

FEATURES

- 2:1 standard input range
- Typical input voltage: 5, 12, 24, 48VDC
- Single and bipolar outputs: 3.3, 5, 9, 12, 15, 24, ± 5 , ± 9 , ± 12 , ± 15 VDC
- Efficiency up to 80% @ full load
- 1.5KVDC, 3KVDC isolation options
- Industrial standard footprint: SIP8
- OCP and output short circuit protection
- Operating temperature range: -40°C to 85°C
- All material compliance with UL94V-0
- Fully encapsulated, high reliability
- MTBF up to 1M hours



PRODUCT OVERVIEW

The DUC1D modules are highly reliable, and efficient isolated DC/DC converter with industrial potted module technology. Wide temperature range and encapsulated package is ideal for industrial applications. Intended target markets include industrial control, power electronics, instrumentations, medical systems, transportation where power modules must meet rugged environmental requirements, impact size and isolated output voltages are required.

The DUC1D modules provide voltage isolation from input to output up to 3KVDC. The operation temperature range is -40 °C to +85 °C , the module delivers full output power @ 105 °C case temperature under free air convection. These modules are ideal for applications that do not require any heat- sink or forced air cooling.

The DUC1D series are designed to safety standards UL62368-1.

Models Selections

Basic Models ^①	Input Voltage [VDC]	Input Voltage Range [VDC]	Output Voltage [VDC]	Output Current [mA]	Efficiency Typ. [%]	Capacitive Load Max. [μF]	Package [inch]
DUC1D05S03	5	4.5-9	3.3	303	70	1800	0.86"×0.36"×0.44" SIP8
DUC1D05S05	5	4.5-9	5	200	71	2200	
DUC1D05S12	5	4.5-9	12	83	75	1000	
DUC1D05S15	5	4.5-9	15	67	74	680	
DUC1D05S24	5	4.5-9	24	42	72	470	
DUC1D05B05	5	4.5-9	± 5	± 100	72	± 1000	
DUC1D05B12	5	4.5-9	± 12	± 42	75	± 470	
DUC1D05B15	5	4.5-9	± 15	± 33	74	± 330	
DUC1D12S03	12	9-18	3.3	303	74	2700	
DUC1D12S05	12	9-18	5	200	76	2200	
DUC1D12S09	12	9-18	9	111	78	1800	
DUC1D12S12	12	9-18	12	83	78	1000	
DUC1D12S15	12	9-18	15	67	79	680	

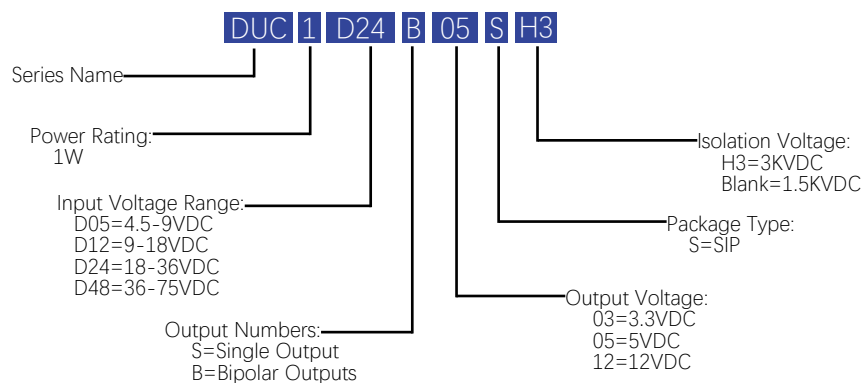
Models Selections

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DUC1D12S24	12	9-18	24	42	75	470	0.86"×0.36"×0.44" SIP8
DUC1D12B05	12	9-18	±5	±100	77	±1000	
DUC1D12B12	12	9-18	±12	±42	80	±470	
DUC1D12B15	12	9-18	±15	±33	77	±330	
DUC1D24S03	24	18-36	3.3	303	74	2700	
DUC1D24S05	24	18-36	5	200	76	2200	
DUC1D24S12	24	18-36	12	83	77	1000	
DUC1D24S15	24	18-36	15	67	77	680	
DUC1D24S24	24	18-36	24	42	76	470	
DUC1D24B05	24	18-36	±5	±100	78	±1000	
DUC1D24B09	24	18-36	±9	±56	78	±680	
DUC1D24B12	24	18-36	±12	±42	78	±470	
DUC1D24B15	24	18-36	±15	±33	78	±330	
DUC1D48S03	48	36-75	3.3	303	74	2700	
DUC1D48S05	48	36-75	5	200	75	2200	
DUC1D48S12	48	36-75	12	83	79	1000	
DUC1D48S15	48	36-75	15	67	78	680	
DUC1D48B05	48	36-75	±5	±100	75	±1000	
DUC1D48B12	48	36-75	±12	±42	77	±470	
DUC1D48B15	48	36-75	±15	±33	79	±330	

Notes:

① Model name with "H3" is for 3KVDC isolation voltage. For example: "DUC1D24B05SH3" is for the model that input to output withstand 3KVDC isolation voltage.

Model Numbering



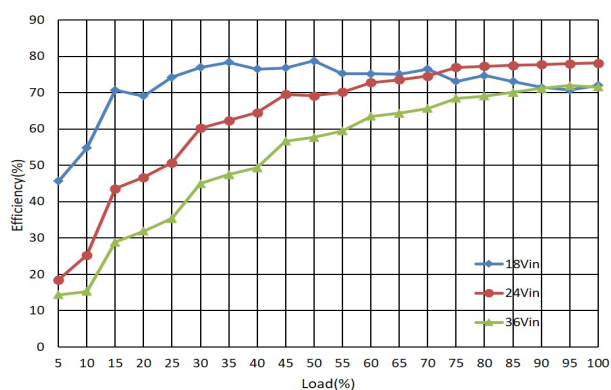
Absolute Maximum Ratings					
Parameters	Conditions	Min.	Typ.	Max.	Units
Input Voltage Transient	5V _{in} type	-0.7		12	VDC
	12V _{in} type	-0.7		25	VDC
	24V _{in} type	-0.7		50	VDC
	48V _{in} type	-0.7		100	VDC
Operating Case Temperature		-40		105	°C
Operating Environment Temperature	≥ 70°C with derating	-40		85	°C
Storage Temperature Range		-50		125	°C
Soldering Temperature	Wave soldering < 10s			300	°C
Relative Humidity		5		95	%
Cooling	Free air convection				
Safety and EMC Compliance					
Conducted Emission	EN55032	Class B (With external filter)			
Radiated Emission	EN55032	Class B (With external filter)			
Conducted Susceptibility	IEC6100-4-6	10V _{rms} Criteria A			
Radiated Susceptibility	IEC6100-4-3	10V/m Criteria A			
EFT	IEC6100-4-4	±2KV Criteria A (With external filter)			
Surge	IEC6100-4-5	±2KV Criteria A (With external filter)			
ESD	IEC6100-4-2	Contact: ±6KV Air: ±8KV Criteria A			
General Specifications					
Parameters	Conditions	Min.	Typ.	Max.	Units
Isolation Voltage (Test for 1 minute, 1mA)	Input to output, standard type			1500	VDC
	Input to output, H3 type			3000	VDC
Isolation Resistance (V _{iso} =500VDC)	Input to output	1			GΩ
Case Temperature Above Ambient			15	35	°C
Switching Frequency			300		KHz
Start-up Delay	From undervoltage shutdown recovery to 10% V _{out}		20		mS
Rise Time	From 10% V _{out} to 90% V _{out} capacitive load		20		mS
Remote On/Off Control	Negative Logic, ON state	0		2.7	VDC
	Negative Logic, OFF state	2.7		15	VDC
Vibration	IEC 60068-2-64, Environmental testing - Part 2				
Shock (Operational)	IEC 60068-2-27, Environmental Testing- Part 2.27				

Input Specifications					
Parameters	Conditions	Min.	Typ.	Max.	Units
Input Voltage Range	See the Model Selection on page 1-2.				
Input Current @ No Load	5 Vin		42		mA
	12 Vin		17		mA
	24 Vin		7		mA
	48 Vin		5		mA
Input Current @ Min. Line	5 Vin		288		mA
	12 Vin		120		mA
	24 Vin		60		mA
	48 Vin		30		mA
Reflected Ripple Current	5 Vin		30		mA
	12 Vin		40		mA
	24 Vin		55		mA
	48 Vin		45		mA
Output Specifications					
Parameters	Conditions	Min.	Typ.	Max.	Units
Vout Accuracy	3.3Vout type	-2.0		+2.0	%
	Other types	-1.0		+1.0	%
Line Regulation			0.2	0.5	%
Load Regulation	5% load to 100% load		0.5	0.75	%
Temperature Coefficient		-0.03		+0.03	% of Vout /°C
Over Current Protection	Foldback, auto-recover		180		%
Output Short Protection	Foldback, auto-recover				
Ripple & Noise ^①			100		mV Pk-Pk
Dynamic Load Peak Deviation ^②		-5		5	%Vout
Dynamic Load Response				400	μS
Minimum Load		10			%
Notes					
① Ripple & noise is tested with certain filter parameters, please see output ripple & noise in technical notes on page 7 for more details.					
② Load is set from 50%-75%-50% of full load, di/dt=0.1A/μS, Cout=10μF & 0.1μF MLCC in parallel.					

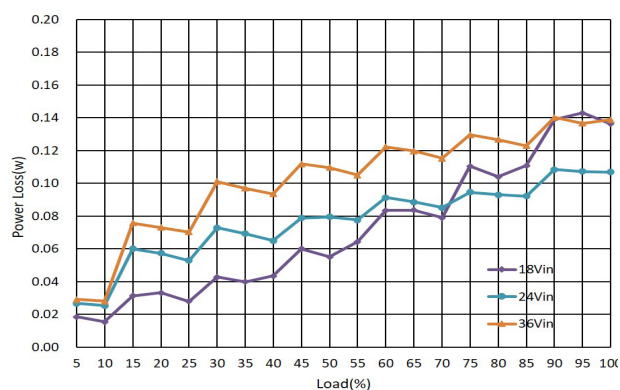
All specifications are tested at 25 °C ambient temperature, nominal input voltage, rated output current conditions unless otherwise specified.

Performance Data (DUC1D24B05S Model)

EFFICIENCY VS LOAD

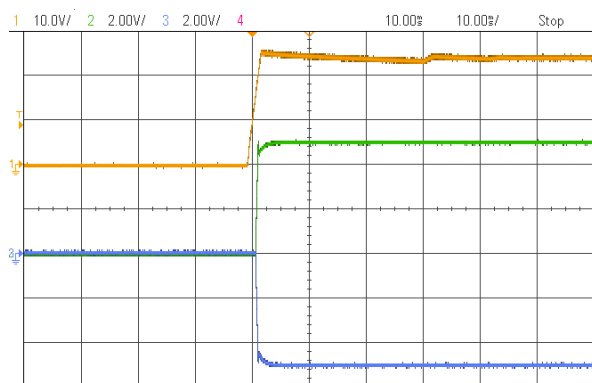


POWER LOSS VS LOAD



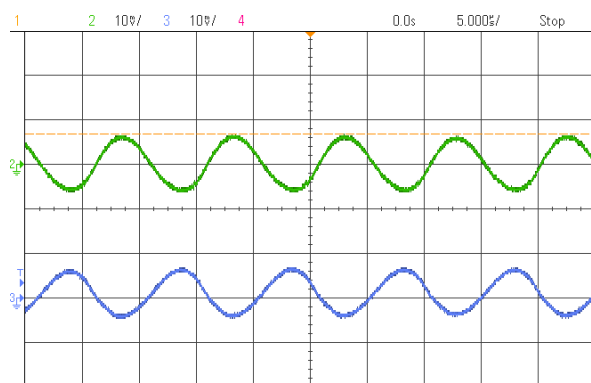
START UP

CH1: Vi CH2: Vo1 CH3: Vo2



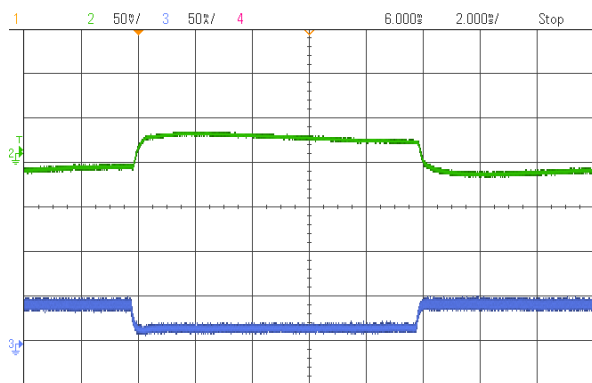
RIPPLE & NOISE 20MHz BANDWIDTH

CH2: Vo1 CH3: Vo2

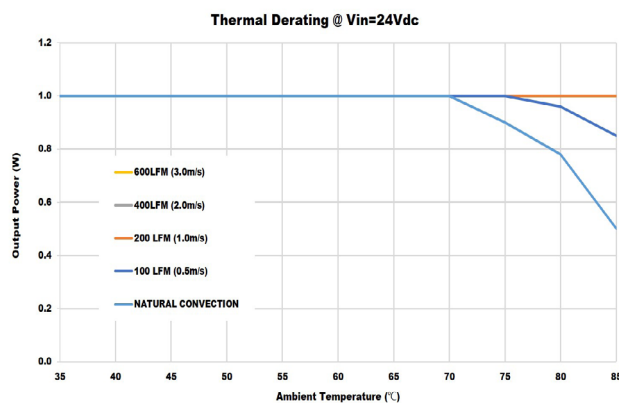


DYNAMIC (50%~75%~50% of I_{max} , di/dt=0.1A/μs)

CH2: Vo1 CH3: Io1

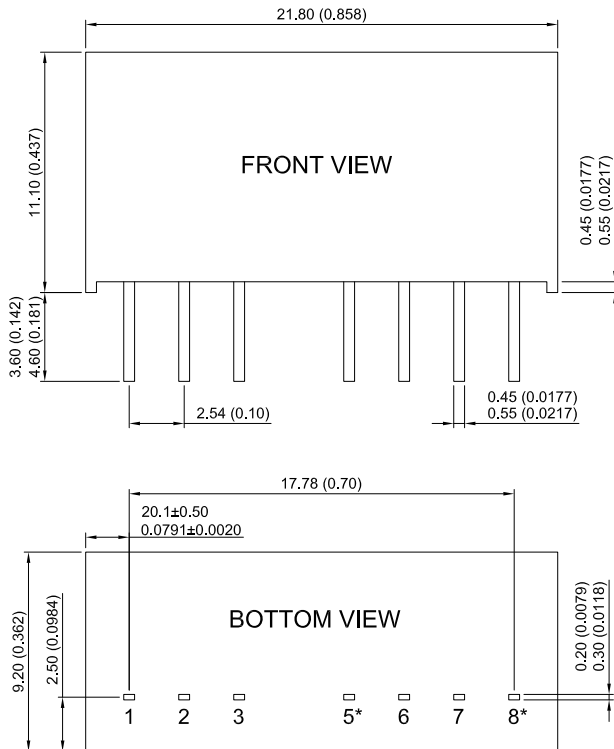


TEMPERATURE DERATING



Mechanical Specifications

MECHANICAL DIMENSIONS

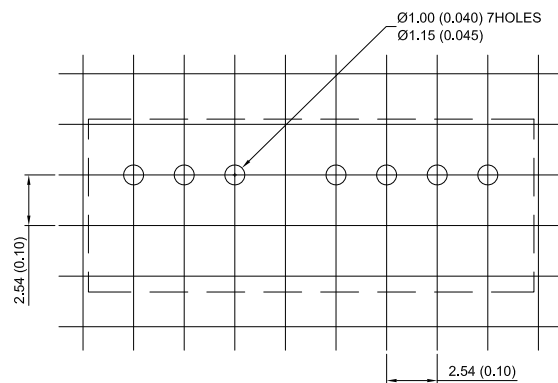


*Pin can not connect with any external circuit.

Unless otherwise specified, all dimensions are in mm±0.25 (inches ±0.01).

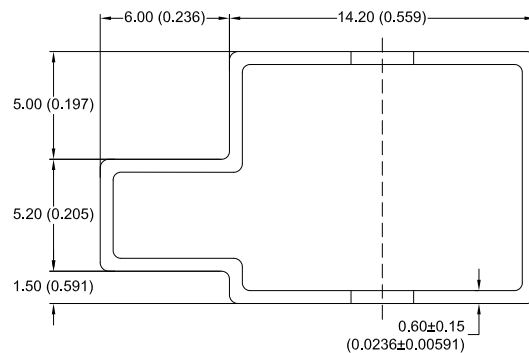
PIN Connections			
Single Output		Bipolar Outputs	
Pin	Function	Pin	Function
1	GND	1	GND
2	Vin	2	Vin
3	CTRL	3	CTRL
5*	NC	5*	NC
6	+Vout	6	+Vout
7	-Vout	7	Common
8*	NC	8	-Vout

RECOMMENDED FOOTPRINT DETAILS



Unless otherwise specified, all dimensions are in mm ±0.5 (inches±0.02).

TUBE OUTLINE DIMENSIONS



Unless otherwise specified, all dimensions are in mm ±0.5 (inches±0.02).

Tube length : 520mm ±2mm (20.47)

Tube quantity : 23pcs

Technical Notes

INPUT FUSING

Certain applications may require fuse at the inputs of power conversion components. Fuses should also be used when there is possibility of sustained input voltage reversal which is not current limited. The DUC1D modules are not internally fused. We strongly recommend a fast blow fuse to be used in the ungrounded input supply line.

For safety agency approvals, the installer must install the converter in compliance with the end user safety standard.

OUTPUT RIPPLE & NOISE

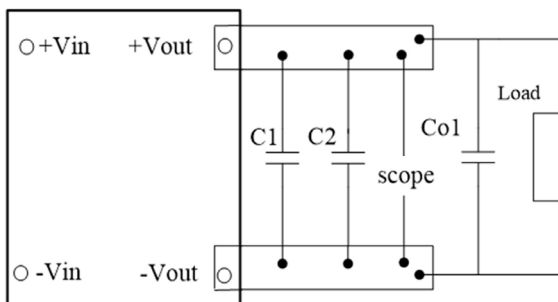


Figure 1: Single Output Type

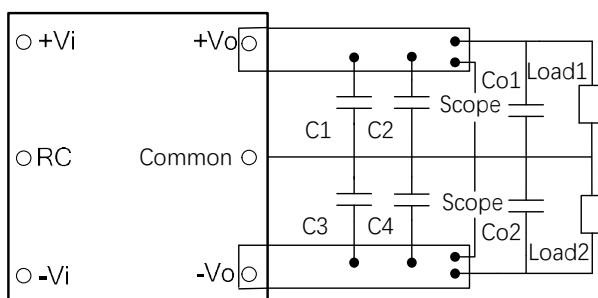


Figure 2: Bipolar Outputs Type

These DUC1D modules output ripple and noise is measured at the rated input voltage and output current, along with 10uF and 0.1uF MLCC are used in parallel with appropriate voltage ratings. The oscilloscope bandwidth is set to 20MHz.

External output capacitors are required to reduce the ripple & noise. The output capacitors should

be low ESR and appropriate frequency response with appropriate voltage ratings, and must be located as close to the converters as possible, also particular load and layout must be taken into consideration.

ISOLATION VOLTAGE

DUC1D modules are 100% production tested at their specified isolation voltage. Parts can be expected to withstand the specified test voltage several times. But it is well known that repeated high-voltage isolation testing will degrade isolation capability which is depending on materials, construction and environment. Thus, the number of tests should be strictly limited and we strongly advise against repeated high voltage isolation testing.

MINIMUM LOAD

DUC1D modules are required for 10% load as minimum load.

PIN 3 (CTRL)

Module Power Remote Control or called ON/OFF pin is for the user to control the power output. DUC1D series adopt positive logic control. Recommend to use optocoupler to control remote pin as below.

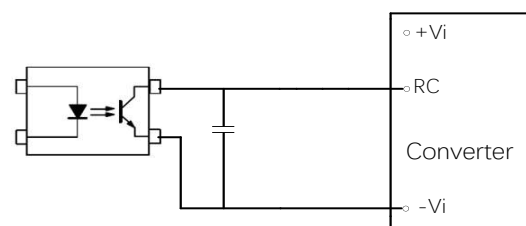


Figure 3: Remote Control Circuit

Remote Control Pin can be connected in parallel for multiple converters which with the same Remote Control characters. However, when several converters share the same remote control circuit, the total sink and source current must be taken into consideration, and make sure that the optocoupler has enough drive capability.

Technical Notes

To reduce external PCB trace interference, it is recommended to add high frequency bypass capacitor between RC pin and -Vi, recommended capacitor value is 100-1000pF.



This product is subject to the following operating requirements and the Life and Safety Critical Application Sales Policy:

Refer to: <http://www.densitypower.com>

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