



THE DATASHEET OF AO4456



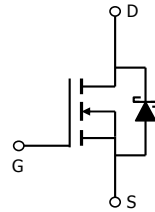
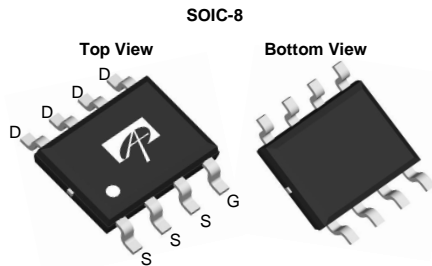
General Description

SRFET™ AO4456 uses advanced trench technology with a monolithically integrated Schottky diode to provide excellent $R_{DS(ON)}$, and low gate charge. This device is suitable for use as a low side FET in SMPS, load switching and general purpose applications.

Product Summary

V_{DS}	30V
I_D (at $V_{GS}=10V$)	20A
$R_{DS(ON)}$ (at $V_{GS}=10V$)	< 4.6m Ω
$R_{DS(ON)}$ (at $V_{GS} = 4.5V$)	< 5.6m Ω

100% UIS Tested
 100% R_g Tested



SRFET™
 Soft Recovery MOSFET:
 Integrated Schottky Diode

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}	± 12	V
Continuous Drain Current ^G	I_D	$T_C=25^\circ\text{C}$	20
		$T_C=70^\circ\text{C}$	16
Pulsed Drain Current ^C	I_{DM}	120	A
Avalanche Current ^C	I_{AS}, I_{AR}	47	A
Avalanche energy $L=0.1\text{mH}$ ^C	E_{AS}, E_{AR}	110	mJ
Power Dissipation ^B	P_D	$T_C=25^\circ\text{C}$	3.1
		$T_C=70^\circ\text{C}$	2.0
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	$R_{\theta JA}$	31	40	$^\circ\text{C/W}$
Maximum Junction-to-Ambient ^{A D}		Steady-State	59	75
Maximum Junction-to-Lead	$R_{\theta JL}$	16	24	$^\circ\text{C/W}$

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} = ±12V			100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} I _D =250μA	1.2	1.8	2.4	V
I _{D(ON)}	On state drain current	V _{GS} =10V, V _{DS} =5V	120			A
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =20A T _J =125°C		3.8 5.9	4.6 7.4	mΩ
		V _{GS} =4.5V, I _D =18A		4.5	5.6	mΩ
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =20A		112		S
V _{SD}	Diode Forward Voltage	I _S =1A, V _{GS} =0V		0.5	0.7	V
I _S	Maximum Body-Diode Continuous Current				5	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =15V, f=1MHz		4320	5185	pF
C _{oss}	Output Capacitance			570		pF
C _{rss}	Reverse Transfer Capacitance			310	493	pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz	0.2	0.5	0.9	Ω
SWITCHING PARAMETERS						
Q _{g(10V)}	Total Gate Charge	V _{GS} =10V, V _{DS} =15V, I _D =20A	60	77	95	nC
Q _{g(4.5V)}	Total Gate Charge		30	44	42	nC
Q _{gs}	Gate Source Charge			9.8		nC
Q _{gd}	Gate Drain Charge			16		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =10V, V _{DS} =15V, R _L =0.75Ω, R _{GEN} =3Ω		11		ns
t _r	Turn-On Rise Time			10		ns
t _{D(off)}	Turn-Off DelayTime			46		ns
t _f	Turn-Off Fall Time			9.5		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =20A, dI/dt=500A/μs		12	15	ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =20A, dI/dt=500A/μs		20		nC

A. The value of R_{qJA} 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 PD 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_{qJA} is the sum of the thermal impedance from junction to lead R_{qJL} and lead to ambient.

E. The static characteristics in Figures 1 to 6 are obtained using <300ms 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

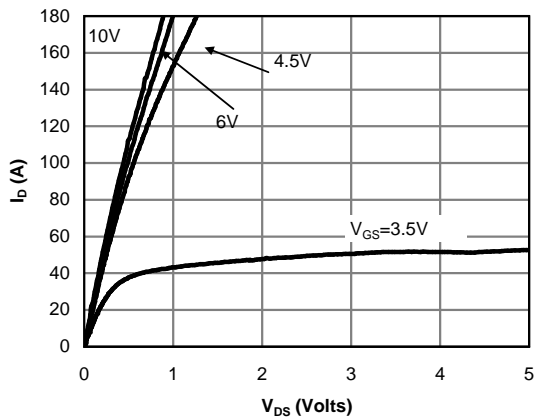


Fig 1: On-Region Characteristics (Note E)

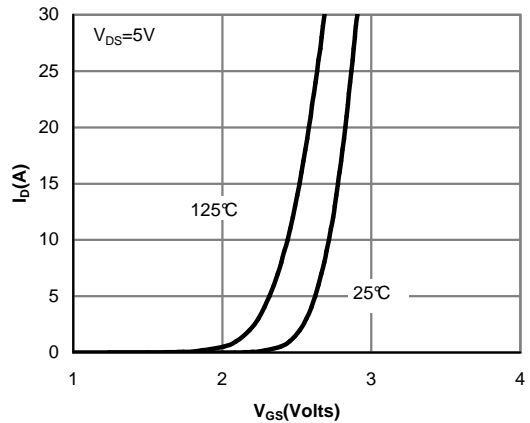


Figure 2: Transfer Characteristics (Note E)

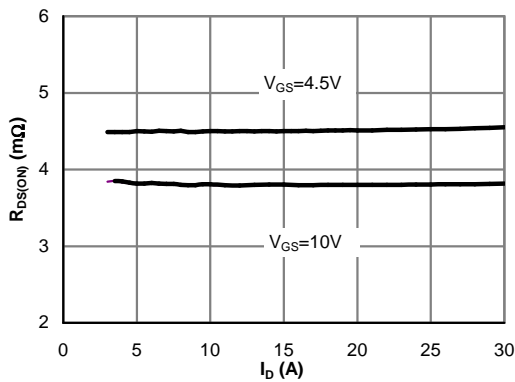


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

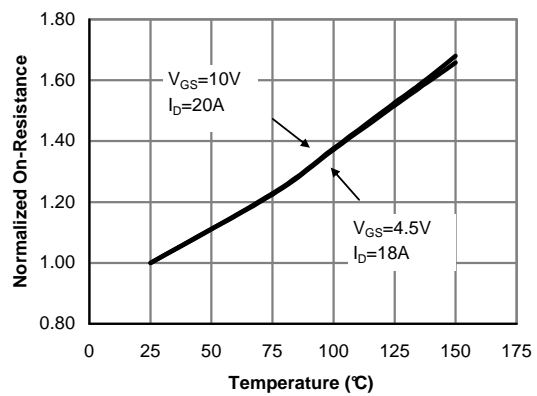


Figure 4: On-Resistance vs. Junction Temperature (Note E)

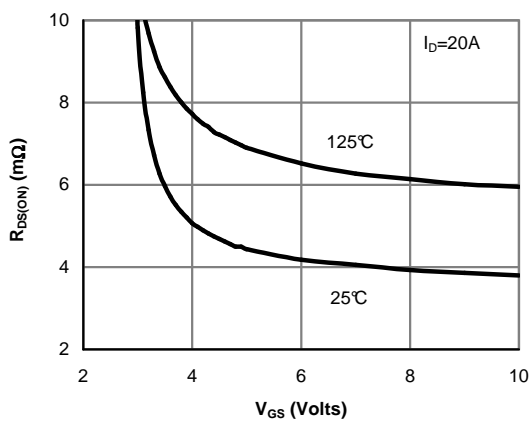


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

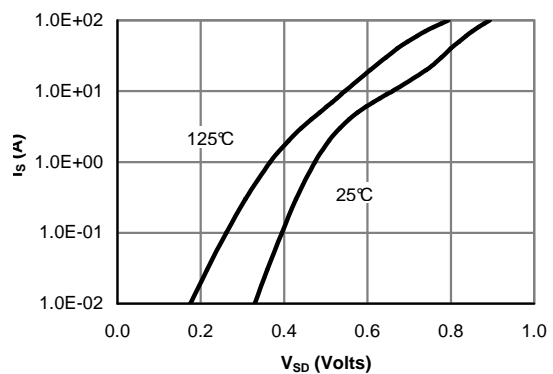


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

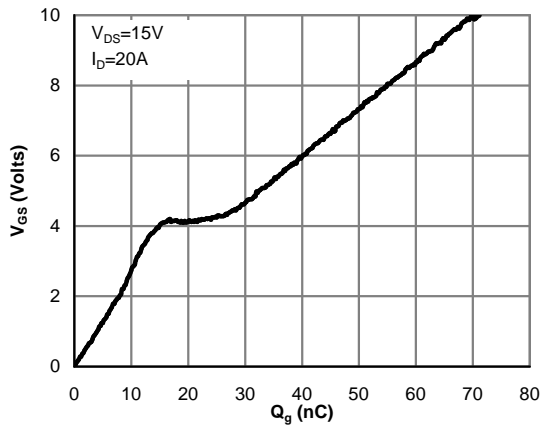


Figure 7: Gate-Charge Characteristics

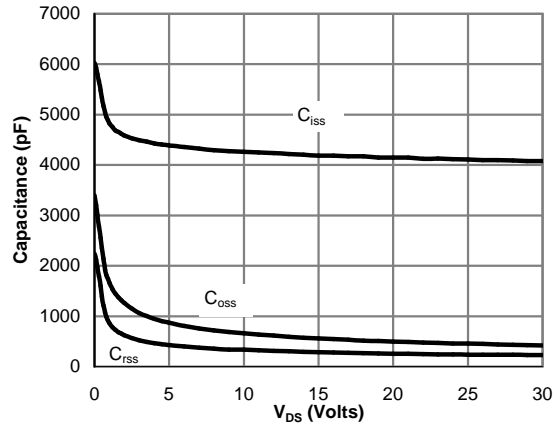


Figure 8: Capacitance Characteristics

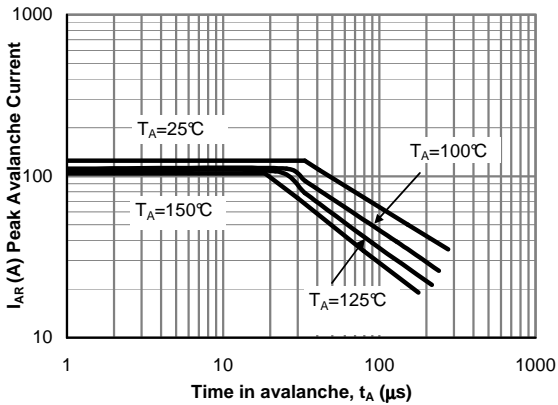


Figure 9: Single Pulse Avalanche capability (Note C)

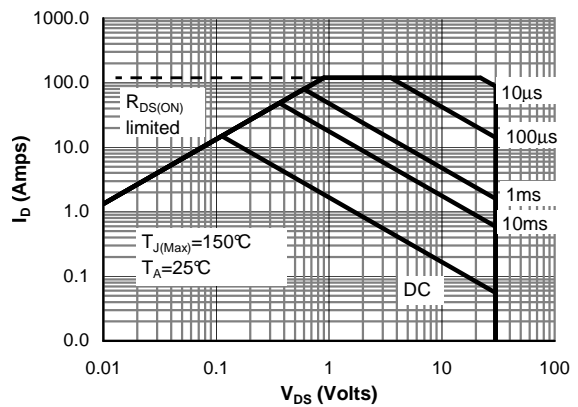


Figure 10: Maximum Forward Biased Safe Operating Area (Note F)

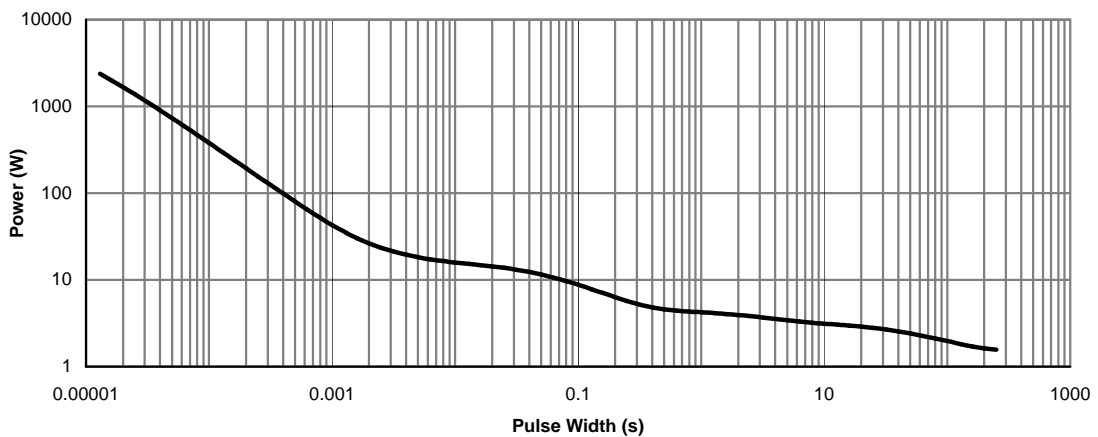
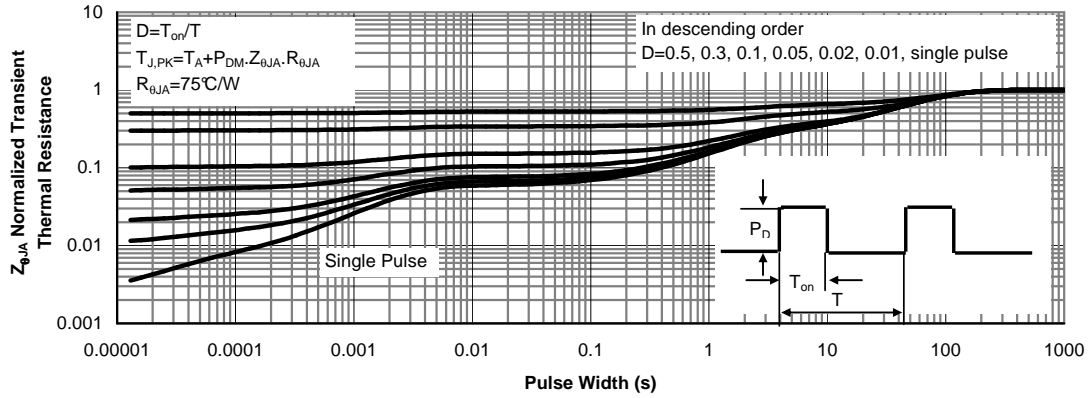


Figure 11: Single Pulse Power Rating Junction-to-Ambient (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS



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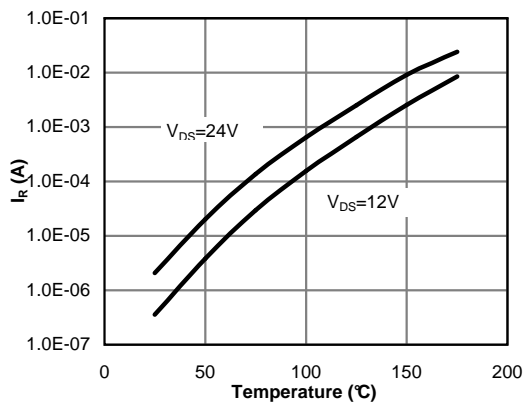


Figure 13: Diode Reverse Leakage Current vs. Junction Temperature

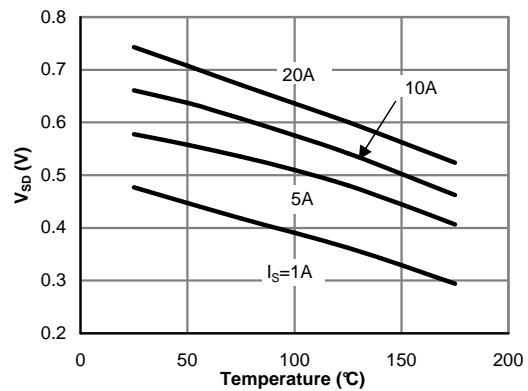


Figure 14: Diode Forward voltage vs. Junction Temperature

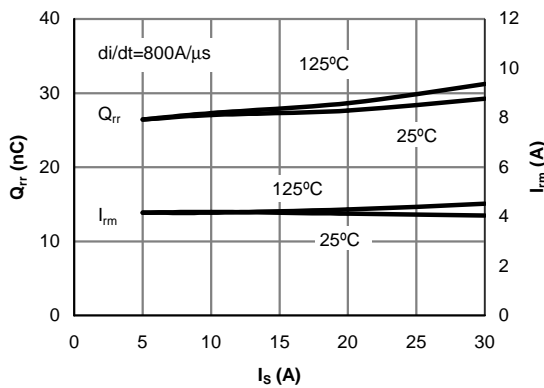


Figure 15: Diode Reverse Recovery Charge and Peak Current vs. Conduction Current

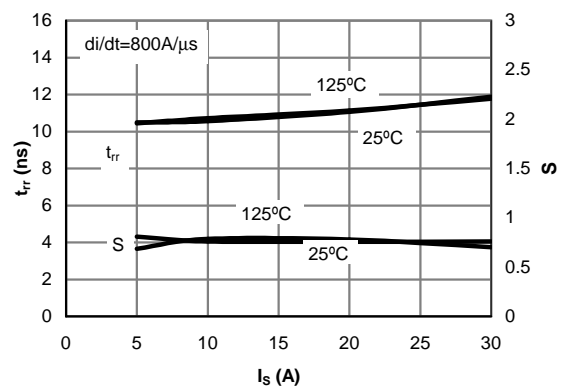


Figure 16: Diode Reverse Recovery Time and Softness Factor vs. Conduction Current

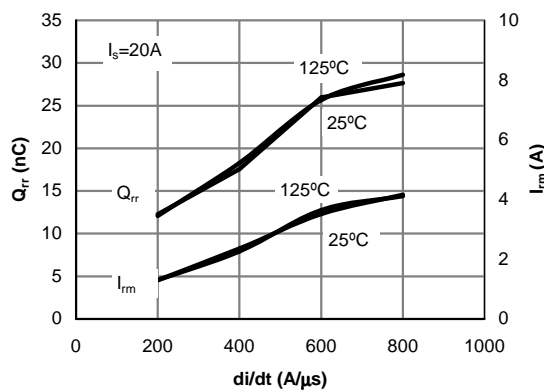


Figure 17: Diode Reverse Recovery Charge and Peak Current vs. di/dt

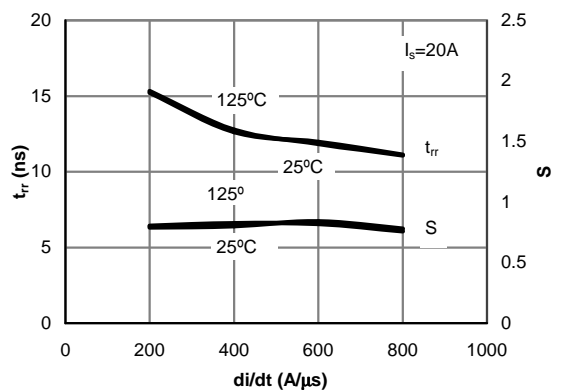
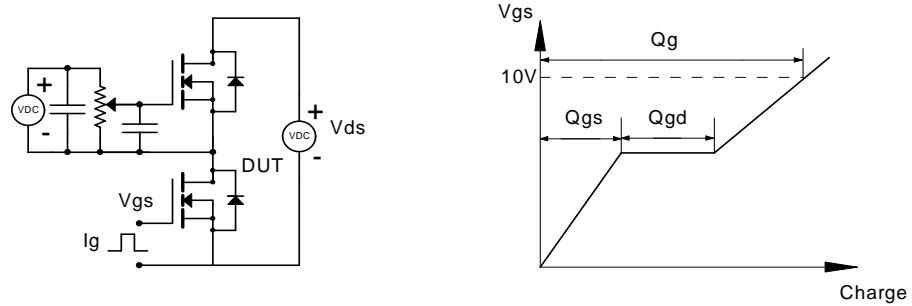
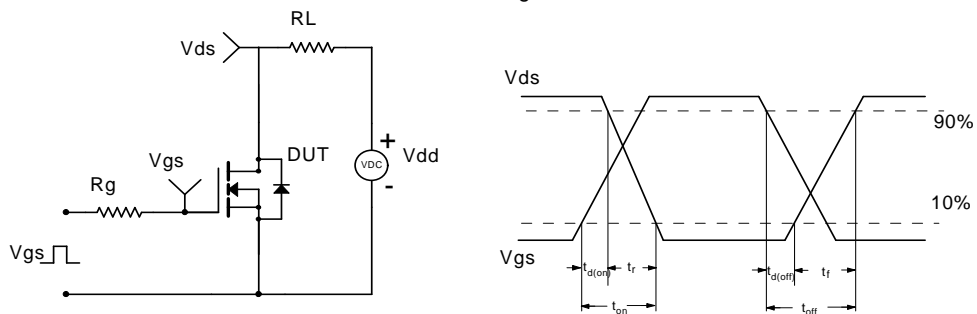


Figure 18: Diode Reverse Recovery Time and Softness Factor vs. di/dt

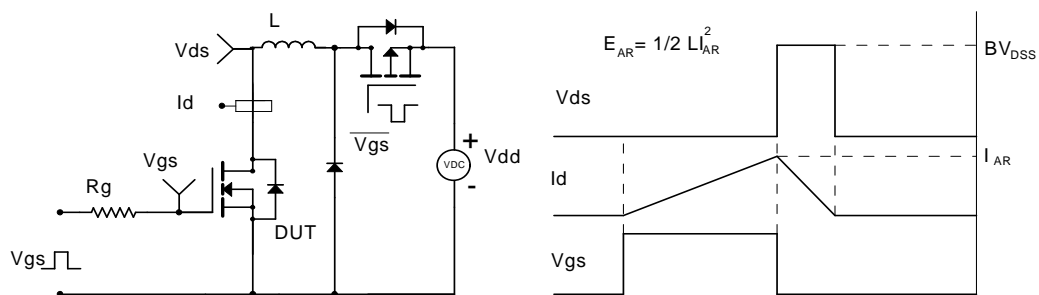
Gate Charge Test Circuit & Waveform



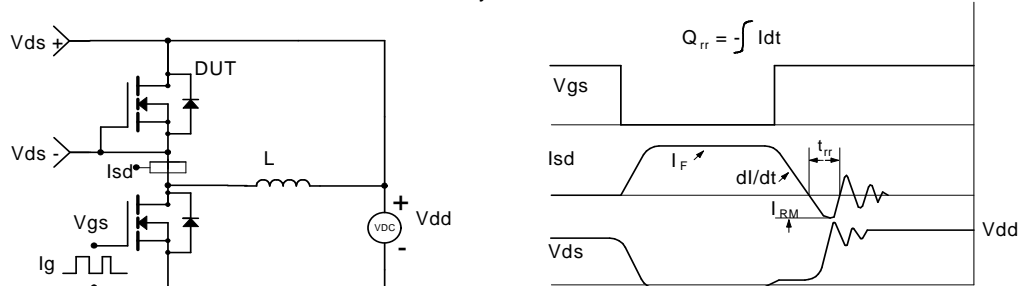
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms





Diode Recovery Test Circuit & Waveforms



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