

## AOD400

### N-Channel Enhancement Mode Field Effect Transistor

#### General Description

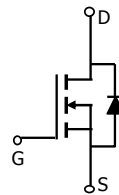
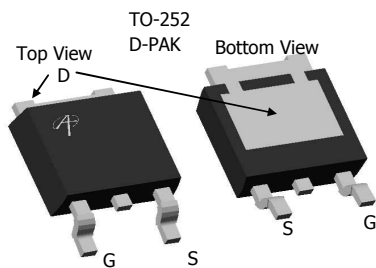
The AOD400 uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. This device is suitable for use in PWM, load switching and general purpose applications.

- RoHS Compliant
- Halogen Free\*

#### Features

- $V_{DS} (V) = 30V$
- $I_D = 10 A (V_{GS} = 10V)$
- $R_{DS(ON)} < 30 m\Omega (V_{GS} = 10V)$
- $R_{DS(ON)} < 36 m\Omega (V_{GS} = 4.5V)$
- $R_{DS(ON)} < 52 m\Omega (V_{GS} = 2.5V)$

**100% Rg Tested!**



#### Absolute Maximum Ratings $T_A=25^\circ C$ unless otherwise noted

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	$V_{DS}$	30	V
Gate-Source Voltage	$V_{GS}$	$\pm 12$	V
Continuous Drain Current <sup>G</sup>	$T_C=25^\circ C$	10	A
	$T_C=100^\circ C$	10	
Pulsed Drain Current <sup>C</sup>	$I_{DM}$	40	
Avalanche Current <sup>C</sup>	$I_{AR}$	10	A
Repetitive avalanche energy $L=0.1mH$ <sup>C</sup>	$E_{AR}$	30	mJ
Power Dissipation <sup>B</sup>	$T_C=25^\circ C$	20	W
	$T_C=100^\circ C$	10	
Power Dissipation <sup>A</sup>	$T_A=25^\circ C$	2.1	W
	$T_A=70^\circ C$	1.3	
Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to 175	$^\circ C$

#### Thermal Characteristics

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient <sup>A</sup>	$R_{\theta JA}$	$t \leq 10s$	17.4	$^\circ C/W$
Maximum Junction-to-Ambient <sup>A</sup>		Steady-State	50	$^\circ C/W$
Maximum Junction-to-Case <sup>B</sup>	$R_{\theta JC}$	4	7.5	$^\circ C/W$

**Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)**

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	I <sub>D</sub> =250μA, V <sub>GS</sub> =0V	30			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =24V, V <sub>GS</sub> =0V T <sub>J</sub> =55°C		0.002	1 5	μA
I <sub>GSS</sub>	Gate-Body leakage current	V <sub>DS</sub> =0V, V <sub>GS</sub> = ±12V			100	nA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	0.7	1.1	1.5	V
I <sub>D(ON)</sub>	On state drain current	V <sub>GS</sub> =4.5V, V <sub>DS</sub> =5V	40			A
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =10A T <sub>J</sub> =125°C		25 35	30 42	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =10A		28.5	36	mΩ
		V <sub>GS</sub> =2.5V, I <sub>D</sub> =3.5A		40.5	52	mΩ
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =10A		21		S
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =1A, V <sub>GS</sub> =0V		0.77	1	V
I <sub>S</sub>	Maximum Body-Diode Continuous Current				3	A
<b>DYNAMIC PARAMETERS</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =15V, f=1MHz		857	1030	pF
C <sub>oss</sub>	Output Capacitance			97		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			71		pF
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz		1.2	3.6	Ω
<b>SWITCHING PARAMETERS</b>						
Q <sub>g</sub>	Total Gate Charge	V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, I <sub>D</sub> =10A		9.7	12	nC
Q <sub>gs</sub>	Gate Source Charge			1.63		nC
Q <sub>gd</sub>	Gate Drain Charge			3.1		nC
t <sub>D(on)</sub>	Turn-On Delay Time	V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, R <sub>L</sub> =1.5Ω, R <sub>GEN</sub> =6Ω		3.5		ns
t <sub>r</sub>	Turn-On Rise Time			3.7		ns
t <sub>D(off)</sub>	Turn-Off Delay Time			25		ns
t <sub>f</sub>	Turn-Off Fall Time			4		ns
t <sub>rr</sub>	Body Diode Reverse Recovery Time	I <sub>F</sub> =10A, dI/dt=100A/μs		20	24	ns
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge	I <sub>F</sub> =10A, dI/dt=100A/μs		13		nC

A: The value of R<sub>θJA</sub> is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=25°C. The Power dissipation P<sub>DSM</sub> is based on R<sub>θJA</sub> 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<sub>D</sub> is based on T<sub>J(MAX)</sub>=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<sub>J(MAX)</sub>=175°C.

D: The R<sub>θJA</sub> is the sum of the thermal impedance from junction to case R<sub>θJC</sub> 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<sub>J(MAX)</sub>=175°C.

G: The maximum current rating is limited by bond-wires.

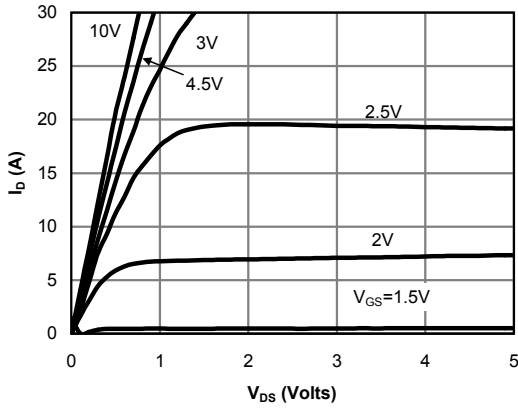
H: These tests are performed with the device mounted on 1 in 2 FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=25°C. The SOA curve provides a single pulse rating.

\*This device is guaranteed green after data code 8X11 (Sep 1ST 2008).

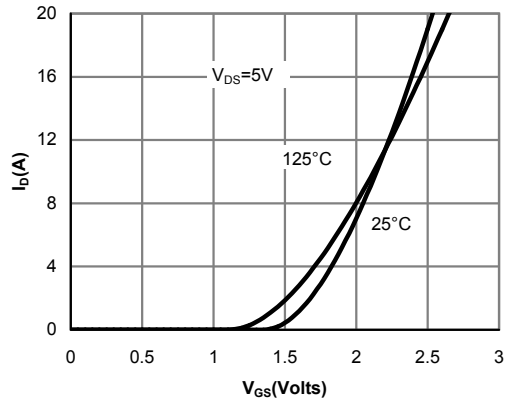
Rev 1 : Sep. 2008

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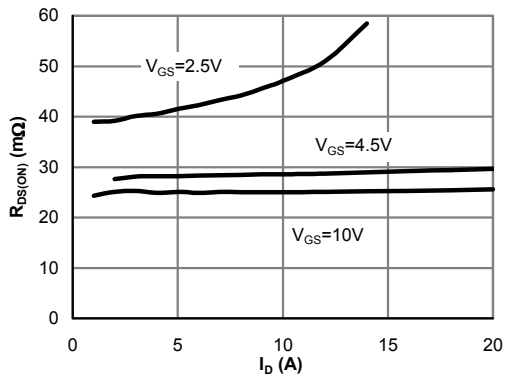
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



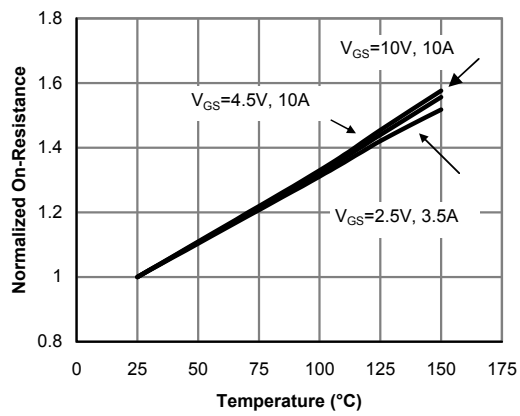
**Fig 1: On-Region Characteristics**



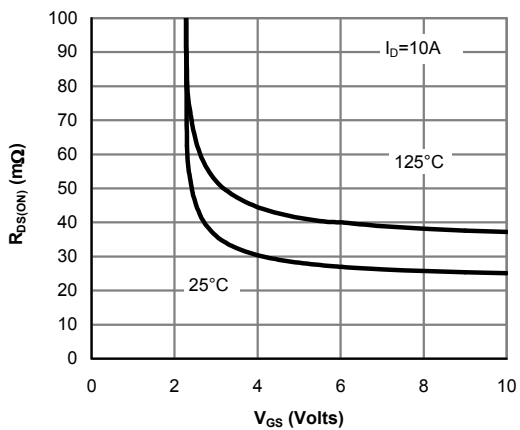
**Figure 2: Transfer Characteristics**



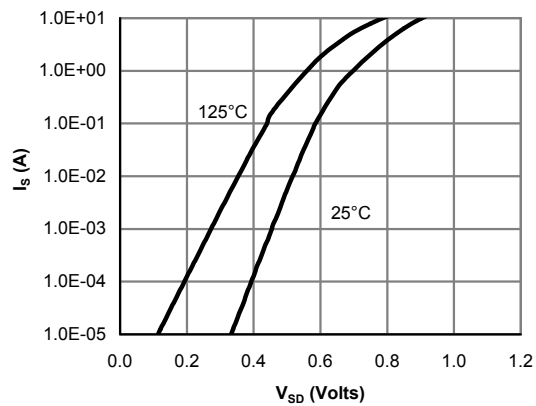
**Figure 3: On-Resistance vs. Drain Current and Gate Voltage**



**Figure 4: On-Resistance vs. Junction Temperature**



**Figure 5: On-Resistance vs. Gate-Source Voltage**



**Figure 6: Body-Diode Characteristics**

**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**

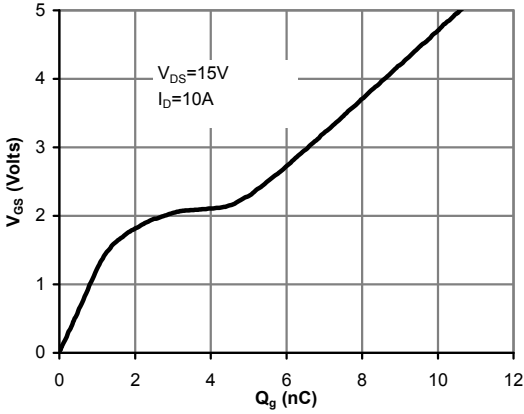


Figure 7: Gate-Charge Characteristics

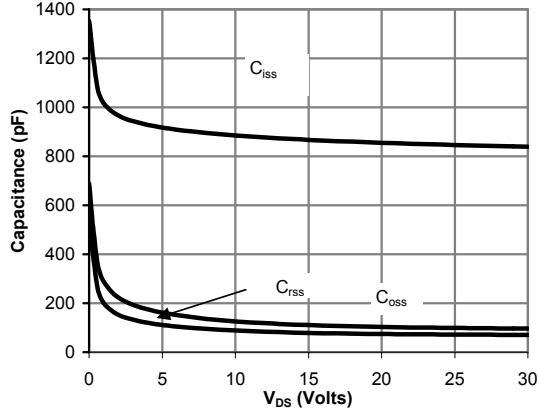


Figure 8: Capacitance Characteristics

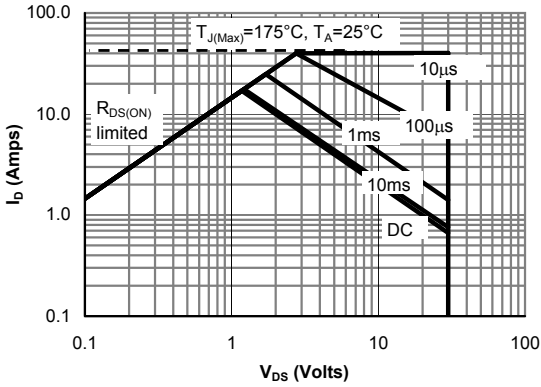


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

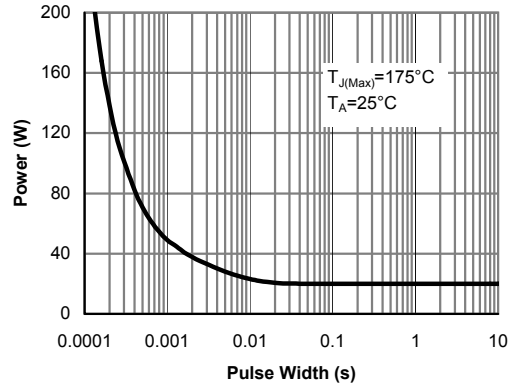


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

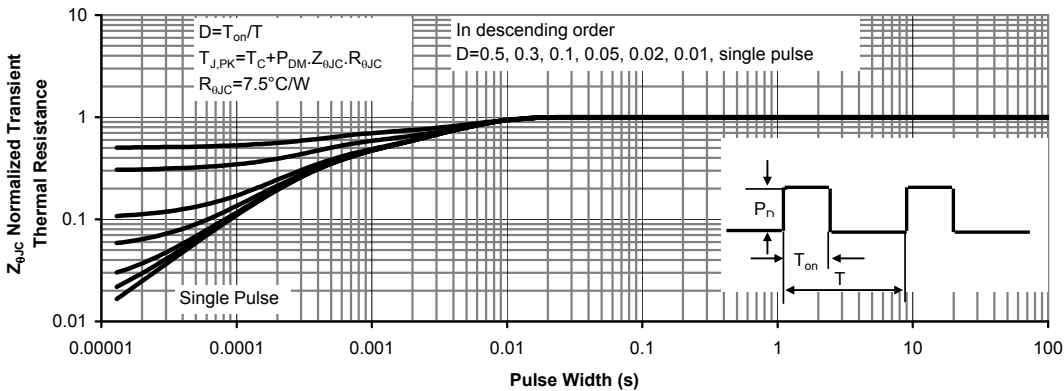


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**

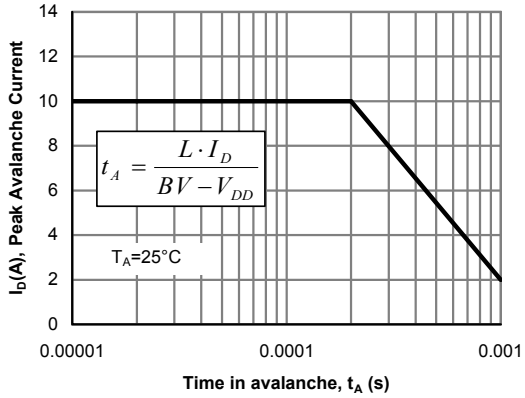


Figure 12: Single Pulse Avalanche capability

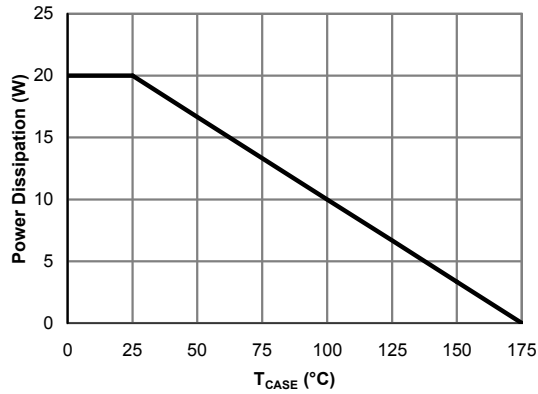


Figure 13: Power De-rating (Note B)

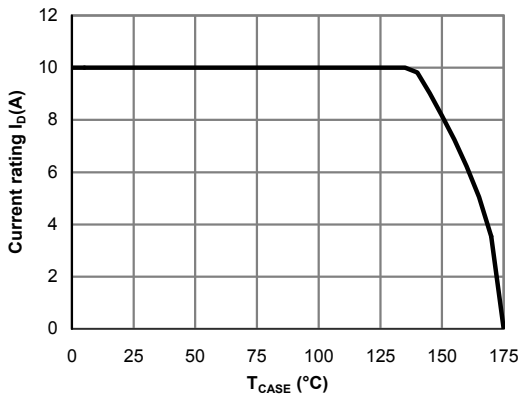


Figure 14: Current De-rating (Note B)

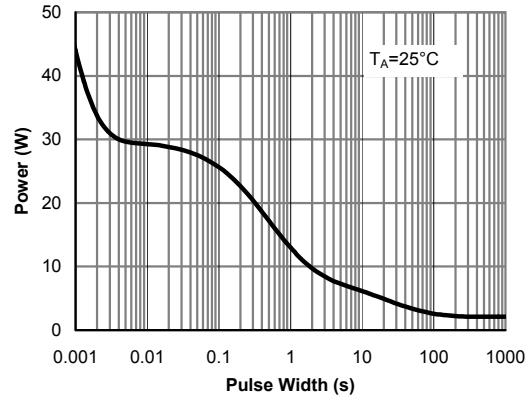


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

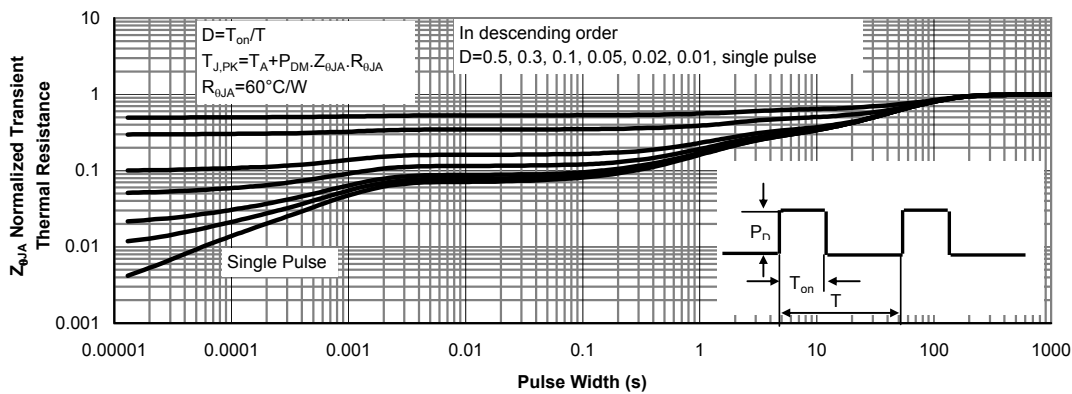
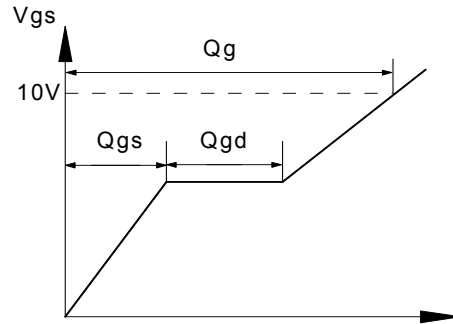
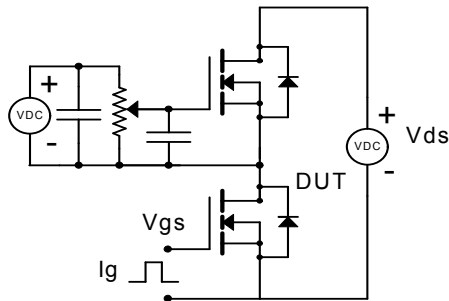
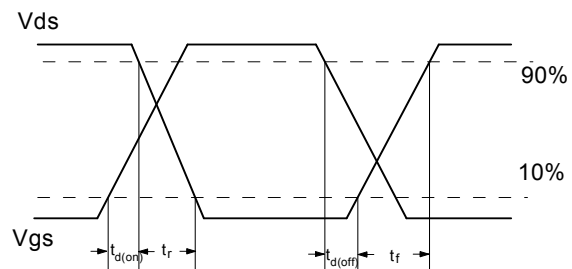
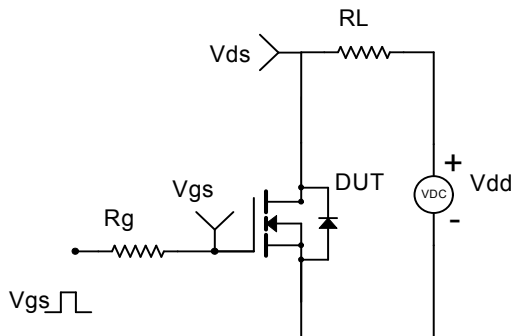


Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

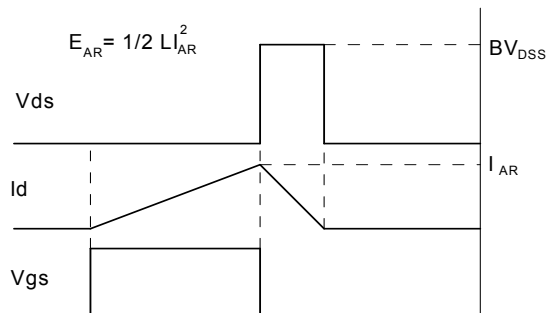
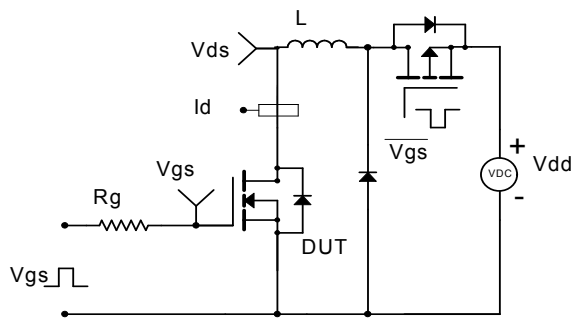
### Gate Charge Test Circuit & Waveform



### Resistive Switching Test Circuit & Waveforms



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



### Diode Recovery Test Circuit & Waveforms

