Descriptions

3W isolated, DC/DC Converter





RoHS

CE Report EN62368-1

UKCA Report BS EN62368-1

Features

- Ultra compact SIP package
- Wide 2:1 input voltage range
- Operating ambient temperature range: -40℃ to +85℃
- I/O isolation test voltage: 1.5k VDC
- Low output ripple & noise
- Short circuit protection (self-recovery)
- Remote On/Off
- High power density

Applications

- Industrial control
- Energy storage systems
- Photovoltaic inverters

Selection Guide

Certification	Part No.	Input Voltage (VDC)		Output		Full Load Efficiency (%) Min./Typ.	Capacitive Load② (μF)Max.
		Nominal (Range)	Max.①	Voltage(VDC)	Current (mA) Max./Min.		
EN/BS EN	DES3-A0505	5 (4.5-9)	11	±5	±250/±13	72/74	1000
	DES3-A0512			±12	±104/±5	75/77	470
	DES3-A0515			±15	±83/±4	75/77	330
	DES3-A0524			±24	±52/±3	74/76	220
	DES3-B0503			3.3	758/38	66/68	1800
	DES3-B0505			5	500/25	71/73	2200
	DES3-B0509			9	278/14	72/74	1000
	DES3-B0512			12	208/10	75/77	680
	DES3-B0515			15	167/8	72/74	470
	DES3-B0524			24	104/5	74/76	330
	DES3-A1205	12 (9-18)	20	±5	±300/±15	76/78	1000
	DES3-A1209			±9	±167/±8	76/78	680
	DES3-A1212			±12	±125/±6	77/79	470
	DES3-A1215			±15	±100/±5	78/80	330
	DES3-B1203			3.3	758/38	73/75	2700
	DES3-B1205			5	600/30	74/76	2200

--	DES3-B1206			6	500/25	77/79	1800
EN/BS EN	DES3-B1209			9	333/17	77/79	1000
	DES3-B1212			12	250/13	80/82	680
	DES3-B1215			15	200/10	81/83	470
	DES3-B1224			24	125/6	79/81	330
	DES3-A2405	24 (18-36)	40	±5	±300/±15	77/79	1000
	DES3-A2409			±9	±167/±8	79/81	680
	DES3-A2412			±12	±125/±6	81/83	470
	DES3-A2415			±15	±100/±5	81/83	330
	DES3-B2403			3.3	758/38	72/74	2700
	DES3-B2405			5	600/30	79/81	2200
	DES3-B2409			9	333/17	81/83	1000
	DES3-B2412			12	250/13	81/83	680
	DES3-B2415			15	200/10	81/83	470
	DES3-B2424			24	125/6	81/83	330
	DES3-A4805	48 (36-75)	80	±5	±300/±15	77/79	1000
	DES3-A4812			±12	±125/±6	80/82	470
	DES3-A4815			±15	±100/±5	80/82	330
	DES3-B4803			3.3	758/38	73/75	2700
	DES3-B4805			5	600/30	74/76	2200
	DES3-B4812			12	250/13	78/80	680
	DES3-B4815			15	200/10	82/84	470
	DES3-B4824			24	125/6	80/82	330

Notes:
①Exceeding the maximum input voltage may cause permanent damage;
②The specified maximum capacitive load value for positive and negative output is identical;
③Product images are for reference only; the actual product shall prevail.

Product Feature

characteristic	Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Specifications	Input Current (full load /no-load)	5VDC Input	3.3V Output	--	735/40	758/85	mA
			Others		805/40	846/85	
		12VDC Input	3.3V Output	--	278/30	286/40	
			Others		314/30	338/40	
		24VDC Input	3.3V Output	--	140/20	145/40	
			Others		154/20	163/40	
		48VDC Input	3.3V Output	--	69/5	72/15	
			Others		78/5	85/15	
	Reflected Ripple Current	5VDC Input		--	20	--	
		12VDC Input		--	20	--	
	Reflected Ripple Current	24VDC Input		--	55	--	mA
		48VDC Input		--	55	--	
	Surge Voltage (1sec. max.)	5VDC Input		-0.7	--	12	VDC
		12VDC Input		-0.7	--	25	

		24VDC Input		-0.7	--	50	
		48VDC Input		-0.7	--	100	
	Start-up Voltage	5VDC Input		--	--	4.5	
		12VDC Input		--	--	9	
		24VDC Input		--	--	18	
		48VDC Input		--	--	36	
	Input Filter	Capacitor filter					
	Hot Plug	Unavailable					
	Ctrl①	Module on		Ctrl pin open (high resistance)			
		Module off		Ctrl pin pulled high (current 5-10mA typ. into Ctrl.)			
Output Specifications	Voltage Accuracy②	5%-100% load, input voltage range		--	±1	±3	
	Linear Regulation③	Input voltage variation from low to high at full load	Main	--	±0.2	±0.5	%
			Auxiliary	--	--	±2	
	Load Regulation	5%-100% load	Main	--	±0.6	±1	
			Auxiliary	--	--	±3	
	Transient Recovery Time	25% load step change		--	0.5	3	ms
	Transient Response Deviation	25% load step change		--	±2.5	±5	%
	Temperature Coefficient	Full load		--	±0.02	±0.03	%/℃
	Ripple & Noise④	20MHz bandwidth	DES3-B1212 DES3-B1215 DES3-B4824	--	70	100	mVp-p
			DES3-B1224 DES3-B2415 DES3-B2424 DES3-A4805 DES3-B4803	--	100	150	
			other		40	75	
	Short-circuit Protection	Continuous, self-recovery					
General Specifications	Isolation	Input-output Electric Strength Test for 1 minute with a leakage current of 1mA max.		1500	--	--	VDC
	Insulation Resistance	Input-output resistance at 500VDC		1000	--	--	MΩ
	Isolation Capacitance	Input-output capacitance at 100kHz/0.1V		--	120	--	pF
	Operating Temperature	See Fig. 1		-40	--	+85	℃
	Storage Temperature			-55	--	+125	
	Pin Soldering Resistance Temperature⑤	Soldering spot is 1.5mm away from the case, 10 seconds max.		--	--	+300	
		Wave soldering, maximum 10 seconds		255	260	265	
	Storage Humidity	Non-condensing		--	--	95	%RH
	Switching Frequency (PFM Mode)	Full load, nominal input voltage		--	250	--	kHz
	MTBF	MIL-HDBK-217F@25℃		1000	--	--	k hours
Mechanical	Case Material	Black plastic; flame-retardant and heat-resistant					

Specifications	Dimensions	22.00 × 9.50 × 12.00 mm
	Weight	4.5g(Typ.)
	Cooling Method	Free air convection

Note:
①For use of Ctrl, please refer to the "design reference" in this manual;
②Under the of 5%-100% load, the maximum output voltage accuracy of DES3-A1209、DES3-A2405 and DES3-A2415 auxiliary circuit is ±4%;
③Linear Regulation for 100% load, DES3-A1209、DES3-A2405 and DES3-A2415 main road increases to ±1%, side road increases to ±2.5% ;
④The " parallel cable" method is used for Ripple and Noise test;
⑤The pin soldering temperature tolerance is not the actual temperature set by the soldering iron but the temperature required for proper solder joints. The actual temperature set by the customer should be determined comprehensively based on factors such as PCB thickness, copper coverage, soldering iron power, and soldering iron tip selection.

Electromagnetic Compatibility (EMC)

Emission	CE	CISPR32/EN55032 CLASS B (see Fig. 3-② for recommended circuit)	
	RE	CISPR32/EN55032 CLASS B (see Fig. 3-② for recommended circuit)	
Immunity	ESD	IEC/EN61000-4-2 Contact ±4kV	perf. Criteria B
	RS	IEC/EN61000-4-3 10V/m	perf. Criteria A
	EFT	IEC/EN61000-4-4 ±2kV (see Fig. 3-① for recommended circuit)	perf. Criteria B
	Surge	IEC/EN61000-4-5 line to line ±2kV (see Fig. 3-① for recommended circuit)	perf. Criteria B
	CS	IEC/EN61000-4-6 3 Vr.m.s	perf. Criteria A

Characteristic Curve

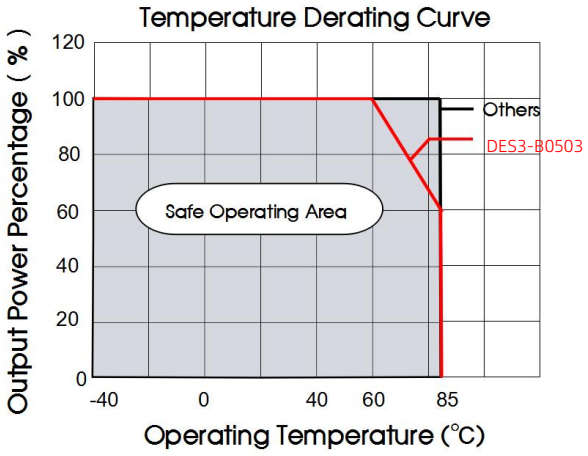
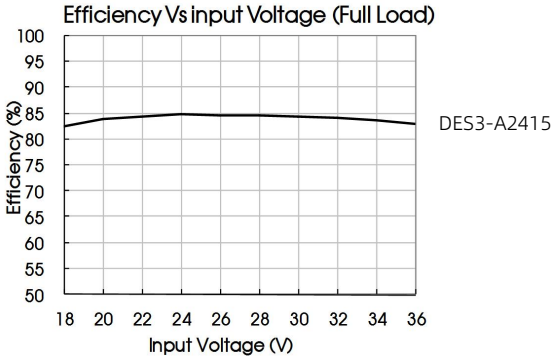
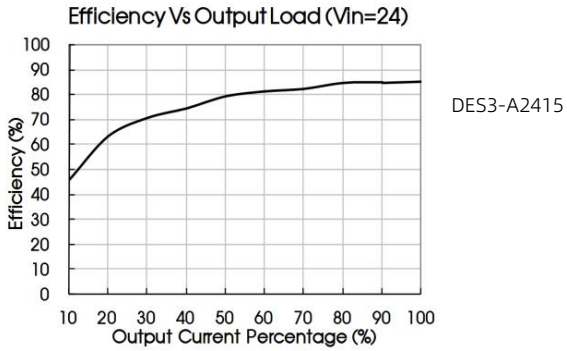
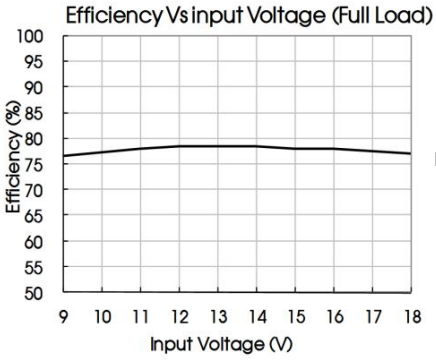
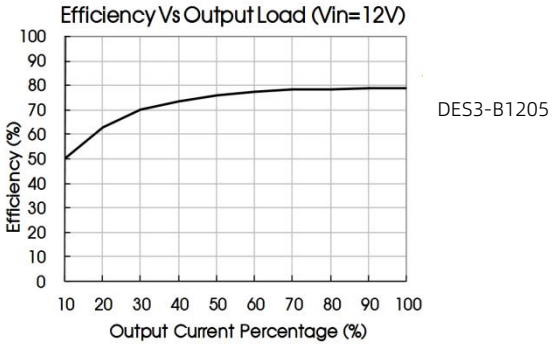


Fig 1









Design Reference

1.Typical application

①All DC-DC converters of this series are tested before delivery using the recommended circuit shown in Fig. 2.

②Input and/or output ripple can be further reduced by appropriately increasing the input & output capacitor values C1, C2, C3 and C4 and/or by selecting capacitors with a low ESR (equivalent series resistance). C3 is used to reduce ripple. No need to add C3, if ripple meets the demand. Appropriate filter capacitance shall be chosen, start-up problems may be caused if the capacitance is too large. For each output circuit, under the condition of safe and reliable operation, the max. capacity of its filter capacitor should be lower than the max. capacitive load.

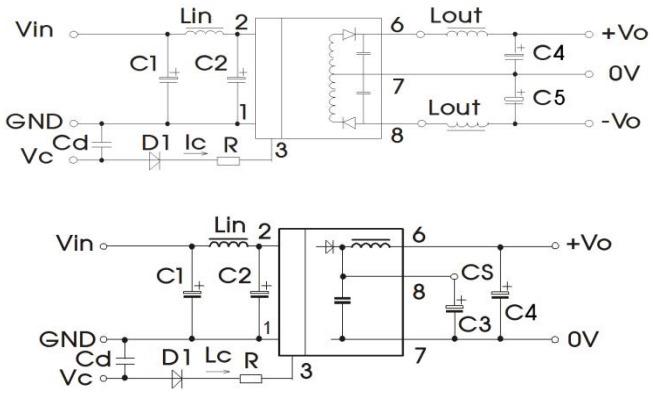


Fig. 2

Vin	5VDC&12VDC	24VDC&48VDC
C1	100μF/25V	10μF/100V
C2	47μF/25V	1μF/100V
Lin	4.7μH-12μH	
C3	10μF/50V-22 μF/50V	
C4/C5	100μF/50V(Typ.)	
Lout	2.2μH-10μH	
Cd	47nF/100V	

2.EMC compliance circuit

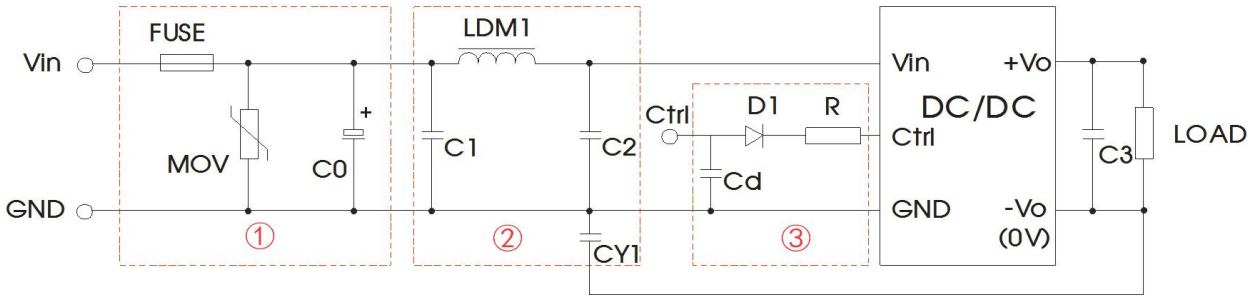


Fig. 3

Parameter description:

Model	Vin: 5VDC	Vin: 12VDC	Vin: 24VDC	Vin: 48VDC
FUSE	Slow-blow, selecting based on needs			
MOV	--	S14K20	S20K30	S14K60
C0	680μF/25V	680μF/25V	330μF/50V	330μF/100V
C1	4.7μF/50V			4.7μF/100V
LDM1	12μH			
C2	4.7μF/50V			4.7μF/100V
C3	Refer to the Cout in Fig.2			
CY1	1nF/2kV			
D1	RB160M-60V/1A			
R	In accordance with the formula: $R=\frac{V_C-V_D-1.0}{I_C}-300$			
Cd	47nF/100V			

Notes:

①For EMC tests we use Part ① in Fig. 3 for immunity and part ② for emissions test. Selecting based on needs.

② VC is the voltage of the Ctrl end relative to the GND of the input grounding; VD is the positive-going conduction pressure drop of D1; IC is the current flows into the Ctrl end and its value is generally 5-10mA, see Fig. 3-③ for the peripheral circuit of Ctrl end;

③ If there is no recommended parameters, no external component is required.

3.Ctrl end

The modules are of normal output when the Ctrl end is suspended or of high resistance; the modules turn off when connecting with high level (relative to the input grounding); notice that the current flows into the pin shall be 5 - 10mA, the modules will be permanently damaged if the current exceeds its max. value (20mA in general).

The value of R can be derived as follows:

$$R=\frac{V_C-V_D-1.0}{I_C}-300$$

For detailed parameter, please refer to EMC compliance circuit in this manual.

4.Input current

When the electricity is provided by the unstable power supply, please make sure that the range of the output voltage fluctuation and the ripple voltage of the power supply do not exceed the indicators of the modules. Input current of power supply should afford the flash start up current of this kind of DC/DC module(see Fig. 4).

Generally: Vin= 5V series Iave =1296mA

Vin=12V series Iave =631mA

Vin=24V series Iave =303mA

Vin=48V series Iave =157mA

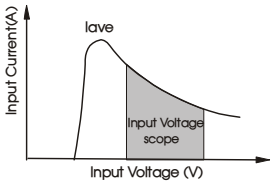
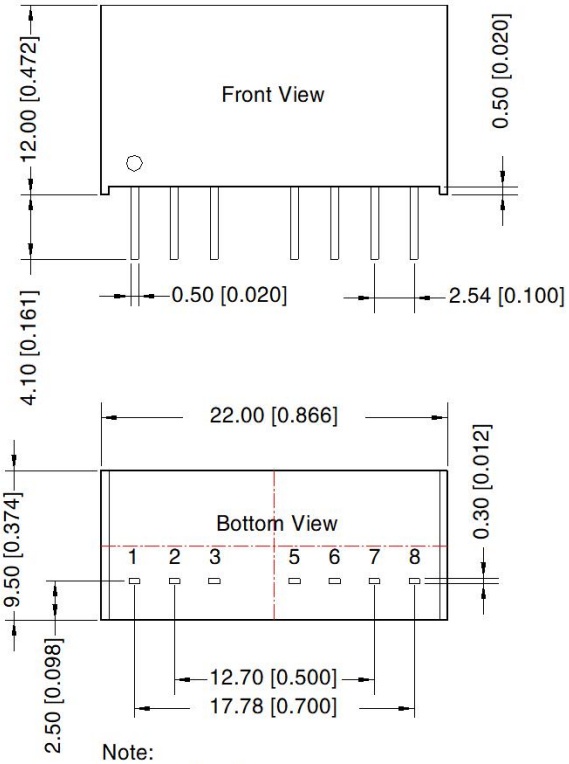


Fig. 4

5.Output load requirements

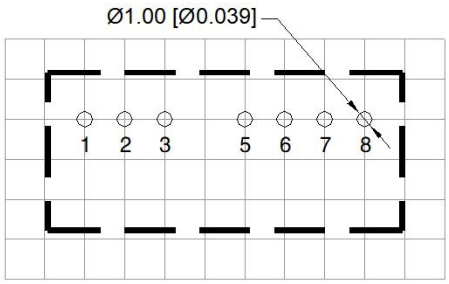
When using, the minimum load of the module output should not be less than 5% of the nominal load. In order to meet the performance parameters of this datasheet, please connect a 5% dummy load in parallel at the output end, the dummy load is generally a resistor, please note that the resistor needs to be used in derating.

DES3-Axxxx Dimensions and Recommended Layout



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

THIRD ANGLE PROJECTION

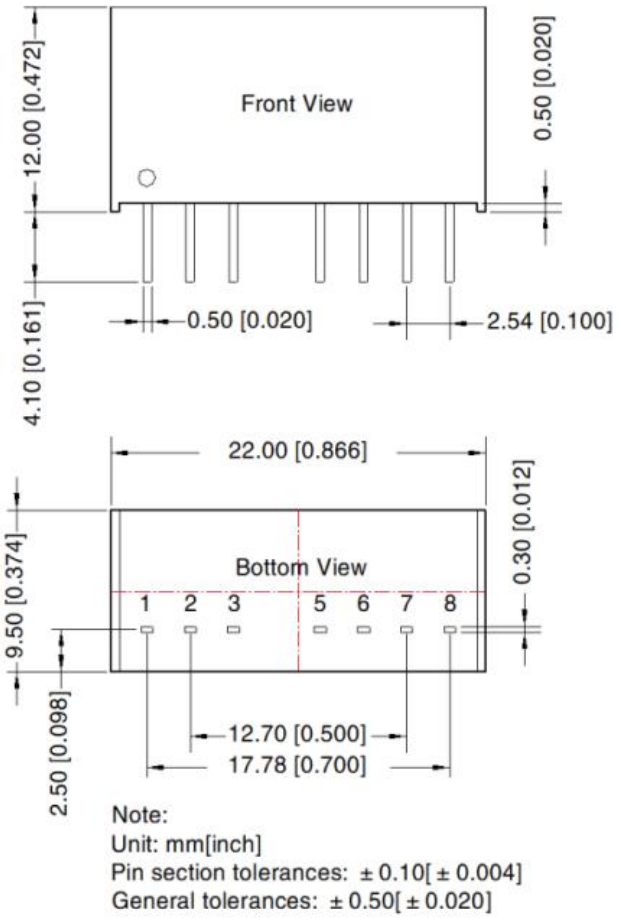


Note: Grid 2.54*2.54mm

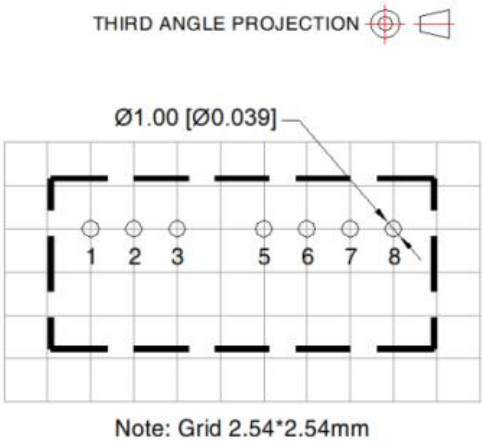
Pin–Out	
Pin	Mark
1	GND
2	Vin
3	Ctrl
5	NC
6	+Vo
7	0V
8	–Vo

NC: Pin to be isolated from circuitry

DES3-Bxxxx Dimensions and Recommended Layout



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



Note: Grid 2.54*2.54mm

Pin–Out	
Pin	Mark
1	GND
2	Vin
3	Ctrl
5	NC
6	+Vo
7	0V
8	CS

NC: Pin to be isolated from circuitry

Notes:

1. Recommend to use module with more than 5% load, if not, the ripple of the product may exceeds the specification, but does not affect the reliability of the product;
2. It is recommended that the load imbalance of the dual output is ≤±5%. If it exceeds ±5%, the performance of the product cannot be guaranteed to meet as datasheet marked. For details, please contact our technical staff;
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℃, humidity<75%RH with nominal input voltage and rated output load;
5. All index testing methods in this datasheet are based on company corporate standards;
6. Products are related to laws and regulations: see "Features" and "EMC";
7. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units;
8. 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.