ALPHA & OMEGA SEMICONDUCTOR

AON6786

30V N-Channel MOSFET

SRFET™

General Description

SRFET™ AON6786 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.

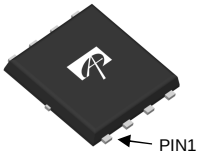
Product Summary

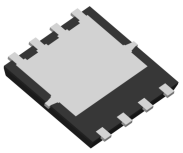
V_{DS}	30V
I_D (at V_{GS}=10V)	85A
$R_{DS(ON)}$ (at V_{GS}=10V)	< 2.9mΩ
$R_{DS(ON)}$ (at V_{GS} = 4.5V)	< 3.9mΩ

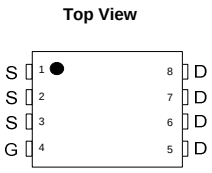
100% UIS Tested
100% R_g Tested

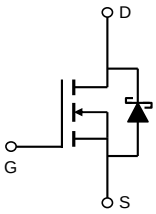
Green Product

DFN5X6









SRFET™
Soft **R**ecovery MOS**FET**: Integrated Schottky Diode

Absolute Maximum Ratings T_A=25°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]	T_C=25°C	I_D	85	A
	T_C=100°C		66	
Pulsed Drain Current [C]		I_{DM}	240	
Continuous Drain Current	T_A=25°C	I_{DSM}	22	A
	T_A=70°C		17	
Avalanche Current [C]		I_{AS}, I_{AR}	40	A
Avalanche energy L=0.1mH [C]		E_{AS}, E_{AR}	80	mJ
Power Dissipation [B]	T_C=25°C	P_D	83	W
	T_C=100°C		33	
Power Dissipation [A]	T_A=25°C	P_{DSM}	2.5	W
	T_A=70°C		1.6	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150	°C

Thermal Characteristics

Parameter		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	15	20	°C/W
Maximum Junction-to-Ambient [A D]	Steady-State		42	50	°C/W
Maximum Junction-to-Case	Steady-State	$R_{\theta JC}$	1.1	1.5	°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=10mA, V_{GS}=0V	30			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=30V, V_{GS}=0V			0.5	mA
		T_J=125°C			100	
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	1.5	2	V
$I_{D(ON)}$	On state drain current	V_{GS}=10V, V_{DS}=5V	240			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=20A		2.3	2.9	mΩ
		T_J=125°C		3.6	4.5	
		V_{GS}=4.5V, I_D=20A		3	3.9	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=20A		115		S
V_{SD}	Diode Forward Voltage	I_S=1A,V_{GS}=0V		0.4		V
I_S	Maximum Body-Diode Continuous Current[G]				85	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=15V, f=1MHz	3500	4380	5250	pF
C_{oss}	Output Capacitance		340	490	640	pF
C_{rss}	Reverse Transfer Capacitance		160	280	400	pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz	0.3	0.7	1.0	Ω
SWITCHING PARAMETERS						
Q_g(4.5V)	Total Gate Charge	V_{GS}=10V, V_{DS}=15V, I_D=20A	24	31	38	nC
Q_{gs}	Gate Source Charge		8	11	14	nC
Q_{gd}	Gate Drain Charge		4	9	13	nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=15V, R_L=0.75Ω, R_{GEN}=3Ω		10		ns
t_r	Turn-On Rise Time			6		ns
$t_{D(off)}$	Turn-Off DelayTime			50		ns
t_f	Turn-Off Fall Time			7		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=20A, dI/dt=500A/µs	9	12	15	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=20A, dI/dt=500A/µs	17	22	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 Power dissipation P_{DSM} is based on $R_{\theta JA}$ and the maximum allowed junction temperature of 150°C. The value in any given application depends on the user's specific board design, and the maximum temperature of 150°C may be used if the PCB allows it.

B. The power dissipation P_D is based on $T_{J(MAX)}$=150°C, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.

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 $R_{\theta JA}$ is the sum of the thermal impedence from junction to case $R_{\theta JC}$ and case 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-case thermal impedence which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of $T_{J(MAX)}$=150°C. The SOA curve provides a single pulse rating.

G. The maximum current rating is package limited.

H. These tests are performed with the device mounted on 1 in^2 FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C.

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.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

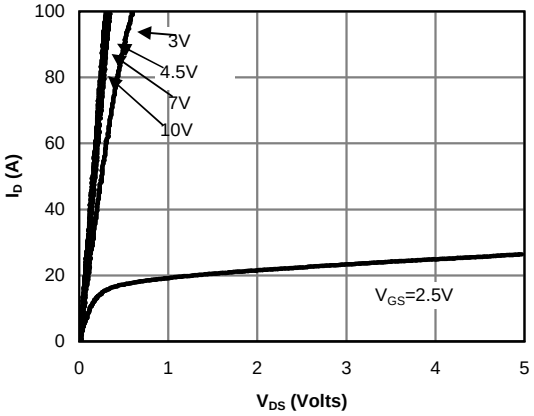


Fig 1: On-Region Characteristics (Note E)

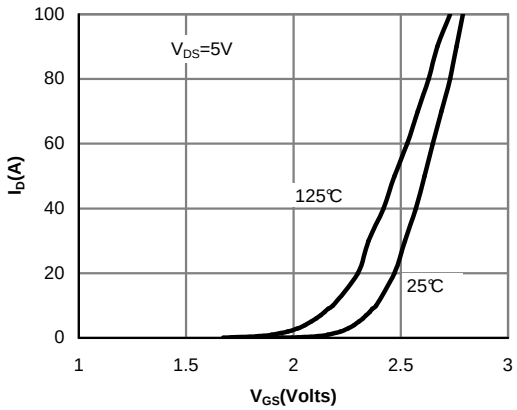


Figure 2: Transfer Characteristics (Note E)

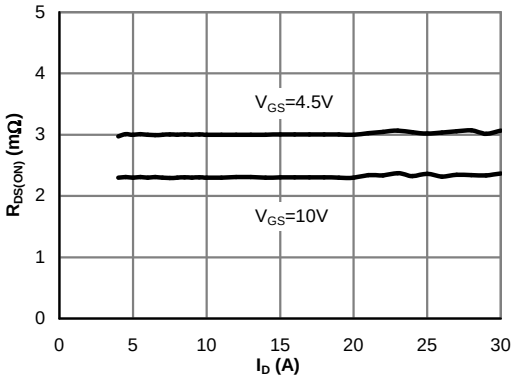


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

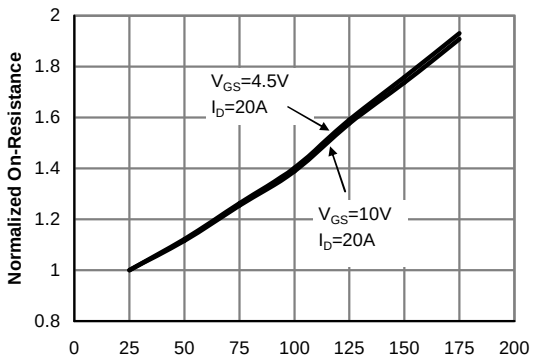


Figure 4: On-Resistance vs. Junction Temperature (Note E)

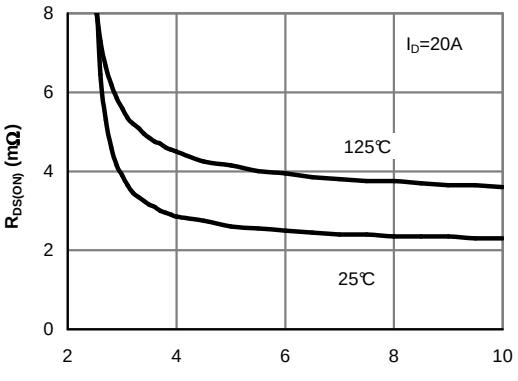


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

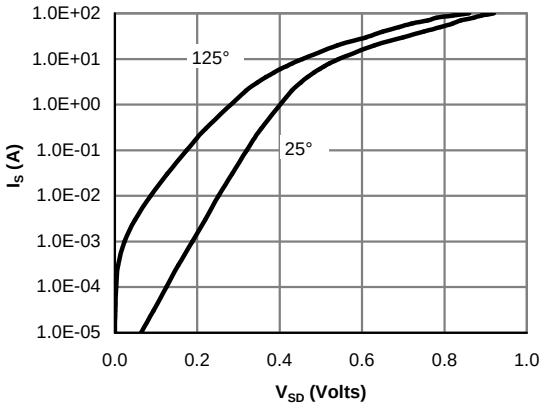


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

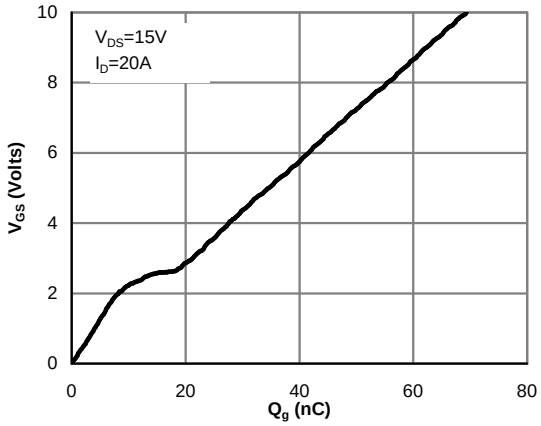


Figure 7: Gate-Charge Characteristics

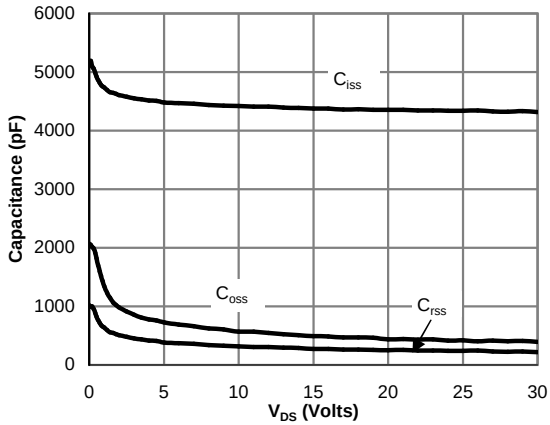


Figure 8: Capacitance Characteristics

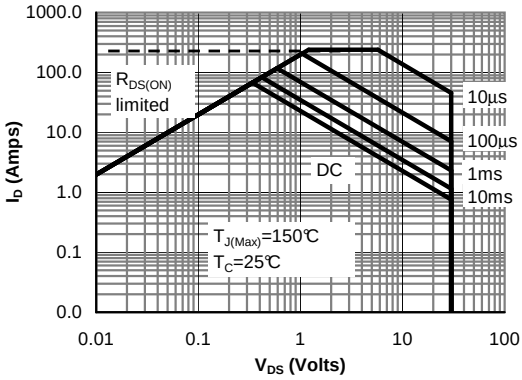


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

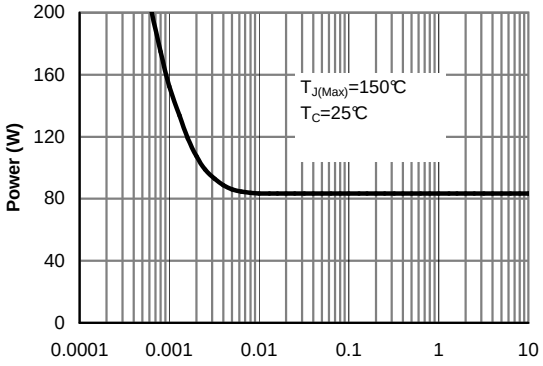


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

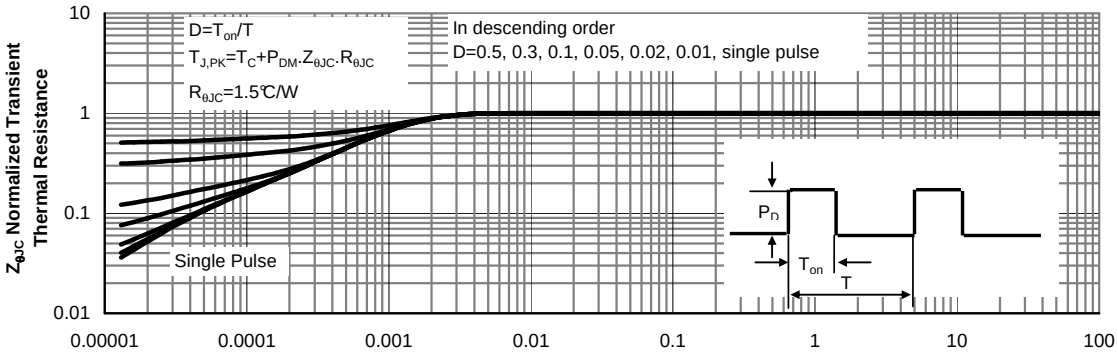


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

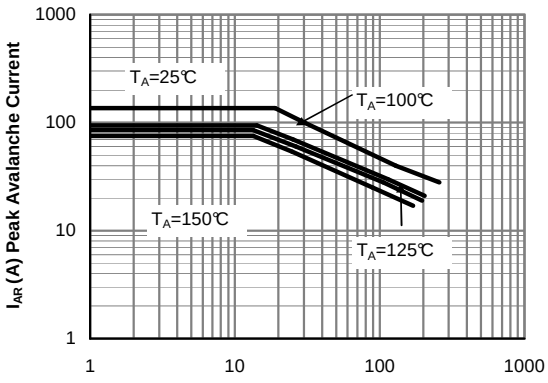


Figure 12: Single Pulse Avalanche capability (Note C)

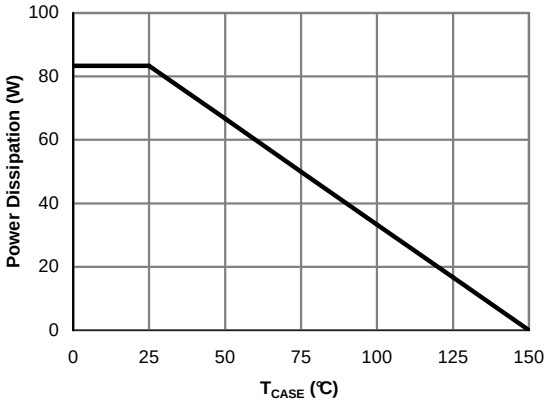


Figure 13: Power De-rating (Note F)

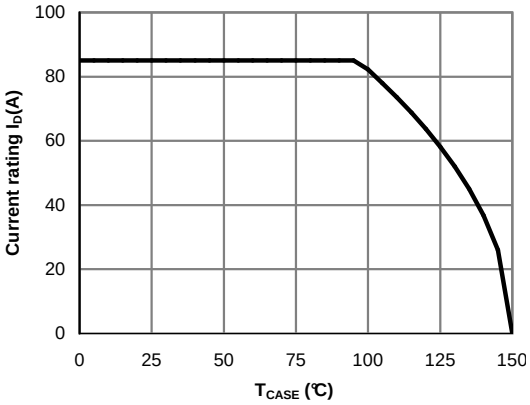


Figure 14: Current De-rating (Note F)

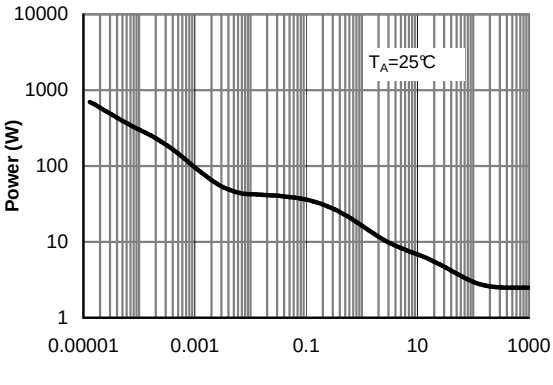


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

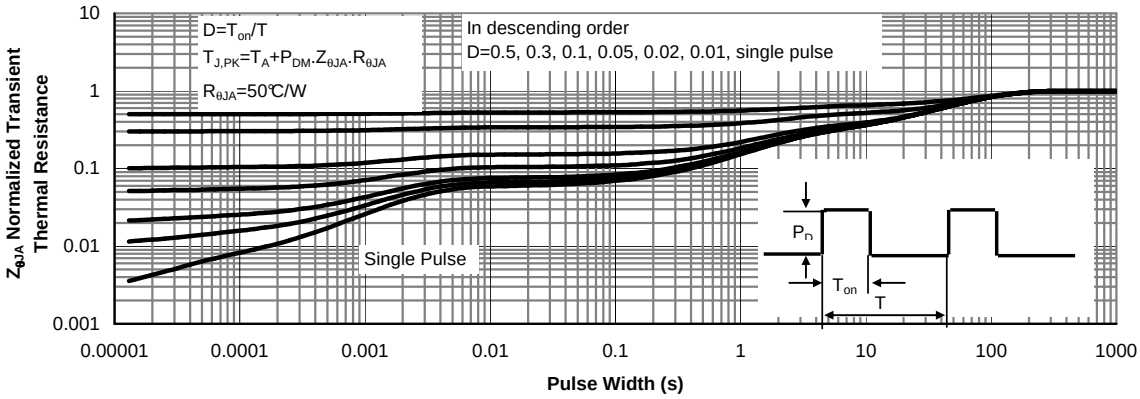


Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

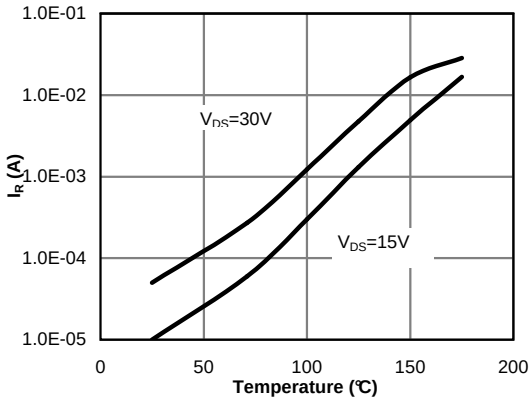


Figure 17: Diode Reverse Leakage Current vs. Junction Temperature

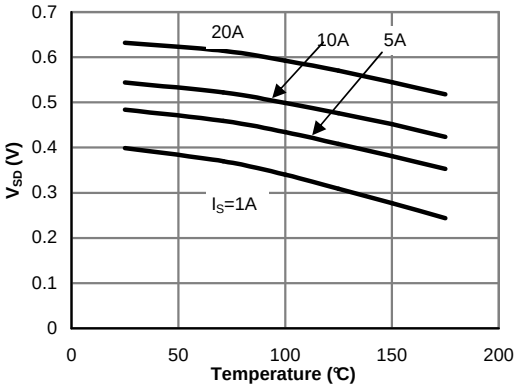


Figure 18: Diode Forward voltage vs. Junction Temperature

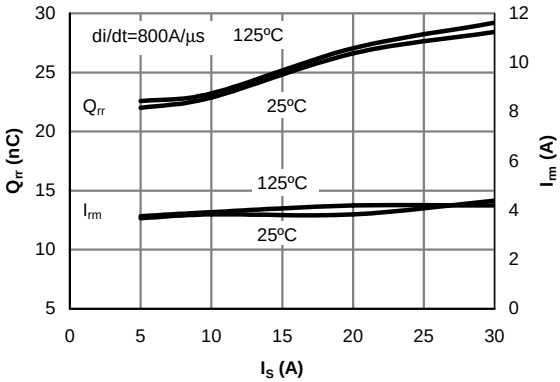


Figure 18: Diode Reverse Recovery Charge and Peak Current vs. Conduction Current

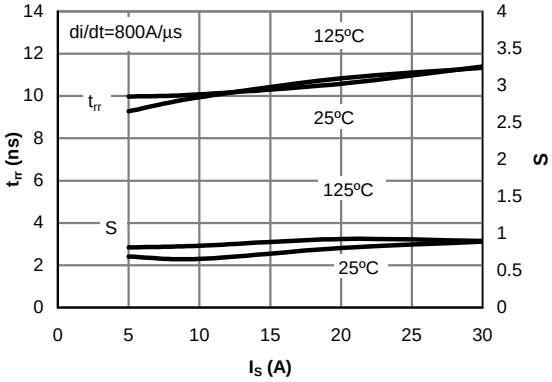


Figure 19: Diode Reverse Recovery Time and Softness Factor vs. Conduction Current

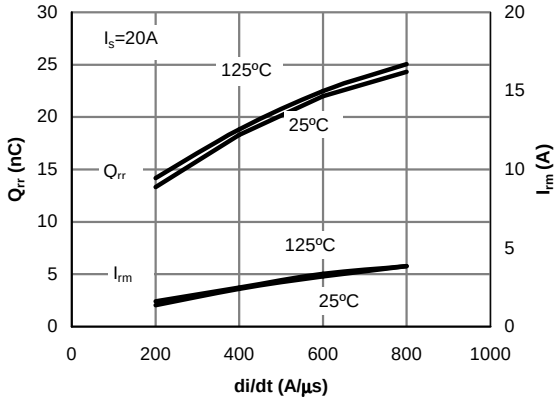


Figure 20: Diode Reverse Recovery Charge and Peak Current vs. di/dt

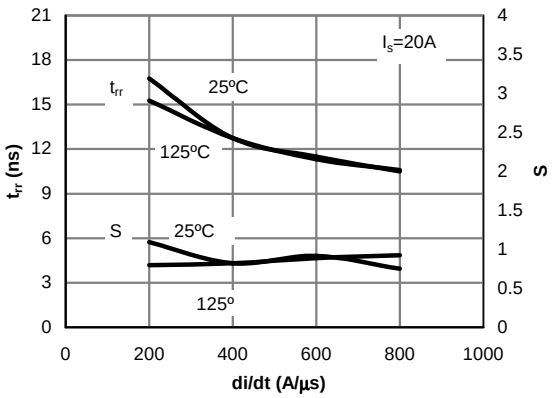
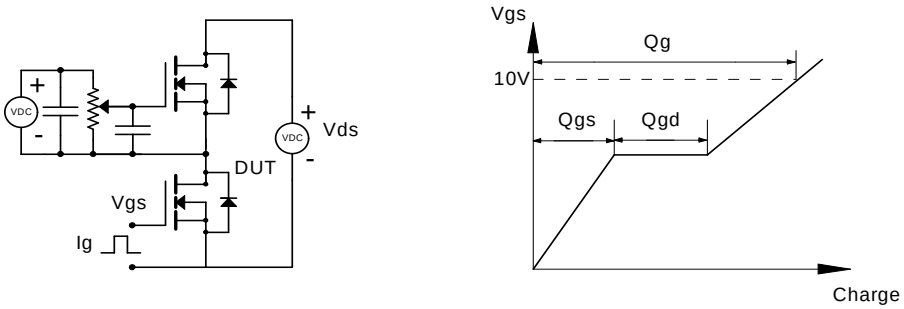
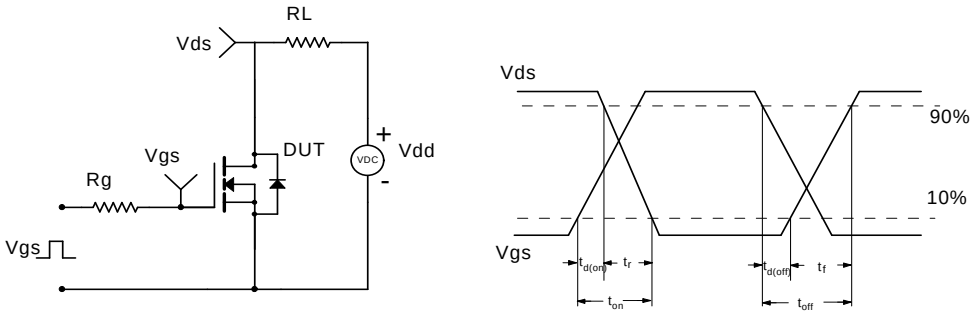


Figure 21: Diode Reverse Recovery Time and Softness Factor vs. di/dt

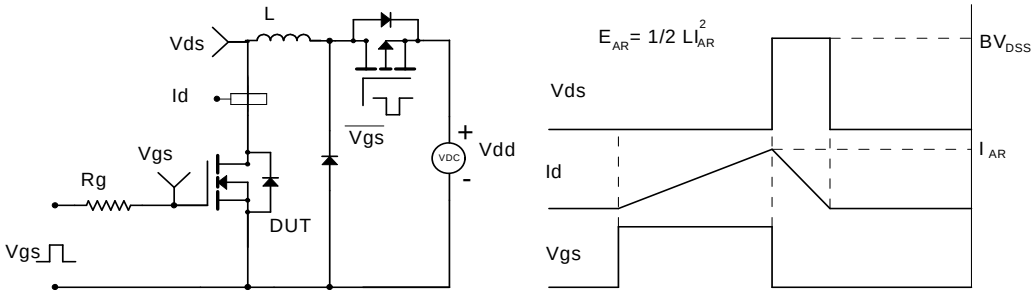
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

