

AOL1412
N-Channel Enhancement Mode Field Effect Transistor

General Description

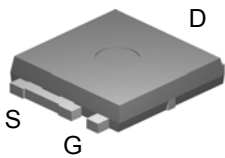
The AOL1412 uses advanced trench technology with a monolithically integrated Schottky diode to provide excellent $R_{DS(ON)}$ and low gate charge. This device is suitable for use as a low side FET in SMPS, load switching and general purpose applications. *Standard Product AOL1412 is Pb-free (meets ROHS & Sony 259 specifications). AOL1412L is a Green Product ordering option. AOL1412 and AOL1412L are electrically identical.*

Features

V_{DS} (V) = 30V
 I_D =85A (V_{GS} = 10V)
 $R_{DS(ON)} < 3.9m\Omega$ (V_{GS} = 10V)
 $R_{DS(ON)} < 4.6m\Omega$ (V_{GS} = 4.5V)

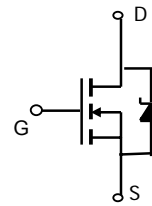
UIS Tested
Rg,Ciss,Coss,Crss Tested

Ultra SO-8™ Top View



Bottom tab
 connected to
 drain

**Fits SOIC8
 footprint !**


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 ^B	I_D	$T_C=25^\circ\text{C}$ ^I	85
		$T_C=100^\circ\text{C}$	84
Pulsed Drain Current	I_{DM}	200	A
Continuous Drain Current ^H	I_{DSM}	$T_A=25^\circ\text{C}$	27
		$T_A=70^\circ\text{C}$	21
Avalanche Current ^C	I_{AR}	40	A
Repetitive avalanche energy $L=0.3\text{mH}$ ^C	E_{AR}	240	mJ
Power Dissipation ^B	P_D	$T_C=25^\circ\text{C}$	100
		$T_C=100^\circ\text{C}$	50
Power Dissipation ^A	P_{DSM}	$T_A=25^\circ\text{C}$	5
		$T_A=70^\circ\text{C}$	3
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 175	$^\circ\text{C}$

Thermal Characteristics

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	$t \leq 10\text{s}$	19.6	$^\circ\text{C/W}$
Maximum Junction-to-Ambient ^A		Steady-State	50	$^\circ\text{C/W}$
Maximum Junction-to-Case ^C	$R_{\theta JC}$	1	1.5	$^\circ\text{C/W}$

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 =1mA, V _{GS} =0V	30			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =24V, V _{GS} =0V T _J =125°C		0.008 9	0.1 20	mA
I _{GSS}	Gate-Body leakage current	V _{DS} =0V, V _{GS} = ±12V			0.1	μA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =250μA	1.4	1.8	2.4	V
I _{D(ON)}	On state drain current	V _{GS} =10V, V _{DS} =5V	200			A
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =20A T _J =125°C		3.2 5.0	3.9 6.2	mΩ
		V _{GS} =4.5V, I _D =20A		3.8	4.6	mΩ
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =20A		112		S
V _{SD}	Diode Forward Voltage	I _S =1A, V _{GS} =0V		0.4	0.5	V
I _S	Maximum Body-Diode Continuous Current				85	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance			6430	7716	pF
C _{oss}	Output Capacitance	V _{GS} =0V, V _{DS} =15V, f=1MHz		756		pF
C _{rss}	Reverse Transfer Capacitance			352		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz		0.9	1.4	Ω
SWITCHING PARAMETERS						
Q _{g(10V)}	Total Gate Charge			96	115	
Q _{g(4.5V)}	Total Gate Charge	V _{GS} =10V, V _{DS} =15V, I _D =20A		44	53	nC
Q _{gs}	Gate Source Charge			17		nC
Q _{gd}	Gate Drain Charge			13		nC
t _{D(on)}	Turn-On Delay Time			17.5		ns
t _r	Turn-On Rise Time	V _{GS} =10V, V _{DS} =15V, R _L =0.75Ω,		10		ns
t _{D(off)}	Turn-Off Delay Time	R _{GEN} =3Ω		56		ns
t _f	Turn-Off Fall Time			10.5		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =20A, dI/dt=300A/μs		20	25	ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =20A, dI/dt=300A/μs		26		nC

A: The value of R_{θJA} is measured with the device in a still air environment with T_A=25°C. The power dissipation P_D and current rating I_B are based on T_J(MAX)=150°C, using t ≤ 10s junction-to-ambient thermal resistance.

B: The power dissipation P_D is based on T_J(MAX)=175°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)=175°C.

D: The R_{θJA} is the sum of the thermal impedance from junction to case R_{θJC} and case to ambient.

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

F: These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of T_J(MAX)=175°C.

G: 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.

H: Surface mounted on a 1 in 2 FR-4 board with 2oz. Copper.

I: The maximum current rating is limited by bond-wires.

Rev1: June 2006

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

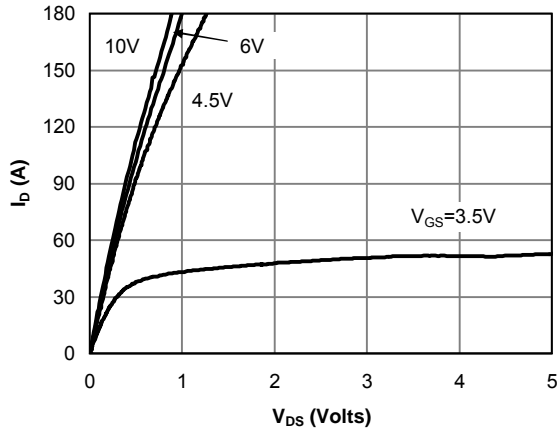


Fig 1: On-Region Characteristics

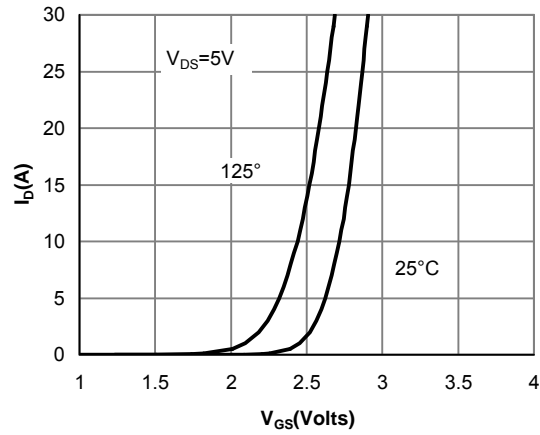


Figure 2: Transfer Characteristics

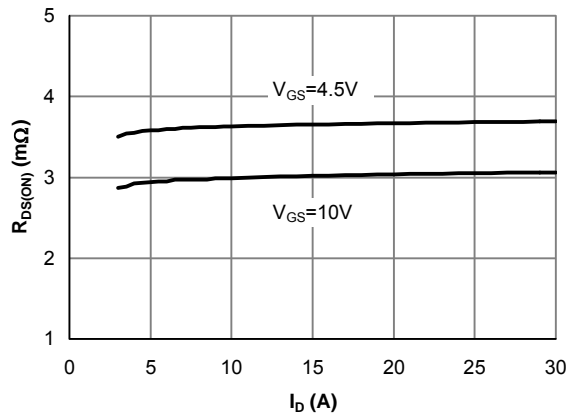


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

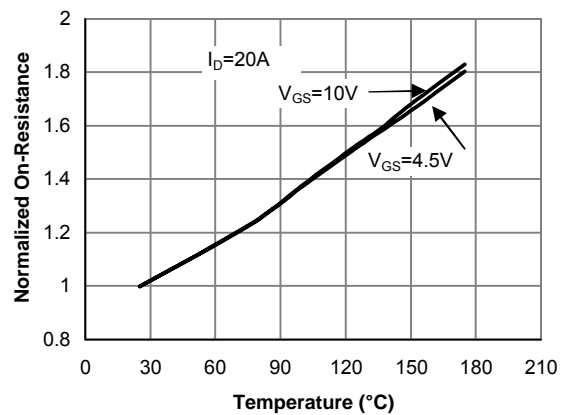


Figure 4: On-Resistance vs. Junction Temperature

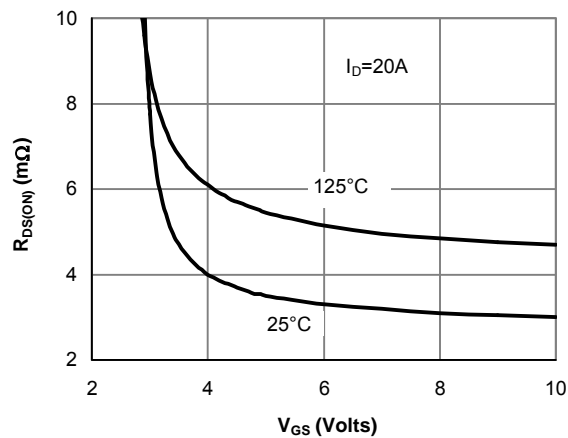


Figure 5: On-Resistance vs. Gate-Source Voltage

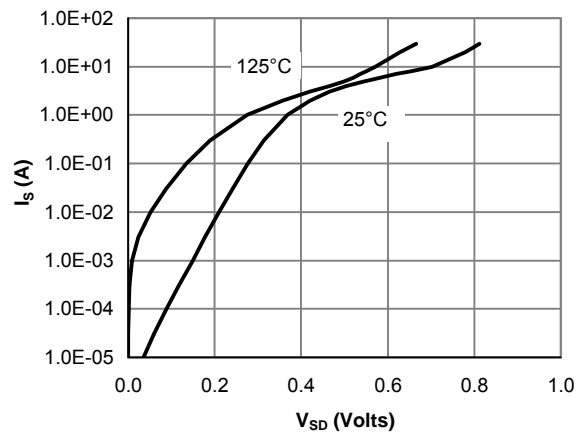


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

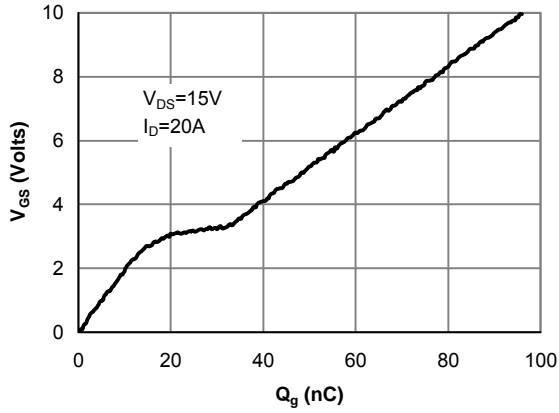


Figure 7: Gate-Charge Characteristics

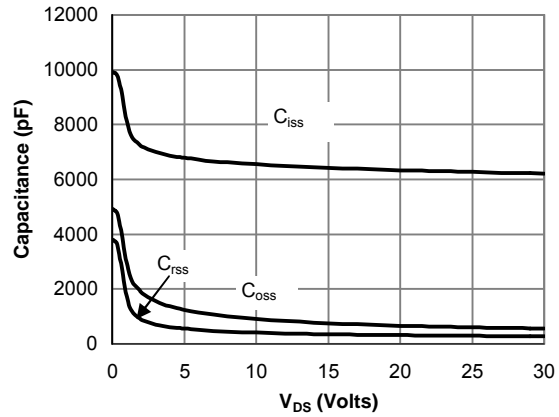


Figure 8: Capacitance Characteristics

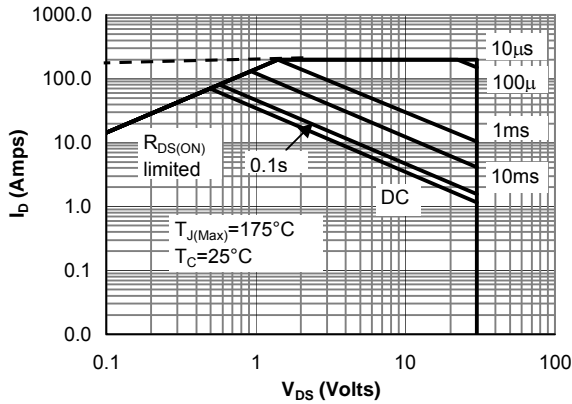


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

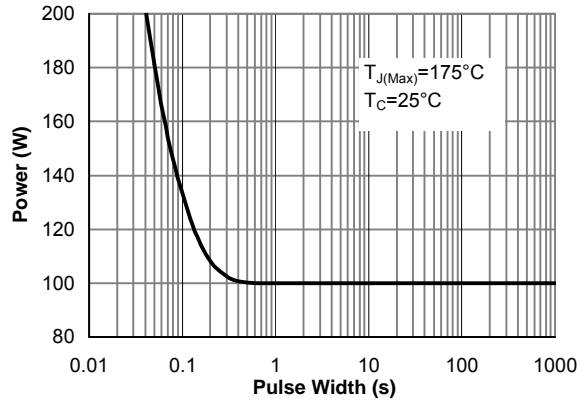


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

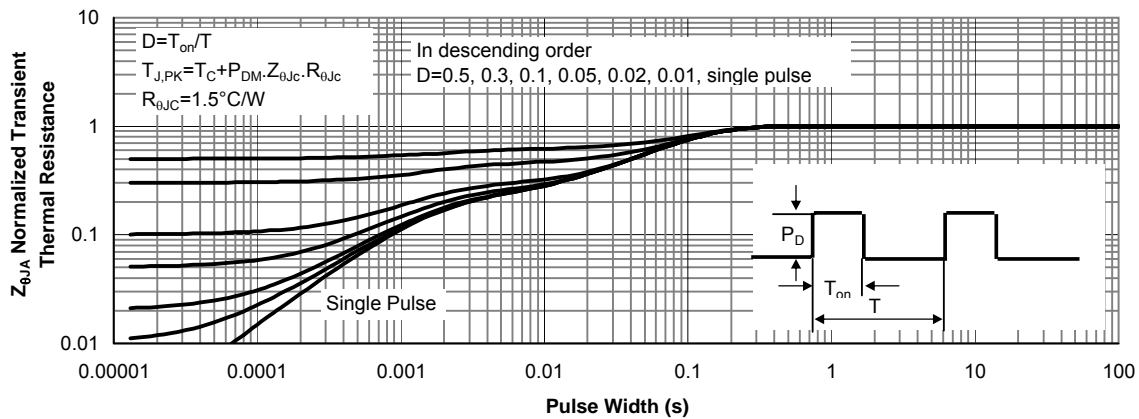


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

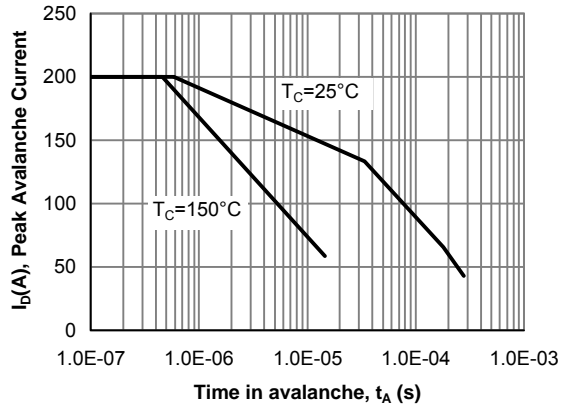


Figure 12: Single Pulse Avalanche capability

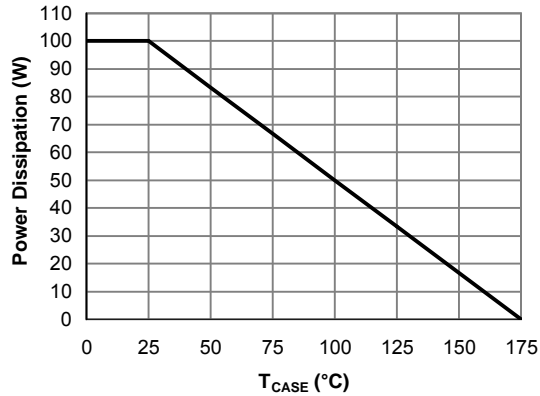


Figure 13: Power De-rating (Note B)

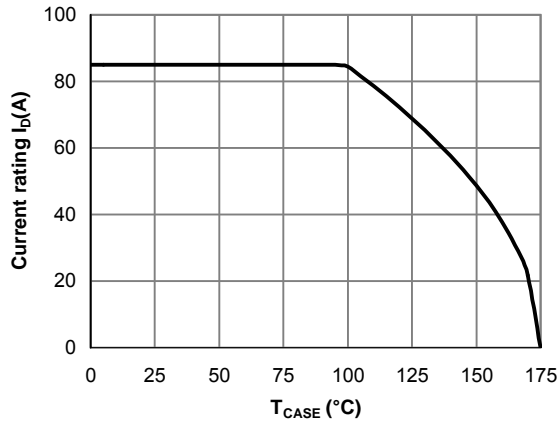


Figure 14: Current De-rating (Note B)

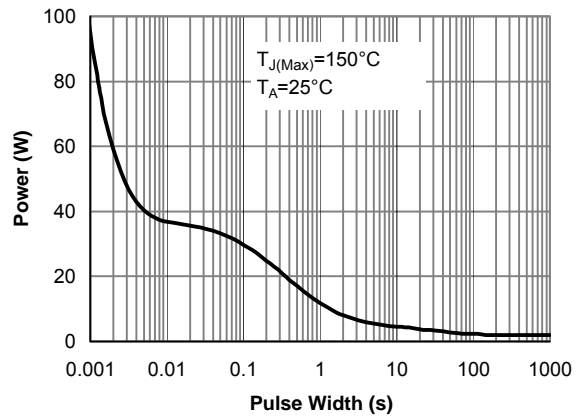


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note G)

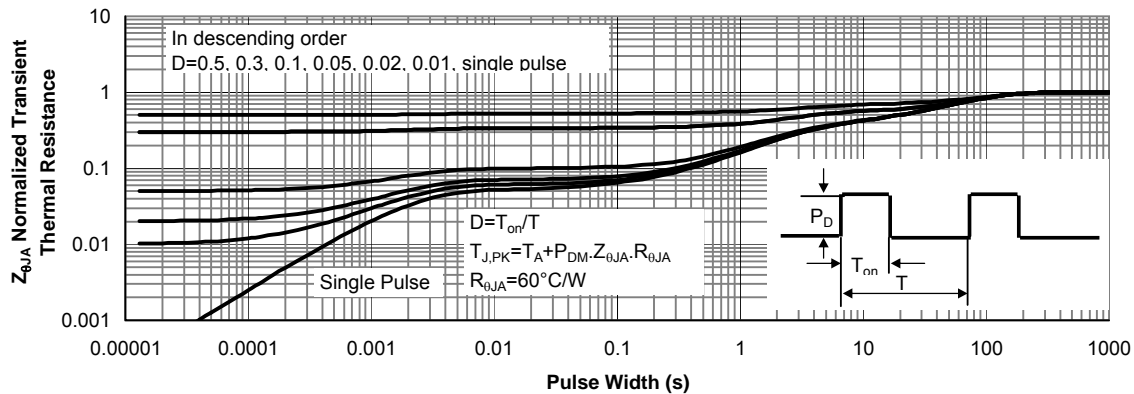


Figure 16: Normalized Maximum Transient Thermal Impedance (Note G)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

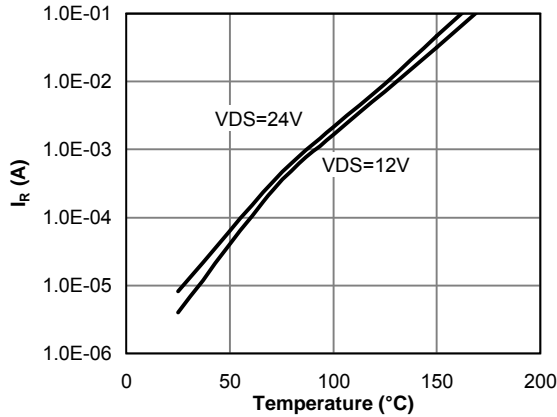


Figure 17: Diode Reverse Leakage Current vs. Junction Temperature

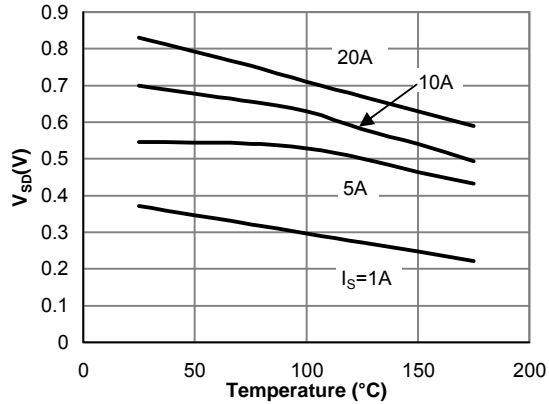


Figure 18: Diode Forward voltage vs. Junction Temperature

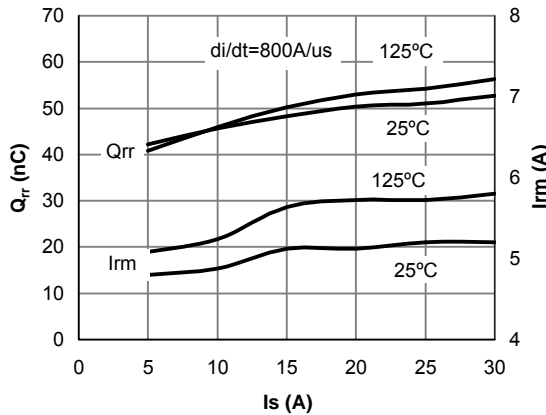


Figure 19: Diode Reverse Recovery Charge and Peak Current vs. Conduction Current

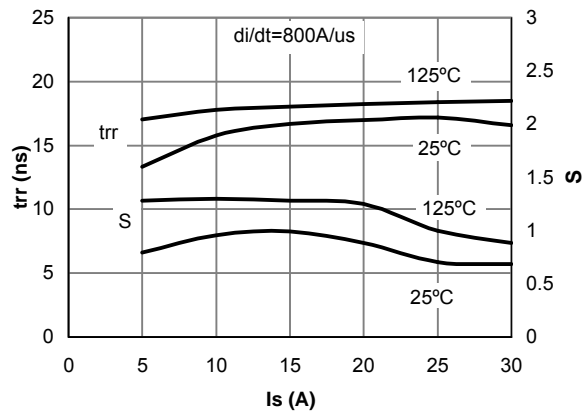


Figure 20: Diode Reverse Recovery Time and Soft Coefficient vs. Conduction Current

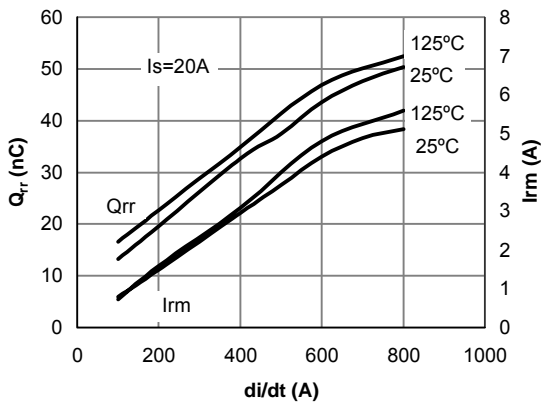


Figure 21: Diode Reverse Recovery Charge and Peak Current vs. di/dt

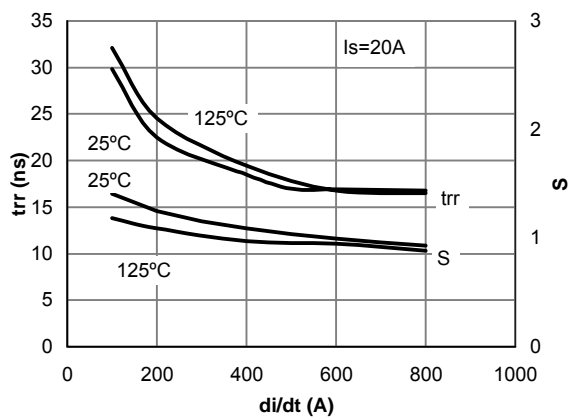


Figure 22: Diode Reverse Recovery Time and Soft Coefficient vs. di/dt