

General Description

- Trench Power MOSFET technology
- Low $R_{DS(ON)}$
- Low Gate Charge
- RoHS and Halogen-Free Compliant

Applications

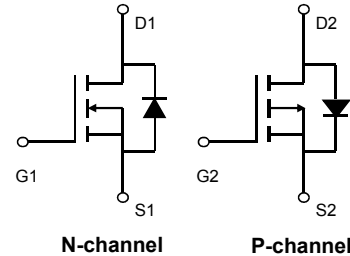
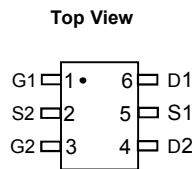
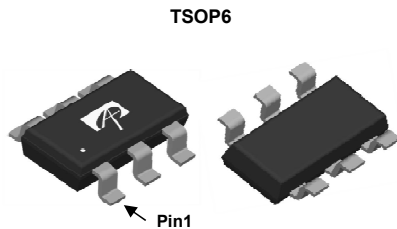
- Complementary MOSFET for DC FAN, Motor

Product Summary
N-Channel

$V_{DS} = 30V$
 $I_D = 3.5A$ ($V_{GS} = 10V$)
 $R_{DS(ON)} < 50m\Omega$ ($V_{GS} = 10V$)
 $< 70m\Omega$ ($V_{GS} = 4.5V$)

P-Channel

$-30V$
 $-2.7A$ ($V_{GS} = -10V$)
 $R_{DS(ON)} < 100m\Omega$ ($V_{GS} = -10V$)
 $< 170m\Omega$ ($V_{GS} = -4.5V$)



Orderable Part Number	Package Type	Form	Minimum Order Quantity
AO6602G	TSOP-6	Tape & Reel	3000

Absolute Maximum Ratings $T_A = 25^\circ C$ unless otherwise noted

Parameter	Symbol	Max N-channel	Max P-channel	Units
Drain-Source Voltage	V_{DS}	30	-30	V
Gate-Source Voltage	V_{GS}	± 20	± 20	V
Continuous Drain Current	$T_A = 25^\circ C$	3.5	-2.7	A
	$T_A = 70^\circ C$	3	-2.1	
Pulsed Drain Current ^C	I_{DM}	20	-15	
Power Dissipation ^B	$T_A = 25^\circ C$	1.15	1.15	W
	$T_A = 70^\circ C$	0.73	0.73	
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150		$^\circ C$

Thermal Characteristics

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	78	110	$^\circ C/W$
Maximum Junction-to-Ambient ^{A,D}		Steady-State	106	150
Maximum Junction-to-Lead	$R_{\theta JL}$	64	80	$^\circ C/W$

N-Channel Electrical Characteristics ($T_J=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV_{DSS}	Drain-Source Breakdown Voltage	$I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$	30			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=30\text{V}$, $V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$			1 5	μA
I_{GSS}	Gate-Body leakage current	$V_{DS}=0\text{V}$, $V_{GS}=\pm 20\text{V}$			± 100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$	1.5	2.0	2.5	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}$, $I_D=3.5\text{A}$ $T_J=125^\circ\text{C}$		42 65	50 78	$\text{m}\Omega$
		$V_{GS}=4.5\text{V}$, $I_D=2\text{A}$		56	70	
		$V_{GS}=10\text{V}$, $I_D=3.5\text{A}$		12		S
V_{SD}	Diode Forward Voltage	$I_S=1\text{A}$, $V_{GS}=0\text{V}$		0.79	1	V
I_S	Maximum Body-Diode Continuous Current				1.5	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=15\text{V}$, $f=1\text{MHz}$		210		pF
C_{oss}	Output Capacitance			35		pF
C_{riss}	Reverse Transfer Capacitance			23		pF
R_g	Gate resistance	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$		1.5		Ω
SWITCHING PARAMETERS						
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS}=10\text{V}$, $V_{DS}=15\text{V}$, $I_D=3.5\text{A}$		4.05		nC
$Q_g(4.5\text{V})$	Total Gate Charge			2		nC
Q_{gs}	Gate Source Charge			0.55		nC
Q_{gd}	Gate Drain Charge			1		nC
$t_{D(on)}$	Turn-On DelayTime	$V_{GS}=10\text{V}$, $V_{DS}=15\text{V}$, $R_L=4.2\Omega$, $R_{GEN}=3\Omega$		4.5		ns
t_r	Turn-On Rise Time			1.5		ns
$t_{D(off)}$	Turn-Off DelayTime			18.5		ns
t_f	Turn-Off Fall Time			1.5		ns
t_{rr}	Body Diode Reverse Recovery Time		$I_F=3.5\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		7.5	
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=3.5\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		2.5		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 $T_A=25^\circ\text{C}$. The value in any given application depends on the user's specific board design.

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

C. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}=150^\circ\text{C}$. Ratings are based on low frequency and duty cycles to keep initial $T_J=25^\circ\text{C}$.

D. The $R_{\theta JA}$ is the sum of the thermal impedance from junction to lead $R_{\theta JL}$ and lead to ambient.

E. The static characteristics in Figures 1 to 6 are obtained using $<300\mu\text{s}$ pulses, duty cycle 0.5% max.

F. These curves are based on the junction-to-ambient thermal impedance which is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, assuming a maximum junction temperature of $T_{J(MAX)}=150^\circ\text{C}$. The SOA curve provides a single pulse rating.

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N-Channel: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

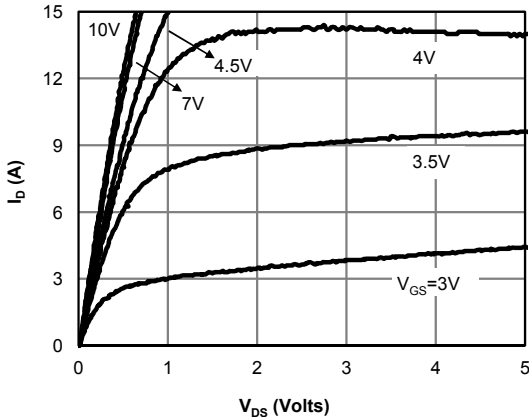


Fig 1: On-Region Characteristics (Note E)

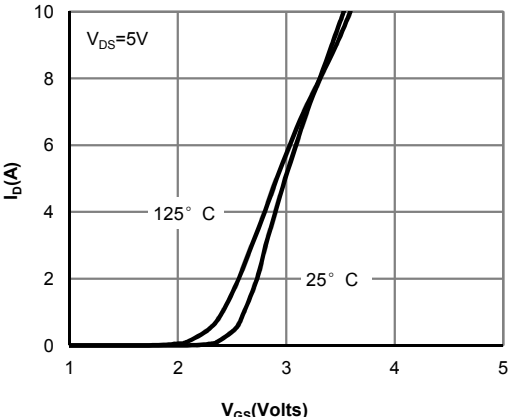


Figure 2: Transfer Characteristics (Note E)

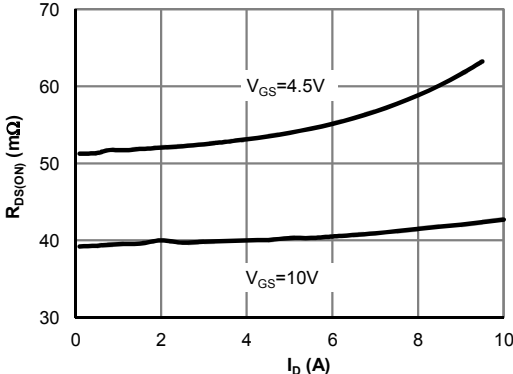


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

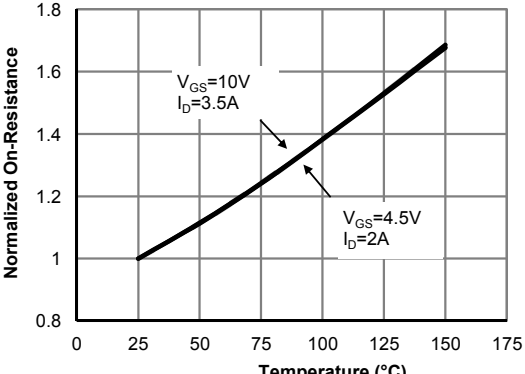


Figure 4: On-Resistance vs. Junction Temperature (Note E)

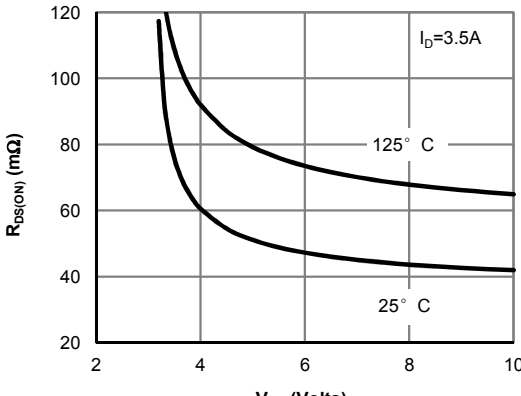


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

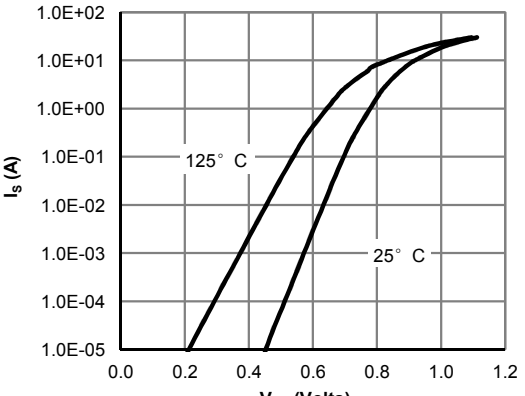


Figure 6: Body-Diode Characteristics (Note E)

N-Channel: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

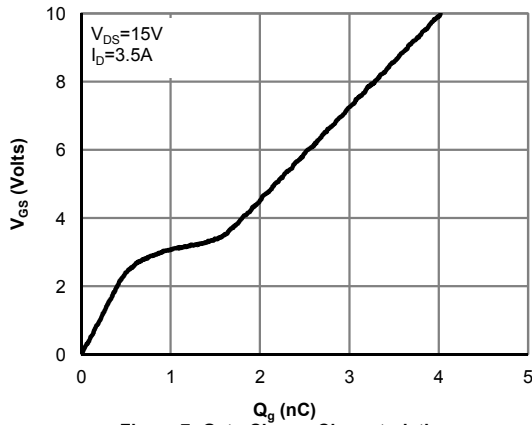


Figure 7: Gate-Charge Characteristics

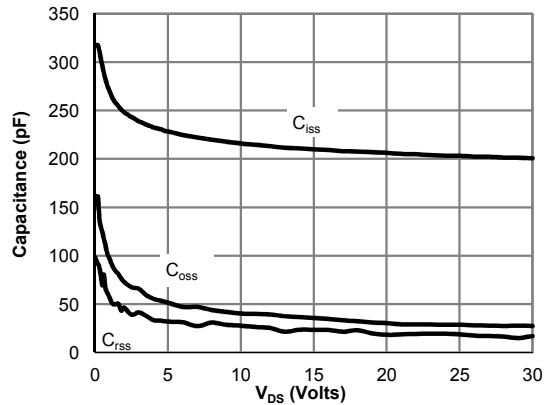


Figure 8: Capacitance Characteristics

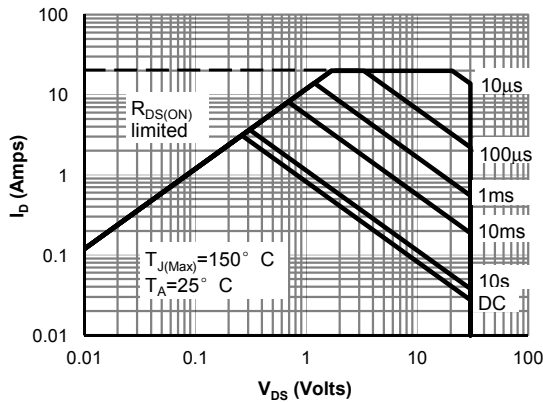


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

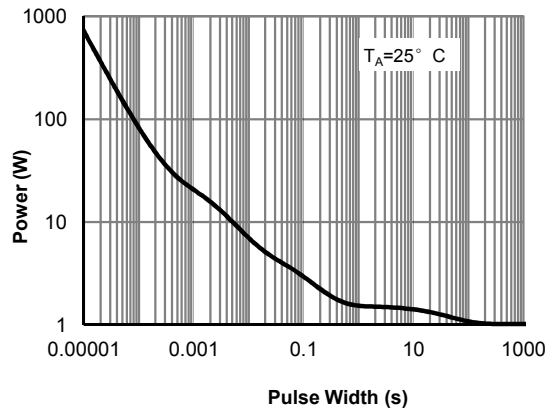


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

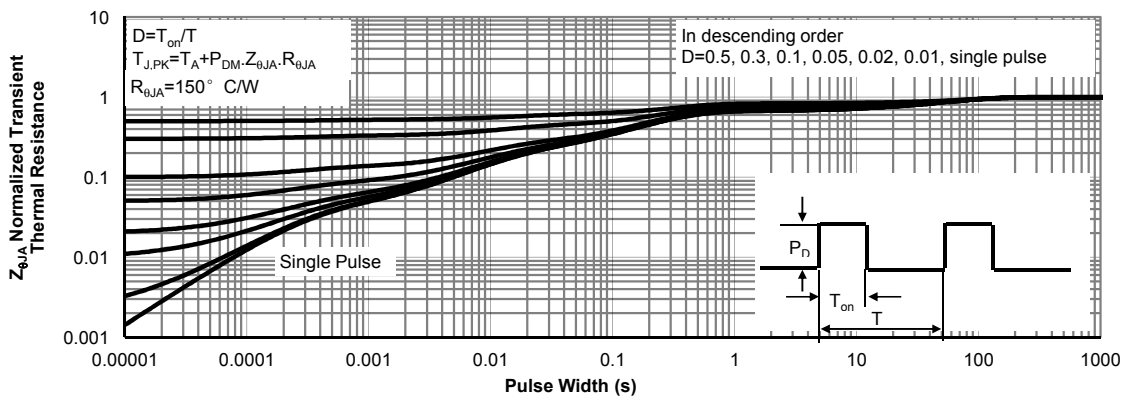
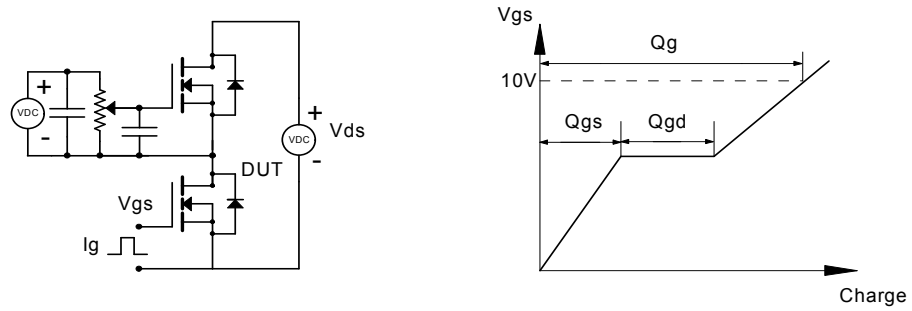
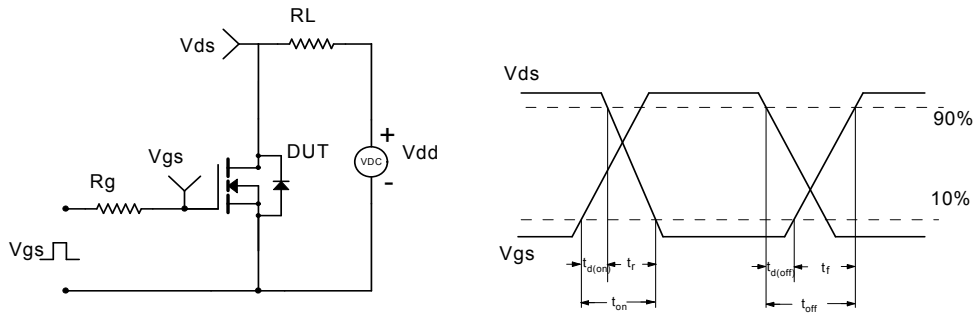


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

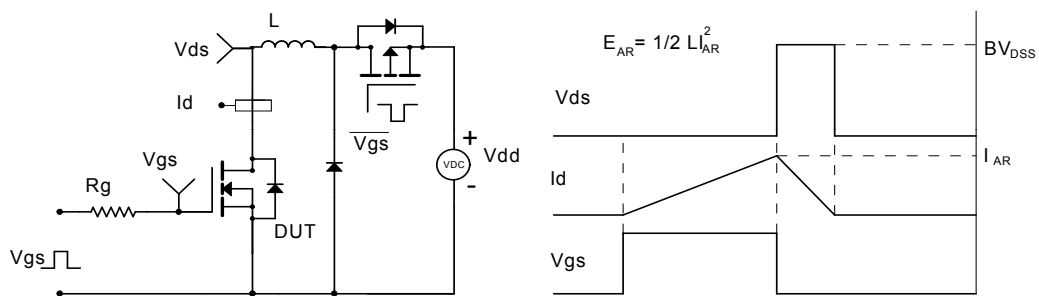
Gate Charge Test Circuit & Waveform



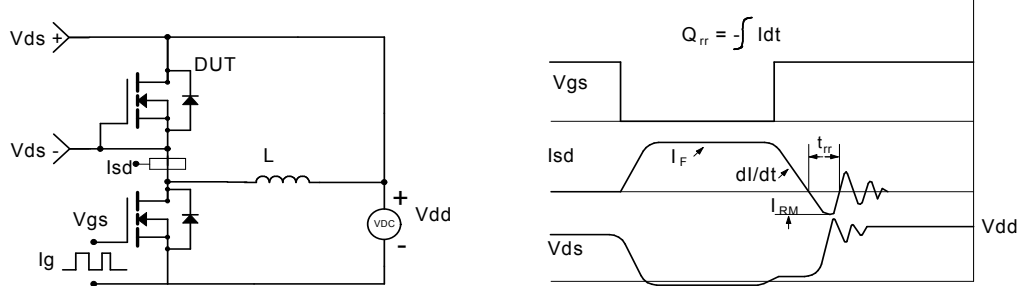
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



P-Channel Electrical Characteristics (T_J=25°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	-1.4	-1.9	-2.4	V
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} =-10V, I _D =-2.7A T _J =125°C		82	100	mΩ
		V _{GS} =-4.5V, I _D =-2A		115	140	
					130	170
g _{FS}	Forward Transconductance	V _{DS} =-5V, I _D =-2.7A		5.5		S
V _{SD}	Diode Forward Voltage	I _S =-1A, V _{GS} =0V		-0.8	-1	V
I _S	Maximum Body-Diode Continuous Current				-1.5	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =-15V, f=1MHz		210		pF
C _{oss}	Output Capacitance			42		pF
C _{riss}	Reverse Transfer Capacitance			26		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz		5.3		Ω
SWITCHING PARAMETERS						
Q _{g(10V)}	Total Gate Charge	V _{GS} =10V, V _{DS} =-15V, I _D =2.7A		4.3		nC
Q _{g(4.5V)}	Total Gate Charge			2.2		nC
Q _{gs}	Gate Source Charge			0.7		nC
Q _{gd}	Gate Drain Charge			1.1		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =10V, V _{DS} =-15V, R _L =5.55Ω, R _{GEN} =3Ω		7.5		ns
t _r	Turn-On Rise Time			4.1		ns
t _{D(off)}	Turn-Off DelayTime			11.8		ns
t _f	Turn-Off Fall Time			3.8		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =-2.7A, dI/dt=100A/μs		11.3		ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =-2.7A, dI/dt=100A/μs		4.4		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.

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 initial T_J=25° C.

D. The R_{θJA} is the sum of the thermal impedance from junction to lead R_{θJL} 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 impedance which is measured with the device mounted on 1in² 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.

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P-Channel: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

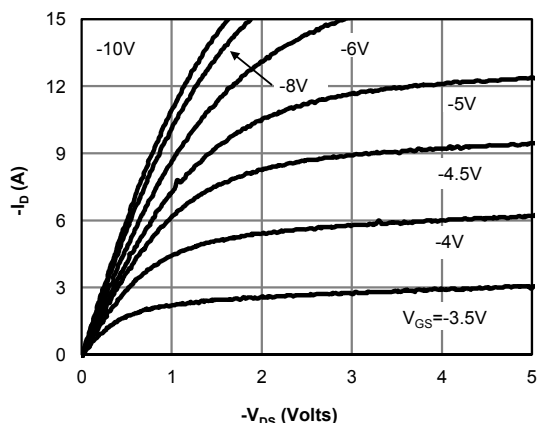


Fig 1: On-Region Characteristics (Note E)

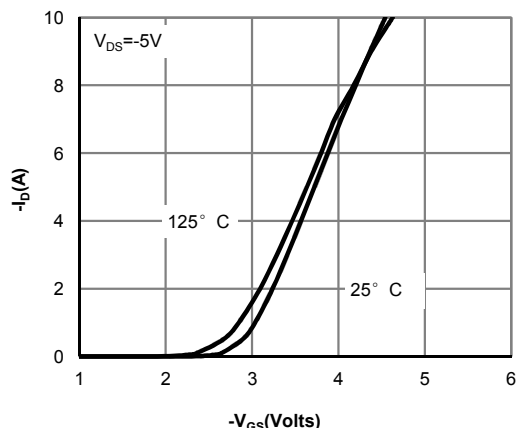


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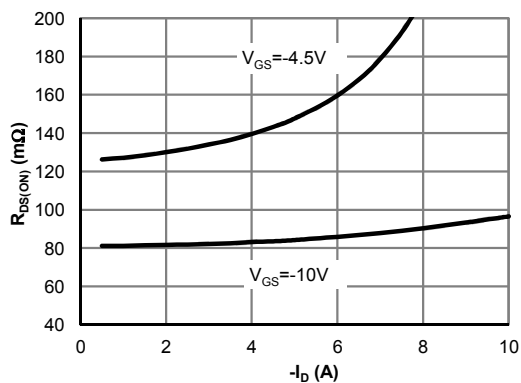


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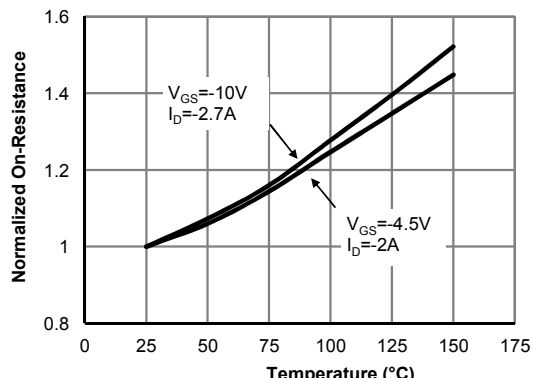


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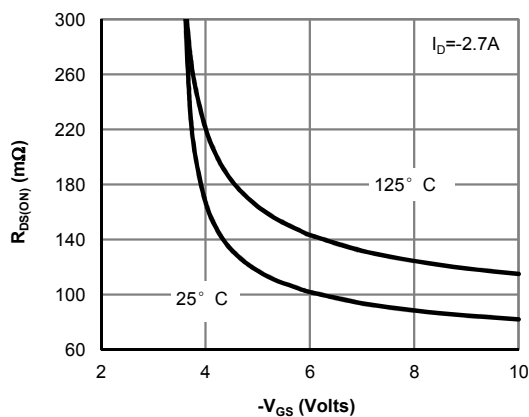


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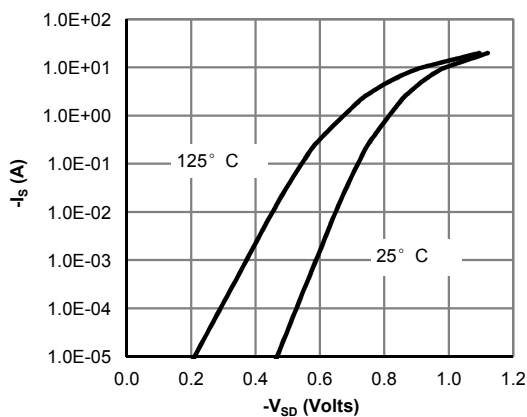


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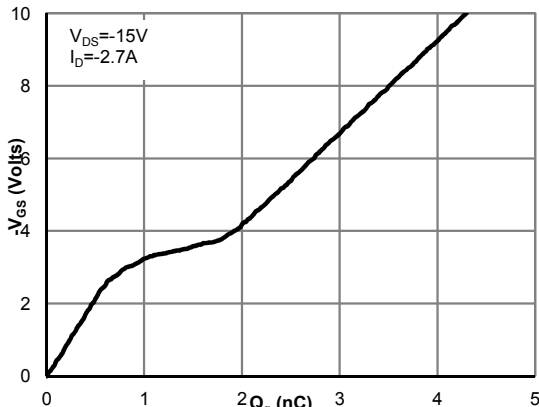


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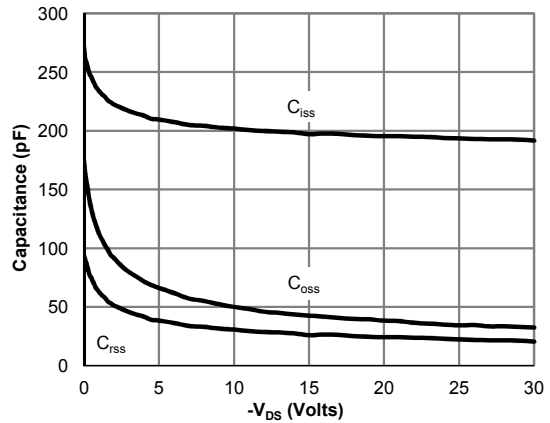


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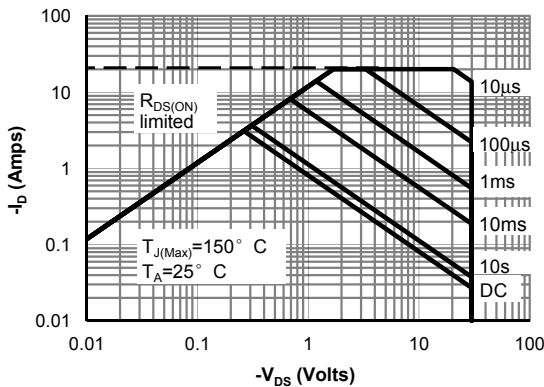


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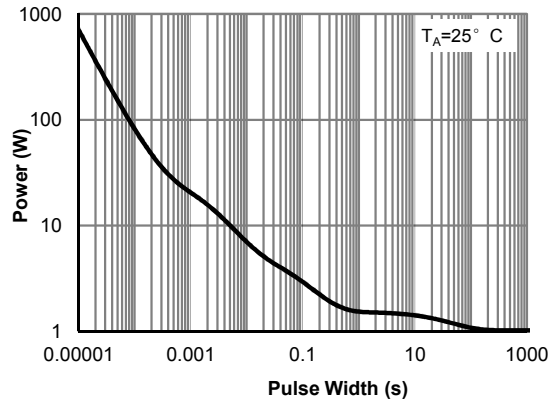


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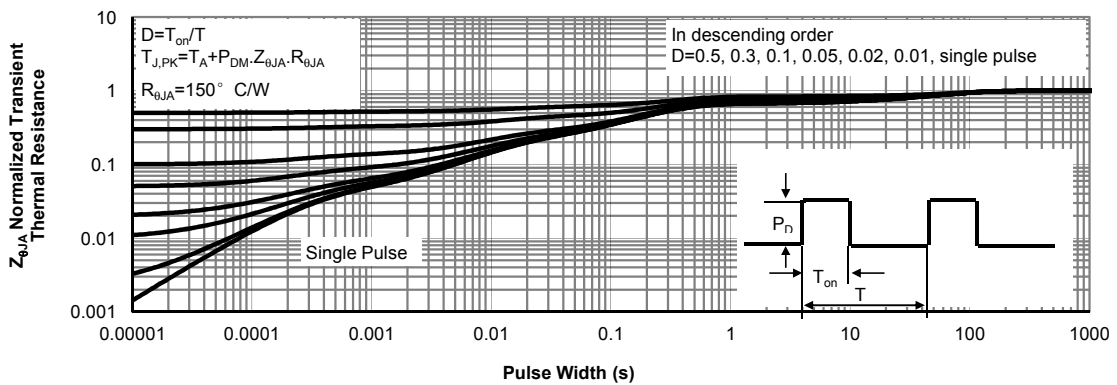
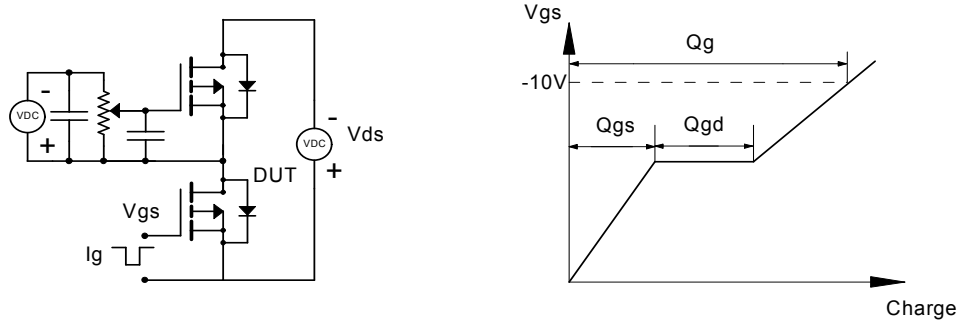
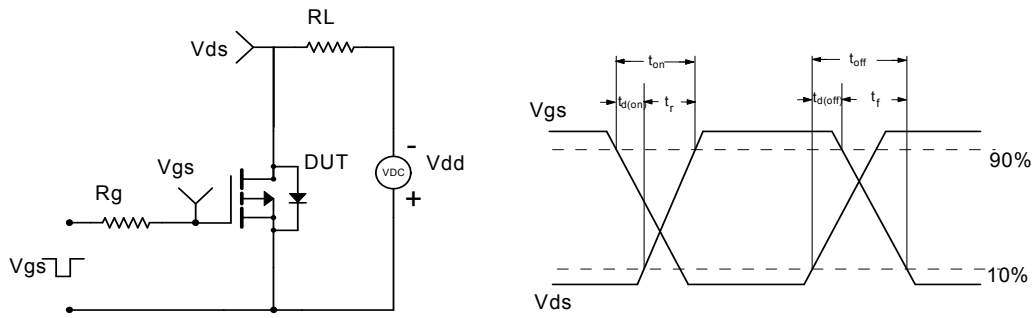


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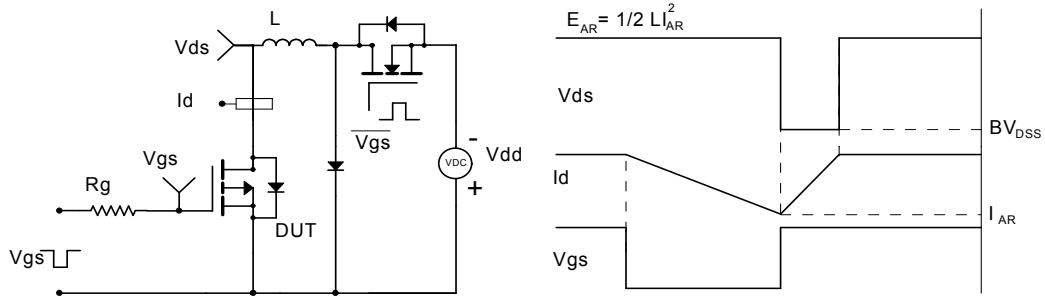
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

