ALPHA & OMEGA SEMICONDUCTOR

AO4932

Asymmetric Dual N-Channel MOSFET

SRFET™

General Description

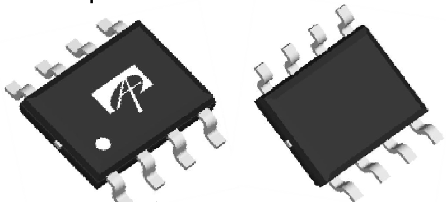
The AO4932 uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. The two MOSFETs make a compact and efficient switch and synchronous rectifier combination for use in DC-DC converters. A monolithically integrated Schottky diode in parallel with the synchronous MOSFET to boost efficiency further.

Product Summary

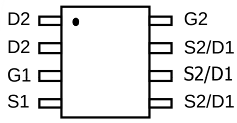
FET1(N-Channel)	FET2(N-Channel)
V_{DS}= 30V	30V
I_D= 11A (V_{GS}=10V)	8A (V_{GS}=10V)
$R_{DS(ON)}$	$R_{DS(ON)}$
< 12.5mΩ (V_{GS}=10V)	< 19mΩ (VGS=10V)
< 15mΩ (V_{GS}=4.5V)	< 23mΩ (VGS=4.5V)
100% UIS Tested	100% UIS Tested
100% R_g Tested	100% R_g Tested

SOIC-8

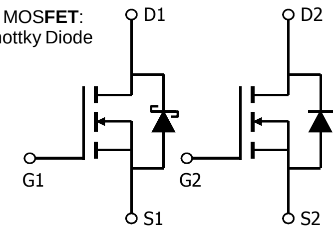
Top View Bottom View



Top View



SRFET™
Soft **R**ecovery MOS**FET**:
Integrated Schottky Diode



Absolute Maximum Ratings T_A=25℃ unless otherwise noted					
Parameter		**Symbol**	**Max FE1**	**Max FET2**	**Units**
Drain-Source Voltage		V_{DS}	30	30	V
Gate-Source Voltage		V_{GS}	±12	±20	V
Continuous Drain Current	T_A=25℃	I_D	11	8	A
	T_A=70℃		9	6.5	
Pulsed Drain Current [C]		I_{DM}	60	40	
Avalanche Current [C]		I_{AS}, I_{AR}	15	19	A
Avalanche energy L=0.1mH [C]		E_{AS}, E_{AR}	11	18	mJ
Power Dissipation [B]	T_A=25℃	P_D	2	2	W
	T_A=70℃		1.3	1.3	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150		℃

Thermal Characteristics					
Parameter		**Symbol**	**Typ**	**Max**	**Units**
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	48	62.5	℃/W
Maximum Junction-to-Ambient [A D]	Steady-State		74	90	℃/W
Maximum Junction-to-Lead	Steady-State	$R_{\theta JL}$	32	40	℃/W

FET1 Electrical Characteristics (T_J=25℃ unless otherwise noted)

Symbol	Parameter	Conditions		Min	Typ	Max	Units
STATIC PARAMETERS							
BV_{DSS}	Drain-Source Breakdown Voltage	I_D=1mA, V_{GS}=0V		30			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=30V, V_{GS}=0V				0.5	mA
			T_J=125℃			500	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}= ±12V				100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=250µA		1.1	1.65	2.1	V
$I_{D(ON)}$	On state drain current	V_{GS}=10V, V_{DS}=5V		60			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=11A			10	12.5	mΩ
			T_J=125℃		15	18	
		V_{GS}=4.5V, I_D=9A			12	15	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=11A			75		S
V_{SD}	Diode Forward Voltage	I_S=1A,V_{GS}=0V			0.4	0.7	V
I_S	Maximum Body-Diode + Schottky Continuous Current					4	A
DYNAMIC PARAMETERS							
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=15V, f=1MHz		930	1170	1400	pF
C_{oss}	Output Capacitance			90	128	170	pF
C_{rss}	Reverse Transfer Capacitance			45	89	125	pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		0.7	1.4	2.1	Ω
SWITCHING PARAMETERS							
Q_g(10V)	Total Gate Charge	V_{GS}=10V, V_{DS}=15V, I_D=11A		16	20	24	nC
Q_g(4.5V)	Total Gate Charge			7	8.7	10.5	nC
Q_{gs}	Gate Source Charge				3.2		nC
Q_{gd}	Gate Drain Charge				3		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=15V, R_L=1.4Ω, R_{GEN}=3Ω			6		ns
t_r	Turn-On Rise Time				2.4		ns
$t_{D(off)}$	Turn-Off DelayTime				23		ns
t_f	Turn-Off Fall Time				4		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=11A, dI/dt=500A/µs		5.5	7	8.5	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=11A, dI/dt=500A/µs		5	6.5	8	nC

A. The value of $R_{\theta JA}$ is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with T_A =25° C. The value in any given application depends on the user's specific board design.
B. The power dissipation P_D is based on $T_{J(MAX)}$=150° C, using ≤ 10s junction-to-ambient thermal resistance.
C. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}$=150° C. Ratings are based on low frequency and duty cycles to keep initialT_J=25° C.
D. The $R_{\theta JA}$ is the sum of the thermal impedence from junction to lead $R_{\theta JL}$ and lead to ambient.
E. The static characteristics in Figures 1 to 6 are obtained using <300µs pulses, duty cycle 0.5% max.
F. These curves are based on the junction-to-ambient thermal impedence which is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, assuming a maximum junction temperature of $T_{J(MAX)}$=150° C. The SOA curve provides a single pulse rating.

FET1: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

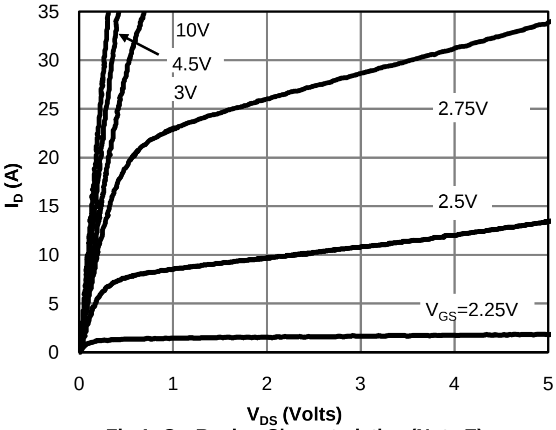


Fig 1: On-Region Characteristics (Note E)

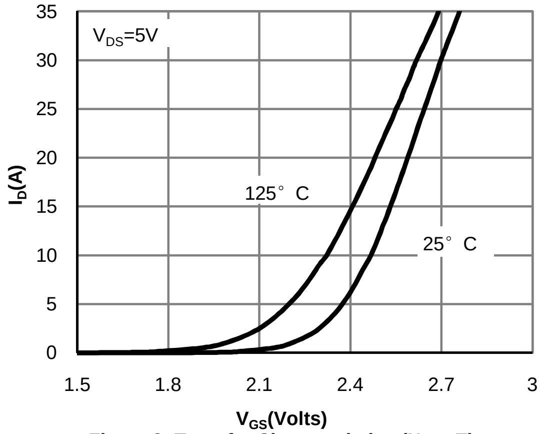


Figure 2: Transfer Characteristics (Note E)

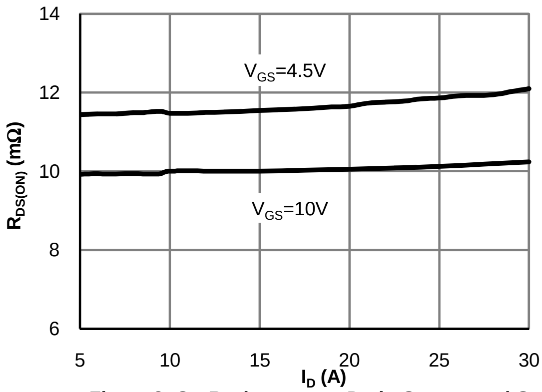


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

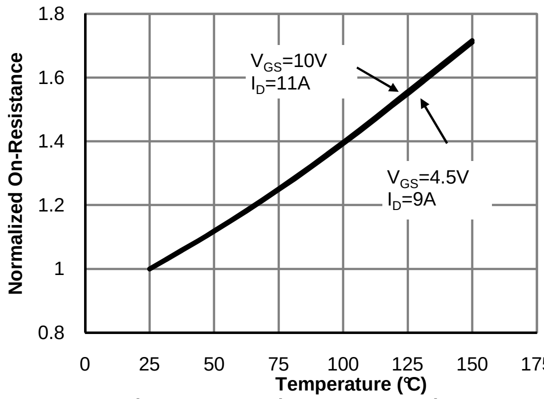


Figure 4: On-Resistance vs. Junction Temperature (Note E)

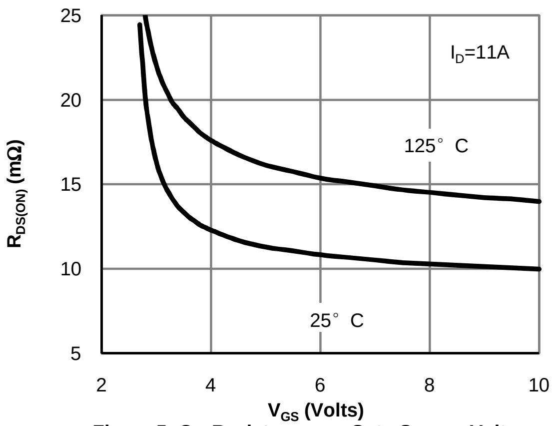


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

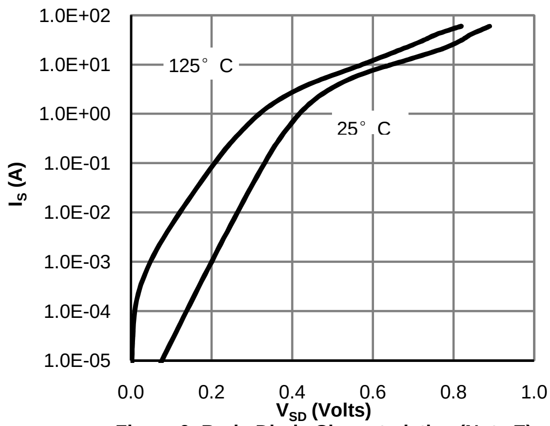


Figure 6: Body-Diode Characteristics (Note E)

FET1: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

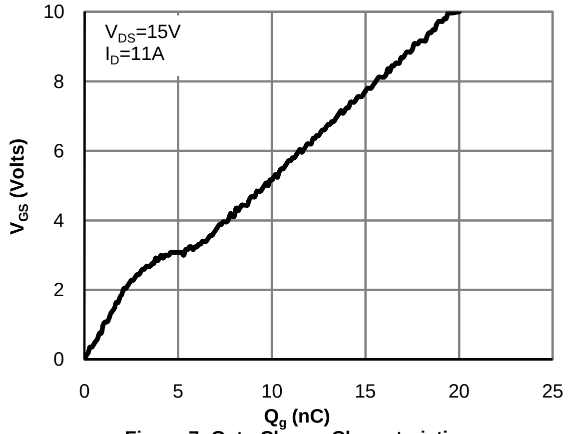


Figure 7: Gate-Charge Characteristics

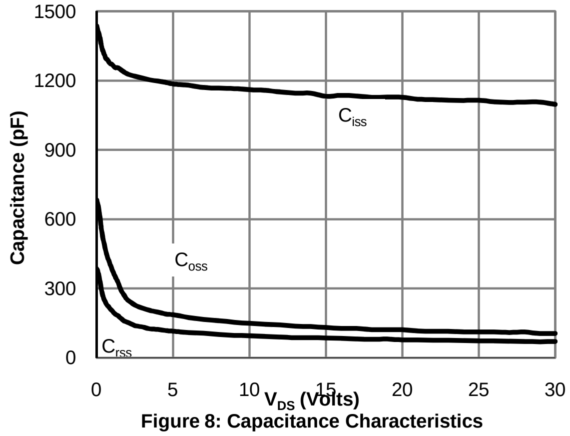


Figure 8: Capacitance Characteristics

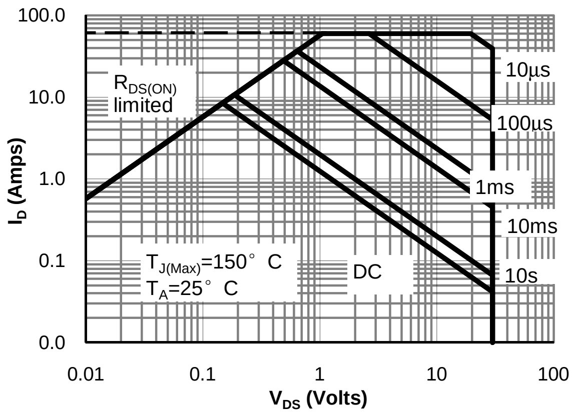


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

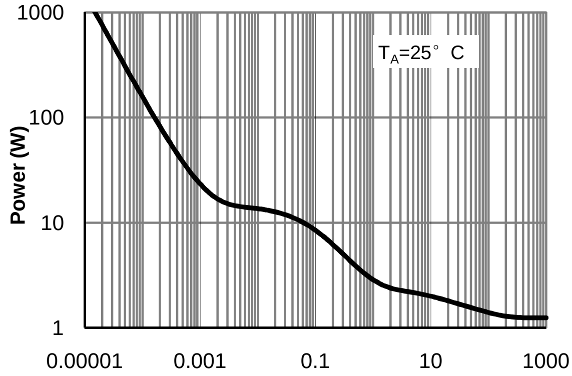


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

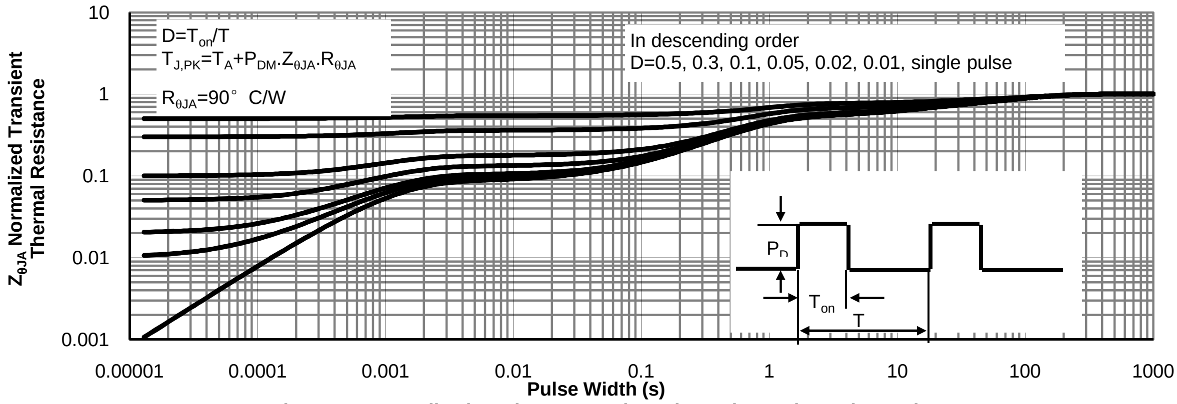


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

FET1: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

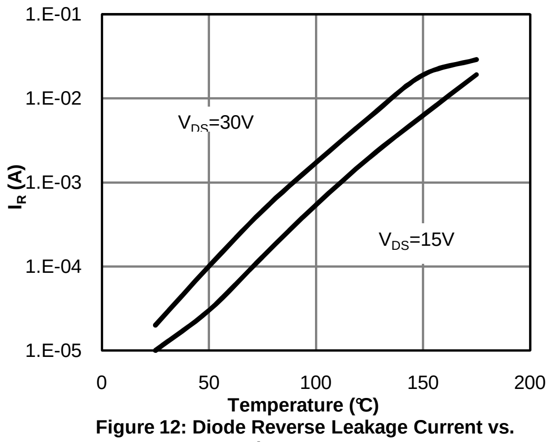


Figure 12: Diode Reverse Leakage Current vs. Junction Temperature

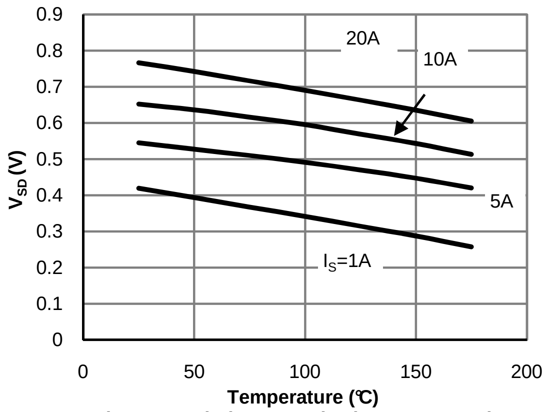


Figure 13: Diode Forward voltage vs. Junction Temperature

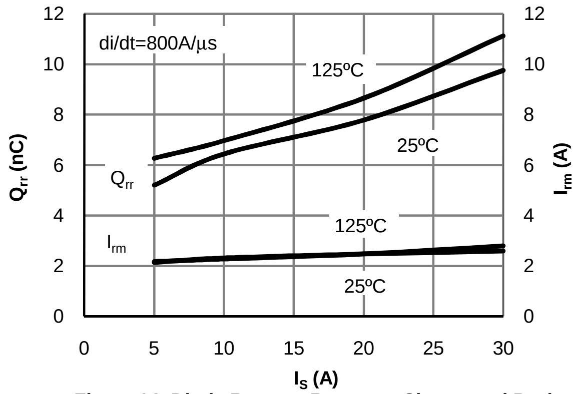


Figure 14: Diode Reverse Recovery Charge and Peak Current vs. Conduction Current

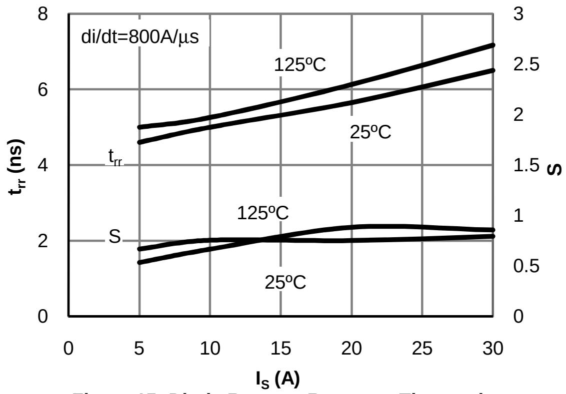


Figure 15: Diode Reverse Recovery Time and Softness Factor vs. Conduction Current

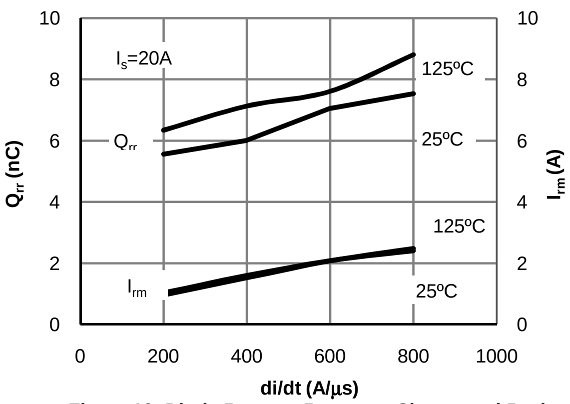


Figure 16: Diode Reverse Recovery Charge and Peak Current vs. di/dt

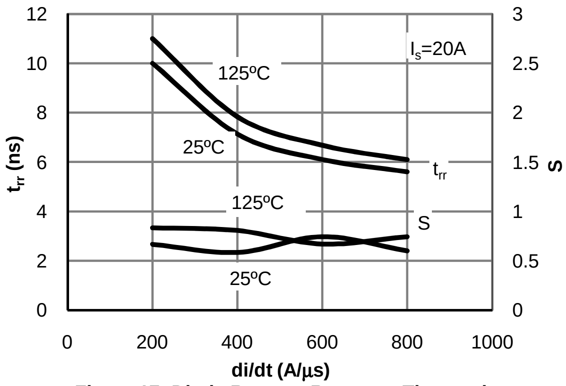


Figure 17: Diode Reverse Recovery Time and Softness Factor vs. di/dt

FET2 Electrical Characteristics (T_J=25℃ unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV_{DSS}	Drain-Source Breakdown Voltage	I_D=250µA, V_{GS}=0V	30			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=30V, V_{GS}=0V			1	µA
		T_J=55℃			5	µA
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}= ±16V			10	µA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=250µA	1.2	1.8	2.4	V
$I_{D(ON)}$	On state drain current	V_{GS}=10V, V_{DS}=5V	40			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=8A		15.5	19	mΩ
		T_J=125℃		21	25	mΩ
		V_{GS}=4.5V, I_D=4A		18.6	23	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=8A		30		S
V_{SD}	Diode Forward Voltage	I_S=1A,V_{GS}=0V		0.75	1	V
I_S	Maximum Body-Diode Continuous Current				2.5	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=15V, f=1MHz	600	740	888	pF
C_{oss}	Output Capacitance		77	110	145	pF
C_{rss}	Reverse Transfer Capacitance		50	82	115	pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz	0.5	1.1	1.7	Ω
SWITCHING PARAMETERS						
Q_g(10V)	Total Gate Charge	V_{GS}=10V, V_{DS}=15V, I_D=8A	12	15	18	nC
Q_g(4.5V)	Total Gate Charge		6	7.5	9	nC
Q_{gs}	Gate Source Charge		2	2.5	3	nC
Q_{gd}	Gate Drain Charge		2	3	5	nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=15V, R_L=1.8Ω, R_{GEN}=3Ω		5		ns
t_r	Turn-On Rise Time			3.5		ns
$t_{D(off)}$	Turn-Off DelayTime			19		ns
t_f	Turn-Off Fall Time			3.5		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=8A, dI/dt=500A/µs	6	8	10	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=8A, dI/dt=500A/µs	14	18	22	nC

A. The value of $R_{\theta JA}$ is measured with the device mounted on 1in^2 FR-4 board with 2oz. Copper, in a still air environment with T_A =25° C. The value in any given application depends on the user's specific board design.
B. The power dissipation P_D is based on $T_{J(MAX)}$=150° C, using ≤ 10s junction-to-ambient thermal resistance.
C. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}$=150° C. Ratings are based on low frequency and duty cycles to keep initialT_J=25° C.
D. The $R_{\theta JA}$ is the sum of the thermal impedence from junction to lead $R_{\theta JL}$ and lead to ambient.
E. The static characteristics in Figures 1 to 6 are obtained using <300µs pulses, duty cycle 0.5% max.
F. These curves are based on the junction-to-ambient thermal impedence which is measured with the device mounted on 1in^2 FR-4 board with 2oz. Copper, assuming a maximum junction temperature of $T_{J(MAX)}$=150° C. The SOA curve provides a single pulse rating.

FET2: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

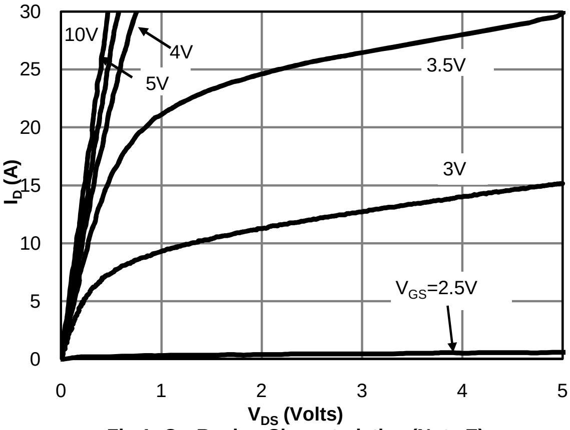


Fig 1: On-Region Characteristics (Note E)

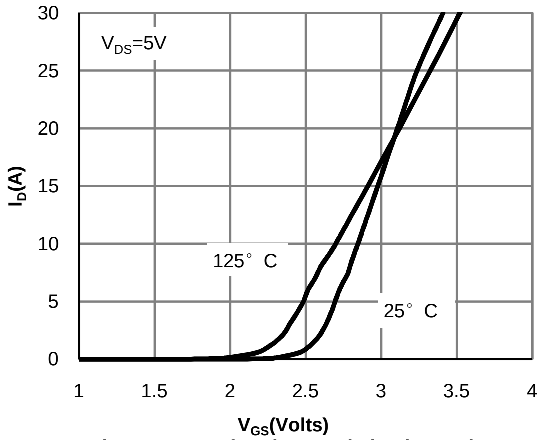


Figure 2: Transfer Characteristics (Note E)

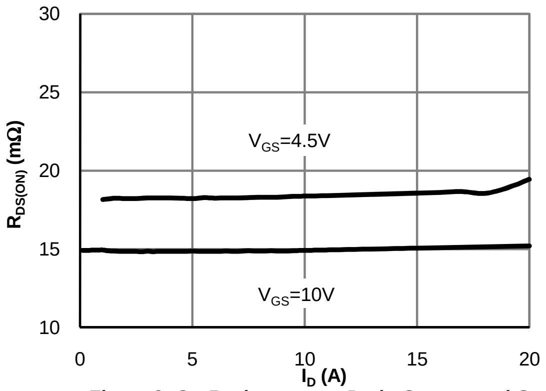


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

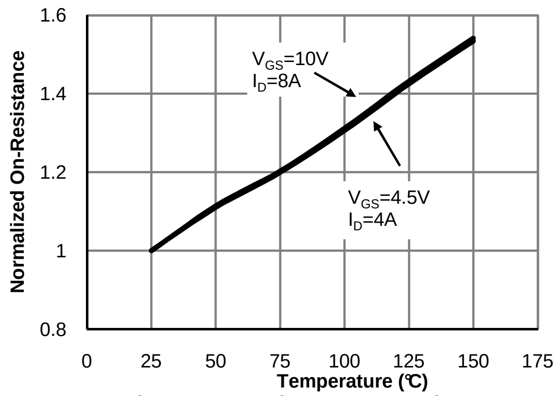


Figure 4: On-Resistance vs. Junction Temperature (Note E)

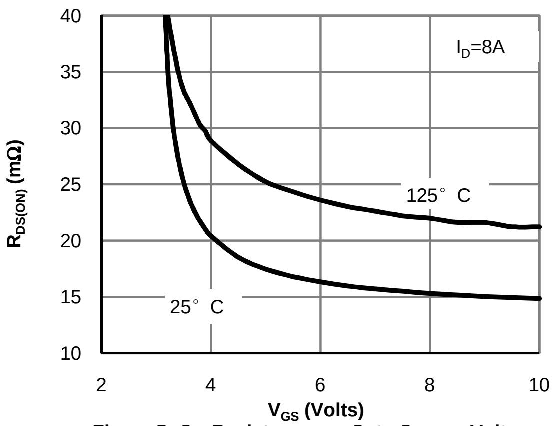


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

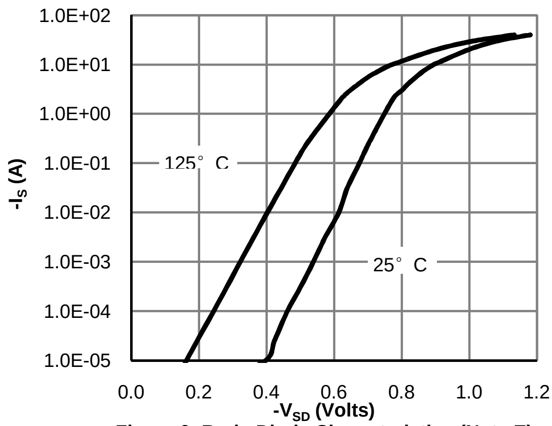


Figure 6: Body-Diode Characteristics (Note E)

P-Channel: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

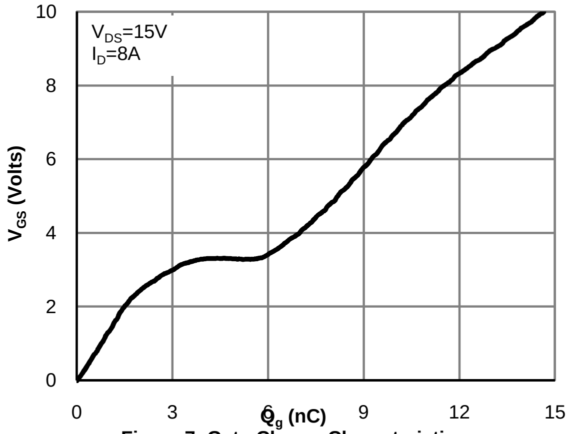


Figure 7: Gate-Charge Characteristics

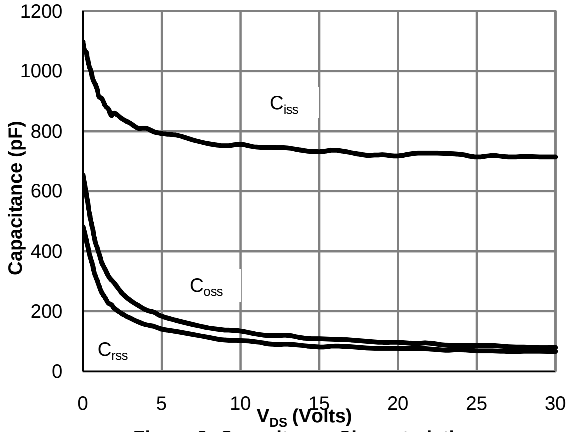


Figure 8: Capacitance Characteristics

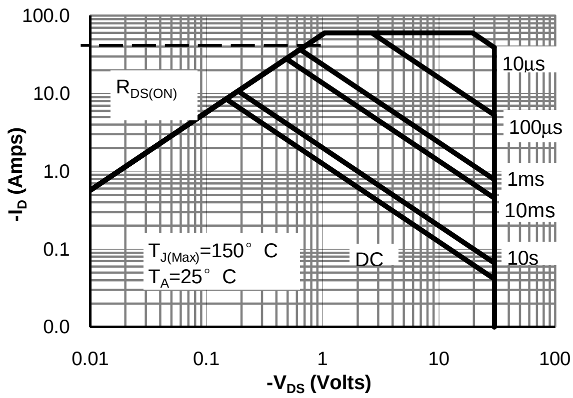


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

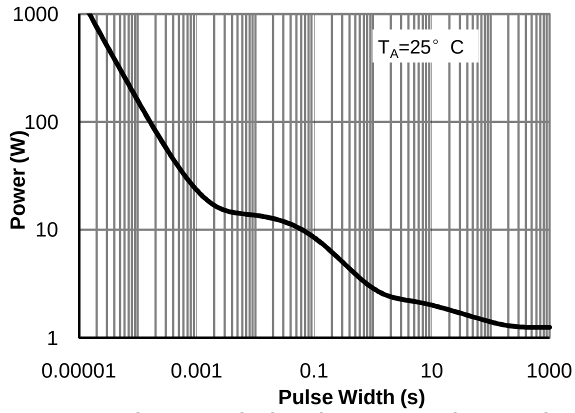


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

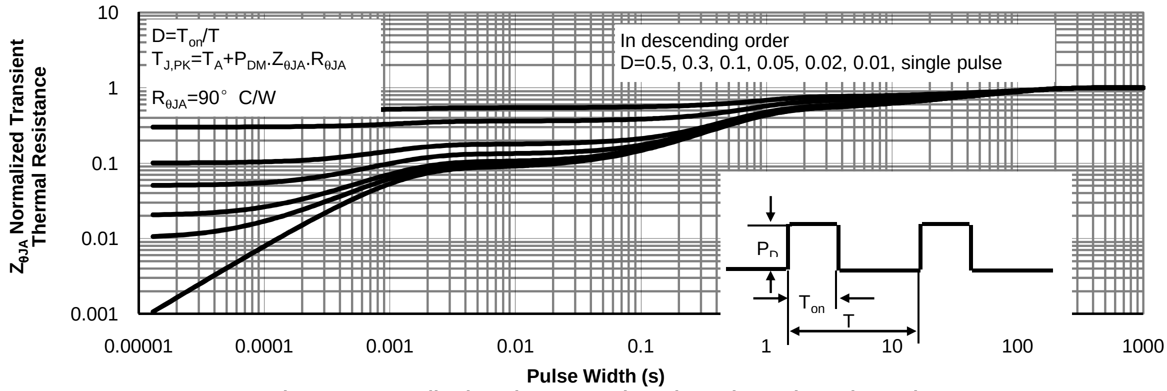
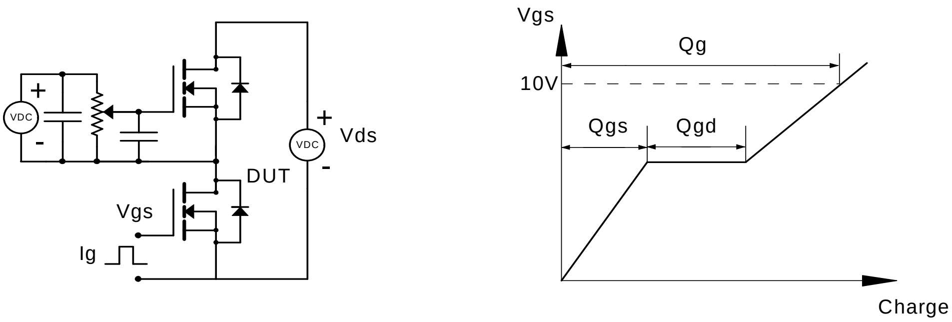
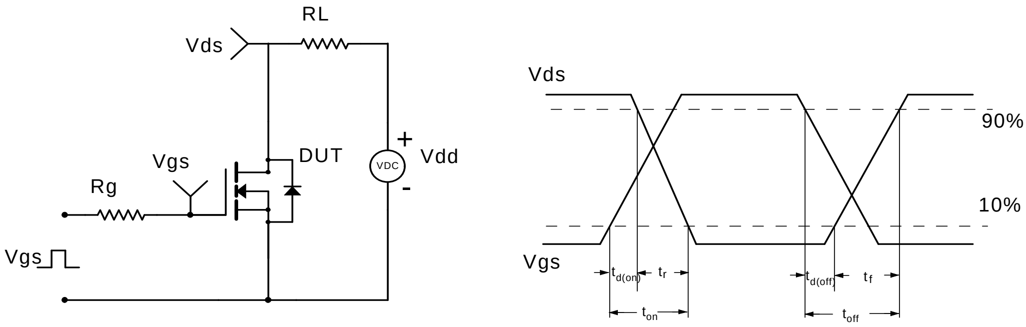


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

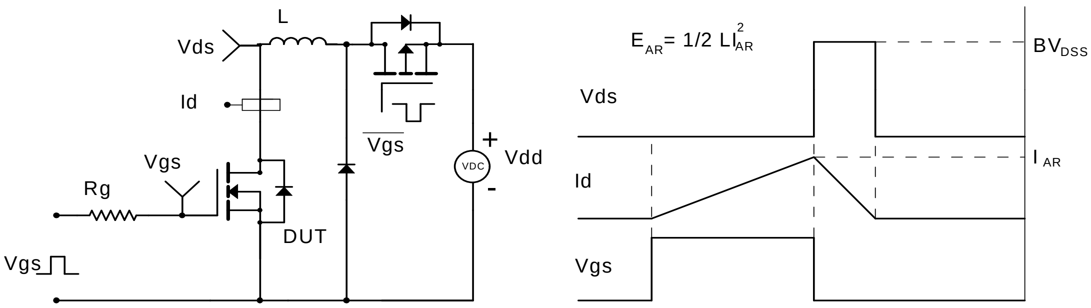
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms