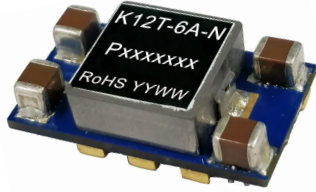# DC/DC Converter

## K12T-6A Series

**MORNSUN®**

Non-isolated & regulated 6A single output

POL power converter



CE  RoHS

## FEATURES

- High efficiency up to 94%
- Operating ambient temperature range: -40℃ ~ +85℃
- Input under-voltage protection, output short-circuit, over-current protection
- High-speed transient response
- Compact SMD package
- EN62368 approved

*K12T-6A series is a 6A non-isolated switching regulator. The output voltage is accurately adjustable from 0.75V to 5.0V, and the product is featured with high efficiency, fast transient response, input under-voltage, output short circuit, over-current protection. They meet CLASS B of CISPR32/EN55032 EMI standards by adding the recommended external components and they are widely used in applications such as communications, computer network industry, power distributed architecture, workstations, servers, LANs/WANs and provide high current with fast transient response for high-speed chips such as FPGA, DSP, and ASIC.*

## Selection Guide

| Certification | Part No.① | Input Voltage (VDC) | | Output | | Efficiency(%) Min./Typ. | Capacitive Load(μF) Max. | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | | Nominal (Range) | Max.② | Voltage(VDC)③ (Range) | Current (A) Max./Min. | | 1mΩ≤ESR<10mΩ | ESR≥10mΩ |
| CE | K12T-6A-P | 12 (8.3~14) | 15 | 0.75~5.0 | 6/0 | 90/94 | 1000 | 3000 |
| | K12T-6A-N | | | | | | | |

Notes: ① "P" indicates that the Ctrl pin is positive logic control, "N" indicates that the Ctrl pin is negative logic control;
② Exceeding the maximum input voltage may cause permanent damage;
③ The default output voltage is 0.75VDC, which can be adjusted to 1.2VDC, 1.8VDC, 2.5VDC, 3.3VDC, 5VDC. See Trim instructions for specific output voltage adjustment;
④Unless otherwise specified, parameters in this table were measured under the 5VDC output voltage.

## Input Specifications

| Item | Operating Conditions | | | Min. | Typ. | Max. | Unit |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Input Current (full load/no-load) | Nominal input voltage | | | -- | 2660/20 | -- | mA |
| Start-up Voltage | | | | -- | -- | 8 | VDC |
| Under-voltage Protection | | | | 6 | -- | -- | |
| Reverse Polarity Input | | | | Avoid / Not protected | | | |
| Hot Plug | | | | Unavailable | | | |
| Input Filter | | | | Capacitance filter | | | |
| Ctrl* | Module on | K12T-6A-P (Positive logic) | | Ctrl pin open or pulled high (Vin-2.5VDC ~ Vin) | | | |
| | | K12T-6A-N (Negative logic) | | Ctrl pin pulled low to GND (0 ~ 0.5VDC) | | | |
| | Module off | K12T-6A-P (Positive logic) | | Ctrl pin pulled low to GND (0 ~ 0.5VDC) | | | |
| | | K12T-6A-N (Negative logic) | | Ctrl pin open or pulled high (Vin-2.5VDC ~ Vin) | | | |
| | Input current when off | | | -- | 1 | -- | mA |

Notes: * 1. The Ctrl pin voltage is referenced to GND.
2. Unless otherwise specified, parameters in this table were measured under the 5VDC output voltage.

## Output Specifications

| Item | Operating Conditions | Min. | Typ. | Max. | Unit |
| --- | --- | --- | --- | --- | --- |
| Voltage Accuracy | Full load, nominal input voltage | -- | ±1.0 | ±2.0 | |
| Linear Regulation | Full load, input voltage range | -- | ±0.3 | -- | % |
| Load Regulation | Nominal input, 0% -100% load | -- | ±0.4 | -- | |

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| Ripple & Noise* | 20MHz bandwidth, nominal input, 100% load | -- | 35 | 75 | mVp-p |
|---|---|---|---|---|---|
| Trim | | 0.75 | -- | 5.0 | VDC |
| Temperature Coefficient | 100% load | -- | ±0.02 | -- | %/℃ |
| Transient Response Deviation | Nominal input, 50%-100%-50% load step change, di/dt=2.5A/us, with external 2 x 150 µF polymer capacitors | -- | ±70 | -- | mV |
| Transient Recovery Time | | -- | 20 | -- | us |
| Over-current Protection | Nominal input | 140 | 160 | -- | %Io |
| Short-circuit Protection | Nominal input | Continuous, self-recovery | | | |

Notes: * 1. The "parallel cable" method is used for Ripple and Noise test, please refer to DC-DC Converter Application Notes for specific information.
2. Unless otherwise specified, parameters in this table were measured under the 5VDC output voltage.

## General Specifications

| Item | Operating Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Operating Temperature | See Fig. 1 | -40 | -- | +85 | ℃ |
| Storage Temperature | | -55 | -- | +125 | |
| Storage Humidity | Non-condensing | 5 | -- | 95 | %RH |
| Reflow Soldering Temperature | | Peak temp. Tc ≤245℃, maximum duration time≤60s over 217℃. For actual application, please refer to IPC/JEDEC J-STD-020D.1. | | | |
| Switching Frequency | Full load, nominal input voltage | -- | 350 | -- | KHz |
| MTBF | MIL-HDBK-217F@25℃ | 1000 | -- | -- | K hours |

## Mechanical Specifications

| Dimensions | 20.30 x 11.40 x 6.60 mm |
|---|---|
| Weight | 3.9g (Typ.) |
| Cooling Method | Nature convection or forced convection |

## Electromagnetic Compatibility (EMC)

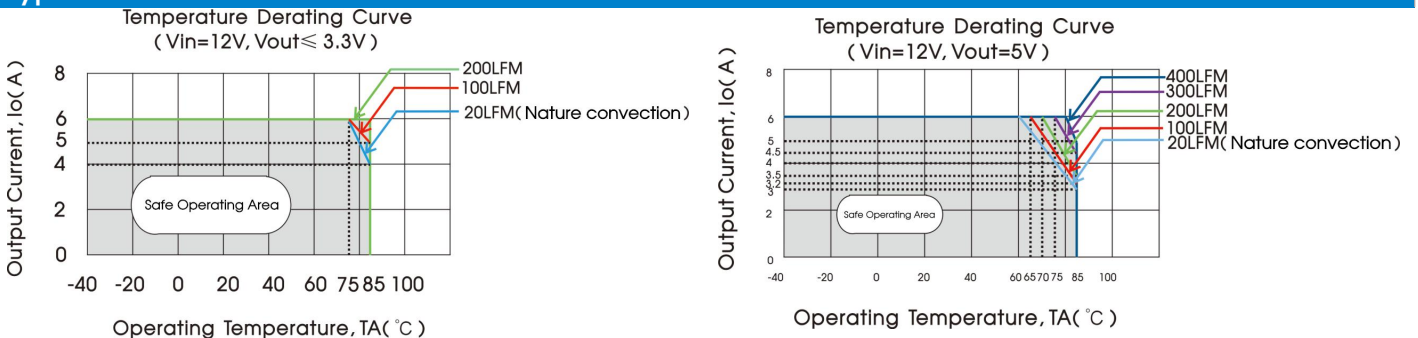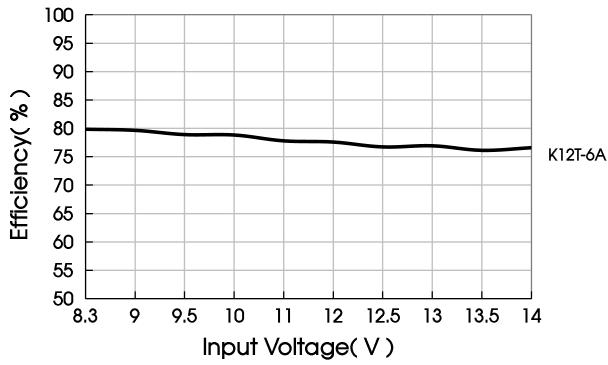| Emissions | CE | CISPR32/EN55032 Class B (see Fig.3 for recommended circuit) | |
|---|---|---|---|
| | RE | CISPR32/EN55032 Class B (see Fig.3 for recommended circuit) | |
| Immunity | ESD | IEC/EN61000-4-2    Contact ±6KV | perf. Criteria B |

## Typical Characteristic Curves

Temperature Derating Curve
(Vin=12V, Vout≤ 3.3V)

200LFM
100LFM
20LFM (Nature convection)

Safe Operating Area

Output Current, Io(A)
Operating Temperature, TA(℃)

Temperature Derating Curve
(Vin=12V, Vout=5V)

400LFM
300LFM
200LFM
100LFM
20LFM (Nature convection)

Safe Operating Area

Output Current, Io(A)
Operating Temperature, TA(℃)

Fig. 1

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### Efficiency Vs input Voltage
### ( Vout=0.75V, Io=6A )



### Efficiency Vs Output Load
### ( Vin=12V, Vout=0.75V )
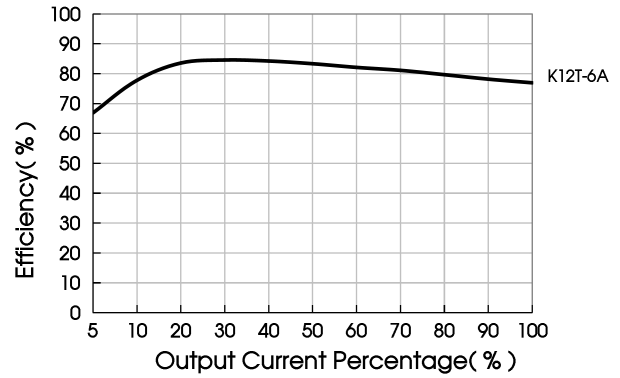


### Efficiency Vs input Voltage
### ( Vout=3.3V, Io=6A )
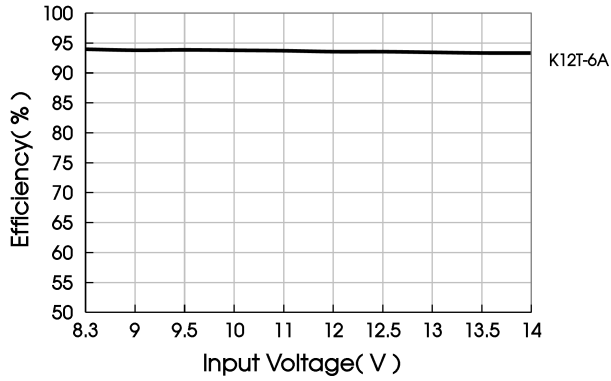


### Efficiency Vs Output Load
### ( Vin=12V, Vout=3.3V )
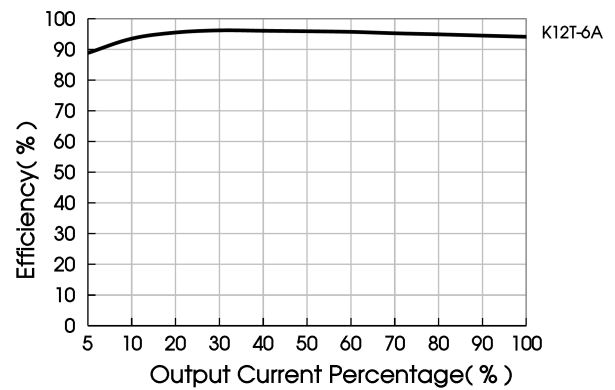


### Efficiency Vs input Voltage
### ( Vout=5V, Io=6A )
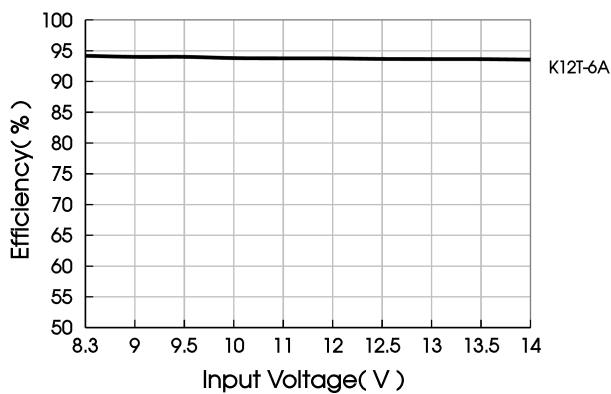


### Efficiency Vs Output Load
### ( Vin=12V, Vout=5V )

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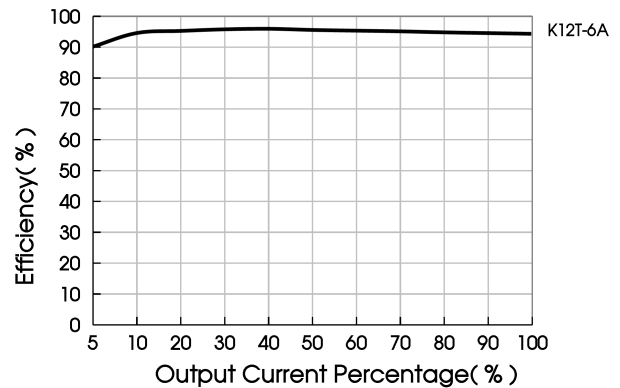
## Design Reference

### 1. Typical application



Fig. 2

Table 1

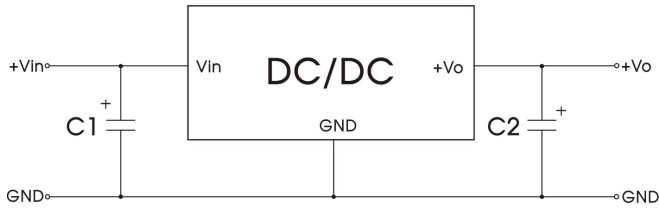| Part No. | C1 | C2 |
|---|---|---|
| K12T-6A-P(N) | 100µF/35V | 22µF/16V |

Notes:
1. 100 µF polymer capacitors (C1) is required and should be connected close to the pin terminal, to ensure the stability of the converter;
2. To reduce the output ripple furtherly, increased values and/or tantalum or low ESR electrolytic capacitors may also be used instead;
3. Refer to Table 1 for C1 and C2 capacitor values;
4. Converter cannot be used for hot swap and with output in parallel.
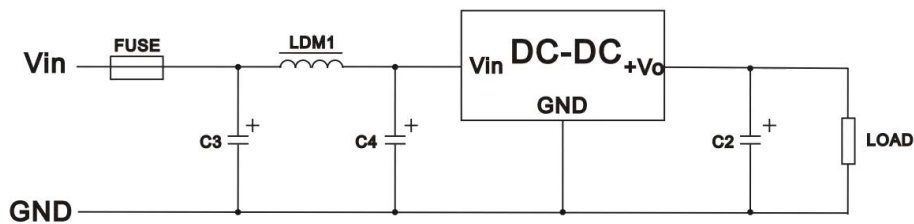
### 2. EMC compliance circuit



Fig. 3

Table 2

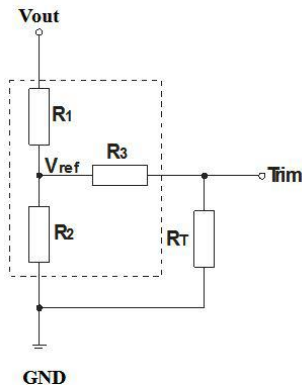| FUSE | C3/C4 | LDM1 | C2 |
|---|---|---|---|
| Selected based on the actual input current in application | 100µF /35V | 6.8µH | Refer to the Cout in Table 1 |

### 3. Trim function for output voltage adjustment (open if unused)



Fig. 4 TRIM resistor connection (dashed line shows internal resistor network)

Table 3

| Vo(VDC) | $R_T$(kΩ) |
|---|---|
| 0.7525 | Open |
| 1.2 | 15.089 |
| 1.8 | 5.873 |
| 2.5 | 3.120 |
| 3.3 | 1.826 |
| 5 | 0.695 |

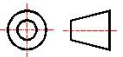Calculating Trim resistor ($R_T$) values:
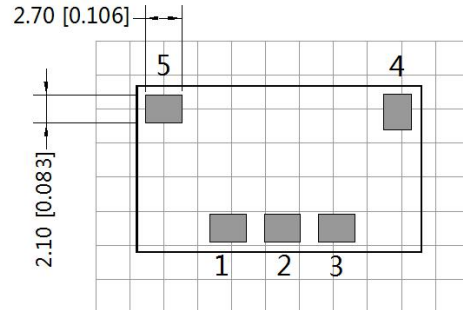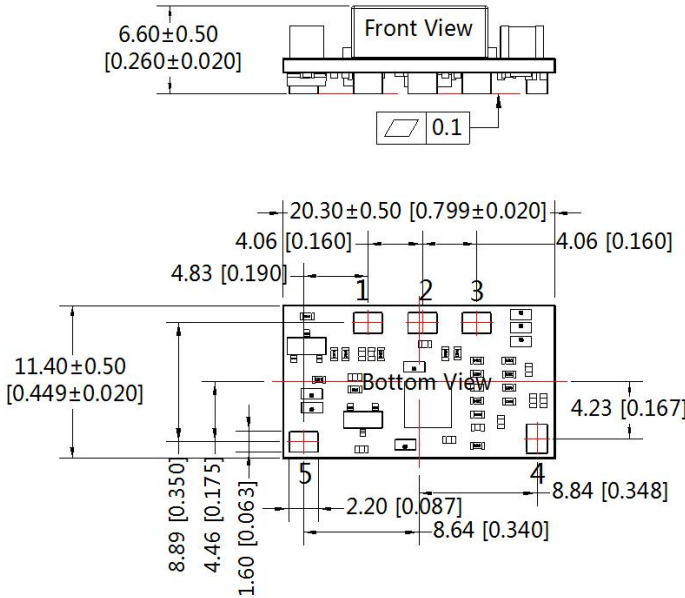
$$R_T(\Omega) = \frac{7200}{V_O - 0.7525} - 1000$$

Notes: 1. $R_T$ : Resistance of Trim; Vo: The trim up voltage;
2. If $R_T$ = ∞ or Trim pin open, Vo = 0.7525 VDC.

### 4. For additional information please refer to DC-DC converter application notes on www.mornsun-power.com

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## Dimensions and Recommended Layout

THIRD ANGLE PROJECTION

2.70 [0.106]

2.10 [0.083]

| 5 | | | | 4 |
| 1 | 2 | 3 | | |

Note : Grid: 2.54*2.54mm

Front View

6.60±0.50
[0.260±0.020]

0.1

20.30±0.50 [0.799±0.020]
4.06 [0.160]          4.06 [0.160]
4.83 [0.190]

11.40±0.50
[0.449±0.020]

Bottom View

4.23 [0.167]

8.89 [0.350]
4.46 [0.175]
1.60 [0.063]

2.20 [0.087]
8.64 [0.340]

8.84 [0.348]

Note :
Unit: mm[inch]
General tolerances: ±0.25[±0.010]
The layout of the device is for reference only ,
please refer to the actual product

| Pin-Out | |
|---|---|
| Pin | Function |
| 1 | GND |
| 2 | Trim |
| 3 | +Vo |
| 4 | Ctrl |
| 5 | Vin |

Notes:
1. For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58210072;
2. The maximum capacitive load offered were tested at input voltage range and full load;
3. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25℃, humidity<75%RH with nominal input voltage, 5VDC output voltage and rated output load;
4. All index testing methods in this datasheet are based on company corporate standards;
5. We can provide product customization service, please contact our technicians directly for specific information;
6. Products are related to laws and regulations: see "Features" and "EMC";
7. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.

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