



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

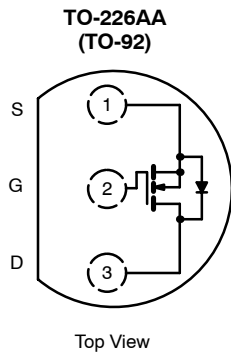
PRODUCT SUMMARY			
V <sub>DS</sub> (V)	r <sub>DS(on)</sub> (Ω)	V <sub>GS(th)</sub> (V)	I <sub>D</sub> (A)
60	2 @ V <sub>GS</sub> = 10 V	1.0 to 2.5	0.47
	4 @ V <sub>GS</sub> = 4.5 V		0.33

## FEATURES

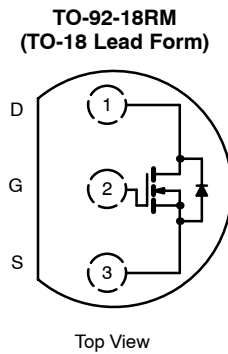
- TrenchFET® Power MOSFET
- ESD Protected: 2000 V

## APPLICATIONS

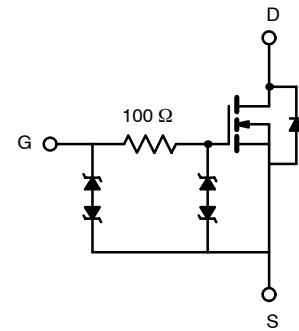
- Direct Logic-Level Interface: TTL/CMOS
- Solid State Relays
- Drivers: Relays, Solenoids, Lamps, Hammers, Displays, Memories, Transistors, etc.
- Battery Operated Systems



Ordering Information: 2N7000KL-TR1



Ordering Information: BS170KL-TR1



ABSOLUTE MAXIMUM RATINGS (T <sub>A</sub> = 25 °C UNLESS OTHERWISE NOTED)			
Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V <sub>DS</sub>	60	V
Gate-Source Voltage	V <sub>GS</sub>	± 20	
Continuous Drain Current (T <sub>J</sub> = 150 °C)	I <sub>D</sub>	T <sub>A</sub> = 25 °C	0.47
		T <sub>A</sub> = 70 °C	0.37
Pulsed Drain Current <sup>a</sup>	I <sub>DM</sub>	1.0	A
Power Dissipation	P <sub>D</sub>	T <sub>A</sub> = 25 °C	0.8
		T <sub>A</sub> = 70 °C	0.51
Maximum Junction-to-Ambient	R <sub>thJA</sub>	156	°C/W
Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	-55 to 150	°C

Notes

a. Pulse width limited by maximum junction temperature.

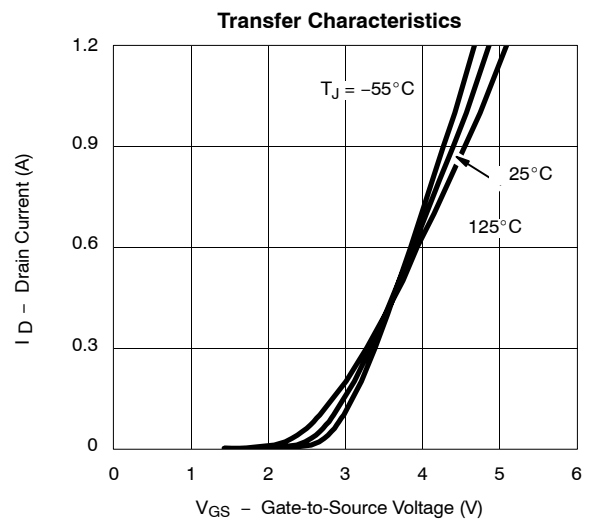
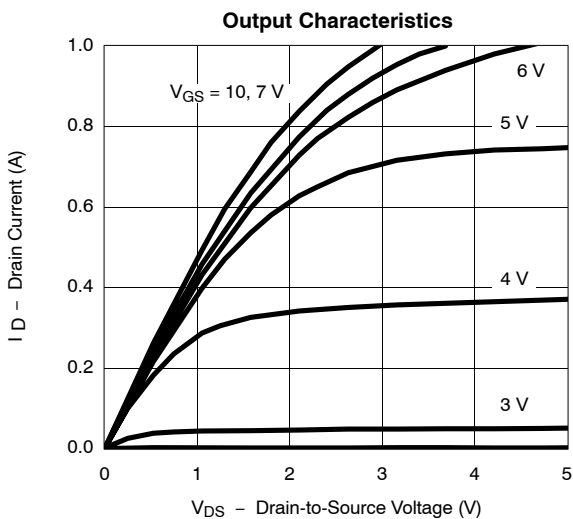
**SPECIFICATIONS<sup>a</sup> (T<sub>A</sub> = 25 °C UNLESS OTHERWISE NOTED)**

Parameter	Symbol	Test Conditions	Limits			Unit
			Min	Typ	Max	
<b>Static</b>						
Drain-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 10 μA	60			V
Gate-Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	1	2.0	2.5	
Gate-Body Leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±10 V			±1	μA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 60 V, V <sub>GS</sub> = 0 V			1	μA
		V <sub>DS</sub> = 60 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 55 °C			10	
On-State Drain Current <sup>b</sup>	I <sub>D(on)</sub>	V <sub>GS</sub> = 10 V, V <sub>DS</sub> = 7.5 V	0.8			A
		V <sub>GS</sub> = 4.5 V, V <sub>DS</sub> = 10 V	0.5			
Drain-Source On-Resistance <sup>b</sup>	r <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 0.5 A		1.1	2	Ω
		V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 0.2 A		1.6	4	
Forward Transconductance <sup>b</sup>	g <sub>fs</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 0.5 A		550		mS
Diode Forward Voltage	V <sub>SD</sub>	I <sub>S</sub> = 0.3 A, V <sub>GS</sub> = 0 V		0.87	1.3	V
<b>Dynamic<sup>b</sup></b>						
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 4.5 V I <sub>D</sub> ≅ 0.25 A		0.4	0.6	nC
Gate-Source Charge	Q <sub>gs</sub>			0.11		
Gate-Drain Charge	Q <sub>gd</sub>			0.15		
Gate Resistance	R <sub>g</sub>		173			Ω
Turn-On Time	t <sub>d(on)</sub>	V <sub>DD</sub> = 30 V, R <sub>L</sub> = 150 Ω I <sub>D</sub> ≅ 0.2 A, V <sub>GEN</sub> = 10 V R <sub>g</sub> = 10 Ω		3.8	10	ns
	t <sub>r</sub>			4.8	15	
Turn-Off Time	t <sub>d(off)</sub>			12.8	20	
	t <sub>f</sub>			9.6	15	

Notes

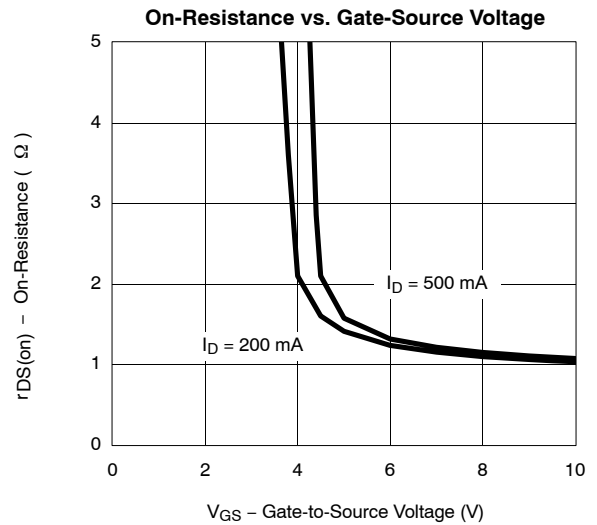
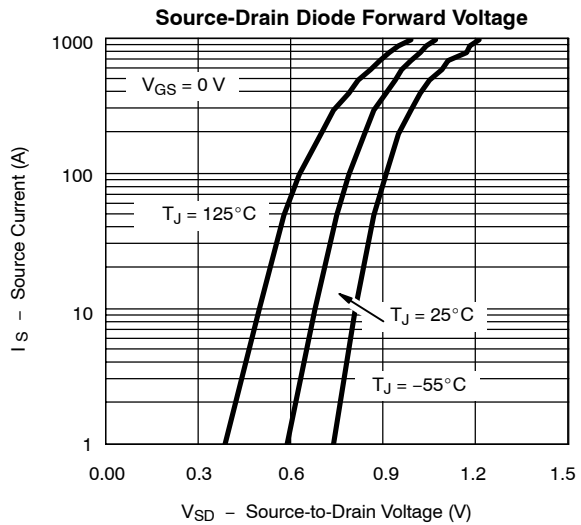
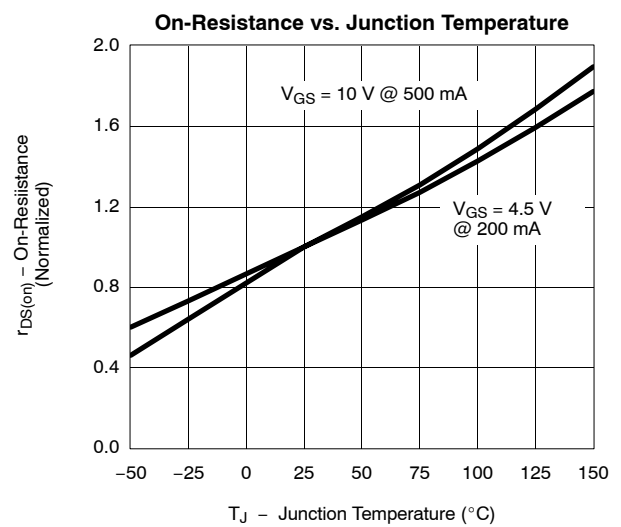
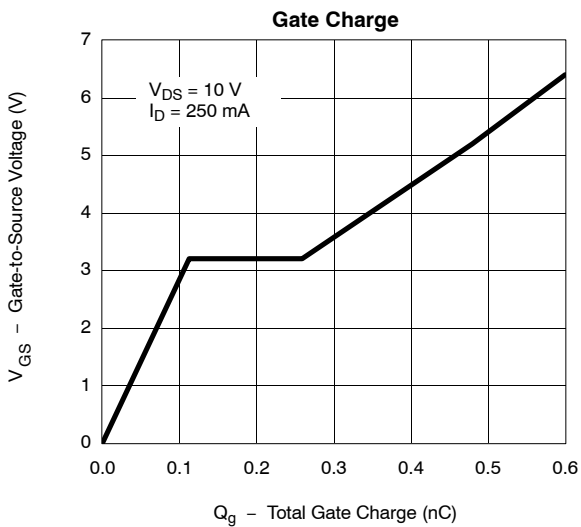
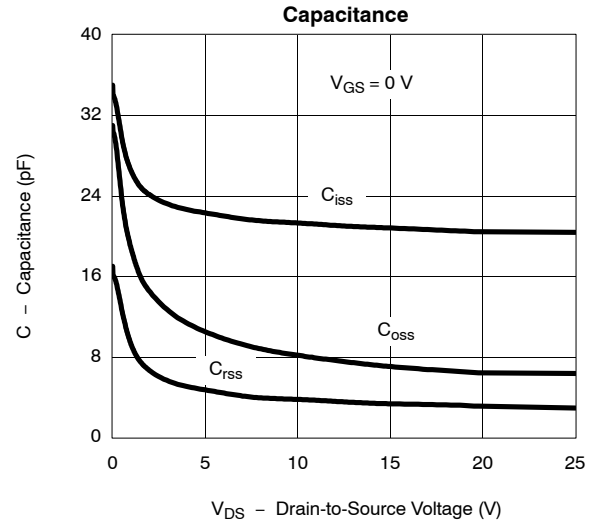
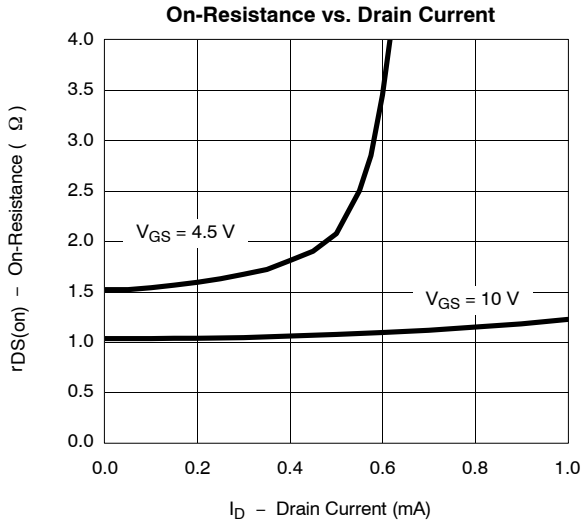
- a. Pulse test: PW ≤ 300 μs duty cycle ≤ 2%.
- b. Guaranteed by design, not subject to production testing.

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



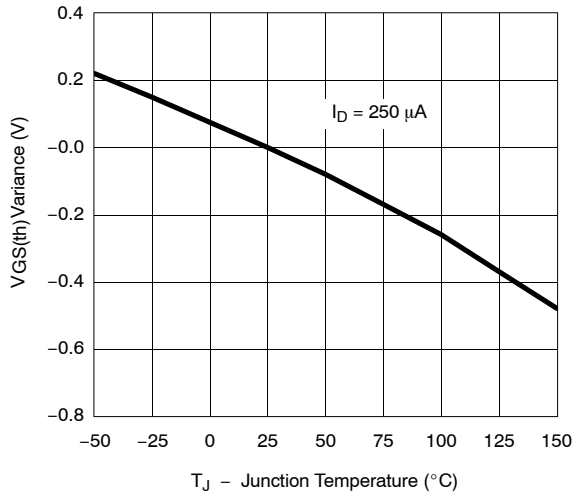


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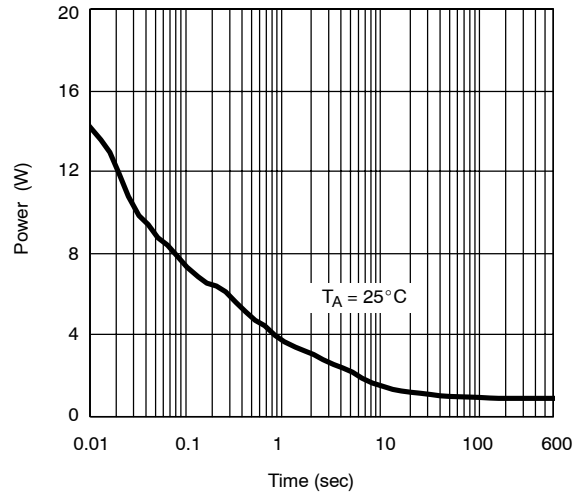


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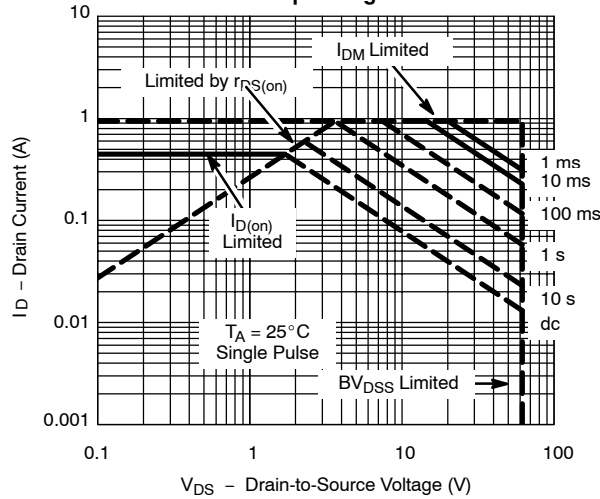
Threshold Voltage Variance Over Temperature



Single Pulse Power, Junction-to-Ambient



Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Ambient

