P-Channel 1.8 V (G-S) MOSFET

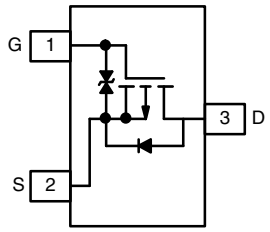
PRODUCT SUMMARY		
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (mA)
- 20	1.2 at V_{GS} = - 4.5 V	- 350
	1.6 at V_{GS} = - 2.5 V	- 300
	2.7 at V_{GS} = - 1.8 V	- 150

FEATURES

- **Halogen-free According to IEC 61249-2-21 Definition**
- 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
- Compliant to RoHS Directive 2002/95/EC

Pb-free
RoHS COMPLIANT
HALOGEN FREE

SC-75A or SC-89



Top View

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

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

APPLICATIONS

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

BENEFITS

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

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]	T_A = 25 °C	I_D	- 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	T_A = 25 °C	P_D	175	150	mW
	T_A = 85 °C		90	80	
Maximum Power Dissipation[b] for SC-89	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.

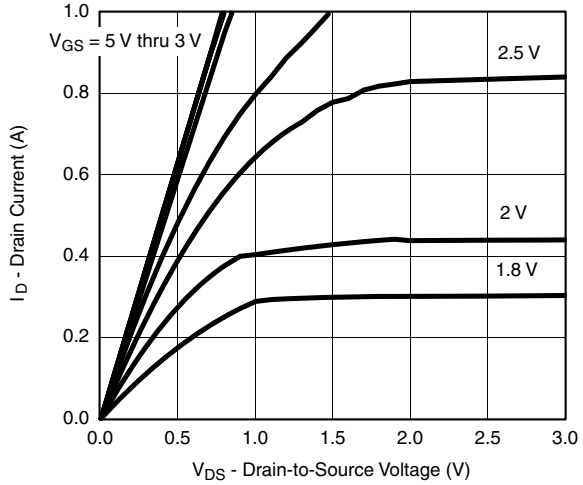
SPECIFICATIONS (T_A = 25 °C, unless otherwise noted)						
Parameter	**Symbol**	**Test Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Static						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = - 250 µA	- 0.45			V
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 4.5 V		± 1	± 2	µA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = - 16 V, V_{GS} = 0 V		- 0.3	- 100	nA
		V_{DS} = - 16 V, V_{GS} = 0 V, T_J = 85 °C			- 5	µA
On-State Drain Current[a]	$I_{D(on)}$	V_{DS} = - 5 V, V_{GS} = - 4.5 V	- 700			mA
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	V_{GS} = - 4.5 V, I_D = - 350 mA		0.8	1.2	Ω
		V_{GS} = - 2.5 V, I_D = - 300 mA		1.2	1.6	
		V_{GS} = - 1.8 V, I_D = - 150 mA		1.8	2.7	
Forward Transconductance[a]	g_{fs}	V_{DS}= - 10 V, I_D = - 250 mA		0.4		S
Diode Forward Voltage[a]	V_{SD}	I_S = - 150 mA, V_{GS} = 0 V		- 0.8	- 1.2	V
Dynamic[b]						
Total Gate Charge	Q_g	V_{DS} = - 10 V, V_{GS} = - 4.5 V, I_D = - 250 mA		1500		pC
Gate-Source Charge	Q_{gs}			150		
Gate-Drain Charge	Q_{gd}			450		
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = - 10 V, R_L = 47 Ω I_D ≅ - 200 mA, V_{GEN} = - 4.5 V, R_g = 10 Ω		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 ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.

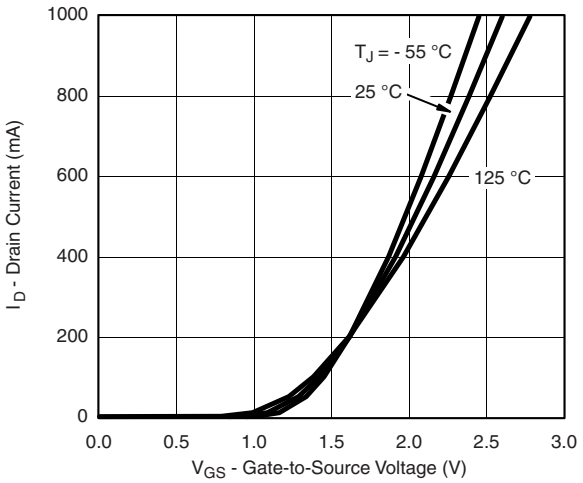
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)

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

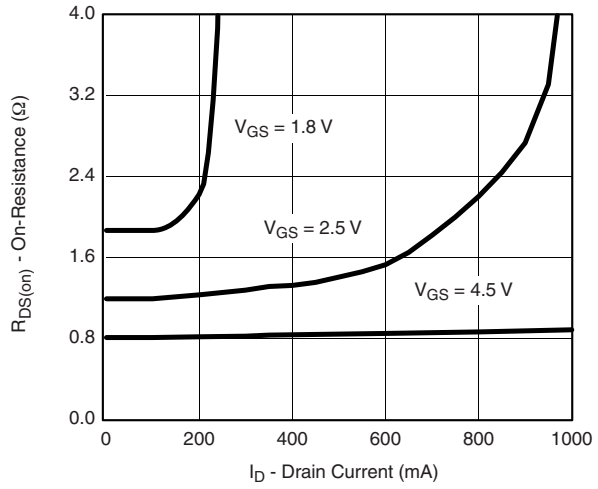


Output Characteristics

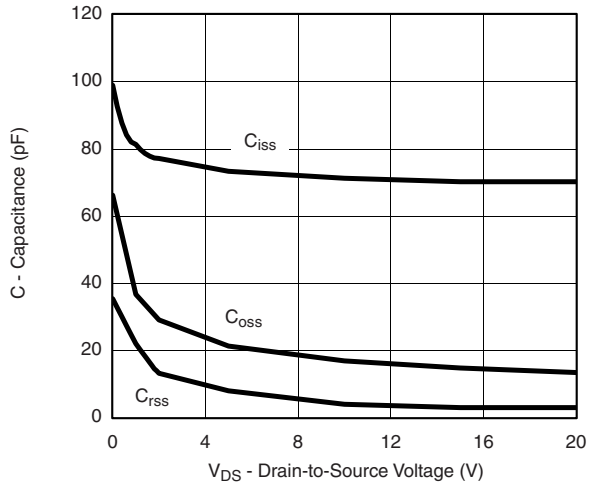


Transfer Characteristics

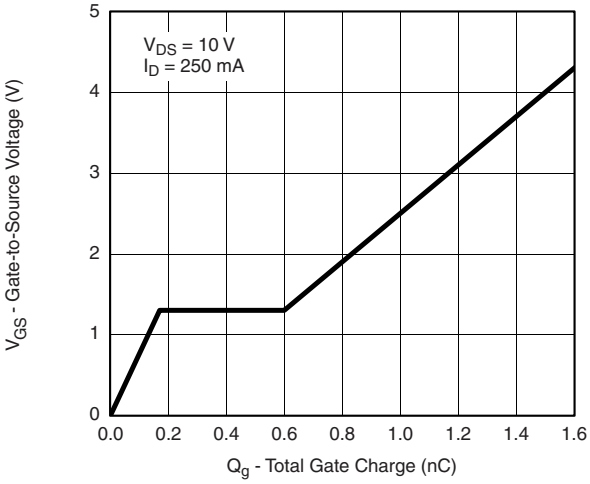
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



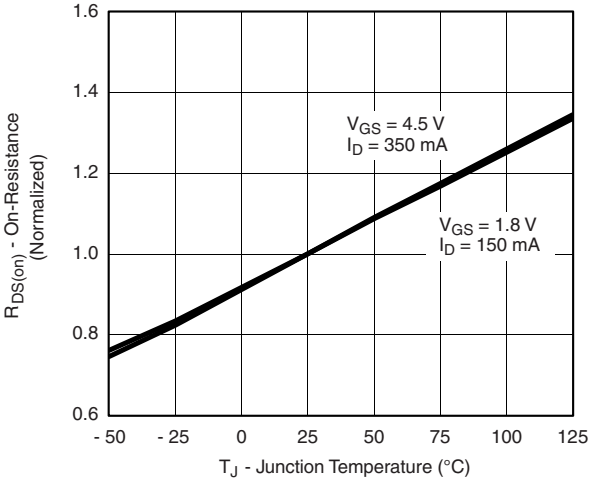
On-Resistance vs. Drain Current



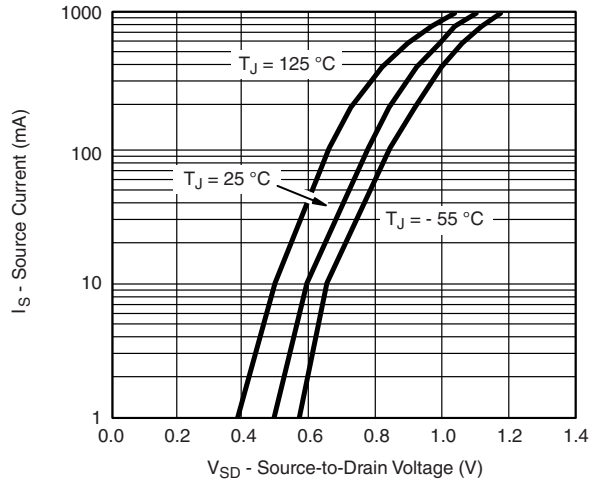
Capacitance



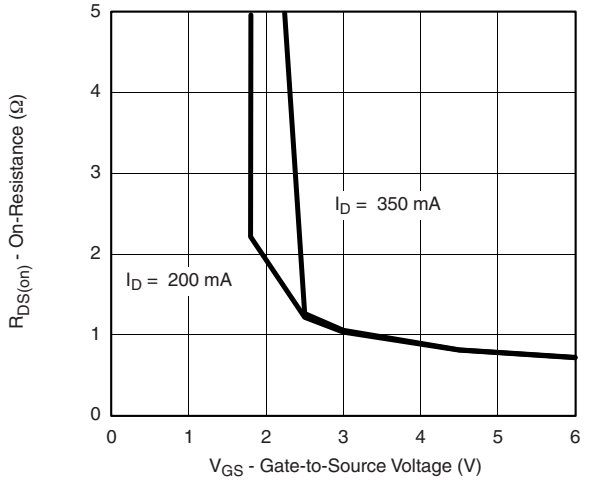
Gate Charge



On-Resistance vs. Junction Temperature

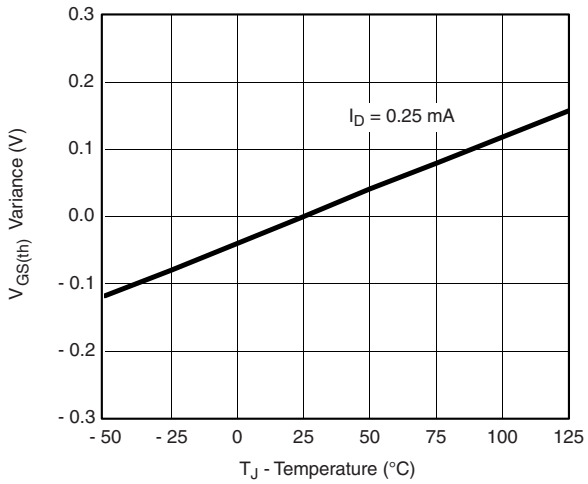


Surge-Drain Diode Forward Voltage

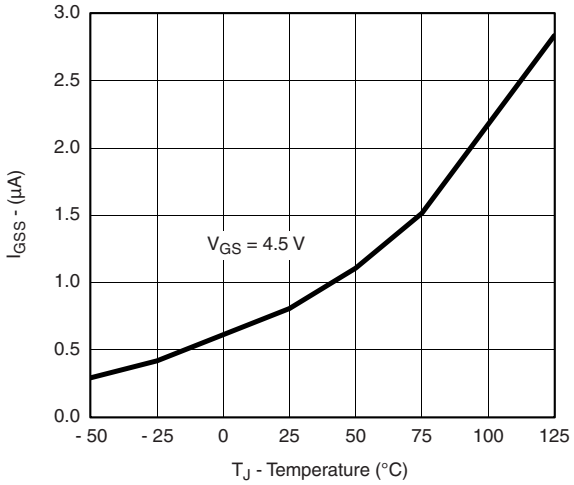


On-Resistance vs. Gate-to-Source Voltage

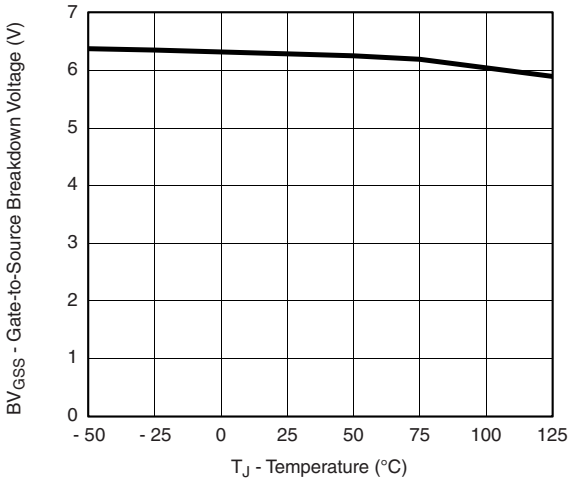
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



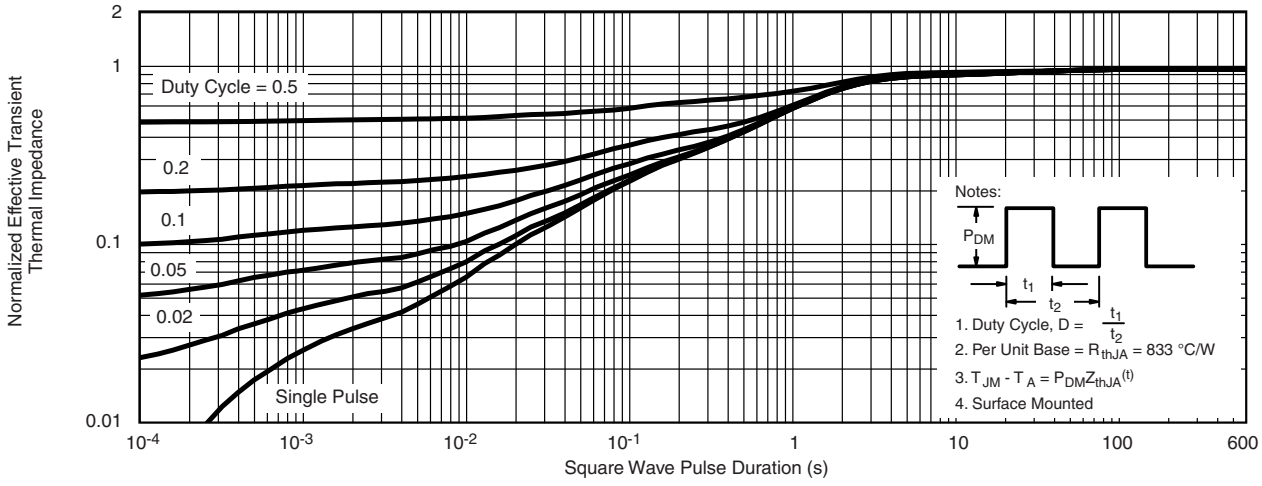
Threshold Voltage Variance vs. Temperature



I_{GSS} vs. Temperature

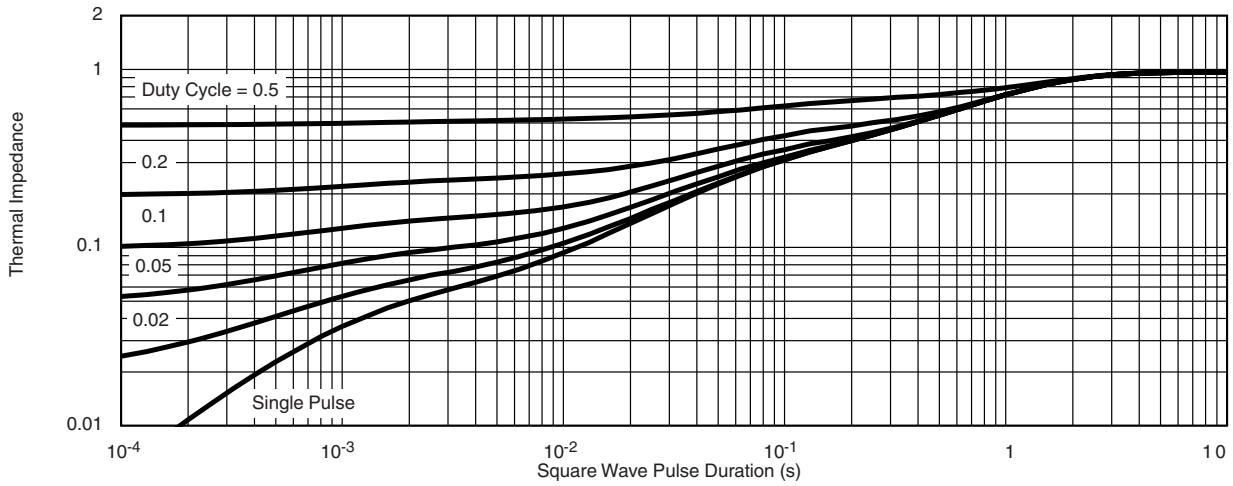


BV_{GSS} vs. Temperature



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

TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Foot

Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see www.vishay.com/ppg?71167.

Disclaimer

All product specifications and data are subject to change without notice.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, “Vishay”), disclaim any and all liability for any errors, inaccuracies or incompleteness contained herein or in any other disclosure relating to any product.

Vishay disclaims any and all liability arising out of the use or application of any product described herein or of any information provided herein to the maximum extent permitted by law. The product specifications do not expand or otherwise modify Vishay’s terms and conditions of purchase, including but not limited to the warranty expressed therein, which apply to these products.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications unless otherwise expressly indicated. Customers using or selling Vishay products not expressly indicated for use in such applications do so entirely at their own risk and agree to fully indemnify Vishay for any damages arising or resulting from such use or sale. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

Product names and markings noted herein may be trademarks of their respective owners.