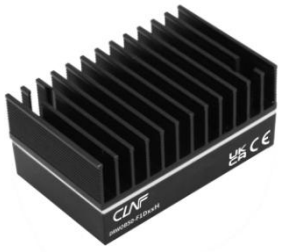
Descriptions

50W isolated，DC/DC Converter





RoHS

CE Report
EN 62368-1

UKCA Report
BS EN 62368-1

Features

- Ultra-wide input voltage range: 43-160VDC
- High efficiency up to 89%
- Low no-load power consumption
- Reinforced insulation, input - output isolation test voltage: 3k VAC, input - case isolation test voltage: 2.1k VAC
- Operating ambient temperature range: -40℃ to +105℃
- Input under-voltage protection, output short-circuit, over-current, over-voltage, over-temperature protection
- Industry standard 1/4 brick

Applications

- railway systems

Selection Guide

Certification	Part No.①	Input Voltage (VDC)		Output		Full Load Efficiency (%) Min./Typ.	Max. Capacitive Load(μF)
		Nominal (Range)	Max.②	Voltage (VDC)	Current (mA) Max./Min.		
EN/BS EN	DRWQB50-F1D03(H)	110 (43-160)	170	3.3	11364/0	84/86	20000
	DRWQB50-F1D05(H)			5	10000/0	85/87	10000
	DRWQB50-F1D12(H)			12	4167/0	86/88	3000
	DRWQB50-F1D15(H)			15	3333/0	86/88	2350
	DRWQB50-F1D24(H)			24	2083/0	87/89	1500
	DRWQB50-F1D48(H)			48	1041/0	85/87	240
--	DRWQB50-F1D03(H)E5(D6)③	110 (43-160)	170	3.3	11364/0	82/84	20000
	DRWQB50-F1D05(H)E5(D6)			5	10000/0	83/85	10000
	DRWQB50-F1D12(H)E5(D6)			12	4167/0	84/86	3000
	DRWQB50-F1D15(H)E5(D6)			15	3333/0	84/86	2350
	DRWQB50-F1D24(H)E5(D6)			24	2083/0	85/87	1500
EN/BS EN	DRWQB50-F1D24HD6						
--	DRWQB50-F1D48(H)E5(D6)			48	1041/0	83/85	240

Note:
①Use "H" suffix for heat sink mounting. We recommend to choose modules with a heat sink for enhanced heat dissipation and applications with extreme temperature requirements;
②Exceeding the maximum input voltage may cause permanent damage.
③Use "E5" suffix for chassis mounting and "D6" suffix for DIN-Rail mounting. The minimum input voltage range and the start-up voltage of the E5/D6 product model are 1VDC higher than the horizontal package;
④Efficiencies for E5 /D6 Model's is decreased by 2% due to the input reverse polarity protection function;
⑤Product images are for reference only; the actual product shall prevail.

Specifications

Product Specifications	Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Specifications	Input Current (full load / no-load)	Nominal input voltage	3.3VDC output	--	397/10	406/20	mA
			24VDC output	--	511/10	523/20	
			12VDC, 15VDC output	--	517/10	529/20	
			05VDC, 48VDC output	--	523/10	535/20	
	Reflected Ripple Current	Nominal input voltage		--	50	--	
	Surge Voltage (1sec. max.)			-0.7	--	180	VDC
	Start-up Voltage			--	--	43	
	Under-voltage Protection			--	40	--	
	Input Filter			Pi filter			
	Hot Plug			Unavailable			
	Ctrl①	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
Output Specifications	Voltage Accuracy	Nominal input voltage, 0%-100% load		--	±1	±3	%
	Linear Regulation	Input voltage variation from low to high at full load	3.3VDC, 5VDC output	--	--	±0.5	
			Others	--	±0.1	±0.3	
	Load Regulation	Nominal input voltage, 10%-100% load	3.3VDC, 5VDC output	--	±0.5	±1.0	
			Others	--	±0.3	±0.5	
	Transient Recovery Time	25% load step change		--	200	500	μs
	Transient Response Deviation		3.3VDC, 5VDC output	--	±6	±9	%
			Others	--	±3	±5	
	Temperature Coefficient	Full load		--	--	±0.03	%/℃
	Ripple & Noise ②	20MHz bandwidth, 10%Io-100%Io load	48VDC output	--	200	300	mVp-p
			Others	--	100	200	
	Trim			90	--	110	%
	Output Voltage Remote Compensation(sense)			--	--	105	
	Over-temperature Protection	Max. temperature		--	105	115	℃
	Over-voltage Protection	Input voltage range	3.3VDC, 5VDC output	110	--	160	%Vo
			Others	110	--	140	
	Over-current Protection	Input voltage range		110	140	190	%Io
	Short-circuit Protection			Hiccup, continuous, self-recovery			

General Specifications	Isolation	Input-output	Electric Strength test for 1 minute with a leakage current of 5mA max.	3000	--	--	VAC
		Input-case		2100	--	--	
		Output-case	Electric Strength test for 1 minute with a leakage current of 1mA max.	1500	--	--	VDC
	Insulation Resistance	Input-output resistance at 500VDC		1000	--	--	MΩ
	Isolation Capacitance	Input-output capacitance at 100KHz/0.1V		--	2200	--	pF
	Switching Frequency	PFM mode		--	170	--	kHz
	MTBF	MIL-HDBK-217F@25℃		500	--	--	khours
Environmental Specifications	Operating Temperature Range	See temperature derating curves		-40	--	+105	℃
	Storage Humidity	Non-condensing		5	--	95	%RH
	Storage Temperature			-55	--	+125	℃
	Pin Soldering Resistance Temperature③	Soldering spot is 1.5mm away from the case, 10 seconds max.		--	--	+300	
		Wave soldering, maximum 10 seconds		255	260	265	
	Cooling Test			EN60068-2-1			
	Dry Heat			EN60068-2-2			
	Damp Heat			EN60068-2-30			
	Shock and Vibration Test			IEC/EN61373 - Category 1, Grade B			
Mechanical Specifications	Case Material	Aluminum alloy case; Black plastic bottom, flame-retardant and heat-resistant (UL94 V-0)					
	Dimensions	DRWQB50-F1Dxx		60.80 × 39.20 × 12.70mm			
		DRWQB50-F1DxxH		61.50 × 39.20 × 27.70mm			
		DRWQB50-F1DxxE5		135.00 x 70.00 x 22.60mm			
		DRWQB50-F1DxxD6		137.00 x 70.00 x 28.10mm			
		DRWQB50-F1DxxHE5		135.00 x 70.00 x 36.20mm			
		DRWQB50-F1DxxHD6		137.00 x 70.00 x 41.70mm			
	Weight	DRWQB50-F1Dxx		88.0g(Typ.)			
		DRWQB50-F1DxxH		119.0g(Typ.)			
		DRWQB50-F1DxxE5		164.0g(Typ.)			
		DRWQB50-F1DxxD6		237.0g(Typ.)			
		DRWQB50-F1DxxHE5		200.0g(Typ.)			
		DRWQB50-F1DxxHD6		268.0g(Typ.)			
	Cooling Method	Free air convection or forced convection					

Note:
①The Ctrl pin voltage is referenced to input -Vin;
②Ripple & 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;
③The pin soldering temperature tolerance is not the actual temperature set by the soldering iron but the temperature required for proper solder joints. The actual temperature set by the customer should be determined comprehensively based on factors such as PCB thickness, copper coverage, soldering iron power, and soldering iron tip selection.

Electromagnetic Compatibility (EMC)

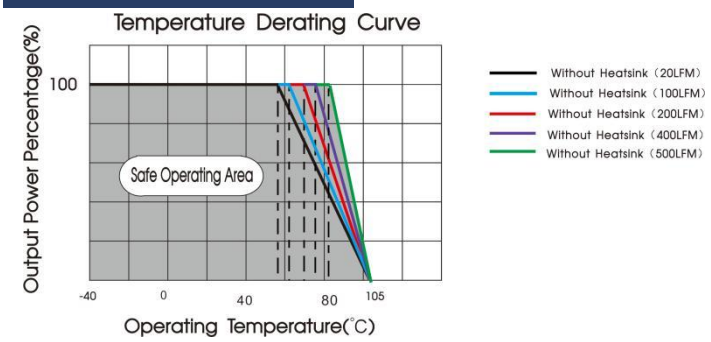
Emissions	CE	CISPR32/EN55032 150KHz-30MHz Class B (see Fig. 3 for recommended circuit)	
	RE*	CISPR32/EN55032 30MHz-1GHz Class B (see Fig. 3 for recommended circuit)	
Immunity	ESD	IEC/EN61000-4-2 GB/T17626.2 Contact ±6KV, Air ±8KV	perf.Criteria A
	RS	IEC/EN61000-4-3 GB/T17626.3 20V/m	perf.Criteria A
	CS	IEC/EN61000-4-6 GB/T17626.6 10Vr.m.s	perf.Criteria A
	EFT	IEC/EN61000-4-4 GB/T17626.4 ±2KV (5KHz, 100KHz) (see Fig. 3 for recommended circuit)	perf.Criteria A
	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 DRWQB50-F1Dxx series (without heatsink).

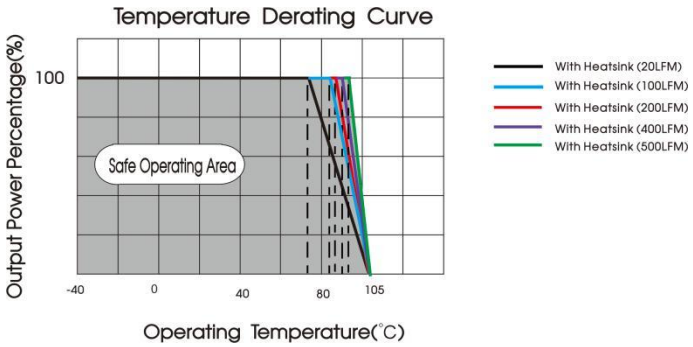
Electromagnetic Compatibility (EMC)（EN50155）

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

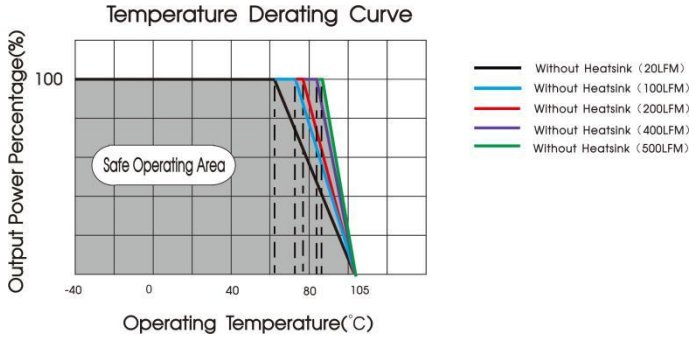
Characteristic Curve



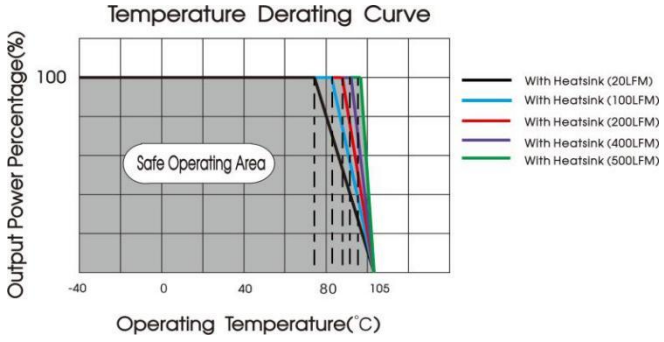
DRWQB50-F1D05 temperature derating curve（Vin=110V）



DRWQB50-F1D05H temperature derating curve（Vin=110V）



DRWQB50-F1D12 temperature derating curve（Vin=110V）

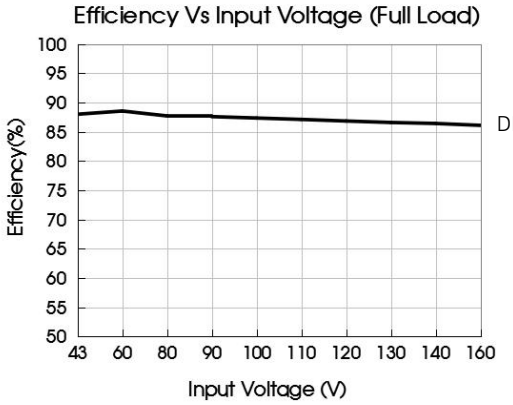


DRWQB50-F1D12H temperature derating curve（Vin=110V）

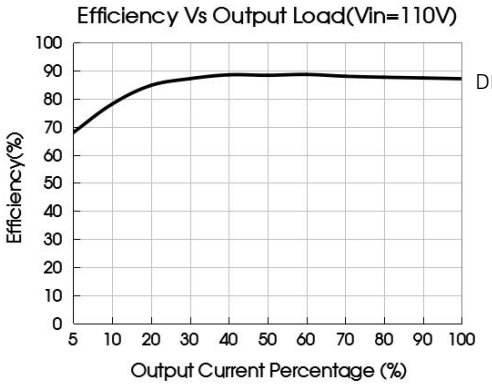
Notes:

1、Temperature derating curves and efficiency curves are typical test values.

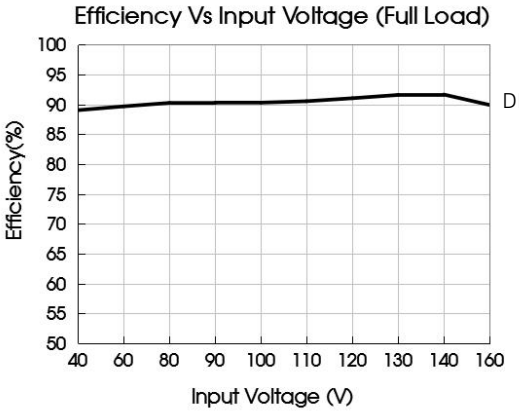
2、Temperature derating curve in accordance with our laboratory test conditions for testing, the actual use of environmental conditions if the customer is not consistent, to ensure that the product aluminum shell temperature does not exceed 100 ℃, can be used within any rated load range.



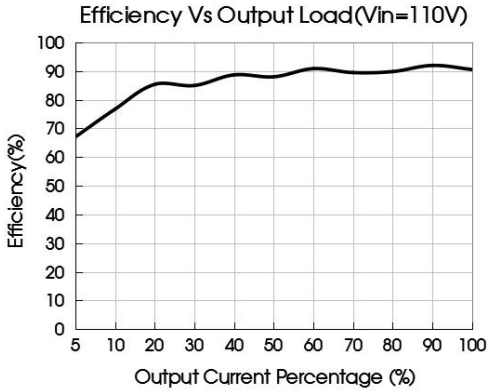
DRWQB50-F1D05



DRWQB50-F1D05



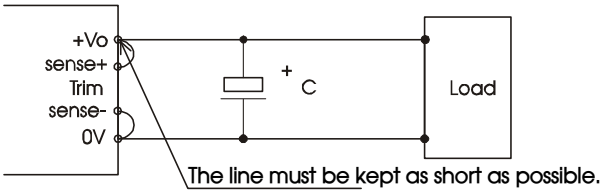
DRWQB50-F1D24



DRWQB50-F1D24

Remote Sense Application

1. Remote Sense Connection if not used

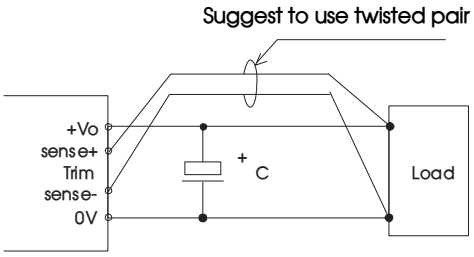


Notes:

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.

2. Remote Sense Connection used for Compensation



Notes:

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.

Design Reference

1. Ripple & Noise

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

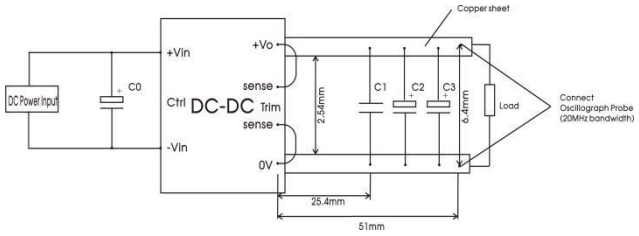


Fig.1

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

2. Typical application

①We 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.

②Input 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.



Capacitors value / Output voltage	Cout(μF)	Cin(μF)
3.3VDC	1000	100
5VDC	680	
12VDC	220	
15VDC		
24VDC		
48VDC		

3. EMC compliance recommended circuit

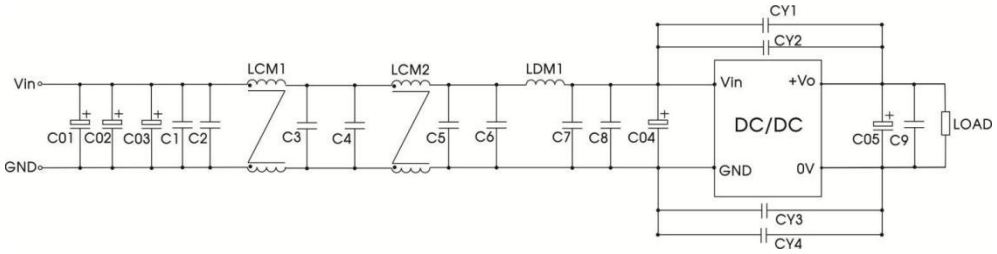


Fig.2

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	4700μH*2, 3A
LCM2	1000μH*2, 3A

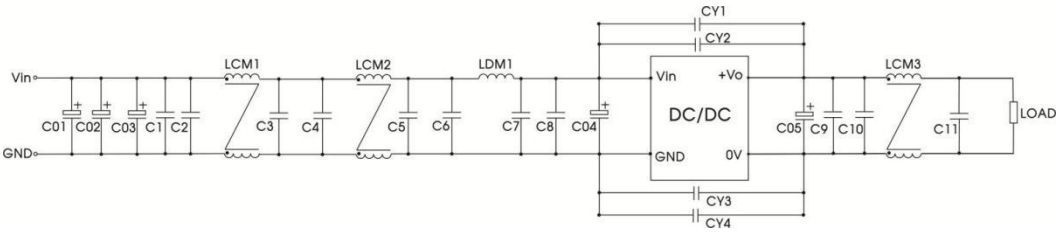
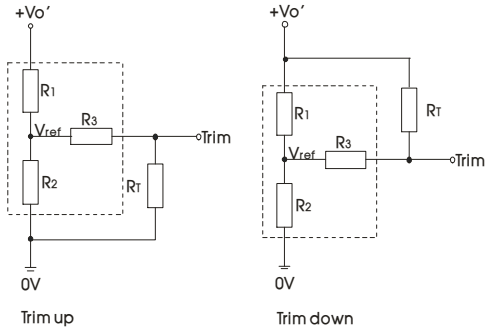


Fig.3

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	4700μH*2 , 3A
LCM2	1000μH*2 , 3A
LCM3	36μH*2, 7A
	36μH*2, 13A
	36μH*2, 25A

4. Trim Function for Output Voltage Adjustment (open if unused)



TRIM resistor connection (dashed line shows internal resistor network)

Trim resistor calculation:

$$\text{up: } R_T = \frac{aR_2}{R_2 - a} - R_3 \qquad a = \frac{Vref}{Vo' - Vref} \cdot R_1$$

$$\text{down: } R_T = \frac{aR_1}{R_1 - a} - R_3 \qquad a = \frac{Vo' - Vref}{Vref} \cdot R_2$$

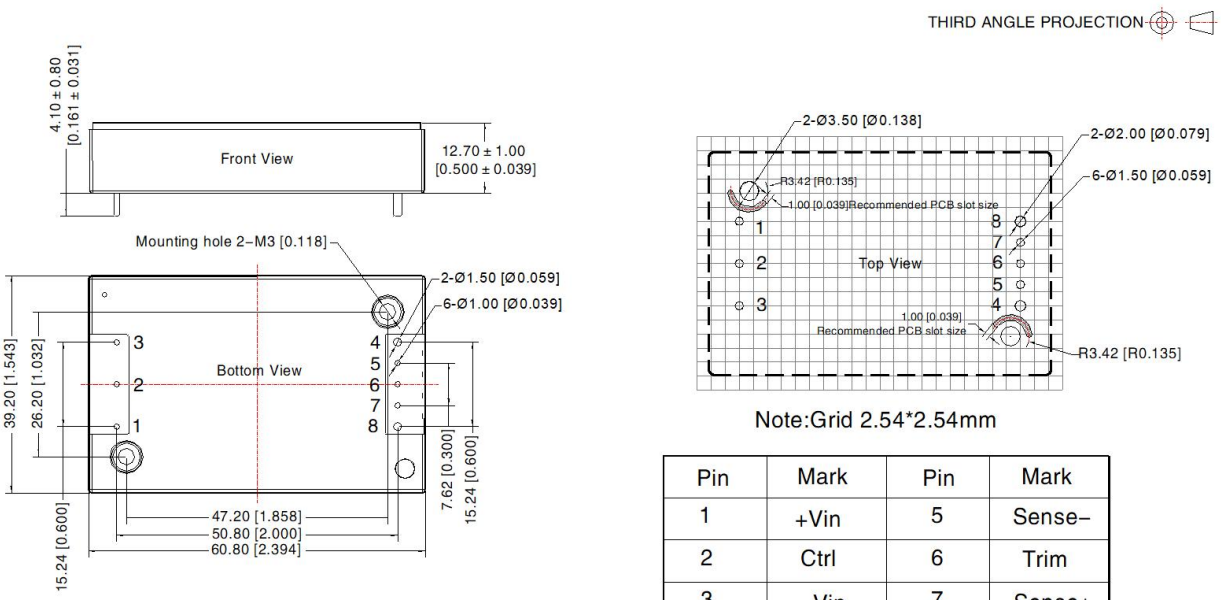
table 1

Vo / 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	58.7
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)	1.25	1.25	2.5	2.5	2.5	2.5

Note: For R1, R2, R3 and Vref values refer to table 1. RT = Trim Resistor value; a = self-defined parameter Vo'= desired output voltage

5. The products do not support parallel connection of their output

DRWQB50-F1Dxx (without heatsink) Dimension and Recommended Layout

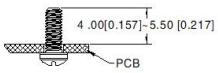


Note:Grid 2.54*2.54mm

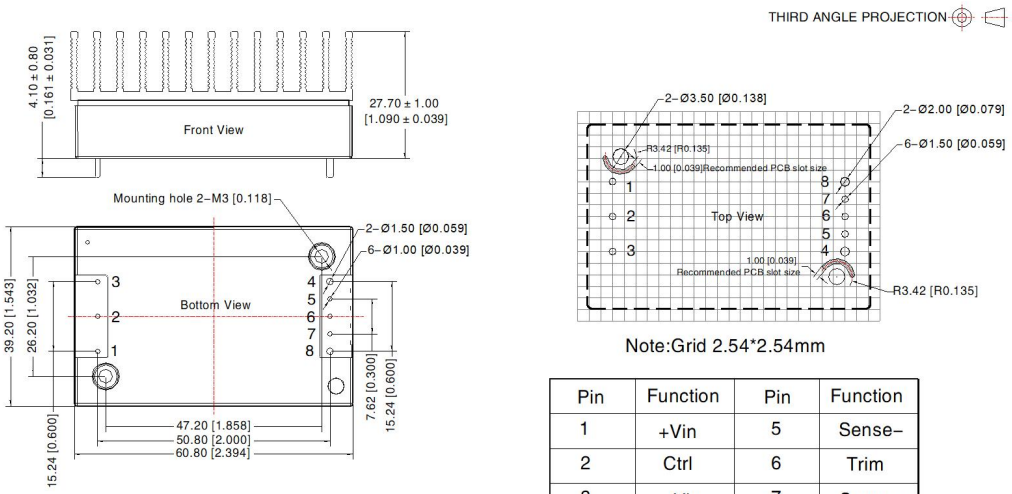
Pin	Mark	Pin	Mark
1	+Vin	5	Sense−
2	Ctrl	6	Trim
3	−Vin	7	Sense+
4	0V	8	+Vo

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



DRWQB50-F1DxxH (with heatsink) Dimension and Recommended Layout

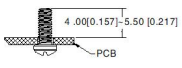


Note:Grid 2.54*2.54mm

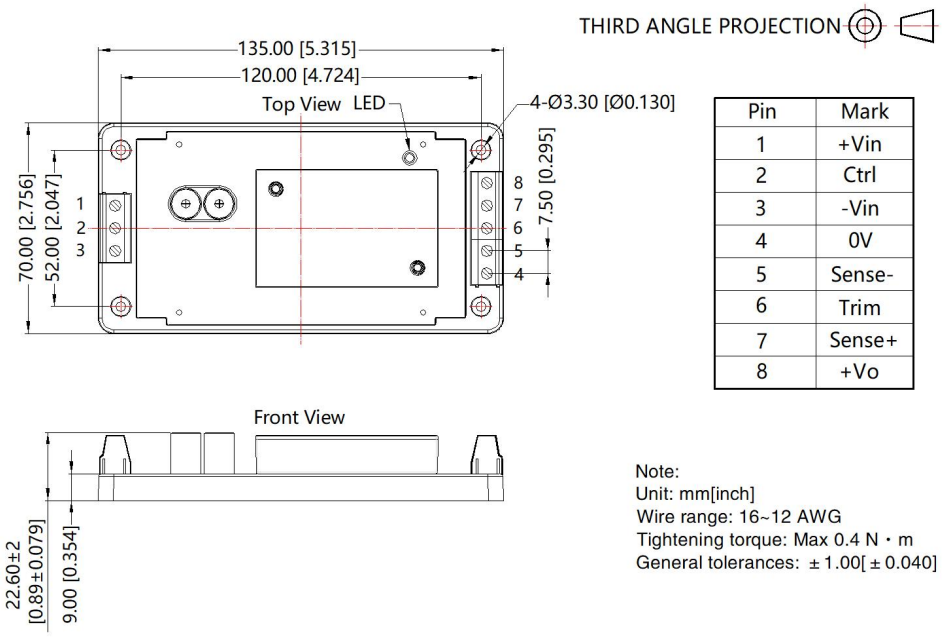
Pin	Function	Pin	Function
1	+Vin	5	Sense−
2	Ctrl	6	Trim
3	−Vin	7	Sense+
4	0V	8	+Vo

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



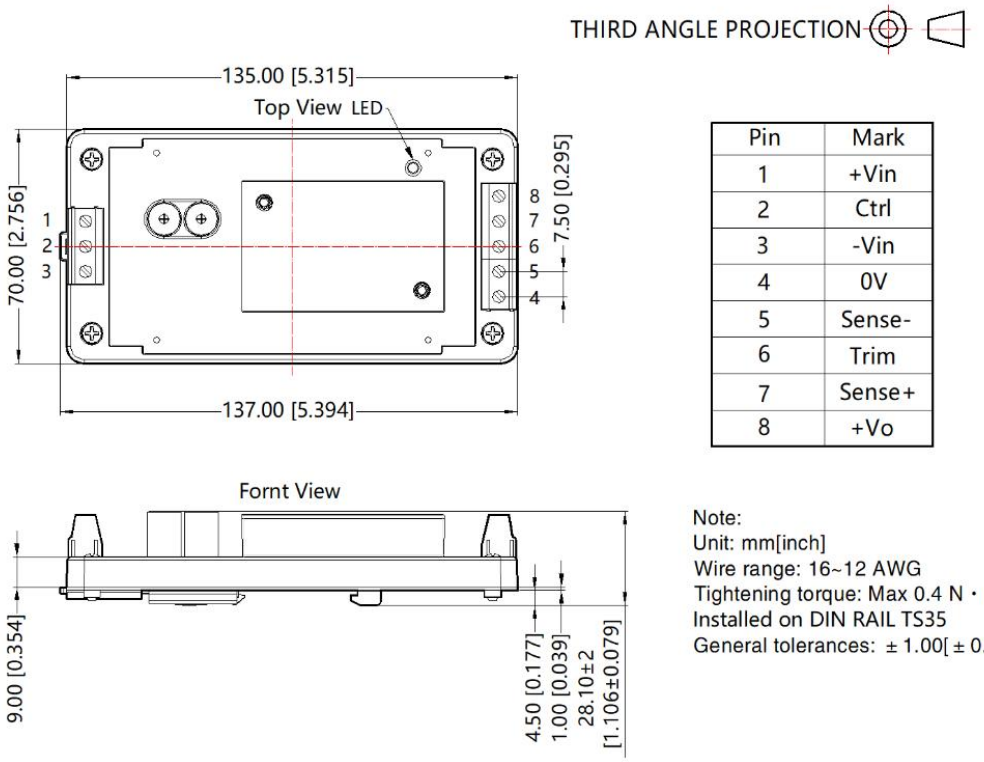
DRWQB50-F1DxxE5 (without heatsink) Dimension



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]

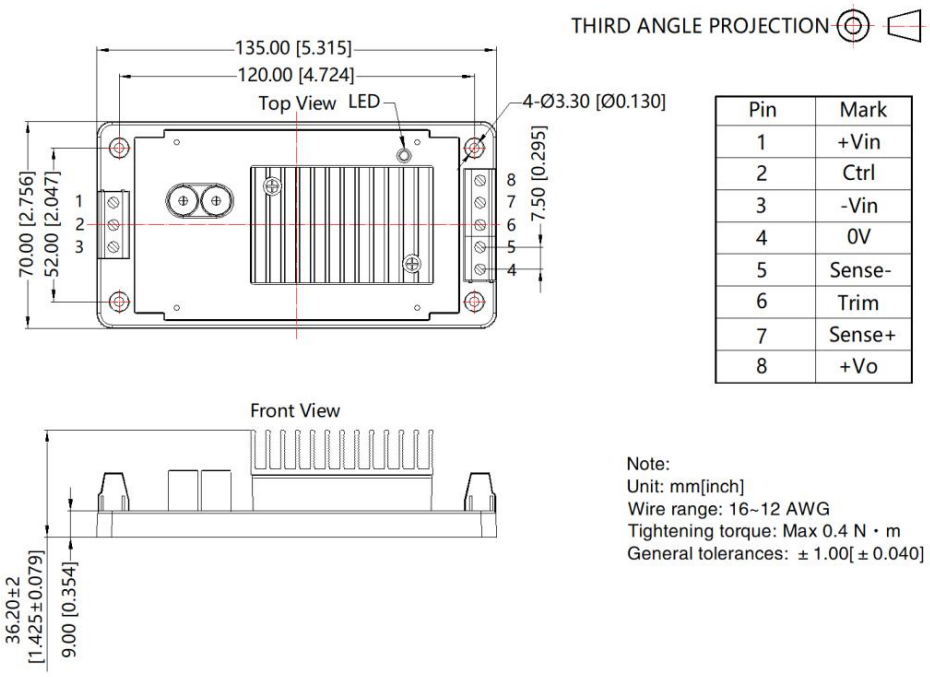
DRWQB50-F1DxxD6 (without heatsink) Dimension



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]

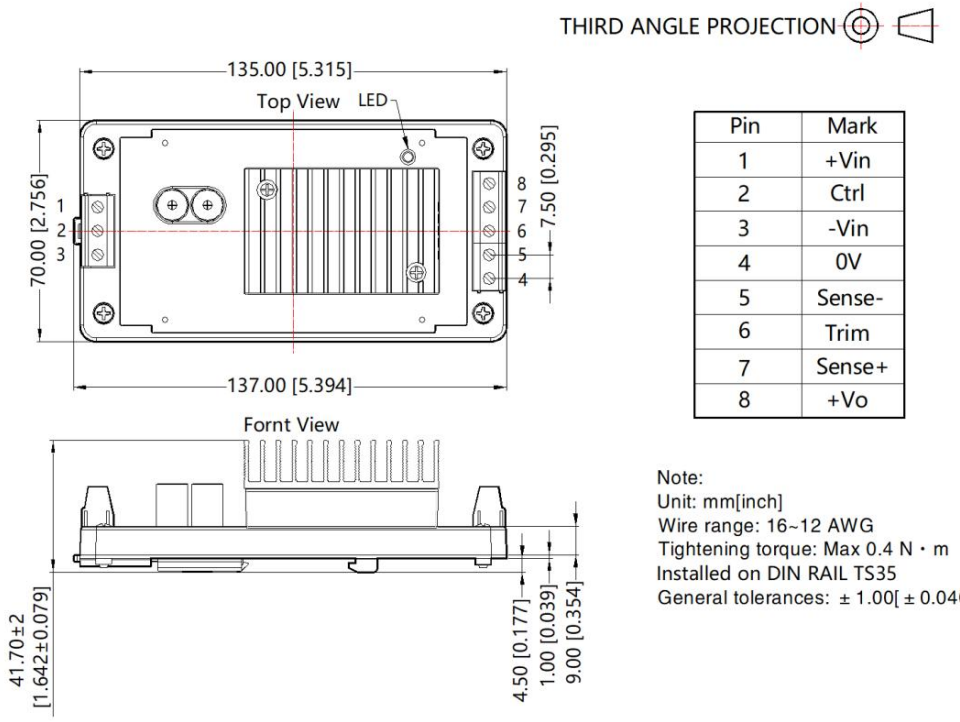
DRWQB50-F1DxxHE5 (with heatsink)Dimension



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]

DRWQB50-F1DxxHD6 (with heatsink)Dimension



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]

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, data in this datasheet should be tested under the conditions of Ta=25℃, humidity<75%RH with nominal input voltage and rated load;
6. All index testing methods in this datasheet are based on company corporate standards;
7. We provide product customization service and match filter module, please directly contact our technicians for specific information;
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 image certification marks are for reference only; please refer to the selection table for actual specifications. Certification is based on the physical mark or packaging label.