

600V 20A 0.34Ω N-ch Power MOSFET

Description

WMOS D Series is Wayon's 1st generation VDMOS family that is dramatic reduction in on-resistance and ultra-low gate charge for applications requiring high power density and high efficiency. And it is very robust and RoHS compliant.

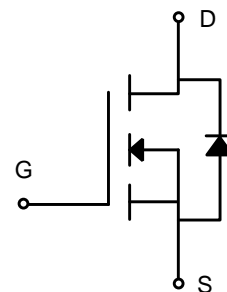
Features

- Typ. $R_{DS(on)}=0.34\Omega@V_{GS}=10V$
- 100% avalanche tested
- RoHS Compliant

Applications

- SMPS
- Charger
- DC-DC

TO-220F



Absolute Maximum Ratings (T_c=25°C)

| Parameter | Symbol | WML20N60D | Unit |
|---|---------------------|-----------|------|
| Drain-source voltage | V _{DSS} | 600 | V |
| Gate-source voltage | V _{GS} | ±30 | V |
| Continuous drain current | I _D | 20 | A |
| Pulsed drain current ¹ | I _{DM} | 80 | A |
| Avalanche energy, single pulse ² | E _{AS} | 1200 | mJ |
| Power dissipation | P _D | 85 | W |
| Derate above 25°C | | 0.7 | W/°C |
| Operating junction temperature | T _j | -55~150 | °C |
| Storage temperature | T _{stg} | -55~150 | °C |
| Continuous diode forward current | I _S | 20 | A |
| Diode pulse current ¹ | I _{Spulse} | 80 | A |

Thermal Characteristic

| | | | |
|--|------------------|------|------|
| Thermal resistance,junction-to-case | R _{θJC} | 1.47 | °C/W |
| Thermal resistance,junction-to-ambient | R _{θJA} | 62.5 | °C/W |

Electrical Characteristics of MOSFET

| | | | | Min. | Typ. | Max. | |
|---|--------------|-------------------------------|-------------------|------|------|------|----------|
| Drain-source break down voltage | BV_{DSS} | $I_D=250\mu A, V_{GS}=0V$ | $T_J=25^\circ C$ | 600 | - | - | V |
| Gate threshold voltage | $V_{GS(th)}$ | $I_D=250\mu A, V_{DS}=V_{GS}$ | $T_J=25^\circ C$ | 2 | - | 4 | V |
| Drain-source leakage current | I_{DSS} | $V_{DS}=600V, V_{GS}=0V$ | $T_J=25^\circ C$ | - | - | 1 | μA |
| | | $V_{DS}=480V, V_{GS}=0V$ | $T_J=125^\circ C$ | - | - | 100 | μA |
| Gate-source leakage current,forward | I_{GSSF} | $V_{DS}=0V, V_{GS}=30V$ | $T_J=25^\circ C$ | - | - | 100 | nA |
| Gate-source leakage current,reverse | I_{GSSR} | $V_{DS}=0V, V_{GS}=-30V$ | $T_J=25^\circ C$ | - | - | -100 | nA |
| Drain-source on-state resistance ³ | $R_{DS(ON)}$ | $V_{GS}=10V, I_D=10A$ | $T_J=25^\circ C$ | - | 0.34 | 0.42 | Ω |
| Transconductance ³ | G_{fs} | $V_{DS}=20V$ | $T_J=25^\circ C$ | - | 23 | - | S |

Dynamic Characteristics of MOSFET ($T_C=25^\circ C$)

| | | | | Min. | Typ. | Max. | |
|------------------------------|-----------|---------------------------------|--|------|------|------|----|
| Input capacitance | C_{iss} | $f=1MHz, V_{DS}=25V, V_{GS}=0V$ | | - | 3100 | - | pF |
| Output capacitance | C_{oss} | | | - | 255 | - | pF |
| Reverse transfer capacitance | C_{rss} | | | - | 11 | - | pF |
| Gate to source charge | Q_{gs} | $V_{DD}=180V$ | | - | 15 | - | nC |
| Gate to drain charge | Q_{gd} | $I_D=20A$ | | - | 12 | - | nC |
| Total gate charge | Q_g | $V_{GS}=0$ to 10V | | - | 51 | - | nC |

Switching Characteristics of MOSFET ($T_C=25^\circ C$)

| | | | | Min. | Typ. | Max. | |
|---------------------|------------|--|--|------|------|------|----|
| Turn-on delay time | t_{don} | $V_{DS}=300V, I_D=20A,$ $R_C=25\Omega, V_{GS}=0$ to 10V | | - | 44 | - | ns |
| Rise time | t_r | | | - | 40 | - | ns |
| Turn-off delay time | t_{doff} | | | - | 154 | - | ns |
| Fall time | t_f | | | - | 46 | - | ns |

Characteristics of Body Diode ($T_C=25^\circ C$)

| | | | | Min. | Typ. | Max. | |
|--------------------------|----------|---|--|------|------|------|---------|
| Forward voltage | V_{SD} | $I_{SD}=25A, V_{GS}=0V$ | | - | - | 1.5 | V |
| Reverse recovery time | t_{rr} | $V_{DS}=300V, I_S=20A, V_{GS}=10V$ $-di/dt=100A/\mu s$ | | - | 820 | - | ns |
| Reverse recovery current | I_{rr} | | | - | 14 | - | A |
| Recovery charge | Q_{rr} | | | - | 5.7 | - | μC |

Notes:

1. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}=150^\circ C$.
2. The E_{AS} data shows Max. rating . The test condition is $V_{DD}=50V, V_{GS}=10V, L=10mH, I_{AS}=16A, T_C=25^\circ C$.
3. The data tested by pulsed , pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.

TYPICAL CHARACTERISTICS

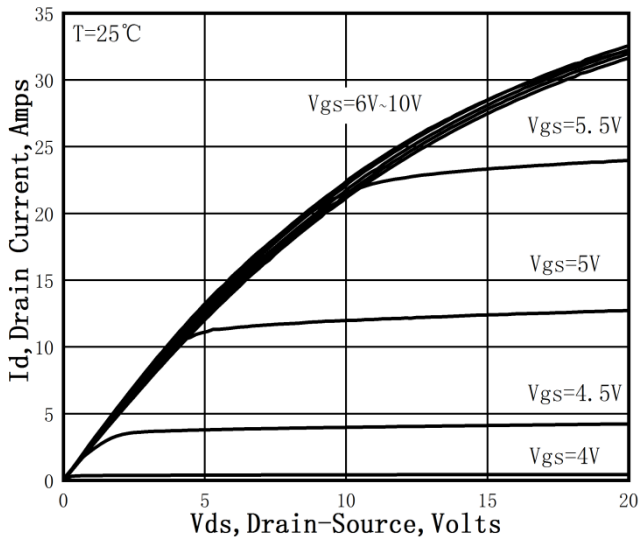


Figure 1. On-Region Characteristics

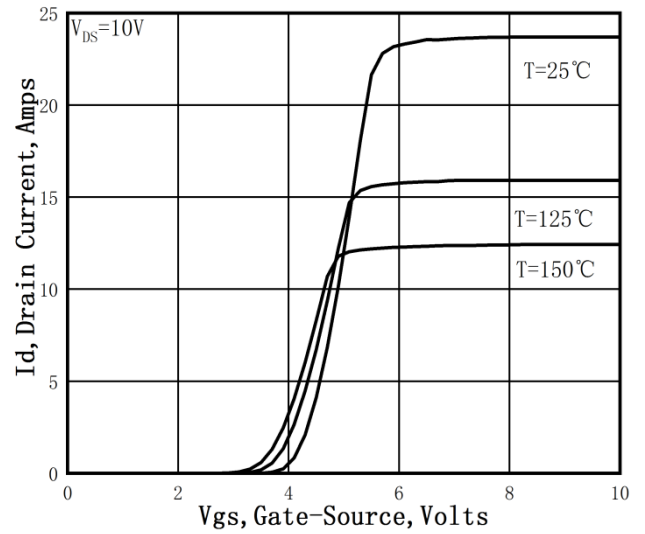


Figure 2. Transfer Characteristics

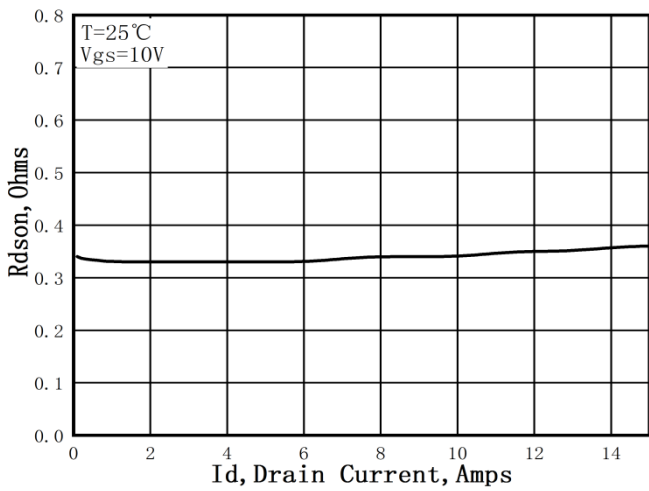


Figure 3. Static Drain-Source On Resistance

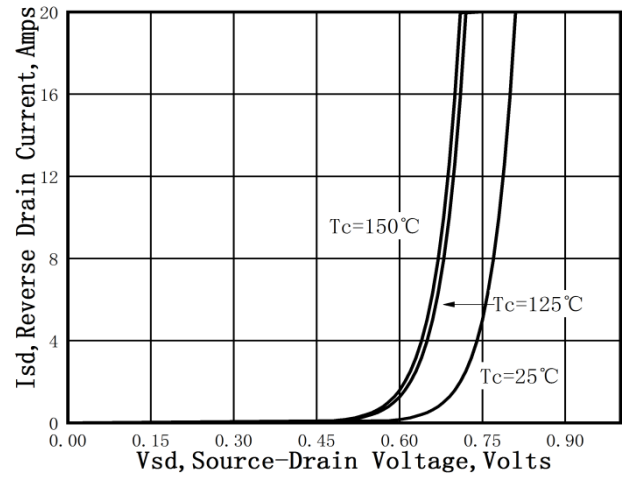


Figure 4. Typical Body Diode Transfer Characteristics

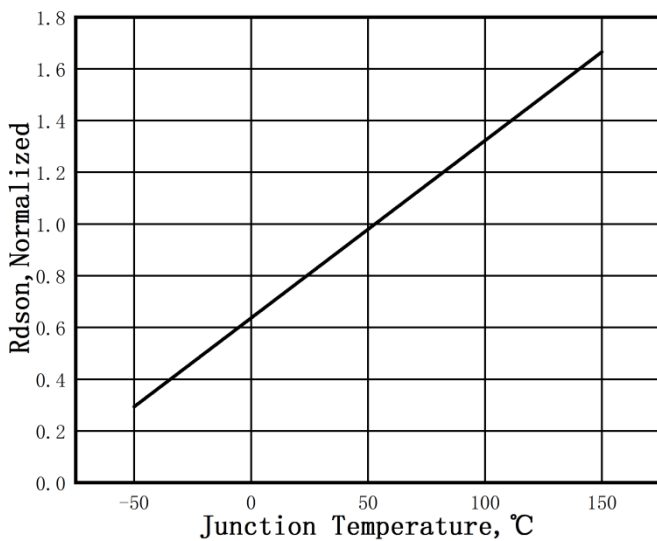


Figure 5. Normalized $R_{DS(on)}$ vs. Temperature

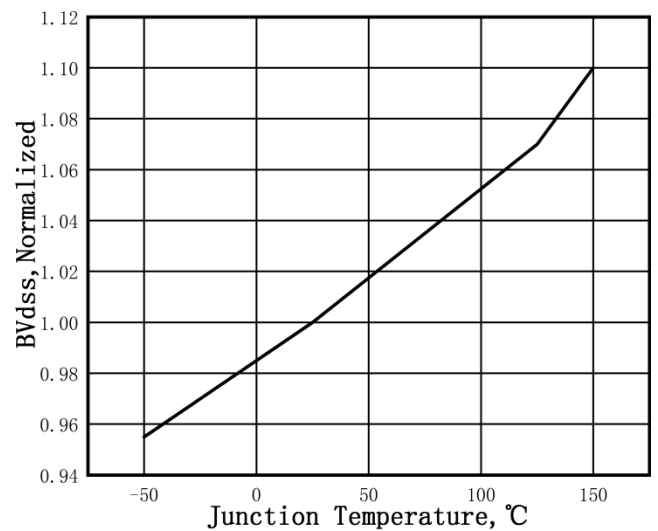


Figure 6. Normalized BV_{DSS} vs. Temperature

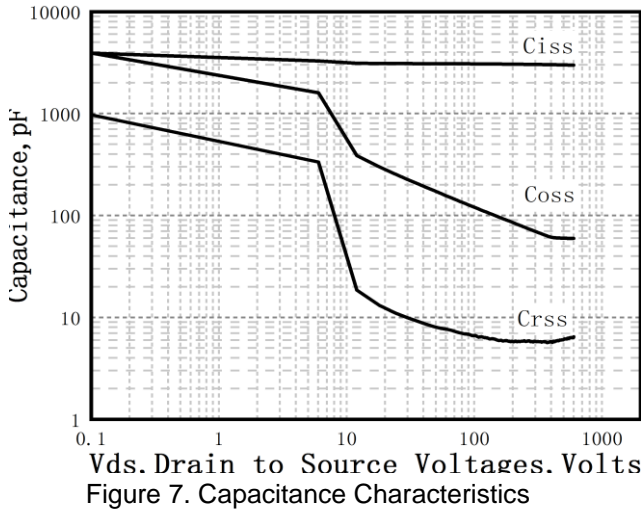


Figure 7. Capacitance Characteristics

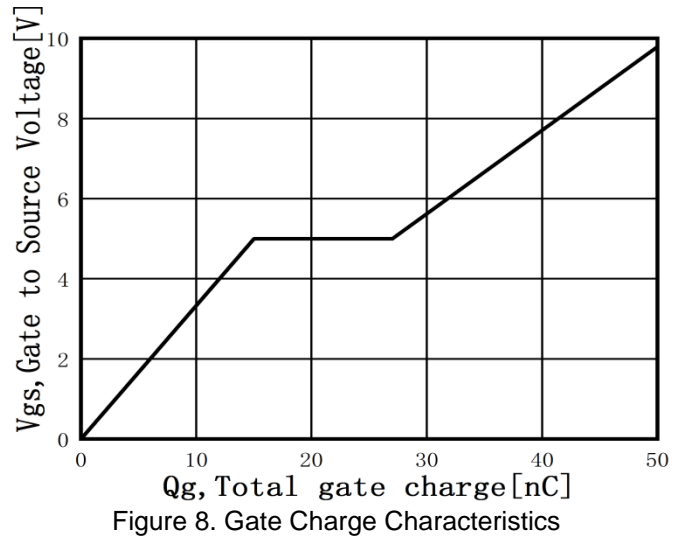


Figure 8. Gate Charge Characteristics

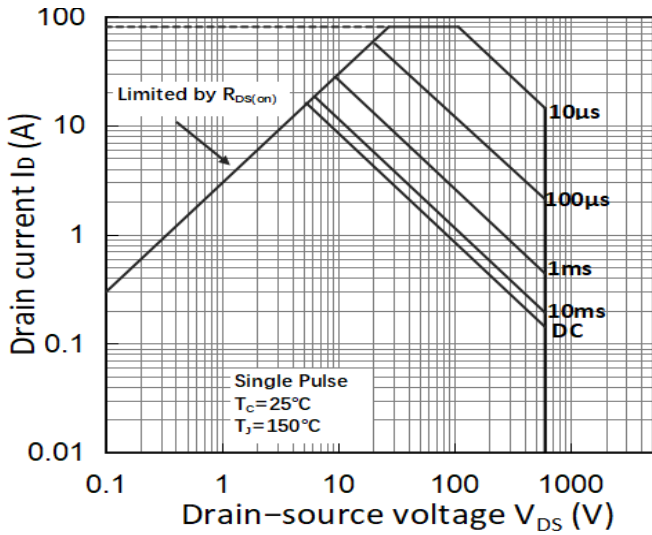


Figure 9. Maximum Safe Operating Area

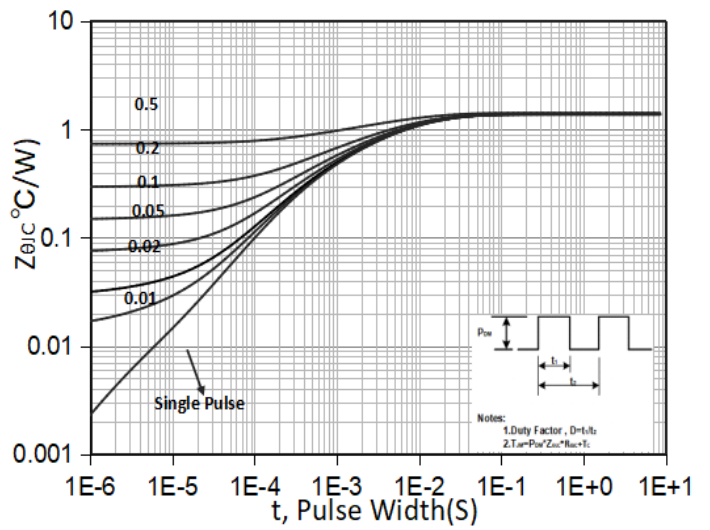
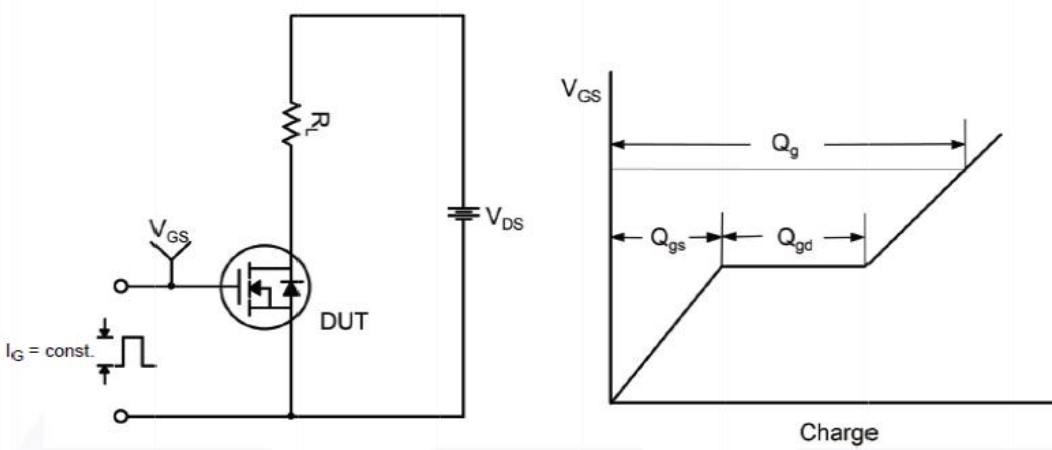


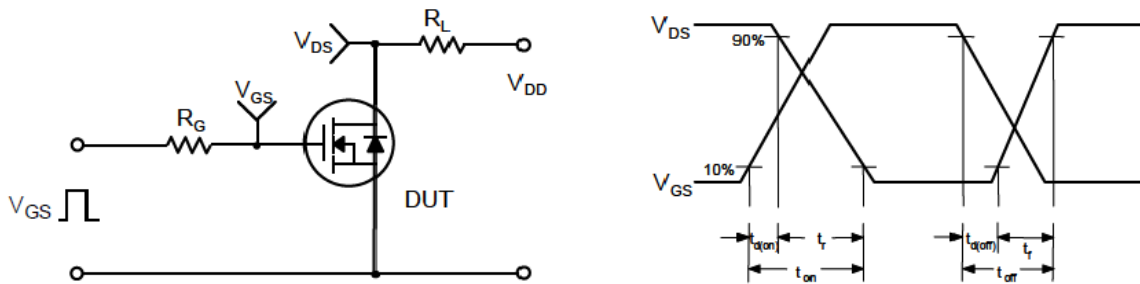
Figure 10. Transient Thermal Response Curve

Test Circuit

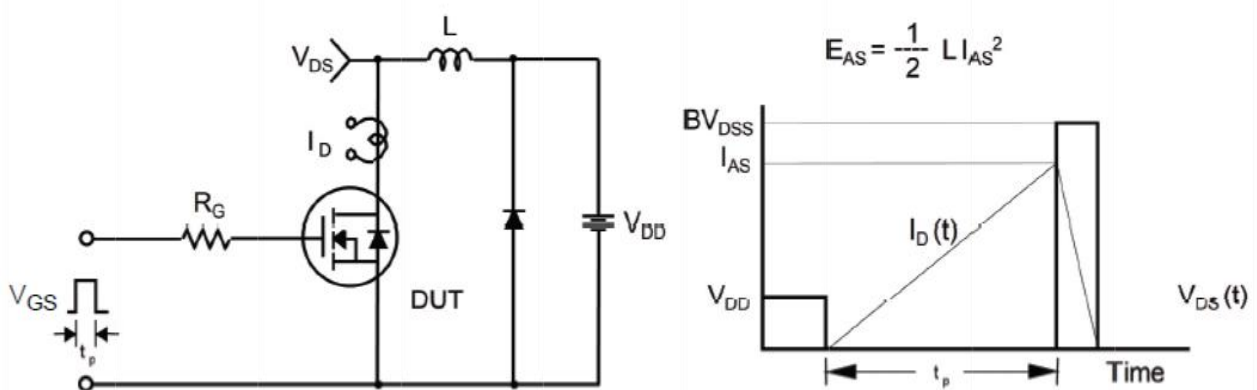
Gate Charge Test Circuit & Waveform



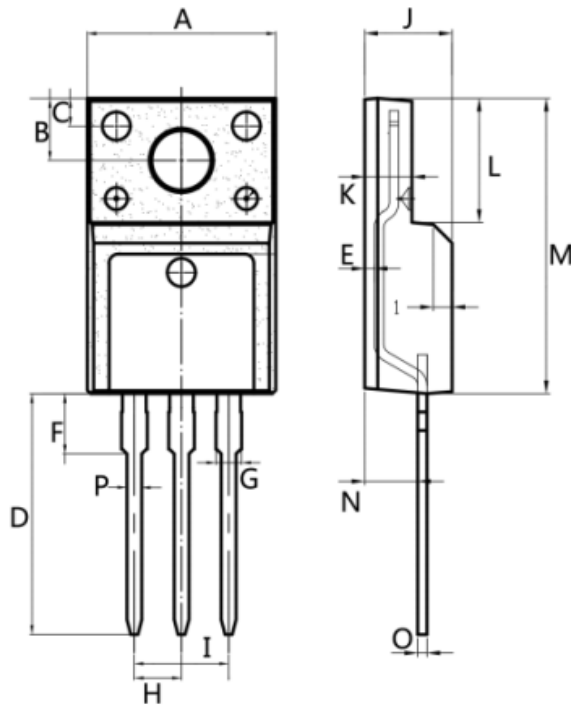
Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



Mechanical Dimensions for TO-220F



COMMON DIMENSIONS

| SYMBOL | MM | |
|--------|-------|-------|
| | MIN | MAX |
| A | 9.95 | 10.36 |
| B | 2.95 | 3.55 |
| C | 1.25 | 1.6 |
| D | 12.64 | 13.5 |
| E | 0.40 | 0.60 |
| F | 2.80 | 3.80 |
| G | 1.14 | 1.58 |
| H | 2.44 | 2.64 |
| I | 4.88 | 5.26 |
| J | 4.50 | 4.90 |
| K | 2.34 | 2.80 |
| L | 6.48 | 6.90 |
| M | 15.40 | 16.07 |
| N | 2.66 | 3.50 |
| O | 0.40 | 0.64 |
| P | 0.70 | 0.94 |

Ordering Information

| Part | Package | Marking | Packing method |
|-----------|---------|-----------|----------------|
| WML20N60D | TO-220F | WML20N60D | Tube |

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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.

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