

## P-Channel 1.8-V (G-S) MOSFET

**(Pb)** Lead(Pb)-Free

### FEATURES:

- \* TrenchFET@ Power MOSFET: 1.8-V Rated
- \* Gate-Source ESD Protected: 2000V
- \* High-Side Switching
- \* Low On-Resistance: 1.2Ω
- \* Low Threshold: 0.8 V (typ)
- \* Fast Switching Speed: 14 ns
- \* S-Prefix for Automotive and Other Applications Requiring Qualified and PPAP Capable

### 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

ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$  UNLESS OTHERWISE NOTED)

Parameter		Symbol	5 secs	Steady State	Unit
Drain-Source Voltage		$V_{DS}$	20		V
Gate-Source Voltage		$V_{GS}$	±6		
Continuous Drain Current ( $T_J = 150^\circ\text{C}$ ) <sup>b</sup>	$T_A = 25^\circ\text{C}$	$I_D$	-400	-350	mA
	$T_A = 85^\circ\text{C}$		-300	-275	
Pulsed Drain Current <sup>a</sup>		$I_{DM}$	-1000		
Continuous Source Current (diode conduction) <sup>b</sup>		$I_S$	-275	-250	
Maximum Power Dissipation <sup>b</sup> for SC-75	$T_A = 25^\circ\text{C}$	$P_D$	175	150	mW
	$T_A = 85^\circ\text{C}$		90	80	
Maximum Power Dissipation <sup>b</sup> for SC-89	$T_A = 25^\circ\text{C}$		275	250	
	$T_A = 85^\circ\text{C}$		160	140	
Operating Junction and Storage Temperature Range		$T_J, T_{stg}$	-55 to 150		°C
Gate-Source ESD Rating (HBM, Method 3015)		ESD	2000		V

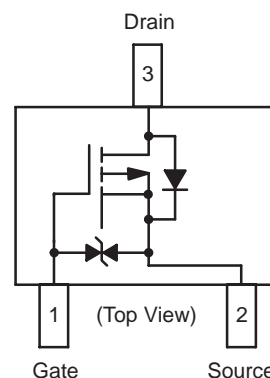
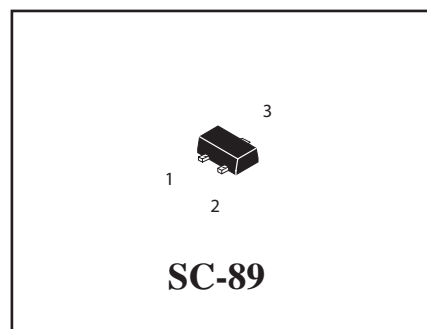
Notes

d. Pulse width limited by maximum junction temperature.

e. Surface Mounted on FR4 Board.

## Device Marking

WTX1013 = B



## Electrical Characteristics (T<sub>A</sub>=25°C Unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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### Static

Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250 μA	-0.45			V
Gate-Body Leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±4.5 V		±01	±2	μA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = -16V, V <sub>GS</sub> = 0 V		-0.3	-100	nA
		V <sub>DS</sub> = -16V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 85°C			-5	μA
On-State Drain Current <sup>1</sup>	I <sub>D(on)</sub>	V <sub>DS</sub> = -5 V, V <sub>GS</sub> = -4.5 V	-700			mA
Drain-Source On-State Resistance <sup>a</sup>	r <sub>DS(on)</sub>	V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -350 mA		0.8	1.2	Ω
		V <sub>GS</sub> = -2.5 V, I <sub>D</sub> = -300 mA		1.2	1.6	
		V <sub>GS</sub> = -1.8 V, I <sub>D</sub> = -10 mA		1.8	2.7	
Forward Transconductance <sup>a</sup>	g <sub>fs</sub>	V <sub>DS</sub> = -10 V, I <sub>D</sub> = -250 mA		0.4		S
Diode Forward Voltage <sup>a</sup>	V <sub>SD</sub>	I <sub>S</sub> = -150 mA, V <sub>GS</sub> = 0 V		-0.8	-1.2	V

### Dynamic

Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> = -10 V, V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -250 mA		1500		pC
Gate-Source Charge	Q <sub>gs</sub>			150		
Gate-Drain Charge	Q <sub>gd</sub>			450		
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = -10 V, R <sub>L</sub> = 47 Ω I <sub>D</sub> = -200 mA, V <sub>GEN</sub> = -4.5 V, R <sub>G</sub> = 10 Ω		5		ns
Rise Time	t <sub>r</sub>			9		
Turn-Off Delay Time	t <sub>d(off)</sub>			35		
Fall Time	t <sub>f</sub>			11		

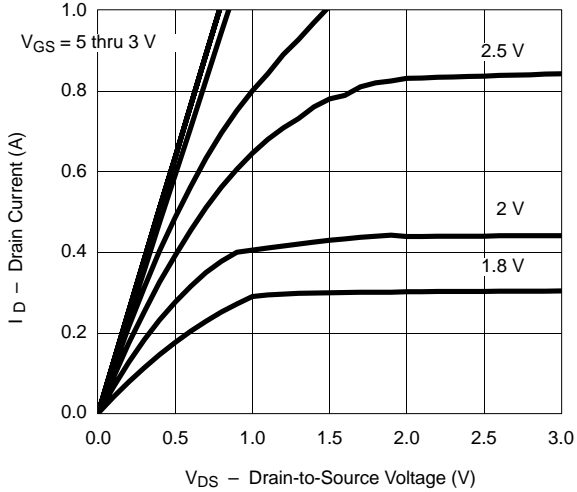
#### Notes

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

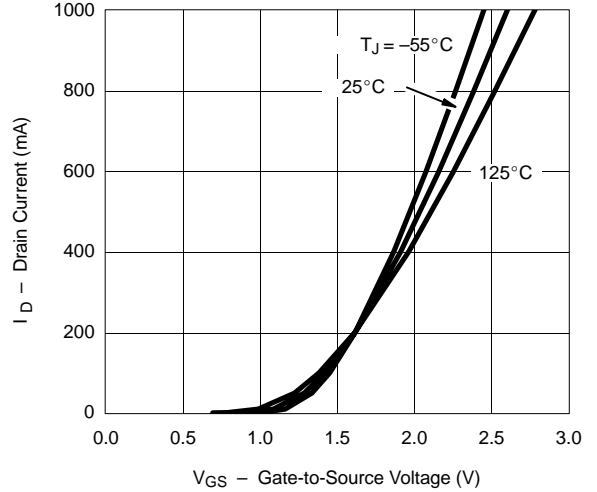
## TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ UNLESS NOTED)

For the following graphs, p-channel negative polarities for all voltage and current values are represented as positive values.

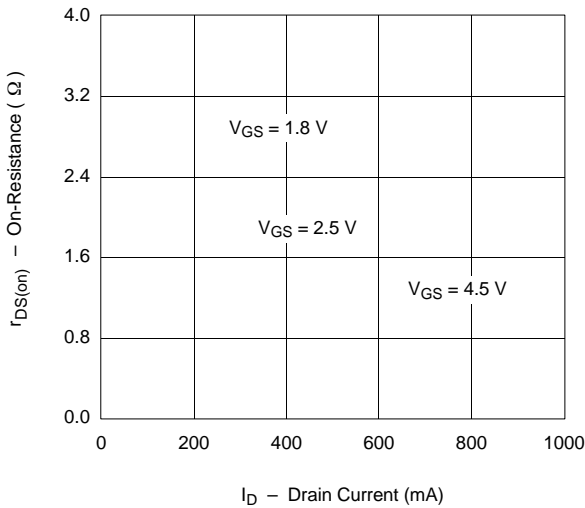
**Output Characteristics**



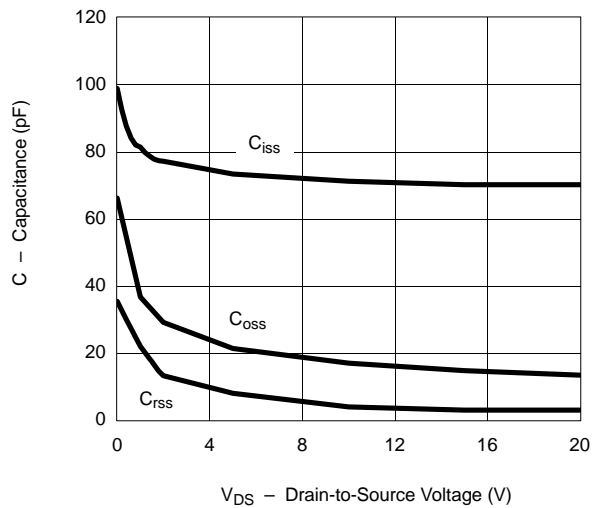
**Transfer Characteristics**



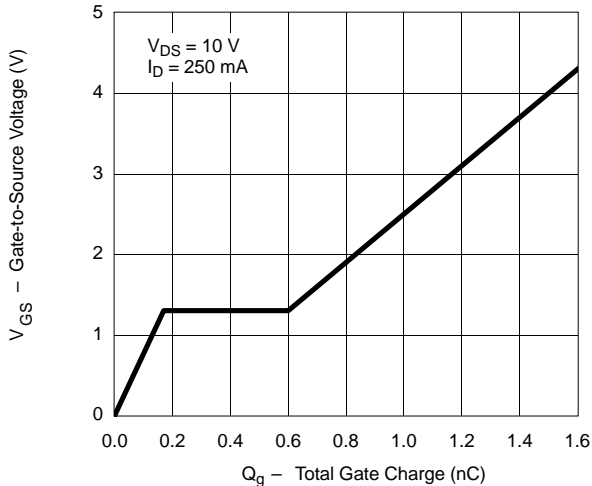
**On-Resistance vs. Drain Current**



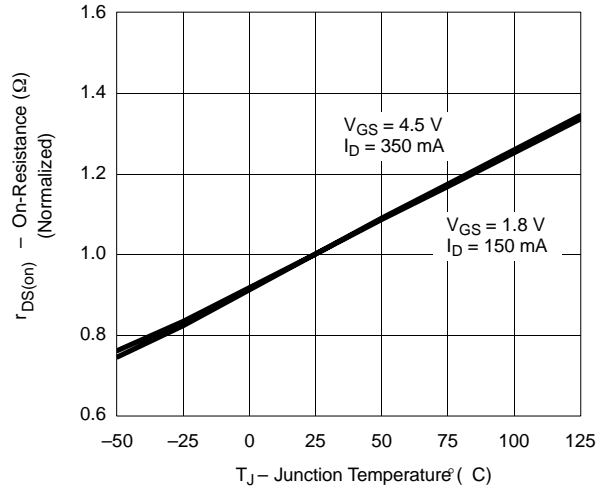
**Capacitance**



**Gate Charge**

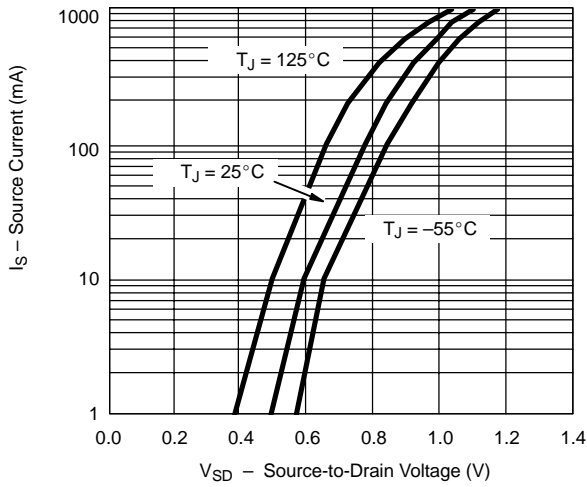


**On-Resistance vs. Junction Temperature**

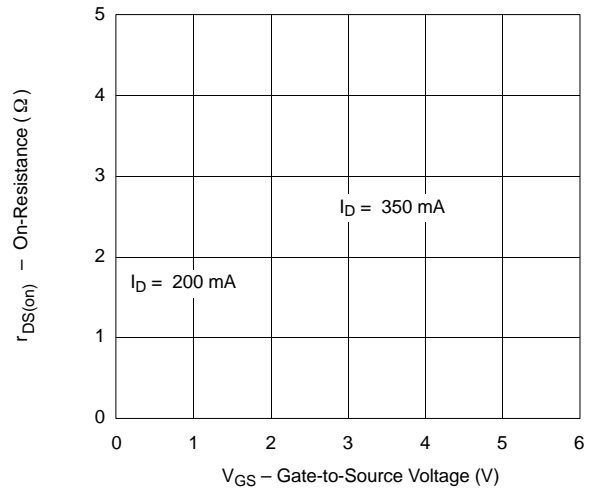


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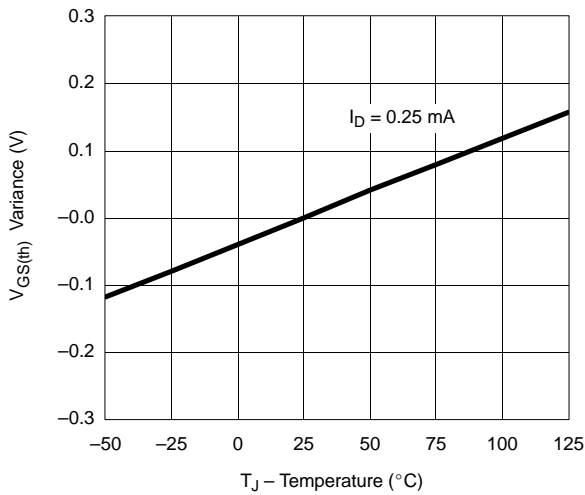
Source-Drain Diode Forward Voltage



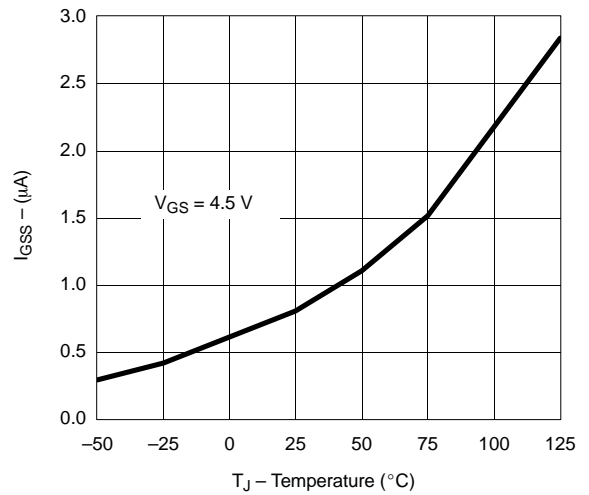
On-Resistance vs. Gate-to-Source Voltage



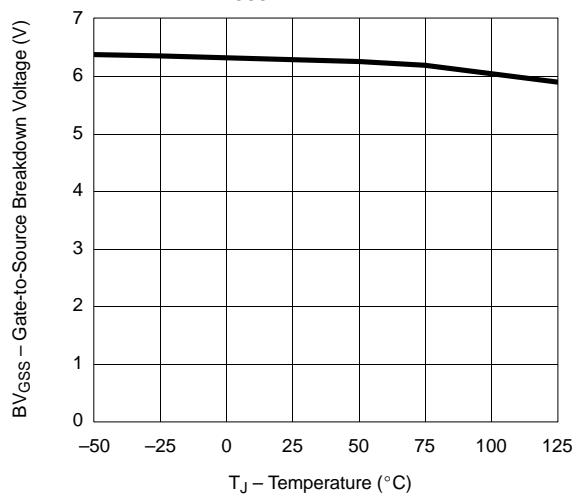
Threshold Voltage Variance vs. Temperature



$I_{GSS}$  vs. Temperature

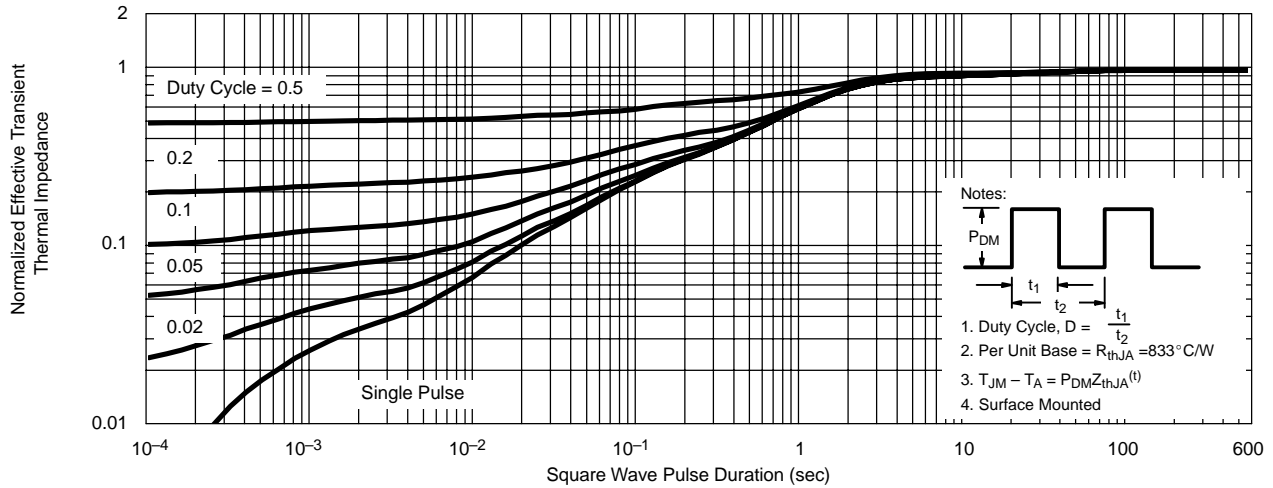


$BV_{GSS}$  vs. Temperature

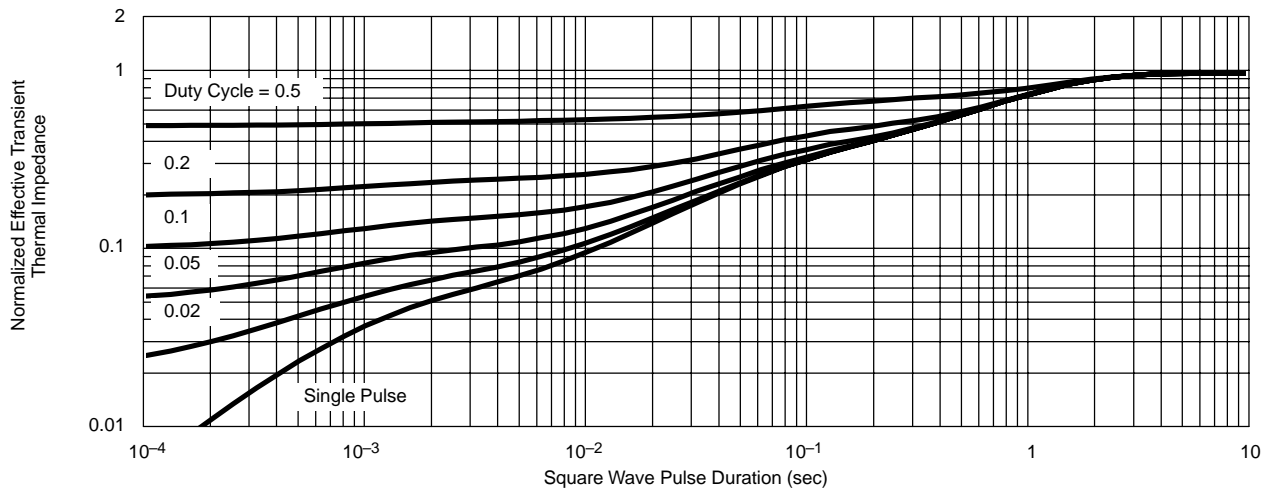


## TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ UNLESS NOTED)

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



Normalized Thermal Transient Impedance, Junction-to-Foot



SC-89 Outline Demensions

Unit:mm

