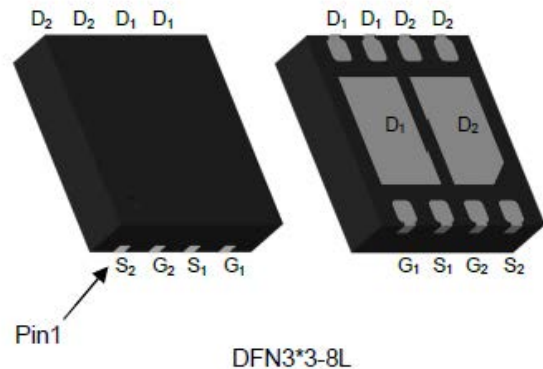


Dual N-Channel Enhancement Mode MOSFET

Feature

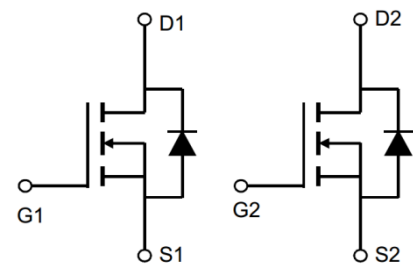
- 30V/24A
 - $R_{DS(ON)} = 15.6 \text{ m}\Omega(\text{typ}) @ V_{GS} = 10\text{V}$
 - $R_{DS(ON)} = 20.5 \text{ m}\Omega(\text{typ}) @ V_{GS} = 4.5\text{V}$
- 100% Avalanche Tested
- Reliable and Rugged
- Halogen Free and Green Devices Available (RoHS Compliant)

Pin Description



Applications

- Switching Application
- Power Management for DC/DC
- Battery Protection



Dual N-Channel MOSFET

Ordering and Marking Information

<p>HMS24DN03Q</p> <p>YYWW</p>	<p>Package Code</p> <p>Q: DFN3*3-8L</p> <p>Date Code</p> <p>YYWW</p>
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Note: H&M Semi lead-free products contain molding compounds/die attach materials and 100% matte tin plate termination finish, which are fully compliant with RoHS. H&M Semi lead-free products meet or exceed the lead-free requirements of IPC/JEDEC J-STD-020 for MSL classification at lead-free peak reflow temperature. H&M Semi 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).

H&M Semi reserves the right to make changes, corrections, enhancements, modifications, and improvements to this product and/or to this document at any time without notice.

Absolute Maximum Ratings

Symbol	Parameter		Rating	Unit
Common Ratings (Tc=25°C Unless Otherwise Noted)				
V _{DSS}	Drain-Source Voltage		30	V
V _{GSS}	Gate-Source Voltage		±20	V
T _J	Junction Temperature Range		-55 to 150	°C
T _{STG}	Storage Temperature Range		-55 to 150	°C
I _S	Source Current-Continuous(Body Diode)	Tc=25°C	24	A
Mounted on Large Heat Sink				
I _{DM}	Pulsed Drain Current *	Tc=25°C	96	A
I _D	Continuous Drain Current	Tc=25°C	24	A
		Tc=100°C	15.1	A
P _D	Maximum Power Dissipation	Tc=25°C	17.8	W
		Tc=100°C	7.1	W
R _{θJC}	Thermal Resistance, Junction-to-Case		7	°C/W
R _{θJA}	Thermal Resistance, Junction-to-Ambient		75	°C/W
E _{AS}	SinglePulsed-Avalanche Energy **	L=0.1mH	10	mJ

Note: * R epetitive rating; pulse width limited by max.junction temperature.

** Limited by T_{Jmax} , starting T_J=25°C, L = 0.1mH, R_G= 25Ω, V_{GS}=10V.

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

Symbol	Parameter	Test Conditions	< A G & (8 B \$ ' E			Unit
			Min	Typ.	Max	
Static Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _{DS} =250μA	30	-		V
I _{DSS}	Drain-to-Source LeakageCurrent	V _{DS} =30V, V _{GS} =0V	-	-	1	μA
			T _J =125°C	-	-	50
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _{DS} =250μA	1	1.6	3	V
I _{GSS}	Gate-Source Leakage Current	V _{GS} =± 20V, V _{DS} =0V	-	-	±100	nA
R _{DS(ON)*}	Drain-Source On-State Resistance	V _{GS} =10V, I _{DS} =6A	-	15.6	19	mΩ
		V _{GS} =4.5V, I _{DS} =4A		20.5	24.6	
Diode Characteristics						
V _{SD} *	Diode Forward Voltage	I _{SD} =1A, V _{GS} =0V	-	0.7	1.0	V
t _{rr}	Reverse Recovery Time	I _{SD} =6A, dI _{SD} /dt=100A/μs	-	8	-	ns
Q _{rr}	Reverse Recovery Charge		-	19	-	nC

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

Symbol	Parameter	Test Conditions	< A G& 8 B\$' E			Unit
			Min	Typ.	Max	
Dynamic Characteristics						
R _G	Gate Resistance	V _{GS} =0V, V _{DS} =0V, F=1 MHz	-	2.0	-	Ω
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =25V, Frequency=1.0MHz	-	354	-	pF
C _{oss}	Output Capacitance		-	59	-	
C _{rss}	Reverse Transfer Capacitance		-	36	-	
t _{d(ON)}	Turn-on Delay Time	V _{DD} =10V, R _G =4Ω, I _{DS} =6A, V _{GS} =10V	-	3.9	-	ns
T _r	Turn-on Rise Time		-	7.5	-	
t _{d(OFF)}	Turn-off Delay Time		-	15.6	-	
T _f	Turn-off Fall Time		-	4.6	-	
Gate Charge Characteristics						
Q _g	Total Gate Charge	V _{DS} =24V, V _{GS} =10V, I _D =6A	-	9	-	nC
Q _{gs}	Gate-Source Charge		-	1.2	-	
Q _{gd}	Gate-Drain Charge		-	2.3	-	

Note: *Pulse test, pulse width ≤ 300us, duty cycle ≤ 2%

Typical Operating Characteristics

Figure 1: Power Dissipation

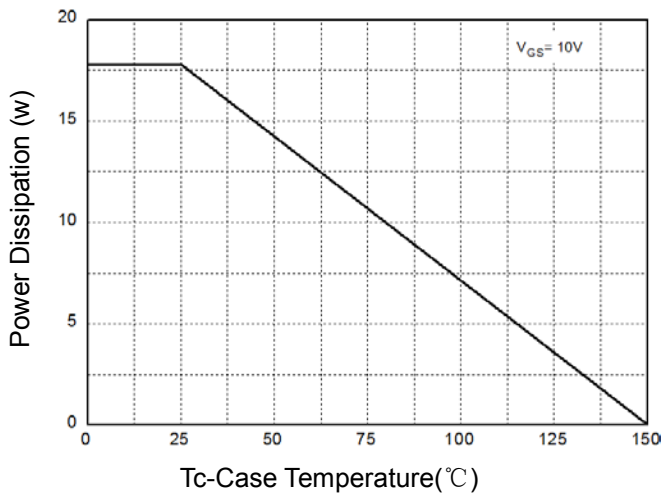


Figure 2: Drain Current

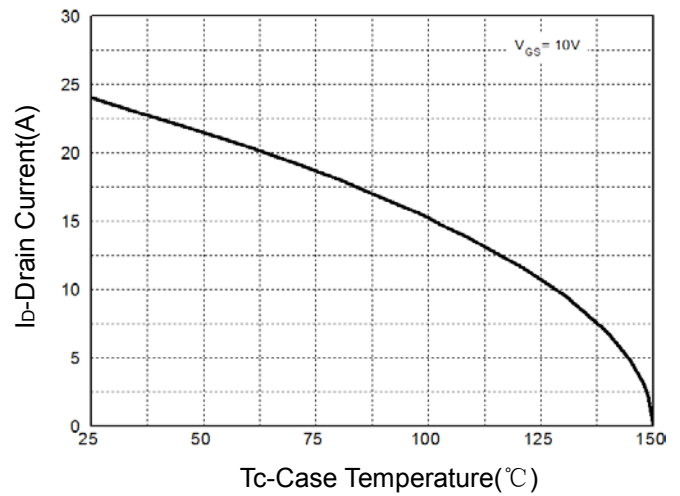


Figure 3: Safe Operation Area

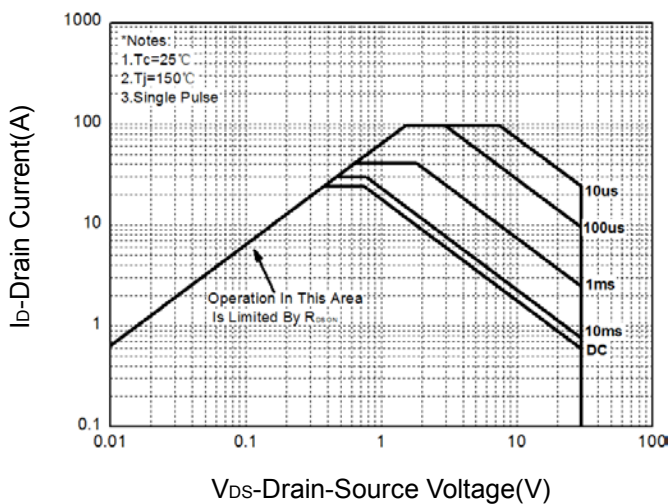


Figure 4: Thermal Transient Impedance

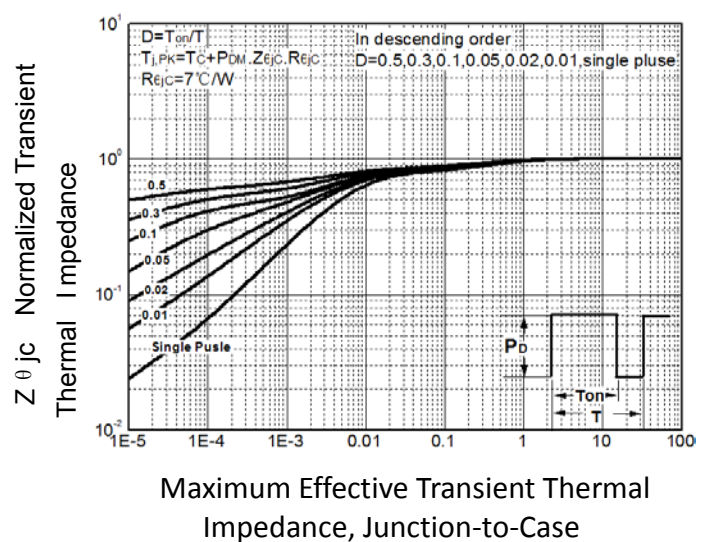


Figure 5: Output Characteristics

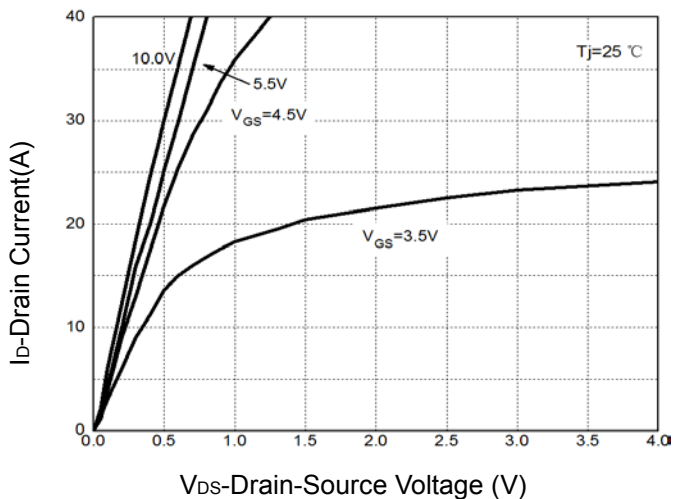
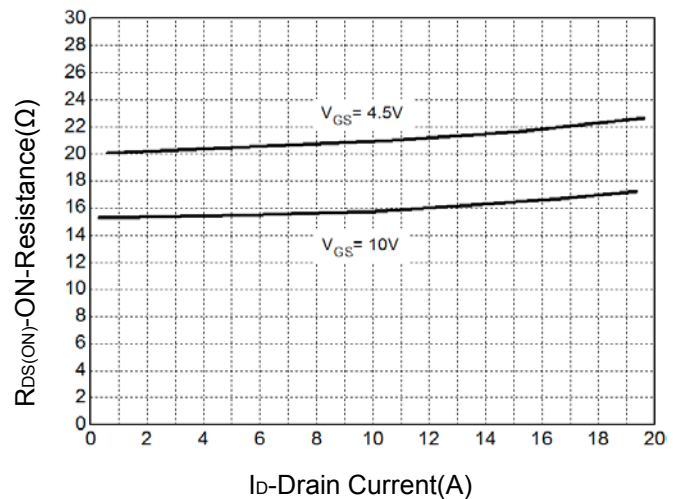


Figure 6: Drain-Source On Resistance



Typical Operating Characteristics

Figure 7: On-Resistance vs. Temperature

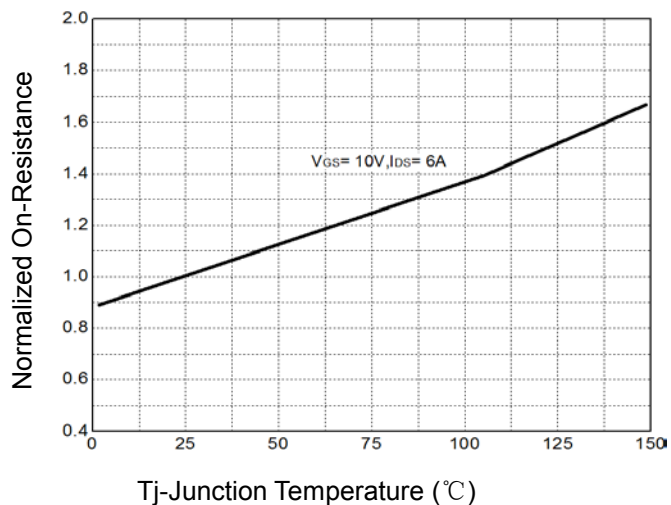


Figure 8: Source-Drain Diode Forward

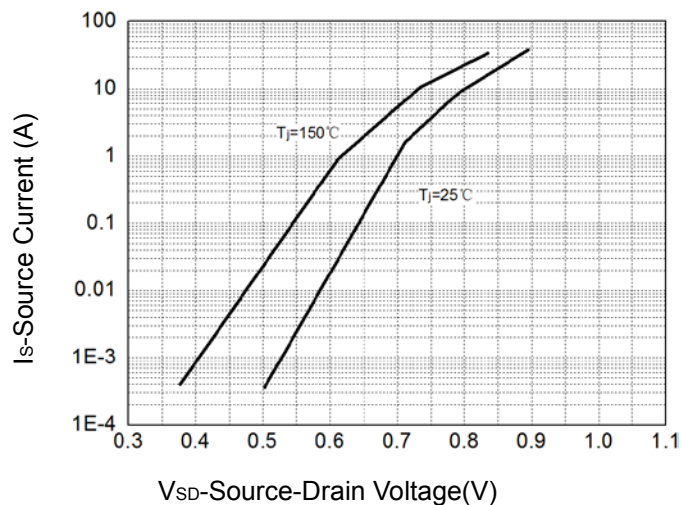


Figure 9: Capacitance Characteristics

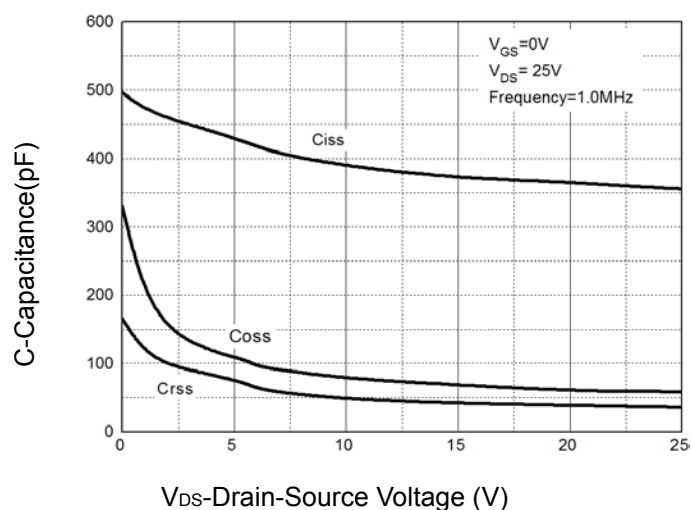
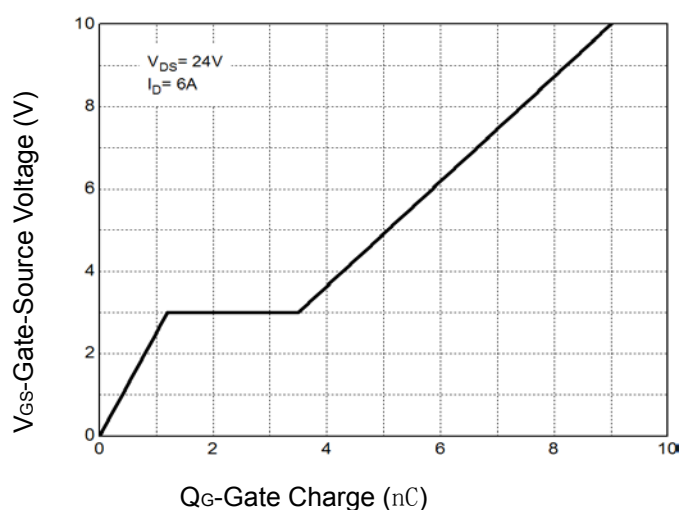
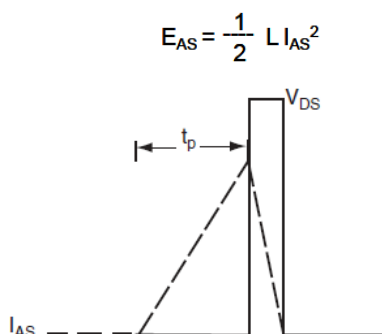
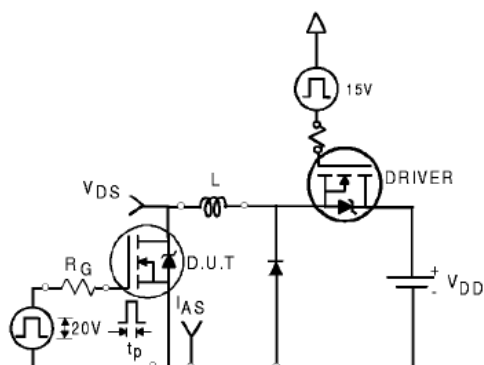


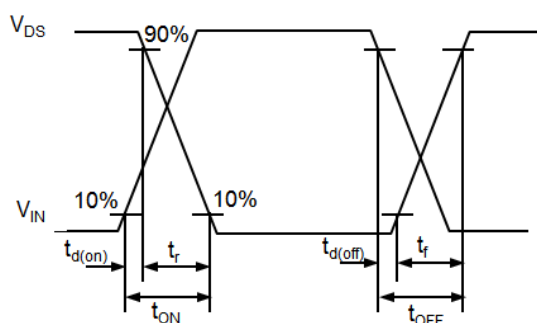
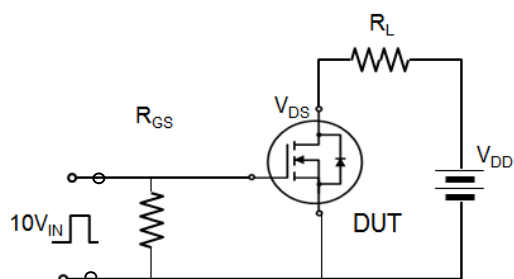
Figure 10: Gate Charge Characteristics



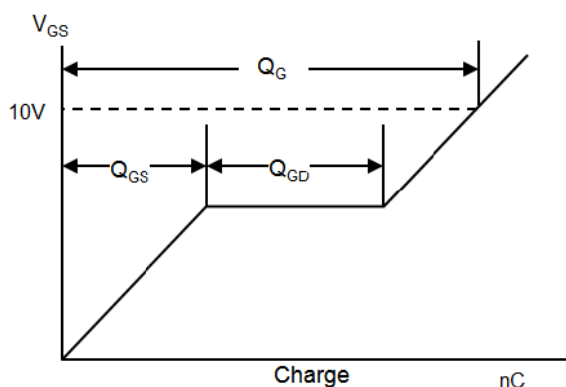
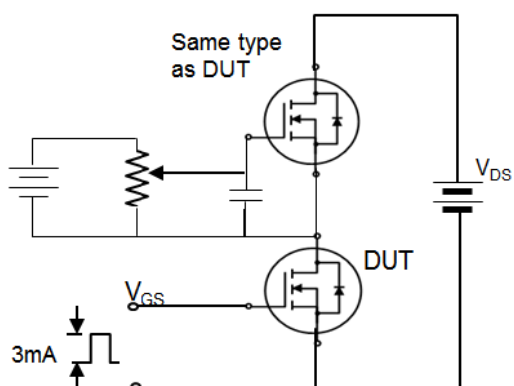
Avalanche Test Circuit



Switching Time Test Circuit



Gate Charge Test Circuit

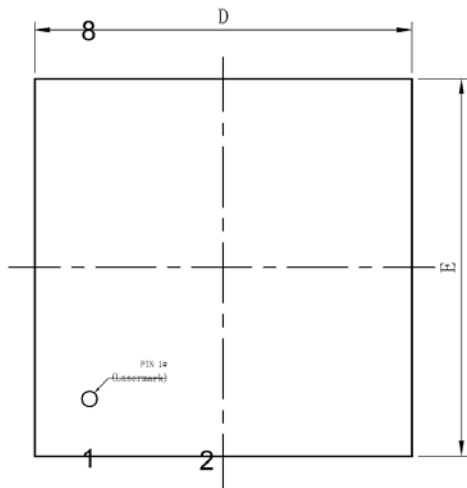


Device Per Unit

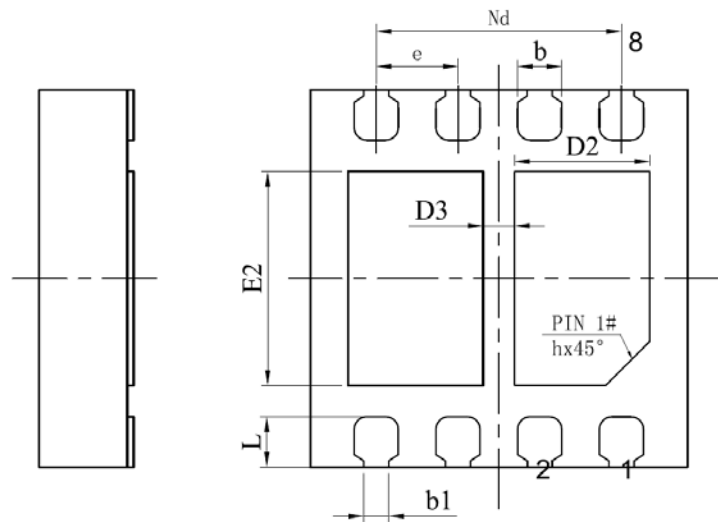
Package Type	Unit	Quantity
DFN3*3-8L	Reel	3000

Package Information

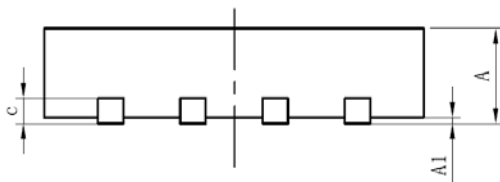
DFN3*3-8L



TOP VIEW



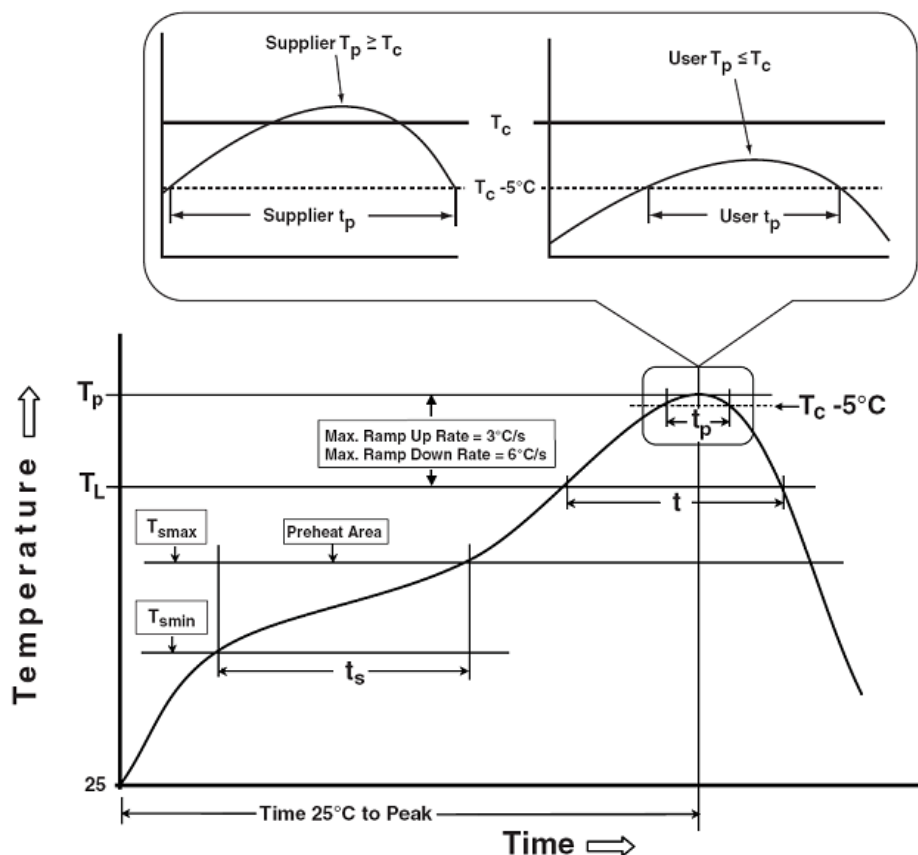
BOTTOM VIEW



SIDE VIEW

SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	0.00	0.02	0.05
b	0.25	0.30	0.35
b1	0.20REF		
c	0.18	0.20	0.23
D	2.90	3.00	3.10
D2	0.975	1.075	1.175
D3	0.25REF		
Nd	1.90	1.95	2.00
E	2.90	3.00	3.10
E2	1.60	1.70	1.80
e	0.65BSC		
L	0.35	0.40	0.45
h	0.30	0.35	0.40

Classification Profile



Classification Reflow Profiles

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat & Soak		
Temperature min (T_{smin})	100 °C	150 °C
Temperature max (T_{smax})	150 °C	200 °C
Time (T_{smin} to T_{smax}) (t_s)	60-120 seconds	60-120 seconds
Average ramp-up rate (T_{smax} to T_p)	3 °C/second max.	3°C/second max.
Liquidous temperature (T_L)	183 °C	217 °C
Time at liquidous (t_L)	60-150 seconds	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 ≥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
HTRB	JESD-22, A108	168 Hrs \ 500Hrs\ 1000 Hrs, Bias @ 125°C
PCT	JESD-22, A102	96 Hrs, 100%RH, 2atm, 121°C
TCT	JESD-22, A104	500 Cycles, -55°C~150°C