



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

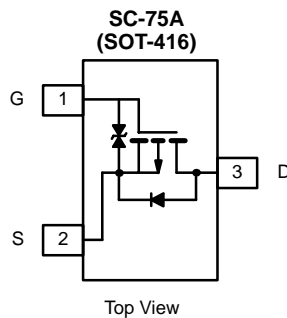
- High-Side Switching
- Low On-Resistance: 4 Ω
- Low Threshold: -2 V (typ)
- Fast Switching Speed: 20 ns (typ)
- Low Input Capacitance: 20 pF (typ)
- Miniature Package
- Gate-Source ESD Protection

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	I_D	$T_A = 25^\circ\text{C}$	-190
		$T_A = 85^\circ\text{C}$	-135
Pulse Drain Current ^b	I_{DM}	-650	mA
Power Dissipation ^a	P_D	$T_A = 25^\circ\text{C}$	
		$T_A = 85^\circ\text{C}$	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

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

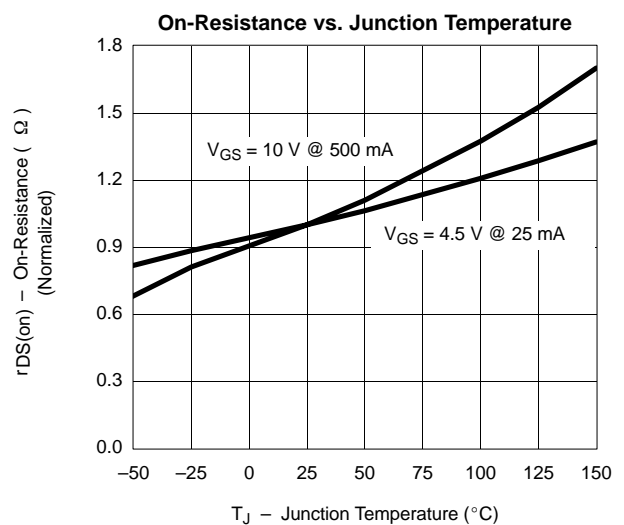
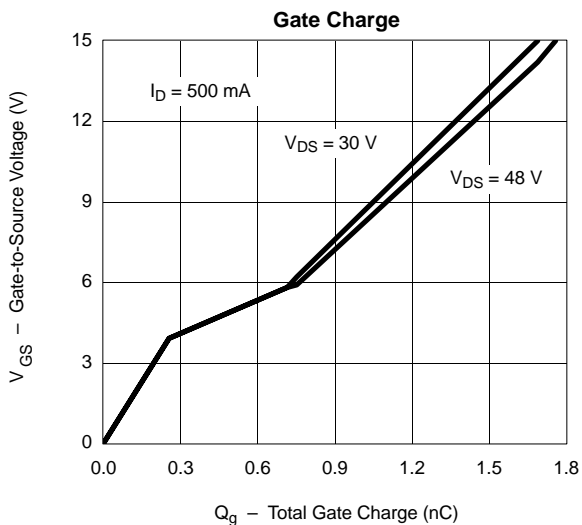
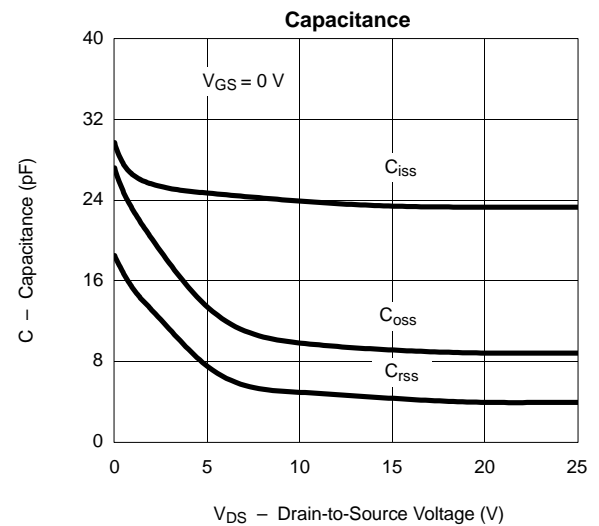
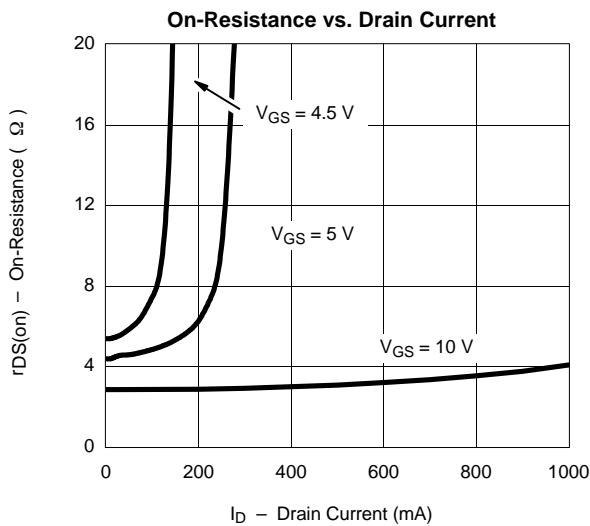
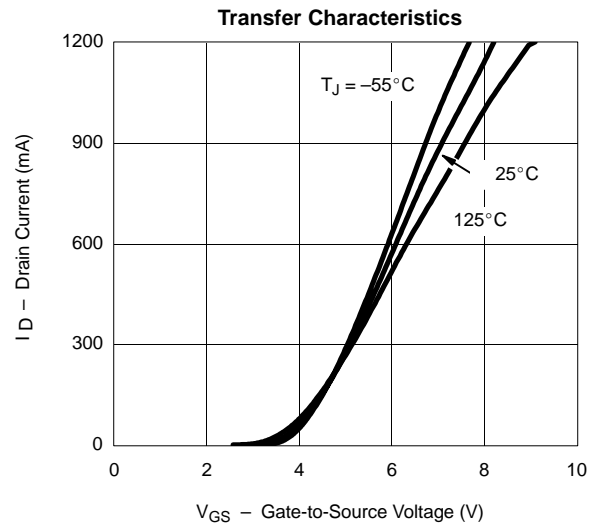
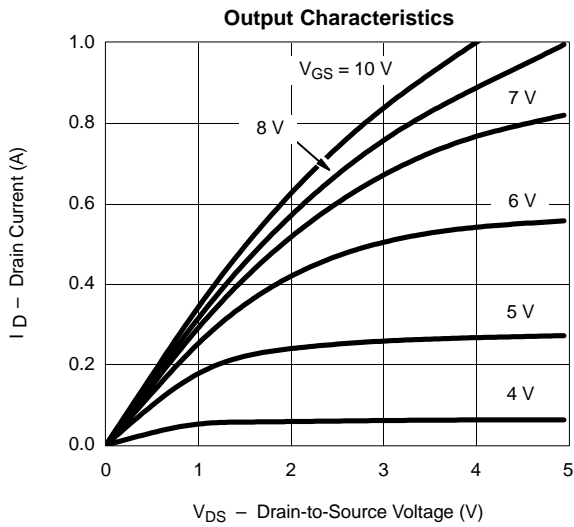
SPECIFICATIONS (T _J = 25 °C UNLESS OTHERWISE NOTED)						
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	V _{(BR)DSS}	V _{GS} = 0 V, I _D = -10 μA	-60			V
Gate-Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = -0.25 mA	-1		-3.0	
Gate-Body Leakage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

Notes

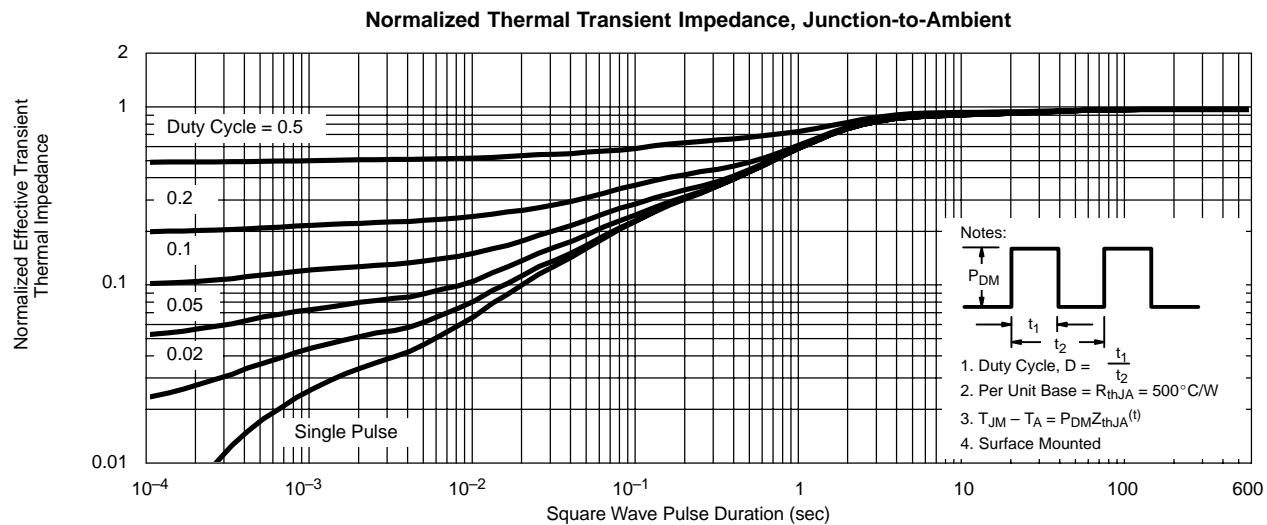
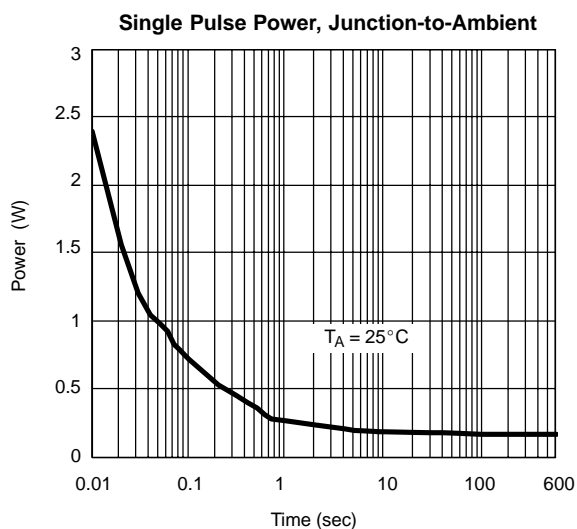
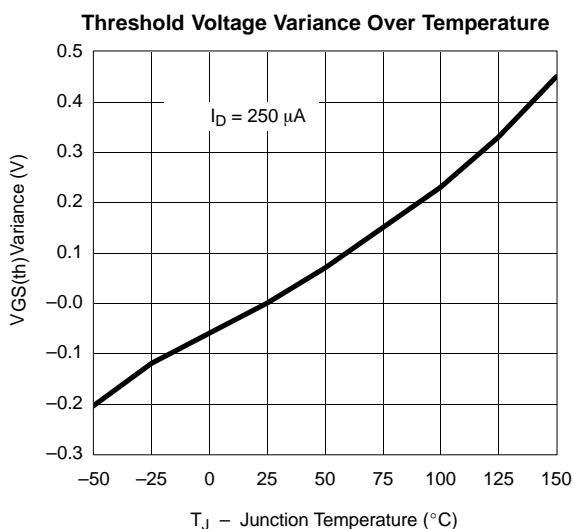
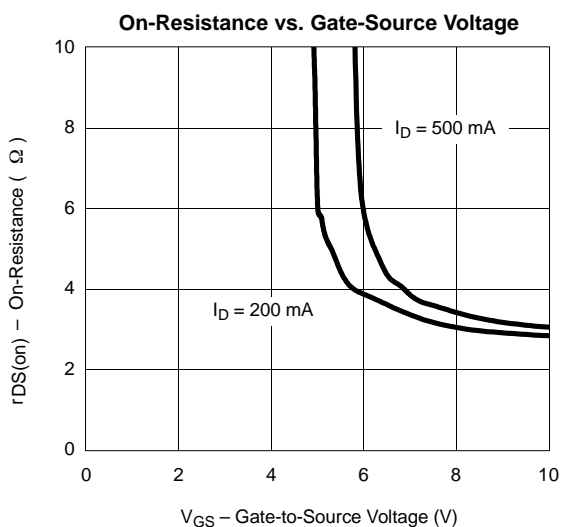
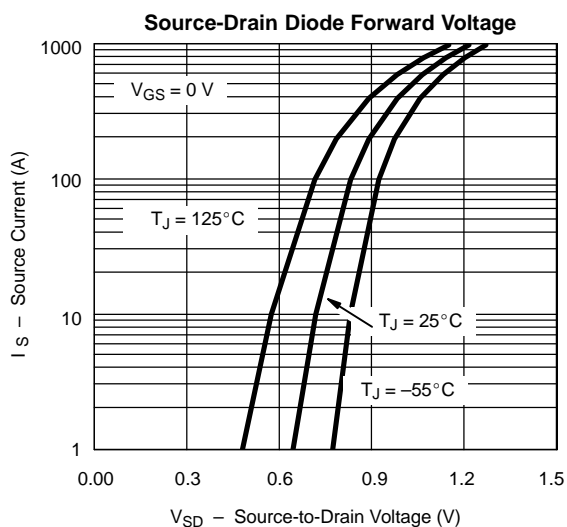
- a. Pulse test: PW ≤ 300 ms duty cycle ≤ 2%.
b. Switching time is essentially independent of operating temperature.



TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)



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