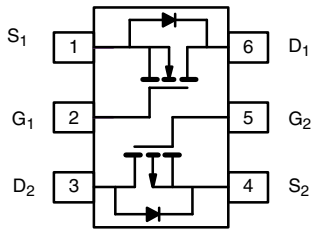
Complementary N- and P-Channel 20 V (D-S) MOSFET

PRODUCT SUMMARY			
	V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (mA)
N-Channel	20	5 at V_{GS} = 4.5 V	200
		7 at V_{GS} = 2.5 V	175
		9 at V_{GS} = 1.8 V	150
		10 at V_{GS} = 1.5 V	50
P-Channel	- 20	8 at V_{GS} = - 4.5 V	- 150
		12 at V_{GS} = - 2.5 V	- 125
		15 at V_{GS} = - 1.8 V	- 100
		20 at V_{GS} = - 1.5 V	- 30

SC-89



Top View

Marking Code: M

Ordering Information: Si1035X-T1-GE3 (Lead (Pb)-free and Halogen-free)

FEATURES

- **Halogen-free According to IEC 61249-2-21 Definition**
- TrenchFET® Power MOSFET: 1.5 V Rated
- Very Small Footprint
- High-Side Switching
- Low On-Resistance:
  N-Channel, 5 Ω
  P-Channel, 8 Ω
- Low Threshold: ± 0.9 V (typ.)
- Fast Switching Speed: 45 ns (typ.)
- 1.5 V Operation
- Gate-Source ESD Protected: 2000 V
- Compliant to RoHS Directive 2002/95/EC

Pb-free
RoHS COMPLIANT
HALOGEN FREE

BENEFITS

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

APPLICATIONS

- Replace Digital Transistor, Level-Shifter
- Battery Operated Systems
- Power Supply Converter Circuits
- Load/Power Switching Cell Phones, Pagers

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

Parameter		Symbol	N-Channel		P-Channel		Unit
			5 s	Steady State	5 s	Steady State	
Drain-Source Voltage		V_{DS}	20		- 20		V
Gate-Source Voltage		V_{GS}	± 5				
Continuous Drain Current (T_J = 150 °C)[a]	T_A = 25 °C	I_D	190	180	- 155	- 145	mA
	T_A = 85 °C		140	130	- 110	- 105	
Pulsed Drain Current[b]		I_{DM}	650		- 650		
Continuous Source Current (Diode Conduction)		I_S	450	380	- 450	- 380	
Maximum Power Dissipation[a]	T_A = 25 °C	P_D	280	250	280	250	mW
	T_A = 85 °C		145	130	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

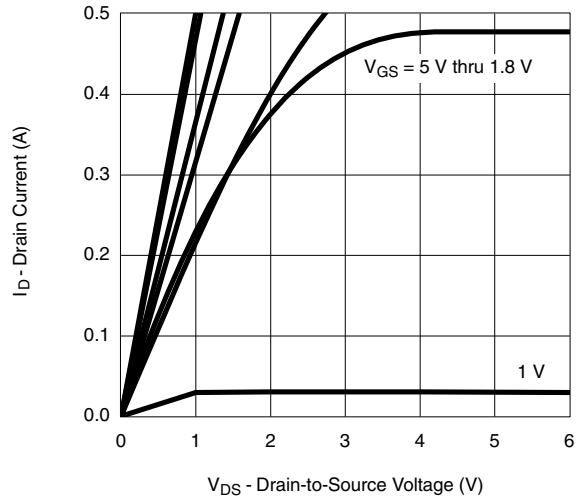
Notes:
a. Surface mounted on FR4 board.
b. Pulse width limited by maximum junction temperature.

SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)							
Parameter	**Symbol**	**Test Conditions**		**Min.**	**Typ.**	**Max.**	**Unit**
Static							
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA	N-Ch	0.40			V
		V_{DS} = V_{GS}, I_D = - 250 µA	P-Ch	- 0.40			
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 2.8 V	N-Ch		± 0.5	± 1.0	µA
			P-Ch		± 0.5	± 1.0	
		V_{DS} = 0 V, V_{GS} = ± 4.5 V	N-Ch		± 1.5	± 3.0	
			P-Ch		± 1.0	± 3.0	
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 16 V, V_{GS} = 0 V	N-Ch		1	500	nA
		V_{DS} = - 16 V, V_{GS} = 0 V	P-Ch		- 1	- 500	
		V_{DS} = 16 V, V_{GS} = 0 V, T_J = 85 °C	N-Ch			10	µA
		V_{DS} = - 16 V, V_{GS} = 0 V, T_J = 85 °C	P-Ch			- 10	
On-State Drain Current[a]	$I_{D(on)}$	V_{DS} = 5 V, V_{GS} = 4.5 V	N-Ch	250			mA
		V_{DS} = - 5 V, V_{GS} = - 4.5 V	P-Ch	- 200			
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	V_{GS} = 4.5 V, I_D = 200 mA	N-Ch			5	Ω
		V_{GS} = - 4.5 V, I_D = - 150 mA	P-Ch			8	
		V_{GS} = 2.5 V, I_D = 175 mA	N-Ch			7	
		V_{GS} = - 2.5 V, I_D = 125 mA	P-Ch			12	
		V_{GS} = 1.8 V, I_D = 150 mA	N-Ch			9	
		V_{GS} = - 1.8 V, I_D = - 100 mA	P-Ch			15	
		V_{DS} = 1.5 V, I_D = 40 mA	N-Ch			10	
		V_{DS} = - 1.5 V, I_D = - 30 mA	P-Ch			20	
Forward Transconductance[a]	g_{fs}	V_{DS} = 10 V, I_D = 200 mA	N-Ch		0.5		S
		V_{DS} = - 10 V, I_D = - 150 mA	P-Ch		0.4		
Diode Forward Voltage[a]	V_{SD}	I_S = 150 mA, V_{GS} = 0 V	N-Ch			1.2	V
		I_S = - 150 mA, V_{GS} = 0 V	P-Ch			- 1.2	
Dynamic[b]							
Total Gate Charge	Q_g	N-Channel V_{DS} = 10 V, V_{GS} = 4.5 V, I_D = 150 mA P-Channel V_{DS} = - 10 V, V_{GS} = - 4.5 V, I_D = - 150 mA	N-Ch		750		pC
			P-Ch		1500		
Gate-Source Charge	Q_{gs}		N-Ch		75		
			P-Ch		150		
Gate-Drain Charge	Q_{gd}		N-Ch		225		
			P-Ch		450		
Turn-On Time	t_{ON}	N-Channel V_{DD} = 10 V, R_L = 47 Ω I_D ≅ 250 mA, V_{GEN} = 4.5 V, R_g = 10 Ω P-Channel V_{DD} = - 10 V, R_L = 65 Ω I_D ≅ - 150 mA, V_{GEN} = - 4.5 V, R_g = 10 Ω	N-Ch			75	ns
			P-Ch			80	
Turn-Off Time	t_{OFF}		N-Ch			75	
			P-Ch			90	

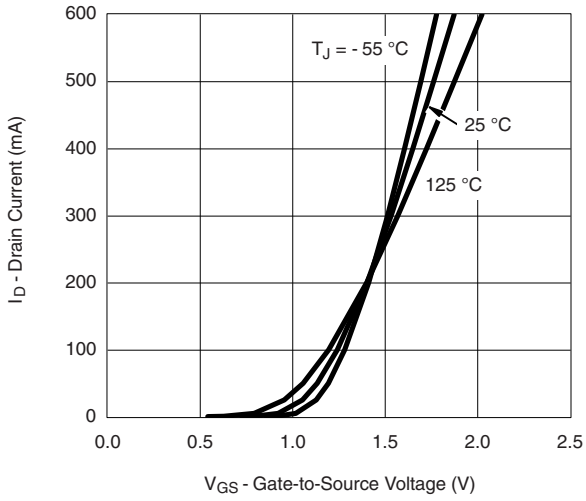
Notes:
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.

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.

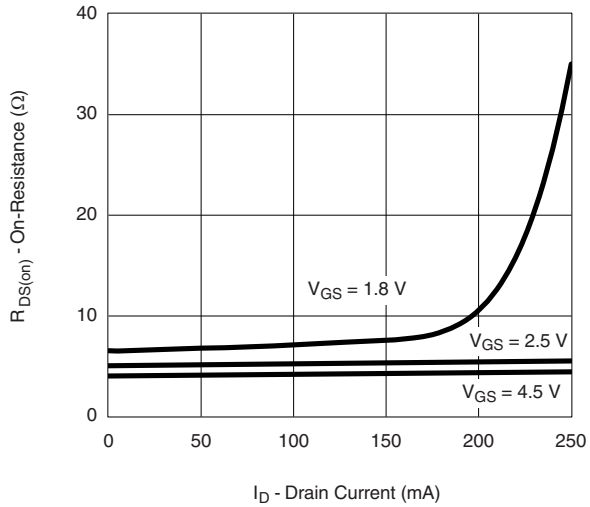
N-CHANNEL TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



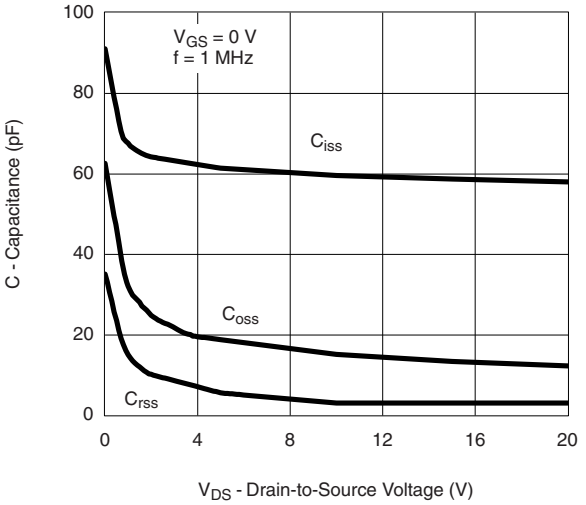
Output Characteristics



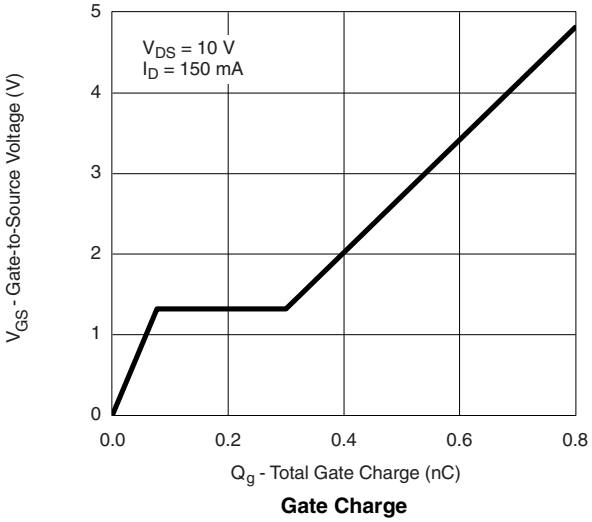
Transfer Characteristics



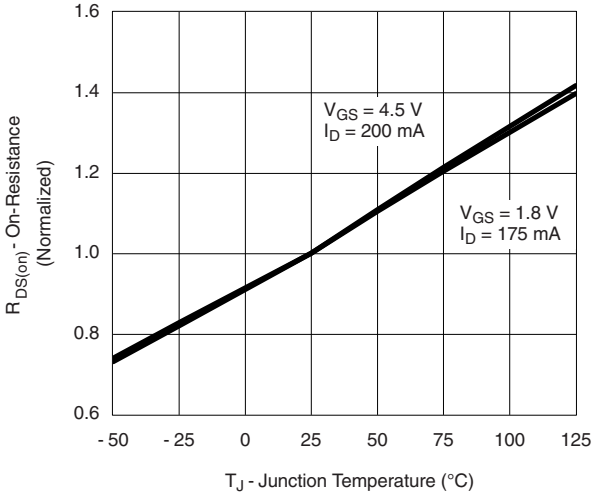
On-Resistance vs. Drain Current



Capacitance

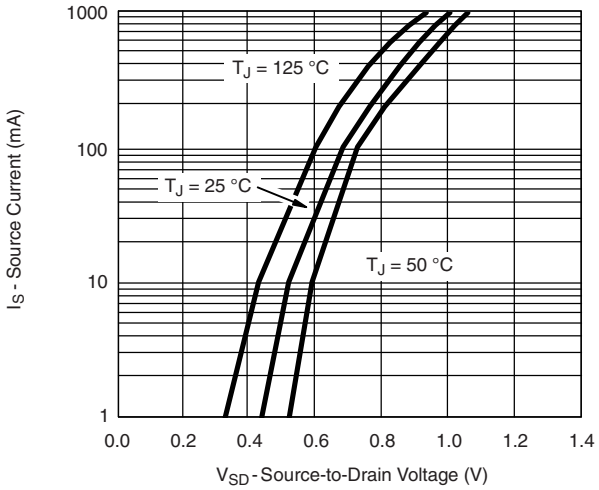


Gate Charge

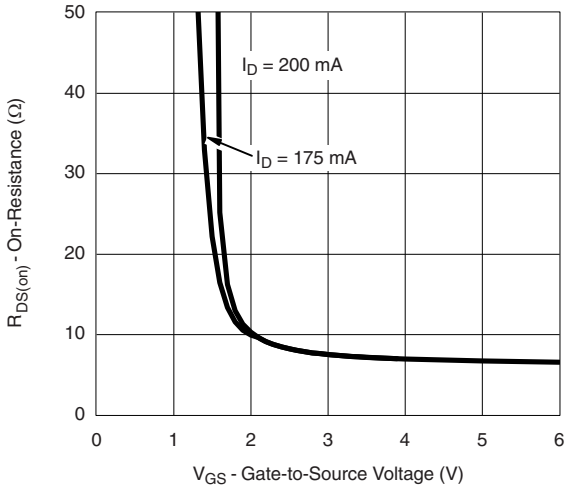


On-Resistance vs. Junction Temperature

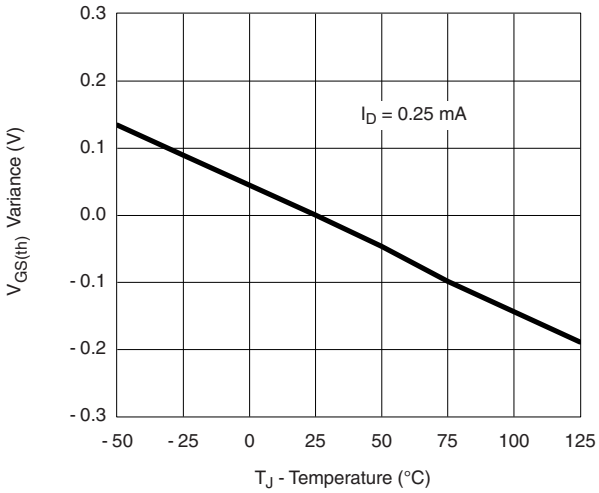
N-CHANNEL TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



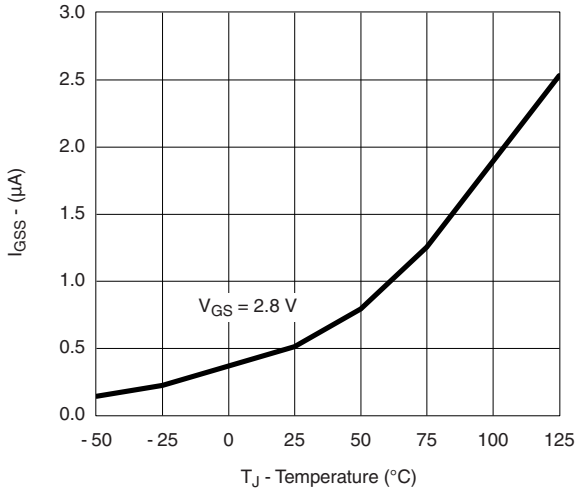
Source-Drain Diode Forward Voltage



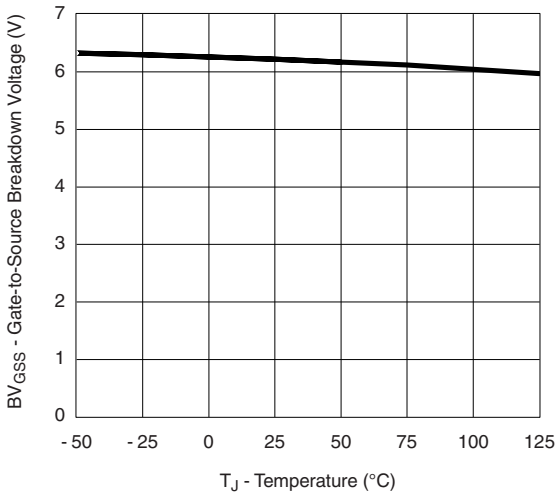
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage Variance vs. Temperature

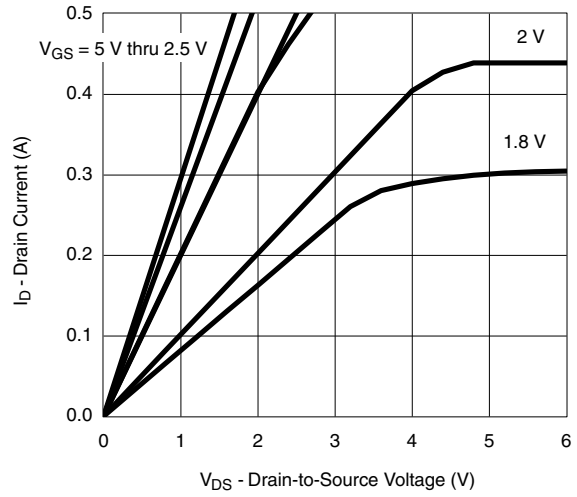


I_{GSS} vs. Temperature

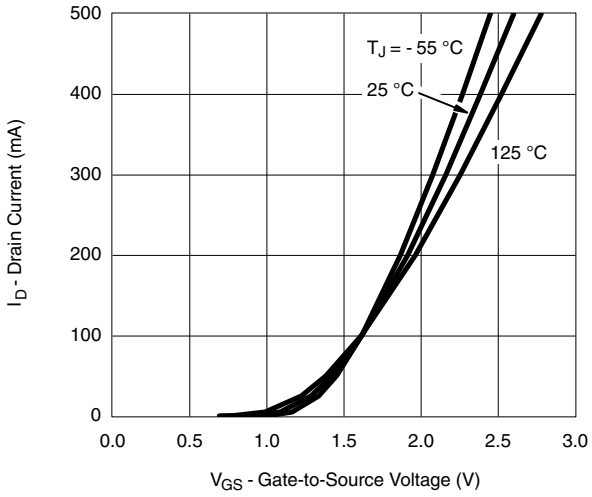


BV_{GSS} vs. Temperature

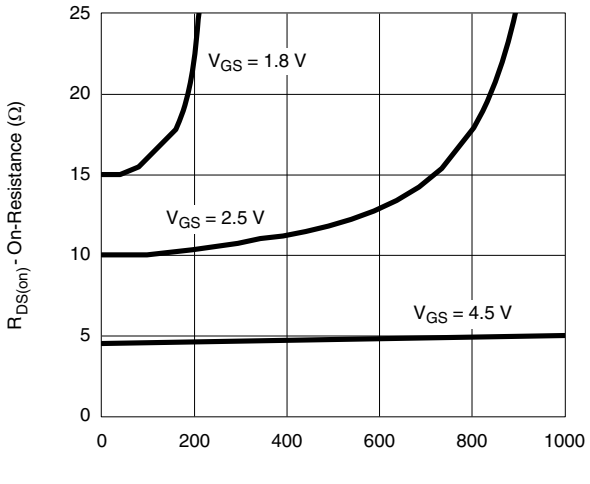
P-CHANNEL TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



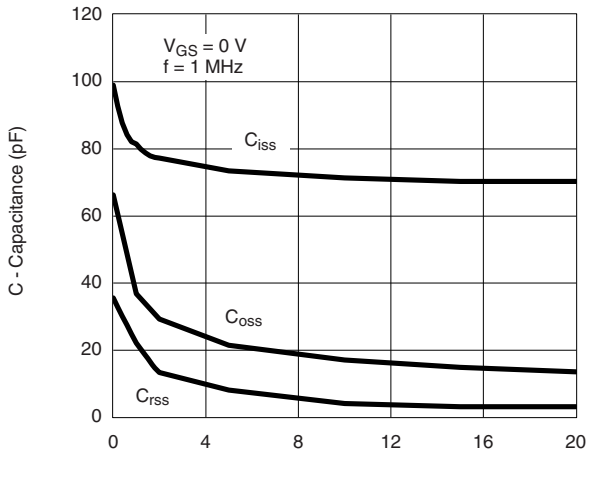
Output Characteristics



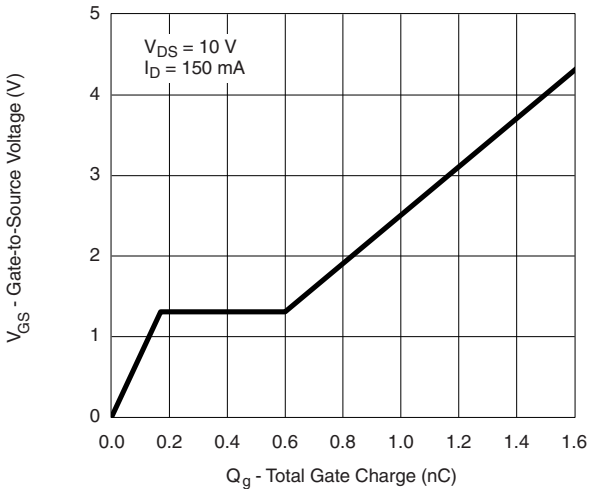
Transfer Characteristics



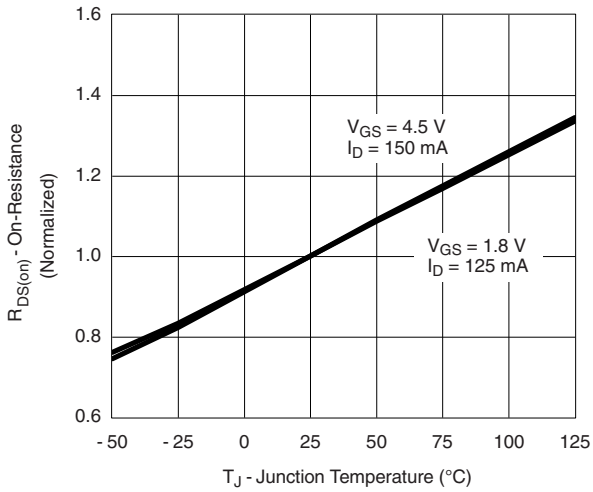
On-Resistance vs. Drain Current



Capacitance

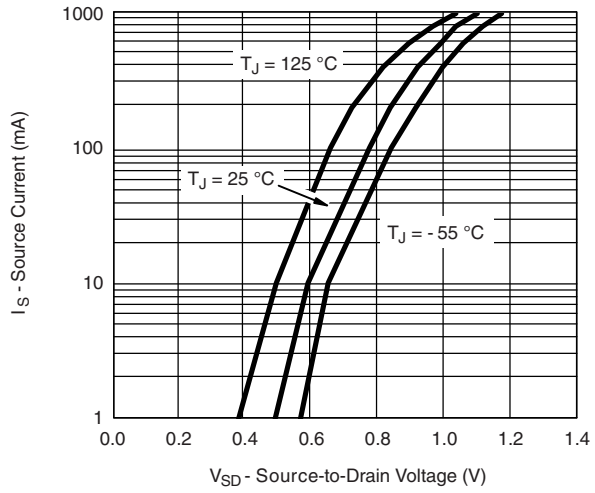


Gate Charge

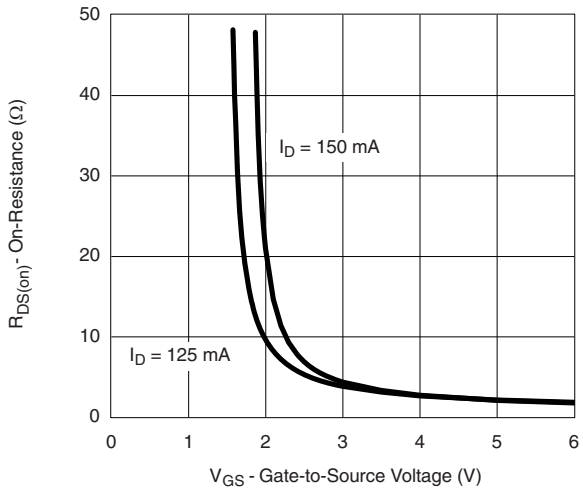


On-Resistance vs. Junction Temperature

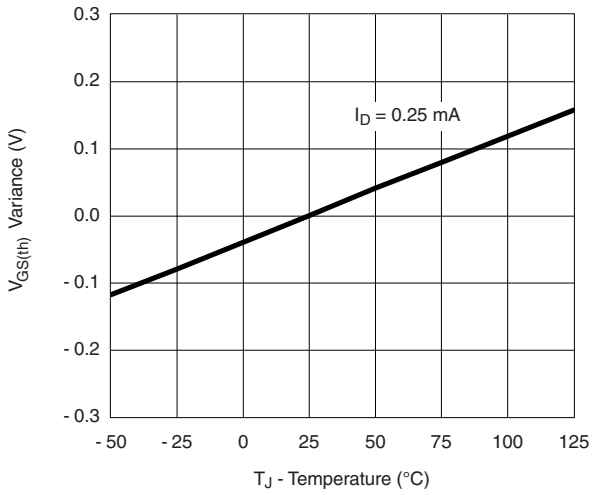
P-CHANNEL TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



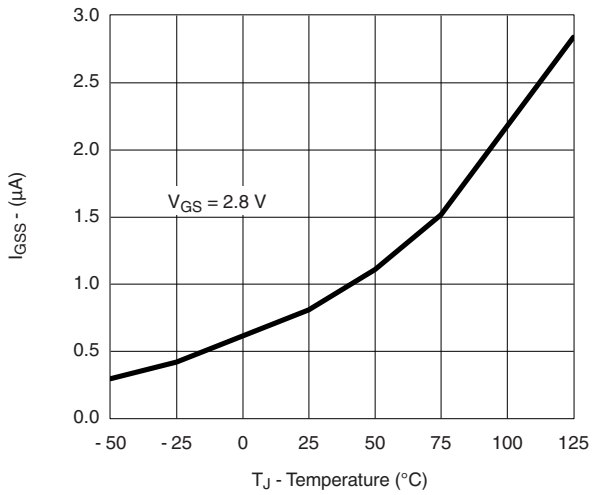
Source-Drain Diode Forward Voltage



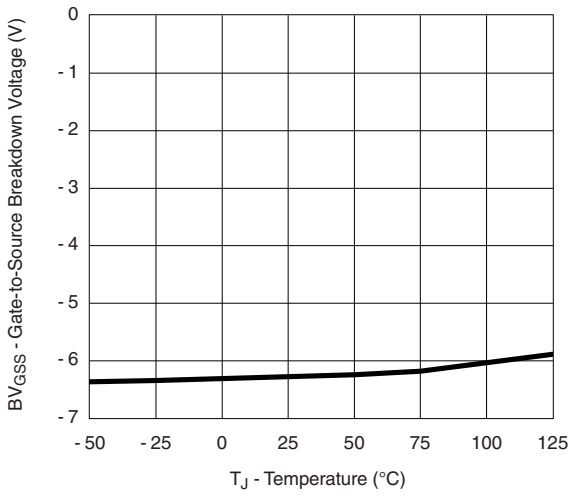
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage Variance vs. Temperature

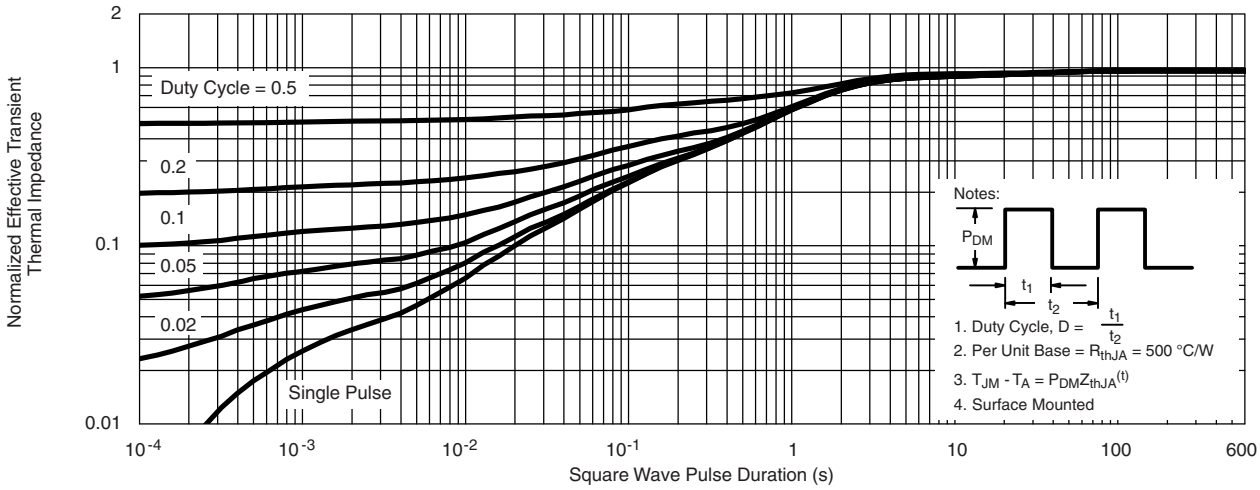


I_{GSS} vs. Temperature



BV_{GSS} vs. Temperature

N- OR P-CHANNEL TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Ambient

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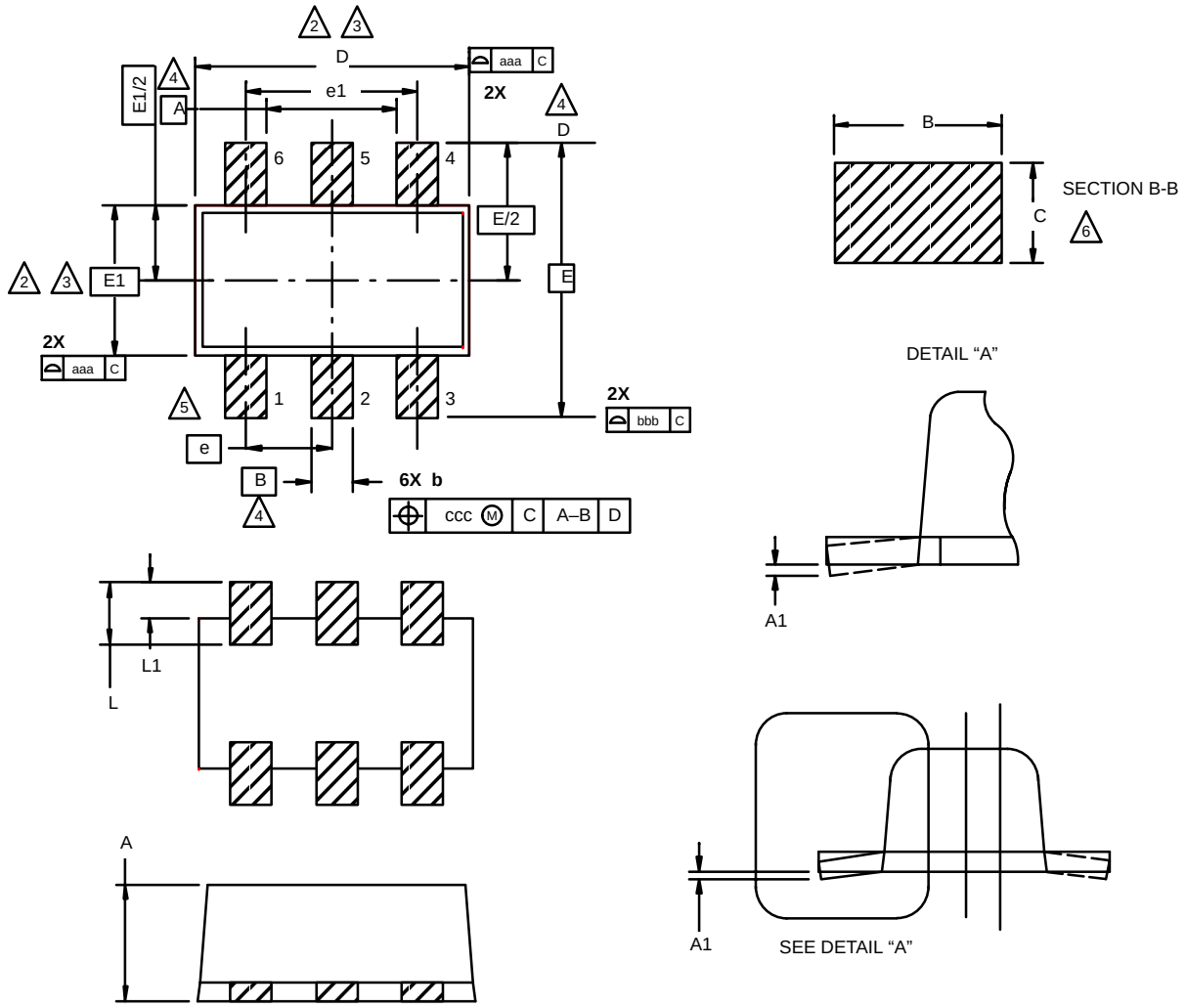
SC89: 6- LEADS (SOT-563F)



NOTES:

1. Dimensions in millimeters.

2. Dimension D does not include mold flash, protrusions or gate burrs. Mold flush, 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.

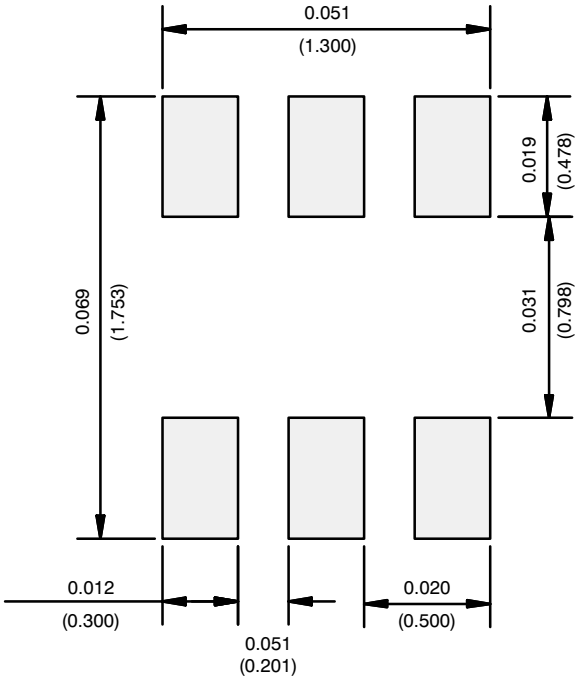
5. Terminal numbers are shown for reference only.

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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OCEAN CHIPS
Океан Электроники
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- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
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AVIC JONHON

«JONHON» (основан в 1970 г.)

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