

## 1. Description

The 20N06 uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. It can be used in a wide variety of applications.

## 2.2 Features

- Advanced Trench Technology
- Excellent  $R_{DS(ON)}$  and Low Gate Charge

## 2.1 Features

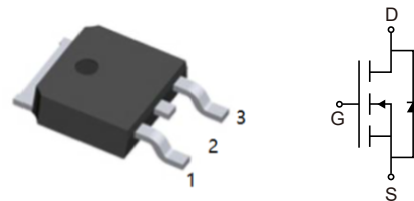
- $V_{DS(V)}=60V$
- $I_D=20A(V_{GS}=10V)$
- $R_{DS(ON)}<23m\Omega(V_{GS}=10V)$
- $R_{DS(ON)}<29m\Omega(V_{GS}=4.5V)$

- Lead free product is acquired

## 3. Pinning information

| Pin | Symbol | Description |
|-----|--------|-------------|
| 1   | G      | GATE        |
| 3   | S      | SOURCE      |
| 2   | D      | DRAIN       |

TO-252(DPAK)  
top view



## 4. Absolute Maximum Ratings $T_A = 25^\circ C$

| Parameter                                 |                   | Symbol    | Rating     | Units      |
|-------------------------------------------|-------------------|-----------|------------|------------|
| Drain-Source Voltage                      |                   | $V_{DS}$  | 60         | V          |
| Gate-Source Voltage                       |                   | $V_{GS}$  | $\pm 20$   |            |
| Drain Current-Continuous <sup>Note3</sup> | $T_C=25^\circ C$  | $I_D$     | 20         | A          |
|                                           | $T_C=100^\circ C$ |           | 14         |            |
| Drain Current-Pulsed <sup>Note1</sup>     |                   | $I_{DM}$  | 120        |            |
| Avalanche Energy <sup>Note4</sup>         |                   | $E_{AS}$  | 72         | mJ         |
| Maximum Power Dissipation                 | $T_C=25^\circ C$  | $P_D$     | 55         | W          |
| Storage Temperature Range                 |                   | $T_{STG}$ | -55 to 150 | $^\circ C$ |
| Operating Junction Temperature Range      |                   | $T_J$     | -55 to 150 | $^\circ C$ |



5.Thermal Resistance Rating

| Parameter                           | Symbol          | Typ | Max | Units |
|-------------------------------------|-----------------|-----|-----|-------|
| Thermal Resistance,Junction-to-Case | $R_{\theta JC}$ |     | 2.7 | °C/W  |



## 6.SPECIFICATIONS (T<sub>J</sub>= 25°C, unless otherwise noted)

| Parameter                        | Symbol              | Conditions                                                                                | Min | Typ  | Max  | Units |
|----------------------------------|---------------------|-------------------------------------------------------------------------------------------|-----|------|------|-------|
| OFF CHARACTERISTICS              |                     |                                                                                           |     |      |      |       |
| Drain-Source Breakdown Voltage   | BV <sub>DSS</sub>   | V <sub>GS</sub> =0V, I <sub>DS</sub> =250μA                                               | 60  |      |      | V     |
| Zero Gate Voltage Drain Current  | I <sub>DSS</sub>    | V <sub>DS</sub> =60V, V <sub>GS</sub> =0V                                                 |     |      | 1    | μA    |
| Gate-Body Leakage                | I <sub>GSS</sub>    | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V                                                |     |      | ±100 | nA    |
| ON CHARACTERISTIC                |                     |                                                                                           |     |      |      |       |
| Gate Threshold Voltage           | V <sub>GS(th)</sub> | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>DS</sub> =250μA                                 | 1   | 1.6  | 2.5  | V     |
| Drain-Source On-State Resistance | R <sub>DS(ON)</sub> | V <sub>GS</sub> =10V, I <sub>DS</sub> =15A                                                |     | 23   | 35   | mΩ    |
|                                  |                     | V <sub>GS</sub> =4.5V, I <sub>DS</sub> =10A                                               |     | 29   | 40   | mΩ    |
| DYNAMIC CHARACTERISTICS          |                     |                                                                                           |     |      |      |       |
| Input Capacitance                | C <sub>iss</sub>    | V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1MHz                                         |     | 1562 |      | pF    |
| Output Capacitance               | C <sub>oss</sub>    |                                                                                           |     | 75.4 |      | pF    |
| Reverse Transfer Capacitance     | C <sub>rss</sub>    |                                                                                           |     | 66.8 |      | pF    |
| SWITCHING CHARACTERISTICS        |                     |                                                                                           |     |      |      |       |
| Turn-On Delay Time               | t <sub>D(on)</sub>  | V <sub>GS</sub> =10V, V <sub>DS</sub> =30V<br>R <sub>GEN</sub> =1.8Ω, I <sub>D</sub> =15A |     | 7.5  |      | ns    |
| Rise Time                        | t <sub>r</sub>      |                                                                                           |     | 21   |      | ns    |
| Turn-Off Delay Time              | t <sub>D(off)</sub> |                                                                                           |     | 16   |      | ns    |
| Fall Time                        | t <sub>f</sub>      |                                                                                           |     | 23.5 |      | ns    |
| Total Gate Charge at 10V         | Q <sub>g</sub>      | V <sub>DS</sub> =30V, I <sub>DS</sub> =15A, V <sub>GS</sub> =10V                          |     | 25   |      | nC    |
| Gate to Source Gate Charge       | Q <sub>gs</sub>     |                                                                                           |     | 4.5  |      | nC    |
| Gate to Drain“Miller”Charge      | Q <sub>gd</sub>     |                                                                                           |     | 6.5  |      | nC    |



| DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS |          |                            |  |    |     |    |
|--------------------------------------------------------|----------|----------------------------|--|----|-----|----|
| Drain-Source Diode Forward Voltage                     | $V_{SD}$ | $V_{GS}=0V, I_{DS}=15A$    |  |    | 1.2 | V  |
| Reverse Recovery Time                                  | $t_{rr}$ | $T_J=25^{\circ}C, I_F=15A$ |  | 29 |     | nS |
| Reverse Recovery Charge                                | $Q_{rr}$ |                            |  | 45 |     | uC |

Notes:

- 1: Repetitive rating, pulse width limited by maximum junction temperature.
- 2: Surface mounted on FR4 Board,  $t_s \leq 10sec$ .
- 3: Pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ .
- 4:  $E_{AS}$  condition:  $L=0.5mH, V_{DD}=30V, V_G=10V, V_{GATE}=60V, Start T_J=25^{\circ}C$ .



## 7.1 Typical Characteristics

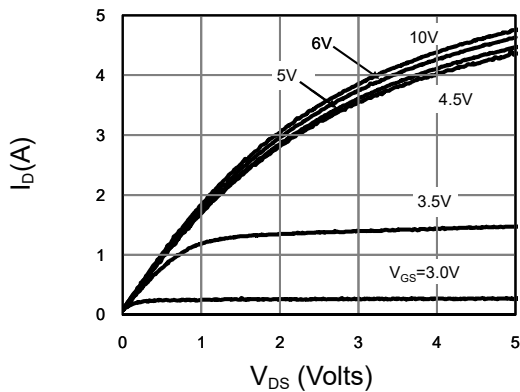


Fig 1: On-Region Characteristics (Note E)

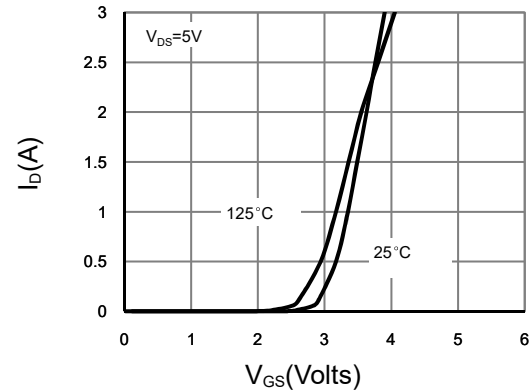


Figure 2: Transfer Characteristics (Note E)

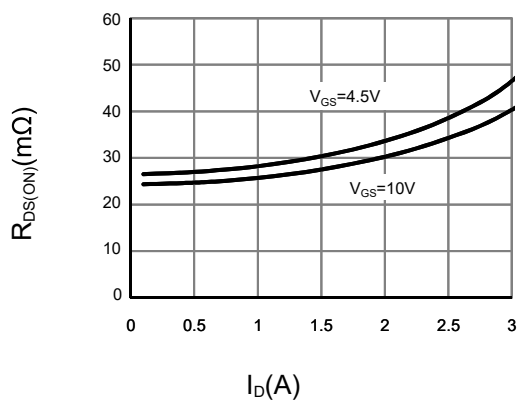


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

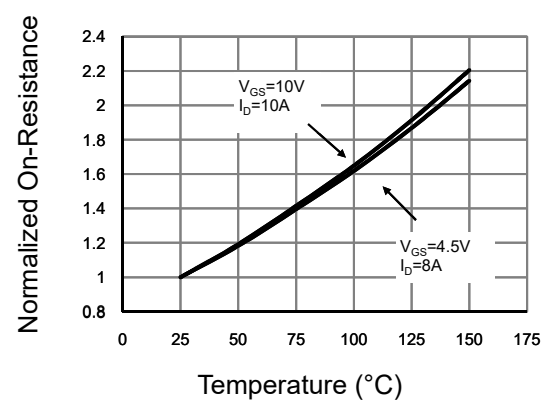


Figure 4: On-Resistance vs. Junction Temperature (Note E)

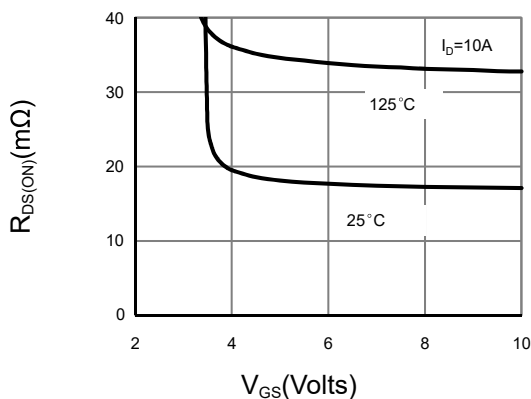


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

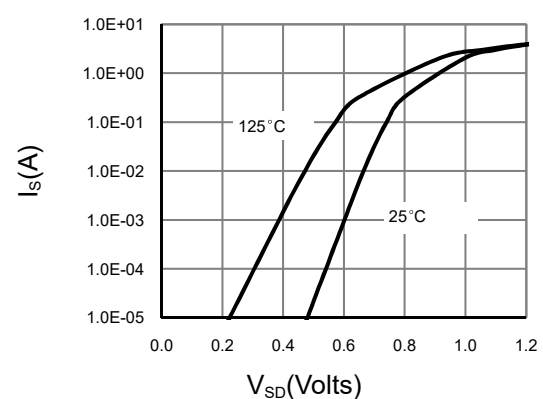


Figure 6: Body-Diode Characteristics (Note E)



## 7.2 Typical Characteristics

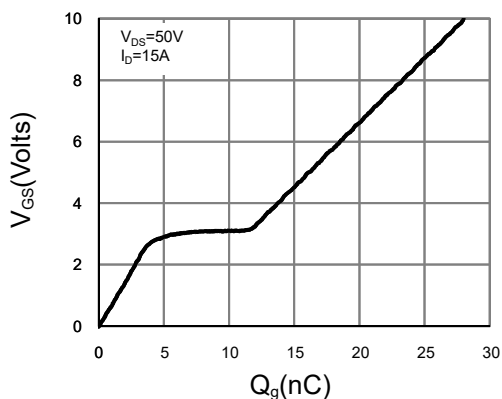


Figure 7: Gate-Charge Characteristics

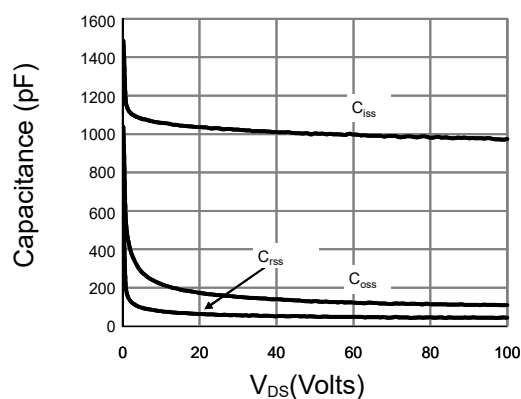


Figure 8: Capacitance Characteristics

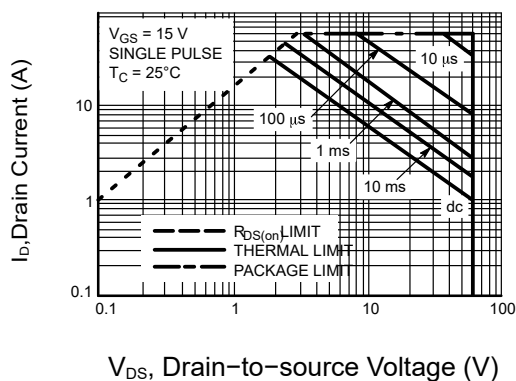


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

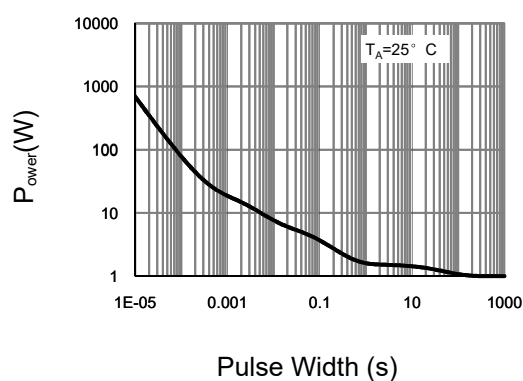


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

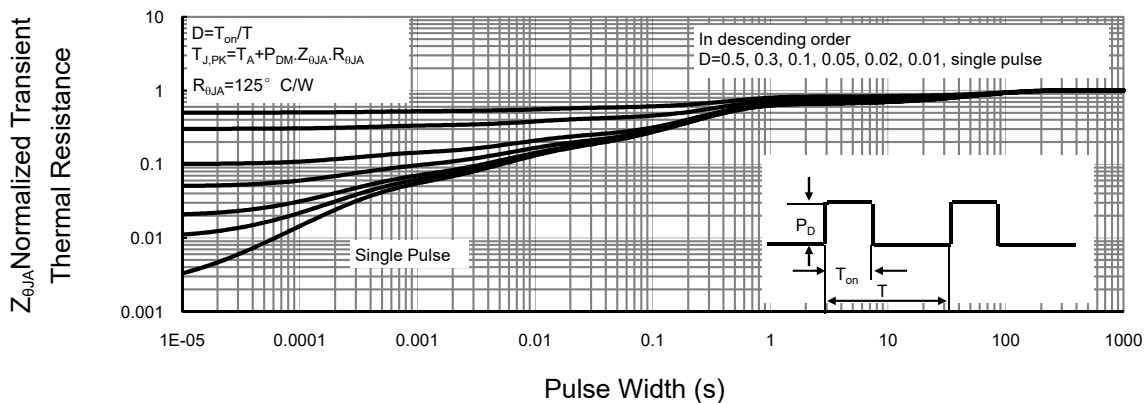


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

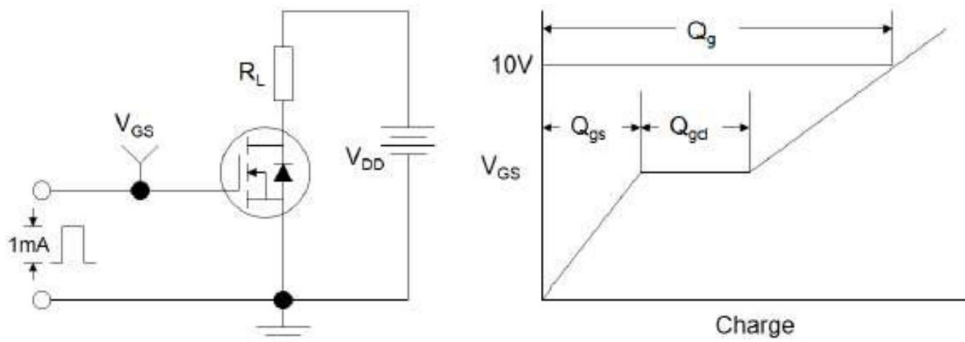


Figure1:Gate Charge Test Circuit &amp; Waveform

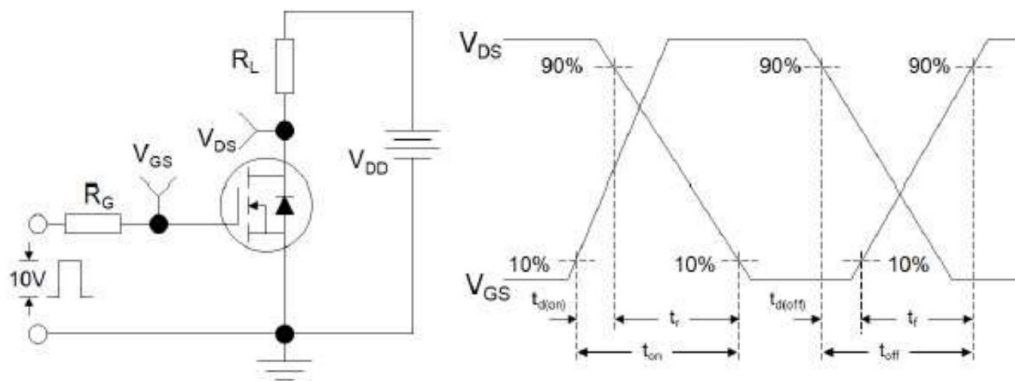


Figure 2: Resistive Switching Test Circuit &amp; Waveforms

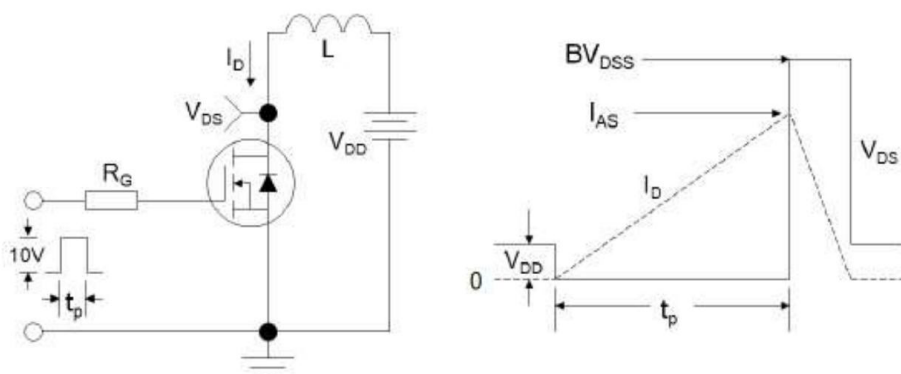
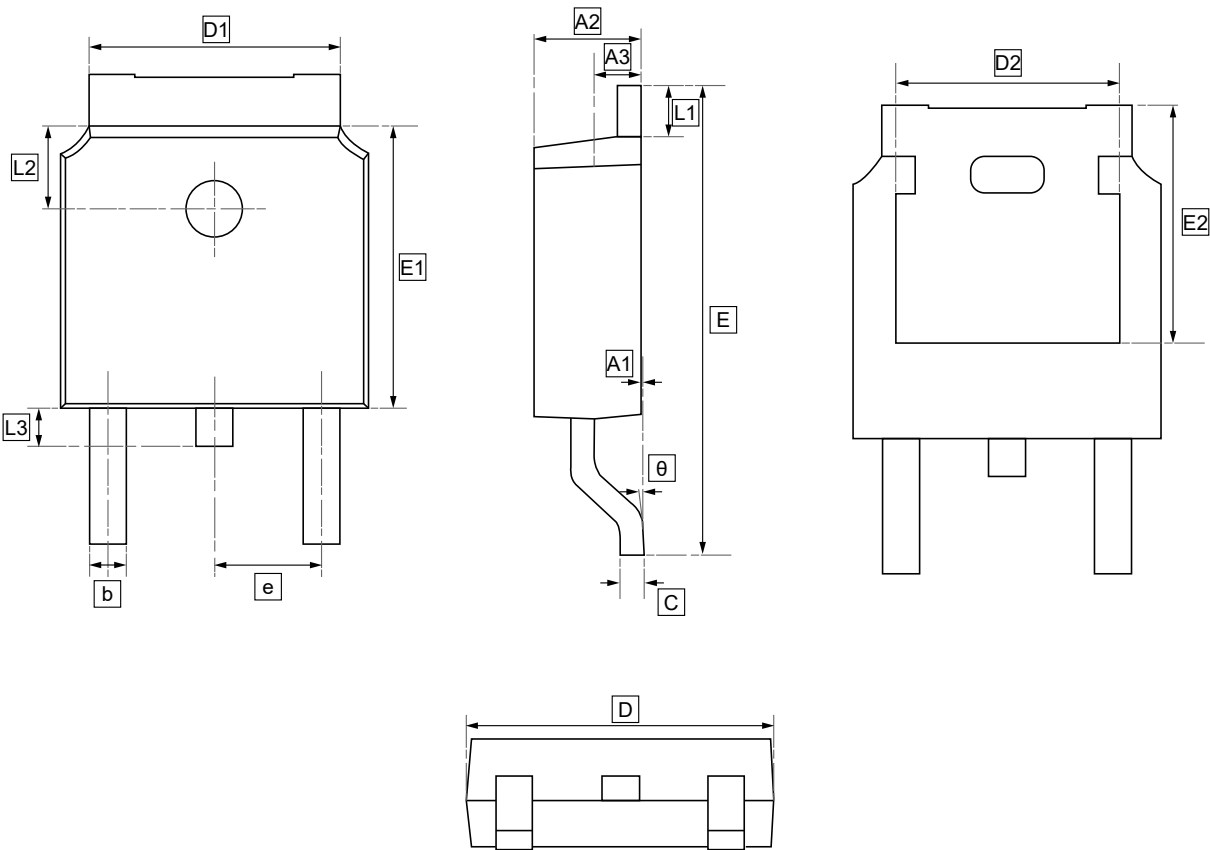


Figure 3:Unclamped inductive Switching Test Circuit &amp; Waveforms



8.TO-252 Package Outline Dimensions



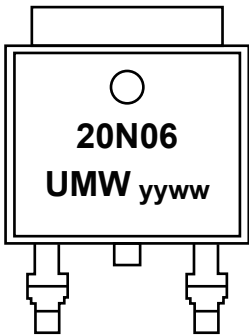
DIMENSIONS (mm are the original dimensions)

| Symbol | A1   | A2   | A3   | b    | c    | D    | D1   | D2   | E     | E1   | E2   | e            | L1   | L2   | L3   | θ    |
|--------|------|------|------|------|------|------|------|------|-------|------|------|--------------|------|------|------|------|
| Min    | 0.00 | 2.18 | 0.90 | 0.65 | 0.46 | 6.35 | 4.95 | 4.32 | 9.40  | 5.97 | 5.21 | 2.286<br>BSC | 0.89 | 1.70 | 0.60 | 0.00 |
| Max    | 0.13 | 2.39 | 1.10 | 0.85 | 0.61 | 6.73 | 5.46 | 4.90 | 10.41 | 6.22 | 5.38 |              | 1.27 | 1.90 | 1.00 | 8.00 |





9.Ordering information



yy: Year Code  
ww: Week Code

| Order Code | Package | Base QTY | Delivery Mode |
|------------|---------|----------|---------------|
| UMW 20N06  | TO-252  | 2500     | Tape and reel |



## 10.Disclaimer

UMW reserves the right to make changes to all products, specifications. Customers should obtain the latest version of product documentation and verify the completeness and currency of the information before placing an order.

When applying our products, please do not exceed the maximum rated values, as this may affect the reliability of the entire system. Under certain conditions, any semiconductor product may experience faults or failures. Buyers are responsible for adhering to safety standards and implementing safety measures during system design, prototyping, and manufacturing when using our products to prevent potential failure risks that could lead to personal injury or property damage.

Unless explicitly stated in writing, UMW products are not intended for use in medical, life-saving, or life-sustaining applications, nor for any other applications where product failure could result in personal injury or death. If customers use or sell the product for such applications without explicit authorization, they assume all associated risks.

When reselling, applying, or exporting, please comply with export control laws and regulations of China, the United States, the United Kingdom, the European Union, and other relevant countries, regions, and international organizations.

This document and any actions by UMW do not grant any intellectual property rights, whether express or implied, by estoppel or otherwise. The product names and marks mentioned herein may be trademarks of their respective owners.