FQP5N50/FQPF5N50

500V, 5A N-Channel MOSFET

General Description

The FQP5N50 & FQPF5N50 have been 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 these parts can be adopted quickly into new and existing offline power supply designs.

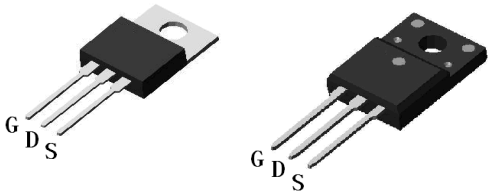
Product Summary

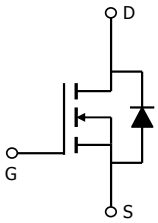
V_{DS}	600V@150℃
I_D (at V_{GS}=10V)	5A
$R_{DS(ON)}$ (at V_{GS}=10V)	< 1.5Ω

100% UIS Tested
100% R_g Tested

RoHS Compliant

TO-220 Top View TO-220F





Absolute Maximum Ratings T_A=25℃ unless otherwise noted

Parameter		Symbol	FQP5N50	FQPF5N50	Units
Drain-Source Voltage		V_{DS}	500		V
Gate-Source Voltage		V_{GS}	±30		V
Continuous Drain Current	T_C=25℃	I_D	5	5*	A
	T_C=100℃		3.3	3.3*	
Pulsed Drain Current [C]		I_{DM}	18		
Avalanche Current [C]		I_{AR}	2.6		A
Repetitive avalanche energy [C]		E_{AR}	101		mJ
Single plused avalanche energy [G]		E_{AS}	203		mJ
Peak diode recovery dv/dt		dv/dt	5		V/ns
Power Dissipation [B]	T_C=25℃	P_D	104	35.0	W
	Derate above 25°C		0.8	0.3	W/ °C
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150		℃
Maximum lead temperature for soldering purpose, 1/8" from case for 5 seconds		T_L	300		℃

Thermal Characteristics

Parameter	Symbol	FQP5N50	FQPF5N50	Units
Maximum Junction-to-Ambient [A,D]	$R_{\theta JA}$	65	65	℃/W
Maximum Case-to-sink [A]	$R_{\theta CS}$	0.5	--	℃/W
Maximum Junction-to-Case	$R_{\theta JC}$	1.2	3.6	℃/W

* Drain current limited by maximum junction temperature.

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, T_J=25℃	500			V
		I_D=250μA, V_{GS}=0V, T_J=150℃		600		
BV_{DSS} /ΔTJ	Zero Gate Voltage Drain Current	ID=250μA, VGS=0V		0.55		V/ °C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=500V, V_{GS}=0V			1	μA
		V_{DS}=400V, T_J=125℃			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	3.5	4.1	4.5	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=2.5A		1.1	1.5	Ω
g_{FS}	Forward Transconductance	V_{DS}=40V, I_D=2.5A		6		S
V_{SD}	Diode Forward Voltage	I_S=1A,V_{GS}=0V		0.75	1	V
I_S	Maximum Body-Diode Continuous Current				5	A
I_{SM}	Maximum Body-Diode Pulsed Current				18	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=25V, f=1MHz	414	517	620	pF
C_{oss}	Output Capacitance		46	57	68	pF
C_{rss}	Reverse Transfer Capacitance		3.9	4.9	5.9	pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz	1.9	3.8	6	Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	V_{GS}=10V, V_{DS}=400V, I_D=5A		15.5	19	nC
Q_{gs}	Gate Source Charge			3.4	4	nC
Q_{gd}	Gate Drain Charge			7.2	8.6	nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=250V, I_D=5A, R_G=25Ω		14.5	17.4	ns
t_r	Turn-On Rise Time			29	35	ns
$t_{D(off)}$	Turn-Off DelayTime			34.5	41.4	ns
t_f	Turn-Off Fall Time			24	29	ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=5A,dI/dt=100A/μs,V_{DS}=100V		166	199	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=5A,dI/dt=100A/μs,V_{DS}=100V		1.37	1.6	μC

A. The value of $R_{\theta JA}$ is measured with the device in a still air environment with T_A=25℃.

B. The power dissipation P_D is based on $T_{J(MAX)}$=150℃, 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℃, Ratings are based on low frequency and duty cycles to keep initial T_J =25℃.

D. The $R_{\theta JA}$ is the sum of the thermal impedence 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 impedence which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of $T_{J(MAX)}$=150℃. The SOA curve provides a single pulse ratin g.

G. L=60mH, I_{AS}=2.6A, V_{DD}=150V, R_G=25Ω, Starting T_J=25℃

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

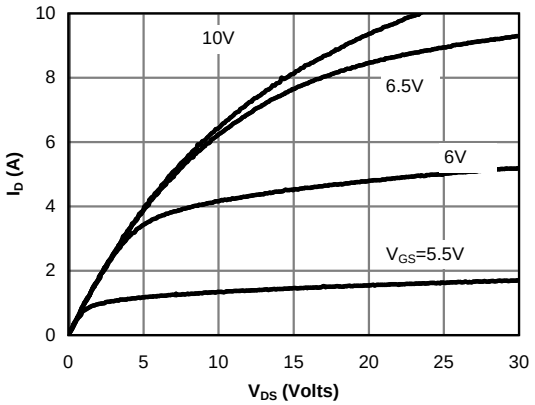


Fig 1: On-Region Characteristics

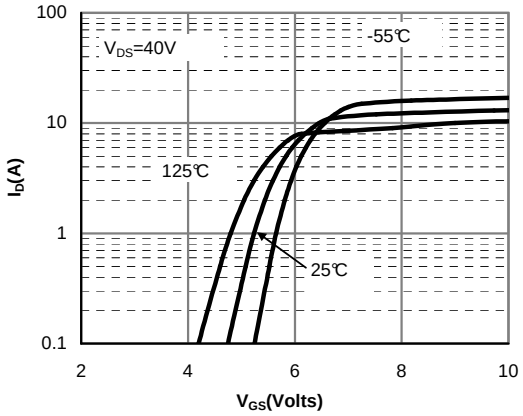


Figure 2: Transfer Characteristics

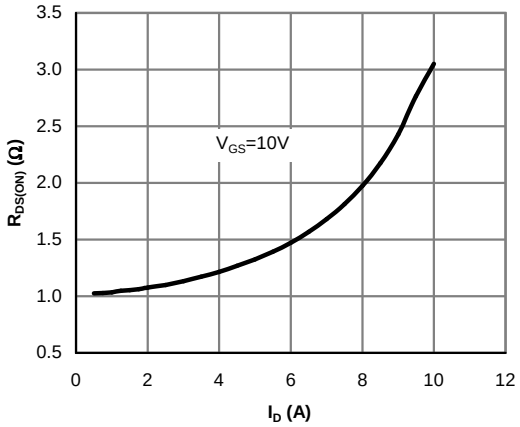


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

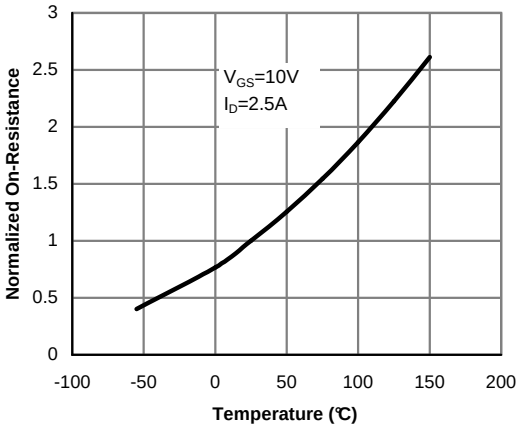


Figure 4: On-Resistance vs. Junction Temperature

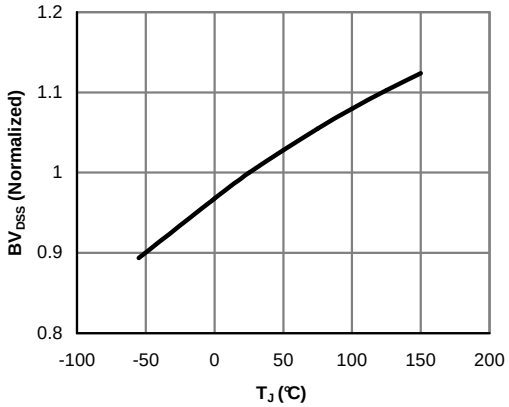


Figure 5:Break Down vs. Junction Temparature

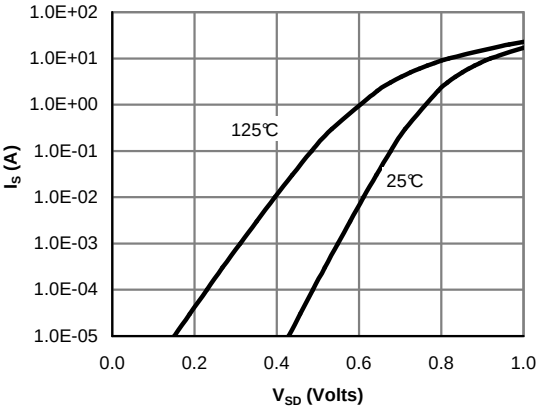


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

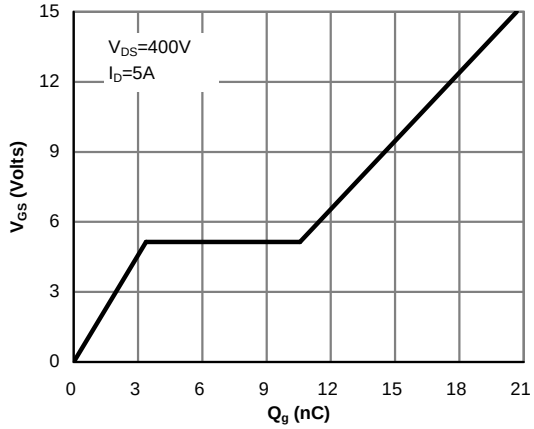


Figure 7: Gate-Charge Characteristics

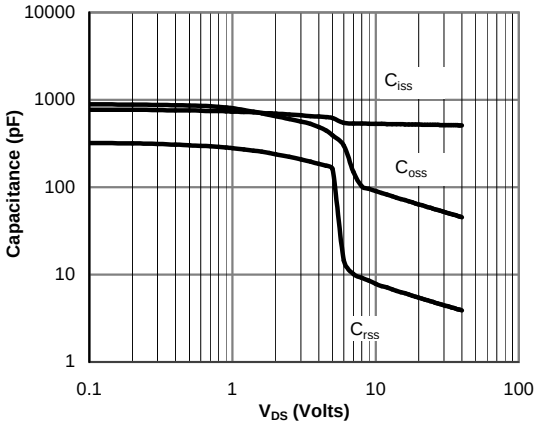


Figure 8: Capacitance Characteristics

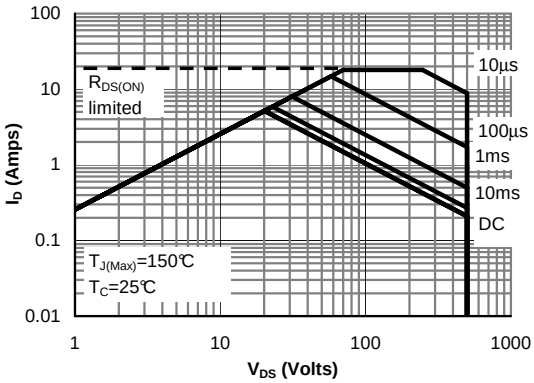


Figure 9: Maximum Forward Biased Safe Operating Area for AOT5N50 (Note F)

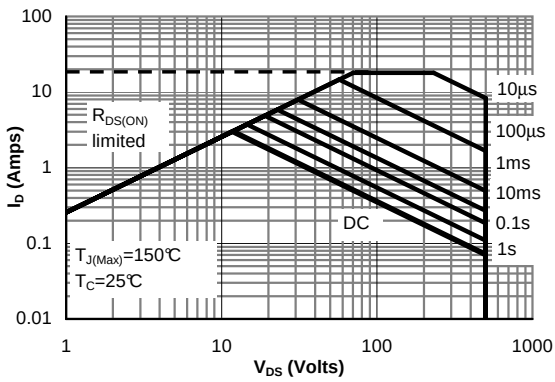


Figure 10: Maximum Forward Biased Safe Operating Area for AOTF5N50 (Note F)

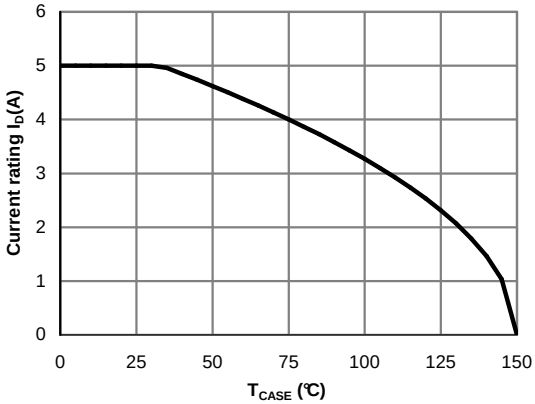


Figure 11: Current De-rating (Note B)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

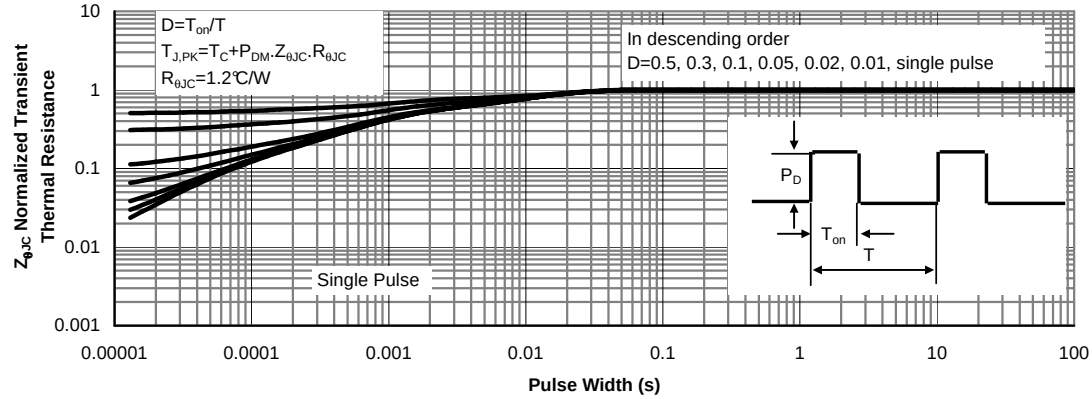


Figure 12: Normalized Maximum Transient Thermal Impedance for AOT5N50 (Note F)

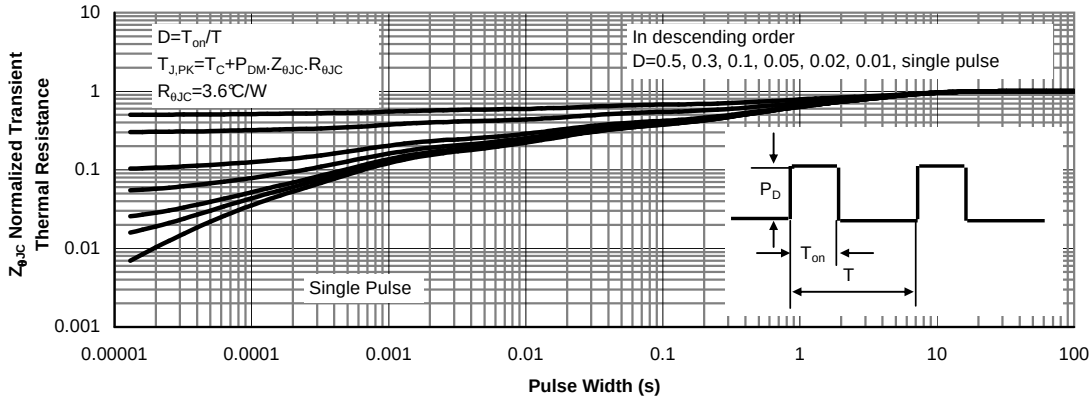
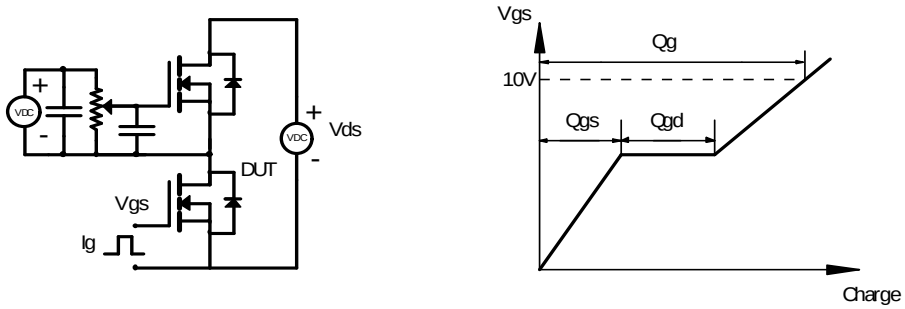
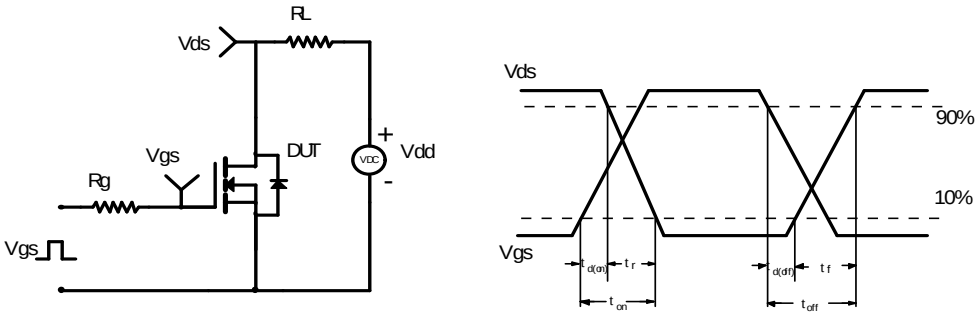


Figure 13: Normalized Maximum Transient Thermal Impedance for AOTF5N50 (Note F)

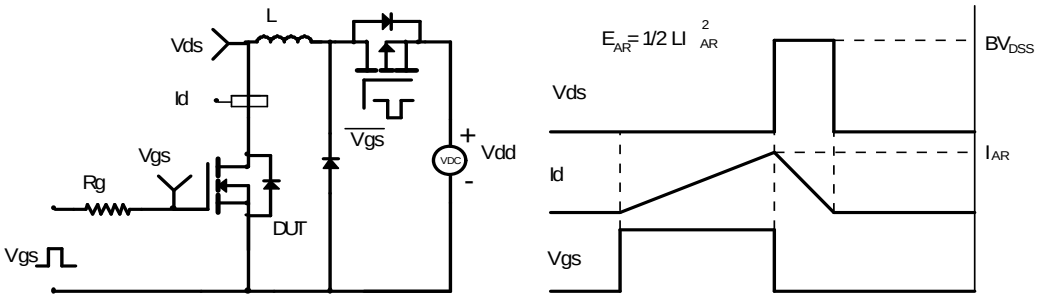
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms