



# CFM06S SERIES 6 WATT OPEN FRAME AC-DC MODULES

## Features

- Universal Input Range 90~264V<sub>ac</sub>
- High Efficiency up to 83%
- 0.764"x1.555" Compact Size
- Class II
- No Load Power <0.075W
- Approval IEC/EN/UL 62368-1 Ed 3.0
- Design Meets IEC/EN 60335-1
- Approval EN 55032 Class B and CISPR/FCC Class B
- Operating Altitude 5000m
- Continuous Short Circuit Protection
- Over Voltage Protection
- Over Voltage Category OVC II & OVC III



| MODEL NUMBER | OUTPUT VOLTAGE | OUTPUT CURRENT | RIPPLE& NOISE NOTE2 | VOLTAGE ACCURACY NOTE1 | LINE REGULATION NOTE3 | LOAD REGULATION NOTE4 | %EFF. (Typ.) NOTE5 |
|--------------|----------------|----------------|---------------------|------------------------|-----------------------|-----------------------|--------------------|
| CFM06S033    | 3.3 V          | 1.5 A          | 100 mV              | ±6%                    | ±1%                   | ±6%                   | 75%                |
| CFM06S050    | 5.0 V          | 1.2 A          | 100 mV              | ±5%                    | ±1%                   | ±5%                   | 78%                |
| CFM06S090    | 9.0 V          | 0.67 A         | 100 mV              | ±5%                    | ±1%                   | ±5%                   | 81%                |
| CFM06S120    | 12 V           | 0.5 A          | 120 mV              | ±3%                    | ±1%                   | ±3%                   | 81%                |
| CFM06S150    | 15 V           | 0.4 A          | 150 mV              | ±3%                    | ±1%                   | ±3%                   | 81%                |
| CFM06S240    | 24 V           | 0.25 A         | 240 mV              | ±3%                    | ±1%                   | ±3%                   | 83%                |

Note:

1. Voltage accuracy is set at 100% full load.
2. Add a 0.1uF ceramic capacitor and a 10uF E.L. capacitor to output for ripple & noise measurement @20MHz BW.
3. Line regulation is measured from high line to low line with 100% full load.
4. Load regulation is measured from 10% to 100% full load.
5. Typical efficiency at 230 V<sub>ac</sub> and 100% full load at 25°C.
6. T Version wafer with JST B3B-PH/B2B-PH and mate with JST PH series or equivalent.

## PART NUMBER

| Series | Number of Outputs | Nominal Output Voltage                                                        | Type                                               |
|--------|-------------------|-------------------------------------------------------------------------------|----------------------------------------------------|
| CFM06  | X                 | XXX                                                                           | -X                                                 |
| CFM06  | S : Single        | 033 : 3.3V<br>050 : 5.0V<br>090 : 9.0V<br>120 : 12V<br>150 : 15V<br>240 : 24V | Blank : PCB mount<br>T : Wafer<br>E : Encapsulated |

Part Number Example:

**CFM06S120:** 6W, Single 12Vdc Output, PCB Mount Type

**CFM06S120-T:** 6W, Single 12Vdc Output, Wafer Type



# CFM06S Series

## TECHNICAL SPECIFICATIONS

(All specifications are typical at nominal input, 100% full load at 25°C unless otherwise noted.)

### ABSOLUTE MAXIMUM RATINGS

| PARAMETER             | NOTES and CONDITIONS                                                           | Device | Min.      | Typ. | Max.                 | Units                              |
|-----------------------|--------------------------------------------------------------------------------|--------|-----------|------|----------------------|------------------------------------|
| Input Voltage         | Safety approvals only to the AC input                                          | All    | 90<br>120 |      | 264<br>370           | V <sub>ac</sub><br>V <sub>dc</sub> |
| Operating Temperature | See Derating Curve                                                             | All    | -40       |      | 80                   | °C                                 |
| Storage Temperature   |                                                                                | All    | -40       |      | 85                   | °C                                 |
| Operating Altitude    | IEC/EN/UL 62368-1 OVC II<br>IEC 62368-1 OVC III<br>Meets IEC/EN 60335-1 OVC II | All    |           |      | 5000<br>2000<br>3000 | m                                  |

### INPUT CHARACTERISTICS

| PARAMETER               | NOTES and CONDITIONS                                     | Device | Min. | Typ. | Max. | Units           |
|-------------------------|----------------------------------------------------------|--------|------|------|------|-----------------|
| Operating Voltage Range |                                                          | All    | 100  |      | 240  | V <sub>ac</sub> |
| Input Frequency Range   |                                                          | All    | 47   |      | 63   | Hz              |
| Maximum Input Current   | 100% full Load, V <sub>in</sub> =100V <sub>ac</sub>      | All    |      |      | 0.25 | A               |
| Leakage Current         |                                                          | All    |      |      | 0.25 | mA              |
| Inrush Current          | V <sub>in</sub> =240V <sub>ac</sub> , Cold Start at 25°C | All    |      |      | 90   | A               |

### OUTPUT CHARACTERISTICS

| PARAMETER                      | NOTES and CONDITIONS                                                                                 | Device                                                                     | Min.                                             | Typ.                                | Max.                                             | Units           |
|--------------------------------|------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|--------------------------------------------------|-------------------------------------|--------------------------------------------------|-----------------|
| Output Voltage Set Point       | V <sub>in</sub> =Nominal V <sub>in</sub> , I <sub>o</sub> =I <sub>o</sub> max., T <sub>c</sub> =25°C | CFM06S033<br>CFM06S050<br>CFM06S090<br>CFM06S120<br>CFM06S150<br>CFM06S240 | 3.102<br>4.75<br>8.55<br>11.64<br>14.55<br>23.28 | 3.3<br>5.0<br>9.0<br>12<br>15<br>24 | 3.498<br>5.25<br>9.45<br>12.36<br>15.45<br>24.72 | V <sub>dc</sub> |
| Operating Output Current Range | V <sub>in</sub> =90V <sub>ac</sub> ~264V <sub>ac</sub> , <b>See Derating Curve</b>                   | CFM06S033<br>CFM06S050<br>CFM06S090<br>CFM06S120<br>CFM06S150<br>CFM06S240 |                                                  |                                     | 1.5<br>1.2<br>0.67<br>0.5<br>0.4<br>0.25         | A               |
| Holdup Time                    | V <sub>in</sub> =115V <sub>ac</sub>                                                                  | All                                                                        |                                                  | 12                                  |                                                  | ms              |
| Output Voltage Regulation      |                                                                                                      |                                                                            |                                                  |                                     |                                                  |                 |
| Load Regulation                | 10% Load to 100% full load                                                                           | CFM06S033<br>CFM06S050<br>CFM06S090<br>CFM06S120<br>CFM06S150<br>CFM06S240 |                                                  |                                     | ±6.0<br>±5.0<br>±5.0<br>±3.0<br>±3.0<br>±3.0     | %               |
| Line Regulation                | V <sub>in</sub> =High line to low line                                                               | All                                                                        |                                                  |                                     | ±1.0                                             | %               |
| Over Current Protection        | Hiccup mode, auto recovery                                                                           | All                                                                        | 110                                              |                                     | 200                                              | %               |
| Short Circuit Protection       | Auto recovery                                                                                        | All                                                                        |                                                  |                                     |                                                  |                 |



## CFM06S Series

| PARAMETER               | NOTES and CONDITIONS                                                                                                                                       | Device    | Min. | Typ. | Max. | Units    |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|------|------|------|----------|
| Over Voltage Protection | Hiccup mode (auto recovery)                                                                                                                                | CFM06S033 | 6.45 |      | 7.14 | $V_{dc}$ |
|                         |                                                                                                                                                            | CFM06S050 | 6.45 |      | 7.14 |          |
|                         |                                                                                                                                                            | CFM06S090 | 10.5 |      | 12.1 |          |
|                         |                                                                                                                                                            | CFM06S120 | 14.3 |      | 15.8 |          |
|                         |                                                                                                                                                            | CFM06S150 | 17.1 |      | 19.5 |          |
|                         |                                                                                                                                                            | CFM06S240 | 28.5 |      | 31.5 |          |
| Output Ripple and Noise | 1. Add a 0.1uF ceramic capacitor and a 10uF aluminum electrolytic capacitor to output<br>2. Oscilloscope is 20MHz bandwidth<br>3. Ambient temperature=25°C | CFM06S033 |      |      | 100  | mV       |
|                         |                                                                                                                                                            | CFM06S050 |      |      | 100  |          |
|                         |                                                                                                                                                            | CFM06S090 |      |      | 100  |          |
|                         |                                                                                                                                                            | CFM06S120 |      |      | 120  |          |
|                         |                                                                                                                                                            | CFM06S150 |      |      | 150  |          |
|                         |                                                                                                                                                            | CFM06S240 |      |      | 240  |          |
| Load Capacitance        | 1. $V_{in}=115V_{ac}$ and $230V_{ac}$<br>2. Output is 100% full load<br>3. Ambient temperature=25°C                                                        | CFM06S033 |      |      | 1500 | $\mu F$  |
|                         |                                                                                                                                                            | CFM06S050 |      |      | 1200 |          |
|                         |                                                                                                                                                            | CFM06S090 |      |      | 670  |          |
|                         |                                                                                                                                                            | CFM06S120 |      |      | 500  |          |
|                         |                                                                                                                                                            | CFM06S150 |      |      | 400  |          |
|                         |                                                                                                                                                            | CFM06S240 |      |      | 250  |          |
| Efficiency              | 1. $V_{in}=230V_{ac}$<br>2. Output is 100% full load<br>3. Ambient temperature=25°C                                                                        | CFM06S033 |      | 75   |      | %        |
|                         |                                                                                                                                                            | CFM06S050 |      | 78   |      |          |
|                         |                                                                                                                                                            | CFM06S090 |      | 81   |      |          |
|                         |                                                                                                                                                            | CFM06S120 |      | 81   |      |          |
|                         |                                                                                                                                                            | CFM06S150 |      | 81   |      |          |
|                         |                                                                                                                                                            | CFM06S240 |      | 83   |      |          |

### ISOLATION CHARACTERISTICS

| PARAMETER            | NOTES and CONDITIONS | Device | Min. | Typ. | Max. | Units    |
|----------------------|----------------------|--------|------|------|------|----------|
| Input to Output      | 1 Minute             | All    |      |      | 4300 | $V_{ac}$ |
| Isolation Resistance | Input to output      | All    | 100  |      |      | MΩ       |

### FEATURE CHARACTERISTICS

| PARAMETER           | NOTES and CONDITIONS        | Device | Min. | Typ. | Max. | Units |
|---------------------|-----------------------------|--------|------|------|------|-------|
| Switching Frequency | $P_{out}$ =max. rated power | All    | 30   |      | 70   | kHz   |

### GENERAL SPECIFICATIONS

| PARAMETER  | NOTES and CONDITIONS                                                                       | Device | Min.                                        | Typ. | Max. | Units   |
|------------|--------------------------------------------------------------------------------------------|--------|---------------------------------------------|------|------|---------|
| MTBF       | I <sub>o</sub> =100%; T <sub>a</sub> =25°C per MIL-HDBK-217F                               | All    |                                             |      | 1120 | k hours |
| Humidity   | Non-condensing                                                                             | All    |                                             |      | 93   | % RH    |
| Shock      | Meet MIL-STD-810F Table 516.5, Table 516.5-1 10ms, each axis 3 times (±X、±Y、±Z axis)       | All    |                                             | 75   |      | g       |
| Vibration  | Meet MIL-STD-810F Table 514.5C-VIII, 15~2000Hz, X、Y、Z axis, 1 hour (each axis), Total 3hrs | All    |                                             | 4    |      | g       |
| Weight     | Blank (PCB mount)                                                                          | All    |                                             | 11   |      | g       |
|            | T (Wafer)                                                                                  |        |                                             | 12   |      |         |
|            | E (Encapsulated)                                                                           |        |                                             | 30   |      |         |
| Dimensions | Blank (PCB mount)                                                                          | All    | 1.56x0.76x0.720 Inches (39.5x19.4x18.30 mm) |      |      |         |
|            | T (Wafer)                                                                                  | All    | 1.95x0.73x0.689 Inches (49.5x18.5x17.50 mm) |      |      |         |
|            | E (Encapsulated)                                                                           | All    | 1.62x0.83x0.787 Inches (41.1x21.0x20.00 mm) |      |      |         |



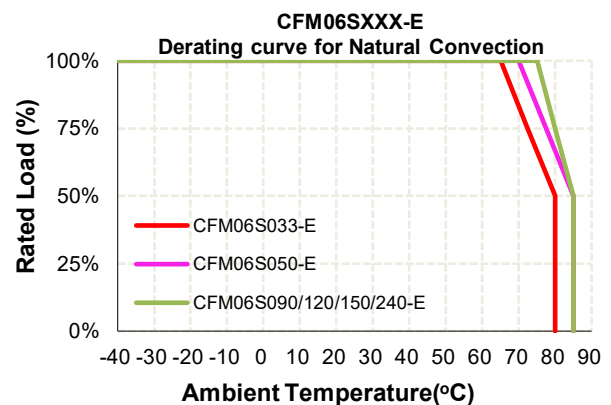
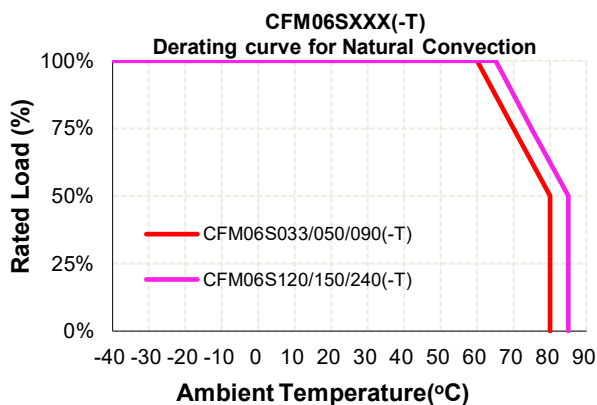
# CFM06S Series

## GENERAL SPECIFICATIONS

|                                                  |                                                                                                                                                                                   |             |
|--------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| <b>Safety</b>                                    | Class II, IEC/EN/UL 62368-1, IEC 60950-1                                                                                                                                          | Ed.3.0      |
| <b>EMC Emission</b>                              | EN 55032:2015+A1:2020, EN 55032:2015+A11:2020, CISPR PUB. 22, FCC Part 15 Subpart B, EN 61000-6-3:2021, EN 61000-6-4:2019<br>EN 61000-3-2:2019+A1:2021, EN 61000-3-3:2013+A2:2021 | Class B     |
| Conducted Disturbance                            | EN 55032:2015+A1:2020, EN 55032:2015+A11:2020, CISPR PUB. 22, FCC Part 15 Subpart B, EN 61000-6-3:2021, EN 61000-6-4:2019                                                         | Class B     |
| Radiated Disturbance                             | EN 55032:2015+A1:2020, EN 55032:2015+A11:2020, CISPR PUB. 22, FCC Part 15 Subpart B, EN 61000-6-3:2021, EN 61000-6-4:2019                                                         | Class B     |
| Harmonic Current Emissions                       | EN 61000-3-2:2019+A1:2021                                                                                                                                                         |             |
| Voltage Fluctuations & Flicker                   | EN 61000-3-3:2013+A2:2021                                                                                                                                                         |             |
| <b>EMC Immunity</b>                              | EN 55035:2017+A11:2020, EN 61000-6-1:2019, EN 61000-6-2:2019, IEC 61000-4-2,3,4,5,6,11                                                                                            |             |
| Electrostatic Discharge (ESD)                    | IEC 61000-4-2:2008, Air Discharge: $\pm 8\text{kV}$ , Contact Discharge: $\pm 4\text{kV}$                                                                                         | Criterion A |
| Radio-Frequency, Continuous Radiated Disturbance | IEC 61000-4-3:2020                                                                                                                                                                | Criterion A |
| Electrical Fast Transient (EFT)                  | IEC 61000-4-4:2012, $\pm 1.0\text{kV}$ , $\pm 2\text{kV}$                                                                                                                         | Criterion A |
| Surge                                            | IEC 61000-4-5:2014+A1:2017, L-N: $\pm 0.5\text{kV}$ , $\pm 1\text{kV}$                                                                                                            | Criterion A |
| Conducted Disturbances, Induced by RF Fields     | IEC 61000-4-6:2013+COR1:2015                                                                                                                                                      | Criterion A |
| Voltage Dips                                     | IEC 61000-4-11:2020, Dip: 30% Reduction, Dip >95% Reduction                                                                                                                       | Criterion A |
| Voltage Interruptions                            | IEC 61000-4-11:2020, >95% Reduction                                                                                                                                               | Criterion B |
| Application Note Link                            | <a href="#">CFM06S Series App Notes</a>                                                                                                                                           |             |

## CHARACTERISTIC CURVE

### Power Derating Curve

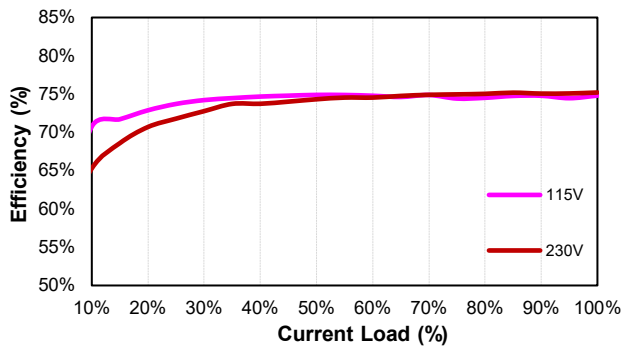




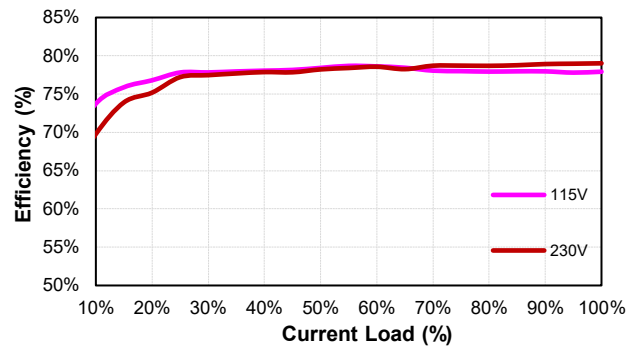
## Performance Data

# CFM06S Series

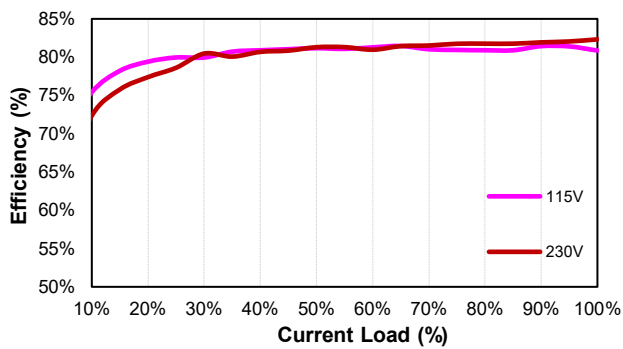
CFM06S033 (Eff Vs Io)



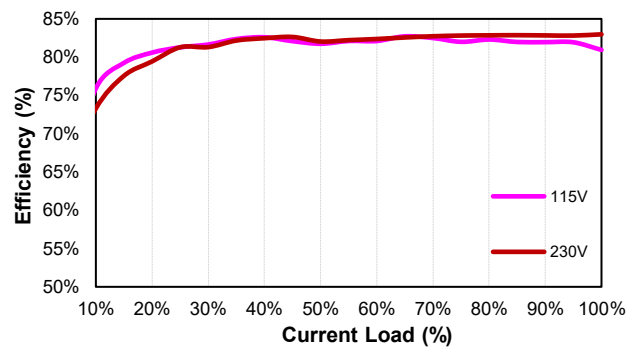
CFM06S050 (Eff Vs Io)



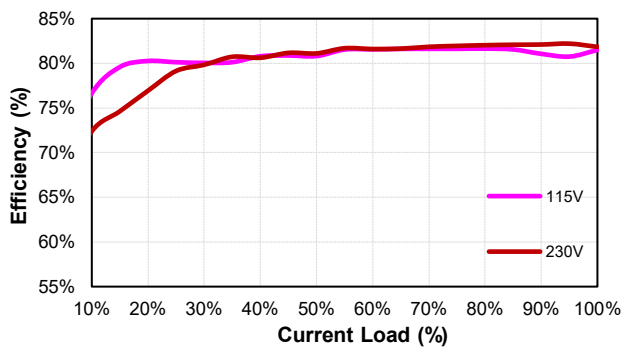
CFM06S090 (Eff Vs Io)



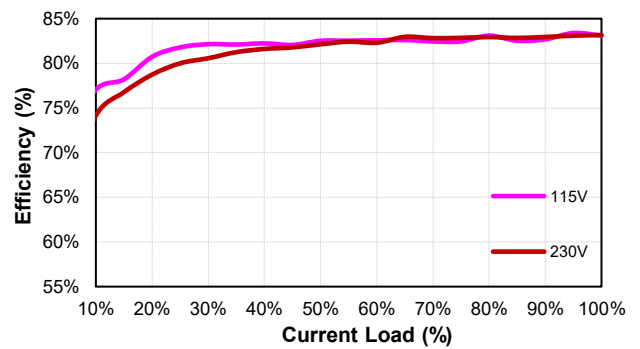
CFM06S120 (Eff Vs Io)



CFM06S150 (Eff Vs Io)



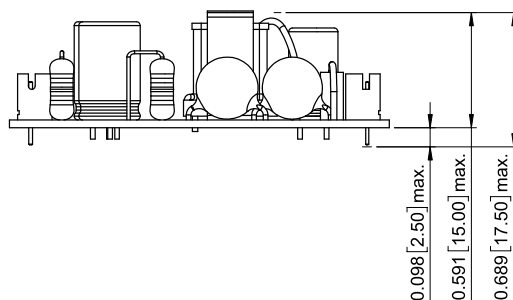
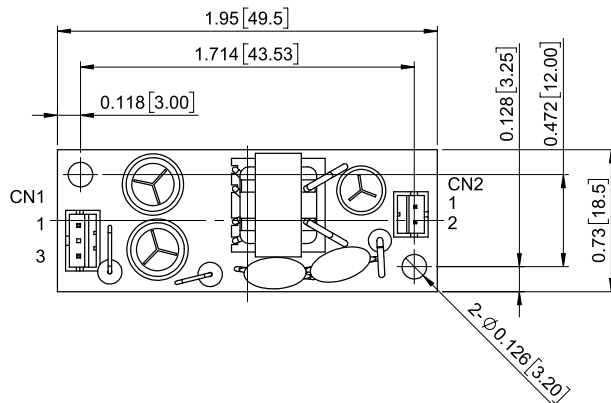
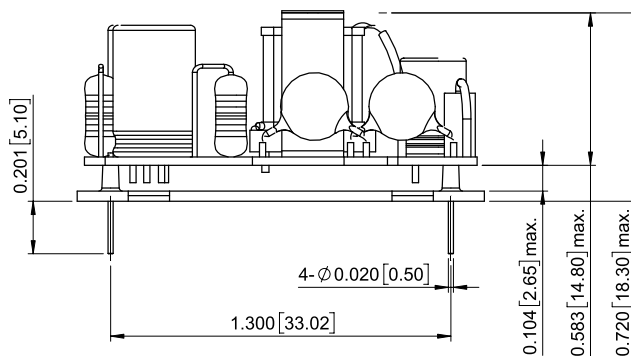
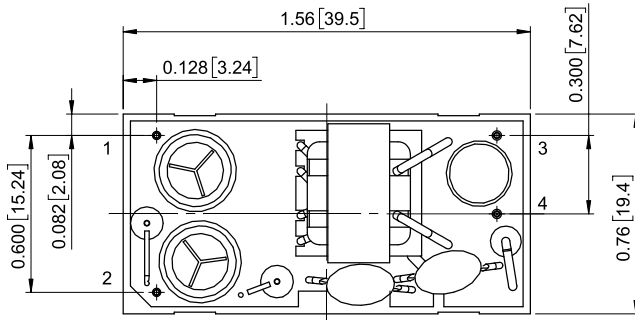
CFM06S240 (Eff Vs Io)





# CFM06S Series

## MECHANICAL SPECIFICATION



### CFM06SXXX

All Dimensions in Inches[mm]  
Tolerance Inches: x.xx=±0.03, x.xxx=±0.020  
Millimeters: x.x=±0.7, x.xx=±0.50

#### Pin Connection

| Pin | Function |
|-----|----------|
| 1   | ACN      |
| 2   | ACL      |
| 3   | +Vout    |
| 4   | -Vout    |

### CFM06SXXX-T

All Dimensions in Inches[mm]  
Tolerance Inches: x.xx=±0.03, x.xxx=±0.020  
Millimeters: x.x=±0.7, x.xx=±0.50

AC Input Connector(CN1):JST B3B-PH-K-S(LF)(SN) or equivalent

| Pin | Function | Mating Housing             | Terminal                               |
|-----|----------|----------------------------|----------------------------------------|
| 1   | ACN      | TKP PHR-3<br>or equivalent | TKP<br>SPH-002T-P0.5L<br>or equivalent |
| 2   | -        |                            |                                        |
| 3   | ACL      |                            |                                        |

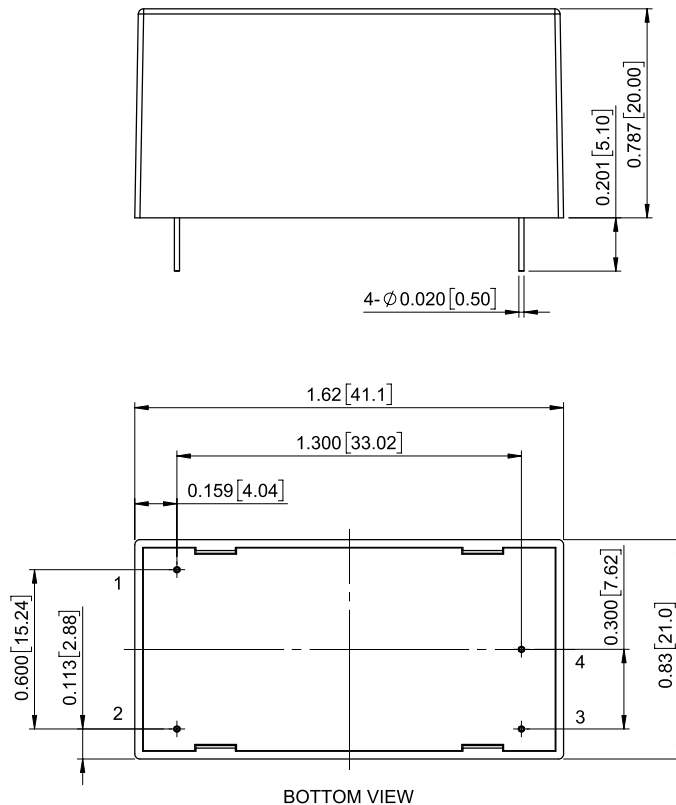
DC Output Connector(CN2):JST B2B-PH-K-S(LF)(SN) or equivalent

| Pin | Function | Mating Housing             | Terminal                               |
|-----|----------|----------------------------|----------------------------------------|
| 1   | +Vout    | TKP PHR-2<br>or equivalent | TKP<br>SPH-002T-P0.5L<br>or equivalent |
| 2   | -Vout    |                            |                                        |



# CFM06S Series

## MECHANICAL SPECIFICATION



### CFM06SXXX-E

All Dimensions in Inches[mm]

Tolerance Inches: x.xx=±0.03, x.xxx=±0.020

Millimeters: x.x=±0.7, x.xx=±0.50

#### Pin Connection

| Pin | Function |
|-----|----------|
| 1   | ACN      |
| 2   | ACL      |
| 3   | +Vout    |
| 4   | -Vout    |