ALPHA & OMEGA SEMICONDUCTOR

AOD442/AOI442

60V N-Channel MOSFET

General Description

The AOD442/AOI442 used advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. Those devices are suitable for use as a load switch or in PWM applications.

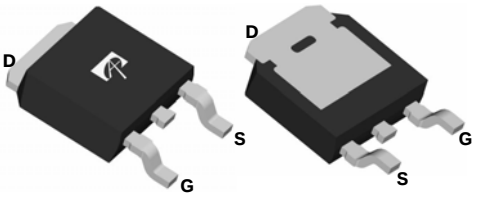
Product Summary

V_{DS}	60V
I_D (at V_{GS}=10V)	37A
$R_{DS(ON)}$ (at V_{GS}=10V)	< 20mΩ
$R_{DS(ON)}$ (at V_{GS} = 4.5V)	< 25mΩ

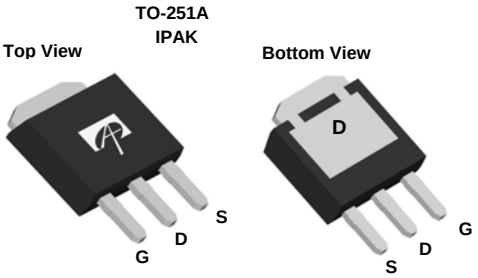
100% UIS Tested
100% R_g Tested

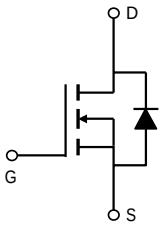
Green Product

TO252
DPAK



TO-251A
IPAK





Absolute Maximum Ratings T_A=25°C unless otherwise noted

Parameter		Symbol	Maximum	Units
Drain-Source Voltage		V_{DS}	60	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current [G]	T_C=25°C	I_D	37	A
	T_C=100°C		26	
Pulsed Drain Current [C]		I_{DM}	60	
Continuous Drain Current	T_A=25°C	I_{DSM}	7	A
	T_A=70°C		5	
Avalanche Current [C]		I_{AS}, I_{AR}	30	A
Avalanche energy L=0.1mH [C]		E_{AS}, E_{AR}	45	mJ
Power Dissipation [B]	T_C=25°C	P_D	60	W
	T_C=100°C		30	
Power Dissipation [A]	T_A=25°C	P_{DSM}	2.1	W
	T_A=70°C		1.3	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 175	°C

Thermal Characteristics

Parameter		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	17.4	25	°C/W
Maximum Junction-to-Ambient [A D]	Steady-State		51	60	°C/W
Maximum Junction-to-Case	Steady-State	$R_{\theta JC}$	1.8	2.5	°C/W

Downloaded from Arrow.com.

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	60			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=48V, V_{GS}=0V			1	µA
		T_J=55°C			5	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}= ±20V			100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=250µA	1.6	2.1	2.7	V
$I_{D(ON)}$	On state drain current	V_{GS}=10V, V_{DS}=5V	60			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=20A		16	20	mΩ
		T_J=125°C		31	37	
		V_{GS}=4.5V, I_D=20A		20	25	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=20A		65		S
V_{SD}	Diode Forward Voltage	I_S=1A,V_{GS}=0V		0.7	1	V
I_S	Maximum Body-Diode Continuous Current				32	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=30V, f=1MHz	1535	1920	2300	pF
C_{oss}	Output Capacitance		108	155	200	pF
C_{rss}	Reverse Transfer Capacitance		70	116	165	pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz	0.3	0.65	0.8	Ω
SWITCHING PARAMETERS						
Q_g(10V)	Total Gate Charge	V_{GS}=10V, V_{DS}=30V, I_D=20A	38	47.6	68	nC
Q_g(4.5V)	Total Gate Charge		20	24.2	30	nC
Q_{gs}	Gate Source Charge		4.8	6	7	nC
Q_{gd}	Gate Drain Charge		8.5	14.4	20	nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=30V, R_L=1.5Ω, R_{GEN}=3Ω		7.4		ns
t_r	Turn-On Rise Time			5.1		ns
$t_{D(off)}$	Turn-Off DelayTime			28.2		ns
t_f	Turn-Off Fall Time			5.5		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=20A, dI/dt=100A/µs		34	41	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=20A, dI/dt=100A/µs		46		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 175°C may be used if the PCB allows it.

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. 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 $T_{J(MAX)}$=175°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.

Downloaded from Arrow.com.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

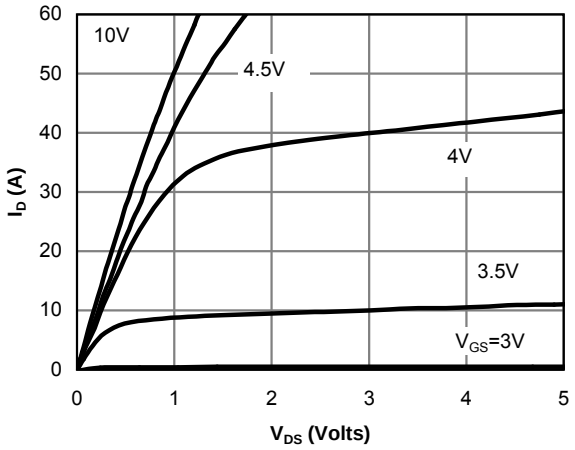


Fig 1: On-Region Characteristics (Note E)

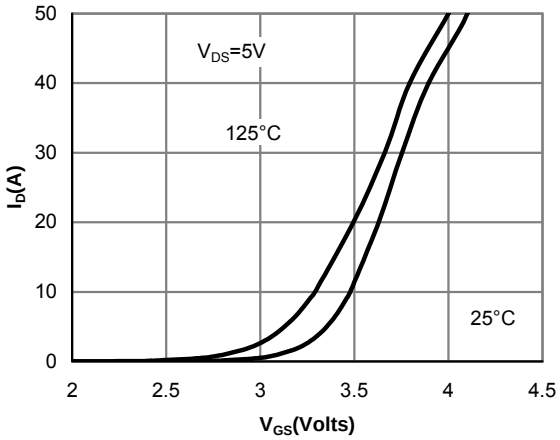


Figure 2: Transfer Characteristics (Note E)

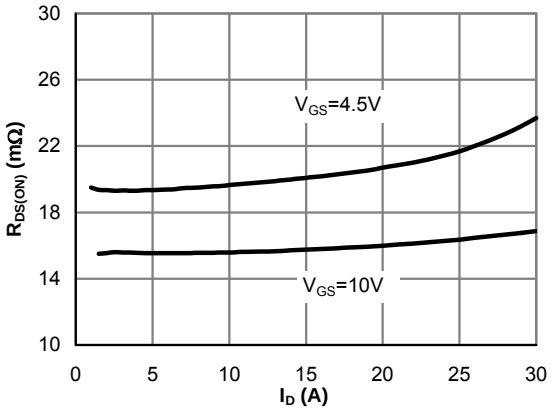


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

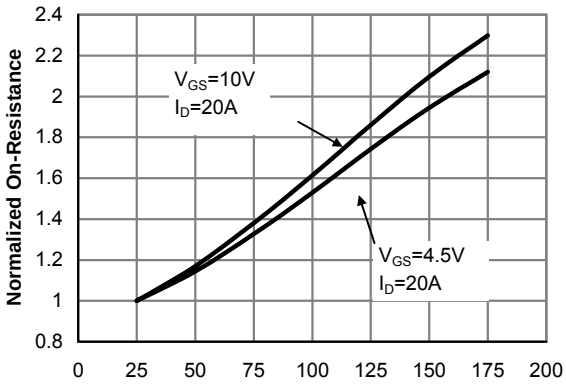


Figure 4: On-Resistance vs. Junction Temperature (Note E)

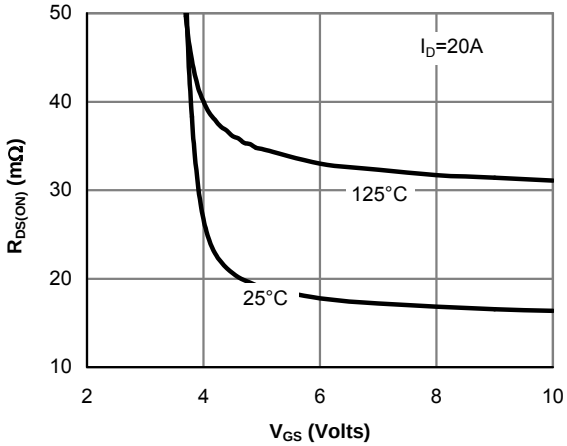


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

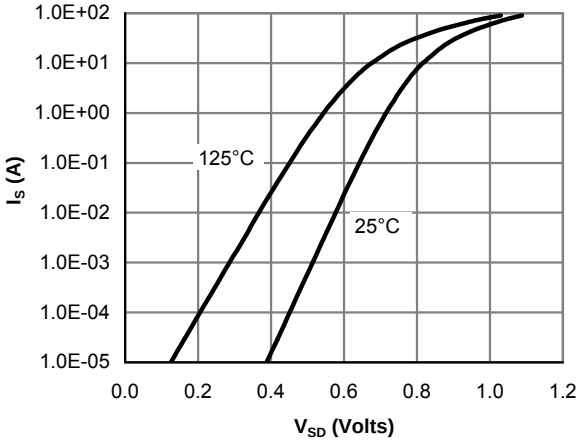


Figure 6: Body-Diode Characteristics (Note E)

Downloaded from Arrow.com.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

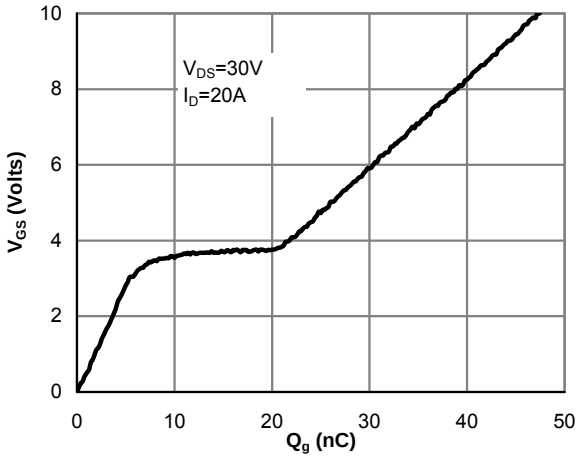


Figure 7: Gate-Charge Characteristics

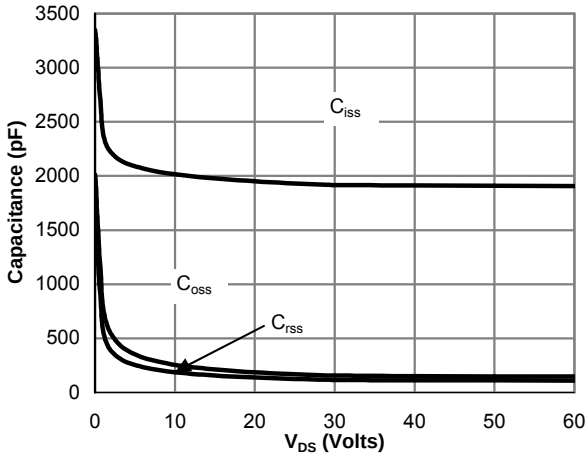


Figure 8: Capacitance Characteristics

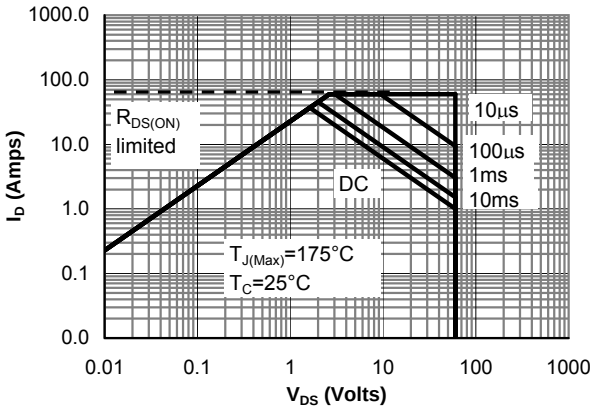


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

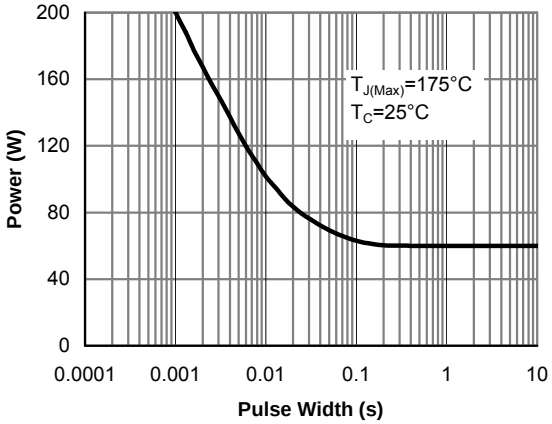


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

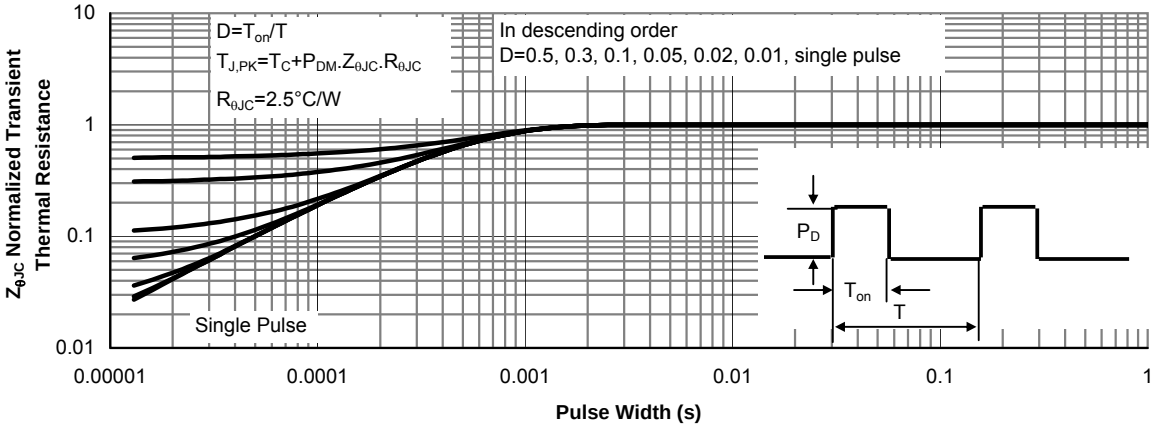


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

Downloaded from Arrow.com.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

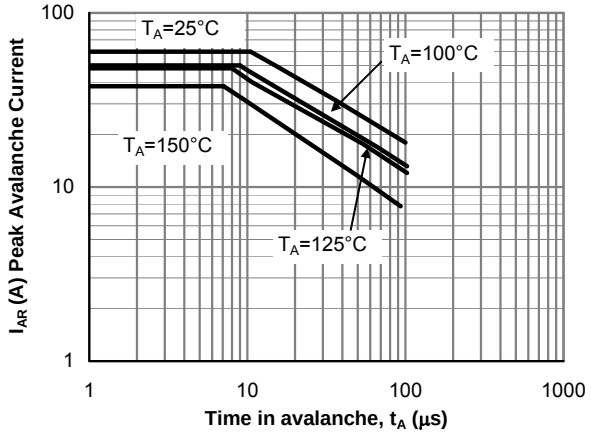


Figure 12: Single Pulse Avalanche capability (Note C)

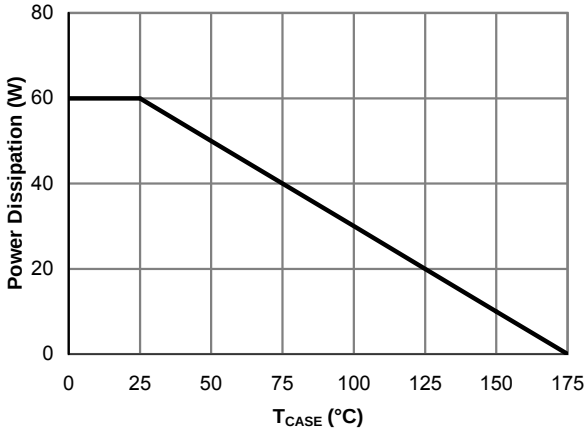


Figure 13: Power De-rating (Note F)

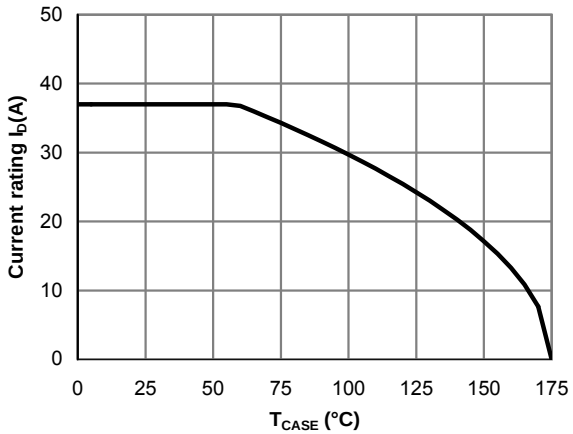


Figure 14: Current De-rating (Note F)

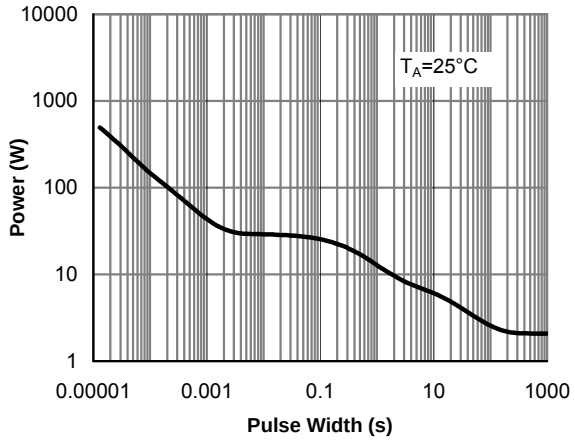


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

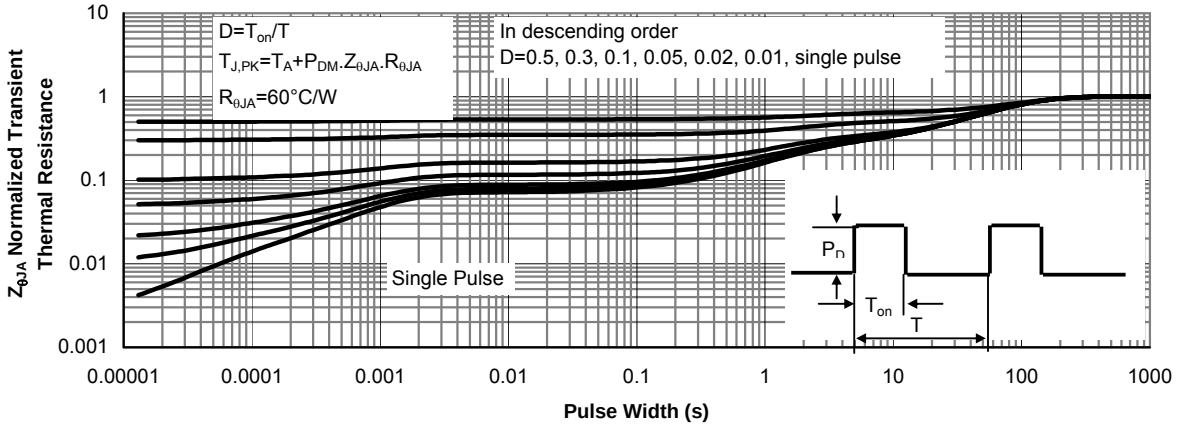
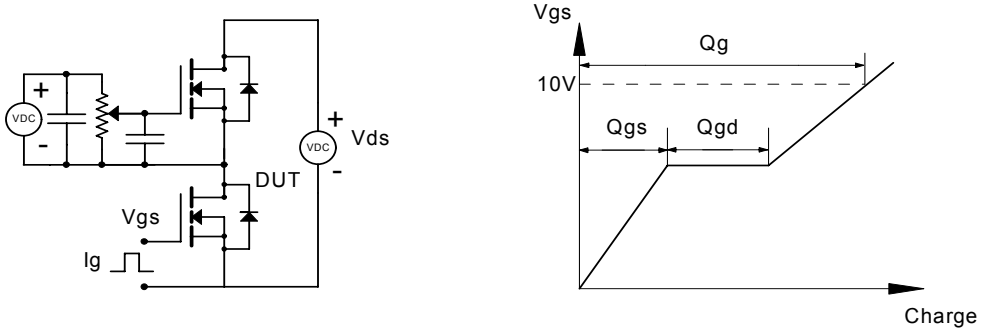


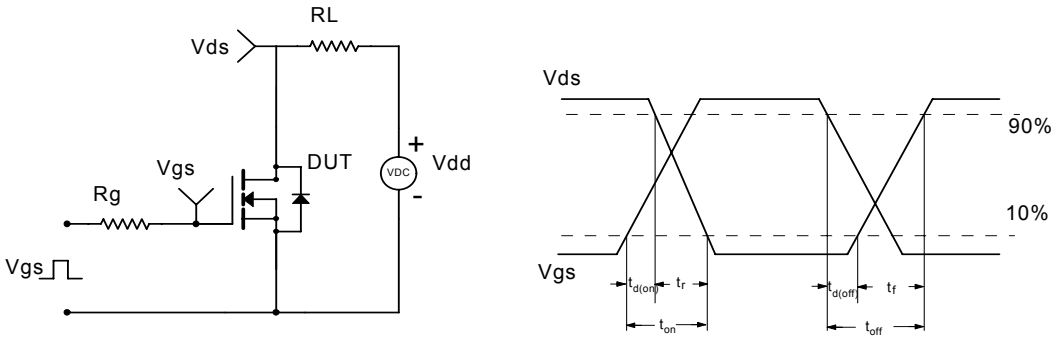
Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

Downloaded from Arrow.com.

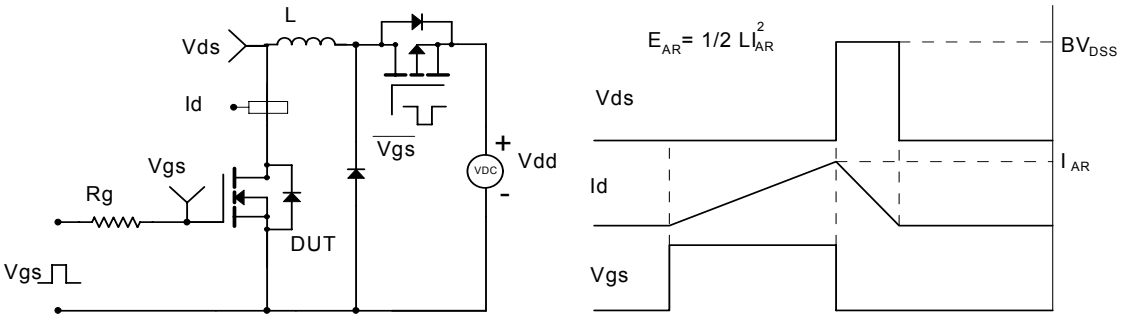
Gate Charge Test Circuit & Waveform



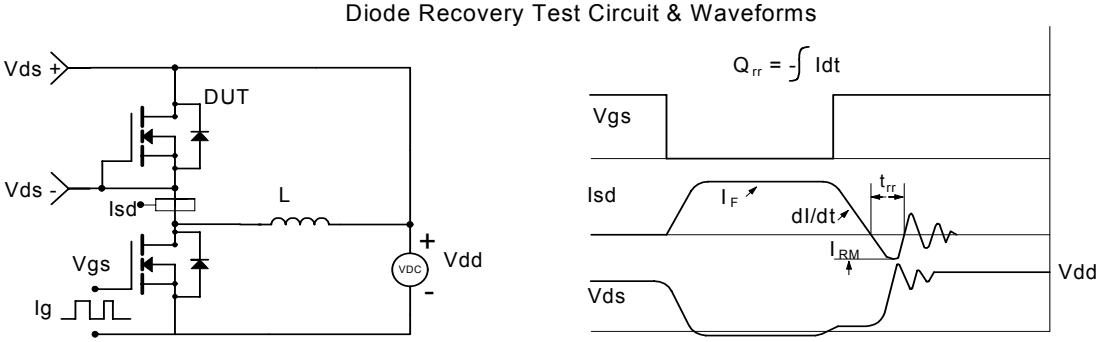
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



Downloaded from Arrow.com.