N- and P-Channel 40-V (D-S) MOSFET

PRODUCT SUMMARY				
	V_{DS} (V)	$r_{DS(on)}$ (Ω)	I_D (A)	Q_g (Typ)
N-Channel	40	0.040 @ V_{GS} = 10 V	5.2	8
		0.045 @ V_{GS} = 4.5 V	4.9	
P-Channel	–40	0.054 @ V_{GS} = –10 V	–4.5	9
		0.072 @ V_{GS} = –4.5 V	–3.9	

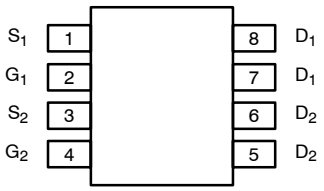
FEATURES

- TrenchFET® Power MOSFET
- 100% R_g Tested
- UIS Tested

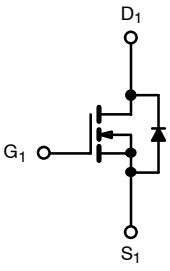
APPLICATIONS

- CCFL Inverter

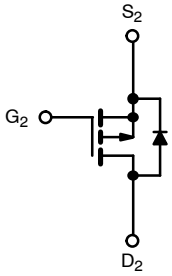
SO-8



Top View



N-Channel MOSFET



P-Channel MOSFET

Ordering Information: Si4565DY—E3
Si4565DY-T1—E3 (with Tape and Reel)

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C UNLESS OTHERWISE NOTED)							
Parameter		Symbol	N-Channel		P-Channel		Unit
			10 secs	Steady State	10 secs	Steady State	
Drain-Source Voltage		V_{DS}	40		–40		V
Gate-Source Voltage		V_{GS}	±12		±16		
Continuous Drain Current (T_J = 150°C)[a]	T_A = 25°C	I_D	5.2	3.9	–4.5	–3.3	A
	T_A = 70°C		4.2	3.1	–3.6	–2.7	
Pulsed Drain Current		I_{DM}	30				
Continuous Source Current (Diode Conduction)[a]		I_S	1.7	0.9	–1.7	–0.9	
Avalanche Current	L = 0.1 mH	I_{AS}	13		16		
Single Pulse Avalanche Energy		E_{AS}	8.5		13		mJ
Maximum Power Dissipatio[a]	T_A = 25°C	P_D	2.0	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}	52	62.5	50	62.5	°C/W
	Steady State		90	110	85	110	
Maximum Junction-to-Foot (Drain)	Steady State	R_{thJF}	32	40	30	40	

Notes
a. Surface Mounted on 1" x 1" FR4 Board.

SPECIFICATIONS (T_J = 25°C UNLESS OTHERWISE NOTED)

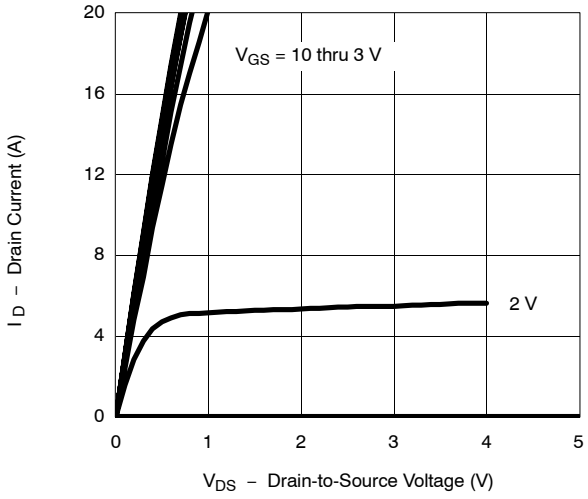
Parameter	Symbol	Test Condition		Min	Typ	Max	Unit
Static							
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 μA	N-Ch	0.6		1.6	V
		V_{DS} = V_{GS}, I_D = −250 μA	P-Ch	−0.8		−2.2	
V_{DS} Temperature Coefficient	$\Delta V_{DS/Tj}$	I_D = 250 μA	N-Ch		40		mV/°C
			P-Ch		−40		
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)/Tj}$		N-Ch		−3.8		
			P-Ch		3.4		
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±12 V	N-Ch			±100	nA
		V_{DS} = 0 V, V_{GS} = ±16 V	P-Ch			±100	
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 40 V, V_{GS} = 0 V	N-Ch			1	μA
		V_{DS} = −40 V, V_{GS} = 0 V	P-Ch			−1	
		V_{DS} = 40 V, V_{GS} = 0 V, T_J = 55°C	N-Ch			10	
		V_{DS} = −40 V, V_{GS} = 0 V, T_J = 55°C	P-Ch			−10	
On-State Drain Current[a]	$I_{D(on)}$	V_{DS} ≥ 5 V, V_{GS} = 10 V	N-Ch	20			A
		V_{DS} ≤ −5 V, V_{GS} = −10 V	P-Ch	−20			
Drain-Source On-State Resistance[a]	$r_{DS(on)}$	V_{GS} = 10 V, I_D = 5.2 A	N-Ch		0.033	0.040	Ω
		V_{GS} = −10 V, I_D = −4.5 A	P-Ch		0.045	0.054	
		V_{GS} = 4.5 V, I_D = 4.9 A	N-Ch		0.037	0.045	
		V_{GS} = −4.5 V, I_D = −3.9 A	P-Ch		0.059	0.072	
Forward Transconductance[a]	g_{fs}	V_{DS} = 15 V, I_D = 5.2 A	N-Ch		18		S
		V_{DS} = −15 V, I_D = −4.5 A	P-Ch		13		
Diode Forward Voltage[a]	V_{SD}	I_S = 1.7 A, V_{GS} = 0 V	N-Ch		0.75	1.2	V
		I_S = −1.7 A, V_{GS} = 0 V	P-Ch		−0.79	−1.2	
Dynamic[b]							
Input Capacitance	C_{iss}	N-Channel V_{DS} = 20 V, V_{GS} = 0 V, f = 1 MHz	N-Ch		700		pF
			P-Ch		805		
Output Capacitance	C_{oss}	P-Channel V_{DS} = −20 V, V_{GS} = 0 V, f = 1 MHz	N-Ch		76		
			P-Ch		120		
Reverse Transfer Capacitance	C_{rss}		N-Ch		45		
			P-Ch		85		
Total Gate Charge	Q_g	N-Channel V_{DS} = 20 V, V_{GS} = 4.5 V, I_D = 5.2 A	N-Ch		8	12	nC
			P-Ch		9	14	
Gate-Source Charge	Q_{gs}	P-Channel V_{DS} = −20 V, V_{GS} = −4.5 V, I_D = −4.5 A	N-Ch		1.5		
			P-Ch		2		
Gate-Drain Charge	Q_{gd}		N-Ch		2.4		
			P-Ch		3.6		
Gate Resistance	R_g		N-Ch	0.9	1.9	2.9	Ω
			P-Ch	5	11.5	18	
Turn-On Delay Time	$t_{d(on)}$	N-Channel V_{DD} = 15 V, R_L = 15 Ω I_D ≅ 1 A, V_{GEN} = 10 V, R_g = 6 Ω	N-Ch		7	11	ns
			P-Ch		8	13	
Rise Time	t_r		N-Ch		11	17	
			P-Ch		12	18	
Turn-Off Delay Time	$t_{d(off)}$	P-Channel V_{DD} = −15 V, R_L = 15 Ω I_D ≅ −1 A, V_{GEN} = −10 V, R_g = 6 Ω	N-Ch		27	40	
			P-Ch		74	110	
Fall Time	t_f		N-Ch		8	13	
			P-Ch		38	60	
Source-Drain Reverse Recovery Time	t_{rr}	I_F = 1.7 A, di/dt = 100 A/μs	N-Ch		25	40	ns
		I_F = −1.7 A, di/dt = 100 A/μs	P-Ch		27	45	
Body Diode Reverse Recovery Charge	Q_{rr}	I_F = 1.7 A, di/dt = 100 A/μs	N-Ch		17	26	nC
		I_F = −1.7 A, di/dt = 100 A/μs	P-Ch		17	26	

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

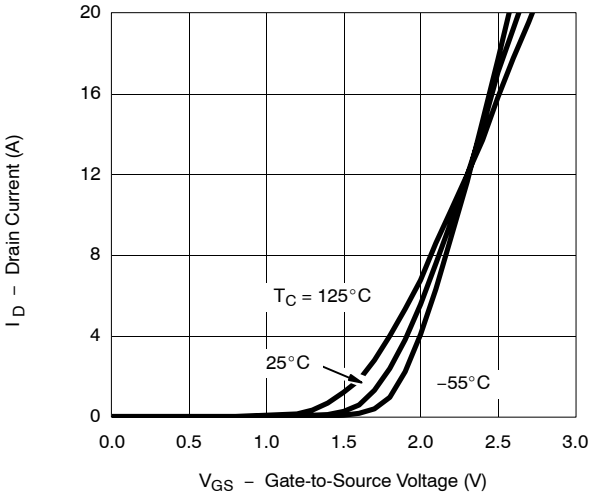
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

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

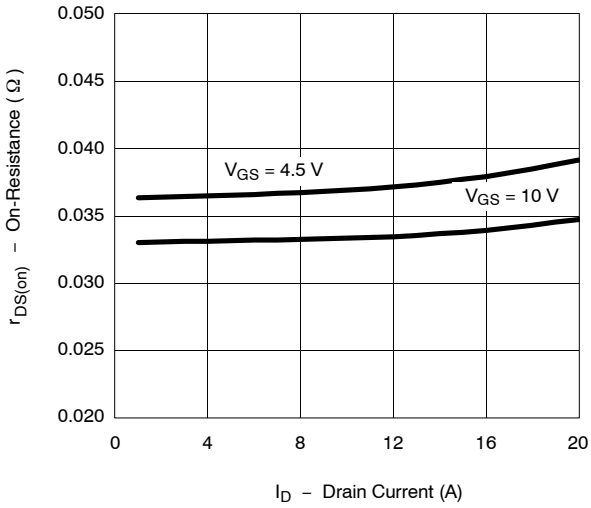
Output Characteristics



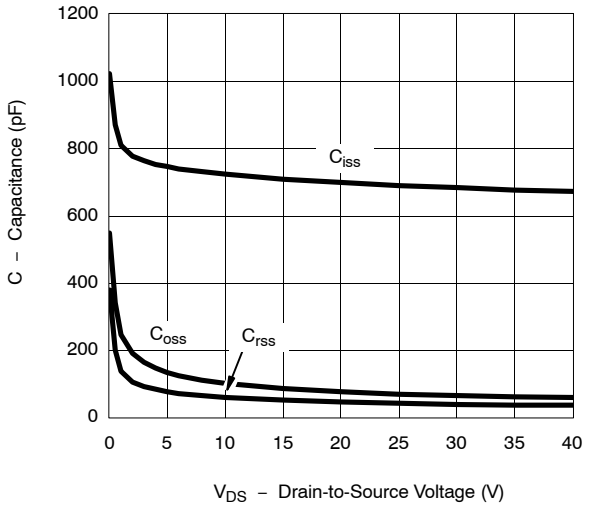
Transfer Characteristics



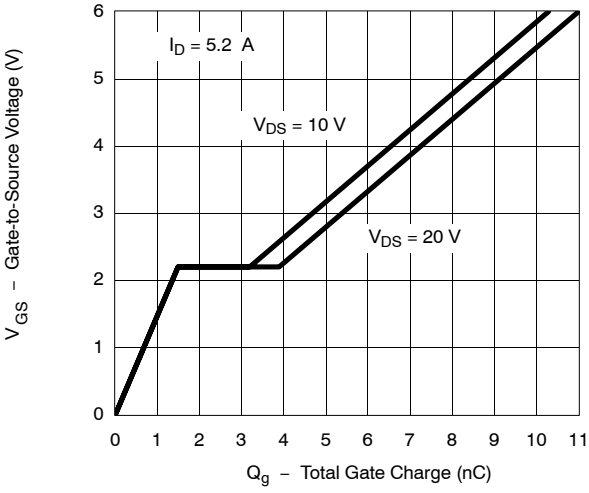
On-Resistance vs. Drain Current



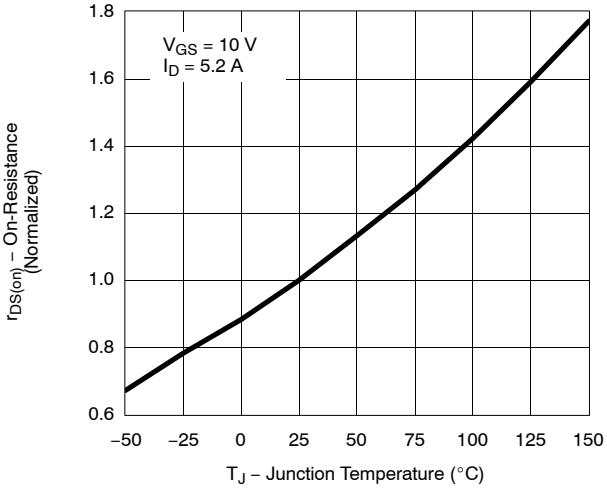
Capacitance



Gate Charge

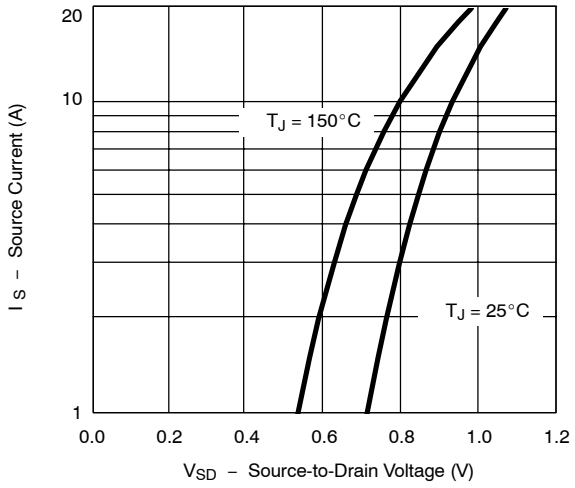


On-Resistance vs. Junction Temperature

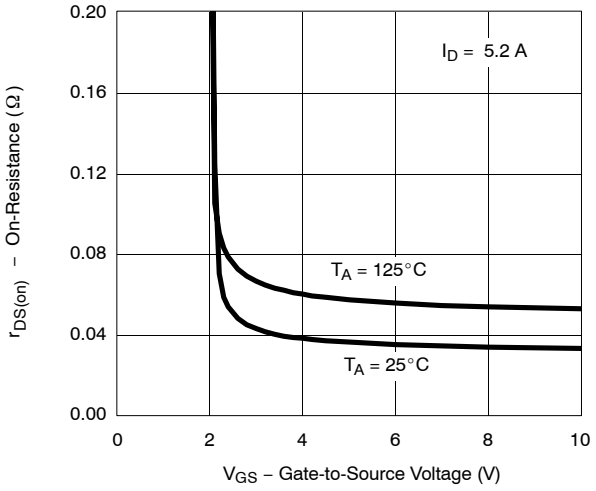


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) N-CHANNEL

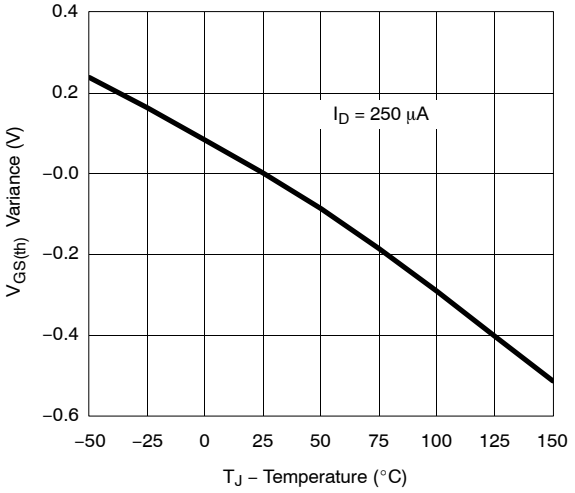
Source-Drain Diode Forward Voltage



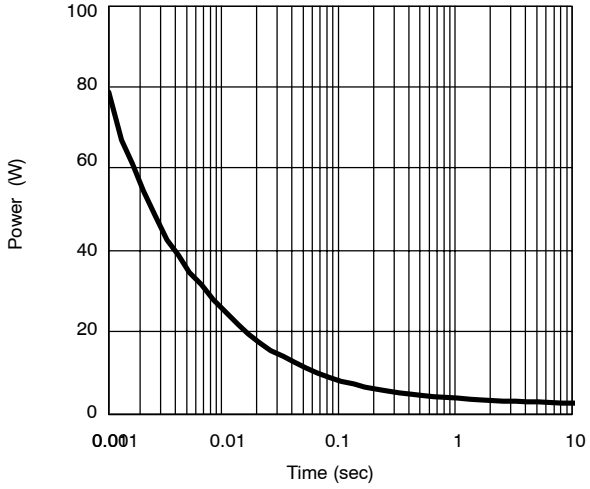
On-Resistance vs. Gate-to-Source Voltage



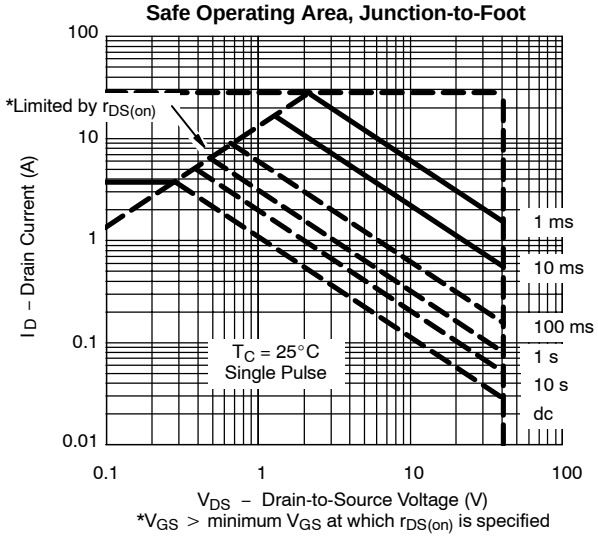
Threshold Voltage



Single Pulse Power, Junction-to-Ambient



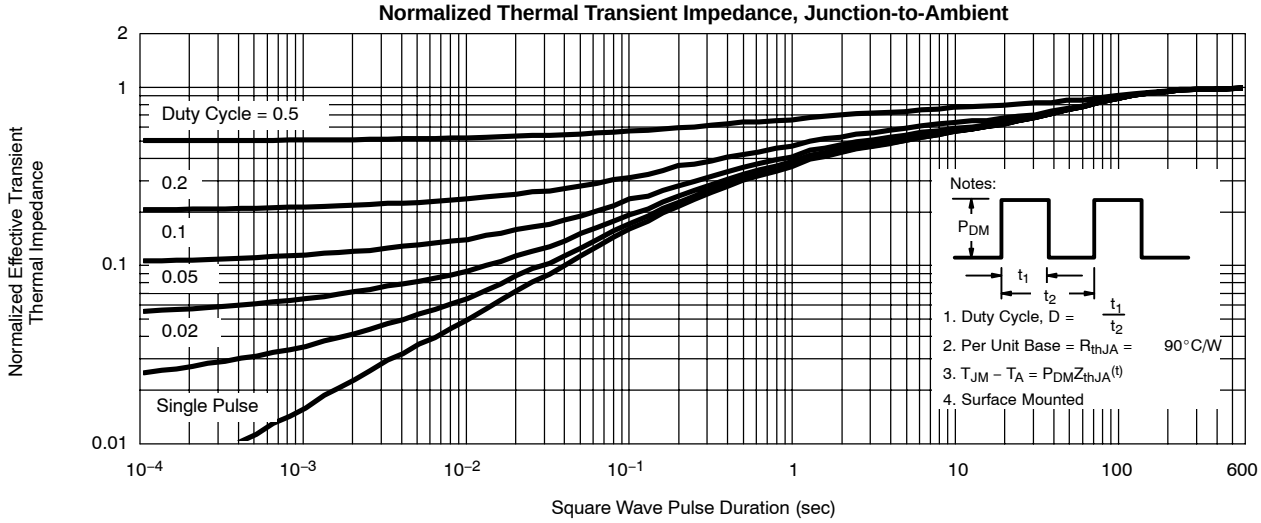
Safe Operating Area, Junction-to-Foot



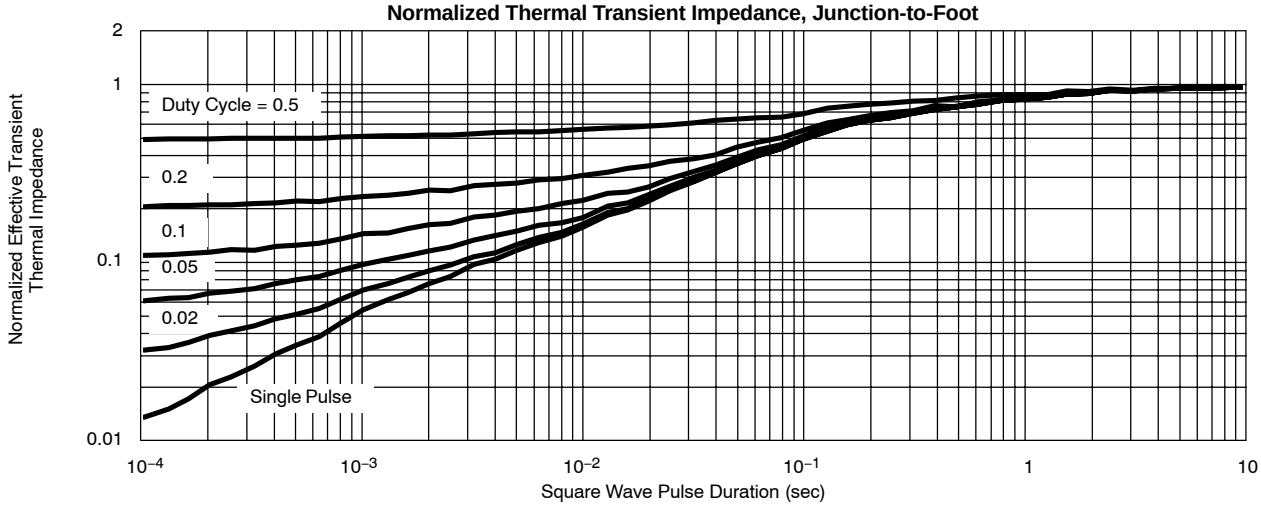
*V_{GS} > minimum V_{GS} at which $r_{DS(on)}$ is specified

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

Normalized Thermal Transient Impedance, Junction-to-Ambient

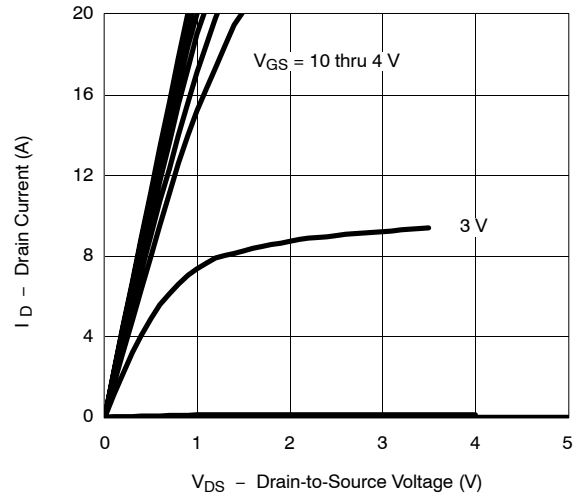


Normalized Thermal Transient Impedance, Junction-to-Foot

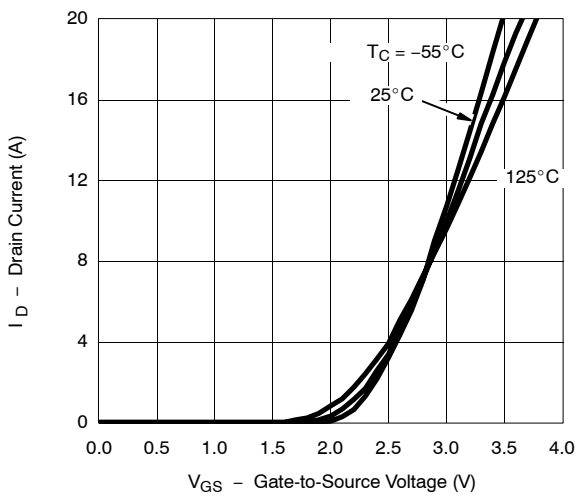


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) P-CHANNEL

Output Characteristics

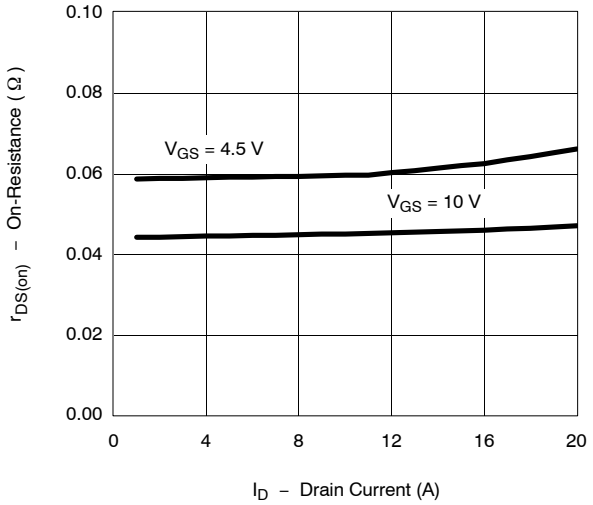


Transfer Characteristics

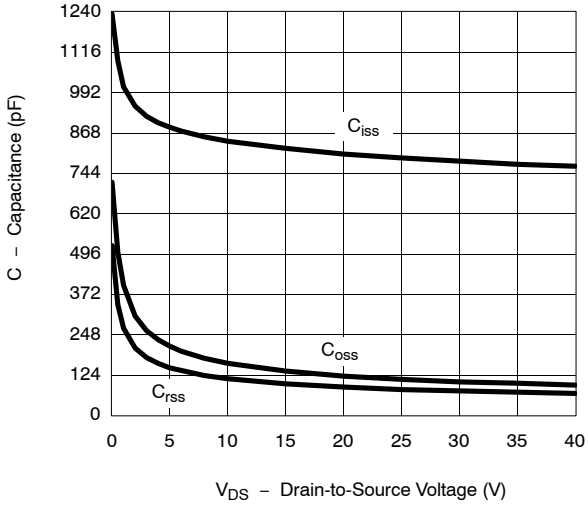


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) P-CHANNEL

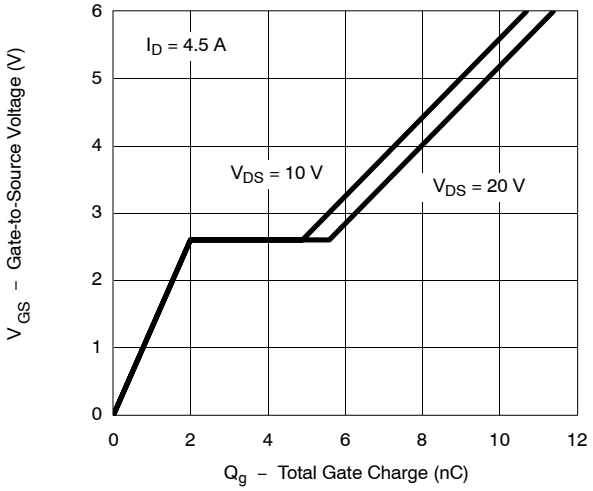
On-Resistance vs. Drain Current



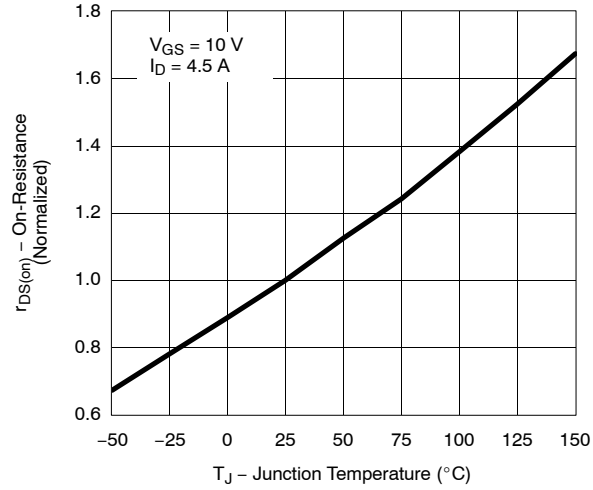
Capacitance



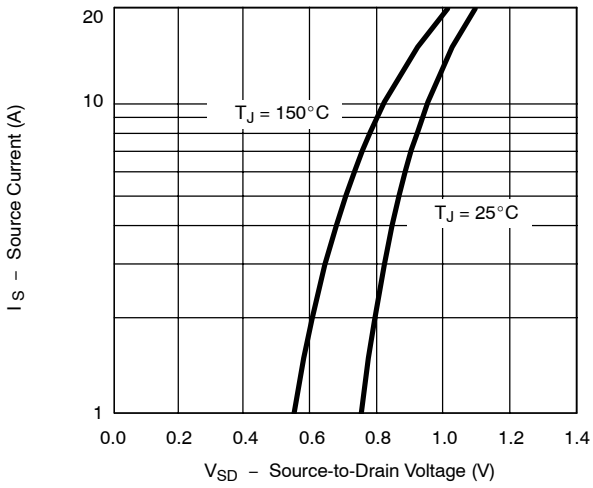
Gate Charge



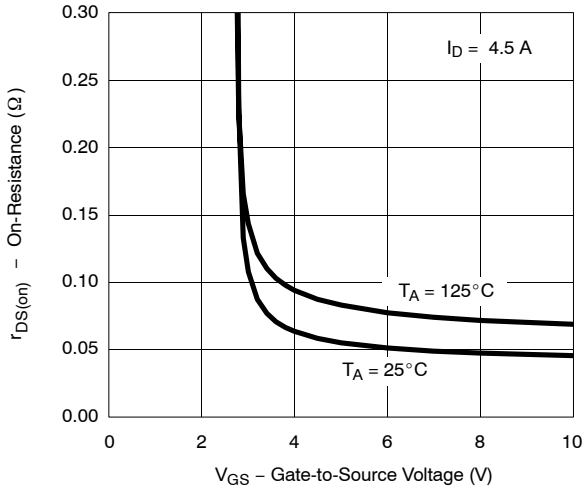
On-Resistance vs. Junction Temperature



Source-Drain Diode Forward Voltage

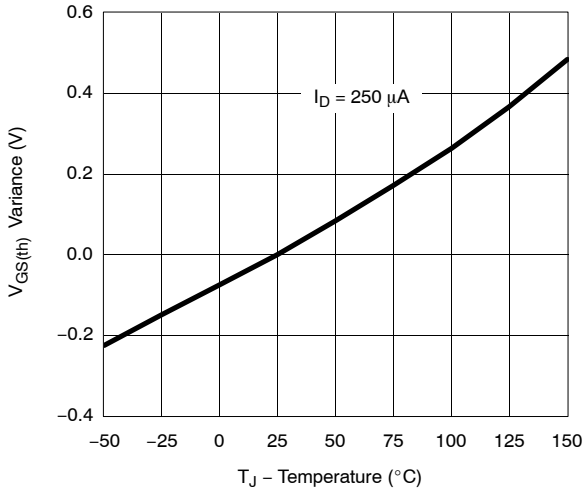


On-Resistance vs. Gate-to-Source Voltage

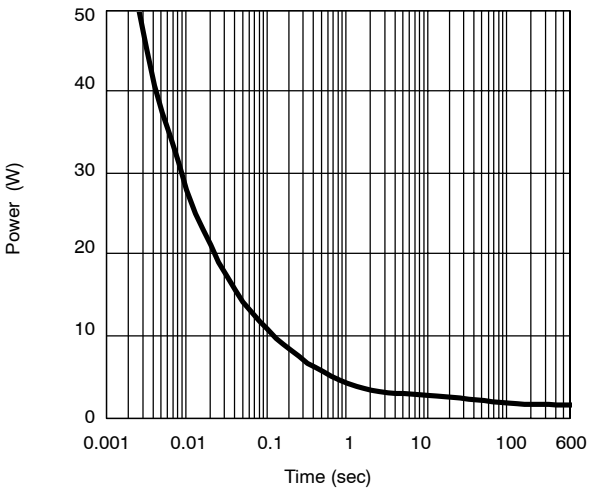


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) — P-CHANNEL

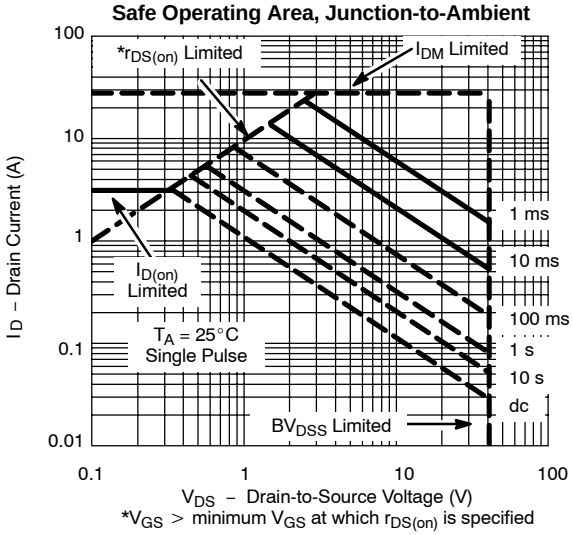
Threshold Voltage



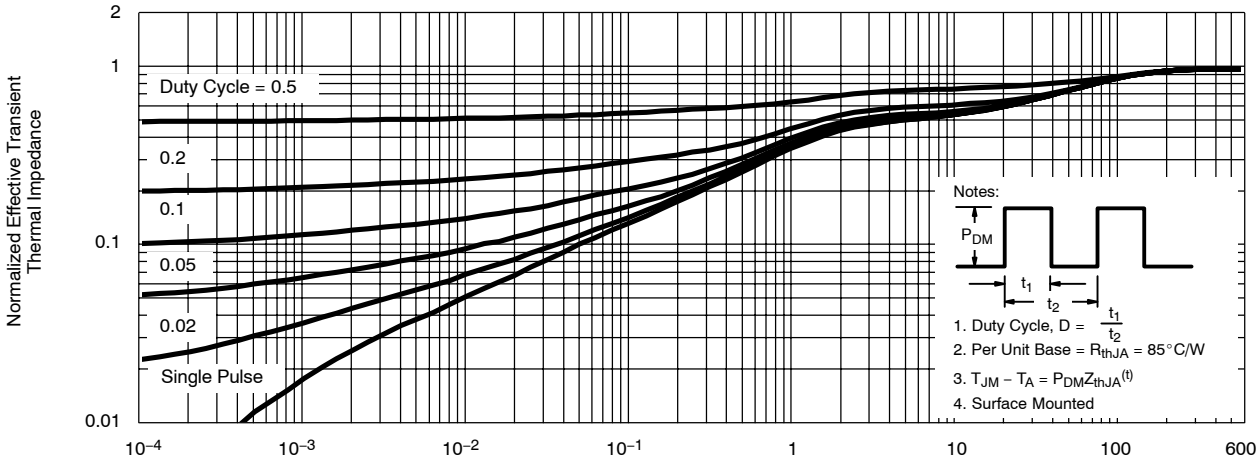
Single Pulse Power



Safe Operating Area, Junction-to-Ambient

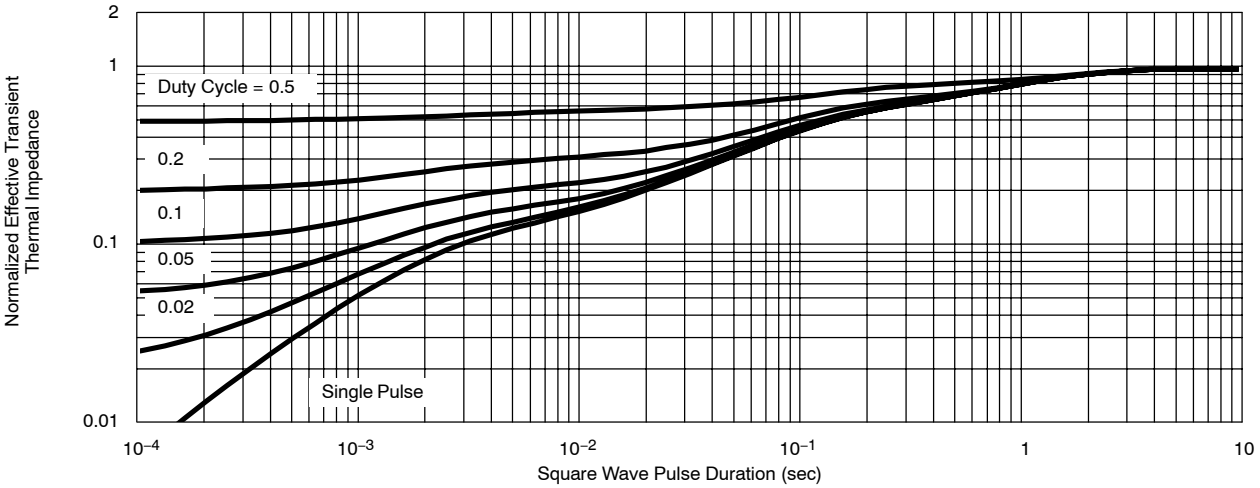


Normalized Thermal Transient Impedance, Junction-to-Ambient



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

Normalized Thermal Transient Impedance, Junction-to-Foot



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