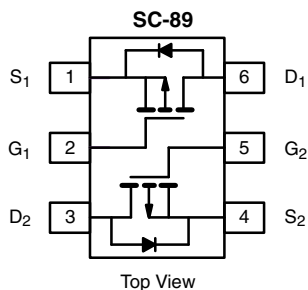


P-Channel 60 V (D-S) MOSFET

PRODUCT SUMMARY

V_{DS} (min) (V)	$R_{DS(on)}$ (Ω)	$V_{GS(th)}$ (V)	I_D (mA)
- 60	4 at $V_{GS} = - 10$ V	- 1 to - 3.0	- 500



Marking Code: D

Ordering Information: Si1025X-T1-GE3 (Lead (Pb)-free and Halogen-free)

FEATURES

- **Halogen-free According to IEC 61249-2-21 Definition**
- TrenchFET® Power MOSFETs
- High-Side Switching
- Low On-Resistance: 4 Ω
- Low Threshold: - 2 V (typ.)
- Fast Switching Speed: 20 ns (typ.)
- Low Input Capacitance: 23 pF (typ.)
- Miniature Package
- Gate-Source ESD Protected: 2000 V
- Compliant to RoHS Directive 2002/95/EC


RoHS
 COMPLIANT
 HALOGEN
FREE

BENEFITS

- Ease in Driving Switches
- Low Offset Voltage
- Low-Voltage Operation
- High-Speed Circuits
- Easily Driven Without Buffer
- Small Board Area

APPLICATIONS

- Drivers: Relays, Solenoids, Lamps, Hammers, Displays, Memories, Transistors etc.
- Battery Operated Systems
- Power Supply Converter Circuits
- Solid State Relays

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

Parameter	Symbol	5 s	Steady State	Unit	
Drain-Source Voltage	V_{DS}	- 60		V	
Gate-Source Voltage	V_{GS}	± 20			
Continuous Drain Current ($T_J = 150$ °C) ^a	I_D	$T_A = 25$ °C	- 200	- 190	mA
		$T_A = 85$ °C	- 145	- 135	
Pulsed Drain Current ^b	I_{DM}	- 650			
Continuous Source Current (Diode Conduction) ^a	I_S	- 450	- 380		
Maximum Power Dissipation ^a	P_D	$T_A = 25$ °C	280	250	mW
		$T_A = 85$ °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:

a. Surface mounted on FR4 board.

b. Pulse width limited by maximum junction temperature.

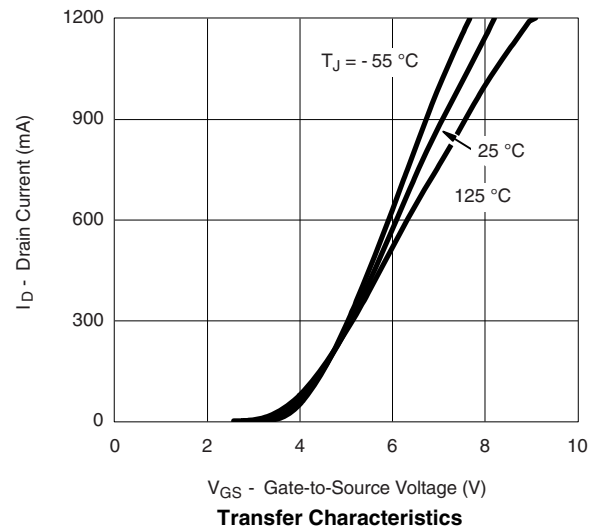
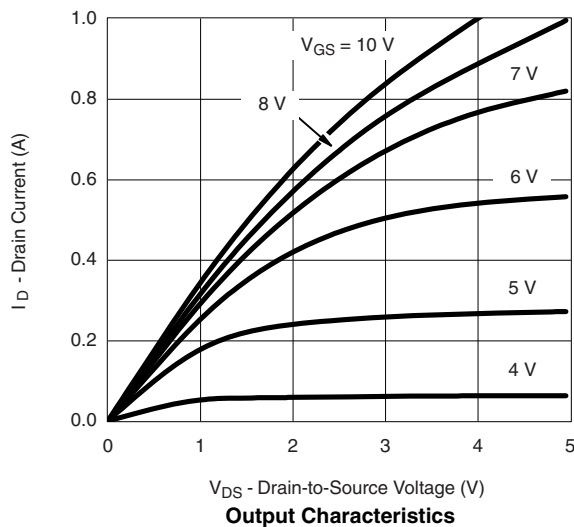
SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = -10\text{ }\mu\text{A}$	- 60			V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -0.25\text{ mA}$	- 1		- 3.0	
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 10\text{ V}$			± 200	nA
		$V_{DS} = 0\text{ V}, V_{GS} = \pm 5\text{ V}$			± 100	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -50\text{ V}, V_{GS} = 0\text{ V}$			- 25	
		$V_{DS} = -50\text{ V}, V_{GS} = 0\text{ V}, T_J = 85\text{ }^\circ\text{C}$			- 250	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} = -10\text{ V}, V_{GS} = -4.5\text{ V}$	- 50			mA
		$V_{DS} = -10\text{ V}, V_{GS} = -10\text{ V}$	- 600			
Drain-Source On-Resistance ^a	$R_{DS(on)}$	$V_{GS} = -4.5\text{ V}, I_D = -25\text{ mA}$			8	Ω
		$V_{GS} = -10\text{ V}, I_D = -500\text{ mA}$			4	
		$V_{GS} = -10\text{ V}, I_D = -500\text{ mA}, T_J = 125\text{ }^\circ\text{C}$			6	
Forward Transconductance ^a	g_{fs}	$V_{DS} = -10\text{ V}, I_D = -100\text{ mA}$		100		mS
Diode Forward Voltage ^a	V_{SD}	$I_S = -200\text{ mA}, V_{GS} = 0\text{ V}$			- 1.4	V
Dynamic^b						
Total Gate Charge	Q_g	$V_{DS} = -30\text{ V}, V_{GS} = -15\text{ V}, I_D \cong -500\text{ mA}$		1.7		nC
Gate-Source Charge	Q_{gs}			0.26		
Gate-Drain Charge	Q_{gd}			0.46		
Input Capacitance	C_{iss}	$V_{DS} = -25\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		23		pF
Output Capacitance	C_{oss}			10		
Reverse Transfer Capacitance	C_{rss}			5		
Switching^{b, c}						
Turn-On Time	t_{ON}	$V_{DD} = -25\text{ V}, R_L = 150\text{ }\Omega, I_D \cong -165\text{ mA},$ $V_{GEN} = -10\text{ V}, R_g = 10\text{ }\Omega$		20		ns
Turn-Off Time	t_{OFF}			35		

Notes:

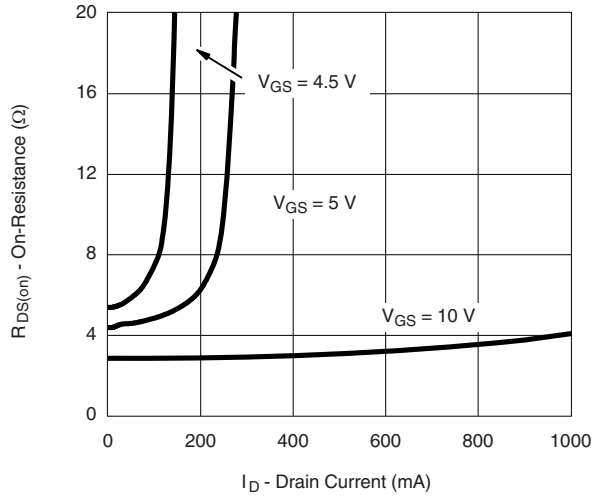
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
- b. For DESIGN AID ONLY, not subject to production testing.
- c. Switching time is essentially independent of operating temperature.

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.

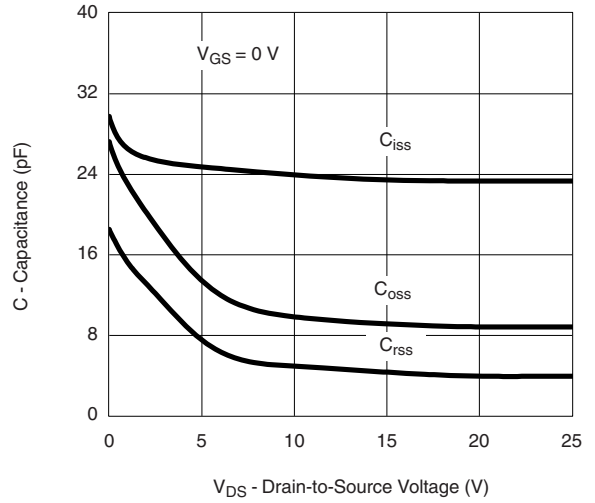
TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)



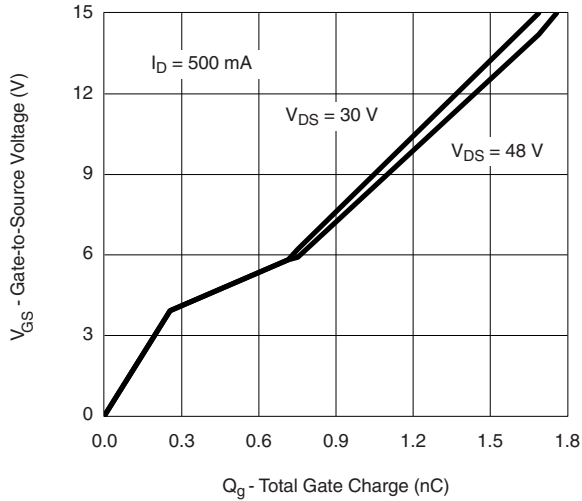
TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)



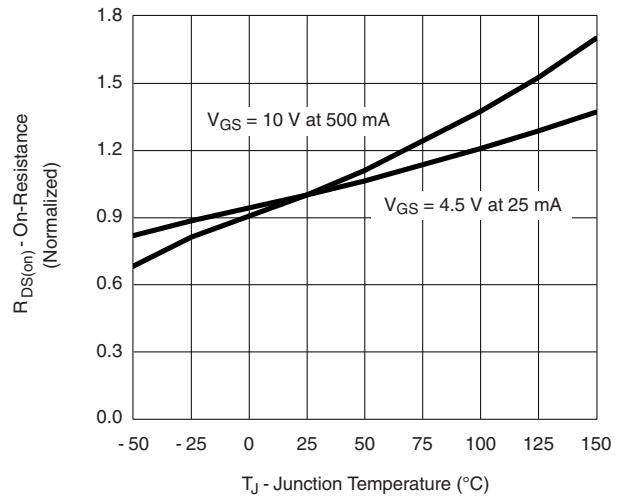
On-Resistance vs. Drain Current



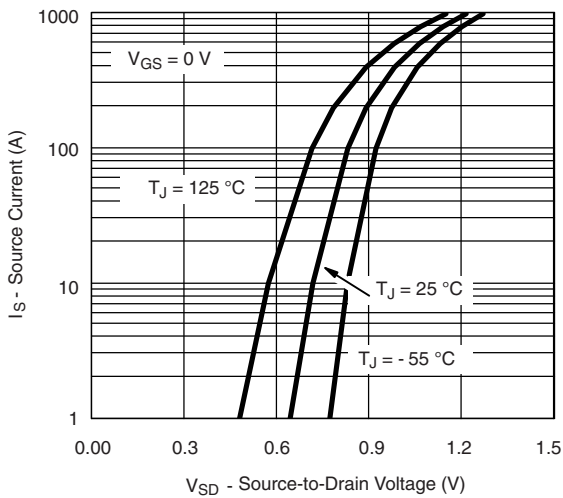
Capacitance



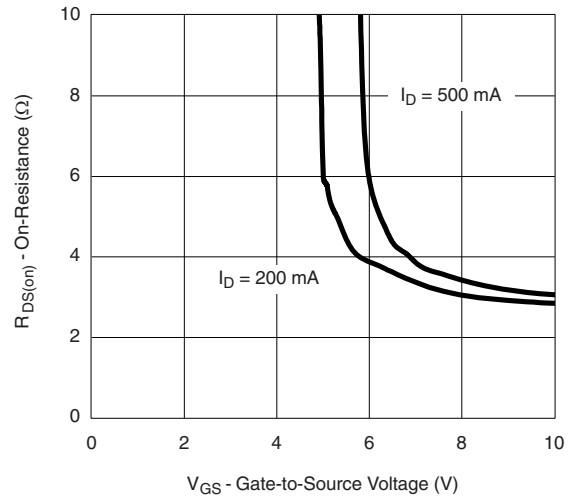
Gate Charge



On-Resistance vs. Junction Temperature

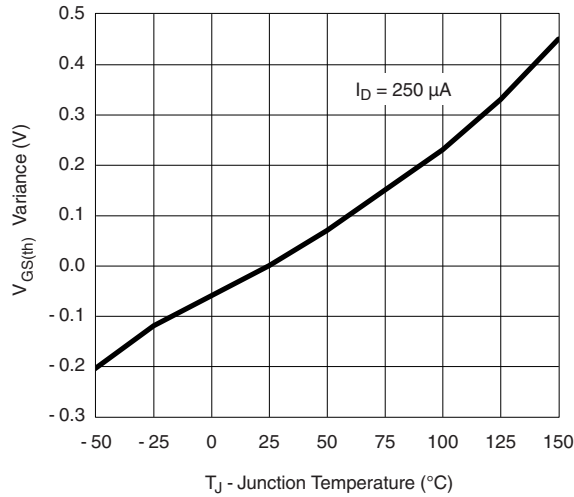


Source-Drain Diode Forward Voltage

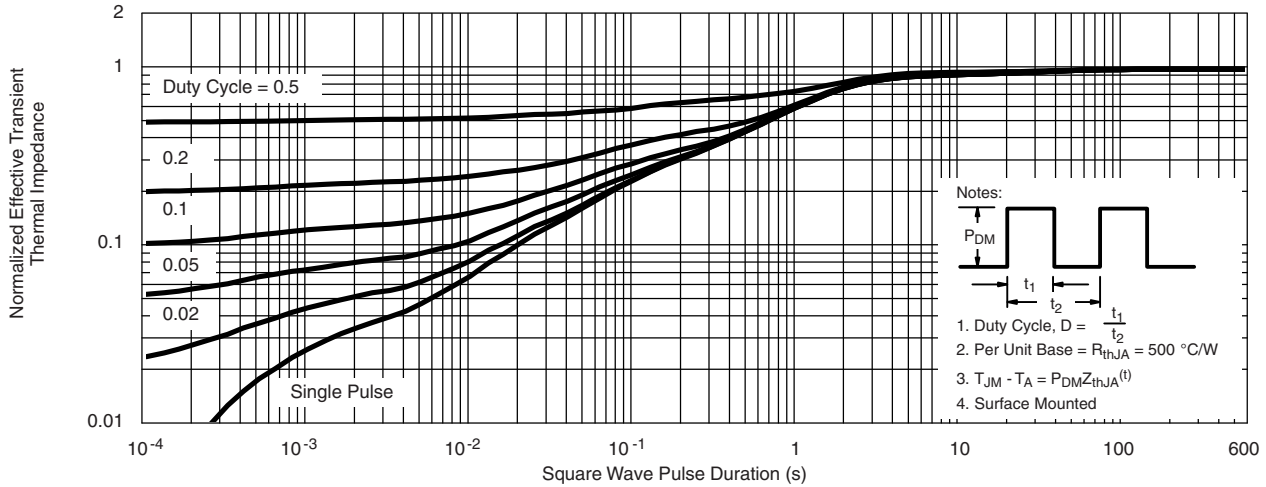


On-Resistance vs. Gate-to-Source Voltage

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



Threshold Voltage Variance Over Temperature



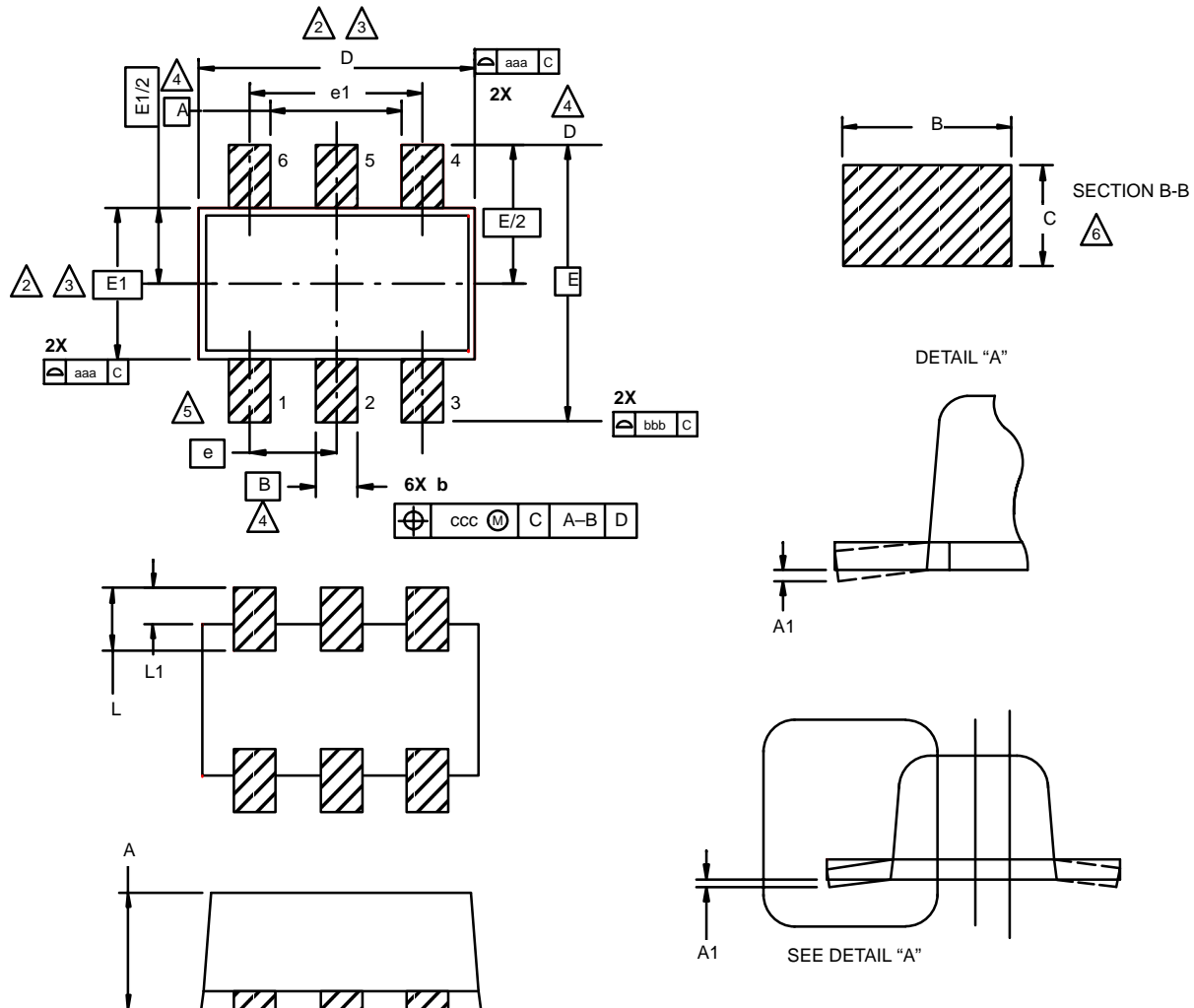
Normalized Thermal Transient Impedance, Junction-to-Ambient

Notes:

1. Duty Cycle, $D = \frac{t_1}{t_2}$
2. Per Unit Base = $R_{thJA} = 500\text{ }^\circ\text{C/W}$
3. $T_{JM} - T_A = P_{DM}Z_{thJA}^{(t)}$
4. Surface Mounted

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?71433.

SC89: 6- LEADS (SOT-563F)



NOTES:

1. Dimensions in millimeters.

2 Dimension D does not include mold flash, protrusions or gate burrs. Mold flash, protrusions or gate burrs shall not exceed 0.15 mm per dimension E1 does not include interlead flash or protrusion, interlead flash or protrusion shall not exceed 0.15 mm per side.

3 Dimensions D and E1 are determined at the outmost extremes of the plastic body exclusive of mold flash, the bar burrs, gate burrs and interlead flash, but including any mismatch between the top and the bottom of the plastic body.

4 Datums A, B and D to be determined 0.10 mm from the lead tip.

5 Terminal numbers are shown for reference only.

6 These dimensions apply to the flat section of the lead between 0.08 mm and 0.15 mm from the lead tip.

Dim	MILLIMETERS		Note	Symbol	Tolerances Of Form And Position
	Min	Max			
A	0.56	0.60		aaa	0.10
A1	0.00	0.10		bbb	0.10
b	0.15	0.30		ccc	0.10
c	0.10	0.18			
D	1.50	1.70	2, 3		
E	1.55	1.70			
E1	1.20 BSC		2, 3		
e	0.50 BSC				
e1	1.00 BSC				
L	0.35 BSC				
L1	0.20 BSC				

ECN: E-00499—Rev. B, 02-Jul-01
DWG: 5880

RECOMMENDED MINIMUM PADS FOR SC-89: 6-Lead



Recommended Minimum Pads
Dimensions in Inches/(mm)

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Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: ocean@oceanchips.ru

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А