



General Description

- Proprietary α MOS5™ technology
- Low $R_{DS(ON)}$
- Optimized switching parameters for better EMI performance
- Enhanced body diode for robustness and fast reverse recovery

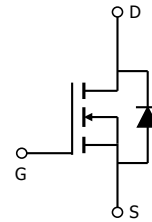
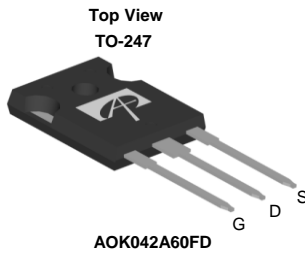
Applications

- PFC and PWM stages (LLC, FSFB, TTF) of Server, Telecom, Industrial, UPS, and Solar Inverters

Product Summary

| | |
|----------------------|------------------|
| $V_{DS} @ T_{j,max}$ | 700V |
| I_{DM} | 250A |
| $R_{DS(ON),max}$ | < 0.042 Ω |
| $Q_{g,typ}$ | 175nC |
| $E_{oss} @ 400V$ | 17.2 μ J |

100% UIS Tested
100% R_g Tested



| Orderable Part Number | Package Type | Form | Minimum Order Quantity |
|-----------------------|--------------|------|------------------------|
| AOK042A60FD | TO247 | Tube | 240 |

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

| Parameter | Symbol | Maximum | Units |
|--|----------------|----------------------------------|------------------|
| Drain-Source Voltage | V_{DS} | 600 | V |
| Gate-Source Voltage | V_{GS} | ± 20 | V |
| Gate-Source Voltage (dynamic) AC($f > 1\text{Hz}$) | V_{GS} | ± 30 | V |
| Continuous Drain Current | I_D | $T_C=25^\circ\text{C}$ | 70 |
| | | $T_C=100^\circ\text{C}$ | 44 |
| Pulsed Drain Current ^C | I_{DM} | 250 | A |
| Avalanche Current ^C L=1mH | I_{AR} | 20 | A |
| Repetitive avalanche energy ^C | E_{AR} | 200 | mJ |
| Single pulsed avalanche energy ^G | E_{AS} | 1687 | mJ |
| MOSFET dv/dt ruggedness | dv/dt | 100 | V/ns |
| Diode reverse recovery $V_{DS}=0$ to 400V, $I_F \leq 50\text{A}$, $T_J=25^\circ\text{C}$ | dv/dt | 20 | V/ns |
| | di/dt | 900 | A/us |
| Power Dissipation ^B | P_D | $T_C=25^\circ\text{C}$ | 500 |
| | | Derate above 25 $^\circ\text{C}$ | 4.0 |
| Junction and Storage Temperature Range | T_J, T_{STG} | -55 to 150 | $^\circ\text{C}$ |
| Maximum lead temperature for soldering purpose, 1/8" from case for 5 seconds | T_L | 300 | $^\circ\text{C}$ |

Thermal Characteristics

| Parameter | Symbol | Maximum | Units |
|--|-----------------|---------|--------------------|
| Maximum Junction-to-Ambient ^{A,D} | $R_{\theta JA}$ | 40 | $^\circ\text{C/W}$ |
| Maximum Case-to-sink ^A | $R_{\theta CS}$ | 0.5 | $^\circ\text{C/W}$ |
| Maximum Junction-to-Case | $R_{\theta JC}$ | 0.25 | $^\circ\text{C/W}$ |

Electrical Characteristics (T_J=25°C unless otherwise noted)

| Symbol | Parameter | Conditions | Min | Typ | Max | Units | |
|------------------------------------|---|--|-----|-------|-------|-------|----|
| STATIC PARAMETERS | | | | | | | |
| BV _{DSS} | Drain-Source Breakdown Voltage | I _D =250μA, V _{GS} =0V, T _J =25°C | 600 | | | V | |
| | | I _D =10mA, V _{GS} =0V, T _J =125°C | | 700 | | | |
| BV _{DSS} /ΔT _J | Breakdown Voltage Temperature Coefficient | I _D =10mA, V _{GS} =0V | | 0.42 | | V/°C | |
| I _{DSS} | Zero Gate Voltage Drain Current | V _{DS} =600V, V _{GS} =0V | | | 10 | μA | |
| | | V _{DS} =480V, T _J =125°C | | | 100 | | |
| I _{GSS} | Gate-Body leakage current | V _{DS} =0V, V _{GS} =±20V | | | ±100 | nA | |
| V _{GS(th)} | Gate Threshold Voltage | V _{DS} =5V, I _D =250μA | 3 | 3.6 | 4.2 | V | |
| R _{DS(ON)} | Static Drain-Source On-Resistance | V _{GS} =10V, I _D =25A | | 0.036 | 0.042 | Ω | |
| g _{FS} | Forward Transconductance | V _{DS} =10V, I _D =25A | | 41 | | S | |
| V _{SD} | Diode Forward Voltage | I _S =25A, V _{GS} =0V | | 0.83 | 1.2 | V | |
| I _S | Maximum Body-Diode Continuous Current | | | | 70 | A | |
| I _{SM} | Maximum Body-Diode Pulsed Current ^C | | | | 250 | A | |
| DYNAMIC PARAMETERS | | | | | | | |
| C _{iss} | Input Capacitance | V _{GS} =0V, V _{DS} =100V, f=1MHz | | 9165 | | pF | |
| C _{oss} | Output Capacitance | | | | 230 | | pF |
| C _{o(er)} | Effective output capacitance, energy related ^H | V _{GS} =0V, V _{DS} =0 to 480V, f=1MHz | | 197 | | pF | |
| C _{o(tr)} | Effective output capacitance, time related ^I | | | | 872 | | pF |
| C _{rss} | Reverse Transfer Capacitance | V _{GS} =0V, V _{DS} =100V, f=1MHz | | 2 | | pF | |
| R _g | Gate resistance | f=1MHz | | 2.3 | | Ω | |
| SWITCHING PARAMETERS | | | | | | | |
| Q _g | Total Gate Charge | V _{GS} =10V, V _{DS} =480V, I _D =25A | | 175 | | nC | |
| Q _{gs} | Gate Source Charge | | | | 56 | | nC |
| Q _{gd} | Gate Drain Charge | | | | 52 | | nC |
| T _{d(on)} | Turn-On DelayTime | V _{GS} =10V, V _{DS} =400V, I _D =25A, R _G =5Ω | | 75 | | ns | |
| T _r | Turn-On Rise Time | | | | 82 | | ns |
| T _{d(off)} | Turn-Off DelayTime | | | | 176 | | ns |
| T _f | Turn-Off Fall Time | | | | 56 | | ns |
| T _{rr} | Body Diode Reverse Recovery Time | | | | 252 | | ns |
| I _{rm} | Peak Reverse Recovery Current | I _F =25A, di/dt=100A/μs, V _{DS} =400V | | 22 | | A | |
| Q _{rr} | Body Diode Reverse Recovery Charge | | | 3 | | μC | |

A. The value of R_{θJA} is measured with the device in a still air environment with T_A=25° C.

B. The power dissipation P_D is based on T_{J(MAX)}=150° C, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.

C. Repetitive rating, pulse width limited by junction temperature T_{J(MAX)}=150° C, Ratings are based on low frequency and duty cycles to keep initial T_J=25° C.

D. The R_{θJA} is the sum of the thermal impedance from junction to case R_{θJC} and case to ambient.

E. The static characteristics in Figures 1 to 6 are obtained using <300μs pulses, duty cycle 0.5% max.

F. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of T_{J(MAX)}=150° C. The SOA curve provides a single pulse rating.

G. L=60mH, I_{AS}=7.5A, R_G=25Ω, Starting T_J=25° C.

H. C_{o(er)} is a fixed capacitance that gives the same stored energy as C_{oss} while V_{DS} is rising from 0 to 80% V_{(BR)DSS}.

I. C_{o(tr)} is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 80% V_{(BR)DSS}.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

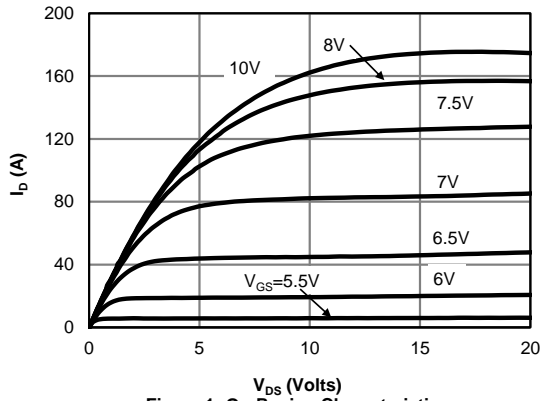


Figure 1: On-Region Characteristics

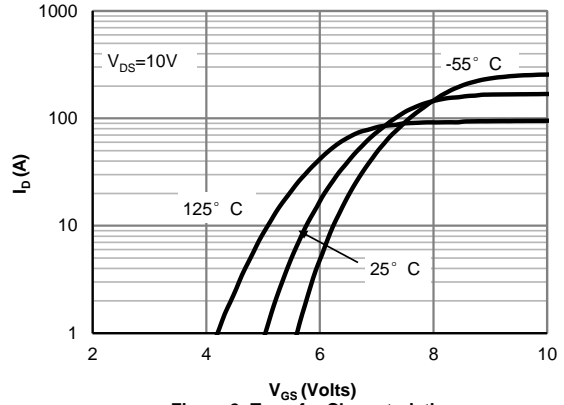


Figure 2: Transfer Characteristics

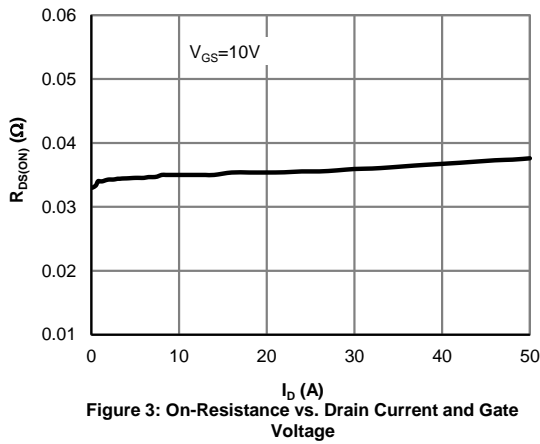


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

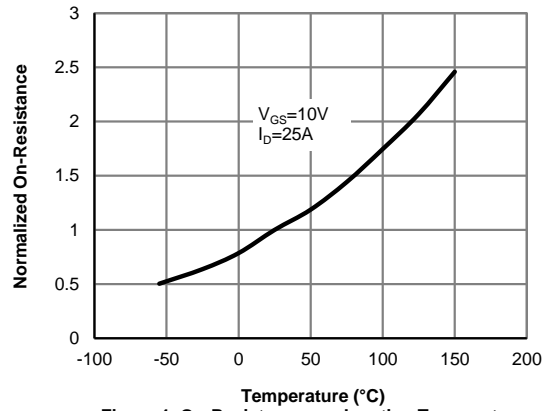


Figure 4: On-Resistance vs. Junction Temperature

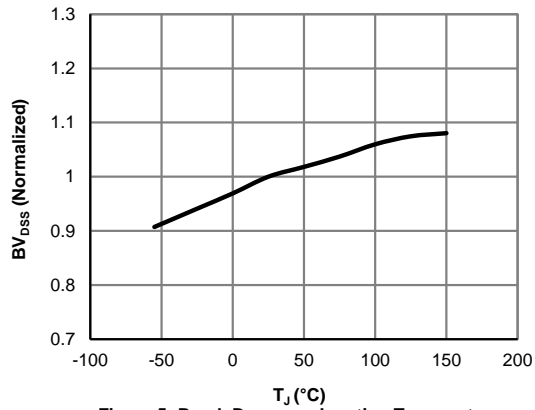


Figure 5: Break Down vs. Junction Temperature

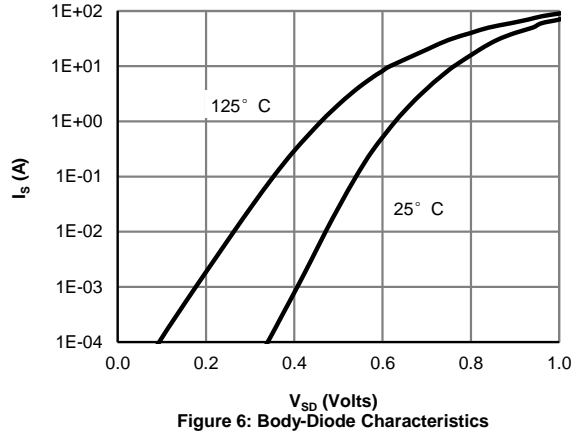


Figure 6: Body-Diode Characteristics

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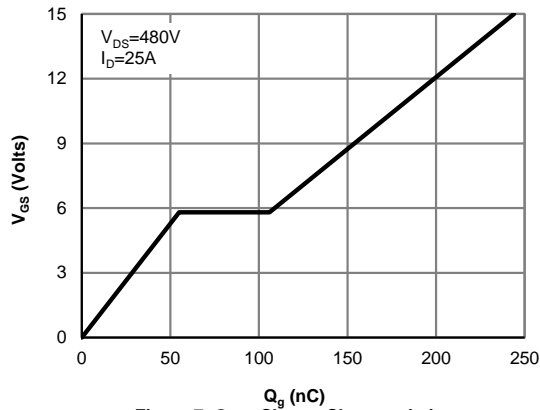


Figure 7: Gate-Charge Characteristics

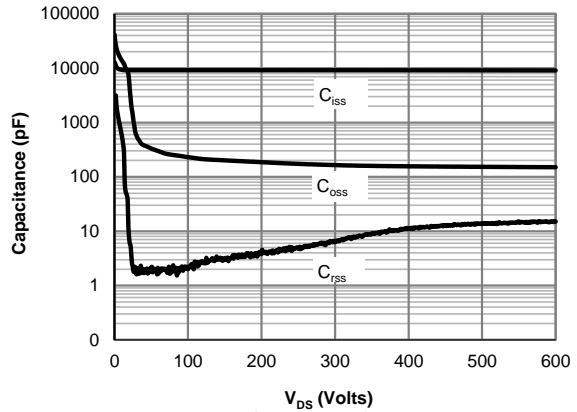


Figure 8: Capacitance Characteristics

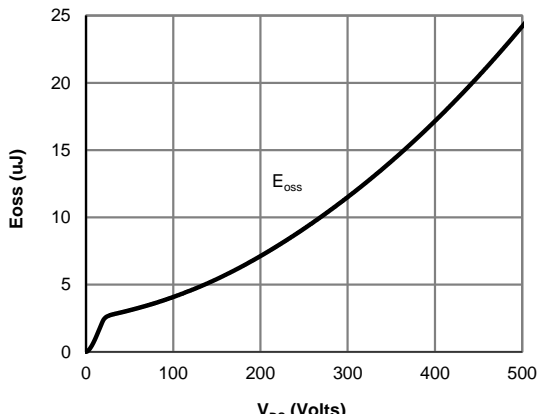


Figure 9: C_{oss} stored Energy

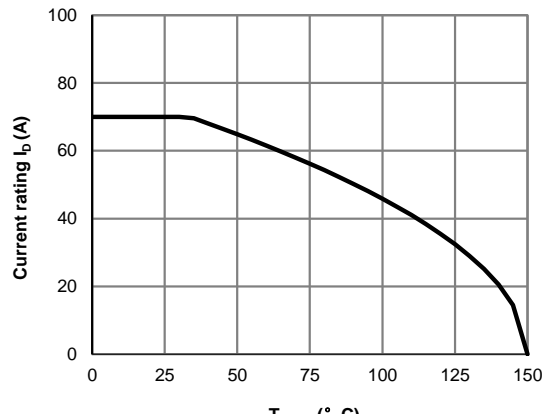


Figure 10: Current De-rating (Note F)

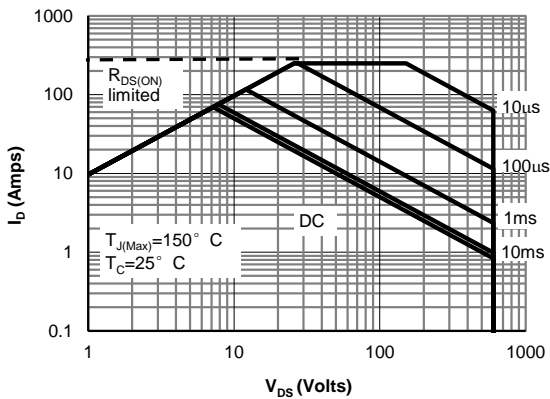


Figure 11: Maximum Forward Biased Safe Operating Area (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

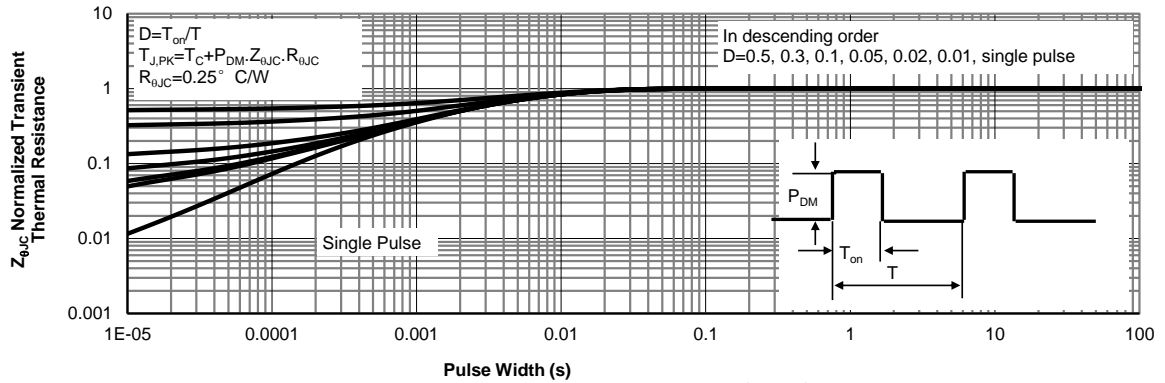
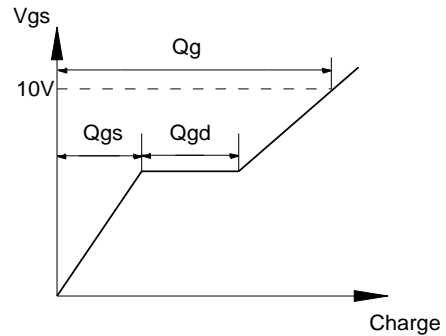
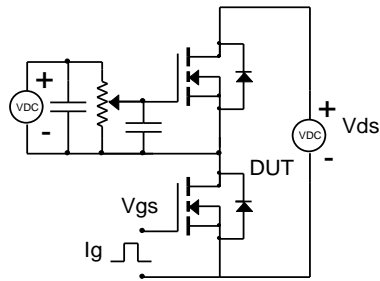
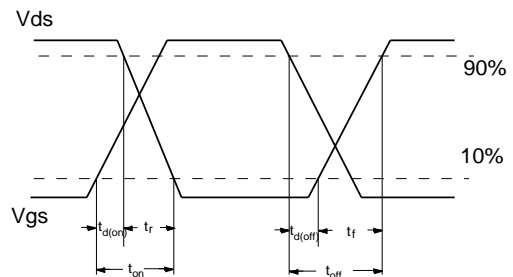
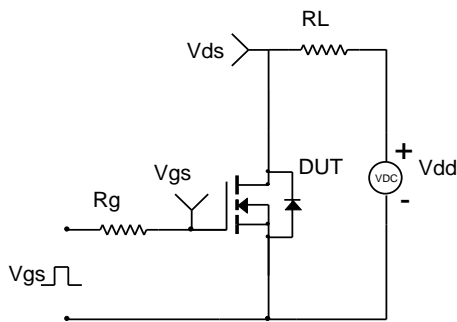


Figure 12: Normalized Maximum Transient Thermal Impedance (Note F)

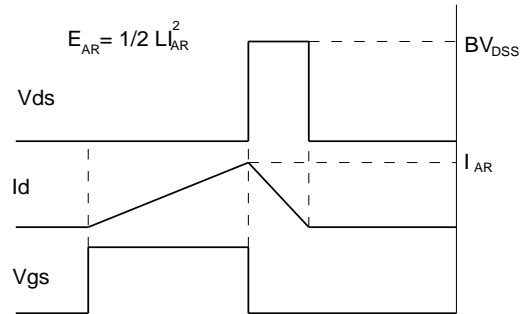
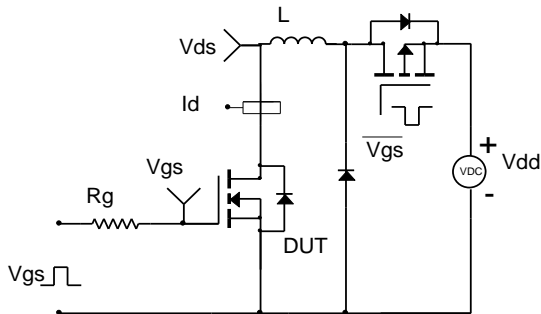
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

