ALPHA & OMEGA SEMICONDUCTOR

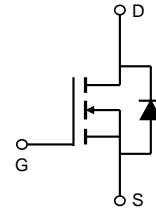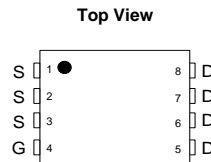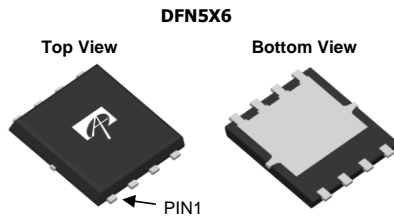# AON6278
80V N-Channel MOSFET

General Description

The AON6278 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}	80V
I_D (at V_{GS}=10V)	85A
$R_{DS(ON)}$ (at V_{GS}=10V)	< 3.3mΩ
$R_{DS(ON)}$ (at V_{GS}=6V)	< 4.6mΩ

100% UIS Tested
100% R_g Tested

Green Product

DFN5X6

Top View   Bottom View

PIN1

Top View

S	1 ●	8	D
S	2	7	D
S	3	6	D
G	4	5	D

Absolute Maximum Ratings T_A=25°C unless otherwise noted

Parameter		Symbol	Maximum	Units
Drain-Source Voltage		V_{DS}	80	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current [G]	T_C=25°C	I_D	85	A
	T_C=100°C		66	
Pulsed Drain Current [C]		I_{DM}	260	
Continuous Drain Current	T_A=25°C	I_{DSM}	34	A
	T_A=70°C		27	
Avalanche Current [C]		I_{AS}	60	A
Avalanche energy L=0.1mH [C]		E_{AS}	180	mJ
Power Dissipation [B]	T_C=25°C	P_D	208	W
	T_C=100°C		83	
Power Dissipation [A]	T_A=25°C	P_{DSM}	7.4	W
	T_A=70°C		4.7	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150	°C

Thermal Characteristics

Parameter		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	14	17	°C/W
Maximum Junction-to-Ambient [A D]	Steady-State		40	55	°C/W
Maximum Junction-to-Case	Steady-State	$R_{\theta JC}$	0.46	0.6	°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		80			V
I$_{DSS}$	Zero Gate Voltage Drain Current	V$_{DS}$=80V, 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		2.3	2.75	3.3	V
R$_{DS(ON)}$	Static Drain-Source On-Resistance	V$_{GS}$=10V, I$_D$=20A			2.75	3.3	mΩ
			T$_J$=125°C		4.7	5.7	
		V$_{GS}$=6V, I$_D$=20A			3.5	4.6	mΩ
g$_{FS}$	Forward Transconductance	V$_{DS}$=5V, I$_D$=20A			90		S
V$_{SD}$	Diode Forward Voltage	I$_S$=1A,V$_{GS}$=0V			0.7	1	V
I$_S$	Maximum Body-Diode Continuous Current [G]					85	A
DYNAMIC PARAMETERS							
C$_{iss}$	Input Capacitance	V$_{GS}$=0V, V$_{DS}$=40V, f=1MHz			4646		pF
C$_{oss}$	Output Capacitance				632		pF
C$_{rss}$	Reverse Transfer Capacitance				31		pF
R$_g$	Gate resistance	V$_{GS}$=0V, V$_{DS}$=0V, f=1MHz		0.3	0.65	1.0	Ω
SWITCHING PARAMETERS							
Q$_{g(10V)}$	Total Gate Charge	V$_{GS}$=10V, V$_{DS}$=40V, I$_D$=20A			61.5	86	nC
Q$_{gs}$	Gate Source Charge				17		nC
Q$_{gd}$	Gate Drain Charge				9.5		nC
t$_{D(on)}$	Turn-On DelayTime	V$_{GS}$=10V, V$_{DS}$=40V, R$_L$=2Ω, R$_{GEN}$=3Ω			13		ns
t$_r$	Turn-On Rise Time				6		ns
t$_{D(off)}$	Turn-Off DelayTime				36		ns
t$_f$	Turn-Off Fall Time				7		ns
t$_{rr}$	Body Diode Reverse Recovery Time	I$_F$=20A, dI/dt=500A/μs			32		ns
Q$_{rr}$	Body Diode Reverse Recovery Charge	I$_F$=20A, dI/dt=500A/μs			174		nC

A. The value of R$_{θJA}$ 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$_{θJA}$ t ≤ 10s and the maximum allowed junction temperature of 150° C. The value in any given application depends on the user's specific board design.
B. The power dissipation P$_D$ is based on T$_{J(MAX)}$=150° 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$_{J(MAX)}$=150° C. Ratings are based on low frequency and duty cycles to keep initial T$_J$ =25° 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 <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$_{J(MAX)}$=150° 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.
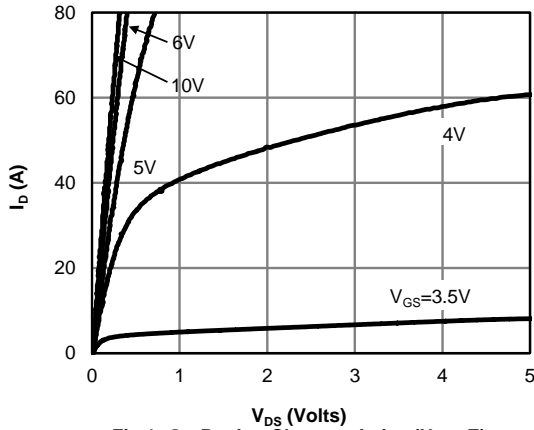
TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

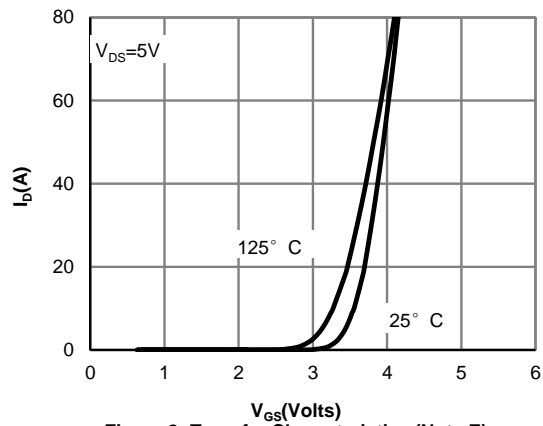Fig 1: On-Region Characteristics (Note E)
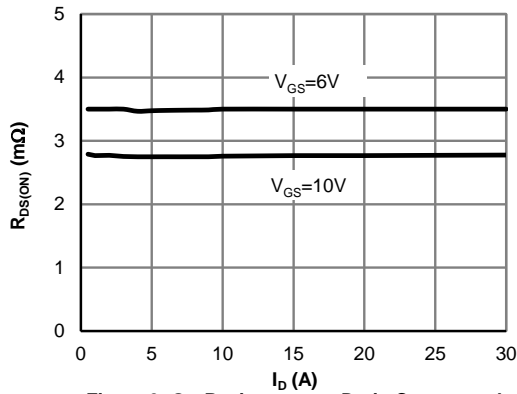

Figure 2: Transfer Characteristics (Note E)

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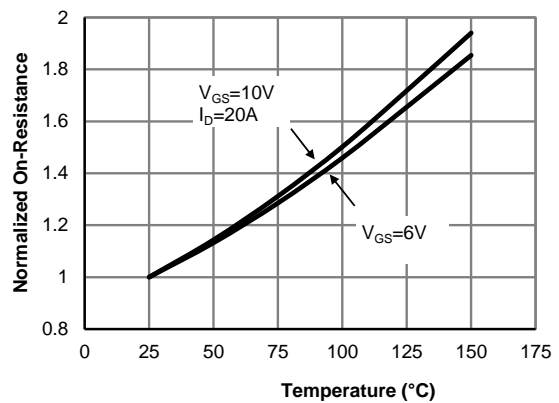Gate Voltage (Note E)

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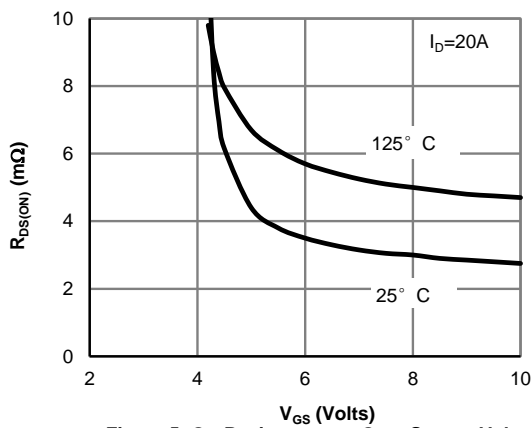(Note E)

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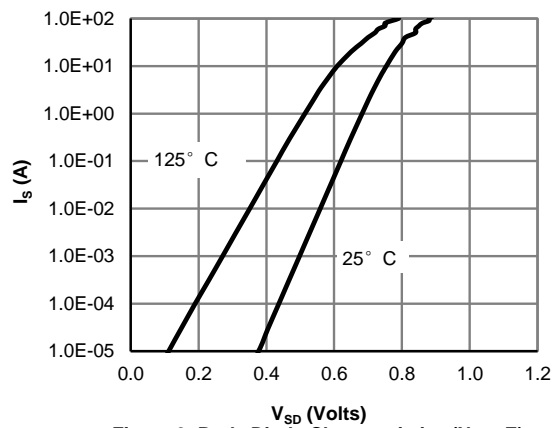(Note E)

Figure 6: Body-Diode Characteristics (Note E)

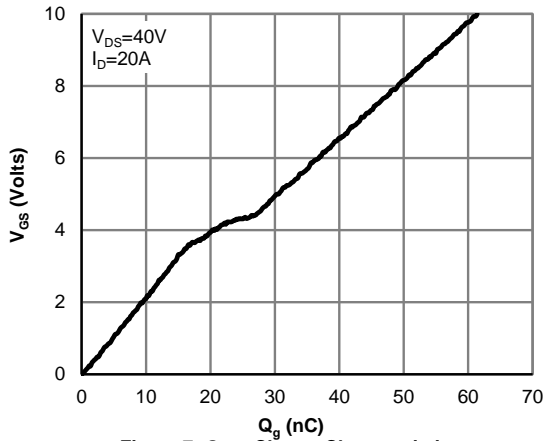## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS
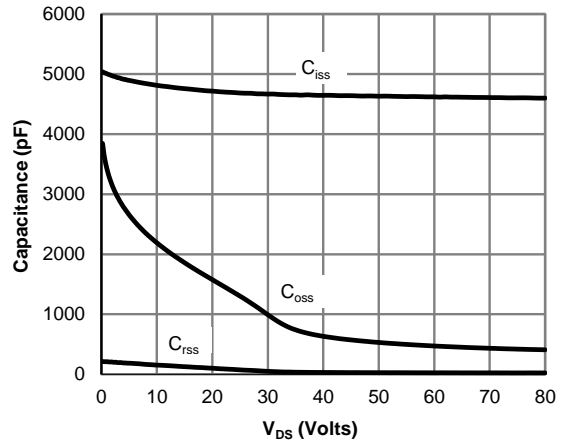

Figure 7: Gate-Charge Characteristics

Figure 8: Capacitance Characteristics
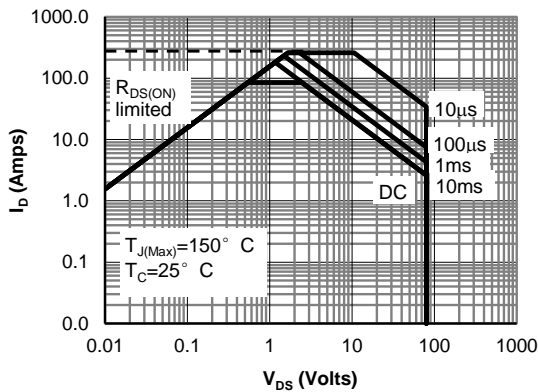
Figure 9: Maximum Forward Biased Safe Operating Area (Note F)
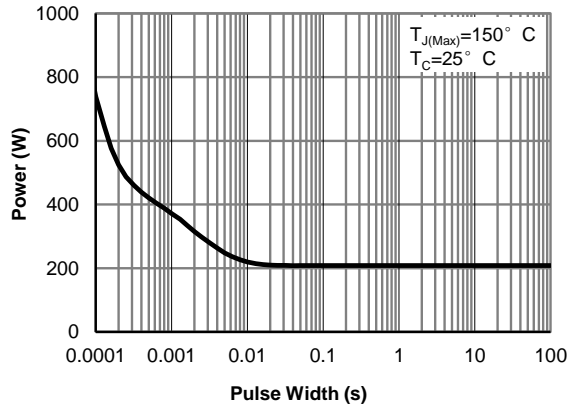
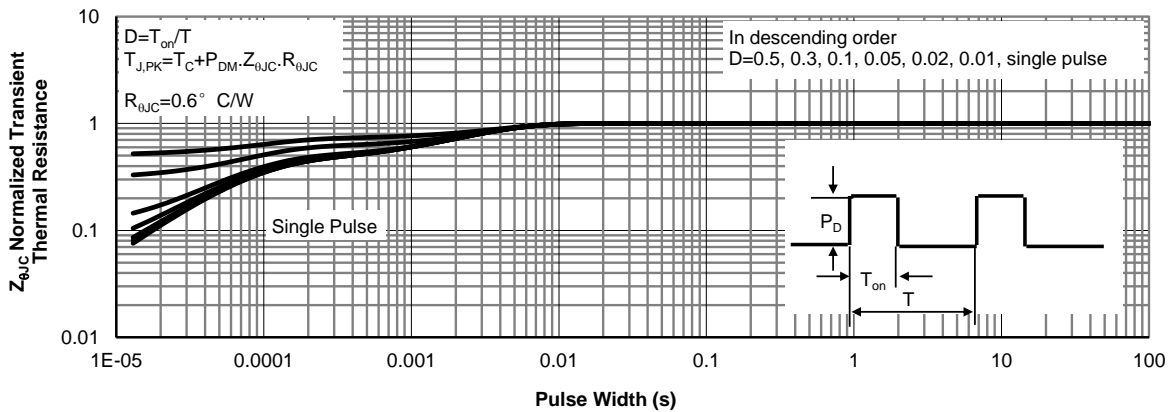**Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)**

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

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS
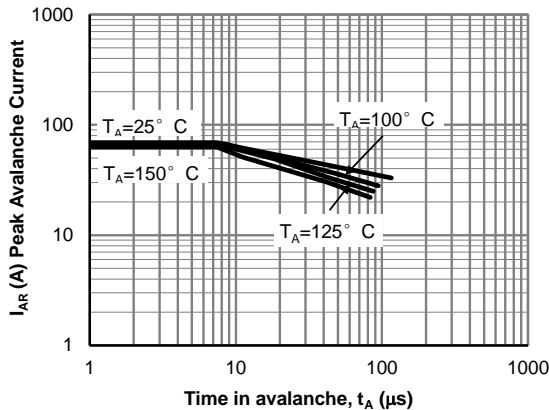
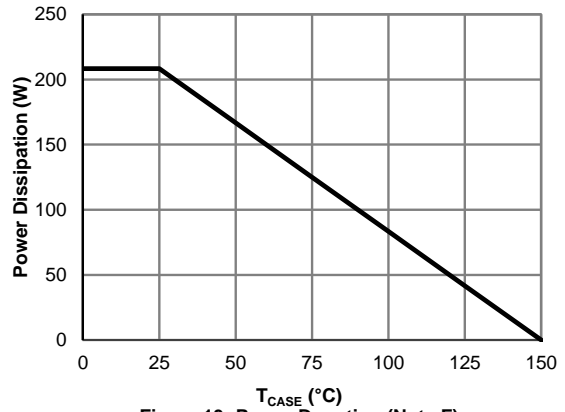Figure 12: Single Pulse Avalanche capability
(Note C)

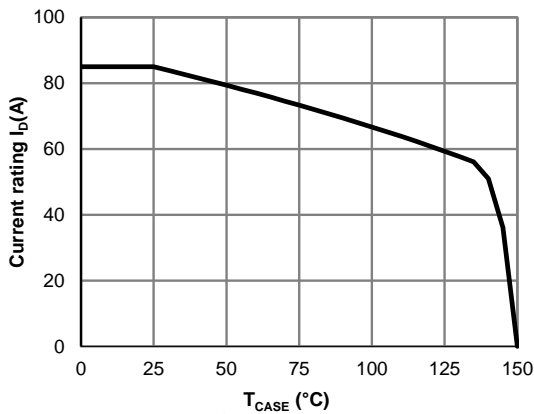Figure 13: Power De-rating (Note F)

Figure 14: Current De-rating (Note F)

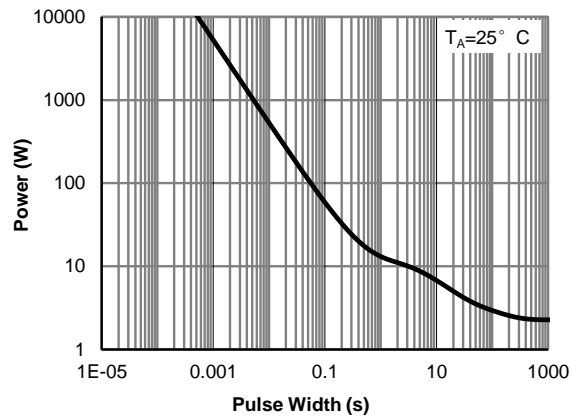Figure 15: Single Pulse Power Rating Junction-to-
Ambient (Note H)

$D=T_{on}/T$

$T_{J,PK}=T_A+P_{DM} \cdot Z_{\theta JA} \cdot R_{\theta JA}$

$R_{\theta JA}=55°\ C/W$

In descending order
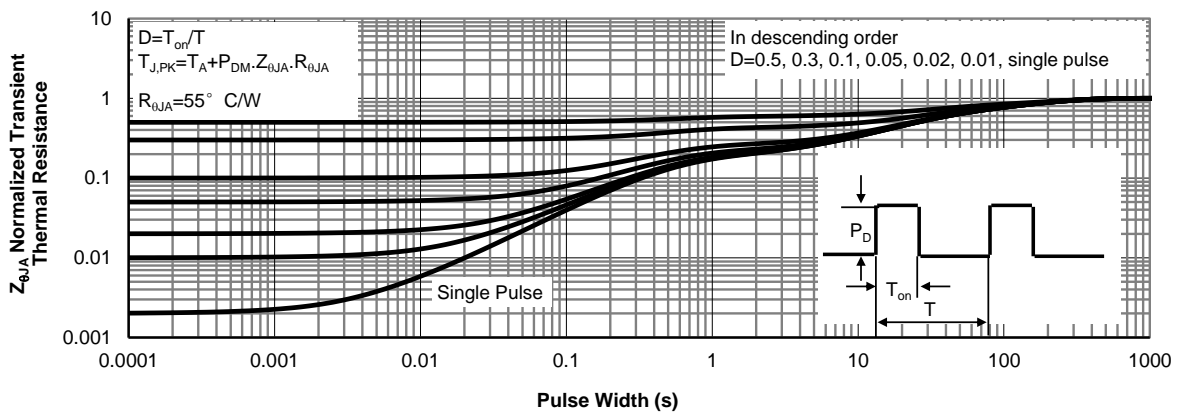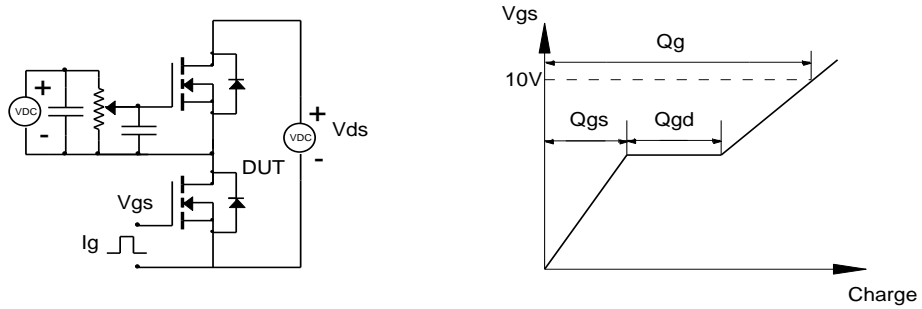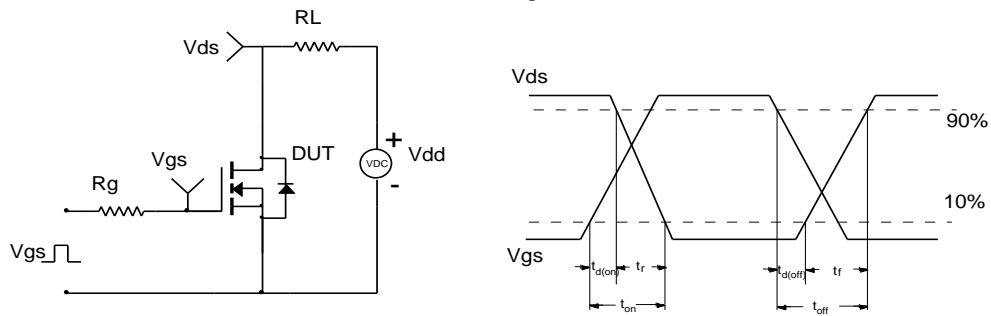D=0.5, 0.3, 0.1, 0.05, 0.02, 0.01, single pulse

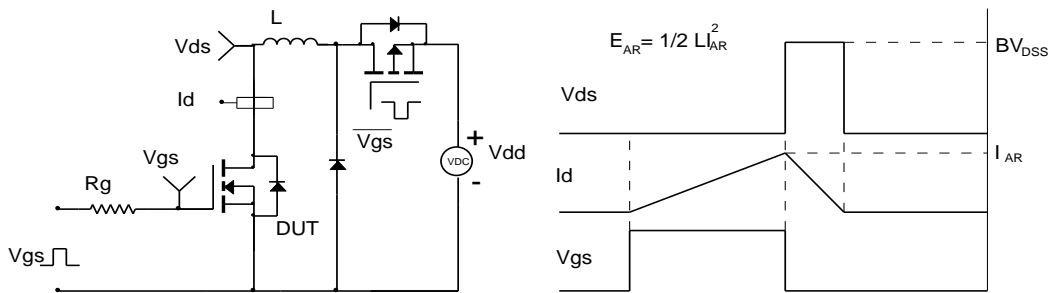Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

Gate Charge Test Circuit & Waveform

Resistive Switching Test Circuit & Waveforms

Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

$$E_{AR} = 1/2 \, L I_{AR}^2$$

Diode Recovery Test Circuit & Waveforms

$$Q_{rr} = -\int I_d t$$