



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

TrenchFET®

MOSFETs

1.5-V Rated



**ESD Protected
2000 V**

PRODUCT SUMMARY			
	V _{DS} (V)	r _{DS(on)} (Ω)	I _D (mA)
N-Channel	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
P-Channel	-20	8 @ V _{GS} = -4.5 V	-150
		12 @ V _{GS} = -2.5 V	-125
		15 @ V _{GS} = -1.8 V	-100
		20 @ V _{GS} = -1.5 V	-30

FEATURES

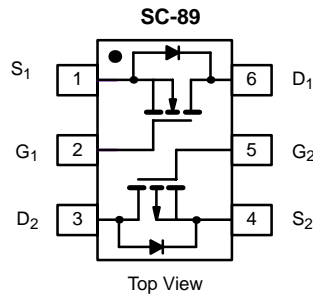
- Very Small Footprint
- High-Side Switching
- Low On-Resistance:
N-Channel, 5 Ω
P-Channel, 8 Ω
- Low Threshold: ±0.9 V (typ)
- Fast Switching Speed: 45 ns (typ)
- 1.5-V Operation
- Gate-Source ESD Protection

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, Pages



Marking Code: M

ABSOLUTE MAXIMUM RATINGS (T _A = 25° C UNLESS OTHERWISE NOTED)						
Parameter	Symbol	N-Channel		P-Channel		Unit
		5 secs	Steady State	5 secs	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	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) ^a	I _S	450	380	-450	-380	
Maximum Power Dissipation ^a	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

- Surface Mounted on FR4 Board.
- Pulse width limited by maximum junction temperature.

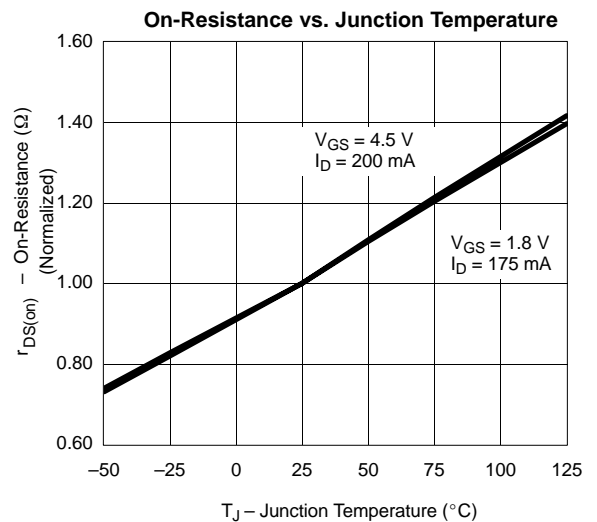
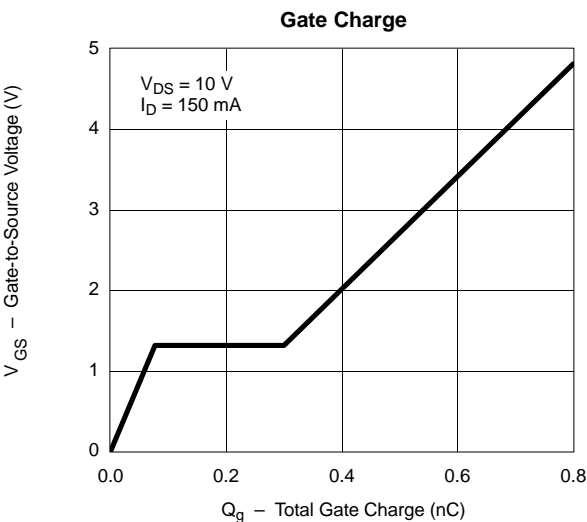
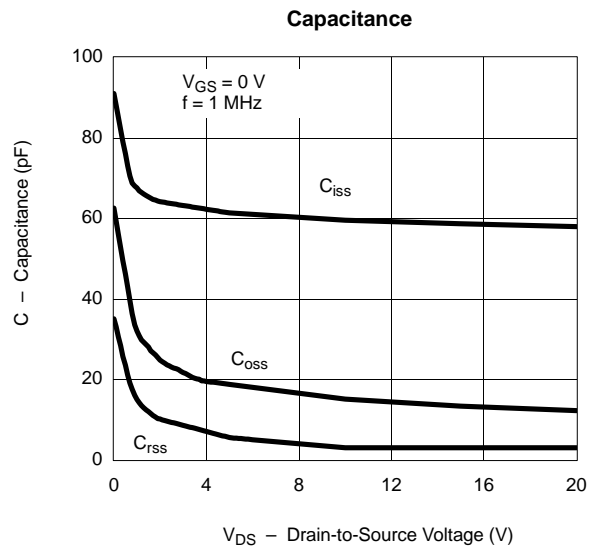
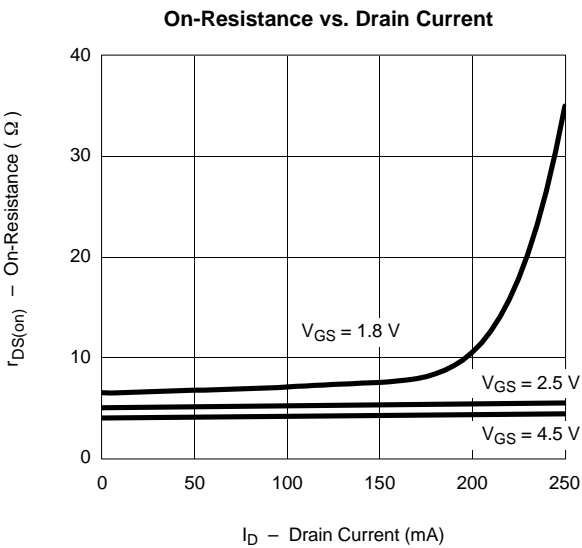
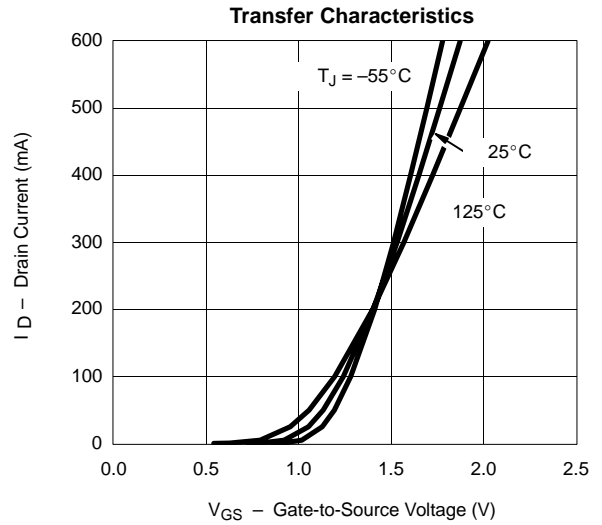
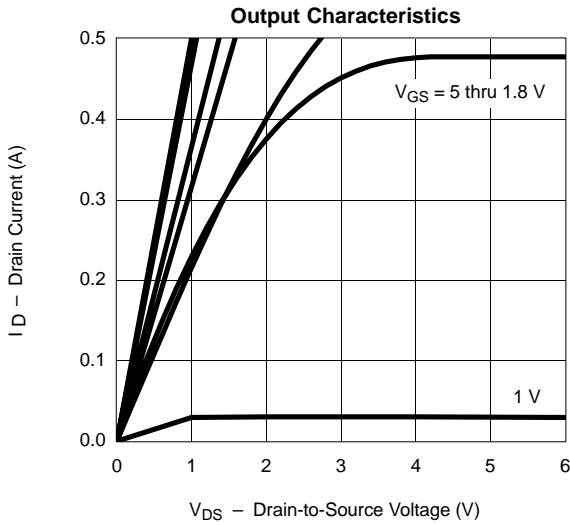
SPECIFICATIONS (T _J = 25 °C UNLESS OTHERWISE NOTED)							
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit	
Static							
Gate Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	N-Ch	0.40			V
		V _{DS} = V _{GS} , I _D = -250 μA	P-Ch	-0.40			
Gate-Body Leakage	I _{GSS}	V _{DS} = 0 V, V _{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 _{GS} = 1.5 V, I _D = 40 mA	N-Ch			10	
		V _{GS} = -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
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 ≅ 200 mA, V _{GEN} = 4.5 V, R _G = 10 Ω	N-Ch			75	ns
			P-Ch			80	
Turn-Off Time	t _{OFF}	P-Channel V _{DD} = -10 V, R _L = 65 Ω I _D ≅ -150 A, V _{GEN} = -4.5 V, R _G = 10 Ω	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.



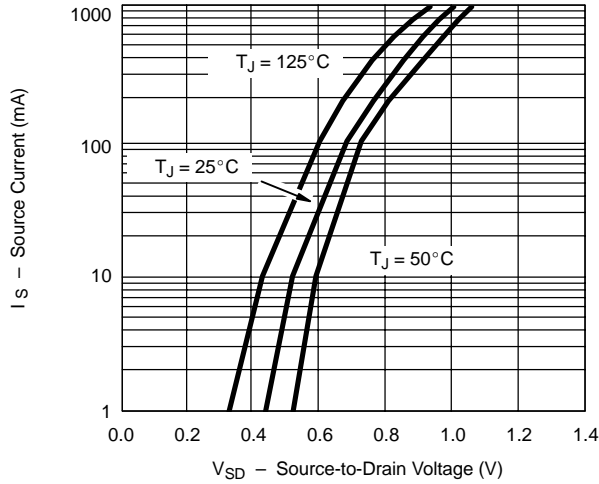
TYPICAL CHARACTERISTICS (T_A = 25°C UNLESS NOTED) N-CHANNEL



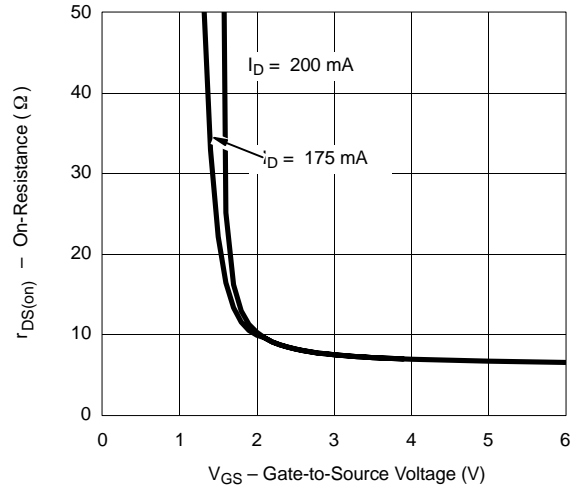


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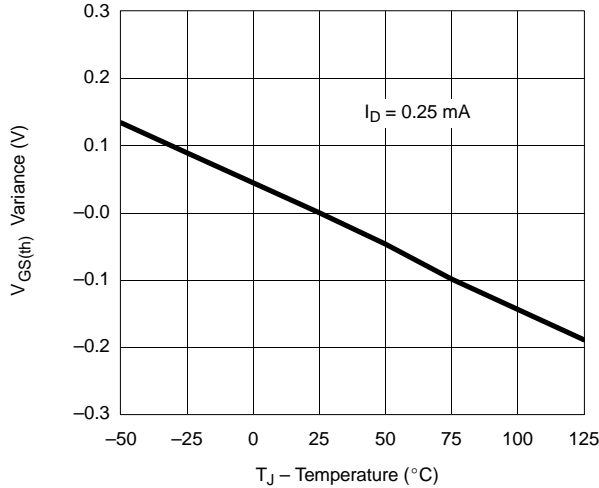
Source-Drain Diode Forward Voltage



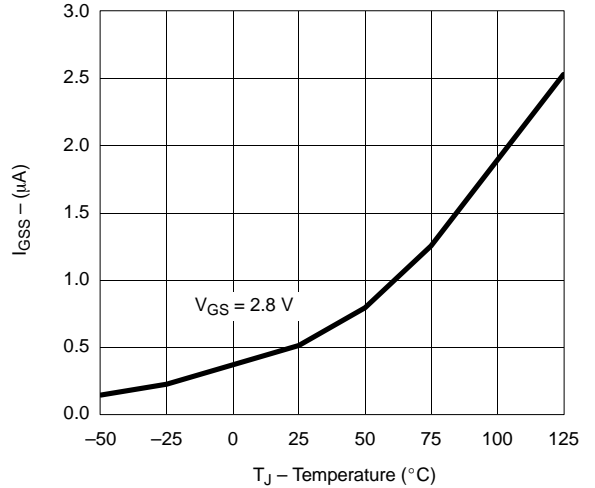
On-Resistance vs. Gate-to-Source Voltage



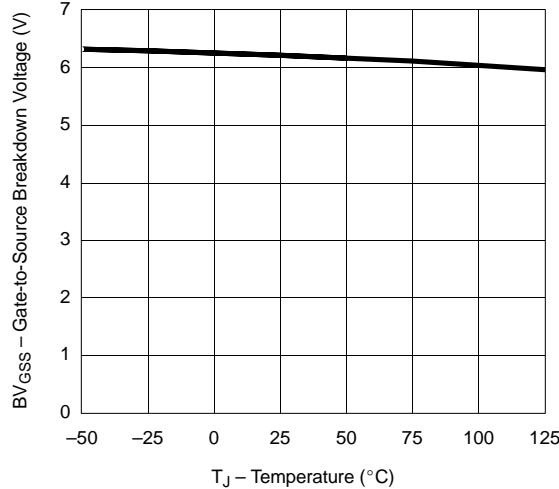
Threshold Voltage Variance vs. Temperature



I_{GSS} vs. Temperature



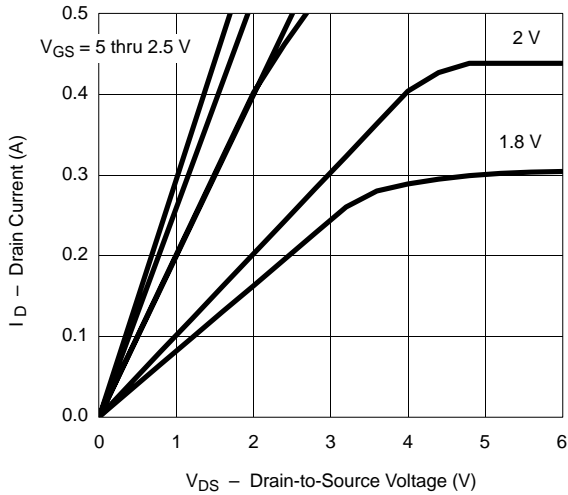
BV_{GSS} vs. Temperature



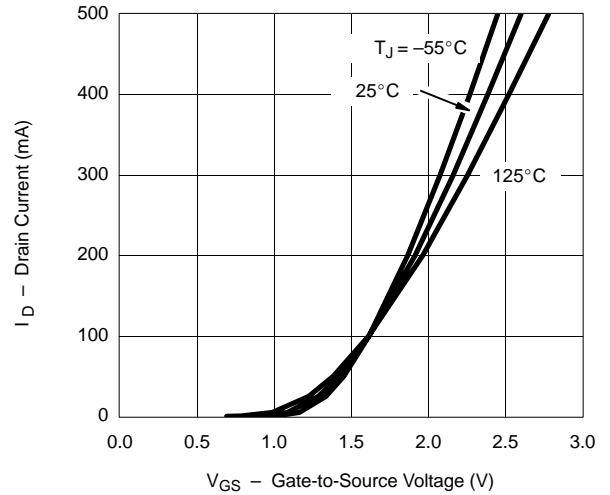


TYPICAL CHARACTERISTICS (T_A = 25°C UNLESS NOTED) P-CHANNEL

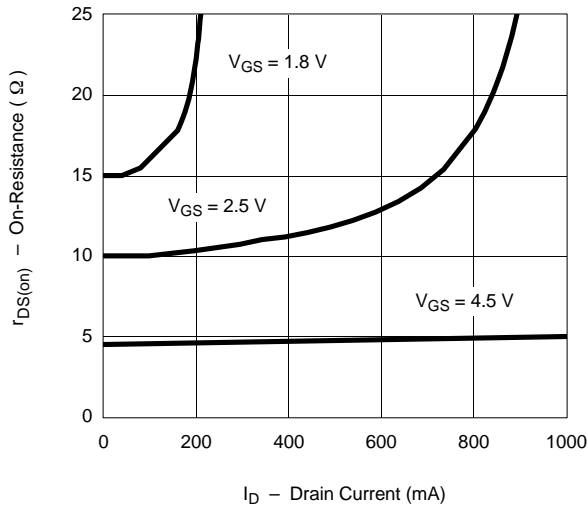
Output Characteristics



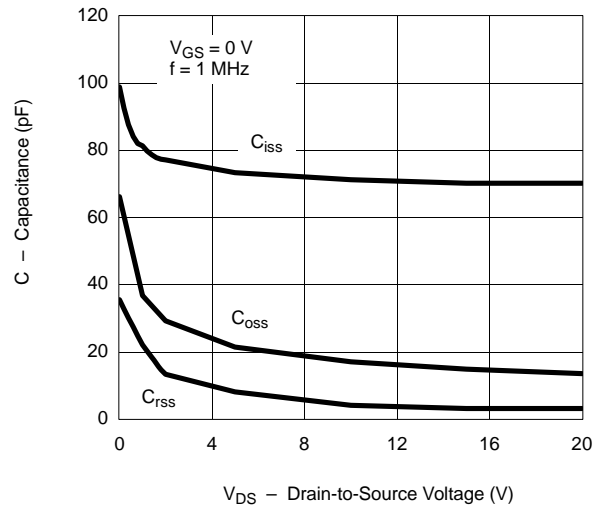
Transfer Characteristics



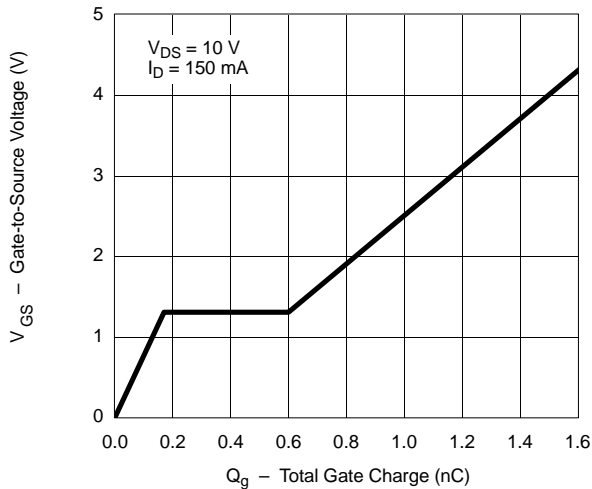
On-Resistance vs. Drain Current



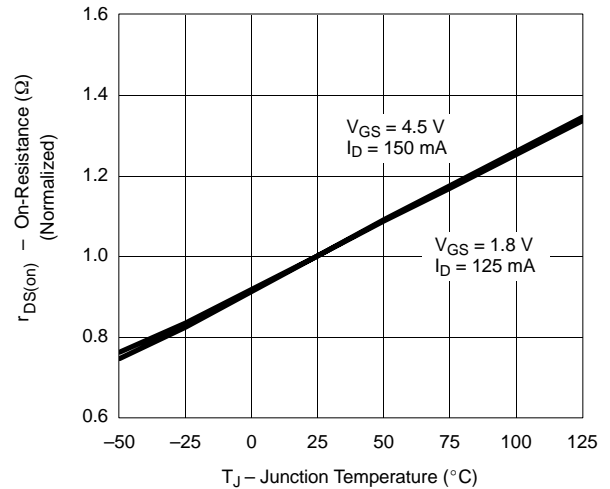
Capacitance



Gate Charge



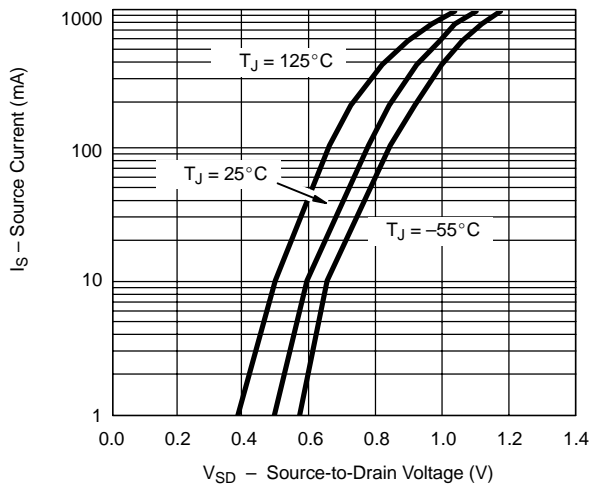
On-Resistance vs. Junction Temperature



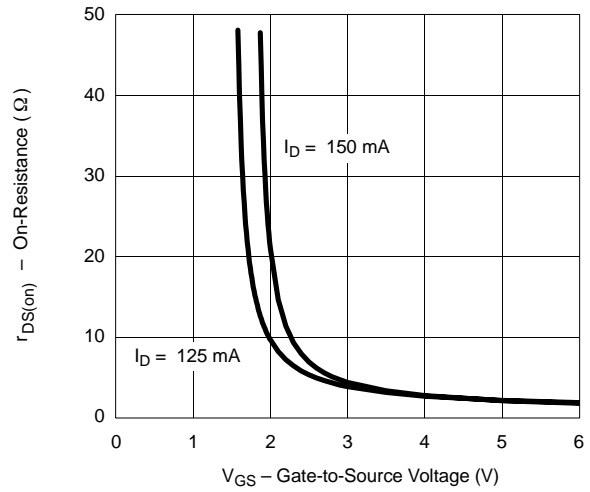


TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ UNLESS NOTED) P-CHANNEL

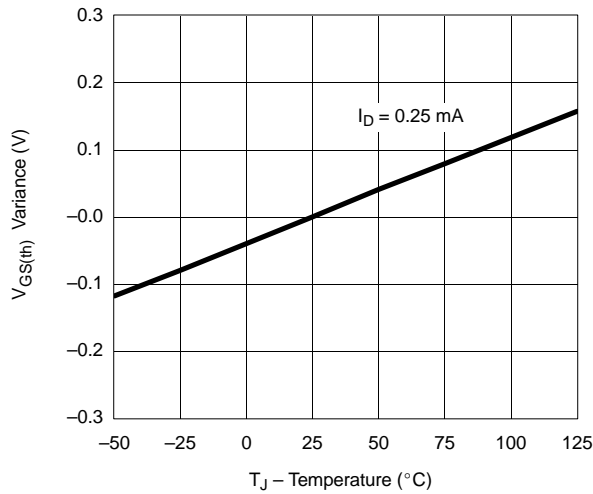
Source-Drain Diode Forward Voltage



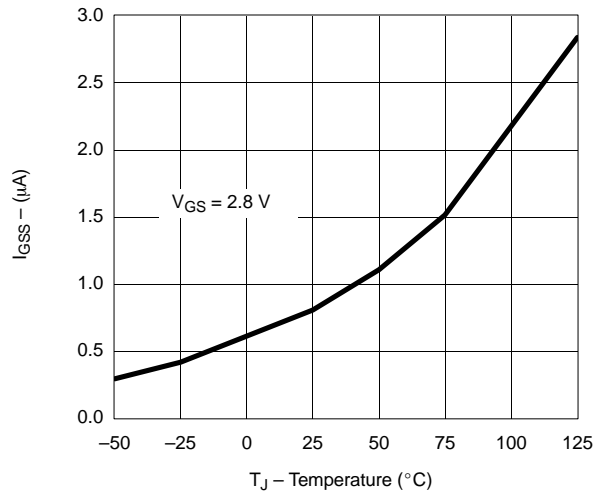
On-Resistance vs. Gate-to-Source Voltage



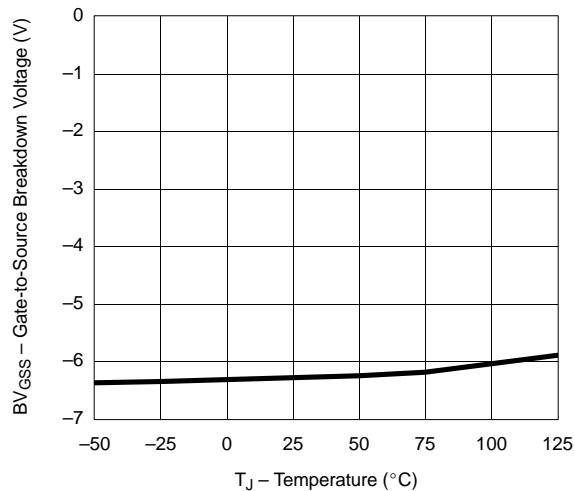
Threshold Voltage Variance vs. Temperature



IGSS vs. Temperature



BVGSS vs. Temperature





TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ UNLESS NOTED) N- OR P-CHANNEL

