

### Description

The RST80H16D uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. It can be used in a wide variety of applications.

### General Features

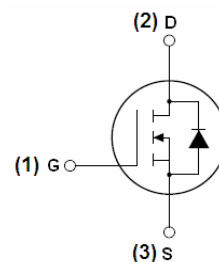
- $V_{DS} = 80V, I_D = 160A$   
 $R_{DS(ON)} < 4.7m\Omega @ V_{GS} = 10V$
- High density cell design for ultra low  $R_{DS(ON)}$
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high  $E_{AS}$
- Excellent package for good heat dissipation
- Special process technology for high ESD capability

### Application

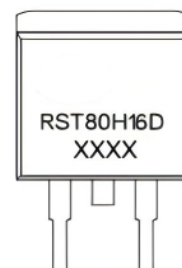
- Automotive applications
- Hard switched and high frequency circuits
- Uninterruptible power supply

**100% UIS TESTED!**

**100%  $\Delta V_{DS}$  TESTED!**



Schematic diagram



Marking and pin assignment



TO-263-2L top view

### Package Marking and Ordering Information

| Device Marking | Device    | Device Package | Reel Size | Tape width | Quantity |
|----------------|-----------|----------------|-----------|------------|----------|
| RST80H16D      | RST80H16D | TO-263-2L      | -         | -          | -        |

### Absolute Maximum Ratings ( $T_C = 25^\circ C$ unless otherwise noted)

| Parameter                                        | Symbol              | Limit      | Unit          |
|--------------------------------------------------|---------------------|------------|---------------|
| Drain-Source Voltage                             | $V_{DS}$            | 80         | V             |
| Gate-Source Voltage                              | $V_{GS}$            | $\pm 20$   | V             |
| Drain Current-Continuous                         | $I_D$               | 160        | A             |
| Drain Current-Continuous( $T_C = 100^\circ C$ )  | $I_D (100^\circ C)$ | 113        | A             |
| Pulsed Drain Current                             | $I_{DM}$            | 500        | A             |
| Maximum Power Dissipation                        | $P_D$               | 285        | W             |
| Derating factor                                  |                     | 1.9        | W/ $^\circ C$ |
| Single pulse avalanche energy (Note 5)           | $E_{AS}$            | 1936       | mJ            |
| Operating Junction and Storage Temperature Range | $T_J, T_{STG}$      | -55 To 175 | $^\circ C$    |

**Thermal Characteristic**

|                                                          |                 |      |      |
|----------------------------------------------------------|-----------------|------|------|
| Thermal Resistance, Junction-to-Case <sup>(Note 2)</sup> | $R_{\theta JC}$ | 0.53 | °C/W |
|----------------------------------------------------------|-----------------|------|------|

**Electrical Characteristics ( $T_C=25^{\circ}\text{C}$  unless otherwise noted)**

| Parameter                                     | Symbol              | Condition                                                                                                   | Min | Typ  | Max  | Unit |
|-----------------------------------------------|---------------------|-------------------------------------------------------------------------------------------------------------|-----|------|------|------|
| Off Characteristics                           |                     |                                                                                                             |     |      |      |      |
| Drain-Source Breakdown Voltage                | BV <sub>DSS</sub>   | V <sub>GS</sub> =0V I <sub>D</sub> =250μA                                                                   | 80  | 88   | -    | V    |
| Zero Gate Voltage Drain Current               | I <sub>DSS</sub>    | V <sub>DS</sub> =80V, V <sub>GS</sub> =0V                                                                   | -   | -    | 1    | μA   |
| Gate-Body Leakage Current                     | I <sub>GSS</sub>    | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V                                                                  | -   | -    | ±100 | nA   |
| On Characteristics <sup>(Note 3)</sup>        |                     |                                                                                                             |     |      |      |      |
| Gate Threshold Voltage                        | V <sub>GS(th)</sub> | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA                                                    | 2   | 3    | 4    | V    |
| Drain-Source On-State Resistance              | R <sub>DS(ON)</sub> | V <sub>GS</sub> =10V, I <sub>D</sub> =20A                                                                   | -   | 3.7  | 4.7  | mΩ   |
| Forward Transconductance                      | g <sub>FS</sub>     | V <sub>DS</sub> =5V, I <sub>D</sub> =20A                                                                    | 60  | -    | -    | S    |
| Dynamic Characteristics <sup>(Note4)</sup>    |                     |                                                                                                             |     |      |      |      |
| Input Capacitance                             | C <sub>iss</sub>    | V <sub>DS</sub> =25V, V <sub>GS</sub> =0V,<br>F=1.0MHz                                                      | -   | 6500 | -    | PF   |
| Output Capacitance                            | C <sub>oss</sub>    |                                                                                                             | -   | 810  | -    | PF   |
| Reverse Transfer Capacitance                  | C <sub>rss</sub>    |                                                                                                             | -   | 310  | -    | PF   |
| Switching Characteristics <sup>(Note 4)</sup> |                     |                                                                                                             |     |      |      |      |
| Turn-on Delay Time                            | t <sub>d(on)</sub>  | V <sub>DD</sub> =40V, I <sub>D</sub> =2A, R <sub>L</sub> =15Ω<br>V <sub>GS</sub> =10V, R <sub>G</sub> =2.5Ω | -   | 31.5 | -    | nS   |
| Turn-on Rise Time                             | t <sub>r</sub>      |                                                                                                             | -   | 33   | -    | nS   |
| Turn-Off Delay Time                           | t <sub>d(off)</sub> |                                                                                                             | -   | 46   | -    | nS   |
| Turn-Off Fall Time                            | t <sub>f</sub>      |                                                                                                             | -   | 17.5 | -    | nS   |
| Total Gate Charge                             | Q <sub>g</sub>      | V <sub>DS</sub> =40V, I <sub>D</sub> =20A,<br>V <sub>GS</sub> =10V                                          | -   | 130  |      | nC   |
| Gate-Source Charge                            | Q <sub>gs</sub>     |                                                                                                             | -   | 36   |      | nC   |
| Gate-Drain Charge                             | Q <sub>gd</sub>     |                                                                                                             | -   | 46   |      | nC   |
| Drain-Source Diode Characteristics            |                     |                                                                                                             |     |      |      |      |
| Diode Forward Voltage <sup>(Note 3)</sup>     | V <sub>SD</sub>     | V <sub>GS</sub> =0V, I <sub>S</sub> =40A                                                                    | -   |      | 1.2  | V    |
| Diode Forward Current <sup>(Note 2)</sup>     | I <sub>S</sub>      |                                                                                                             | -   | -    | 160  | A    |
| Reverse Recovery Time                         | t <sub>rr</sub>     | T <sub>J</sub> = 25°C, I <sub>F</sub> = 20A<br>di/dt = 500A/μs <sup>(Note3)</sup>                           | -   | 51   | -    | nS   |
| Reverse Recovery Charge                       | Q <sub>rr</sub>     |                                                                                                             | -   | 61   | -    | nC   |
| Forward Turn-On Time                          | t <sub>on</sub>     | Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)                                        |     |      |      |      |

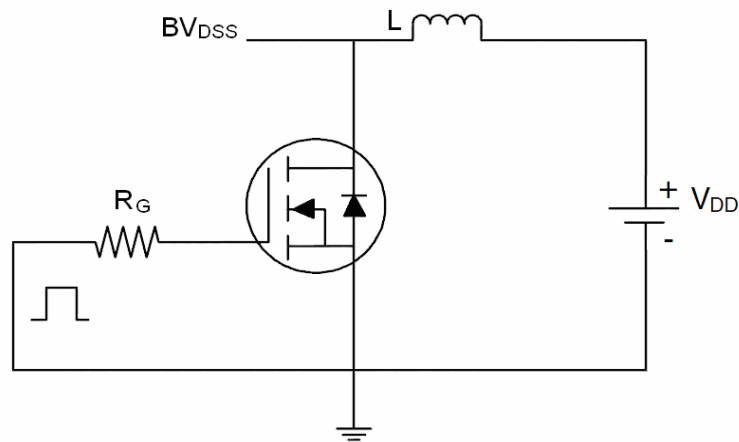
**Notes:**

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production
5. EAS condition:  $T_J=25^{\circ}\text{C}, V_{DD}=40V, V_G=10V, L=0.5mH, R_G=25\Omega$

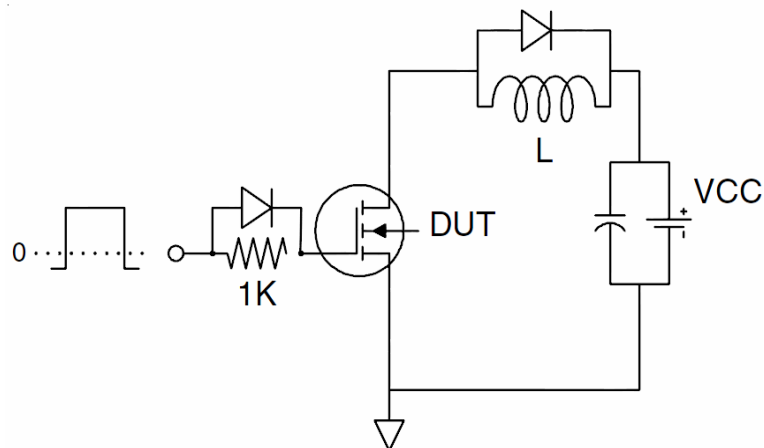
### Test circuit

Pb Free Product

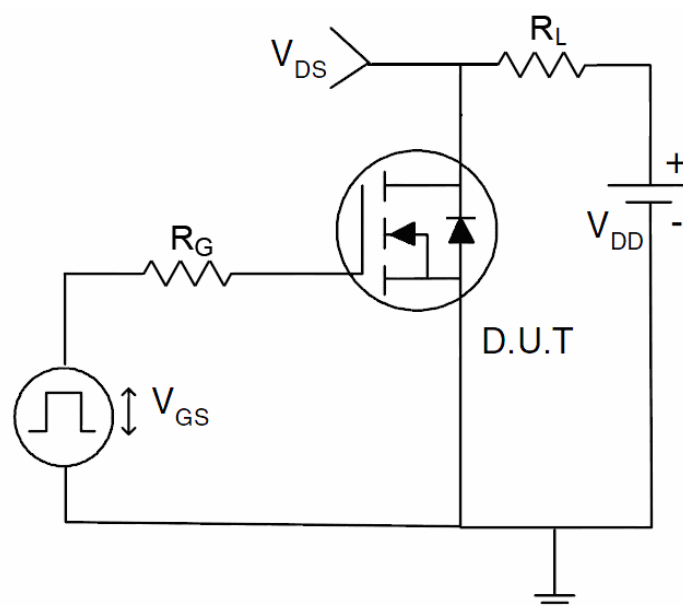
#### 1) $E_{AS}$ test Circuit



#### 2) Gate charge test Circuit

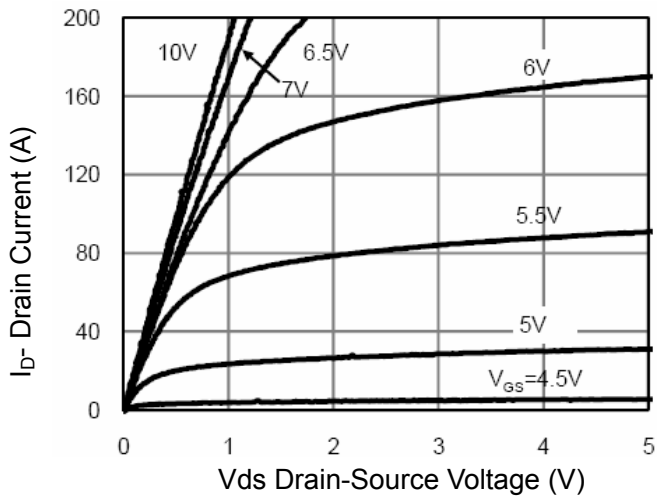


#### 3) Switch Time Test Circuit

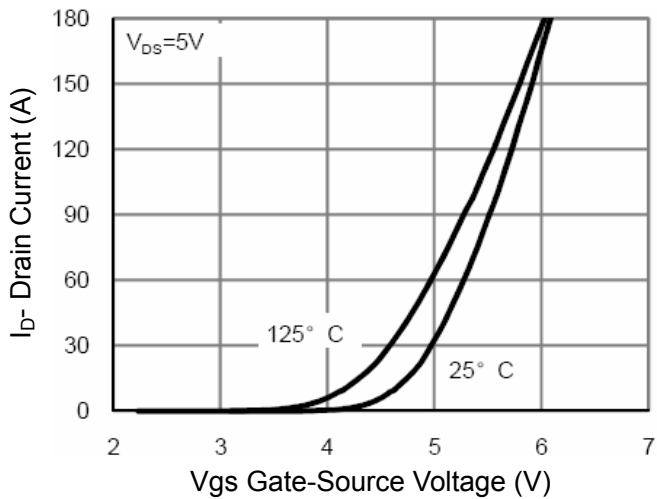


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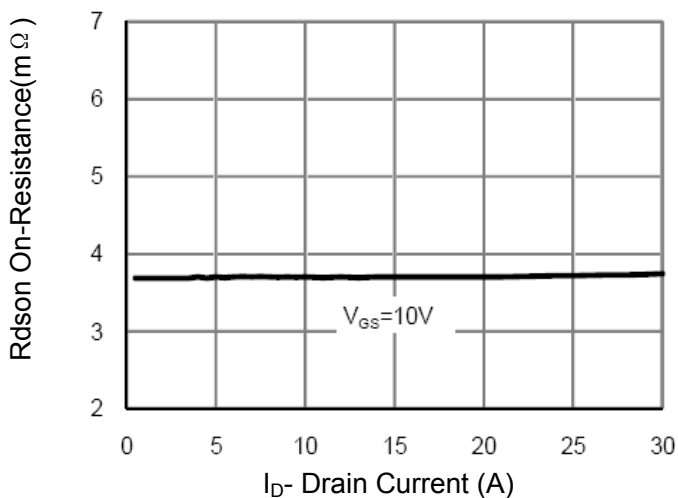
### Typical Electrical and Thermal Characteristics (Curves)



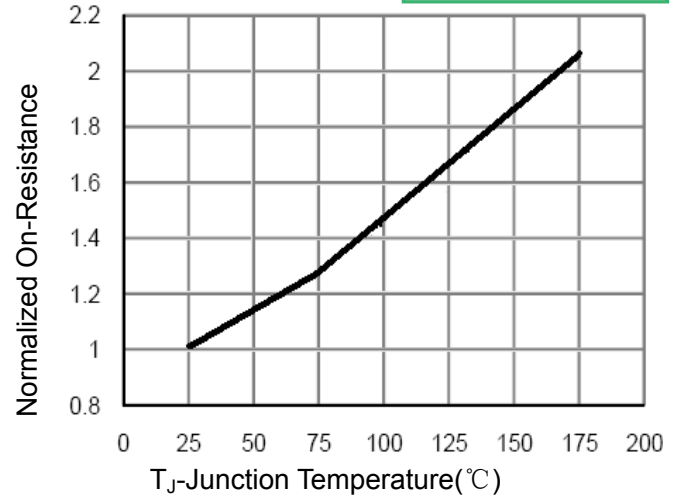
**Figure 1 Output Characteristics**



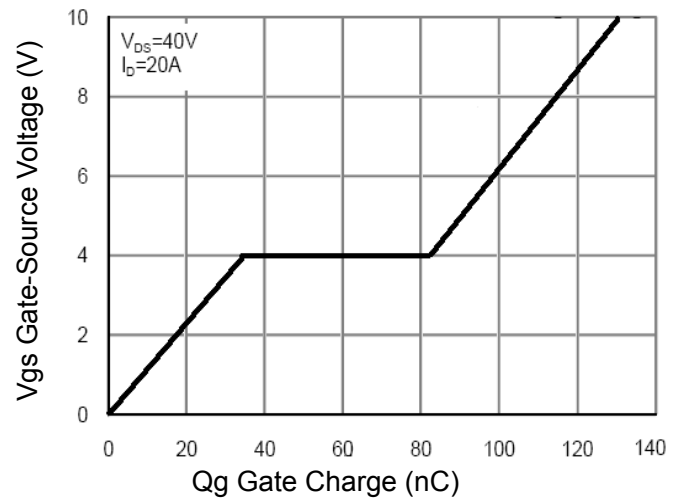
**Figure 2 Transfer Characteristics**



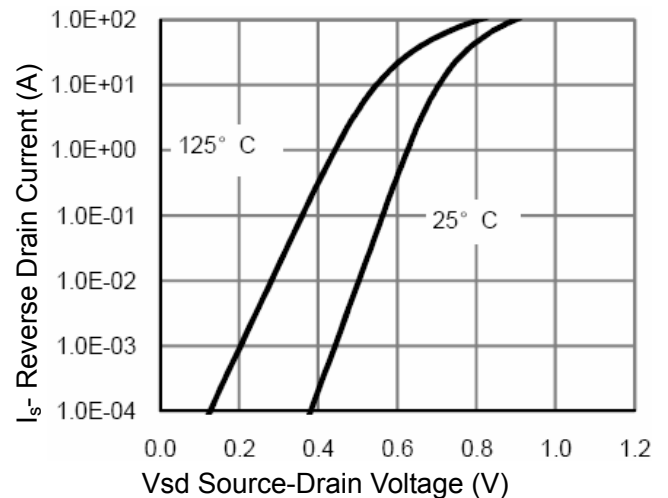
**Figure 3 Rdson- Drain Current**



**Figure 4 Rdson-Junction Temperature**

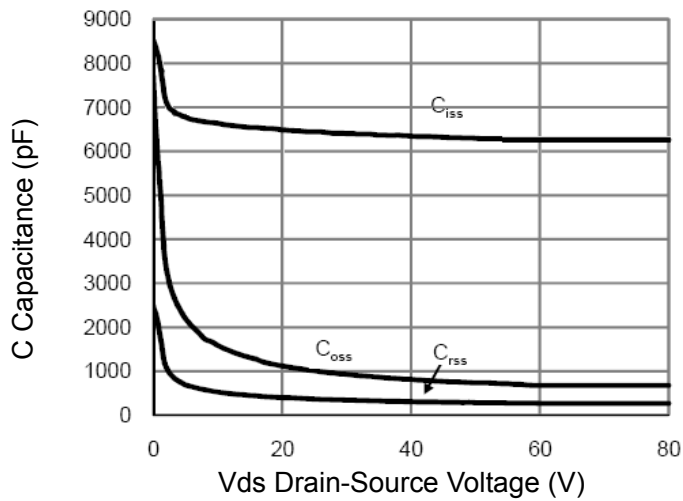


**Figure 5 Gate Charge**

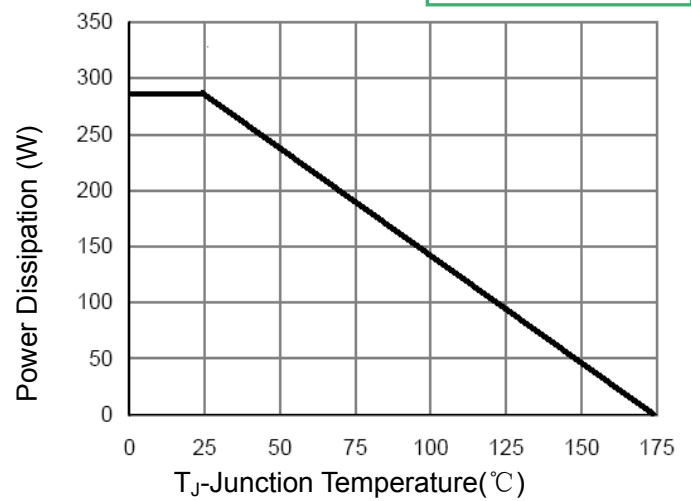


**Figure 6 Source- Drain Diode Forward**

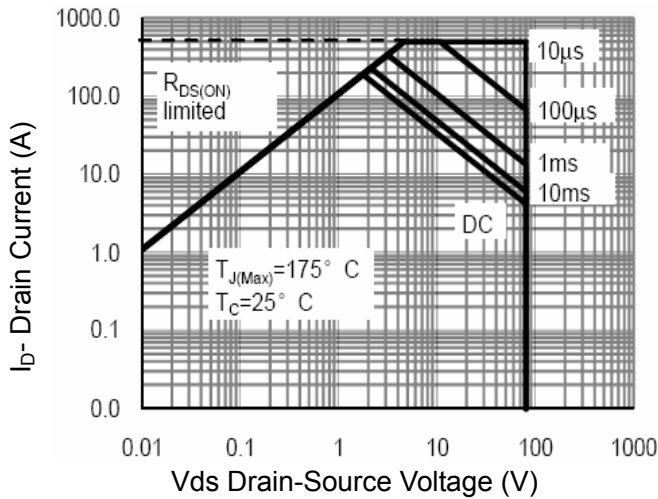
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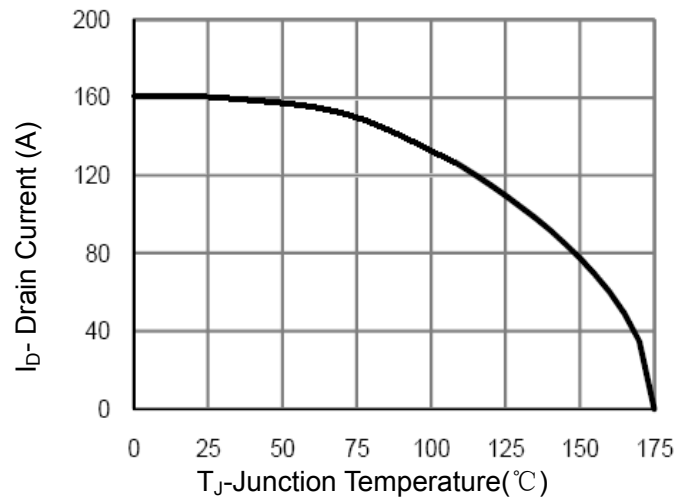
**Figure 7 Capacitance vs Vds**



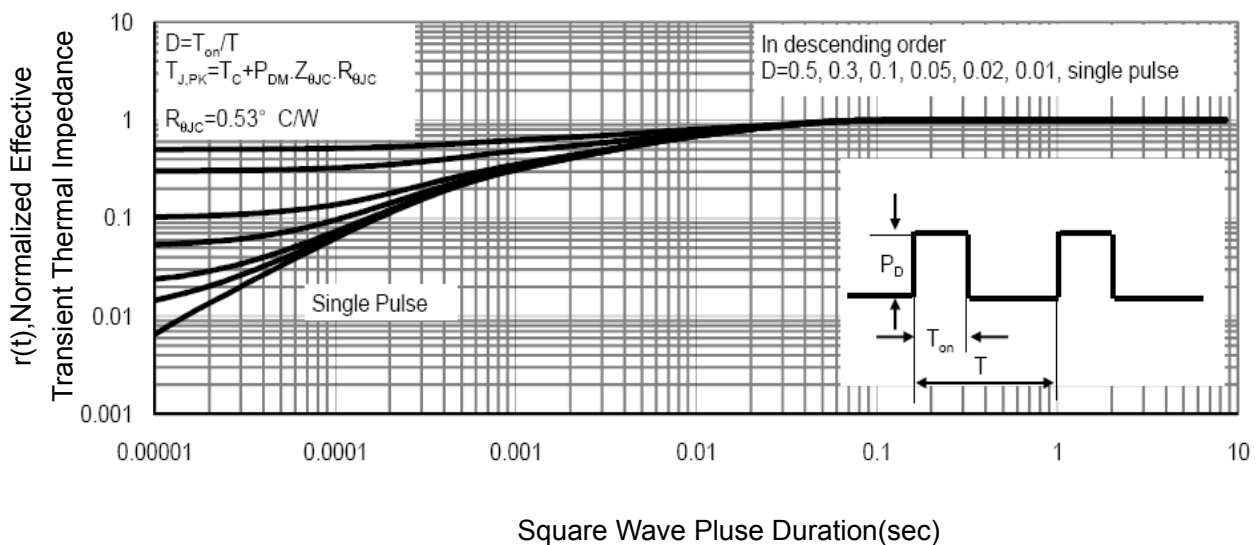
**Figure 9 Power De-rating**



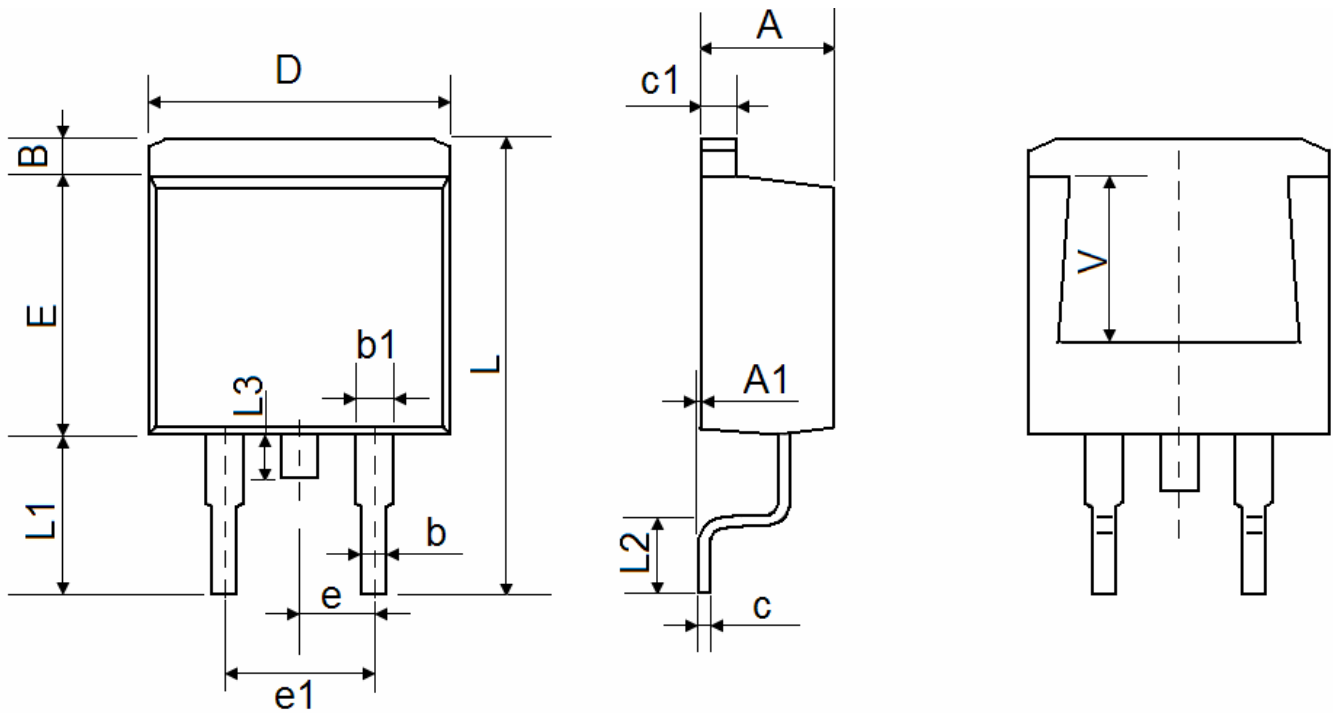
**Figure 8 Safe Operation Area**



**Figure 10 Current De-rating**



**Figure 11 Normalized Maximum Transient Thermal Impedance**

**Pb Free Product**
**TO-263-2L Package Information**


| Symbol | Dimensions In Millimeters |        | Dimensions In Inches |       |
|--------|---------------------------|--------|----------------------|-------|
|        | Min.                      | Max.   | Min.                 | Max.  |
| A      | 4.470                     | 4.670  | 0.176                | 0.184 |
| A1     | 0.000                     | 0.150  | 0.000                | 0.006 |
| B      | 1.170                     | 1.370  | 0.046                | 0.054 |
| b      | 0.710                     | 0.910  | 0.028                | 0.036 |
| b1     | 1.170                     | 1.370  | 0.046                | 0.054 |
| c      | 0.310                     | 0.530  | 0.012                | 0.021 |
| c1     | 1.170                     | 1.370  | 0.046                | 0.054 |
| D      | 10.010                    | 10.310 | 0.394                | 0.406 |
| E      | 8.500                     | 8.900  | 0.335                | 0.350 |
| e      | 2.540 TYP.                |        | 0.100 TYP.           |       |
| e1     | 4.980                     | 5.180  | 0.196                | 0.204 |
| L      | 15.050                    | 15.450 | 0.593                | 0.608 |
| L1     | 5.080                     | 5.480  | 0.200                | 0.216 |
| L2     | 2.340                     | 2.740  | 0.092                | 0.108 |
| L3     | 1.300                     | 1.700  | 0.051                | 0.067 |
| V      | 5.600 REF                 |        | 0.220 REF            |       |