



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

### FEATURES

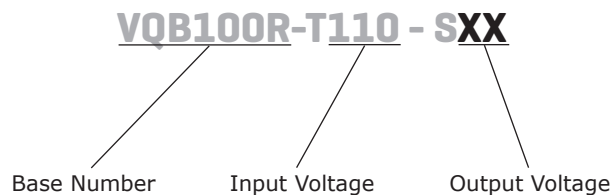
- up to 100 W isolated output
- industry standard quarter brick package
- 3:1 input range (66~160 Vdc)
- single output from 5~24 Vdc
- 2,250 Vdc isolation
- over current, over temperature, over voltage, and short circuit protections
- remote on/off
- efficiency up to 92%



| MODEL            | input voltage range | output voltage | output current max | output power max | ripple and noise <sup>1</sup> max | efficiency typ |
|------------------|---------------------|----------------|--------------------|------------------|-----------------------------------|----------------|
|                  | (Vdc)               | (Vdc)          | (A)                | (W)              | (mVp-p)                           | (%)            |
| 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 10 $\mu$ F tantalum capacitor and 1 $\mu$ F ceramic capacitor across output  
2. an external input capacitor of 120  $\mu$ F 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<br>200 | % Vout<br>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   |       |       |     |       |
|                       | EN61000-4-2 Air ±8 kV Class B                                   |       |       |     |       |
| ESD                   | 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  |       |       |     |       |

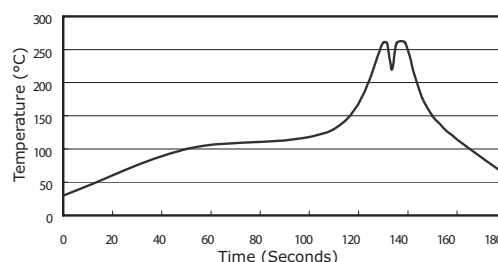
## ENVIRONMENTAL

| 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)



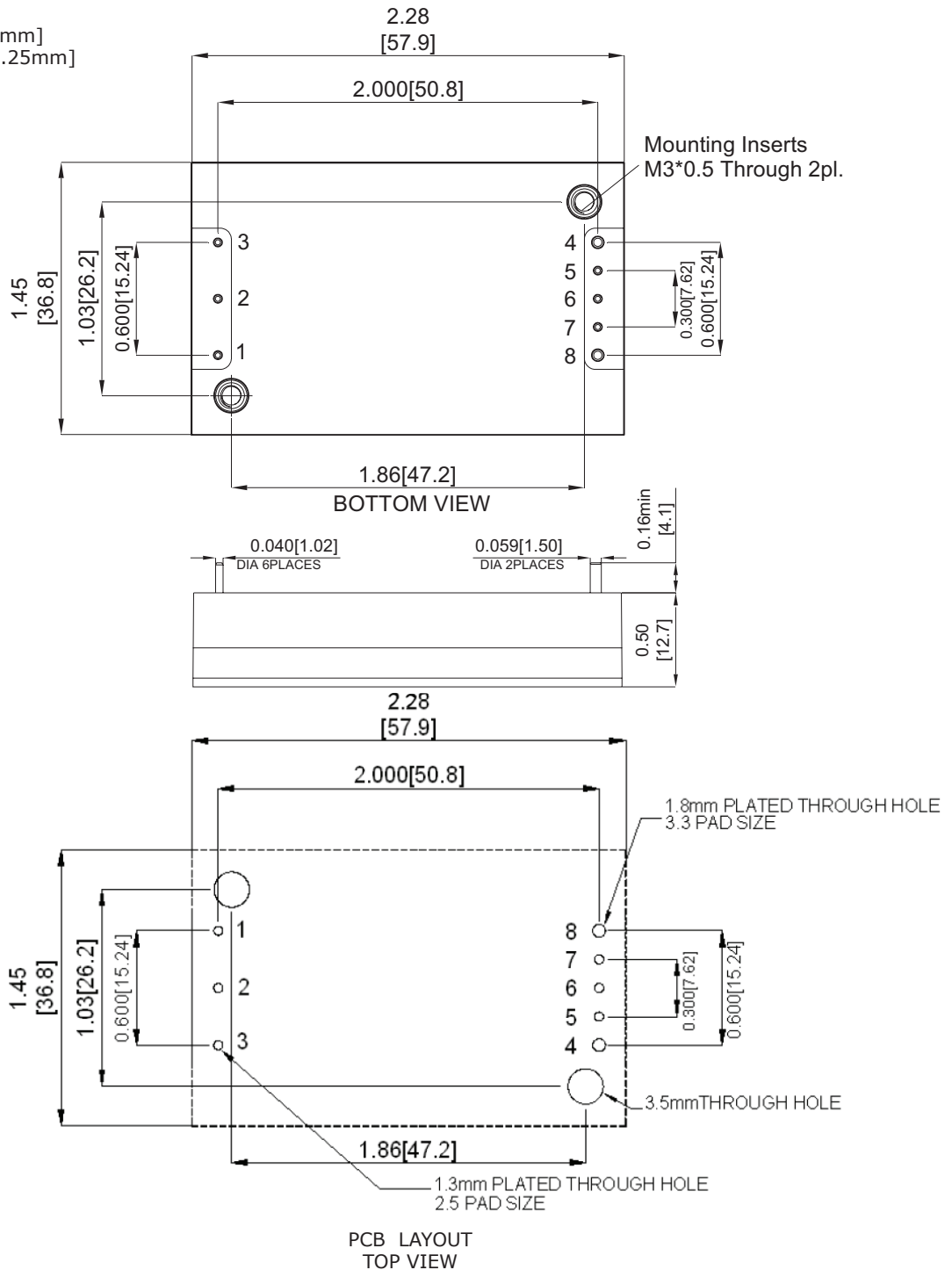
## MECHANICAL

| 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]

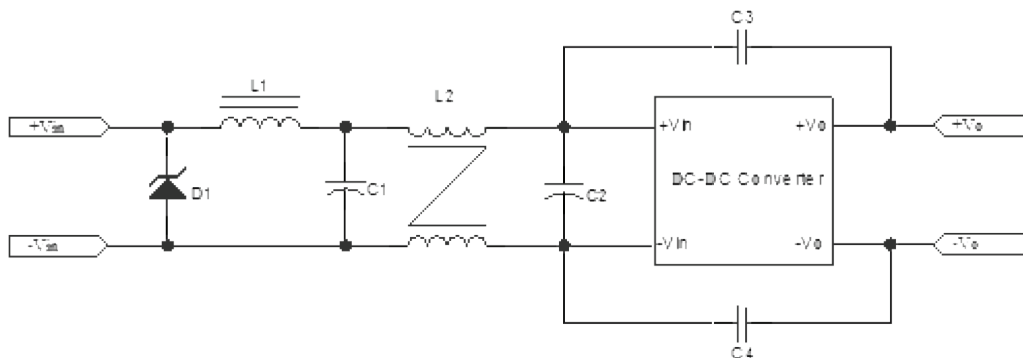
| PIN CONNECTIONS |          |
|-----------------|----------|
| PIN             | FUNCTION |
| 1               | +Vin     |
| 2               | On/Off   |
| 3               | -Vin     |
| 4               | -Vo      |
| 5               | -S       |
| 6               | TRIM     |
| 7               | +S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



## EMC RECOMMENDED CIRCUITS

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

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



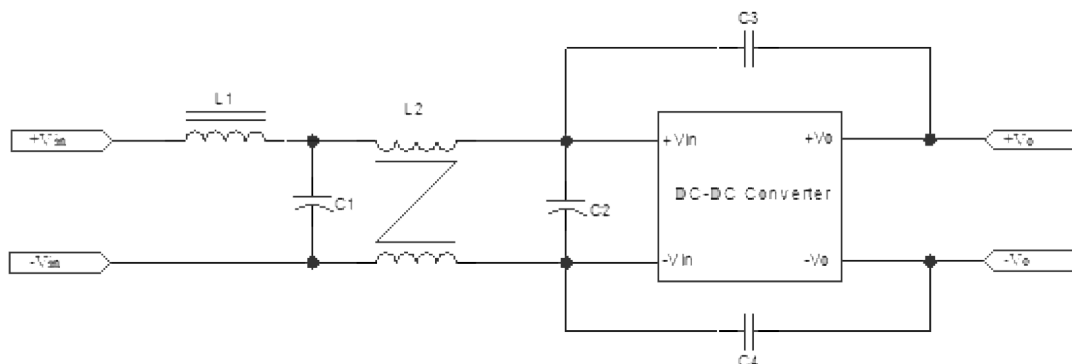
**Table 1**

| 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 μH | 0.33 mH |
| VQB100R-T110-S12                        | 1.5KE180A<br>Littelfuse | 220uF/200V<br>YXF | 220uF/200V<br>YXF | 2200 pF | 2200 pF | 5 μH | 0.33 mH |
| VQB100R-T110-S24                        | 1.5KE180A<br>Littelfuse | 220uF/200V<br>YXF | 220uF/200V<br>YXF | 2200 pF | 2200 pF | 5 μH | 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 μF/200 V<br>YXF | 220 μF/200 V<br>YXF | 2200 pF | 2200 pF | 5 μH | 0.33 mH |
| VQB100R-T110-S12                        | 220 μF/200 V<br>YXF | 220 μF/200 V<br>YXF | 2200 pF | 2200 pF | 5 μH | 0.33 mH |
| VQB100R-T110-S24                        | 220 μF/200 V<br>YXF | 220 μF/200 V<br>YXF | 2200 pF | 2200 pF | 5 μH | 0.33 mH |

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

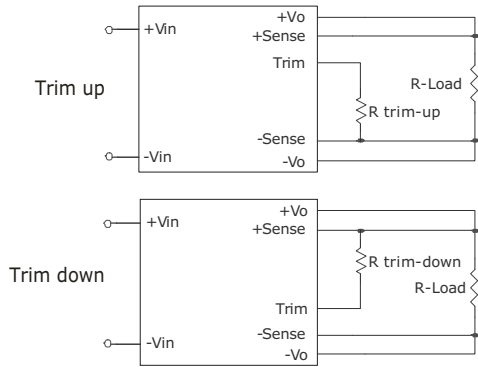
## APPLICATION NOTES

### 1. Output Voltage Trimming

Leave open if not used.

**Figure 3**

Application Circuit for Trim pin



### Formula for Trim Resistor

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

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

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

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| 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.



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