



THE DATASHEET OF AOTF20N40L



General Description

The AOTF20N40 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.

For Halogen Free add "L" suffix to part number:
 AOTF20N40L

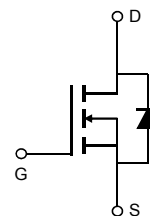
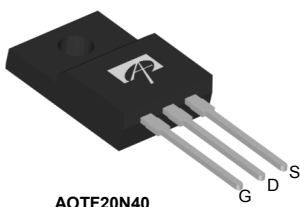
Product Summary

V_{DS}	500@150°C
I_D (at $V_{GS}=10V$)	20A
$R_{DS(on)}$ (at $V_{GS}=10V$)	< 0.25Ω

100% UIS Tested
 100% R_g Tested



Top View
 TO-220F



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

Parameter	Symbol	AOTF20N40	AOTF20N40L	Units
Drain-Source Voltage	V_{DS}	400		V
Gate-Source Voltage	V_{GS}	±30		V
Continuous Drain Current	I_D	$T_C=25^\circ\text{C}$	20*	A
		$T_C=100^\circ\text{C}$	13*	
Pulsed Drain Current ^C	I_{DM}	54		
Avalanche Current ^C	I_{AR}	6		A
Repetitive avalanche energy ^C	E_{AR}	540		mJ
Single pulsed avalanche energy ^G	E_{AS}	1080		mJ
Peak diode recovery dv/dt	dv/dt	5		V/ns
Power Dissipation ^B	P_D	$T_C=25^\circ\text{C}$	50	W
		Derate above 25°C	0.4	
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	AOTF20N40	AOTF20N40L	Units
Maximum Junction-to-Ambient ^{A,D}	$R_{\theta JA}$	65	65	°C/W
Maximum Junction-to-Case	$R_{\theta JC}$	2.5	3.1	°C/W

* Drain current limited by maximum junction temperature.

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	3.0	3.7	4.3	V
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =10A		0.2	0.25	Ω
g _{FS}	Forward Transconductance	V _{DS} =40V, I _D =10A		20		S
V _{SD}	Diode Forward Voltage	I _S =1A, V _{GS} =0V		0.7	1	V
I _S	Maximum Body-Diode Continuous Current				20	A
I _{SM}	Maximum Body-Diode Pulsed Current				54	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =25V, f=1MHz	1510	1898	2290	pF
C _{oss}	Output Capacitance		145	212	290	pF
C _{rss}	Reverse Transfer Capacitance		9	15	21	pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz	1.5	3	4.5	Ω
SWITCHING PARAMETERS						
Q _g	Total Gate Charge	V _{GS} =10V, V _{DS} =320V, I _D =20A	28	37	45	nC
Q _{gs}	Gate Source Charge				12	nC
Q _{gd}	Gate Drain Charge				12	nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =10V, V _{DS} =200V, I _D =20A, R _G =25Ω			44	ns
t _r	Turn-On Rise Time				87	ns
t _{D(off)}	Turn-Off DelayTime				96	ns
t _f	Turn-Off Fall Time				59	ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =20A, di/dt=100A/μs, V _{DS} =100V	220	285	345	ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =20A, di/dt=100A/μs, V _{DS} =100V	3	3.9	4.8	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}=6A, V_{DD}=150V, R_G=25Ω, Starting T_J=25° C

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

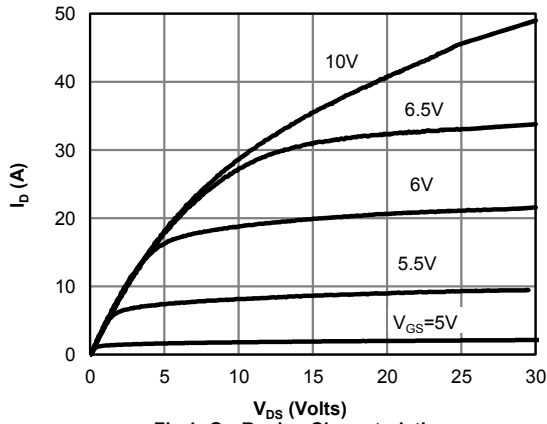


Fig 1: On-Region Characteristics

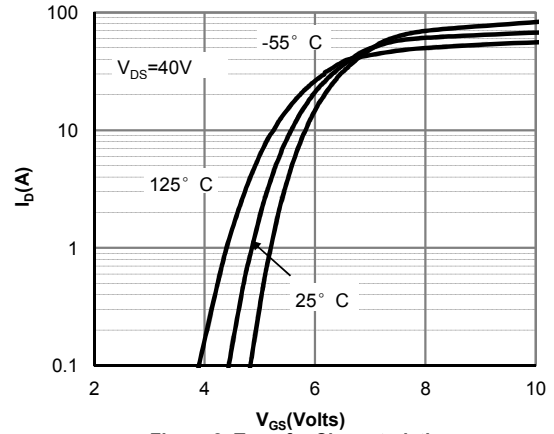


Figure 2: Transfer Characteristics

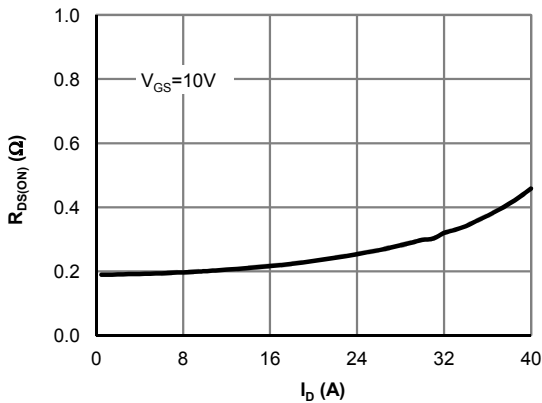


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

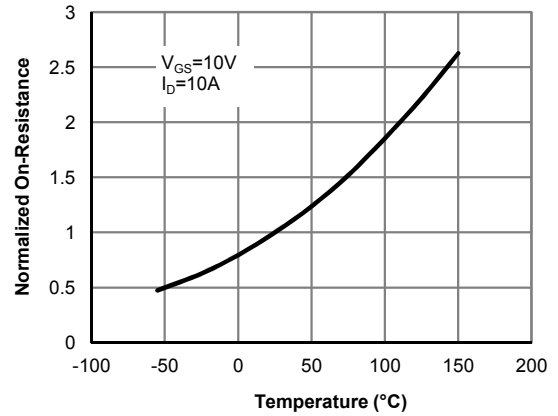


Figure 4: On-Resistance vs. Junction Temperature

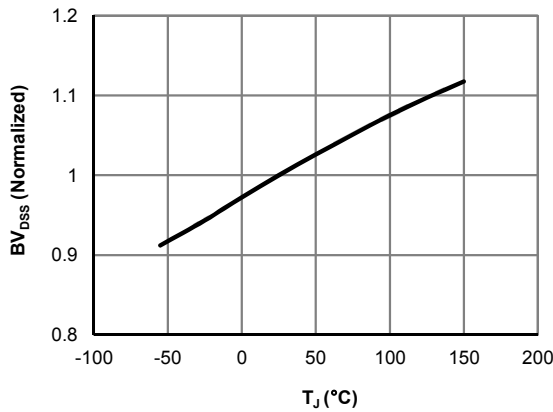


Figure 5: Break Down vs. Junction Temperature

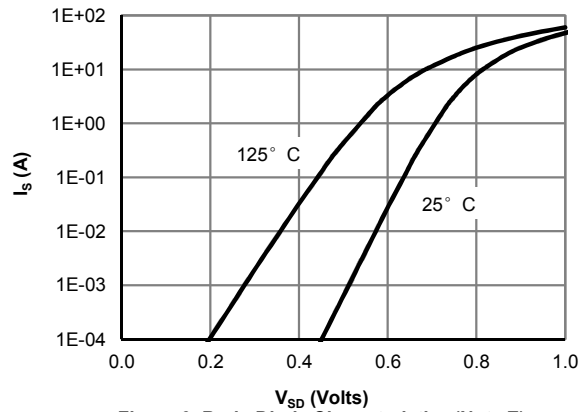


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

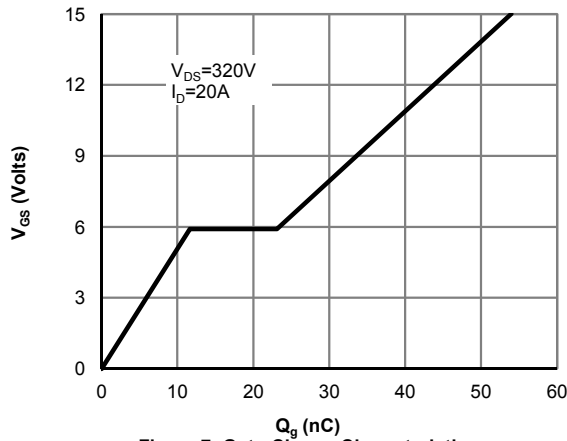


Figure 7: Gate-Charge Characteristics

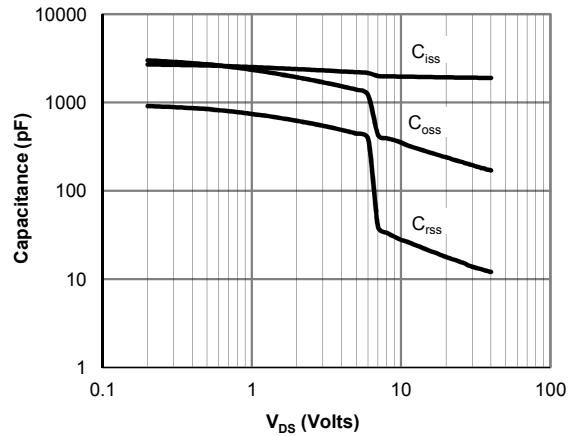


Figure 8: Capacitance Characteristics

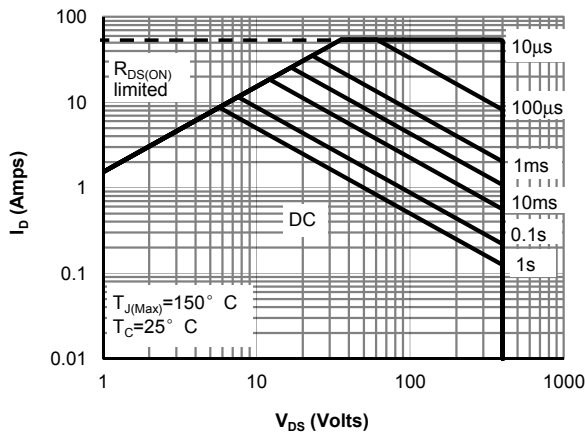


Figure 9: Maximum Forward Biased Safe Operating Area for AOTF20N40 (Note F)

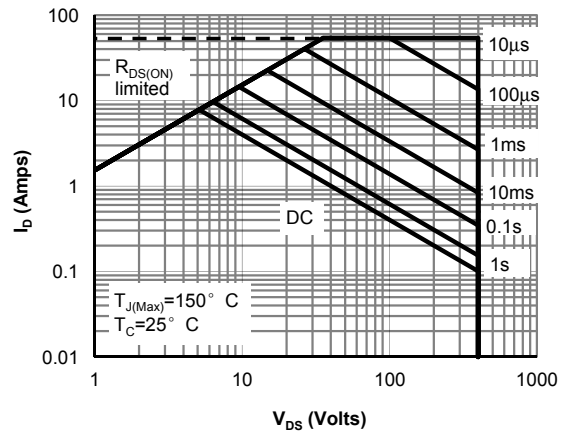


Figure 10: Maximum Forward Biased Safe Operating Area for AOTF20N40L (Note F)

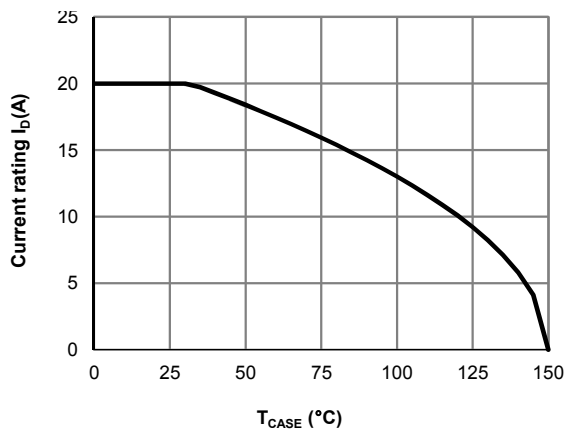


Figure 11: Current De-rating (Note B)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

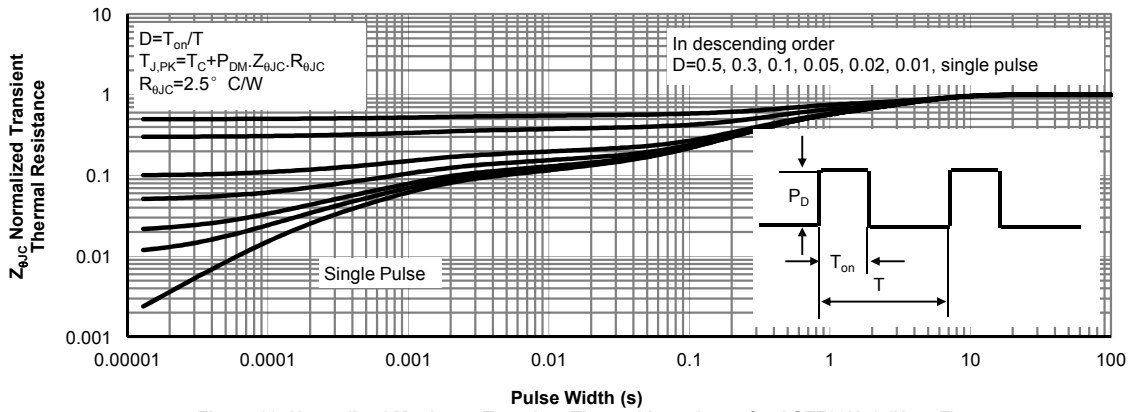


Figure 12: Normalized Maximum Transient Thermal Impedance for AOTF20N40 (Note F)

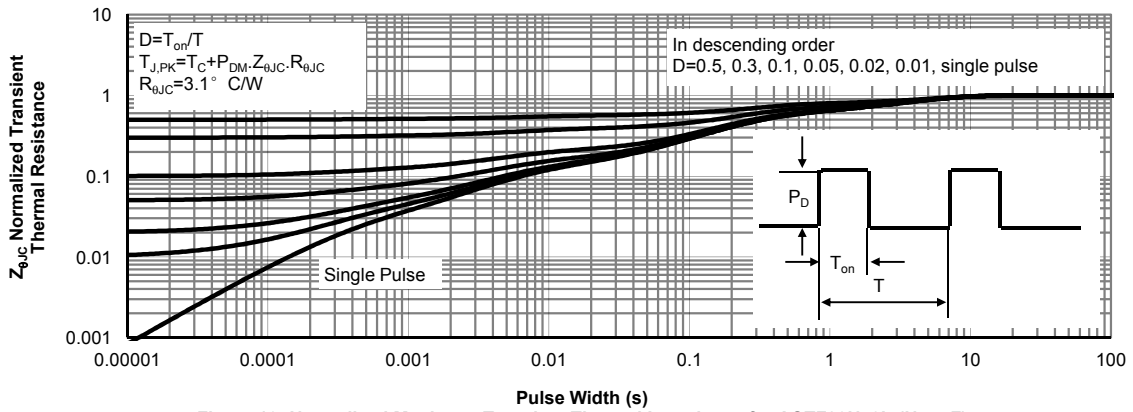
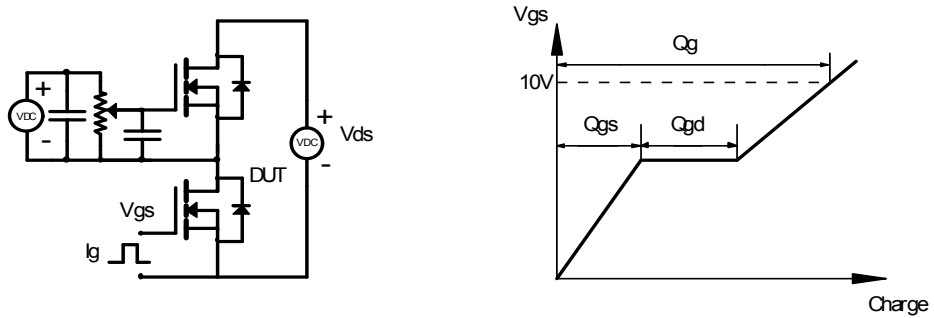
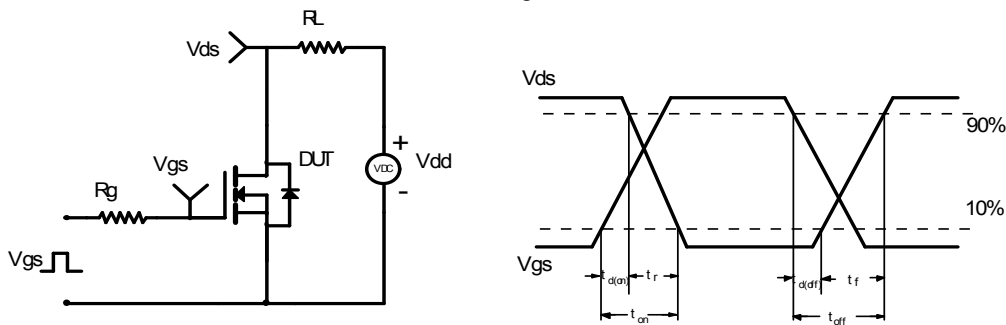


Figure 13: Normalized Maximum Transient Thermal Impedance for AOTF20N40L (Note F)

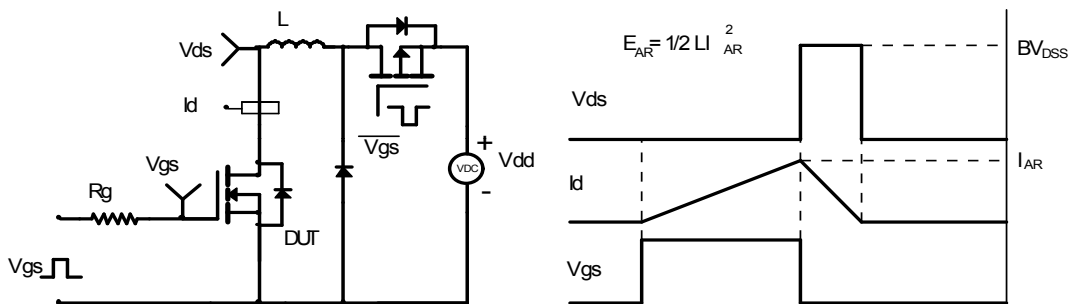
Gate Charge Test Circuit & Waveform



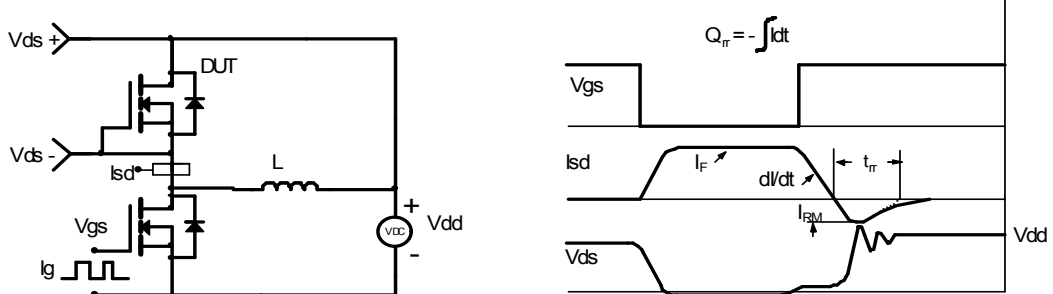
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



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