

Product Summary

$V_{(BR)DSS}$	$R_{DS(on)TYP}$	I_D
150V	$3.55m\Omega@10V$	235A



合肥矽普半导体

Siliup Semiconductor Technology Co., Ltd

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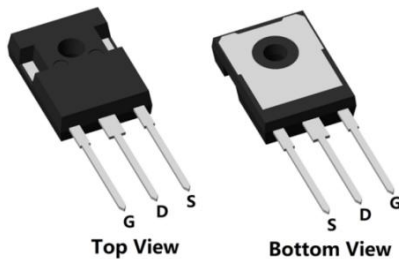
Feature

- Fast Switching
- Low Gate Charge and $R_{DS(on)}$
- Advanced Split Gate Trench Technology
- 100% Single Pulse avalanche energy Test
- **AEC-Q101** quality

Applications

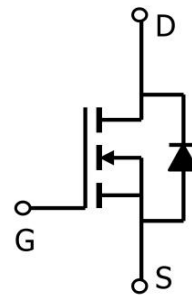
- PWM Application
- Hard switched and high frequency circuits
- Power Management

Package

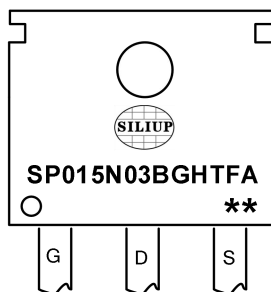


TO-247(1:G 2:D 3:S)

Circuit diagram



Marking



SP015N03BGHTFA : Product code
** : Week code

Order Information

Device	Package	Unit/Tube
SP015N03BGHTFA	TO-247	30

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

Parameter	Symbol	Rating	Units
Drain-Source Voltage	V_{DS}	150	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current (Tc=25°C)	I_D	235	A
Continuous Drain Current (Tc=100°C)	I_D	157	A
Pulsed Drain Current	I_{DM}	940	A
Single Pulse Avalanche Energy ¹	E_{AS}	1681	mJ
Power Dissipation (Tc=25°C)	P_D	430	W
Power Dissipation (Tc=100°C)	P_D	215	W
Thermal Resistance Junction-to-Case	$R_{\theta JC}$	0.35	°C/W
Thermal Resistance Junction-to-Ambient	$R_{\theta JA}$	46	°C/W
Storage Temperature Range	T_{STG}	-55 to 175	°C
Operating Junction Temperature Range	T_J	-55 to 175	°C

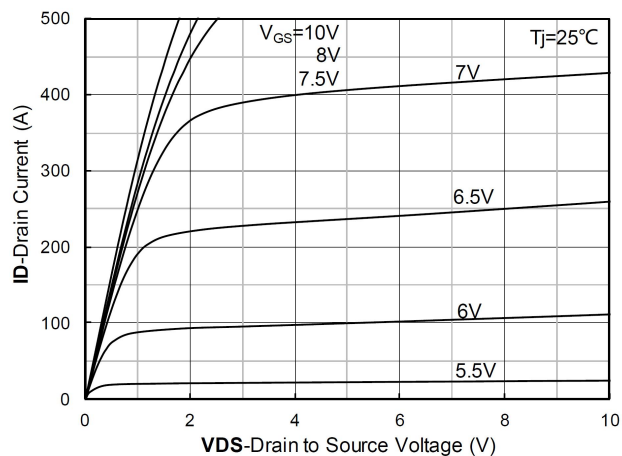
Electrical characteristics (Ta=25°C, unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	ID=250μA , VGS=0V	150	170	-	V
Drain-Source Leakage Current	Idss	VDS=150V , VGS=0V	-	-	1	uA
Gate-Source Leakage Current	IGSS	VGS=±20V , VDS=0V	-	-	±100	nA
Gate Threshold Voltage	VGS(th)	VDS=VGS , ID=250μA	2.6	3.0	3.4	V
Static Drain-Source On-Resistance	RDS(ON)	VGS=10V , ID=20A	-	3.55	4.2	mΩ
Gate Resistance	RG	VDS=75V , VGS=0V , f=1MHz	-	1.5	-	Ω
Dynamic characteristics						
Input Capacitance	Ciss	VDS=75V , VGS=0V , f=1MHz	-	10402	-	pF
Output Capacitance	Coss		-	635	-	
Reverse Transfer Capacitance	Crss		-	24	-	
Total Gate Charge	Qg	VDS=75V , VGS=10V , ID=20A	-	148	-	nC
Gate-Source Charge	Qgs		-	58	-	
Gate-Drain Charge	Qgd		-	40	-	
Gate Plateau Voltage	Vplateau		-	5.1	-	V
Switching Characteristics						
Turn-On Delay Time	Td(on)	VDD=75V , VGS=10V , RG=3.0Ω , ID=20A	-	40	-	nS
Rise Time	Tr		-	72	-	
Turn-Off Delay Time	Td(off)		-	108	-	
Fall Time	Tf		-	58	-	
Diode Characteristics						
Diode Forward Voltage	VSD	VGS=0V , IS=1A , TJ=25℃	-	-	1.2	V
Maximum Body-Diode Continuous Current	IS		-	-	235	A
Reverse Recovery Time	Trr	IS=15A , di/dt=100A/us , TJ=25℃	-	112	-	nS
Reverse Recovery Charge	Qrr		-	426	-	nC

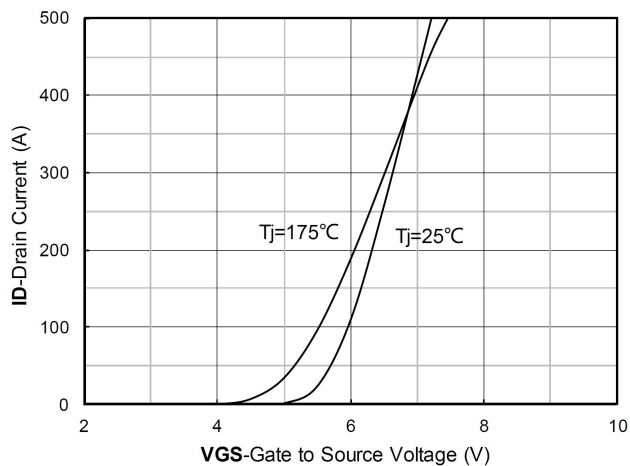
Note :

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

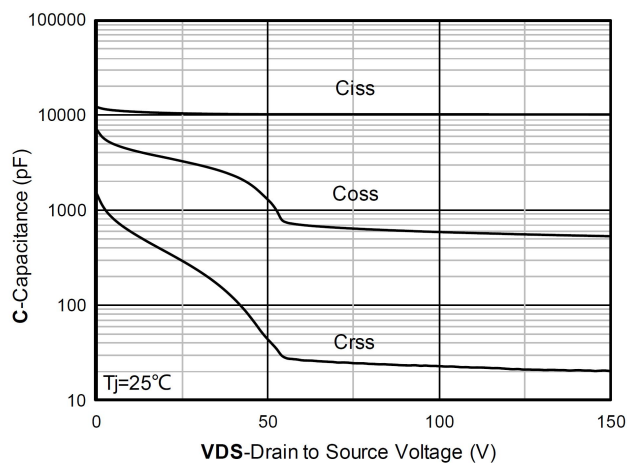
Typical Characteristics



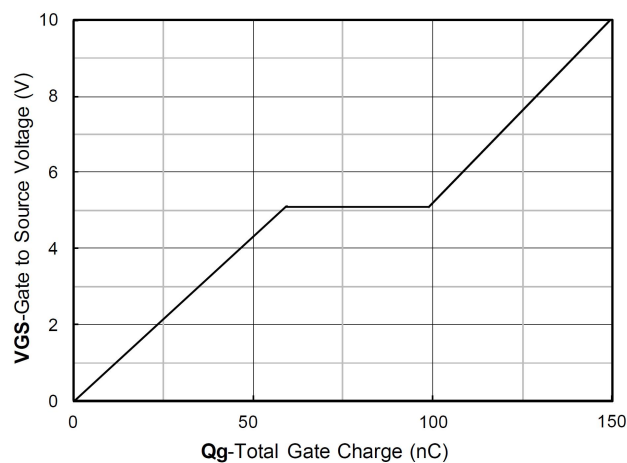
Output Characteristics



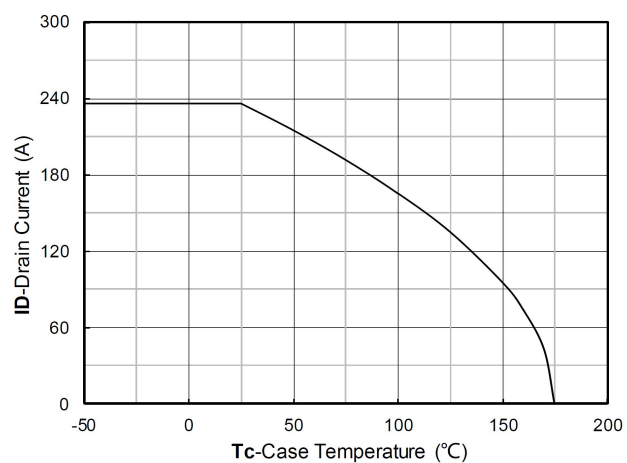
Transfer Characteristics



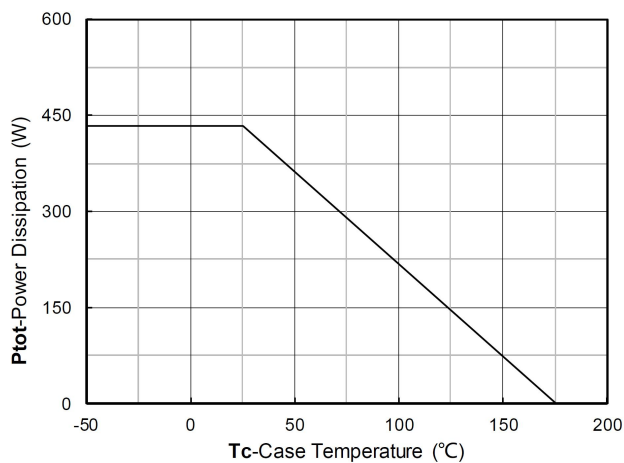
Capacitance Characteristics



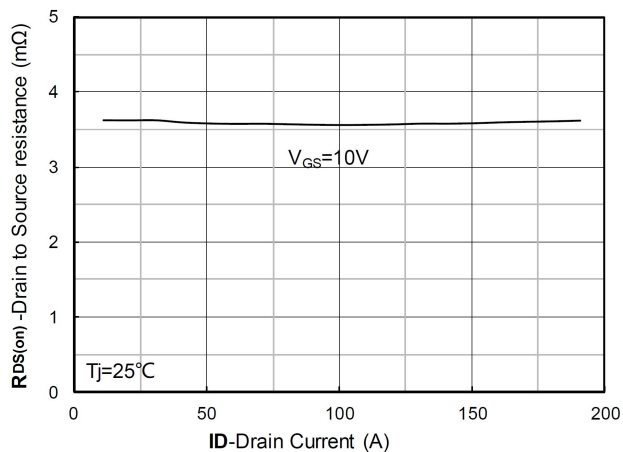
Gate Charge



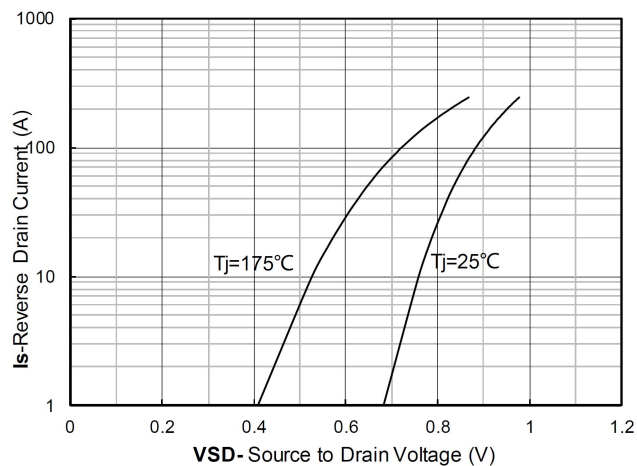
Current dissipation



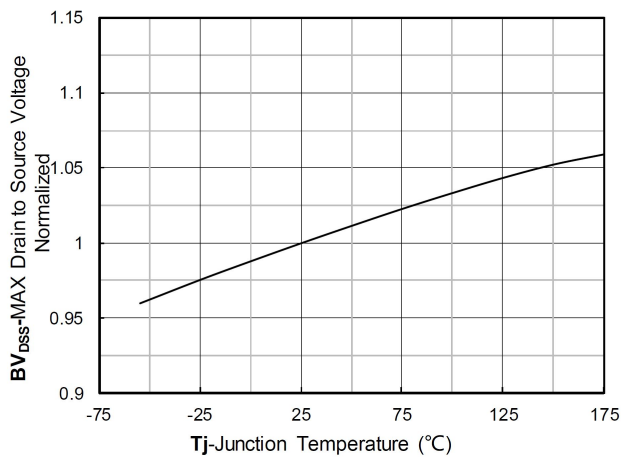
Power dissipation



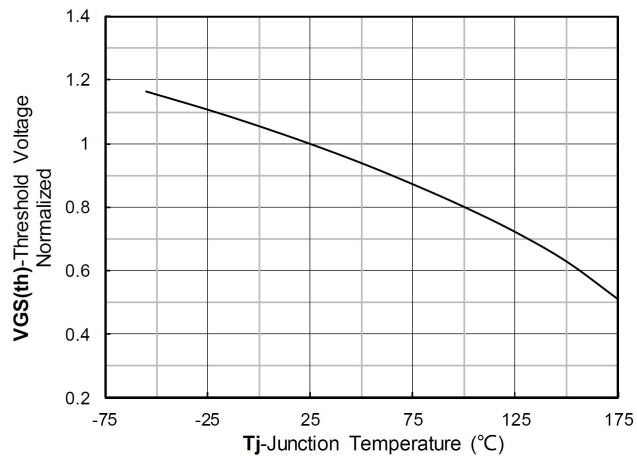
$R_{DS(on)}$ vs. Drain Current



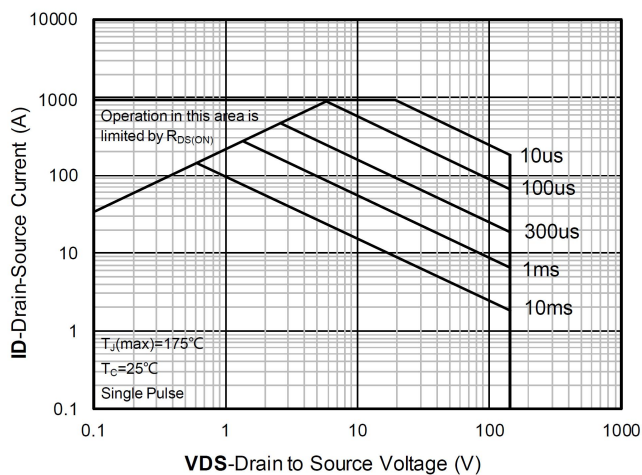
Forward characteristics of reverse diode



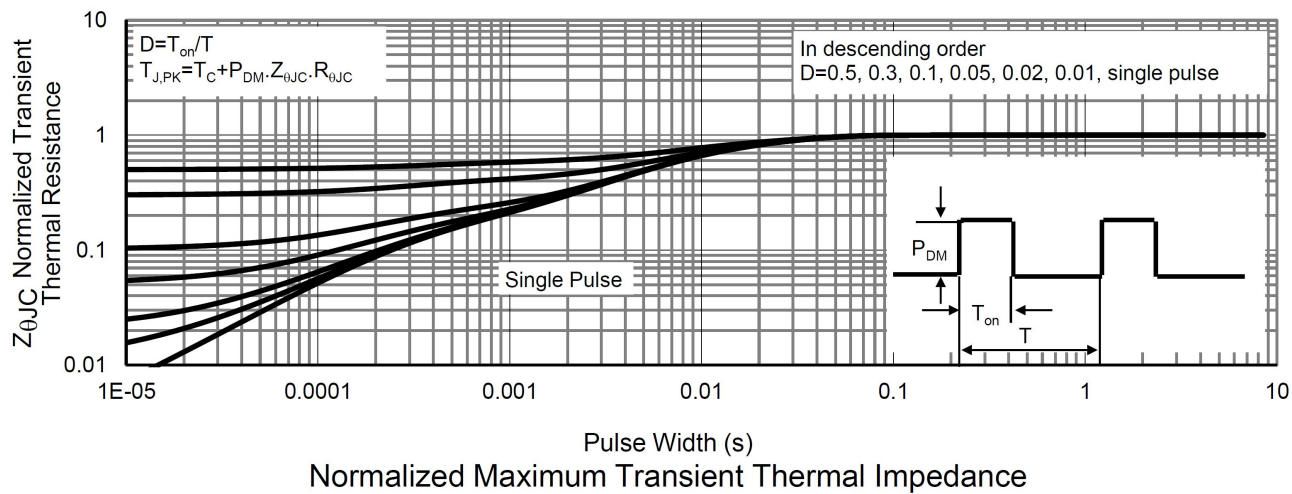
Normalized breakdown voltage



Normalized Threshold voltage

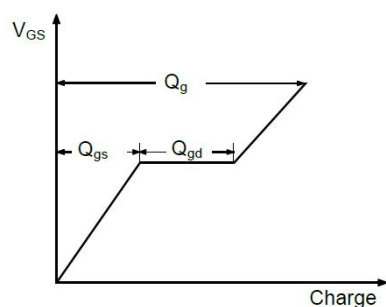
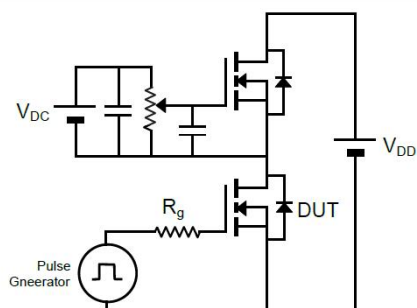


Safe Operation Area

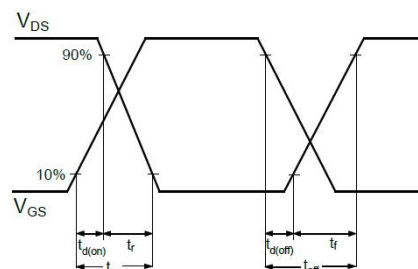
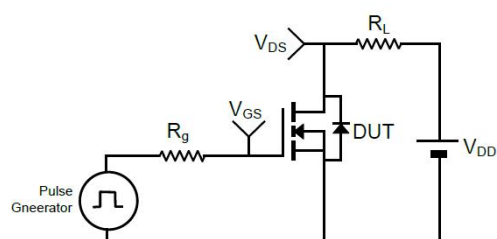


Test Circuit

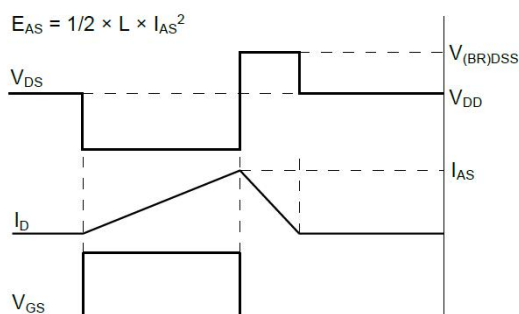
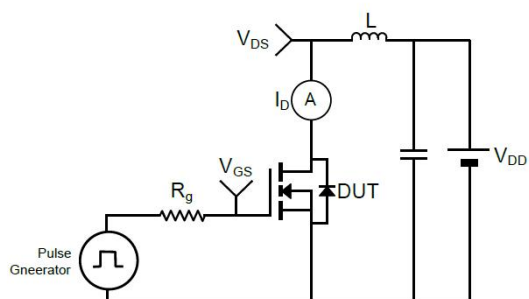
Gate Charge



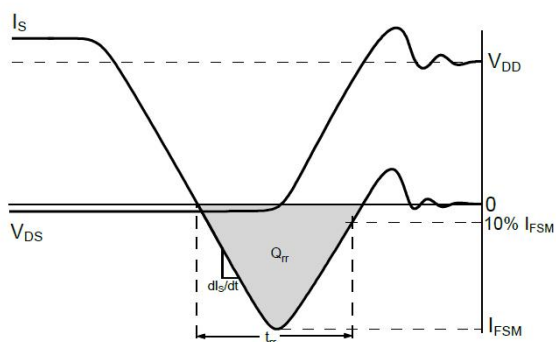
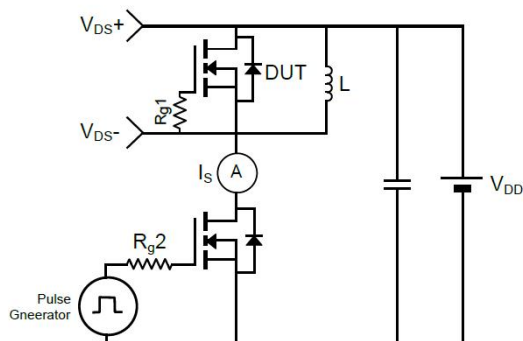
Resistive Load Switching Time

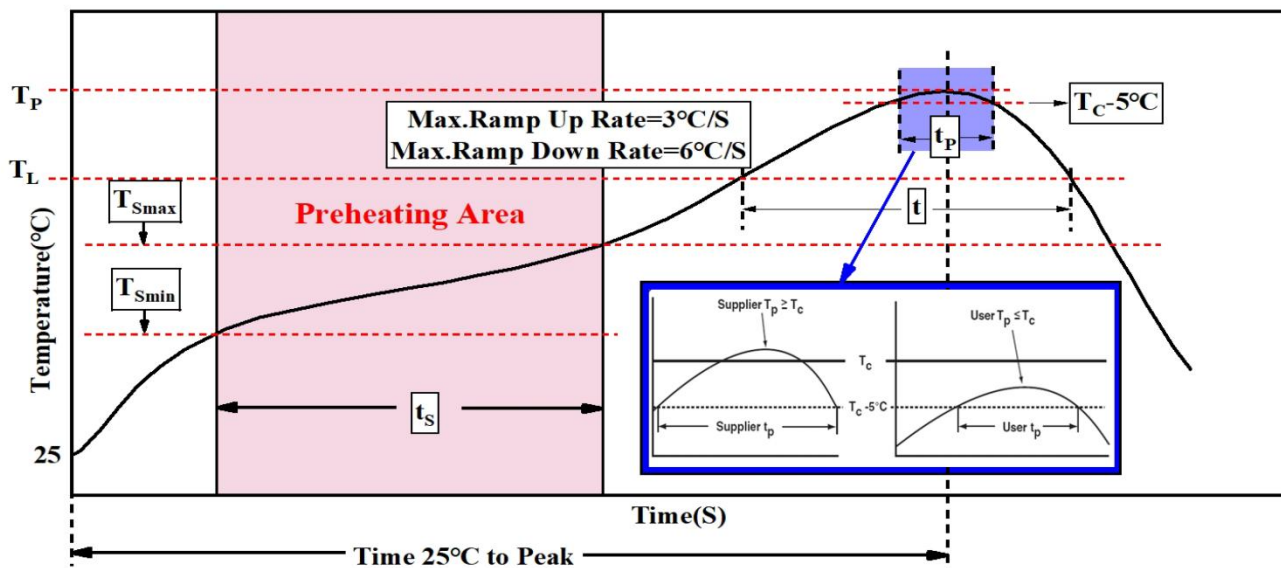


Un-clamped Inductive Load Switching



Drain-Source Body Diode Reverse Recovery



Temperature Profile for IR Reflow Soldering


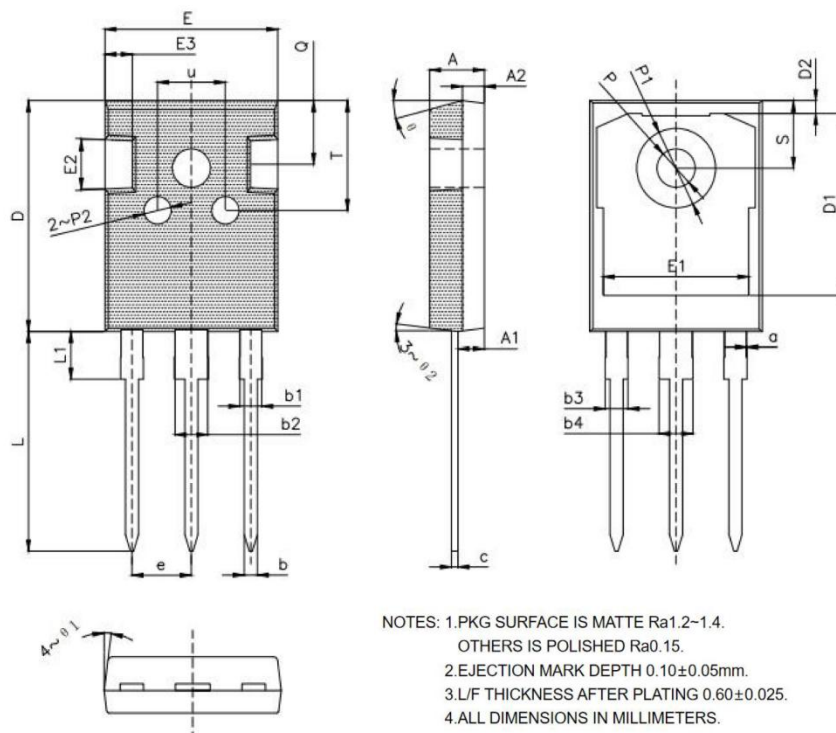
Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat & Soak		
Temperature min (T_{Smin})	100°C	150°C
Temperature max (T_{Smax})	150°C	200°C
Time (T_{Smin} to T_{Smax}) (t_s)	60-120 seconds	60-120 seconds
Average ramp-up rate (T_{Smax} to T_P)	3 °C/second max.	3°C/second max.
Liquidous temperature (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

TO-247 Package Information


- NOTES: 1.PKG SURFACE IS MATTE Ra1.2~1.4.
OTHERS IS POLISHED Ra0.15.
2.EJECTION MARK DEPTH 0.10 ± 0.05 mm.
3.L/F THICKNESS AFTER PLATING 0.60 ± 0.025 .
4.ALL DIMENSIONS IN MILLIMETERS.

Symbol	Dimensions In Millimeters	
	Min.	Max.
A	4.900	5.100
A1	2.310	2.510
A2	1.900	2.100
a	0.000	0.150
b	1.160	1.260
b1	1.960	2.040
b2	2.960	3.040
b3	2.000	2.200
b4	3.000	3.200
c	0.550	0.650
D	20.900	21.200
D1	16.350	16.750
D2	1.070	1.270
E	15.700	15.900
E1	13.100	13.500
E2	4.400	4.600
E3	2.400	2.600
e	5.436 BSC.	
L	19.720	20.120
L1	-	4.300
P	3.400	3.600
P1	7.100	7.300
P2	2.400	2.600
Q	5.600	6.000
S	6.050	6.250
T	9.800	10.200
U	6.000	6.400
θ	13°	17°
θ1	5°	9°
θ2	5°	9°