Product Summary

$V_{(BR)DSS}$	$R_{DS(on)TYP}$	I_D
300V	13mΩ@10V	125A

合肥矽普半导体
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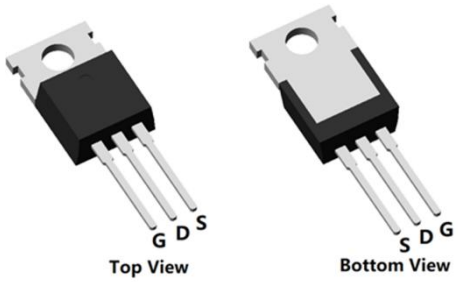
Feature

- Fast Switching
- Low Gate Charge and Rdson
- 100% Single Pulse avalanche energy Test

Applications

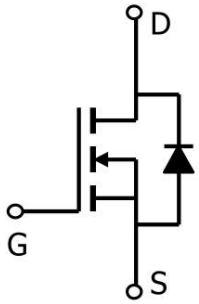
- PWM Application
- Hard switched and high frequency circuits
- Power Management

Package

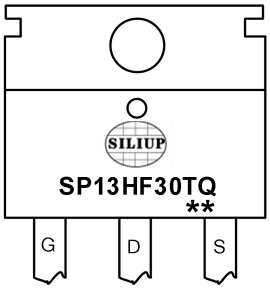


TO-220-3L(1:G 2:D 3:S)

Circuit diagram



Marking



SP13HF30TQ :Device Code
** :Week Code

Order Information

Device	Package	Unit/Tape
SP13HF30TQ	TO-220-3L	50

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

Parameter	Symbol	Rating	Unit
Drain source voltage	V_{DS}	300	V
Gate source voltage	V_{GS}	±20	V
Continuous drain current (Tc=25℃)	I_D	125	A
Continuous drain current (Tc=100℃)	I_D	83	A
Pulsed drain current	I_{DM}	380	A
Single pulsed avalanche energy[1]	E_{AS}	1332	mJ
Power dissipation (Tc=25℃)	P_D	500	W
Power dissipation (Tc=100℃)	P_D	200	W
Thermal resistance Junction-to-case	$R_{\theta JC}$	0.25	℃/W
Recovery diode dv/dt	dv/dt	50	V/ns
Storage Temperature Range	T_{STG}	-55 to 150	℃
Operating Junction Temperature Range	T_J	-55 to 150	℃

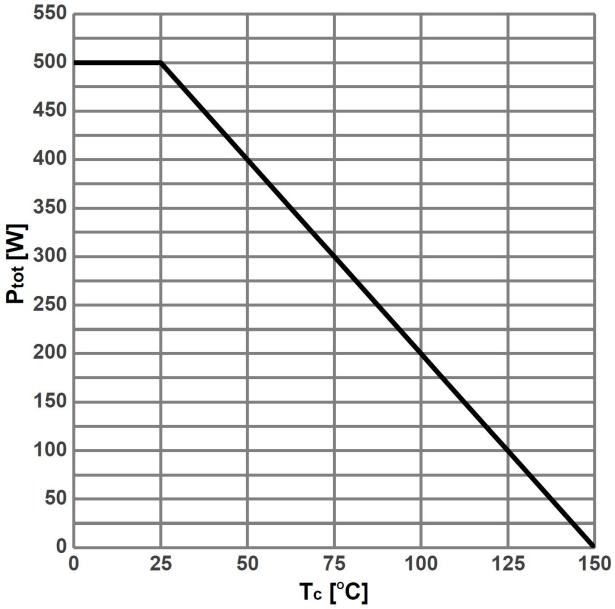
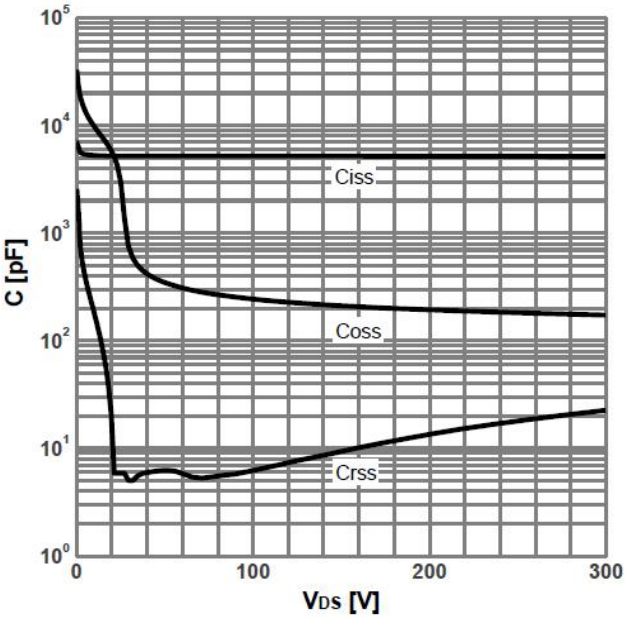
Electrical characteristics (Ta=25℃, unless otherwise noted)

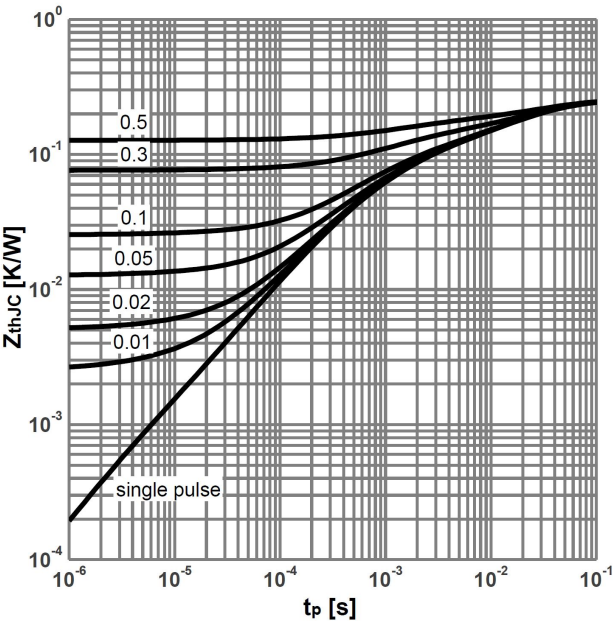
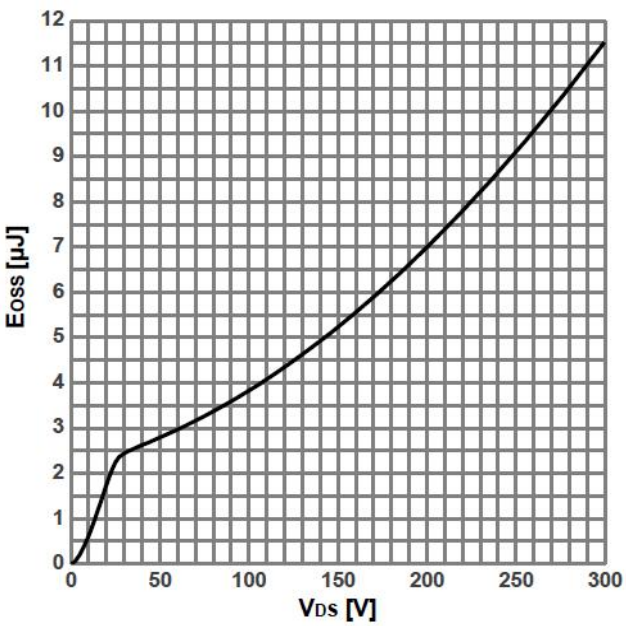
Characteristics	Symbol	Test Condition	Min	Typ	Max	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	VGS=0V , ID=250μA	300	350	-	V
Drain Cut-Off Current	I_{DSS}	VDS=240V , VGS=0V	-	-	1	μA
Gate Leakage Current	I_{GSS}	VGS=±20V , VDS=0V	-	-	±0.1	
Gate Threshold Voltage	$V_{GS(th)}$	VDS=VGS , ID=250μA	2.5	3.5	4.5	V
Drain-Source ON Resistance	$R_{DS(ON)}$	VGS=10V , ID=35A	-	13	16	mΩ
Gate Resistance	R_G	VDS=50V , VGS=0V , f=1MHz	-	3.5	-	Ω
Dynamic Characteristics						
Input Capacitance	C_{iss}	VDS=50V , VGS=0V , f=1.0MHz	-	5200	-	pF
Output Capacitance	C_{oss}		-	340	-	
Reverse Transfer Capacitance	C_{rss}		-	6.5	-	
Total Gate Charge	Q_g	VDS=200V , VGS=10V , ID=40A	-	85	-	nC
Gate-Source Charge	Q_{gs}		-	26	-	
Gate-Drain Charge	Q_{gd}		-	22	-	
Gate Pleteau Vlotage	$V_{pleteau}$		-	5.6	-	V
Switching Characteristics						
Turn-On Delay Time	$t_{d(on)}$	VGS=10V , VDS=200V , ID=40A , RG=20Ω	-	49	-	nS
Rise Time	t_r		-	32	-	
Turn-Off Delay Time	$t_{d(off)}$		-	82	-	
Fall Time	t_f		-	8	-	
Drain-Source Body Diode Characteristics						
Diode Forward Voltage	V_{SD}	VGS=0V , IS=1A , TJ=25℃	-	-	1.2	V
Maximum Body-Diode Continuous Current	I_S		-	-	125	A
Reverse Recovery Time	Trr	VR=200V,IS=40A,di/dt=100A/us	-	118	-	nS
Reverse Recovery Charge	Qrr		-	0.56	-	uC

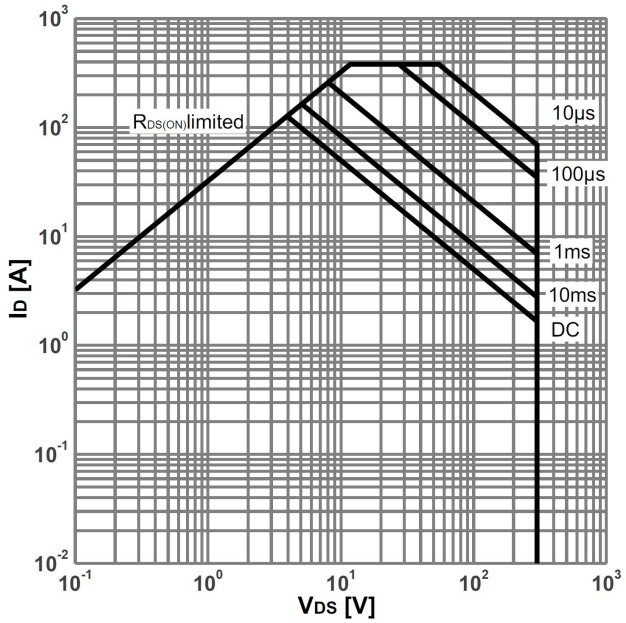
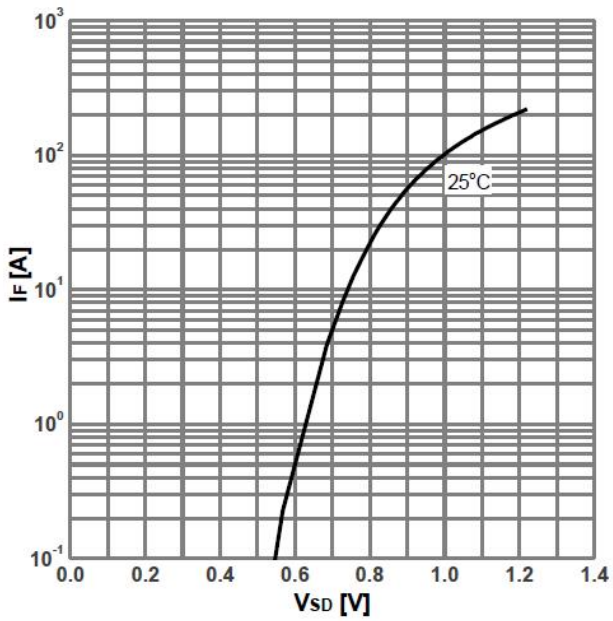
Note :

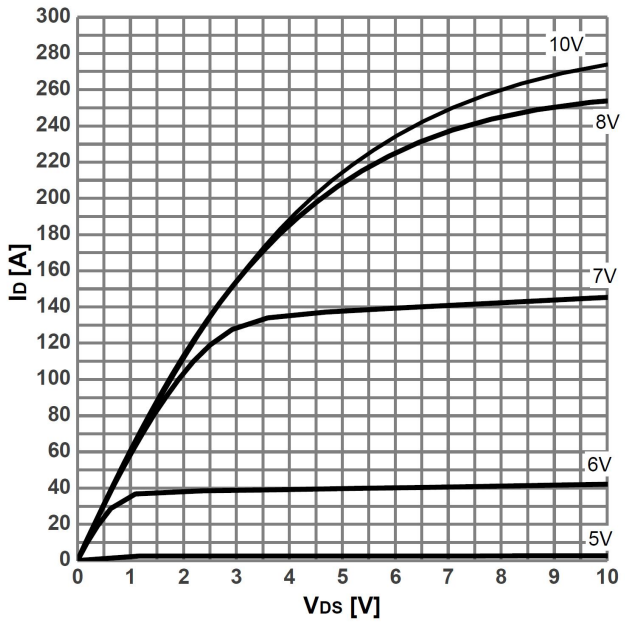
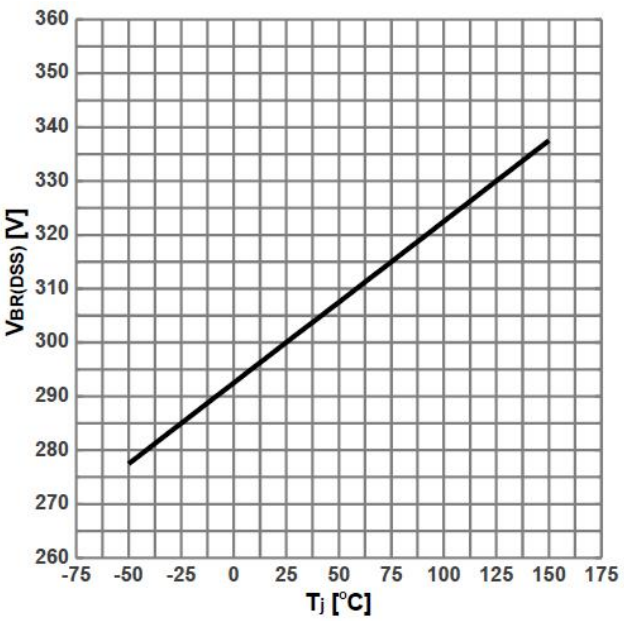
1. The test condition is VDD=50V, VGS=10V, L=0.5mH, RG=25Ω

Typical Characteristics

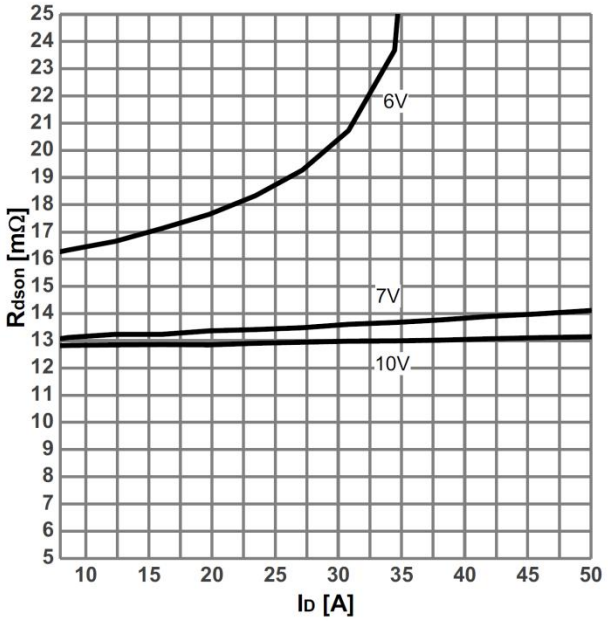
Power dissipation	Typ. capacitances
	
P_{tot}=f(T_C)	*C=f(VDS); VGS=0V; f=1MHz*

Max. transient thermal impedance	Typ. Coss stored energy
	
Z_{thJC}=f(t_p); parameter: D= t_p/T	*EOSS =f(VDS)*

Safe operating area	Forward characteristics of reverse diode
	
I_D=f(V_{DS}); T_j=25°C; D=0; parameter: t_p	*IF=f(VSD); parameter: Tj*

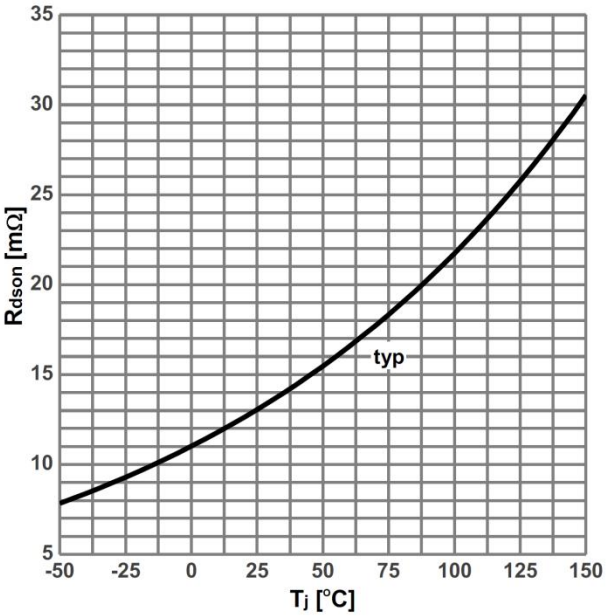
Typ. output characteristics	Drain-source breakdown voltage
	
I_D=f(V_{DS}); T_j=25°C; parameter: V_{GS}	*VBR(DSS)=f(Tj); ID=1mA*

Typ. drain-source on-state resistance



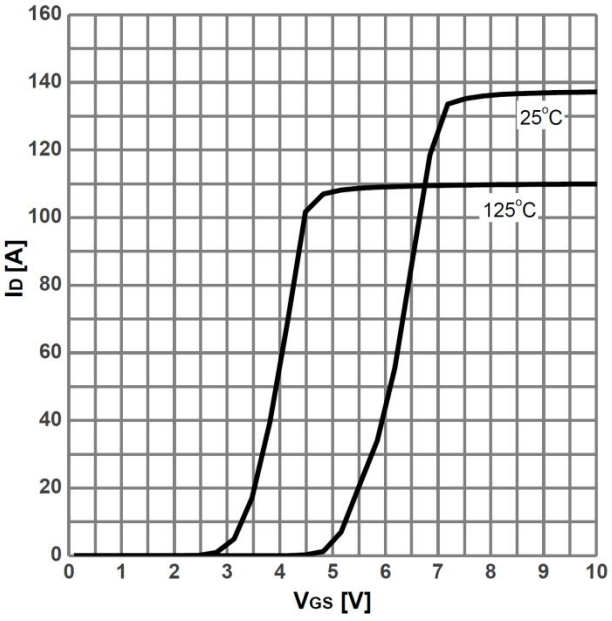
$R_{DS}(on)=f(I_D)$; $T_j=25°C$; parameter: V_{GS}

Drain-source on-state resistance



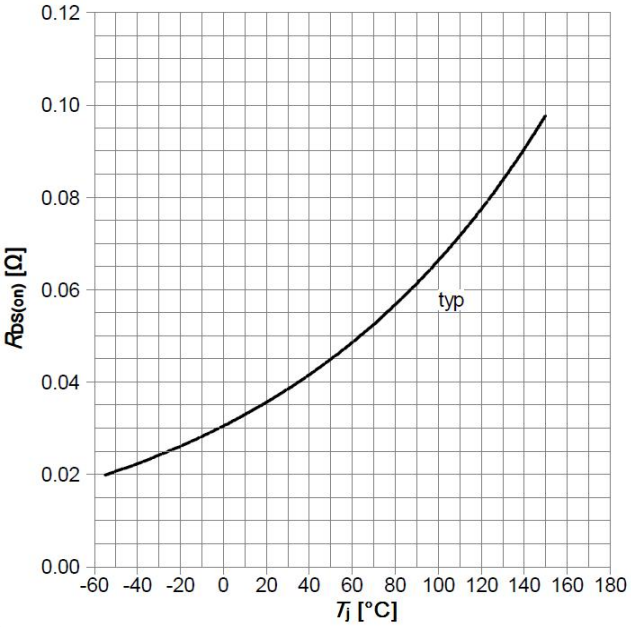
$R_{DS}(on)=f(T_j)$; $I_D=36A$; $V_{GS}=10V$

Typ. transfer characteristics



$I_D=f(V_{GS})$; $V_{DS}=20V$; parameter: T_j

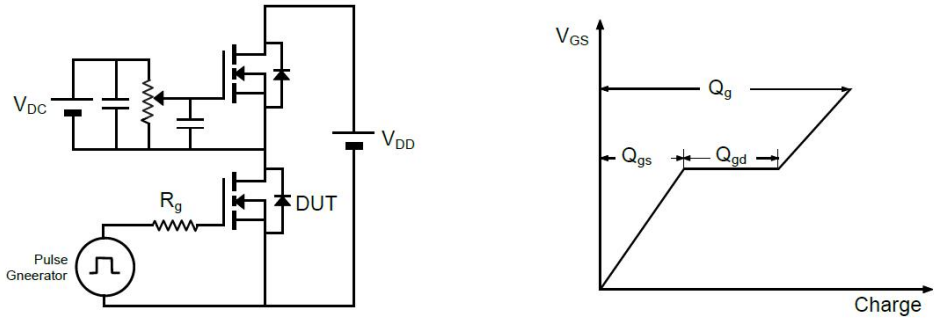
Typ. gate charge



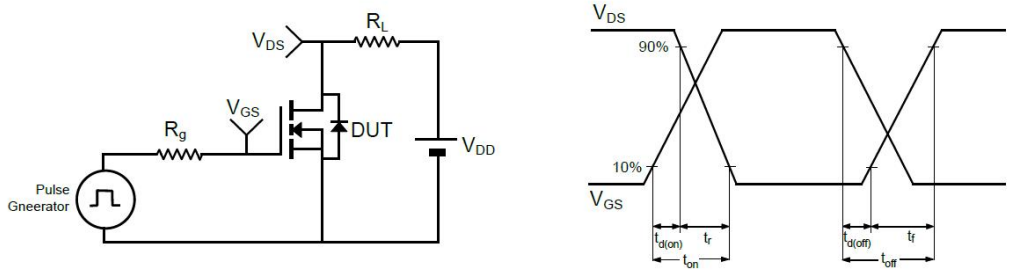
$V_{GS}=f(Q_{gate})$; $I_D=40A$ pulsed; $V_{DS}=200V$

Test Circuit

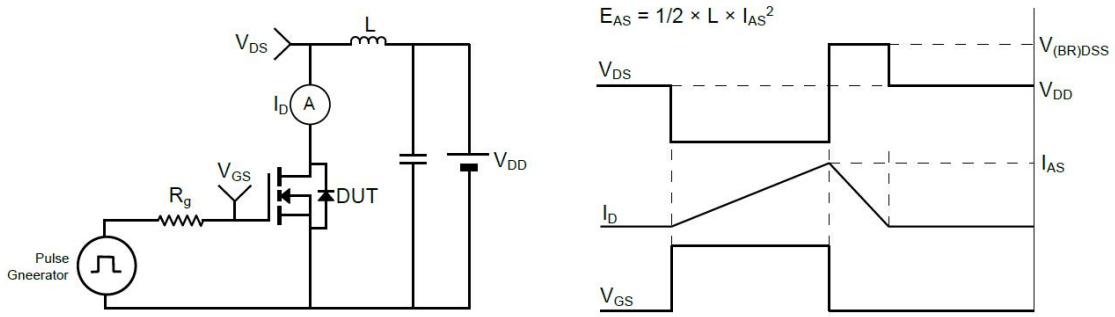
Gate Charge



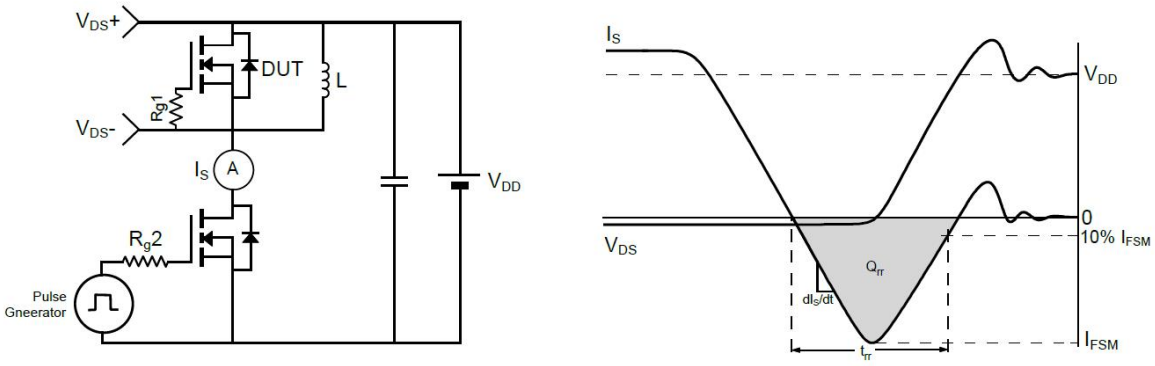
Resistive Load Switching Time



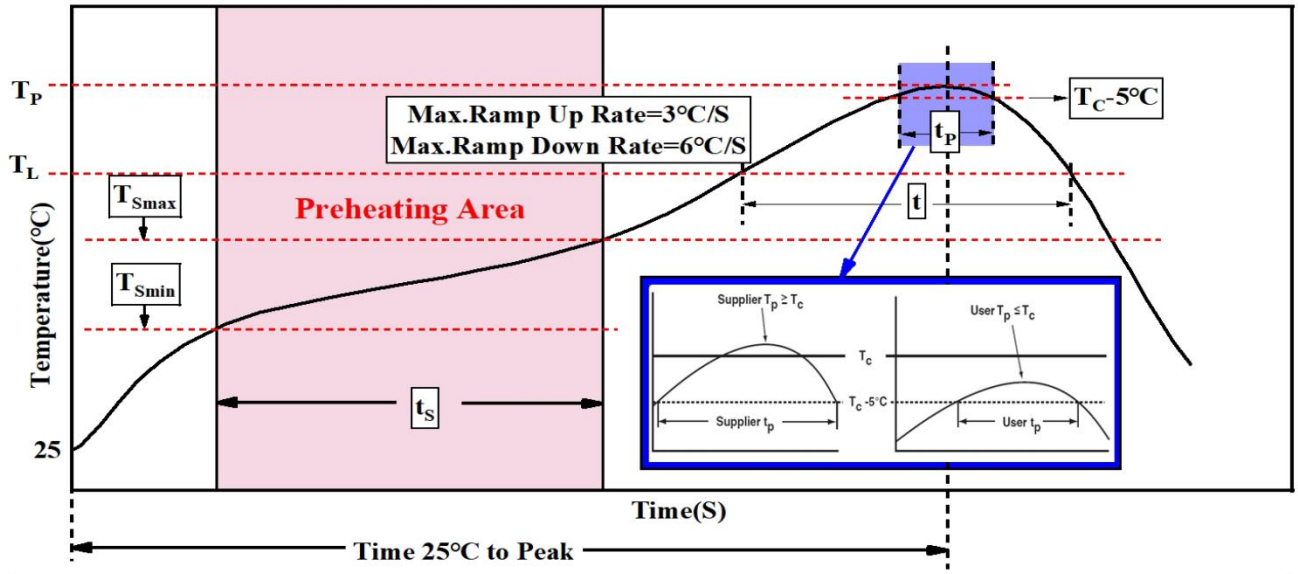
Un-clamped Inductive Load Switching



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 (Tsmin) Temperature max (Tsmax) Time (Tsmin to Tsmax) (ts)	 100°C 150°C 60-120 seconds	 150°C 200°C 60-120 seconds
Average ramp-up rate (Tsmax to Tp)	3 °C/second max.	3°C/second max.
Liquidous temperature (TL) Time at liquidous (tL)	183 °C 60-150 seconds	217°C 60-150 seconds
Peak package body Temperature e (Tp)*	See Classification Temp in table 1	See Classification Temp in table 2
Time (tp)** within 5°C of the specified classification temperature (Tc)	20** seconds	30** seconds
Average ramp-down rate (Tp to Tsmax)	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 (Tp) is defined as a supplier minimum and a user maximum. ** Tolerance for time at peak profile temperature (tp) is defined as a supplier minimum and a user maximum		

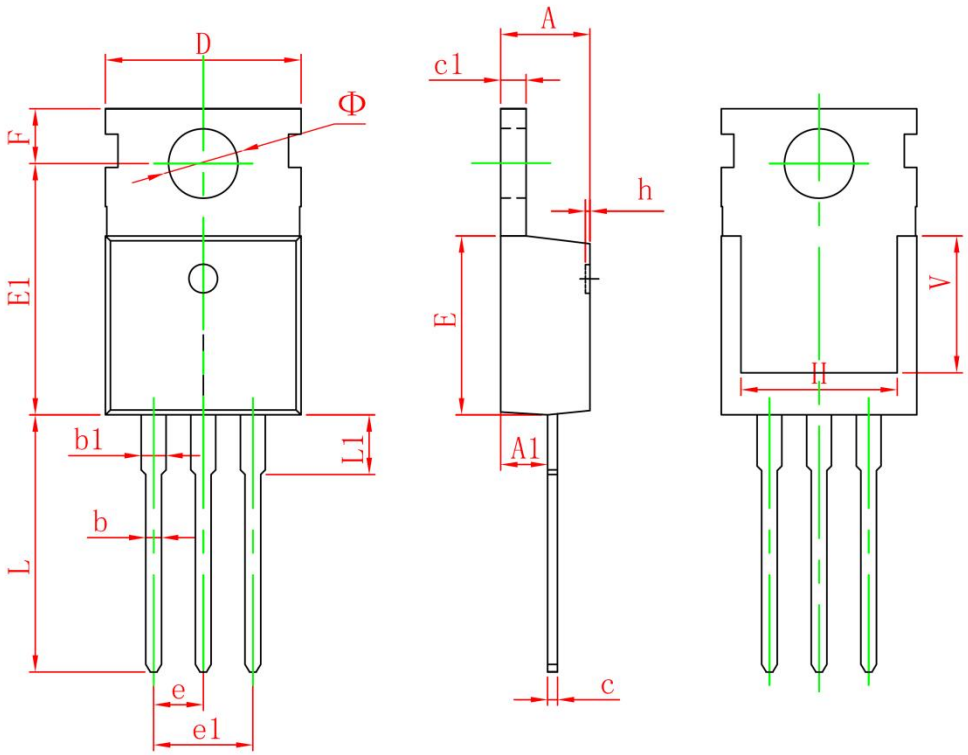
Table 1. SnPb Eutectic Process – Classification Temperatures (Tc)

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 (Tc)

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