

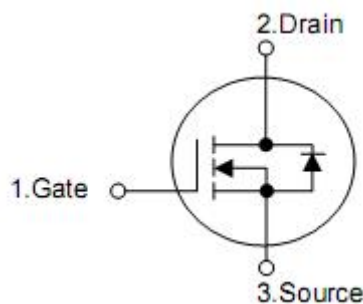
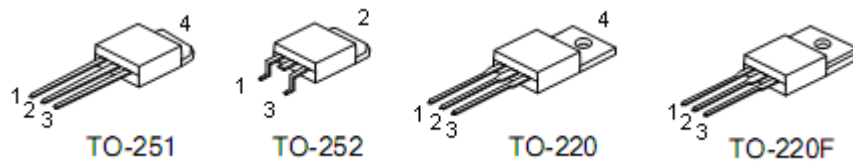
1. Description

This Power MOSFET is produced using KIA 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

- n $R_{DS(on)}=2.5\Omega$ @ $V_{GS}=10V$
- n Low gate charge (typical 16nC)
- n High ruggedness
- n Fast switching
- n 100% avalanche tested
- n Improved dv/dt capability

3. Pin configuration



Pin	Function
1	Gate
2	Drain
3	Source
4	Drain

4. Absolute maximum ratings

(T_C=25°C , unless otherwise noted)

Parameter	Symbol	Rating				Units	
		TO251	TO252	TO220	TO220F		
Drain-source voltage	V _{DSS}	650				V	
Drain current continuous	I _D	T _C =25°C	3.0	3.0	4.0	4.0*	A
		T _C =100°C	1.8	1.8	2.4	2.4*	A
Drain current pulsed (note1)	I _{DM}	12	12	16	16*	A	
Gate-source voltage	V _{GSS}	±30				V	
Single Pulse avalanche energy (note2)	E _{AS}	210	210	180	180	mJ	
Repetitive avalanche energy (note1)	E _{AR}	5.8	5.8	10	10	mJ	
Peak diode recovery dv/dt (note3)	dv/dt	4.5				V/ns	
Power dissipation	P _D	T _C =25°C	58	58	104	34	W
		Derate above 25°C	0.46	0.46	0.83	0.27	W/°C
Operating and storage temperature range	T _J , T _{STG}	-55~+150				°C	
Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	T _L	300				°C	

*Drain current limited by maximum junction temperature.

5. Thermal characteristics

Parameter	Symbol	TO251	TO252	TO220	TO220F	Unit
Thermal resistance junction-case	R _{thJC}	2.16	2.16	1.2	3.65	°C/W
Thermal resistance, case-to-sink typ.	R _{thJS}	50	50	0.5	0.5	
Thermal resistance junction-ambient	R _{thJA}	110	110	62.5	62.5	

6. Electrical characteristics

(T_J=25°C, unless otherwise noted)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Off characteristics						
Drain-source breakdown voltage	BV _{DSS}	V _{GS} =0V, I _D =250μA	650	-	-	V
Breakdown voltage temperature coefficient	ΔBV _{DSS} /ΔT _J	I _D =250μA, Referenced to 25°C	-	0.65	-	V/°C
Zero gate voltage drain current	I _{DSS}	V _{DS} =650V, V _{GS} =0V	-	-	1	μA
		V _{DS} =520V, T _C =125°C	-	-	10	μA
Gate-body leakage current	Forward	V _{GS} =30V, V _{DS} =0V	-	-	100	nA
	Reverse	V _{GS} =-30V, V _{DS} =0V	-	-	-100	nA
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 _{GS} =10V, I _D =1.5A(TO251, TO252) I _D =2.0A(TO220, TO220F)	-	2.5	3.0	Ω
Dynamic characteristics						
Input capacitance	C _{ISS}	V _{DS} =25V, V _{GS} =0V, f=1MHz	-	560	-	pF
Output capacitance	C _{OSS}		-	55	-	pF
Reverse transfer capacitance	C _{RSS}		-	7	-	pF
Switching characteristics						
Turn-on delay time	t _{D(ON)}	V _{DD} =300V, I _D =4.5A (TO251, TO252), V _{DD} =325V, I _D =4.0A (TO220, TO220F) R _G =25Ω, (note4,5)	-	10	-	ns
Rise time	t _R		-	40	-	ns
Turn-off delay time	t _{D(OFF)}		-	40	-	ns
Fall time	t _F		-	50	-	ns
Total gate charge	Q _G	V _{DS} =480V, I _D =4.5A (TO251, TO252)	-	16	-	nC
Gate-source charge	Q _{GS}	V _{DS} =520V, I _D =4.0A (TO220, TO220F)	-	2.5	-	nC
Gate-drain charge	Q _{GD}	V _{GS} =10V (note4,5)	-	6.5	-	nC
Drain-source diode characteristics						
Continuous drain-source current	I _S	TO251, TO252	-	-	3.0	A
		TO220, TO220F	-	-	4.0	
Pulsed drain-source current	I _{SM}	TO251, TO252	-	-	12	A
		TO220, TO220F	-	-	16	
Drain-source diode forward voltage	V _{SD}	V _{GS} =0V, I _S =3.0A (TO251, TO252) I _S =4.0A (TO220, TO220F)	-	-	1.4	V
Reverse recovery time	t _{RR}	V _{GS} =0V, di _F /dt=100A/μs I _S =4.5A, (TO251, TO252) I _S =4.0A (TO220, TO220F)	-	300	-	ns
Reverse recovery charge	Q _{RR}	(note 4)	-	2.0	-	μC

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

2. I_{AS}=4.5A, V_{DD}=50V, (TO251, TO252), I_{AS}=4.0A, V_{DD}=25V (TO220, TO220F), R_G=25Ω, starting T_J=25°C

3. I_{SD}≤4.5A, (TO251, TO252), I_{SD}≤4.0A (TO220, TO220F), di/dt ≤200A/μs, V_{DD}≤BV_{DSS}, starting T_J=25°C

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

5. Essentially independent of operating temperature

7. Test circuits and waveforms

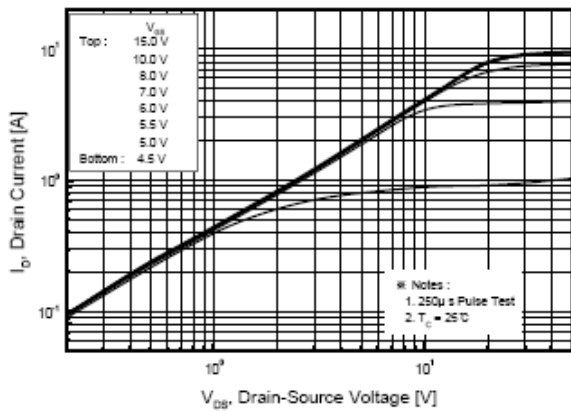


Figure 1. On-Region Characteristics

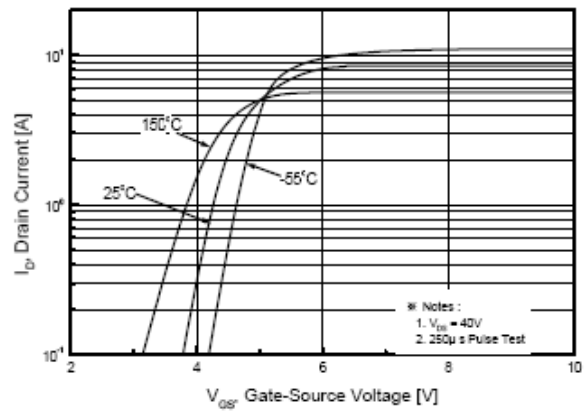


Figure 2. Transfer Characteristics

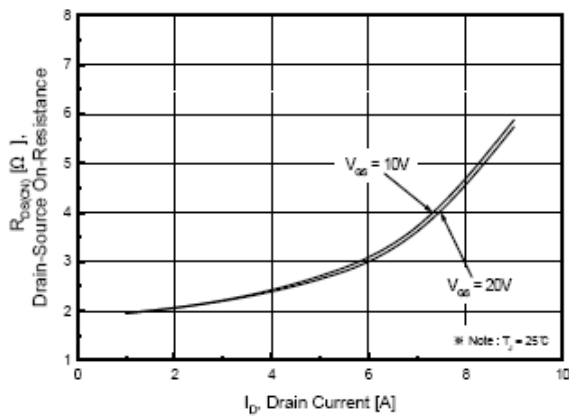


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

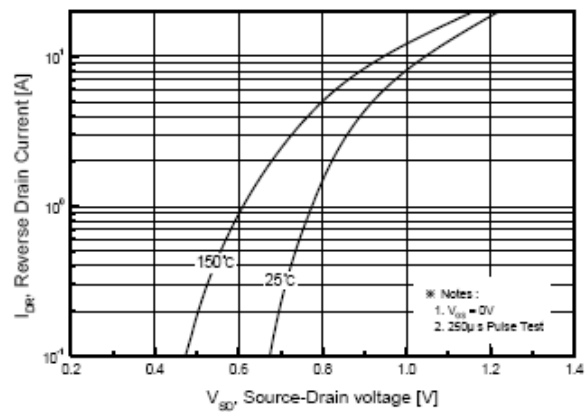


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

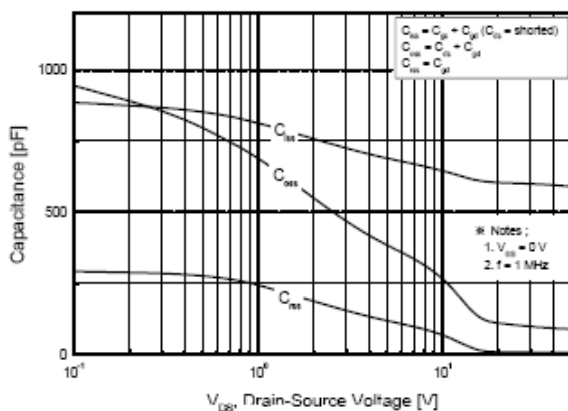


Figure 5. Capacitance Characteristics

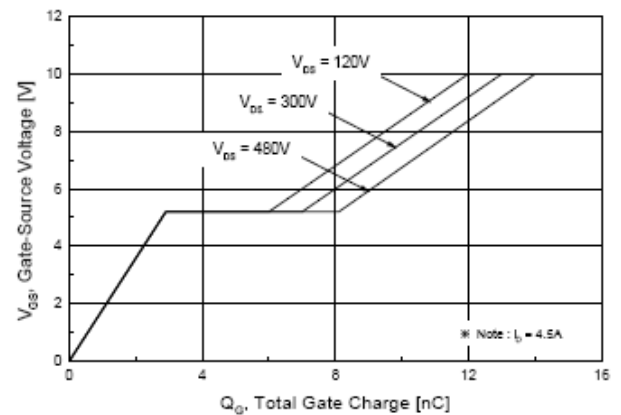


Figure 6. Gate Charge Characteristics

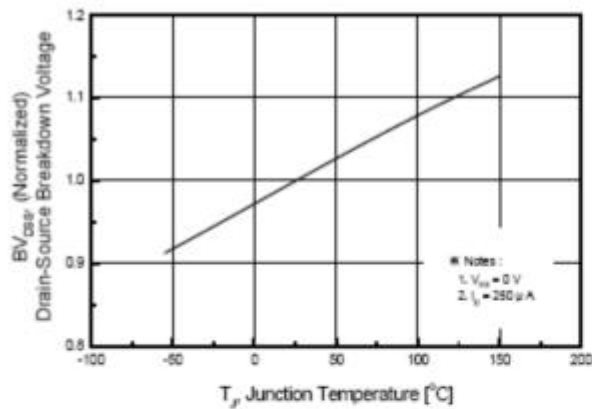


Figure 7. Breakdown Voltage Variation vs Temperature

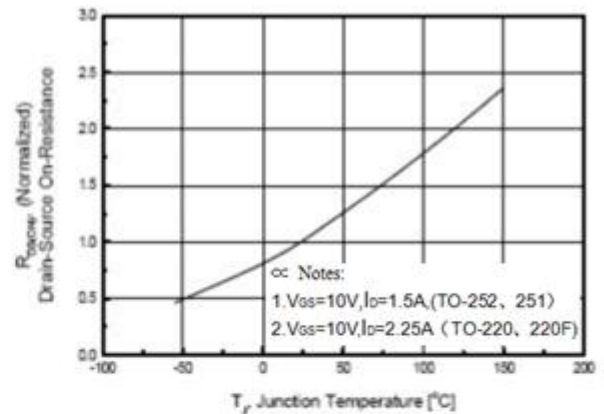


Figure 8. On-Resistance Variation vs Temperature

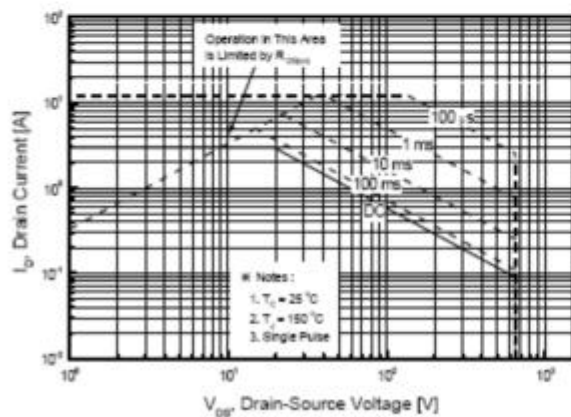


Figure 9. Maximum Safe Operating Area

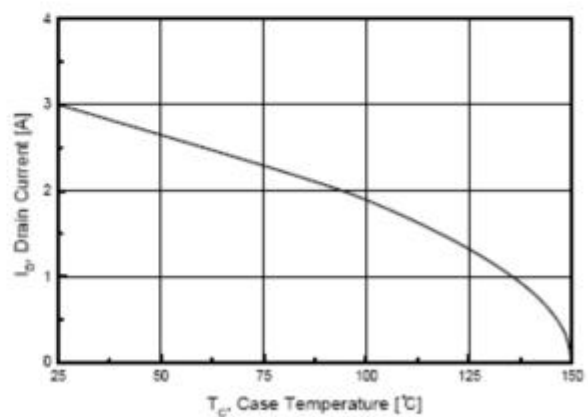


Figure 10. Maximum Drain Current vs Case Temperature

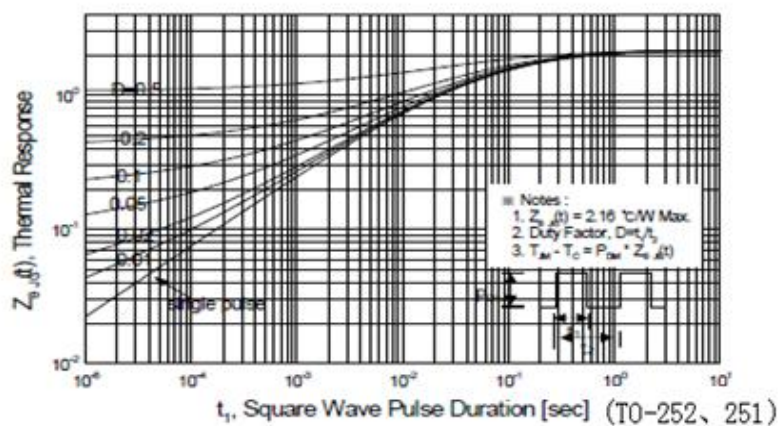


Figure 11. Transient Thermal Response Curve

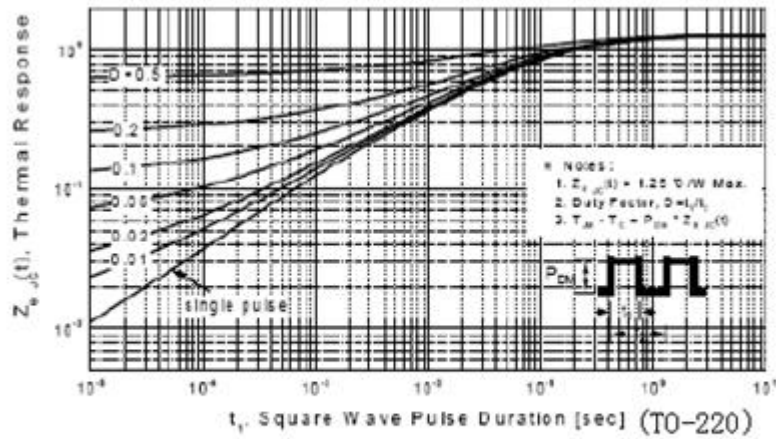


Figure 11-1. Transient Thermal Response Curve

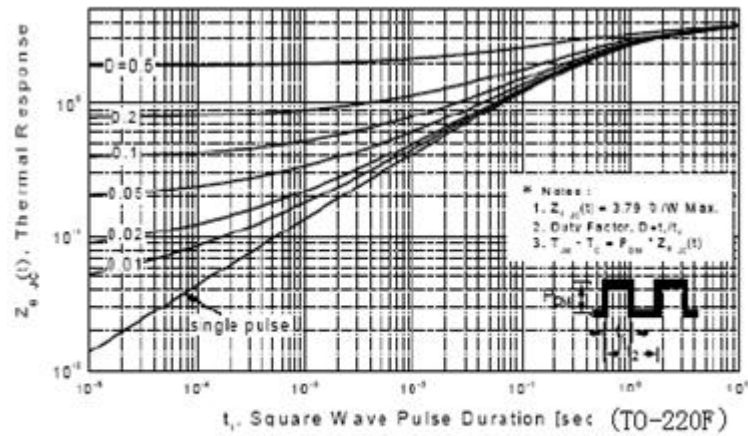


Figure 11-2. Transient Thermal Response Curve