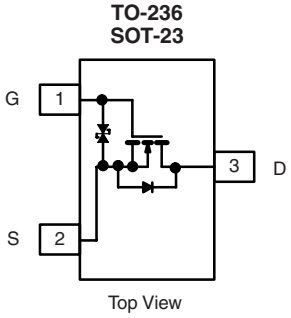
N-Channel 60-V (D-S) MOSFET

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



Top View

2N7002K (7K)*
* Marking Code

Ordering Information: 2N7002K-T1
2N7002K-T1-E3 (Lead (Pb)-free)
2N7002K-T1-GE3 (Lead (Pb)-free and Halogen-free)

FEATURES

- **Halogen-free According to IEC 61249-2-21 Definition**
- 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
- TrenchFET® Power MOSFET
- 2000 V ESD Protection
- Compliant to RoHS Directive 2002/95/EC

Pb-free Available
RoHS* COMPLIANT
HALOGEN FREE Available

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

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.

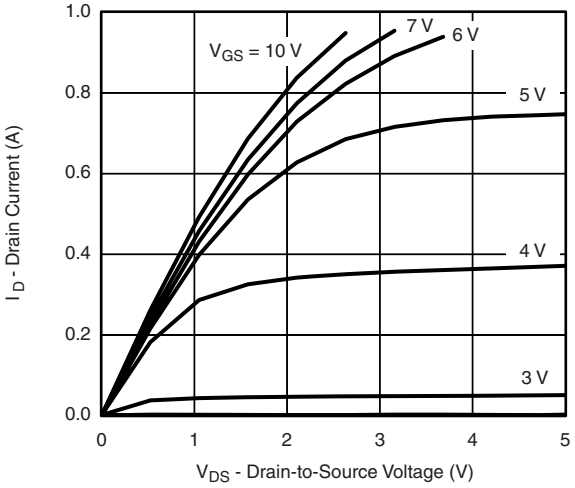
* Pb containing terminations are not RoHS compliant, exemptions may apply.

SPECIFICATIONS T_A = 25 °C, unless otherwise noted						
			Limits			
Parameter	**Symbol**	**Test Conditions**	**Min.**	**Typ.[a]**	**Max.**	**Unit**
Static						
Drain-Source Breakdown Voltage	V_{DS}	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	
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 20 V			± 10	µA
		V_{DS} = 0 V, V_{GS} = ± 15 V			1	
		V_{DS} = 0 V, V_{GS} = ± 10 V			± 150	nA
		V_{DS} = 0 V, V_{GS} = ± 10 V, T_J = 85 °C			± 1000	
		V_{DS} = 0 V, V_{GS} = ± 5 V			± 100	
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_J = 125 °C			500	
On-State Drain Current[a]	$I_{D(on)}$	V_{GS} = 10 V, V_{DS} = 7.5 V	800			mA
		V_{GS} = 4.5 V, V_{DS} = 10 V	500			
Drain-Source On-Resistance[a]	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 500 mA			2	Ω
		V_{GS} = 4.5 V, I_D = 200 mA			4	
Forward Transconductance[a]	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[a]						
Total Gate Charge	Q_g	V_{DS} = 10 V, V_{GS} = 4.5 V $I_D \cong$ 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		
Reverse Transfer Capacitance	C_{rss}			2.5		
Switching[a, b, c]						
Turn-On Time	$t_{d(on)}$	V_{DD} = 30 V, R_L = 150 Ω $I_D \cong$ 200 mA, V_{GEN} = 10 V, R_G = 10 Ω			25	ns
Turn-Off Time	$t_{d(off)}$				35	

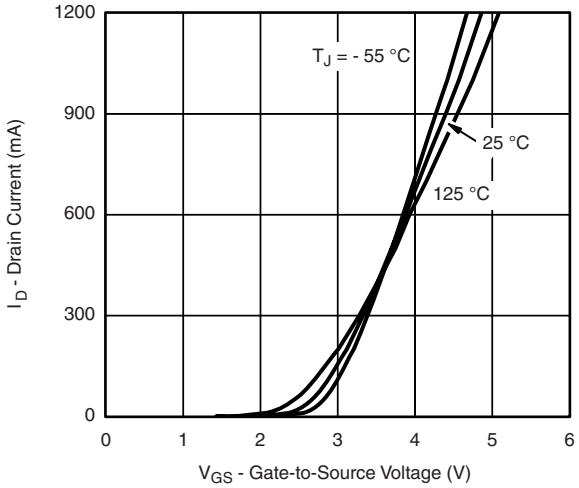
Notes:
a. For DESIGN AID ONLY, not subject to production testing.
b. Pulse test: PW ≤ 300 µs duty cycle ≤ 2 %.
c. Switching time is essentially independent of operating temperature.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

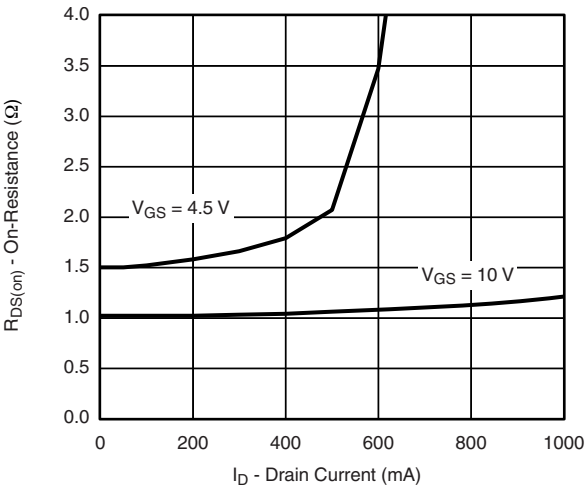
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



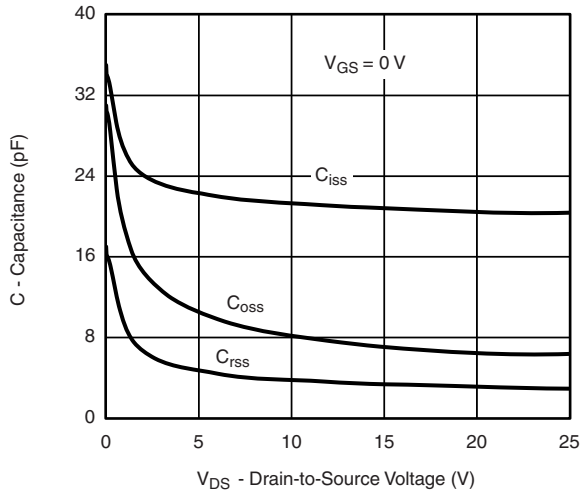
Output Characteristics



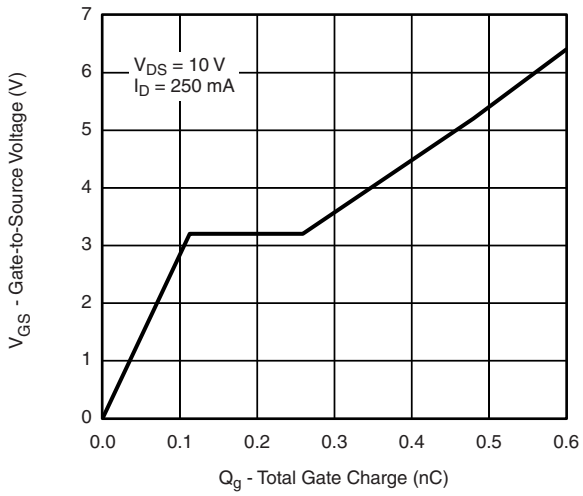
Transfer Characteristics



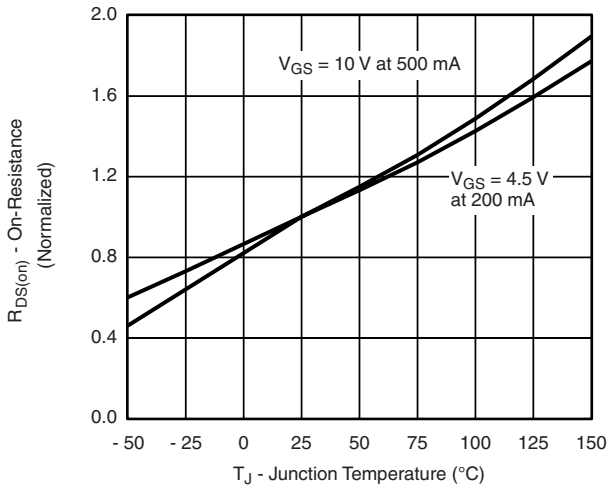
On-Resistance vs. Drain Current



Capacitance



Gate Charge



On-Resistance vs. Junction Temperature

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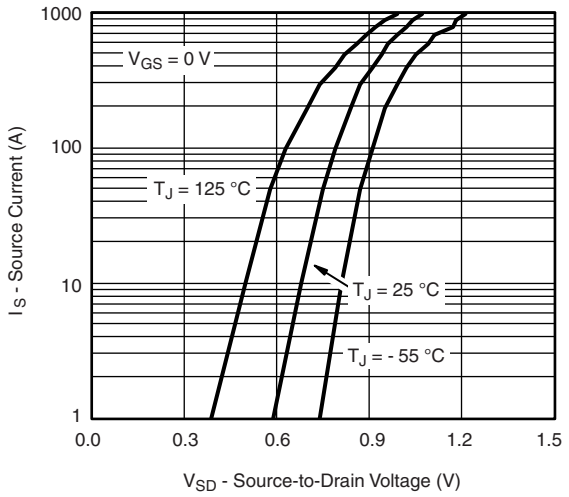
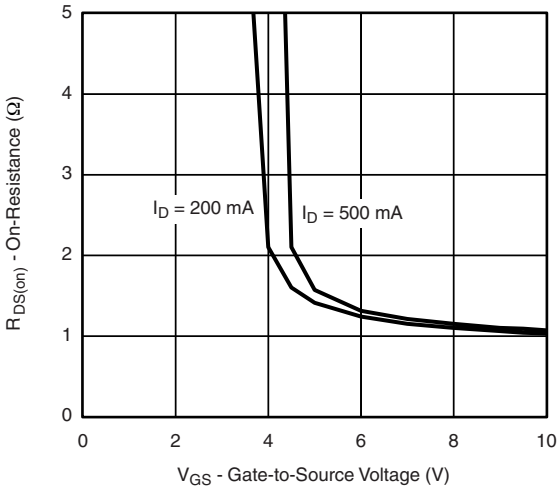
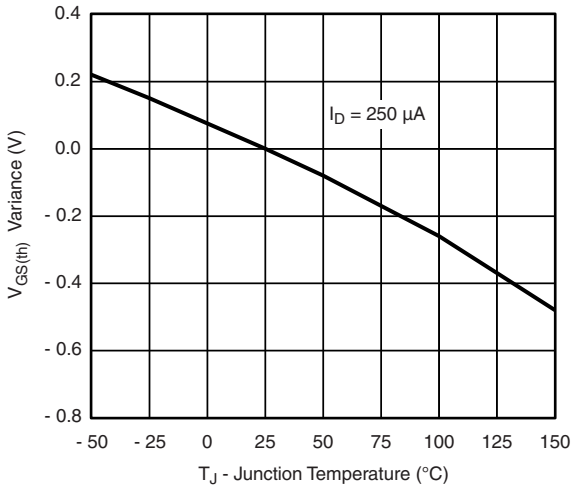


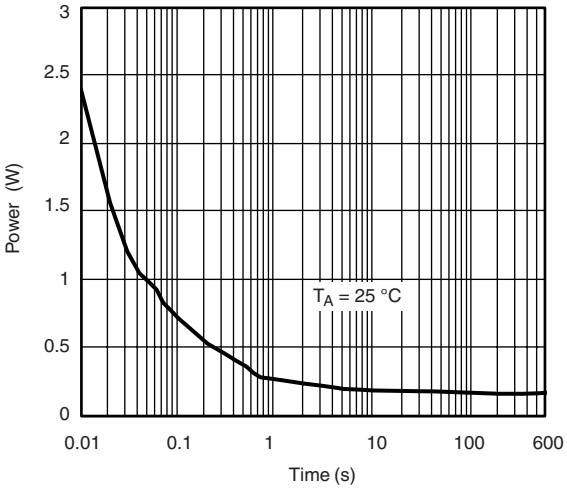
Source-Drain Diode Forward Voltage



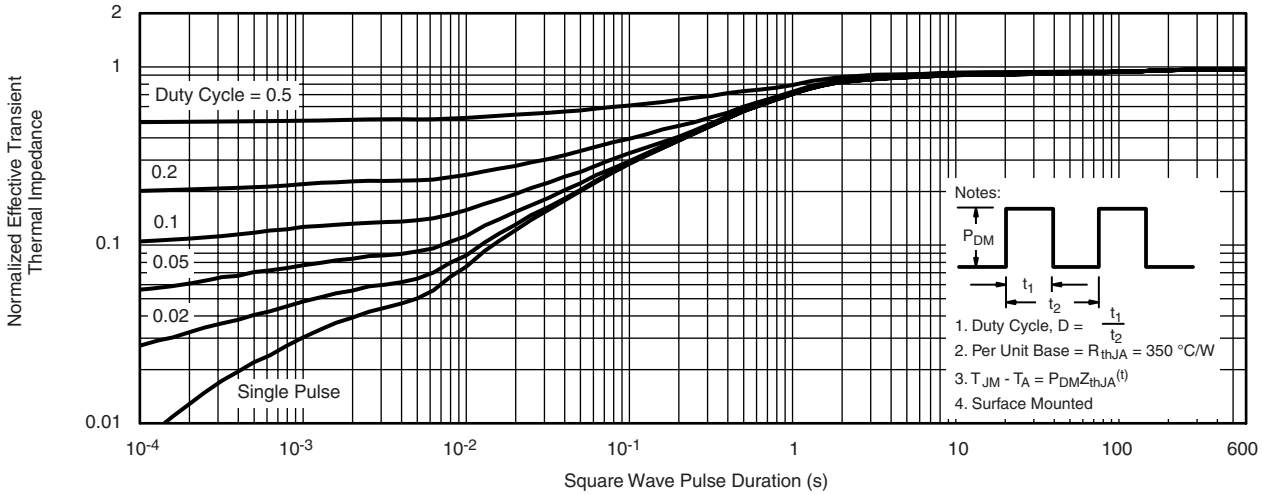
On-Resistance vs. Gate-Source Voltage



Threshold Voltage Variance Over Temperature

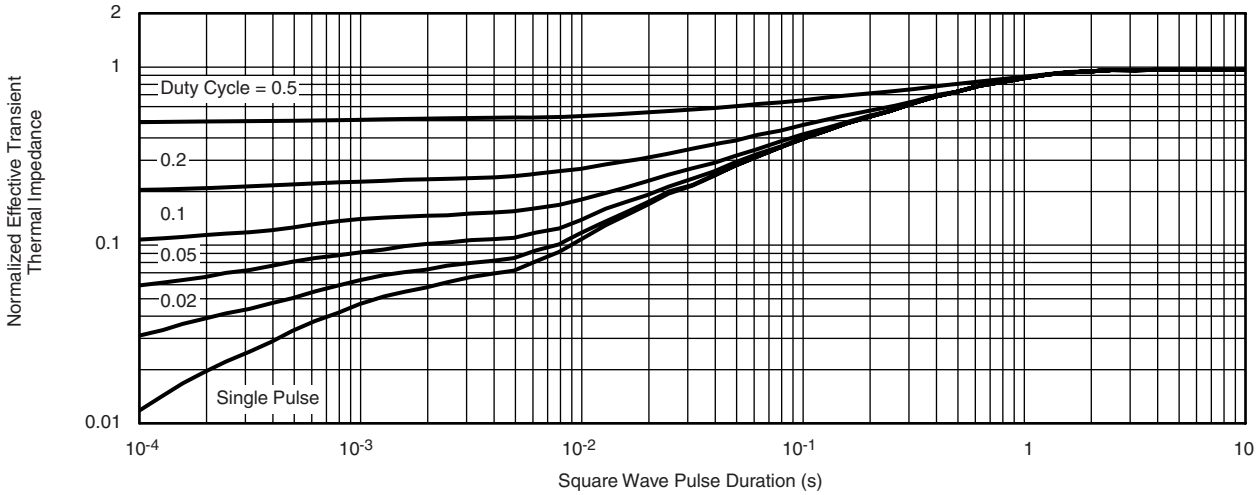


Single Pulse Power, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Ambient

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Normalized Thermal Transient Impedance, Junction-to-Foot

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