

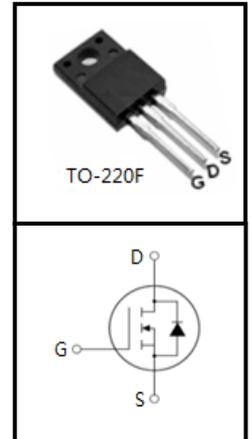
# 1000V N-Channel MOSFET

## FEATURES

- Fast switching
- 100% avalanche tested
- Improved dv/dt capability

## APPLICATIONS

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply (UPS)
- Power Factor Correction (PFC)



## Device Marking and Package Information

| Device    | Package | Marking   |
|-----------|---------|-----------|
| CS2N100LF | TO-220F | CS2N100LF |

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

| Parameter  | Symbol         | Value    | Unit             |
|--|----------------|----------|------------------|
|  |                | TO-220F  |                  |
| Drain-Source Voltage ( $V_{GS} = 0V$ )           | $V_{DSS}$      | 1000     | V                |
| Continuous Drain Current                         | $I_D$          | 1.5      | A                |
| Pulsed Drain Current (note1)                     | $I_{DM}$       | 6        | A                |
| Gate-Source Voltage                              | $V_{GSS}$      | $\pm 30$ | V                |
| Single Pulse Avalanche Energy (note2)            | $E_{AS}$       | 90       | mJ               |
| Avalanche Current (note1)                        | $I_{AS}$       | 3        | A                |
| Repetitive Avalanche Energy (note1)              | $E_{AR}$       | 54       | mJ               |
| Power Dissipation ( $T_C = 25^\circ\text{C}$ )   | $P_D$          | 36       | W                |
| Operating Junction and Storage Temperature Range | $T_J, T_{stg}$ | -55~+150 | $^\circ\text{C}$ |

## Thermal Resistance

| Parameter                               | Symbol     | Value   | Unit                      |
|---|------------|---------|---------------------------|
|   |            | TO-220F |                           |
| Thermal Resistance, Junction-to-Case    | $R_{thJC}$ | 3.47    | $^\circ\text{C}/\text{W}$ |
| Thermal Resistance, Junction-to-Ambient | $R_{thJA}$ | 62.5    |                           |

| <b>Specifications</b> $T_J = 25^\circ\text{C}$ , unless otherwise noted |               |   |       |      |           |               |
|---|---------------|---|-------|------|-----------|---------------|
| Parameter   | Symbol        | Test Conditions   | Value |      |           | Unit          |
|   |               |   | Min.  | Typ. | Max.      |               |
| <b>Static</b>   |               |   |       |      |           |               |
| Drain-Source Breakdown Voltage  | $V_{(BR)DSS}$ | $V_{GS} = 0V, I_D = 250\mu\text{A}$                       | 1000  | --   | --        | V             |
| Zero Gate Voltage Drain Current   | $I_{DSS}$     | $V_{DS} = 1000V, V_{GS} = 0V, T_J = 25^\circ\text{C}$     | --    | --   | 1         | $\mu\text{A}$ |
| Gate-Source Leakage   | $I_{GSS}$     | $V_{GS} = \pm 30V$  | --    | --   | $\pm 100$ | nA            |
| Gate-Source Threshold Voltage   | $V_{GS(th)}$  | $V_{DS} = V_{GS}, I_D = 250\mu\text{A}$                   | 3.0   | --   | 4.0       | V             |
| Drain-Source On-Resistance (Note3)                                      | $R_{DS(on)}$  | $V_{GS} = 10V, I_D = 0.75A$                               | --    | 8    | 9.6       | $\Omega$      |
| <b>Dynamic</b>  |               |   |       |      |           |               |
| Input Capacitance   | $C_{iss}$     | $V_{GS} = 0V,$<br>$V_{DS} = 25V,$<br>$f = 1.0\text{MHz}$  | --    | 308  | --        | pF            |
| Output Capacitance  | $C_{oss}$     |   | --    | 32   | --        |               |
| Reverse Transfer Capacitance  | $C_{rss}$     |   | --    | 6.2  | --        |               |
| Gate Resistance   | $R_g$         | $V_{GS} = 0V, V_{DS} = 0V, f = 1.0\text{MHz}$             | --    | 2.2  | --        | $\Omega$      |
| Total Gate Charge   | $Q_g$         | $V_{DD} = 800V, I_D = 1.5A,$<br>$V_{GS} = 15V$            | --    | 16   | --        | nC            |
| Gate-Source Charge  | $Q_{gs}$      |   | --    | 2    | --        |               |
| Gate-Drain Charge   | $Q_{gd}$      |   | --    | 10   | --        |               |
| Turn-on Delay Time  | $t_{d(on)}$   | $V_{DD} = 500V, I_D = 1.5A,$<br>$R_G = 25\Omega$          | --    | 34   | --        | ns            |
| Turn-on Rise Time   | $t_r$         |   | --    | 12   | --        |               |
| Turn-off Delay Time   | $t_{d(off)}$  |   | --    | 80   | --        |               |
| Turn-off Fall Time  | $t_f$         |   | --    | 45   | --        |               |
| <b>Drain-Source Body Diode Characteristics</b>                          |               |   |       |      |           |               |
| Continuous Body Diode Current   | $I_S$         | $T_C = 25^\circ\text{C}$                                  | --    | --   | 2         | A             |
| Pulsed Diode Forward Current  | $I_{SM}$      |   | --    | --   | 8         |               |
| Body Diode Voltage  | $V_{SD}$      | $T_J = 25^\circ\text{C}, I_{SD} = 0.75A, V_{GS} = 0V$     | --    | --   | 1.4       | V             |
| Reverse Recovery Time   | $t_{rr}$      | $V_R = 500V, I_S = 1.5A,$<br>$di_F/dt = 100A/\mu\text{s}$ | --    | 590  | --        | ns            |
| Reverse Recovery Charge   | $Q_{rr}$      |   | --    | 2.34 | --        | $\mu\text{C}$ |

**Notes**

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2.  $L = 20.0\text{mH}, V_{DD} = 90V, R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$
3. Pulse Test: Pulse width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 1\%$

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

Figure 1. Output Characteristics ( $T_J = 25^\circ\text{C}$ )

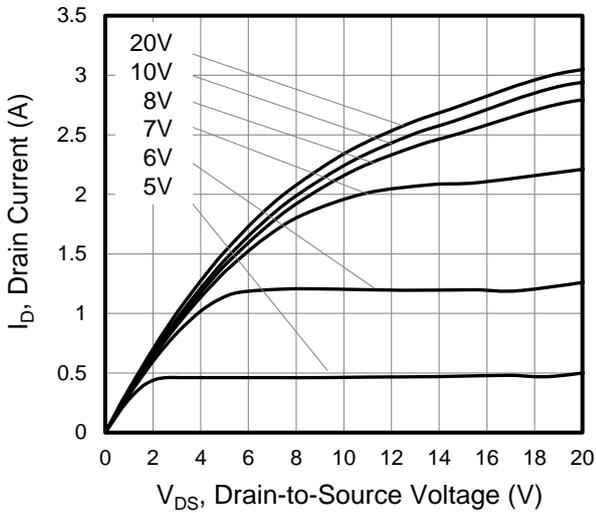


Figure 2. Body Diode Forward Voltage

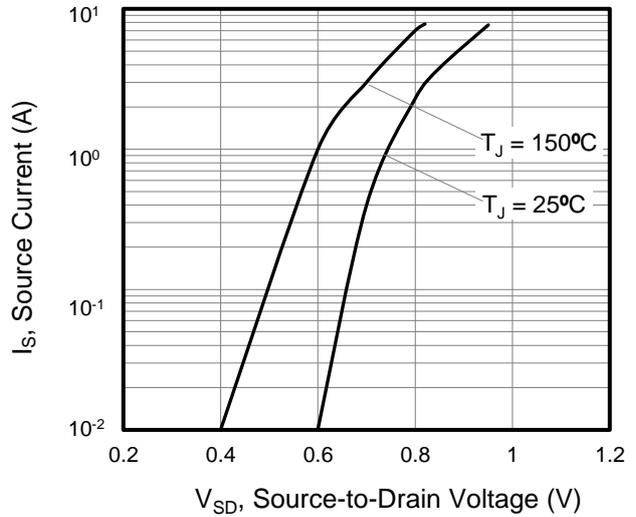


Figure 3. Drain Current vs. Temperature

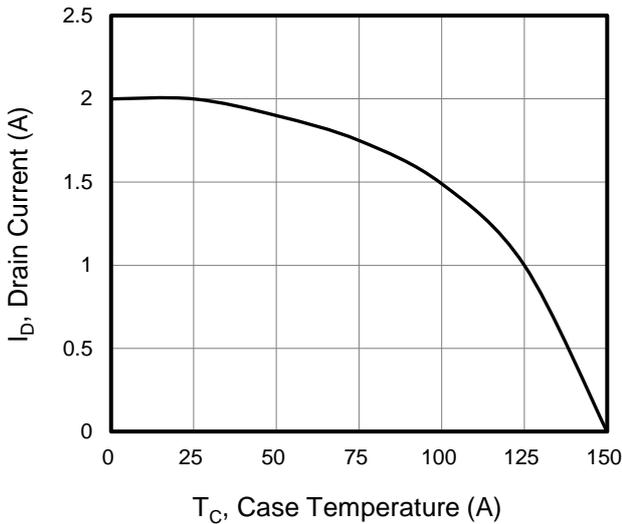


Figure 4.  $BV_{DSS}$  Variation vs. Temperature

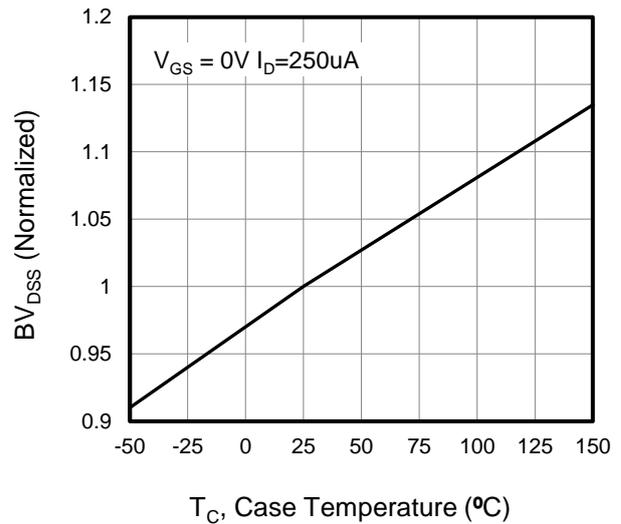


Figure 5. Transfer Characteristics

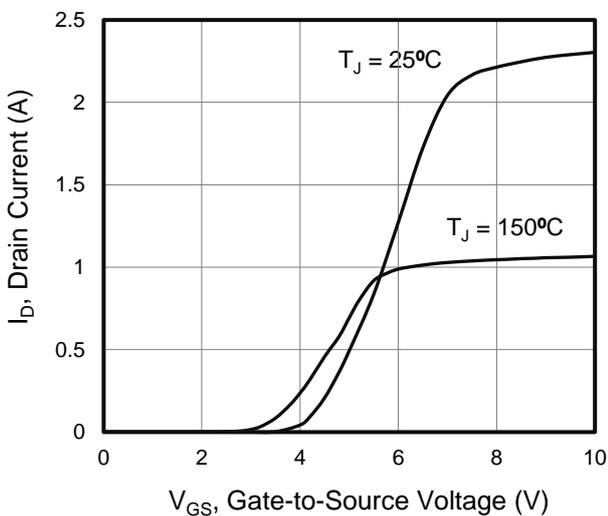
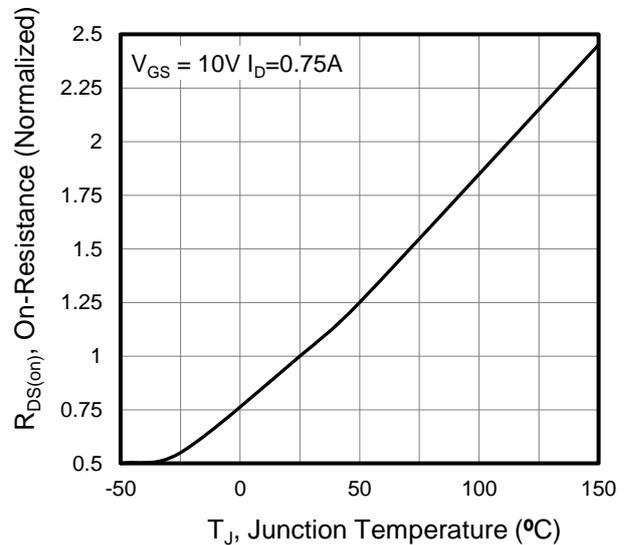
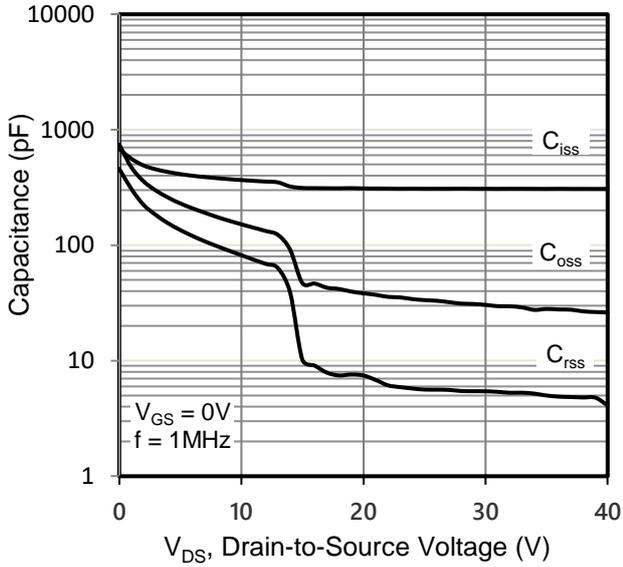
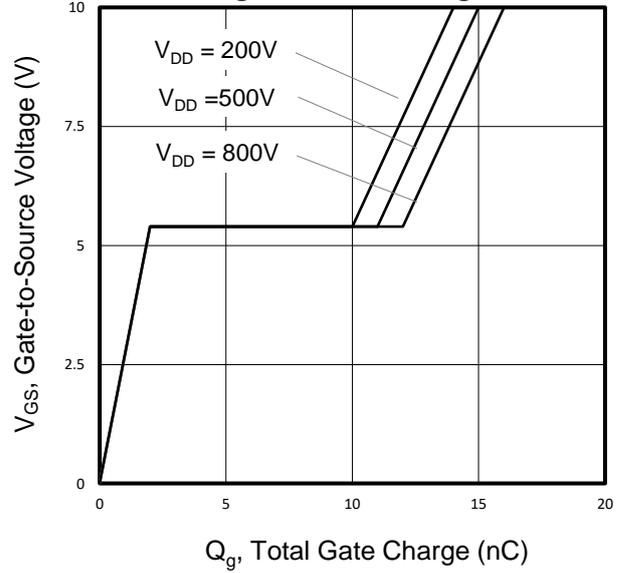
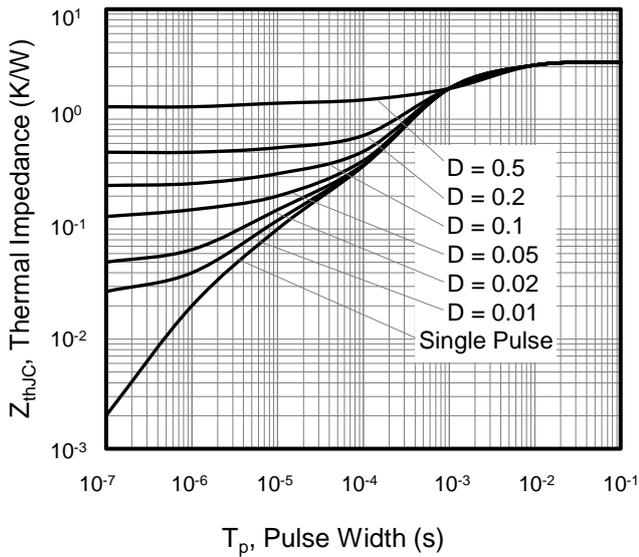
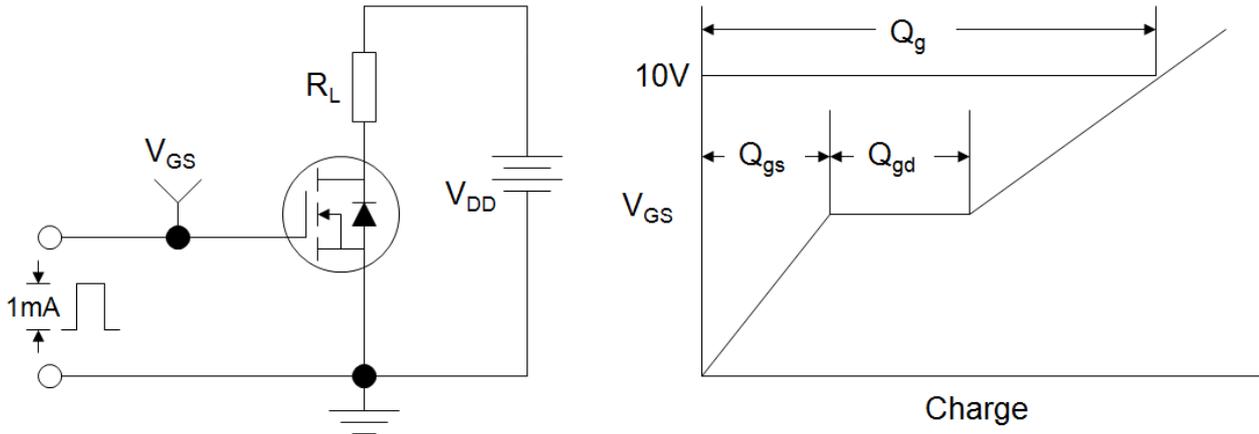
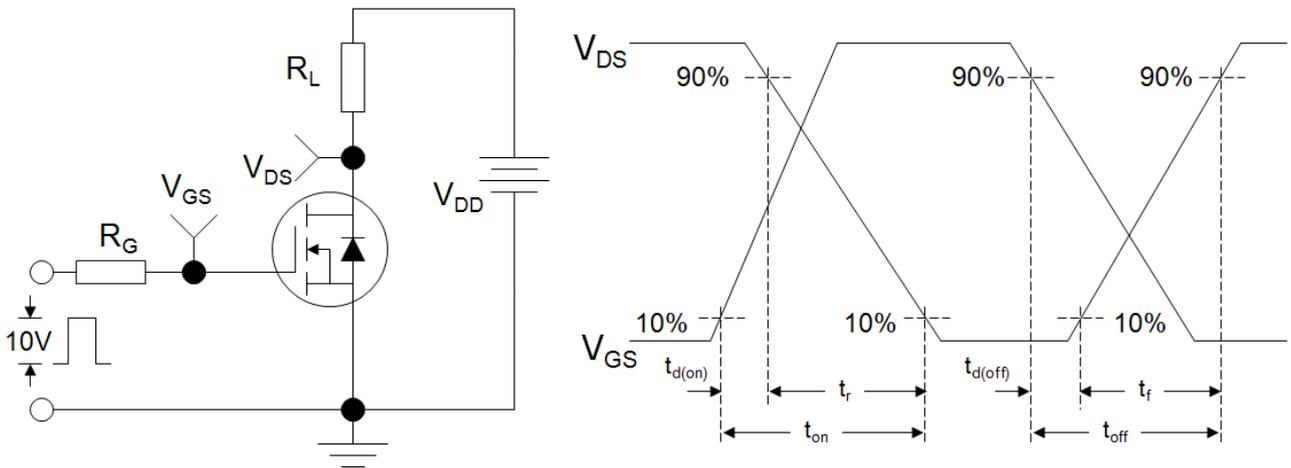
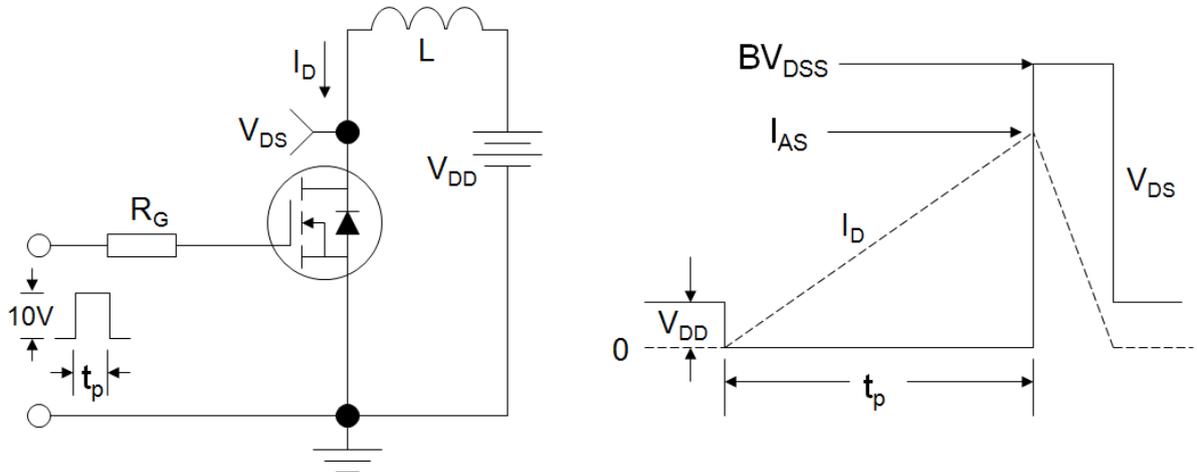


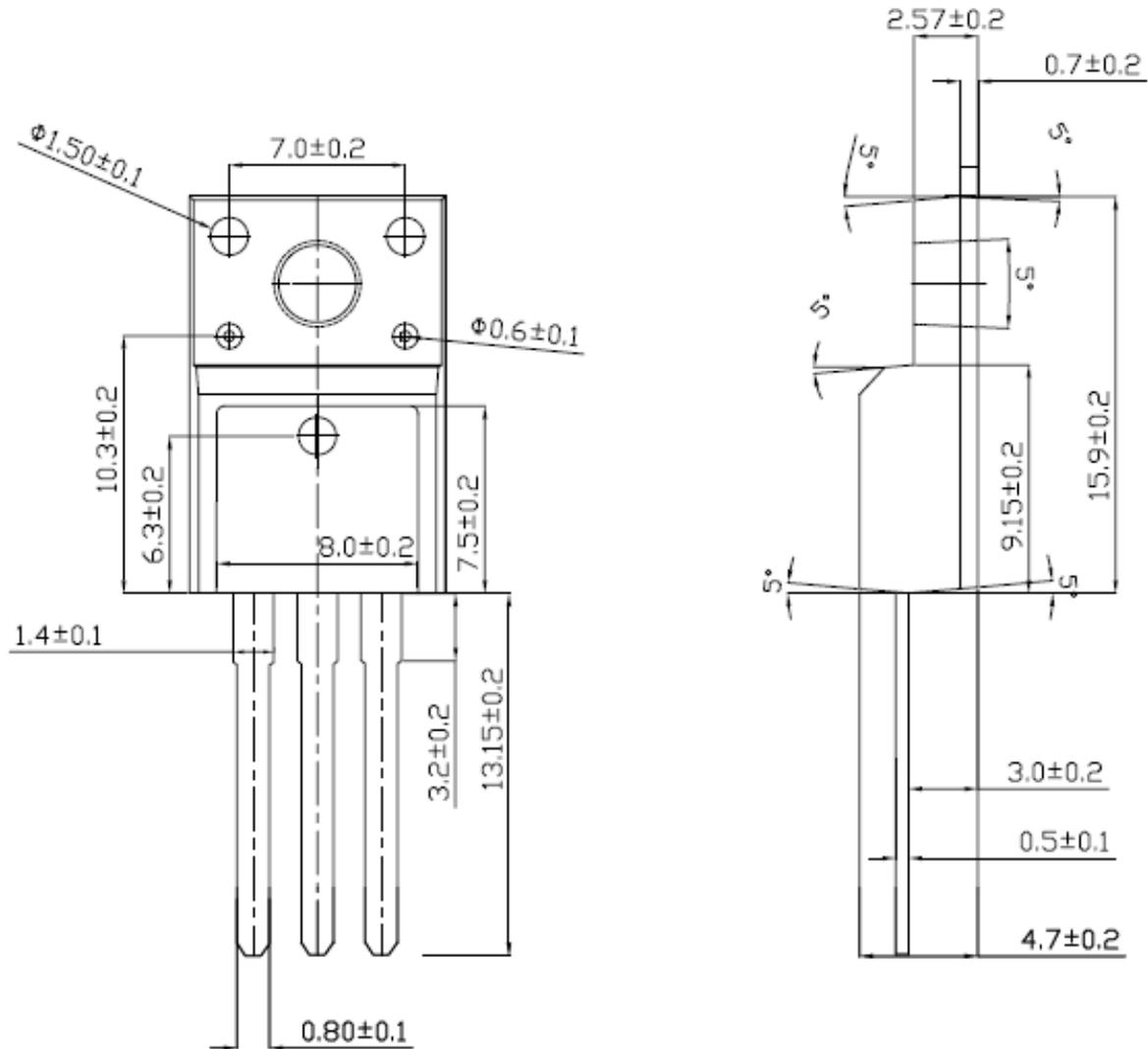
Figure 6. On-Resistance vs. Temperature



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

**Figure 7. Capacitance**

**Figure 8. Gate Charge**

**Figure 9. Transient Thermal Impedance TO-220F**


**Figure A: Gate Charge Test Circuit and Waveform**

**Figure B: Resistive Switching Test Circuit and Waveform**

**Figure C: Unclamped Inductive Switching Test Circuit and Waveform**


**TO-220F**


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