



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

## TrenchFET MOSFET



**ESD Protected  
2000 V**

PRODUCT SUMMARY		
$V_{DS}$ (V)	$r_{DS(on)}$ ( $\Omega$ )	$I_D$ (mA)
60	2 @ $V_{GS} = 10$ V	300

### FEATURES

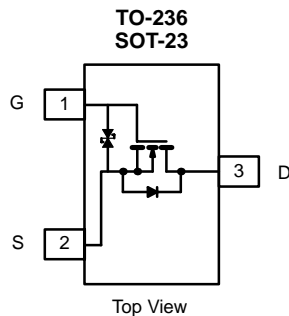
- Low On-Resistance: 2  $\Omega$
- Low Threshold: 2 V (typ)
- Low Input Capacitance: 25 pF
- Fast Switching Speed: 25 ns
- Low Input and Output Leakage

### 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



2N7002 (7K)\*  
\*Marking Code

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	$V_{GS}$	$\pm 20$	
Continuous Drain Current ( $T_J = 150^\circ\text{C}$ ) <sup>b</sup>	$I_D$	$T_A = 25^\circ\text{C}$	300
		$T_A = 100^\circ\text{C}$	190
Pulsed Drain Current <sup>a</sup>	$I_{DM}$	800	mA
Power Dissipation <sup>b</sup>	$P_D$	$T_A = 25^\circ\text{C}$	0.35
		$T_A = 100^\circ\text{C}$	0.14
Maximum Junction-to-Ambient <sup>b</sup>	$R_{thJA}$	350	$^\circ\text{C/W}$
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.
- b. Surface mounted on FR4 board.

SPECIFICATIONS <sup>a</sup>						
Parameter	Symbol	Test Conditions	Limits			Unit
			Min	Typ <sup>b</sup>	Max	
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 10\ \mu\text{A}$	60			V
Gate-Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	1		2.5	
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			$\pm 10$	$\mu\text{A}$
		$V_{DS} = 0\text{ V}, V_{GS} = \pm 10\text{ V}$			$\pm 150$	
		$V_{DS} = 0\text{ V}, V_{GS} = \pm 10\text{ V}, T_J = 85^\circ\text{C}$			$\pm 1000$	
		$V_{DS} = 0\text{ V}, V_{GS} = \pm 5\text{ V}$			$\pm 100$	
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 50\text{ V}, V_{GS} = 0\text{ V}$			10	$\mu\text{A}$
		$V_{DS} = 50\text{ V}, V_{GS} = 0\text{ V}, T_J = 85^\circ\text{C}$			100	
		$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}$			1	
		$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}, T_J = 125^\circ\text{C}$			500	
On-State Drain Current <sup>b</sup>	$I_{D(on)}$	$V_{GS} = 10\text{ V}, V_{DS} = 7.5\text{ V}$	800			mA
		$V_{GS} = 4.5\text{ V}, V_{DS} = 10\text{ V}$	500			
Drain-Source On-Resistance <sup>b</sup>	$r_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 500\text{ mA}$			2	$\Omega$
		$V_{GS} = 4.5\text{ V}, I_D = 200\text{ mA}$			4	
Forward Transconductance <sup>b</sup>	$g_{fs}$	$V_{DS} = 10\text{ V}, I_D = 200\text{ mA}$	100			mS
Diode Forward Voltage	$V_{SD}$	$I_S = 200\text{ mA}, V_{GS} = 0\text{ V}$			1.3	V
<b>Dynamic<sup>b</sup></b>						
Total Gate Charge	$Q_g$	$V_{DS} = 10\text{ V}, V_{GS} = 4.5\text{ V}$ $I_D \cong 250\text{ mA}$		0.4	0.6	nC
Input Capacitance	$C_{iss}$	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		30		pF
Output Capacitance	$C_{oss}$			6		
Reverse Transfer Capacitance	$C_{rss}$			2.5		
<b>Switching<sup>b, c</sup></b>						
Turn-On Time	$t_{(on)}$	$V_{DD} = 30\text{ V}, R_L = 150\ \Omega$ $I_D \cong 200\text{ mA}, V_{GEN} = 10\text{ V}$ $R_G = 10\ \Omega$			25	ns
Turn-Off Time	$t_{(off)}$				35	

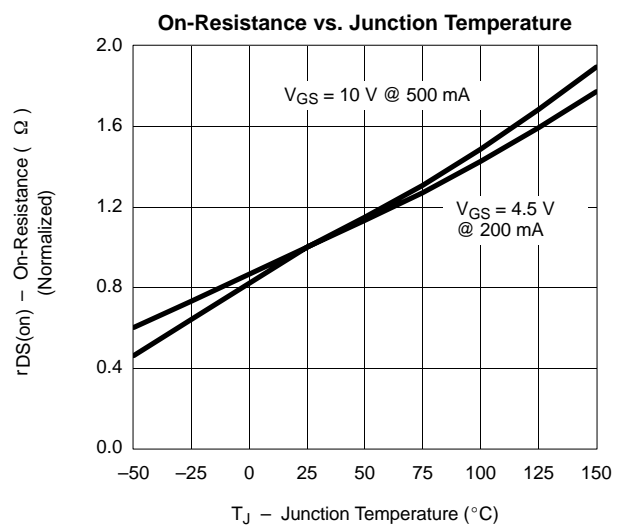
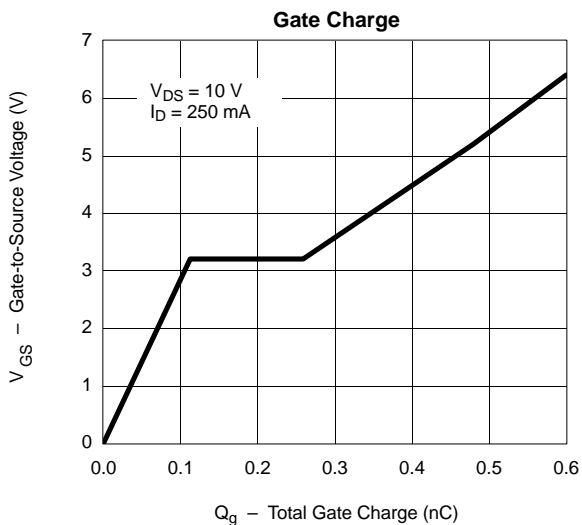
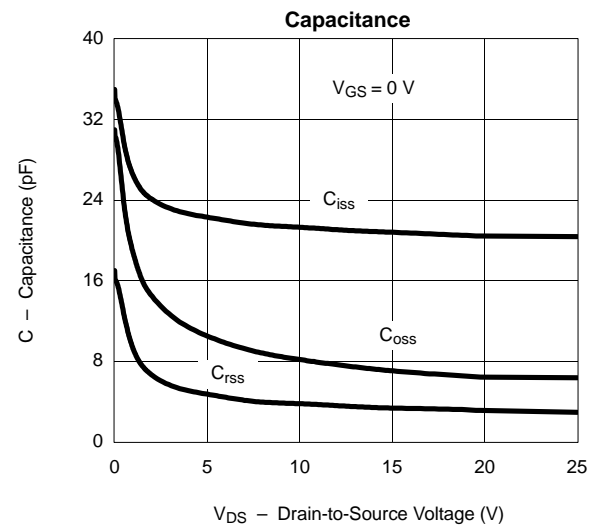
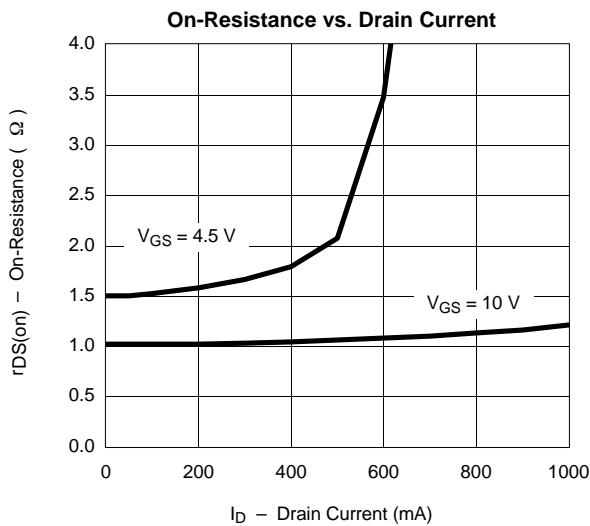
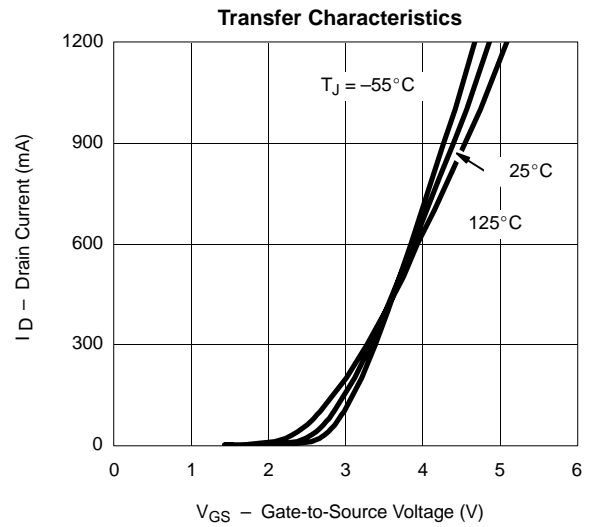
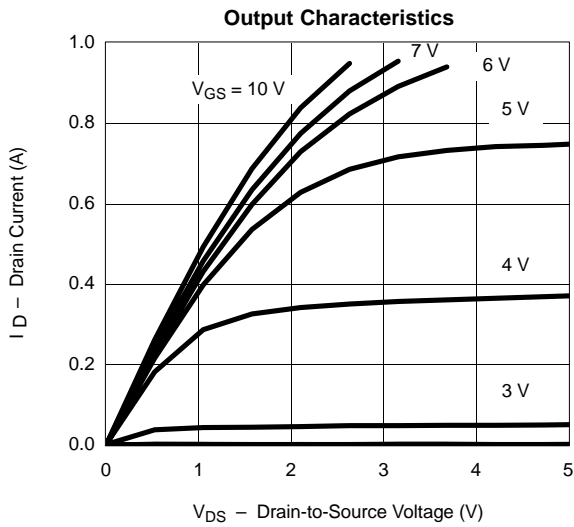
## Notes

- $T_A = 25^\circ\text{C}$  unless otherwise noted.
- For DESIGN AID ONLY, not subject to production testing.
- Pulse test:  $PW \leq 300\ \mu\text{s}$  duty cycle  $\leq 2\%$ .
- Switching time is essentially independent of operating temperature.

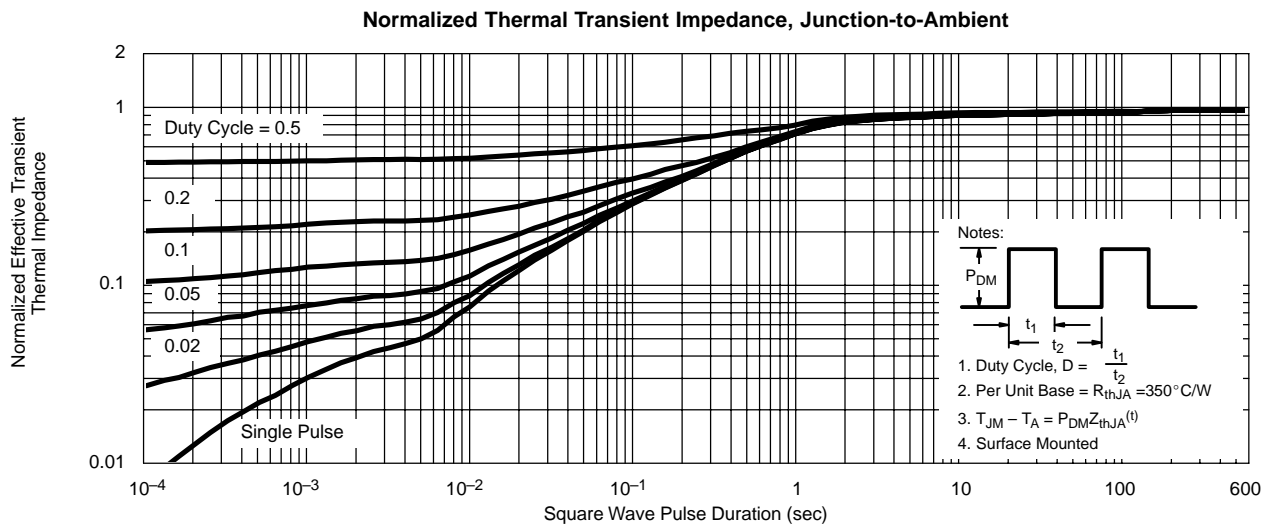
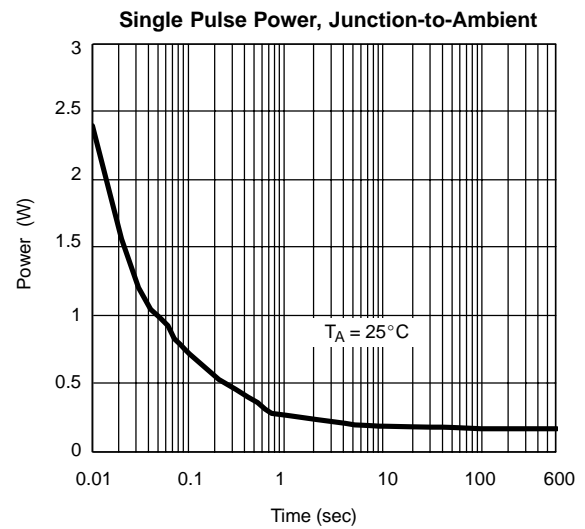
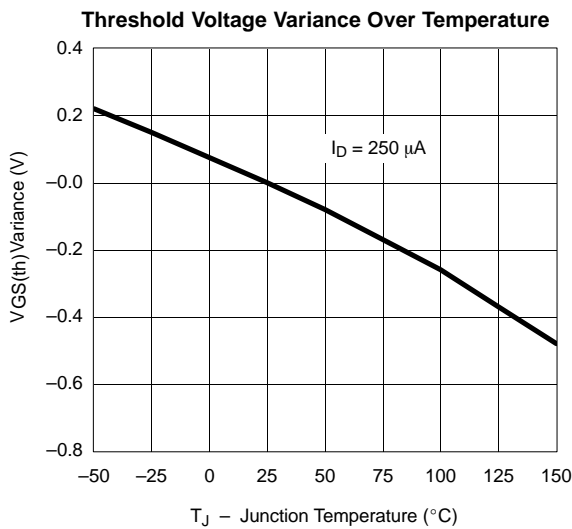
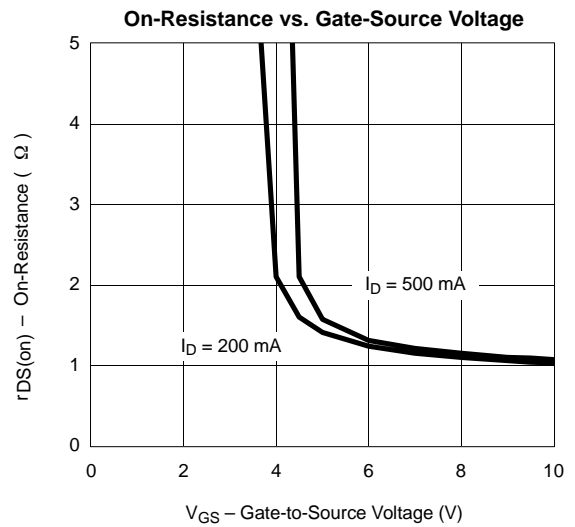
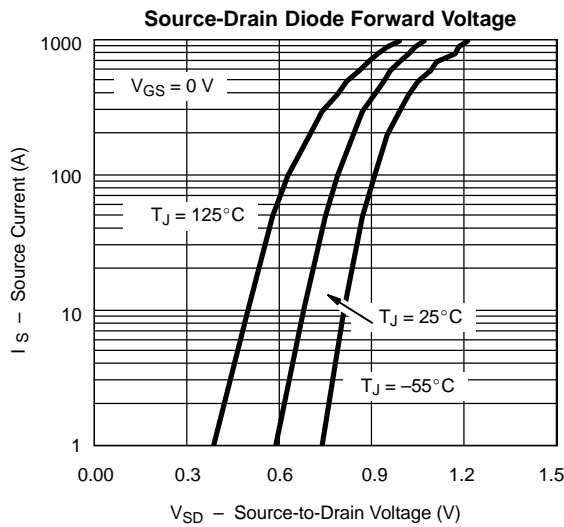
TNJO60BE



**TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)**



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