



# CUI INC

a bel group

date 09/20/2021

page 1 of 7

## SERIES: P78A-0500 | DESCRIPTION: DC-DC CONVERTER

### FEATURES

- up to 500 mA current output
- pin compatible with LM78XX linear regulators
- non-isolated switching regulator
- high start-up current capability
- wide input voltage range
- efficiency up to 95%
- low ripple and noise
- short circuit protection
- ultra-compact SIP3 package
- -40°C to +85°C temperature range



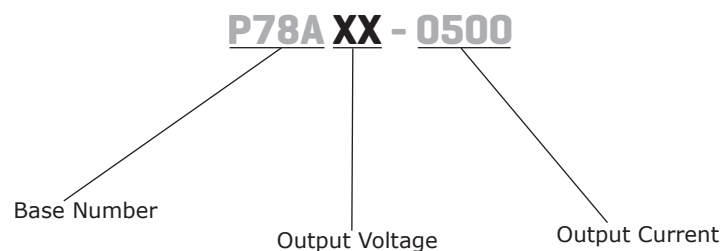
### MODEL

| MODEL       | input voltage |             | output voltage | output current        |          | output power | ripple & noise <sup>1</sup> | efficiency <sup>2</sup> |
|-------------|---------------|-------------|----------------|-----------------------|----------|--------------|-----------------------------|-------------------------|
|             | typ (Vdc)     | range (Vdc) | (Vdc)          | min <sup>3</sup> (mA) | max (mA) | max (W)      | typ (mVp-p)                 | typ (%)                 |
| P78A03-0500 | 24            | 6~28        | 3.3            | 10                    | 500      | 1.65         | 50                          | 88                      |
| P78A05-0500 | 24            | 7~28        | 5              | 10                    | 500      | 2.5          | 50                          | 92                      |

Notes:

1. At full load, nominal input, 20 MHz bandwidth oscilloscope.
2. At min Vin.
3. Operation under minimum load will not affect the reliability of the converter; however, the ripple and noise may exceed the specified values.
4. All specifications measured at: Ta=25°C, nominal input voltage, rated output load, and after warm up unless otherwise specified.

### PART NUMBER KEY



## INPUT

| parameter               | conditions/description | min | typ | max | units |
|-------------------------|------------------------|-----|-----|-----|-------|
| operating input voltage | 3.3 Vdc model          | 6   | 24  | 28  | Vdc   |
|                         | 5 Vdc model            | 7   | 24  | 28  | Vdc   |
| no load input current   |                        |     | 1.5 |     | mA    |

## OUTPUT

| parameter                            | conditions/description                    | min | typ  | max | units |
|--------------------------------------|-------------------------------------------|-----|------|-----|-------|
| maximum capacitive load <sup>1</sup> |                                           |     |      | 220 | μF    |
| line regulation                      | measured from low to high line, full load |     | ±0.5 |     | %     |
| load regulation                      | measured from 10~100% load                |     | ±1   |     | %     |
| voltage accuracy                     |                                           |     | ±3   |     | %     |
| switching frequency                  |                                           |     | 570  |     | kHz   |

Note: 1. Maximum capacitive load is tested at minimum input voltage and full load.

## PROTECTIONS

| parameter                | conditions/description    | min | typ | max | units |
|--------------------------|---------------------------|-----|-----|-----|-------|
| short circuit protection | continuous, auto recovery |     |     |     |       |

## SAFETY AND COMPLIANCE

| parameter           | conditions/description                                              | min       | typ | max | units |
|---------------------|---------------------------------------------------------------------|-----------|-----|-----|-------|
| conducted emissions | EN55022, class A, class B (external circuit required, see Figure 2) |           |     |     |       |
| radiated emissions  | EN55022, class A, class B (external circuit required, see Figure 2) |           |     |     |       |
| MTBF                | as per MIL-HDBK-217F, full load, 25 °C                              | 4,185,000 |     |     | hours |
|                     | as per MIL-HDBK-217F, full load, 85 °C                              | 2,182,000 |     |     | hours |
| RoHS                | 2011/65/EU                                                          |           |     |     |       |

## ENVIRONMENTAL

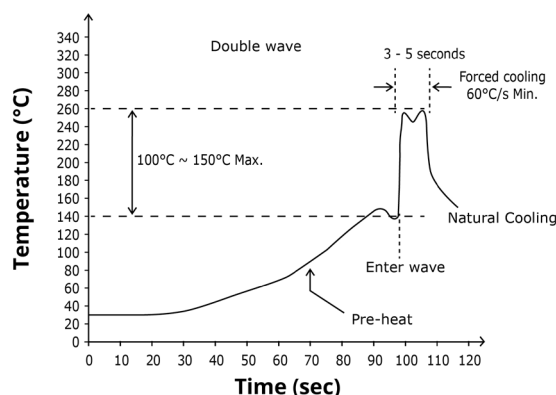
| parameter             | conditions/description               | min | typ | max | units |
|-----------------------|--------------------------------------|-----|-----|-----|-------|
| operating temperature | see derating curve                   | -40 |     | 85  | °C    |
| storage temperature   |                                      | -55 |     | 125 | °C    |
| vibration             | 10~55 Hz, 30 minutes along each axis |     | 2   |     | G     |

## SOLDERABILITY

| parameter      | conditions/description  | min | typ | max | units |
|----------------|-------------------------|-----|-----|-----|-------|
| wave soldering | see wave solder profile |     |     | 260 | °C    |

Note: 2. The wave solder profile is measured on lead temperature.  
3. Need to keep the solder parts internal temperature less than about 210°C.

### WAVE SOLDERING PROFILE (Lead-free)



## MECHANICAL

| parameter        | conditions/description                 | min | typ | max | units |
|------------------|----------------------------------------|-----|-----|-----|-------|
| dimensions       | 11.6 x 8.5 x 10.4                      |     |     |     | mm    |
| case material    | non-conductive black plastic (UL94V-0) |     |     |     |       |
| potting material | silicone (UL94V-0)                     |     |     |     |       |
| weight           |                                        |     | 2   |     | g     |

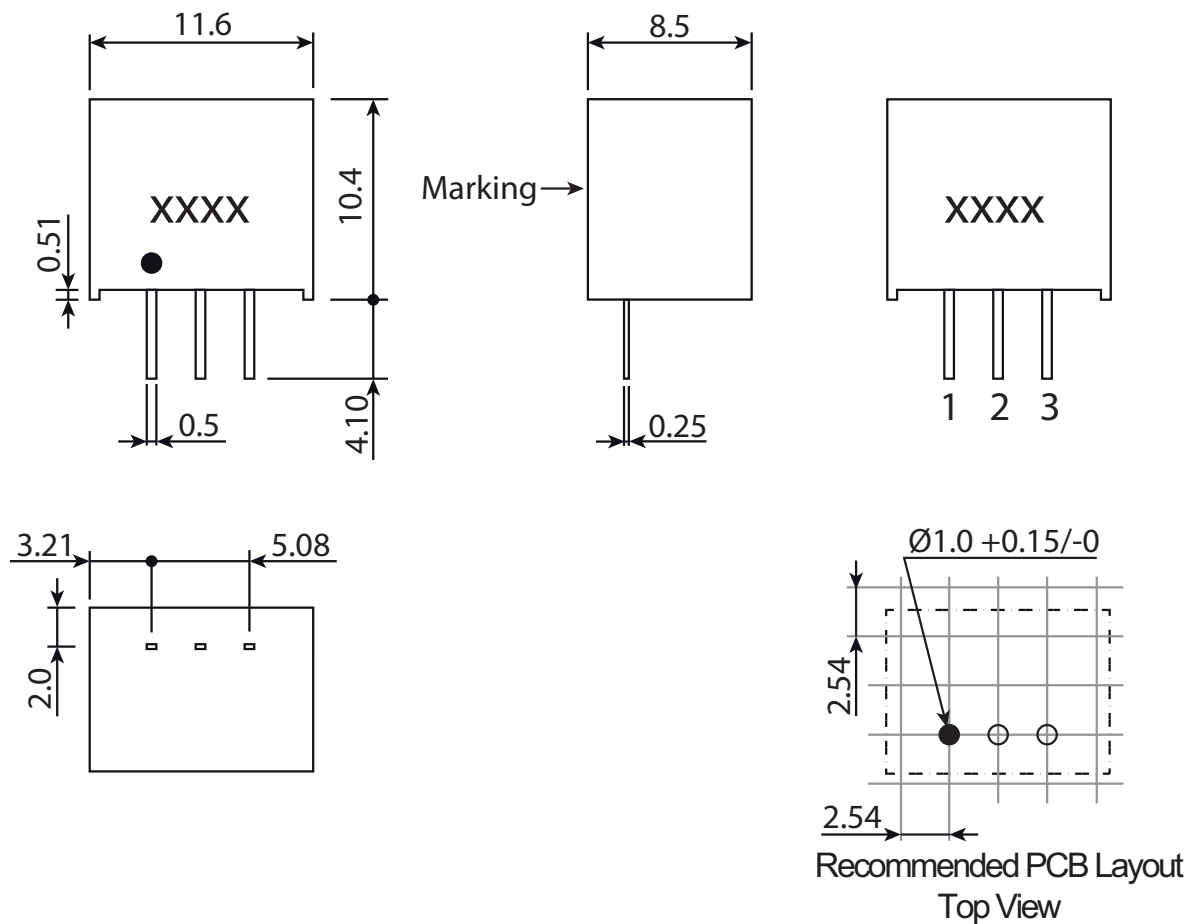
## MECHANICAL DRAWING

units: mm

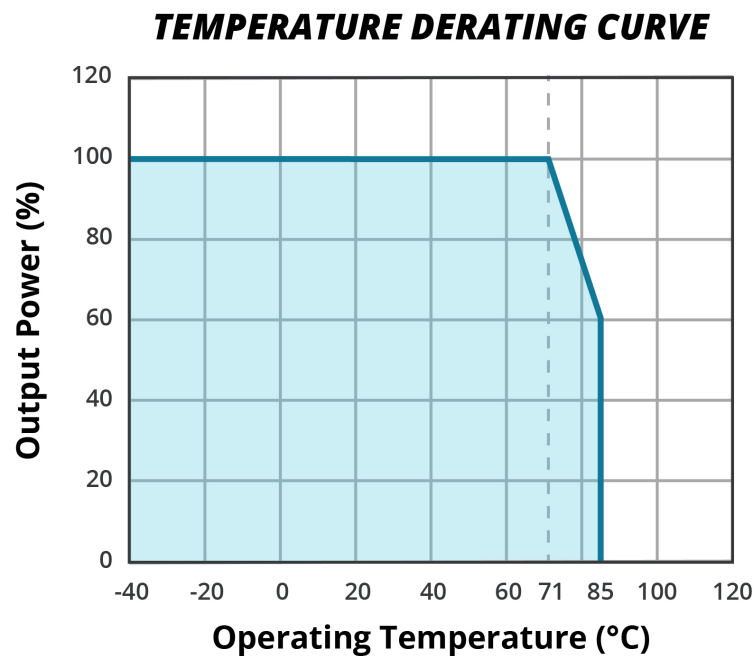
tolerance: XX.X=±0.50 mm

XX.XX=±0.25 mm

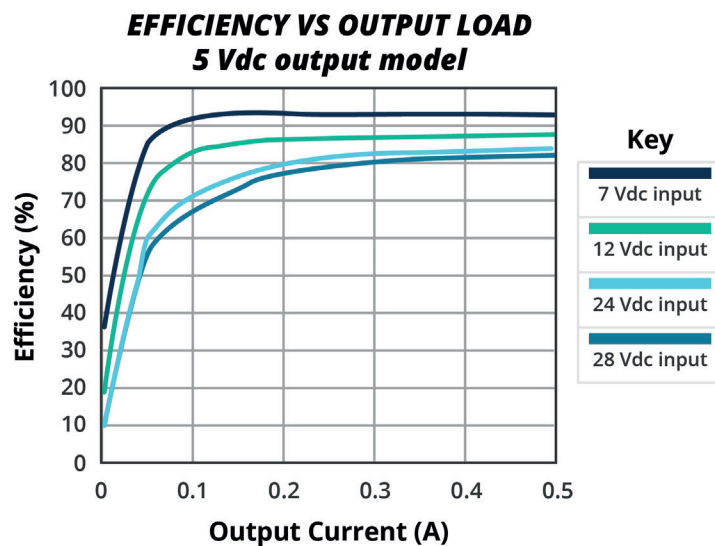
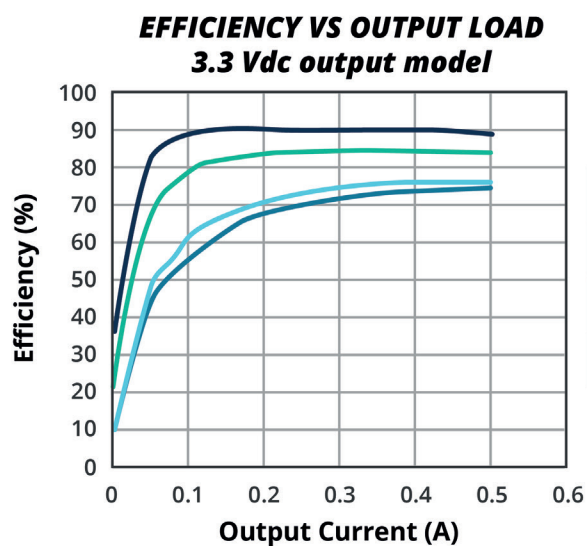
| PIN CONNECTIONS |          |
|-----------------|----------|
| PIN             | Function |
| 1               | +Vin     |
| 2               | GND      |
| 3               | +Vout    |



## DERATING CURVE



## EFFICIENCY CURVES



## APPLICATION CIRCUIT

Figure 1

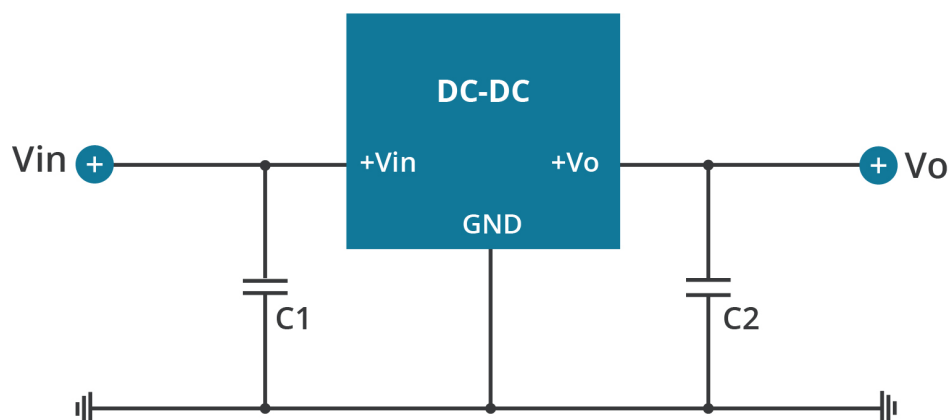


Table 1

| Optional External Components |                 |
|------------------------------|-----------------|
| C1                           | 10 $\mu$ F MLCC |
| C2                           | 10 $\mu$ F MLCC |

Notes: 1. The converter cannot be used as a positive to negative converter.

## EMC RECOMMENDED CIRCUIT

### EMC FILTERING

Figure 2

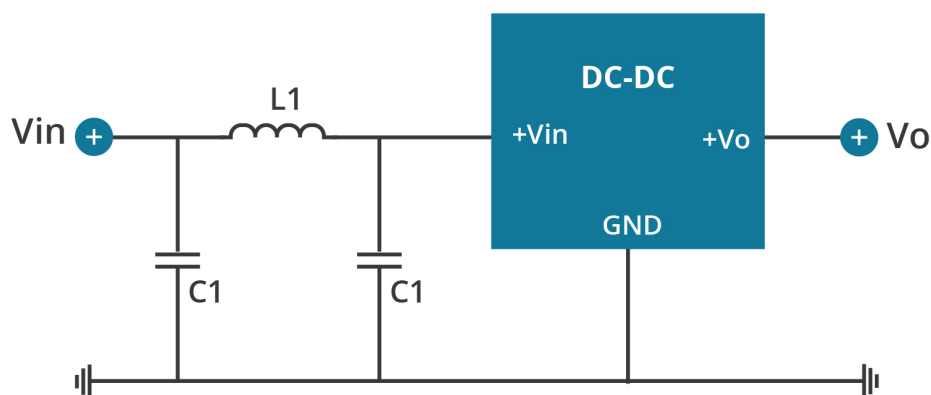


Table 2

| EN55022 Class A<br>Recommended External Circuit Components |             |    |
|------------------------------------------------------------|-------------|----|
| C1                                                         | L1          | C2 |
| 1206 4.7 $\mu$ F, 50V MLCC                                 | 3.3 $\mu$ H | NC |

Table 3

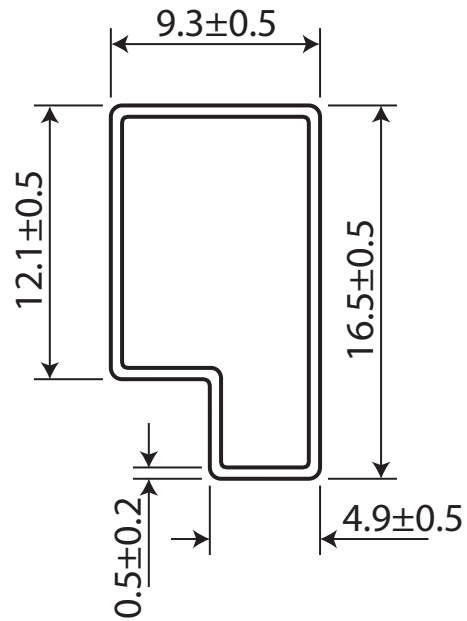
| EN55022 Class B<br>Recommended External Circuit Components |            |                            |
|------------------------------------------------------------|------------|----------------------------|
| C1                                                         | L1         | C2                         |
| 1210 10 $\mu$ F, 50V MLCC                                  | 10 $\mu$ H | 1206 4.7 $\mu$ F, 50V MLCC |

## PACKAGING

units: mm

Tube Size: 520 x 16.5 x 9.3 mm

QTY: 42 pcs



## REVISION HISTORY

| rev. | description                                                   | date       |
|------|---------------------------------------------------------------|------------|
| 1.0  | initial release                                               | 05/25/2016 |
| 1.01 | company logo updated                                          | 04/14/2021 |
| 1.02 | derating curve, efficiency curves and circuit figures updated | 09/20/2021 |

The revision history provided is for informational purposes only and is believed to be accurate.



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CUI offers a two (2) year limited warranty. Complete warranty information is listed on our website.

CUI reserves the right to make changes to the product at any time without notice. Information provided by CUI is believed to be accurate and reliable. However, no responsibility is assumed by CUI for its use, nor for any infringements of patents or other rights of third parties which may result from its use.

CUI products are not authorized or warranted for use as critical components in equipment that requires an extremely high level of reliability. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.