

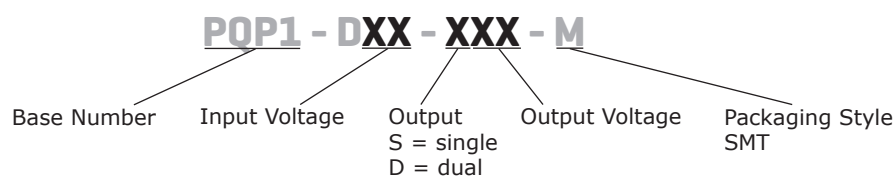
**SERIES: PQP1-M | DESCRIPTION: DC-DC CONVERTER**
**FEATURES**

- wide 2:1 input range
- single and Dual output options
- 1500 Vdc isolation
- industry standard pin-out
- ultra compact SMD package
- short circuit protection (continuous)
- wide operating temp: -40°C to +85°C
- supports negative output (dual output model)
- EN62368 approved



| MODEL          | input voltage |             | output voltage | output current |          | output power max | ripple and noise <sup>1</sup> max | efficiency typ |
|----------------|---------------|-------------|----------------|----------------|----------|------------------|-----------------------------------|----------------|
|                | typ (Vdc)     | range (Vdc) |                | min (mA)       | max (mA) |                  |                                   |                |
| PQP1-D12-S3-M  | 12            | 9~18        | 3.3            | 15             | 303      | 1                | 150                               | 75             |
| PQP1-D12-S5-M  | 12            | 9~18        | 5              | 10             | 200      | 1                | 150                               | 77             |
| PQP1-D12-S12-M | 12            | 9~18        | 12             | 4              | 83       | 1                | 150                               | 79             |
| PQP1-D12-S15-M | 12            | 9~18        | 15             | 3              | 67       | 1                | 150                               | 80             |
| PQP1-D12-S24-M | 12            | 9~18        | 24             | 2              | 42       | 1                | 150                               | 76             |
| PQP1-D24-S3-M  | 24            | 18~36       | 3.3            | 15             | 303      | 1                | 100                               | 75             |
| PQP1-D24-S5-M  | 24            | 18~36       | 5              | 10             | 200      | 1                | 100                               | 77             |
| PQP1-D24-S12-M | 24            | 18~36       | 12             | 4              | 83       | 1                | 100                               | 78             |
| PQP1-D24-S15-M | 24            | 18~36       | 15             | 3              | 67       | 1                | 100                               | 78             |
| PQP1-D24-S24-M | 24            | 18~36       | 24             | 2              | 42       | 1                | 100                               | 77             |
| PQP1-D12-D5-M  | 12            | 9~18        | ±5             | ±5             | ±100     | 1                | 150                               | 77             |
| PQP1-D12-D9-M  | 12            | 9~18        | ±9             | ±2             | ±56      | 1                | 150                               | 80             |
| PQP1-D12-D12-M | 12            | 9~18        | ±12            | ±2             | ±42      | 1                | 150                               | 80             |
| PQP1-D12-D15-M | 12            | 9~18        | ±15            | ±1.7           | ±33      | 1                | 150                               | 77             |
| PQP1-D24-D5-M  | 24            | 18~36       | ±5             | ±5             | ±100     | 1                | 100                               | 77             |
| PQP1-D24-D9-M  | 24            | 18~36       | ±9             | ±2.8           | ±56      | 1                | 100                               | 77             |
| PQP1-D24-D12-M | 24            | 18~36       | ±12            | ±2.1           | ±42      | 1                | 100                               | 77             |
| PQP1-D24-D15-M | 24            | 18~36       | ±15            | ±1.7           | ±33      | 1                | 100                               | 77             |

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          | 12 Vdc input models     |      | 108/15 | 112/30 | mA    |
|                  | 24 Vdc input models     |      | 54/6   | 56/12  | mA    |

## OUTPUT

| parameter               | conditions/description   | min | typ  | max   | units |
|-------------------------|--------------------------|-----|------|-------|-------|
| line regulation         | min to max Vin           |     |      |       | %     |
|                         | positive output          |     | ±0.2 | ±0.5  |       |
|                         | negative output          |     | ±0.5 | ±1    |       |
| load regulation         | 5% ~ 100% load           |     |      |       | %     |
|                         | positive output          |     | ±0.5 | ±1    |       |
|                         | negative output          |     |      | ±2    |       |
| 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     |     | ±3   | ±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      | EN62368                                                                        |      |     |     |        |
| 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 |

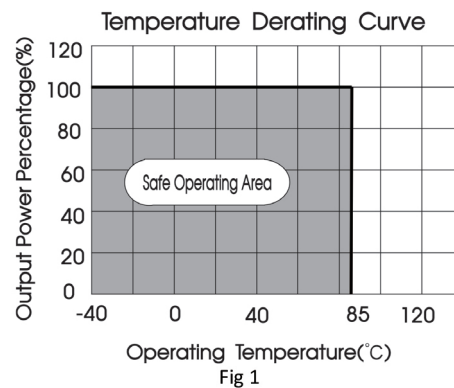
## ENVIRONMENTAL

| 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

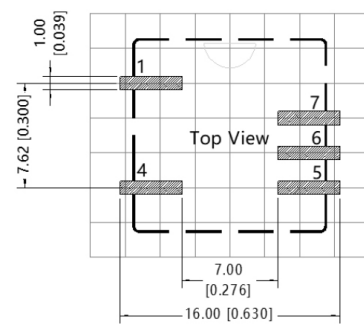
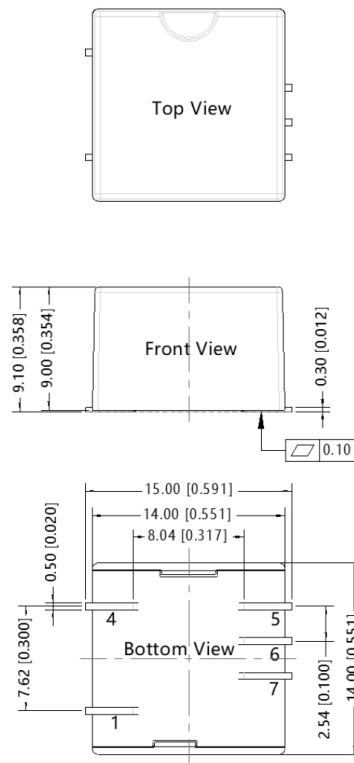
| parameter     | conditions/description                                      | min | typ | max | units |
|---------------|-------------------------------------------------------------|-----|-----|-----|-------|
| dimensions    | 14 x 14 x 9                                                 |     |     |     | mm    |
| case material | Black plastic; flame-retardant and heat-resistant (UL94-V0) |     |     |     |       |
| weight        |                                                             |     | 2.2 |     | g     |

## MECHANICAL DRAWING

units: mm [inches]

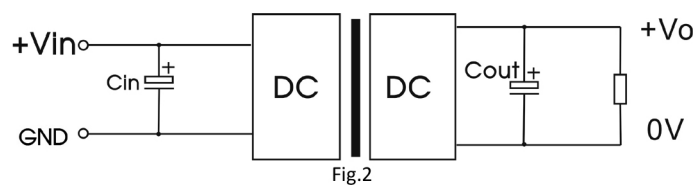
tolerance:  $\pm 0.50$  [ $\pm 0.020$ ]

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



Note: Grid 2.54\*2.54mm

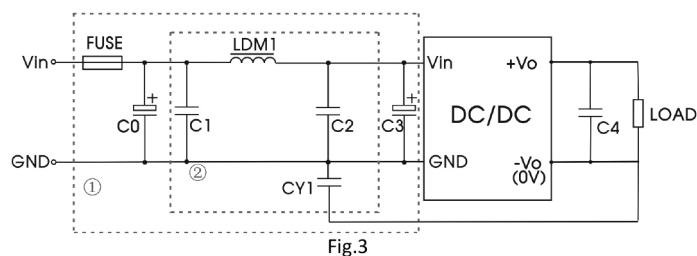
## RECOMMENDED CIRCUITS



| Parameter Description |          |          |
|-----------------------|----------|----------|
| Vin (Vdc)             | 12       | 24       |
| Cin                   | 47uF/25V | 47uF/50V |

|          |            |            |
|----------|------------|------------|
| Vo (Vdc) | 3.3, 5     | 12, 15, 24 |
| Cout     | 100uF/6.3V | 27uF/35V   |

## EMC COMPLIANCE CIRCUITS



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

## REVISION HISTORY

| rev. | description          | date       |
|------|----------------------|------------|
| 1.0  | initial release      | 03/28/2020 |
| 1.01 | measurements updated | 10/30/2020 |

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



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