



FQP7N65/FQPF7N65

650V, 7A N-Channel MOSFET

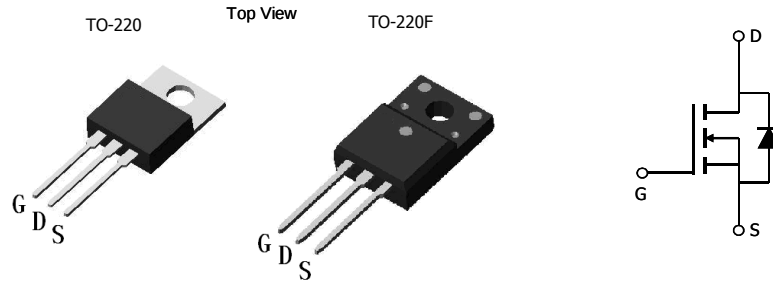
General Description

The FQP7N65 & FQPF7N65 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}	750V@150°C
I_D (at $V_{GS}=10V$)	7A
$R_{DS(on)}$ (at $V_{GS}=10V$)	< 1.56Ω

100% UIS Tested
100% R_g Tested



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

Parameter	Symbol	FQP7N65	FQPF7N65	Units
Drain-Source Voltage	V_{DS}	650		V
Gate-Source Voltage	V_{GS}	±30		V
Continuous Drain Current	I_D	7	7*	A
		4.4	4.4*	
Pulsed Drain Current ^C	I_{DM}	24		A
Avalanche Current ^C	I_{AR}	3.4		A
Repetitive avalanche energy ^C	E_{AR}	173		mJ
Single plused avalanche energy ^G	E_{AS}	347		mJ
Peak diode recovery dv/dt	dv/dt	5		V/ns
Power Dissipation ^B	P_D	192	38.5	W
		1.5	0.3	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	FQP7N65	FQPF7N65	Units
Maximum Junction-to-Ambient ^{A,D}	$R_{\theta JA}$	65	65	°C/W
Maximum Case-to-sink ^A	$R_{\theta CS}$	0.5	--	°C/W
Maximum Junction-to-Case	$R_{\theta JC}$	0.65	3.25	°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	650			V
		I _D =250μA, V _{GS} =0V, T _J =150°C		750		
BV _{DSS} /ΔT _J	Zero Gate Voltage Drain Current	I _D =250μA, V _{GS} =0V		0.74		V/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =650V, V _{GS} =0V			1	μA
		V _{DS} =520V, 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	4.5	V
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =3.5A		1.3	1.56	Ω
g _{FS}	Forward Transconductance	V _{DS} =40V, I _D =3.5A		8		S
V _{SD}	Diode Forward Voltage	I _S =1A, V _{GS} =0V		0.75	1	V
I _S	Maximum Body-Diode Continuous Current				7	A
I _{SM}	Maximum Body-Diode Pulsed Current				24	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =25V, f=1MHz	710	887	1060	pF
C _{oss}	Output Capacitance		60	77	92	pF
C _{rss}	Reverse Transfer Capacitance		5.5	7	9	pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz	1.9	3.8	5.8	Ω
SWITCHING PARAMETERS						
Q _g	Total Gate Charge	V _{GS} =10V, V _{DS} =520V, I _D =7A	15	19	23	nC
Q _{gs}	Gate Source Charge		4	4.9	6	nC
Q _{gd}	Gate Drain Charge		6.5	8.3	10	nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =10V, V _{DS} =325V, I _D =7A, R _G =25Ω		22	31	ns
t _r	Turn-On Rise Time			47	66	ns
t _{D(off)}	Turn-Off DelayTime			54	76	ns
t _f	Turn-Off Fall Time			37	52	ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =7A, dI/dt=100A/μs, V _{DS} =100V	220	280	340	ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =7A, dI/dt=100A/μs, V _{DS} =100V	3	4.2	5	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}=3.4A, V_{DD}=150V, R_G=25Ω, Starting T_J=25° C

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

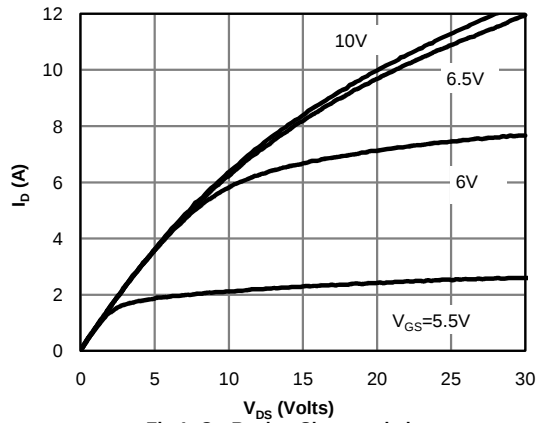


Fig 1: On-Region Characteristics

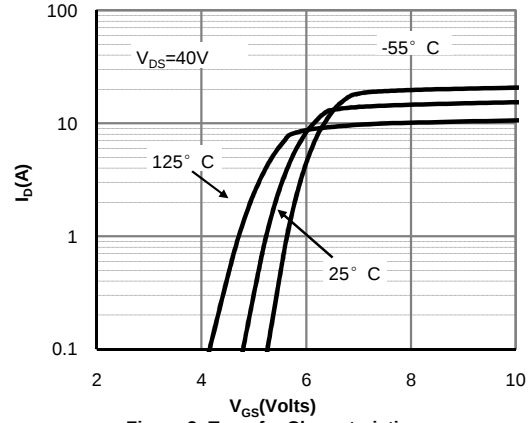


Figure 2: Transfer Characteristics

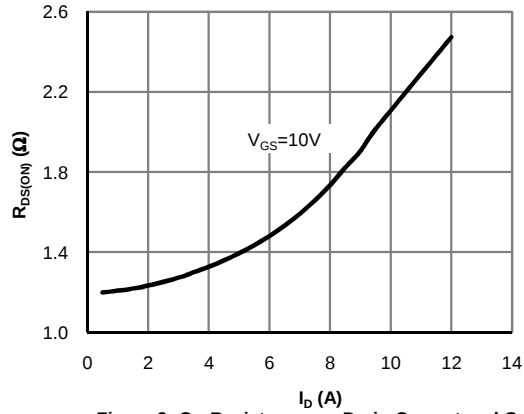


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

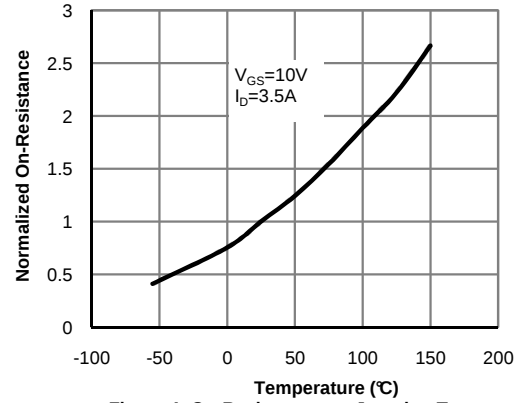


Figure 4: On-Resistance vs. Junction Temperature

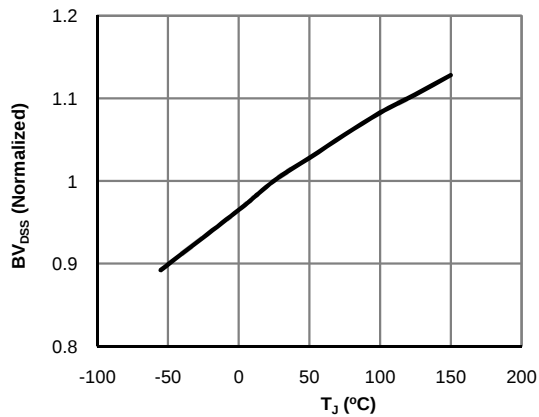


Figure 5: Break Down vs. Junction Temperature

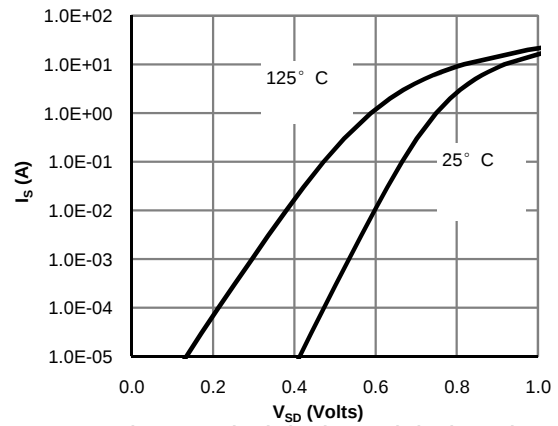


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

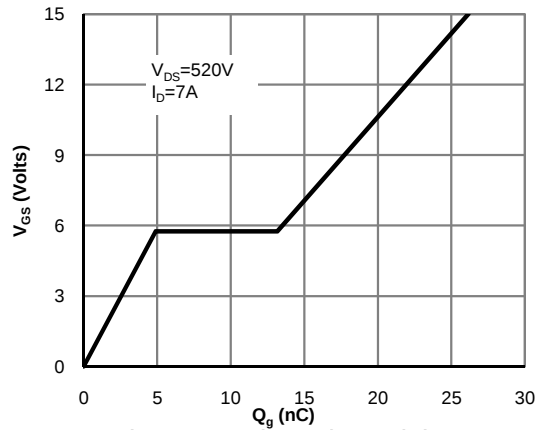


Figure 7: Gate-Charge Characteristics

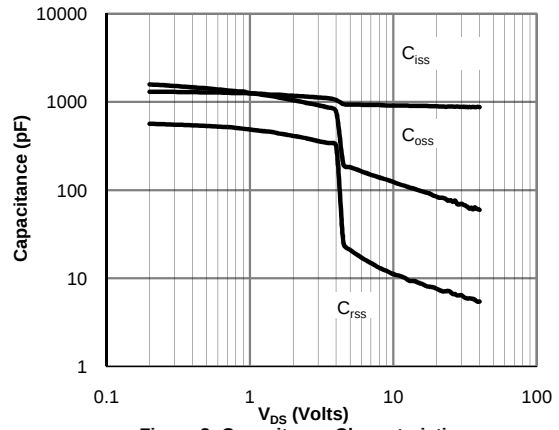


Figure 8: Capacitance Characteristics

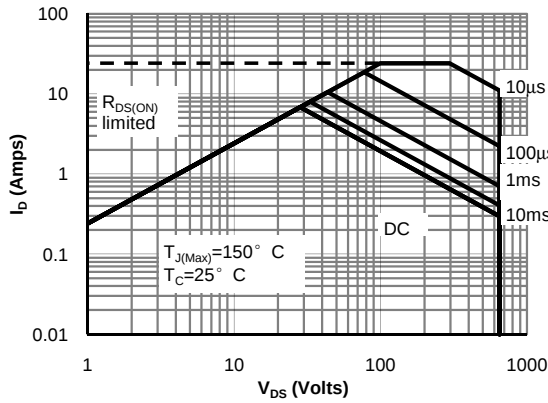


Figure 9: Maximum Forward Biased Safe Operating Area for AOT7N65 (Note F)

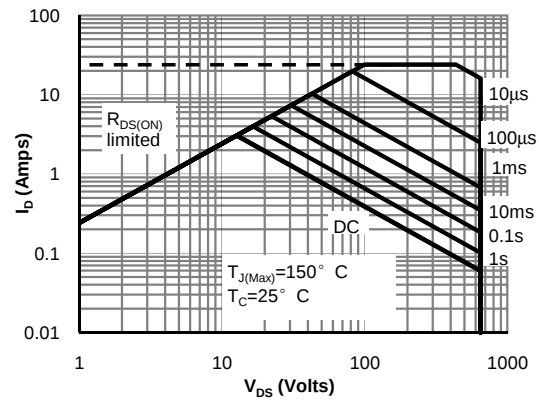


Figure 10: Maximum Forward Biased Safe Operating Area for AOTF7N65 (Note F)

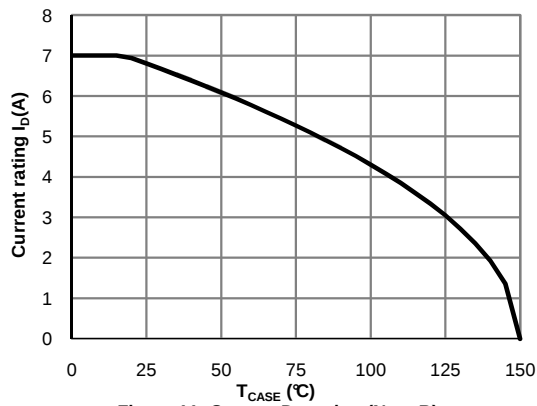
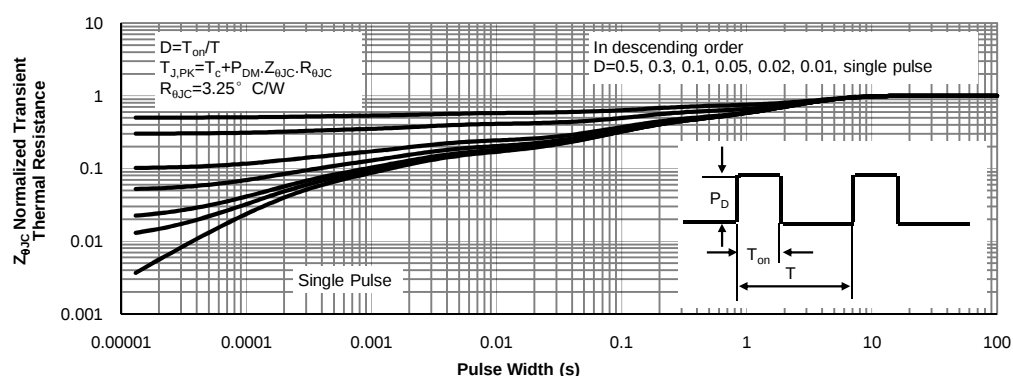
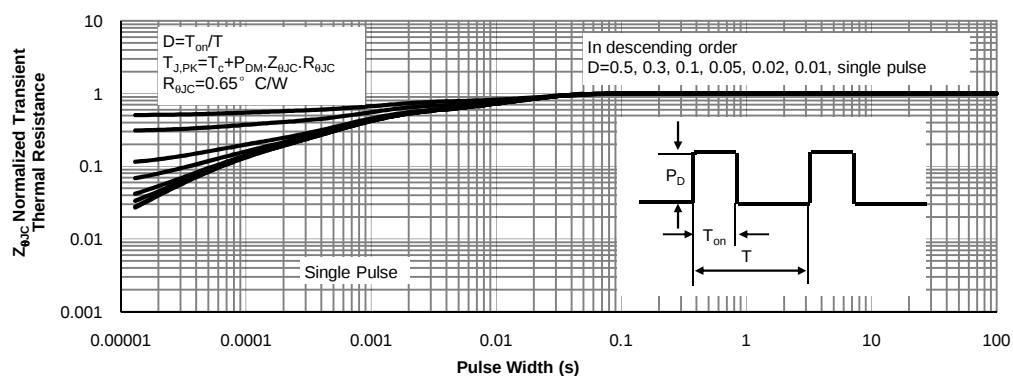
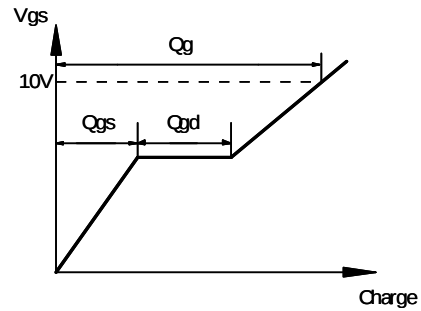
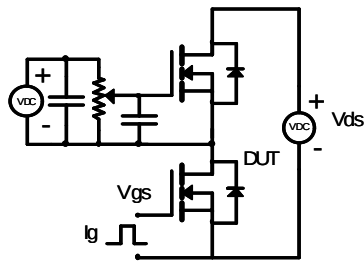


Figure 11: Current De-rating (Note B)

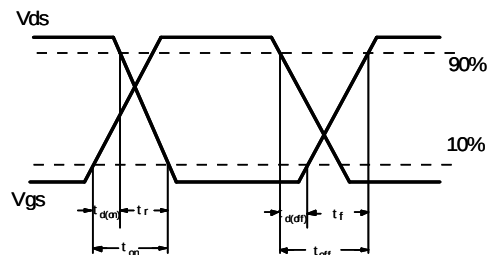
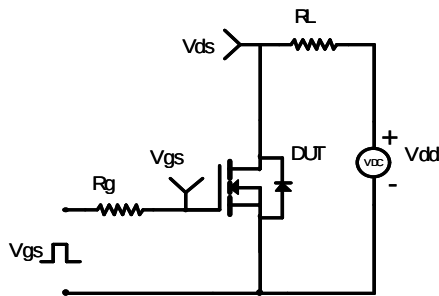
TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS



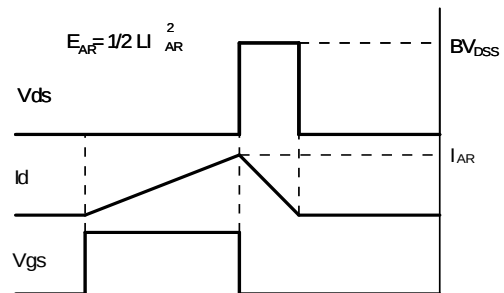
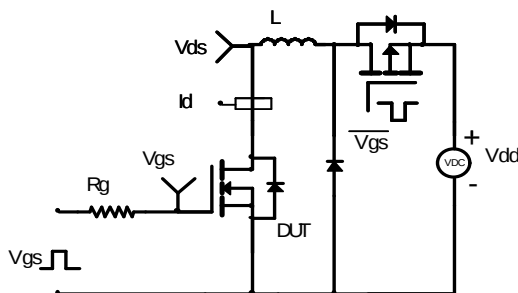
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

