

date 07/11/2013

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# **SERIES:** VIFSD1-DIP | **DESCRIPTION:** DC-DC CONVERTER

#### **FEATURES**

- isolated 1 W output
- regulated
- single voltage output
- small footprint
- industry standard pinout
- UL94-V0 package
- no heatsink required
- 3,000 Vdc isolation
- temperature range: -40°C~+85°C
- no external component required
- high efficiency up to 73%

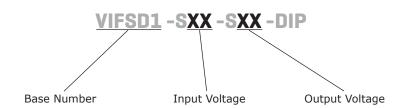




| MODEL              | ,                   | input<br>voltage | output<br>voltage |             | put<br>rent | output<br>power | ripple<br>and noise¹  | efficiency        |
|--------------------|---------------------|------------------|-------------------|-------------|-------------|-----------------|-----------------------|-------------------|
|                    | <b>typ</b><br>(Vdc) | range<br>(Vdc)   | (Vdc)             | min<br>(mA) | max<br>(mA) | max<br>(W)      | <b>max</b><br>(mVp-p) | <b>typ</b><br>(%) |
| VIFSD1-S5-S5-DIP   | 5                   | 4.75 ~ 5.25      | 5                 | 15          | 150         | 1               | 15                    | 69                |
| VIFSD1-S5-S9-DIP   | 5                   | 4.75 ~ 5.25      | 9                 | 12          | 111         | 1               | 15                    | 70                |
| VIFSD1-S5-S12-DIP  | 5                   | 4.75 ~ 5.25      | 12                | 9           | 83          | 1               | 15                    | 71                |
| VIFSD1-S5-S15-DIP  | 5                   | 4.75 ~ 5.25      | 15                | 7           | 67          | 1               | 15                    | 72                |
| VIFSD1-S12-S5-DIP  | 12                  | 11.4 ~ 12.6      | 5                 | 15          | 150         | 1               | 15                    | 69                |
| VIFSD1-S12-S9-DIP  | 12                  | 11.4 ~ 12.6      | 9                 | 12          | 111         | 1               | 15                    | 71                |
| VIFSD1-S12-S12-DIP | 12                  | 11.4 ~ 12.6      | 12                | 9           | 83          | 1               | 15                    | 72                |
| VIFSD1-S12-S15-DIP | 12                  | 11.4 ~ 12.6      | 15                | 7           | 67          | 1               | 15                    | 72                |
| VIFSD1-S24-S5-DIP  | 24                  | 22.8 ~ 25.2      | 5                 | 15          | 150         | 1               | 15                    | 70                |
| VIFSD1-S24-S9-DIP  | 24                  | 22.8 ~ 25.2      | 9                 | 12          | 111         | 1               | 15                    | 72                |
| VIFSD1-S24-S12-DIP | 24                  | 22.8 ~ 25.2      | 12                | 9           | 83          | 1               | 15                    | 73                |
| VIFSD1-S24-S15-DIP | 24                  | 22.8 ~ 25.2      | 15                | 7           | 67          | 1               | 15                    | 73                |

Notes: 1. Ripple and noise are measured at 20 MHz BW with 220 µF aluminum capacitor accross the input. Add 470 µF aluminum, 1 µF ceramic, 10 µF tantalum capacitors across output.

## **PART NUMBER KEY**



# **INPUT**

| parameter                 | conditions/description      | min  | typ | max  | units |
|---------------------------|-----------------------------|------|-----|------|-------|
|                           | 5 V model                   | 4.75 | 5   | 5.75 | Vdc   |
| operating input voltage   | 12 V model                  | 11.4 | 12  | 12.6 | Vdc   |
|                           | 24 V model                  | 22.8 | 24  | 25.2 | Vdc   |
| no load power consumption | 10% nominal power (typical) |      |     |      |       |

# **OUTPUT**

| parameter               | conditions/description          | min | typ | max  | units |
|-------------------------|---------------------------------|-----|-----|------|-------|
| line regulation         | For Vin change of 1%, full load |     |     | 0.25 | %     |
| load regulation         | 10% to 100% full load           |     |     | 1    | %     |
| voltage accuracy        | 100% full load                  |     |     | ±3   | %     |
| switching frequency     | 100% load, nominal input        |     | 100 |      | kHz   |
| temperature coefficient |                                 |     |     | 0.03 | %/°C  |

## **PROTECTIONS**

| parameter                | conditions/description         | min | typ | max | units |
|--------------------------|--------------------------------|-----|-----|-----|-------|
| short circuit protection | continuous, automatic recovery |     | 1   |     | S     |

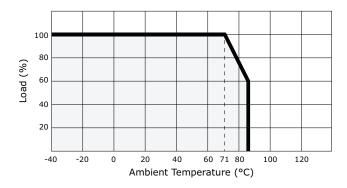
## **SAFETY AND COMPLIANCE**

| parameter            | conditions/description | min       | typ | max | units |
|----------------------|------------------------|-----------|-----|-----|-------|
| isolation voltage    | tested for 1 minute    | 3,000     |     |     | Vdc   |
| isolation resistance | at 500 Vdc             | 1,000     |     |     | ΜΩ    |
| RoHS compliant       | yes                    |           |     |     |       |
| MTBF                 |                        | 3,500,000 |     |     | hrs   |

# **ENVIRONMENTAL**

| parameter                  | conditions/description              | min | typ | max | units |
|----------------------------|-------------------------------------|-----|-----|-----|-------|
| case operating temperature |                                     | -40 |     | 85  | °C    |
| storage temperature        |                                     | -55 |     | 125 | °C    |
| storage humidity           | non-condensing                      |     |     | 95  | %     |
| temperature rise 100% load |                                     |     | 15  | 25  | °C    |
| lead temperature           | 1.5 mm from the case for 10 seconds |     |     | 300 | °C    |

# **DERATING CURVES**



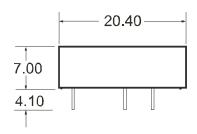
# **MECHANICAL**

| parameter     | conditions/description   | min | typ | max | units |
|---------------|--|-----|-----|-----|-------|
| dimensions    | $20.4 \times 10.00 \times 7.0 (0.77 \times 0.39 \times 0.27 inch)$ |     |     |     | mm    |
| case material | Plastic (UL94-V0)  |     |     |     |       |
| weight        |  |     | 2.1 |     | g     |

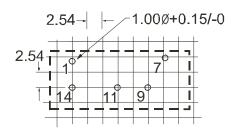
## **MECHANICAL DRAWING**

units: mm

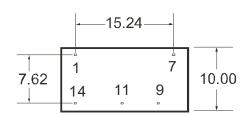
Side View



Layout



## **Bottom View**



| PIN CONNECTIONS |                 |  |  |  |
|-----------------|-----------------|--|--|--|
| PIN             | FUNCTION        |  |  |  |
| 1               | -Vin            |  |  |  |
| 7               | NC              |  |  |  |
| 9               | +V <sub>0</sub> |  |  |  |
| 11              | -Vo             |  |  |  |
| 14              | +Vin            |  |  |  |

## **APPLICATION NOTES**

#### 1. Input filtering

To reduce the reflected ripple current and minimize EMI, especially when the converter input is more than 2" away from the DC source, it is recommended to connect a low ESR electrolytic capacitor between Vin and Gnd. The values suggested are as shown in Table 1. If additional filtering is required, the capacitance may be increased, or expanded to an LC network as shown in Figure 1.

Table 1

|   | Input Voltage<br>(Vdc) | External Input Capacitance (µF) |
|---|------------------------|---------------------------------|
| ſ | 5 V                    | 4.7                             |
|   | 12 V                   | 2.2                             |
| ĺ | 24 V                   | 1.0                             |

#### 2. Recommended Circuit

The VIFSD1-DIP series has been tested according to the following recommended testing circuit. This series should be tested under load. (see Figure 1)

Figure 1



#### 3. Output filtering

An output capacitor as shown in Table 2 may be used to reduce output ripples and noise. requirements as shown in Table 2. Output capacitance may be increased for additional filtering, but should not exceed  $10\mu F$ . It can also be expanded to an LC network as in Figure 1.

Table 2

| Vout<br>(Vdc) | External Output<br>Capacitance<br>(µF) |
|---------------|--|
| 5 V           | 10                                     |
| 9 V           | 4.7                                    |
| 12 V          | 2.2                                    |
| 15 V          | 1.0                                    |

#### 4. Minimum loading

The converter needs a minimum of 10% loading to maintain output regulation. Operation under no-load conditions will not cause immediate damages but may reduce reliability, and cause performance not to meet specifications.

#### Protection

The converter has minimal protection against input over-voltage or output over-load, and may be permanently damaged if exposed to these conditions. An input clamping device can be used for input voltage limiting. An input fuse or an output fuse can also be used to protect against over-loading.

#### 6. Unregulated input

As fixed input converters, this series can accept voltages within a limited range of the nominal input. Otherwise the converter may not function properly or may be damaged. An optional regulator can be used at the input to bring voltage within regulation, as shown in Figure 2.

Figure 2



#### 7. Overload protection

Under normal operating conditions, the output circuit of these products has no protection against over-current and short-circuits. The simplest method is to connect a self-recovery fuse in series at the input end or add a circuit breaker to the circuit. When the environment temperature is higher than 70°C, the product output power should be less then 60% of the rated power.

Note:

All specifications measured at 25°C, humidity <75%, nominal input voltage, and full load unless otherwise noted.

## **REVISION HISTORY**

| rev. | description                 | date       |
|------|-----------------------------|------------|
| 1.0  | initial release             | 01/01/2006 |
| 1.01 | new template applied        | 07/13/2011 |
| 1.02 | V-Infinity branding removed | 09/04/2012 |
| 1.03 | updated spec                | 07/11/2013 |

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



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