

## 1200V 4A N-Channel Enhancement Mode Power MOSFET

### Description

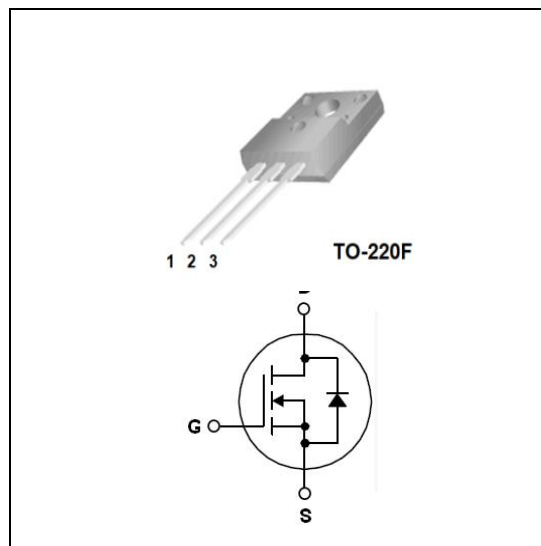
The AKQPF4N120 is an N-Channel enhancement mode power MOSFET, it has low static on-resistance and high avalanche energy strength. This device provide excellent switching performance for switched mode power supplies, active power factor correction and electronic lamp ballasts.

### Features

- Low on-Resistance:  $R_{DS(on)}=3.0\Omega(\text{typ.})$
- Special Process Technology for high ESD Capability
- 100% Avalanche Test
- Good Stability and Uniformity with High  $E_{AS}$

### Applications

- Switched Mode Power Supplies
- Active Power Factor Correction, Electronic Ballasts



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

Symbol	Parameter	Ratings	Unit
$V_{DSS}$	Drain to Source Voltage	1200	V
$V_{GSS}$	Gate to Source Voltage	$\pm 30$	V
$I_D$	Drain Current	$T_C=25^\circ\text{C}$	4
		$T_C=100^\circ\text{C}$	2.5
$I_{DM}$	Pulsed Drain Current (Note1)	12	A
$P_D$	Maximum Power Dissipation	$T_C=25^\circ\text{C}$	65
	Derate above $25^\circ\text{C}$		0.52
$E_{AS}$	Single Pulsed Avalanche Energy (Note 2)	700	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	1.92	$^\circ\text{C/W}$
$R_{th(J-A)}$	Thermal Resistance, Junction to Ambient	70	$^\circ\text{C/W}$

## Electrical Characteristics @ $T_c=25\text{ }^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$BV_{DSS}$	Drain to Source Breakdown Voltage	$V_{GS}=0V, I_D=1mA$	1200	-	-	V
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	3.5	-	4.5	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS}=10V, I_D=2A$	-	3.0	4.5	$\Omega$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=V_{DSS}, V_{GS}=0V$	-	-	10	$\mu A$
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS}=V_{GSS}, V_{DS}=0V$	-	-	$\pm 100$	nA

## D-S Diode Characteristics and Maximum Rating @ $T_c=25\text{ }^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$I_S$	Maximum Drain to Source Diode Forward Current		-	-	4.0	A
$V_{SD}$	Drain-Source Diode Forward Voltage	$V_{GS}=0V, I_S=4A$	-	0.9	1.2	V
$T_{rr}$	Reverse Recovery Time	$V_{GS}=0V, I_S=4A,$	-	510	-	ns
$Q_{rr}$	Reverse Recovery Charge	$di/dt=-100A/\mu s$	-	3.2	-	nC

## Switching Characteristics @ $T_c=25\text{ }^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	$I_D=4A,$ $V_{DD}=600V,$ $R_G=5\Omega$ (Note 3)	-	9.0	-	ns
$t_r$	Rise Time		-	8.0	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	20	-	ns
$t_f$	Fall Time		-	10.0	-	ns
$C_{ies}$	Input Capacitance	$V_{GS}=0V, V_{DS}=25V,$ $f=1.0MHz$	-	1410	-	pF
$C_{oes}$	Output Capacitance		-	112	-	pF
$C_{rss}$	Reverse Transfer Capacitance		-	5.8	-	pF
$Q_g$	Total Gate Charge	$I_D=4A,$ $V_{DD}=960V$ $V_{GS}=10V$ (Note 3)	-	41	-	nC
$Q_{gs}$	Gate to Source Charge		-	11	-	nC
$Q_{gd}$	Gate to Drain Charge		-	17	-	nC

### Note:

1. Repetitive rating: pulse-width limited by maximum junction temperature
2.  $V_{DD}=100V, L=20mH, R_G=25\Omega, V_G=20V,$  stating  $T_J=25^\circ\text{C}$
3. Essentially independent of operating temperature typical characteristics

**Typical Performance Characteristics**

Fig. 1. Typical on-Region Characteristics

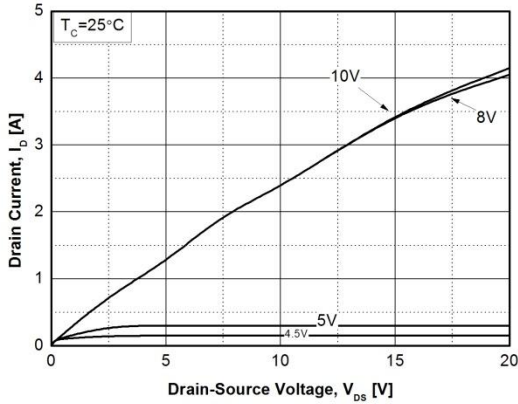


Fig. 2. Typical Transfer Characteristics

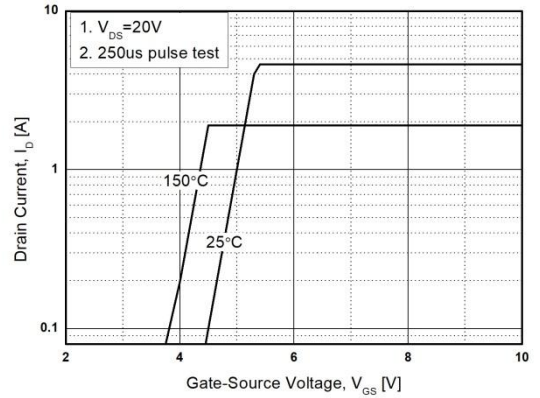


Fig. 3. Static on-Resistance vs.  $I_D$

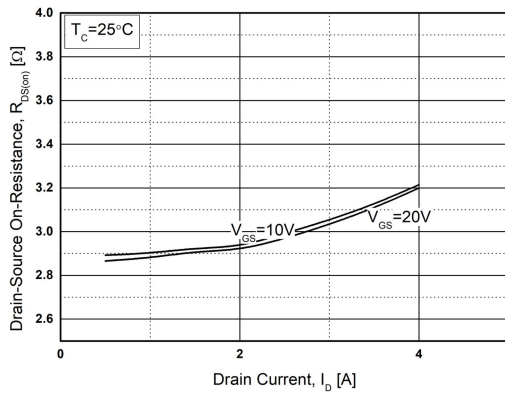


Fig. 4. Body Diode Forward Voltage vs.  $I_{DR}$

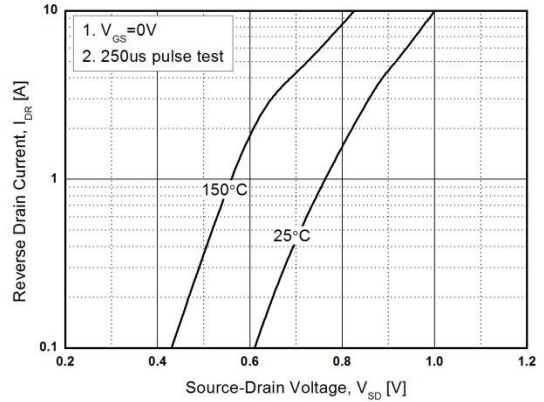


Fig. 5. Capacitance Characteristics

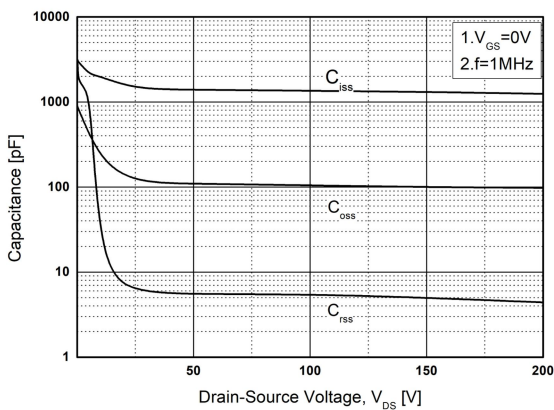
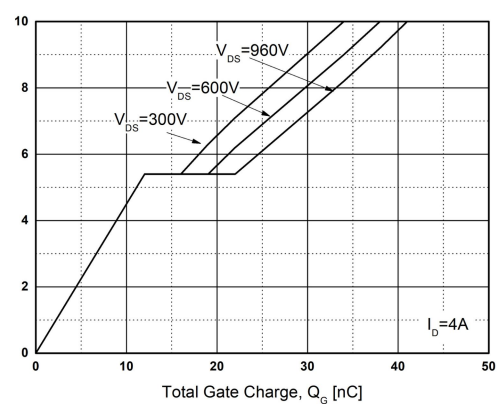


Fig. 6. Gate Charge Characteristics



**Typical Performance Characteristics**

Fig. 7. Breakdown Voltage vs. Temperature

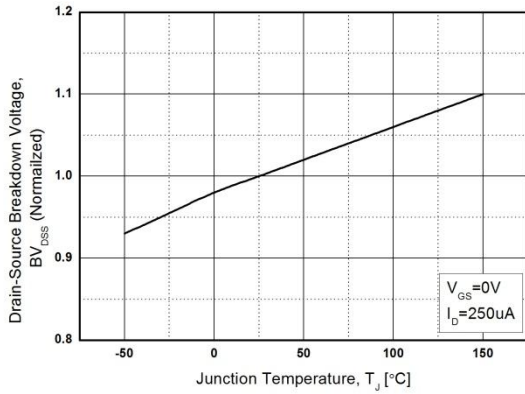


Fig. 8. Static on-Resistance vs. Temperature

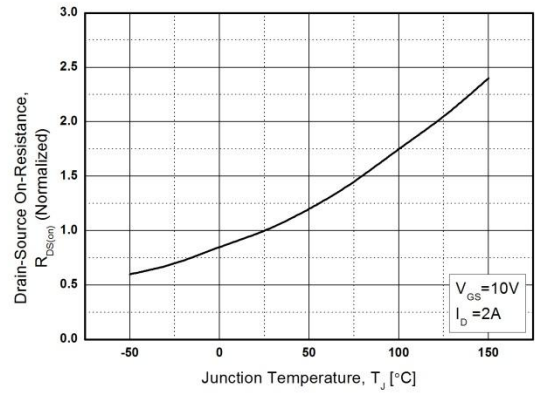


Fig. 9. Maximum Safe Operating Area

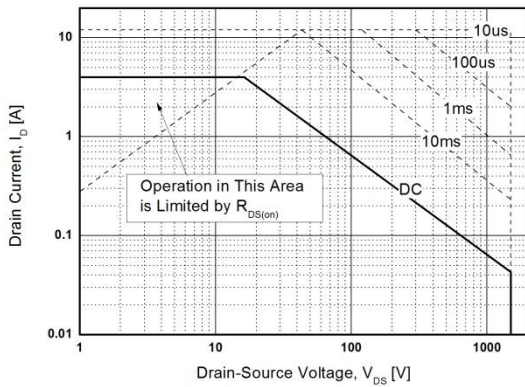


Fig. 10. Maximum Drain Current vs. Temperature

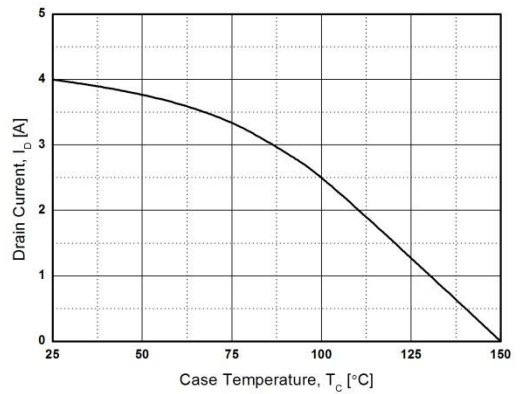
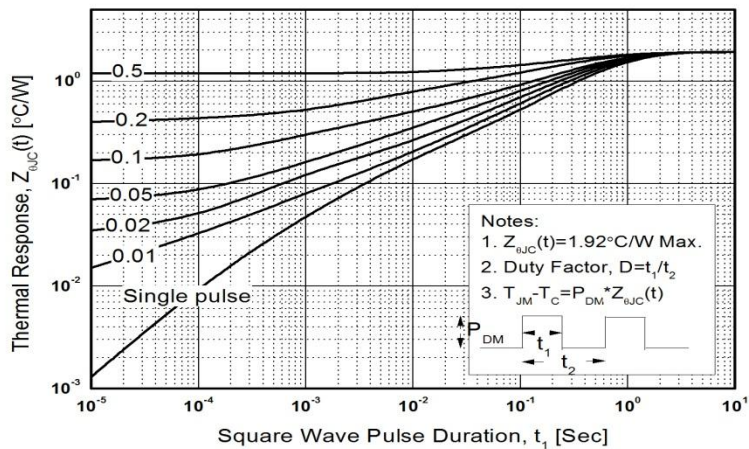


Fig. 11. Transient Thermal Response Curve



**Package Dimensions**

**TO-220F**

(Dimensions in Millimeters)

