

N-Channel 60 V (D-S) MOSFET

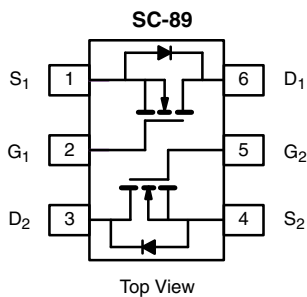
PRODUCT SUMMARY			
$V_{DS(min)}$ (V)	$R_{DS(on)}$ (Ω)	$V_{GS(th)}$ (V)	I_D (mA)
60	1.40 at $V_{GS} = 10$ V	1 to 2.5	500

FEATURES

- **Halogen-free According to IEC 61249-2-21 Definition**
- Low On-Resistance: 1.40 Ω
- 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

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

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

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	320	305	mA
		$T_A = 85$ °C	230	220	
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:

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

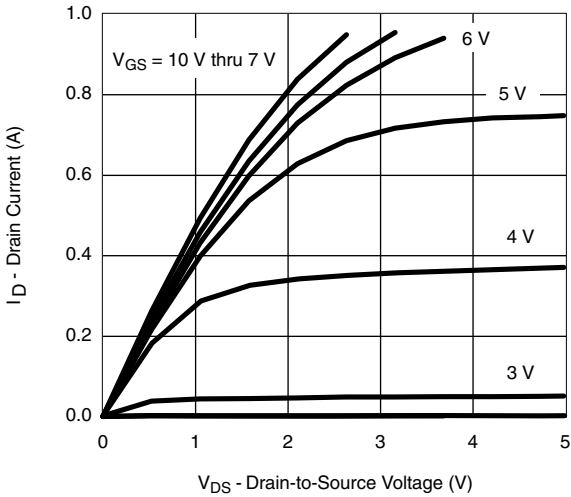
SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}$, $I_D = 10\text{ }\mu\text{A}$	60			V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 0.25\text{ mA}$	1		2.5	
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 10\text{ V}$			± 150	nA
		$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 5\text{ V}$			± 50	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 60\text{ V}$, $V_{GS} = 0\text{ V}$			1	μA
		$V_{DS} = 60\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 85\text{ }^\circ\text{C}$			10	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} = 10\text{ V}$, $V_{GS} = 4.5\text{ V}$	500			mA
		$V_{DS} = 7.5\text{ V}$, $V_{GS} = 10\text{ V}$	800			
Drain-Source On-Resistance ^a	$R_{DS(on)}$	$V_{GS} = 4.5\text{ V}$, $I_D = 200\text{ mA}$			3.0	Ω
		$V_{GS} = 10\text{ V}$, $I_D = 500\text{ mA}$			1.40	
		$V_{GS} = 10\text{ V}$, $I_D = 500\text{ mA}$, $T_J = 125\text{ }^\circ\text{C}$			2.50	
Forward Transconductance ^a	g_{fs}	$V_{DS} = 10\text{ V}$, $I_D = 200\text{ mA}$		200		mS
Diode Forward Voltage ^a	V_{SD}	$V_{GS} = 0\text{ V}$, $I_S = 200\text{ mA}$			1.40	V
Dynamic^b						
Total Gate Charge	Q_g	$V_{DS} = 10\text{ V}$, $I_D = 250\text{ mA}$, $V_{GS} = 4.5\text{ V}$		600		pC
Gate-Source Charge	Q_{gs}			120		
Gate-Drain Charge	Q_{gd}			225		
Input Capacitance	C_{iss}	$V_{DS} = 25\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$		30		pF
Output Capacitance	C_{oss}			6		
Reverse Transfer Capacitance	C_{rss}			3		
Switching^{b, c}						
Turn-On Time	$t_{(on)}$	$V_{DD} = 30\text{ V}$, $R_L = 150\text{ }\Omega$ $I_D = 200\text{ mA}$, $V_{GEN} = 10\text{ V}$, $R_g = 10\text{ }\Omega$		15		ns
Turn-Off Time	$t_{(off)}$			20		

Notes:

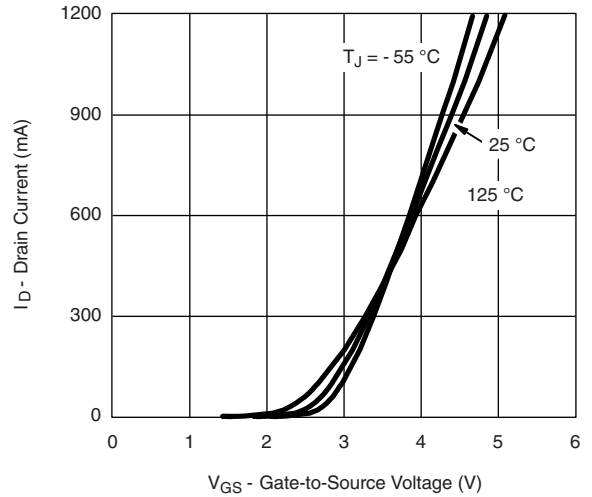
- Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
- For DESIGN AID ONLY, not subject to production testing.
- Switching time is essentially independent of operating temperature.

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.

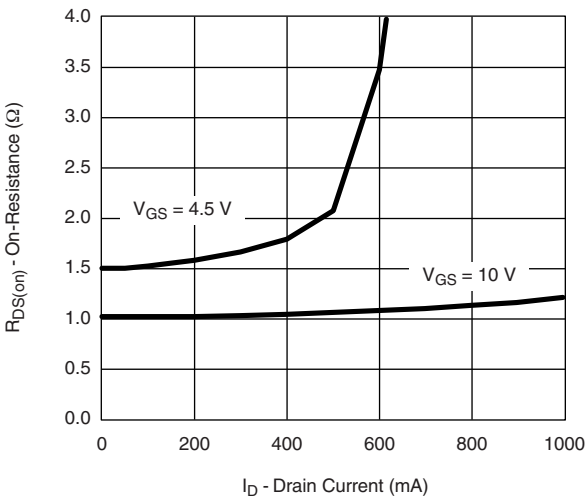
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



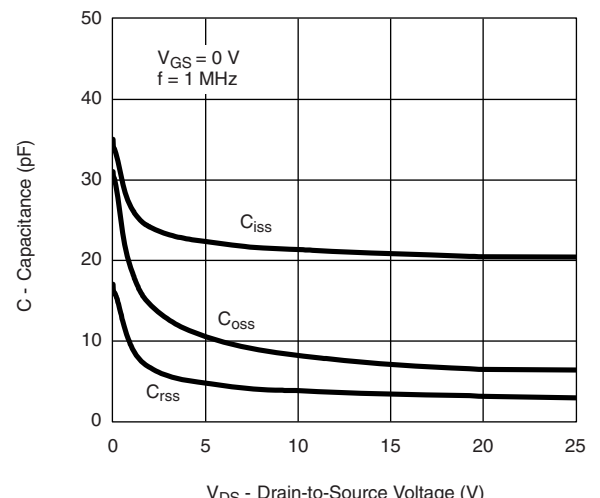
$V_{GS} = 10$ V thru 7 V
Output Characteristics



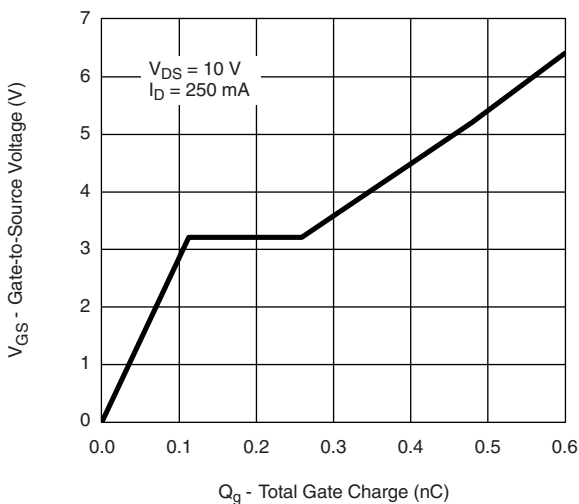
$T_J = -55$ °C
25 °C
125 °C
Transfer Characteristics



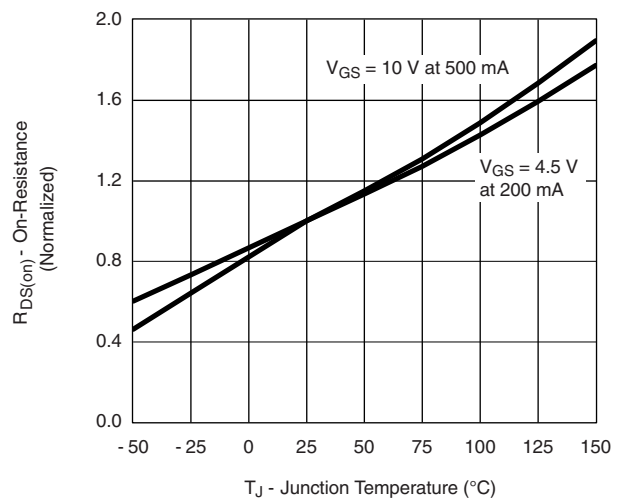
$V_{GS} = 4.5$ V
 $V_{GS} = 10$ V
On-Resistance vs. Drain Current



$V_{GS} = 0$ V
 $f = 1$ MHz
 C_{iss}
 C_{oss}
 C_{rss}
Capacitance

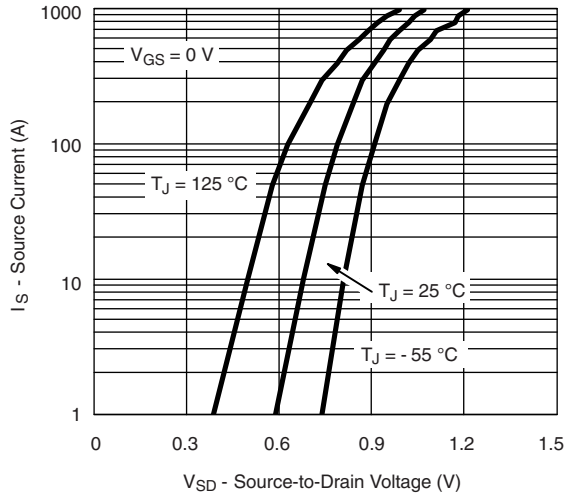


$V_{DS} = 10$ V
 $I_D = 250$ mA
Gate Charge

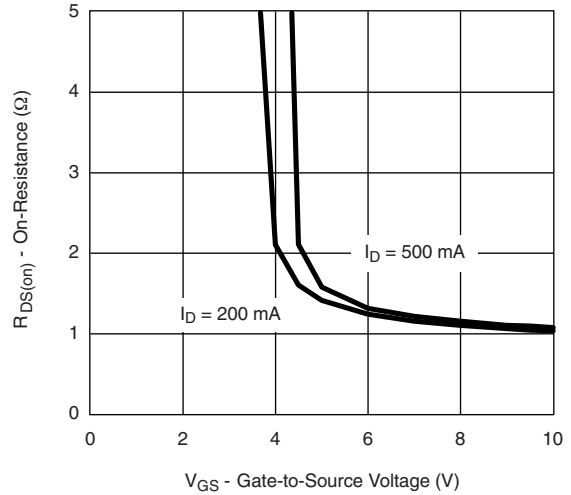


$V_{GS} = 10$ V at 500 mA
 $V_{GS} = 4.5$ V at 200 mA
On-Resistance vs. Junction Temperature

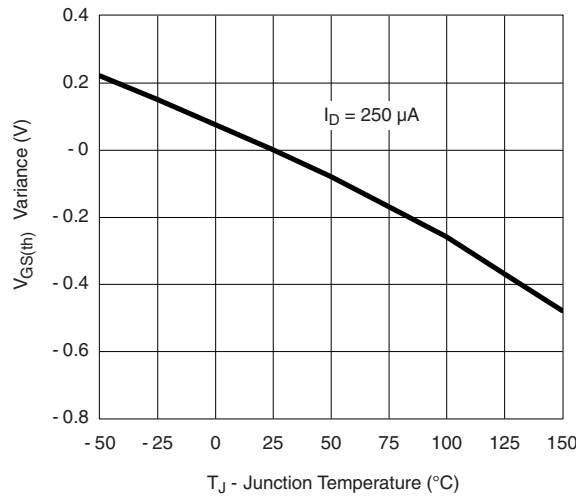
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



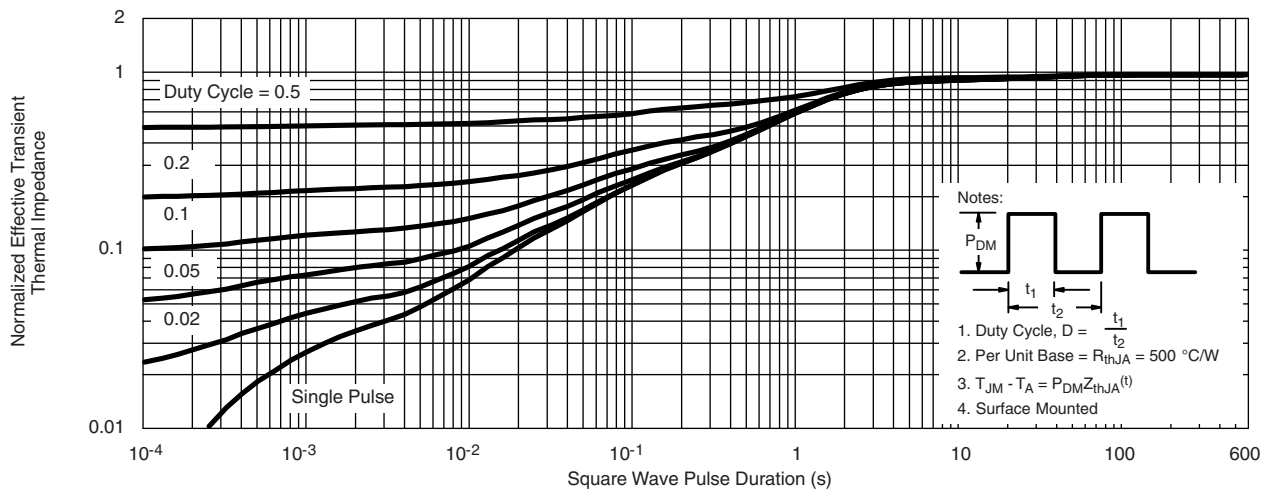
Source-Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage Variance Over Temperature



Normalized Thermal Transient Impedance, Junction-to-Ambient

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SC-89 6-Leads (SOT-563F)



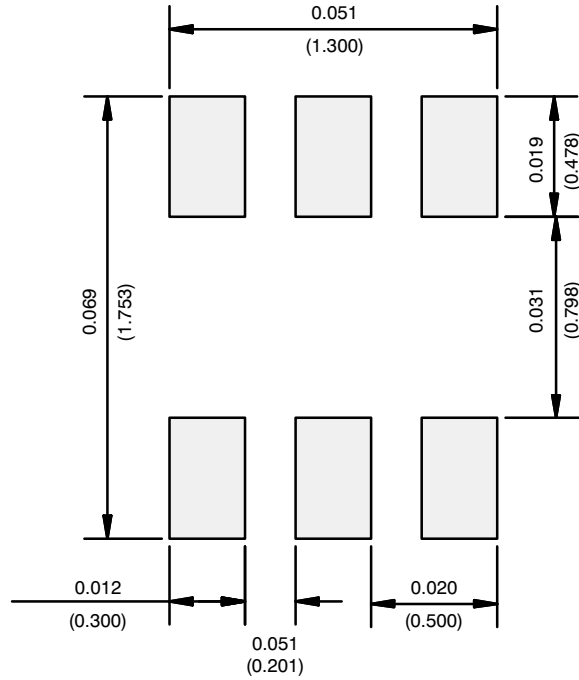
Notes

- Dimensions in millimeters.
- 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.
- 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.
- Datums A, B and D to be determined 0.10 mm from the lead tip.
- Terminal numbers are shown for reference only.
- These dimensions apply to the flat section of the lead between 0.08 mm and 0.15 mm from the lead tip.

DIM.	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.56	0.58	0.60
A1	0	0.02	0.10
b	0.15	0.22	0.30
c	0.10	0.14	0.18
D	1.50	1.60	1.70
E	1.50	1.60	1.70
E1	1.15	1.20	1.25
e	0.45	0.50	0.55
e1	0.95	1.00	1.05
L	0.25	0.35	0.50
L1	0.10	0.20	0.30

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DWG: 5880

RECOMMENDED MINIMUM PADS FOR SC-89: 6-Lead



Recommended Minimum Pads
Dimensions in Inches/(mm)

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