

General Description

The AOT12N40 is fabricated using an advanced high voltage MOSFET process that is designed to deliver high levels of performance and robustness in popular AC-DC applications. By providing low $R_{DS(on)}$, C_{iss} and C_{rss} along with guaranteed avalanche capability this part can be adopted quickly into new and existing offline power supply designs.

For Halogen Free add "L" suffix to part number:
 AOT12N40L

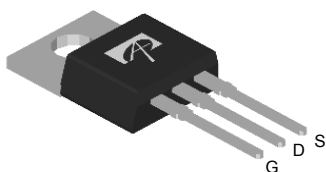
Product Summary

V_{DS}	500V@150°C
I_D (at $V_{GS}=10V$)	11A
$R_{DS(on)}$ (at $V_{GS}=10V$)	<0.59Ω

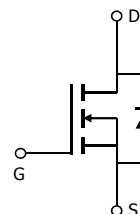
100% UIS Tested
 100% R_g Tested



Top View
 TO-220



AOT12N40



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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	400	V
Gate-Source Voltage	V_{GS}	±30	V
Continuous Drain Current	I_D	$T_C=25^\circ\text{C}$	11
		$T_C=100^\circ\text{C}$	7
Pulsed Drain Current ^C	I_{DM}	28	A
Avalanche Current ^C	I_{AR}	3.5	A
Repetitive avalanche energy ^C	E_{AR}	184	mJ
Single pulsed avalanche energy ^G	E_{AS}	368	mJ
Peak diode recovery dv/dt	dv/dt	5	V/ns
Power Dissipation ^B	P_D	$T_C=25^\circ\text{C}$	184
		Derate above 25°C	1.5
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	°C
Maximum lead temperature for soldering purpose, 1/8" from case for 5 seconds	T_L	300	°C

Thermal Characteristics

Parameter	Symbol	Typical	Maximum	Units
Maximum Junction-to-Ambient ^{A,D}	$R_{\theta JA}$	54	65	°C/W
Maximum Case-to-sink ^A	$R_{\theta CS}$	-	0.5	°C/W
Maximum Junction-to-Case	$R_{\theta JC}$	0.56	0.68	°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, T _J =25°C	400			V	
		I _D =250μA, V _{GS} =0V, T _J =150°C		500			
BV _{DSS} /ΔT _J	Zero Gate Voltage Drain Current	I _D =250μA, V _{GS} =0V		0.4		V/°C	
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =400V, V _{GS} =0V			1	μA	
		V _{DS} =320V, T _J =125°C			10		
I _{GSS}	Gate-Body leakage current	V _{DS} =0V, V _{GS} =±30V			±100	nA	
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =5V, I _D =250μA	3.3	3.9	4.5	V	
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =6A		0.49	0.59	Ω	
g _{FS}	Forward Transconductance	V _{DS} =40V, I _D =6A		10		S	
V _{SD}	Diode Forward Voltage	I _S =1A, V _{GS} =0V		0.72	1	V	
I _S	Maximum Body-Diode Continuous Current				11	A	
I _{SM}	Maximum Body-Diode Pulsed Current				28	A	
DYNAMIC PARAMETERS							
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =25V, f=1MHz	740	925	1110	pF	
C _{oss}	Output Capacitance		70	100	130	pF	
C _{rss}	Reverse Transfer Capacitance		3.5	6.4	9.0	pF	
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz	1.4	2.9	4.5	Ω	
SWITCHING PARAMETERS							
Q _g	Total Gate Charge	V _{GS} =10V, V _{DS} =320V, I _D =12A	13	17	21	nC	
Q _{gs}	Gate Source Charge				5.4		nC
Q _{gd}	Gate Drain Charge				5.7		nC
t _{D(on)}	Turn-On Delay Time	V _{GS} =10V, V _{DS} =200V, I _D =12A, R _G =25Ω		25		ns	
t _r	Turn-On Rise Time			57		ns	
t _{D(off)}	Turn-Off Delay Time			41		ns	
t _f	Turn-Off Fall Time			32		ns	
t _{rr}	Body Diode Reverse Recovery Time	I _F =12A, dI/dt=100A/μs, V _{DS} =100V	180	235	290	ns	
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =12A, dI/dt=100A/μs, V _{DS} =100V	1.9	2.4	2.9	μC	

A. The value of R_{θJA} is measured with the device in a still air environment with T_A=25°C.

B. The power dissipation P_D is based on T_{J(MAX)}=150°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)}=150°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 <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(MAX)}=150°C. The SOA curve provides a single pulse rating.

G. L=60mH, I_{AS}=3.5A, V_{DD}=150V, R_G=25Ω, Starting T_J=25°C

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

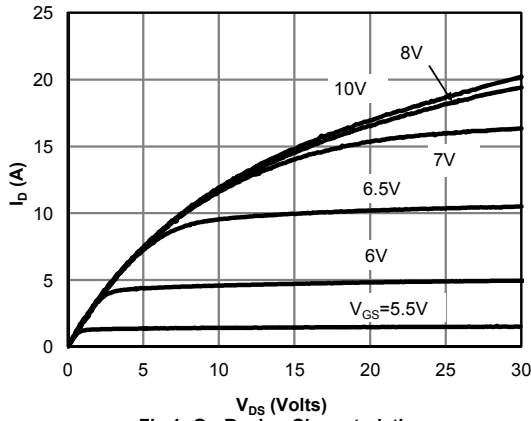


Fig 1: On-Region Characteristics

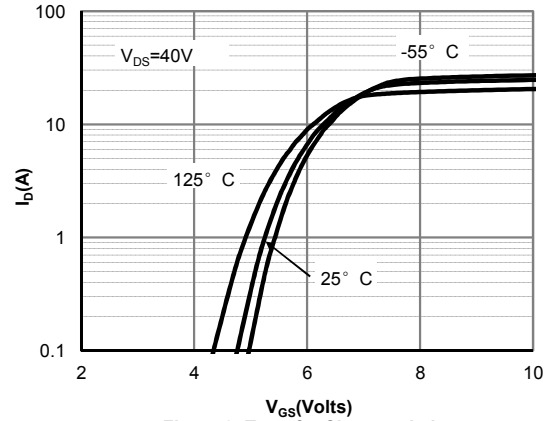


Figure 2: Transfer Characteristics

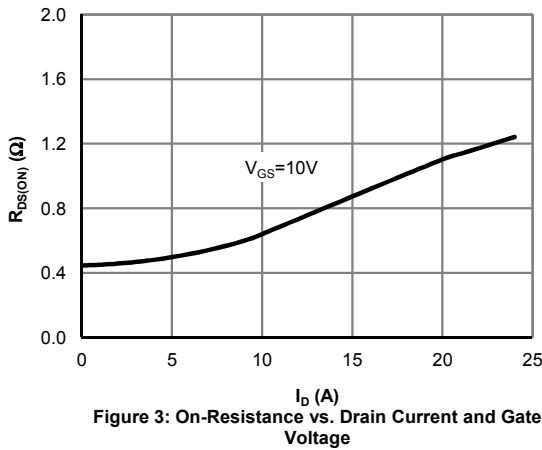


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

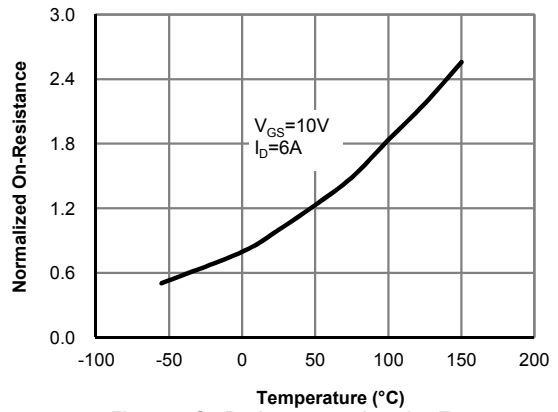


Figure 4: On-Resistance vs. Junction Temperature

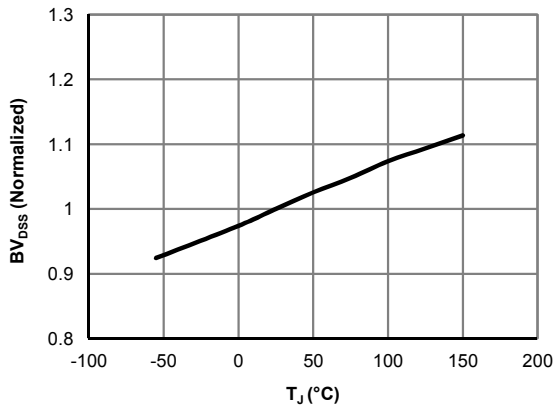


Figure 5: Break Down vs. Junction Temperature

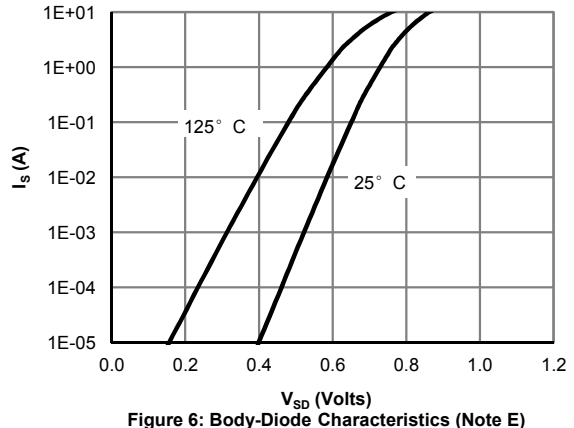


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

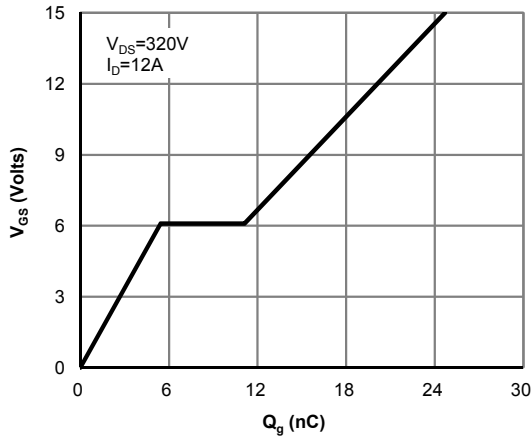


Figure 7: Gate-Charge Characteristics

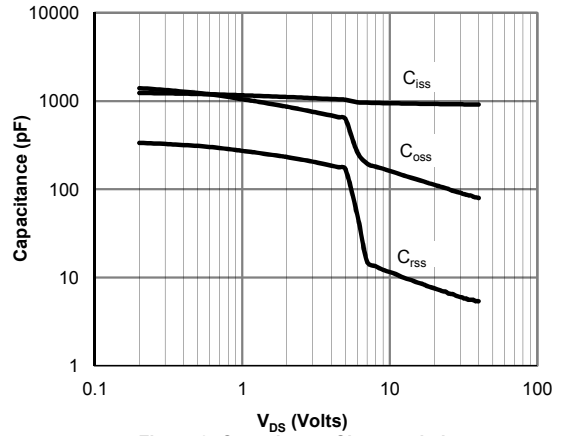


Figure 8: Capacitance Characteristics

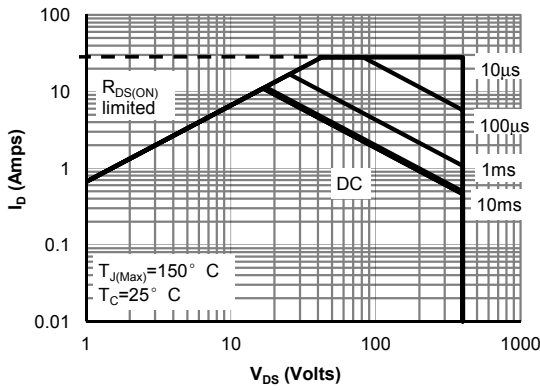


Figure 9: Maximum Forward Biased Safe Operating Area for AOT12N40 (Note F)

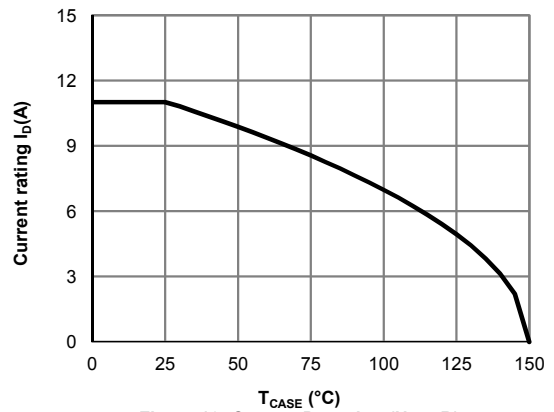


Figure 10: Current De-rating (Note B)

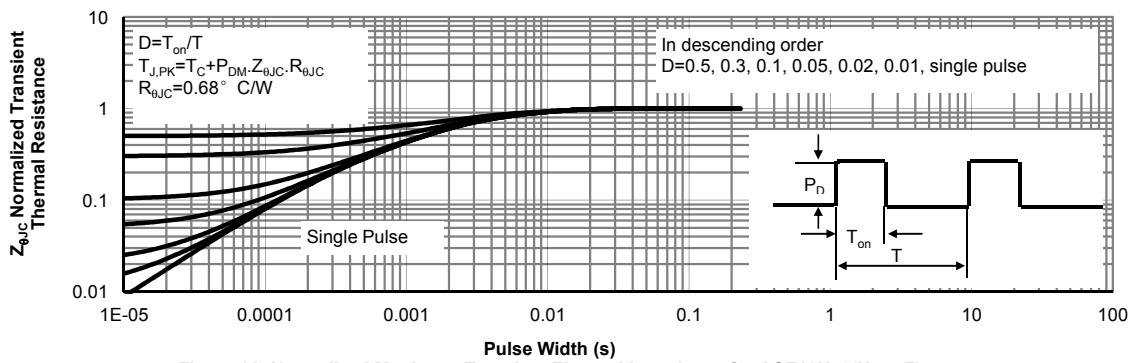
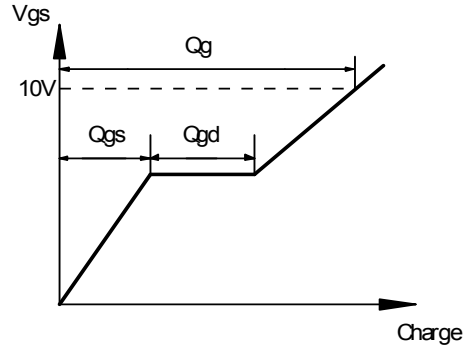
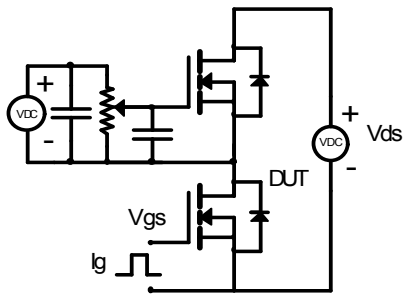
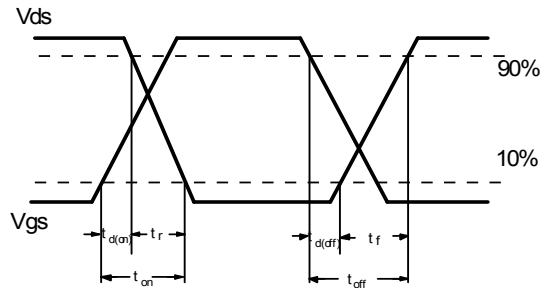
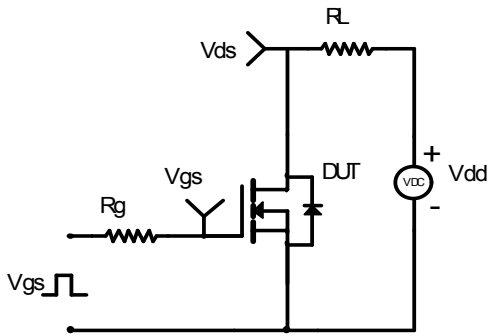


Figure 11: Normalized Maximum Transient Thermal Impedance for AOT12N40 (Note F)

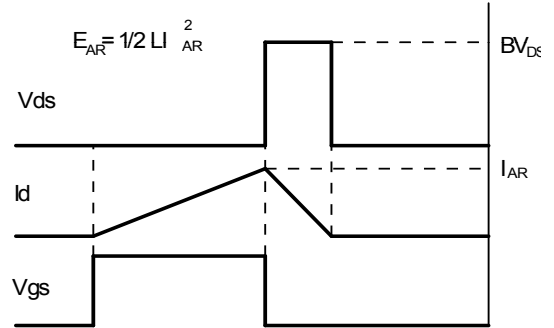
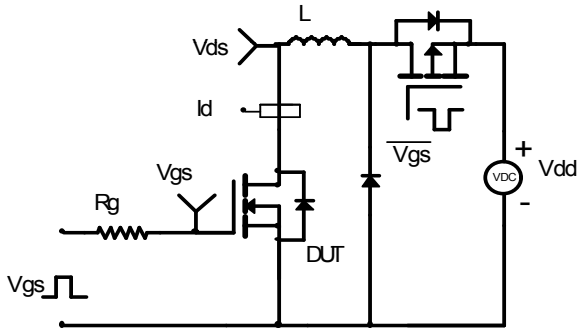
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

