



## 1S7B\_6UP series

1W - Single/Dual Output DC-DC Converter - Fixed Input - Isolated & Unregulated

# DC-DC Converter 1 Watt

- ⊕ High efficiency up to 81%
- ⊕ 4200VAC/6000VDC isolation
- ⊕ SIP package
- ⊕ Reinforced insulation
- ⊕ The patient leakage current: Max 2μA
- ⊕ International standard pinout
- ⊕ Operating temperature: -40°C up to +85°C
- ⊕ RoHS compliance
- ⊕ Short circuit protection
- ⊕ EN60601-1, ANSI/AAMI ES60601-1 approved (1 x MOPP/2 x MOOP)
- ⊕ Meets EN62368

The 1S7B\_6UP series meets reinforced insulation requirements. They are specially designed for applications where require compact size, high isolation, low isolation capacitor and low leakage current power. They are widely used in medical, electricity, IGBT driver and so on.

They are suitable for:

1. Where the voltage of the input power supply is stable (voltage variation: ±10%Vin);
2. Where isolation is necessary between input and output (isolation voltage ≤4200VAC or 6000VDC);
3. Where do not has high requirement of line regulation and the ripple & noise of the output voltage; Such as: Medical collection and isolation, High voltage collection circuit, IGBT-driven circuits, etc.



| Common specifications           |   |
|---------------------------------|---|
| Short circuit protection:       | Continuous, self-recovery                                   |
| Operation temperature range:    | -40°C – +85°C   |
| Storage temperature range:      | -55°C – +125°C  |
| Pin Soldering Resistance Temp   | 300°C MAX, 1.5mm from case for 10 sec                       |
| Storage humidity range:         | < 95% (Non-condensing)                                      |
| MTBF (MIL-HDBK-217F@25°C):      | >3,500,000 hours  |
| Case Temperature Rise (Ta=25°C) | 25°C  |
| Transformer Creepage:           | 5mm   |
| Transformer Clearance:          | 5mm   |
| PCB Creepage & Clearance:       | 5.5mm   |
| Case material:                  | Black plastic; flame-retardant and heat-resistant (UL94-V0) |
| Weight:                         | 4.2g  |
| Dimensions                      | 19.50 x 9.80 x 12.50 mm                                     |
| Cooling:                        | Free air convection   |

| Output specifications   |   |     |                                  |              |                |
|-------------------------|---|-----|----------------------------------|--------------|----------------|
| Item                    | Test condition  | Min | Typ                              | Max          | Units          |
| Voltage accuracy        | See output regulation curve (Fig. 1)  |     |                                  |              |                |
| Line regulation         | For Vin change of ±1%<br>3.3V output<br>others  |     |                                  | ±1.5<br>±1.2 | %              |
| Load regulation         | 10% to 100% load<br>• 3.3VDC output<br>• 5VDC output<br>• 7.2/9VDC output<br>• 12VDC output<br>• 15VDC output<br>• 24VDC output |     | 20<br>20<br>15<br>15<br>15<br>15 |              | %              |
| Temperature coefficient | full load   |     | ±0.02                            |              | %/°C           |
| Ripple & Noise*         | 20MHz Bandwidth<br>• 3.3VDC output<br>• others  |     | 80<br>70                         | 150<br>120   | mVp-p<br>mVp-p |
| Switching frequency     | Full load, nominal input  |     | 100                              |              | KHz            |

\* Note:\* The "parallel cable" method is used for Ripple and Noise test, please refer to DC-DC Converter Application Notes for specific information.

| Input specifications              |                     |      |        |      |       |
|-----------------------------------|---------------------|------|--------|------|-------|
| Item                              | Test condition      | Min  | Typ    | Max  | Units |
| Input current (no-load/full load) | • 3.3VDC input      |      | 45/426 | 70/- | mA    |
|                                   | • 5VDC input        |      | 35/274 | 60/- | mA    |
|                                   | • 12VDC input       |      | 15/114 | 40/- | mA    |
|                                   | • 15VDC input       |      | 18/93  | 40/- | mA    |
|                                   | • 24VDC input       |      | 10/56  | 25/- | mA    |
| Reflected Ripple Current*         | • 5VDC input        |      | 15     |      | mA    |
|                                   | • 12/15/24VDC input |      | 5      |      | mA    |
| Input surge voltage (1sec. max.)  | • 3.3VDC input      | -0.7 |        | 7    | VDC   |
|                                   | • 5VDC input        | -0.7 |        | 9    | VDC   |
|                                   | • 12VDC input       | -0.7 |        | 18   | VDC   |
|                                   | • 15VDC input       | -0.7 |        | 21   | VDC   |
|                                   | • 24VDC input       | -0.7 |        | 30   | VDC   |
| Input filter                      | Capacitor           |      |        |      |       |
| Hot plug                          | Unavailable         |      |        |      |       |

Note: \* Refer to DC-DC Converter Application Notes for detailed description of reflected ripple current test method.

| Isolation specifications  |  |      |     |      |            |
|---------------------------|--|------|-----|------|------------|
| Item                      | Test condition                               | Min  | Typ | Max  | Units      |
| Isolation voltage         | Input-output, with the test time of 1 minute | 6000 |     | 4200 | VDC<br>VAC |
| Isolation resistance      | Test at 500VDC                               | 1000 |     |      | MΩ         |
| Isolation capacitance     | Input/Output, 100KHz/0.1V                    |      | 5   |      | pF         |
| Patient leakage current*: | 250VAC, 50/60Hz                              |      |     | 2    | μA         |

### Example:

#### 1S7B\_0505D6UP

1 = 1Watt; S7 = SIP7; B = Pinning; 05 = 5Vin; 05 = 5Vout;  
D = Dual Output; 6 = 6kVDC isolation; U = Unregulated Output;  
P = Short circuit protection

| EMC specifications |     |   |
|--------------------|-----|---|
| EMI                | CE  | CISPR32/EN55032 CLASS B (see EMC recommended circuit)     |
| EMI                | RE  | CISPR32/EN55032 CLASS B (see EMC for recommended circuit) |
| EMS                | ESD | IEC/EN61000-4-2 Contact ±8kV perf. Criteria B             |

# 1S7B\_6UP series

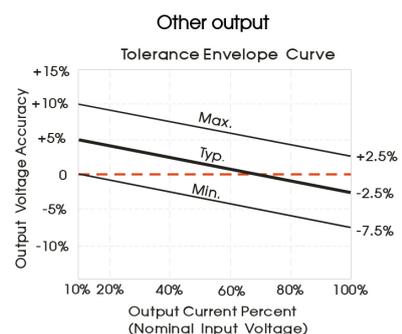
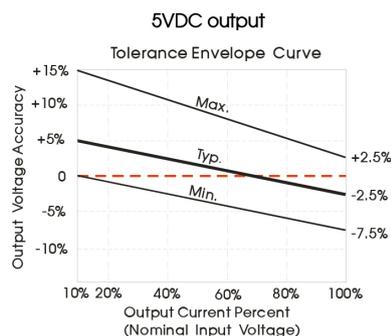
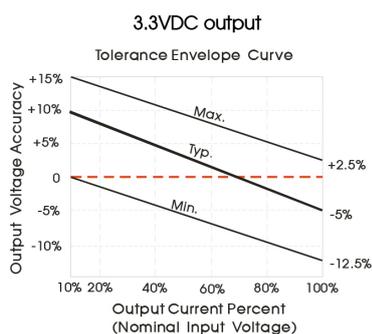
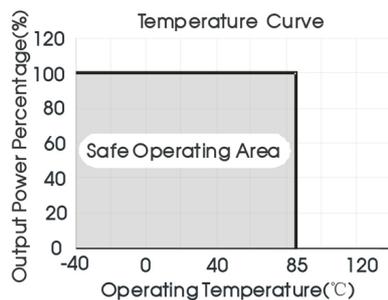
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## Product Selection Guide

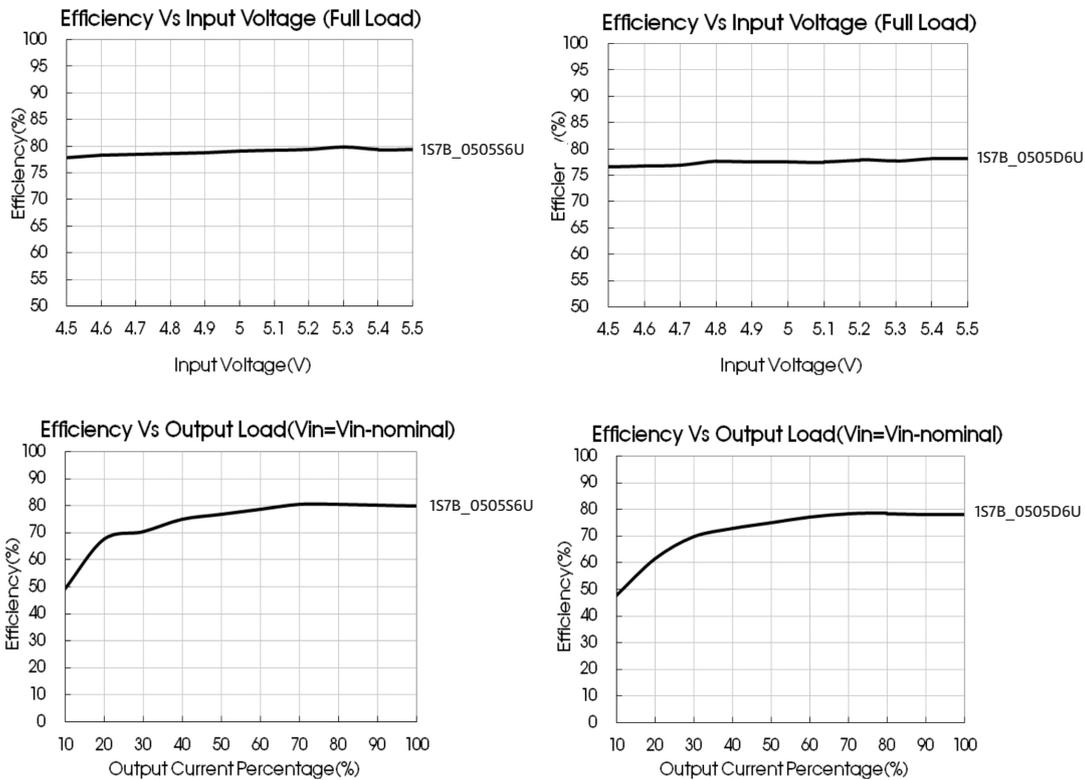
| Part Number   | Input Voltage [Nominal (Range), V] | Output Voltage [VDC] | Output current [mA] | Max. capacitive load [ $\mu$ F] | Efficiency [%, typ] |
|---------------|------------------------------------|----------------------|---------------------|---------------------------------|---------------------|
| 1S7B_0305S6UP | 3.3 (2.97-3.63)                    | 5                    | 200                 | 1000                            | 71                  |
| 1S7B_0503S6UP | 5 (4.5-5.5)                        | 3.3                  | 303                 | 1000                            | 73                  |
| 1S7B_0505S6UP | 5 (4.5-5.5)                        | 5                    | 200                 | 1000                            | 78                  |
| 1S7B_0512S6UP | 5 (4.5-5.5)                        | 12                   | 84                  | 470                             | 76                  |
| 1S7B_0515S6UP | 5 (4.5-5.5)                        | 15                   | 67                  | 470                             | 76                  |
| 1S7B_1205S6UP | 12 (10.8-13.2)                     | 5                    | 200                 | 1000                            | 77                  |
| 1S7B_1212S6UP | 12 (10.8-13.2)                     | 12                   | 84                  | 470                             | 81                  |
| 1S7B_1215S6UP | 12 (10.8-13.2)                     | 15                   | 67                  | 470                             | 81                  |
| 1S7B_2405S6UP | 24 (21.6- 26.4)                    | 5                    | 200                 | 1000                            | 76                  |
| 1S7B_2412S6UP | 24 (21.6- 26.4)                    | 12                   | 84                  | 470                             | 78                  |
| 1S7B_2415S6UP | 24 (21.6- 26.4)                    | 15                   | 67                  | 470                             | 78                  |

| Part Number   | Input Voltage [Nominal (Range), V] | Output Voltage [VDC] | Output current [mA] | Max. capacitive load [ $\mu$ F] | Efficiency [%, typ] |
|---------------|------------------------------------|----------------------|---------------------|---------------------------------|---------------------|
| 1S7B_0505D6UP | 5 (4.5-5.5)                        | $\pm$ 5              | $\pm$ 100           | 470                             | 78                  |
| 1S7B_0509D6UP | 5 (4.5-5.5)                        | $\pm$ 9              | $\pm$ 56            | 470                             | 80                  |
| 1S7B_0512D6UP | 5 (4.5-5.5)                        | $\pm$ 12             | $\pm$ 42            | 220                             | 74                  |
| 1S7B_0515D6UP | 5 (4.5-5.5)                        | $\pm$ 15             | $\pm$ 33            | 220                             | 76                  |
| 1S7B_1205D6UP | 12 (10.8-13.2)                     | $\pm$ 5              | $\pm$ 100           | 470                             | 77                  |
| 1S7B_1209D6UP | 12 (10.8-13.2)                     | $\pm$ 9              | $\pm$ 56            | 470                             | 80                  |
| 1S7B_1212D6UP | 12 (10.8-13.2)                     | $\pm$ 12             | $\pm$ 42            | 220                             | 73                  |
| 1S7B_1215D6UP | 12 (10.8-13.2)                     | $\pm$ 15             | $\pm$ 34            | 220                             | 75                  |
| 1S7B_1515D6UP | 15 (13.5-16.5)                     | $\pm$ 15             | $\pm$ 34            | 220                             | 72                  |
| 1S7B_2405D6UP | 24 (21.6- 26.4)                    | $\pm$ 5              | $\pm$ 100           | 470                             | 75                  |
| 1S7B_2409D6UP | 24 (21.6- 26.4)                    | $\pm$ 9              | $\pm$ 56            | 470                             | 79                  |
| 1S7B_2412D6UP | 24 (21.6- 26.4)                    | $\pm$ 12             | $\pm$ 42            | 220                             | 76                  |
| 1S7B_2415D6UP | 24 (21.6- 26.4)                    | $\pm$ 15             | $\pm$ 42            | 220                             | 76                  |

## Typical characteristics



## Efficiency curves



## Typical application

If it is required to further reduce input and output ripple, a filter capacitor can be connected to the input and output terminals, see Fig. 1. Moreover, choosing suitable filter capacitor is very important, start-up problems may be caused by too large capacitance. To ensure the modules running well, the recommended capacitive load values as shown in Table 1.

The simplest device for output voltage regulation, over-voltage and over-current protection is a linear voltage regulator with overheat protection that is connected to the input or output end in series (see Fig. 2).

Recommended capacitive load value table:

| Vin (VDC) | Cin (μF) | Single Vout (VDC) | Cout (μF) | Dual Vout (VDC) | Cout (μF) |
|-----------|----------|-------------------|-----------|-----------------|-----------|
| 3.3/5     | 10       | 3.3/5             | 10        | ±5              | 4.7       |
| 12/15     | 4.7      | 12                | 2.2       | ±9              | 2.2       |
| 24        | 2.2      | 15                | 1         | ±12/±15         | 1         |

It's not recommended to connect any external capacitor in the application field with less than 0.5 watt output.

Table 1

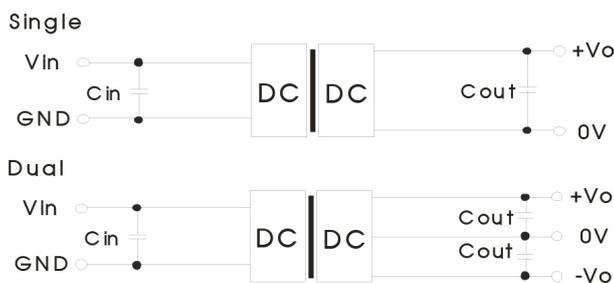


Fig. 1

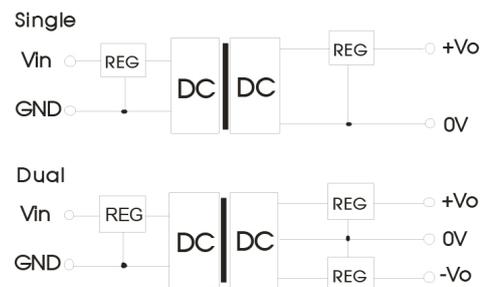
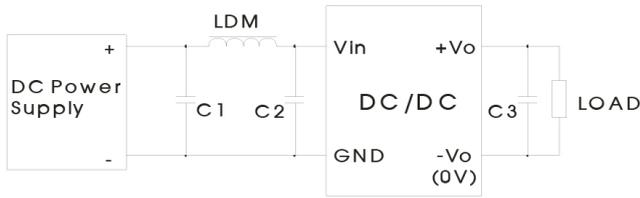


Fig. 2

# 1S7B\_6UP series

1W - Single/Dual Output DC-DC Converter - Fixed Input - Isolated & Unregulated

## EMC typical recommended circuit (CLASS B)



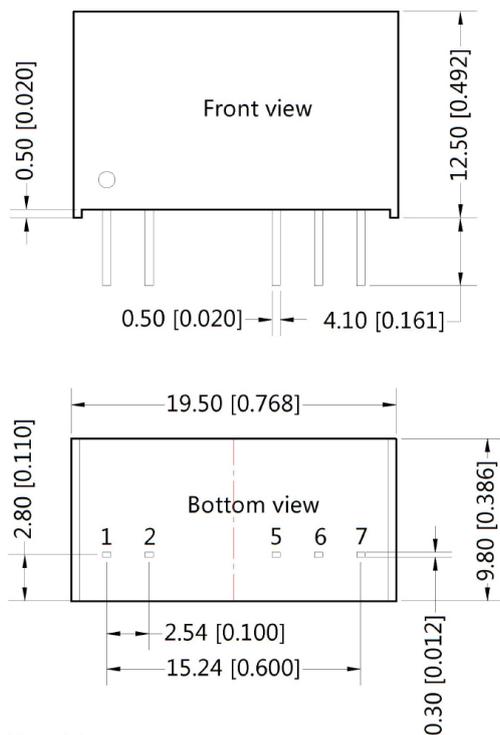
Recommended typical circuit parameters:

|               |                |  |
|---------------|----------------|--|
| Input voltage | 3.3/5/12/15/24 |  |
| EMI           | C1, C2         | 4.7μF/50V  |
| EMI           | C3             | Refer to the Cout in Typical application, fig. 1 |
| EMI           | LDM            | 6.8μH  |

### Output load requirements

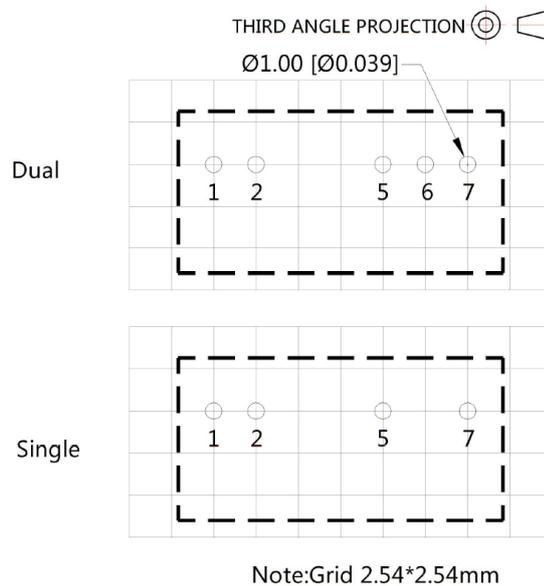
In order to ensure the converter can work reliably with high efficiency, the minimum load should not less than 10% rated load when it is used. If the needed power is indeed small, please parallel a resistor on the output side (The sum of the efficient power and resistor consumption power is not less than 10%).

## Mechanical dimensions



Note:M  
Unit :mm[inch]  
Pin section tolerances:±0.10[±0.004]  
General tolerances:±0.25[±0.010]

## Recommended footprint



| Pin-Out |        |      |
|---------|--------|------|
| Pin     | Single | Dual |
| 1       | Vin    | Vin  |
| 2       | GND    | GND  |
| 5       | 0V     | -Vo  |
| 6       | No Pin | 0V   |
| 7       | +Vo    | +Vo  |

### Note:

1. Operation under minimum load will not damage the converter; however, they may not meet all specifications.
2. Max. Capacitive Load is tested at nominal input voltage and full load.
3. Unless otherwise noted, All specifications are measured at Ta = 25°C, humidity <75%, nominal input voltage and rated output load.
4. In this datasheet, all test methods are based on our corporate standards.
5. All characteristics are for listed models, and non-standard models may perform differently. Please contact our technical support for more detail.
6. Please contact our technical support for any specific requirement.
7. Specifications of this product are subject to changes without prior notice.