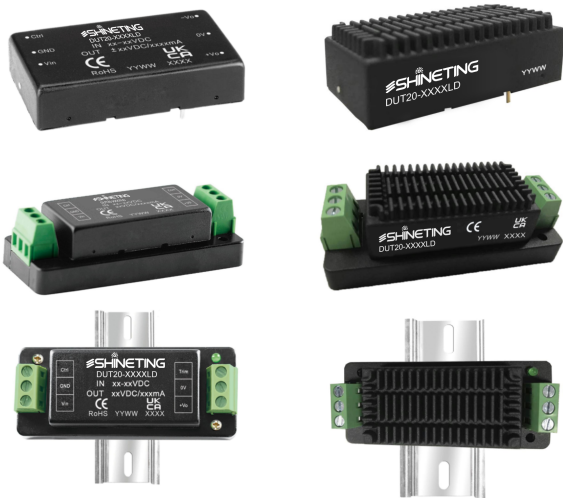


- Ultra-wide 4:1 input voltage range
- High efficiency up to 90%
- No-load power consumption as low as 0.15W
- I/O isolation test voltage 1.5k VDC
- Input under-voltage protection, output short-circuit, over-voltage, over-current protection
- Operating ambient temperature range: -40°C to +85°C
- Meets CISPR32/EN55032 CLASS A, without extra components
- Six-sided metal shielding package
- Input reverse polarity protection available with chassis(A2S) or Din-Rail mounting (A4S) version

DUT20-XXXXLD



RoHS 3-Year Warranty

Description

DUT20-XXXXLD series of isolated 20W DC-DC products with an ultra 4:1 input voltage range. They feature efficiencies up to 90%, input to output isolation is tested with 1500VDC, operating ambient temperature range of -40 °C to +85 °C , input under-voltage protection, output short-circuit, over-voltage, over-current protection.

Selection Guide

Certification	Part No.	Input Voltage (VDC) Nominal (Range)	Input Voltage (VDC) Max.	Output Voltage (Vdc)	Output Current (mA) Max./Min.	Full Load Efficiency (%) Min./Typ.	Capacitive Load(μF) Max.
/	DUT20-2403LD	24 (9-36)	40	3.3	5000/0	84/86	10000
	DUT20-2405LD			5	4000/0	86/88	10000
	DUT20-2409LD			9	2222/0	86/88	4700
	DUT20-2412LD			12	1667/0	87/89	1600
	DUT20-2415LD			15	1333/0	88/90	1000
	DUT20-2424LD			24	834/0	88/90	500

Selection Guide

Certification	Part No.	Input Voltage (Vdc) Nominal (Range)	Input Voltage (VDC) Max.	Output Voltage (Vdc)	Output Current (mA) Max./Min.	Full Load Efficiency (%) Min./Typ.	Capacitive Load(μF) Max.
/	DUT20-4803LD	48 (18-75)	80	3.3	5000/0	84/86	10000
	DUT20-4805LD			5	4000/0	84/86	10000
	DUT20-4809LD			9	2222/0	87/89	4700
	DUT20-4812LD			12	1667/0	85/87	1600
	DUT20-4815LD			15	1333/0	88/90	1000
	DUT20-4824LD			24	834/0	86/88	500

Notes:

①Use “H” suffix for heat sink mounting, “A2S” suffix for chassis mounting and “A4S” suffix for DIN-Rail mounting. We recommend to choose modules with a heat sink for enhanced heat dissipation and applications with extreme temperature requirements;

②The minimum input voltage and starting voltage of A2S and A4S Model are 1VDC higher than those of DIP package due to input reverse polarity protection function;

③Exceeding the maximum input voltage may cause permanent damage;

④Efficiency is measured at nominal input voltage and rated output load; efficiencies for A2S and A4S Model's is decreased by 2% due to the input reverse polarity protection circuit;

⑤The specified maximum capacitive load for positive and negative output is identical.

Input Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Current (full load / no-load)	24VDC input	3.3V output	--	799/40	818/45	mA
		5V output	--	969/40	993/80	
		Others	--	947/6	969/10	
	48VDC input	3.3V output	--	400/20	409/25	
		5V output	--	485/20	497/60	
		Others	--	474/5	485/9	
Reflected Ripple Current	24VDC input		--	30	--	
	48VDC input		--	30	--	

Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Surge Voltage (1sec. max.)	24VDC input	-0.7	--	50	VDC
	48VDC input	-0.7	--	100	
Start-up Voltage	24VDC input	--	--	9	
	48VDC input	--	--	18	
Input Under-voltage Protection	24VDC input	5.5	6.5	--	
	48VDC input	12	15.5	--	
Start-up Time	Nominal input & constant resistance load	--	10	--	ms
Input Filter		Pi filter			
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	--	4	7	mA
Hot Plug		Unavailable			
Note: *The Ctrl pin voltage is referenced to input GND.					

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Voltage Accuracy①	0%-100% load		--	±1	±3	%
Linear Regulation	Input voltage variation from low to high at full load	Positive Output	--	±0.2	±0.5	
		Negative Output	--	±0.5	±1	
Load Regulation②	5%-100% load	Positive Output	--	±0.5	±1	
		Negative Output	--	±0.5	±1.5	
Cross Regulation	Dual output with Positive output at 50% load and Negative output from 10%-100% load		--	--	±5	

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Transient Recovery Time	25% load step change, nominal input voltage		--	300	500	μs
Transient Response Deviation		3.3V/5V/±5V output	--	±5	±8	%
		Others	--	±3	±5	
Temperature Coefficient	Full load		--	--	±0.03	%/°C
Ripple & Noise③	20MHz bandwidth, 5%-100% load		--	50	100	mVp-p
Trim	Input voltage range		90	--	110	%Vo
Over-voltage Protection			110	--	160	
Over-current Protection			110	--	190	%Io
Short-circuit Protection			Hiccup, continuous, self-recovery			

Note:

①Output voltage accuracy of ±5VDC/±9VDC output converter for 0%-5% load is ±5% max;

②Load regulation for 0%-100% load is ±5%;

③Under 0% -5% load conditions, ripple & noise does not exceed 5%Vo. The “parallel cable” method is used for Ripple and Noise test, please refer to DC-DC

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.		1500	--	--	VDC
Insulation Resistance	Input-output resistance at 500VDC		1000	--	--	MΩ
Isolation Capacitance	Input-output capacitance at 100kHz/0.1V	URB2424LD-20WR3	--	2050	--	p
		Others	--	1050	--	
Operating Temperature	See Fig. 1		-40	--	+85	°C
Cross Regulation	Dual output with Positive output at 50% load and Negative output from 10%-100% load		-55	--	+125	

General Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Storage Humidity	Non-condensing	5	--	95	%RH
Pin Soldering Resistance Temperature	Soldering spot is 1.5mm away from case for 10 seconds	--	--	300	°C
Vibration		IEC/EN61373 - Category 1, Grade B			
Switching Frequency *	PWM mode	--	270	--	kHz
MTBF	MIL-HDBK-217F@25°C	1000	--	--	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	Horizontal package (without heat sink)		50.80 × 25.40 × 11.80 mm
	Horizontal package (with heat sink)		51.40 × 26.20 × 16.50mm
	A2S chassis mounting (without heat sink)		76.00 × 31.50 × 21.20 mm
	A2S chassis mounting (with heat sink)		76.00 × 31.50 × 25.30 mm
	A4S Din-rail mounting (without heat sink)		76.00 × 31.50 × 25.80 mm
	A4S Din-rail mounting (with heat sink)		76.00 × 31.50 × 29.90 mm
Weight	Without heat sink	Horizontal package/A2S chassis mounting/A4S Din-rail mounting	25.0g/48.0g/68.0g(Typ.)
	With heat sink	Horizontal package/A2S chassis mounting/A4S Din-rail mounting	34.0g/56.0g/76.0g(Typ.)
Cooling Method	Free air convection		

Electromagnetic Compatibility (EMC)

Emissions	CE	CISPR32/EN55032 CLASS A (without extra components)/ CLASS B (see Fig.3-② for recommended circuit)
	RE	CISPR32/EN55032 CLASS A (without extra components)/ 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 (without extra components) 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.3-①for recommended circuit) perf. Criteria B
	CS	IEC/EN61000-4-6 3 Vr.m.s (without extra components) perf. Criteria A
	Voltage dips, short interruptions and voltage variations immunity	IEC/EN61000-4-29 0%, 70% perf. Criteria B

Electromagnetic Compatibility (EMC) (EN50155)

Emissions	CE	EN50121-3-2 150kHz-500kHz 99dBμV (see Fig.3-② for recommended circuit) EN55016-2-1 500kHz-30MHz 93dBμV (see Fig.3-② for recommended circuit)
	RE	EN50121-3-2 30MHz-230MHz 40dBμV/m at 10m (see Fig.3-② for recommended circuit) EN55016-2-1 230MHz-1GHz 47dBμV/m at 10m (see Fig.3-② for recommended circuit)
Immunity	ESD	EN50121-3-2 Contact ±6kV/Air ±8kV perf. Criteria A
	RS	EN50121-3-2 20V/m (without extra components) perf. Criteria A
	EFT	EN50121-3-2 ±2kV 5/50ns 5kHz (see Fig.3-① for recommended circuit) perf. Criteria A
	Surge	EN50121-3-2 line to line ±1kV (42Ω, 0.5μF) (see Fig.3-① for recommended circuit) perf. Criteria A
	CS	EN50121-3-2 0.15MHz-80MHz 10V r.m.s (without extra components) perf. Criteria A

Typical Characteristic Curves

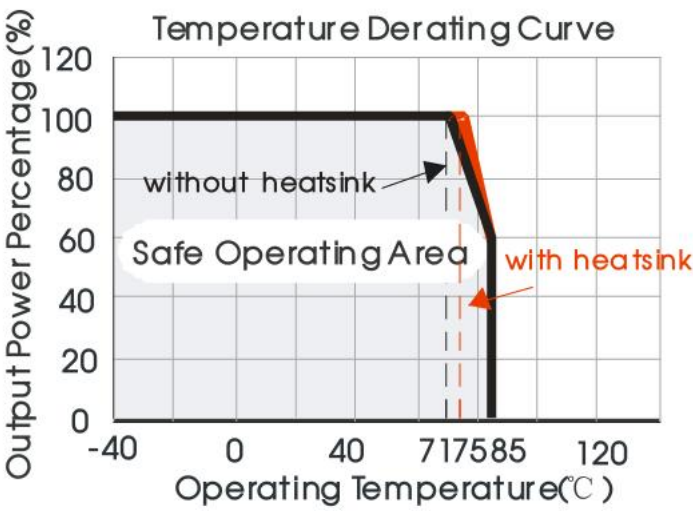
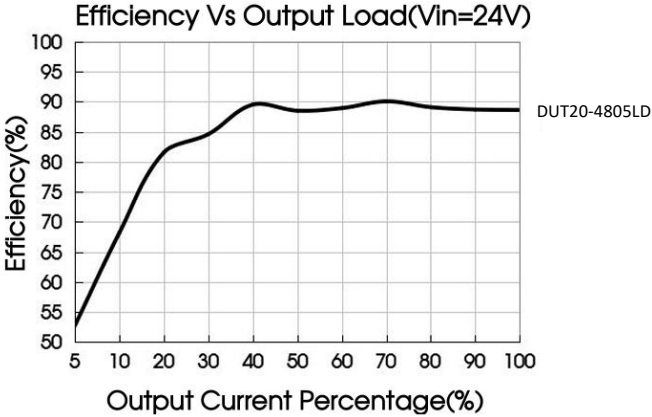
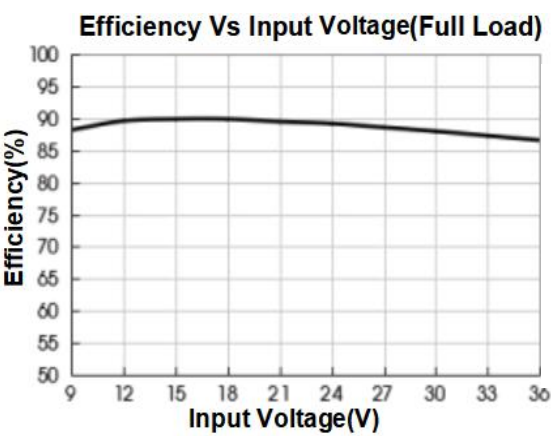


Fig. 1



Design Reference

1. Typical application

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

Input and/or output ripple can be further reduced by appropriately increasing the input & output capacitor values C_{in} and C_{out} 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.

DC/DC Converter

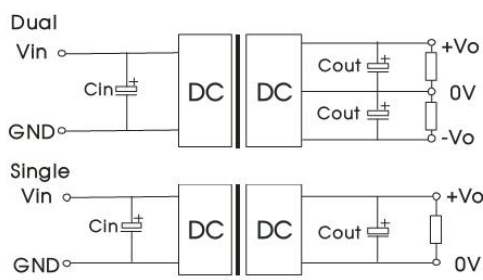


Fig. 2

Cin		Single Vo (VDC)	Cout	Dual Vo (VDC)	Cout
Vin: 24VDC	Vin: 48VDC				
100μF/50V	100μF/100V	3.3/5	470μF/16V	±5	220μF/16V
		9	220μF/16V	±9	100μF/16V
		12/15	220μF/25V	±12/±15	100μF/25V
		24	100μF/50V	--	--

2. EMC compliance circuit

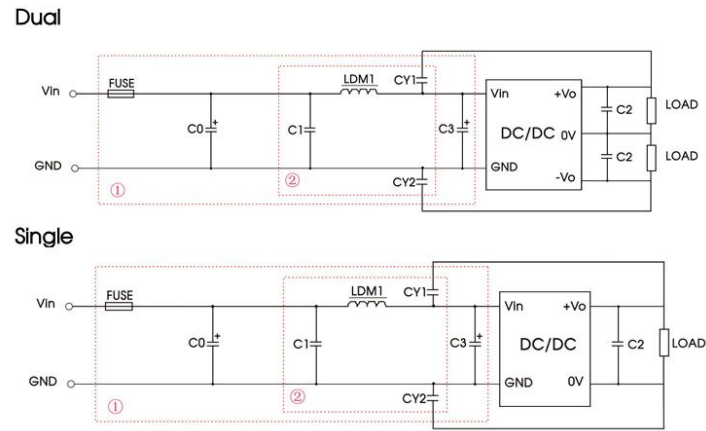


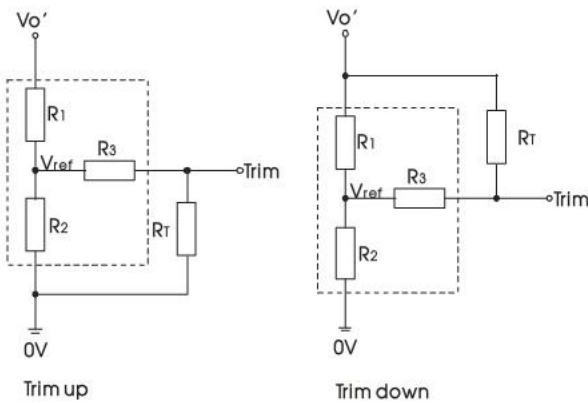
Fig. 3

Notes: We use Part ① in Fig. 3 for Immunity tests and Part ② for Emissions test. Selecting based on needs.

Parameter description:

Model	Vin: 24VDC	Vin: 48VDC
FUSE	Choose according to actual input current	
C0/C3	330μF/50V	330μF/100V
C1	1μF/50V	1μF/100V
C2	Refer to the Cout in Fig.2	
LDM1	4.7μH/3.1A	
CY1/CY2	1nF/2kV	

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



TRIM resistor connection (dashed line shows internal resistor network)

Calculating Trim resistor values:

$$\begin{aligned} \text{up: } R_T &= \frac{\alpha R_2}{R_2 - \alpha} - R_3 & \alpha &= \frac{V_{ref}}{V_o' - V_{ref}} \cdot R_1 \\ \text{down: } R_T &= \frac{\alpha R_1}{R_1 - \alpha} - R_3 & \alpha &= \frac{V_o' - V_{ref}}{V_{ref}} \cdot R_2 \end{aligned}$$

R_T = Trim Resistor value
 α = self-defined parameter

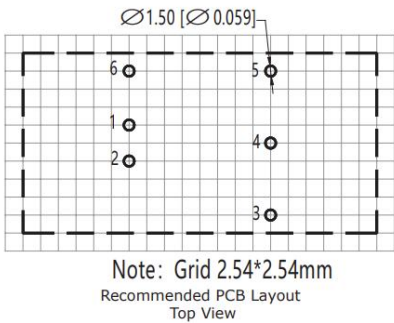
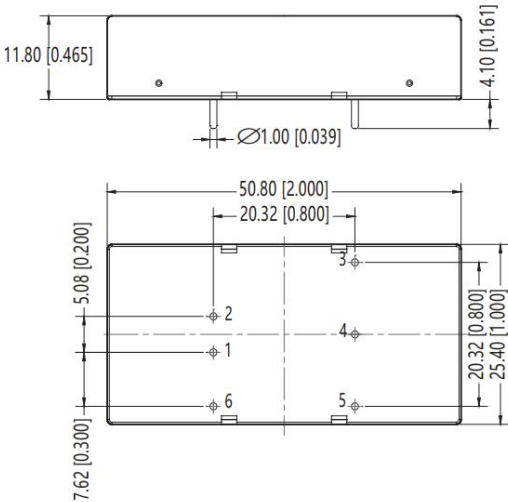
Vout(V)	R1(kΩ)	R2(kΩ)	R3(kΩ)	Vref(V)
3.3	4.772	2.87	12.4	1.25
5	2.883	2.87	10	2.5
9	7.500	2.87	15	2.5
12	11.000	2.87	15	2.5
15	14.494	2.87	15	2.5
24	24.872	2.87	17.8	2.5

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

Horizontal Package (without heat sink) Dimensions and Recommended Layout

units: mm [inch]
tolerance: ±0.50[±0.020]
pin diameter tolerance: ±0.10[±0.004]

PIN CONNECTIONS		
PIN	Function	
	Single	Dual
1	GND	GND
2	Vin	Vin
3	+Vo	+Vo
4	trim	0V
5	0V	-Vo
6	CTRL	CTRL



- Note:
- 1. 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;
 - 2. The maximum capacitive load offered were tested at input voltage range and full load;
 - 3. 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;
 - 4. All index testing methods in this datasheet are based on our company corporate standards;
 - 5. We can provide product customization service, please contact our technicians directly for specific information;
 - 6. Products are related to laws and regulations: see "Features" and "EMC";