

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

### PRODUCT SUMMARY

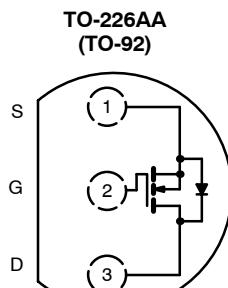
$V_{DS}$ (V)	$r_{DS(on)}$ ( $\Omega$ )	$V_{GS(th)}$ (V)	$I_D$ (A)
60	2 @ $V_{GS} = 10$ V	1.0 to 2.5	0.47
	4 @ $V_{GS} = 4.5$ V		0.33

### FEATURES

- TrenchFET® Power MOSFET
- ESD Protected: 2000 V

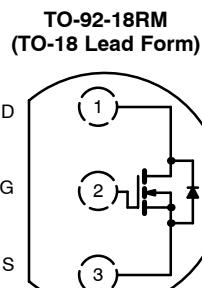
### APPLICATIONS

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



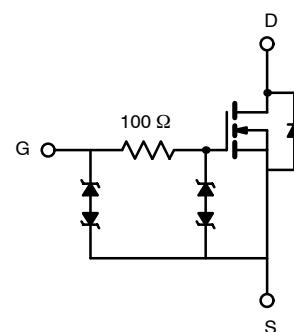
Top View

Device Marking Front View  
"S" 2N 7000KL  
xxyy  
"S" = Siliconix Logo  
xxyy = Date Code



Top View

Device Marking Front View  
"S" BS 170KL  
xxyy  
"S" = Siliconix Logo  
xxyy = Date Code



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	$^\circ\text{C}/\text{W}$
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	-55 to 150	$^\circ\text{C}$

Notes

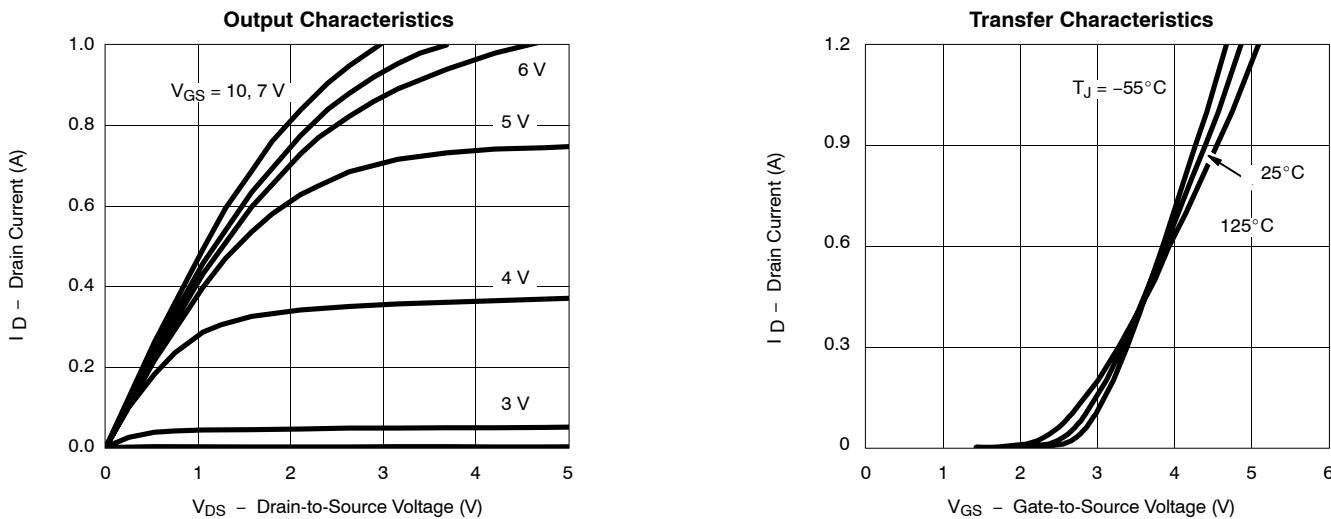
a. Pulse width limited by maximum junction temperature.

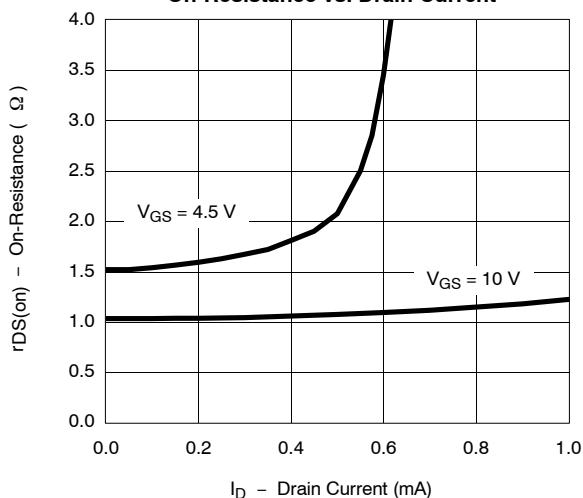
**SPECIFICATIONS<sup>a</sup> ( $T_A = 25^\circ C$  UNLESS OTHERWISE NOTED)**

Parameter	Symbol	Test Conditions	Limits			Unit
			Min	Typ	Max	
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0 V, I_D = 10 \mu A$	60			V
Gate-Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250 \mu A$	1	2.0	2.5	
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0 V, V_{GS} = \pm 10 V$			$\pm 1$	$\mu A$
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 60 V, V_{GS} = 0 V$			1	$\mu A$
		$V_{DS} = 60 V, V_{GS} = 0 V, T_J = 55^\circ C$			10	
On-State Drain Current <sup>b</sup>	$I_{D(on)}$	$V_{GS} = 10 V, V_{DS} = 7.5 V$	0.8			A
		$V_{GS} = 4.5 V, V_{DS} = 10 V$	0.5			
Drain-Source On-Resistance <sup>b</sup>	$r_{DS(on)}$	$V_{GS} = 10 V, I_D = 0.5 A$		1.1	2	$\Omega$
		$V_{GS} = 4.5 V, I_D = 0.2 A$		1.6	4	
Forward Transconductance <sup>b</sup>	$g_{fs}$	$V_{DS} = 10 V, I_D = 0.5 A$		550		mS
Diode Forward Voltage	$V_{SD}$	$I_S = 0.3 A, V_{GS} = 0 V$		0.87	1.3	V
<b>Dynamic<sup>b</sup></b>						
Total Gate Charge	$Q_g$	$V_{DS} = 10 V, V_{GS} = 4.5 V$ $I_D \approx 0.25 A$		0.4	0.6	nC
Gate-Source Charge	$Q_{gs}$			0.11		
Gate-Drain Charge	$Q_{gd}$			0.15		
Gate Resistance	$R_g$			173		$\Omega$
Turn-On Time	$t_{d(on)}$	$V_{DD} = 30 V, R_L = 150 \Omega$ $I_D \approx 0.2 A, V_{GEN} = 10 V$ $R_g = 10 \Omega$		3.8	10	ns
	$t_r$			4.8	15	
Turn-Off Time	$t_{d(off)}$			12.8	20	
	$t_f$			9.6	15	

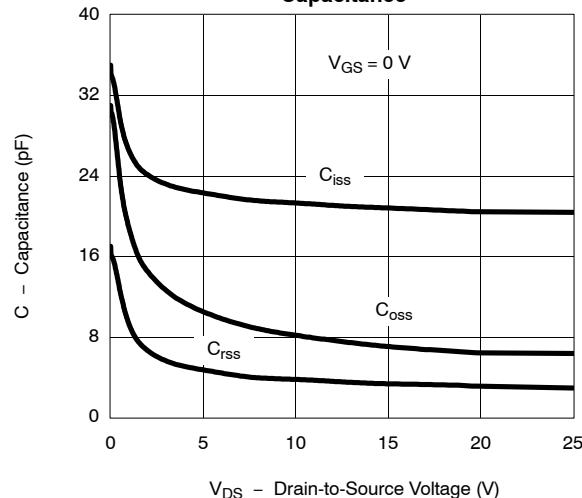
## Notes

- a. Pulse test: PW  $\leq 300 \mu s$  duty cycle  $\leq 2\%$ .  
 b. Guaranteed by design, not subject to production testing.

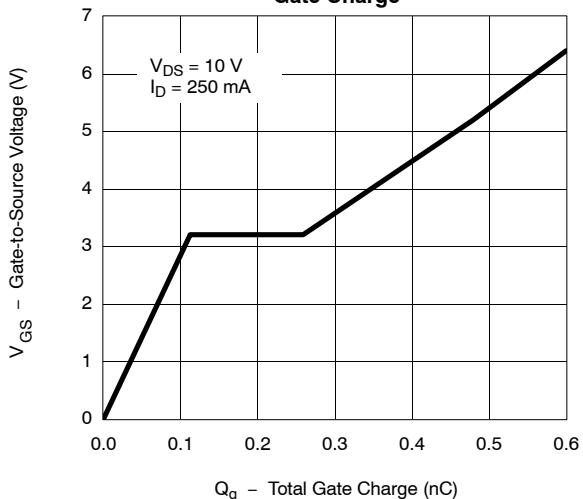
**TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)**

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**On-Resistance vs. Drain Current**


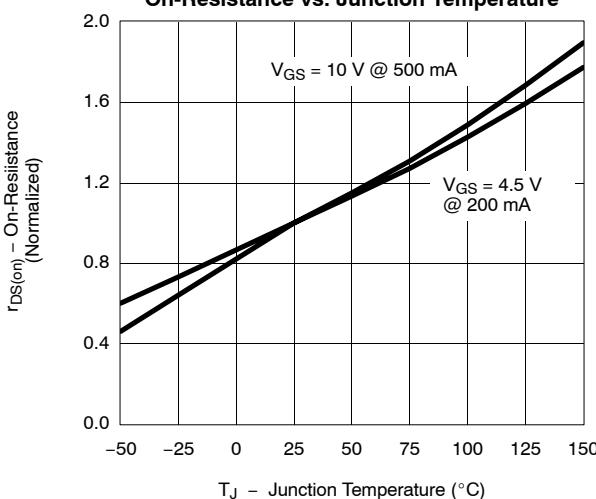
ID – Drain Current (mA)

**Capacitance**


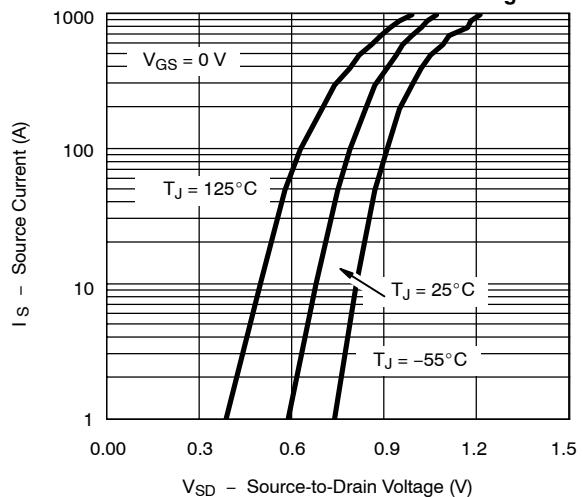
VDS – Drain-to-Source Voltage (V)

**Gate Charge**


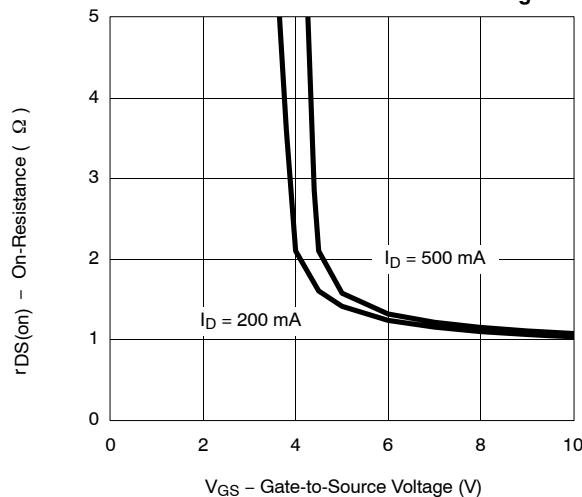
Qg – Total Gate Charge (nC)

**On-Resistance vs. Junction Temperature**


TJ – Junction Temperature (°C)

**Source-Drain Diode Forward Voltage**


VSD – Source-to-Drain Voltage (V)

**On-Resistance vs. Gate-Source Voltage**


VGS – Gate-to-Source Voltage (V)

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