Dual N-Channel 30-V (D-S) MOSFET with Schottky Diode

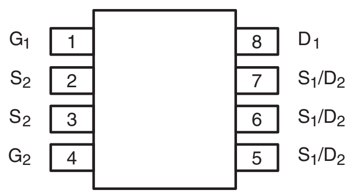
PRODUCT SUMMARY

	V_{DS} (V)	$r_{DS(on)}$ (Ω)	I_D (A)[a]	Q_g (Typ)
Channel-1	30	0.017 at V_{GS} = 10 V	8.0	12.5
		0.0195 at V_{GS} = 4.5 V	7.5	
Channel-2	30	0.010 at V_{GS} = 10 V	15.2	17
		0.0115 at V_{GS} = 4.5 V	14.1	

SCHOTTKY PRODUCT SUMMARY

V_{DS} (V)	V_{SD} (V) Diode Forward Voltage	I_F (A)[a]
30	0.43 V at 1.0 A	3.8

SO-8



Top View

Ordering Information: Si4618DY-T1-E3 (Lead (Pb)-free)

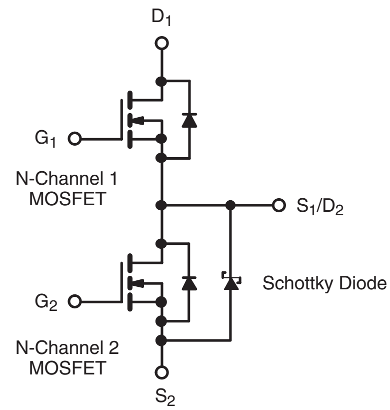
FEATURES

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

Pb-free
RoHS COMPLIANT

APPLICATIONS

- Notebook Logic DC-DC
- Low Current DC-DC



ABSOLUTE MAXIMUM RATINGS T_A = 25 °C, unless otherwise noted

Parameter		Symbol	Channel-1	Channel-2	Unit
Drain-Source Voltage		V_{DS}	30	30	V
Gate-Source Voltage		V_{GS}	± 16	± 16	
Continuous Drain Current (T_J = 150 °C)	T_C = 25 °C	I_D	8.0	15.2	A
	T_C = 70 °C		6.4	12.1	
	T_A = 25 °C		6.7[b, c]	11.4[b, c]	
	T_A = 70 °C		5.4[b, c]	9.1[b, c]	
Pulsed Drain Current (10 µs Pulse Width)		I_{DM}	35	60	
Source-Drain Current Diode Current	T_C = 25 °C	I_S	1.8	3.8	
	T_A = 25 °C		1.25[b, c]	2.4[b, c]	
Pulsed Source-Drain Current		I_{SM}	35	35	
Single Pulse Avalanche Current	L = 0.1 mH	I_{AS}	15	15	
Single Pulse Avalanche Energy		E_{AS}	11.2	11.2	mJ
Maximum Power Dissipation	T_C = 25 °C	P_D	1.98	4.16	W
	T_C = 70 °C		1.26	2.66	
	T_A = 25 °C		1.38[b, c]	2.35[b, c]	
	T_A = 70 °C		0.88[b, c]	1.5[b, c]	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to 150		°C

THERMAL RESISTANCE RATINGS

Parameter		Symbol	Channel-1		Channel-2		Unit
			Typ	Max	Typ	Max	
Maximum Junction-to-Ambient[b, d]	t ≤ 10 sec	R_{thJA}	72	90	43	53	°C/W
Maximum Junction-to-Foot (Drain)	Steady State	R_{thJF}	51	63	25	30	

Notes:
a. Based on T_C = 25 °C.
b. Surface Mounted on 1" x 1" FR4 Board.
c. t = 10 sec.
d. Maximum under Steady State conditions is 125 °C/W (Channel-1) and 100 °C/W (Channel-2).

SPECIFICATIONS T_J = 25 °C, unless otherwise noted

Parameter	Symbol	Test Conditions		Min	Typ[a]	Max	Unit
Static							
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0 V, I_D = 1 mA	Ch-1	30			V
		V_{GS} = 0 V, I_D = 1 mA	Ch-2	30			
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	I_D = 250 µA	Ch-1		35		
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$	I_D = 250 µA	Ch-1		- 6		
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 1 mA	Ch-1	1		2.5	
		V_{DS} = V_{GS}, I_D = 1 mA	Ch-2	1		2.5	
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 16 V	Ch-1			100	µA
		V_{DS} = 0 V, V_{GS} = ± 16 V	Ch-2			100	
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 30 V, V_{GS} = 0 V	Ch-1			0.001	mA
		V_{DS} = 30 V, V_{GS} = 0 V	Ch-2		0.05	0.5	
		V_{DS} = 30 V, V_{GS} = 0 V, T_J = 100 °C	Ch-1			0.025	
		V_{DS} = 30 V, V_{GS} = 0 V, T_J = 100 °C	Ch-2		3	15	
On-State Drain Current[b]	$I_{D(on)}$	V_{DS} = 5 V, V_{GS} = 10 V	Ch-1	20			A
		V_{DS} = 5 V, V_{GS} = 10 V	Ch-2	20			
Drain-Source On-State Resistance[b]	$r_{DS(on)}$	V_{GS} = 10 V, I_D = 8 A	Ch-1		0.014	0.017	Ω
		V_{GS} = 10 V, I_D = 8 A	Ch-2		0.0083	0.010	
		V_{GS} = 4.5 V, I_D = 5 A	Ch-1		0.016	0.0195	
		V_{GS} = 4.5 V, I_D = 5 A	Ch-2		0.0095	0.0115	
Forward Transconductance[b]	g_{fs}	V_{DS} = 15 V, I_D = 8 A	Ch-1		40		S
		V_{DS} = 15 V, I_D = 8 A	Ch-2		47		
Dynamic[a]							
Input Capacitance	C_{iss}	Channel-1 V_{DS} = 15 V, V_{GS} = 0 V, f = 1 MHz Channel-2 V_{DS} = 15 V, V_{GS} = 0 V, f = 1 MHz	Ch-1		1535		pF
			Ch-2		2290		
Output Capacitance	C_{oss}		Ch-1		205		
			Ch-2		360		
Reverse Transfer Capacitance	C_{rss}		Ch-1		91		
			Ch-2		117		
Total Gate Charge	Q_g	V_{DS} = 15 V, V_{GS} = 10 V, I_D = 8 A	Ch-1		29	44	nC
		V_{DS} = 15 V, V_{GS} = 10 V, I_D = 8 A	Ch-2		39	59	
		Channel-1 V_{DS} = 15 V, V_{GS} = 4.5 V, I_D = 8 A Channel-2 V_{DS} = 15 V, V_{GS} = 4.5 V, I_D = 8 A	Ch-1		12.5	19	
			Ch-2		17	26	
Gate-Source Charge	Q_{gs}		Ch-1		4.1		
			Ch-2		5.6		
Gate-Drain Charge	Q_{gd}		Ch-1		3.4		
			Ch-2		4		
Gate Resistance	R_g	f = 1 MHz	Ch-1		1.8	3.0	Ω
			Ch-2		1.9	3.0	

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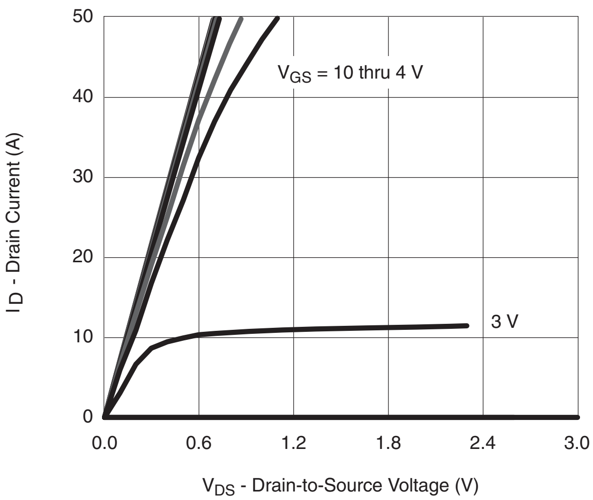
SPECIFICATIONS T_J = 25 °C, unless otherwise noted							
Parameter	**Symbol**	**Test Conditions**		**Min**	**Typ**[a]	**Max**	**Unit**
Dynamic[a]							
Turn-On Delay Time	$t_{d(on)}$	Channel-1 V_{DD} = 15 V, R_L = 3 Ω $I_D \cong$ 5 A, V_{GEN} = 10 V, R_g = 1 Ω Channel-2 V_{DD} = 15 V, R_L = 3 Ω $I_D \cong$ 5 A, V_{GEN} = 10 V, R_g = 1 Ω	Ch-1		8	15	ns
			Ch-2		9	16	
Rise Time	t_r		Ch-1		22	33	
			Ch-2		24	36	
Turn-Off Delay Time	$t_{d(off)}$		Ch-1		20	30	
			Ch-2		26	39	
Fall Time	t_f		Ch-1		8	15	
			Ch-2		8	15	
Turn-On Delay Time	$t_{d(on)}$	Channel-1 V_{DD} = 15 V, R_L = 3 Ω $I_D \cong$ 5 A, V_{GEN} = 4.5 V, R_g = 1 Ω Channel-2 V_{DD} = 15 V, R_L = 3 Ω $I_D \cong$ 5 A, V_{GEN} = 4.5 V, R_g = 1 Ω	Ch-1		24	36	
			Ch-2		24	36	
Rise Time	t_r		Ch-1		87	130	
			Ch-2		97	145	
Turn-Off Delay Time	$t_{d(off)}$		Ch-1		30	45	
			Ch-2		35	53	
Fall Time	t_f		Ch-1		34	51	
			Ch-2		45	68	
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I_S	T_C = 25 °C	Ch-1			1.8	A
			Ch-2			3.8	
Pulse Diode Forward Current[a]	I_{SM}		Ch-1			35	
			Ch-2			35	
Body Diode Voltage	V_{SD}	I_S = 2 A	Ch-1		0.77	1.1	V
		I_S = 1 A	Ch-2		0.37	0.43	
Body Diode Reverse Recovery Time	t_{rr}	Channel-1 I_F = 4 A, di/dt = 100 A/µs, T_J = 25 °C Channel-2 I_F = 4 A, di/dt = 100 A/µs, T_J = 25 °C	Ch-1		22	33	ns
			Ch-2		26	39	
Body Diode Reverse Recovery Charge	Q_{rr}		Ch-1		15	23	nC
			Ch-2		15	23	
Reverse Recovery Fall Time	t_a		Ch-1		13		ns
			Ch-2		13		
Reverse Recovery Rise Time	t_b		Ch-1		9		
			Ch-2		13		

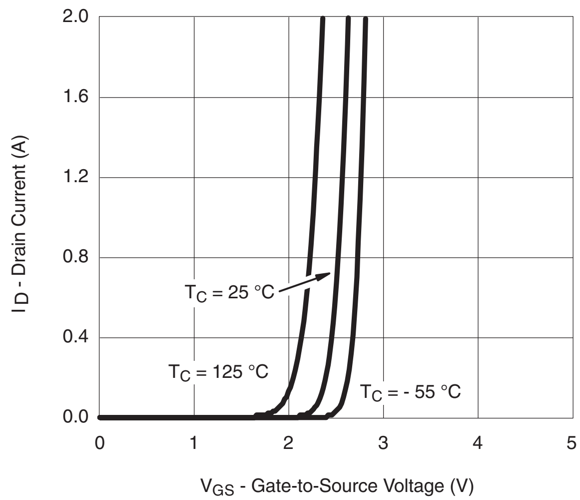
Notes:
a. Guaranteed by design, not subject to production testing.
b. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.

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.

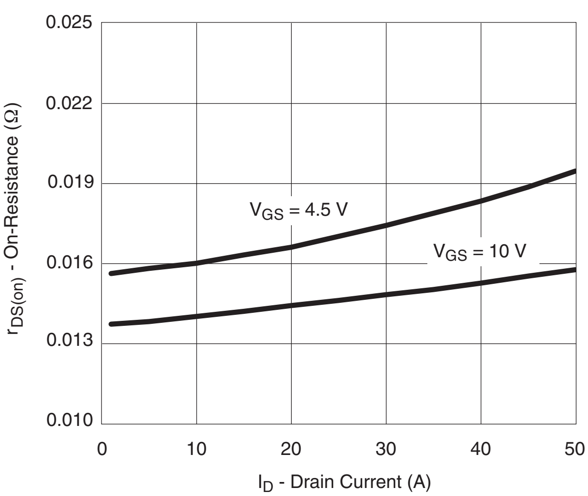
CHANNEL-1 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



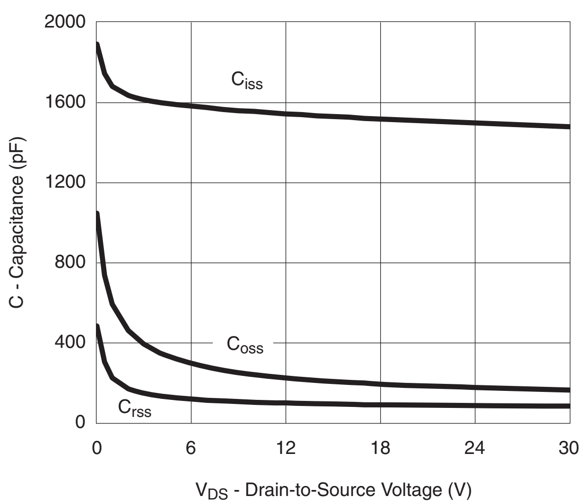
Output Characteristics



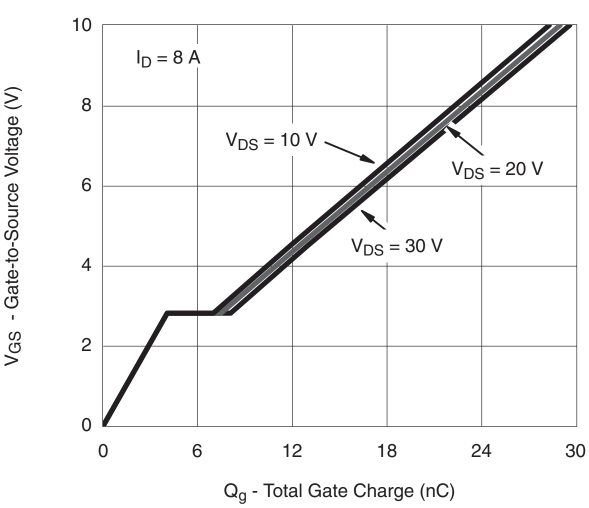
Transfer Characteristics



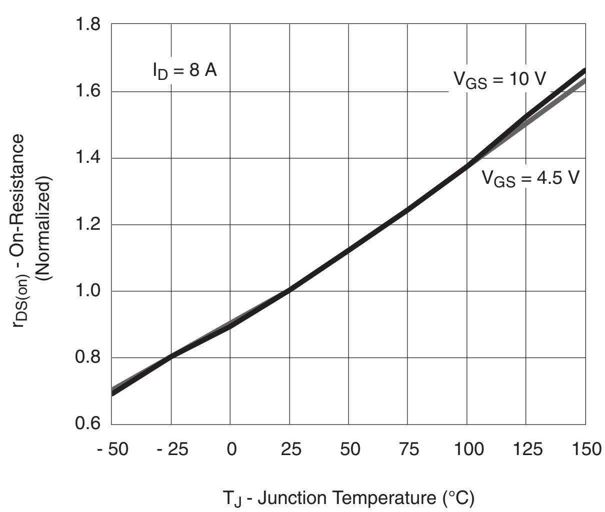
On-Resistance vs. Drain Current



Capacitance

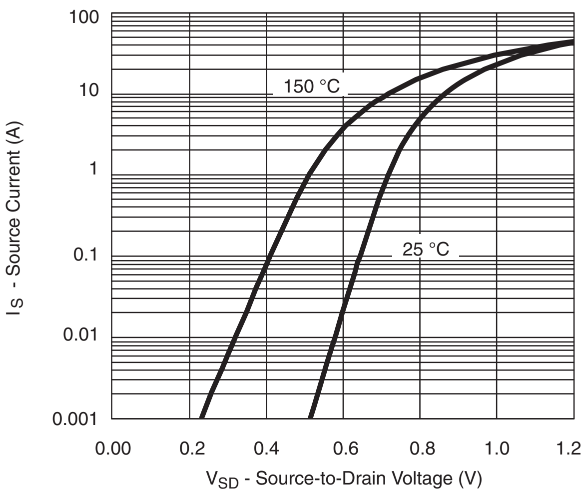


Gate Charge

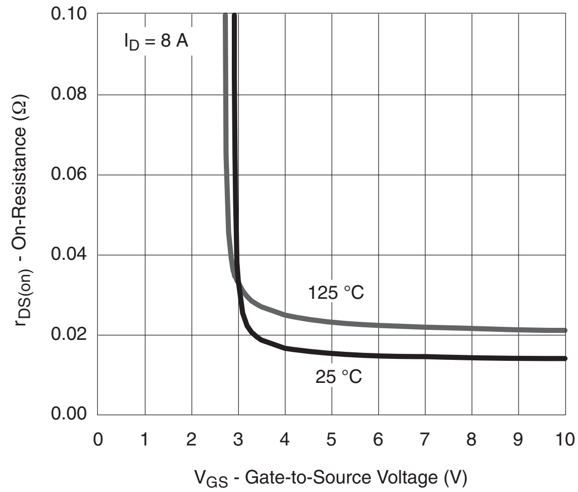


On-Resistance vs. Junction Temperature

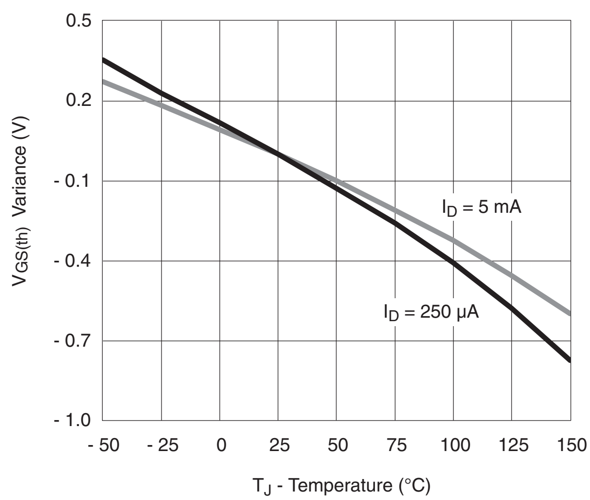
CHANNEL-1 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



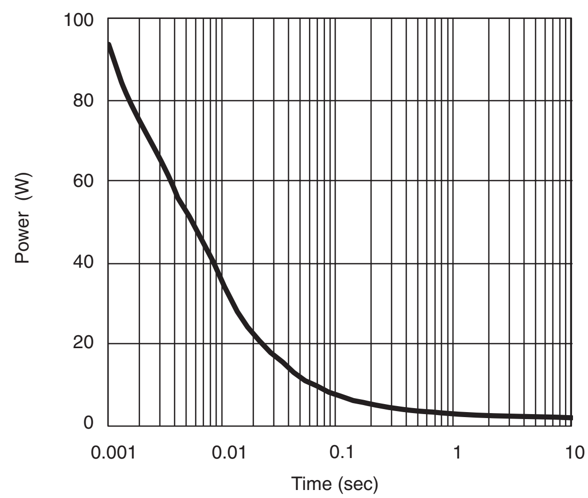
Source-Drain Diode Forward Voltage



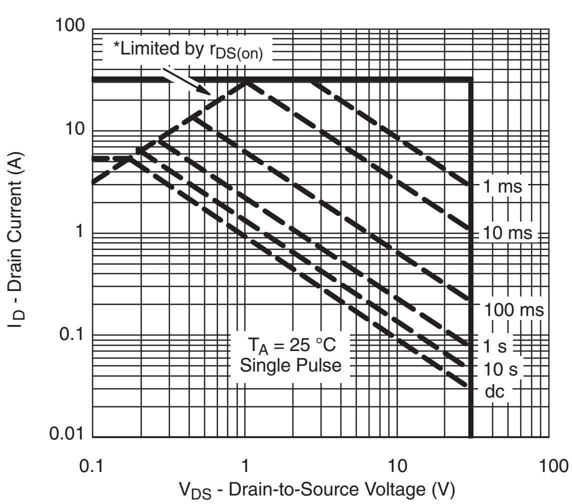
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



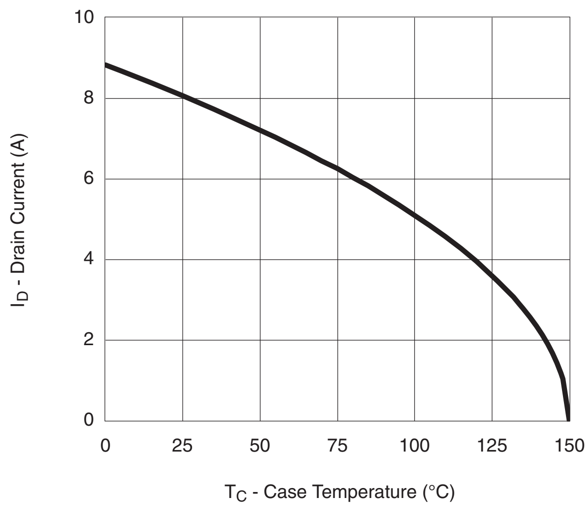
Single Pulse Power, Junction-to-Ambient



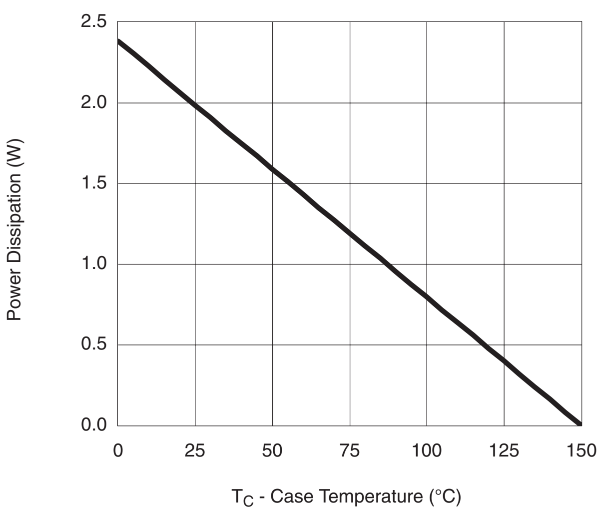
*V_{GS} > minimum V_{GS} at which $r_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient

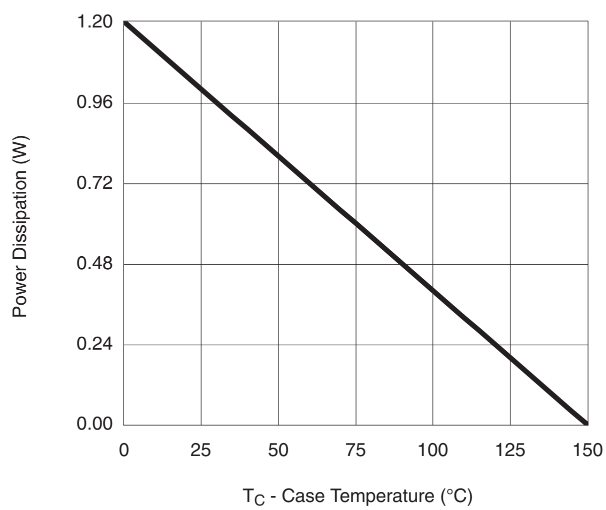
CHANNEL-1 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Current Derating*



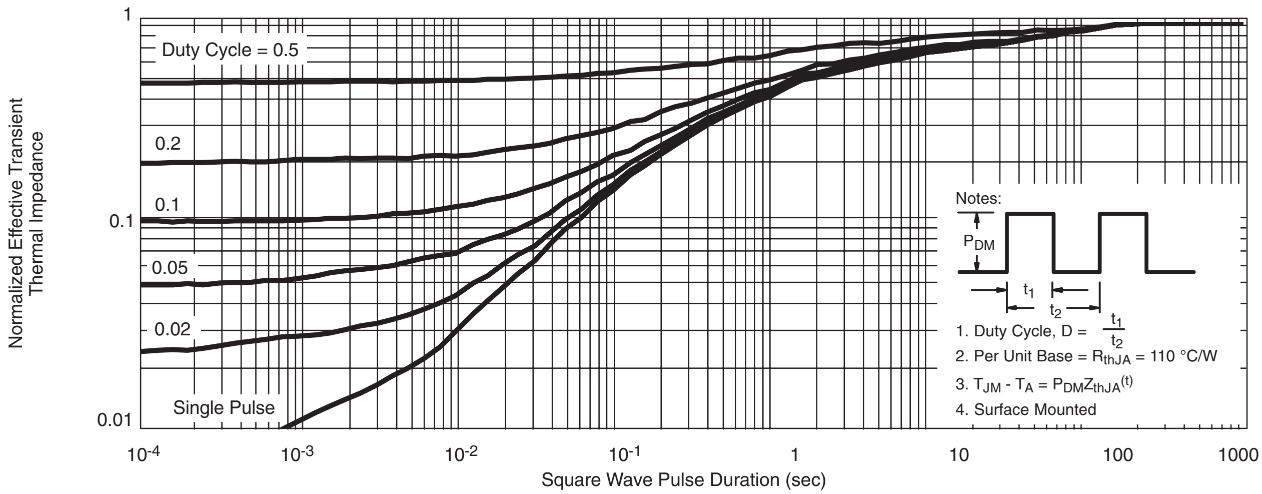
Power Derating, Junction-to-Foot



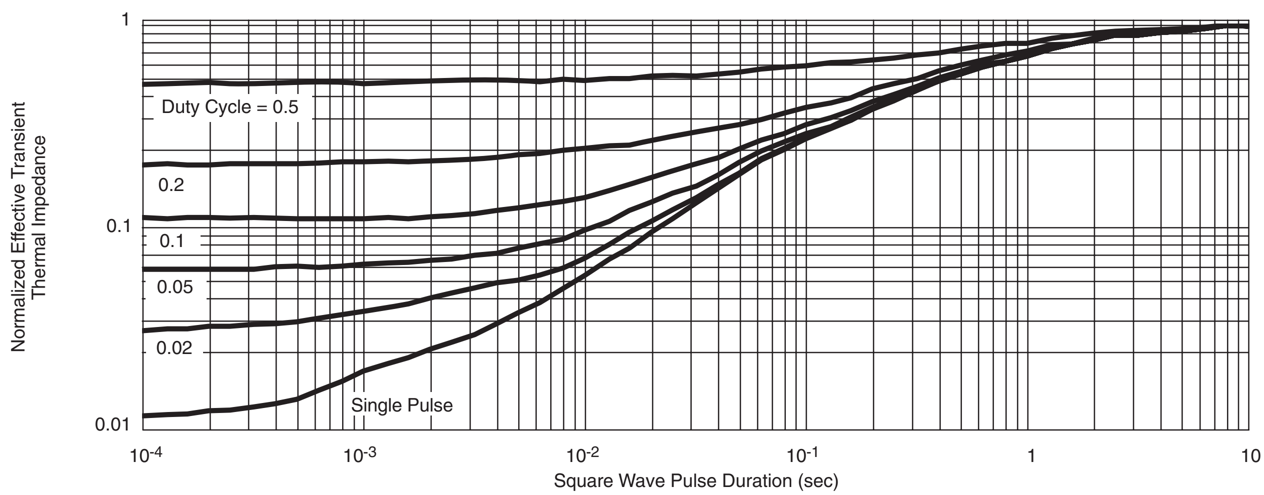
Power Derating, Junction-to-Ambient

*The power dissipation P_D is based on $T_{J(max)}$ = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

CHANNEL-1 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

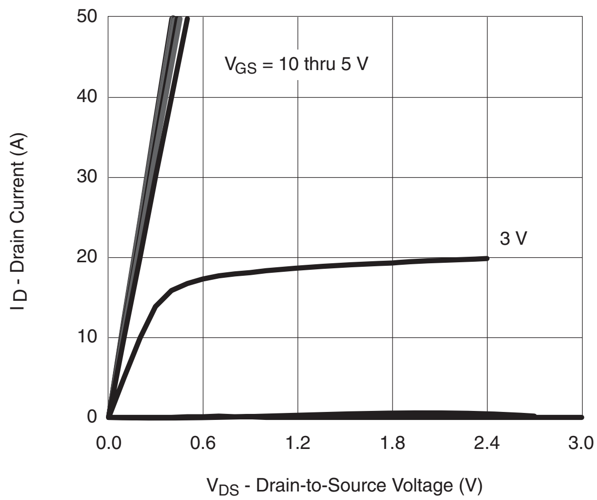


Normalized Thermal Transient Impedance, Junction-to-Ambient

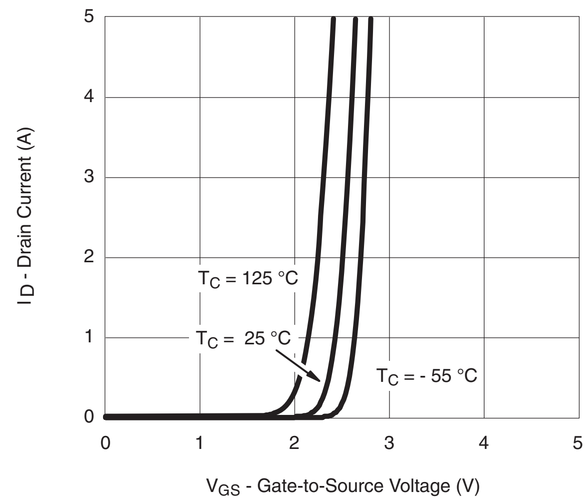


Normalized Thermal Transient Impedance, Junction-to-Foot

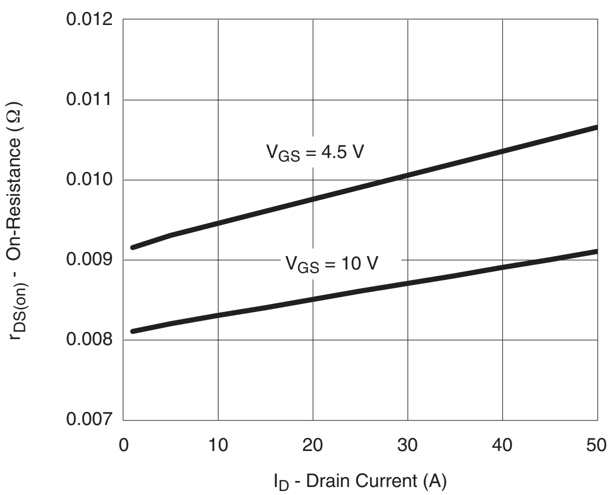
CHANNEL-2 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



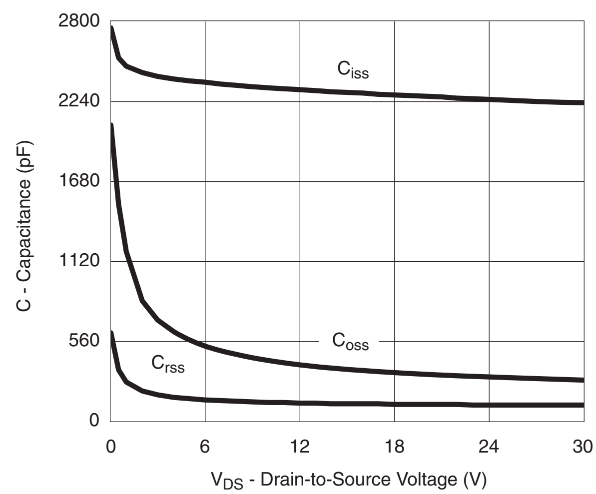
Output Characteristics



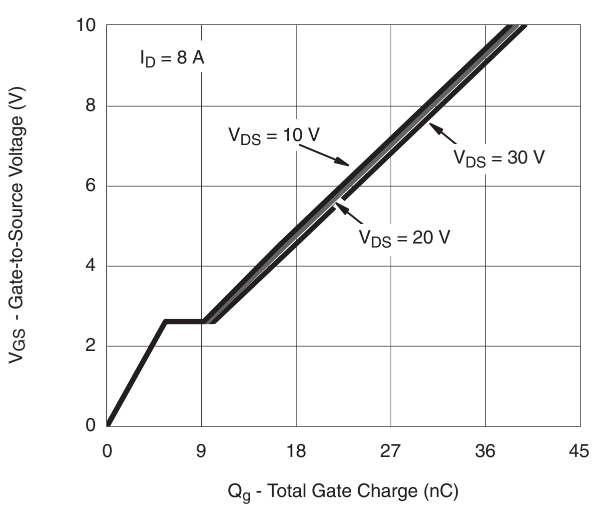
Transfer Characteristics



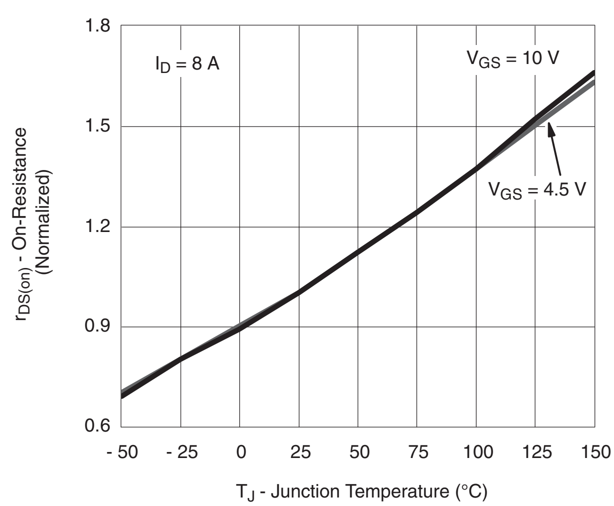
On-Resistance vs. Drain Current



Capacitance

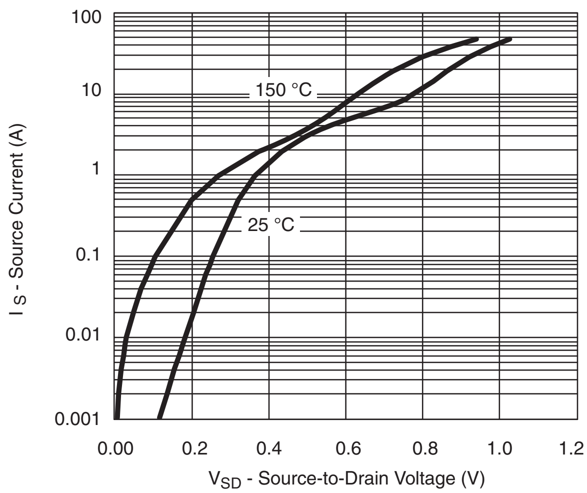


Gate Charge

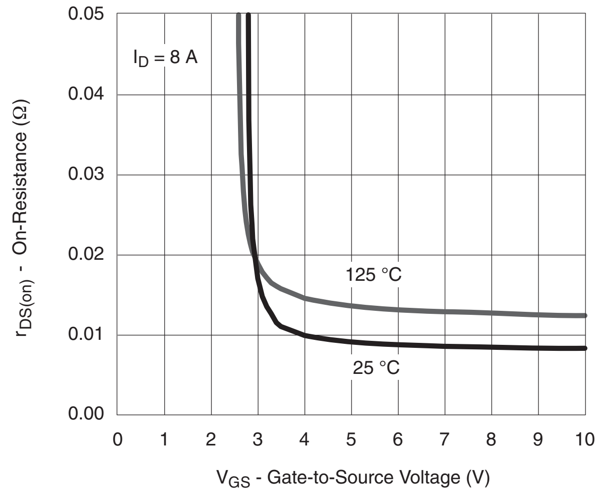


On-Resistance vs. Junction Temperature

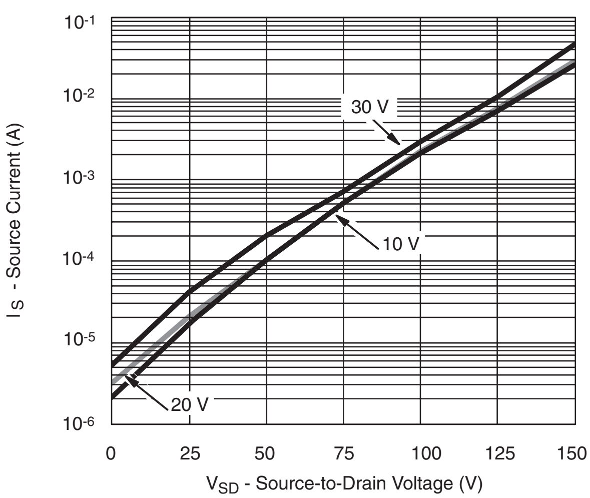
CHANNEL-2 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



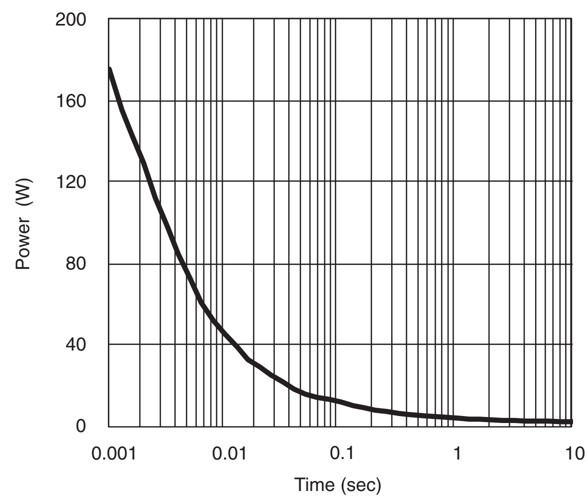
Source-Drain Diode Forward Voltage



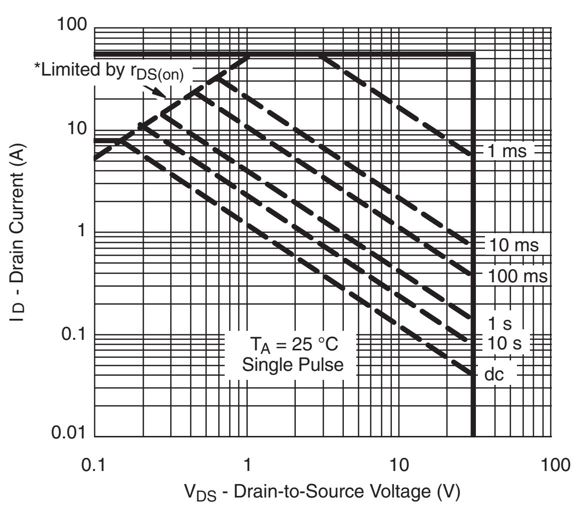
On-Resistance vs. Gate-to-Source Voltage



Reverse Current (Schottky)



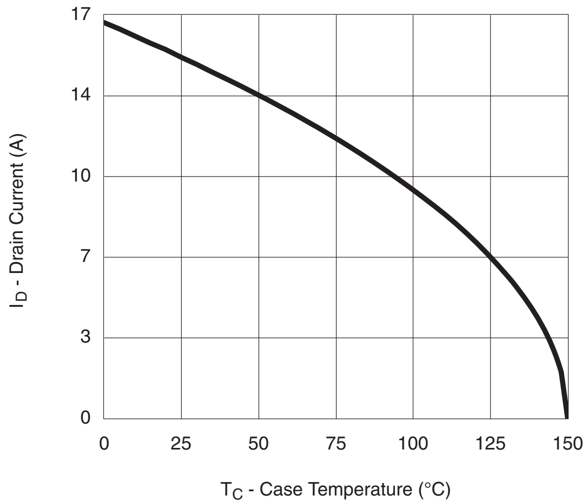
Single Pulse Power, Junction-to-Ambient



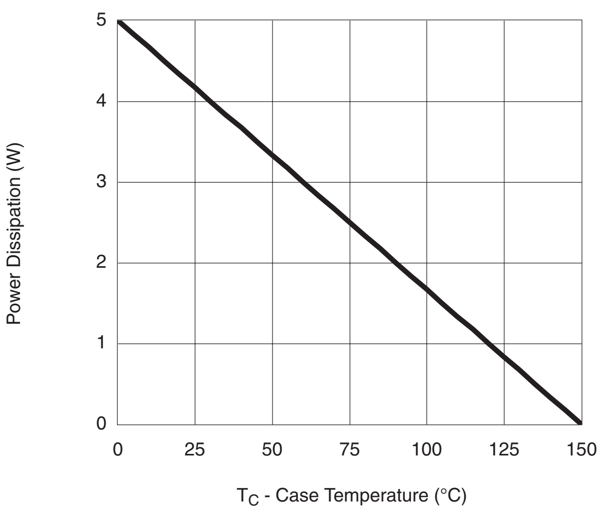
*V_{GS} > minimum V_{GS} at which $r_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient

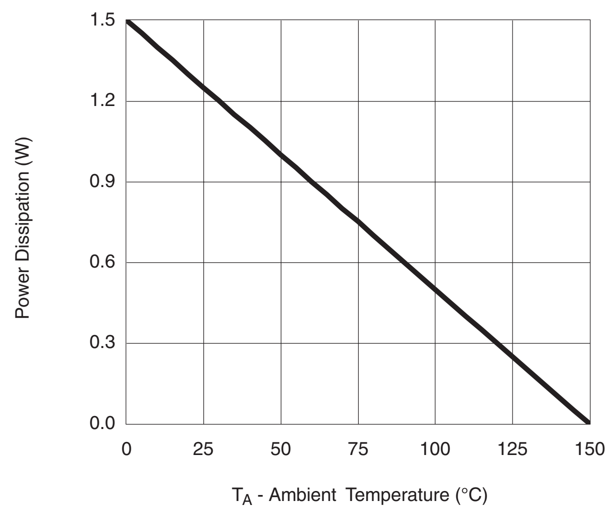
CHANNEL-2 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Current Derating*



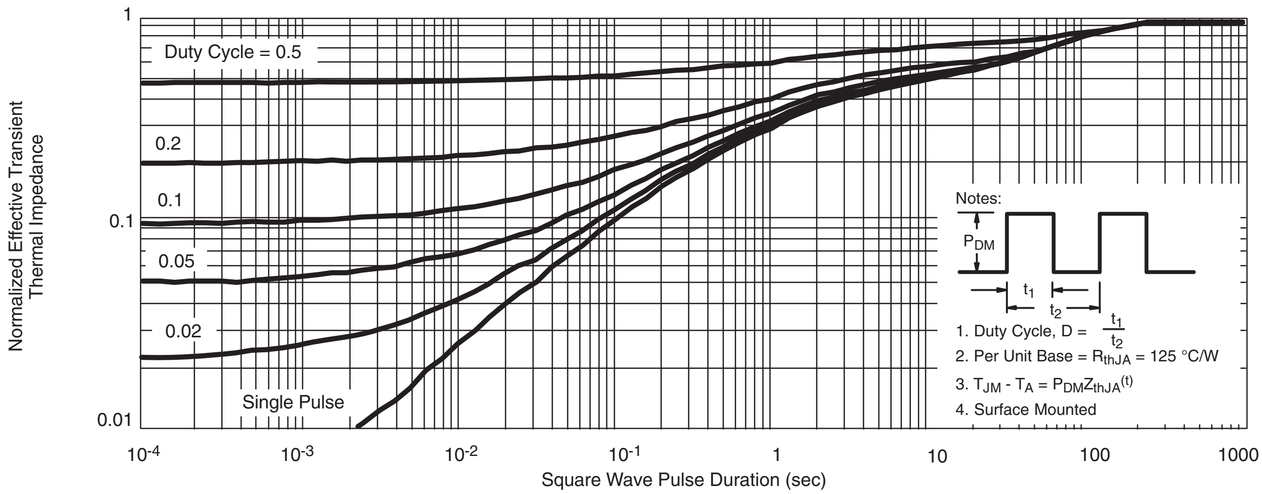
Power Derating, Junction-to-Foot



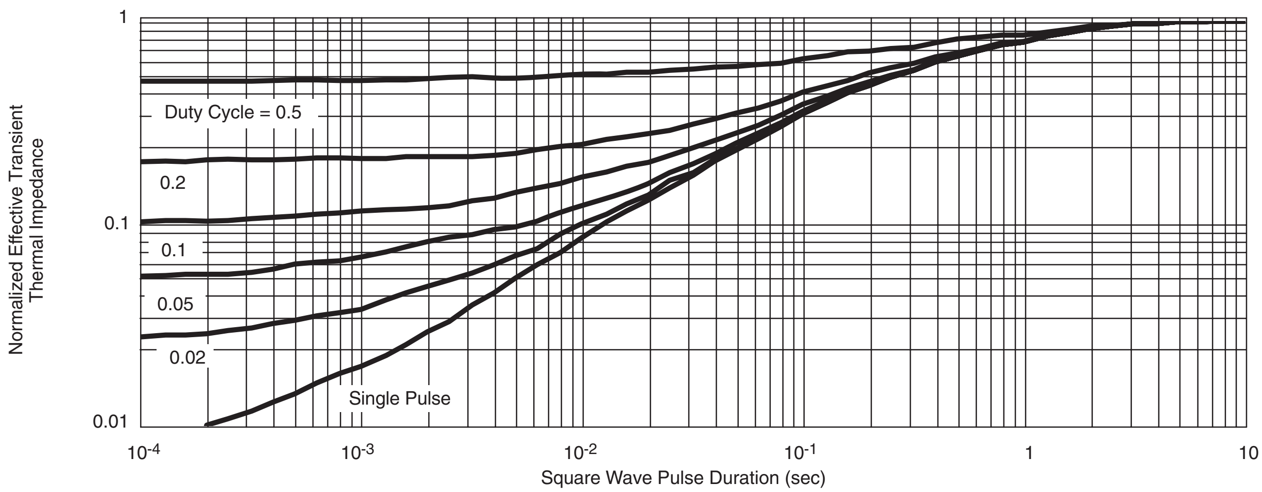
Power Derating, Junction-to-Ambient

*The power dissipation P_D is based on $T_{J(max)}$ = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

CHANNEL-2 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case

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