

## 1700V 45mΩ N-Channel SiC Power MOSFET

### Description

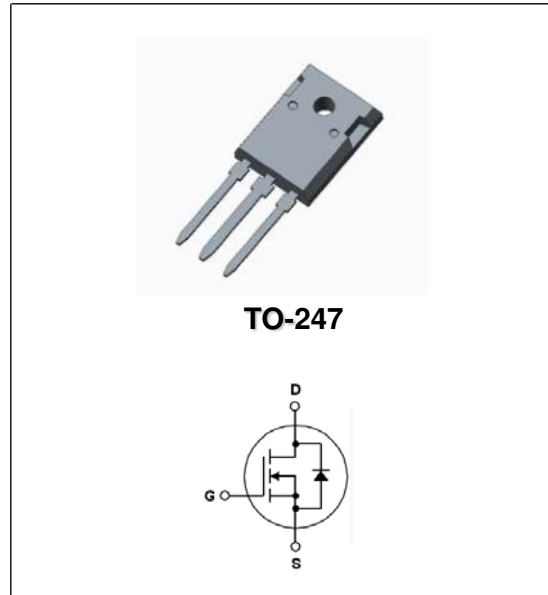
The AKCT45N170HB is a high blocking voltage N-Channel SiC power MOSFET. This device provide excellent performance for high voltage power supplies or pulse circuits.

### Features

- Typical on-Resistance:  $R_{DS(on)}=45m\Omega$ (typ.)
- High Blocking Voltage
- 100% Avalanche Test
- Good Stability and Uniformity with High  $E_{AS}$

### Applications

- Solar Inverters
- High Voltage DC/DC Converters
- Motor Drivers
- Switch Mode Power Supplies



### Absolute Maximum Ratings @ $T_C=25\text{ }^\circ\text{C}$ unless otherwise noted

| Symbol     | Parameter  | Ratings                         | Unit             |
|------------|--|---------------------------------|------------------|
| $V_{DSS}$  | Drain to Source Voltage                              | 1700                            | V                |
| $V_{GSS}$  | Gate to Source Voltage                               | -10/+25                         | V                |
| $V_{GSop}$ | Recommended operation Values of Gate -Source Voltage | -5/+20                          | V                |
| $I_D$      | Drain Current  | $T_C=25\text{ }^\circ\text{C}$  | 72               |
|            |  | $T_C=100\text{ }^\circ\text{C}$ | 48               |
| $I_{DM}$   | Pulsed Drain Current (Note1)                         | 160                             | A                |
| $P_D$      | Maximum Power Dissipation                            | $T_C=25\text{ }^\circ\text{C}$  | 357              |
|            | Derate above 25 $^\circ\text{C}$                     |                                 | 2.86             |
| $E_{AS}$   | Single Pulsed Avalanche Energy (Note 2)              | 1500                            | mJ               |
| $T_J$      | Operating Junction Temperature Range                 | -40~+175                        | $^\circ\text{C}$ |
| $T_{STG}$  | Storage Temperature Range                            | -40~+150                        | $^\circ\text{C}$ |

### Thermal Characteristics

| Symbol        | Parameter                               | Ratings | Unit                      |
|---------------|---|---------|---------------------------|
| $R_{th(J-C)}$ | Thermal Resistance, Junction to case    | 0.42    | $^\circ\text{C}/\text{W}$ |
| $R_{th(J-A)}$ | Thermal Resistance, Junction to Ambient | 40      | $^\circ\text{C}/\text{W}$ |

## Electrical Characteristics @T<sub>C</sub>=25 °C unless otherwise noted

| Symbol              | Parameter                         | Conditions  | Min. | Typ. | Max. | Unit |
|---------------------|-----------------------------------|---|------|------|------|------|
| BV <sub>DSS</sub>   | Drain to Source Breakdown Voltage | V <sub>GS</sub> =0V, I <sub>D</sub> =100uA              | 1700 | -    | -    | V    |
| V <sub>GS(th)</sub> | Gate Threshold Voltage            | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =10mA | 2    | 2.5  | 4.0  | V    |
| R <sub>DS(on)</sub> | Static Drain-Source On-Resistance | V <sub>GS</sub> =20V, I <sub>D</sub> =30A               | -    | 45   | 55   | mΩ   |
| I <sub>DSS</sub>    | Zero Gate Voltage Drain Current   | V <sub>DS</sub> =V <sub>DSS</sub> , V <sub>GS</sub> =0V | -    | -    | 100  | uA   |
| I <sub>GSS</sub>    | Gate to Source Leakage Current    | V <sub>GS</sub> =V <sub>GSS</sub> , V <sub>DS</sub> =0V | -    | -    | ±500 | nA   |

## D-S Diode Characteristics and Maximum Rating @T<sub>C</sub>=25 °C unless otherwise noted

| Symbol          | Parameter                          | Conditions                                | Min. | Typ. | Max. | Unit |
|-----------------|------------------------------------|---|------|------|------|------|
| V <sub>SD</sub> | Drain-Source Diode Forward Voltage | V <sub>GS</sub> =0V, I <sub>S</sub> =50A  | -    | 4.6  | -    | V    |
| t <sub>rr</sub> | Reverse Recovery Time              | V <sub>GS</sub> =0V, I <sub>S</sub> =25A, | -    | 50   | -    | ns   |
| Q <sub>rr</sub> | Reverse Recovery Charge            |   | -    | 220  | -    | nC   |

## Switching Characteristics @T<sub>C</sub>=25 °C unless otherwise noted

| Symbol              | Parameter                    | Conditions  | Min. | Typ. | Max. | Unit |
|---------------------|------------------------------|---|------|------|------|------|
| t <sub>d(on)</sub>  | Turn-on Delay Time           | I <sub>D</sub> =30A ,<br>V <sub>DD</sub> =1200V,<br>R <sub>G</sub> =2.5Ω<br>V <sub>GS</sub> = -5/20V,<br>(Note 3) | -    | 30   | -    | ns   |
| t <sub>r</sub>      | Turn-on Rise Time            |   | -    | 22   | -    | ns   |
| t <sub>d(off)</sub> | Turn-off Delay Time          |   | -    | 50   | -    | ns   |
| t <sub>f</sub>      | Turn-off Fall Time           |   | -    | 15   | -    | ns   |
| C <sub>iss</sub>    | Input Capacitance            | V <sub>GS</sub> =0V, V <sub>DS</sub> =1700V,<br>f=1.0MHz  | -    | 4270 | -    | pF   |
| C <sub>oss</sub>    | Output Capacitance           |   | -    | 136  | -    | pF   |
| C <sub>rss</sub>    | Reverse Transfer Capacitance |   | -    | 16   | -    | pF   |
| Q <sub>g</sub>      | Total Gate Charge            | I <sub>D</sub> =20A,<br>V <sub>DD</sub> =800V<br>V <sub>GS</sub> =-5V/20V<br>(Note 3)                             | -    | 195  | -    | nC   |
| Q <sub>gs</sub>     | Gate to Source Charge        |   | -    | 54   | -    | nC   |
| Q <sub>gd</sub>     | Gate to Drain Charge         |   | -    | 25   | -    | nC   |

### Note:

1. Repetitive rating: pulse-width limited by maximum junction temperature
2. V<sub>DD</sub>=100V, L=10mH, V<sub>clamp</sub>=1700V, V<sub>G</sub>=10V
3. Essentially independent of operating temperature typical characteristics

**Typical Performance Characteristics**

Fig. 1. Typical on-Resistance Characteristics

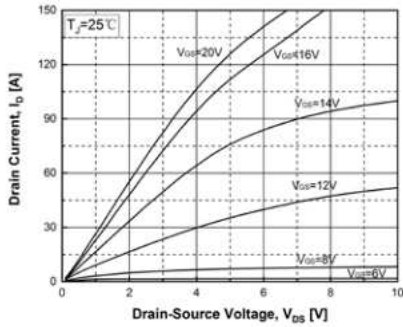


Fig. 2. Resistance vs. Drain Current and Gate Voltage

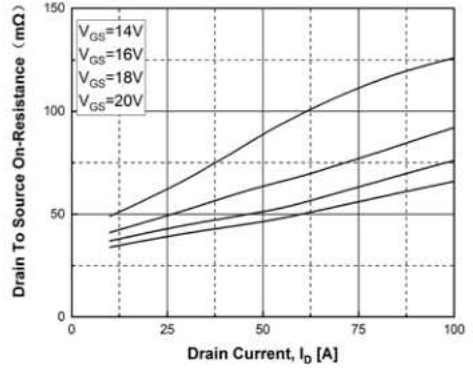


Fig. 3. Normalized On-Resistance vs. Junction Temperature

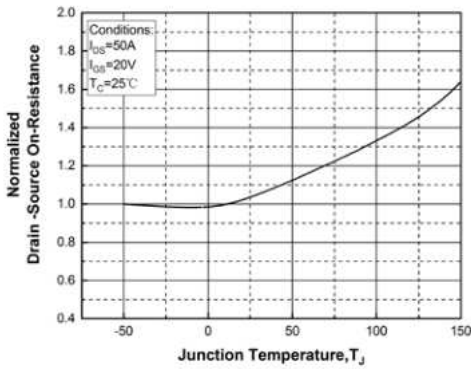


Fig. 4. On-Resistance vs. Gate-to-source Voltage

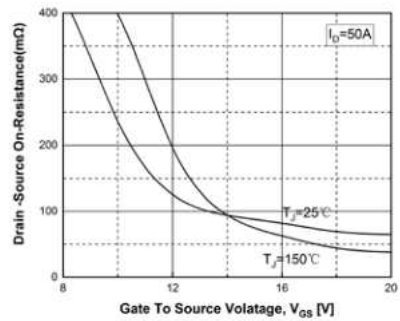


Fig. 5. Transfer Characteristics

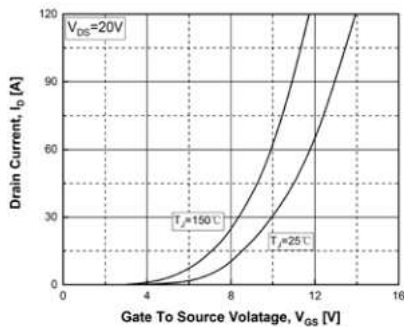
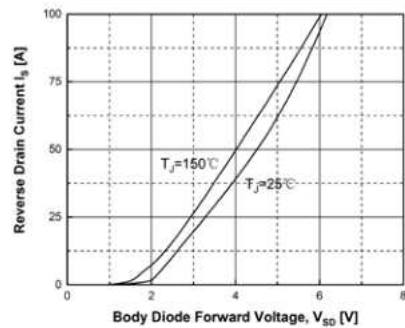


Fig. 6. Source-to-Drain Diode Forward Voltage vs. Source Current



**Typical Performance Characteristics**

Fig. 7. Gate Charge Characteristics

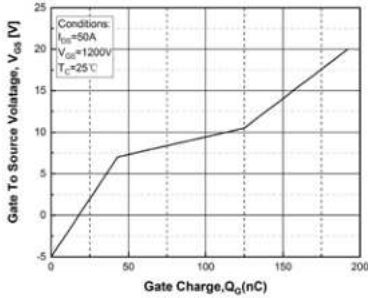


Fig. 8. Characteristics vs. Drain-to-Source Voltage

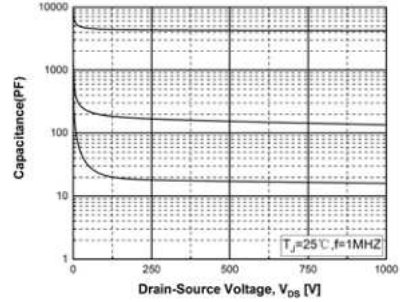
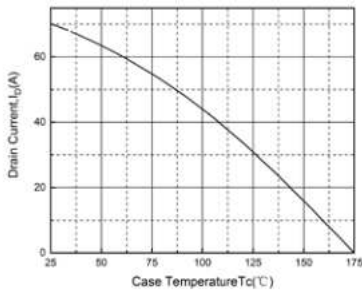


Fig. 9. Maximum Drain Current vs. Temperature



**Package Dimensions**

**TO-247**

(Dimensions in Millimeters)

