1S7A_1.5UP series

1W - Single/Dual Output DC-DC Converter - Fixed Input - Isolated & Unregulated

5Vin DC-DC Converter 1 Watt

- SIP package
- Efficiency up to 85%
- Short circuit protection (SCP)
- 1500VDC isolation voltage
- No-load input current as low as 5mA
- Operating temperature: -40°C to +105°C
- Industry standard pinout
- RoHS compliance
- UL62368, EN62368 approved

The 1S7A_1.5UP series are specially designed for applications where an isolated (two isolated) voltage is required in a distributed power supply system. They are suitable for: pure digital circuits, low frequency analog circuits, relay-driven circuits and data switching circuits.

UL-62368-1 (E347551)

Common specifications

Short circuit protection*:	Continuous, automatic recovery
Temperature rise at full load:	15°C TYP, Ta = 25°C
Cooling:	Free air convection
Operation temperature range:	-40°C~+105°C
Storage temperature range:	-55°C ~+125°C
Pin welding resistance temperature:	300°C max, 1.5mm from case for 10 sec
Storage humidity range:	< 95%
Package material:	Plastic [UL94-V0]
Switching frequency:	Full load, nominal input 270KHz typ.
MTBF (MIL-HDFK-217F@25°C):	>3500 Khours
Dimensions:	19.65*6.00*10.16mm
Weight:	2.1g

Input specifications

Item	Test condition	Min	Typ	Max	Units
Input current (Full load/no load)	• 3.3/5V output • 9/12V output • 15/24V output		270/5 241/12 241/18	286/10 254/20 254/30	mA mA mA
Surge voltage (1sec. max.)	5VDC input	-0.7		9	VDC
Reflected ripple current			15		mA
Filter	Filter capacitor				
Hot plug	Unavailable				

Isolation specifications

Item	Test condition	Min	Typ	Max	Units
Isolation voltage	Tested for 1 minute and 1mA max	1500			VDC
Isolation resistance	Test at 500VDC	1000			MΩ
Isolation Capacitance	Input/output, 100KHz/0.1V		20		pF

Output specifications

Item	Test condition	Min	Typ	Max	Units
Output voltage accuracy	See tolerance envelope curve				
Line regulation	For Vin change of ±1% 3.3VDC output others			1.5 1.2	% %
Load regulation	10% to 100% load • 3.3VDC output • 5VDC output • 9VDC output • 12VDC output • 15VDC output • 24VDC output		 15 10 8 7 6 5	 20 15 10 10 10 10	 % % % % % %
Temperature coefficient	100% full load		±0.02		%/°C
Ripple & Noise*	20MHz Bandwidth 24VDC output others		 50 30	 100 75	 mVp-p mVp-p

* Test ripple and noise by "parallel cable" method.

Example:
1S7A_0505D1.5UP
1 = 1Watt; S7 = SIP7; A = series; 5Vin; 5Vout; D = Dual Output;
1.5 = 1.5kVDC; U = Unregulated Output; P = Short Circuit Protection

Note:

1. If the product is operated under the min. required load, the product performance cannot be guaranteed to comply with all performance indexes in this datasheet;
2. If the product is not operated within the required load range, the product performance cannot be guaranteed to comply with all parameters in the datasheet;
3. The maximum capacitive load offered were tested at input voltage range and full load;
4. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta = 25°C, humidity <75%RH with nominal input voltage and rated output load;
5. All index testing methods in this datasheet are based on our Company's corporate standards;
6. We can provide product customization service, please contact our technicians directly for specific information;
7. Products are related to laws and regulations: see „Features" and „EMC";
8. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.

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EMC specifications				
EMI	CE	CISPR32/EN55032	CLASS B (see EMC recommended circuit)	
EMI	RE	CISPR32/EN55032	CLASS B (see EMC recommended circuit)	
EMS	ESD	IEC/EN61000-4-2	Contact ±4KV, Air ±8KV	perfect Criteria B

Product Selection Guide

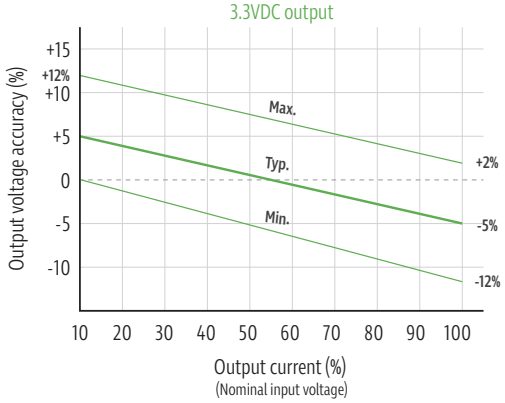
Part Number	Input Voltage [V]	Output Voltage [VDC]	Current [mA, max]	Efficiency [%, typ]	Capacitive load [µF, max]	Certification
1S7A_0503S1.5UP	5	3.3	303	74	2400	UL
1S7A_0505S1.5UP	5	5	200	82	2400	UL
1S7A_0509S1.5UP	5	9	111	83	1000	UL
1S7A_0512S1.5UP	5	12	84	83	560	UL
1S7A_0515S1.5UP	5	15	67	83	560	UL
1S7A_0524S1.5UP	5	24	42	85	220	UL

Part Number	Input Voltage [V]	Output Voltage [VDC]	Current [mA, max]	Efficiency [%, typ]	Capacitive load [µF, max]	Certification
1S7A_0503D1.5UP	5	±3.3	±152	74	1200	UL
1S7A_0505D1.5UP	5	±5	±100	82	1200	UL
1S7A_0509D1.5UP	5	±9	±56	83	470	UL
1S7A_0512D1.5UP	5	±12	±42	83	220	UL
1S7A_0515D1.5UP	5	±15	±34	83	220	UL
1S7A_0524D1.5UP	5	±24	±21	85	100	UL

Typical characteristics

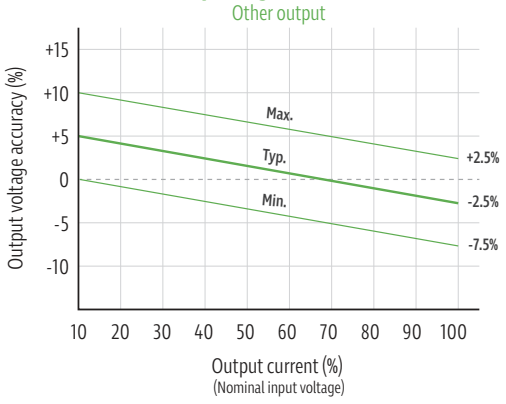
Output regulation curve

3.3VDC output

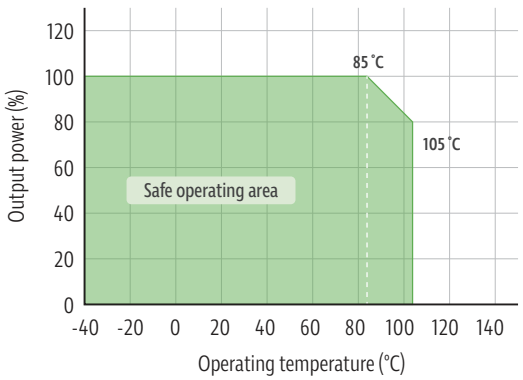


Output regulation curve

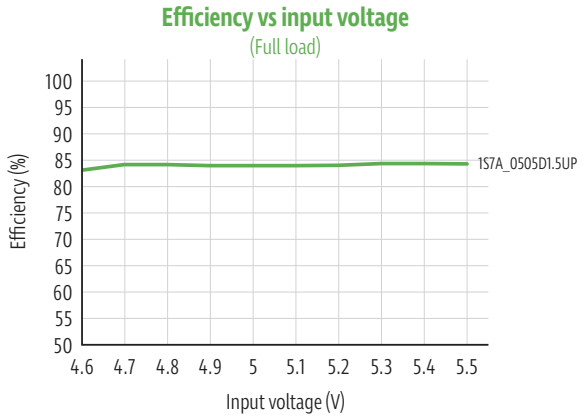
Other output

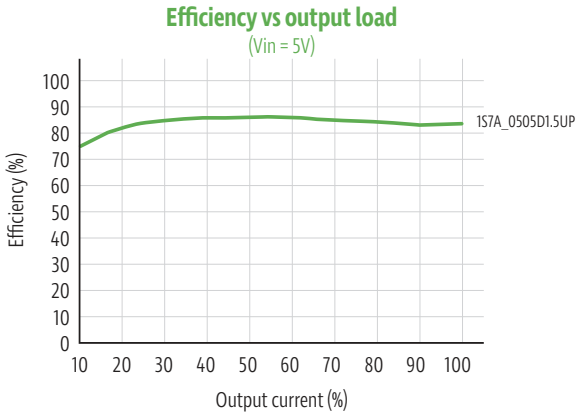


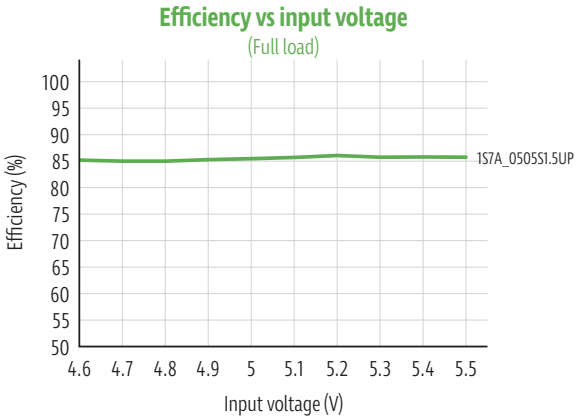
Temperature derating graph

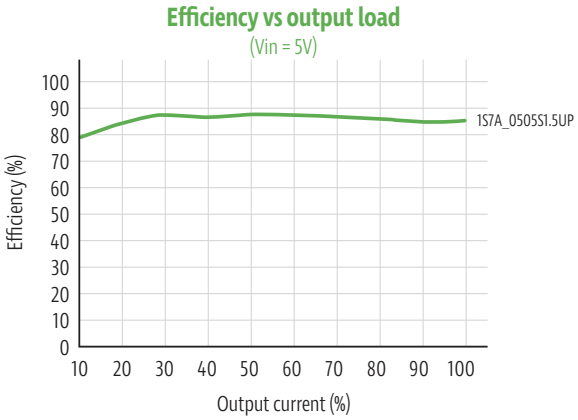


Efficiency









Typical application

If it is required to further reduce input and output ripple, a filter capacitor may be connected to the input and output terminals, see Fig. 1.
Moreover, choosing a suitable filter capacitor is very important, start-up problems may be caused if the capacitance is too large. Under the condition of safe and reliable operation, the recommended capacitive load values are shown in Table 1.

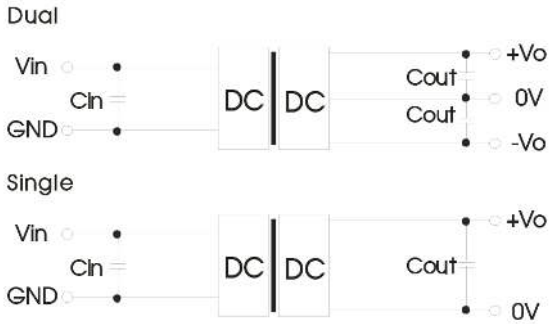
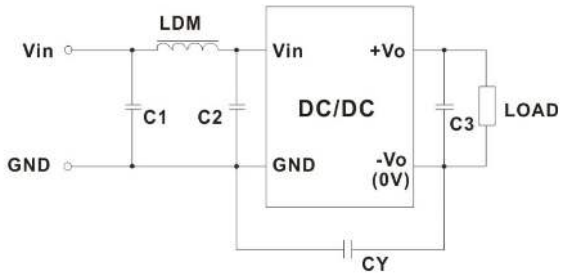


Figure 1

Recommended capacitive load value table (Table 1)

Vin (VDC)	Cin (µF)	Single Vout (VDC)	Cout (µF)	Dual Vout (VDC)	Cout (µF)
5	4.7	3.3/5	10	±5	4.7
–	–	9/12	2.2	±9/±12	1
–	–	15/24	1	±15/±24	0.47

EMC solution-recommended circuit

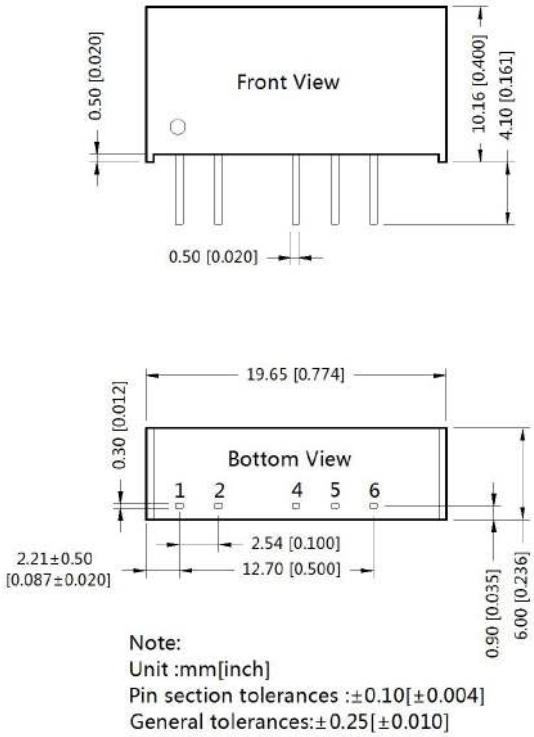


EMC recommended circuit value table

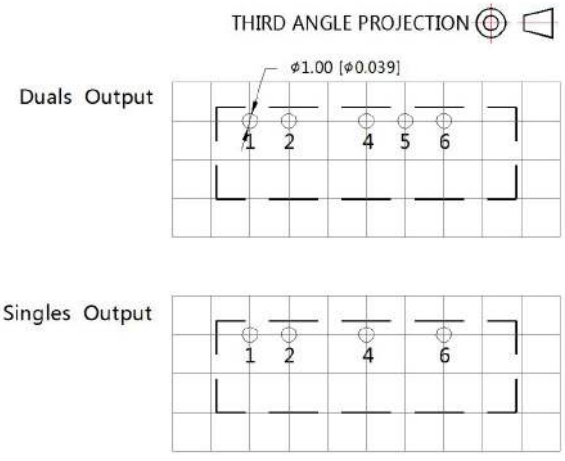
EMI // Output voltage	Vout: 5/9V	Vout: 12/15V
C1/C2	4.7μF/25V	4.7μF/25V
CY	-	1nF/4KVDC VISHAY HGZ102MBP TDK CD45-E2GA102M-G
C3	Refer to the Cout in typical application	
LDM	6.8μH	

Note:
In the case of actual use, the requirements for EMI are high, it is subject to CY .

Mechanical dimensions



Note:
Unit :mm[inch]
Pin section tolerances :±0.10[±0.004]
General tolerances:±0.25[±0.010]



Note : Grid 2.54*2.54mm

Pin-Out		
Pin	Singles	Duals
1	Vin	Vin
2	GND	GND
4	0V	-Vo
5	No Pin	0V
6	+Vo	+Vo

1S7A_1.5UP series

1W - Single/Dual Output DC-DC Converter - Fixed Input - Isolated & Unregulated

12/15/24Vin DC-DC Converter 1 Watt

- Continuous short-circuit protection
- No-load input current as low as 8mA
- Operating ambient temp range: -40°C to +105°C
- High efficiency up to 81%
- I/O isolation test voltage: 1.5kVDC
- Industry standard pin-out
- IEC62368, UL62368, EN62368 approved

The 1S7A_1.5UP series are specially designed for applications where an isolated (two isolated) voltage is required in a distributed power supply system. They are suitable for: pure digital circuits, low frequency analog circuits, relay-driven circuits and data switching circuits.

UL-62368-1 (E347551)

Common specifications

Short circuit protection*:	Continuous, self-recovery
Operation temperature range:	-40°C~+105°C (Derating when operating temperature ≥100°C, see Fig. 2)
Storage temperature range:	-55°C ~+125°C
Temperature rise at full load:	25°C TYP, Ta = 25°C
Pin welding resistance temp.:	300°C max, 1.5mm from case for 10 sec
Storage humidity range:	5 ~ 95 %RH (Non-condensing)
Vibration:	10-150Hz, 5G, 0.75mm. along X, Y and Z
MTBF (MIL-HDFK-217F@25°C):	>3500 Khours
Cooling:	Free air convection
Package material:	10-150Hz, 5G, 0.75mm. along X, Y and Z
Dimensions:	19.65 x 6.00 x 10.16mm
Weight:	2.1g

Input specifications

Item	Test condition	Min	Typ	Max	Units
Input current (Full load/no load)	• 12VDC input • 15VDC input • 24VDC input		105/8 84/8 56/8	110/- 88/- 61/-	mA mA mA
Reflected ripple current			15		mA
Surge voltage (1sec. max.)	• 12VDC input • 15VDC input • 24VDC input	-0.7 -0.7 -0.7		18 21 30	VDC VDC VDC
Filter	Filter capacitor				
Hot plug	Unavailable				

Note: * Reflected ripple current testing method please see DC-DC Converter Application Notes for specific operation.

Isolation specifications

Item	Test condition	Min	Typ	Max	Units
Isolation voltage	Tested for 1 minute and 1mA max	1500			VDC
Isolation resistance	Test at 500VDC	1000			MΩ
Isolation Capacitance	Input/output, 100KHz/0.1V		20		pF

Output specifications

Item	Test condition	Min	Typ	Max	Units
Voltage accuracy	See output regulation curves (Fig. 1)				
Line regulation	Input voltage change:±1% • 3.3VDC output • others			1.5 1.2	% %
Load regulation	10% to 100% load • 3.3VDC output • 5VDC output • 9VDC output • 12VDC output • 15VDC output • 24VDC output		 8 5 3 3 3 2	 20 15 10 10 10 10	 % % % % % %
Temperature coefficient	100% full load		±0.02		%/°C
Ripple & Noise*	20MHz Bandwidth 24VDC output others		 50 30	 100 75	 mVp-p mVp-p
Switching frequency:	Full load, nominal input			260	KHz

* The "parallel cable" method is used for ripple and noise test, please refer to DC-DC Converter Application Notes for specific information.

Example:
1S7A_1205D1.5UP
1 = 1Watt; S7 = SIP7; A = series; 12 = 12Vin; 05 = 5Vout; D = Dual Output; 1.5 = 1.5kVDC; U = Unregulated Output; P = Short Circuit

Note:

1. If the product is operated under the min. required load, the product performance cannot be guaranteed to comply with all performance indexes in this datasheet;
2. If the product is not operated within the required load range, the product performance cannot be guaranteed to comply with all parameters in the datasheet;
3. The maximum capacitive load offered were tested at input voltage range and full load;
4. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta = 25°C, humidity <75%RH with nominal input voltage and rated output load;
5. All index testing methods in this datasheet are based on our Company's corporate standards;
6. We can provide product customization service, please contact our technicians directly for specific information;
7. Products are related to laws and regulations: see „Features" and „EMC";
8. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.

EMC specifications				
Emissions	CE	CISPR32/EN55032	CLASS B (see EMC recommended circuit)	
Emissions	RE	CISPR32/EN55032	CLASS B (see EMC recommended circuit)	
Immunity	ESD	IEC/EN61000-4-2	IEC/EN61000-4-2 Air ±8kV, Contact ±6kV	perf. Criteria B

Refer to Fig.4 for recommended circuit test.

Product Selection Guide

Part Number	Input Voltage [V]	Output Voltage [VDC]	Current [mA, max]	Efficiency [%, typ]	Capacitive load [µF, max]	Certification
1S7A_1203S1.5UP	12 (10.8-13.2)	3.3	303/30	71/75	2400	UL
1S7A_1205S1.5UP	12 (10.8-13.2)	5	200/20	76/80	2400	UL
1S7A_1209S1.5UP	12 (10.8-13.2)	9	111/12	76/80	1000	UL
1S7A_1212S1.5UP	12 (10.8-13.2)	12	83/9	76/80	560	UL
1S7A_1215S1.5UP	12 (10.8-13.2)	15	67/7	77/81	560	UL
1S7A_1224S1.5UP	12 (10.8-13.2)	24	42/4	77/81	220	UL
1S7A_1505S1.5UP	15 (13.5-16.5)	5	200/20	76/80	2400	UL
1S7A_1509S1.5UP	15 (13.5-16.5)	9	111/12	76/80	1000	UL
1S7A_1512S1.5UP	15 (13.5-16.5)	12	83/9	76/80	560	UL
1S7A_1515S1.5UP	15 (13.5-16.5)	15	67/7	77/81	560	UL
1S7A_2403S1.5UP	24 (21.6-26.4)	3.3	303/30	69/75	2400	UL
1S7A_2405S1.5UP	24 (21.6-26.4)	5	200/20	73/79	2400	UL
1S7A_2409S1.5UP	24 (21.6-26.4)	9	111/12	74/80	1000	UL
1S7A_2412S1.5UP	24 (21.6-26.4)	12	83/9	75/81	560	UL
1S7A_2415S1.5UP	24 (21.6-26.4)	15	67/7	75/81	560	UL
1S7A_2424S1.5UP	24 (21.6-26.4)	24	42/4	75/81	220	UL

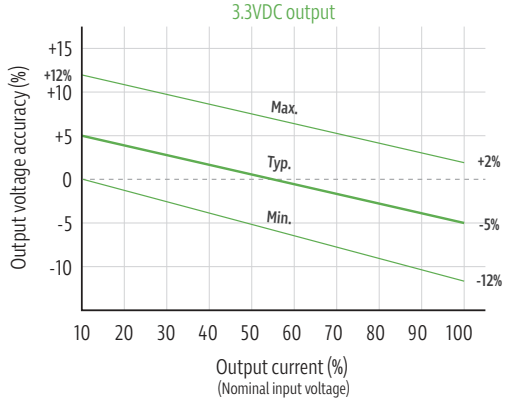
Part Number	Input Voltage [V]	Output Voltage [VDC]	Current [mA, max]	Efficiency [%, typ]	Capacitive load [µF, max]	Certification
1S7A_1203D1.5UP	12 (10.8-13.2)	±3.3	±152/±15	71/75	1200	UL
1S7A_1205D1.5UP	12 (10.8-13.2)	±5	±100/±10	76/80	1200	UL
1S7A_1212D1.5UP	12 (10.8-13.2)	±12	±42/±5	77/81	220	UL
1S7A_1215D1.5UP	12 (10.8-13.2)	±15	±34/±4	77/81	220	UL
1S7A_1224D1.5UP	12 (10.8-13.2)	±24	±21/±3	76/80	100	UL
1S7A_1505D1.5UP	15 (13.5-16.5)	±5	±100/±10	76/80	1200	UL
1S7A_1512D1.5UP	15 (13.5-16.5)	±12	±42/±5	76/80	220	UL
1S7A_1515D1.5UP	15 (13.5-16.5)	±15	±34/±4	77/81	220	UL
1S7A_2405D1.5UP	24 (21.6-26.4)	±5	±100/±10	74/80	1200	UL
1S7A_2412D1.5UP	24 (21.6-26.4)	±12	±42/±5	75/81	220	UL
1S7A_2415D1.5UP	24 (21.6-26.4)	±15	±34/±4	73/79	220	UL
1S7A_2424D1.5UP	24 (21.6-26.4)	±24	±21/±3	74/80	100	UL

Note: * The specified maximum capacitive load for positive and negative output is identical.

Typical characteristics

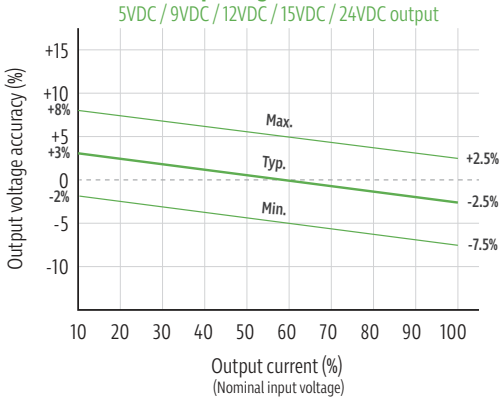
Output regulation curve

3.3VDC output



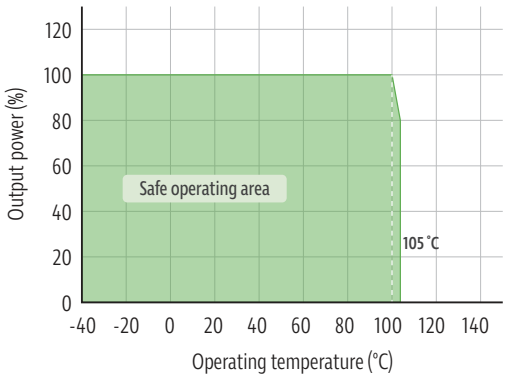
Output regulation curve

5VDC / 9VDC / 12VDC / 15VDC / 24VDC output



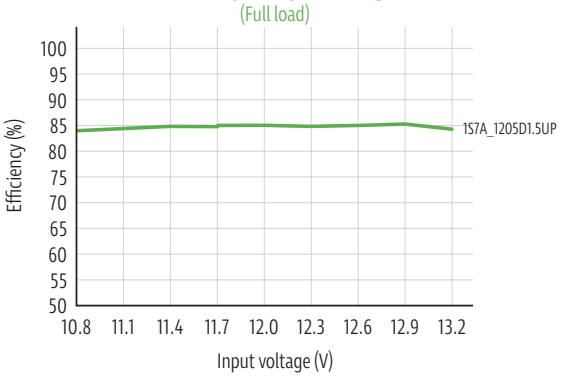
Typical characteristics

Temperature derating graph

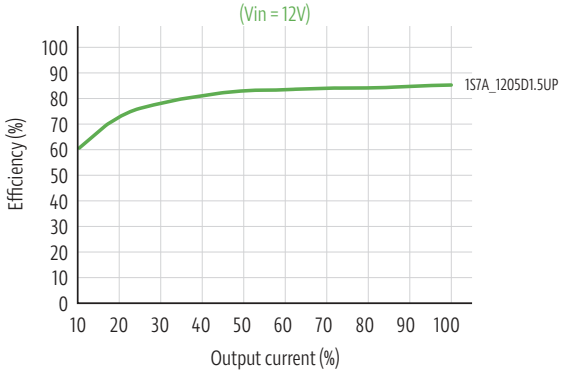


Efficiency

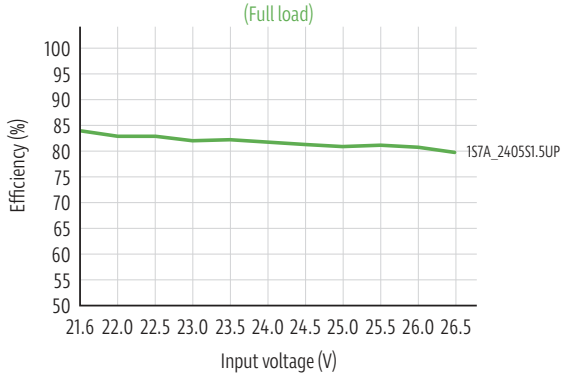
Efficiency vs input voltage
(Full load)



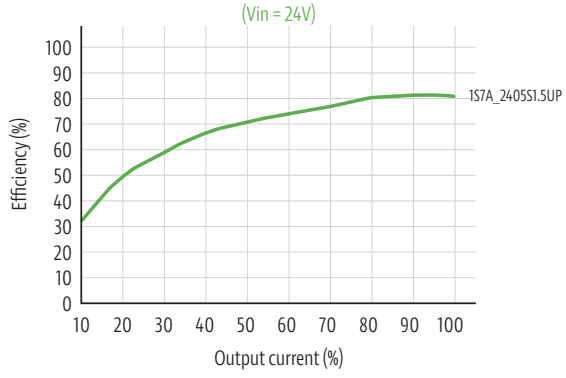
Efficiency vs output load
(Vin = 12V)



Efficiency vs input voltage
(Full load)



Efficiency vs output load
(Vin = 24V)



Typical application

Input and/or output ripple can be further reduced, by connecting a filter capacitor from the input and/or output terminals to ground as shown in Fig.3. Choosing suitable filter capacitor values is very important for a smooth operation of the modules, particularly to avoid start-up problems caused by capacitor values that are too high. For recommended input and output capacitor values refer to Table 1.

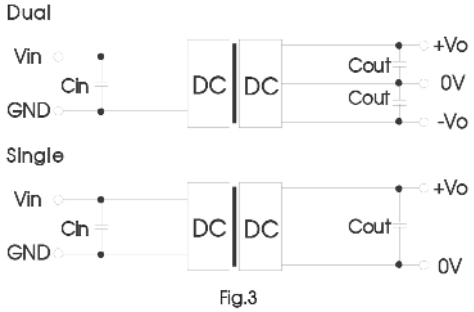


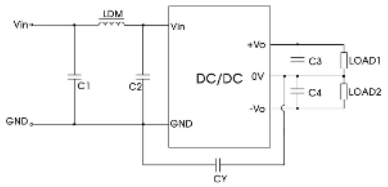
Fig.3

Table: Recommended input and output capacitor values

Vin	Cin	Single output	Cout	Dual output	Cout
12VDC	2.2µF/25V	3.3VDC	10µF/16V	±3.3VDC	4.7µF/16V
15VDC	2.2µF/25V	5VDC	10µF/16V	±5VDC	4.7µF/16V
24VDC	1µF/50V	9VDC	2.2µF/16V	±12VDC	1µF/25V
	–	12VDC	2.2µF/25V	±15VDC	0.47µF/25V
	–	15VDC	1µF/25V	±24VDC	0.47µF/50V
	–	24VDC	1µF/50V		

EMC solution-recommended circuit

Dual



Single

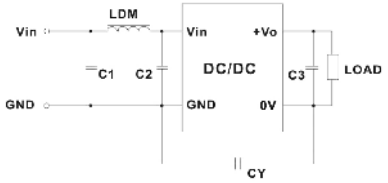
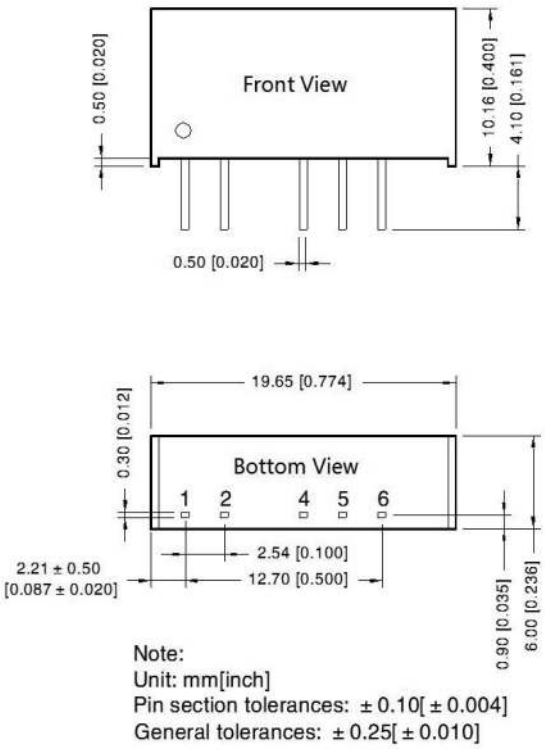


Fig.4

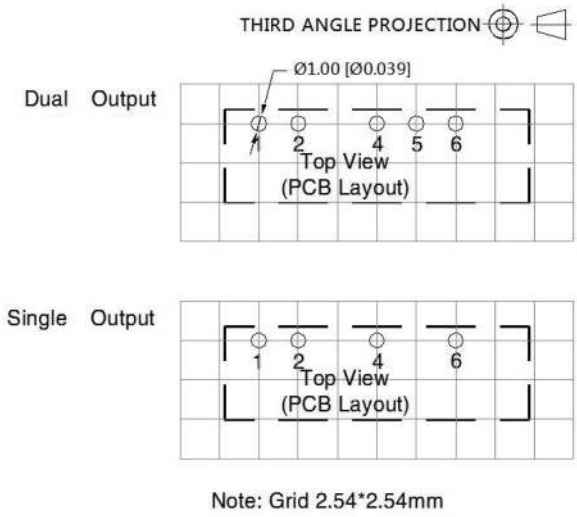
EMC recommended circuit value table

Emissions	C1	4.7μF /50V
	C2	4.7μF /50V
	CY	270pF/2kV
	C3	Refer to the Cout in table 1
	C4	Refer to the Cout in table 1
	LDM	6.8μH

Mechanical dimensions



Note:
Unit: mm[inch]
Pin section tolerances: ± 0.10[± 0.004]
General tolerances: ± 0.25[± 0.010]



Note: Grid 2.54*2.54mm

Pin–Out		
Pin	Single	Dual
1	Vin	Vin
2	GND	GND
4	0V	–Vo
5	No Pin	0V
6	+Vo	+Vo