

Product Summary

$V_{(BR)DSS}$	$R_{DS(on)TYP}$	I_D
100V	13m Ω @10V	55A
	16m Ω @4.5V	



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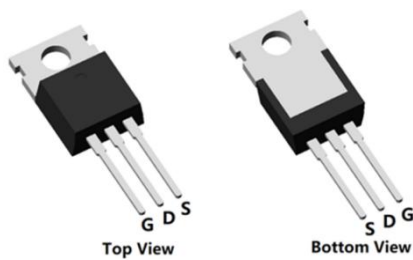
Feature

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

Applications

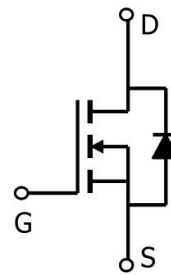
- Power switching application
- Battery management
- Uninterruptible power supply

Package

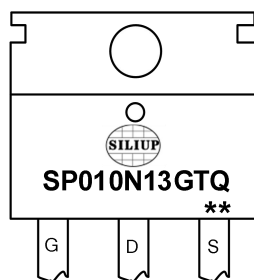


TO-220-3L(1:G 2:D 3:S)

Circuit diagram



Marking



SP010N13GTQ : Product code
** : Week code

Order Information

Device	Package	Unit/Tube
SP010N13GTQ	TO-220-3L	50

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

Parameter	Symbol	Rating	Unit
Drain-Source Voltage	V_{DS}	100	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current (Tc=25°C)	I_D	55	A
Continuous Drain Current (Tc=100°C)	I_D	37	A
Pulsed Drain Current	I_{DM}	220	A
Single Pulse Avalanche Energy ¹	E_{AS}	144	mJ
Power Dissipation (Tc=25°C)	P_D	87	W
Power Dissipation (Tc=100°C)	P_D	35	W
Thermal Resistance Junction-to-Case	$R_{\theta JC}$	1.44	°C/W
Storage Temperature Range	T_{STG}	-55 to 150	°C
Operating Junction Temperature Range	T_J	-55 to 150	°C

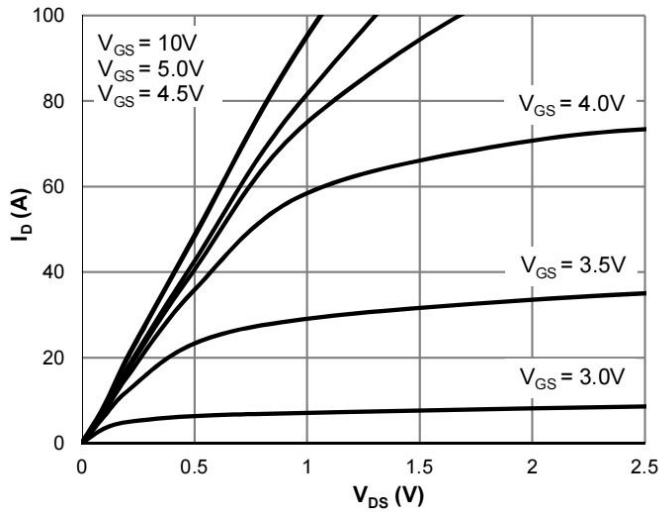
Electrical characteristics (Ta=25°C, unless otherwise noted)

Characteristics	Symbol	Test Condition	Min	Typ	Max	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	VGS=0V , ID=250uA	100	-	-	V
Drain Cut-Off Current	IDSS	VDS=80V , VGS=0V , TJ=25℃	-	-	1	μA
Gate Leakage Current	IGSS	VGS=±20V , VDS=0V	-	-	±100	nA
Gate Threshold Voltage	VGS(th)	VGS=VDS , ID=250uA	1.5	1.9	2.5	V
Drain-Source ON Resistance	RDS(ON)	VGS=10V , ID=20A	-	13	17	mΩ
		VGS=4.5V , ID=10A	-	16	21	
Gate Resistance	RG	VDS=50V , VGS=0V , f=1MHz	-	2.2	-	Ω
Dynamic Characteristics						
Input Capacitance	Ciss	VDS=50V , VGS=0V , f=1MHz	-	1062	-	pF
Output Capacitance	Coss		-	210	-	
Reverse Transfer Capacitance	Crss		-	14	-	
Total Gate Charge	Qg	VDS=50V , VGS=10V , ID=20A	-	17	-	nC
Gate-Source Charge	Qgs		-	5.2	-	
Gate-Drain Charge	Qgd		-	2.8	-	
Gate Plateau Voltage	Vplateau		-	3.6	-	V
Switching Characteristics						
Turn-On Delay Time	td(on)	VDD=50V, VGS=10V , RG=2.2Ω , ID=20A	-	33	-	nS
Rise Time	tr		-	10.4	-	
Turn-Off Delay Time	td(off)		-	44	-	
Fall Time	tf		-	14.7	-	
Drain-Source Body Diode Characteristics						
Source-Drain Diode Forward Voltage	VSD	IS=1A , VGS=0V , TJ=25℃	-	-	1.2	V
Maximum Body-Diode Continuous Current	IS		-	-	55	A
Reverse Recovery Time	Trr	IS=20A , di/dt=100A/us , TJ=25℃	-	40	-	nS
Reverse Recovery Charge	Qrr		-	42	-	nC

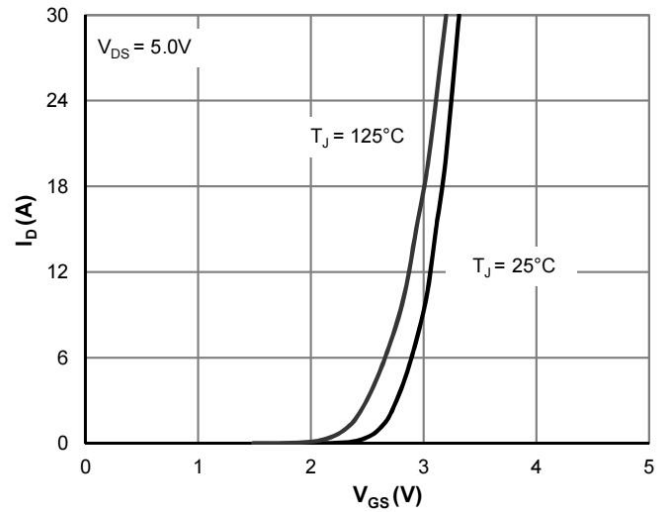
Note:

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

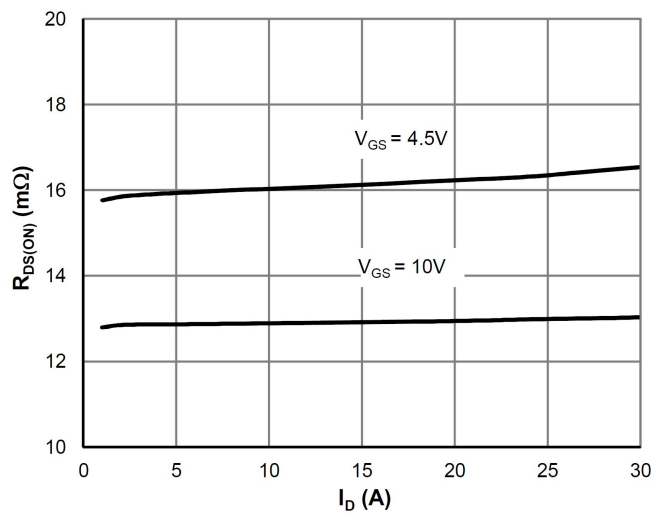
Typical Characteristics



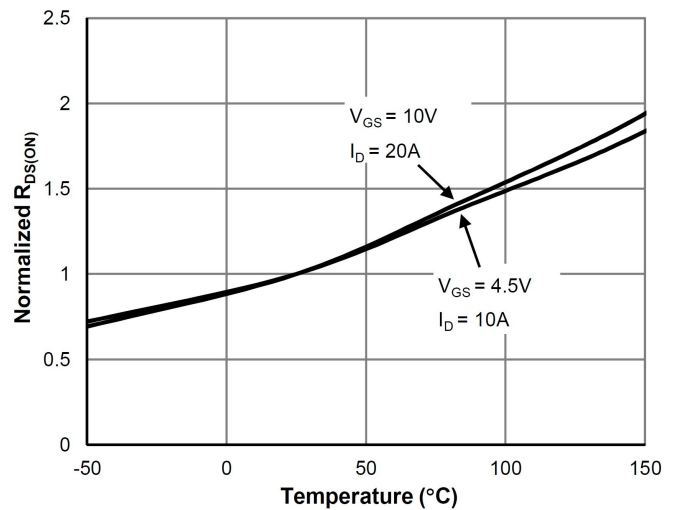
Typical Output Characteristics



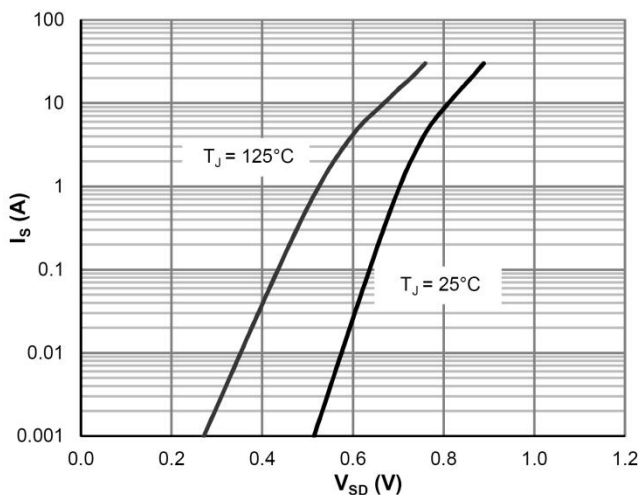
Transfer Characteristics



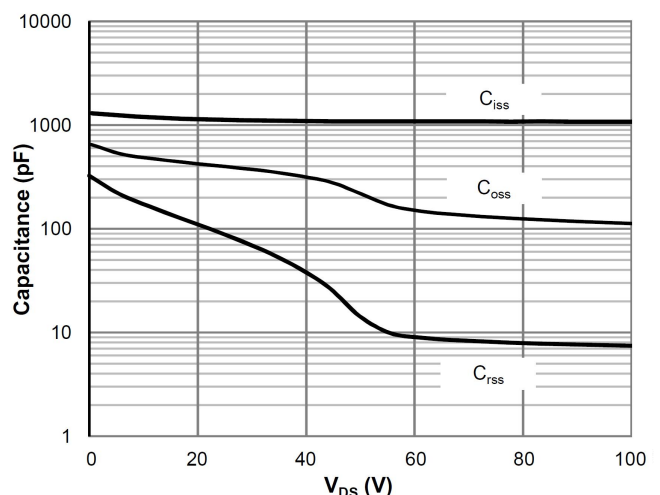
On-Resistance vs. Drain Current



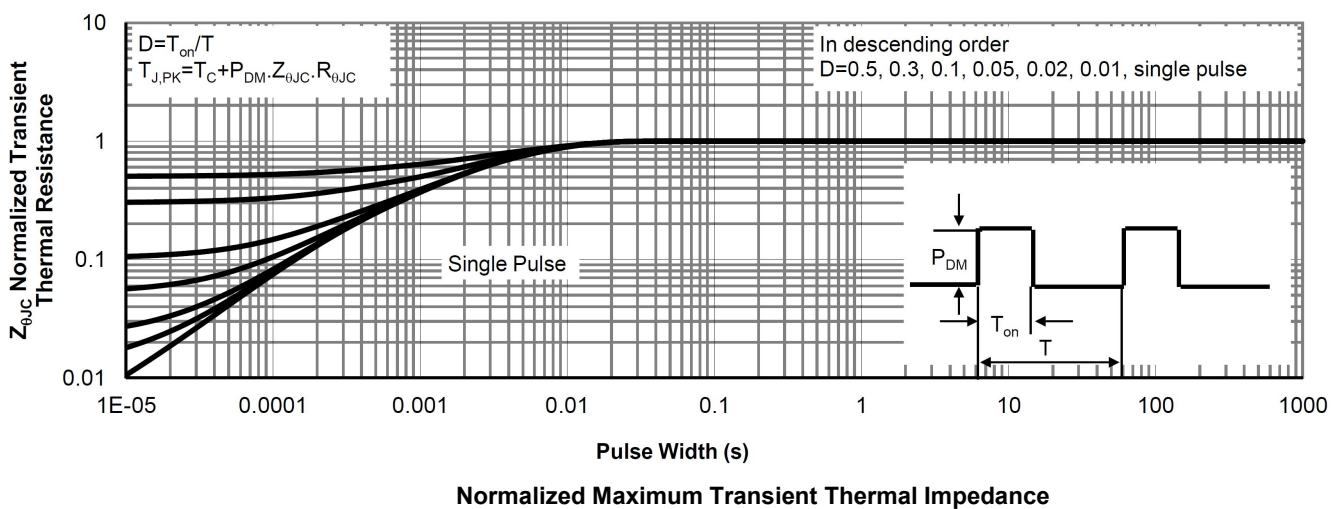
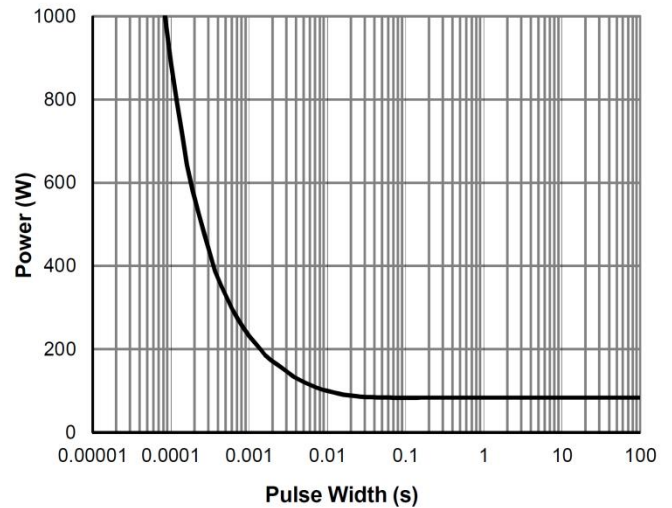
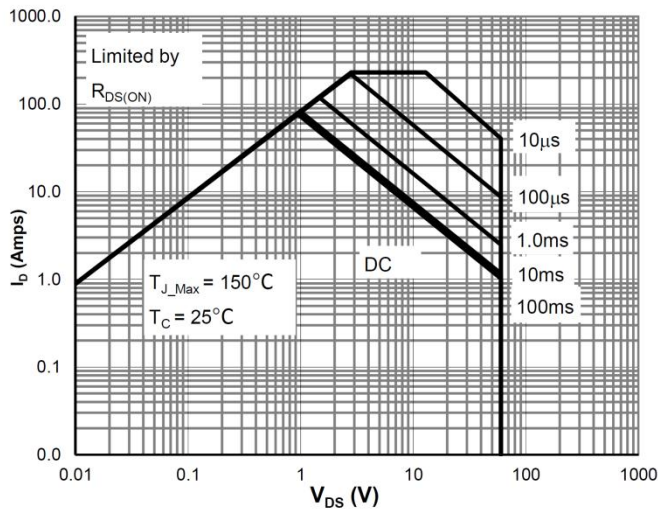
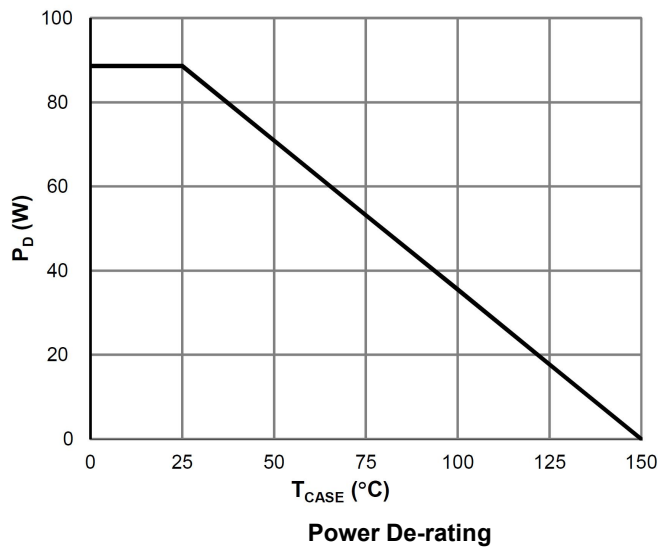
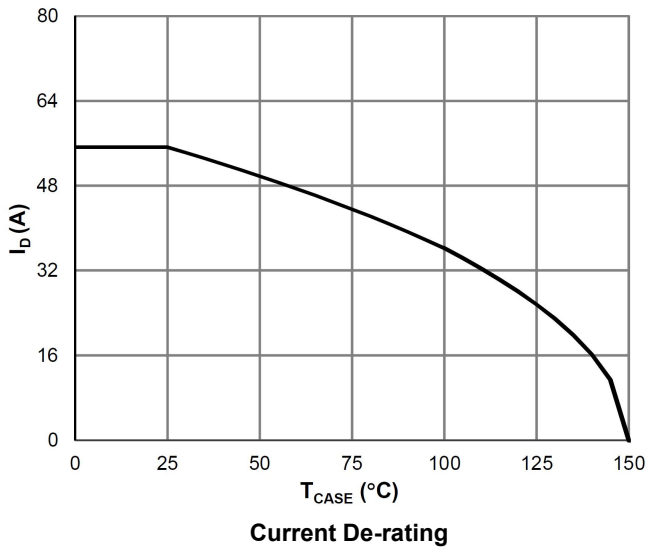
On-Resistance vs. Junction Temperature



Body-Diode Characteristics

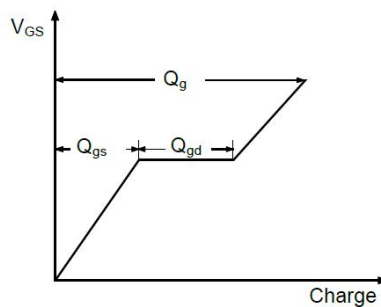
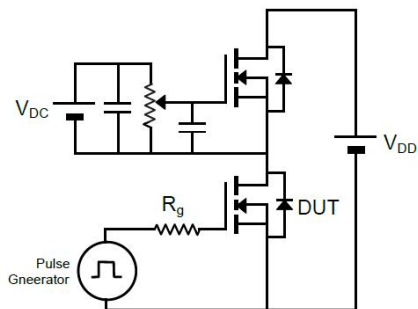


Capacitance Characteristics

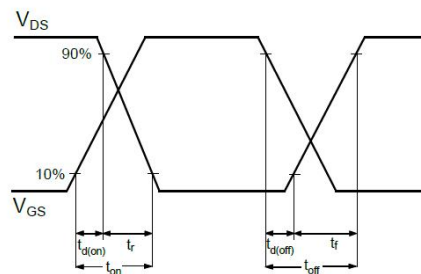
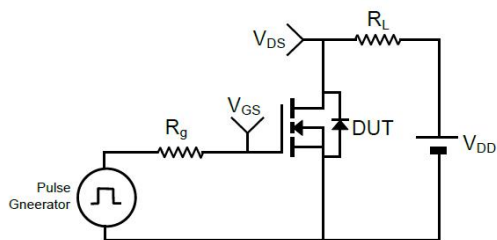


Test Circuit

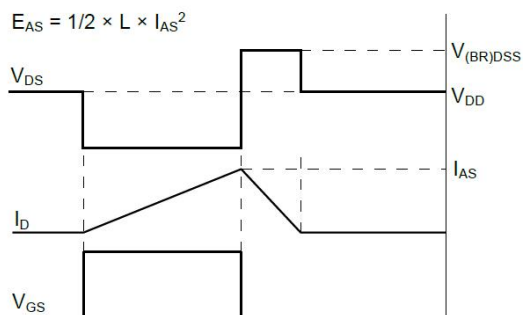
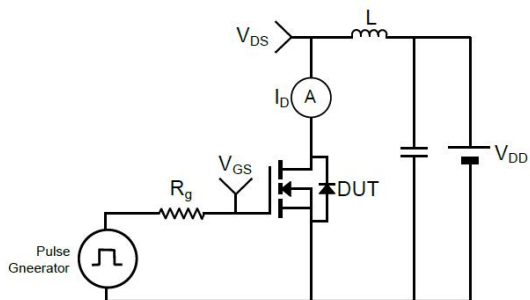
Gate Charge



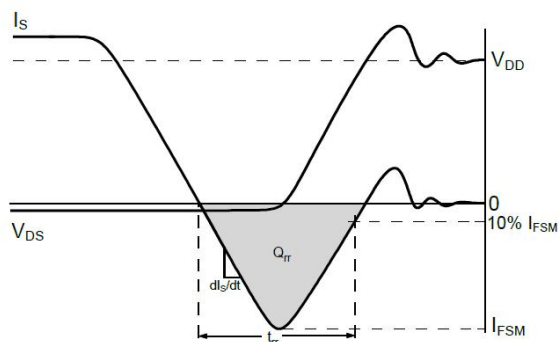
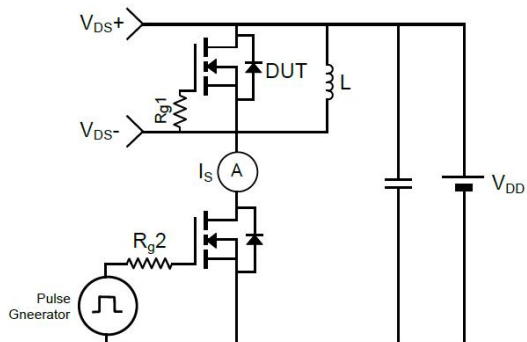
Resistive Load Switching Time



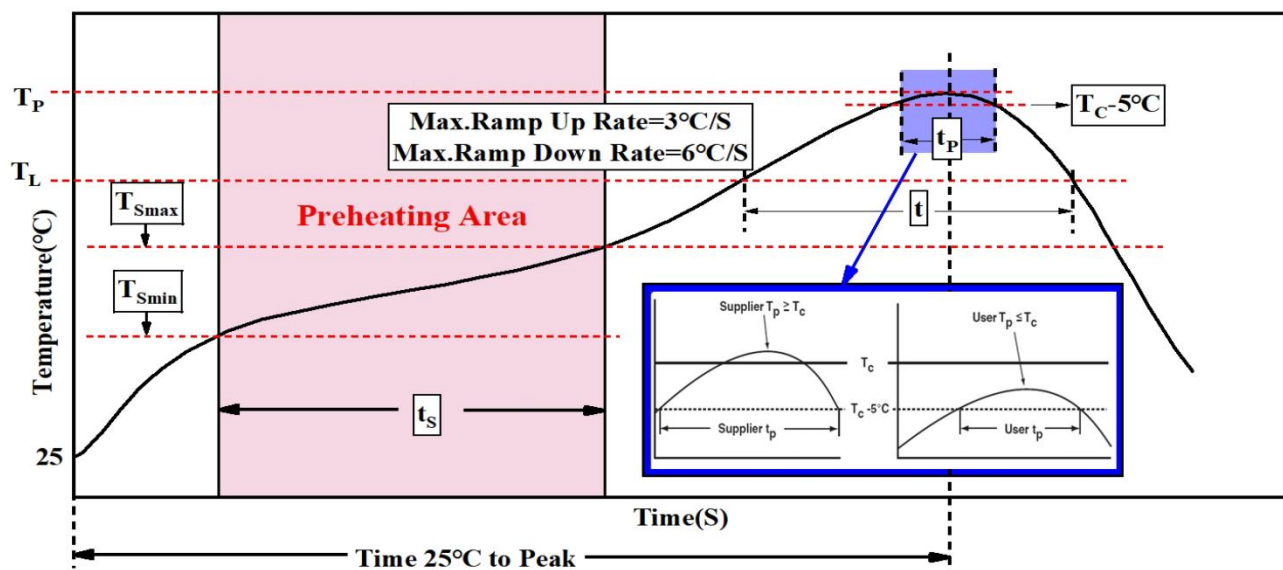
Un-clamped Inductive Load Switching



Drain-Source Body Diode Reverse Recovery



Temperature Profile for IR Reflow Soldering



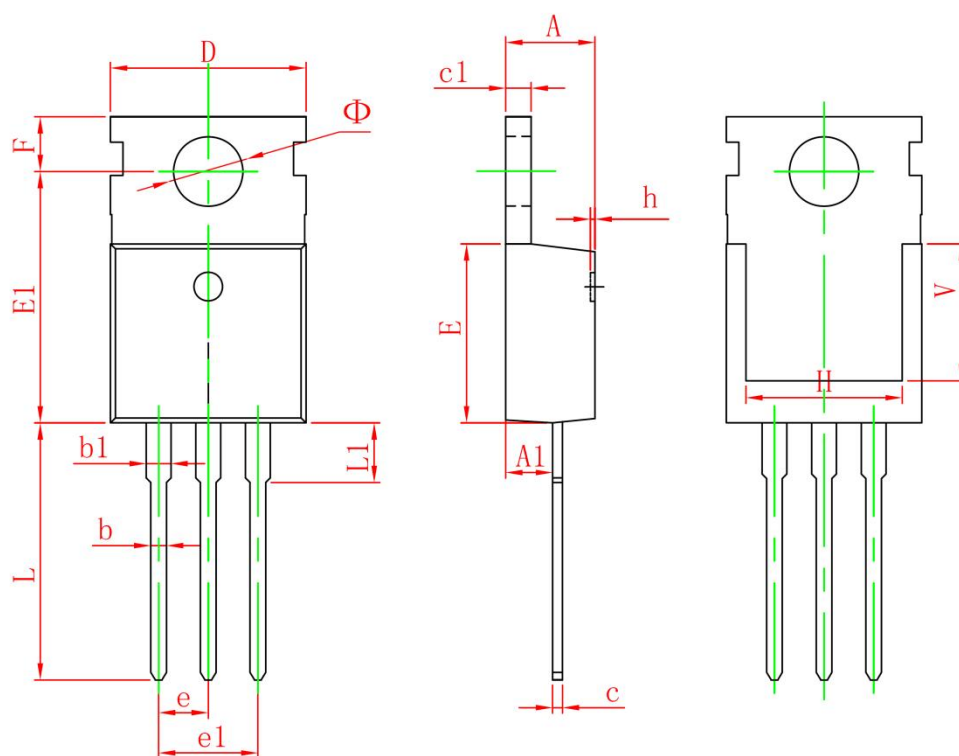
Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat & Soak		
Temperature min (T _{min})	100°C	150°C
Temperature max (T _{max})	150°C	200°C
Time (T _{min} to T _{max}) (t _s)	60-120 seconds	60-120 seconds
Average ramp-up rate (T _{max} to T _p)	3 °C/second max.	3°C/second max.
Liquidous temperature (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 _{max})	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