

## Product Summary

| $V_{(BR)DSS}$ | $R_{DS(on)TYP}$ | $I_D$ |
|---------------|-----------------|-------|
| 100V          | 3.2mΩ@10V       | 170A  |



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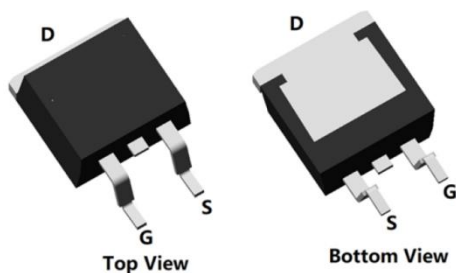
## Feature

- Fast Switching
- Low Gate Charge and Rdson
- Low Reverse transfer capacitances
- 100% Single Pulse avalanche energy Test

## Applications

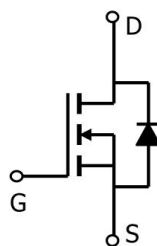
- Power switching application
- DC-DC Converter
- Power Management

## Package

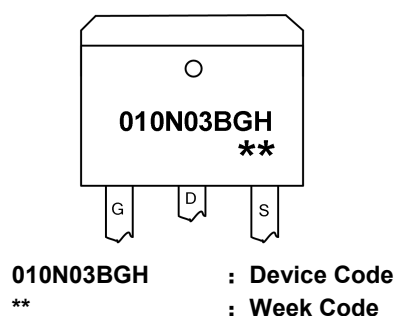


TO-263(1:G 2:D 3:S)

## Circuit diagram



## Marking



## Order Information

| Device        | Package | Unit/Tape |
|---------------|---------|-----------|
| SP010N03BGHTD | TO-263  | 800       |

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

| Parameter                                  | Symbol          | Rating     | Units |
|--------------------------------------------|-----------------|------------|-------|
| Drain-Source Voltage                       | $V_{DS}$        | 100        | V     |
| Gate-Source Voltage                        | $V_{GS}$        | $\pm 20$   | V     |
| Continuous Drain Current (Tc=25°C)         | $I_D$           | 170        | A     |
| Continuous Drain Current (Tc=100°C)        | $I_D$           | 113        | A     |
| Pulsed Drain Current                       | $I_{DM}$        | 680        | A     |
| Single Pulse Avalanche Energy <sup>1</sup> | $E_{AS}$        | 3136       | mJ    |
| Power Dissipation (Tc=25°C)                | $P_D$           | 205        | W     |
| Power Dissipation (Tc=100°C)               | $P_D$           | 82         | W     |
| Thermal Resistance Junction-to-Case        | $R_{\theta JC}$ | 0.61       | °C/W  |
| Storage Temperature Range                  | $T_{STG}$       | -55 to 150 | °C    |
| Operating Junction Temperature Range       | $T_J$           | -55 to 150 | °C    |

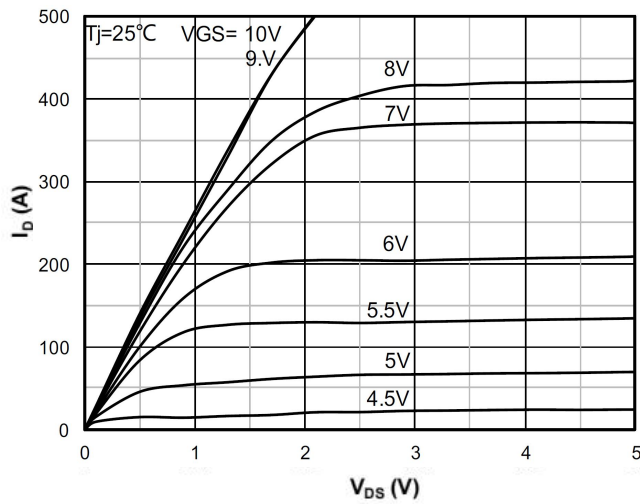
**Electrical characteristics (Ta=25°C, unless otherwise noted)**

| Characteristics                         | Symbol            | Test Condition                        | Min | Typ  | Max  | Unit |
|-----------------------------------------|-------------------|---------------------------------------|-----|------|------|------|
| Static Characteristics                  |                   |                                       |     |      |      |      |
| Drain-Source Breakdown Voltage          | BV <sub>DSS</sub> | VGS=0V , ID=250uA                     | 100 | -    | -    | V    |
| Drain Cut-Off Current                   | IDSS              | VDS=80V , VGS=0V , TJ=25℃             | -   | -    | 1    | μA   |
| Gate Leakage Current                    | IGSS              | VGS=±20V , VDS=0V                     | -   | -    | ±100 | nA   |
| Gate Threshold Voltage                  | VGS(th)           | VGS=VDS , ID =250uA                   | 2.6 | 3.0  | 3.4  | V    |
| Drain-Source ON Resistance              | RDS(ON)           | VGS=10V , ID=20A                      | -   | 3.2  | 4.6  | mΩ   |
| Gate Resistance                         | RG                | VDS=50V , VGS=0V , f=1MHz             | -   | 2.18 | -    | Ω    |
| Dynamic Characteristics                 |                   |                                       |     |      |      |      |
| Input Capacitance                       | Ciss              | VDS=50V , VGS=0V , f=1MHz             | -   | 5428 | -    | pF   |
| Output Capacitance                      | Coss              |                                       | -   | 811  | -    |      |
| Reverse Transfer Capacitance            | Crss              |                                       | -   | 25   | -    |      |
| Total Gate Charge                       | Qg                | VDS=50V , VGS=10V , ID=20A            | -   | 87   | -    | nC   |
| Gate-Source Charge                      | Qgs               |                                       | -   | 13   | -    |      |
| Gate-Drain Charge                       | Qgd               |                                       | -   | 19   | -    |      |
| Gate Plateau Voltage                    | Vplateau          |                                       | -   | 5.6  | -    |      |
| Switching Characteristics               |                   |                                       |     |      |      |      |
| Turn-On Delay Time                      | td(on)            | VDD=50V , VGS=10V , RG=1.6Ω , ID=125A | -   | 24.6 | -    | nS   |
| Rise Time                               | tr                |                                       | -   | 86   | -    |      |
| Turn-Off Delay Time                     | td(off)           |                                       | -   | 62   | -    |      |
| Fall Time                               | tf                |                                       | -   | 20   | -    |      |
| Drain-Source Body Diode Characteristics |                   |                                       |     |      |      |      |
| Source-Drain Diode Forward Voltage      | VSD               | IS=1A , VGS=0V , TJ=25℃               | -   | -    | 1.2  | V    |
| Maximum Body-Diode Continuous Current   | IS                |                                       | -   | -    | 170  | A    |
| Reverse Recovery Time                   | Trr               | IS=50A , di/dt=100A/us , TJ=25℃       | -   | 86   | -    | nS   |
| Reverse Recovery Charge                 | Qrr               |                                       | -   | 206  | -    | nC   |

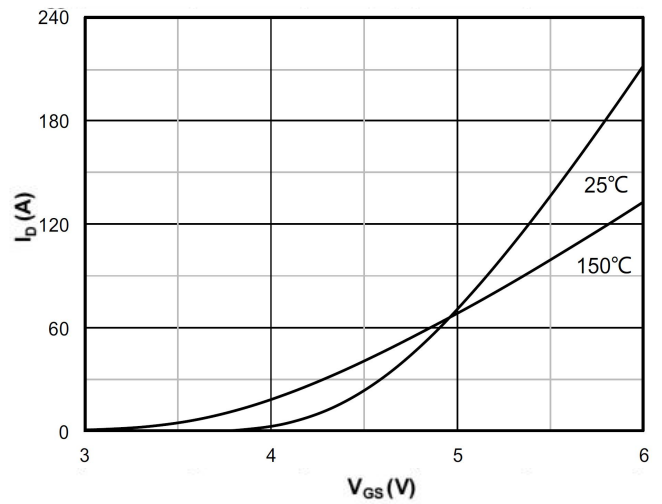
**Note :**

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

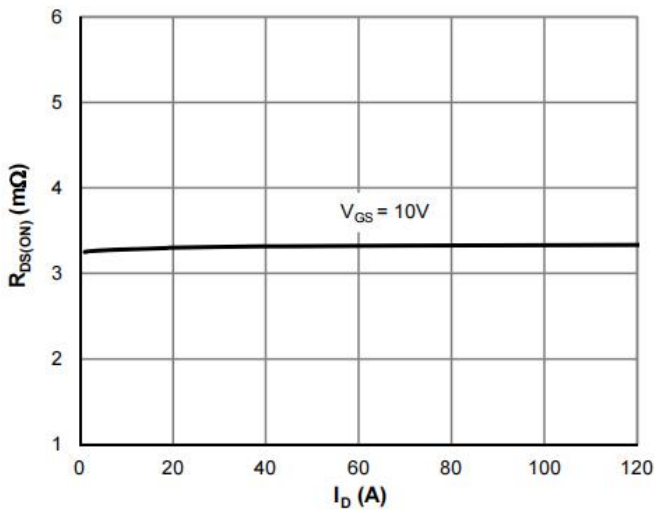
## Typical Characteristics



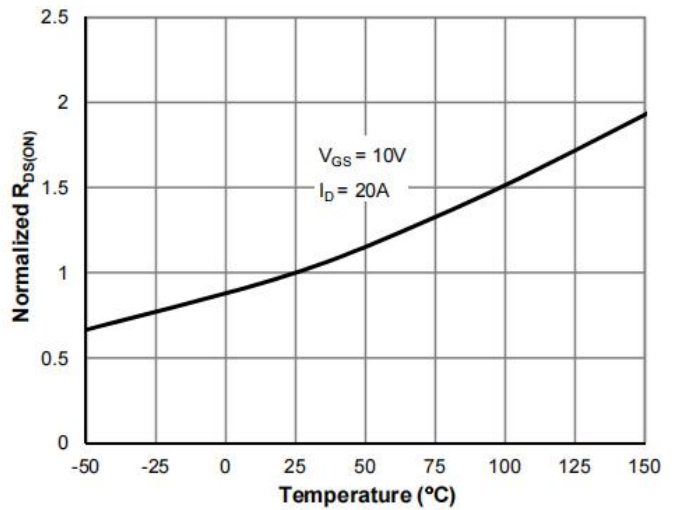
Typical Output Characteristics



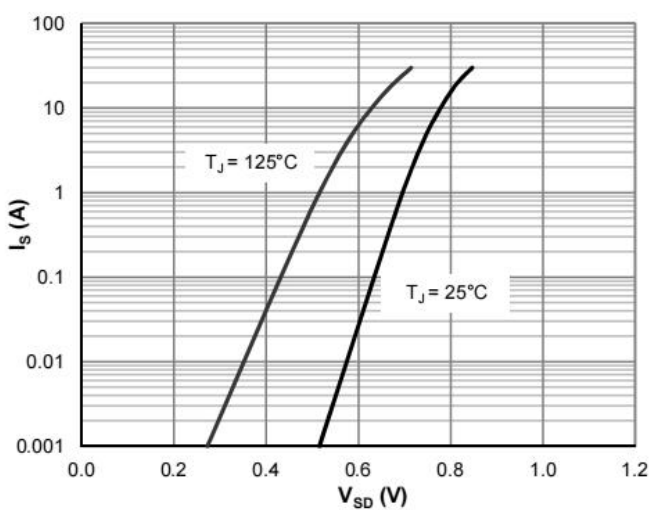
Transfer Characteristics



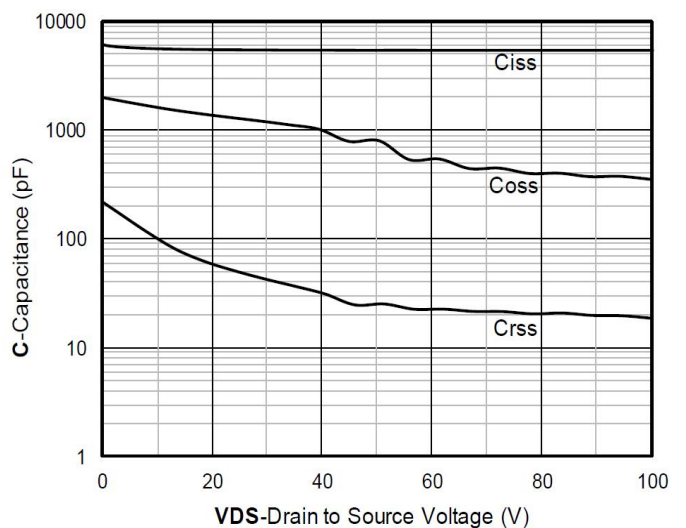
On-Resistance vs. Drain Current



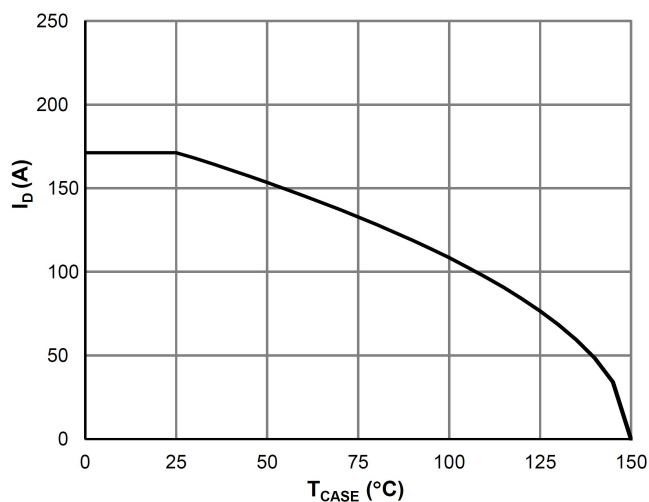
On-Resistance vs. Junction Temperature



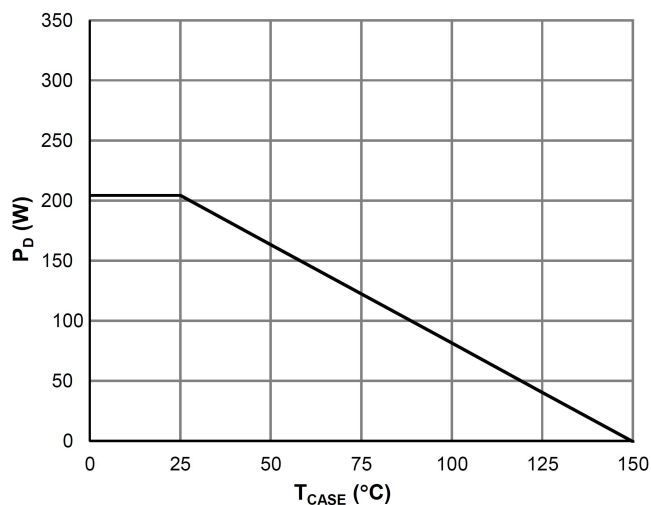
Body-Diode Characteristics



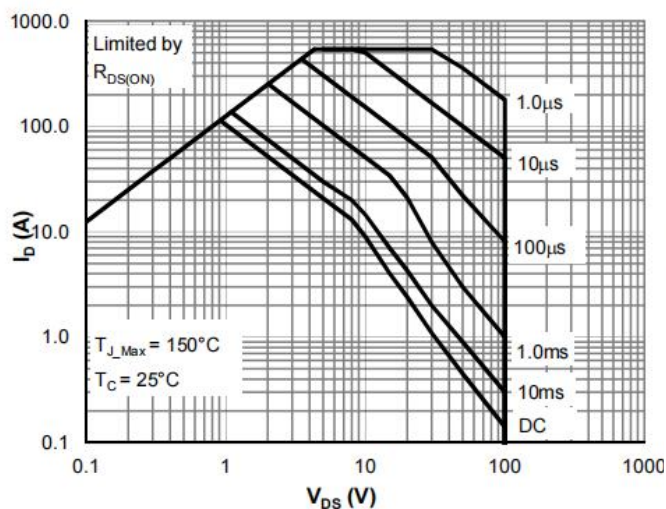
Capacitance Characteristics



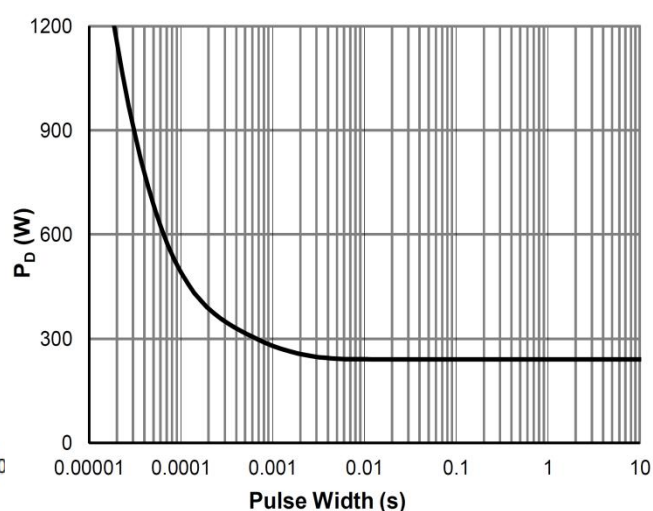
Current De-rating



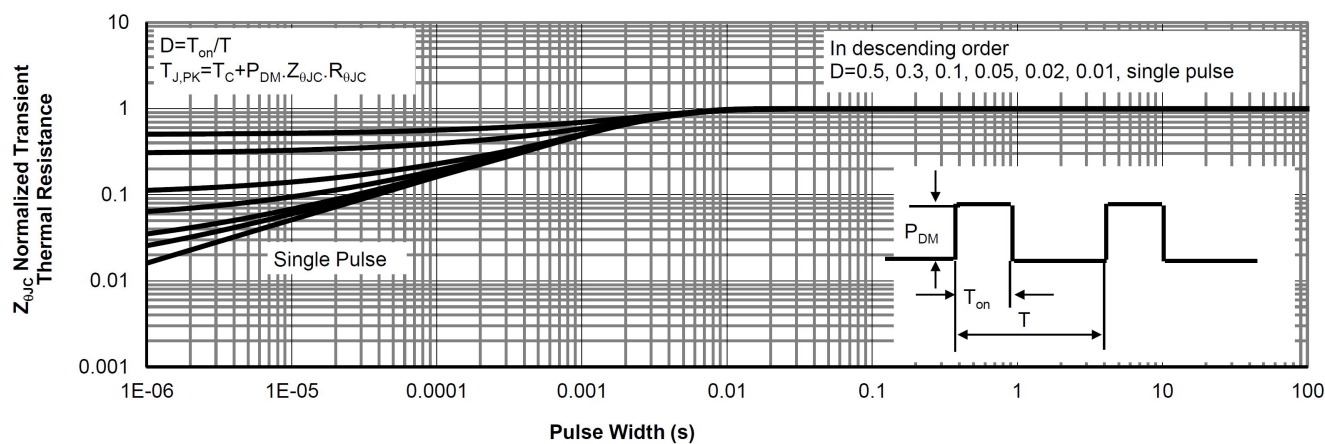
Power De-rating



Maximum Safe Operating Area



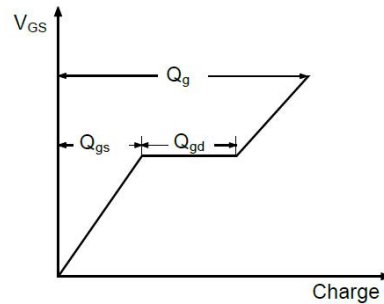
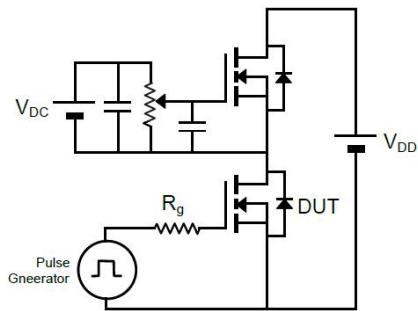
Single Pulse Power Rating, Junction-to-Case



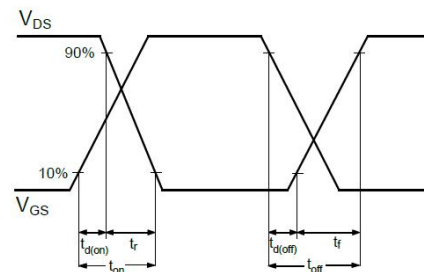
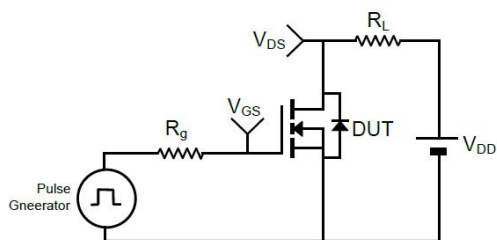
Normalized Maximum Transient Thermal Impedance

## Test Circuit

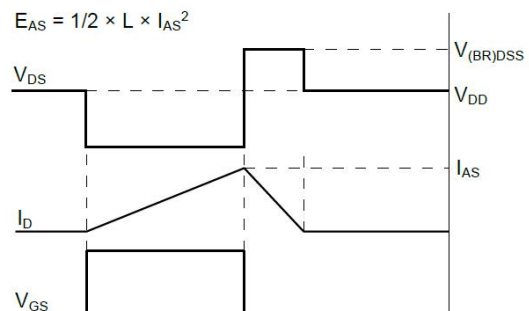
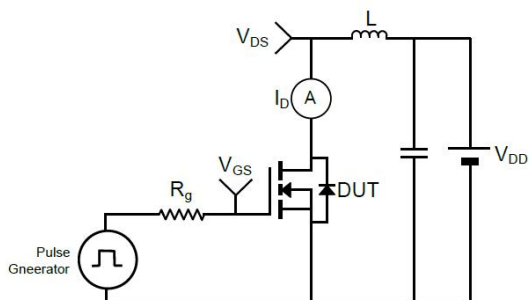
### Gate Charge



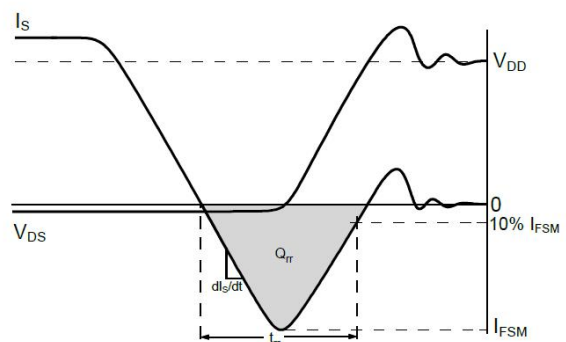
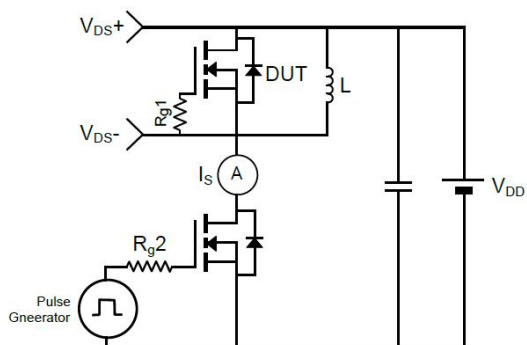
### Resistive Load Switching Time

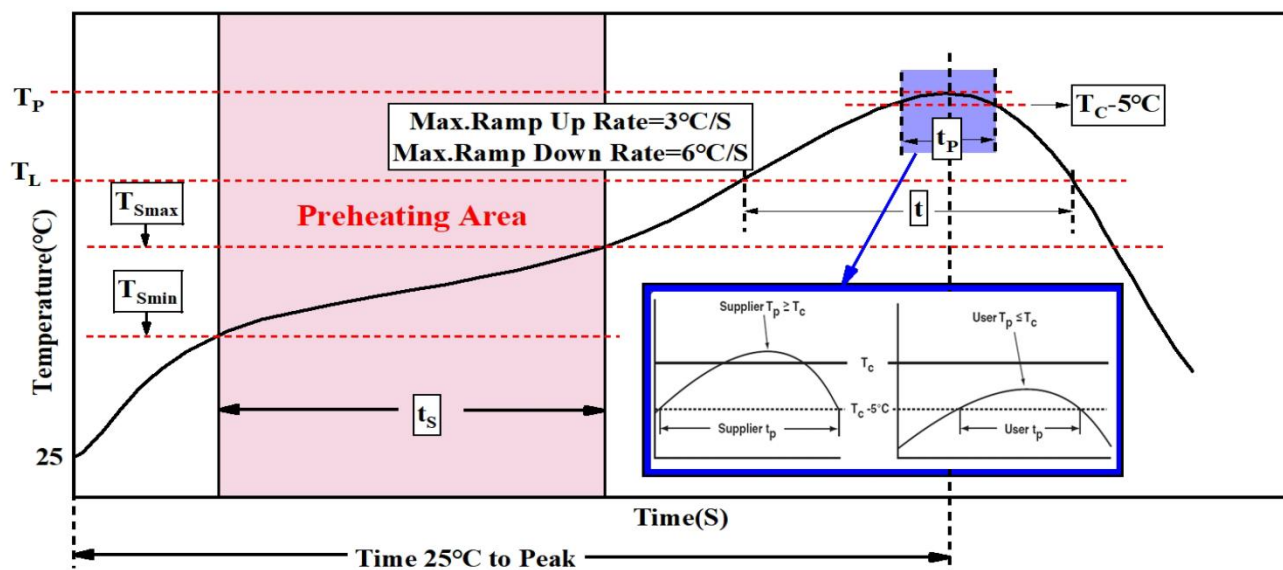


### Un-clamped Inductive Load Switching



### Drain-Source Body Diode Reverse Recovery



**Temperature Profile for IR Reflow Soldering**


| Profile Feature                                                                                                                                                                                                            | Sn-Pb Eutectic Assembly            | Pb-Free Assembly                   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|------------------------------------|
| <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 |                                    |                                    |

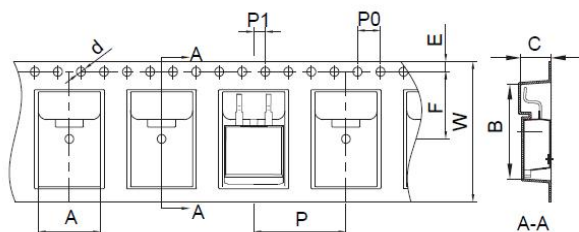
Table 1. SnPb Eutectic Process – Classification Temperatures ( $T_C$ )

| Package Thickness | Volume mm <sup>3</sup><br><350 | Volume mm <sup>3</sup><br>≥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><br><350 | Volume mm <sup>3</sup><br>350-2000 | Volume mm <sup>3</sup><br>>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-263 Reel Information

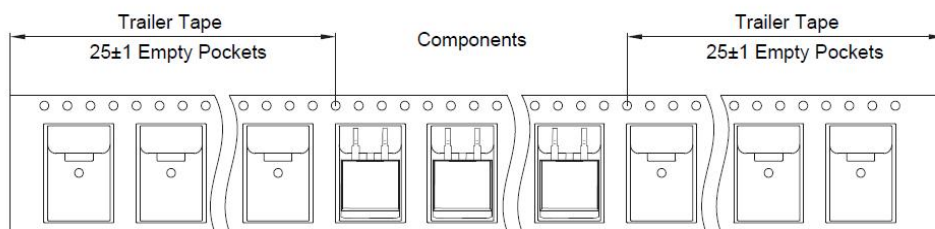


### Packaging Description:

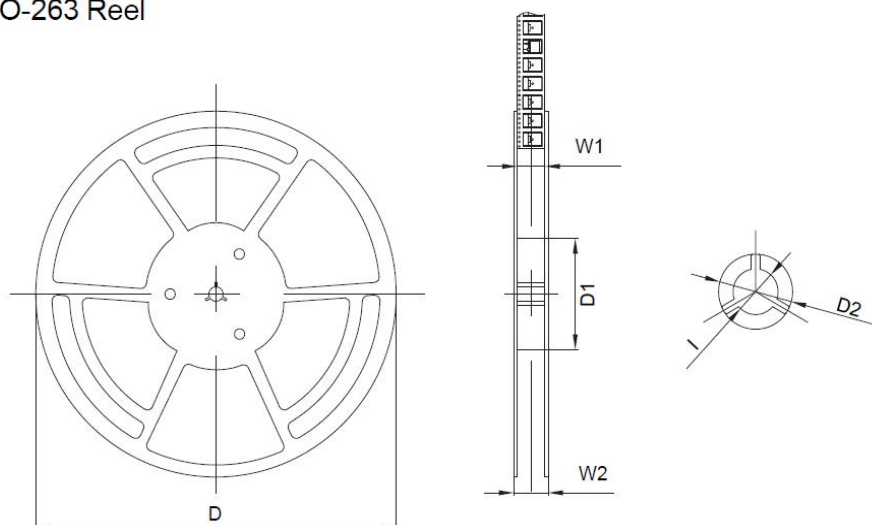
TO-263 parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Hear Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts in standard option are shipped with 800 units per 13" or 33.0 cm diameter reel. The reels are clear in color and is made of polystyrene plastic (anti-static coated).

| Dimensions are in millimeter |       |       |      |       |      |       |      |       |      |       |
|------------------------------|-------|-------|------|-------|------|-------|------|-------|------|-------|
| Pkg type                     | A     | B     | C    | d     | E    | F     | P0   | P     | P1   | W     |
| TO-263                       | 10.80 | 16.13 | 5.21 | Φ1.55 | 1.75 | 11.50 | 4.00 | 16.00 | 2.00 | 24.00 |

## TO-263 Tape Leader and Trailer

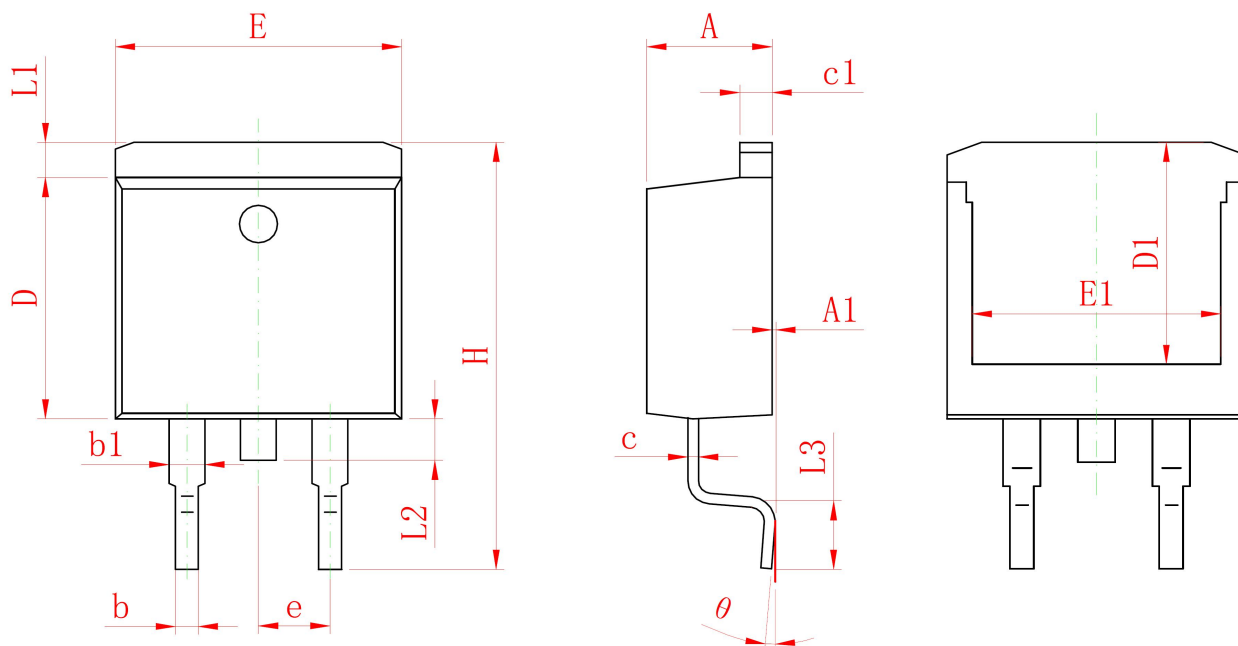


## TO-263 Reel



| Dimensions are in millimeter |        |        |        |       |       |        |
|------------------------------|--------|--------|--------|-------|-------|--------|
| Reel                         | D      | D1     | D2     | W1    | W2    | I      |
| 13" Dia                      | 330.00 | 100.00 | Φ21.00 | 24.40 | 30.40 | Φ13.00 |

| Reel    | Reel Size | Box      | Box Size(mm) | Carton   | Carton Size(mm) |
|---------|-----------|----------|--------------|----------|-----------------|
| 800 pcs | 13 inch   | 1600 pcs | 360×360×65   | 8000 pcs | 378×358×382     |

**TO-263 Package Information**


| Symbol   | Dimensions In Millimeters |       |
|----------|---------------------------|-------|
|          | Min.                      | Max.  |
| A        | 4.40                      | 4.67  |
| A1       | 0.02                      | 0.23  |
| b        | 0.70                      | 0.90  |
| b1       | 1.21                      | 1.40  |
| c        | 0.40                      | 0.60  |
| c1       | 1.25                      | 1.45  |
| D        | 9.00                      | 9.30  |
| D1       | 8.10 REF                  |       |
| E        | 9.70                      | 10.20 |
| E1       | 7.00                      | 8.20  |
| e        | 2.54 TYP.                 |       |
| H        | 14.80                     | 15.40 |
| L1       | 1.10                      | 1.40  |
| L2       | 1.10                      | 1.70  |
| L3       | 2.10                      | 2.50  |
| $\theta$ | 0°                        | 9°    |