120V N-CHANNEL ENHANCEMENT MODE MOSFET

DESCRIPTION:

The ALPB195N12 is an 195A, 120V N-Channel Enhancement Mode MOSFET and it uses super trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge.

It can be used in a wide variety of applications. The package form is TO-220, which accords with the ROHS standard and Halogen Free standard.

FEATURES:

- $R_{DS\ (ON)\ typ}$ = 3.3mΩ @V_{GS} = 10V, I_D = 195A, V_{DS} = 120V
- High Speed Power Switching
- Enhanced Avalanche Ruggedness
- RoHS compliant & halogen-free
- Suffix "-H" indicated Halogen Free part, ex. ALPB195N12H

APPLICATIONS:

- Power Management
- Portable Equipment
- DC- DC Converter

MECHANICAL CHARACTERISTICS

- Epoxy: UL94-V0 rated flame retardant.
- Case: Molded plastic, TO-220
- Terminals: Solder plated, solderable per MIL-STD-750, Method 2026
- Mounting Position: Any.

ORDERING PART NUMBER

PART NUMBER	ORDERING PART NUMBER
ALPB195N12	**ALPB195N12-LT**

MAXIMUM RATINGS

MAXIMUM RATINGS @ T_A = 25 °C unless otherwise specified				
PARAMETER		**SYMBOL**	**RATINGS**	**UNIT**
Drain-Source Voltage		V_{DSS}	120	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current	@T_C=25℃	I_D	195	A
	@T_C=100℃		125	
Pulsed Drain Current		I_{DM} (note 1)	780	A
Single pulse avalanche energy	V_{DD} = 100V, Rg=25Ω, L=5mH, @T_C=25℃	E_{AS}	2300	mJ
Power Dissipation	@T_C=25℃	P_D	250	W
Operating Junction Temperature Range		T_J	-55 to +150	°C
Storage Temperature Range		T_{STG}	-55 to +150	°C
Maximum Temperature for Soldering		T_L	260	°C

Note:
1. Repetitive rating; pulse width limited by maximum junction temperature.

THERMAL CHARACHTERISTICS @ T_A = 25 °C unless otherwise specified			
PARAMETER	**SYMBOL**	**RATINGS**	**UNIT**
Thermal Resistance Junction to Ambient	$R_{\theta JA}$	60	°C/W
Thermal Resistance Junction to Case	$R_{\theta JC}$	0.5	°C/W

ELECTRICAL CHARACTERISTICS @ TA = 25 °C unless otherwise specified

PARAMETER	CONDITIONS	SYMBOL	MIN	TYP.	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D=250 µA	$V_{(BR)DSS}$	120			V
Drain to Source Leakage Current	V_{GS}=0V, V_{DS}=120V, T_j=25℃	I_{DSS}			1.0	µA
Gate to Source Forward Leakage current	V_{GS} = +20V	$I_{GSS(F)}$			100	nA
Gate to Source Reverse Leakage current	V_{GS} = -20V	$I_{GSS(R)}$			-100	nA
ON CHARACTERISTICS						
Gate-Threshold Voltage	V_{GS}= $V_{DS,}$ I_D = 250µA	$V_{GS(TH)}$	2.8	3.0	3.8	V
Drain-to-Source On-Resistance	V_{GS} = 10V, I_D = 20A	$R_{DS(ON)}$		2.95	3.3	mΩ
Gate Resistance	V_{GS}=0V, V_{DS}=60V, f=1MHz	R_G		1.06		Ω

SWITCHING PARAMETERS						
PARAMETER	**CONDITIONS**	**SYMBOL**	**MIN**	**TYP.**	**MAX**	**UNIT**
Input Capacitance	V_{GS} = 0V, V_{DS} = 60V, f=1MHz	C_{iss}		7980		pF
Output Capacitance		C_{oss}		871		
Reserve Transfer Capacitance		C_{rss}		21.6		
Total Gate Charge	V_{DS}=60V, I_D=5A, V_{GS}=0 ~ 10V	Q_g		113		nC
Gate to Source Charge		Q_{gs}		33		
Gate to Drain Charge		Q_{gd}		23		
Turn-On Delay Time	V_{DS}=60V, I_D=20A, V_{GS}=10V, R_G=5Ω	$t_{d(on)}$		30		nS
Rise time		t_r		25		
Turn-Off Delay Time		$t_{d(off)}$		75		
Fall time		t_f		30		

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS						
PARAMETER	**CONDITIONS**	**SYMBOL**	**MIN**	**TYP.**	**MAX**	**UNIT**
Drain forward current	T_C=25℃	I_S			195	A
Drain forward voltage	V_{GS} = 0V, I_S = 20A	V_{SD}			1.2	V
Reverse recovery time	V_{DS}=60V, I_S=100A, dI_F/dt=100A/µs	t_{rr}		100		ns
Reverse recovery charge		Q_{rr}		260		nC

TYPICAL DEVICE RATING AND CHARACTERISTICS CURVES (T_A = 25 °C unless otherwise noted)

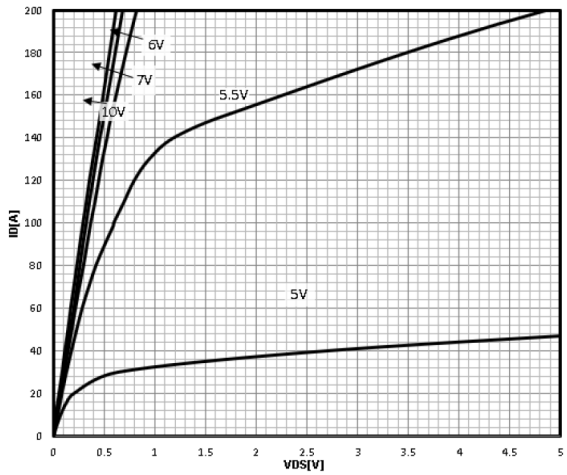


Fig.1 TYPICAL OUTPUT CHARACTERISTICS
I_D=f(V_{DS})

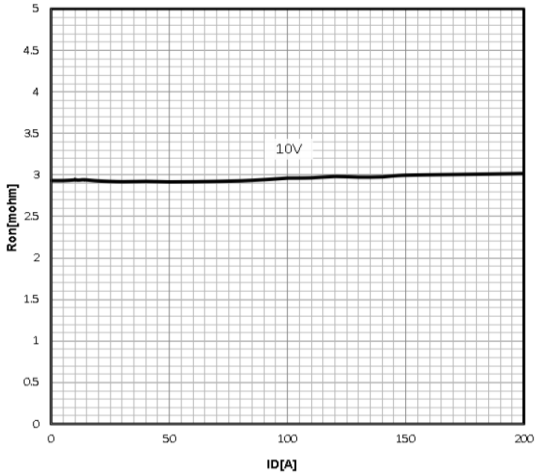


Fig.2 TYP. DRAIN DRAIN-SOURCE ON RESISTANCE
$R_{DS(on)}$=f(I_D)

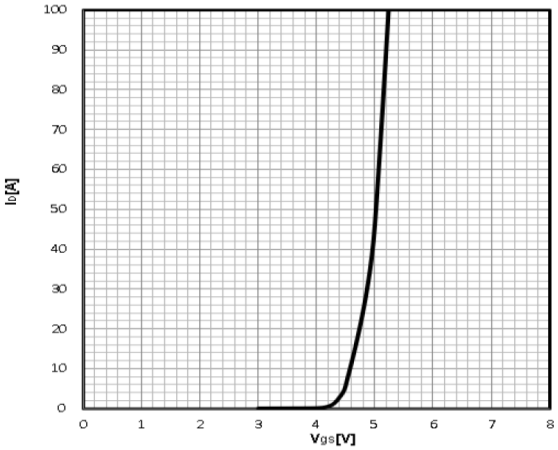


Fig.3 TYP. TRANSFER CHARACTERISTICS
I_D=f(V_{GS})

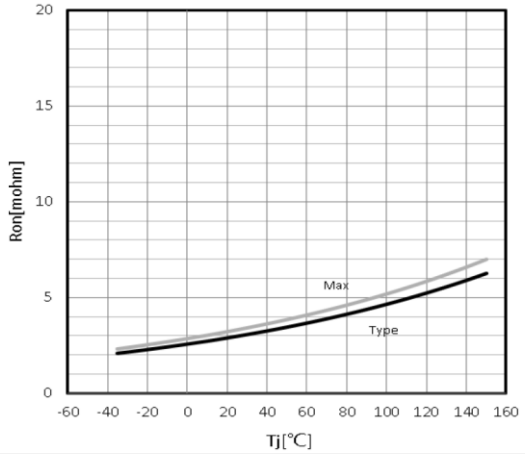


Fig.4 DRAIN-SOURCE ON ON-STATE RESISTANCE
$R_{DS(on)}$=f(T_j); I_D=20A; V_{GS}=10V

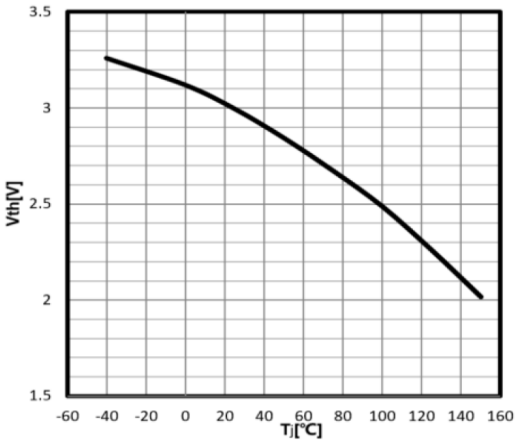


Fig.5 GATE THRESHOLD VOLTAGE
V_{TH}=f(T_j); I_D=250μA

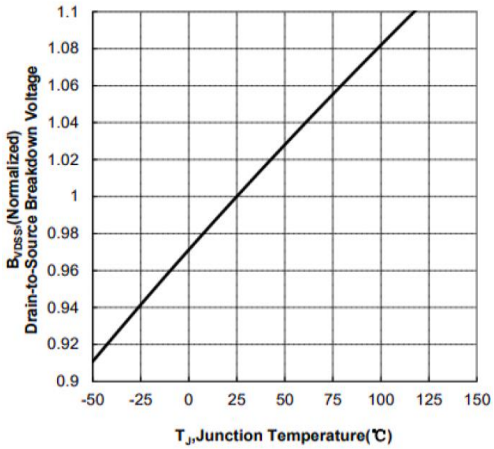


Fig.6 DRAIN SOURCE BREAKDOWN VOLTAGE
$V_{BR(DSS)}$=f(T_j); I_D=250μA

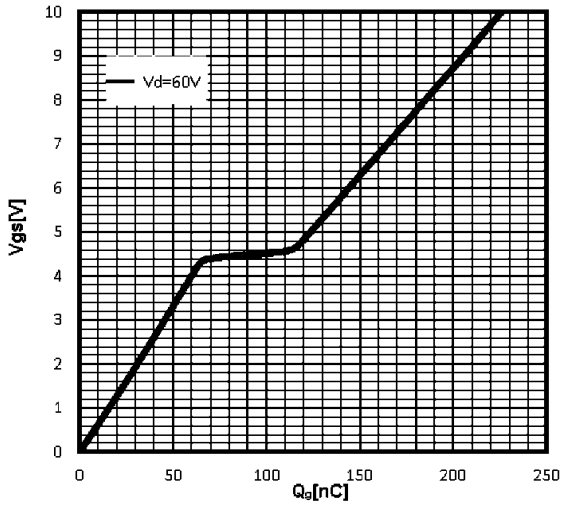


Fig.7 TYP. GATE CHARGE
$V_{GS}=f(Q_{gate})$

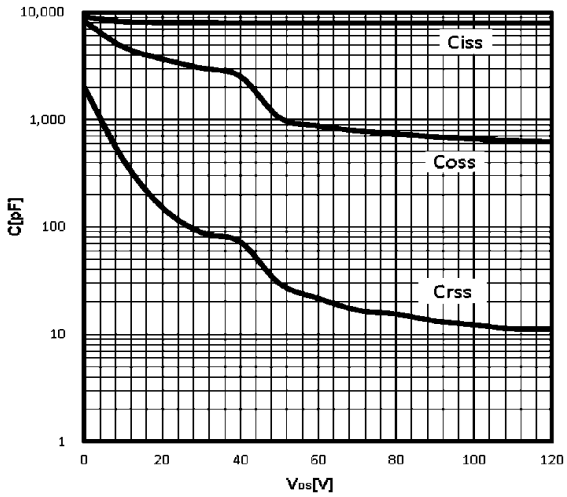


Fig.8 TYP. CAPACITANCES
$C=f(V_{DS})$; $V_{GS}=0V$; f =1MHz

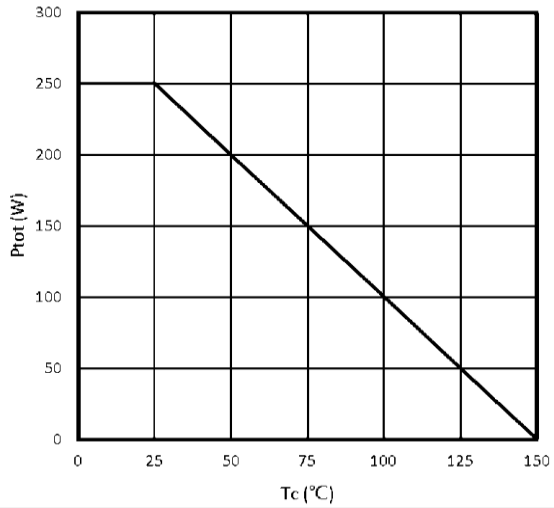


Fig.9 Power Dissipation
$P_{tot}=f(T_j)$

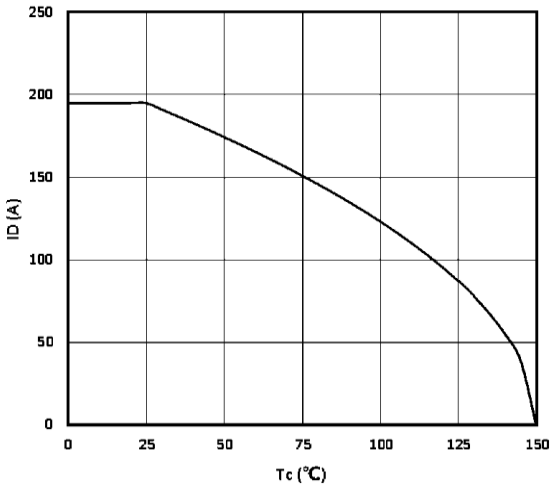


Fig.10 MAXIMUM DRAIN CURRENT
$I_D=f(T_C)$

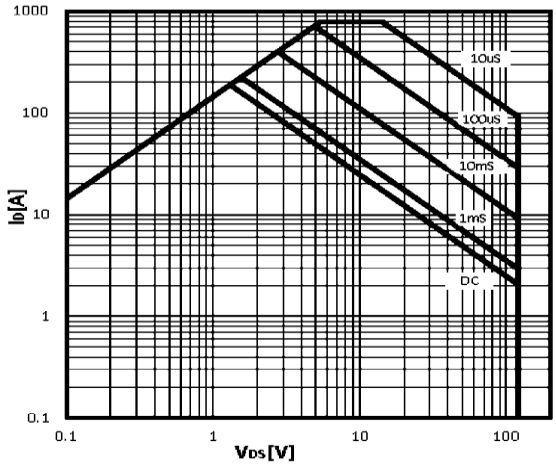


Fig.11 SAFE OPERATING AREA
$I_D=f(V_{DS})$

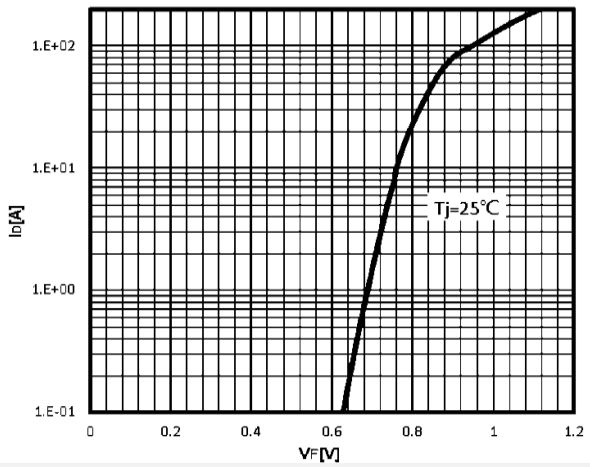


Fig.12 BODY DIODE FORWARD VOLTAGE VARIATION
$I_F=f(V_{GS})$

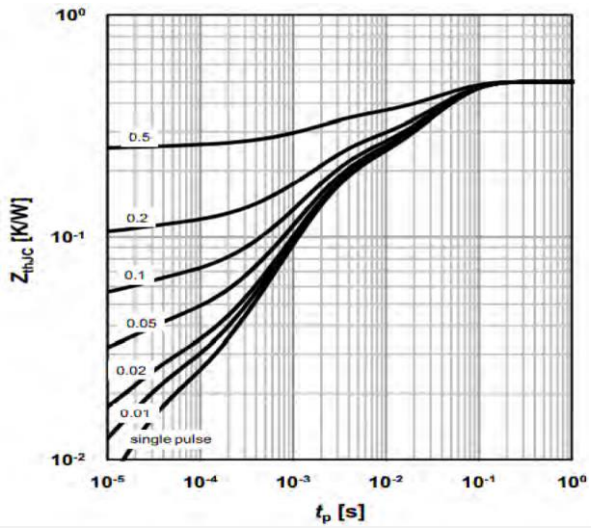
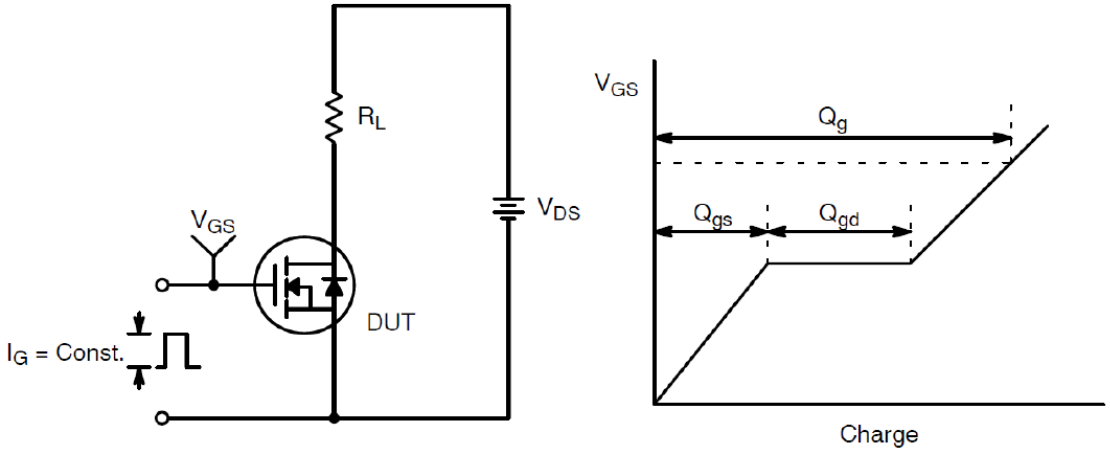
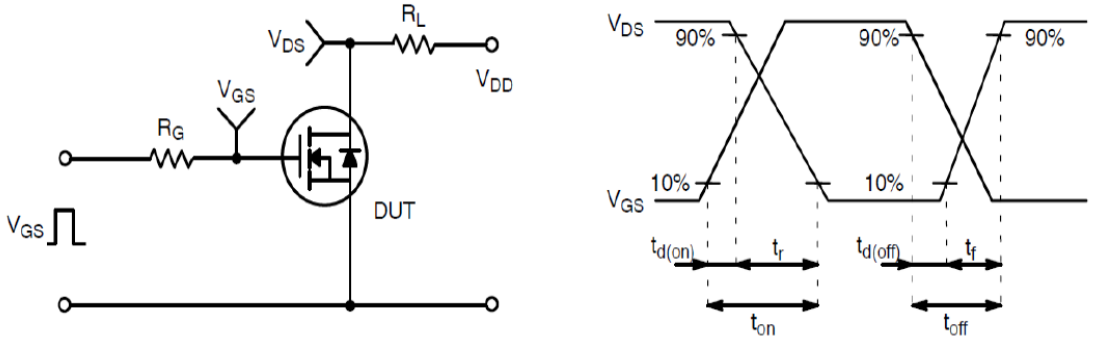


Fig.13 MAX. TRANSIENT THERMAL IMPEDANCE
$Z_{thJC}=f(t_p)$

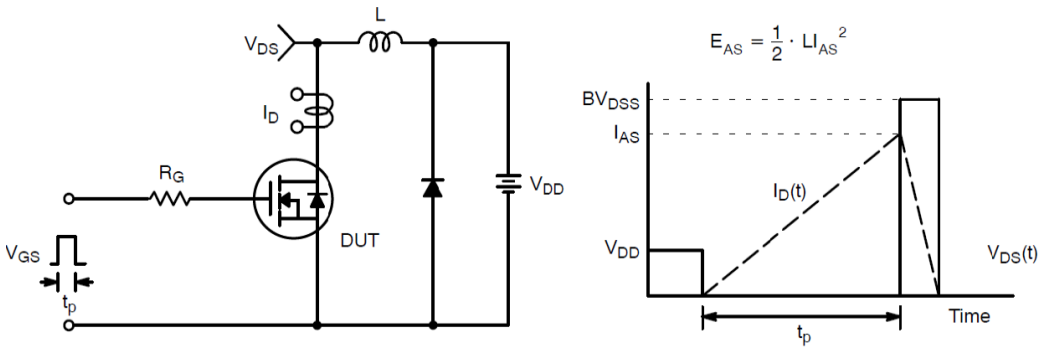
TEST RESULTS CURVES (T_A = 25 °C unless otherwise noted)



GATE CHARGE TEST CIRCUIT & WAVEFORM



RESISTIVE SWITCHING TEST CIRCUIT & WAVEFORMS

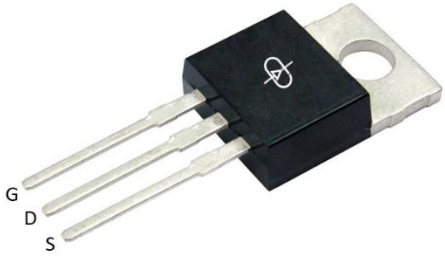


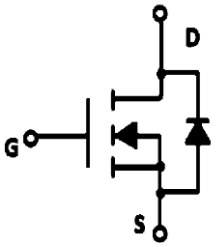
UNCLAMPED INDUCTIVE SWITCHING TEST CIRCUIT & WAVEFORMS

PINNING INFORMATION

SIMPLIFIED OUTLINE	SYMBOL

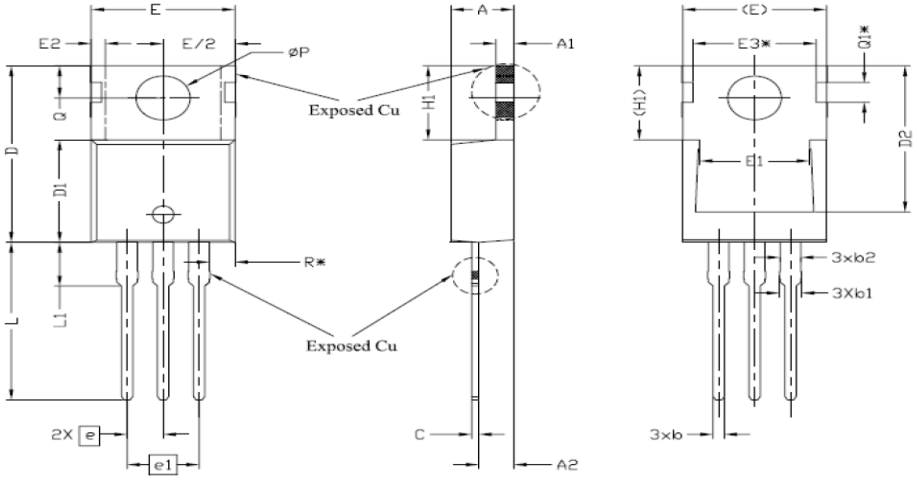
TO-220





PACKAGE INFORMATION

TO-220

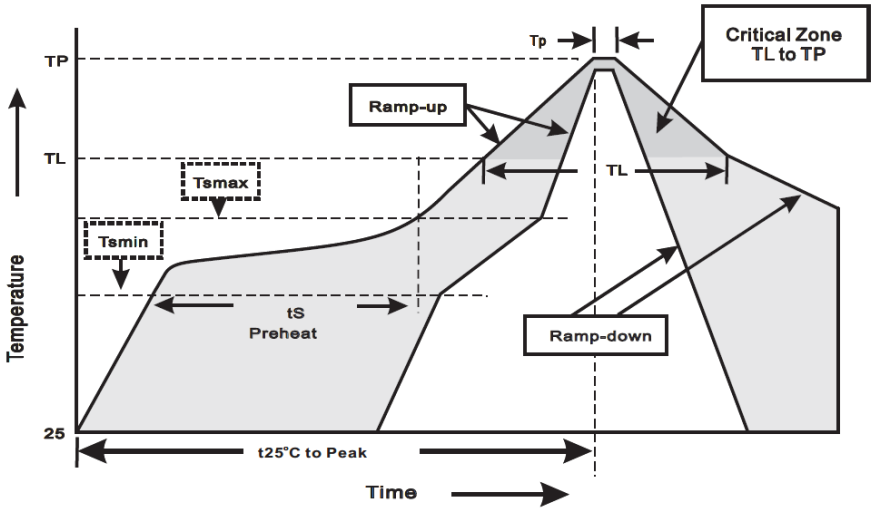


OUTLINE DIMENSIONS						
SYMBOL	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	4.24	4.44	4.64	0.167	0.175	0.183
A1	1.15	1.27	1.40	0.045	0.050	0.055
A2	2.30	2.48	2.70	0.091	0.098	0.106
b	0.70	0.80	0.90	0.028	0.031	0.035
b1	1.20	1.55	1.75	0.047	0.061	0.069
b2	1.20	1.45	1.70	0.047	0.057	0.067
c	0.40	0.50	0.60	0.016	0.020	0.024
D	14.70	15.37	16.00	0.579	0.605	0.630
D1	8.82	8.92	9.02	0.347	0.351	0.355
D2	12.63	12.73	12.83	0.497	0.501	0.505
E	9.96	10.16	10.36	0.392	0.400	0.408
E1	6.86	7.77	8.89	0.270	0.306	0.350
E2	-	-	0.76	-	-	0.030
E3*	8.70 REF.			0.343 REF.		
e	2.54 REF.			0.100 REF.		
e1	5.08 REF.			0.200 REF.		
H1	6.30	6.45	6.60	0.248	0.254	0.260
L	13.47	13.72	13.97	0.530	0.540	0.550
L1	3.60	3.80	4.00	0.142	0.150	0.157
ΦP	3.75	3.84	3.93	0.148	0.151	0.155
Q	2.60	2.80	3.00	0.102	0.110	0.118
Q1*	1.73 REF.			0.068 REF.		
R*	1.82 REF.			0.072 REF.		

SOLDERING PARAMETERS

SUGGESTED THERMAL PROFILES FOR SOLDERING PROCESSES

1. Storage environment: Temperature=5 °C~40 °C Humidity=55% ±25%
2. Reflow soldering of surface-mount devices



3. Reflow soldering

PROFILE FEATURE	SOLDERING CONDITION
Average ramp-up rate (T_L to T_P)	<3 °C/sec
Preheat - Temperature Min (T_{smin}) - Temperature Max (T_{smax}) - Time (min to max) (t_s)	 150 °C 200 °C 60 ~ 120 sec
T_{smax} to T_L - Ramp-upRate	 <3 °C/sec
Time maintained above: - Temperature (T_L) - Time(tL)	 217 °C 60 ~ 260 sec
Peak Temperature (T_P)	255 °C-0/+5 °C
Time within 5 °C of actual Peak Temperature(tP)	10 ~ 30 sec
Ramp-down Rate	<3 °C/sec
Time 25 °C to Peak Temperature	<6 minutes

CUSTOMER NOTE:

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2. In Europe, please dispose as per EU Directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE).

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