

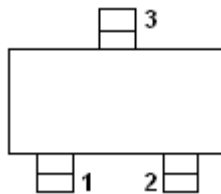
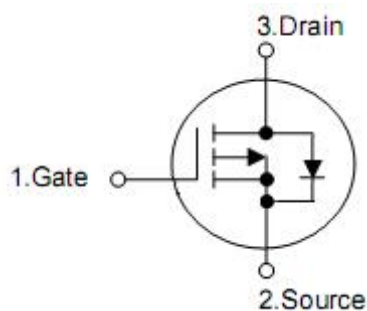
## 1. Description

The KIA3415 uses advanced trench technology to provide excellent  $R_{DS(on)}$ , low gate charge and operation with gate voltages as low as 1.8V. This device is suitable for use as a load switch or in PWM applications. Standard Product KIA3415 is Pb-free (meets ROHS & Sony 259 specifications). KIA3415 is a Green Product ordering option. KIA3415 is electrically identical.

## 2. Features

- n  $V_{DS}(V) = -16V$
- n  $I_D = -4.0A$
- n  $R_{DS(on)} < 45m\Omega (V_{GS} = -4.5V, I_D = -4.0A)$
- n  $R_{DS(on)} < 54m\Omega (V_{GS} = -2.5V, I_D = -2.5A)$
- n  $R_{DS(on)} < 75m\Omega (V_{GS} = -1.8V, I_D = -2.0A)$

## 3. Symbol



Pin	Function
1	Gate
2	Source
3	Drain

#### 4. Absolute maximum ratings

( $T_A=25^{\circ}\text{C}$ , unless otherwise noted)

Parameter	Symbol	Rating	Units
Drain-source voltage	$V_{DS}$	-16	V
Gate-source voltage	$V_{GS}$	$\pm 8$	V
Continuous drain current <sup>A</sup>	$I_D$	$T_A=25^{\circ}\text{C}$	-4.0
		$T_A=70^{\circ}\text{C}$	-3.5
Pulsed drain current <sup>B</sup>	$I_{DM}$	-30	A
Total power dissipation <sup>A</sup>	$P_D$	$T_A=25^{\circ}\text{C}$	1.4
		$T_A=70^{\circ}\text{C}$	0.9
Junction and storage temperature range	$T_J, T_{STG}$	-55 to 150	$^{\circ}\text{C}$

#### 5. Thermal characteristics

Parameter	Symbol	Typ	Max	Unit
Maximum junction-ambient <sup>A</sup> ( $t \leq 10\text{s}$ )	$R_{\theta JA}$	65	90	$^{\circ}\text{C}/\text{W}$
Maximum junction-ambient <sup>A</sup>	$R_{\theta JA}$	85	125	$^{\circ}\text{C}/\text{W}$
Maximum junction-Lead <sup>C</sup>	$R_{\theta JL}$	43	60	$^{\circ}\text{C}/\text{W}$

## 6. Electrical characteristics

( $T_A=25^\circ\text{C}$ , unless otherwise noted)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Drain-source breakdown voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=-250\mu A$	-16	-	-	V
Zero gate voltage drain current	$I_{DSS}$	$V_{DS}=-12V, V_{GS}=0V$	-	-	-50	nA
Gate- body leakage current	$I_{GSS}$	$V_{GS}=\pm 8V, V_{DS}=0V$	-	-	$\pm 100$	nA
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-0.4	-0.55	-0.8	V
On state drain current	$I_{D(on)}$	$V_{GS}=-4.5V, V_{DS}=-5V$	-25	-	-	A
Static drain-source on-resistance	$R_{DS(on)}$	$V_{GS}=-4.5V, I_D=-4.0A$	-	40	45	m $\Omega$
		$V_{GS}=-2.5V, I_D=-2.5A$	-	50	54	
		$V_{GS}=-1.8V, I_D=-2.0A$	-	70	75	
Forward transconductance	$g_{fs}$	$V_{DS}=-5.0V, I_D=-4A$	8	16	-	S
Diode forward voltage	$V_{SD}$	$V_{GS}=0V, I_S=-1A$	-	-0.78	-1.28	V
Maximum body-diode continuous current	$I_S$		-	-	-2.2	A
Input capacitance	$C_{iss}$	$V_{DS}=-10V, V_{GS}=0V,$ $f=1\text{MHz}$	-	1450	-	pF
Output capacitance	$C_{oss}$		-	205	-	
Reverse transfer capacitance	$C_{rss}$		-	160	-	
Gate resistance	$R_g$	$V_{DS}=0V,$ $V_{GS}=0V, f=1\text{MHz}$	-	6.5	-	$\Omega$
Total gate charge	$Q_g$	$V_{DS}=-10V, V_{GS}=-4.5V$ $I_D=-4.0A$	-	17.2	-	nC
Gate-source charge	$Q_{gs}$		-	1.3	-	
Gate-drain charge	$Q_{gd}$		-	4.5	-	
Turn-on delay time	$t_{d(on)}$	$V_{DS}=-10V, R_L=2.5\Omega,$ $R_G=3\Omega, V_{GS}=-4.5V$	-	9.5	-	ns
Rise time	$t_r$		-	17	-	
Turn-off delay time	$t_{d(off)}$		-	94	-	
Fall time	$t_f$		-	35	-	
Reverse recovery time	$t_{rr}$	$I_F=-4A, di/dt=100A/\mu s,$	-	31	-	nS
Reverse recovery charge	$Q_{rr}$		-	13.8	-	nC

Note: A. The value of  $R_{\theta JA}$  is measured with the device mounted on 1 in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A=25^\circ\text{C}$ . The value in any given application depends on the user's specific board design. The current rating is based on the  $t_{\leq 10s}$  thermal resistance rating.

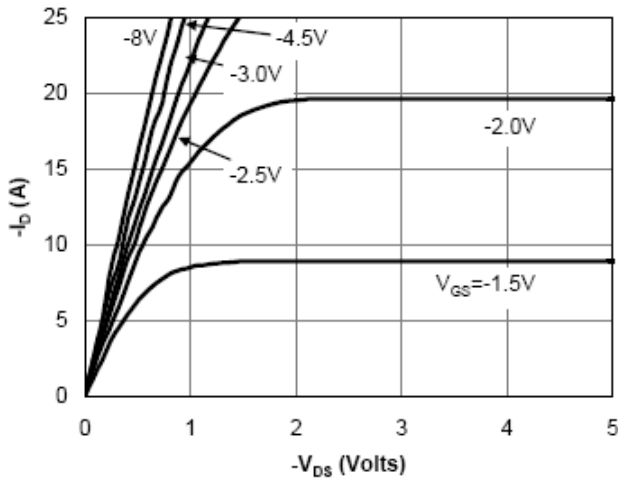
B. Repetitive rating, pulse width limited by junction temperature.

C. The  $R_{\theta JA}$  the sum of the thermal impedance from junction to lead  $R_{\theta JA}$  and lead to ambient.

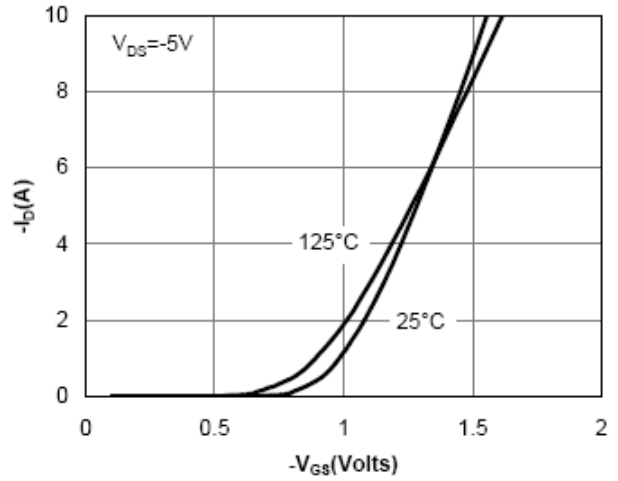
D. The static characteristics in Figures 1 to 6, 12, 14 are obtained using 80 $\mu s$  pulses, duty cycle 0.5% max.

E. These tests are performed with the device mounted on 1 in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A=25^\circ\text{C}$ . The SOA curve provides a single pulse rating.

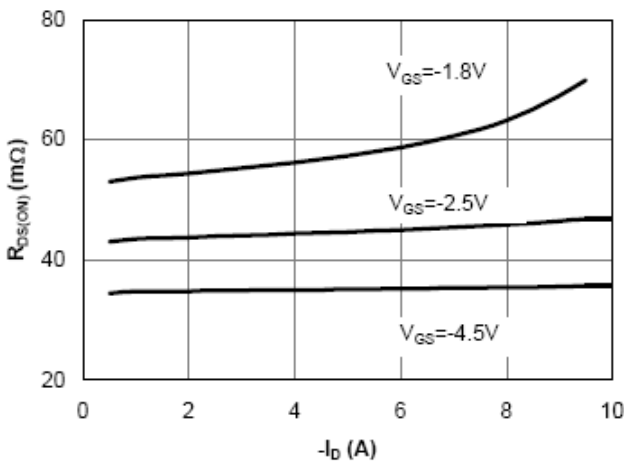
**7. Test circuits and waveforms**



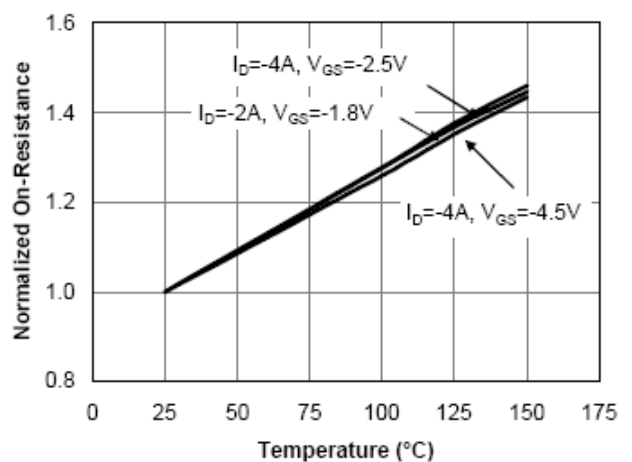
**Fig 1: On-Region Characteristics**



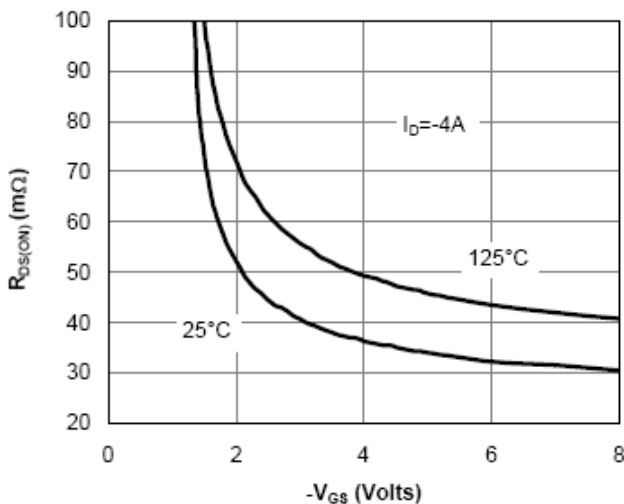
**Figure 2: Transfer Characteristics**



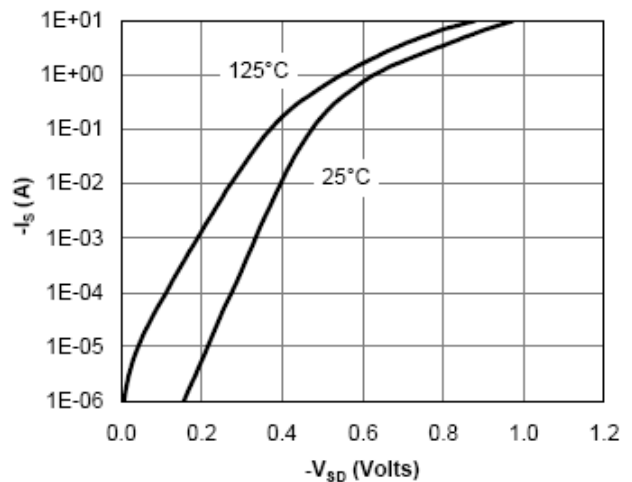
**Figure 3: On-Resistance vs. Drain Current and Gate Voltage**



**Figure 4: On-Resistance vs. Junction Temperature**



**Figure 5: On-Resistance vs. Gate-Source Voltage**



**Figure 6: Body-Diode Characteristics**

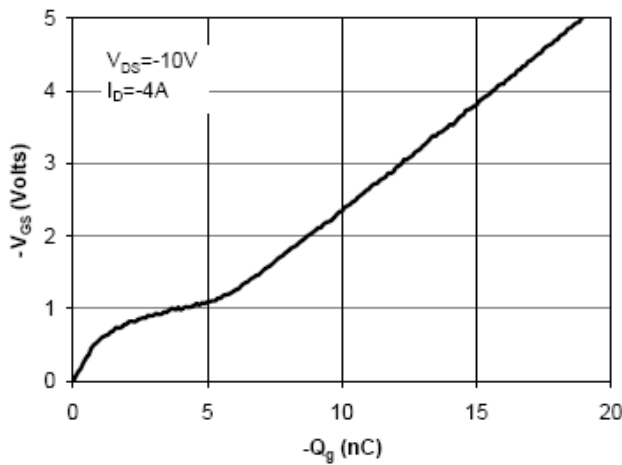


Figure 7: Gate-Charge Characteristics

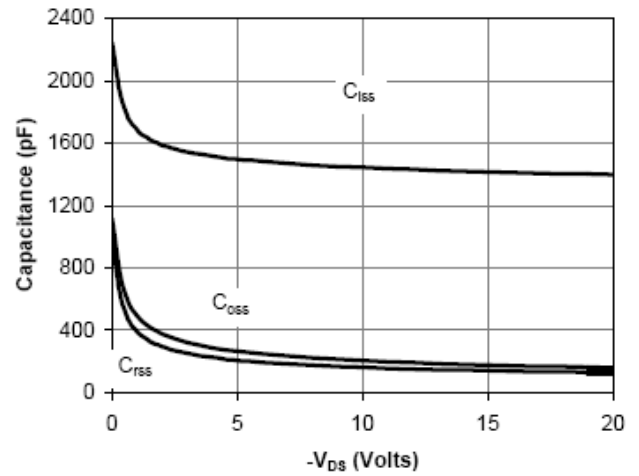


Figure 8: Capacitance Characteristics

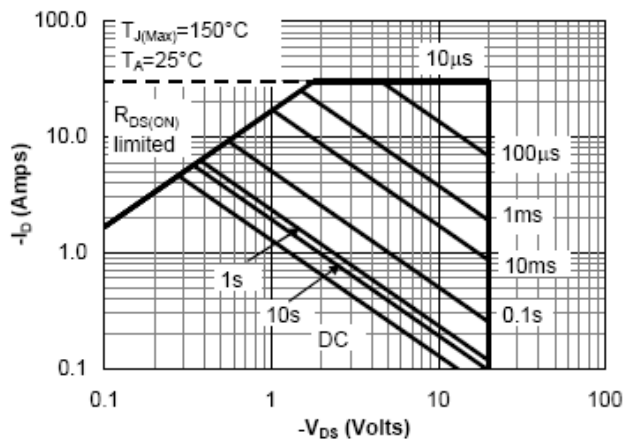


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

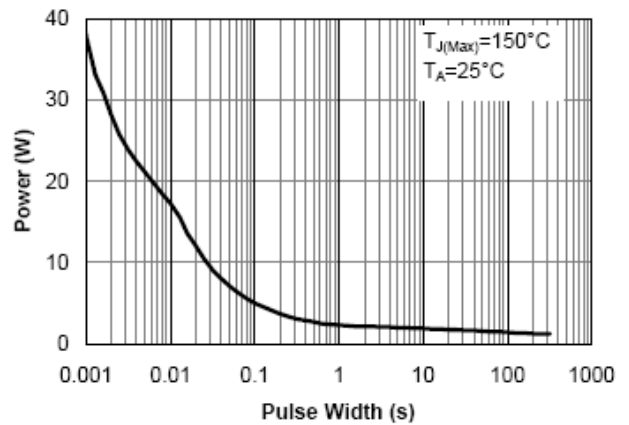


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

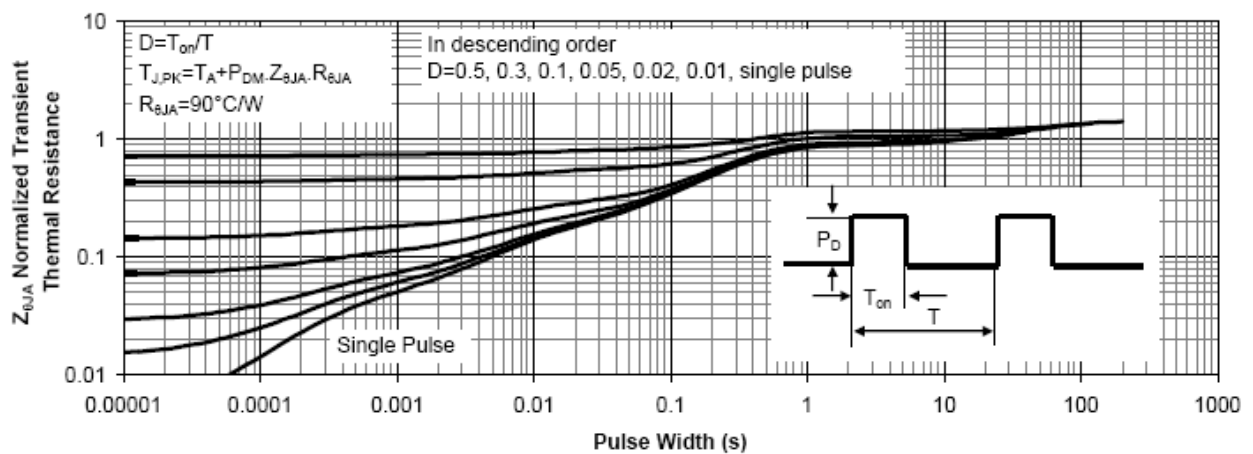


Figure 11: Normalized Maximum Transient Thermal Impedance