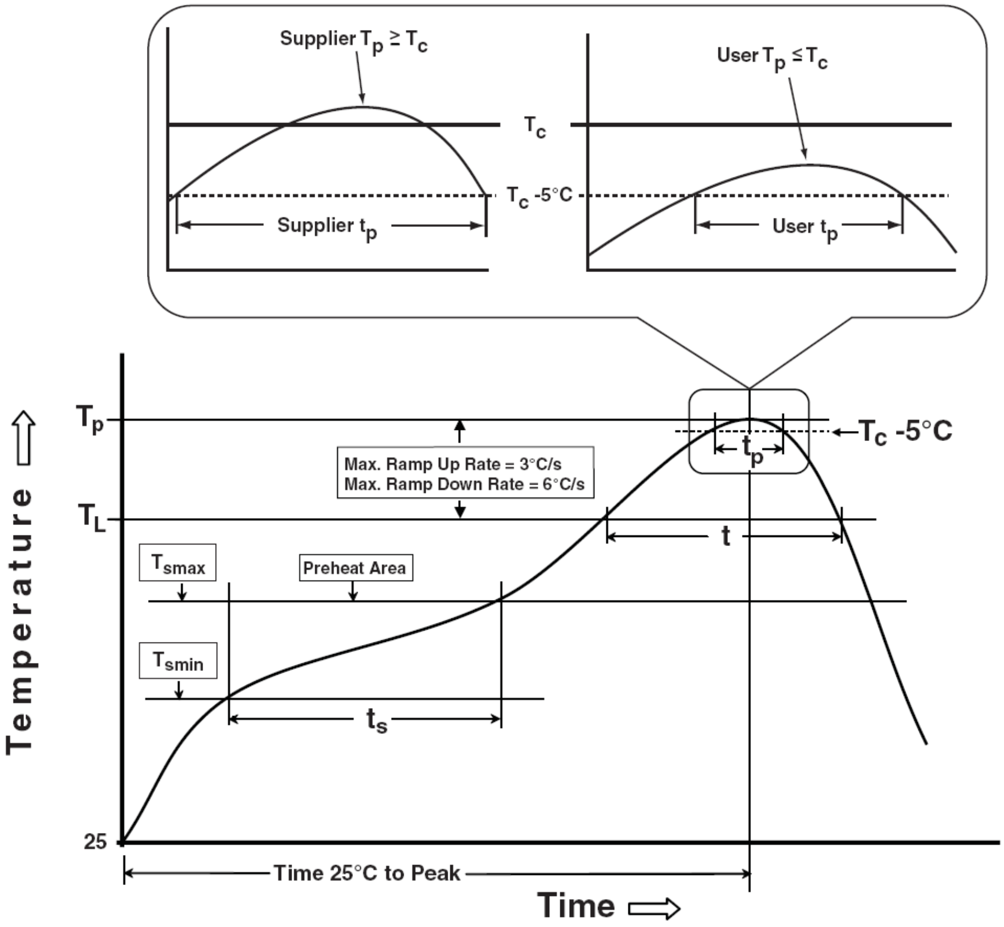
Package Type	Unit	Quantity
DFN3x3-8B	Tape & Reel	3000

Taping Direction Information

DFN3x3-8B



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 ^{3}350
<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

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