

# DC/DC Converter

## PVxx-27BxxR2 Series

# MORNSUN®

5-15W Isolation DC-DC converter with ultra-wide, ultra-high 100-1000V DC input for Renewable Energy



## FEATURES

- Input voltage up to 1000VDC
- Wide 10:1 input voltage range of 100 -1000VDC
- Industrial grade operating temperature -40°C to +70°C
- High I/O isolation test voltage of 4000VAC
- High efficiency, low ripple & noise
- Input reverse polarity protection, output short circuit, over-voltage protection
- High reliability, long service life
- Mounting options available for PCB mounting, chassis mounting and DIN-Rail mounting

PVxx-27BxxR2 series is regulated DC-DC converters with an ultra-wide and ultra-high DC input of 100-1000VDC. The products feature high efficiency, high reliability, high insulation and a high level of safety protection. This type of power supply is widely used in renewable energy industries such as photovoltaic, power generation, energy storage, inverters and high-voltage DC conversions. The converters provide multiple protection features and guarantee stable and safe operating environments even under abnormal working conditions. For extremely harsh EMC environment, we recommend using the application circuit show in Design Reference of this datasheet.

## Selection Guide

| Certification | Model*                 | Output Power | Nominal Output Voltage and Current (Vo/Io) | Efficiency at 200VDC (%) Typ. | Capacitive Load (μF) Max. |
|---------------|------------------------|--------------|--|-------------------------------|---------------------------|
| EN            | PV05-27B05R2 (A2C/A4C) | 5W           | 5V/1.00A                                   | 72                            | 6000                      |
|               | PV10-27B05R2 (A2C/A4C) |              | 5V/2.00A                                   | 72                            | 6000                      |
|               | PV10-27B09R2 (A2C/A4C) |              | 9V/1.11A                                   | 76                            | 4000                      |
|               | PV10-27B24R2 (A2C/A4C) | 10W          | 24V/0.42A                                  | 80                            | 470                       |
|               | PV15-27B12R2 (A2C/A4C) |              | 12V/1.25A                                  | 77                            | 2000                      |
|               | PV15-27B15R2 (A2C/A4C) |              | 15V/1.00A                                  | 78                            | 1200                      |
|               | PV15-27B24R2 (A2C/A4C) |              | 24V/0.625A                                 | 80                            | 470                       |

Note: \*Use suffix "A2C" for chassis mounting and suffix "A4C" for DIN-Rail mounting. The A2C and A4C suffix parts include CE certification.

## Input Specifications

| Item                | Operating Conditions | Min.                 | Typ. | Max. | Unit |
|---------------------|----------------------|----------------------|------|------|------|
| Input Voltage Range |                      | 100                  | --   | 1000 | VDC  |
| Input Current       | PV05 model           | 200VDC               | --   | 38   | mA   |
|                     |                      | 600VDC               | --   | 15   |      |
|                     |                      | 1000VDC              | --   | 10   |      |
|                     | PV10 model           | 200VDC               | --   | 75   |      |
|                     |                      | 600VDC               | --   | 25   |      |
|                     |                      | 1000VDC              | --   | 16   |      |
|                     | PV15 model           | 200VDC               | --   | 120  |      |
|                     |                      | 600VDC               | --   | 40   |      |
|                     |                      | 1000VDC              | --   | 22   |      |
| Inrush Current      | 200VDC               | --                   | 7    | --   | A    |
|                     | 600VDC               | --                   | 20   | --   |      |
|                     | 1000VDC              | --                   | 30   | --   |      |
| External Input Fuse | PV05/ PV10 model     | 1A/1500VDC, required |      |      |      |
|                     | PV15 model           | 2A/1500VDC, required |      |      |      |
| Hot Plug            |                      | Unavailable          |      |      |      |

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Output Specifications

| Item                          | Operating Conditions                 | Min.                      | Typ.  | Max. | Unit |
|-------------------------------|--------------------------------------|---------------------------|-------|------|------|
| Output Voltage Accuracy       |                                      | --                        | ±1    | ±2   | %    |
| Line Regulation               |                                      | --                        | ±0.5  | ±1   |      |
| Load Regulation               |                                      | --                        | ±0.5  | ±1   |      |
| Ripple & Noise*               | 20MHz bandwidth (peak-to-peak value) | --                        | 100   | 200  | mV   |
| Temperature Drift Coefficient |                                      | --                        | ±0.02 | --   | %/°C |
| Short Circuit Protection      |                                      | Continuous, self-recovery |       |      |      |
| Over-current Protection       |                                      | ≥ 110%Io self-recovery    |       |      |      |
| Over-voltage Protection       | PVxx-27B05R2                         | ≤ 7.5VDC                  |       |      |      |
|                               | PVxx-27B09R2                         | ≤ 12VDC                   |       |      |      |
|                               | PVxx-27B12R2                         | ≤ 15VDC                   |       |      |      |
|                               | PVxx-27B15R2                         | ≤ 19VDC                   |       |      |      |
|                               | PVxx-27B24R2                         | ≤ 28VDC                   |       |      |      |
| Minimum Load                  |                                      | 0                         | --    | --   | %    |
| Start-up Delay Time           | 200-1000VDC                          | --                        | --    | 1    | s    |

Note: \* The "parallel cable" method is used for ripple and noise test, please refer to PV Converter Application Notes for specific information.

General Specifications

| Item                  | Operating Conditions | Min.                           | Typ. | Max. | Unit |
|-----------------------|----------------------|--------------------------------|------|------|------|
| Isolation             | Input-output         | 4000                           | --   | --   | VAC  |
| Operating Temperature |                      | -40                            | --   | +70  | °C   |
| Storage Temperature   |                      | -40                            | --   | +105 |      |
| Storage Humidity      |                      | --                             | --   | 95   | %RH  |
| Soldering Temperature | Wave-soldering       | 260±5°C; time:5 - 10s          |      |      |      |
|                       | Manual-welding       | 360±10°C; time:3 - 5s          |      |      |      |
| Switching Frequency   |                      | --                             | --   | 75   | kHz  |
| Power Derating        | +50°C to +70°C       | PV10/15-27BxxR2                | 2    | --   | %/°C |
| Safety Standard       |                      | EN62109-1                      |      |      |      |
| MTBF                  |                      | MIL-HDBK-217F@25°C > 300,000 h |      |      |      |

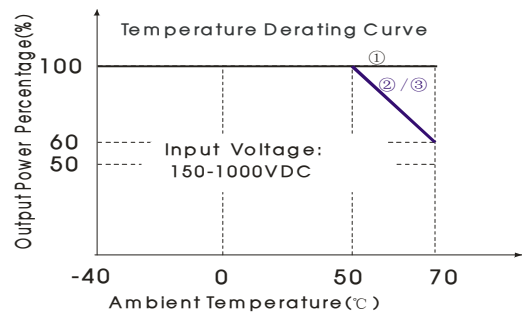
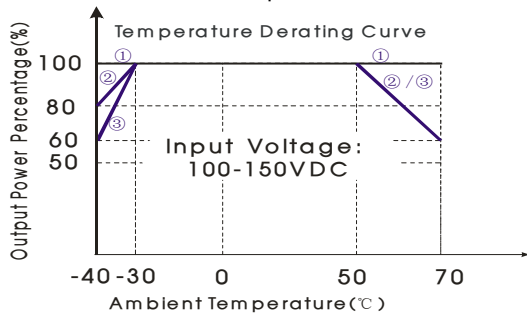
Mechanical Specifications

|                |  |                       |  |  |  |
|----------------|--|-----------------------|--|--|--|
| Case Material  | Black flame-retardant and heat-resistant plastic (UL94V-0) |                       |  |  |  |
| Dimensions     | Horizontal package   | 70.0 x 48.0 x 23.5 mm |  |  |  |
|                | A2C chassis mounting                                       | 96.1 x 54.0 x 32.0 mm |  |  |  |
|                | A4C DIN-Rail mounting                                      | 96.1 x 54.0 x 36.6 mm |  |  |  |
| Weight         | Horizontal package   | 95g (Typ.)            |  |  |  |
|                | A2C chassis mounting                                       | 150g (Typ.)           |  |  |  |
|                | A4C DIN-Rail mounting                                      | 190g (Typ.)           |  |  |  |
| Cooling method | Free air convection  |                       |  |  |  |

Electromagnetic Compatibility (EMC)

|           |       |                 |  |  |                  |
|-----------|-------|-----------------|--|--|------------------|
| Emissions | CE    | CISPR32/EN55032 | CLASS A (See Fig. 2 for recommended circuit)           |  |                  |
|           | RE    | CISPR32/EN55032 | CLASS A (See Fig. 2 for recommended circuit)           |  |                  |
| Immunity  | ESD   | IEC/EN61000-4-2 | Contact ±6KV/Air ±8KV                                  |  | Perf. Criteria B |
|           | RS    | IEC/EN61000-4-3 | 10V/m  |  | perf. Criteria A |
|           | EFT   | IEC/EN61000-4-4 | ±4KV (See Fig. 2 for recommended circuit)              |  | perf. Criteria B |
|           | Surge | IEC/EN61000-4-5 | line to line ±2KV (See Fig. 2 for recommended circuit) |  | perf. Criteria B |
|           | CS    | IEC/EN61000-4-6 | 10Vr.m.s   |  | perf. Criteria A |

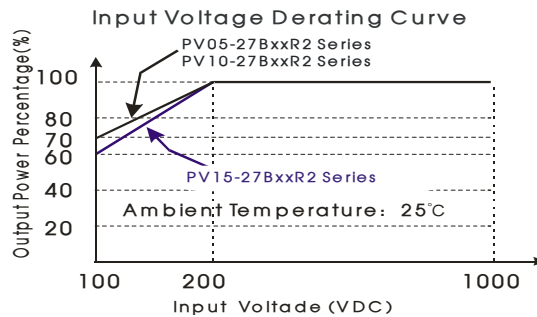
Product Characteristic Curve



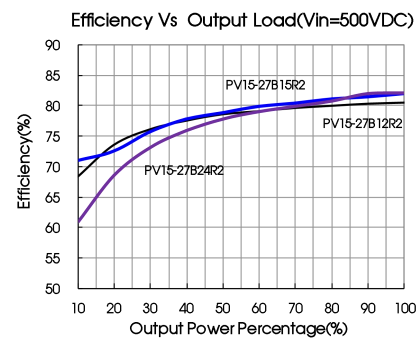
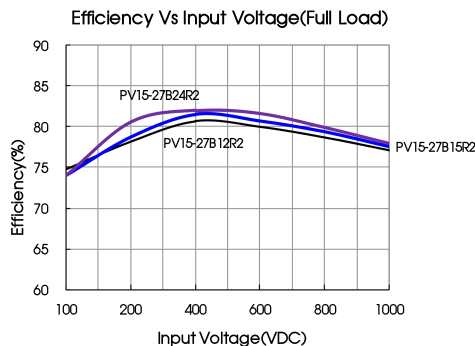
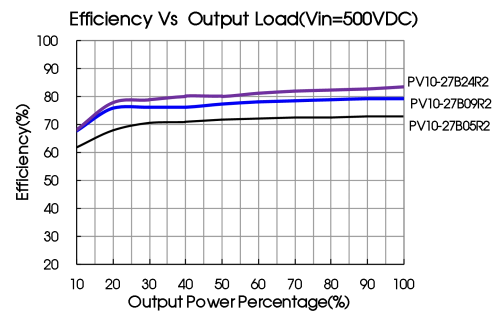
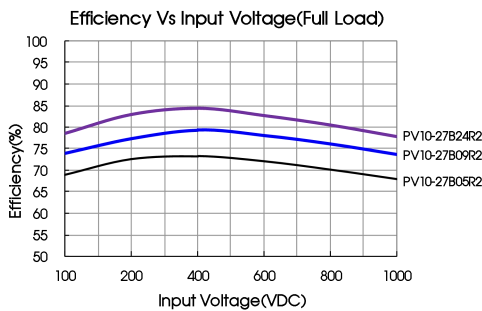
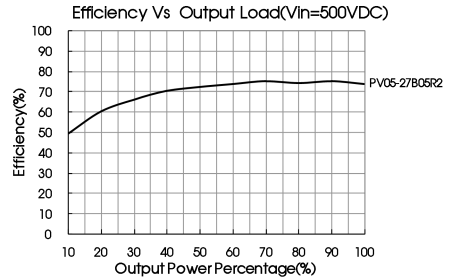
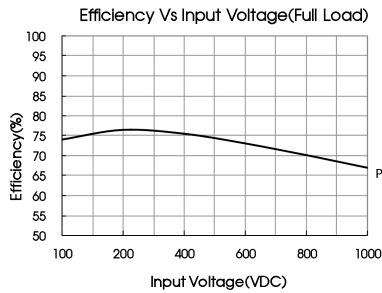
Note: The output power must be derated as per temperature derating curves

- 1. PV05-27BxxR2 models derating curve is line ①;
- PV10-27BxxR2 models derating curve is line ②;
- PV15-27BxxR2 models derating curve is line ③.

2. This product is suitable for applications using natural air cooling; for applications in closed environment please consult factory or one of our FAE.



Note: Calculating the actual output power = Nominal output power x Temperature derating x Input voltage derating.



Design Reference

1. Typical application

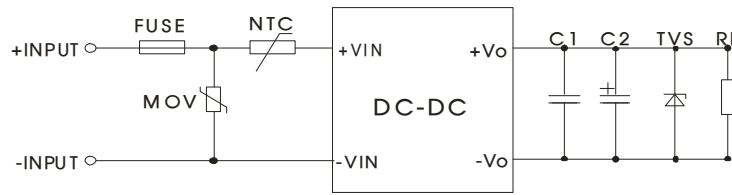


Fig. 1

| Model        | FUSE       | MOV     | NTC             | C1(μF)  | C2(μF)    | TVS      |
|--------------|------------|---------|-----------------|---------|-----------|----------|
| PV05-27B05R2 | 1A/1500VDC | S14K880 | 10D-11<br>(10Ω) | 1uF/16V | 220uF/16V | SMBJ7.0A |
| PV10-27B05R2 |            |         |                 | 1uF/16V | 220uF/16V | SMBJ7.0A |
| PV10-27B09R2 |            |         |                 | 1uF/16V | 120uF/16V | SMBJ12A  |
| PV10-27B24R2 |            |         |                 | 1uF/35V | 68uF/35V  | SMBJ33A  |
| PV15-27B12R2 | 2A/1500VDC | S14K880 | 10D-11<br>(10Ω) | 1uF/25V | 120uF/25V | SMBJ15A  |
| PV15-27B15R2 |            |         |                 | 1uF/25V | 120uF/25V | SMBJ20A  |
| PV15-27B24R2 |            |         |                 | 1uF/35V | 68uF/35V  | SMBJ33A  |

Note on filter components:

We recommend using an electrolytic capacitor with high frequency and low ESR rating for C2 (refer to manufacture's datasheet). Choose a capacitor voltage rating with at least 20% margin, in other words not exceeding 80%. C1 is a ceramic capacitor, used to filter high-frequency noise. TVS is a recommended suppressor diode to protect the application in case of a converter failure.

2. EMC compliance recommended circuit

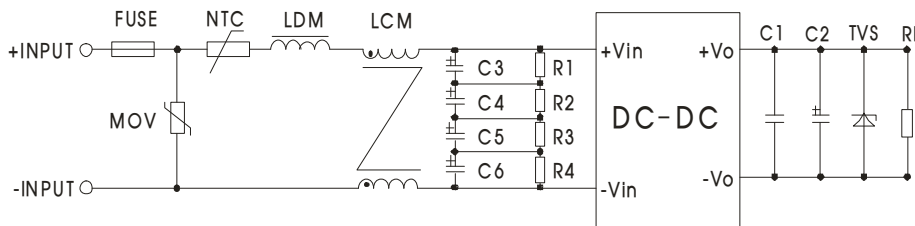
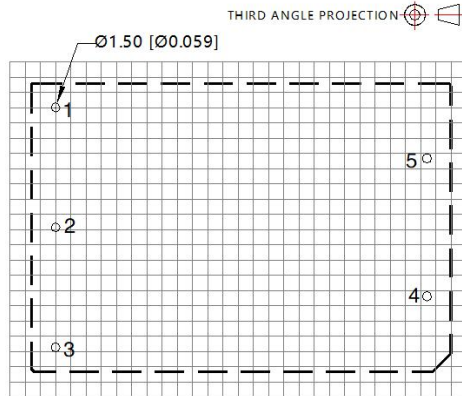
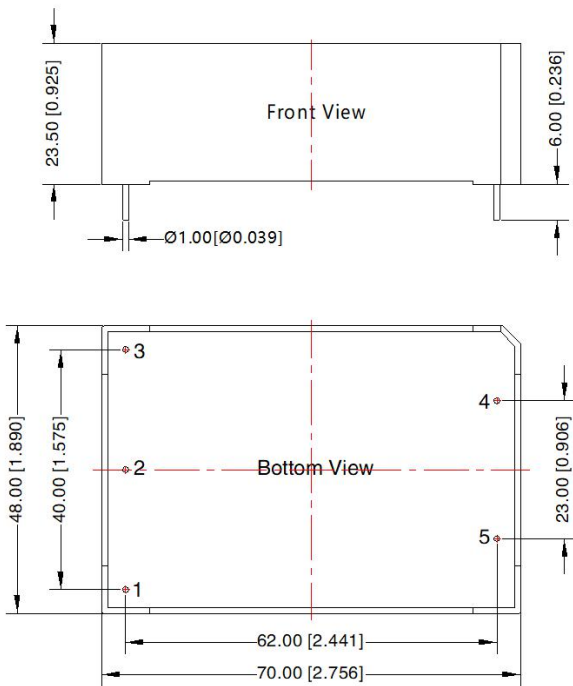


Fig. 2: EMC Recommended circuit (for output components also refer to typical application)

| Component      | Recommended value  |
|----------------|--|
| MOV            | S14K880  |
| C3, C4, C5, C6 | 47μF/400VDC  |
| R1, R2, R3, R4 | 1MΩ/2W   |
| NTC            | 10D-11   |
| LDM            | 4.7mH/0.38A  |
| LCM            | 10mH, recommended to use MORNSUN's FL2D-Z5-103   |
| FUSE           | 1A/1500VDC, required for PV05-27BxxR2/ PV10-27BxxR2<br>2A/1500VDC, required for PV15-27BxxR2 |

3. For additional information please refer to application notes on [www.mornsun-power.com](http://www.mornsun-power.com)

Dimensions and Recommended Layout

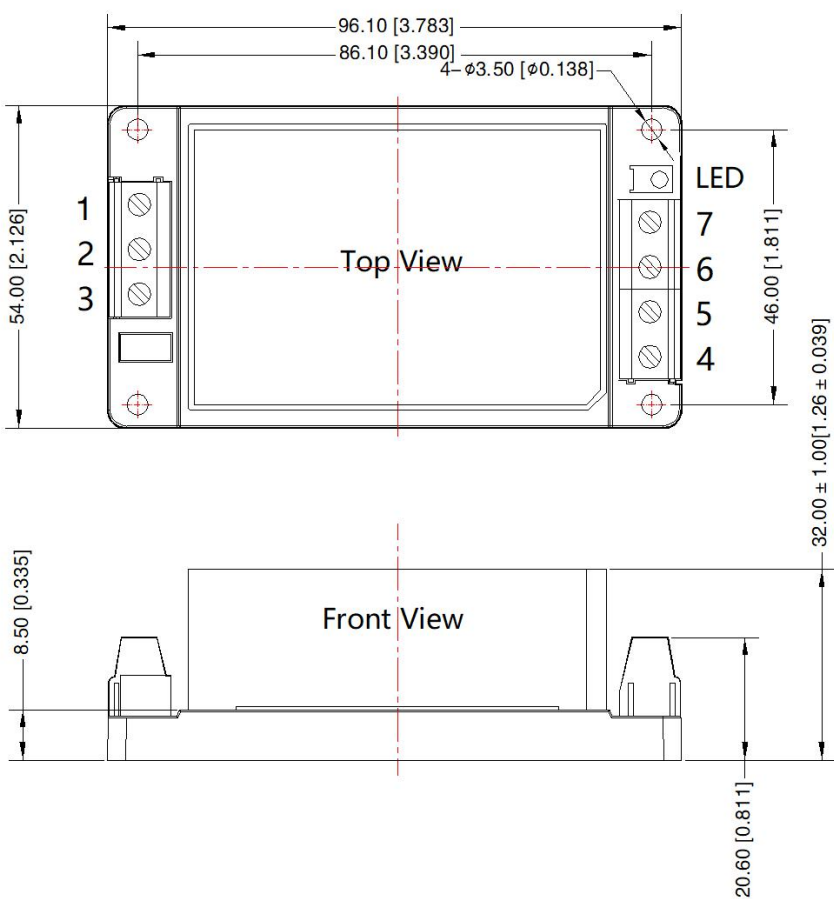


Note: Grid 2.54\*2.54mm

| Pin-Out |          |
|---------|----------|
| Pin     | Function |
| 1       | NC       |
| 2       | -Vin     |
| 3       | +Vin     |
| 4       | +Vo      |
| 5       | -Vo      |

Note:  
Unit: mm[inch]  
Pin diameter tolerances:  $\pm 0.10[\pm 0.004]$   
General tolerances:  $\pm 0.50[\pm 0.020]$

A2C chassis mounting Dimensions



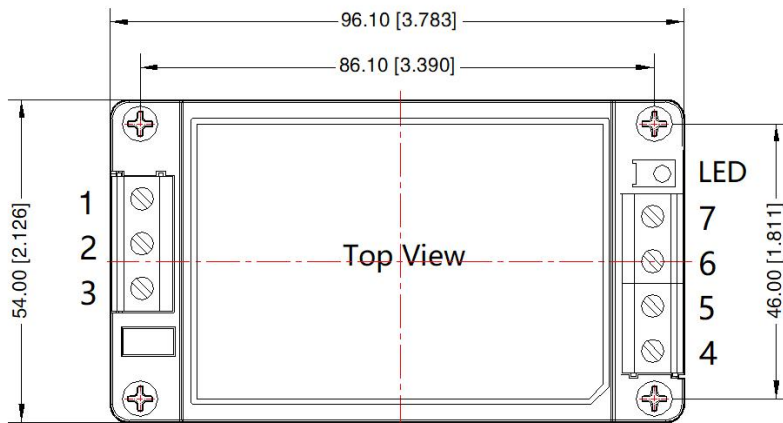
THIRD ANGLE PROJECTION

| Pin-Out |      |
|---------|------|
| Pin     | Mark |
| 1       | -Vin |
| 2       | NC   |
| 3       | +Vin |
| 4       | +Vo  |
| 5       | NC   |
| 6       | NC   |
| 7       | -Vo  |

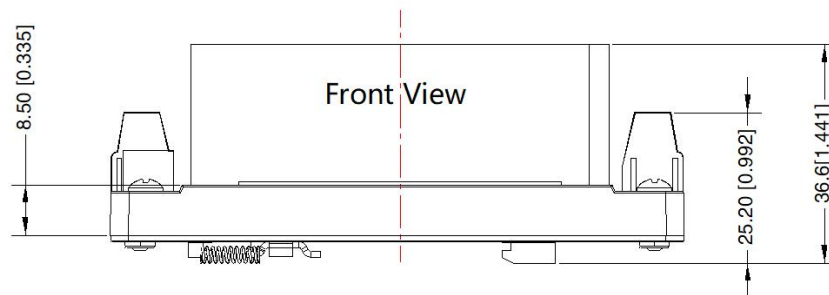
Note:  
Unit: mm[inch]  
Wire range: 24-12 AWG  
Tightening torque: Max 0.4 N · m  
General tolerances:  $\pm 0.5[\pm 0.020]$

A4C Din-Rail mounting Dimensions

THIRD ANGLE PROJECTION 



| Pin-Out |      |
|---------|------|
| Pin     | Mark |
| 1       | -Vin |
| 2       | NC   |
| 3       | +Vin |
| 4       | +Vo  |
| 5       | NC   |
| 6       | NC   |
| 7       | -Vo  |



Note:  
Unit: mm[inch]  
Mounting rail: TS35, rail needs to connect safety ground  
Wire range: 24-12 AWG  
Tightening torque: Max 0.4 N · m  
General tolerances:  $\pm 1.00 [\pm 0.039]$

- Note:
- For additional information on Product Packaging please refer to [www.mornsun-power.com](http://www.mornsun-power.com). Packaging bag number: 58220006; the Packing bag number of A2C/A4C package: 58220192;
  - Unless otherwise specified, parameters in this datasheet were measured under the conditions of  $T_a=25^\circ\text{C}$ , humidity<75% with nominal input voltage and rated output load;
  - All index testing methods in this datasheet are based on our company corporate standards;
  - We can provide product customization service, please contact our technicians directly for specific information;
  - Specifications are subject to change without prior notice.

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