1. Description

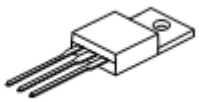
The KIA4N60 is a high voltage MOSFET and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and have a high rugged avalanche characteristics. This power MOSFET is usually used at high speed switching applications in power supplies, PWM motor controls, high efficient DC to DC converters and bridge circuits.

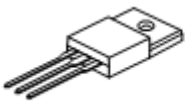
2. Features

- 600V, $R_{DS(ON)}$ =2.1Ω@ V_{GS}=10V
- Ultra low gate charge (typ Qg=15.5nC)
- Low Reverse capacitance (typ C_{rss}=8pF)
- 100% avalanche tested
- RoHS compliant

3. Pin configuration


TO-252


TO-220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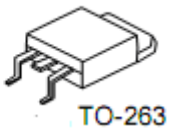
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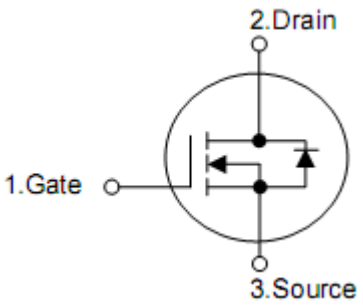


Pin	Function
1	Gate
2	Drain
3	Source

4. Absolute maximum ratings

(TC= 25 ºC , unless otherwise specified)

Parameter		Symbol	Rating	Units
Drain-source voltage		V_{DSS}	600	V
Drain current	Tc=25 ºC	I_D	4	A
	Tc=100 ºC		2.5	A
Drain current pulsed (note 1)		I_{DM}	16	A
Gate current voltage		V_{GSS}	±30	V
Single pulsed avalanche energy (note 2)		E_{AS}	260	mJ
Avalanche current (note 1)		I_{AR}	4.4	A
Repetitive avalanche energy (note 1)		E_{AR}	10.6	mJ
Peak diode recovery dv/dt (note 3)		dv/dt	4.5	V/ns
Power dissipation	Tc=25 ºC	P_D	75	W
	derate above 25 ºC		0.59	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

5. Thermal characteristics

Parameter	Symbol	Rating	Unit
Thermal resistance,Junction-to-case	$R_{\theta JC}$	2.5	ºC /W
Thermal resistance,Junction-to-ambient	$R_{\theta JA}$	83	ºC /W

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, T_J=25ºC	600			V
Breakdown voltage temperature coefficient		$\Delta BV_{DSS}/\Delta T_J$	I_D=250μA, referenced to 25 ºC		0.6		V/ºC
Zero gate voltage drain current		I_{DSS}	V_{DS}=600V ,V_{GS}=0V			1	μA
			V_{DS}=480V ,T_C=125 ºC			10	μA
Gate-body leakage current	Forward	I_{GSSF}	V_{GS}=30V,V_{DS}=0V			100	nA
	Reverse	I_{GSSR}	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=2.0A		2.1	2.4	Ω
Forward transconductance		g_{FS}	V_{DS}=100V, I_D=2.4A (note 4)	2.9			S
Dynamic characteristics							
Input capacitance		C_{iss}	V_{DS}=25V,V_{GS}=0V,f=1.0MHz		650	800	pF
Output capacitance		C_{oss}			70	90	pF
Reverse transfer capacitance		C_{rss}			8	11	pF
Switching characteristics							
Turn-on delay time		$t_{d(on)}$	V_{DD}=300V,I_D=4.0A,R_G=25Ω (note4,5)		16	45	ns
Turn-on rise time		t_r			45	100	ns
Turn-off delay time		$t_{d(off)}$			36	85	ns
Turn-off fall time		t_f			30	70	ns
Total gate charge		Q_g	V_{DS}=480V, I_D=4.0A ,V_{GS}=10V, (note4,5)		15.5	21	nC
Gate-source charge		Q_{gs}			2.4		nC
Gate-drain charge		Q_{gd}			7.1		nC
Drain-source diode characteristics and maximum rating							
Maximum continuous drain-source diode forward current		I_S				4.4	A
Maximum pulsed drain-source diode forward current		I_{SM}				17.6	A
Drain-source diode forward voltage		V_{SD}	V_{GS}=0V,I_S=4.0A			1.4	V
Reverse recovery time		t_{rr}	V_{GS}=0V,I_S=4.0A di/dt=100A/μs (note4)		277		ns
Reverse recovery charge		Q_{rr}			2.07		μC

Note:1.repetitive rating:pulse width limited by maximum junctio/n temperature

2.I_{AS}=4.0A,V_{DD}=50V,R_G=25Ω,staring T_J=25ºC

3.I_{SD}≤4.0A,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

Figure 1. On-Region Characteristics

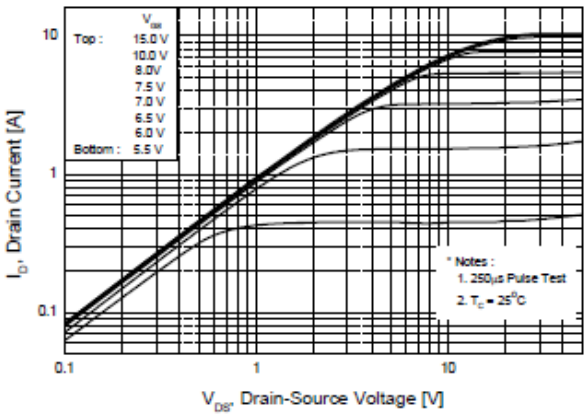


Figure 2. Transfer Characteristics

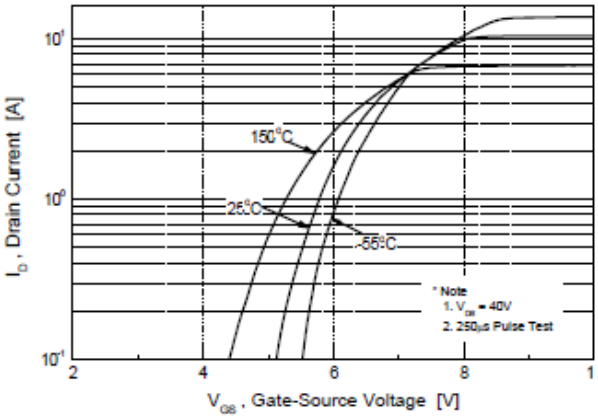


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

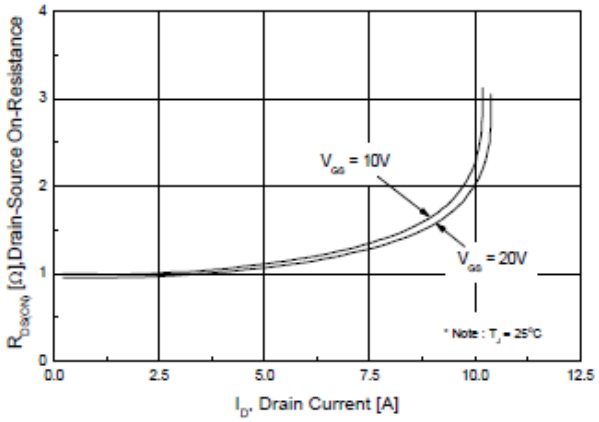


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperatue

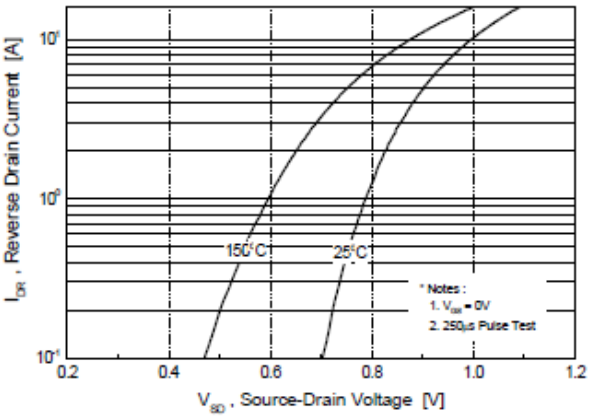


Figure 5. Capacitance Characteristics

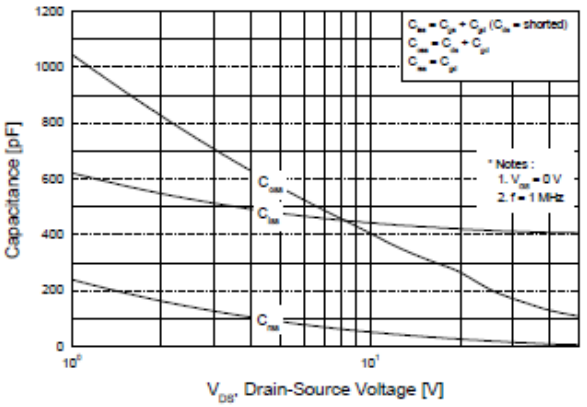


Figure 6. Gate Charge Characteristics

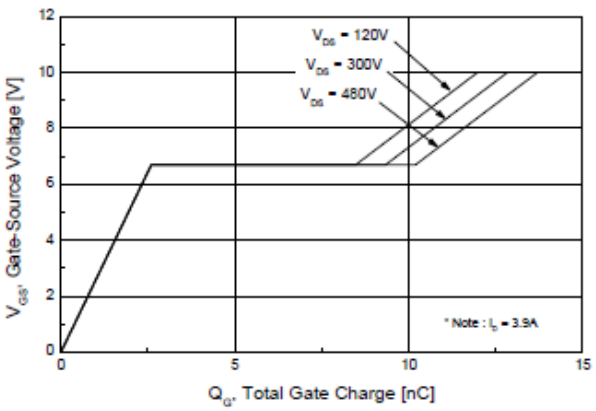


Figure 7. Breakdown Voltage Variation vs. Temperature

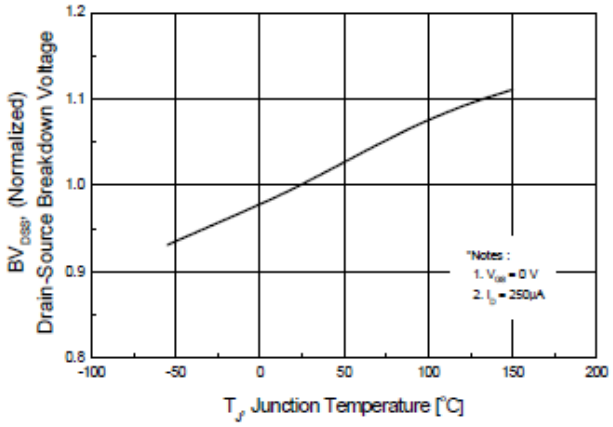


Figure 8. On-Resistance Variation vs. Temperature

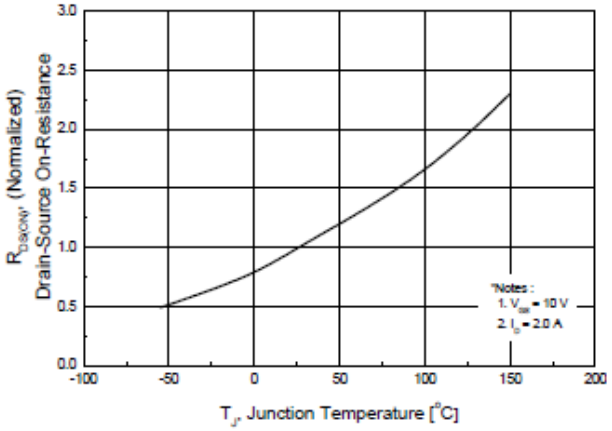


Figure 9. Maximum Safe Operating Area

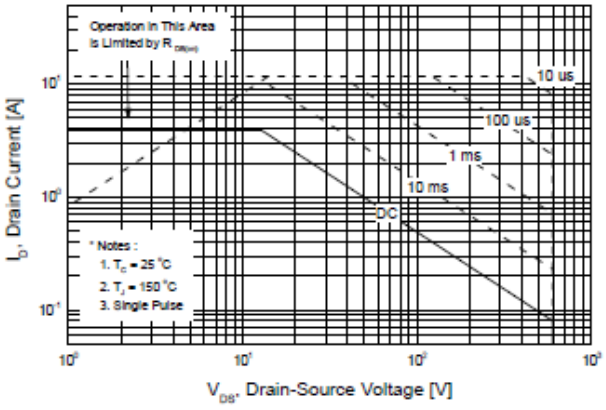


Figure 10. Maximum Drain Current vs. Case Temperature

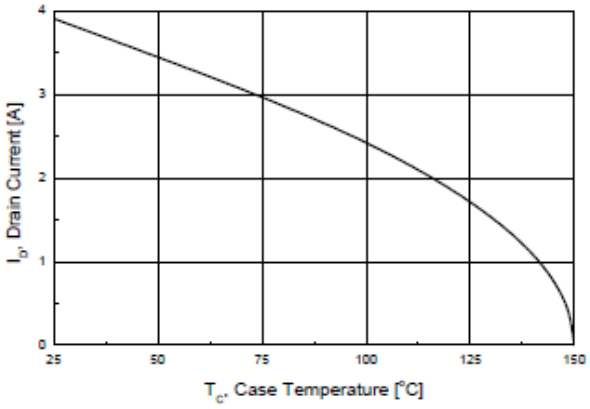
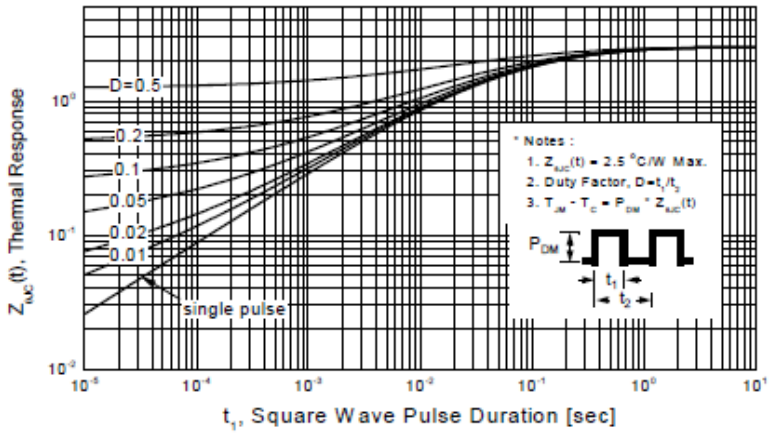
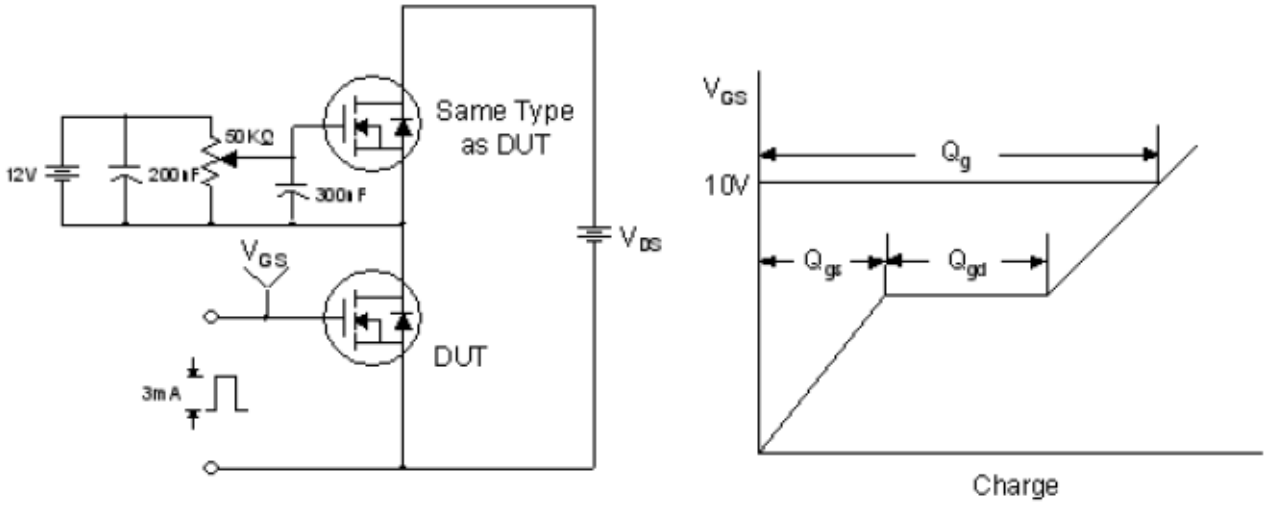


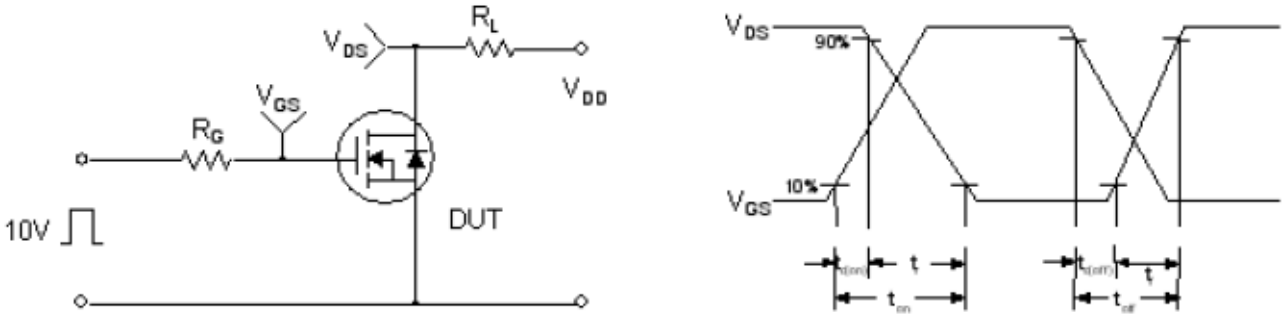
Figure 11-1. Transient Thermal Response Curve



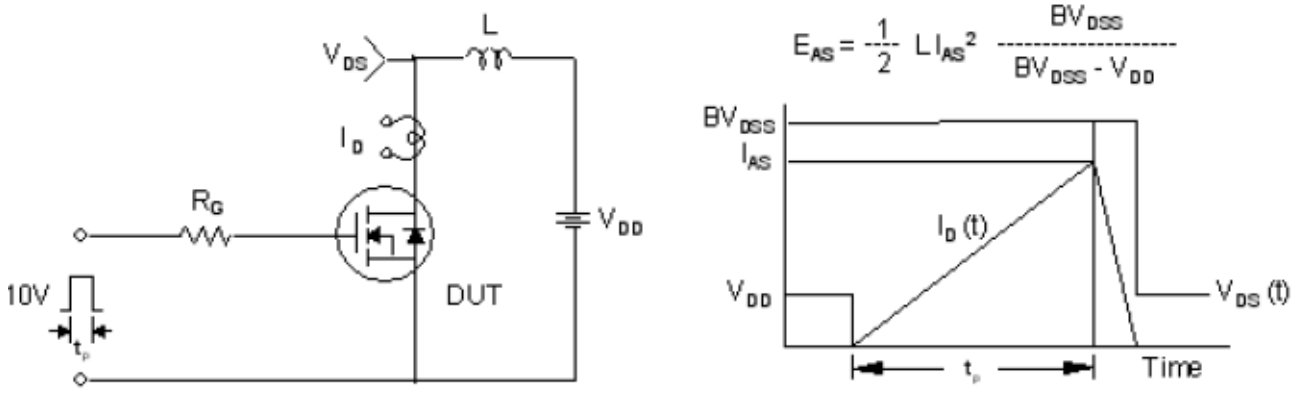
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



Peak Diode Recovery dv/dt Test Circuit & Waveforms