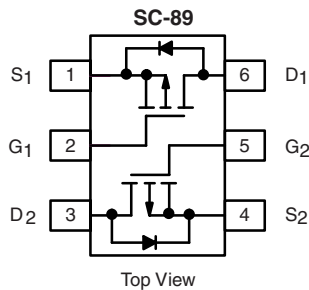


P-Channel 20-V (D-S) MOSFET

PRODUCT SUMMARY		
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (mA)
- 20	8 at $V_{GS} = - 4.5$ V	- 150
	12 at $V_{GS} = - 2.5$ V	- 125
	15 at $V_{GS} = - 1.8$ V	- 100
	20 at $V_{GS} = - 1.5$ V	- 30



Marking Code: K

Ordering Information: Si1033X-T1-E3 (Lead (Pb)-free)
 Si1033X-T1-GE3 (Lead (Pb)-free and Halogen-free)

FEATURES

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


RoHS
 COMPLIANT

BENEFITS

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

APPLICATIONS

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

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}	± 5		
Continuous Drain Current ($T_J = 150$ °C) ^a	I_D	$T_A = 25$ °C	- 155	- 145
		$T_A = 85$ °C	- 110	- 105
Pulsed Drain Current ^b	I_{DM}	- 650		mA
Continuous Source Current (Diode Conduction) ^a	I_S	- 450	- 380	
Maximum Power Dissipation ^a	P_D	$T_A = 25$ °C	280	250
		$T_A = 85$ °C	145	130
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:

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



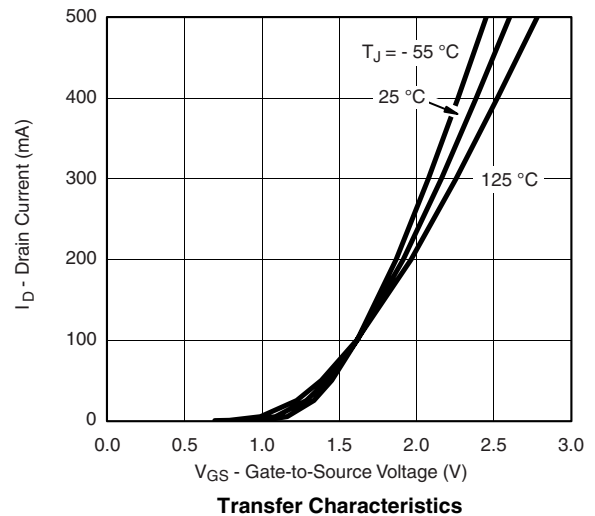
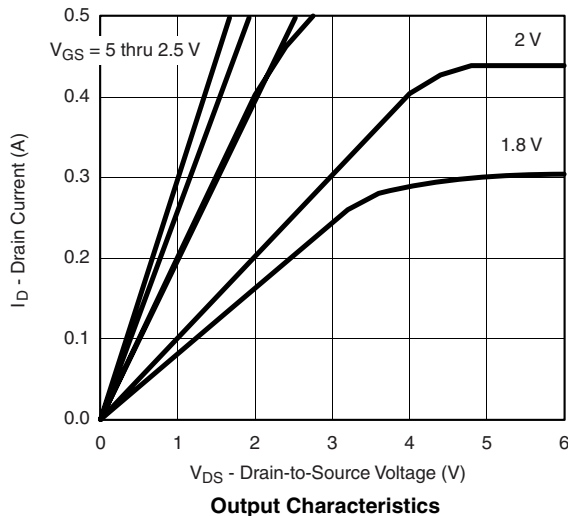
SPECIFICATIONS $T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ. ^a	Max.	Unit
Static						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	-0.40		-1.20	V
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 2.8\text{ V}$		± 0.5	± 1	μA
		$V_{DS} = 0\text{ V}, V_{GS} = \pm 4.5\text{ V}$		± 1	± 2	
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	μA
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} = -5\text{ V}, V_{GS} = -4.5\text{ V}$	-200			mA
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = -4.5\text{ V}, I_D = -150\text{ mA}$			8	Ω
		$V_{GS} = -2.5\text{ V}, I_D = -125\text{ mA}$			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 ^a	g_{fs}	$V_{DS} = -10\text{ V}, I_D = -150\text{ mA}$		0.4		S
Diode Forward Voltage ^a	V_{SD}	$I_S = -150\text{ mA}, V_{GS} = 0\text{ V}$			-1.2	V
Dynamic^b						
Total Gate Charge	Q_g	$V_{DS} = -10\text{ V}, V_{GS} = -4.5\text{ V}, I_D = -150\text{ mA}$		1500		μC
Gate-Source Charge	Q_{gs}			150		
Gate-Drain Charge	Q_{gd}			450		
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -10\text{ V}, R_L = 65\text{ }\Omega$ $I_D \cong -150\text{ mA}, V_{GEN} = -4.5\text{ V}, R_G = 10\text{ }\Omega$			55	ns
Rise Time	t_r				30	
Turn-Off Delay Time	$t_{d(off)}$				60	
Fall Time	t_f				30	

Notes:

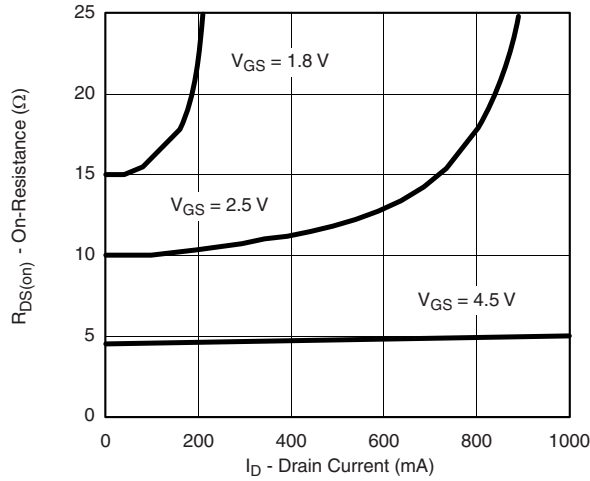
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
- b. Guaranteed by design, not subject to production testing.

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.

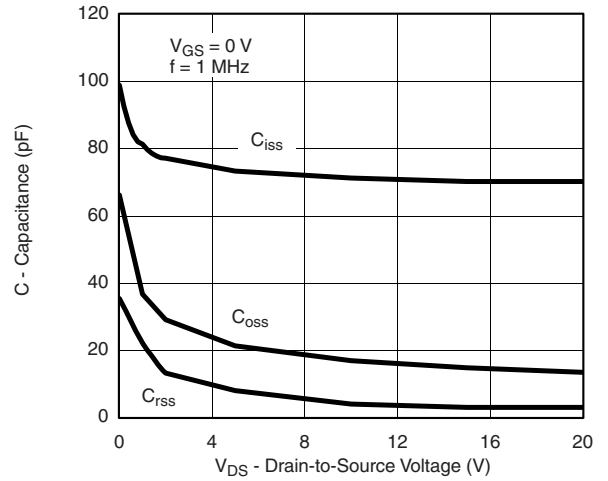
TYPICAL CHARACTERISTICS $T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted



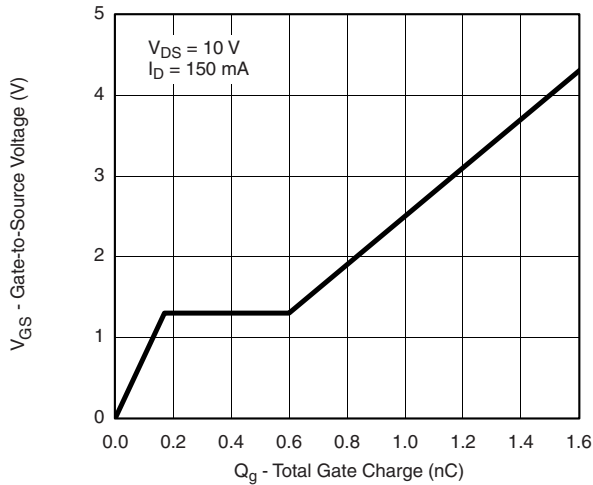
TYPICAL CHARACTERISTICS $T_A = 25^\circ\text{C}$, unless otherwise noted



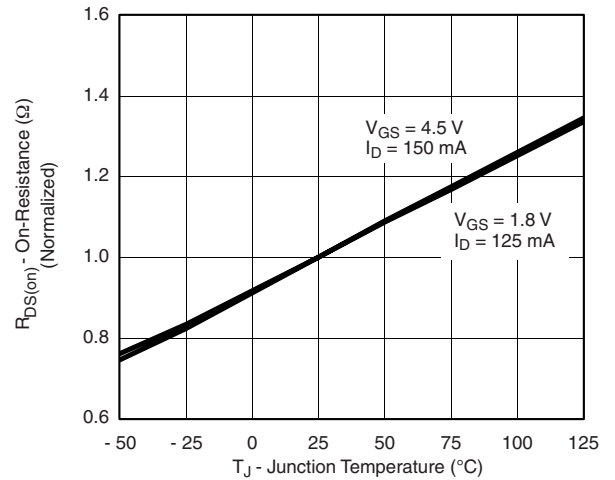
On-Resistance vs. Drain Current



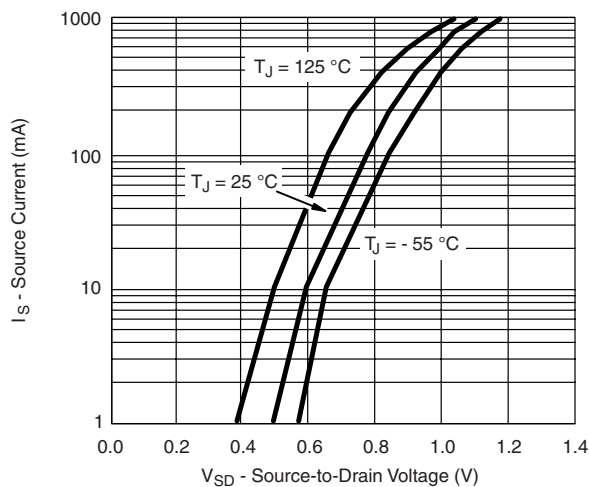
Capacitance



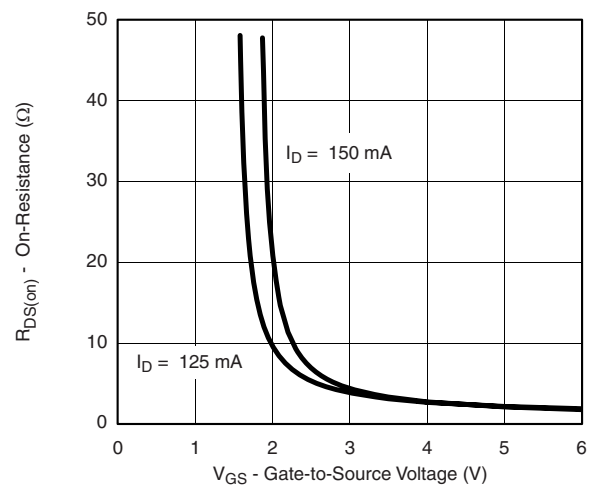
Gate Charge



On-Resistance vs. Junction Temperature

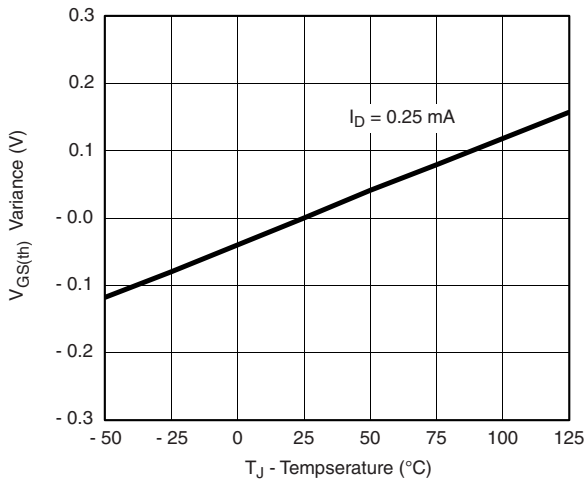


Surge-Drain Diode Forward Voltage

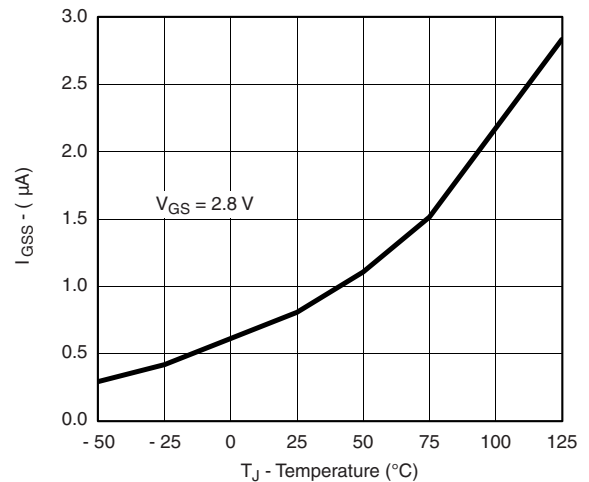


On-Resistance vs. Gate-to-Source Voltage

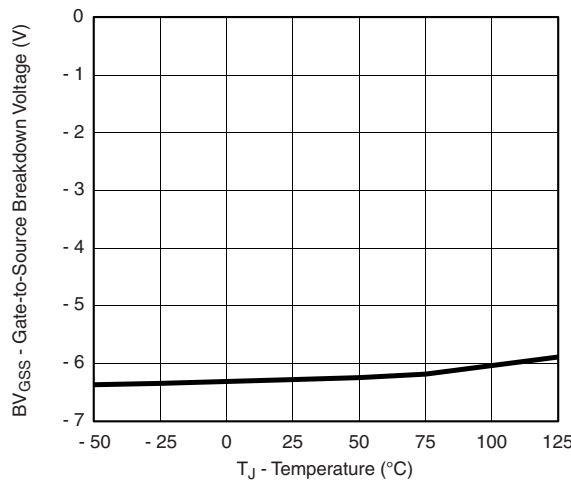
TYPICAL CHARACTERISTICS $T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted



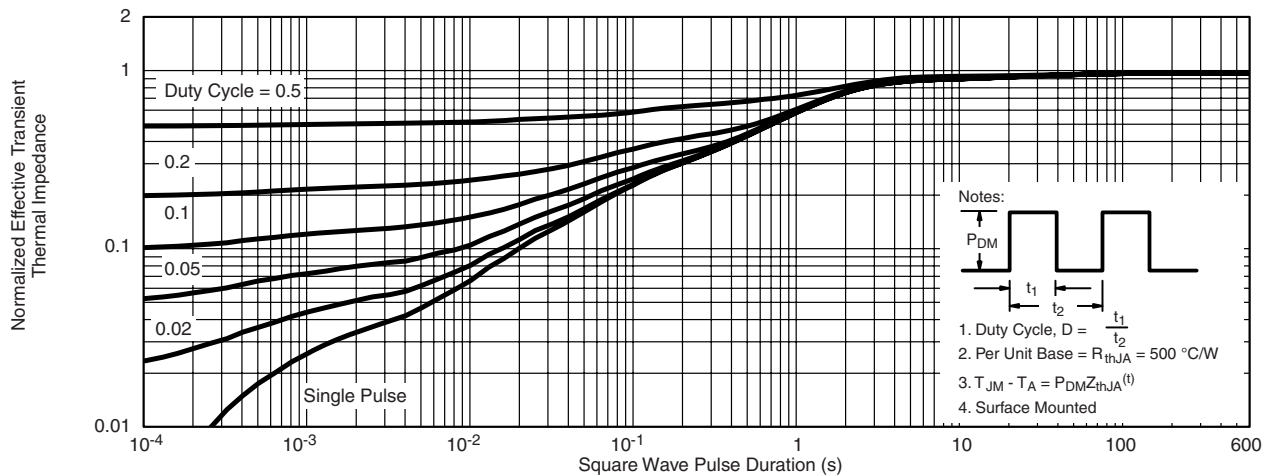
Threshold Voltage Variance vs. Temperature



I_{GSS} vs. Temperature



BV_{GSS} vs. Temperature



Normalized Thermal Transient Impedance, Junction-to-Ambient

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?71428>.



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