

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 R_{ds(on)}
- 100% Single Pulse avalanche energy Test

Applications

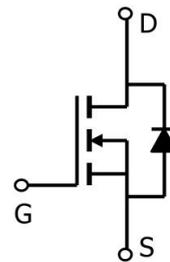
- PWM Application
- Hard switched and high frequency circuits
- Power Management

Package

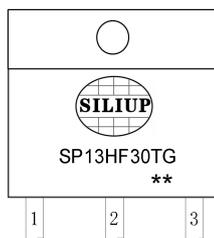


TO-220F(1:G 2:D 3:S)

Circuit diagram



Marking



SP13HF30TG :Product code
** :Week code

Order Information

Device	Package	Unit/Tube
SP13HF30TG	TO-220F	50

Absolute maximum ratings (Ta=25°C, 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°C)	I _D	125	A
Continuous drain current (Tc=100°C)	I _D	83	A
Pulsed drain current	I _{DM}	380	A
Single pulsed avalanche energy ¹	E _{AS}	1332	mJ
Power dissipation (Tc=25°C)	P _D	34	W
Power dissipation (Tc=100°C)	P _D	13.6	W
Thermal resistance Junction-to-case	R _{θJC}	3.68	°C/W
Recovery diode dv/dt	dv/dt	50	V/ns
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)

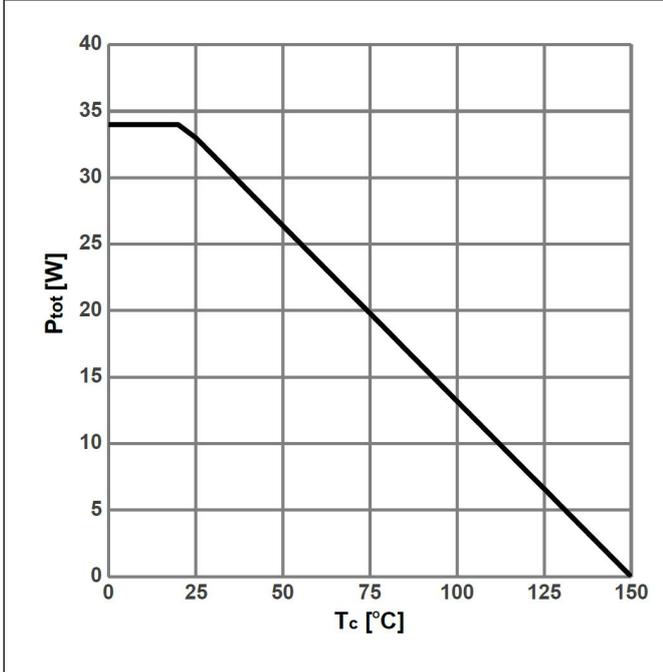
Characteristics	Symbol	Test Condition	Min	Typ	Max	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V , I _D =250μA	300	350	-	V
Drain Cut-Off Current	I _{DSS}	V _{DS} =240V , V _{GS} =0V	-	-	1	μA
Gate Leakage Current	I _{GSS}	V _{GS} =±20V , V _{DS} =0V	-	-	±0.1	
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	2.5	3.5	4.5	V
Drain-Source ON Resistance	R _{DS(ON)}	V _{GS} =10V , I _D =35A	-	13	16	mΩ
Gate Resistance	R _G	V _{DS} =50V , V _{GS} =0V , f=1MHz	-	3.5	-	Ω
Dynamic Characteristics						
Input Capacitance	C _{iss}	V _{DS} =50V , V _{GS} =0V , f=1.0MHz	-	5200	-	pF
Output Capacitance	C _{oss}		-	340	-	
Reverse Transfer Capacitance	C _{rss}		-	6.5	-	
Total Gate Charge	Q _g	V _{DS} =200V , V _{GS} =10V , I _D =40A	-	85	-	nC
Gate-Source Charge	Q _{gs}		-	26	-	
Gate-Drain Charge	Q _{gd}		-	22	-	
Gate Plateau Voltage	V _{plateau}		-	5.6	-	V
Switching Characteristics						
Turn-On Delay Time	t _{d(on)}	V _{GS} =10V , V _{DS} =200V , I _D =40A , R _G =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}	V _{GS} =0V , I _S =1A , T _J =25°C	-	-	1.2	V
Maximum Body-Diode Continuous Current	I _S		-	-	125	A
Reverse Recovery Time	T _{rr}	V _R =200V, I _S =40A, di/dt=100A/us	-	118	-	nS
Reverse Recovery Charge	Q _{rr}		-	0.56	-	uC

Note :

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

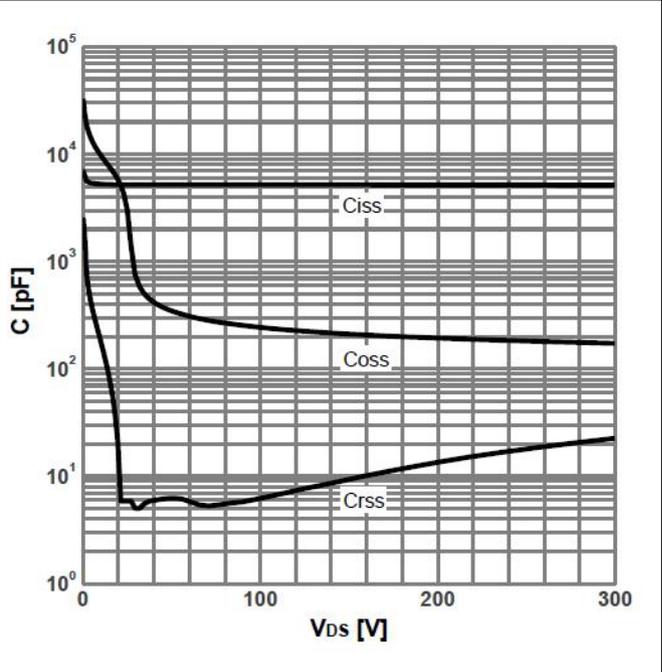
Typical Characteristics

Power dissipation



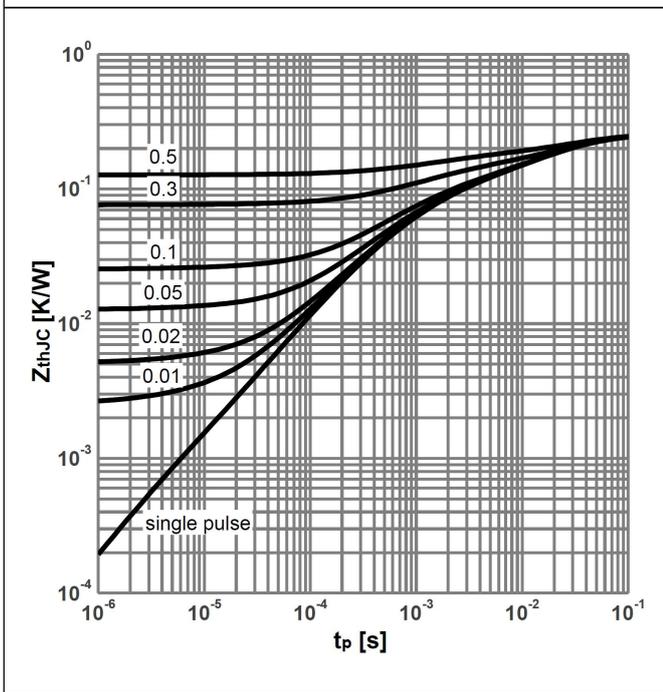
$P_{tot}=f(T_c)$

Typ. capacitances



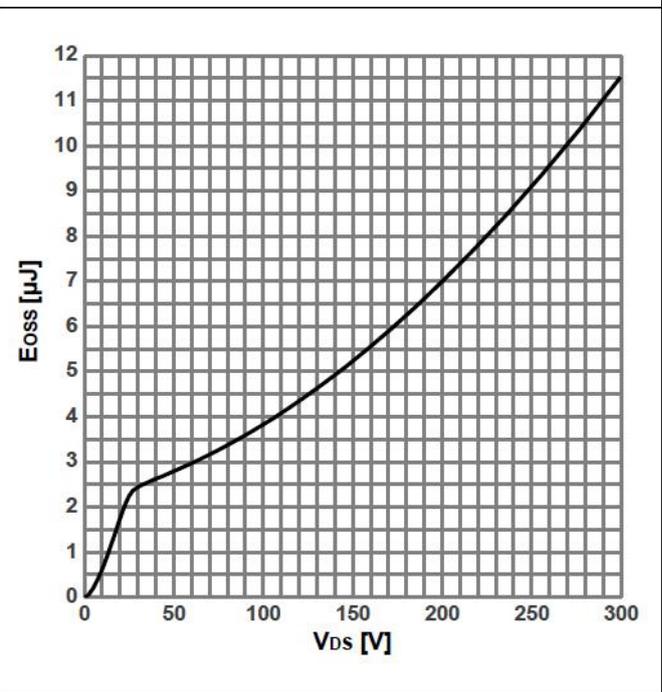
$C=f(V_{DS}); V_{GS}=0V; f=1MHz$

Max. transient thermal impedance



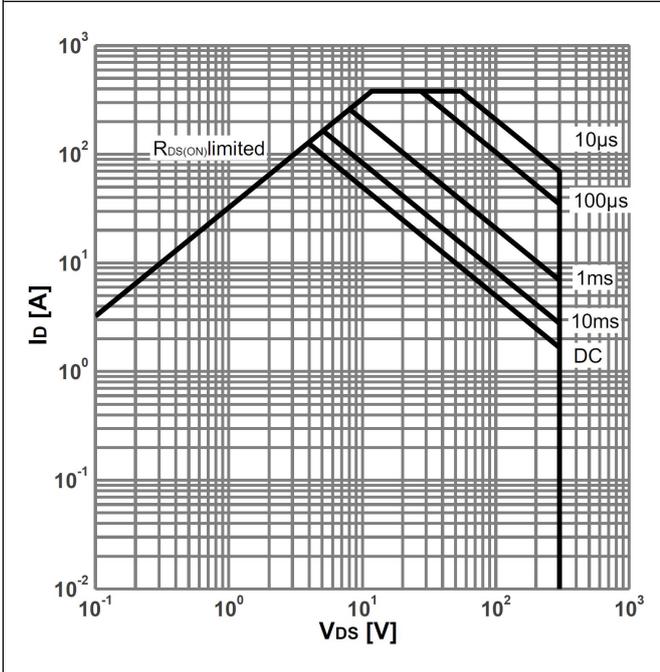
$Z_{thJC}=f(t_p); \text{parameter: } D= t_p/T$

Typ. Coss stored energy



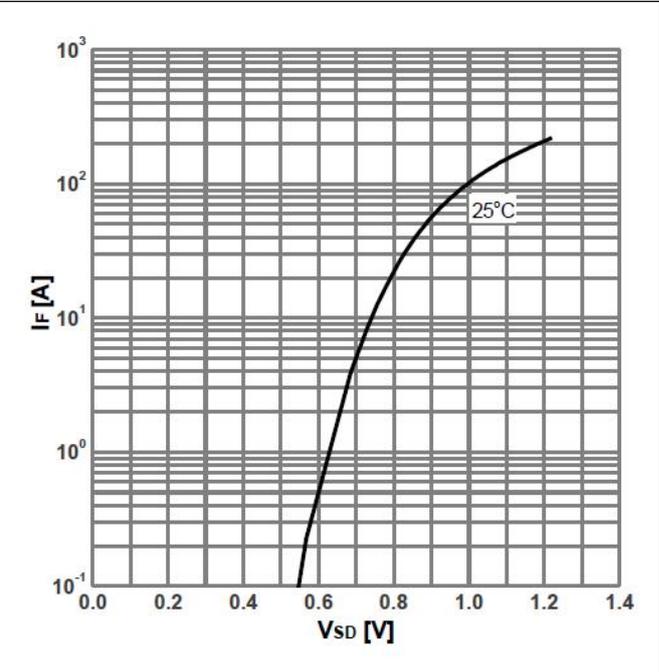
$E_{OSS} =f(V_{DS})$

Safe operating area



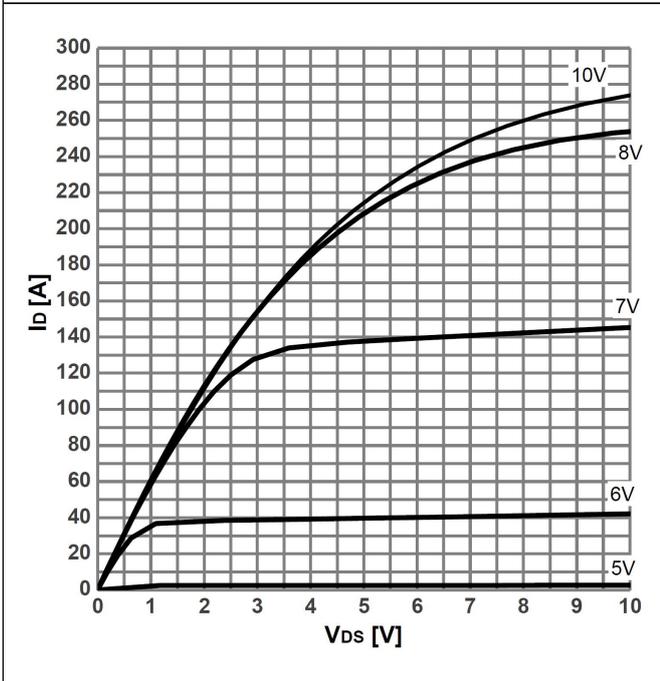
$I_D=f(V_{DS}); T_J=25^\circ\text{C}; D=0$; parameter: t_p

Forward characteristics of reverse diode



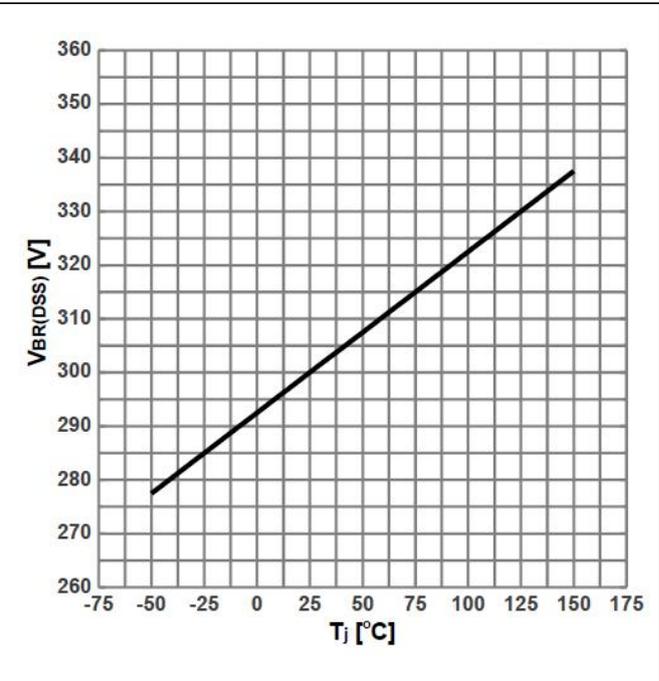
$I_F=f(V_{SD});$ parameter: T_J

Typ. output characteristics



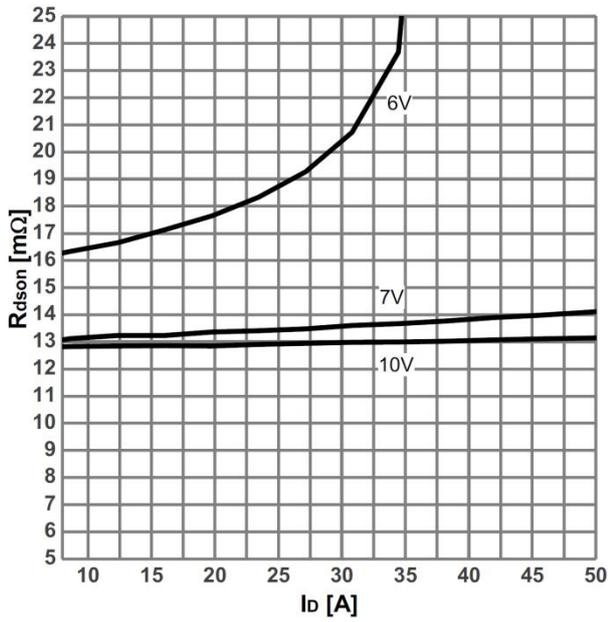
$I_D=f(V_{DS}); T_J=25^\circ\text{C}$; parameter: V_{GS}

Drain-source breakdown voltage



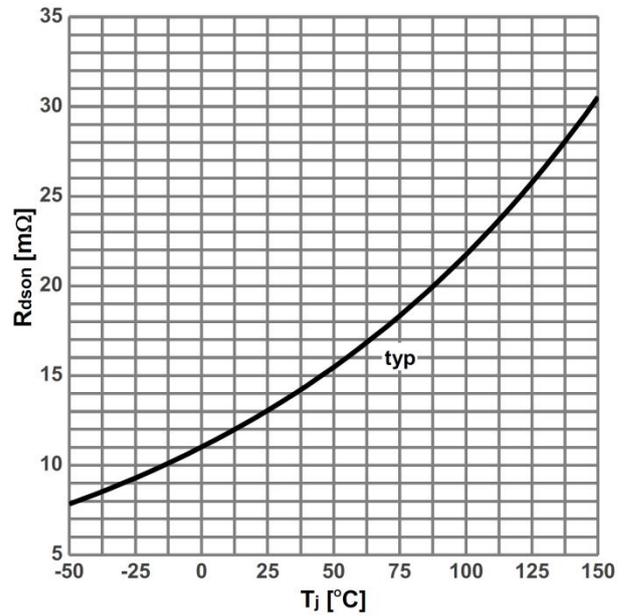
$V_{BR(DSS)}=f(T_J); I_D=1\text{mA}$

Typ. drain-source on-state resistance



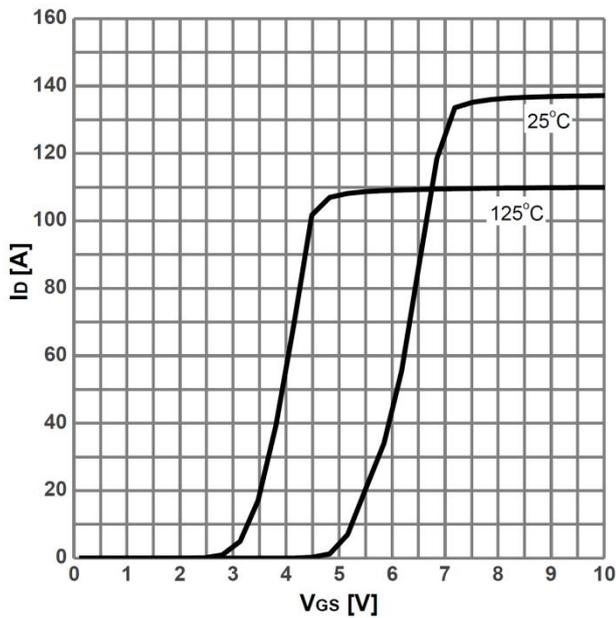
$R_{DS(on)}=f(I_D)$; $T_j=25^\circ C$; parameter: V_{GS}

Drain-source on-state resistance



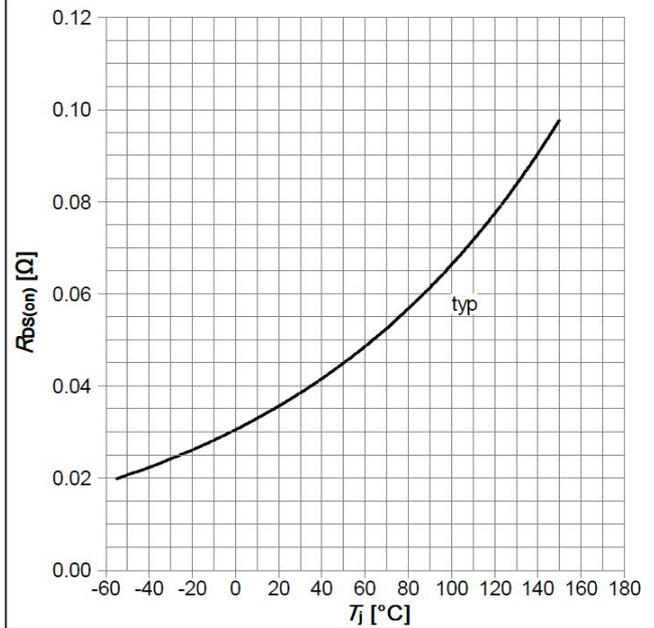
$R_{DS(on)}=f(T_j)$; $I_D=36A$; $V_{GS}=10V$

Typ. transfer characteristics



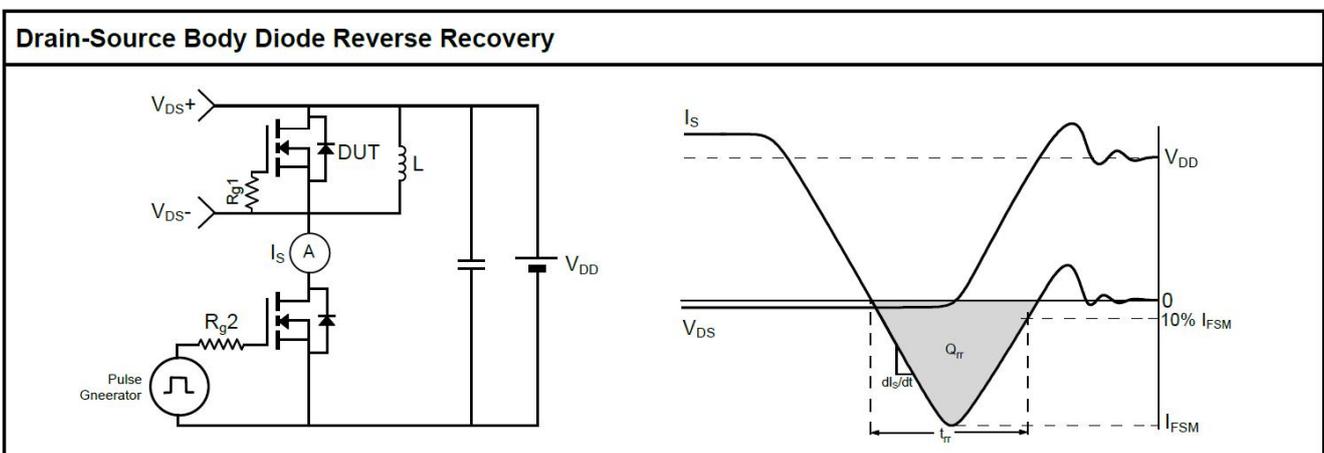
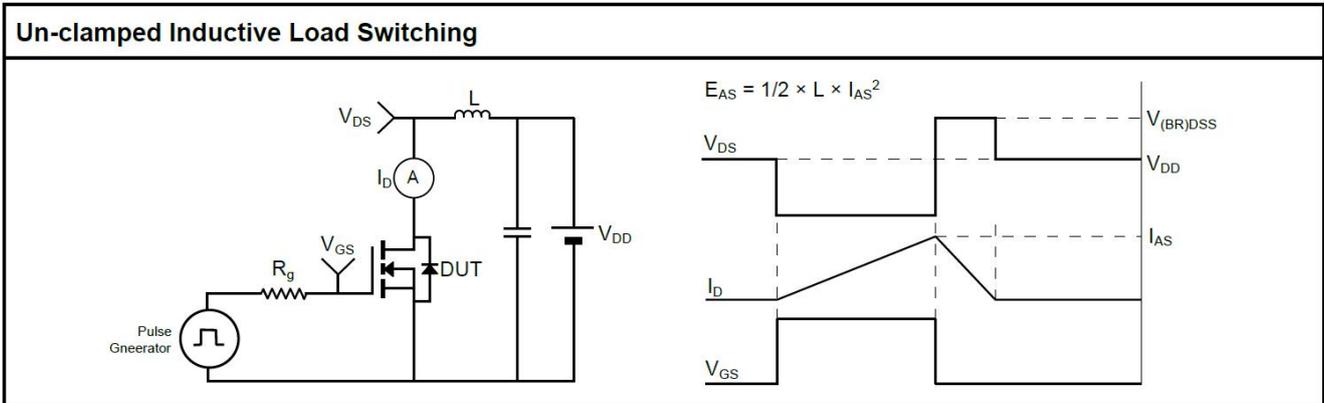
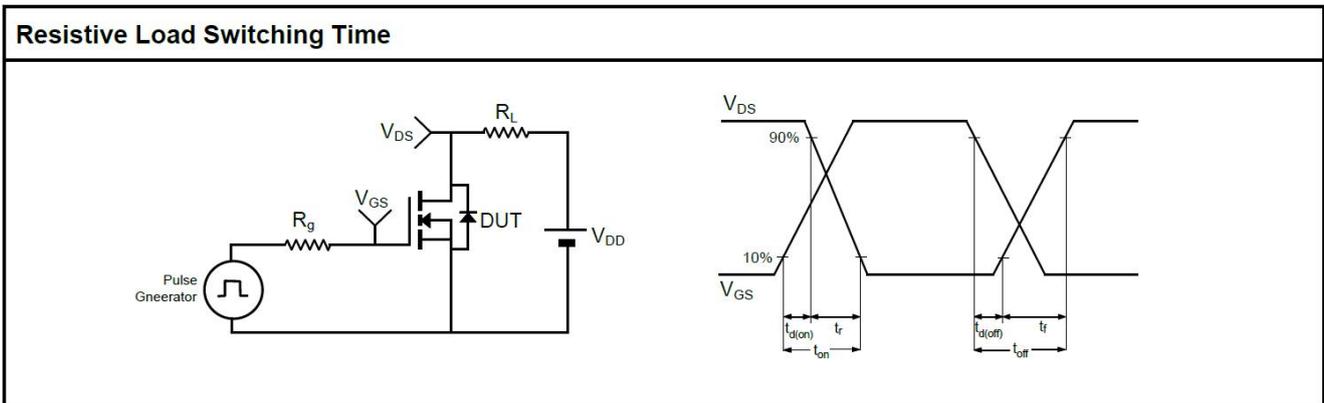
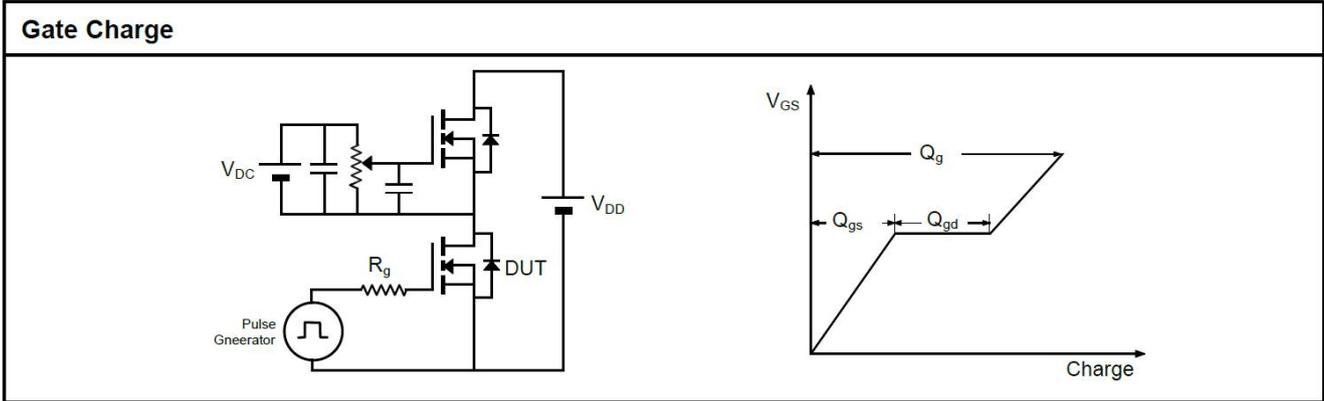
$I_D=f(V_{GS})$; $V_{DS}=20V$; parameter: T_j

Typ. gate charge

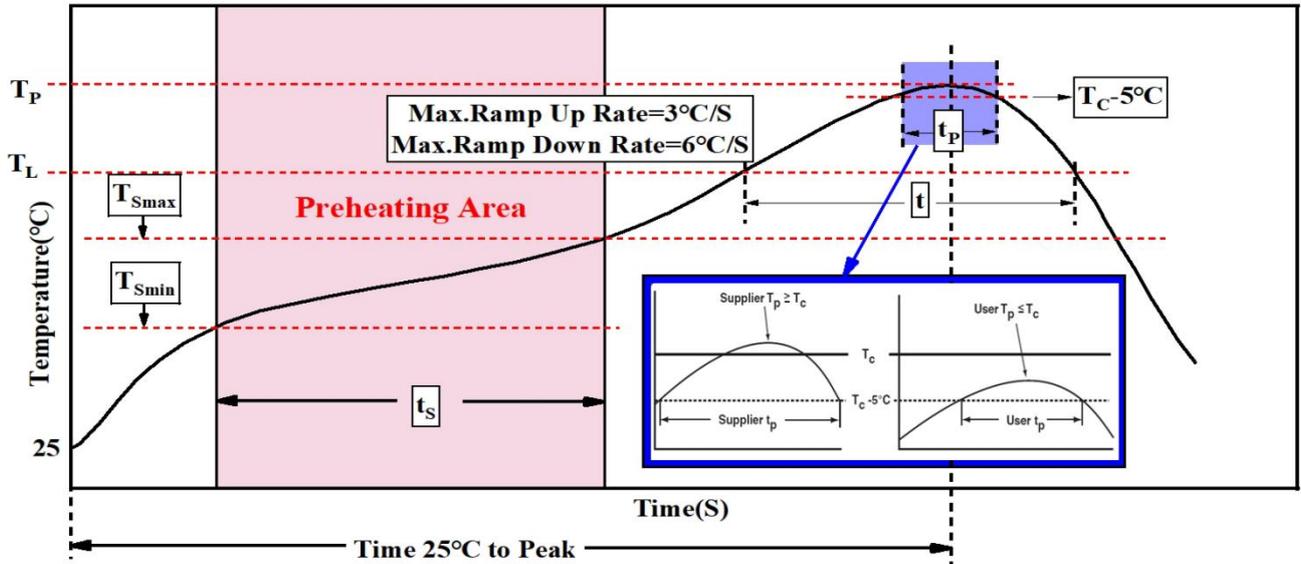


$V_{GS}=f(Q_{gate})$; $I_D=40A$ pulsed; $V_{DS}=200V$

Test Circuit



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 (TL)	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		

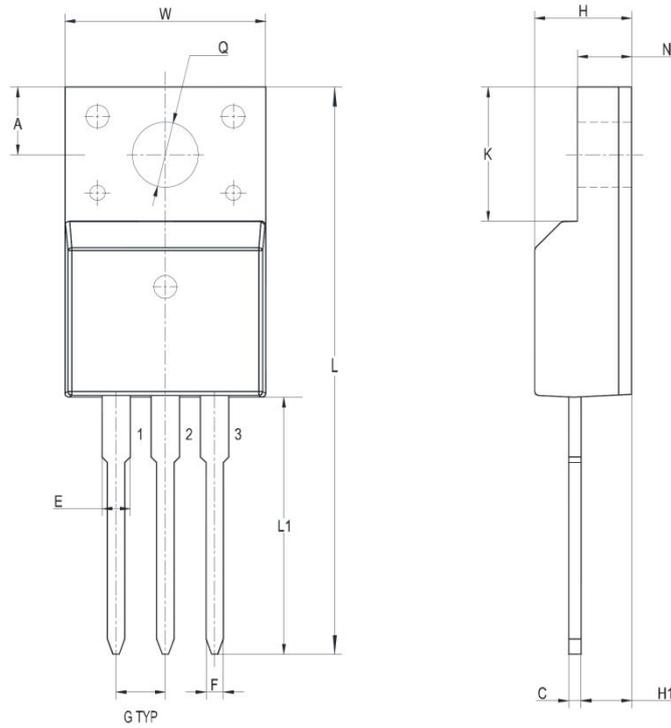
Table 1. SnPb Eutectic Process – Classification Temperatures (T_c)

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-220F Package Information



Symbol	Dimensions In Millimeters	
	Min.	Max.
A	2.80	3.50
C	0.40	0.60
E	1.15	1.45
F	0.70	0.90
G	2.54 TYP.	
W	9.50	10.50
H	4.50	4.90
H1	2.50	2.95
Q	2.90	3.55
L	28.00	29.50
L1	12.50	13.50
K	6.20	6.77
N	2.30	2.80