ALPHA & OMEGA SEMICONDUCTOR

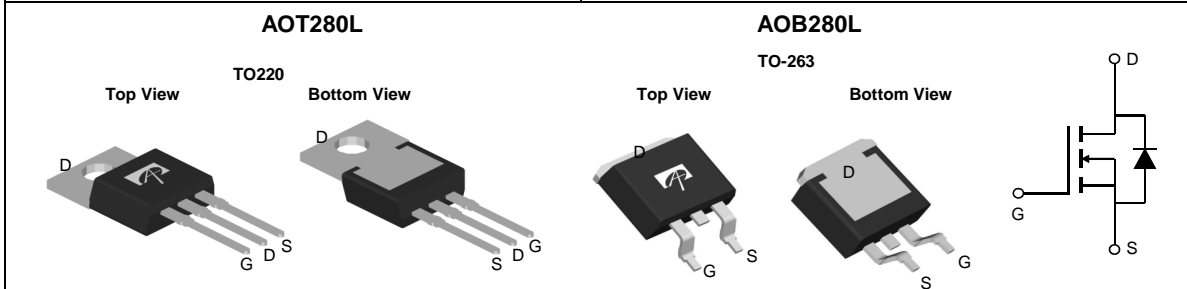# AOT280L/AOB280L
80V N-Channel MOSFET

General Description

The AOT280L/AOB280L 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}	80V
I_D (at V_{GS}=10V)	140A
$R_{DS(ON)}$ (at V_{GS}=10V)	< 2.7mΩ (< 2.2mΩ*)
$R_{DS(ON)}$ (at V_{GS}=6V)	< 3.5mΩ (< 3.1mΩ*)

100% UIS Tested
100% R_g Tested

Green Product

AOT280L
TO220

Top View   Bottom View

AOB280L
TO-263

Top View   Bottom View

Absolute Maximum Ratings T_A=25°C unless otherwise noted

Parameter		Symbol	Maximum	Units
Drain-Source Voltage		V_{DS}	80	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current [G]	T_C=25°C	I_D	140	A
	T_C=100°C		110	
Pulsed Drain Current [C]		I_{DM}	560	
Continuous Drain Current	T_A=25°C	I_{DSM}	20.5	A
	T_A=70°C		16	
Avalanche Current [C]		I_{AS}	70	A
Avalanche energy L=0.3mH [C]		E_{AS}	735	mJ
Power Dissipation [B]	T_C=25°C	P_D	333	W
	T_C=100°C		166.5	
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	$R_{\theta JC}$	0.35	0.45	°C/W

* Surface mount package TO263

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Electrical Characteristics (T$_J$=25℃ unless otherwise noted)

Symbol	Parameter	Conditions		Min	Typ	Max	Units
STATIC PARAMETERS							
BV$_{DSS}$	Drain-Source Breakdown Voltage	I$_D$=250μA, V$_{GS}$=0V		80			V
I$_{DSS}$	Zero Gate Voltage Drain Current	V$_{DS}$=80V, V$_{GS}$=0V				1	μA
			T$_J$=55℃			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		2.4	2.75	3.4	V
I$_{D(ON)}$	On state drain current	V$_{GS}$=10V, V$_{DS}$=5V		560			A
R$_{DS(ON)}$	Static Drain-Source On-Resistance	V$_{GS}$=10V, I$_D$=20A TO220			2.2	2.7	mΩ
		TO220	T$_J$=125℃		3.4	4.2	mΩ
		V$_{GS}$=6V, I$_D$=20A TO220			2.5	3.5	mΩ
		V$_{GS}$=10V, I$_D$=20A TO263			1.8	2.2	mΩ
		V$_{GS}$=6V, I$_D$=20A TO263			2.2	3.1	mΩ
g$_{FS}$	Forward Transconductance	V$_{DS}$=5V, I$_D$=20A			76		S
V$_{SD}$	Diode Forward Voltage	I$_S$=1A,V$_{GS}$=0V			0.67	1	V
I$_S$	Maximum Body-Diode Continuous Current [G]					140	A
DYNAMIC PARAMETERS							
C$_{iss}$	Input Capacitance	V$_{GS}$=0V, V$_{DS}$=40V, f=1MHz			11135		pF
C$_{oss}$	Output Capacitance				1315		pF
C$_{rss}$	Reverse Transfer Capacitance				80		pF
R$_g$	Gate resistance	V$_{GS}$=0V, V$_{DS}$=0V, f=1MHz		0.4	0.75	1.2	Ω
SWITCHING PARAMETERS							
Q$_{g(10V)}$	Total Gate Charge	V$_{GS}$=10V, V$_{DS}$=40V, I$_D$=20A			160	224	nC
Q$_{gs}$	Gate Source Charge				38		nC
Q$_{gd}$	Gate Drain Charge				28		nC
t$_{D(on)}$	Turn-On DelayTime				30		ns
t$_r$	Turn-On Rise Time	V$_{GS}$=10V, V$_{DS}$=40V, R$_L$=2Ω, R$_{GEN}$=3Ω			23		ns
t$_{D(off)}$	Turn-Off DelayTime				75		ns
t$_f$	Turn-Off Fall Time				27		ns
t$_{rr}$	Body Diode Reverse Recovery Time	I$_F$=20A, dI/dt=500A/μs			44		ns
Q$_{rr}$	Body Diode Reverse Recovery Charge	I$_F$=20A, dI/dt=500A/μs			348		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. The maximum current limited by package.

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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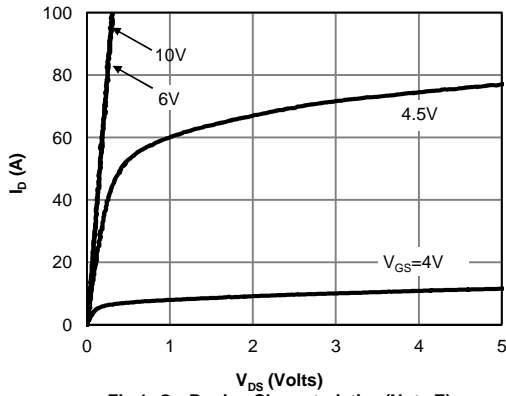**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**
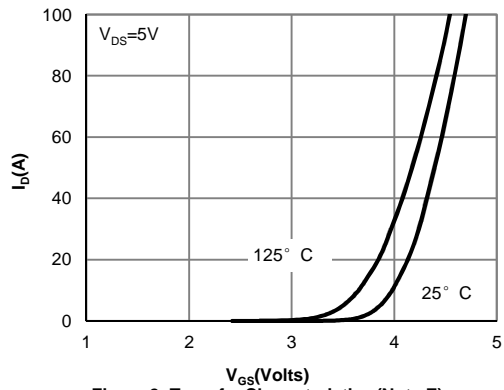

Fig 1: On-Region Characteristics (Note E)

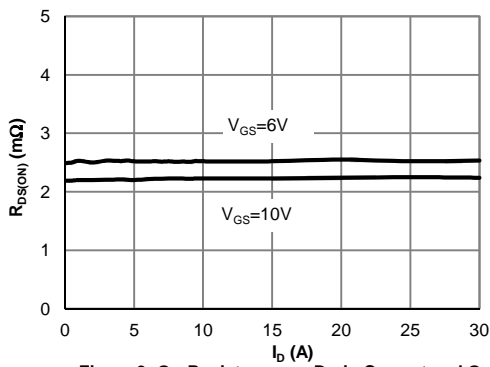Figure 2: Transfer Characteristics (Note E)

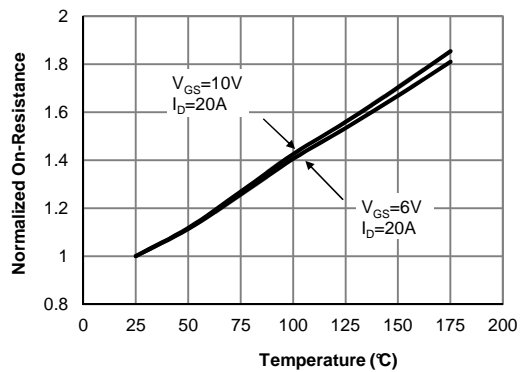Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

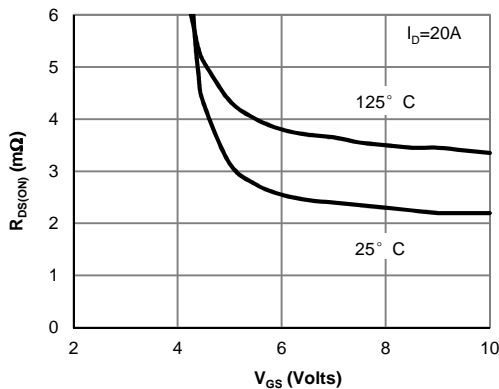Figure 4: On-Resistance vs. Junction Temperature (Note E)

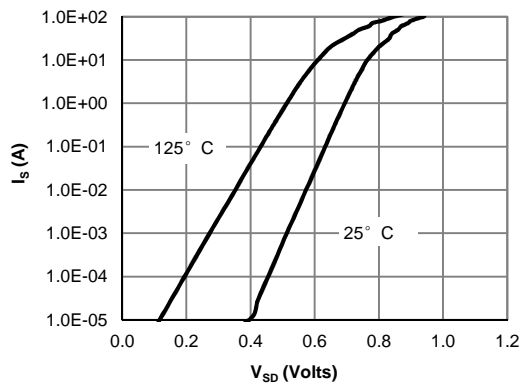Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

Figure 6: Body-Diode Characteristics (Note E)

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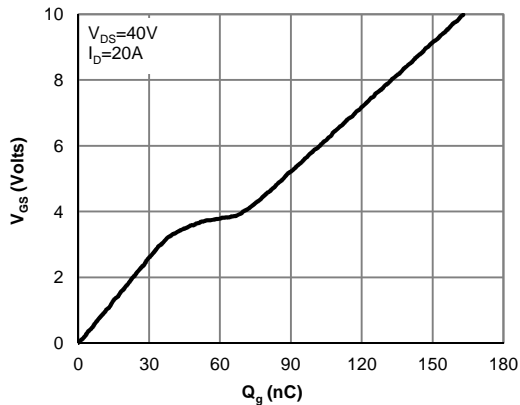
Figure 7: Gate-Charge Characteristics
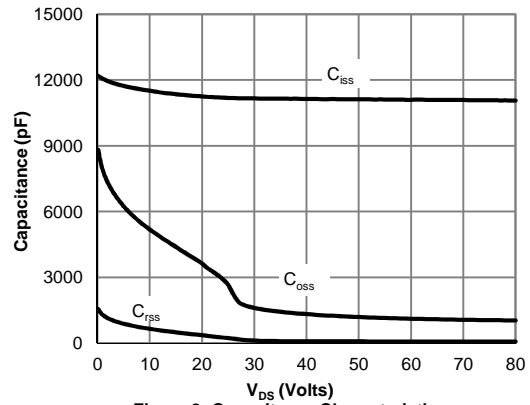
Figure 8: Capacitance Characteristics
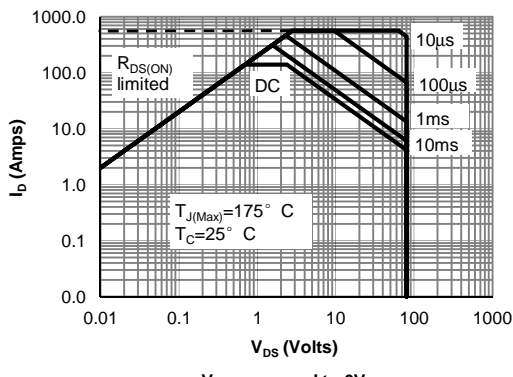
V_{GS} > or equal to 6V
Figure 9: Maximum Forward Biased Safe Operating Area (Note F)
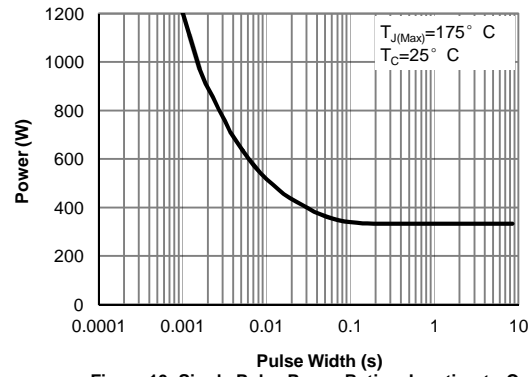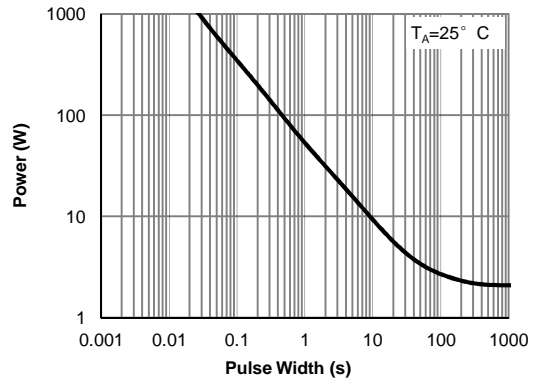

Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)
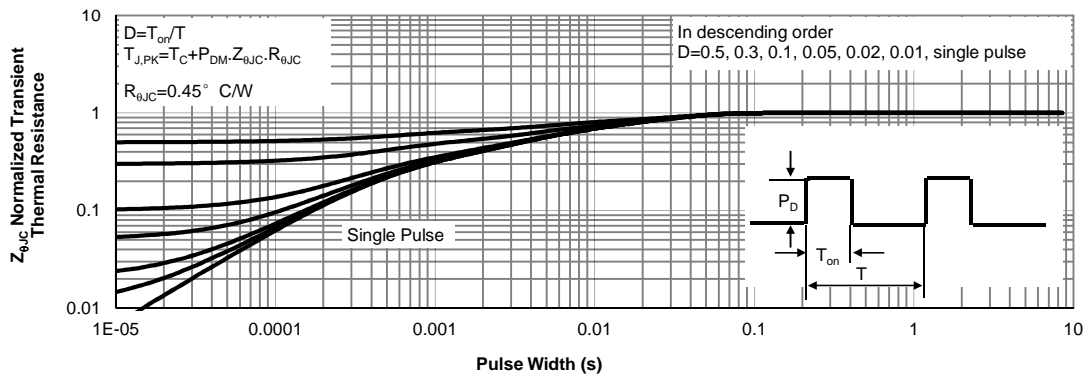
Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

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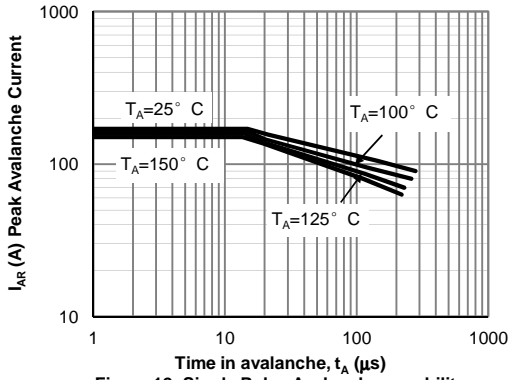
Figure 12: Single Pulse Avalanche capability (Note C)
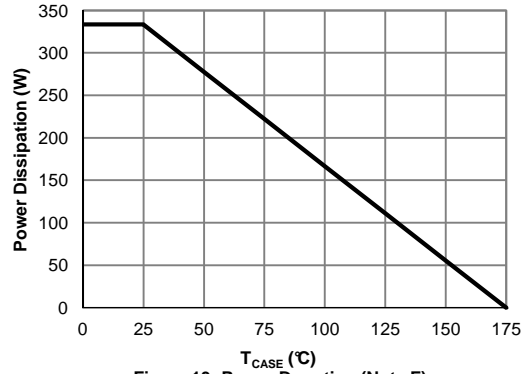
Figure 13: Power De-rating (Note F)
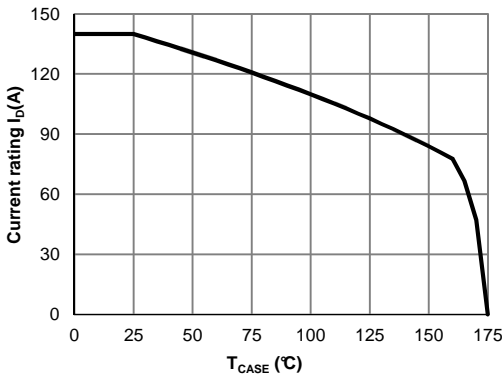
Figure 14: Current De-rating (Note F)

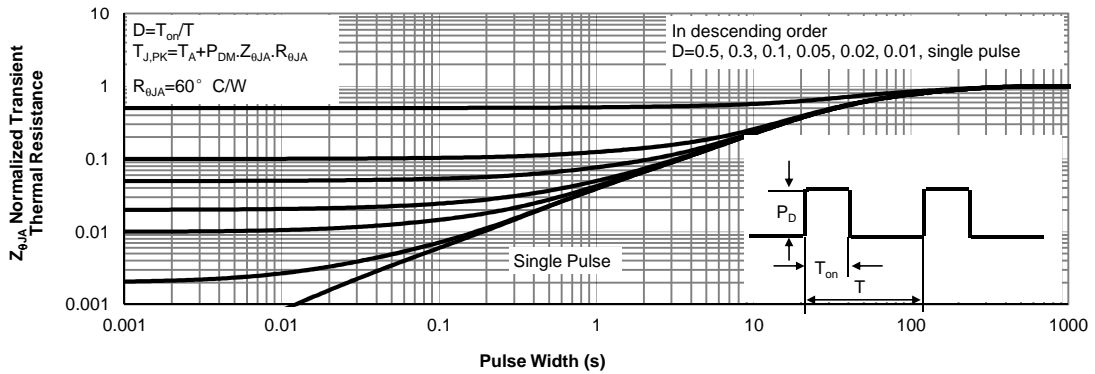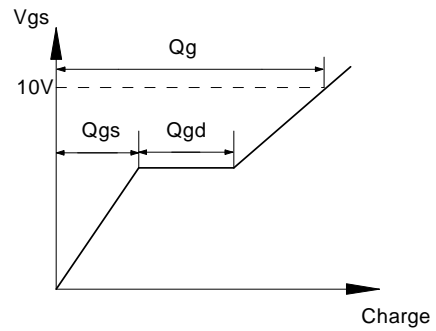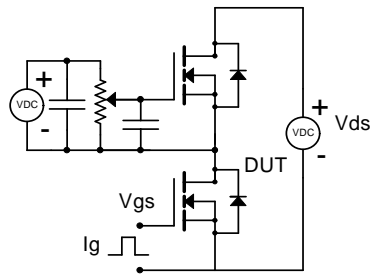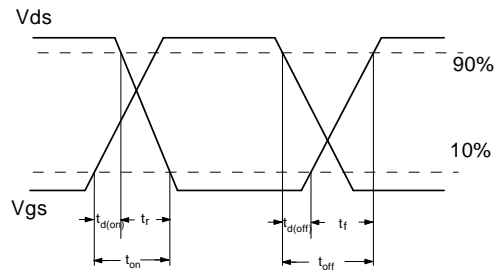Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)
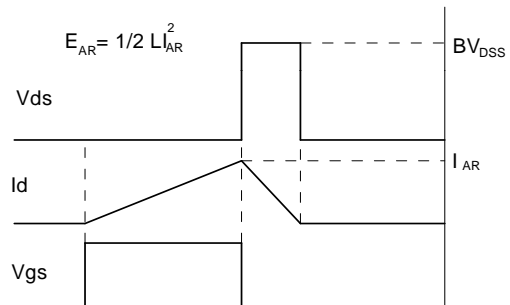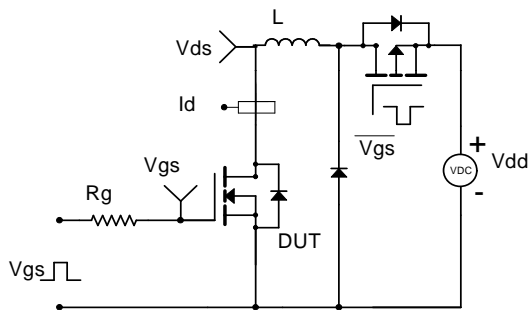
Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

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Gate Charge Test Circuit & Waveform

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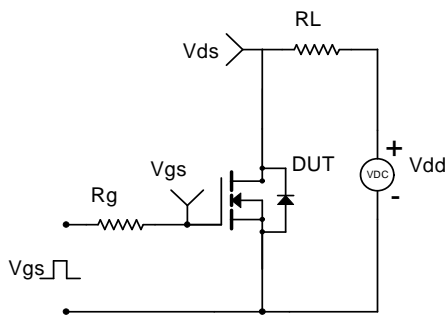
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

$$E_{AR} = 1/2 \, LI_{AR}^2$$

Diode Recovery Test Circuit & Waveforms

$$Q_{rr} = \int I dt$$