

Product Summary

$V_{(BR)DSS}$	$R_{DS(on)TYP}$	I_D
85V	2.5mΩ@10V	200A



合肥矽普半导体

Siliup Semiconductor Technology Co., Ltd

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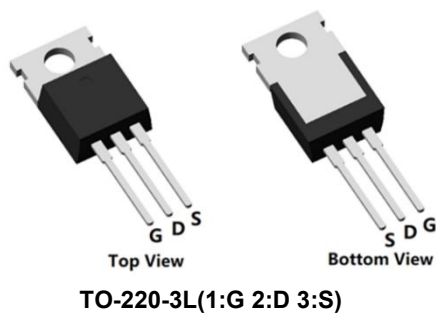
Feature

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

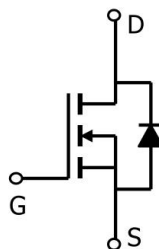
Applications

- Power switching application
- DC-DC Converter
- Power Management

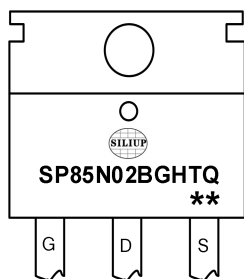
Package



Circuit diagram



Marking



SP85N02BGHTQ : Product code
****** : Week code

Order Information

Device	Package	Unit/Tube
SP85N02BGHTQ	TO-220-3L	50

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

Parameter		Symbol	Rating	Unit
Drain-Source Voltage		V_{DS}	85	V
Gate-Source Voltage		V_{GS}	± 20	V
Continuous Drain Current (Tc=25°C)	Silicon limit	I_D	310	A
Continuous Drain Current (Tc=25°C)	Package limit	I_D	200	A
Continuous Drain Current (Tc=100°C)		I_D	130	A
Pulsed Drain Current		I_{DM}	800	A
Single Pulse Avalanche Energy ¹		E_{AS}	1650	mJ
Power Dissipation (Tc=25°C)		P_D	240	W
Power Dissipation (Tc=100°C)		P_D	96	W
Thermal Resistance Junction-to-Case		$R_{\theta JC}$	0.52	°C/W
Storage Temperature Range		T_{STG}	-55 to 150	°C
Operating Junction Temperature Range		T_J	-55 to 150	°C

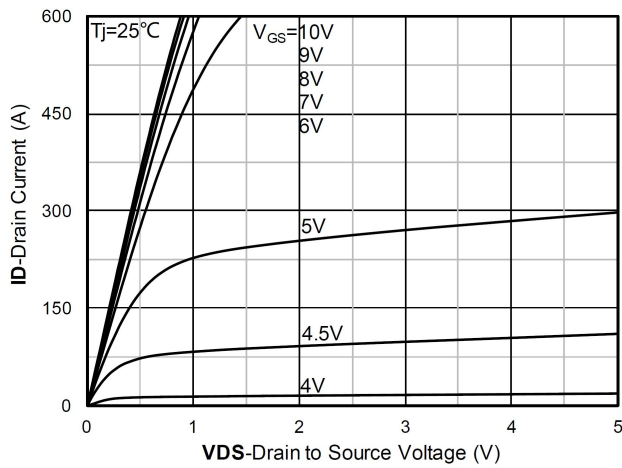
Electrical characteristics (Ta=25°C, unless otherwise noted)

Characteristics	Symbol	Test Condition	Min	Typ	Max	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	VGS=0V , ID=250uA	85	-	-	V
Drain Cut-Off Current	I _{DSS}	VDS=68V , VGS=0V , TJ=25℃	-	-	1	μA
Gate Leakage Current	I _{GSS}	VGS=±20V , VDS=0V	-	-	±100	nA
Gate Threshold Voltage	V _{GS(th)}	VGS=VDS , ID =250uA	2.6	3.0	3.4	V
Drain-Source ON Resistance	R _{DS(ON)}	VGS=10V , ID=20A	-	2.5	3.2	mΩ
Gate Resistance	R _G	VDS=40V , VGS=0V , f=1MHz	-	2.2	-	Ω
Dynamic Characteristics						
Input Capacitance	C _{iss}	VDS=40V , VGS=0V , f=1MHz	-	9222	-	pF
Output Capacitance	C _{oss}		-	3200	-	
Reverse Transfer Capacitance	C _{rss}		-	84	-	
Total Gate Charge	Q _g	VDS=40V , VGS=10V , ID=165A	-	145	-	nC
Gate-Source Charge	Q _{gs}		-	51	-	
Gate-Drain Charge	Q _{gd}		-	25	-	
Gate Plateau Voltage	V _{plateau}		-	4.5	-	
Switching Characteristics						
Turn-On Delay Time	t _{d(on)}	VDD=40V, VGS=10V , RG=1.6Ω, ID=165A	-	27	-	nS
Rise Time	t _r		-	75	-	
Turn-Off Delay Time	t _{d(off)}		-	86	-	
Fall Time	t _f		-	35	-	
Drain-Source Body Diode Characteristics						
Source-Drain Diode Forward Voltage	V _{SD}	I _s = 1A, VGS = 0V	-	-	1.2	V
Maximum Body-Diode Continuous Current	I _s		-	-	200	A
Reverse Recovery Time	T _{rr}	I _s =50A, di/dt=100A/us, TJ=25℃	-	106	-	nS
Reverse Recovery Charge	Q _{rr}		-	256	-	nC

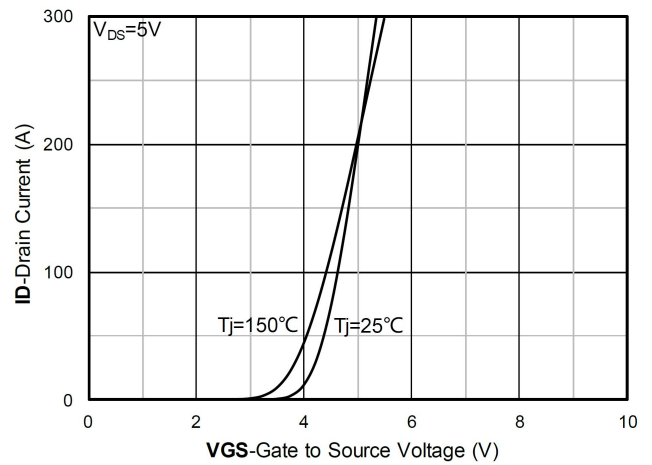
Note:

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

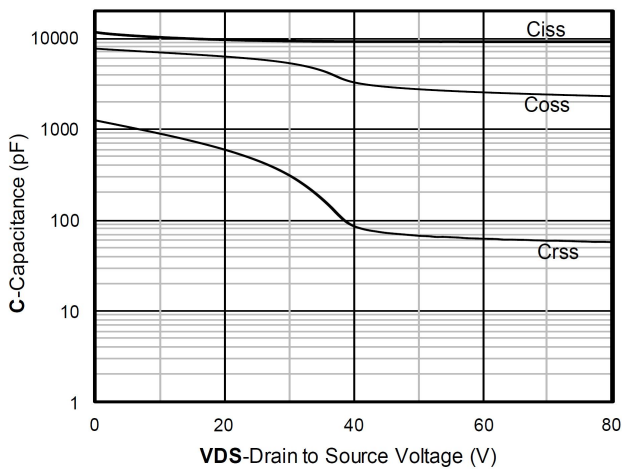
Typical Characteristics



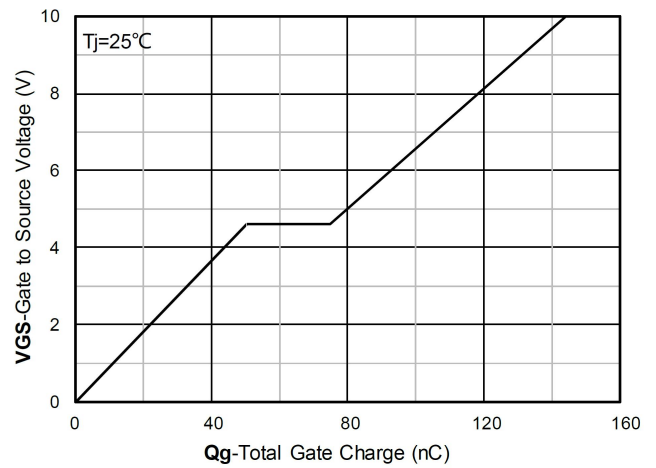
Output Characteristics



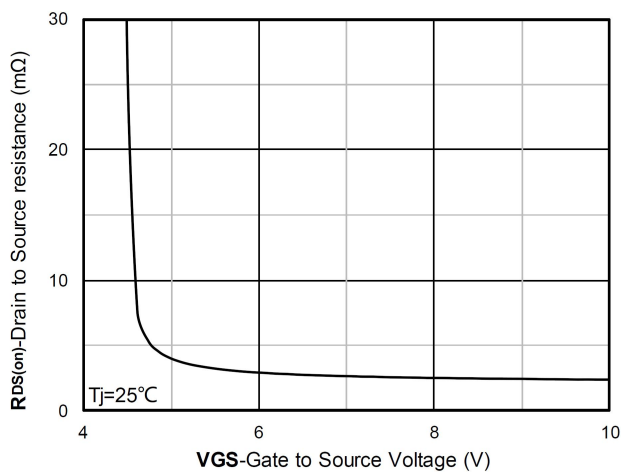
Transfer Characteristics



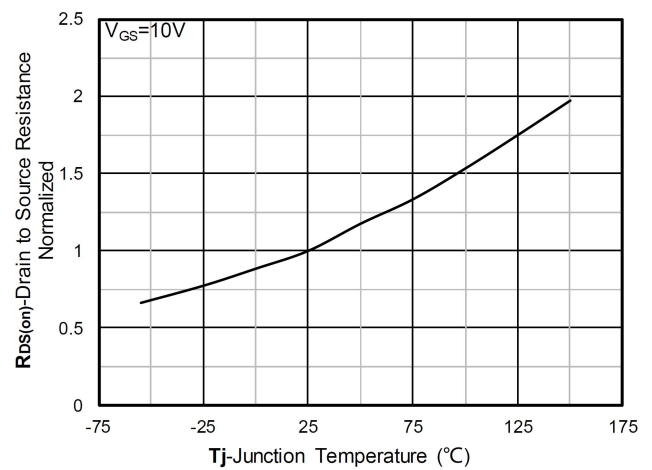
Capacitance Characteristics



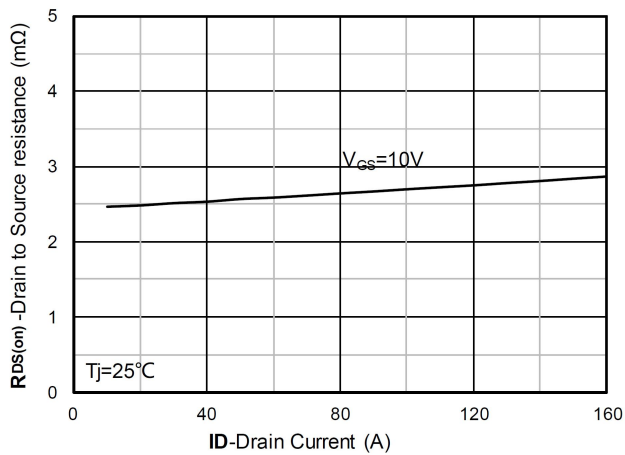
Gate Charge



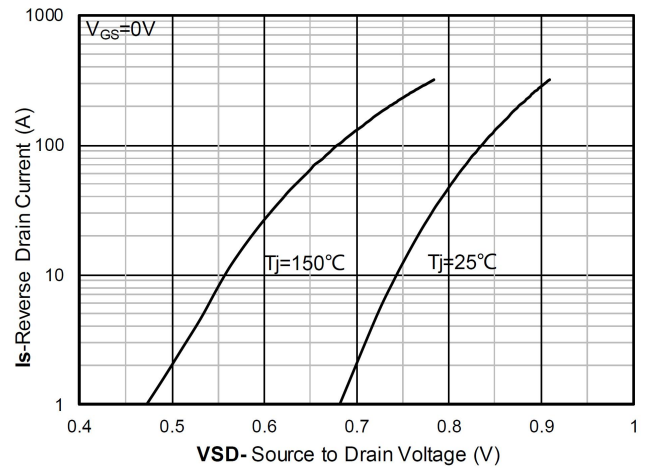
On-Resistance vs. Gate to Source Voltage



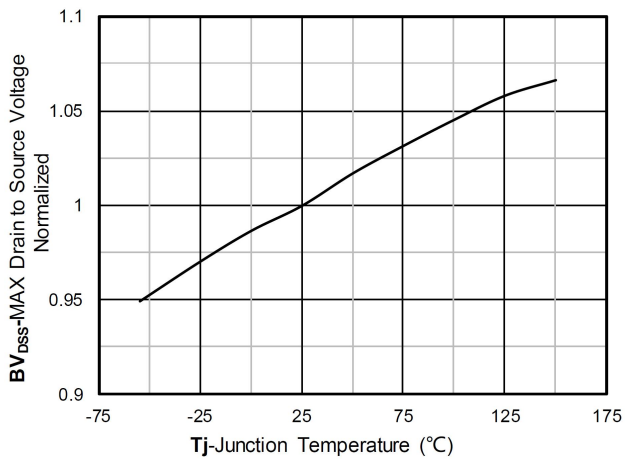
Normalized On-Resistance



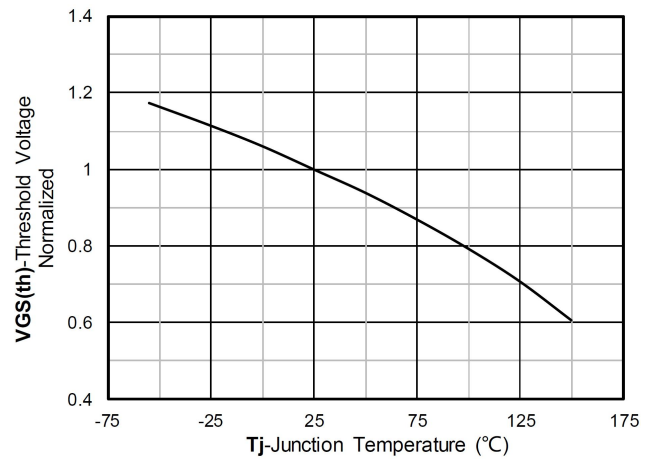
$R_{DS(on)}$ vs. Drain Current



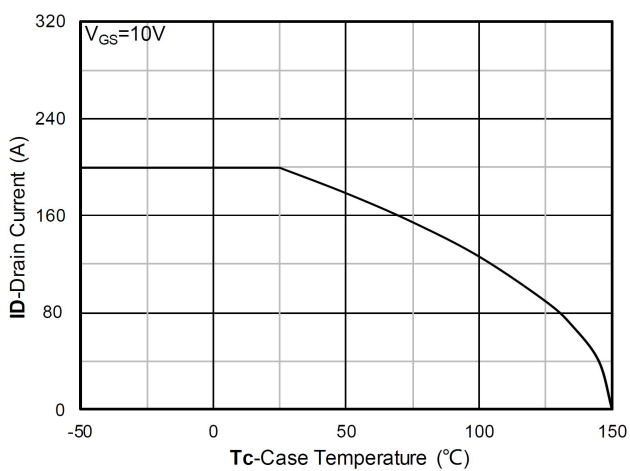
Forward characteristics of reverse diode



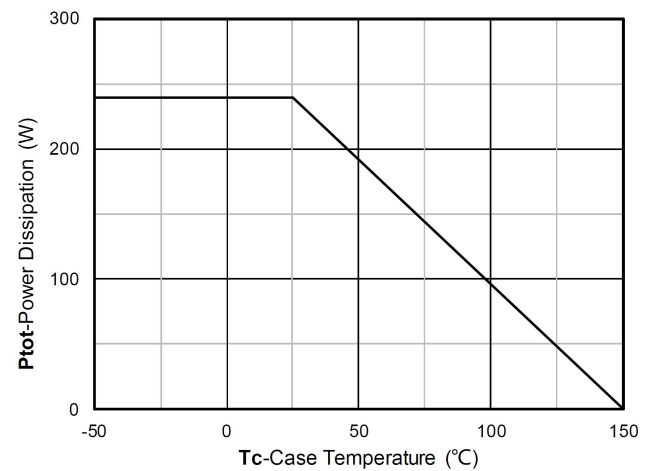
Normalized breakdown voltage



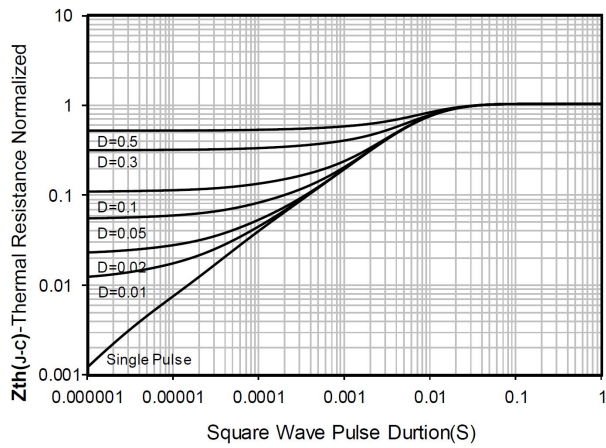
Normalized Threshold voltage



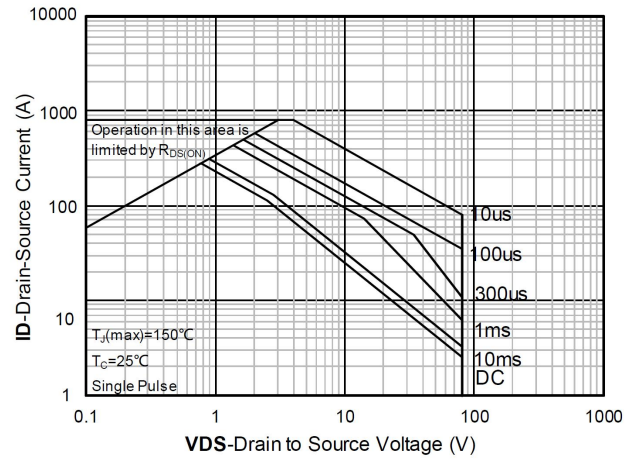
Current dissipation



Power dissipation



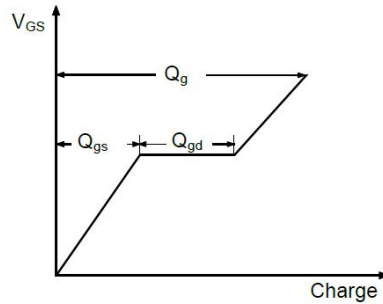
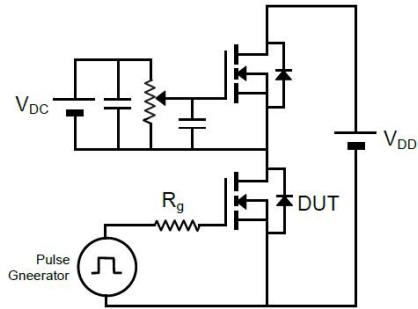
Normalized Maximum Transient Thermal Impedance



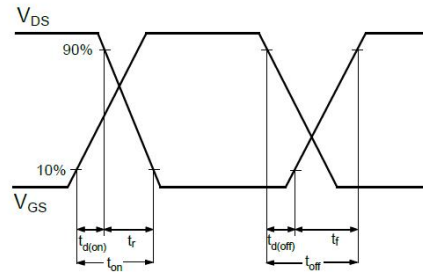
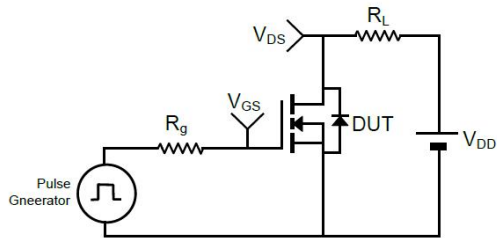
Safe Operation Area

Test Circuit

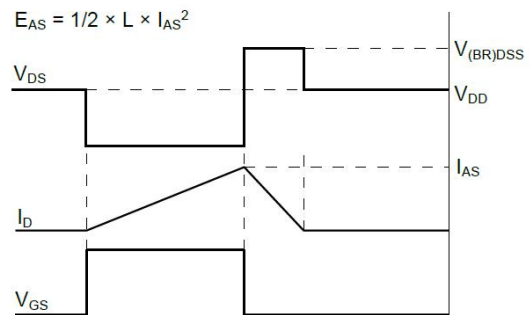
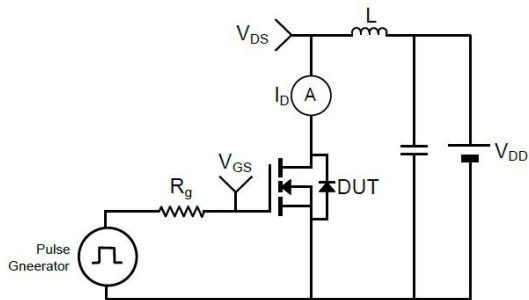
Gate Charge



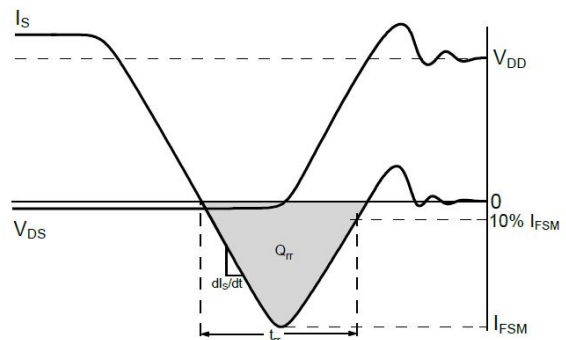
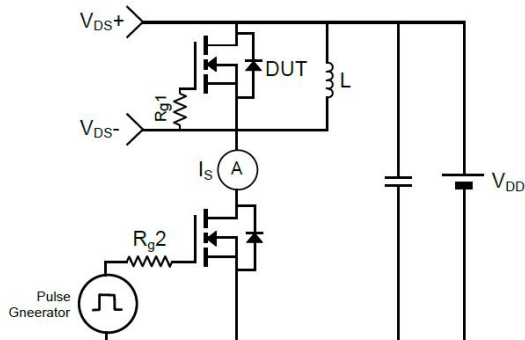
Resistive Load Switching Time



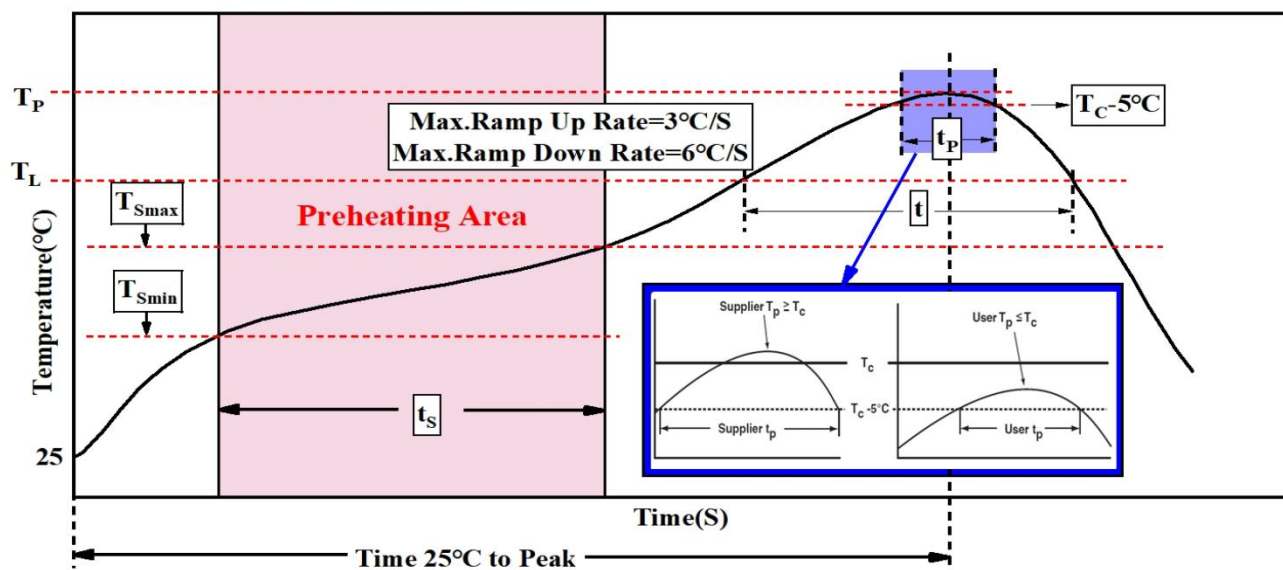
Un-clamped Inductive Load Switching



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