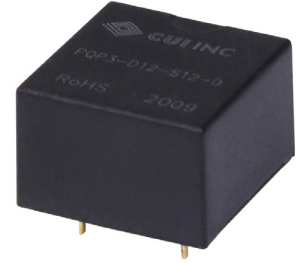


SERIES: PQP3-D | **DESCRIPTION:** DC-DC CONVERTER

FEATURES

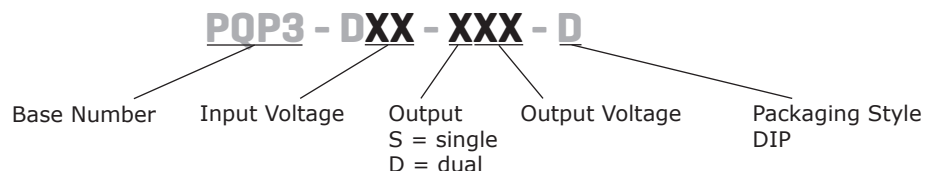
- wide 2:1 input range
- single and Dual output options
- 1500 Vdc isolation
- industry standard pin-out
- ultra compact DIP package
- short circuit protection (continuous)
- wide operating temp: -40°C to +85°C
- supports negative output (dual output model)
- designed to meet EN/BS EN 62368



| MODEL | input voltage | | output voltage (Vdc) | output current | | output power max (W) | ripple and noise ¹ max (mVp-p) | efficiency typ (%) |
|----------------|---------------|----------------|-------------------------|----------------|-------------|----------------------------|---|--------------------------|
| | typ (Vdc) | range (Vdc) | | min (mA) | max (mA) | | | |
| PQP3-D12-S3-D | 12 | 9~18 | 3.3 | 38 | 758 | 2.5 | 100 | 75 |
| PQP3-D12-S5-D | 12 | 9~18 | 5 | 30 | 600 | 3 | 100 | 79 |
| PQP3-D12-S12-D | 12 | 9~18 | 12 | 13 | 250 | 3 | 100 | 82 |
| PQP3-D12-S15-D | 12 | 9~18 | 15 | 10 | 200 | 3 | 100 | 83 |
| PQP3-D12-S24-D | 12 | 9~18 | 24 | 6 | 125 | 3 | 100 | 81 |
| PQP3-D24-S3-D | 24 | 18~36 | 3.3 | 38 | 758 | 2.5 | 100 | 74 |
| PQP3-D24-S5-D | 24 | 18~36 | 5 | 30 | 600 | 3 | 100 | 81 |
| PQP3-D24-S12-D | 24 | 18~36 | 12 | 13 | 250 | 3 | 100 | 83 |
| PQP3-D24-S15-D | 24 | 18~36 | 15 | 10 | 200 | 3 | 100 | 83 |
| PQP3-D24-S24-D | 24 | 18~36 | 24 | 6 | 125 | 3 | 100 | 83 |
| PQP3-D12-D5-D | 12 | 9~18 | ±5 | ±15 | ±300 | 3 | 100 | 78 |
| PQP3-D12-D9-D | 12 | 9~18 | ±9 | ±9 | ±167 | 3 | 100 | 78 |
| PQP3-D12-D12-D | 12 | 9~18 | ±12 | ±7 | ±125 | 3 | 100 | 79 |
| PQP3-D12-D15-D | 12 | 9~18 | ±15 | ±5 | ±100 | 3 | 100 | 79 |
| PQP3-D24-D5-D | 24 | 18~36 | ±5 | ±15 | ±300 | 3 | 100 | 78 |
| PQP3-D24-D9-D | 24 | 18~36 | ±9 | ±9 | ±167 | 3 | 100 | 80 |
| PQP3-D24-D12-D | 24 | 18~36 | ±12 | ±7 | ±125 | 3 | 100 | 82 |
| PQP3-D24-D15-D | 24 | 18~36 | ±15 | ±5 | ±100 | 3 | 100 | 81 |

Notes: 1. Ripple & noise testing condition at nominal input voltage and 5%-100% load, the "tip and barrel" method is used for ripple and noise test, please refer to DC-DC Converter Application Notes for specific information.

PART NUMBER KEY



INPUT

| parameter | conditions/description | min | typ | max | units |
|------------------|-------------------------|------|--------|--------|-------|
| input voltage | 12 Vdc input models | 9 | 12 | 18 | Vdc |
| | 24 Vdc input models | 18 | 24 | 36 | Vdc |
| start-up voltage | 12 Vdc input models | | | 9 | Vdc |
| | 24 Vdc input models | | | 18 | Vdc |
| surge voltage | for maximum of 1 second | | | | |
| | 12 Vdc input models | -0.7 | | 25 | Vdc |
| | 24 Vdc input models | -0.7 | | 50 | Vdc |
| filter | capacitance filter | | | | |
| current | full load/no load | | | | |
| | 12 Vdc input models | | 314/30 | 338/50 | mA |
| | 24 Vdc input models | | 154/20 | 165/40 | mA |

OUTPUT

| parameter | conditions/description | min | typ | max | units |
|-------------------------|--------------------------|-----|------|-------|-------|
| line regulation | min to max Vin | | | | |
| | positive outputs | | ±0.2 | ±0.5 | % |
| | negative outputs | | ±0.5 | ±1 | % |
| load regulation | 5% ~ 100% load | | | | |
| | positive outputs | | ±0.5 | ±1 | % |
| | negative outputs | | | ±3 | % |
| set-point accuracy | 5% ~ 100% load | | | | |
| | positive outputs | | ±1 | ±3 | % |
| | negative outputs | | ±3 | ±5 | % |
| switching frequency | full load, nominal input | | 300 | | kHz |
| transient response | 25% load step change | | ±2.5 | ±5 | % |
| temperature coefficient | full load | | | ±0.03 | %/°C |

PROTECTIONS

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

SAFETY AND COMPLIANCE

| parameter | conditions/description | min | typ | max | units |
|-----------------------|--|------|-----|-----|--------|
| isolation voltage | input-output electric strength test for 1 minute | 1500 | | | Vdc |
| isolation resistance | input-output insulation at 500 Vdc | 1000 | | | MΩ |
| isolation capacitance | input-output capacitance at 100 KHz / 0.1 V | | 100 | | pF |
| safety approvals | designed to meet 62368: EN/BS EN | | | | |
| EMC | CISPR32/EN55032 Class B (see recommended circuit) | | | | |
| ESD | IEC/EN61000-4-2, Contact ±6K, perf. Criteria B | | | | |
| radiated immunity | IEC/EN61000-4-3, 10 v/m, perf. Criteria A | | | | |
| EFT/burst | IEC/EN61000-4-4, ±2KV, perf. Criteria B (see recommended circuit) | | | | |
| surge | IEC/EN61000-4-5, line to line ±2KV, perf. Criteria B (see recommended circuit) | | | | |
| conducted immunity | IEC/EN61000-4-6 3 Vrms, perf. Criteria A | | | | |
| RoHS | yes | | | | |
| MTBF | MIL-HDBK-217F @ 25°C | 1000 | | | kHours |

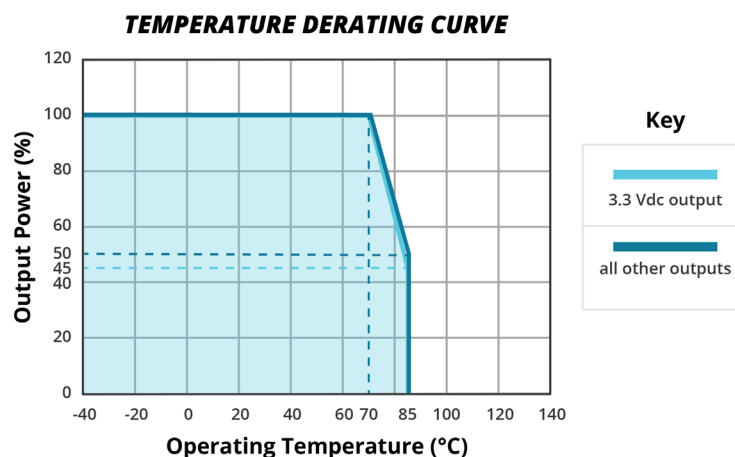
ENVIRONMENTAL

| parameter | conditions/description | min | typ | max | units |
|-----------------------|------------------------|-----|-----|-----|-------|
| operating temperature | | -40 | | 85 | °C |
| storage temperature | | -55 | | 125 | °C |
| humidity | non-condensing | 5 | | 95 | % |

SOLDERABILITY

| parameter | conditions/description | min | typ | max | units |
|------------------|---------------------------------|-----|-----|-----|-------|
| hand soldering | 1.5 mm from case for 10 seconds | | | 300 | °C |
| reflow soldering | 60 s max over 217°C | | | 245 | °C |

DERATING CURVE



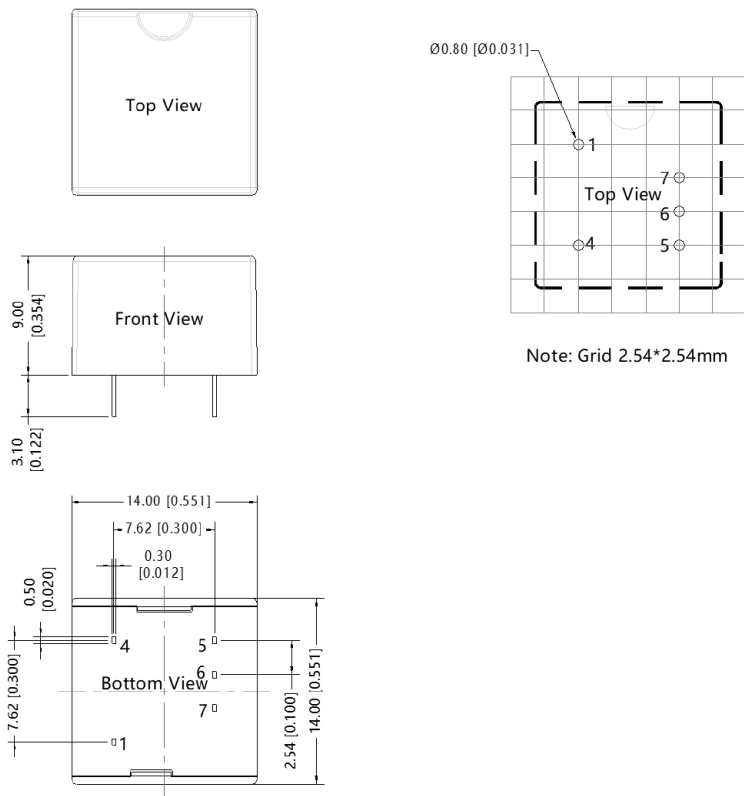
MECHANICAL

| parameter | conditions/description | min | typ | max | units |
|---------------|---|-----|-----|-----|-------|
| dimensions | 14 x 14 x 9 | | | | mm |
| case material | Black plastic; flame-retardant and heat-resistant | | | | |
| weight | | | 2.2 | | g |

MECHANICAL DRAWING

units: mm [inches]
 tolerance: ± 0.50 [± 0.020]

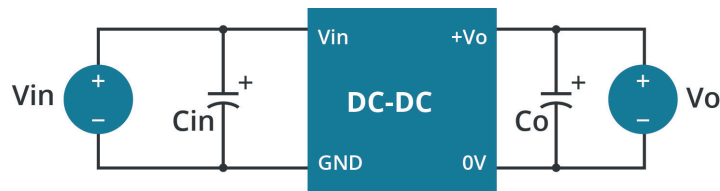
| PIN CONNECTIONS | | |
|-----------------|--------|------|
| PIN | Single | Dual |
| 1 | GND | GND |
| 4 | Vin | Vin |
| 5 | +Vo | +Vo |
| 6 | NC | 0V |
| 7 | 0V | -Vo |



RECOMMENDED CIRCUITS

Figure 1

Single output



Dual output

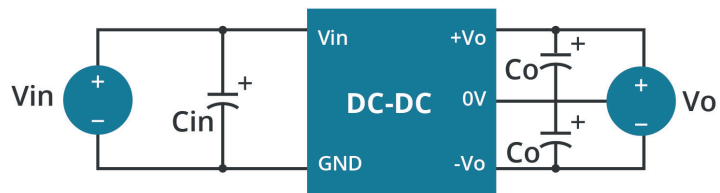


Table 1

| Parameter Description / Single Output | | |
|---------------------------------------|------------|------------|
| Vin (Vdc) | 12 | 24 |
| Cin | 47uF/25V | 47uF/50V |
| Vo (Vdc) | 3.3, 5 | 12, 15, 24 |
| Co | 100uF/6.3V | 27uF/35V |

| Parameter Description / Dual Output | | |
|-------------------------------------|----------|----------|
| Vin (Vdc) | 12 | 24 |
| Cin | 47uF/50V | 47uF/50V |
| Vo (Vdc) | 5, 9 | 12, 15 |
| Co | 47uF/16V | 10uF/35V |

EMC COMPLIANCE CIRCUITS

Figure 2

Single output

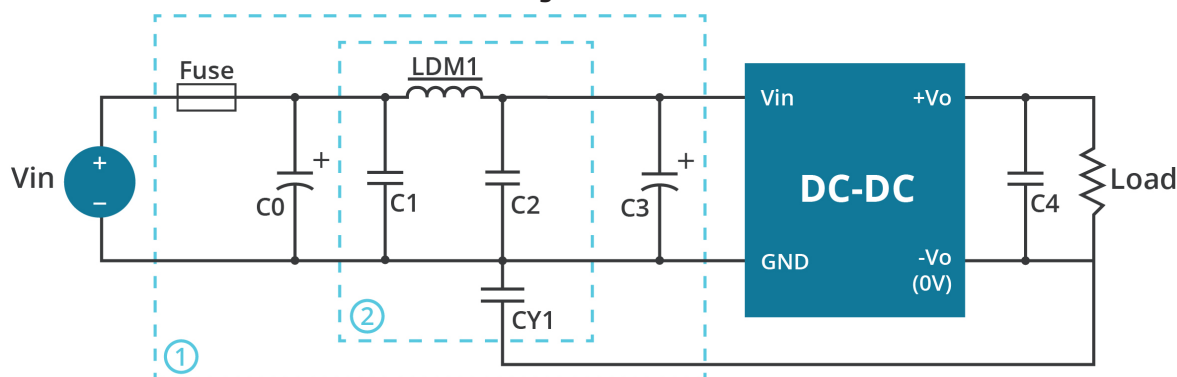


Table 2

| Parameter Description | | | | | | | | | | |
|-----------------------|---|---|-----------|----|----|-------------|---|-----------|----|----|
| Part No. | Vin: 12 Vdc | | | | | Vin: 24 Vdc | | | | |
| Vo (Vdc) | 3.3 | 5 | 12 | 15 | 24 | 3.3 | 5 | 12 | 15 | 24 |
| FUSE | slow blow, choose according to actual input current | | | | | | | | | |
| C0 | 1000μF/25V | | | | | 680μF/50V | | | | |
| C1 | 10μF/50V | | 4.7μF/50V | | | 10μF/50V | | 4.7μF/50V | | |
| LDM1 | 15μH | | | | | | | | | |
| C2 | 4.7μF/50V | | | | | | | | | |
| C3 | 330μF/50V | | | | | | | | | |
| CY1 | 1nF/2KV | | | | | | | | | |
| C4 | Refer to the Cout Fig.1 | | | | | | | | | |

EMC COMPLIANCE CIRCUITS (CONTINUED)

Figure 3

Dual output

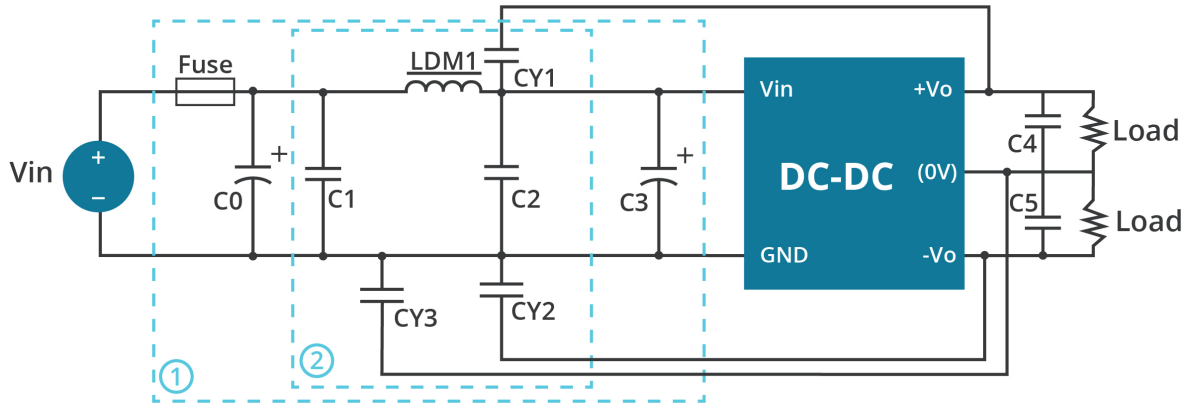


Table 3

| Parameter Description | | | | | | | | |
|-----------------------|---|-------------|-----|-----------|-------------|----|-----|-----|
| Part No. | Vin: 12 Vdc | | | | Vin: 24 Vdc | | | |
| Vo (Vdc) | ±5 | ±9 | ±12 | ±15 | ±5 | ±9 | ±12 | ±15 |
| FUSE | slow blow, choose according to actual input current | | | | | | | |
| C0 | 1000µF/25V | | | | 680µF/50V | | | |
| C1 | 4.7µF/50V | | | | | | | |
| LDM1 | 10µH | | | | | | | |
| C2 | 10µF/50V | | | | | | | |
| C3 | 330µF/50V | | | | | | | |
| CY1 | 1nF/2000V | 470pF/2000V | | 1nF/2000V | | | | |
| CY2 | 1nF/2000V | 470pF/2000V | | 1nF/2000V | | | | |
| CY3 | 1nF/2000V | 470pF/2000V | | / | | | | |
| C4, C5 | Refer to the Cout Fig.1 | | | | | | | |

REVISION HISTORY

| rev. | description | date |
|------|---|------------|
| 1.0 | initial release | 03/28/2020 |
| 1.01 | units updated in the mechanical drawing section | 10/19/2020 |
| 1.02 | derating curve and circuit figures updated | 07/14/2021 |
| 1.03 | dual diagrams added | 04/06/2022 |
| 1.04 | CE certification removed | 11/22/2022 |

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



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