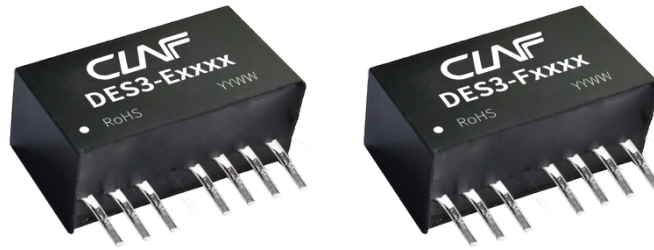


DESCRIPTIONS

3W, DC/DC Converter



RoHS



Report



Report

EN62368-1

BS EN62368-1

FEATURES

- Compact SIP package
- Wide input voltage range (2:1)
- Operating temperature range: -40°C to +85°C
- I/O Isolation test voltage 3k VDC
- High power density
- Short circuit protection (self-recovery)
- Remote On/Off

APPLICATIONS

- Industrial control
- Power
- Home appliances
- Instrumentation
- Communication
- Civil applications

Selection Guide

Certification	Part No.	Input Voltage (VDC)		Output		Ripple&noise (mVp-p) Typ./Max.	Full Load Efficiency (%) Min./Typ.	Capacitive Load ^② (μF)Max.
		Nominal (Range)	Max. ^①	Voltage (VDC)	Current(mA) Max./Min.			
EN/BS EN	DES3-E0505	5 (4.5-9)	11	±5	±250/±13	40/75	72/74	1000
	DES3-E0512			±12	±104/±5		75/77	470
	DES3-E0515			±15	±83/±4		75/77	330
	DES3-F0505			5	500/25		71/73	2200
	DES3-F0509			9	278/14		72/74	1000
	DES3-F0512			12	208/10		75/77	680
	DES3-F0515			15	167/8		72/74	470
EN/BS EN	DES3-E1205	12 (9-18)	20	±5	±300/±15	40/75	76/78	1000
	DES3-E1212			±12	±125/±6		77/79	470
	DES3-E1215			±15	±100/±5		78/80	330
	DES3-F1203			3.3	758/38	70/100	73/75	2700
	DES3-F1205			5	600/30		74/76	2200
	DES3-F1209			9	333/17		77/79	1000
	DES3-F1212			12	250/13	100/150	80/82	680
	DES3-F1215			15	200/10		81/83	470
	DES3-F1224			24	125/6		79/81	330
EN/BS EN	DES3-E2405	24 (18-36)	40	±5	±300/±15	40/75	77/79	1000
	DES3-E2409			±9	±167/±8		79/81	680
	DES3-E2412			±12	±125/±6		81/83	470
	DES3-E2415			±15	±100/±5		81/83	330
UL/EN/ BS EN/IEC	DES3-F2403			3.3	758/38		72/74	2700
	DES3-F2405			5	600/30		79/81	2200
EN/BS EN	DES3-F2409			9	333/17		81/83	1000
	DES3-F2412			12	250/13		81/83	680
	DES3-F2415			15	200/10	100/150	81/83	470
UL/EN/ BS EN/IEC	DES3-F2424			24	125/6		81/83	330
EN/BS EN	DES3-E4805	48 (36-75)	80	±5	±300/±15	40/75	77/79	1000
	DES3-E4812			±12	±125/±6		80/82	470
	DES3-E4815			±15	±100/±5		80/82	330
	DES3-F4803	48 (36-75)	80	3.3	758/38	100/150	73/75	2700
	DES3-F4805			5	600/30	40/75	74/76	2200
	DES3-F4812			12	250/13		78/80	680
	DES3-F4815			15	200/10	70/100	82/84	470

Notes:

①Exceeding the maximum input voltage may cause permanent damage;

②For the dual output modules, the capacitive loads of positive and negative outputs are the same.

Specifications

Specifications	Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Specifications	Input Current (full load/no-load)	5VDC Input		--	800/60	846/65	mA
		12VDC Input	3.3V Output	--	277/25	286/30	
			Others	--	314/25	338/30	
		24VDC Input	3.3V Output	--	140/8	145/13	
			Others	--	154/8	163/13	
		48VDC Input	3.3V Output	--	69/3	72/10	
	Others		--	78/3	85/10		
	Reflected Ripple Current	5VDC Input		--	20	--	
		12VDC Input		--	20	--	
		24VDC Input		--	55	--	
		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	
	Starting Voltage	5VDC Input		3.5	4	4.5	
		12VDC Input		4.5	8	9	
		24VDC Input		11	16	18	
		48VDC Input		24	33	36	
	Input Filter			Capacitor filter			
	Hot Plug			Unavailable			
	Ctrl ^①	Module turn-on		The Ctrl end is suspended or of high resistance			
		Module turn-off		Connect with high level (relative to the input grounding) to make the 5-10mA current flows into the Ctrl end.			
Output Specifications	Output Voltage Accuracy ^②	5%-100% load		--	±1	±3	%
	Line Regulation ^③	Full load, the input voltage is from low to high		--	±0.2	±0.5	
	Load Regulation	5%-100% load		--	±0.4	±0.75	
	Transient Recovery Time	25% load step change		--	0.5	3	ms
	Transient Response Deviation			--	±2.5	±5	%
	Temperature Coefficient	Full load		--	±0.02	±0.03	%/°C
	Ripple & Noise ^④	20MHz bandwidth		See Selection Guide			
	Short Circuit Protection			Continuous, self-recovery			
General Specifications	Insulation Voltage	Input-output, with the test time of 1 minute and the leak current lower than 1mA		3000	--	--	VDC
	Insulation Resistance	Input-output, isolation voltage 500VDC		1000	--	--	MΩ

General Specifications	Isolation Capacitance	Input-output, 100kHz/0.1V	--	30	50	pF
	Operating Temperature	see Fig. 1	-40	--	+85	°C
	Storage Temperature		-55	--	+125	
	Casing Temperature Rise	Ta=25°C, nominal input, full load output	--	+25	--	°C
	Pin Welding Resistance Temperature	Welding spot is 1.5mm away from the casing, 10 seconds	--	--	+300	
	Storage Humidity	Non-condensing	--	--	95	%RH
	Switching Frequency (PFM Mode)	Full load, nominal input voltage	--	250	--	kHz
	MTBF	MIL-HDBK-217F@25°C	1000	--	--	k hours
Mechanical Specifications	Casing Material	Black flame-retardant and heat-resistant plastic				
	Dimension	22.00 x 9.50 x 12.00 mm				
	Weight	4.9g(Typ.)				
	Cooling Method	Free air convection				

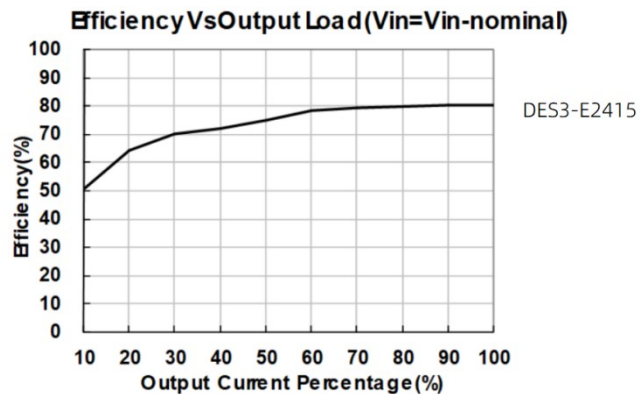
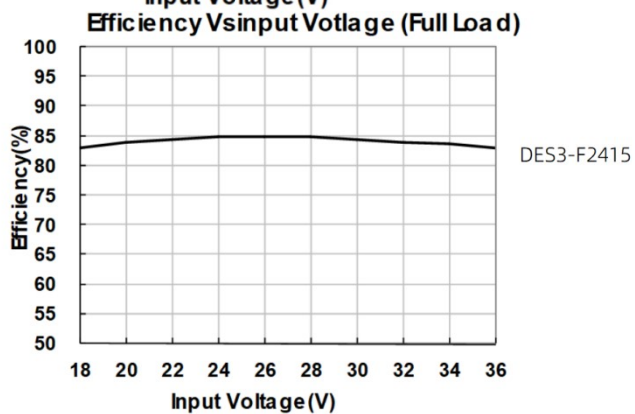
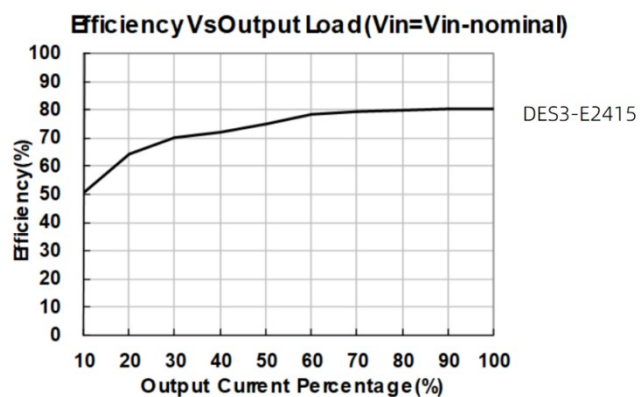
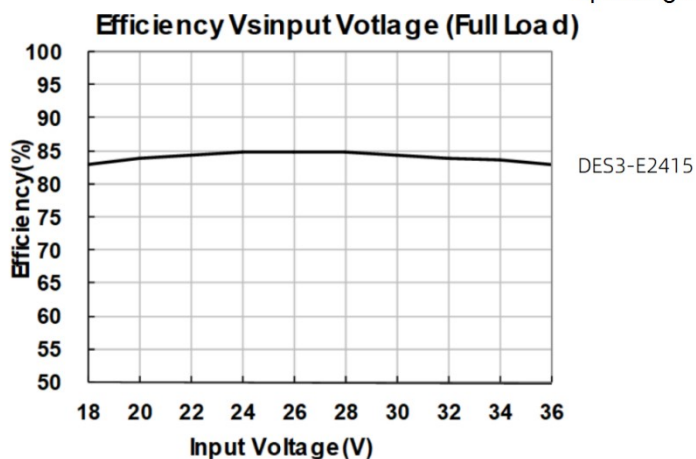
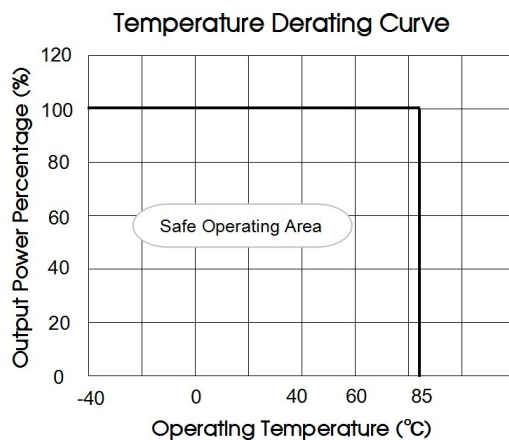
Note:

- 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-E2405 auxiliary circuit is $\pm 4\%$;
 ③Linear Regulation for 100% load, DES3-E2405 increases to $\pm 1\%$;
 ④Ripple and noise are measured by “parallel cable” method, The DES3-E2405 ripple maximum is 65 mVp-p.

Electromagnetic Compatibility (EMC)

EMI	CE	CISPR32/EN55032 CLASS B (see Fig. 3-② for recommended circuit)				
	RE	CISPR32/EN55032 CLASS B (see Fig. 3-② for recommended circuit)				
EMS	ESD	IEC/EN61000-4-2	Contact $\pm 4\text{kV}$			perf. Criteria B
	RS	IEC/EN61000-4-3	10V/m			perf. Criteria A
	EFT	IEC/EN61000-4-4	$\pm 2\text{kV}$ (see Fig. 3-① for recommended circuit)			perf. Criteria B
	Surge	IEC/EN61000-4-5	line to line $\pm 2\text{kV}$ (see Fig. 3-① for recommended circuit)			perf. Criteria B
	CS	IEC/EN61000-4-6	3 Vr.m.s			perf. Criteria A
	Voltage dips, short interruptions and voltage variations immunity	IEC/EN61000-4-29	0%, 70%			perf. Criteria B

Characteristic Curve



Design Reference

1. Typical application

All the DC/DC converters of this series are tested according to the recommended circuit (see Fig. 2) before delivery.

If a further decrease of the input and output ripple is required, properly increase the input & output of additional capacitors C_{in1} , C_{in2} , C_s and C_{out} ; or select capacitors of low equivalent impedance like series capacitor, etc. C_s is used to reduce ripple. No need to add C_s , 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.

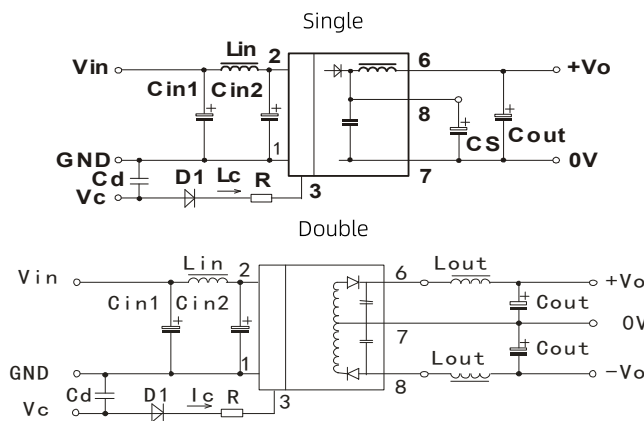


Fig. 2

Vin	5VDC&12VDC	24VDC&48VDC
Cin1	100 μ F/25VDC	10 μ F/100VDC
Cin2	47 μ F/25VDC	1 μ F/100VDC
Lin	4.7 μ H-12 μ H	
Cs	10 μ F-22 μ F/50VDC	
Cout	100 μ F/50VDC(Typ.)	
Cd	47nF/100V	

2. EMC compliance recommended circuit

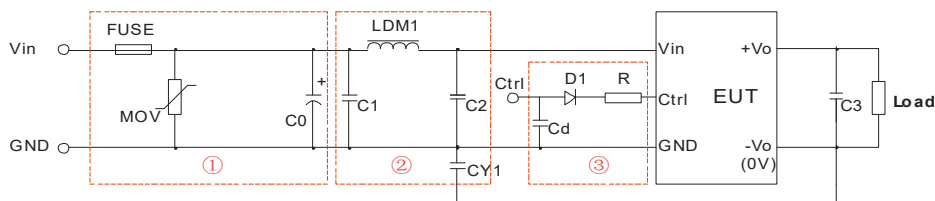


Fig 3

Parameter description:

Model	Vin: 5VDC	Vin: 12VDC	Vin: 24VDC	Vin: 48VDC
FUSE	Selecting based on needs			
MOV	--	S14K20	S20K30	S14K60
LDM1	12 μ H	12 μ H	12 μ H	12 μ H
C0	680 μ F/25V		330 μ F/50V	330 μ F/100V

C1	4.7μF/50V	4.7μF/100V
C2	4.7μF/50V	4.7μF/100V
C3	Refer to the Cout in Fig.2	
CY1	1nF/3kV	
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:

- ① Part ① in Fig. 3 is used for EMS test while part ② is used for EMI filtering; and parts ① and ② may be selected based on needs.
- ② V_C is the voltage of the Ctrl end relative to the GND of the input grounding; V_D is the positive-going conduction pressure drop of D1; I_C 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 solution-recommended 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 startup current of this kind of DC/DC module(see Fig. 5).

Generally: Vin= 5V series Iave =1315mA
 Vin=12V series Iave =631mA
 Vin=24V series Iave =303mA
 Vin=48V series Iave =158mA

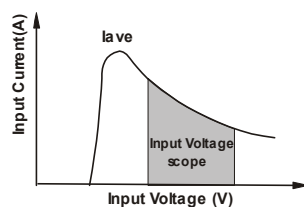
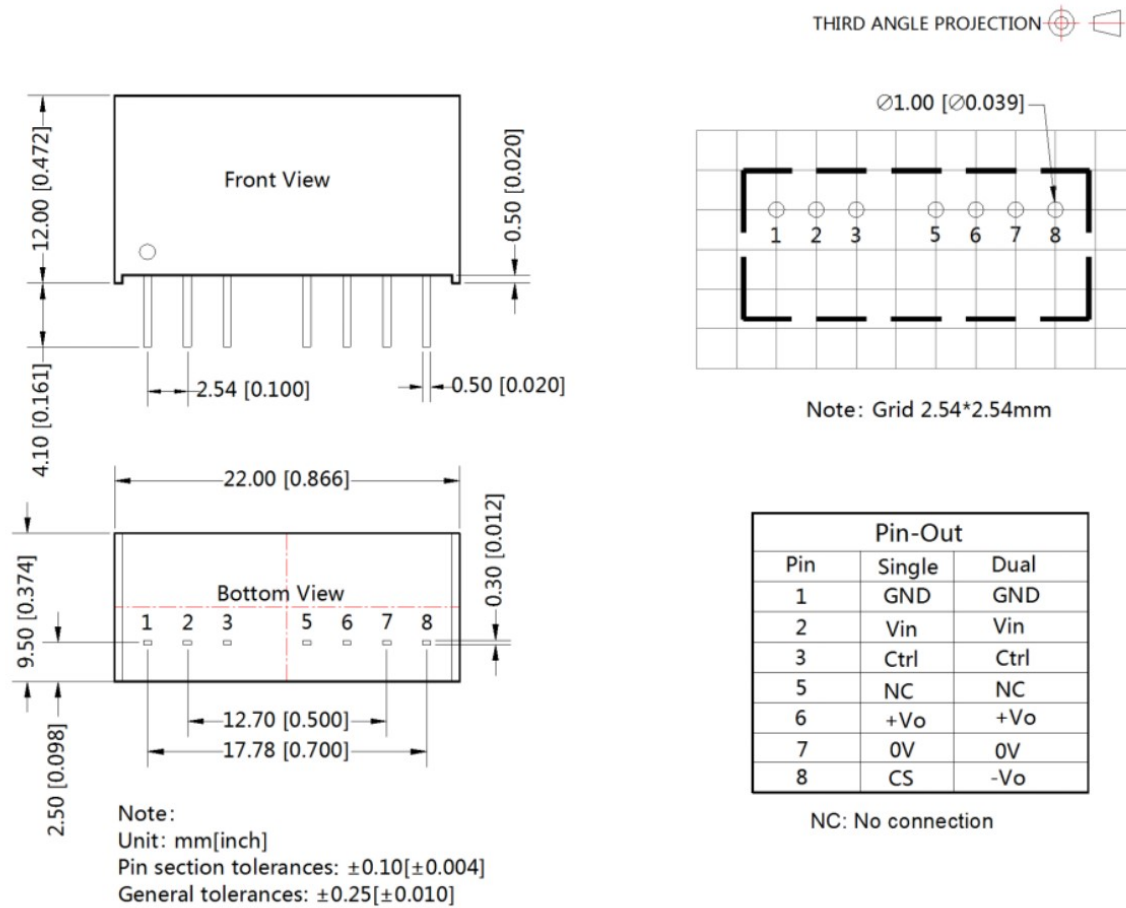


Fig. 5

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.

Dimensions and Recommended



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. The recommended unbalance degree of the dual output module load is $\leq \pm 5\%$; if the degree exceeds $\pm 5\%$, than 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 $T_a = 25^\circ\text{C}$, humidity $< 75\% \text{RH}$ with nominal input voltage and rated output load;
5. All index testing methods in this datasheet are based on company corporate standards.