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

TrenchFET
MOSFET

ESD Protected
2000 V

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

FEATURES

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

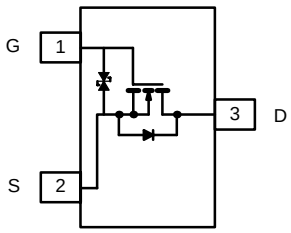
BENEFITS

- 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

TO-236
SOT-23



Top View

2N7002 (7K)*
*Marking Code

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C UNLESS OTHERWISE NOTED)				
Parameter		**Symbol**	**Limit**	**Unit**
Drain-Source Voltage		V_{DS}	60	V
Gate-Source Voltage		V_{GS}	±20	
Continuous Drain Current (T_J = 150°C)[b]	T_A = 25°C	I_D	300	mA
	T_A = 100°C		190	
Pulsed Drain Current[a]		I_{DM}	800	
Power Dissipation[b]	T_A = 25°C	P_D	0.35	W
	T_A = 100°C		0.14	
Maximum Junction-to-Ambient[b]		R_{thJA}	350	°C/W
Operating Junction and Storage Temperature Range		T_J, T_{stg}	–55 to 150	°C

Notes
a. Pulse width limited by maximum junction temperature.
b. Surface mounted on FR4 board.

SPECIFICATIONS[a]

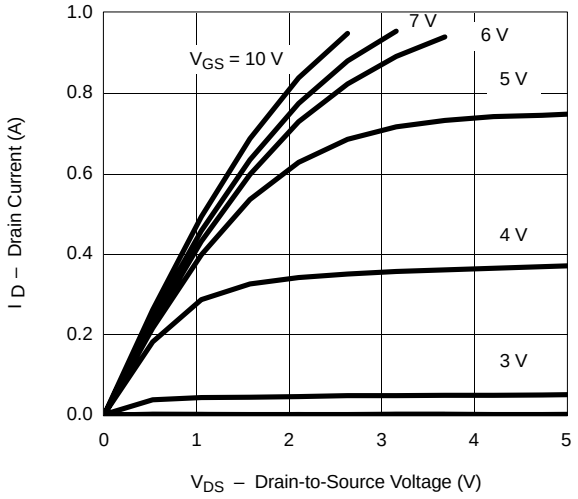
Parameter	Symbol	Test Conditions	Limits Min	Limits Typ[b]	Limits Max	Unit
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 10 μA	60			V
Gate-Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 μA	1		2.5	V
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±20 V			±10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

Notes
a. T_A = 25°C unless otherwise noted.
b. For DESIGN AID ONLY, not subject to production testing.
c. Pulse test: PW ≤ 300 μs duty cycle ≤ 2%.
d. Switching time is essentially independent of operating temperature.

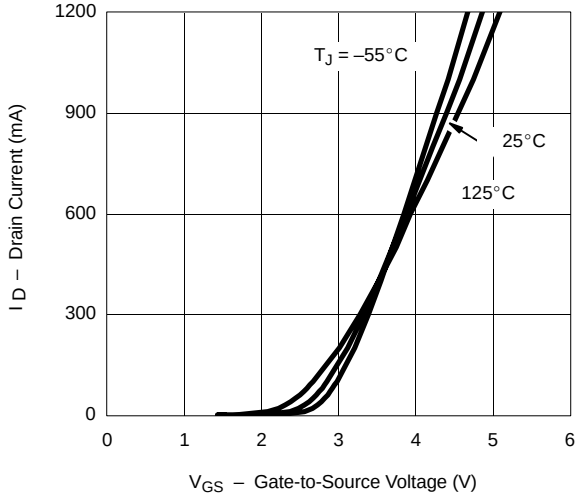
TNJO60BE

TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

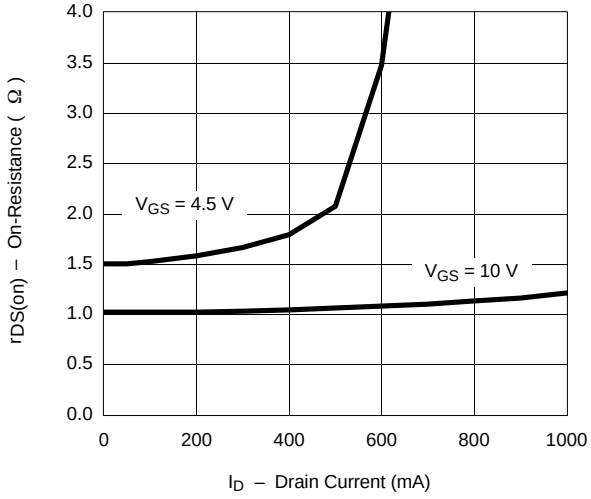
Output Characteristics



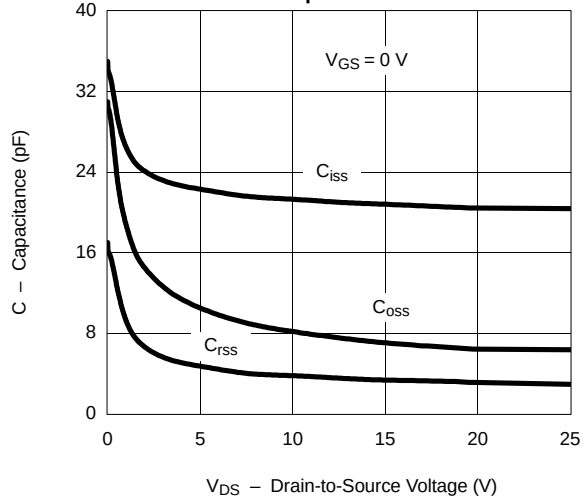
Transfer Characteristics



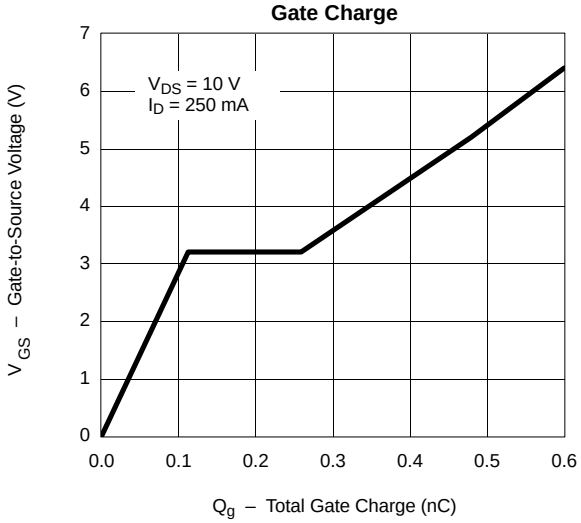
On-Resistance vs. Drain Current



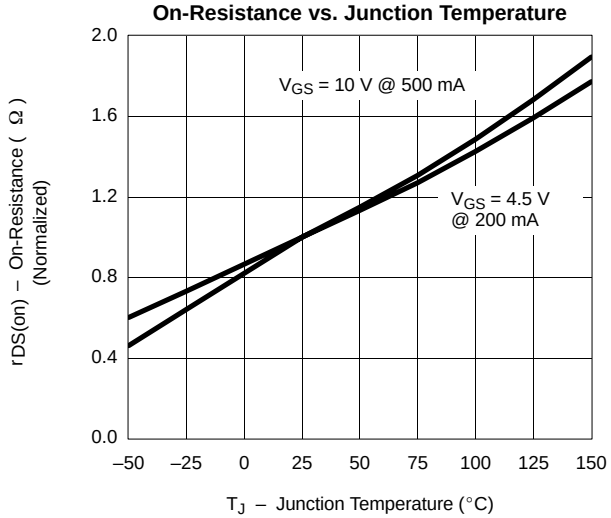
Capacitance



Gate Charge

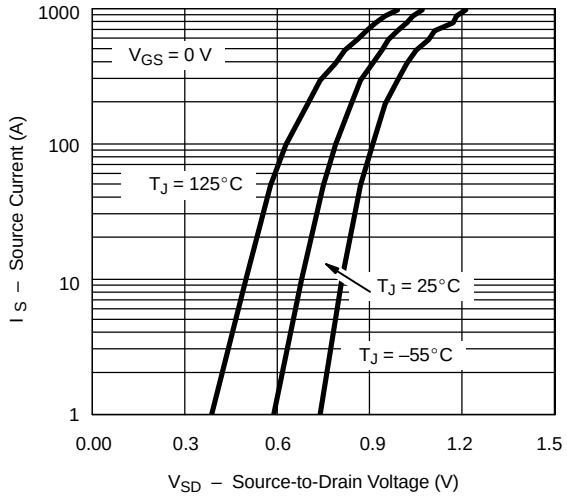


On-Resistance vs. Junction Temperature

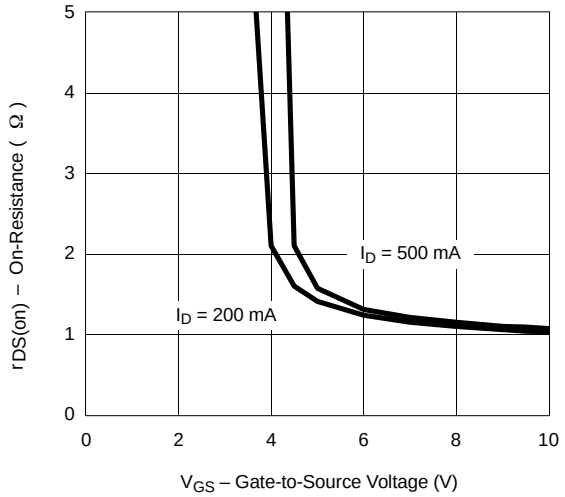


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

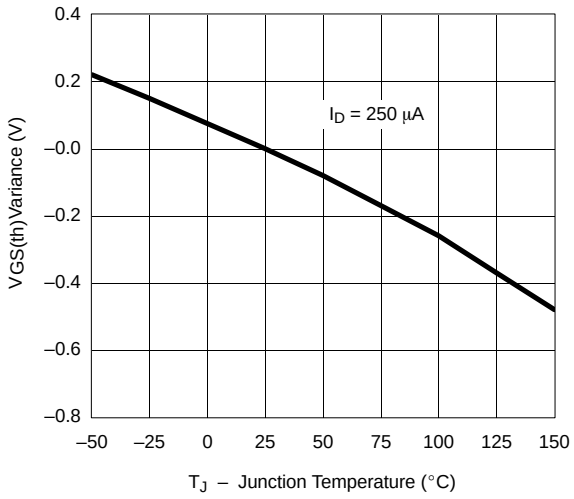
Source-Drain Diode Forward Voltage



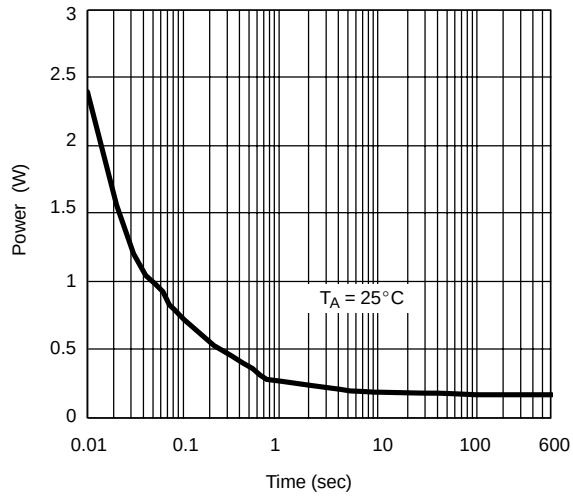
On-Resistance vs. Gate-Source Voltage



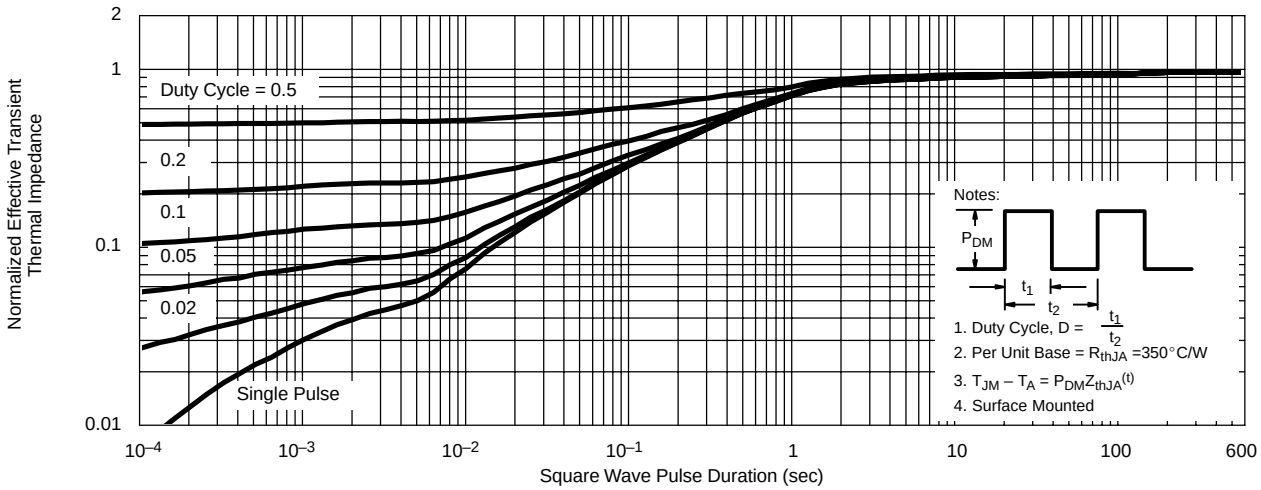
Threshold Voltage Variance Over Temperature



Single Pulse Power, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Ambient



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TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

Normalized Thermal Transient Impedance, Junction-to-Foot