



## N-Channel 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  | $BV_{DSS}$   | $V_{GS} = 0V, I_D = 250\mu A$                             | 40  |     |      | V         |
| Zero Gate Voltage Drain Current   | $I_{DSS}$    | $V_{DS} = 40V, V_{GS} = 0V$                               |     |     | 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 <sup>c</sup></b>  |              |   |     |     |      |           |
| Gate Threshold Voltage  | $V_{GS(th)}$ | $V_{GS} = V_{DS}, I_D = 250\mu A$                         | 1   |     | 3    | V         |
| Static Drain-Source On-Resistance   | $R_{DS(on)}$ | $V_{GS} = 10V, I_D = 6A$                                  |     | 28  | 43   | $m\Omega$ |
|   |              | $V_{GS} = 4.5V, I_D = 5A$                                 |     | 38  | 65   | $m\Omega$ |
| <b>Dynamic Characteristics <sup>d</sup></b>   |              |   |     |     |      |           |
| Input Capacitance   | $C_{iss}$    | $V_{DS} = 25V, V_{GS} = 0V, f = 1.0\text{ MHz}$           |     | 480 |      | pF        |
| Output Capacitance  | $C_{oss}$    |   |     | 80  |      | pF        |
| Reverse Transfer Capacitance  | $C_{rss}$    |   |     | 45  |      | pF        |
| <b>Switching Characteristics <sup>d</sup></b>   |              |   |     |     |      |           |
| Turn-On Delay Time  | $t_{d(on)}$  | $V_{DD} = 32V, I_D = 1A, V_{GS} = 10V, R_{GEN} = 6\Omega$ |     | 9   |      | ns        |
| Turn-On Rise Time   | $t_r$        |   |     | 4   |      | ns        |
| Turn-Off Delay Time   | $t_{d(off)}$ |   |     | 28  |      | ns        |
| Turn-Off Fall Time  | $t_f$        |   |     | 4   |      | ns        |
| Total Gate Charge   | $Q_g$        | $V_{DS} = 32V, I_D = 1A, V_{GS} = 10V$                    |     | 11  |      | nC        |
| Gate-Source Charge  | $Q_{gs}$     |   |     | 0.9 |      | nC        |
| Gate-Drain Charge   | $Q_{gd}$     |   |     | 2.8 |      | nC        |
| <b>Drain-Source Diode Characteristics and Maximum Ratings</b>   |              |   |     |     |      |           |
| Drain-Source Diode Forward Current <sup>b</sup>   | $I_S$        |   |     |     | 2    | A         |
| Drain-Source Diode Forward Voltage <sup>c</sup>   | $V_{SD}$     | $V_{GS} = 0V, I_S = 1A$                                   |     |     | 1    | V         |
| <b>Notes :</b> □<br>a.Repetitive Rating : Pulse width limited by maximum junction temperature.□<br>b.Surface Mounted on FR4 Board, $t \leq 10\text{ sec.}$ □<br>c.Pulse Test : Pulse Width $\leq 300\mu s$ , Duty Cycle $\leq 2\%$ .□<br>d.Guaranteed by design, not subject to production testing.□<br>□ |              |   |     |     |      |           |

## P-Channel 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   | $BV_{DSS}$   | $V_{GS} = 0V, I_D = -250\mu A$                               | -40 |      |      | V         |
| Zero Gate Voltage Drain Current  | $I_{DSS}$    | $V_{DS} = -40V, V_{GS} = 0V$                                 |     |      | -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 <sup>c</sup></b>   |              |  |     |      |      |           |
| Gate Threshold Voltage   | $V_{GS(th)}$ | $V_{GS} = V_{DS}, I_D = -250\mu A$                           | -1  |      | -3   | V         |
| Static Drain-Source On-Resistance  | $R_{DS(on)}$ | $V_{GS} = -10V, I_D = -5A$                                   |     | 33   | 40   | $m\Omega$ |
|  |              | $V_{GS} = -4.5V, I_D = -2A$                                  |     | 44   | 57   | $m\Omega$ |
| <b>Dynamic Characteristics <sup>d</sup></b>  |              |  |     |      |      |           |
| Input Capacitance  | $C_{iss}$    | $V_{DS} = -20V, V_{GS} = 0V, f = 1.0\text{ MHz}$             |     | 1125 |      | pF        |
| Output Capacitance   | $C_{oss}$    |  |     | 150  |      | pF        |
| Reverse Transfer Capacitance   | $C_{rss}$    |  |     | 100  |      | pF        |
| <b>Switching Characteristics <sup>d</sup></b>  |              |  |     |      |      |           |
| Turn-On Delay Time   | $t_{d(on)}$  | $V_{DD} = -20V, I_D = -5A, V_{GS} = -10V, R_{GEN} = 3\Omega$ |     | 12   |      | ns        |
| Turn-On Rise Time  | $t_r$        |  |     | 5    |      | ns        |
| Turn-Off Delay Time  | $t_{d(off)}$ |  |     | 33   |      | ns        |
| Turn-Off Fall Time   | $t_f$        |  |     | 4    |      | ns        |
| Total Gate Charge  | $Q_g$        | $V_{DS} = -20V, I_D = -5A, V_{GS} = -10V$                    |     | 20   |      | nC        |
| Gate-Source Charge   | $Q_{gs}$     |  |     | 2.5  |      | nC        |
| Gate-Drain Charge  | $Q_{gd}$     |  |     | 3.5  |      | nC        |
| <b>Drain-Source Diode Characteristics and Maximum Ratings</b>  |              |  |     |      |      |           |
| Drain-Source Diode Forward Current <sup>b</sup>  | $I_S$        |  |     |      | -2   | A         |
| Drain-Source Diode Forward Voltage <sup>c</sup>  | $V_{SD}$     | $V_{GS} = 0V, I_S = -1A$                                     |     |      | -1   | V         |
| <b>Notes :</b> <input type="checkbox"/><br>a.Repetitive Rating : Pulse width limited by maximum junction temperature. <input type="checkbox"/><br>b.Surface Mounted on FR4 Board, $t \leq 10\text{ sec.}$ <input type="checkbox"/><br>c.Pulse Test : Pulse Width $\leq 300\mu s$ , Duty Cycle $\leq 2\%$ . <input type="checkbox"/><br>d.Guaranteed by design, not subject to production testing. <input type="checkbox"/><br><input type="checkbox"/> |              |  |     |      |      |           |

## N-CHANNEL

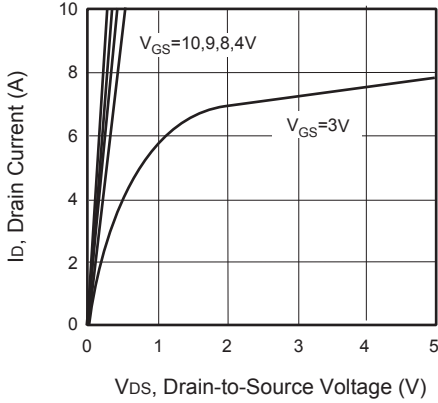


Figure 1. Output Characteristics

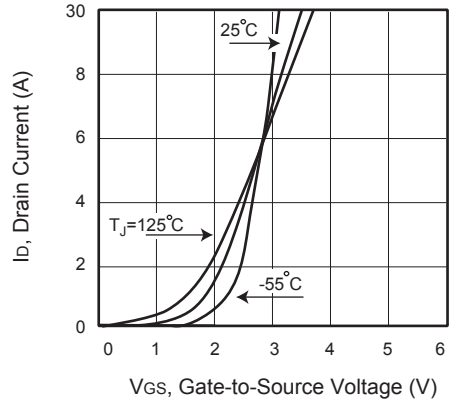


Figure 2. Transfer Characteristics

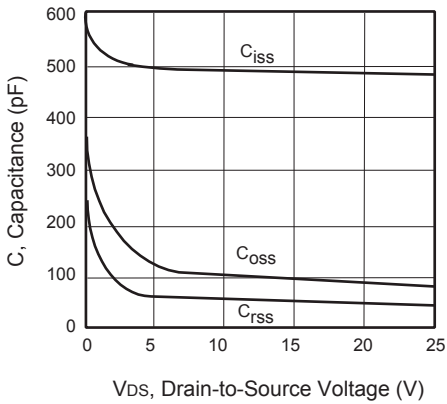


Figure 3. Capacitance

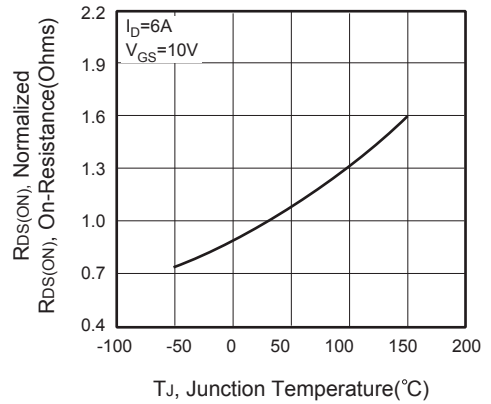


Figure 4. On-Resistance Variation with Temperature

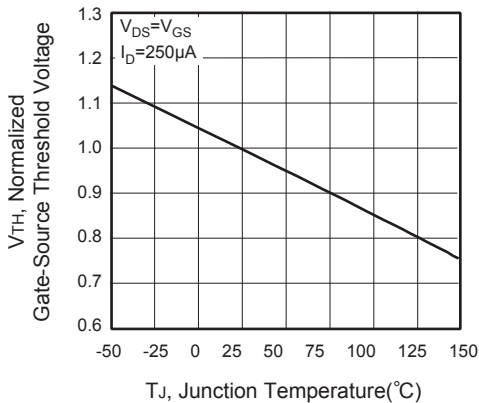


Figure 5. Gate Threshold Variation with Temperature

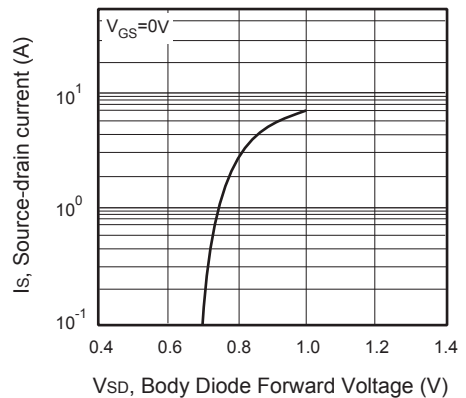


Figure 6. Body Diode Forward Voltage Variation with Source Current

## P-CHANNEL

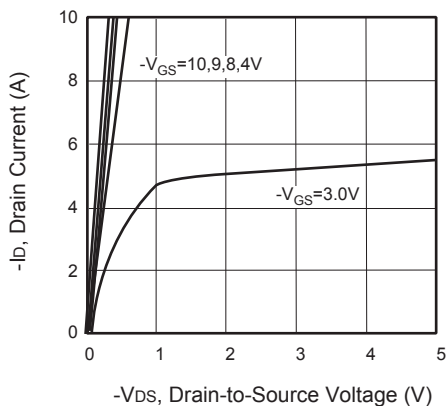


Figure 7. Output Characteristics

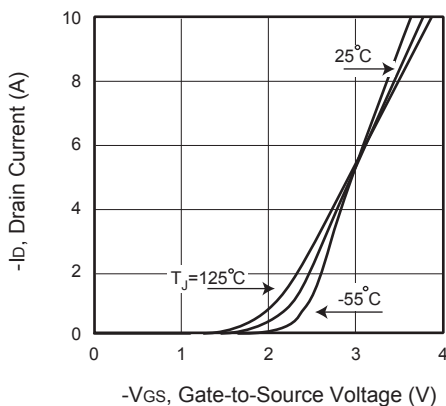


Figure 8. Transfer Characteristics

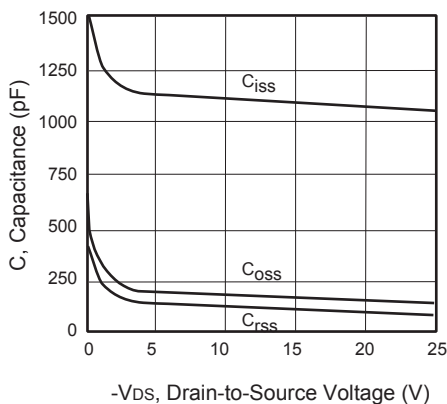


Figure 9. Capacitance

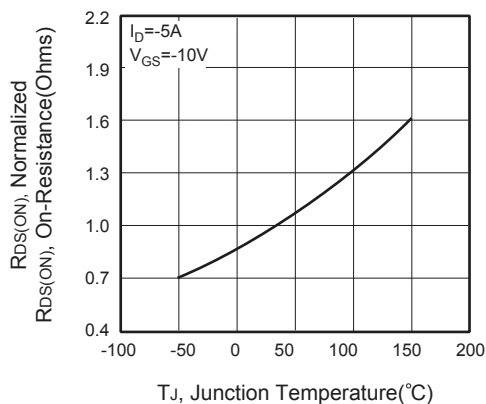


Figure 10. On-Resistance Variation with Temperature

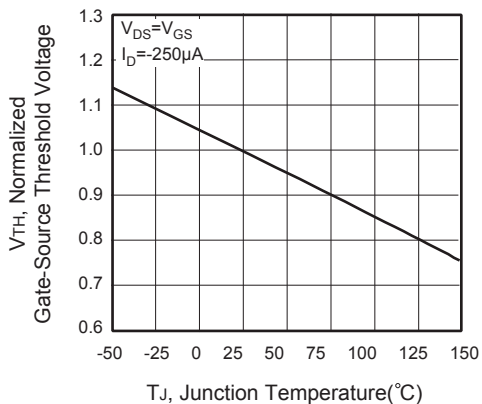


Figure 11. Gate Threshold Variation with Temperature

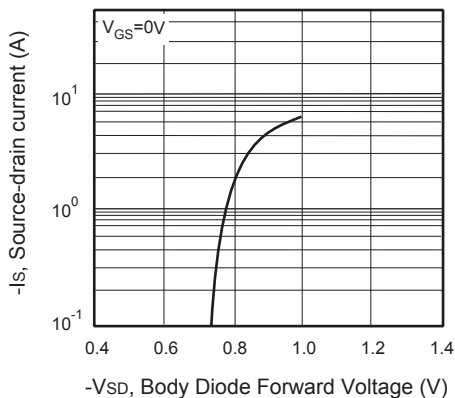


Figure 12. Body Diode Forward Voltage Variation with Source Current

## N-CHANNEL

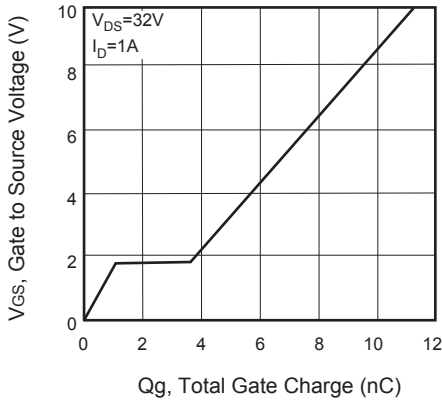


Figure 13. Gate Charge

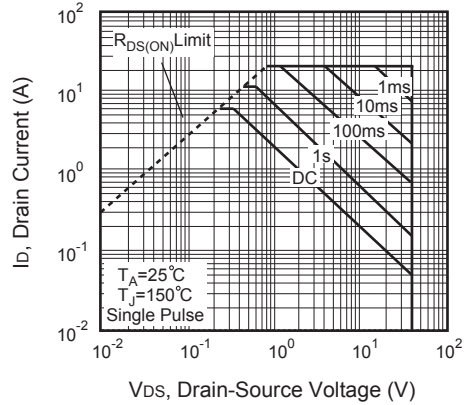


Figure 14. Maximum Safe Operating Area

## P-CHANNEL

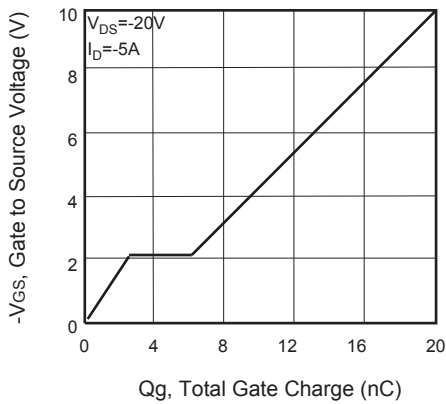


Figure 15. Gate Charge

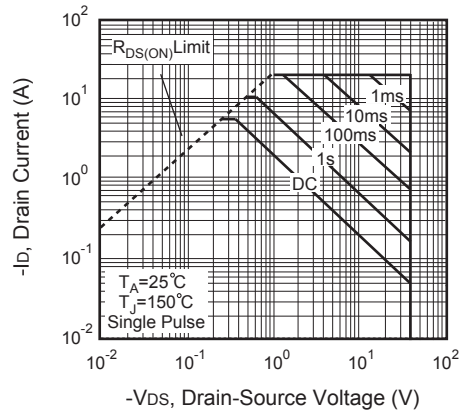


Figure 16. Maximum Safe Operating Area

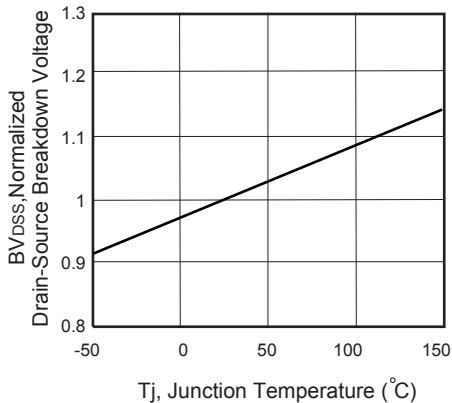


Figure 17. Breakdown Voltage Variation VS Temperature

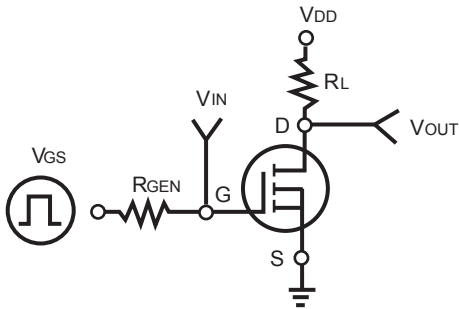


Figure 18. Switching Test Circuit

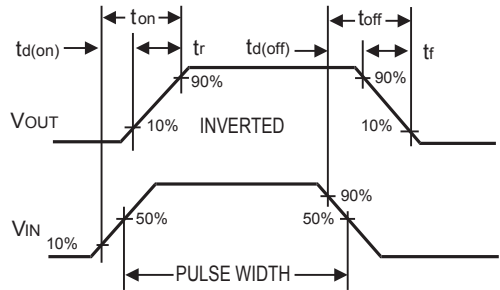


Figure 19. Switching Waveforms

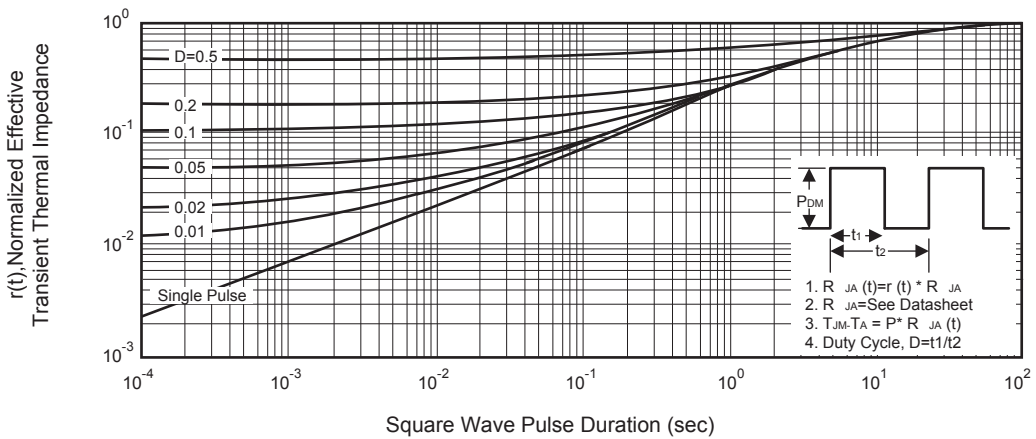


Figure 20. Normalized Thermal Transient Impedance Curve