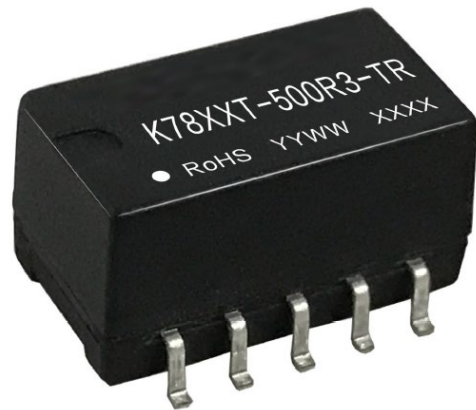


## Features

- High efficiency up to 95%
- No-load input current as low as 0.2mA
- Operating ambient temperature range -40°C to +85°C
- Output short-circuit protection
- SMD package
- EN62368 Approved



Ideal Power's 36K78xxT-500R3-TR 6W Non-Isolated DC/DC Converters in SMD Series are certified to UKCA, CE & RoHS & IEC/UL60950/EN62368 Standards and comply with the relevant Efficiency Regulations. These are primarily used in ITE, Audio & Video Industries and customised solutions are available upon request.

### Models

| Model No.         | Input Voltage (VDC)*<br>Nominal (Range) | Output        |                          | Full Load<br>Efficiency (%)<br>Vin Min/Vin Max | Capacitive<br>Load<br>(µF) Max. |
|-------------------|---|---------------|--------------------------|--|---------------------------------|
|                   |   | Voltage (VDC) | Current (mA)<br>Max/Min. |  |                                 |
| 36K7801T-500R3-TR | 12 (4.75-28)                            | 1.5           | 500                      | 76/67  | 680                             |
| 36K7802T-500R3-TR | 12 (4.75-32)                            | 2.5           | 500                      | 81/74  | 680                             |
| 36K7803T-500R3-TR | 24 (4.75-36)                            | 3.3           | 500                      | 86/80  | 680                             |
| 36K7805T-500R3-TR | 24 (6.5-36)                             | 5             | 500                      | 90/84  | 680                             |
| 36K78X6T-500R3-TR | 24 (8-36)                               | 6.5           | 500                      | 92/87  | 680                             |
| 36K7809T-500R3-TR | 24 (12-36)                              | 9             | 500                      | 93/90  | 680                             |
| 36K7812T-500R3-TR | 24 (15-36)                              | 12            | 500                      | 94/91  | 680                             |
| 36K7815T-500R3-TR | 24 (19-36)                              | 15            | 500                      | 95/93  | 680                             |

Note: \*For input voltage exceeding 30 VDC, an input capacitor of 22µF/50V is required.

### Input Specifications

| Conditions                |            | Min  | Typ | Max | Unit |
|---------------------------|------------|--|-----|-----|------|
| No-load Input Current     |            | --   | 0.2 | 1.5 | mA   |
| Reverse Polarity at Input |            | Avoid / Not protected                      |     |     |      |
| Input Filter              |            | Capacitance filter                         |     |     |      |
| Ctrl*                     | Module on  | Open or pulled high (TTL level 3.2-5.5VDC) |     |     |      |
|                           | Module off | Pulled low to GND level (0-0.8VDC)         |     |     |      |
| Input current when off    |            | --   | 30  | 100 | µA   |

Note: \*The Ctrl pin voltage is referenced to input GND.

**Output Specifications**

| Parameter                    | Conditions                                  |                          | Min                       | Typ  | Max   | Unit  |
|------------------------------|---|--------------------------|---------------------------|------|-------|-------|
| Voltage Accuracy             | Full load, input voltage range              | 1.5/1.8/2.5/3.3 VDC      | --                        | ±2   | ±4    | %     |
|                              |   | Others                   | --                        | ±2   | ±3    |       |
| Linear Regulation            | Full load, input voltage range              |                          | --                        | ±0.2 | ±0.4  | %     |
| Load Regulation              | Nominal input voltage, 10% -100% load       | 1.5/2.5/3.3/5 VDC output | --                        | 0.8  | ±1.5  |       |
|                              |   | Others                   | --                        | 0.3  | --    |       |
| Ripple & Noise*              | 20MHz bandwidth, nominal input voltage      | 1.5/2.5/3.3 VDC output,  | --                        | 20   | 50    | mVp-p |
|                              |   | Others, 10% -100% load   | --                        | 20   | 50    |       |
| Transient Recovery Time      | Nominal input voltage, 25% load step change |                          | --                        | 0.2  | 1     | ms    |
| Transient Response Deviation |   |                          | --                        | 50   | 200   | mV    |
| Temperature Coefficient      | Operating temperature -40°C to +85°C        |                          | --                        | --   | ±0.03 | %/°C  |
| Short-circuit Protection     | Nominal input voltage                       |                          | Continuous, self-recovery |      |       |       |
| Vadj                         | Input voltage range                         |                          | --                        | ±10  | --    | %Vo   |

Note: \*

① The “parallel cable” method is used for ripple and noise test, please refer to DC-DC Converter Application Notes for specific information;

② With light loads at or below 20%, Ripple & Noise for 1.5/2.5/3.3V output parts increases to 100mVp-p max. and a load below 10% for 5V/6.5V/9V/12V/15V output parts levels increase to 150mVp-p max.

**General Specifications**

| Parameter                      | Conditions                       |                       | Min  | Typ | Max  | Unit    |
|--------------------------------|----------------------------------|-----------------------|--|-----|------|---------|
| Operating Temperature          | see Fig. 1                       |                       | -40  | --  | +85  | °C      |
| Storage Temperature            |                                  |                       | -55  | --  | +125 |         |
| Storage Humidity               | Non-condensing                   |                       | 5  | --  | 95   | %RH     |
| Reflow Soldering Temperature   |                                  |                       | Peak temperature ≤245°C, duration ≤60s max. over 217°C.<br>Also refer to IPC/JEDEC J-STD-020D.1. |     |      |         |
| Switching Frequency (PFM Mode) | Full load, nominal input voltage | 1.5/1.8/2.5VDC output | --   | 370 | --   | KHz     |
|                                |                                  | 3.3/5/6.5VDC output   | --   | 700 | --   |         |
| MTBF                           | MIL-HDBK-217F@25°C               |                       | 2000   | --  | --   | K hours |

**Mechanical Specifications**

|                |  |
|----------------|--|
| Case material  | Black plastic; flame-retardant and heat-resistant (UL94 V-0) |
| Dimensions     | 15.24 x11.40 x 8.25mm  |
| Weight         | 1.5g (Typ.)  |
| Cooling method | Free air convection  |

**Electromagnetic Compatibility (EMC)**

|           |       |                  |  |  |                  |
|-----------|-------|------------------|--|--|------------------|
| Emissions | CE    | CISPR32/EN55032  | CLASS B (see Fig. 4-② for recommended circuit)           |  |                  |
|           | RE    | CISPR32/EN55032  | CLASS B (see Fig. 4-② for recommended circuit)           |  |                  |
| Immunity  | ESD   | IEC/EN 61000-4-2 | Contact ±4KV   |  | perf. Criteria B |
|           | RS    | IEC/EN 61000-4-3 | 10V/m  |  | perf. Criteria A |
|           | EFT   | IEC/EN 61000-4-4 | ±1KV (see Fig. 4-① for recommended circuit)              |  | perf. Criteria B |
|           | Surge | IEC/EN 61000-4-5 | line to line ±1KV (see Fig. 4-① for recommended circuit) |  | perf. Criteria B |
|           | CS    | IEC/EN 61000-4-6 | 3Vr.m.s  |  | perf. Criteria A |

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Page 2 of 6

**Characteristic Curve**

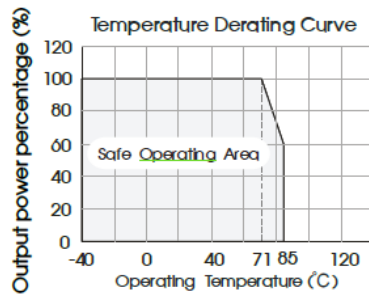
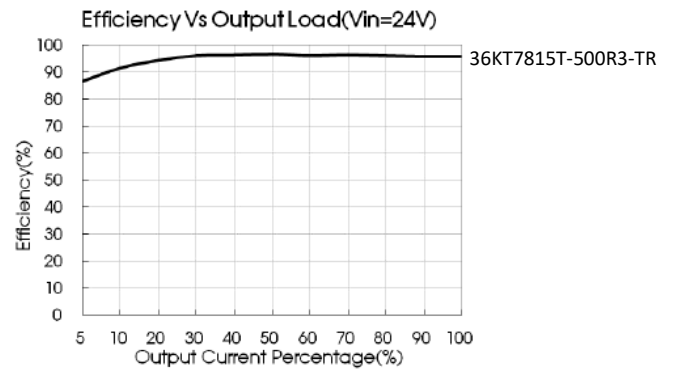
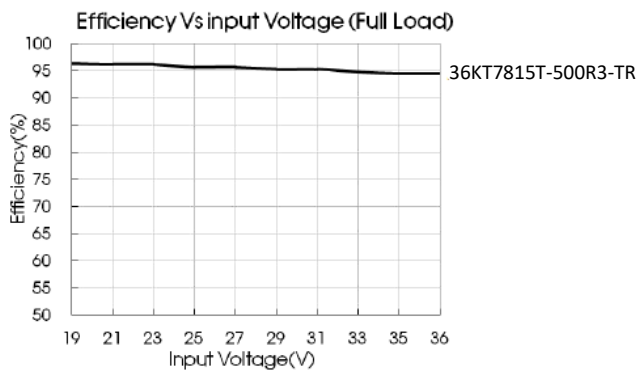
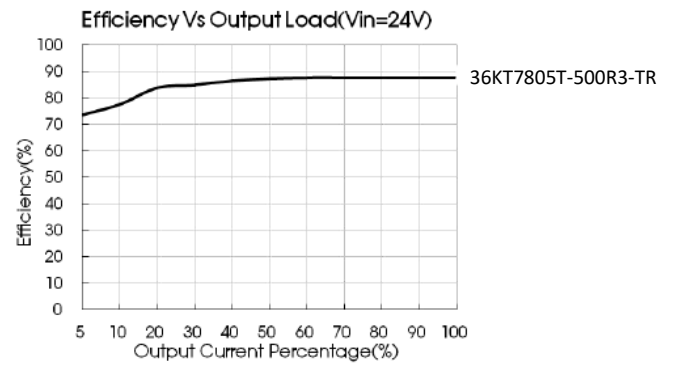
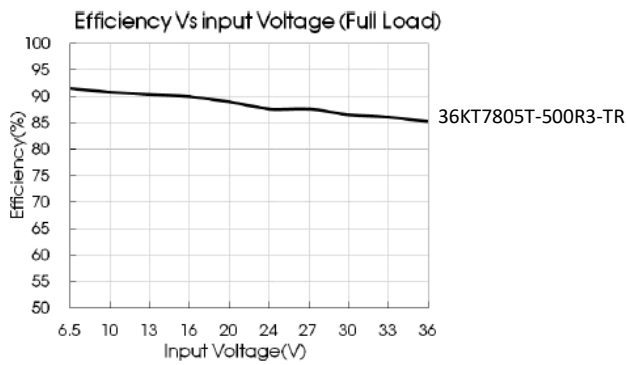


Fig. 1



Design Reference (Figure 1)

1 Typical application

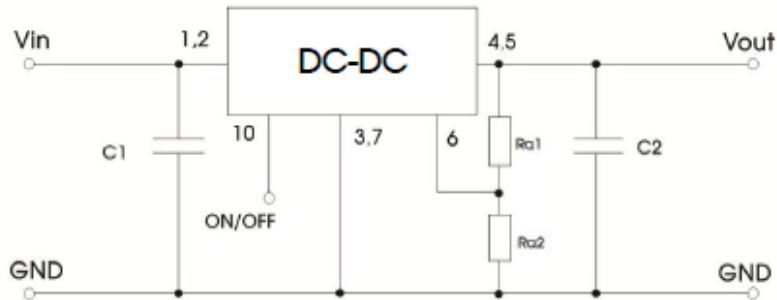


Fig. 2 Typical application circuit

| Model No          | C1<br>(Ceramic capacitor) | C2<br>(Ceramic capacitor) | Ra1/Ra2<br>(Vadj resistance)            |
|-------------------|---------------------------|---------------------------|---|
| 36K7801T-500R3-TR | 10μF/50V                  | 22μF/10V                  | Refer to Vadj<br>resistance calculation |
| 36K7802T-500R3-TR |                           | 22μF/10V                  |   |
| 36K7803T-500R3-TR |                           | 22μF/10V                  |   |
| 36K7805T-500R3-TR |                           | 22μF/16V                  |   |
| 36K78X6T-500R3-TR |                           | 22μF/16V                  |   |
| 36K7809T-500R3-TR |                           | 22μF/25V                  |   |
| 36K7812T-500R3-TR |                           | 22μF/25V                  |   |
| 36K7815T-500R3-TR |                           | 22μF/25V                  |   |

## Design Reference (Continued)

### 2 EMC Compliance circuit

Note:

The required C1 and C2 capacitors must be connected as close as possible to the terminals of the module.

Refer to Table 1 for C1 and C2 capacitor values. For certain applications, increased values and/or tantalum or low ESR electrolytic capacitors may also be used instead.

Converter cannot be used for hot swap and with output in parallel.

To further reduce the output ripple and noise, we suggested the use of a "LC" filter at the output terminals, with an inductor value (L) of 10μH-47μH.

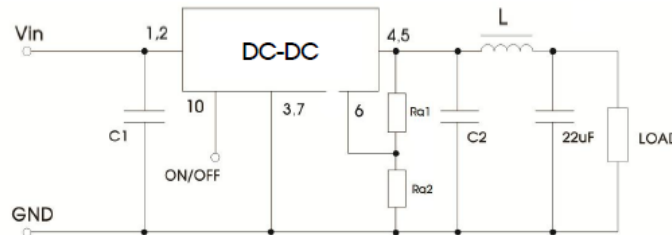


Fig. 3 External "LC" output filter circuit diagram

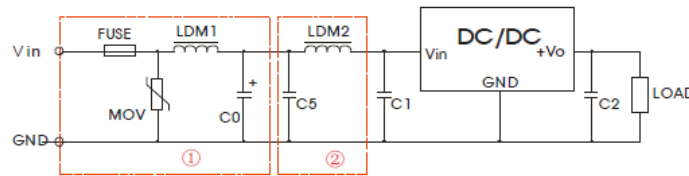


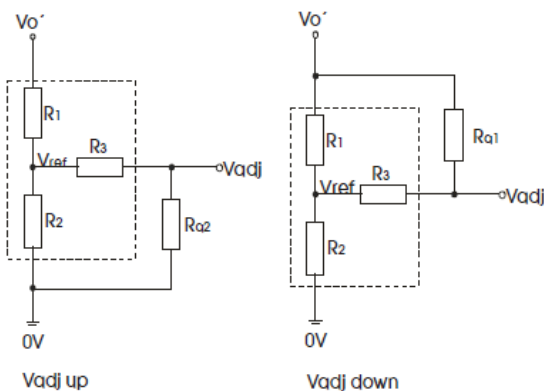
Fig. 4 Recommended compliance circuit

| FUSE  | MOV    | LDM1 | C0         | C1/C2            | C5         | LDM2 |
|---|--------|------|------------|------------------|------------|------|
| Select fuse value according to actual input current | S20K30 | 82μH | 680μF /50V | Refer to table 1 | 4.7μF /50V | 12μH |

Note: Part ① in Fig. 4 shows Immunity compliance filter and part ② filter for Emission compliance; depending on requirement both filters ① and ② can be used in series as shown.

Trim Function for Output Voltage Adjustment (open if unused)

### 3 Trim Function for Output Voltage Adjustment (open if unused)



Calculating Trim resistor values:

$$\text{up: } R_{a2} = \frac{\alpha R_2}{R_2 - \alpha} - R_3$$

$$\alpha = \frac{V_{ref}}{V_{o'} - V_{ref}} \cdot R_1$$

$$\text{down: } R_{a1} = \frac{\alpha R_1}{R_1 - \alpha} - R_3$$

$$\alpha = \frac{V_{o'} - V_{ref}}{V_{ref}} \cdot R_2$$

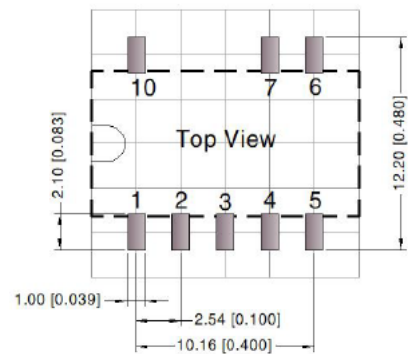
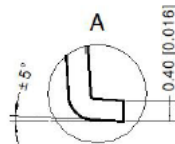
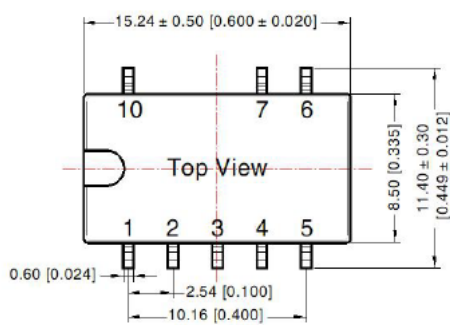
Ra1, Ra2= Trim Resistor value;  
 α= self-defined parameter;  
 Vo' =desired output voltage.

Fig. 5 Circuit diagram of Vadj up and down (dashed line shows internal part of module)

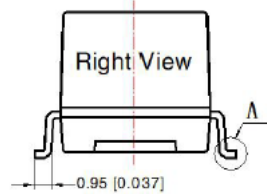
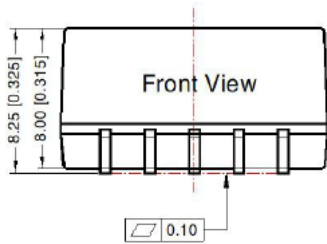
| Vout(V) | R1(KΩ) | R2(KΩ) | R3(KΩ) | Vref(V) |
|---------|--------|--------|--------|---------|
| 1.5     | 7.5    | 7.5    | 15     | 0.75    |
| 1.8     | 35.7   | 26.29  | 100    | 0.765   |
| 2.5     | 27     | 11.858 | 51     | 0.765   |
| 3.3     | 33     | 9.9    | 47     | 0.765   |
| 5       | 75     | 13.5   | 75     | 0.765   |
| 6.5     | 75     | 10     | 51     | 0.765   |
| 9       | 51     | 4.7    | 27     | 0.765   |
| 12      | 75     | 5.1    | 27     | 0.765   |
| 15      | 82     | 4.423  | 27     | 0.765   |

Note: The 1.5V model's output voltage can only be adjusted up (Vadj up) and cannot be adjusted to a lower voltage (Vadj down is not applicable).

### Dimensions and Recommended Layout



Note: Grid 2.54\*2.54mm



Note:  
 Unit: mm[inch]  
 Pin section tolerances:  $\pm 0.10[\pm 0.004]$   
 General tolerances:  $\pm 0.25[\pm 0.010]$

| Pin-Out |               |
|---------|---------------|
| Pin     | Mark          |
| 1       | +Vin          |
| 2       | +Vin          |
| 3       | GND           |
| 4       | +Vout         |
| 5       | +Vout         |
| 6       | Vadj          |
| 7       | GND           |
| 10      | Remote on/off |

NC: Pin to be isolated from circuitry

#### Notes:

For additional information on Product Packaging please refer to [www.idealpower.com](http://www.idealpower.com).  
 The specified maximum capacitive load is tested under full load condition and over the input voltage range.  
 All parameters in this datasheet were measured under following conditions: Ta=25°C, relative humidity <75%RH, nominal input voltage and rated output load (unless otherwise specified).  
 All index testing methods in this data table are based on our Company's corporate standards.  
 The performance indexes of the product models listed in this manual are as above, but some indexes of non-standard model products will exceed the above-mentioned requirements, and please directly contact with our technician for specific information.  
 Products are related to laws and regulations: see "Features" and "EMC".  
 Our products shall be classified according to ISO14001 and related environmental laws and regulations and shall be handled by qualified units.