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# 40 W DC-DC Converter P40B-Series

- Wide 4:1 input range
- Efficiency up to 92 %
- Adjustable output voltage
- On/Off remote control
- 1600 V<sub>DC</sub> isolation
- Continuous short circuit protection
- Over voltage protection
- Over temperature protection
- Standard package 2" x 2" x 0.4"
- -40...85°C operating temperature range
- Soft start function



## Model guide

| Type          | Input voltage                 |                             | Input current           |                           | Output voltage<br>[V <sub>DC</sub> ] | Output current<br>max.<br>[mA] | Ripple & noise<br>(see fig. 2)<br>max.<br>[mVp-p] | Outp. over<br>voltage<br>protection<br>[V <sub>DC</sub> ] | Efficiency<br>@ full load<br>typ<br>[%] | Output<br>capacitor<br>load<br>[μF] max. |
|---------------|-------------------------------|-----------------------------|-------------------------|---------------------------|--------------------------------------|--------------------------------|---|---|---|--|
|               | Nominal<br>[V <sub>DC</sub> ] | Range<br>[V <sub>DC</sub> ] | no load<br>typ.<br>[mA] | full load<br>typ.<br>[mA] |                                      |                                |   |   |   |  |
| Single output |                               |                             |                         |                           |                                      |                                |   |   |   |  |
| P40B243R3S    | 24                            | 9...36                      | 80                      | 1600                      | 3.3                                  | 10000                          | 50  | 3.9   | 89                                      | 25000                                    |
| P40B2405S     | 24                            | 9...36                      | 100                     | 1900                      | 5.0                                  | 8000                           | 50  | 6.2   | 91                                      | 13000                                    |
| P40B2412S     | 24                            | 9...36                      | 50                      | 1920                      | 12.0                                 | 3350                           | 75  | 15  | 90                                      | 2300                                     |
| P40B2415S     | 24                            | 9...36                      | 50                      | 1920                      | 15.0                                 | 2650                           | 75  | 18  | 90                                      | 1500                                     |
| P40B483R3S    | 48                            | 18...75                     | 60                      | 800                       | 3.3                                  | 10000                          | 50  | 3.9   | 89                                      | 25000                                    |
| P40B4805S     | 48                            | 18...75                     | 60                      | 950                       | 5.0                                  | 8000                           | 50  | 6.2   | 92                                      | 13000                                    |
| P40B4812S     | 48                            | 18...75                     | 30                      | 960                       | 12.0                                 | 3350                           | 75  | 15  | 90                                      | 2300                                     |
| P40B4815S     | 48                            | 18...75                     | 30                      | 950                       | 15.0                                 | 2650                           | 75  | 18  | 91                                      | 1500                                     |
| Dual output   |                               |                             |                         |                           |                                      |                                |   |   |   |  |
| P40B2412D     | 24                            | 9...36                      | 60                      | 1940                      | ±12.0                                | ±1650                          | 150   | ±15   | 89                                      | 2 x 1200                                 |
| P40B2415D     | 24                            | 9...36                      | 60                      | 1940                      | ±15.0                                | ±1350                          | 150   | ±18   | 89                                      | 2 x 750                                  |
| P40B4812D     | 48                            | 18...75                     | 30                      | 960                       | ±12.0                                | ±1650                          | 150   | ±15   | 90                                      | 2 x 1200                                 |
| P40B4815D     | 48                            | 18...75                     | 30                      | 960                       | ±15.0                                | ±1350                          | 150   | ±18   | 90                                      | 2 x 750                                  |

Ordering information: Add suffix "K" for heat sink version, E.G.: P40B2405SK

## Specifications

|  |   |
|--|---|
| <b>Input</b>   |   |
| Start up voltage   | P24xxx: 8.6 V <sub>DC</sub> , typ.<br>P48xxx: 17.8 V <sub>DC</sub> , typ. |
| Under voltage lockout                                    | P24xxx: 7.9 V <sub>DC</sub> , typ.<br>P48xxx: 16 V <sub>DC</sub> , typ.   |
| Filter   | π - type  |
| Reflected ripple current                                 | 20 mA <sub>p-p</sub> , typ. (See fig. 1)                                  |
| <b>Remote control levels</b>                             |   |
| On   | 3 ... 12 V <sub>DC</sub> or open input                                    |
| Off  | 0 ... 1.2 V <sub>DC</sub> (see figure 3)                                  |
| Off state input idle current                             | 5 mA, typ.  |
| <b>Isolation:</b>  |   |
| Rated voltage input / output,<br>input or output to case | 1600 V <sub>DC</sub>  |
| Resistance   | 10 <sup>9</sup> Ω   |
| Capacitance  | 2500 pF, typ.   |
| <b>Output</b>  |   |
| Voltage accuracy   | ± 1 %   |
| Output voltage trim range                                | ± 10 %  |
| Voltage cross balance<br>(dual outputs)                  | ±5 % @ 75 % load difference   |
| Line voltage regulation                                  | ± 0.5 %   |
| Load voltage regulation single                           | ± 0.5 % @ 0 %...100 % load  |
| Load voltage regulation dual                             | ± 1 % @ 1 %...100 % load  |
| Temperature coefficient                                  | ± 0.02 % / °C   |
| Transient recovery time                                  | 250 μs, typ. @ 25 % load<br>change steps                                  |
| Transient response deviation                             | ≤3 % @ 25 % load change steps   |
| Short circuit protection                                 | Continuous, hiccup  |
| Over load protection                                     | 130 % of full load, typ.  |
| Short circuit restart                                    | Automatic   |
| Over voltage protection (Z-diode)                        |   |
| P40Bxx3R3x   | 3.9 V <sub>DC</sub>   |
| P40Bxx05x  | 6.2 V <sub>DC</sub>   |
| P40Bxx12x  | 12 V <sub>DC</sub>  |
| P40Bxx15x  | 15 V <sub>DC</sub>  |
| Start up time  | 25 ms, typ. @ R-load, nom. Vin  |

|  |  |
|--|--|
| <b>General</b>   |  |
| Switching frequency                                    | 270 kHz, typ.  |
| Safety standard in accordance with                     | IEC, EN 60950-1                                      |
| Reliability Calculated MBTF                            | >150000 h  |
| <b>EMC characteristics</b>                             |  |
| Radiated emissions                                     | EN55032 Class A                                      |
| Conducted emissions                                    | EN55032 Class A                                      |
| ESD  | EN61000-4-2 pref criteria A                          |
| RS   | EN61000-4-3 pref criteria A                          |
| EFT  | EN61000-4-4 pref criteria A                          |
| Surge  | EN61000-4-5 pref criteria A                          |
| CS   | EN61000-4-6 pref criteria A                          |
| PFMF   | EN61000-4-8 pref criteria A                          |
| <b>Environmental</b>                                   |  |
| Operating temperatur (ambient)                         | -40 ... 85 °C (see SOA diagram)                      |
| Case temperature                                       | 105 °C, max.   |
| Storage temperature                                    | -40 ... 125 °C                                       |
| Over temperature protection                            | Tc 110 °C, typ                                       |
| Cooling  | Free air convection                                  |
| Thermal impedance                                      | Without heat sink 10.8 K/W<br>With heat sink 8.8 K/W |
| Storage humidity                                       | 95 %, non condensing                                 |
| <b>Physical</b>  |  |
| Dimensions   | 50.8 x 50.8 x 10.16 mm                               |
| Weight   | Standard version: 87 g<br>Heat sink version: 100 g   |
| Case material  | Nickel coated brass                                  |
| Potting Material                                       | Epoxy (UL94V-0 rated)                                |
| <b>Absolute max. ratings</b>                           |  |
| Pin soldering temperature<br>1.5 mm distance from body | 260°C for 10 sec                                     |
| <b>Max. input voltage for 0.1s</b>                     |  |
| P40B24xxx  | 50 V <sub>DC</sub>                                   |
| P40B48xxx  | 100 V <sub>DC</sub>                                  |



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Figure 1 Measure circuit for reflected input ripple current.

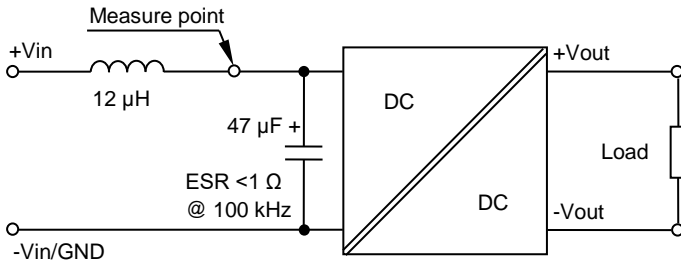
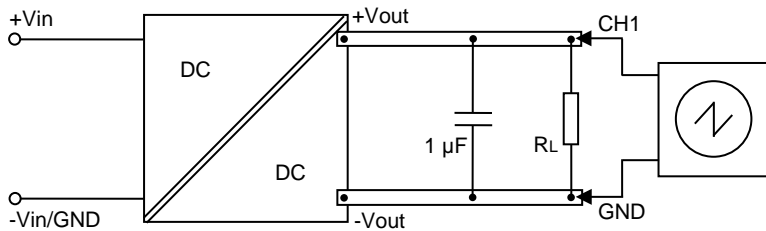


Figure 2 Measure circuit for output ripple & noise. Single output



Dual output

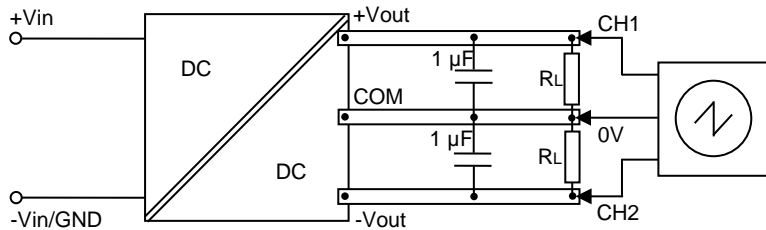


Figure 3 Application circuit remote control

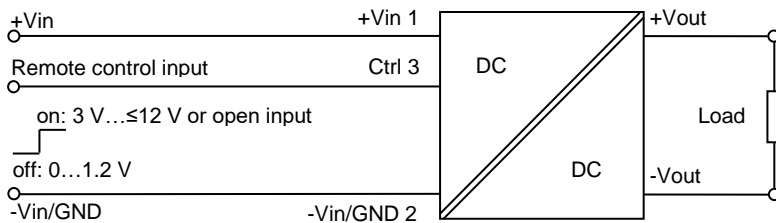
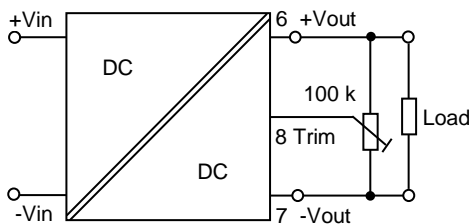
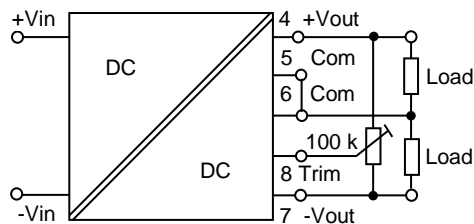


Figure 4 Application circuit output voltage trimming

Single output



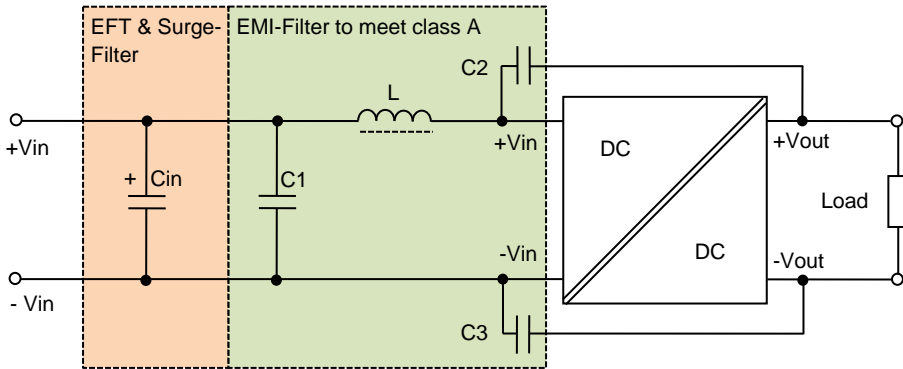
Dual output



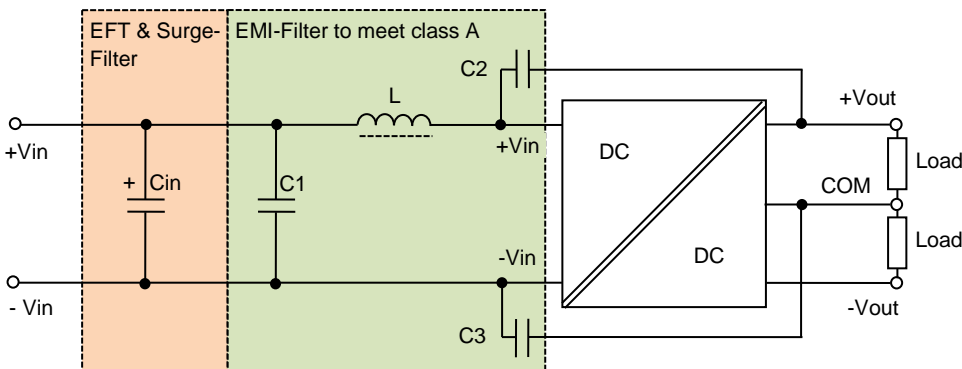
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For the Single output: Maximum output deviation is 10 % inclusive of remote sense and trim. If remote sense is not being used, the + SENSE should be connected to its corresponding +OUTPUT and likewise the - SENSE should be connected to its corresponding -OUTPUT.

Figure 5 Application circuit to meet EMI EN55032 ClassA, EFT IEC61000-4-4 perf. crit. A & Surge IEC61000-4-5 perf. crit. A Single output



Dual output



| BOM to Figure 5 |  |                    |            |            |            |  |
|-----------------|--|--------------------|------------|------------|------------|--|
|                 | Cin  | C1                 | L          | C2         | C3         |  |
| P40B-24xxxx     | 220 $\mu$ F, 100 V, KY-Series, nippon chemicon | 100 $\mu$ F, 100 V | 12 $\mu$ H | 1 nF, 2 kV | 1 nF, 2 kV |  |
| P40B-48xxxx     | 220 $\mu$ F, 100 V, KY-Series, nippon chemicon | 100 $\mu$ F, 100 V | 12 $\mu$ H | 1 nF, 2 kV | 1 nF, 2 kV |  |

Note:

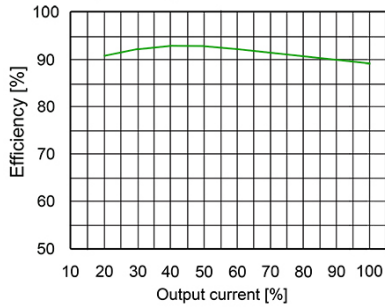
1. The maximum capacitive load is specified at minimal input voltage and constant resistive load.
2. With input filter circuit to meet of conducted emissions EN55032 class A. (See figure 5)
3. An external input blocking capacitor is required if the converter has to meet IEC61000-4-5. Suggested capacitor type: KY-series, 220  $\mu$ F, 100 V, Nippon Chemicon. (See figure 5)
4. Not usable for parallel output operation.



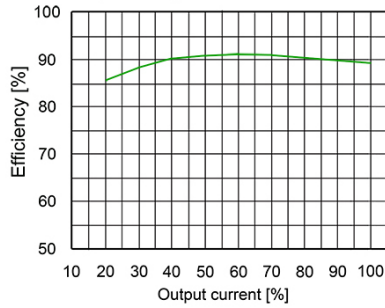
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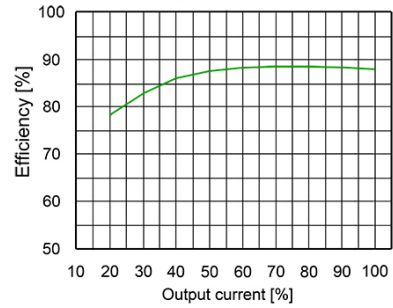
P40B243R3S Efficiency vs output current at input voltage 9 V



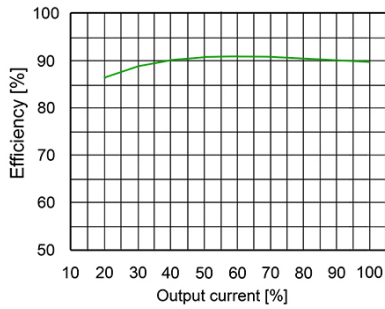
P40B243R3S Efficiency vs output current at input voltage 24 V



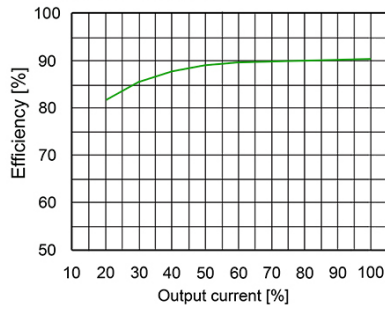
P40B243R3S Efficiency vs output current at input voltage 36 V



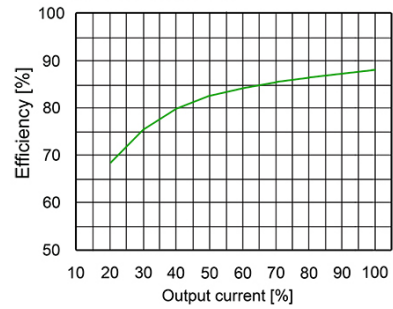
P40B2415S Efficiency vs output current at input voltage 9 V



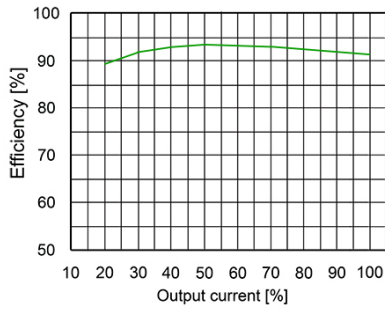
P40B2415S Efficiency vs output current at input voltage 24 V



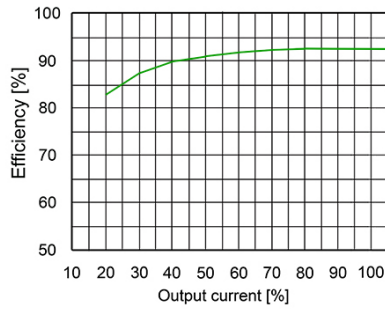
P40B2415S Efficiency vs output current at input voltage 36 V



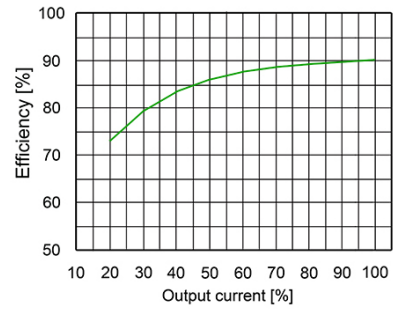
P40B4805S Efficiency vs output current at input voltage 18 V



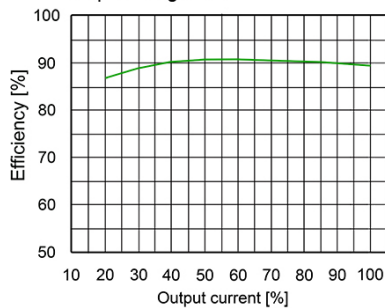
P40B4805S Efficiency vs output current at input voltage 48 V



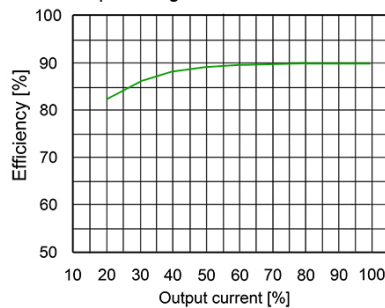
P40B4805S Efficiency vs output current at input voltage 75 V



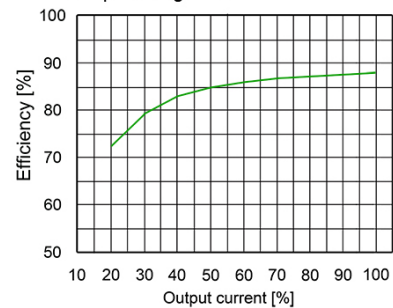
P40B4815D Efficiency vs output current at input voltage 18 V



P40B4815D Efficiency vs output current at input voltage 48 V

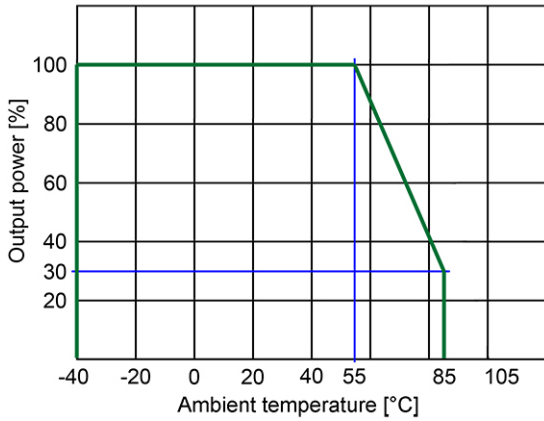


P40B4812D Efficiency vs output current at input voltage 75 V

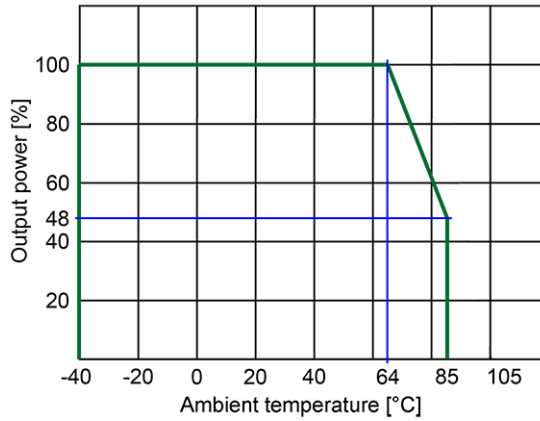


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Derating diagram without heat sink

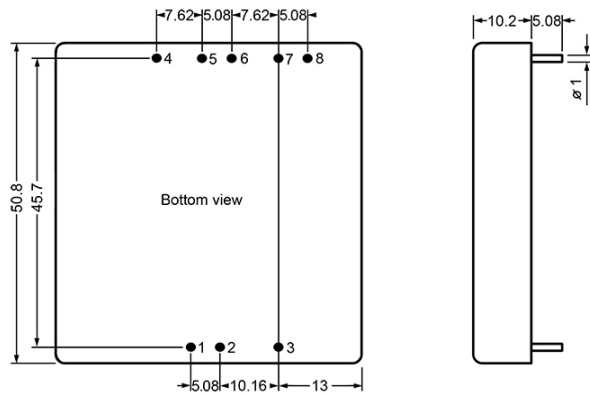


Derating diagram with heat sink

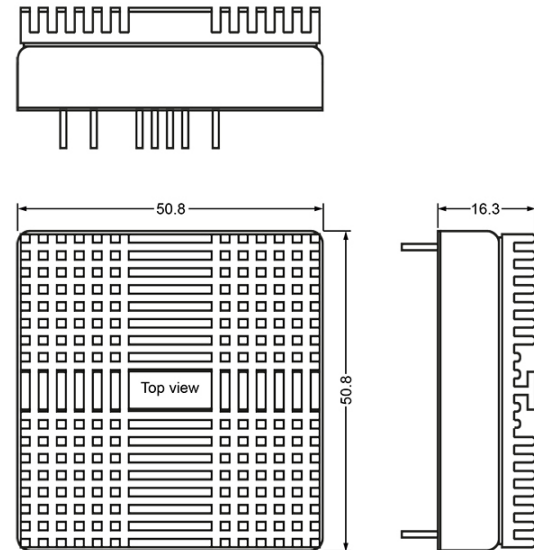


## Dimensions

Standard version



Heat sink version



| Pin Assignment |               |             |
|----------------|---------------|-------------|
| Pin            | Single output | Dual output |
| 1              | + Vin         | + Vin       |
| 2              | - Vin         | - Vin       |
| 3              | Rem ctrl      | Rem ctrl    |
| 4              | - Sense       | + Vout      |
| 5              | + Sense       | Common      |
| 6              | + Vout        | Common      |
| 7              | - Vout        | - Vout      |
| 8              | Trim          | Trim        |

Note:

All dimensions are in mm

1. Pin diameter tolerance  $\pm 0.05$  mm
2. Pin pitch tolerance  $\pm 0.35$
3. Pin length tolerance  $\pm 0.35$
4. Case tolerance  $\pm 0.5$

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