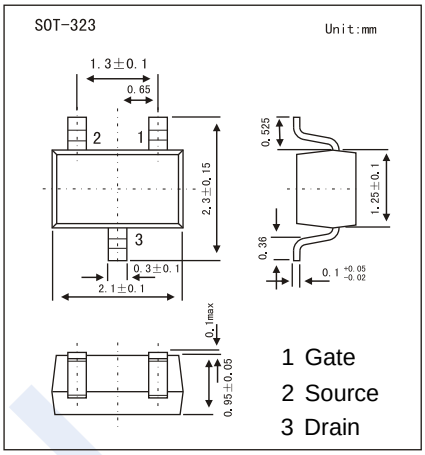
# N-Channel MOSFET
# 2N7002W




## ■ Features

- $V_{DS\ (V)}$ = 60V
- $I_D$ = 0.34 A ($V_{GS}$ = 10V)
- $R_{DS(ON)}$ < 1.6Ω ($V_{GS}$ = 10V)
- $R_{DS(ON)}$ < 2.5Ω ($V_{GS}$ = 4.5V)
- ESD Protected

## ■ Absolute Maximum Ratings Ta = 25℃

| Parameter | | Symbol | Rating | Unit |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | 60 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±20 | |
| Continuous Drain Current ( Steady State) | Ta=25℃ | $I_D$ | 310 | mA |
| | Ta=85℃ | | 220 | |
| Continuous Drain Current ( t < 5 s) | Ta=25℃ | | 340 | |
| | Ta=85℃ | | 240 | |
| Pulsed Drain Current (tp = 10 us) | | $I_{DM}$ | 1.4 | A |
| Gate−Source ESD Rating | | ESD | 900 | V |
| Power Dissipation | Steady State | $P_D$ | 280 | mW |
| | t < 5 s | | 330 | |
| Thermal Resistance.Junction- to-Ambient | Steady State | $R_{thJA}$ | 450 | ℃/W |
| Thermal Resistance.Junction- to-Case | t ≤ 5 s | $R_{thJC}$ | 375 | |
| Lead Temperature for Soldering Purposes | | $T_L$ | 260 | ℃ |
| Junction Temperature | | $T_J$ | 150 | |
| Storage Temperature Range | | $T_{stg}$ | -55 to 150 | |

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■ Electrical Characteristics Ta = 25℃

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Drain-Source Breakdown Voltage | $V_{DSS}$ | $I_D$=250μA, $V_{GS}$=0V | 60 | | | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=60V, $V_{GS}$=0V, $T_J$=25℃ | | | 1 | uA |
| | | $V_{DS}$=60V, $V_{GS}$=0V, $T_J$=125℃ | | | 500 | |
| | | $V_{DS}$=50V, $V_{GS}$=0V, $T_J$=25℃ | | | 0.1 | |
| Gate-Body Leakage Current | $I_{GSS}$ | $V_{DS}$=0V, $V_{GS}$=±20V | | | ±10 | uA |
| | | $V_{DS}$=0V, $V_{GS}$=±10V | | | ±450 | nA |
| | | $V_{DS}$=0V, $V_{GS}$=±5V | | | ±150 | |
| Gate Threshold Voltage (Note.1) | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$, $I_D$=250μA | 1 | | 2.5 | V |
| Static Drain-Source On-Resistance (Note.1) | $R_{DS(ON)}$ | $V_{GS}$=10V, $I_D$=500mA | | 1.19 | 1.6 | Ω |
| | | $V_{GS}$=4.5V, $I_D$=200mA | | 1.33 | 2.5 | |
| On State Drain Current | $I_{D(ON)}$ | $V_{GS}$=4.5V, $V_{DS}$=5V | 30 | | | A |
| Forward Transconductance (Note.1) | $g_{FS}$ | $V_{DS}$=5V, $I_D$=200mA | | 80 | | mS |
| Input Capacitance | $C_{iss}$ | $V_{GS}$=0V, $V_{DS}$=20V, f=1MHz | | 24.5 | | pF |
| Output Capacitance | $C_{oss}$ | | | 4.2 | | |
| Reverse Transfer Capacitance | $C_{rss}$ | | | 2.2 | | |
| Total Gate Charge | $Q_g$ | $V_{GS}$=4.5V, $V_{DS}$=10V, $I_D$=200mA | | 0.7 | | nC |
| Threshold Gate Charge | $Q_{gT}$ | | | 0.1 | | |
| Gate Source Charge | $Q_{gs}$ | | | 0.3 | | |
| Gate Drain Charge | $Q_{gd}$ | | | 0.1 | | |
| Turn-On DelayTime | $t_{d(on)}$ | $V_{GS}$=10V, $V_{DS}$=25V, $I_D$=500mA, $R_G$=25Ω (Note.2) | | 12.2 | | ns |
| Turn-On Rise Time | $t_r$ | | | 9 | | |
| Turn-Off DelayTime | $t_{d(off)}$ | | | 55.8 | | |
| Turn-Off Fall Time | $t_f$ | | | 29 | | |
| Maximum Body-Diode Continuous Current | $I_S$ | | | | 0.25 | A |
| Diode Forward Voltage | $V_{SD}$ | $I_S$=0.2A, $V_{GS}$=0V, $T_J$ = 25℃ | | 0.8 | 1.2 | V |
| | | $I_S$=0.2A, $V_{GS}$=0V, $T_J$ = 85℃ | | 0.7 | | |

Note.1:Pulse Test: pulse width ≤ 300us, duty cycle ≤ 2%

Note.2:Switching characteristics are independent of operating junction temperatures

■ Marking

| Marking | 71 |
|---|---|

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■ Typical Characterisitics

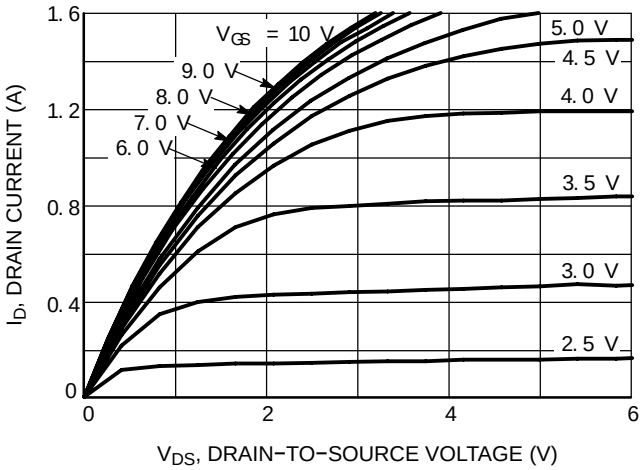


Figure 1. On −Region Characteristics

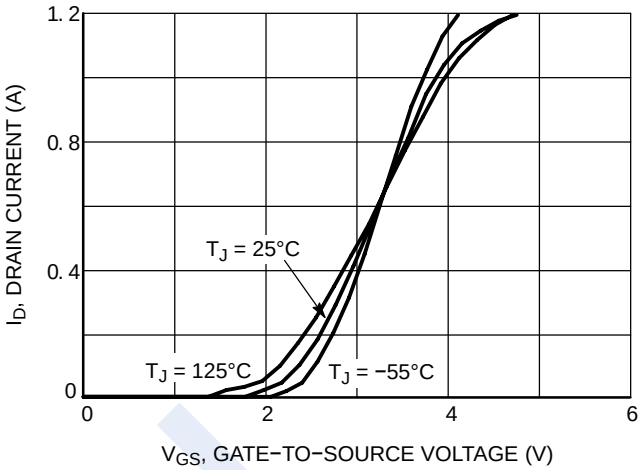


Figure 2. Transfer Characteristics

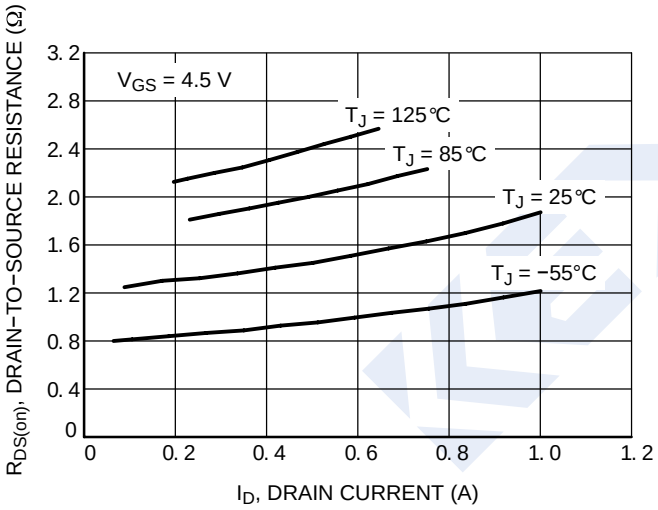


Figure 3. On −Resistance vs. Drain Current and Temperature

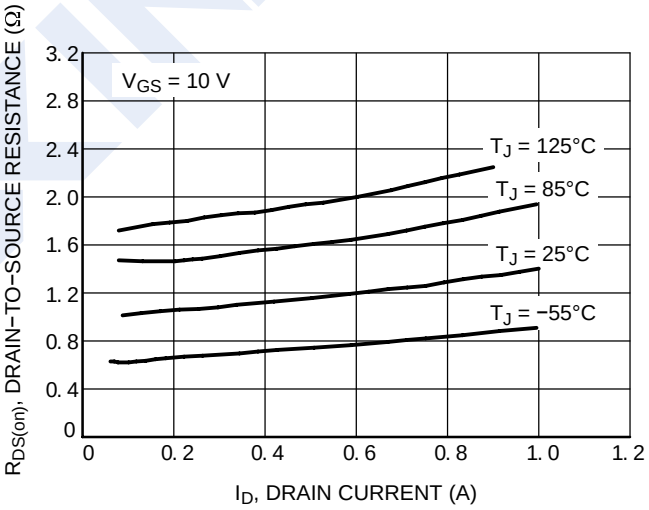


Figure 4. On −Resistance vs. Drain Current and Temperature

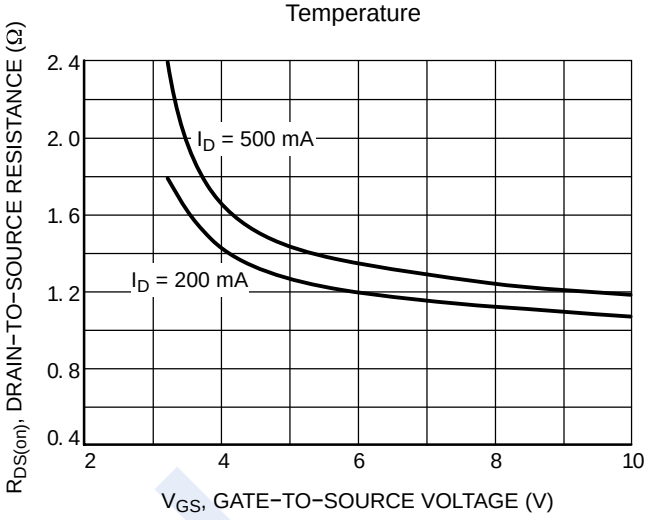


Figure 5. On −Resistance vs. Gate −to−Source Voltage

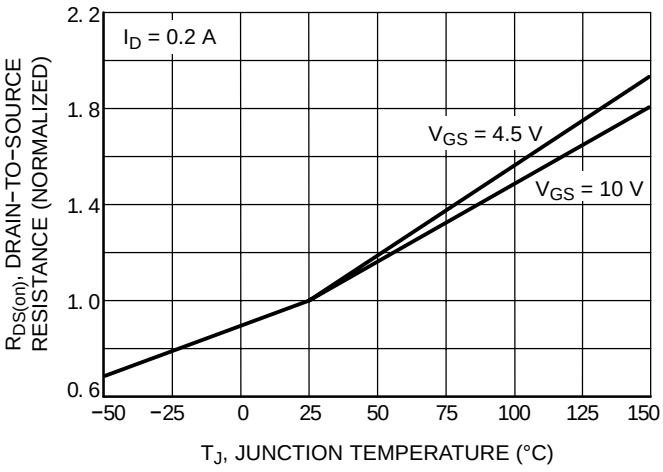


Figure 6. On −Resistance Variation with Temperature

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■ Typical Characterisitics

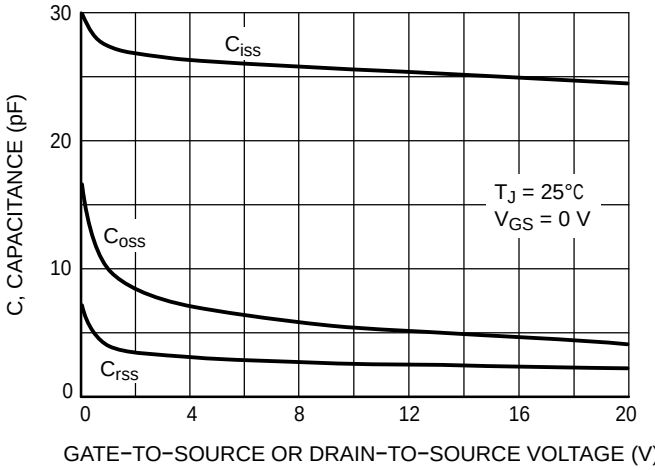


Figure 7. Capacitance Variation

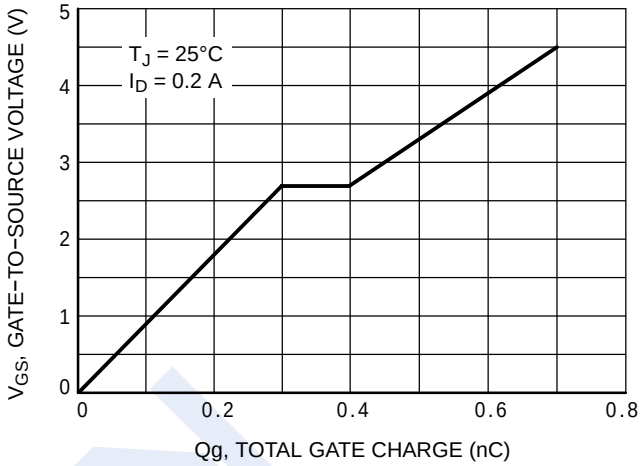


Figure 8. Gate−to−Source and Drain−to−Source Voltage vs. Total Charge

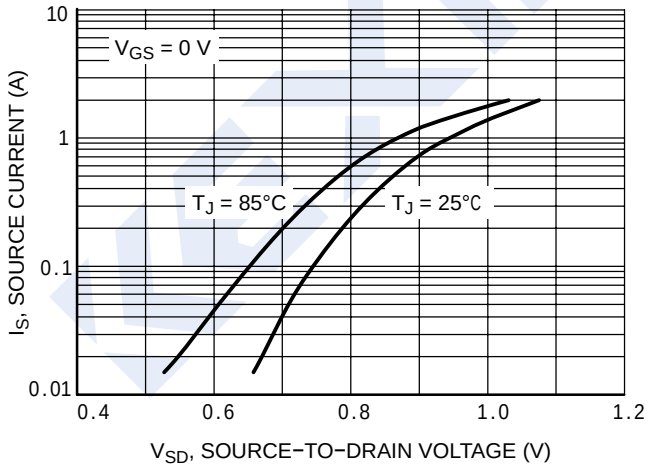


Figure 9. Diode Forward Voltage vs. Current