

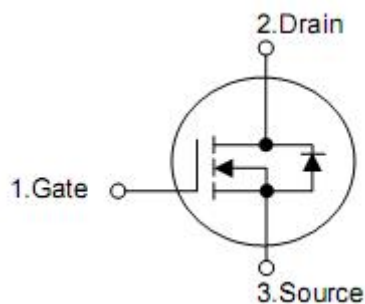
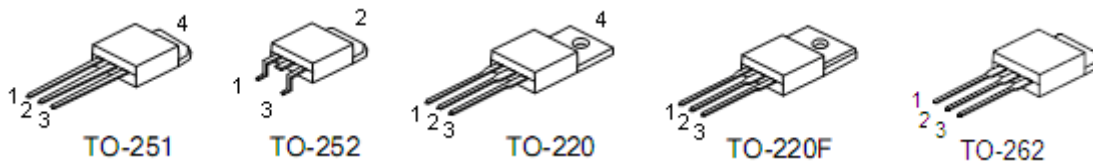
1. Description

The KIA4N60H N-Channel enhancement mode silicon gate power MOSFET is designed for high voltage, high speed power switching applications such as switching regulators, switching converters, solenoid, motor drivers, relay drivers.

2. Features

- n $R_{DS(ON)}=2.3\Omega @ V_{GS}=10V$
- n Low gate charge (typical 13.5nC)
- n High ruggedness
- 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	Drain

4. Absolute maximum ratings

($T_C = 25^\circ\text{C}$, unless otherwise specified)

Parameter	Symbol	Rating				Units
		TO220 TO262	TO220F	TO251	TO252	
Drain-source voltage	V_{DSS}	600				V
Gate-source voltage	V_{GSS}	± 30				V
Drain current continuous	I_D	$T_C=25^\circ\text{C}$	4.0	4.0*	2.8	A
		$T_C=100^\circ\text{C}$	2.4	2.4*	1.8	A
Drain current pulsed (note1)	I_{DM}	16	16*	12	A	
Avalanche energy	Repetitive (note1)	9.3		5.5		mJ
	Single pulse (note2)	180				mJ
Peak diode recovery dv/dt (note3)	dv/dt	4.5				V/ns
Total power dissipation	P_D	$T_C=25^\circ\text{C}$	93	31	55	W
		Derate above 25°C	0.74	0.24	0.44	W/ $^\circ\text{C}$
Junction temperature	T_J	+150				$^\circ\text{C}$
Storage temperature	T_{STG}	-55~+150				$^\circ\text{C}$

*Drain current limited by maximum junction temperature.

5. Thermal characteristics

Parameter	Symbol	Rating				Unit
		TO220 TO262	TO220F	TO251	TO252	
Thermal resistance, junction-ambient	R_{thJA}	62.5		110		$^\circ\text{C}/\text{W}$
Thermal resistance, case-to-sink typ	R_{thJS}	0.5	--	50		
Thermal resistance junction-case	R_{thJC}	1.35	4.05	2.25		

6. Electrical characteristics

(T_J=25°C, unless otherwise notes)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
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 =125 °C	-	-	10	μA
Gate-body leakage current	Forward	I _{GSS}	-	-	100	nA
	Reverse				-100	nA
Breakdown voltage temperature coefficient	ΔBV _{DSS} /ΔT _J	I _D =250μA	-	0.6	-	V/°C
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 =2.0A(TO220, TO262, TO220F) I _D =1.4A(TO251, TO252)	-	2.3	2.7	Ω
Dynamic characteristics						
Input capacitance	C _{ISS}	V _{DS} =25V, V _{GS} =0V, f=1MHz	-	500	-	pF
Output capacitance	C _{OSS}		-	45	-	pF
Reverse transfer capacitance	C _{RSS}		-	4.5	-	pF
Switching characteristics						
Turn-on delay time	t _{D(ON)}	V _{DD} =300V, I _D =4.0A(TO220, TO262, TO220F)	-	10	-	ns
Rise time	t _R		-	32	-	ns
Turn-off delay time	t _{D(OFF)}		-	32	-	ns
Fall time	t _F	I _D =2.8A(TO251, TO252) R _G =25Ω (note4,5)	-	40	-	ns
Total gate charge	Q _G	V _{DS} =480V, I _D =4.0A(TO220, TO262, TO220F)	-	13.5	-	nC
Gate-source charge	Q _{GS}		-	2.2	-	nC
Gate-drain charge	Q _{GD}		I _D =2.8A(TO251, TO252) V _{GS} =10V (note4,5)	-	5.4	-
Drain-source diode characteristics						
Drain-source diode forward voltage	V _{SD}	V _{GS} =0V, I _{SD} =4.0A(TO220, TO262, TO220F) I _{SD} =2.8A(TO251, TO252)	-	-	1.4	V
Continuous drain-source current	I _{SD}	TO220, TO262, TO220F	-	-	4.0	A
		TO251, TO252	-	-	2.8	
Pulsed drain-source current	I _{SM}	TO220, TO262, TO220F	-	-	16.0	A
		TO251, TO252	-	-	12	
Reverse recovery time	t _{RR}	I _{SD} =4.0A(TO220, TO262, TO220F)	-	250	-	ns
Reverse recovery charge	Q _{RR}	I _{SD} =2.8A(TO251, TO252) di _{SD} /dt=100A/μs (note 4)	-	1.8	-	μC

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

2. L=20mH, I_{AS}=4.0A, V_{DD}=50V, R_G=25Ω, starting T_J=25°C

3. I_{SD}≤4.0A, 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

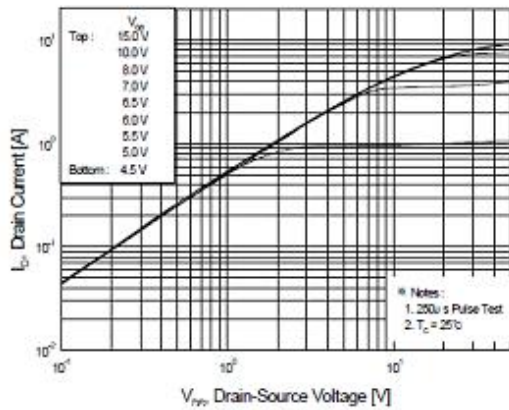


Figure 1. On-Region Characteristics

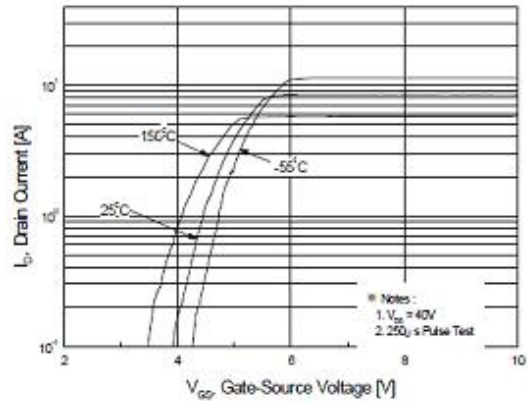


Figure 2. Transfer Characteristics

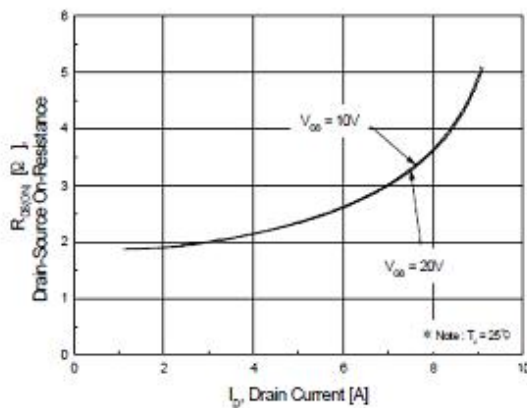


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

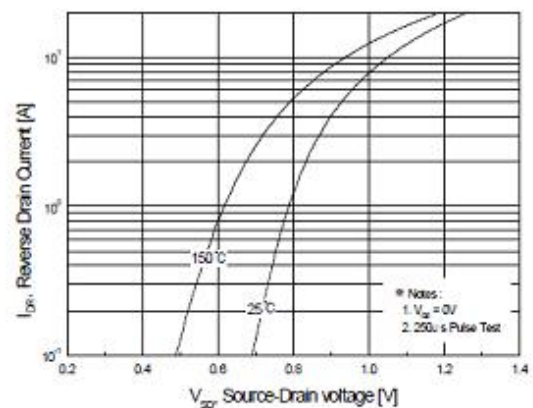


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

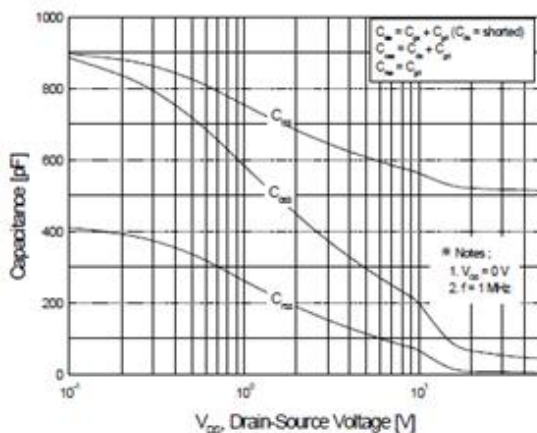


Figure 5. Capacitance Characteristics

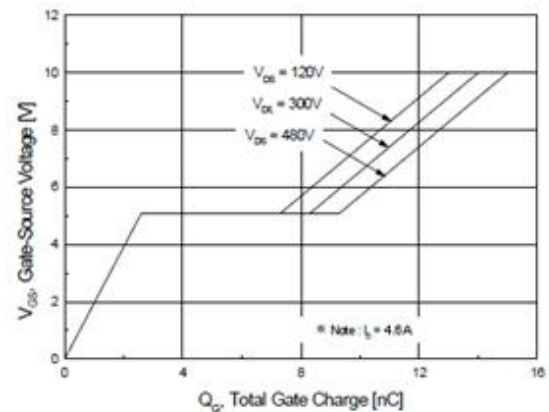


Figure 6. Gate Charge Characteristics

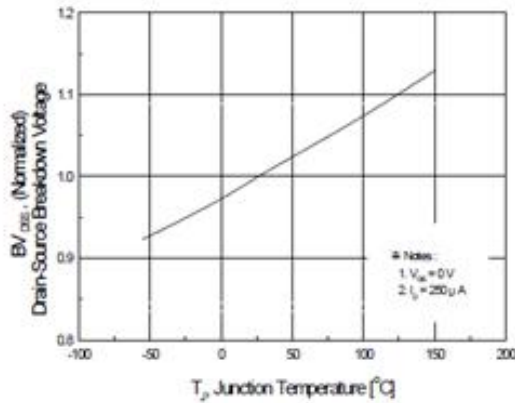


Figure 7. Breakdown Voltage Variation vs Temperature

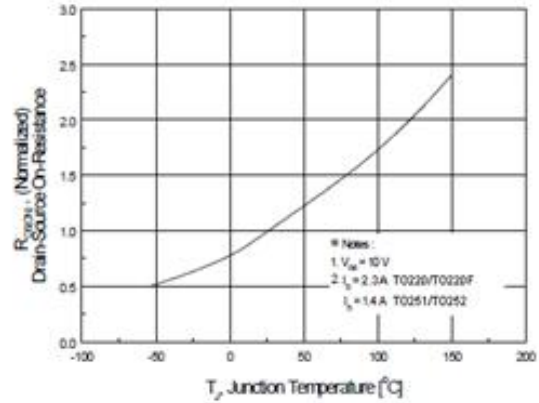


Figure 8. On-Resistance Variation vs Temperature

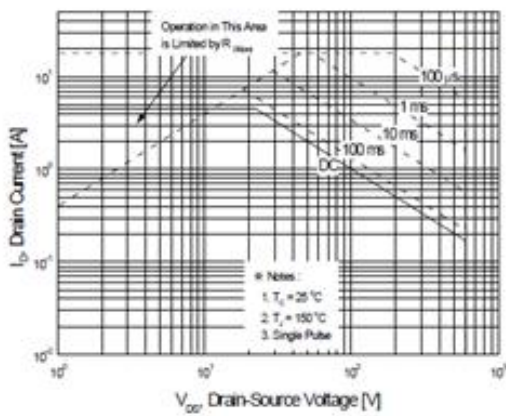


Figure 9-1. Maximum Safe Operating Area for TO220

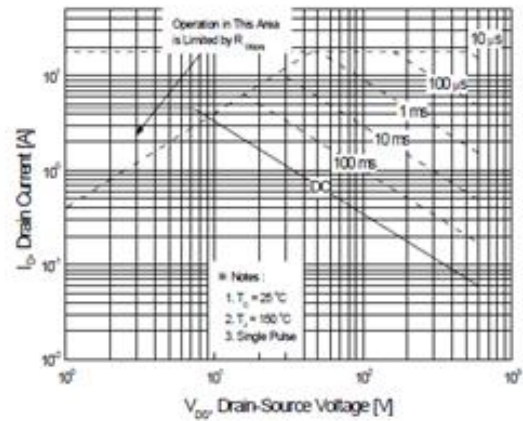


Figure 9-2. Maximum Safe Operating Area for TO220F

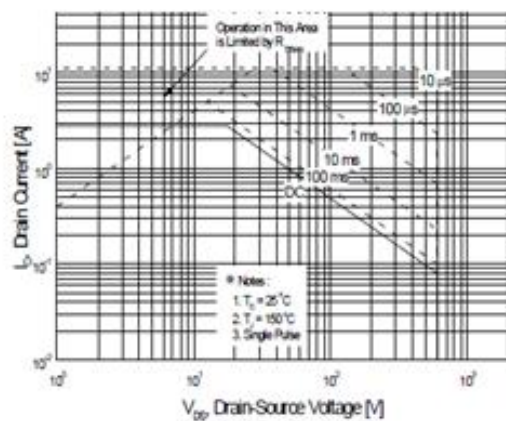


Figure 9-3. Maximum Safe Operating Area for TO251, TO252

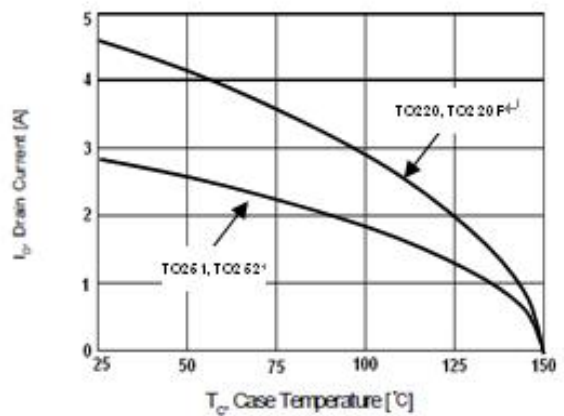


Figure 10. Maximum Drain Current vs Case Temperature

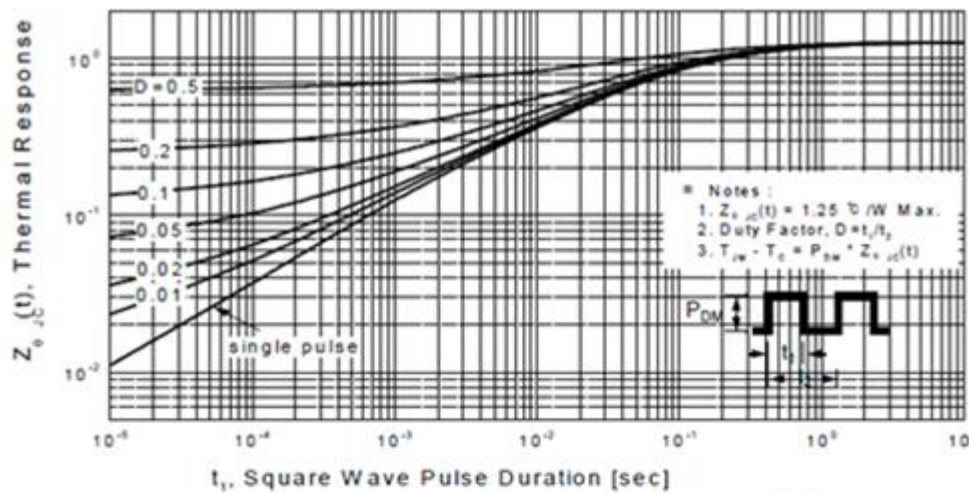


Figure 11-1. Transient Thermal Response Curve for TO220/TO262

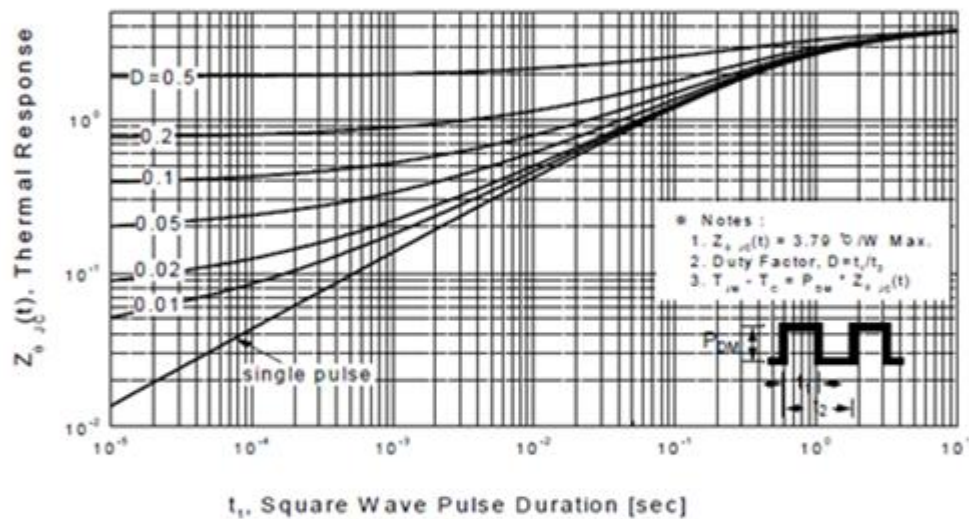


Figure 11-2. Transient Thermal Response Curve for TO220F

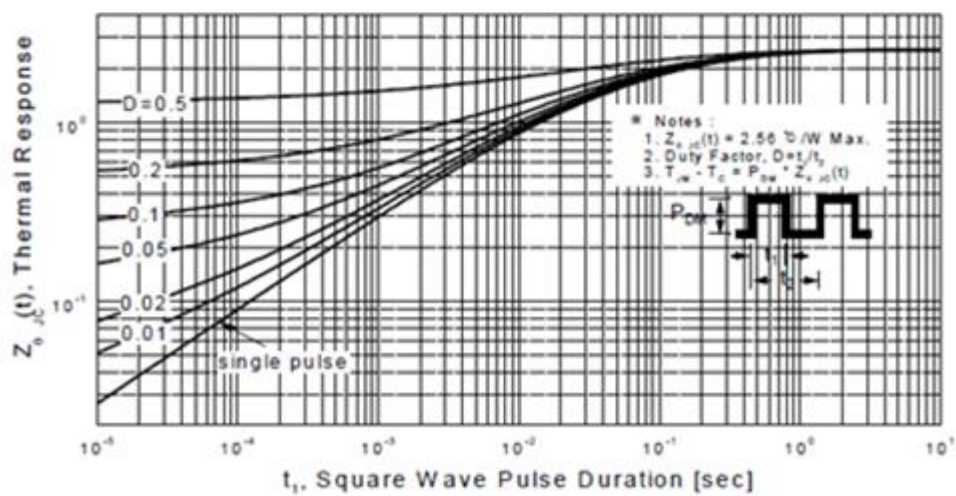


Figure 11-3. Transient Thermal Response Curve for T0251/ T0252