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	0.018 @ V_{GS} = 10 V	10	6.6
		0.023 @ V_{GS} = 4.5 V	8.5	
Channel-2		0.018 @ V_{GS} = 10 V	10.5	8.9
		0.022 @ V_{GS} = 4.5 V	9.3	

SCHOTTKY PRODUCT SUMMARY		
V_{DS} (V)	V_{SD} (V)—Diode Forward Voltage	I_F (A)
30	0.50 V @ 1.0 A	2.0

FEATURES

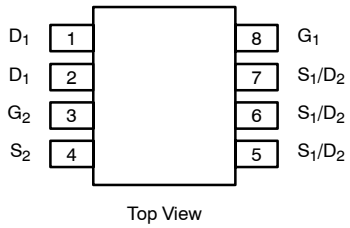
- LITTLE FOOT® *Plus* Integrated Schottky
- 100% R_g Tested

Pb-free
Product Is Completely Pb-free

APPLICATIONS

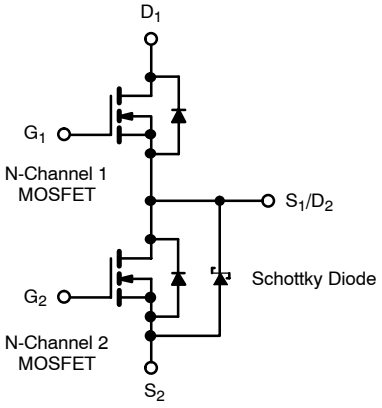
- DC/DC Converters
  - Notebook

SO-8



Top View

Ordering Information: Si4814BDY—E3
Si4814BDY-T1—E3 (with Tape and Reel)



ABSOLUTE MAXIMUM RATINGS (T_A = 25°C UNLESS OTHERWISE NOTED)					
Parameter		Symbol	Channel-1	Channel-2	Unit
Drain-Source Voltage		V_{DS}	30		V
Gate-Source Voltage		V_{GS}	20		
Continuous Drain Current (T_J = 150°C)[a, b]	T_C = 25°C	I_D	10	10.5	A
	T_C = 70°C		8	8.3	
	T_A = 25°C		7.5[a, b, c]	7.8[a, b, c]	
	T_A = 70°C		6[a, b, c]	6.3[a, b, c]	
Pulsed Drain Current (10 μs Pulse Width)		I_{DM}	40	40	
Continuous Source-Drain Diode Current	T_C = 25°C	I_S	3	3.2	
	T_A = 25°C		1.7[a, b, c]	1.8[a, b, c]	
Pulsed Source-Drain Current		I_{SM}	40	40	
Single-Pulse Avalanche Current	L = 0.1 mH	I_{AS}	15		
Single-Pulse Avalanche Energy		E_{AS}	11.2		mJ
Maximum Power Dissipation[a, b]	T_C= 25°C	P_D	3.3	3.5	W
	T_C= 70°C		2.1	2.2	
	T_A = 25°C		1.9[a, b, c]	2.0[a, b, c]	
	T_A = 70°C		1.2[a, b, c]	1.3[a, b, c]	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	–55 to 150		°C

Notes
a. Based on T_C = 25°C.
b. Surface Mounted on 1" x 1" FR4 Board.
c. t = 10 sec

THERMAL RESISTANCE RATINGS

Parameter		Symbol	Channel-1 Typ	Channel-1 Max	Channel-2 Typ	Channel-2 Max	Unit
Maximum Junction-to-Ambient[a]	$t \le 10$ sec	R_{thJA}	54	65	47	60	°C/W
Maximum Junction-to-Foot (Drain)	Steady-State	R_{thJF}	32	38	30	35	°C/W

Notes
a. Surface Mounted on 1" x 1" FR4 Board.
b. Maximum under steady state conditions is 112 °C/W for Channel 1 and 107 °C/W for Channel 2.

MOSFET SPECIFICATIONS (T_J = 25°C UNLESS OTHERWISE NOTED)

Parameter	Symbol	Test Condition		Min	Typ[a]	Max	Unit
Static							
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0 V, I_D = 250 µA	Ch-1	30			V
			Ch-2	30			
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	I_D = 250 µA	Ch-1		24		mV/°C
			Ch-2		25		
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$		Ch-1		−6		V
			Ch-2		−6		
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA	Ch-1	1.5		3.0	
			Ch-2	1.5		2.7	
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = 20 V	Ch-1			100	nA
			Ch-2			100	
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 30 V, V_{GS} = 0 V	Ch-1			1	µA
			Ch-2			100	
		V_{DS} = 30 V, V_{GS} = 0 V, T_J = 85°C	Ch-1			15	
			Ch-2			2000	
On-State Drain Current[b]	$I_{D(on)}$	V_{DS} = 5 V, V_{GS} = 10 V	Ch-1	20			A
			Ch-2	20			
Drain-Source On-State Resistance[b]	$r_{DS(on)}$	V_{GS} = 10 V, I_D = 10 A	Ch-1		0.0145	0.018	Ω
		V_{GS} = 10 V, I_D = 10.5 A	Ch-2		0.015	0.018	
		V_{GS} = 4.5 V, I_D = 8.5 A	Ch-1		0.019	0.023	
		V_{GS} = 4.5 V, I_D = 9.3 A	Ch-2		0.018	0.022	
Forward Transconductance[b]	g_{fs}	V_{DS} = 15 V, I_D = 10 A	Ch-1		30		S
		V_{DS} = 15 V, I_D = 10.5 A	Ch-2		35		
Diode Forward Voltage[b]	V_{SD}	I_S = 1.7 A, V_{GS} = 0 V	Ch-1		0.75	1.1	V
		I_S = 1 A, V_{GS} = 0 V	Ch-2		0.47	0.5	
Dynamic[a]							
Total Gate Charge	Q_g	Channel-1 V_{DS} = 15 V, V_{GS} = 4.5 V, I_D = 10 A; Channel-2 V_{DS} = 15 V, V_{GS} = 4.5 V, I_D = −10.5 A	Ch-1		6.6	10	nC
			Ch-2		8.9	14	
Gate-Source Charge	Q_{gs}		Ch-1		2.9		
			Ch-2		3.4		
Gate-Drain Charge	Q_{gd}		Ch-1		2.3		
			Ch-2		2.4		
Gate Resistance	R_g		Ch-1	0.5	1.9	2.9	Ω
			Ch-2	0.5	2.3	3.5	

MOSFET SPECIFICATIONS (T_J = 25°C UNLESS OTHERWISE NOTED)							
Parameter	**Symbol**	**Test Condition**		**Min**	**Typ[a]**	**Max**	**Unit**
Dynamic[a]							
Turn-On Delay Time	$t_{d(on)}$	Channel-1 V_{DD} = 15 V, R_L = 15 Ω $I_D \cong$ 1 A, V_{GEN} = 10 V, R_g = 6 Ω Channel-2 V_{DD} = 15 V, R_L = 15 Ω $I_D \cong$ 1 A, V_{GEN} = 10 V, R_g = 6 Ω	Ch-1		8	15	ns
			Ch-2		9	15	
Rise Time	t_r		Ch-1		11	18	
			Ch-2		13	20	
Turn-Off Delay Time	$t_{d(off)}$		Ch-1		21	32	
			Ch-2		27	40	
Fall Time	t_f		Ch-1		6	10	
			Ch-2		9	15	
Source-Drain Reverse Recovery Time	t_{rr}	I_F = 1.3 A, di/dt = 100 A/μs	Ch-1		28	40	
		I_F = 2.2 A, di/dt = 100 μA/μs	Ch-2		24	35	
Body Diode Reverse Recovery Charge	Q_{rr}	I_F = 1.3 A, di/dt = 100 A/μs	Ch-1		17		nC
		I_F = 2.2 A, di/dt = 100 μA/μs	Ch-2		12		
Reverse Recovery Fall Time	t_a	I_F = 1.3 A, di/dt = 100 A/μs	Ch-1		12		ns
		I_F = 2.2 A, di/dt = 100 μA/μs	Ch-2		11		
Reverse Recovery Rise Time	t_b	I_F = 1.3 A, di/dt = 100 A/μs	Ch-1		16		
		I_F = 2.2 A, di/dt = 100 μA/μs	Ch-2		13		

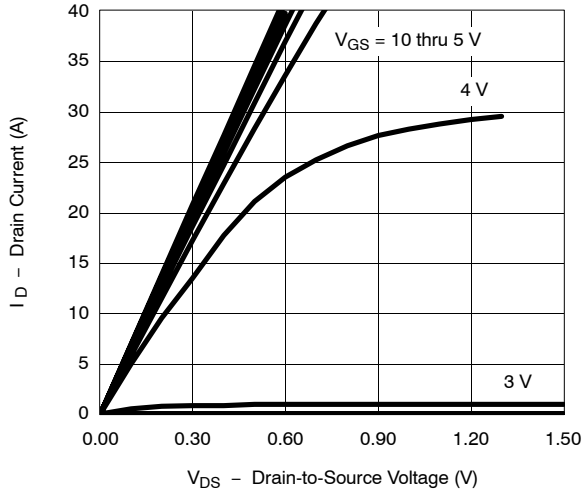
Notes
a. Guaranteed by design, not subject to production testing.
b. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2%.

SCHOTTKY SPECIFICATIONS (T_J = 25°C UNLESS OTHERWISE NOTED)						
Parameter	**Symbol**	**Test Condition**	**Min**	**Typ**	**Max**	**Unit**
Forward Voltage Drop	V_F	I_F = 1.0 A		0.47	0.50	V
		I_F = 1.0 A, T_J = 125°C		0.36	0.42	
Maximum Reverse Leakage Current	I_{rm}	V_r = 30 V		0.004	0.100	mA
		V_r = 30 V, T_J = 100°C		0.7	10	
		V_r = –30 V, T_J = 125°C		3.0	20	
Junction Capacitance	C_T	V_r = 10 V		50		pF

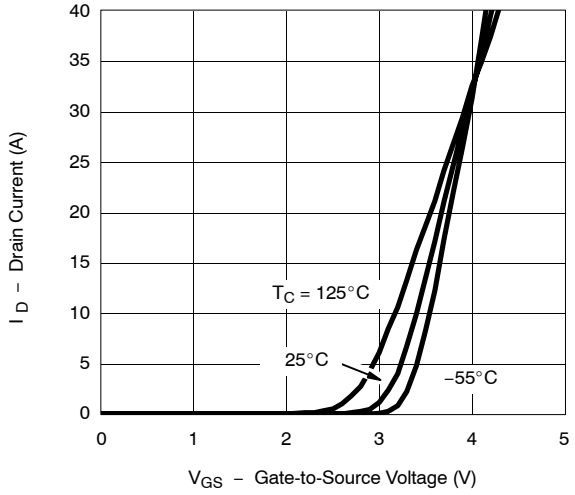
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) CHANNEL-1

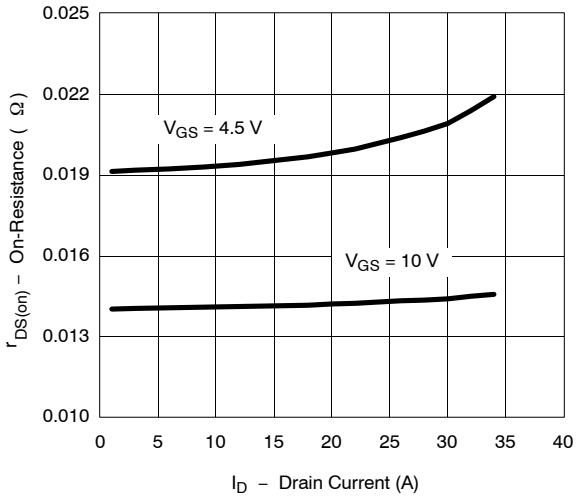
Output Characteristics



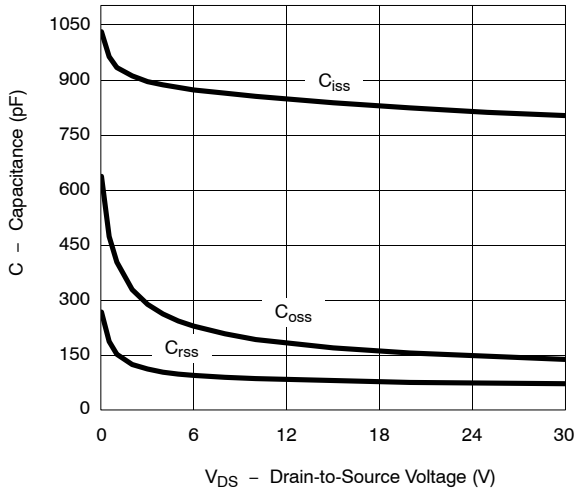
Transfer Characteristics



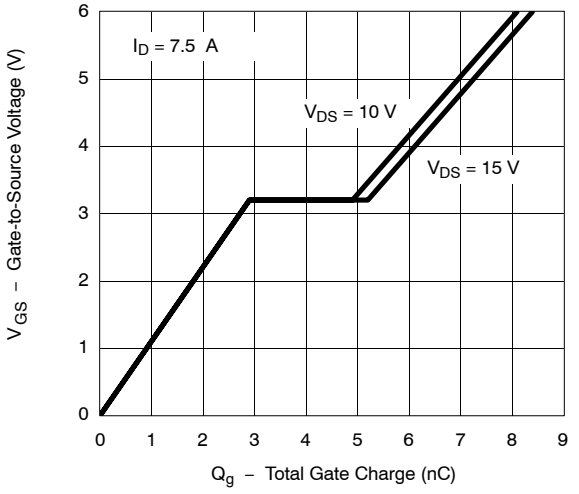
On-Resistance vs. Drain Current



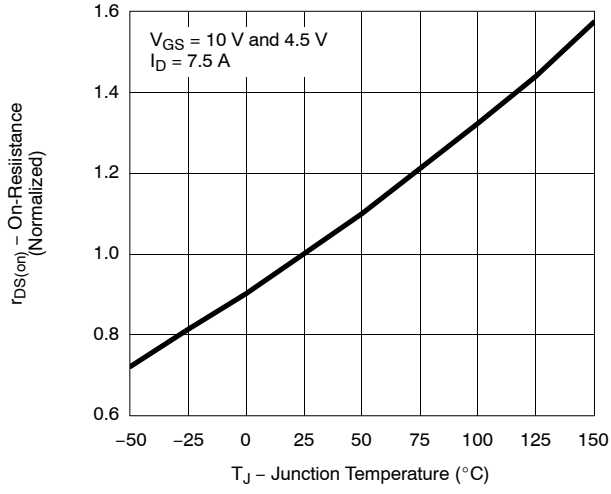
Capacitance



Gate Charge

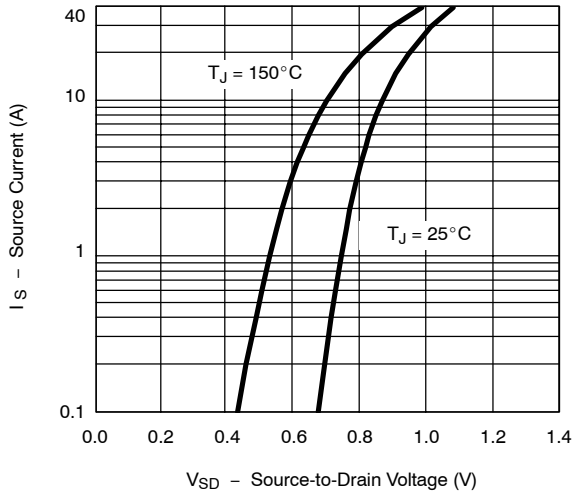


On-Resistance vs. Junction Temperature

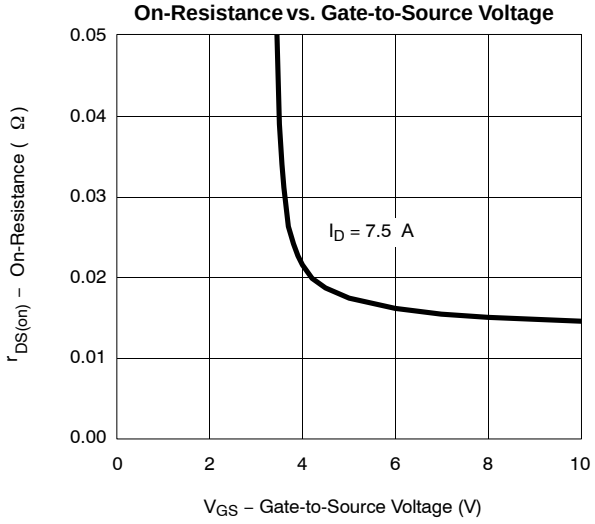


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) CHANNEL-1

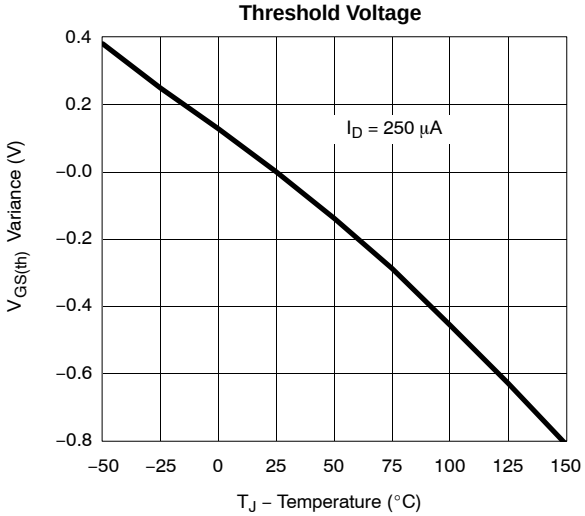
Source-Drain Diode Forward Voltage



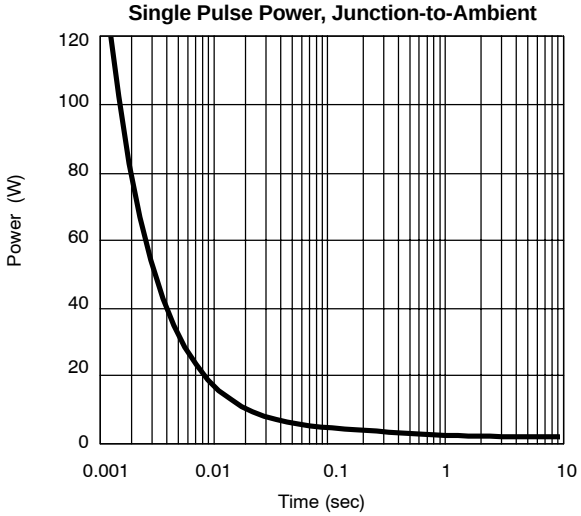
On-Resistance vs. Gate-to-Source Voltage



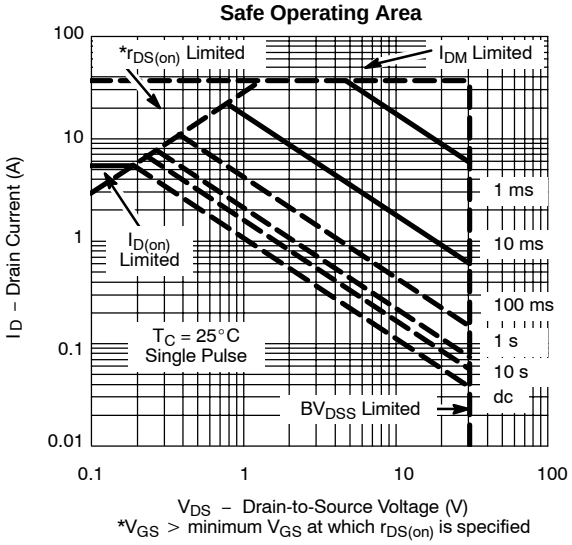
Threshold Voltage



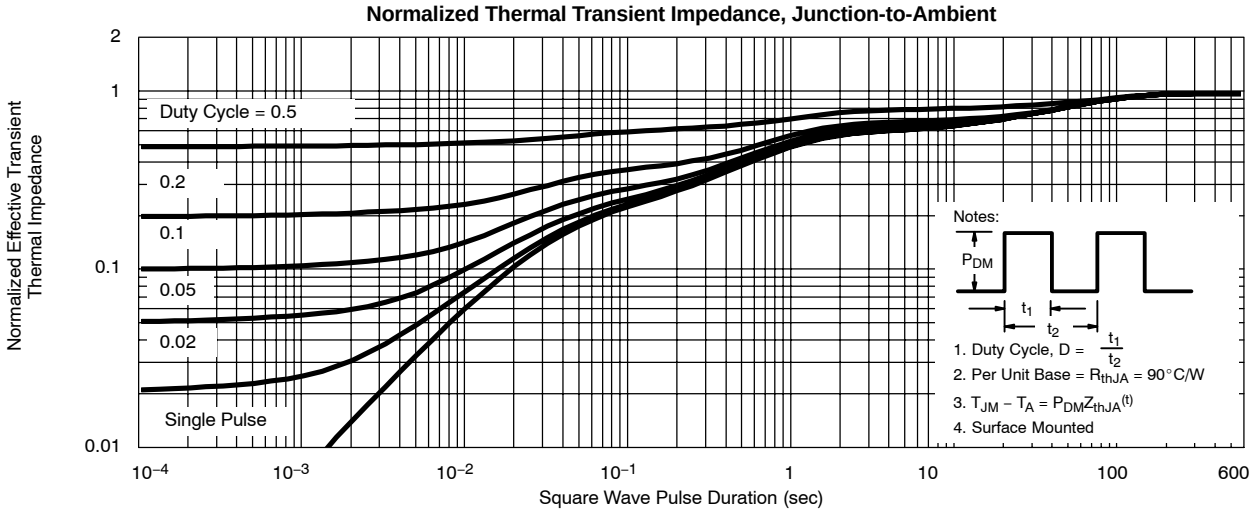
Single Pulse Power, Junction-to-Ambient

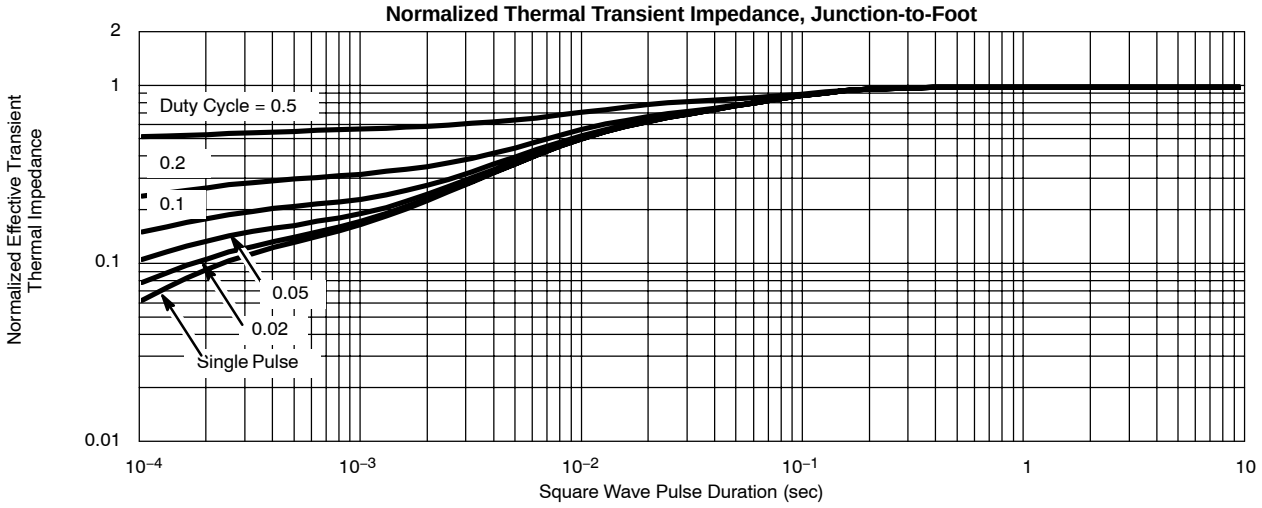


Safe Operating Area



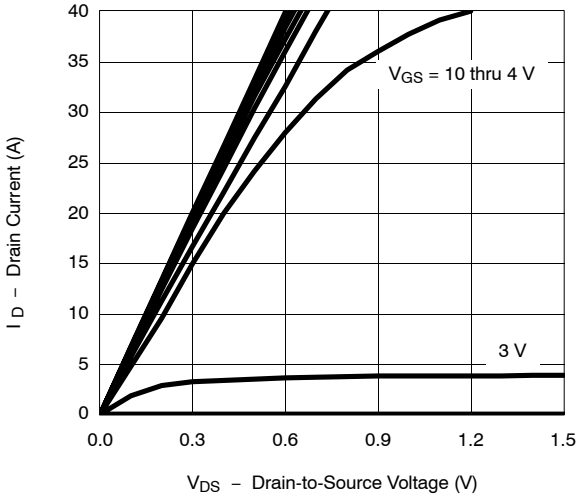
TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) CHANNEL-1



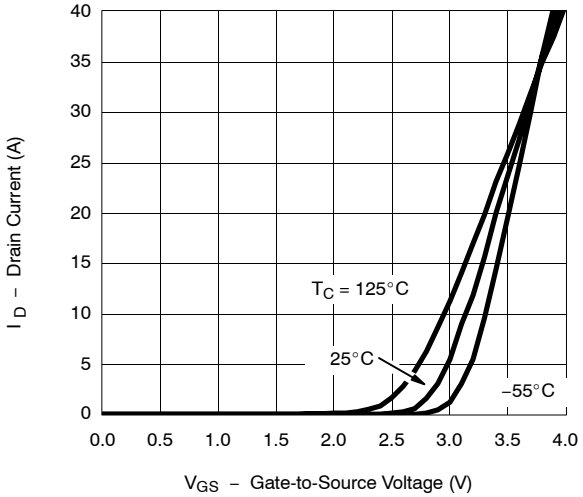


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) CHANNEL-2

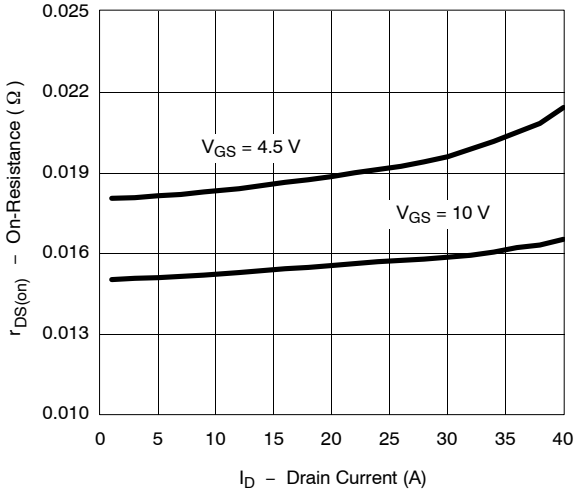
Output Characteristics



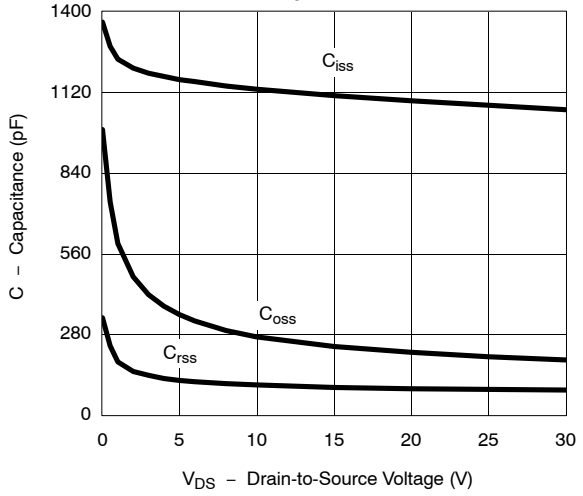
Transfer Characteristics



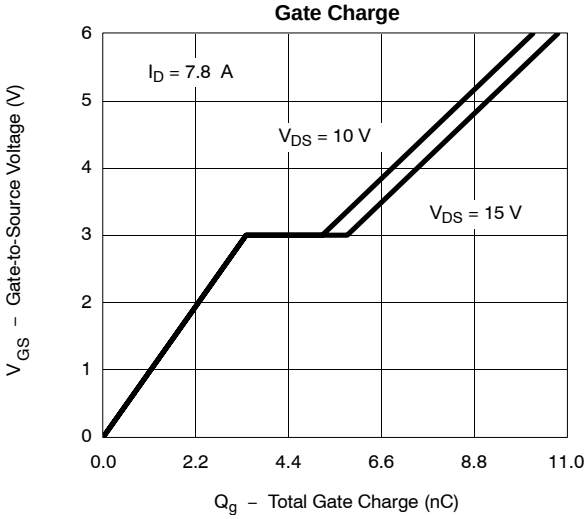
On-Resistance vs. Drain Current



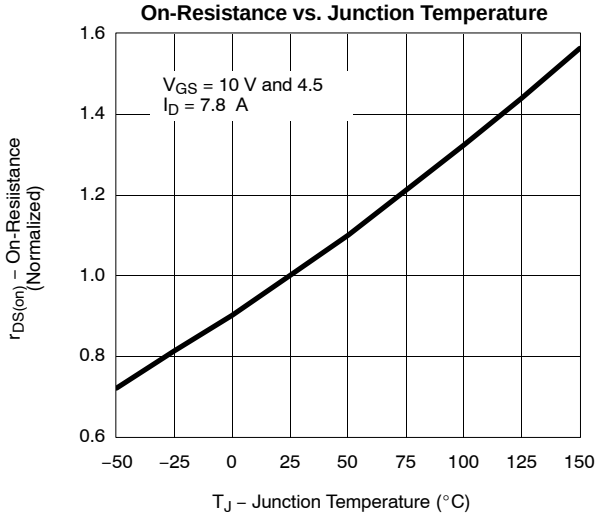
Capacitance



Gate Charge

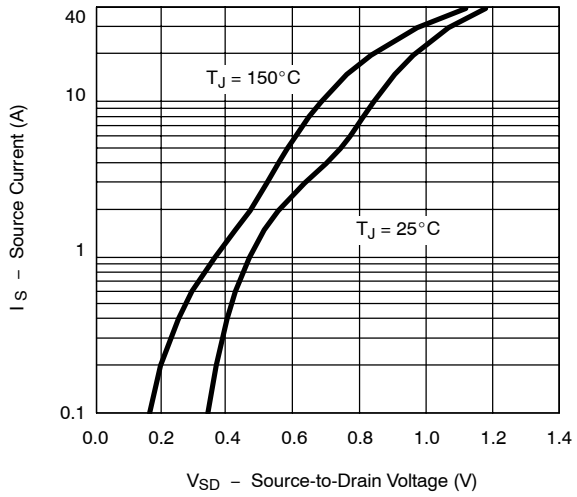


On-Resistance vs. Junction Temperature

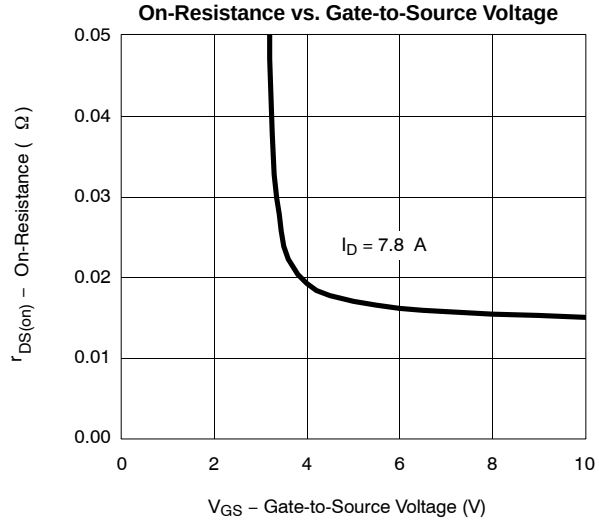


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) CHANNEL-2

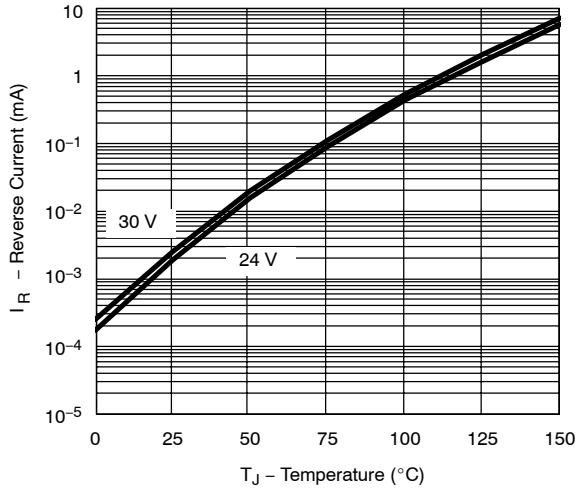
Source-Drain Diode Forward Voltage



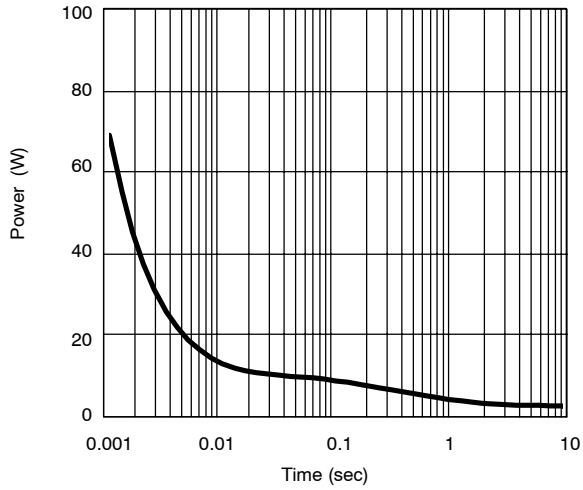
On-Resistance vs. Gate-to-Source Voltage



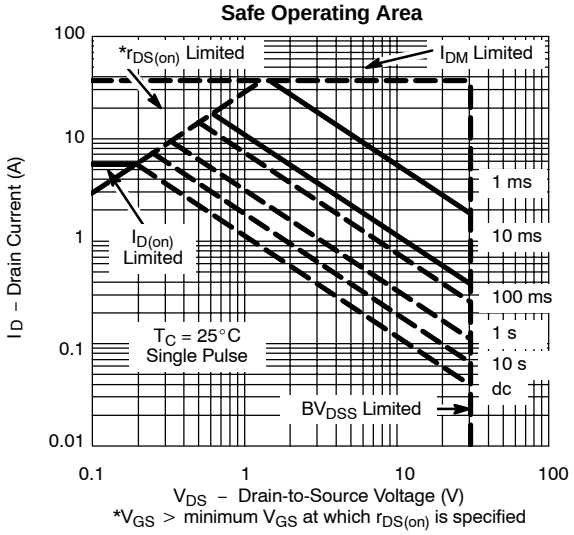
Reverse Current vs. Junction Temperature



Single Pulse Power, Junction-to-Ambient

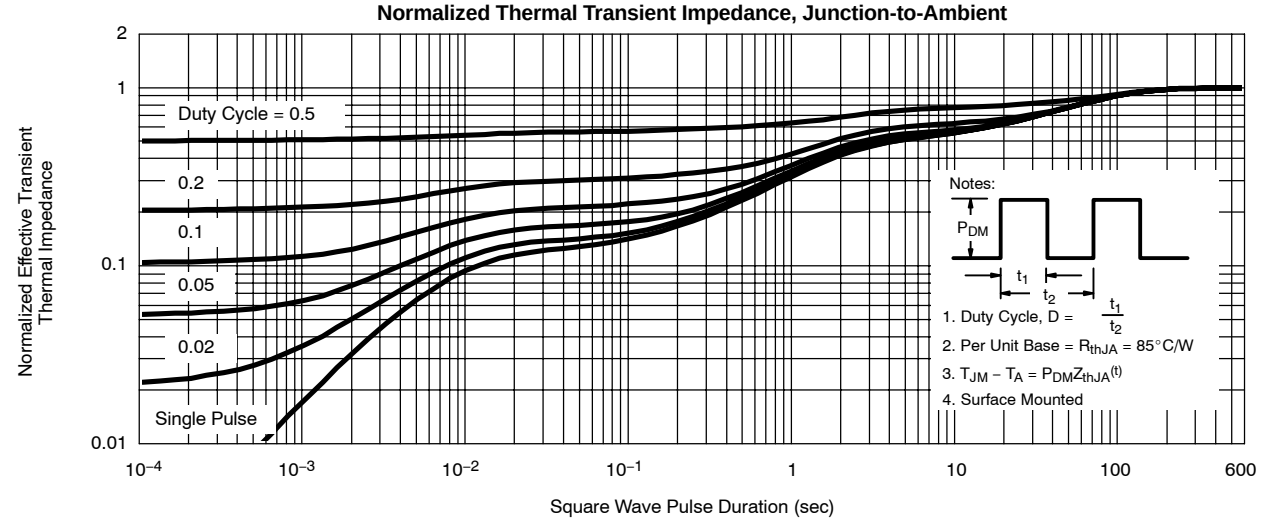


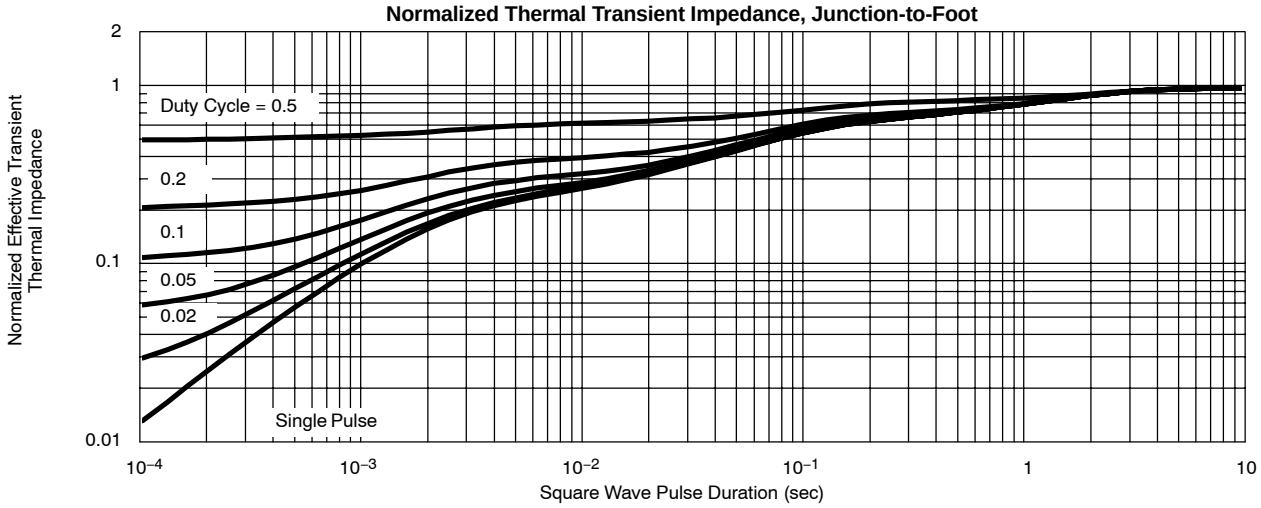
Safe Operating Area



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

TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) CHANNEL-2





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