



P-Channel 1.8-V (G-S) MOSFET

PRODUCT SUMMARY		
V _{DS} (V)	R _{DS(on)} (Ω)	I _D (mA)
- 20	1.2 at V _{GS} = - 4.5 V	- 350
	1.6 at V _{GS} = - 2.5 V	- 300
	2.7 at V _{GS} = - 1.8 V	- 150

FEATURES

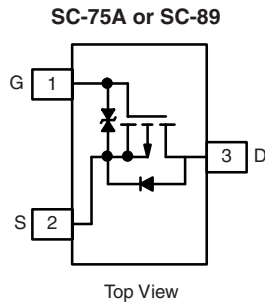
- Halogen-free Option Available
- High-Side Switching
- Low On-Resistance: 1.2 Ω
- Low Threshold: 0.8 V (Typ.)
- Fast Switching Speed: 14 ns
- 1.8 V Operation
- TrenchFET[®] Power MOSFETs
- 2000 V ESD Protection



RoHS COMPLIANT

APPLICATIONS

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



SC-75A (SOT-416):
Si1013R - Marking Code D
SC-89 (SOT-490):
Si1013X - Marking Code B

BENEFITS

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

Ordering Information:

Si1013R-T1-E3 (SC-75A, Lead (Pb)-free)
Si1013R-T1-GE3 (SC-75A, Lead (Pb)-free and Halogen-free)
Si1013X-T1-E3 (SC-89, Lead (Pb)-free)
Si1013X-T1-GE3 (SC-89, Lead (Pb)-free and Halogen-free)

ABSOLUTE MAXIMUM RATINGS T _A = 25 °C, unless otherwise noted					
Parameter	Symbol	5 s	Steady State	Unit	
Drain-Source Voltage	V _{DS}	- 20		V	
Gate-Source Voltage	V _{GS}	± 6			
Continuous Drain Current (T _J = 150 °C) ^b	I _D	T _A = 25 °C	- 400	- 350	mA
		T _A = 85 °C	- 300	- 275	
Pulsed Drain Current ^a	I _{DM}	- 1000			
Continuous Source Current (diode conduction) ^b	I _S	- 275	- 250		
Maximum Power Dissipation ^b for SC-75	P _D	T _A = 25 °C	175	150	mW
		T _A = 85 °C	90	80	
Maximum Power Dissipation ^b for SC-89	P _D	T _A = 25 °C	275	250	
		T _A = 85 °C	160	140	
Operating Junction and Storage Temperature Range	T _J , T _{stg}	- 55 to 150		°C	
Gate-Source ESD Rating (HBM, Method 3015)	ESD	2000		V	

Notes:

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

Si1013R/X

Vishay Siliconix



SPECIFICATIONS $T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	-0.45			V
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 4.5\text{ V}$		± 1	± 2	μA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -16\text{ V}, V_{GS} = 0\text{ V}$		-0.3	-100	nA
		$V_{DS} = -16\text{ V}, V_{GS} = 0\text{ V}, T_J = 85\text{ }^\circ\text{C}$			-5	μA
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} = -5\text{ V}, V_{GS} = -4.5\text{ V}$	-700			mA
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = -4.5\text{ V}, I_D = -350\text{ mA}$		0.8	1.2	Ω
		$V_{GS} = -2.5\text{ V}, I_D = -300\text{ mA}$		1.2	1.6	
		$V_{GS} = -1.8\text{ V}, I_D = -150\text{ mA}$		1.8	2.7	
Forward Transconductance ^a	g_{fs}	$V_{DS} = -10\text{ V}, I_D = -250\text{ mA}$		0.4		S
Diode Forward Voltage ^a	V_{SD}	$I_S = -150\text{ mA}, V_{GS} = 0\text{ V}$		-0.8	-1.2	V
Dynamic^b						
Total Gate Charge	Q_g	$V_{DS} = -10\text{ V}, V_{GS} = -4.5\text{ V}, I_D = -250\text{ mA}$		1500		μC
Gate-Source Charge	Q_{gs}			150		
Gate-Drain Charge	Q_{gd}			450		
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -10\text{ V}, R_L = 47\text{ }\Omega$ $I_D \cong -200\text{ mA}, V_{GEN} = -4.5\text{ V}, R_G = 10\text{ }\Omega$		5		ns
Rise Time	t_r			9		
Turn-Off Delay Time	$t_{d(off)}$			35		
Fall Time	t_f			11		

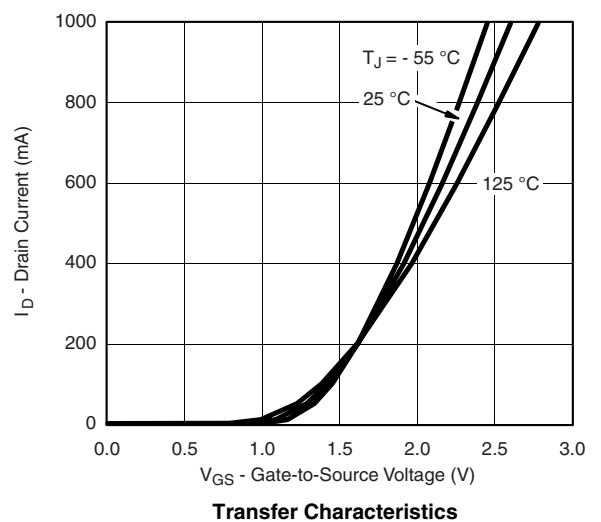
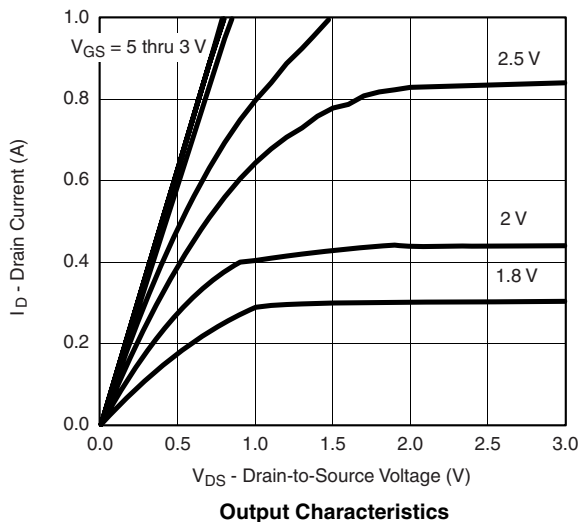
Notes:

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

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

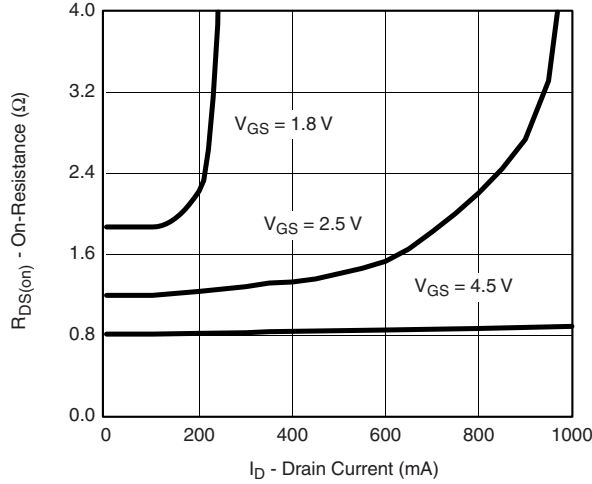
TYPICAL CHARACTERISTICS $T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted

For the following graphs, P-Channel negative polarities for all voltage and current values are represented as positive values.

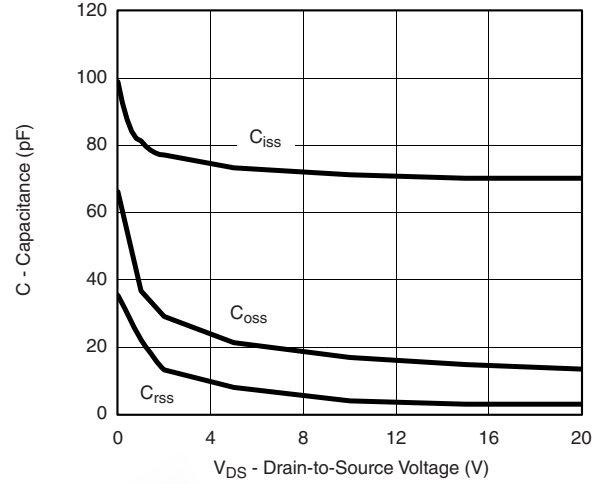




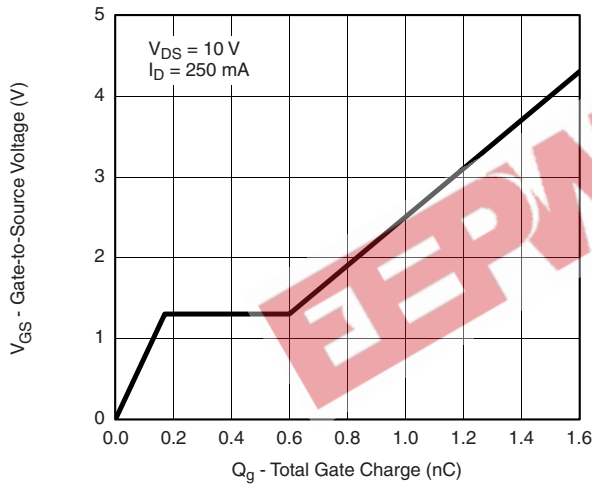
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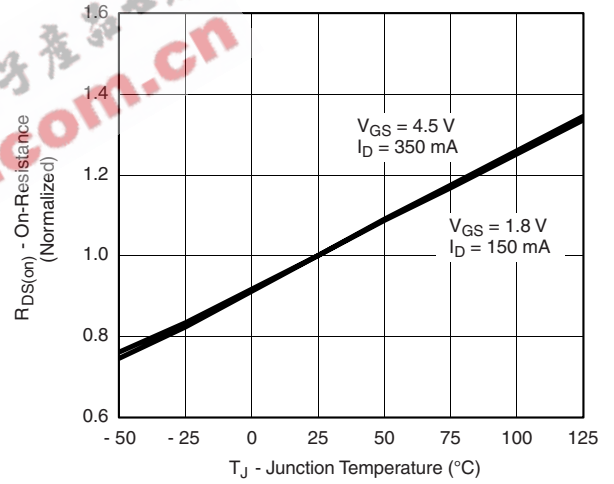
On-Resistance vs. Drain Current



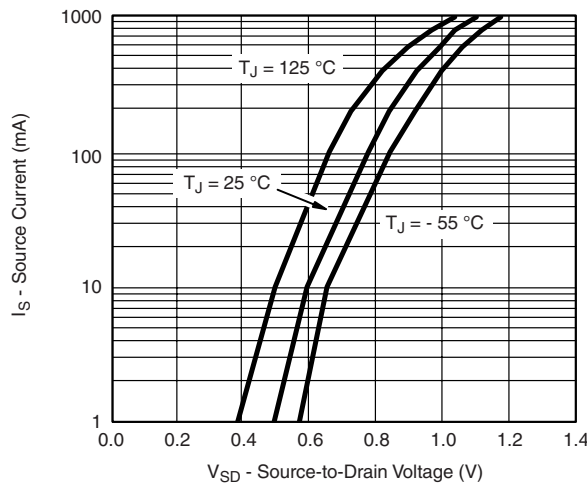
Capacitance



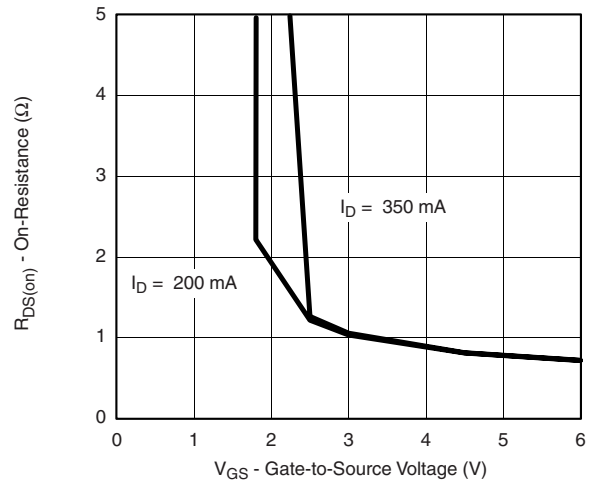
Gate Charge



On-Resistance vs. Junction Temperature

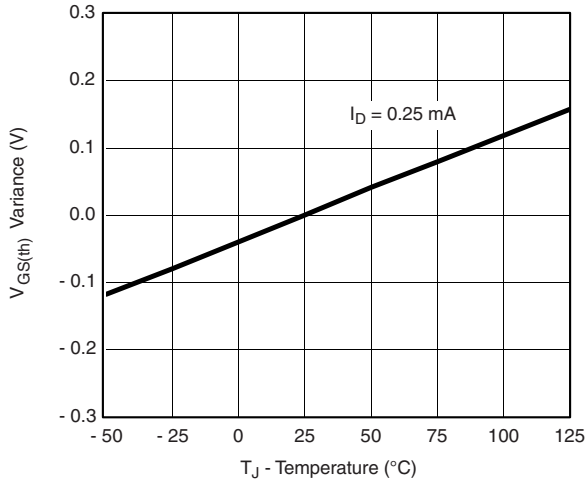


Surge-Drain Diode Forward Voltage

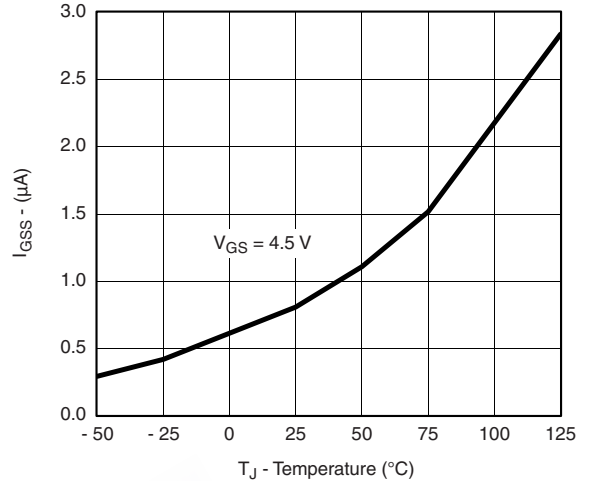


On-Resistance vs. Gate-to-Source Voltage

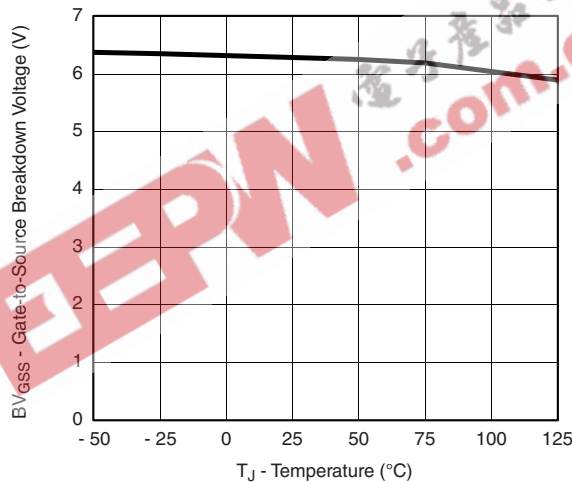
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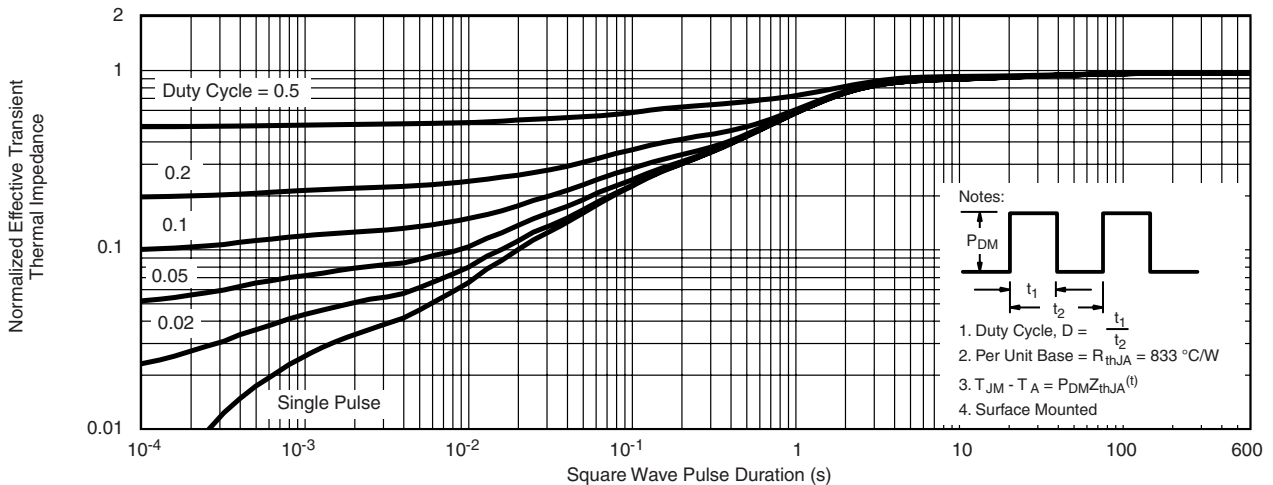
Threshold Voltage Variance vs. Temperature



I_{GSS} vs. Temperature



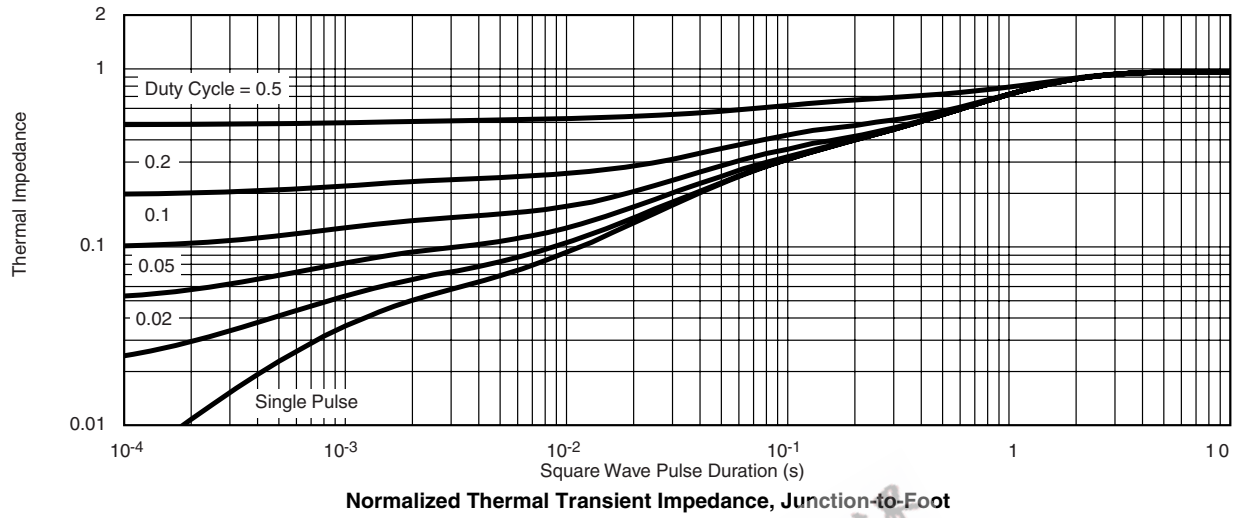
BV_{GSS} vs. Temperature



Normalized Thermal Transient Impedance, Junction-to-Ambient (SC-75A)



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