

N-Channel Enhancement Mode Power MOSFET

LUT120T10

BV_{DSS}	100V
I_D	120A
R_{DSON}	7.4 m Ω

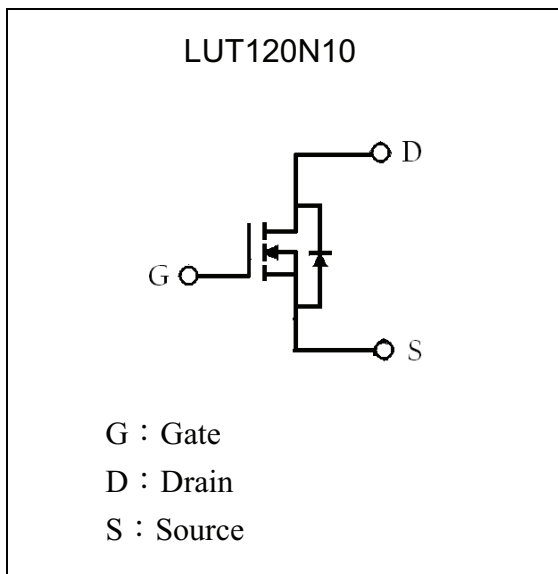
Features

- Low Gate Charge
- Simple Drive Requirement
- Repetitive Avalanche Rated
- Fast Switching Characteristic
- RoHS compliant package

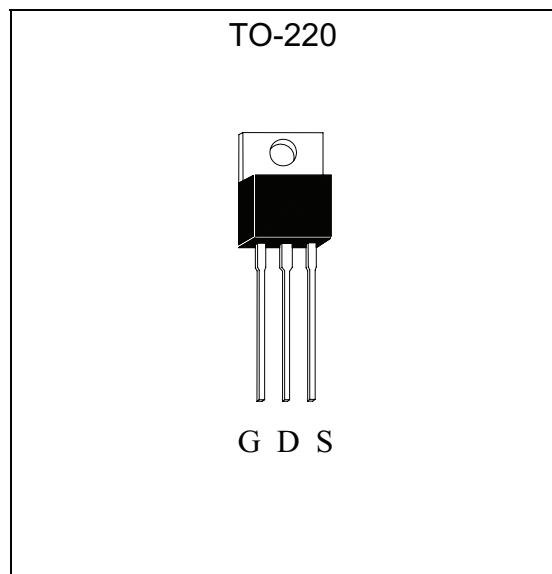
Applications

- BLDC Motor Control Application
- High Power System
- SMPS Appliances
- Synchronous Rectification.
- Power Management in Inverter Systems.
- LED Appliances

Symbol



Outline



Note: LUL Company lead-free products contain molding compounds/die attach materials and 100% matte tin plate termination finish; which are fully compliant with RoHS. LUL Company lead-free products meet or exceed the lead-free requirements of IPC/JEDEC J-STD-020D for MSL classification at lead-free peak reflow temperature. LUL Company 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).

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Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit	
Common Ratings ($T_A=25^\circ\text{C}$ Unless Otherwise Noted)				
V_{DSS}	Drain-Source Voltage	100	V	
V_{GSS}	Gate-Source Voltage	± 25		
T_J	Maximum Junction Temperature	175	$^\circ\text{C}$	
T_{STG}	Storage Temperature Range	-55 to 175	$^\circ\text{C}$	
I_S	Diode Continuous Forward Current	$T_C=25^\circ\text{C}$	80	A
Mounted on Large Heat Sink				
I_{DP}	300 μs Pulse Drain Current Tested	$T_C=25^\circ\text{C}$	480*	A
I_D	Continuous Drain Current	$T_C=25^\circ\text{C}$	120**	A
		$T_C=100^\circ\text{C}$	90	
P_D	Maximum Power Dissipation	$T_C=25^\circ\text{C}$	300	W
		$T_C=100^\circ\text{C}$	150	
$R_{\theta JC}$	Thermal Resistance-Junction to Case		0.5	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance-Junction to Ambient		62.5	

Note : * Pulse width limited by safe operating area.

** Current limited by bond wire.

Electrical Characteristics ($T_A = 25^\circ\text{C}$ Unless Otherwise Noted)

Symbol	Parameter	Test Conditions	LUT120T10			Unit
			Min.	Typ.	Max.	
Static Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0\text{V}, I_{DS}=250\mu\text{A}$	100	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=80\text{V}, V_{GS}=0\text{V}$ $T_J=85^\circ\text{C}$	-	-	1	μA
			-	-	30	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_{DS}=250\mu\text{A}$	2	3	4	V
I_{GSS}	Gate Leakage Current	$V_{GS}=\pm 25\text{V}, V_{DS}=0\text{V}$	-	-	± 100	nA
$R_{DS(ON)}^a$	Drain-Source On-state Resistance	$V_{GS}=10\text{V}, I_{DS}=40\text{A}$	-	6	7.4	m Ω
Diode Characteristics						
V_{SD}^a	Diode Forward Voltage	$I_{SD}=20\text{A}, V_{GS}=0\text{V}$	-	0.8	1.1	V
t_{rr}	Reverse Recovery Time	$I_{DS}=40\text{A}, dI_{SD}/dt=100\text{A}/\mu\text{s}$	-	75	-	ns
Q_{rr}	Reverse Recovery Charge		-	230	-	nC

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

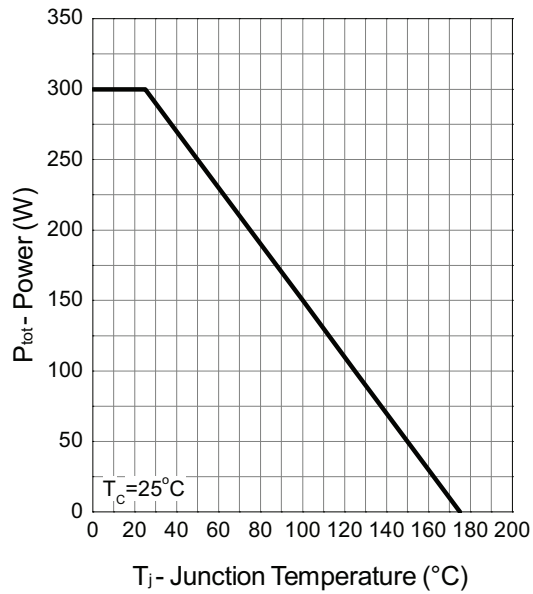
Symbol	Parameter	Test Conditions	LUT120T10			Unit
			Min.	Typ.	Max.	
Dynamic Characteristics^b						
R _G	Gate Resistance	V _{GS} =0V, V _{DS} =0V, F=1MHz	-	1.5	-	Ω
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =30V, Frequency=1.0MHz	-	3400	4420	pF
C _{oss}	Output Capacitance		-	900	-	
C _{rss}	Reverse Transfer Capacitance		-	400	-	
t _{d(ON)}	Turn-on Delay Time	V _{DD} =30V, R _L =30Ω, I _{DS} =1A, V _{GEN} =10V, R _G =6Ω	-	21	40	ns
T _r	Turn-on Rise Time		-	20	36	
t _{d(OFF)}	Turn-off Delay Time		-	85	153	
T _f	Turn-off Fall Time		-	68	122	
Gate Charge Characteristics^b						
Q _g	Total Gate Charge	V _{DS} =50V, V _{GS} =10V, I _{DS} =40A	-	110	160	nC
Q _{gs}	Gate-Source Charge		-	18	-	
Q _{gd}	Gate-Drain Charge		-	45	-	

Note a : Pulse test ; pulse width ≤ 300μs, duty cycle ≤ 2%.

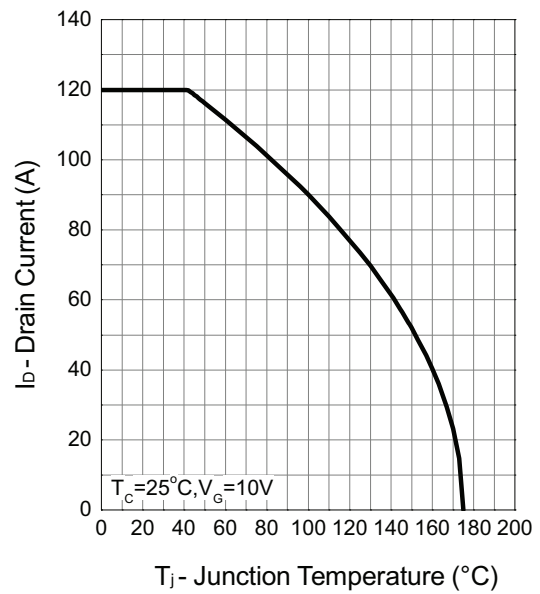
Note b : Guaranteed by design, not subject to production testing.

Typical Operating Characteristics

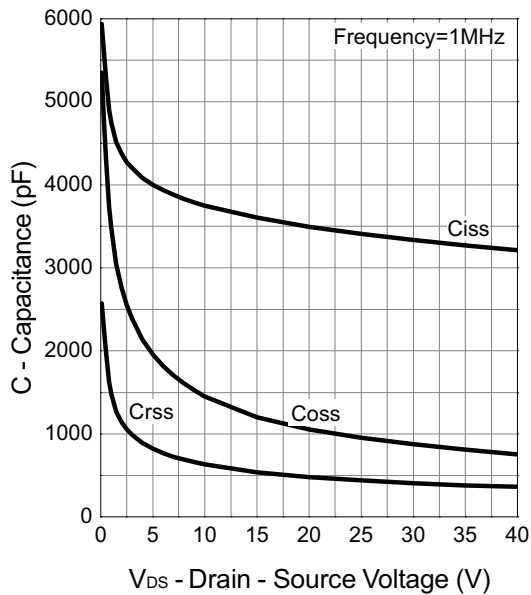
Power Dissipation



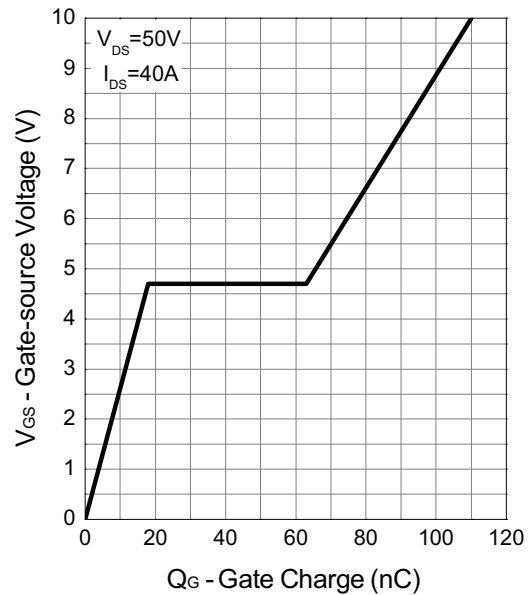
Drain Current



Capacitance

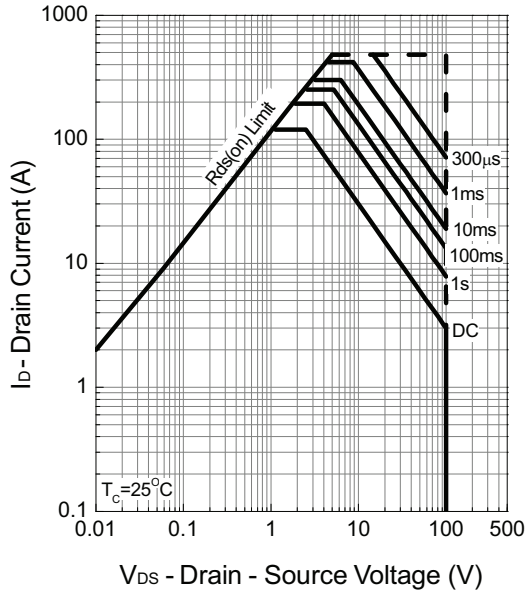


Gate Charge

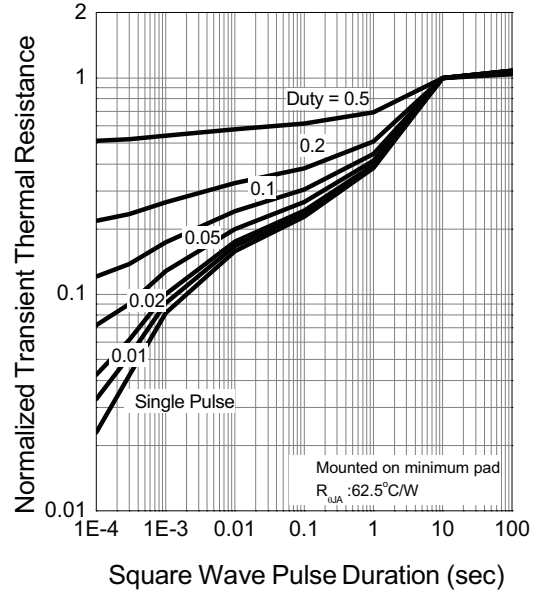


Typical Operating Characteristics (Cont.)

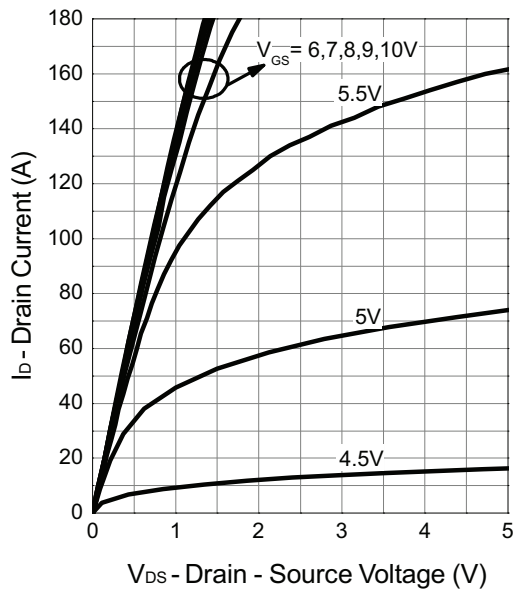
Safe Operation Area



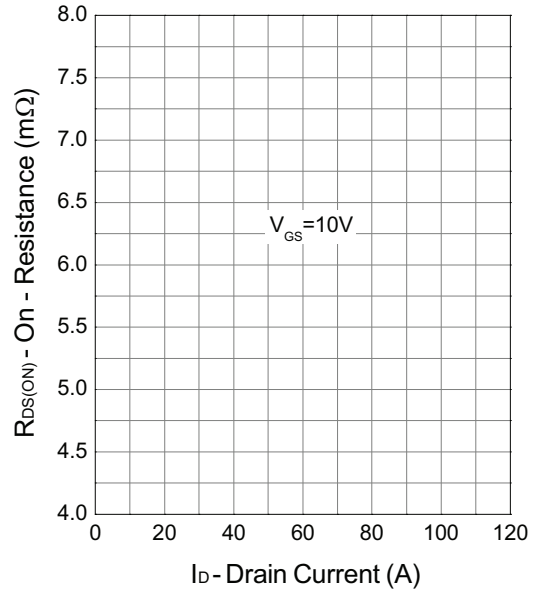
Thermal Transient Impedance



Output Characteristics

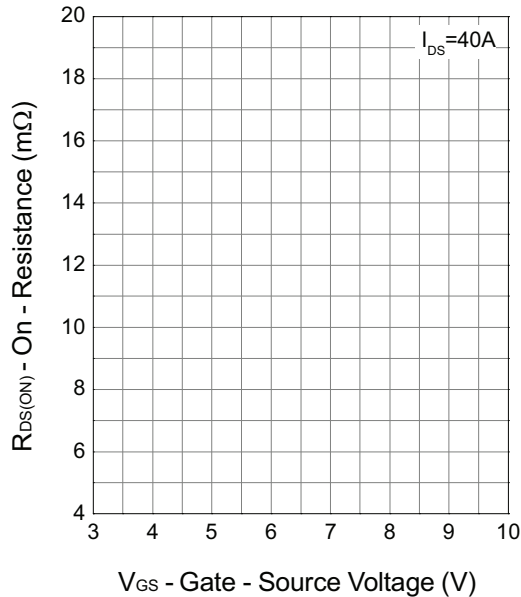


Drain-Source On Resistance

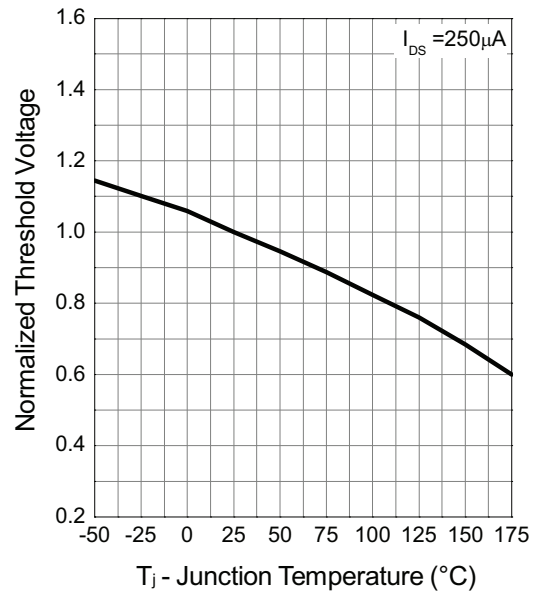


Typical Operating Characteristics (Cont.)

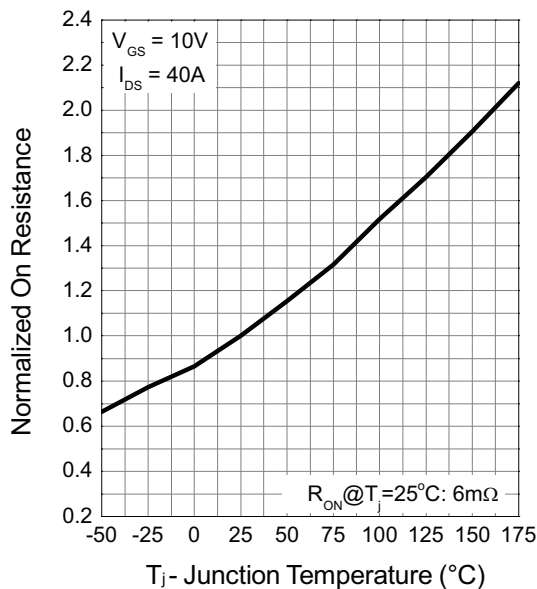
Gate-Source On Resistance



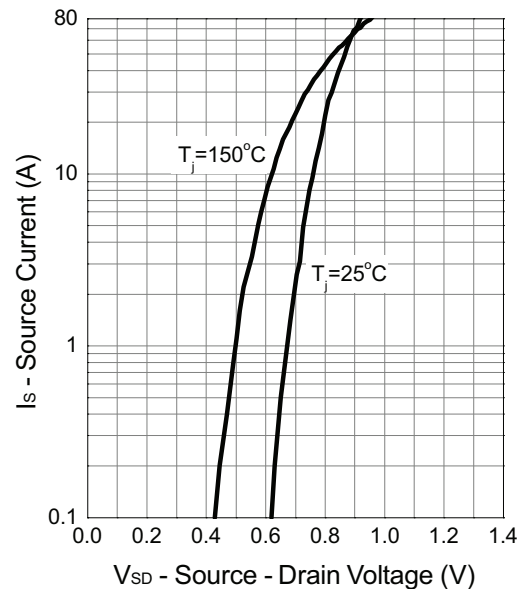
Gate Threshold Voltage



Drain-Source On Resistance

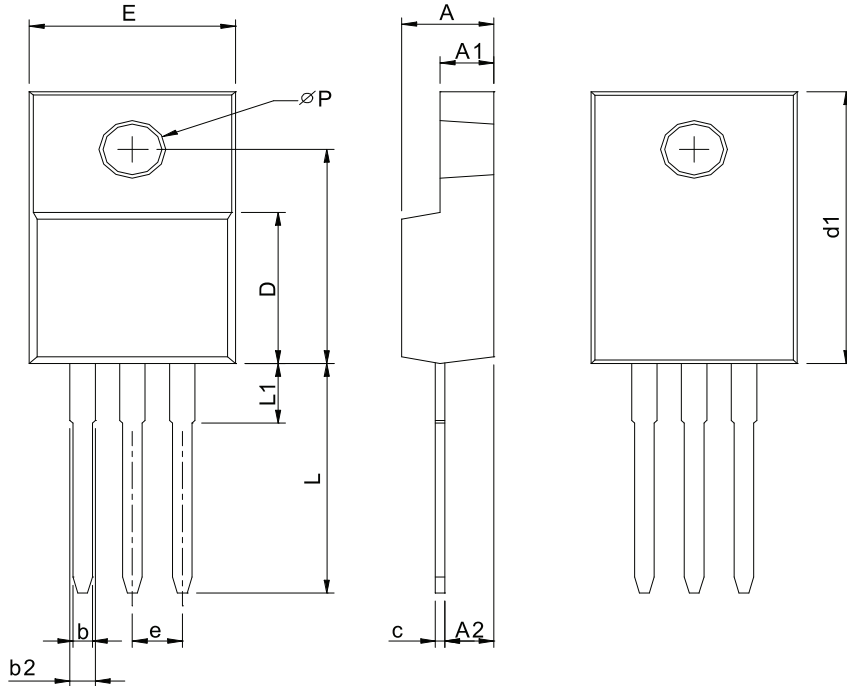


Source-Drain Diode Forward



Package Information

TO-220

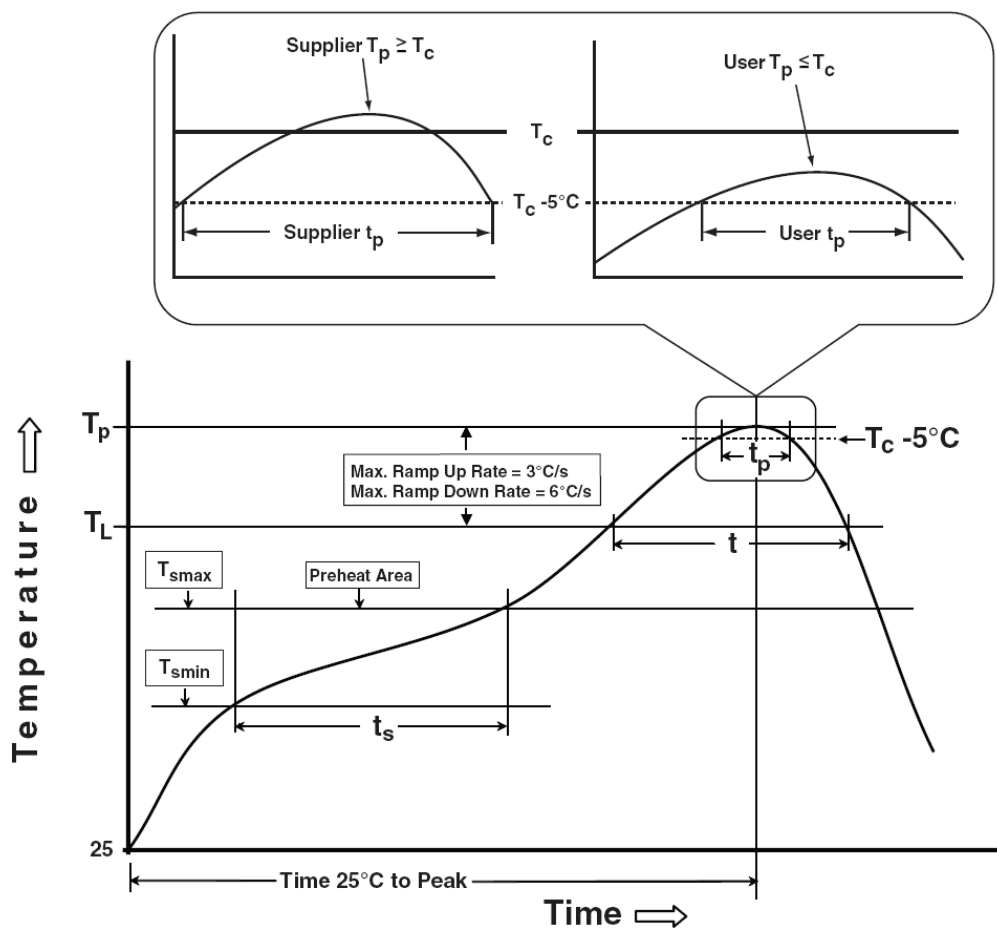


DIMENSIONS	TO-220			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.20	4.80	0.165	0.189
A1	2.60	3.20	0.102	0.126
A2	2.10	2.90	0.083	0.114
b	0.50	1.00	0.020	0.039
b2	0.90	1.90	0.035	0.075
c	0.30	0.80	0.012	0.031
D	8.10	9.10	0.319	0.358
d1	14.50	16.50	0.571	0.650
d2	12.10	12.90	0.476	0.508
E	9.70	10.70	0.382	0.421
e	2.54 BSC		0.100 BSC	
L	13.00	14.50	0.512	0.570
L1	1.60	4.00	0.063	0.157
P	3.00	3.60	0.118	0.142

Devices Per Unit

Package Type	Unit	Quantity
TO-220	Tube	50

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 (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