



### P-Channel 20-V (D-S) MOSFET

PRODUCT SUMMARY		
V <sub>DS</sub> (V)	R <sub>DS(on)</sub> (Ω)	I <sub>D</sub> (mA)
- 20	8 at V <sub>GS</sub> = - 4.5 V	- 150
	12 at V <sub>GS</sub> = - 2.5 V	- 125
	15 at V <sub>GS</sub> = - 1.8 V	- 100
	20 at V <sub>GS</sub> = - 1.5 V	- 30

#### FEATURES

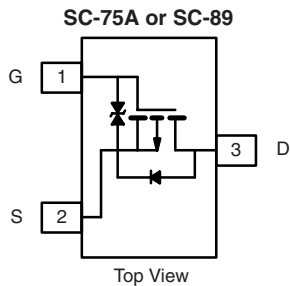
- Halogen-free Option Available
- High-Side Switching
- Low On-Resistance: 8 Ω
- Low Threshold: 0.9 V (typ.)
- Fast Switching Speed: 45 ns
- TrenchFET® Power MOSFETs: 1.5-V Rated
- ESD Protected: 2000 V



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): Si1031R  
 SC-89 (SOT- 490): Si1031X

Marking Code: H

#### BENEFITS

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

#### Ordering Information:

- Si1031R-T1-E3 (SC-75A, Lead (Pb)-free)
- Si1031R-T1-GE3 (SC-75A, Lead (Pb)-free and Halogen-free)
- Si1031X-T1-E3 (SC-89, Lead (Pb)-free)
- Si1031X-T1-GE3 (SC-89, Lead (Pb)-free and Halogen-free)

ABSOLUTE MAXIMUM RATINGS T <sub>A</sub> = 25 °C, unless otherwise noted							
Parameter	Symbol	Si1031R		Si1031X		Unit	
		5 s	Steady State	5 s	Steady State		
Drain-Source Voltage	V <sub>DS</sub>	- 20				V	
Gate-Source Voltage	V <sub>GS</sub>	± 6					
Continuous Drain Current (T <sub>J</sub> = 150 °C) <sup>a</sup>	I <sub>D</sub>	T <sub>A</sub> = 25 °C	- 150	- 140	- 165	- 155	mA
		T <sub>A</sub> = 85 °C	- 110	- 100	- 150	- 125	
Pulsed Drain Current <sup>a</sup>	I <sub>DM</sub>	- 500		- 600			
Continuous Source Current (Diode Conduction) <sup>a</sup>	I <sub>S</sub>	- 250	- 200	- 340	- 240		
Maximum Power Dissipation <sup>a</sup>	P <sub>D</sub>	T <sub>A</sub> = 25 °C	280	250	340	300	mW
		T <sub>A</sub> = 85 °C	145	130	170	150	
Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	- 55 to 150				°C	
Gate-Source ESD Rating (HBM, Method 3015)	ESD	2000				V	

Notes:

a. Surface Mounted on FR4 board.

# Si1031R/X

Vishay Siliconix



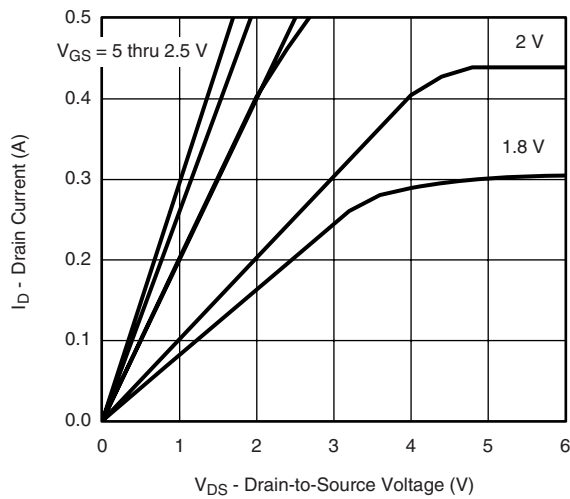
<b>SPECIFICATIONS</b> $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ. <sup>a</sup>	Max.	Unit
<b>Static</b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	-0.40		-1.2	V
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 2.8\text{ V}$		$\pm 0.5$	$\pm 1.0$	$\mu\text{A}$
		$V_{DS} = 0\text{ V}, V_{GS} = \pm 4.5\text{ V}$		$\pm 1.0$	$\pm 2.0$	
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = -16\text{ V}, V_{GS} = 0\text{ V}$		-1	-500	nA
		$V_{DS} = -16\text{ V}, V_{GS} = 0\text{ V}, T_J = 85\text{ }^\circ\text{C}$			-10	$\mu\text{A}$
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} = -5\text{ V}, V_{GS} = -4.5\text{ V}$	-200			mA
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = -4.5\text{ V}, I_D = -150\text{ mA}$			8	$\Omega$
		$V_{GS} = -2.5\text{ V}, I_D = -125\text{ mA}$			12	
		$V_{GS} = -1.8\text{ V}, I_D = -100\text{ mA}$			15	
		$V_{GS} = -1.5\text{ V}, I_D = -30\text{ mA}$			20	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = -10\text{ V}, I_D = 150\text{ mA}$		0.4		S
Diode Forward Voltage <sup>a</sup>	$V_{SD}$	$I_S = -150\text{ mA}, V_{GS} = 0\text{ V}$			-1.2	V
<b>Dynamic<sup>b</sup></b>						
Total Gate Charge	$Q_g$	$V_{DS} = -10\text{ V}, V_{GS} = -4.5\text{ V}, I_D = -150\text{ mA}$		1500		$\mu\text{C}$
Gate-Source Charge	$Q_{gs}$			150		
Gate-Drain Charge	$Q_{gd}$			450		
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -10\text{ V}, R_L = 65\text{ }\Omega$ $I_D \cong -150\text{ mA}, V_{GEN} = -4.5\text{ V}, R_G = 10\text{ }\Omega$			55	ns
Rise Time	$t_r$				30	
Turn-Off Delay Time	$t_{d(off)}$				60	
Fall Time	$t_f$				30	

Notes:

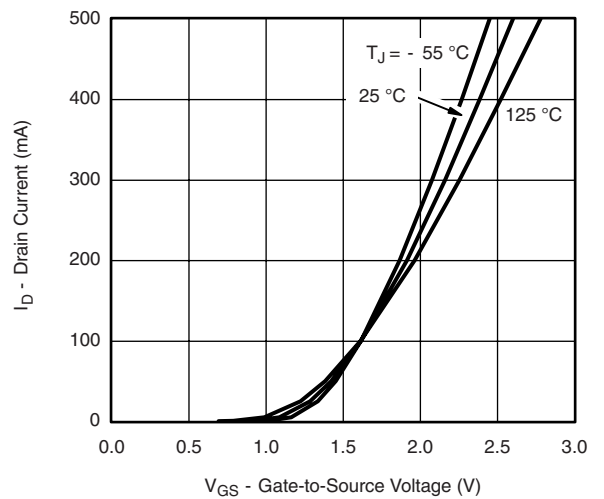
- a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .
- b. Guaranteed by design, not subject to production testing.

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



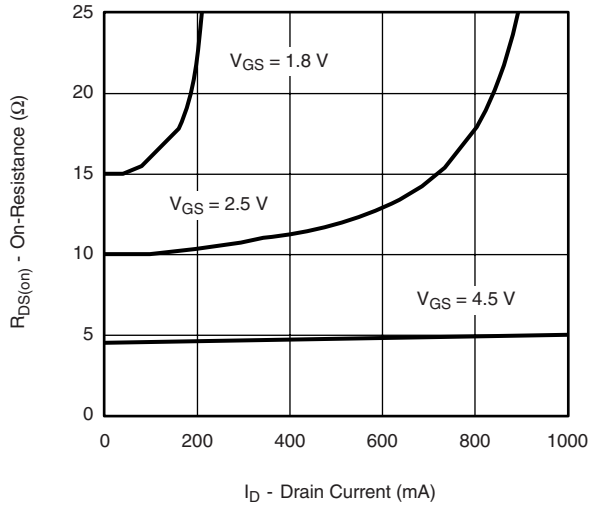
Output Characteristics



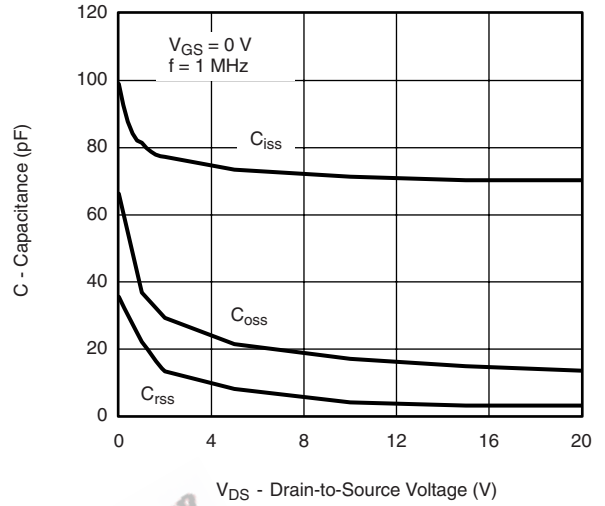
Transfer Characteristics



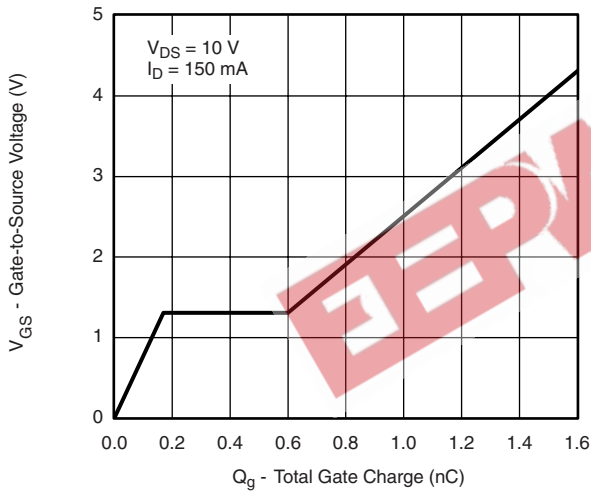
**TYPICAL CHARACTERISTICS**  $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted



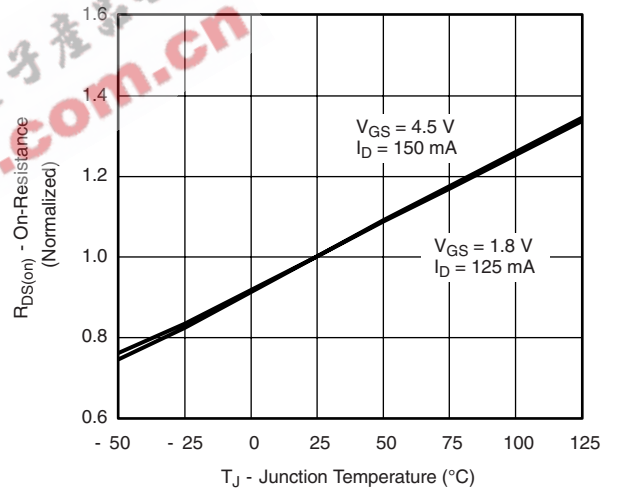
**On-Resistance vs. Drain Current**



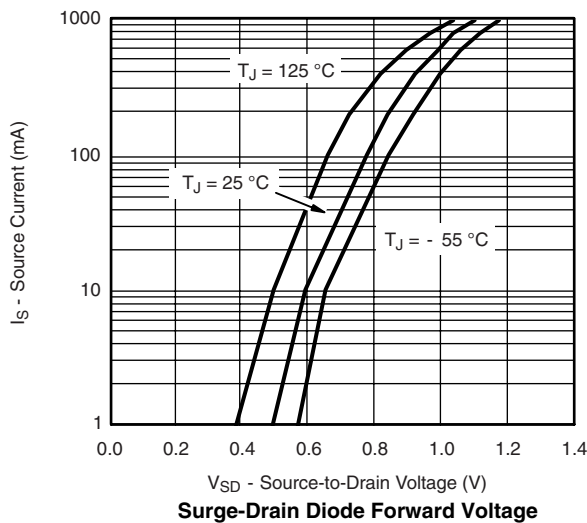
**Capacitance**



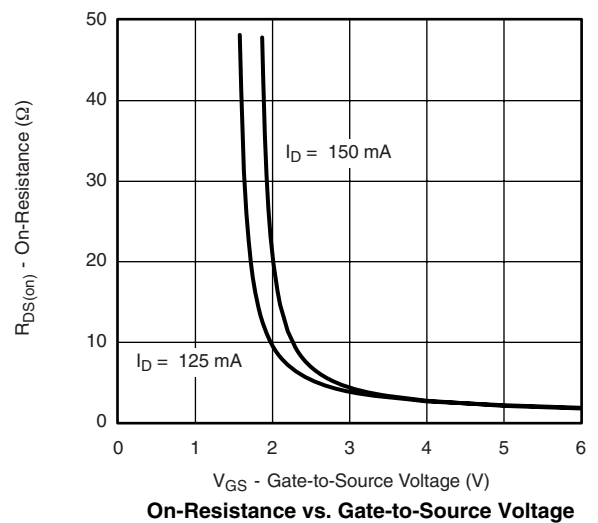
**Gate Charge**



**On-Resistance vs. Junction Temperature**



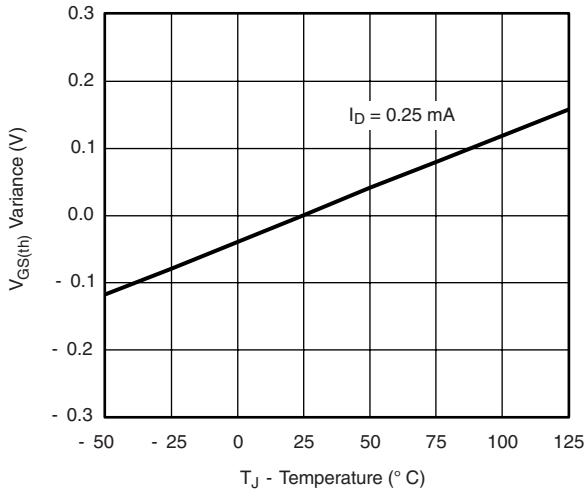
**Surge-Drain Diode Forward Voltage**



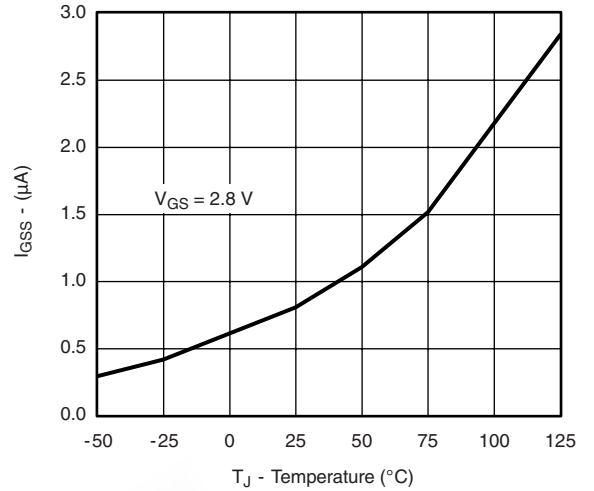
**On-Resistance vs. Gate-to-Source Voltage**



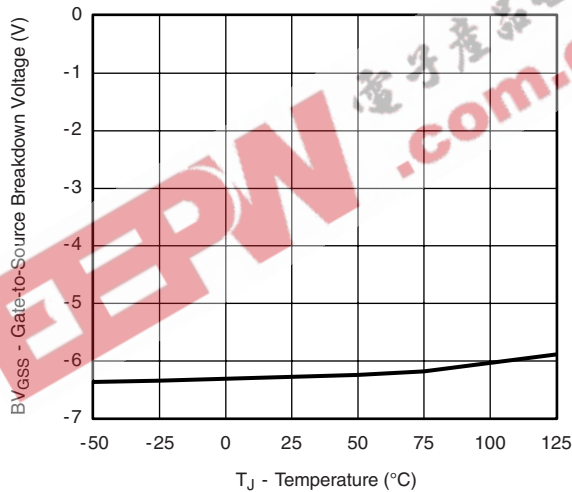
**TYPICAL CHARACTERISTICS**  $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted



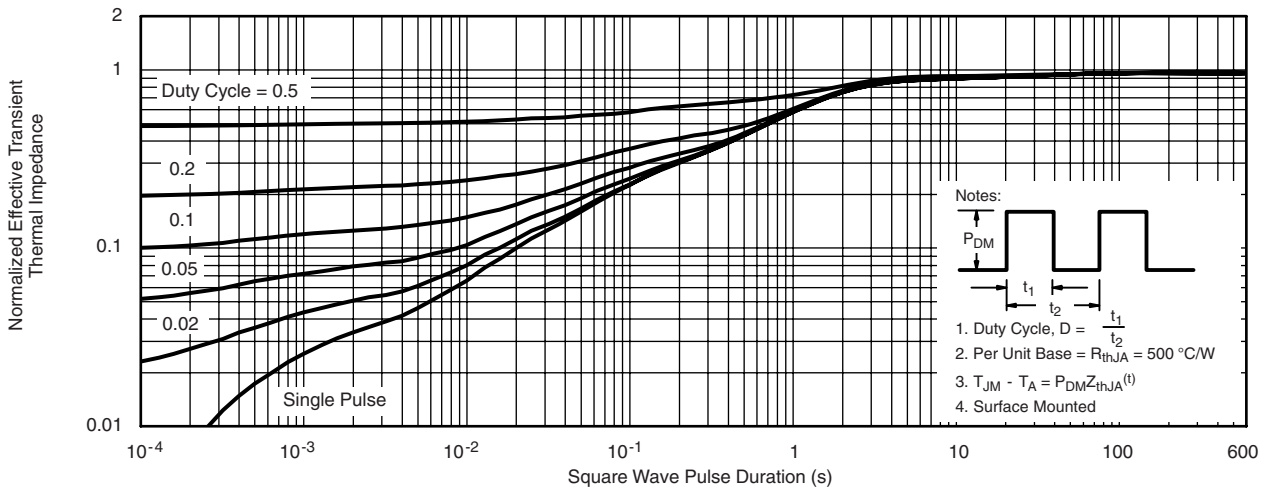
**Threshold Voltage Variance vs. Temperature**



**IGSS vs. Temperature**



**BVGS vs. Temperature**



**Normalized Thermal Transient Impedance, Junction-to-Ambient (SC-75A, Si1031R Only)**

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 <http://www.vishay.com/ppg?71171>.



### 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.