



## FEATURES

- ◆ RoHS compliant
- ◆ Industry standard footprint
- ◆ Efficiency to 82%
- ◆ Power density 0.90W/cm<sup>3</sup>
- ◆ 2:1 wide input range
- ◆ Single isolated output
- ◆ Short circuit protection
- ◆ Low profile 24 pin case
- ◆ UL 94V-0 package material
- ◆ Operating temperature range -40°C to 85°C
- ◆ No heatsink required
- ◆ Footprint 4.73cm
- ◆ 5V, 12V, 24V & 48V input
- ◆ 3.3V, 5V, 9V, 12V & 15V output
- ◆ Internal SMD construction
- ◆ Fully encapsulated

## MODEL SELECTION

### WRB<sup>①</sup> 05<sup>②</sup> 05<sup>③</sup> Y<sup>④</sup> DK<sup>⑤</sup> -3W<sup>⑥</sup>

- ① Product Series      ② Input Voltage  
 ③ Output Voltage      ④ 2:1 Wide Input Range  
 ⑤ DIP24k Package Style      ⑥ Rated Power

## APPLICATIONS

The WRB-YDK-3W series is a range of low profile DC/DC converters offering a single regulated output over a 2:1 input voltage range. All parts deliver 3W output power up to 85°C without heatsinking, except the 4.5V to 9V input voltage range which should be derated to 2W at the lower input voltage. A flyback oscillator design with isolated feedback is used to give regulation over the full operating range of 25% to 100% of full load. It is strongly recommended that external capacitors be used on input and output to guarantee performance over full load and input voltage range.



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## Models

Order Code	Nominal Input Voltage	Rated Output Voltage	Output Current <sup>1</sup>		Input Current Full load	Efficiency <sup>2</sup> (Min.)	Isolation Capacitance	MTTF
			Min. Load	Full Load				
			V (nom.)	V				
WRB0505YDK-3W	5	5	100-150	400-600	615	66	40	1939
WRB0509YDK-3W	5	9	55-83	222-333	563	72	52	1926
WRB0512YDK-3W	5	12	42-62	166-250	548	71	43	1907
WRB0515YDK-3W	5	15	33-50	133-200	533	73	44	1924
WRB1205YDK-3W	12	5	150	600	362	71	36	1928
WRB1209YDK-3W	12	9	83	333	320	78	52	1916
WRB1212YDK-3W	12	12	62	250	316	78	44	1897
WRB1215YDK-3W	12	15	50	200	308	79	47	1914
WRB2403YDK-3W	24	3.3	227	909	178	70	30	1671
WRB2405YDK-3W	24	5	150	600	174	70	36	1673
WRB2409YDK-3W	24	9	83	333	156	78	52	1663
WRB2412YDK-3W	24	12	62	250	154	80	44	1644
WRB2415YDK-3W	24	15	50	200	150	82	54	1657
WRB4803YDK-3W	48	3.3	227	909	87	71	30	1676
WRB4805YDK-3W	48	5	150	600	87	73	35	1668
WRB4809YDK-3W	48	9	83	333	78	80	52	1663
WRB4812YDK-3W	48	12	62	250	77	81	44	1648
WRB4815YDK-3W	48	15	50	200	76	81	53	1661

## INPUT CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Voltage range	All WRB05XX	4.5	5	9	VDC
	All WRB12XX	9	12	18	VDC
	All WRB24XX	18	24	36	VDC
	All WRB48XX	36	48	72	VDC
Reflected ripple current <sup>2</sup>	WRB2403		180	360	mA p-p
	WRB4803		140	290	mA p-p
	All WRB05XX		400	500	mA p-p
	All WRB12XX		150	170	mA p-p
	All other WRB24XX		290	360	mA p-p
	All other WRB48XX		100	127	mA p-p

## ABSOLUTE MAXIMUM RATINGS

Short-circuit protection	Continuous
Lead temperature 1.5mm from case for 10 seconds	300°C
Minimum load	25% of rated load
Input voltage 05 types	10V
Input voltage 12 types	20V
Input voltage 24 types	40V
Input voltage 48 types	80V
Internal dissipation	1.7W

1. Refer to power derating graph.

2. Measured at full load with external input/output capacitors, refer to filter circuit 1.

3. Calculated using MIL-HDBK-217F with nominal input voltage at full load (ground benign) at 25°C.

All specifications typical at TA=25°C, nominal input voltage and rated output current unless otherwise specified

OUTPUT CHARACTERISTIC					
Parameter	Conditions	Min.	Typ.	Max.	Units
Voltage set point accuracy	With external input/output capacitors		±1	±5	%
Line regulation	Low line to high line, 3.3V output with external input/output capacitors		0.05	0.25	%
	Low line to high line, all other outputs with external input/output capacitors		0.05	0.5	%
Load regulation	25% load to 100% load, 3.3V output with external input/output capacitors		0.6	1.0	%
	25% load to 100% load, all other outputs with external input/output capacitors		0.2	0.5	%
Ripple <sup>1</sup>	BW = 20Hz to 300kHz, 3.3V output with external input/output capacitors		80	120	mV rms
	BW = 20Hz to 300kHz, all other outputs with external input/output capacitors		5	10	mV rms
Noise	BW = DC to 100MHz, 3.3V output with external input/output capacitors			180	mV p-p
	BW = DC to 20MHz, all other outputs with external input/output capacitors		50	100	mV p-p

GENERAL CHARACTERISTICS					
Parameter	Conditions	Min.	Typ.	Max.	Units
Switching frequency	100% load VIN nominal 3.3V output	160		220	kHz
	25% load VIN nominal 3.3V output	290		560	kHz
	100% load VIN nominal, all other outputs	80		220	kHz
	25% load VIN nominal, all other outputs	290		560	kHz

TEMPERATURE CHARACTERISTICS					
Parameter	Conditions	Min.	Typ.	Max.	Units
Operation	Ambient temperature	-40		85	°C
Storage		-50		130	°C
Cooling	Free air convection				

ISOLATION CHARACTERISTICS					
Parameter	Conditions	Min.	Typ.	Max.	Units
Isolation test voltage	Flash tested for 1 second	100			VDC
Resistance	Viso=500VDC	1			GΩ

### TECHNICAL NOTES

#### ISOLATION VOLTAGE

'Hi Pot Test', 'Flash Tested', 'Withstand Voltage', 'Proof Voltage', 'Dielectric Withstand Voltage' & 'Isolation Test Voltage' are all terms that relate to the same thing, a test voltage, applied for a specified time, across a component designed to provide electrical isolation, to verify the integrity of that isolation.

Microdc Professional Power Module WRB-YDK-3W series of DC/DC converters are all 100% production tested at their stated isolation voltage. This is 1kVDC for 1 second.

A question commonly asked is, "What is the continuous voltage that can be applied across the part in normal operation?"

For a part holding no specific agency approvals, such as the WRB-YDK-3W series, both input and output should normally be maintained within SELV limits i.e. less than 42.4V peak, or 60VDC. The isolation test voltage represents a measure of immunity to transient voltages and the part should never be used as an element of a safety isolation system. The part could be expected to function correctly with several hundred volts offset applied continuously across the isolation barrier; but then the circuitry on both sides of the barrier must be regarded as operating at an unsafe voltage and further isolation/insulation systems must form a barrier between these circuits and any user-accessible circuitry according to safety standard requirements.

#### REPEATED HIGH-VOLTAGE ISOLATION TESTING

It is well known that repeated high-voltage isolation testing of a barrier component can actually degrade isolation capability, to a lesser or greater degree depending on materials, construction and environment. The WRB-YDK-3W series has an EI ferrite core, with no additional insulation between primary and secondary windings of enameled wire. While parts can be expected to withstand several times the stated test voltage, the isolation capability does depend on the wire insulation. Any material, including this enamel (typically polyurethane) is susceptible to eventual chemical degradation when subject to very high applied voltages thus implying that the number of tests should be strictly limited. We therefore strongly advise against repeated high voltage isolation testing, but if it is absolutely required, that the voltage be reduced by 20% from specified test voltage.

This consideration equally applies to agency recognized parts rated for better than functional isolation where the wire enamel insulation is always supplemented by a further insulation system of physical spacing or barriers.

1. For lower ripple refer to circuit for reduced ripple.

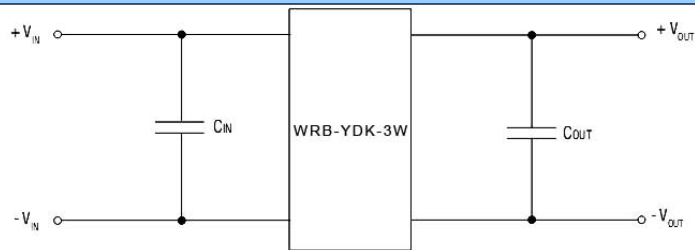
### APPLICATION NOTES

#### Recommended input & output capacitors

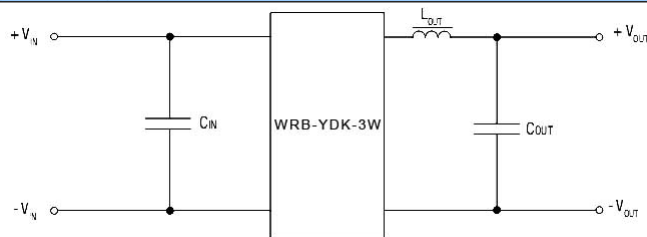
Although these converters will work without external capacitors, they are necessary in order to guarantee the full parametric performance over the full line and load range. All parts have been tested and characterized using the following values and test circuit.

Input Voltage	C <sub>IN</sub>	Output Voltage	C <sub>OUT</sub>	L <sub>OUT</sub>
5V, 12V	100μF, 25V (0.25Ω at 100KHz)	3.3V	100μF, 25V (0.25Ω at 100KHz)	MPS# - 24100C
24V, 48V	10μF, 100V (1.5Ω at 100KHz)	5V, 12V, 15V		Not required

#### Test circuit, 5V, 12V and 15V output



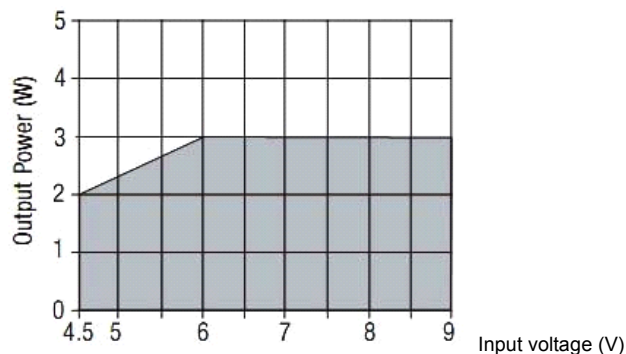
#### Recommended circuit for reduced ripple 3.3V output



#### Output load

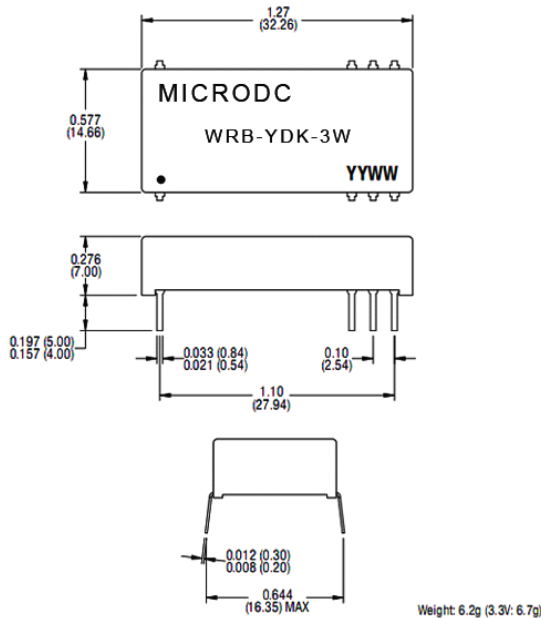
The minimum rated load across the whole input voltage range is 25% of the full load output. It is important to take care that the load does not fall below this as the output ripple will greatly increase. While this condition will not harm the device the resultant increase in output ripple could cause customers' application to malfunction.

### NDY05 POWER DERATING CURVE



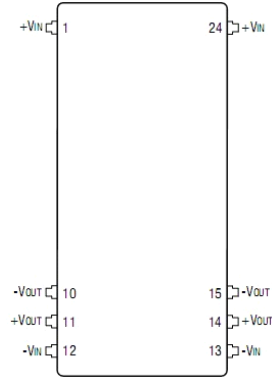
### PACKAGE SPECIFICATIONS

#### MECHANICAL DIMENSIONS

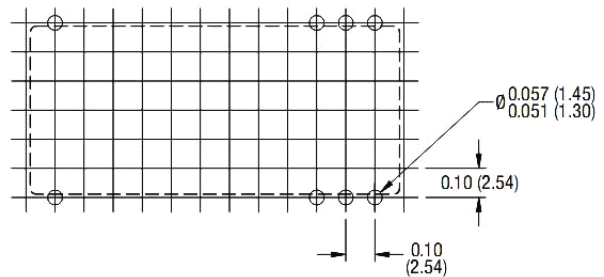


All dimensions in inches  $\pm 0.01$  (mm  $\pm 0.25$ mm). All pins on a 0.1 (2.54) pitch and within  $\pm 0.01$  (0.25) of true position.

#### PIN CONNECTIONS (TOP VIEW)

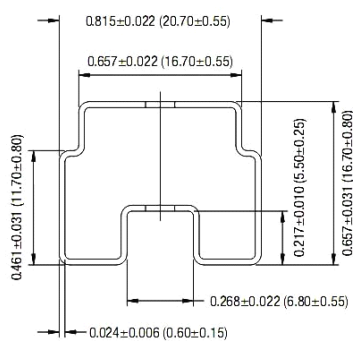


#### RECOMMENDED FOOTPRINT DETAILS



Unless otherwise stated all dimensions in inches  $\pm 0.01$  (mm  $\pm 0.5$ mm).

#### TUBE OUTLINE DIMENSIONS



Unless otherwise stated all dimensions in inches  $\pm 0.01$  (mm)  $\pm 0.5$ mm.

Tube length : 20.47  $\pm$  0.079 (520mm  $\pm$  2mm).

Tube Quantity : 15

# MICRODC

Professional Power Module

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#### RoHS COMPLIANT INFORMATION

This series is compatible with RoHS soldering systems with a peak wave solder temperature of 300° C for 10 seconds. The pin termination finish on the SIP package type is Tin Plate, Hot Dipped over Matte Tin with Nickel Preplate. The DIP types are Matte Tin over Nickel Preplate. Both types in this series are backward compatible with Sn/Pb soldering systems.



#### REACH COMPLIANT INFORMATION

This series has proven that this product does not contain harmful chemicals, it also has harmful chemical substances through the registration, inspection and approval.