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

PRODUCT SUMMARY			
V_{DS} (V)	$r_{DS(on)}$ (Ω)	$V_{GS(th)}$ (V)	I_D (A)
60	2 at V_{GS} = 10 V	1.0 to 2.5	0.47
	4 at V_{GS} = 4.5 V		0.33

FEATURES

- TrenchFET® Power MOSFET
- ESD Protected: 2000 V

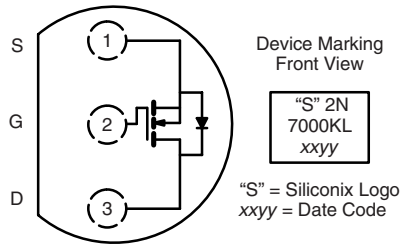
Pb-free Available

RoHS* COMPLIANT

APPLICATIONS

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

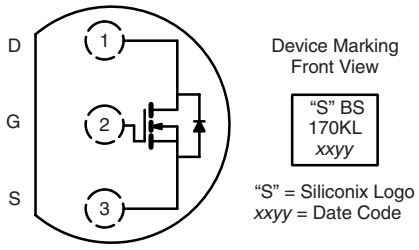
TO-226AA (TO-92)



Top View

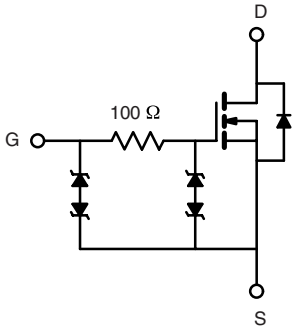
Ordering Information: 2N7000KL-TR1
2N7000KL-TR1-E3 (Lead (Pb)-free)

TO-92-18RM (TO-18 Lead Form)



Top View

Ordering Information: BS170KL-TR1
BS170KL-TR1-E3 (Lead (Pb)-free)



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	0.47	A
	T_A = 70 °C		0.37	
Pulsed Drain Current[a]		I_{DM}	1.0	
Power Dissipation	T_A = 25 °C	P_D	0.8	W
	T_A = 70 °C		0.51	
Maximum Junction-to-Ambient		R_{thJA}	158	°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.

* 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**	**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	2.0	2.5	
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 10 V			± 1	µA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 60 V, V_{GS} = 0 V			1	
		V_{DS} = 60 V, V_{GS} = 0 V, T_J = 55 °C			10	
On-State Drain Current[b]	$I_{D(on)}$	V_{GS} = 10 V, V_{DS} = 7.5 V	0.8			A
		V_{GS} = 4.5 V, V_{DS} = 10 V	0.5			
Drain-Source On-Resistance[b]	$r_{DS(on)}$	V_{GS} = 10 V, I_D = 0.5 A		1.1	2	Ω
		V_{GS} = 4.5 V, I_D = 0.2 A		1.6	4	
Forward Transconductance[b]	g_{fs}	V_{DS} = 10 V, I_D = 0.5 A		550		ms
Diode Forward Voltage	V_{SD}	I_S = 0.3 A, V_{GS} = 0 V		0.87	1.3	V
Dynamic[b]						
Total Gate Charge	Q_g	V_{DS} = 10 V, V_{GS} = 4.5 V $I_D \cong$ 0.25 A		0.4	0.6	nC
Gate-Source Charge	Q_{gs}			0.11		pF
Gate-Drain Charge	Q_{gd}			0.15		
Gate Resistance	R_g			173		
Turn-On Time	$t_{d(on)}$	V_{DD} = 30 V, R_L = 150 Ω $I_D \cong$ 0.2 A, V_{GEN} = 10 V, R_G = 10 Ω		3.8	10	ns
	t_r			4.8	15	
Turn-Off Time	$t_{d(off)}$			12.8	20	
	t_f			9.6	15	

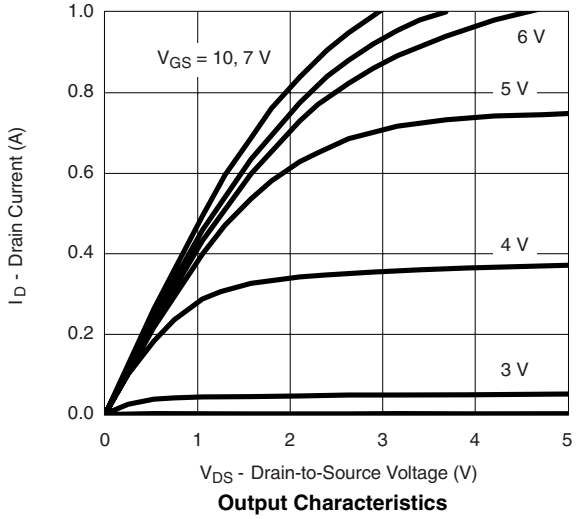
Notes:

a. Pulse test: PW ≤ 300 µs duty cycle ≤ 2 %.

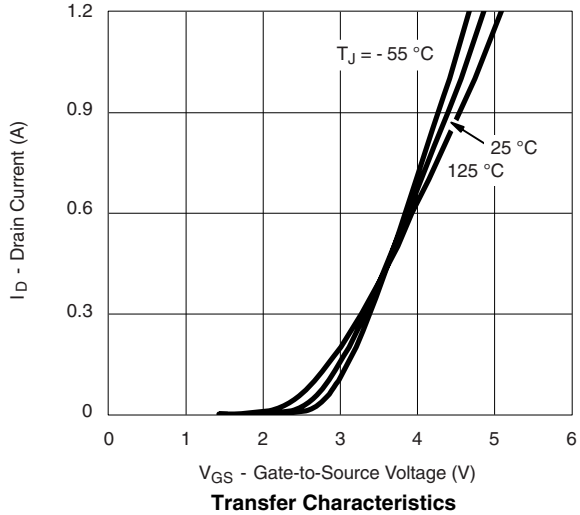
b. Guaranteed by design, not subject to production testing.

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

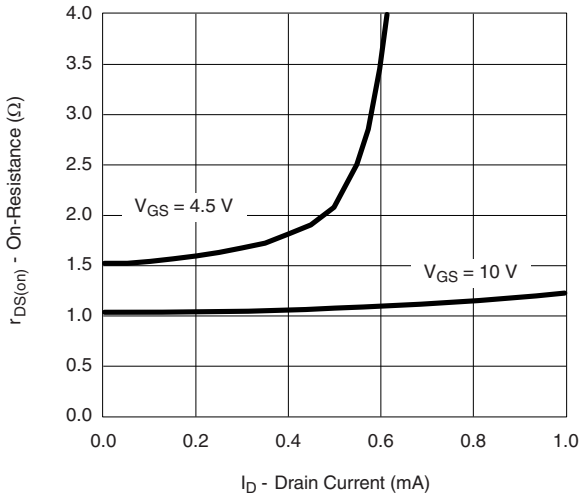


Output Characteristics

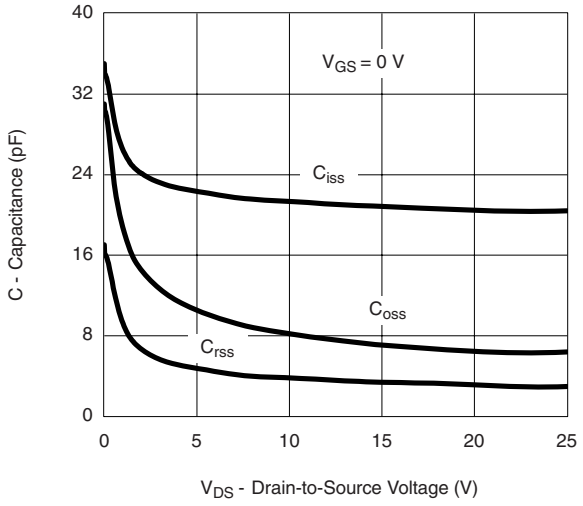


Transfer Characteristics

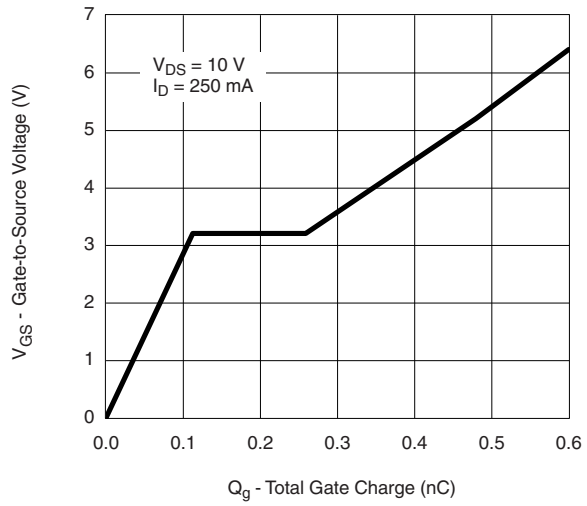
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



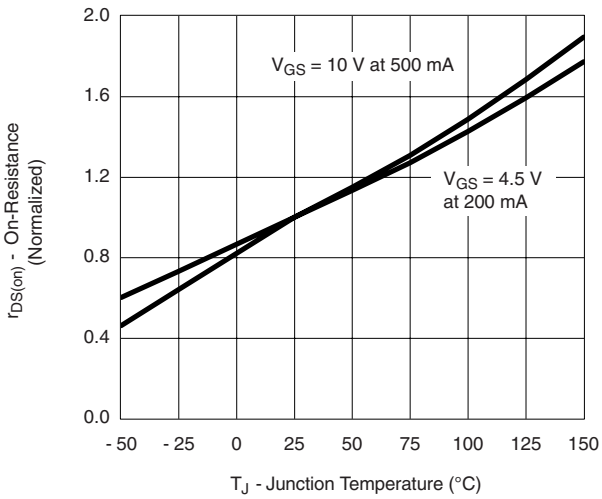
On-Resistance vs. Drain Current



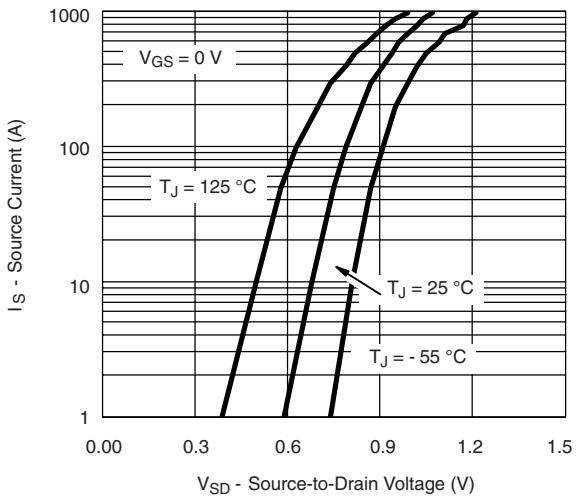
Capacitance



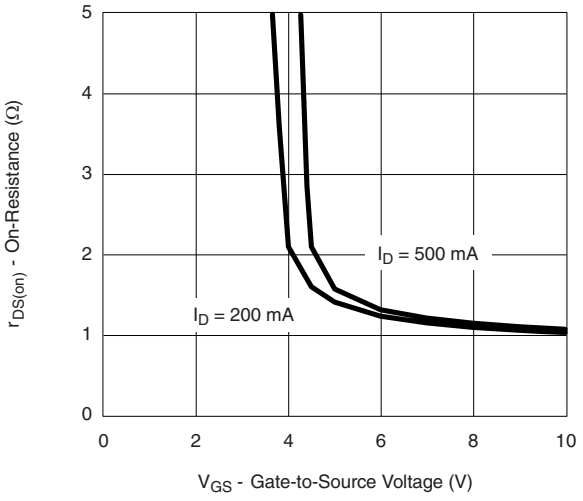
Gate Charge



On-Resistance vs. Junction Temperature

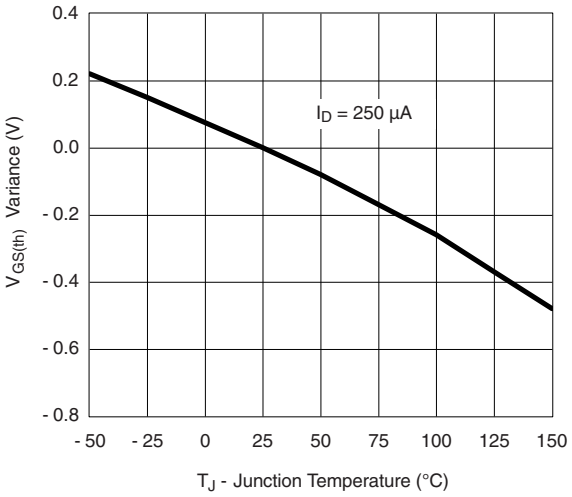


Source-Drain Diode Forward Voltage

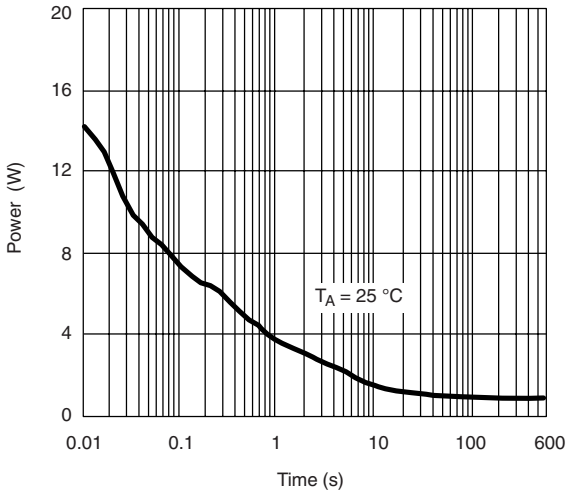


On-Resistance vs. Gate-Source Voltage

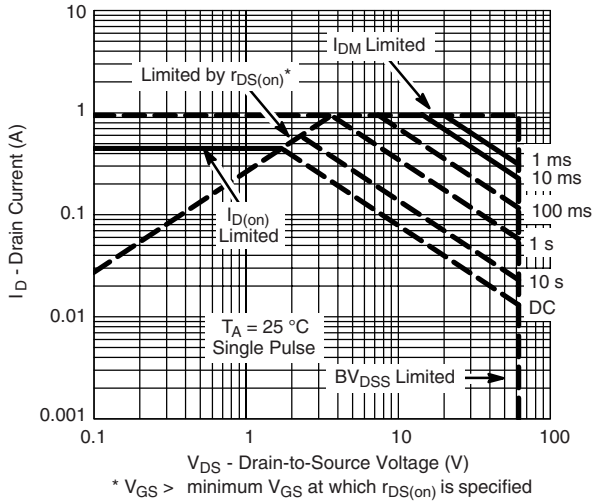
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



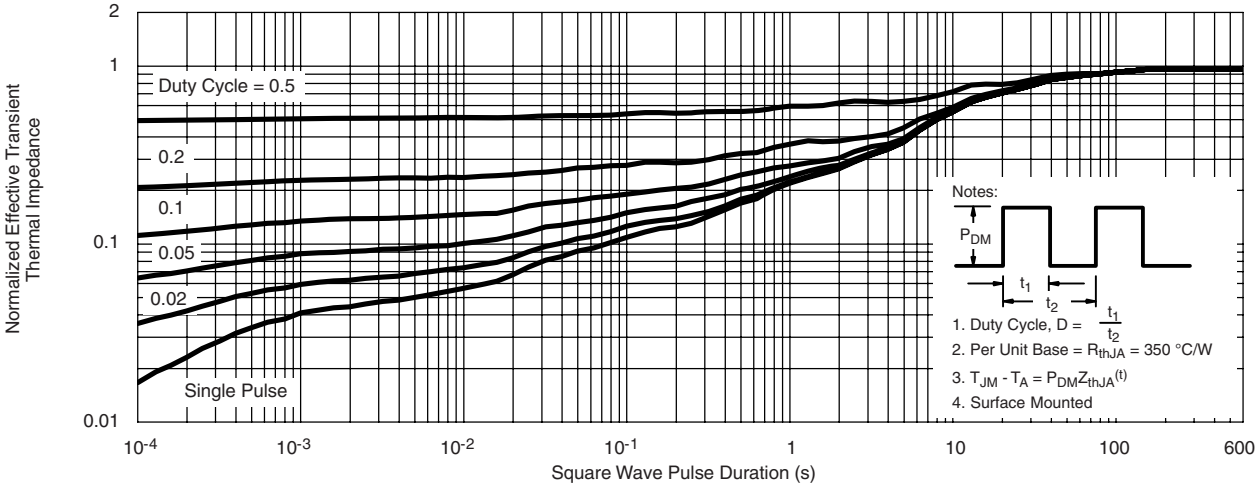
Threshold Voltage Variance Over Temperature



Single Pulse Power, Junction-to-Ambient



Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Ambient

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