



N-Channel 60-V (D-S) MOSFET

| PRODUCT SUMMARY | | |
|------------------------|---------------------------|------------|
| V_{DS} (V) | $r_{DS(on)}$ (Ω) | I_D (mA) |
| 60 | 3 @ $V_{GS} = 10$ V | 240 |

FEATURES

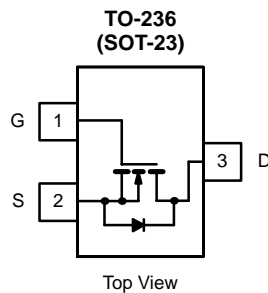
- Low On-Resistance: 3 Ω
- Low Threshold: 2 V (typ)
- Low Input Capacitance: 25 pF
- Fast Switching Speed: 7.5 ns
- Low Input and Output Leakage

BENEFITS

- Low Offset Voltage
- Low-Voltage Operation
- Easily Driven Without Buffer
- High-Speed Circuits
- Low Error Voltage

APPLICATIONS

- Direct Logic-Level Interface: TTL/CMOS
- Drivers: Relays, Solenoids, Lamps, Hammers, Display, Memories, Transistors, etc.
- Battery Operated Systems
- Solid-State Relays



Marking Code: 7Ew/
 E = Part Number Code for 2N7002E
 w = Week Code
 / = Lot Traceability

| ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED) | | | |
|--|----------------|--------------------------|---------------------------|
| Parameter | Symbol | Limit | Unit |
| Drain-Source Voltage | V_{DS} | 60 | V |
| Gate-Source Voltage | V_{GS} | ± 20 | V |
| Continuous Drain Current ($T_J = 150^\circ\text{C}$) | I_D | 240 | mA |
| | | $T_A = 25^\circ\text{C}$ | |
| | | 190 | $T_A = 70^\circ\text{C}$ |
| Pulsed Drain Current ^a | I_{DM} | 1300 | |
| Power Dissipation | P_D | 0.35 | W |
| | | 0.22 | |
| Thermal Resistance, Junction-to-Ambient | R_{thJA} | 357 | $^\circ\text{C}/\text{W}$ |
| Operating Junction and Storage Temperature Range | T_J, T_{stg} | -55 to 150 | $^\circ\text{C}$ |

Notes
 a. Pulse width limited by maximum junction temperature.

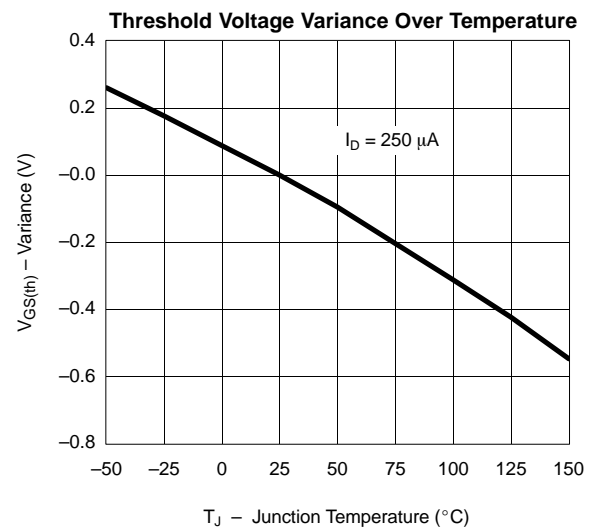
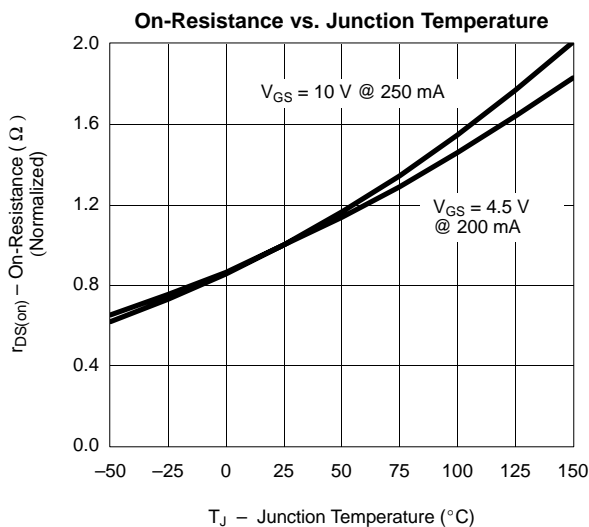
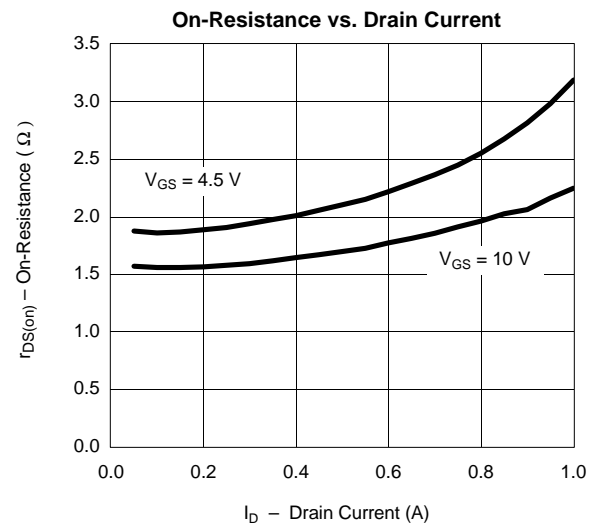
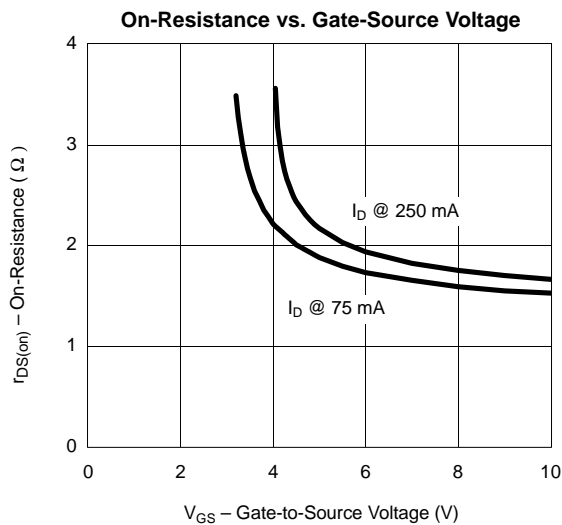
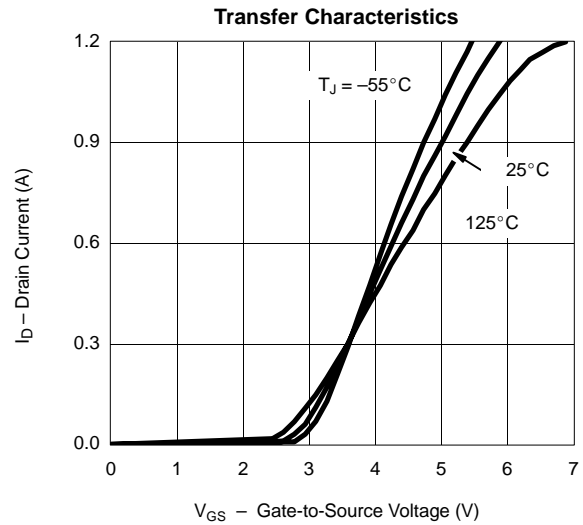
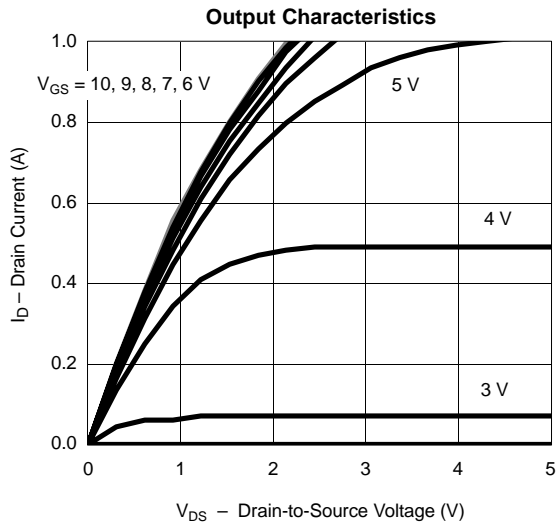
| SPECIFICATIONS (T _J = 25 °C UNLESS OTHERWISE NOTED) | | | | | | |
|--|----------------------|---|--------|------------------|------|------|
| Parameter | Symbol | Test Conditions | Limits | | | Unit |
| | | | Min | Typ ^a | Max | |
| Static | | | | | | |
| Drain-Source Breakdown Voltage | V _{(BR)DSS} | V _{GS} = 0 V, I _D = 10 μA | 60 | 68 | | V |
| Gate-Threshold Voltage | V _{GS(th)} | V _{DS} = V _{GS} , I _D = 250 μA | 1 | 2 | 2.5 | |
| Gate-Body Leakage | I _{GSS} | V _{DS} = 0 V, V _{GS} = ± 15 V | | | ± 10 | nA |
| Zero Gate Voltage Drain Current | I _{DSS} | V _{DS} = 60 V, V _{GS} = 0 V | | | 1 | μA |
| | | V _{DS} = 60 V, V _{GS} = 0 V, T _C = 125 °C | | | 500 | |
| On-State Drain Current ^b | I _{D(on)} | V _{GS} = 10 V, V _{DS} = 7.5 V | 800 | 1300 | | mA |
| | | V _{GS} = 4.5 V, V _{DS} = 10 V | 500 | 700 | | |
| Drain-Source On-Resistance ^b | r _{DS(on)} | V _{GS} = 10 V, I _D = 250 mA | | 1.2 | 3 | Ω |
| | | V _{GS} = 4.5 V, I _D = 200 mA | | 1.8 | 4 | |
| Forward Transconductance ^b | g _{fs} | V _{DS} = 15 V, I _D = 200 mA | | 600 | | mS |
| Diode Forward Voltage | V _{SD} | I _S = 200 mA, V _{GS} = 0 V | | 0.85 | 1.2 | V |
| Dynamic^a | | | | | | |
| Total Gate Charge | Q _g | V _{DS} = 10 V, V _{GS} = 4.5 V I _D ≅ 250 mA | | 0.4 | 0.6 | nC |
| Gate-Source Charge | Q _{gs} | | | 0.06 | | |
| Gate-Drain Charge | Q _{gd} | | | 0.06 | | |
| Input Capacitance | C _{iss} | V _{DS} = 25 V, V _{GS} = 0 V, f = 1 MHz | | 21 | | pF |
| Output Capacitance | C _{oss} | | | 7 | | |
| Reverse Transfer Capacitance | C _{rss} | | | 2.5 | | |
| Switching^{a, c} | | | | | | |
| Turn-On Time | t _{on} | V _{DD} = 10 V, R _L = 40 Ω I _D ≅ 250 mA, V _{GEN} = 10V R _G = 10 Ω | | 13 | 20 | ns |
| Turn-Off Time | t _{off} | | | 18 | 25 | |

Notes

- a. For DESIGN AID ONLY, not subject to production testing.
b. Pulse test: PW ≤ 300 μs duty cycle ≤ 2%.
c. Switching time is essentially independent of operating temperature.



TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)



TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)

