

Product Summary

$V_{(BR)DSS}$	$R_{DS(on)TYP}$	I_D
120V	3.9mΩ@10V	180A



合肥矽普半导体

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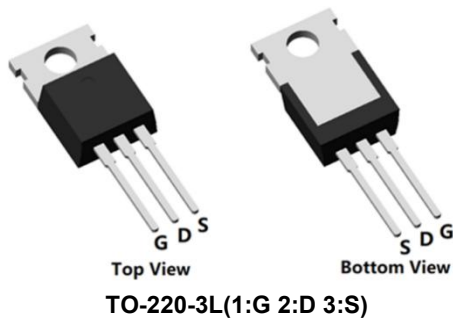
Feature

- Fast Switching
- Low Gate Charge and Rdson
- Low Reverse transfer capacitances
- **100% UIS TESTED**

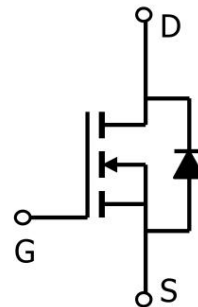
Applications

- High Speed Power switching
- DC-DC Converter
- Power Management

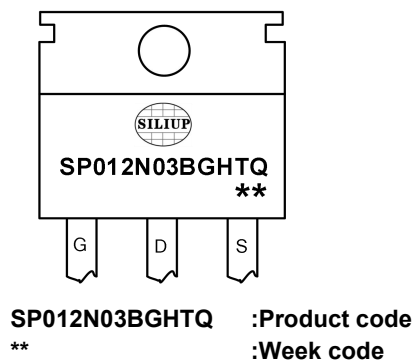
Package



Circuit diagram



Marking



Order Information

Device	Package	Unit/Tube
SP012N03BGHTQ	TO-220-3L	50

Absolute maximum ratings (Ta=25°C, unless otherwise noted)

Parameter	Symbol	Rating	Unit
Drain-Source Voltage	V _{DS}	120	V
Gate-Source Voltage	V _{GS}	±20	V
Continuous Drain Current (Tc=25°C)	I _D	180	A
Continuous Drain Current (Tc=100°C)	I _D	120	A
Pulsed Drain Current	I _{DM}	720	A
Single Pulse Avalanche Energy ¹	E _{AS}	900	mJ
Power Dissipation (Tc=25°C)	P _D	230	W
Power Dissipation (Tc=100°C)	P _D	92	W
Thermal Resistance Junction-to-Case	R _{θJC}	0.54	°C/W
Storage Temperature Range	T _{STG}	-55 to 150	°C
Operating Junction Temperature Range	T _J	-55 to 150	°C

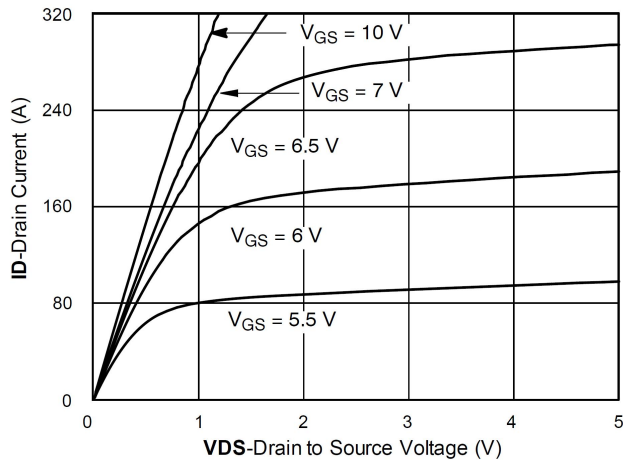
Electrical characteristics (Ta=25°C, unless otherwise noted)

Characteristics	Symbol	Test Condition	Min	Typ	Max	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	ID=250μA , VGS=0V	120	-	-	V
Drain Cut-Off Current	I _{DSS}	VDS=96V , VGS=0V	-	-	1	μA
Gate Leakage Current	I _{GSS}	VGS=±20V , VDS=0V	-	-	±100	nA
Gate Threshold Voltage	V _{GS(th)}	VDS=VGS , ID=250μA	2.8	3.2	3.8	V
Drain-Source ON Resistance	R _{DS(ON)}	VGS=10V , ID=50A	-	3.9	5	mΩ
Gate Resistance	R _G	VDS=60V , VGS=0V , f=1MHz	-	1.6	-	Ω
Dynamic Characteristics						
Input Capacitance	C _{iss}	VDS=60V , VGS=0V , f=1.0MHz	-	5640	-	pF
Output Capacitance	C _{oss}		-	1049	-	
Reverse Transfer Capacitance	C _{rss}		-	36	-	
Total Gate Charge	Q _g	VDS=60V , VGS=10V , ID=75A	-	104	-	nC
Gate-Source Charge	Q _{gs}		-	26	-	
Gate-Drain Charge	Q _{gd}		-	18	-	
Gate Plateau Voltage	V _{plateau}		-	4.6	-	V
Switching Characteristics						
Turn-On Delay Time	t _{d(on)}	VGS=10V , VDS=50V , ID=75A , RG=1.6Ω	-	28	-	nS
Rise Time	t _r		-	18	-	
Turn-Off Delay Time	t _{d(off)}		-	38	-	
Fall Time	t _f		-	12	-	
Drain-Source Body Diode Characteristics						
Source-Drain Diode Forward Voltage	V _{SD}	IS=1A , VGS=0V , TJ=25℃	-	-	1.2	V
Maximum Body-Diode Continuous Current	I _S		-	-	180	A
Reverse Recovery Time	T _{rr}	IS=100A , di/dt=100A/us , TJ=25℃	-	88	-	nS
Reverse Recovery Charge	Q _{rr}		-	166	-	nC

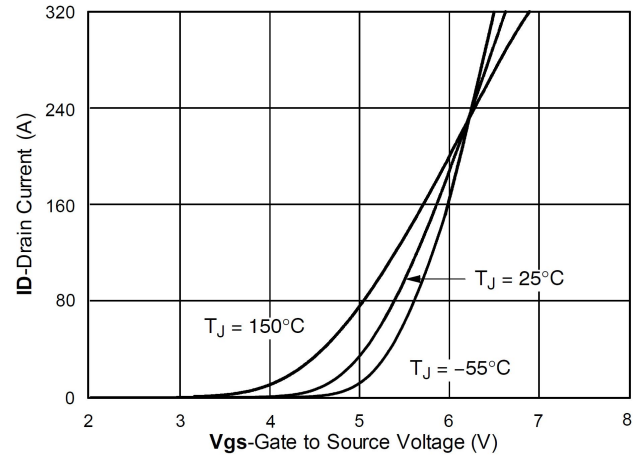
Note :

1. The test condition is VDD=50V, VGS=10V, L=0.5mH, RG=25Ω;

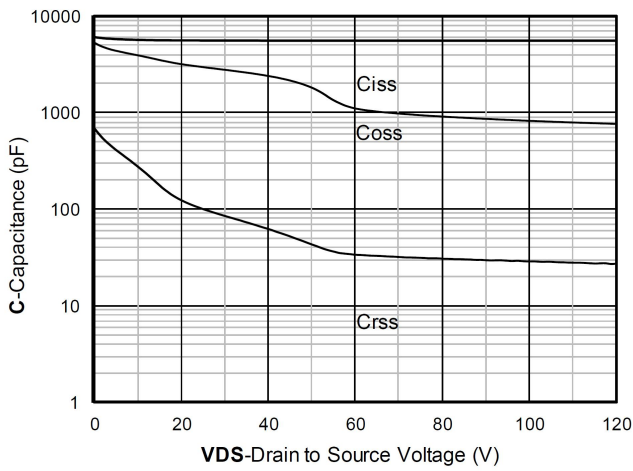
Typical Characteristics



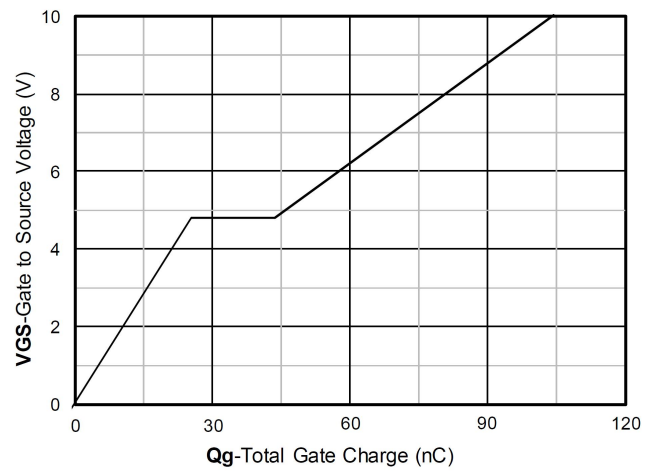
Output Characteristics



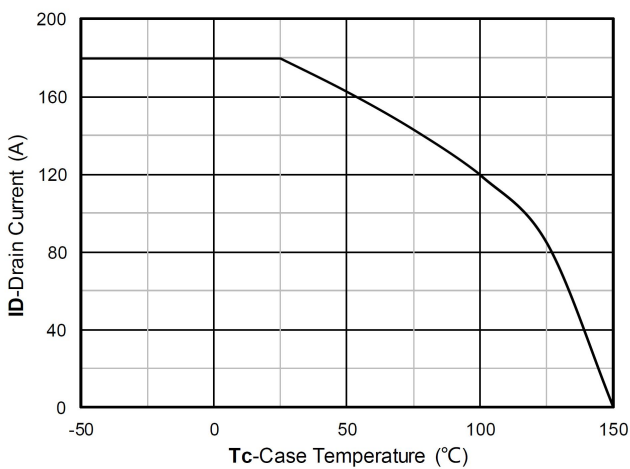
Transfer Characteristics



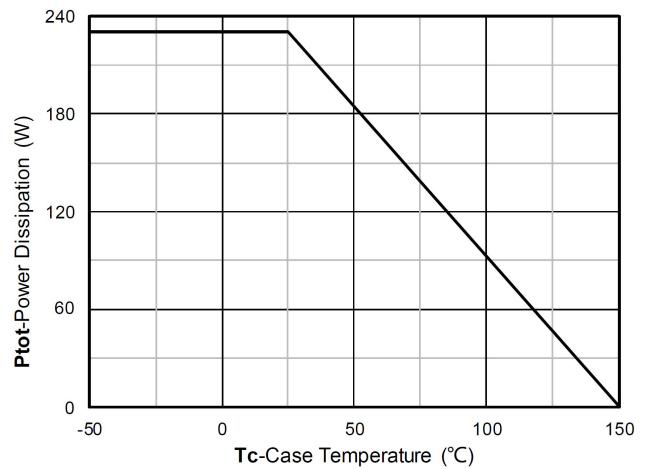
Capacitance Characteristics



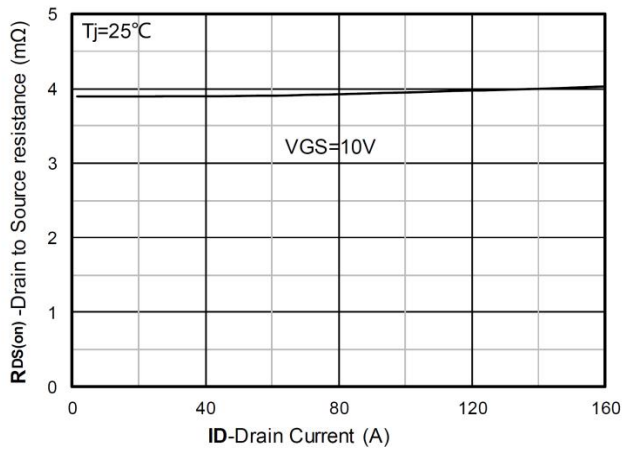
Gate Charge



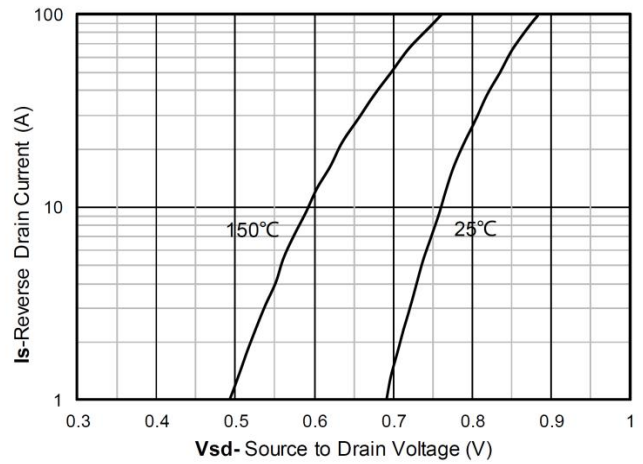
Current dissipation



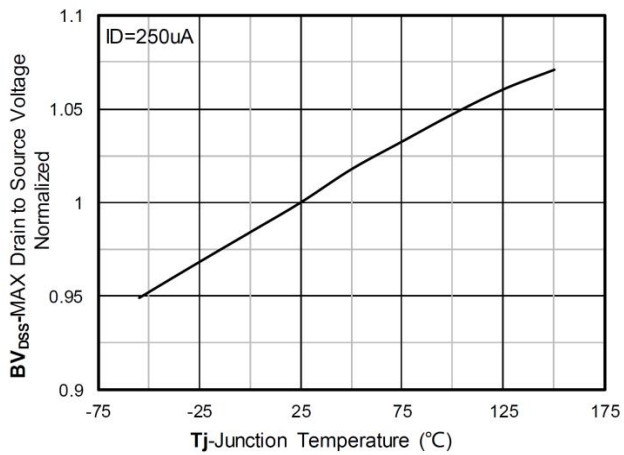
Power dissipation



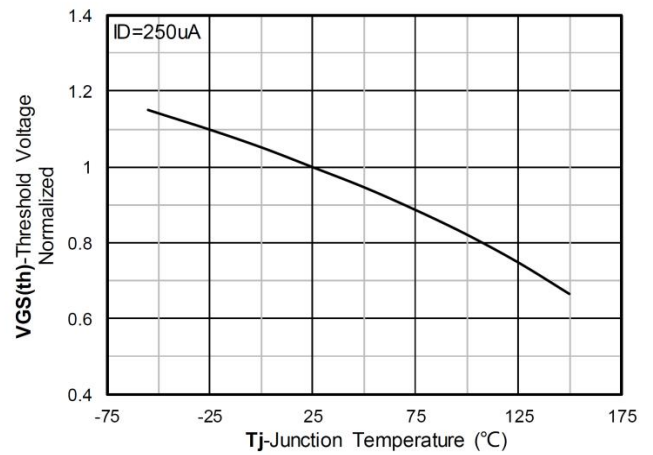
$R_{DS(on)}$ VS Drain Current



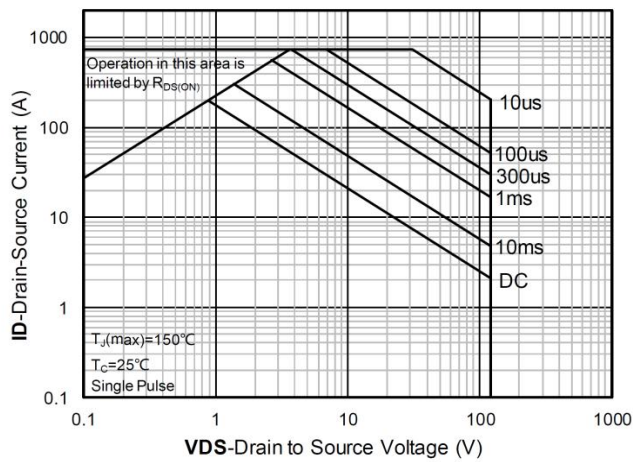
Forward characteristics of reverse diode



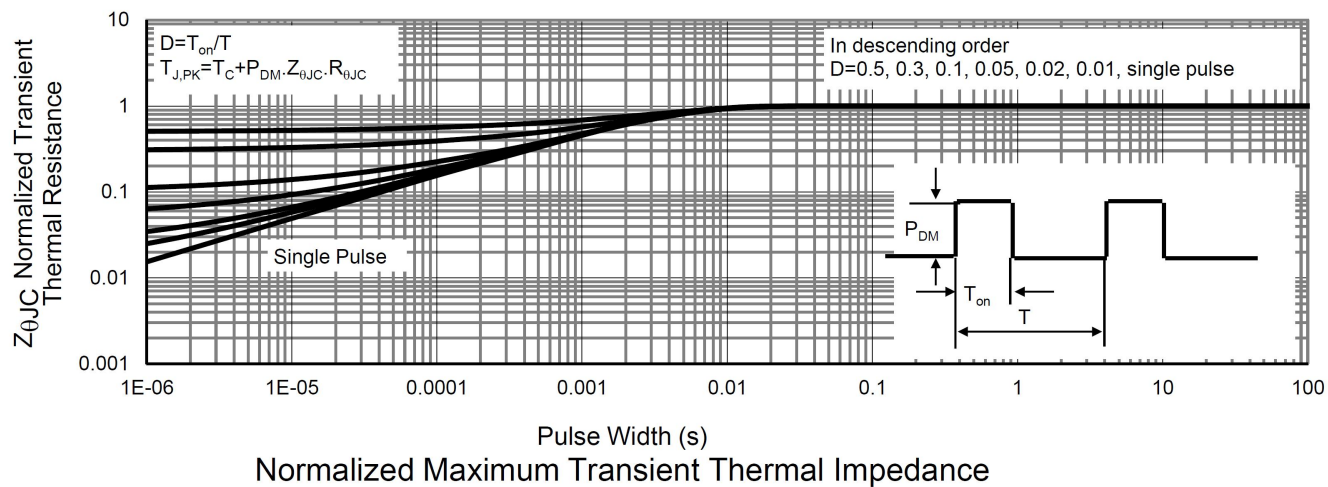
Normalized breakdown voltage



Normalized Threshold voltage

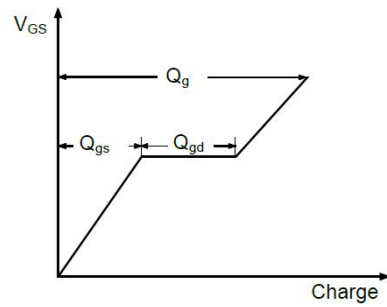
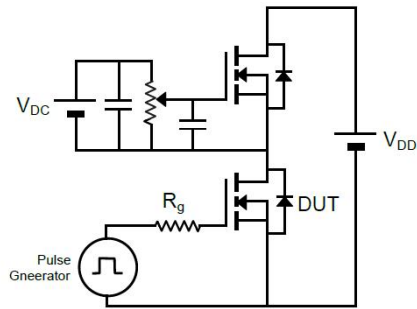


Safe Operation Area

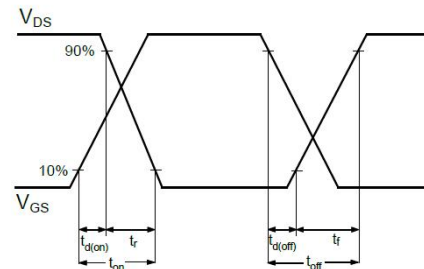
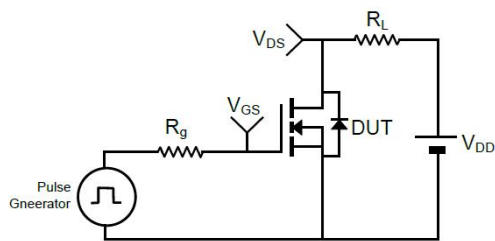


Test Circuit

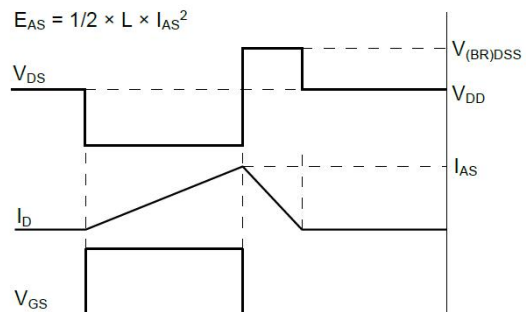
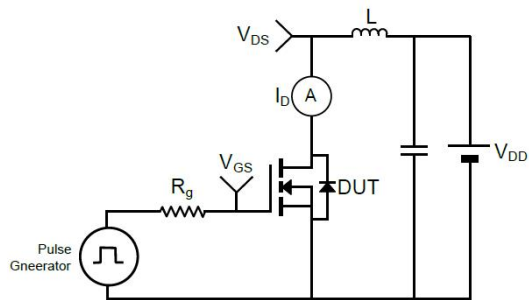
Gate Charge



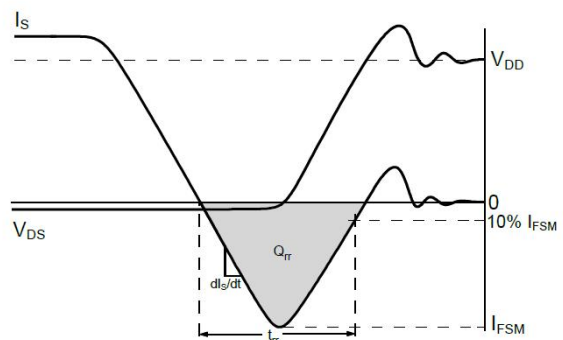
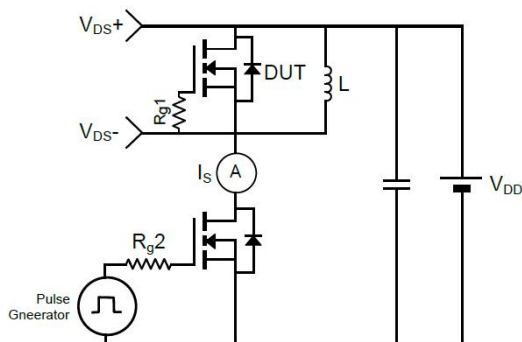
Resistive Load Switching Time



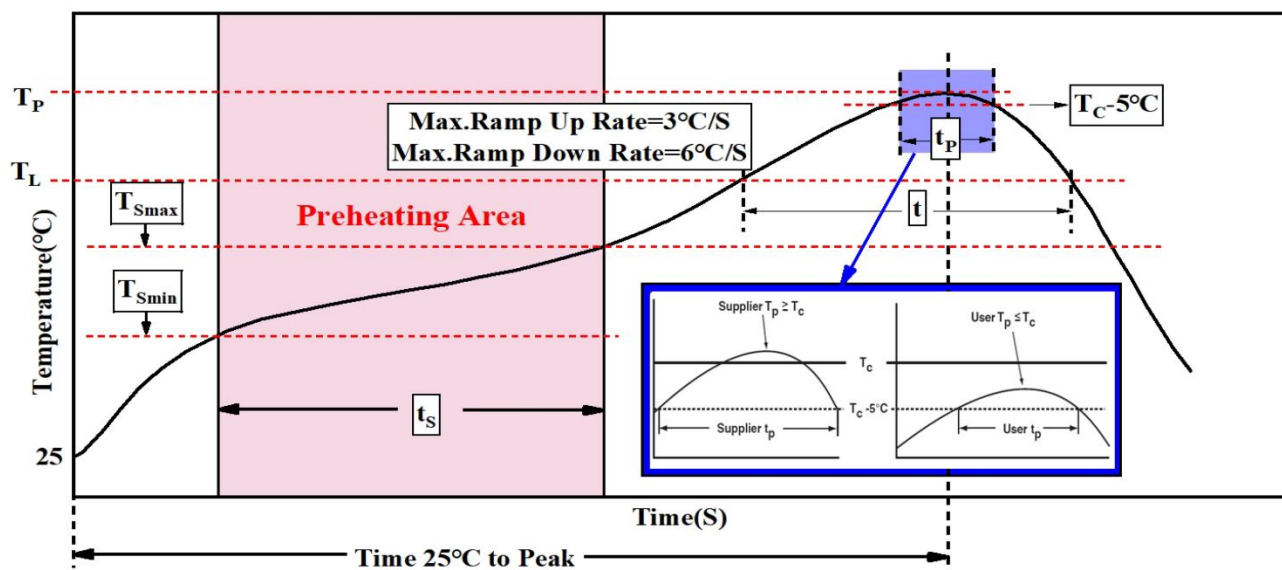
Un-clamped Inductive Load Switching



Drain-Source Body Diode Reverse Recovery



Temperature Profile for IR Reflow Soldering



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 e (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		

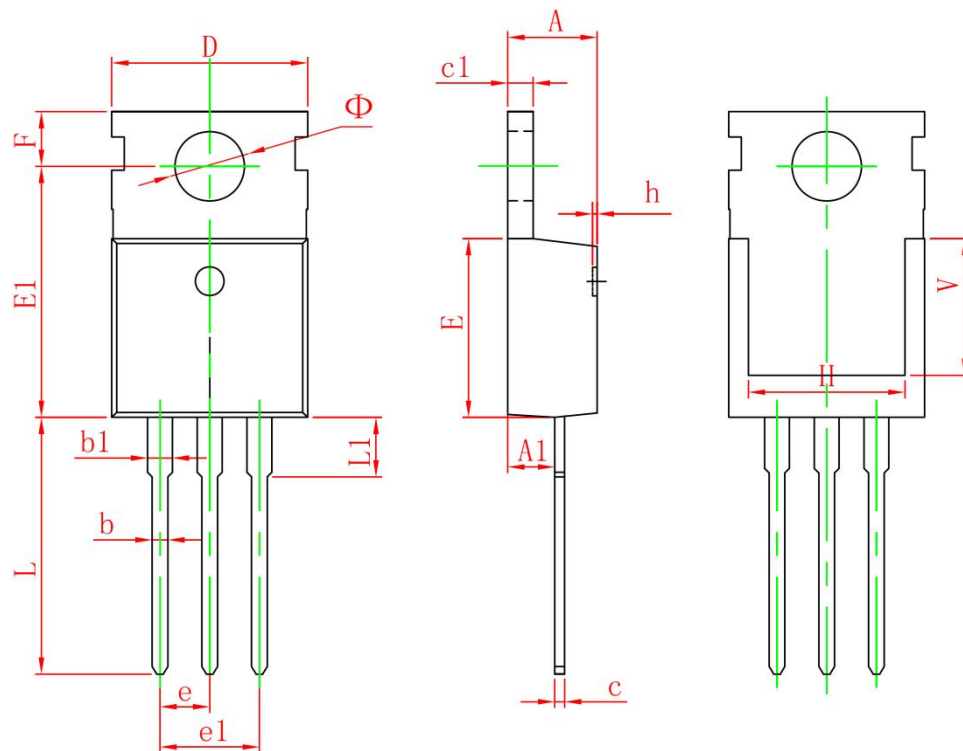
Table 1. SnPb Eutectic Process – Classification Temperatures (T_c)

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

TO-220-3L Package Information



Symbol	Dimensions In Millimeters	
	Min.	Max.
A	4.300	4.700
A1	2.200	2.500
b	0.700	0.900
b1	1.100	1.400
c	0.300	0.700
c1	1.200	1.400
D	9.800	10.200
E	9.000	9.400
E1	12.700	13.500
e	2.490	2.590
e1	4.980	5.180
F	2.650	2.950
H	7.600	8.400
h	0.000	0.300
L	12.700	13.500
L1	2.850	3.250
V	6.900 REF.	
Φ	3.400	3.800