

## N-Channel Enhancement Mode Power MOSFET

**Description**

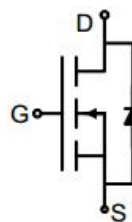
The GC075N65QF uses advanced super junction technology and design to provide excellent  $R_{DS(on)}$ , low gate charge and operation. This device is suitable for industry's AC-DC SMPS requirement for PFC, AC/DC power conversion, and industrial power application.

**General Features**

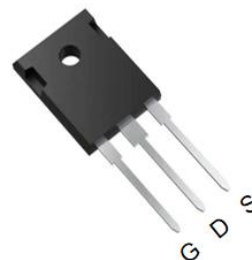
- $V_{DS}$  650V
- $I_D$  (at  $V_{GS} = 10V$ ) 44A
- $R_{DS(ON)}$  (at  $V_{GS} = 10V$ ) < 80m $\Omega$
- 100% Avalanche Tested
- RoHS Compliant
- Ultra-fast body diode

**Application**

- Power switch
- DC/DC converters



Schematic diagram



TO-247

**Ordering Information**

| Device     | Package | Marking   | Packaging  |
|------------|---------|-----------|------------|
| GC075N65QF | TO-247  | GC075N65F | 30pcs/Tube |

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

| Parameter                                        | Symbol                    | Value      | Unit             |
|--------------------------------------------------|---------------------------|------------|------------------|
| Drain-Source Voltage                             | $V_{DS}$                  | 650        | V                |
| Continuous Drain Current                         | $T_C = 25^\circ\text{C}$  | 44         | A                |
|                                                  | $T_C = 100^\circ\text{C}$ | 28         |                  |
| Pulsed Drain Current (note1)                     | $I_{DM}$                  | 132        | A                |
| Gate-Source Voltage                              | $V_{GS}$                  | $\pm 30$   | V                |
| Power Dissipation                                | $P_D$                     | 347        | W                |
| Single pulse avalanche energy (note2)            | $E_{AS}$                  | 211        | 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 | $R_{thJA}$ | 45    | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction-to-Case    | $R_{thJC}$ | 0.36  | $^\circ\text{C/W}$ |

## Specifications $T_J = 25^\circ\text{C}$ , 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                              | 650   | --   | --   | V    |
| Zero Gate Voltage Drain Current         | I <sub>DSS</sub>     | V <sub>DS</sub> = 650V, V <sub>GS</sub> = 0V                              | --    | --   | 5    | μA   |
| Gate-Source Leakage                     | I <sub>GSS</sub>     | V <sub>GS</sub> = ±30V                                                    | --    | --   | ±100 | nA   |
| Gate-Source Threshold Voltage           | V <sub>GS(th)</sub>  | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA                | 3.3   | 4.1  | 5.3  | V    |
| Drain-Source On-Resistance              | R <sub>DS(on)</sub>  | V <sub>GS</sub> = 10V, I <sub>D</sub> = 22A                               | --    | 65   | 80   | mΩ   |
| Forward Transconductance                | g <sub>FS</sub>      | V <sub>GS</sub> = 20V, I <sub>D</sub> = 22A                               | --    | 14   | --   | S    |
| Dynamic Parameters                      |                      |                                                                           |       |      |      |      |
| Input Capacitance                       | C <sub>iss</sub>     | V <sub>GS</sub> = 0V,<br>V <sub>DS</sub> = 400V,<br>f = 1MHz              | --    | 3100 | --   | pF   |
| Output Capacitance                      | C <sub>oss</sub>     |                                                                           | --    | 105  | --   |      |
| Reverse Transfer Capacitance            | C <sub>rss</sub>     |                                                                           | --    | 22   | --   |      |
| Total Gate Charge                       | Q <sub>g</sub>       | V <sub>DD</sub> = 400V,<br>I <sub>D</sub> = 22A,<br>V <sub>GS</sub> = 10V | --    | 75   | --   | nC   |
| Gate-Source Charge                      | Q <sub>gs</sub>      |                                                                           | --    | 29   | --   |      |
| Gate-Drain Charge                       | Q <sub>gd</sub>      |                                                                           | --    | 33   | --   |      |
| Turn-on Delay Time                      | t <sub>d(on)</sub>   | V <sub>DD</sub> = 400V,<br>I <sub>D</sub> = 22A,<br>R <sub>G</sub> = 27Ω  | --    | 43   | --   | ns   |
| Turn-on Rise Time                       | t <sub>r</sub>       |                                                                           | --    | 84   | --   |      |
| Turn-off Delay Time                     | t <sub>d(off)</sub>  |                                                                           | --    | 81   | --   |      |
| Turn-off Fall Time                      | t <sub>f</sub>       |                                                                           | --    | 37   | --   |      |
| Drain-Source Body Diode Characteristics |                      |                                                                           |       |      |      |      |
| Continuous Body Diode Current           | I <sub>S</sub>       | T <sub>C</sub> = 25°C                                                     | --    | --   | 44   | A    |
| Body Diode Voltage                      | V <sub>SD</sub>      | T <sub>J</sub> = 25°C, I <sub>SD</sub> = 22A, V <sub>GS</sub> = 0V        | --    | --   | 1.2  | V    |
| Reverse Recovery Charge                 | Q <sub>rr</sub>      | I <sub>F</sub> = 22A, V <sub>GS</sub> = 0V<br>di/dt=100A/us               | --    | 0.57 | --   | μC   |
| Reverse Recovery Time                   | T <sub>rr</sub>      |                                                                           | --    | 105  | --   | ns   |

### Notes

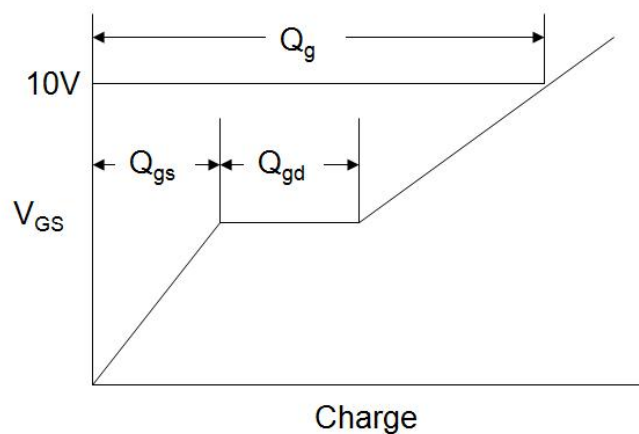
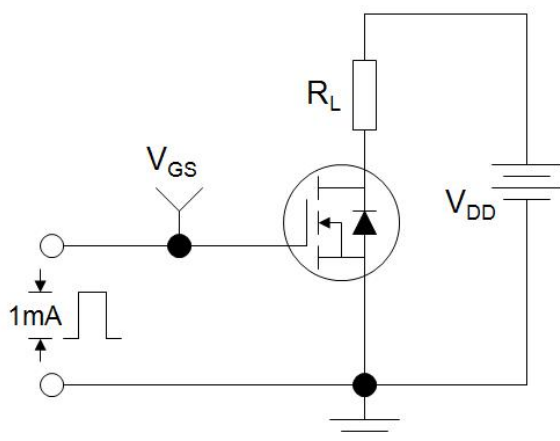
1. Repetitive Rating: Pulse width limited by maximum junction temperature

2. EAS condition :  $T_J = 25^\circ\text{C}, V_{DD} = 50V, V_{GS} = 10V, L = 10mH, R_G = 25\Omega$

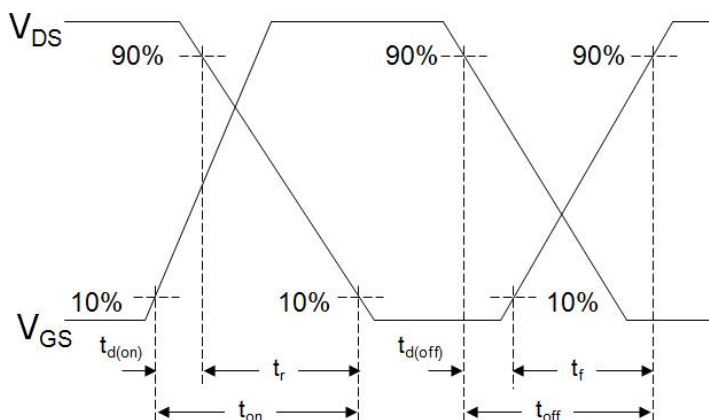
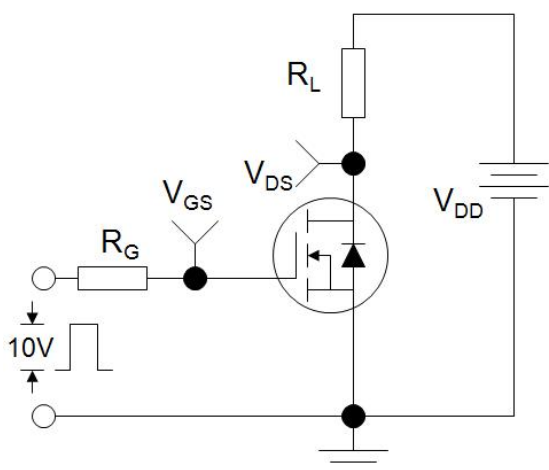
The table shows the minimum avalanche energy, which is 580mJ when the device is tested until failure

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

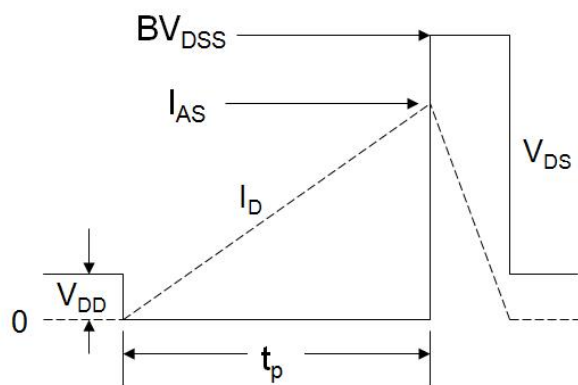
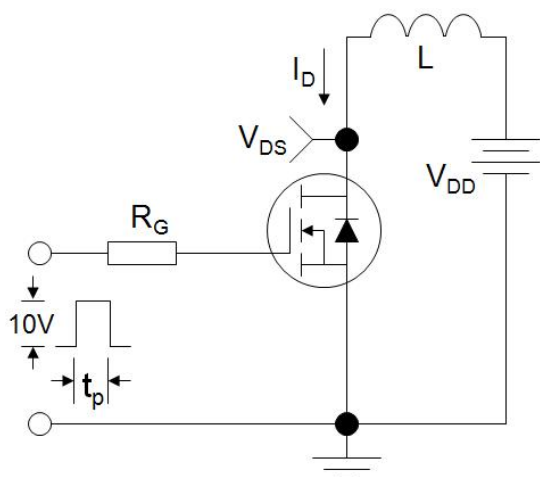
### Gate Charge Test Circuit



### Switch Time Test Circuit

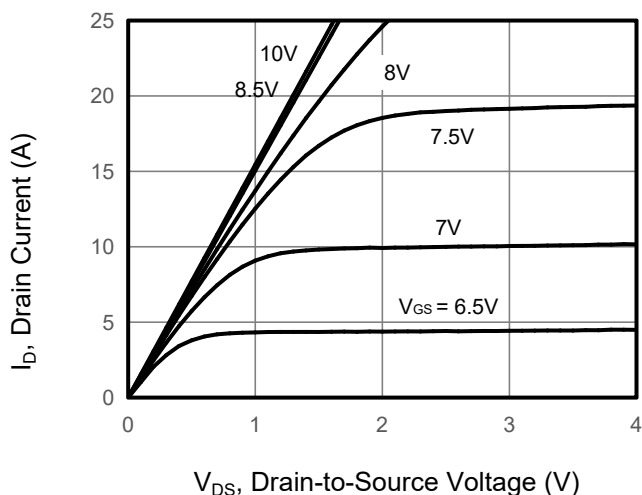


### EAS Test Circuit

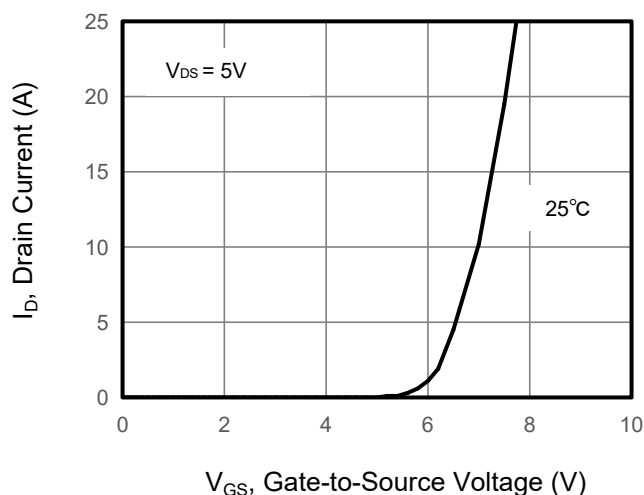


**Typical Characteristics**  $T_J = 25^\circ\text{C}$ , unless otherwise noted

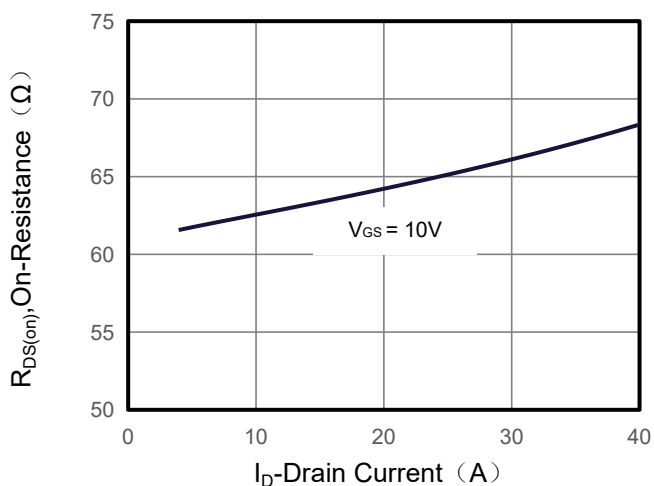
**Figure 1. Output Characteristics**



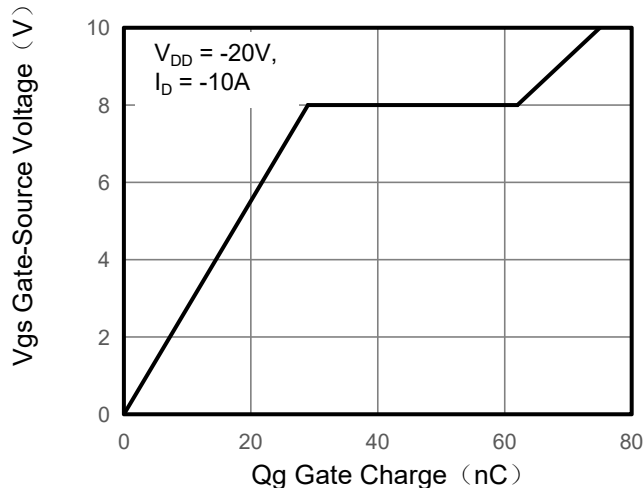
**Figure 2. Transfer Characteristics**



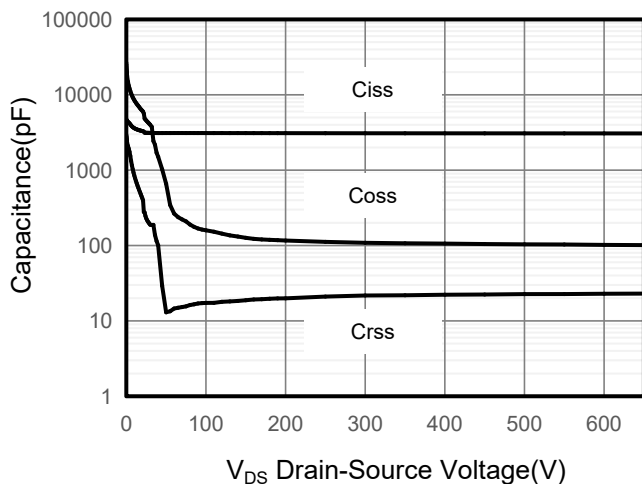
**Figure 3. Drain Source On Resistance**



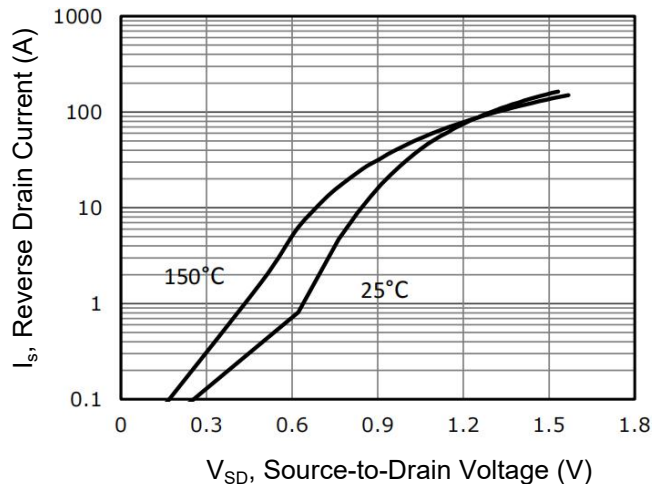
**Figure 4. Gate Charge**



**Figure 5. Capacitance**

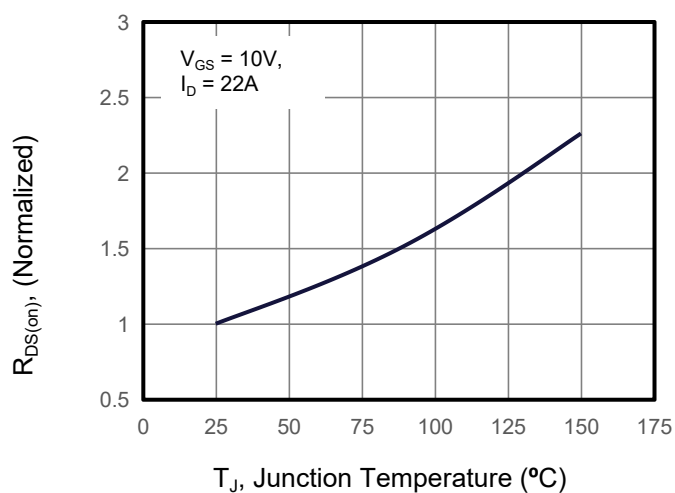


**Figure 6. Source-Drain Diode Forward**

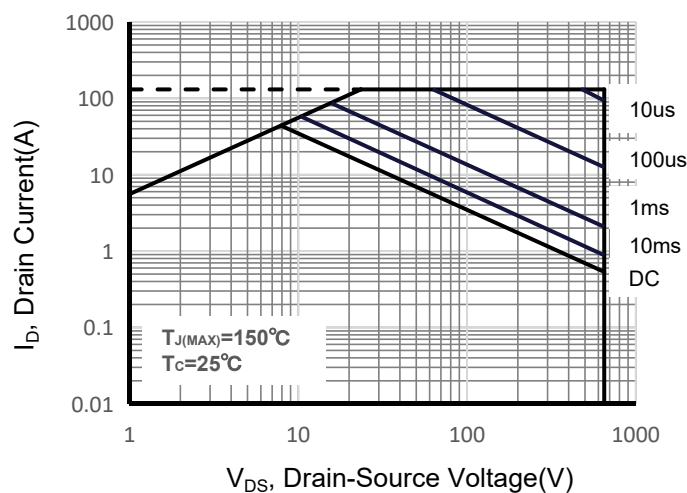


**Typical Characteristics**  $T_J = 25^\circ\text{C}$ , unless otherwise noted

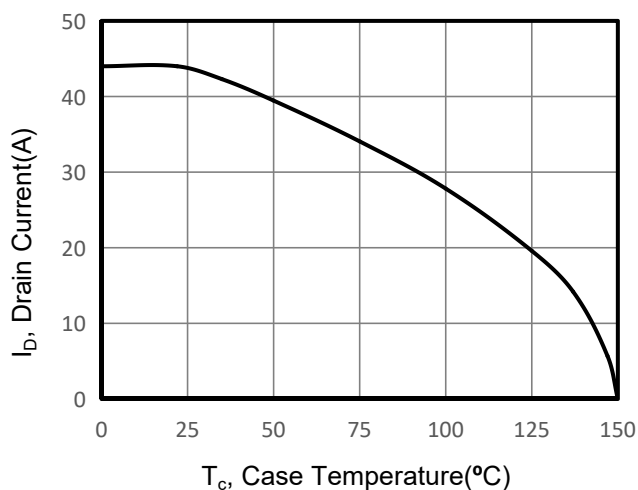
**Figure 7. Drain-Source On-Resistance**



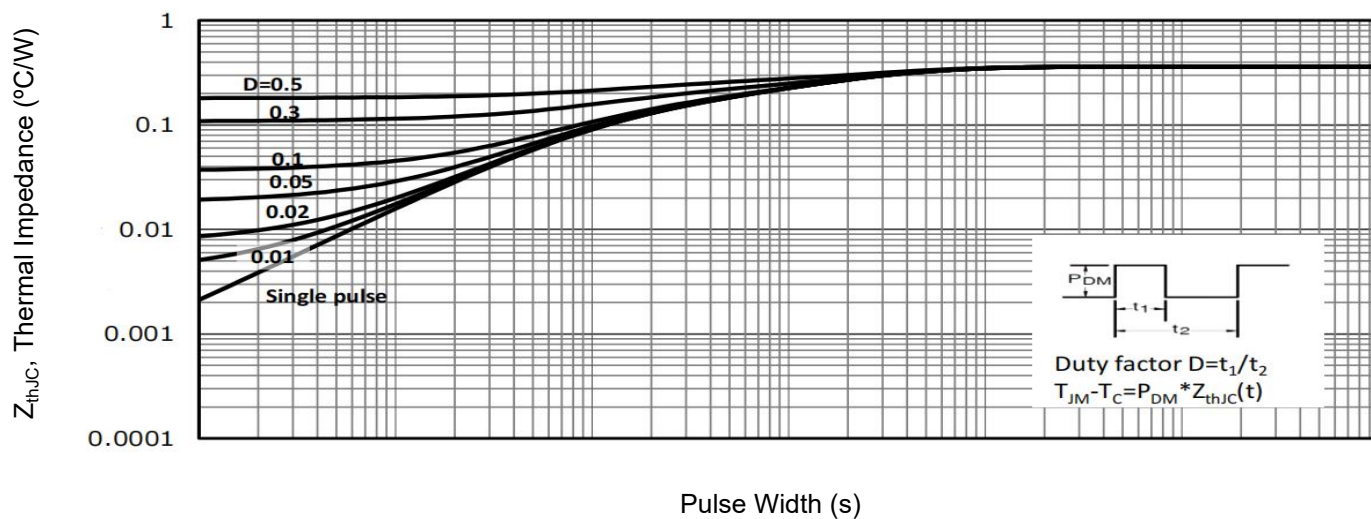
**Figure 8. Safe Operation Area**



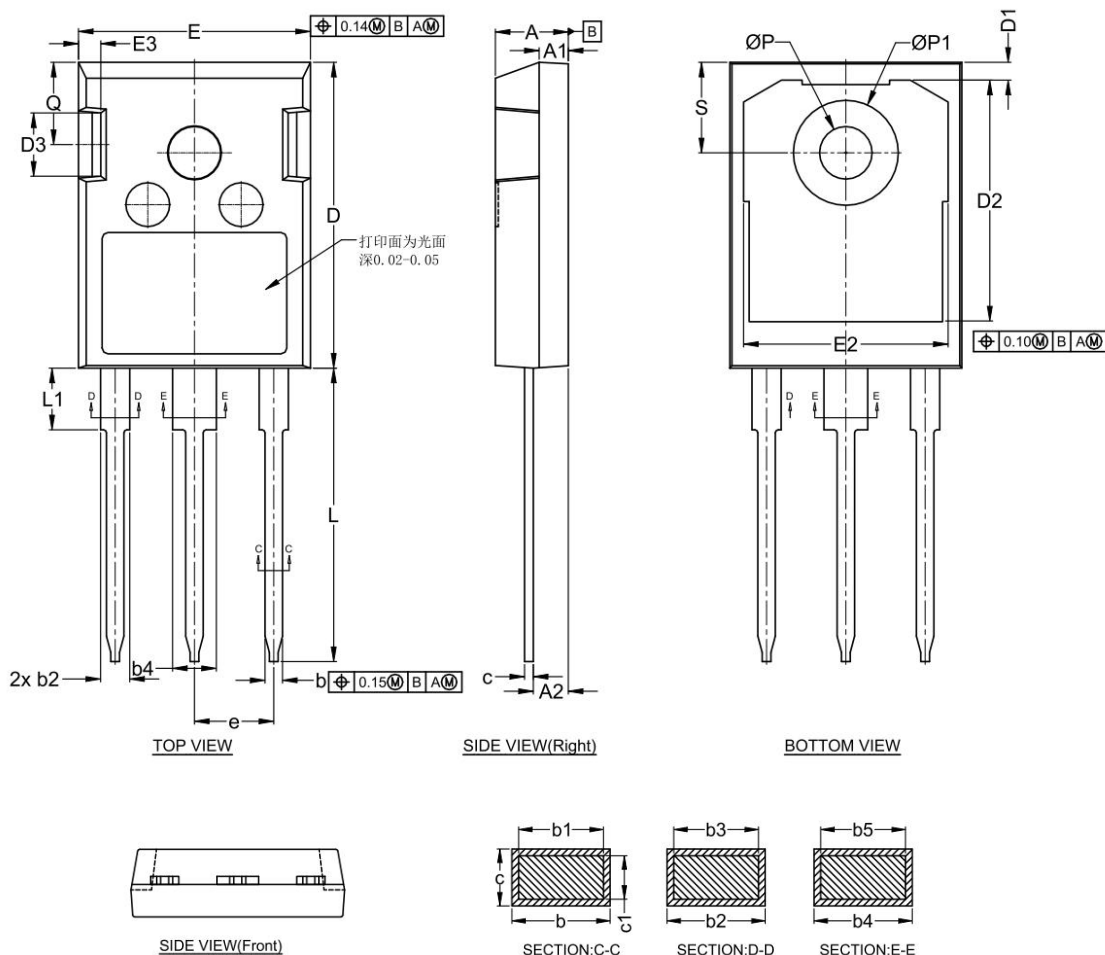
**Figure 9. Maximum Continuous Drain Current vs Case Temperature**



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



## TO-247 Package Information



| DIM<br>SYMBOL | MIN.   | NOM.   | MAX.   | DIM<br>SYMBOL | MIN.       | NOM.   | MAX.   |
|---------------|--------|--------|--------|---------------|------------|--------|--------|
| A             | 4.900  | 5.000  | 5.100  | D1            | 1.022      | 1.222  | 1.400  |
| A1            | 1.940  | 2.040  | 2.140  | D2            | 16.348     | 16.548 | 16.748 |
| A2            | 2.300  | 2.400  | 2.500  | D3            | 4.232      | 4.332  | 4.432  |
| b             | 1.139  | 1.239  | 1.330  | E             | 15.800     | 15.900 | 16.000 |
| b1            | 1.099  | 1.199  | 1.299  | E2            | 13.821     | 14.021 | 14.221 |
| b2            | 1.939  | 2.039  | 2.139  | E3            | 1.430      | 1.530  | 1.630  |
| b3            | 1.899  | 1.999  | 2.099  | e             | 5.436 BSC. |        |        |
| b4            | 2.940  | 3.040  | 3.140  | L             | 19.900     | 20.100 | 20.300 |
| b5            | 2.900  | 3.000  | 3.100  | L1            | 4.024      | 4.224  | 4.424  |
| c             | 0.550  | 0.640  | 0.700  | ØP            | 3.500      | 3.600  | 3.700  |
| c1            | 0.500  | 0.600  | 0.700  | ØP1           | 7.088      | 7.188  | 7.288  |
| D             | 20.850 | 20.950 | 21.050 | Q             | 5.435      | 5.635  | 5.835  |
| D1            | 1.022  | 1.222  | 1.400  | S             | 6.040      | 6.200  | 6.300  |