



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

**TrenchFET<sup>®</sup>**  
MOSFETs



**ESD Protected  
2000 V**

PRODUCT SUMMARY			
$V_{(BR)DSS(min)}$ (V)	$r_{DS(on)}$ ( $\Omega$ )	$V_{GS(th)}$ (V)	$I_D$ (mA)
-60	4 @ $V_{GS} = -10$ V	-1 to -3.0	-190

## FEATURES

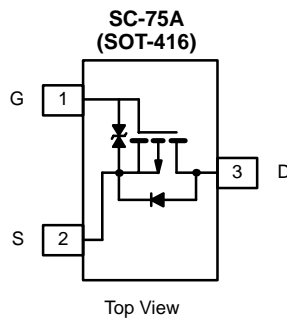
- High-Side Switching
- Low On-Resistance: 4  $\Omega$
- Low Threshold: -2 V (typ)
- Fast Switching Speed: 20 ns (typ)
- Low Input Capacitance: 20 pF (typ)
- Miniature Package
- Gate-Source ESD Protection

## BENEFITS

- Ease in Driving Switches
- Low Offset Voltage
- Low-Voltage Operation
- High-Speed Circuits
- Easily Driven Without Buffer
- Small Board Area

## APPLICATIONS

- Drivers: Relays, Solenoids, Lamps, Hammers, Displays, Memories, Transistors, etc.
- Battery Operated Systems
- Power Supply Converter Circuits
- Solid-State Relays



Marking Code: F

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 ( $T_J = 150^\circ\text{C}$ ) <sup>a</sup>	$I_D$	$T_A = 25^\circ\text{C}$	-190
		$T_A = 85^\circ\text{C}$	-135
Pulse Drain Current <sup>b</sup>	$I_{DM}$	-650	mA
Power Dissipation <sup>a</sup>	$P_D$	$T_A = 25^\circ\text{C}$	250
		$T_A = 85^\circ\text{C}$	130
Maximum Junction-to-Ambient <sup>a</sup>	$R_{thJA}$	500	$^\circ\text{C/W}$
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	-55 to 150	$^\circ\text{C}$

### Notes

- Surface mounted on FR4 board.
- Pulse width limited by maximum junction temperature.

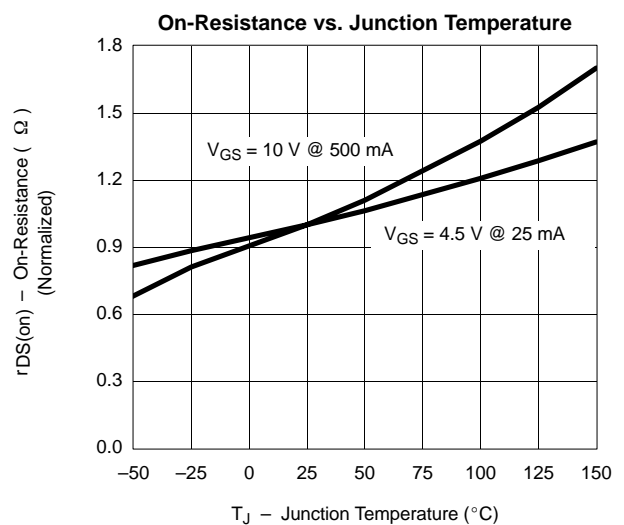
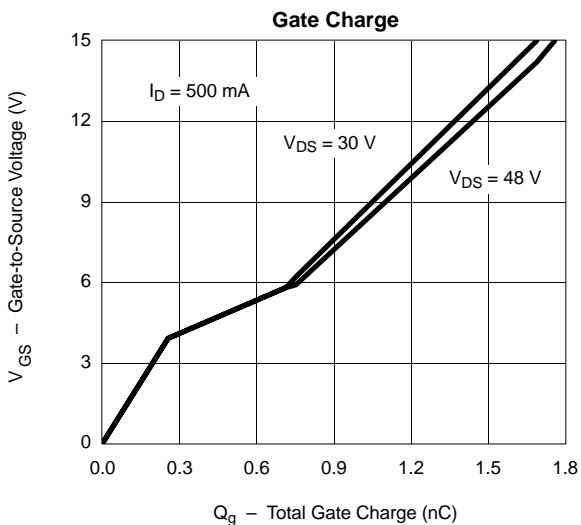
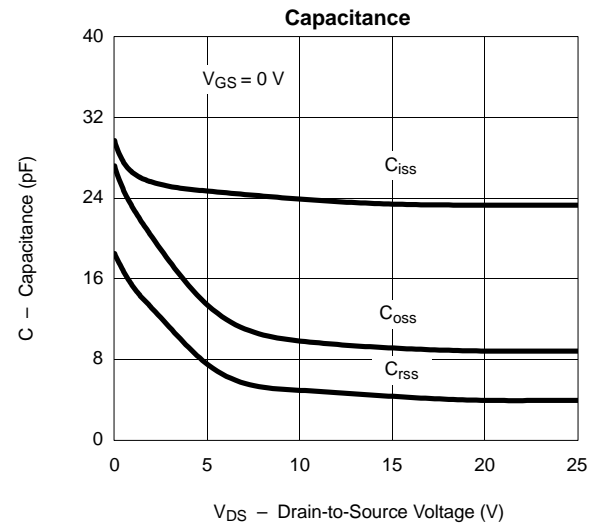
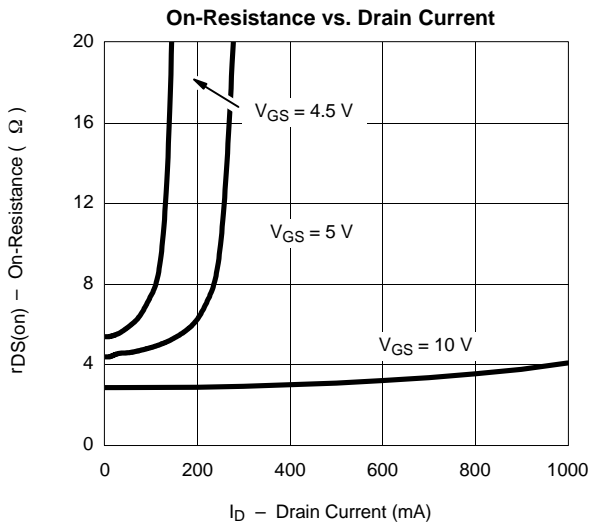
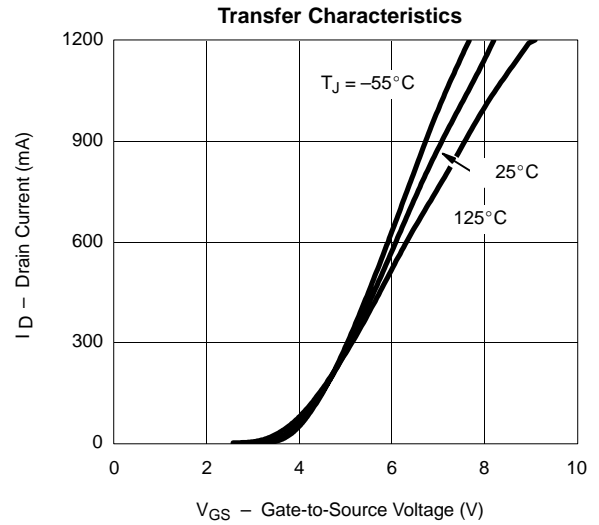
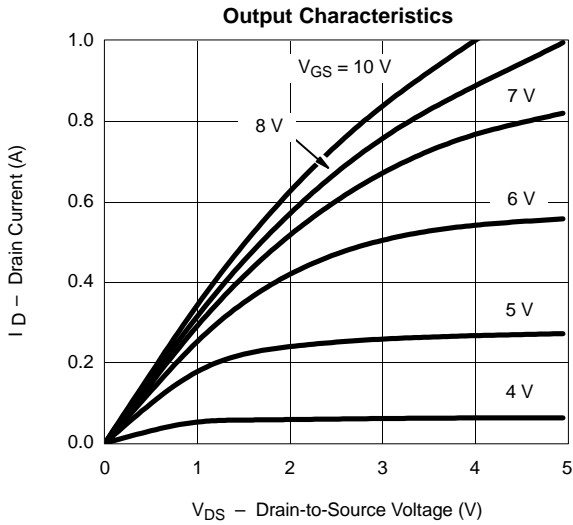
SPECIFICATIONS (T <sub>J</sub> = 25 °C UNLESS OTHERWISE NOTED)						
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = -10 μA	-60			V
Gate-Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -0.25 mA	-1		-3.0	
Gate-Body Leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±20 V			±10	μA
		V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±10 V			±200	
		V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±10 V, T <sub>J</sub> = 85 °C			±500	
		V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±5 V			±100	nA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = -50 V, V <sub>GS</sub> = 0 V			-25	
		V <sub>DS</sub> = -50 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 85 °C			-250	
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	V <sub>DS</sub> = -10 V, V <sub>GS</sub> = -4.5 V	-50			mA
		V <sub>DS</sub> = -10 V, V <sub>GS</sub> = -10 V	-600			
Drain-Source On-Resistance <sup>a</sup>	r <sub>DS(on)</sub>	V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -25 mA			8	Ω
		V <sub>GS</sub> = -10 V, I <sub>D</sub> = -500 mA			4	
		V <sub>GS</sub> = -10 V, I <sub>D</sub> = -500 mA, T <sub>J</sub> = 125 °C			6	
Forward Transconductance <sup>a</sup>	g <sub>fs</sub>	V <sub>DS</sub> = -10 V, I <sub>D</sub> = -100 mA	80			mS
Diode Forward Voltage <sup>a</sup>	V <sub>SD</sub>	I <sub>S</sub> = -200 mA, V <sub>GS</sub> = 0 V			-1.4	V
<b>Dynamic</b>						
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> = -30 V, V <sub>GS</sub> = -15 V, I <sub>D</sub> ≅ -500 mA		1.7		nC
Gate-Source Charge	Q <sub>gs</sub>			0.26		
Gate-Drain Charge	Q <sub>gd</sub>			0.46		
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = -25 V, V <sub>GS</sub> = 0 V, f = 1 MHz		23		pF
Output Capacitance	C <sub>oss</sub>			10		
Reverse Transfer Capacitance	C <sub>rss</sub>			5		
<b>Switching<sup>b</sup></b>						
Turn-On Time	t <sub>ON</sub>	V <sub>DD</sub> = -25 V, R <sub>L</sub> = 150 Ω I <sub>D</sub> ≅ -200 mA, V <sub>GEN</sub> = -10 V R <sub>G</sub> = 10 Ω		20		ns
Turn-Off Time	t <sub>OFF</sub>			35		

## Notes

- a. Pulse test: PW ≤ 300 ms duty cycle ≤ 2%.  
b. Switching time is essentially independent of operating temperature.



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





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