

## P-Channel Enhancement Mode Power MOSFET

## Description

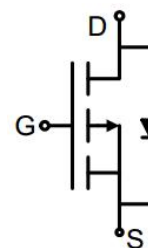
The GT180P10M uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge. It can be used in a wide variety of applications.

## General Features

- $V_{DS}$  -100V
- $I_D$  (at  $V_{GS} = -10V$ ) -70A
- $R_{DS(ON)}$  (at  $V_{GS} = -10V$ ) < 20m $\Omega$
- $R_{DS(ON)}$  (at  $V_{GS} = -4.5V$ ) < 24m $\Omega$
- 100% Avalanche Tested
- RoHS Compliant

## Application

- Power switch
- DC/DC converters



Schematic diagram



TO-263

## Ordering Information

| Device    | Package | Marking  | Packaging   |
|-----------|---------|----------|-------------|
| GT180P10M | TO-263  | GT180P10 | 800pcs/Reel |

Absolute Maximum Ratings  $T_C = 25^\circ\text{C}$ , unless otherwise noted

| Parameter                                        | Symbol         | Value                            | Unit             |
|--------------------------------------------------|----------------|----------------------------------|------------------|
| Drain-Source Voltage                             | $V_{DS}$       | -100                             | V                |
| Continuous Drain Current                         | $I_D$          | $T_C = 25^\circ\text{C}$<br>-70  | A                |
|                                                  |                | $T_C = 100^\circ\text{C}$<br>-44 |                  |
| Pulsed Drain Current (note1)                     | $I_{DM}$       | -280                             | A                |
| Gate-Source Voltage                              | $V_{GS}$       | $\pm 20$                         | V                |
| Power Dissipation                                | $P_D$          | 210                              | W                |
| Single pulse avalanche energy (note2)            | $E_{AS}$       | 380                              | mJ               |
| Operating Junction and Storage Temperature Range | $T_J, T_{stg}$ | -55 To 150                       | $^\circ\text{C}$ |

## Thermal Resistance

| Parameter                               | Symbol     | Value | Unit               |
|-----------------------------------------|------------|-------|--------------------|
| Thermal Resistance, Junction-to-Ambient | $R_{thJA}$ | 50    | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction-to-Case    | $R_{thJC}$ | 0.6   | $^\circ\text{C/W}$ |

| Specifications T <sub>J</sub> = 25°C, unless otherwise noted |                      |                                                                             |       |      |      |      |
|--------------------------------------------------------------|----------------------|-----------------------------------------------------------------------------|-------|------|------|------|
| Parameter                                                    | Symbol               | Test Conditions                                                             | Value |      |      | Unit |
|                                                              |                      |                                                                             | Min.  | Typ. | Max. |      |
| Static Parameters                                            |                      |                                                                             |       |      |      |      |
| Drain-Source Breakdown Voltage                               | V <sub>(BR)DSS</sub> | V <sub>GS</sub> = 0V, I <sub>D</sub> = -250μA                               | -100  | --   | --   | V    |
| Zero Gate Voltage Drain Current                              | I <sub>DSS</sub>     | V <sub>DS</sub> = -100V, V <sub>GS</sub> = 0V                               | --    | --   | -1   | μA   |
| Gate-Source Leakage                                          | I <sub>GSS</sub>     | V <sub>GS</sub> = ±20V                                                      | --    | --   | ±100 | nA   |
| Gate-Source Threshold Voltage                                | V <sub>GS(th)</sub>  | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA                 | -1.0  | -1.6 | -2.5 | V    |
| Drain-Source On-Resistance                                   | R <sub>DS(on)</sub>  | V <sub>GS</sub> = -10V, I <sub>D</sub> = -20A                               | --    | 16   | 20   | mΩ   |
|                                                              |                      | V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -20A                              | --    | 18   | 24   |      |
| Forward Transconductance                                     | g <sub>FS</sub>      | V <sub>DS</sub> = -5V, I <sub>D</sub> = -20A                                | --    | 49   | --   | S    |
| Dynamic Parameters                                           |                      |                                                                             |       |      |      |      |
| Input Capacitance                                            | C <sub>iss</sub>     | V <sub>GS</sub> = 0V,<br>V <sub>DS</sub> = -50V,<br>f = 1.0MHz              | --    | 6000 | --   | pF   |
| Output Capacitance                                           | C <sub>oss</sub>     |                                                                             | --    | 500  | --   |      |
| Reverse Transfer Capacitance                                 | C <sub>rss</sub>     |                                                                             | --    | 35   | --   |      |
| Total Gate Charge                                            | Q <sub>g</sub>       | V <sub>DD</sub> = -50V,<br>I <sub>D</sub> = -20A,<br>V <sub>GS</sub> = -10V | --    | 92   | --   | nC   |
| Gate-Source Charge                                           | Q <sub>gs</sub>      |                                                                             | --    | 16   | --   |      |
| Gate-Drain Charge                                            | Q <sub>gd</sub>      |                                                                             | --    | 12   | --   |      |
| Turn-on Delay Time                                           | t <sub>d(on)</sub>   | V <sub>DD</sub> = -50V,<br>I <sub>D</sub> = -20A,<br>R <sub>G</sub> = 1.6Ω  | --    | 22   | --   | ns   |
| Turn-on Rise Time                                            | t <sub>r</sub>       |                                                                             | --    | 18   | --   |      |
| Turn-off Delay Time                                          | t <sub>d(off)</sub>  |                                                                             | --    | 80   | --   |      |
| Turn-off Fall Time                                           | t <sub>f</sub>       |                                                                             | --    | 22   | --   |      |
| Drain-Source Body Diode Characteristics                      |                      |                                                                             |       |      |      |      |
| Continuous Body Diode Current                                | I <sub>S</sub>       | T <sub>C</sub> = 25°C                                                       | --    | --   | -70  | A    |
| Body Diode Voltage                                           | V <sub>SD</sub>      | T <sub>J</sub> = 25°C, I <sub>SD</sub> = -20A, V <sub>GS</sub> = 0V         | --    | --   | -1.2 | V    |
| Reverse Recovery Charge                                      | Q <sub>rr</sub>      | I <sub>F</sub> = -20A, V <sub>GS</sub> = 0V<br>di/dt=-100A/us               | --    | 160  | --   | nC   |
| Reverse Recovery Time                                        | T <sub>rr</sub>      |                                                                             | --    | 88   | --   | ns   |

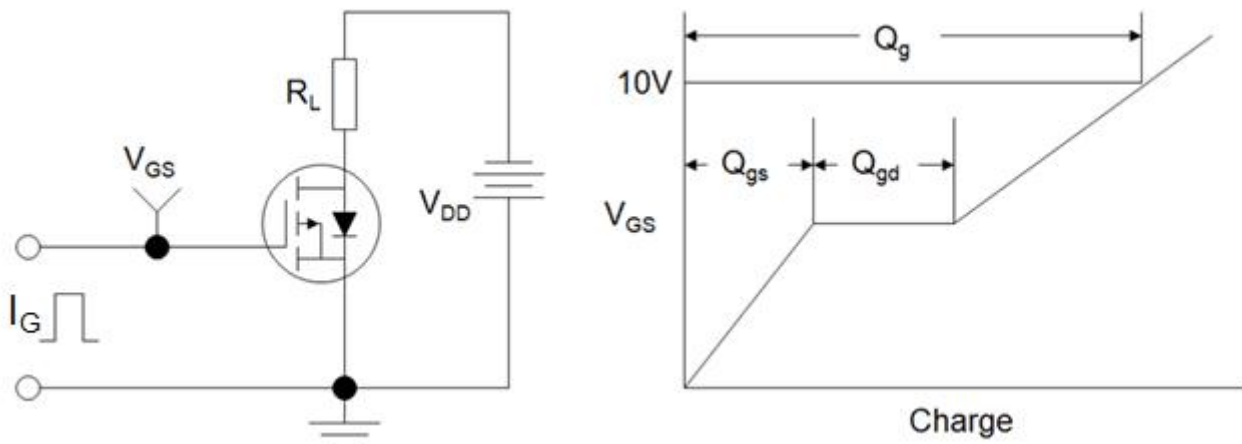
## Notes

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. EAS condition :  $T_J = 25^{\circ}\text{C}, V_{DD} = -50V, V_{GS} = -10V, L = 0.5mH, R_G = 25\Omega$

The table shows the minimum avalanche energy, which is 1056mJ when the device is tested until failure

3. Identical low side and high side switch with identical  $R_G$

### Gate Charge Test Circuit



### Switch Time Test Circuit

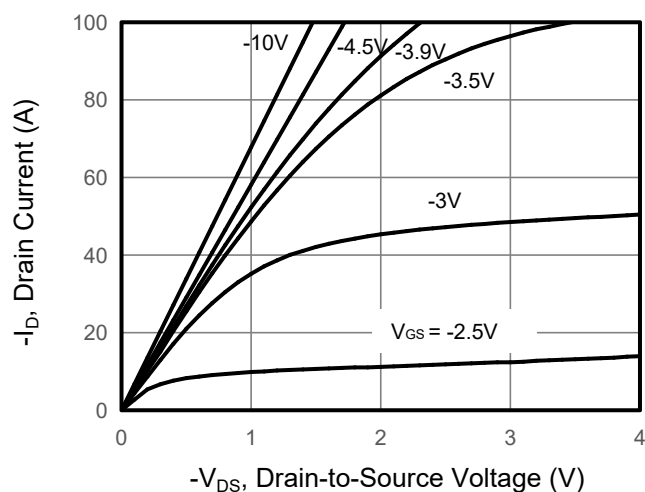


### EAS Test Circuit

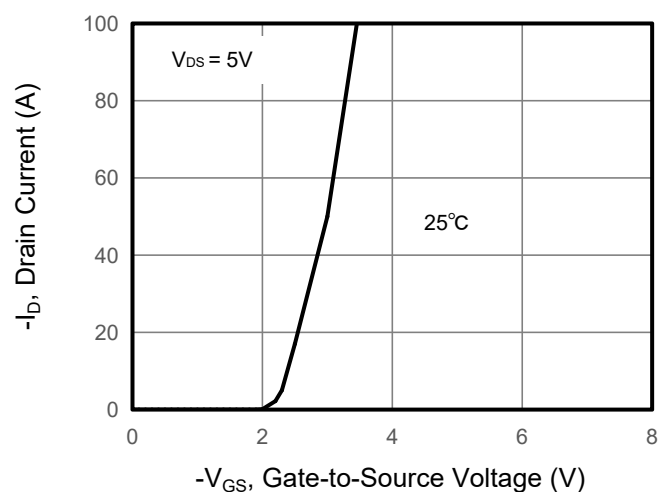


**Typical Characteristics**  $T_J = 25^\circ\text{C}$ , unless otherwise noted

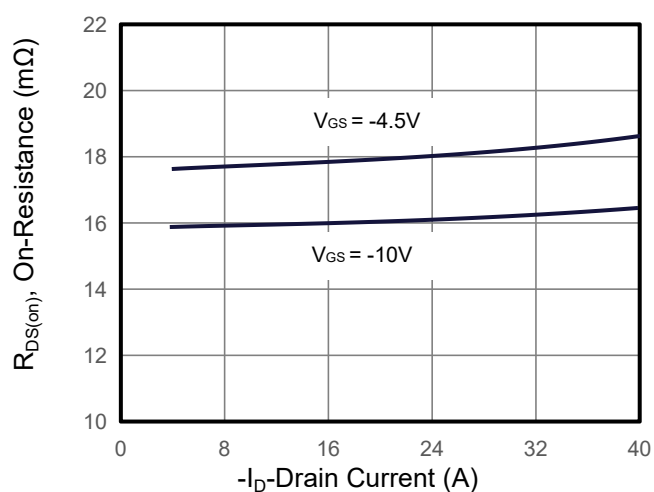
**Figure 1. Output Characteristics**



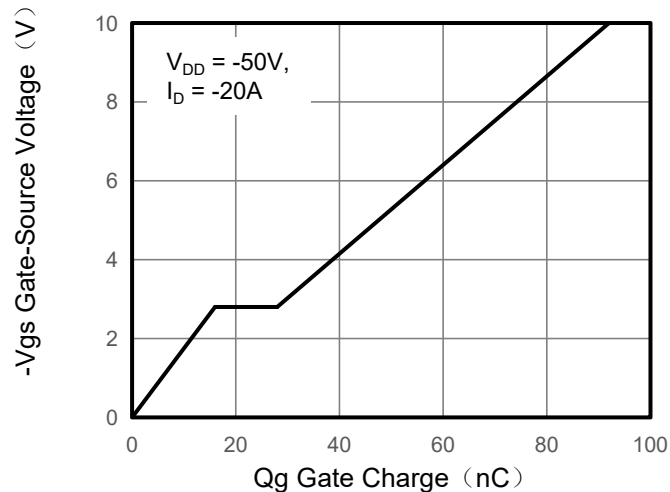
**Figure 2. Transfer Characteristics**



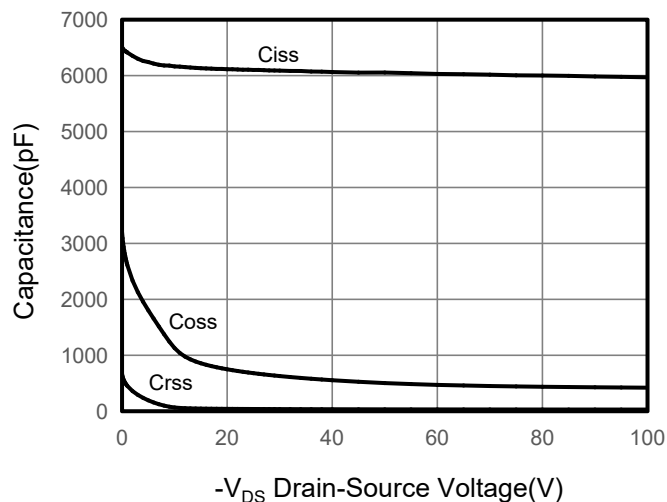
**Figure 3. Drain Source On Resistance**



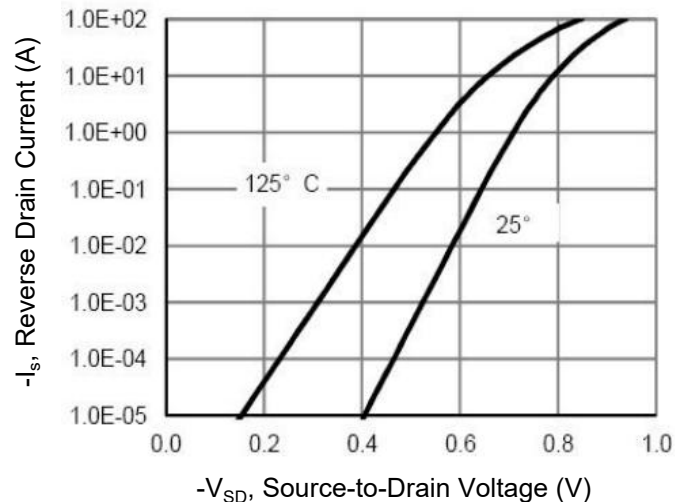
**Figure 4. Gate Charge**



**Figure 5. Capacitance**

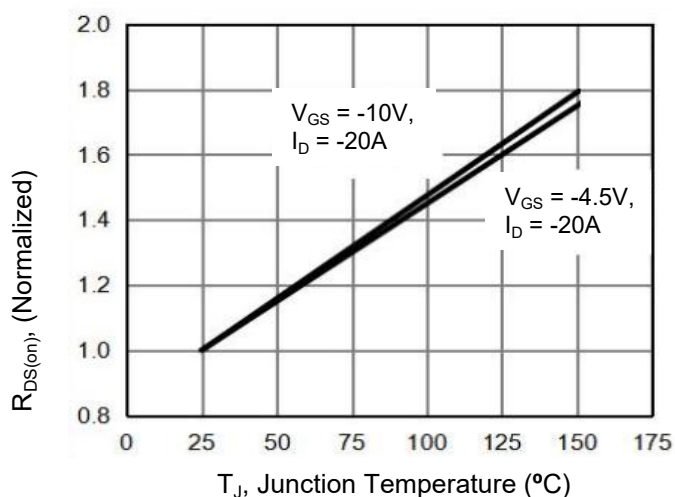


**Figure 6. Source-Drain Diode Forward**

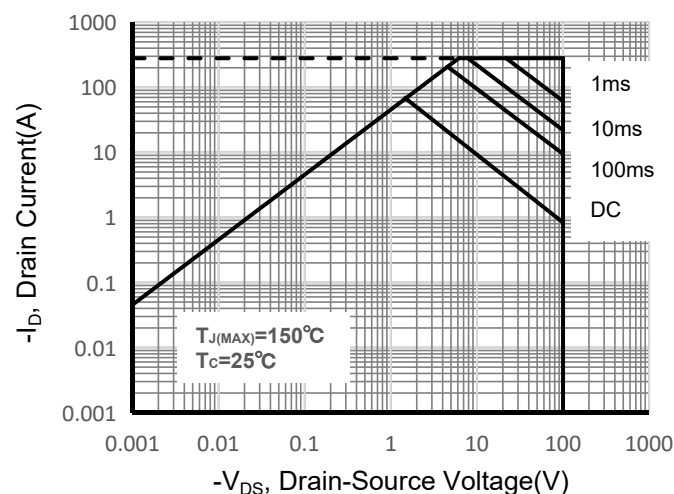


**Typical Characteristics**  $T_J = 25^\circ\text{C}$ , unless otherwise noted

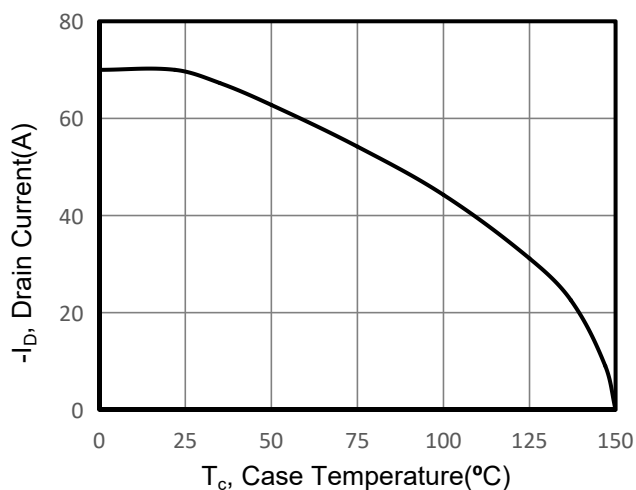
**Figure 7. Drain-Source On-Resistance**



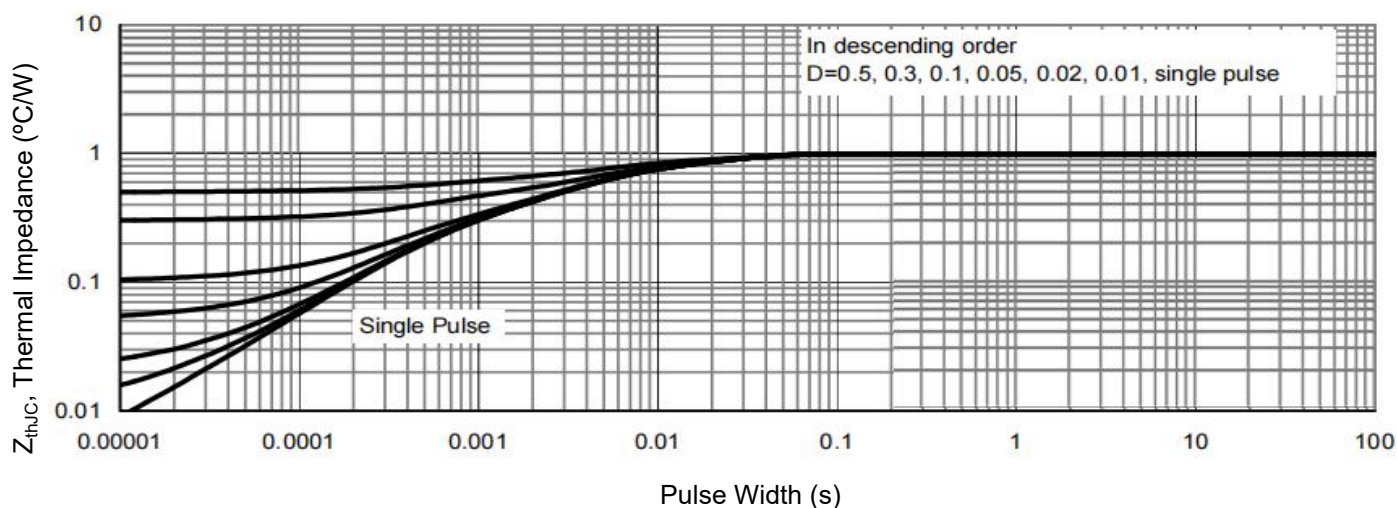
**Figure 8. Safe Operation Area**



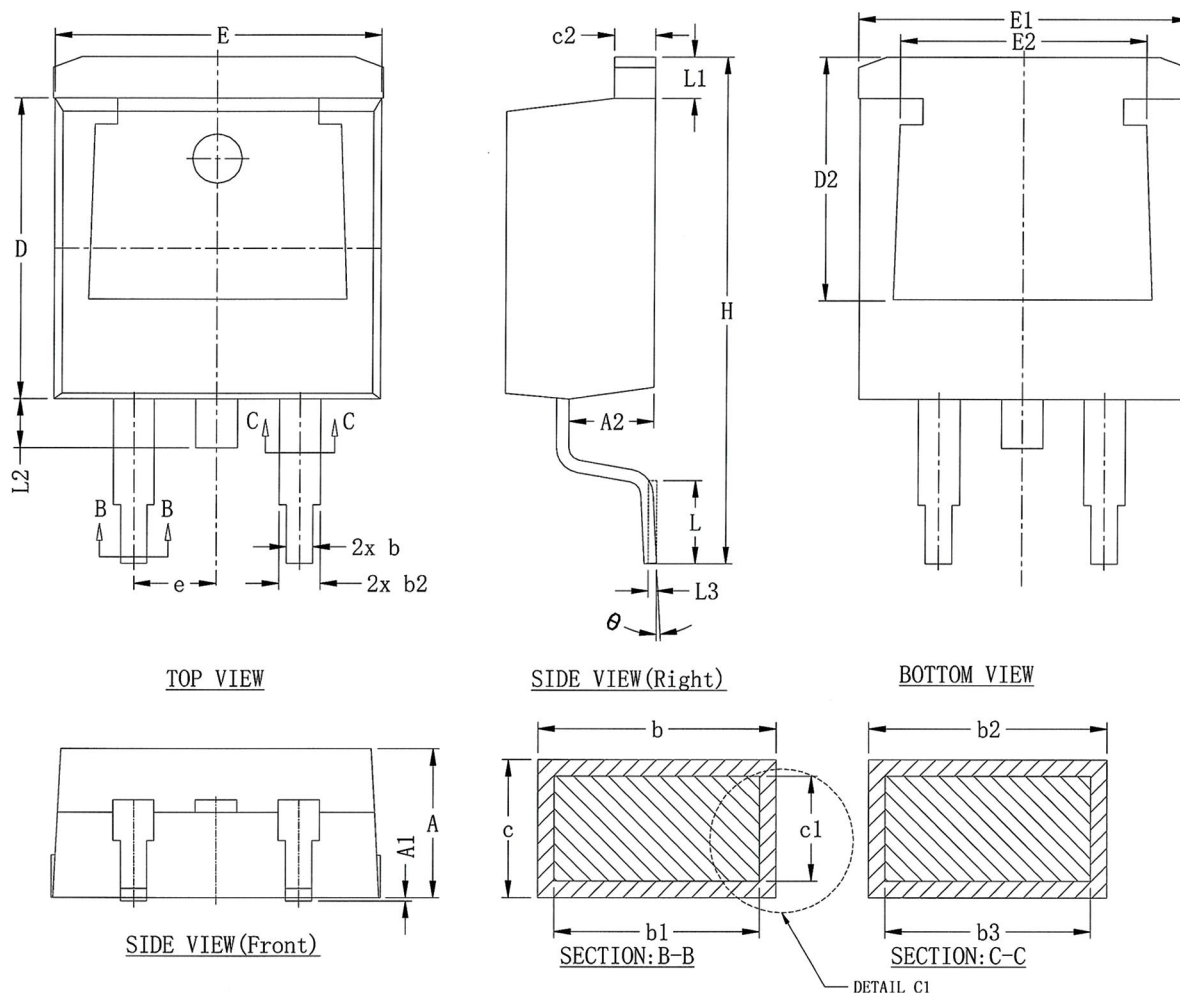
**Figure 9. Maximum Continuous Drain Current vs Case Temperature**



**Figure 10. Normalized Maximum Transient Thermal Impedance**



## TO-263 Package Information



| DIM<br>SYMBOL | MIN.  | NOM.  | MAX.  | DIM<br>SYMBOL | MIN.       | NOM.   | MAX.   |
|---------------|-------|-------|-------|---------------|------------|--------|--------|
| A             | 4.450 | 4.550 | 4.650 | D2            | 7.215      | 7.415  | 7.615  |
| A1            | 0.000 | —     | 0.150 | E             | 9.900      | 10.000 | 10.100 |
| A2            | 2.500 | 2.600 | 2.700 | E1            | 9.900      | 10.100 | 10.300 |
| b             | 0.753 | 0.853 | 0.953 | E2            | 7.341      | 7.541  | 7.741  |
| b1            | 0.713 | 0.813 | 0.913 | e             | 2.540 BSC. |        |        |
| b2            | 1.210 | 1.310 | 1.410 | H             | 15.300     | 15.500 | 15.700 |
| b3            | 1.170 | 1.270 | 1.370 | L             | 2.340      | 2.540  | 2.740  |
| c             | 0.330 | 0.421 | 0.521 | L1            | 1.066      | 1.266  | 1.466  |
| c1            | 0.281 | 0.381 | 0.481 | L2            | 1.400      | 1.500  | 1.600  |
| c2            | 1.210 | 1.310 | 1.410 | L3            | 0.254 BSC. |        |        |
| D             | 9.100 | 9.200 | 9.300 | $\theta$      | 0°         | ---    | 5°     |