DC – DC

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
- EN50155 approved

Ideal Power's 36URF1D-QB-50WR3 50W Quarter Brick DC/DC Converters Series are certified to UKCA, CE, RoHS & EN 62368-1 Standards and comply with the relevant Efficiency Regulations. These are primarily used in ITE, Audio & Video, Railway Industries and customised solutions are available upon request.

Models

Model No	Input Voltage (VDC)		Output		Full Load Efficiency (%) Typ.	Capacitive Load⑤ (μF) Max.
	Nominal	Max. ②	Voltage (VDC)	Current (mA) Max./Min.		
36URF1D03QB-50W(H)R3	110	170	3.3	11364/0	84/86	20000
36URF1D05QB-50W(H)R3			5	10000/0	85/87	10000
36URF1D12QB-50W(H)R3			12	4167/0	86/88	3000
36URF1D15QB-50W(H)R3			15	3333/0	86/88	2350
36URF1D24QB-50W(H)R3			24	2083/0	87/89	1500
36URF1D48QB-50W(H)R3			48	1041/0	85/87	240

Note:

① Use “H” suffix for heat sink mounting. We recommend choosing modules with a heat sink for enhanced heat dissipation and applications with extreme temperature requirements.

② Exceeding the maximum input voltage may cause permanent damage.

Input Specifications

Parameter	Conditions		Min	Typ	Max	Unit
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		
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	10	mA

Note:

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

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Voltage Accuracy	Nominal input voltage, 0%-		--	±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	0%-100% load	3.3VDC, 5VDC output	--	±0.5	±1.0	
		Others	--	±0.3	±0.5	
Transient Recovery Time	25% load step change, nominal input voltage		--	200	500	µs
Transient Response Deviation		3.3VDC, 5VDC output	--	±6	±9	%
		Others	--	±3	±5	
Temperature Coefficient	Full load		--	--	±0.03	%/℃
Ripple & Noise	20MHz bandwidth, 5%-100% load	48VDC output	--	200	300	mV p-p
		Others	--	100	200	
Trim			90	--	110	%
Output Voltage Remote Compensation(sense)			--	--	105	
Over-temperature Protection	Surface 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		100	140	190	%Io
Short-circuit Protection	Input voltage range		Continuous, self-recovery			

General Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Isolation	Electric Strength Test for 1 minute with a leakage current of 5mA max	Input-output	3000	--	--	V AC
		Input-case	2100	--	--	
	Electric Strength test for 1 minute with a leakage current of 1mA max.	Output-case	1500	--	--	V DC
Insulation Resistance	Input-output insulation at 500VDC		1000	--	--	MΩ
Isolation Capacitance	Input-output capacitance at 1KHz/0.1V		--	2200	--	pF
Switching Frequency	PWM mode		--	170	--	kHz
Operating Temperature	See temperature derating curves		-40	--	+105	℃
Storage Humidity	Non-condensing		5	--	95	%RH
Storage Temperature			-55	--	+125	℃
Pin Soldering Resistance	Soldering spot is 1.5mm away from case for 10 seconds		--	--	+300	℃
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		
MTBF	MIL-HDBK-217F@25℃		500	--	--	k hours

Mechanical Specifications

Case Material		Aluminum alloy case
Dimensions	Without heatsink	60.80 × 39.20 × 12.70mm
	With heatsink	61.50 × 39.20 × 27.80mm
Weight	Without heatsink	78.0g(Typ.)
	With heatsink	109.0g(Typ.)
Cooling method		Free air convection or forced convection

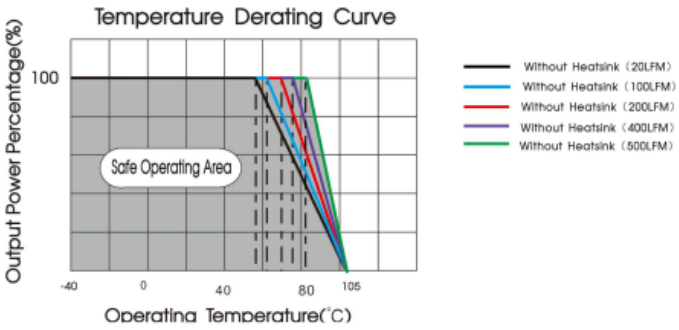
Electromagnetic Compatibility (EMC)

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	line to line ±2KV (1.2μs/50μs 2Ω) (see Fig. 3 for recommended circuit)	perf.Criteria A

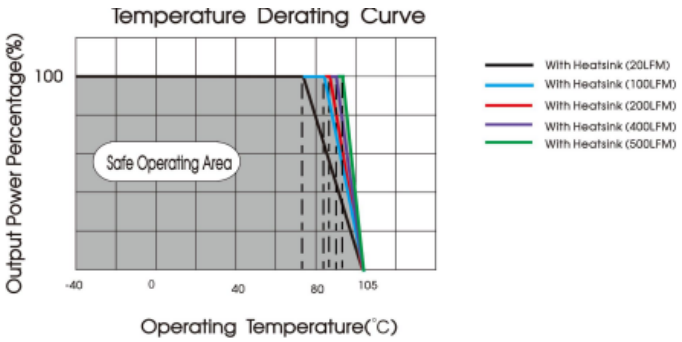
Electromagnetic Compatibility (EMC - EN 50155)

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 10 Vr.m.s perf. Criteria A

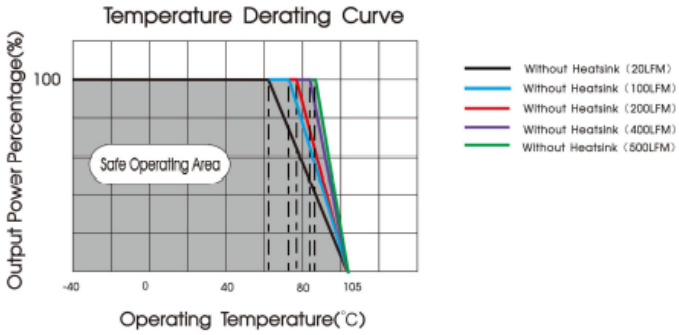
Characteristic Curve



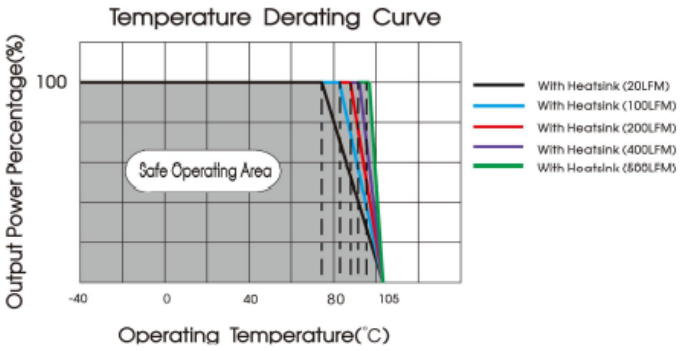
36URF1D05QB-50WR3 temperature derating curve (Vin=110V)



3URF1D05QB-50WHR3 temperature derating curve (Vin=110V)



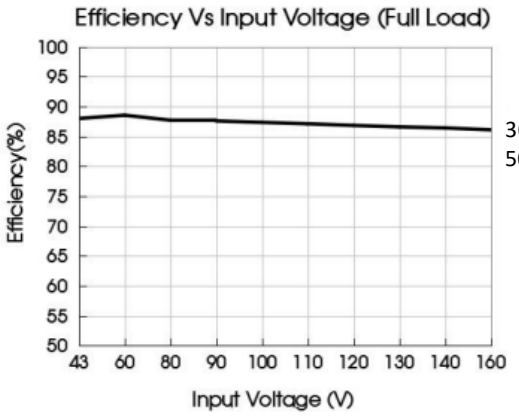
36URF1D12QB-50WR3 temperature derating curve (Vin=110V)



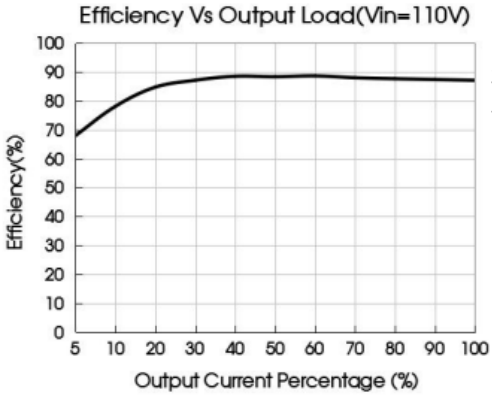
36URF1D12QB-50WHR3 temperature derating curve

DC – DC

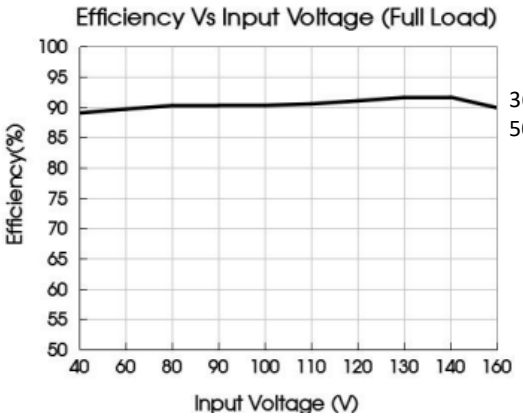
Characteristic Curve (Continued)



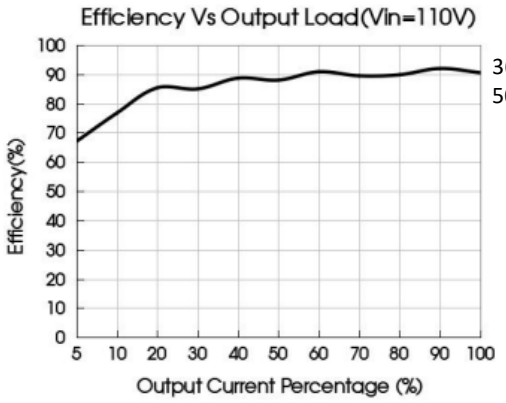
36URF1D05QB-50WR3



36URF1D05QB-50WR3



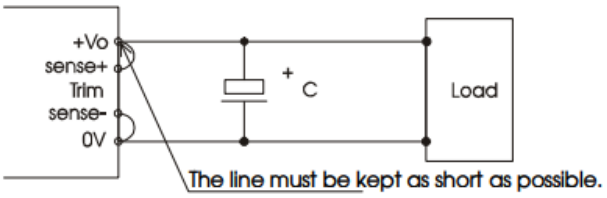
36URF1D24QB-50WR3



36URF1D24QB-50WR3

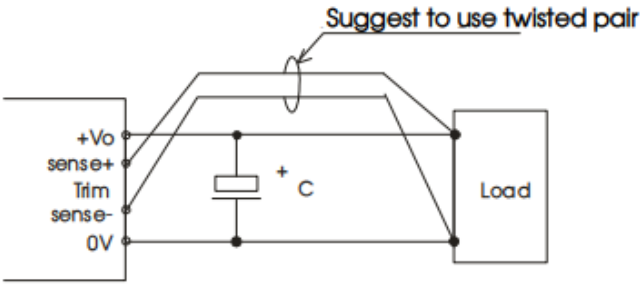
Remote Sense Application

Typical application:



Note:
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.
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.

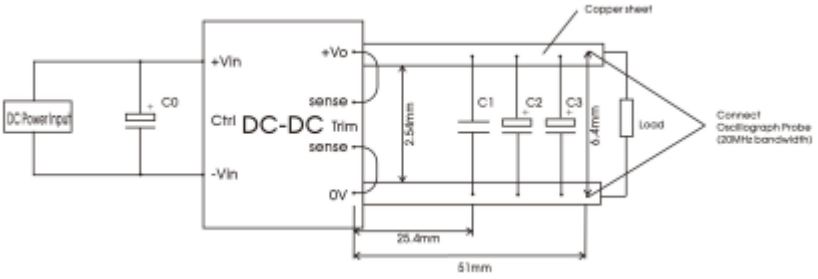
Remote Sense Connection used for Compensation:



Notes:
Using remote sense with long wires may cause unstable output, please contact technical support if long wires must be used.
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.
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.
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

Ripple & Noise: Fig.1



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

Typical Application:

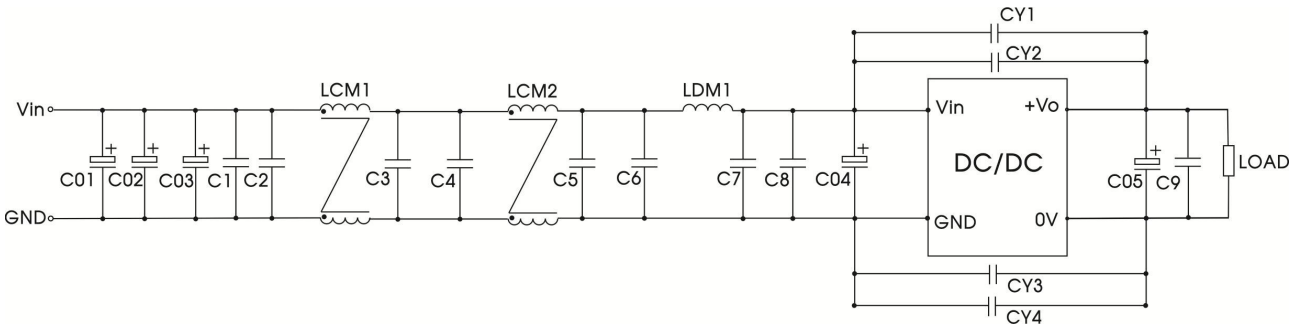
Please ensure that at least a 100µF electrolytic capacitors is connected at the input in order to ensure adequate voltage surge suppression and protection.

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 \ Capacitors Value	Cout(µF)	Cin(µF)
3.3VDC	1000	100
5VDC	680	
12VDC	220	
15VDC		
24VDC		
48VDC		

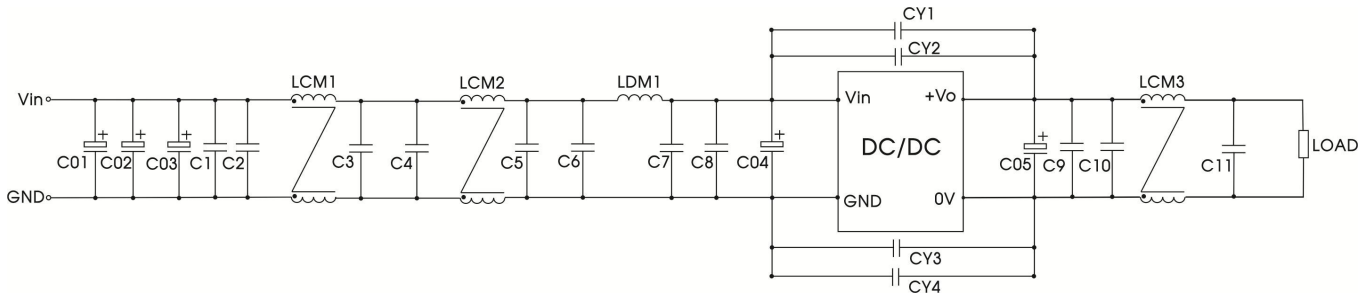
Design Reference (continued)

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	FL2D-30-472
LCM2	FL2D-30-102

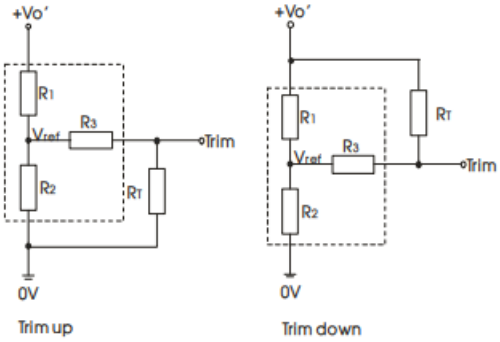
EMC compliance recommended circuit: Fig.3



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	FL2D-30-472
LCM2	FL2D-30-102
LCM3	FL2D-70-360C (7A max.)
	FL2D-A3-360C (13A max.)
	FL2D-B5-360C (25A max.)

Design Reference (continued)

Trim Function for Output Voltage Adjustment (open if unused):



TRIM resistor connection (dashed line shows internal resistor network)

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

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

Resistance \ Vo	3.3(VDC)	5(VDC)	12(VDC)	15(VDC)	24(VDC)	48(VDC)
R1(KΩ)	4.83	8.80	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)	1.24	1.24	2.5	2.5	2.5	2.5

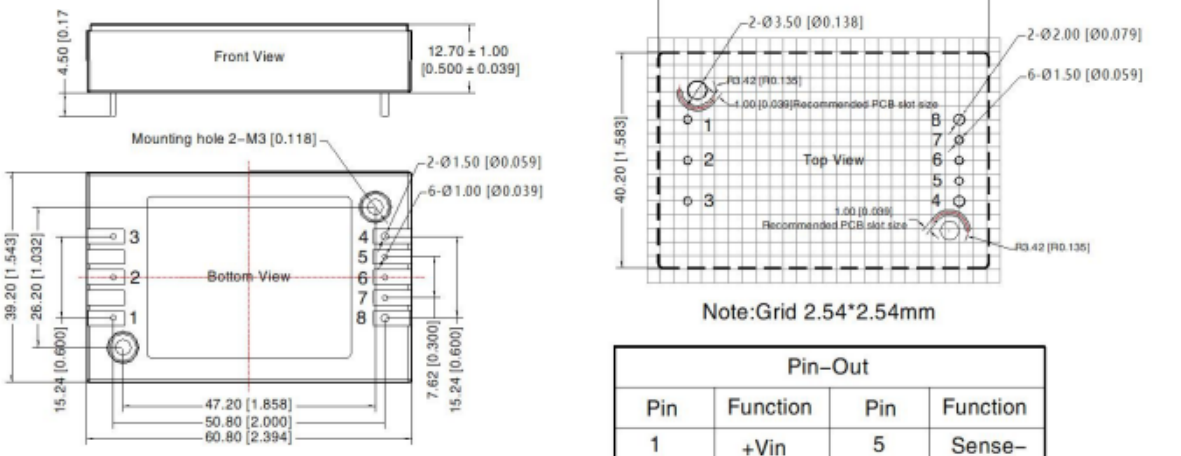
Note：

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

The products do not support parallel connection of their output

Dimensions and Recommended Layout

Without Heat Sink:

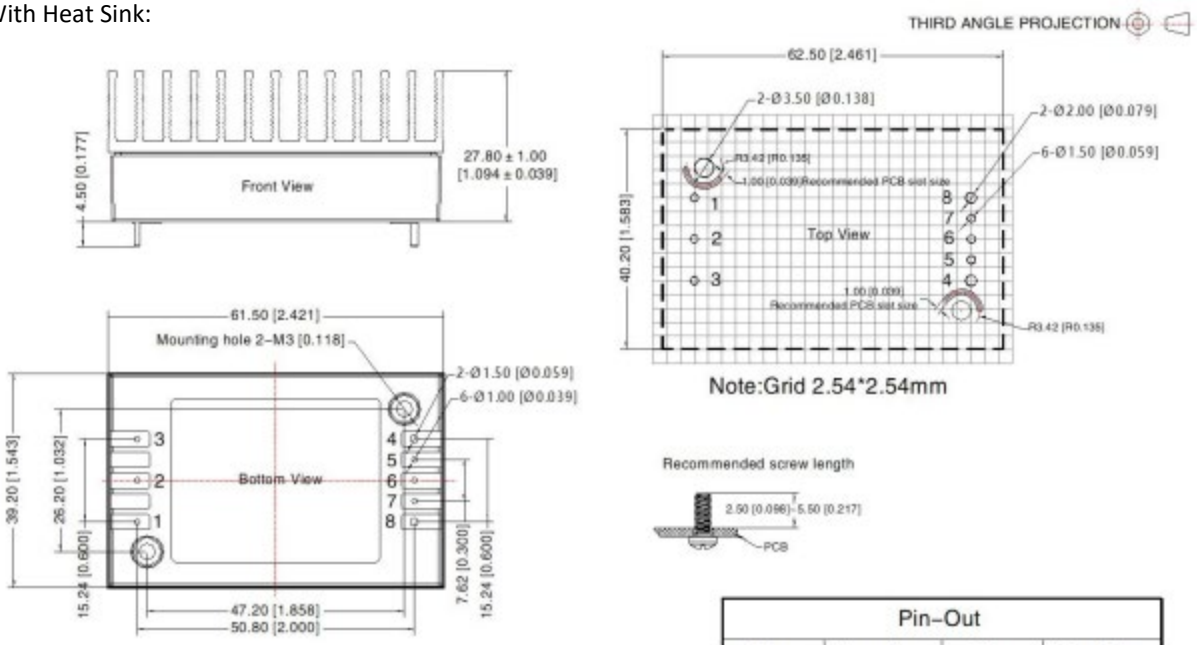


Note:Grid 2.54*2.54mm

Pin–Out			
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

With Heat Sink:



Note:Grid 2.54*2.54mm

Pin–Out			
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

Notes:

For additional information on Product Packaging please refer to www.Idealpower.co.uk.
Recommend using module with more than 5% load, if not, the ripple of the product may exceed the specification, but does not affect the reliability of the product.
The maximum capacitive load offered were tested at input voltage range and full load.
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.
All index testing methods in this datasheet are based on company corporate standards.
We can provide product customization service, please contact our technicians directly for specific information.
Products are related to laws and regulations: see "Features" and "EMC".
OUR products shall be classified according to ISO14001 and related environmental laws and regulations and shall be handled by qualified units.