## ORDERING INFORMATION

| Part Number | Package |
|---|---|
| IRF40N03 | TO-220 |

## ELECTRICAL CHARACTERISTICS

Unless otherwise specified, $T_J$ = 25℃.

| | | IRF40N03 | | | |
|---|---|---|---|---|---|
| **Characteristic** | **Symbol** | **Min** | **Typ** | **Max** | **Units** |
| **OFF Characteristics** | | | | | |
| Drain-to-Source Breakdown Voltage ($V_{GS}$ = 0 V, $I_D$ = 250 μA) | $V_{DSS}$ | 30 | | | V |
| Breakdown Voltage Temperature Coefficient (Reference to 25℃, $I_D$ = 1mA) | $\Delta V_{DSS}/\Delta T_J$ | | 0.037 | | V/℃ |
| Drain-to-Source Leakage Current ($V_{DS}$ = 30 V, $V_{GS}$ = 0 V, $T_J$ = 25℃) ($V_{DS}$ = 24 V, $V_{GS}$ = 0 V, $T_J$ = 150℃) | $I_{DSS}$ | | | 1<br>25 | μA |
| Gate-to-Source Forward Leakage ($V_{GS}$ = 20 V) | $I_{GSS}$ | | | 100 | nA |
| Gate-to-Source Reverse Leakage ($V_{GS}$ = -20 V) | $I_{GSS}$ | | | -100 | nA |
| **ON Characteristics** | | | | | |
| Gate Threshold Voltage ($V_{DS}$ = $V_{GS}$, $I_D$ = 250 μA) | $V_{GS(th)}$ | 1.0 | 2.0 | 3.0 | V |
| Static Drain-to-Source On-Resistance (Note 4) ($V_{GS}$ = 10 V, $I_D$ = 20A) | $R_{DS(on)}$ | | 14 | 17 | mΩ |
| Forward Transconductance ($V_{DS}$ = 10 V, $I_D$ = 20A) (Note 4) | $g_{FS}$ | | 26 | | S |
| **Dynamic Characteristics** | | | | | |
| Input Capacitance | $C_{iss}$ | | 800 | | pF |
| Output Capacitance | $C_{oss}$ | | 380 | | pF |
| Reverse Transfer Capacitance | ($V_{DS}$ = 25 V, $V_{GS}$ = 0 V, f = 1.0 MHz) | $C_{rss}$ | | 133 | | pF |
| Total Gate Charge ($V_{GS}$ = 10 V) | | $Q_g$ | | 17 | | nC |
| Gate-to-Source Charge | ($V_{DS}$ = 24 V, $I_D$ = 20 A, $V_{GS}$ = 5 V) (Note 5) | $Q_{gs}$ | | 3 | | nC |
| Gate-to-Drain (“Miller”) Charge | | $Q_{gd}$ | | 10 | | nC |
| **Resistive Switching Characteristics** | | | | | |
| Turn-On Delay Time | | $t_{d(on)}$ | | 7.2 | | ns |
| Rise Time | ($V_{DS}$ = 15 V, $I_D$ = 20 A, $V_{GS}$ = 10 V, $R_G$ = 3.3Ω) (Note 5) | $t_{rise}$ | | 60 | | ns |
| Turn-Off Delay Time | | $t_{d(off)}$ | | 22.5 | | ns |
| Fall Time | | $t_{fall}$ | | 10 | | ns |
| **Source-Drain Diode Characteristics** | | | | | |
| Continuous Source Current (Body Diode) | Integral pn-diode in MOSFET | $I_S$ | | | 40 | A |
| Pulse Source Current (Body Diode) | | $I_{SM}$ | | | 170 | A |
| Diode Forward On-Voltage | ($I_S$ = 40 A, $V_{GS}$ = 0 V) | $V_{SD}$ | | | 1.3 | V |
| Reverse Recovery Time | ($I_F$ = 40A, $V_{GS}$ = 0 V, | $t_{rr}$ | | 55 | | ns |
| Reverse Recovery Charge | $d_I/d_t$ = 100A/μs) | $Q_{rr}$ | | 110 | | nC |

Note 1: $T_J$ = +25℃ to 150℃

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

Note 3: $I_{SD}$ = 12.0A, di/dt ≤100A/μs, $V_{DD}$ ≤ $BV_{DSS}$, $T_J$ = +150℃

Note 4: Pulse width ≤ 250μs; duty cycle ≤ 2%

Note 5: Essentially independent of operating temerpature.

## TYPICAL ELECTRICAL CHARACTERISTICS

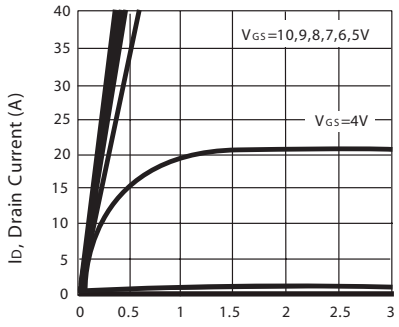


Figure 1. Output Characteristics

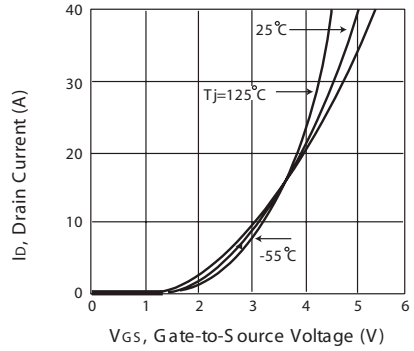


Figure 2. Transfer Characteristics

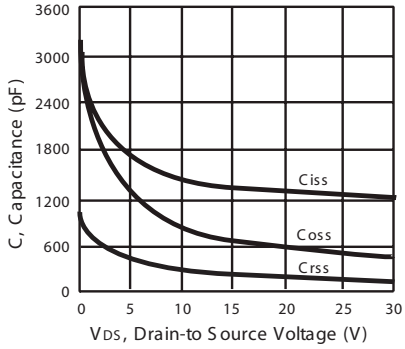


Figure 3. Capacitance

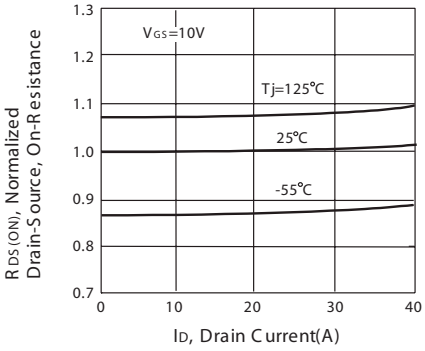


Figure 4. On-Resistance Variation with Drain Current and Temperature

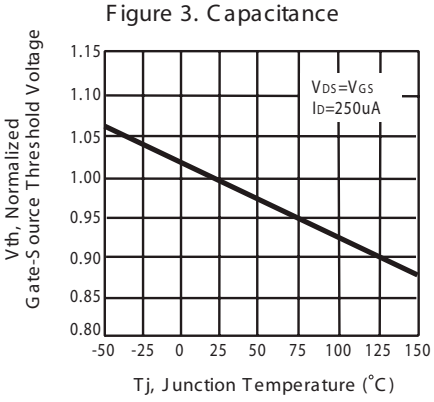


Figure 5. Gate Threshold Variation with Temperature

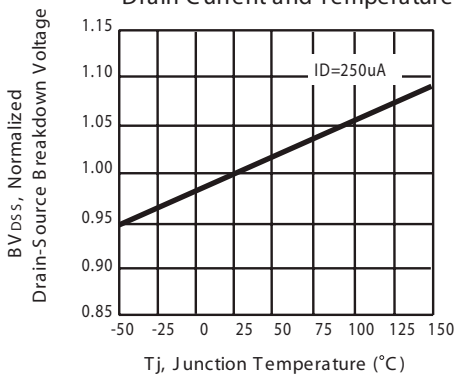


Figure 6. Breakdown Voltage Variation with Temperature

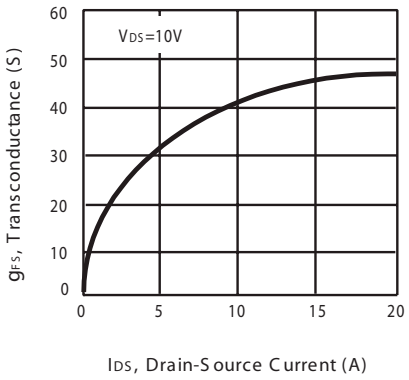


Figure 7. Transconductance Variation with Drain Current

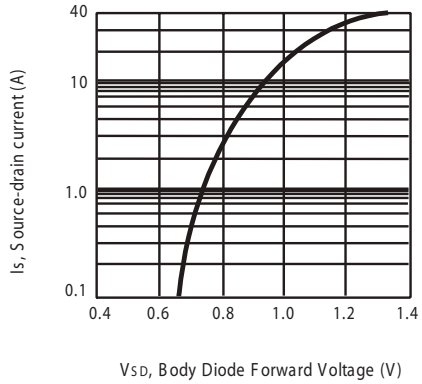


Figure 8. Body Diode Forward Voltage Variation with Source Current

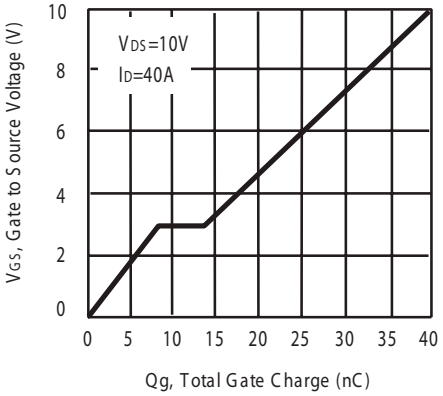


Figure 9. Gate Charge

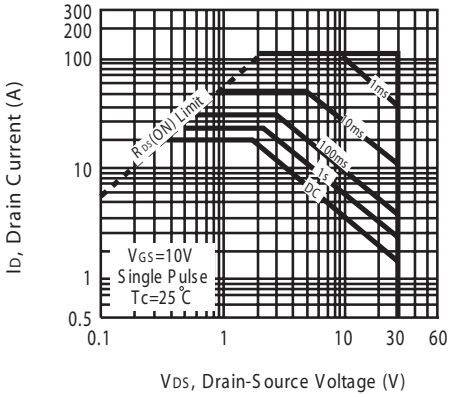


Figure 10. Maximum Safe Operating Area

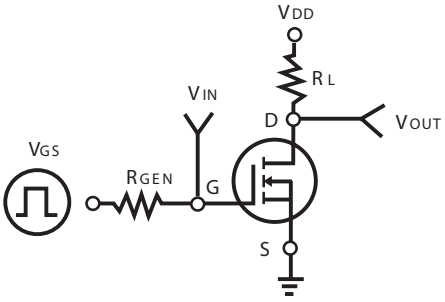


Figure 11. Switching Test Circuit

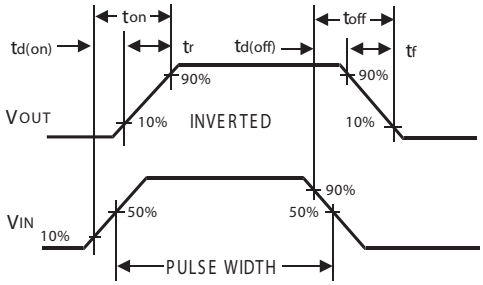


Figure 12. Switching Waveforms

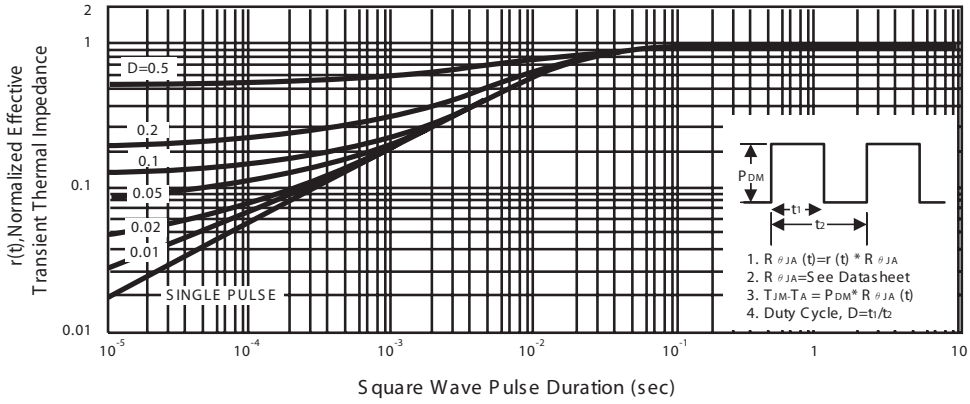


Figure 13. Normalized Thermal Transient Impedance Curve