

AO4824
Asymmetric Dual N-Channel Enhancement Mode Field Effect Transistor

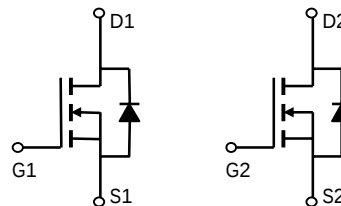
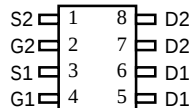
General Description

The AO4824 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 AO4824 is Pb-free (meets ROHS & Sony 259 specifications). AO4824L is a Green Product ordering option. AO4824 and AO4824L are electrically identical.*

Features
Q1
 $V_{DS} (V) = 30V$
 $I_D = 8.5A$
 $R_{DS(ON)} < 17m\Omega$
 $R_{DS(ON)} < 27m\Omega$
Q2
 $V_{DS}(V) = 30V$
 $I_D = 9.8A$ ($V_{GS} = 10V$)

 $< 13m\Omega$ ($V_{GS} = 10V$)

 $< 15m\Omega$ ($V_{GS} = 4.5V$)

SOIC-8

Absolute Maximum Ratings $T_A = 25^\circ C$ 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 ^A	$T_A = 25^\circ C$	8.5	9.8	A
	$T_A = 70^\circ C$	6.8	7.8	
Pulsed Drain Current ^B	I_{DM}	30	40	
Power Dissipation	$T_A = 25^\circ C$	2	2	W
	$T_A = 70^\circ C$	1.28	1.28	
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	-55 to 150	$^\circ C$

Parameter: Thermal Characteristics MOSFET Q1		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	$t \leq 10s$	$R_{\theta JA}$	48	62.5	$^\circ C/W$
Maximum Junction-to-Ambient ^A	Steady-State		74	110	
Maximum Junction-to-Lead ^C	Steady-State	$R_{\theta JL}$	35	40	
Parameter: Thermal Characteristics MOSFET Q2		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	$t \leq 10s$	$R_{\theta JA}$	48	62.5	$^\circ C/W$
Maximum Junction-to-Ambient ^A	Steady-State		74	110	
Maximum Junction-to-Lead ^C	Steady-State	$R_{\theta JL}$	35	40	

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
I_{DSS}	Drain-Source Breakdown Voltage	$I_D=250\mu A, V_{GS}=0V$	30			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=24V, V_{GS}=0V, T_J=55^\circ C$		0.003	1	μA
I_{GSS}	Gate-Body leakage current	$V_{DS}=0V, V_{GS}=\pm 20V$			100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	1	1.8	3	V
$I_{D(ON)}$	On state drain current	$V_{GS}=10V, V_{DS}=5V$	30			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=10V, I_D=8.5A, T_J=125^\circ C$		13.8	17	$m\Omega$
				20	25	$m\Omega$
g_{FS}	Forward Transconductance	$V_{GS}=4.5V, I_D=6A$		23		S
V_{SD}	Diode Forward Voltage	$V_{DS}=5V, I_D=8.5A$		0.76	1	V
I_S	Maximum Body-Diode Continuous Current	$I_S=1A, V_{GS}=0V$			3	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0V, V_{DS}=15V, f=1MHz$		1040	1250	pF
C_{oss}	Output Capacitance			180		pF
C_{rss}	Reverse Transfer Capacitance			110		pF
R_g	Gate resistance	$V_{GS}=0V, V_{DS}=0V, f=1MHz$		0.7	0.85	Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	$V_{GS}=10V, V_{DS}=15V, I_D=8.5A$		19.2	23	nC
$Q_{g(4.5V)}$	Total Gate Charge			9.36	11.2	nC
Q_{gs}	Gate Source Charge			2.6		nC
Q_{gd}	Gate Drain Charge			4.2		nC
$t_{D(on)}$	Turn-On Delay Time	$V_{GS}=10V, V_{DS}=15V, R_L=1.8\Omega, R_{GEN}=3\Omega$		5.2	7.5	ns
t_r	Turn-On Rise Time			4.4	6.5	ns
$t_{D(off)}$	Turn-Off Delay Time			17.3	25	ns
t_f	Turn-Off Fall Time			3.3	5	ns
t_{rr}	Body Diode Reverse Recovery Time	$I_F=8.5A, dI/dt=100A/\mu s$		16.7	21	ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=8.5A, dI/dt=100A/\mu s$		6.7	10	nC

A: The value of $R_{\theta JA}$ 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 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 impedance 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 in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C. The SOA curve provides a single pulse rating.

Rev 4 : Aug 2005

THIS PRODUCT HAS BEEN DESIGNED AND QUALIFIED FOR THE CONSUMER MARKET. APPLICATIONS OR USES AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS ARE NOT AUTHORIZED. AOS DOES NOT ASSUME ANY LIABILITY ARISING OUT OF SUCH APPLICATIONS OR USES OF ITS PRODUCTS. AOS RESERVES THE RIGHT TO IMPROVE PRODUCT DESIGN, FUNCTIONS AND RELIABILITY WITHOUT NOTICE.

Q1 TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

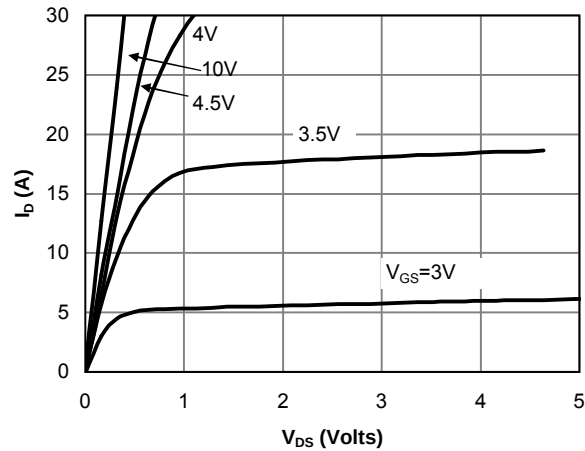


Fig 1: On-Region Characteristics

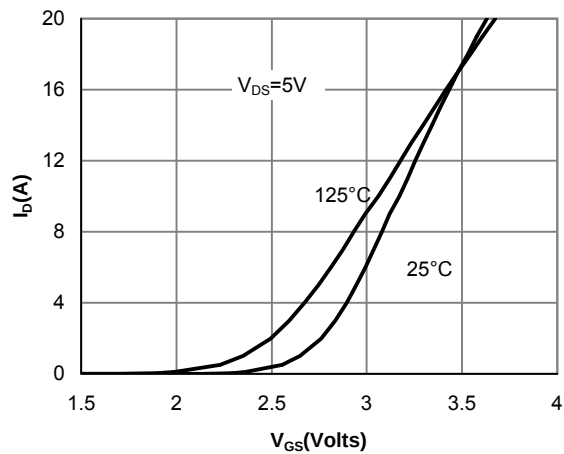


Figure 2: Transfer Characteristics

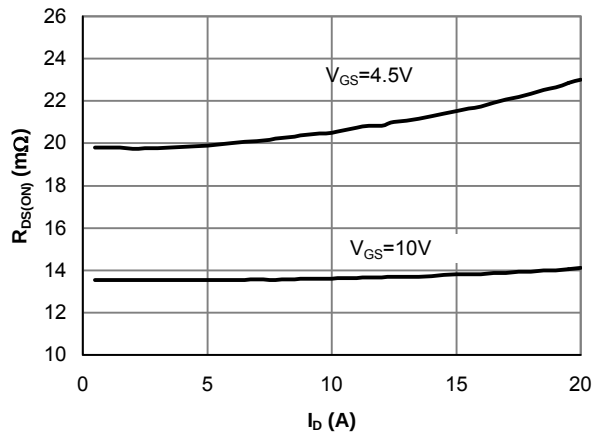


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

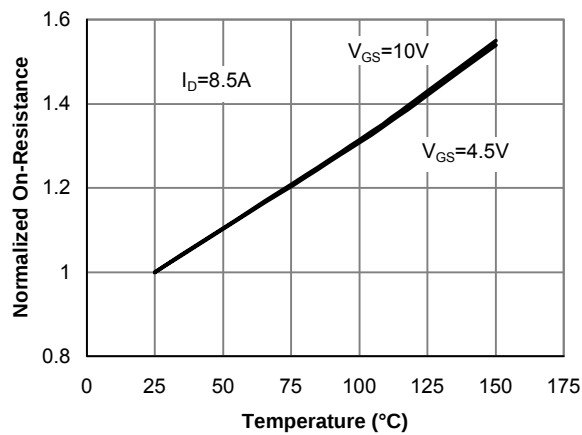


Figure 4: On-Resistance vs. Junction Temperature

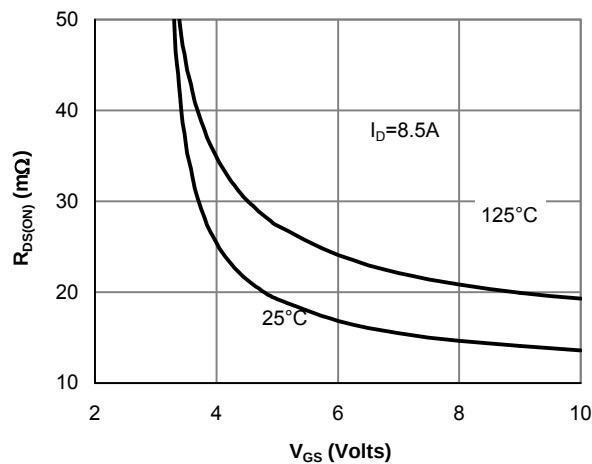


Figure 5: On-Resistance vs. Gate-Source Voltage

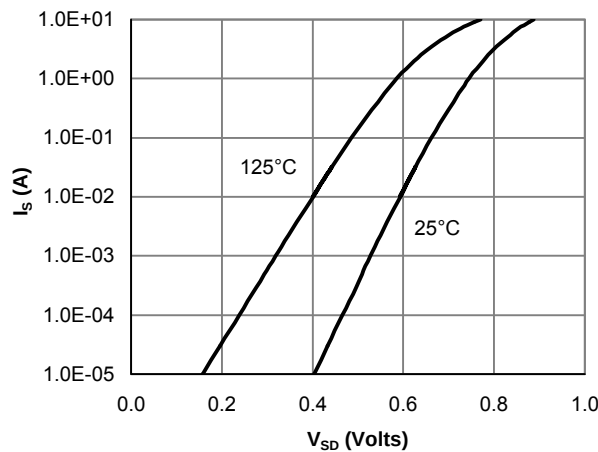


Figure 6: Body-Diode Characteristics

Q1 TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

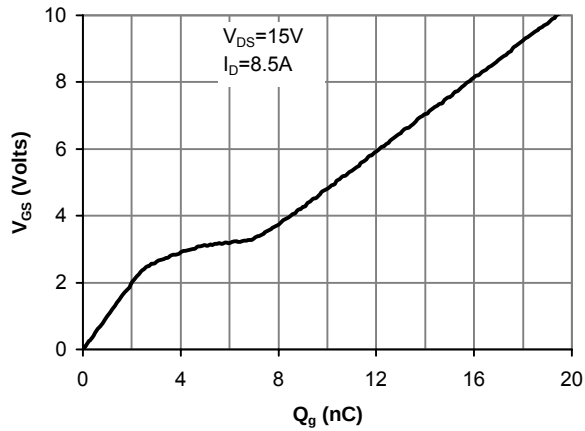


Figure 7: Gate-Charge Characteristics

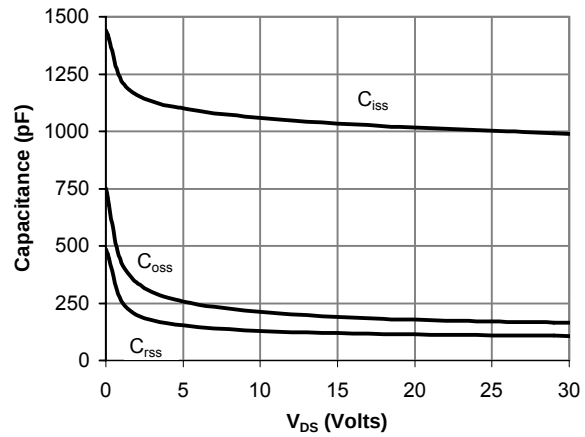


Figure 8: Capacitance Characteristics

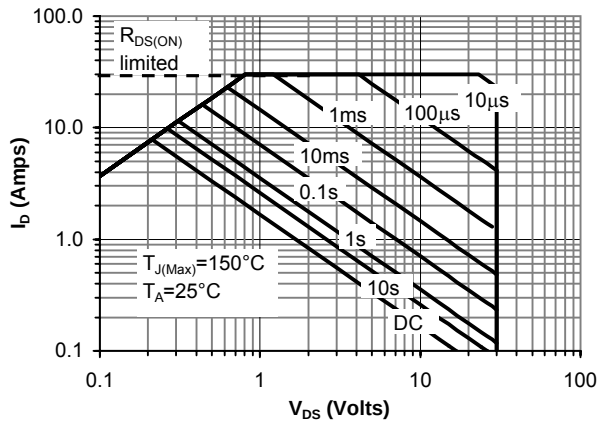


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

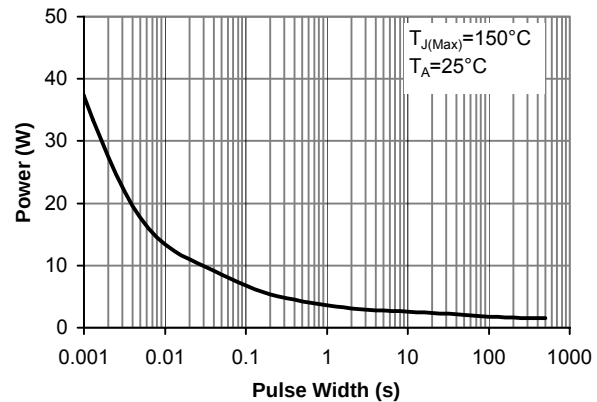


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

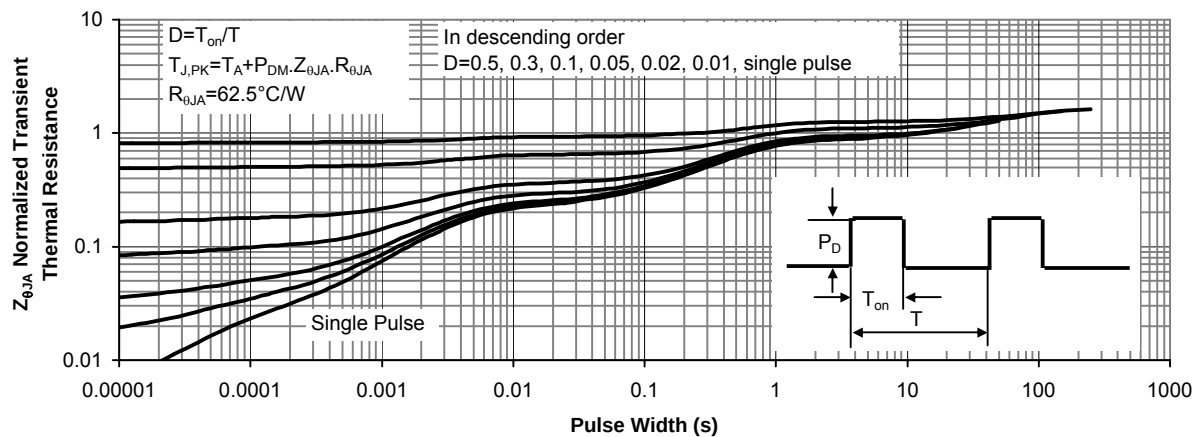


Figure 11: Normalized Maximum Transient Thermal Impedance

Q2 Electrical Characteristics (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 T _J =55°C		0.004	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	0.6	1.1	2	V
I _{D(ON)}	On state drain current	V _{GS} =4.5V, V _{DS} =5V	40			A
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =9.8A		10.5	13	mΩ
		T _J =125°C		13.4	17	
		V _{GS} =4.5V, I _D =9A		12	15	mΩ
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =9.8A	30	37		S
V _{SD}	Diode Forward Voltage	I _S =1A		0.73	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		3656	4250	pF
C _{oss}	Output Capacitance			256		pF
C _{rss}	Reverse Transfer Capacitance			168		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz		0.86	1.05	Ω
SWITCHING PARAMETERS						
Q _g	Total Gate Charge	V _{GS} =4.5V, V _{DS} =15V, I _D =9.8A		30.5	36	nC
Q _{gs}	Gate Source Charge			4.5		nC
Q _{gd}	Gate Drain Charge			8.5		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =10V, V _{DS} =15V, R _L =1.6Ω, R _{GEN} =3Ω		5.5	8.2	ns
t _r	Turn-On Rise Time			3.1	5	ns
t _{D(off)}	Turn-Off DelayTime			52.4	75	ns
t _f	Turn-Off Fall Time			5.7	8.5	ns
t _{rr}	Body Diode Reverse Recovery time	I _F =9.8A, dI/dt=100A/μs		21.5	26	ns
Q _{rr}	Body Diode Reverse Recovery charge	I _F =9.8A, dI/dt=100A/μs		11	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 value in any given application depends on the user's specific board design. The current rating is based on the t_s ≤ 10s thermal resistance rating.

B: Repetitive rating, pulse width limited by junction temperature.

C: The R_{θJA} is the sum of the thermal impedance from junction to lead R_{θJL} 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 in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C. The SOA curve provides a single pulse rating.

Rev 4: Aug 2005

THIS PRODUCT HAS BEEN DESIGNED AND QUALIFIED FOR THE CONSUMER MARKET. APPLICATIONS OR USES AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS ARE NOT AUTHORIZED. AOS DOES NOT ASSUME ANY LIABILITY ARISING OUT OF SUCH APPLICATIONS OR USES OF ITS PRODUCTS. AOS RESERVES THE RIGHT TO IMPROVE PRODUCT DESIGN, FUNCTIONS AND RELIABILITY WITHOUT NOTICE.

Q2 TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

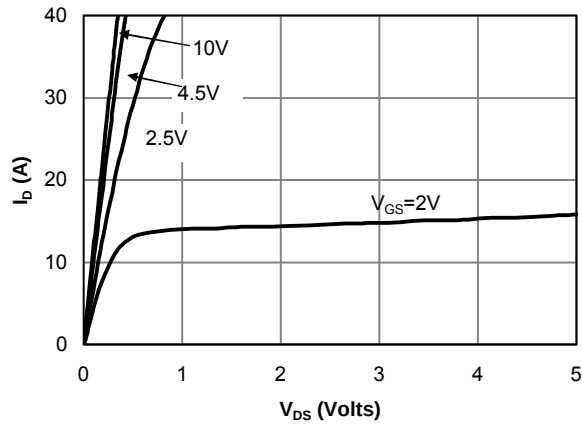


Fig 1: On-Region Characteristics

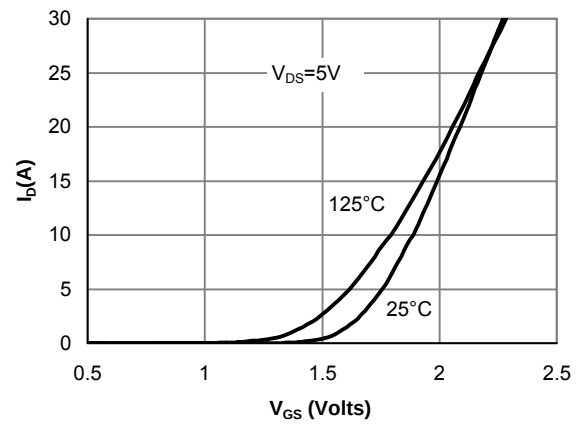


Figure 2: Transfer Characteristics

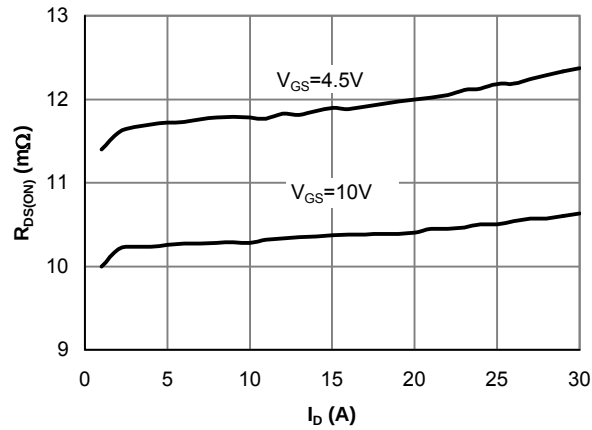


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

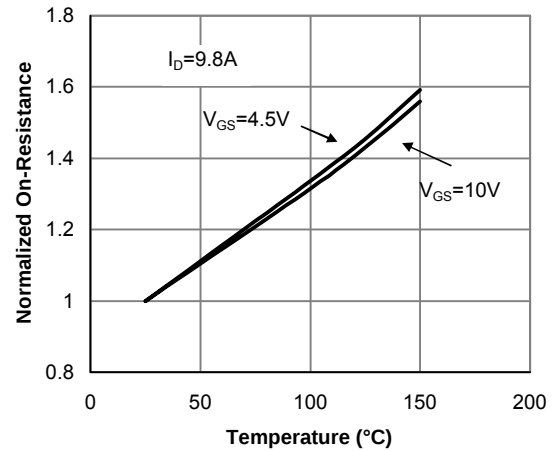


Figure 4: On resistance vs. Junction Temperature

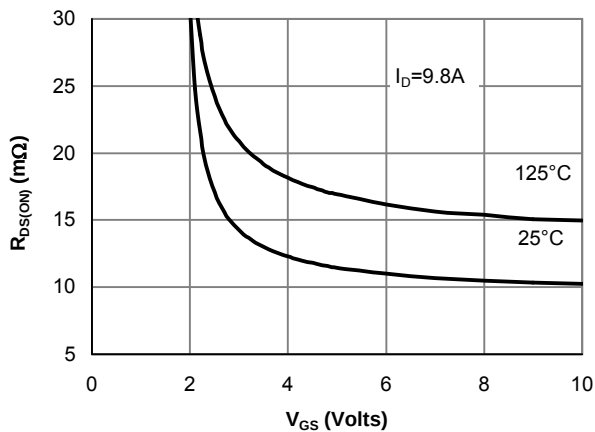


Figure 5: On resistance vs. Gate-Source Voltage

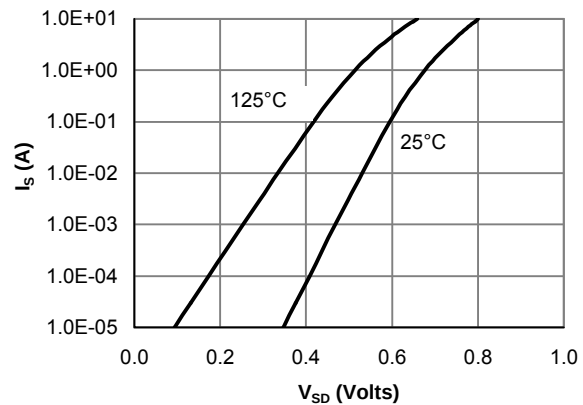


Figure 6: Body-Diode Characteristics

Q2 TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

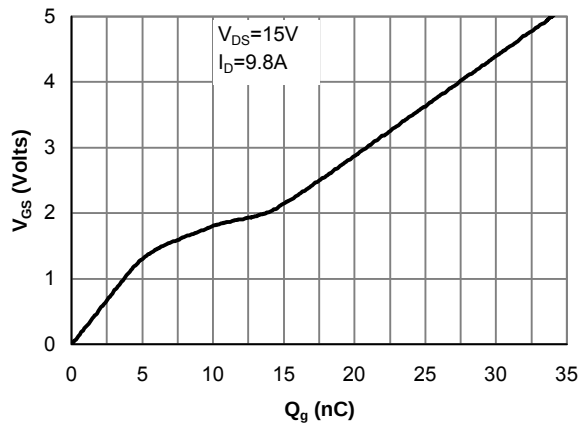


Figure 7: Gate-Charge Characteristics

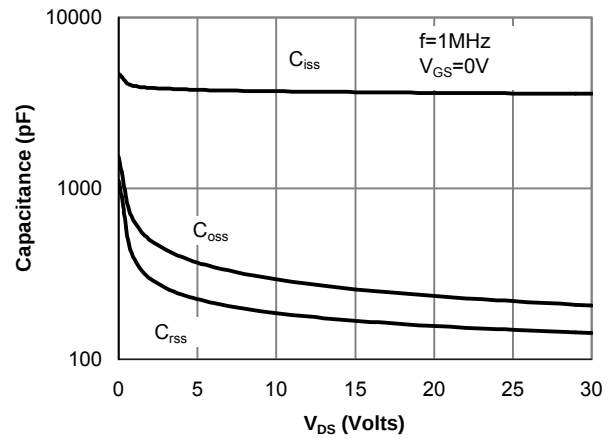


Figure 8: Capacitance Characteristics

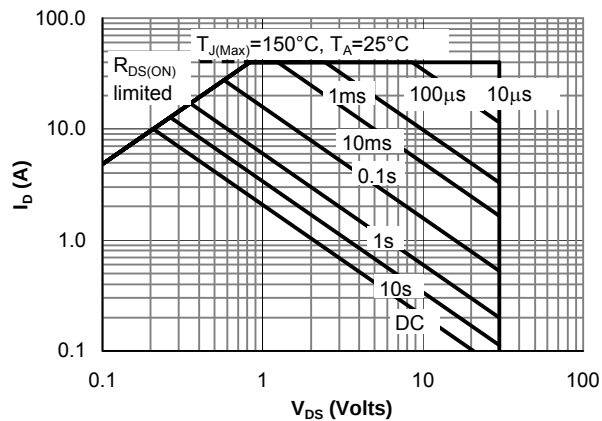


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

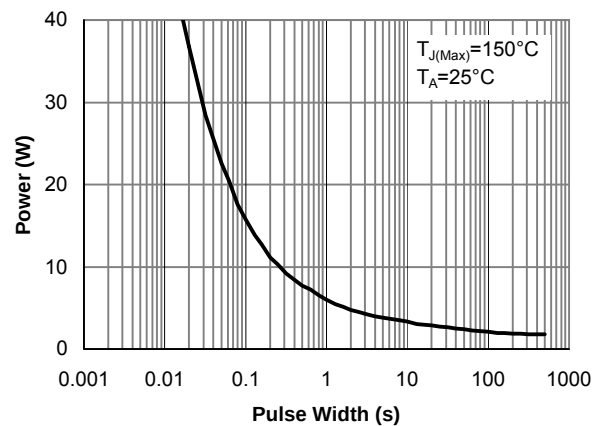


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

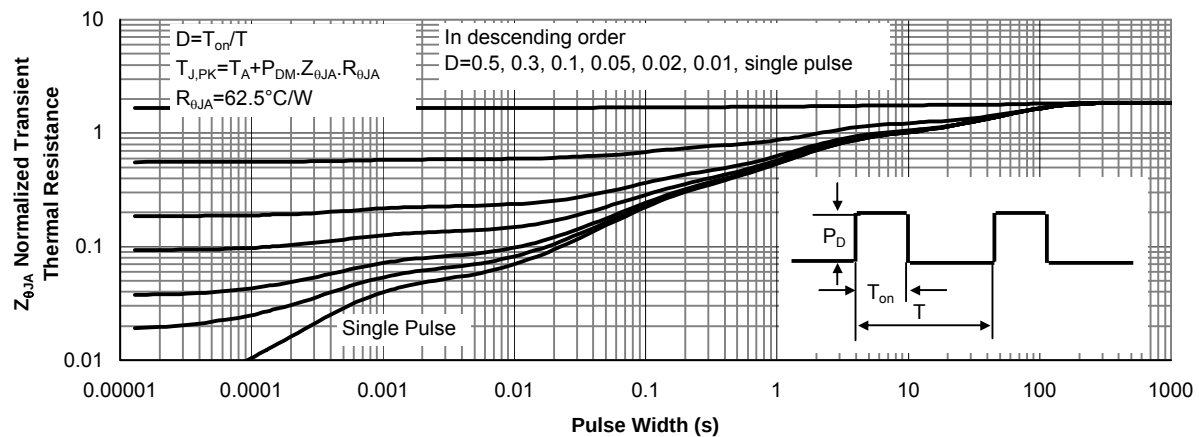


Figure 11: Normalized Maximum Transient Thermal Impedance