

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

FEATURES

- Halogen-free Option Available
- 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

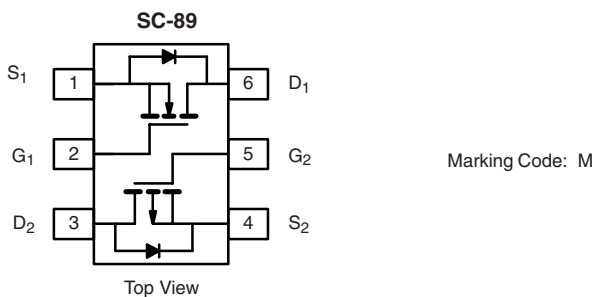

RoHS
COMPLIANT

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



Ordering Information: Si1035X-T1-E3 (Lead (Pb)-free)
Si1035X-T1-GE3 (Lead (Pb)-free and Halogen-free)

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	I_D	$T_A = 25$ °C	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	P_D	$T_A = 25$ °C	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.

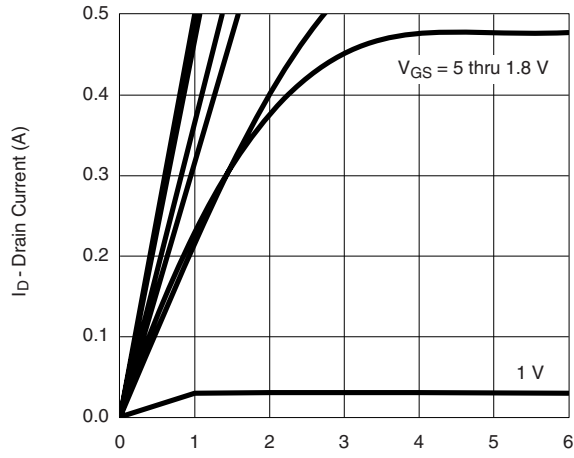
SPECIFICATIONS $T_J = 25^\circ\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	N-Ch	0.40		V
		$V_{DS} = V_{GS}, I_D = -250\ \mu\text{A}$	P-Ch	-0.40		
Gate-Body Leakage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

Notes:

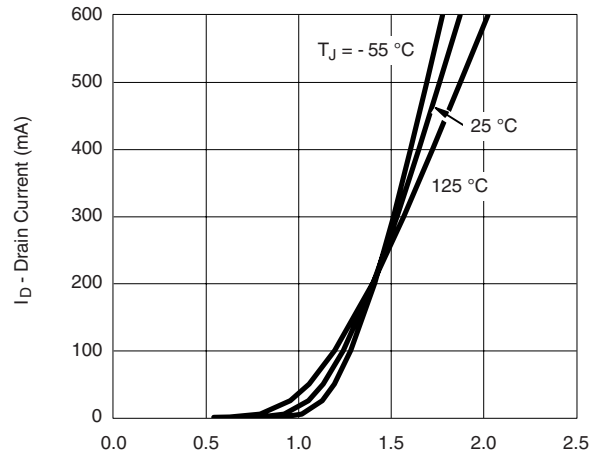
- a. Pulse test; pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.
b. Guaranteed by design, not subject to production testing.

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.

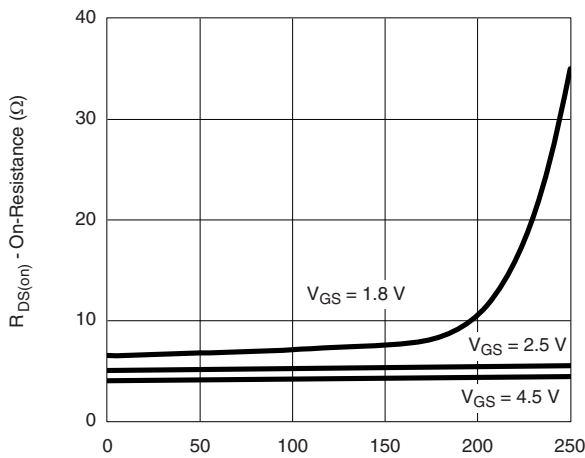
N-CHANNEL TYPICAL CHARACTERISTICS $T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted



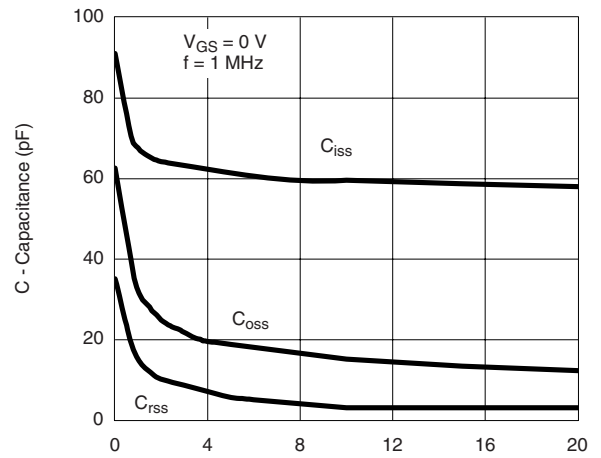
V_{DS} - Drain-to-Source Voltage (V)
Output Characteristics



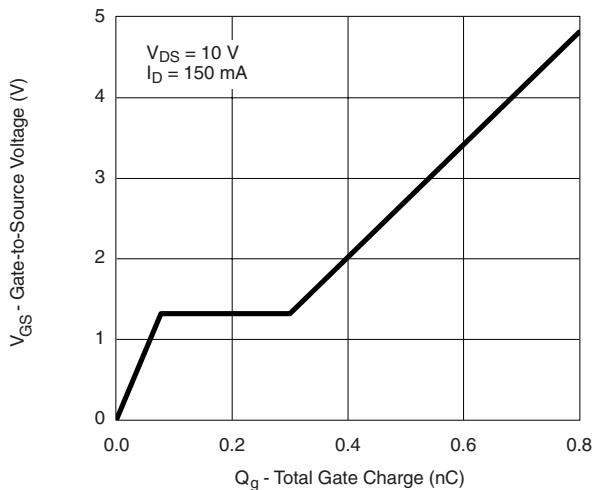
V_{GS} - Gate-to-Source Voltage (V)
Transfer Characteristics



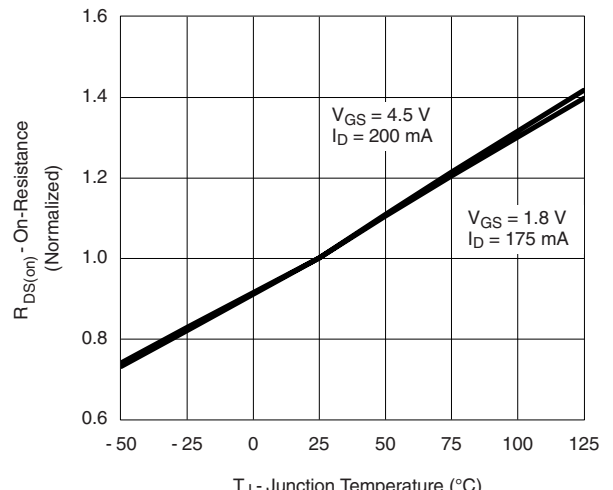
I_D - Drain Current (mA)
On-Resistance vs. Drain Current



V_{DS} - Drain-to-Source Voltage (V)
Capacitance

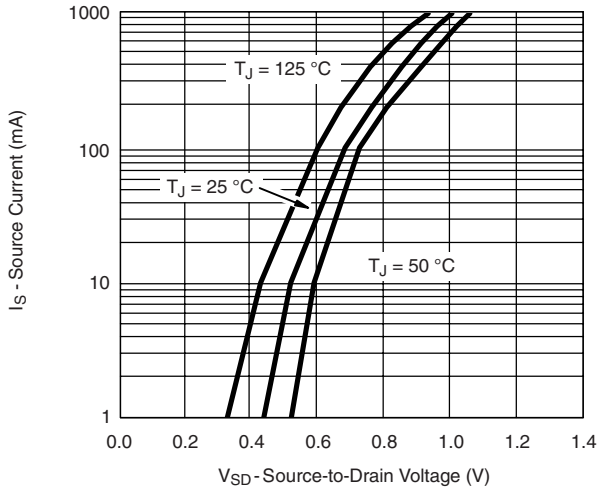


Gate Charge

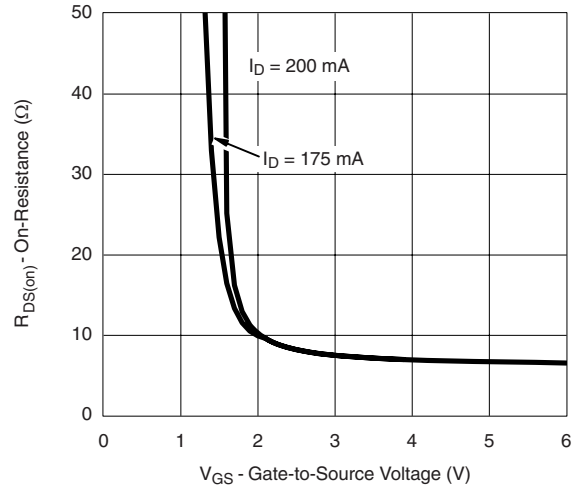


T_J - Junction Temperature ($^\circ\text{C}$)
On-Resistance vs. Junction Temperature

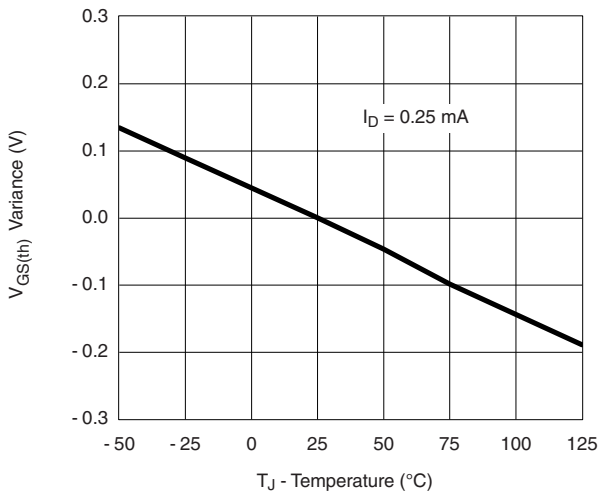
N-CHANNEL TYPICAL CHARACTERISTICS $T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted



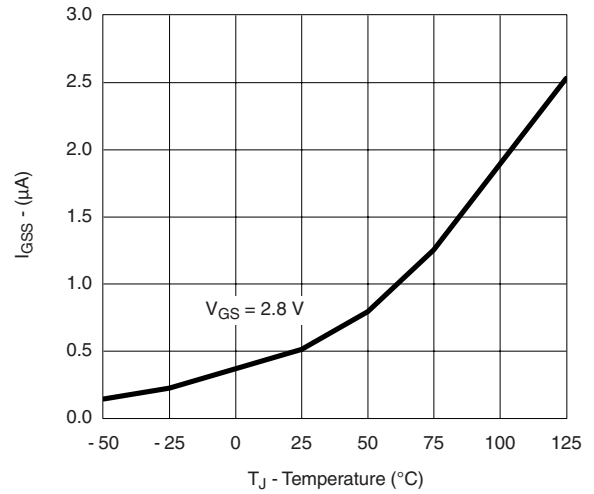
Source-Drain Diode Forward Voltage



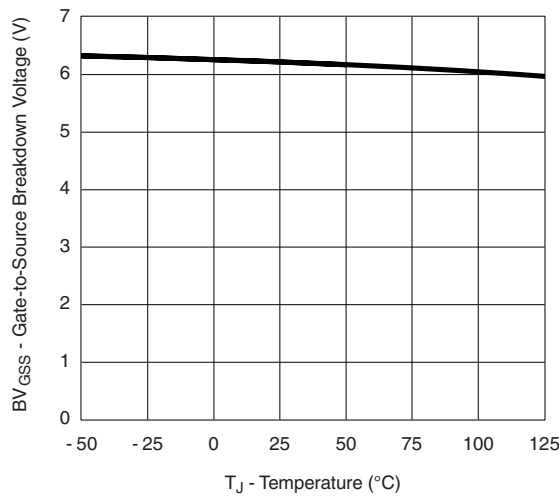
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage Variance vs. Temperature

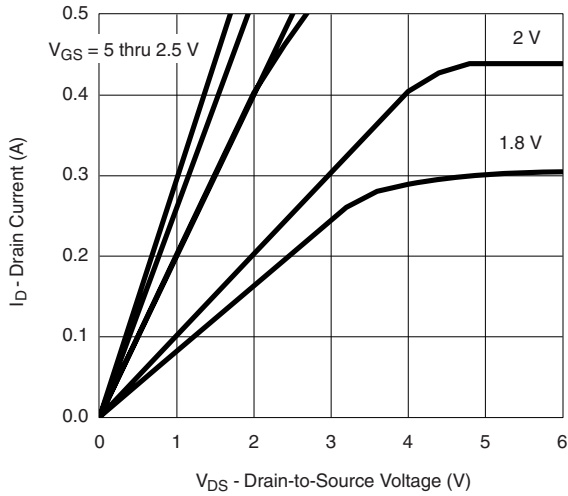


I_{GSS} vs. Temperature

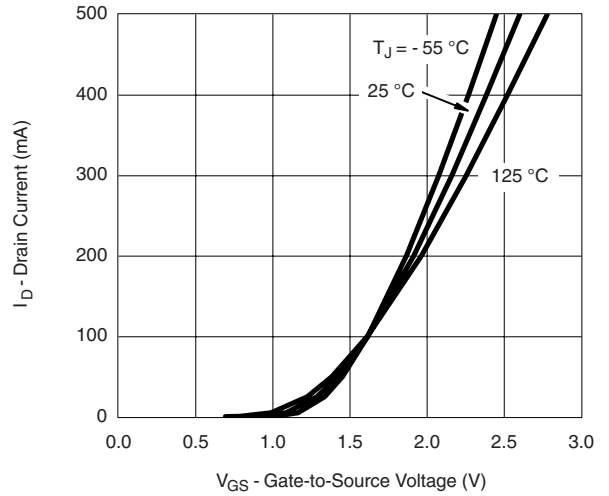


BV_{GSS} vs. Temperature

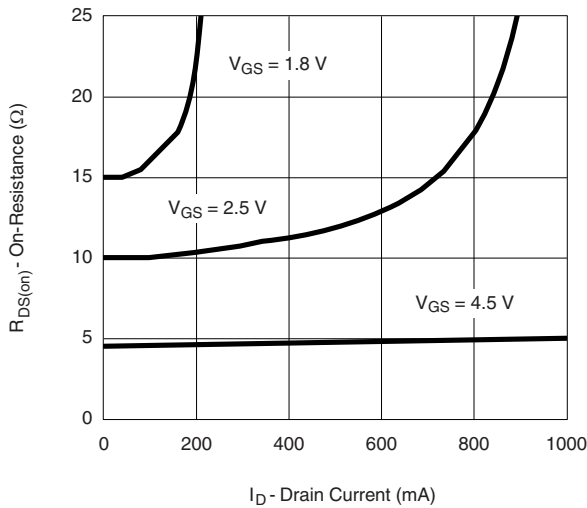
P-CHANNEL TYPICAL CHARACTERISTICS $T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted



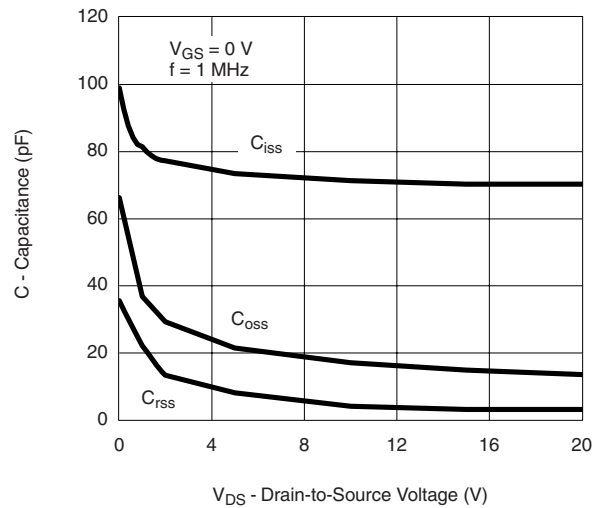
Output Characteristics



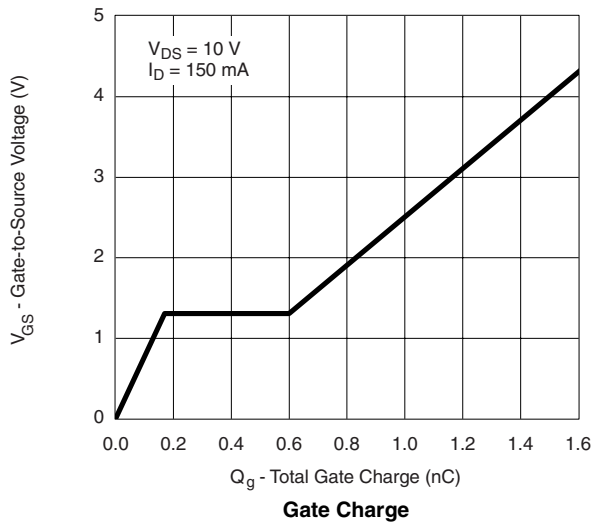
Transfer Characteristics



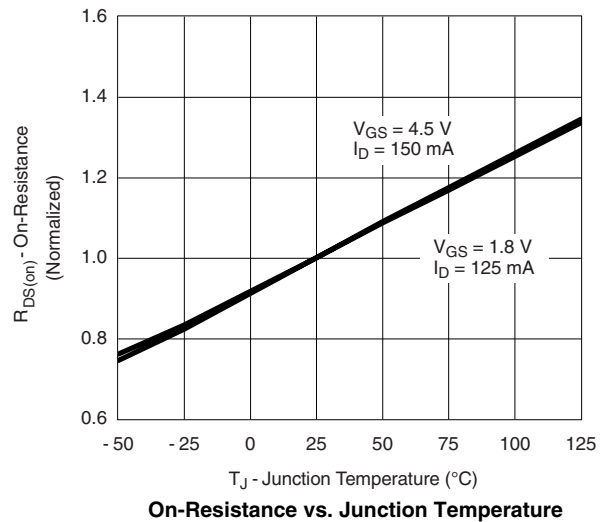
On-Resistance vs. Drain Current



Capacitance

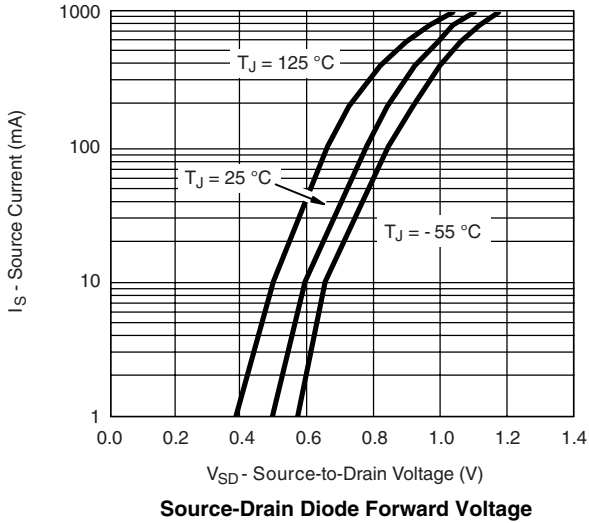


Gate Charge

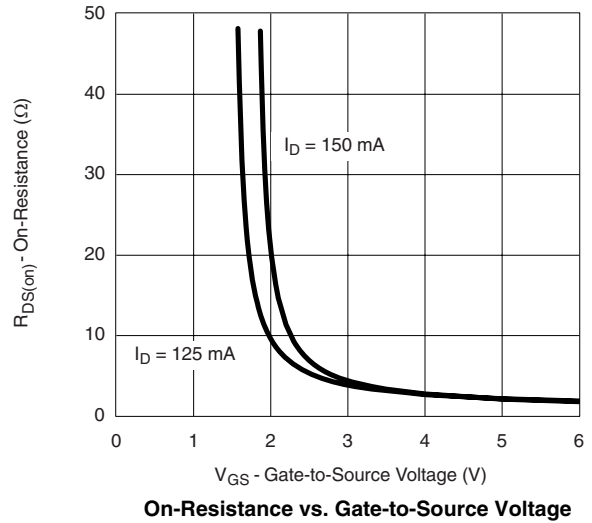


On-Resistance vs. Junction Temperature

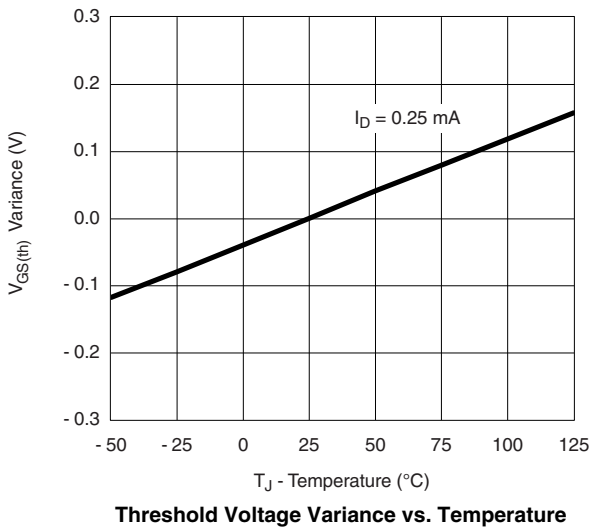
P-CHANNEL TYPICAL CHARACTERISTICS $T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted



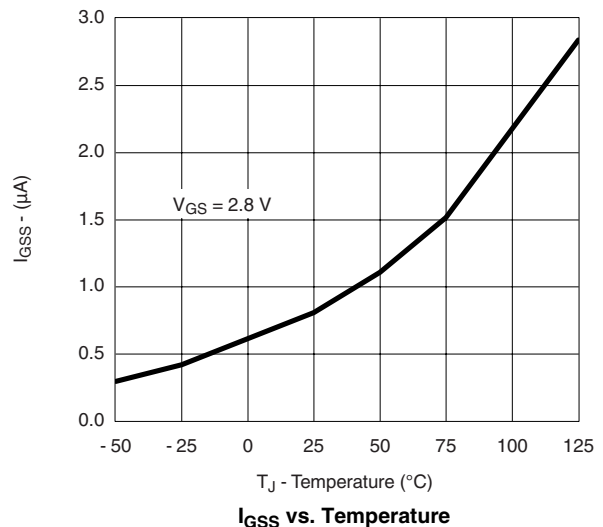
Source-Drain Diode Forward Voltage



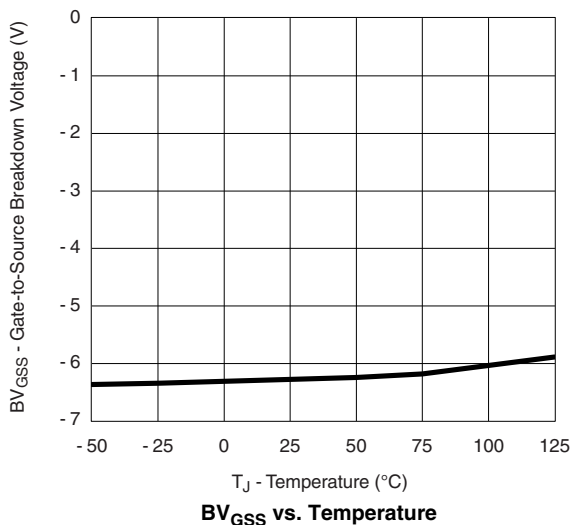
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage Variance vs. Temperature

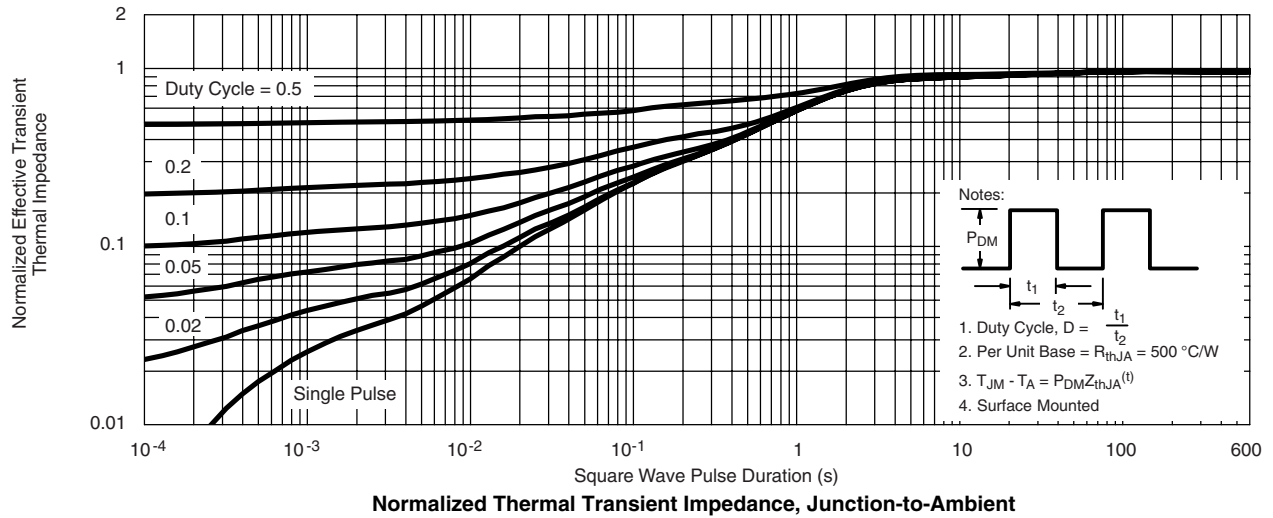


I_{GSS} vs. Temperature



BV_{GSS} vs. Temperature

N- OR P-CHANNEL TYPICAL CHARACTERISTICS $T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted



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