MB3000BRU

30W, 2"x 1" Case, Ultrawide 4:1 Input Range DC/DC Converters

Key Features:

- 30W Output Power
- Ultrawide 4:1 Input Range
- -40°C to +105°C Temp
- 1500 VDC Isolation
- Efficiency to 90%
- Short Circuit Protection
- Over Voltage Protection
- Over Current Protection
- Industry Standard Pin-Out

Electrical Specifications

Specifications typical @ +25°C, nominal input voltage & rated output current, unless otherwise noted. Specifications subject to change without notice.

Input

Parameter	Conditions	Min.	Typ.	Max.	Units
Input Voltage, See Note 3	24 VDC Input	9	24	36	VDC
	48 VDC Input	18	48	75	
Impulse Voltage	24 VDC Input	-0.7		50	VDC
	48 VDC Input	-0.7		100	
Input Start Voltage	24 VDC Input			9	VDC
	48 VDC Input			18	
Input Under Voltage Protection	24 VDC Input	5.5	6.5		VDC
	48 VDC Input	12	15.5		
Reflected Ripple Current	Rated Input Voltage		40		mA
Input Filter			PI Filter		
Start Time			10		ms

Output

Parameter	Conditions	Min.	Typ.	Max.	Units
Output Voltage Accuracy	5% - 100% Load		±1.0	±3.0	%
Line Regulation	Vin = Min. to Max. @ Full Load		±0.2	±0.5	
Load Regulation	5%-100% Load		±0.5	±1.0	%
Ripple & Noise, See Note 2	20 MHz bandwidth, 5%-100% load		50	100	mVp-p
Transient Recovery Time	25% Load step change		300	500	µs
Transient Response Deviation			±5	±8	%
Temperature Coefficient	Full load		±0.01	±0.02	%/°C
Trim			±10		%
Over Load Protection		110		190	%Io
Output Short Circuit	Continuous, self-recovery				
Over Voltage Protection		110		160	%VOUT

General

Parameter	Conditions	Min.	Typ.	Max.	Units
Isolation Voltage	60 seconds, leakage current < 1 mA	1500			VDC
Isolation Resistance	500 VDC	1000			MΩ
Isolation Capacitance	100 KHz /0. 1V		2000		pF
Switching Frequency	PWM		330		kHz

Environmental

Parameter	Conditions	Min.	Typ	Max.	Units
Operating Temperature Range	See Fig 1 & 2	-40		+105	°C
Storage Temperature Range		-55		+125	°C
Cooling	Free Air Convection				
Humidity, See Note 7	Non-Condensing			95	%RH

Physical

Case Size	2.0 x 1.0 x 0.46 in (See mechanical diagrams on page 4)
Case Material	Aluminum Alloy
Weight	1.06 oz (30g)

Reliability Specifications

Parameter	Conditions	Min.	Typ.	Max.	Units
MTBF	MIL-HDBK-217F@25°C	1.0			MHours
Lead Temperature	1.5mm from case for 10 seconds			300	°C

Caution: Exceeding Absolute Maximum Ratings may damage the module. These are not continuous operating ratings.

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Model Selection Guide

Model Number	Input				Output			Full Load Efficiency (%, Typ)	Reflected Ripple Current (mA, Typ)	Capacitive Load (µF, Max) (See Note 2)	Fuse Rating Slow-Blow (mA) (See Note 1)
	Voltage (VDC)		Current (mA)		Voltage (VDC)	Current (mA, Max)	Current (mA, Min)				
	Nominal	Range	Full-Load (Typ)	No-Load							
MB3024S-03BRU	24	9 - 36	970	60	3.3	6000	0	85	40	10000	8000
MB3024S-05BRU	24	9 - 36	1454	60	5	6000	0	88	40	10000	8000
MB3024S-09BRU	24	9 - 36	1388	6	9	3333	0	88	40	4700	8000
MB3024S-12BRU	24	9 - 36	1388	6	12	2500	0	88	40	2700	8000
MB3024S-15BRU	24	9 - 36	1388	6	15	2000	0	90	40	1680	8000
MB3024S-24BRU	24	9 - 36	1388	6	24	1250	0	90	40	680	8000
MB3024D-05BRU	24	9 - 36	1454	60	±5	±3000	0	86	40	#2000	8000
MB3024D-12BRU	24	9 - 36	1388	6	±12	±1250	0	89	40	#1250	8000
MB3024D-15BRU	24	9 - 36	1388	6	±15	±1000	0	89	40	#680	8000
MB3024D-24BRU	24	9 - 36	1388	6	±24	±625	0	89	40	#470	8000
MB3048S-03BRU	48	18 - 75	474	20	3.3	6000	0	86	40	10000	3000
MB3048S-05BRU	48	18 - 75	710	20	5	6000	0	87	40	10000	4000
MB3048S-12BRU	48	18 - 75	702	5	12	2500	0	88	40	2700	4000
MB3048S-15BRU	48	18 - 75	702	5	15	2000	0	89	40	1680	4000
MB3048S-24BRU	48	18 - 75	702	5	24	1250	0	87	40	680	4000
MB3048D-05BRU	48	18 - 75	710	20	±5	±3000	0	86	40	#2000	4000
MB3048D-12BRU	48	18 - 75	702	5	±12	±1250	0	90	40	#1250	4000
MB3048D-15BRU	48	18 - 75	702	5	±15	±1000	0	90	40	#680	4000

Notes:

1. It is recommended that a fuse be used on the input of a power supply for protection. See the Model Selection Guide.
2. All DC-DC converters of this series are tested before delivery using the recommended circuit shown in Fig. 5. Input and/or output ripple can be further reduced by appropriately increasing the input & output capacitor values Cin and Cout and/or by selecting capacitors with a low ESR (equivalent series resistance). Also make sure that the capacitance is not exceeding the specified max. capacitive load value of the product.
3. The input voltage should not exceed the specified range value, otherwise it may cause permanent and irreparable damage.
4. It is recommended to use at a load of over 5%. If the load is below 5%, the ripple index of the product may exceed the specifications, but it does not affect the reliability of the product.
5. The maximum capacitive load is tested within the input voltage range and under full load conditions.
6. Unless otherwise specified, all indicators in this manual are measured at Ta=25 °C, humidity<75% RH, nominal input voltage, and output rated load.
7. Product specifications are subject to change without prior notice.

For the heat sink option, add the suffix "**-H**" to the product model number (i.e. **MB3024S-12BRU-H**)

For the extended wiring package option, add the suffix "**-CW**" to the product model number (i.e. **MB3024S-12BRU-CW**)

For the extended rail package option, add the suffix "**-CR**" to the product model number (i.e. **MB3024S-12BRU-CR**)

Temperature Derating: 24VIN Models

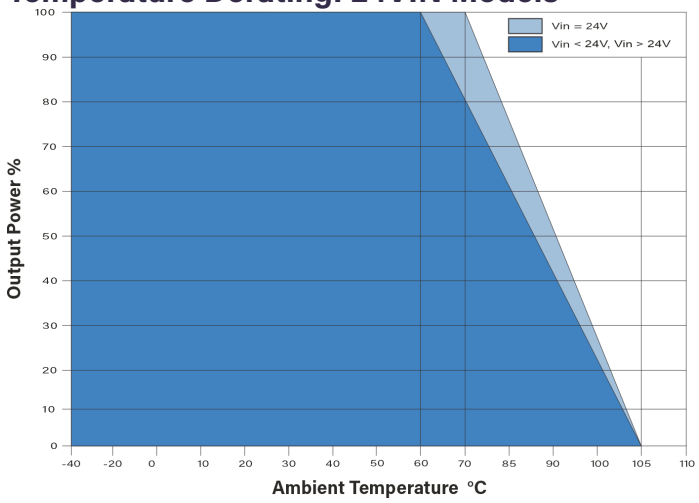


Fig. 1

Temperature Derating: 48VIN Models

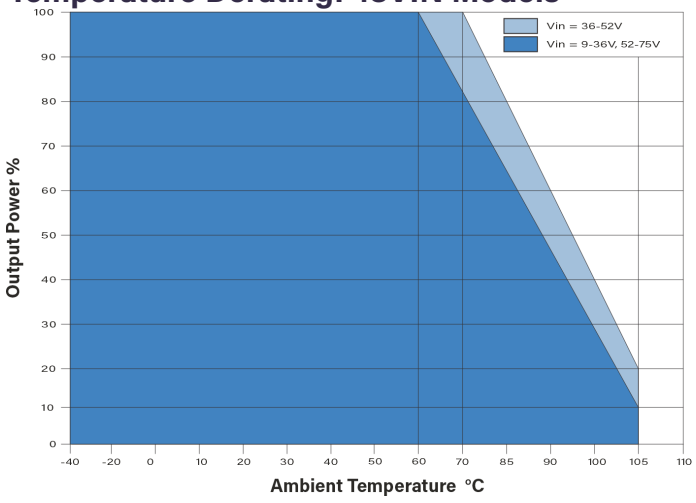


Fig. 2

Efficiency vs Input Voltage: 24VIN Models

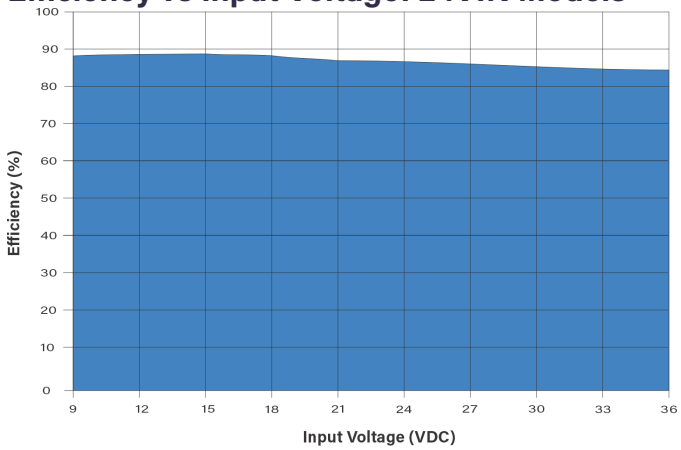


Fig. 3

Efficiency vs Output Load: 24VIN Models

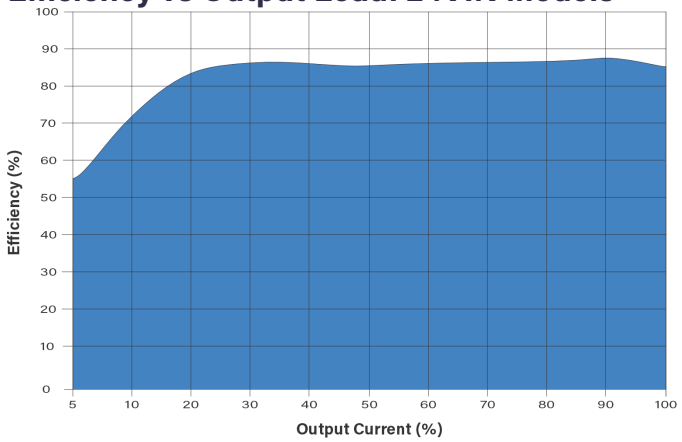


Fig. 4

Typical Application Circuit

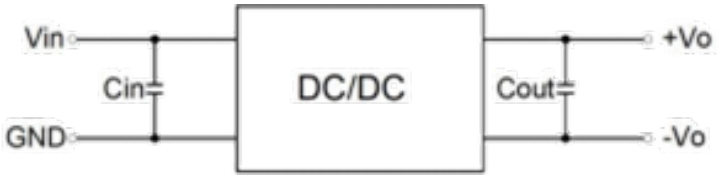


Fig. 5

Recommended Component Parameters		
Vout(VDC)	Cin (uF)	Cout (uF)
3.3/5/9/12/15	100	220
24	100	100

EMI Recommended Circuit

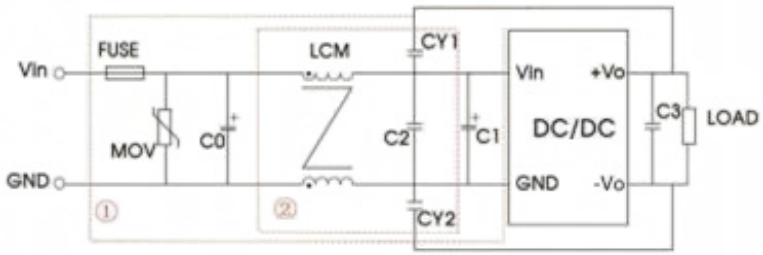


Fig. 6

EMI Recommended Component Parameters		
Vin(VDC)	24VDC	48VDC
FUSE	Choose according to actual input current	
MOV	20D470K	14D101K
C0, C1	680uF/50V	330uF/100V
C2	4.7uF/50V	2.2uF/100V
C3	Refer to the Cout in Fig. 5	
LCM	1.0mH/4A	1.0mH/2A
CY1/CY2	1nF/2KV	

Trim Resistor Connections

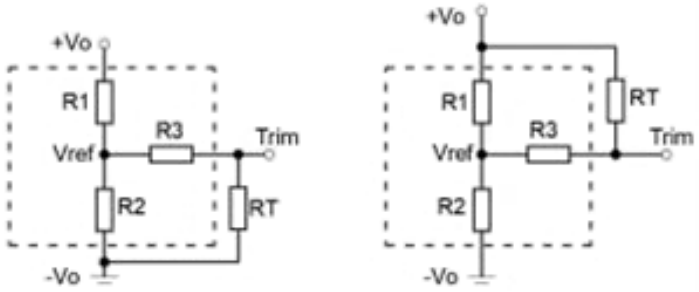


Fig. 7

Trim Recommended Component Parameters				
Vout (V)	R1 (KΩ)	R2 (KΩ)	R3 (KΩ)	Vref (V)
3.3	10	6.064	13.622	1.24
5	2.4	2.344	13.622	2.5
12	8.2	2.153	17.346	2.5
15	12	2.388	21.016	2.5
24	10	1.158	10.714	2.5

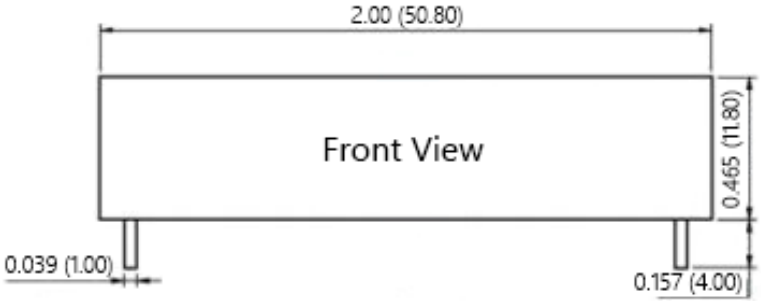
Up: $Rt=\frac{nR2}{R2-n}-R3$ $n=\frac{Vref}{Vo-Vref}*R1$

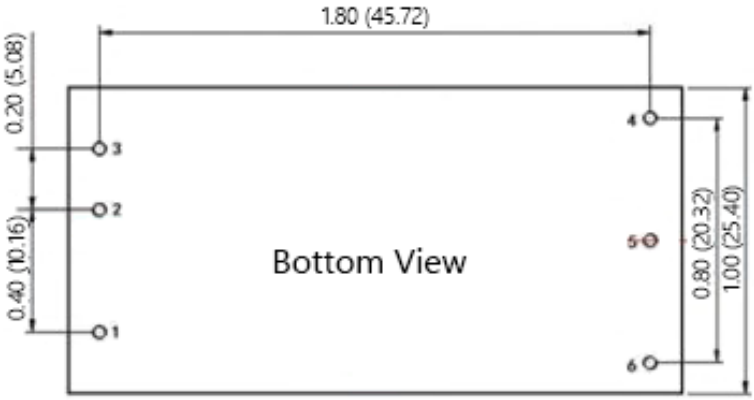
Down: $Rt=\frac{nR1}{R1-n}-R3$ $n=\frac{Vo-Vref}{Vref}*R2$

EMI Characteristics

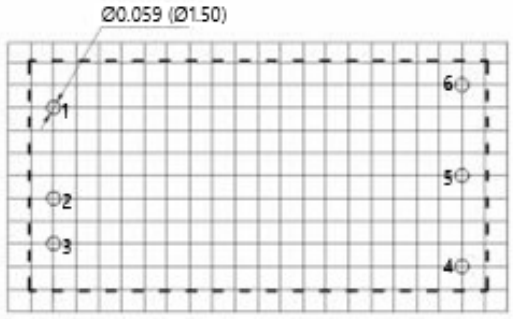
Parameter	Standard	Criteria	Level
Radiated Emissions	CISPR32/EN 55032		Class A
	CISPR32/EN 55032		Class B (See Fig. 6 - 2)
Conducted Emissions	EN 55032, FCC PART 15		Class A
	EN 55032, FCC PART 15		Class B (See Fig. 6 - 2)
ESD	IEC/EN 61000-4-2	B	±6 kV Contact, ±8 kV Air
RS	IEC/EN 61000-4-3	A	10V/m
EFT	IEC/EN 61000-4-4	B	±2 kV (Recommended circuit Fig. 6 - 1)
Input Voltage Surge	IEC/EN61000-4-5	B	±1 kV line to line (Recommended circuit Fig. 6 - 1)
CS	IEC/EN 61000-4-6	A	10 Vr.m.s

Mechanical Dimensions





PCB Layout



The grid distance is 2.54 x 2.54 mm

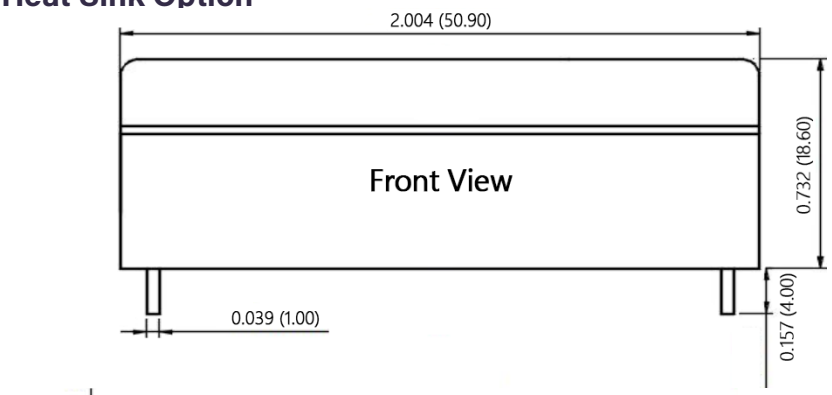
Pin	Single	Dual
1	CTRL	CTRL
2	GND	GND
3	Vin	Vin
4	+Vo	+Vo
5	-Vo	COM
6	Trim	-Vo

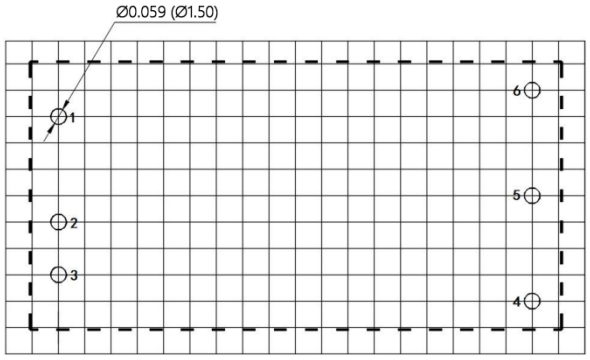
Note:
Unit: inches(mm)
Pin section tolerances: ±0.004 (±0.10)
General tolerances: ±0.020 (±0.50)

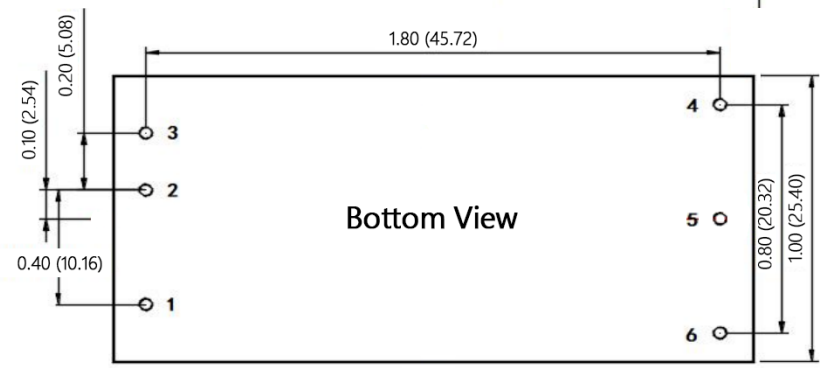
Control Pin Conditions

Item	Operating Conditions	Min.	Typ.	Max.	Units
Ctrl	Turn off module	Connected GND or (0-1.2V)			
	Turn on module	Not Connected or (3.5-12V)			
	Input current when off	--	5	8	mA

Heat Sink Option



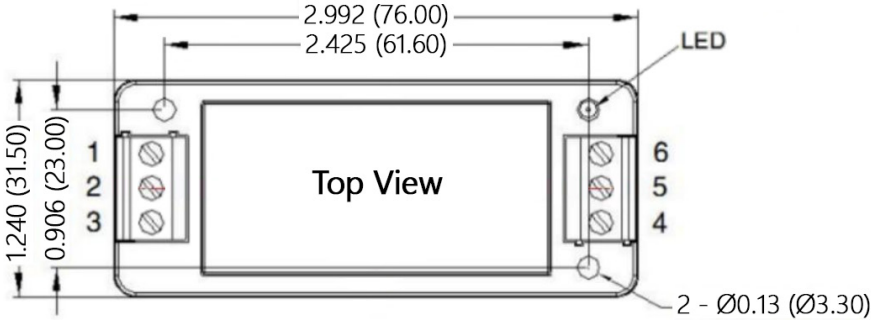


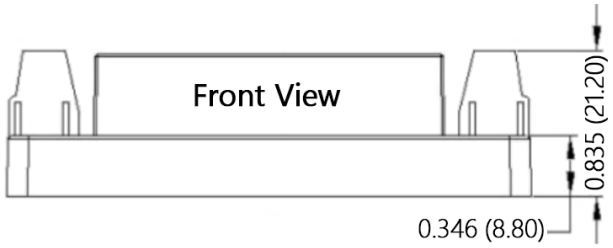


Pin	Single	Dual
1	CTRL	CTRL
2	GND	GND
3	Vin	Vin
4	+Vo	+Vo
5	-Vo	COM
6	Trim	-Vo

Note:
Unit: inches(mm)
Pin section tolerances: ±0.004 (±0.10)
General tolerances: ±0.020 (±0.50)

Extended Wiring Package Option

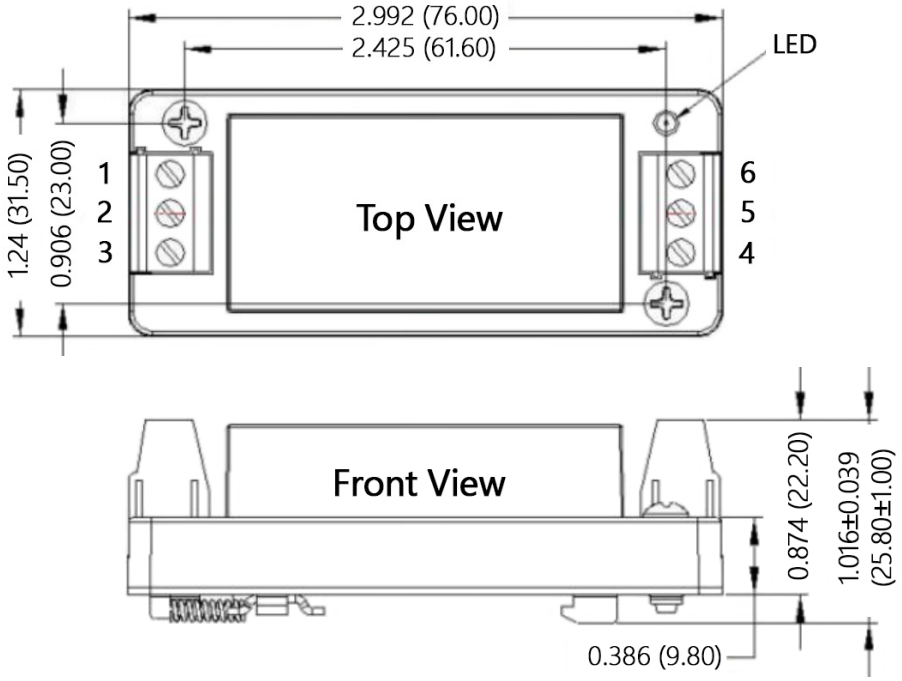




Pin	Single	Dual
1	CTRL	CTRL
2	GND	GND
3	Vin	Vin
4	+Vo	+Vo
5	-Vo	COM
6	Trim	-Vo

Note:
Unit: inches(mm)
Wire range: 24-12 AWG
Tightening torque: 0.4N • m (max)
General tolerances: ±0.039 (±1.00)

Extended Rail Package Option



Pin	Single	Dual
1	CTRL	CTRL
2	GND	GND
3	Vin	Vin
4	+Vo	+Vo
5	-Vo	COM
6	Trim	-Vo

Note:
Unit: inches(mm)
Mounting rail: TS35
Wire range: 24-12 AWG
Tightening torque: 0.4N • m (max)
General tolerances: ±0.039 (±1.00)