ALPHA & OMEGA SEMICONDUCTOR

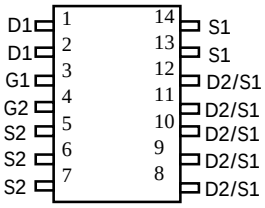
AO4F800
Asymmetric Dual N-Channel Enhancement Mode Field Effect Transistor

General Description

The AO4F800 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. *Standard Product AOF800 is Pb-free (meets ROHS & Sony 259 specifications). AOF800L is a Green Product ordering option. AOF800 and AOF800L are electrically identical.*

Features

Q1	Q2	
V_{DS} (V) = 30V	V_{DS}(V) = 30V	
I_D = 8.3A (V_{GS} = 10V)	I_D=17.7A	
$R_{DS(ON)}$ < 18mΩ	< 6.5mΩ	(V_{GS} = 10V)
$R_{DS(ON)}$ < 27mΩ	< 8.5mΩ	(V_{GS} = 4.5V)



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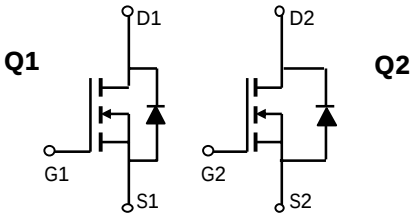

Absolute Maximum Ratings T_A=25°C unless otherwise noted

Parameter		Symbol	Max Q1	Max Q2	Units
Drain-Source Voltage		V_{DS}	30	30	V
Gate-Source Voltage		V_{GS}	±20	±20	V
Continuous Drain Current[A]	T_A=25°C	I_D	8.3	17.7	A
	T_A=70°C		6.7	13	
Pulsed Drain Current[B]		I_{DM}	30	80	
Power Dissipation	T_A=25°C	P_D	2	3	W
	T_A=70°C		1.28	2.1	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150	-55 to 150	°C

Parameter: Thermal Characteristics MOSFET Q1		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient[A]	t ≤ 10s	$R_{\theta JA}$	47	62.5	°C/W
Maximum Junction-to-Ambient[A]	Steady-State		83	110	
Maximum Junction-to-Lead[C]	Steady-State	$R_{\theta JL}$	23	40	

Parameter: Thermal Characteristics MOSFET Q2		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient[A]	t ≤ 10s	$R_{\theta JA}$	31	40	°C/W
Maximum Junction-to-Ambient[A]	Steady-State		59	75	
Maximum Junction-to-Lead[C]	Steady-State	$R_{\theta JL}$	16	24	

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}=24V, V_{GS}=0V			1	µA
		T_J=55°C			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	1.8	3	V
$I_{D(ON)}$	On state drain current	V_{GS}=4.5V, V_{DS}=5V	30			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=8.3A		15	18	mΩ
		T_J=125°C		21	25	
		V_{GS}=4.5V, I_D=6.7A		22	27	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=8.3A	18	23		S
V_{SD}	Diode Forward Voltage	I_S=1A		0.76	1	V
I_S	Maximum Body-Diode Continuous Current				3	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=15V, f=1MHz		1040	1250	pF
C_{oss}	Output Capacitance			190		pF
C_{rss}	Reverse Transfer Capacitance			120		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		0.7	0.85	Ω
SWITCHING PARAMETERS						
Q_g(10V)	Total Gate Charge	V_{GS}=10V, V_{DS}=15V, I_D=8.3A		19.8	24	nC
Q_g	Total Gate Charge			9.8	12	nC
Q_{gs}	Gate Source Charge			2.5		nC
Q_{gd}	Gate Drain Charge			3.5		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=15V, R_L=1.8Ω, R_{GEN}=3Ω		5.2	6.25	ns
t_r	Turn-On Rise Time			5	6	ns
$t_{D(off)}$	Turn-Off DelayTime			20.5	25	ns
t_f	Turn-Off Fall Time			3.6	4.3	ns
t_{rr}	Body Diode Reverse Recovery time	I_F=8.3A, dI/dt=100A/µs		15	18	ns
Q_{rr}	Body Diode Reverse Recovery charge	I_F=8.3A, dI/dt=100A/µs		8	10	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 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 $R_{\theta JA}$ is the sum of the thermal impedence from junction to lead $R_{\theta JL}$ and lead to ambient.

D. The static characteristics in Figures 1 to 6,12,14 are obtained using 80µs 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.

Rev2: August 2005

Q1 Electrical Characteristics (T_J=25°C unless otherwise noted)

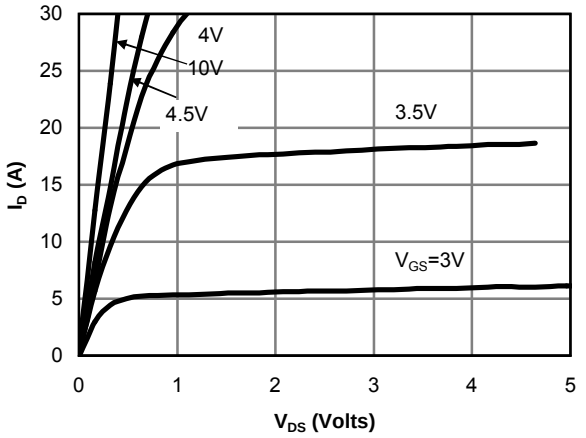

Fig 1: On-Region Characteristics

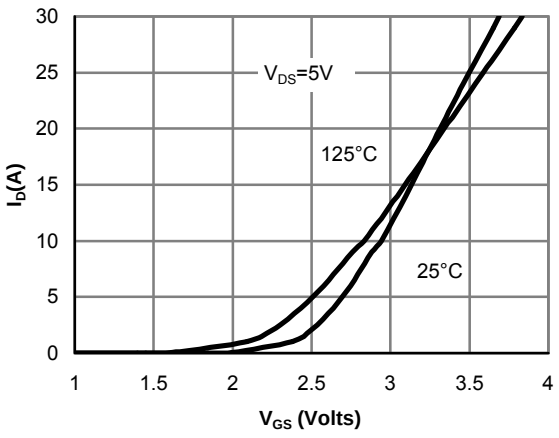

Figure 2: Transfer Characteristics

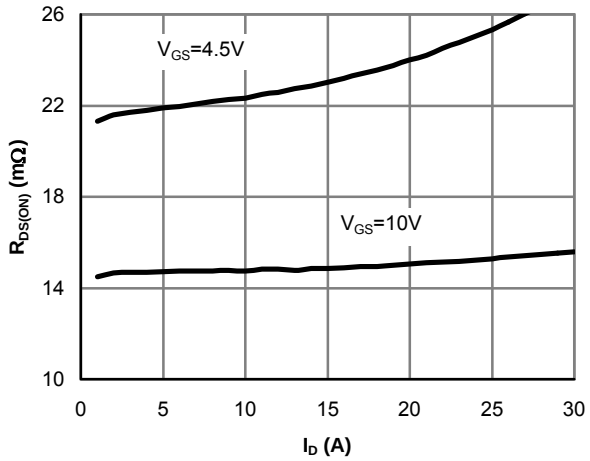

Figure 3: On-Resistance vs. Drain Current and Gate Voltage

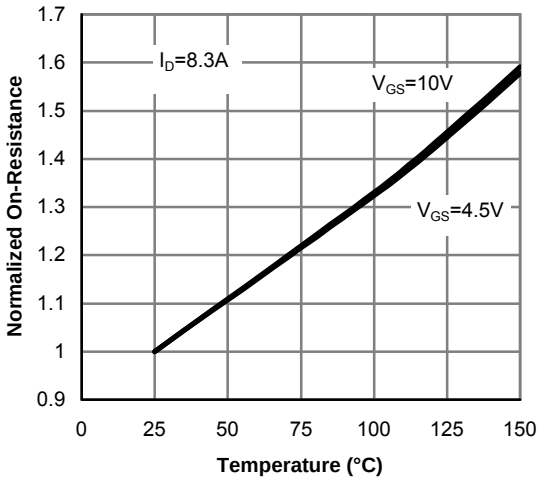

Figure 4: On resistance vs. Junction Temperature

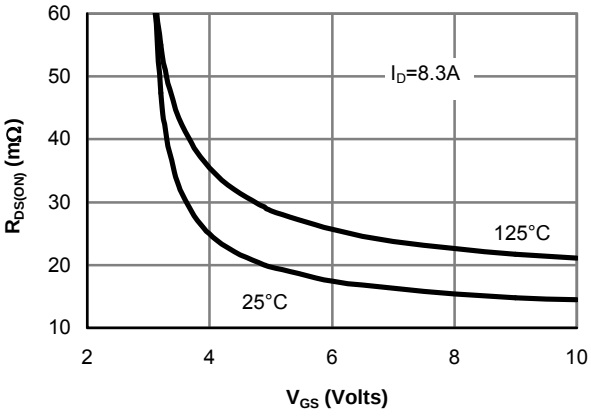

Figure 5: On resistance vs. Gate-Source Voltage

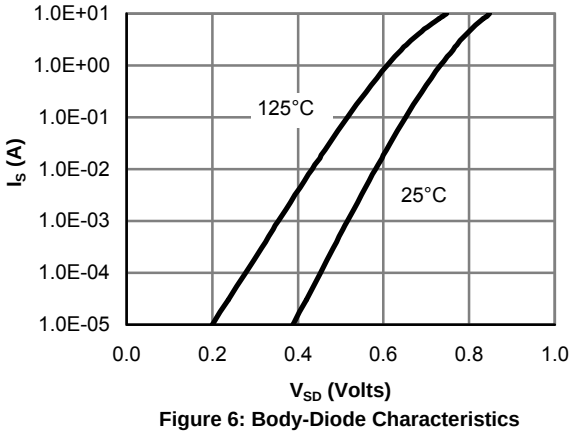

Figure 6: Body-Diode Characteristics

Q1 Electrical Characteristics (T_J=25°C unless otherwise noted)

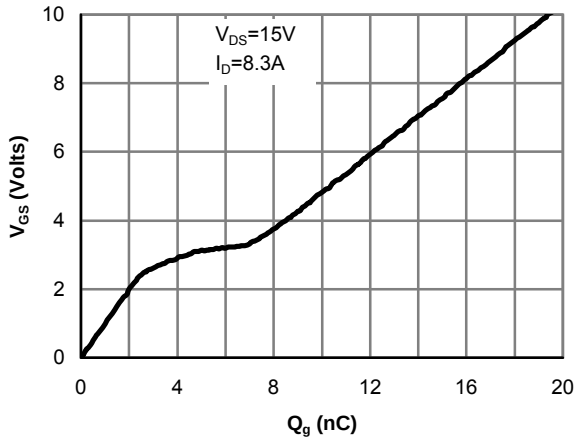

Figure 7: Gate-Charge Characteristics

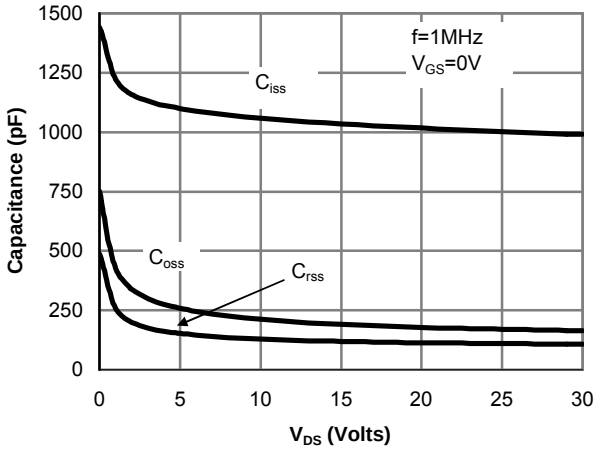

Figure 8: Capacitance Characteristics

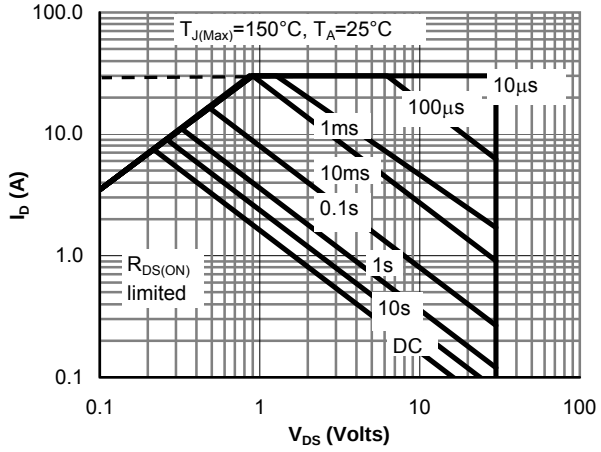

Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

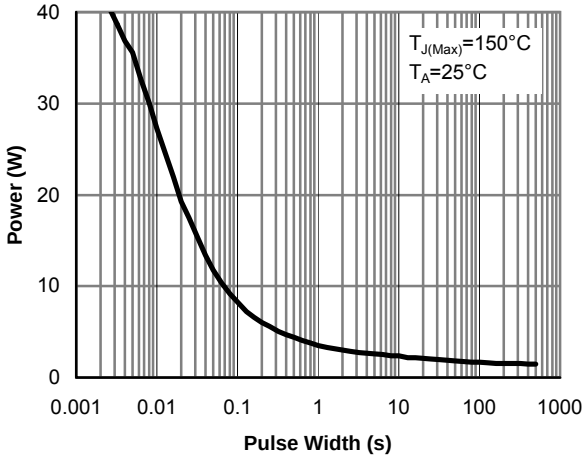

Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

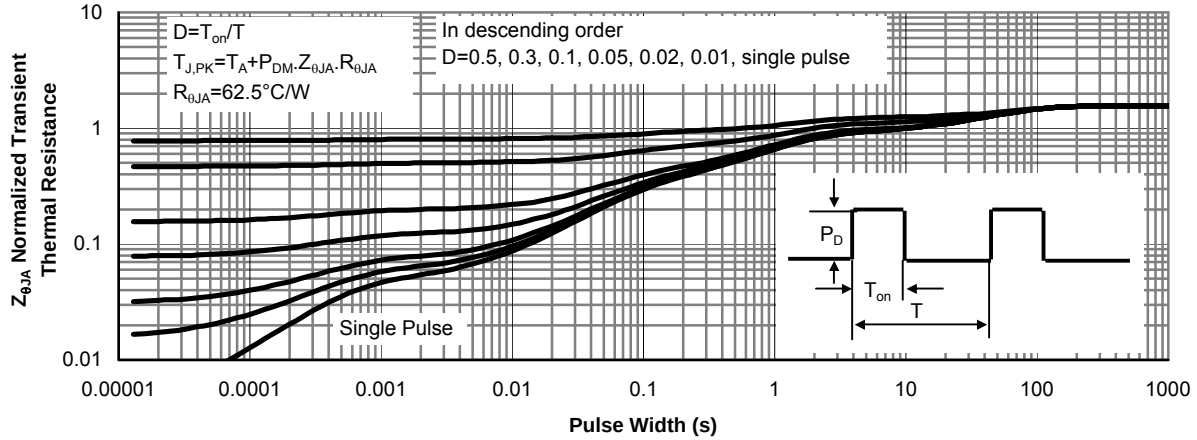

Figure 11: Normalized Maximum Transient Thermal Impedance

Q2 Electrical Characteristics (TJ=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			1	µA
		T_J=55°C			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	1.8	2.5	V
$I_{D(ON)}$	On state drain current	V_{GS}=4.5V, V_{DS}=5V	80			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=17.7A		5.4	6.5	mΩ
		T_J=125°C		7.56	9.1	
		V_{GS}=4.5V, I_D=13A		6.8	8.5	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=17.7A		82		S
V_{SD}	Diode Forward Voltage	I_S=1A,V_{GS}=0V		0.7	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		6060	7270	pF
C_{oss}	Output Capacitance			638		pF
C_{rss}	Reverse Transfer Capacitance			355		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		0.45	0.54	Ω
SWITCHING PARAMETERS						
Q_g(10V)	Total Gate Charge	V_{GS}=10V, V_{DS}=15V, I_D=17.7A		103	124	nC
Q_g(4.5V)	Total Gate Charge			48	57	nC
Q_{gs}	Gate Source Charge			18		nC
Q_{gd}	Gate Drain Charge			15		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=15V, R_L=0.85Ω, R_{GEN}=3Ω		12	14	ns
t_r	Turn-On Rise Time			8	10	ns
$t_{D(off)}$	Turn-Off DelayTime			51.5	62	ns
t_f	Turn-Off Fall Time			8.8	11	ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=17.7A, dI/dt=100A/µs		33.5	40	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=17.7A, dI/dt=100A/µs		22	26	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 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 $R_{\theta JA}$ is the sum of the thermal impedence from junction to lead $R_{\theta JL}$ and lead to ambient.
D. The static characteristics in Figures 1 to 6 are obtained using 80µs 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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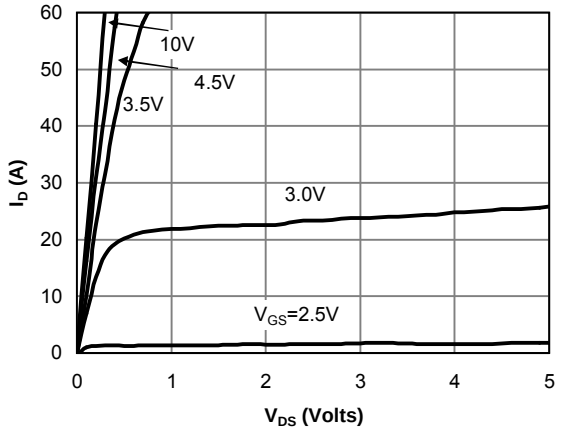
Q2 Electrical Characteristics (TJ=25°C unless otherwise noted)



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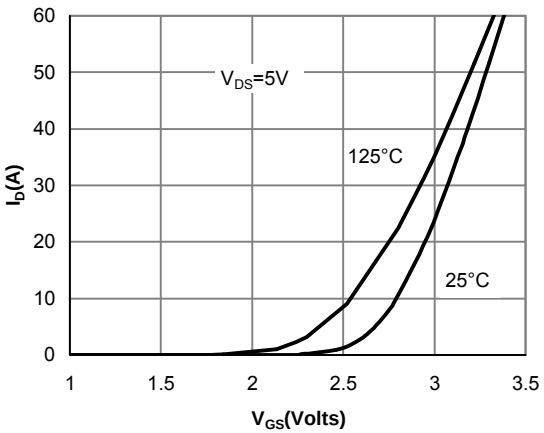


Figure 2: Transfer Characteristics

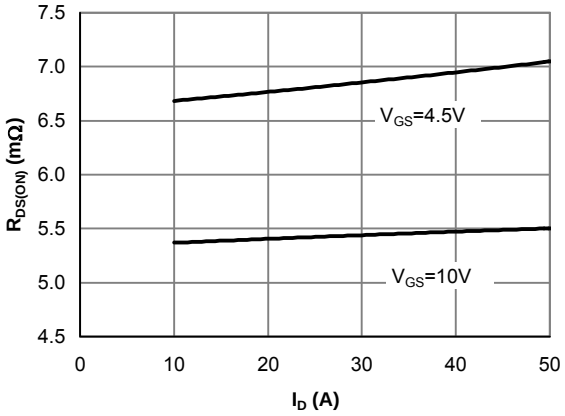


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

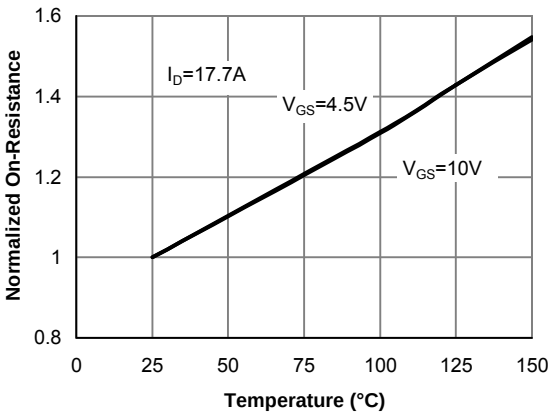
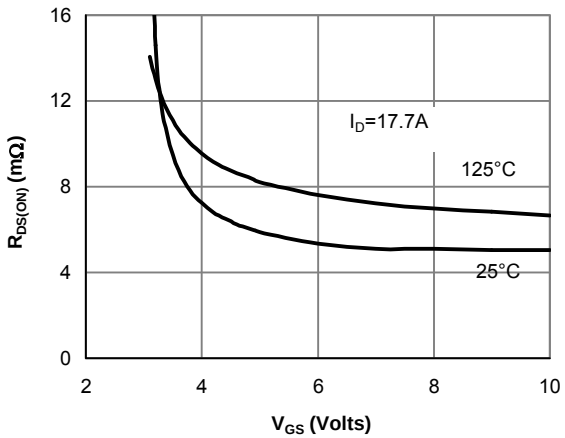


Figure 4: On-Resistance vs. Junction Temperature



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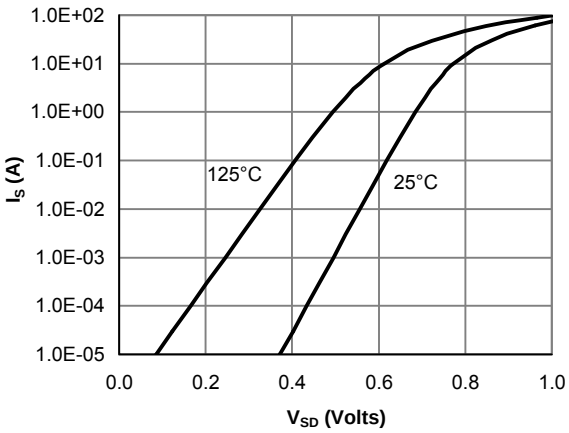
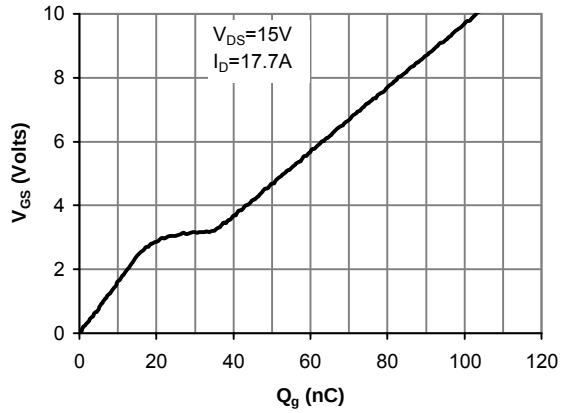


Figure 6: Body-Diode Characteristics

Q2 Electrical Characteristics (TJ=25°C unless otherwise noted)



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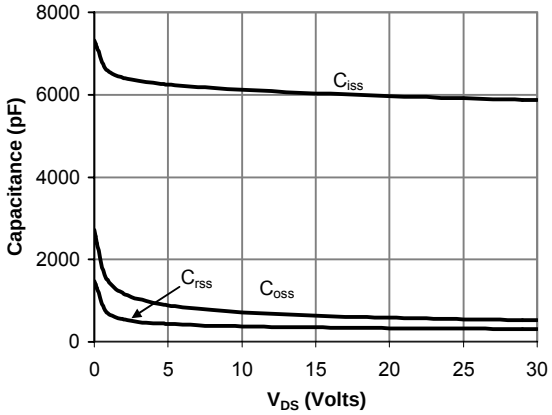

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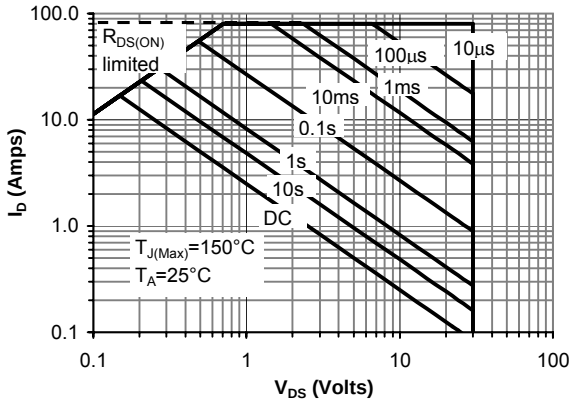

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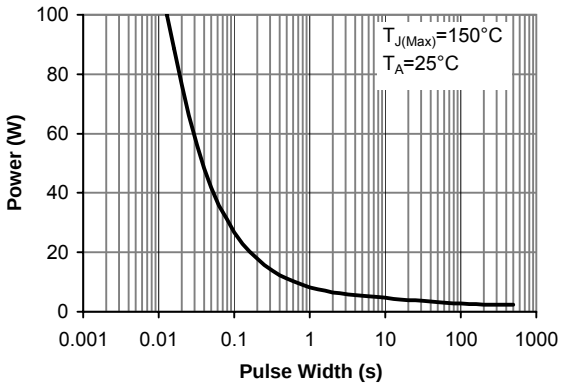

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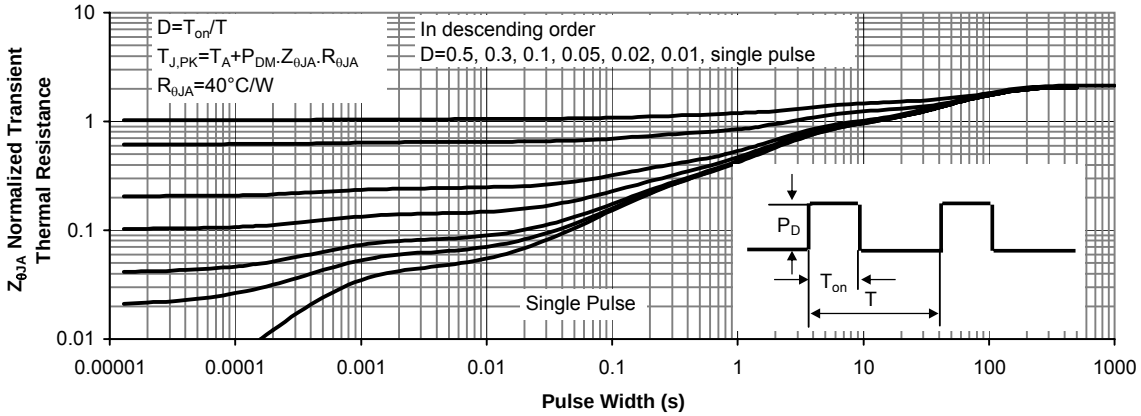

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