N-Channel 20-V (D-S) MOSFET

PRODUCT SUMMARY		
V_{DS} (V)	$r_{DS(on)}$ (Ω)	I_D (mA)
20	5 @ V_{GS} = 4.5 V	200
	7 @ V_{GS} = 2.5 V	175
	9 @ V_{GS} = 1.8 V	150
	10 @ V_{GS} = 1.5 V	50

TrenchFET ®
MOSFETs
1.5-V Rated

ESD Protected
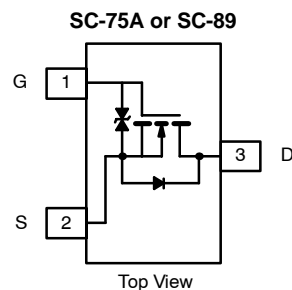**2000 V**

FEATURES

- Low-Side Switching
- Low On-Resistance: 5 Ω
- Low Threshold: 0.9 V (typ)
- Fast Switching Speed: 35 ns
- 1.8-V Operation
- Gate-Source ESD Protection

BENEFITS

- Ease in Driving Switches
- Low Offset (Error) Voltage
- Low-Voltage Operation
- High-Speed Circuits
- Low Battery Voltage Operation

APPLICATIONS

- Drivers: Relays, Solenoids, Lamps, Hammers, Displays, Memories
- Battery Operated Systems
- Power Supply Converter Circuits
- Load/Power Switching Cell Phones, Pagers

SC-75A or SC-89

Top View

Ordering Information:
SC-75A (SOT-416): Si1032R-T1
SC-75A (SOT-416): Si1032R-T1—E3 (Lead Free)
SC-89 (SOT-490): Si1032X-T1
SC-89 (SOT-490): Si1032X-T1—E3 (Lead Free)

Marking Code: G

ABSOLUTE MAXIMUM RATINGS (T_A = 25$°$C UNLESS OTHERWISE NOTED)

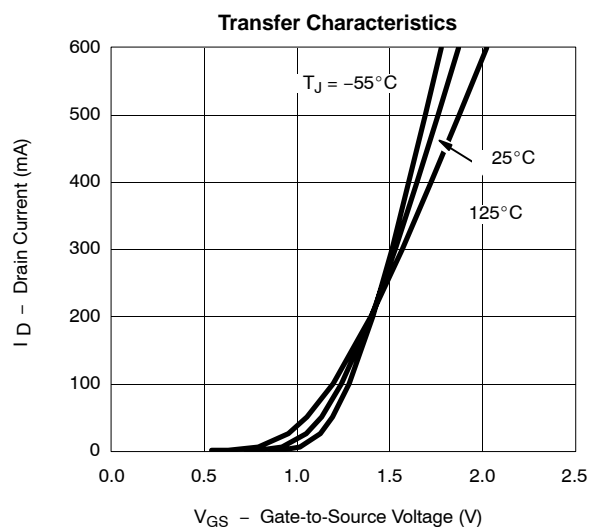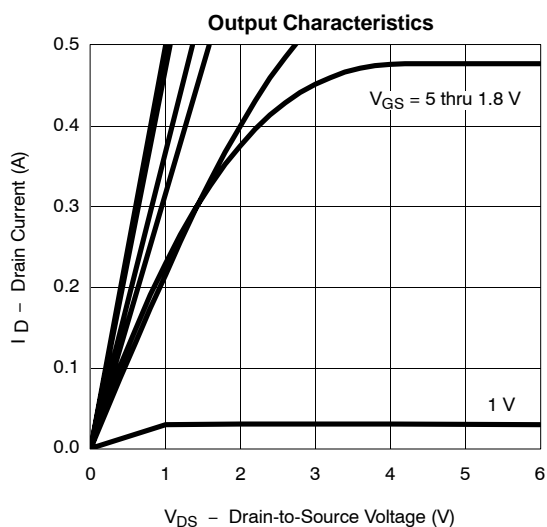| Parameter		Symbol	Si1032R		Si1032X		Unit
			5 secs	Steady State	5 secs	Steady State	
Drain-Source Voltage		V_{DS}	20				V
Gate-Source Voltage		V_{GS}	± 6				
Continuous Drain Current (T_J = 150$°$C)[a]	T_A = 25$°$C	I_D	200	140	210	200	mA
	T_A = 85$°$C		110	100	150	140	
Pulsed Drain Current[a]		I_{DM}	500		600		
Continuous Source Current (diode conduction)[a]		I_S	250	200	300	240	
Maximum Power Dissipation[a] for SC-75	T_A = 25$°$C	P_D	280	250	340	300	mW
	T_A = 85$°$C		145	130	170	150	
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
c.   Surface Mounted on FR4 Board.

SPECIFICATIONS (T_A = 25°C UNLESS OTHERWISE NOTED)

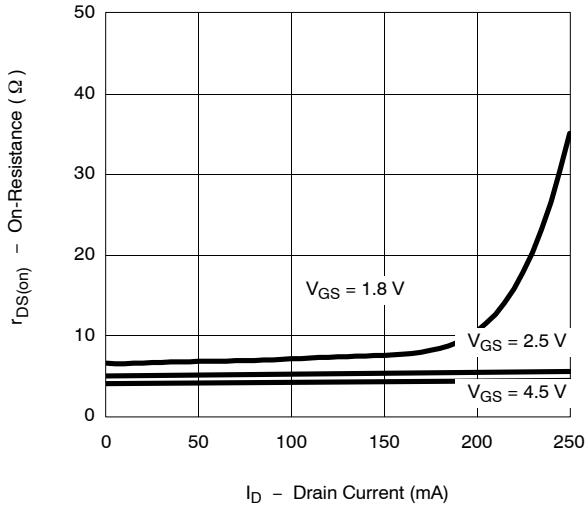| Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Static						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250\ \mu A$	0.40	0.7	1.2	V
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0$ V, $V_{GS} = \pm 2.8$ V		± 0.5	± 1.0	μA
		$V_{DS} = 0$ V, $V_{GS} = \pm 4.5$ V		± 1.0	± 3.0	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 20$ V, $V_{GS} = 0$ V			1	
		$V_{DS} = 20$ V, $V_{GS} = 0$ V, $T_J = 55$°C			10	
On-State Drain Current[a]	$I_{D(on)}$	$V_{DS} = 5$ V, $V_{GS} = 4.5$ V	250			mA
Drain-Source On-State Resistance[a]	$r_{DS(on)}$	$V_{GS} = 4.5$ V, $I_D = 200$ mA			5	Ω
		$V_{GS} = 2.5$ V, $I_D = 175$ m A			7	
		$V_{GS} = 1.8$ V, $I_D = 150$ m A			9	
		$V_{DS} = 1.5$ V, $I_D = 40$ mA			10	
Forward Transconductance[a]	g_{fs}	$V_{DS} = 10$ V, $I_D = 200$ mA		0.5		S
Diode Forward Voltage[a]	V_{SD}	$I_S = 150$ mA, $V_{GS} = 0$ V			1.2	V
Dynamic[b]						
Total Gate Charge	Q_g	$V_{DS} = 10$ V, $V_{GS} = 4.5$ V, $I_D = 150$ mA		750		pC
Gate-Source Charge	Q_{gs}			75		
Gate-Drain Charge	Q_{gd}			225		
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 10$ V, $R_L = 47\ \Omega$, $I_D \cong 200$ mA, $V_{GEN} = 4.5$ V, $R_G = 10\ \Omega$			50	ns
Rise Time	t_r				25	
Turn-Off Delay Time	$t_{d(off)}$				50	
Fall Time	t_f				25	

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

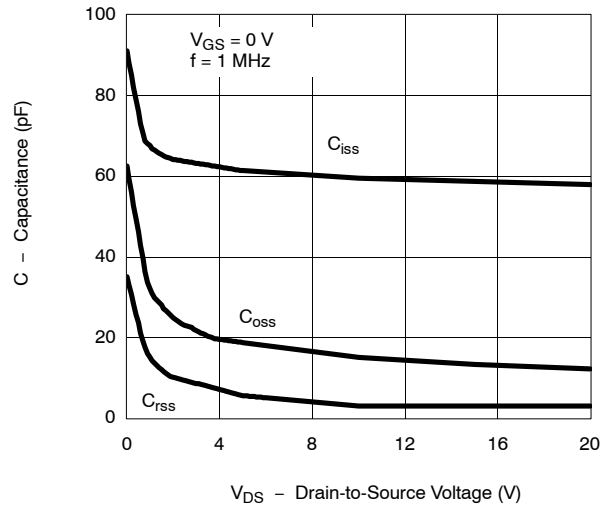## TYPICAL CHARACTERISTICS (T_A = 25°C UNLESS NOTED)

Output Characteristics

V_{GS} = 5 thru 1.8 V

1 V

I_D – Drain Current (A) vs V_{DS} – Drain-to-Source Voltage (V)

Transfer Characteristics

$T_J = -55$°C

25°C

125°C

I_D – Drain Current (mA) vs V_{GS} – Gate-to-Source Voltage (V)
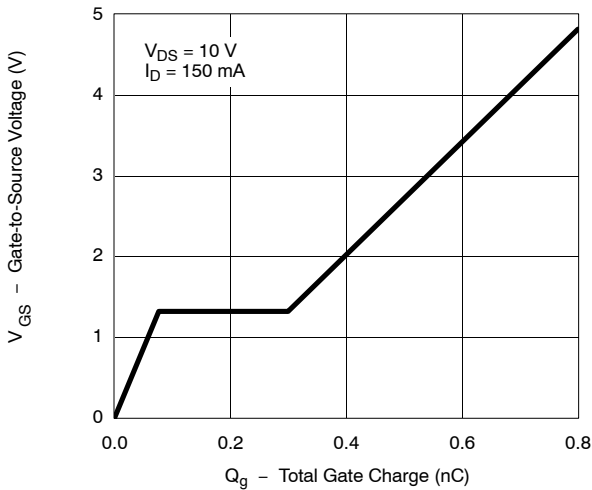
TYPICAL CHARACTERISTICS (T$_A$ = 25°C UNLESS NOTED)
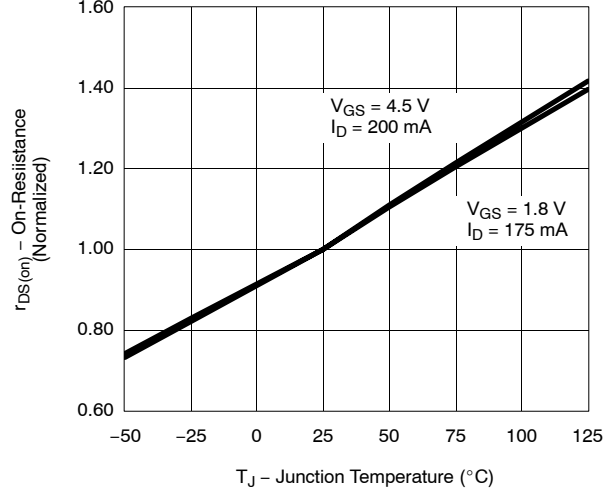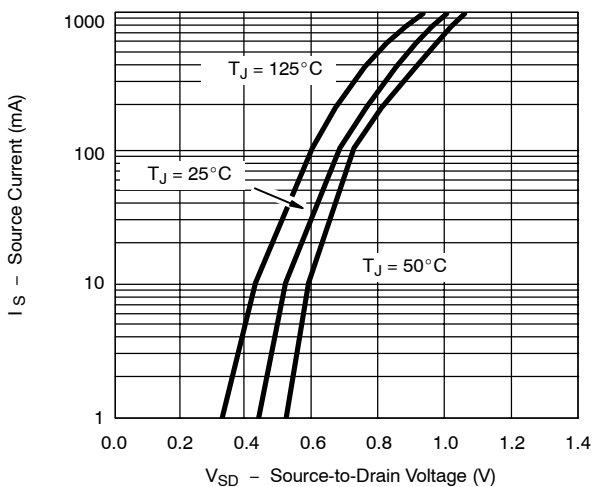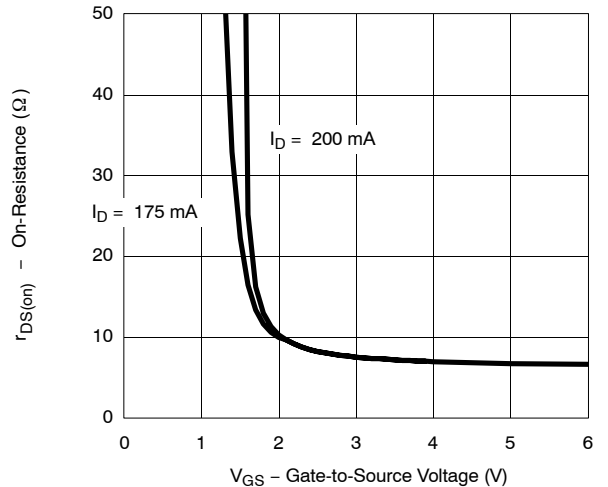
On-Resistance vs. Drain Current

Capacitance

Gate Charge

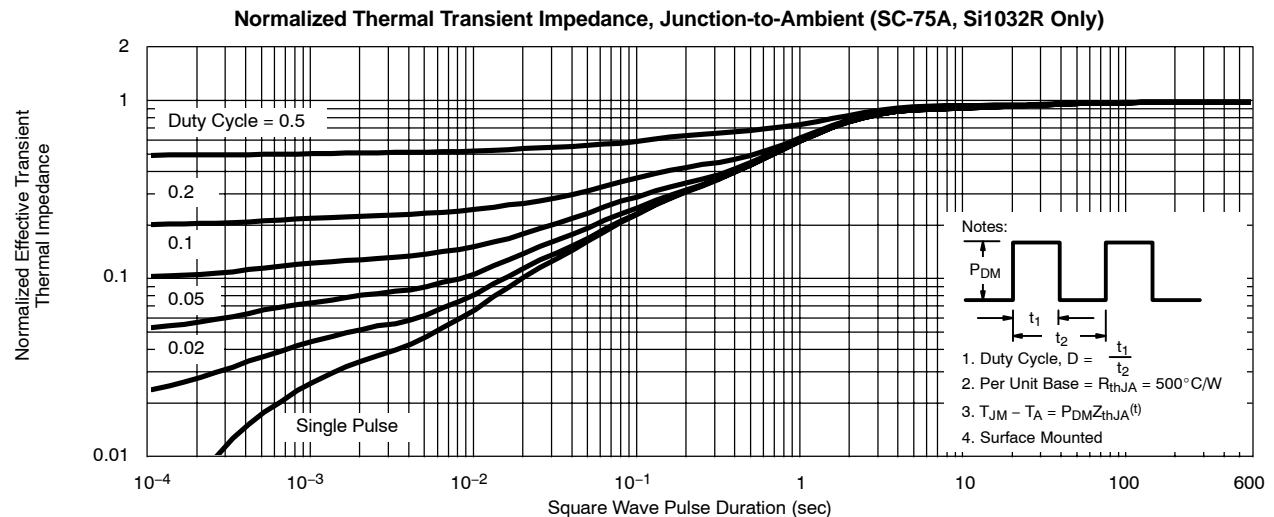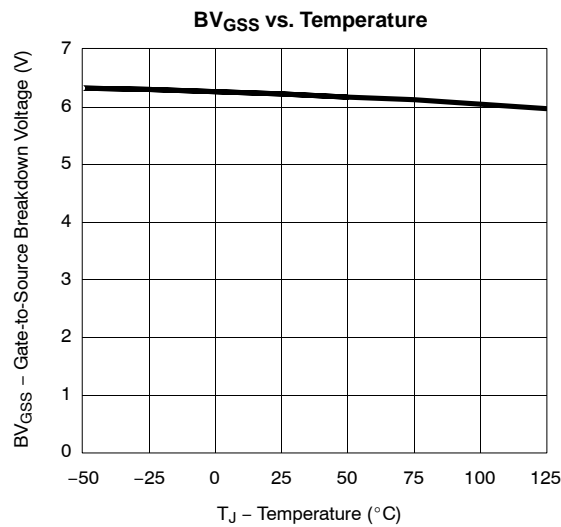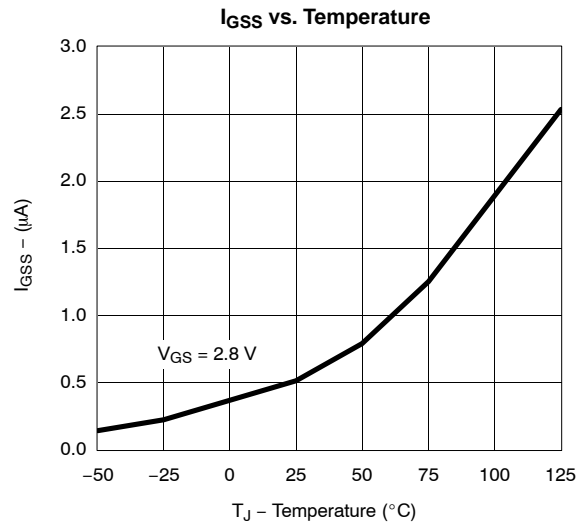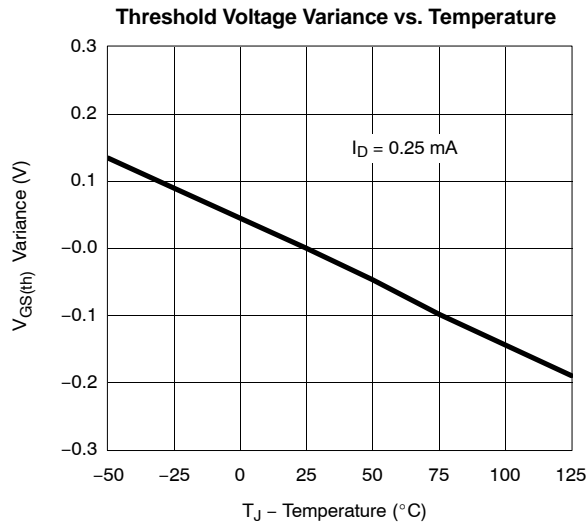**On-Resistance vs. Junction Temperature**

Source-Drain Diode Forward Voltage

On-Resistance vs. Gate-to-Source Voltage

TYPICAL CHARACTERISTICS (T$_A$ = 25°C UNLESS NOTED)

Threshold Voltage Variance vs. Temperature

I_D = 0.25 mA

y-axis: $V_{GS(th)}$ Variance (V)
x-axis: T$_J$ – Temperature (°C)

I$_{GSS}$ vs. Temperature

V_{GS} = 2.8 V

y-axis: I$_{GSS}$ – (µA)
x-axis: T$_J$ – Temperature (°C)

BV$_{GSS}$ vs. Temperature

y-axis: BV$_{GSS}$ – Gate-to-Source Breakdown Voltage (V)
x-axis: T$_J$ – Temperature (°C)

Normalized Thermal Transient Impedance, Junction-to-Ambient (SC-75A, Si1032R Only)

Duty Cycle = 0.5
0.2
0.1
0.05
0.02
Single Pulse

y-axis: Normalized Effective Transient Thermal Impedance
x-axis: Square Wave Pulse Duration (sec)

Notes:
1. Duty Cycle, D = $\frac{t_1}{t_2}$
2. Per Unit Base = R$_{thJA}$ = 500°C/W
3. T$_{JM}$ – T$_A$ = P$_{DM}$Z$_{thJA}$(t)
4. Surface Mounted