

## 1. Features

- $R_{DS(ON)}=6.5m\Omega(\text{typ.})@V_{GS}=10V$
- Very Low On-resistance  $R_{DS(ON)}$
- Low  $C_{rss}$
- Fast switching
- 100% avalanche tested
- Improved  $dv/dt$  capability

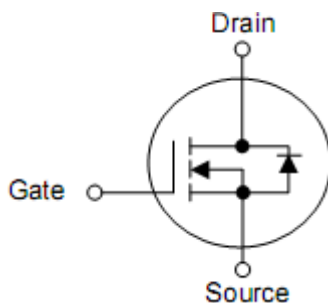
## 2. Applications

- PWM Application
- Power Management
- Load switch

## 3. Symbol



TO-252



Pin	Function
1	Gate
2	Drain
3	Source

## 4. Ordering Information

Part Number	Package	Brand
KIA50N03CD	TO-252	KIA

## 5. Absolute maximum ratings

$T_C=25^\circ\text{C}$  unless otherwise noted

Parameter	Symbol	Rating	Units	
Drain-source voltage	$V_{DSS}$	30	V	
Continuous drain current	$T_C=25^\circ\text{C}$	$I_D$	40	A
	$T_C=100^\circ\text{C}$	$I_D$	24	A
Pulsed drain current -Pulsed <sup>1)</sup>	$I_{DM}$	120	A	
Gate-source voltage	$V_{GS}$	$\pm 20$	V	
Single pulse avalanche energy <sup>2)</sup>	$E_{AS}$	121	mJ	
Repetitive Avalanche Energy	$E_{AR}$	25	mJ	
Peak diode recovery dv/dt	dv/dt	5	V/ns	
Power dissipation ( $T_C=25^\circ\text{C}$ )	$P_D$	36	W	
Operating junction and storage temperature range	$T_J, T_{STG}$	-55 to 150	$^\circ\text{C}$	
Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	$T_L$	300	$^\circ\text{C}$	

\*Drain current limited by maximum junction temperature.

## 6. Thermal characteristics

Parameter	Symbol	Rating	Unit
Thermal resistance junction-case	$R_{\theta JC}$	3.47	$^\circ\text{C/W}$

## 7. Electrical characteristics

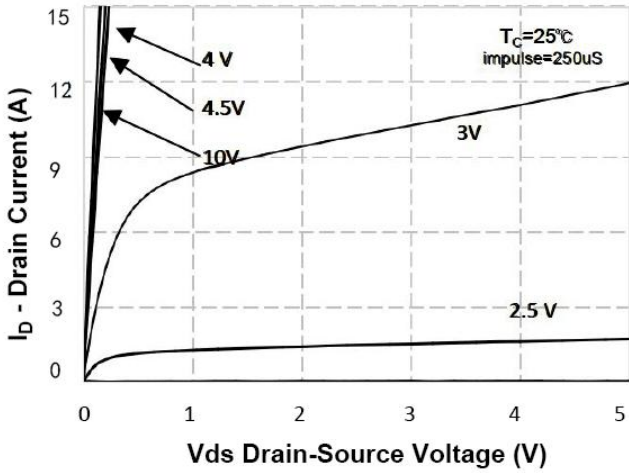
(T<sub>C</sub>=25°C, unless otherwise noted)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Drain-source breakdown voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	30	-	-	V
Drain-source leakage current	I <sub>DSS</sub>	V <sub>DS</sub> =30V, V <sub>GS</sub> =0V	-	-	1	μA
		V <sub>DS</sub> =24V, T <sub>C</sub> =125°C	-	-	10	μA
Gate-source forward leakage	I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	-	-	±100	nA
Gate threshold voltage	V <sub>GS(TH)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> =250μA	1.1	1.6	2.2	V
Drain-source on-resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =15A	-	6.5	8.5	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =15A	-	10	13	mΩ
Input capacitance	C <sub>iss</sub>	V <sub>DS</sub> =15V, V <sub>GS</sub> =0V f=1MHz	-	1271	-	pF
Output capacitance	C <sub>oss</sub>		-	130	-	pF
Reverse transfer capacitance	C <sub>rss</sub>		-	112	-	pF
Turn-on delay time	t <sub>d(on)</sub>	V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, R <sub>G</sub> =3Ω, I <sub>D</sub> =15A <sup>3)</sup>		13		ns
Rise time	t <sub>r</sub>			19		ns
Turn-off delay time	t <sub>d(off)</sub>			27		ns
Fall time	t <sub>f</sub>			20		ns
Total gate charge(10V)	Q <sub>g</sub>	V <sub>DS</sub> =15V, I <sub>D</sub> =15A V <sub>GS</sub> =10V <sup>3)</sup>	-	21	-	nC
Gate-source charge	Q <sub>gs</sub>		-	4.5	-	nC
Gate-drain charge	Q <sub>gd</sub>		-	3.2	-	nC
Maximum Continuous Drain-Source Diode Forward Current	I <sub>S</sub>	—	-	-	40	A
Maximum Pulsed Drain-Source Diode Forward Current	I <sub>SM</sub>	—	-	-	120	A
Diode forward voltage	V <sub>SD</sub>	I <sub>SD</sub> =15A, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C	-	-	1.2	V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> =15A, di/dt=100A/μs	-	20	-	nS
Reverse Recovery Charge	Q <sub>rr</sub>		-	23	-	nC

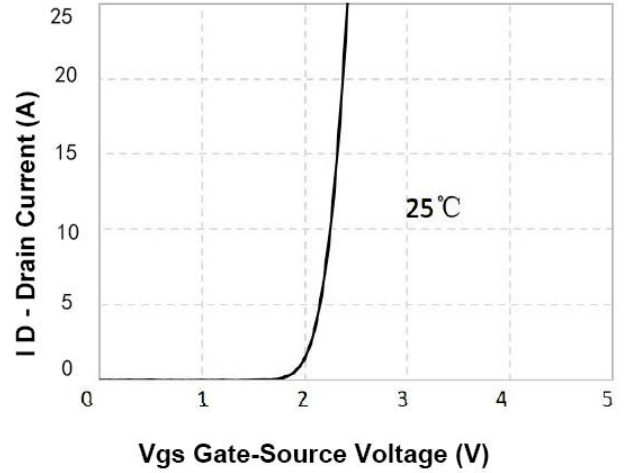
Note:

1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature
2. EAS condition : T<sub>J</sub>=25°C, V<sub>DD</sub>=15V, V<sub>G</sub>=10V, L=0.5mH, R<sub>G</sub>=25Ω
3. Pulse Test: Pulse Width≤300μs, Duty Cycle≤0.5%

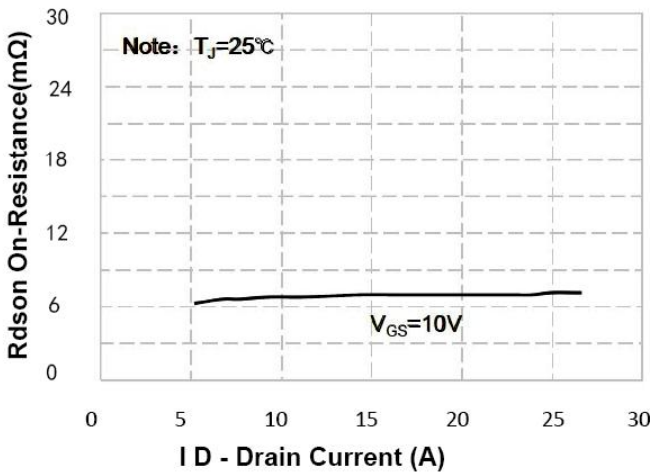
**8. Typical operating characteristics**



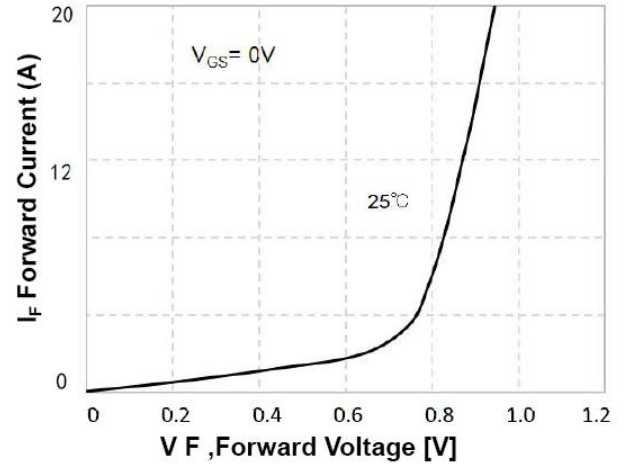
**Figure 1. On-Region Characteristics**



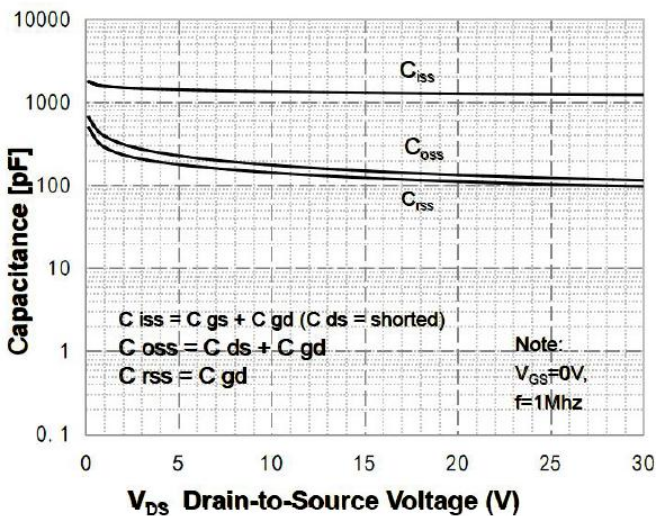
**Figure 2. Transfer Characteristics**



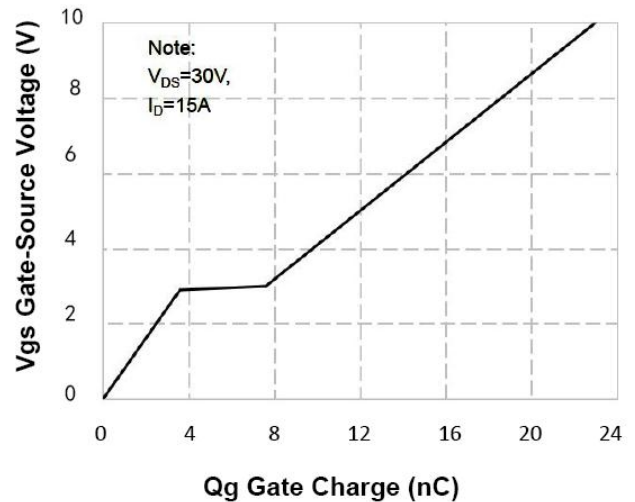
**Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage**



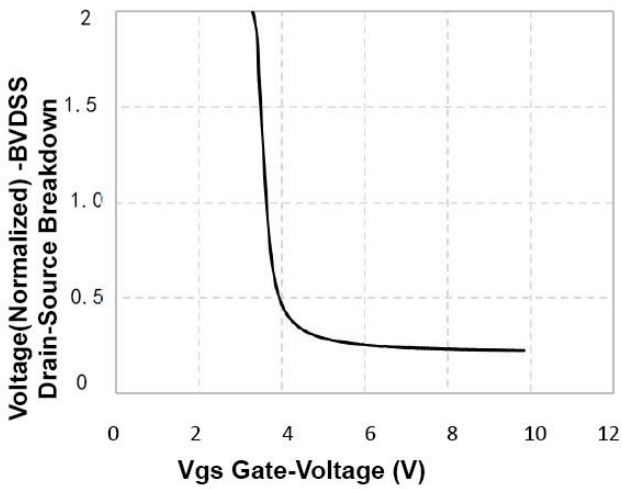
**Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature**



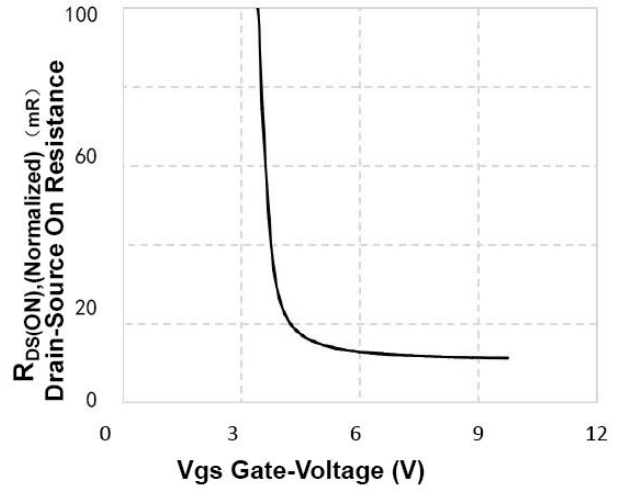
**Figure 5. Capacitance Characteristics**



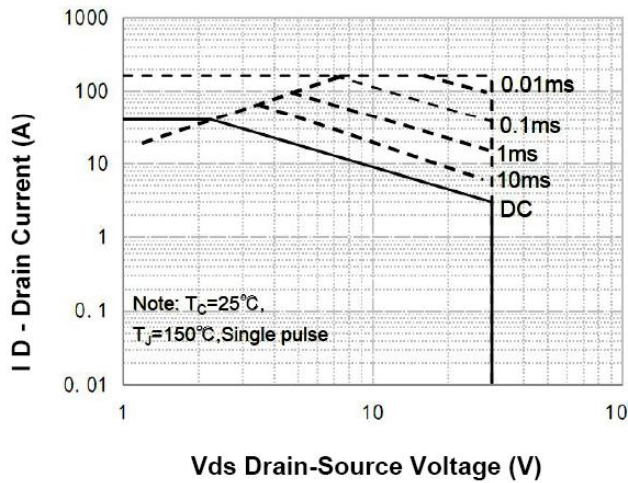
**Figure 6. Gate Charge Characteristics**



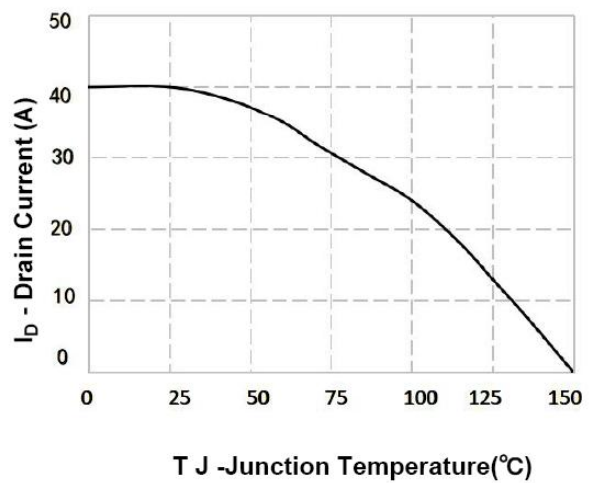
**Figure 7. Breakdown Voltage Variation vs Gate-Voltage**



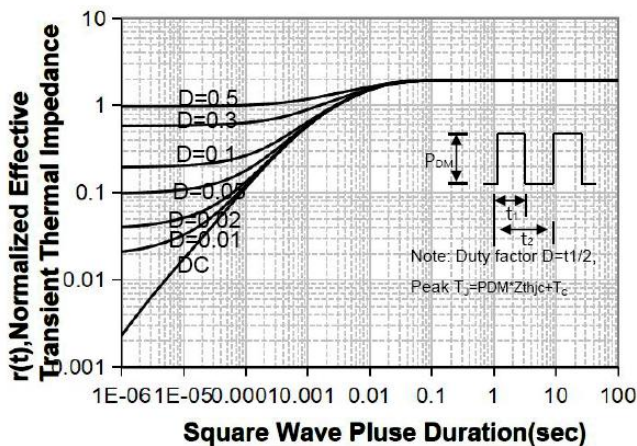
**Figure 8. On-Resistance Variation vs Gate Voltage**



**Figure 9. Maximum Safe Operating Area**



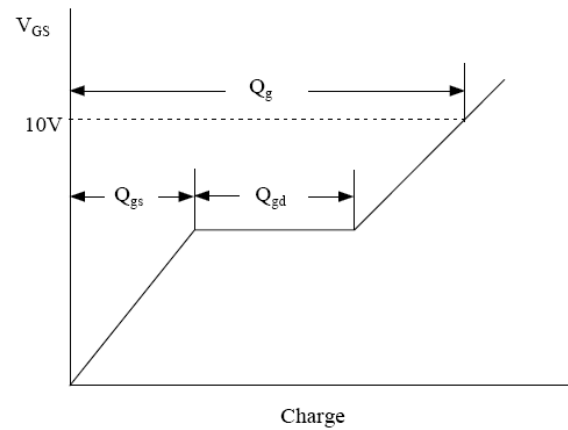
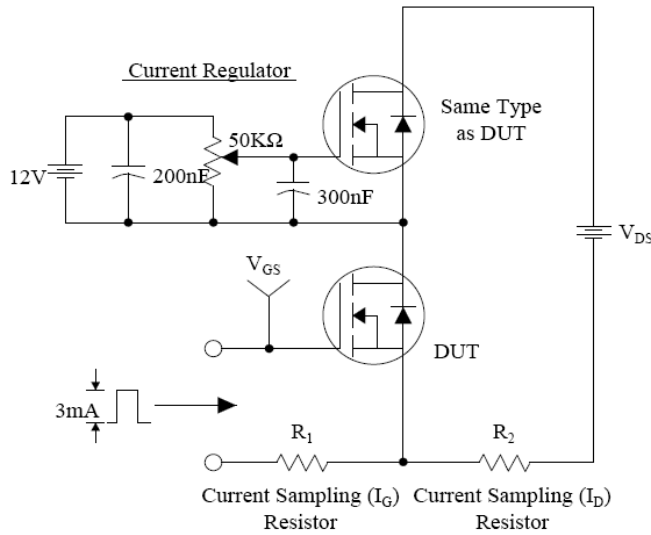
**Figure 10. Maximum PContinuous Drain Current vs Case Temperature**



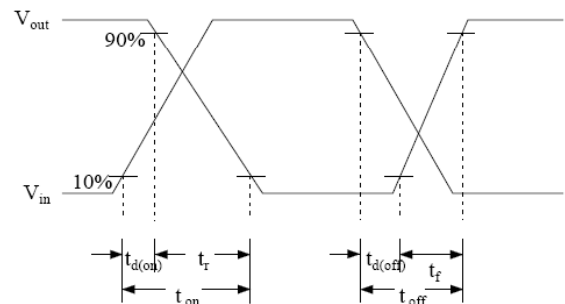
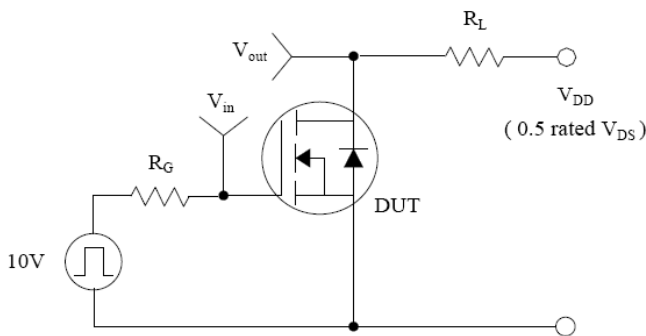
**Figure 11. Transient Thermal Response Curve**

**9. Test Circuits and Waveforms**

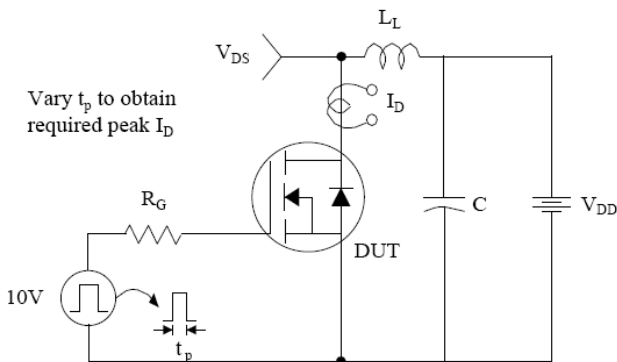
**Gate Charge Test Circuit & Waveform**



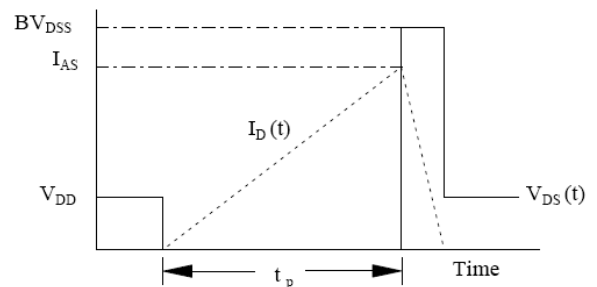
**Resistive Switching Test Circuit & Waveforms**



**Unclamped Inductive Switching Test Circuit & Waveforms**



$$E_{AS} = \frac{1}{2} L_L I_{AS}^2$$



## Peak Diode Recovery dv/dt Test Circuit & Waveforms

