

800V 14A 0.58Ω N-ch Power MOSFET

Description

WMOS D1 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.

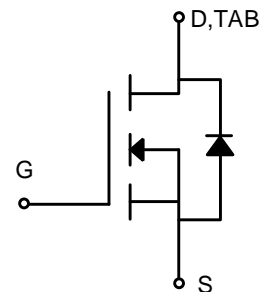
Features

- Typ. $R_{DS(on)}=0.58\Omega@V_{GS}=10V$
- 100% avalanche tested
- RoHS Compliant

Applications

- SMPS
- Charger
- DC-DC

TO-247



Absolute Maximum Ratings (T_c=25°C)

| Parameter | Symbol | WMJ14N80D1 | Unit |
|---|----------------------------------|------------|------|
| Drain-source voltage | V _{DSS} | 800 | V |
| Gate-source voltage | V _{GS} | ±30 | V |
| Continuous drain current | I _D | 14 | A |
| Pulsed drain current ¹ | I _{DM} | 56 | A |
| Avalanche energy, single pulse ² | E _{AS} | 720 | mJ |
| Power dissipation | P _D | 298 | W |
| Derate above 25°C | | 2.4 | W/°C |
| Operating junction temperature | T _j | -55~150 | °C |
| Storage temperature | T _{stg} | -55~150 | °C |
| Continuous diode forward current | I _S | 14 | A |
| Diode pulse current | I _{Spulse} ¹ | 56 | A |

Thermal Characteristic

| | | | |
|---|------------------|------|------|
| Thermal resistance, junction-to-case | R _{θJC} | 0.42 | °C/W |
| Thermal resistance, junction-to-ambient | R _{θJA} | 0.25 | °C/W |

Electrical Characteristics of MOSFET

| | | | | Min. | Typ. | Max. | |
|---|--------------|-------------------------------|-------------------|------|------|------|----------|
| Drain-source break down voltage | BV_{DSS} | $I_D=250\mu A, V_{GS}=0V$ | $T_C=25^\circ C$ | 800 | - | - | 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} | $V_{DS}=800V, V_{GS}=0V$ | $T_J=25^\circ C$ | - | - | 1 | μA |
| | | $V_{DS}=640V, V_{GS}=0V$ | $T_J=125^\circ C$ | - | - | 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 | $R_{DS(ON)}$ | $V_{GS}=10V, I_D=7A$ | $T_J=25^\circ C$ | - | 0.58 | 0.72 | Ω |
| Transconductance ³ | G_{fs} | $V_{DS}=20V$ | $T_J=25^\circ C$ | - | 27 | - | S |

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

| | | | | Min. | Typ. | Max. | |
|------------------------------|-----------|---------------------------------|--|------|------|------|----|
| Input capacitance | C_{iss} | $f=1MHz, V_{DS}=25V, V_{GS}=0V$ | | - | 3172 | - | pF |
| Output capacitance | C_{oss} | | | - | 306 | - | pF |
| Reverse transfer capacitance | C_{rss} | | | - | 50 | - | pF |
| Gate to source charge | Q_{gs} | $V_{DD}=270V$ | | - | 20 | - | nC |
| Gate to drain charge | Q_{gd} | $I_D=14A$ | | - | 34 | - | nC |
| Total gate charge | Q_g | $V_{GS}=0$ to 10V | | - | 92 | - | nC |

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

| | | | | Min. | Typ. | Max. | |
|---------------------|-------------|---|--|------|------|------|----|
| Turn-on delay time | $t_{d on}$ | $V_{DS}=400V, I_D=14A,$ $R_G=25\Omega, V_{GS}=10V$ | | - | 52 | - | ns |
| Rise time | t_r | | | - | 94 | - | ns |
| Turn-off delay time | $t_{d off}$ | | | - | 314 | - | ns |
| Fall time | t_f | | | - | 102 | - | ns |

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

| | | | | Min. | Typ. | Max. | |
|--------------------------|----------|--|--|------|------|------|---------|
| Forward voltage | V_{SD} | $I_{SD}=14A, V_{GS}=0V$ | | - | - | 1.4 | V |
| Reverse recovery time | t_{rr} | $I_S=14A, V_{DD}=400V$ $di/dt=100A/\mu s$ | | - | 203 | - | ns |
| Reverse recovery current | I_{rr} | | | - | 12 | - | A |
| Recovery charge | Q_{rr} | | | - | 1.2 | - | μC |

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 $V_{DD}=50V, V_{GS}=10V, L=10mH, I_{AS}=12A, T_C=25^\circ C$.

3. The data tested by pulsed , pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.

TYPICAL CHARACTERISTICS

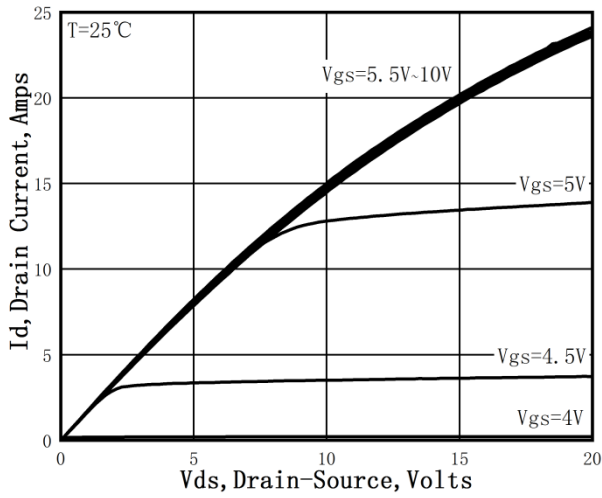


Figure 1. On-Region Characteristics

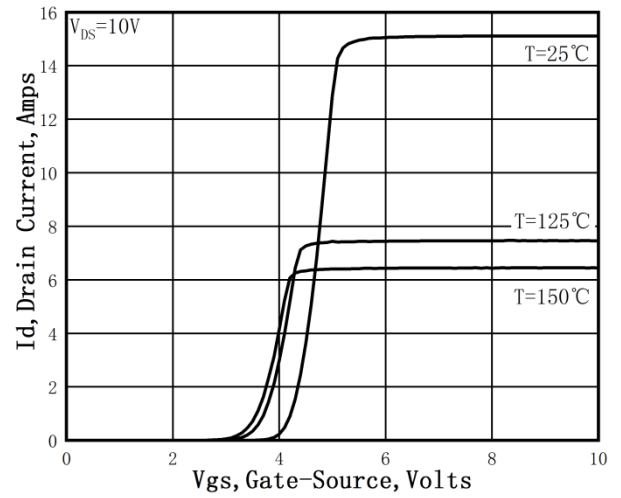


Figure 2. Transfer Characteristics

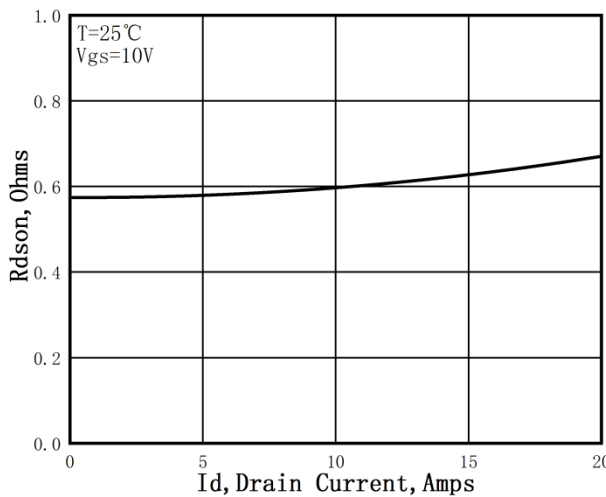


Figure 3. Static Drain-Source On Resistance

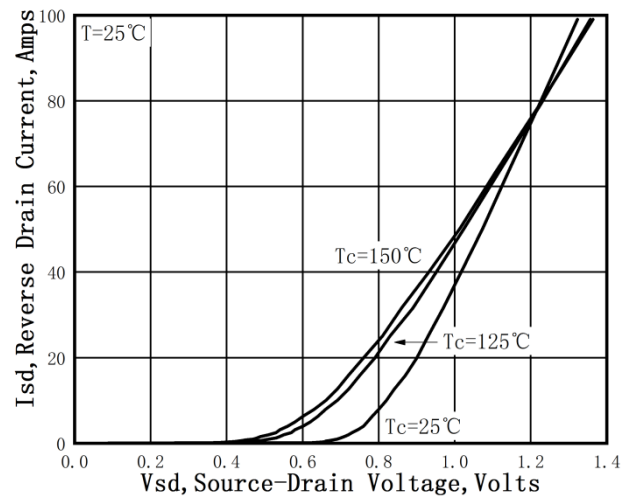


Figure 4. Typical Body Diode Transfer Characteristics

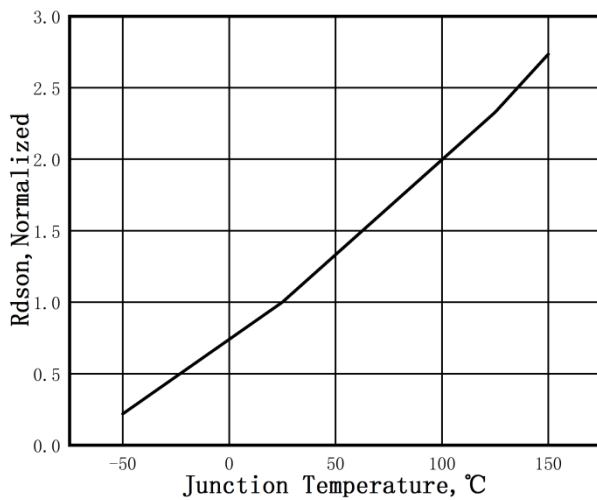


Figure 5. Normalized $R_{dS(on)}$ vs. Temperature

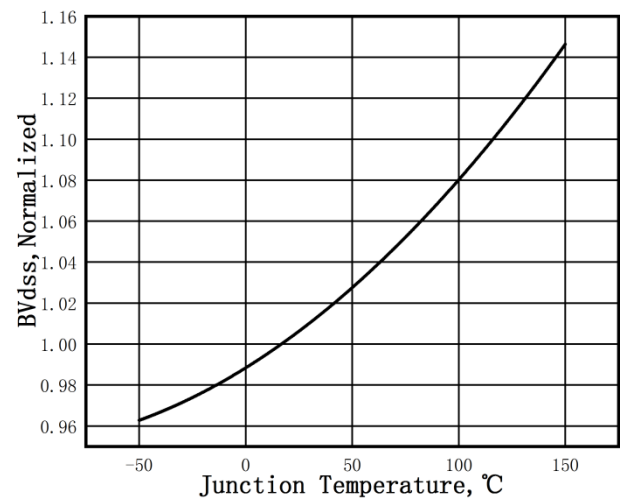


Figure 6. Normalized BV_{dss} vs. Temperature

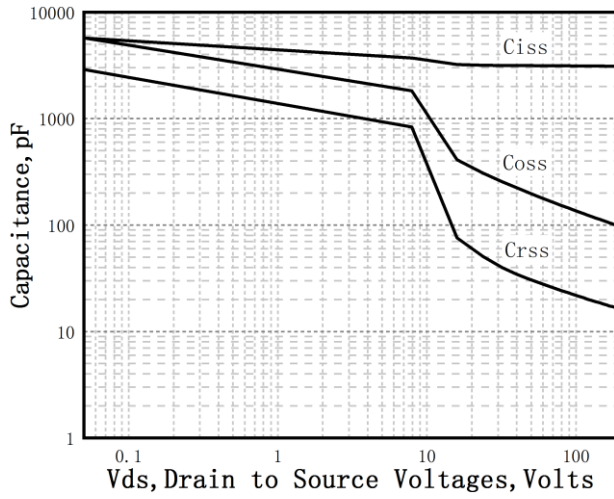


Figure 7. Capacitance Characteristics

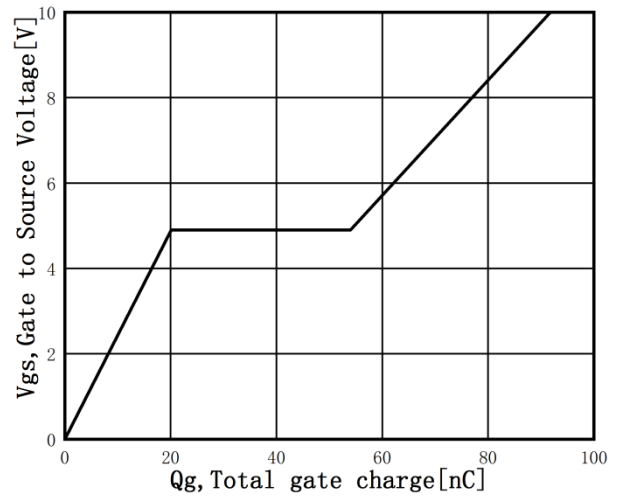


Figure 8. Gate Charge Characteristics

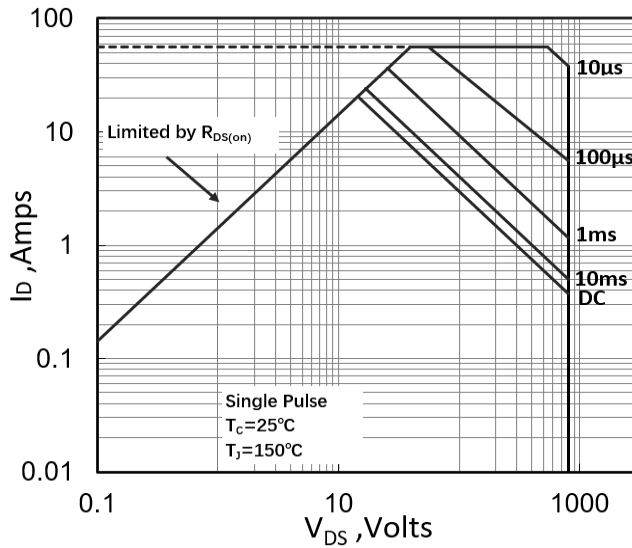


Figure 9. Maximum Safe Operating Area

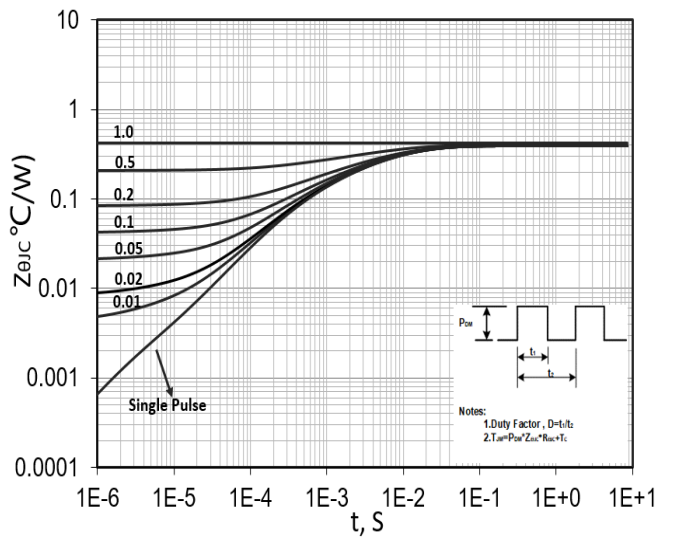
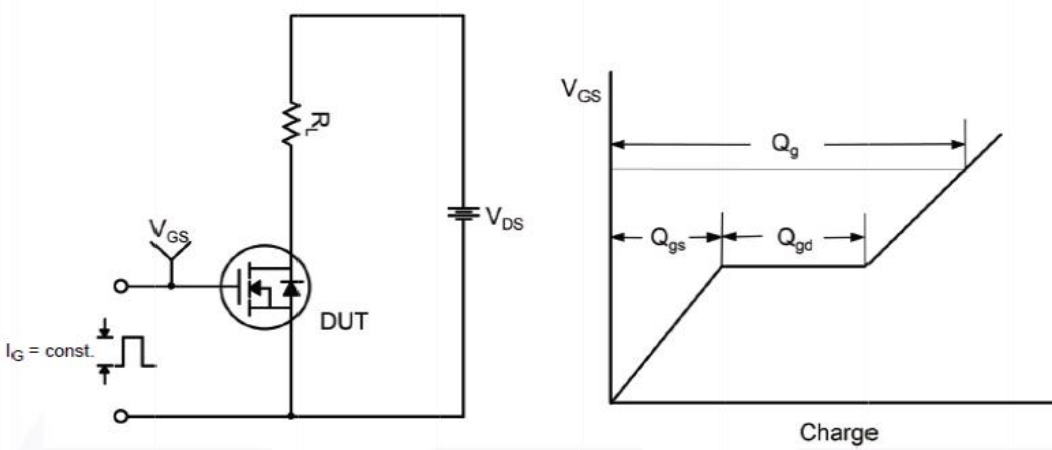


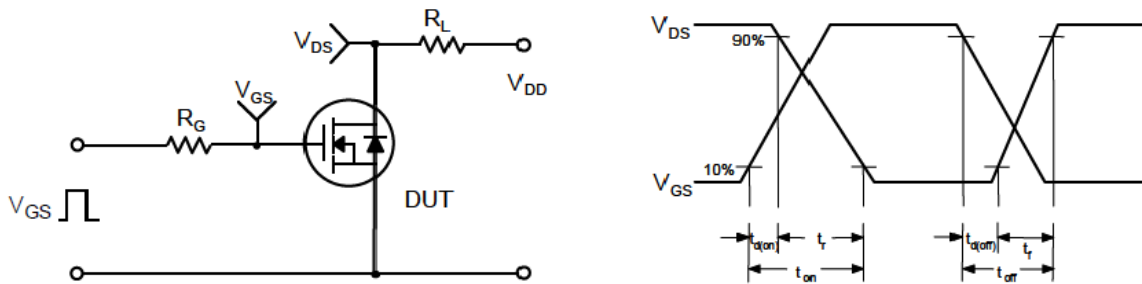
Figure 10. Transient Thermal Response Curve

Test Circuit

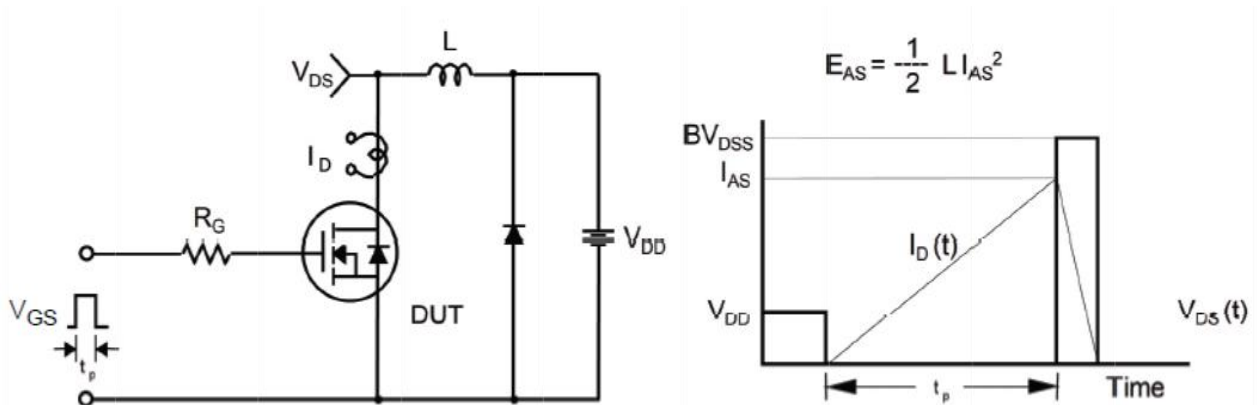
Gate Charge Test Circuit & Waveform



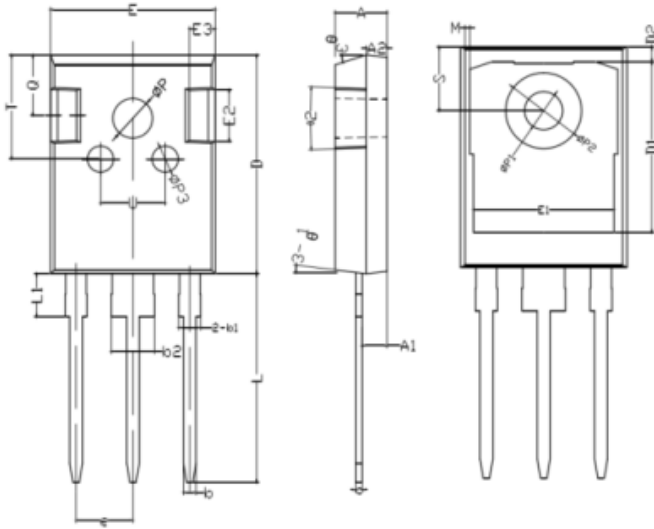
Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



Mechanical Dimensions for TO-247



COMMON DIMENSIONS

| SYMBOL | MM | |
|--------|-------|-------|
| | MIN | MAX |
| A | 4.80 | 5.20 |
| A1 | 2.21 | 2.59 |
| A2 | 1.85 | 2.15 |
| b | 1.11 | 1.36 |
| b1 | 1.91 | 2.25 |
| b2 | 2.91 | 3.25 |
| c | 0.51 | 0.75 |
| D | 20.70 | 21.30 |
| D1 | 16.25 | 16.85 |
| E | 15.50 | 16.10 |
| E1 | 13.00 | 13.60 |
| E2 | 4.80 | 5.20 |
| E3 | 2.30 | 2.70 |
| e | 5.40 | 5.48 |
| L | 19.62 | 20.22 |
| L1 | - | 4.30 |
| ØP | 3.40 | 3.80 |
| ØP2 | 6.90 | 7.30 |
| S | 6.05 | 6.25 |

Ordering Information

| Part | Package | Marking | Packing method |
|------------|---------|------------|----------------|
| WMJ14N80D1 | TO-247 | WMJ14N80D1 | Tube |


Contact Information

No.1001, Shiwan(7) Road, Pudong District, Shanghai, P.R.China.201207

Tel: 86-21-50310888 Fax: 86-21-50757680 Email: market@way-on.com

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

For additional information, please contact your local Sales Representative.

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