

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

## PRODUCT SUMMARY

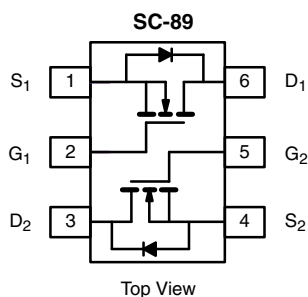
$V_{DS(min)}$ (V)	$R_{DS(on)}$ ( $\Omega$ )	$V_{GS(th)}$ (V)	$I_D$ (mA)
60	1.40 at $V_{GS} = 10$ V	1 to 2.5	500

## FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- Low On-Resistance: 1.40  $\Omega$
- Low Threshold: 2 V (typ.)
- Low Input Capacitance: 30 pF
- Fast Switching Speed: 15 ns (typ.)
- Low Input and Output Leakage
- ESD Protected: 2000 V
- Miniature Package
- Compliant to RoHS Directive 2002/95/EC



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



Marking Code: E

**Ordering Information:** Si1026X-T1-GE3 (Lead (Pb)-free and Halogen-free)

## BENEFITS

- Low Offset Voltage
- Low-Voltage Operation
- High-Speed Circuits
- Low Error Voltage
- Small Board Area

## APPLICATIONS

- Drivers: Relays, Solenoids, Lamps, Hammers, Displays, Memories, Transistors, etc.
- Battery Operated Systems
- 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>	$I_D$	320	305	mA
		230	220	
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>	$P_D$	280	250	mW
		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.

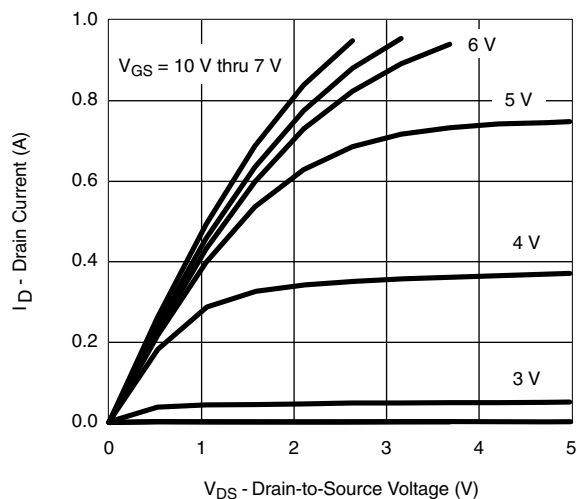
SPECIFICATIONS (T <sub>J</sub> = 25 °C, unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V <sub>DS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 10 μA	60			V
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 0.25 mA	1		2.5	
Gate-Body Leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 10 V			± 150	nA
		V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 5 V			± 50	
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 60 V, V <sub>GS</sub> = 0 V			1	μA
		V <sub>DS</sub> = 60 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> = 10 V, V <sub>GS</sub> = 4.5 V	500			mA
		V <sub>DS</sub> = 7.5 V, V <sub>GS</sub> = 10 V	800			
Drain-Source On-Resistance <sup>a</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 200 mA			3.0	Ω
		V <sub>GS</sub> = 10 V, I <sub>D</sub> = 500 mA			1.40	
		V <sub>GS</sub> = 10 V, I <sub>D</sub> = 500 mA, T <sub>J</sub> = 125 °C			2.50	
Forward Transconductance <sup>a</sup>	g <sub>fs</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 200 mA		200		mS
Diode Forward Voltage <sup>a</sup>	V <sub>SD</sub>	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 200 mA			1.40	V
Dynamic <sup>b</sup>						
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 250 mA, V <sub>GS</sub> = 4.5 V		600		pC
Gate-Source Charge	Q <sub>gs</sub>			120		
Gate-Drain Charge	Q <sub>gd</sub>			225		
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0 V, f = 1 MHz		30		pF
Output Capacitance	C <sub>oss</sub>			6		
Reverse Transfer Capacitance	C <sub>rss</sub>			3		
Switching <sup>b, c</sup>						
Turn-On Time	t <sub>(on)</sub>	V <sub>DD</sub> = 30 V, R <sub>L</sub> = 150 Ω		15		ns
Turn-Off Time	t <sub>(off)</sub>	I <sub>D</sub> = 200 mA, V <sub>GEN</sub> = 10 V, R <sub>g</sub> = 10 Ω		20		

## Notes:

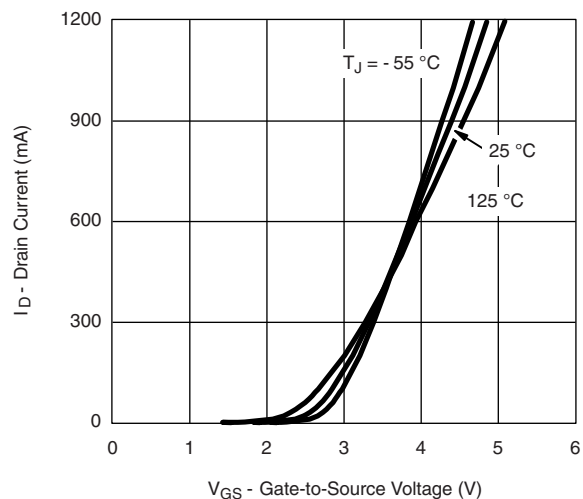
- a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .  
b. For DESIGN AID ONLY, not subject to production testing.  
c. Switching time is essentially independent of operating temperature.

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.

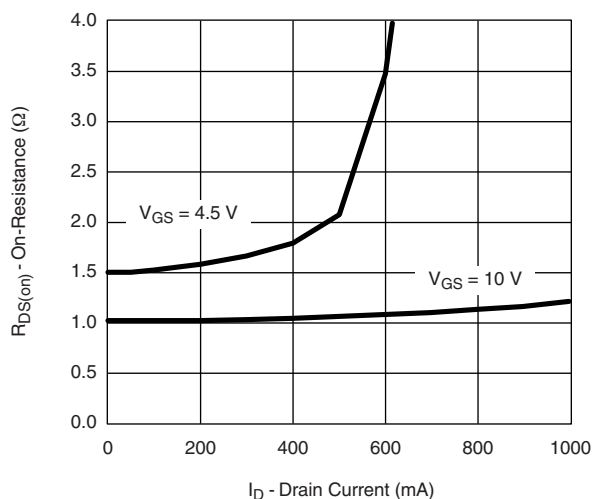
## TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



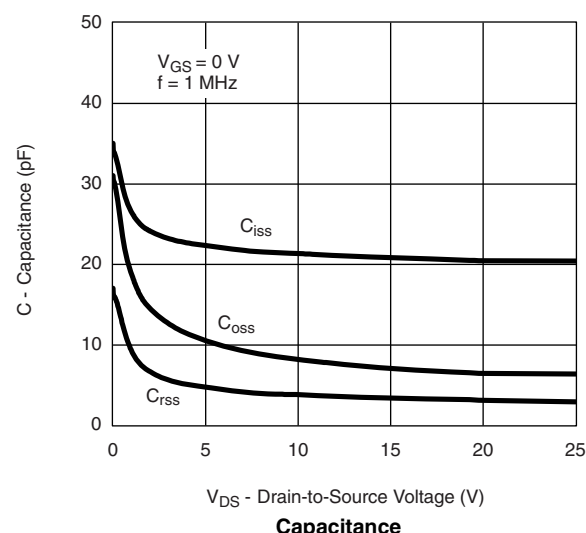
Output Characteristics



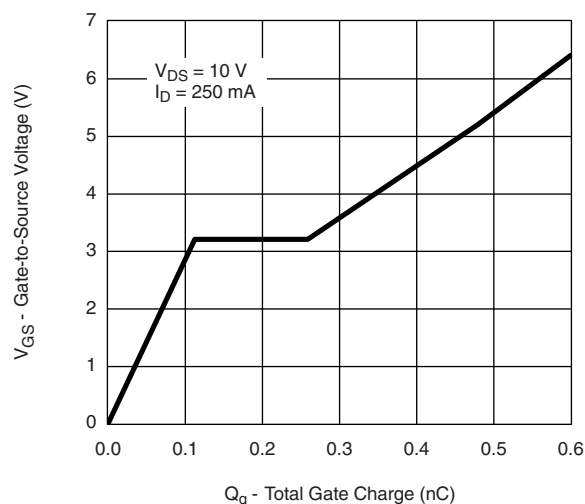
Transfer Characteristics



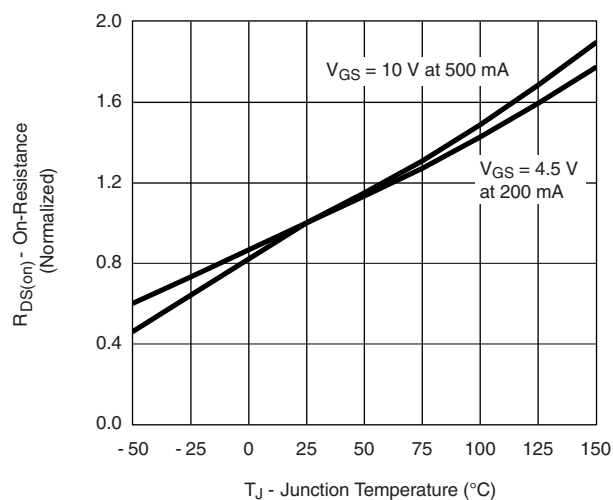
On-Resistance vs. Drain Current



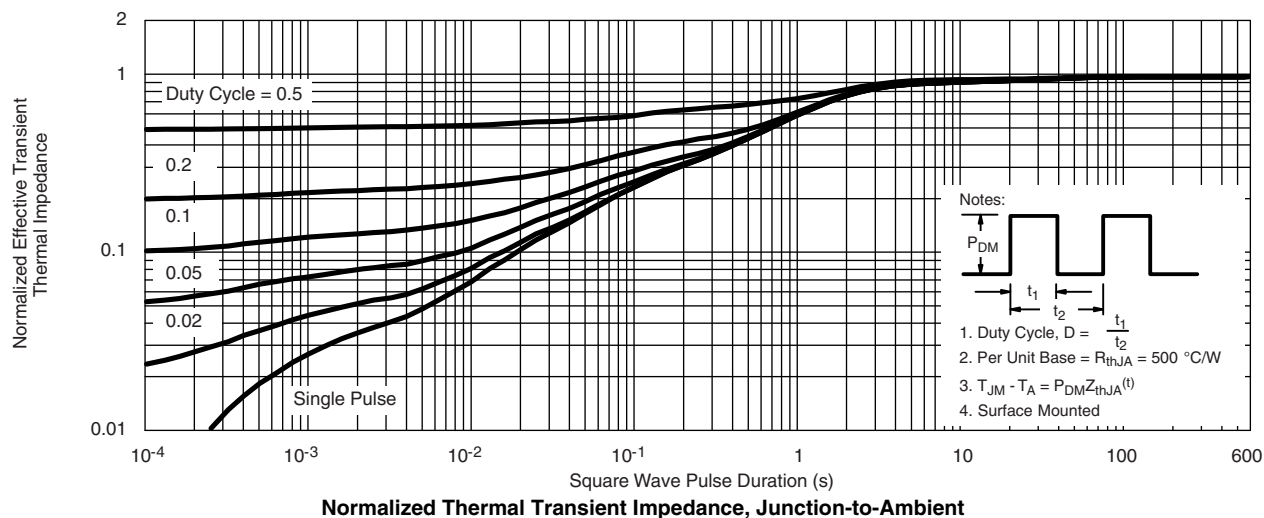
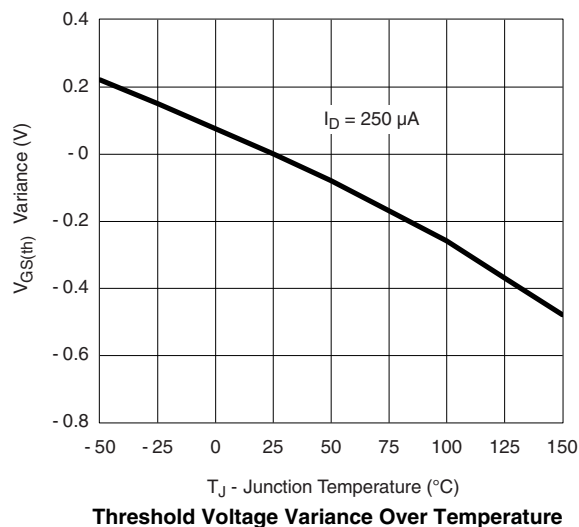
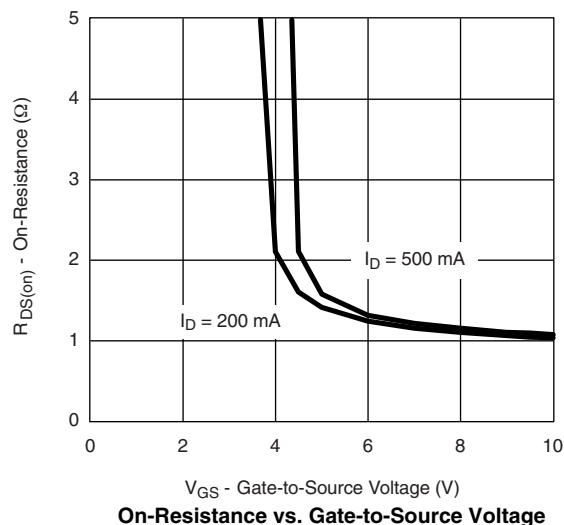
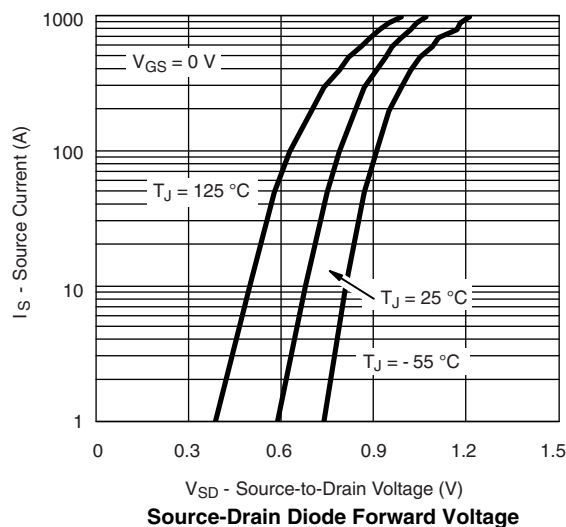
Capacitance



Gate Charge



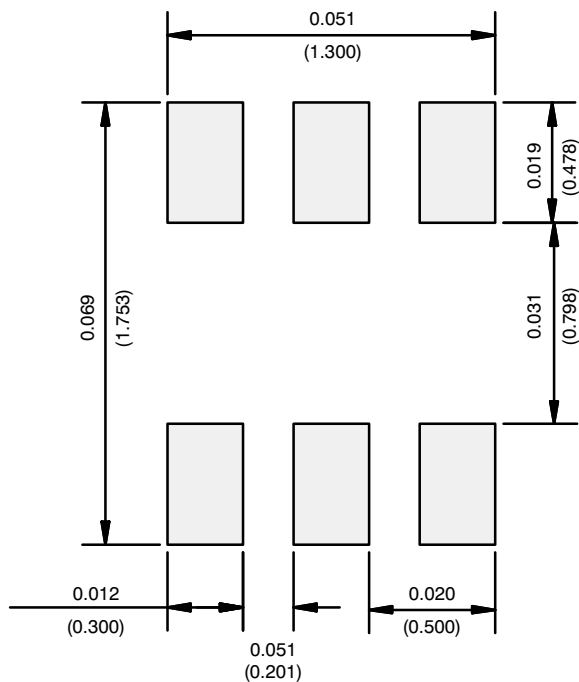
On-Resistance vs. Junction Temperature

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

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



Recommended Minimum Pads  
Dimensions in Inches/(mm)

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