

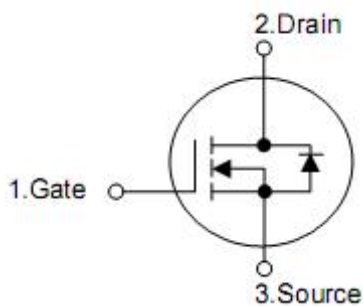
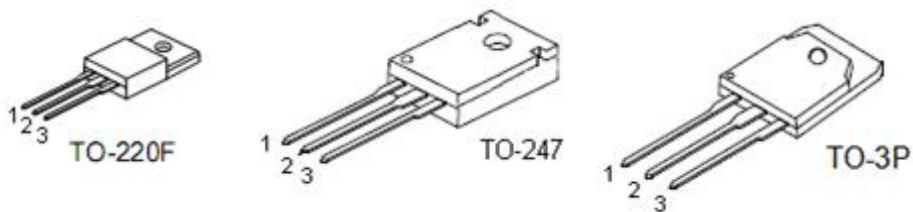
## 1. Description

The KIA20N50H N-Channel enhancement mode silicon gate power MOSFET is designed for high voltage, high speed power switching applications such as high efficiency switched mode power supplies, active power factor correction.

## 2. Features

- n  $R_{DS(on)}=0.21\Omega$  @  $V_{GS}=10V$
- n Low gate charge ( typical 70nC)
- n Fast switching capability
- n Avalanche energy specified
- n Improved dv/dt capability

## 3. Pin configuration



Pin	Function
1	Gate
2	Drain
3	Source

## 4. Absolute maximum ratings

(T<sub>C</sub>= 25 °C , unless otherwise specified)

Parameter	Symbol	Ratings			Units	
		TO220F	TO247	TO3P		
Drain-source voltage	V <sub>DSS</sub>	500			V	
Gate-source voltage	V <sub>GSS</sub>	±30			V	
Drain current continuous	I <sub>D</sub>	20.0			A	
		T <sub>C</sub> =25°C	13*	13.0	13.0	A
	T <sub>C</sub> =100°C				A	
Drain current pulsed (note1)	I <sub>DP</sub>	80*	80	80	A	
Avalanche energy	Repetitive (note1)	E <sub>AR</sub>	3.8	28	28	mJ
	Single pulse (note2)	E <sub>AS</sub>	1110			mJ
Peak diode recovery dv/dt (note 3)	dv/dt	4.5			V/ns	
Total power dissipation	T <sub>C</sub> =25°C	P <sub>D</sub>	38.5	280	280	W
	derate above 25°C		0.3	2.3	2.3	W/°C
Junction temperature	T <sub>J</sub>	+150			°C	
Storage temperature	T <sub>STG</sub>	-55~+150			°C	

\*Drain current limited by maximum junction temperature.

## 5. Thermal characteristics

Parameter	Symbol	Ratings			Units
		TO220F	TO247	TO3P	
Thermal resistance,junction-ambient	R <sub>thJA</sub>	62.5	40	40	°C/W
Thermal resistance,case-to-sink typ.	R <sub>thCS</sub>	--	0.24	0.24	
Thermal resistance,Junction-case	R <sub>thJC</sub>	3.3	0.44	0.44	

## 6. Electrical characteristics

(T<sub>J</sub>=25°C, unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
<b>Off characteristics</b>						
Drain-source breakdown voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	500	-	-	V
Zero gate voltage drain current	I <sub>DSS</sub>	V <sub>DS</sub> =500V, V <sub>GS</sub> =0V	-	-	1	μA
		V <sub>DS</sub> =400V, T <sub>C</sub> =125 °C	-	-	10	μA
Gate-body leakage current	Forward	I <sub>GSS</sub>	-	-	100	nA
	Reverse				-100	nA
Breakdown voltage temperature coefficient	ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	I <sub>D</sub> =250μA	-	0.5	-	V/°C
<b>On characteristics</b>						
Gate threshold voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	2.0	-	4.0	V
Static drain-source on-resistance	R <sub>DS(on)</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =10.0A	-	0.21	0.26	Ω
<b>Dynamic characteristics</b>						
Input capacitance	C <sub>iss</sub>	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1MHz	-	2700	-	pF
Output capacitance	C <sub>oss</sub>		-	400	-	pF
Reverse transfer capacitance	C <sub>rss</sub>		-	40	-	pF
<b>Switching characteristics</b>						
Turn-on delay time	t <sub>d(on)</sub>	V <sub>DD</sub> =250V, I <sub>D</sub> =20.0A, R <sub>G</sub> =25Ω (note4,5)	-	100	-	ns
Rise time	t <sub>r</sub>		-	400	-	ns
Turn-off delay time	t <sub>d(off)</sub>		-	100	-	ns
Fall time	t <sub>f</sub>		-	100	-	ns
Total gate charge	Q <sub>g</sub>	V <sub>DS</sub> =400V, I <sub>D</sub> =20.0A , V <sub>GS</sub> =10V (note4,5)	-	70	-	nC
Gate-source charge	Q <sub>gs</sub>		-	18	-	nC
Gate-drain charge	Q <sub>gd</sub>		-	35	-	nC
<b>Drain-source diode characteristics</b>						
Drain-source diode forward voltage	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =20.0A	-	-	1.5	V
Continuous drain-source current	I <sub>SD</sub>		-	-	20.0	A
Pulsed drain-source current	I <sub>SM</sub>		-	-	80.0	A
Reverse recovery time	t <sub>rr</sub>	I <sub>SD</sub> =20.0A di <sub>SD</sub> /dt=100A/μs (note4)	-	500	-	ns
Reverse recovery charge	Q <sub>rr</sub>		-	7.2	-	μC

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

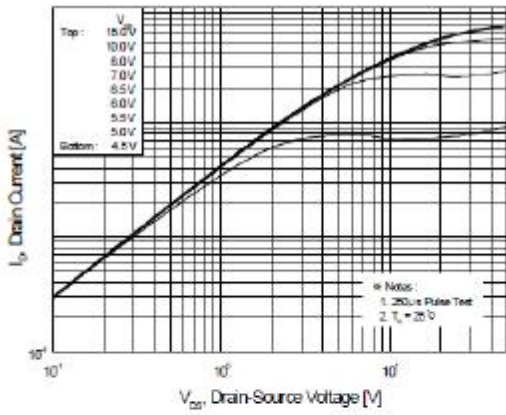
2. L=5.0mH, I<sub>AS</sub>=20.0A, V<sub>DD</sub>=50V, R<sub>G</sub>=25Ω, starting T<sub>J</sub>=25°C

3. I<sub>SD</sub>≤20.0A, di/dt≤200A/μs, V<sub>DD</sub>≤BV<sub>DSS</sub>, starting T<sub>J</sub>=25 °C

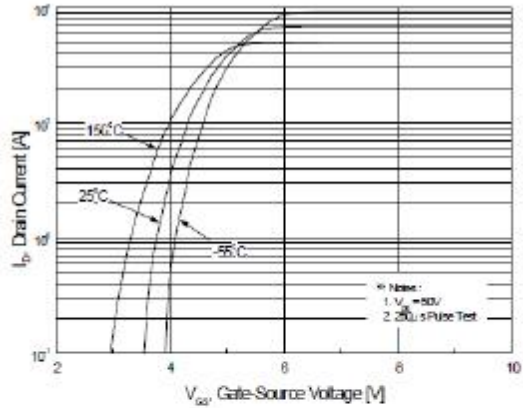
4. Pulse test: pulse width≤300μs, duty cycle≤2%

5. Essentially independent of operating temperature

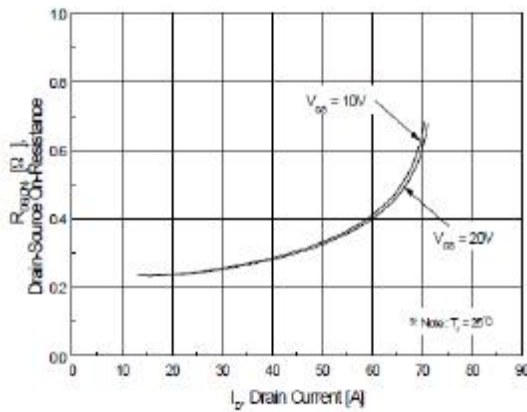
**7. Test circuits and waveforms**



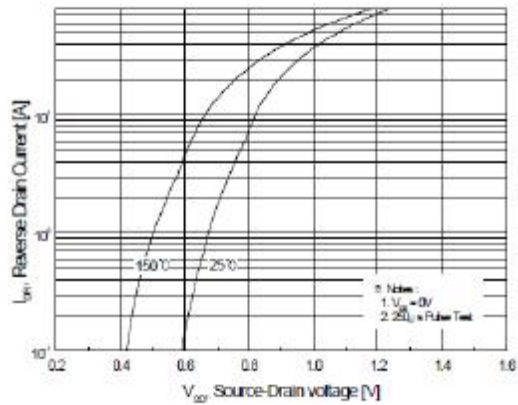
**Figure 1. On-Region Characteristics**



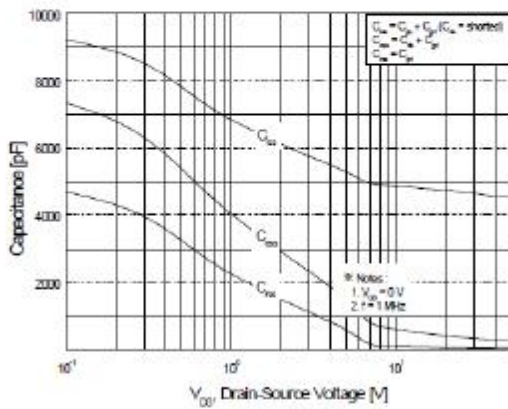
**Figure 2. Transfer Characteristics**



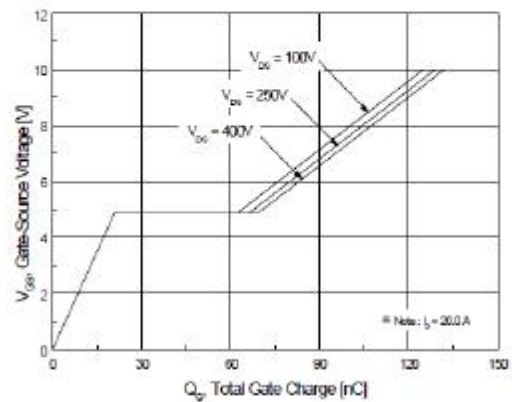
**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**



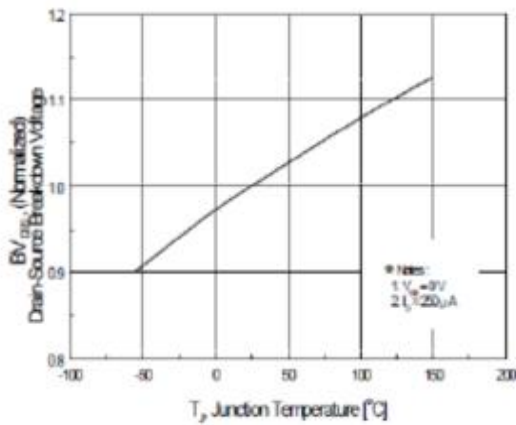
**Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature**



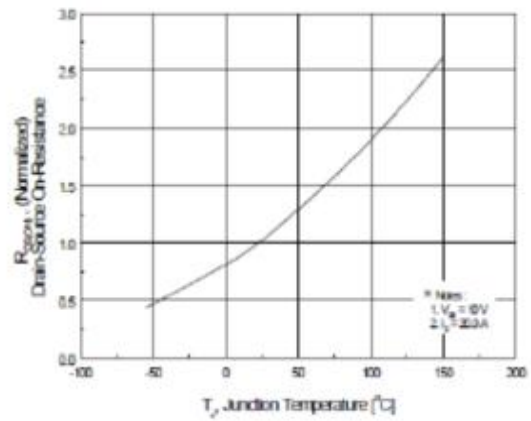
**Figure 5. Capacitance Characteristics**



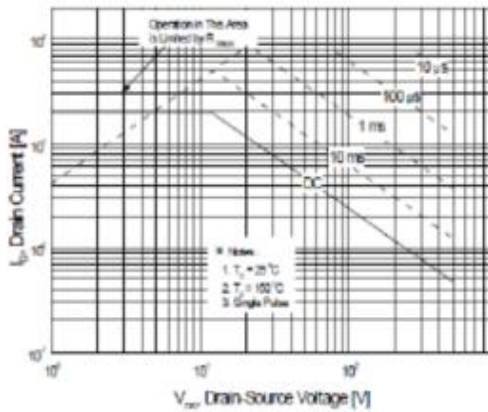
**Figure 6. Gate Charge Characteristics**



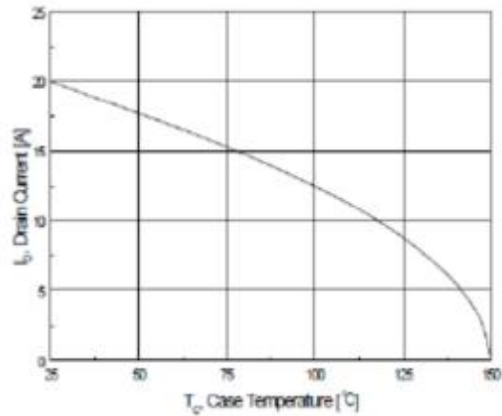
**Figure 7. Breakdown Voltage Variation vs Temperature**



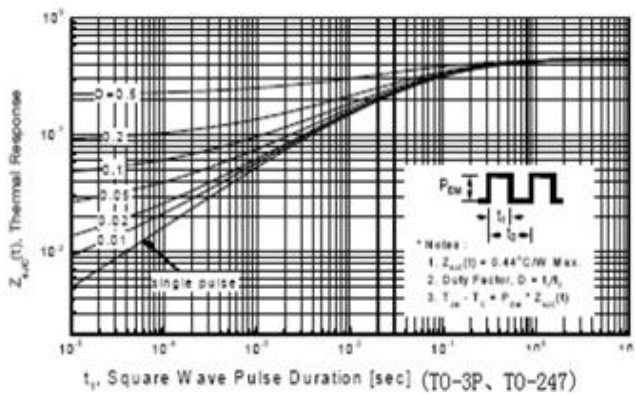
**Figure 8. On-Resistance Variation vs Temperature**



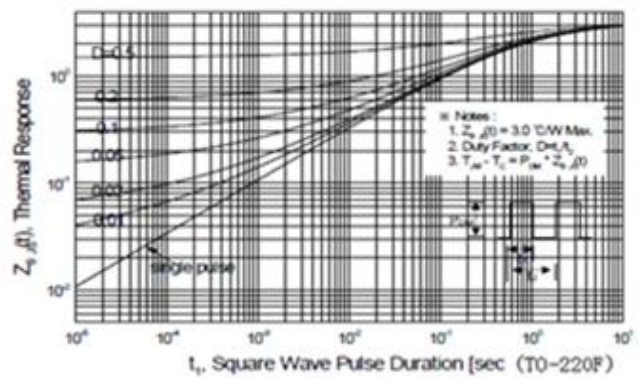
**Figure 9. Maximum Safe Operating Area**



**Figure 10. Maximum Drain Current vs Case Temperature**



**Figure 11 Transient Thermal Response Curve**



**Figure 11-1. Transient Thermal Response Curve**