

General Description

SRFET™ The AO4720 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.

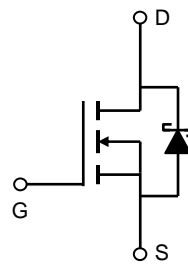
Features

$V_{DS} (V) = 30V$

$I_D = 13A$ ($V_{GS} = 10V$)

$R_{DS(ON)} < 11m\Omega$ ($V_{GS} = 10V$)

$R_{DS(ON)} < 17.5m\Omega$ ($V_{GS} = 4.5V$)



SRFET™
 Soft Recovery MOSFET:
 Integrated Schottky Diode

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

Parameter	Symbol	Max	Units
Drain-Source Voltage	V_{DS}	30	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current ^{AF}	I_{DSM}	$T_A=25^\circ C$	13
		$T_A=70^\circ C$	11
Pulsed Drain Current ^B	I_{DM}	120	A
Avalanche Current ^C	I_{AR}	21	A
Repetitive avalanche energy $L=0.3mH$ ^C	E_{AR}	66	mJ
Power Dissipation	P_{DSM}	$T_A=25^\circ C$	3.1
		$T_A=70^\circ C$	2
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	$R_{\theta JA}$	32	40	$^\circ C/W$
Maximum Junction-to-Ambient ^A		Steady-State	60	75
Maximum Junction-to-Lead ^C	$R_{\theta JL}$	17	24	$^\circ C/W$

Electrical Characteristics (T_J=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
B _V 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	1.3	1.62	2	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 =13A T _J =125°C		9.3 13.8	11.0 17.3	mΩ
		V _{GS} =4.5V, I _D =11A		14	17.5	mΩ
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =13A		37		S
V _{SD}	Diode Forward Voltage	I _S =1A, V _{GS} =0V		0.40	0.5	V
I _S	Maximum Body-Diode + Schottky Continuous Current				5	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =15V, f=1MHz		1267	1600	pF
C _{oss}	Output Capacitance			308		pF
C _{rss}	Reverse Transfer Capacitance			118		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz		1.3	2.0	Ω
SWITCHING PARAMETERS						
Q _{g(10V)}	Total Gate Charge	V _{GS} =10V, V _{DS} =15V, I _D =13A		21	30	nC
Q _{g(4.5V)}	Total Gate Charge			10.4	14	nC
Q _{gs}	Gate Source Charge			3.0		nC
Q _{gd}	Gate Drain Charge			3.6		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =10V, V _{DS} =15V, R _L =1.2Ω, R _{GEN} =3Ω		5.2		ns
t _r	Turn-On Rise Time			3.8		ns
t _{D(off)}	Turn-Off DelayTime			21.2		ns
t _f	Turn-Off Fall Time			4.4		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =13A, di/dt=300A/μs		11.2	17	ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =13A, di/dt=300A/μs		10.5		nC

A: The value of R_{θJA} is measured with the device mounted on 1 in 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: Repetitive rating, pulse width limited by junction temperature T_{J(MAX)}=150°C.

C: The R_{θJA} is the sum of the thermal impedance from junction to lead R_{θJL} and lead to ambient.

D: The static characteristics in Figures 1 to 6 are obtained using <300 μs pulses, duty cycle 0.5% max.

E: 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. The SOA curve provides a single pulse rating.

F: The power dissipation and current rating is based on the t ≤ 10s junction to ambient thermal resistance rating.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

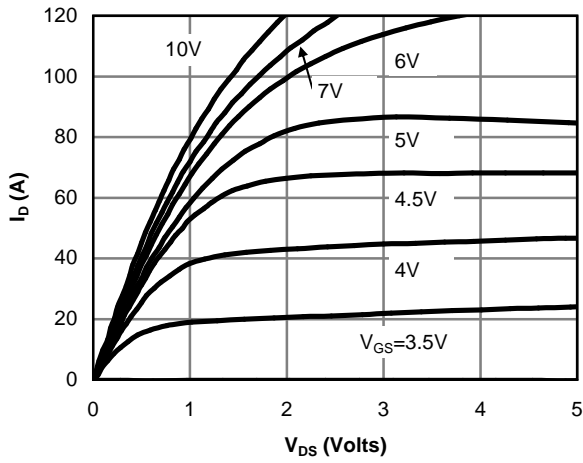


Figure 1: On-Region Characteristics

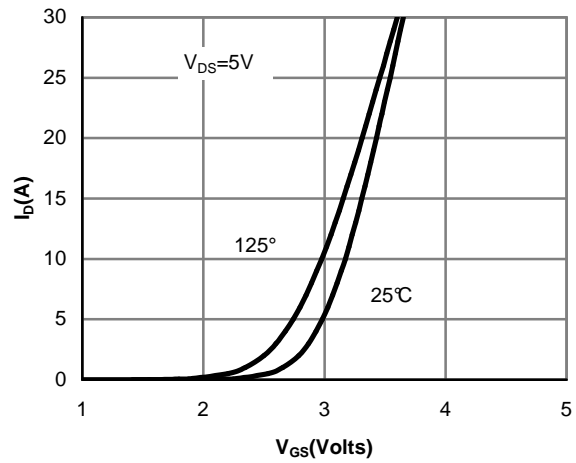


Figure 2: Transfer Characteristics

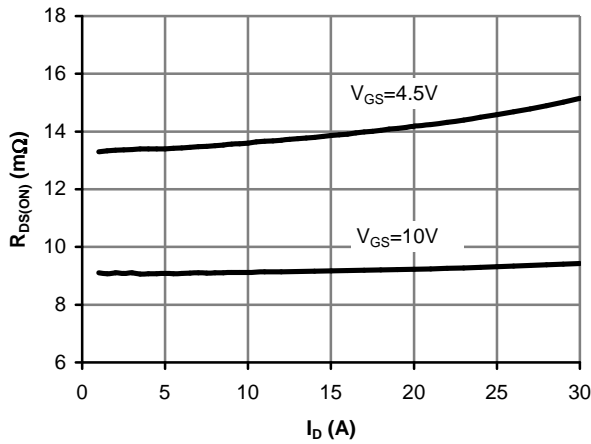


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

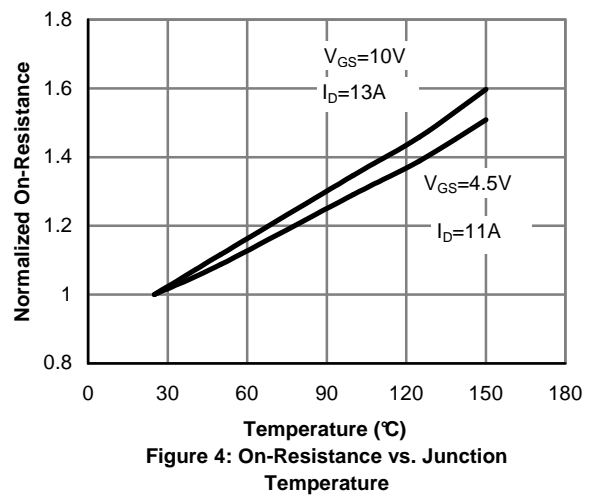


Figure 4: On-Resistance vs. Junction Temperature

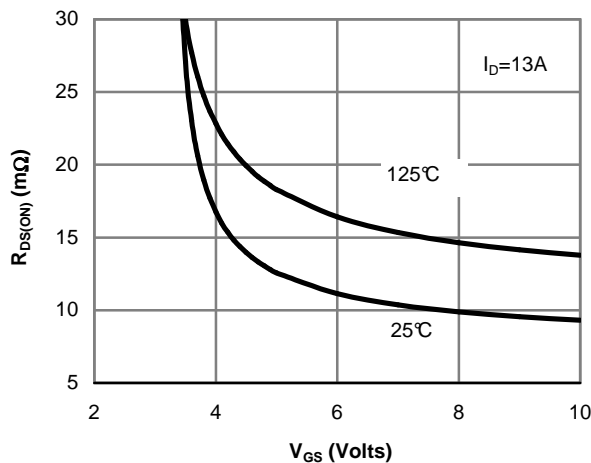


Figure 5: On-Resistance vs. Gate-Source Voltage

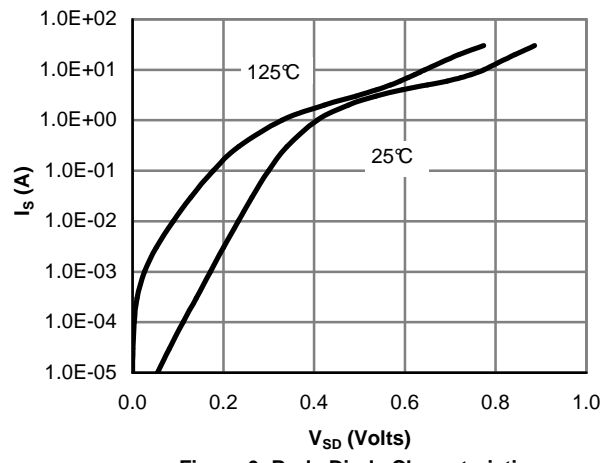


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

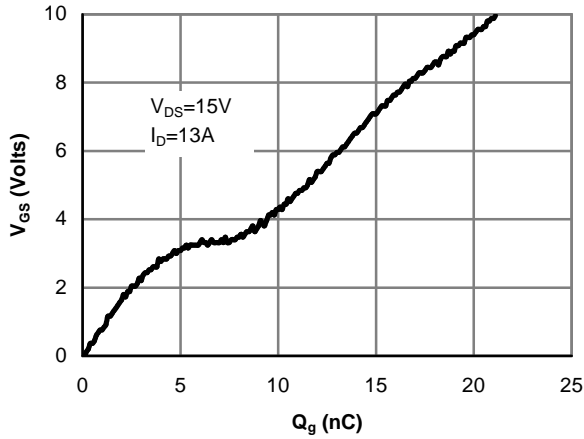


Figure 7: Gate-Charge Characteristics

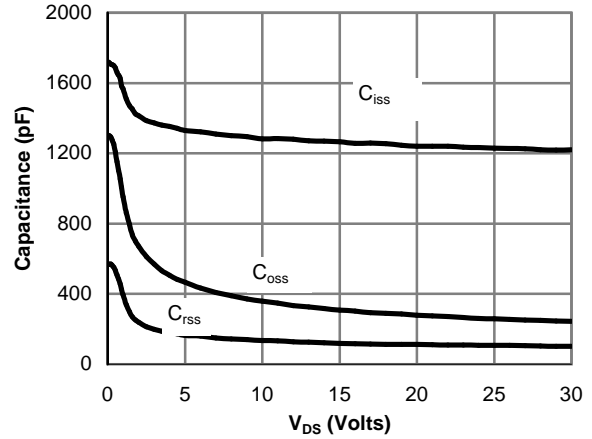


Figure 8: Capacitance Characteristics

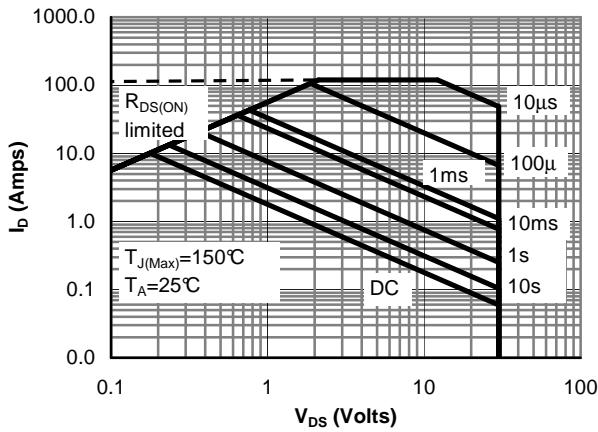


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

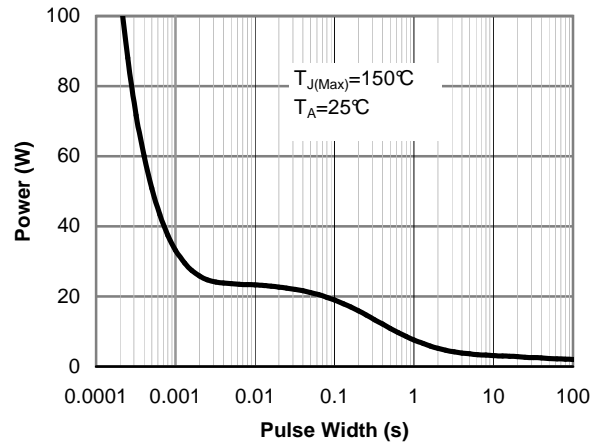


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

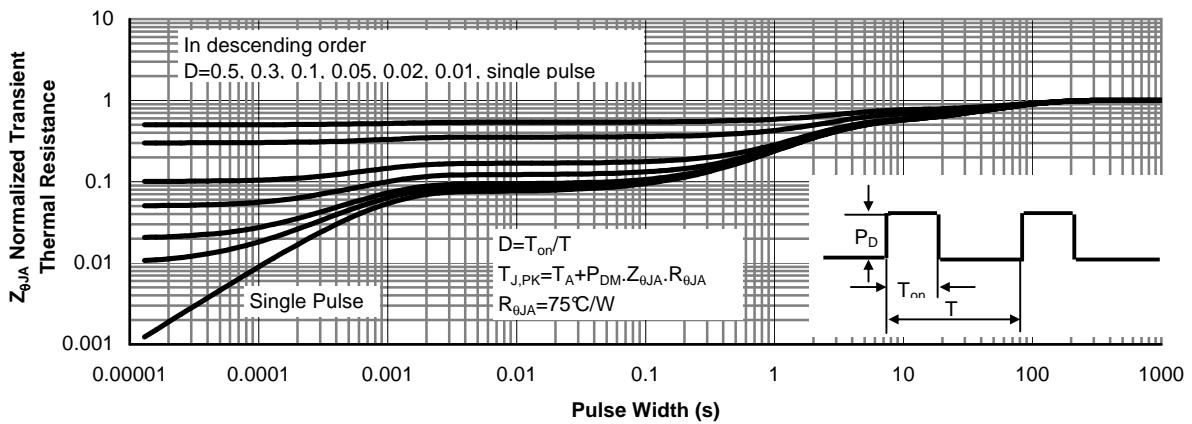
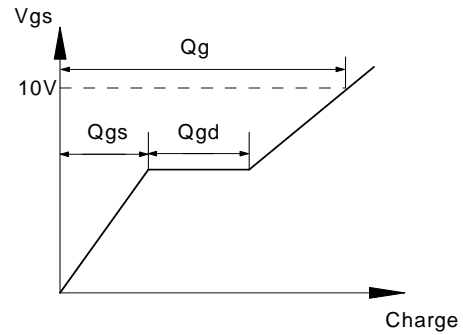
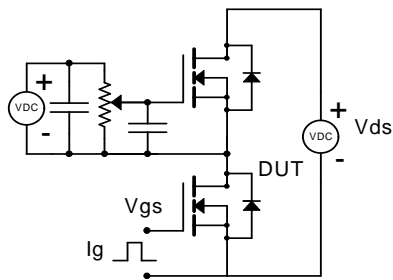
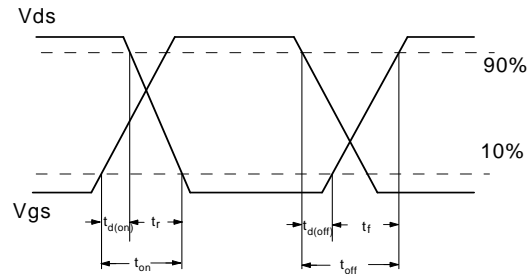
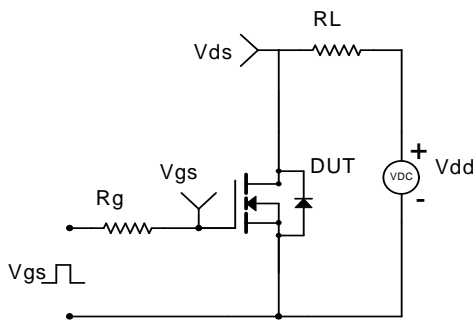


Figure 11: Normalized Maximum Transient Thermal Impedance (Note E)

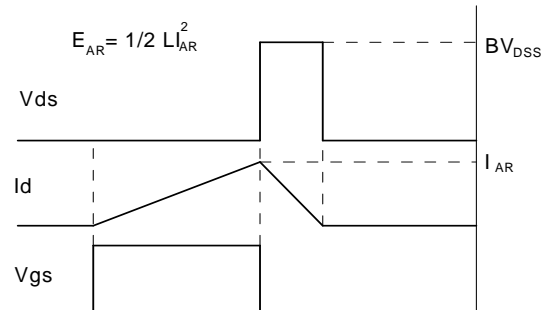
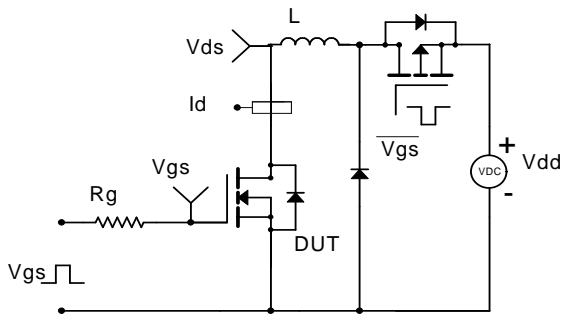
Gate Charge Test Circuit & Waveform



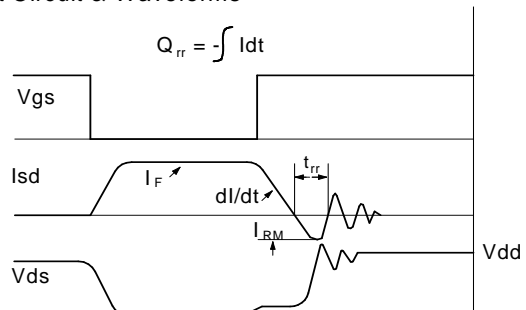
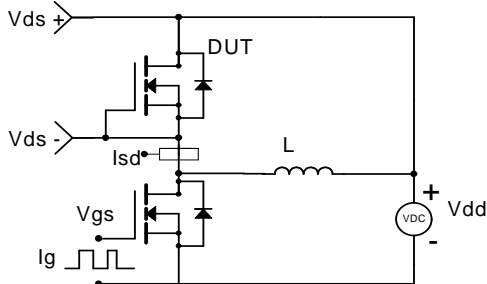
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

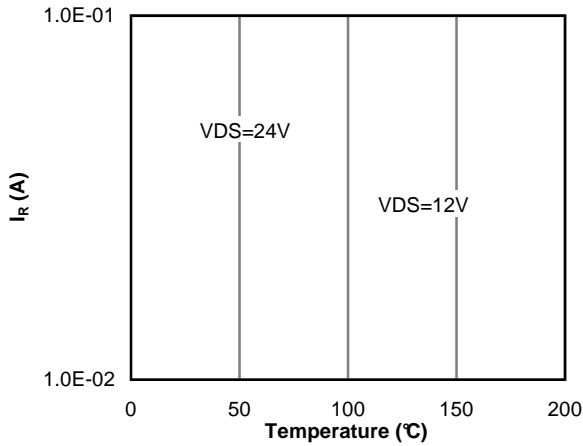


Figure 12: Diode Reverse Leakage Current vs. Junction Temperature

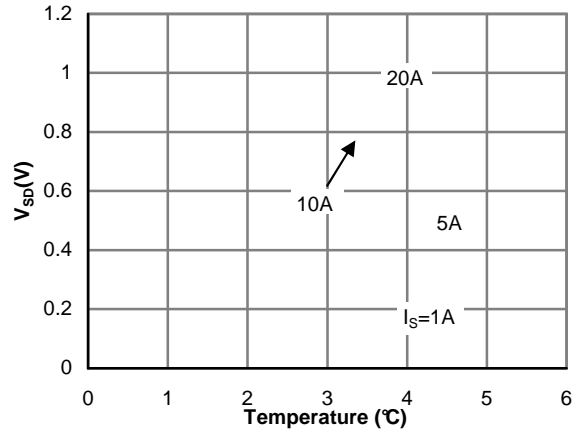


Figure 13: Diode Forward voltage vs. Junction Temperature

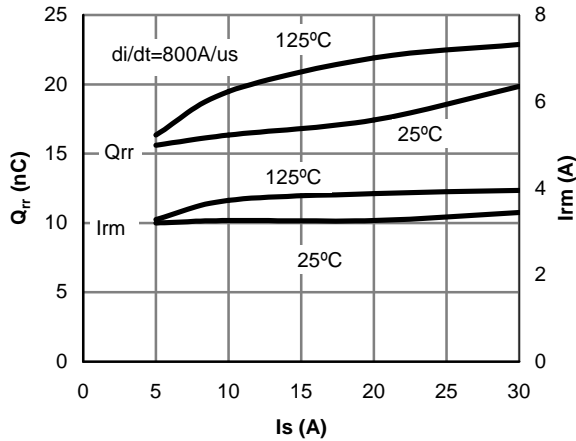


Figure 14: Diode Reverse Recovery Charge and Peak Current vs. Conduction Current

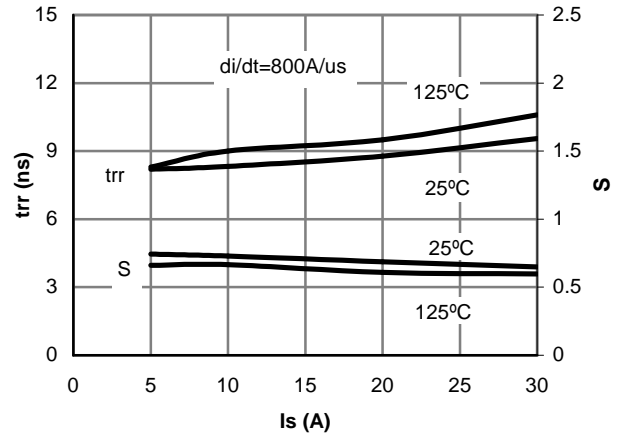


Figure 15: Diode Reverse Recovery Time and Soft Coefficient vs. Conduction Current

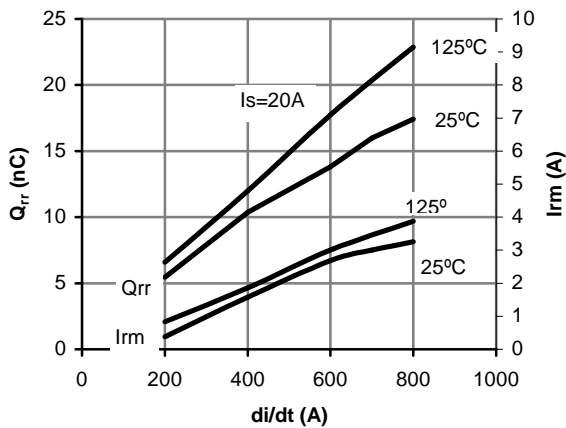


Figure 16: Diode Reverse Recovery Charge and Peak Current vs. di/dt

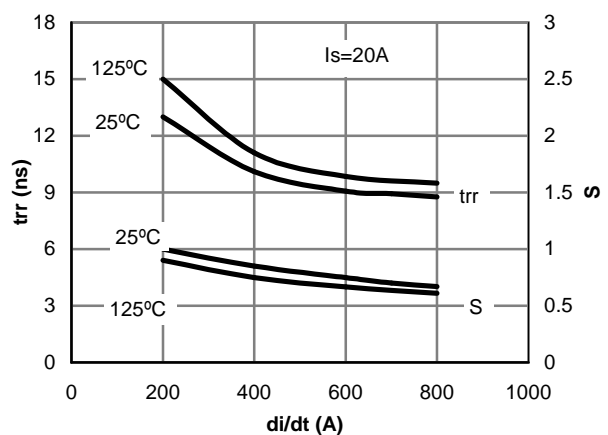


Figure 17: Diode Reverse Recovery Time and Soft Coefficient vs. di/dt