

P-Channel Enhancement Mode MOSFET with Schottky Diode

Features

MOSFET

- 20V/-2.6A,
 $R_{DS(ON)} = 85m\Omega(\text{typ.}) @ V_{GS} = -4.5V$
 $R_{DS(ON)} = 120m\Omega(\text{typ.}) @ V_{GS} = -2.5V$
- Super High Dense Cell Design
- Reliable and Rugged

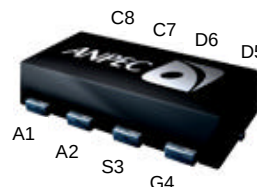
SBD

- $V_F = 0.45V$ (typ.) @ $I_F = 500mA$.
- Lead Free and Green Devices Available
(RoHS Compliant)

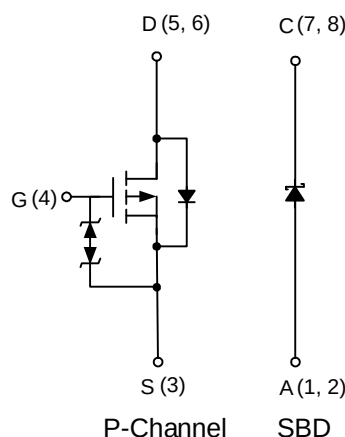
Applications

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

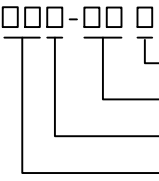
Pin Description



Top View of DFN3x2-8



Ordering and Marking Information

APM2805 □□□-□□□  Assembly Material Handling Code Temperature Range Package Code	Package Code QA : DFN3x2-8 Operating Junction Temperature Range C : -55 to 150 °C Handling Code TR : Tape & Reel Assembly Material G : Halogen and Lead Free Device
APM2805 QA : M2805 XXXXXX	XXXXXX - 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).

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 (T_A = 25°C unless otherwise noted)

Symbol	Parameter		Rating	Unit
[MOSFET]				
V _{DSS}	Drain-Source Voltage		-20	V
V _{GSS}	Gate-Source Voltage		±10	
I _D *	Continuous Drain Current	V _{GS} =-4.5V	-2.6	A
I _{DM} *	300μs Pulsed Drain Current		-9	
I _S *	Diode Continuous Forward Current		-1.4	A
T _J	Maximum Junction Temperature		150	°C
T _{STG}	Storage Temperature Range		-55 to 150	
P _D *	Maximum Power Dissipation	T _A =25°C	1.13	W
		T _A =100°C	0.45	
R _{θJA} *	Thermal Resistance-Junction to Ambient		110	°C/W
[SBD]				
V _{RRM}	Repetitive Peak Reverse Voltage		20	V
V _R	DC Blocking Voltage		20	V
I _F	Average Rectified Forward Current	Steady State	1	A
		t ≤5 s	2	A
R _{θJA} *	Thermal Resistance-Junction to Ambient	Steady State	130	°C/W
		t ≤5 s	100	°C/W

Note : *Surface Mounted on 1in² pad area, t ≤ 5sec.

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

Symbol	Parameter	Test Conditions	APM2805QA			Unit
			Min.	Typ.	Max.	
[MOSFET]						
Static Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _{DS} =-250μA	-20	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =-16V, V _{GS} =0V	-	-	-1	μA
		T _J =85°C	-	-	-30	
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _{DS} =-250μA	-0.45	-0.7	-1	V
I _{GSS}	Gate Leakage Current	V _{GS} =±10V, V _{DS} =0V	-	-	±10	μA
R _{DS(ON)} ^a	Drain-Source On-state Resistance	V _{GS} =-4.5V, I _{DS} =-2.6A	-	85	110	mΩ
		V _{GS} =-2.5V, I _{DS} =-2A	-	120	160	

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

Symbol	Parameter	Test Conditions	APM2805QA			Unit
			Min.	Typ.	Max.	
[MOSFET]						
Diode Characteristics						
V _{SD} ^a	Diode Forward Voltage	I _{SD} =-1.4A, V _{GS} =0V	-	-0.7	-1.3	V
t _{rr}	Reverse Recovery Time	I _{DS} =-2.6A, dI _{SD} /dt=100A/μs	-	13.5	-	ns
Q _{rr}	Reverse Recovery Charge		-	4	-	nC
Dynamic Characteristics ^b						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =-10V, Frequency=1.0MHz	-	390	-	pF
C _{oss}	Output Capacitance		-	70	-	
C _{rss}	Reverse Transfer Capacitance		-	50	-	
t _{d(ON)}	Turn-on Delay Time	V _{DD} =-10V, R _L =10Ω, I _{DS} =-1A, V _{GEN} =-4.5V, R _G =6Ω	-	6	13	ns
T _r	Turn-on Rise Time		-	14	29	
t _{d(OFF)}	Turn-off Delay Time		-	28	55	
T _f	Turn-off Fall Time		-	20	39	
Gate Charge Characteristics ^b						
Q _g	Total Gate Charge	V _{DS} =-10V, V _{GS} =-4.5V, I _{DS} =-2.6A	-	4.2	6	nC
Q _{gs}	Gate-Source Charge		-	0.6	-	
Q _{gd}	Gate-Drain Charge		-	1.3	-	
[SBD]						
V _R	Reverse Voltage	I _R =0.5A	20	-	-	V
V _{F1}	Forward Voltage	I _F =500mA	-	0.45	-	V
V _{F2}		I _F =500mA, T _A =125°C	-	0.37	-	V
I _{R1}	Reverse Current	V _R =10V	-	2	10	μA
I _{R2}	Reverse Current	V _R =20V	-	10	40	μA
C ^b	Junction Capacitance	V _R =10V, Frequency=1.0MHz	-	14	-	pF

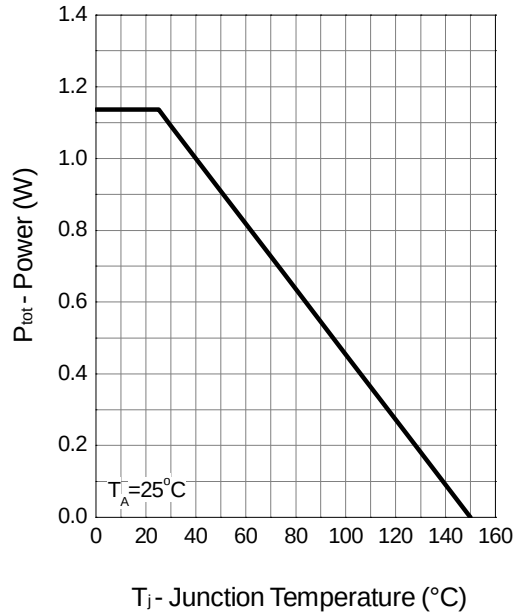
Note a : Pulse test ; pulse width $\leq 300\mu\text{s}$, duty cycle $\leq 2\%$.

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

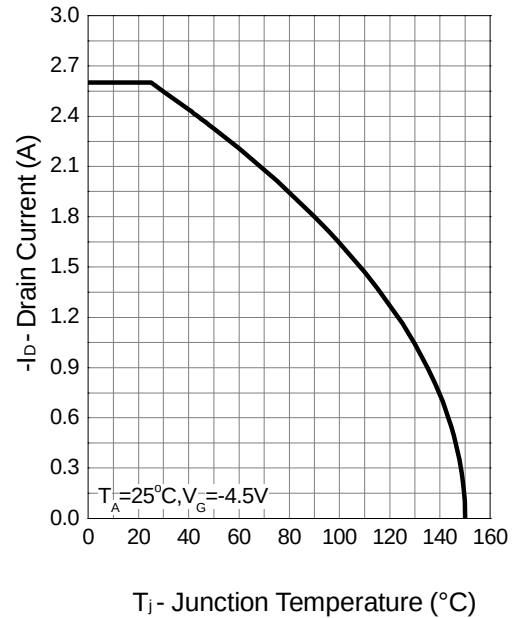
Typical Operating Characteristics (Cont.)

P-Channel

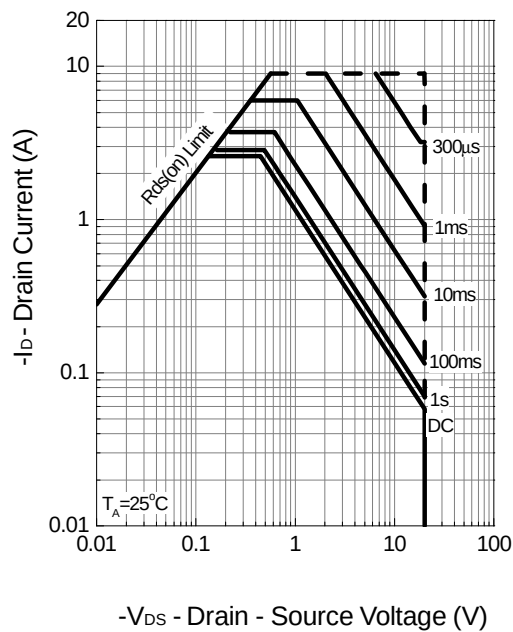
Power Dissipation



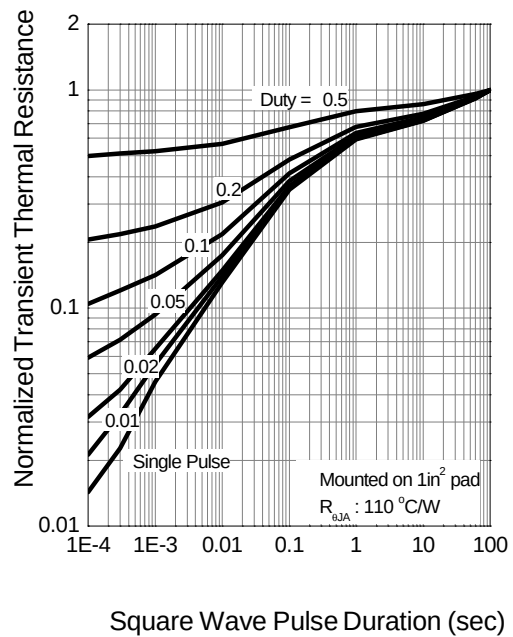
Drain Current



Safe Operation Area



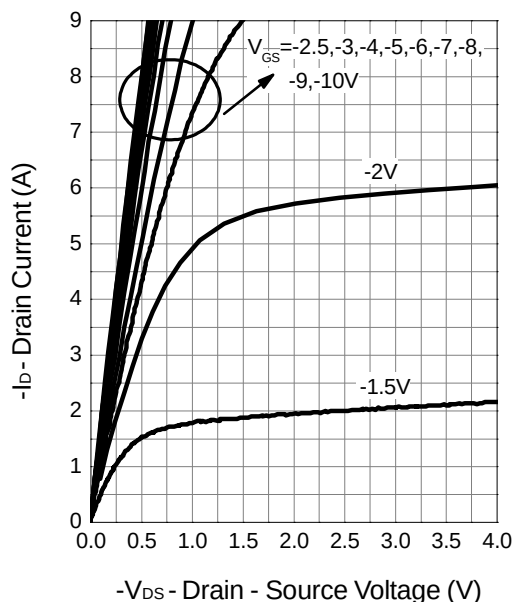
Thermal Transient Impedance



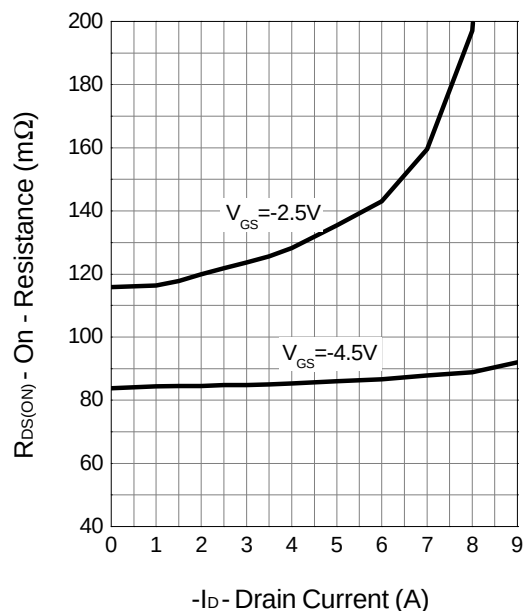
Typical Operating Characteristics (Cont.)

P-Channel

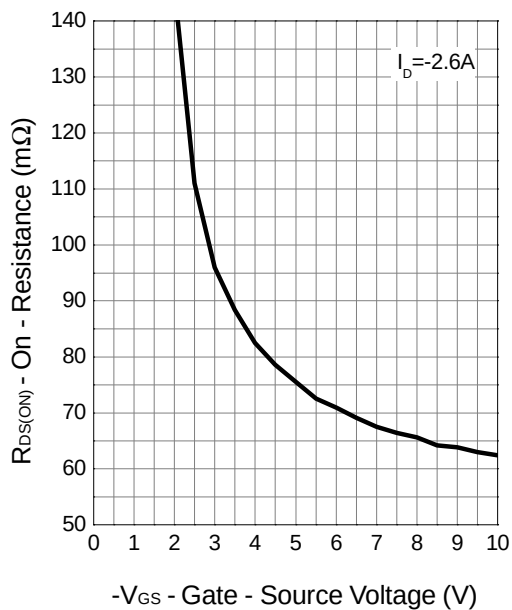
Output Characteristics



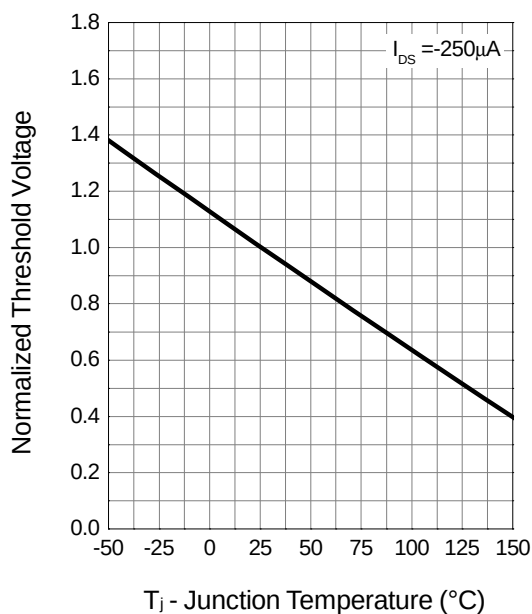
Drain-Source On Resistance



Drain-Source On Resistance



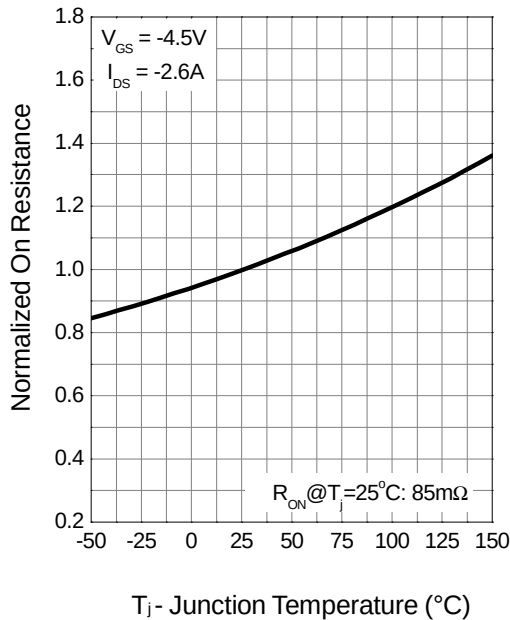
Gate Threshold Voltage



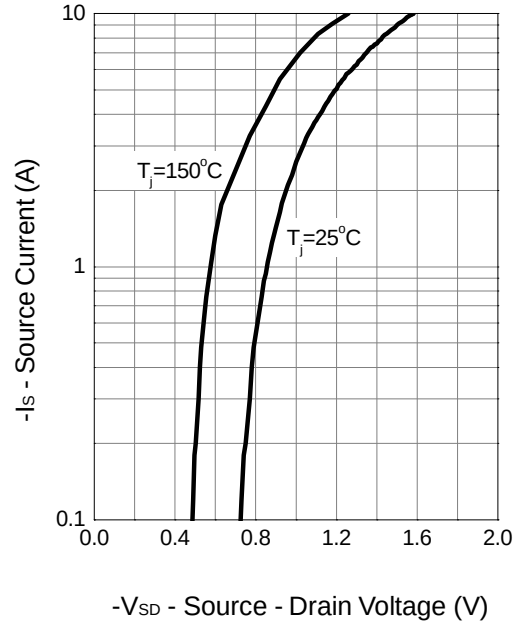
Typical Operating Characteristics (Cont.)

P-Channel

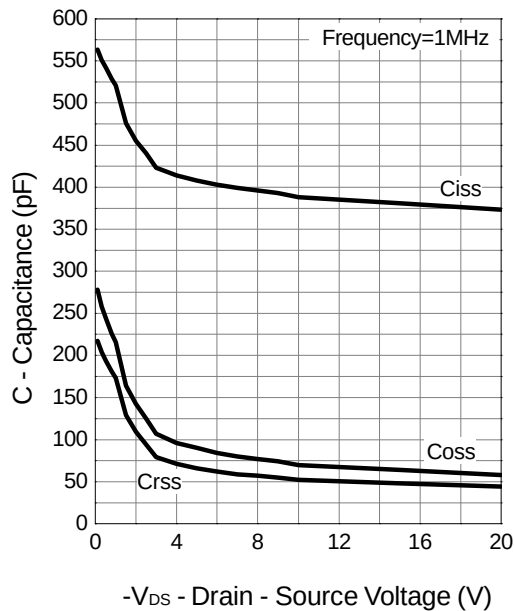
Drain-Source On Resistance



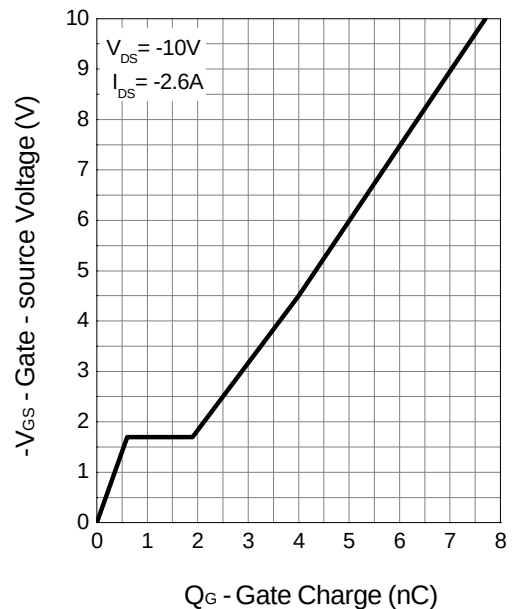
Source-Drain Diode Forward



Capacitance

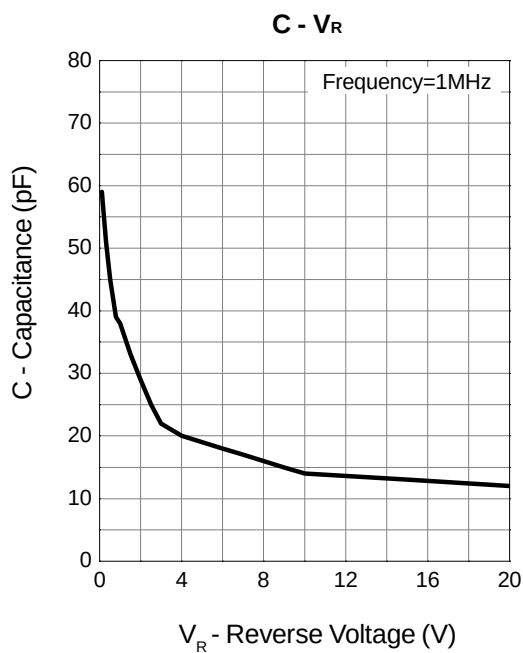
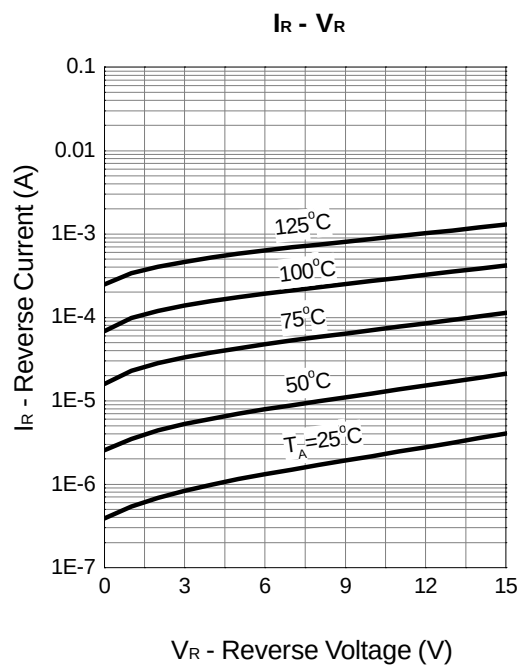
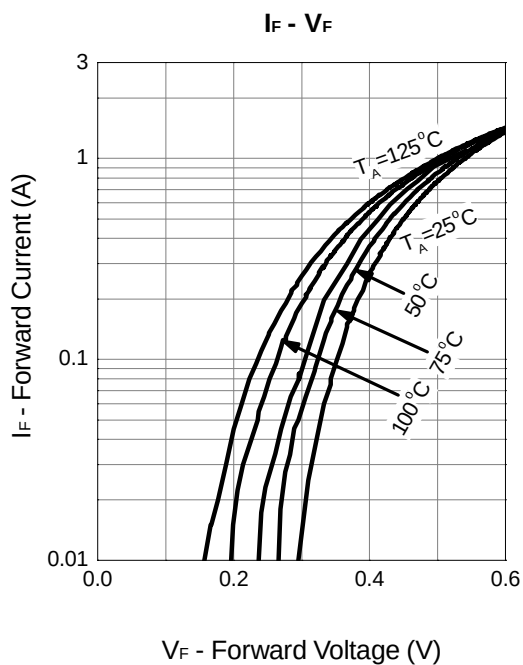


Gate Charge



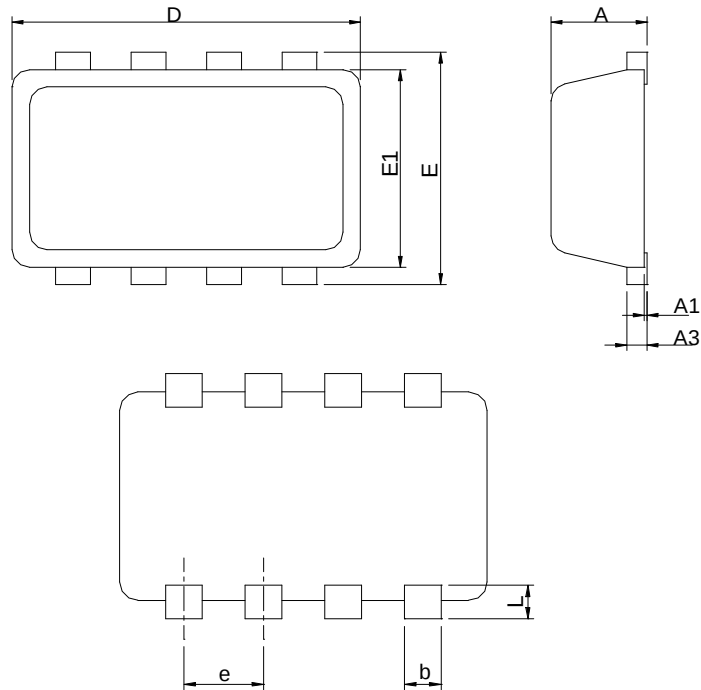
Typical Operating Characteristics (Cont.)

SBD



Package Information

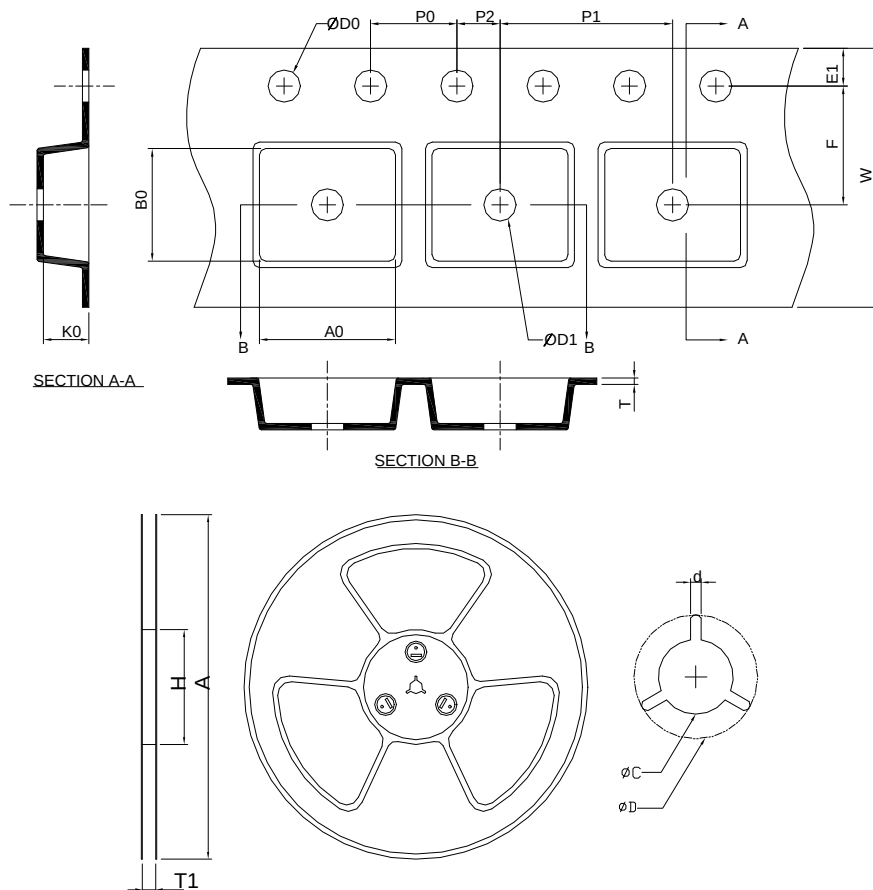
DFN3x2-8



SYMBOL	DFN3x2-8			
	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	0.08	0.25	0.003	0.010
b	0.24	0.35	0.009	0.014
D	2.90	3.10	0.114	0.122
E	1.90	2.10	0.075	0.083
E1	1.60	1.80	0.063	0.071
e	0.65 BSC		0.026 BSC	
L	0.20	0.40	0.008	0.016

Note : 1. Follow JEDEC MO-229 VECC.

Carrier Tape & Reel Dimensions



Application	A	H	T1	C	d	D	W	E1	F
DFN3x2-8	178.0 $\pm$ 2.00	50 MIN.	12.4 $\pm$ 2.00 -0.00	13.0 $\pm$ 0.50 -0.20	1.5 MIN.	20.2 MIN.	12.0 $\pm$ 0.30	1.75 $\pm$ 0.10	5.5 $\pm$ 0.05
	P0	P1	P2	D0	D1	T	A0	B0	K0
	4.0 $\pm$ 0.10	8.0 $\pm$ 0.10	2.0 $\pm$ 0.05	1.5 $\pm$ 0.10 -0.00	1.5 MIN.	0.6 $\pm$ 0.00 -0.40	3.30 $\pm$ 0.20	3.30 $\pm$ 0.20	1.30 $\pm$ 0.20

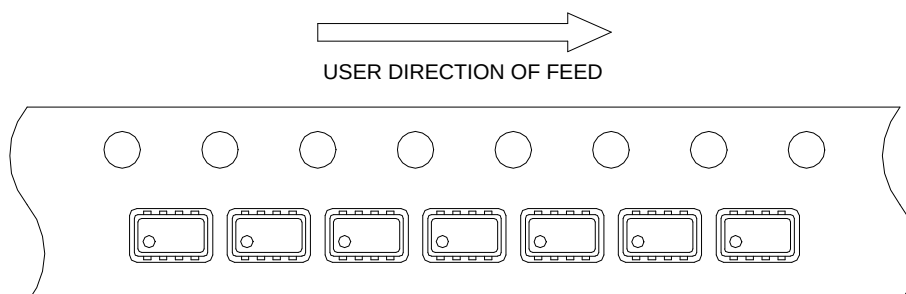
(mm)

Devices Per Unit

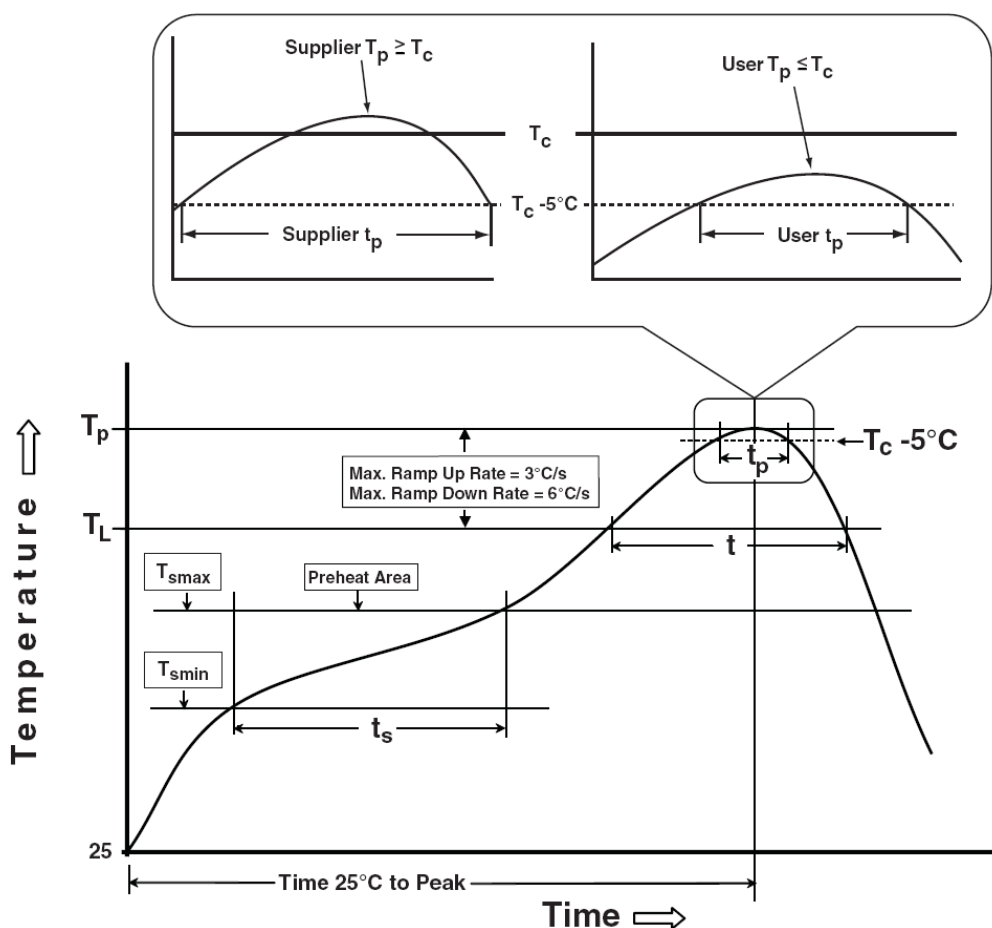
Package Type	Unit	Quantity
DFN3x2-8	Tape & Reel	3000

Taping Direction Information

DFN3x2-8



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 (T_c)

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

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

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

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