N-Channel 20 V (D-S) MOSFET

PRODUCT SUMMARY

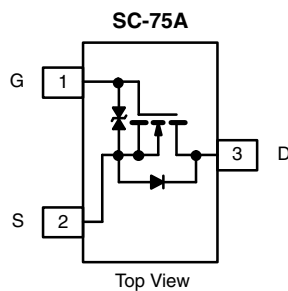| V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (mA)	Q_g (Typ.)
20	0.396 at V_{GS} = 4.5 V	600	0.75
	0.456 at V_{GS} = 2.5 V	500	
	0.546 at V_{GS} = 1.8 V	350	
	1.100 at V_{GS} = 1.5 V	50	

FEATURES

- TrenchFET[®] Power MOSFET: 1.2 V Rated
- 100 % R_g Tested
- Gate-Source ESD Protected: 1000 V
- Material categorization:
  For definitions of compliance please see www.vishay.com/doc?99912

APPLICATIONS

- Load/Power Switching for Portable Devices
- Drivers: Relays, Solenoids, Lamps, Hammers, Displays, Memories
- Battery Operated Systems
- Power Supply Converter Circuits

SC-75A

Top View

Ordering Information:
Si1012CR-T1-GE3 (Lead (Pb)-free and Halogen-free)

Marking Code: K

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}	± 8	
Continuous Drain Current (T_J = 150 °C)[a]	T_A = 25 °C	I_D	0.63[a, b]	A
	T_A = 70 °C		0.5[a, b]	
Pulsed Drain Current (t = 300 µs)		I_{DM}	2	
Continuous Source-Drain Diode Current	T_A = 25 °C	I_S	0.2[a, b]	A
Maximum Power Dissipation[a]	T_A = 25 °C	P_D	0.24[a, b]	W
	T_A = 70 °C		0.15[a, b]	
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[b]	t ≤ 5 s	R_{thJA}	440	530	°C/W
	Steady State		540	650	

Notes:
a. Surface mounted on 1" x 1" FR4 board.
b. t = 5 s.

SPECIFICATIONS (T$_J$ = 25 °C, unless otherwise noted)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V$_{DS}$	V$_{GS}$ = 0 V, I$_D$ = 250 µA	20			V
V$_{DS}$ Temperature Coefficient	ΔV$_{DS}$/T$_J$	I$_D$ = 250 µA		17		mV/°C
V$_{GS(th)}$ Temperature Coefficient	ΔV$_{GS(th)}$/T$_J$			- 1.8		
Gate-Source Threshold Voltage	V$_{GS(th)}$	V$_{DS}$ = V$_{GS}$, I$_D$ = 250 µA	0.4		1	V
Gate-Source Leakage	I$_{GSS}$	V$_{DS}$ = 0 V, V$_{GS}$ = ± 8 V			± 30	µA
		V$_{DS}$ = 0 V, V$_{GS}$ = ± 4.5 V			± 1	
Zero Gate Voltage Drain Current	I$_{DSS}$	V$_{DS}$ = 20 V, V$_{GS}$ = 0 V			1	
		V$_{DS}$ = 20 V, V$_{GS}$ = 0 V, T$_J$ = 85 °C			10	
On-State Drain Current[a]	I$_{D(on)}$	V$_{DS}$ = ≥ 5 V, V$_{GS}$ = 4.5 V	2			A
Drain-Source On-State Resistance[a]	R$_{DS(on)}$	V$_{GS}$ = 4.5 V, I$_D$ = 0.6 A		0.330	0.396	Ω
		V$_{GS}$ = 2.5 V, I$_D$ = 0.3 A		0.380	0.456	
		V$_{GS}$ = 1.8 V, I$_D$ = 0.3 A		0.420	0.546	
		V$_{GS}$ = 1.5 V, I$_D$ = 0.05 A		0.720	1.100	
Forward Transconductance	g$_{fs}$	V$_{DS}$ = 10 V, I$_D$ = 0.5 A		7.5		S
Dynamic[b]						
Input Capacitance	C$_{iss}$	V$_{DS}$ = 10 V, V$_{GS}$ = 0 V, f = 1 MHz		43		pF
Output Capacitance	C$_{oss}$			14		
Reverse Transfer Capacitance	C$_{rss}$			8		
Total Gate Charge	Q$_g$	V$_{DS}$ = 10 V, V$_{GS}$ = 8 V, I$_D$ = 0.6 A		1.3	2	nC
		V$_{DS}$ = 10 V, V$_{GS}$ = 4.5 V, I$_D$ = 0.6 A		0.75	1.2	
Gate-Source Charge	Q$_{gs}$			0.15		
Gate-Drain Charge	Q$_{gd}$			0.13		
Gate Resistance	R$_g$	f = 1 MHz	2.4	12.2	24.4	Ω
Turn-On Delay Time	t$_{d(on)}$	V$_{DD}$ = 10 V, R$_L$ = 20 Ω, I$_D$ ≅ 0.5 A, V$_{GEN}$ = 4.5 V, R$_g$ = 1 Ω		11	20	ns
Rise Time	t$_r$			16	24	
Turn-Off Delay Time	t$_{d(off)}$			26	39	
Fall Time	t$_f$			11	20	
Drain-Source Body Diode Characteristics						
Pulse Diode Forward Current[a]	I$_{SM}$				2	A
Body Diode Voltage	V$_{SD}$	I$_S$ = 0.5 A		0.8	1.2	V
Body Diode Reverse Recovery Time	t$_{rr}$	I$_F$ = 0.5 A, dI/dt = 100 A/µs		10	15	ns
Body Diode Reverse Recovery Charge	Q$_{rr}$			2	4	nC
Reverse Recovery Fall Time	t$_a$			5		ns
Reverse Recovery Rise Time	t$_b$			5		

Notes:
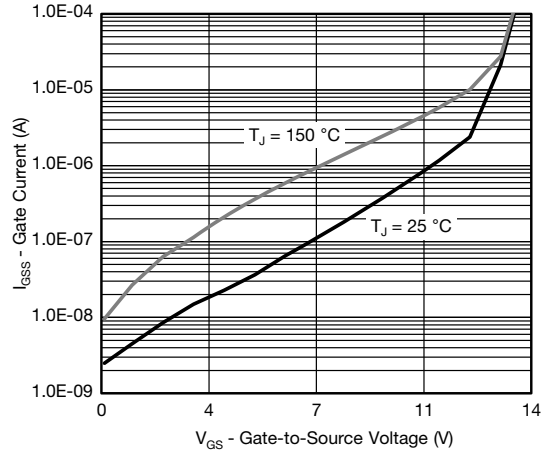a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.

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.
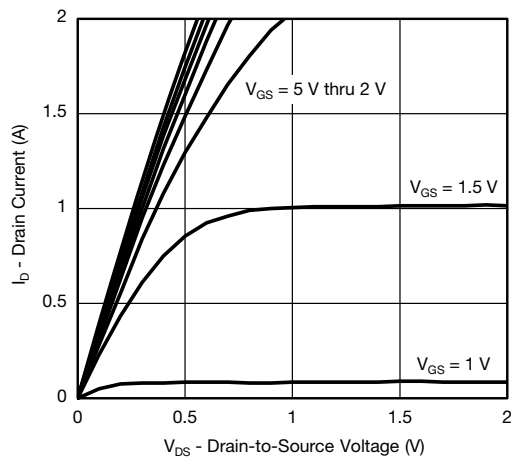
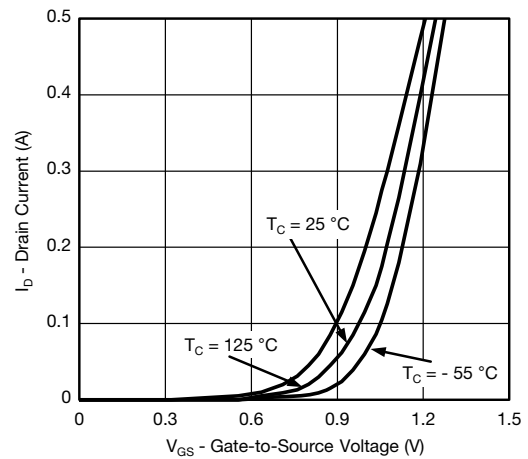**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)

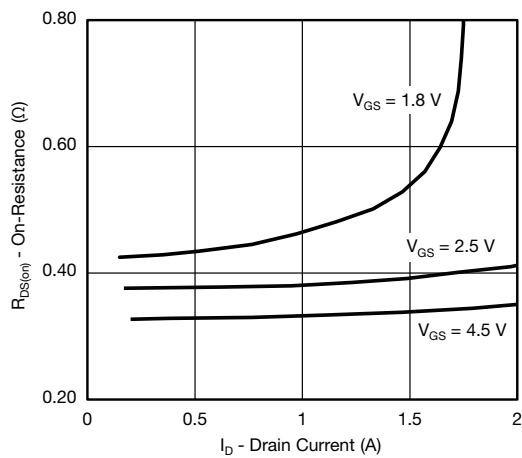Gate Current vs. Gate-Source Voltage

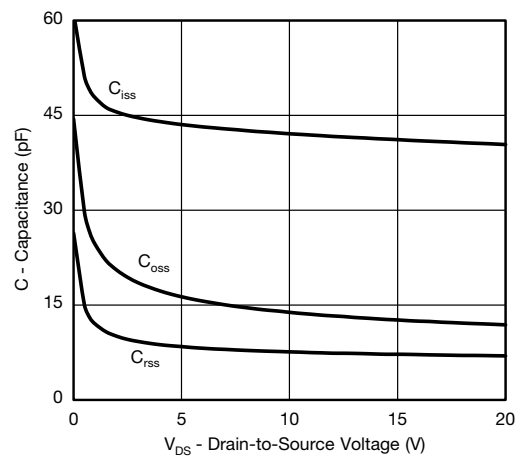Gate Current vs. Gate-Source Voltage

Output Characteristics

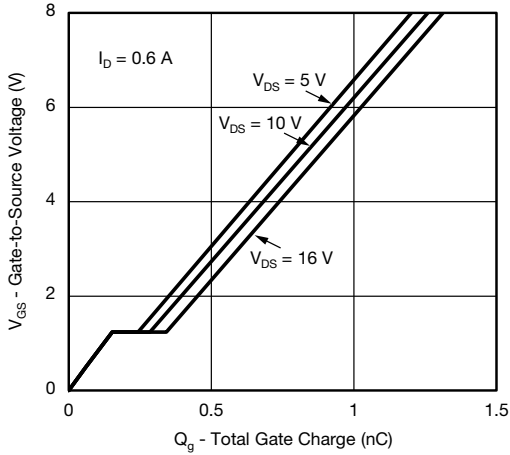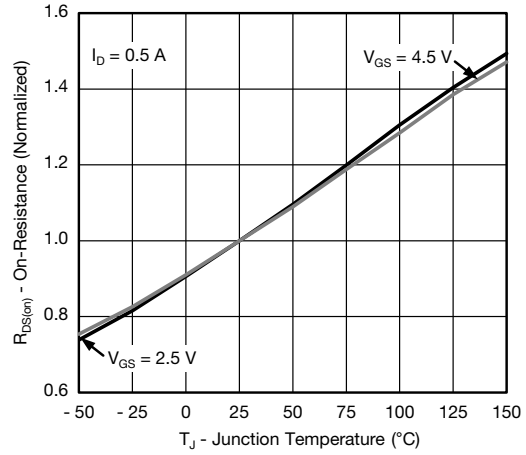Transfer Characteristics

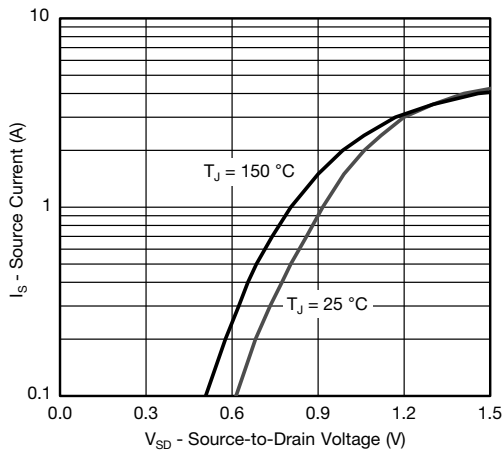On-Resistance vs. Drain Current

Capacitance

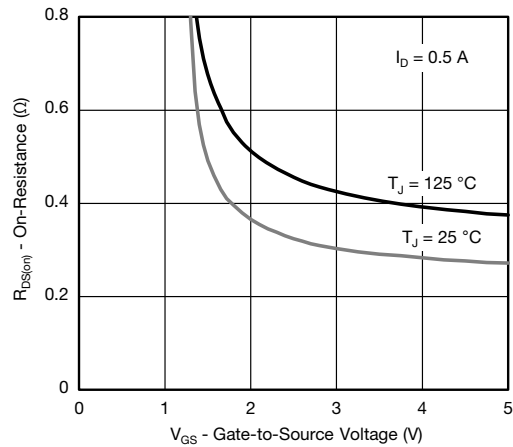## TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)
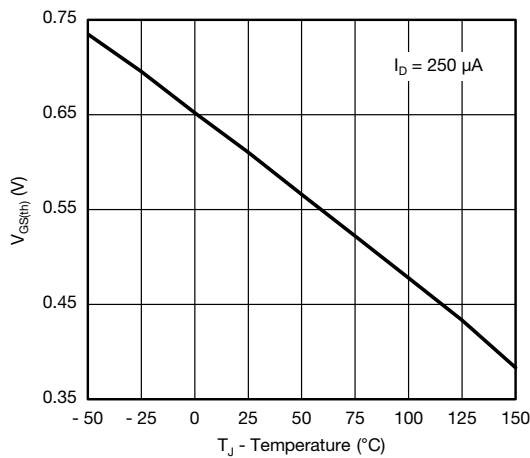

Gate Charge
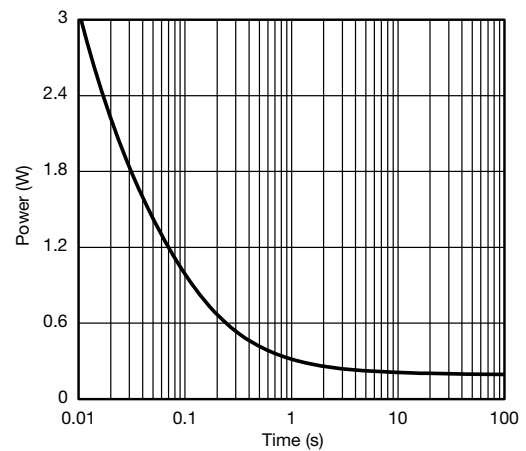

On-Resistance vs. Junction Temperature

Soure-Drain Diode Forward Voltage

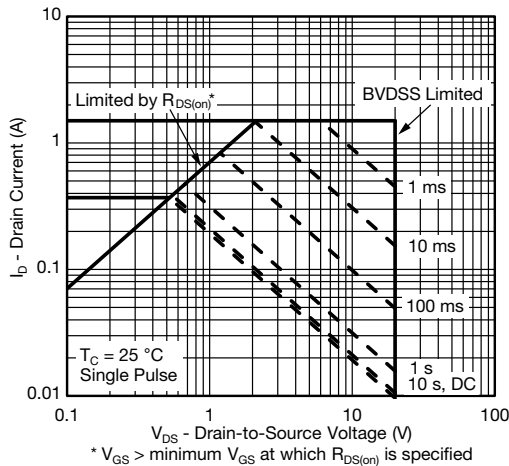**On-Resistance vs. Gate-to-Source Voltage**

Threshold Voltage

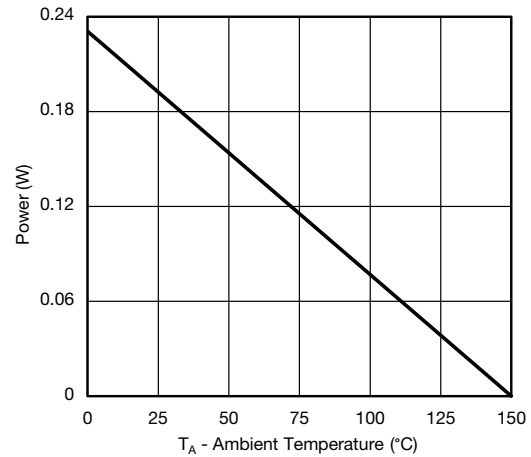**Single Pulse Power, Junction-to-Ambient**

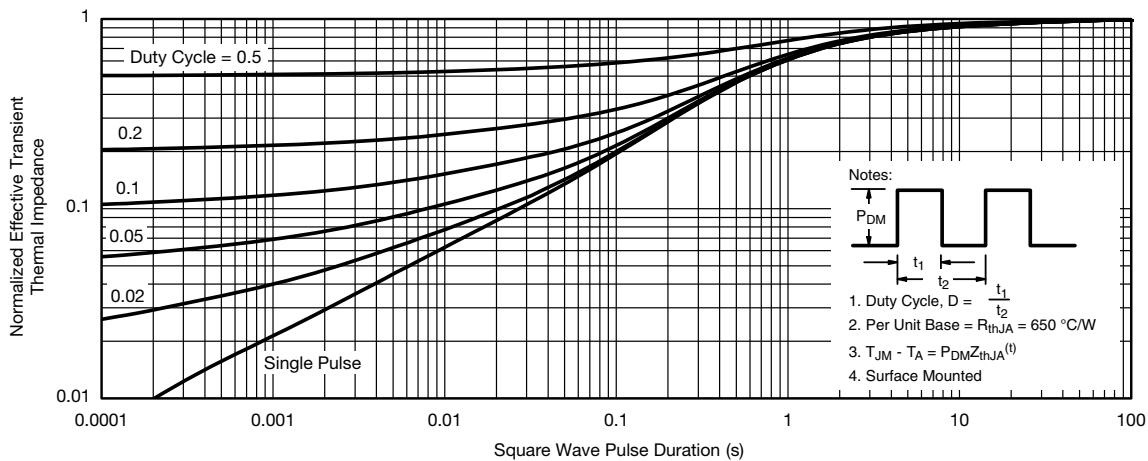## TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

Safe Operating Area, Junction-to-Ambient

Power Derating, Junction-to-Ambient

* The power dissipation P_D is based on $T_{J(max.)}$ = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

Normalized Thermal Transient Impedance, Junction-to-Ambient

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Document Number: 67519
S13-0195-Rev. E, 28-Jan-13

For technical questions, contact: pmostechsupport@vishay.com

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SC-75A: 3 Leads

DWG: 5868

Notes

Dimensions in millimeters will govern.

1. Dimension D does not include mold flash, protrusions or gate burrs. Mold flash protrusions or gate burrs shall not exceed 0.10 mm per end. Dimension E1 does not include Interlead flash or protrusion. Interlead flash or protrusion shall not exceed 0.10 mm per side.
2. Dimensions D and E1 are determined at the outmost extremes of the plastic body exclusive of mold flash, tie bar burrs, gate burrs and interlead flash, but including any mismatch between the top and bottom of the plastic body.
3. Datums A, B and D to be determined 0.10 mm from the lead tip.
4. Terminal positions are shown for reference only.
5. These dimensions apply to the flat section of the lead between 0.08 mm and 0.15 mm from the lead tip.

DIMENSIONS	TOLERANCES
aaa	0.10
bbb	0.10
ccc	0.10
ddd	0.10

DIM.	MILLIMETERS			NOTE
	MIN.	NOM.	MAX.	
A	-	-	0.80	
A1	0.00	-	0.10	
A2	0.65	0.70	0.80	
B1	0.19	-	0.24	5
b1	0.17	-	0.21	
c	0.13	-	0.15	5
c1	0.10	-	0.12	5
D	1.48	1.575	1.68	1, 2
E	1.50	1.60	1.70	
E1	0.66	0.76	0.86	1, 2
e1	0.50 BSC			
e2	1.00 BSC			
e3	0.50 BSC			
L	0.15	0.205	0.30	
L1	0.40 ref.			
L2	0.15 BSC			
q	0°	-	8°	
q1	4°	-	10°	

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RECOMMENDED MINIMUM PADS FOR SC-75A: 3-Lead

Recommended Minimum Pads
Dimensions in Inches/(mm)

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APPLICATION NOTE

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