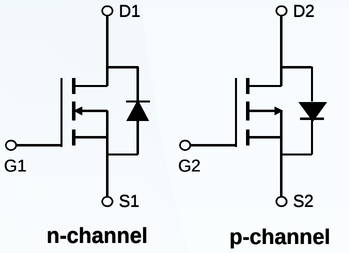
EVVOSEMI®
THINK CHANGE DO

ESD TVS MOS LDO Diode Sensor DC-DC

Product Specification

‣ Domestic Part Number	AO6604
‣ Overseas Part Number	AO6604
‣ Equivalent Part Number	AO6604

N+ P Channel MOSFET



General Description

The AO6604 combines advanced trench MOSFET technology with a low resistance package to provide extremely low $R_{DS(ON)}$. This device is ideal for load switch and battery protection applications.

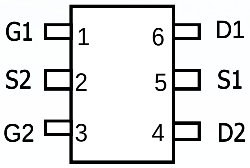
Product Summary

N-Ch:

- V_{DS} (V)=20V
- $R_{DS(ON)} < 65m\Omega$ (V_{GS} = 4.5V)
- $R_{DS(ON)} < 75 m\Omega$ (V_{GS} = 2.5V)
- $R_{DS(ON)} < 100m\Omega$ (V_{GS} = 1.8V)

P-Ch:

- V_{DS} (V)=-20V
- $R_{DS(ON)} < 75m\Omega$ (V_{GS} = -4.5V)
- $R_{DS(ON)} < 95m\Omega$ (V_{GS} = -2.5V)
- $R_{DS(ON)} < 115m\Omega$ (V_{GS} = -1.8V)



SOT23-6

Absolute Maximum Ratings T_A=25℃ unless otherwise noted

Parameter		Symbol	Max n-channel	Max p-channel	Units
Drain-Source Voltage		V_{DS}	20	-20	V
Gate-Source Voltage		V_{GS}	±8	±8	V
Continuous Drain Current	T_A=25℃	I_D	3.4	-2.5	A
	T_A=70℃		2.5	-2	
Pulsed Drain Current [C]		I_{DM}	13	-13	
Power Dissipation [B]	T_A=25℃	P_D	1.1	1.1	W
	T_A=70℃		0.7	0.7	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150		℃

Thermal Characteristics

Parameter		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	78	110	℃/W
Maximum Junction-to-Ambient [A D]	Steady-State		106	150	℃/W
Maximum Junction-to-Lead	Steady-State	$R_{\theta JL}$	64	80	℃/W

N＋ P Channel MOSFET

N-Channel 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	20			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=20V, V_{GS}=0V			1	μA
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}= ±8V			±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=250μA	0.4	0.7	1	V
$I_{D(ON)}$	On state drain current	V_{GS}=4.5V, V_{DS}=5V	13			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=4.5V, I_D=3.4A		51	65	mΩ
		V_{GS}=2.5V, I_D=3A		58	75	mΩ
		V_{GS}=1.8V, I_D=2A		68	100	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=3.4A		16		S
V_{SD}	Diode Forward Voltage	I_S=1A,V_{GS}=0V		0.7	1	V
I_S	Maximum Body-Diode Continuous Current				1.5	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=10V, f=1MHz	205	260	320	pF
C_{oss}	Output Capacitance		33	48	63	pF
C_{rss}	Reverse Transfer Capacitance		16	27	38	pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz	1.5	3	4.5	Ω
SWITCHING PARAMETERS						
Q_g(4.5V)	Total Gate Charge	V_{GS}=4.5V, V_{DS}=10V, I_D=3.4A		2.9	3.8	nC
Q_{gs}	Gate Source Charge			0.4		nC
Q_{gd}	Gate Drain Charge			0.6		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=5V, V_{DS}=10V, R_L=2.95Ω, R_{GEN}=3Ω		2.5		ns
t_r	Turn-On Rise Time			3.2		ns
$t_{D(off)}$	Turn-Off DelayTime			21		ns
t_f	Turn-Off Fall Time			3		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=3.4A, dI/dt=100A/μs		14	19	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=3.4A, dI/dt=100A/μs		3.8		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.

B. The power dissipation P_D is based on $T_{J(MAX)}$=150° C, using ⩽ 10s junction-to-ambient thermal resistance.

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 initialT_J=25° C.

D. The $R_{\theta JA}$ is the sum of the thermal impedence from junction to lead $R_{\theta JL}$ and lead 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-ambient thermal impedence which is measured with the device mounted on 1in^2 FR-4 board with 2oz. Copper, assuming a maximum junction temperature of $T_{J(MAX)}$=150° C. The SOA curve provides a single pulse rating.

N-Channel: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

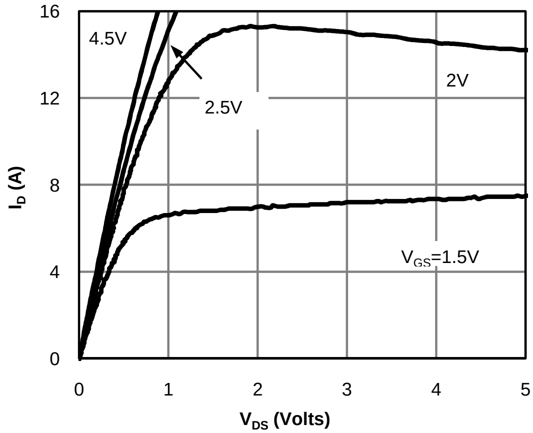


Fig 1: On-Region Characteristics (Note E)

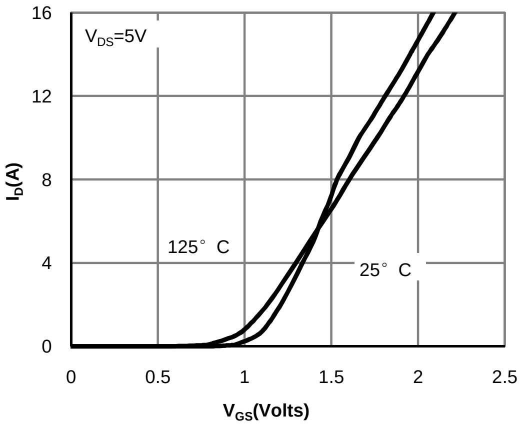


Figure 2: Transfer Characteristics (Note E)

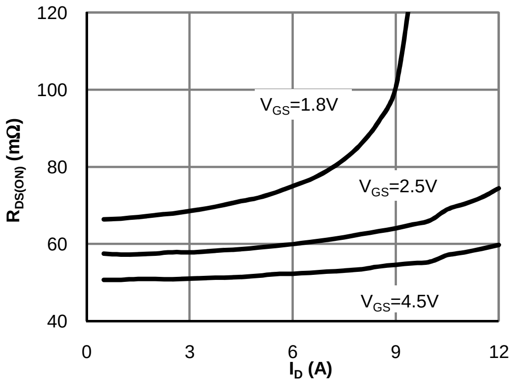


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

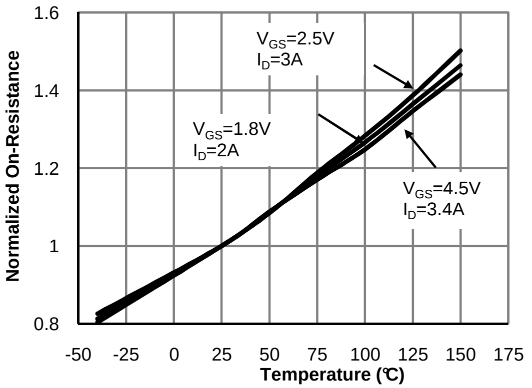


Figure 4: On-Resistance vs. Junction Temperature (Note E)

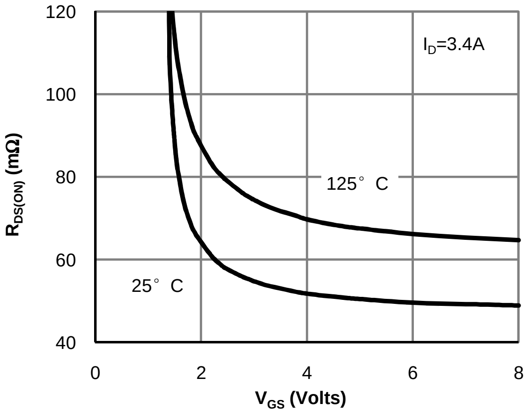


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

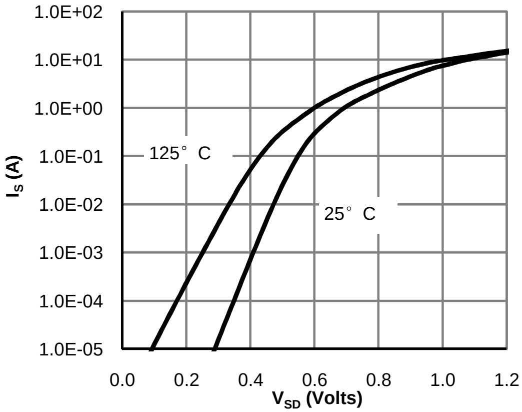


Figure 6: Body-Diode Characteristics (NoteE)

N-Channel: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

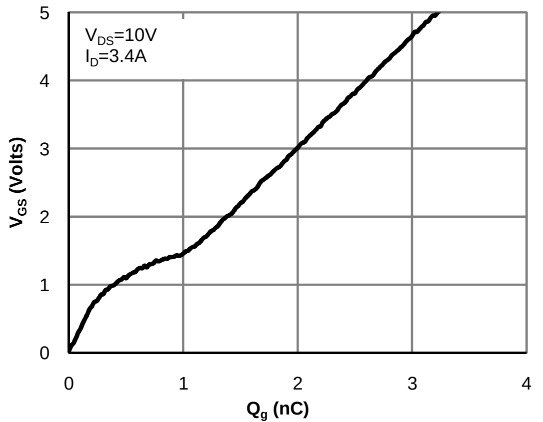


Figure 7: Gate-Charge Characteristics

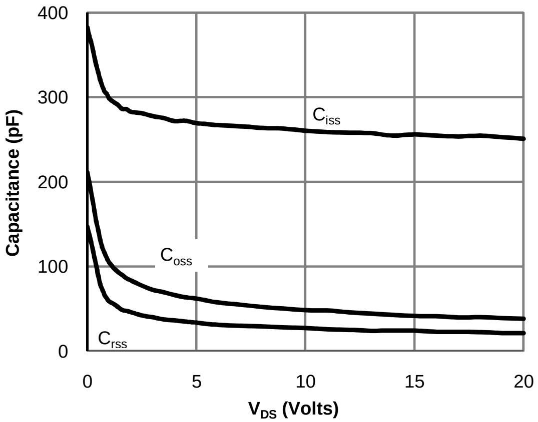


Figure 8: Capacitance Characteristics

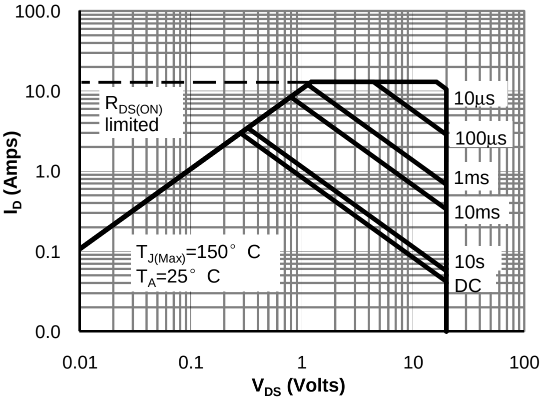


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

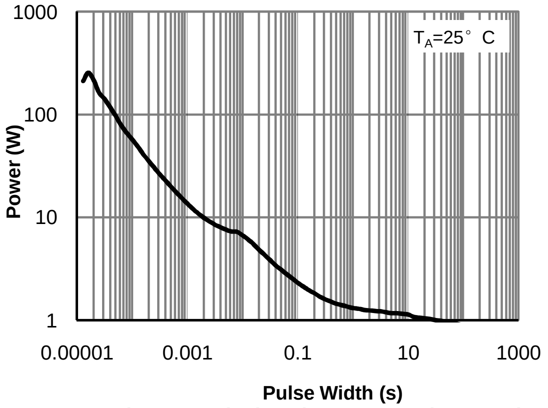


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

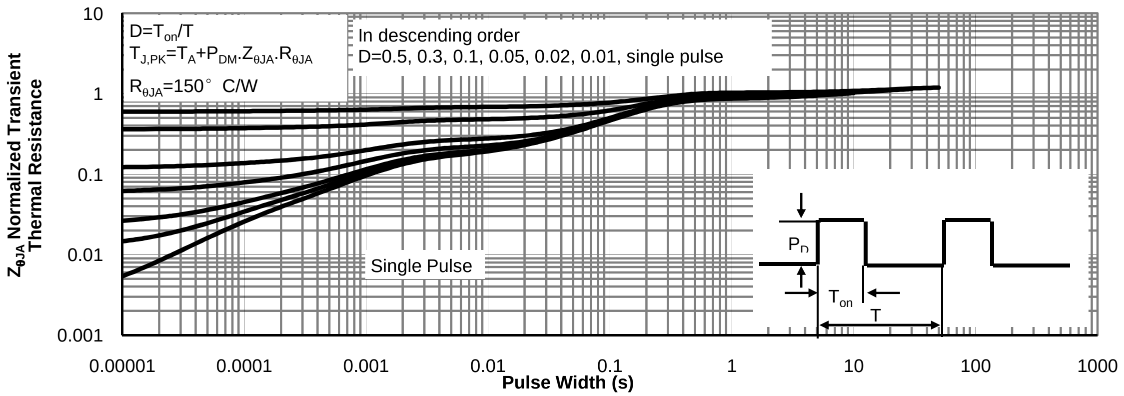
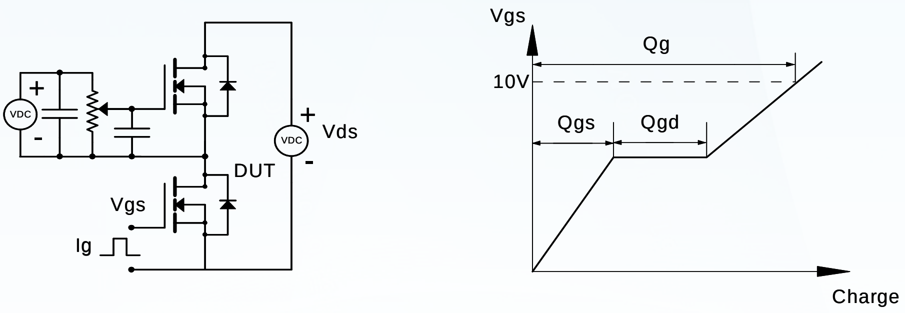
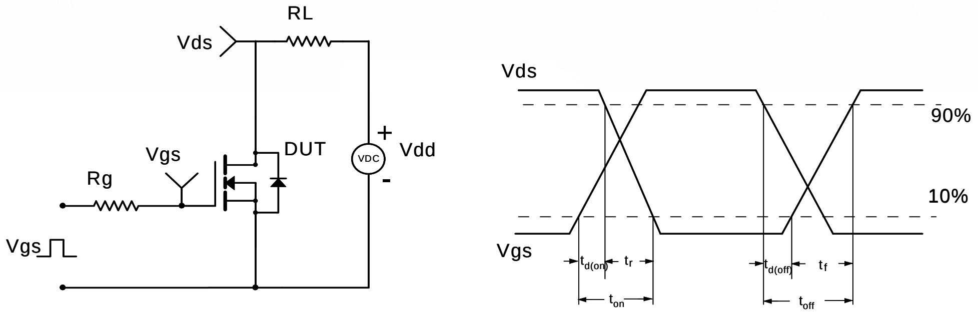


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

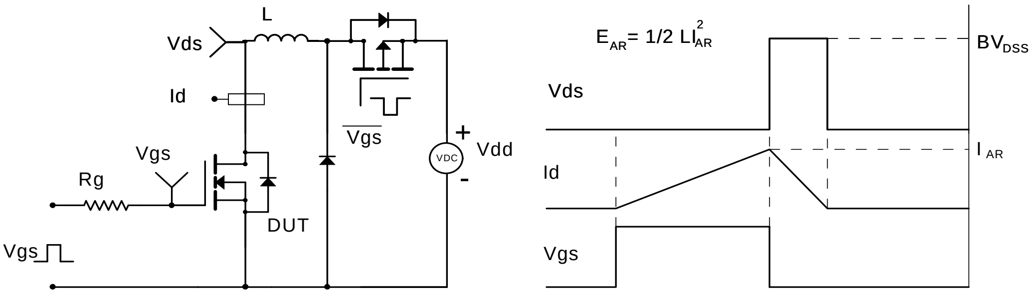
Gate Charge Test Circuit & Waveform



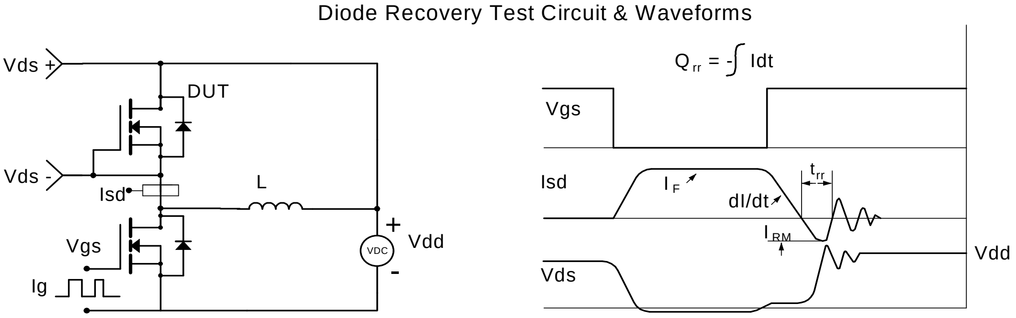
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



P-Channel 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	-20			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=-20V, V_{GS}=0V			-1	µA
		T_J=55℃			-5	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}= ±8V			±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=-250µA	-0.4	-0.65	-1	V
$I_{D(ON)}$	On state drain current	V_{GS}=-4.5V, V_{DS}=-5V	-13			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=-4.5V, I_D=-2.5A		56	75	mΩ
		V_{GS}=-2.5V, I_D=-2A		70	95	mΩ
		V_{GS}=-1.8V, I_D=-1A		85	115	mΩ
g_{FS}	Forward Transconductance	V_{DS}=-5V, I_D=-2.5A		13		S
V_{SD}	Diode Forward Voltage	I_S=-1A,V_{GS}=0V		-0.7	-1	V
I_S	Maximum Body-Diode Continuous Current				-1.5	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=-10V, f=1MHz		560	745	pF
C_{oss}	Output Capacitance			80		pF
C_{rss}	Reverse Transfer Capacitance			70		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		15	23	Ω
SWITCHING PARAMETERS						
Q_g(4.5V)	Total Gate Charge	V_{GS}=-4.5V, V_{DS}=-10V, I_D=-2.5A		8.5	11	nC
Q_{gs}	Gate Source Charge			1.2		nC
Q_{gd}	Gate Drain Charge			2.1		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=-4.5V, V_{DS}=-10V, R_L=4Ω, R_{GEN}=6Ω		7.2		ns
t_r	Turn-On Rise Time			36		ns
$t_{D(off)}$	Turn-Off DelayTime			53		ns
t_f	Turn-Off Fall Time			56		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=-2.5A, dI/dt=100A/µs		37	49	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=-2.5A, dI/dt=100A/µs		27		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.
B. The power dissipation P_D is based on $T_{J(MAX)}$=150° C, using $\leqslant$ 10s junction-to-ambient thermal resistance.
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 initialT_J=25° C.
D. The $R_{\theta JA}$ is the sum of the thermal impedence from junction to lead $R_{\theta JL}$ and lead 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-ambient thermal impedence which is measured with the device mounted on 1in^2 FR-4 board with 2oz. Copper, assuming a maximum junction temperature of $T_{J(MAX)}$=150° C. The SOA curve provides a single pulse rating.

P-Channel: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

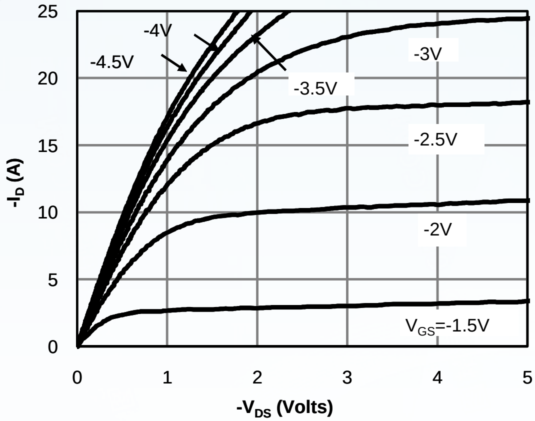


Fig 1: On-Region Characteristics (Note E)

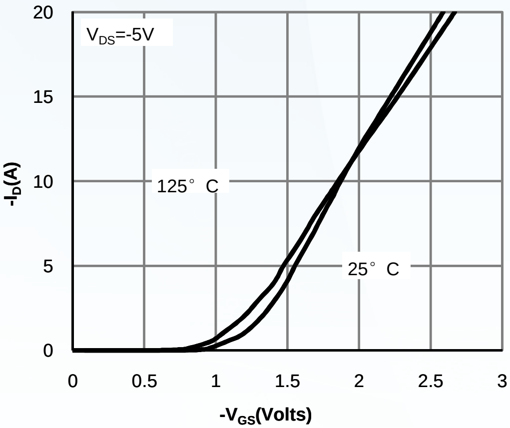


Figure 2: Transfer Characteristics (Note E)

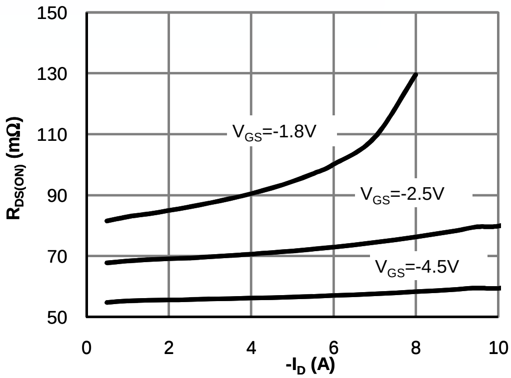
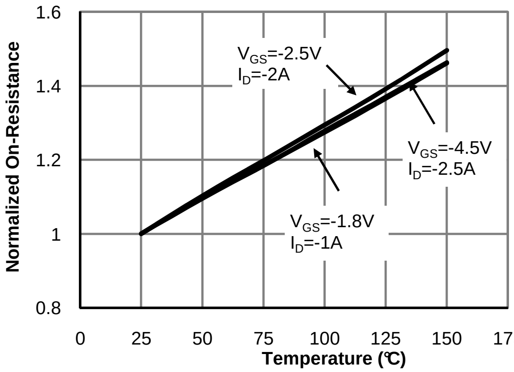


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)



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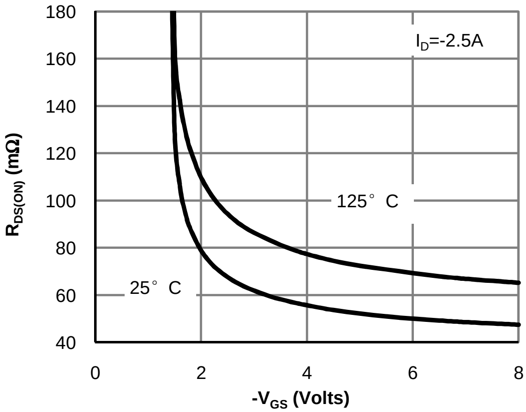


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

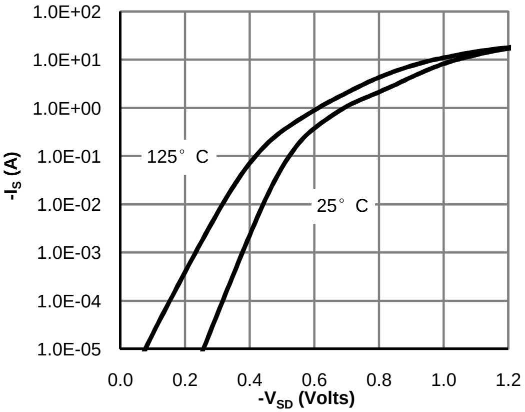


Figure 6: Body-Diode Characteristics (Note E)

P-Channel: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

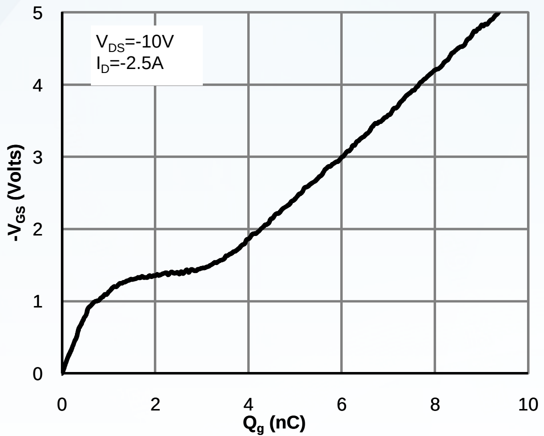


Figure 7: Gate-Charge Characteristics

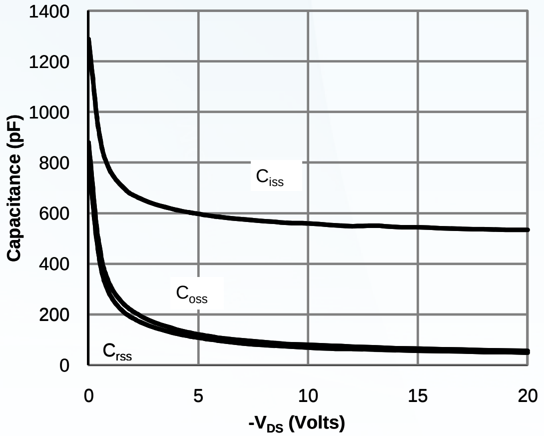


Figure 8: Capacitance Characteristics

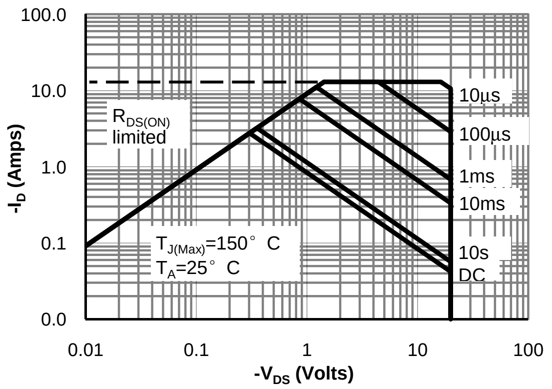


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

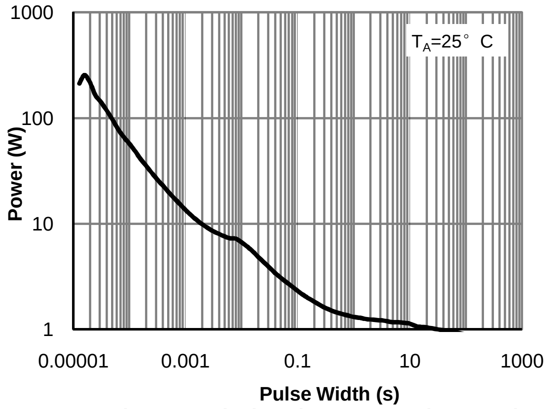


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

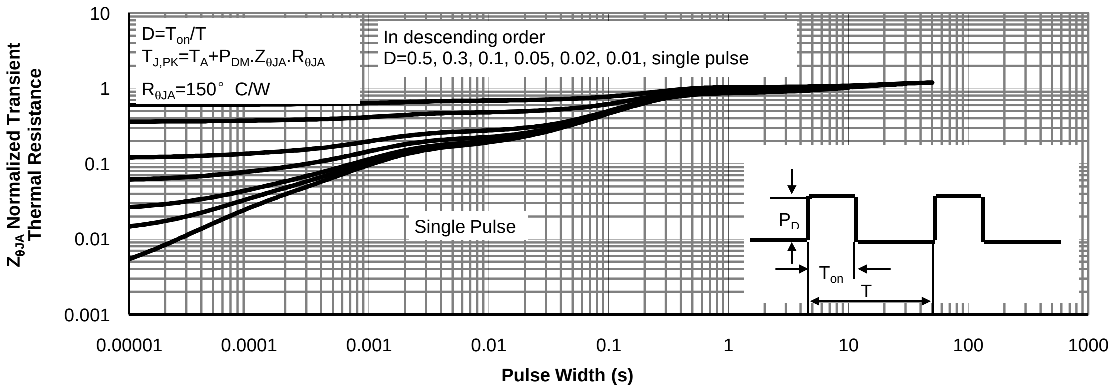
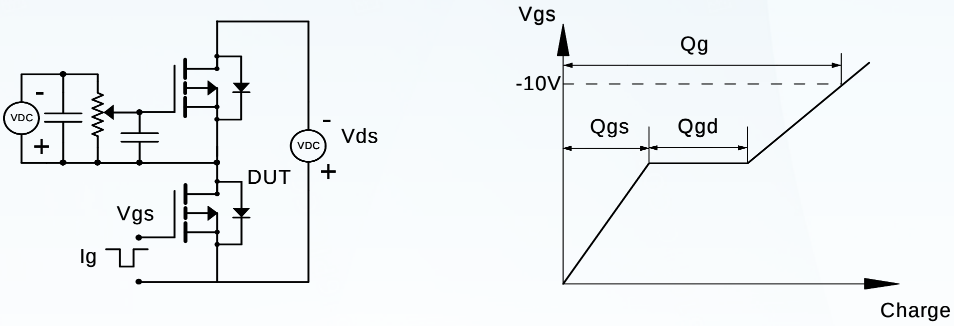
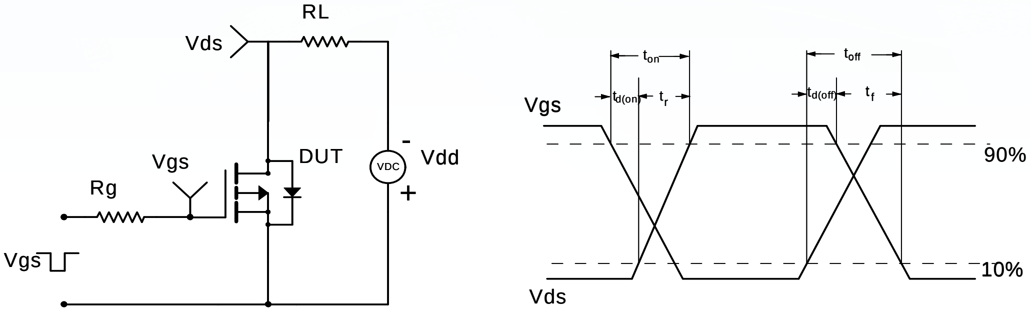


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

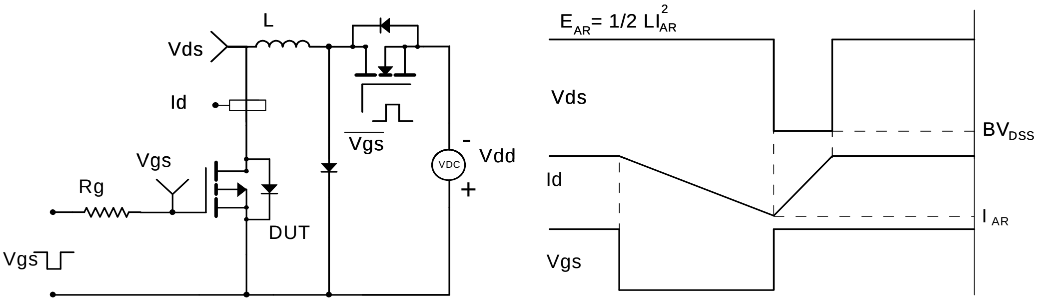
Gate Charge Test Circuit & Waveform



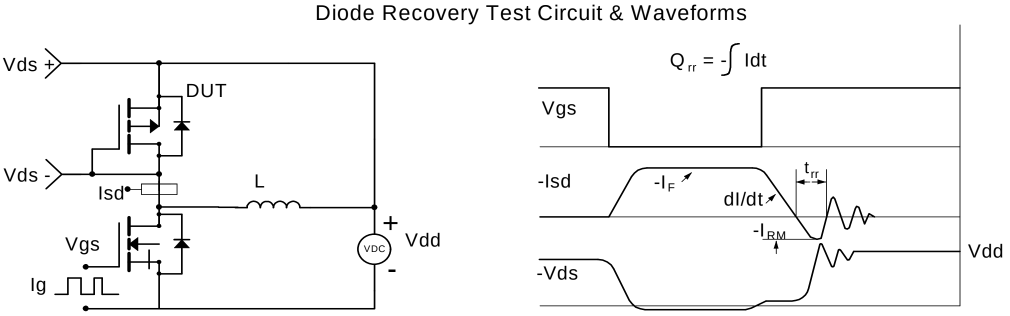
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



N＋ P Channel MOSFET

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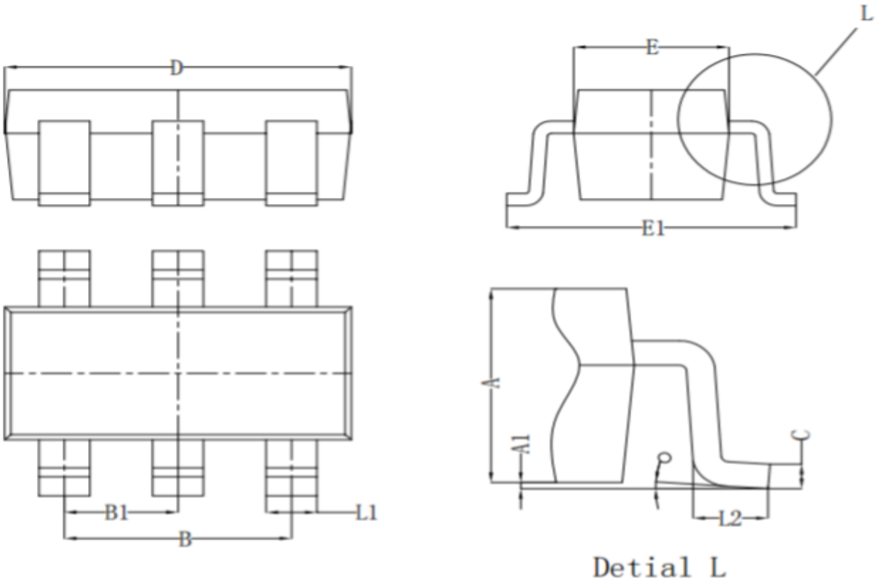
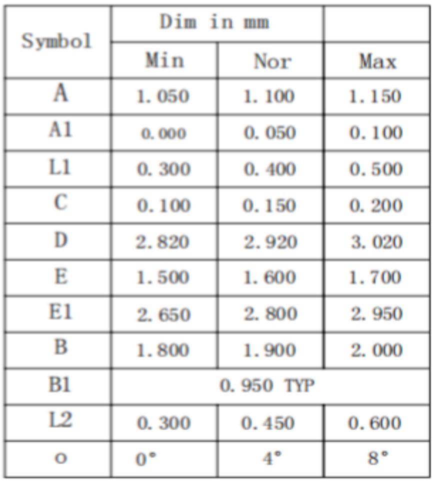
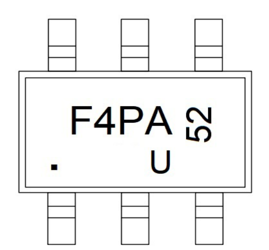




Symbol	Dim in mm		
	Min	Nor	Max
A	1. 050	1. 100	1. 150
A1	0. 000	0. 050	0. 100
L1	0. 300	0. 400	0. 500
C	0. 100	0. 150	0. 200
D	2. 820	2. 920	3. 020
E	1. 500	1. 600	1. 700
E1	2. 650	2. 800	2. 950
B	1. 800	1. 900	2. 000
B1	0. 950 TYP		
L2	0. 300	0. 450	0. 600
o	0°	4°	8°

Marking



Ordering information

Order code	Package	Baseqty	Deliverymode
AO6604	SOT23-6	3000	Tape and reel

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