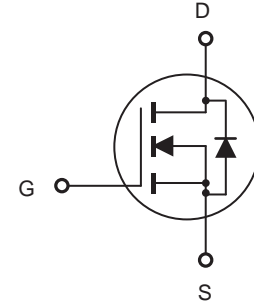
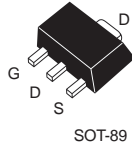


## N-Channel Enhancement Mode Field Effect Transistor

### FEATURES

- 60V, 5.2A,  $R_{DS(ON)} = 46m\Omega$  @  $V_{GS} = 10V$ .  
 $R_{DS(ON)} = 52m\Omega$  @  $V_{GS} = 4.5V$ .
- High dense cell design for extremely low  $R_{DS(ON)}$ .
- Rugged and reliable.
- RoHS compliant.
- SOT-89 package.



### ABSOLUTE MAXIMUM RATINGS $T_A = 25^\circ\text{C}$ unless otherwise noted

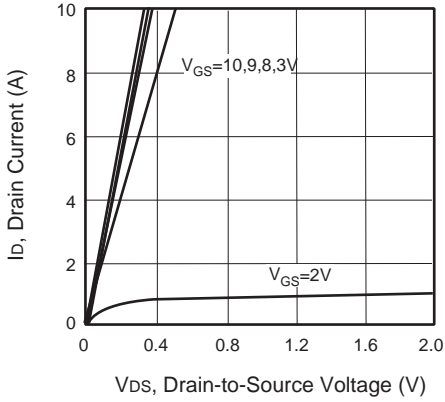
| Parameter                             | Symbol         | Limit      | Units            |
|---------------------------------------|----------------|------------|------------------|
| Drain-Source Voltage                  | $V_{DS}$       | 60         | V                |
| Gate-Source Voltage                   | $V_{GS}$       | $\pm 20$   | V                |
| Drain Current-Continuous              | $I_D$          | 5.2        | A                |
| Drain Current-Pulsed <sup>a</sup>     | $I_{DM}$       | 20.8       | A                |
| Maximum Power Dissipation             | $P_D$          | 2          | W                |
| Operating and Store Temperature Range | $T_J, T_{stg}$ | -55 to 150 | $^\circ\text{C}$ |

### Thermal Characteristics

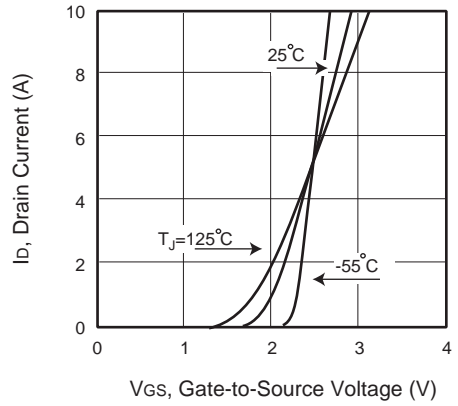
| Parameter                                            | Symbol          | Limit | Units              |
|------------------------------------------------------|-----------------|-------|--------------------|
| Thermal Resistance, Junction-to-Ambient <sup>b</sup> | $R_{\theta JA}$ | 62.5  | $^\circ\text{C/W}$ |

## Electrical Characteristics $T_A = 25^\circ\text{C}$ unless otherwise noted

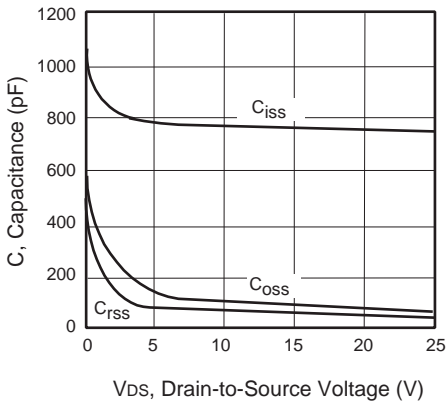
| Parameter                                                                                                                                                                                                                                                                              | Symbol       | Test Condition                                            | Min | Typ | Max  | Units     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-----------------------------------------------------------|-----|-----|------|-----------|
| <b>Off Characteristics</b>                                                                                                                                                                                                                                                             |              |                                                           |     |     |      |           |
| Drain-Source Breakdown Voltage                                                                                                                                                                                                                                                         | $BV_{DSS}$   | $V_{GS} = 0V, I_D = 250\mu A$                             | 60  |     |      | V         |
| Zero Gate Voltage Drain Current                                                                                                                                                                                                                                                        | $I_{DSS}$    | $V_{DS} = 60V, V_{GS} = 0V$                               |     |     | 1    | $\mu A$   |
| Gate Body Leakage Current, Forward                                                                                                                                                                                                                                                     | $I_{GSSF}$   | $V_{GS} = 20V, V_{DS} = 0V$                               |     |     | 100  | nA        |
| Gate Body Leakage Current, Reverse                                                                                                                                                                                                                                                     | $I_{GSSR}$   | $V_{GS} = -20V, V_{DS} = 0V$                              |     |     | -100 | nA        |
| <b>On Characteristics</b>                                                                                                                                                                                                                                                              |              |                                                           |     |     |      |           |
| Gate Threshold Voltage                                                                                                                                                                                                                                                                 | $V_{GS(th)}$ | $V_{GS} = V_{DS}, I_D = 250\mu A$                         | 1   |     | 2.5  | V         |
| Static Drain-Source On-Resistance                                                                                                                                                                                                                                                      | $R_{DS(on)}$ | $V_{GS} = 10V, I_D = 3A$                                  |     | 37  | 46   | $m\Omega$ |
|                                                                                                                                                                                                                                                                                        |              | $V_{GS} = 4.5V, I_D = 2A$                                 |     | 40  | 52   | $m\Omega$ |
| <b>Dynamic Characteristics<sup>d</sup></b>                                                                                                                                                                                                                                             |              |                                                           |     |     |      |           |
| Input Capacitance                                                                                                                                                                                                                                                                      | $C_{iss}$    | $V_{DS} = 25V, V_{GS} = 0V, f = 1.0\text{ MHz}$           |     | 750 |      | pF        |
| Output Capacitance                                                                                                                                                                                                                                                                     | $C_{oss}$    |                                                           |     | 65  |      | pF        |
| Reverse Transfer Capacitance                                                                                                                                                                                                                                                           | $C_{rss}$    |                                                           |     | 50  |      | pF        |
| <b>Switching Characteristics<sup>d</sup></b>                                                                                                                                                                                                                                           |              |                                                           |     |     |      |           |
| Turn-On Delay Time                                                                                                                                                                                                                                                                     | $t_{d(on)}$  | $V_{DD} = 30V, I_D = 1A, V_{GS} = 10V, R_{GEN} = 6\Omega$ |     | 11  |      | ns        |
| Turn-On Rise Time                                                                                                                                                                                                                                                                      | $t_r$        |                                                           |     | 4   |      | ns        |
| Turn-Off Delay Time                                                                                                                                                                                                                                                                    | $t_{d(off)}$ |                                                           |     | 51  |      | ns        |
| Turn-Off Fall Time                                                                                                                                                                                                                                                                     | $t_f$        |                                                           |     | 7   |      | ns        |
| Total Gate Charge                                                                                                                                                                                                                                                                      | $Q_g$        | $V_{DS} = 30V, I_D = 2A, V_{GS} = 4.5V$                   |     | 9.8 |      | nC        |
| Gate-Source Charge                                                                                                                                                                                                                                                                     | $Q_{gs}$     |                                                           |     | 1.6 |      | nC        |
| Gate-Drain Charge                                                                                                                                                                                                                                                                      | $Q_{gd}$     |                                                           |     | 4.1 |      | nC        |
| <b>Drain-Source Diode Characteristics and Maximum Ratings</b>                                                                                                                                                                                                                          |              |                                                           |     |     |      |           |
| Drain-Source Diode Forward Current                                                                                                                                                                                                                                                     | $I_S$        |                                                           |     |     | 1.5  | A         |
| Drain-Source Diode Forward Voltage <sup>c</sup>                                                                                                                                                                                                                                        | $V_{SD}$     | $V_{GS} = 0V, I_S = 1A$                                   |     |     | 1.3  | V         |
| <b>Notes :</b><br>a.Repetitive Rating : Pulse width limited by maximum junction temperature.<br>b.Surface Mounted on FR4 Board, $t \leq 10$ sec.<br>c.Pulse Test : Pulse Width $\leq 300\mu s$ , Duty Cycle $\leq 2\%$ .<br>d.Guaranteed by design, not subject to production testing. |              |                                                           |     |     |      |           |



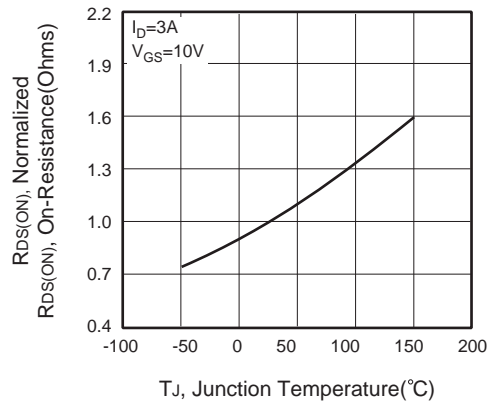
**Figure 1. Output Characteristics**



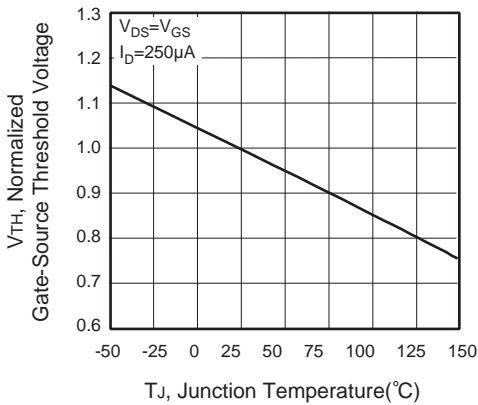
**Figure 2. Transfer Characteristics**



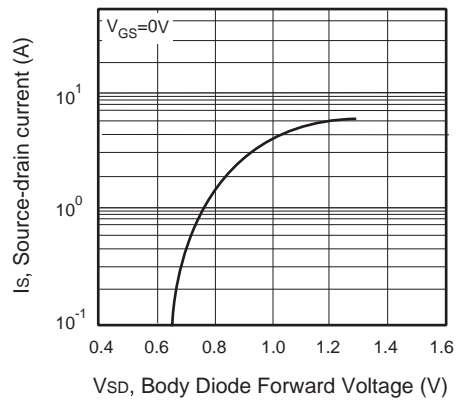
**Figure 3. Capacitance**



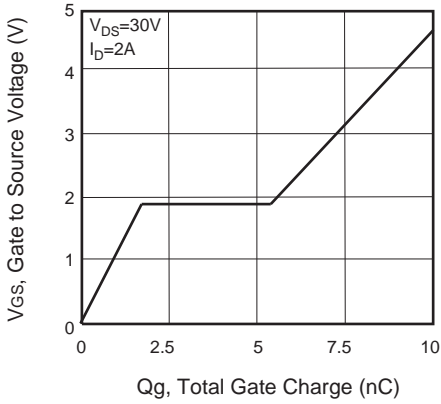
**Figure 4. On-Resistance Variation with Temperature**



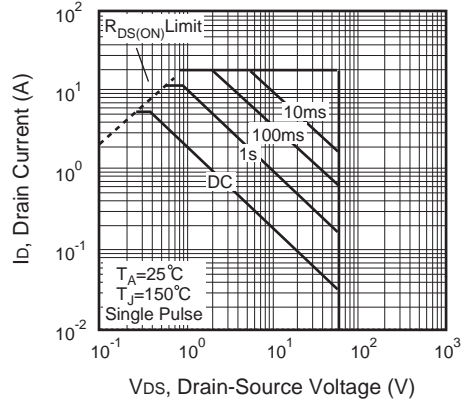
**Figure 5. Gate Threshold Variation with Temperature**



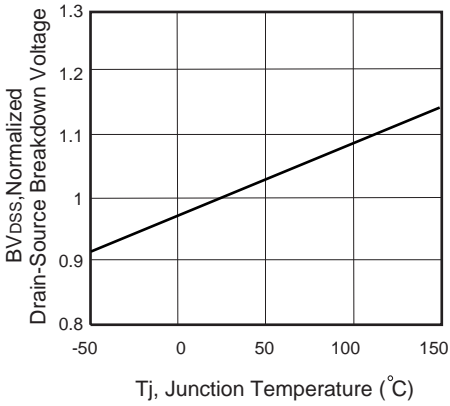
**Figure 6. Body Diode Forward Voltage Variation with Source Current**



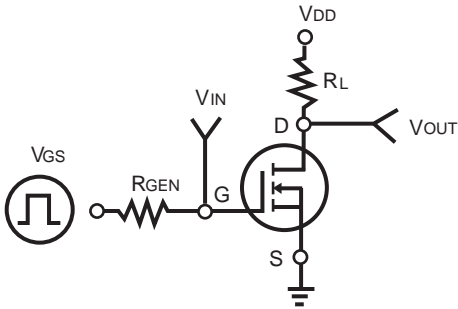
**Figure 7. Gate Charge**



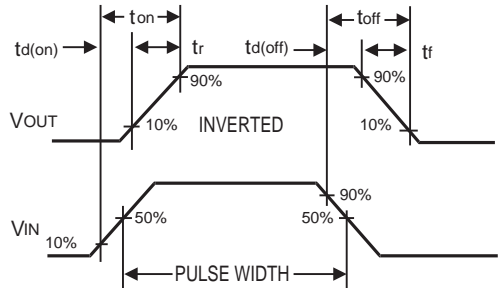
**Figure 8. Maximum Safe Operating Area**



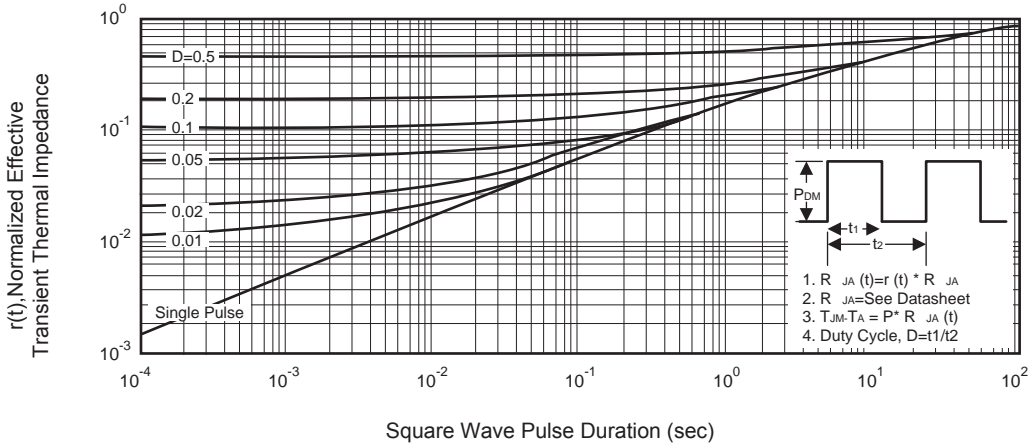
**Figure 9. Breakdown Voltage Variation VS Temperature**



**Figure 10. Switching Test Circuit**



**Figure 11. Switching Waveforms**



**Figure 12. Normalized Thermal Transient Impedance Curve**