ALPHA & OMEGA SEMICONDUCTOR

AO4456

30V N-Channel MOSFET

SRFET™

General Description

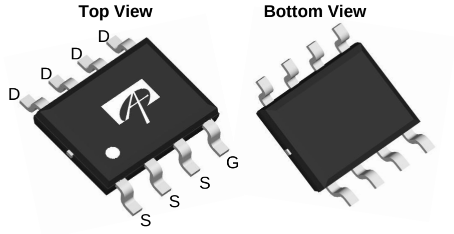
SRFET[TM] AO4456 uses advanced trench technology with a monolithically integrated Schottky diode to provide excellent $R_{DS(ON)}$,and low gate charge. This device is suitable for use as a low side FET in SMPS, load switching and general purpose applications.

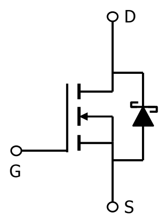
Product Summary

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

100% UIS Tested
100% R_g Tested

SOIC-8





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

Absolute Maximum Ratings T_A=25℃ 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℃	I_D	20	A
	T_C=70℃		16	
Pulsed Drain Current [C]		I_{DM}	120	
Avalanche Current [C]		I_{AS}, I_{AR}	47	A
Avalanche energy L=0.1mH [C]		E_{AS}, E_{AR}	110	mJ
Power Dissipation [B]	T_C=25℃	P_D	3.1	W
	T_C=70℃		2.0	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150	℃

Thermal Characteristics					
Parameter		**Symbol**	**Typ**	**Max**	**Units**
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	31	40	℃/W
Maximum Junction-to-Ambient [A D]	Steady-State		59	75	℃/W
Maximum Junction-to-Lead	Steady-State	$R_{\theta JL}$	16	24	℃/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				0.1	mA
			T_J=125°C			20	
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			3.8	4.6	mΩ
			T_J=125°C		5.9	7.4	
		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 RqJA is measured with the device mounted on 1in2 FR-4 board with 2oz. Copper, in a still air environment with TA =25°C. The value in any given application depends on the user's specific board design.
B. The power dissipation PD is based on TJ(MAX)=150°C, using ≤ 10s junction-to-ambient thermal resistance.
C. Repetitive rating, pulse width limited by junction temperature TJ(MAX)=150°C. Ratings are based on low frequency and duty cycles to keep initialTJ=25°C.
D. The RqJA is the sum of the thermal impedence from junction to lead RqJL 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 impedence which is measured with the device mounted on 1in2 FR-4 board with 2oz. Copper, assuming a maximum junction temperature of TJ(MAX)=150°C. The SOA curve provides a s ingle pulse rating.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

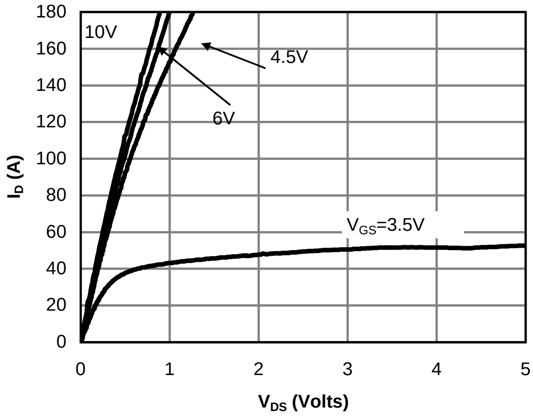


Fig 1: On-Region Characteristics (Note E)

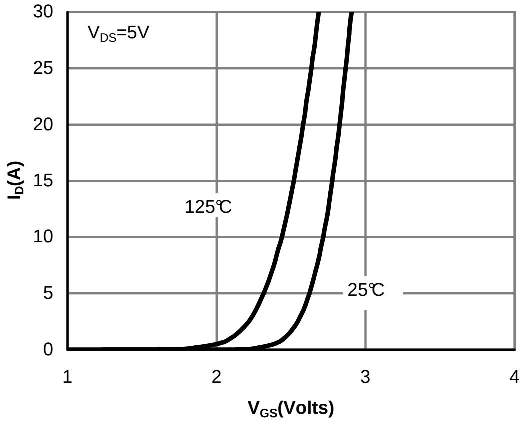


Figure 2: Transfer Characteristics (Note E)

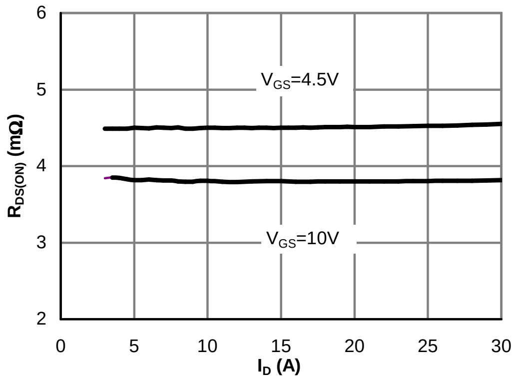


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

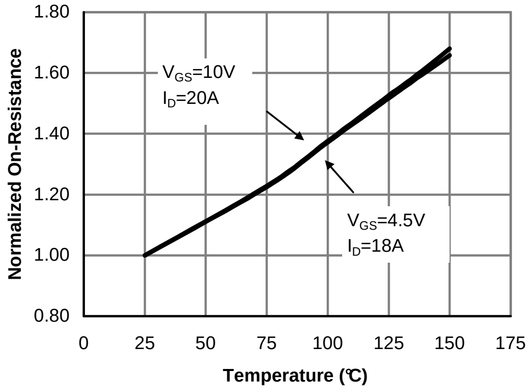


Figure 4: On-Resistance vs. Junction Temperature (Note E)

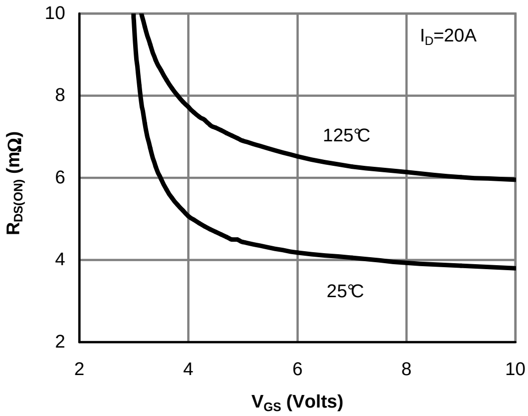


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

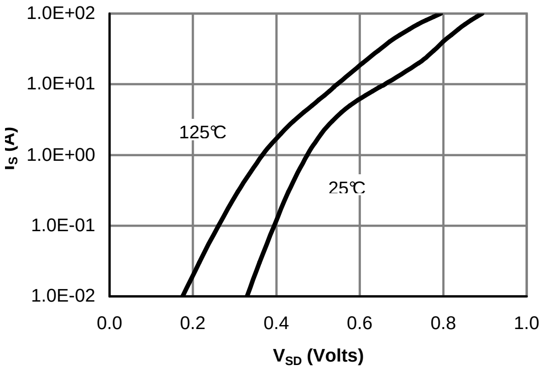


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

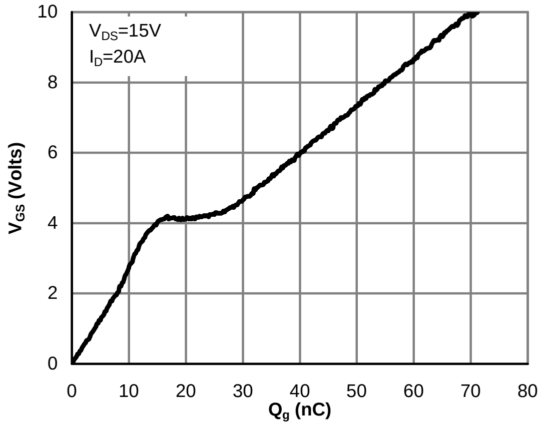


Figure 7: Gate-Charge Characteristics

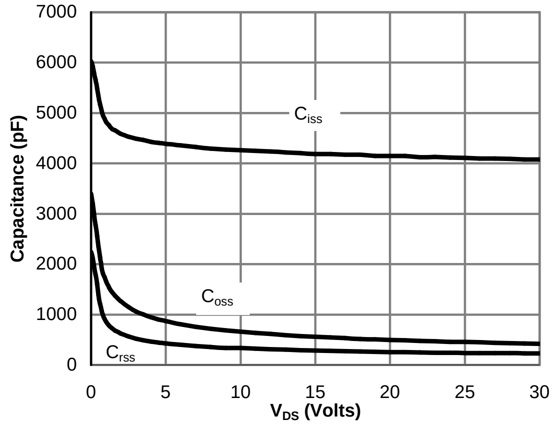


Figure 8: Capacitance Characteristics

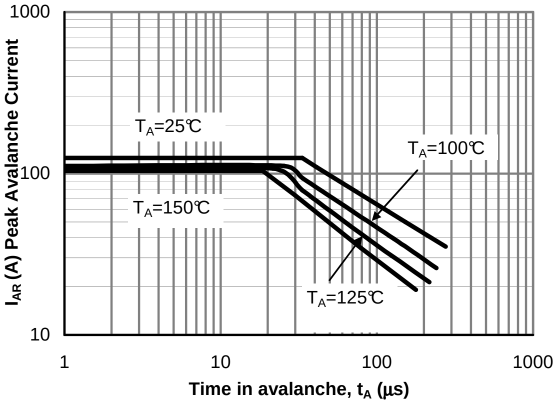


Figure 9: Single Pulse Avalanche capability (Note C)

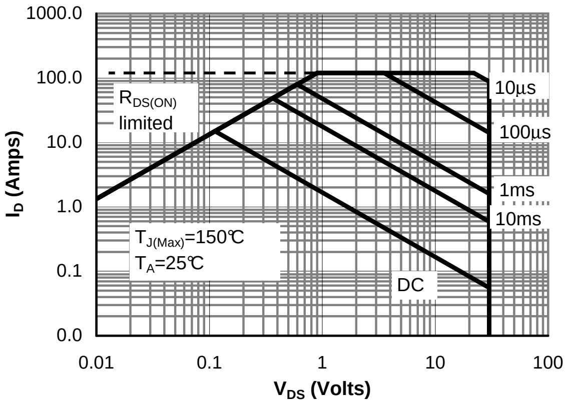


Figure 10: Maximum Forward Biased Safe Operating Area (Note F)

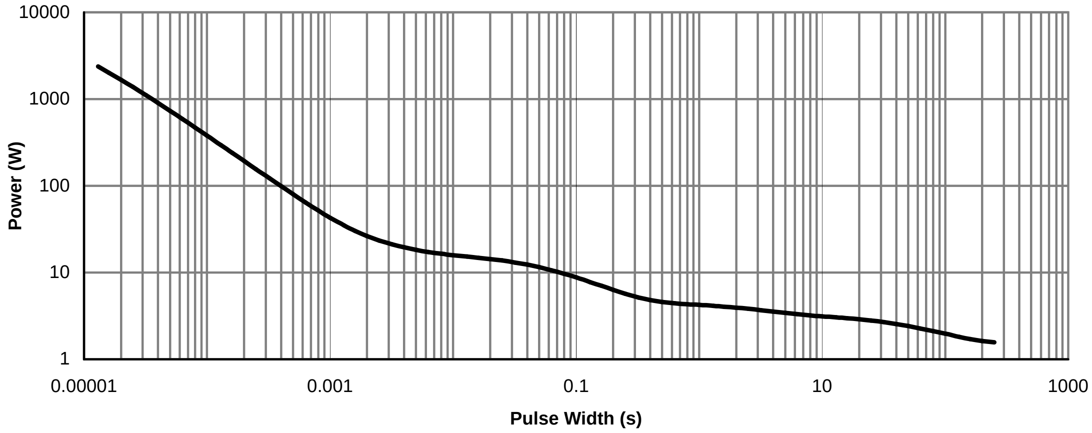


Figure 11: Single Pulse Power Rating Junction-to-Ambient (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

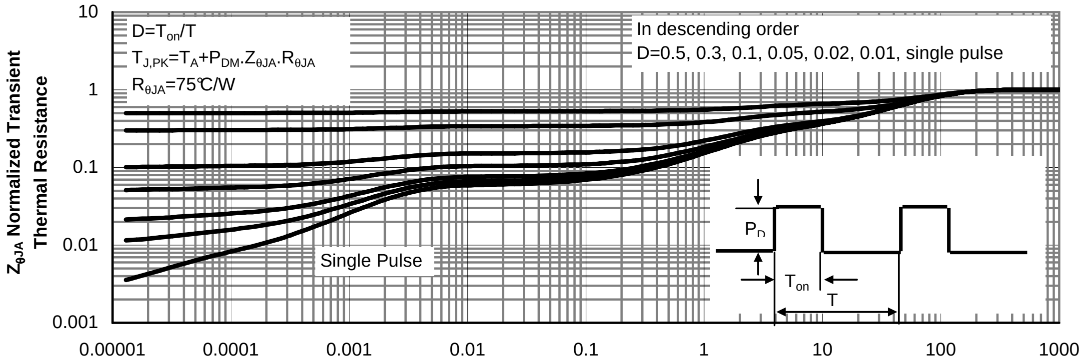


Figure 12: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

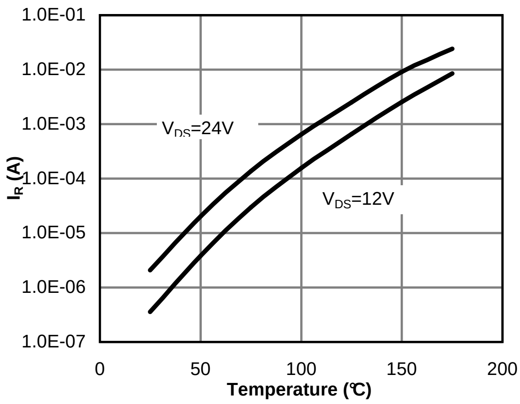


Figure 13: Diode Reverse Leakage Current vs. Junction Temperature

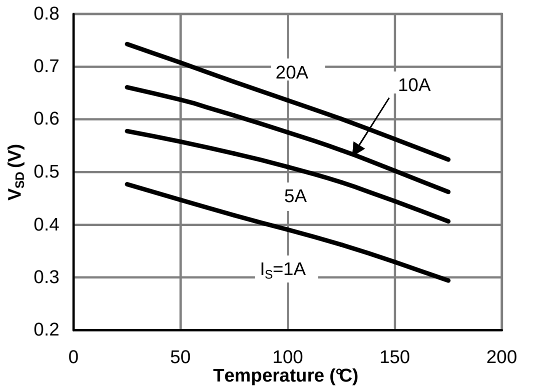


Figure 14: Diode Forward voltage vs. Junction Temperature

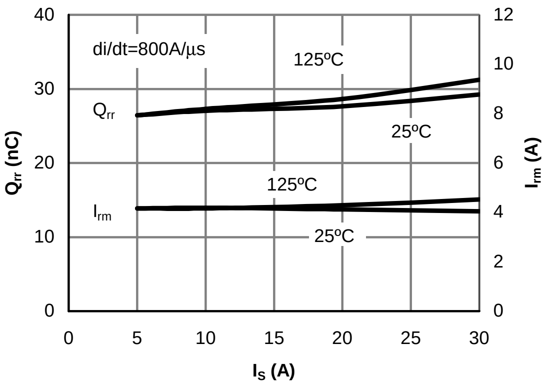


Figure 15: Diode Reverse Recovery Charge and Peak Current vs. Conduction Current

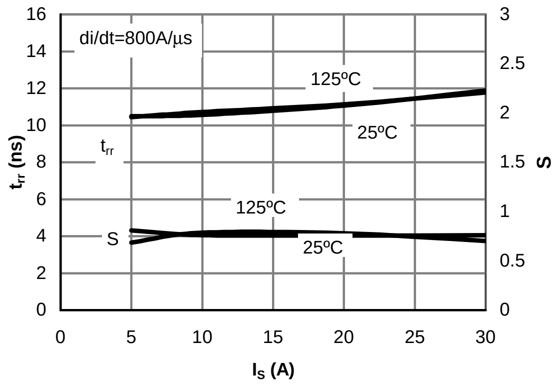


Figure 16: Diode Reverse Recovery Time and Softness Factor vs. Conduction Current

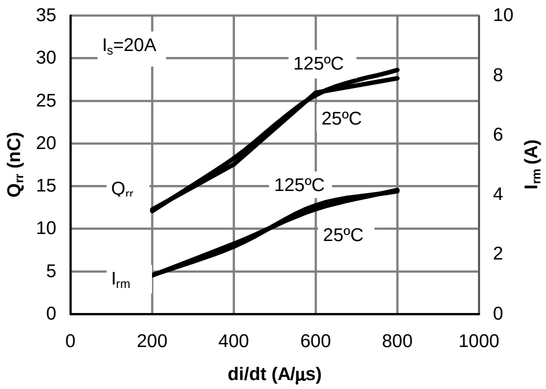


Figure 17: Diode Reverse Recovery Charge and Peak Current vs. di/dt

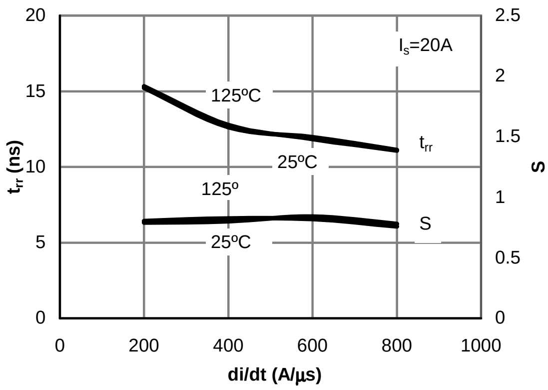
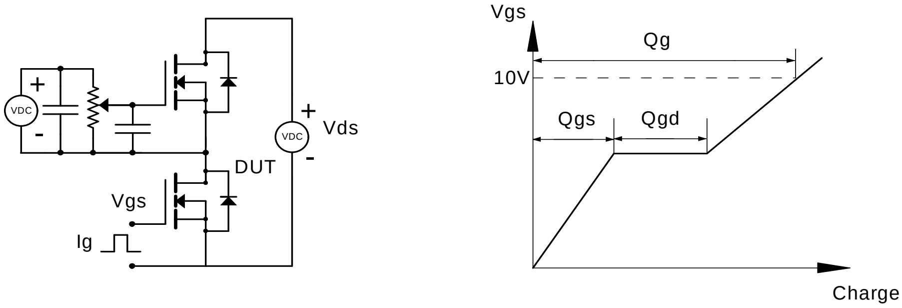
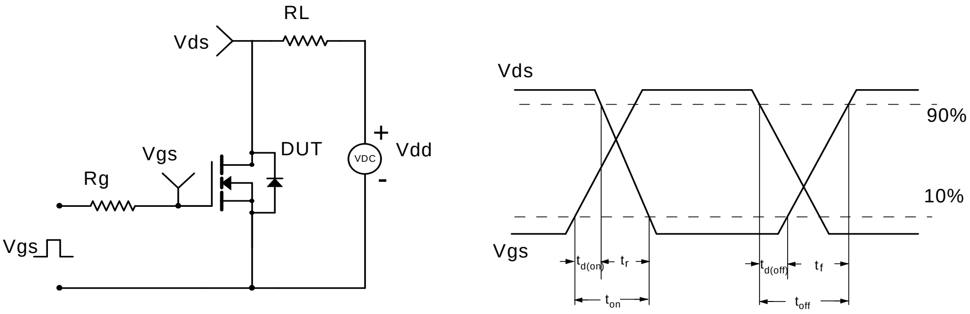


Figure 18: Diode Reverse Recovery Time and Softness Factor vs. di/dt

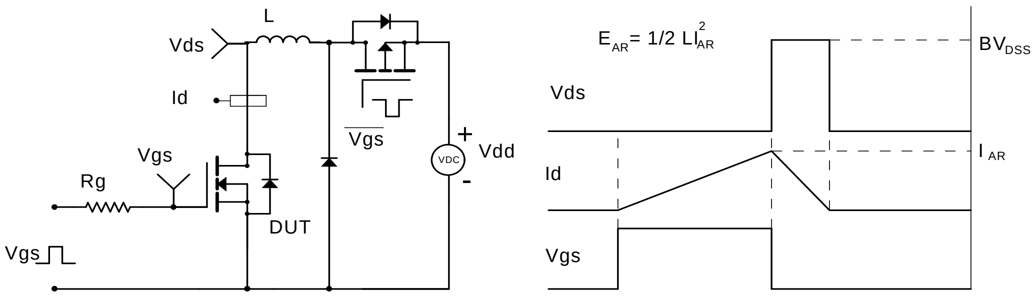
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms