

## Product Summary

| $V_{(BR)DSS}$ | $R_{DS(on)TYP}$ | $I_D$ |
|---------------|-----------------|-------|
| 150V          | 5.1mΩ@10V       | 200A  |



**合肥矽普半导体**

*Siliup Semiconductor Technology Co., Ltd*

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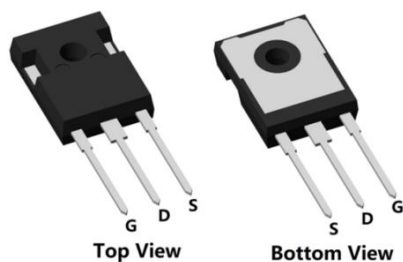
## Feature

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

## Applications

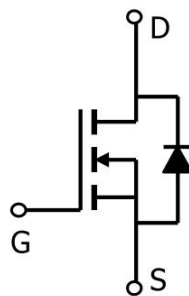
- Power switching application
- DC-DC Converter
- Power Management

## Package

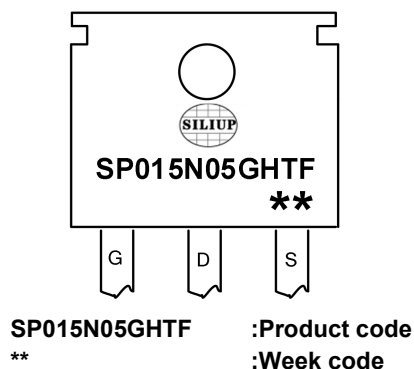


TO-247(1:G 2:D 3:S)

## Circuit diagram



## Marking



## Order Information

| Device       | Package | Unit/Tube |
|--------------|---------|-----------|
| SP015N05GHTF | TO-247  | 30        |

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

| Parameter                                  | Symbol          | Rating     | Unit |
|--------------------------------------------|-----------------|------------|------|
| Drain-Source Voltage                       | $V_{DS}$        | 150        | V    |
| Gate-Source Voltage                        | $V_{GS}$        | $\pm 20$   | V    |
| Continuous Drain Current (Tc=25°C)         | $I_D$           | 200        | A    |
| Continuous Drain Current (Tc=100°C)        | $I_D$           | 133        | A    |
| Pulsed Drain Current                       | $I_{DM}$        | 800        | A    |
| Single Pulse Avalanche Energy <sup>1</sup> | $E_{AS}$        | 1225       | mJ   |
| Power Dissipation (Tc=25°C)                | $P_D$           | 335        | W    |
| Power Dissipation (Tc=100°C)               | $P_D$           | 134        | W    |
| Thermal Resistance Junction-to-Case        | $R_{\theta JC}$ | 0.37       | °C/W |
| Storage Temperature Range                  | $T_{STG}$       | -55 to 150 | °C   |
| Operating Junction Temperature Range       | $T_J$           | -55 to 150 | °C   |

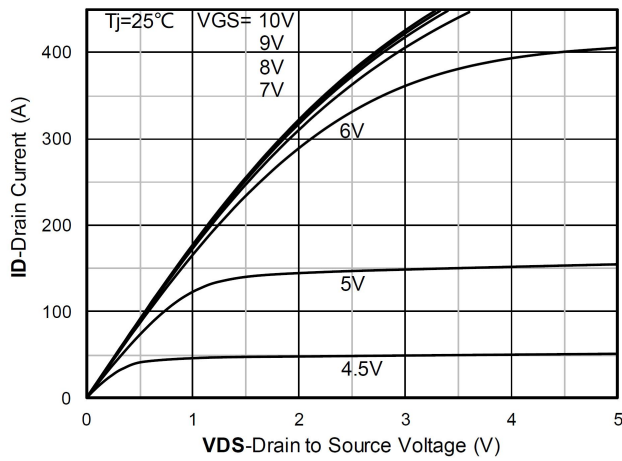
**Electrical characteristics (Ta=25°C, unless otherwise noted)**

| Parameter                             | Symbol            | Conditions                           | Min. | Typ. | Max. | Unit |
|---------------------------------------|-------------------|--------------------------------------|------|------|------|------|
| Static Characteristics                |                   |                                      |      |      |      |      |
| Drain-Source Breakdown Voltage        | BV <sub>DSS</sub> | ID=250μA , VGS=0V                    | 150  | -    | -    | V    |
| Drain-Source Leakage Current          | IDSS              | VDS=120V , VGS=0V                    | -    | -    | 1    | uA   |
| Gate-Source Leakage Current           | IGSS              | VGS=±20V , VDS=0V                    | -    | -    | ±100 | nA   |
| Gate Threshold Voltage                | VGS(th)           | VDS=VGS , ID=250μA                   | 2.8  | 3.2  | 3.8  | V    |
| Static Drain-Source On-Resistance     | RDS(ON)           | VGS=10V , ID=20A                     | -    | 5.1  | 6.4  | mΩ   |
| Gate Resistance                       | RG                | VDS=75V , VGS=0V , f=1MHz            | -    | 4.4  | -    | Ω    |
| Dynamic characteristics               |                   |                                      |      |      |      |      |
| Input Capacitance                     | Ciss              | VDS=75V , VGS=0V , f=1MHz            | -    | 5450 | -    | pF   |
| Output Capacitance                    | Coss              |                                      | -    | 545  | -    |      |
| Reverse Transfer Capacitance          | Crss              |                                      | -    | 16   | -    |      |
| Total Gate Charge                     | Qg                | VDS=75V , VGS=10V , ID=20A           | -    | 72   | -    | nC   |
| Gate-Source Charge                    | Qgs               |                                      | -    | 24   | -    |      |
| Gate-Drain Charge                     | Qgd               |                                      | -    | 16   | -    |      |
| Gate Plateau Voltage                  | Vplateau          |                                      | -    | 4.7  | -    |      |
| Switching Characteristics             |                   |                                      |      |      |      |      |
| Turn-On Delay Time                    | Td(on)            | VDD=75V , VGS=10V , RG=3.0Ω , ID=20A | -    | 14.6 | -    | nS   |
| Rise Time                             | Tr                |                                      | -    | 22   | -    |      |
| Turn-Off Delay Time                   | Td(off)           |                                      | -    | 30   | -    |      |
| Fall Time                             | Tf                |                                      | -    | 11.6 | -    |      |
| Diode Characteristics                 |                   |                                      |      |      |      |      |
| Diode Forward Voltage                 | VSD               | VGS=0V , IS=1A , TJ=25℃              | -    | -    | 1.2  | V    |
| Maximum Body-Diode Continuous Current | IS                |                                      | -    | -    | 200  | A    |
| Reverse Recovery Time                 | Trr               | IS=140A , di/dt=100A/us , TJ=25℃     | -    | 98   | -    | nS   |
| Reverse Recovery Charge               | Qrr               |                                      | -    | 218  | -    | nC   |

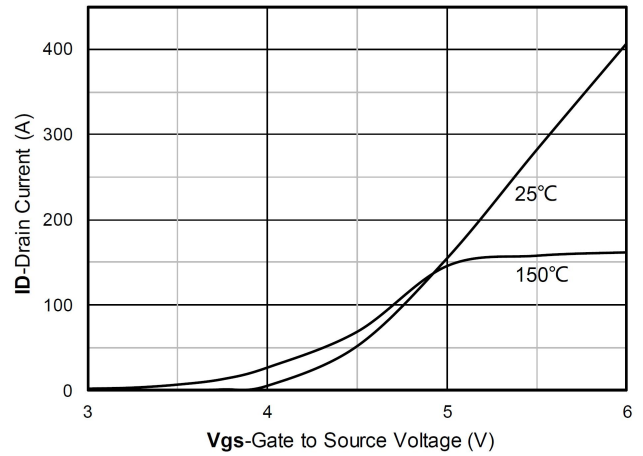
**Note :**

- The test condition is  $V_{DD}=75V$ ,  $V_{GS}=10V$ ,  $L=0.5mH$ ,  $R_G=25\Omega$ ;

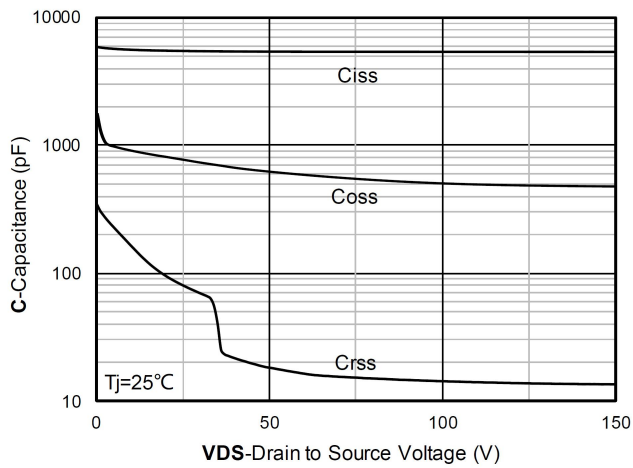
## Typical Characteristics



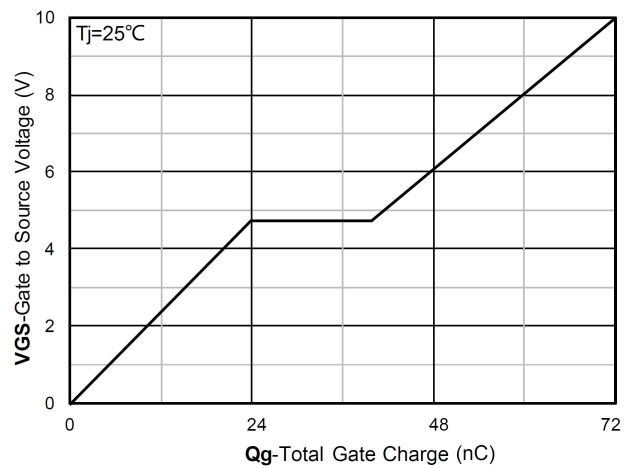
Output Characteristics



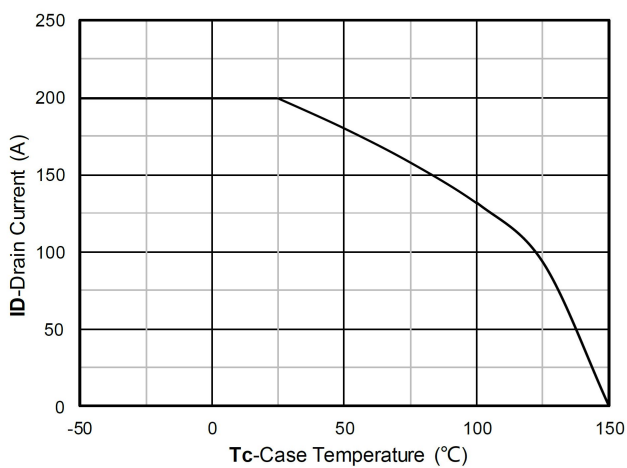
Transfer Characteristics



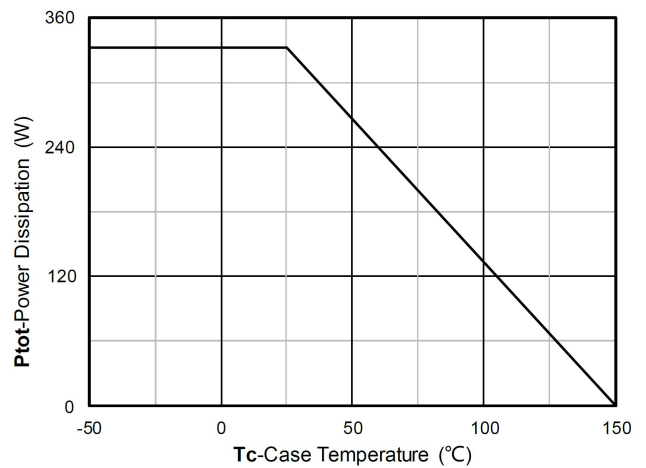
Capacitance Characteristics



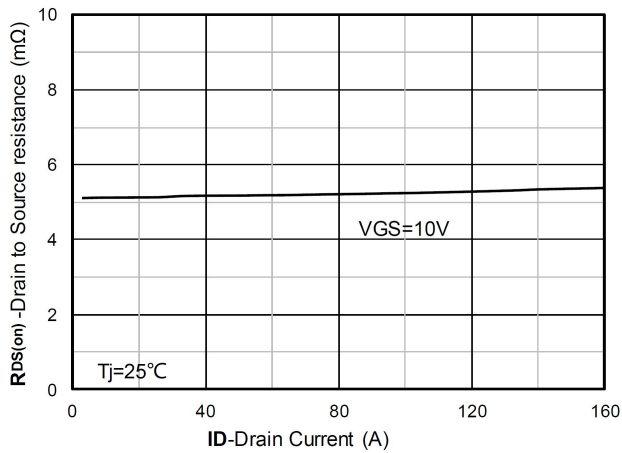
Gate Charge



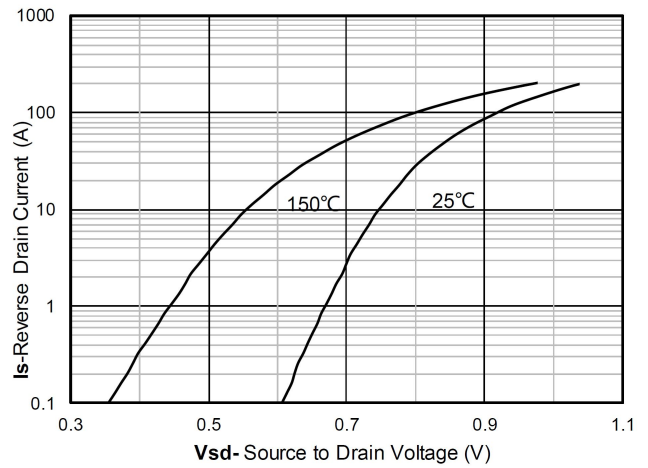
Current dissipation



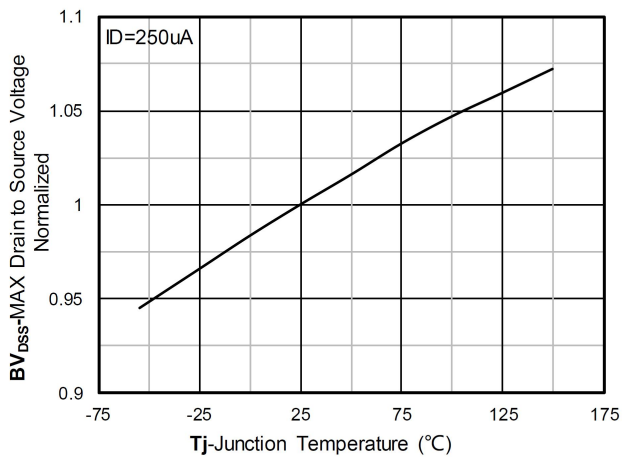
Power dissipation



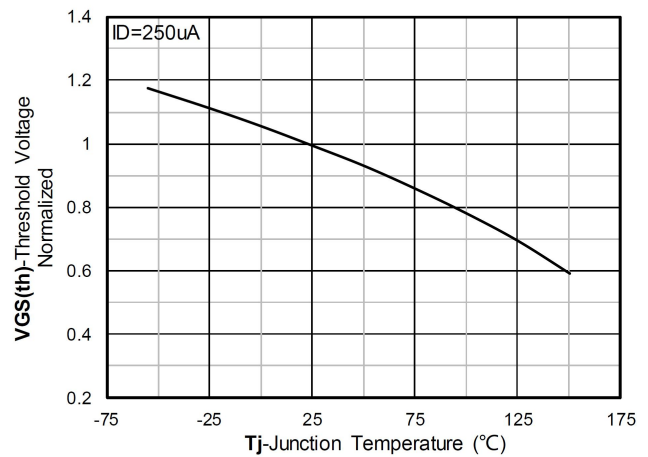
$R_{DS(on)}$  VS Drain Current



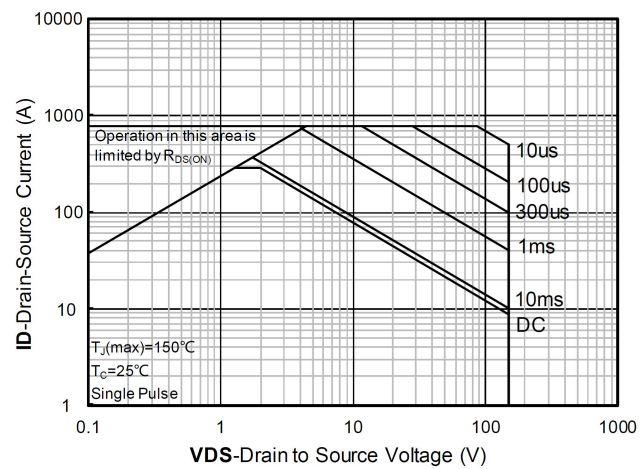
Forward characteristics of reverse diode



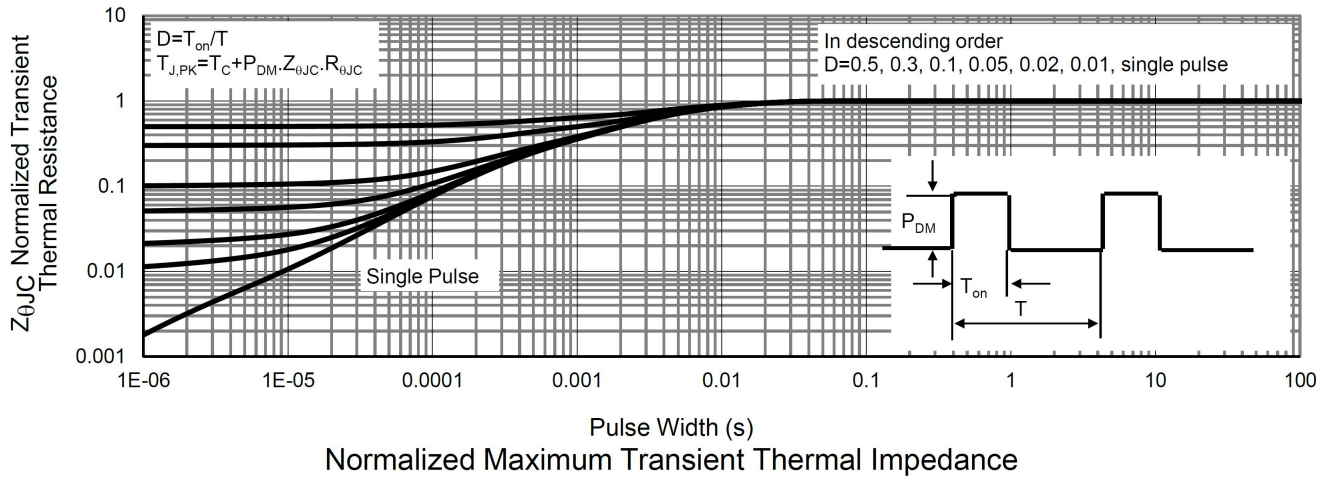
Normalized breakdown voltage



Normalized Threshold voltage

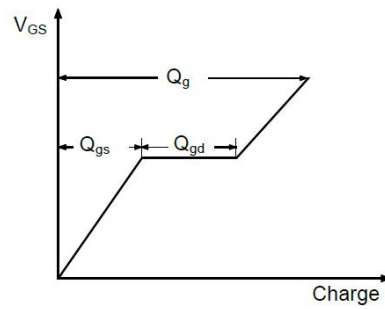
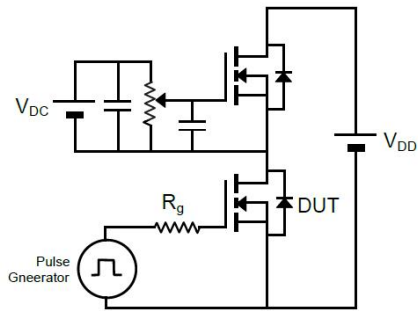


Safe Operation Area

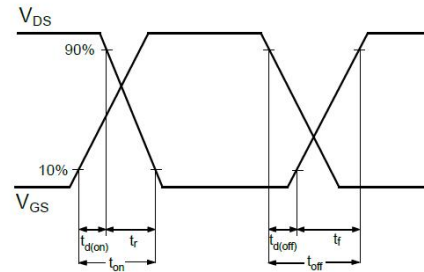
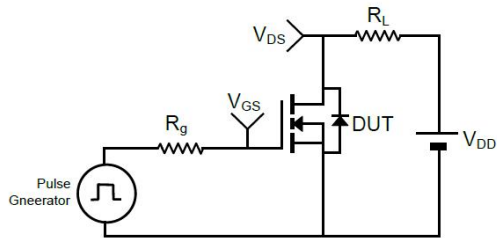


## Test Circuit

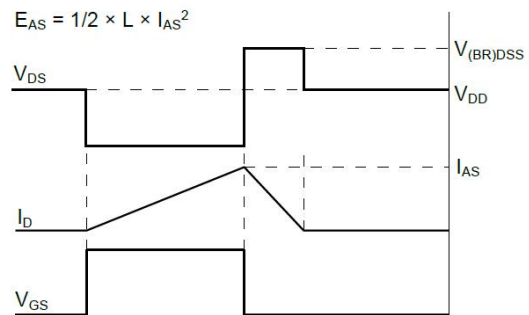
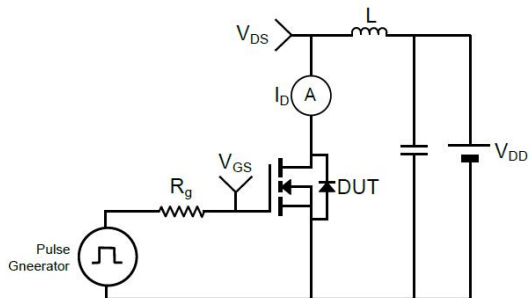
### Gate Charge



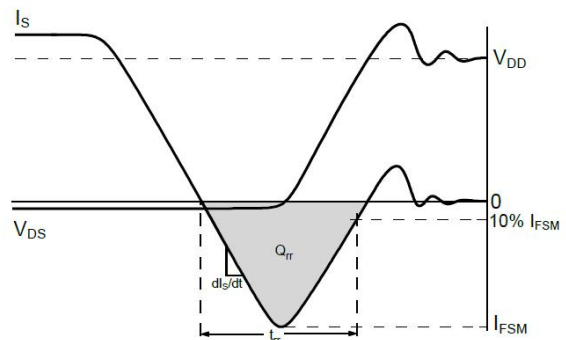
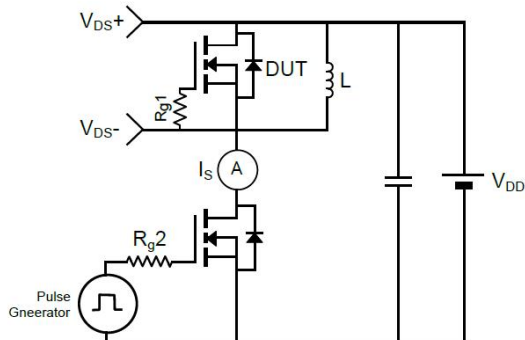
### Resistive Load Switching Time

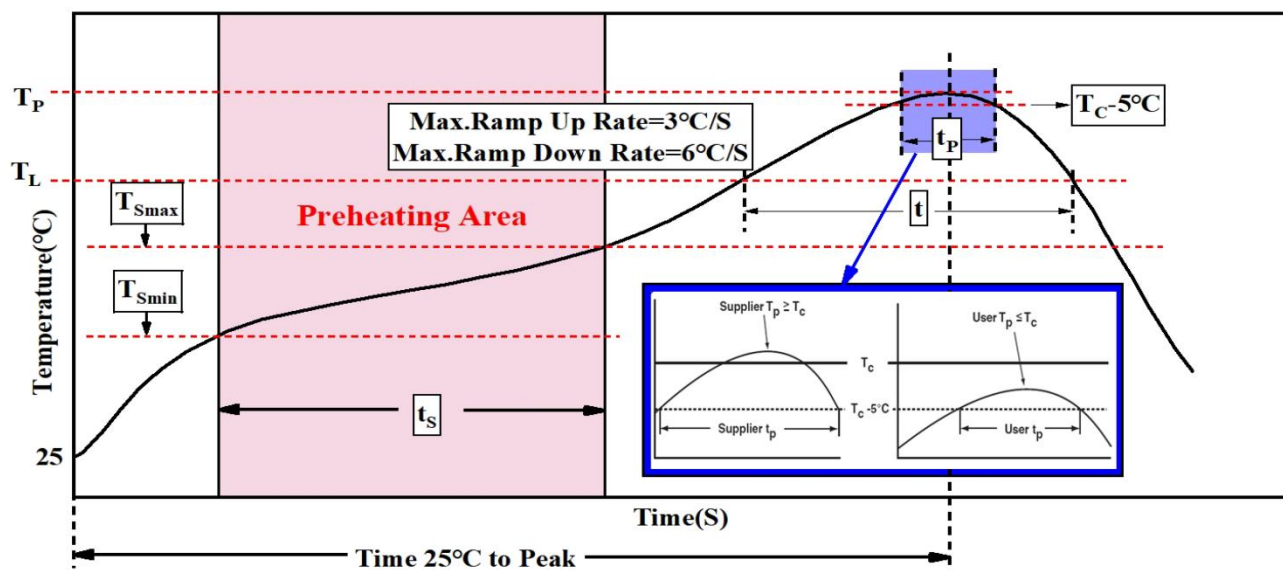


### Un-clamped Inductive Load Switching



### Drain-Source Body Diode Reverse Recovery



**Temperature Profile for IR Reflow Soldering(Pb-Free)**


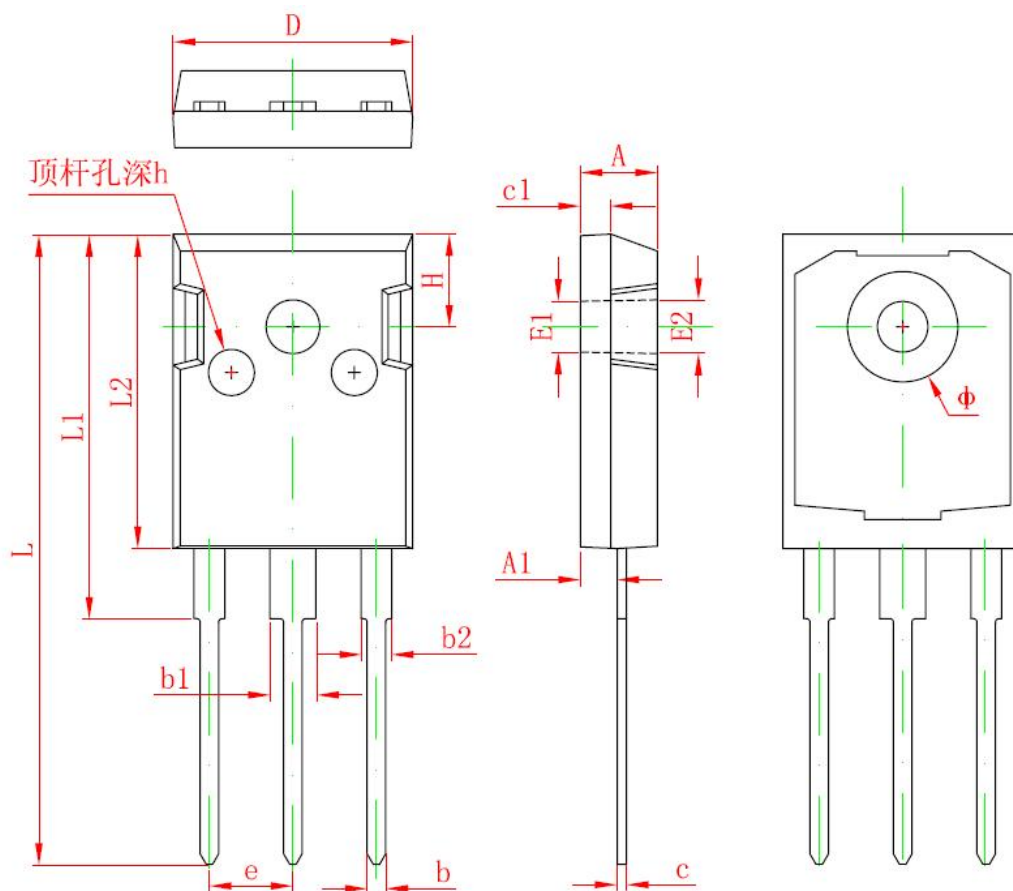
| Profile Feature                                                                                                                                                                                                            | Sn-Pb Eutectic Assembly            | Pb-Free Assembly                   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|------------------------------------|
| <b>Preheat &amp; Soak</b>                                                                                                                                                                                                  |                                    |                                    |
| 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.<br>** 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 <sup>3</sup> <350 | Volume mm <sup>3</sup> ≥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 <sup>3</sup> <350 | Volume mm <sup>3</sup> 350-2000 | Volume mm <sup>3</sup> >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      | 4.700                     | 5.300  |
| A1     | 2.100                     | 2.600  |
| b      | 1.000                     | 1.400  |
| b1     | 2.800                     | 3.200  |
| b2     | 1.800                     | 2.200  |
| c      | 0.500                     | 0.700  |
| c1     | 1.900                     | 2.500  |
| D      | 15.450                    | 16.200 |
| E1     | 3.500 REF.                |        |
| E2     | 3.600 REF.                |        |
| L      | 40.400                    | 41.600 |
| L1     | 24.750                    | 25.750 |
| L2     | 20.300                    | 21.300 |
| Φ      | 7.100                     | 7.300  |
| e      | 5.450 TYP.                |        |
| H      | 5.980 REF.                |        |
| h      | 0.000                     | 0.300  |