AOTF256L Datasheet

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DiGi Electronics Part Number	AOTF256L-DG
Manufacturer	Alpha & Omega Semiconductor Inc.
Manufacturer Product Number	AOTF256L
Description	MOSFET N-CH 150V 3A/12A TO220-3F
Detailed Description	N-Channel 150 V 3A (Ta), 12A (Tc) 2.1W (Ta), 33W (Tc) Through Hole TO-220F

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Purchase and inquiry

Manufacturer Product Number:	Manufacturer:
AOTF256L	Alpha & Omega Semiconductor Inc.
Series:	Product Status:
-	Active
FET Type:	Technology:
N-Channel	MOSFET (Metal Oxide)
Drain to Source Voltage (Vdss):	Current - Continuous Drain (Id) @ 25°C:
150 V	3A (Ta), 12A (Tc)
Drive Voltage (Max Rds On, Min Rds On):	Rds On (Max) @ Id, Vgs:
4.5V, 10V	85mOhm @ 10A, 10V
Vgs(th) (Max) @ Id:	Gate Charge (Qg) (Max) @ Vgs:
2.8V @ 250µA	22 nC @ 10 V
Vgs (Max):	Input Capacitance (Ciss) (Max) @ Vds:
±20V	1165 pF @ 75 V
FET Feature:	Power Dissipation (Max):
-	2.1W (Ta), 33W (Tc)
Operating Temperature:	Mounting Type:
-55°C ~ 175°C (TJ)	Through Hole
Supplier Device Package:	Package / Case:
TO-220F	TO-220-3 Full Pack
Base Product Number:	
AOTF256	

Environmental & Export classification

RoHS Status:	Moisture Sensitivity Level (MSL):
ROHS3 Compliant	1 (Unlimited)
REACH Status:	ECCN:
REACH Unaffected	EAR99
HTSUS:	
8541.29.0095	

ALPHA & OMEGA
SEMICONDUCTOR

AOTF256L

150V N-Channel MOSFET

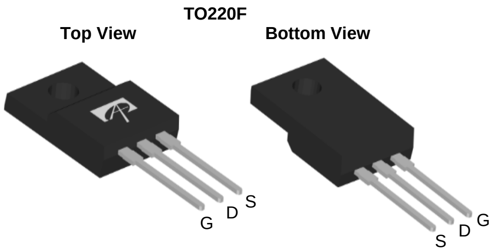
General Description

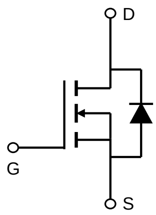
The AOTF256L uses trench MOSFET technology that is uniquely optimized to provide the most efficient high frequency switching performance. Both conduction and switching power losses are minimized due to an extremely low combination of $R_{DS(ON)}$, Ciss and Coss. This device is ideal for boost converters and synchronous rectifiers for consumer, telecom, industrial power supplies and LED backlighting.

Product Summary

V_{DS}	150V
I_D (at V_{GS}=10V)	12A
$R_{DS(ON)}$ (at V_{GS}=10V)	< 85mΩ
$R_{DS(ON)}$ (at V_{GS}=4.5V)	< 100mΩ

100% UIS Tested
100% R_g Tested





Absolute Maximum Ratings T_A=25°C unless otherwise noted

Parameter		Symbol	Maximum	Units
Drain-Source Voltage		V_{DS}	150	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current	T_C=25°C	I_D	12	A
	T_C=100°C		8.5	
Pulsed Drain Current [C]		I_{DM}	35	
Continuous Drain Current	T_A=25°C	I_{DSM}	3	A
	T_A=70°C		2.5	
Avalanche Current [C]		I_{AS}	9	A
Avalanche energy L=0.1mH [C]		E_{AS}	4	mJ
Power Dissipation [B]	T_C=25°C	P_D	33	W
	T_C=100°C		16	
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	$R_{\theta JA}$	12	15	°C/W
Maximum Junction-to-Ambient [A D]	Steady-State		50	60	°C/W
Maximum Junction-to-Case	Steady-State	$R_{\theta JC}$	3.8	4.6	°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=250μA, V_{GS}=0V	150			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=150V, 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	1.8	2.25	2.8	V
$I_{D(ON)}$	On state drain current	V_{GS}=10V, V_{DS}=5V	35			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=10A		70	85	mΩ
		T_J=125°C		139	170	
		V_{GS}=4.5V, I_D=8A		78	100	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=10A		35		S
V_{SD}	Diode Forward Voltage	I_S=1A,V_{GS}=0V		0.72	1	V
I_S	Maximum Body-Diode Continuous Current				12	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=75V, f=1MHz		1165		pF
C_{oss}	Output Capacitance			61.5		pF
C_{rss}	Reverse Transfer Capacitance			2.5		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz	1.1	2.2	3.3	Ω
SWITCHING PARAMETERS						
Q_g(10V)	Total Gate Charge	V_{GS}=10V, V_{DS}=75V, I_D=10A		15.5	22	nC
Q_g(4.5V)	Total Gate Charge			7	10	nC
Q_{gs}	Gate Source Charge			4		nC
Q_{gd}	Gate Drain Charge			1.2		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=75V, R_L=7.5Ω, R_{GEN}=3Ω		6.5		ns
t_r	Turn-On Rise Time			5		ns
$t_{D(off)}$	Turn-Off DelayTime			23		ns
t_f	Turn-Off Fall Time			2.5		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=10A, dI/dt=500A/μs		37		ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=10A, dI/dt=500A/μs		265		nC

A. The value of $R_{\theta JA}$ is measured with the device mounted on 1in² 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 impedance 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 impedance 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 in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25° C.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

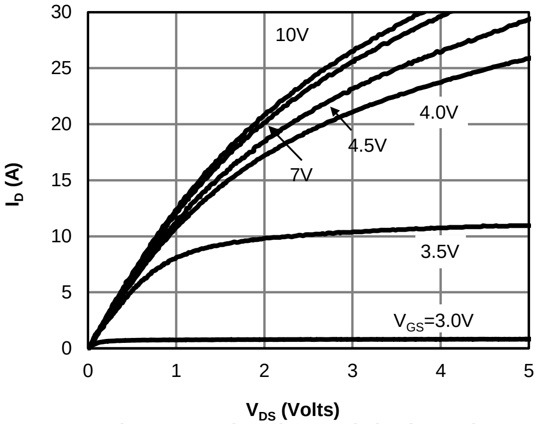


Fig 1: On-Region Characteristics (Note E)

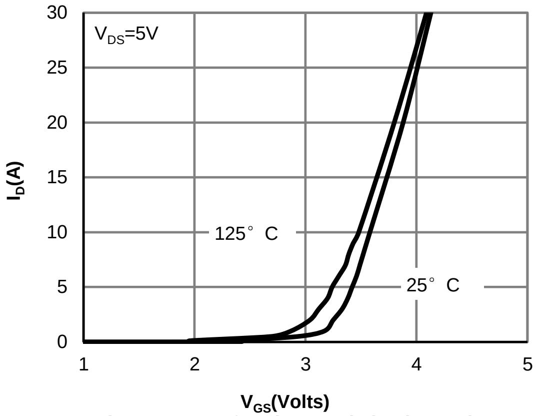


Figure 2: Transfer Characteristics (Note E)

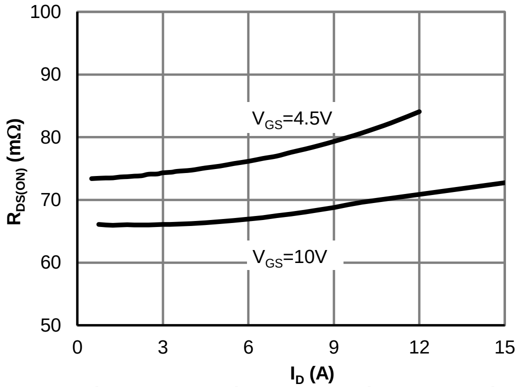


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

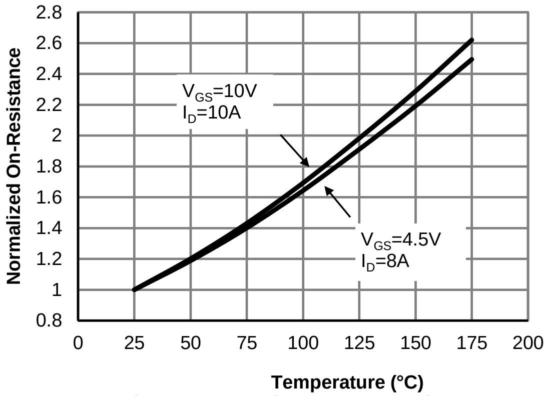


Figure 4: On-Resistance vs. Junction Temperature (Note E)

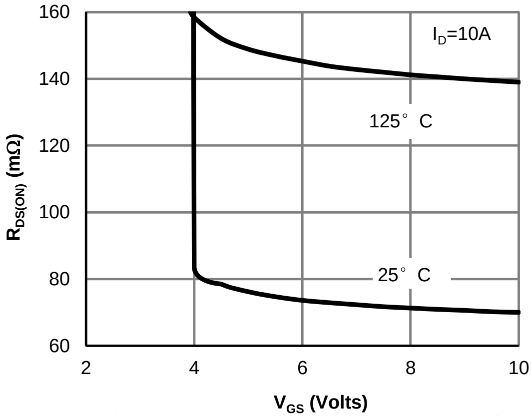


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

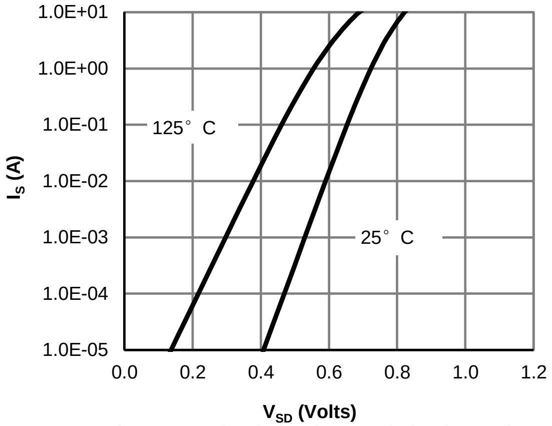


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

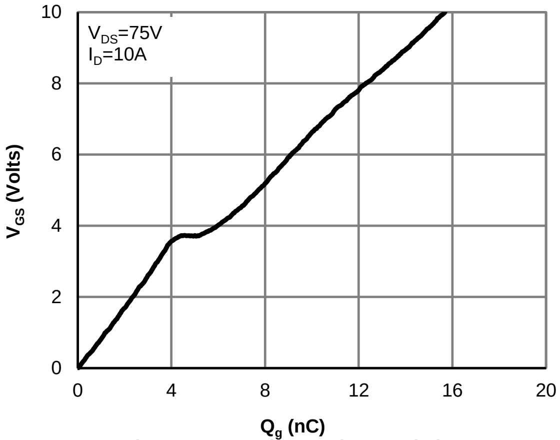


Figure 7: Gate-Charge Characteristics

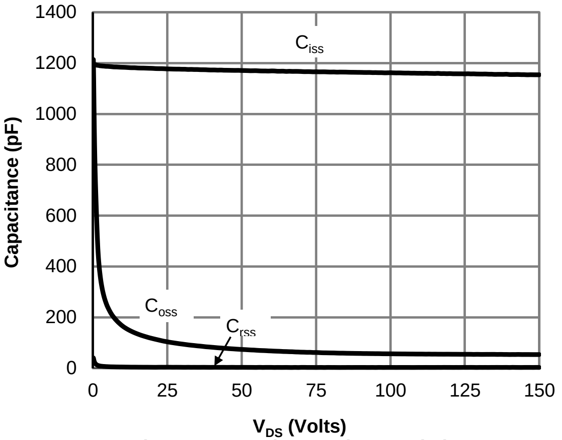


Figure 8: Capacitance Characteristics

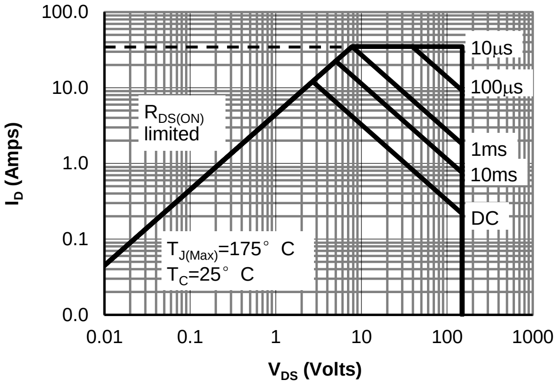


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

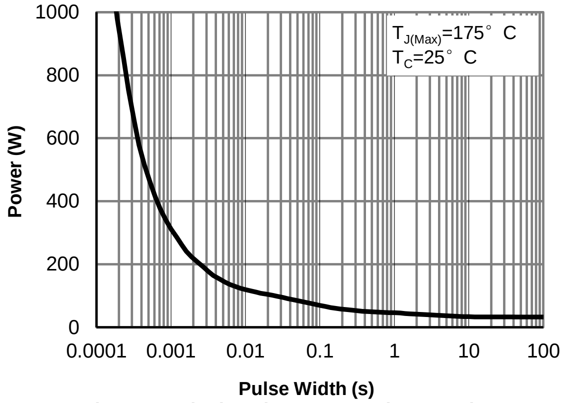


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

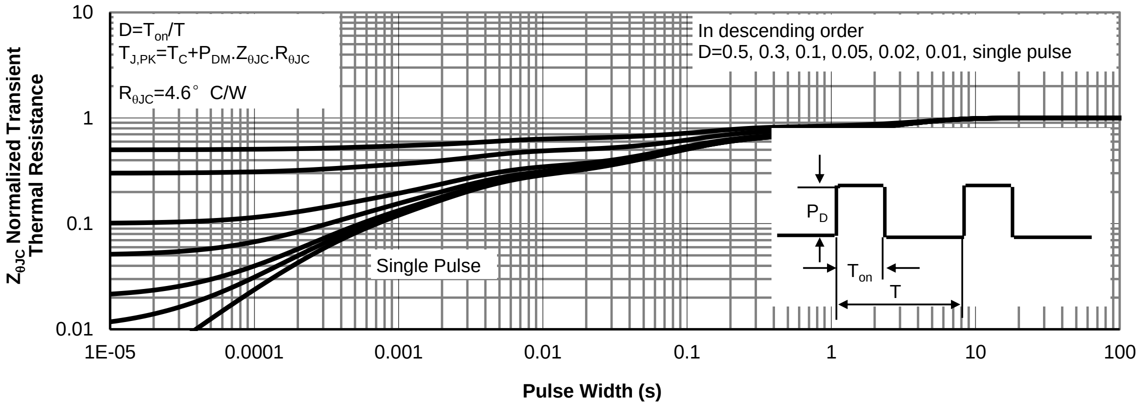
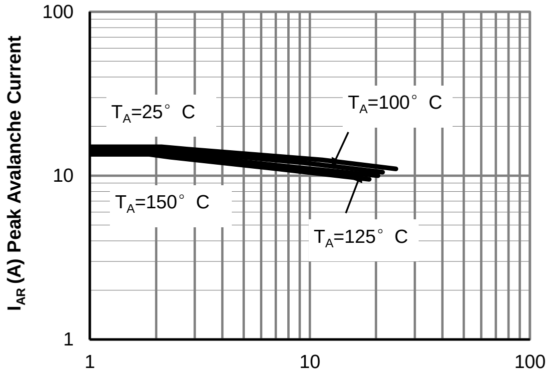
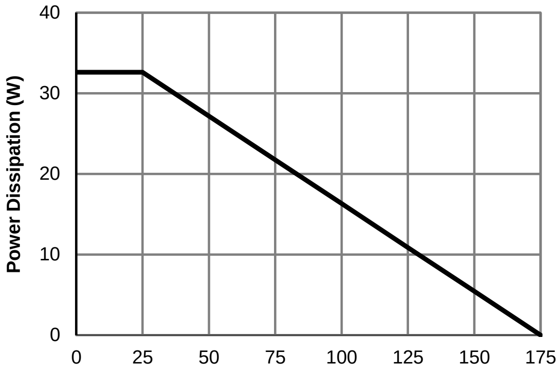


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

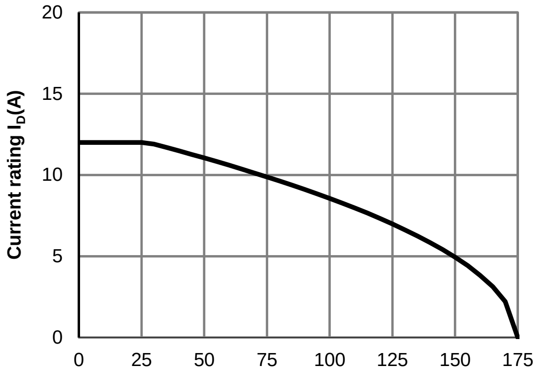
TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS



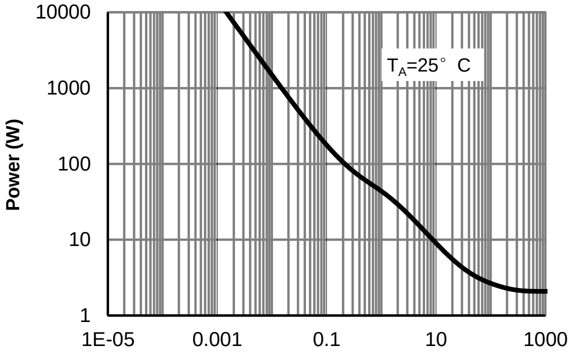
Time in avalanche, t_A (µs)
Figure 12: Single Pulse Avalanche capability (Note C)



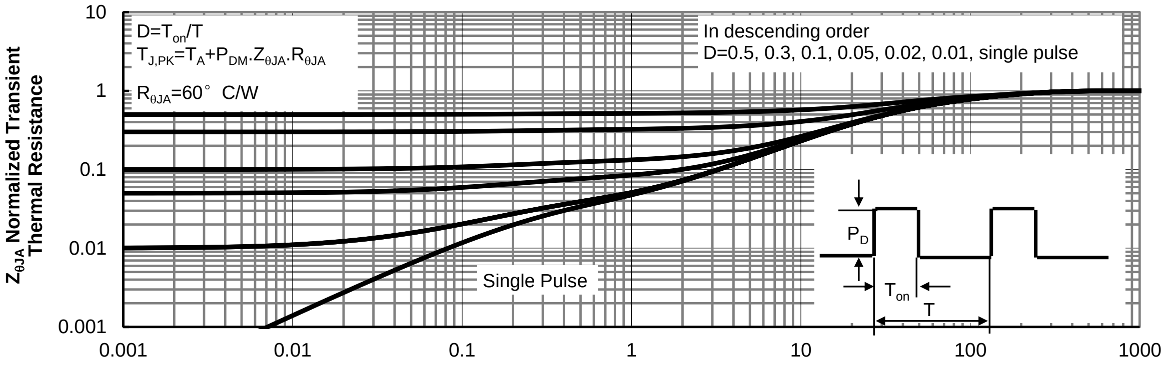
T_{CASE} (°C)
Figure 13: Power De-rating (Note F)



T_{CASE} (°C)
Figure 14: Current De-rating (Note F)

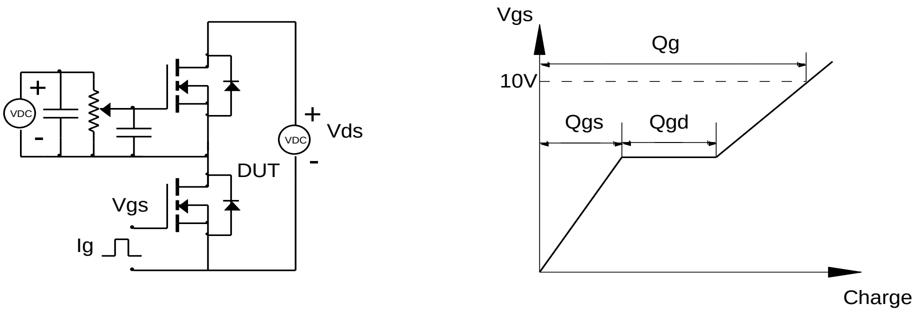


Pulse Width (s)
Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

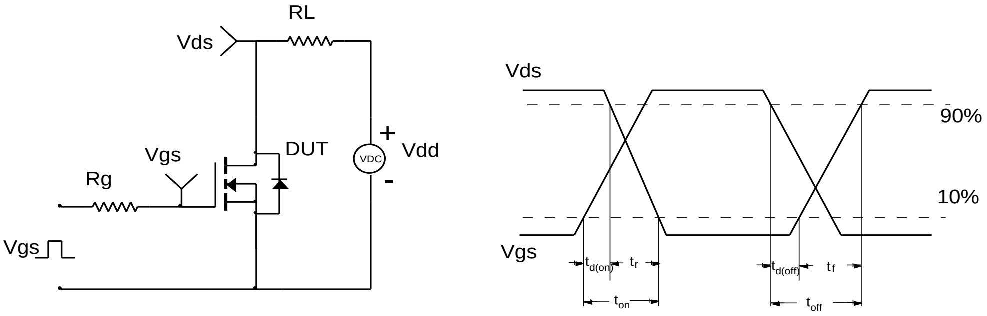


Pulse Width (s)
Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

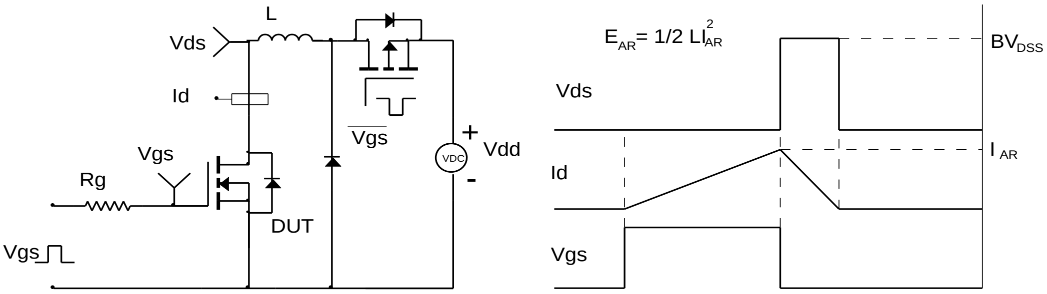
Gate Charge Test Circuit & Waveform



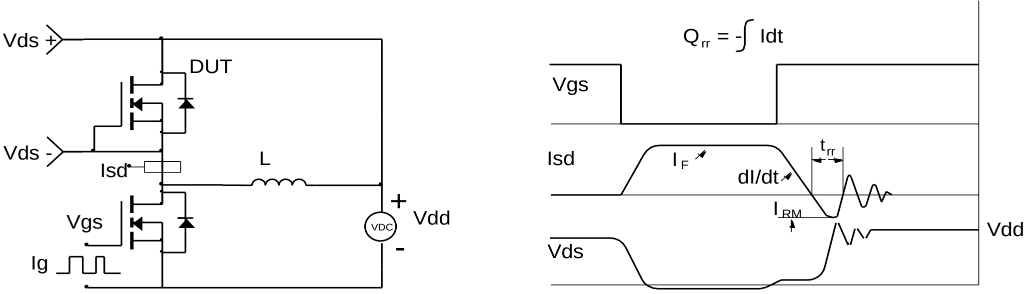
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



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