

## 9W

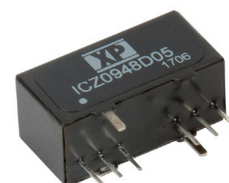
DC-DC  
converters



The ICZ09 series offers 9 Watts in an ultra-compact metal SIP8 package that measures only 21.9 x 9.6 x 11.2mm (0.86 x 0.38 x 0.44"). They are fully regulated to within  $\pm 0.2\%$  of line variations and  $\pm 0.5\%$  for load changes from 0 to 100%. (dual outputs  $\pm 1.0\%$ ), they require no minimum load to maintain these specifications.

There are 3 input ranges of 9 to 18VDC for nominal 12Vin, 18 to 36VDC for 24Vin applications or 36-75VDC for nominal 48Vin applications. Each input range offers the choice of six single outputs from 3.3 to 24VDC, and three dual output voltages with  $\pm 5$ ,  $\pm 12$  or  $\pm 15$ VDC.

Providing 1.6kVDC isolation, all models include a remote on/off pin to facilitate external control or sequencing. The ICZ09 range meet class A conducted emissions with external components and has protection features for input surge voltage, overload and short circuit conditions.



### Features

- ▶ Regulated single & dual outputs
- ▶ 2:1 input range
- ▶ Single outputs 3.3 to 24VDC
- ▶ Dual outputs  $\pm 5.0$  to  $\pm 15$ VDC
- ▶ SIP8 package
- ▶ 1.6kVDC isolation
- ▶ Remote On/Off
- ▶ No minimum load
- ▶  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  operating temperature
- ▶ Full power to  $+60^{\circ}\text{C}$
- ▶ 3 year warranty

### Applications



### Dimensions

21.8 x 9.6 x 11.2mm (0.86" x 0.38" x 0.44" )

### Documentation

For further information click the link or scan the code

→ [xppower.com](http://xppower.com)



### Models & ratings

| Model number | Input voltage | Output voltage | Output current | Efficiency | Input current <sup>(1)</sup> |           | Maximum capacitive load <sup>(2)</sup> |
|--------------|---------------|----------------|----------------|------------|------------------------------|-----------|--|
|              |               |                |                |            | No load                      | Full load |  |
| ICZ0912S3V3  | 9-18VDC       | 3.3VDC         | 2000mA         | 81%        | 15mA                         | 679mA     | 2600 $\mu$ F                           |
| ICZ0912S05   |               | 5.0VDC         | 1600mA         | 85%        |                              | 784mA     | 1300 $\mu$ F                           |
| ICZ0912S09   |               | 9.0VDC         | 1000mA         | 87%        |                              | 862mA     | 800 $\mu$ F                            |
| ICZ0912S12   |               | 12.0VDC        | 750mA          | 88%        |                              | 852mA     | 560 $\mu$ F                            |
| ICZ0912S15   |               | 15.0VDC        | 600mA          | 89%        |                              | 843mA     | 470 $\mu$ F                            |
| ICZ0912S24   |               | 24.0VDC        | 375mA          | 89%        |                              | 843mA     | 200 $\mu$ F                            |
| ICZ0912D05   |               | $\pm 5.0$ VDC  | $\pm 800$ mA   | 85%        |                              | 784mA     | $\pm 800$ $\mu$ F                      |
| ICZ0912D12   |               | $\pm 12.0$ VDC | $\pm 375$ mA   | 88%        |                              | 852mA     | $\pm 390$ $\mu$ F                      |
| ICZ0912D15   |               | $\pm 15.0$ VDC | $\pm 300$ mA   | 89%        |                              | 843mA     | $\pm 200$ $\mu$ F                      |

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#### Notes:

1. Input currents measured at nominal input voltage.
2. Maximum capacitive load is per output.

3. Standard tube quantity = 20

Models & ratings

| Model number | Input voltage | Output voltage | Output current | Efficiency | Input current <sup>(1)</sup> |           | Maximum capacitive load <sup>(2)</sup> |
|--------------|---------------|----------------|----------------|------------|------------------------------|-----------|--|
|              |               |                |                |            | No load                      | Full load |  |
| ICZ0924S3V3  | 18-36VDC      | 3.3VDC         | 2000mA         | 80%        | 15mA                         | 344mA     | 2600μF                                 |
| ICZ0924S05   |               | 5.0VDC         | 1600mA         | 85%        |                              | 392mA     | 1300μF                                 |
| ICZ0924S09   |               | 9.0VDC         | 1000mA         | 88%        |                              | 426mA     | 800μF                                  |
| ICZ0924S12   |               | 12.0VDC        | 750mA          | 89%        |                              | 421mA     | 560μF                                  |
| ICZ0924S15   |               | 15.0VDC        | 600mA          | 90%        |                              | 417mA     | 470μF                                  |
| ICZ0924S24   |               | 24.0VDC        | 375mA          | 90%        |                              | 417mA     | 200μF                                  |
| ICZ0924D05   |               | ±5.0VDC        | ±800mA         | 86%        |                              | 388mA     | ±800μF                                 |
| ICZ0924D12   |               | ±12.0VDC       | ±375mA         | 89%        |                              | 421mA     | ±390 μF                                |
| ICZ0924D15   |               | ±15.0VDC       | ±300mA         | 87%        |                              | 431mA     | ±200μF                                 |
| ICZ0948S3V3  | 36-75VDC      | 3.3VDC         | 2000mA         | 82%        | 10mA                         | 168mA     | 2600μF                                 |
| ICZ0948S05   |               | 5.0VDC         | 1600mA         | 85%        |                              | 196mA     | 1300μF                                 |
| ICZ0948S09   |               | 9.0VDC         | 1000mA         | 88%        |                              | 213mA     | 800μF                                  |
| ICZ0948S12   |               | 12.0VDC        | 750mA          | 89%        |                              | 211mA     | 560μF                                  |
| ICZ0948S15   |               | 15.0VDC        | 600mA          | 89%        |                              | 211mA     | 470μF                                  |
| ICZ0948S24   |               | 24.0VDC        | 375mA          | 89%        |                              | 211mA     | 200μF                                  |
| ICZ0948D05   |               | ±5.0VDC        | ±800mA         | 86%        |                              | 194mA     | ±800μF                                 |
| ICZ0948D12   |               | ±12.0VDC       | ±375mA         | 87%        |                              | 216mA     | ±390μF                                 |
| ICZ0948D15   |               | ±15.0VDC       | ±300mA         | 87%        |                              | 216mA     | ±200μF                                 |

- Notes:
1. Input currents measured at nominal input voltage.

2. Maximum capacitive load is per output.

3. Standard tube quantity = 20

Input

| Characteristic         | Minimum                   | Typical | Maximum | Units         | Notes & conditions                       |
|------------------------|---------------------------|---------|---------|---------------|--|
| Input voltage range    | 9                         |         | 18      | VDC           | 12VDC nominal                            |
|                        | 18                        |         | 36      |               | 24VDC nominal                            |
|                        | 36                        |         | 75      |               | 48VDC nominal                            |
| Input filter           | Capacitor                 |         |         |               |  |
| Input reflected ripple |                           |         | 30      | mA pk-pk      | Through 12μH inductor and 47μF capacitor |
| Undervoltage lockout   | On at >8.9V, Off at <7.1V |         |         |               | 12VDC models                             |
|                        | On at >16V, Off at <13.1V |         |         |               | 24VDC models                             |
|                        | On at >33V, Off at <30.1  |         |         |               | 48VDC models                             |
|                        |                           |         | 25      |               | 12VDC models                             |
| Input surge            |                           |         | 50      | VDC for 100ms | 24VDC models                             |
|                        |                           |         | 100     |               | 48VDC models                             |

## Output

| Characteristic           | Minimum   | Typical | Maximum | Units    | Notes & conditions   |
|--------------------------|---|---------|---------|----------|--|
| Output voltage           | 3.3   |         | 30      | VDC      | See models and ratings table   |
| Minimum load             | 0   |         |         | %        | No minimum load required   |
| Initial set accuracy     |   |         | ±1      | %        | At full load   |
| Line regulation          |   |         | ±0.2    | %        | From minimum to maximum input at full load   |
| Load regulation          |   |         | ±0.5    | %        | Single output from 0 to full load  |
|                          |   |         | ±1      |          | 3V3 and dual output from 0 to full load  |
| Cross regulation         |   |         | ±5      | %        | On dual output models when one load is varied between 25% and 100% and other is fixed at 100%          |
| Transient response       |   |         | ±5      | %        | For 3V3 output models / all other models. Recovery within 2% in less than 250 µs for a 25% load change |
|                          |   |         | ±3      |          | 3.3-9V/12-24V. 20 MHz bandwidth. Measured using 1 µF ceramic and 10 µF electrolytic capacitors         |
| Ripple & noise           |   |         | 75      | mV pk-pk | 20MHz bandwidth, measured using 0.1µF ceramic capacitor  |
| Short circuit protection | Continuous trip & restart (hiccup mode), with auto recovery   |         |         |          |  |
| Temperature coefficient  |   |         | 0.02    | %/ °C    |  |
| Overload protection      |   | 150     |         | %        |  |
| Maximum capacitive load  | See models and ratings table  |         |         |          |  |
| Remote on/off            | Output is ON if remote On Off (pin 3) is an open circuit or if the voltage on pin 3 is ≤0.1VDC<br>Output is OFF if a voltage (max 5VDC) is applied to the remote On / Off (pin 3) with a maximum current of 4mA<br>Note: For correct operation ensure pin 3 current is >11µA. |         |         |          |  |

## General

| Characteristic                              | Minimum   | Typical     | Maximum | Units                                  | Notes & conditions              |
|---|---|-------------|---------|--|---------------------------------|
| Efficiency                                  |   | 88          |         | %                                      | See models and ratings table    |
| Isolation: input to output                  | 1600  |             |         | VDC                                    | For 60s, insulation: functional |
| Isolation: input to case                    | 1000  |             |         |  |                                 |
| Continuous working voltage: input to output |   |             | 500     | VDC                                    | 200Vrms                         |
| Isolation resistance                        | 10 <sup>9</sup>                                   |             |         | Ω                                      |                                 |
| Isolation capacitance                       |   | 50          |         | pF                                     |                                 |
| Switching frequency                         |   | 400/500     |         | kHz                                    | 12 & 24Vin/48Vin                |
| Power density                               |   | 3.9 (65.0)  |         | W/cm <sup>3</sup> (W/in <sup>3</sup> ) |                                 |
| Mean time between failure                   | 900   |             |         | khrs                                   | MIL-HDBK-217F, +25°C GB         |
| Case material                               | Copper  |             |         |  |                                 |
| Potting material                            | Epoxy UL94V-0                                     |             |         |  |                                 |
| Pin material                                | Solder coated phosphor bronze C519R-H             |             |         |  |                                 |
| Solder profile                              | 260°C max, 1.5mm from case 10s max                |             |         |  |                                 |
| Water wash                                  | Use deionized water, do not soak. Dry thoroughly. |             |         |  |                                 |
| Weight                                      |   | 7.3 (0.016) |         | g (lb)                                 |                                 |

## Environmental

| Characteristic        | Minimum            | Typical | Maximum | Units | Notes & conditions   |
|-----------------------|--------------------|---------|---------|-------|--|
| Operating temperature | -40                |         | +85     | °C    | Derate from 100% load at +60 °C to no load at +85 °C.<br>Derate from 100% load at +50 °C to no load at +85 °C for 3V3 output models. |
| Storage temperature   | -55                |         | +125    | °C    |  |
| Case temperature      |                    |         | +100    | °C    |  |
| Cooling               | Natural convection |         |         |       |  |
| Operating humidity    |                    |         | 95      | %     | RH, non condensing   |

Safety approvals

| Safety agency | Standard                         | Notes & conditions |
|---------------|----------------------------------|--------------------|
| UL            | UL/cUL60950-1, 62368-1           |                    |
| CE            | Meets all applicable directives  |                    |
| UKCA          | Meets all applicable legislation |                    |

Emissions - EMC

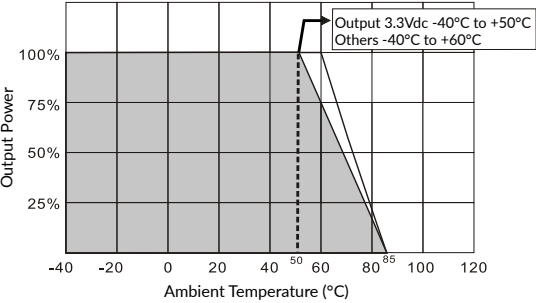
| Phenomenon | Standard | Test level | Notes & conditions    |
|------------|----------|------------|-----------------------|
| Conducted  | EN55032  | Class A    | See application notes |
| Radiated   | EN55032  | Class A    |                       |

Immunity - EMC

| Phenomenon         | Standard    | Test level | Criteria | Notes & conditions    |
|--------------------|-------------|------------|----------|-----------------------|
| ESD Immunity       | EN61000-4-2 | ±6kV       | A        | Contact               |
|                    |             | ±8kV       |          | Air                   |
| Radiated immunity  | EN61000-4-3 | 20V/m      | A        |                       |
| EFT/Burst          | EN61000-4-4 | ±2kV       | A        | See application notes |
| Surge              | EN61000-4-5 | ±2kV       | A        | See application notes |
| Conducted immunity | EN61000-4-6 | 10Vrms     | A        |                       |
| Magnetic fields    | EN61000-4-8 | 100A/m     | A        |                       |

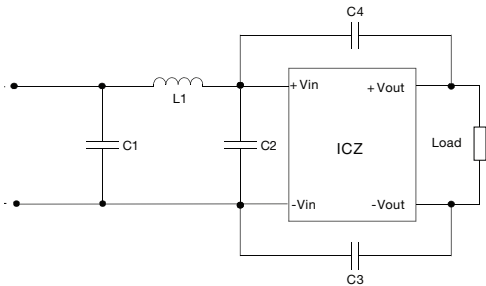
Application notes

Derating curve

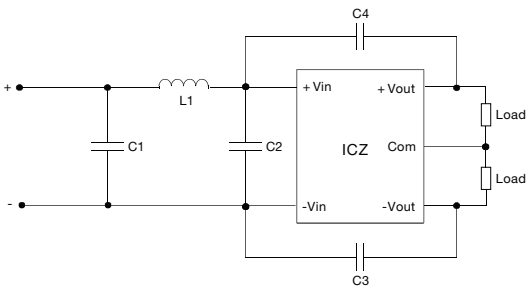


EMI filter

Single output models



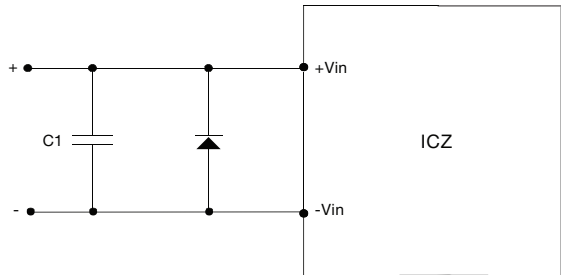
Dual output models



| Model         | C1                | C2               | C3, C4           | L1               |
|---------------|-------------------|------------------|------------------|------------------|
| 12Vin         | 1210, 10µF/35V    | N/A              | 1210, 4.7µF/100V | 1210, 4.7µF/100V |
| 24Vin & 48Vin | 1210, 4.7µF /100V | 1210, 4.7µF/100V | 2x 133µH         | 10µH             |

Application notes

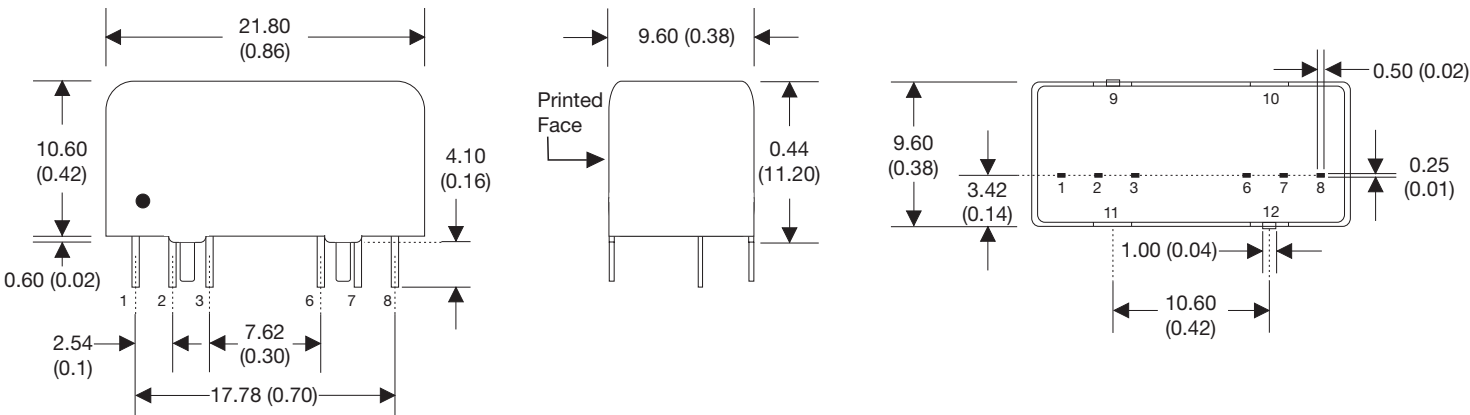
EFT/surge filter



| Model | C1          | D1             |
|-------|-------------|----------------|
| 12Vin | 330μF, 100V | TVS, 3kW, 26V  |
| 24Vin | 330μF, 100V | TVS, 3kW, 70V  |
| 48Vin | 330μF, 100V | TVS, 3kW, 120V |

C1 suggested series Nippon Chemicon KY

Mechanical details



| Pin connections |               |               |
|-----------------|---------------|---------------|
| Pin             | Single        | Dual          |
| 1               | -Vin          | -Vin          |
| 2               | +Vin          | +Vin          |
| 3               | Remote On/Off | Remote On/Off |
| 6               | +Vout         | +Vout         |
| 7               | -Vout         | Common        |
| 8               | No Connection | -Vout         |
| 9               | Case          | Case          |
| 10              | Stand Off     | Stand Off     |
| 11              | Stand Off     | Stand Off     |
| 12              | Case          | Case          |

Notes:

1. All dimensions are in mm (inches)
2. Weight: 7.3 (0.016) g (lb) approx.
3. Case tolerance: ±0.5 (±0.02)
4. Pin pitch tolerance: ±0.35 (±0.014)
5. Pin diameter: 0.5 ±0.05 (0.02 ±0.002)