



ALPHA & OMEGA
SEMICONDUCTOR

AONS20485

40V P-Channel MOSFET

General Description

- Trench Power MOSFET technology
- Low $R_{DS(ON)}$
- Low Gate Charge
- High Current Capability
- RoHS 2.0 and Halogen-Free Compliant

Applications

- Load Switch
- Battery Protection

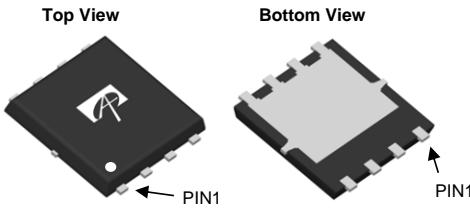
Product Summary

V_{DS}	-40V
I_D (at $V_{GS}=-10V$)	-40A
$R_{DS(ON)}$ (at $V_{GS}=-10V$)	< 15mΩ
$R_{DS(ON)}$ (at $V_{GS}=-4.5V$)	< 20mΩ

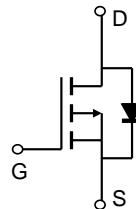
100% UIS Tested
100% R_g Tested



DFN5x6



Top View



Orderable Part Number	Package Type	Form	Minimum Order Quantity
AONS20485	DFN 5x6	Tape & Reel	3000

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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	-40	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current ^G	I_D	-40	A
$T_C=100^\circ C$		-31	
Pulsed Drain Current ^C	I_{DM}	-92	
Continuous Drain Current	I_{DSM}	-13	A
$T_A=70^\circ C$		-11	
Avalanche Current ^C	I_{AS}	40	A
Avalanche energy $L=0.1\text{mH}$ ^C	E_{AS}	80	mJ
Power Dissipation ^B	P_D	73	W
$T_C=100^\circ C$		29	
Power Dissipation ^A	P_{DSM}	5	W
$T_A=70^\circ C$		3.2	
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	°C

Thermal Characteristics

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	20	25	°C/W
$t \leq 10s$		45	55	°C/W
Maximum Junction-to-Ambient ^{AD}	Steady-State			
Maximum Junction-to-Case	Steady-State	1.3	1.7	°C/W

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV_{DSS}	Drain-Source Breakdown Voltage	$I_D=-250\mu\text{A}, V_{GS}=0\text{V}$	-40			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=-40\text{V}, V_{GS}=0\text{V}$			-1	μA
		$T_J=55^\circ\text{C}$			-5	
I_{GSS}	Gate-Body leakage current	$V_{DS}=0\text{V}, V_{GS}=\pm20\text{V}$			±100	nA
$\text{V}_{\text{GS(th)}}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	-1.2	-1.75	-2.3	V
$\text{R}_{\text{DS(ON)}}$	Static Drain-Source On-Resistance	$V_{GS}=-10\text{V}, I_D=20\text{A}$		12.5	15	$\text{m}\Omega$
		$T_J=125^\circ\text{C}$		19.7	24	
g_{FS}	Forward Transconductance	$V_{DS}=-5\text{V}, I_D=20\text{A}$		16	20	$\text{m}\Omega$
				60		
V_{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 ^G				-40	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}, V_{DS}=-20\text{V}, f=1\text{MHz}$		2430		pF
C_{oss}	Output Capacitance			250		pF
C_{rss}	Reverse Transfer Capacitance			175		pF
R_g	Gate resistance	$f=1\text{MHz}$	2.2	4.5	6.8	Ω
SWITCHING PARAMETERS						
$\text{Q}_g(10\text{V})$	Total Gate Charge	$V_{GS}=-10\text{V}, V_{DS}=-20\text{V}, I_D=-20\text{A}$		43	60	nC
$\text{Q}_g(4.5\text{V})$	Total Gate Charge			20	28	nC
Q_{gs}	Gate Source Charge			8.2		nC
Q_{gd}	Gate Drain Charge			8		nC
Q_{oss}	Output Charge	$V_{GS}=0\text{V}, V_{DS}=-20\text{V}$		8		nC
$t_{\text{D(on)}}$	Turn-On DelayTime	$V_{GS}=-10\text{V}, V_{DS}=-20\text{V}, R_L=1\Omega, R_{\text{GEN}}=3\Omega$		17		ns
t_r	Turn-On Rise Time			13		ns
$t_{\text{D(off)}}$	Turn-Off DelayTime			57		ns
t_f	Turn-Off Fall Time			20		ns
t_{rr}	Body Diode Reverse Recovery Time	$I_F=-20\text{A}, \text{di/dt}=500\text{A}/\mu\text{s}$		18		ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=-20\text{A}, \text{di/dt}=500\text{A}/\mu\text{s}$		54		nC

A. The value of R_{JJA} is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^\circ\text{C}$. The Power dissipation P_{DSM} is based on R_{JJA} ts 10s and the maximum allowed junction temperature of 150° 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. Single pulse width limited by junction temperature $T_{J(\text{MAX})}=150^\circ\text{C}$.

D. The R_{JJA} is the sum of the thermal impedance from junction to case R_{JJC} and case to ambient.

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

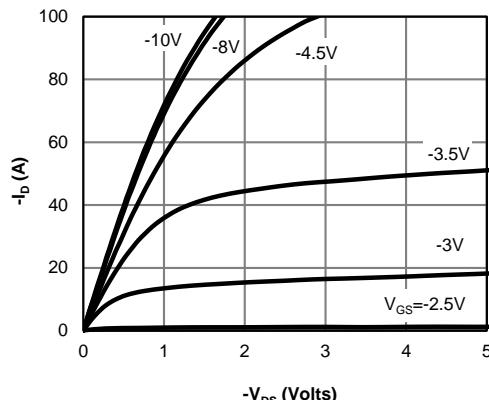
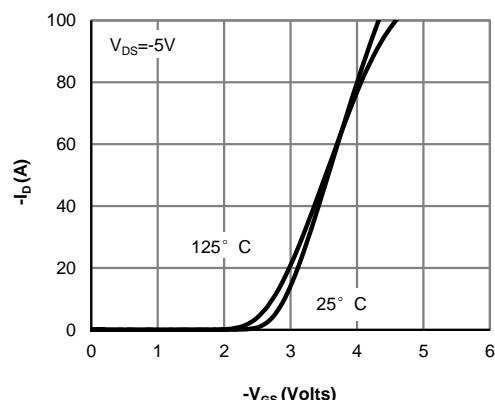
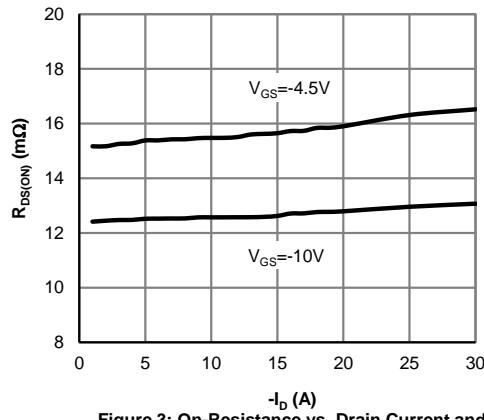
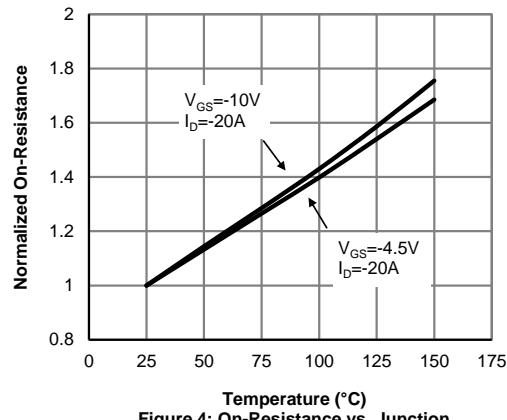
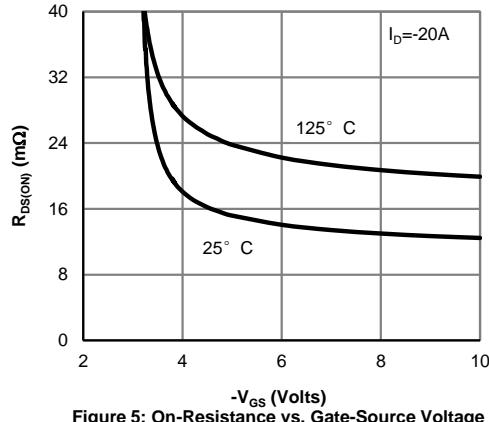
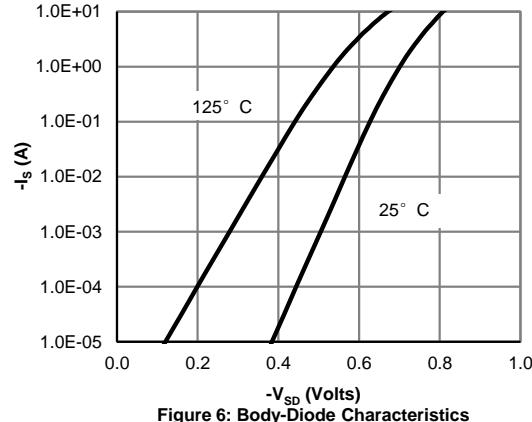
F. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of $T_{J(\text{MAX})}=150^\circ\text{C}$. The SOA curve provides a single pulse rating.

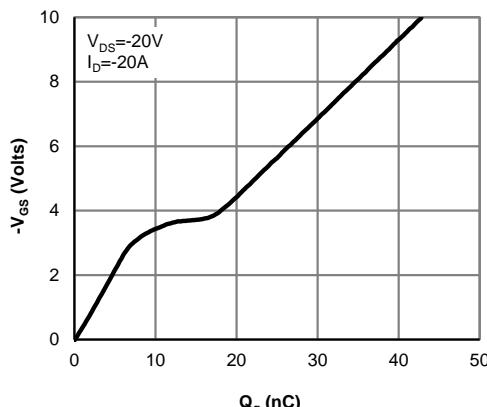
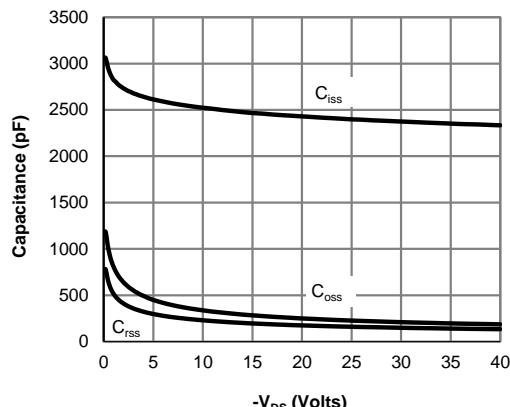
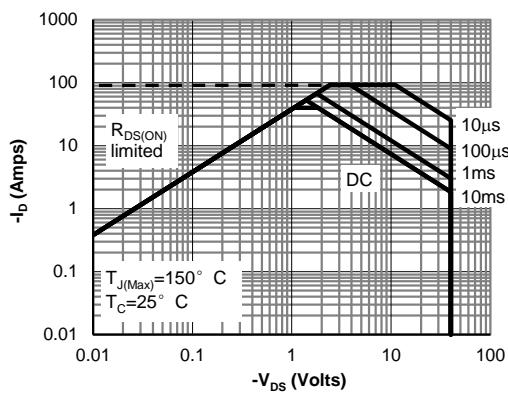
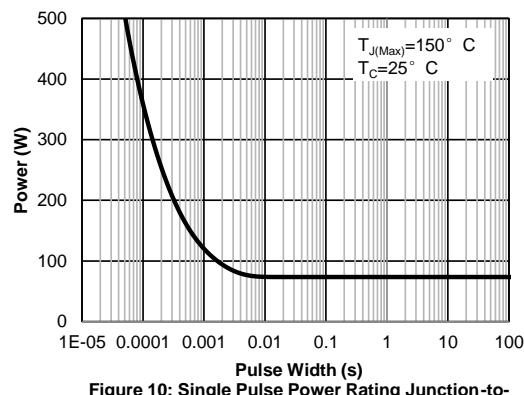
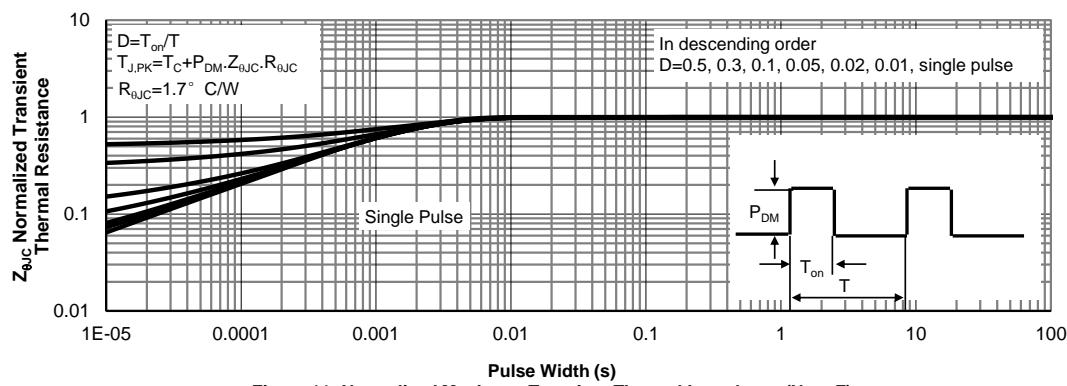
G. The maximum current rating is package limited.

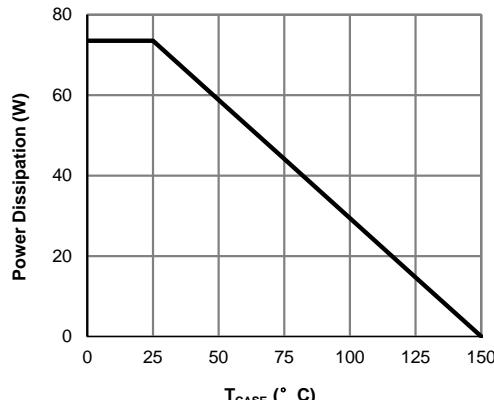
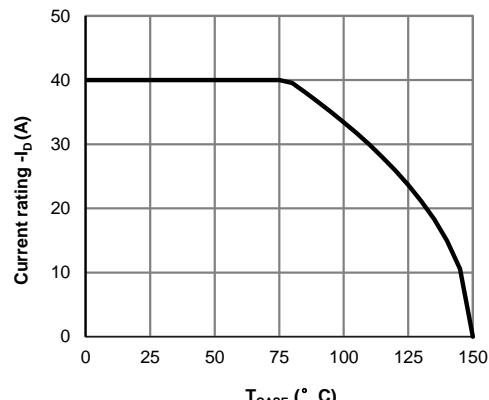
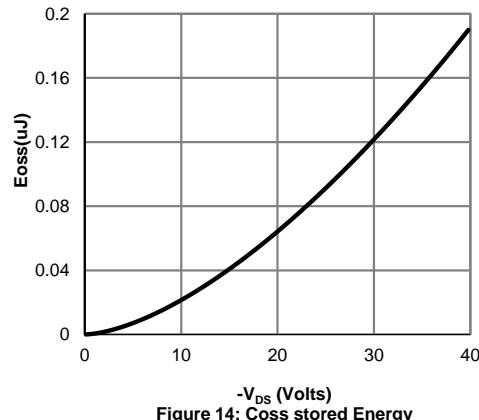
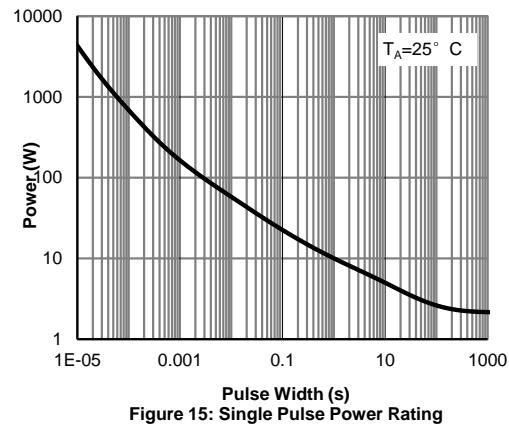
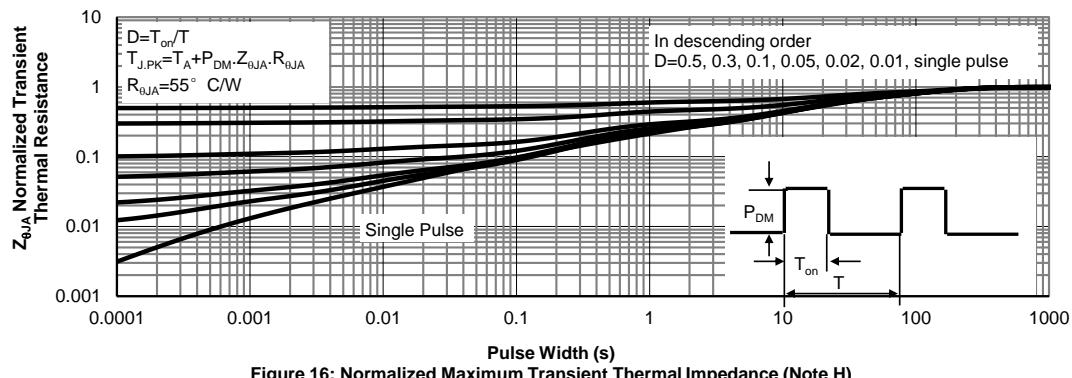
H. These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^\circ\text{C}$.

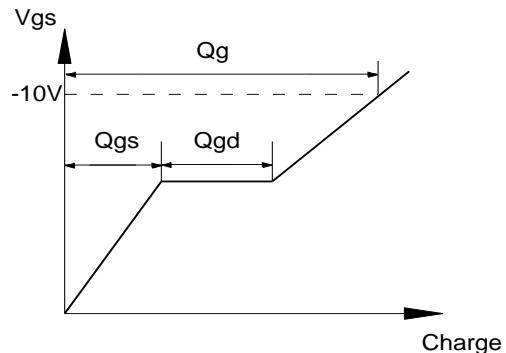
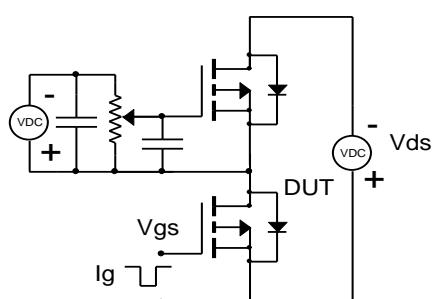
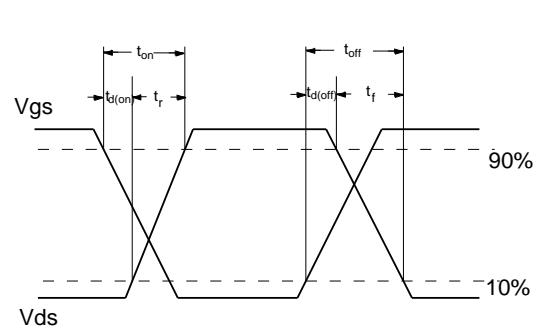
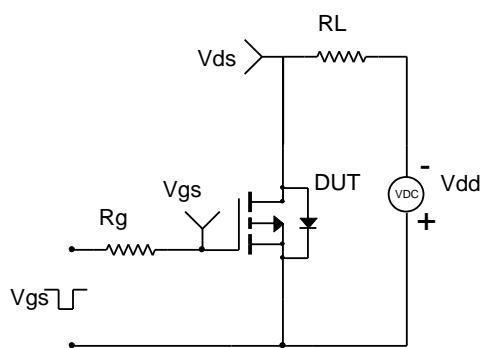
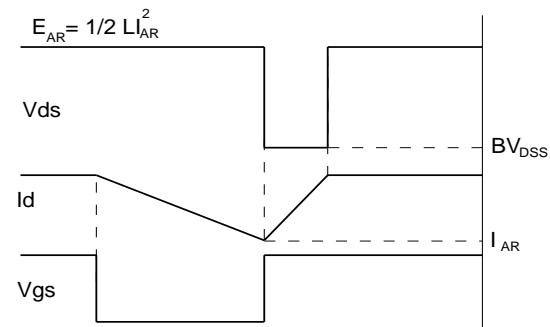
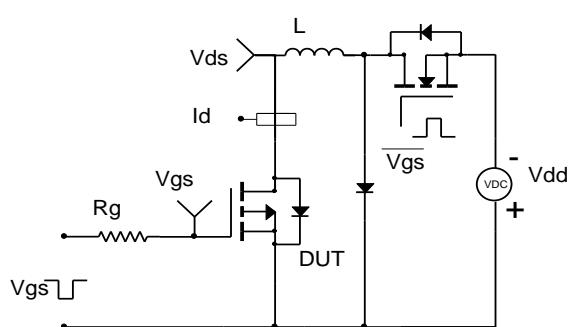
APPLICATIONS OR USES AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS ARE NOT AUTHORIZED. AOS DOES NOT ASSUME ANY LIABILITY ARISING OUT OF SUCH APPLICATIONS OR USES OF ITS PRODUCTS. AOS RESERVES THE RIGHT TO MAKE CHANGES TO PRODUCT SPECIFICATIONS WITHOUT NOTICE. IT IS THE RESPONSIBILITY OF THE CUSTOMER TO EVALUATE SUITABILITY OF THE PRODUCT FOR THEIR INTENDED APPLICATION. CUSTOMER SHALL COMPLY WITH APPLICABLE LEGAL REQUIREMENTS, INCLUDING ALL APPLICABLE EXPORT CONTROL RULES, REGULATIONS AND LIMITATIONS.

AOS' products are provided subject to AOS' terms and conditions of sale which are set forth at:
http://www.aosmd.com/terms_and_conditions_of_sale

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: 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: Coss stored Energy

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
