ALPHA & OMEGA SEMICONDUCTOR

AOT2500L/AOB2500L

150V N-Channel MOSFET

General Description

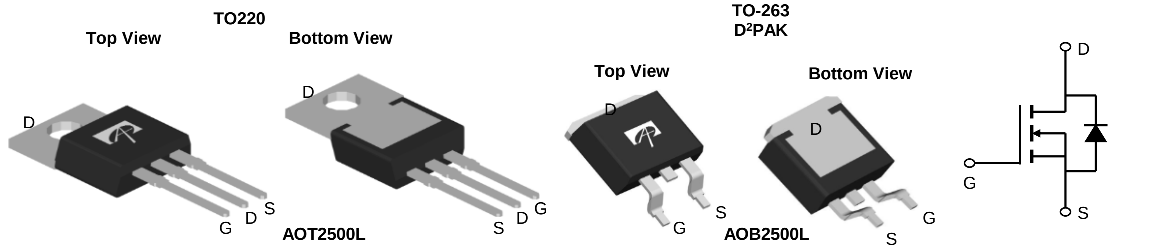
The AOT2500L/AOB2500L uses Trench MOSFET technology that is uniquely optimized to provide the most efficient high frequency switching performance. Both conduction and switching power losses are minimized due to an extremely low combination of $R_{DS(ON)}$, Ciss and Coss. This device is ideal for boost converters and synchronous rectifiers for consumer, telecom, industrial power supplies and LED backlighting.

Product Summary

V_{DS}	150V
I_D (at V_{GS}=10V)	152A
$R_{DS(ON)}$ (at V_{GS}=10V)	< 6.5mΩ (< 6.2mΩ*)
$R_{DS(ON)}$ (at V_{GS}=6V)	< 7.6mΩ (<7.3mΩ*)

100% UIS Tested
100% R_g Tested

Green Product



Absolute Maximum Ratings T_A=25°C unless otherwise noted				
Parameter		**Symbol**	**Maximum**	**Units**
Drain-Source Voltage		V_{DS}	150	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current	T_C=25°C	I_D	152	A
	T_C=100°C		107	
Pulsed Drain Current [C]		I_{DM}	440	
Continuous Drain Current	T_A=25°C	I_{DSM}	11.5	A
	T_A=70°C		9.0	
Avalanche Current [C]		I_{AS}	65	A
Avalanche energy L=0.3mH [C]		E_{AS}	634	mJ
Power Dissipation [B]	T_C=25°C	P_D	375	W
	T_C=100°C		187.5	
Power Dissipation [A]	T_A=25°C	P_{DSM}	2.1	W
	T_A=70°C		1.3	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 175	°C

Thermal Characteristics					
Parameter		**Symbol**	**Typ**	**Max**	**Units**
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	12	15	°C/W
Maximum Junction-to-Ambient [A D]	Steady-State		48	60	°C/W
Maximum Junction-to-Case	Steady-State	$R_{\theta JC}$	0.26	0.4	°C/W

* Surface mount package TO263

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		150			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=150V, 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	2.8	3.5	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=20A			5.4	6.5	mΩ
		TO220	T_J=125°C		10.2	12.3	
		V_{GS}=6V, I_D=20A TO220			5.9	7.6	mΩ
		V_{GS}=10V, I_D=20A TO263			5.1	6.2	mΩ
		V_{GS}=6V, I_D=20A TO263			5.6	7.3	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=20A			70		S
V_{SD}	Diode Forward Voltage	I_S=1A,V_{GS}=0V			0.66	1	V
I_S	Maximum Body-Diode Continuous Current					152	A
DYNAMIC PARAMETERS							
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=75V, f=1MHz			6460		pF
C_{oss}	Output Capacitance				586		pF
C_{rss}	Reverse Transfer Capacitance				22		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		1	2.1	3.2	Ω
SWITCHING PARAMETERS							
$Q_{g(10V)}$	Total Gate Charge	V_{GS}=10V, V_{DS}=75V, I_D=20A			97	136	nC
Q_{gs}	Gate Source Charge				22.5		nC
Q_{gd}	Gate Drain Charge				17		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=75V, R_L=3.75Ω, R_{GEN}=3Ω			18.5		ns
t_r	Turn-On Rise Time				20		ns
$t_{D(off)}$	Turn-Off DelayTime				67.5		ns
t_f	Turn-Off Fall Time				14		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=20A, dI/dt=500A/µs			90		ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=20A, dI/dt=500A/µs			1090		nC

A. The value of $R_{\theta JA}$ 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 $_{\theta JA}$ 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 $R_{\theta JA}$ 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 $T_{J(MAX)}$=175° C. The SOA curve provides a single pulse rating.
G. The maximum current limited by package.
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

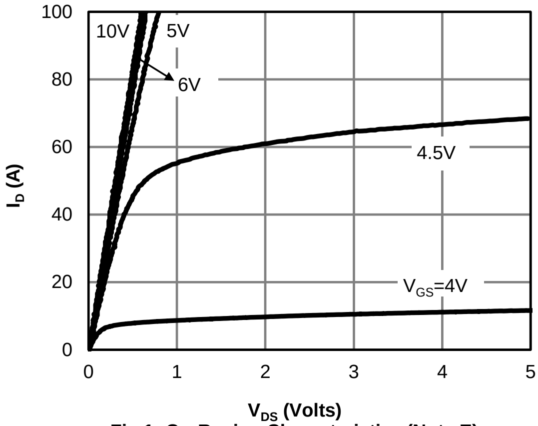


Fig 1: On-Region Characteristics (Note E)

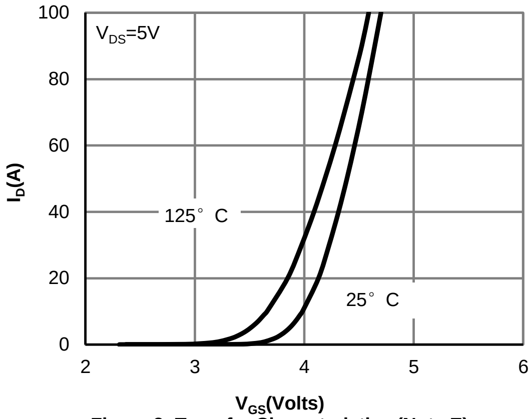


Figure 2: Transfer Characteristics (Note E)

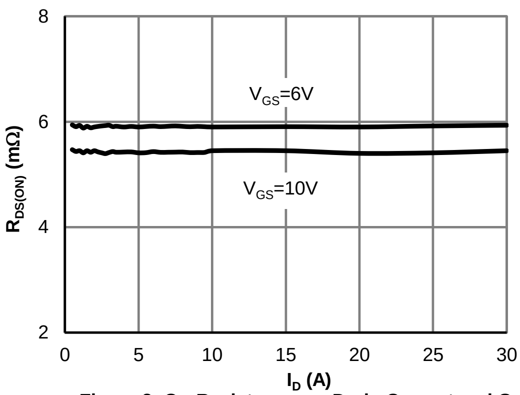


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

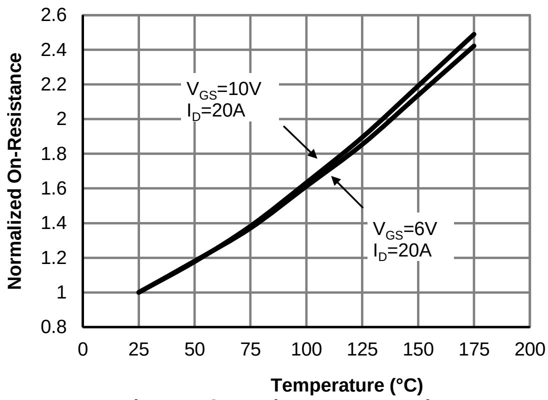


Figure 4: On-Resistance vs. Junction Temperature (Note E)

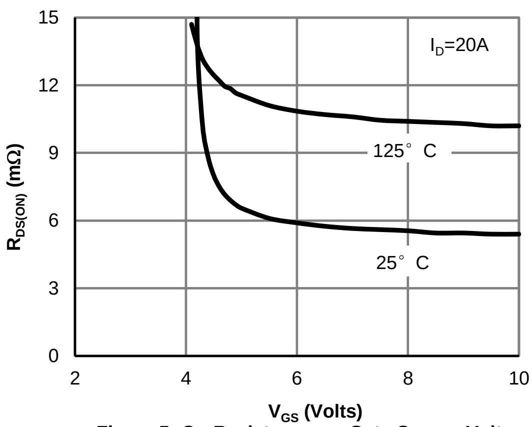


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

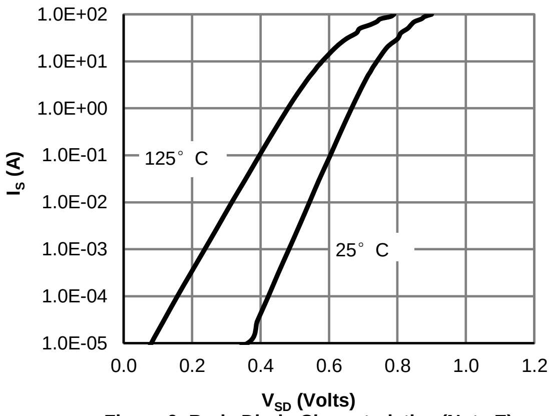


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

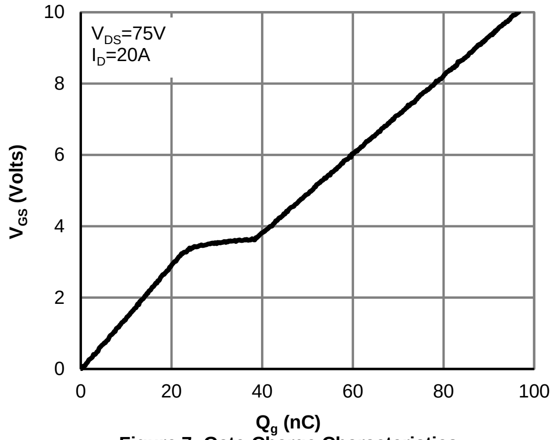


Figure 7: Gate-Charge Characteristics

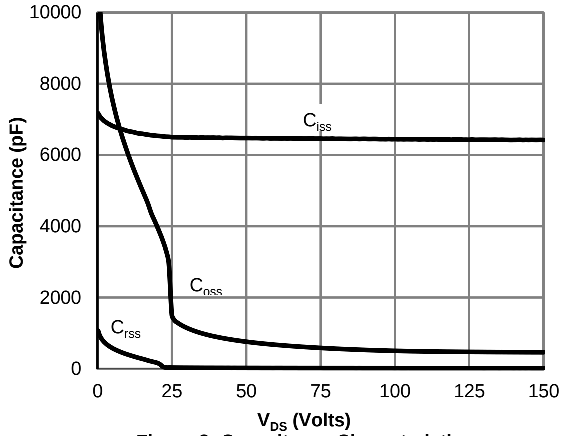
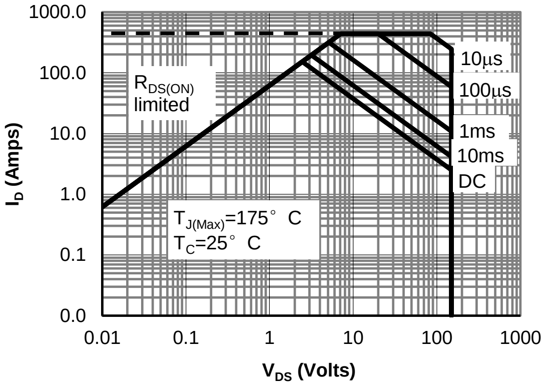


Figure 8: Capacitance Characteristics



V_{GS} > or equal to 6V
Figure 9: Maximum Forward Biased

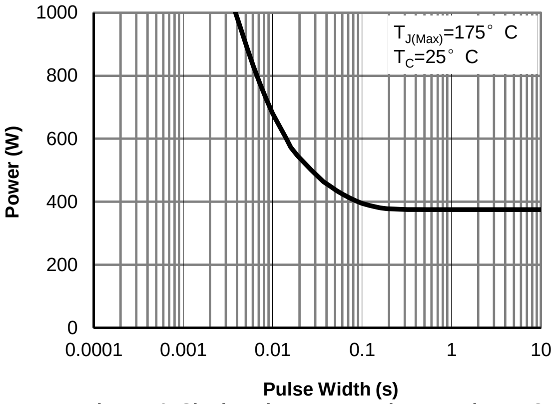


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

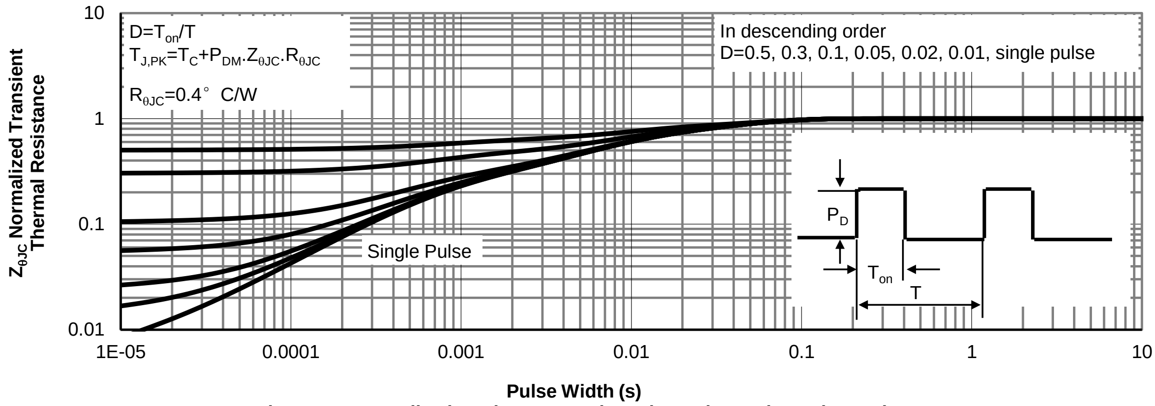


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

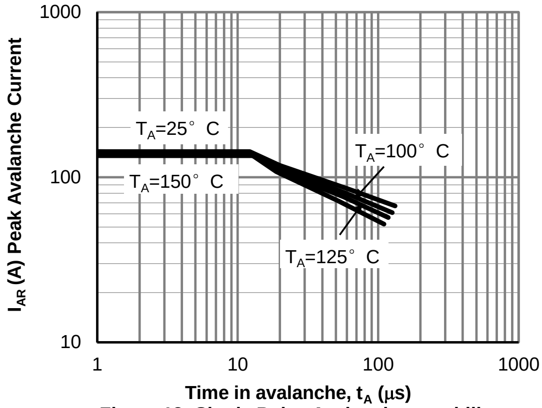


Figure 12: Single Pulse Avalanche capability (Note C)

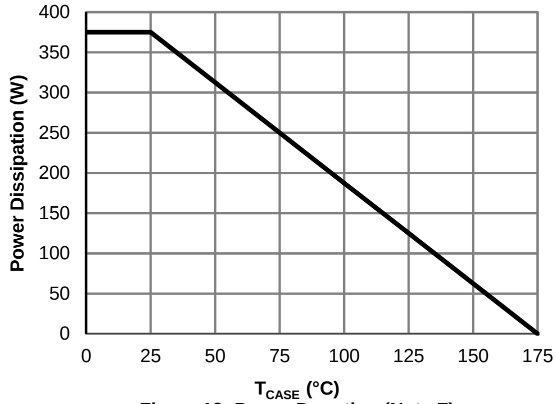


Figure 13: Power De-rating (Note F)

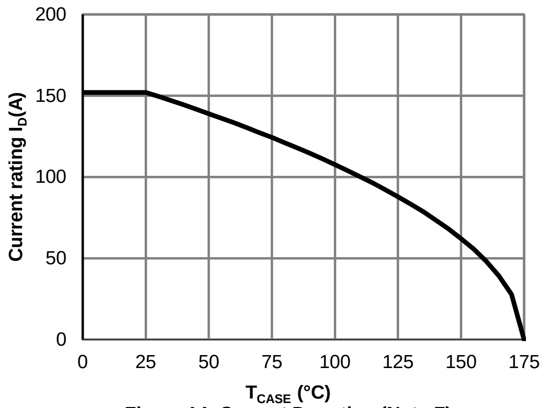


Figure 14: Current De-rating (Note F)

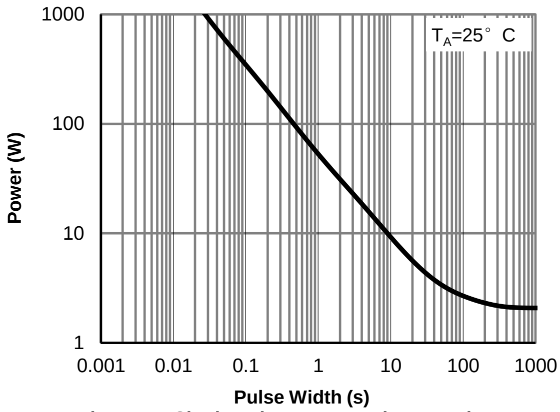


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

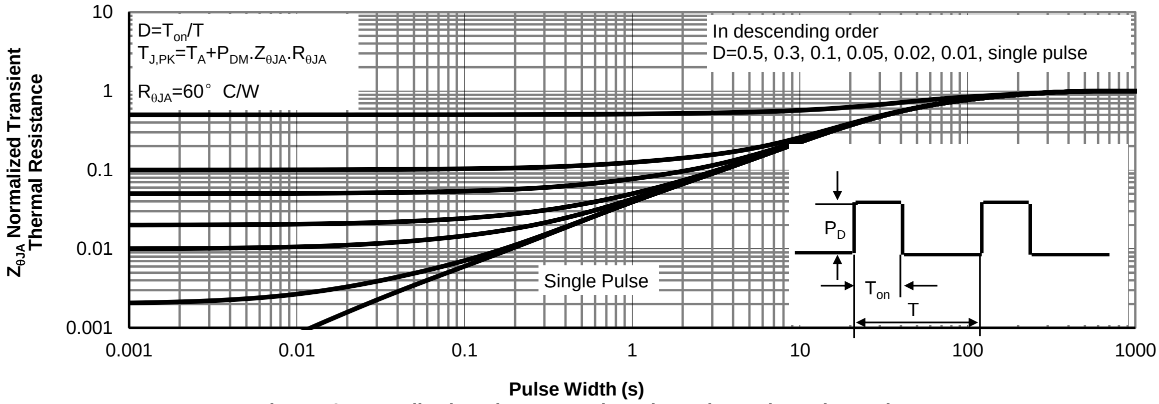
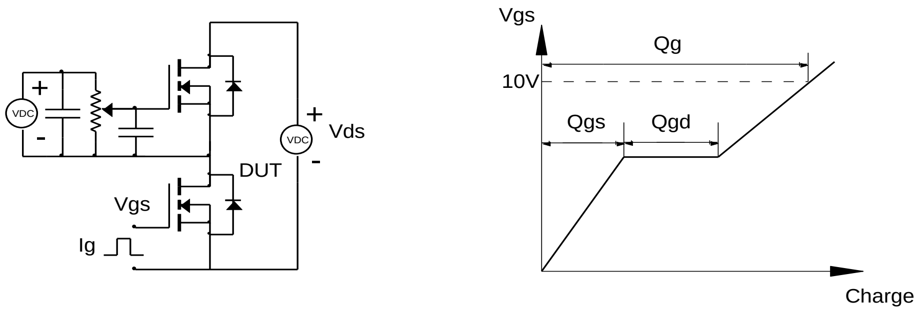
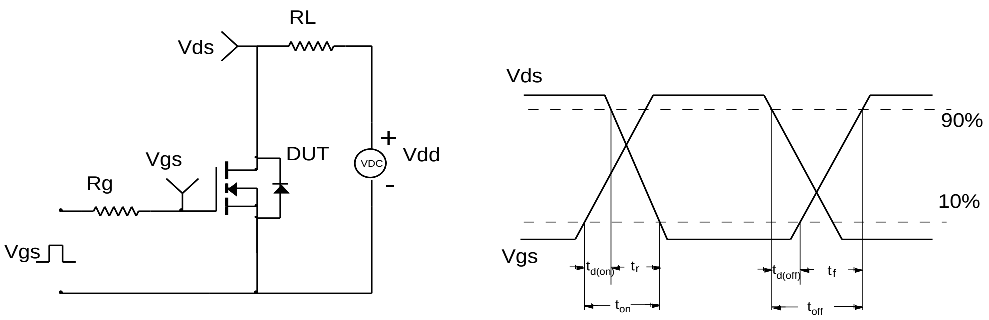


Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

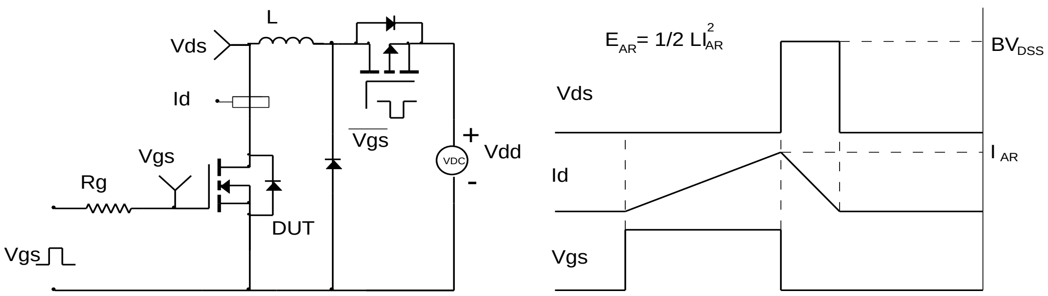
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms