

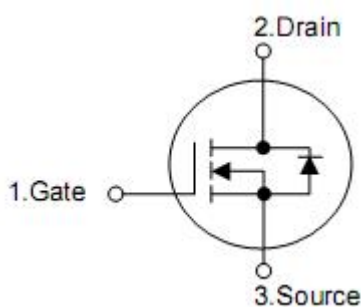
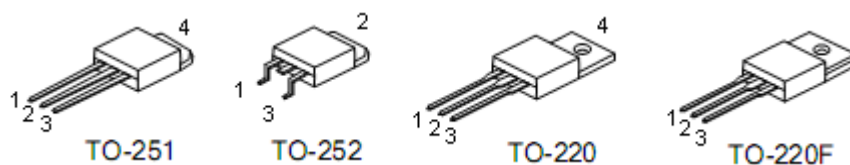
## 1. Description

The KIA50N06 is three-terminal silicon device with current conduction capability of about 50A, fast switching speed. Low on-state resistance, breakdown voltage rating of 60V, and max threshold voltages of 4 volt. It is mainly suitable electronic ballast, and low power switching

## 2. Features

- n  $R_{DS(ON)}=18m\Omega@V_{GS}=10V$ .
- n Ultra low gate charge (typical 30nC)
- n Low reverse transfer capacitance
- n Fast switching capability
- n 100% avalanche energy specified
- n Improved dv/dt capability

## 3. Pin configuration



| Pin | Function |
|-----|----------|
| 1   | Gate     |
| 2   | Drain    |
| 3   | Source   |
| 4   | Drain    |

#### 4. Absolute maximum ratings

| Parameter                                                   |                                   | Symbol    | Value           | Unit                  |
|-------------------------------------------------------------|-----------------------------------|-----------|-----------------|-----------------------|
| Drain to source voltage                                     |                                   | $V_{DSS}$ | 60              | V                     |
| Gate to source voltage                                      |                                   | $V_{GSS}$ | $\pm 20$        | V                     |
| Continuous drain current                                    | $T_J=25\text{ }^{\circ}\text{C}$  | $I_D$     | 50              | A                     |
|                                                             | $T_J=100\text{ }^{\circ}\text{C}$ | $I_D$     | 35              | A                     |
| Drain current pulsed (note1)                                |                                   | $I_{DM}$  | 200             | A                     |
| Single pulsed avalanche energy (note2)                      |                                   | $E_{AS}$  | 480             | mJ                    |
| Repetitive avalanche energy (note1)                         |                                   | $E_{AR}$  | 13              | mJ                    |
| Peak diode recovery dv/dt (note3)                           |                                   | dv/dt     | 7               | V/ns                  |
| Total power dissipation( $T_J=25\text{ }^{\circ}\text{C}$ ) |                                   | $P_D$     | 130             | W                     |
| Derating factor above $25\text{ }^{\circ}\text{C}$          |                                   | $P_D$     | 0.9             | W/ $^{\circ}\text{C}$ |
| Operating junction temperature                              |                                   | $T_J$     | $-55 \sim +150$ | $^{\circ}\text{C}$    |
| Storage temperature                                         |                                   | $T_{STG}$ | $-55 \sim +150$ | $^{\circ}\text{C}$    |

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged.

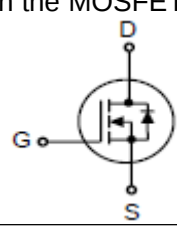
Absolute maximum ratings are stress ratings only and functional device operation is not implied.

#### 5. Thermal resistance

| Parameter                               | Symbol        | Typ | Max  | Units                |
|-----------------------------------------|---------------|-----|------|----------------------|
| Thermal resistance, junction-to-case    | $\theta_{JC}$ |     | 1.15 | $^{\circ}\text{C/W}$ |
| Thermal resistance, case-to-sink        | $\theta_{CS}$ | 0.5 |      | $^{\circ}\text{C/W}$ |
| Thermal resistance, junction-to-ambient | $\theta_{JA}$ |     | 62.5 | $^{\circ}\text{C/W}$ |

## 6. Electrical characteristics

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

| Parameter                                      | Symbol                              | Test 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                                                                                                | 60  |      |      | V    |
| Breakdown voltage temperature coefficient      | ΔBV <sub>DSS</sub> /ΔT <sub>J</sub> | I <sub>D</sub> =250μA, referenced to 25 °C                                                                                                |     | 0.07 |      | V/°C |
| Drain-source leakage current                   | I <sub>DSS</sub>                    | V <sub>DS</sub> =60V, V <sub>GS</sub> =0V                                                                                                 |     |      | 1    | μA   |
|                                                |                                     | V <sub>DS</sub> =48V, T <sub>C</sub> =125 °C                                                                                              |     |      | 1    | μA   |
| Gate-source leakage current                    | I <sub>GSS</sub>                    | V <sub>GS</sub> =20V, V <sub>DS</sub> =0V                                                                                                 |     |      | 100  | nA   |
| Gate-source leakage Reverse                    |                                     | V <sub>GS</sub> =-20V, V <sub>DS</sub> =0V                                                                                                |     |      | -100 | nA   |
| On characteristics                             |                                     |                                                                                                                                           |     |      |      |      |
| Gate threshold voltage                         | V <sub>GS(TH)</sub>                 | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA                                                                                  | 2.0 |      | 4.0  | V    |
| Static drain-source on-state resistance        | R <sub>DS(ON)</sub>                 | V <sub>GS</sub> =10V, I <sub>D</sub> =25A                                                                                                 |     | 18   | 23   | mΩ   |
| Dynamic characteristics                        |                                     |                                                                                                                                           |     |      |      |      |
| Input capacitance                              | C <sub>ISS</sub>                    | V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1MHz                                                                                         |     | 900  | 1220 | pF   |
| Output capacitance                             | C <sub>OSS</sub>                    |                                                                                                                                           |     | 430  | 550  | pF   |
| Reverse transfer capacitance                   | C <sub>RSS</sub>                    |                                                                                                                                           |     | 80   | 100  | pF   |
| Switching characteristics                      |                                     |                                                                                                                                           |     |      |      |      |
| Turn-on delay time                             | t <sub>D(ON)</sub>                  | V <sub>DD</sub> =30V, I <sub>D</sub> =25A, R <sub>G</sub> =50Ω (note4,5)                                                                  |     | 40   | 60   | ns   |
| Rise time                                      | t <sub>R</sub>                      |                                                                                                                                           |     | 100  | 200  | ns   |
| Turn-off delay time                            | t <sub>D(OFF)</sub>                 |                                                                                                                                           |     | 90   | 180  | ns   |
| Fall time                                      | t <sub>F</sub>                      |                                                                                                                                           |     | 80   | 160  | ns   |
| Total gate charge                              | Q <sub>G</sub>                      | V <sub>DS</sub> =48V, V <sub>GS</sub> =10V, I <sub>D</sub> =50A (note4,5)                                                                 |     | 30   | 40   | nC   |
| Gate-source charge                             | Q <sub>GS</sub>                     |                                                                                                                                           |     | 9.6  |      | nC   |
| Gate-drain charge (miller charge)              | Q <sub>GD</sub>                     |                                                                                                                                           |     | 10   |      | nC   |
| Source-drain diode ratings and characteristics |                                     |                                                                                                                                           |     |      |      |      |
| Diode forward voltage                          | V <sub>SD</sub>                     | V <sub>GS</sub> =0V, I <sub>S</sub> =50A                                                                                                  |     |      | 1.5  | V    |
| Continuous source current                      | I <sub>S</sub>                      | Integral reverse p-n junction diode in the MOSFET<br> |     |      | 50   | A    |
| Pulsed source current                          | I <sub>SM</sub>                     |                                                                                                                                           |     |      | 200  | A    |
| Reverse recovery time                          | t <sub>RR</sub>                     | V <sub>GS</sub> =0V, I <sub>S</sub> =50A                                                                                                  |     | 54   |      | ns   |
| Reverse recovery charge                        | Q <sub>RR</sub>                     | di <sub>F</sub> /dt=100A/μs(note4)                                                                                                        |     | 81   |      | μC   |

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

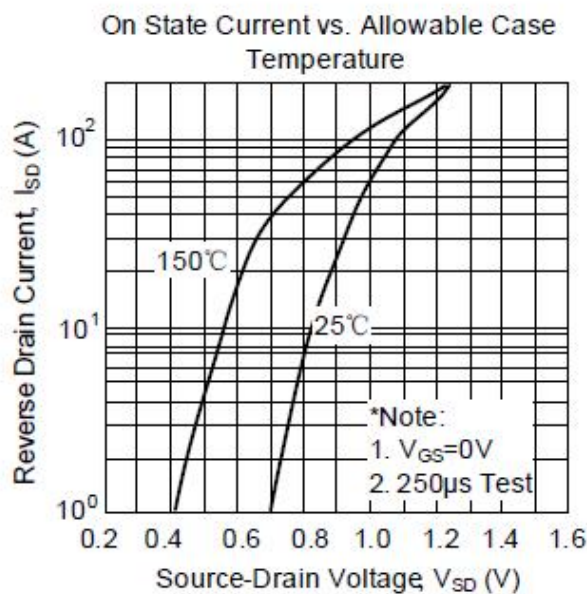
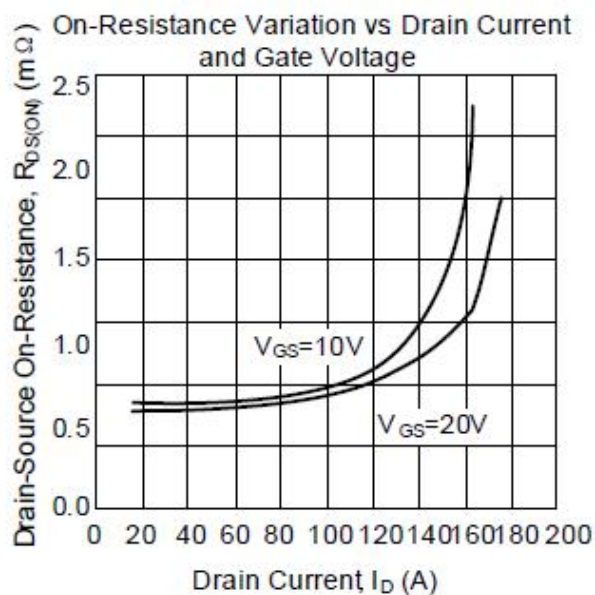
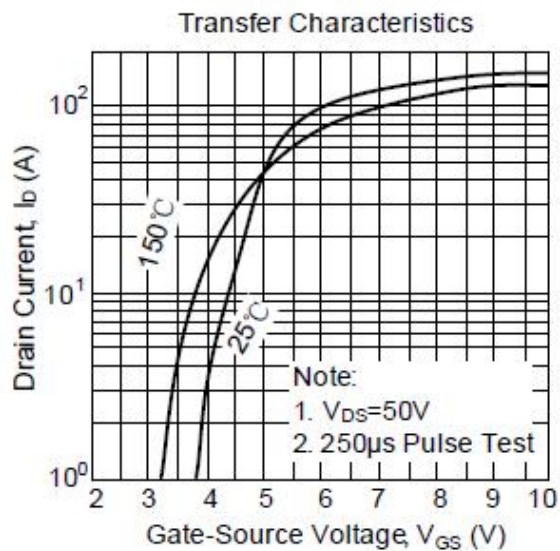
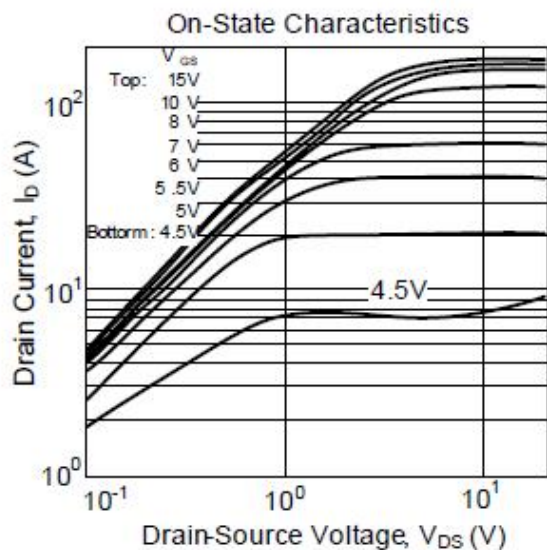
2.L=0.5mH, I<sub>AS</sub>=50A, V<sub>DD</sub>=25V, R<sub>G</sub>=0Ω, starting T<sub>J</sub>=25°C

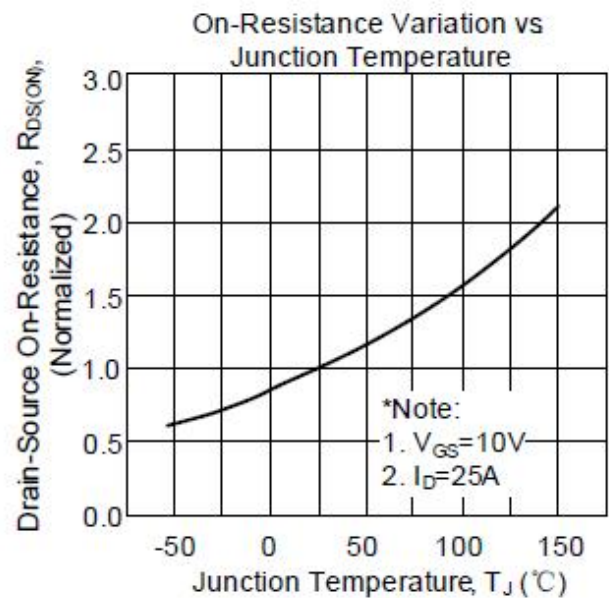
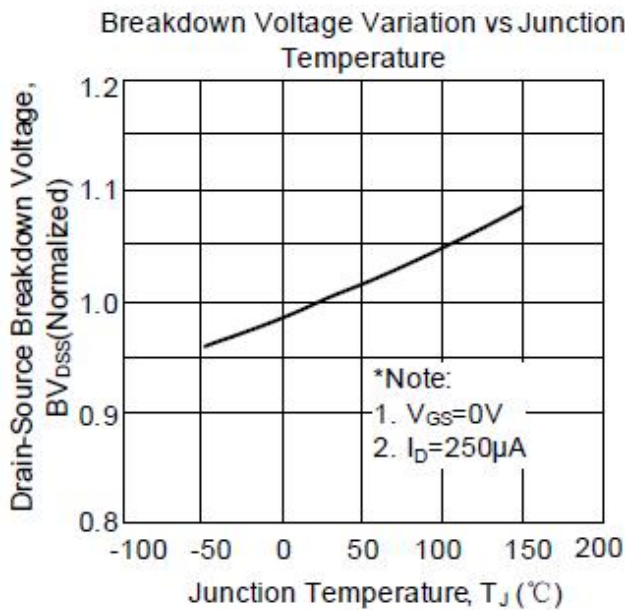
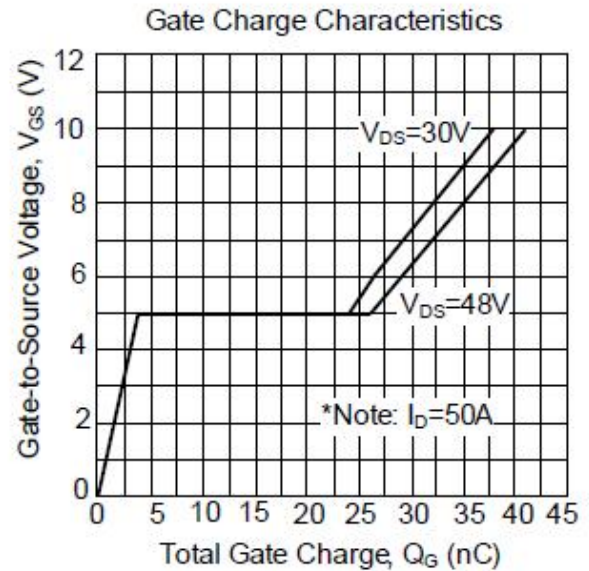
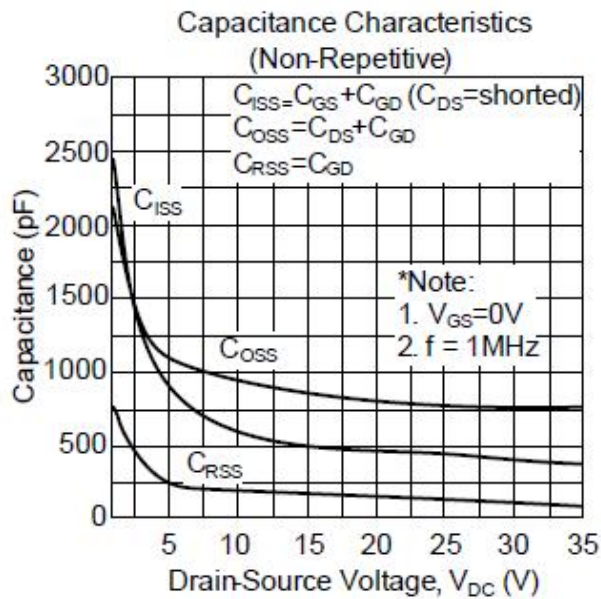
3.I<sub>SD</sub>≤50A, di/dt≤300A/μs, V<sub>DD</sub>≤BV<sub>DSS</sub>, starting T<sub>J</sub>=25 °C

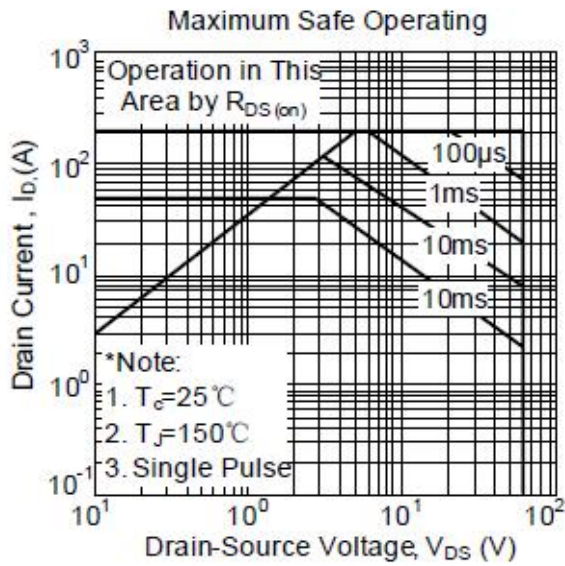
4.Pulse test:pulse width≤300μs, duty cycle≤2%

5.Essentially independent of operating temperature

## 7. Typical characteristics







Maximum Drain Current vs Case Temperature

