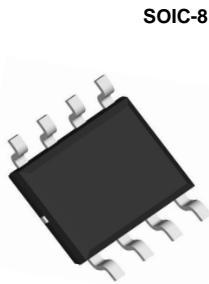


General Description

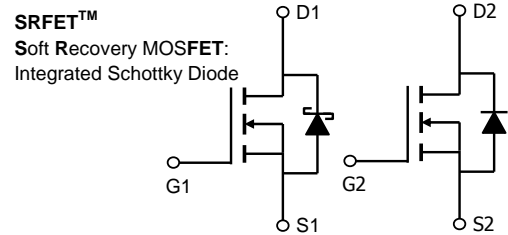
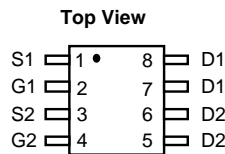
The AO4924 uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. The two MOSFETs make a compact and efficient switch and synchronous rectifier combination for use in DC-DC converters. A monolithically integrated Schottky diode in parallel with the synchronous MOSFET to boost efficiency further.

Features

FET1	FET2
$V_{DS} (V) = 30V$	$V_{DS}(V) = 30V$
$I_D = 9A$	$I_D=7.3A$ ($V_{GS} = 10V$)
$R_{DS(ON)} < 15.8m\Omega$	$<24m\Omega$ ($V_{GS} = 10V$)
$R_{DS(ON)} < 19.5m\Omega$	$<29m\Omega$ ($V_{GS} = 4.5V$)



SOIC-8



Absolute Maximum Ratings $T_A=25^\circ C$ unless otherwise noted

Parameter	Symbol	Max FET1	Max FET2	Units
Drain-Source Voltage	V_{DS}	30	30	V
Gate-Source Voltage	V_{GS}	± 12	± 12	V
Continuous Drain Current ^A	I_{DSM}	$T_A=25^\circ C$	9.0	A
		$T_A=70^\circ C$	7.2	
Pulsed Drain Current ^B	I_{DM}	40	40	
Avalanche Current ^B	I_{AR}	16	12	A
Repetitive avalanche energy $L=0.3mH$ ^B	E_{AR}	38	22	mJ
Power Dissipation	P_{DSM}	$T_A=25^\circ C$	2.0	W
		$T_A=70^\circ C$	1.3	
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	-55 to 150	$^\circ C$

Thermal Characteristics FET1

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	48	62.5	$^\circ C/W$
$t \leq 10s$				
Maximum Junction-to-Ambient ^A	$R_{\theta JL}$	32	40	$^\circ C/W$
Steady-State				
Maximum Junction-to-Lead ^C				

Thermal Characteristics FET2

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	48	62.5	$^\circ C/W$
$t \leq 10s$				
Maximum Junction-to-Ambient ^A	$R_{\theta JL}$	32	40	$^\circ C/W$
Steady-State				
Maximum Junction-to-Lead ^C				

FET1 Electrical Characteristics (T_J=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
B _V DSS	Drain-Source Breakdown Voltage	I _D =1mA, V _{GS} =0V	30			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =24V, V _{GS} =0V T _J =125°C		0.01 5	0.1 10	mA
I _{GSS}	Gate-Body leakage current	V _{DS} =0V, V _{GS} = ±12V			0.1	μA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} I _D =250μA	1.5	1.85	2.4	V
I _{D(ON)}	On state drain current	V _{GS} =4.5V, V _{DS} =5V	40			A
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =9A T _J =125°C		13 20.0	15.8 25.0	mΩ
		V _{GS} =4.5V, I _D =7A		15.7	19.5	mΩ
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =9A		64		S
V _{SD}	Diode Forward Voltage	I _S =1A, V _{GS} =0V		0.4	0.6	V
I _S	Maximum Body-Diode + Schottky Continuous Current				4.5	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =15V, f=1MHz		1450	1885	pF
C _{oss}	Output Capacitance			224		pF
C _{rss}	Reverse Transfer Capacitance			92		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz		1.6	3	Ω
SWITCHING PARAMETERS						
Q _{g(10V)}	Total Gate Charge	V _{GS} =10V, V _{DS} =15V, I _D =9A		24.0	31	
Q _{g(4.5V)}	Total Gate Charge			12.0		nC
Q _{gs}	Gate Source Charge			3.9		nC
Q _{gd}	Gate Drain Charge			4.2		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =10V, V _{DS} =15V, R _L =1.7Ω, R _{GEN} =3Ω		5.5		ns
t _r	Turn-On Rise Time			4.7		ns
t _{D(off)}	Turn-Off DelayTime			24.0		ns
t _f	Turn-Off Fall Time			4.0		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =9A, di/dt=300A/μs		10	13	ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =9A, di/dt=300A/μs		6.8		nC

A: The value of R_{θJA} is measured with the device in a still air environment with T_A=25°C. The power dissipation P_{DSM} and current rating I_{DSM} are based on T_{J(MAX)}=150°C, using t ≤ 10s junction-to-ambient thermal resistance.

B: Repetitive rating, pulse width limited by junction temperature T_{J(MAX)}=150°C.

C: The R_{θJA} is the sum of the thermal impedance from junction to lead R_{θJL} and lead to ambient.

D: The static characteristics in Figures 1 to 6 are obtained using <300 μs pulses, duty cycle 0.5% max.

E: These tests are performed with the device mounted on 1 in 2 FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C. The SOA curve provides a single pulse rating.

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FET1 TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

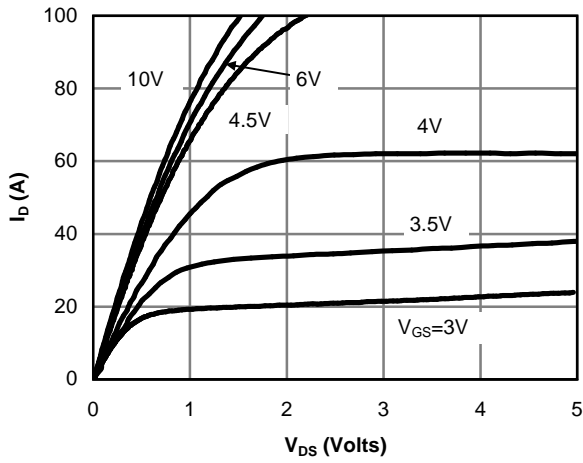


Figure 1: On-Region Characteristics

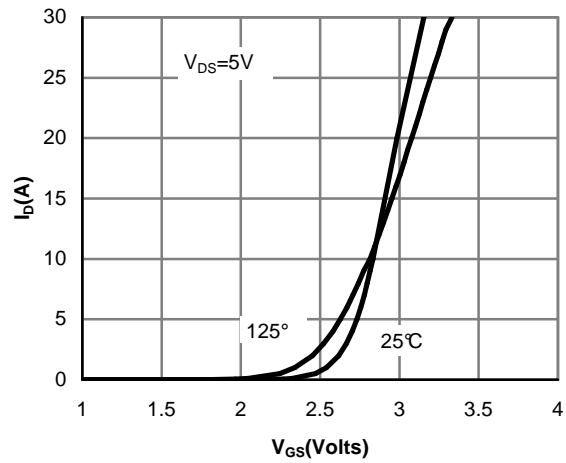


Figure 2: Transfer Characteristics

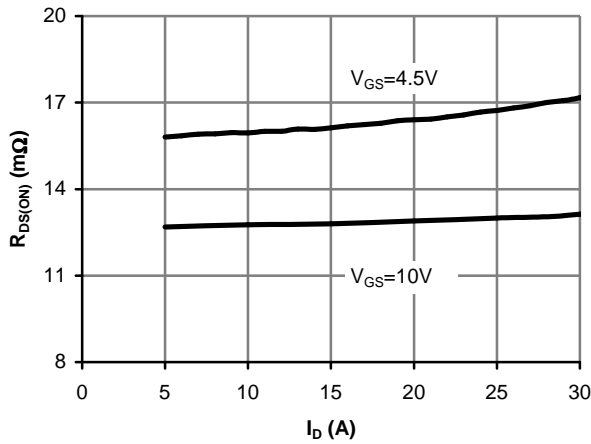


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

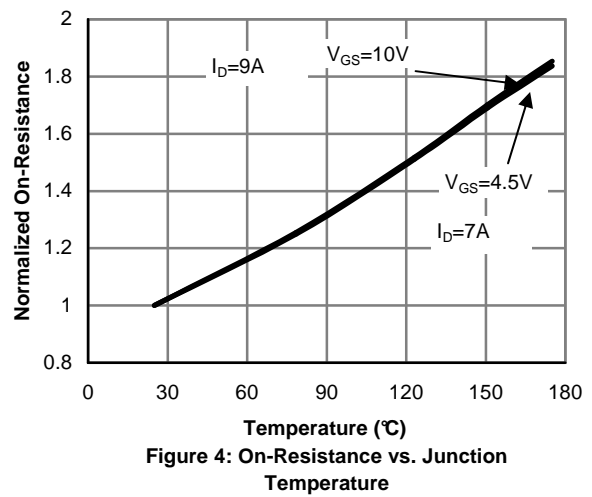


Figure 4: On-Resistance vs. Junction Temperature

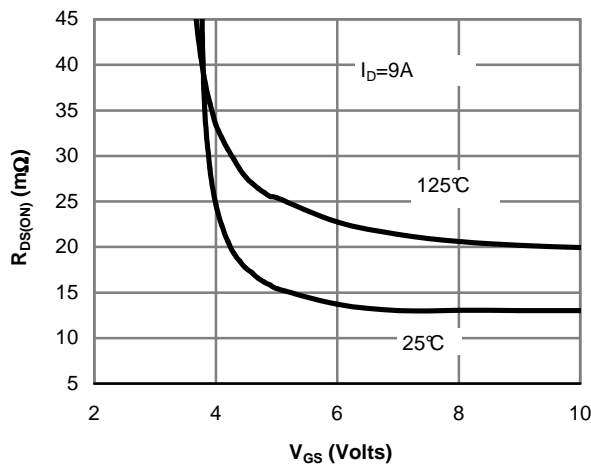


Figure 5: On-Resistance vs. Gate-Source Voltage

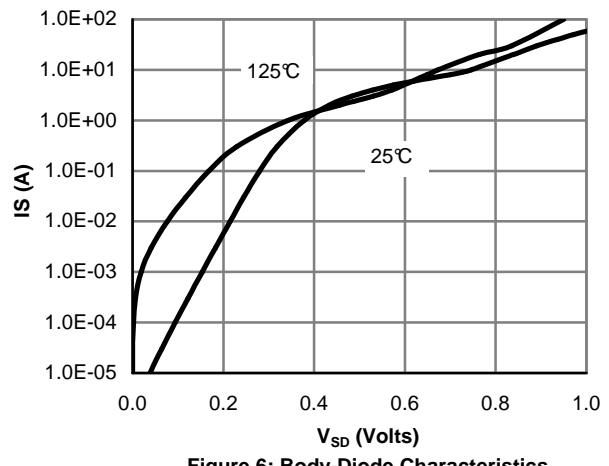


Figure 6: Body-Diode Characteristics

FET1 TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

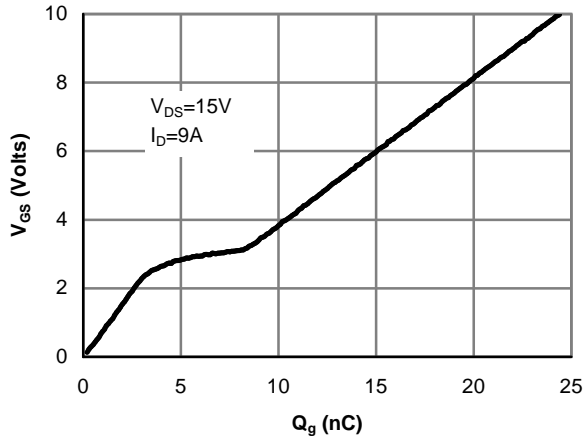


Figure 7: Gate-Charge Characteristics

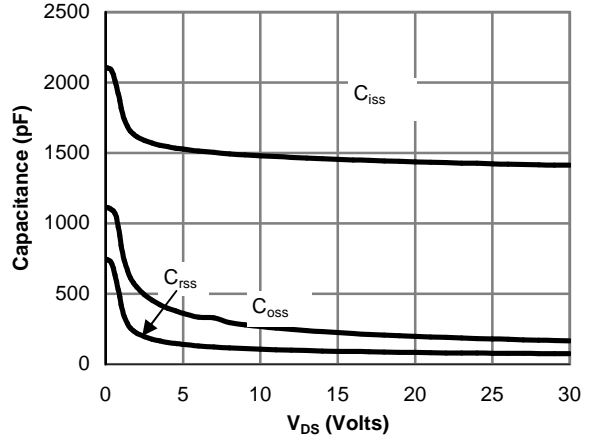


Figure 8: Capacitance Characteristics

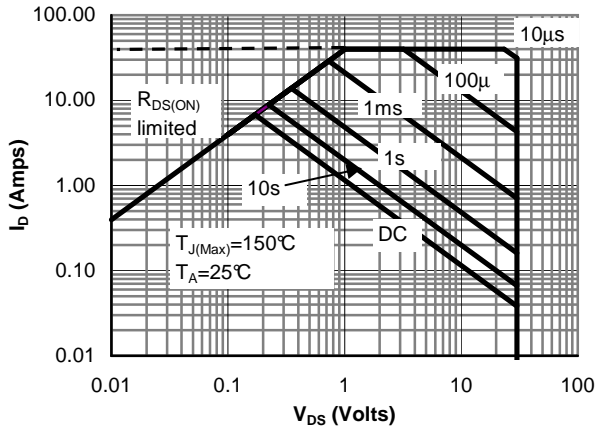


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

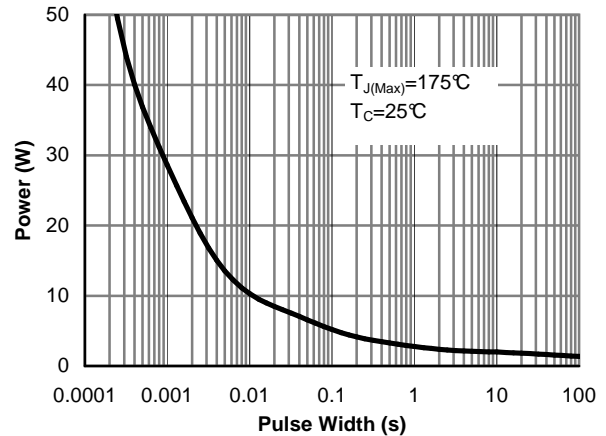


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

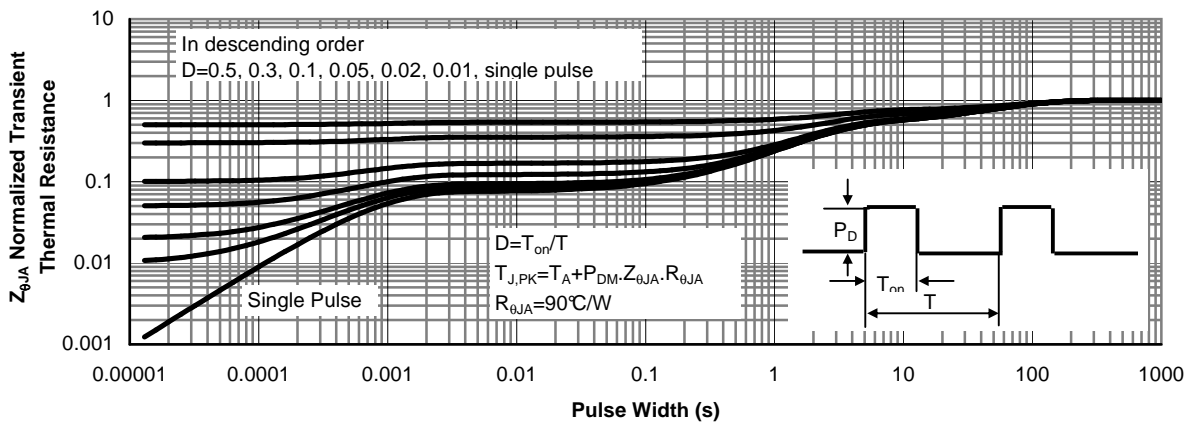


Figure 11: Normalized Maximum Transient Thermal Impedance (Note E)

FET1 TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

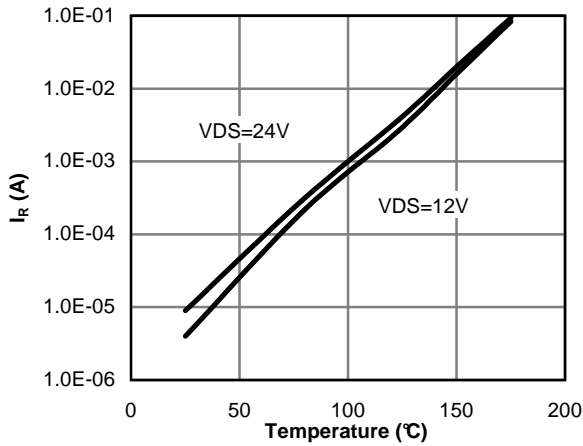


Figure 12: Diode Reverse Leakage Current vs. Junction Temperature

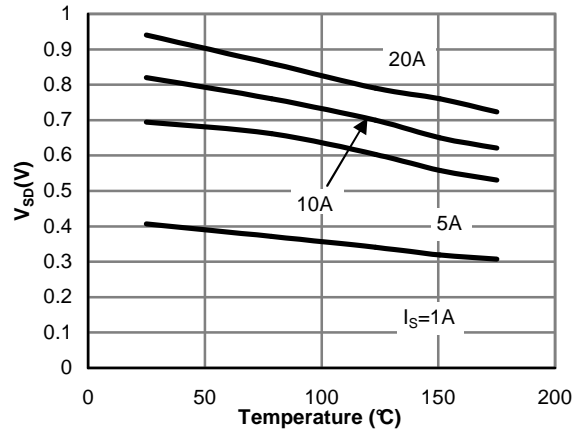


Figure 13: Diode Forward voltage vs. Junction Temperature

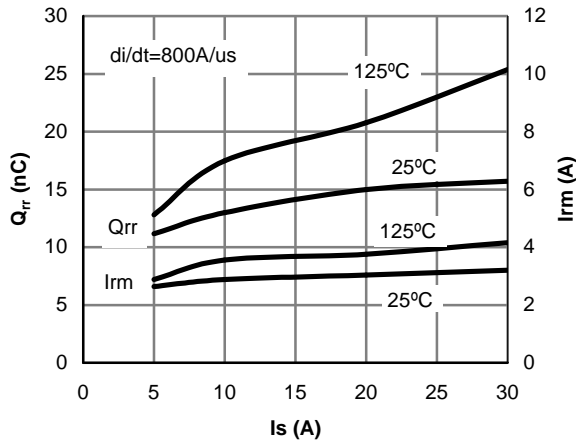


Figure 14: Diode Reverse Recovery Charge and Peak Current vs. Conduction Current

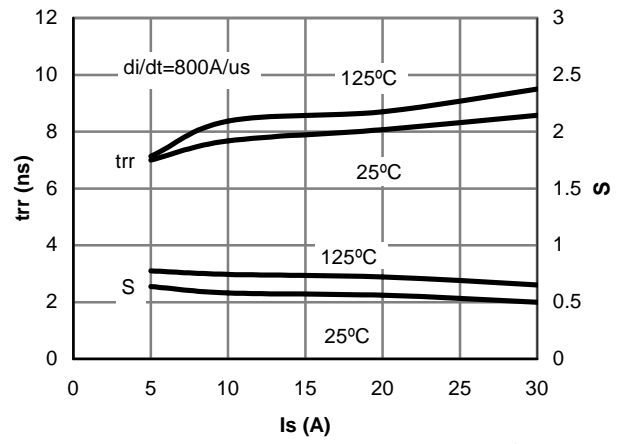


Figure 15: Diode Reverse Recovery Time and Soft Coefficient vs. Conduction Current

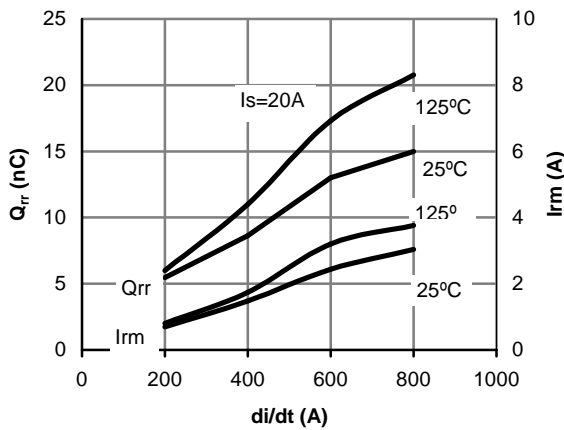


Figure 16: Diode Reverse Recovery Charge and Peak Current vs. di/dt

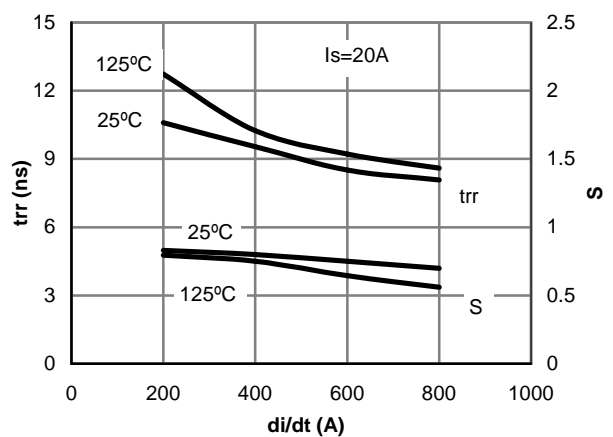


Figure 17: Diode Reverse Recovery Time and Soft Coefficient vs. di/dt

FET2 Electrical Characteristics (T_J=25°C 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} =24V, V _{GS} =0V T _J =55°C			1 5	μA
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	0.7	1	1.5	V
I _{D(ON)}	On state drain current	V _{GS} =4.5V, V _{DS} =5V	40			A
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =7.3A T _J =125°C		20 28	24 34	mΩ
		V _{GS} =4.5V, I _D =6A		23.5	29	mΩ
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =7.3A		26		S
V _{SD}	Diode Forward Voltage	I _S =1A, V _{GS} =0V		0.71	1	V
I _S	Maximum Body-Diode Continuous Current				4.5	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =15V, f=1MHz		900	1100	pF
C _{oss}	Output Capacitance			88		pF
C _{rss}	Reverse Transfer Capacitance			65		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz		0.95	1.5	Ω
SWITCHING PARAMETERS						
Q _g	Total Gate Charge	V _{GS} =4.5V, V _{DS} =15V, I _D =7.3A		10	12	nC
Q _{gs}	Gate Source Charge			1.8		nC
Q _{gd}	Gate Drain Charge			3.75		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =10V, V _{DS} =15V, R _L =2Ω, R _{GEN} =6Ω		3.2		ns
t _r	Turn-On Rise Time			3.5		ns
t _{D(off)}	Turn-Off DelayTime			21.5		ns
t _f	Turn-Off Fall Time			2.7		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =7.3A, dI/dt=100A/μs		16.8	20	ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =7.3A, dI/dt=100A/μs		8	12	nC

A: The value of R_{θJA} 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. The current rating is based on the t ≤ 10s thermal resistance rating.

B: Repetitive rating, pulse width limited by junction temperature.

C: The R_{θJA} is the sum of the thermal impedance from junction to lead R_{θJL} and lead to ambient.

D: The static characteristics in Figures 1 to 6 are obtained using <300 μs pulses, duty cycle 0.5% max.

E: These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C. The SOA curve provides a single pulse rating.

Rev2: May 2011

FET2 TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

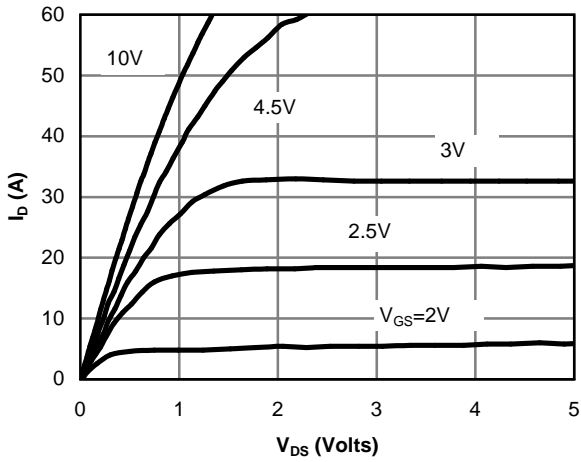


Fig 1: On-Region Characteristics

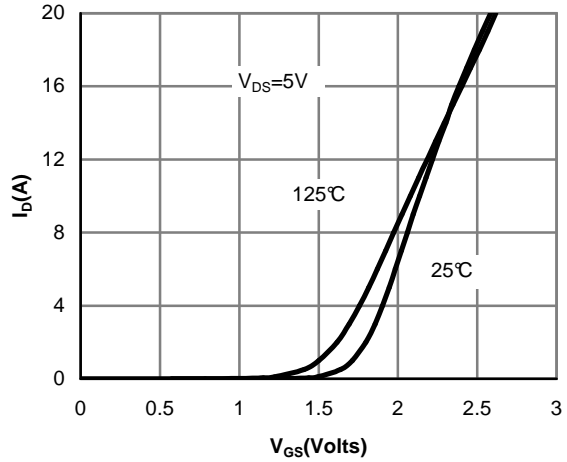


Figure 2: Transfer Characteristics

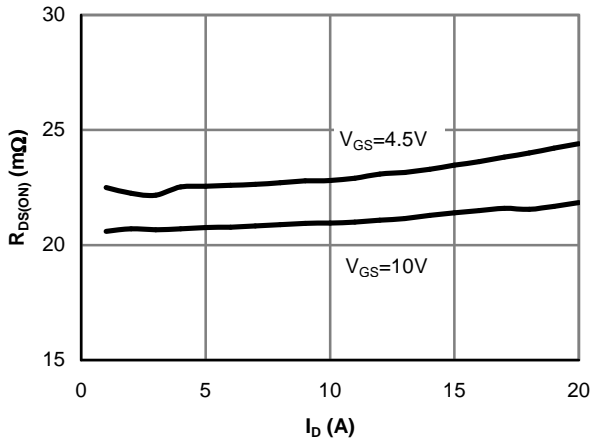


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

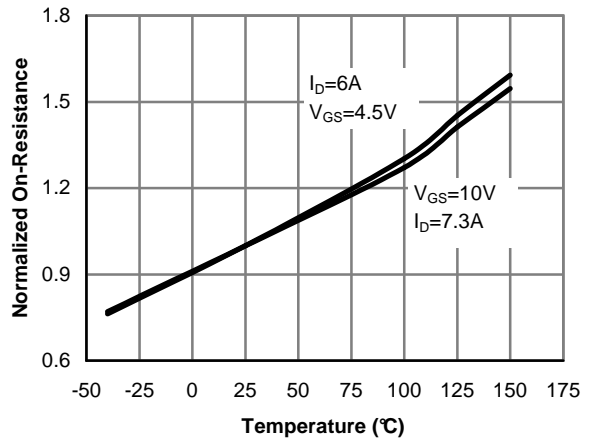


Figure 4: On-Resistance vs. Junction Temperature

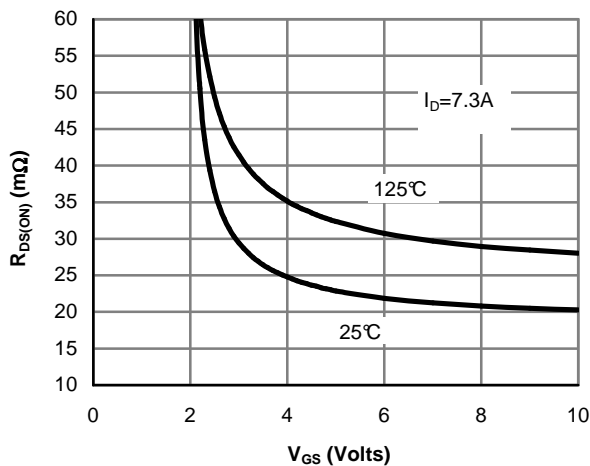


Figure 5: On-Resistance vs. Gate-Source Voltage

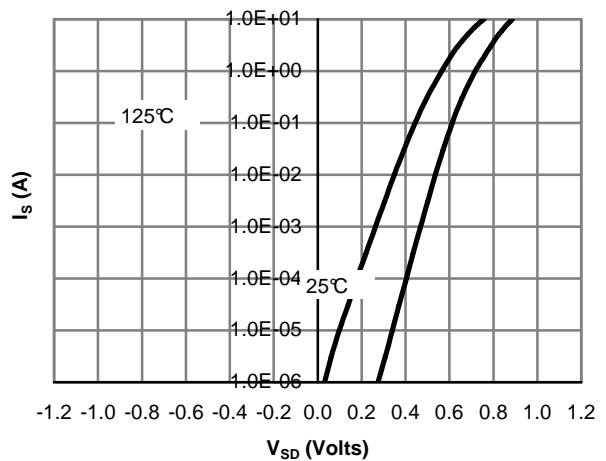


Figure 6: Body-Diode Characteristics

FET2 TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

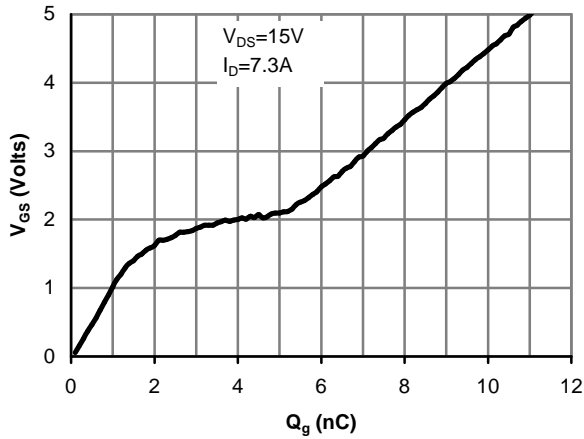


Figure 7: Gate-Charge Characteristics

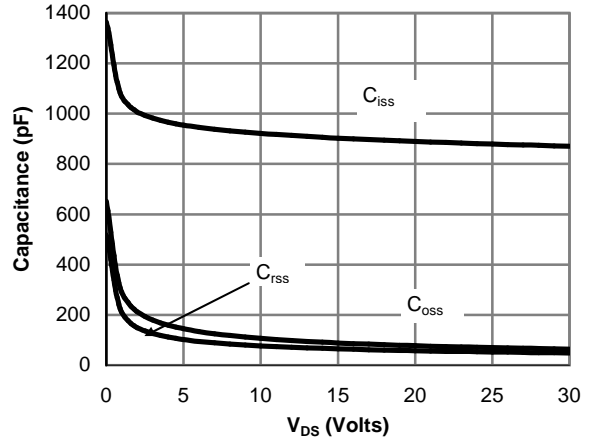


Figure 8: Capacitance Characteristics

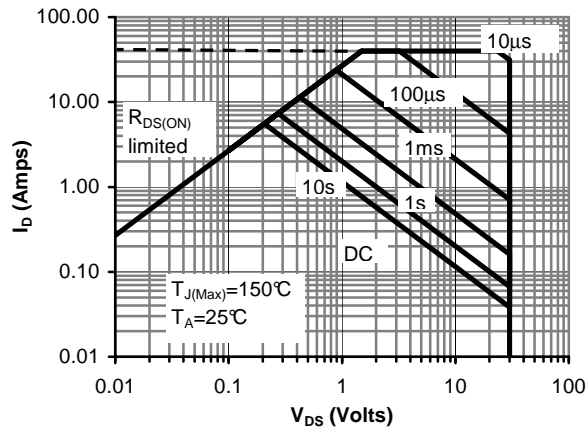


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

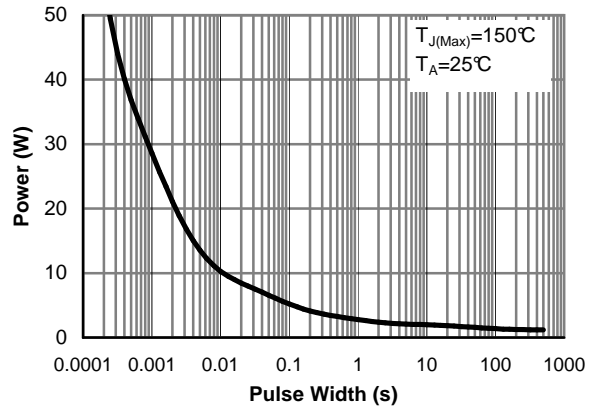


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

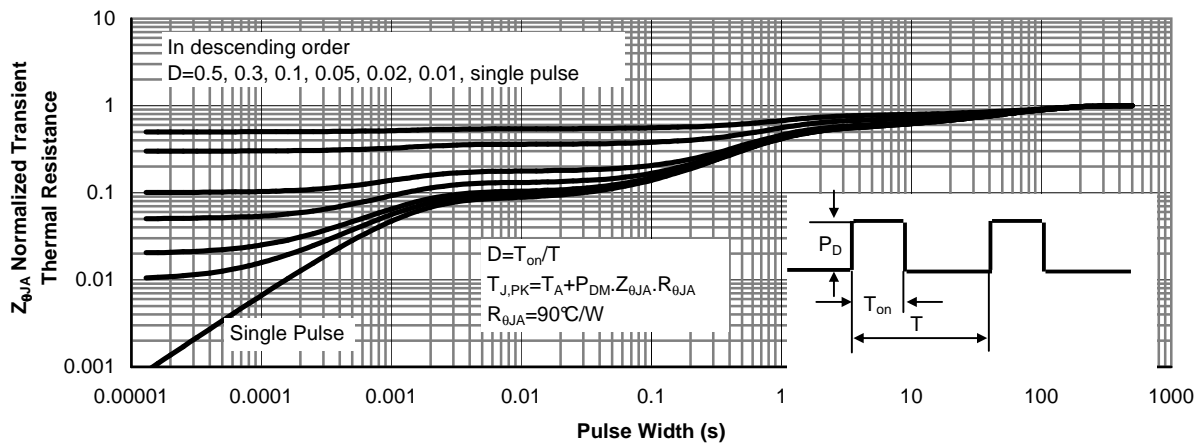
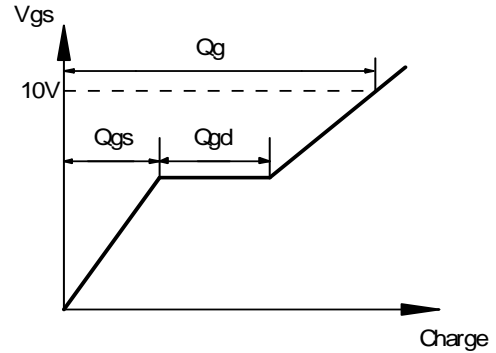
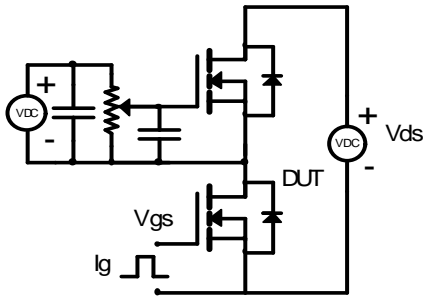
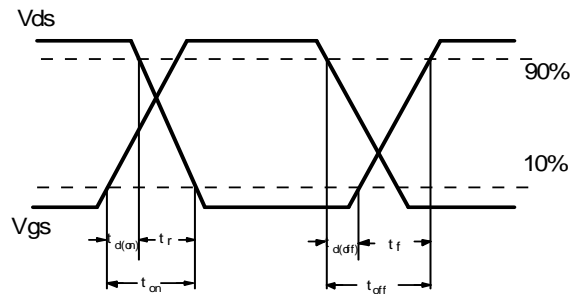
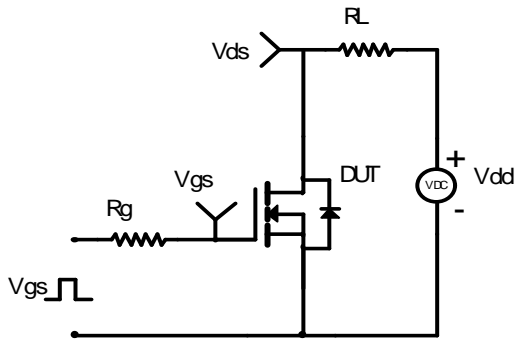


Figure 11: Normalized Maximum Transient Thermal Impedance

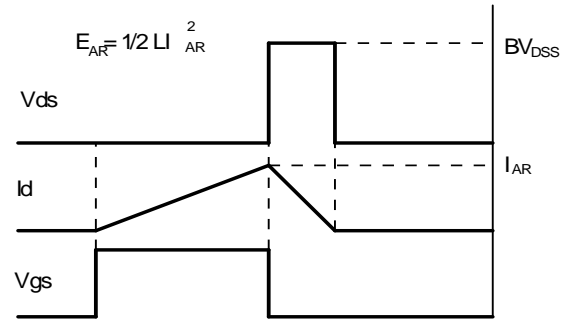
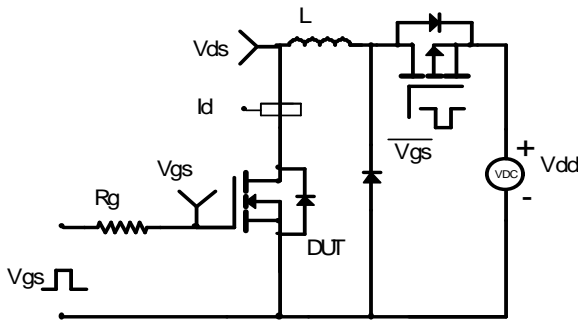
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

