



THE DATASHEET OF
AO4728



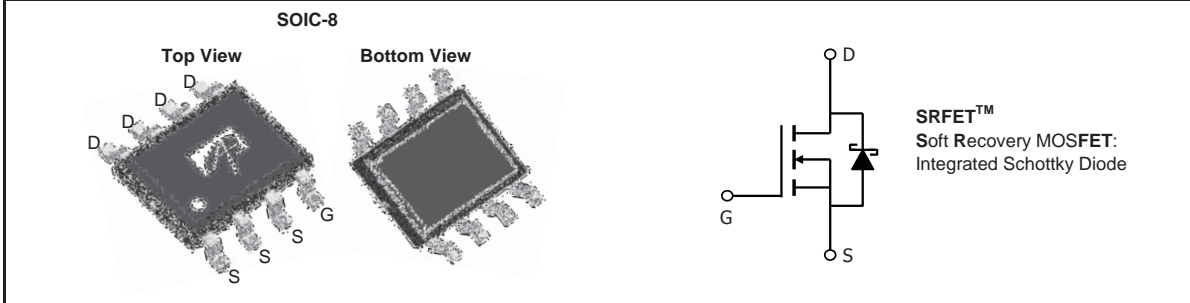
General Description

SRFET™ AO4728 uses advanced trench technology with a monolithically integrated Schottky diode to provide excellent $R_{DS(ON)}$, and low gate charge. This device is ideally suited for use as a low side switch in CPU core power conversion.

Product Summary

V_{DS} (V) = 30V
 I_D = 20A (V_{GS} = 10V)
 $R_{DS(ON)}$ < 4.3m Ω (V_{GS} = 10V)
 $R_{DS(ON)}$ < 6m Ω (V_{GS} = 4.5V)

100% UIS Tested
 100% Rg Tested



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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	30	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current	I_D	$T_C=25^\circ\text{C}$	20
		$T_C=70^\circ\text{C}$	17
Pulsed Drain Current ^C	I_{DM}	146	A
Avalanche Current ^C	I_{AR}	40	A
Repetitive avalanche energy $L=0.1\text{mH}$ ^C	E_{AR}	80	mJ
Power Dissipation ^B	P_D	$T_C=25^\circ\text{C}$	3.1
		$T_C=70^\circ\text{C}$	2
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	$^\circ\text{C}$

Thermal Characteristics

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	$t \leq 10\text{s}$	31	$^\circ\text{C}/\text{W}$
Maximum Junction-to-Ambient ^{A,D}		Steady-State	59	$^\circ\text{C}/\text{W}$
Maximum Junction-to-Lead	$R_{\theta JL}$	16	24	$^\circ\text{C}/\text{W}$

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 =125°C			0.1 20	mA
I _{GSS}	Gate-Body leakage current	V _{DS} =0V, V _{GS} = ±20V			0.1	μA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} I _D =250μA	1.2	1.8	2.2	V
I _{D(ON)}	On state drain current	V _{GS} =10V, V _{DS} =5V	146			A
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =20A T _J =125°C		3.6 5.5	4.3 6.6	mΩ
		V _{GS} =4.5V, I _D =18A		4.8	6	mΩ
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =20A		87		S
V _{SD}	Diode Forward Voltage	I _S =1A, V _{GS} =0V		0.4	0.7	V
I _S	Maximum Body-Diode Continuous Current				6	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =15V, f=1MHz	2975	3719	4463	pF
C _{oss}	Output Capacitance		485	693	900	pF
C _{rss}	Reverse Transfer Capacitance		204	340	476	pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz	0.28	0.56	0.84	Ω
SWITCHING PARAMETERS						
Q _g (10V)	Total Gate Charge	V _{GS} =10V, V _{DS} =15V, I _D =20A	48	60	72	nC
Q _g (4.5V)	Total Gate Charge		20	25	30	nC
Q _{gs}	Gate Source Charge		12	15	18	nC
Q _{gd}	Gate Drain Charge		6	10	14	nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =10V, V _{DS} =15V, R _L =0.75Ω, R _{GEN} =3Ω		9.2		ns
t _r	Turn-On Rise Time			10.7		ns
t _{D(off)}	Turn-Off DelayTime			40		ns
t _f	Turn-Off Fall Time			12.5		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =20A, di/dt=500A/μs	10	13	16	ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =20A, di/dt=500A/μs	21	26.5	32	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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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

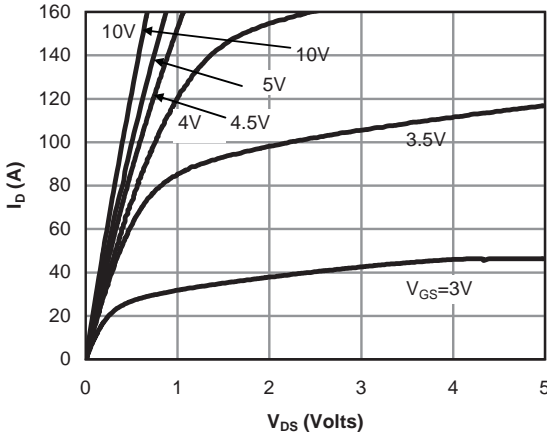


Fig 1: On-Region Characteristics (Note E)

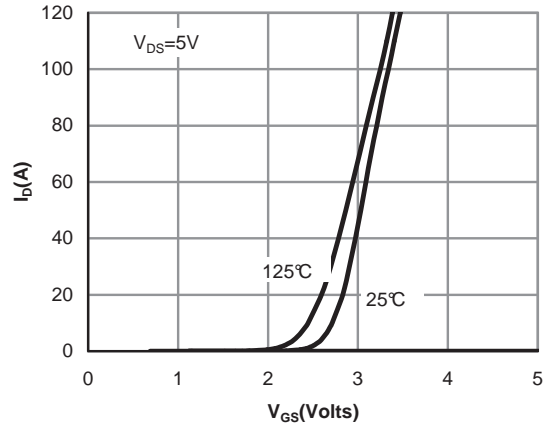


Figure 2: Transfer Characteristics (Note E)

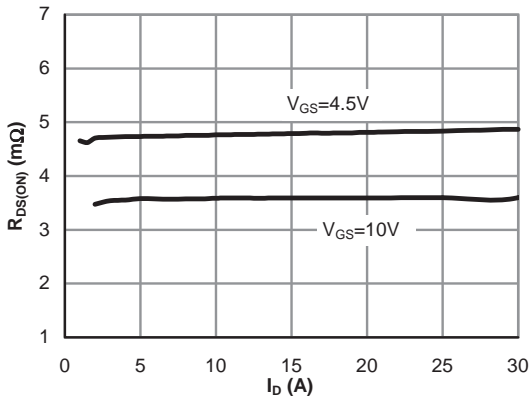


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

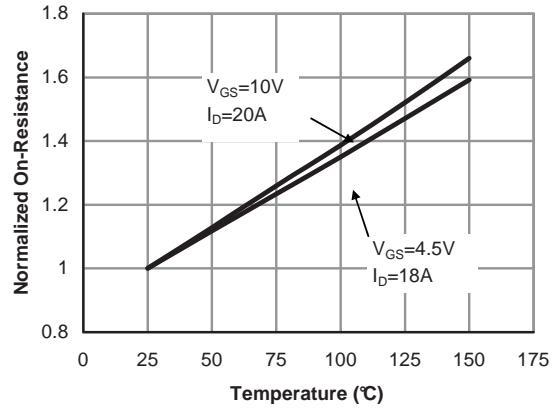


Figure 4: On-Resistance vs. Junction Temperature (Note E)

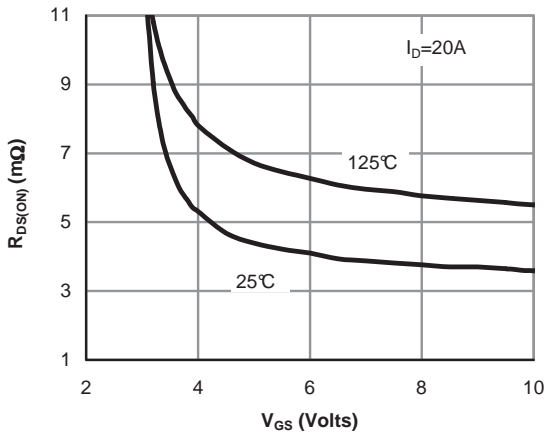


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

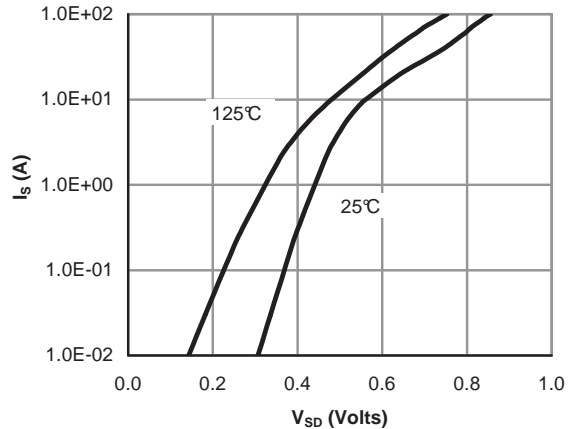


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

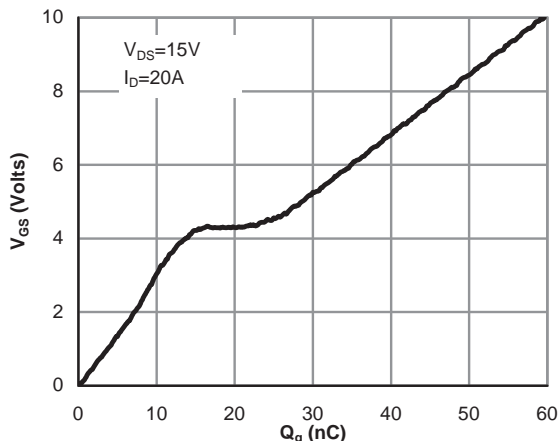


Figure 7: Gate-Charge Characteristics

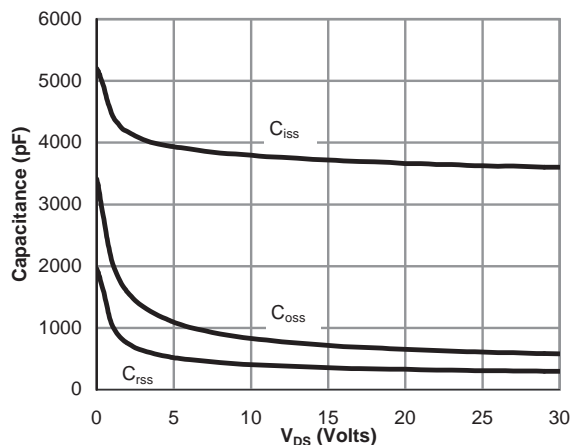


Figure 8: Capacitance Characteristics

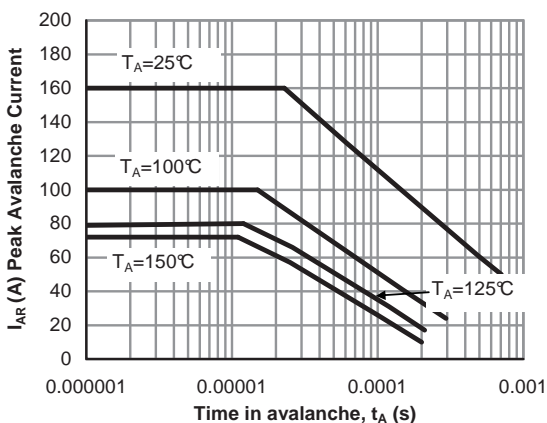


Figure 9: Single Pulse Avalanche capability (Note C)

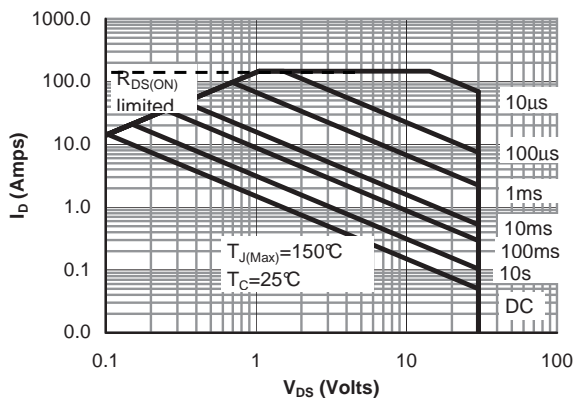


Figure 10: Maximum Forward Biased Safe Operating Area (Note F)

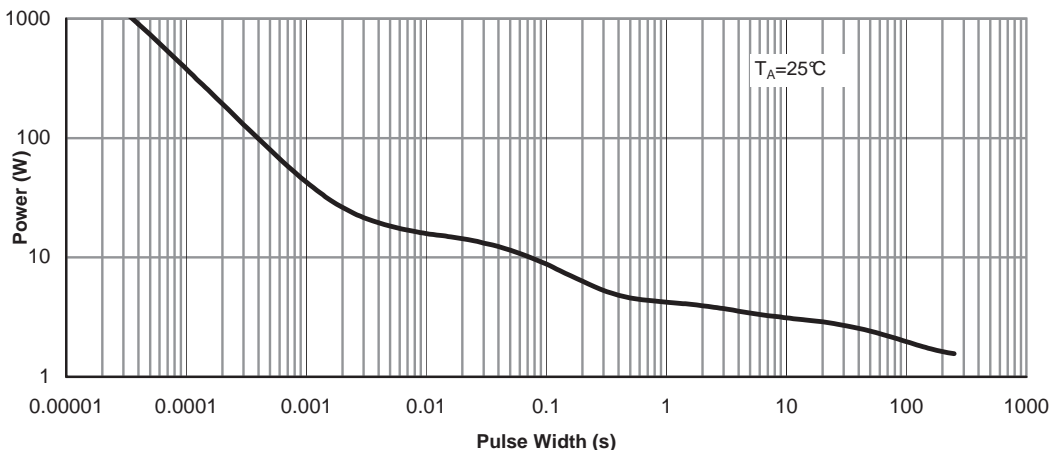


Figure 11: Single Pulse Power Rating Junction-to-Ambient (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

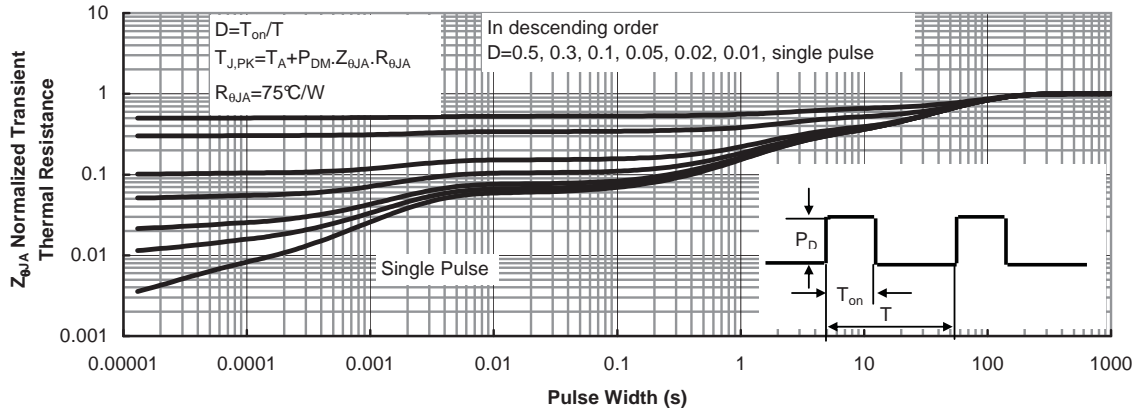


Figure 12: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

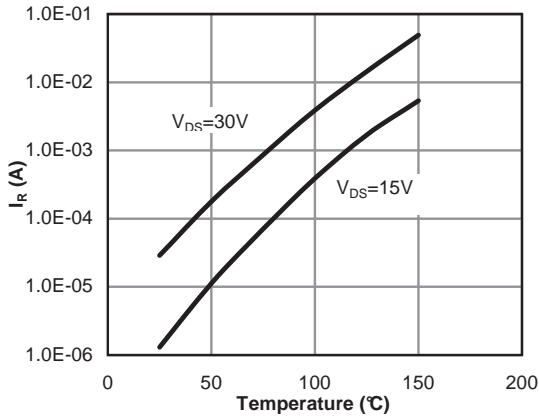


Figure 13: Diode Reverse Leakage Current vs. Junction Temperature

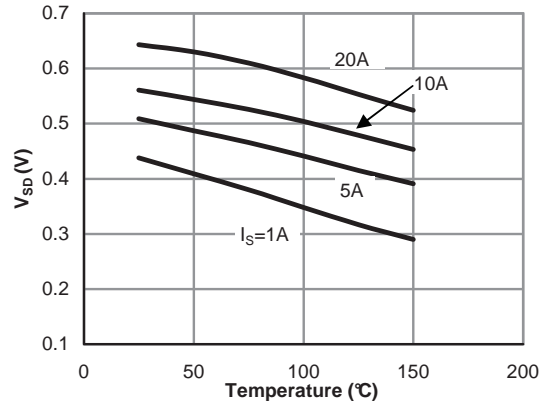


Figure 14: Diode Forward Voltage vs. Junction Temperature

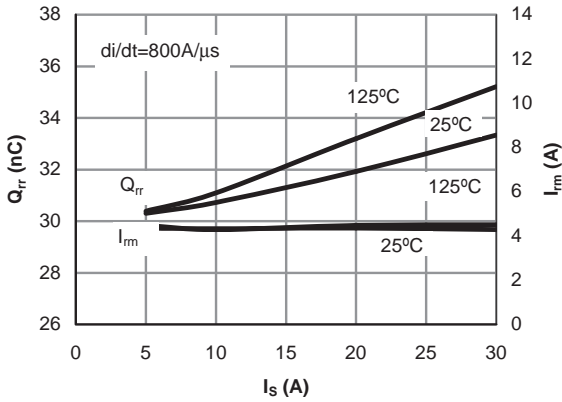


Figure 15: Diode Reverse Recovery Charge and Peak Current vs. Conduction Current

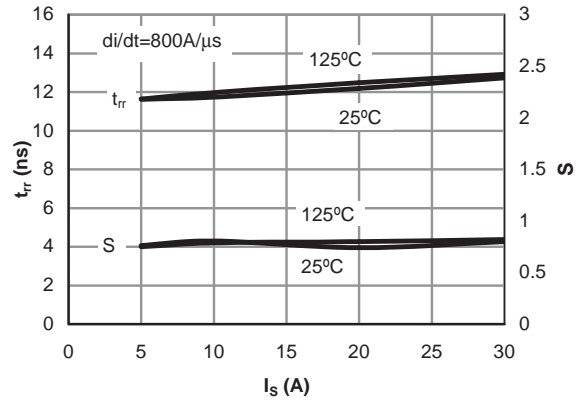


Figure 16: Diode Reverse Recovery Time and Softness Factor vs. Conduction Current

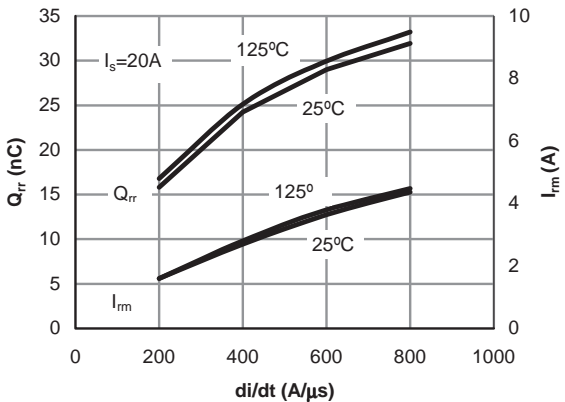


Figure 17: Diode Reverse Recovery Charge and Peak Current vs. di/dt

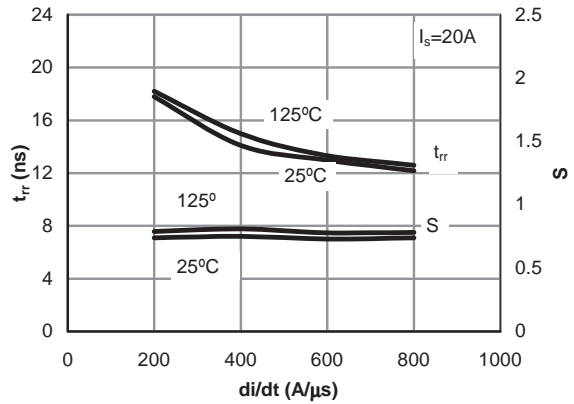
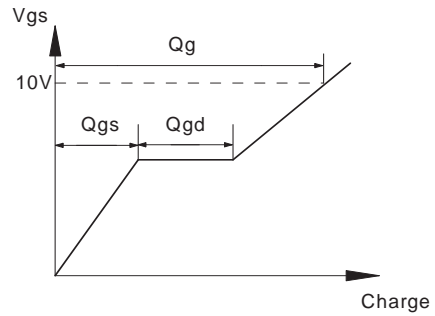
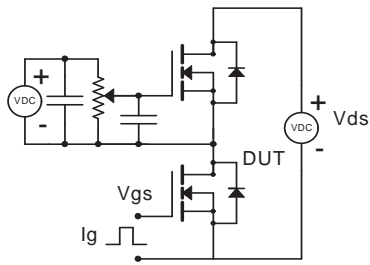
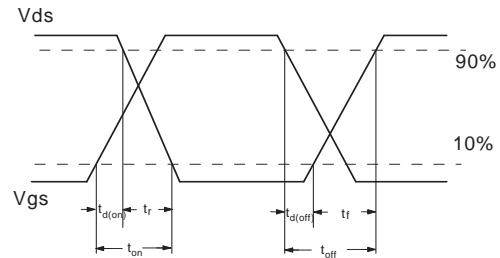
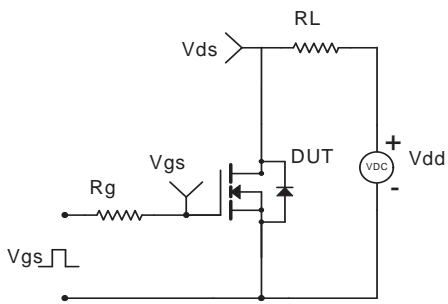


Figure 18: Diode Reverse Recovery Time and Softness Factor vs. di/dt

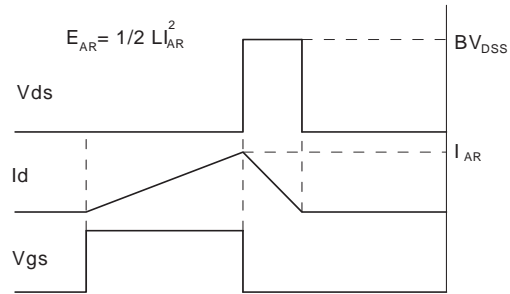
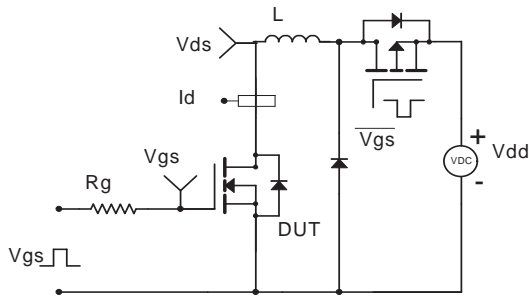
Gate Charge Test Circuit & Waveform



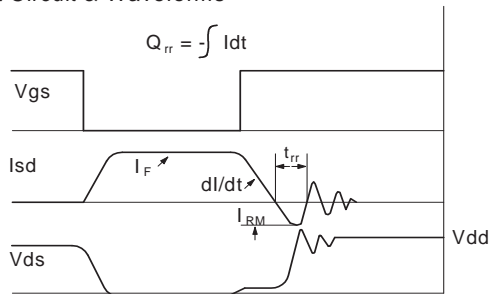
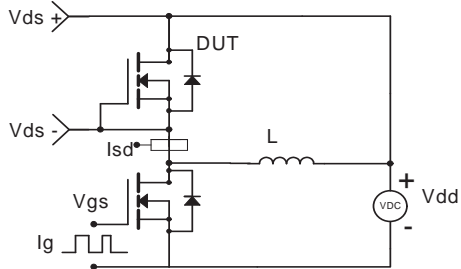
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



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