

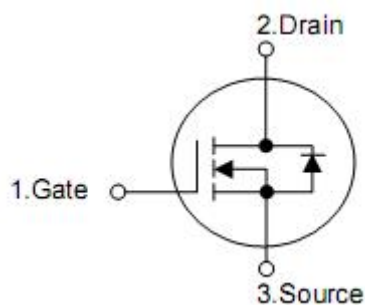
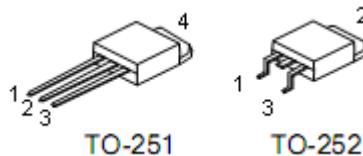
## 1. Description

This Power MOSFET is produced using KIA semi's 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

- n  $R_{DS(on)}=0.38\Omega$  @  $V_{GS}=10V$
- n Low gate charge ( typical 33nC)
- 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<sub>C</sub>= 25 °C , unless otherwise noted)

Parameter	Symbol	Rating	Units
Drain-source voltage	V <sub>DSS</sub>	650	V
Gate-source voltage	V <sub>GSS</sub>	±30	V
Drain current continuous	I <sub>D</sub>	T <sub>C</sub> =25°C	11*
		T <sub>C</sub> =100°C	6.7*
Drain current pulsed (note1)	I <sub>DM</sub>	30*	A
Avalanche energy	Repetitive (note1)	E <sub>AR</sub>	65
	Single pulse (note2)	E <sub>AS</sub>	132
Avalanche energy(note1)	I <sub>AR</sub>	2.1	A
Peak diode recovery dv/dt (note3)	dv/dt	5.0	V/ns
Total power dissipation	P <sub>D</sub>	T <sub>C</sub> =25 °C	125
		derate above 25 °C	1.0
Operating and storage temperature range	T <sub>J</sub> , T <sub>STG</sub>	-55~+150	°C
Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	T <sub>L</sub>	300	°C

\* Drain current limited by maximum junction temperature

## 5. Thermal characteristics

Parameter	Symbol	Rating	Unit
Thermal resistance, Junction-ambient	R <sub>thJA</sub>	62	°C/W
Thermal resistance, case-to-sink typ.	R <sub>thJS</sub>	1.0	°C/W
Thermal resistance, Junction-case	R <sub>thJC</sub>	0.6	°C/W

## 6. Electrical characteristics

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

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Off characteristics						
Drain-source breakdown voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	650	-	-	V
Zero gate voltage drain current	I <sub>DSS</sub>	V <sub>DS</sub> =650V, V <sub>GS</sub> =0V	-	-	1	μA
		V <sub>DS</sub> =480V, 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, referenced to 25°C	-	0.6	-	V/°C
On characteristics						
Gate threshold voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	2.5	-	4.5	V
Static drain-source on-resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =5.5A	-	0.38	0.42	Ω
Forward transconductance	g <sub>FS</sub>	V <sub>DS</sub> =40V, I <sub>D</sub> =5.5A (note4)	-	16	-	S
Dynamic characteristics						
Input capacitance	C <sub>iss</sub>	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1MHz	-	680	-	pF
Output capacitance	C <sub>oss</sub>		-	140	-	pF
Reverse transfer capacitance	C <sub>rss</sub>		-	5	-	pF
Switching characteristics						
Turn-on delay time	t <sub>d(on)</sub>	V <sub>DD</sub> =400V, I <sub>D</sub> =5.5A, R <sub>G</sub> =20Ω (note4,5)	-	26	-	ns
Rise time	t <sub>r</sub>		-	60	-	ns
Turn-off delay time	t <sub>d(off)</sub>		-	75	-	ns
Fall time	t <sub>f</sub>		-	44	-	ns
Total gate charge	Q <sub>g</sub>		V <sub>DS</sub> =480V, I <sub>D</sub> =11A, V <sub>GS</sub> =10V (note4,5)	-	33	-
Gate-source charge	Q <sub>gs</sub>	-		4	-	nC
Gate-drain charge	Q <sub>gd</sub>	-		4.2	-	nC
Drain-source diode characteristics and maximum ratings						
Drain-source diode forward voltage	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>SD</sub> =11A	-	-	1.5	V
Continuous drain-source current	I <sub>S</sub>		-	-	11	A
Pulsed drain-source current	I <sub>SM</sub>		-	-	30	A
Reverse recovery time	t <sub>rr</sub>	V <sub>GS</sub> =0V, I <sub>SD</sub> =4.9A, di <sub>F</sub> /dt=100A/μs (note4)	-	270	-	ns
Reverse recovery charge	Q <sub>rr</sub>		-	3.3	-	μC

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

2. I<sub>AS</sub>=2.1A, L=60mH, V<sub>DD</sub>=150V, R<sub>G</sub>=25Ω, starting T<sub>J</sub>=25°C

3. I<sub>SD</sub>≤10A, 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 typical characteristics.

**Typical Characteristics**

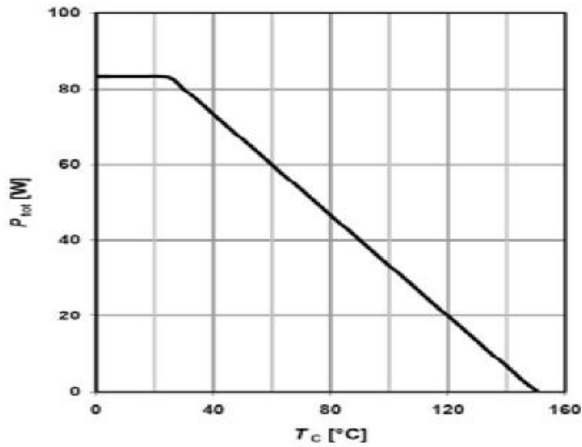


Figure 1. Power Dissipation for TO-251, TO-252

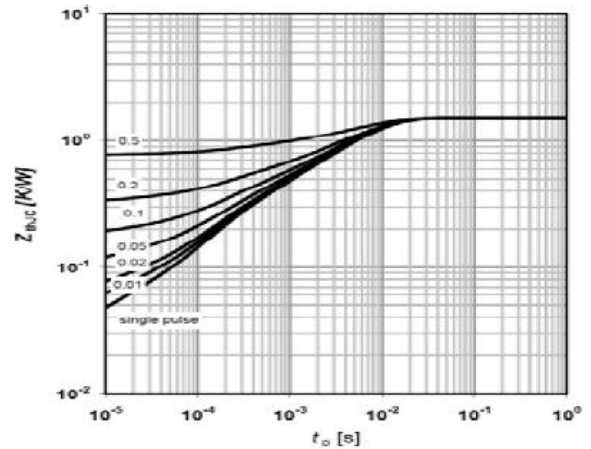


Figure 2. Transient Thermal Response Curve for TO-251, TO-252

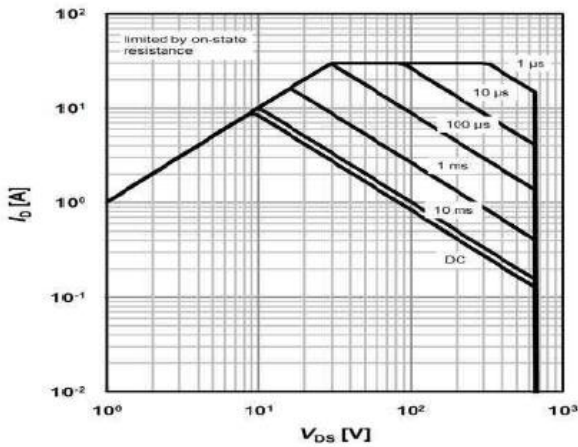


Figure 3. Maximum Safe Operating Area for TO-251, TO-252 @ 25°C

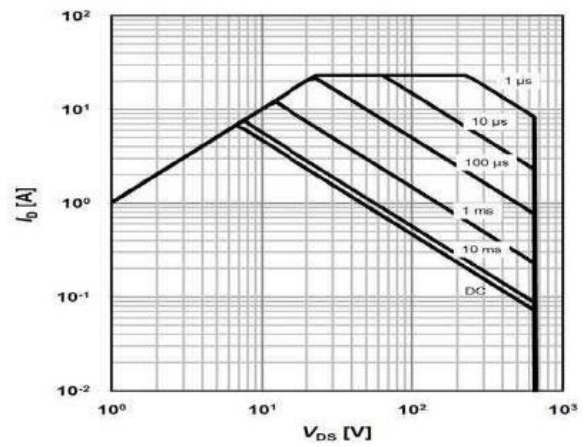


Figure 4. Maximum Safe Operating Area for TO-251, TO-252 @ 80°C

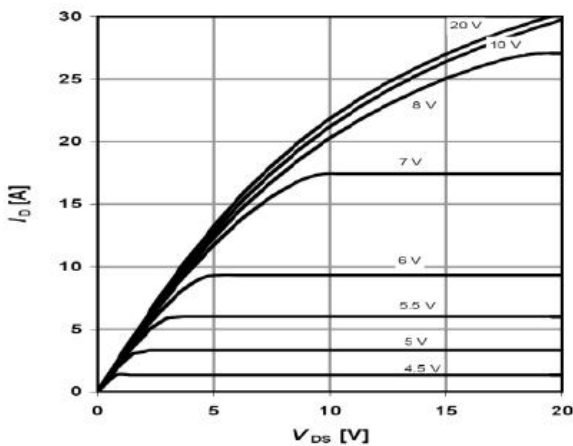


Figure 5. Output Characteristics @ 25°C

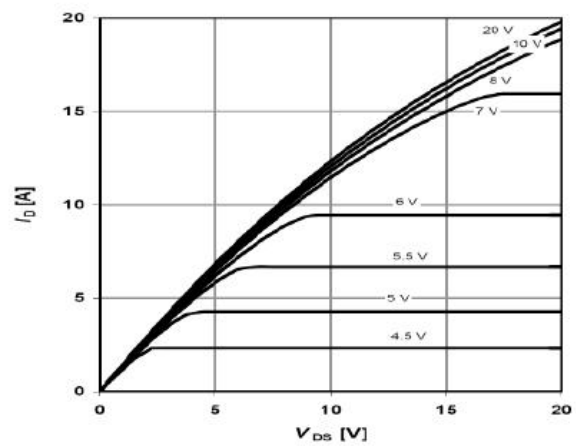
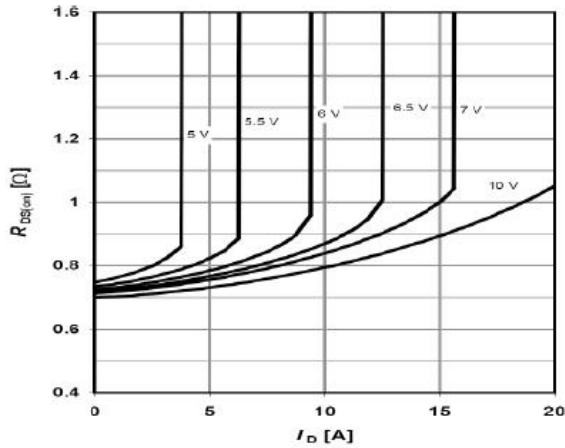
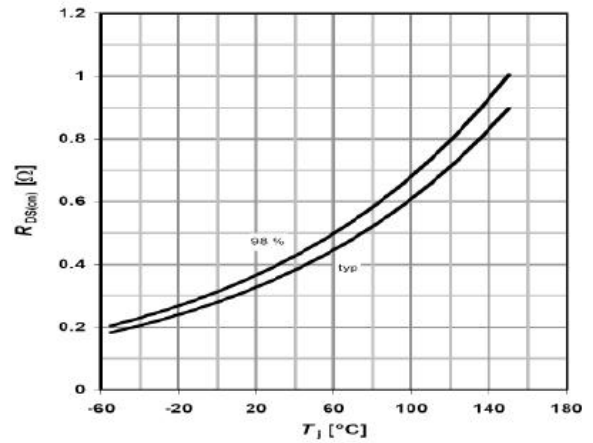


Figure 6. Output Characteristics @ 125°C

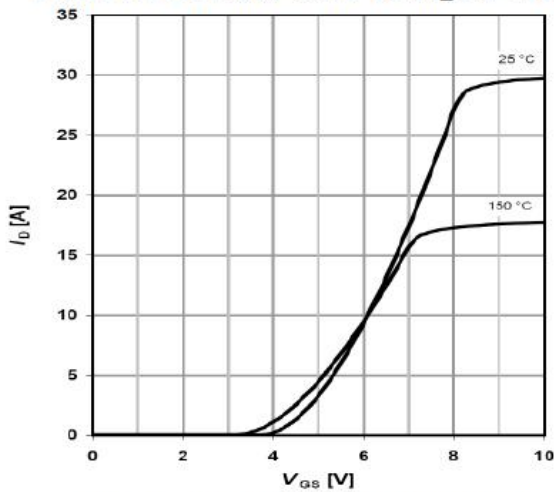
**Typical Characteristics** (Continued)



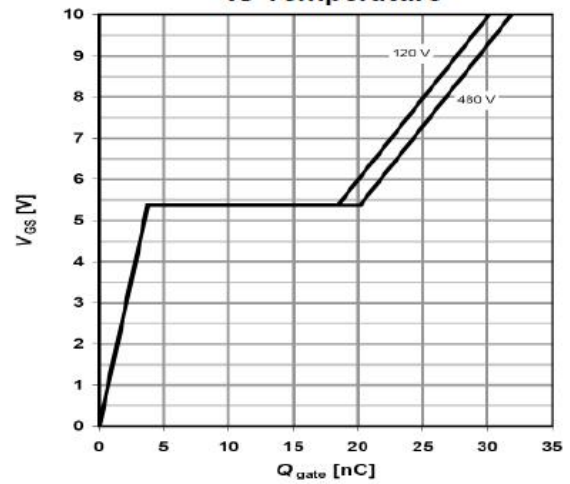
**Figure 7. On-Resistance Variation vs Drain Current and Gate Voltage@125°C**



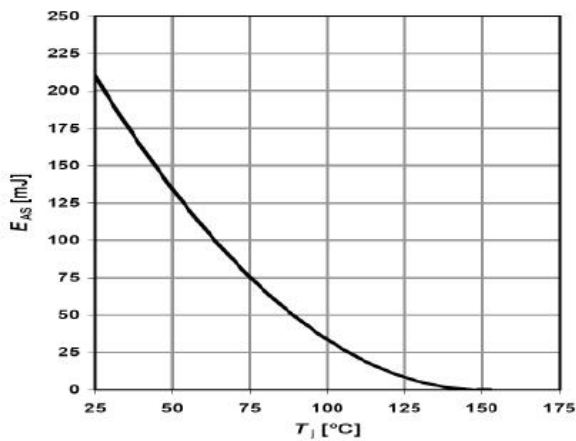
**Figure 8. On-Resistance Variation vs Temperature**



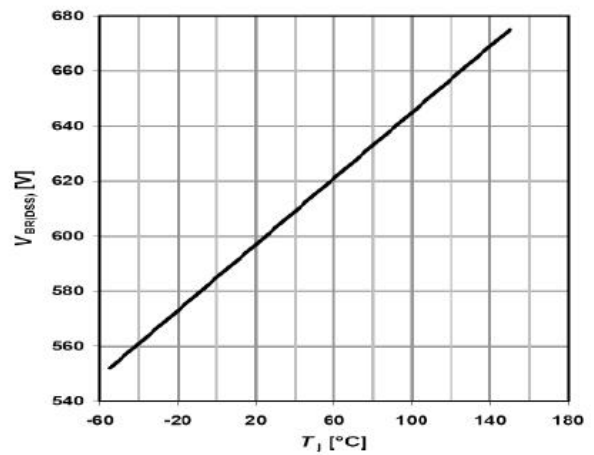
**Figure 9. Transfer characteristics**



**Figure 10. Gate charge**

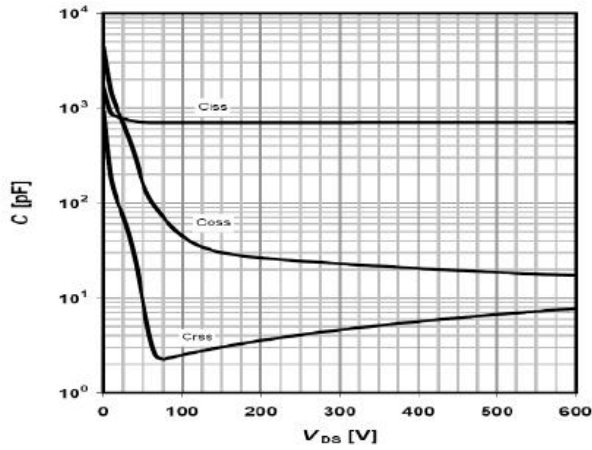


**Figure 11. Avalanche Energy Characteristics**

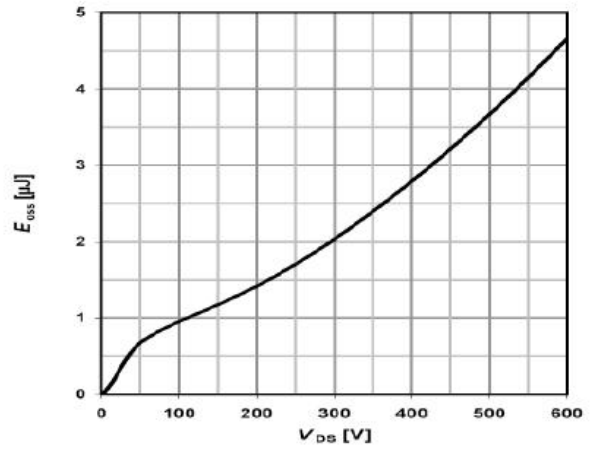


**Figure 12. Breakdown Voltage Variation vs Temperature**

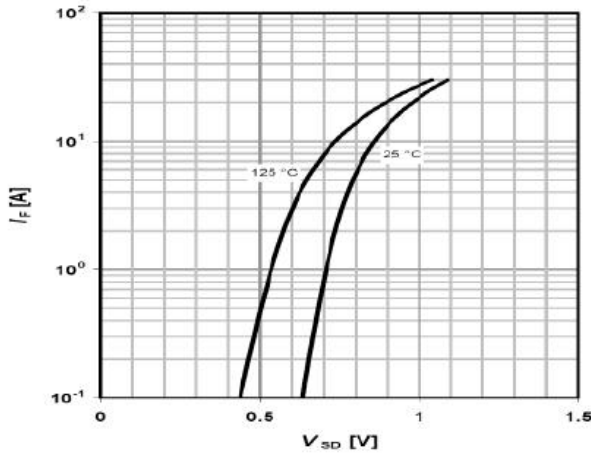
**Typical Characteristics** (Continued)



**Figure 13. Capacitance Characteristics**



**Figure 14. On-Resistance Variation vs Temperature**



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