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

PRODUCT SUMMARY			
	V_{DS} (V)	$r_{DS(on)}$ (Ω)	I_D (A)
N-Channel	20	0.0145 @ V_{GS} = 10 V	9.6
		0.017 @ V_{GS} = 4.5 V	8.6
P-Channel	−20	0.033 @ V_{GS} = −4.5 V	−6.2
		0.050 @ V_{GS} = −2.5 V	−5

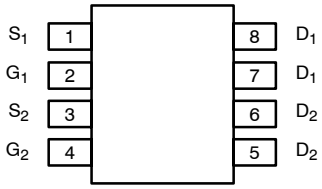
FEATURES

- TrenchFET® Power MOSFET

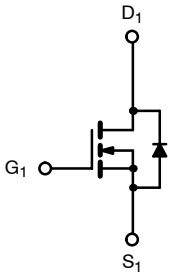
APPLICATIONS

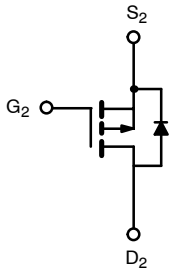
- Level Shift
- Load Switch

SO-8



Top View





Ordering Information: Si4511DY
Si4511DY-T1 (with Tape and Reel)
Si4511DY—E3 (Lead (Pb)-Free)
Si4511DY-T1—E3 (Lead (Pb)-Free with Tape and Reel)

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C UNLESS OTHERWISE NOTED)

Parameter		Symbol	N-Channel		P-Channel		Unit
			10 sec.	Steady State	10 sec.	Steady State	
Drain-Source Voltage		V_{DS}	20		−20		V
Gate-Source Voltage		V_{GS}	±16		±12		
Continuous Drain Current (T_J = 150°C)[a, b]	T_A = 25°C	I_D	9.6	7.2	−6.2	−4.6	A
	T_A = 70°C		7.7	5.8	−4.9	−3.7	
Pulsed Drain Current		I_{DM}	40		−40		
Continuous Source Current (Diode Conduction)[a, b]		I_S	1.7	0.9	−1.7	0.9	
Maximum Power Dissipation[a, b]	T_A = 25°C	P_D	2	1.1	2	1.1	W
	T_A = 70°C		1.3	0.7	1.3	0.7	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	−55 to 150				°C

THERMAL RESISTANCE RATINGS

Parameter		Symbol	N-Channel		P- Channel		Unit
			Typ	Max	Typ	Max	
Maximum Junction-to-Ambient[a]	t ≤ 10 sec	R_{thJA}	50	62.5	50	62.5	°C/W
	Steady-State		85	110	90	110	
Maximum Junction-to-Foot (Drain)	Steady-State	R_{thJF}	30	40	30	35	

Notes
a. Surface Mounted on FR4 Board.
b. t ≤ 10 sec

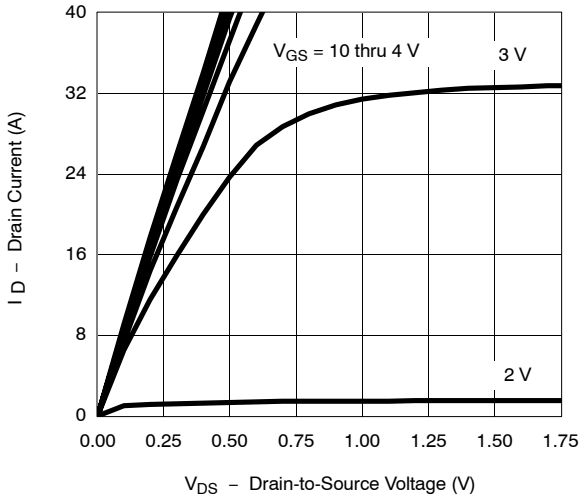
SPECIFICATIONS (T_J = 25°C UNLESS OTHERWISE NOTED)

Parameter	Symbol	Test Condition		Min	Typ[a]	Max	Unit
Static							
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA	N-Ch	0.6		1.8	V
		V_{DS} = V_{GS}, I_D = −250 µA	P-Ch	−0.6		1.4	
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±16 V	N-Ch			±100	nA
		V_{DS} = 0 V, V_{GS} = ±12 V	P-Ch			±100	
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 20 V, V_{GS} = 0 V	N-Ch			1	µA
		V_{DS} = −16 V, V_{GS} = 0 V	P-Ch			−1	
		V_{DS} = 20 V, V_{GS} = 0 V, T_J = 55°C	N-Ch			5	
		V_{DS} = −16 V, V_{GS} = 0 V, T_J = 55°C	P-Ch			−5	
On-State Drain Current[b]	$I_{D(on)}$	V_{DS} = 5 V, V_{GS} = 10 V	N-Ch	40			A
		V_{DS} = −5 V, V_{GS} = −4.5 V	P-Ch	−40			
Drain-Source On-State Resistance[b]	$r_{DS(on)}$	V_{GS} = 10 V, I_D = 9.6 A	N-Ch		0.0115	0.0145	Ω
		V_{GS} = −4.5 V, I_D = −6.2 A	P-Ch		0.022	0.033	
		V_{GS} = 4.5 V, I_D = 8.6 A	N-Ch		0.0135	0.017	
		V_{GS} = −2.5 V, I_D = −5 A	P-Ch		0.035	0.050	
Forward Transconductance[b]	g_{fs}	V_{DS} = 15 V, I_D = 9.6 A	N-Ch		33		S
		V_{DS} = −15 V, I_D = −6.2 A	P-Ch		17		
Diode Forward Voltage[b]	V_{SD}	I_S = 1.7 A, V_{GS} = 0 V	N-Ch		0.8	1.2	V
		I_S = −1.7 A, V_{GS} = 0 V	P-Ch		−0.8	−1.2	
Dynamic[a]							
Total Gate Charge	Q_g	N-Channel V_{DS} = 10 V, V_{GS} = 4.5 V, I_D = 9.6 A P-Channel V_{DS} = −10 V, V_{GS} = −4.5 V, I_D = −6.2 A	N-Ch		11.5	18	nC
			P-Ch		17	20	
Gate-Source Charge	Q_{gs}		N-Ch		3.7		
			P-Ch		4.1		
Gate-Drain Charge	Q_{gd}		N-Ch		3.3		
			P-Ch		4.3		
Turn-On Delay Time	$t_{d(on)}$	N-Channel V_{DD} = 10 V, R_L = 10 Ω I_D ≅ 1 A, V_{GEN} = 10 V, R_g = 6 Ω P-Channel V_{DD} = −10 V, R_L = 10 Ω I_D ≅ −1 A, V_{GEN} = −4.5 V, R_g = 6 Ω	N-Ch		12	20	ns
			P-Ch		25	40	
Rise Time	t_r		N-Ch		12	20	
			P-Ch		30	45	
Turn-Off Delay Time	$t_{d(off)}$		N-Ch		55	85	
			P-Ch		70	105	
Fall Time	t_f		N-Ch		15	25	
			P-Ch		50	75	
Source-Drain Reverse Recovery Time	t_{rr}	I_F = 1.7 A, di/dt = 100 A/µs	N-Ch		50	100	
		I_F = −1.7 A, di/dt = 100 A/µs	P-Ch		40	80	

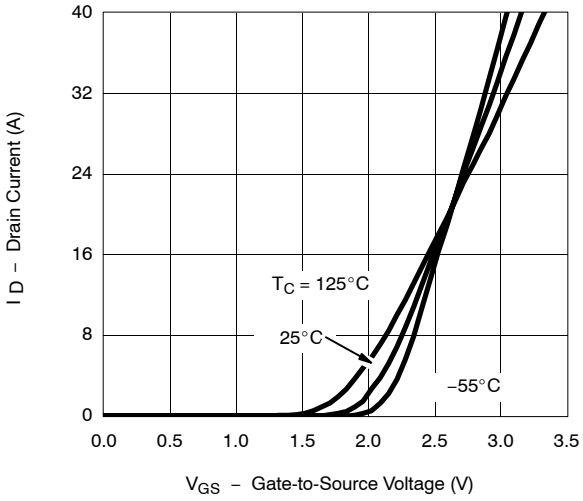
Notes
a. Guaranteed by design, not subject to production testing.
b. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2%.

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

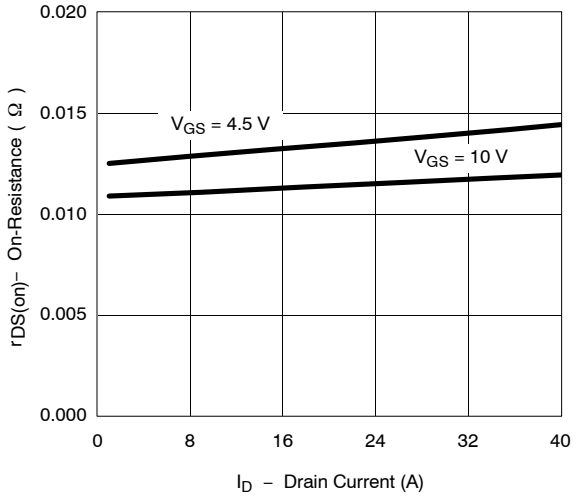
Output Characteristics



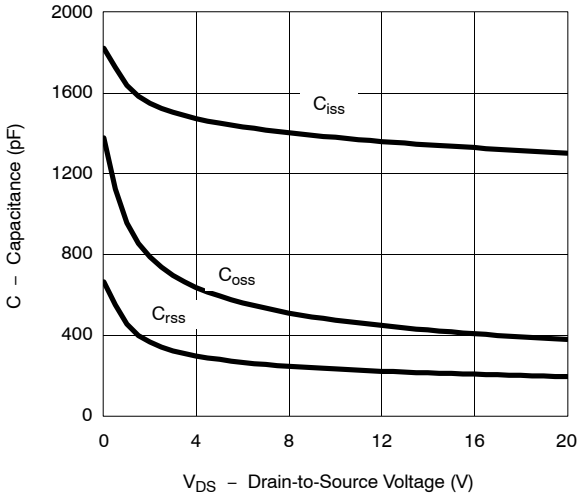
Transfer Characteristics



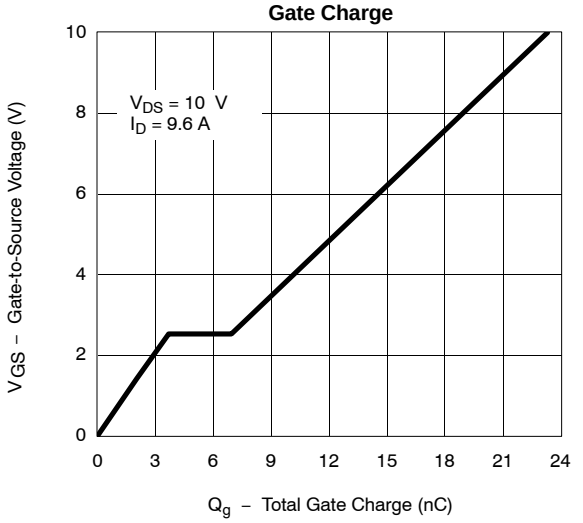
On-Resistance vs. Drain Current



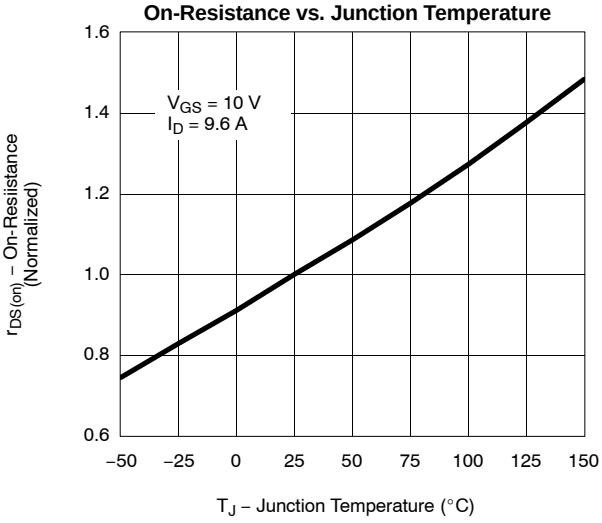
Capacitance



Gate Charge

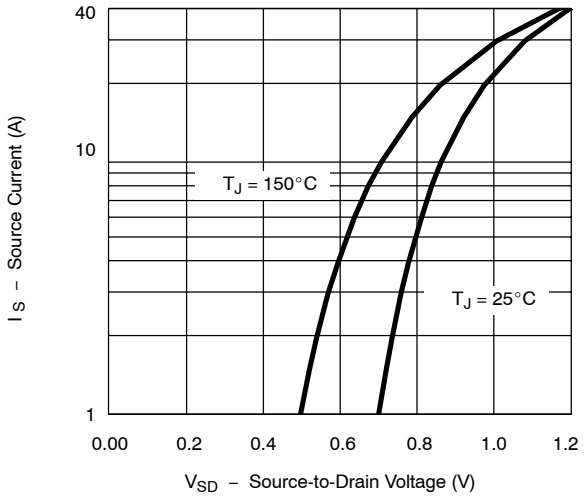


On-Resistance vs. Junction Temperature

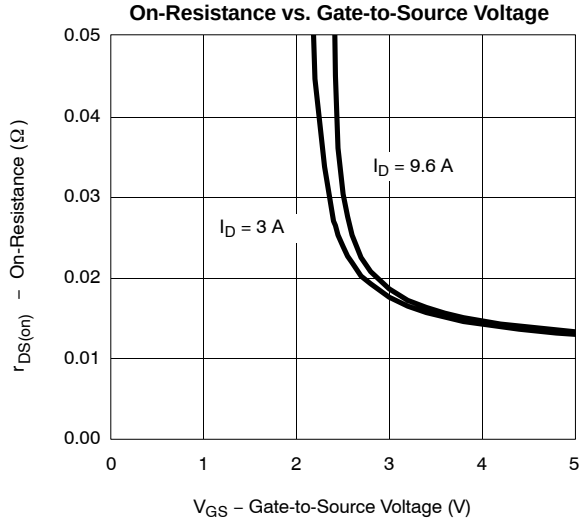


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) N-CHANNEL

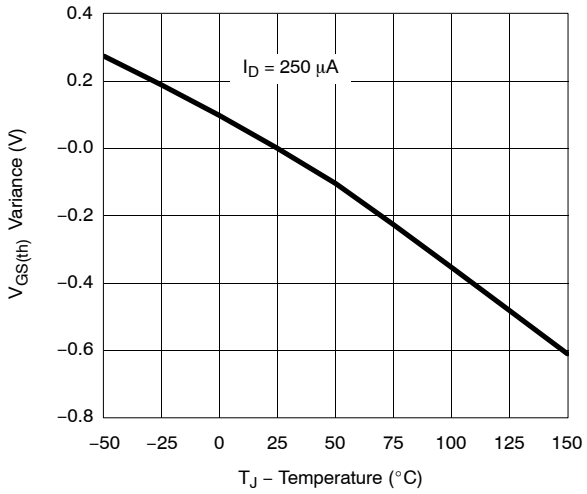
Source-Drain Diode Forward Voltage



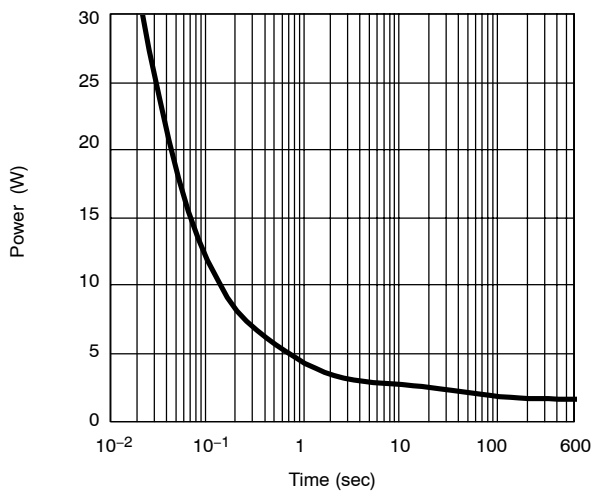
On-Resistance vs. Gate-to-Source Voltage



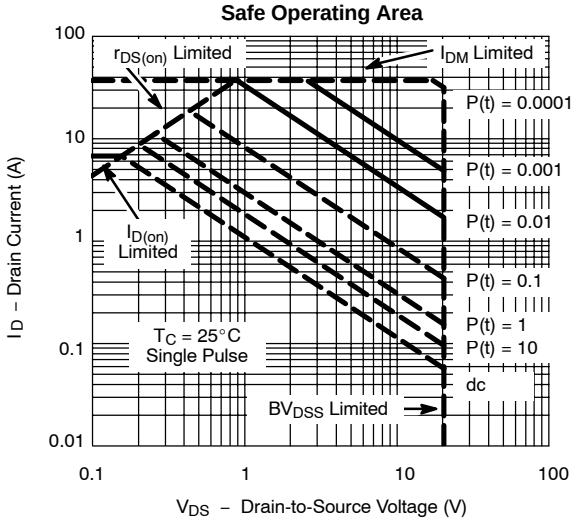
Threshold Voltage



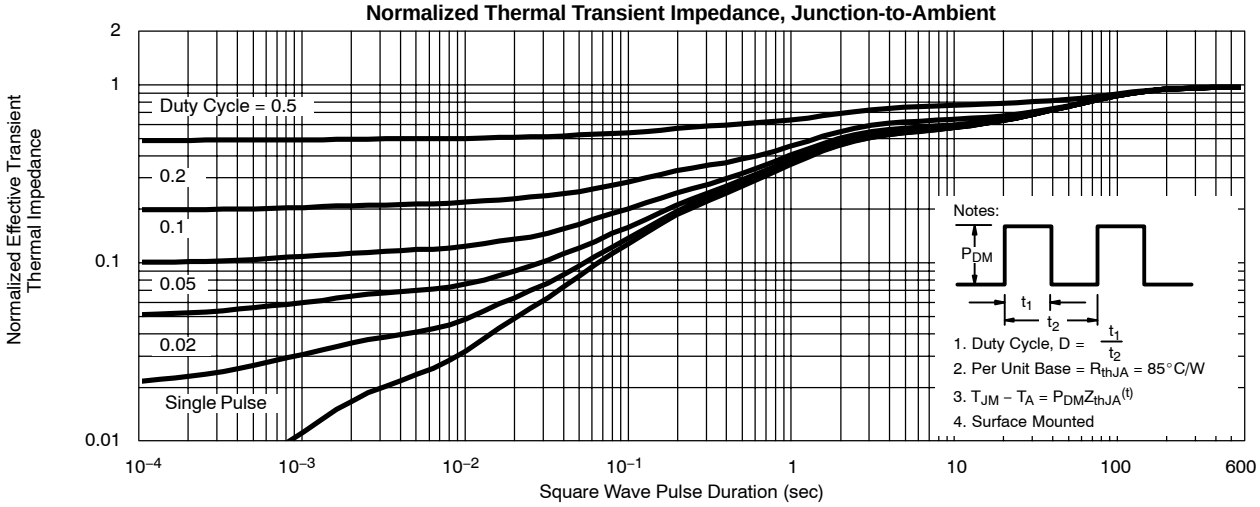
Single Pulse Power

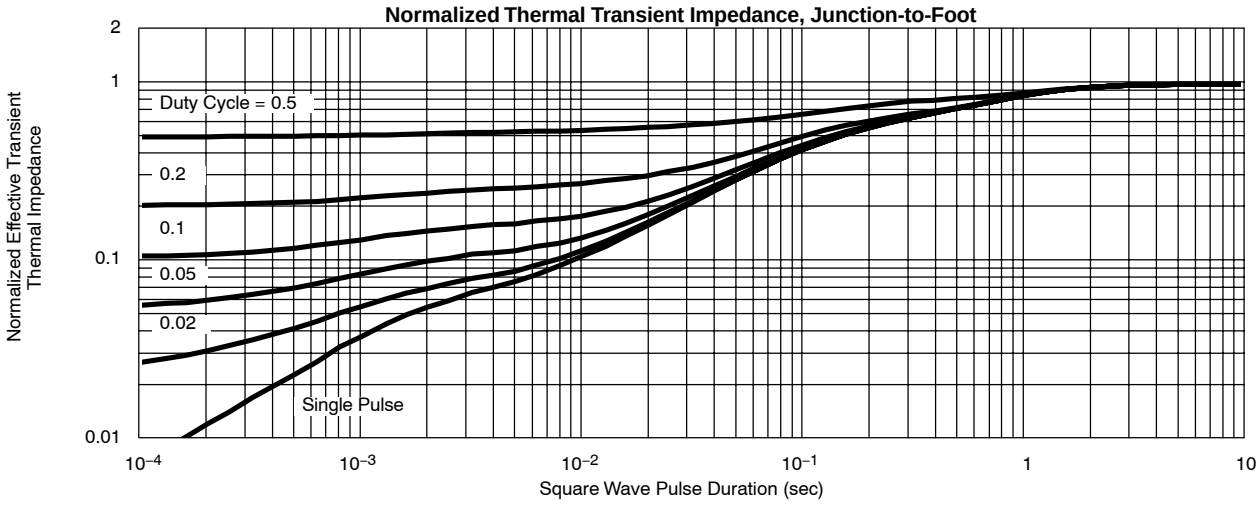


Safe Operating Area

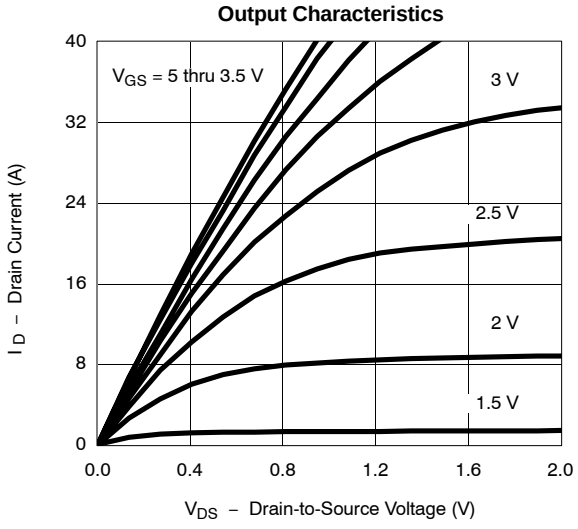


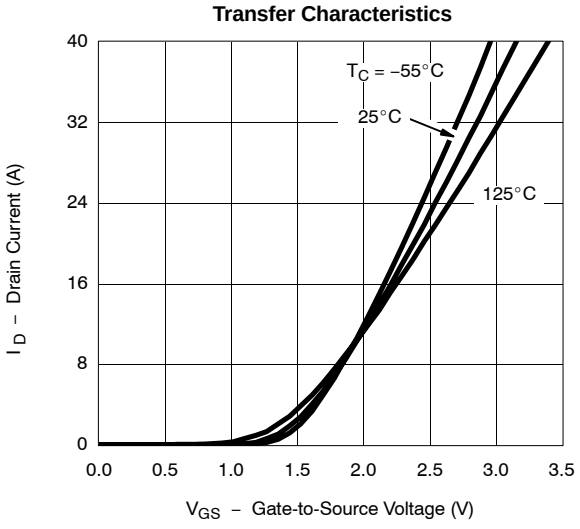
TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) N-CHANNEL





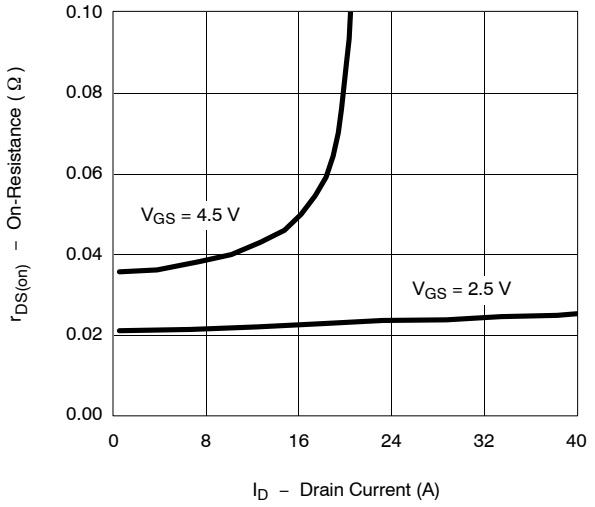
TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) P-CHANNEL



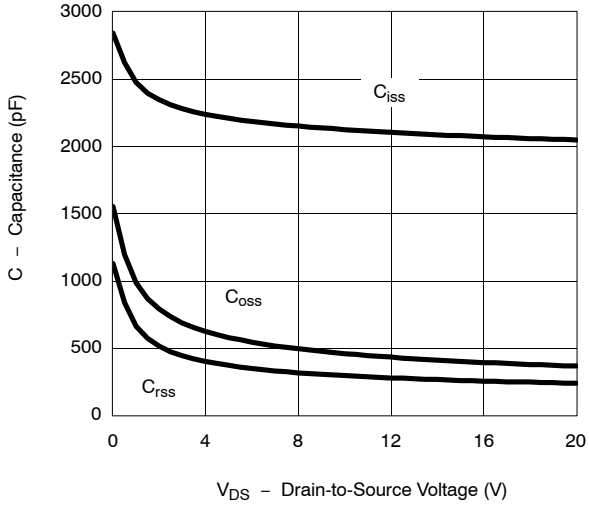


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) P-CHANNEL

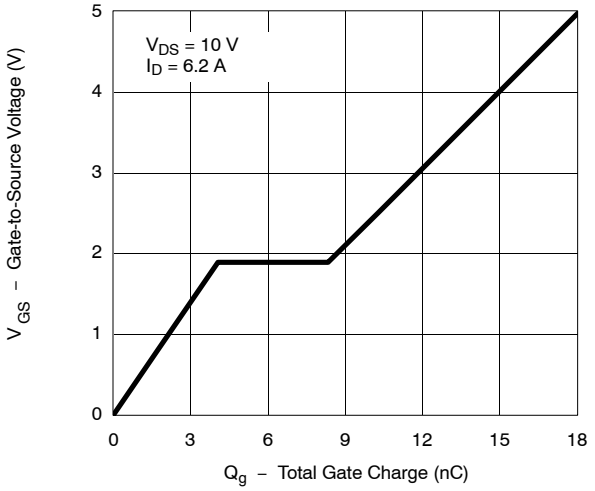
On-Resistance vs. Drain Current



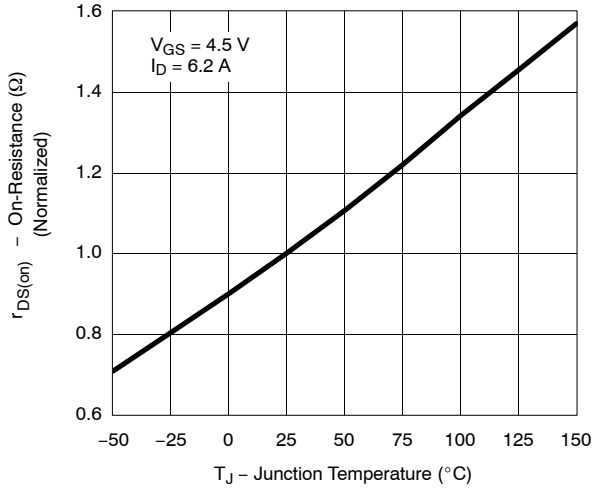
Capacitance



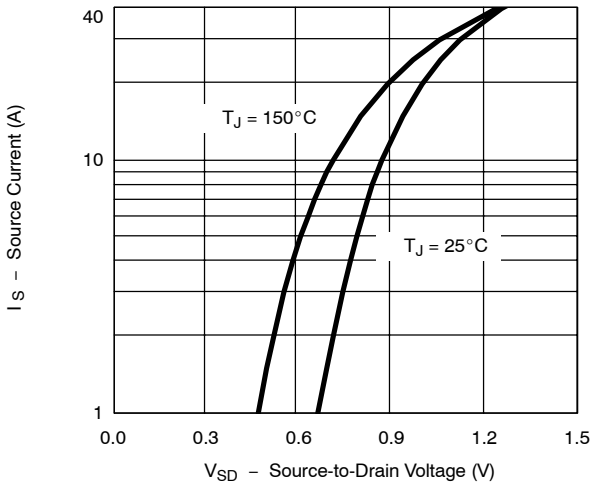
Gate Charge



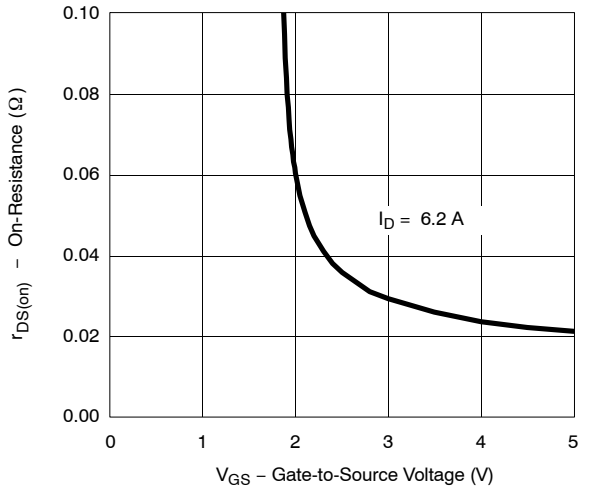
On-Resistance vs. Junction Temperature



Source-Drain Diode Forward Voltage

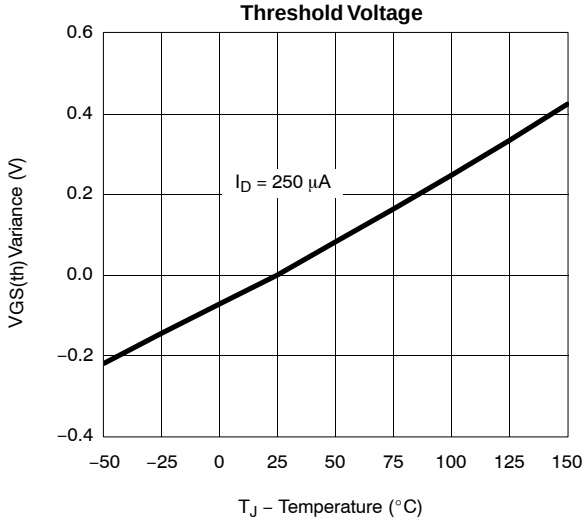


On-Resistance vs. Gate-to-Source Voltage

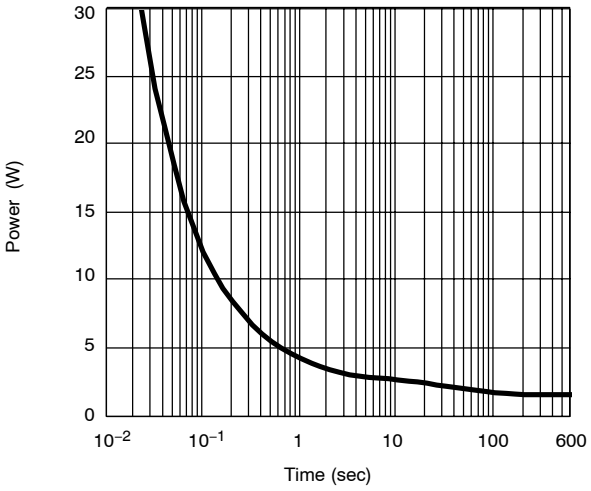


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) P-CHANNEL

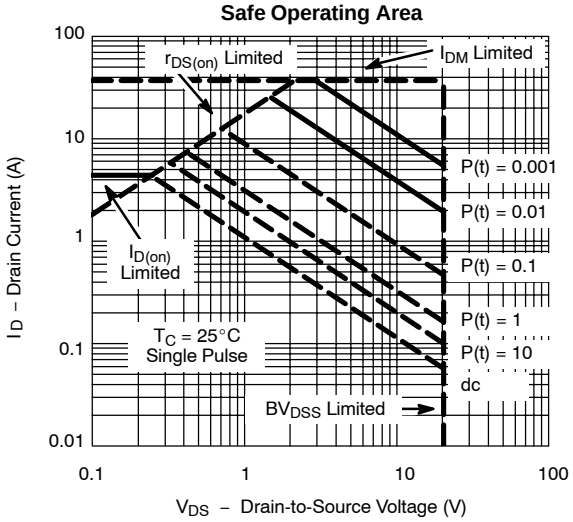
Threshold Voltage



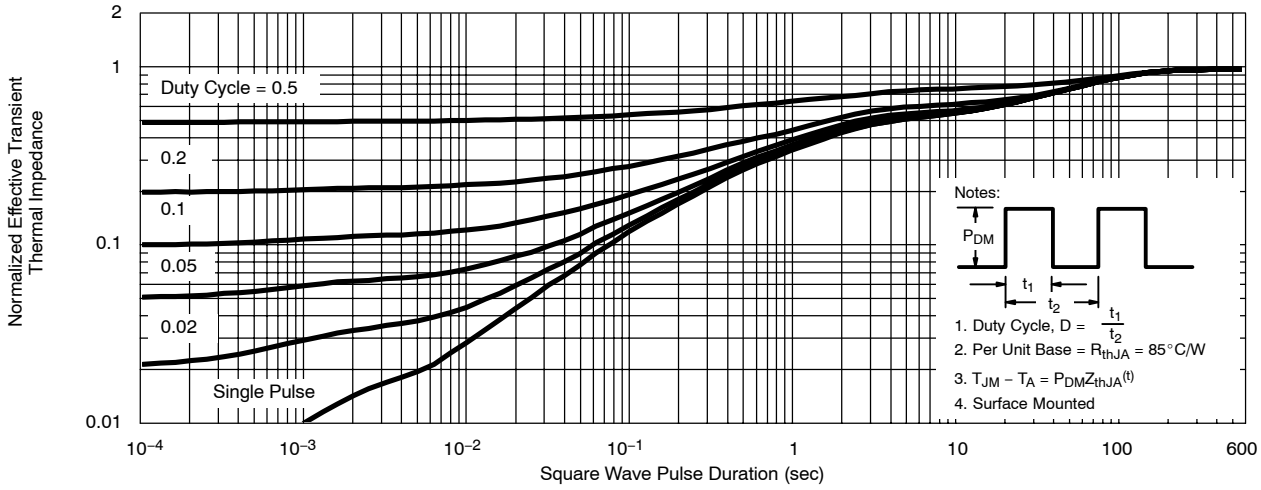
Single Pulse Power



Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Ambient



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