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AOD444/AOI444

60V N-Channel MOSFET

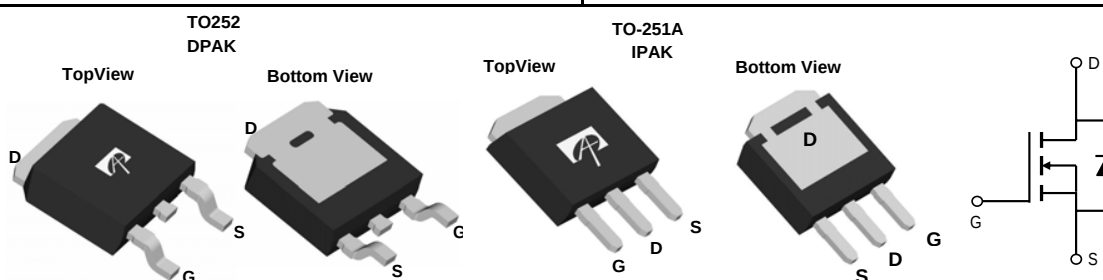
General Description

The AOD444/AOI444 combine advanced trench MOSFET technology with a low resistance package to provide extremely low $R_{DS(ON)}$. Those devices are suitable for use in PWM, load switching and general purpose applications.

Product Summary

V_{DS}	60V
I_D (at $V_{GS}=10V$)	12A
$R_{DS(ON)}$ (at $V_{GS}=10V$)	< 60m Ω
$R_{DS(ON)}$ (at $V_{GS} = 4.5V$)	< 85m Ω

100% UIS Tested
100% Rg Tested



Absolute Maximum Ratings $T_A=25^\circ\text{C}$ 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	I_D	12	A
$T_C=25^\circ\text{C}$		9	
$T_C=100^\circ\text{C}$			
Pulsed Drain Current ^C	I_{DM}	30	
Continuous Drain Current	I_{DSM}	4	A
$T_A=25^\circ\text{C}$		3	
$T_A=70^\circ\text{C}$			
Avalanche Current ^C	I_{AS}, I_{AR}	19	A
Avalanche energy $L=0.1\text{mH}$ ^C	E_{AS}, E_{AR}	18	mJ
Power Dissipation ^B	P_D	20	W
$T_C=25^\circ\text{C}$		10	
$T_C=100^\circ\text{C}$			
Power Dissipation ^A	P_{DSM}	2.1	W
$T_A=25^\circ\text{C}$		1.3	
$T_A=70^\circ\text{C}$			
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 175	$^\circ\text{C}$

Thermal Characteristics

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	17.4	30	$^\circ\text{C/W}$
$t \leq 10\text{s}$				
Maximum Junction-to-Ambient ^{A D}	$R_{\theta JA}$	50	60	$^\circ\text{C/W}$
Steady-State				
Maximum Junction-to-Case	$R_{\theta JC}$	4	7.5	$^\circ\text{C/W}$
Steady-State				

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 T _J =55°C			1 5	μA
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	2.4	3	V
I _{D(ON)}	On state drain current	V _{GS} =10V, V _{DS} =5V	30			A
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =12A T _J =125°C		47 85	60 100	mΩ
		V _{GS} =4.5V, I _D =6A		67	85	mΩ
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =20A		14		S
V _{SD}	Diode Forward Voltage	I _S =1A, V _{GS} =0V		0.74	1	V
I _S	Maximum Body-Diode Continuous Current				12	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =30V, f=1MHz	360	450	540	pF
C _{oss}	Output Capacitance		40	61	80	pF
C _{rss}	Reverse Transfer Capacitance		16	27	40	pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz	0.6	1.4	2.0	Ω
SWITCHING PARAMETERS						
Q _g (10V)	Total Gate Charge	V _{GS} =10V, V _{DS} =30V, I _D =12A		7.5	10	nC
Q _g (4.5V)	Total Gate Charge			3.8	5	nC
Q _{gs}	Gate Source Charge			1.2		nC
Q _{gd}	Gate Drain Charge			1.9		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =10V, V _{DS} =30V, R _L =2.5Ω, R _{GEN} =3Ω		4.2		ns
t _r	Turn-On Rise Time			3.4		ns
t _{D(off)}	Turn-Off DelayTime			16		ns
t _f	Turn-Off Fall Time			2		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =12A, dI/dt=100A/μs		27	35	ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =12A, dI/dt=100A/μs		30		nC

A. The value of R_{θJA} is measured with the device mounted on 1 in² 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} 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_{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 <300 μs 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.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

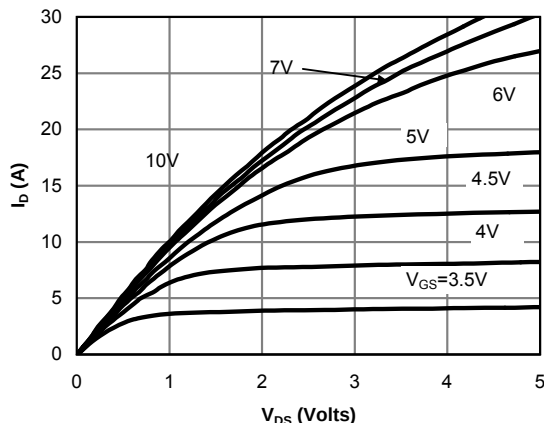


Fig 1: On-Region Characteristics (Note E)

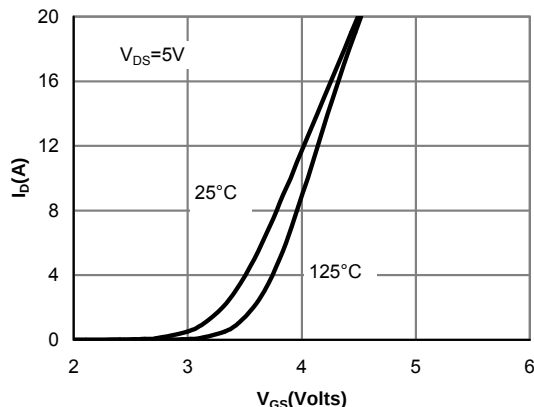


Figure 2: Transfer Characteristics (Note E)

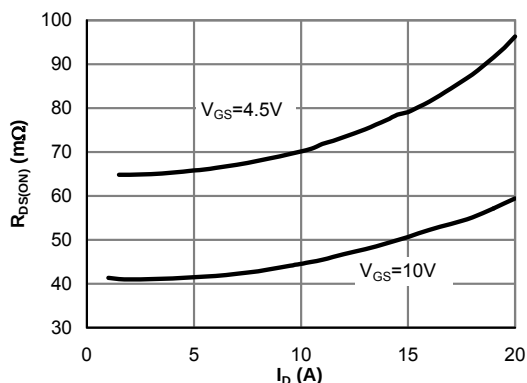


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

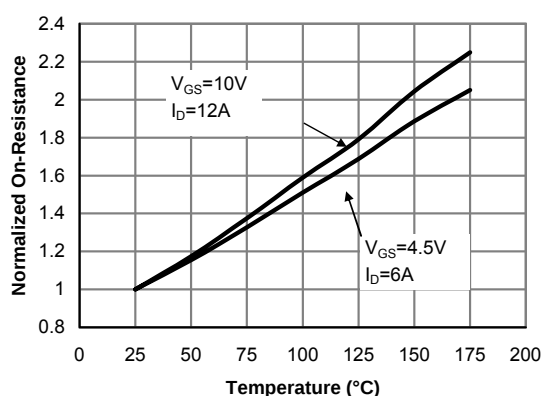


Figure 4: On-Resistance vs. Junction Temperature (Note E)

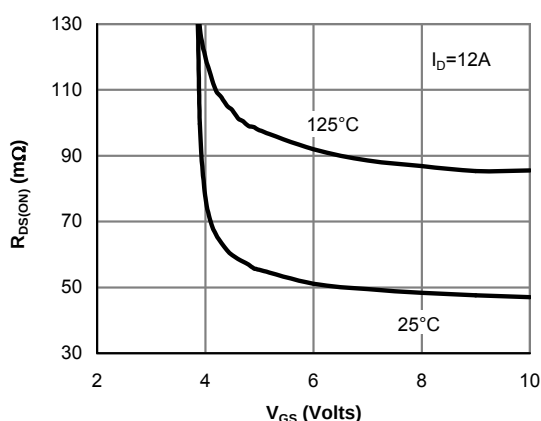


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

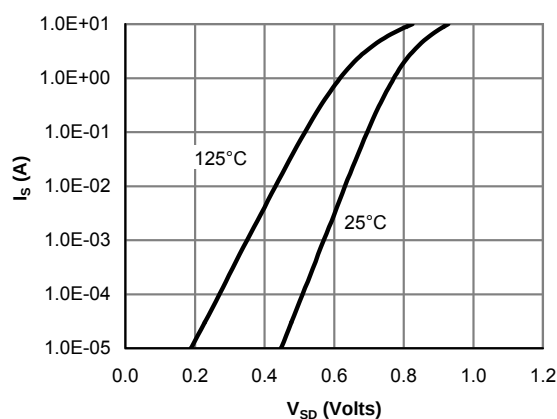


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

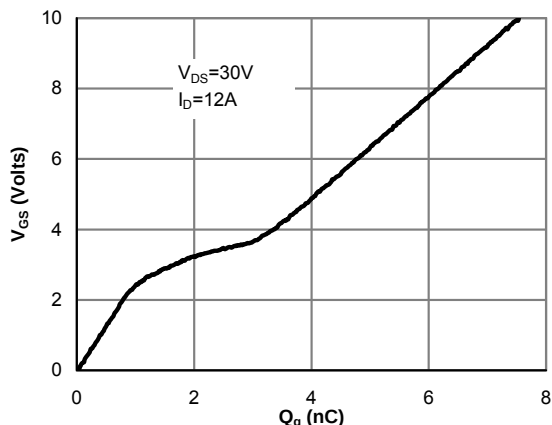


Figure 7: Gate-Charge Characteristics

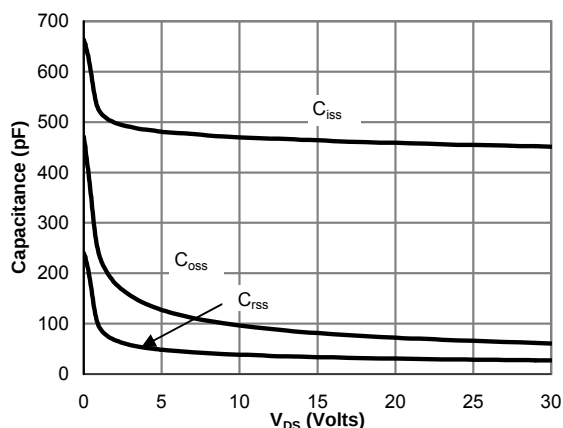


Figure 8: Capacitance Characteristics

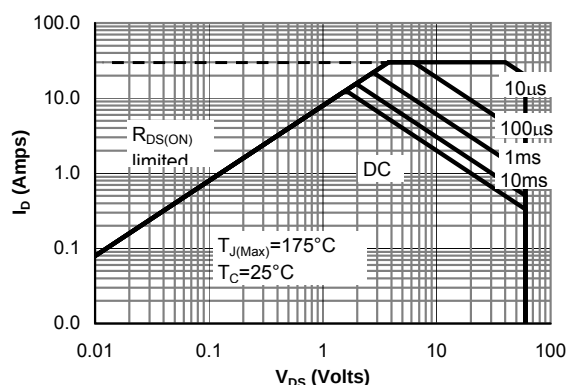


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

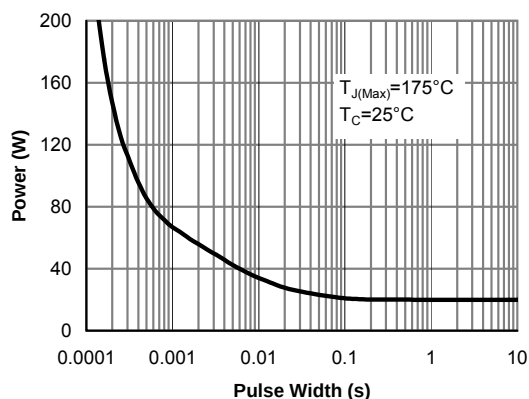


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

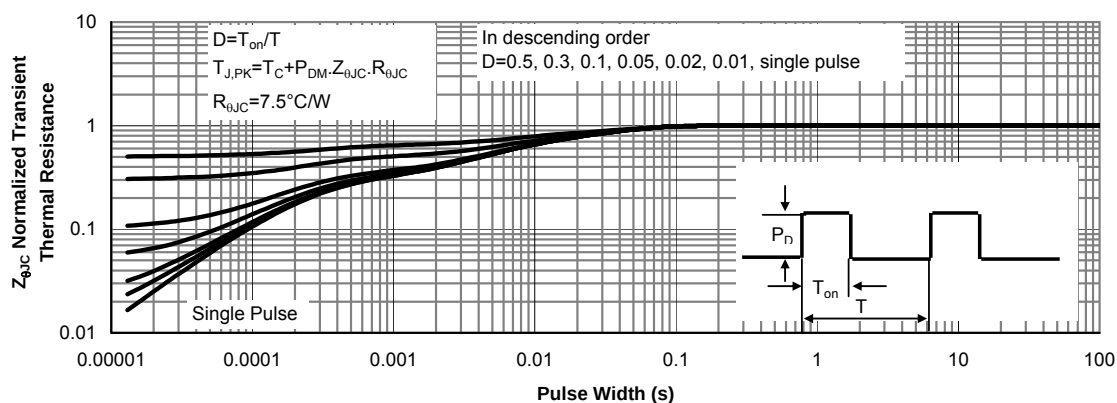


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

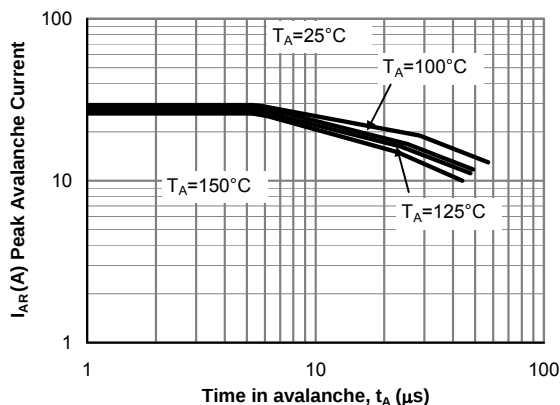


Figure 12: Single Pulse Avalanche capability (Note C)

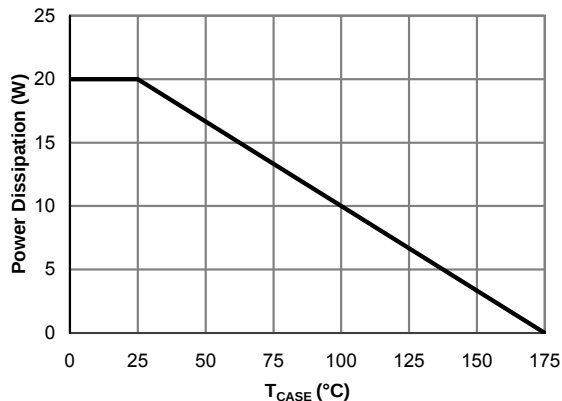


Figure 13: Power De-rating (Note F)

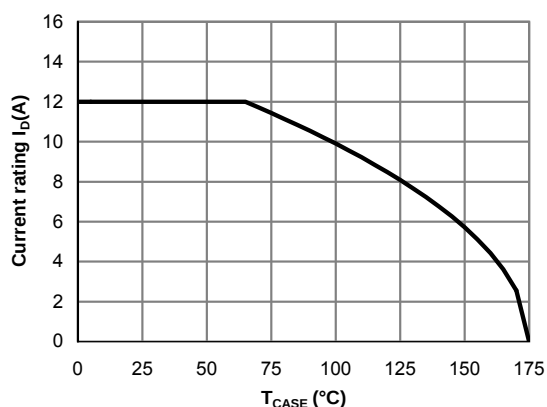


Figure 14: Current De-rating (Note F)

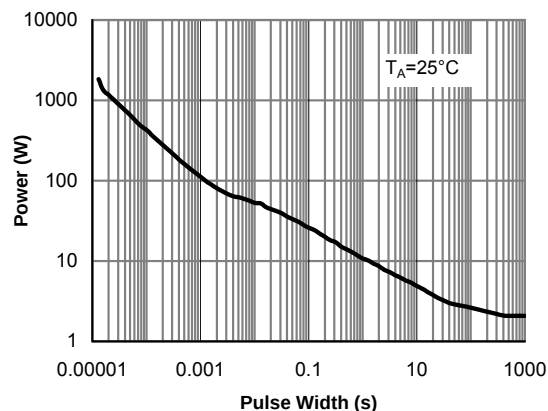


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

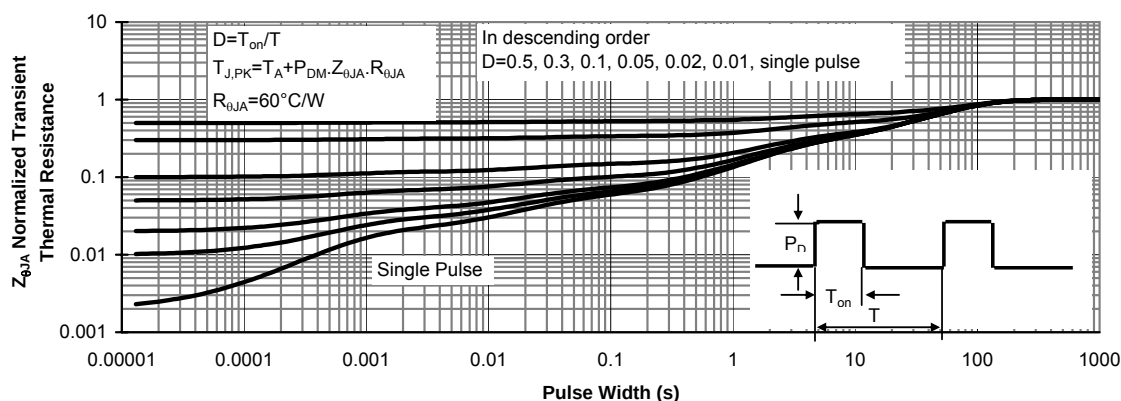
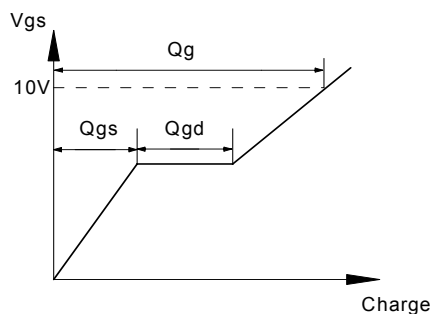
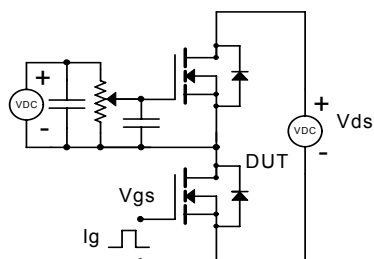
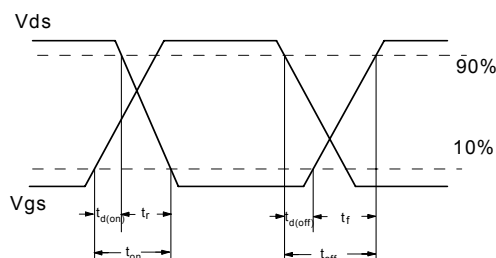
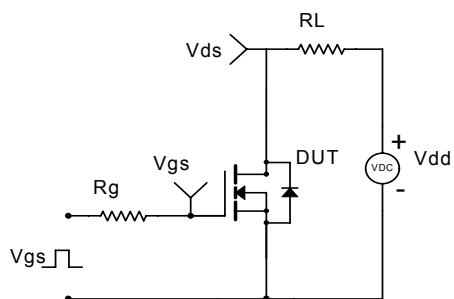


Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

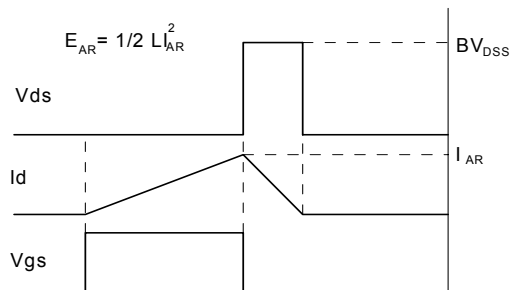
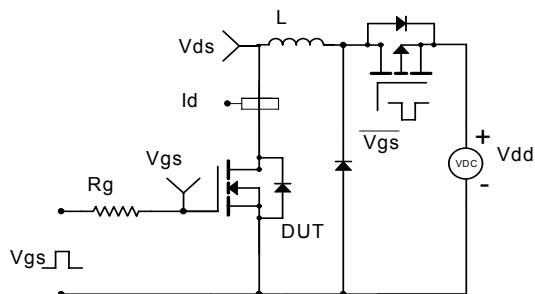
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

