

## 30V Dual N-Channel Enhancement Mode Power MOSFET

## Description

WMB050DN03LG4 uses Wayon's 4<sup>th</sup> generation power trench MOSFET technology that has been especially tailored to minimize the on-state resistance and yet maintain superior switching performance. This device is well suited for high efficiency fast switching applications.

## Features

- $V_{DS} = 30V$ ,  $I_D = 49A$   
 $R_{DS(on)} < 6.5m\Omega$  @  $V_{GS} = 10V$   
 $R_{DS(on)} < 8.5m\Omega$  @  $V_{GS} = 4.5V$
- Low  $R_{DS(ON)}$
- RoHS Compliant & Halogen-Free
- Low Gate Charge
- 100% EAS Guaranteed

## Applications

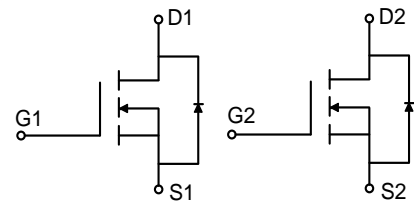
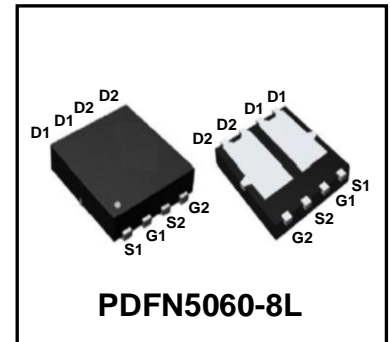
- Power Management Switches
- DC/DC Converter

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

| Parameter  |                     | Symbol         | Value      | Unit       |
|--|---------------------|----------------|------------|------------|
| Drain-Source Voltage                             |                     | $V_{DS}$       | 30         | V          |
| Gate-Source Voltage                              |                     | $V_{GS}$       | $\pm 20$   | V          |
| Continuous Drain Current                         | $T_C = 25^\circ C$  | $I_D$          | 49         | A          |
|  | $T_C = 100^\circ C$ |                | 31         |            |
| Pulsed Drain Current <sup>1</sup>                |                     | $I_{DM}$       | 196        | A          |
| Single Pulse Avalanche Energy <sup>2</sup>       |                     | EAS            | 45         | mJ         |
| Total Power Dissipation                          | $T_C = 25^\circ C$  | $P_D$          | 25         | 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 <sup>3</sup> | $R_{\theta JA}$ | 60    | $^\circ C/W$ |
| Thermal Resistance from Junction-to-Case                 | $R_{\theta JC}$ | 5     | $^\circ C/W$ |



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 <sub>(BR)DSS</sub> | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA   | 30   | -    | -    | V    |
| Gate-body Leakage Current               |                       | I <sub>GSS</sub>     | V <sub>DS</sub> = 0V, V <sub>GS</sub> = ±20V   | -    | -    | ±100 | nA   |
| Zero Gate Voltage Drain Current         | T <sub>J</sub> =25°C  | I <sub>DSS</sub>     | V <sub>DS</sub> = 30V, V <sub>GS</sub> = 0V  | -    | -    | 1    | μA   |
|   | T <sub>J</sub> =100°C |                      |  | -    | -    | 100  |      |
| Gate-Threshold Voltage                  |                       | V <sub>GS(th)</sub>  | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA                             | 1.2  | 1.6  | 2.4  | V    |
| Drain-Source On-Resistance <sup>4</sup> |                       | R <sub>DS(on)</sub>  | V <sub>GS</sub> = 10V, I <sub>D</sub> = 20A  | -    | 5    | 6.5  | mΩ   |
|   |                       |                      | V <sub>GS</sub> = 4.5V, I <sub>D</sub> =10A  | -    | 6.5  | 8.5  |      |
| Forward Transconductance <sup>4</sup>   |                       | g <sub>fs</sub>      | V <sub>DS</sub> = 10V, I <sub>D</sub> = 20A  | -    | 130  | -    | S    |
| Dynamic Characteristics <sup>5</sup>    |                       |                      |  |      |      |      |      |
| Input Capacitance                       |                       | C <sub>iss</sub>     | V <sub>DS</sub> = 15V, V <sub>GS</sub> =0V, f =1MHz                                    | -    | 892  | -    | pF   |
| Output Capacitance                      |                       | C <sub>oss</sub>     |  | -    | 341  | -    |      |
| Reverse Transfer Capacitance            |                       | C <sub>rss</sub>     |  | -    | 28   | -    |      |
| Gate Resistance                         |                       | R <sub>g</sub>       | f = 1MHz   | -    | 1.9  | -    | Ω    |
| Switching Characteristics <sup>5</sup>  |                       |                      |  |      |      |      |      |
| Total Gate Charge                       |                       | Q <sub>g</sub>       | V <sub>GS</sub> = 10V, V <sub>DS</sub> = 15V, I <sub>D</sub> = 20A                     | -    | 14   | -    | nC   |
| Gate-Source Charge                      |                       | Q <sub>gs</sub>      |  | -    | 2.6  | -    |      |
| Gate-Drain Charge                       |                       | Q <sub>gd</sub>      |  | -    | 1.9  | -    |      |
| Turn-On Delay Time                      |                       | t <sub>d(on)</sub>   | V <sub>GS</sub> =10V, V <sub>DD</sub> = 15V, R <sub>G</sub> = 3Ω, I <sub>D</sub> = 20A | -    | 5.9  | -    | ns   |
| Rise Time                               |                       | t <sub>r</sub>       |  | -    | 3.8  | -    |      |
| Turn-Off Delay Time                     |                       | t <sub>d(off)</sub>  |  | -    | 16.2 | -    |      |
| Fall Time                               |                       | t <sub>f</sub>       |  | -    | 3.4  | -    |      |
| Body Diode Reverse Recovery Time        |                       | t <sub>rr</sub>      | I <sub>F</sub> = 20A, di/dt = 100A/μs  | -    | 25   | -    | ns   |
| Body Diode Reverse Recovery Charge      |                       | Q <sub>rr</sub>      |  | -    | 10.7 | -    | nC   |
| Drain-Source Body Diode Characteristics |                       |                      |  |      |      |      |      |
| Diode Forward Voltage <sup>4</sup>      |                       | V <sub>SD</sub>      | I <sub>S</sub> = 20A, V <sub>GS</sub> = 0V   | -    | -    | 1.2  | V    |
| Continuous Source Current               | T <sub>C</sub> =25°C  | I <sub>S</sub>       | -  | -    | -    | 49   | A    |

## Notes:

1. Repetitive rating, pulse width limited by junction temperature  $T_{J(MAX)} = 150^\circ\text{C}$ .
2. The test condition is  $V_{DD} = 25V, V_{GS} = 10V, L = 0.4\text{mH}, I_{AS} = 15A$ .
3. The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 20Z 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

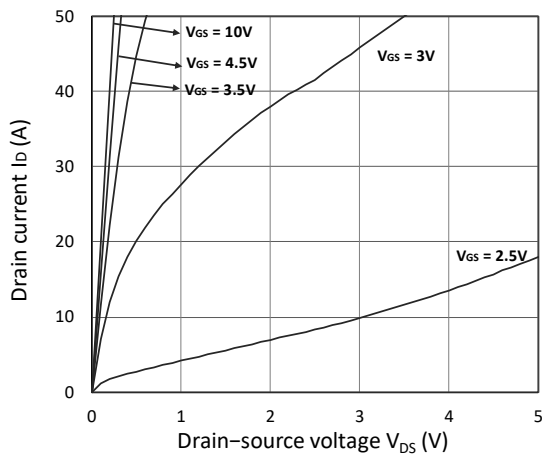


Figure 1. Output Characteristics

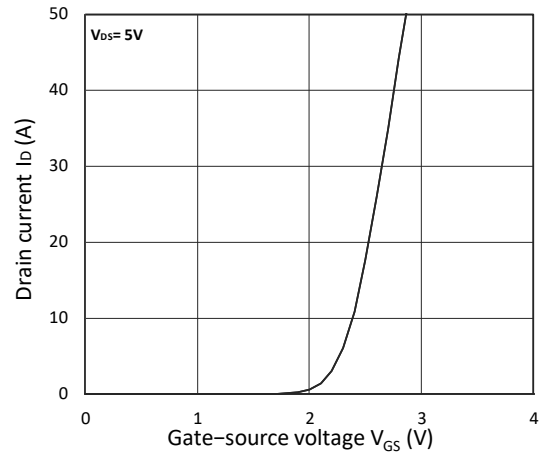


Figure 2. Transfer Characteristics

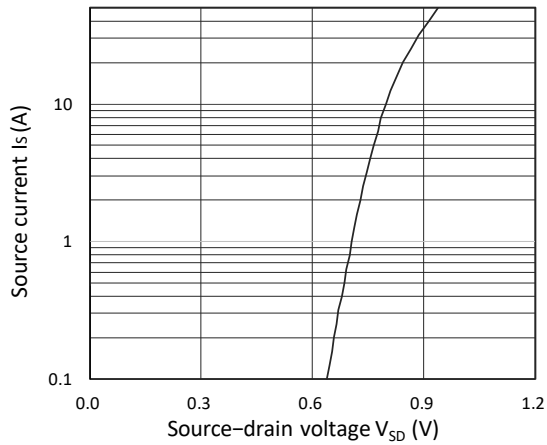
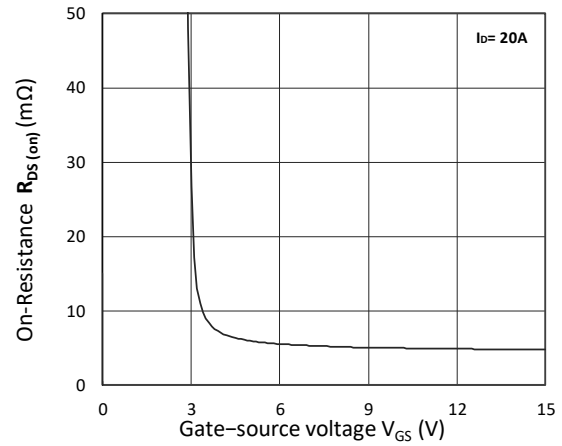
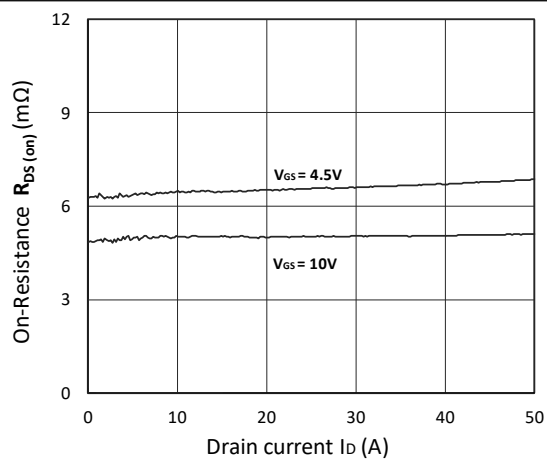
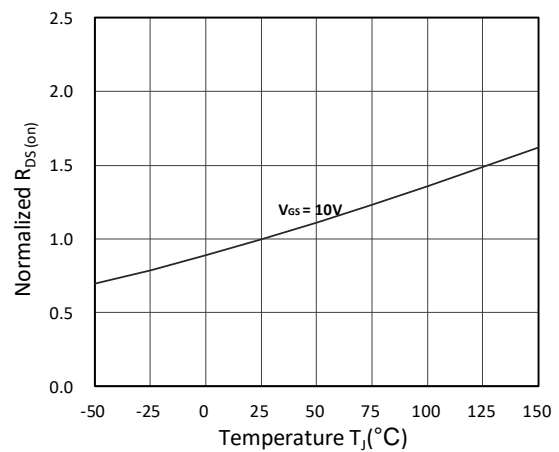


Figure 3. Forward Characteristics of Reverse

Figure 4.  $R_{DS(on)}$  vs.  $V_{GS}$ Figure 5.  $R_{DS(on)}$  vs.  $I_D$ Figure 6. Normalized  $R_{DS(on)}$  vs. Temperature

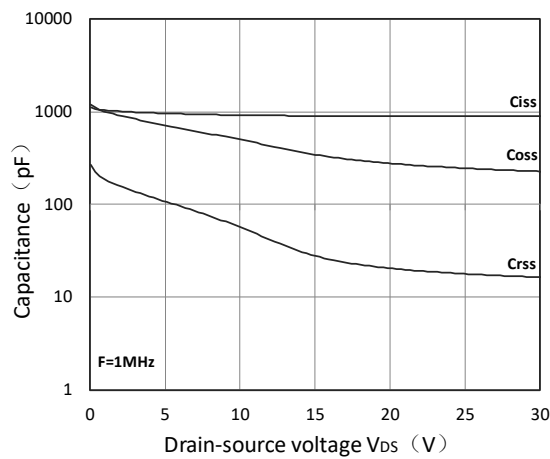


Figure 7. Capacitance Characteristics

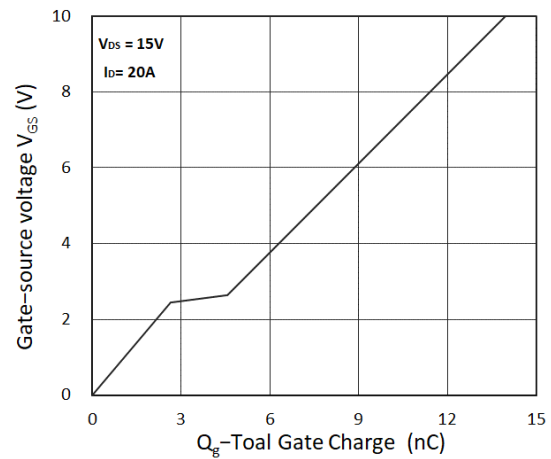


Figure 8. Gate Charge Characteristics

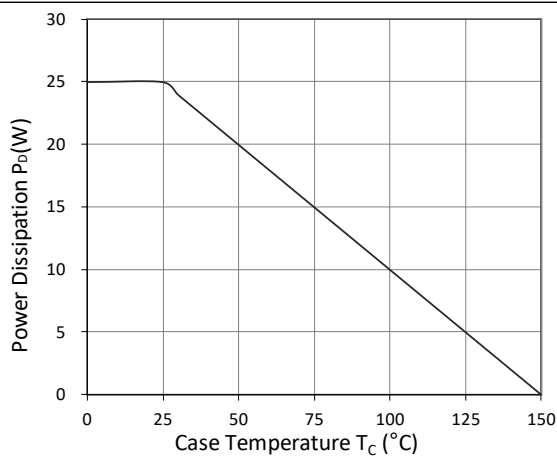


Figure 9. Power Dissipation

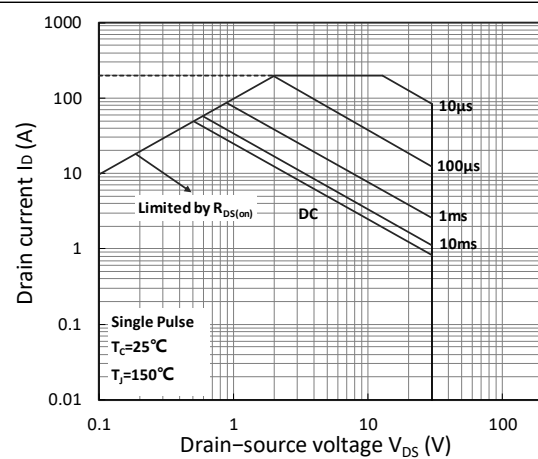


Figure10. Safe Operating Area

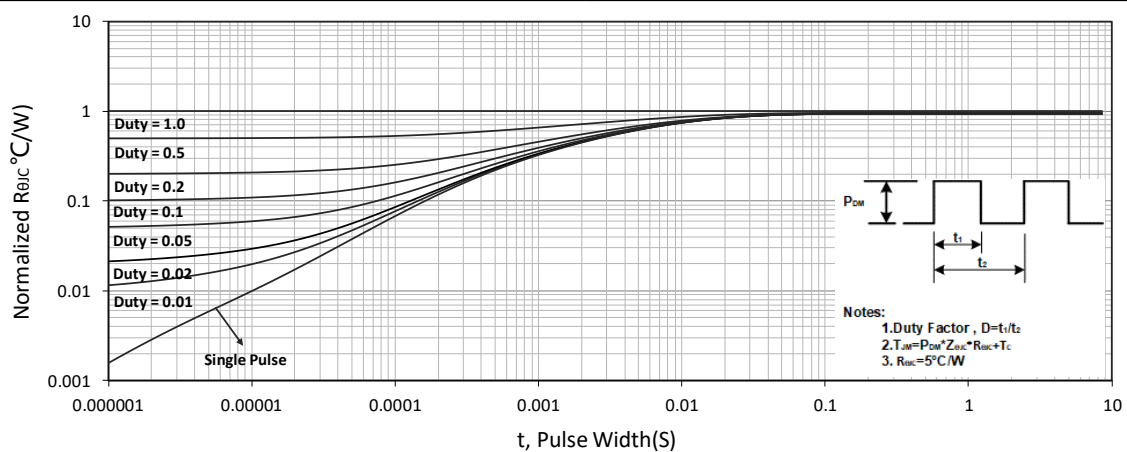


Figure 11. Normalized Maximum Transient Thermal Impedance

## Test Circuit

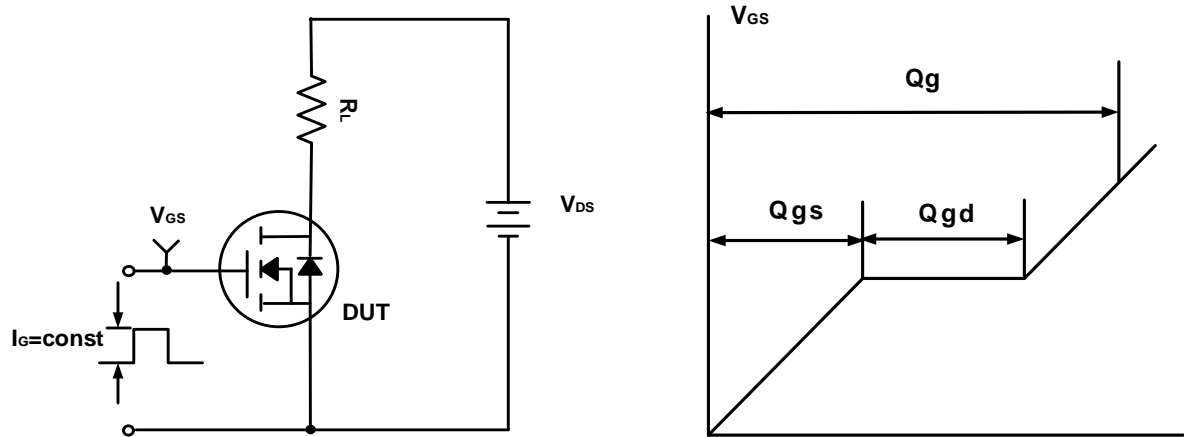


Figure A. Gate Charge Test Circuit &amp; Waveforms

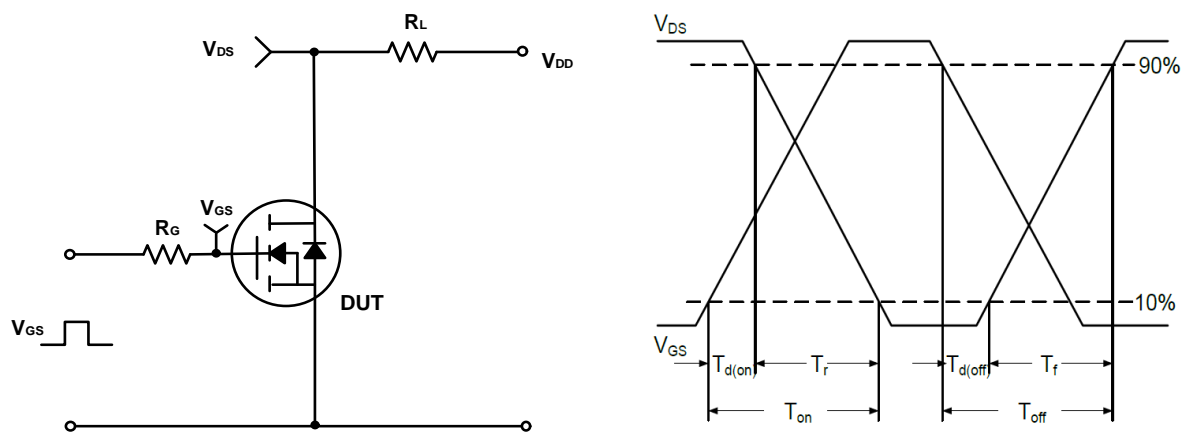


Figure B. Switching Test Circuit &amp; Waveforms

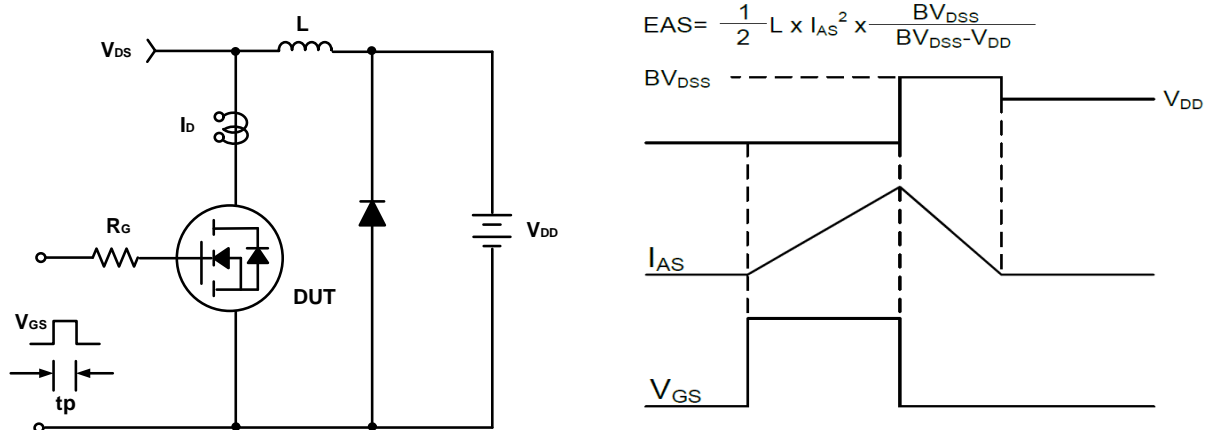
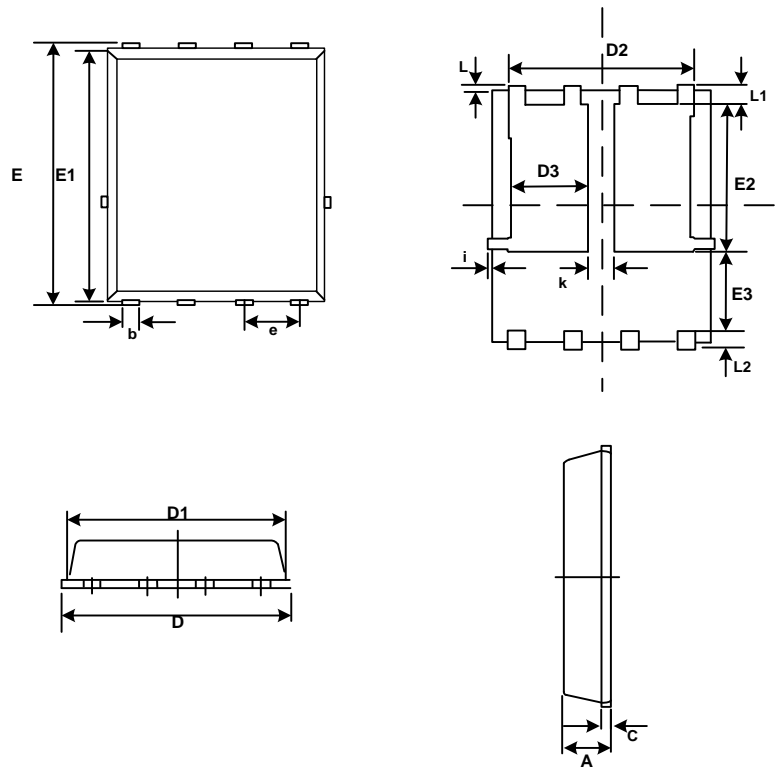


Figure C. Unclamped Inductive Switching Circuit &amp; Waveforms

Mechanical Dimensions for PDFN5060-8L

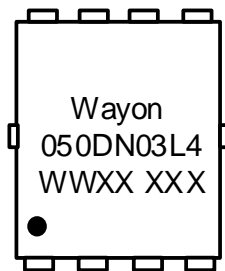


COMMON DIMENSIONS

| SYMBOL | MM      |      |
|--------|---------|------|
|        | MIN     | MAX  |
| A      | 0.90    | 1.17 |
| b      | 0.33    | 0.51 |
| c      | 0.20BSC |      |
| D      | 4.80    | 5.40 |
| D1     | 4.80    | 5.00 |
| D2     | 3.95    | 4.45 |
| D3     | 1.55    | 1.80 |
| E      | 5.90    | 6.15 |
| E1     | 5.65    | 5.85 |
| E2     | 3.30    | 3.78 |
| E3     | 1.10    | /    |
| e      | 1.27BSC |      |
| L      | 0.05    | 0.25 |
| L1     | 0.38    | 0.61 |
| L2     | 0.38    | 0.71 |
| i      | /       | 0.18 |
| k      | 0.50    | 0.70 |

**Ordering Information**

| Part          | Package     | Marking   | Packing method |
|---------------|-------------|-----------|----------------|
| WMB050DN03LG4 | PDFN5060-8L | 050DN03L4 | Tape and Reel  |

**Marking Information**

050DN03L4= Device code

WWXX XXX= Date code

**Contact Information.**

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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.
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