FEATURES

1. Ultra-wide 4:1 input voltage range
2. Reinforced isolation, I/O isolation test voltage 3.0KVDC/1.5KVAC
3. Operating ambient temperature range: -40°C to +85°C
4. Input under-voltage protection, output short-circuit, over-current, over-voltage protection, over-temperature protection
5. Industry standard pin-out

RoHS CE 3 years Warranty

Selection Guide

Part No. ①	Input Voltage (VDC)		Output		Full Load Efficiency③ (%) Min./Typ.	Max. Capacitive Load(μF)
	Nominal (Range)	Max.②	Voltage (VDC)	Current(mA) Max./Min.		
ATF1D03LD-40W(H)R3	110 (40-160)	170	3.3	10000/0	87	10000
ATF1D05LD-40W(H)R3			5	8000/0	88	10000
ATF1D12LD-40W(H)R3			12	3333/0	91	2700
ATF1D15LD-40W(H)R3			15	2667/0	91	1680
ATF1D24LD-40W(H)R3			24	1667/0	89	680
ATF1D48LD-40W(H)R3			48	833/0	89	470

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;
③Efficiency is measured at nominal input voltage and rated output load

Input Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Current (full load / no-load)	Nominal input voltage	3.3V output	–	345/5	353/15	mA
		Others	–	413/3	423/15	
Reflected Ripple Current	Nominal input voltage		–	25	–	
Surge Voltage (1sec. max.)			-0.7	–	180	VDC
Start-up Voltage	100% load		–	–	40	
Input Under-Voltage Protection			28	32	–	
Start-up Time	Nominal input voltage & constant resistance load		–	20	–	ms
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 GND.

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Voltage Accuracy	0% -100% load		–	±1	±3	%
Linear Regulation	Input voltage variation from low to high at full load		–	±0.4	±1	
Load Regulation	0% -100% load		–	±0.5	±1	
Transient Recovery Time	25% load step change, nominal input voltage		–	300	500	μs
Transient Response Deviation		3.3V/5V output	–	±5	±8	%
		Others	–	±3	±5	
Temperature Coefficient	Nominal input voltage, full load		–	±0.02	±0.03	%/°C
Ripple & Noise	20MHz bandwidth, nominal input voltage, full load		–	150	200	mV p-p
Trim	Input voltage range		90	-	110	%Vo
Over-voltage Protection			110	–	160	
Over-current Protection			110	140	190	%Io
Short-circuit Protection			Continuous, self-recovery			

General Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Isolation	Input-output Electric Strength Test for 1 minute with a leakage current of 1mA max.	3000	–	–	VDC
Insulation Resistance	Input-output resistance at 500VDC	1000	–	–	MΩ
Isolation Capacitance	Input-output capacitance at 100KHz/0.1V	–	2200	--	pF
Operating Temperature	See Fig. 1	-40	–	+85	°C
Storage Temperature		-55	–	+125	
Storage Humidity	Non-condensing	5	–	95	%RH
Pin Soldering Resistance Temperature	Soldering spot is 1.5mm away from case for 10 seconds	–	–	+300	°C
Switching Frequency*	PWM mode	–	220	–	KHz
Vibration		design meet IEC61373 -Category 1, Grade B			
MTBF	MIL-HDBK-217F@25°C	500	–	–	K hours

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

Mechanical Specifications

Case Material		Aluminum alloy	
Dimensions	**Without heat sink**	Horizontal package	50.80 ×25.40 ×11.80 mm
	With heat sink	Horizontal package	51.40 ×26.20 ×16.50 mm
Weight	**Without heat sink**	Horizontal package	25g(Typ.)
	With heat sink	Horizontal package	41.0g (Typ.)
Cooling Method		Free air convection	

Electromagnetic compatibility (EMC) (EN62368)

Emissions	CE	CISPR32/EN55032	CLASS B(see Fig. 4-①/4-③ for recommended circuit)	
	RE	CISPR32/EN55032	CLASS B (see Fig. 4-①/4-③ for recommended circuit)	
Immunity	ESD	IEC/EN61000-4-2	Contact ±6KV/Air ±8KV	perf. Criteria B
	RS	IEC/EN61000-4-3	20V/m	perf. Criteria A
	EFT	IEC/EN61000-4-4	100kHz ±4KV (see Fig.4-②/4-④ for recommended circuit)	perf. Criteria B
	Surge	IEC/EN61000-4-5	line to line ±2KV (2Ω 18uF see Fig.4-②/4-④ for recommended circuit)	perf. Criteria B
	CS	IEC/EN61000-4-6	10 Vr.m.s	perf. Criteria A

Typical Characteristic Curves

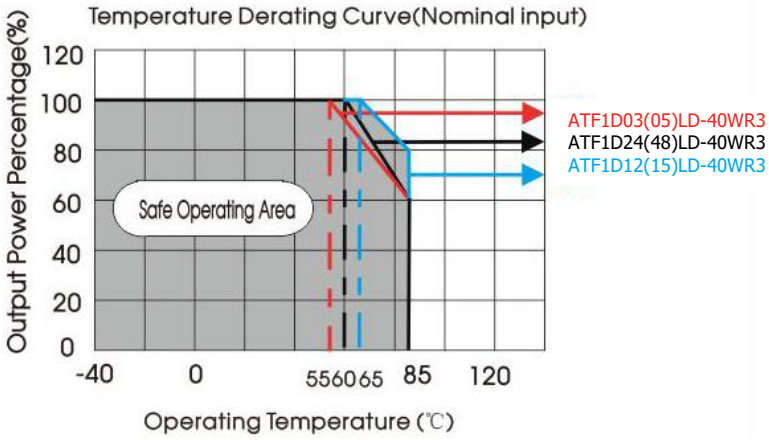


Fig. 1

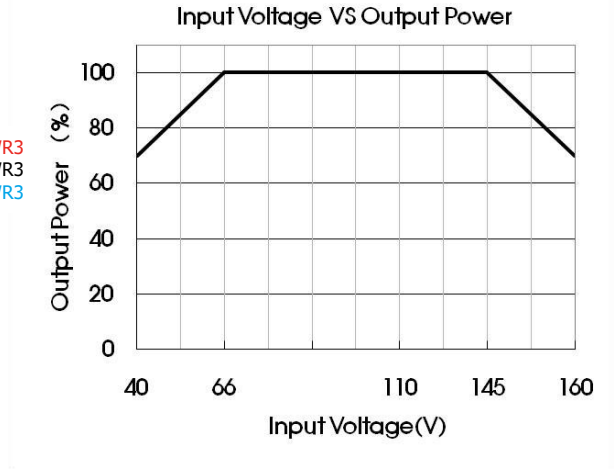
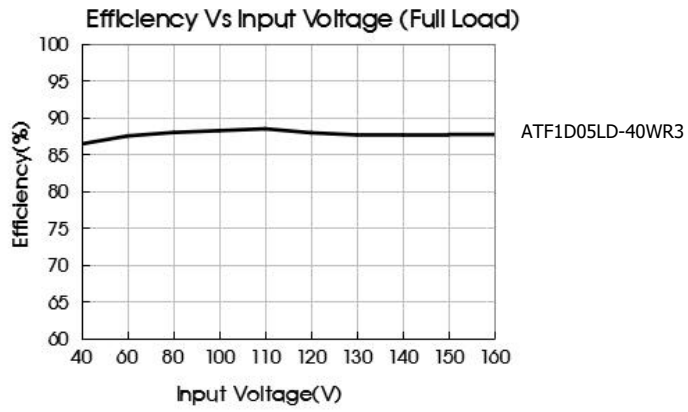
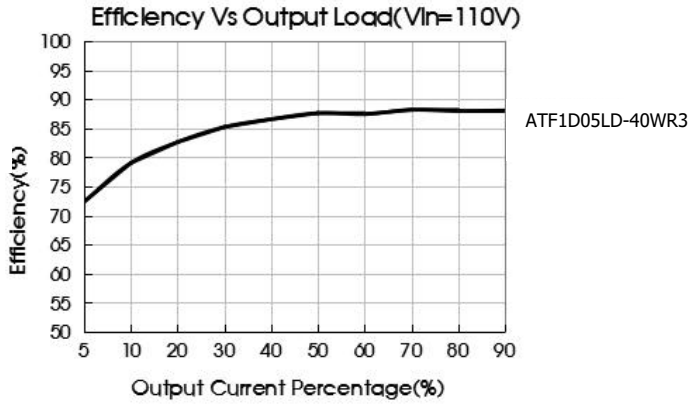
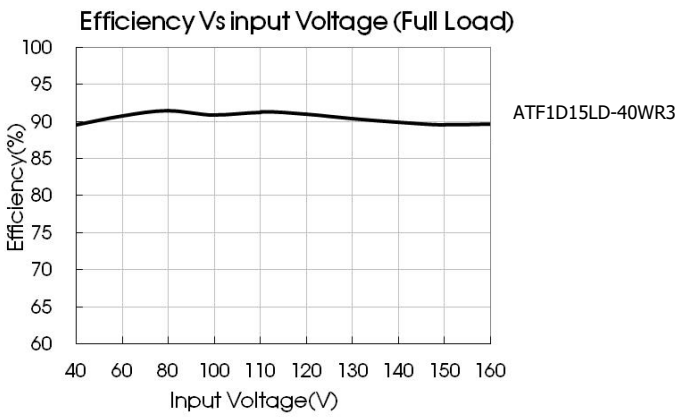


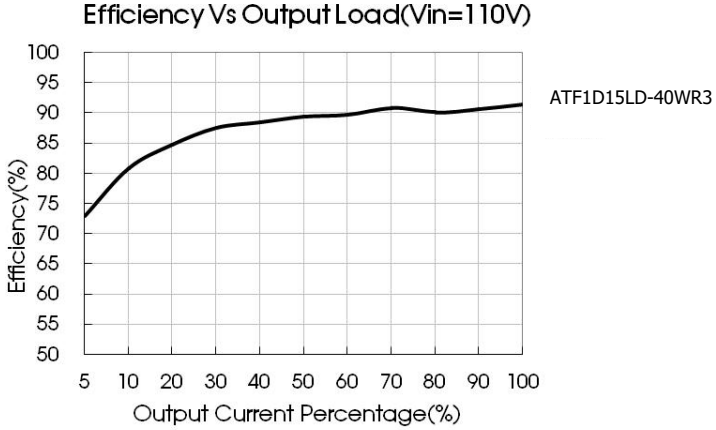
Fig. 2

Note:
Fig.2 Input voltage VS output power derating curve for reference only, when opearting, as long as the case temperature does not exceed 100 °C, the product can be used under any conditions within the input voltage and output load range.









Design Reference

1. Typical application

All DC-DC converters of this series are tested before delivery using the recommended circuit shown in Fig. 3.

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 max. capacitive load value of the product.

Fig. 3

Vout(VDC)	Fuse	Cin	Cout
3.3, 5	2A, slow blow	100μF	470μF
12, 15			220μF
24, 48			100μF

2. EMC compliance circuit

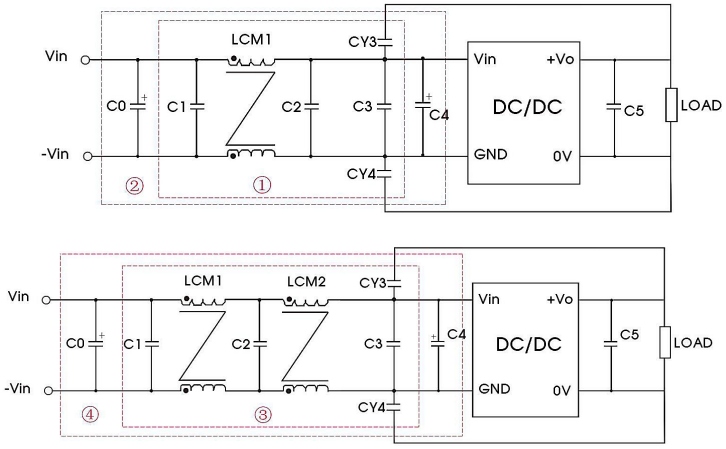
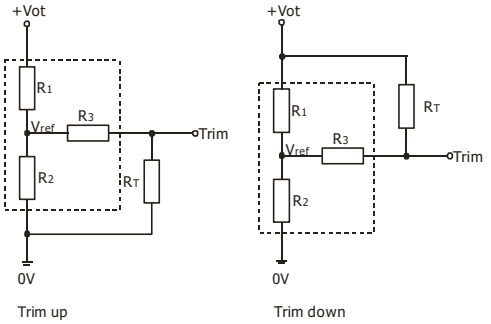


Fig. 4

Fig.4 List of components:	
C0, C4	100μF/200V
C1, C2	2.2μF/250V
C3	Refer to the Cin in Fig.3
LCM1	10mH
LCM2	2.2mH
CY3, CY4	2200pF/400VAC
C5	Refer to the Cout in Fig.3

Notes:
1.For 3.3VDC, 5VDC, 12VDC, 15VDC, 24VDC output EMC tests we use Part ②in Fig. 4 for immunity and part ①for emissions test.
2.For 48VDC voltage EMC tests we use Part ④ in Fig. 4 for immunity and part ③ for emissions test.

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



TRIM resistor connection (dashed line shows internal resistor network)

Calculating Trim resistor values:

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

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

RT = Trim Resistor value;
a = self-defined parameter; Vo' = desired output voltage

Vout(V)	R1(KΩ)	R2(KΩ)	R3(KΩ)	Vref(V)
3.3	4.801	2.87	10	1.24
5	2.883	2.87	10	2.5
12	11.000	2.87	15	2.5
15	14.384	2.87	15	2.5
24	24.872	2.87	17.8	2.5
48	55.28	3.0	20	2.5

4. Reflected Ripple Current testing circuit

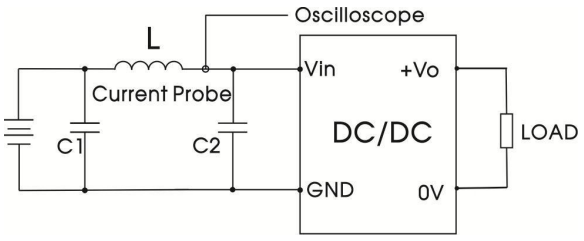
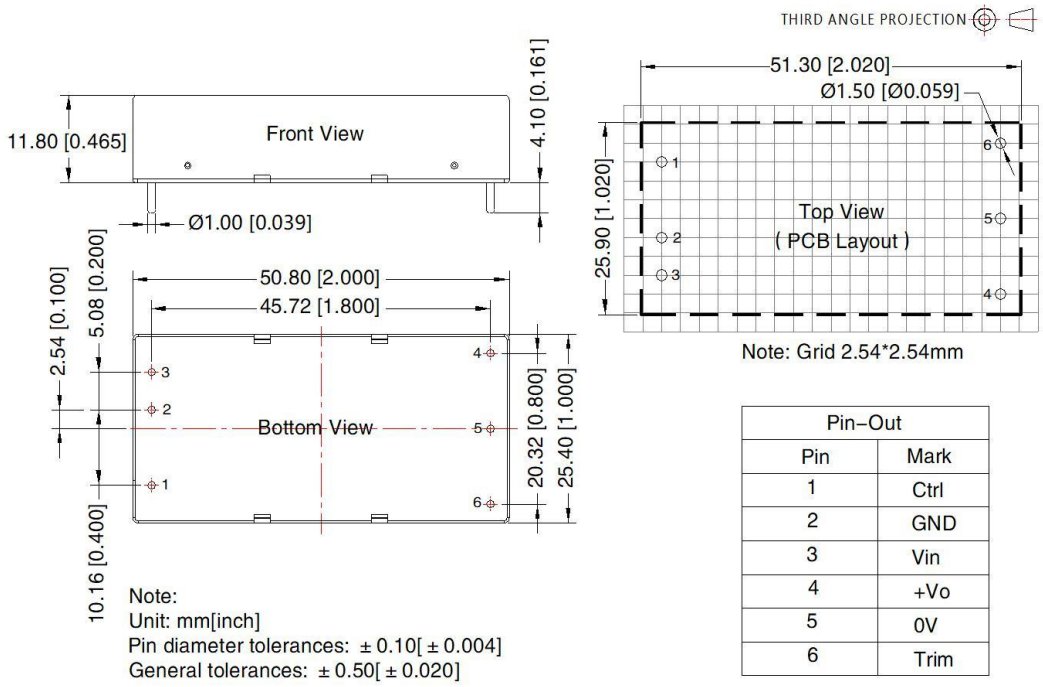


Fig.5

Fig.5 Parameter description:	
C1	220uF, ESR<1.0Ωat 100KHz
L	4.7uH
C2	4.7uF/250V

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

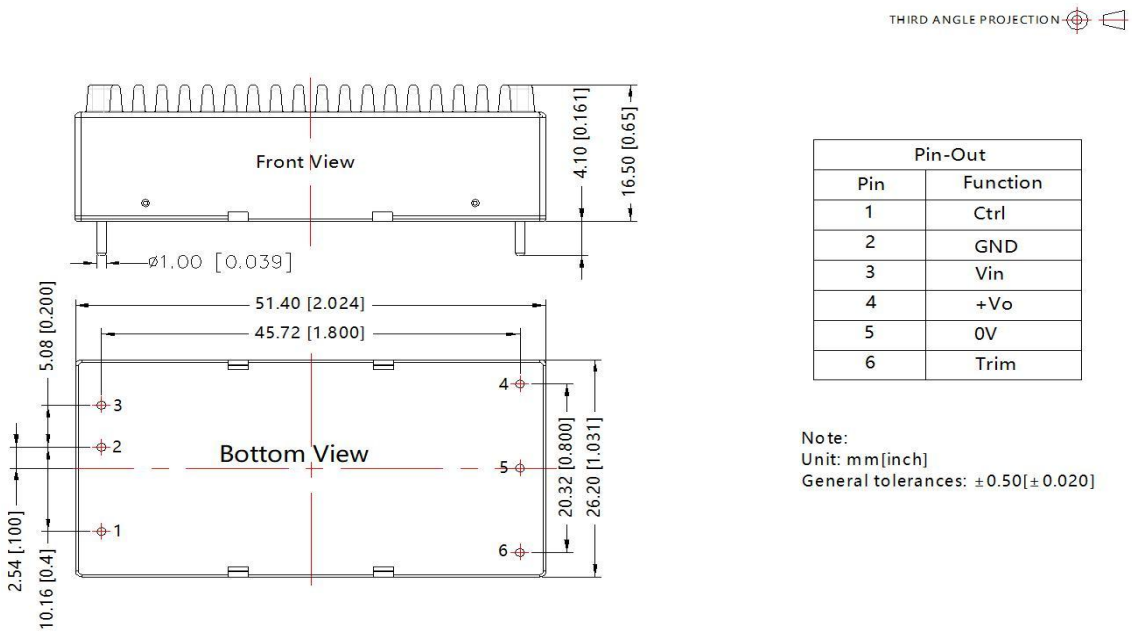
Horizontal Package (without heat sink) Dimensions and Recommended Layout



Note:
Unit: mm[inch]
Pin diameter tolerances: ± 0.10[± 0.004]
General tolerances: ± 0.50[± 0.020]

Pin–Out	
Pin	Mark
1	Ctrl
2	GND
3	Vin
4	+Vo
5	0V
6	Trim

Horizontal Package (with heat sink) Dimensions



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

Note:
Unit: mm[inch]
General tolerances: ±0.50[±0.020]

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℃, 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;