



ALPHA & OMEGA
SEMICONDUCTOR

AOT290L/AOB290L

100V N-Channel MOSFET

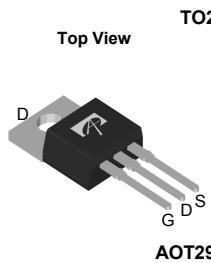
General Description

The AOT290L/AOB290L uses Trench MOSFET technology that is uniquely optimized to provide the most efficient high frequency switching performance. Power losses are minimized due to an extremely low combination of $R_{DS(ON)}$ and C_{rss} . In addition, switching behavior is well controlled with a soft recovery body diode. This device is ideal for boost converters and synchronous rectifiers for consumer, telecom, industrial power supplies and LED backlighting.

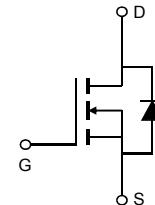
Product Summary

V_{DS}	100V
I_D (at $V_{GS}=10V$)	140A
$R_{DS(ON)}$ (at $V_{GS}=10V$)	< 3.5mΩ (< 3.2mΩ*)

100% UIS Tested
100% R_g Tested



TO220

TO-263
D²PAK

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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	100	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current ^G	I_D	140	A
		110	
Pulsed Drain Current ^C	I_{DM}	500	A
Continuous Drain Current	I_{DSM}	18	A
		15	
Avalanche Current ^C	I_{AS}, I_{AR}	100	A
Avalanche energy $L=0.1mH$ ^C	E_{AS}, E_{AR}	500	mJ
V_{DS} Spike ^I	V_{SPIKE}	120	V
Power Dissipation ^B	P_D	500	W
		250	
Power Dissipation ^A	P_{DSM}	2.1	W
		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	R_{0JA}	12	15	°C/W
Maximum Junction-to-Ambient ^D		50	60	°C/W
Maximum Junction-to-Case	R_{0JC}	0.25	0.3	°C/W

* Surface mount package TO263

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	$I_D=250\mu\text{A}, V_{GS}=0\text{V}$	100			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=100\text{V}, V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$			1 5	μA
I_{GSS}	Gate-Body leakage current	$V_{DS}=0\text{V}, V_{GS}=\pm 20\text{V}$			100	nA
$V_{\text{GS(th)}}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	2.9	3.5	4.1	V
$I_{\text{D(ON)}}$	On state drain current	$V_{GS}=10\text{V}, V_{DS}=5\text{V}$	500			A
$R_{\text{DS(ON)}}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}, I_D=20\text{A}$		2.7	3.5	$\text{m}\Omega$
		TO220 $T_J=125^\circ\text{C}$		4.4	5.7	
		TO263		2.5	3.2	
g_{FS}	Forward Transconductance	$V_{DS}=5\text{V}, I_D=20\text{A}$		50		S
V_{SD}	Diode Forward Voltage	$I_S=1\text{A}, V_{GS}=0\text{V}$		0.67	1	V
I_S	Maximum Body-Diode Continuous Current ^G				140	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}, V_{DS}=50\text{V}, f=1\text{MHz}$		7180	9550	pF
C_{oss}	Output Capacitance			2780	3700	pF
C_{rss}	Reverse Transfer Capacitance			42	72	pF
R_g	Gate resistance	$V_{GS}=0\text{V}, V_{DS}=0\text{V}, f=1\text{MHz}$		1.7		Ω
SWITCHING PARAMETERS						
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS}=10\text{V}, V_{DS}=50\text{V}, I_D=20\text{A}$		90	126	nC
Q_{gs}	Gate Source Charge			33		nC
Q_{gd}	Gate Drain Charge			21		nC
$t_{\text{D(on)}}$	Turn-On Delay Time	$V_{GS}=10\text{V}, V_{DS}=50\text{V}, R_L=2.5\Omega, R_{\text{GEN}}=3\Omega$		31	69	ns
t_r	Turn-On Rise Time			24	53	ns
$t_{\text{D(off)}}$	Turn-Off Delay Time			45	99	ns
t_f	Turn-Off Fall Time			27	60	ns
t_{rr}	Body Diode Reverse Recovery Time	$I_F=20\text{A}, dI/dt=500\text{A}/\mu\text{s}$		65	91	ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=20\text{A}, dI/dt=500\text{A}/\mu\text{s}$		460	644	nC

A. The value of $R_{\theta_{JA}}$ is measured with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^\circ\text{C}$. 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 $T_{J(\text{MAX})}=175^\circ\text{C}$, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.

C. Repetitive rating, pulse width limited by junction temperature $T_{J(\text{MAX})}=175^\circ\text{C}$. Ratings are based on low frequency and duty cycles to keep initial $T_J=25^\circ\text{C}$.

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 <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 $T_{J(\text{MAX})}=175^\circ\text{C}$. 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 $T_A=25^\circ\text{C}$.

I. The spike duty cycle 5% max, limited by junction temperature $T_{J(\text{MAX})}=120^\circ\text{C}$.

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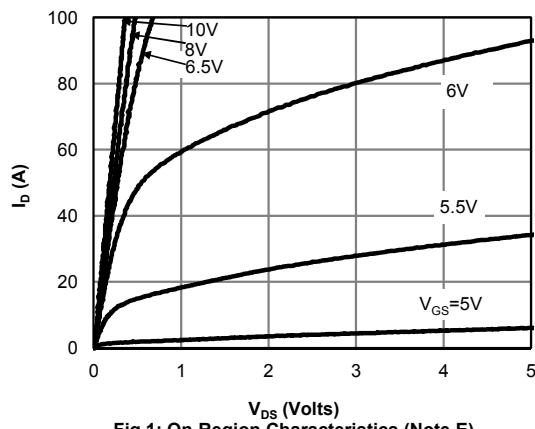
TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS


Fig 1: On-Region Characteristics (Note E)

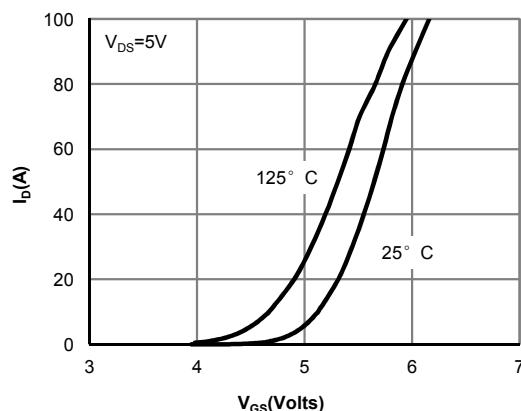


Figure 2: Transfer Characteristics (Note E)

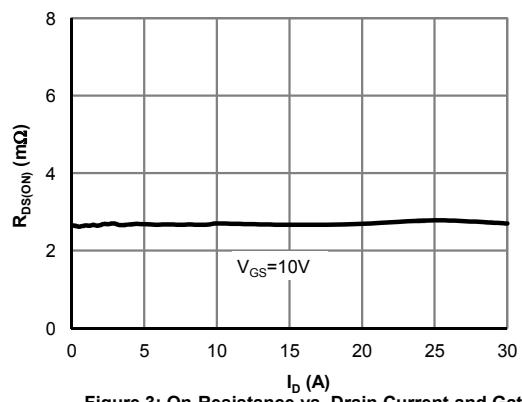


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

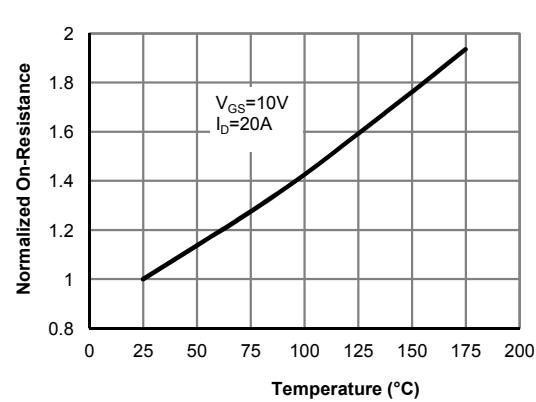


Figure 4: On-Resistance vs. Junction Temperature (Note E)

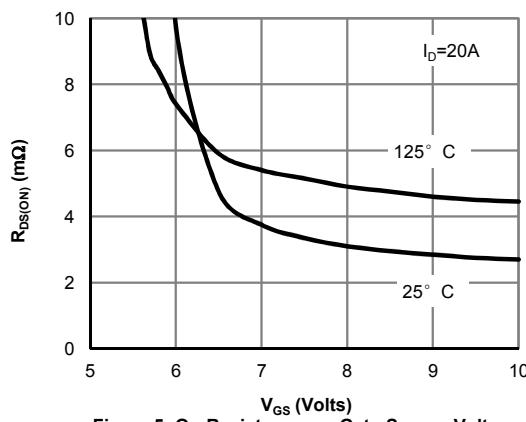


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

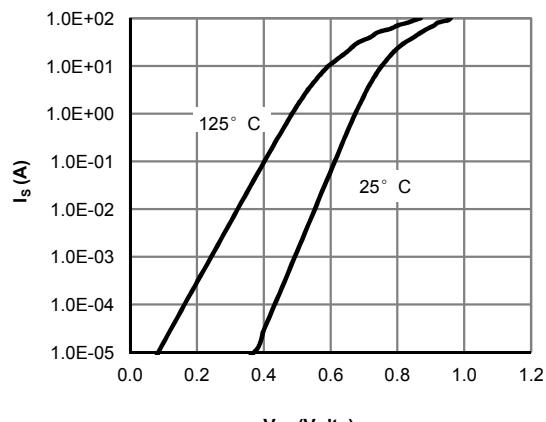
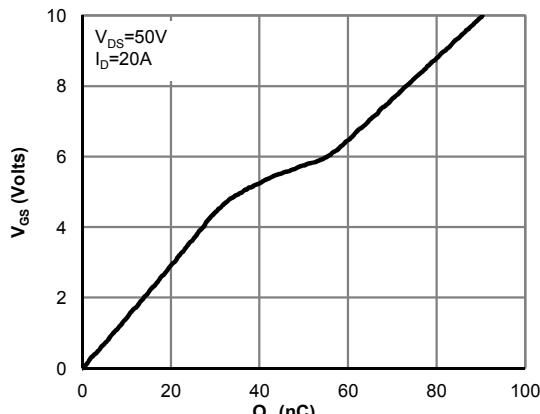
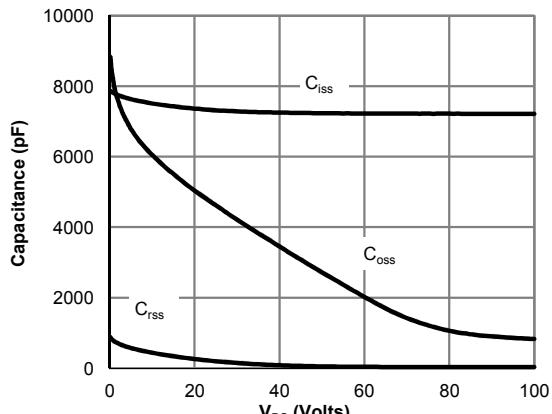
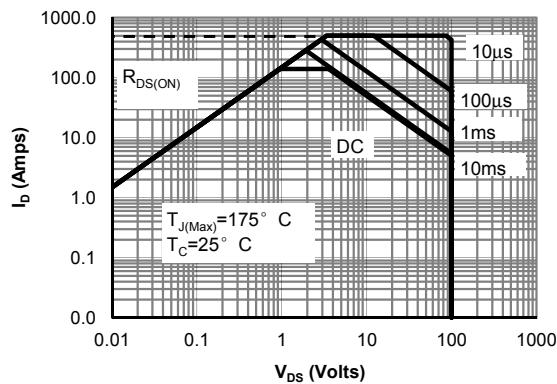
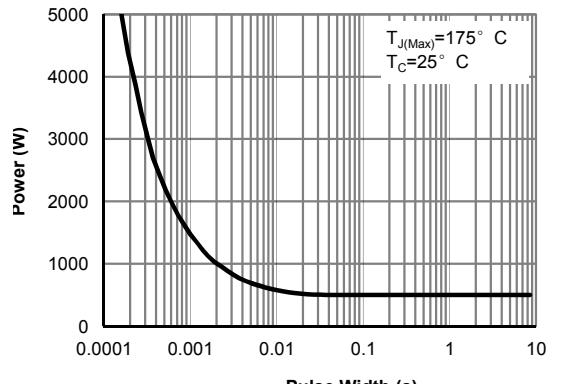
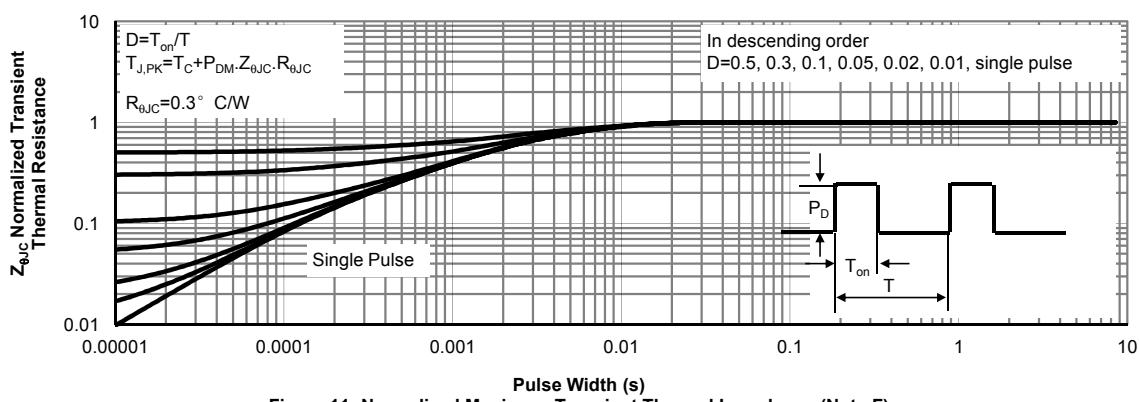


Figure 6: Body-Diode Characteristics (Note E)

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)

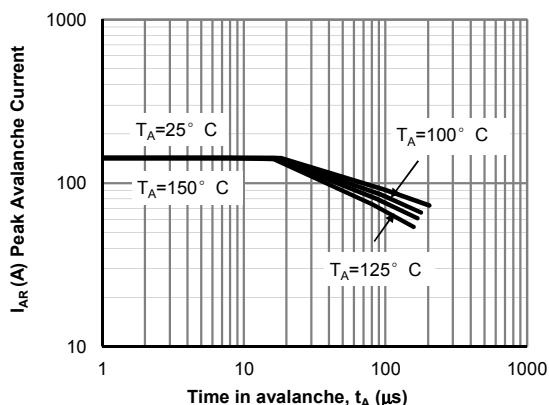
TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS


Figure 12: Single Pulse Avalanche capability
(Note C)

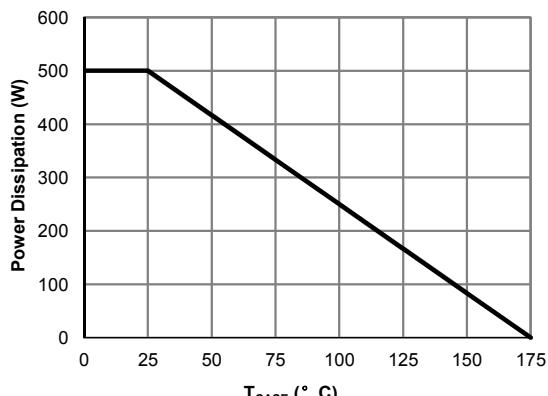


Figure 13: Power De-rating (Note F)

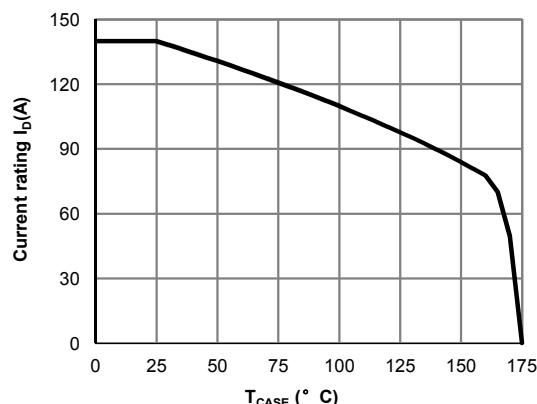


Figure 14: Current De-rating (Note F)

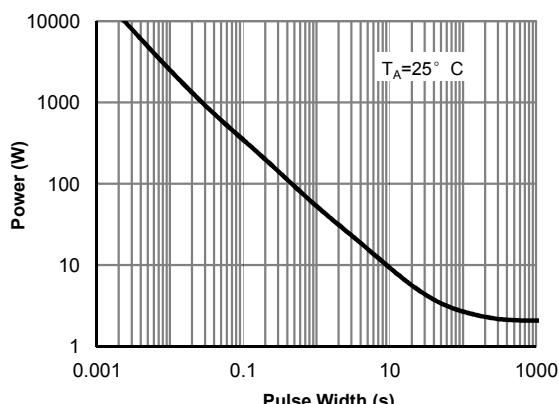


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

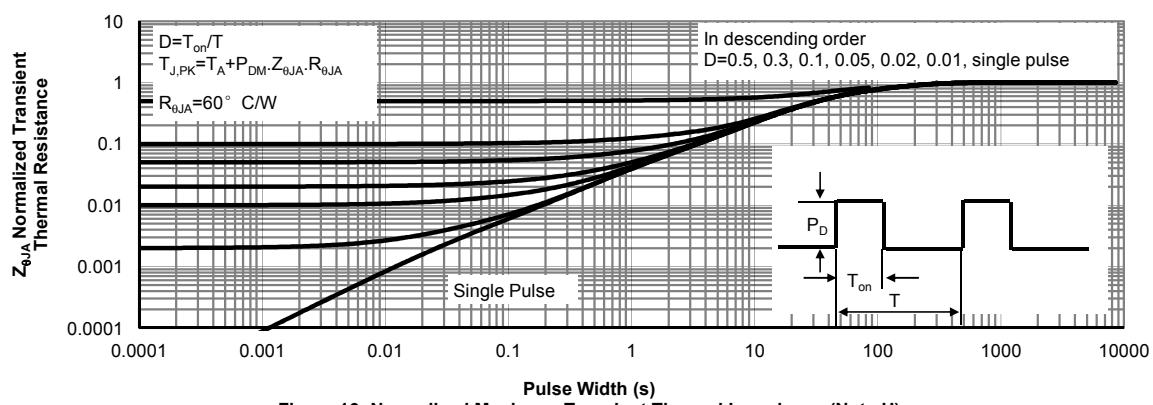
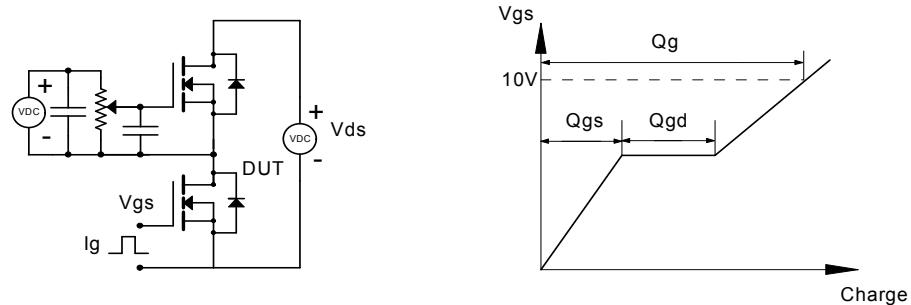
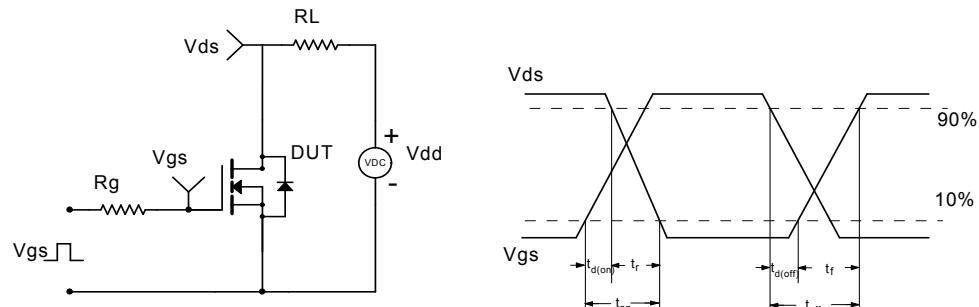
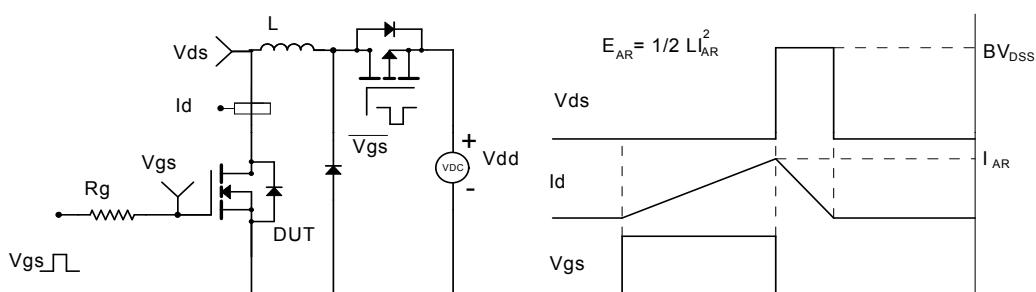


Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

Gate Charge Test Circuit & Waveform

Resistive Switching Test Circuit & Waveforms

Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

Diode Recovery Test Circuit & Waveforms
