



**ALPHA & OMEGA**  
SEMICONDUCTOR

**AON6816**

**30V Dual N-Channel AlphaMOS**

### General Description

- Latest Trench Power AlphaMOS (αMOS LV) technology
- Very Low RDS(on) at 4.5V<sub>GS</sub>
- Low Gate Charge
- ESD protection
- RoHS and Halogen-Free Compliant

### Product Summary

V <sub>DS</sub>	30V
I <sub>D</sub> (at V <sub>GS</sub> =10V)	16A
R <sub>DS(ON)</sub> (at V <sub>GS</sub> =10V)	< 6.2mΩ
R <sub>DS(ON)</sub> (at V <sub>GS</sub> = 4.5V)	< 9.6mΩ

### Typical ESD protection

HBM Class 2

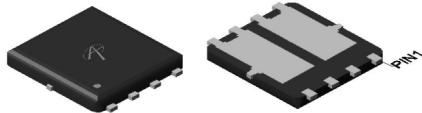
- 100% UIS Tested
- 100% R<sub>g</sub> Tested



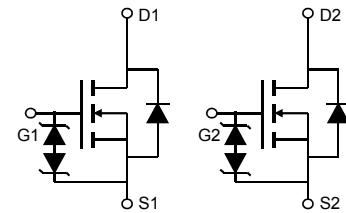
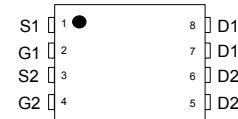
### Application

- DC/DC Converters

DFN5X6 EP2



Top View



### Absolute Maximum Ratings T<sub>A</sub>=25°C unless otherwise noted

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V <sub>DS</sub>	30	V
Gate-Source Voltage	V <sub>GS</sub>	±20	V
Continuous Drain Current <sup>G</sup>	T <sub>C</sub> =25°C I <sub>D</sub>	16	A
	T <sub>C</sub> =100°C I <sub>D</sub>	16	
Pulsed Drain Current <sup>C</sup>	I <sub>DM</sub>	64	
Continuous Drain Current	T <sub>A</sub> =25°C I <sub>DSM</sub>	16	A
	T <sub>A</sub> =70°C I <sub>DSM</sub>	14	
Avalanche Current <sup>C</sup>	I <sub>AS</sub>	35	A
Avalanche energy L=0.05mH <sup>C</sup>	E <sub>AS</sub>	31	mJ
V <sub>DS</sub> Spike	100ns V <sub>SPIKE</sub>	36	V
Power Dissipation <sup>B</sup>	T <sub>C</sub> =25°C P <sub>D</sub>	21	W
	T <sub>C</sub> =100°C P <sub>D</sub>	8	
Power Dissipation <sup>A</sup>	T <sub>A</sub> =25°C P <sub>DSM</sub>	2.8	W
	T <sub>A</sub> =70°C P <sub>DSM</sub>	1.8	
Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to 150	°C

### Thermal Characteristics

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient <sup>A</sup>	t ≤ 10s R <sub>θJA</sub>	35	45	°C/W
Maximum Junction-to-Ambient <sup>A,D</sup>		65	80	°C/W
Maximum Junction-to-Case	R <sub>θJC</sub>	5	6	°C/W

**Electrical Characteristics ( $T_J=25^\circ\text{C}$  unless otherwise noted)**

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
$\text{BV}_{\text{DSS}}$	Drain-Source Breakdown Voltage	$I_D=250\mu\text{A}, V_{GS}=0\text{V}$	30			V
$I_{\text{DSS}}$	Zero Gate Voltage Drain Current	$V_{DS}=30\text{V}, V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$			1 5	$\mu\text{A}$
$I_{\text{GSS}}$	Gate-Body leakage current	$V_{DS}=0\text{V}, V_{GS}= \pm 20\text{V}$			$\pm 10$	$\mu\text{A}$
$V_{\text{GS(th)}}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	1.2	1.8	2.2	V
$R_{\text{DS(ON)}}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}, I_D=16\text{A}$ $T_J=125^\circ\text{C}$	5	6.2		$\text{m}\Omega$
		$V_{GS}=4.5\text{V}, I_D=15\text{A}$	6.8	8.4		$\text{m}\Omega$
$g_{\text{FS}}$	Forward Transconductance	$V_{DS}=5\text{V}, I_D=16\text{A}$	7.5	9.6		S
$V_{\text{SD}}$	Diode Forward Voltage	$I_S=1\text{A}, V_{GS}=0\text{V}$	0.7	1		V
$I_S$	Maximum Body-Diode Continuous Current <sup>G</sup>				16	A
<b>DYNAMIC PARAMETERS</b>						
$C_{\text{iss}}$	Input Capacitance	$V_{GS}=0\text{V}, V_{DS}=15\text{V}, f=1\text{MHz}$		1540		$\text{pF}$
$C_{\text{oss}}$	Output Capacitance			485		$\text{pF}$
$C_{\text{rss}}$	Reverse Transfer Capacitance			448		$\text{pF}$
$R_g$	Gate resistance	$V_{GS}=0\text{V}, V_{DS}=0\text{V}, f=1\text{MHz}$	0.8	1.7	2.6	$\Omega$
<b>SWITCHING PARAMETERS</b>						
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS}=10\text{V}, V_{DS}=15\text{V}, I_D=16\text{A}$		33.4	45	nC
$Q_g(4.5\text{V})$	Total Gate Charge			19.7	27	nC
$Q_{\text{gs}}$	Gate Source Charge			3.3		nC
$Q_{\text{gd}}$	Gate Drain Charge			15.0		nC
$t_{\text{D(on)}}$	Turn-On Delay Time	$V_{GS}=10\text{V}, V_{DS}=15\text{V}, R_L=0.9\Omega, R_{\text{GEN}}=3\Omega$		7		ns
$t_r$	Turn-On Rise Time			8.3		ns
$t_{\text{D(off)}}$	Turn-Off Delay Time			24		ns
$t_f$	Turn-Off Fall Time			10		ns
$t_{\text{rr}}$	Body Diode Reverse Recovery Time	$I_F=16\text{A}, dI/dt=500\text{A}/\mu\text{s}$		15.2		ns
$Q_{\text{rr}}$	Body Diode Reverse Recovery Charge	$I_F=16\text{A}, dI/dt=500\text{A}/\mu\text{s}$		22.2		nC

A. The value of  $R_{\theta JA}$  is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A=25^\circ\text{ C}$ . The Power dissipation  $P_{\text{DSM}}$  is based on  $R_{\theta JA}$  and the maximum allowed junction temperature of  $150^\circ\text{ C}$ . The value in any given application depends on the user's specific board design.

B. The power dissipation  $P_D$  is based on  $T_{J(\text{MAX})}=150^\circ\text{ C}$ , 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  $T_{J(\text{MAX})}=150^\circ\text{ C}$ . Ratings are based on low frequency and duty cycles to keep initial  $T_J=25^\circ\text{ C}$ .

D. The  $R_{\theta JA}$  is the sum of the thermal impedance from junction to case  $R_{\theta JC}$  and case to ambient.

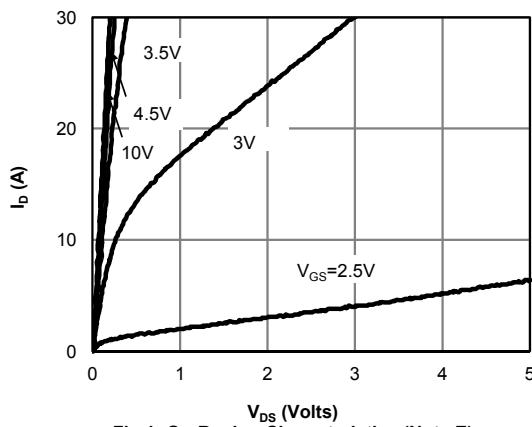
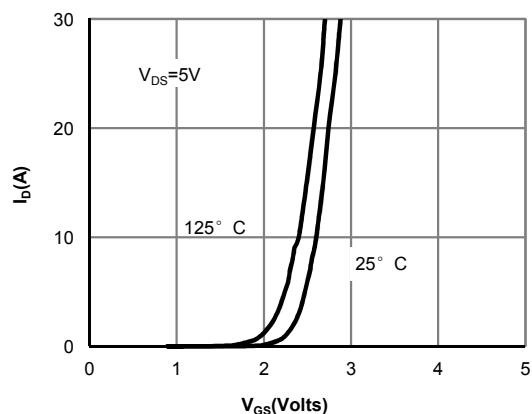
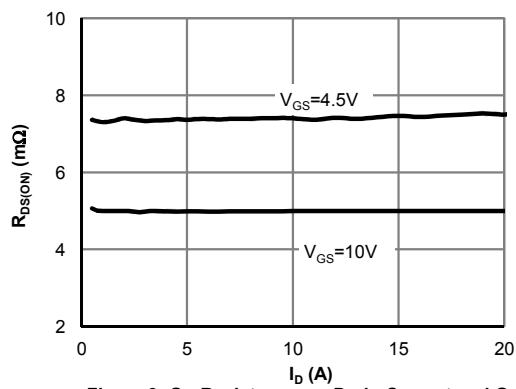
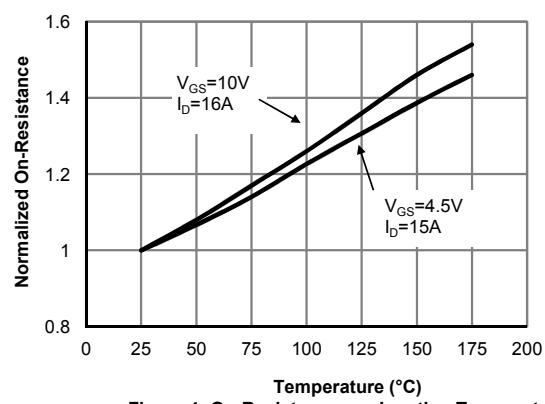
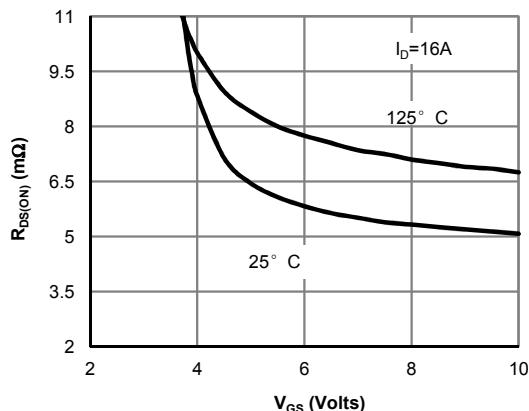
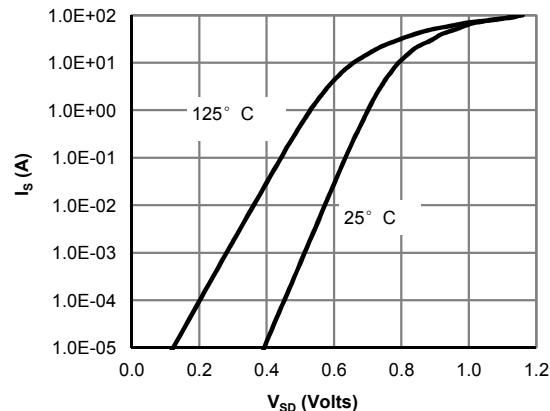
E. The static characteristics in Figures 1 to 6 are obtained using <300μs pulses, duty cycle 0.5% max.

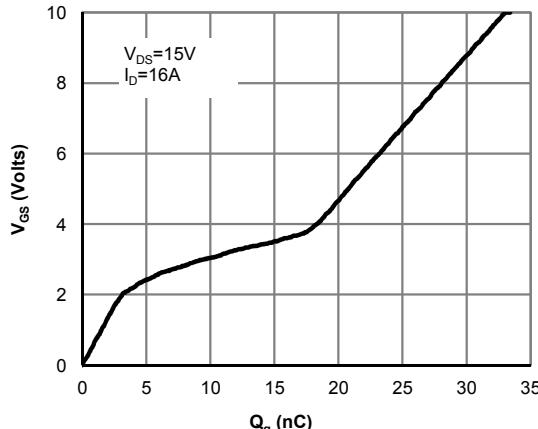
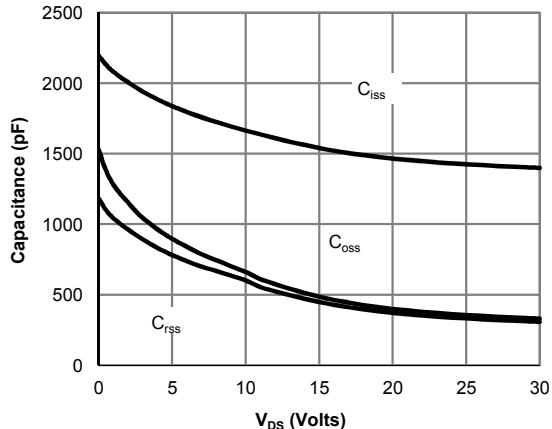
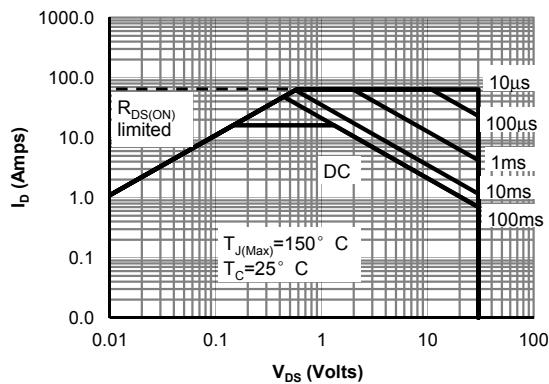
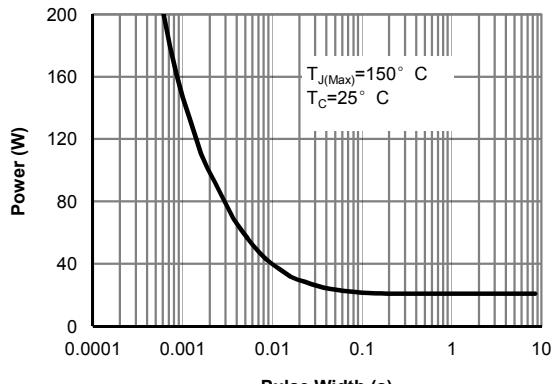
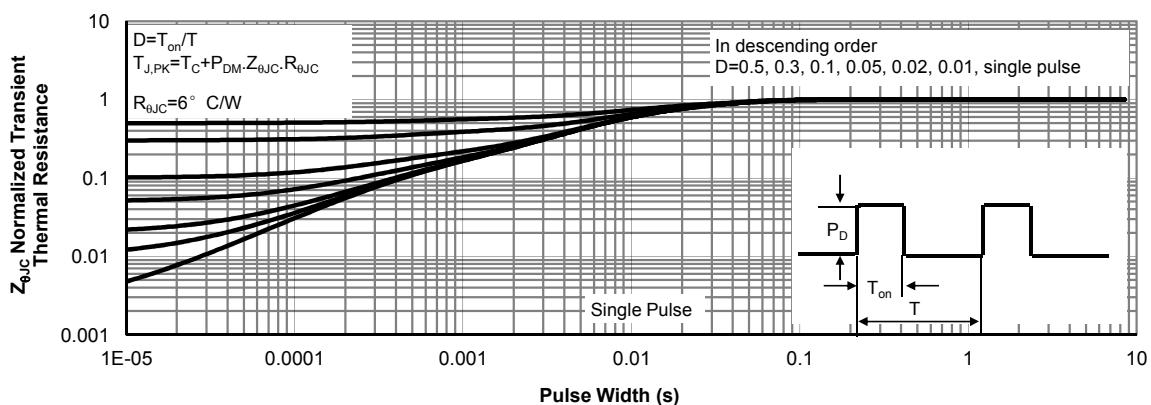
F. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of  $T_{J(\text{MAX})}=150^\circ\text{ C}$ . The SOA curve provides a single pulse rating.

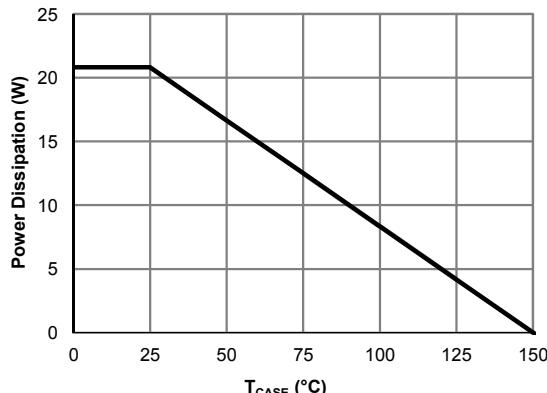
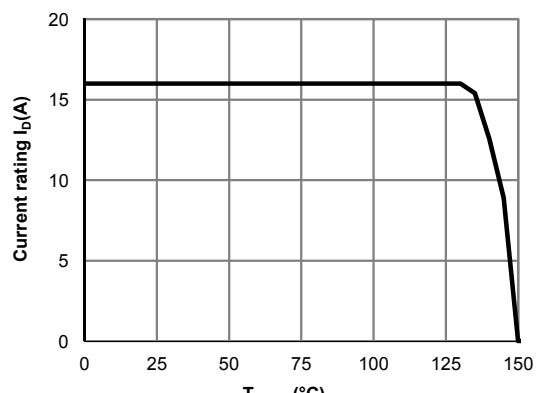
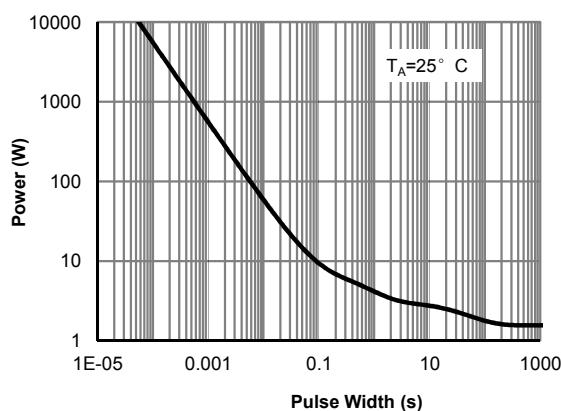
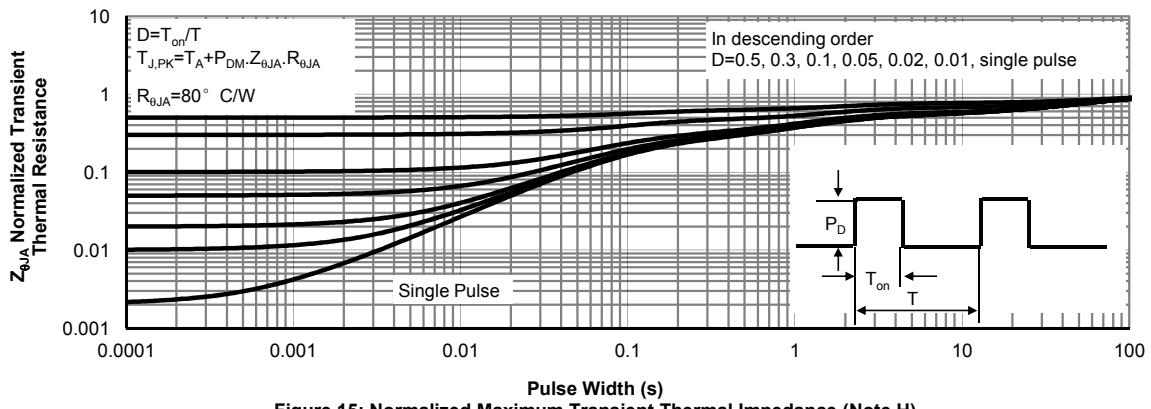
G. The maximum current rating is package limited.

H. These tests are performed with the device mounted on 1 in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A=25^\circ\text{ C}$ .

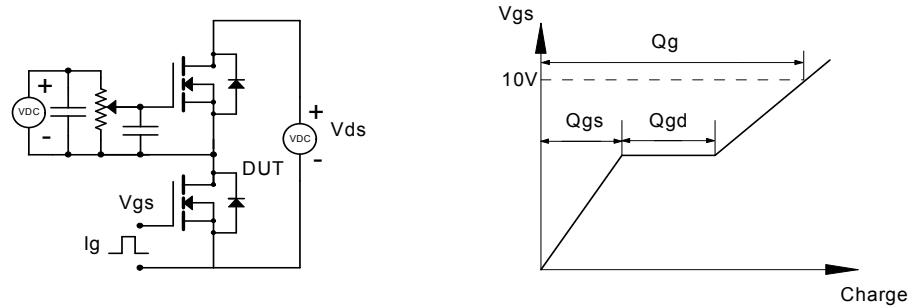
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**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**

**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)**

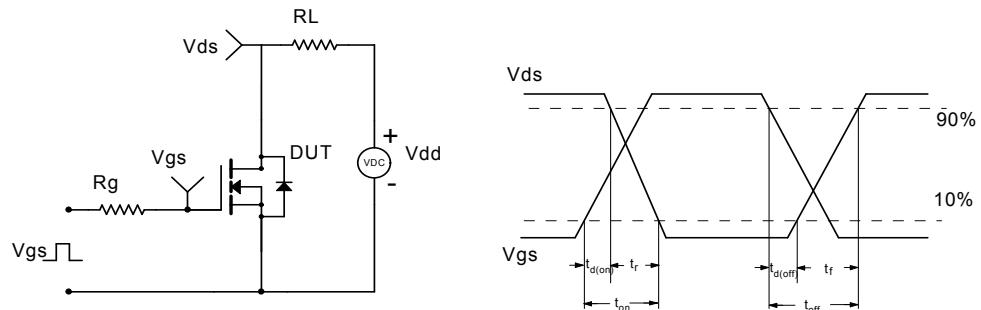
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**

**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**

**Figure 12: Power De-rating (Note F)**

**Figure 13: Current De-rating (Note F)**

**Figure 14: Single Pulse Power Rating Junction-to-Ambient (Note H)**

**Figure 15: Normalized Maximum Transient Thermal Impedance (Note H)**

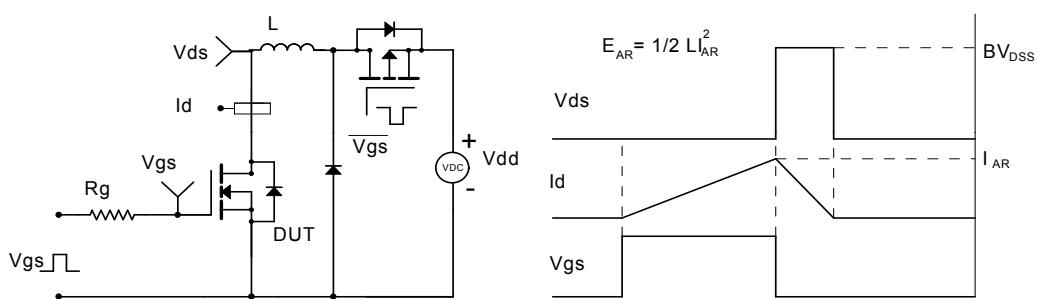
### Gate Charge Test Circuit & Waveform



### Resistive Switching Test Circuit & Waveforms



### Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



### Diode Recovery Test Circuit & Waveforms

