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AOT474/AOTF474

75V N-Channel MOSFET

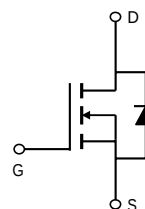
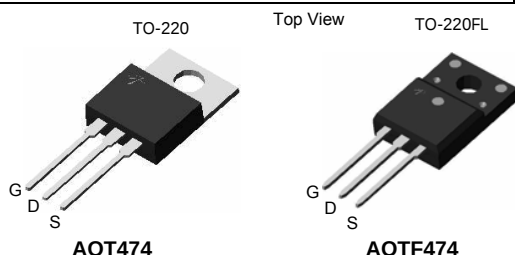
General Description

The AOT474 and AOTF474 use a robust technology that is designed to provide efficient and reliable power conversion even in the most demanding applications, including motor control. With low $R_{DS(ON)}$ and excellent thermal capability this device is appropriate for high current switching and can endure adverse operating conditions.

Product Summary

V_{DS}	75V
I_D (TO220 at $V_{GS}=10V$)	127A
I_D (TO220FL at $V_{GS}=10V$)	47A
$R_{DS(ON)}$ (at $V_{GS}=10V$)	< 11.3m Ω

100% UIS Tested
100% Rg Tested



Absolute Maximum Ratings $T_A=25^\circ\text{C}$ unless otherwise noted

Parameter	Symbol	AOT474	AOTF474	Units
Drain-Source Voltage	V_{DS}	75		V
Gate-Source Voltage	V_{GS}	± 20		V
Continuous Drain Current	$T_C=25^\circ\text{C}$	127	47	A
	$T_C=100^\circ\text{C}$	89	33	
Pulsed Drain Current ^C	I_{DM}	240		
Continuous Drain Current	$T_A=25^\circ\text{C}$	9	9	A
	$T_A=70^\circ\text{C}$	7	7	
Avalanche Current ^C	I_{AS}, I_{AR}	106		A
Avalanche energy $L=0.1\text{mH}$ ^C	E_{AS}, E_{AR}	562		mJ
Power Dissipation ^B	$T_C=25^\circ\text{C}$	417	57.5	W
	$T_C=100^\circ\text{C}$	208	29	
Power Dissipation ^A	$T_A=25^\circ\text{C}$	1.9	1.9	W
	$T_A=70^\circ\text{C}$	1.2	1.2	
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 175		$^\circ\text{C}$

Thermal Characteristics

Parameter	Symbol	AOT474	AOTF474	Units
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	13.9	13.9	$^\circ\text{C/W}$
Maximum Junction-to-Ambient ^{A D}		65	65	$^\circ\text{C/W}$
Maximum Junction-to-Case	$R_{\theta JC}$	0.36	2.6	$^\circ\text{C/W}$

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	75			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =75V, 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	2.6	3.4	4	V
I _{D(ON)}	On state drain current	V _{GS} =10V, V _{DS} =5V	240			A
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =30A T _J =125°C		9.4 18	11.3 21.5	mΩ
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =30A		67		S
V _{SD}	Diode Forward Voltage	I _S =1A, V _{GS} =0V		0.73	1	V
I _S	Maximum Body-Diode Continuous Current				128	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =30V, f=1MHz	2240	2805	3370	pF
C _{oss}	Output Capacitance		355	507	660	pF
C _{rss}	Reverse Transfer Capacitance		22	36	50	pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz	1.4	2.8	4.2	Ω
SWITCHING PARAMETERS						
Q _g (10V)	Total Gate Charge	V _{GS} =10V, V _{DS} =30V, I _D =30A	39	49.6	60	nC
Q _{gs}	Gate Source Charge		11	13.8	17	nC
Q _{gd}	Gate Drain Charge		8	14	20	nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =10V, V _{DS} =30V, R _L =1Ω, R _{GEN} =3Ω		15		ns
t _r	Turn-On Rise Time			34		ns
t _{D(off)}	Turn-Off DelayTime			42		ns
t _f	Turn-Off Fall Time			4.5		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =30A, dI/dt=500A/μs	35	50	65	ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =30A, dI/dt=500A/μs	330	472	614	nC

A. The value of R_{θJA} 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_{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 <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. 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

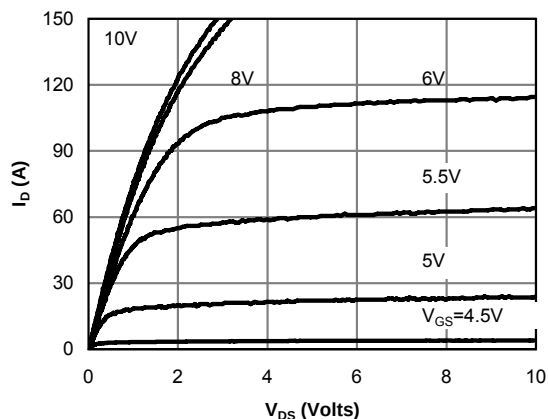


Figure 1: On-Region Characteristics (Note E)

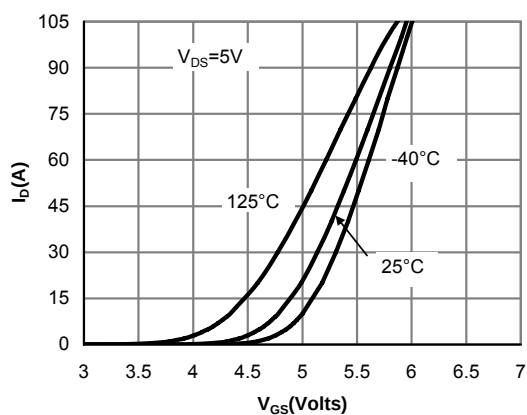


Figure 2: Transfer Characteristics (Note E)

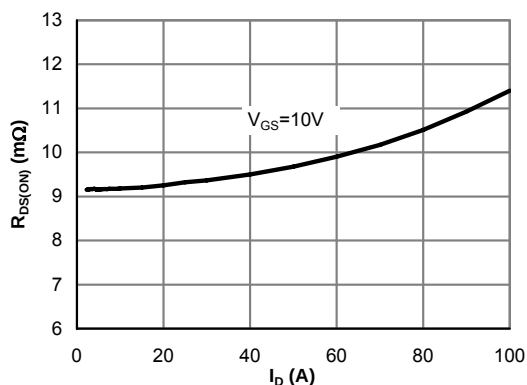


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

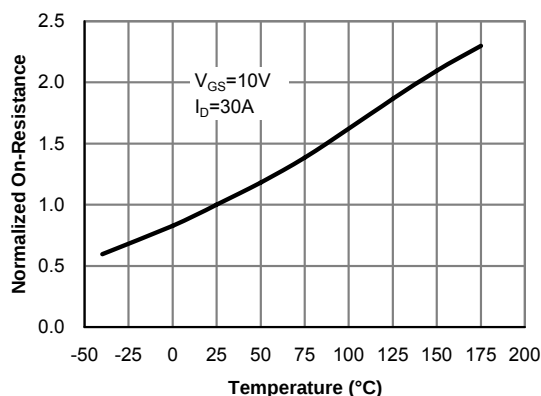


Figure 4: On-Resistance vs. Junction Temperature (Note E)

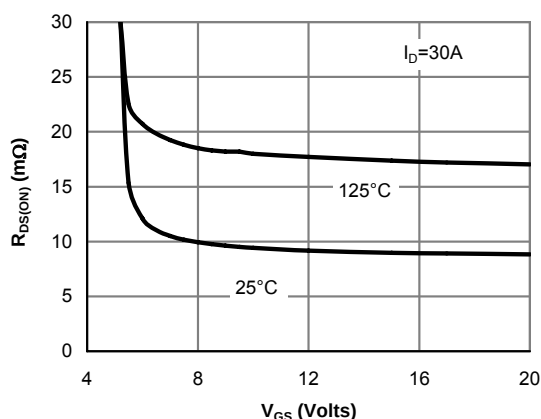


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

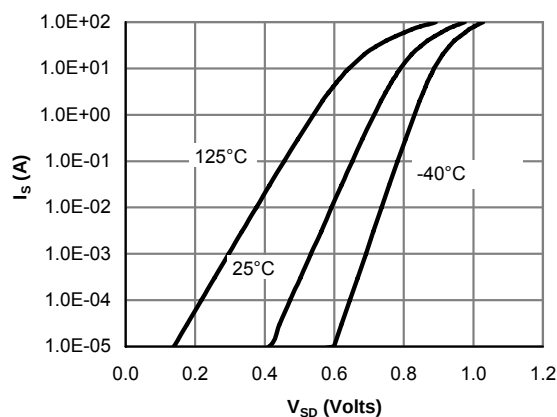


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

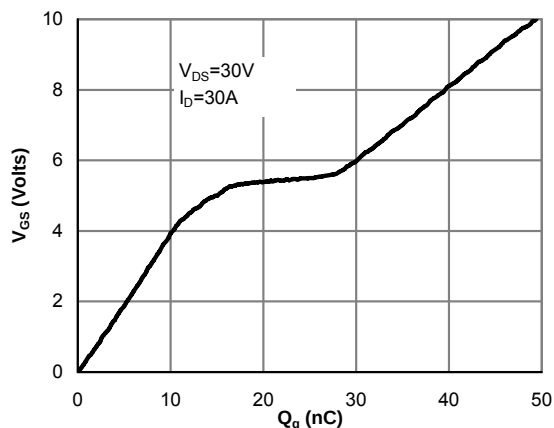


Figure 7: Gate-Charge Characteristics

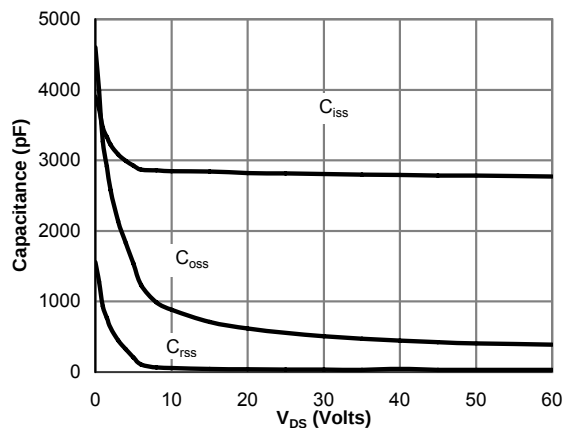


Figure 8: Capacitance Characteristics

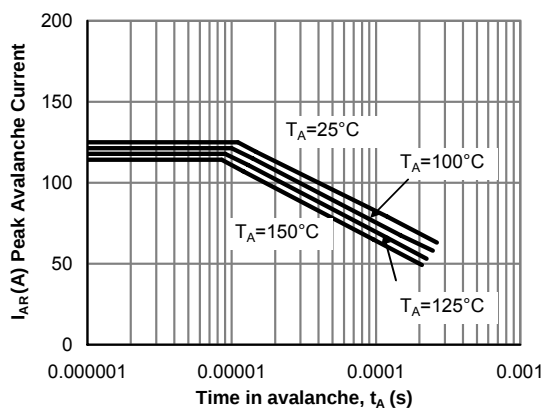


Figure 9: Single Pulse Avalanche capability (Note C)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

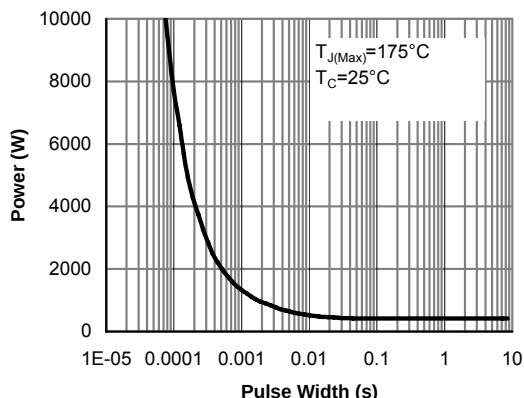


Figure 10: Single Pulse Power Rating Junction-to-Case for AOT474 (Note F)

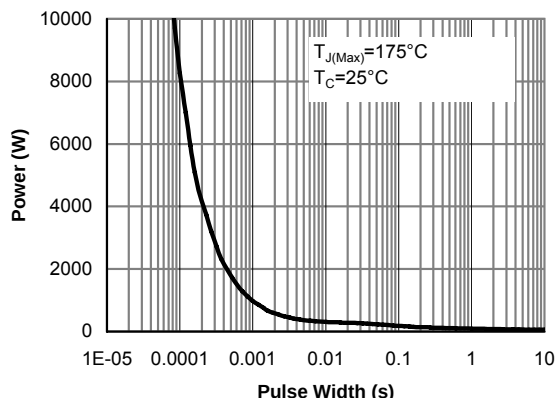


Figure 11: Single Pulse Power Rating Junction-to-Case for AOTF474 (Note F)

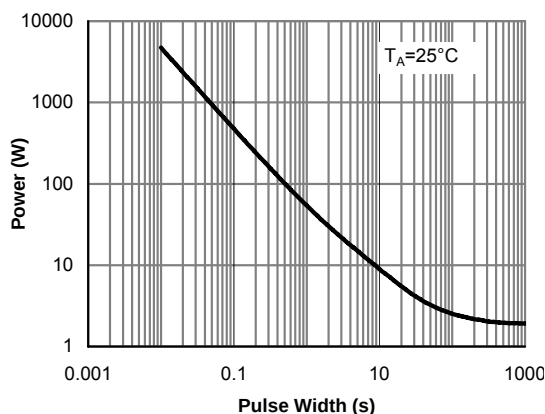


Figure 12: Single Pulse Power Rating Junction-to-Ambient for AOT474 (Note G)

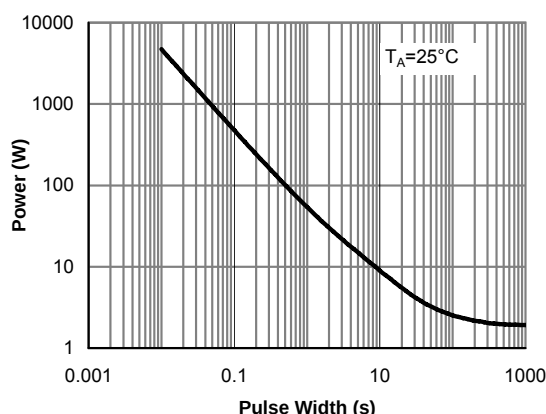


Figure 13: Single Pulse Power Rating Junction-to-Ambient for AOTF474 (Note G)

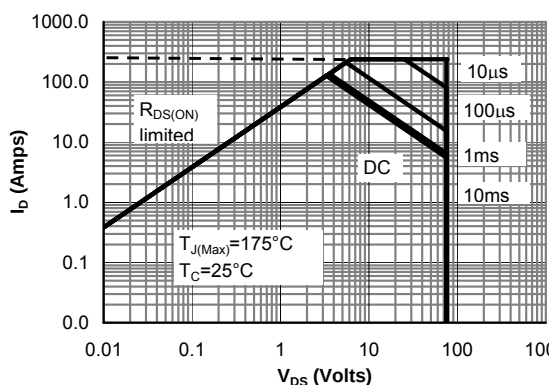


Figure 14: Maximum Forward Biased Safe Operating Area for AOT474 (Note F)

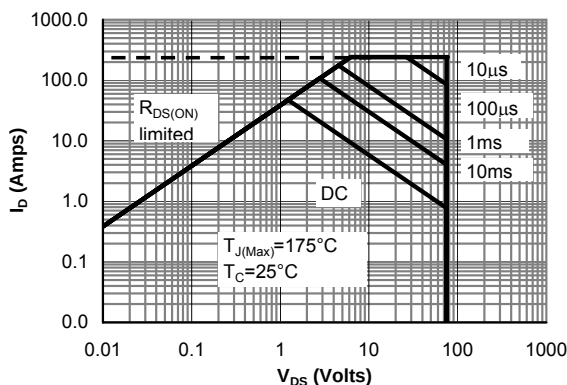


Figure 15: Maximum Forward Biased Safe Operating Area for AOTF474 (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

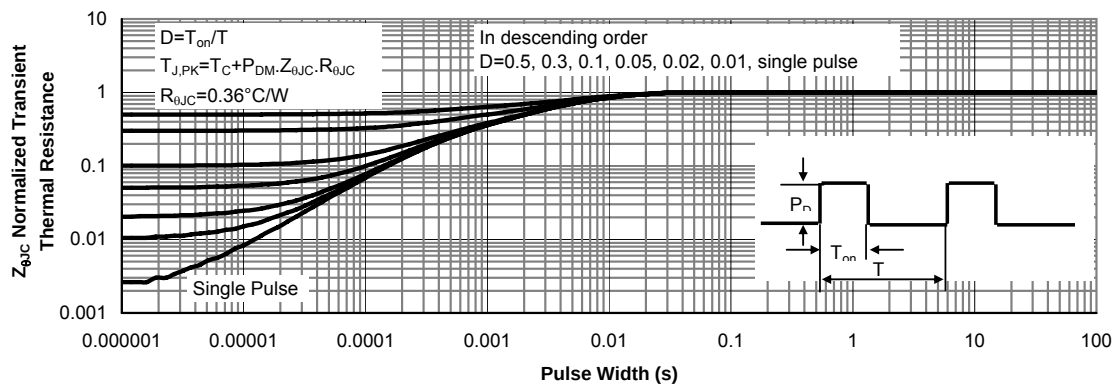


Figure 16: Normalized Maximum Transient Thermal Impedance for AOT474 (Note F)

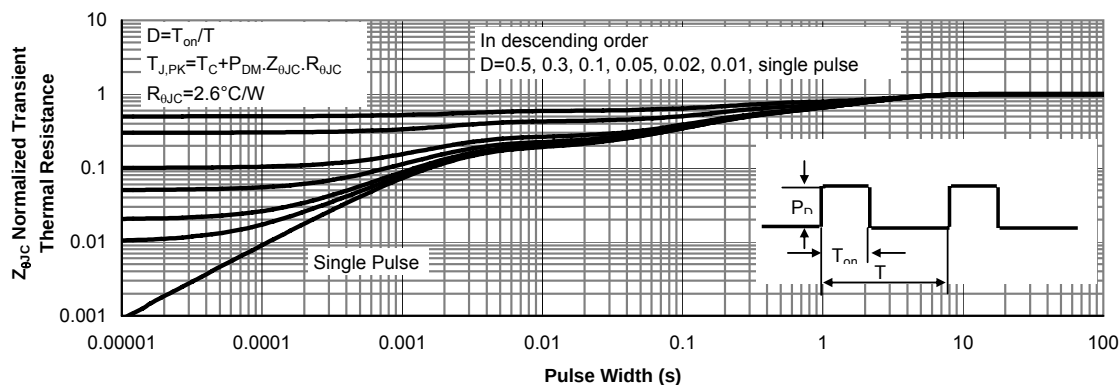
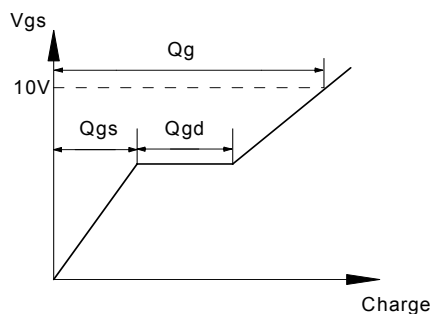
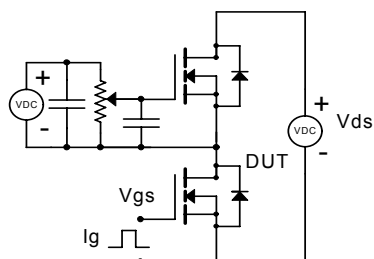
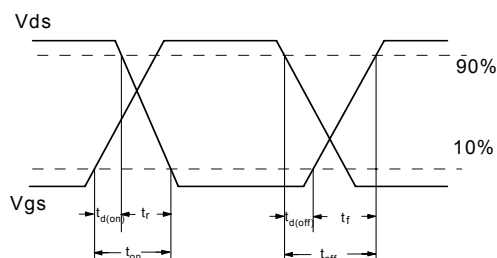
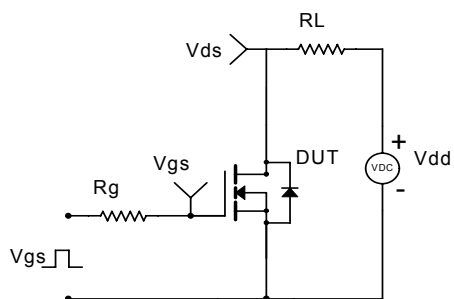


Figure 17: Normalized Maximum Transient Thermal Impedance for AOTF474 (Note F)

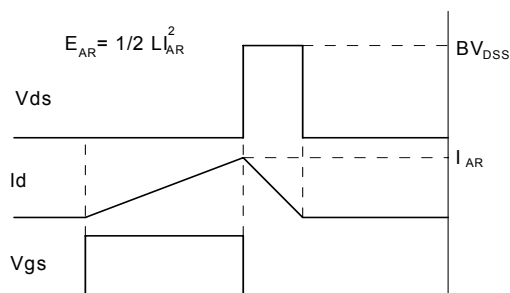
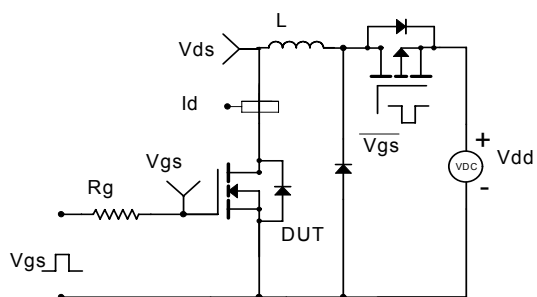
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

