# SERIES: VFSD1-SIP | DESCRIPTION: DC-DC CONVERTER

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## FEATURES

- 1 W isolated output
- industry standard pinout
- unregulated
- single output (5~24 V)
- small footprint
- 3,000 V isolation
- short circuit protection
- temperature range (-40~85°C)
- efficiency up to 81%




## MODEL

| MODEL | input voltage | | output voltage | output current | | output power | ripple noise | efficiency |
|---|---|---|---|---|---|---|---|---|
| | typ (Vdc) | range (Vdc) | (Vdc) | min (mA) | max (mA) | max (W) | max (mVp-p) | typ (%) |
| VFSD1-S3.3-S3.3-SIP | 3.3 | 3.0 ~ 3.6 | 3.3 | 31 | 303 | 1 | 100 | 69 |
| VFSD1-S3.3-S5-SIP | 3.3 | 3.0 ~ 3.6 | 5 | 20 | 200 | 1 | 100 | 74 |
| VFSD1-S5-S5-SIP | 5 | 4.5 ~ 5.5 | 5 | 20 | 200 | 1 | 30 | 80 |
| VFSD1-S5-S12-SIP | 5 | 4.5 ~ 5.5 | 12 | 9 | 83 | 1 | 30 | 80 |
| VFSD1-S5-S15-SIP | 5 | 4.5 ~ 5.5 | 15 | 7 | 67 | 1 | 60 | 81 |
| VFSD1-S5-S24-SIP | 5 | 4.5 ~ 5.5 | 24 | 5 | 42 | 1 | 60 | 81 |
| VFSD1-S12-S5-SIP | 12 | 10.8 ~ 13.2 | 5 | 20 | 200 | 1 | 30 | 80 |
| VFSD1-S12-S12-SIP | 12 | 10.8 ~ 13.2 | 12 | 9 | 83 | 1 | 30 | 80 |
| VFSD1-S12-S15-SIP | 12 | 10.8 ~ 13.2 | 15 | 7 | 67 | 1 | 60 | 81 |
| VFSD1-S15-S5-SIP | 15 | 13.5 ~ 16.5 | 5 | 20 | 200 | 1 | 30 | 80 |
| VFSD1-S15-S15-SIP | 15 | 13.5 ~ 16.5 | 15 | 7 | 67 | 1 | 60 | 81 |
| VFSD1-S24-S5-SIP | 24 | 21.6 ~ 26.4 | 5 | 20 | 200 | 1 | 30 | 79 |
| VFSD1-S24-S12-SIP | 24 | 21.6 ~ 26.4 | 12 | 9 | 83 | 1 | 30 | 81 |
| VFSD1-S24-S15-SIP | 24 | 21.6 ~ 26.4 | 15 | 7 | 67 | 1 | 60 | 82 |

Note: 1. Ripple and noise measured at 20 mHz BW

## PART NUMBER KEY

VFSD1-S **XX** -S **XX** -SIP

Base Number | Input Voltage | Output Voltage



Please read our datasheet & drawing disclaimer here.

## INPUT

| parameter | conditions/description | min | typ | max | units |
|---|---|---|---|---|---|
| operating input voltage | 5 V model | 4.5 | 5 | 5.5 | Vdc |
| | 12 V model | 10.8 | 12 | 13.2 | Vdc |
| | 15 V model | 13.5 | 15 | 16.5 | Vdc |
| | 24 V model | 21.6 | 24 | 26.4 | Vdc |
| input surge voltage | 1 second max. | -0.7 | | 9 | Vdc |
| | | -0.7 | | 18 | Vdc |
| | | -0.7 | | 21 | Vdc |
| | | -0.7 | | 30 | Vdc |
| input filter | C filter | | | | |

## OUTPUT

| parameter | conditions/description | | min | typ | max | units |
|---|---|---|---|---|---|---|
| voltage accuracy | see derating curves | | | | | |
| line regulation | for Vin change of ±1% | | | | ±1.2 | % |
| load regulation | 10 ~ 100% full load | 5 V model | | 10 | 15 | % |
| | | 12 V model | | 8 | 15 | % |
| | | 15 V model | | 7 | 15 | % |
| | | 24 V model | | 6 | 15 | % |
| switching frequency | 100% load, nominal input voltage | | | 100 | 300 | kHz |
| temperature coefficient | 100% load | | | | ±0.03 | %/°C |

## PROTECTIONS

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

## SAFETY AND COMPLIANCE

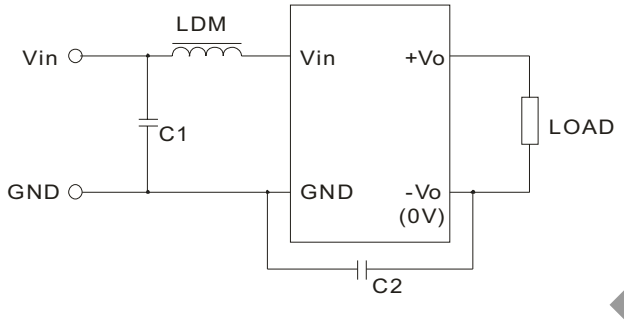
| parameter | conditions/description | min | typ | max | units |
|---|---|---|---|---|---|
| isolation voltage | tested for 1 minute at 1 mA max. | 3,000 | | | Vdc |
| isolation resistance | at 500 Vdc | 1,000 | | | MΩ |
| isolation capacitance | input to output, 100 kHz / 0.1 V | | 20 | | pF |
| EMI/EMC | CISPR22/EN 55022 Class B, IEC/EN 61000-4-2 | | | | |
| RoHS compliant | yes | | | | |
| MTBF | MIL-HDBK-217F, 25°C | 3,500,000 | | | hours |

## ENVIRONMENTAL

| parameter | conditions/description | min | typ | max | units |
|---|---|---|---|---|---|
| operating temperature | | -40 | | 105 | °C |
| storage temperature | | -55 | | 125 | °C |
| storage humidity | non-condensing | | | 95 | % |
| temperature rise | 100% load | | 25 | | °C |
| lead temperature | 1.5 mm from the case for 10 seconds | | | 300 | °C |

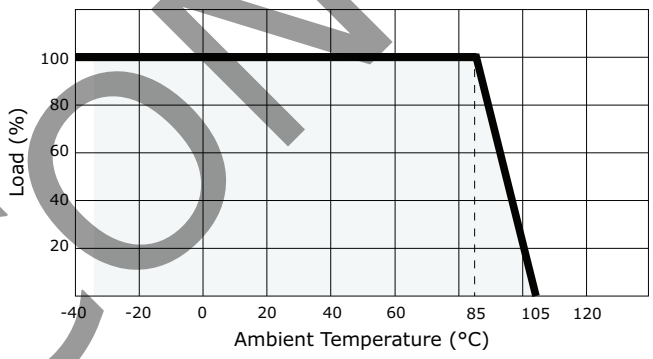
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## EMC RECOMMENDED CIRCUIT




| RECOMMENDED EXTERNAL CIRCUIT PARAMETERS | Vin = 5V | Vin = 12V | Vin = 15V | Vin = 24V |
|---|---|---|---|---|
| C1 | 475 k / 50 V | | | |
| LDM | 6.8 µH | | | |
| C2 | --- | | 470 pF / 2 kV | |

## DERATING CURVES



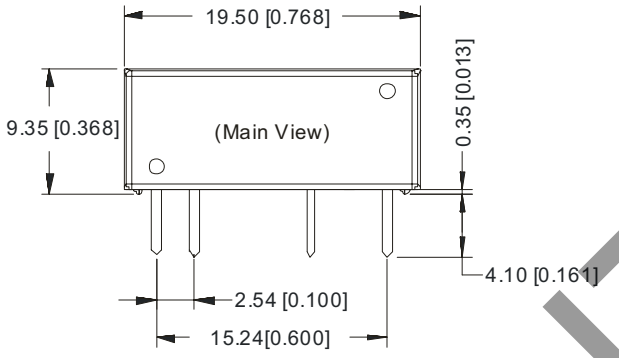

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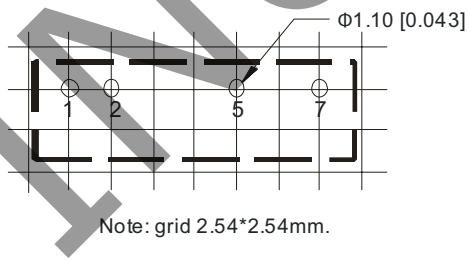
## MECHANICAL

| parameter | conditions/description | min | typ | max | units |
|---|---|---|---|---|---|
| dimensions | 0.768 x 0.236 x 0.39 (19.50 x 6.00 x 10.0 mm) | | | | inch |
| case material | Plastic (UL94-V0) | | | | |
| weight | | | 2.4 | | g |

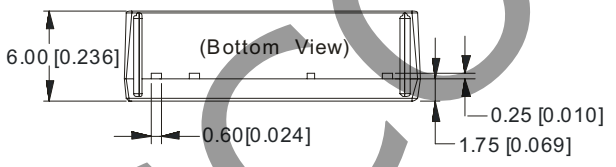
## MECHANICAL DRAWING

units: mm [inches]
tolerance: ±0.25 [±0.010]
pin section tolerance: ±0.10 mm [±0.004]




| PIN CONNECTIONS | |
|---|---|
| PIN | FUNCTION |
| 1 | Vin |
| 2 | GND |
| 5 | 0 V |
| 7 | +Vo |




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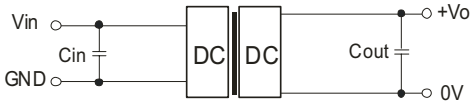
## APPLICATION NOTES

1. **Requirement on output load**
   To ensure this module can operate efficiently and reliably, During operation, the minimum output load could not be less than 10% of the full load. If the actual output power is very small, please connect a resistor with proper resistance at the output end in parallel to increase the load, or use our company's products with a lower rated output power.

2. **Overload Protection**
   Under normal operating conditions, the output circuit of these products has no protection against overload. The simplest method is to connect a self-recovery fuse in series at the input end or add a circuit breaker to the circuit.

3. **Recommended testing and application circuit**
   If you want to further decrease the input/output ripple, an "LC" filtering network may be connected to the input and output ends of the DC/DC converter, see (Figure 1). It should also be noted that the inductance and the frequency of the "LC" filtering network should be staggered with the DC/DC frequency to avoid mutual interference. However, the capacitance of the output filter capacitor must be proper. If the capacitance is too big, a startup problem might arise. For every channel of output, provided the safe and reliable operation is ensured, the recommended capacitance of its filter capacitor sees (Table 1).

**Figure 1**

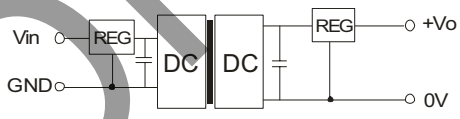



**External Capacitor Table (Table 1)**

| Vin (Vdc) | Cin (µF) | Vout (Vdc) | Cout (µF) |
|---|---|---|---|
| 5 | 4.7 | 5 | 10 |
| 12 | 2.2 | 9.0 | 4.7 |
| 15 | 2.2 | 12 | 2.2 |
| 24 | 1.0 | 15, 24 | 1.0 |

4. **Output Voltage Regulation and Over-voltage Protection Circuit**
   The simplest device for output voltage regulation, over-voltage and over-current protection is a linear voltage regulator with overheat protection that is connected to the input or output end in series (Figure 2).

**Figure 2**




5. **No parallel connection or plug and play**

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## REVISION HISTORY

| rev. | description | date |
|---|---|---|
| 1.0 | initial release | 10/04/2007 |
| 1.01 | updated drawings and data | 05/31/2012 |
| 1.02 | V-Infinity branding removed | 09/05/2012 |
| 1.03 | added 2 models to datasheet | 01/28/2013 |

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

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