

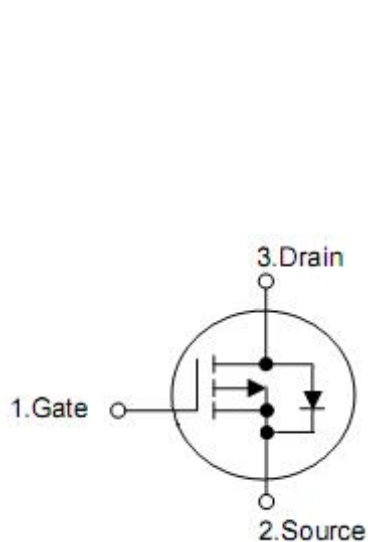
1. Description

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 $V_{DS}(V) = -20V$
- n $I_D = -4.0A$
- n $R_{DS(on)} < 45m\Omega (V_{GS} = -4.5V, I_D = -4.0A)$
- n $R_{DS(on)} < 54m\Omega (V_{GS} = -2.5V, I_D = -4.0A)$
- 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°C, unless otherwise noted)

| Parameter | Symbol | Rating | Units |
|--|-----------------------------------|-----------------------|-------|
| Drain-source voltage | V _{DS} | -20 | V |
| Gate-source voltage | V _{GS} | ±8 | V |
| Continuous drain current ^A | I _D | T _A =25°C | -4.0 |
| | | T _A =70°C | -3.5 |
| Pulsed drain current ^B | I _{DM} | -30 | A |
| Total power dissipation ^A | P _D | T _A =25 °C | 1.4 |
| | | T _A =70°C | 0.9 |
| Junction and storage temperature range | T _J , T _{STG} | -55 to 150 | °C |

5. Thermal characteristics

| Parameter | Symbol | Typ | Max | Unit |
|---|------------------|-----|-----|------|
| Maximum junction-ambient ^A (t≤10s) | R _{θJA} | 65 | 90 | °C/W |
| Maximum junction-ambient ^A | R _{θJA} | 85 | 125 | °C/W |
| Maximum junction-Lead ^C | R _{θJL} | 43 | 60 | °C/W |

6. Electrical characteristics

(T_A=25°C, unless otherwise noted)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Units |
|---------------------------------------|---------------------|---|------|-------|-------|-------|
| Drain-source breakdown voltage | BV _{DSS} | V _{GS} =0V, I _D =-250μA | -20 | - | - | V |
| Zero gate voltage drain current | I _{DSS} | V _{DS} =-16V, V _{GS} =0V | - | - | -50 | nA |
| Gate- body leakage current | I _{GSS} | V _{GS} =±8V, V _{DS} =0V | - | - | ±100 | nA |
| Gate threshold voltage | V _{GS(th)} | V _{DS} =V _{GS} , I _D =-250μA | -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 | mΩ |
| | | V _{GS} =-2.5V, I _D =-4.0A | - | 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=1MHz | - | 1450 | - | pF |
| Output capacitance | C _{oss} | | - | 205 | - | |
| Reverse transfer capacitance | C _{rss} | | - | 160 | - | |
| Gate resistance | R _g | V _{DS} =0V, V _{GS} =0V, f=1MHz | - | 6.5 | - | Ω |
| 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 =2.5Ω,, R _G =3Ω, 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} | IF=-4A, dl/dt=100A/μs, | - | 31 | - | nS |
| Reverse recovery charge | Q _{rr} | | - | 13.8 | - | nC |

Note: A. The value of R_{θJA} is measured with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C. The value in any given application depends on the user's specific board design. The current rating is based on the t_{≤10s} thermal resistance rating.

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

C. The R_{θJA} the sum of the thermal impedance from junction to lead R_{θJA} and lead to ambient.

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

E. These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C. The SOA curve provides a single pulse rating.

7. Test circuits and waveforms

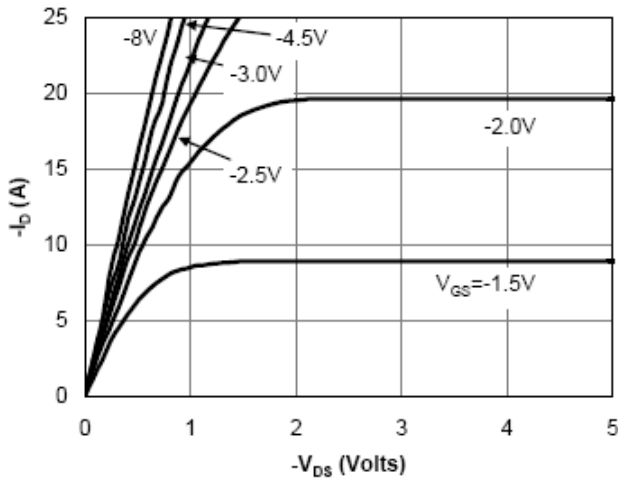


Fig 1: On-Region Characteristics

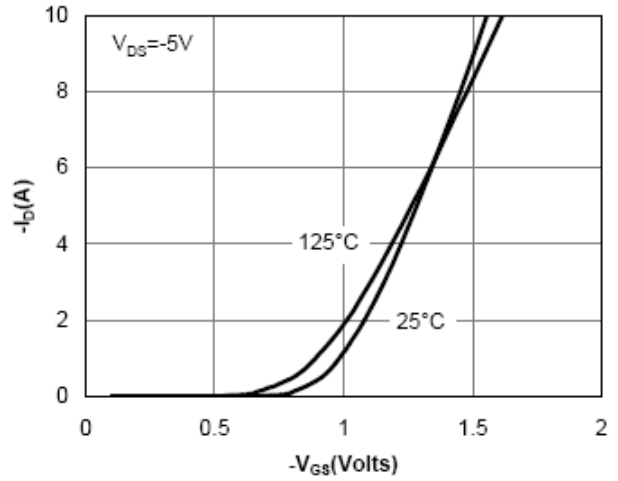


Figure 2: Transfer Characteristics

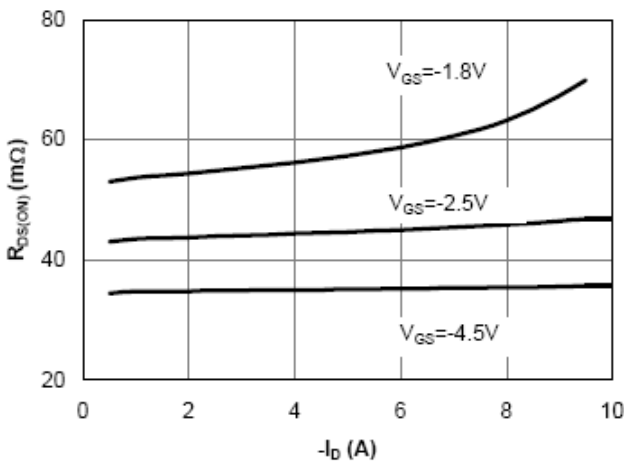


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

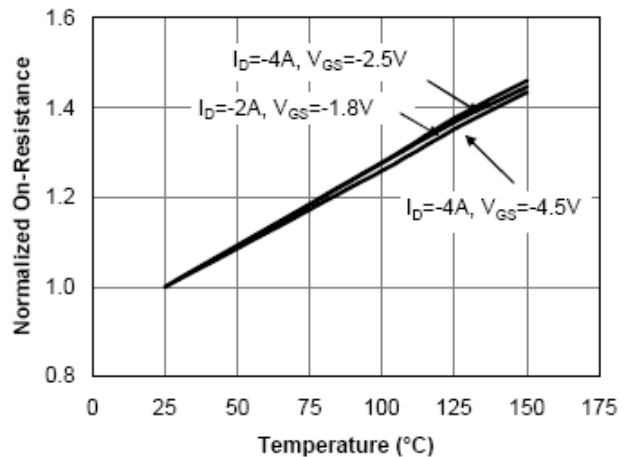


Figure 4: On-Resistance vs. Junction Temperature

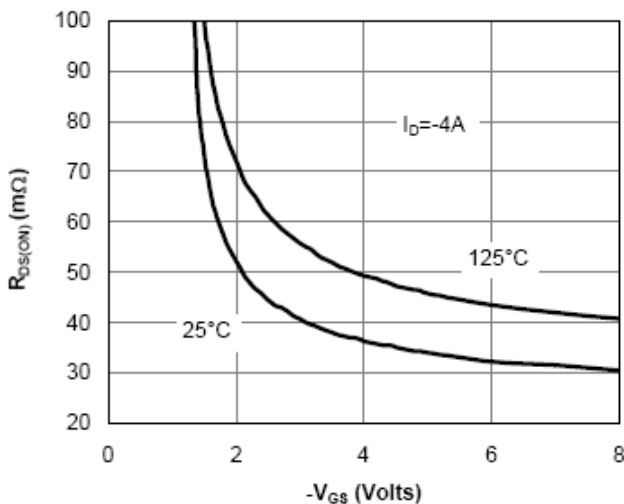


Figure 5: On-Resistance vs. Gate-Source Voltage

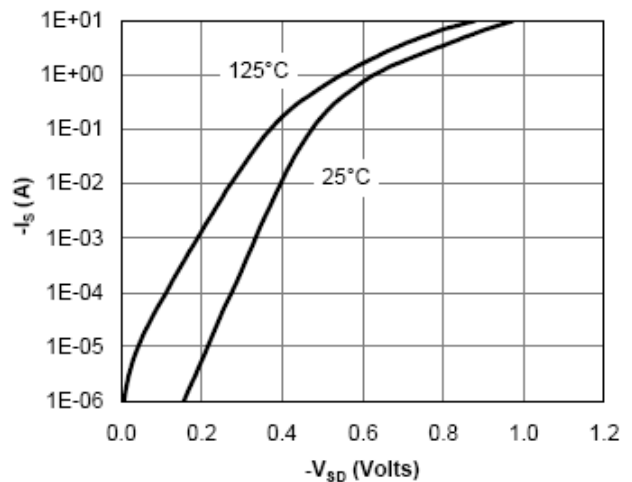


Figure 6: Body-Diode Characteristics

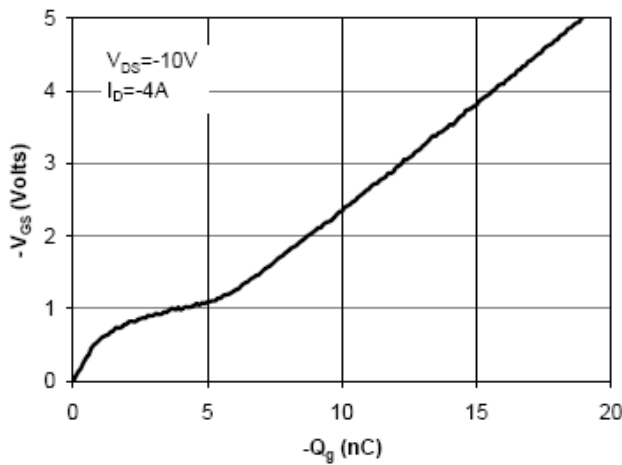


Figure 7: Gate-Charge Characteristics

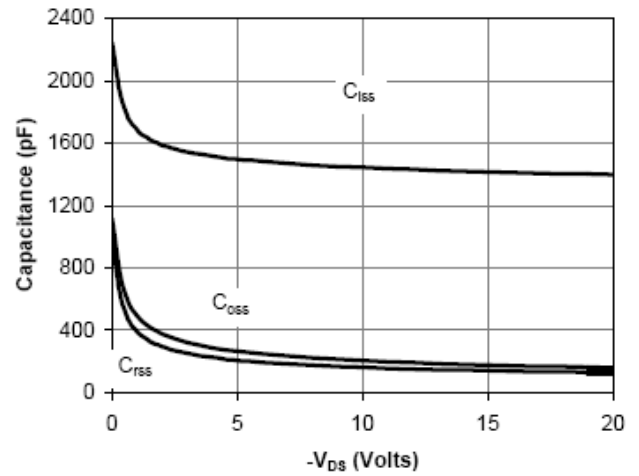


Figure 8: Capacitance Characteristics

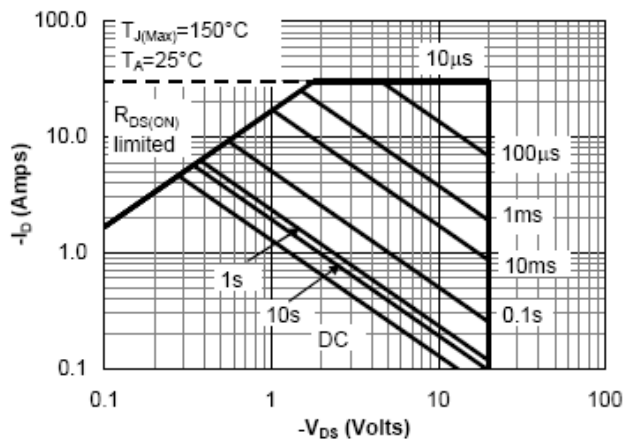


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

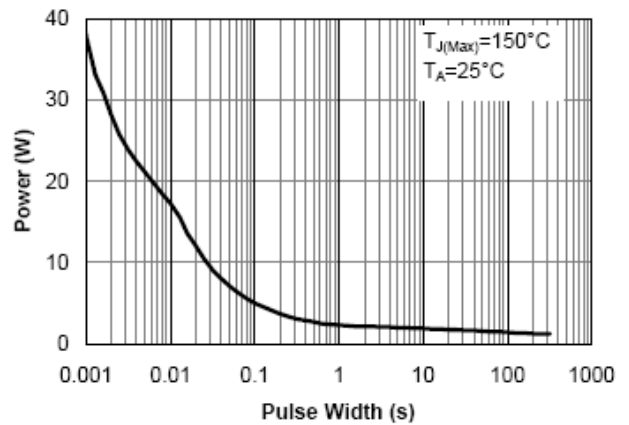


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

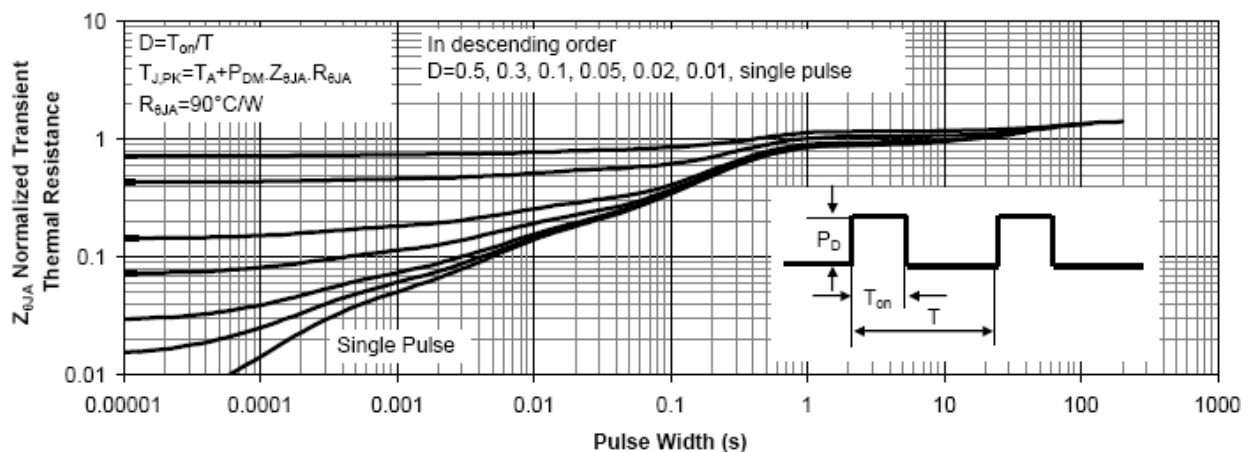


Figure 11: Normalized Maximum Transient Thermal Impedance