

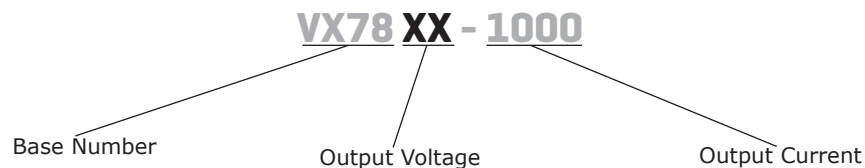
**SERIES: VX78-1000 | DESCRIPTION: NON-ISOLATED DC SWITCHING REGULATOR**
**FEATURES**

- 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**

| 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

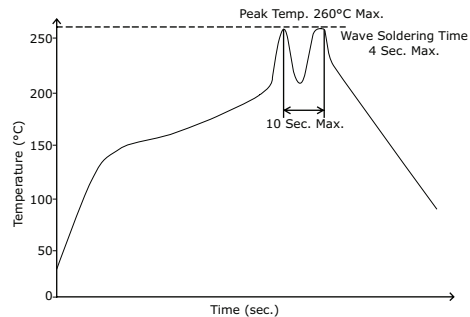
| parameter           | conditions/description                                                                | min       | typ | max | units |
|---------------------|---------------------------------------------------------------------------------------|-----------|-----|-----|-------|
| safety approvals    | 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

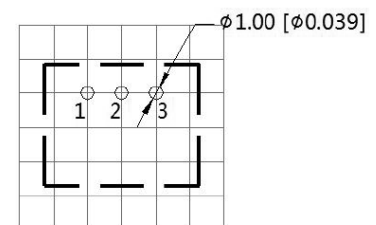
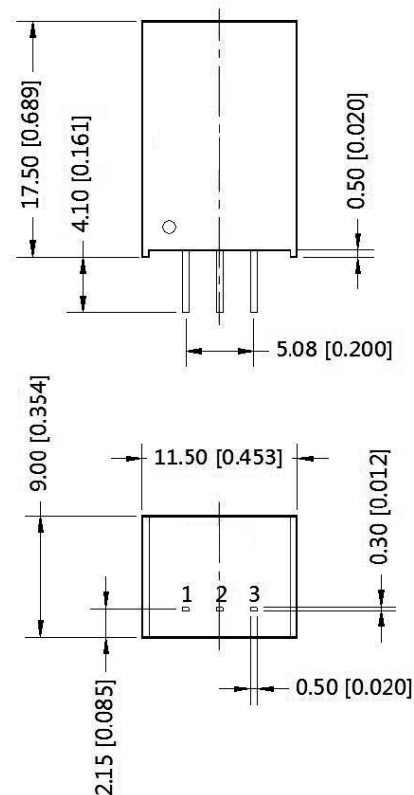
| parameter     | conditions/description                             | min | typ | max | units |
|---------------|----------------------------------------------------|-----|-----|-----|-------|
| dimensions    | 11.50 x 9.00 x 17.50 [0.453 x 0.354 x 0.689 inch]  |     |     |     | mm    |
| case material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

## MECHANICAL DRAWING

units: mm [inch]

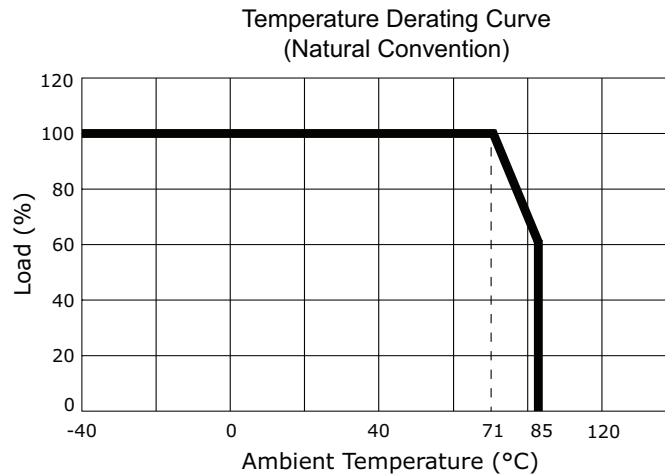
tolerance:  $\pm 0.25$  [ $\pm 0.010$ ]pin diameter tolerance:  $\pm 0.10$  [ $\pm 0.004$ ]

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



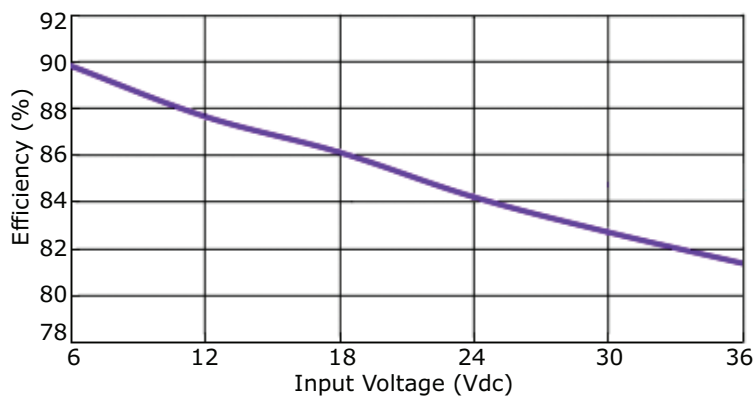
Note : Grid 2.54\*2.54mm  
Recommended PCB Layout  
Top View

## DERATING CURVE

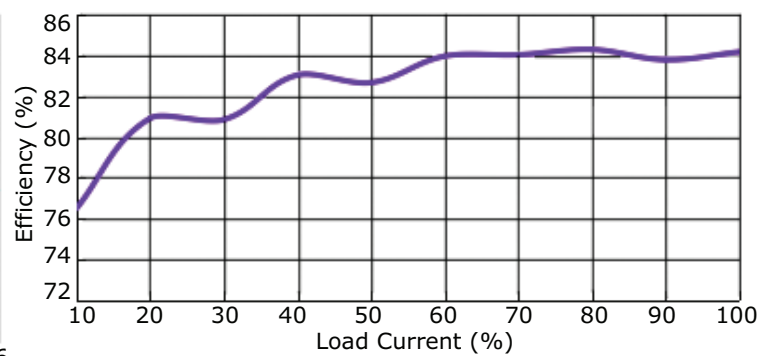


## EFFICIENCY CURVES

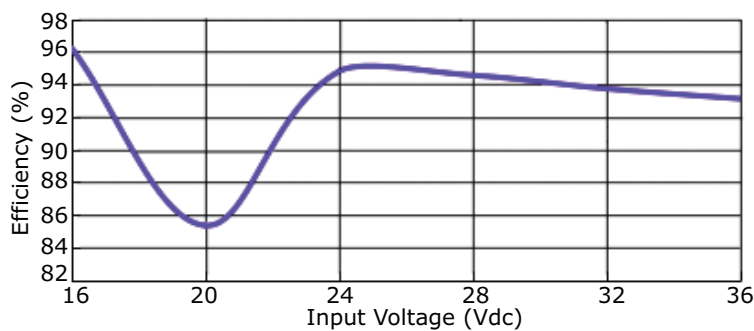
VX7803-1000 Efficiency Curve  
Positive Output, Efficiency vs. Input Voltage  
(at full load)



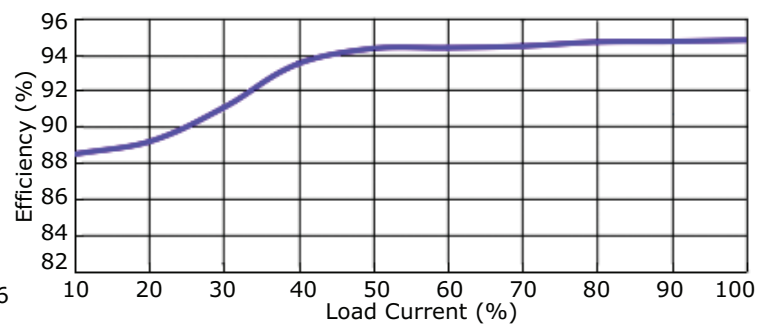
VX7803-1000 Efficiency Curve  
Positive Output, Efficiency vs. Load Current  
(at Vin nominal)



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

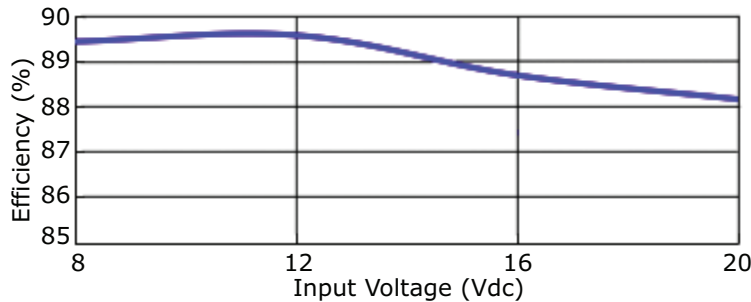


VX78012-1000 Efficiency Curve  
Positive Output, Efficiency vs. Load Current  
(at Vin nominal)

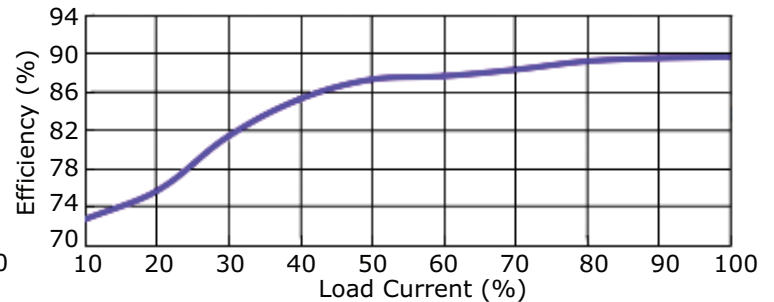


## EFFICIENCY CURVES (CONTINUED)

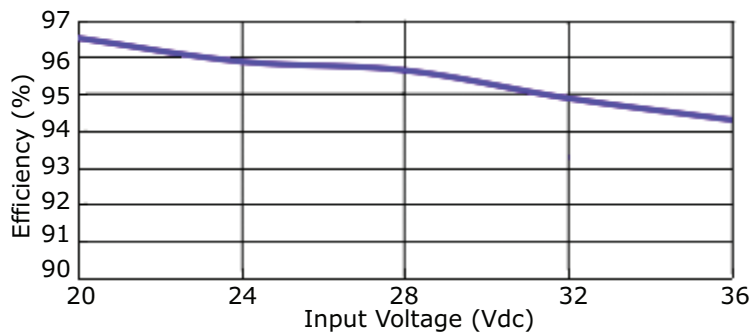
VX78012-1000 Efficiency Curve  
Negative Output, Efficiency vs. Input Voltage  
(at full load)



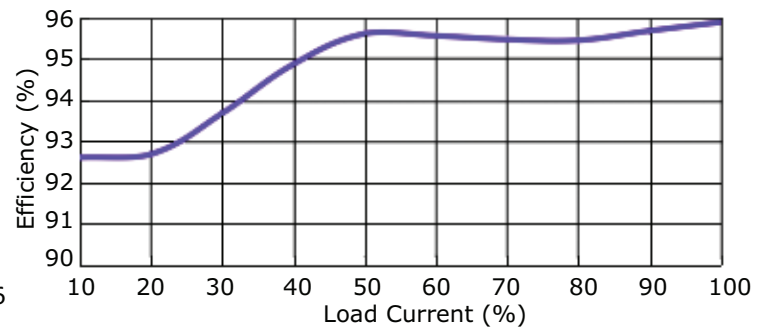
VX78012-1000 Efficiency Curve  
Negative Output, Efficiency vs. Load Current  
(at Vin nominal)



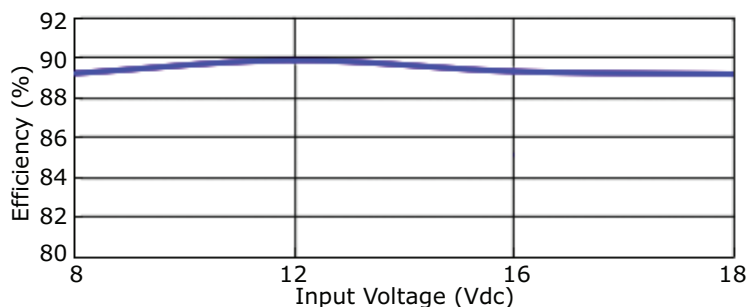
VX7815-1000 Efficiency Curve  
Positive Output, Efficiency vs. Input Voltage  
(at full load)



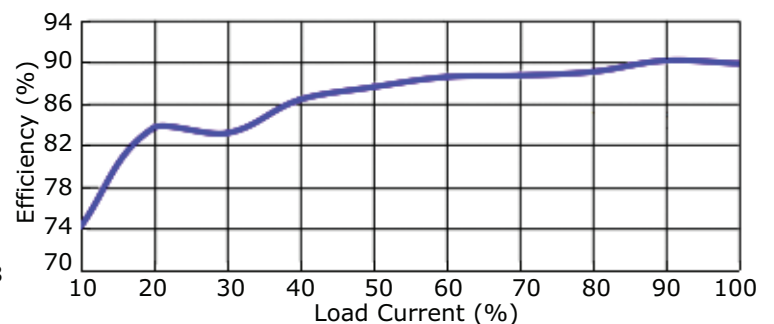
VX7815-1000 Efficiency Curve  
Positive Output, Efficiency vs. Load Current  
(at Vin nominal)



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



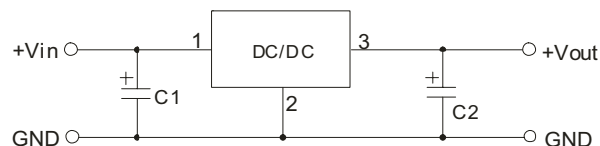
VX7815-1000 Efficiency Curve  
Negative Output, Efficiency vs. Load Current  
(at Vin nominal)



## TYPICAL APPLICATION CIRCUIT

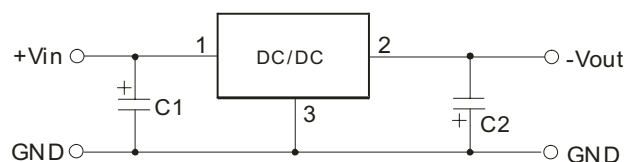
**Figure 1**

Positive Output Application Circuit



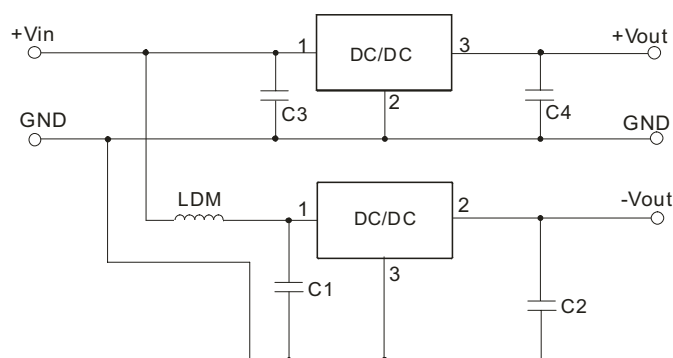
**Figure 2**

Negative Output Application Circuit



**Figure 3**

Positive and Negative Output Paralleling Application Circuit



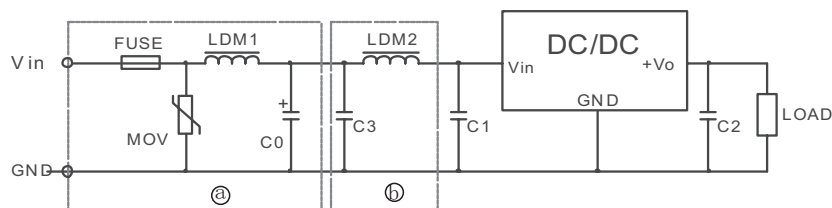
**Table 1**

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:

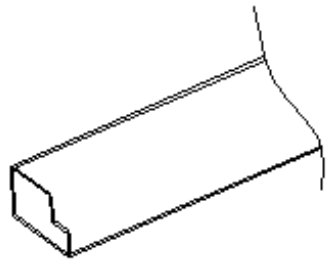
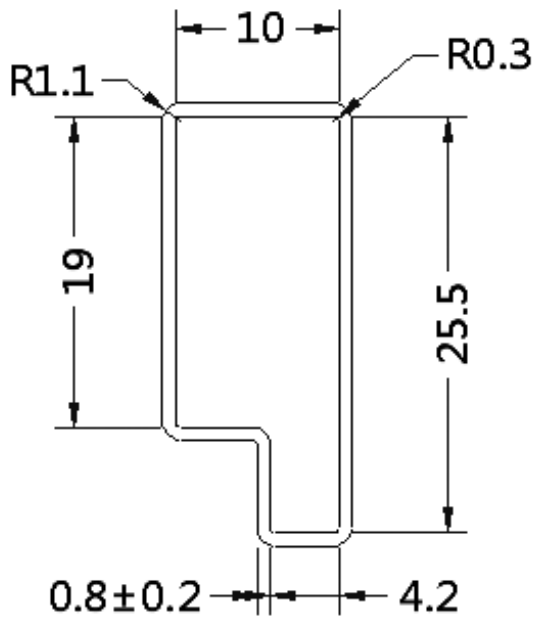
1. C1 & C2 (C3 & C4) are required and should be connected as close to the module pins as possible.
2. To reduce the output ripple further, C2 & C4 can be increased as needed and the use of tantalum or low ESR electrolytic capacitors would be recommended.
3. When using application circuit in Figure 3, 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.



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