Lucent Technologies
Bell Labs Innovations

700B Power Module: Custom dc-dc Converter
5 Vdc Input; 24 V to 97 V Adjustable Output; 0.1 W

Features

- Small size/low profile: 0.40 in. x 1.9 in. x 2.0 in.

- Output voltage adjustable from 24 V to 97 V

- Temperature-dependent output: ~0.1% or ~0.2%/°C with external thermistor

- Total regulation—0.20% maximum

- Complete input and output filtering

- Operating range 0 °C to 75 °C, natural convection

- Mountable on PC card

Applications

- Fiber-optic telecommunications systems

- Avalanche photodiode biasing

The 700B Power Module uses advanced, surface-mount technology and delivers high-quality, efficient, and compact dc-dc conversion.

Description

The 700B power module is an application-specific 0.1 W module designed to boost a nominal 5 V input into an output voltage adjustable from 24 V to 97 V. It is intended for reverse biasing of avalanche photodiodes. The module is unpotted to allow access to the DIP switch used for adjusting the output voltage. The output voltage is adjusted for setting an on-board dip switch. A thermistor can be externally added for temperature compensation of ~0.1% or ~0.2% per °C.

Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operations sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

Parameter	Symbol	Min	Max	Unit
Input Voltage	V_I	—	7.0	V
I/O Operating Ambient Temperature (natural convection)	T_A	0	75	°C
Storage Temperature	T_{stg}	−40	100	°C

Electrical Specifications

Unless otherwise indicated, specifications apply over all operating input voltage, resistive load, and temperature conditions.

Parameter	Symbol	Min	Typ	Max	Unit
Operating Input Voltage	V_I	4.75	5.0	5.25	V
Maximum Input Current (V_I = 5.25 V)	$I_{I, max}$	—	—	100	mA
Minimum Output Voltage Adjustment Range: With 3 kΩ from Pin 4 to Ground With 3 kΩ from Pin 5 to Ground	V_O V_O	24.0 23.4	— —	90.0 86.0	V V
Output Voltage Initial Set Point (switch resolution)	—	−0.1	—	0.1	%
Output Regulation Line, Load, and Temperature Variation after Switches are Set (fixed resistance from pin 4 or 5 to ground):	—	−0.2	—	0.2	%
Output Shift for Resistance from 3 kΩ to 624.7 kΩ*: At pin 4 At pin 5	— —	7.6 3.8	8.0 4.0	8.4 4.2	% %
Output Ripple and Noise Voltage: RMS	—	—	—	180	mVrms
Output Current	I_O	0	—	1.1	mA
Calculated Reliability (T_A = 40 °C)	—		2,000,000		MTBF

*Normal thermistor resistance at 25 °C and 65 °C, respectively (Yellow Spring Instrument Co., part # YSI 44005).

Applications Information

Output Voltage Adjustment

The output voltage is adjusted using 12 switches in a DIP package. The switch settings are used to adjust the output voltage with a ladder network of precision resistors. The value of the resistances on the ladder network are R, 2R, 4R, 8R, 16R, up to 204.8K, where R is 100 Ω. Figure 1 illustrates the ladder network. The value of Rb is the parallel value of all resistors with closed switches in series.
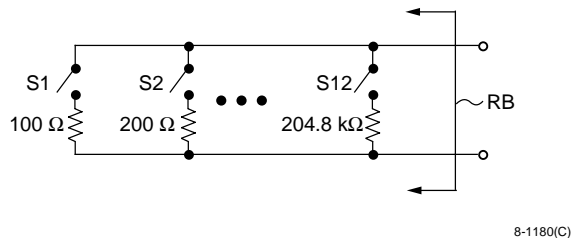

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Figure 1. R2R Ladder Network

Pin 4 is intended to allow for a ~0.2% per °C change in the output voltage when used with the specified thermistor. However, the exact value and accuracy of the output voltage is a function of the thermistor resistance, Rt. The equation below shows how to calculate the output voltage as a function of the thermistor resistance (Rt) and the equivalent resistance (Rb):

$$V_O = 76.67 \times \left(\frac{5.789 \text{ k}\Omega + Rt}{4.324 \text{ k}\Omega + Rt} \right) \times \frac{Rb}{148 \text{ }\Omega + Rb}$$

Pin 5 is intended to allow for a ~0.1% per °C change in the output voltage when used with the specified thermistor. However, the exact value and accuracy of the output voltage is a function of the thermistor resistance, Rt. The following equation shows how to calculate the output voltage as a function of the thermistor resistance (Rt) and the equivalent resistance (Rb):

$$V_O = 76.67 \times \left(\frac{8.443 \text{k }\Omega + Rt}{6.978 \text{k }\Omega + Rt} \right) \times \frac{Rb}{148 \text{ }\Omega + Rb}$$
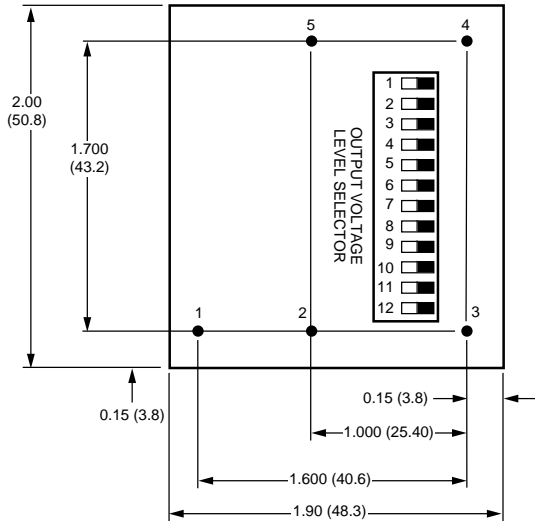
External Current Limit

The output of this module is not current limited, and protection against overloads is recommended. A 10 kΩ —0.1 µF R-C filter on the output has been used in some applications to minimize the possibility of overloads. This can also be used to filter output voltage overshoot seen at start-up.

Outline Diagram
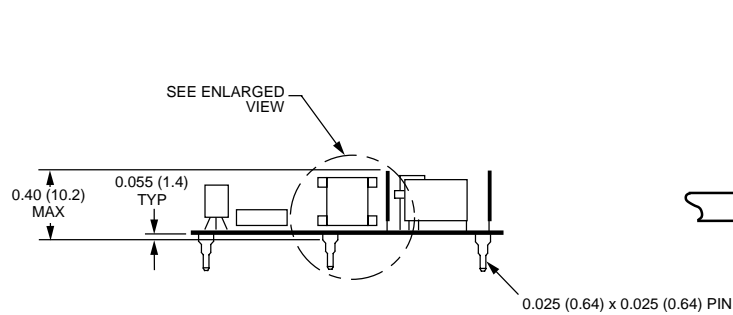
Dimensions are in inches and (millimeters).

Tolerances: x.xxx $\pm$ 0.020 in., x.xxx $\pm$ 0.010 in.
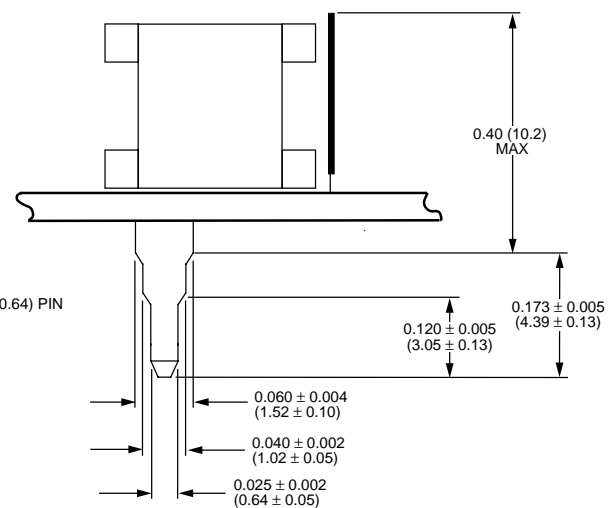
Top View (I/O pins extend from bottom)

Pin	Description
1	Vout
2	Common
3	Vin
4	~0.2% per °C
5	~0.1% per °C

OUTPUT VOLTAGE
LEVEL SELECTOR

2.00 (50.8)
1.700 (43.2)
0.15 (3.8)
0.15 (3.8)
1.000 (25.40)
1.600 (40.6)
1.90 (48.3)

Side View

SEE ENLARGED VIEW

0.40 (10.2) MAX
0.055 (1.4) TYP
0.025 (0.64) x 0.025 (0.64) PIN

Enlarged Side View

0.40 (10.2) MAX
0.173 $\pm$ 0.005 (4.39 $\pm$ 0.13)
0.120 $\pm$ 0.005 (3.05 $\pm$ 0.13)
0.060 $\pm$ 0.004 (1.52 $\pm$ 0.10)
0.040 $\pm$ 0.002 (1.02 $\pm$ 0.05)
0.025 $\pm$ 0.002 (0.64 $\pm$ 0.05)

ENLARGED VIEW

8-1181(C)

Ordering Information

For assistance in ordering options, plase contact your Lucent Technologies Account Manager or Application Engineer.

Description	Output Voltage	Product Code	Comcode
5 V	24 V to 97 V	700B	105715965

Notes

Notes

October 1996
DS95-182EPS

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Recycled Paper**

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