

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

### PRODUCT SUMMARY

$V_{DS}$ (V)	$R_{DS(on)}$ ( $\Omega$ ) Max.	$I_D$ (A)	$Q_g$ (Typ.)
- 20	0.078 at $V_{GS} = - 4.5$ V	- 1.4	12.1 nC
	0.098 at $V_{GS} = - 2.5$ V	- 1	
	0.130 at $V_{GS} = - 1.8$ V	- 1	
	0.188 at $V_{GS} = - 1.5$ V	- 0.3	

### FEATURES

- TrenchFET® Power MOSFET
- Typical ESD Performance 2500 V
- 100 %  $R_g$  Tested
- Material categorization:  
For definitions of compliance please see  
[www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

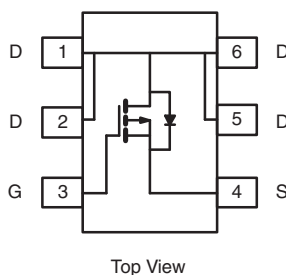


**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

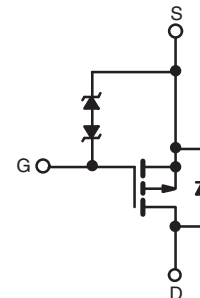
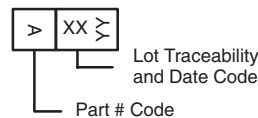
### APPLICATIONS

- Load Switch for Portable Devices
- Power Management

SC-89 (6-LEADS)



Marking Code



Ordering Information: Si1077X-T1-GE3 (Lead (Pb)-free and Halogen-free)

P-Channel MOSFET

### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25$ °C, unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	- 20	V
Gate-Source Voltage	$V_{GS}$	$\pm 8$	
Continuous Drain Current ( $T_J = 150$ °C)	$T_A = 25$ °C	$I_D$	A
	$T_A = 70$ °C	- 1.75 <sup>b, c</sup>	
Pulsed Drain Current ( $t = 300$ $\mu$ s)	$I_{DM}$	- 8	
Continuous Source-Drain Diode Current	$T_A = 25$ °C	$I_S$	
Maximum Power Dissipation	$T_A = 25$ °C	$P_D$	W
	$T_A = 70$ °C	0.33 <sup>b, c</sup>	
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to 150	°C

### THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient <sup>a, b</sup>	$R_{thJA}$	$t \leq 5$ s	300	°C/W
		Steady State	360	

Notes:

- Maximum under steady state conditions is 450 °C/W.
- Surface mounted on 1" x 1" FR4 board.
- $t = 5$  s.

SPECIFICATIONS (T <sub>J</sub> = 25 °C, unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V <sub>DS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = - 250 μA	- 20			V
V <sub>DS</sub> Temperature Coefficient	ΔV <sub>DS</sub> /T <sub>J</sub>	I <sub>D</sub> = - 250 μA		- 11		mV/°C
V <sub>GS(th)</sub> Temperature Coefficient	ΔV <sub>GS(th)</sub> /T <sub>J</sub>			2.4		
Gate-Source Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = - 250 μA	- 0.4		- 1	V
Gate-Source Leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 8 V			± 10	μA
		V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 4.5 V			± 1	
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = - 20 V, V <sub>GS</sub> = 0 V			- 1	
		V <sub>DS</sub> = - 20 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 85 °C			- 10	
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	V <sub>DS</sub> = ≥ - 5 V, V <sub>GS</sub> = - 4.5 V	- 8			A
Drain-Source On-State Resistance <sup>a</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = - 4.5 V, I <sub>D</sub> = - 1.8 A		0.065	0.078	Ω
		V <sub>GS</sub> = - 2.5 V, I <sub>D</sub> = - 1 A		0.081	0.098	
		V <sub>GS</sub> = - 1.8 V, I <sub>D</sub> = - 1 A		0.100	0.130	
		V <sub>GS</sub> = - 1.5 V, I <sub>D</sub> = - 0.3 A		0.125	0.188	
Forward Transconductance	g <sub>fs</sub>	V <sub>DS</sub> = - 10 V, I <sub>D</sub> = - 1.8 A		10		S
Dynamic <sup>b</sup>						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = - 10 V, V <sub>GS</sub> = 0 V, f = 1 MHz		965		pF
Output Capacitance	C <sub>oss</sub>			110		
Reverse Transfer Capacitance	C <sub>rss</sub>			101		
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> = - 10 V, V <sub>GS</sub> = - 8 V, I <sub>D</sub> = - 1.75 A		20.7	31.1	nC
		V <sub>DS</sub> = - 10 V, V <sub>GS</sub> = - 4.5 V, I <sub>D</sub> = - 1.75 A		12.1	18.2	
Gate-Source Charge	Q <sub>gs</sub>			1.85		
Gate-Drain Charge	Q <sub>gd</sub>			2.21		
Gate Resistance	R <sub>g</sub>	f = 1 MHz	3.6	18	36	Ω
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = - 10 V, R <sub>L</sub> = 7.1 Ω I <sub>D</sub> ≅ - 1.4 A, V <sub>GEN</sub> = - 4.5 V, R <sub>g</sub> = 1 Ω		24	36	ns
Rise Time	t <sub>r</sub>			17	26	
Turn-Off Delay Time	t <sub>d(off)</sub>			95	145	
Fall Time	t <sub>f</sub>			28	42	
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = - 10 V, R <sub>L</sub> = 7.1 Ω I <sub>D</sub> = - 1.4 A, V <sub>GEN</sub> = - 8 V, R <sub>g</sub> = 1 Ω		5	10	ns
Rise Time	t <sub>r</sub>			8	16	
Turn-Off Delay Time	t <sub>d(off)</sub>			115	173	
Fall Time	t <sub>f</sub>			26	39	
Drain-Source Body Diode Characteristics						
Pulse Diode Forward Current <sup>a</sup>	I <sub>SM</sub>				- 8	A
Body Diode Voltage	V <sub>SD</sub>	I <sub>S</sub> = - 1.4 A		- 0.75	- 1.2	V
Body Diode Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = - 1.4 A, dI/dt = 100 A/μs		16	24	ns
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>			7	14	nC
Reverse Recovery Fall Time	t <sub>a</sub>			9		ns
Reverse Recovery Rise Time	t <sub>b</sub>			7		

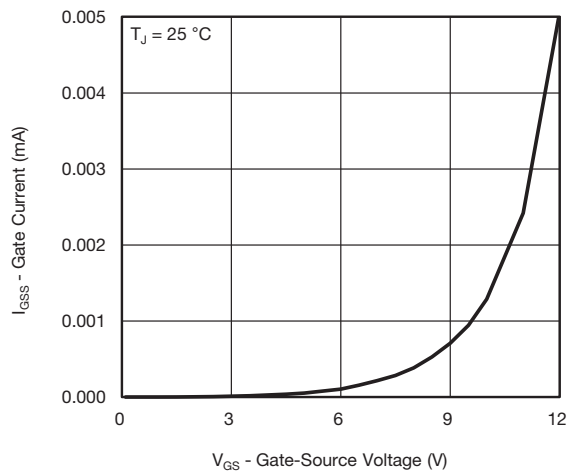
Notes:

a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .

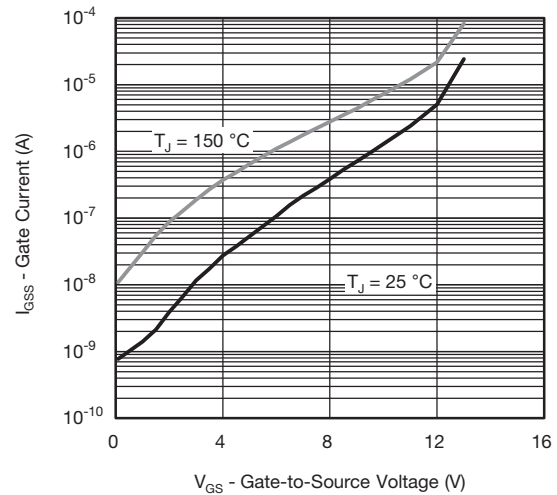
b. Guaranteed by design, not subject to production testing.

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.

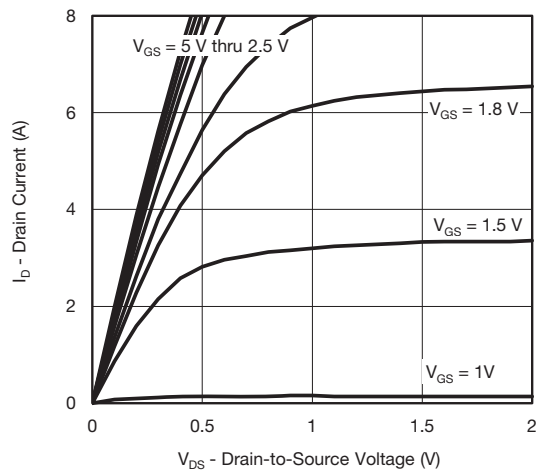
## TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ , unless otherwise noted)



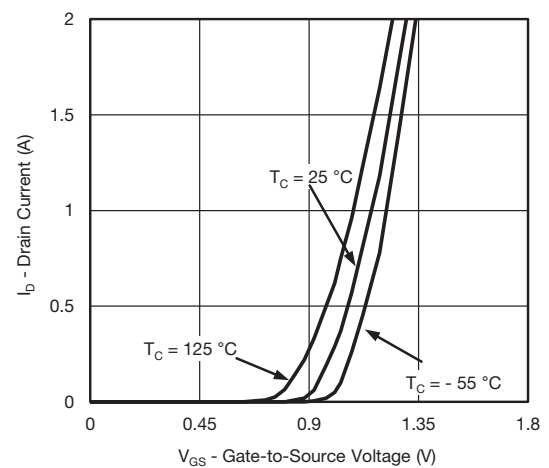
Gate Current vs. Gate-Source Voltage



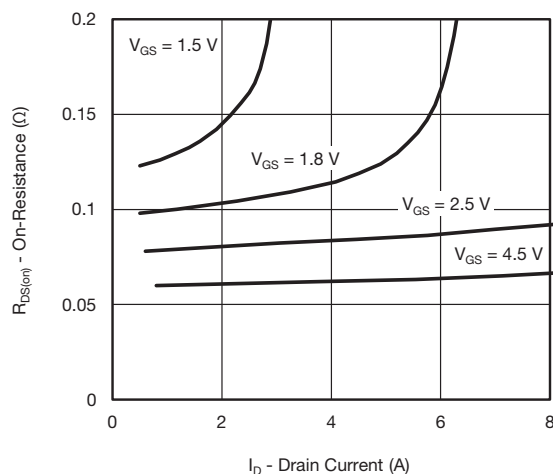
Gate Current vs. Gate-to-Source Voltage



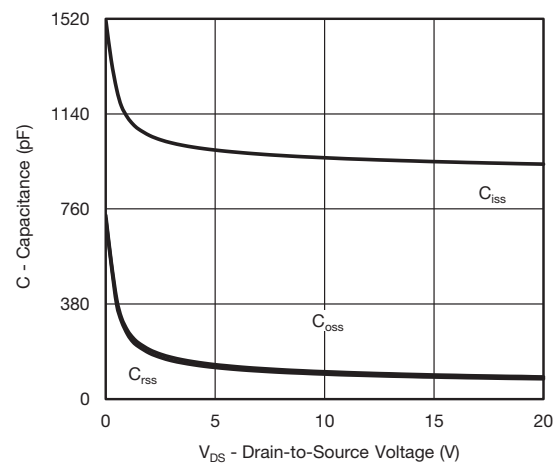
Output Characteristics



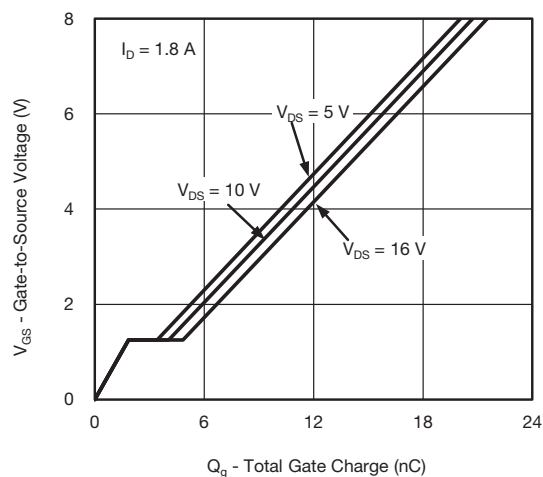
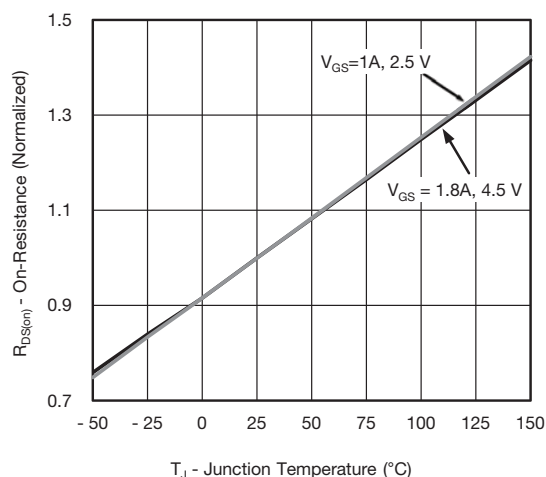
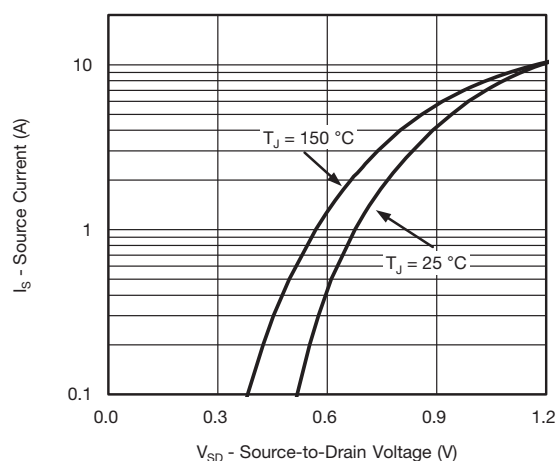
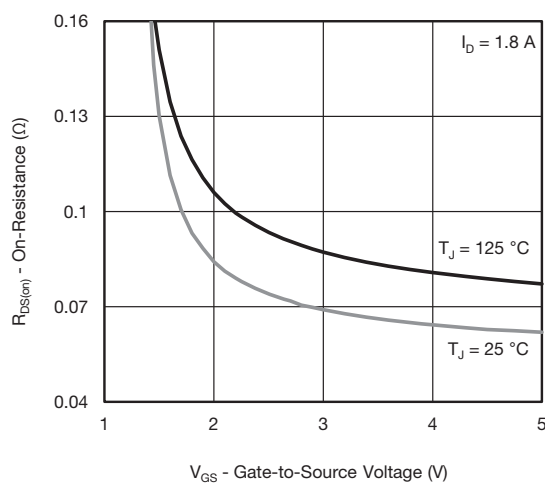
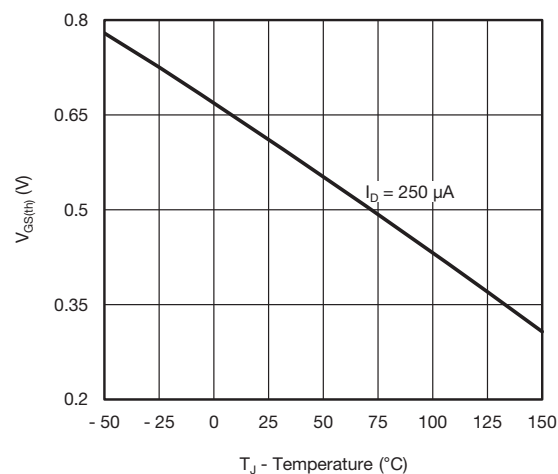
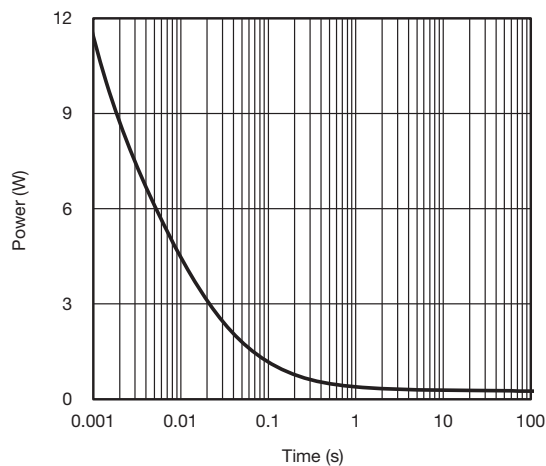
Transfer Characteristics Curves vs. Temperature



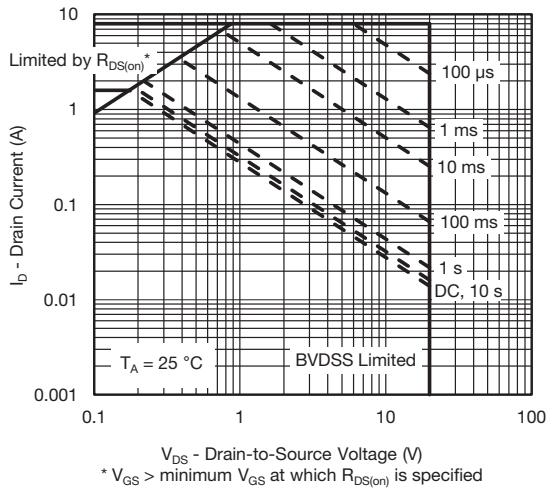
On-Resistance vs. Drain Current



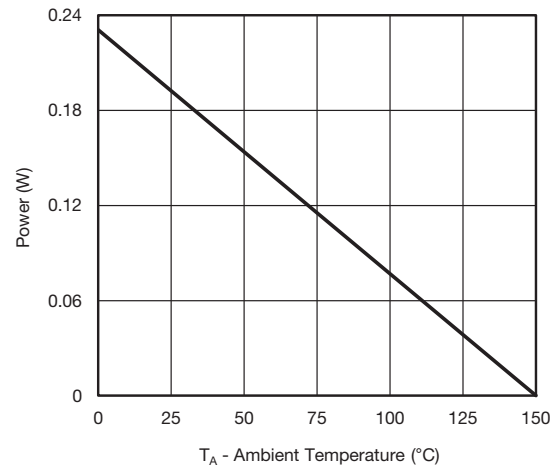
Capacitance

**TYPICAL CHARACTERISTICS** ( $T_A = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted)**Gate Charge****On-Resistance vs. Junction Temperature****Source-Drain Diode Forward Voltage****On-Resistance vs. Gate-to-Source Voltage****Threshold Voltage****Single Pulse Power, Junction-to-Ambient**

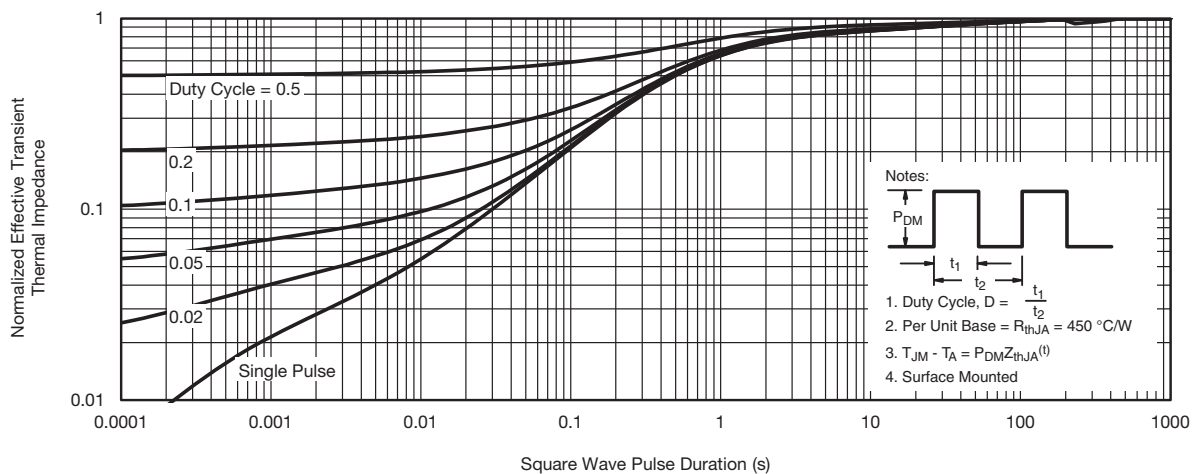
## TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ , unless otherwise noted)



Safe Operating Area, Junction-to-Ambient



Power Junction-to-Ambient

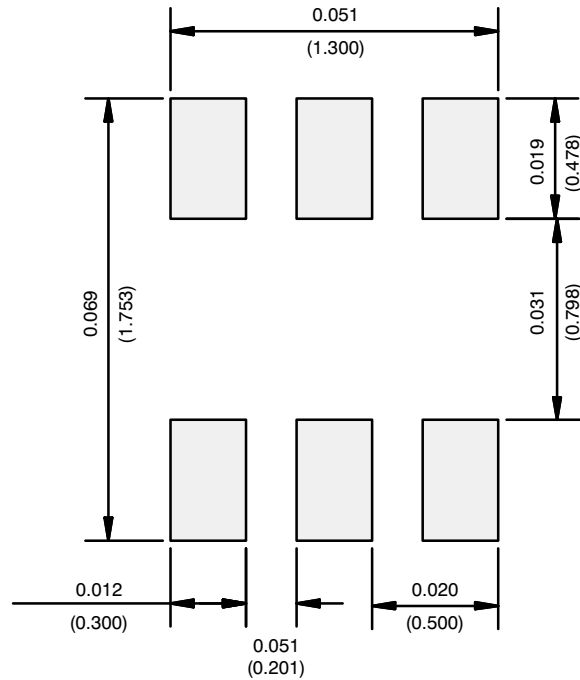


Normalized Thermal Transient Impedance, Junction-to-Ambient

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## RECOMMENDED MINIMUM PADS FOR SC-89: 6-Lead



Recommended Minimum Pads  
Dimensions in Inches/(mm)

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