

**SERIES: VX78-1000 | DESCRIPTION: NON-ISOLATED DC SWITCHING REGULATOR**
**FEATURES**

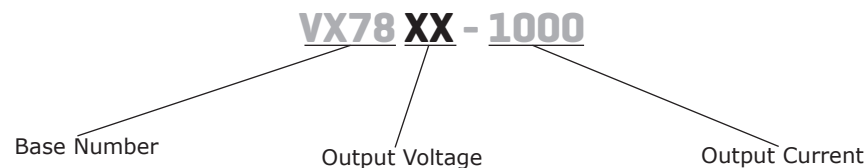
- wide input
- pin-out compatible with linear regulators
- encapsulated
- UL & CSA approved
- high efficiency up to 96%
- no-load input current as low as 0.2 mA
- wide operating temp: -40°C to +85°C
- supports negative output
- short circuit protection on the output


**MODEL**

|              | input voltage <sup>1</sup> |                | output voltage<br>(Vdc) | output current<br>max<br>(mA) | output power<br>max<br>(W) | ripple & noise <sup>2</sup><br>max<br>(mVp-p) | efficiency <sup>3</sup><br>typ<br>(%) |
|--------------|----------------------------|----------------|-------------------------|-------------------------------|----------------------------|-----------------------------------------------|---------------------------------------|
|              | typ<br>(Vdc)               | range<br>(Vdc) |                         |                               |                            |                                               |                                       |
| VX7803-1000  | 24                         | 6~36           | 3.3                     | 1000                          | 3.3                        | 75                                            | 90                                    |
| VX7805-1000  | 24                         | 8~36           | 5                       | 1000                          | 5                          | 75                                            | 93                                    |
|              | 12                         | 8~27           | -5                      | -500                          | 2.5                        | 75                                            | 86                                    |
| VX78039-1000 | 24                         | 13~36          | 9                       | 1000                          | 9                          | 75                                            | 95                                    |
| VX78012-1000 | 24                         | 16~36          | 12                      | 1000                          | 12                         | 75                                            | 96                                    |
|              | 12                         | 8~20           | -12                     | -300                          | 3.6                        | 75                                            | 89                                    |
| VX7815-1000  | 24                         | 20~36          | 15                      | 1000                          | 15                         | 75                                            | 96                                    |
|              | 12                         | 8~18           | -15                     | -300                          | 4.5                        | 75                                            | 89                                    |

Notes:

1. For input voltages higher than 30 Vdc, a 22  $\mu$ F / 50 V input capacitor is required.
2. Tested at nominal input, 20~100% load, 20 MHz bandwidth, with 10  $\mu$ F electrolytic and 1  $\mu$ F ceramic capacitor on the output. At loads below 20%, the max ripple and noise of the 3.3 & 5 Vdc outputs will be 100 mVp-p, and the other outputs will be 2% Vo.
3. Measured at min Vin, full load.
4. All specifications are measured at Ta=25°C, humidity < 75%, nominal input voltage, and rated output load unless otherwise specified.

**PART NUMBER KEY**


## INPUT

| parameter                            | conditions/description           | min | typ | max | units |
|--------------------------------------|----------------------------------|-----|-----|-----|-------|
| operating input voltage <sup>1</sup> | for positive output applications | 6   | 24  | 36  | Vdc   |
|                                      | for negative output applications | 8   | 12  | 27  | Vdc   |
| filter                               | capacitor filter                 |     |     |     |       |
| input reverse polarity protection    | no                               |     |     |     |       |
| no-load input current                | positive outputs                 |     | 0.1 | 1   | mA    |

Note: 1. See Model section on page 1 for specific input voltage ranges.

## OUTPUT

| parameter                            | conditions/description                         | min | typ  | max   | units |
|--------------------------------------|------------------------------------------------|-----|------|-------|-------|
| maximum capacitive load <sup>2</sup> | for positive output applications               |     |      | 680   | μF    |
|                                      | for negative output applications               |     |      | 330   | μF    |
| voltage accuracy                     | at full load, input voltage range              |     | ±2   | ±4    | %     |
|                                      | 3.3 Vdc output model                           |     | ±2   | ±3    | %     |
|                                      | all other models                               |     |      |       |       |
| line regulation                      | at full load, input voltage range              |     | ±0.2 | ±0.4  | %     |
| load regulation                      | at nominal input, 10~100% load                 |     | ±0.4 | ±0.6  | %     |
| switching frequency                  | at nominal input voltage, full load            |     |      |       |       |
|                                      | 3.3/5 Vdc output models                        | 420 | 520  | 620   | kHz   |
|                                      | all other models                               | 580 | 680  | 780   | kHz   |
| transient recovery time              | at nominal input voltage, 25% load step change |     | 0.1  | 1     | ms    |
| transient response deviation         | at nominal input voltage, 25% load step change |     | 50   | 300   | mV    |
| temperature coefficient              | at full load                                   |     |      | ±0.03 | %/°C  |

Note: 2. The maximum capacitive load was tested at nominal input voltage, full load.

## PROTECTIONS

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

## SAFETY AND COMPLIANCE

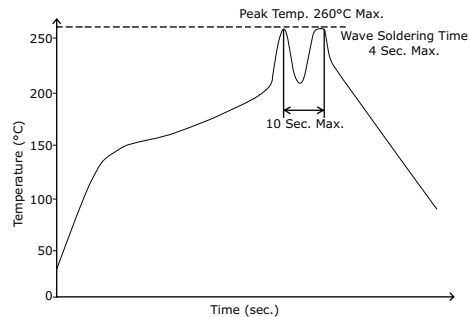
| parameter           | conditions/description                                                                | min       | typ | max | units |
|---------------------|---------------------------------------------------------------------------------------|-----------|-----|-----|-------|
| safety approvals    | UL 60950-1                                                                            |           |     |     |       |
| EMI/EMC             | EN 55032, EN 55024                                                                    |           |     |     |       |
| conducted emissions | CISPR22/EN55022, class B (external circuit required, see Figure 4-b)                  |           |     |     |       |
| radiated emissions  | CISPR22/EN55022, class B (external circuit required, see Figure 4-b)                  |           |     |     |       |
| ESD                 | IEC/EN61000-4-2, contact ± 4kV, class B                                               |           |     |     |       |
| radiated immunity   | IEC/EN61000-4-3, 10V/m, class A                                                       |           |     |     |       |
| EFT/burst           | IEC/EN61000-4-4, ± 1kV, class B (external circuit required, see Figure 4-a)           |           |     |     |       |
| surge               | IEC/EN61000-4-5, line-line ± 1kV, class B (external circuit required, see Figure 4-a) |           |     |     |       |
| conducted immunity  | IEC/EN61000-4-6, 3 Vr.m.s, class A                                                    |           |     |     |       |
| MTBF                | as per MIL-HDBK-217F, 25°C                                                            | 2,000,000 |     |     | 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    |
| storage humidity      | non-condensing         | 5   |     | 95  | %     |

## SOLDERABILITY

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



## MECHANICAL

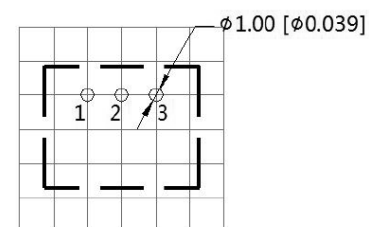
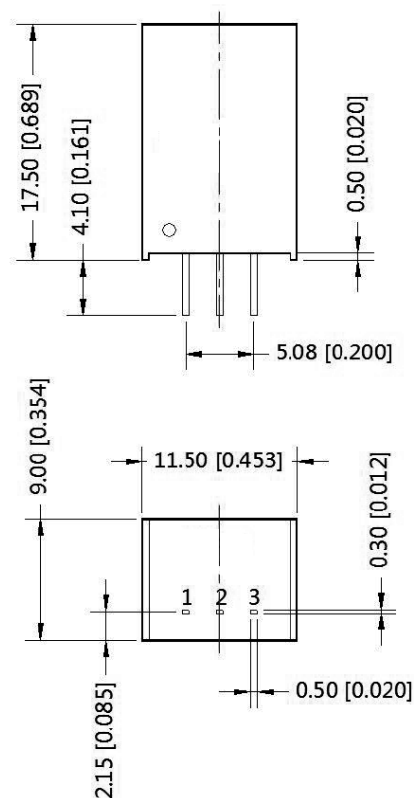
| parameter     | conditions/description                             | min | typ | max | units |
|---------------|----------------------------------------------------|-----|-----|-----|-------|
| dimensions    | 11.50 x 9.00 x 17.50 [0.453 x 0.354 x 0.689 inch]  |     |     |     | mm    |
| case material | black flame-retardant heat-proof plastic (UL94V-0) |     |     |     |       |
| weight        |                                                    |     | 3.8 |     | g     |

## MECHANICAL DRAWING

units: mm [inch]

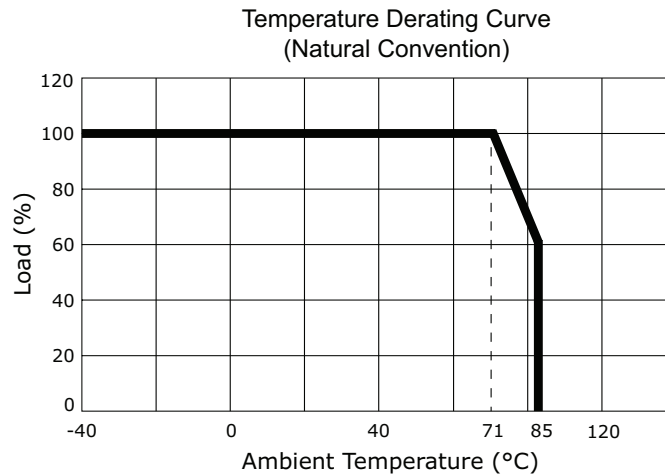
tolerance:  $\pm 0.25$  [ $\pm 0.010$ ]pin diameter tolerance:  $\pm 0.10$  [ $\pm 0.004$ ]

| PIN CONNECTIONS |         |         |
|-----------------|---------|---------|
| PIN             | +OUTPUT | -OUTPUT |
| 1               | +VIN    | +VIN    |
| 2               | GND     | -VOUT   |
| 3               | +VOUT   | GND     |



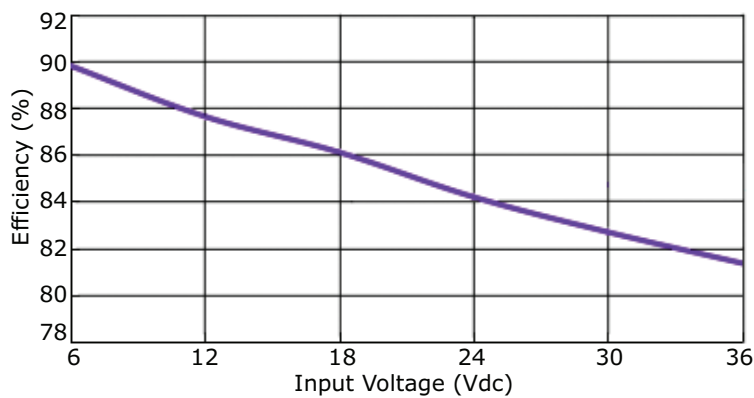
Note : Grid 2.54\*2.54mm  
Recommended PCB Layout  
Top View

## DERATING CURVE

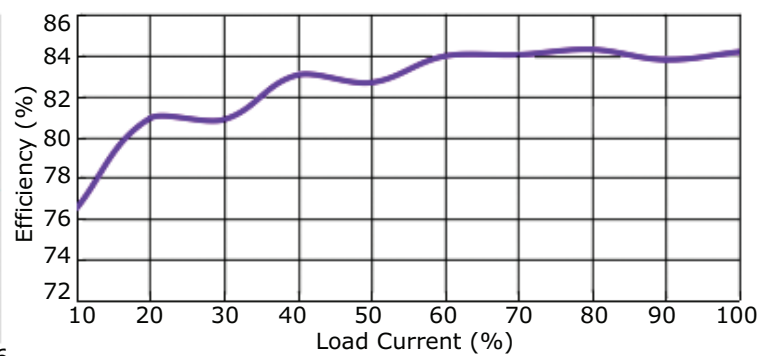


## EFFICIENCY CURVES

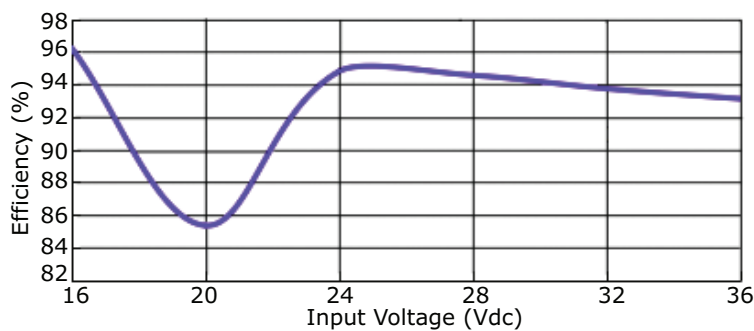
VX7803-1000 Efficiency Curve  
Positive Output, Efficiency vs. Input Voltage  
(at full load)



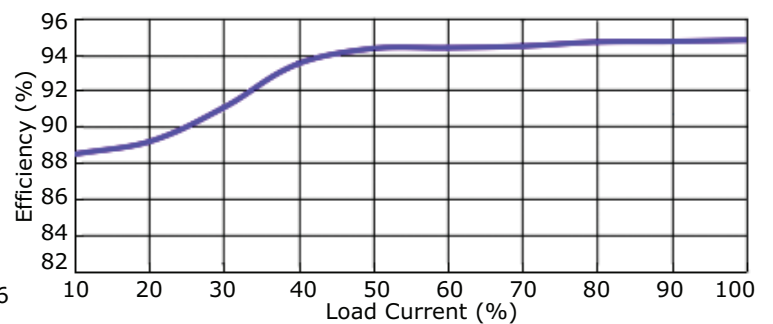
VX7803-1000 Efficiency Curve  
Positive Output, Efficiency vs. Load Current  
(at Vin nominal)



VX78012-1000 Efficiency Curve  
Positive Output, Efficiency vs. Input Voltage  
(at full load)

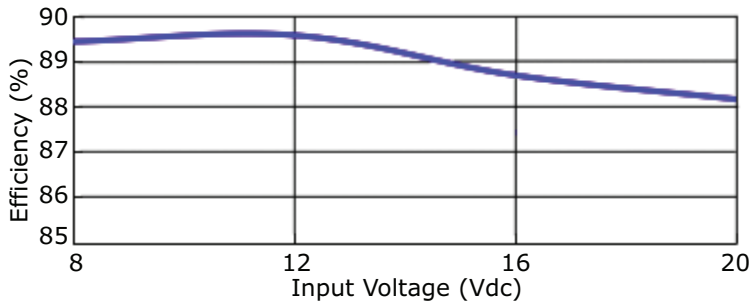


VX78012-1000 Efficiency Curve  
Positive Output, Efficiency vs. Load Current  
(at Vin nominal)

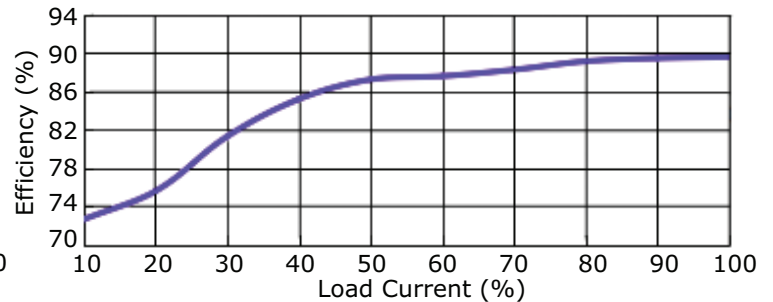


## EFFICIENCY CURVES (CONTINUED)

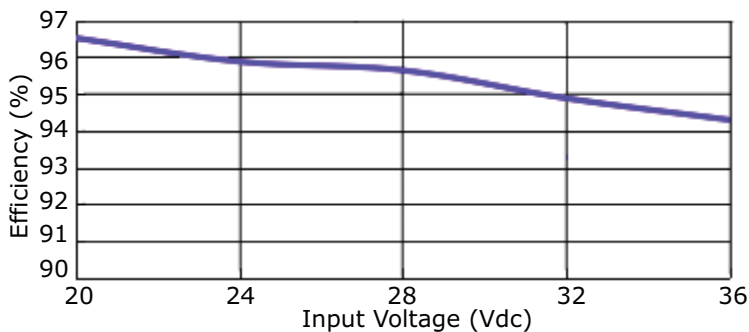
VX78012-1000 Efficiency Curve  
Negative Output, Efficiency vs. Input Voltage  
(at full load)



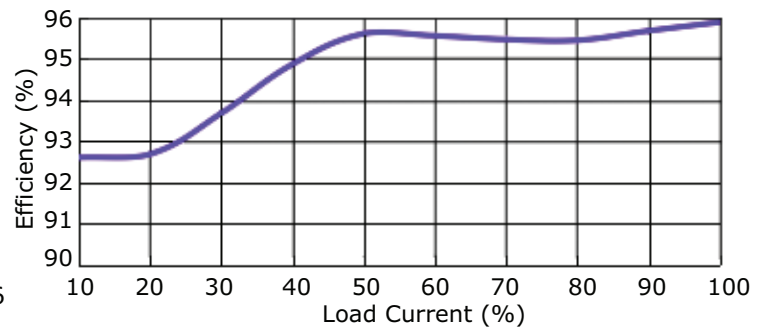
VX78012-1000 Efficiency Curve  
Negative Output, Efficiency vs. Load Current  
(at Vin nominal)



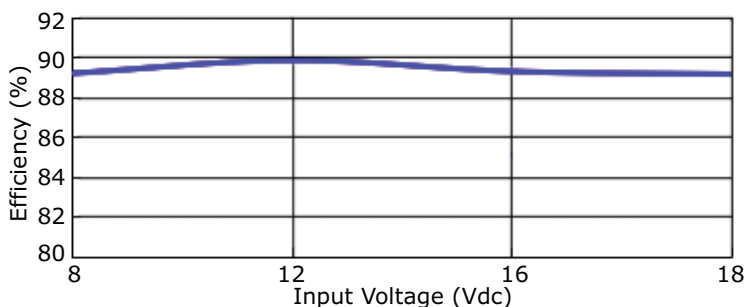
VX7815-1000 Efficiency Curve  
Positive Output, Efficiency vs. Input Voltage  
(at full load)



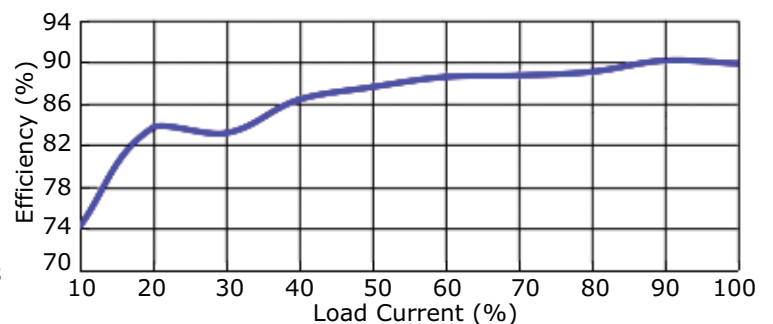
VX7815-1000 Efficiency Curve  
Positive Output, Efficiency vs. Load Current  
(at Vin nominal)



VX7815-1000 Efficiency Curve  
Negative Output, Efficiency vs. Input Voltage  
(at full load)



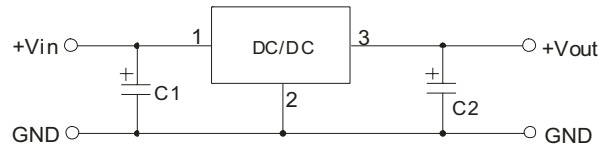
VX7815-1000 Efficiency Curve  
Negative Output, Efficiency vs. Load Current  
(at Vin nominal)



## TYPICAL APPLICATION CIRCUIT

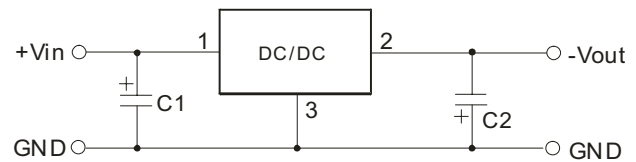
**Figure 1**

Positive Output Application Circuit



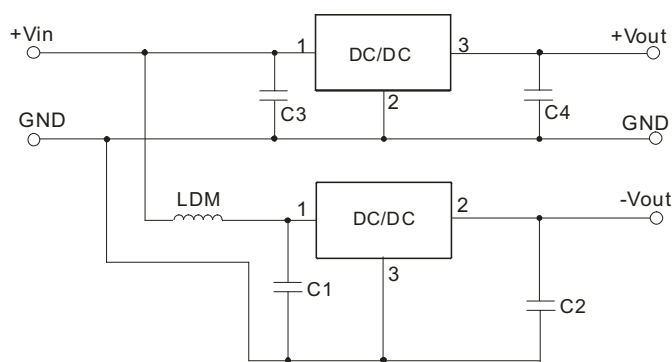
**Figure 2**

Negative Output Application Circuit



**Figure 3**

Positive and Negative Output Paralleling Application Circuit



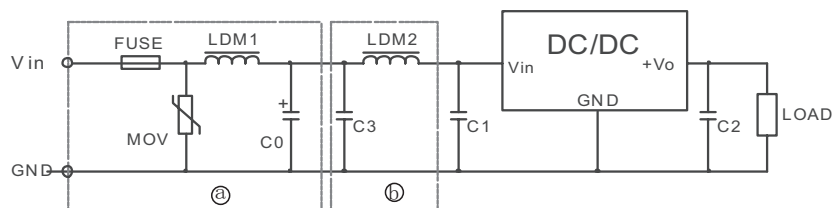
**Table 1**

External Capacitor Table

| Model Number | C1, C3<br>(ceramic capacitor) | C2, C4<br>(ceramic capacitor) |
|--------------|-------------------------------|-------------------------------|
| VX7803-1000  | 10 $\mu$ F/50 V               | 22 $\mu$ F/10 V               |
| VX7805-1000  | 10 $\mu$ F/50 V               | 22 $\mu$ F/10 V               |
| VX78039-1000 | 10 $\mu$ F/50 V               | 22 $\mu$ F/16 V               |
| VX78012-1000 | 10 $\mu$ F/50 V               | 22 $\mu$ F/25 V               |
| VX7815-1000  | 10 $\mu$ F/50 V               | 22 $\mu$ F/25 V               |

## EMC RECOMMENDED CIRCUIT

**Figure 4**



**Table 2**

| Recommended external circuit components |                                          |
|-----------------------------------------|------------------------------------------|
| FUSE                                    | choose according to actual input current |
| MOV                                     | S20K30                                   |
| LDM1                                    | 82 $\mu$ H                               |
| C0                                      | 680 $\mu$ F/50 V                         |
| C1, C2                                  | see Table 1                              |
| C3                                      | 4.7 $\mu$ F/50 V                         |
| LDM2                                    | 12 $\mu$ H                               |

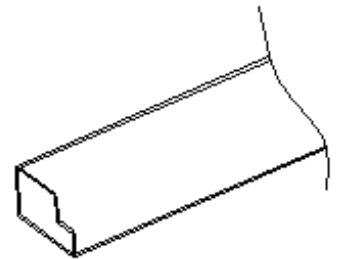
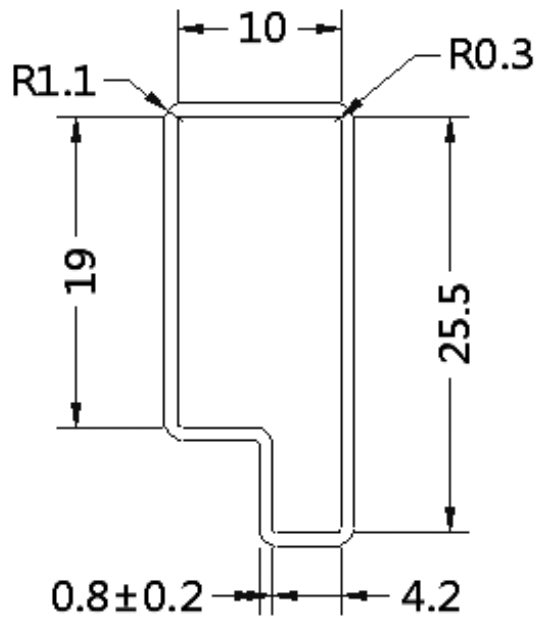
- Note:
1. C1 & C2 (C3 & C4) are required and should be connected as close to the module pins as possible.
  2. To reduce the output ripple further, C2 & C4 can be increased as needed and the use of tantalum or low ESR electrolytic capacitors would be recommended.
  3. When using application circuit in Figure 3, a 10  $\mu$ H LDM component is recommended to reduce the interference.

## PACKAGING

units: mm

Tube Size: 11.6 x 27.1 x 530 mm

QTY: 44 pcs



## REVISION HISTORY

| rev. | description     | date       |
|------|-----------------|------------|
| 1.0  | initial release | 05/18/2017 |

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



**CUI INC<sup>®</sup>**

**Headquarters**  
20050 SW 112th Ave.  
Tualatin, OR 97062  
**800.275.4899**

Fax 503.612.2383  
**cui.com**  
techsupport@cui.com

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.