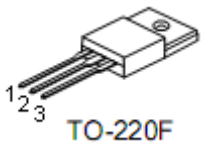
1. Description

This Power MOSFET is produced using KIA semi`s advanced super-junction technology. This advanced technology has been especially tailored to minimize conduction loss, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for AC/DC power conversion in switching mode operation for higher efficiency.

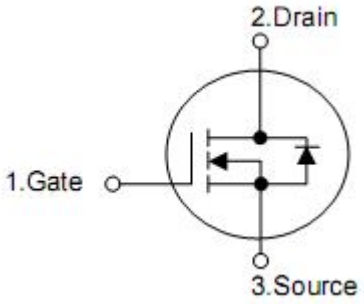
2. Features

- $R_{DS(on)}$=0.85Ω @ V_{GS}=10V
- Low gate charge (typical 15nC)
- High ruggedness
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability

3. Pin configuration



TO-220F



Pin	Function
1	Gate
2	Drain
3	Source

4. Absolute maximum ratings

(T_C= 25 ºC , unless otherwise noted)

Parameter		Symbol	Rating	Units
Drain-source voltage		V_{DSS}	650	V
Gate-source voltage		V_{GSS}	±30	V
Drain current continuous	T_C=25ºC	I_D	5*	A
	T_C=100ºC		4*	A
Drain current pulsed (note1)		I_{DM}	16*	A
Avalanche energy	Repetitive (note1)	E_{AR}	34	mJ
	Single pulse (note2)	E_{AS}	67.5	mJ
Avalanche energy(note1)		I_{AR}	1	A
Peak diode recovery dv/dt (note3)		dv/dt	4.5	V/ns
Total power dissipation	T_C=25 ºC	P_D	35	W
	derate above 25 ºC		0.3	W/ºC
Operating and storage temperature range		T_J, T_{STG}	-55~+150	ºC
Maximum lead temperature for soldering purposes, 1/8″ from case for 5 seconds		T_L	300	ºC

* Drain current limited by maximum junction temperature

5. Thermal characteristics

Parameter	Symbol	Rating	Unit
Thermal resistance, Junction-ambient	R_{thJA}	62	ºC/W
Thermal resistance, case-to-sink typ.	R_{thJS}	-	ºC/W
Thermal resistance, Junction-case	R_{thJC}	3.6	ºC/W

6. Electrical characteristics

(T_C=25°C,unless otherwise noted)

Parameter		Symbol	Conditions	Min	Typ	Max	Unit
Off characteristics							
Drain-source breakdown voltage	T_J=25ºC	BV_{DSS}	V_{GS}=0V,I_D=250μA	650	-	-	V
	T_J=125ºC		V_{GS}=0V,I_D=250μA	-	700	-	V
Zero gate voltage drain current		I_{DSS}	V_{DS}=650V ,V_{GS}=0V	-	-	1	μA
			V_{DS}=480V ,T_C=125ºC	-	-	10	μA
Gate-body leakage current	Forward	I_{GSS}	V_{GS}=30V,V_{DS}=0V	-	-	100	nA
	Reverse		V_{GS}=-30V,V_{DS}=0V	-	-	-100	nA
Breakdown voltage temperature coefficient		$\triangle BV_{DSS}/\triangle T_J$	I_D=250μA,referenced to 25°C	-	0.6	-	V/°C
On characteristics							
Gate threshold voltage		$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=250μA	2.5	-	4.5	V
Static drain-source on-resistance		$R_{DS(on)}$	V_{GS}=10V,I_D=2.5A	-	0.85	0.95	Ω
Forward transconductance		g_{FS}	V_{DS}=40V,I_D=2.5A (note4)	-	8	-	S
Gate resistance		R_g	F=1.0MHZ, Open drain	-	3.5	-	Ω
Dynamic characteristics							
Input capacitance		C_{iss}	V_{DS}=25V,V_{GS}=0V, f=1MHz	-	320	-	pF
Output capacitance		C_{oss}		-	75	-	pF
Reverse transfer capacitance		C_{rss}		-	4	-	pF
Switching characteristics							
Turn-on delay time		$t_{d(on)}$	V_{DD}=400V,I_D=2.5A, R_G=20Ω (note4,5)	-	18	-	ns
Rise time		t_r		-	40	-	ns
Turn-off delay time		$t_{d(off)}$		-	50	-	ns
Fall time		t_f		-	30	-	ns
Total gate charge		Q_g	V_{DS}=480V,I_D=5A , V_{GS}=10V (note4,5)	-	15	-	nC
Gate-source charge		Q_{gs}		-	3	-	nC
Gate-drain charge		Q_{gd}		-	6	-	nC
Drain-source diode characteristics and maximum ratings							
Drain-source diode forward voltage		V_{SD}	V_{GS}=0V,I_{SD}=5A	-	-	1.5	V
Continuous drain-source current		I_S		-	-	5	A
Pulsed drain-source current		I_{SM}		-	-	16	A
Reverse recovery time		t_{rr}	V_{GS}=0V,I_{SD}=5A dI_F/dt=100A/μs (note4)	-	180	-	ns
Reverse recovery charge		Q_{rr}		-	2.5	-	μC

Note:1. repetitive rating: pulse width limited by maximum junction temperature

2. L=60mH, I_{AS}=1.5A, V_{DD}=150V ,staring T_J=25ºC

3. I_{SD}≤4.5A,di/dt≤200A/μs, V_{DD}≤BV_{DSS}, staring T_J=25 ºC

4. Pulse test: pulse width≤300μs, duty cycle≤2%

5. Essentially independent of operating temperature typical characteristics.

7. Test circuits and waveforms

Typical Characteristics

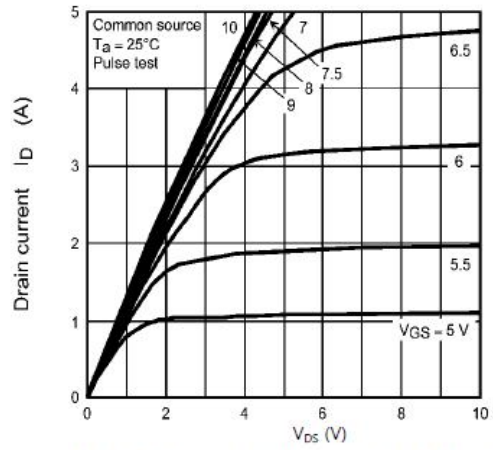


Figure 1: On-Region Characteristics@25°C

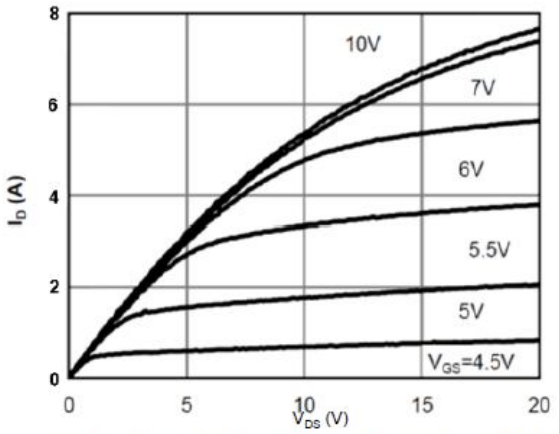


Figure 2: On-Region Characteristics@125°C

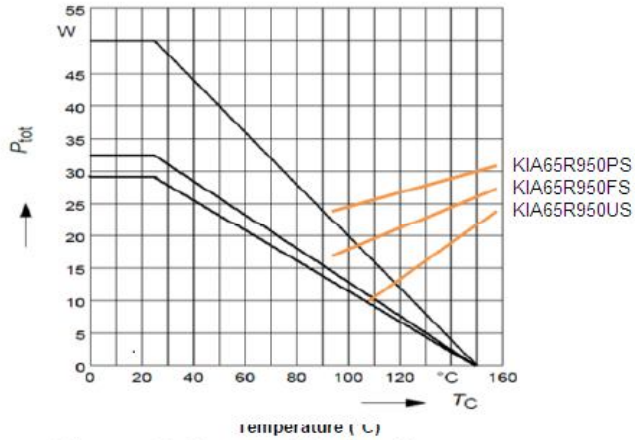


Figure 3: Power Dissipation

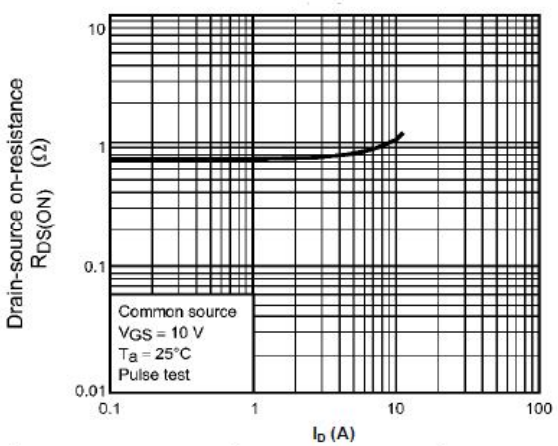


Figure 4: On-Resistance vs. Drain Current and Gate Voltage

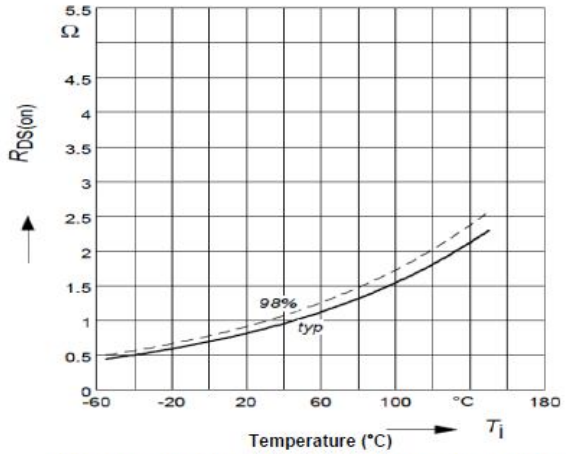


Figure 5: On-Resistance vs. Junction Temperature

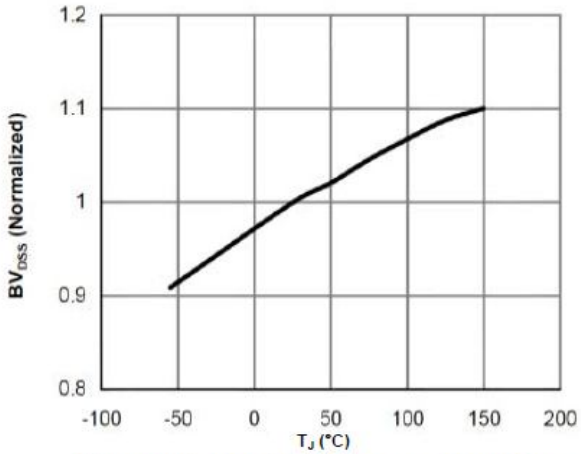


Figure 6: Break Down vs. Junction Temperature

Typical Characteristics

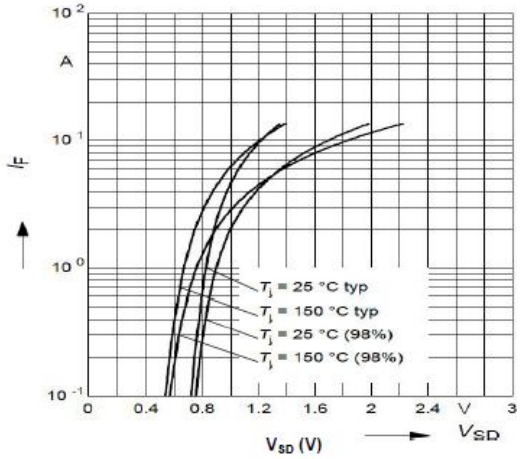


Figure 7: Body-Diode Characteristics

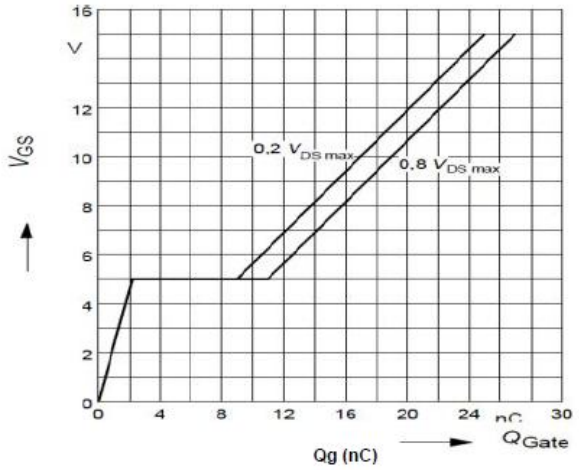


Figure 8: Gate-Charge Characteristics

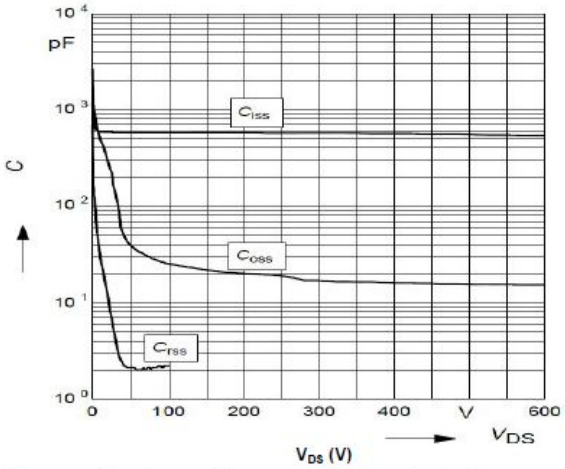


Figure 9: Capacitance Characteristics

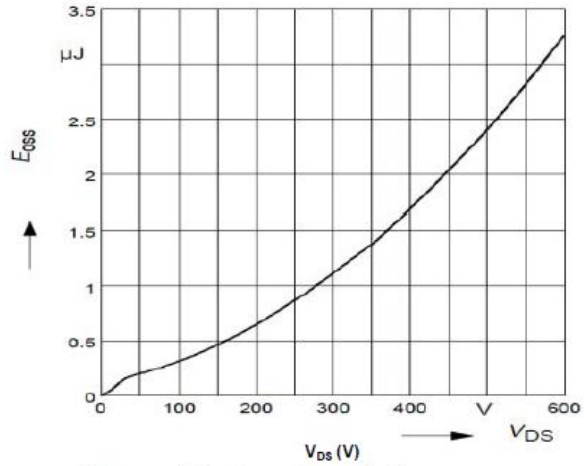


Figure 10: C_{oss} stored Energy

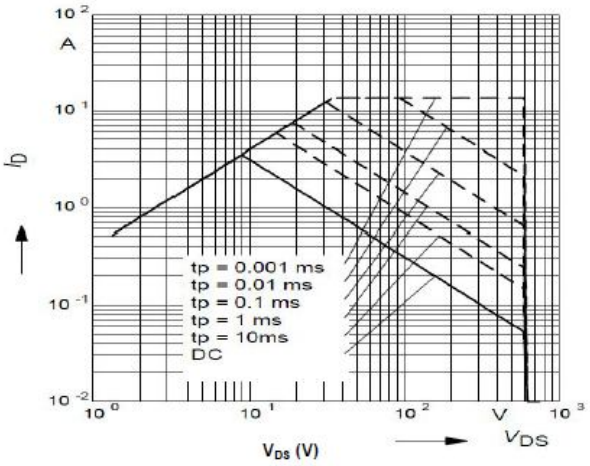


Figure 11: Maximum Forward Biased Safe Operating Area (FullPAK)

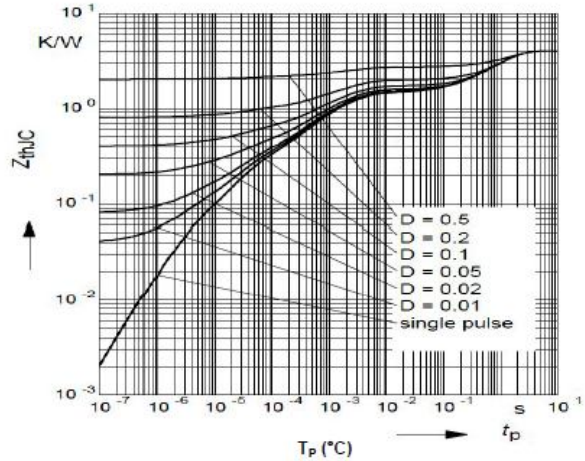


Figure 12: Sing Pulse Power Rating Junction to Case (FullPAK)

Typical Characteristics

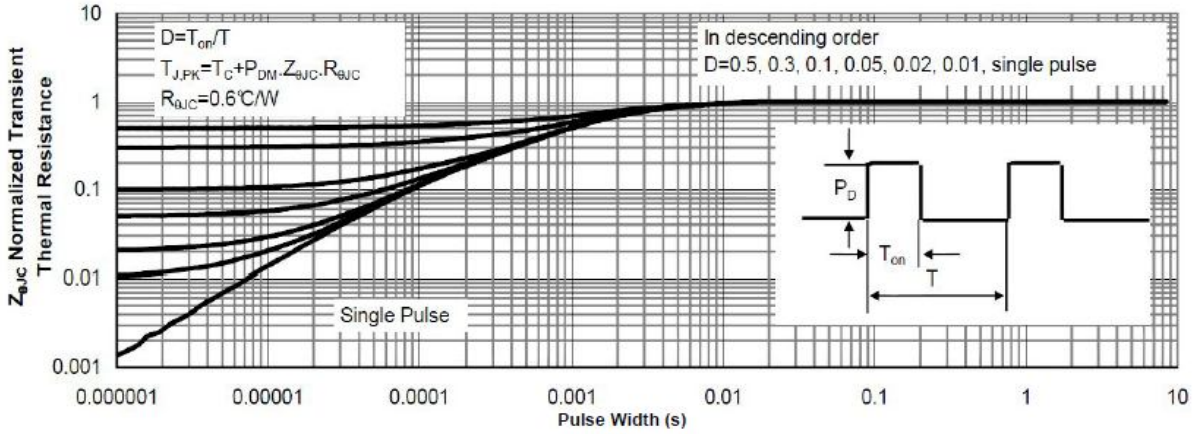


Figure 13: Normalized Maximum Transient Thermal Impedance

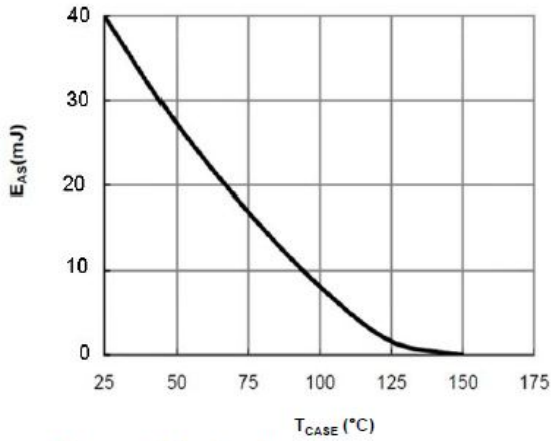


Figure 14: Avalanche energy

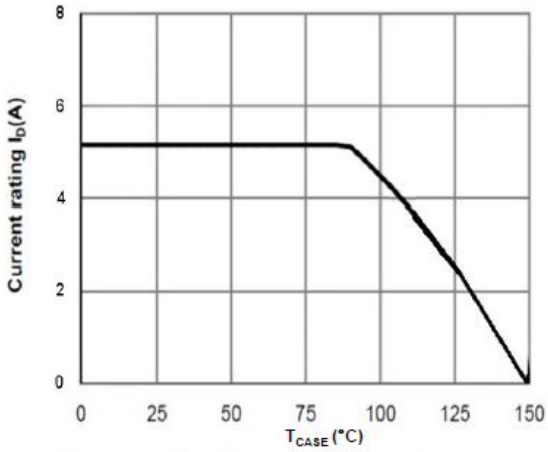


Figure 15: Current De-rating

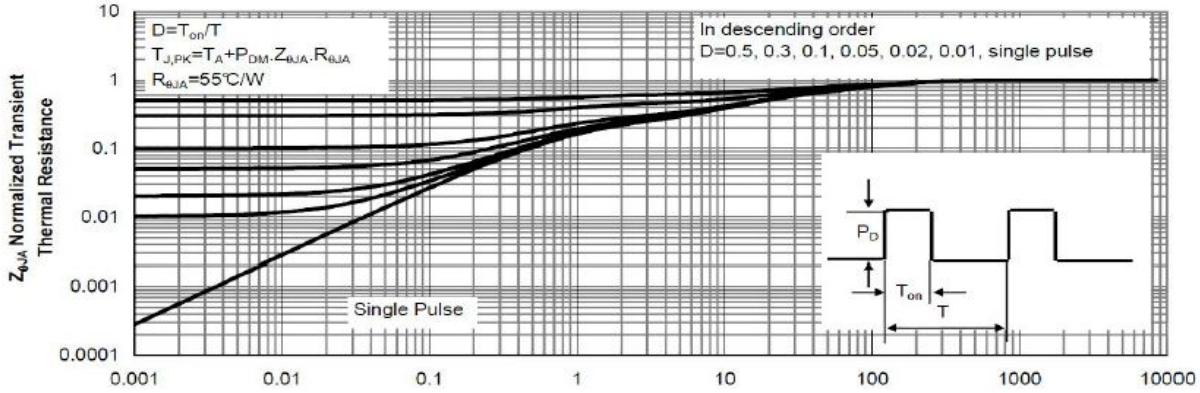


Figure 16: Normalized Maximum Transient Thermal Impedance