B2000RU Series

4:1 Input Range, 20W Single & Dual Output DC/DC Converters

Key Features:

- 20W Output Power
- 4:1 Input Voltage Range
- Compact 1 x 2 Inch Case
- 1,600 VDC Isolation
- High Efficiency
- Single & Dual Outputs
- Remote ON/OFF
- Industry Standard Pin-Out

RoHS

CE

Electrical Specifications

Specifications typical @ +25°C, nominal input voltage & rated output current, unless otherwise noted. Specifications subject to change without notice.

Input

Parameter	Conditions	Min.	Typ.	Max.	Units
Input Voltage Range	24 VDC Input	9.0	24.0	36.0	VDC
	48 VDC Input	18.0	48.0	75.0	
Input Filter	π (Pi) Filter				
Input Reflected Ripple Current			20.0		mA P - P

Output

Parameter	Conditions	Min.	Typ.	Max.	Units
Output Voltage Accuracy			±1.0		%
Output Voltage Balance	Dual Output , Balanced Loads		±0.5		%
Line Regulation	Vin = Min to Max			±0.5	%
Load Regulation, Single Output	Iout = 0% to 100%			±0.5	%
Load Regulation, Dual Output	Iout = 0% to 100%			±1.0	%
Ripple & Noise (20 MHz) (Note 1)				75	mV P - P
Output Power Protection			120		% I_{OUT}
Transient Recovery Time (Note 2)	25% Load Step Change		250		µSec
Transient Response Deviation				±3.0	%
Temperature Coefficient			±0.02		%/°C
Output Short Circuit Protection	Continuous (Autorecovery)				

General

Parameter	Conditions	Min.	Typ.	Max.	Units
Isolation Voltage (Input/Output)	3 Seconds	1,600			VDC
Isolation Voltage (Case/Input(output)	3 Seconds	1,600			
Isolation Resistance	500 VDC	1,000			MΩ
Isolation Capacitance	100 kHz, 1V		1,200		pF
Switching Frequency			330		kHz

EMI Characteristics

Parameter	Standard	Level
Radiated Emissions	EN55022	Class A
Conducted Emissions (Note 3)	EN55022	Class A
ESD	EN6100-4-2	Criteria B
RS	EN6100-4-3	Criteria A
EFT (Note 4)	EN6100-4-4	Criteria B
Surge (Note 4)	EN6100-4-5	Criteria B
CS (Note 4)	EN6100-4-6	Criteria A
PFMF	EN6100-4-8	Criteria A

Environmental

Parameter	Conditions	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient	-40	+25	+66	°C
Operating Temperature Range	Case			+105	°C
Storage Temperature Range		-40		+125	°C
Cooling	Free Air Convection				
Humidity	RH, Non-condensing			95	%
RFI	Six-Side Shielded Metal Case				

Physical

Case Size	2.0 x 1.0 x 0.40 Inches (50.8 x 25.4 x 10.2 mm)
Case Material	Metal with Non-Conductive Base (UL94-V0)
Weight	1.06 Oz (30g)

Reliability Specifications

Parameter	Conditions	Min.	Typ.	Max.	Units
MTBF	MIL HDBK 217F, 25°C, Gnd Benign	560			kHours

Absolute Maximum Ratings

Parameter	Conditions	Min.	Typ.	Max.	Units
Input Voltage Surge (1 Sec)	24 VDC Input	-0.7		50.0	VDC
	48 VDC Input	-0.7		100.0	
Lead Temperature	1.5 mm From Case For 10 Sec			260.0	°C

Caution: Exceeding Absolute Maximum Ratings may damage the module. These are not continuous operating ratings.

MicroPower Direct
292 Page Street
Suite D
Stoughton, MA 02072
USA

T: (781) 344-8226
F: (781) 344-8481
E: sales@micropowerdirect.com
W: www.micropowerdirect.com

Model Selection Guide

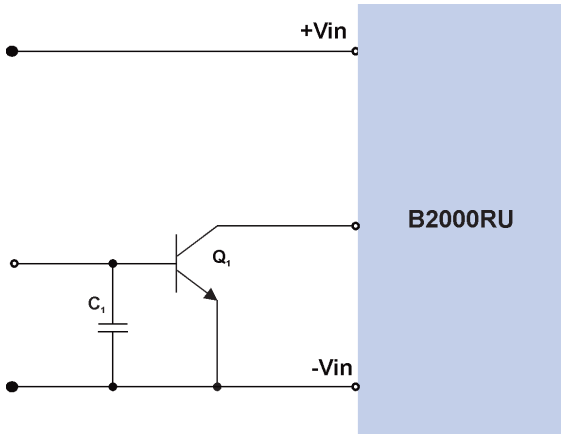
Model Number	Input				Output			Over Voltage Protection (VDC)	Efficiency (%, Typ)	Fuse Rating Slow-Blow (mA)	Max Capacitive Load (µF Max)
	Voltage (VDC)		Current (mA)		Voltage (VDC)	Current (mA, Max)	Current (mA, Min)				
	Nominal	Range	Full-Load	No-Load							
B2001RU	24	9.0 - 36.0	879	50	3.3	5,500.0	0.0	3.9	89	2,000	10,000
B2002RU	24	9.0 - 36.0	957	50	5.0	4,000.0	0.0	6.2	90	2,000	6,800
B2003RU	24	9.0 - 36.0	980	22	12.0	1,670.0	0.0	15.0	88	2,000	1,000
B2004RU	24	9.0 - 36.0	968	22	15.0	1,330.0	0.0	18.0	89	2,000	680
B2005RU	24	9.0 - 36.0	968	65	±5.0	±2000.0	0.0	±6.2	89	2,000	±2,200
B2006RU	24	9.0 - 36.0	980	25	±12.0	±835.0	0.0	±15.0	88	2,000	±470
B2007RU	24	9.0 - 36.0	980	25	±15.0	±665.0	0.0	±18.0	88	2,000	±330
B2011RU	48	18.0 - 75.0	440	30	3.3	5,500.0	0.0	3.9	89	1,500	10,000
B2012RU	48	18.0 - 75.0	413	30	5.0	4,000.0	0.0	6.2	91	1,500	6,800
B2013RU	48	18.0 - 75.0	484	15	12.0	1,670.0	0.0	15.0	89	1,500	1,000
B2014RU	48	18.0 - 75.0	484	15	15.0	1,330.0	0.0	18.0	89	1,500	680
B2015RU	48	18.0 - 75.0	484	40	±5.0	±2000.0	0.0	±6.2	89	1,500	±2,200
B2016RU	48	18.0 - 75.0	490	15	±12.0	±835.0	0.0	±15.0	88	1,500	±470
B2017RU	48	18.0 - 75.0	490	15	±15.0	±665.0	0.0	±18.0	88	1,500	±330

Notes:

1. Transient recovery is measured to within a 1% error band for a load step change of 75% to 50% to 25%.
2. Operation at no-load will not damage these units. However, they may not meet all specifications.
3. Dual output units may be connected to provide a 10 VDC, 24 VDC or 30 VDC output. To do this, connect the load across the positive (+Vout) and negative (-Vout) outputs and float the output common.
4. It is recommended that a fuse be used on the input of a power supply for protection. See the table above for the correct rating.

Remote ON/OFF

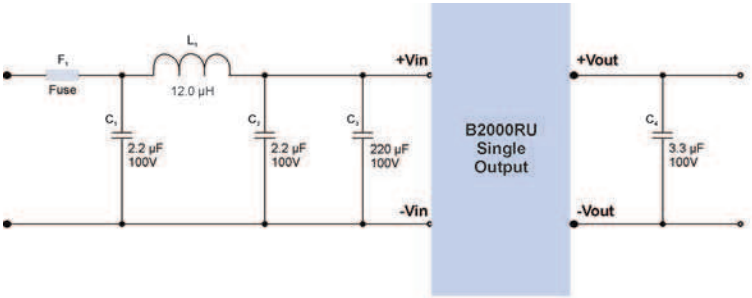
Parameter	Min	Max	Units
Supply On	3.0	12 or Open	VDC
Supply Off	0.0	1.2	VDC
Standby Input Current	5 mA Typical		
Control Common	Referenced to Neg. Input (pin 2)		

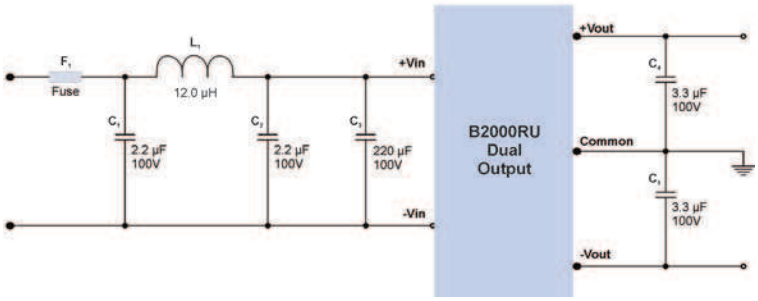


A positive logic Remote On/Off input (Pin 6) can be used to control the converter. An open collector (or open drain) switch (Q_1) is placed between the control input (Pin 6) and the -V Input (Pin 2).

If not being used, the control input should be left open.

Recommended Input/Output Components





To help meet EN55022 conducted emissions requirements, a simple Pi filter should be added externally to the input of the converter. Recommended components (C_1, C_2 & L_1) are shown in the diagram above.These components should be mounted as close to the module as possible.

To meet the requiremets of EN61000-4-4, EN61000-4-5 and EN61000-4-6, an external capacitor is required. It is recommended that the value shown in the figure above (C_3) be used.

When measuring output ripple, it is recommended that an external 1.0 µF ceramic capacitor be placed from the +Vout pin to the -Vout pin for single output units and from each output to common for dual output units. For noise sensitive applications, the use of 3.3 µF capacitors (as shown in the diagram above) will reduce the output ripple.

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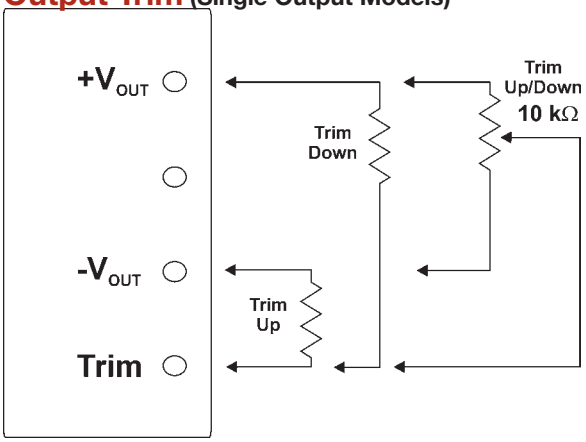
Output Trim (Single Output Models)



A simple external circuit may be used to adjust Vout on single output models. To adjust the output DOWN, connect a 5%, 3W resistor between the plus output pin and the Vout trim pin. To adjust the output UP, connect a 5%, 3W resistor between the minus output pin and the Vout trim pin. Resistor values are given in the chart below.

For UP/Down trimming capability, connect a 10 kW potentiometer between the plus and minus outputs with the wiper arm connected to the Vout trim pin.

Care should be taken that the maximum output power of the unit does not exceed the maximum rating.

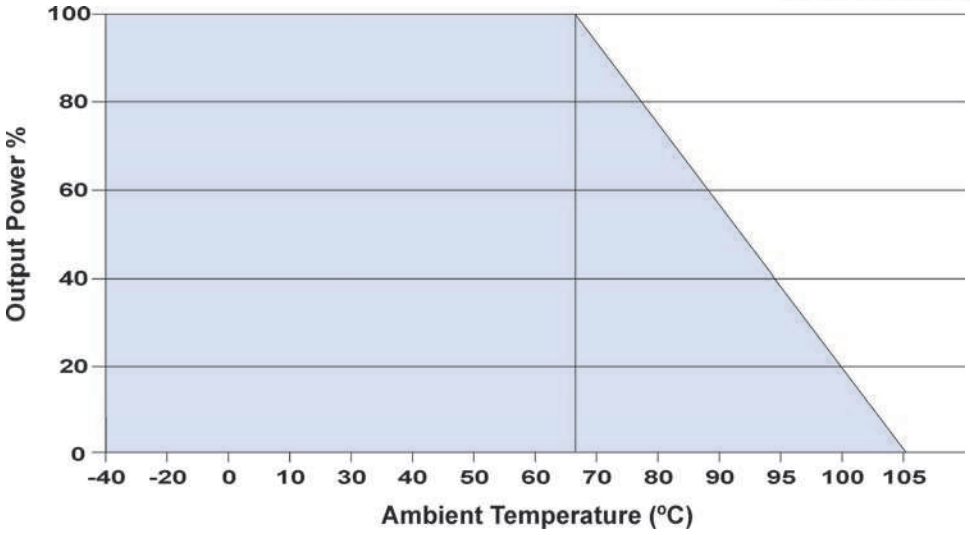
B2001RU, B2011RU											
Trim Down	1	2	3	4	5	6	7	8	9	10	%
Vout =	3.267	3.234	3.201	3.168	3.135	3.102	3.069	3.036	3.003	2.970	VDC
RTRIM Down =	315.932	172.257	112.528	79.806	59.153	44.930	34.539	26.616	20.374	15.330	kΩ
Trim UP	1	2	3	4	5	6	7	8	9	10	%
Vout =	3.333	3.366	3.399	3.432	3.465	3.498	3.531	3.564	3.597	3.630	VDC
RTRIM Up =	544.612	184.034	103.305	67.715	47.676	34.824	25.880	19.297	14.249	10.255	kΩ

B2002RU, B2012RU											
Trim Down	1	2	3	4	5	6	7	8	9	10	%
Vout =	4.950	4.900	4.850	4.800	4.750	4.700	4.650	4.600	4.550	4.500	VDC
RTRIM Down =	230.566	106.182	64.301	43.281	30.643	22.207	16.177	11.651	8.129	5.310	kΩ
Trim UP	1	2	3	4	5	6	7	8	9	10	%
Vout =	5.050	5.100	5.150	5.200	5.250	5.300	5.350	5.400	5.450	5.500	VDC
RTRIM Up =	244.547	113.776	70.631	49.142	36.274	27.707	21.592	17.010	13.447	10.598	kΩ

B2003RU, B2013RU											
Trim Down	1	2	3	4	5	6	7	8	9	10	%
Vout =	11.880	11.760	11.640	11.520	11.400	11.280	11.160	11.040	10.920	10.800	VDC
RTRIM Down =	327.351	142,100	83.928	55.470	38.591	27.418	19.477	13.542	8.939	5.264	kΩ
Trim UP	1	2	3	4	5	6	7	8	9	10	%
Vout =	12.120	12.240	12.360	12.480	12.600	12.720	12.840	12.960	13.080	13.200	VDC
RTRIM Up =	371.425	183.645	117.623	83.929	63.489	49.767	39.919	32.508	26.728	22.094	kΩ

B2004RU, B2014RU											
Trim Down	1	2	3	4	5	6	7	8	9	10	%
Vout =	14.850	14.700	14.550	14.400	14.250	14.100	13.950	13.800	13.650	13.500	VDC
RTRIM Down =	433.811	174.916	100.946	65,907	45.468	32.077	22.625	15.596	10.165	5.842	kΩ
Trim UP	1	2	3	4	5	6	7	8	9	10	%
Vout =	15.150	15.300	15.450	15.600	15.750	15.900	16.050	16.200	16.350	16.500	VDC
RTRIM Up =	347.293	178.523	115.235	82.084	61.683	47.863	37.882	30.336	24.430	19.682	kΩ

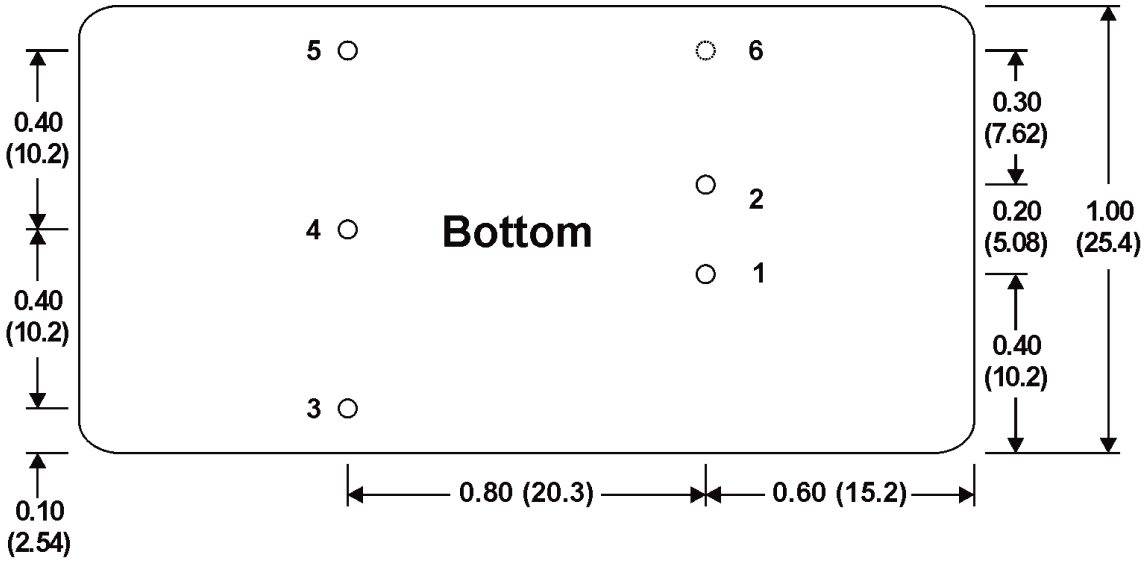
Derating Curve

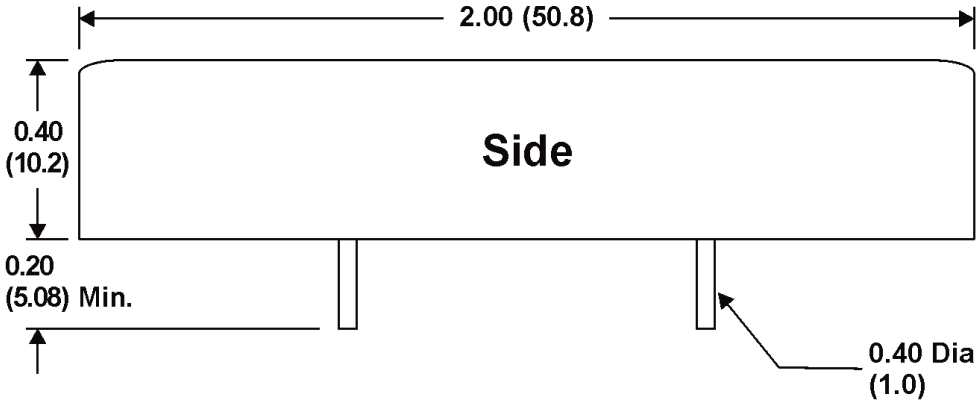


Pin Connections

Pin	Single	Dual
1	+Vin	+Vin
2	-Vin	-Vin
3	+Vout	+Vout
4	Trim	Common
5	-Vout	-Vout
6	Remote On/Off	Remote On/Off

Mechanical Dimensions





Mechanical Notes:
- All dimensions are typical in inches (mm)
- Tolerance x.xx = ±0.01 (±0.25)

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