



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

TrenchFET®
MOSFETs**ESD Protected**
2000 V**PRODUCT SUMMARY**

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

FEATURES

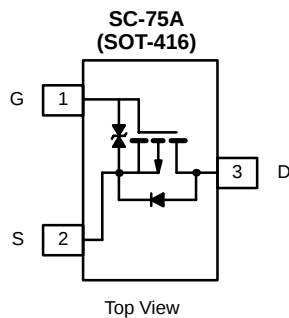
- High-Side Switching
- Low On-Resistance: 4 Ω
- Low Threshold: -2 V (typ)
- Fast Switching Speed: 20 ns (typ)
- Low Input Capacitance: 20 pF (typ)
- Miniature Package
- Gate-Source ESD Protection

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}	± 20	
Continuous Drain Current ($T_J = 150^\circ\text{C}$) ^a	$T_A = 25^\circ\text{C}$	I_D	-190	mA
	$T_A = 85^\circ\text{C}$		-135	
Pulse Drain Current ^b		I_{DM}	-650	
Power Dissipation ^a	$T_A = 25^\circ\text{C}$	P_D	250	mW
	$T_A = 85^\circ\text{C}$		130	
Maximum Junction-to-Ambient ^a		R_{thJA}	500	$^\circ\text{C/W}$
Operating Junction and Storage Temperature Range		T_J, T_{stg}	-55 to 150	$^\circ\text{C}$

Notes

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

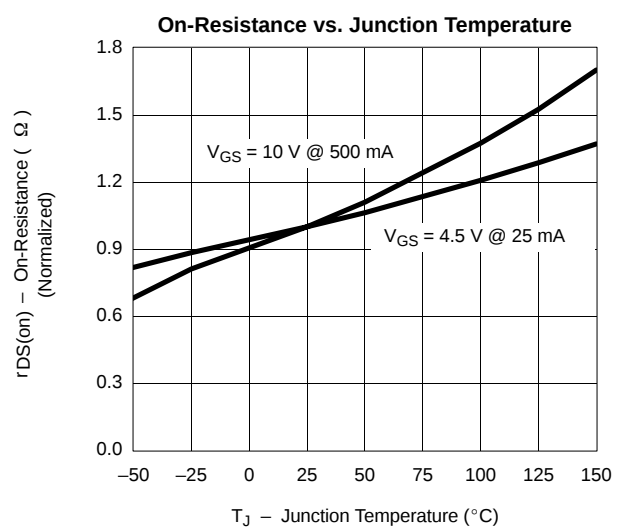
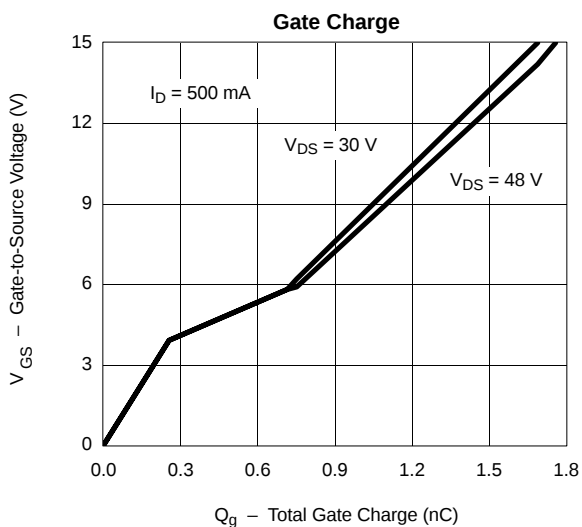
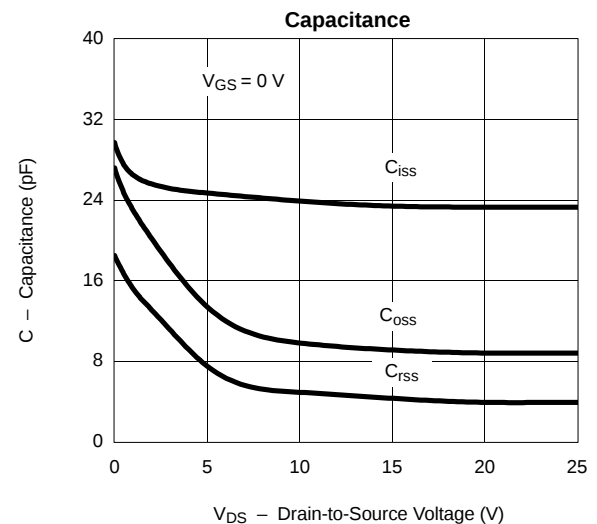
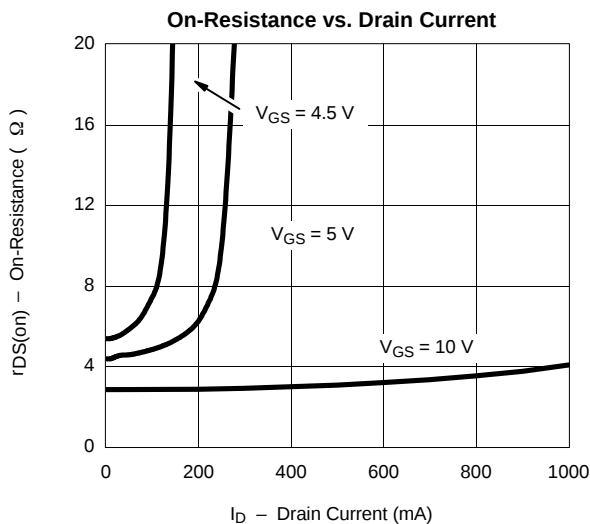
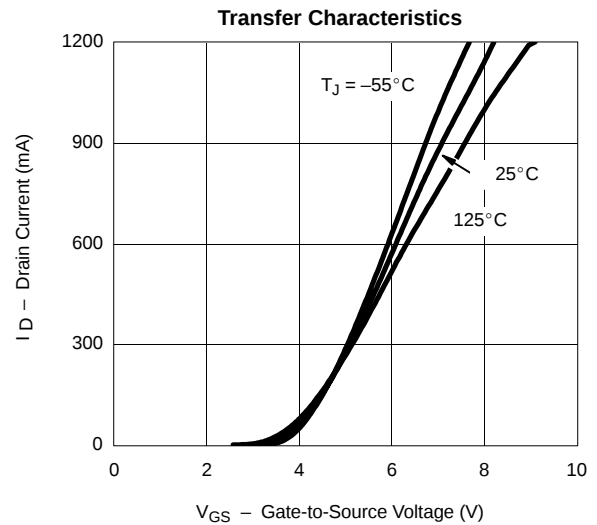
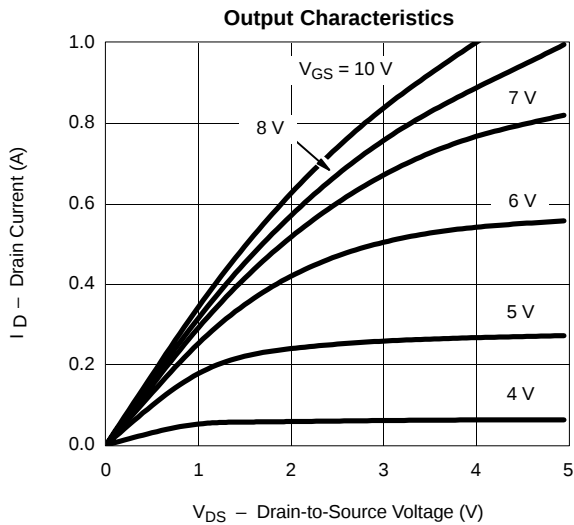
SPECIFICATIONS ($T_J = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -0.25\text{ mA}$	-1		-3.0	
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			± 10	μA
		$V_{DS} = 0\text{ V}, V_{GS} = \pm 10\text{ V}$			± 200	nA
		$V_{DS} = 0\text{ V}, V_{GS} = \pm 10\text{ V}, T_J = 85^\circ\text{C}$			± 500	
		$V_{DS} = 0\text{ V}, V_{GS} = \pm 5\text{ V}$			± 100	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -50\text{ V}, V_{GS} = 0\text{ V}$			-25	
		$V_{DS} = -50\text{ V}, V_{GS} = 0\text{ V}, T_J = 85^\circ\text{C}$			-250	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} = -10\text{ V}, V_{GS} = -4.5\text{ V}$	-50			mA
		$V_{DS} = -10\text{ V}, V_{GS} = -10\text{ V}$	-600			
Drain-Source On-Resistance ^a	$r_{DS(on)}$	$V_{GS} = -4.5\text{ V}, I_D = -25\text{ mA}$			8	Ω
		$V_{GS} = -10\text{ V}, I_D = -500\text{ mA}$			4	
		$V_{GS} = -10\text{ V}, I_D = -500\text{ mA}, T_J = 125^\circ\text{C}$			6	
Forward Transconductance ^a	g_{fs}	$V_{DS} = -10\text{ V}, I_D = -100\text{ mA}$	80			mS
Diode Forward Voltage ^a	V_{SD}	$I_S = -200\text{ mA}, V_{GS} = 0\text{ V}$			-1.4	V
Dynamic						
Total Gate Charge	Q_g	$V_{DS} = -30\text{ V}, V_{GS} = -15\text{ V}, I_D \cong -500\text{ mA}$		1.7		nC
Gate-Source Charge	Q_{gs}			0.26		
Gate-Drain Charge	Q_{gd}			0.46		
Input Capacitance	C_{iss}	$V_{DS} = -25\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		23		pF
Output Capacitance	C_{oss}			10		
Reverse Transfer Capacitance	C_{rss}			5		
Switching ^b						
Turn-On Time	t_{ON}	$V_{DD} = -25\text{ V}, R_L = 150\text{ }\Omega$ $I_D \cong -200\text{ mA}, V_{GEN} = -10\text{ V}$ $R_G = 10\text{ }\Omega$		20		ns
Turn-Off Time	t_{OFF}			35		

Notes

a. Pulse test: $PW \leq 300\text{ ms}$ duty cycle $\leq 2\%$.

b. Switching time is essentially independent of operating temperature.

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

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