



Complementary N- and P-Channel 60-V (D-S) MOSFET

PRODUCT SUMMARY			
	V_{DS} (V)	$r_{DS(on)}$ (Ω)	I_D (mA)
N-Channel	60	1.40 @ $V_{GS} = 10$ V	500
		3 @ $V_{GS} = 4.5$ V	200
P-Channel	-60	4 @ $V_{GS} = -10$ V	-500
		8 @ $V_{GS} = -4.5$ V	-25

TrenchFET[®]

MOSFETs

ESD Protected
2000 V

FEATURES

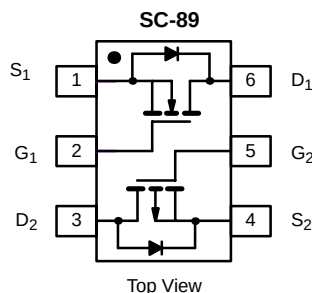
- Very Small Footprint
- High-Side Switching
- Low On-Resistance:
 - N-Channel, 1.40 Ω
 - P-Channel, 4 Ω
- Low Threshold: ± 2 V (typ)
- Fast Switching Speed: 15 ns (typ)
- Gate-Source ESD Protection

BENEFITS

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

APPLICATIONS

- Replace Digital Transistor, Level-Shifter
- Battery Operated Systems
- Power Supply Converter Circuits



Marking Code: H

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

Parameter		Symbol	N-Channel		P-Channel		Unit
			5 secs	Steady State	5 secs	Steady State	
Drain-Source Voltage		V _{DS}	60		−60		V
Gate-Source Voltage		V _{GS}	± 20				
Continuous Drain Current (T _J = 150°C) ^a	T _A = 25°C	I _D	320	305	−200	−190	mA
	T _A = 85°C		230	220	−145	−135	
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	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

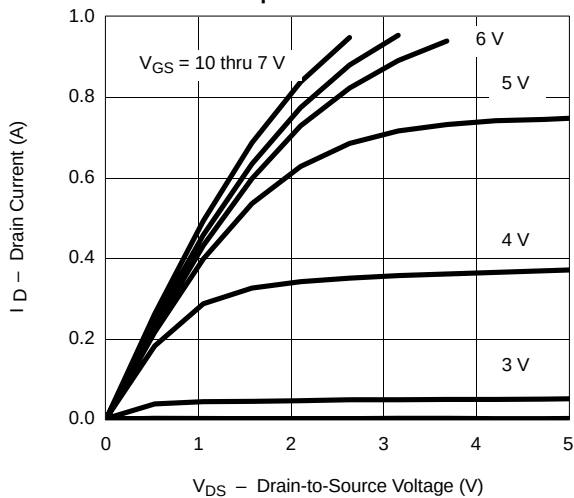
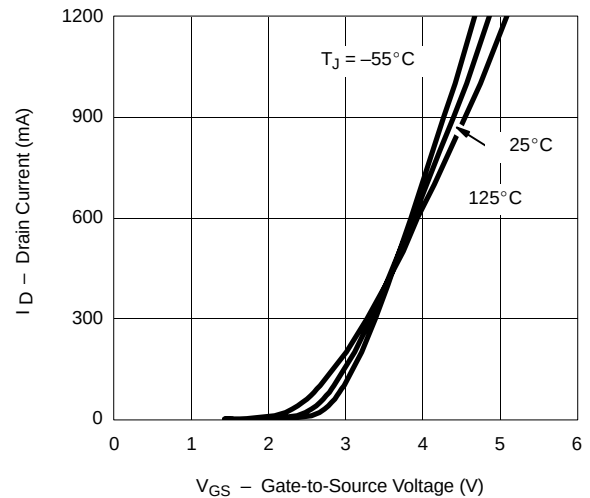
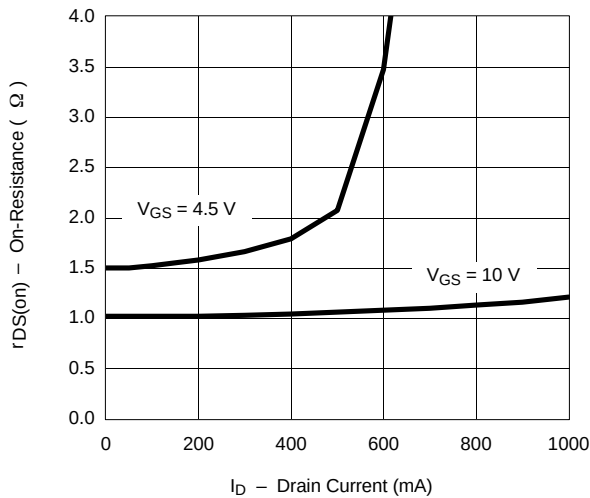
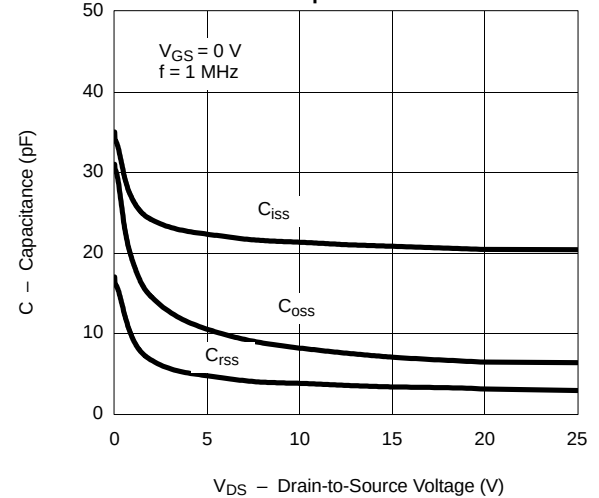
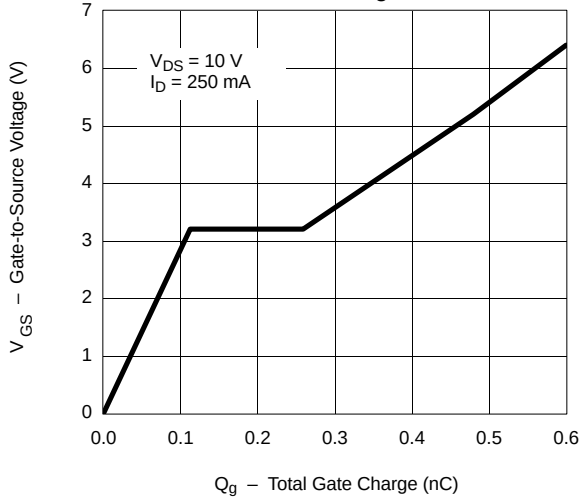
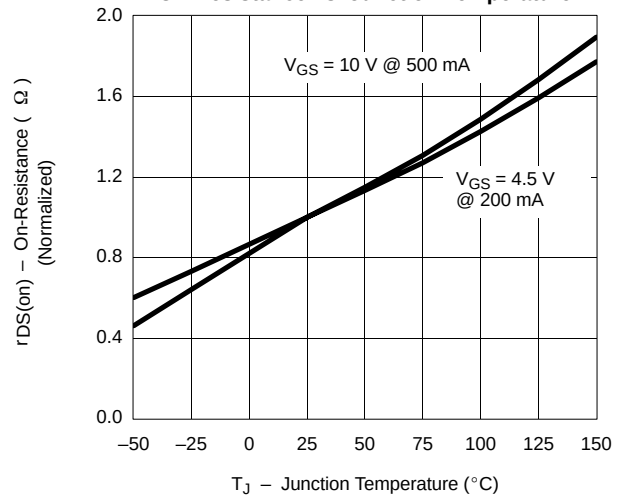
Notes

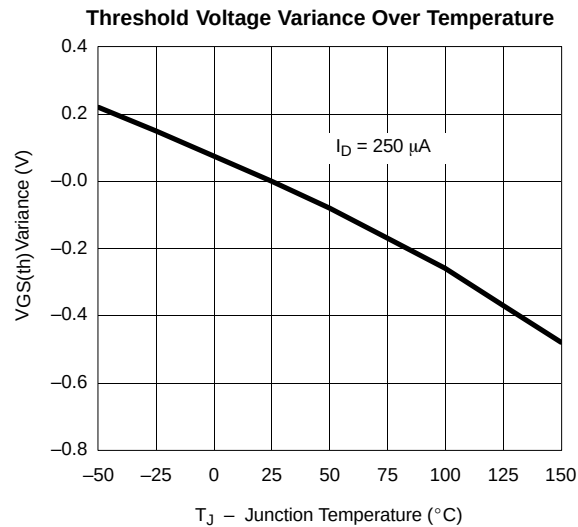
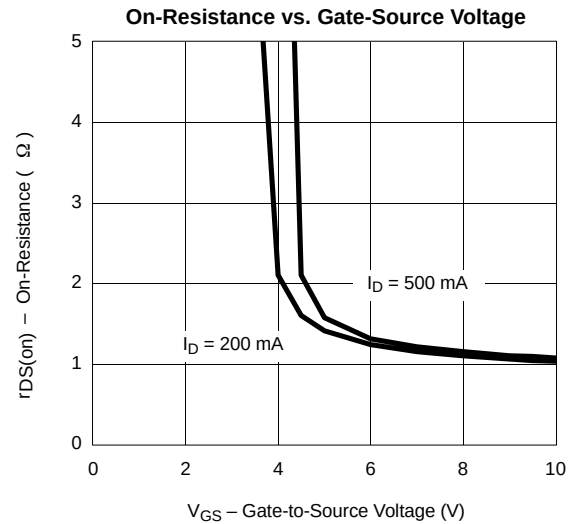
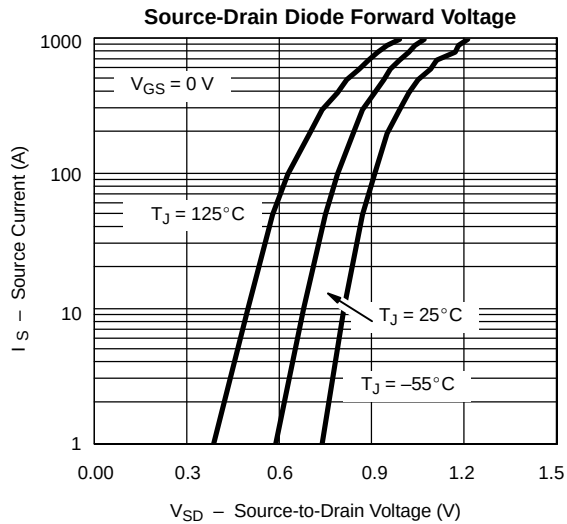
- a. Surface Mounted on FR4 Board.
b. Pulse width limited by maximum junction temperature.

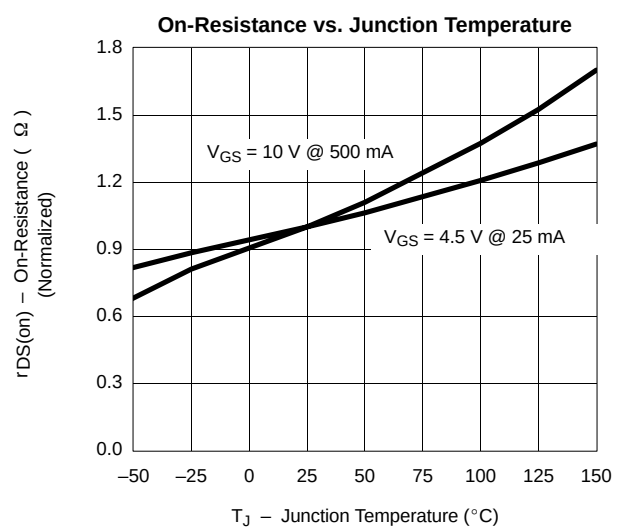
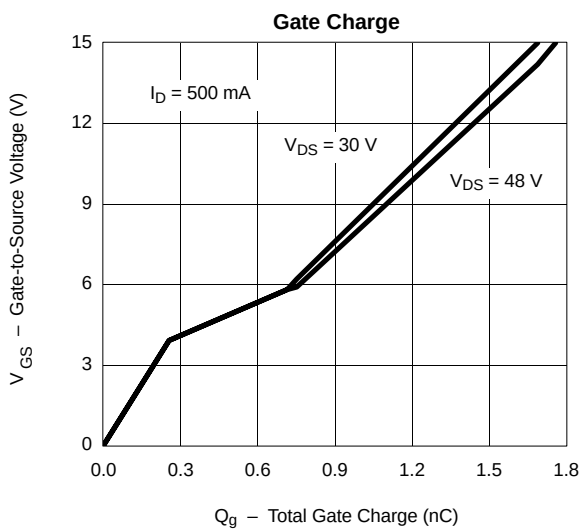
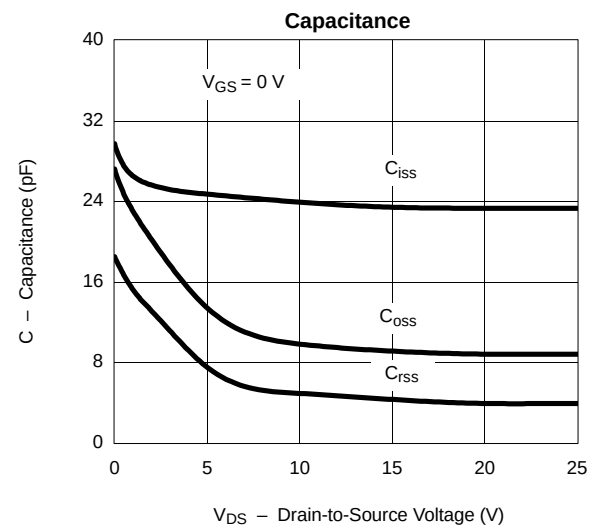
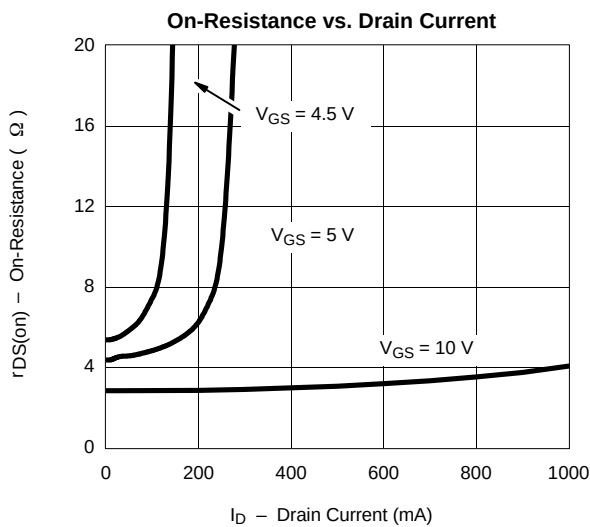
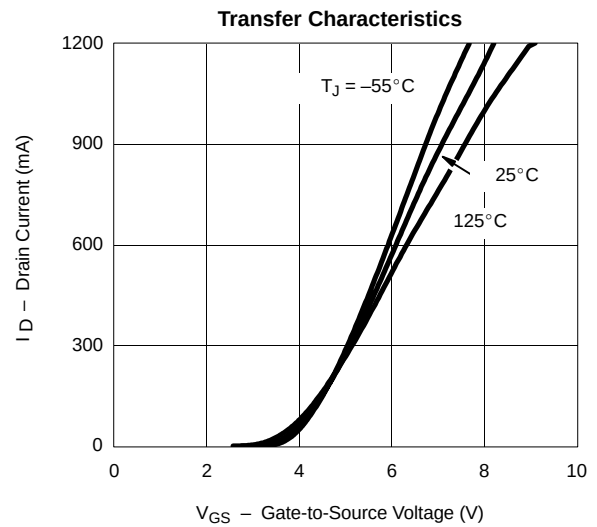
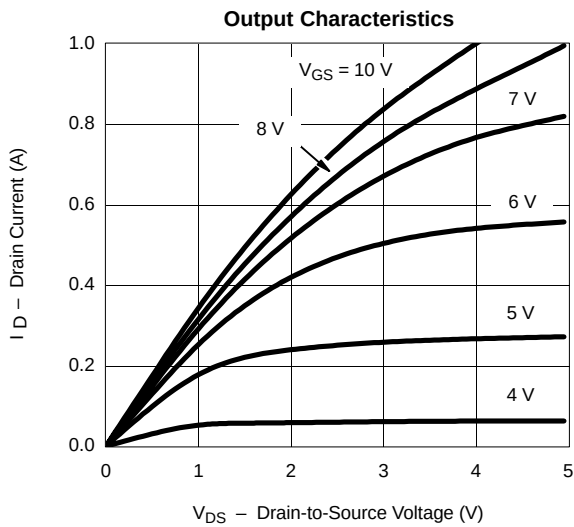
SPECIFICATIONS (T _J = 25 °C UNLESS OTHERWISE NOTED)							
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit	
Static							
Drain-Source Breakdown Voltage	V _{(BR)DSS}	V _{GS} = 0 V, I _D = 10 μA	N-Ch	60		V	
		V _{GS} = 0 V, I _D = −10 μA	P-Ch	−60			
Gate Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	N-Ch	1	2.5		
		V _{DS} = V _{GS} , I _D = −250 μA	P-Ch	−1.0	−3.0		
Gate-Body Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ±5 V	N-Ch		±50	nA	
			P-Ch		±100		
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 0 V, V _{GS} = ±10 V	N-Ch		±150		
			P-Ch		±200		
		V _{DS} = 50 V, V _{GS} = 0 V	N-Ch		10		
		V _{DS} = −50 V, V _{GS} = 0 V	P-Ch		−25		
On-State Drain Current ^a	I _{D(on)}	V _{DS} = 50 V, V _{GS} = 0 V, T _J = 85 °C	N-Ch		100		
		V _{DS} = −50 V, V _{GS} = 0 V, T _J = 85 °C	P-Ch		−250		
		V _{DS} = 10 V, V _{GS} = 4.5 V	N-Ch	500			mA
		V _{DS} = −10 V, V _{GS} = −4.5 V	P-Ch	−50			
Drain-Source On-State Resistance ^a	r _{DS(on)}	V _{DS} = 7.5 V, V _{GS} = −4.5 V	N-Ch	800		Ω	
		V _{DS} = −10 V, V _{GS} = −10 V	P-Ch	−600			
		V _{GS} = 4.5 V, I _D = 200 mA	N-Ch		3		
		V _{GS} = −4.5 V, I _D = −25 mA	P-Ch		8		
		V _{GS} = 10 V, I _D = 500 mA	N-Ch		1.40		
		V _{GS} = −10 V, I _D = −500 mA	P-Ch		4		
V _{GS} = 10 V, I _D = 500 mA, T _J = 125 °C	N-Ch		2.50				
V _{GS} = −10 V, I _D = −500 mA, T _J = 125 °C	P-Ch		6				
Forward Transconductance ^a	g _{fs}	V _{DS} = 10 V, I _D = 200 mA	N-Ch		200	mS	
		V _{DS} = −10 V, I _D = −100 mA	P-Ch		100		
Diode Forward Voltage ^a	V _{SD}	I _S = 200 mA, V _{GS} = 0 V	N-Ch		1.4	V	
		I _S = −200 mA, V _{GS} = 0 V	P-Ch		−1.4		
Dynamic ^b							
Total Gate Charge	Q _g	N-Channel V _{DS} = 10 V, V _{GS} = 4.5 V, I _D = 250 mA P-Channel V _{DS} = −30 V, V _{GS} = −15 V, I _D = −500 mA	N-Ch		750	pC	
Gate-Source Charge	Q _{gs}		P-Ch		1700		
			N-Ch		75		
Gate-Drain Charge	Q _{gd}		P-Ch		260		
		N-Ch		225			
		P-Ch		460			
Input Capacitance	C _{iss}	N-Channel V _{DS} = 25 V, V _{GS} = 0 V, f = 1 MHz P-Channel V _{DS} = −25 V, V _{GS} = 0 V, f = 1 MHz	N-Ch		30	pF	
Output Capacitance	C _{oss}		P-Ch		23		
			N-Ch		6		
Reverse Transfer Capacitance	C _{rss}		P-Ch		10		
			N-Ch		3		
			P-Ch		5		
Turn-On Time ^c	t _{ON}	N-Channel V _{DD} = 30 V, R _L = 150 Ω I _D ≅ 200 mA, V _{GEN} = 10 V, R _G = 10 Ω P-Channel V _{DD} = −25 V, R _L = 150 Ω I _D ≅ −165 mA, V _{GEN} = −10 V, R _G = 10 Ω	N-Ch		15	ns	
Turn-Off Time ^c	t _{OFF}		P-Ch		20		
			N-Ch		20		
			P-Ch		35		

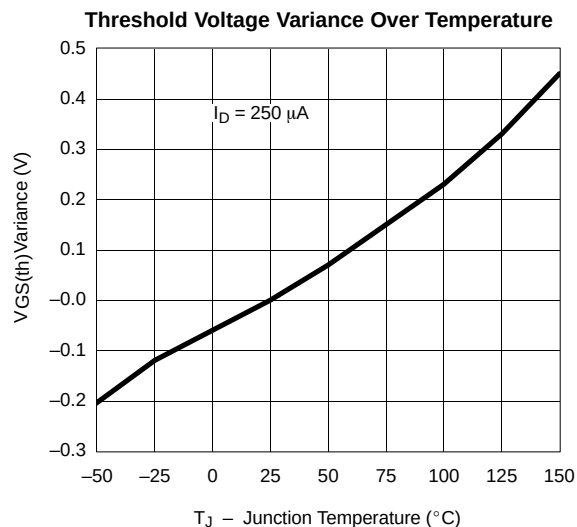
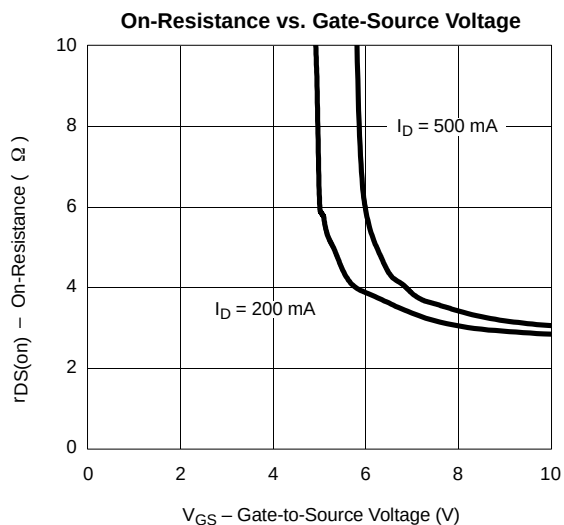
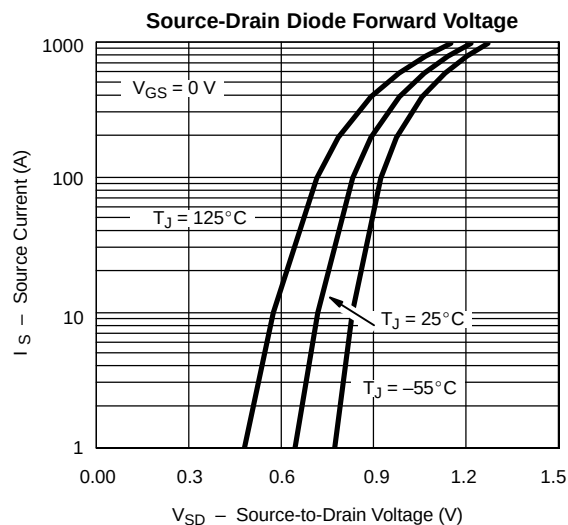
Notes

- a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2%.
b. Guaranteed by design, not subject to production testing.
c. Switching time is essentially independent of operating temperature.

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

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

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