



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

## PRODUCT SUMMARY

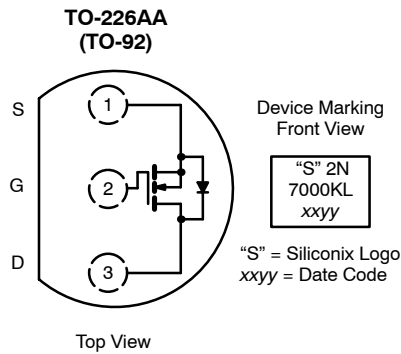
$V_{DS}$ (V)	$r_{DS(on)}$ ( $\Omega$ )	$V_{GS(th)}$ (V)	$I_D$ (A)
60	2 @ $V_{GS} = 10$ V	1.0 to 2.5	0.47
	4 @ $V_{GS} = 4.5$ V		0.33

## FEATURES

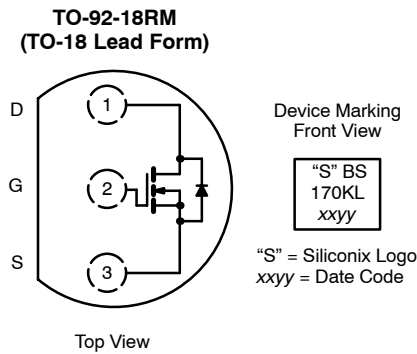
- TrenchFET® Power MOSFET
- ESD Protected: 2000 V

## APPLICATIONS

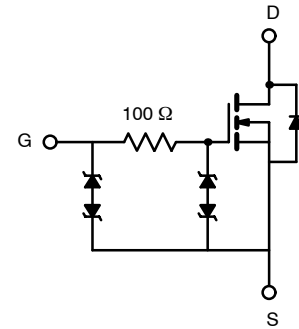
- Direct Logic-Level Interface: TTL/CMOS
- Solid State Relays
- Drivers: Relays, Solenoids, Lamps, Hammers, Displays, Memories, Transistors, etc.
- Battery Operated Systems



Ordering Information: 2N7000KL-TR1



Ordering Information: BS170KL-TR1

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 ( $T_J = 150^\circ\text{C}$ )	$I_D$	0.47	A
		0.37	
Pulsed Drain Current <sup>a</sup>	$I_{DM}$	1.0	
Power Dissipation	$P_D$	0.8	W
		0.51	
Maximum Junction-to-Ambient	$R_{thJA}$	156	$^\circ\text{C/W}$
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.

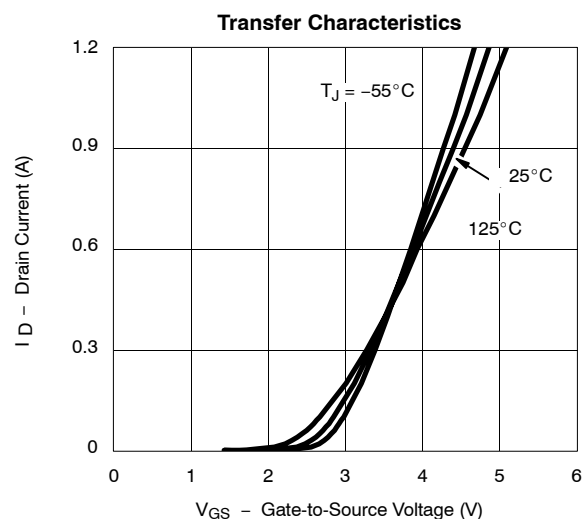
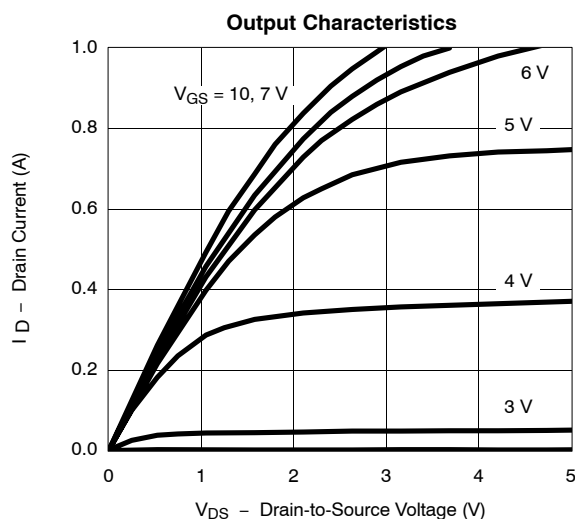
**SPECIFICATIONS<sup>a</sup> ( $T_A = 25^\circ\text{C}$  UNLESS OTHERWISE NOTED)**

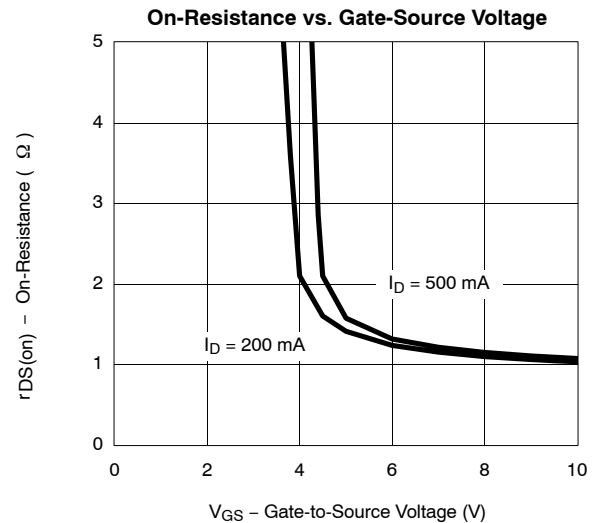
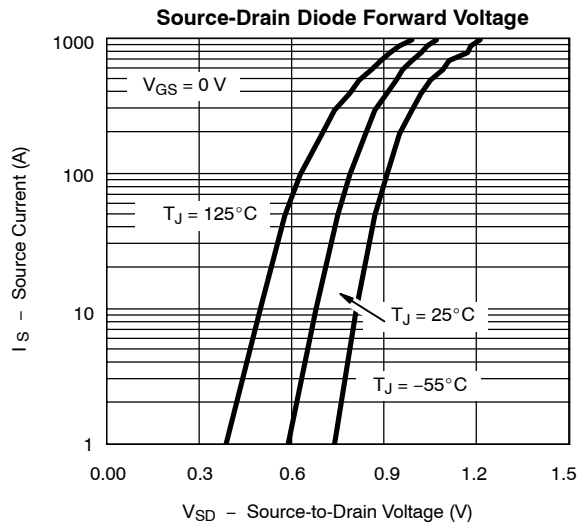
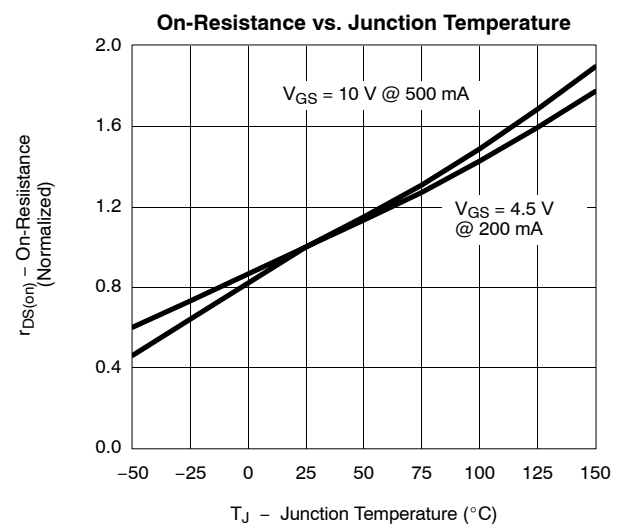
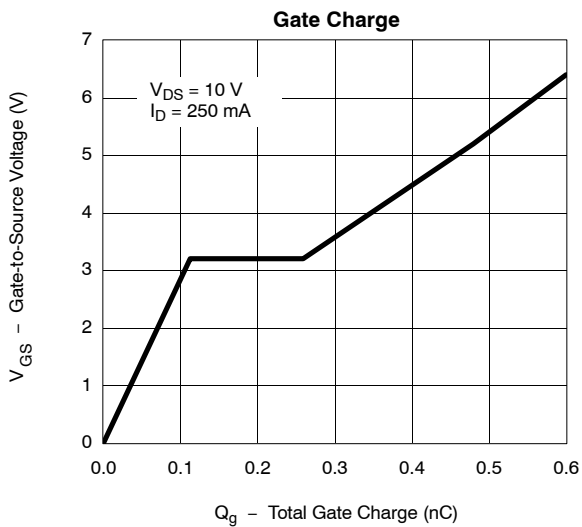
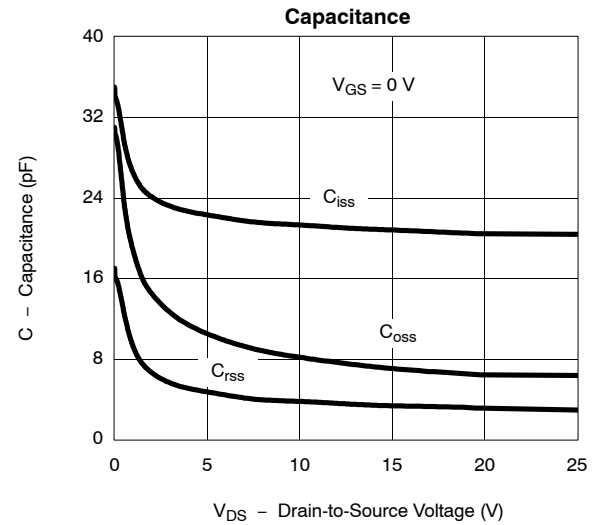
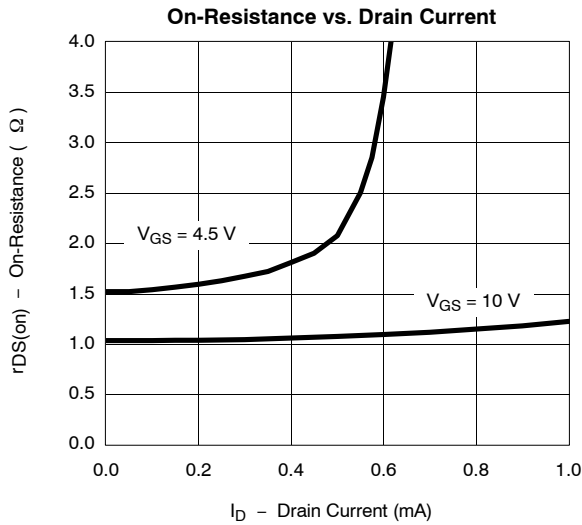
Parameter	Symbol	Test Conditions	Limits			Unit
			Min	Typ	Max	
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 10\text{ }\mu\text{A}$	60			V
Gate-Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1	2.0	2.5	
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 10\text{ V}$			$\pm 1$	$\mu\text{A}$
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
		$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}, T_J = 55^\circ\text{C}$			10	
On-State Drain Current <sup>b</sup>	$I_{D(on)}$	$V_{GS} = 10\text{ V}, V_{DS} = 7.5\text{ V}$	0.8			A
		$V_{GS} = 4.5\text{ V}, V_{DS} = 10\text{ V}$	0.5			
Drain-Source On-Resistance <sup>b</sup>	$r_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 0.5\text{ A}$		1.1	2	$\Omega$
		$V_{GS} = 4.5\text{ V}, I_D = 0.2\text{ A}$		1.6	4	
Forward Transconductance <sup>b</sup>	$g_{fs}$	$V_{DS} = 10\text{ V}, I_D = 0.5\text{ A}$		550		mS
Diode Forward Voltage	$V_{SD}$	$I_S = 0.3\text{ A}, V_{GS} = 0\text{ V}$		0.87	1.3	V
Dynamic <sup>b</sup>						
Total Gate Charge	$Q_g$	$V_{DS} = 10\text{ V}, V_{GS} = 4.5\text{ V}$ $I_D \equiv 0.25\text{ A}$		0.4	0.6	nC
Gate-Source Charge	$Q_{gs}$			0.11		
Gate-Drain Charge	$Q_{gd}$			0.15		
Gate Resistance	$R_g$			173		$\Omega$
Turn-On Time	$t_{d(on)}$	$V_{DD} = 30\text{ V}, R_L = 150\text{ }\Omega$ $I_D \equiv 0.2\text{ A}, V_{GEN} = 10\text{ V}$ $R_g = 10\text{ }\Omega$		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:  $PW \leq 300\text{ }\mu\text{s}$  duty cycle  $\leq 2\%$ .

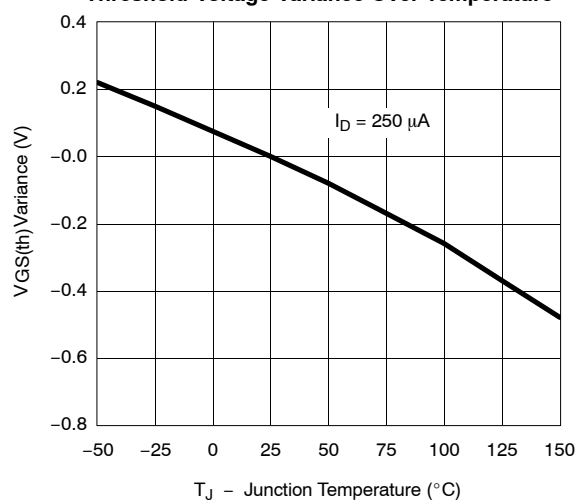
b. Guaranteed by design, not subject to production testing.

**TYPICAL CHARACTERISTICS ( $25^\circ\text{C}$  UNLESS NOTED)**

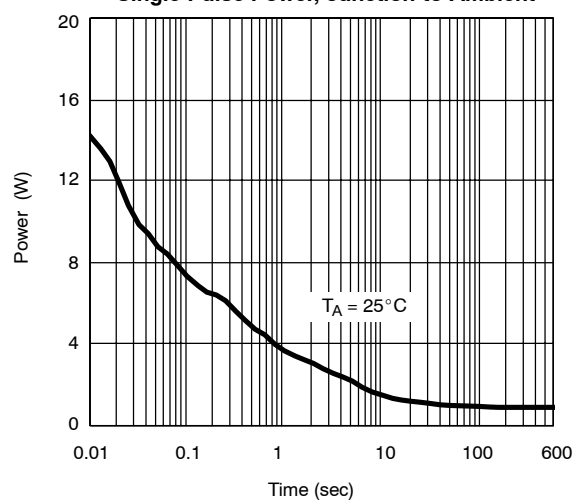
**TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)**

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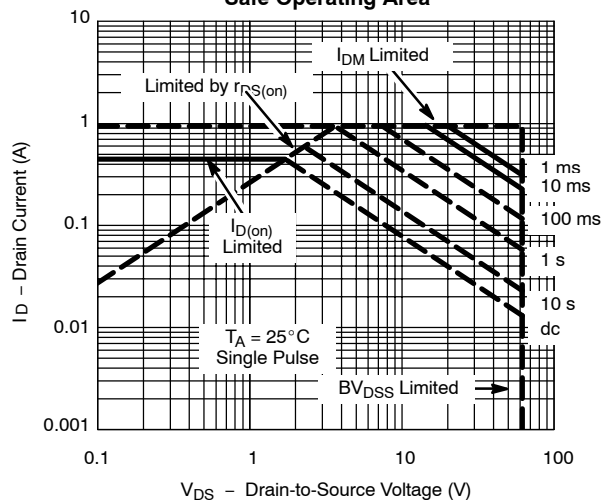
Threshold Voltage Variance Over Temperature



Single Pulse Power, Junction-to-Ambient



Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Ambient

