

# NON-ISOLATED DC/DC CONVERTERS

5V Input / 0.9V – 3.3V Output / 8A



BP03x7AH-08B

## S7AH-08B / V7AH-08B Series

- Nonisolated
- Compact, low profile surface mount package
- Fixed frequency
- High efficiency means less power dissipation
- Excellent thermal performance
- Optimized for cost
- Remote on/off
- Undervoltage lockout (UVLO)
- Over current and short circuit protection



### Description

The Bel S7AH-08B and V7AH-08B modules are a series of non-isolated, step down DC/DC power converters that operate from a nominal 5V source. These converters are available in a range of output voltages from 0.9V to 3.3V. They are packaged in a compact, overmolded package rated at 8A. Optional lead forming provides a vertical mount product for minimal footprint or a surface mount option for a very low profile. Standard features include remote on/off, over current and short circuit protection, output voltage adjust and industrial temperature range (-40° to +85° C). The output is closely regulated and the efficiency is typically 92% at full load. These products may be used almost anywhere low voltage silicon is employed and a 5V source is available. Typical applications include file servers, routers, line cards and other computing and communications equipment.

### Applications

- Distributed power architectures
- Data networking equipment
- Telecommunications
- Computers and peripherals

### Part Number Selection

Output Voltage	Input Voltage	Max. Output Current	Max. Output Power	Typical Efficiency	Part Number Surface Mount	Part Number Vertical Mount
3.3V	5V	8A	26.4W	92%	S7AH-08B330	V7AH-08B330
2.5V	5V	8A	20W	90%	S7AH-08B250	V7AH-08B250
1.8V	5V	8A	14.4W	86%	S7AH-08B180	V7AH-08B180
1.5V	5V	8A	12W	84%	S7AH-08B150	V7AH-08B150
1.2V	5V	8A	9.6W	82%	S7AH-08B120	V7AH-08B120
1.0V	5V	8A	8W	80%	S7AH-08B100	V7AH-08B100
0.9V	5V	8A	7.2W	79%	S7AH-08B090	V7AH-08B090
0.9V - 3.3V	5V	8A	26.4W	92%	S7AH-08B1A0	V7AH-08B1A0

©2003 Bel Fuse Inc. Specifications subject to change without notice. 07.03

BP03x7AH-08B

## Absolute Maximum Ratings

Parameter	Symbol	Min	Typical	Max	Unit
Continuous Input Voltage	Vin	-0.3		6	V
Output Enable Terminal Voltage	Vouten	-0.3		6	V
Ambient Temperature	Tamb	-40		85	°C
Storage Temperature	Tstor	-55		125	°C

Note: Use beyond the maximum ratings may cause a reliability degradation of the DC/DC converter or may permanently damage the device.

## Input Specifications

Parameter	Module	Symbol	Min	Typical	Max	Units
Operating Input Voltage	All	Vin	4.5		5.5	V
Input Current	3.3V 2.5V 1.8V 1.5V 1.2V 1.0V 0.9V	Iin			7.3 5.6 4.3 3.6 3.0 2.5 2.3	A
No Load Input Current	All				80	mA
Remote Off Input Current				9	15	mA
Input Reflected Ripple Current <sup>1</sup>	All			50	80	mA <sub>rms</sub>
Input Reflected Ripple Current (P-P) <sup>1</sup>	All			150	200	mApk
I <sup>2</sup> t Inrush Current Transient	All			0.02	0.05	A <sup>2</sup> s
Turn On Voltage Threshold	All		4.19	4.3	4.5	V
Turn Off Voltage Threshold	All			3.8	4.49	V

Note: Input capacitance one 270µF/16V, ESR = 0.018 Ω max at 100kHz @ 25° C.

1. With simulated source impedance of 500nH, 5Hz to 20MHz.

# NON-ISOLATED DC/DC CONVERTERS

## 5V Input / 0.9V – 3.3V Output / 8A



BP03x7AH-08B

### Output Specifications

Parameter	Module	Symbol	Min	Typical	Max	Units
Output Voltage Set Point <sup>1</sup>	3.3V	Vout	3.234	3.3	3.366	V
	2.5V		2.45	2.5	2.55	
	1.8V		1.764	1.8	1.836	
	1.5V		1.47	1.5	1.53	
	1.2V		1.176	1.2	1.224	
	1.0V		0.98	1.0	1.02	
	0.9V		0.882	0.9	0.918	
	Load Regulation		3.3V			
2.5V		6	15			
1.8V		6	15			
1.5V		3	10			
1.2V		3	10			
1.0V		3	10			
0.9V		3	10			
Line Regulation		All			2	5
Regulation Over Temperature (-40° to +85° C)	3.3V			20	33	mV
	2.5V		20	25		
	1.8V		10	18		
	1.5V		10	15		
	1.2V		5	10		
	1.0V		5	10		
	0.9V		5	10		
	Total Output Voltage Regulation		3.3V			
2.5V		28	45			
1.8V		18	38			
1.5V		15	30			
1.2V		10	25			
1.0V		10	25			
0.9V		10	25			
Output Ripple and Noise <sup>2</sup>		All				50
Output Ripple and Noise <sup>2</sup>	All			15	25	mVrms
Output Current Range	All	Iout	0		8	A
Output DC Current Limit	All	Ioutlim	10.4		20	A
Short Circuit Surge	3.3V	Ioutsurge		0.08	0.2	A <sup>2</sup> s
	2.5V		0.05	0.1		
	1.8V		0.05	0.1		
	1.5V		0.05	0.1		
	1.2V		0.05	0.1		
	1.0V		0.05	0.1		
	0.9V		0.05	0.1		
	Turn on Time		All	Ton		
Overshoot at Turn On	All			0	3	%
Output Capacitance	All	Cout	0		3300	μF

Note: All specifications are typical at nominal input, full load at 25° C unless otherwise stated.

1. Vin = 5V, Iout = full load, Ta = 25° C.

2. 0 - 20MHz, 1μF ceramic cap and 10μF aluminum cap on output.

©2003 Bel Fuse Inc. Specifications subject to change without notice. 07.03

BP03x7AH-08B

## Output Specifications

Parameter	Module	Symbol	Min	Typical	Max	Units
<b>Transient Response <sup>3</sup></b>						
$\Delta V$ 50% to 100% of Max Load	3.3V			130	165	mV
Settling Time		Ts		100	150	$\mu s$
$\Delta V$ 100% to 50% of Max Load				130	165	mV
Settling Time		Ts		100	150	$\mu s$
<b>Transient Response <sup>3</sup></b>						
$\Delta V$ 50% to 100% of Max Load	2.5V			130	165	mV
Settling Time		Ts		30	60	$\mu s$
$\Delta V$ 100% to 50% of Max Load				120	165	mV
Settling Time		Ts		30	60	$\mu s$
<b>Transient Response <sup>3</sup></b>						
$\Delta V$ 50% to 100% of Max Load	1.8V			120	165	mV
Settling Time		Ts		25	50	$\mu s$
$\Delta V$ 100% to 50% of Max Load				120	165	mV
Settling Time		Ts		25	50	$\mu s$
<b>Transient Response <sup>3</sup></b>						
$\Delta V$ 50% to 100% of Max Load	1.5V			100	150	mV
Settling Time		Ts		25	50	$\mu s$
$\Delta V$ 100% to 50% of Max Load				100	150	mV
Settling Time		Ts		25	50	$\mu s$
<b>Transient Response <sup>3</sup></b>						
$\Delta V$ 50% to 100% of Max Load	1.2V			90	125	mV
Settling Time		Ts		25	50	$\mu s$
$\Delta V$ 100% to 50% of Max Load				90	125	mV
Settling Time		Ts		25	50	$\mu s$
<b>Transient Response <sup>3</sup></b>						
$\Delta V$ 50% to 100% of Max Load	1.0V			70	110	mV
Settling Time		Ts		25	50	$\mu s$
$\Delta V$ 100% to 50% of Max Load				70	110	mV
Settling Time		Ts		25	50	$\mu s$
<b>Transient Response <sup>3</sup></b>						
$\Delta V$ 50% to 100% of Max Load	0.9V			70	110	mV
Settling Time		Ts		25	50	$\mu s$
$\Delta V$ 100% to 50% of Max Load				70	110	mV
Settling Time		Ts		25	50	$\mu s$

Note: All specifications are typical at nominal input, full load at 25° C unless otherwise stated.  
 $3. di/dt = 0.5A/\mu s$ ,  $T_a = 25^\circ C$  without external load capacitance; when  $V_{out}=3.3V$  or  $2.5V$  a  $220\mu F$  aluminum cap is added at output.

©2003 Bel Fuse Inc. Specifications subject to change without notice. 07.03

# NON-ISOLATED DC/DC CONVERTERS

## 5V Input / 0.9V – 3.3V Output / 8A



BP03x7AH-08B

### General Specifications

Parameter	Module	Symbol	Min	Typical	Max	Units
Efficiency <sup>1</sup>	3.3V	$\eta$	89	92		%
	2.5V		87	90		
	1.8V		83	86		
	1.5V		81	84		
	1.2V		79	82		
	1.0V		77	80		
	0.9V		76	79		
Switching Frequency	All	Fsw	250	300	340	kHz
Output Voltage Trim Range <sup>2</sup> (Wide Trim)	1.8V		47.5		202	%
Output Voltage Trim Range <sup>2</sup> (Narrow Trim)	3.3V		90		110	%
	2.5V		90		110	
	1.8V		90		110	
	1.5V		90		110	
	1.2V		90		110	
	1.0V		90		110	
	0.9V		95		110	
Weight	All			4.7		g

1. Vin=5V, full load and Ta=25° C.
2. See graphs on page 13 - 20.

### Control Specifications

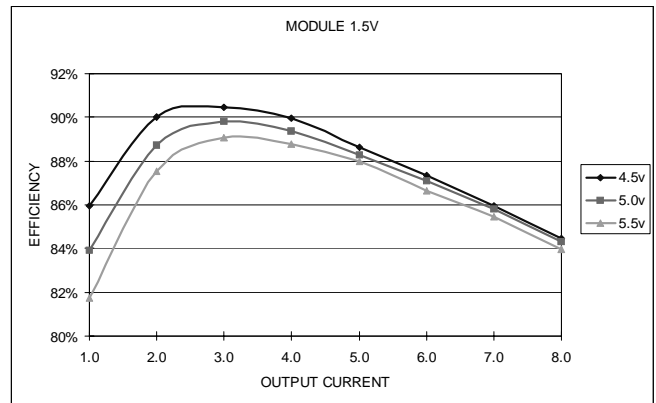
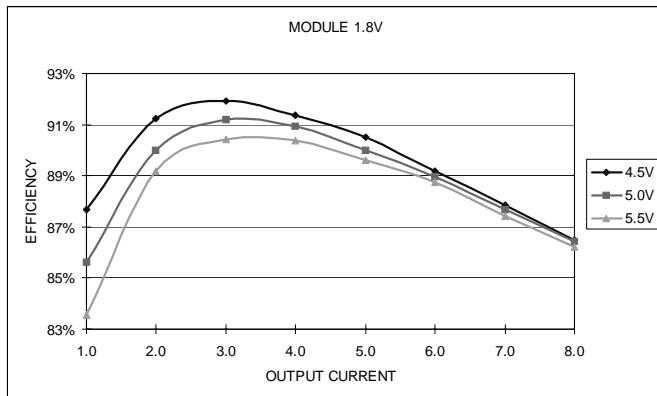
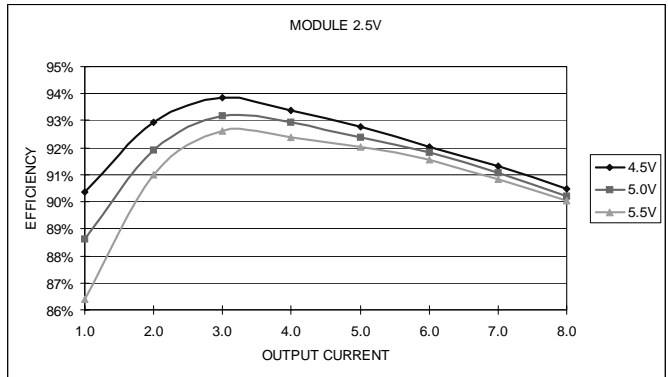
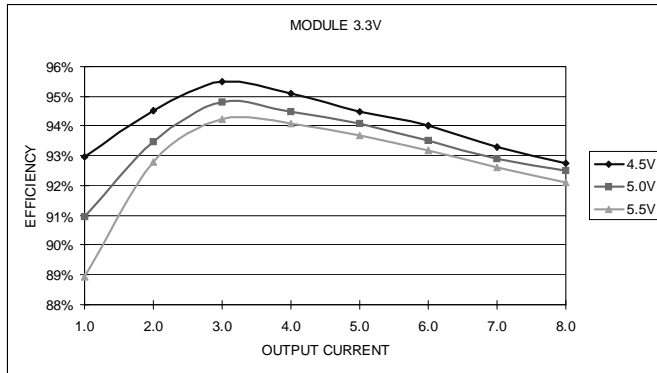
Parameter		Module	Symbol	Min	Typical	Max	Units
Remote On/Off <sup>1</sup>		All	Vouten				V
Signal Low (Unit Off) <sup>2</sup>	Vin = 4.5V	All		-0.3		1.35	V
	Vin = 5.5V					1.65	
Signal High (Unit On) <sup>2</sup>	Vin = 4.5V	All		3.15		5.5	V
	Vin = 5.5V			3.85			

1. With remote on/off pin 1 open, the module is on.
2. Signal low and signal high varies based on Vin.

Note: On/off pin designed to work with an open collector/drain switch.

BP03x7AH-08B

### Efficiency Data



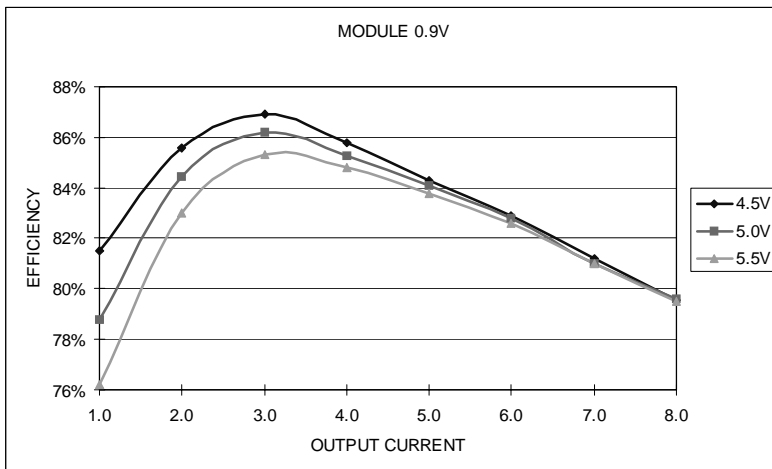
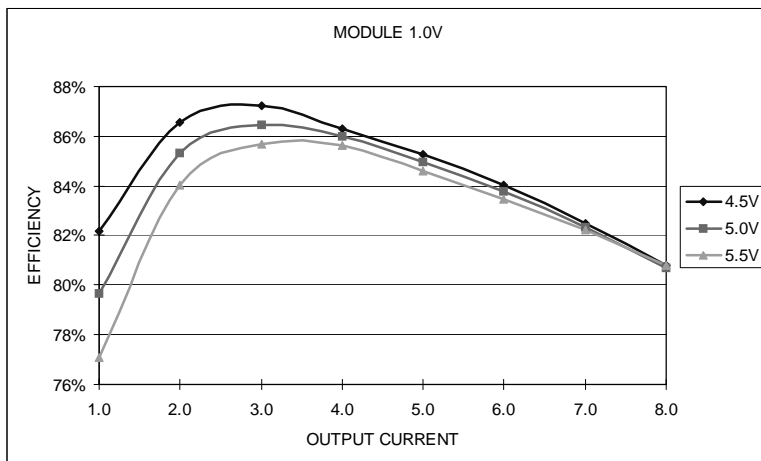
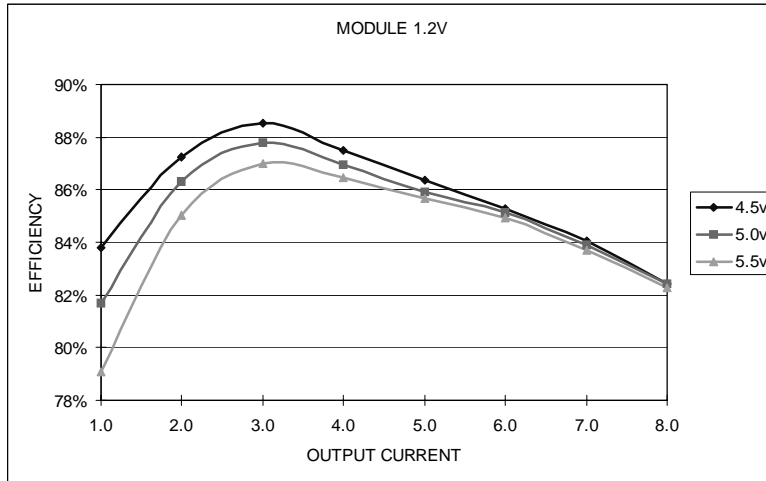
# NON-ISOLATED DC/DC CONVERTERS

5V Input / 0.9V – 3.3V Output / 8A



BP03x7AH-08B

## Efficiency Data

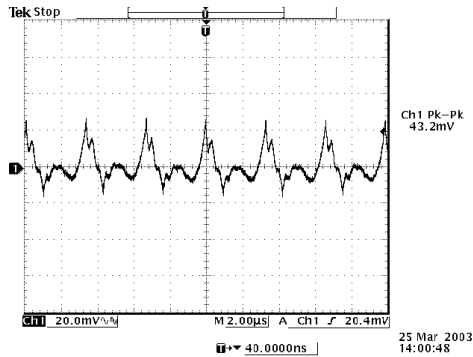


©2003 Bel Fuse Inc. Specifications subject to change without notice. 07.03

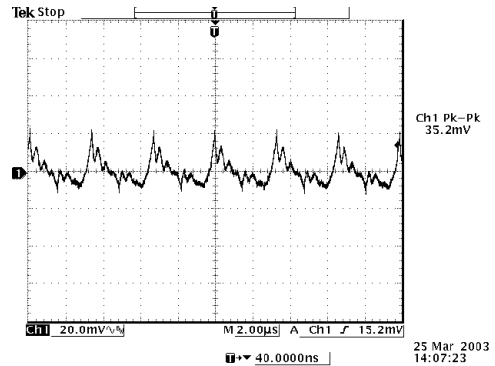
BP03x7AH-08B

### Ripple and Noise

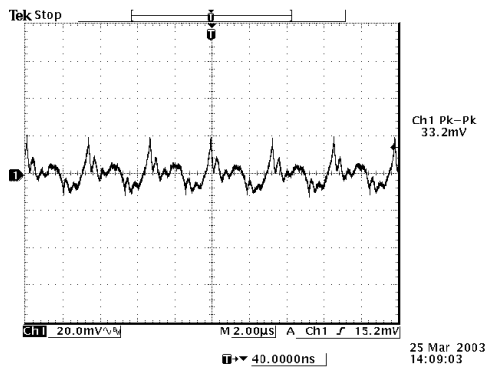
1 $\mu$ F ceramic cap and 10 $\mu$ F aluminum electrolytic cap added at the output.



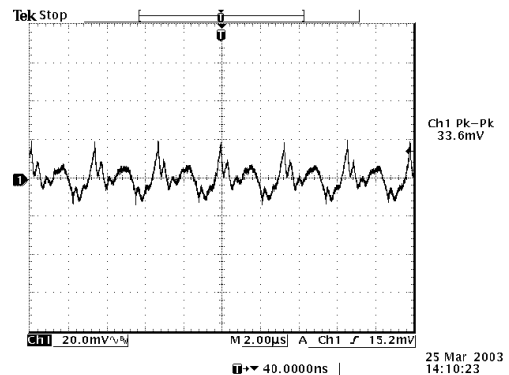
Ripple and noise at full load and 5Vdc input, 3.3Vdc output and Ta=25° C



Ripple and noise at full load and 5Vdc input, 2.5Vdc output and Ta=25° C



Ripple and noise at full load and 5Vdc input, 1.8Vdc output and Ta=25° C



Ripple and noise at full load and 5Vdc input, 1.5Vdc output and Ta=25° C



# NON-ISOLATED DC/DC CONVERTERS

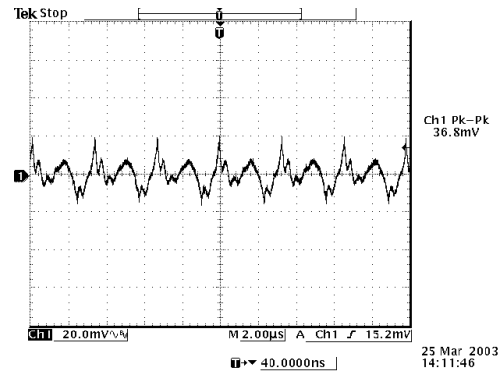
5V Input / 0.9V – 3.3V Output / 8A



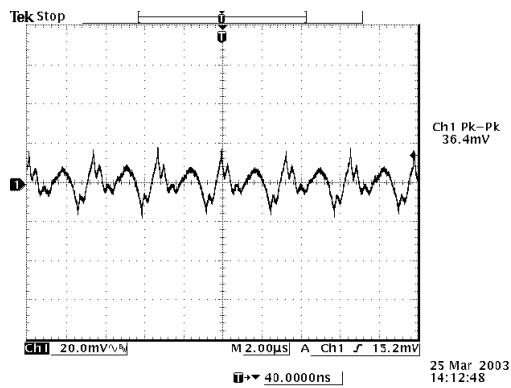
BP03x7AH-08B

## Ripple and Noise

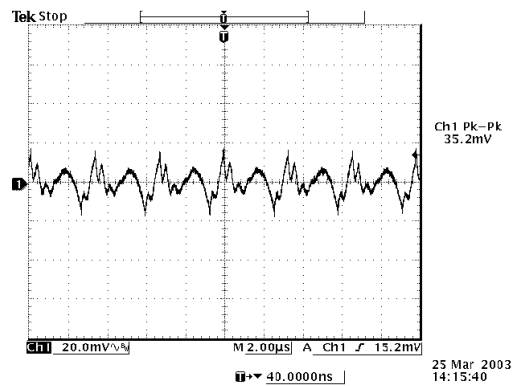
1 $\mu$ F ceramic cap and 10 $\mu$ F aluminum electrolytic cap added at the output.



Ripple and noise at full load and 5Vdc input, 1.2Vdc output and Ta=25° C



Ripple and noise at full load and 5Vdc input, 1.0Vdc output and Ta=25° C



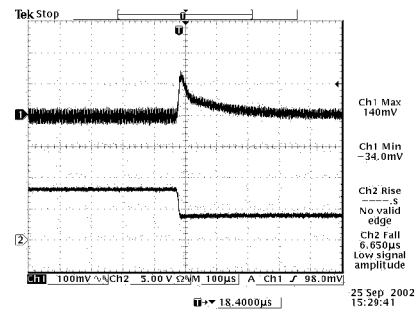
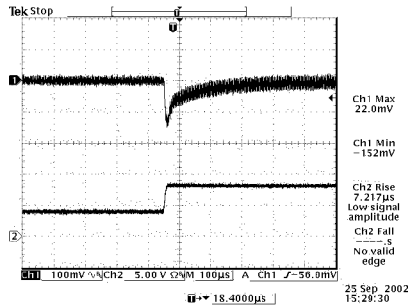
Ripple and noise at full load and 5Vdc input, 0.9Vdc output and Ta=25° C

BP03x7AH-08B

### Transient Response

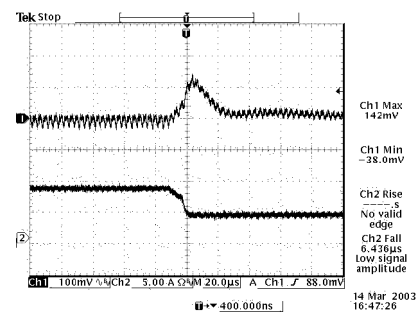
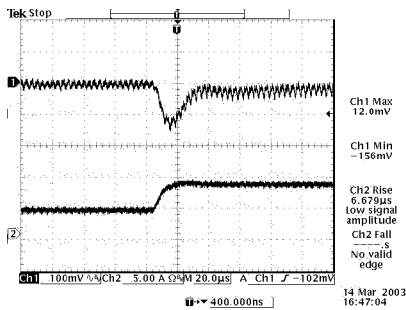
Transient response:  $di/dt = 0.5A/\mu S$ , no external load capacitance.

Note: 3.3Vdc and 2.5Vdc output with external 220uF aluminum capacitance.



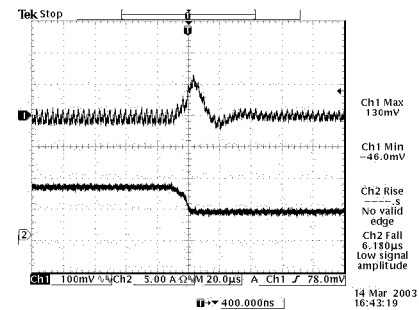
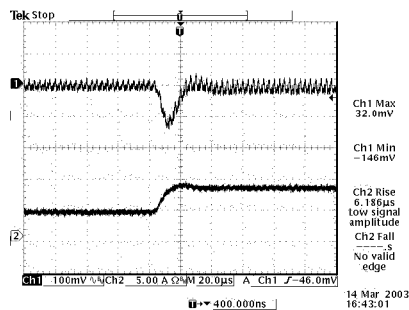
Vout=3.3V  
50% to 100% load transients at 5V input and Ta=25° C

Vout=3.3V  
100% to 50% load transients at 5V input and Ta=25° C



Vout=2.5V  
50% to 100% load transients at 5V input and Ta=25° C

Vout=2.5V  
100% to 50% load transients at 5V input and Ta=25° C



Vout=1.8V  
50% to 100% load transients at 5V input and Ta=25° C

Vout=1.8V  
100% to 50% load transients at 5V input and Ta=25° C

# NON-ISOLATED DC/DC CONVERTERS

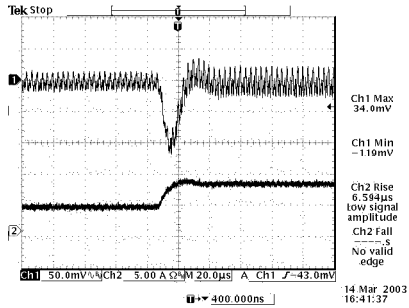
## 5V Input / 0.9V – 3.3V Output / 8A



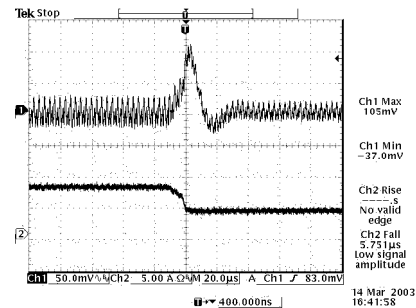
BP03x7AH-08B

### Transient Response

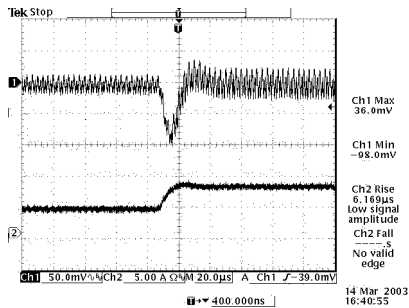
Transient response:  $di/dt = 0.5A/\mu S$ , no external load capacitance



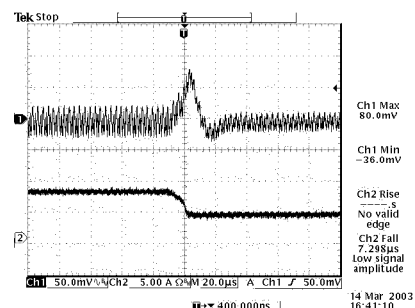
Vout=1.5V  
50% to 100% load transients at 5V input and Ta=25° C



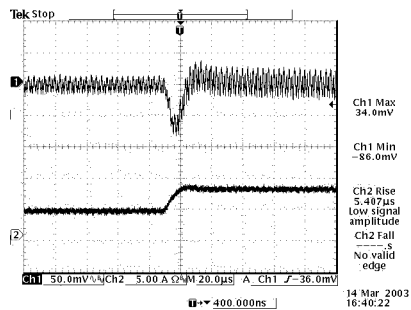
Vout=1.5V  
100% to 50% load transients at 5V input and Ta=25° C



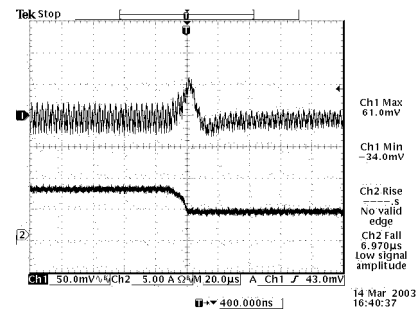
Vout=1.2V  
50% to 100% load transients at 5V input and Ta=25° C



Vout=1.2V  
100% to 50% load transients at 5V input and Ta=25° C



Vout=1.0V  
50% to 100% load transients at 5V input and Ta=25° C



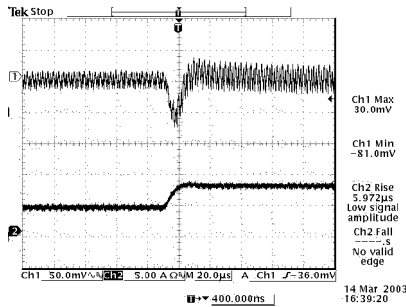
Vout=1.0V  
100% to 50% load transients at 5V input and Ta=25° C

©2003 Bel Fuse Inc. Specifications subject to change without notice. 07.03

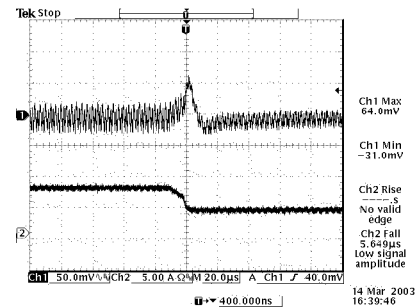
BP03x7AH-08B

### Transient Response

Transient response:  $di/dt = 0.5A/\mu S$ , no external load capacitance



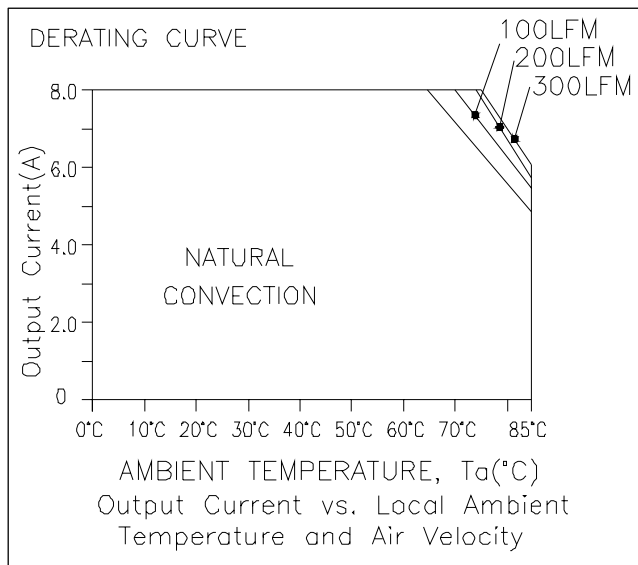
Vout=0.9V  
50% to 100% load transients at 5V input and Ta=25° C



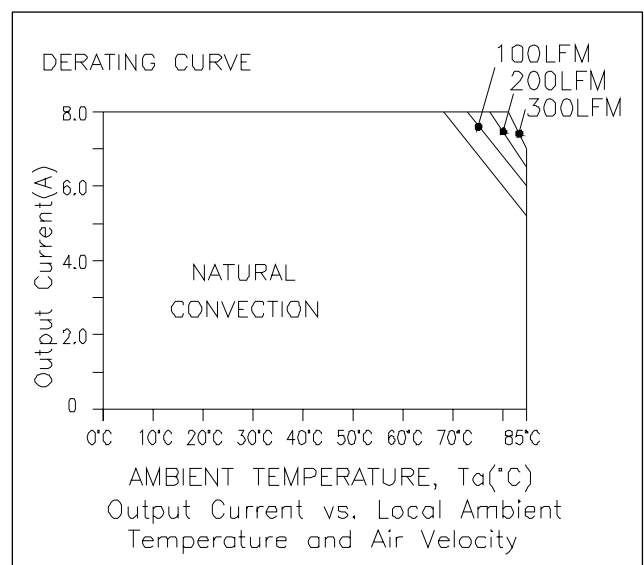
Vout=0.9V  
100% to 50% load transients at 5V input and Ta=25° C

### Thermal Considerations

S7AH-08B



V7AH-08B



# NON-ISOLATED DC/DC CONVERTERS

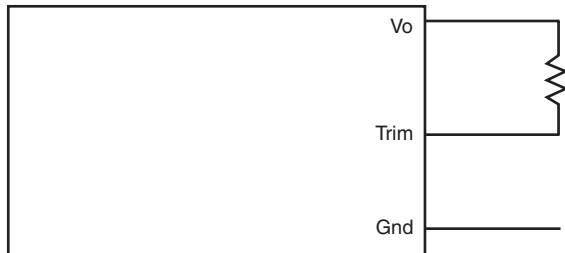
5V Input / 0.9V – 3.3V Output / 8A



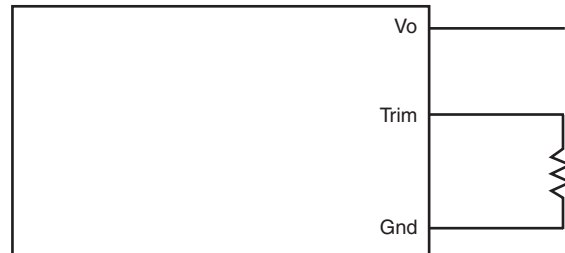
BP03x7AH-08B

## Output Voltage Set-Point Adjustment

Trim Down Test Circuit

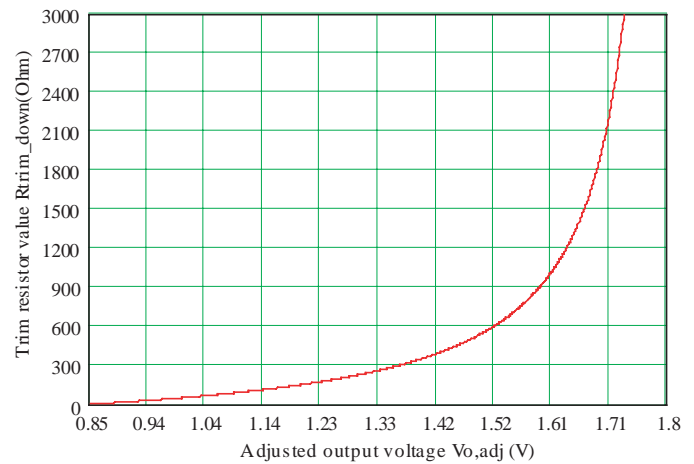


Trim Up Test Circuit

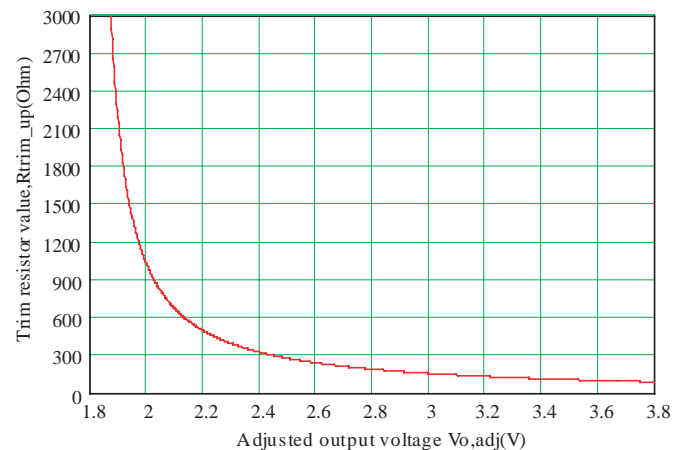


### x7AH-08B1A0 Trim Resistor Calculation

$$R_{trim-down} = \left( \frac{250.362}{V_o - V_{o,adj}} - 261.1 \right) ohm$$



$$R_{trim-up} = \left( \frac{199.2}{V_{o,adj} - V_o} - 12.1 \right) ohm$$



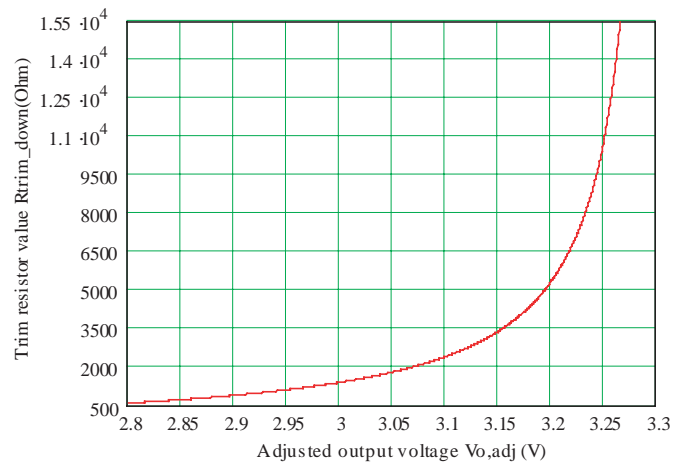
©2003 Bel Fuse Inc. Specifications subject to change without notice. 07.03

BP03x7AH-08B

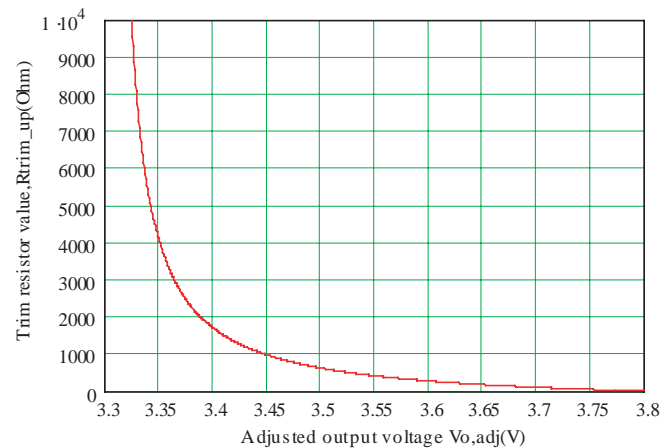
## Output Voltage Set-Point Adjustment

### x7AH-08B330 Trim Resistor Calculation

$$R_{trim-down} = \left( \frac{623.741}{V_o - V_{o,adj}} - 651 \right) ohm$$



$$R_{trim-up} = \left( \frac{199.2}{V_{o,adj} - V_o} - 402 \right) ohm$$



# NON-ISOLATED DC/DC CONVERTERS

5V Input / 0.9V – 3.3V Output / 8A

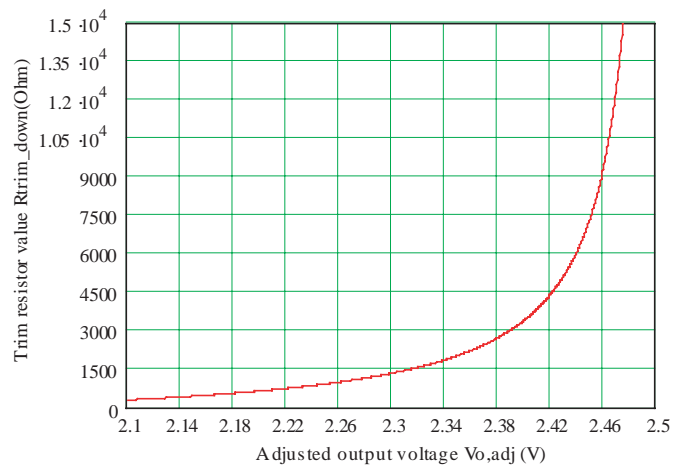


BP03x7AH-08B

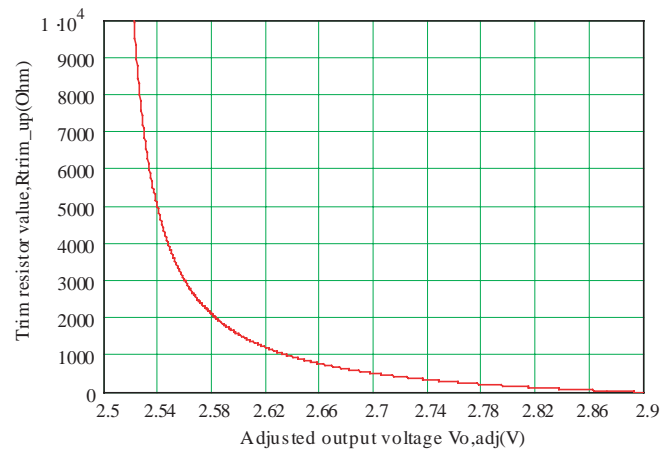
## Output Voltage Set-Point Adjustment

### x7AH-08B250 Trim Resistor Calculation

$$R_{trim-down} = \left( \frac{423.933}{V_o - V_{o,adj}} - 760 \right) ohm$$



$$R_{trim-up} = \left( \frac{199.2}{V_{o,adj} - V_o} - 511 \right) ohm$$

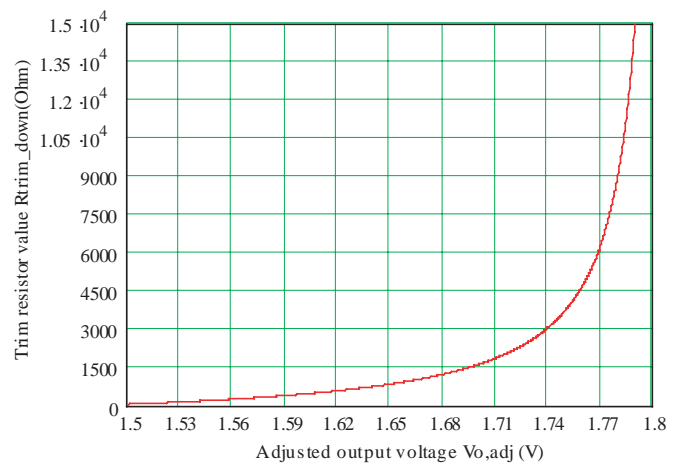


BP03x7AH-08B

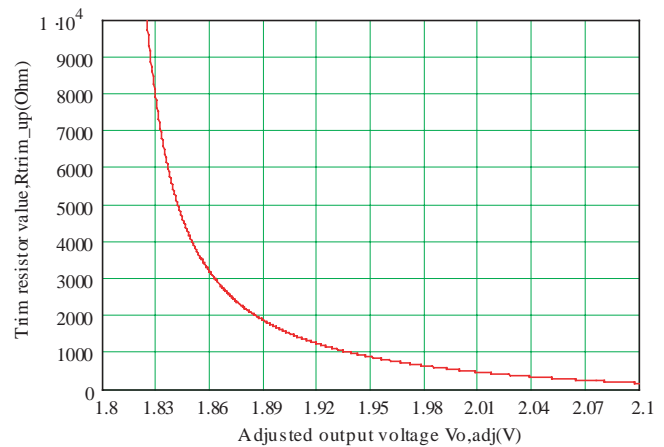
## Output Voltage Set-Point Adjustment

### x7AH-08B180 Trim Resistor Calculation

$$R_{trim-down} = \left( \frac{250.362}{V_o - V_{o,adj}} - 760 \right) ohm$$



$$R_{trim-up} = \left( \frac{199.2}{V_{o,adj} - V_o} - 511 \right) ohm$$





# NON-ISOLATED DC/DC CONVERTERS

5V Input / 0.9V – 3.3V Output / 8A



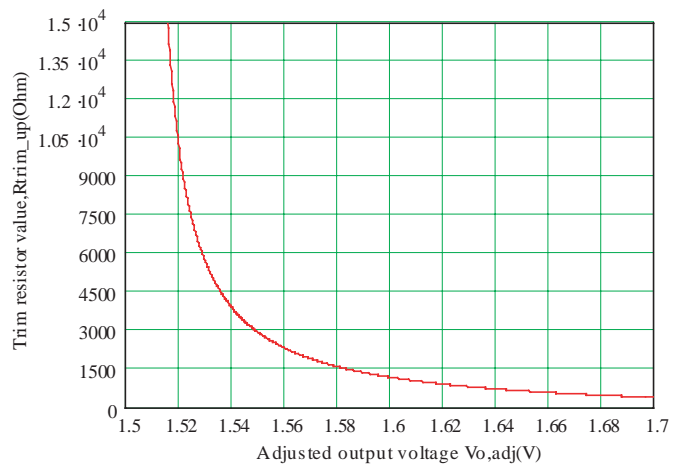
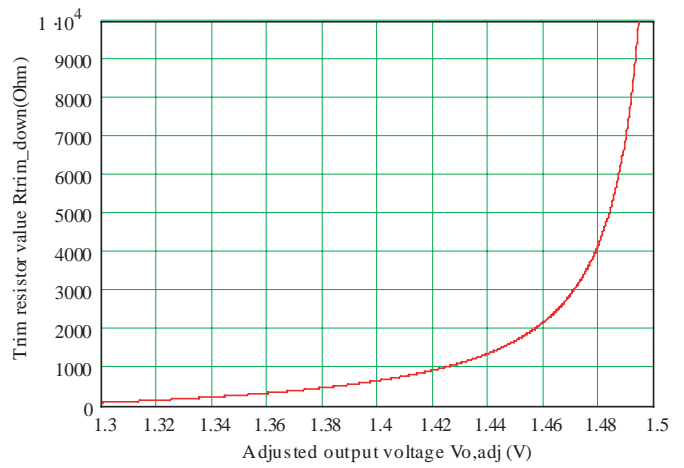
BP03x7AH-08B

## Output Voltage Set-Point Adjustment

### x7AH-08B150 Trim Resistor Calculation

$$R_{trim-down} = \left( \frac{125.74}{V_o - V_{o,adj}} - 526 \right) ohm$$

$$R_{trim-up} = \left( \frac{142.4}{V_{o,adj} - V_o} - 348 \right) ohm$$

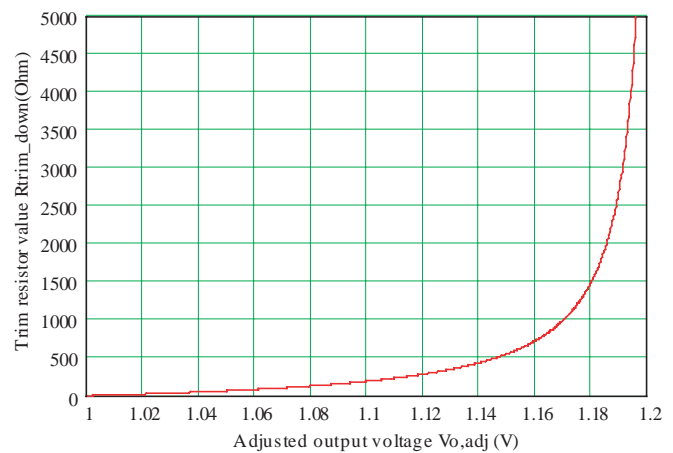


BP03x7AH-08B

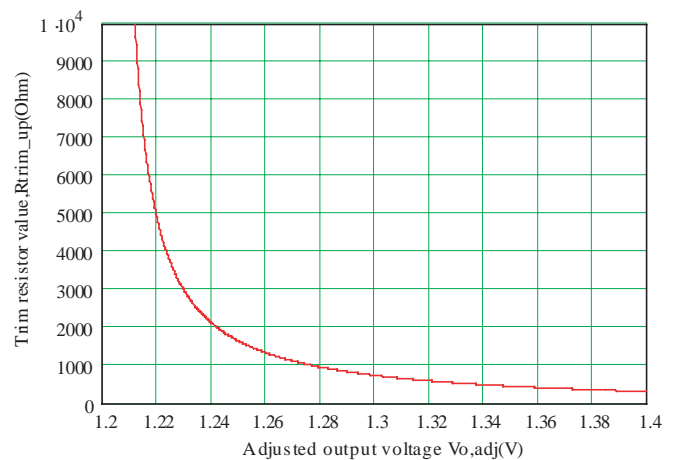
## Output Voltage Set-Point Adjustment

### x7AH-08B120 Trim Resistor Calculation

$$R_{trim-down} = \left( \frac{40.38}{V_o - V_{o,adj}} - 200 \right) ohm$$



$$R_{trim-up} = \left( \frac{80}{V_{o,adj} - V_o} - 100 \right) ohm$$

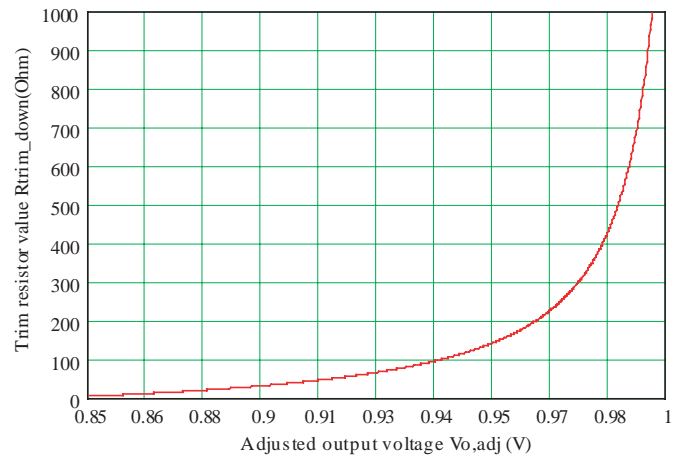


BP03x7AH-08B

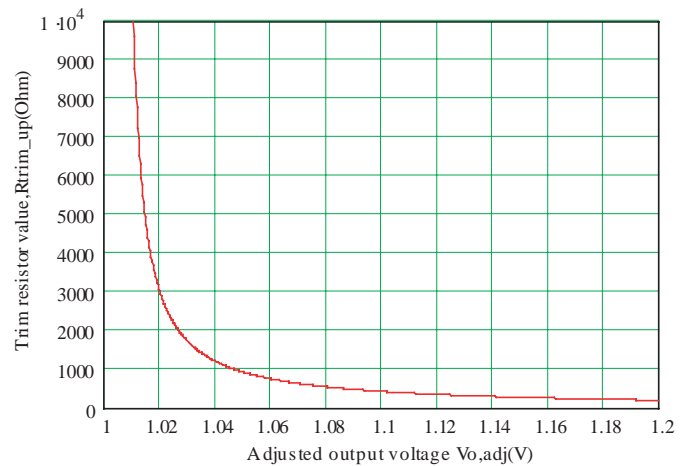
**Output Voltage Set-Point Adjustment**

**x7AH-08B100 Trim Resistor Calculation**

$$R_{trim-down} = \left( \frac{10.544}{V_o - V_{o,adj}} - 63.2 \right) ohm$$



$$R_{trim-up} = \left( \frac{40.88}{V_{o,adj} - V_o} - 12.1 \right) ohm$$

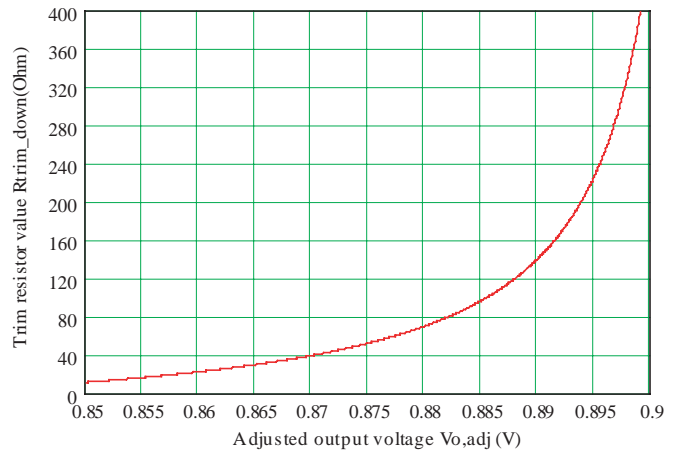


BP03x7AH-08B

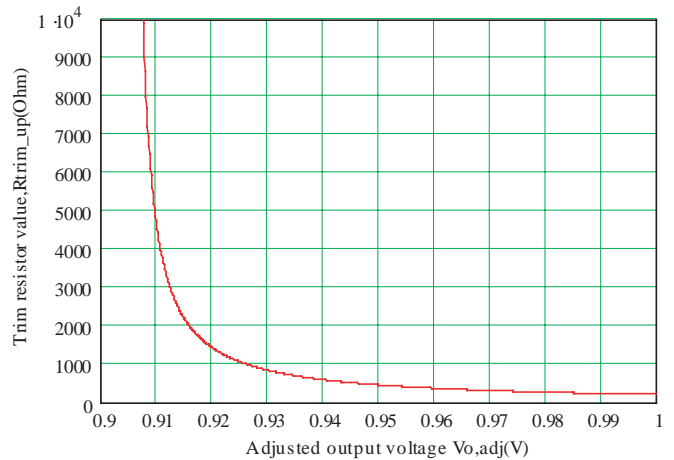
**Output Voltage Set-Point Adjustment**

**x7AH-08B090 Trim Resistor Calculation**

$$R_{trim-down} = \left( \frac{2.751}{V_o - V_{o,adj}} - 38.2 \right) ohm$$



$$R_{trim-up} = \left( \frac{20.88}{V_{o,adj} - V_o} - 12.1 \right) ohm$$



# NON-ISOLATED DC/DC CONVERTERS

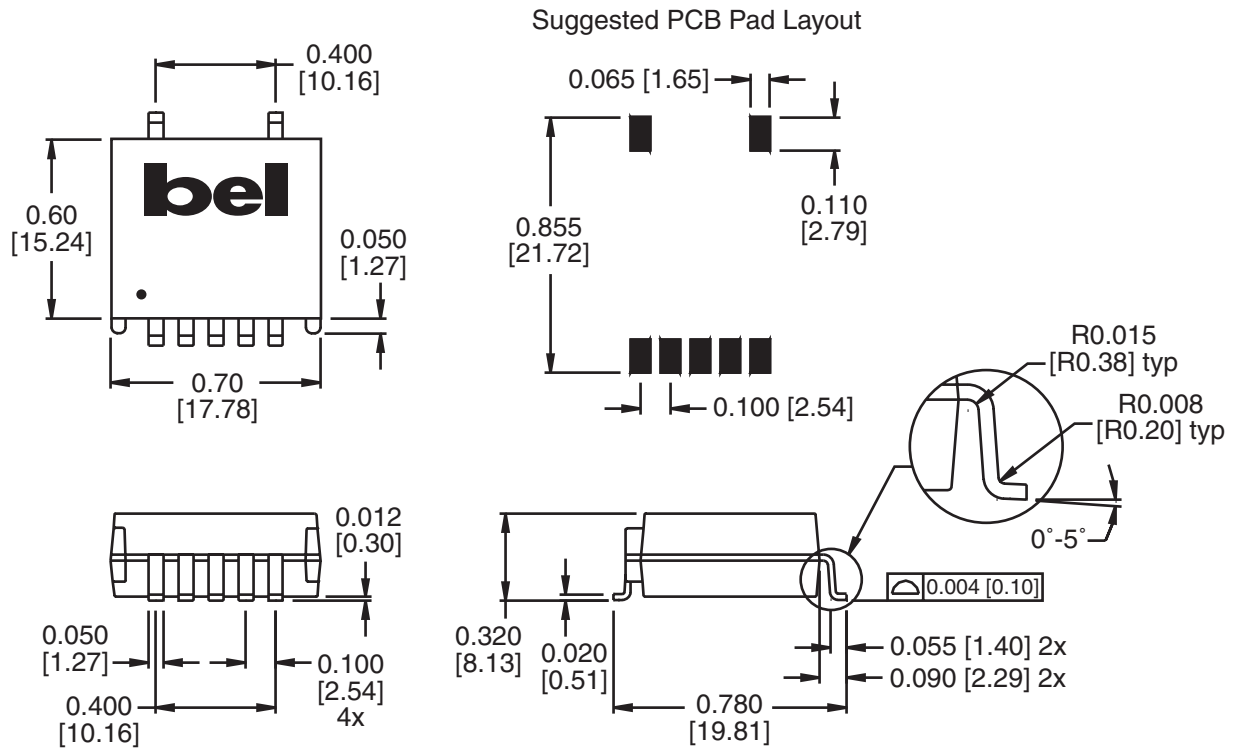
5V Input / 0.9V – 3.3V Output / 8A



BP03x7AH-08B

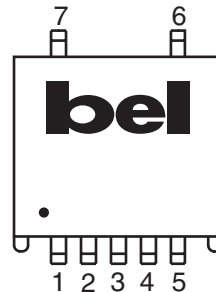
## Mechanical

S7AH-08B



Dimensions are in inches [millimeters].  
Standard dimension tolerance is  $\pm 0.005$  [0.13] unless otherwise noted.

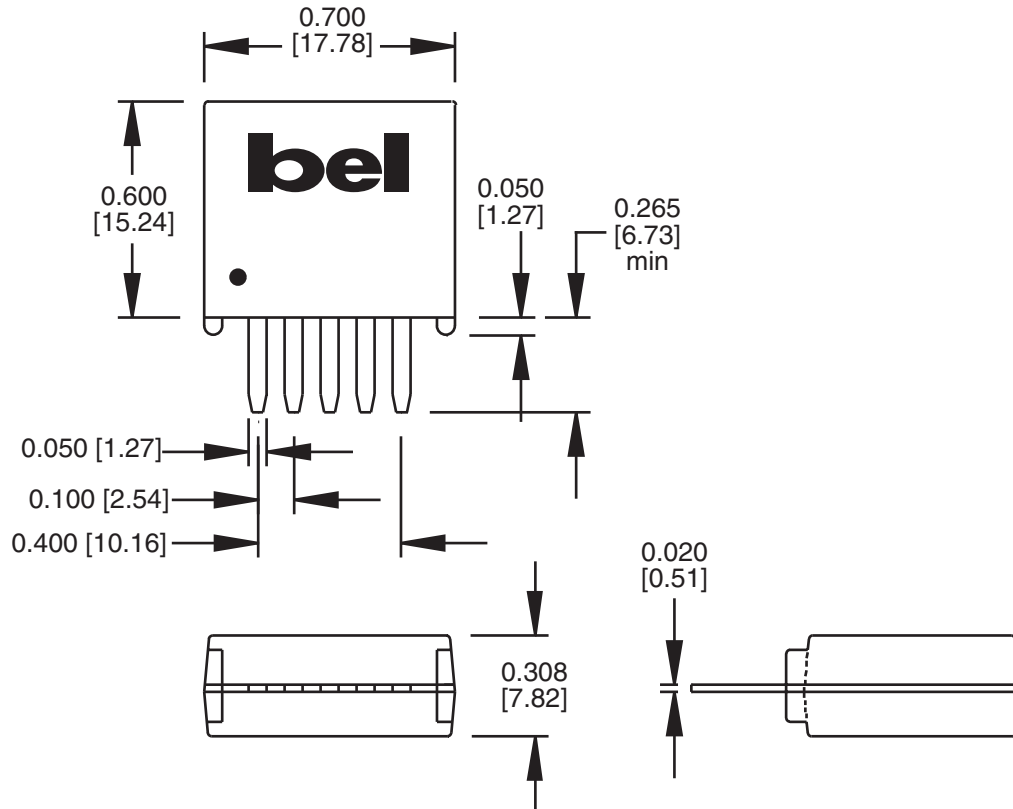
Pin	Function
1	Remote On/Off
2	+Vin
3	Ground
4	+Vo
5	Trim
6	No Connection
7	No Connection



BP03x7AH-08B

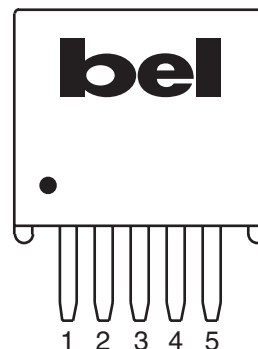
### Mechanical

V7AH-08B



Dimensions are in inches [millimeters].  
Standard dimension tolerance is  $\pm 0.005$  [0.13] unless otherwise noted.

Pin	Function
1	Remote On/Off
2	+Vin
3	Ground
4	+Vo
5	Trim



©2003 Bel Fuse Inc. Specifications subject to change without notice. 07.03

#### CORPORATE

**Bel Fuse Inc.**  
206 Van Vorst Street  
Jersey City, NJ 07302  
Tel 201-432-0463  
Fax 201-432-9542  
www.belfuse.com

page 22

#### FAR EAST

**Bel Fuse Ltd.**  
8F / 8 Luk Hop Street  
San Po Kong  
Kowloon, Hong Kong  
Tel 852-2328-5515  
Fax 852-2352-3706  
www.belfuse.com

#### EUROPE

**Bel Fuse Europe Ltd.**  
Preston Technology Management Centre  
Marsh Lane, Suite G7, Preston  
Lancashire, PR1 8UD, U.K.  
Tel 44-1772-556601  
Fax 44-1772-888366  
www.belfuse.com