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AON7902

30V Dual Asymmetric N-Channel MOSFET

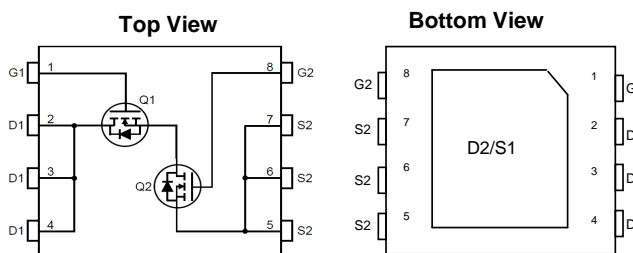
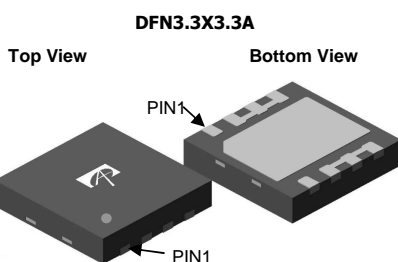
General Description

The AON7902 is designed to provide a high efficiency synchronous buck power stage with optimal layout and board space utilization. It includes two specialized MOSFETs in a dual Power DFN3.3x3.3A package. The Q1 "High Side" MOSFET is designed to minimize switching losses. The Q2 "Low Side" MOSFET use advance trench technology with a monolithically integrated Schottky to provide excellent $R_{DS(ON)}$ and low gate charge. The AON7902 is well suited for use in compact DC/DC converter applications.

Product Summary

	Q1	Q2
V_{DS}	30V	30V
I_D (at $V_{GS}=10V$)	27A	40A
$R_{DS(ON)}$ (at $V_{GS}=10V$)	<21m Ω	<6.2m Ω
$R_{DS(ON)}$ (at $V_{GS} = 4.5V$)	<28m Ω	<7.4m Ω

100% UIS Tested
100% Rg Tested



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

Parameter	Symbol	Max Q1	Max Q2	Units
Drain-Source Voltage	V_{DS}	30		V
Gate-Source Voltage	V_{GS}	± 20	± 12	V
Continuous Drain Current ^G	I_D	$T_C=25^\circ\text{C}$	24	A
		$T_C=100^\circ\text{C}$	15	
Pulsed Drain Current ^C	I_{DM}	90	150	A
Continuous Drain Current	I_{DSM}	$T_A=25^\circ\text{C}$	8	A
		$T_A=70^\circ\text{C}$	6	
Avalanche Current ^C	I_{AS}, I_{AR}	22	36	A
Avalanche Energy $L=0.1\text{mH}$ ^C	E_{AS}, E_{AR}	24	65	mJ
Power Dissipation ^B	P_D	$T_C=25^\circ\text{C}$	17	W
		$T_C=100^\circ\text{C}$	7	
Power Dissipation ^A	P_{DSM}	$T_A=25^\circ\text{C}$	1.8	W
		$T_A=70^\circ\text{C}$	1.1	
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150		$^\circ\text{C}$

Thermal Characteristics

Parameter	Symbol	Typ Q1	Typ Q2	Max Q1	Max Q2	Units
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	$t \leq 10\text{s}$	27	27	35	$^\circ\text{C/W}$
Maximum Junction-to-Ambient ^{A,D}		Steady-State	60	60	72	
Maximum Junction-to-Case	$R_{\theta JC}$	6	2	7.5	2.5	$^\circ\text{C/W}$

Q1 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} =30V, V _{GS} =0V T _J =55°C			1 5	μA
I _{GSS}	Gate-Body leakage current	V _{DS} =0V, V _{GS} = ±20V			100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} I _D =250μA	1.3	1.8	2.3	V
I _{D(ON)}	On state drain current	V _{GS} =10V, V _{DS} =5V	90			A
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =8A T _J =125°C		17 24	21 29	mΩ
		V _{GS} =4.5V, I _D =4A		22	28	mΩ
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =8A		33		S
V _{SD}	Diode Forward Voltage	I _S =1A, V _{GS} =0V		0.7		V
I _S	Maximum Body-Diode Continuous Current				20	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =15V, f=1MHz	470	590	710	pF
C _{oss}	Output Capacitance		250	360	470	pF
C _{rss}	Reverse Transfer Capacitance		13	23	40	pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz	0.7	1.5	2.3	Ω
SWITCHING PARAMETERS						
Q _{g(10V)}	Total Gate Charge	V _{GS} =10V, V _{DS} =15V, I _D =8A	7	9	11.0	nC
Q _{g(4.5V)}	Total Gate Charge		3	4	5.0	nC
Q _{gs}	Gate Source Charge			1.5		nC
Q _{gd}	Gate Drain Charge			1.5		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =10V, V _{DS} =15V, R _L =1.8Ω, R _{GEN} =3Ω		6		ns
t _r	Turn-On Rise Time			3		ns
t _{D(off)}	Turn-Off DelayTime			18		ns
t _f	Turn-Off Fall Time			3		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =8A, di/dt=500A/μs	8	11	14	ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =8A, di/dt=500A/μs	15	19	23	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 Power dissipation P_{DSM} is based on R_{θJA} and the maximum allowed junction temperature of 150°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 junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.

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 initial T_J =25°C.

D. The R_{θJA} is the sum of the thermal impedance from junction to case R_{θJC} and case 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-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of T_{J(MAX)}=150°C. The SOA curve provides a single pulse rating g.

G. The maximum current rating is limited by package.

H. 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.

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Q1-CHANNEL: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

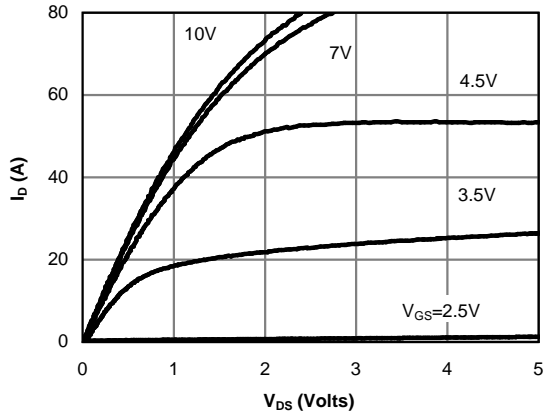


Fig 1: On-Region Characteristics (Note E)

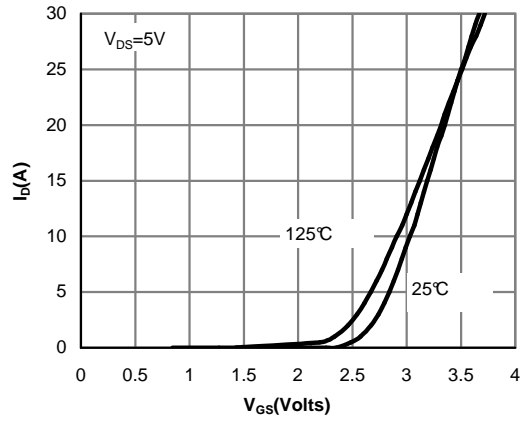


Figure 2: Transfer Characteristics (Note E)

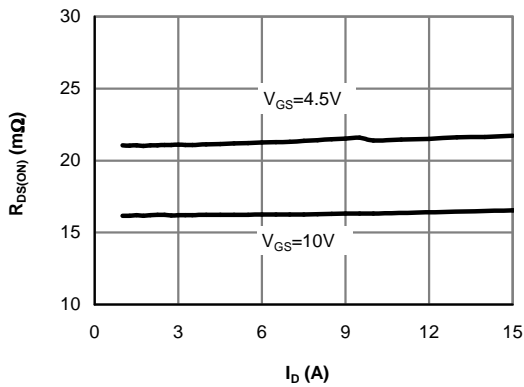


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

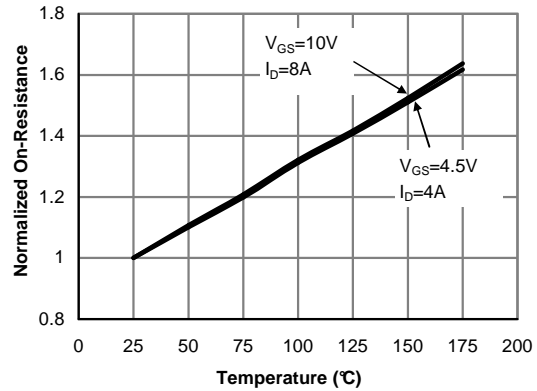


Figure 4: On-Resistance vs. Junction Temperature (Note E)

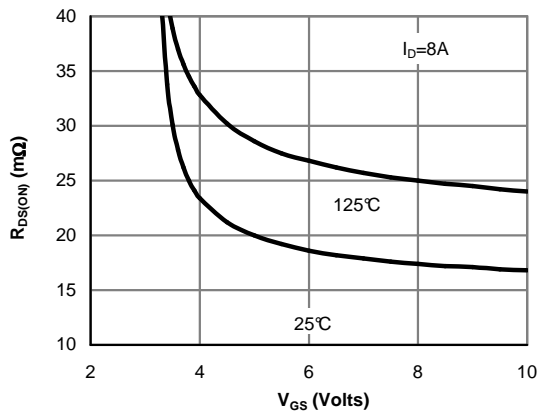


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

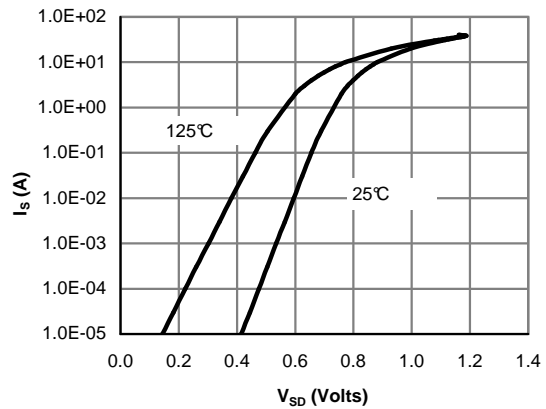


Figure 6: Body-Diode Characteristics (Note E)

Q1-CHANNEL: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

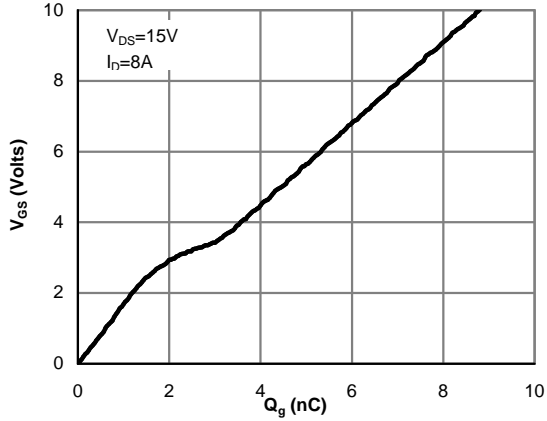


Figure 7: Gate-Charge Characteristics

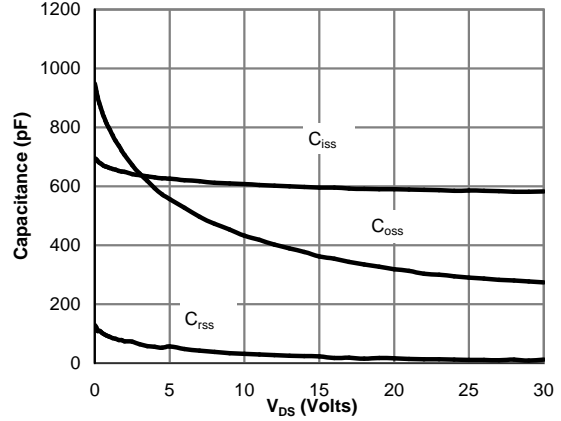


Figure 8: Capacitance Characteristics

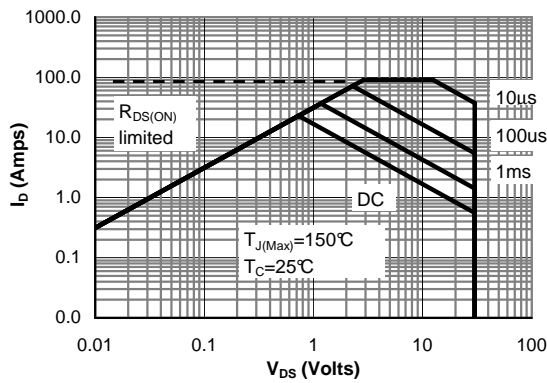


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

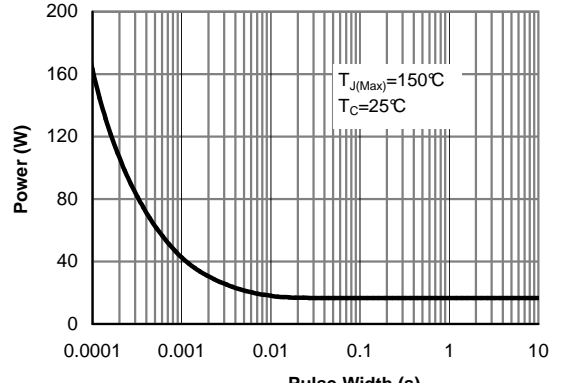


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

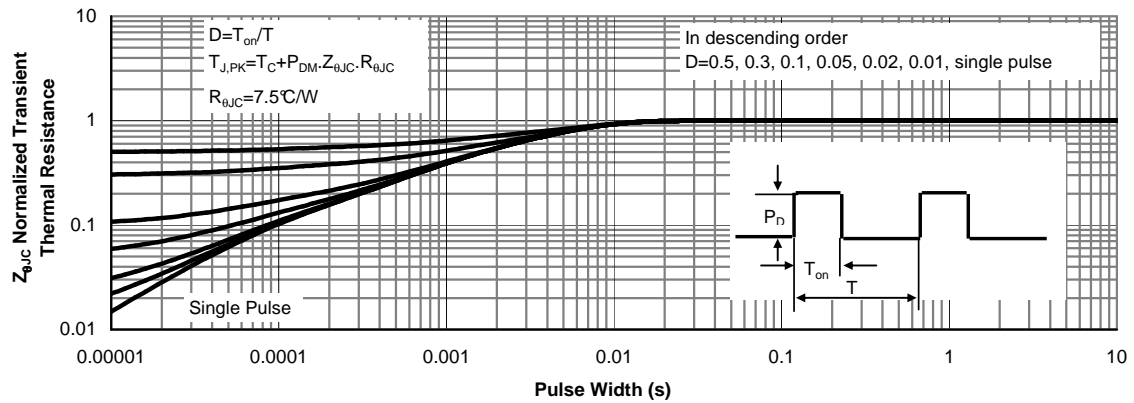


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

Q1-CHANNEL: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

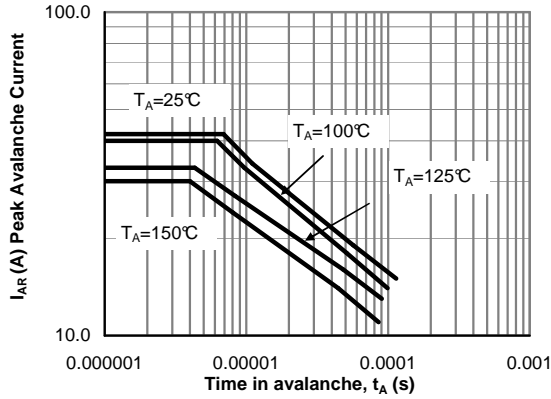


Figure 12: Single Pulse Avalanche capability (Note C)

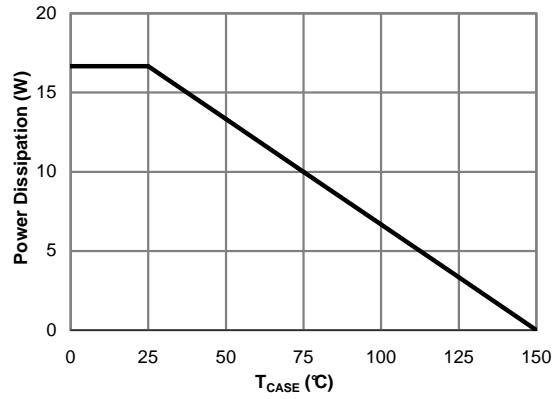


Figure 13: Power De-rating (Note F)

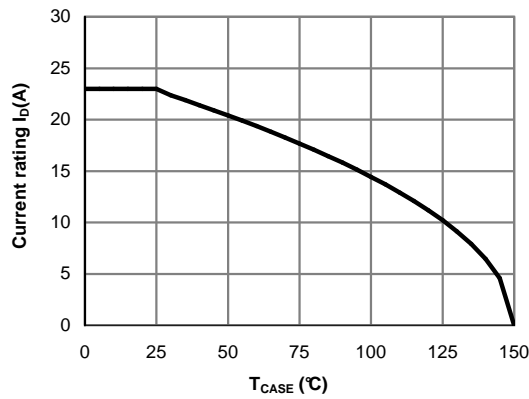


Figure 14: Current De-rating (Note F)

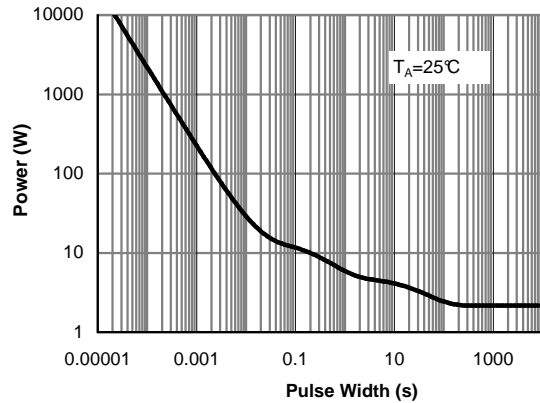


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

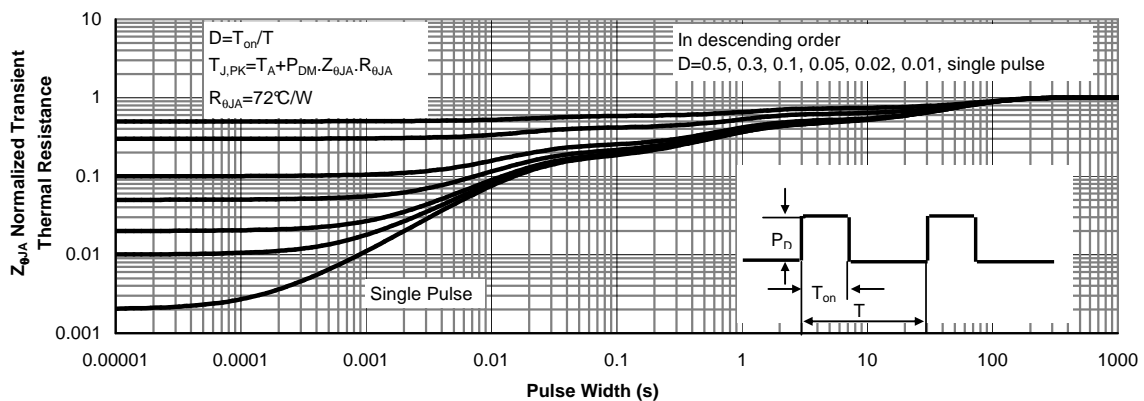


Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

Q2 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 =10mA, V _{GS} =0V	30			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =30V, V _{GS} =0V T _J =55°C			0.5 500	mA
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	1.6	2.1	V
I _{D(ON)}	On state drain current	V _{GS} =10V, V _{DS} =5V	150			A
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =13A T _J =125°C		5.1 7.4	6.2 9	mΩ
		V _{GS} =4.5V, I _D =10A		5.7	7.4	mΩ
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =13A		50		S
V _{SD}	Diode Forward Voltage	I _S =1A, V _{GS} =0V		0.4	0.7	V
I _S	Maximum Body-Diode Continuous Current ^G				40	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =15V, f=1MHz	2800	3500	4200	pF
C _{oss}	Output Capacitance		360	520	680	pF
C _{rss}	Reverse Transfer Capacitance		150	260	450	pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz	0.6	1.2	1.8	Ω
SWITCHING PARAMETERS						
Q _{g(4.5V)}	Total Gate Charge	V _{GS} =10V, V _{DS} =15V, I _D =13A	22	28	34	nC
Q _{gs}	Gate Source Charge		9			nC
Q _{gd}	Gate Drain Charge		11			nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =10V, V _{DS} =15V, R _L =1.2Ω, R _{GEN} =3Ω		8		ns
t _r	Turn-On Rise Time		5			ns
t _{D(off)}	Turn-Off DelayTime		50			ns
t _f	Turn-Off Fall Time		8			ns
t _{rr}	Body Diode Reverse Recovery Time		I _F =13A, dI/dt=500A/μs	10	13	16
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =13A, dI/dt=500A/μs	16	21	26	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 Power dissipation P_{DSM} is based on R_{θJA} and the maximum allowed junction temperature of 150°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 junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.

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 initial T_J=25°C.

D. The R_{θJA} is the sum of the thermal impedance from junction to case R_{θJC} and case 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-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of T_{J(MAX)}=150°C. The SOA curve provides a single pulse rating g.

G. 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.

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Q2-CHANNEL: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

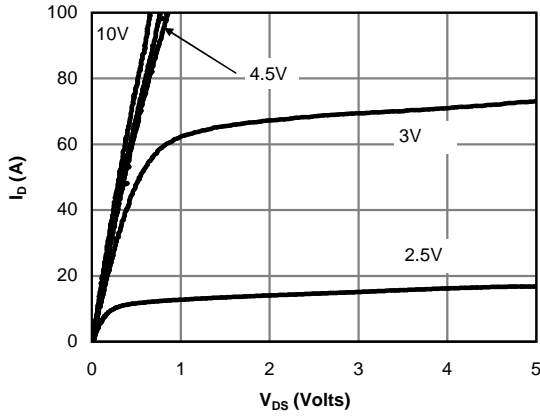


Fig 1: On-Region Characteristics (Note E)

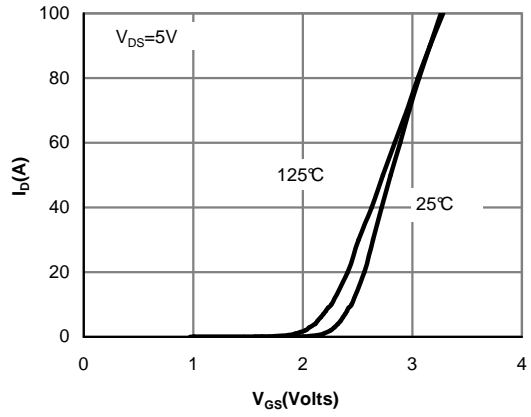


Figure 2: Transfer Characteristics (Note E)

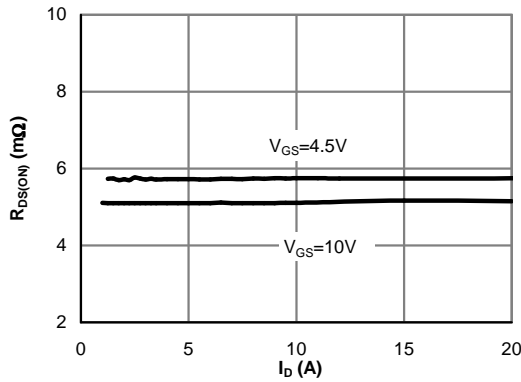


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

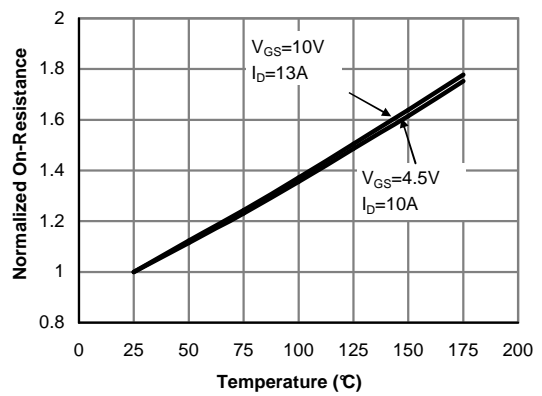


Figure 4: On-Resistance vs. Junction Temperature (Note E)

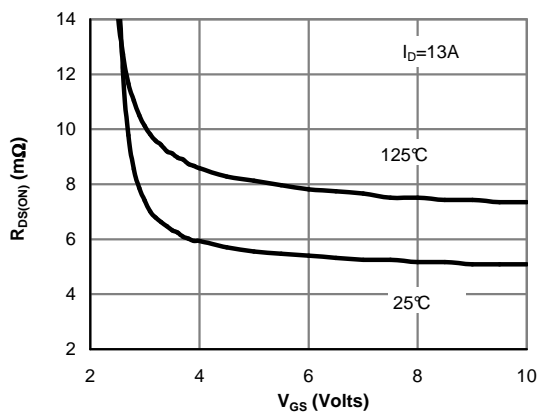


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

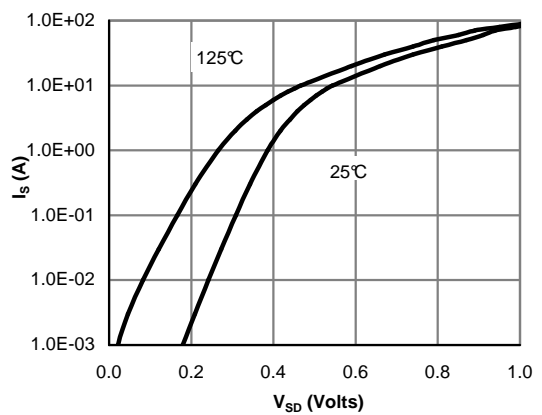


Figure 6: Body-Diode Characteristics (Note E)

Q2-CHANNEL: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

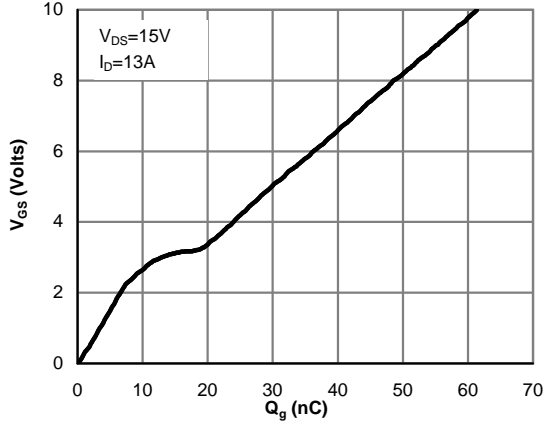


Figure 7: Gate-Charge Characteristics

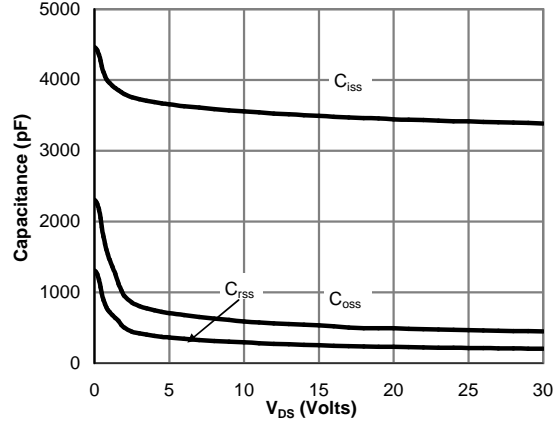


Figure 8: Capacitance Characteristics

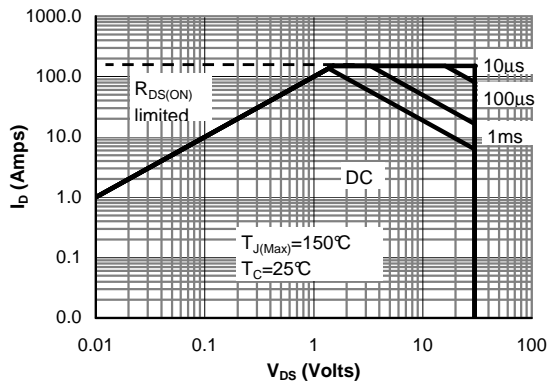


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

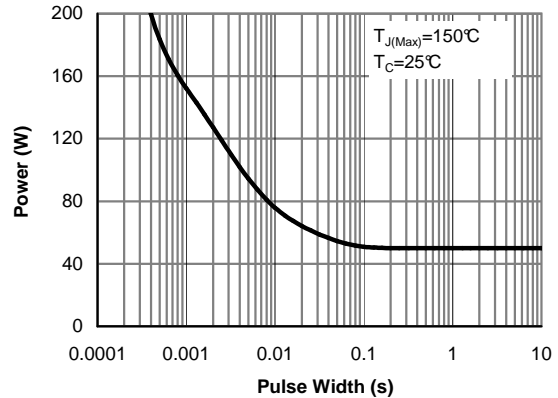


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

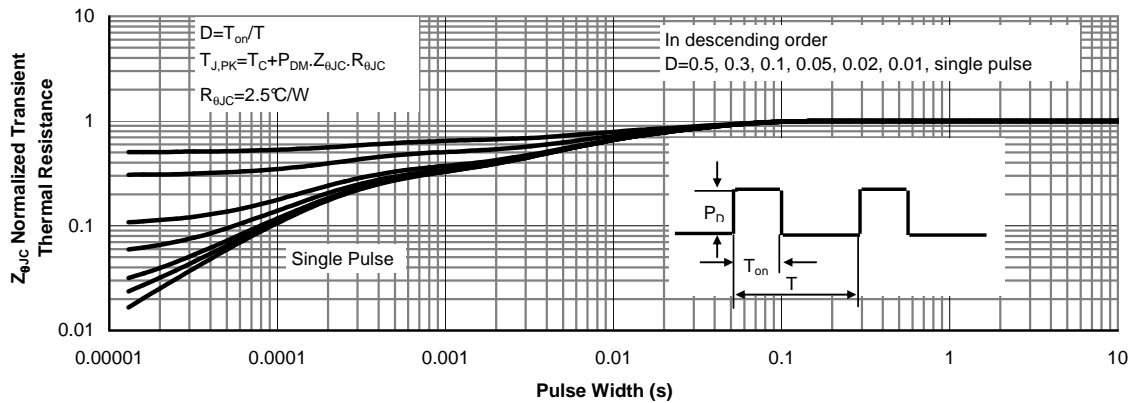


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

Q2-CHANNEL: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

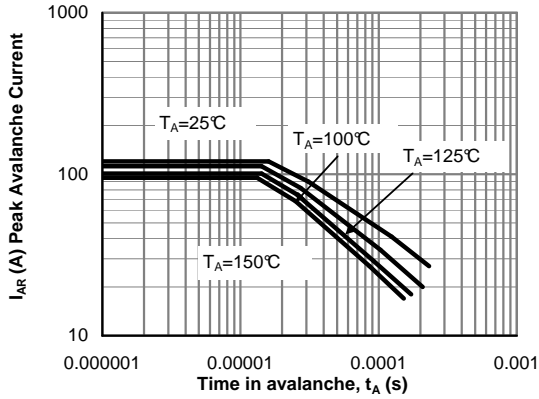


Figure 12: Single Pulse Avalanche capability (Note C)

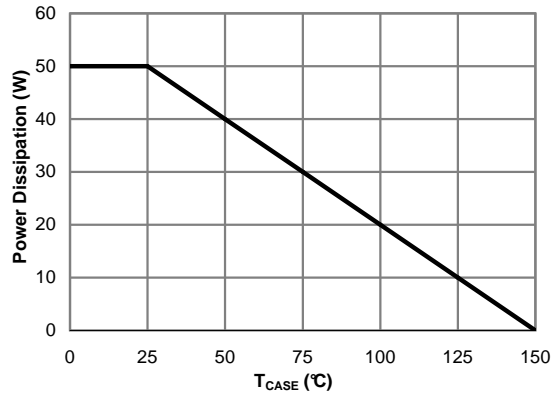


Figure 13: Power De-rating (Note F)

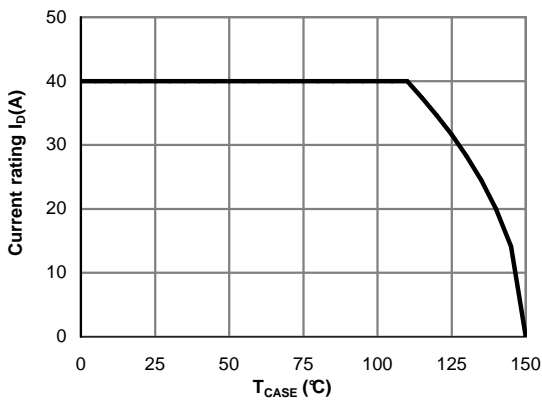


Figure 14: Current De-rating (Note F)

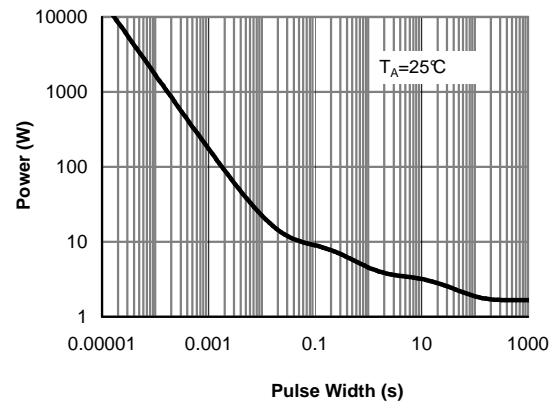


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note G)

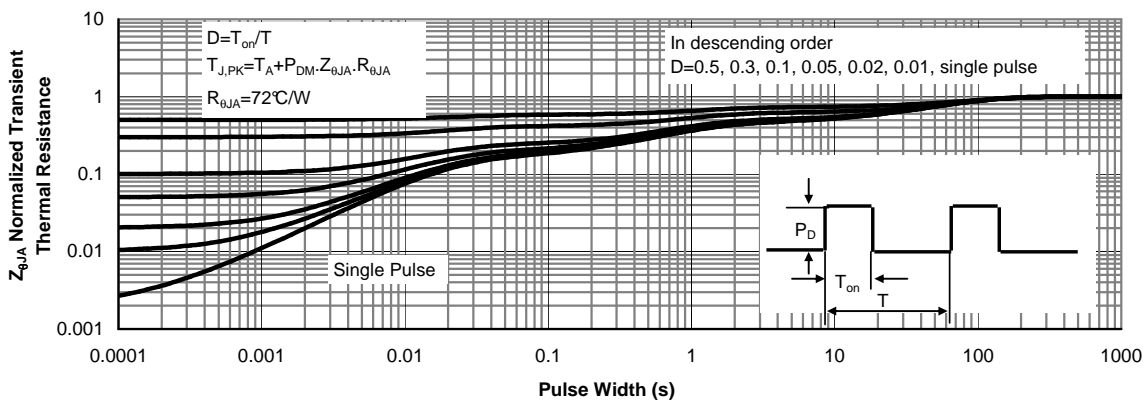


Figure 16: Normalized Maximum Transient Thermal Impedance (Note G)

Q2-CHANNEL: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

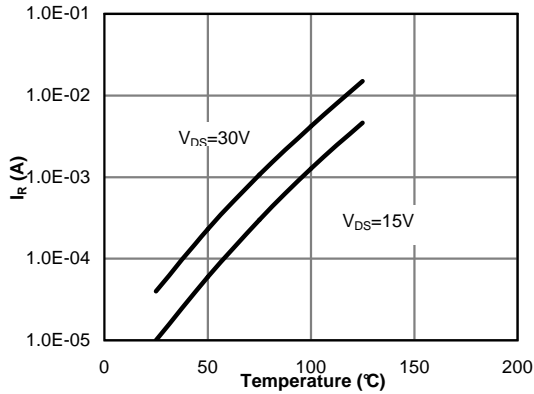


Figure 17: Diode Reverse Leakage Current vs. Junction Temperature

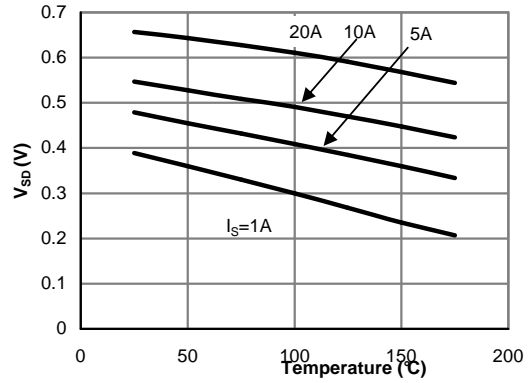


Figure 18: Diode Forward voltage vs. Junction Temperature

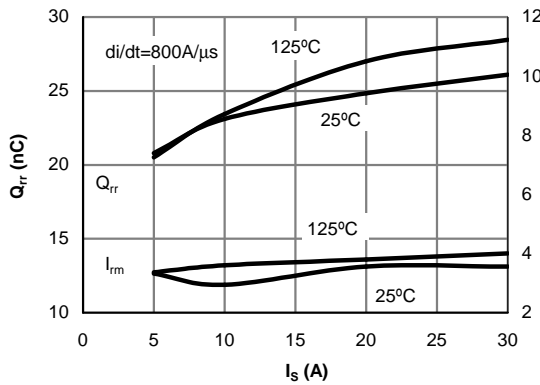


Figure 18: Diode Reverse Recovery Charge and Peak Current vs. Conduction Current

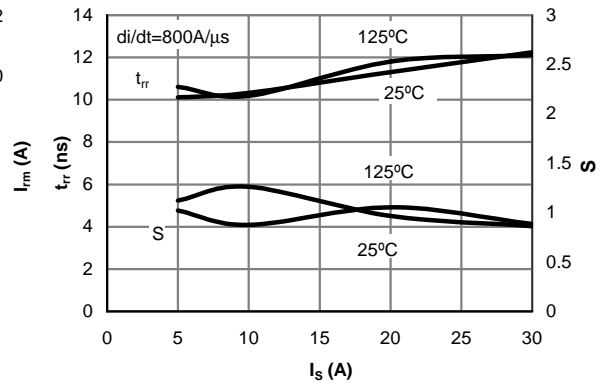


Figure 19: Diode Reverse Recovery Time and Softness Factor vs. Conduction Current

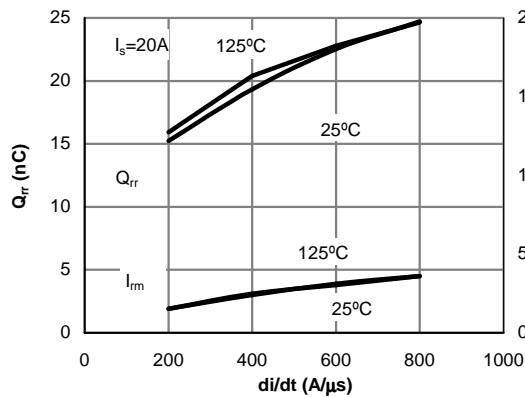


Figure 20: Diode Reverse Recovery Charge and Peak Current vs. di/dt

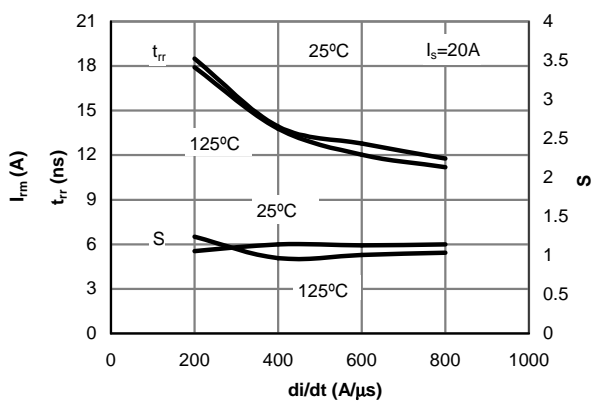
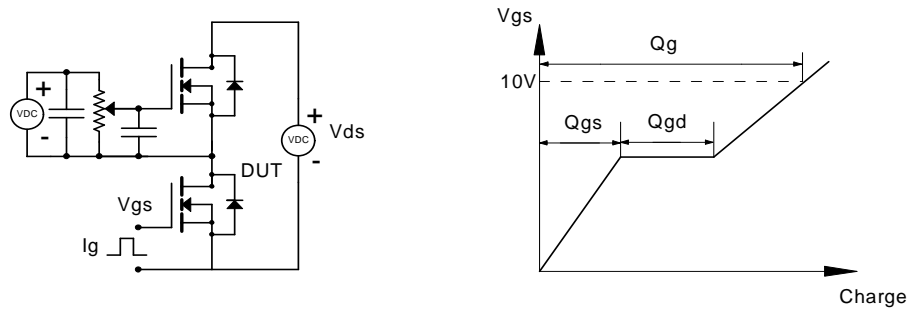
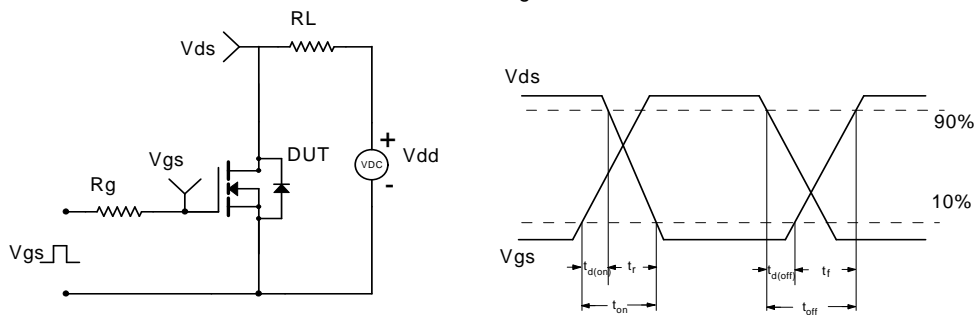


Figure 21: Diode Reverse Recovery Time and Softness Factor vs. di/dt

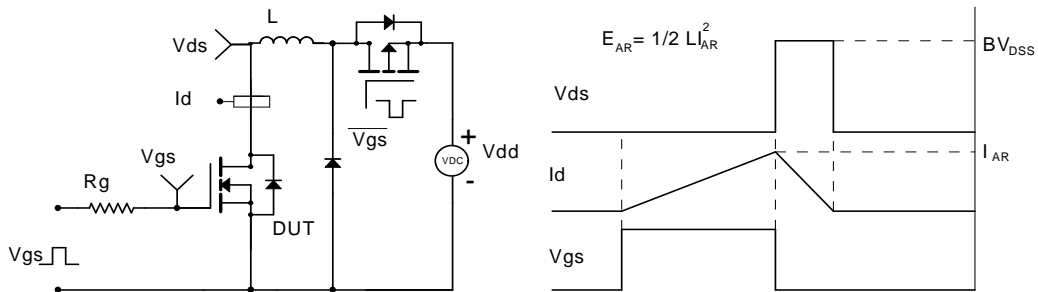
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

