

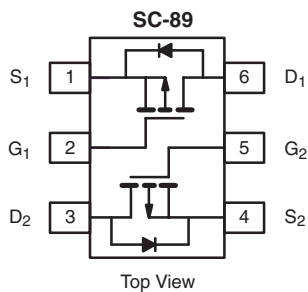
## P-Channel 60-V (D-S) MOSFET

### PRODUCT SUMMARY

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

### FEATURES

- Halogen-free Option Available
- TrenchFET<sup>®</sup> Power MOSFETs
- High-Side Switching
- Low On-Resistance: 4  $\Omega$
- 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


**RoHS**  
COMPLIANT


Marking Code: D

Ordering Information: Si1025X-T1-E3 (Lead (Pb)-free)  
Si1025X-T1-GE3 (Lead (Pb)-free and 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	$V_{GS}$	$\pm 20$			
Continuous Drain Current ( $T_J = 150$ °C) <sup>a</sup>	$I_D$	$T_A = 25$ °C	- 200	- 190	mA
		$T_A = 85$ °C	- 145	- 135	
Pulsed Drain Current <sup>b</sup>	$I_{DM}$	- 650			
Continuous Source Current (Diode Conduction) <sup>a</sup>	$I_S$	- 450	- 380		
Maximum Power Dissipation <sup>a</sup>	$P_D$	$T_A = 25$ °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:

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

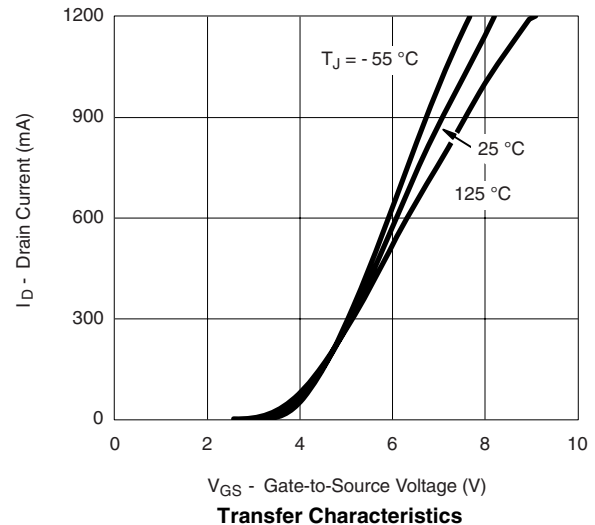
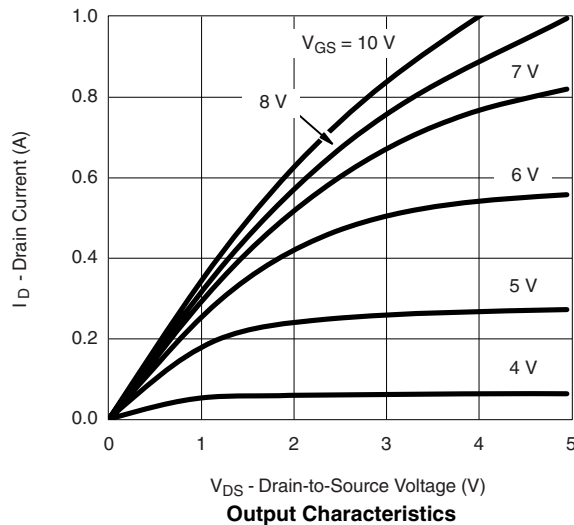
<b>SPECIFICATIONS</b> $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = -10\text{ }\mu\text{A}$	- 60			V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -0.25\text{ mA}$	- 1		- 3.0	
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 10\text{ V}$			$\pm 200$	nA
		$V_{DS} = 0\text{ V}, V_{GS} = \pm 5\text{ V}$			$\pm 100$	
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = -50\text{ V}, V_{GS} = 0\text{ V}$			- 25	mA
		$V_{DS} = -50\text{ V}, V_{GS} = 0\text{ V}, T_J = 85\text{ }^\circ\text{C}$			- 250	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} = -10\text{ V}, V_{GS} = -4.5\text{ V}$	- 50			mA
		$V_{DS} = -10\text{ V}, V_{GS} = -10\text{ V}$	- 600			
Drain-Source On-Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = -4.5\text{ V}, I_D = -25\text{ mA}$			8	$\Omega$
		$V_{GS} = -10\text{ V}, I_D = -500\text{ mA}$			4	
		$V_{GS} = -10\text{ V}, I_D = -500\text{ mA}, T_J = 125\text{ }^\circ\text{C}$			6	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = -10\text{ V}, I_D = -100\text{ mA}$		100		mS
Diode Forward Voltage <sup>a</sup>	$V_{SD}$	$I_S = -200\text{ mA}, V_{GS} = 0\text{ V}$			- 1.4	V
<b>Dynamic<sup>b</sup></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		
<b>Switching<sup>b, c</sup></b>						
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:**

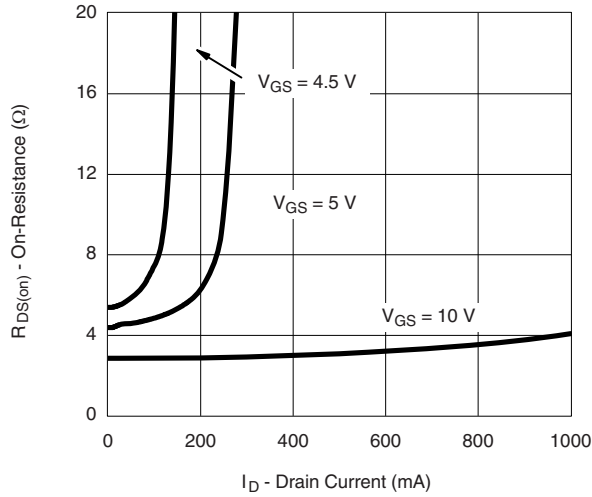
- a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .
- b. For DESIGN AID ONLY, not subject to production testing.
- c. Switching time is essentially independent of operating temperature.

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.

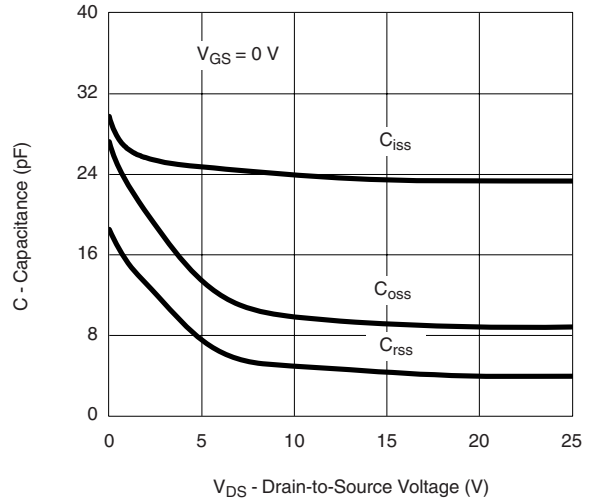
### TYPICAL CHARACTERISTICS $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted



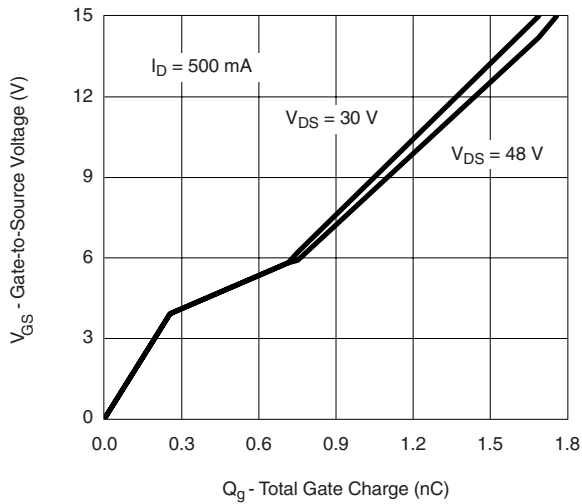
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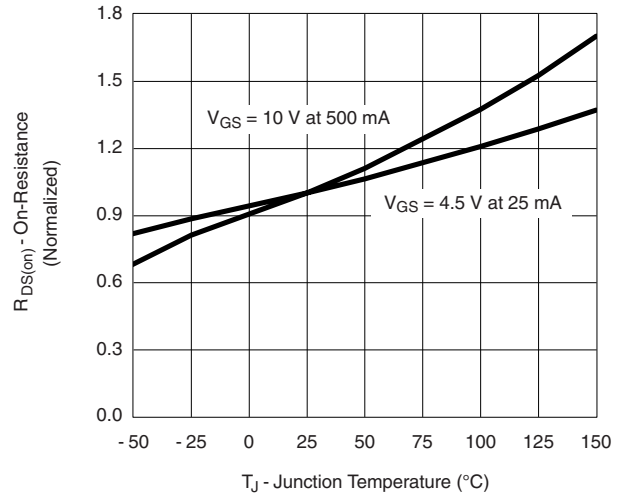
**On-Resistance vs. Drain Current**



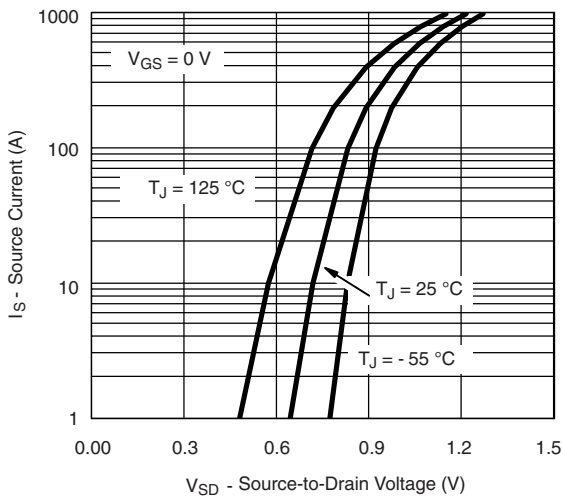
**Capacitance**



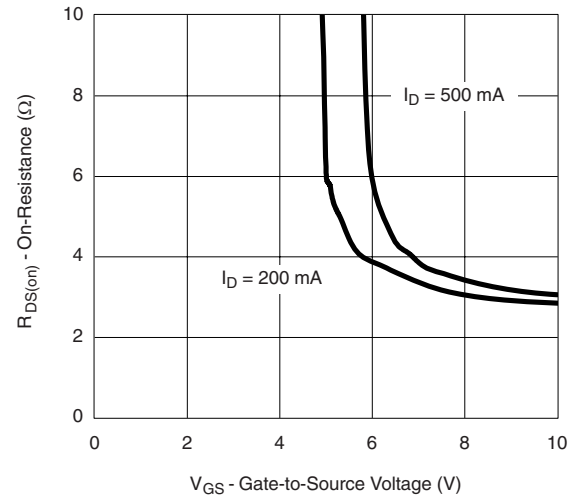
**Gate Charge**



**On-Resistance vs. Junction Temperature**

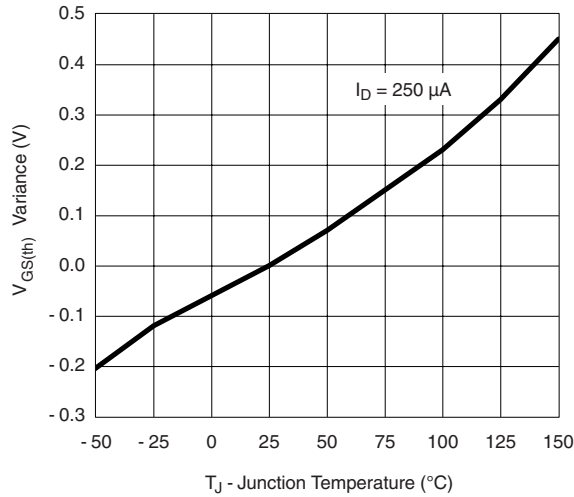


**Source-Drain Diode Forward Voltage**

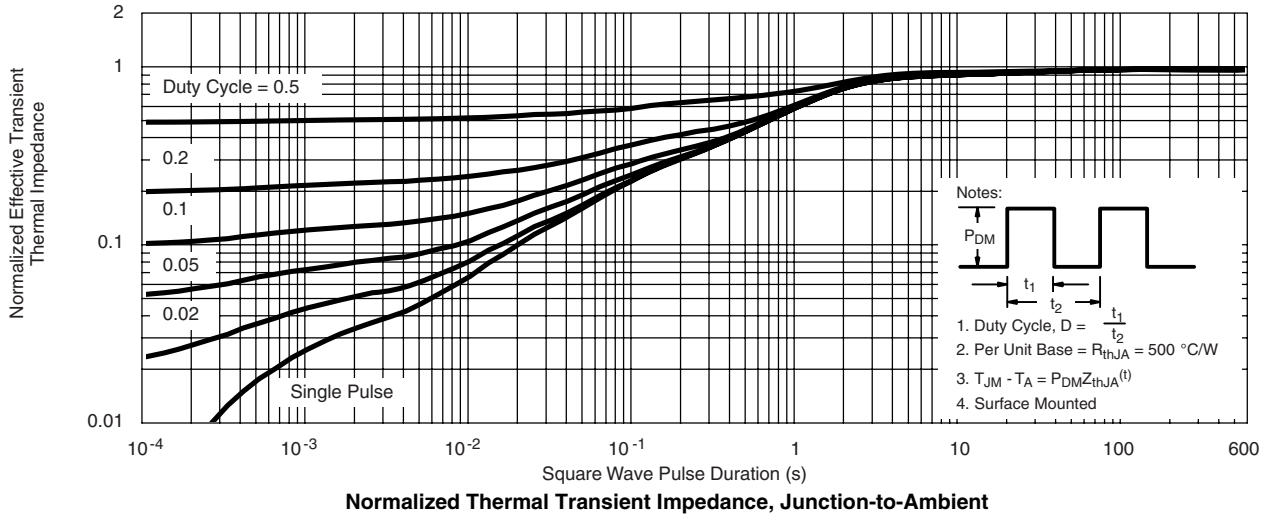


**On-Resistance vs. Gate-to-Source Voltage**

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



**Threshold Voltage Variance Over Temperature**



**Normalized Thermal Transient Impedance, Junction-to-Ambient**

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