ALPHA & OMEGA SEMICONDUCTOR

# AON2240

## 40V N-Channel MOSFET

### General Description

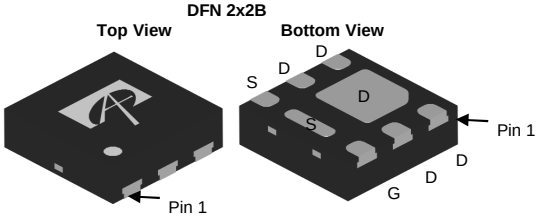
The AON2240 combines advanced trench MOSFET technology with a low resistance package to provide extremely low $R_{DS(ON)}$. This device is ideal for load switch and battery protection applications.

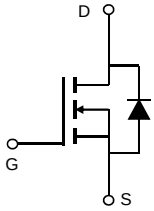
### Product Summary

| | |
|---|---|
| $V_{DS}$ | 40V |
| $I_D$ (at $V_{GS}$=10V) | 8A |
| $R_{DS(ON)}$ (at $V_{GS}$ =10V) | < 21mΩ |
| $R_{DS(ON)}$ (at $V_{GS}$ =4.5V) | < 29mΩ |

Green Product

DFN 2x2B




**Absolute Maximum Ratings $T_A$=25°C unless otherwise noted**

| Parameter | | Symbol | Maximum | Units |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | 40 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±20 | V |
| Continuous Drain Current [G] | $T_A$=25°C | $I_D$ | 8 | A |
| | $T_A$=100°C | | 6 | |
| Pulsed Drain Current [C] | | $I_{DM}$ | 32 | |
| Power Dissipation [A] | $T_A$=25°C | $P_D$ | 2.8 | W |
| | $T_A$=70°C | | 1.8 | |
| Junction and Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to 150 | °C |

**Thermal Characteristics**

| Parameter | | Symbol | Typ | Max | Units |
|---|---|---|---|---|---|
| Maximum Junction-to-Ambient [A] | t ≤ 10s | $R_{\theta JA}$ | 37 | 45 | °C/W |
| Maximum Junction-to-Ambient [A D] | Steady-State | | 66 | 80 | °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 | 40 | | | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$=40V, $V_{GS}$=0V | | | 1 | µA |
| | | $T_J$=55°C | | | 5 | |
| $I_{GSS}$ | Gate-Body leakage current | $V_{DS}$=0V, $V_{GS}$=±20V | | | ±100 | nA |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$=$V_{GS}$, $I_D$=250µA | 1.4 | 1.9 | 2.4 | V |
| $I_{D(ON)}$ | On state drain current | $V_{GS}$=10V, $V_{DS}$=5V | 32 | | | A |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS}$=10V, $I_D$=8A | | 16.8 | 21 | mΩ |
| | | $T_J$=125°C | | 24.5 | 31 | |
| | | $V_{GS}$=4.5V, $I_D$=4A | | 22.6 | 29 | mΩ |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$=5V, $I_D$=8A | | 33 | | S |
| $V_{SD}$ | Diode Forward Voltage | $I_S$=1A,$V_{GS}$=0V | | 0.75 | 1 | V |
| $I_S$ | Maximum Body-Diode Continuous Current | | | | 3.5 | A |
| **DYNAMIC PARAMETERS** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{GS}$=0V, $V_{DS}$=20V, f=1MHz | | 415 | | pF |
| $C_{oss}$ | Output Capacitance | | | 112 | | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | | 11 | | pF |
| $R_g$ | Gate resistance | $V_{GS}$=0V, $V_{DS}$=0V, f=1MHz | 1 | 2.2 | 3.5 | Ω |
| **SWITCHING PARAMETERS** | | | | | | |
| $Q_g$(10V) | Total Gate Charge | $V_{GS}$=10V, $V_{DS}$=20V, $I_D$=8A | | 6.5 | 12 | nC |
| $Q_g$(4.5V) | Total Gate Charge | | | 3 | 6 | nC |
| $Q_{gs}$ | Gate Source Charge | | | 1.2 | | nC |
| $Q_{gd}$ | Gate Drain Charge | | | 1.1 | | nC |
| $t_{D(on)}$ | Turn-On DelayTime | $V_{GS}$=10V, $V_{DS}$=20V, $R_L$=2.5Ω, $R_{GEN}$=3Ω | | 4 | | ns |
| $t_r$ | Turn-On Rise Time | | | 3 | | ns |
| $t_{D(off)}$ | Turn-Off DelayTime | | | 15 | | ns |
| $t_f$ | Turn-Off Fall Time | | | 2 | | ns |
| $t_{rr}$ | Body Diode Reverse Recovery Time | $I_F$=8A, dI/dt=100A/µs | | 12.5 | | ns |
| $Q_{rr}$ | Body Diode Reverse Recovery Charge | $I_F$=8A, dI/dt=100A/µs | | 3.5 | | nC |

A. The value of $R_{\theta JA}$ is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with $T_A$ =25° C. The Power dissipation $P_{DSM}$ is based on $R_{\theta JA}$ t ≤ 10s value and the maximum allowed junction temperature of 150° C. The value in any given application depends on the user's specific board design.

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 $R_{\theta JA}$ is the sum of the thermal impedance from junction to case $R_{\theta JC}$ 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. The maximum current rating is package limited.

H. These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with $T_A$=25° C.

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## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

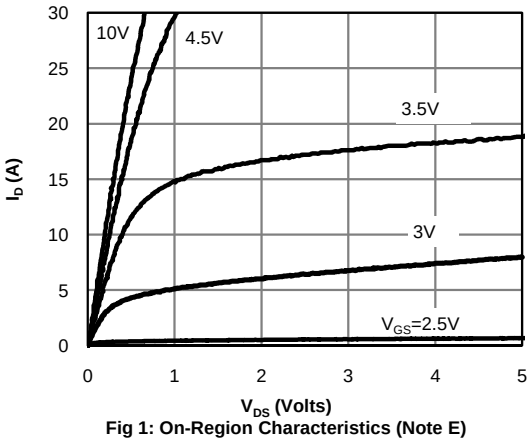



Fig 1: On-Region Characteristics (Note E)

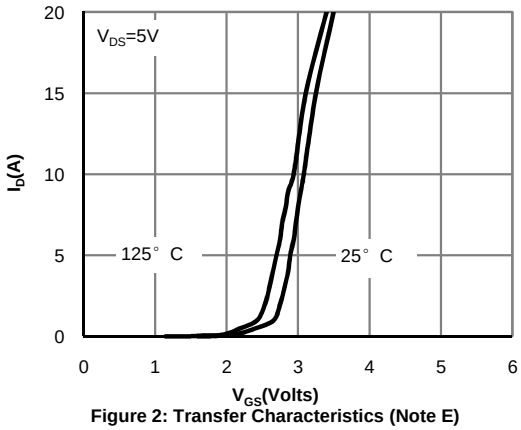



Figure 2: Transfer Characteristics (Note E)

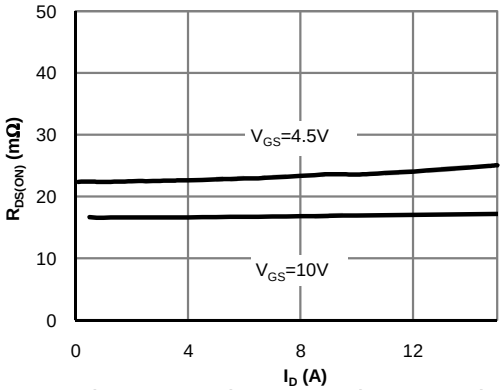



Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

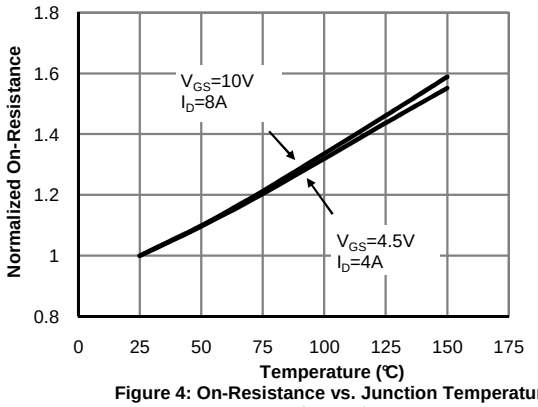



Figure 4: On-Resistance vs. Junction Temperature (Note E)

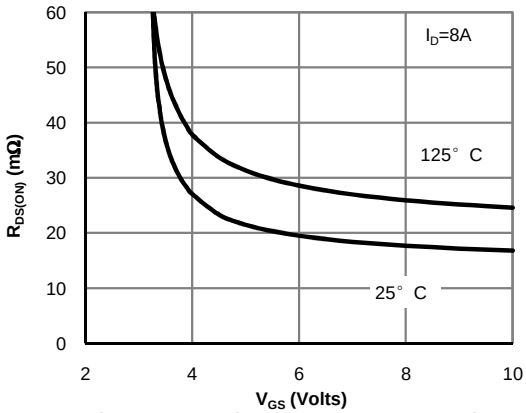



Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

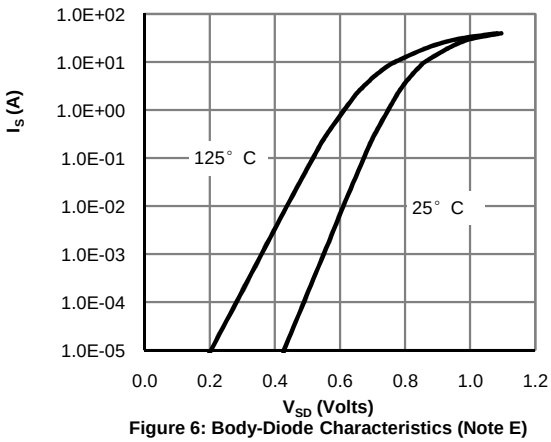



Figure 6: Body-Diode Characteristics (Note E)

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

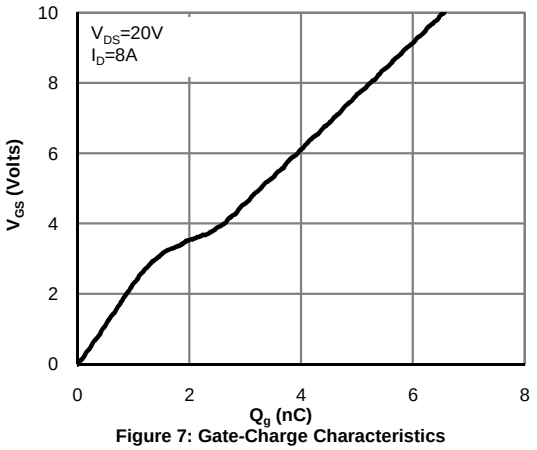



Figure 7: Gate-Charge Characteristics

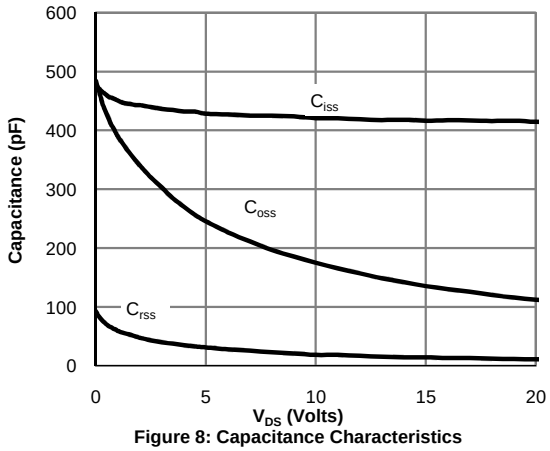



Figure 8: Capacitance Characteristics

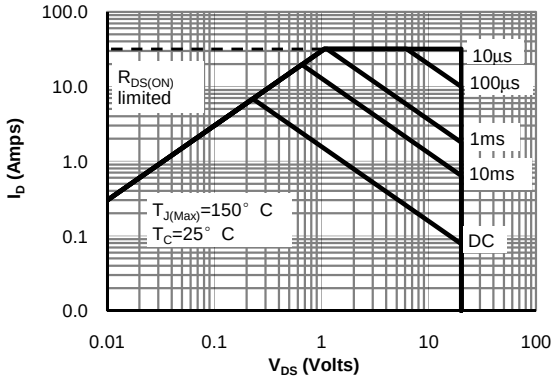



Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

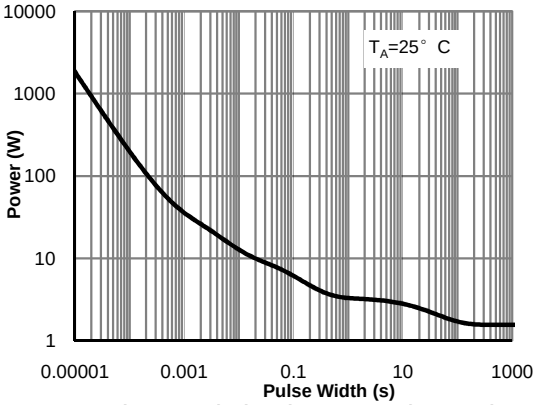



Figure 11: Single Pulse Power Rating Junction-to-Ambient (Note H)

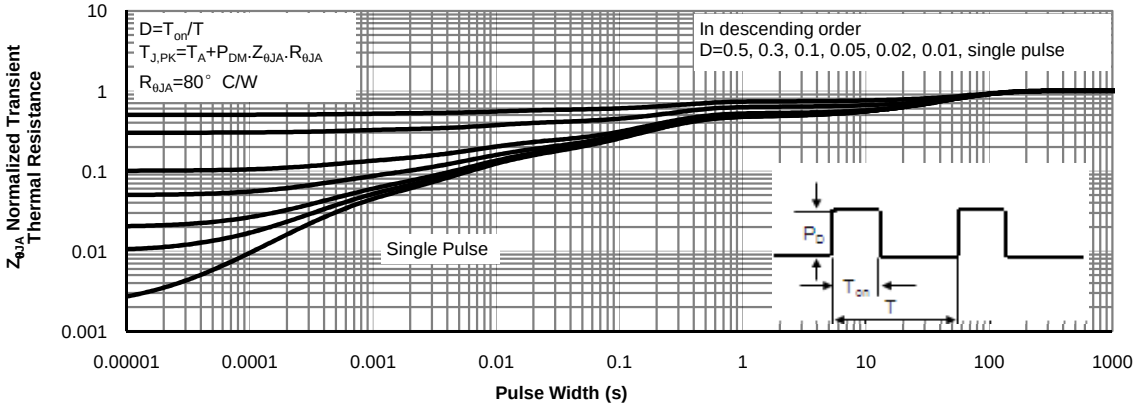
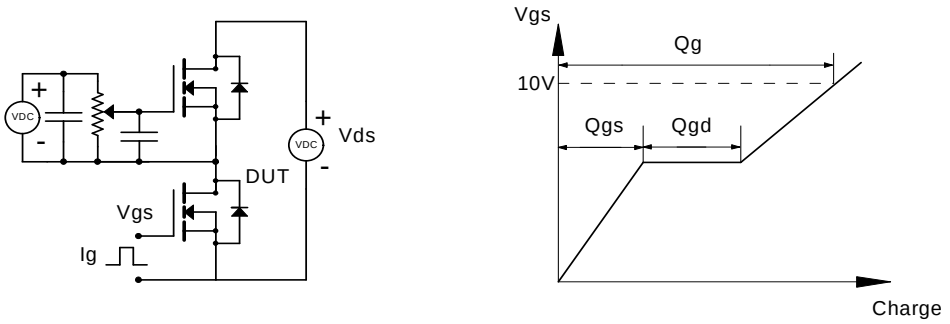
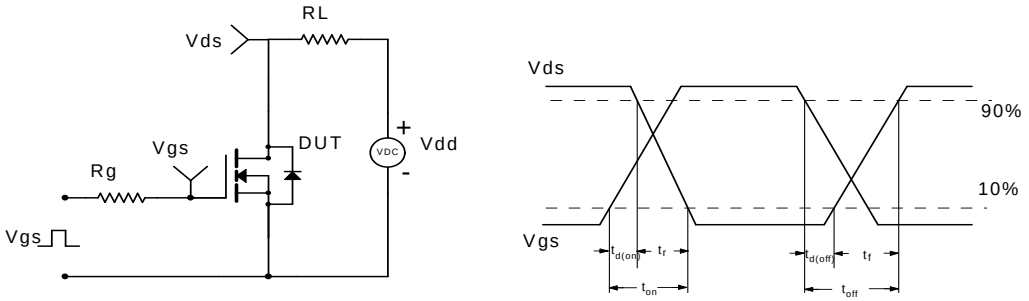



Figure 12: Normalized Maximum Transient Thermal Impedance (Note H)

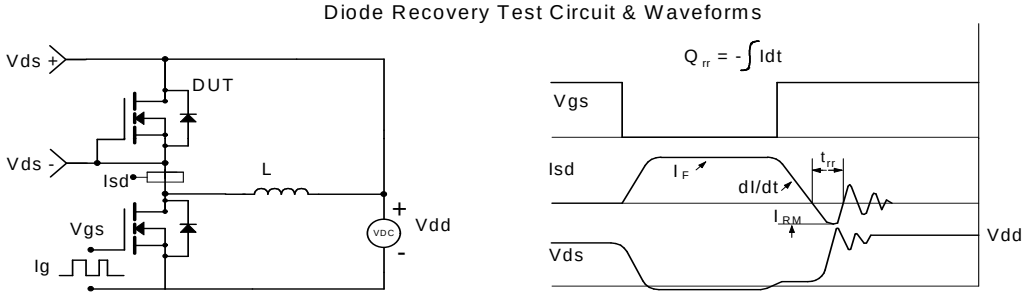
## Gate Charge Test Circuit & Waveform



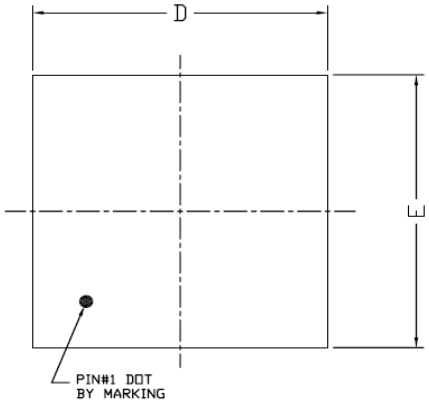

## Resistive Switching Test Circuit & Waveforms

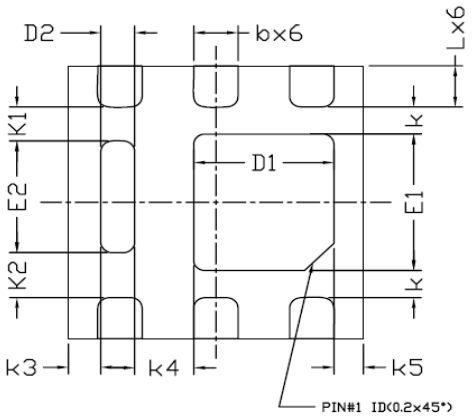



## Diode Recovery Test Circuit & Waveforms

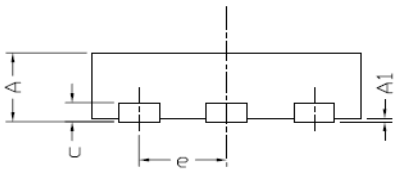


## DFN2x2B_6L_EP1_S PACKAGE OUTLINE

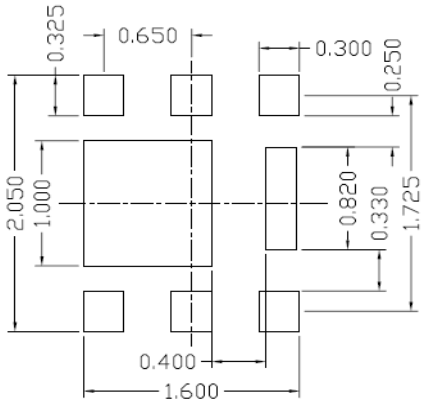



BOTTOM VIEW




RECOMMENDED LAND PATTERN




UNIT: mm

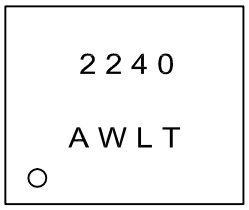
| SYMBOLS | DIMENSIONS IN MILLIMETERS | | | DIMENSIONS IN INCHES | | |
|---|---|---|---|---|---|---|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 0.50 | 0.55 | 0.60 | 0.020 | 0.022 | 0.024 |
| A1 | 0.00 | —— | 0.05 | 0.000 | —— | 0.002 |
| b | 0.25 | 0.30 | 0.35 | 0.010 | 0.012 | 0.014 |
| c | 0.152 REF | | | 0.006 REF | | |
| D | 1.90 | 2.00 | 2.10 | 0.075 | 0.079 | 0.083 |
| D1 | 0.85 | 0.95 | 1.05 | 0.033 | 0.037 | 0.041 |
| D2 | 0.13 | 0.23 | 0.33 | 0.005 | 0.009 | 0.013 |
| E | 1.90 | 2.00 | 2.10 | 0.075 | 0.079 | 0.083 |
| E1 | 0.90 | 1.00 | 1.10 | 0.035 | 0.039 | 0.043 |
| E2 | 0.72 | 0.82 | 0.92 | 0.028 | 0.032 | 0.036 |
| e | 0.65 BSC | | | 0.026 BSC | | |
| K | 0.20 BSC | | | 0.008 BSC | | |
| K1 | 0.25 BSC | | | 0.010 BSC | | |
| K2 | 0.33 BSC | | | 0.013 BSC | | |
| K3 | 0.22 BSC | | | 0.009 BSC | | |
| K4 | 0.40 BSC | | | 0.016 BSC | | |
| K5 | 0.20 BSC | | | 0.008 BSC | | |
| L | 0.25 | 0.30 | 0.35 | 0.010 | 0.012 | 0.014 |

NOTE
1. CONTROLLING DIMENSION IS MILLIMETER.
   CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.

ALPHA & OMEGA SEMICONDUCTOR

| Document No. | PD-01743 |
|---|---|
| Version | A |
| Title | AON2240 Marking Description |

# DFN2X2 PACKAGE MARKING DESCRIPTION




Green product

NOTE:
2240 - Product Number Code
A - Assembly location code
W - Week code & Year Code
L&T - Assembly lot code

| PART NO. | DESCRIPTION | CODE |
|---|---|---|
| AON2240 | Green product | 2240 |
| AON2240L | Green product | 2240 |