



## SERIES: VQB100R | DESCRIPTION: DC-DC CONVERTER

### FEATURES

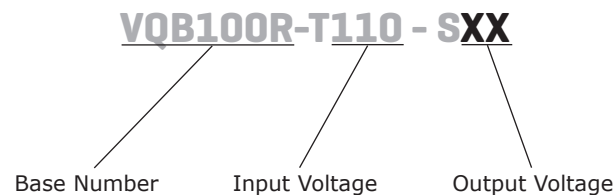
- up to 100 W isolated output
- industry standard quarter brick package
- 3:1 input range (66~160 Vdc)
- single output from 5~24 Vdc
- 2,250 Vdc isolation
- over current, over temperature, over voltage, and short circuit protections
- remote on/off
- efficiency up to 92%



| MODEL            | input<br>voltage<br>range<br>(Vdc) | output<br>voltage<br>(Vdc) | output<br>current<br>max<br>(A) | output<br>power<br>max<br>(W) | ripple<br>and noise <sup>1</sup><br>max<br>(mVp-p) | efficiency<br>typ<br>(%) |
|------------------|------------------------------------|----------------------------|---------------------------------|-------------------------------|----------------------------------------------------|--------------------------|
| VQB100R-T110-S5  | 66 ~ 160                           | 5                          | 20                              | 100                           | 100                                                | 90                       |
| VQB100R-T110-S12 | 66 ~ 160                           | 12                         | 8.4                             | 100                           | 150                                                | 92                       |
| VQB100R-T110-S24 | 66 ~ 160                           | 24                         | 4.2                             | 100                           | 240                                                | 91                       |

Notes: 1. ripple and noise are measured at 20 MHz BW with 10μF tantalum capacitor and 1μF ceramic capacitor across output  
2. an external input capacitor of 120 μF is recommended to reduce the input ripple voltage.

### PART NUMBER KEY



## INPUT

| parameter               | conditions/description                 | min | typ | max | units |
|-------------------------|----------------------------------------|-----|-----|-----|-------|
| operating input voltage |                                        | 66  | 110 | 160 | Vdc   |
| input surge voltage     | 100 ms max.                            |     |     | 180 | Vdc   |
| under voltage lockout   | power up                               |     | 62  |     | Vdc   |
|                         | power down                             |     | 56  |     | Vdc   |
| start-up time           |                                        |     | 45  |     | ms    |
| filter                  | PI type                                |     |     |     |       |
| on/off <sup>1</sup>     | models ON (open circuit or 3.5~75 Vdc) |     |     |     |       |
|                         | models OFF (0~1.8 Vdc)                 |     |     |     |       |

Notes: 1. logic compatibility, open collector reference to -input.

## OUTPUT

| parameter               | conditions/description               | min                        | typ   | max    | units  |
|-------------------------|--------------------------------------|----------------------------|-------|--------|--------|
| output capacitance      | 5 Vdc output model                   |                            |       | 10,000 | μF     |
|                         | 12 Vdc output model                  |                            |       | 8,800  | μF     |
|                         | 24 Vdc output model                  |                            |       | 1,500  | μF     |
| line regulation         | measured from high line to low line  |                            |       | ±0.2   | %      |
| load regulation         | measured from full load to zero load |                            |       | ±0.2   | %      |
| voltage accuracy        |                                      |                            |       | ±1.5   | %      |
| adjustability           | see application notes                |                            | ±10   |        | %      |
| switching frequency     | 100% load, input voltage range       |                            | 200   |        | kHz    |
| transient response      | 25% step load change                 | error band<br>recover time |       | ±5     | % Vout |
|                         |                                      |                            |       | 200    | μs     |
| temperature coefficient |                                      |                            | ±0.03 |        | %/°C   |

## PROTECTIONS

| parameter                   | conditions/description   | min | typ | max | units |
|-----------------------------|--------------------------|-----|-----|-----|-------|
| over voltage protection     | %Vo                      | 115 |     | 140 | %     |
| over current protection     | % nominal output current | 110 |     | 180 | %     |
| short circuit protection    | continuous               |     |     |     |       |
| over temperature protection |                          |     | 105 |     | °C    |

## SAFETY AND COMPLIANCE

| parameter             | conditions/description                                          | min   | typ   | max | units |
|-----------------------|-----------------------------------------------------------------|-------|-------|-----|-------|
| isolation voltage     | input to output                                                 | 2,250 |       |     | Vdc   |
|                       | input to case                                                   | 2,250 |       |     | Vdc   |
|                       | output to case                                                  | 1,500 |       |     | Vdc   |
| isolation resistance  |                                                                 | 10    |       |     | MΩ    |
| isolation capacitance |                                                                 |       | 1,000 |     | pF    |
| safety approvals      | UL 60950-1                                                      |       |       |     |       |
| EMC                   | EN50155 (EN50121-3-2) (external circuit required, see Figure 1) |       |       |     |       |
| EMI                   | EN55011 Class A                                                 |       |       |     |       |
| ESD                   | EN61000-4-2 Air ±8 kV Class B                                   |       |       |     |       |
|                       | EN61000-4-2 Contactr ±6 kV Class A                              |       |       |     |       |
| radiated immunity     | EN61000-4-3 10 V/m Class A                                      |       |       |     |       |
| EFT/burst             | EN61000-4-4 ±2 kV Class A                                       |       |       |     |       |
| surge                 | EN61000-4-5 ±1 kV Class B                                       |       |       |     |       |
| conducted immunity    | EN61000-4-6 10 Vr.m.s Class A                                   |       |       |     |       |
| RoHS                  | 2011/65/EU                                                      |       |       |     |       |

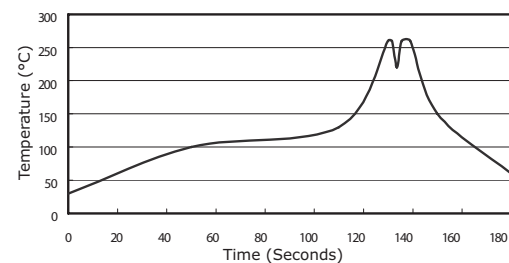
## ENVIRONMENTAL

| parameter                  | conditions/description                           | min | typ | max | units |
|----------------------------|--------------------------------------------------|-----|-----|-----|-------|
| operating case temperature |                                                  | -40 |     | 100 | °C    |
| storage temperature        |                                                  | -55 |     | 105 | °C    |
| humidity                   | non-condensing                                   |     |     | 95  | %     |
| shock/vibration            | EN50155 (EN61373)                                |     |     |     |       |
| enviromental               | EN50155 (EN60068-2-1, EN60068-2-2, EN60068-2-30) |     |     |     |       |

## SOLDERABILITY

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

- Notes:
1. Soldering materials: Sn/Cu/Ni
  2. Ramp up rate during preheat: 1.4°C/s (from 50°C to 100°C)
  3. Soaking temperature: 0.5°C/s (from 100°C to 130°C), 60±20 seconds
  4. Peak temperature: 260°C, above 250°C for 3~6 seconds
  5. Ramp down rate during cooling: -10°C/s (from 260°C to 150°C)



## MECHANICAL

| parameter     | conditions/description                    | min | typ  | max | units |
|---------------|-------------------------------------------|-----|------|-----|-------|
| dimensions    | 2.28 x 1.45 x 0.5 (57.9 x 36.8 x 12.7 mm) |     |      |     | inch  |
| case material | aluminum baseplate with plastic case      |     |      |     |       |
| weight        |                                           |     | 61.5 |     | g     |

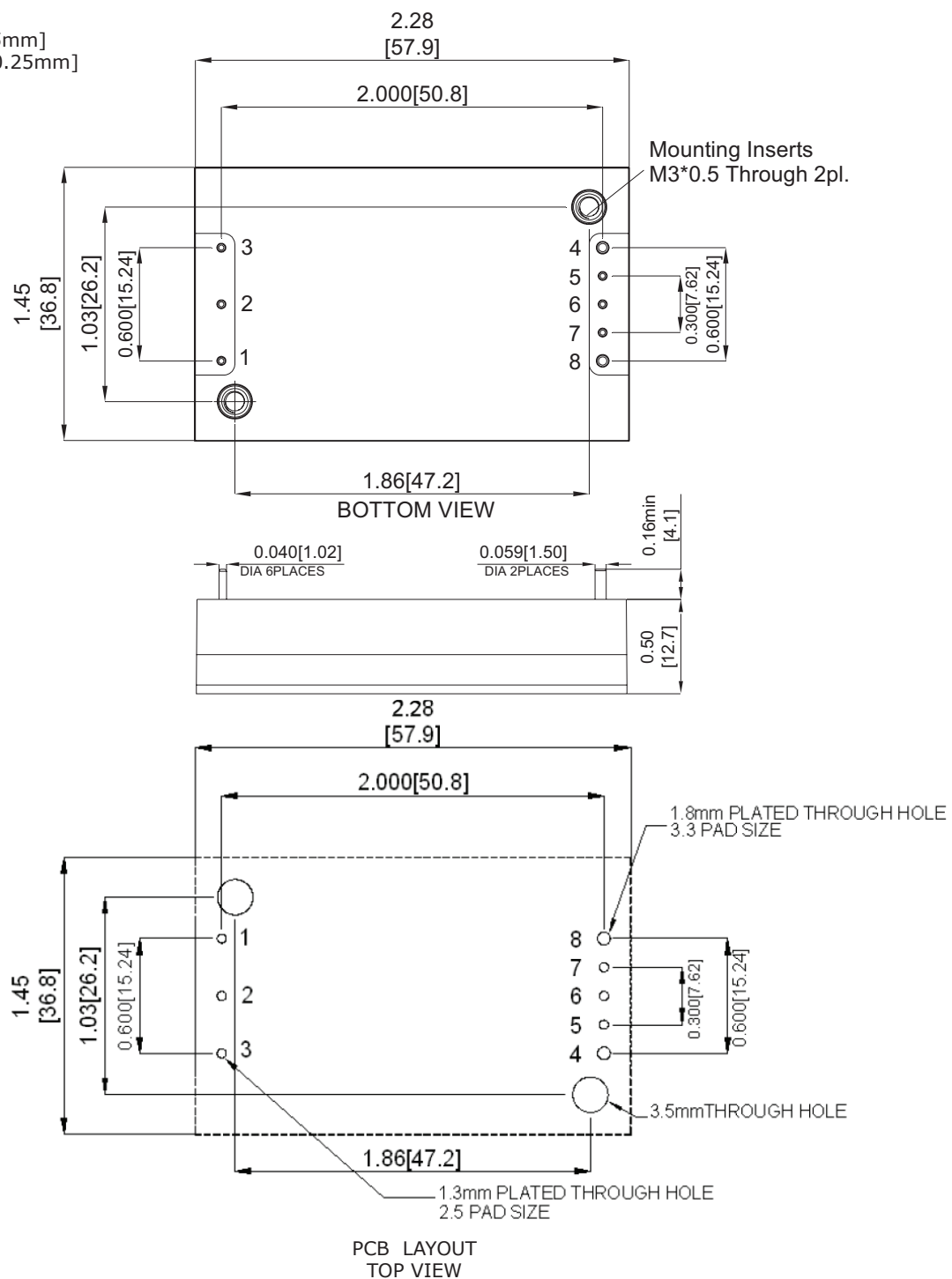
## MECHANICAL DRAWING

units: inches [mm]

tolerance: x.xx ± 0.02" [±0.5mm]

x.xxx ± 0.010" [±0.25mm]

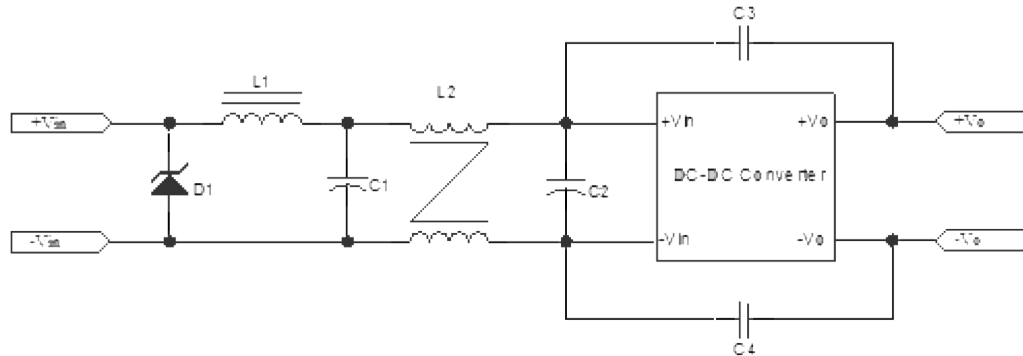
| PIN CONNECTIONS |          |
|-----------------|----------|
| PIN             | FUNCTION |
| 1               | +Vin     |
| 2               | On/Off   |
| 3               | -Vin     |
| 4               | -Vo      |
| 5               | -S       |
| 6               | TRIM     |
| 7               | +S       |
| 8               | +Vo      |



## EMC RECOMMENDED CIRCUITS

### EN50155 [EN50121-3-2] [EN55011 Class A]

**Figure 1**  
**Recommended Circuit for EN50155 (EN50121-3-2) (EN55011 Class A)**



**Table 1**

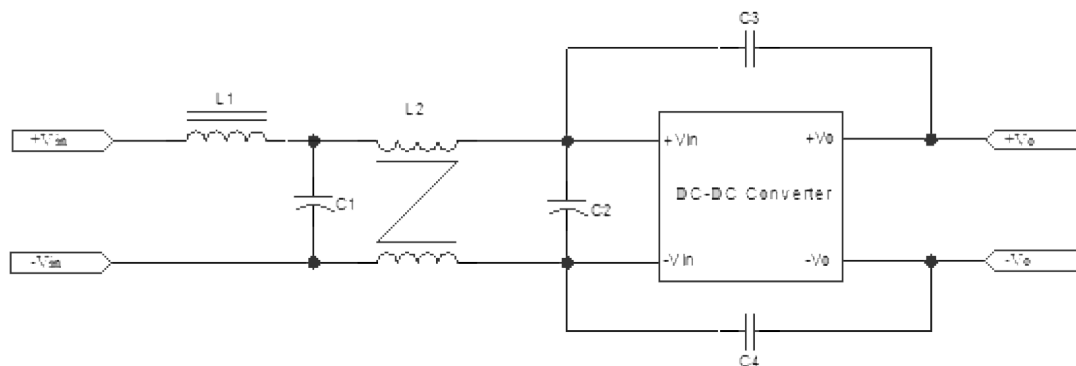
Recommended External Circuit Components

| Model            | D1                      | C1                | C2                | C3      | C4      | L1        | L2      |
|------------------|-------------------------|-------------------|-------------------|---------|---------|-----------|---------|
| VQB100R-T110-S5  | 1.5KE180A<br>Littelfuse | 220uF/200V<br>YXF | 220uF/200V<br>YXF | 2200 pF | 2200 pF | 5 $\mu$ H | 0.33 mH |
| VQB100R-T110-S12 | 1.5KE180A<br>Littelfuse | 220uF/200V<br>YXF | 220uF/200V<br>YXF | 2200 pF | 2200 pF | 5 $\mu$ H | 0.33 mH |
| VQB100R-T110-S24 | 1.5KE180A<br>Littelfuse | 220uF/200V<br>YXF | 220uF/200V<br>YXF | 2200 pF | 2200 pF | 5 $\mu$ H | 0.33 mH |

Note: C1, C2 Aluminum Capacitors and C3, C4 Ceramic Capacitors

### EN55022 Class B

**Figure 2**  
**Recommended Circuit for EN55022 Class B**



**Table 2**

Recommended External Circuit Components

| Model            | C1                       | C2                       | C3      | C4      | L1        | L2      |
|------------------|--------------------------|--------------------------|---------|---------|-----------|---------|
| VQB100R-T110-S5  | 220 $\mu$ F/200 V<br>YXF | 220 $\mu$ F/200 V<br>YXF | 2200 pF | 2200 pF | 5 $\mu$ H | 0.33 mH |
| VQB100R-T110-S12 | 220 $\mu$ F/200 V<br>YXF | 220 $\mu$ F/200 V<br>YXF | 2200 pF | 2200 pF | 5 $\mu$ H | 0.33 mH |
| VQB100R-T110-S24 | 220 $\mu$ F/200 V<br>YXF | 220 $\mu$ F/200 V<br>YXF | 2200 pF | 2200 pF | 5 $\mu$ H | 0.33 mH |

Note: C1, C2 Aluminum Capacitors and C3, C4 Ceramic Capacitors

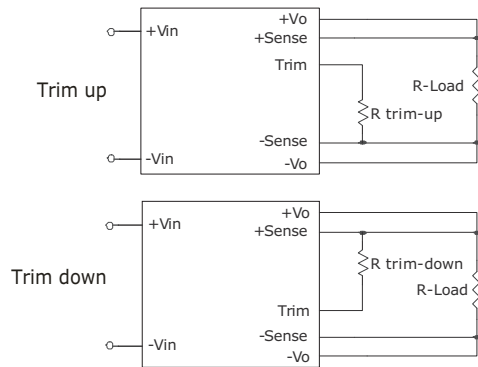
## APPLICATION NOTES

### 1. Output Voltage Trimming

Leave open if not used.

**Figure 3**

Application Circuit for Trim pin



### Formula for Trim Resistor

$$R_{trim - up} = \left( \frac{R_1(V_r - V_f(\frac{R_2}{R_2 + R_3}))}{V_o - V_{o, nom}} \right) - \frac{R_2 R_3}{R_2 + R_3} (k\Omega)$$

$$R_{trim - down} = \frac{R_1(V_o - V_r)}{V_{o, nom} - V_o} - R_2 (k\Omega)$$

Note:  $R_{trim-up}$  is the external resistor in  $k\Omega$   
 $R_{trim-down}$  is the external resistor in  $k\Omega$   
 $V_{o, nom}$  is the nominal output voltage  
 $V_o$  is the desired output voltage  
 $R_1, R_2, R_3,$  and  $V_r$  are internal (see Table 3).

**Table 3**

| Vout (Vdc) | R1 (kΩ) | R2 (kΩ) | R3 (kΩ) | Vr (V) | Vf (V) |
|------------|---------|---------|---------|--------|--------|
| 5          | 2.32    | 3.3     | 0       | 2.5    | 0      |
| 12         | 9.1     | 51      | 5.1     | 2.5    | 0.46   |
| 24         | 20      | 100     | 7.5     | 2.5    | 0.46   |

## REVISION HISTORY

| rev. | description                             | date       |
|------|-----------------------------------------|------------|
| 1.0  | initial release                         | 06/20/2012 |
| 1.01 | misc. updates, added product photo      | 11/13/2012 |
| 1.02 | updated input voltage range and drawing | 01/29/2013 |
| 1.03 | updated spec                            | 03/18/2013 |
| 1.04 | updated features section                | 05/30/2013 |
| 1.05 | added EMC recommendations               | 06/18/2015 |

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



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

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

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Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: [ocean@oceanchips.ru](mailto:ocean@oceanchips.ru)

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А