

General Description

- Latest Trench Power AlphaMOS (αMOS LV) technology
- Very Low $R_{DS(on)}$ at 4.5V V_{GS}
- Low Gate Charge
- High Current Capability
- RoHS and Halogen-Free Compliant

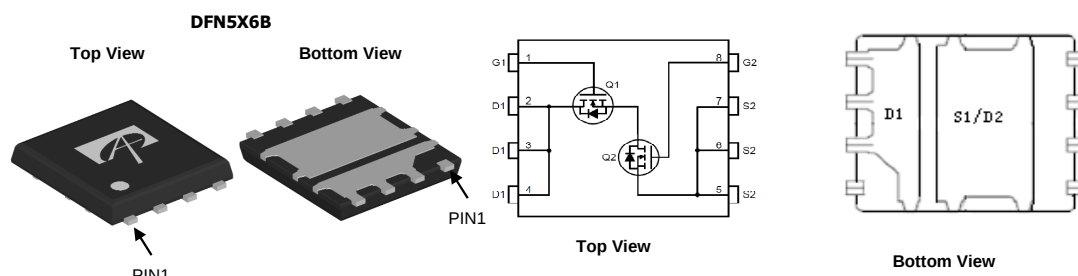
Application

- DC/DC Converters in Computing, Servers, and POL
- Isolated DC/DC Converters in Telecom and Industrial

Product Summary

	<u>Q1</u>	<u>Q2</u>
V_{DS}	30V	30V
I_D (at $V_{GS}=10V$)	16A	18A
$R_{DS(on)}$ (at $V_{GS}=10V$)	<11.6mΩ	<7.8mΩ
$R_{DS(on)}$ (at $V_{GS}=4.5V$)	<17mΩ	<11.8mΩ

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	±20	V
Continuous Drain Current ^G	T _C =25°C	I _D	16	18	A
	T _C =100°C		12	14	
Pulsed Drain Current ^C		I _{DM}	64	72	
Continuous Drain Current	T _A =25°C	I _{DSM}	14	18 ^G	A
	T _A =70°C		11.5	14	
Avalanche Current ^C		I _{AS}	19	25	A
Avalanche Energy L=0.05mH ^C		E _{AS}	9	16	mJ
V _{DS} Spike	100ns	V _{SPIKE}	36	36	V
Power Dissipation ^B	T _C =25°C	P _D	7.3	13	W
	T _C =100°C		2.9	5.2	
Power Dissipation ^A	T _A =25°C	P _{DSM}	3.5	3.9	W
	T _A =70°C		2.3	2.5	
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	$R_{\theta JA}$	29	26	35	32	°C/W
Maximum Junction-to-Ambient ^{A D}		55	50	66	60	°C/W
Maximum Junction-to-Case	$R_{\theta JC}$	13.8	7.7	17	9.5	°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	1.2	1.8	2.2	V
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =13A T _J =125°C		9.6 13.4	11.6 16.2	mΩ
		V _{GS} =4.5V, I _D =10A		13.6	17	mΩ
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =13A		50		S
V _{SD}	Diode Forward Voltage	I _S =1A, V _{GS} =0V		0.7	1	V
I _S	Maximum Body-Diode Continuous Current				9	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =15V, f=1MHz		485		pF
C _{oss}	Output Capacitance			235		pF
C _{rss}	Reverse Transfer Capacitance			32		pF
R _g	Gate resistance	f=1MHz	0.9	1.8	2.7	Ω
SWITCHING PARAMETERS						
Q _{g(10V)}	Total Gate Charge	V _{GS} =10V, V _{DS} =15V, I _D =13A		8	15	nC
Q _{g(4.5V)}	Total Gate Charge			3.9	8	nC
Q _{gs}	Gate Source Charge			1.1		nC
Q _{gd}	Gate Drain Charge			2.1		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =10V, V _{DS} =15V, R _L =1.2Ω, R _{GEN} =3Ω		3.5		ns
t _r	Turn-On Rise Time			2.8		ns
t _{D(off)}	Turn-Off DelayTime			16.3		ns
t _f	Turn-Off Fall Time			3		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =13A, dI/dt=500A/μs		9.9		ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =13A, dI/dt=500A/μs		12.9		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} ≤ 10s 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. 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

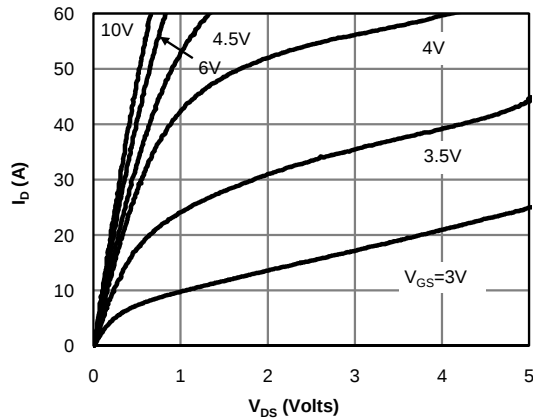


Fig 1: On-Region Characteristics (Note E)

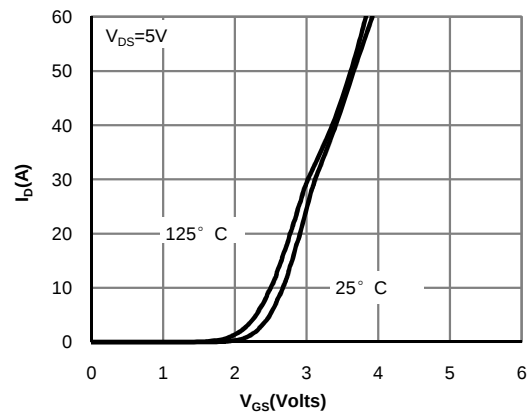


Figure 2: Transfer Characteristics (Note E)

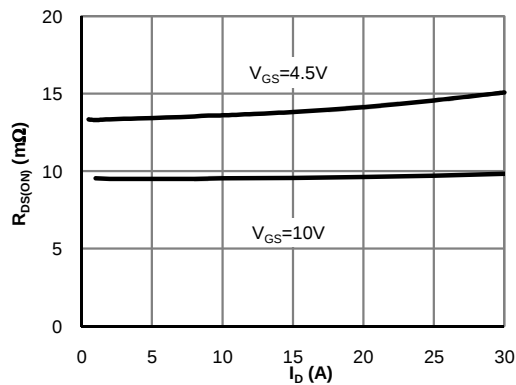


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

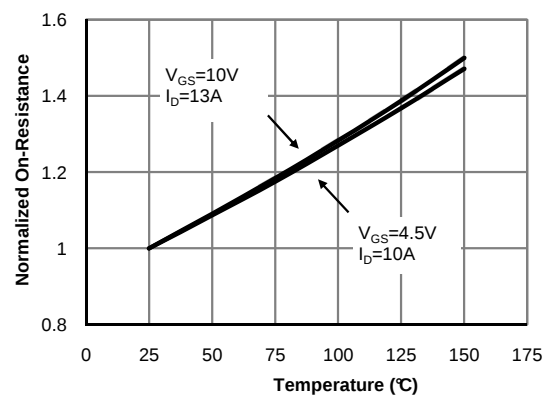


Figure 4: On-Resistance vs. Junction Temperature (Note E)

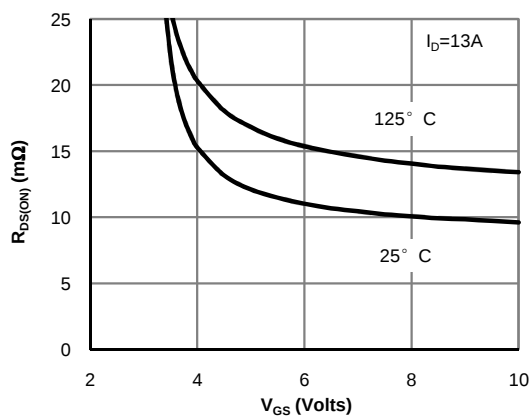


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

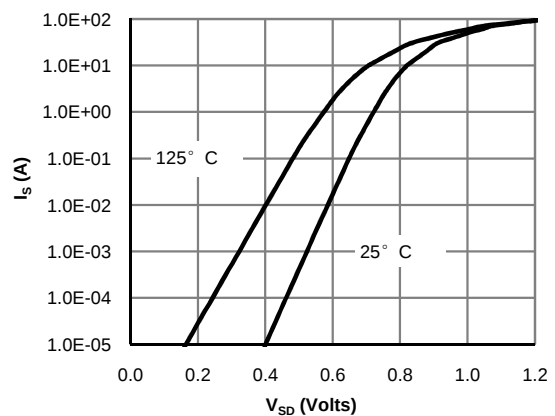


Figure 6: Body-Diode Characteristics (Note E)

Q1-CHANNEL: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

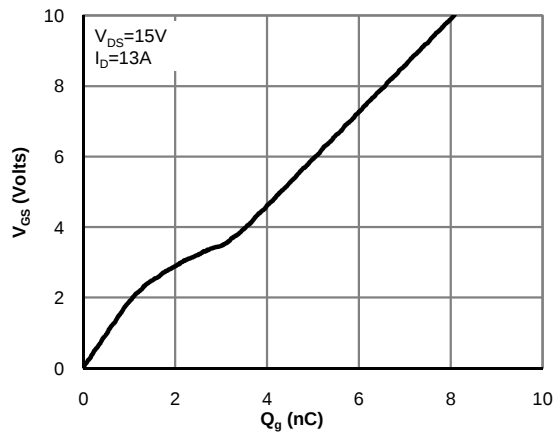


Figure 7: Gate-Charge Characteristics

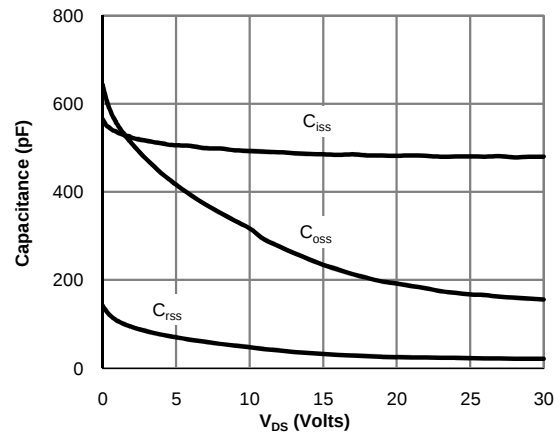


Figure 8: Capacitance Characteristics

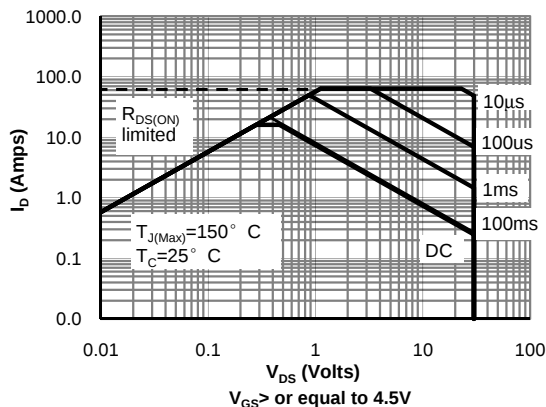


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

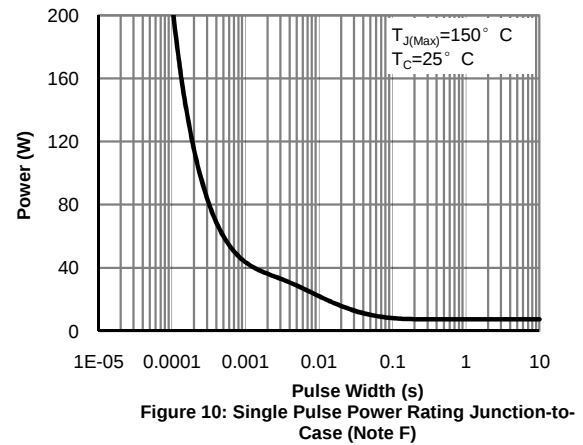


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

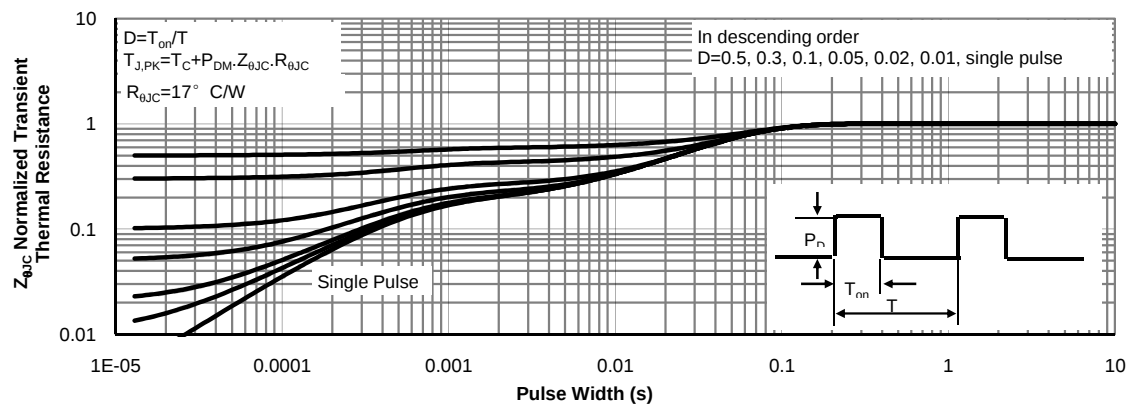


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

Q1-CHANNEL: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

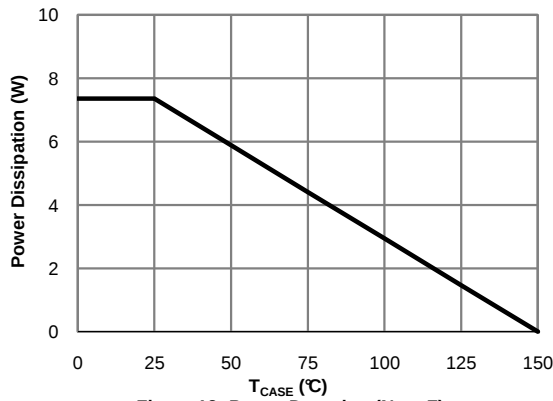


Figure 12: Power De-rating (Note F)

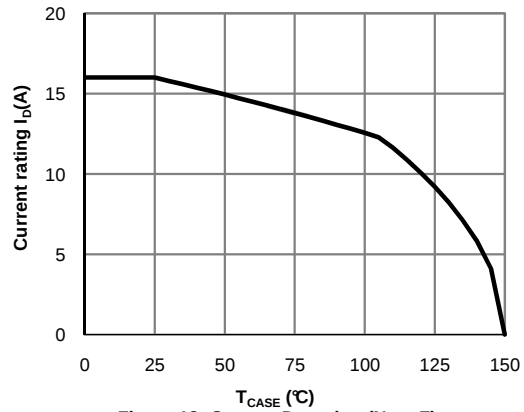


Figure 13: Current De-rating (Note F)

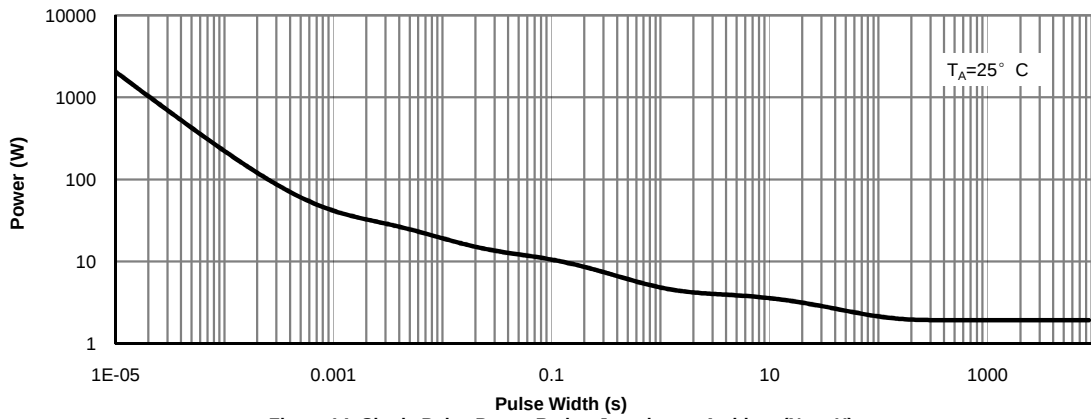


Figure 14: Single Pulse Power Rating Junction-to-Ambient (Note H)

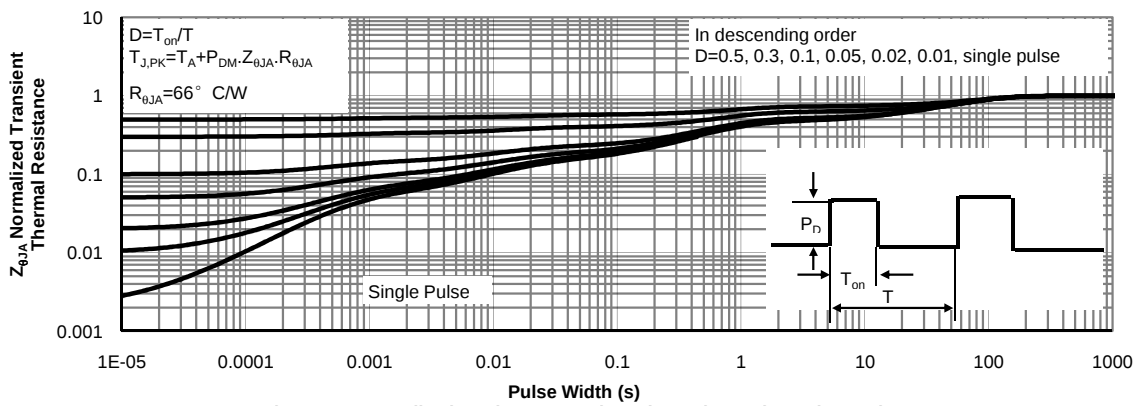


Figure 15: Normalized Maximum Transient Thermal Impedance (Note H)

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 =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	1.2	1.8	2.2	V
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =15A T _J =125°C		6.5 8.8	7.8 10.6	mΩ
		V _{GS} =4.5V, I _D =10A		9.4	11.8	mΩ
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =15A		100		S
V _{SD}	Diode Forward Voltage	I _S =1A, V _{GS} =0V		0.7	1	V
I _S	Maximum Body-Diode Continuous Current				15	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =15V, f=1MHz		807		pF
C _{oss}	Output Capacitance			314		pF
C _{rss}	Reverse Transfer Capacitance			40		pF
R _g	Gate resistance	f=1MHz	0.6	1.3	2	Ω
SWITCHING PARAMETERS						
Q _{g(10V)}	Total Gate Charge	V _{GS} =10V, V _{DS} =15V, I _D =15A		12.9	20	nC
Q _{g(4.5V)}	Total Gate Charge			6	12	nC
Q _{gs}	Gate Source Charge			2.1		nC
Q _{gd}	Gate Drain Charge			3		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =10V, V _{DS} =15V, R _L =1Ω, R _{GEN} =3Ω		4.8		ns
t _r	Turn-On Rise Time			3.3		ns
t _{D(off)}	Turn-Off DelayTime			18.8		ns
t _f	Turn-Off Fall Time			3.3		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =15A, dI/dt=500A/μs		11.3		ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =15A, dI/dt=500A/μs		15		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} ≤ 10s 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.
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Q2-CHANNEL: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

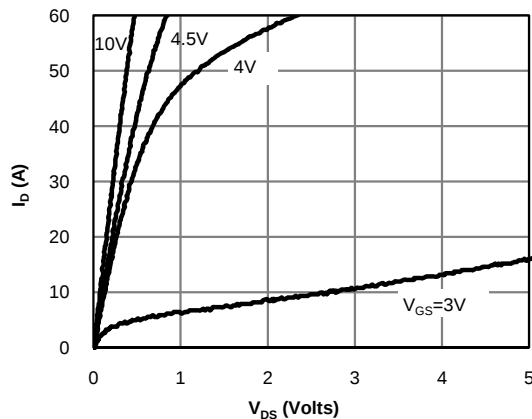


Fig 1: On-Region Characteristics (Note E)

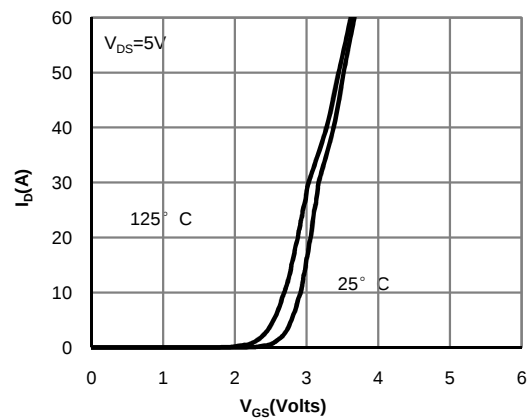


Figure 2: Transfer Characteristics (Note E)

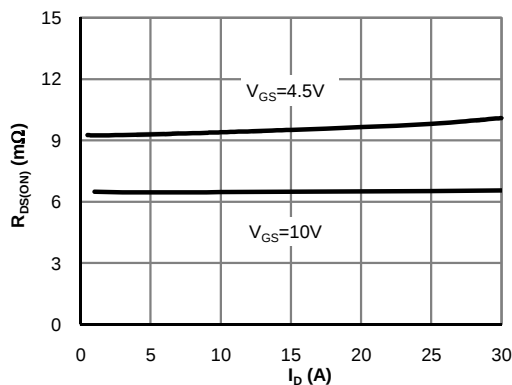


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

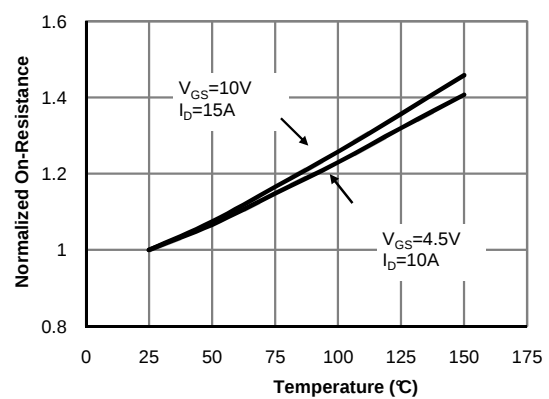


Figure 4: On-Resistance vs. Junction Temperature (Note E)

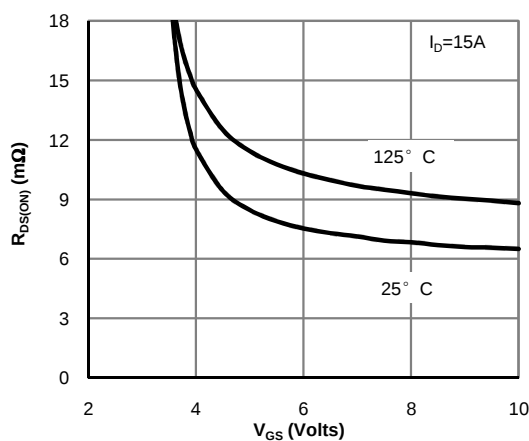


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

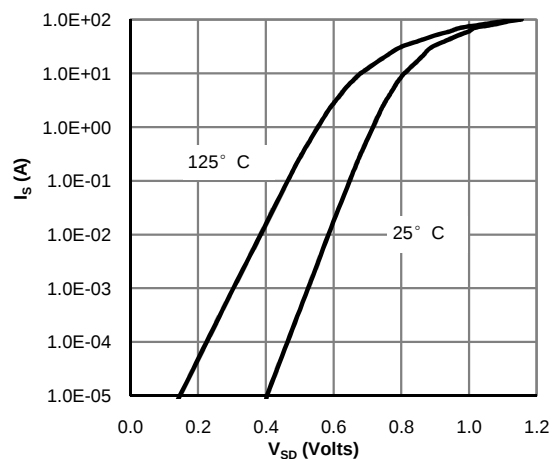


Figure 6: Body-Diode Characteristics (Note E)

Q2-CHANNEL: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

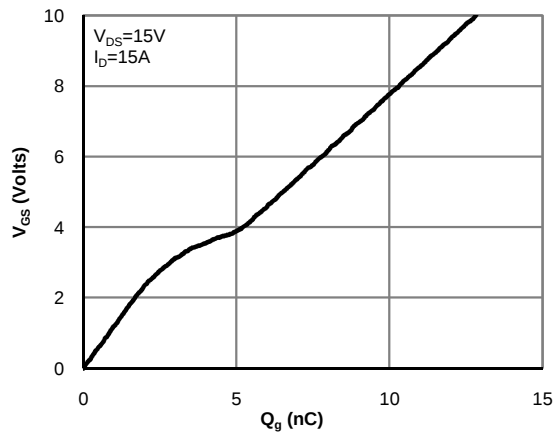


Figure 7: Gate-Charge Characteristics

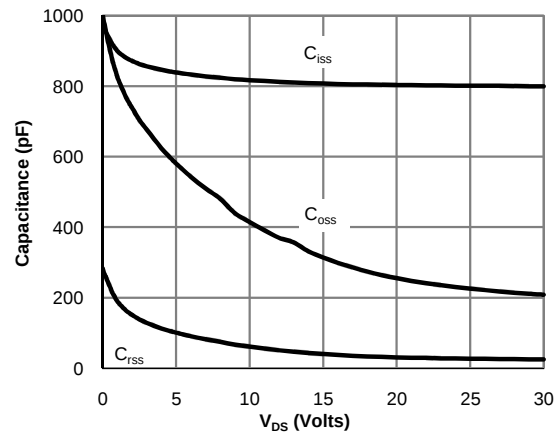


Figure 8: Capacitance Characteristics

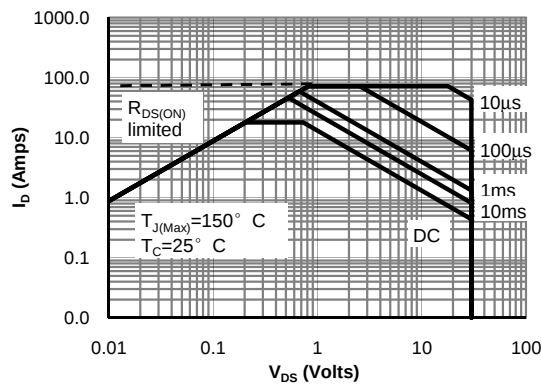


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

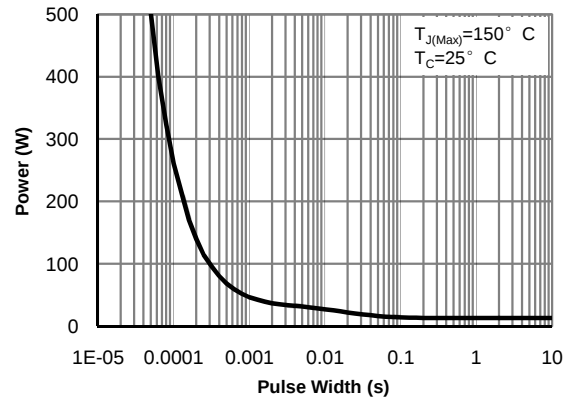


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

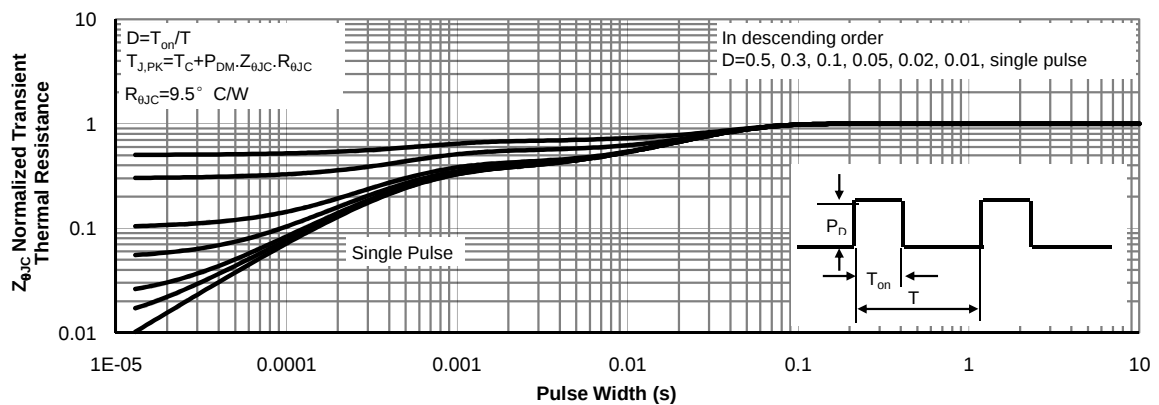


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

Q2-CHANNEL: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

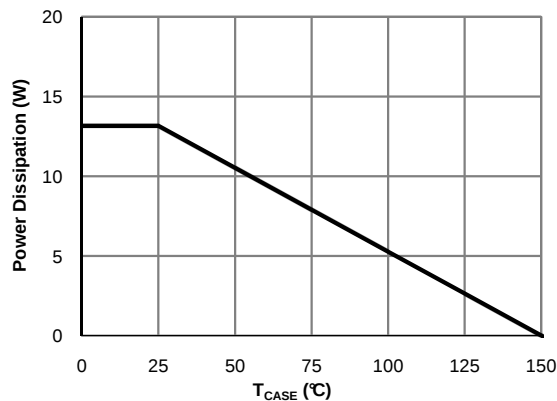


Figure 12: Power De-rating (Note F)

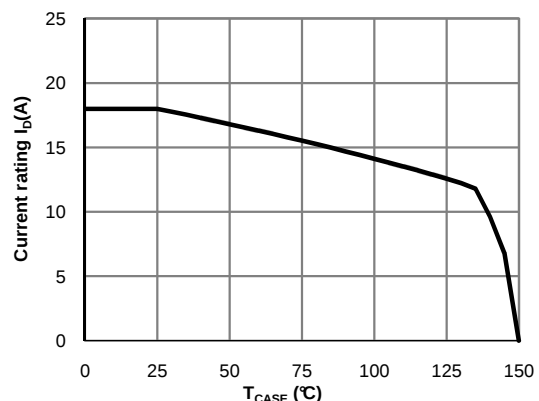


Figure 13: Current De-rating (Note F)

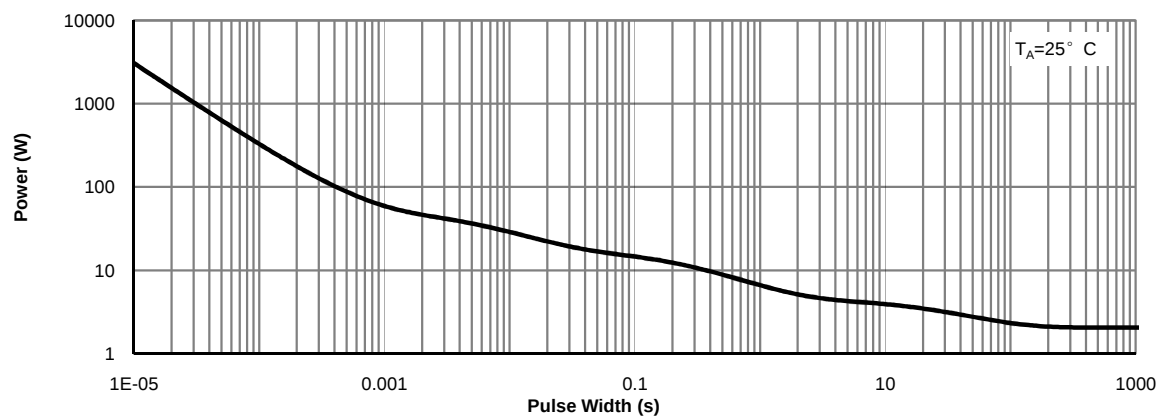


Figure 14: Single Pulse Power Rating Junction-to-Ambient (Note H)

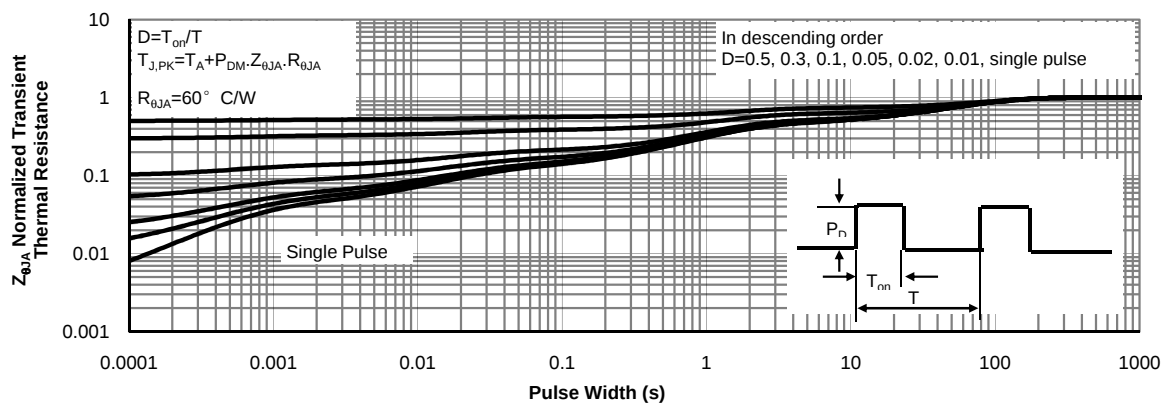
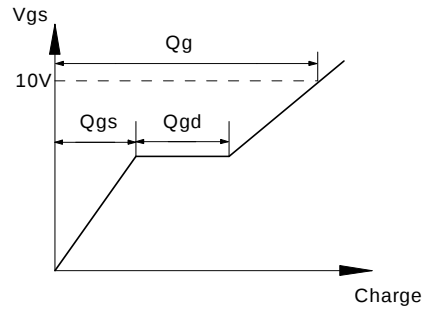
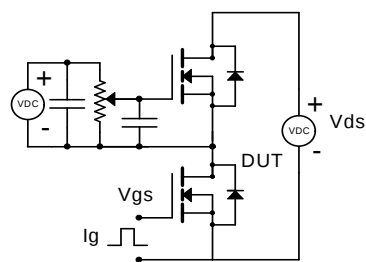
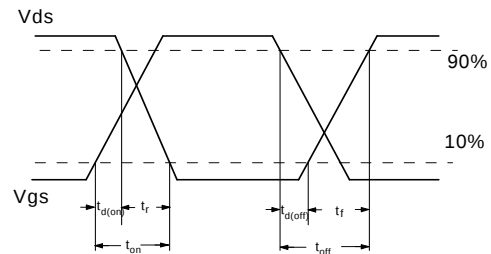
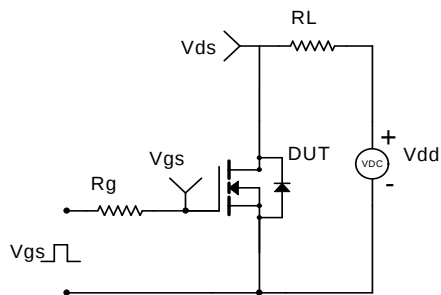


Figure 15: Normalized Maximum Transient Thermal Impedance (Note H)

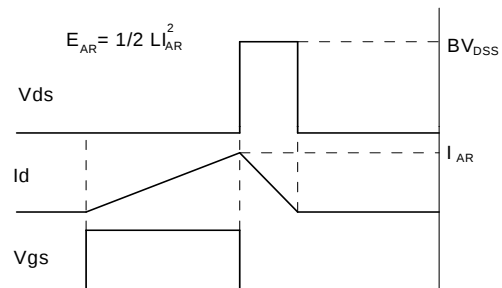
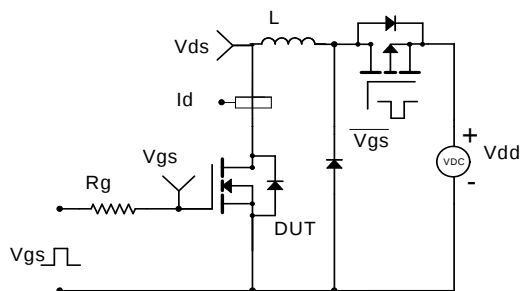
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

