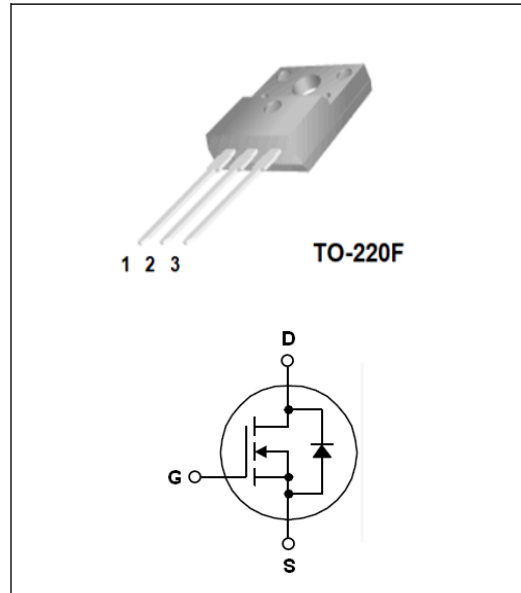


## 650V 20A N-Channel Enhancement Mode Power MOSFET

### Description

The AKQPF20N65 is an N-Channel enhancement mode power MOSFET which using proprietary planar stripe and DMOS technology.

This MOSFET has low static on-resistance and high avalanche energy strength. This device provide excellent switching performance for UPS,DC-DC converters and AC-DC power supply.



### Features

- Low on-Resistance:  $R_{DS(on)}=0.39\Omega(\text{typ.})$
- Special Process Technology for high ESD Capability
- 100% Avalanche Test
- Good Stability and Uniformity with High  $E_{AS}$

### Applications

- UPS Applications
- DC-DC Converters and AC-DC Power Supply

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

Symbol	Parameter	Ratings	Unit	
$V_{DSS}$	Drain to Source Voltage	650	V	
$V_{GSS}$	Gate to Source Voltage	$\pm 30$	V	
$I_D$	Drain Current	$T_C=25^\circ\text{C}$	20	A
		$T_C=100^\circ\text{C}$	12	A
$I_{DM}$	Pulsed Drain Current (Note1)	80	A	
$P_D$	Maximum Power Dissipation	$T_C=25^\circ\text{C}$	70	W
	Derate above $25^\circ\text{C}$		0.56	W/ $^\circ\text{C}$
$E_{AS}$	Single Pulsed Avalanche Energy (Note 2)	820	mJ	
$T_J$	Operating Junction Temperature Range	-55~+150	$^\circ\text{C}$	
$T_{STG}$	Storage Temperature Range	-55~+150	$^\circ\text{C}$	

### Thermal Characteristics

Symbol	Parameter	Ratings	Unit
$R_{th(J-C)}$	Thermal Resistance, Junction to case	1.78	$^\circ\text{C}/\text{W}$
$R_{th(J-A)}$	Thermal Resistance, Junction to Ambient	62.5	$^\circ\text{C}/\text{W}$

## Electrical Characteristics @T<sub>C</sub>=25 °C unless otherwise noted

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV <sub>DSS</sub>	Drain to Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250uA	650	-	-	V
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250uA	2.5	-	4.0	V
R <sub>DS(on)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =10A	-	0.39	0.5	Ω
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =650V, V <sub>GS</sub> =0V	-	-	1	uA
I <sub>GSS</sub>	Gate to Source Leakage Current	V <sub>GS</sub> =±30V, V <sub>DS</sub> =0V	-	-	±100	nA

## D-S Diode Characteristics and Maximum Rating @T<sub>C</sub>=25 °C unless otherwise noted

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I <sub>S</sub>	Maximum Drain to Source Diode Forward Current		-	-	20	A
V <sub>SD</sub>	Drain-Source Diode Forward Voltage	V <sub>GS</sub> =0V, I <sub>S</sub> =20A	-	0.86	1.2	V
t <sub>rr</sub>	Reverse Recovery Time	V <sub>GS</sub> =0V, I <sub>S</sub> =20A,	-	535	-	ns
Q <sub>rr</sub>	Reverse Recovery Charge	di/dt=-100A/us	-	9.5	-	uC

## Switching Characteristics @T<sub>C</sub>=25 °C unless otherwise noted

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
t <sub>d(on)</sub>	Turn-on Delay Time	I <sub>D</sub> =20A, V <sub>DD</sub> =325V, R <sub>G</sub> =25Ω (Note 3)	-	62	-	ns
t <sub>r</sub>	Rising Time		-	145	-	ns
t <sub>d(off)</sub>	Turn-off Delay Time		-	220	-	ns
t <sub>f</sub>	Falling Time		-	65	-	ns
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1.0MHz	-	2360	-	pF
C <sub>oss</sub>	Output Capacitance		-	1250	-	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		-	85	-	pF
Q <sub>g</sub>	Total Gate Charge	I <sub>D</sub> =20A, V <sub>DS</sub> =480V V <sub>GS</sub> =10V (Note 3)	-	75	-	nC
Q <sub>gs</sub>	Gate to Source Charge		-	13.4	-	nC
Q <sub>gd</sub>	Gate to Drain Charge		-	35	-	nC

### Note:

1. Repetitive rating: pulse-width limited by maximum junction temperature
2. L=5mH, V<sub>DD</sub>=50V, V<sub>G</sub>=10V, @T<sub>C</sub>=25°C
3. Essentially independent of operating temperature typical characteristics

**Typical Performance Characteristics**

Fig. 1. Typical on-Region Characteristics

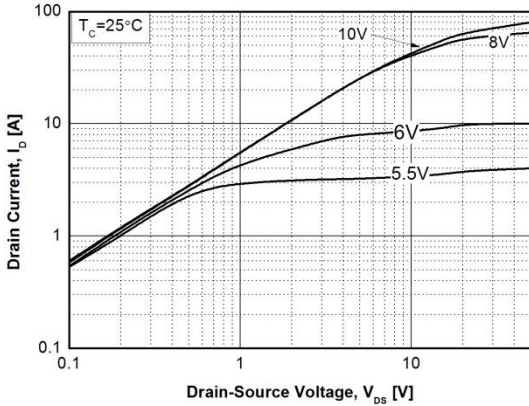


Fig. 2. Typical Transfer Characteristics

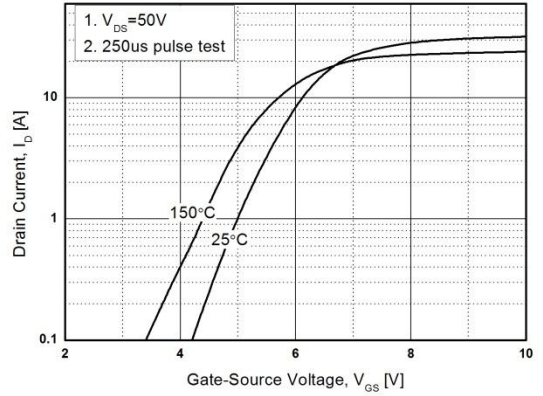


Fig. 3. Static on-Resistance vs.  $I_D$

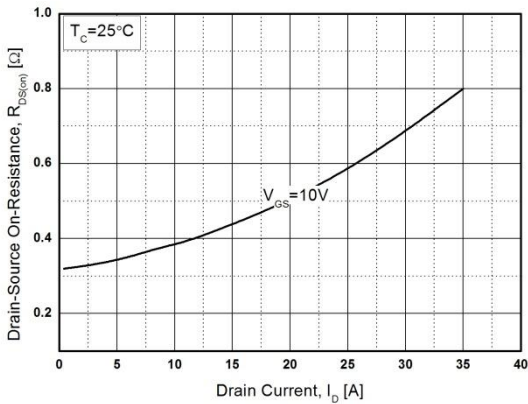


Fig. 4. Body Diode Forward Voltage vs.  $I_{DR}$

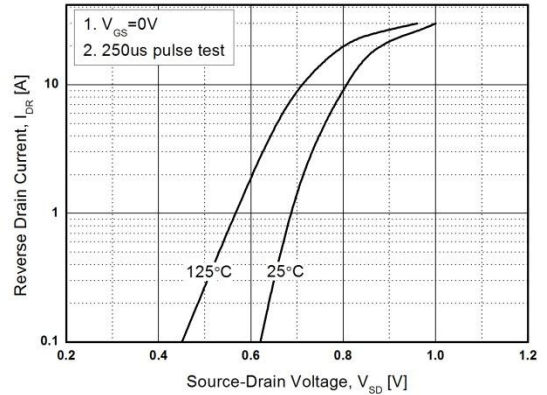


Fig. 5. Capacitance Characteristics

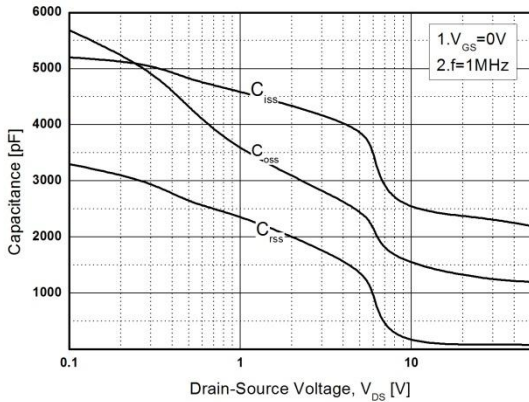
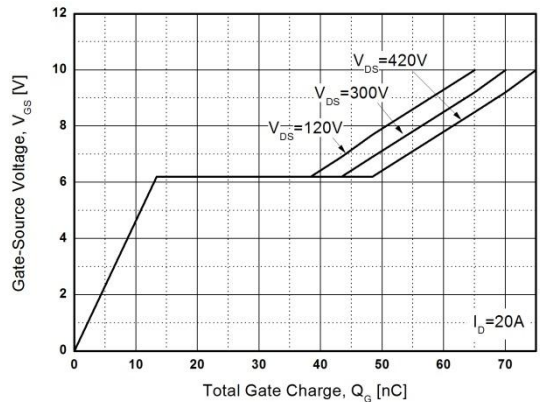


Fig. 6. Gate Charge Characteristics



**Typical Performance Characteristics**

Fig. 7. Breakdown Voltage vs. Temperature

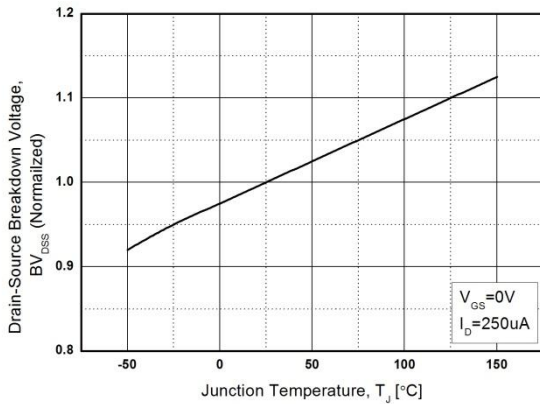


Fig. 8. Static on-Resistance vs. Temperature

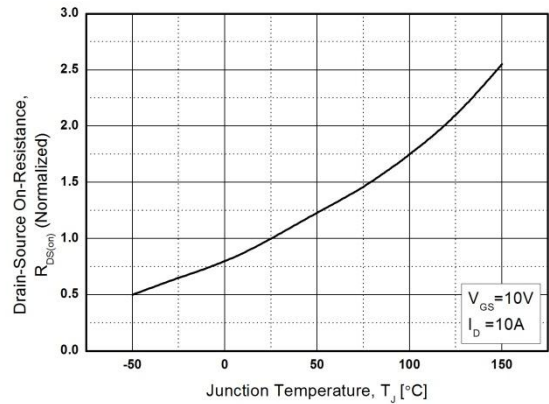


Fig. 9. Maximum Safe Operating Area

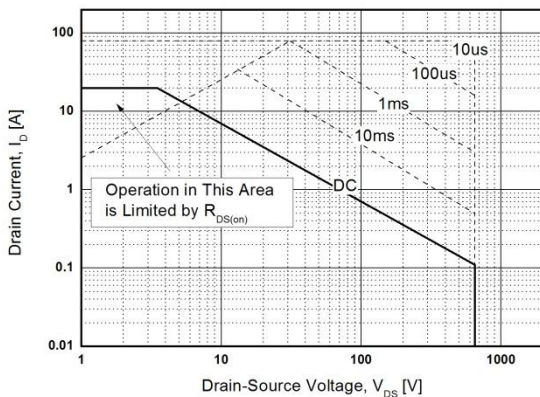


Fig. 10. Maximum Drain Current vs. Temperature

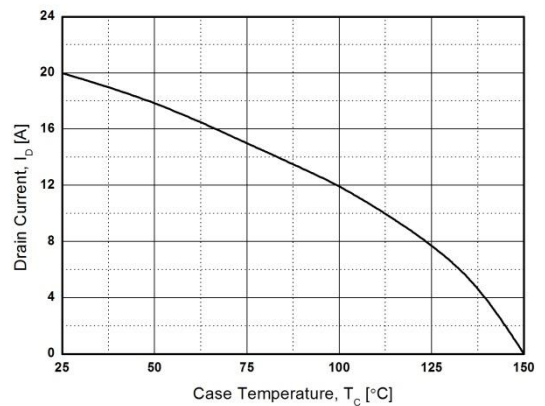
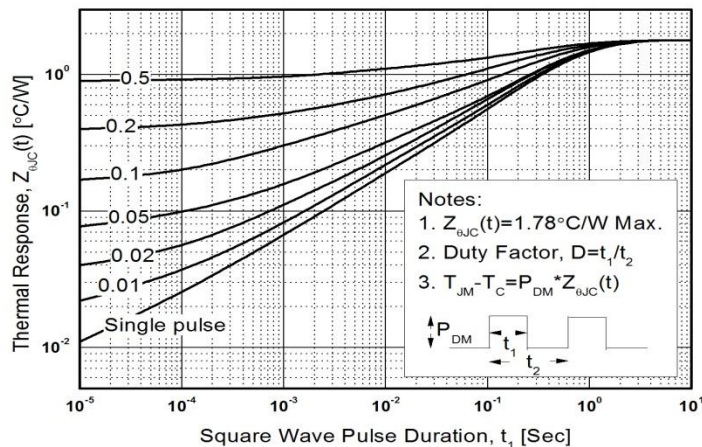


Fig. 11. Transient Thermal Response Curve



**Package Dimensions**

**TO-220F**

(Dimensions in Millimeters)

