

Product Summary

$V_{(BR)DSS}$	$R_{DS(on)TYP}$	I_D
100V	4.9mΩ@10V	125A
	6.4mΩ@4.5V	



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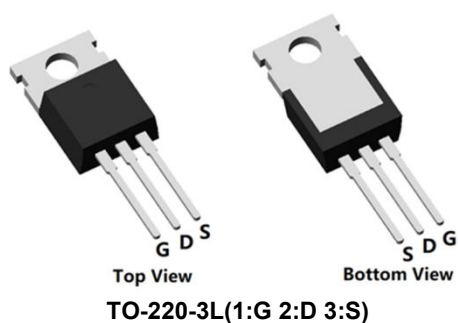
Feature

- Fast switching speed
- Low Gate Charge and Rdson
- Advanced Split Gate Trench Technology
- 100% Single Pulse avalanche energy Test

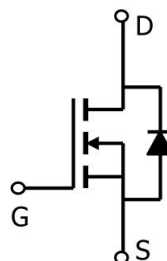
Applications

- DC-DC Converters
- Motor Control
- Portable equipment application

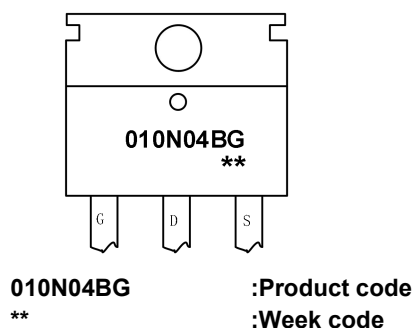
Package



Circuit diagram



Marking



Order Information

Device	Package	Unit/Tube
SP010N04BGTQ	TO-220-3L	50

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

Parameter	Symbol	Rating	Unit
Drain-Source Voltage	V_{DSS}	100	V
Gate-Source Voltage	V_{GSS}	± 20	V
Continuous Drain Current (Tc=25°C)	I_D	125	A
Continuous Drain Current (Tc=100°C)	I_D	83	A
Pulse Drain Current Tested	I_{DM}	500	A
Single pulsed avalanche energy ¹	E_{AS}	361	mJ
Power Dissipation (Tc=25°C)	P_D	185	W
Power Dissipation (Tc=100°C)	P_D	74	W
Thermal Resistance Junction-to-Case	$R_{\theta JC}$	0.68	°C/W
Storage Temperature Range	T_{STG}	-55 to 150	°C
Operating Junction Temperature Range	T_J	-55 to 150	°C

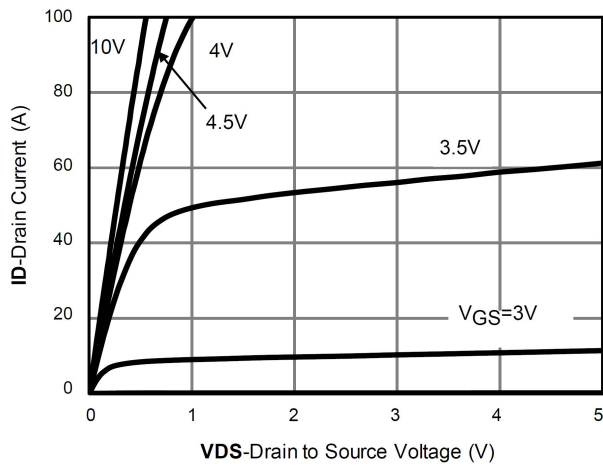
Electrical characteristics (Ta=25°C, unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	VGS=0V , ID=250uA	100	-	-	V
Drain-Source Leakage Current	IDSS	VDS=80V , VGS=0V , TJ=25℃	-	-	1	uA
Gate-Source Leakage Current	IGSS	VGS=±20V , VDS=0V	-	-	±100	nA
Gate Threshold Voltage	VGS(th)	VGS=VDS , ID =250uA	1.3	1.7	2.3	V
Static Drain-Source On-Resistance	RDS(ON)	VGS=10V , ID=30A	-	4.9	6.1	mΩ
		VGS=4.5V , ID=20A	-	6.4	8.5	
Gate Resistance	RG	VDS=50V , VGS=0V , f=1MHz	-	1.2	-	Ω
Dynamic characteristics						
Input Capacitance	Ciss	VDS=50V , VGS=0V , f=1MHz	-	2288	-	pF
Output Capacitance	Coss		-	1172	-	
Reverse Transfer Capacitance	Crss		-	24	-	
Total Gate Charge	Qg	VDS=50V , VGS=10V , ID=50A	-	37	-	nC
Gate-Source Charge	Qgs		-	8	-	
Gate-Drain Charge	Qgd		-	9	-	
Gate Plateau Voltage	Vplateau		-	3.9	-	V
Switching Characteristics						
Turn-On Delay Time	Td(on)	VDD=50V , VGS=10V , RG=3Ω , ID=50A	-	12.6	-	nS
Rise Time	Tr		-	28	-	
Turn-Off Delay Time	Td(off)		-	41	-	
Fall Time	Tf		-	43	-	
Diode Characteristics						
Diode Forward Voltage	VSD	VGS=0V , IS=1A , TJ=25℃	-	-	1.2	V
Diode Continuous Current	IS		-	-	125	A
Reverse recover time	Trr	IS=50A , di/dt=100A/us , TJ=25℃	-	46	-	nS
Reverse recovery charge	Qrr		-	51	-	nC

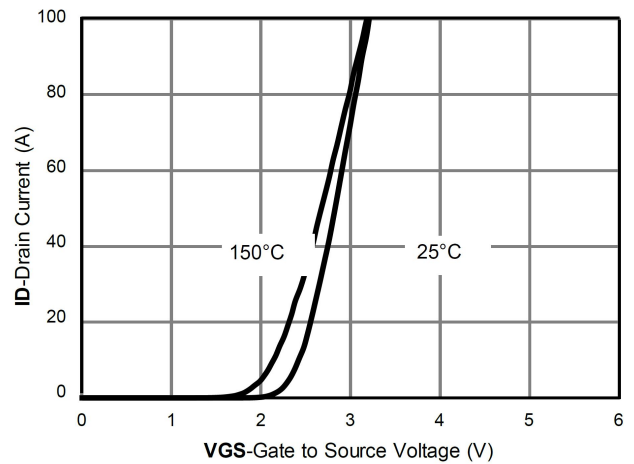
Note:

1. The EAS Test condition is $V_{DD}=50V, V_{GS}=10V, L=0.5mH, R_G=25\Omega$

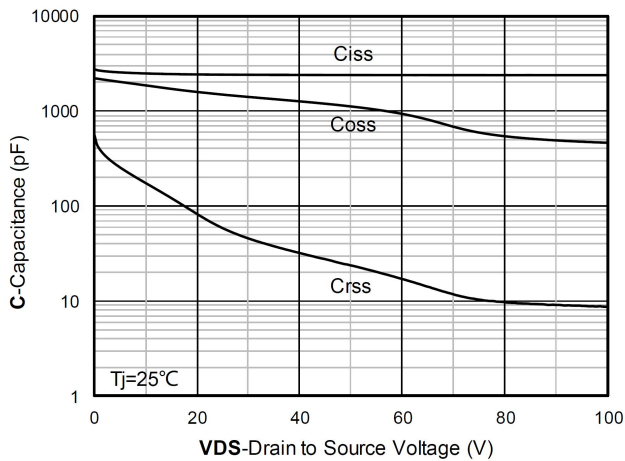
Typical Characteristics



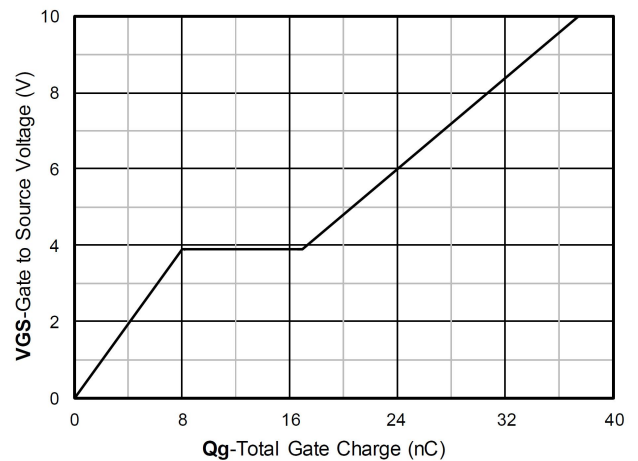
Output Characteristics



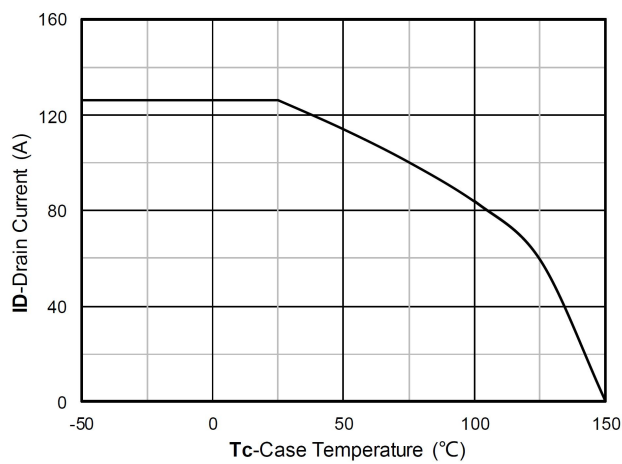
Transfer Characteristics



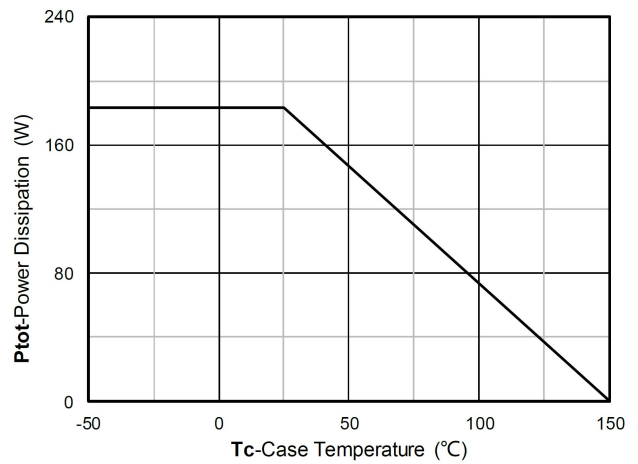
Capacitance Characteristics



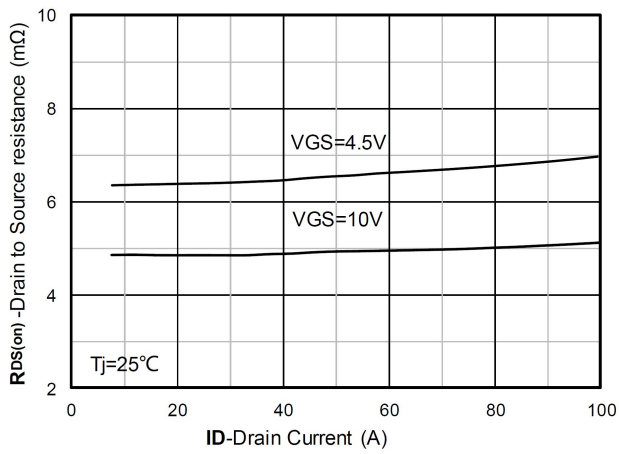
Gate Charge



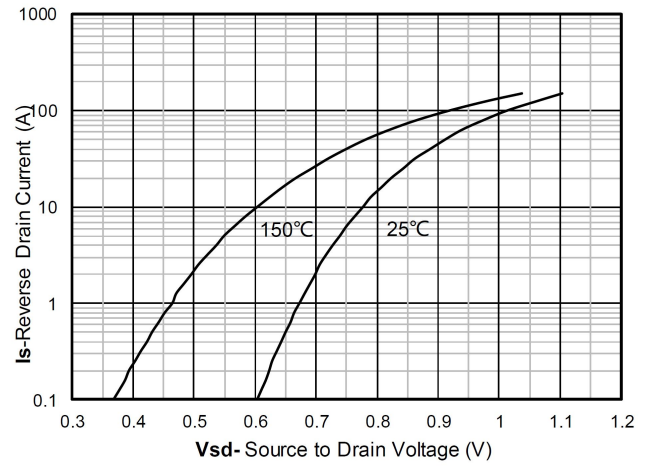
Current dissipation



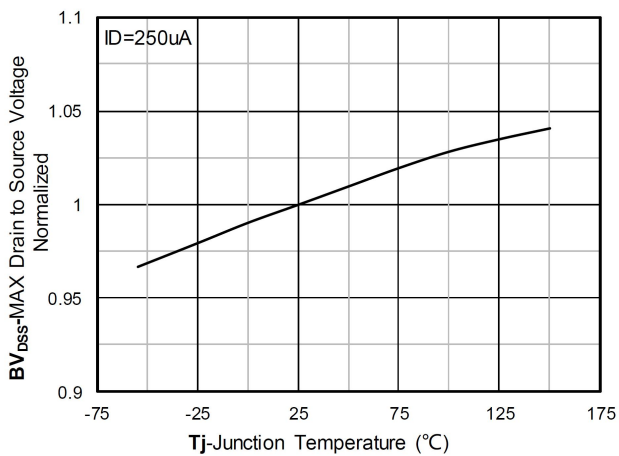
Power dissipation



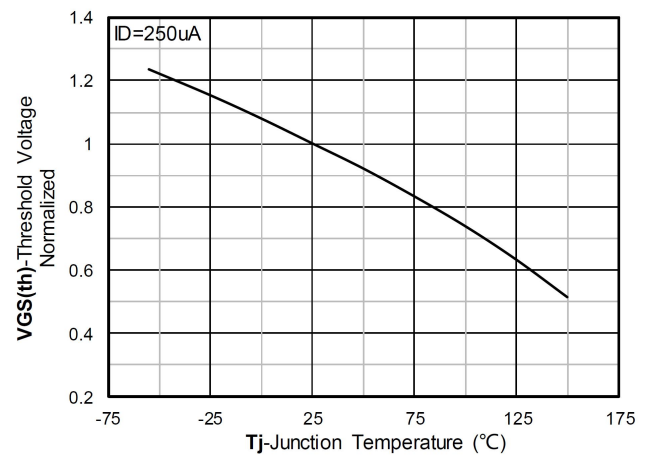
$R_{DS(on)}$ VS Drain Current



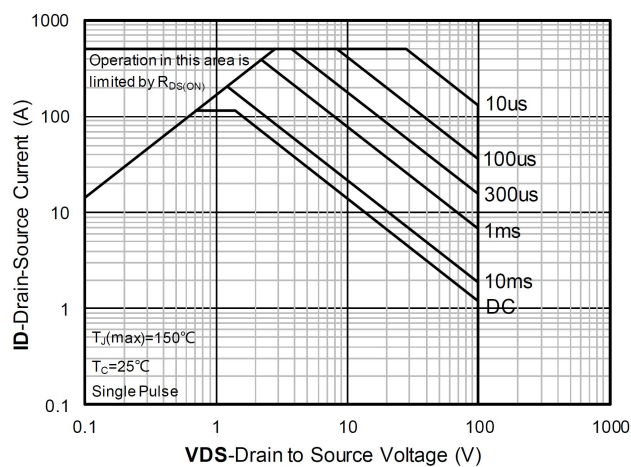
Forward characteristics of reverse diode



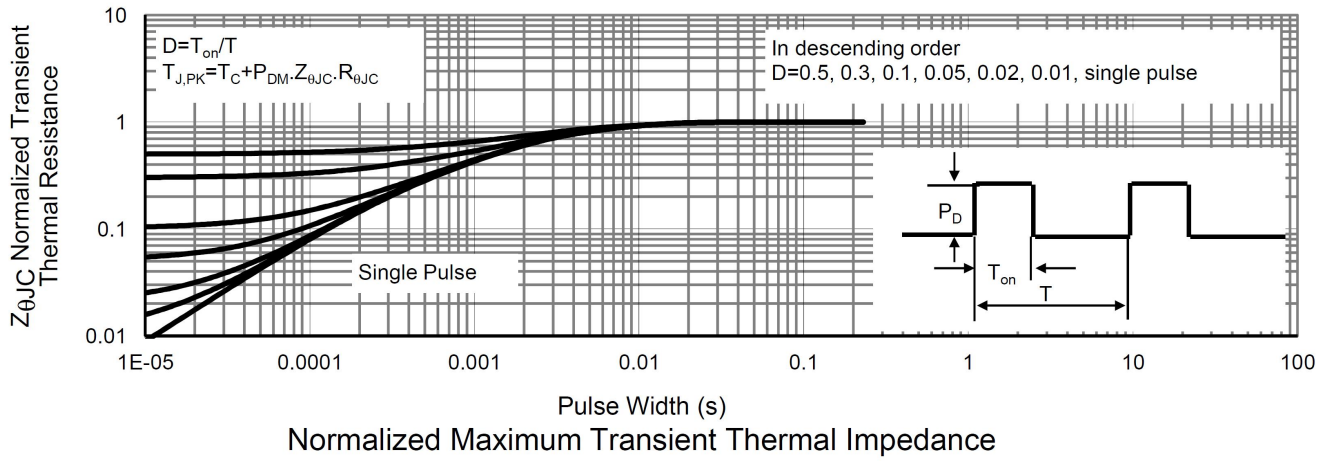
Normalized breakdown voltage



Normalized Threshold voltage

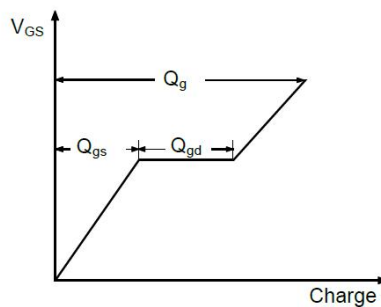
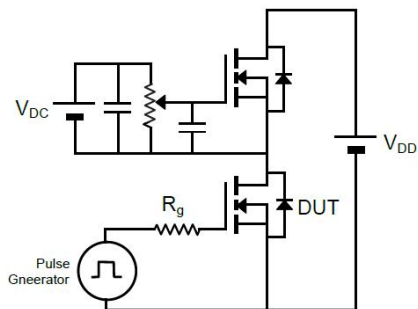


Safe Operation Area

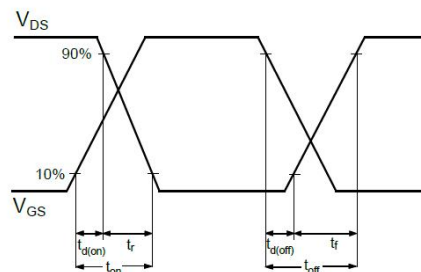
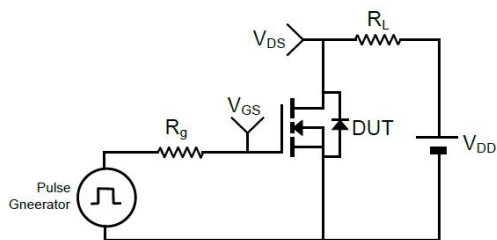


Test Circuit

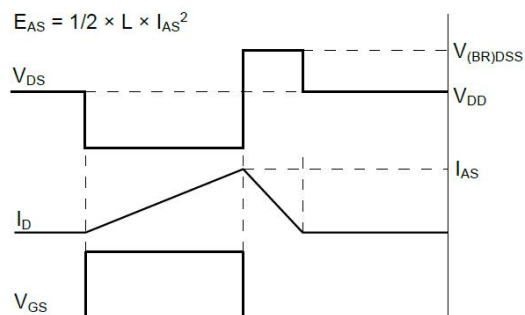
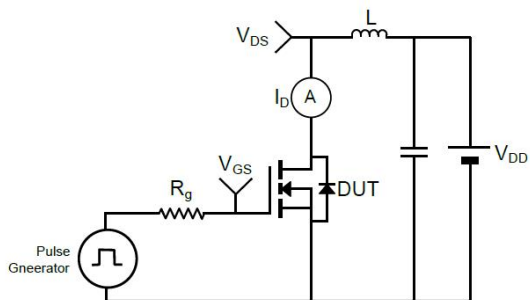
Gate Charge



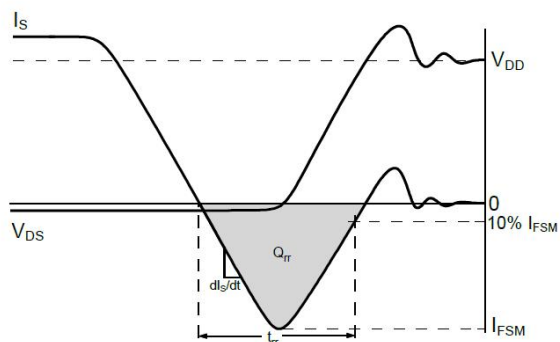
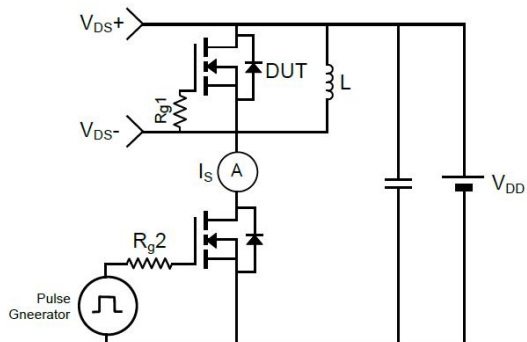
Resistive Load Switching Time



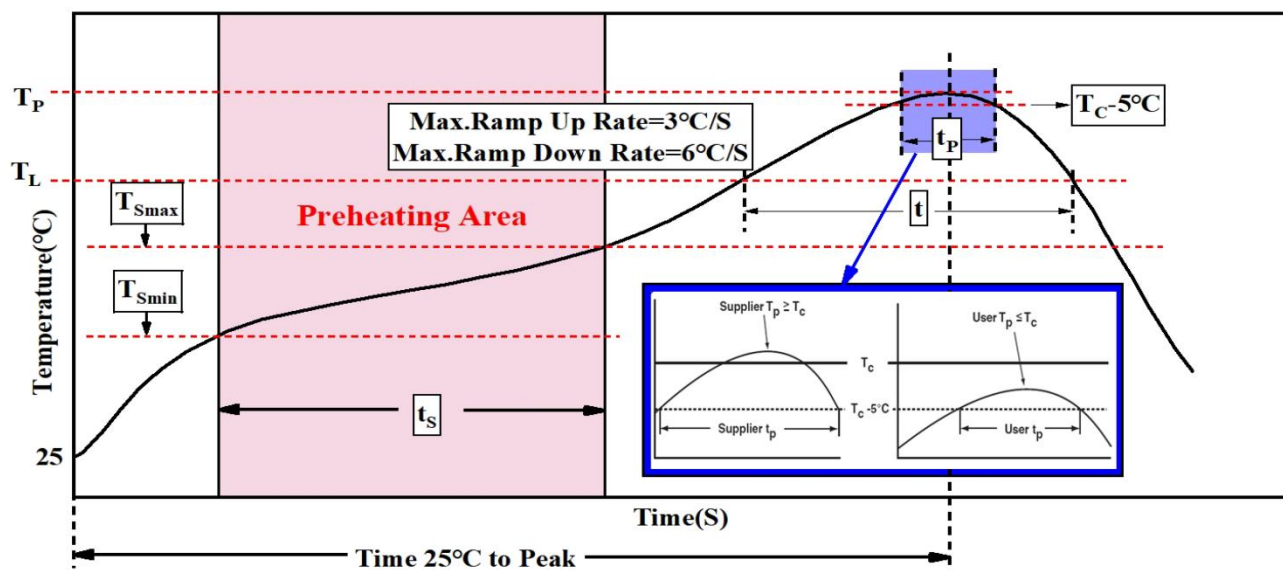
Un-clamped Inductive Load Switching



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		

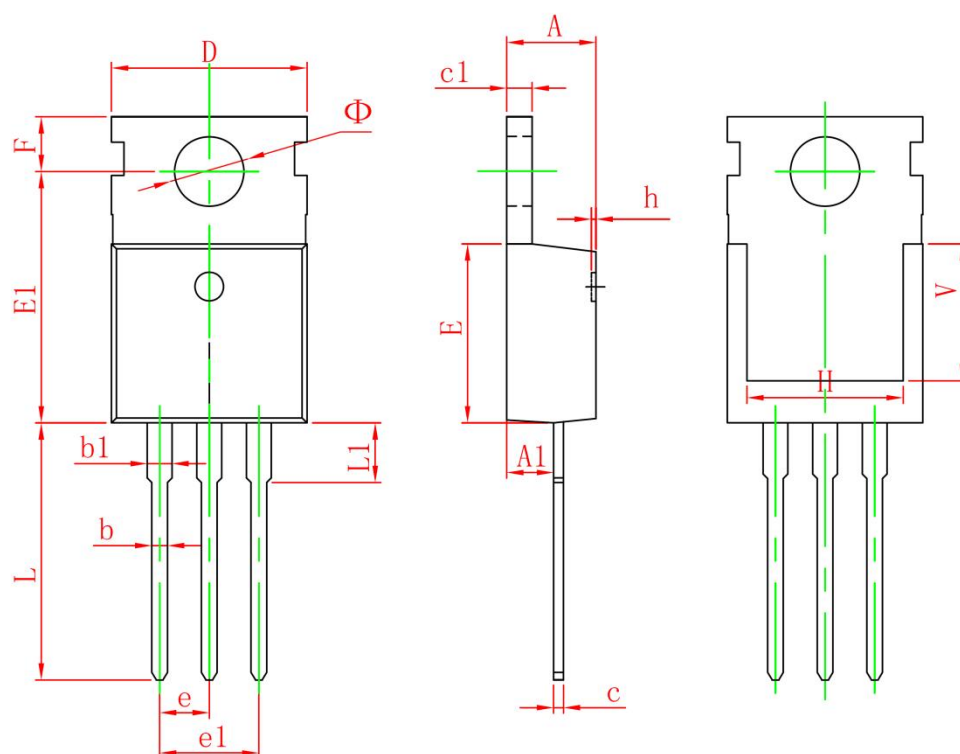
Table 1. SnPb Eutectic Process – Classification Temperatures (T_c)

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