矽普
Siliup Semiconductor

# SP85N01AGHTOA

## 85V N-Channel Power MOSFET

## Product Summary

| $V_{(BR)DSS}$ | $R_{DS(on)TYP}$ | $I_D$ |
|---|---|---|
| 85V | 0.85mΩ@10V | 460A |

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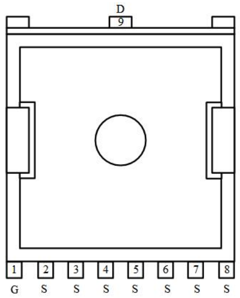
## Feature

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

## Applications

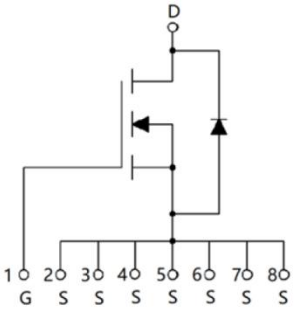
- DC-DC Converters
- Power management functions
- Synchronous-rectification applications

## Package

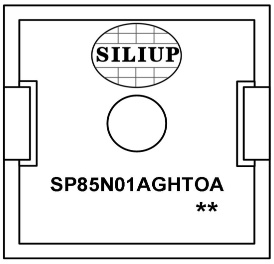


**TOLL**

## Circuit diagram



## Marking



**SP85N01AGHTOA : Product code**
**** : Week code**

## Order Information

| Device | Package | Unit/Tape |
|---|---|---|
| SP85N01AGHTOA | TOLL | 2000 |

## Absolute maximum ratings (Ta=25℃ unless otherwise noted)

| Parameter | Symbol | Rating | Unit |
|---|---|---|---|
| Drain-Source Voltage | $V_{DS}$ | 85 | V |
| Gate-Source Voltage | $V_{GS}$ | ±20 | V |
| Continuous Drain Current1 (Tc=25℃) | $I_D$ | 460 | A |
| Continuous Drain Current1 (Tc=100℃) | $I_D$ | 326 | A |
| Pulsed Drain Current | $I_{DM}$ | 1840 | A |
| Single Pulse Avalanche Energy[1] | $E_{AS}$ | 3600 | mJ |
| Power Dissipation (Tc=25℃) | $P_D$ | 680 | W |
| Power Dissipation (Tc=100℃) | $P_D$ | 340 | W |
| Thermal Resistance Junction-to-Case | $R_{\theta JC}$ | 0.22 | ℃/W |
| Thermal Resistance Junction-to-Ambient | $R_{\theta JA}$ | 36 | ℃/W |
| Storage Temperature Range | $T_{STG}$ | -55 to 175 | ℃ |
| Operating Junction Temperature Range | $T_J$ | -55 to 175 | ℃ |

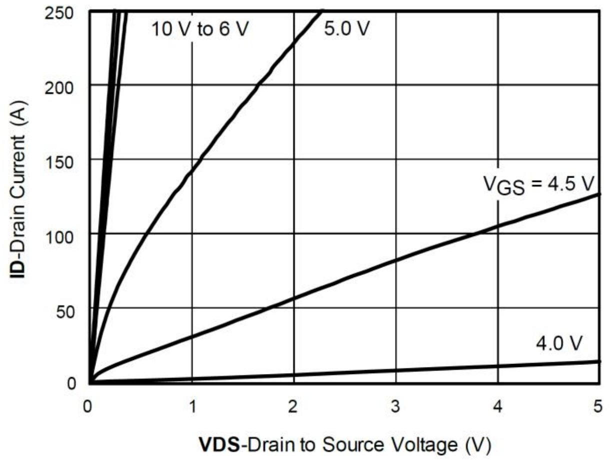
## Electrical characteristics (Ta=25℃, unless otherwise noted)

| Characteristics | Symbol | Test Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Static Characteristics** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | ID=250μA , VGS=0V | 85 | 90 | - | V |
| Drain Cut-Off Current | $I_{DSS}$ | VDS=85V , 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 | 3.0 | 3.4 | V |
| Drain-Source ON Resistance | $R_{DS(ON)}$ | VGS=10V , ID=20A | - | 0.85 | 1.0 | mΩ |
| Gate Resistance | $R_G$ | VDS=40V , VGS=0V , f=1.0MHz | - | 1.9 | - | Ω |
| **Dynamic Characteristics** | | | | | | |
| Input Capacitance | $C_{iss}$ | VDS=40V , VGS=0V , f=1.0MHz | - | 14500 | - | pF |
| Output Capacitance | $C_{oss}$ | | - | 2680 | - | |
| Reverse Transfer Capacitance | $C_{rss}$ | | - | 171 | - | |
| Total Gate Charge | $Q_g$ | VDS=40V , VGS=10V , ID=50A | - | 240 | - | nC |
| Gate-Source Charge | $Q_{gs}$ | | - | 55 | - | |
| Gate-Drain Charge | $Q_{gd}$ | | - | 61 | - | |
| Gate Pleteau Vlotage | $V_{pleteau}$ | | - | 4.5 | - | V |
| **Switching Characteristics** | | | | | | |
| Turn-On Delay Time | $t_{d(on)}$ | VGS=10V , VDS=40V , ID=50A, RG=4.5Ω | - | 42 | - | nS |
| Rise Time | $t_r$ | | - | 125 | - | |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 118 | - | |
| Fall Time | $t_f$ | | - | 134 | - | |
| **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 | $I_S$ | | - | - | 460 | A |
| Reverse Recovery Time | Trr | IS=50A , di/dt=100A/us , TJ=25℃ | - | 125 | - | nS |
| Reverse Recovery Charge | Qrr | | - | 366 | - | nC |

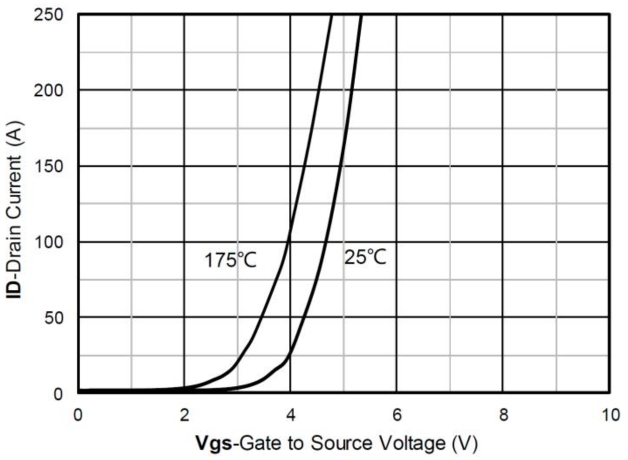
**Note :**

1. The test condition is VDD=40V, VGS=10V, L=0.5mH, RG=25Ω

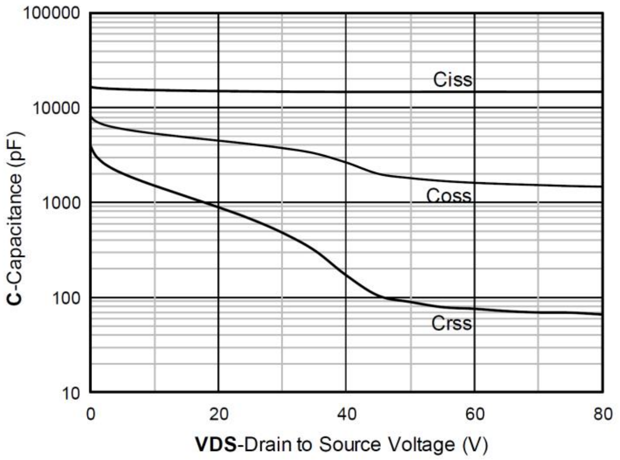
## Typical Characteristics



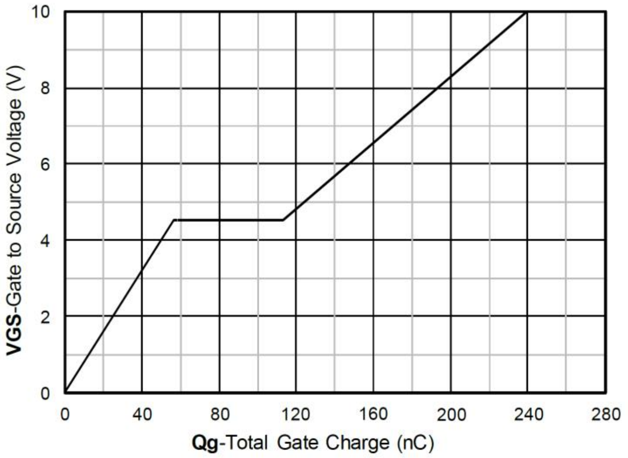
Output Characteristics



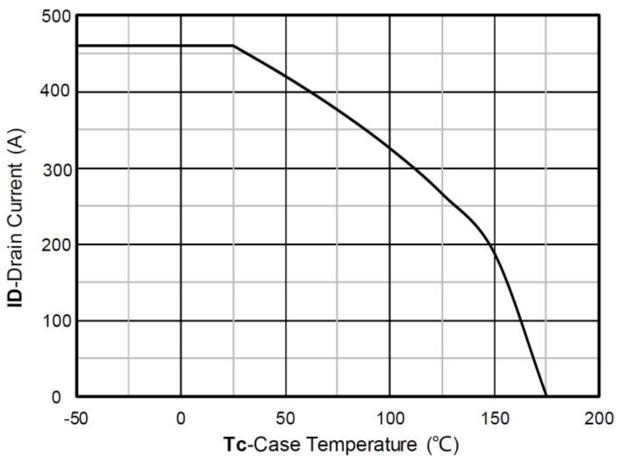
Transfer Characteristics



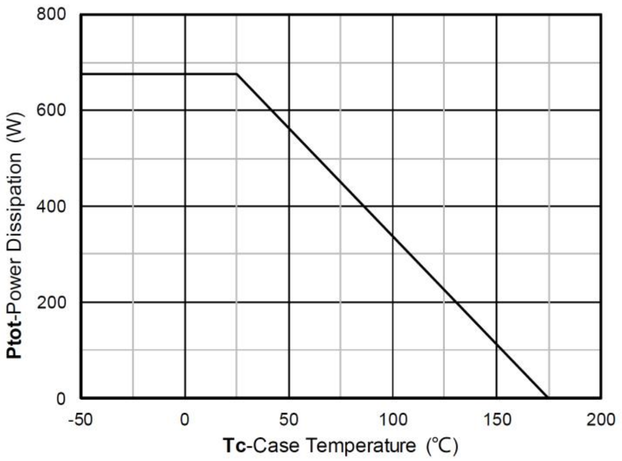
Capacitance Characteristics



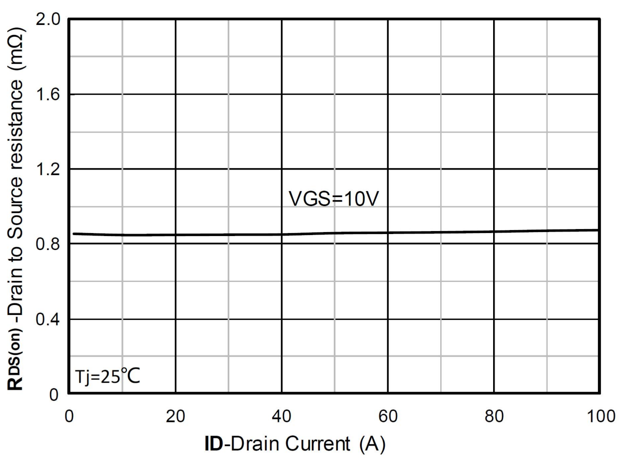
Gate Charge



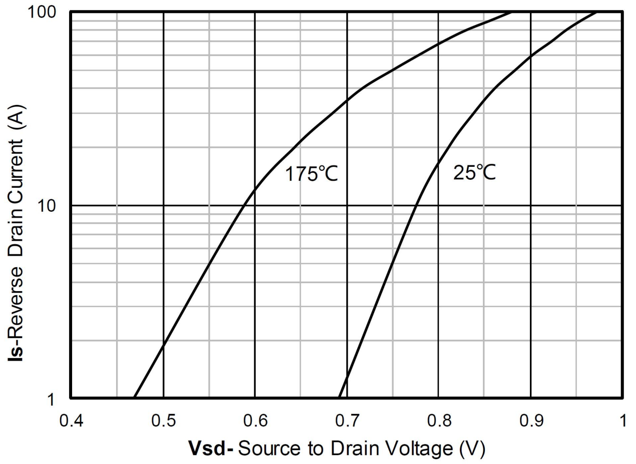
Current dissipation



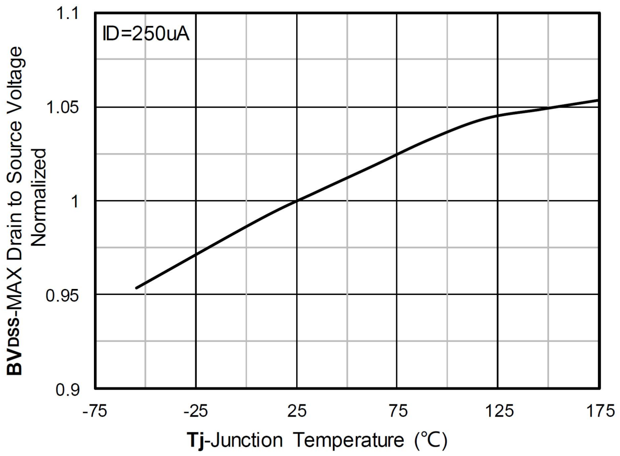
Power dissipation



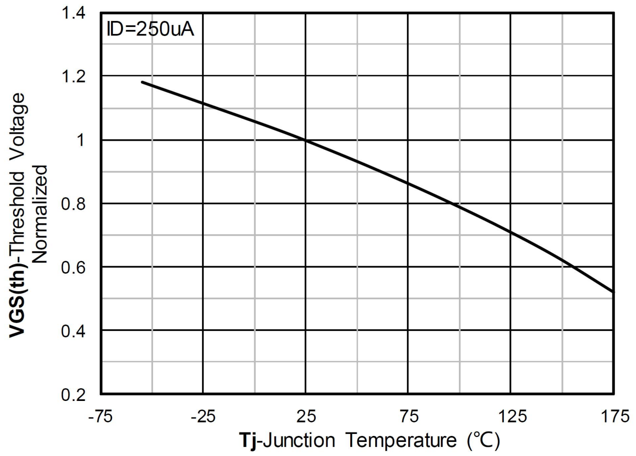
RDS(on) VS Drain Current



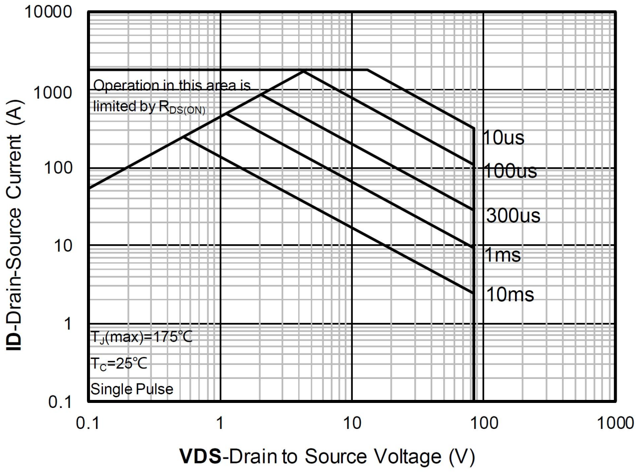
Forward characteristics of reverse diode



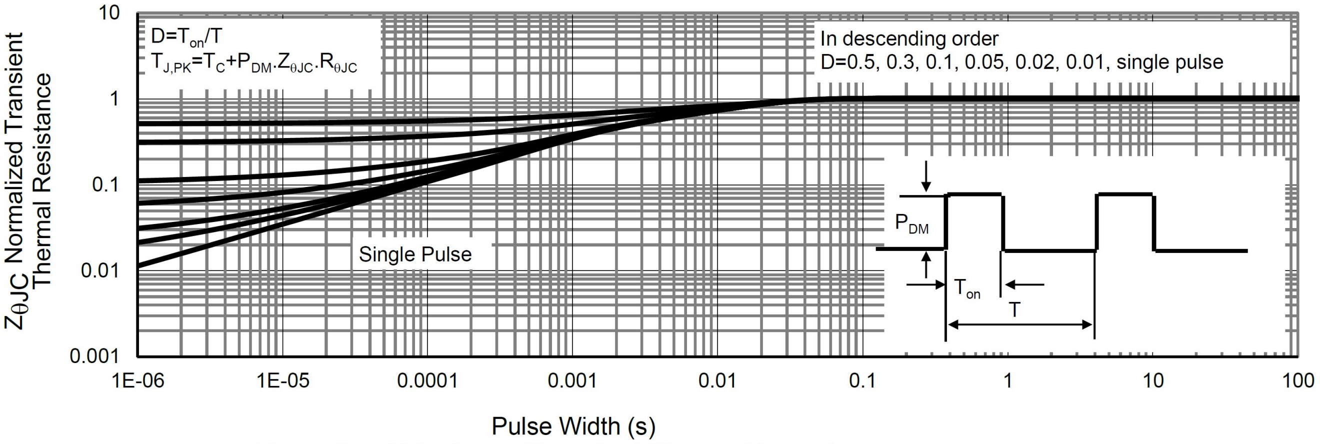
Normalized breakdown voltage



Normalized Threshold voltage



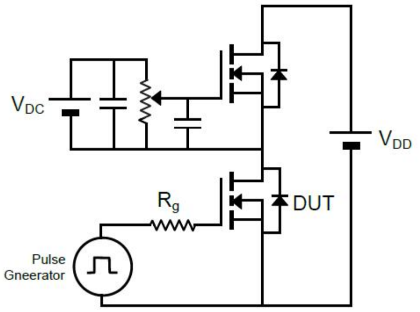
Safe Operation Area

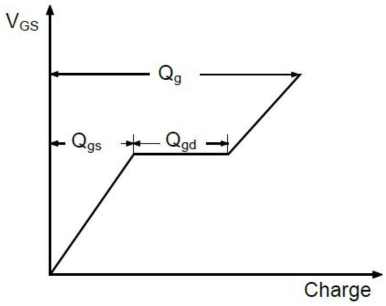


Normalized Maximum Transient Thermal Impedance

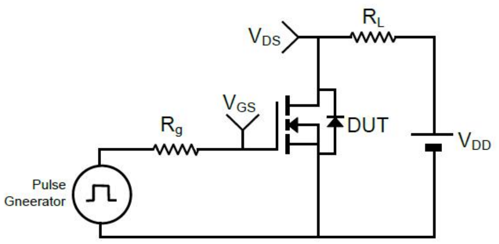
## Test Circuit

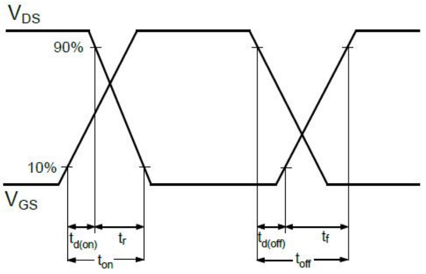
### Gate Charge



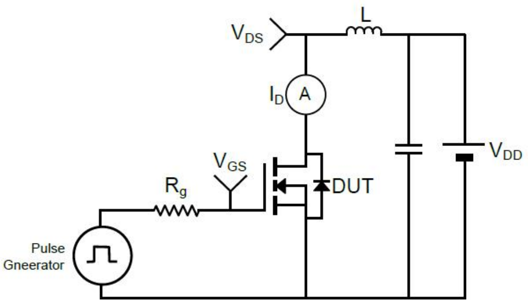


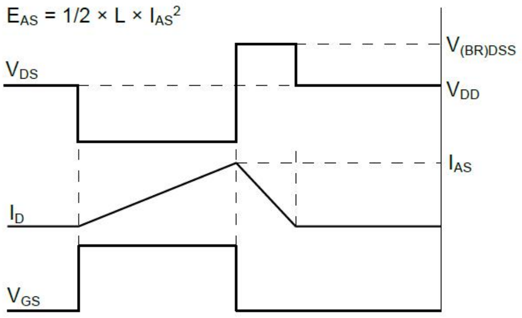
### Resistive Load Switching Time



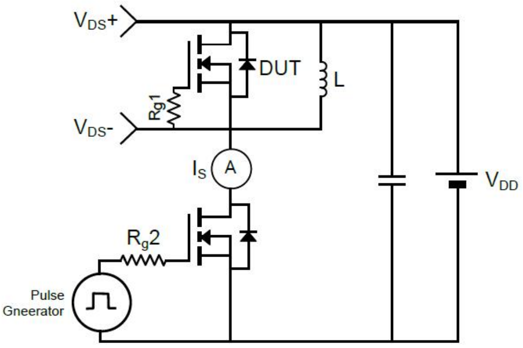


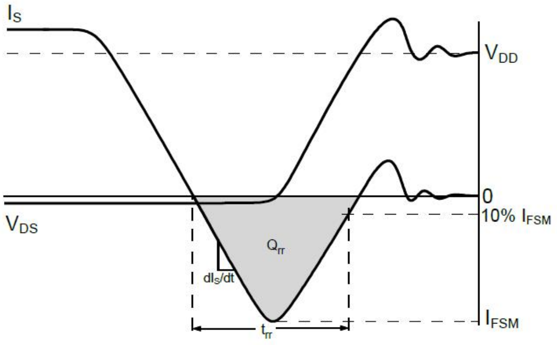
### Un-clamped Inductive Load Switching



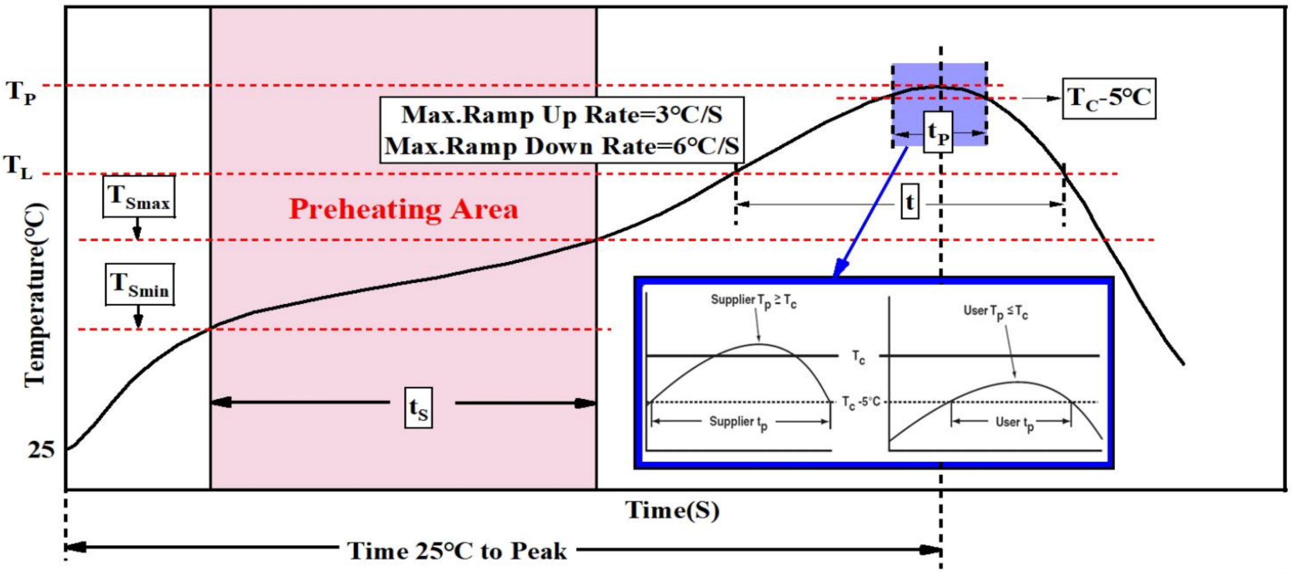


### Drain-Source Body Diode Reverse Recovery





## Temperature Profile for IR Reflow Soldering



| Profile Feature | Sn-Pb Eutectic Assembly | Pb-Free Assembly |
|---|---|---|
| **Preheat & Soak**<br>Temperature min (Tsmin)<br>Temperature max (Tsmax)<br>Time (Tsmin to Tsmax) (ts) | 100°C<br>150°C<br>60-120 seconds | 150°C<br>200°C<br>60-120 seconds |
| Average ramp-up rate (Tsmax to Tp) | 3 °C/second max. | 3°C/second max. |
| Liquidous temperature (TL)<br>Time at liquidous (tL) | 183 °C<br>60-150 seconds | 217°C<br>60-150 seconds |
| Peak package body Temperature e (Tp)* | See Classification Temp in table 1 | See Classification Temp in table 2 |
| Time (tp)** within 5°C of the specified classification temperature (Tc) | 20** seconds | 30** seconds |
| Average ramp-down rate (Tp to Tsmax) | 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 (Tp) is defined as a supplier minimum and a user maximum.
** Tolerance for time at peak profile temperature (tp) is defined as a supplier minimum and a user maximum

Table 1. SnPb Eutectic Process – Classification Temperatures (Tc)

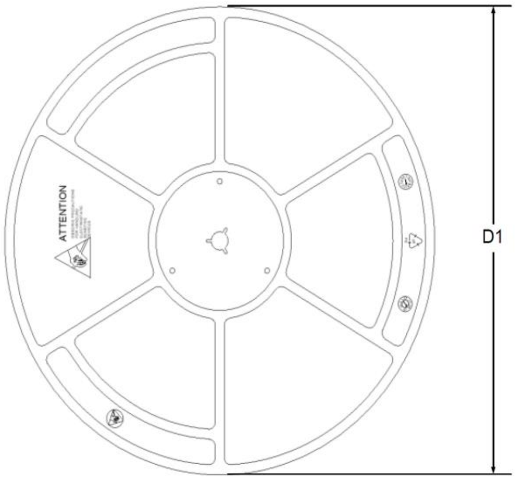
| Package Thickness | Volume mm$^3$ <350 | Volume mm$^3$ ≥350 |
|---|---|---|
| <2.5 mm | 235 °C | 220 °C |
| ≥2.5 mm | 220 °C | 220 °C |

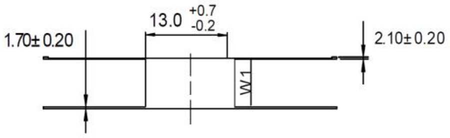
Table 2. Pb-free Process – Classification Temperatures (Tc)

| 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 |

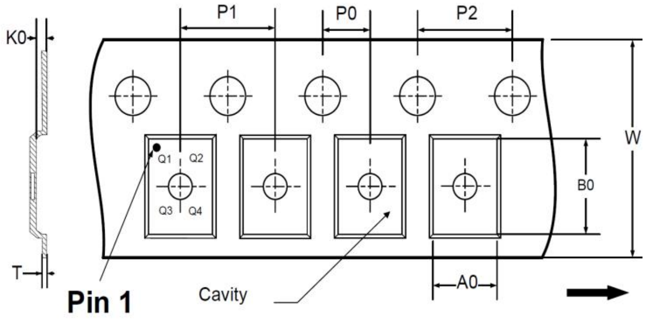
## TOLL Reel Information

REEL DIMENSIONS





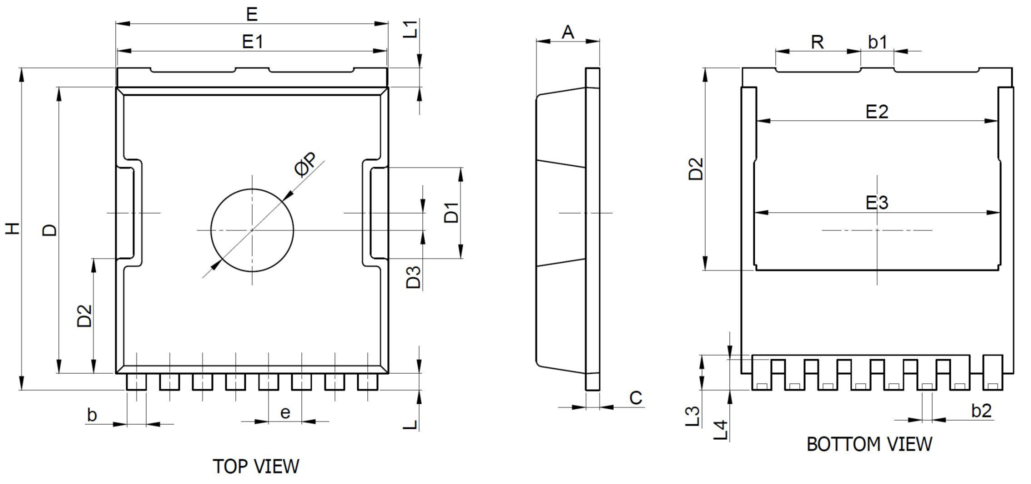
TAPE DIMENSIONS

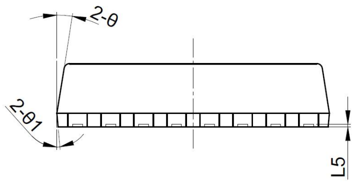


A0：Dimension designed to accommodate the component width
B0：Dimension designed to accommodate the component length
K0：Dimension designed to accommodate the component thickness
W：Overall width of the carrier tape
P0：Pitch between successive cavity centers and sprocket hole
P1：Pitch between successive cavity centers
P2：Pitch between sprocket hole
T：Tape material thickness
D1：Reel Diameter
W1：Reel Width

| DIMENSIONS | | | | | | | | | | (Unit: mm) |
|---|---|---|---|---|---|---|---|---|---|---|
| | D1 | W1 | | | | | | | | Material |
| Reel | 330 | 24.4 | | | | | | | | Hips |
| | P0 | P1 | P2 | W | A0 | B0 | K0 | T | Pin 1 Quadrant | Material |
| Tape | 2 | 4 | 12 | 24 | 10.3 | 12.1 | 2.6 | 0.35 | Q1 | PC |
| All dimensions are nominal | | | | | | | | | | |

## TOLL Package Outline Dimensions





NOTES:1.PKG SURFACE Ra=1.40±0.20um.
2.EJECTION MARK DEPTH 0.10±0.10mm.
3.L/F THICKNESS AFTER PLATING 0.50±0.02mm.
4.ALL DIMENSIONS IN MILLIMETERS.

| Symbol | Dimensions In Millimeters | | |
|---|---|---|---|
| | Min. | Nom. | Max. |
| A | 2.20 | 2.30 | 2.40 |
| b | 0.60 | 0.70 | 0.80 |
| b1 | 1.10 | 1.20 | 1.30 |
| b2 | 0.36 REF. | | |
| C | 0.40 | 0.50 | 0.60 |
| D | 10.30 | 10.40 | 10.50 |
| D1 | 3.20 | 3.30 | 3.40 |
| D2 | 4.08 | 4.18 | 4.28 |
| D3 | 0.53 | 0.63 | 0.73 |
| D4 | 7.35 REF. | | |
| E | 9.80 | 9.9 | 10.00 |
| E1 | 9.70 | 9.80 | 9.90 |
| E2 | 8.80 REF. | | |
| E3 | 8.95 REF. | | |
| e | 1.20 BSC. | | |
| H | 11.5 | 11.7 | 11.90 |
| L | 0.5 | 0.6 | 0.7 |
| L1 | 0.60 | 0.7 | 0.80 |
| L2 | 0.10 REF. | | |
| L3 | 1.27 REF. | | |
| L4 | 1.10 REF. | | |
| P | 2.00 | 3.00 | 4.00 |
| R | 3.00 | 3.10 | 3.20 |
| θ | 7' | 9' | 11' |
| θ1 | 3' | 5' | 7' |