

## 700V 120A N-Channel SIC Power MOSFET

### Features

- High blocking voltage with low on-resistance
- High speed switching with low capacitance
- High operating junction temperature capability
- Wide bandgap SIC MOSFET technology
- Halogen free, RoHs compliant
- Easy to Parallel and Simple to Drive
- Robust against Parasitic Turn on Even 0V Turn off Gate Voltage

### Mechanical Data

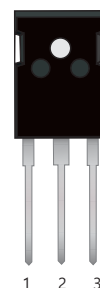
- Case:TO-247 Package

### Application

- Motor drivers
- Renewable energy
- Automotive DC/DC converters
- Switch mode power supplies

| Product Summary |                             |                    |                      |
|-----------------|-----------------------------|--------------------|----------------------|
| V <sub>DS</sub> | R <sub>DS(on)</sub> (mΩ)Typ | I <sub>D</sub> (A) | Q <sub>g</sub> (Typ) |
| 700V            | 20@ 18V 60A                 | 120                | 125nc                |

TO-247



Block Diagram

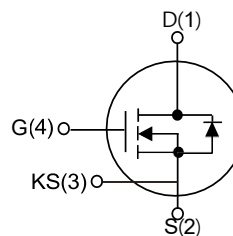


Table1 Absolute Maximum Ratings (T<sub>C</sub>=25°C, unless otherwise specified)

| Parameter                                  | Symbol                           | Value                 | Unit |
|--------------------------------------------|----------------------------------|-----------------------|------|
| Drain-Source Voltage                       | V <sub>DS</sub>                  | 700                   | V    |
| Gate-Source Voltage(Max)                   | V <sub>GS(max)</sub>             | -10/+22               | V    |
| Recommend Gate-Source Voltage              | V <sub>GSop</sub>                | 0/+18                 | V    |
| Continuous Drain Current                   | I <sub>D</sub>                   | T <sub>C</sub> =25°C  | 120  |
|                                            |                                  | T <sub>C</sub> =100°C | 100  |
| Pulsed Drain Current (Note 1)              | I <sub>DM</sub>                  | 240                   | A    |
| Power Dissipation T <sub>C</sub> =25°C     | P <sub>D</sub>                   | 333                   | W    |
| Operating Junction and Storage Temperature | T <sub>J</sub> /T <sub>STG</sub> | -55 ~ +175            | °C   |

Table 2.Thermal Characteristics

| Parameter                              | Symbol           | KWSC20N70P | Unit |
|----------------------------------------|------------------|------------|------|
| Thermal resistance Junction to Case    | R <sub>θJC</sub> | 0.45       | °C/W |
| Thermal resistance Junction to Ambient | R <sub>θJA</sub> | 40         | °C/W |

Table 3. Electrical Characteristics ( $T_J=25^{\circ}\text{C}$ , unless otherwise specified)

| 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> =100μA                                  | 700 | -    | -    | V    |
| Drain-Source Leakage Current                                    |         | I <sub>DSS</sub>    | V <sub>DS</sub> =700V, V <sub>GS</sub> =0V                                  | -   | -    | 10   | μA   |
| Gate- Source Leakage Current                                    | Forward | I <sub>GSS</sub>    | V <sub>GS</sub> =22V, V <sub>DS</sub> =0V                                   | -   | 10   | 250  | nA   |
|                                                                 | Reverse |                     | V <sub>GS</sub> =-8V, V <sub>DS</sub> =0V                                   | -   | -10  | -250 | nA   |
| On Characteristics                                              |         |                     |                                                                             |     |      |      |      |
| Gate Threshold Voltage                                          |         | V <sub>GS(TH)</sub> | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =23mA                     | 2.7 | -    | 4.5  | V    |
| Static Drain-Source On-State Resistance                         |         | R <sub>DS(ON)</sub> | V <sub>GS</sub> =18V, I <sub>D</sub> =60A, T <sub>J</sub> =25°C             | -   | 20   | 26   | mΩ   |
|                                                                 |         |                     | V <sub>GS</sub> =18V, I <sub>D</sub> =60A, T <sub>J</sub> =175°C            | -   | 23   | -    |      |
| Gate Resisitance                                                |         | R <sub>G</sub>      | f=1MHz                                                                      | -   | 1.3  | -    | Ω    |
| Dynamic Characteristics                                         |         |                     |                                                                             |     |      |      |      |
| Input Capacitance                                               |         | C <sub>ISS</sub>    | V <sub>DS</sub> =500V, V <sub>GS</sub> =0V, f=100KHz, V <sub>AC</sub> =25mV | -   | 3200 | -    | pF   |
| Output Capacitance                                              |         | C <sub>OSS</sub>    |                                                                             | -   | 230  | -    | pF   |
| Reverse Transfer Capacitance                                    |         | C <sub>RSS</sub>    |                                                                             | -   | 20   | -    | pF   |
| Total Gate Charge                                               |         | Q <sub>G</sub>      | V <sub>DD</sub> =500V, I <sub>D</sub> =60A, V <sub>GS</sub> =0/18V          | -   | 125  | -    | nC   |
| Gate-Source Charge                                              |         | Q <sub>GS</sub>     |                                                                             | -   | 35   | -    | nC   |
| Gate-Drain Charge                                               |         | Q <sub>GD</sub>     |                                                                             | -   | 17   | -    | nC   |
| Drain-Source Diode Characteristics and Maximum Ratings (Note 2) |         |                     |                                                                             |     |      |      |      |
| Drain-Source Diode Forward Voltage                              |         | V <sub>SD</sub>     | V <sub>GS</sub> =0V, I <sub>S</sub> =30A                                    | -   | 3.4  | -    | V    |
| Continuous Diode Forward Current                                |         | I <sub>S</sub>      |                                                                             | -   | 120  | -    | A    |
| Reverse Recovery Time                                           |         | trr                 | V <sub>GS</sub> =0V, V <sub>R</sub> =500V, I <sub>SD</sub> =60A             | -   | 35   | -    | ns   |
| Recovered charge                                                |         | Q <sub>rr</sub>     |                                                                             | -   | 13   | -    | nC   |
| Peak reverse recovery current                                   |         | I <sub>rrm</sub>    |                                                                             | -   | 6    | -    | A    |

Notes: 1 RepetitiveRating: Pulse width limited by maximum junction temperature

2 Pulse Test: Pulse width  $\leq 300\mu S$ , Duty cycle  $\leq 2\%$

## Typical Characteristics Diagrams

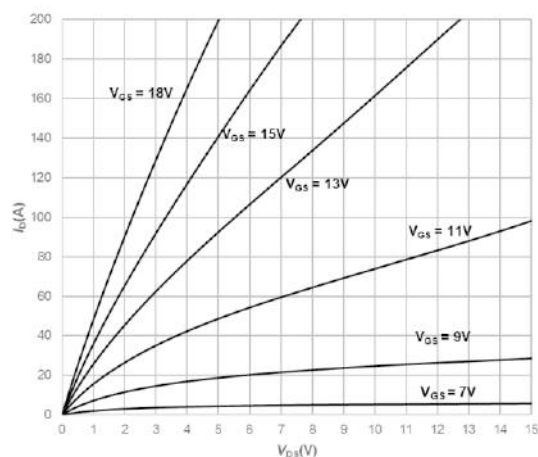


Fig1. Output Characteristics  $T_j = 25^\circ\text{C}$

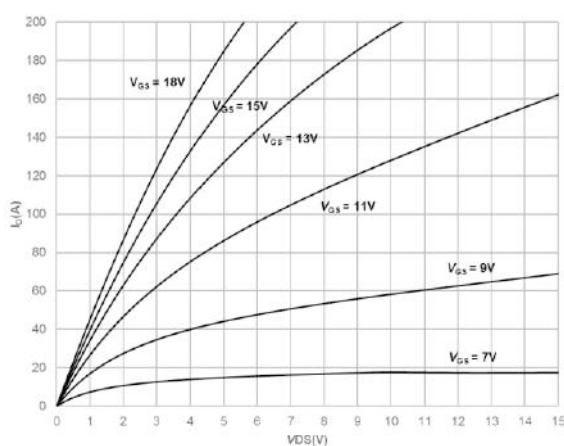


Fig2. Output Characteristics  $T_j = 175^\circ\text{C}$

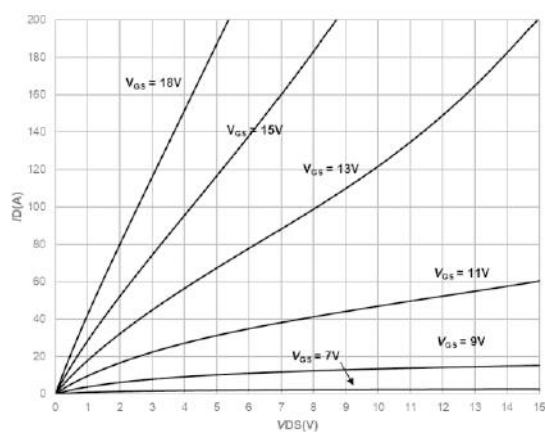


Fig3. Output Characteristics  $T_j = -40^\circ\text{C}$

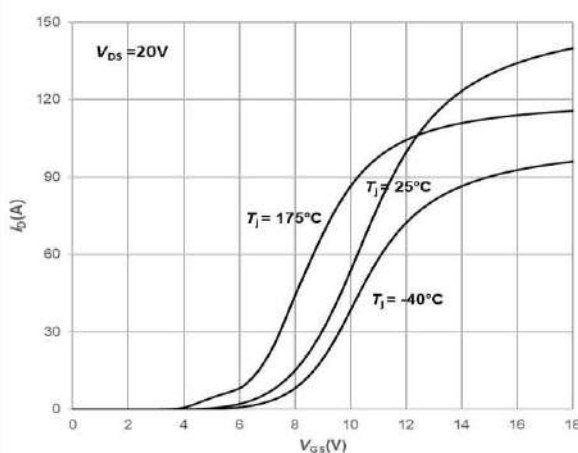


Fig4. Typical Transfer Characteristics

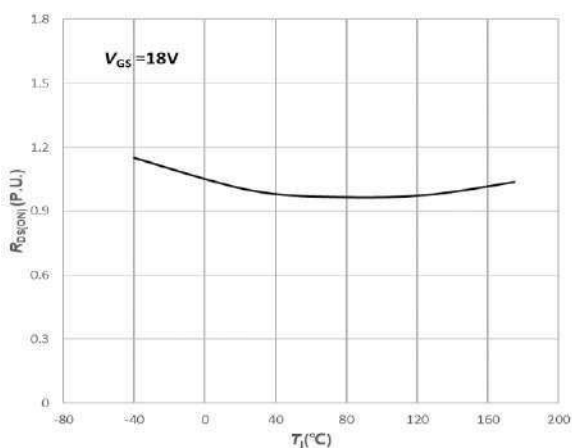


Fig5. Normalized On-Resistance vs. Temperature

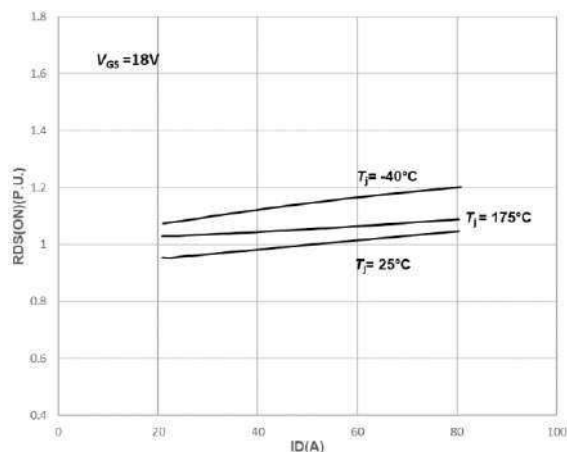


Fig6. Normalized On-Resistance vs. Drain Current For Various Temperatures

## Typical Characteristics Diagrams

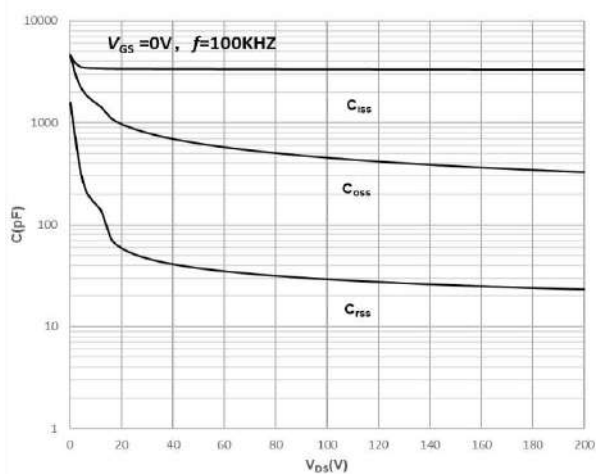


Fig7. Capacitances vs. Drain-Source Voltage (0-200V)

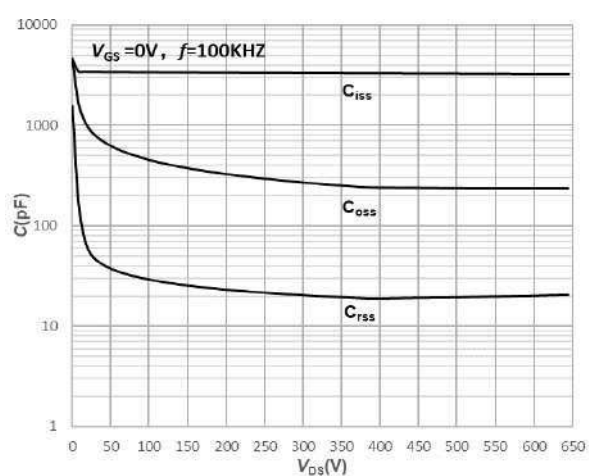


Fig8. Capacitances vs. Drain-Source Voltage (0-650V)

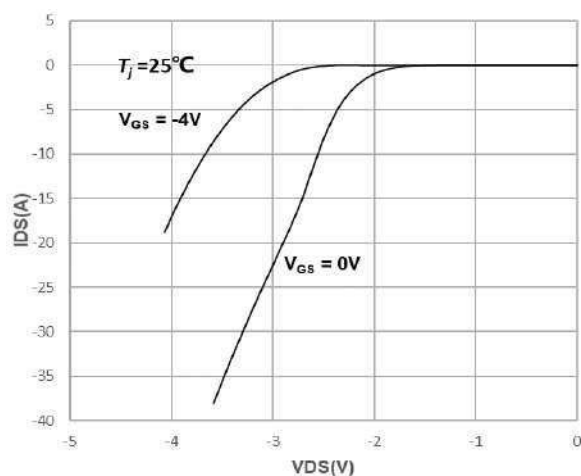


Fig9. Body Diode Characteristics

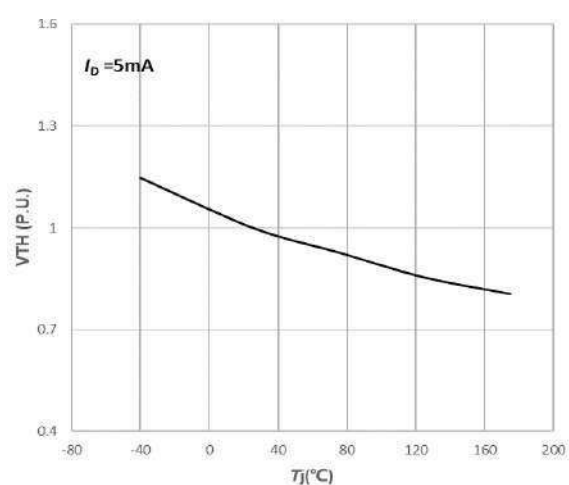


Fig10. Normalized Threshold Voltage vs. Temperature

## Dimensions

## TO-247 package

