

### APPLICATION

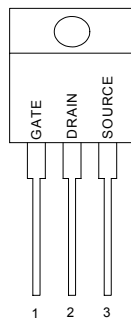
- ◆ DC motor control
- ◆ UPS
- ◆ Class D Amplifier

| $V_{DSS}$ | $R_{DS(ON)}$ Typ. | $I_D$ |
|-----------|-------------------|-------|
| 60V       | 15.8m $\Omega$    | 60A   |

### PIN CONFIGURATION

TO-220  
Front View

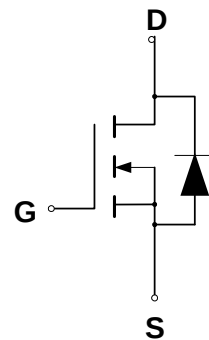
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### FEATURES

- ◆ Low ON Resistance
- ◆ Low Gate Charge
- ◆ Peak Current vs Pulse Width Curve
- ◆ Inductive Switching Curves

### SYMBOL



N-Channel MOSFET

### ABSOLUTE MAXIMUM RATINGS

| Rating                                                                       | Symbol         | Value      | Unit |
|------------------------------------------------------------------------------|----------------|------------|------|
| Drain to Source Voltage (Note 1)                                             | $V_{DSS}$      | 60         | V    |
| Drain to Current - Continuous $T_c = 25^\circ\text{C}$ , $V_{GS}@10\text{V}$ | $I_D$          | 60         | A    |
| - Continuous $T_c = 100^\circ\text{C}$ , $V_{GS}@10\text{V}$                 | $I_D$          | 43         |      |
| - Pulsed $T_c = 25^\circ\text{C}$ , $V_{GS}@10\text{V}$ (Note 2)             | $I_{DM}$       | 241        |      |
| Gate-to-Source Voltage - Continue                                            | $V_{GS}$       | $\pm 20$   | V    |
| Total Power Dissipation                                                      | $P_D$          | 150        | W    |
| Derating Factor above 25                                                     |                | 1.0        | W/   |
| Peak Diode Recovery dv/dt (Note 3)                                           | dv/dt          | 4.5        | V/ns |
| Operating Junction and Storage Temperature Range                             | $T_J, T_{STG}$ | -55 to 175 |      |
| Single Pulse Avalanche Energy $L=144\mu\text{H}, I_D=40\text{Amps}$          | $E_{AS}$       | 500        | mJ   |
| Maximum Lead Temperature for Soldering Purposes                              | $T_L$          | 300        |      |
| Maximum Package Body for 10 seconds                                          | $T_{PKG}$      | 260        |      |
| Pulsed Avalanche Rating                                                      | $I_{AS}$       | 60         | A    |

### THERMAL RESISTANCE

| Symbol          | Parameter           | Min | Typ | Max | Units | Test Conditions                                                               |
|-----------------|---------------------|-----|-----|-----|-------|-------------------------------------------------------------------------------|
| $R_{\theta JC}$ | Junction-to-case    |     |     | 1.0 | /W    | Water cooled heatsink, $P_D$ adjusted for a peak junction temperature of +175 |
| $R_{\theta JA}$ | Junction-to-ambient |     |     | 62  | /W    | 1 cubic foot chamber, free air                                                |

### ORDERING INFORMATION

| Part Number | Package |
|-------------|---------|
| CMT60N06    | TO-220  |

### ELECTRICAL CHARACTERISTICS

Unless otherwise specified,  $T_J = 25^\circ\text{C}$ .

|                                                                                                                                                                                                                    |                                                                                                             | CMT60N06     |       |           |               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|--------------|-------|-----------|---------------|
| Characteristic                                                                                                                                                                                                     | Symbol                                                                                                      | Min          | Typ   | Max       | Units         |
| OFF Characteristics                                                                                                                                                                                                |                                                                                                             |              |       |           |               |
| Drain-to-Source Breakdown Voltage<br>( $V_{GS} = 0\text{ V}$ , $I_D = 250\text{ }\mu\text{A}$ )                                                                                                                    | $V_{DSS}$                                                                                                   | 60           |       |           | V             |
| Breakdown Voltage Temperature Coefficient<br>(Reference to 25 , $I_D = 250\text{ }\mu\text{A}$ )                                                                                                                   | $\Delta V_{DSS}/\Delta T_J$                                                                                 |              | 0.069 |           | mV/           |
| Drain-to-Source Leakage Current<br>( $V_{DS} = 60\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 25\text{ }^\circ\text{C}$ )<br>( $V_{DS} = 48\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 150\text{ }^\circ\text{C}$ ) | $I_{DSS}$                                                                                                   |              |       | 25<br>250 | $\mu\text{A}$ |
| Gate-to-Source Forward Leakage<br>( $V_{GS} = 20\text{ V}$ )                                                                                                                                                       | $I_{GSS}$                                                                                                   |              |       | 100       | nA            |
| Gate-to-Source Reverse Leakage<br>( $V_{GS} = -20\text{ V}$ )                                                                                                                                                      | $I_{GSS}$                                                                                                   |              |       | -100      | nA            |
| ON Characteristics                                                                                                                                                                                                 |                                                                                                             |              |       |           |               |
| Gate Threshold Voltage<br>( $V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$ )                                                                                                                                   | $V_{GS(th)}$                                                                                                | 1.0          | 2.0   | 3.0       | V             |
| Static Drain-to-Source On-Resistance (Note 4)<br>( $V_{GS} = 10\text{ V}$ , $I_D = 60\text{A}$ )                                                                                                                   | $R_{DS(on)}$                                                                                                |              | 15.8  | 18        | m $\Omega$    |
| Forward Transconductance ( $V_{DS} = 15\text{ V}$ , $I_D = 60\text{A}$ ) (Note 4)                                                                                                                                  | $g_{FS}$                                                                                                    |              | 36    |           | S             |
| Dynamic Characteristics                                                                                                                                                                                            |                                                                                                             |              |       |           |               |
| Input Capacitance                                                                                                                                                                                                  | $(V_{DS} = 25\text{ V}$ , $V_{GS} = 0\text{ V}$ ,<br>$f = 1.0\text{ MHz}$ )                                 | $C_{iss}$    |       | 1430      | pF            |
| Output Capacitance                                                                                                                                                                                                 |                                                                                                             | $C_{oss}$    |       | 420       | pF            |
| Reverse Transfer Capacitance                                                                                                                                                                                       |                                                                                                             | $C_{rss}$    |       | 88        | pF            |
| Total Gate Charge ( $V_{GS} = 10\text{ V}$ )                                                                                                                                                                       |                                                                                                             | $Q_g$        |       | 37.7      | nC            |
| Gate-to-Source Charge                                                                                                                                                                                              | $(V_{DS} = 30\text{ V}$ , $I_D = 60\text{ A}$ ,<br>$V_{GS} = 10\text{ V}$ ) (Note 5)                        | $Q_{gs}$     |       | 8.4       | nC            |
| Gate-to-Drain ("Miller") Charge                                                                                                                                                                                    |                                                                                                             | $Q_{gd}$     |       | 9.8       | nC            |
| Resistive Switching Characteristics                                                                                                                                                                                |                                                                                                             |              |       |           |               |
| Turn-On Delay Time                                                                                                                                                                                                 | $(V_{DD} = 30\text{ V}$ , $I_D = 60\text{ A}$ ,<br>$V_{GS} = 10\text{ V}$ ,<br>$R_G = 9.1\Omega$ ) (Note 5) | $t_{d(on)}$  |       | 12.1      | ns            |
| Rise Time                                                                                                                                                                                                          |                                                                                                             | $t_{rise}$   |       | 64        | ns            |
| Turn-Off Delay Time                                                                                                                                                                                                |                                                                                                             | $t_{d(off)}$ |       | 69        | ns            |
| Fall Time                                                                                                                                                                                                          |                                                                                                             | $t_{fall}$   |       | 39        | ns            |
| Source-Drain Diode Characteristics                                                                                                                                                                                 |                                                                                                             |              |       |           |               |
| Continuous Source Current<br>(Body Diode)                                                                                                                                                                          | Integral pn-diode in MOSFET                                                                                 | $I_S$        |       | 60        | A             |
| Pulse Source Current (Body Diode)                                                                                                                                                                                  |                                                                                                             | $I_{SM}$     |       | 241       | A             |
| Diode Forward On-Voltage                                                                                                                                                                                           | $(I_S = 60\text{ A}$ , $V_{GS} = 0\text{ V})$                                                               | $V_{SD}$     |       | 1.5       | V             |
| Reverse Recovery Time                                                                                                                                                                                              | $(I_F = 60\text{A}$ , $V_{GS} = 0\text{ V}$ ,<br>$d_i/d_t = 100\text{A}/\mu\text{s})$                       | $t_{rr}$     |       | 55        | ns            |
| Reverse Recovery Charge                                                                                                                                                                                            |                                                                                                             | $Q_{rr}$     |       | 110       | nC            |



# CMT60N06

## N-CHANNEL Logic Level Power MOSFET

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Note 1:  $T_J = +25$  to  $+175$

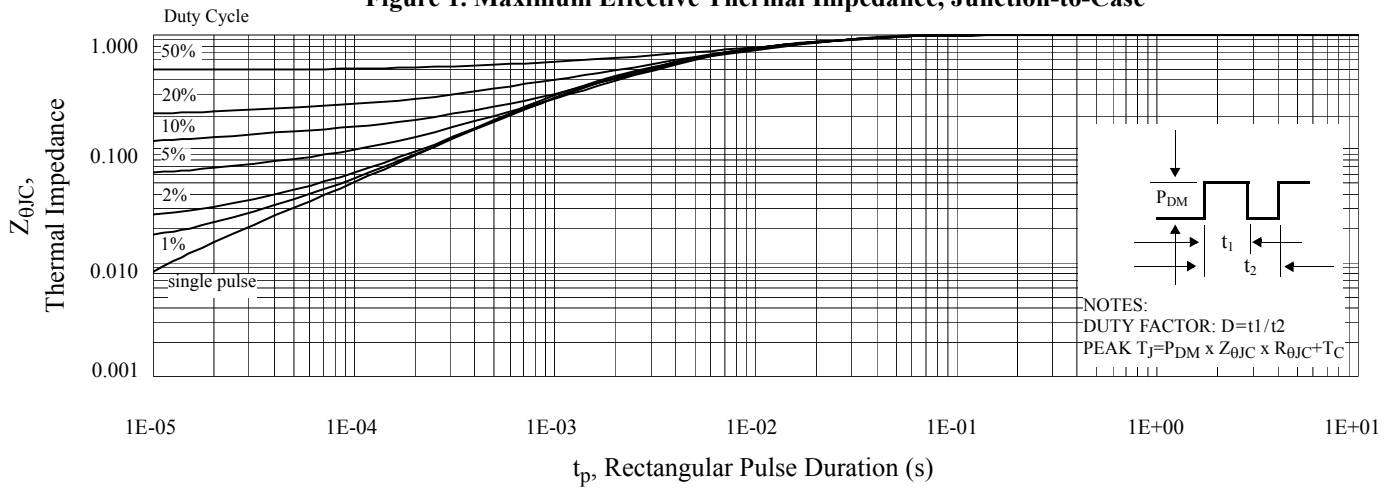
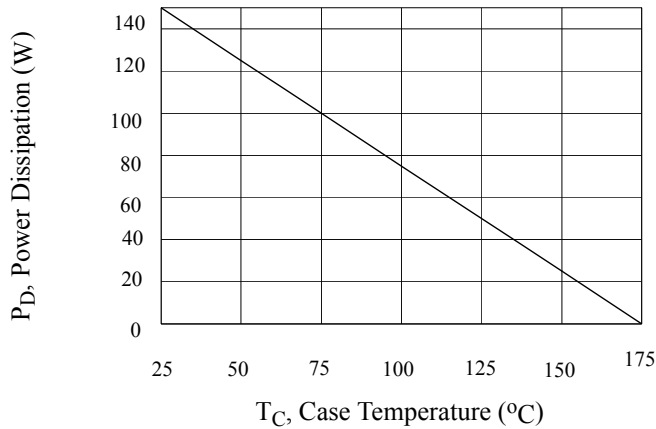
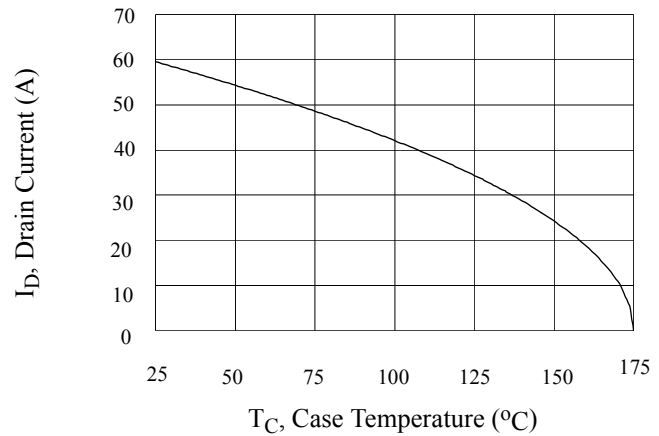
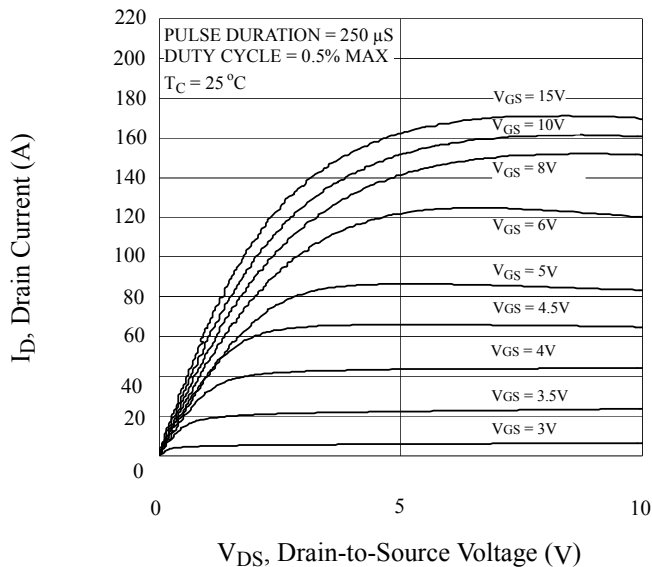
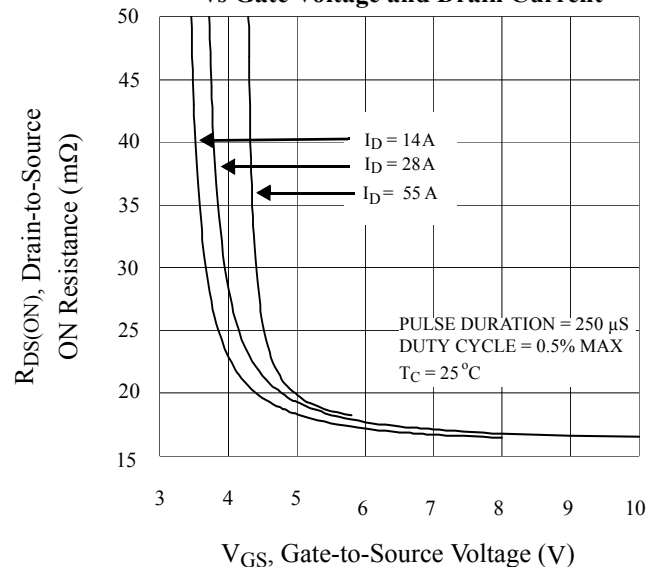
Note 2: Repetitive rating; pulse width limited by maximum junction temperature.

Note 3:  $I_{SD} = 60A$ ,  $di/dt \leq 100A/\mu s$ ,  $V_{DD} \leq BV_{DSS}$ ,  $T_J = +175$

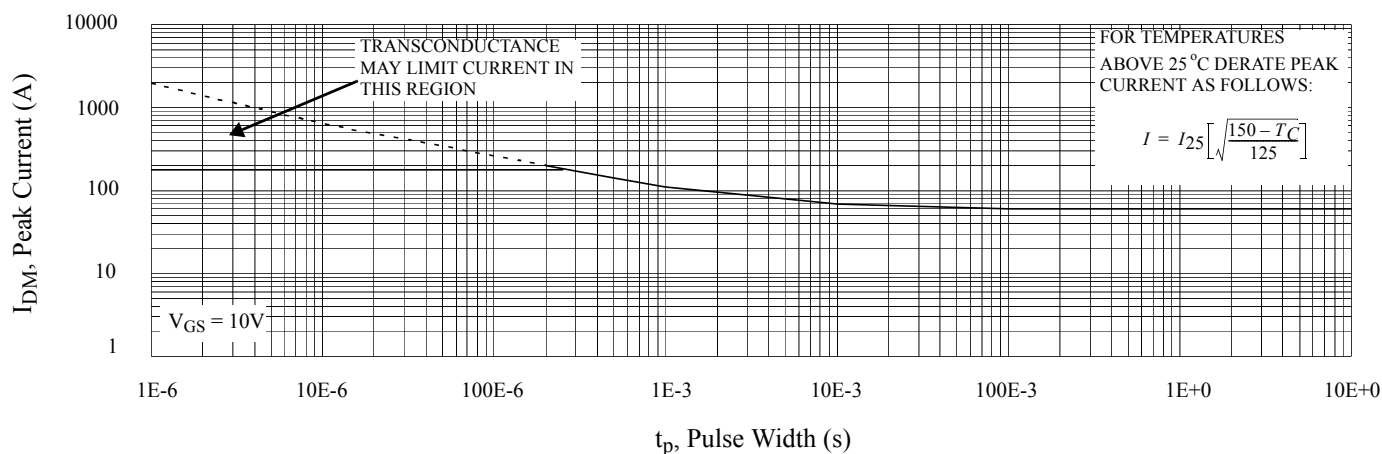
Note 4: Pulse width  $\leq 250\mu s$ ; duty cycle  $\leq 2\%$

Note 5: Essentially independent of operating temperature.

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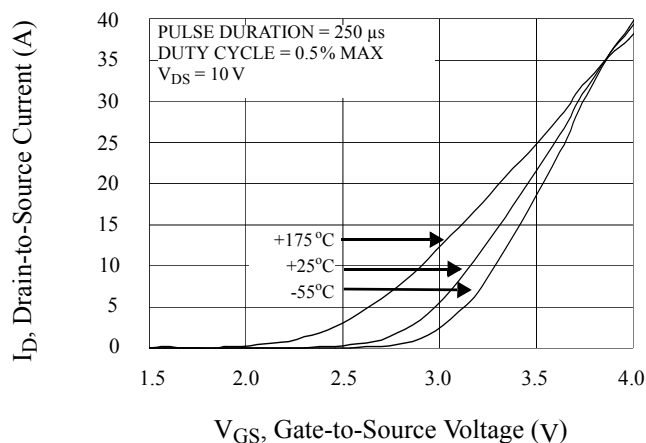
**Figure 1. Maximum Effective Thermal Impedance, Junction-to-Case**

**Figure 2. Maximum Power Dissipation vs Case Temperature**

**Figure 3. Maximum Continuous Drain Current vs Case Temperature**

**Figure 4. Typical Output Characteristics**

**Figure 5. Typical Drain-to-Source ON Resistance vs Gate Voltage and Drain Current**


**Figure 6. Maximum Peak Current Capability**

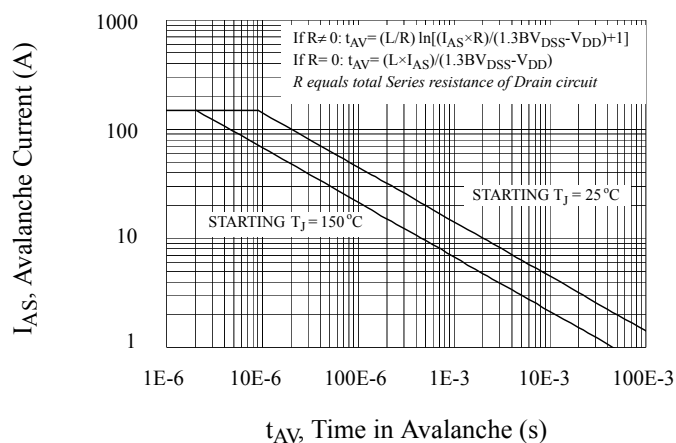


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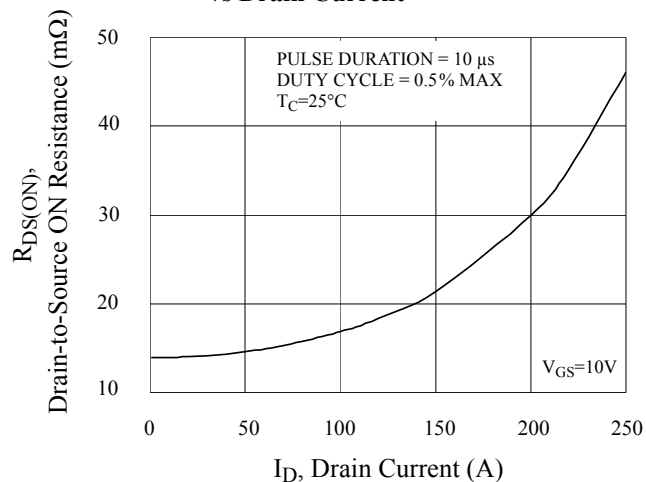
**Figure 7. Typical Transfer Characteristics**



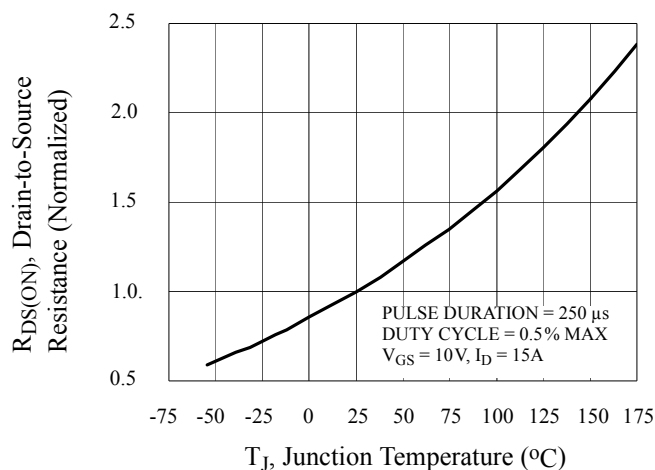
**Figure 8. Unclamped Inductive Switching Capability**



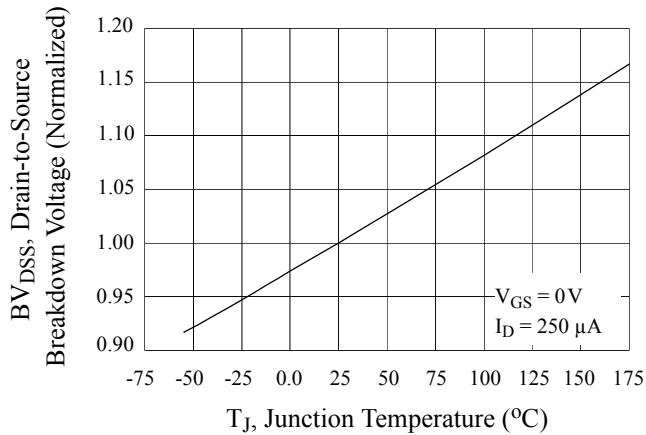
**Figure 9. Typical Drain-to-Source ON Resistance vs Drain Current**



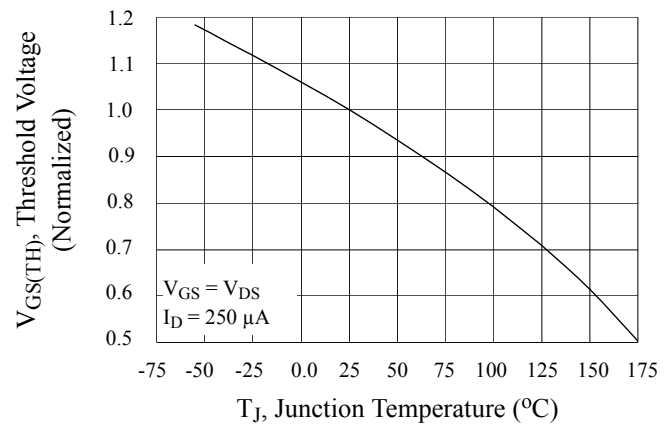
**Figure 10. Typical Drain-to-Source ON Resistance vs Junction Temperature**



**Figure 11. Typical Breakdown Voltage vs Junction Temperature**

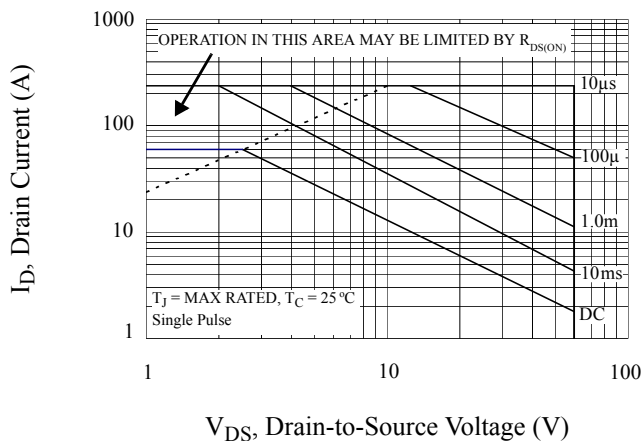


**Figure 12. Typical Threshold Voltage vs Junction Temperature**

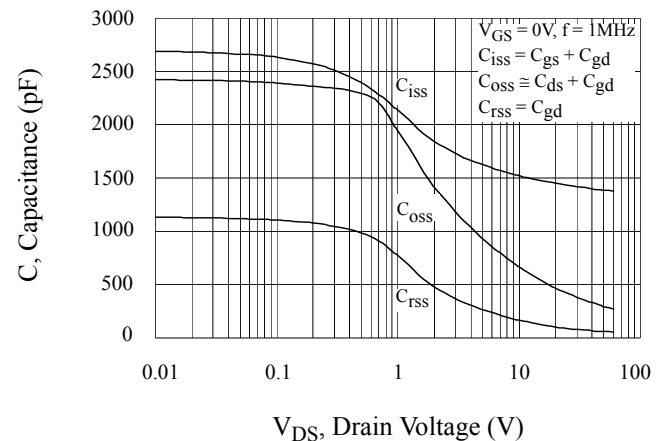


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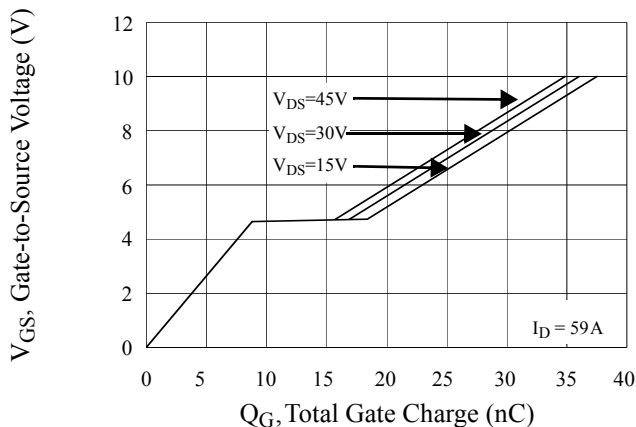
**Figure 13. Maximum Forward Bias Safe Operating Area**



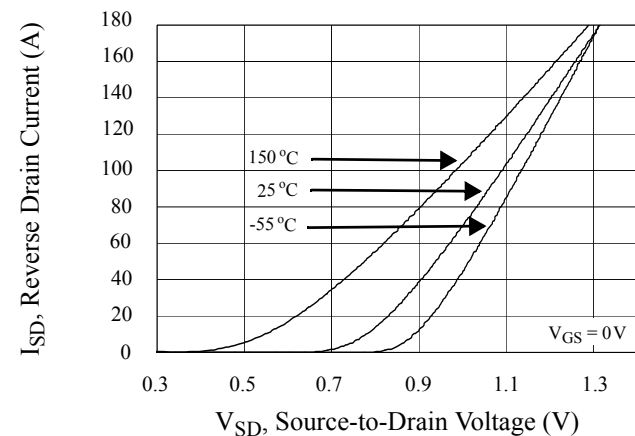
**Figure 14. Typical Capacitance vs Drain-to-Source Voltage**



**Figure 15. Typical Gate Charge vs Gate-to-Source Voltage**

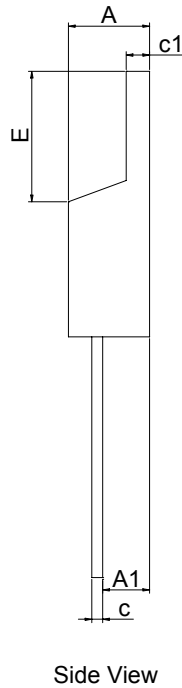
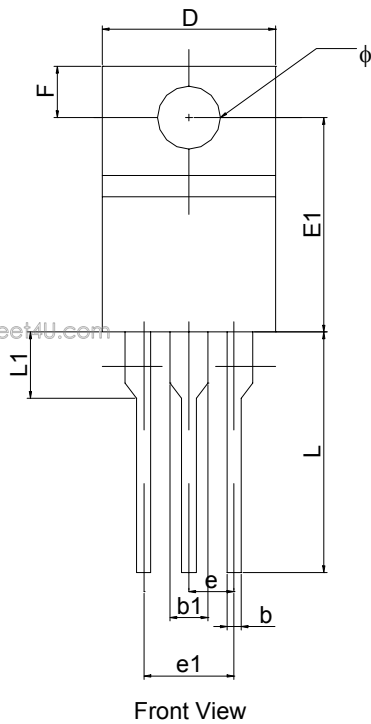


**Figure 16. Typical Body Diode Transfer Characteristics**



### PACKAGE DIMENSION

TO-220



**PIN 1: GATE**  
**PIN 2: DRAIN**  
**PIN 3: SOURCE**

| SYMBOLS | DIMENSIONS IN MILLIMETERS |      |       | DIMENSIONS IN INCHES |       |       |
|---------|---------------------------|------|-------|----------------------|-------|-------|
|         | MIN                       | NOM  | MAX   | MIN                  | NOM   | MAX   |
| A       | 4.47                      | ---  | 4.67  | 0.176                | ---   | 0.184 |
| A1      | 2.52                      | ---  | 2.62  | 0.099                | ---   | 0.111 |
| b       | 0.71                      | ---  | 0.91  | 0.028                | ---   | 0.036 |
| b1      | 1.17                      | ---  | 1.37  | 0.046                | ---   | 0.054 |
| c       | 0.31                      | ---  | 0.53  | 0.012                | ---   | 0.021 |
| c1      | 1.17                      | ---  | 1.37  | 0.046                | ---   | 0.054 |
| D       | 10.01                     | ---  | 10.31 | 0.394                | ---   | 0.406 |
| E       | 8.50                      | ---  | 8.90  | 0.335                | ---   | 0.350 |
| E1      | 12.06                     | ---  | 12.46 | 0.475                | ---   | 0.491 |
| e       | ---                       | 2.54 | ---   | ---                  | 0.100 | ---   |
| e1      | 4.98                      | ---  | 5.18  | 0.196                | ---   | 0.204 |
| F       | 2.59                      | ---  | 2.69  | 0.102                | ---   | 0.114 |
| L       | 13.40                     | ---  | 13.80 | 0.528                | ---   | 0.543 |
| L1      | 3.56                      | ---  | 3.96  | 0.140                | ---   | 0.156 |
| φ       | 3.79                      | ---  | 3.89  | 0.149                | ---   | 0.153 |

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