

Product Summary

$V_{(BR)DSS}$	$R_{DS(on)TYP}$	I_D
120V	1.95mΩ@10V	275A



合肥矽普半导体

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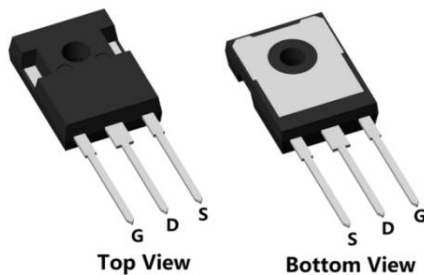
Feature

- Fast Switching
- Low Gate Charge and $R_{DS(on)}$
- Advanced Split Gate Trench Technology
- **AEC-Q101** quality
- **100% UIS TESTED**

Applications

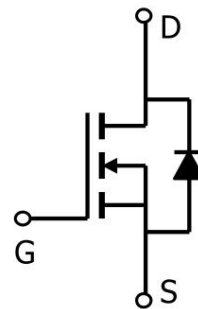
- PWM Application
- Hard switched and high frequency circuits
- Power Management

Package

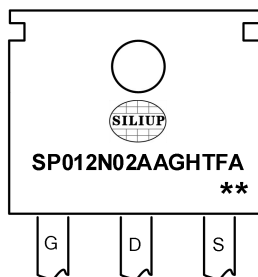


TO-247(1:G 2:D 3:S)

Circuit diagram



Marking



SP012N02AAGHTFA : Product code
****** : Week code

Order Information

Device	Package	Unit/Tube
SP012N02AAGHTFA	TO-247	30

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

Parameter		Symbol	Rating	Units
Drain-Source Voltage		V_{DS}	120	V
Gate-Source Voltage		V_{GS}	± 20	V
Continuous Drain Current (Tc=25°C)	Package Limit	I_D	275	A
Continuous Drain Current (Tc=25°C)	Silicon Limit	I_D	345	A
Continuous Drain Current (Tc=100°C)		I_D	183	A
Pulsed Drain Current		I_{DM}	1100	A
Single Pulse Avalanche Energy ¹		E_{AS}	2809	mJ
Power Dissipation (Tc=25°C)		P_D	335	W
Power Dissipation (Tc=100°C)		P_D	167.5	W
Thermal Resistance Junction-to-Case		$R_{\theta JC}$	0.45	°C/W
Thermal Resistance Junction-to-Ambient		$R_{\theta JA}$	43	°C/W
Storage Temperature Range		T_{STG}	-55 to 175	°C
Operating Junction Temperature Range		T_J	-55 to 175	°C

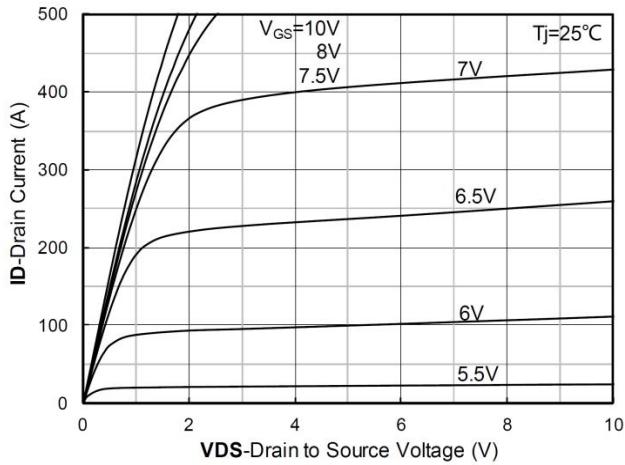
Electrical characteristics (Ta=25°C, unless otherwise noted)

Characteristics	Symbol	Test Condition	Min	Typ	Max	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	ID=250μA , VGS=0V	120	135	-	V
Drain Cut-Off Current	I _{DSS}	VDS=120V , VGS=0V	-	-	1	μA
Gate Leakage Current	I _{GSS}	VGS=±20V , VDS=0V	-	-	±100	nA
Gate Threshold Voltage	V _{GS(th)}	VDS=VGS , ID=250μA	2.6	3.2	3.6	V
Drain-Source ON Resistance	R _{DS(ON)}	VGS=10V , ID=50A	-	1.95	2.75	mΩ
Gate Resistance	R _G	f=1MHz	-	2.16	-	Ω
Dynamic Characteristics						
Input Capacitance	C _{iss}	VDS=60V , VGS=0V , f=1.0MHz	-	10852	-	pF
Output Capacitance	C _{OSS}		-	1352	-	
Reverse Transfer Capacitance	C _{rss}		-	49	-	
Total Gate Charge	Q _g	VDS=60V , VGS=10V , ID=100A	-	200	-	nC
Gate-Source Charge	Q _{gs}		-	56	-	
Gate-Drain Charge	Q _{gd}		-	52	-	
Gate Plateau Voltage	V _{plateau}		-	5	-	V
Switching Characteristics						
Turn-On Delay Time	t _{d(on)}	VDS=60V , VGS=10V , ID=100A , RG=1.6Ω	-	32	-	nS
Rise Time	t _r		-	25	-	
Turn-Off Delay Time	t _{d(off)}		-	72	-	
Fall Time	t _f		-	27	-	
Drain-Source Body Diode Characteristics						
Source-Drain Diode Forward Voltage	V _{SD}	IS=1A , VGS=0V , TJ=25℃	-	-	1.2	V
Maximum Body-Diode Continuous Current	I _S		-	-	275	A
Reverse Recovery Time	T _{rr}	IS=100A , di/dt=100A/us , TJ=25℃	-	103	-	nS
Reverse Recovery Charge	Q _{rr}		-	264	-	nC

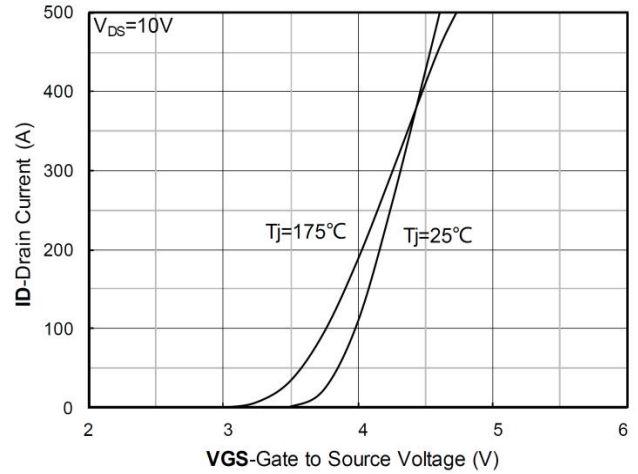
Note :

1. The test condition is VDD=60V, VGS=10V, L=0.5mH, RG=25 Ω ;

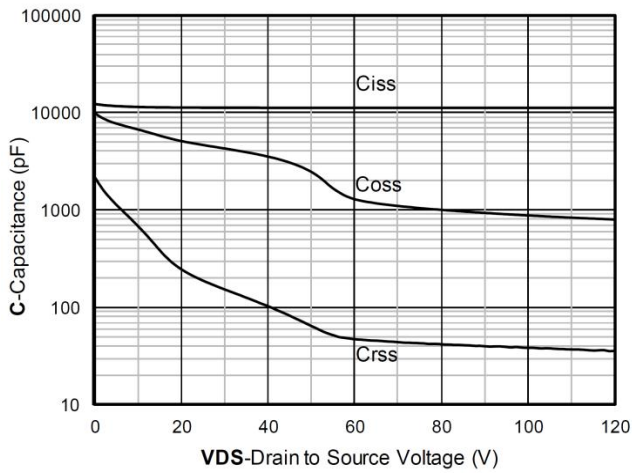
Typical Characteristics



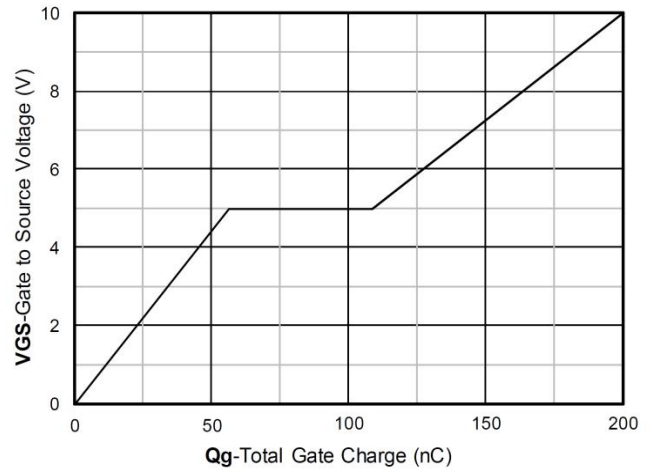
Output Characteristics



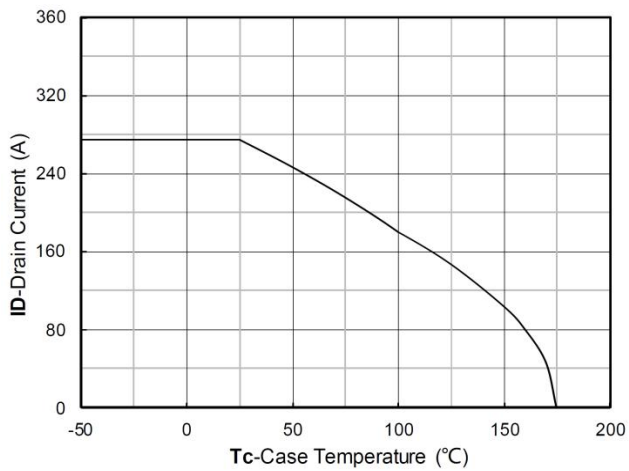
Transfer Characteristics



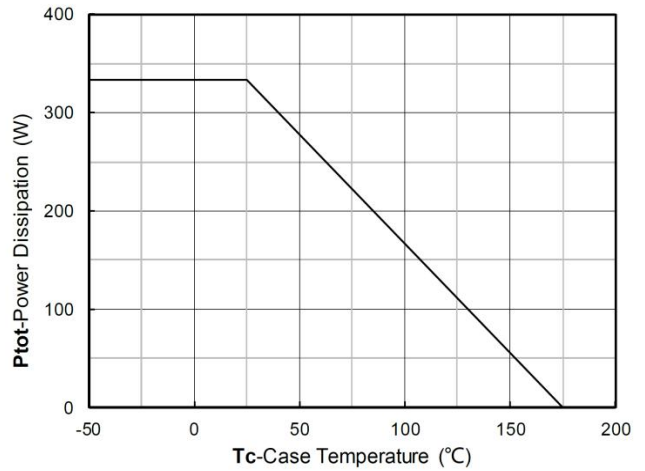
Capacitance Characteristics



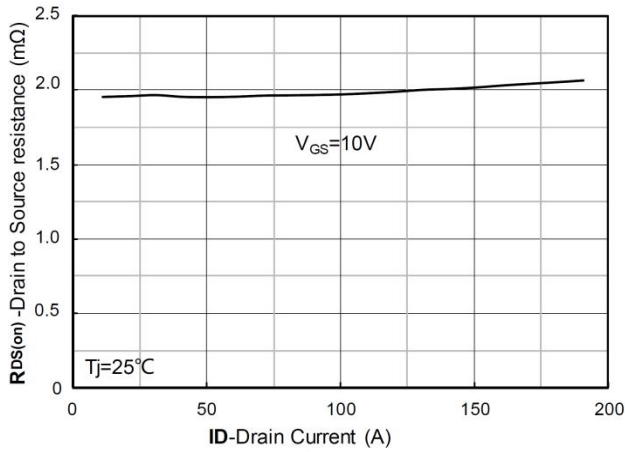
Gate Charge



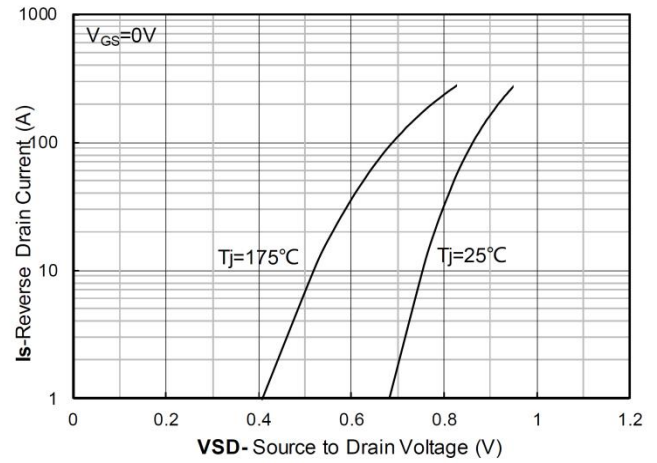
Current dissipation



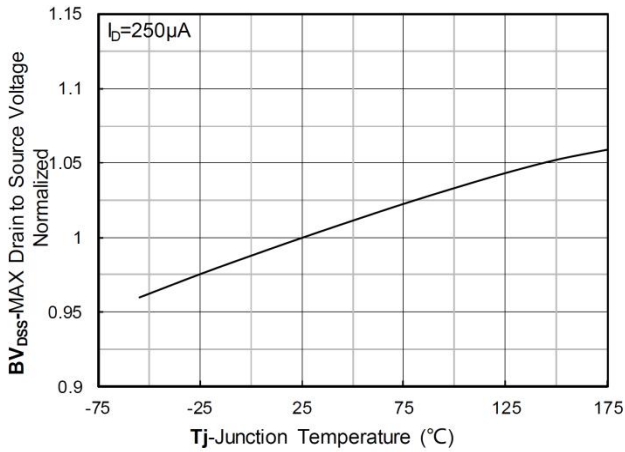
Power dissipation



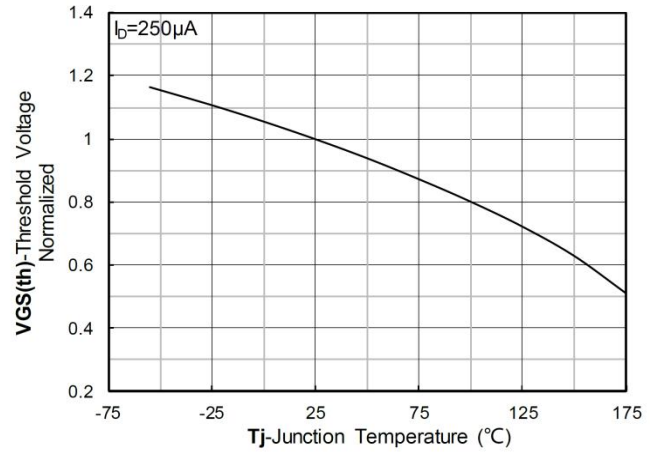
RDS(on) vs. Drain Current



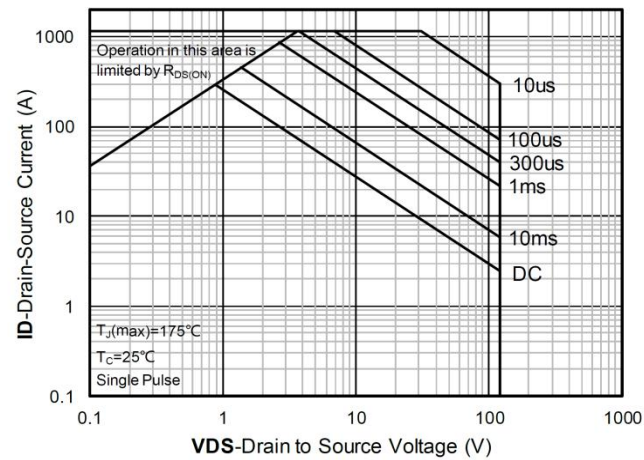
Forward characteristics of reverse diode



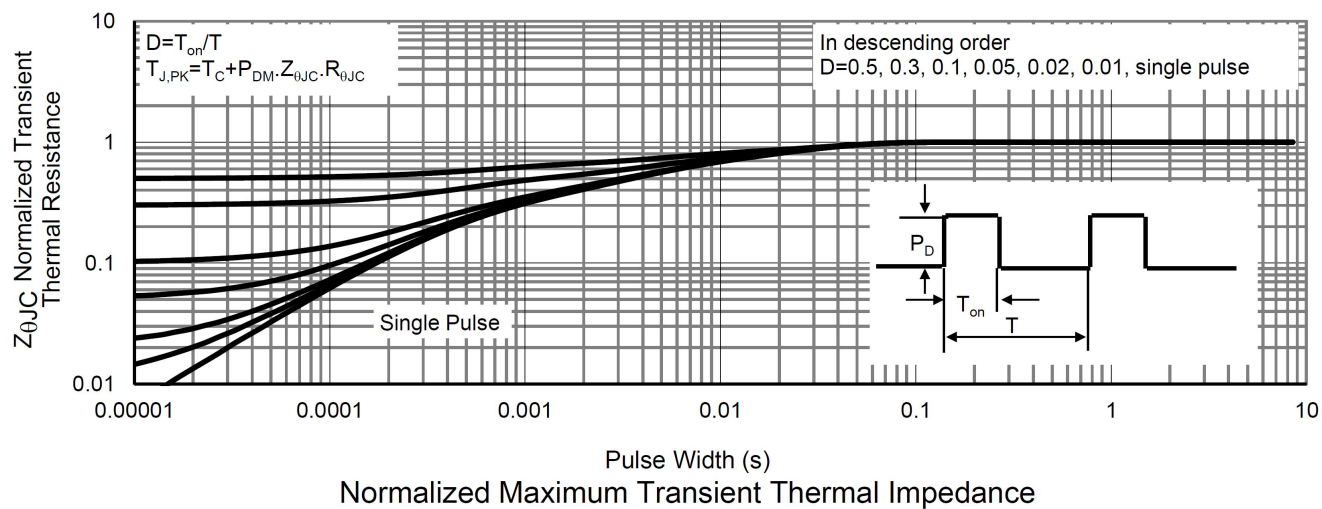
Normalized breakdown voltage

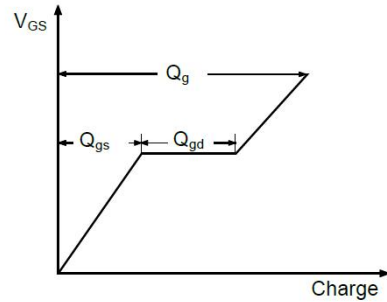
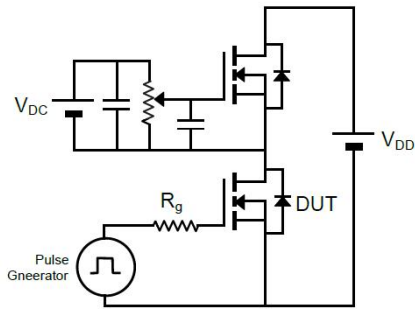
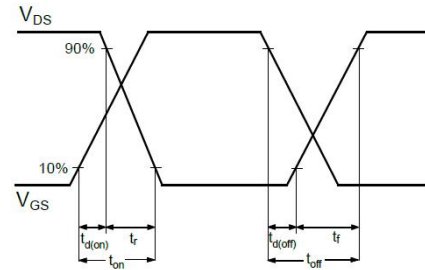
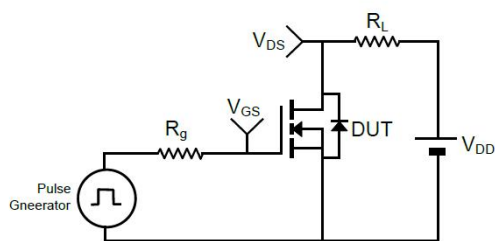
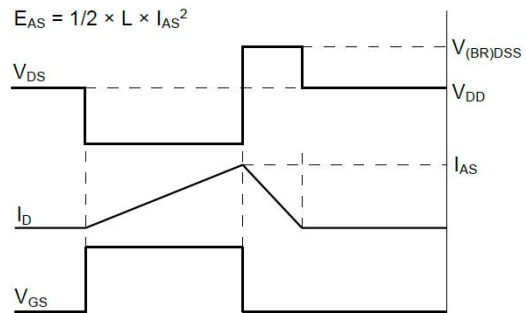
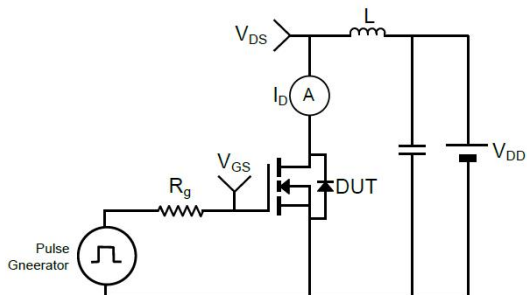
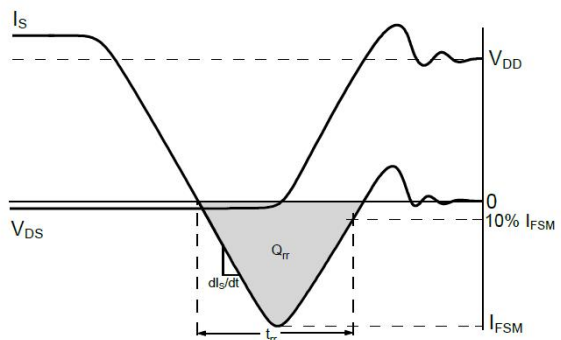
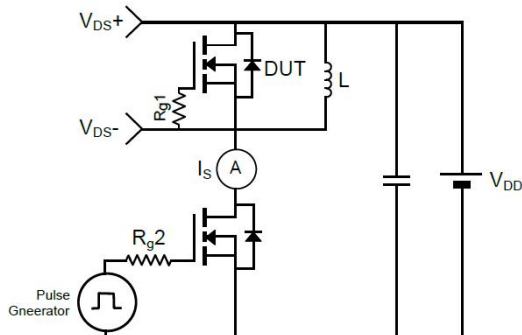


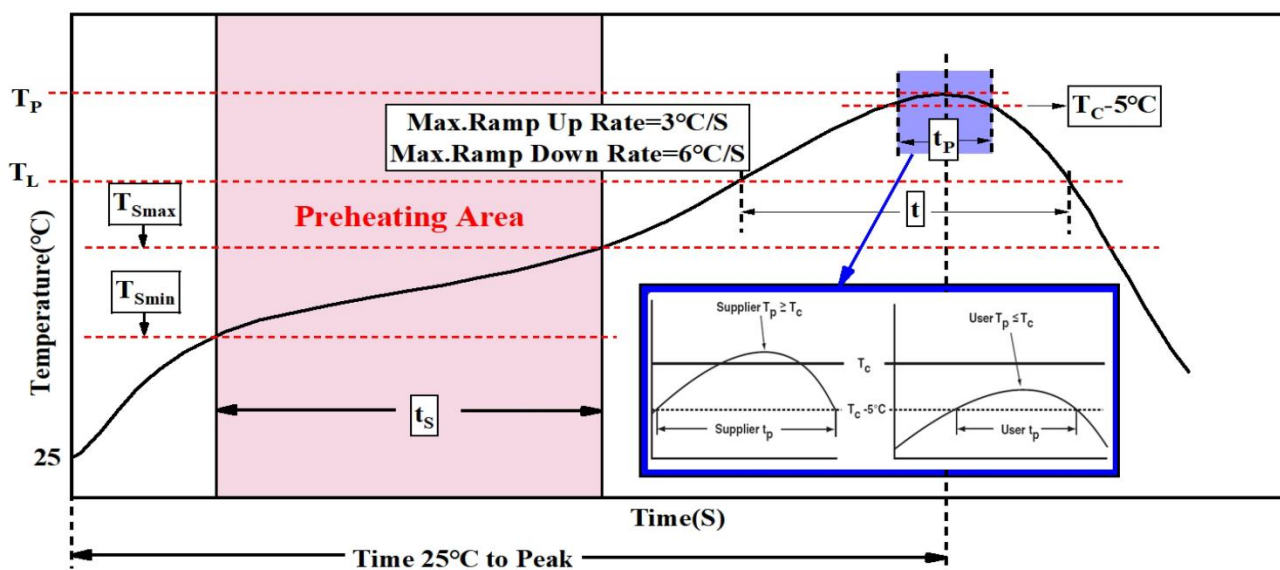
Normalized Threshold voltage



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


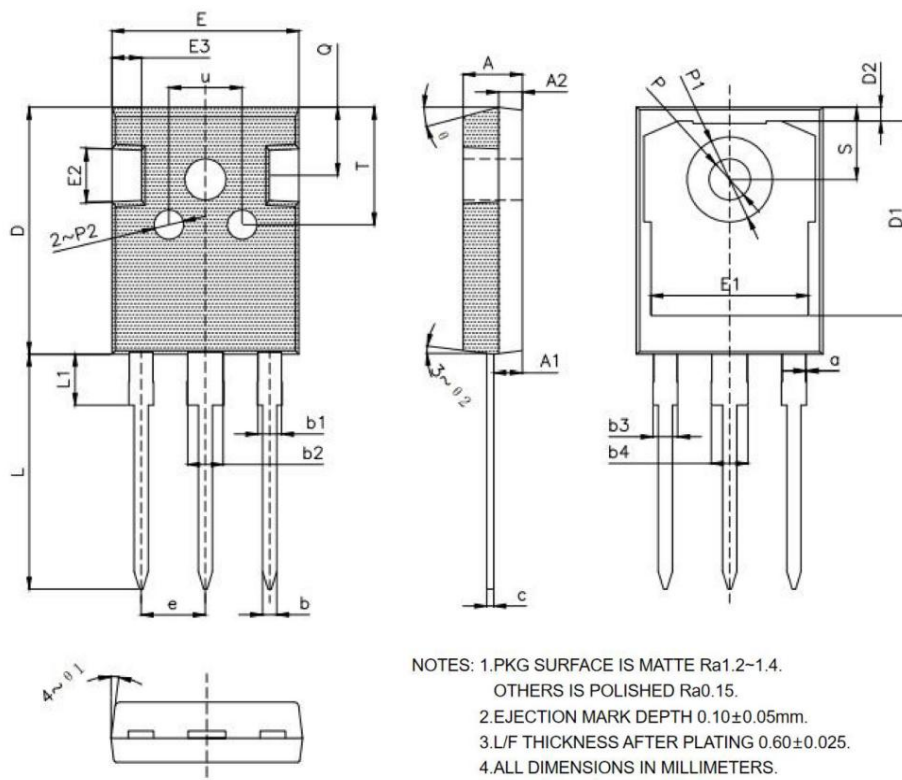
Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat & Soak		
Temperature min (T_{smin})	100°C	150°C
Temperature max (T_{smax})	150°C	200°C
Time (T_{smin} to T_{smax}) (t_s)	60-120 seconds	60-120 seconds
Average ramp-up rate (T_{smax} to T_p)	3 °C/second max.	3°C/second max.
Liquidous temperature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


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°