

General Description

- Bottom Source Technology
- Very Low $R_{DS(ON)}$
- Low Gate Charge
- High Current Capability
- RoHS 2.0 and Halogen-Free Compliant

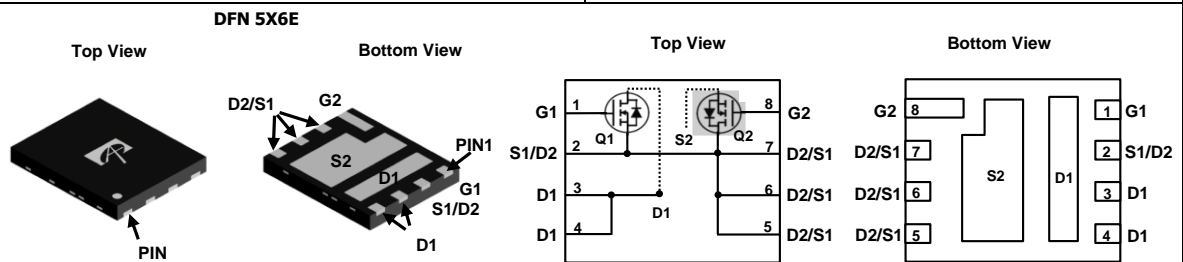
Applications

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

Product Summary

	Q1	Q2
V_{DS}	30V	30V
I_D (at $V_{GS}=10V$)	22A	85A
$R_{DS(ON)}$ (at $V_{GS}=10V$)	< 4.3m Ω	< 0.83m Ω
$R_{DS(ON)}$ (at $V_{GS}=4.5V$)	< 7.0m Ω	< 1.05m Ω

100% UIS Tested
100% Rg Tested



Orderable Part Number	Package Type	Form	Minimum Order Quantity
AOE6930	DFN 5x6E	Tape & Reel	3000

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	30	V	
Gate-Source Voltage	V_{GS}	± 20	± 12	V	
Continuous Drain Current ^G	I_D	$T_C=25^\circ\text{C}$	22	85	A
		$T_C=100^\circ\text{C}$	22	85	
Pulsed Drain Current ^C	I_{DM}	88	340	A	
Continuous Drain Current	I_{DSM}	$T_A=25^\circ\text{C}$	22 ^G	60	A
		$T_A=70^\circ\text{C}$	19	48	
Avalanche Current ^C	I_{AS}	50	80	A	
Avalanche energy	E_{AS}	13	32	mJ	
V_{DS} Spike	V_{SPIKE}	36	36	V	
Power Dissipation ^B	P_D	$T_C=25^\circ\text{C}$	24	75	W
		$T_C=100^\circ\text{C}$	9.6	30	
Power Dissipation ^A	P_{DSM}	$T_A=25^\circ\text{C}$	4.1	5	W
		$T_A=70^\circ\text{C}$	2.6	3.2	
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	$R_{\theta JA}$	$t \leq 10s$	23	20	30	$^\circ\text{C}/\text{W}$
Maximum Junction-to-Ambient ^{A,D}		Steady-State	45	40	60	$^\circ\text{C}/\text{W}$
Maximum Junction-to-Case (Note)	$R_{\theta JC}$	4	1.25	5.2	1.65	$^\circ\text{C}/\text{W}$

Note: Bottom S2, D1.

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	1.7	2.1	V
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =20A T _J =125°C		3.5 5.0	4.3 6.2	mΩ
		V _{GS} =4.5V, I _D =20A		5.2	7.0	mΩ
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =20A		85		S
V _{SD}	Diode Forward Voltage	I _S =1A, V _{GS} =0V		0.7	1	V
I _S	Maximum Body-Diode Continuous Current ^G				22	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =15V, f=1MHz		1075		pF
C _{oss}	Output Capacitance			480		pF
C _{riss}	Reverse Transfer Capacitance			55		pF
R _g	Gate resistance	f=1MHz	0.2	1.0	2.0	Ω
SWITCHING PARAMETERS						
Q _{g(10V)}	Total Gate Charge	V _{GS} =10V, V _{DS} =15V, I _D =20A		15	25	nC
Q _{g(4.5V)}	Total Gate Charge			7	15	nC
Q _{gs}	Gate Source Charge			2.5		nC
Q _{gd}	Gate Drain Charge			2.5		nC
Q _{gs}	Gate Source Charge	V _{GS} =4.5V, V _{DS} =15V, I _D =20A		2.5		nC
Q _{gd}	Gate Drain Charge			2.5		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =10V, V _{DS} =15V, R _L =0.75Ω, R _{GEN} =3Ω		4.5		ns
t _r	Turn-On Rise Time			4		ns
t _{D(off)}	Turn-Off DelayTime			19		ns
t _f	Turn-Off Fall Time			3		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =20A, dI/dt=500A/μs		12.5		ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =20A, dI/dt=500A/μs		21.5		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. Single pulse width limited by junction temperature T_{J(MAX)}=150° 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 package limited.

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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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

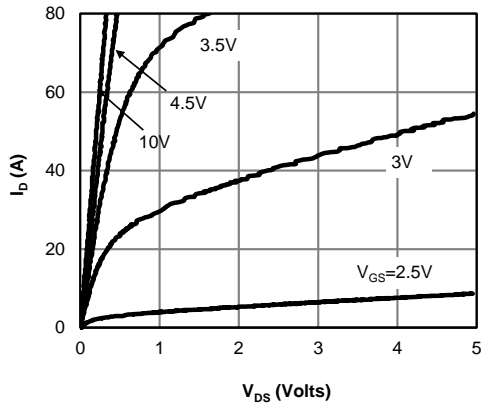


Figure 1: On-Region Characteristics (Note E)

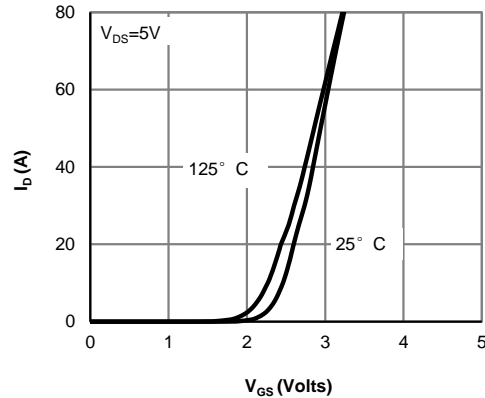


Figure 2: Transfer Characteristics (Note E)

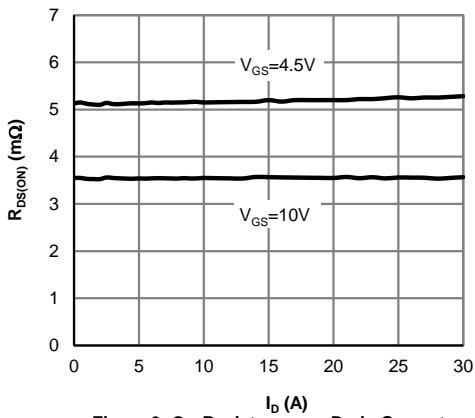


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

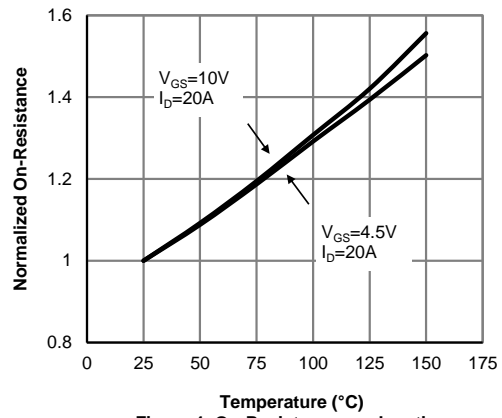


Figure 4: On-Resistance vs. Junction Temperature (Note E)

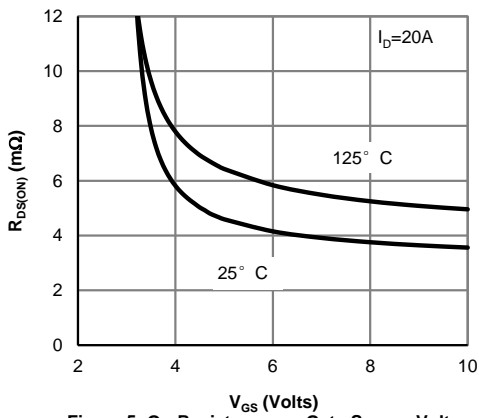


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

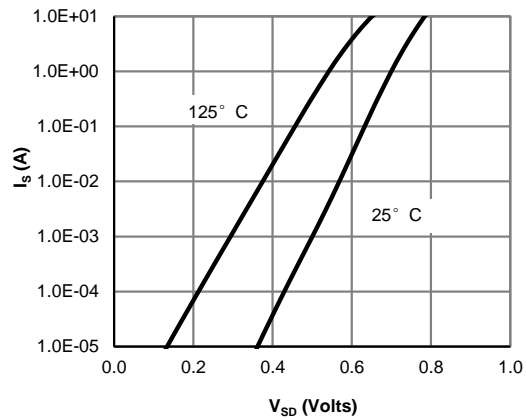


Figure 6: Body-Diode Characteristics (Note E)

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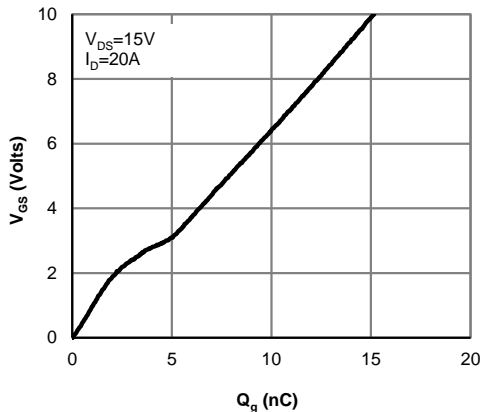


Figure 7: Gate-Charge Characteristics

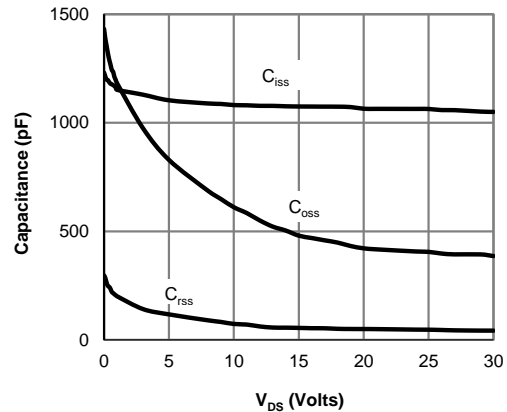


Figure 8: Capacitance Characteristics

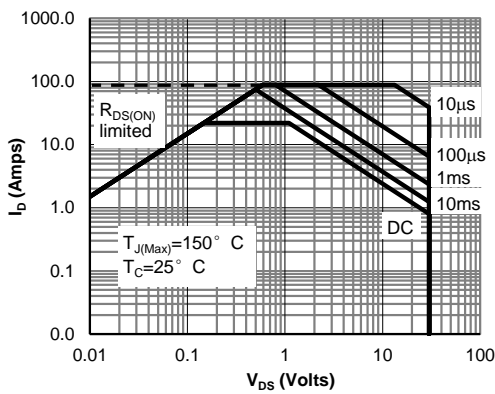


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

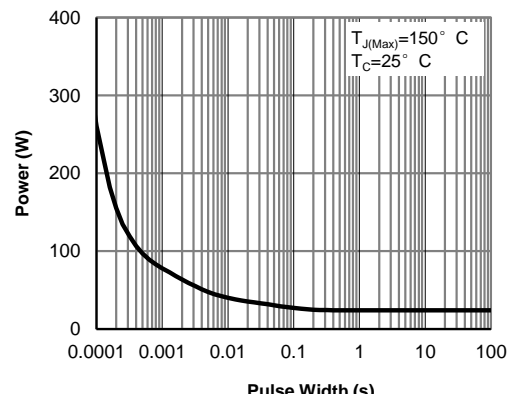


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

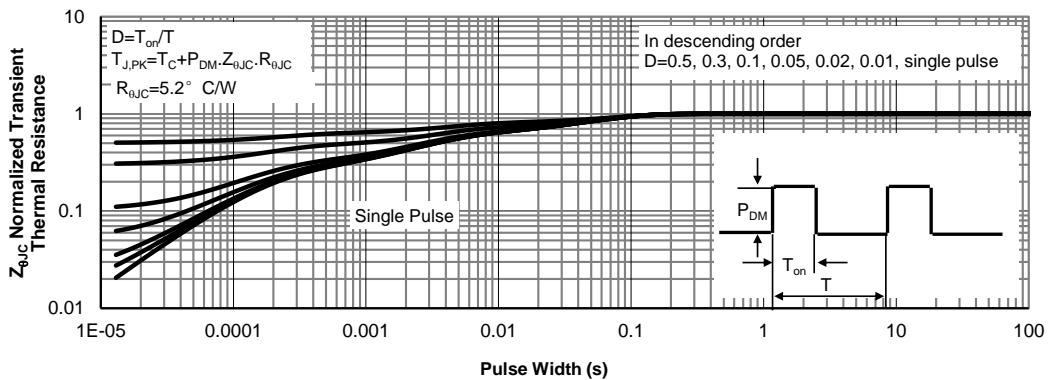


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

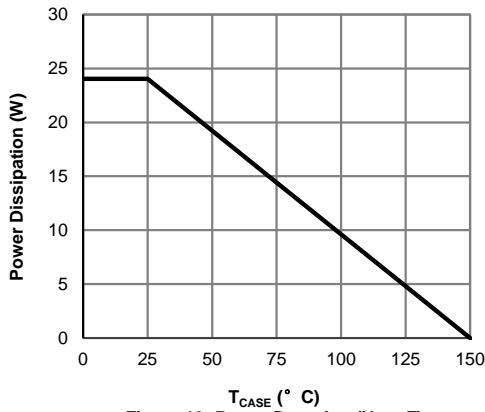


Figure 12: Power De-rating (Note F)

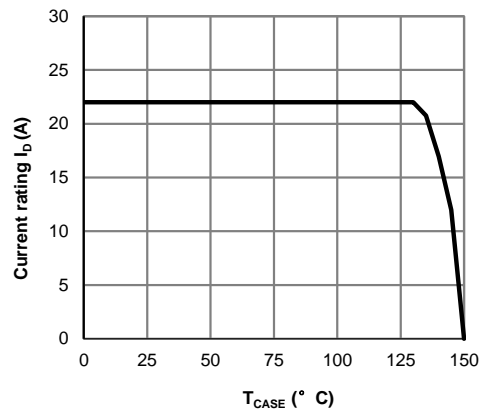


Figure 13: Current De-rating (Note F)

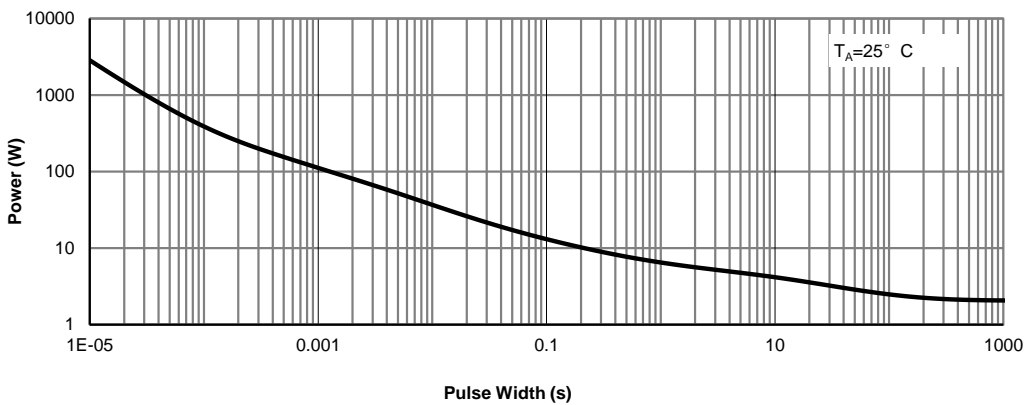


Figure 14: Single Pulse Power Rating Junction-to-Ambient (Note H)

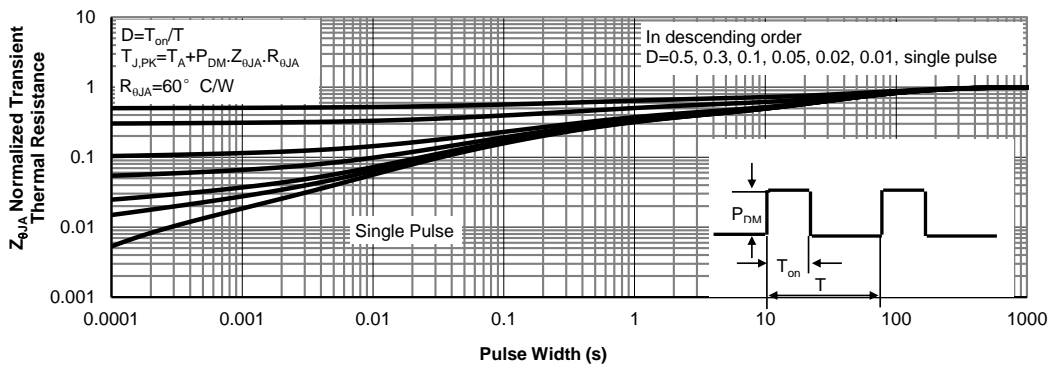


Figure 15: Normalized Maximum Transient Thermal Impedance (Note H)

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} =±12V			±100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =250μA	1.2	1.5	1.9	V
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =30A T _J =125°C		0.65 0.95	0.83 1.2	mΩ
		V _{GS} =4.5V, I _D =30A		0.8	1.05	mΩ
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =20A		278		S
V _{SD}	Diode Forward Voltage	I _S =1A, V _{GS} =0V		0.65	1	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		5560		pF
C _{oss}	Output Capacitance			1670		pF
C _{riss}	Reverse Transfer Capacitance			200		pF
R _g	Gate resistance	f=1MHz	0.2	1.0	2.0	Ω
SWITCHING PARAMETERS						
Q _{g(10V)}	Total Gate Charge	V _{GS} =10V, V _{DS} =15V, I _D =20A		95	150	nC
Q _{g(4.5V)}	Total Gate Charge			42	65	nC
Q _{gs}	Gate Source Charge			11.5		nC
Q _{gd}	Gate Drain Charge			12		nC
Q _{gs}	Gate Source Charge	V _{GS} =4.5V, V _{DS} =15V, I _D =20A		11.5		nC
Q _{gd}	Gate Drain Charge			12		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =10V, V _{DS} =15V, R _L =0.75Ω, R _{GEN} =3Ω		12.5		ns
t _r	Turn-On Rise Time			27		ns
t _{D(off)}	Turn-Off DelayTime			66.5		ns
t _f	Turn-Off Fall Time			13		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =20A, dI/dt=500A/μs		23		ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =20A, dI/dt=500A/μs		72.5		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. Single pulse width limited by junction temperature T_{J(MAX)}=150° 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 package limited.

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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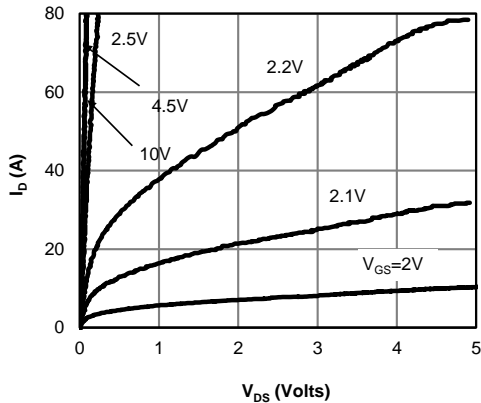


Figure 1: On-Region Characteristics (Note E)

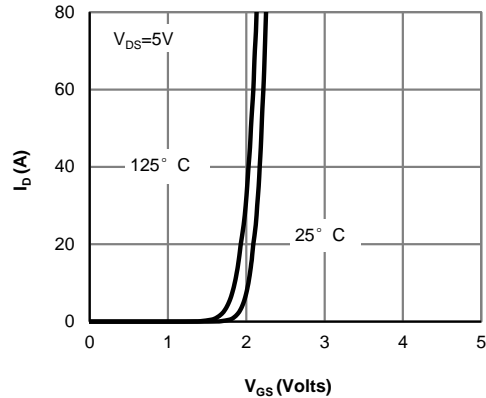


Figure 2: Transfer Characteristics (Note E)

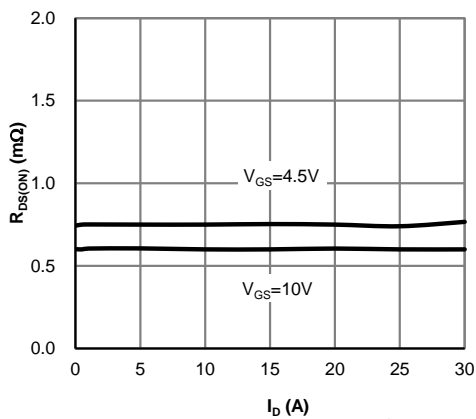


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

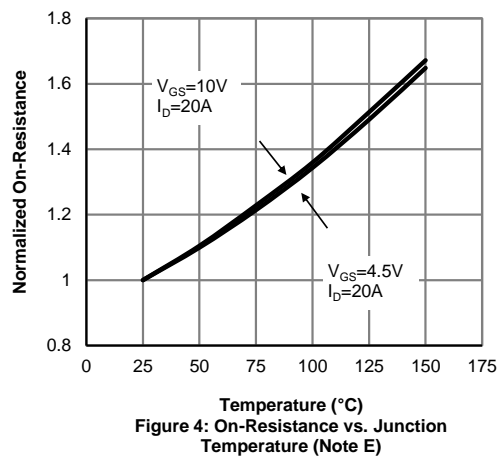


Figure 4: On-Resistance vs. Junction Temperature (Note E)

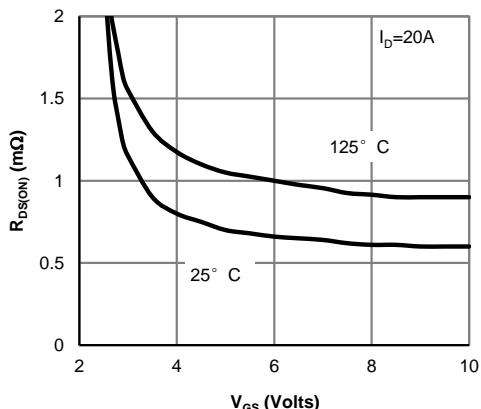


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

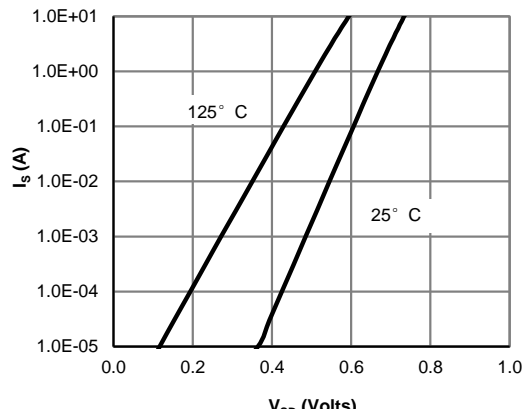


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

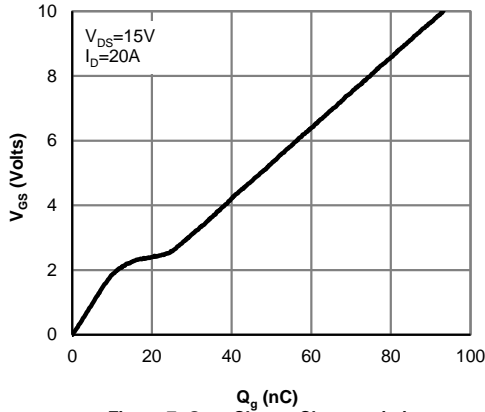


Figure 7: Gate-Charge Characteristics

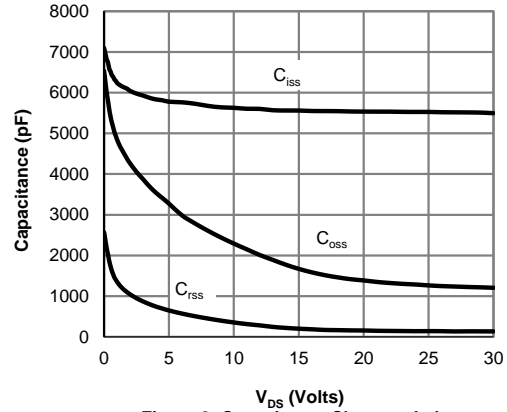


Figure 8: Capacitance Characteristics

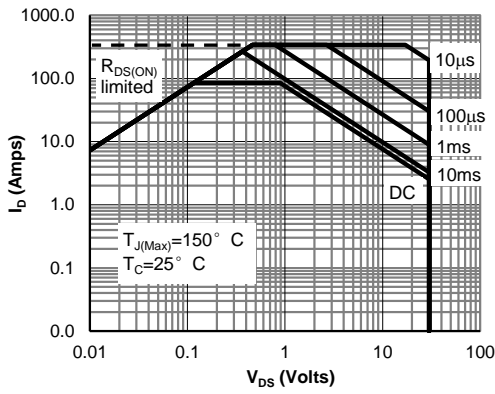


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

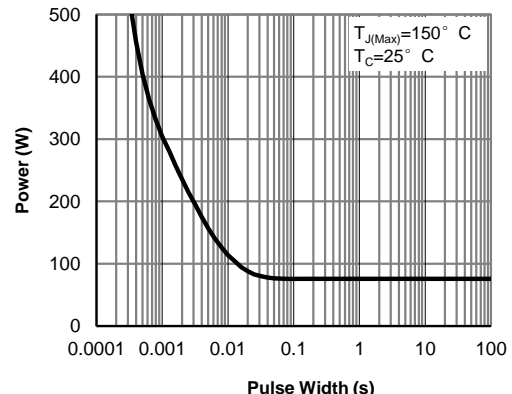


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

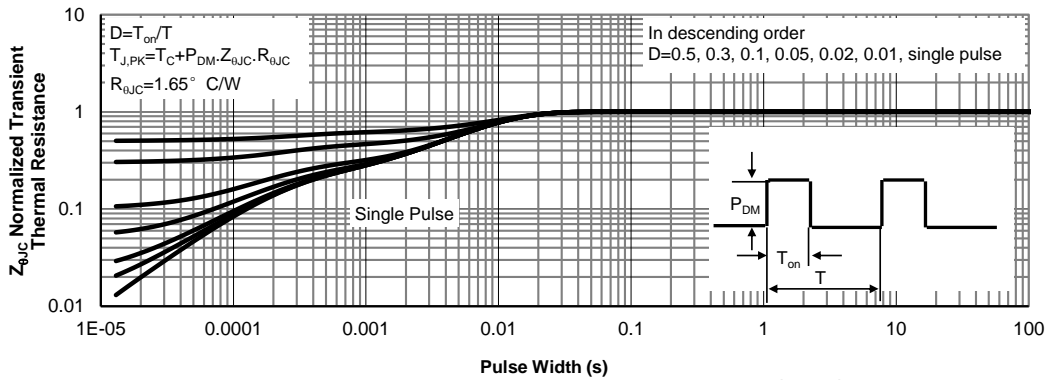


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

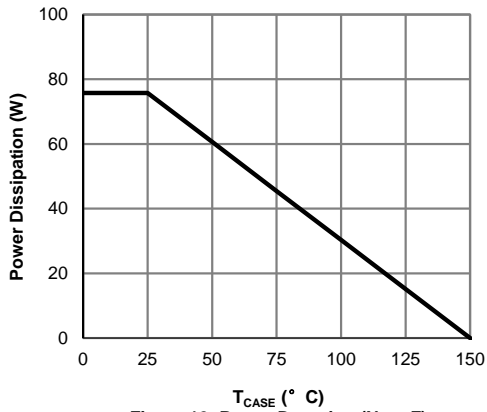


Figure 12: Power De-rating (Note F)

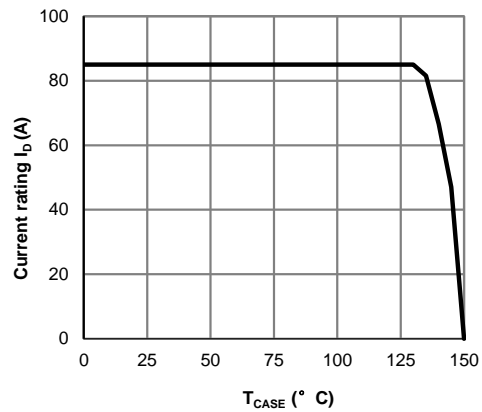


Figure 13: Current De-rating (Note F)

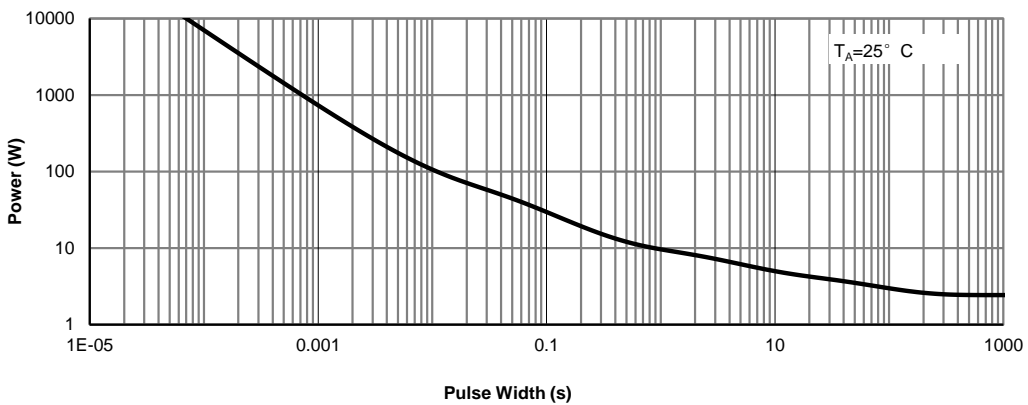


Figure 14: Single Pulse Power Rating Junction-to-Ambient (Note H)

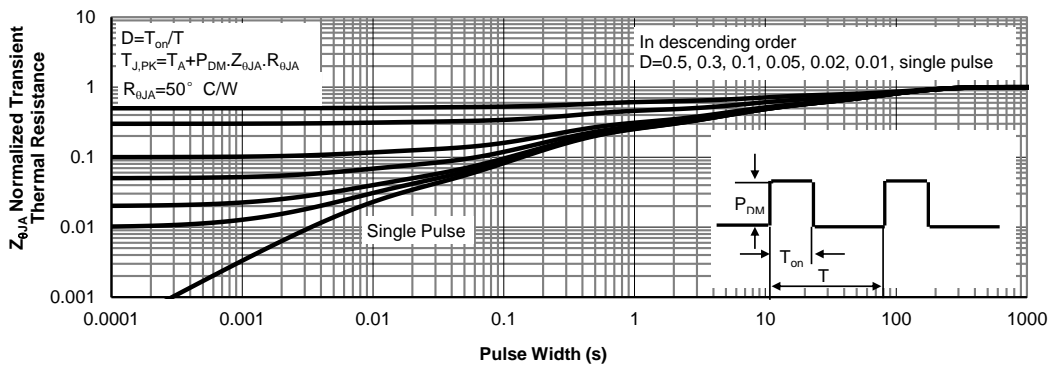


Figure 15: Normalized Maximum Transient Thermal Impedance (Note H)

Figure A: Gate Charge Test Circuit & Waveforms

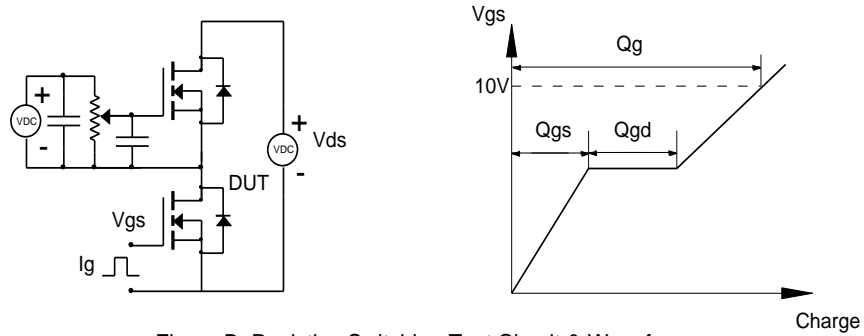


Figure B: Resistive Switching Test Circuit & Waveforms

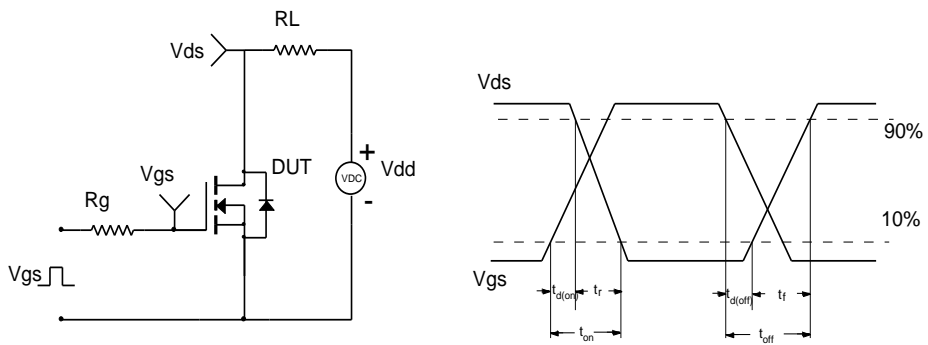


Figure C: Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

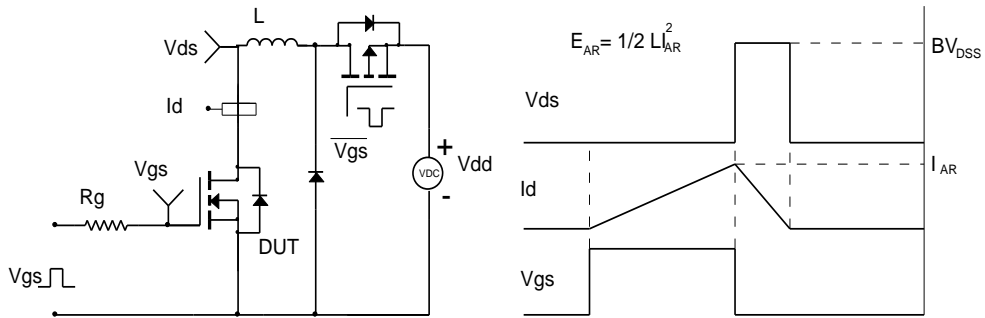


Figure D: Diode Recovery Test Circuit & Waveforms

