RHENXV
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DC - DC CONVERTERS

150 WATTS

DCWF1D_HB-150W

FEATURES

- Ultra-wide input voltage range: 43 -160VDC
- Operating ambient temperature range -40°C to +105°C
- Reinforced insulation, I/O isolation test voltage 3k VAC
- High efficiency up to 90%
- Input under-voltage protection, output over-voltage, over-current, short-circuit protection, over-temperature protection

Applications

- Railways

MODEL NUMBERING

DCWF1DxxHB-150W

- Series Name
- Wide Input
- Output Voltage
- Rated Wattage
- Packaging Form

SELECTION GUIDE

Product Model	Input Voltage Range (Nominal)	(Range)	Output Voltage (Vdc)	Output Current (mA) (Max./Min.)	Efficiency % (Min./Typ.)	Maximum Capacative load (μF)
DCWF1D05HB-150W	110	43-160	5	19200/0	86/88	26400
						3300
DCWF1D12HB-150W		43-66	12	10000/0	87/89	10000
		66-160		12500/0		12500
DCWF1D15HB-150W		43-66	15	8000/0	87/89	5400
		66-160		10000/0		6800
DCWF1D24HB-150W		43-66	24	4375/0	87/89	3080
		66-160		6250/0		4400
DCWF1D48HB-150W		43-66	48	2496/0	86/88	800
		66-160		3120/0		1000

Note: Use suffix “H” for heatsink, use suffix “ST” for screw terminal, suffix “DR’ for DIN-Rail

INPUT CHARACTERISTICS

Parameter	Operating Conditions		Min.	Typ.	Max.	Units
Input Current (full load / no-load)	Nominal input voltage	5V Output	--	1240/25	1586/45	mA
		12/15V Output	--	1533/25	1568/45	mA
		24V Output	--	1516/25	1550/4	mA
		48V Output	--	1548/25	1584/25	mA
Reflected Ripple Current	Nominal input voltage		--	100	--	mA
Input impulse voltage	1sec. max.		-0.7	--	180	VDC
Starting voltage			--	--	43	VDC
Under-voltage protection			--	40	--	VDC
Input Filter			Capacitance filter			
Remote control foot (Ctrl*)	Module on		Ctrl pin open or pulled high(3.5-12VDC)			
	Module off		Ctrl pin pulled low to GND (0-1.2VDC)			
	Input current when off		--	2	8	mA

Note: *The Ctrl pin voltage is referenced to input GND. Remarks: This product does not support hot plug

OUTPUT CHARACTERISTICS

Parameter	Operating Conditions		Min.	Typ.	Max.	Units
Output Voltage Accuracy	0%-100% load		--	±1	±3	%
Line regulation rate	Input voltage variation from low to high at full load		--	±0.1	±0.3	%
Load Regulation rate	0%-100% load		--	±0.3	±0.5	%
Dynamic response recovery time	25% load step change, nominal input voltage		--	200	500	μs
Dynamic response step deviation	25% load step change, input voltage range	5V Output	--	--	±10	%
		Others	--	±3	±5	%
Temperature drift coefficient	Full load		--	--	±0.03	%/°C
Ripple & Noise *	20MHz bandwidth, nominal input voltage, 0%-100% load	48 Output	--	200	200	mVp-p
		Others		100	200	

Parameter	Operating Conditions		Min.	Typ.	Max.	Units
Trim			90	--	110	%Vo
Sense			--	--	105	
Over-Temperature Protection	Max. Case Temperature		--	105	115	°C
Over-Voltage Protection	Input Voltage Range	5V Output	110	--	160	%Vo
		Others	110	--	140	
Over-Current Protection	Input Voltage Range		110	140	190	%Io
Shot-Circuit Protection			Continuous, self-recovery			

GENERAL CHARACTERISTIC

Parameter	Operating Conditions		Min.	Typ.	Max.	Units
Isolation voltage	Input-output Electric Strength Test for 1 minute with a leakage current of 1mA max.		3000	--	--	VAC
			2100	--	--	VDC
	Input/output-case Electric Strength Test for 1 minute with a leakage current of 1mA max.		1500	--	--	
Insulation Resistance	Input-output resistance at 500VDC		1000	--	--	MΩ
Isolation Capacitance	Input-output capacitance at 100KHz/0.1V		--	2200	--	pF
Working temperature	See Fig. 1		-40	--	+105	°C
Storage Humidity	Without condensation		5	--	95	%RH
Storage Temperature			-55	--	+125	°C
Soldering temperature resistance of pins	Soldering spot is 1.5mm away from case for 10 seconds		--	--	300	°C
Thermal Resistance	DCWF1D05HB-150W	100LFM	4.3	--	--	°C/W
	DCWF1D12HB-150W	200LFM	2.8	--	--	
	DCWF1D15HB-150W					
	DCWF1D24HB-150W					
	DCWF1D48HB-150W					

Parameter	Operating Conditions		Min.	Typ.	Max.	Units
Thermal Resistance	DCWF1D05HB-150W	Natural Convection	3.5	--	--	°C/W
		100LFM	3.5	--	--	
	DCWF1D12HB-150W	Natural Convection	3.4	--	--	
	DCWF1D24HB-150W	100LFM	3.4	--	--	
	DCWF1D48HB-150W		2.8	--	--	
Vibration			IEC/EN 61373 - Category 1, Grade B			
Switching Frequency *	PWM mode		--	170	--	KHz
MTBF	MIL-HDBK-217F@25°C		500	--	--	Khours

Note: *Switching frequency is measured at full load. The module reduces the switching frequency for light load (below 50%) efficiency improvement.

EMC CHARACTERISTICS

	Parameter	Category	Content	
EMI	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)	
EMC	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
	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
	CS	IEC/EN61000-4-6	GB/T17626.2 Contact ±6KV, Air ±8KV	perf. Criteria A

EMC CHARACTERISTICS (EN50155)

	Parameter	Category	Content	
EMI	CE	EN50121-3-2 EN55016-2-1	150kHz-500kHz 99dBuV (see Fig.2 for recommended circuit) 500kHz-30MHz 93dBuV (see Fig.2 for recommended circuit)	
	RE	EN50121-3-2 EN55016-2-1	30MHz-230MHz 40dBuV/m at 10m (see Fig.2 for recommended circuit) 230MHz-1GHz 47dBuV/m at10m(see Fig.2 for recommended circuit)	
EMC	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.2for recommended circuit)	perf. Criteria A
	CS	EN50121-3-2	0.15MHz-80MHz10Vr.m.s	perf. Criteria A

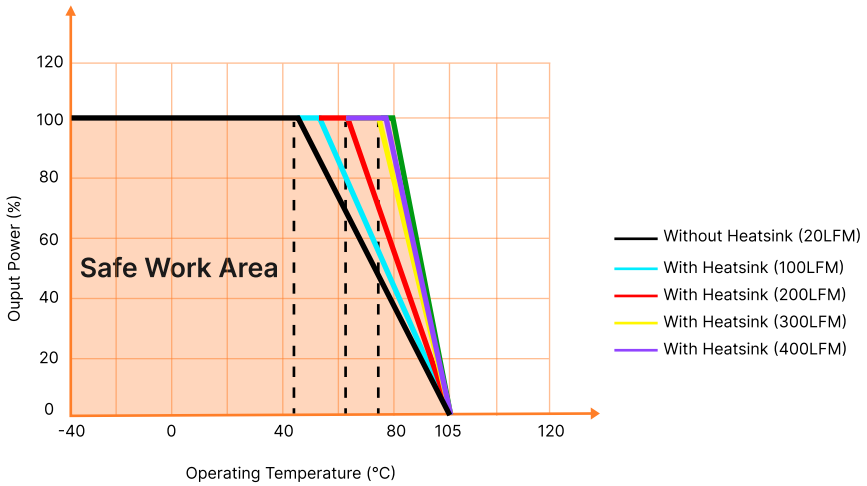
PHYSICAL CHARACTERISTICS

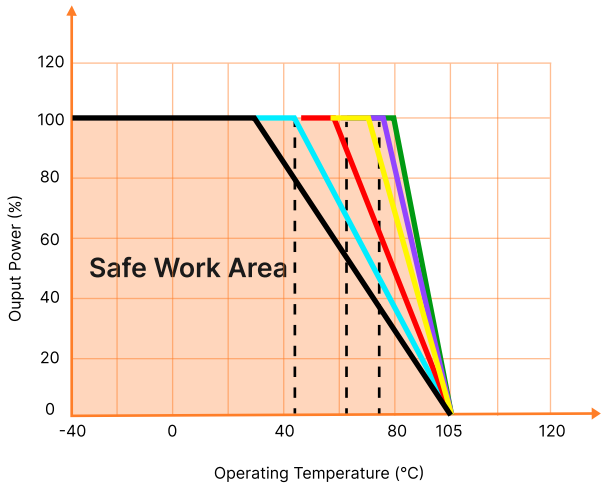
Parameter	Conditions		
Case Material	Aluminum alloy		
Dimensions	Without heat sink	Horizontal package	61.00 × 58.00 × 13.80mm
	With heat sink	Horizontal package	62.00 × 58.00 × 31.80mm
		Screw Terminal (ST)	135.00 × 70.00 × 40.40mm
		DIN Rail (DR)	135.00 × 70.00 × 44.90mm
Weight	Without heat sink	Horizontal package	139g (Typ.)
	With heat sink	Horizontal package	194g (Typ.)
		Screw Terminal (ST)	274g (Typ.)
		DIN Rail (DR)	365g (Typ.)
Cooling Method	Free air convection (20LFM) or forced air convection		

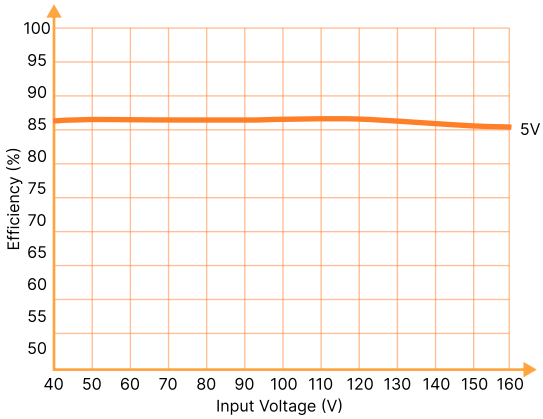
NOTE

1. If the product works under the minimum required load, it cannot guarantee that the performance of the product complies with all the performance indicators in this manual;
2. The maximum capacitive load is tested under the input voltage range and full load condition;
3. Unless otherwise stated, all indexes in this manual are measured at Ta=25°C, humidity <75%RH, nominal input voltage and rated output load;
4. All index testing methods in this manual are based on the enterprise standards of the company;
5. Our company can provide product customization, specific needs can directly contact our technical staff;

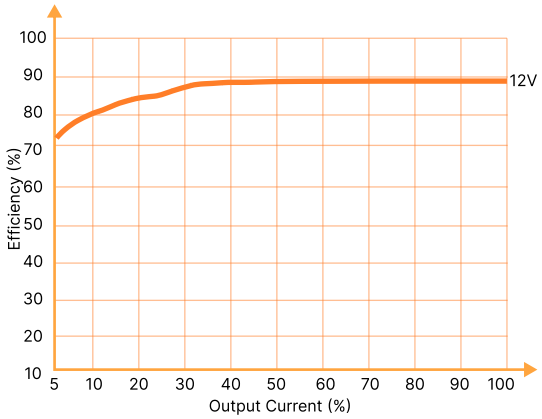
PRODUCT CHARACTERISTIC CURVE



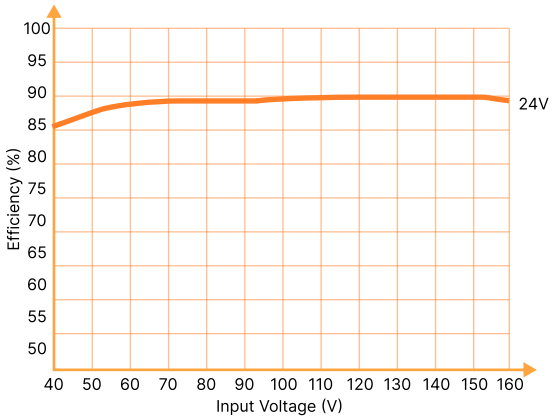




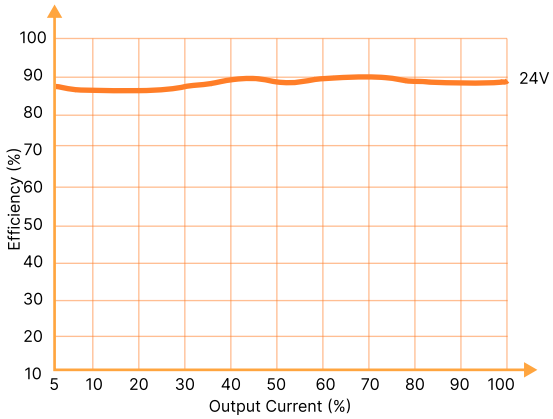
Efficiency Vs Input Voltage (Full Load)



Efficiency Vs Output Load (Vin=110V)



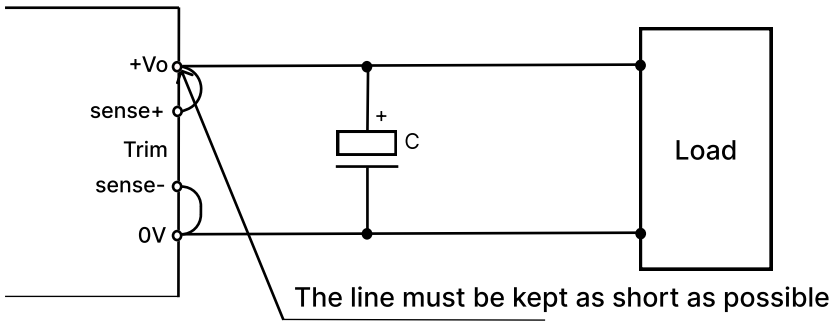
Efficiency Vs Input Voltage (Full Load)



Efficiency Vs Output Load (Vin=110V)

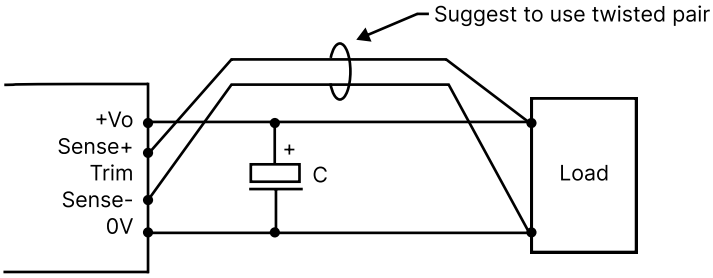
CIRCUIT DESIGN AND APPLICATION

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 wires 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.

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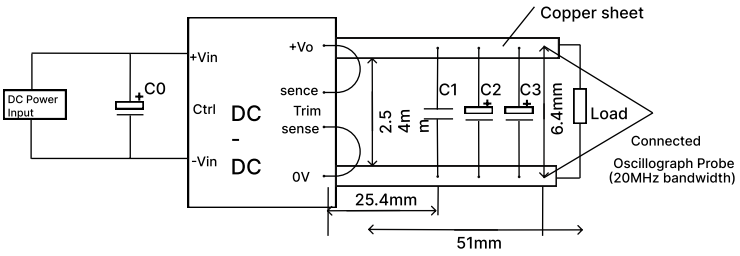
1. Ripple & noise

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



Capacitors Output Voltage Value	C0(μF)	C1(μF)	C1(μF)	C1(μF)
5VDC	100μF/ 200V	1μF/16V	10μF/16V	330μF/16V
12VDC		1μF/25V	10μF/25V	330μF/25V
15VDC		1μF/25V	10μF/25V	330μF/25V
24VDC		1μF/50V	10μF/50V	330μF/50V
48VDC		1μF/100V	10μF/100V	330μF/100V

2. 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.

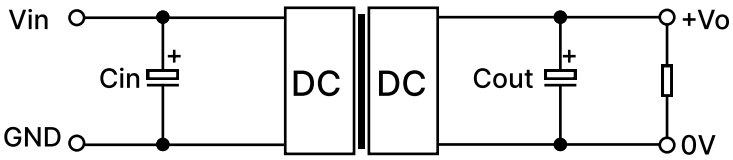
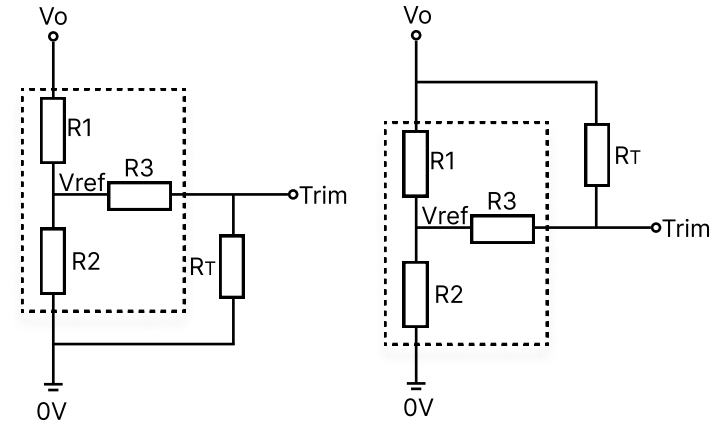


Figure 2: Application circuit

Capacitors Output Voltage Value	Cin(μF)	Cout(μF)
5VDC	100μF/ 200V	330μF/16V
12VDC		330μF/25V
15VDC		330μF/25V
24VDC		330μF/50V
48VDC		330μF/100V

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



TRIM resistor connection (dashed line shows internal resistor network)

The Calculation formula for trip resistance

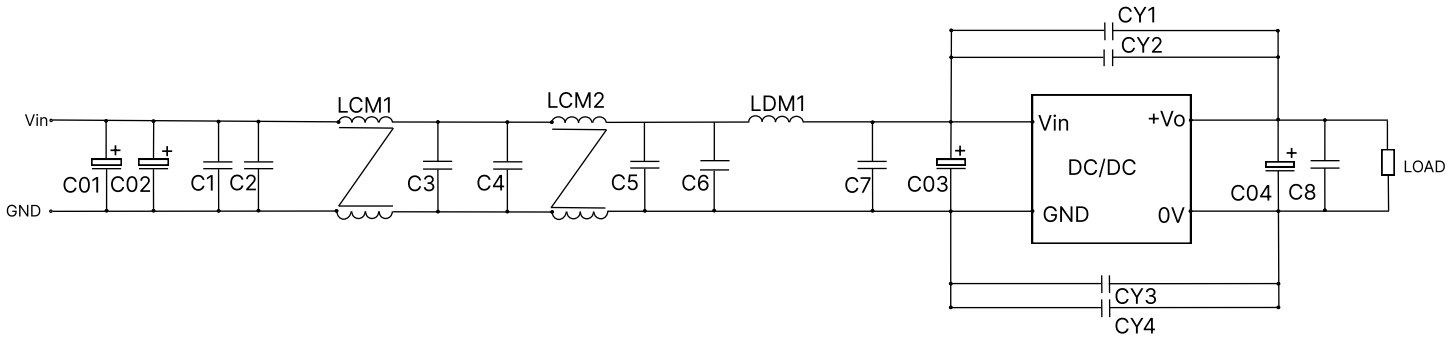
Trim up: $R_T = \frac{aR_2}{R_2-a} - R_3$ $\quad a = \frac{Vref}{Vo'-Vref} R_1$

Trim down: $R_T = \frac{aR_1}{R_1-a} - R_3$ $\quad a = \frac{Vo'-Vref}{Vref} R_2$

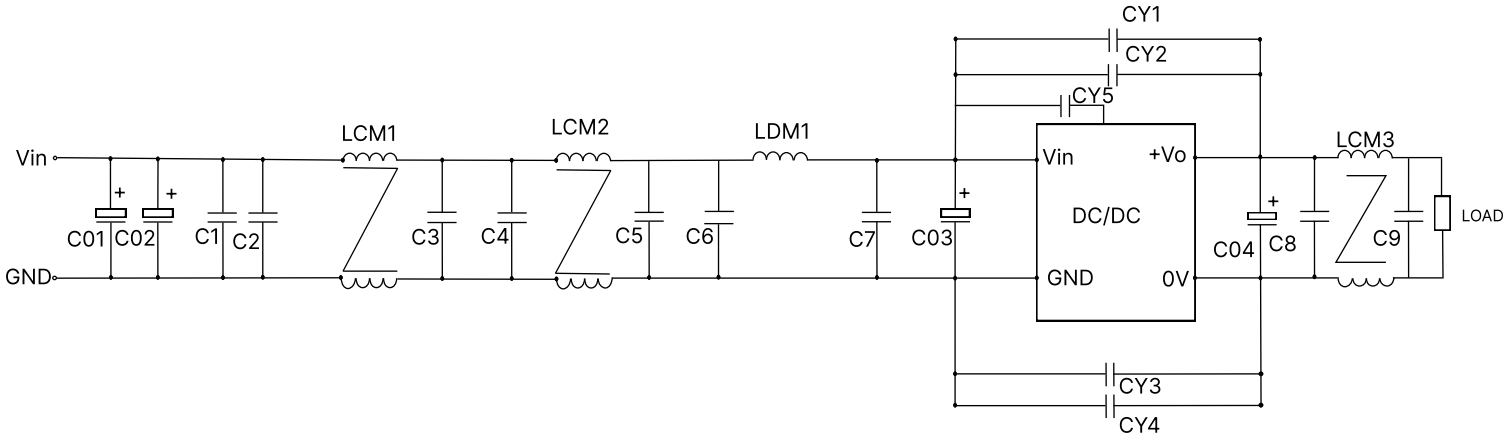
R_T is Trim resistance
a is a self-defined parameter, with no real meaning.

Vout(V)	R1(KΩ)	R2(KΩ)	R3(KΩ)	Vref(V)
5	2.87	2.87	4	2.5
12	11	2.87	11	2.5
15	14.99	2.87	16	2.5
24	27.87	2.87	21	2.5
48	58.69	3.21	2.5	2.5

4. EMC compliance circuit



Components	Value
C01, C02, C03	220uF/200V
C04	220uF/63V
LDM1	1.5uH
C1, C2, C3, C4, C5, C6, C7,C8, C9	2.2uF/250V
CY1, CY2, CY3, CY4	2200 pF /400VAC
LCM1	/
LCM2	/



Note: The products do not support parallel connection of their output

Components	Value
C01, C02, C03	220uF/200V
C04	220uF/63V
LDM1	1.5uH (Shielded inductor)
C1, C2, C3, C4, C5, C6, C7,C8, C9	2.2uF/250V
CY1, CY2, CY3, CY4	2200pF /400VAC(Y safety capacitor)
LCM1	/
LCM2	/
LCM3	/

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DC - DC CONVERTERS

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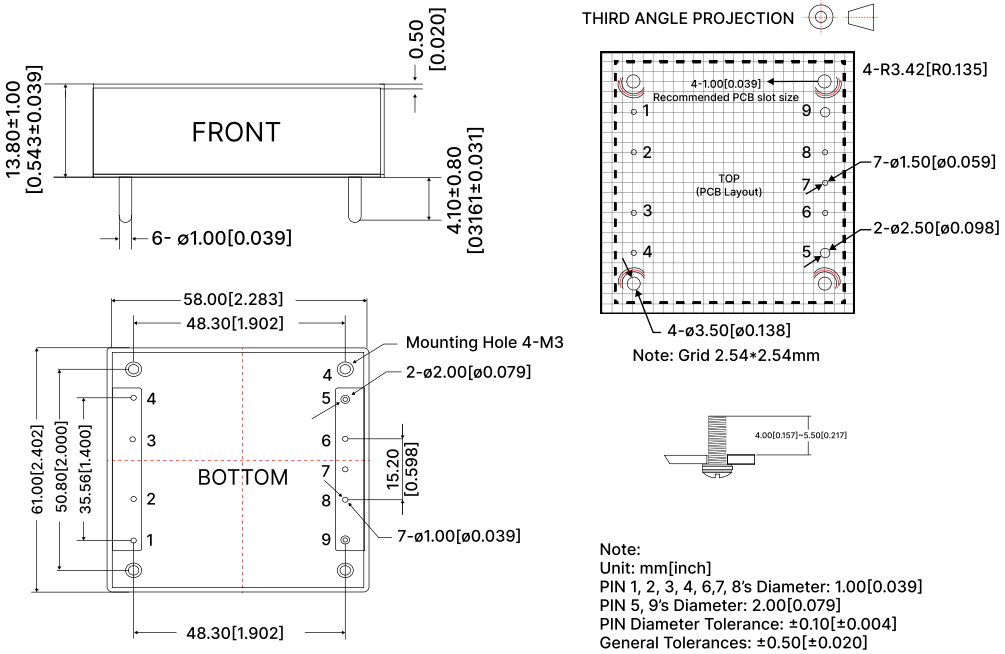
DIMENSIONS AND INSTALLATION

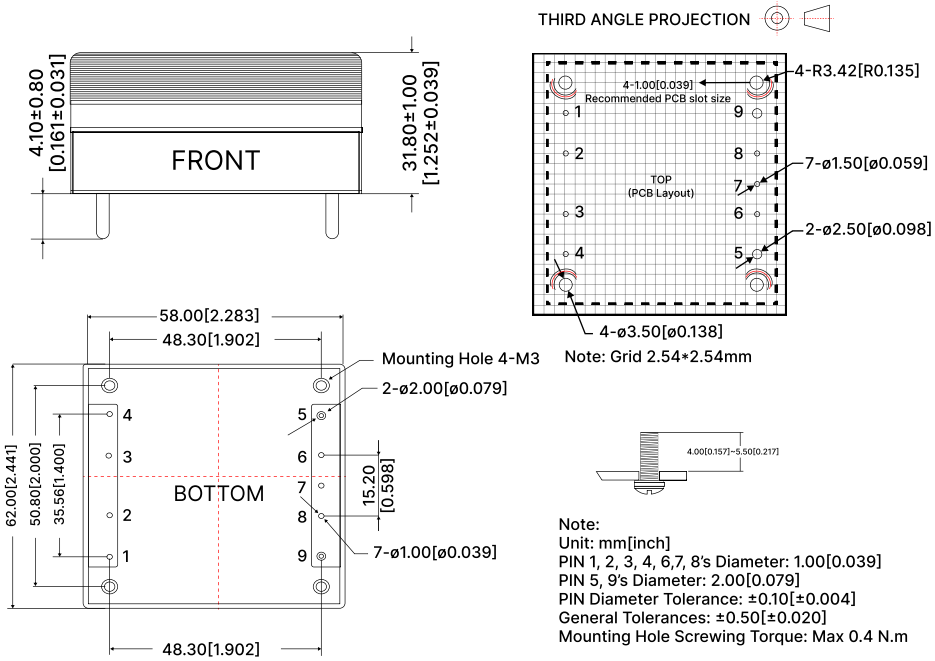
DCWF1D_HB-150W (without heatsink)



Note:
Unit: mm[inch]
PIN 1, 2, 3, 4, 6,7, 8's Diameter: 1.00[0.039]
PIN 5, 9's Diameter: 2.00[0.079]
PIN Diameter Tolerance: ±0.10[±0.004]
General Tolerances: ±0.50[±0.020]
Mounting Hole Screwing Torque: Max 0.4 N.m

Pin	Function
1	+Vin
2	Ctrl
3	Case
4	GND
5	0V
6	Sense-
7	Trim
8	Sense+
9	+Vo

DCWF1D_HB-150WH (with heatsink)



Note:
Unit: mm[inch]
PIN 1, 2, 3, 4, 6,7, 8's Diameter: 1.00[0.039]
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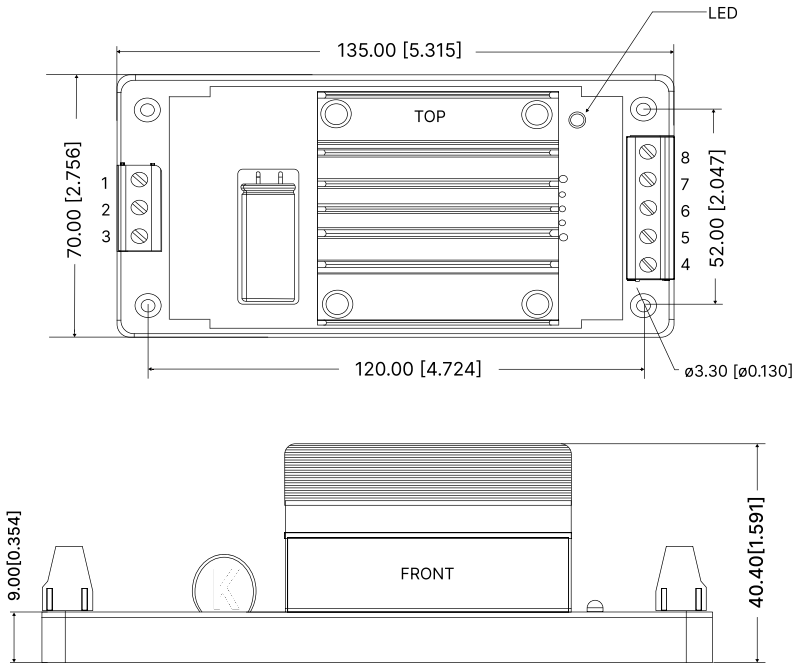
Mounting Hole Screwing Torque: Max 0.4 N.m

Pin	Function
1	+Vin
2	Ctrl
3	Case
4	GND
5	0V
6	Sense-
7	Trim
8	Sense+
9	+Vo

DIMENSIONS AND INSTALLATION

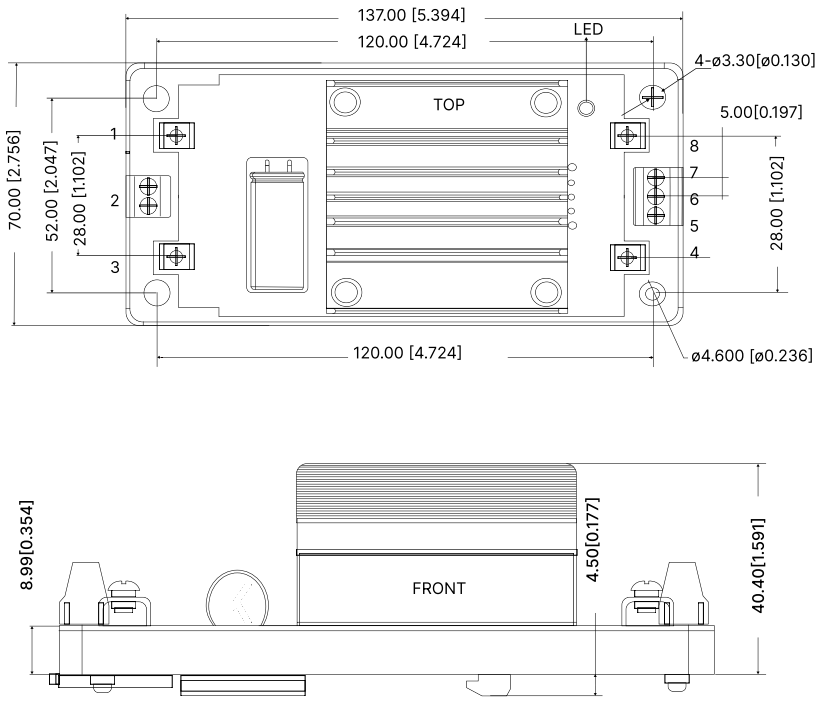
DCWF1D_HB-150WDCWF1D_HB-150WHST(with heatsink)



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

Note:
Unit: mm[inch]
Wire Range: 24-12 AWG
Tightening Torque: Max:0.4 N-m
Installed on DIN Rail TS35
General Tolerances: ±1.00[±0.039]

DCWF1D_HB-150WHDR(with heatsink)



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

Note:
Unit: mm[inch]
Wire Range: PIN 1, 3, 4, 8, 10-8 AWG
PIN 2,5-7, 24-12 AWG
Tightening Torque: PIN 1, 3, 4, 8M4, Max0.9 N.M
PIN 2, 5-7 M3, Max 0.4 N.m
Installed on DIN Rail TS35
General Tolerances: ±1.00[±0.039]

NOTES

1. If the product works under the minimum required load, it cannot guarantee that the performance of the product complies with all the performance indicators in this manual;
2. The maximum capacitive load is tested under the input voltage range and full load condition;
3. Unless otherwise stated, all indexes in this manual are measured at Ta=25°C, humidity <75%RH, nominal input voltage and rated output load;
4. All index testing methods in this manual are based on the enterprise standards of the company;
5. Our company can provide product customization, specific needs can directly contact our technical staff;