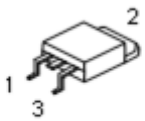
1. Description

This Power MOSFET is produced using KIA advanced Super-Junction technology.This advanced technology has been especially tailored to minimize conduction loss, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for AC/DC power conversion in switching mode operation for higher efficiency.

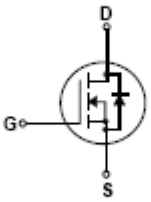
2. Features

- $R_{DS(on)}$=0.34Ω@VGS = 10 V
- Low gate charge (typical 33 nC)
- High ruggedness
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability

3. Pin configuration



TO-252



Pin	Function
1	Gate
2	Drain
3	Source

4. Absolute maximum ratings

(T_C= 25 ºC , unless otherwise noted)

Parameter		Symbol	Ratings	Units
Drain-source voltage		V_{DSS}	600	V
Drain current	T_C=25°C	I_D	11*	A
	T_C=100°C		6.7*	A
Drain current (note1)		I_{DM}	30*	A
Gate-source Voltage		V_{GSS}	± 30	V
Single pulsed avalanche energy (note2)		E_{AS}	132	mJ
Avalanche current (note1)		I_{AR}	2.1	A
Repetitive avalanche energy (note1)		E_{AR}	65	mJ
Peak diode recovery dv/dt (note 3)		dv/dt	5.0	V/ns
Power dissipation	T_C=25°C	P_D	125	W
	Derate above 25°C		1.0	W/°C
Operating and storage temperature range		T_J, T_{STG}	-55 to +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	60R380DS	Units
Thermal resistance, junction-to-case	$R_{\theta JC}$	0.6	°C/W
Thermal resistance, case-to-sink Typ.	$R_{\theta CS}$	1.0	°C/W
Thermal resistance, junction-to-ambient	$R_{\theta JA}$	62	°C/W

6. Electrical characteristics

(T_C=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=125°C	-	-	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
Breakdown voltage temperature coefficient		$\triangle BV_{DSS}/\triangle T_J$	I_D=250μA Referenced to 25°C	-	0.6	-	V/°C
On characteristics							
Gate threshold voltage		$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=250μA	2.5	-	4.5	V
Static drain-source on-resistance		$R_{DS(on)}$	V_{GS}=10V,I_D=5.5A	-	0.34	0.38	Ω
Forward transconductance		g_{FS}	V_{DS}=40V,I_D=5.5A (note4)	-	16	-	S
Dynamic characteristics							
Input capacitance		C_{ISS}	V_{DS}=25V,V_{GS}=0V, f=1.0MHz	-	680	-	pF
Output capacitance		C_{OSS}		-	140	-	pF
Reverse transfer capacitance		C_{RSS}		-	5	-	pF
Switching characteristics							
Turn-on delay time		$t_{D(ON)}$	V_{DD}=400V,I_D=5.5A, R_G=20Ω (note4, 5)	-	26	-	ns
Rise time		t_R		-	60	-	ns
Turn-off delay time		$t_{D(OFF)}$		-	75	-	ns
Fall time		t_F		-	44	-	ns
Total gate charge		Q_G	V_{DS}=480V, I_D=11A, V_{GS}=10V (note4, 5)	-	33	-	nC
Gate-source charge		Q_{GS}		-	4	-	nC
Gate-drain charge		Q_{GD}		-	4.2	-	nC
Drain-source diode characteristics and maximum ratings							
Maximum continuous drain-source diode forward current		I_S		-	-	11	A
Maximum pulsed drain-source diode forward current		I_{SM}		-	-	30	A
Drain-source diode forward voltage		V_{SD}	V_{GS}=0V,I_S=11A	-	-	1.5	V
Reverse recovery time		t_{RR}	V_{GS}=0V,I_S=11A, dI_F/dt=100A/μs (note 4)	-	270	-	ns
Reverse recovery charge		Q_{RR}		-	3.3	-	μC

Note：1. Repetitive rating : pulse width limited by maximum junction temperature
2. I_{AS} = 2.1A, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25°C
3. I_{SD}≤10A, 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

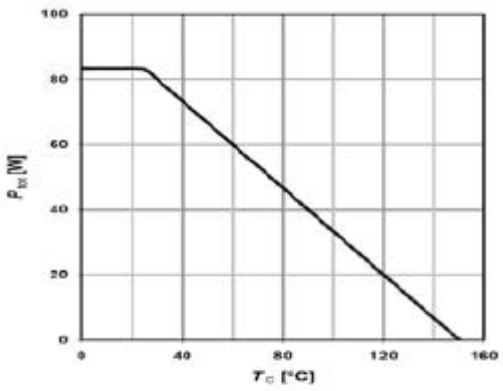


Figure 1. Power Dissipation for TO-251, TO-252

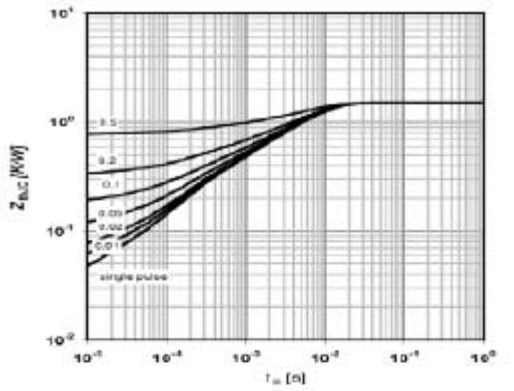


Figure 2. Transient Thermal Response Curve for TO-251,TO-252

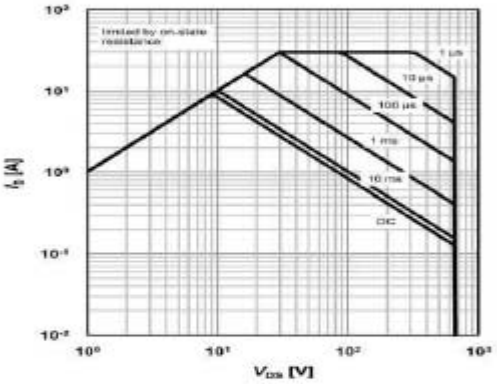


Figure 3. Maximum Safe Operating Area for TO-251,TO-252@25℃

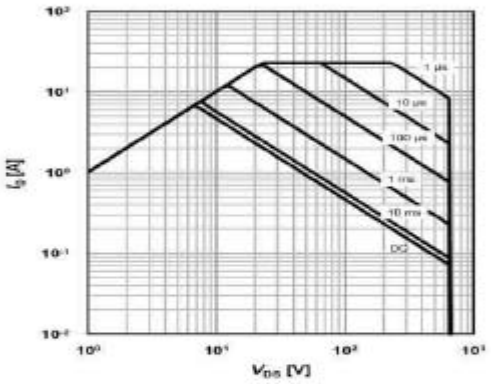


Figure 4. Maximum Safe Operating Area for TO-251,TO-252@80℃

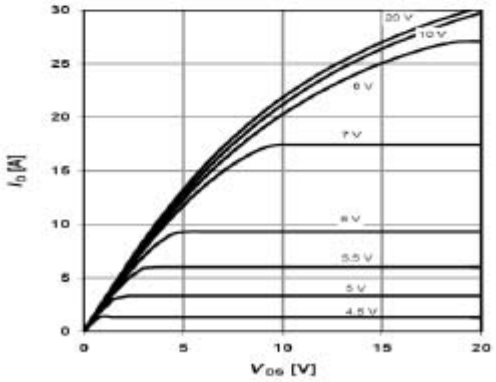


Figure 5. Output Characteristics@25℃

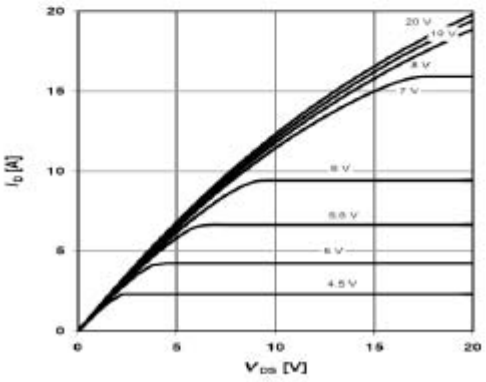


Figure 6. Output Characteristics@125℃

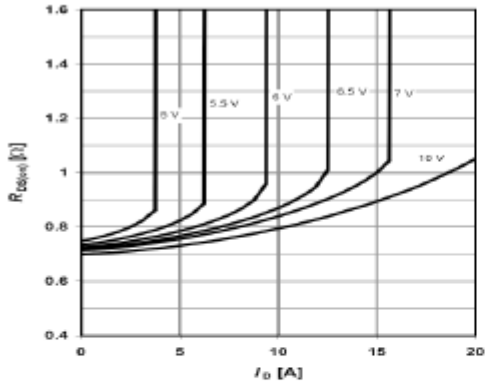


Figure 7. On-Resistance Variation vs Drain Current and Gate Voltage@125℃

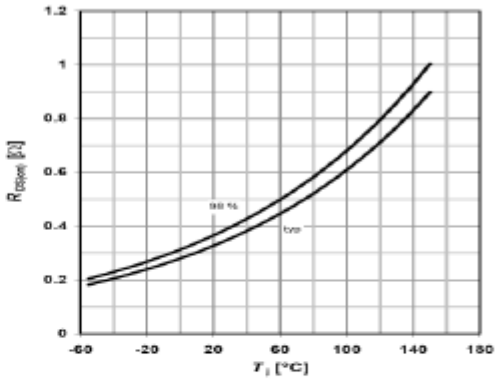


Figure 8. On-Resistance Variation vs Temperature

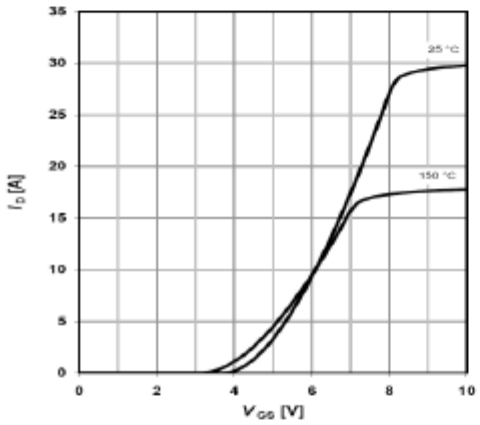


Figure 9. Transfer characteristics

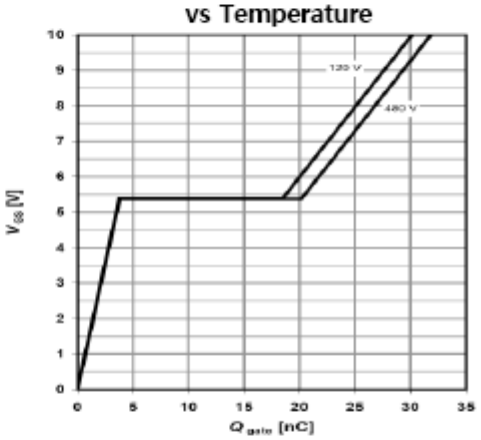


Figure 10. Gate charge

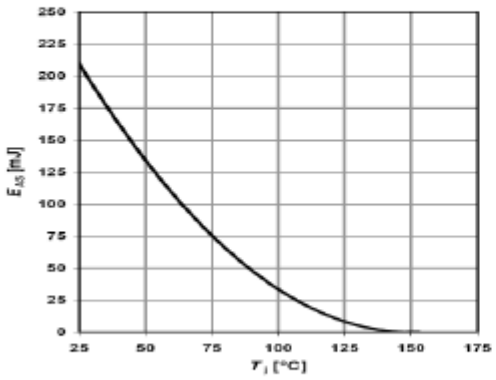


Figure 11. Avalanche Energy Characteristics

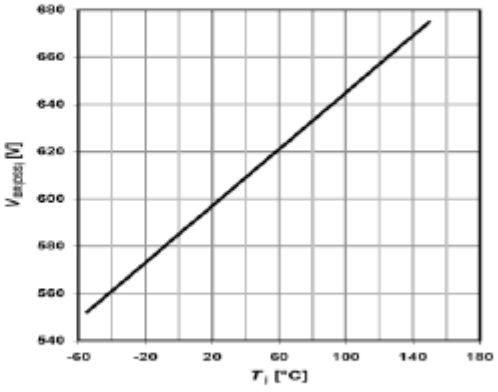


Figure 12. Breakdown Voltage Variation vs Temperature

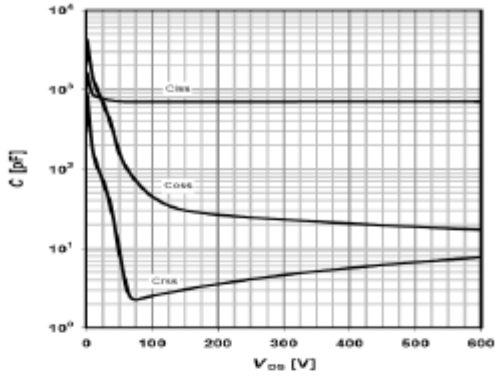


Figure 13. Capacitance Characteristics

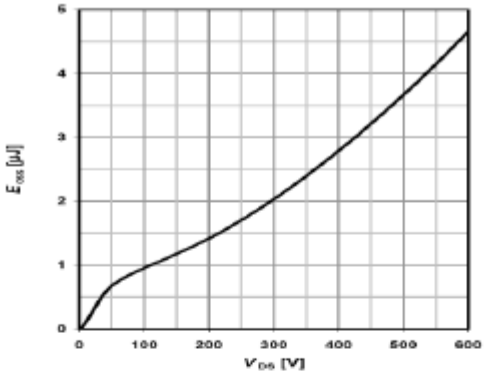


Figure 14. On-Resistance Variation vs Temperature

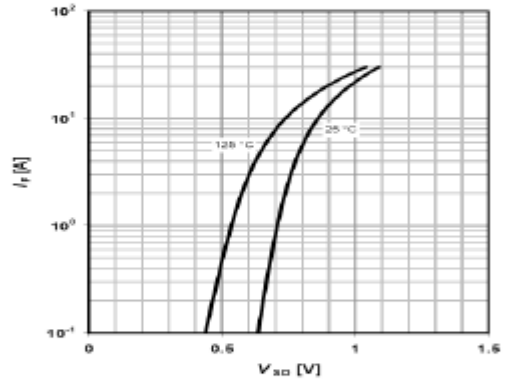
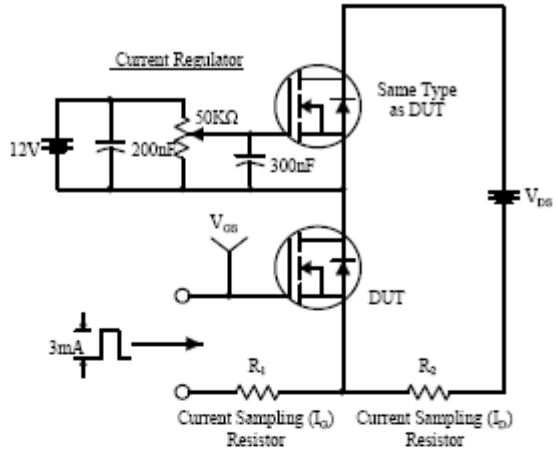
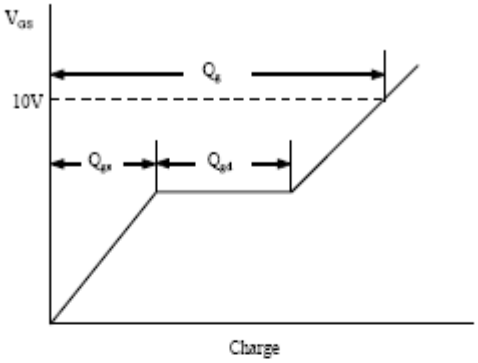


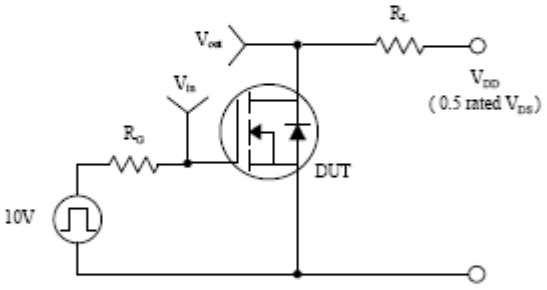
Figure 15. Body Diode Forward Voltage Variation with Source Current and Temperature

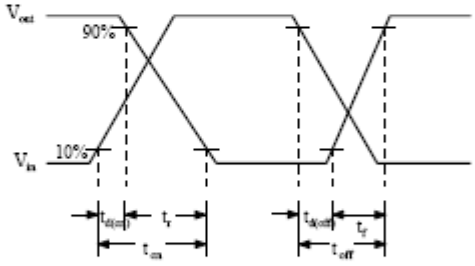
Gate Charge Test Circuit & Waveform



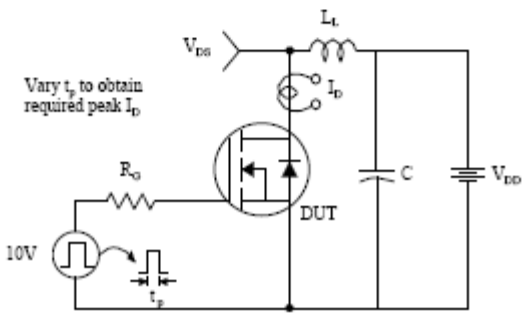


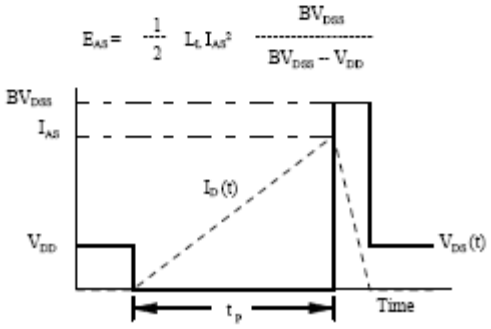
Resistive Switching Test Circuit & Waveforms





Unclamped Inductive Switching Test Circuit & Waveforms





Peak Diode Recovery dv/dt Test Circuit & Waveforms