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 @ V_{GS} = 10 V	1.0 to 2.5	0.47
	4 @ V_{GS} = 4.5 V		0.33

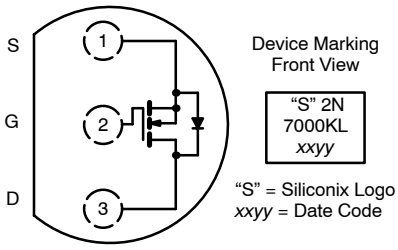
FEATURES

- TrenchFET® Power MOSFET
- ESD Protected: 2000 V

APPLICATIONS

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

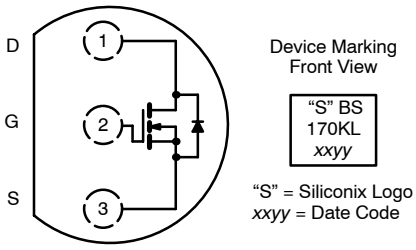
TO-226AA
(TO-92)



Top View

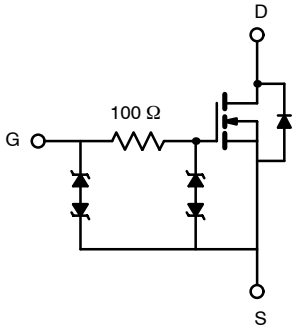
Ordering Information: 2N7000KL-TR1

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



Top View

Ordering Information: BS170KL-TR1



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)	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}	156	°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.

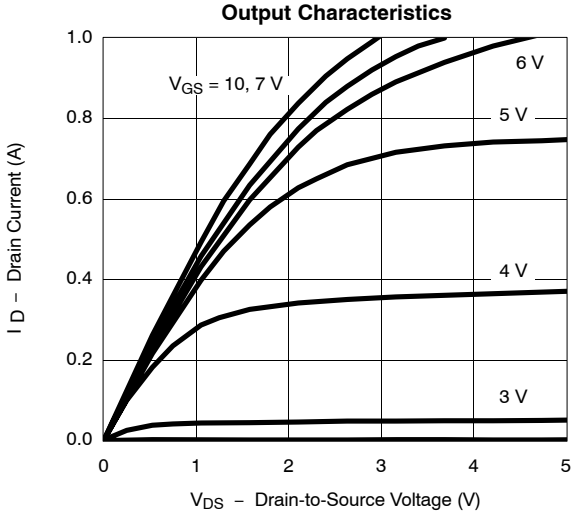
SPECIFICATIONS[a] (T_A = 25°C UNLESS OTHERWISE NOTED)

Parameter	Symbol	Test Conditions	Limits Min	Limits Typ	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	2.0	2.5	V
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	μA
		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 ≅ 0.25 A		0.4	0.6	nC
Gate-Source Charge	Q_{gs}			0.11		
Gate-Drain Charge	Q_{gd}			0.15		
Gate Resistance	R_g			173		Ω
Turn-On Time	$t_{d(on)}$	V_{DD} = 30 V, R_L = 150 Ω I_D ≅ 0.2 A, V_{GEN} = 10V 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	

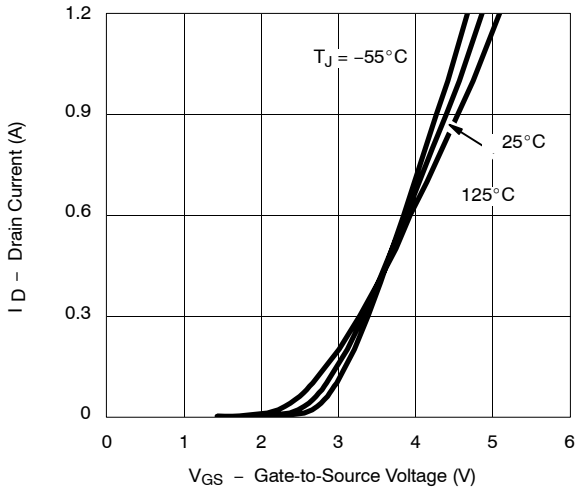
Notes
a. Pulse test: PW ≤300 μs duty cycle ≤2%.
b. Guaranteed by design, not subject to production testing.

TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

Output Characteristics

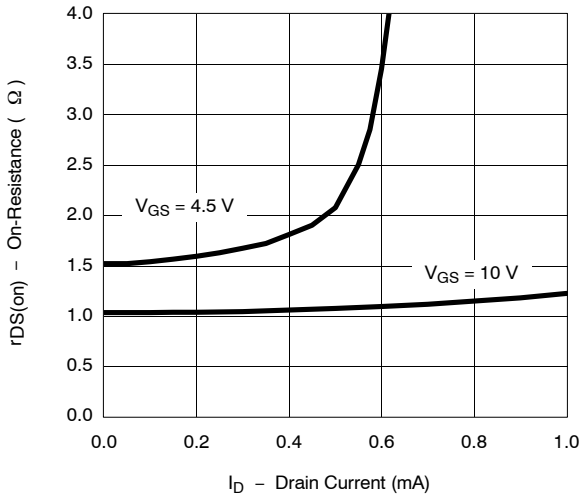


Transfer Characteristics

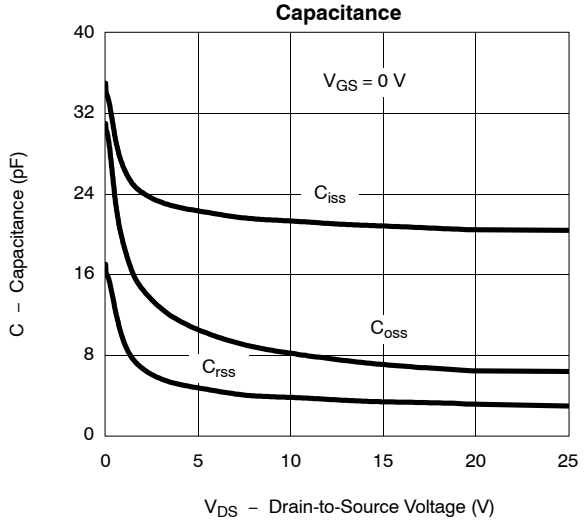


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

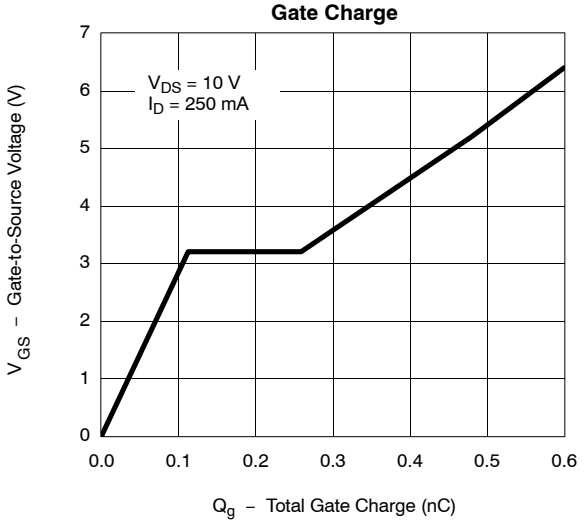
On-Resistance vs. Drain Current



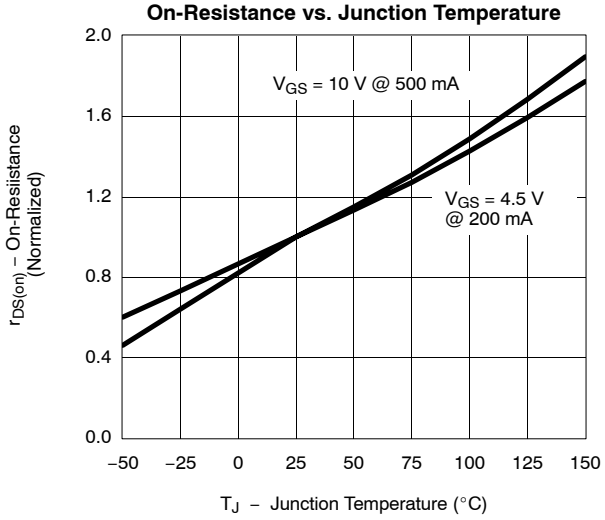
Capacitance



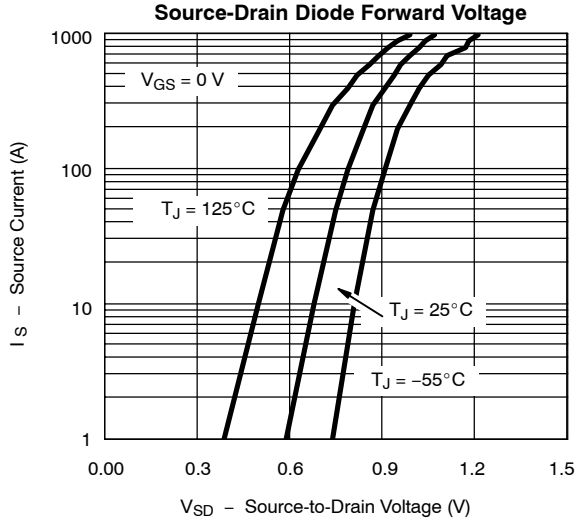
Gate Charge



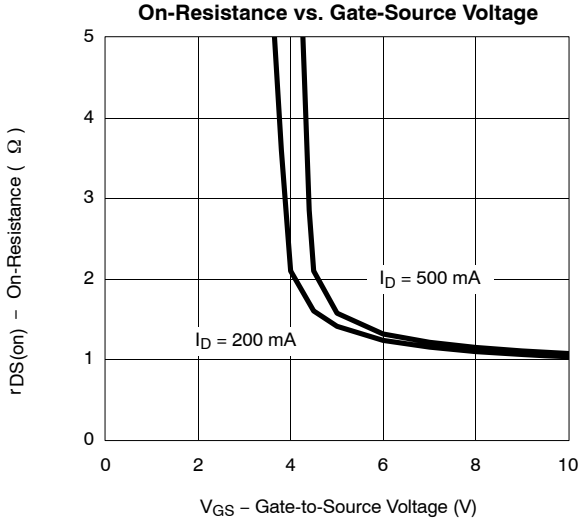
On-Resistance vs. Junction Temperature



Source-Drain Diode Forward Voltage

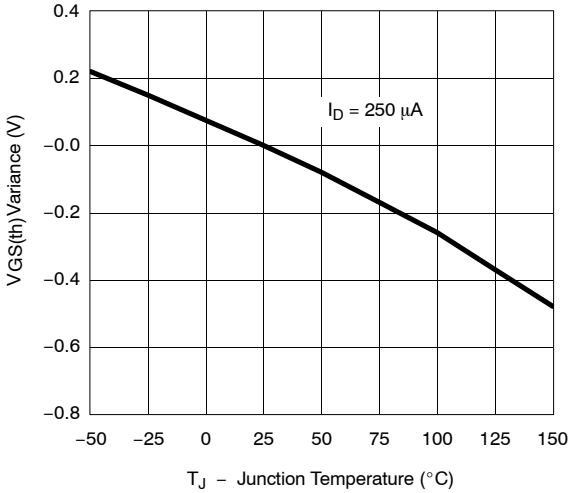


On-Resistance vs. Gate-Source Voltage

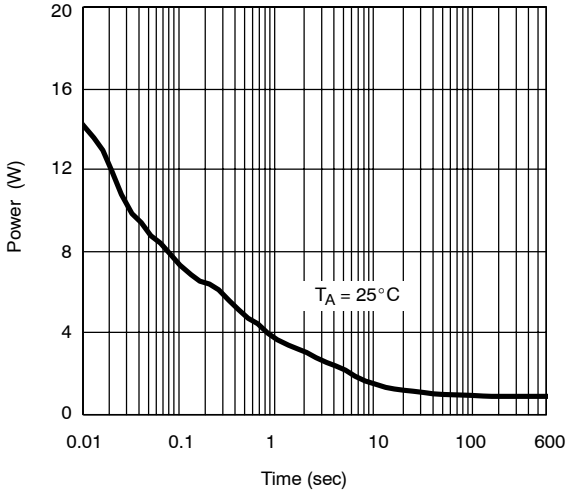


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

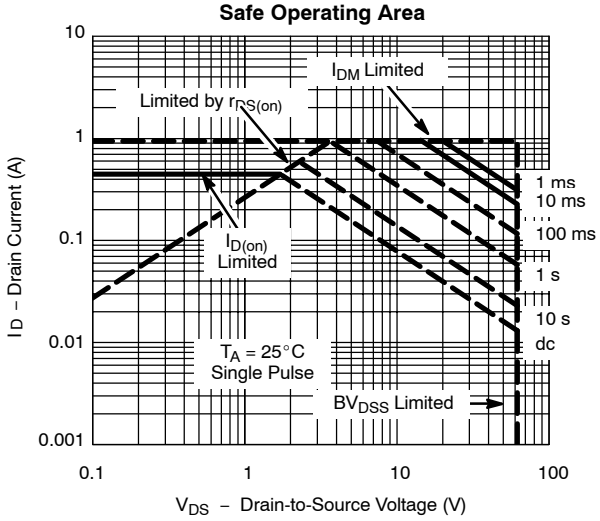
Threshold Voltage Variance Over Temperature



Single Pulse Power, Junction-to-Ambient



Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Ambient

