

1200V 25mΩ N-Channel SiC Power MOSFET

Description

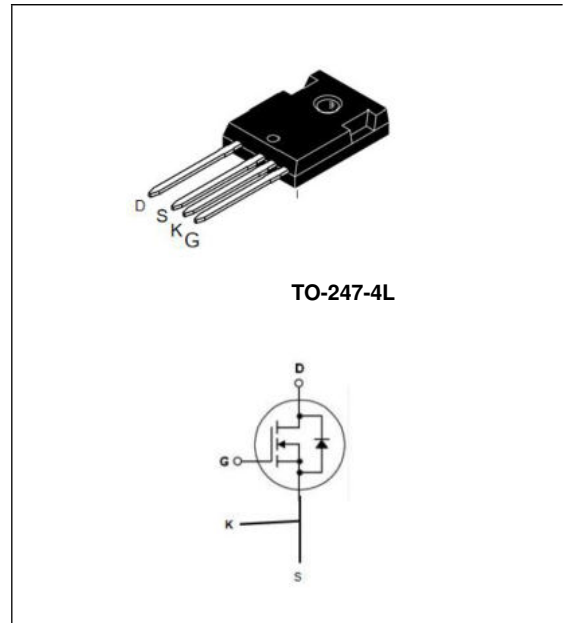
The AKCT25N120HB4L is a high blocking voltage N-Channel SiC power MOSFET. This device provide excellent performance for high voltage power supplies or pulse circuits.

Features

- Typical on-Resistance: $R_{DS(on)}=25m\Omega$ (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 | 1200 | 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 | $T_C=25\text{ }^\circ\text{C}$ | 80 | A |
| | | $T_C=100\text{ }^\circ\text{C}$ | 50 | A |
| I_{DM} | Pulsed Drain Current (Note1) | 200 | A | |
| P_D | Maximum Power Dissipation | $T_C=25\text{ }^\circ\text{C}$ | 428 | W |
| | Derate above 25 $^\circ\text{C}$ | | 2.86 | W/ $^\circ\text{C}$ |
| E_{AS} | Single Pulsed Avalanche Energy (Note 2) | 2560 | mJ | |
| T_J | Operating Junction Temperature Range | -40~+175 | $^\circ\text{C}$ | |
| T_{STG} | Storage Temperature Range | -40~+175 | $^\circ\text{C}$ | |

Thermal Characteristics

| Symbol | Parameter | Ratings | Unit |
|---------------|---|---------|---------------------------|
| $R_{th(J-C)}$ | Thermal Resistance, Junction to case | 0.35 | $^\circ\text{C}/\text{W}$ |
| $R_{th(J-A)}$ | Thermal Resistance, Junction to Ambient | 40 | $^\circ\text{C}/\text{W}$ |

Electrical Characteristics @T_C=25 °C unless otherwise noted

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---------------------|-----------------------------------|---|------|------|------|------|
| BV _{DSS} | Drain to Source Breakdown Voltage | V _{GS} =0V, I _D =100uA | 1200 | - | - | V |
| V _{GS(th)} | Gate Threshold Voltage | V _{DS} =V _{GS} , I _D =15mA | 2.0 | 3.0 | 4.7 | V |
| R _{DS(on)} | Static Drain-Source On-Resistance | V _{GS} =20V, I _D =50A | - | 25 | 45 | mΩ |
| I _{DSS} | Zero Gate Voltage Drain Current | V _{DS} =V _{DSS} , V _{GS} =0V | - | - | 100 | uA |
| I _{GSS} | Gate to Source Leakage Current | V _{GS} =V _{GSS} , V _{DS} =0V | - | - | ±500 | nA |

D-S Diode Characteristics and Maximum Rating @T_C=25 °C unless otherwise noted

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|-----------------|------------------------------------|--|------|------|------|------|
| V _{SD} | Drain-Source Diode Forward Voltage | V _{GS} =0V, I _S =25A | - | 2.6 | - | V |
| t _{rr} | Reverse Recovery Time | V _{GS} =0V, I _S =20A, di/dt=-1000A/us | - | 50 | - | ns |
| Q _{rr} | Reverse Recovery Charge | | - | 170 | - | nC |

Switching Characteristics @T_C=25 °C unless otherwise noted

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---------------------|------------------------------|---|------|------|------|------|
| t _{d(on)} | Turn-on Delay Time | I _D =20A, V _{DD} =800V, R _G =2.5Ω V _{GS} = -5/20V, (Note 3) | - | 26 | - | ns |
| t _r | Turn-on Rise Time | | - | 22 | - | ns |
| t _{d(off)} | Turn-off Delay Time | | - | 150 | - | ns |
| t _f | Turn-off Fall Time | | - | 39 | - | ns |
| C _{iss} | Input Capacitance | V _{GS} =0V, V _{DS} =1000V, f=1.0MHz | - | 4300 | - | pF |
| C _{oss} | Output Capacitance | | - | 190 | - | pF |
| C _{rss} | Reverse Transfer Capacitance | | - | 19 | - | pF |
| Q _g | Total Gate Charge | I _D =20A, V _{DD} =800V V _{GS} =-5V/20V (Note 3) | - | 178 | - | nC |
| Q _{gs} | Gate to Source Charge | | - | 63 | - | nC |
| Q _{gd} | Gate to Drain Charge | | - | 28 | - | nC |

Note:

1. Repetitive rating: pulse-width limited by maximum junction temperature
2. V_{DD}=100V, L=5mH, V_{clamp}=1700V, V_G=10V, I_D=32.0A
3. Essentially independent of operating temperature typical characteristics

Typical Performance Characteristics

Fig. 1. Typical on-Resistance Characteristics

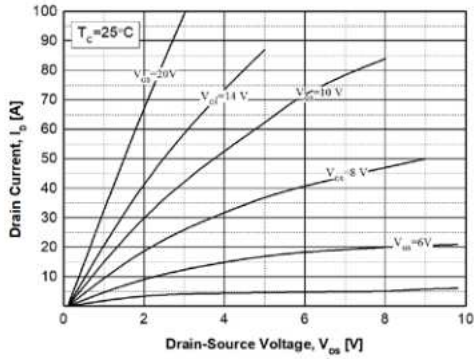


Fig. 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

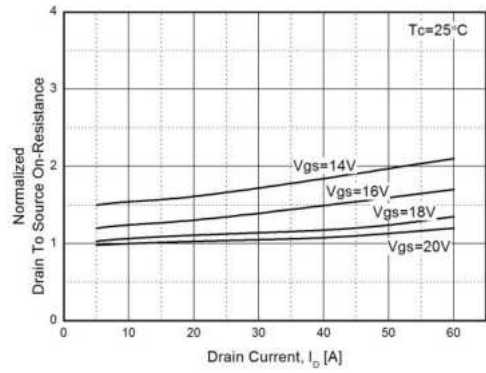


Fig. 3. Normalized On-Resistance vs. Junction Temperature

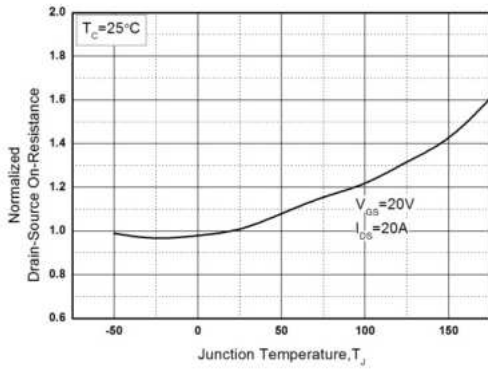


Fig. 4. On-Resistance vs. Gate-to-source Voltage

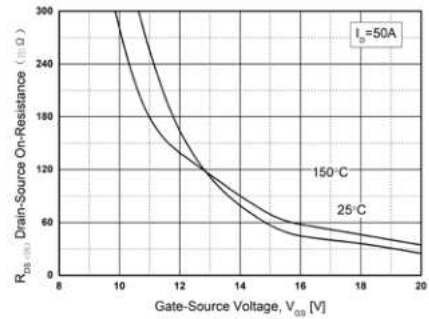


Fig. 5. Transfer Characteristics

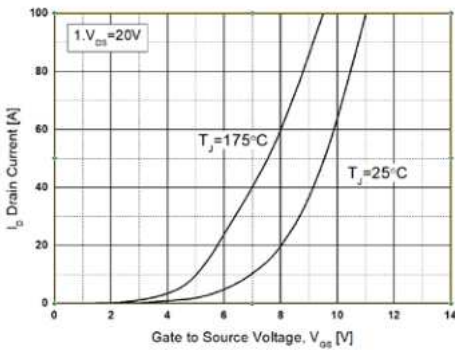
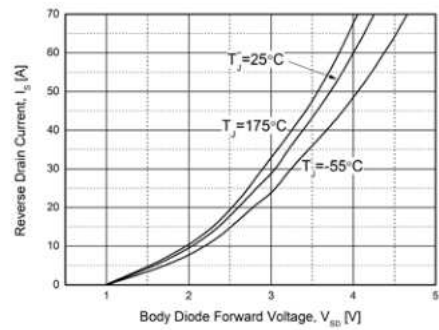


Fig. 6. Source-to-Drain Diode Forward Voltage vs. Source Current



Typical Performance Characteristics

Fig. 7. Gate Charge Characteristics

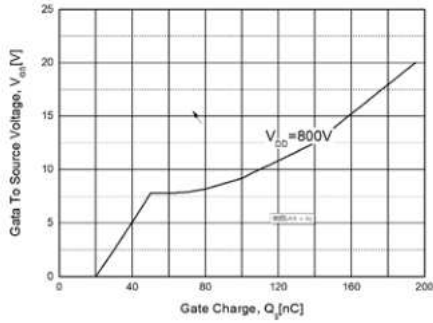


Fig. 8. Characteristics vs. Drain-to-Source Voltage

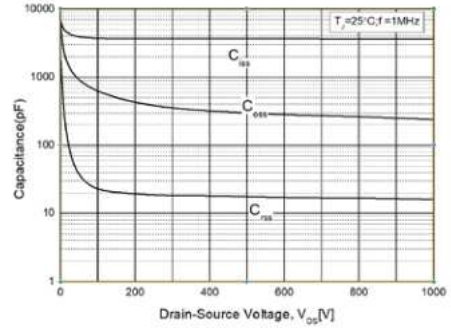
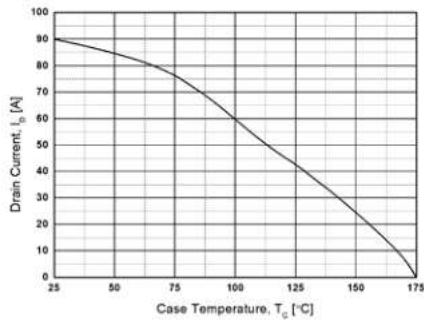


Fig. 9. Maximum Drain Current vs. Temperature



Package Dimensions

TO-247-4L

(Dimensions in Millimeters)

