

General Description

The AOT9N40 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 parts can be adopted quickly into new and existing offline power supply designs. These parts are ideal for boost converters and synchronous rectifiers for consumer, telecom, industrial power supplies and LED backlighting.

For Halogen Free add "L" suffix to part number:
AOT9N40L

Product Summary

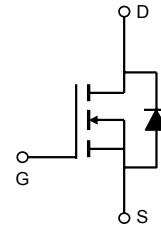
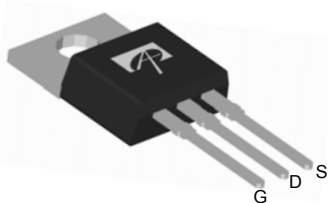
V_{DS} 500V@150°C
 I_D (at $V_{GS}=10V$) 8A
 $R_{DS(ON)}$ (at $V_{GS}=10V$) < 0.8Ω

100% UIS Tested
 100% R_g Tested



Top View

TO-220



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

Parameter	Symbol	AOT9N40	Units
Drain-Source Voltage	V_{DS}	400	V
Gate-Source Voltage	V_{GS}	±30	V
Continuous Drain Current	I_D	8	A
$T_C=25^\circ\text{C}$			
Current		5	
$T_C=100^\circ\text{C}$			
Pulsed Drain Current ^C	I_{DM}	22	
Avalanche Current ^C	I_{AR}	3.2	A
Repetitive avalanche energy ^C	E_{AR}	150	mJ
Single pulsed avalanche energy ^C	E_{AS}	300	mJ
Peak diode recovery dv/dt	dv/dt	5	V/ns
Power Dissipation ^B	P_D	132	W
$T_C=25^\circ\text{C}$			
Derate above 25°C		1	W/°C
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	AOT9N40	Units
Maximum Junction-to-Ambient ^{A,D}	$R_{\theta JA}$	65	°C/W
Maximum Case-to-sink ^A	$R_{\theta CS}$	0.5	°C/W
Maximum Junction-to-Case	$R_{\theta JC}$	0.95	°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	3.4	4	4.5	V
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =4A		0.64	0.8	Ω
g _{FS}	Forward Transconductance	V _{DS} =40V, I _D =4A		8		S
V _{SD}	Diode Forward Voltage	I _S =1A, V _{GS} =0V		0.75	1	V
I _S	Maximum Body-Diode Continuous Current				8	A
I _{SM}	Maximum Body-Diode Pulsed Current				22	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =25V, f=1MHz	500	630	760	pF
C _{oss}	Output Capacitance		45	73	100	pF
C _{rss}	Reverse Transfer Capacitance		2	5.7	9	pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz	1.2	2.6	4.0	Ω
SWITCHING PARAMETERS						
Q _g	Total Gate Charge	V _{GS} =10V, V _{DS} =320V, I _D =8A	10	13.1	16	nC
Q _{gs}	Gate Source Charge			3.9		nC
Q _{gd}	Gate Drain Charge			4.8		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =10V, V _{DS} =200V, I _D =8A, R _G =25Ω		17		ns
t _r	Turn-On Rise Time			52		ns
t _{D(off)}	Turn-Off DelayTime			25		ns
t _f	Turn-Off Fall Time			30		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =8A, dI/dt=100A/μs, V _{DS} =100V	150	195	240	ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =8A, dI/dt=100A/μs, V _{DS} =100V	1.5	1.9	2.3	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}=3.2A, V_{DD}=150V, R_G=25Ω, Starting T_J=25°C

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

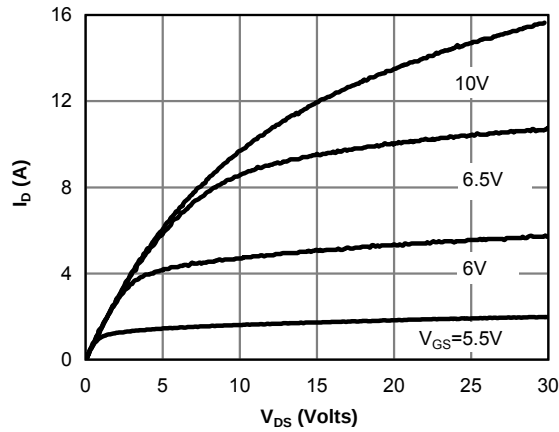


Fig 1: On-Region Characteristics

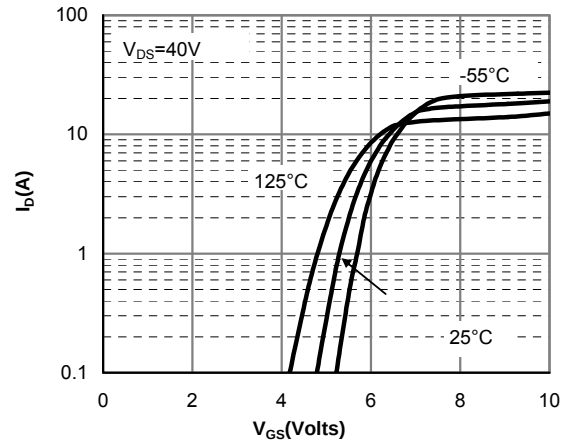


Figure 2: Transfer Characteristics

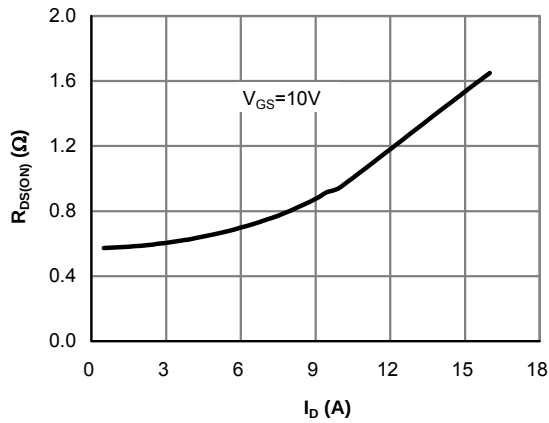


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

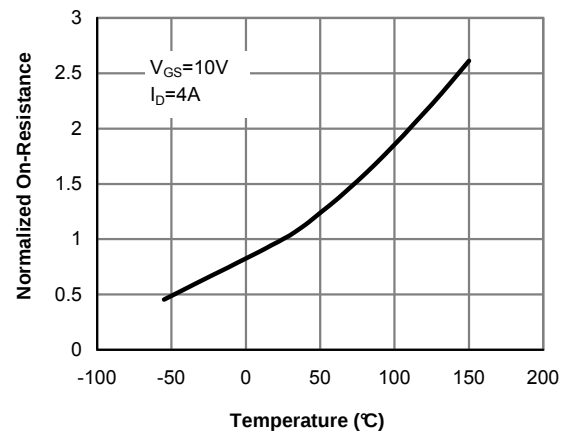


Figure 4: On-Resistance vs. Junction Temperature

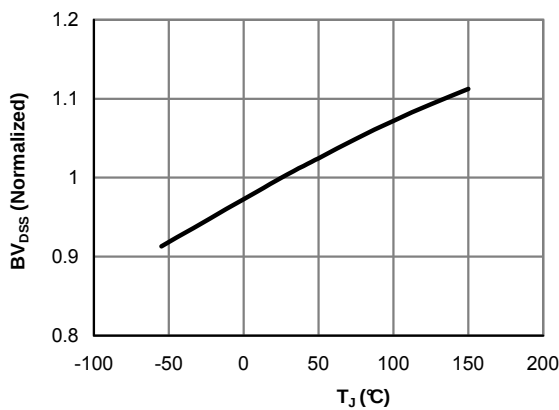


Figure 5: Break Down vs. Junction Temperature

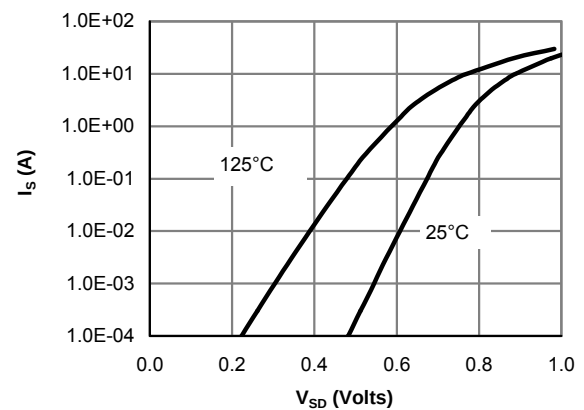


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

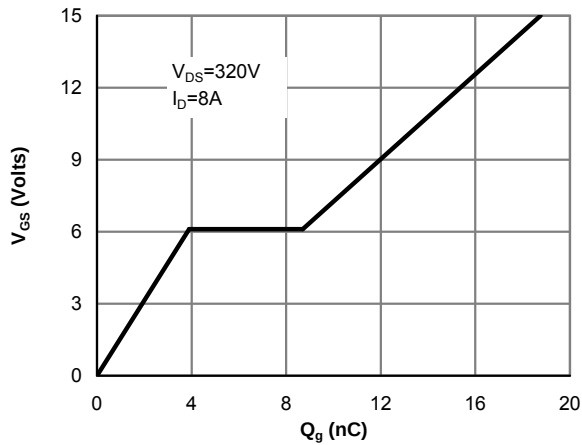


Figure 7: Gate-Charge Characteristics

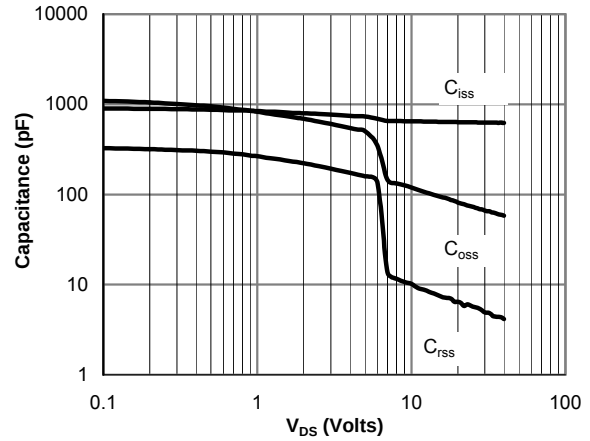


Figure 8: Capacitance Characteristics

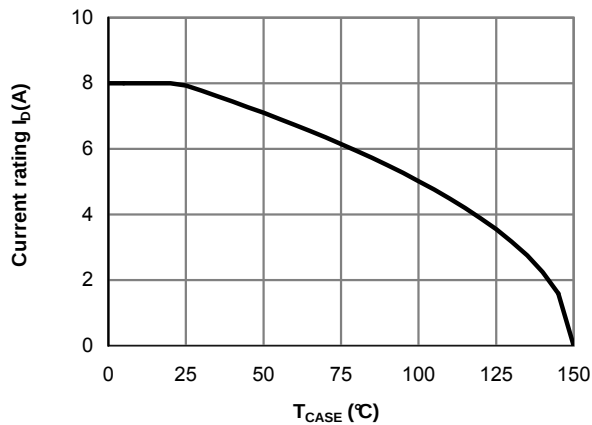


Figure 9: Current De-rating (Note B)

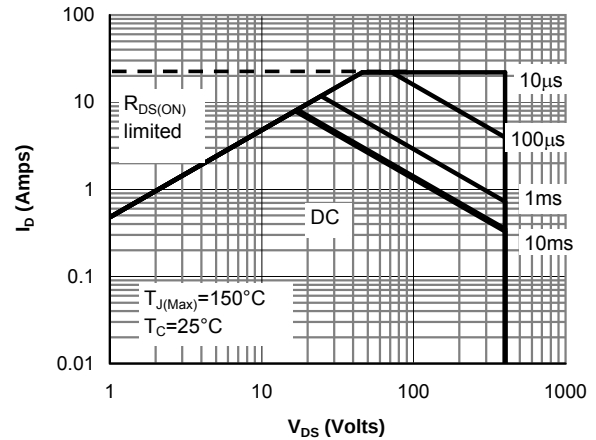


Figure 10: Maximum Forward Biased Safe Operating Area for AOT9N40 (Note F)

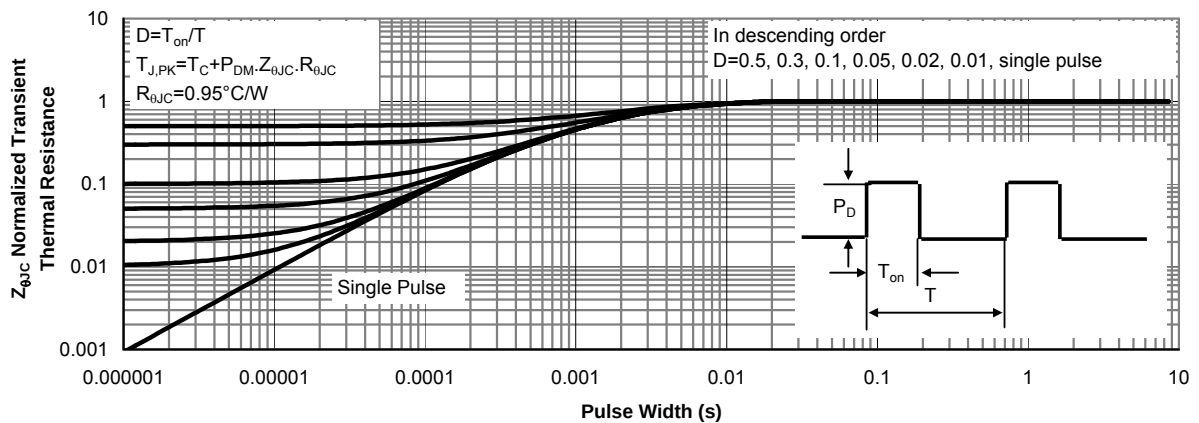
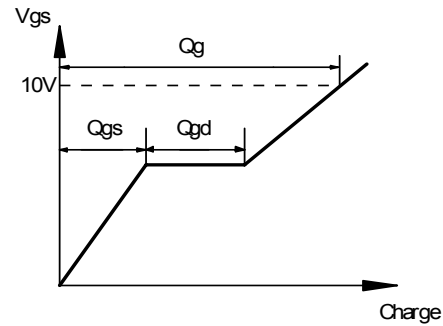
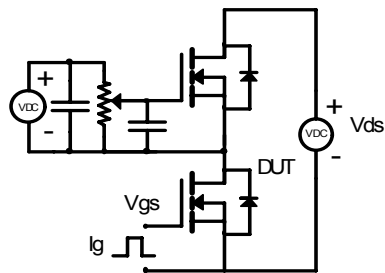
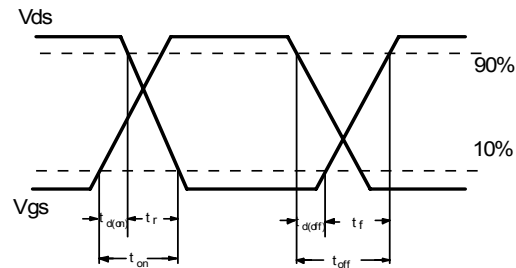
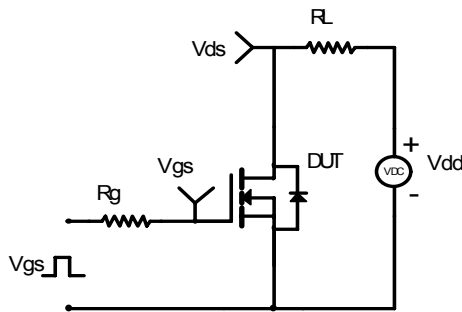


Figure 11: Normalized Maximum Transient Thermal Impedance for AOT9N40 (Note F)

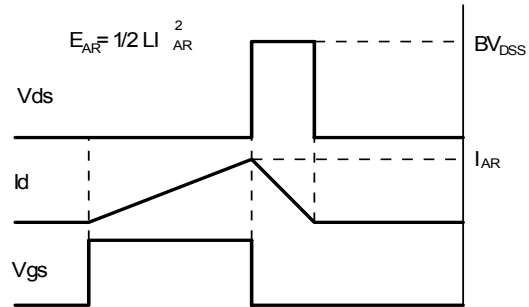
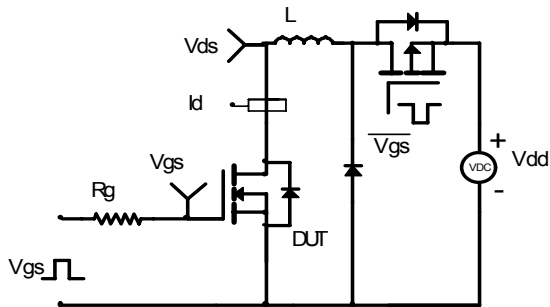
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

