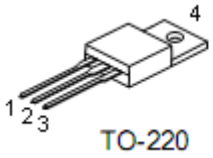
1. Description

This Power MOSFET is produced using KIA`s advanced planar stripe DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency switched mode power supplies, active power factor correction based on half bridge topology.

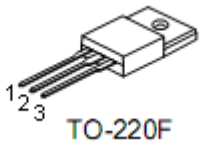
2. Features

- $R_{DS(on)}$=1.0Ω @ V_{GS}=10V
- Ultra low gate charge (typical 27nC)
- Low reverse transfer capacitance
- Fast switching capability
- Avalanche energy tested
- Improved dv/dt capability, high ruggedness

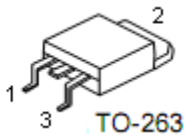
3. Pin configuration



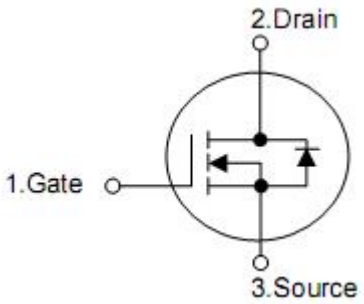
TO-220



TO-220F



TO-263



Pin	Function
1	Gate
2	Drain
3	Source
4	Drain

4. Absolute maximum ratings

(T_C=25ºC , unless otherwise specified)

Parameter		Symbol	Rating			Units
			TO-220	TO-220F	TO-263	
Drain-source voltage		V_{DSS}	600			V
Gate-source voltage		V_{GSS}	±30			V
Drain current continuous	T_C=25ºC	I_D	7.0	7.0*	7.0	A
	T_C=100ºC		4.2	4.2*	4.2	A
Drain current pulsed (note1)		I_{DP}	28	28*	28	A
Avalanche energy	Repetitive (note1)	E_{AR}	13.5			mJ
	Single Pulse (note2)	E_{AS}	215			mJ
Peak diode recovery dv/dt (note3)		dv/dt	4.5			V/ns
Total power dissipation	T_C=25ºC	P_D	140	45	140	W
	Derate above 25ºC		1.11	0.35	1.11	W/ºC
Junction temperature		T_J	+150			ºC
Storage temperature		T_{STG}	-55~+150			ºC

* Drain current limited by maximum junction temperature.

5. Thermal characteristics

Parameter	Symbol	Rating			Unit
		TO-220	TO-220F	TO-263	
Thermal resistance junction-ambient	R_{thJA}	62.5			ºC/W
Thermal resistance case-to-sink typ.	R_{thCS}	0.5	-	0.5	
Thermal resistance junction-case	R_{thJC}	0.9	2.8	0.9	

6. Electrical characteristics

(T_J=25°C,unless otherwise notes)

Parameter		Symbol	Test Conditions	Min	Typ	Max	Units
Off characteristics							
Drain-source breakdown voltage		BV_{DSS}	V_{GS}=0V,I_D=250μA	600	-	-	V
Zero gate voltage drain current		I_{DSS}	V_{DS}=600V,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
Breakdow voltage temperature coefficient		$\triangle BV_{DSS}\triangle T_J$	I_D=250μA	-	0.6	-	V/ ºC
On characteristics							
Gate threshold voltage		$V_{GS(TH)}$	V_{DS}=V_{GS},I_D=250μA	2.0	-	4.0	V
Static drain-source on-resistance		$R_{DS(ON)}$	V_{DS}=10V,I_D=3.5A	-	1.0	1.2	Ω
Dynamic characteristics							
Input capacitance		C_{ISS}	V_{DS}=25V,V_{GS}=0V, f=1MHz	-	900	-	pF
Output capacitance		C_{OSS}		-	100	-	pF
Reverse transfer capacitance		C_{RSS}		-	11.5	-	pF
Switching characteristics							
Turn-on delay time		$t_{D(ON)}$	V_{DD}=300V,R_G=25Ω, I_D=7.0A (note4,5)	-	20	-	ns
Rise time		t_R		-	45	-	ns
Turn-off delay time		$t_{D(OFF)}$		-	75	-	ns
Fall time		t_F		-	70	-	ns
Total gate charge		Q_G	V_{DS}=480V,V_{GS}=10V I_D=7.0A (note4,5)	-	27	-	nC
Gate-source charge		Q_{GS}		-	4.5	-	nC
Gate-drain charge		Q_{GD}		-	12	-	nC
Drain-source diode characteristics							
Drain-source diode forward voltage		V_{SD}	V_{GS}=0V,I_{SD}=7.0A	-	-	1.4	V
Continuous drain-source current		I_{SD}		-	-	7.0	A
Pulsed drain-source current		I_{SM}		-	-	28	A
Reverse recovery time		t_{RR}	V_{GS}=0V,I_{SD}=7.0A, dI_{SD}/dt=100A/μs (note 4)	-	320	-	ns
Reverse recovery charge		Q_{RR}		-	3.0	-	μC

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

2. L=8.5mH ,I_{AS}=7.0A,V_{DD}=50V,R_G=25Ω,starting T_J=25ºC

3. I_{SD}≤7.0A,di/dt≤200A/μs, V_{DD}≤BV_{DSS}, starting T_J=25ºC

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

5. Essentially independent of operating temperature

7. Test circuits and waveforms

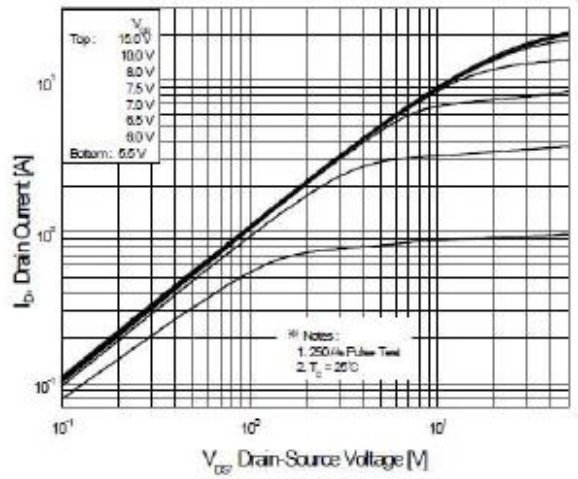


Figure 1. On-Region Characteristics

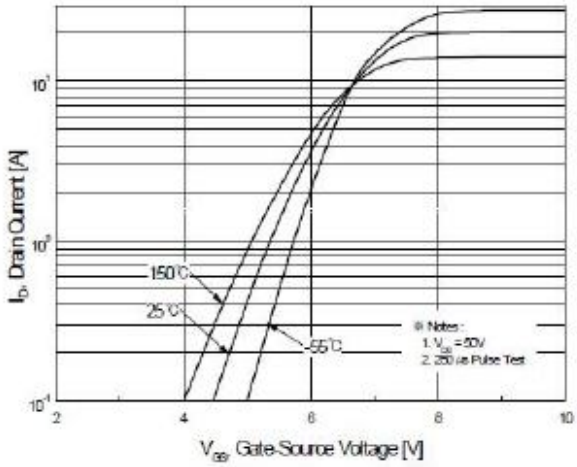


Figure 2. Transfer Characteristics

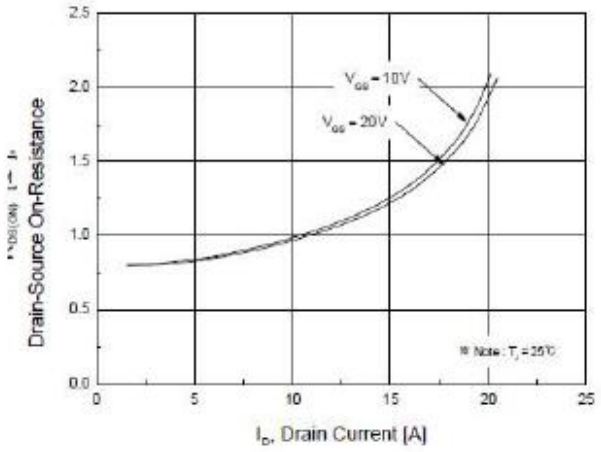


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

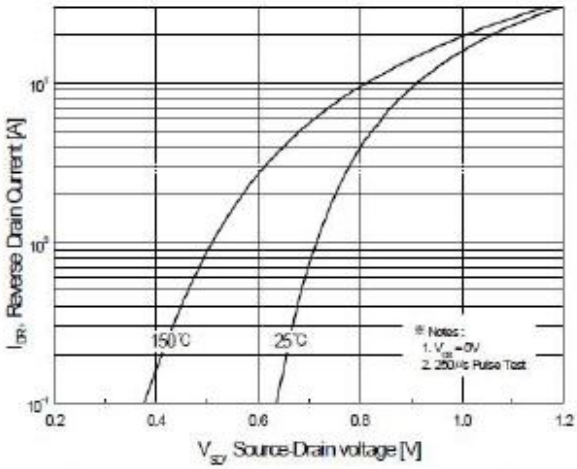


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

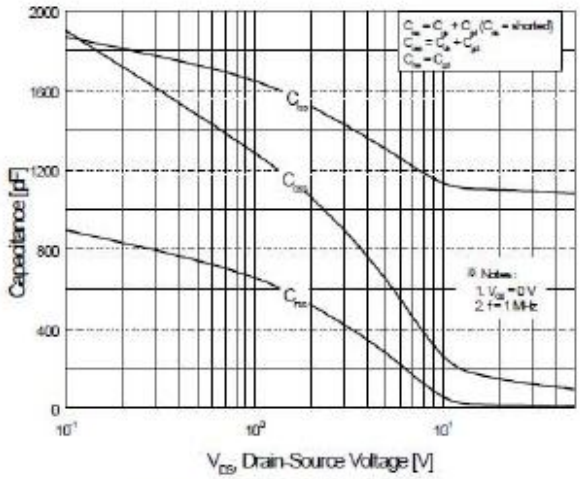


Figure 5. Capacitance Characteristics

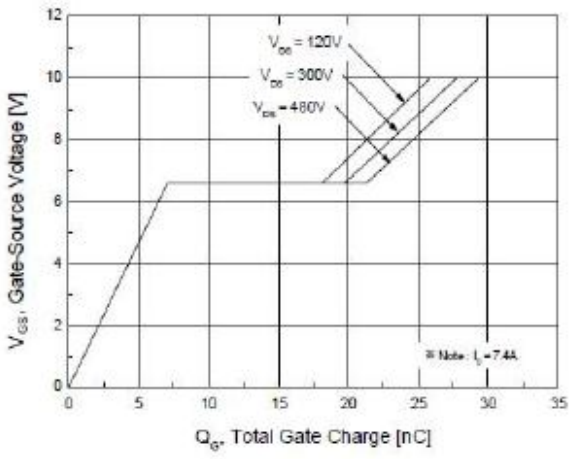


Figure 6. Gate Charge Characteristics

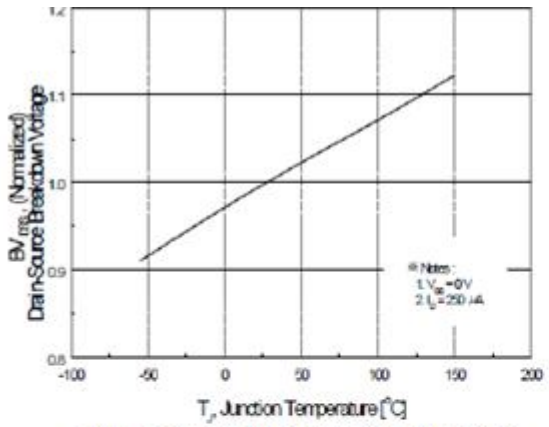


Figure 7. Breakdown Voltage Variation vs. Temperature

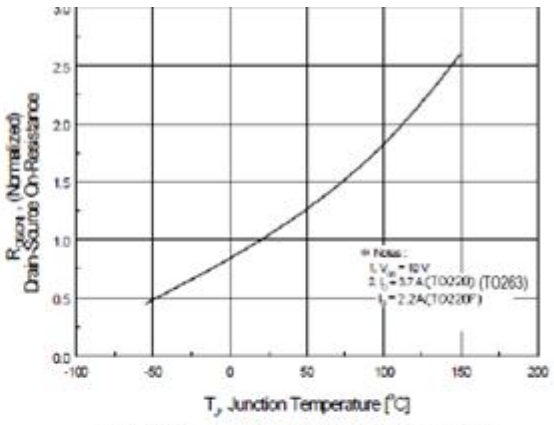


Figure8. On-Resistance Variation vs Temperature

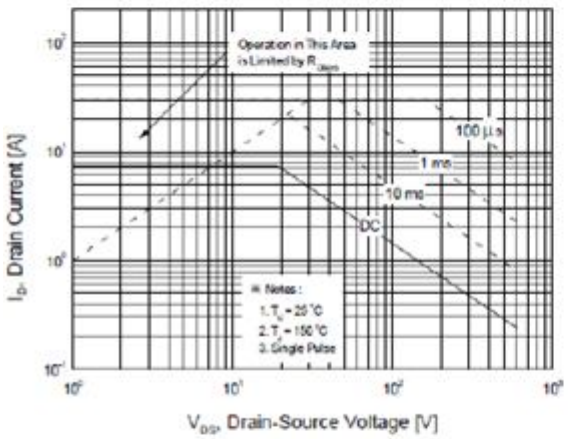


Figure 9 . Maximum Safe Operating Area

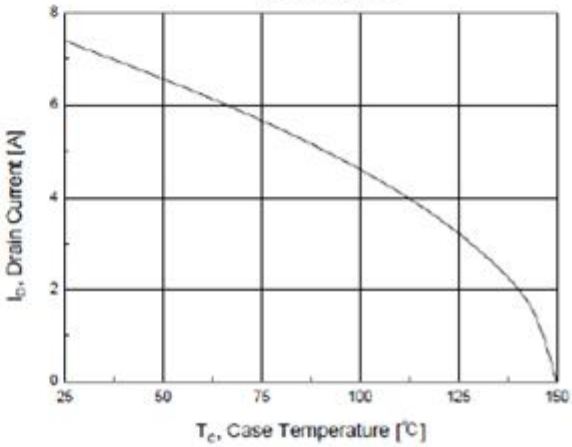


Figure 10. Maximum Drain Current vs Case Temperature

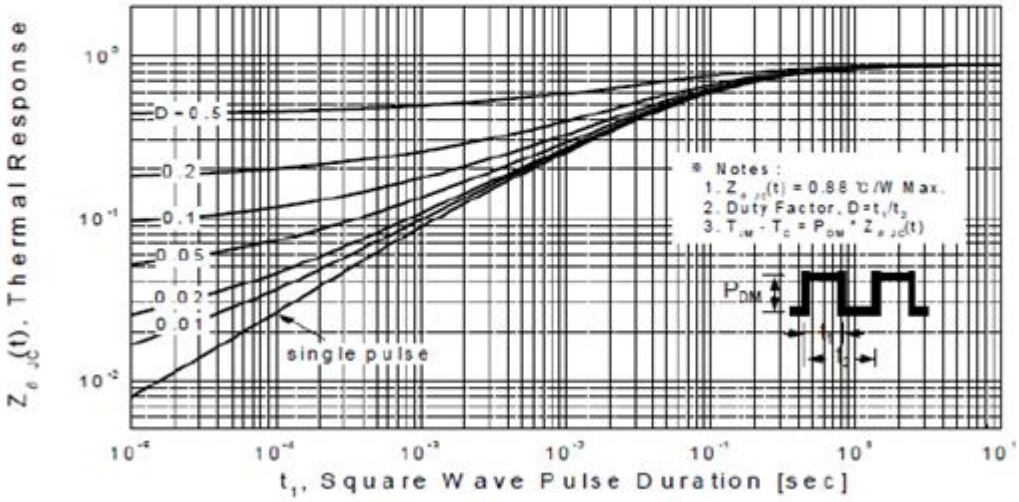


Figure 11-1. Transient Thermal Response Curve for TO220 、TO263

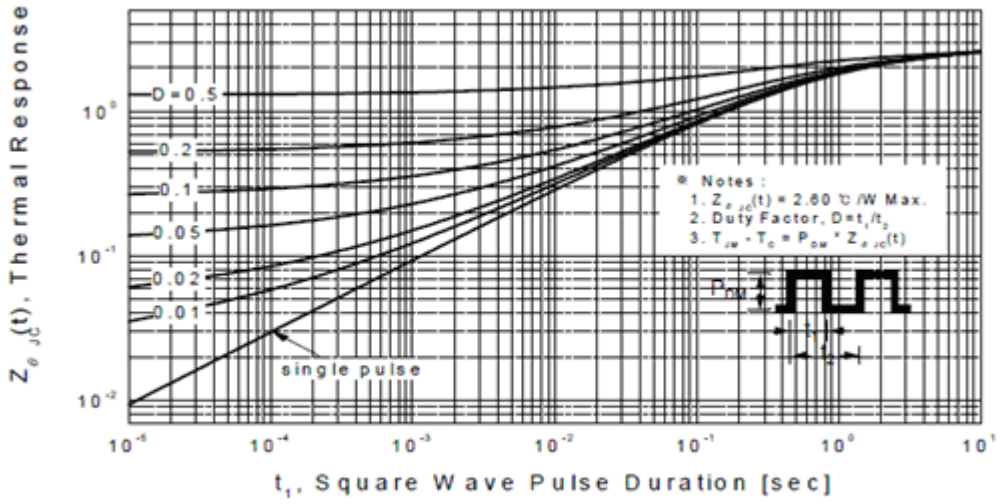


Figure 11-2. Transient Thermal Response Curve for TO220F