AON6924

30V Dual Asymmetric N-Channel MOSFET

General Description

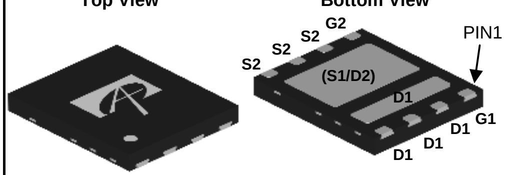
The AON6924 is designed to provide a high efficiency synchronous buck power stage with optimal layout and board space utilization. It includes two specialized MOSFETs in a dual Power DFN5x6A package. The Q1 " High Side" MOSFET and the Q2 "Low Side" MOSFET with integrated Schottky have been designed for optimal power efficiency.The AON6924 is well suited for use in compact DC/DC converter applications.

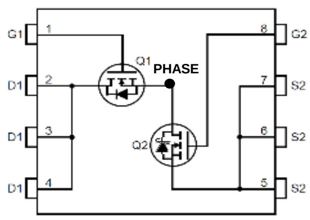
Product Summary

	Q1	Q2
V_{DS}	30V	30V
I_D (at V_{GS}=10V)	60A	85A
$R_{DS(ON)}$ (at V_{GS}=10V)	<5.2mΩ	<1.6mΩ
$R_{DS(ON)}$ (at V_{GS} = 4.5V)	<7.8mΩ	<1.9mΩ

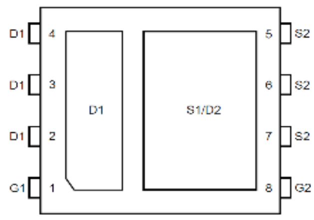
100% UIS Tested
100% Rg Tested

DFN5X6A





Top View



Bottom View

Absolute Maximum Ratings T_A=25°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	T_C=25°C	I_D	60	85	A
	T_C=100°C		38	66	
Pulsed Drain Current C		I_{DM}	200	510	
Continuous Drain Current	T_A=25°C	I_{DSM}	15	28	A
	T_A=70°C		12	22	
Avalanche Current C		I_{AS}, I_{AR}	40	68	A
Avalanche Energy L=0.1mH C		E_{AS}, E_{AR}	80	231	mJ
Power Dissipation B	T_C=25°C	P_D	31	104	W
	T_C=100°C		12.5	41.5	
Power Dissipation A	T_A=25°C	P_{DSM}	2	2.2	W
	T_A=70°C		1.3	1.4	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150		°C

Thermal Characteristics

Parameter		Symbol	Typ Q1	Typ Q2	Max Q1	Max Q2	Units
Maximum Junction-to-Ambient A	t ≤ 10s	$R_{\theta JA}$	25	20	30	25	°C/W
Maximum Junction-to-Ambient A D	Steady-State		50	45	60	55	°C/W
Maximum Junction-to-Case	Steady-State	$R_{\theta JC}$	3.1	0.9	4	1.2	°C/W

Q1 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	
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		1.2	1.7	2.3	V
$I_{D(ON)}$	On state drain current	V_{GS}=10V, V_{DS}=5V		200			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=20A			4.3	5.2	mΩ
			T_J=125℃		6.6	8	
		V_{GS}=4.5V, I_D=20A			6.2	7.8	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=20A			70		S
V_{SD}	Diode Forward Voltage	I_S=1A,V_{GS}=0V			0.7	1	V
I_S	Maximum Body-Diode Continuous Current					30	A
DYNAMIC PARAMETERS							
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=15V, f=1MHz		1040	1300	1560	pF
C_{oss}	Output Capacitance			370	530	690	pF
C_{rss}	Reverse Transfer Capacitance			10	35	60	pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		0.8	1.7	2.6	Ω
SWITCHING PARAMETERS							
Q_g(10V)	Total Gate Charge	V_{GS}=10V, V_{DS}=15V, I_D=20A		13	17	21.0	nC
Q_g(4.5V)	Total Gate Charge				7.2		nC
Q_{gs}	Gate Source Charge				3.9		nC
Q_{gd}	Gate Drain Charge				1.8		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=15V, R_L=0.75Ω, R_{GEN}=3Ω			5		ns
t_r	Turn-On Rise Time				16		ns
$t_{D(off)}$	Turn-Off DelayTime				20		ns
t_f	Turn-Off Fall Time				4		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=20A, dI/dt=500A/µs		16	21	26	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=20A, dI/dt=500A/µs		31	39	47	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℃. The Power dissipation P_{DSM} is based on $R_{\theta JA}$ and the maximum allowed junction temperature of 150℃. 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℃, 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℃. Ratings are based on low frequency and duty cycles to keep initial T_J =25℃.
D. The $R_{\theta JA}$ is the sum of the thermal impedence from junction to case $R_{\theta JC}$ 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 impedence which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of $T_{J(MAX)}$=150℃. The SOA curve provides a single pulse ratin g.
G. The maximum current rating is package limited.
H. 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℃.

Q1-CHANNEL: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

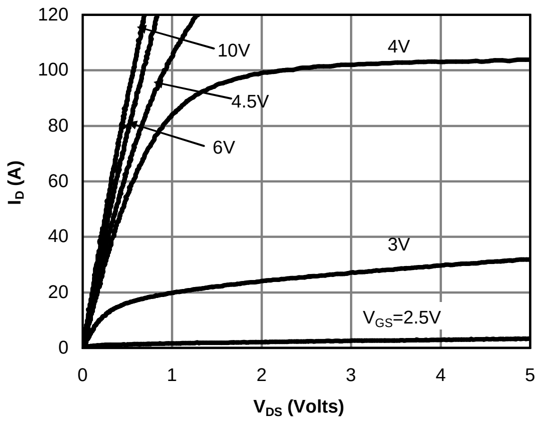


Fig 1: On-Region Characteristics (Note E)

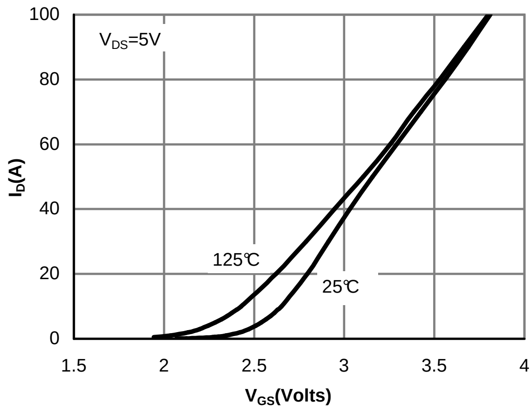


Figure 2: Transfer Characteristics (Note E)

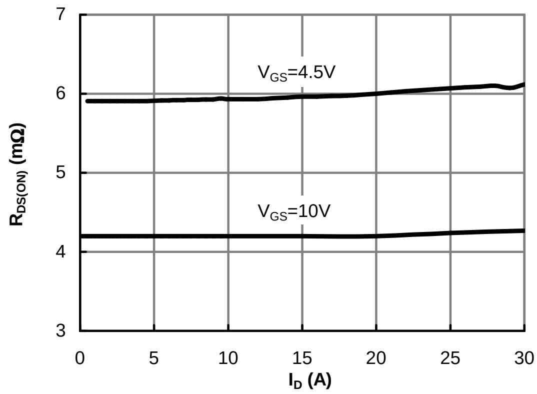


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

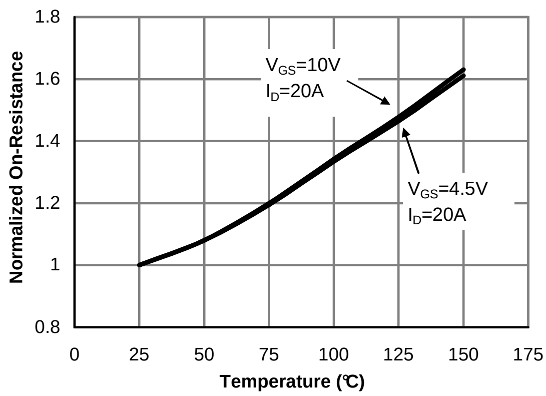


Figure 4: On-Resistance vs. Junction Temperature (Note E)

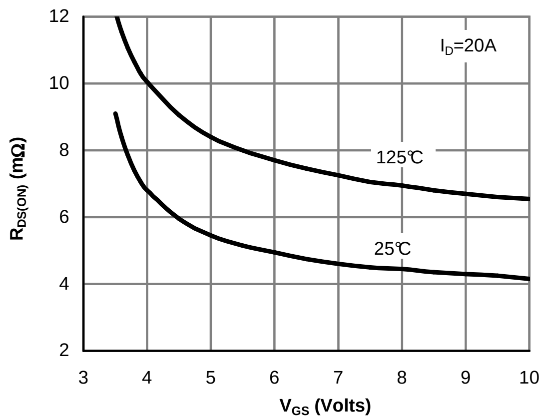


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

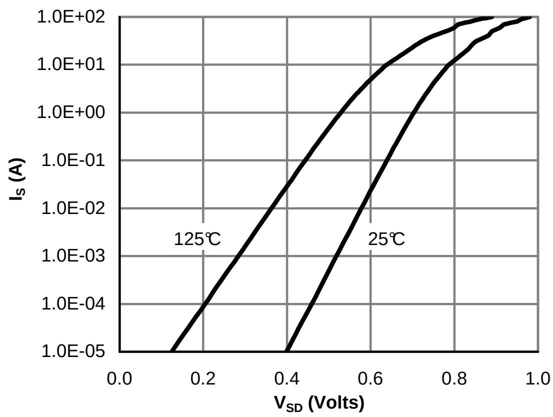


Figure 6: Body-Diode Characteristics (Note E)

Q1-CHANNEL: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

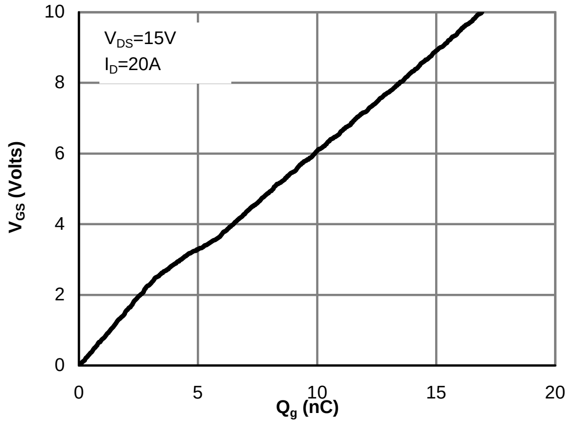


Figure 7: Gate-Charge Characteristics

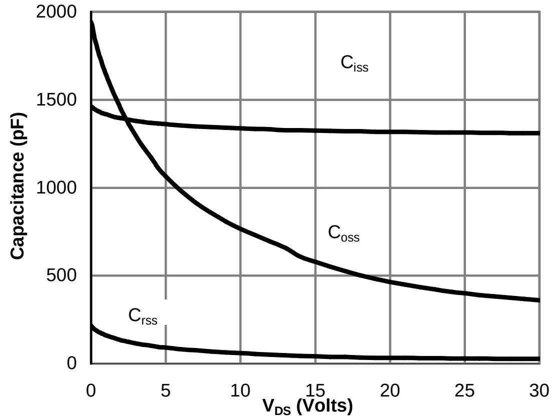


Figure 8: Capacitance Characteristics

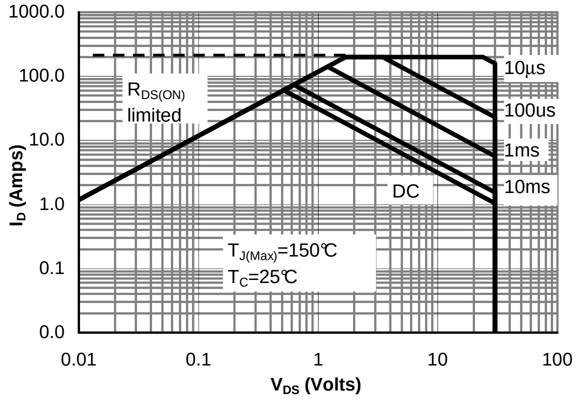


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

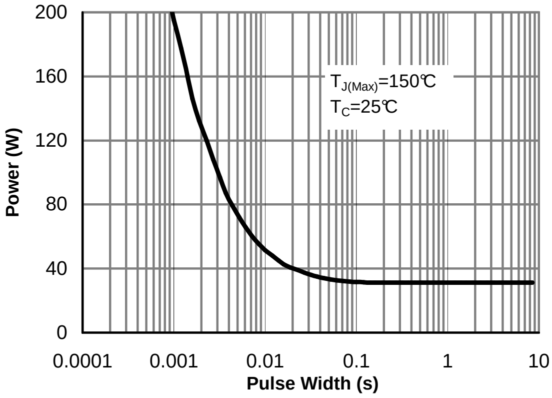


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

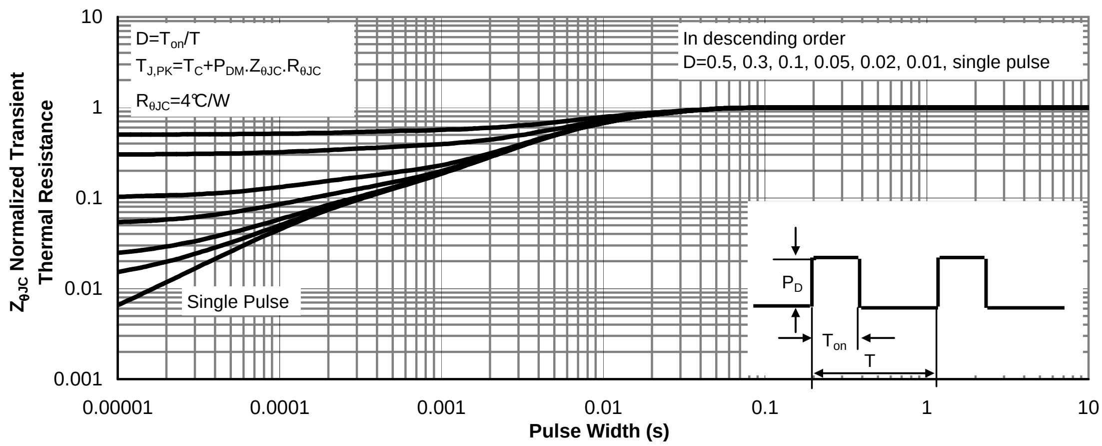


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

Q1-CHANNEL: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

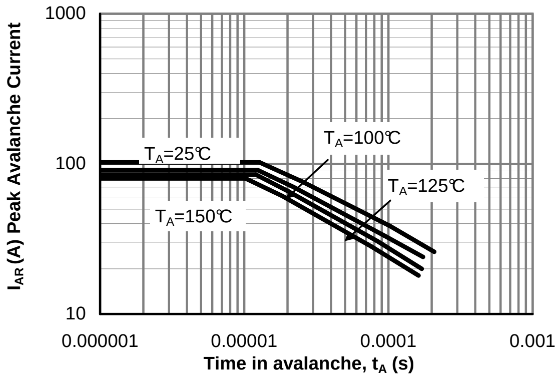


Figure 12: Single Pulse Avalanche capability (Note C)

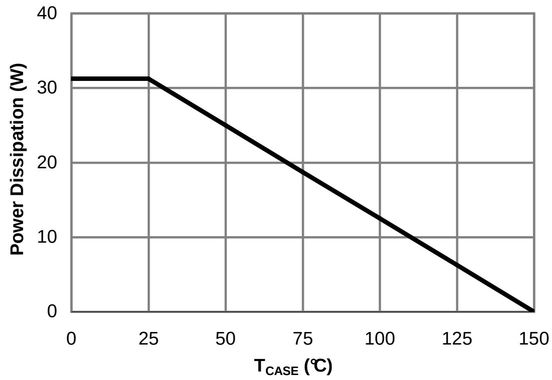


Figure 13: Power De-rating (Note F)

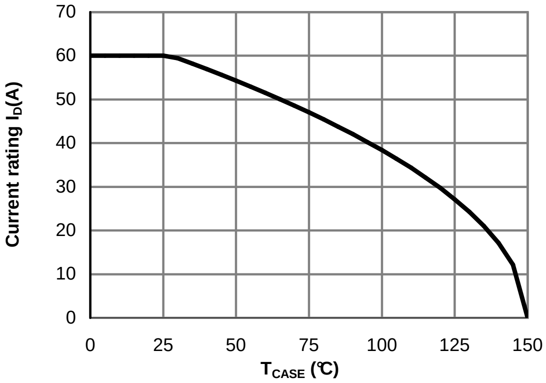


Figure 14: Current De-rating (Note F)

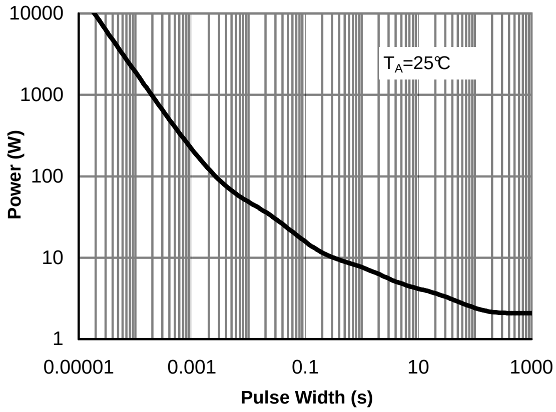


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

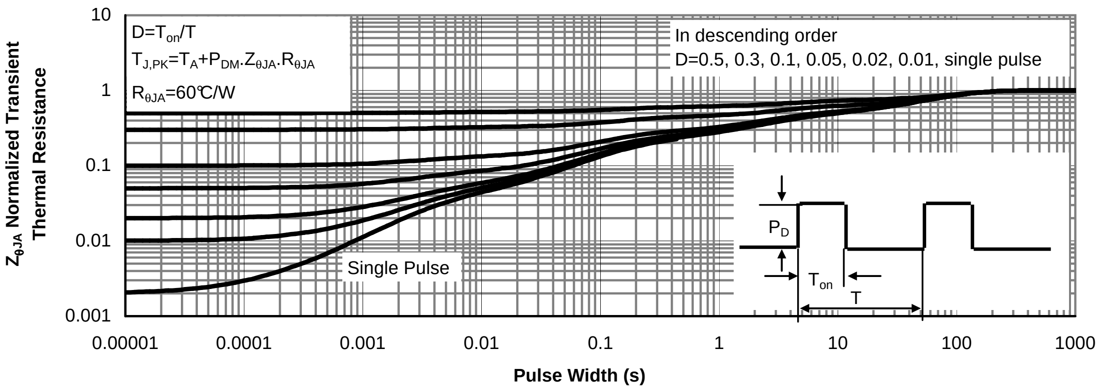


Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

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				0.5	mA
			T_J=55°C			100	
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		1.2	1.5	2.1	V
$I_{D(ON)}$	On state drain current	V_{GS}=10V, V_{DS}=5V		510			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=20A			1.2	1.6	mΩ
			T_J=125°C		1.9	2.5	
		V_{GS}=4.5V, I_D=20A			1.5	1.9	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=20A			180		S
V_{SD}	Diode Forward Voltage	I_S=1A,V_{GS}=0V			0.36		V
I_S	Maximum Body-Diode Continuous Current[G]					85	A
DYNAMIC PARAMETERS							
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=15V, f=1MHz		6550	8190	9830	pF
C_{oss}	Output Capacitance			630	900	1170	pF
C_{rss}	Reverse Transfer Capacitance			400	670	950	pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		0.3	0.65	1.0	Ω
SWITCHING PARAMETERS							
Q_g(10V)	Total Gate Charge	V_{GS}=10V, V_{DS}=15V, I_D=20A		110	140	170	nC
Q_g(4.5V)	Total Gate Charge			48	60	72	nC
Q_{gs}	Gate Source Charge				17		nC
Q_{gd}	Gate Drain Charge				20		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=15V, R_L=0.75Ω, R_{GEN}=3Ω			15		ns
t_r	Turn-On Rise Time				17		ns
$t_{D(off)}$	Turn-Off DelayTime				103		ns
t_f	Turn-Off Fall Time				18		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=20A, dI/dt=500A/µs		12.5	16	20	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=20A, dI/dt=500A/µs		27	34	41	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 Power dissipation P_{DSM} is based on $R_{\theta JA}$ 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 $R_{\theta JA}$ is the sum of the thermal impedence from junction to case $R_{\theta JC}$ 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 impedence 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 ratin g.
G. 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.

Q2-CHANNEL: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

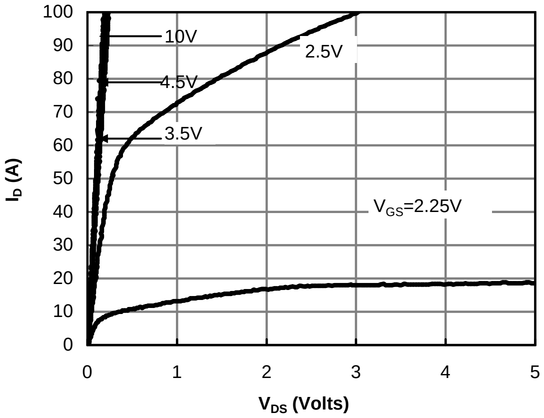


Fig 1: On-Region Characteristics (Note E)

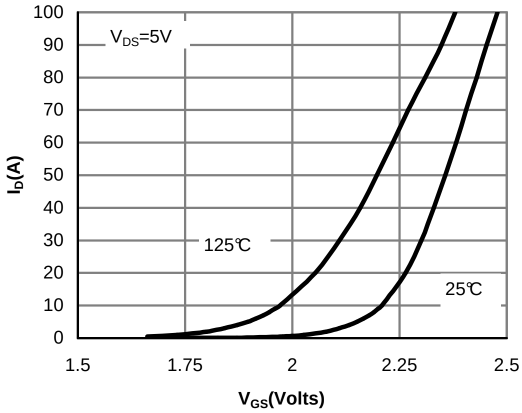


Figure 2: Transfer Characteristics (Note E)

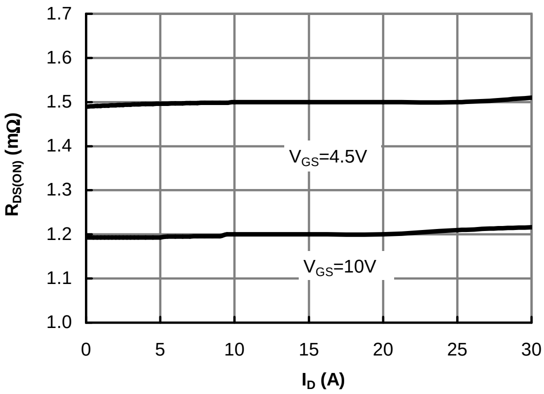


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

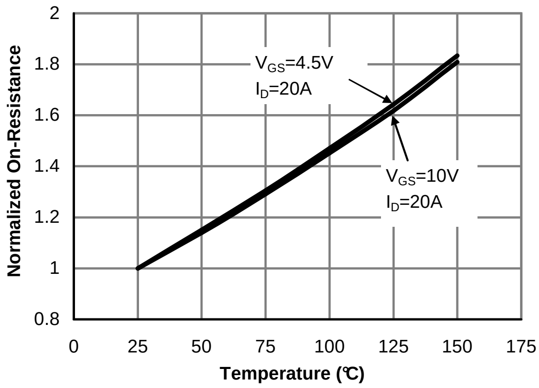


Figure 4: On-Resistance vs. Junction Temperature (Note E)

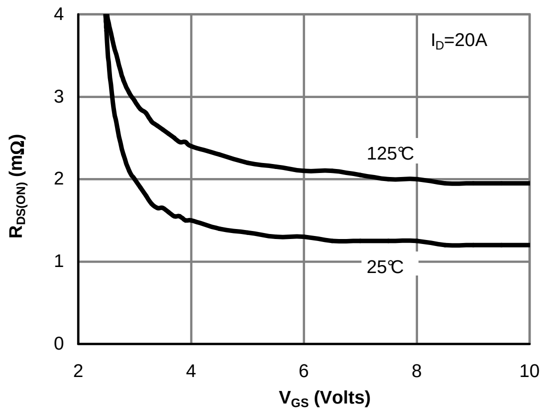


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

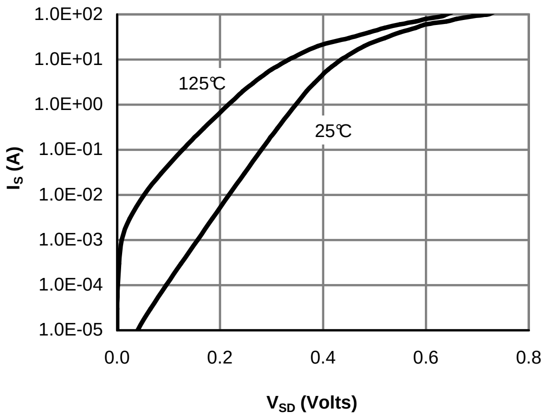


Figure 6: Body-Diode Characteristics (Note E)

Q2-CHANNEL: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

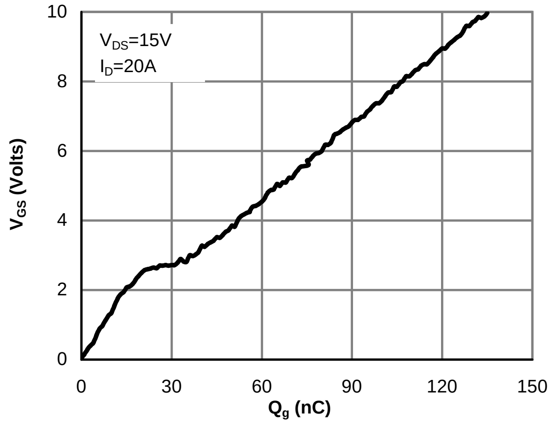


Figure 7: Gate-Charge Characteristics

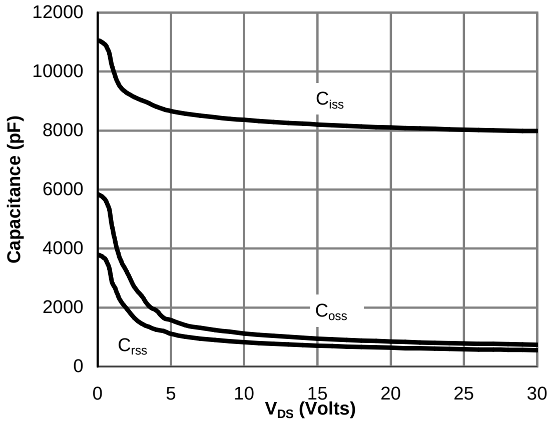


Figure 8: Capacitance Characteristics

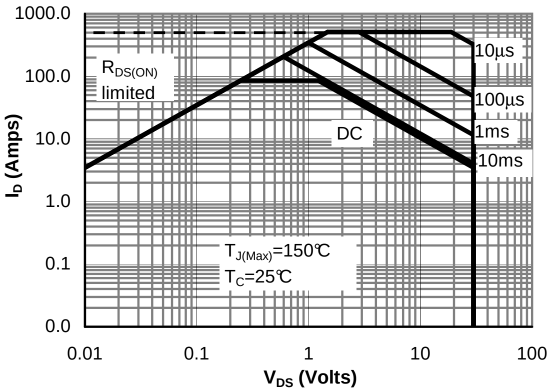


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

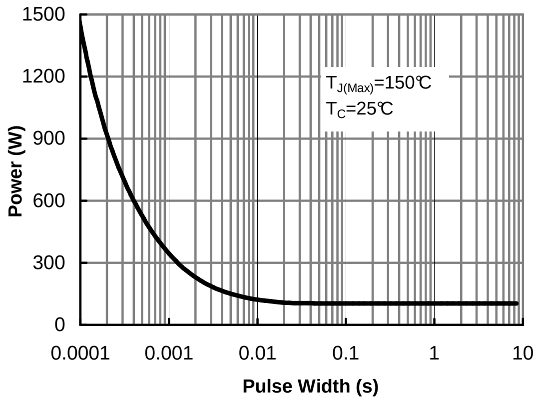


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

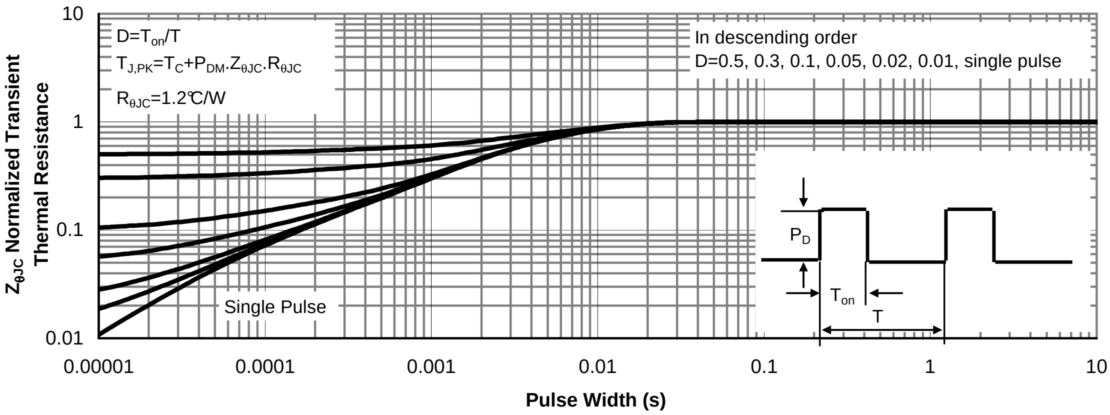


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

Q2-CHANNEL: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

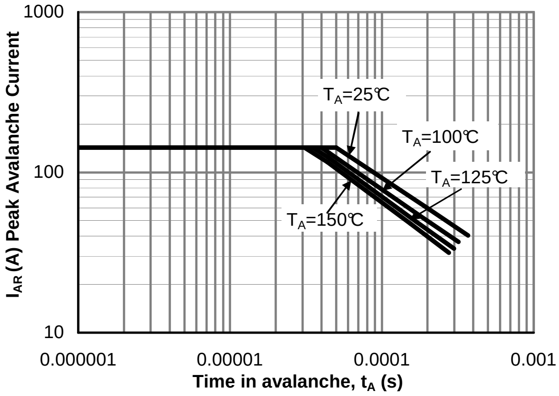


Figure 12: Single Pulse Avalanche capability (Note C)

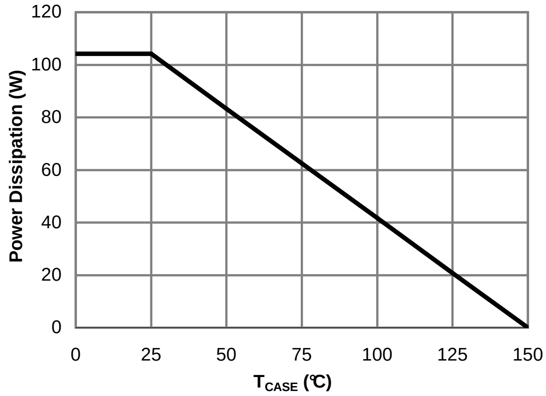


Figure 13: Power De-rating (Note F)

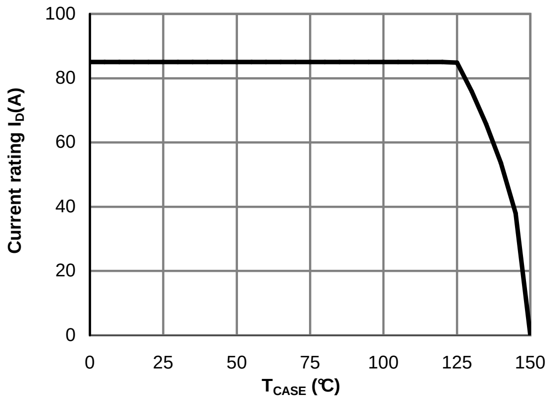


Figure 14: Current De-rating (Note F)

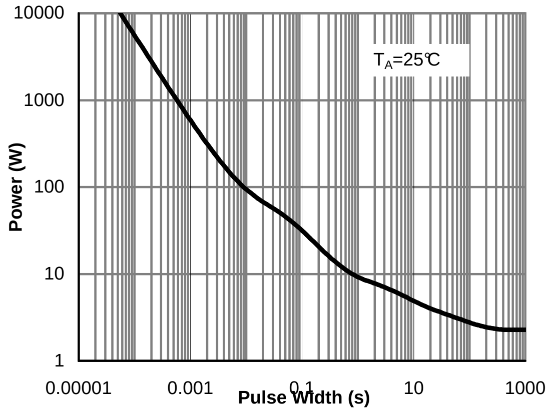


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note G)

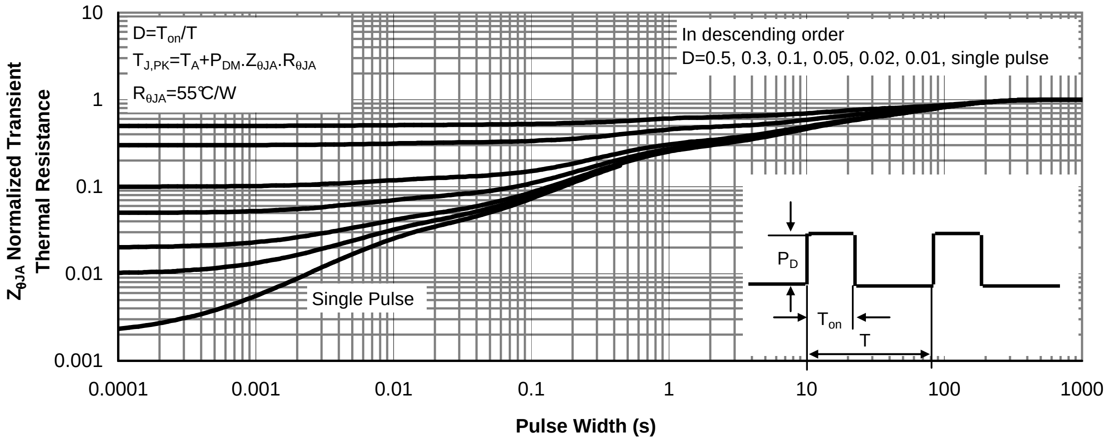


Figure 16: Normalized Maximum Transient Thermal Impedance (Note G)

Q2-CHANNEL: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

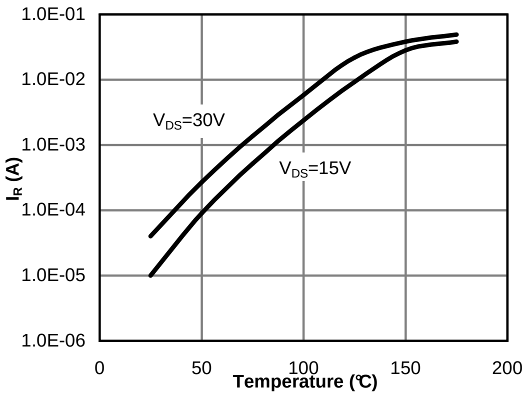


Figure 17: Diode Reverse Leakage Current vs. Junction Temperature

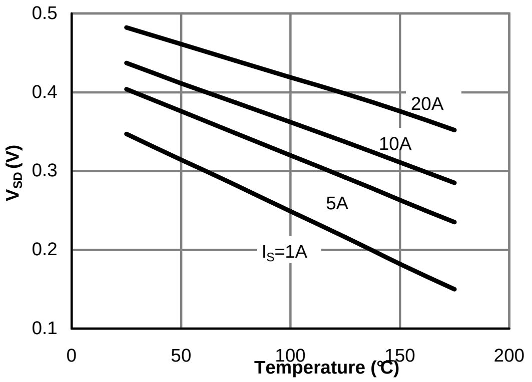


Figure 18: Diode Forward voltage vs. Junction Temperature

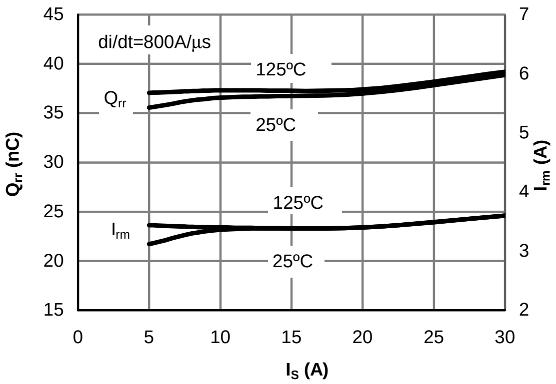


Figure 19: Diode Reverse Recovery Charge and Peak Current vs. Conduction Current

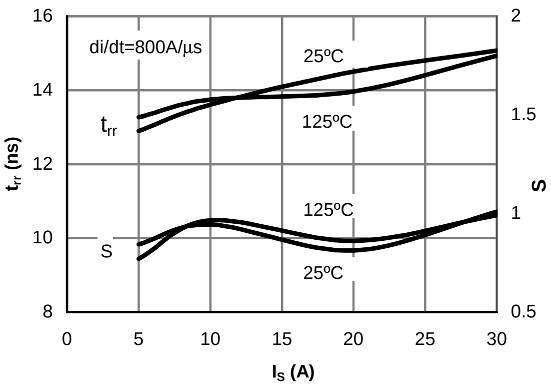


Figure 20: Diode Reverse Recovery Time and Softness Factor vs. Conduction Current

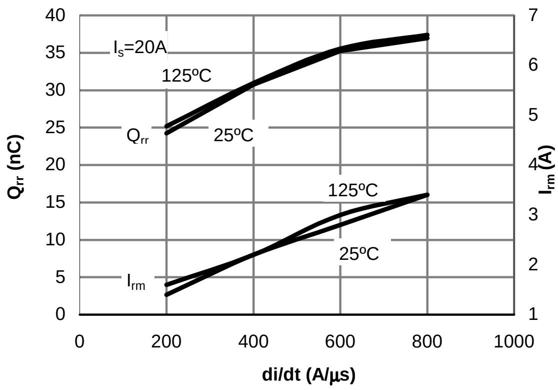


Figure 21: Diode Reverse Recovery Charge and Peak Current vs. di/dt

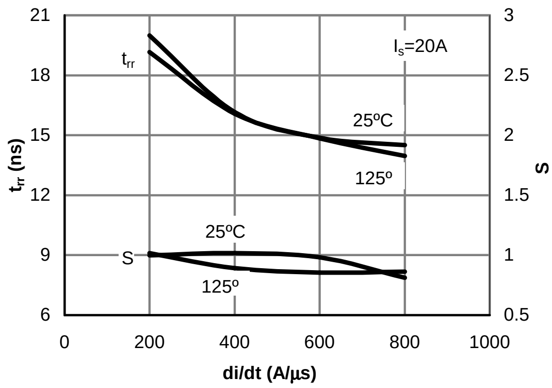
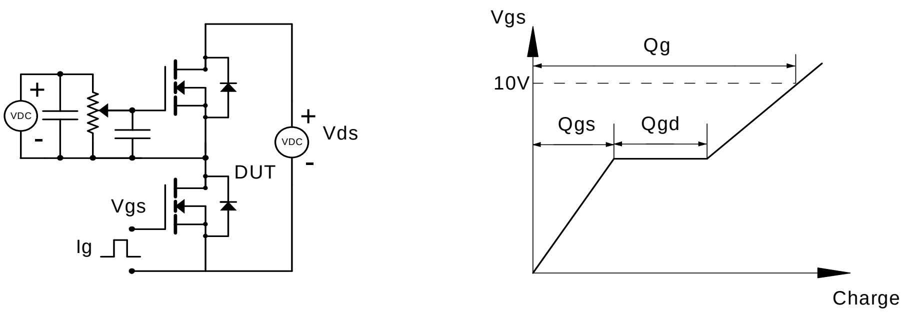
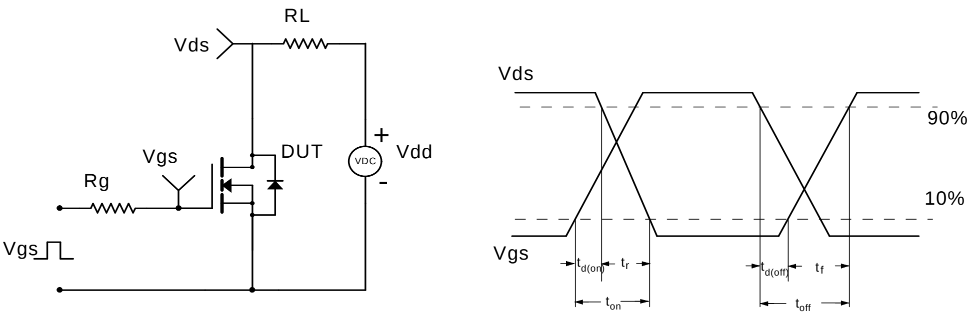


Figure 22: Diode Reverse Recovery Time and Softness Factor vs. di/dt

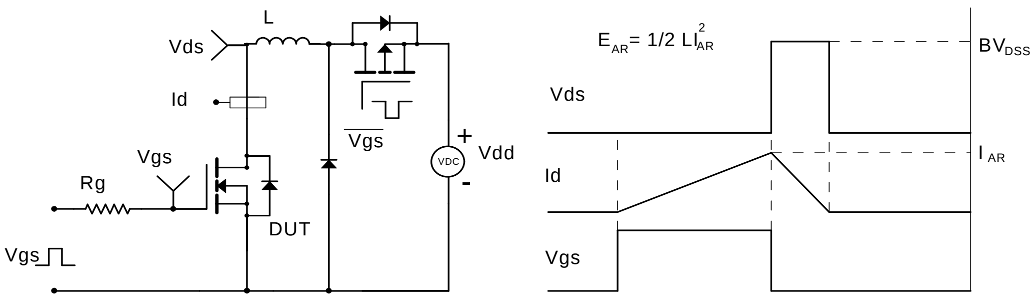
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms