

650V 20A N-Channel MOSFET With Fast-Recovery

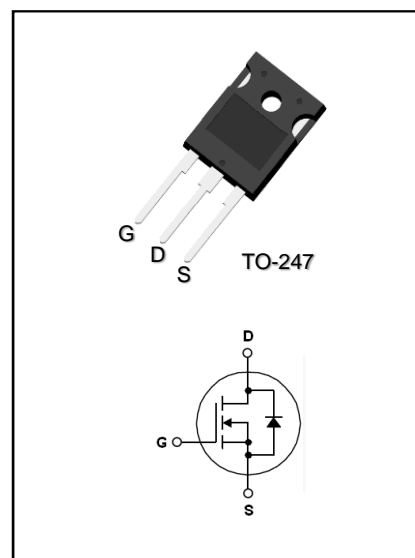
Description

AKQH20N65CM is utilizing an advanced charge balance mechanism for outstanding low onresistance and lower gate charge performance.

This advanced technology has been tailored to minimize conduction loss, provide superior switching performance, and withstand extreme dv/dt rate and higher avalanche energy. AKQH20N65CM is suitable for ACDC power conversion inswitching mode operation for higher efficiency.

Features

- Low on-Resistance: $R_{DS(on)}=163m\Omega$ (typ.)
- Fast-Recovery body diode
- 100% Avalanche Test
- Extremely Low Reverse Recovery Charge



Applications

- DC-DC Converters and AC-DC Power Supply

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

| Symbol | Parameter | Ratings | Unit |
|-----------|---|-------------------------|------------------|
| V_{DSS} | Drain to Source Voltage | 650 | V |
| V_{GSS} | Gate to Source Voltage | ± 30 | V |
| I_D | Drain Current | $T_c=25^\circ\text{C}$ | 20 |
| | | $T_c=100^\circ\text{C}$ | 12 |
| I_{DM} | Pulsed Drain Current (Note1) | 60 | A |
| P_D | Maximum Power Dissipation | $T_c=25^\circ\text{C}$ | 150 |
| | Derate above 25°C | | 1.2 |
| E_{AS} | Single Pulsed Avalanche Energy (Note 2) | 122 | mJ |
| T_J | Operating Junction Temperature Range | -55~+150 | $^\circ\text{C}$ |
| T_{STG} | Storage Temperature Range | -55~+150 | $^\circ\text{C}$ |

Thermal Characteristics

| Symbol | Parameter | Ratings | Unit |
|---------------|---|---------|--------------------|
| $R_{th(J-C)}$ | Thermal Resistance, Junction to case | 0.83 | $^\circ\text{C/W}$ |
| $R_{th(J-A)}$ | Thermal Resistance, Junction to Ambient | 62 | $^\circ\text{C/W}$ |

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 =250uA | 650 | - | - | V |
| V _{GS(th)} | Gate Threshold Voltage | V _{DS} =V _{GS} , I _D =250uA | 2.5 | 2.9 | 4.5 | V |
| R _{DS(on)} | Static Drain-Source On-Resistance | V _{GS} =10V, I _D =10A | - | 163 | - | mΩ |
| I _{DSS} | Zero Gate Voltage Drain Current | V _{DS} =V _{DSS} , V _{GS} =0V | - | - | 2 | uA |
| I _{GSS} | Gate to Source Leakage Current | V _{GS} =V _{GSS} , V _{DS} =0V | - | - | ±200 | nA |

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

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|-----------------|---|---|------|------|------|------|
| I _S | Maximum Drain to Source Diode Forward Current | | - | - | 20 | A |
| V _{SD} | Drain-Source Diode Forward Voltage | V _{GS} =0V, I _S =20A | - | 0.89 | - | V |
| t _{rr} | Reverse Recovery Time | V _{GS} =0V, I _S =20A, | - | 305 | - | ns |
| Q _{rr} | Reverse Recovery Charge | di/dt=-100A/us | - | 2.2 | - | uC |

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} =325V, R _G =20Ω (Note 3) | - | 27 | - | ns |
| t _r | Rising Time | | - | 36 | - | ns |
| t _{d(off)} | Turn-off Delay Time | | - | 88 | - | ns |
| t _f | Falling Time | | - | 6 | - | ns |
| C _{iss} | Input Capacitance | V _{GS} =0V, V _{DS} =100V, f=1.0MHz | - | 1760 | - | pF |
| C _{oss} | Output Capacitance | | - | 78 | - | pF |
| C _{rss} | Reverse Transfer Capacitance | | - | 1.8 | - | pF |
| Q _g | Total Gate Charge | I _D =10A, V _{DS} =520V V _{GS} =10V (Note 3) | - | 42 | - | nC |
| Q _{gs} | Gate to Source Charge | | - | 15 | - | nC |
| Q _{gd} | Gate to Drain Charge | | - | 12 | - | nC |

Note:

1. Repetitive rating: pulse-width limited by maximum junction temperature
2. L=5mH, V_{DD}=50V, V_G=10V, @T_C=25°C
3. Essentially independent of operating temperature typical characteristics

Typical Performance Characteristics

Fig. 1. Typical on-Region Characteristics

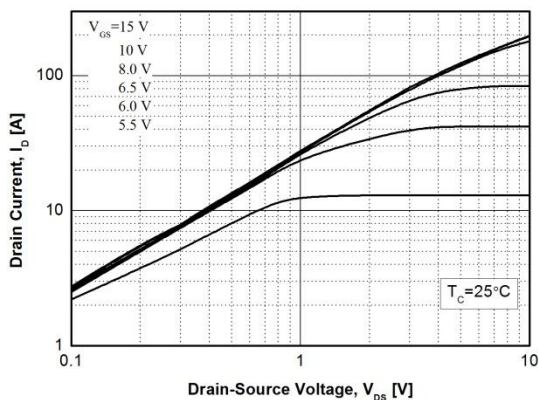


Fig. 2. Typical Transfer Characteristics

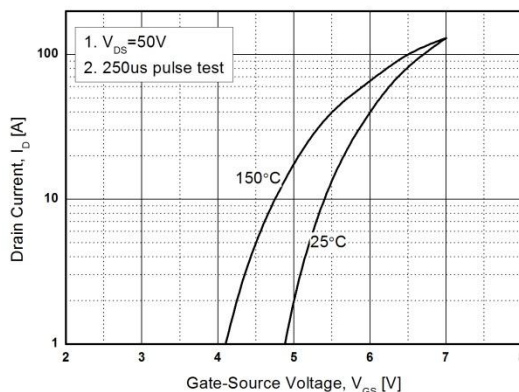


Fig. 3. Static on-Resistance vs. I_D

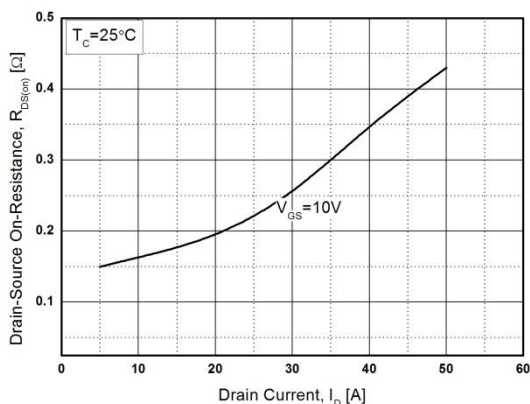


Fig. 4. Body Diode Forward Voltage vs. I_{DR}

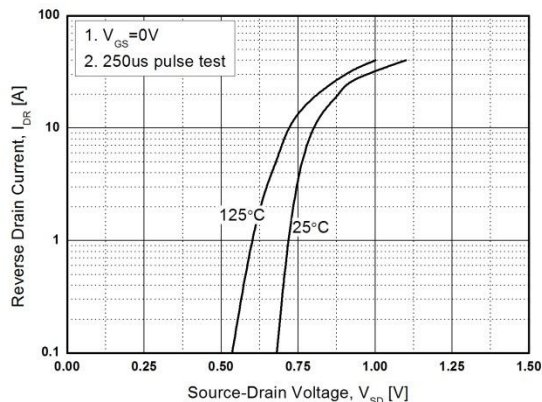


Fig. 5. Capacitance Characteristics

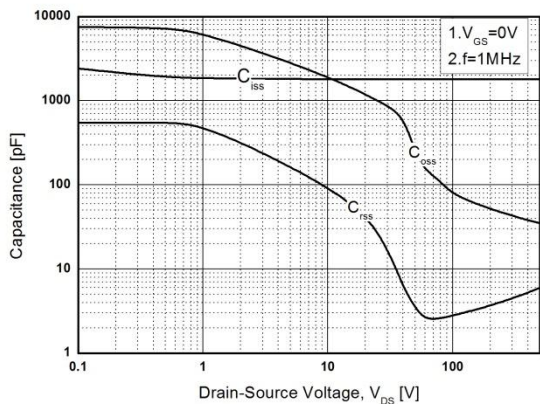
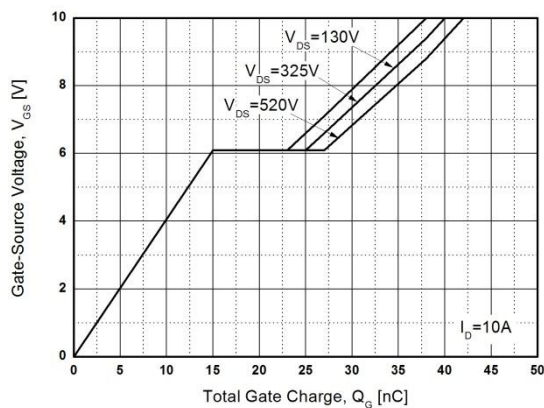


Fig. 6. Gate Charge Characteristics



Typical Performance Characteristics

Fig. 7. Breakdown Voltage vs. Temperature

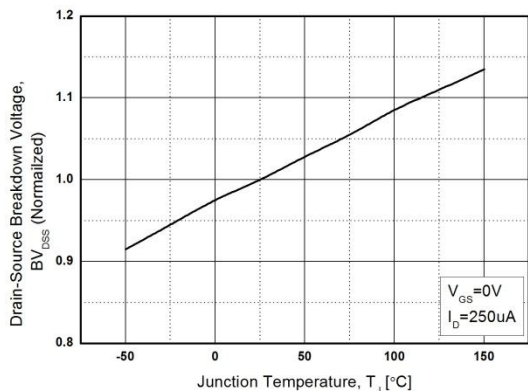


Fig. 8. Static on-Resistance vs. Temperature

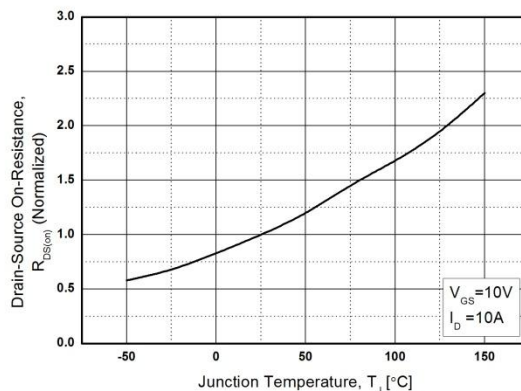


Fig. 9. Maximum Safe Operating Area

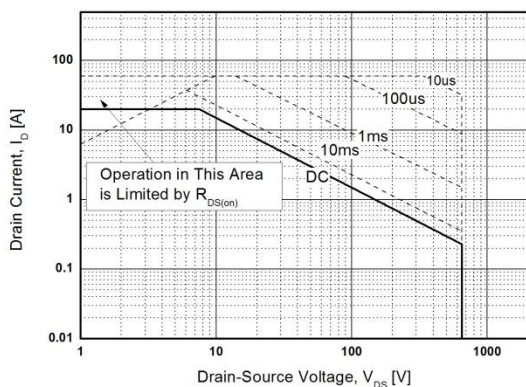


Fig. 10. Maximum Drain Current vs. Temperature

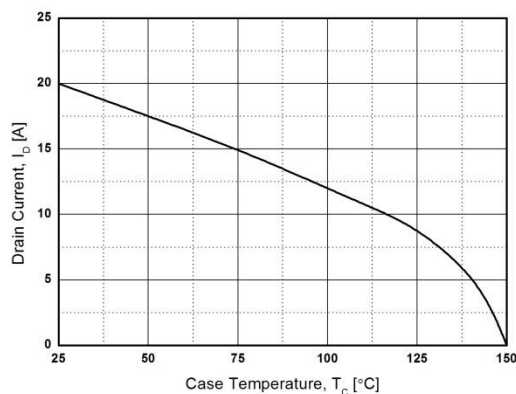
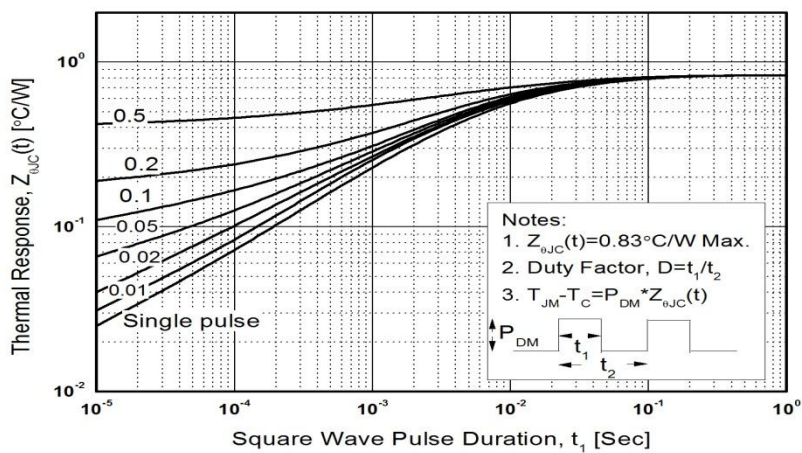


Fig. 11. Transient Thermal Response Curve



Package Dimensions

TO-247

(Dimensions in Millimeters)

