75QBRW4_3 series

75W Quarter-Brick - Single Output DC-DC Converter - Wide Input - Isolated & Regulated

DC-DC Converter 75 Watt

- **Ultra-wide input voltage range: 43-160VDC**
- **High efficiency up to 90%**
- **Low no-load power consumption**
- **Reinforced insulation, input - output isolation test voltage: 3kVAC, input - case isolation test voltage: 2.1kVAC**
- **Operating ambient temperature range: -40°C to +105°C**
- **Input under-voltage protection, output-short-circuit, over-current, over-voltage, over-temperature protection**
- **Industry standard 1/4 brick**

The 75QBRW4_3 series is a high-performance product specifically designed for a variety of railway applications. The DC-DC converters feature 75W output power with no requirement for minimum load, wide input voltage from 43-160VDC, and allowing operating temperature as high as 105°C. The products also provide input under-voltage protection, output over-voltage, short-circuit and over-temperature protection. Additional functions include remote On/Off control, remote sense compensation and output voltage trim adjustment. EN50155 approved and they are widely used in railway systems and associated equipment.

Common specifications

Item	Test condition	Min	Typ	Max	Units
Short circuit protection	Hiccup, continuous, self-recovery				
Operation temperature	See temperature derating curves	-40		105	°C
Storage Humidity	Non-condensing	5		95	%RH
Storage Temperature		–55		125	°C
Soldering Resistance Temperature	Soldering spot is 1.5mm from case for 10s			+300	°C%
Cooling Test	EN60068-2-1				
Dry Heat	EN60068-2-2				
Damp Heat	EN60068-2-30				
Shock & Vibration Test	IEC/EN61373 - Category 1, Grade B				
Switching Frequency	PFM mode		170		kHz
MTBF	MIL-HDBK-217F@25°C	500000 h			
Case Material	Aluminum alloy case; Black plastic bottom, flame-retardant and heat-resistant (UL94 V-0)				
Dimensions	Without heatsink 60.8 × 39.2 × 12.7mm With heatsink 61.5 × 39.2 × 27.7mm Chasssis Mount (without heatsink) 135.0x 70.0x22.6mm DIN Rail (without heatsink) 137.00 x 70.00 x 28.10mm Chasssis Mount (with heatsink) 135.00x70.00x36.20mm DIN Rai (without heatsink) 137.00 x 70.00 x 41.70mm				
Weight	Without heatsink 88.0g (Typ.) With heatsink 119.0g (Typ.) Chasssis Mount (without heatsink) 164.0g (Typ.) DIN Rail (without heatsink) 237.0g (Typ.) Chasssis Mount (with heatsink) 200.0g (Typ.) DIN Rai (without heatsink) 268.0g (Typ.)				
Cooling Method	Free air convection or forced convection				

Input specifications

Item	Test condition	Min	Typ	Max	Units
Input current full load/no load (Nominal input voltage)	• 3.3VDC output • 24VDC output • 12, 15VDC output • 05, 48VDC output		595/10 758/10 767/10 775/10	609/20 775/20 784/20 793/20	mA mA mA mA
Reflected ripple current	Nominal input voltage		100		mA
Surge Voltage	1sec. max.	-0.7		180	VDC
Starting voltage				43	VDC
Under-voltage Protection			40		VDC
Input filter	Pi filter				
Hot plug	Unavailable				
Ctrl*	• Module on Ctrl pin open or pulled high (3.5-12VDC) • Module off Ctrl pin -Vin or pulled low (0-1.2VDC) • Input current when off		2	10	mA

Note: *The Ctrl pin voltage is referenced to input -Vin.

Output specifications

Item	Test condition	Min	Typ	Max	Units
Output voltage accuracy	Nominal input, 10%-100% load		±1	±3	%
Line regulation	Input voltage variation from low to high at full load • 3.3, 5VDC output • Others		 ±0.1	±0.5 ±0.3	% %
Load regulation	Nominal nput, 10%-100% load • 3.3, 5VDC output • Others		±0.5 ±0.3	±1.0 ±0.5	% %
Transient recovery Time	25% load step change		200	500	µs
Transient response deviation	25% load step change • 3.3, 5VDC output • Others		±6 ±3	±9 ±5	% %
Temperature Coefficient	Full load			±0.03	%/ °C
Ripple & Noise*	20MHz Bandwidth 10%-100% load • 48VDC output • Others		200 100	300 200	mVp-p mVp-p
Trim		90		110	%
Output voltage remote compensation	Sense			105	%
Over-temperature Protection	Out-case temperature		105	115	°C
Over voltage protection	Input voltage range • 3.3, 5VDC output • Others	110 110		160 140	%Vo %Vo
Over current protection	Input voltage range	110	140	190	%Io

*Ripple & Noise for 48VDC output at 0%Io-100%Io load ≤ 400mV, others outputs at 0%Io-100%Io load ≤ 300mV, the measuring method of ripple and noise, please refer to Fig. 1

Isolation specifications

Item	Test condition	Min	Typ	Max	Units
Isolation voltage	• input-output • input-case • output-case	3000 2100 1500			VAC VAC VDC
Isolation resistance	Input-output at 500VDC	1000			MΩ
Isolation capacitance	Input-output, 100KHz/0.1V		2200		pF

Example:
75QBRW4_11012S3
75W = 75 Watt; QBR = Quarter-Brick; W4 = Wide input (4:1);
110 = 43-160Vin; 12 = 12Vout; S = Single Output; 3 = 3kVDC Isolation

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EMC specifications			
Emissions	CE	CISPR32/EN55032 150KHz-30MHz Class B (see Fig. 3 for recommended circuit)	
Emissions	RE*	CISPR32/EN55032 30MHz-1GHz Class B (see Fig. 3 for recommended circuit)	
Immunity	ESD	IEC/EN61000-4-2 GB/T17626.2 Contact ±6KV, Air ±8KV	perf.Criteria A
Immunity	RS	IEC/EN61000-4-3 GB/T17626.3 20V/m	perf.Criteria A
Immunity	CS	IEC/EN61000-4-6 GB/T17626.6 10Vr.m.s	perf.Criteria A
Immunity	EFT	IEC/EN61000-4-4 GB/T17626.4 ±2KV (5KHz, 100KHz) (see Fig. 3 for recommended circuit)	perf.Criteria A
Immunity	Surge	IEC/EN61000-4-5 GB/T17626.5 line to line ±2KV (1.2µs/50µs 2Ω) (see Fig. 3 for recommended circuit)	perf.Criteria A

Note: *The standard only suit for series without heatsink

EMC specifications (EN50155)				
Emissions	CE	EN50121-3-2 150kHz-500kHz EN55016-2-1 500kHz-30MHz	99dBuV (see Fig. 2 for recommended circuit) 93dBuV (see Fig. 2 for recommended circuit)	
Emissions	RE	EN50121-3-2 30MHz-230MHz EN55016-2-1 230MHz-1GHz	40dBuV/m at 10m (see Fig. 2 for recommended circuit) 47dBuV/m at 10m (see Fig. 2 for recommended circuit)	
Immunity	ESD	EN50121-3-2 Contact	±6KV/Air ±8KV	perf. Criteria A
Immunity	RS	EN50121-3-2	20V/m	perf. Criteria A
Immunity	CS	EN50121-3-2 0.15MHz-80MHz	10V r.m.s	perf. Criteria A
Immunity	EFT	EN50121-3-2 ±2kV	5/50ns 5kHz (see Fig. 2 for recommended circuit)	perf. Criteria A
Immunity	Surge	EN50121-3-2	line to line ±1KV (42Ω, 0.5µF) (see Fig. 2 for recommended circuit)	perf. Criteria A
Immunity	CS	EN50121-3-2	0.15MHz-80MHz 10V r.m.s	perf. Criteria A

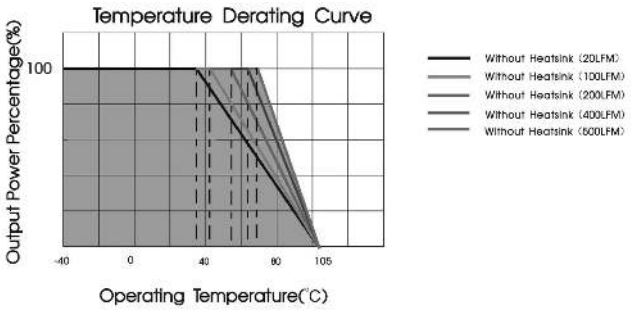
Product Selection Guide

Part Number	Input Voltage [VDC] Nominal	Range	Max*	Output Voltage [VDC]	Output Current [mA, Max./Min.]	Capacitive load [µF]	Efficiency [%, Min./Typ.]
75QBRW4_11003S3	110	43-160	170	3	17045/0	30000	84/86
75QBRW4_11005S3	110	43-160	170	5	15000/0	15000	86/88
75QBRW4_11012S3	110	43-160	170	12	6250/0	4500	87/89
75QBRW4_11015S3	110	43-160	170	15	5000/0	3600	87/89
75QBRW4_11024S3	110	43-160	170	24	3125/0	2250	89/91
75QBRW4_11048S3	110	43-160	170	48	1563/0	360	86/88

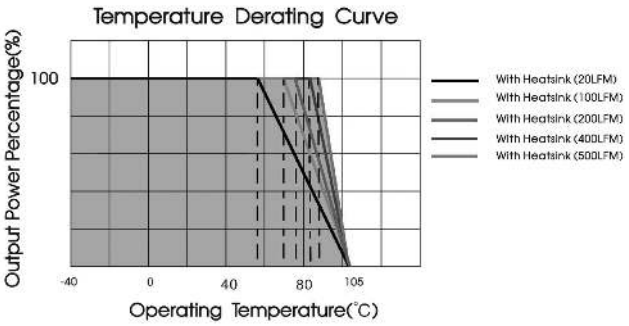
Use "/CM" suffix for chassis mounting and "/DR" suffix for DIN-Rail mounting i.e.: 75QBRW4_11048S3**/DR**.

Include suffix „H" for heatsink, for example: 75QBRW4_11012S**H**3
* Exceeding the maximum input voltage may cause permanent damage.

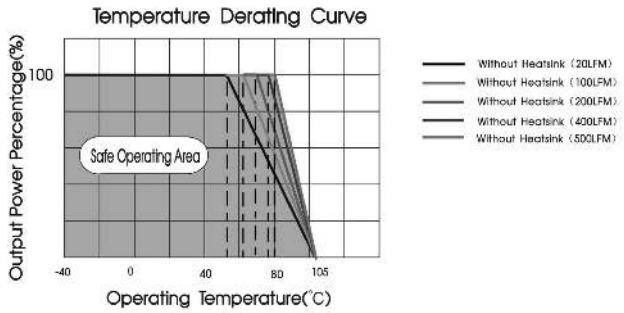
Typical Characteristic Curves



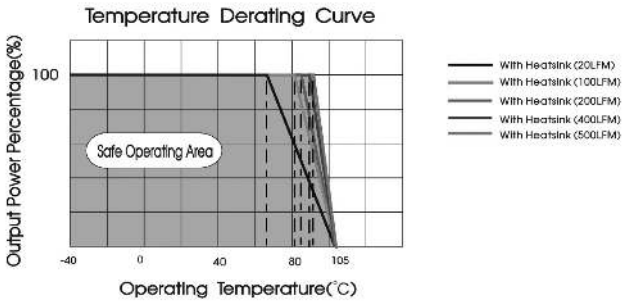
75QBRW4_11005S3 without heatsink - temperature derating curve (Vin=110V)



75QBRW4_11005S3 with heatsink - temperature derating curve (Vin=110V)



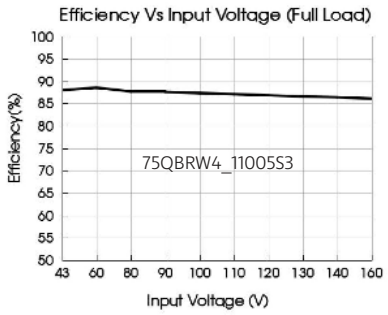
75QBRW4_110125S3 with heatsink - temperature derating curve (Vin=110V)

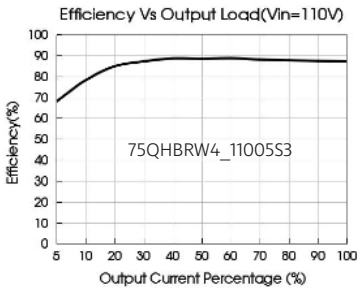


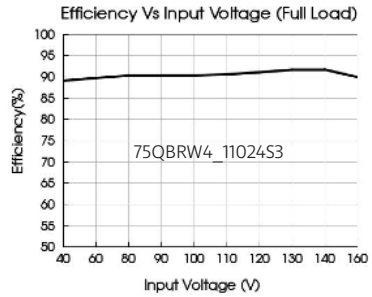
75QBRW4_11012S3 with heatsink - temperature derating curve (Vin=110V)

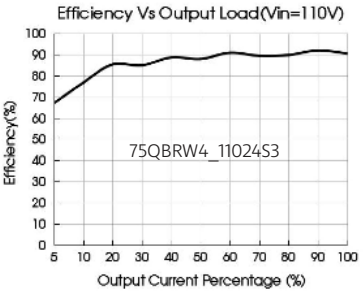
1. Temperature derating curves and efficiency curves are typical test values.
2. Temperature derating curve in accordance with our laboratory test conditions for testing, the actual use of environmental conditions if the customer is not consistent, to ensure that the product aluminum shell temperature does not exceed 100°C, can be used within any rated load range.

Efficiency





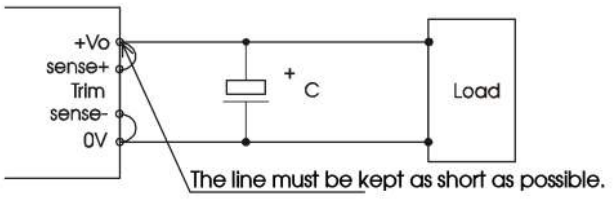




Remote Sense Application

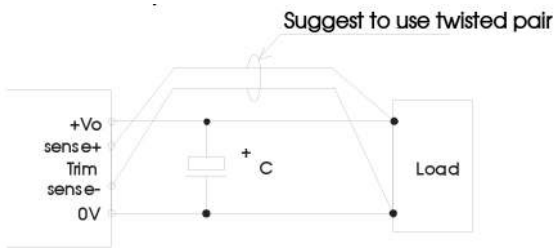
When remote sense is not used

(1) If the sense function is not used for remote regulation the user must connect the +Sense to + Vo and -Sense to 0V at the DC-DC converter pins and will compensate for voltage drop across pins only.
(2) The connections between Sense lines and their respective power lines must be kept as short as possible, otherwise they may be picking up noise, interference and/or causing unstable operation of the power module.



When remote sense is used

(1) Using remote sense with long wires may cause unstable output, please contact technical support if long wires must be used.
(2) PCB-tracks or cables/wires for Remote Sense must be kept as short as possible. Twisted pair or shielded wairs are suggested for remote compensation and must be kept as short as possible.
(3) We recommend using adequate cross section for PCB-track layout and/or cables to connect the power supply module to the load in order to keep the voltage drop below 0.3V and to make sure the power supply's output voltage remains within the specified range.
(4) Note that large wire impedance may cause oscillation of the output voltage and/or increased ripple. Consult technical support or factory for further advice of sense operation.



Ripple and noise

All the DC-DC converters of this series are tested before delivery using the recommended circuit shown in Fig. 1.

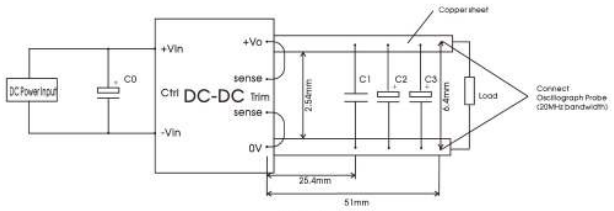


Fig.1

Output Voltage	C0(μF)	C1(μF)	C2(μF)	C3(μF)
3.3VDC	100	1	10	1000
5VDC				680
12VDC				220
15VDC				
24VDC				
48VDC				

Typical application

We recommended using EMC circuit, otherwise please ensure that at least a 100μF electrolytic capacitors is connected at the input in order to ensure adequate voltage surge suppression and protection.

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.

Output Voltage	Cin (μF)	Cout (μF)
3.3VDC	1000	100
5VDC	680	
12VDC	220	
15VDC		
24VDC		
48VDC		

EMC solution-module recommended circuit

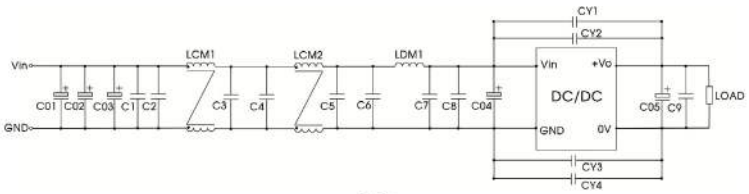


Fig.2

Components	Value
C01, C02, C03, C04	220uF/200V (electrolytic capacitor)
C05	220uF/63V (electrolytic capacitor)
LDM1	1.5uH (Shielded inductor)
C1, C2, C3, C4, C5, C6, C7, C8, C9	2.2uF/250V
CY1, CY2, CY3, CY4	2200 pF /400VAC (Y safety capacitor)
LCM1	FL2D-30-472
LCM2	FL2D-30-102

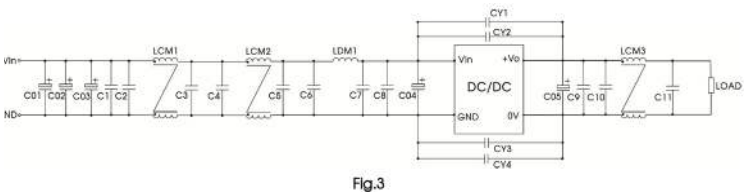
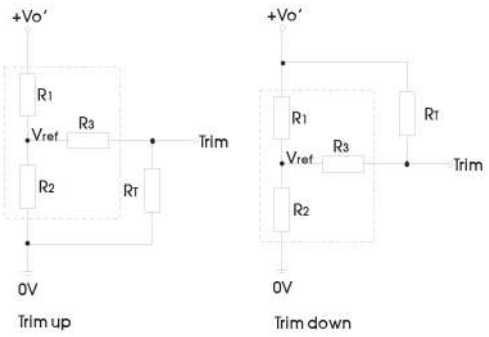


Fig.3

Components	Value
C01, C02, C03, C04	220uF/200V (electrolytic capacitor)
C05	220uF/63V (electrolytic capacitor)
LDM1	1.5uH (Shielded inductor)
C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11	2.2uF/250V
CY1, CY2, CY3, CY4	2200 pF /400VAC(Y safety capacitor)
LCM1	FL2D-30-472
LCM2	FL2D-30-102
LCM3	FL2D-70-360C (7A max.) FL2D-A3-360C (13A max.) FL2D-B5-360C (25A max.)

Trim

Trim Function for Output Voltage Adjustment (open if unused)



TRIM resistor connection (dashed line shows internal resistor network)

Trim resistor calculation:

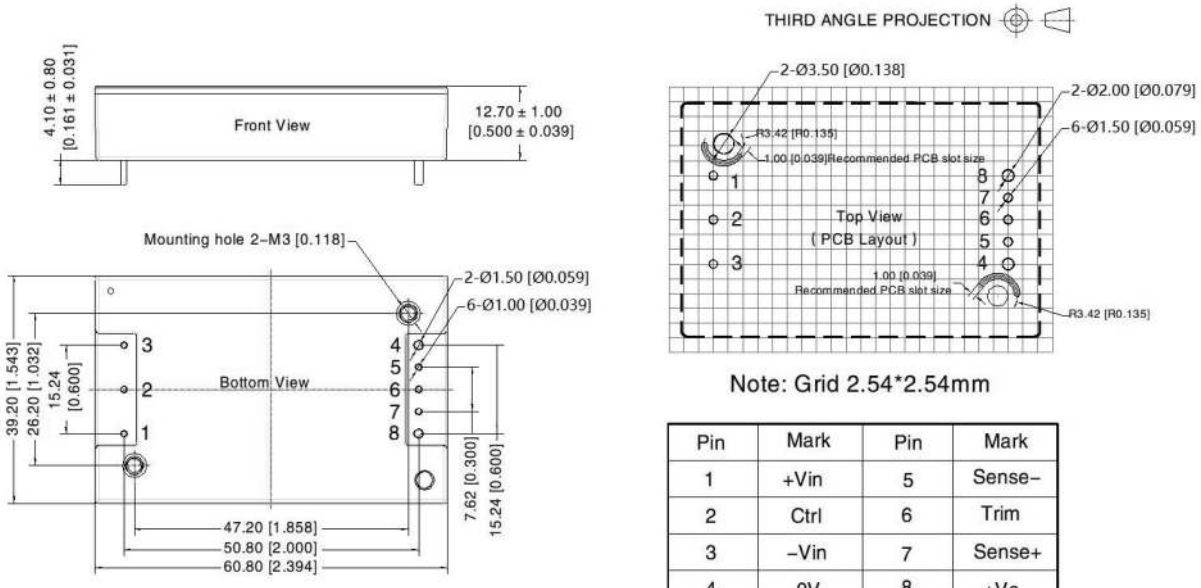
$$up:\ R_T = \frac{aR_2}{R_2 - a} - R_3 \qquad a = \frac{V_{ref}}{V_o' - V_{ref}} R_1$$

$$down:\ R_T = \frac{aR_1}{R_1 - a} - R_3 \qquad a = \frac{V_o' - V_{ref}}{V_{ref}} R_2$$

Note:
Value for R1, R2, R3, and Vref refer to the above table 1. RT: Resistance of Trim.
a: User-defined parameter, no actual meanings. Vo': The trim up/down voltage.

resistance	3.3(VDC)	5(VDC)	12(VDC)	15(VDC)	24(VDC)	48(VDC)
R1 (KΩ)	4.74	8.74	11	14.49	24.87	58.69
R2 (KΩ)	2.87	2.87	2.87	2.87	2.87	3.21
R3 (KΩ)	9.66	11	11	16	21	11
Vref (V)	1.24	1.24	2.5	2.5	2.5	2.5

Mechanical dimensions (without heatsink)

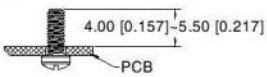


Note: Grid 2.54*2.54mm

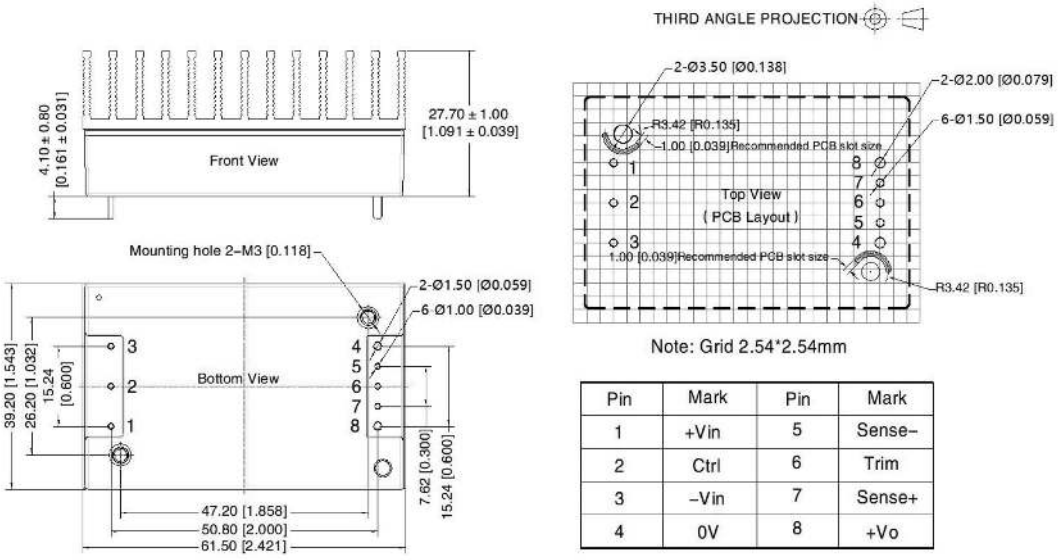
Pin	Mark	Pin	Mark
1	+Vin	5	Sense–
2	Ctrl	6	Trim
3	–Vin	7	Sense+
4	0V	8	+Vo

Note:
Unit: mm[inch]
Pin1, 2, 3, 5, 6, 7's diameter: 1.00[0.039]
Pin4, 8's diameter: 1.50[0.059]
Pin diameter tolerances: ± 0.10[± 0.004]
General tolerances: ± 0.50[± 0.020]
Mounting hole screwing torque: Max 0.4 N • m

Recommended screw length



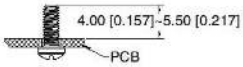
Mechanical dimensions (with heatsink)



Note: Grid 2.54*2.54mm

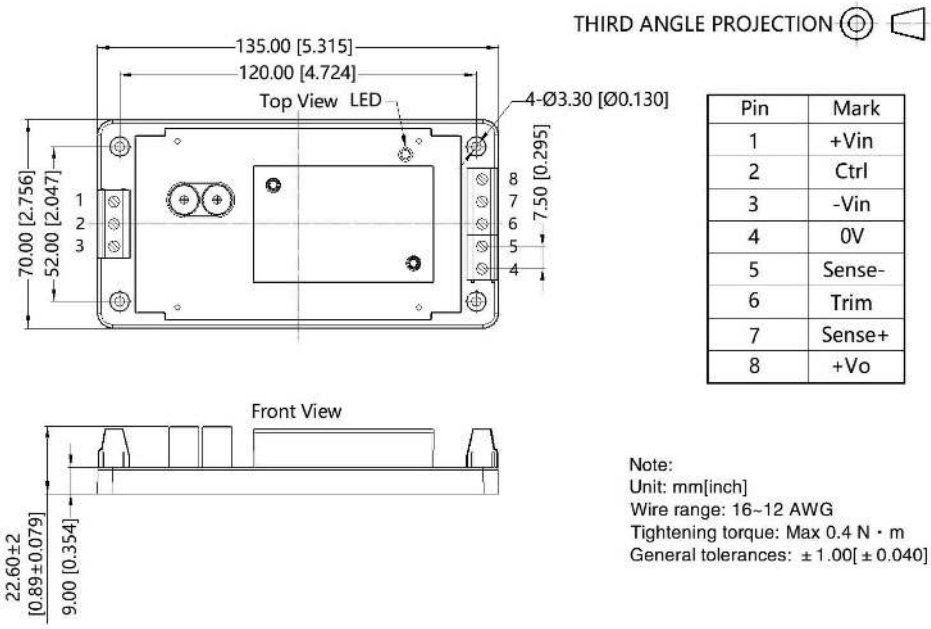
Pin	Mark	Pin	Mark
1	+Vin	5	Sense–
2	Ctrl	6	Trim
3	–Vin	7	Sense+
4	0V	8	+Vo

Recommended screw length



Note:
Unit: mm[inch]
Pin1, 2, 3, 5, 6, 7's diameter: 1.00[0.039]
Pin4, 8's diameter: 1.50[0.059]
Pin diameter tolerances: ± 0.10[± 0.004]
General tolerances: ± 0.50[± 0.020]
Mounting hole screwing torque: Max 0.4 N • m

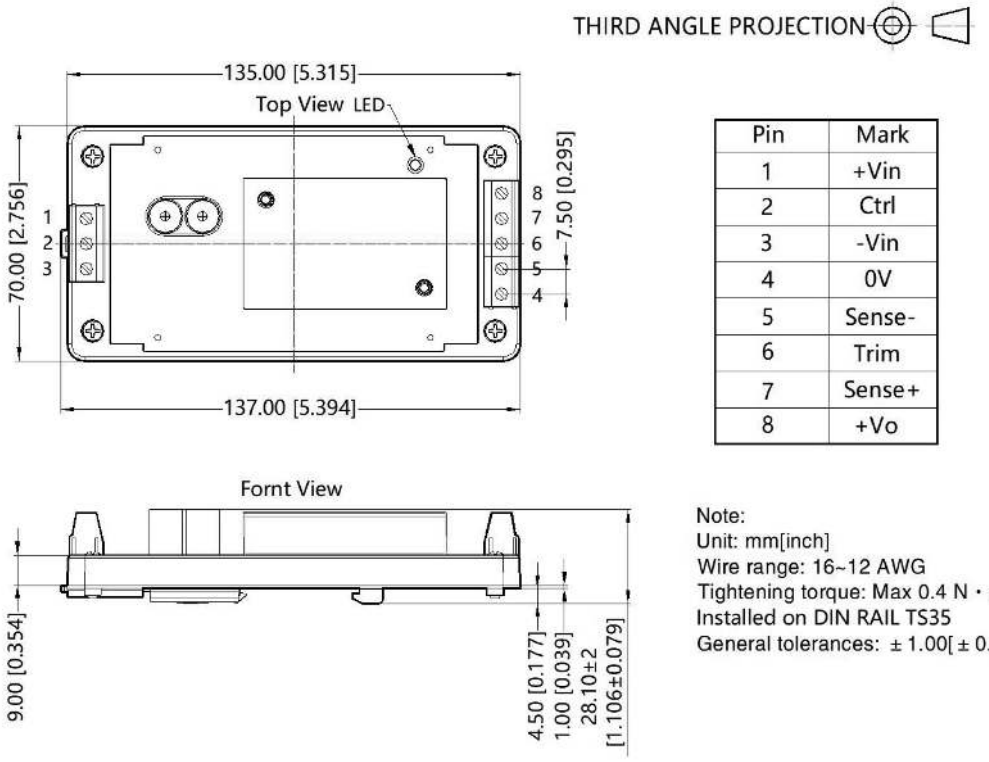
Mechanical dimensions (chasssis mount)



Pin	Mark
1	+Vin
2	Ctrl
3	-Vin
4	0V
5	Sense-
6	Trim
7	Sense+
8	+Vo

Note:
Unit: mm[inch]
Wire range: 16~12 AWG
Tightening torque: Max 0.4 N • m
General tolerances: ± 1.00[± 0.040]

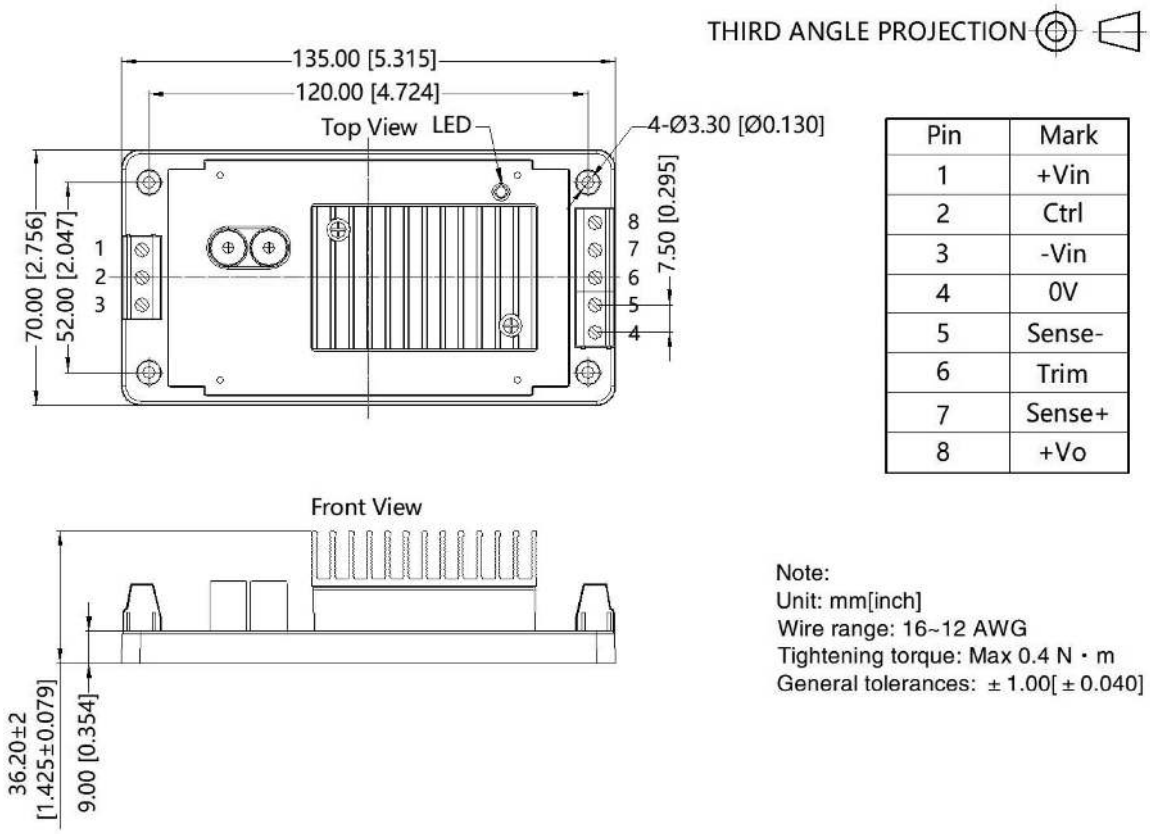
Mechanical dimensions (DIN rail)



Pin	Mark
1	+Vin
2	Ctrl
3	-Vin
4	0V
5	Sense-
6	Trim
7	Sense+
8	+Vo

Note:
Unit: mm[inch]
Wire range: 16~12 AWG
Tightening torque: Max 0.4 N・m
Installed on DIN RAIL TS35
General tolerances: ±1.00[±0.040]

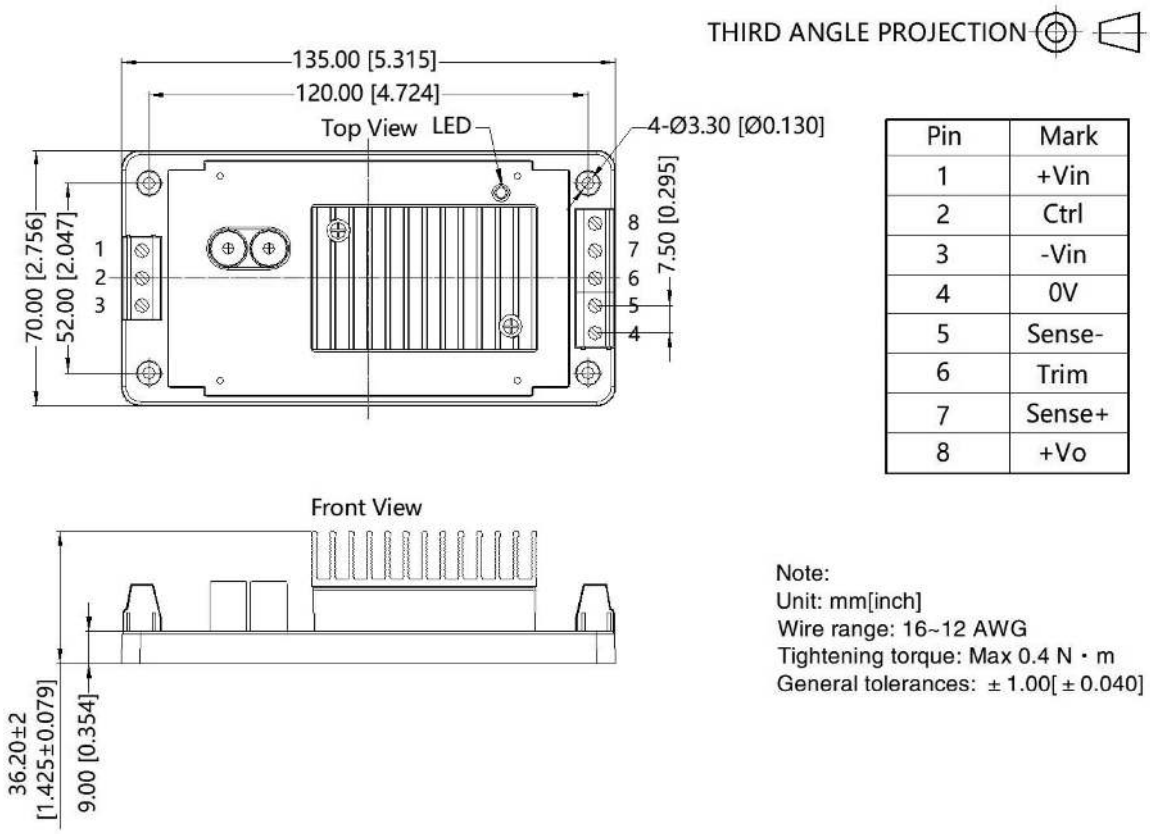
Mechanical dimensions (with heatsink & chasssis mount)



Pin	Mark
1	+Vin
2	Ctrl
3	-Vin
4	0V
5	Sense-
6	Trim
7	Sense+
8	+Vo

Note:
Unit: mm[inch]
Wire range: 16~12 AWG
Tightening torque: Max 0.4 N・m
General tolerances: ±1.00[±0.040]

Mechanical dimensions (with heatsink & DIN rail)



Pin	Mark
1	+Vin
2	Ctrl
3	-Vin
4	0V
5	Sense-
6	Trim
7	Sense+
8	+Vo

Note:
Unit: mm[inch]
Wire range: 16~12 AWG
Tightening torque: Max 0.4 N・m
General tolerances: ±1.00[±0.040]

Note:
1. Recommend to use module with more than 5% load, if not, the ripple of the product may exceeds the specification, but does not affect the reliability of the product;
2. The maximum capacitive load offered were tested at input voltage range and full load;
3. It is suggested to take our recommended circuit for EMC testing. If the customer needs to meet the performance of the surge and without taking recommended solution of ours, please make sure the residual voltage of surge less than 180V;
4. It is suggested that customers use enamel film or thermal grease between the heat sink and the module when using the heat sink to ensure good heat dissipation;
5. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta = 25°C, humidity <75%RH with nominal input voltage and rated output load;
6. All index testing methods in this datasheet are based on company corporate standards;
7. We can provide customized and matched filter modules. For details, please contact our technical staff;
8. Products are related to laws and regulations: see „Features" and „EMC";
9. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.
10. The products do not support parallel connection of their output.