



# N-Channel 20-V (D-S) MOSFET

## TrenchFET®

MOSFETs

### 1.5-V Rated



### ESD Protected 2000 V

PRODUCT SUMMARY		
V <sub>DS</sub> (V)	r <sub>DS(on)</sub> (Ω)	I <sub>D</sub> (mA)
20	5 @ V <sub>GS</sub> = 4.5 V	200
	7 @ V <sub>GS</sub> = 2.5 V	175
	9 @ V <sub>GS</sub> = 1.8 V	150
	10 @ V <sub>GS</sub> = 1.5 V	50

### FEATURES

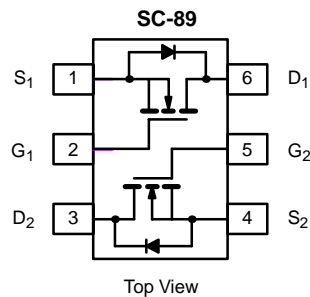
- Low-Side Switching
- Low On-Resistance: 5 Ω
- Low Threshold: 0.9 V (typ)
- Fast Switching Speed: 35 ns (typ)
- 1.5-V Operation
- Gate-Source ESD Protection

### BENEFITS

- Ease in Driving Switches
- Low Offset (Error) Voltage
- Low-Voltage Operation
- High-Speed Circuits
- Low Battery Voltage Operation

### APPLICATIONS

- Drivers: Relays, Solenoids, Lamps, Hammers, Displays, Memories
- Battery Operated Systems
- Power Supply Converter Circuits
- Load/Power Switching Cell Phones, Pagers



Marking Code: L

ABSOLUTE MAXIMUM RATINGS (T <sub>A</sub> = 25 °C UNLESS OTHERWISE NOTED)					
Parameter	Symbol	5 secs	Steady State	Unit	
Drain-Source Voltage	V <sub>DS</sub>	20		V	
Gate-Source Voltage	V <sub>GS</sub>	±5			
Continuous Drain Current (T <sub>J</sub> = 150 °C) <sup>a</sup>	I <sub>D</sub>	T <sub>A</sub> = 25 °C	190	180	mA
		T <sub>A</sub> = 85 °C	140	130	
Pulsed Drain Current <sup>b</sup>	I <sub>DM</sub>	650			
Continuous Source Current (diode conduction)	I <sub>S</sub>	450	380		
Maximum Power Dissipation <sup>a</sup>	P <sub>D</sub>	T <sub>A</sub> = 25 °C	280	250	mW
		T <sub>A</sub> = 85 °C	145	130	
Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	-55 to 150		°C	
Gate-Source ESD Rating (HBM, Method 3015)	ESD	2000		V	

Notes

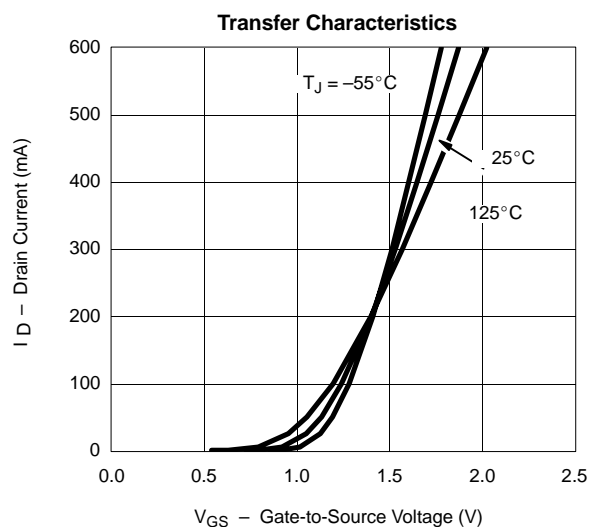
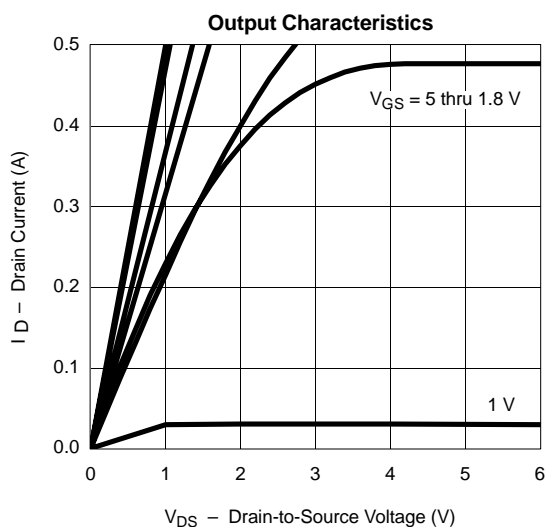
- a. Surface Mounted on FR4 Board.
- b. Pulse width limited by maximum junction temperature.

**SPECIFICATIONS ( $T_A = 25^\circ\text{C}$  UNLESS OTHERWISE NOTED)**

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
<b>Static</b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	0.40		1.2	V
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\ \text{V}, V_{GS} = \pm 2.8\ \text{V}$		$\pm 0.5$	$\pm 1.0$	$\mu\text{A}$
		$V_{DS} = 0\ \text{V}, V_{GS} = \pm 4.5\ \text{V}$		$\pm 1.0$	$\pm 3.0$	
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 16\ \text{V}, V_{GS} = 0\ \text{V}$		1	500	nA
		$V_{DS} = 16\ \text{V}, V_{GS} = 0\ \text{V}, T_J = 85^\circ\text{C}$			10	$\mu\text{A}$
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} = 5\ \text{V}, V_{GS} = 4.5\ \text{V}$	250			mA
Drain-Source On-State Resistance <sup>a</sup>	$r_{DS(on)}$	$V_{GS} = 4.5\ \text{V}, I_D = 200\ \text{mA}$			5	$\Omega$
		$V_{GS} = 2.5\ \text{V}, I_D = 175\ \text{mA}$			7	
		$V_{GS} = 1.8\ \text{V}, I_D = 150\ \text{mA}$			9	
		$V_{DS} = 1.5\ \text{V}, I_D = 40\ \text{mA}$			10	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 10\ \text{V}, I_D = 200\ \text{mA}$		0.5		S
Diode Forward Voltage <sup>a</sup>	$V_{SD}$	$I_S = 150\ \text{mA}, V_{GS} = 0\ \text{V}$			1.2	V
<b>Dynamic<sup>b</sup></b>						
Total Gate Charge	$Q_g$	$V_{DS} = 10\ \text{V}, V_{GS} = 4.5\ \text{V}, I_D = 150\ \text{mA}$		750		$\text{pC}$
Gate-Source Charge	$Q_{gs}$			75		
Gate-Drain Charge	$Q_{gd}$			225		
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 10\ \text{V}, R_L = 47\ \Omega$ $I_D \cong 200\ \text{mA}, V_{GEN} = 4.5\ \text{V}, R_G = 10\ \Omega$			50	ns
Rise Time	$t_r$				25	
Turn-Off Delay Time	$t_{d(off)}$				50	
Fall Time	$t_f$				25	

## Notes

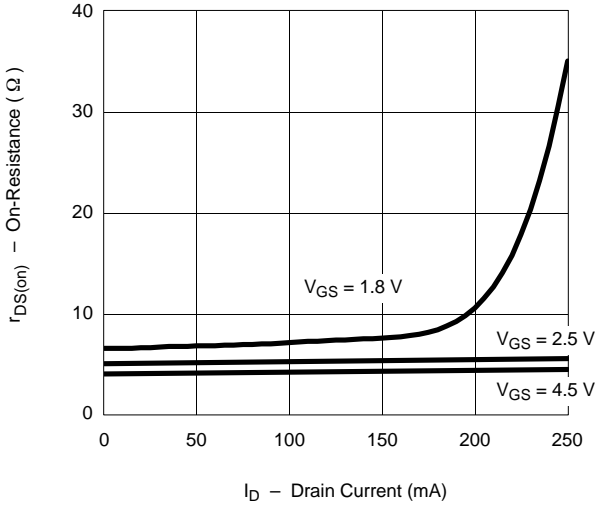
- a. Pulse test; pulse width  $\leq 300\ \mu\text{s}$ , duty cycle  $\leq 2\%$ .  
b. Guaranteed by design, not subject to production testing.

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

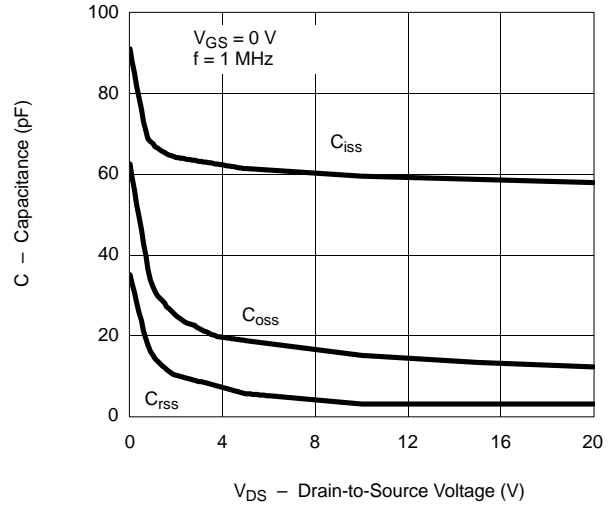


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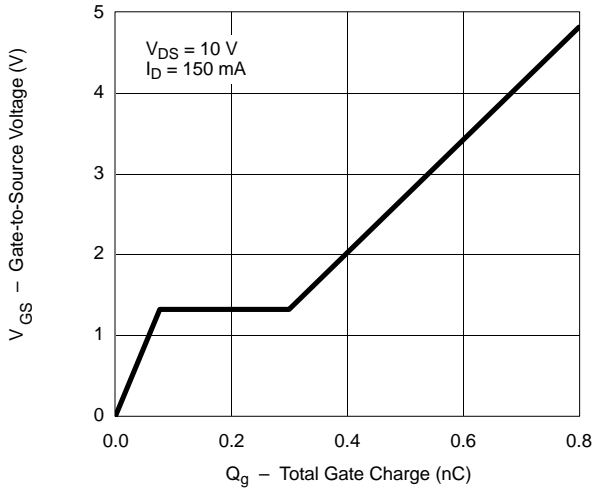
**On-Resistance vs. Drain Current**



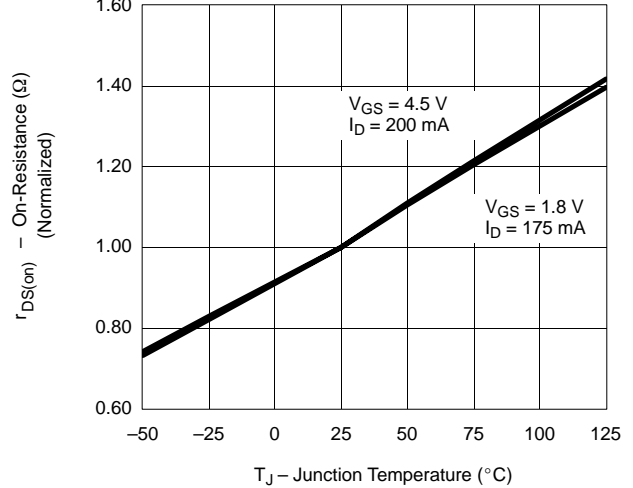
**Capacitance**



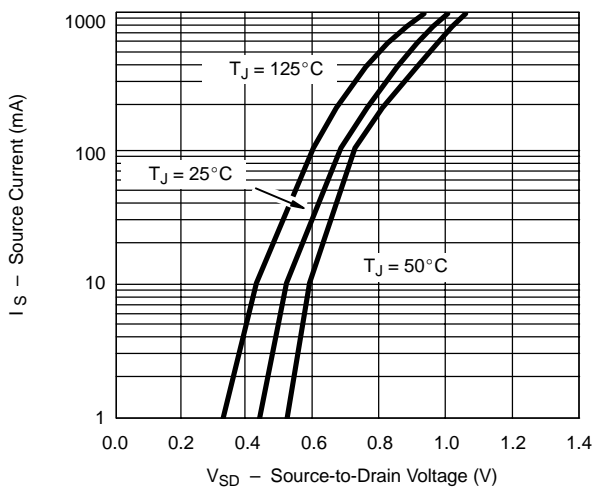
**Gate Charge**



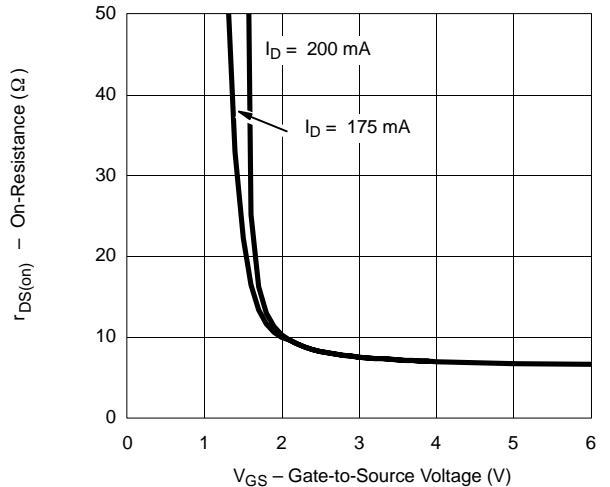
**On-Resistance vs. Junction Temperature**



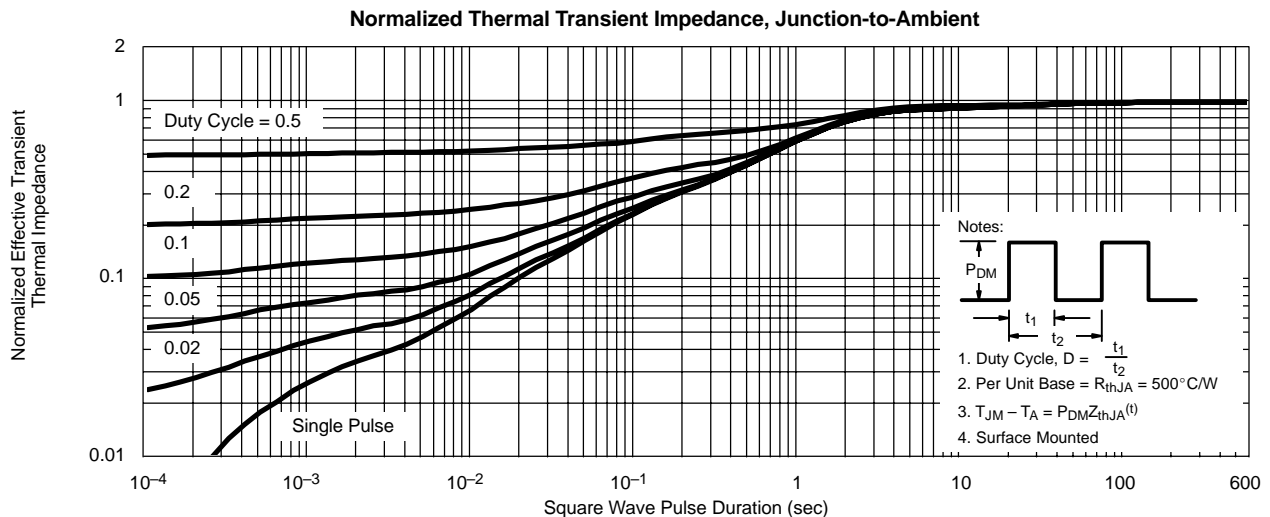
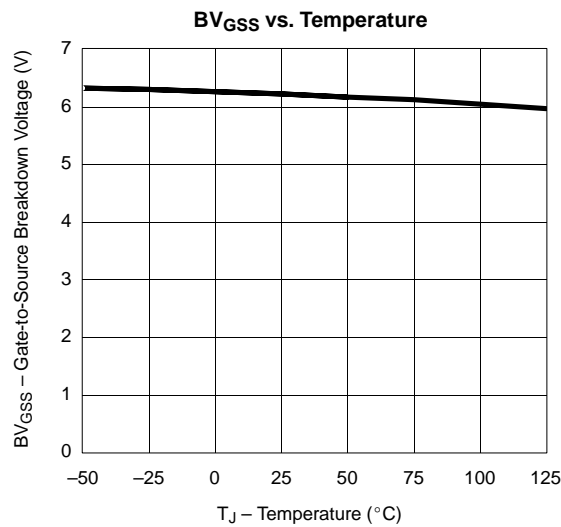
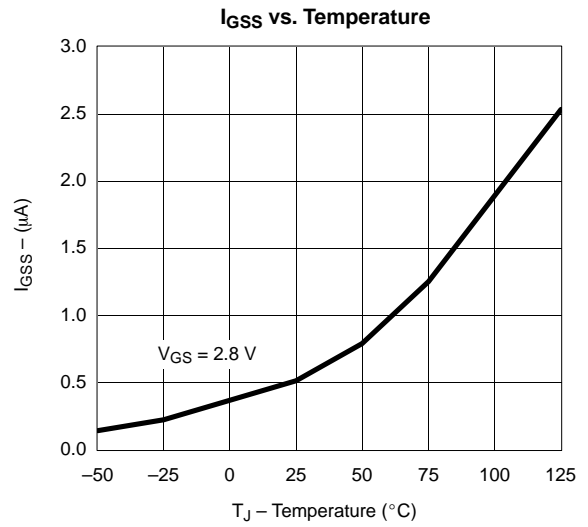
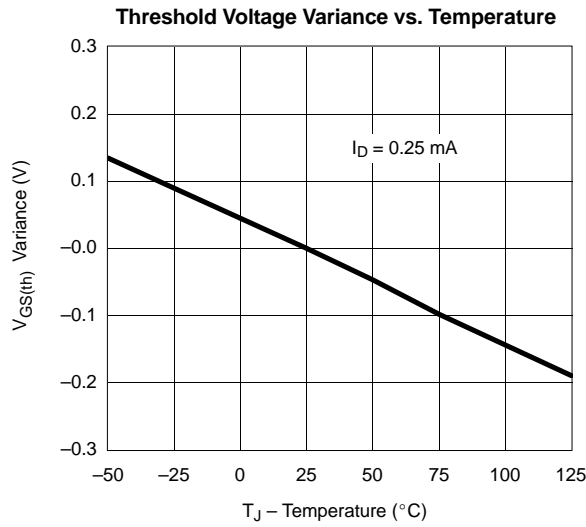
**Source-Drain Diode Forward Voltage**



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



**TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25°C UNLESS NOTED)**





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