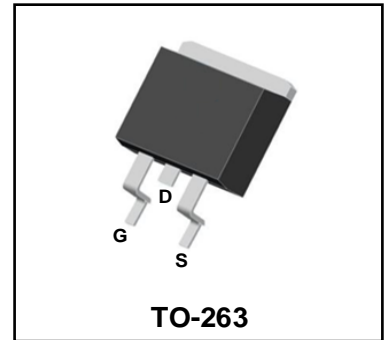


40V P-Channel Enhancement Mode Power MOSFET

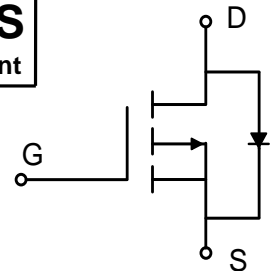
Description

WMM50P04T1 uses advanced power trench technology that has been especially tailored to minimize the on-state resistance and yet maintain superior switching performance.



Features

- $V_{DS} = -40V$, $I_D = -55A$
 $R_{DS(on)} < 13m\Omega$ @ $V_{GS} = -10V$
 $R_{DS(on)} < 20m\Omega$ @ $V_{GS} = -4.5V$
- Green Device Available
- RoHS Compliant & Halogen-Free
- Low Gate Charge
- Advanced High Cell Density Trench Technology
- 100% EAS Guaranteed



Applications

- Power Management Switches
- DC/DC Converters

Absolute Maximum Ratings ($T_A = 25^\circ C$, unless otherwise noted)

| Parameter | Symbol | Value | Unit |
|--|----------------|-------------------|------------|
| Drain-Source Voltage | V_{DS} | -40 | V |
| Gate-Source Voltage | V_{GS} | ± 20 | V |
| Continuous Drain Current | I_D | $T_C=25^\circ C$ | -55 |
| | | $T_C=100^\circ C$ | -34.5 |
| Pulsed Drain Current ¹ | I_{DM} | -220 | A |
| Single Pulse Avalanche Energy ² | EAS | 145.8 | mJ |
| Total Power Dissipation | P_D | 65.7 | W |
| Operating Junction and Storage Temperature Range | T_J, T_{STG} | -55 to 150 | $^\circ C$ |

Thermal Characteristics

| Parameter | Symbol | Value | Unit |
|--|-----------------|-------|--------------|
| Thermal Resistance from Junction-to-Ambient ³ | $R_{\theta JA}$ | 61 | $^\circ C/W$ |
| Thermal Resistance from Junction-to-Case | $R_{\theta JC}$ | 1.9 | $^\circ C/W$ |

Electrical Characteristics ($T_J = 25^\circ\text{C}$, unless otherwise noted)

| Parameter | Symbol | Test Conditions | Min. | Typ. | Max. | Unit |
|--|-------------------------|--|------|------|-----------|------------|
| Static Characteristics | | | | | | |
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS} = 0V, I_D = -250\mu A$ | -40 | - | - | V |
| Gate-body Leakage current | I_{GSS} | $V_{DS} = 0V, V_{GS} = \pm 20V$ | - | - | ± 100 | nA |
| Zero Gate Voltage Drain Current | $T_J=25^\circ\text{C}$ | I_{DSS} $V_{DS} = -40V, V_{GS} = 0V$ | - | - | 1 | μA |
| | $T_J=100^\circ\text{C}$ | | - | - | 100 | |
| Gate-Threshold Voltage | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = -250\mu A$ | -1.0 | -1.6 | -2.2 | V |
| Drain-Source On-Resistance ⁴ | $R_{DS(on)}$ | $V_{GS} = -10V, I_D = -20A$ | - | 11.3 | 13 | m Ω |
| | | $V_{GS} = -4.5V, I_D = -12A$ | - | 14 | 20 | |
| Forward Transconductance ⁴ | g_{fs} | $V_{DS} = -10V, I_D = -16A$ | - | 44 | - | S |
| Dynamic Characteristics⁵ | | | | | | |
| Input Capacitance | C_{iss} | $V_{DS} = -20V, V_{GS} = 0V,$ $f = 1\text{MHz}$ | - | 3225 | - | pF |
| Output Capacitance | C_{oss} | | - | 270 | - | |
| Reverse Transfer Capacitance | C_{rss} | | - | 230 | - | |
| Gate Resistance | R_g | $f = 1\text{MHz}$ | - | 9 | - | Ω |
| Switching Characteristics⁵ | | | | | | |
| Total Gate Charge | Q_g | $V_{GS} = -10V, V_{DS} = -20V,$ $I_D = -20A$ | - | 72 | - | nC |
| Gate-Source Charge | Q_{gs} | | - | 7.2 | - | |
| Gate-Drain Charge | Q_{gd} | | - | 13.3 | - | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{GS} = -10V, V_{DD} = -15V,$ $R_G = 3\Omega, I_D = -20A$ | - | 38 | - | ns |
| Rise Time | t_r | | - | 31 | - | |
| Turn-off Delay Time | $t_{d(off)}$ | | - | 90 | - | |
| Fall Time | t_f | | - | 9.2 | - | |
| Drain-Source Body Diode Characteristics | | | | | | |
| Diode Forward Voltage ⁴ | V_{SD} | $I_S = -1A, V_{GS} = 0V$ | - | - | -1.2 | V |
| Continuous Source Current | $T_C=25^\circ\text{C}$ | I_S | - | - | -55 | A |

Notes:

1. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}=150^\circ\text{C}$.
2. The test condition is $V_{DD} = -25V, V_{GS} = -10V, L=0.4\text{mH}, I_{AS} = -27A$.
3. The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper, The value in any given application depends on the user's specific board design.
4. The data tested by pulsed , pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.
5. This value is guaranteed by design hence it is not included in the production test.

Typical Characteristics

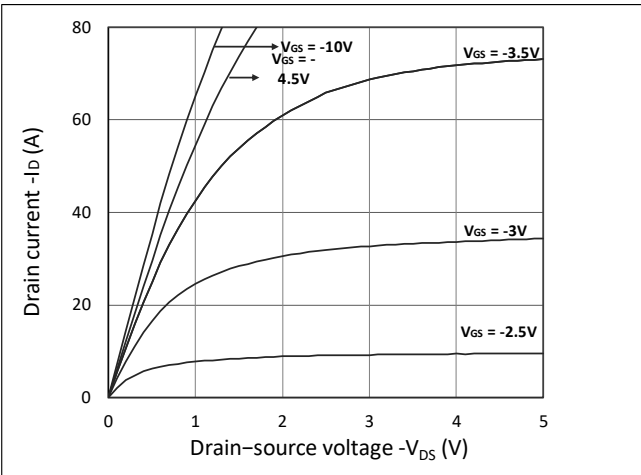


Figure 1. Output Characteristics

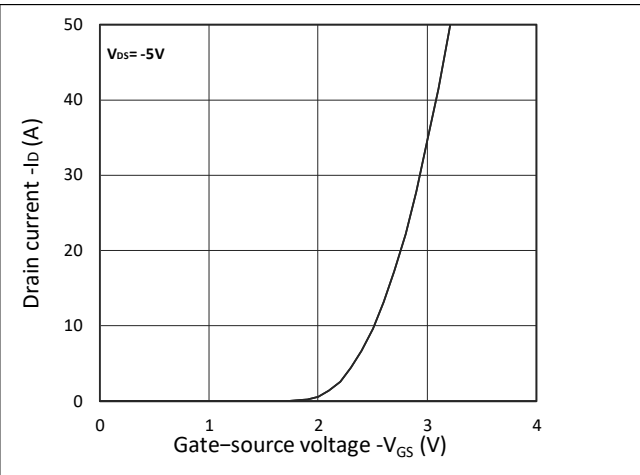


Figure 2. Transfer Characteristics

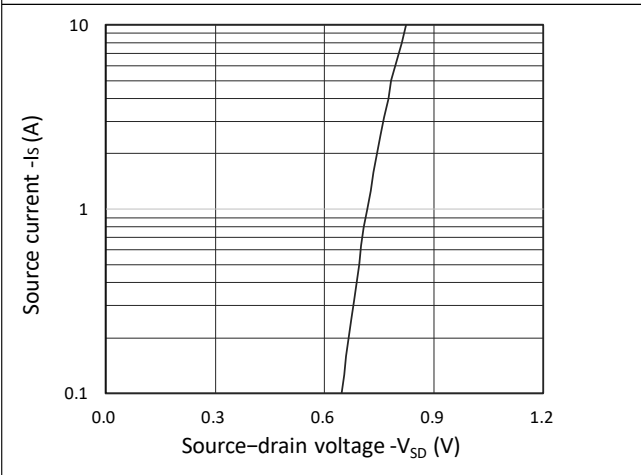


Figure 3. Forward Characteristics of Reverse

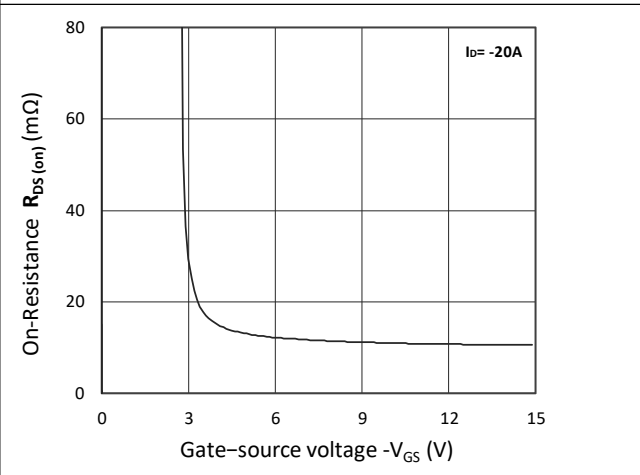


Figure 4. $R_{DS(ON)}$ vs. V_{GS}

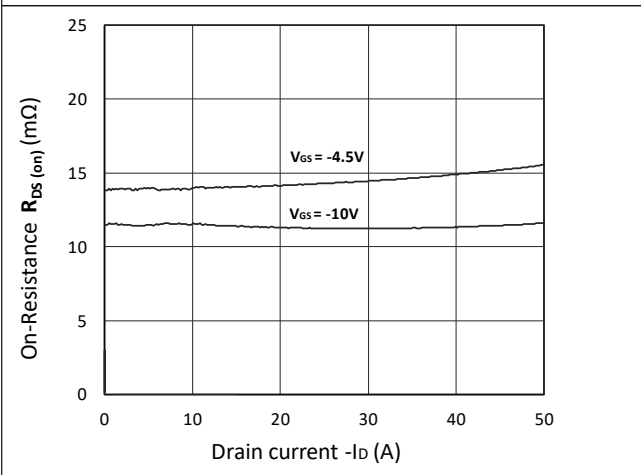


Figure 5. $R_{DS(ON)}$ vs. I_D

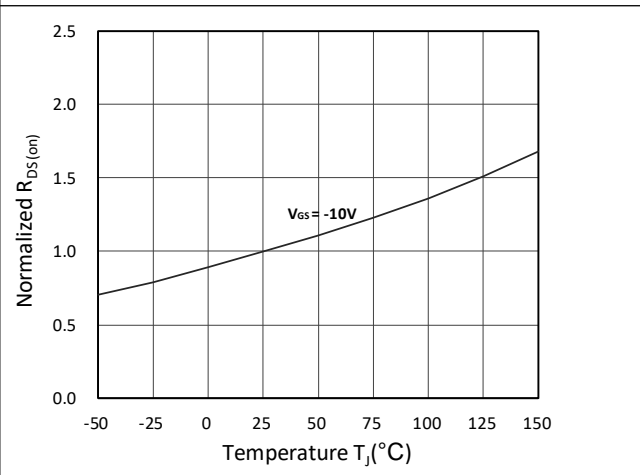


Figure 6. Normalized $R_{DS(ON)}$ vs. Temperature

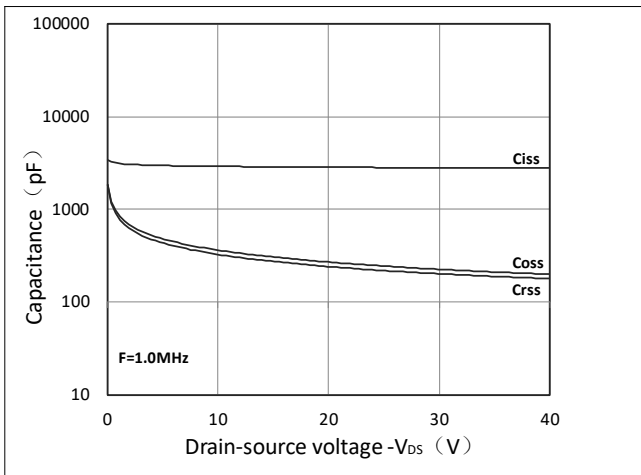


Figure 7. Capacitance Characteristics

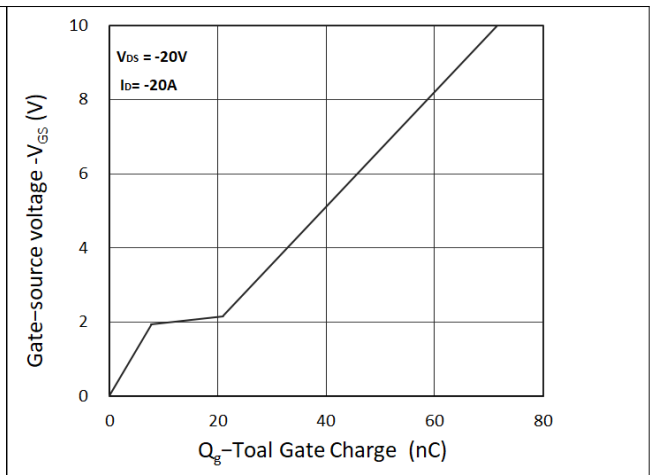


Figure 8. Gate Charge Characteristics

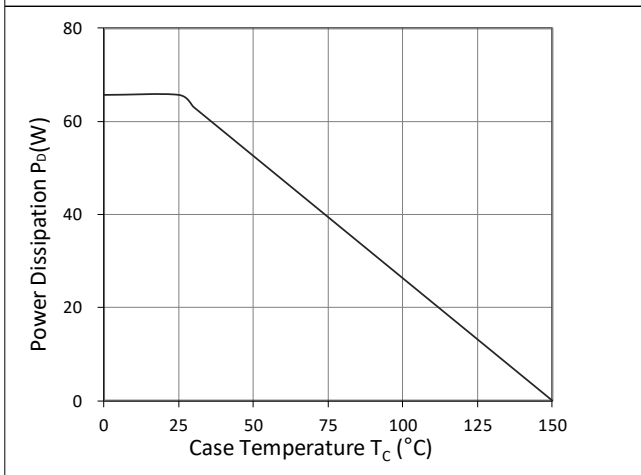


Figure 9. Power Dissipation

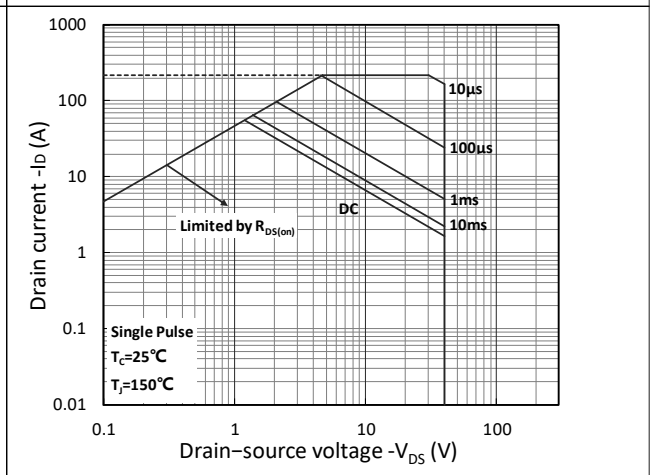


Figure 10. Safe Operating Area

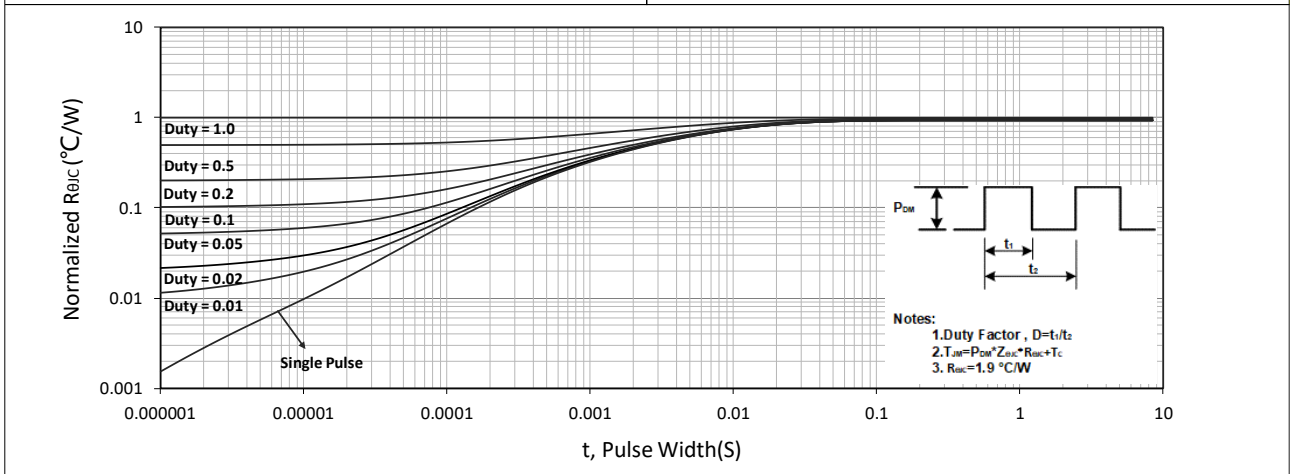


Figure 11. Normalized Maximum Transient Thermal Impedance

Test Circuit

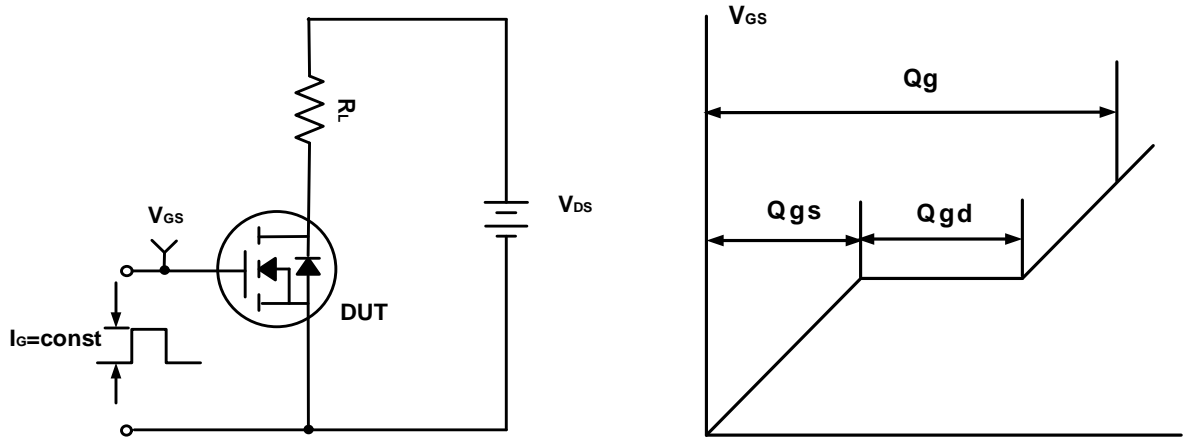


Figure A. Gate Charge Test Circuit & Waveforms

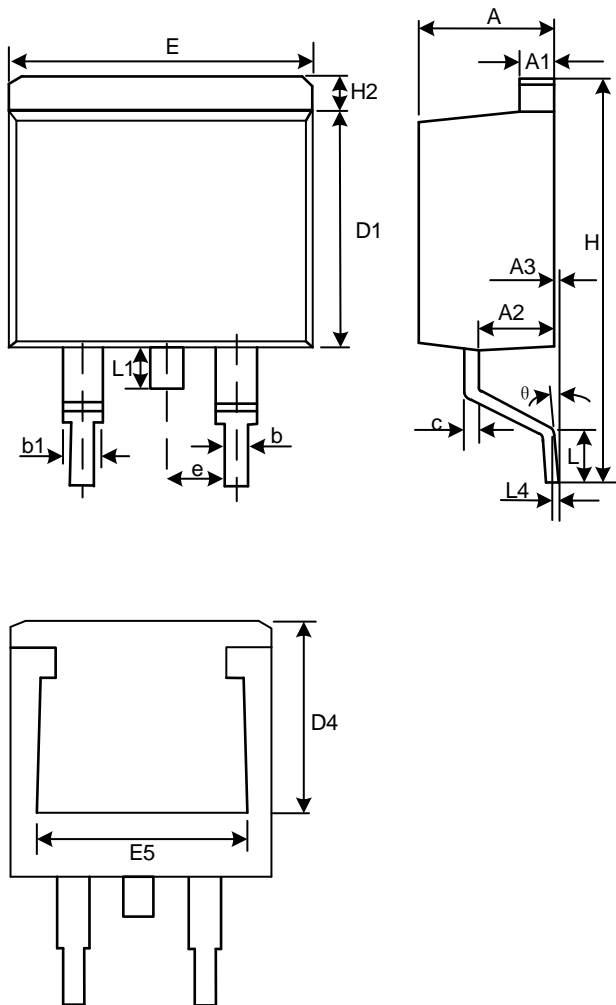


Figure B. Switching Test Circuit & Waveforms



Figure C. Unclamped Inductive Switching Circuit & Waveforms

Mechanical Dimensions for TO-263



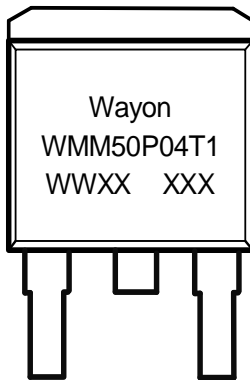
COMMON DIMENSIONS

| SYMBOL | MM | |
|--------|----------|-------|
| | MIN | MAX |
| A | 4.37 | 4.89 |
| A1 | 1.17 | 1.42 |
| A2 | 2.20 | 2.90 |
| A3 | 0.00 | 0.25 |
| b | 0.70 | 0.96 |
| b1 | 1.17 | 1.47 |
| c | 0.28 | 0.60 |
| D1 | 8.45 | 9.30 |
| D4 | 6.60 | - |
| E | 9.80 | 10.40 |
| E5 | 7.06 | - |
| e | 2.54BSC | |
| H | 14.70 | 15.70 |
| H2 | 1.07 | 1.47 |
| L | 2.00 | 2.80 |
| L1 | - | 1.75 |
| L4 | 0.254BSC | |
| θ | 0° | 9° |

Ordering Information

| Part | Package | Marking | Packing method |
|------------|---------|------------|----------------|
| WMM50P04T1 | TO-263 | WMM50P04T1 | Tape and Reel |

Marking Information



WMM50P04T1 = Device code

WWXX XXX= Date code

Contact Information

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WAYON website: <http://www.way-on.com>

For additional information, please contact your local Sales Representative.

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Product Specification Statement

1. The product specification aims to provide users with a reference regarding various product parameters, performance, and usage. It presents certain aspects of the product's performance in graphical form and is intended solely for users to select product and make product comparisons, enabling users to better understand and evaluate the characteristics and advantages of the product. It does not constitute any commitment, warranty, or guarantee.
2. The product parameters described in the product specification are numerical values, characteristics, and functions obtained through actual testing or theoretical calculations of the product in an independent or ideal state. Due to the complexity of product applications and variations in test conditions and equipment, there may be slight fluctuations in parameter test values. WAYON shall not guarantee that the actual performance of the product when installed in the customer's system or equipment will be entirely consistent with the product specification, especially concerning dynamic parameters. It is recommended that users consult with professionals for product selection and system design. Users should also thoroughly validate and assess whether the actual parameters and performance when installed in their respective systems or equipment meet their requirements or expectations. Additionally, users should exercise caution in verifying product compatibility issues, and WAYON assumes no responsibility for the application of the product.
3. WAYON strives to provide accurate and up-to-date information to the best of our ability. However, due to technical, human, or other reasons, WAYON cannot guarantee that the information provided in the product specification is entirely accurate and error-free. WAYON shall not be held responsible for any losses or damages resulting from the use or reliance on any information in these product specifications. WAYON reserves the right to revise or update the product specification and the products at any time without prior notice, and the user's continued use of the product specification is considered an acceptance of these revisions and updates. Prior to purchasing and using the product, users should verify the above information with WAYON to ensure that the product specification is the most current, effective, and complete. If users are particularly concerned about product parameters, please consult WAYON in detail or request relevant product test reports. Any data not explicitly mentioned in the product specification shall be subject to separate agreement.
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