

Product Summary

$V_{(BR)DSS}$	$R_{DS(on)TYP}$	$I_D (T_c=100^{\circ}C)$
1200V	115mΩ@10V	14A



合肥矽普半导体

Siliup Semiconductor Technology Co., Ltd

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Feature

- High Speed Switching with Low Capacitances
- High Blocking Voltage with Low $R_{DS(on)}$
- Easy to Parallel
- Simple to Drive
- RoHS Compliant
- Wafer level burn in&FT high temperature test
- AECQ-101 Qualified

Applications

- Power Factor Correction Modules
- Switch Mode Power Supplies
- Photovoltaic Inverter
- UPS Power Supply
- Motor Drive
- High Voltage DC/DC Converter
- Switching Mode Power Supply

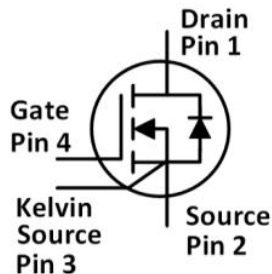
Package



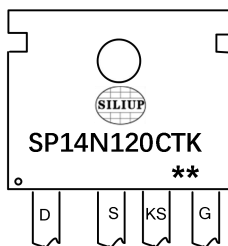
TO-247-4L

(1-Drain; 2-Source; 3Kelvin Source;4-Gate)

Circuit diagram



Marking



SP14N120CTK :Device Code
** :Week Code

Order Information

Device	Package	Unit/Tube
SP14N120CTK	TO-247	30

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

Parameter	Symbol	Rating	Units
Drain-Source Voltage	V_{DS}	1200	V
Gate-Source Voltage	V_{GSMAX}	-10/+22	V
Recommend Gate-Source Voltage	V_{GSop}	-5/+18	V
Continuous Drain Current(Tc=25°C)	I_D	20	A
Continuous Drain Current(Tc=100°C)	I_D	14	A
Pulsed Drain Current	I_{DM}	64	A
Total Power Dissipation(Tc=25°C)	P_D	110	W
Total Power Dissipation ² (Tc=100°C)	P_D	55	W
Thermal Resistance Junction-Case	$R_{\theta JC}$	1.36	°C/W
Storage Temperature Range	T_{STG}	-55 to 175	°C
Operating Junction Temperature Range	T_J	-55 to 175	°C

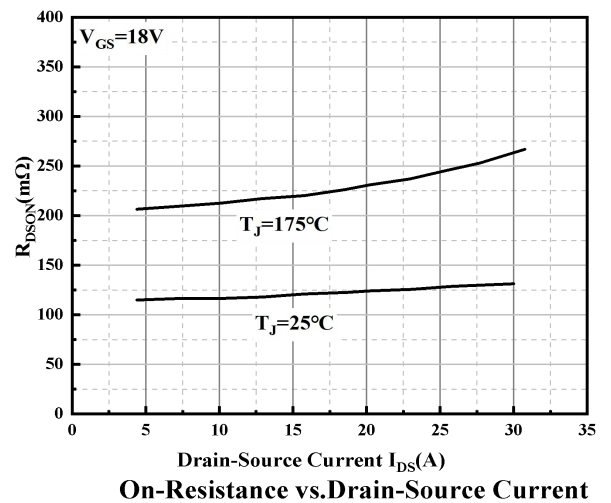
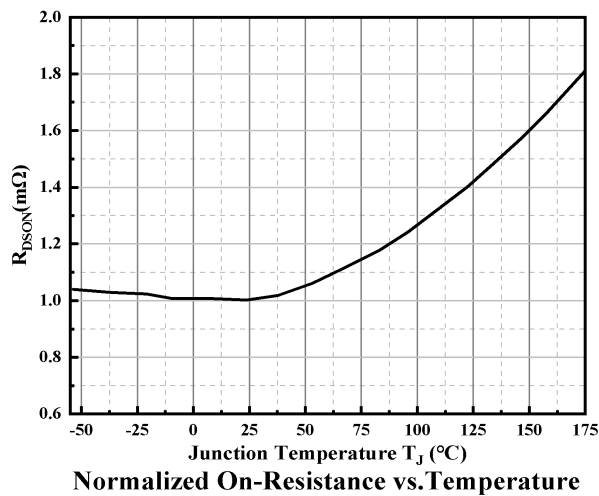
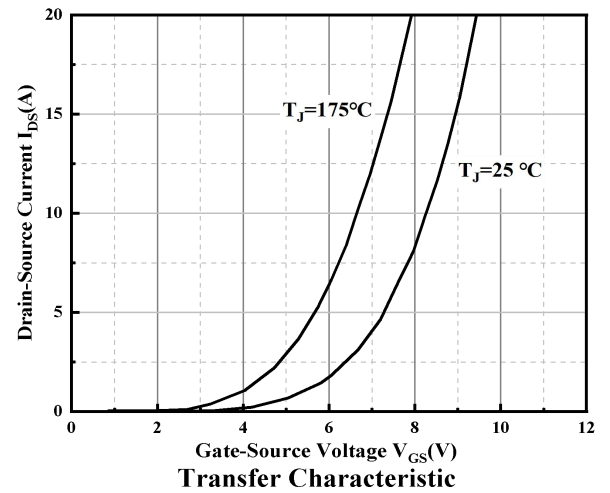
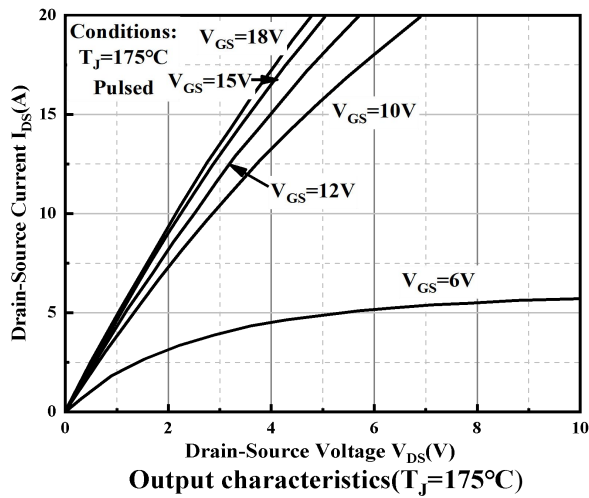
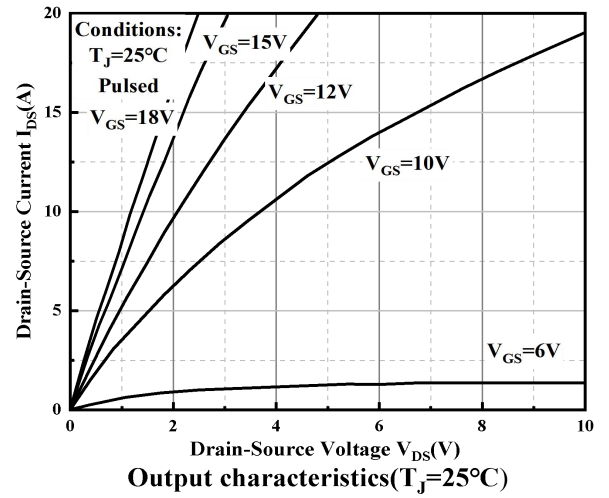
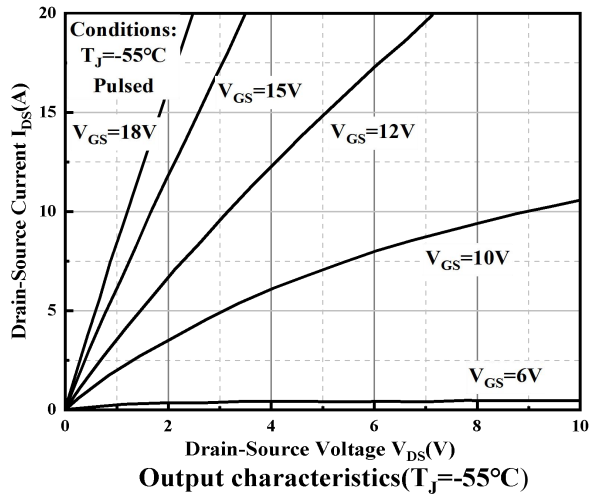
Electrical characteristics (Ta=25°C, unless otherwise noted)

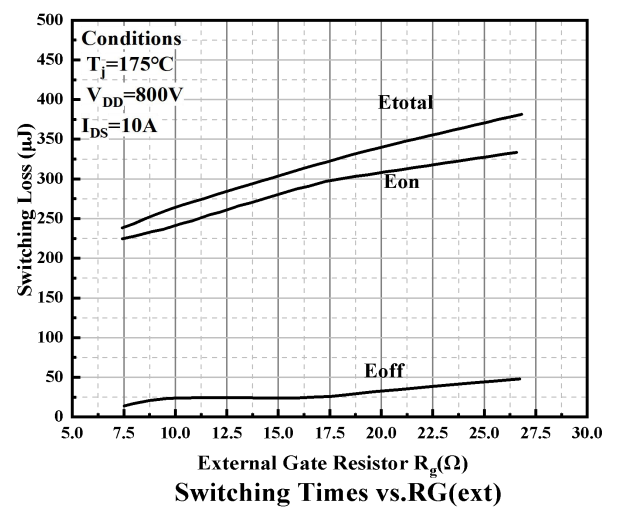
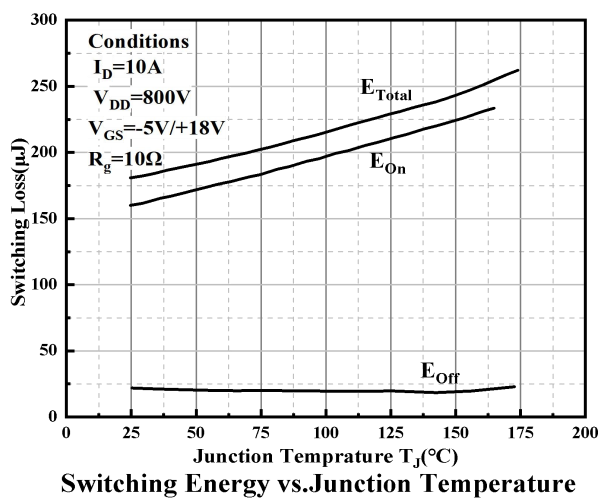
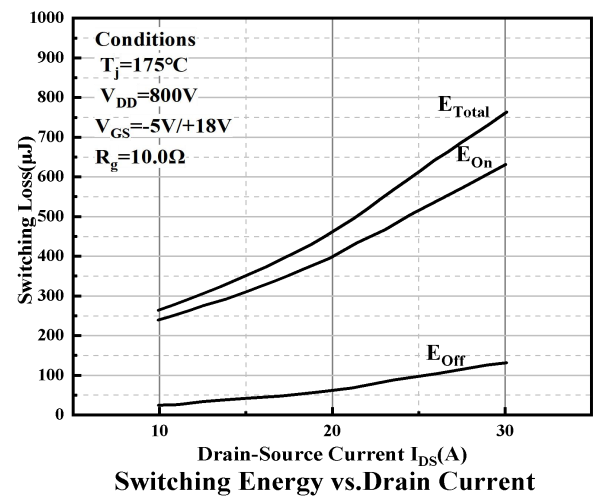
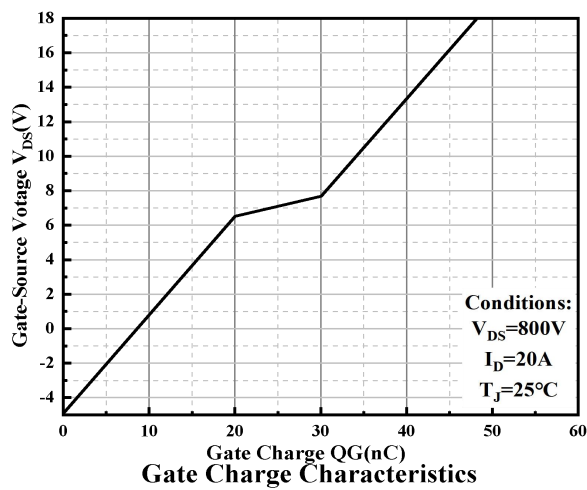
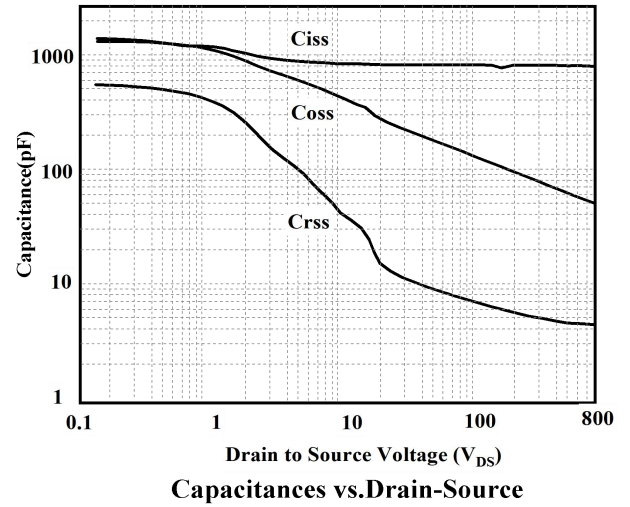
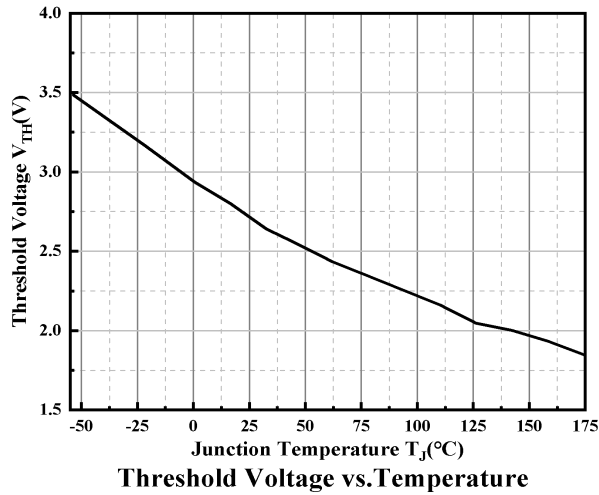
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V , I _D =250uA	1200	-	-	V
Drain-Source Leakage Current	I _{DSS}	V _{DS} =1200V, V _{GS} =0V, T _J =25℃	-	0.1	50	uA
Gate-Source Leakage Current	I _{GSS}	V _{GS} =-10 to 20V , V _{DS} =0V, T _J =25℃	-	-	±100	nA
Gate Threshold Voltage	V _{GS(th)}	V _{GS} =V _{DS} , I _D =2.8mA, T _J =25℃	2.0	2.7	4.0	V
		V _{GS} =V _{DS} , I _D =2.8mA, T _J =175℃	-	1.8	-	
Static Drain-Source On-Resistance	R _{DS(ON)}	V _{GS} =15V , I _D =10A, T _J =25℃	-	139	-	mΩ
		V _{GS} =18V , I _D =10A, T _J =25℃	-	115	149	
		V _{GS} =18V , I _D =10A, T _J =175℃	-	214	-	
Dynamic characteristics						
Input Capacitance	C _{iss}	V _{DS} =800V , V _{GS} =0V , f=100KHz , V _{AC} =30mV	-	625	-	pF
Output Capacitance	C _{oss}		-	37	-	
Reverse Transfer Capacitance	C _{rss}		-	4.8	-	
Switching Characteristics						
Total Gate Charge	Q _g	V _{DS} =800V , V _{GS} = -5/+18V , I _D =10A	-	48	-	nC
Gate-Source Charge	Q _{gs}		-	20	-	
Gate-Drain Charge	Q _{gd}		-	8	-	
Turn-On Delay Time	T _{d(on)}	V _{DS} =800V , V _{GS} = -5/+18V , I _D =10A R _G =10Ω, T _J =25℃	-	11	-	ns
Rise Time	T _r		-	14	-	
Turn-Off Delay Time	T _{d(off)}		-	16	-	
Fall Time	T _f		-	14	-	
Turn-On Energy	E _{on}		-	160	-	μJ
Turn-Off Energy	E _{off}		-	22	-	
Total Switching Loss	E _{tot}		-	182	-	

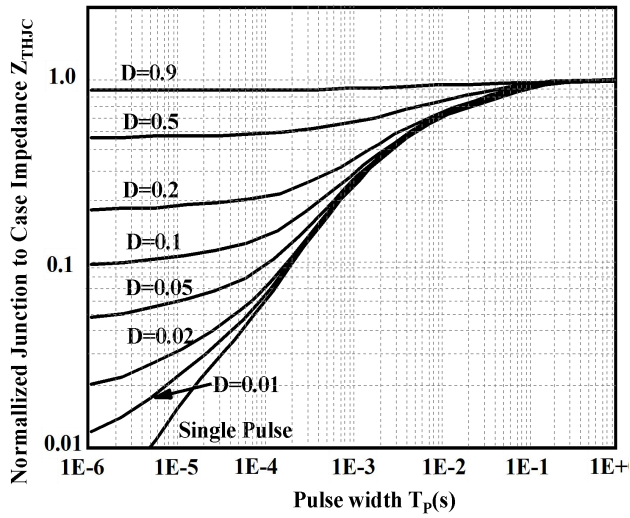
Reverse Diode Characteristics

Diode Forward Voltage	V_{SD}	$V_{GS} = -5V, I_{SD} = 5A, T_J = 25^\circ C$	-	3.5	-	V
		$V_{GS} = -5V, I_{SD} = 5A, T_J = 175^\circ C$	-	3.0	-	
Reverse Recovery Time	t_{rr}	$V_{GS} = -5V, I_{SD} = 10A,$ $V_R = 800V, R_G = 10\Omega$ $T_J = 175^\circ C$	-	21	-	ns
Reverse Recovery Charge	Q_{rr}		-	356	-	nC
Peak Reverse Recovery Current	I_{rrm}		-	24	-	A
Maximum Body-Diode Continuous Current	I_S	$V_{GS} = -5V, T_J = 25^\circ C$	-	23	-	A

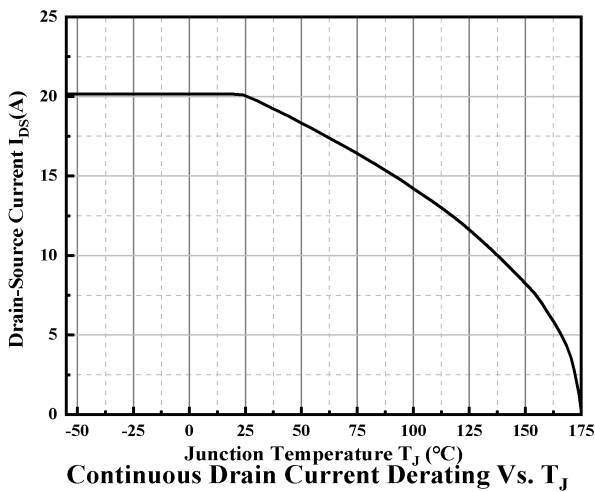
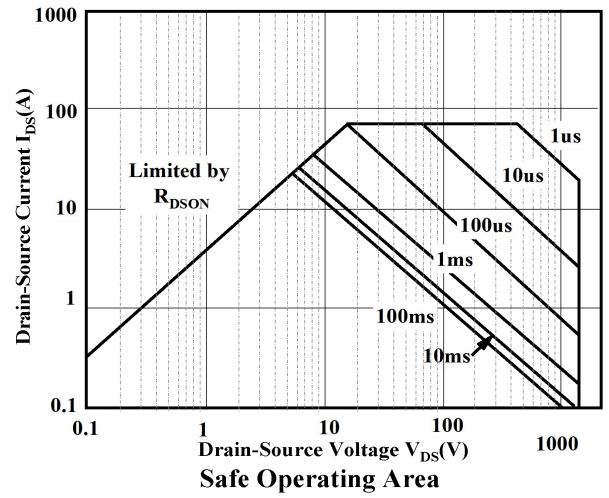
Typical Characteristics



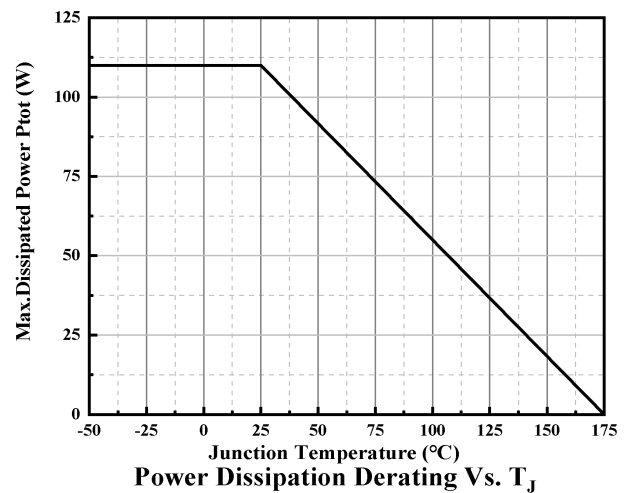




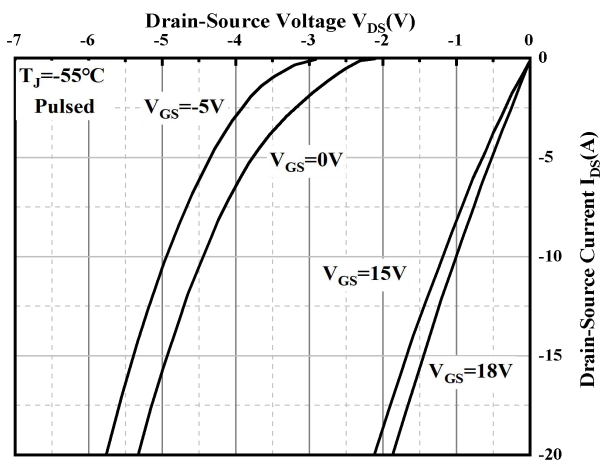
Normalized Maximum Transient Thermal Impedance



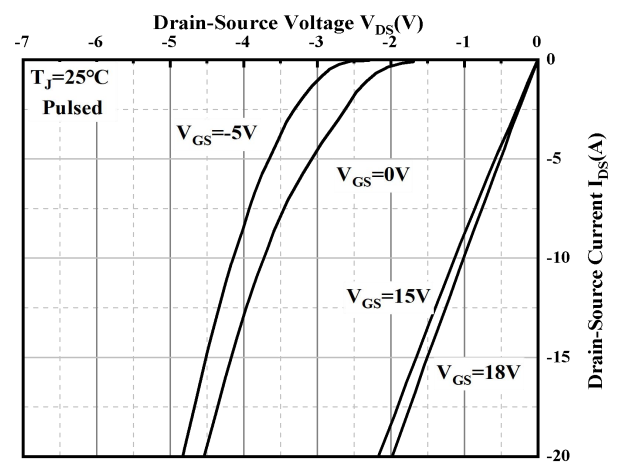
Continuous Drain Current Derating Vs. T_j



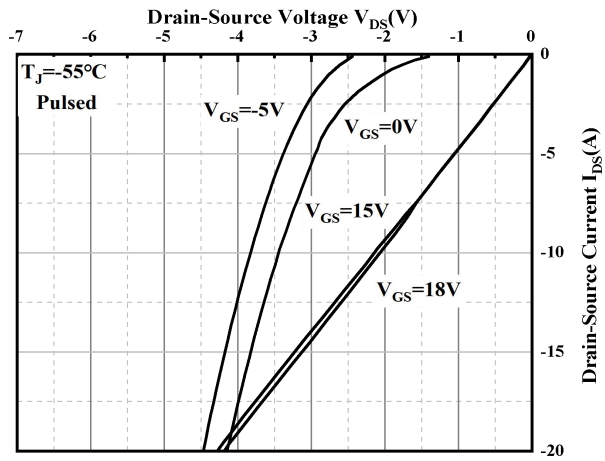
Power Dissipation Derating Vs. T_j



3rd Quadrant Characteristic at -55 °C



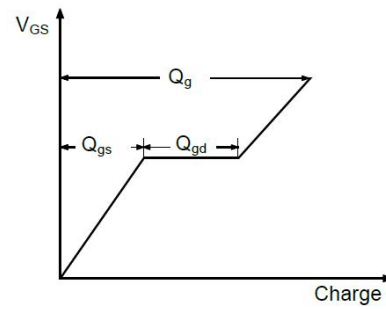
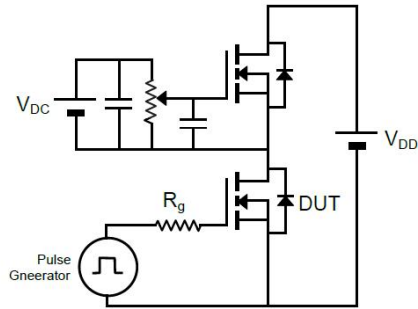
3rd Quadrant Characteristic at 25 °C



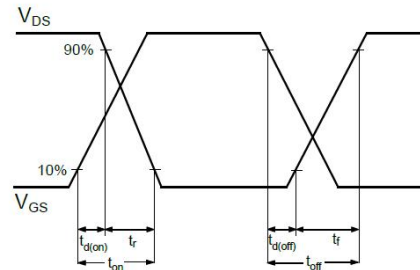
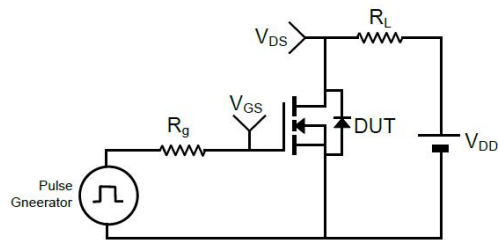
3rd Quadrant Characteristic at 175 °C

Test Circuit

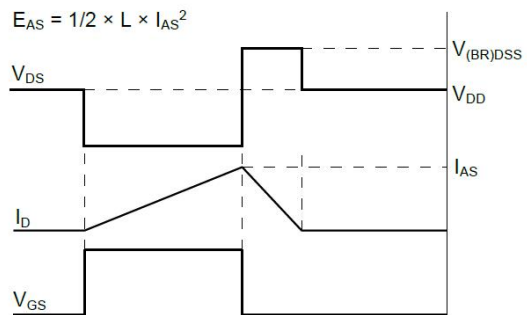
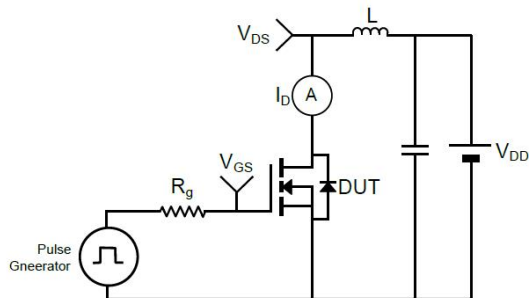
Gate Charge



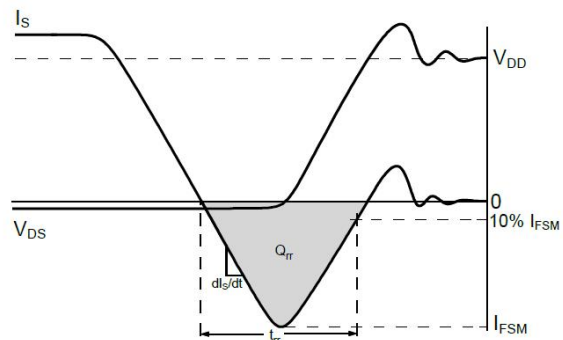
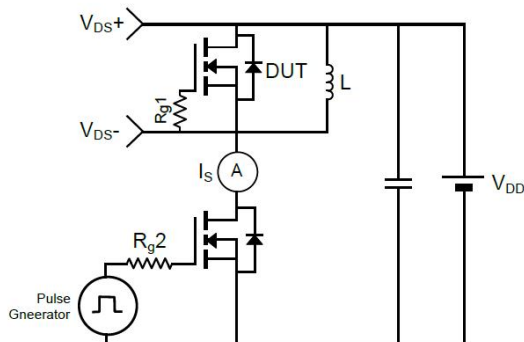
Resistive Load Switching Time



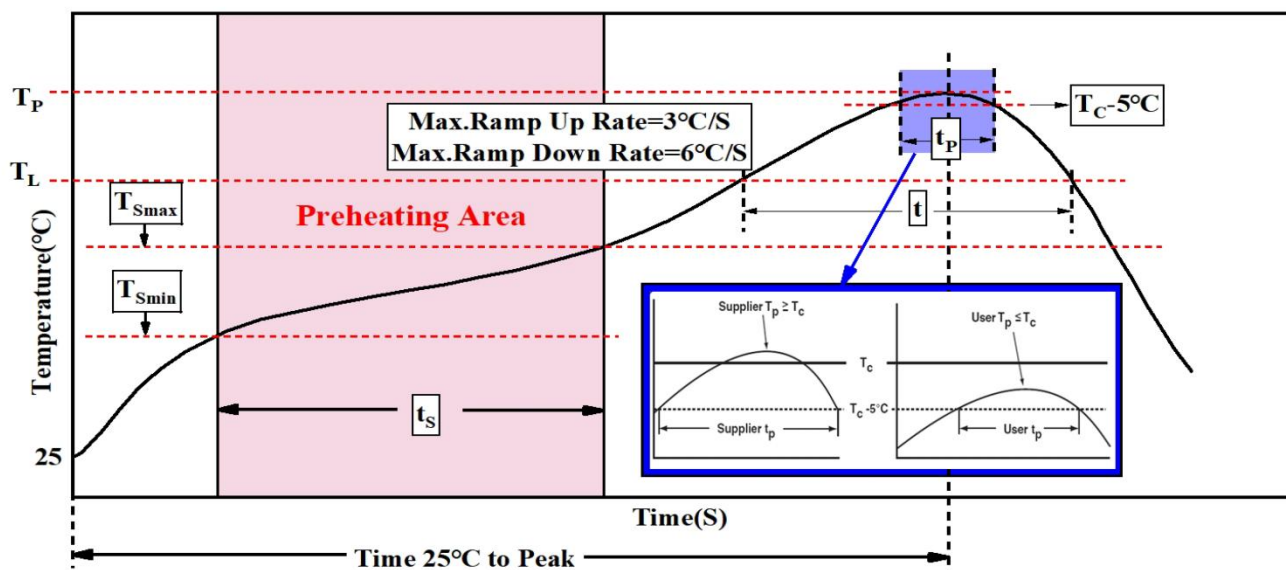
Un-clamped Inductive Load Switching



Drain-Source Body Diode Reverse Recovery



Temperature Profile for IR Reflow Soldering(Pb-Free)



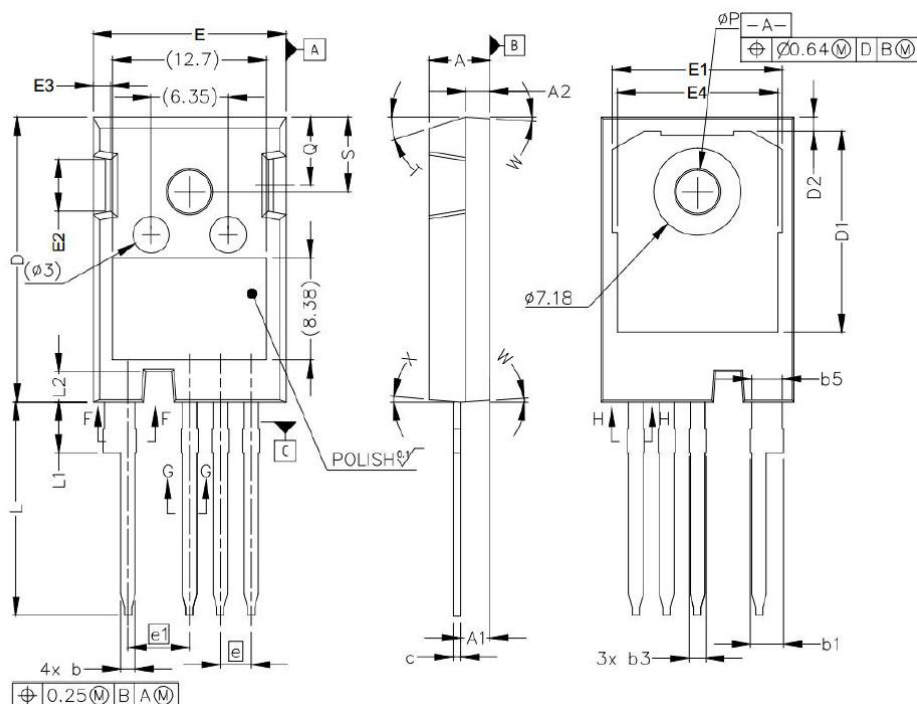
Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat & Soak		
Temperature min (T _{min})	100°C	150°C
Temperature max (T _{max})	150°C	200°C
Time (T _{min} to T _{max}) (t _s)	60-120 seconds	60-120 seconds
Average ramp-up rate (T _{max} to T _p)	3 °C/second max.	3°C/second max.
Liquidous temperature (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-247-4L Package Information


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.83	5.21	0.19	0.21
A1	2.29	2.54	0.09	0.10
A2	1.91	2.16	0.08	0.09
b1	2.39	2.94	0.09	0.12
b3	1.07	1.60	0.04	0.06
b5	2.39	2.69	0.09	0.11
c	0.55	0.68	0.02	0.03
D	23.30	23.60	0.92	0.93
D1	16.25	17.65	0.64	0.69
D2	0.95	1.25	0.04	0.05
E	15.75	16.13	0.62	0.64
E1	13.10	14.15	0.52	0.56
E2	3.68	5.10	0.14	0.20
E3	1.00	1.90	0.04	0.07
E4	12.38	13.43	0.49	0.53
e	2.54 BSC		0.1 BSC	
e1	5.08 BSC		0.2 BSC	
L	17.31	17.82	0.68	0.70
L1	3.97	4.37	0.16	0.17
L2	2.35	2.65	0.09	0.10
ΦP	3.51	3.65	0.14	0.14
Q	5.49	6.00	0.22	0.24
S	6.04	6.30	0.24	0.25
T	17.5° REF.		0.69° REF.	
W	3.5° REF.		0.14° REF.	
X	4.0° REF.		0.16° REF.	