DESCRIPTIONS

DC-DC converter



Note: 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.

3 Years Warranty

RoHS

Features

- Wide 2:1 input voltage range
- Ultra-wide input voltage range: 9 - 90VDC
- Output voltage range: 0 - 90VDC
- High efficiency up to 98%
- Reverse Current Protection
- Protections: input under-voltage, input over-voltage,output over-voltage, short-circuit, output over-current, over-temperature
- Parallel support（4PCS）
- Operating ambient temperature range: -40℃ to 100℃(case temperature)
- Industry standard half-Brick package and pin-out

Applications

- Robotics
- Communications
- Battery management
- DC-DC distributed power

Selection Guide

Certification	Part No.	Input			Output	
		Nominal (Range) (VDC)	Max.① (VDC)	Current ② (A) Max.	Voltage (Range) (VDC)	Current ② (A) Max.
--	DNUHB30-B9090G	9-90	90	30	0-90	30

Note: ①The input voltage should not exceed this value, otherwise permanent and unrecoverable damage may be caused;
②When Vin＞Vo，the output current does not exceed 30A;when Vin≤Vo，the input current does not exceed 30A;
③The product image is for reference only, please refer to the actual product for details.

Typical input-output Efficiency

Input	Output			Efficiency (%)
Voltage(VDC)	Voltage(VDC)	Current(A)	Power(W)	Typ.
90	90	30	2700	97.8
	72	30	2160	98
	48	30	1440	97
	28	30	840	95
	12	30	360	90.5
72	90	24	2160	98
	72	30	2160	97.8
	48	30	1440	97.5
	28	30	840	95.6
	12	30	360	91
48	90	15	1350	97
	72	19	1368	97.6
	48	30	1440	97
	28	30	840	96.5
	12	30	360	92.7
28	90	8	720	95.5
	72	11	792	96
	48	16	768	96.6
	28	30	840	96
	12	30	360	93.5

Specifications

Product Specifications	Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Specifications	Input Current (no-load)	Vin=48V，Vout=12V，Io=0A	--	100	--	mA
		Vin=48V，Vout=28V，Io=0A	--	100	--	
		Vin=48V，Vout=48V，Io=0A	--	100	--	
		Vin=48V，Vout=72V，Io=0A	--	160	--	
		Vin=60V，Vout=12V，Io=0A	--	60	--	
		Vin=60V，Vout=28V，Io=0A	--	100	--	
		Vin=60V，Vout=48V，Io=0A	--	60	--	
		Vin=60V，Vout=72V，Io=0A	--	70	--	
		Vin=72V，Vout=12V，Io=0A	--	60	--	
		Vin=72V，Vout=28V，Io=0A	--	120	--	
		Vin=72V，Vout=48V，Io=0A	--	120	--	
		Vin=72V，Vout=72V，Io=0A	--	130	--	
	Reflected Ripple Current	Vin=48V，Vout=24V，Io=30A	--	150	--	

	Surge Voltage (1sec. max.)	1sec. Max.Non-Operating	-1	--	100	VDC
	Start-up Voltage		--	--	9	
	Under-voltage Protection		5	--	--	
	Over-voltage Protection	self-recovery	--	95	--	
	Input Filter		Pi filter			
	Hot Plug		Unavailable			
	Input Reverse Polarity Protection		Unavailable			
	Input Current Limit		--	30	--	A
	Ctrl	Module on	Ctrl pin pulled -VIN or pulled low (0-1VDC)			
		Module off	Ctrl is floating or connected to a TTL high level (1.5 - 5.5 VDC)			
		Input current when off	--	2	--	mA
Output Specifications	Output voltage accuracy①	3.3V-90Vo	±100mV ±2%*Vout-2%*Vout*Iout/Iomax			
	Load Regulation	Nominal input voltage, 5%Io-100%Iomax	-2%*Vout*Iout/Imax (Typ)			/
	Transient Response Deviation	Vin=48V，Vout=12V, 25% load step change，0.1A/uS	--	500	--	mV
	Transient Recovery Time	Vin=48V，Vout=12V, 25% load step change，0.1A/uS	--	400	--	us
	Temperature Coefficient	Operating temperature -40℃ to +100℃	--	±0.03	--	%/℃
	Ripple & Noise②	20MHz bandwidth,Vin=48V， Vout=12V，Io=30A	--	50	--	mVp-p
		20MHz bandwidth,Vin=48V， Vout=28V，Io=30A	--	100	--	
		20MHz bandwidth,Vin=48V， Vout=48V，Io=30A	--	100	--	
		20MHz bandwidth, Vin=28V，Vout=48V，Io=16A	--	120	--	
		20MHz bandwidth, Vin=72V， Vout=28V，Io=30A	--	50	--	
		20MHz bandwidth, Vin=72V， Vout=48V，Io=30A	--	50	--	
		20MHz bandwidth, Vin=90V， Vout=28V，Io=30A	--	50	--	
		20MHz bandwidth, Vin=90V， Vout=48V，Io=30A	--	60	--	
	Over-temperature Protection	Maximum surface temperature of the product	--	110	--	℃

	Output Over-voltage Protection	Input voltage range, output power range, self-recovery	--	95	--	VDC
	Output Current Limit	Input voltage range, output power range	--	33	--	A
	Over current &Short-circuit Protection	Input voltage range	constant current			
	Iset	Input to set maximum output current	See Iset function for output current adjustment			
		Pin Voltage (floating)	--	3.3	--	VDC
		Adjustable range of output current	0	--	30	A
	Vset	Input to set output voltage	For detailed information, kindly refer to the design of the output voltage Vset regulation and the corresponding precautions.			
		Pin Voltage (floating)	--	2.5	--	VDC
		Adjustable range of output voltage	0	--	90	VDC
	Sense	See part of Remote Sense Application	See Sense function adjustment			
		Sense compensation voltage range	--	--	105	%Vo
	Ishare	Current detection	The relationship between Ishare voltage and output current Io is shown in Figure 10			
General Specifications	Isolation	Input/output-case Electric Strength test for 1 minute with a leakage current of 1mA max.	500	--	--	VDC
	Insulation Resistance	Input-output resistance at 500VDC	-40	--	+100	℃
	Isolation Capacitance	Input-output capacitance at 100KHz/0.1V	-55	--	+125	
	Operating Temperature④	See typical characteristic curves	5	--	95	%RH
	Storage Temperature		+255	+260	+265	℃
	Storage Humidity	Non-condensing	--	--	+300	
	Pin Soldering Resistance Temperature	Wave soldering, 10 seconds	Level 3			
		Soldering spot is 1.5mm away from case for 10 seconds	10-150Hz, 5g, 0.75mm, 90 Min. along X, Y and Z			
	Shock and Vibration Test		--	270	--	kHz
	Switching Frequency ⑤	PWM Mode	Altitude: ≤2000m, Atmospheric pressure: 80-110KPa			
	Altitude		500	--	--	k hours
	MTBF	MIL-HDBK-217F@25℃	500	--	--	VDC
Mechanical Specifications	Case Material	Aluminum alloy				
	Dimensions	63.14 × 60.6 × 12.70 mm				
	Weight	150 g(Typ.)				
	Cooling Method	Free air convection forced convection				

Note:

①5%Io-100%Iomax, when the output voltage is 0-3.3V, it can work in Non-fixed voltage mode;

②The "Tip and barrel" method is used for ripple and noise test.;

③Test condition: Ta = 25℃, the product surface temperature is less than 100℃;

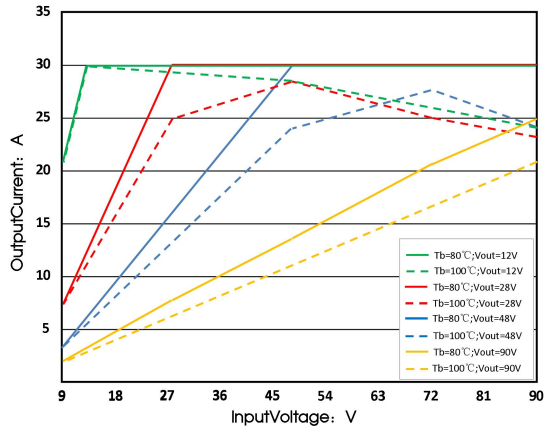
④Operating temperature refers to the surface temperature of the product;
⑤The soldering temperature that the pin can withstand is not the actual set temperature of the soldering iron, but the temperature required for a good solder joint. The actual set temperature by the customer needs to be comprehensively set based on the thickness of the PCB, the size of the copper cladding, the power of the soldering iron, and the selection of the soldering iron tip.

Electromagnetic Compatibility (EMC)

Emissions	CE	CISPR32/EN55032 CLASS A (see Fig. 4 for recommended circuit)	
	RE	CISPR32/EN55032 CLASS A (see Fig. 4 for recommended circuit)	
Immunity	ESD	IEC/EN 61000-4-2 Contact ±6kV	perf. Criteria B
	RS	IEC/EN 61000-4-3 10V/m	perf. Criteria A
	EFT	IEC/EN 61000-4-4 ±2kV (see Fig. 4 for recommended circuit)	perf. Criteria B
	Surge	IEC/EN 61000-4-5 line to line ±2kV (see Fig. 4 for recommended circuit)	perf. Criteria B
	CS	IEC/EN 61000-4-6 10Vr.m.s	perf. Criteria A

Typical Characteristic Curves

Temperature derating curve



Note: Relationship between the maximum output power and input voltage when the temperature at point A of the metal case is controlled at 80°C and 100°C

Fig.1

Efficiency VS Load Current

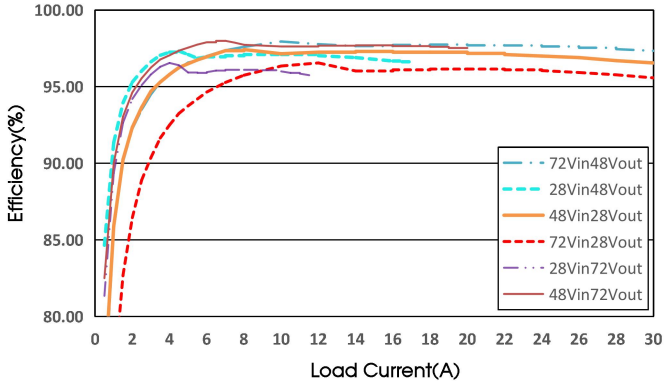
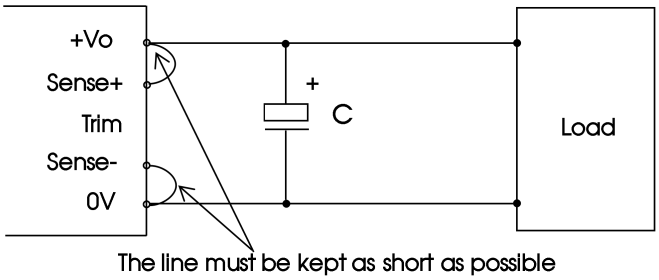


Fig.2

Remote Sense Application

1. Remote Sense Connection if not used

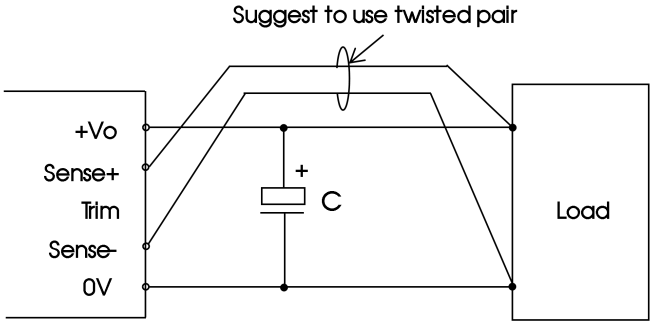


Notes:

(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) Do not exceed the output voltage range when using remote compensation;

(2) Using remote sense with long wires may cause unstable output, please contact technical support if long wires must be used;

(3) 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;

(4) 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;

(5) 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.

Vset Output Voltage Regulation Design and Precautions

The impedance between the control pin Vset and 0V can adjust the output voltage within the range of 0-90Vdc. The output voltage can be regulated by either an external regulating resistor or an external power supply. When pin Vset is left floating, its voltage is 2.5V, and at this time, the output voltage is 0V. The relationship curve between the Vset voltage and the output voltage Vo is as follows:

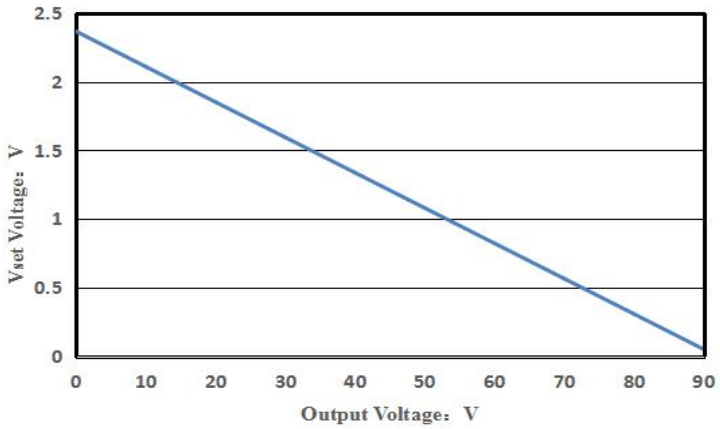


Fig.3 Voltage Vs output voltage

Usage mode 1: external power driver, wiring mode see Fig. 6 on the right

Vset Voltage calculation formula:

$$V_{set} = 2.366 - 0.02573Vo$$

Note: Vo is the desired output voltage,units:A,

Vvset is the voltage of the external power supply,units:V.

Use mode 2: external adjusting resistor R(Vset), the wiring mode is shown in Fig.7 on the right.

Vset resistance calculation formula:

$$R_{vset} = \frac{aR_2}{R_2 - a}$$

$$a = \frac{2.366 - 0.02573Vo}{0.934 + 0.02573Vo} R_1$$

Note: Rvset is an external adjusting resistor;units:kΩ

a indicates a user-defined parameter and has no actual meaning.

Vo is the desired output voltage,units:V;

Figure 8 on the right shows the internal Vset circuit of the module, where R1=14.4kΩ and R2=45.4kΩ.

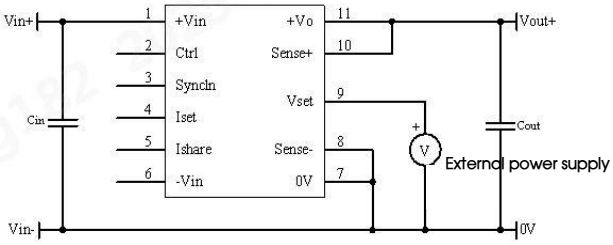


Fig. 4 Vset external power driver wiring diagram

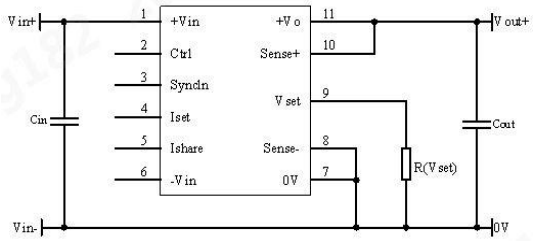


Fig.5 Vset External Adjusting resistance R(Vset) wiring diagram

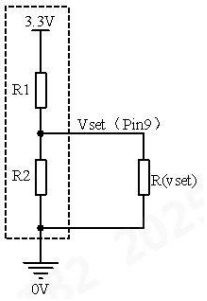


Fig.6 Vset connection diagram inside the module (dashed box)

Vo(V)	3.3	12	24	36	48	60	72	90
R_{vset} (kΩ)	111.2	50.19	25.255	14.77	8.996	5.34	2.818	0.224

Iset Function for Output Current Adjustment

The module contains an output overcurrent protection circuit inside. The impedance between the control pin Iset and 0V can limit the output current to be adjusted within the range of 0-30A. The output current can be adjusted by either adjusting the resistor or driving it with an external power supply. When the Iset pin is suspended, its voltage is 3.3V, and at this time, the default overcurrent point is 110%*30A.

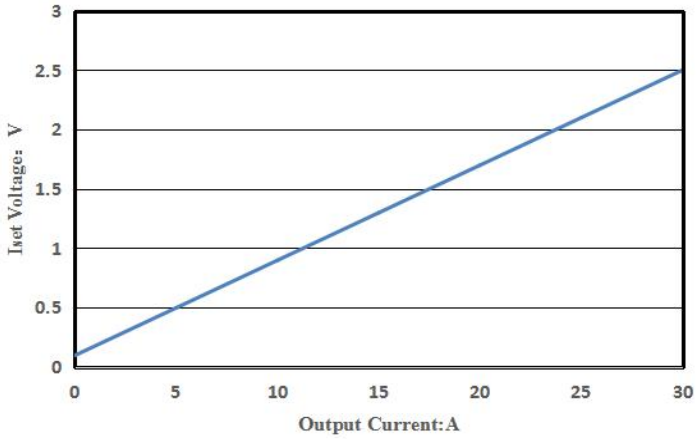


Fig.7 Iset voltage Vs output current

Usage mode 1: external power drive, wiring mode see Fig.10 on the right.

Iset Voltage calculation formula:

$$V_{Iset}(Iset) = 0.0802Iset + 0.0953$$

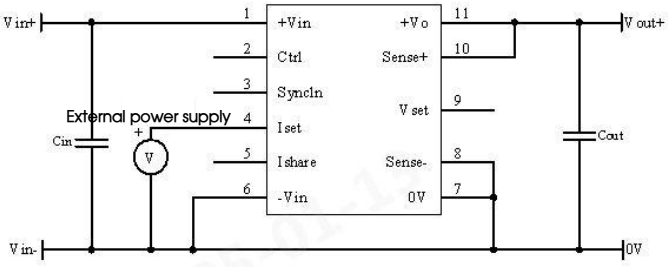


Fig.8 Iset external power driver wiring diagram

Note:Iset is the expected output current，units:A;

VIset is the external power supply，units:V。

Use mode 2: external adjusting resistor R(Vset), wiring mode is shown in Figure 11 on the right.

Iset resistance calculation formula:

$$R_{Iset} = \frac{0.802Iset + 0.953}{3.2047 - 0.0802Iset}(K\Omega)$$

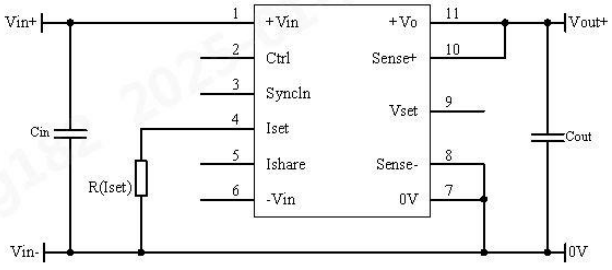


Fig.9 Iset External Adjusting resistance R(Iset) wiring diagram

Note:R_{Iset} is the external resistance，units:kΩ;

Iset is the expected output current，units:A。

Current detection and sharing Ishare design and precautions

Usage mode 1: Current detection

Ishare Voltage calculation formula:

$$V_{Ishare} = 0.05 * I_o + 0.2$$

Note:I_o is the actual output current，unit:A；VIshare is the Ishare pin voltage，unit:V，Ishare level in a 0V as a reference

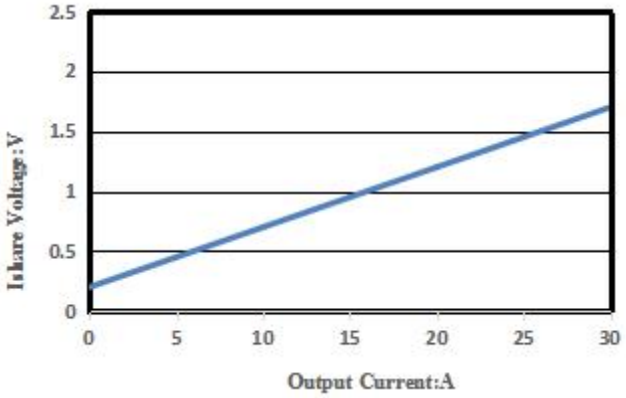


Fig.10 Ishare Vs output current

Usage mode 2: Current share

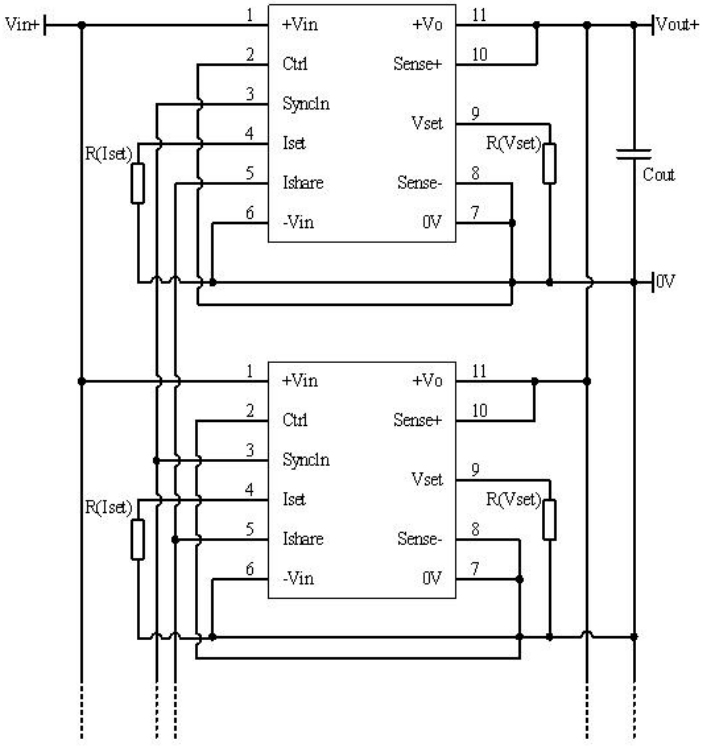


Figure 11 Parallel current sharing wiring diagram

Precautions for parallel use

1. Use Vset pin to set the single module at the same output voltage;
2. Use iset pin to set the single module at the same output current limit;
3 Connect the +Vin,-Vin,Syncln, Ishare, +Vo, OV of each module respectively inTogether;
4. Connect the cables as shown on the left to support a maximum of 4 modules in parallel, and the current of a single module does not exceed 30A when parallel.
5. After the product starts up and operates normally, if the input power supply voltage is unstable, fluctuating or switches rapidly (the slope of input voltage change is greater than 0.1V/ms), it is recommended to add an NTC (thermistor) or inductor between the fluctuating power supply source and the product input terminal to suppress the slope of voltage change.

Design Reference

1. Application Circuit

(1) During product testing and application, the peripheral circuit shall be built in accordance with the recommended test circuit in Figure 12; at least one external electrolytic capacitor Cin (≥560μF) shall be connected to suppress surge voltage that may occur at the input terminal.
(2) If the product input terminal is connected in parallel with circuits featuring large transient energy (such as parallel motor drive circuits), the

product input voltage may be pulled down. In this case, monitor the fluctuation of the product input voltage. It is recommended to appropriately increase the capacitance of the input electrolytic capacitor Cin to ensure stable input voltage, and avoid repeated startup of the product caused by input voltage dropping below the undervoltage protection threshold.

(3) If the product output terminal is connected to inductive loads (such as relays and motors), it is recommended to increase the capacitance of the output capacitor Cout and add a TVS diode to filter voltage spikes.

(4) To further reduce input and output ripples, appropriately increase the capacitance of external capacitors Cin and Cout, or select external capacitors with low equivalent series resistance (ESR).

(5) When using Ctrl, it can be directly short- connected to 0V (Pin7) to realize output enable control. The pin shall be routed independently and nearby as the reference ground for Ctrl.

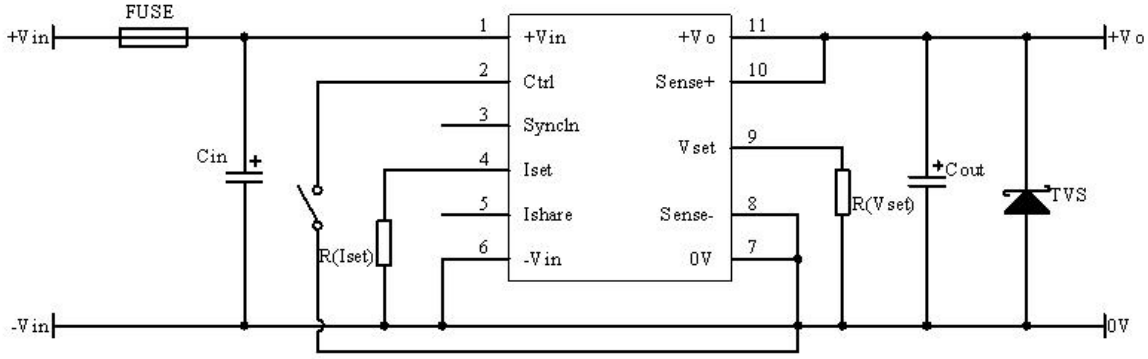


Fig.12 Recommended Test Circuit

Fuse (optional)	Cin*	Cout	TVS Diode (optional)
50A, slow-blow	560μF/100V (electrolytic capacitor) + 2.2μF/100V×5 (ceramic capacitors)	330μF/100V×2 (solid capacitors) + 470μF/100V (electrolytic capacitor) + 2.2μF/100V×5 (ceramic capacitors)	Selected according to output voltage

2. EMC Solution – Recommended Circuit

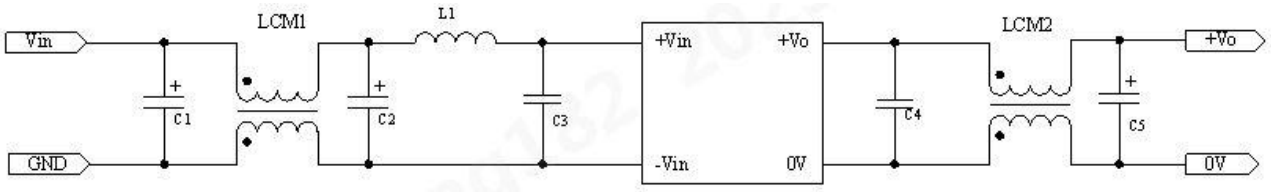


Fig.13 Recommended EMC Circuit

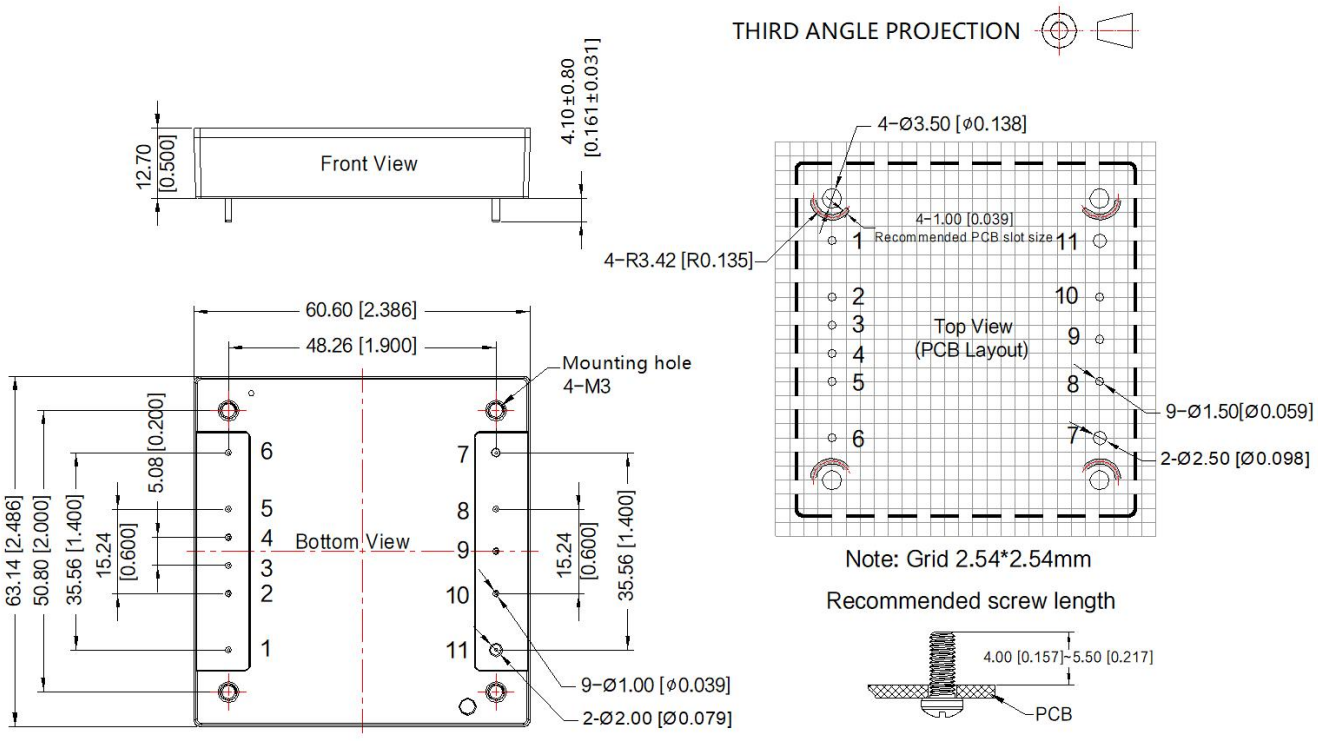
C1	LCM1	C2	L1	C3	C4	LCM2	C5
680μF/100V ((Electrolytic Capacitor)	**EFL2D-65-040**	**600μF/100V** (Solid Capacitor)	**4.7uH**	**475/100V*16** (Ceramic Capacitor)	**475/100V*4** (Ceramic Capacitor)	**EFL2D-65-040**	**330μF/200V** (Electrolytic Capacitor)

3. Recommended solution for thermal test

In the process of application, product thermal design can be evaluated by combining product temperature derating curve; Or determine the stable working range of the product by the temperature at point A of the metal shell in the following test diagram. When the temperature at point A is lower than 100℃, it is the stable working range of the product. Or under the condition of natural air cooling, when the maximum temperature of the center point of the four positions on the side of the control module shell is lower than 90℃, it is the stable working range of the product.



Dimensions and Recommended Layout



Note:
Unit: mm[inch]
Pin1, 2, 3, 4, 5, 6, 8, 9, 10diameter: 1.00[0.039]
Pin7, 11diameter: 2.00[0.079]
Pin diameter tolerances: ± 0.10[± 0.004]
General tolerances: ± 0.50[± 0.020]
Mounting hole recommended torque: M3，0.65 N · m ± 10%

Pin-Out			
Pin	Mark	Pin	Mark
1	+Vin	7	0V
2	Ctrl	8	Sense−
3	Syncln	9	Vset
4	Iset	10	Sense+
5	Ishare	11	+Vo
6	−Vin		

Notes:

1. The maximum capacitive load offered were tested at nominal input voltage and full load;

2. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25℃, humidity<75%RH with nominal input voltage and rated output load;

3. All index testing methods in this datasheet are based on our company corporate standards;

4. Products are related to laws and regulations: see "Features" and "EMC";

5. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.