

NON-ISOLATED DC/DC CONVERTERS

5V Input / 1.2V – 3.3V Output / 5A



BP02x7AH-05B

S7AH-05B / V7AH-05B 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-05B and V7AH-05B 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 1.2V to 3.3V. They are packaged in a compact, overmolded package rated at 5A. 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, and output voltage adjust. 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	5A	16.5W	92%	S7AH-05B330	V7AH-05B330
2.5V	5V	5A	12.5W	90%	S7AH-05B250	V7AH-05B250
1.8V	5V	5A	9.0W	86%	S7AH-05B180	V7AH-05B180
1.5V	5V	5A	7.5W	84%	S7AH-05B150	V7AH-05B150
1.2V	5V	5A	6W	82%	S7AH-05B120	V7AH-05B120

BP02x7AH-05B

Absolute Maximum Ratings

Parameter	Symbol	Min	Typical	Max	Unit
Continuous Input Voltage	V _{in}	-0.3		6	V
Output Enable Terminal Voltage	V _{outen}	-0.3		6	V
Ambient Temperature	T _{amb}	0		70	°C
Storage Temperature	T _{stor}	-40		100	°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	V _{in}	4.5		5.5	V
Input Current	3.3V 2.5V 1.8V 1.5V 1.2V	I _{in}			4.6 3.6 2.7 2.3 1.9	A
No Load Input Current	All			30		mA
Remote Off Input Current				4	8	mA
Input Reflected Ripple Current ¹	All			30	60	mA _{rms}
Input Reflected Ripple Current (P-P) ¹	All			100	150	mApk
I ² t Inrush Current Transient	All			0.02	0.05	A ² s
Turn On Voltage Threshold	All		4.19	4.3	4.5	V
Turn Off Voltage Threshold	All			3.9	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 / 1.2V – 3.3V Output / 5A



BP02x7AH-05B

Output Specifications

Parameter	Module	Symbol	Min	Typical	Max	Units
Output Voltage Set Point ¹	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	
Load Regulation	3.3V			6.0	15	mV
	2.5V			6.0	15	
	1.8V			6.0	15	
	1.5V			6.0	15	
	1.2V			6.0	15	
Line Regulation	3.3V			3.0	10	mV
	2.5V			3.0	10	
	1.8V			3.0	8	
	1.5V			3.0	8	
	1.2V			3.0	8	
Regulation Over Temperature	3.3V			20	33	mV
	2.5V			20	25	
	1.8V			10	18	
	1.5V			10	15	
	1.2V			8	12	
Total Output Voltage Regulation	3.3V				58	mV
	2.5V				50	
	1.8V				41	
	1.5V				38	
	1.2V				35	
Output Ripple and Noise ²	All			50	100	mVp-p
Output Ripple and Noise ²	All			15	25	mVrms
Output Current Range	All	Iout	0		5	A
Output DC Current Limit	All	Ioutlim	6.5		12.5	A
Short Circuit Surge	3.3V	Ioutsurge		0.08	0.2	A ² 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	
Turn on Time	All	Ton		12	20	ms
Overshoot at Turn On	All			0	3	%
Output Capacitance	All	Cout	0		2000	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.

BP02x7AH-05B

Output Specifications

Parameter	Module	Symbol	Min	Typical	Max	Units
Transient Response ³						
ΔV 50% to 100% of Max Load	3.3V			120	165	mV
Settling Time		Ts		25	50	μ s
ΔV 100% to 50% of Max Load				120	165	mV
Settling Time		Ts		25	50	μ s
Transient Response ³						
ΔV 50% to 100% of Max Load	2.5V			100	150	mV
Settling Time		Ts		25	50	μ s
ΔV 100% to 50% of Max Load				100	150	mV
Settling Time		Ts		25	50	μ s
Transient Response ³						
ΔV 50% to 100% of Max Load	1.8V			100	150	mV
Settling Time		Ts		25	50	μ s
ΔV 100% to 50% of Max Load				100	150	mV
Settling Time		Ts		25	50	μ s
Transient Response ³						
ΔV 50% to 100% of Max Load	1.5V			100	150	mV
Settling Time		Ts		25	50	μ s
ΔV 100% to 50% of Max Load				100	150	mV
Settling Time		Ts		25	50	μ s
Transient Response ³						
ΔV 50% to 100% of Max Load	1.2V			100	150	mV
Settling Time		Ts		25	50	μ s
ΔV 100% to 50% of Max Load				100	150	mV
Settling Time		Ts		25	50	μ s

Note: All specifications are typical at nominal input, full load at 25° C unless otherwise stated.
 3. di/dt = 0.5A/1 μ S, Ta = 25° C without external load capacitance.

NON-ISOLATED DC/DC CONVERTERS

5V Input / 1.2V – 3.3V Output / 5A



BP02x7AH-05B

General Specifications

Parameter	Module	Symbol	Min	Typical	Max	Units
Efficiency ¹	3.3V	η	89	92		%
	2.5V		87	90		
	1.8V		83	86		
	1.5V		81	84		
	1.2V		79	82		
Switching Frequency	All	Fsw	260	300	340	kHz
Output Voltage Trim Range ²	All		90		110	%
Weight	All			4.7		g

1. Vin=5V, full load and Ta=25° C.
2. See graphs on pages 10-12.

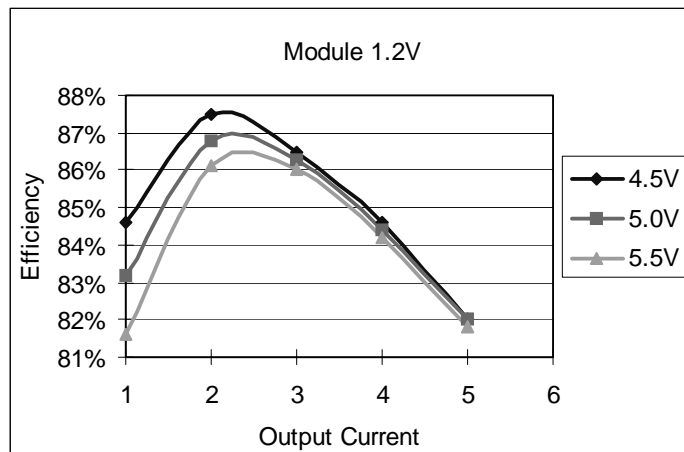
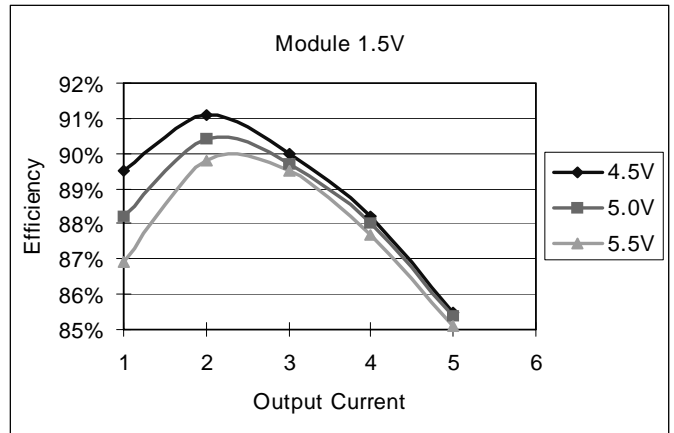
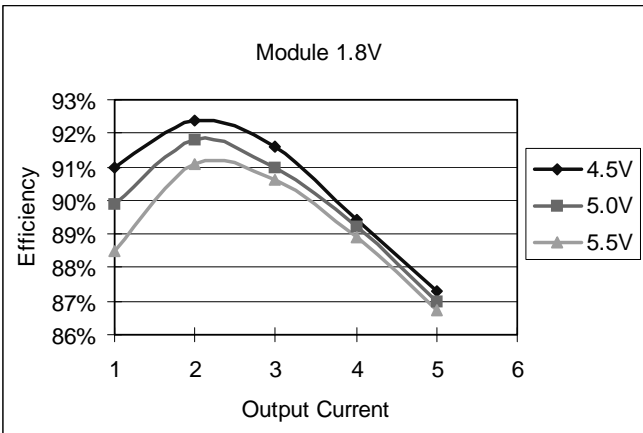
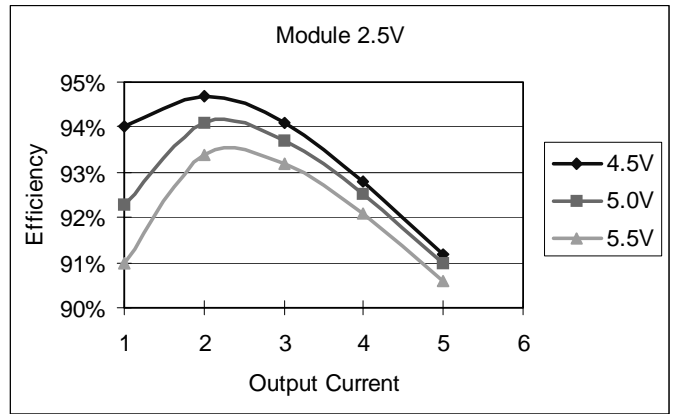
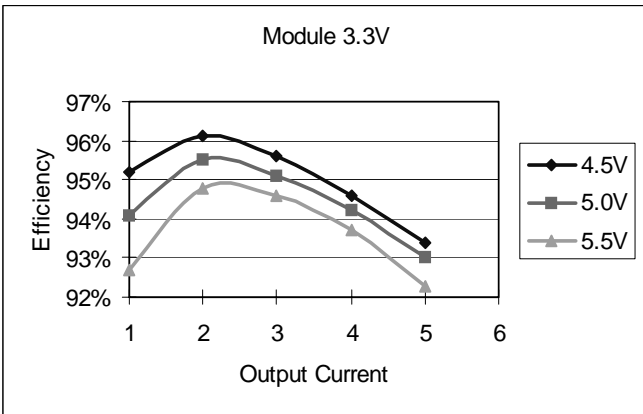
Control Specifications

Parameter	Module	Symbol	Min	Typical	Max	Units
Remote On/Off ³	All	Vouten				V
Signal Low (Unit On)	All		0		1	V
Signal High (Unit Off)	All		2.8		5.5	V

3. With remote on/off pin 1 open, the module is on.

BP02x7AH-05B

Efficiency Data



NON-ISOLATED DC/DC CONVERTERS

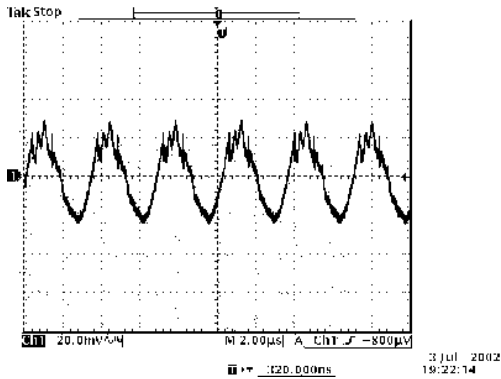
5V Input / 1.2V – 3.3V Output / 5A



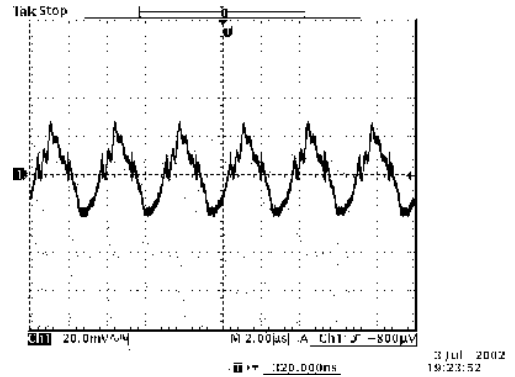
BP02x7AH-05B

Ripple and Noise

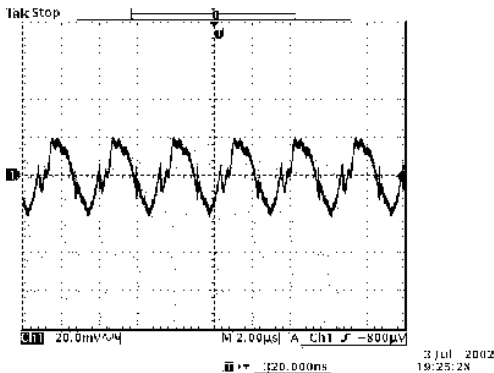
1 μ F ceramic cap and 10 μ F aluminum electrolytic cap added at the output.



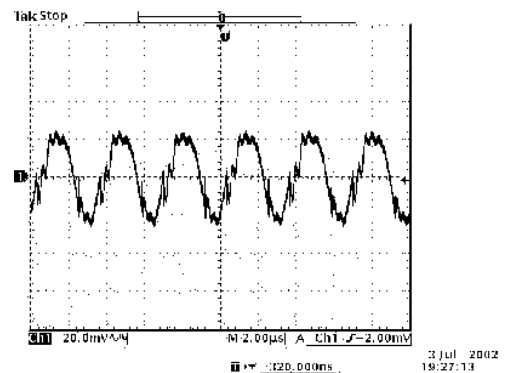
Ripple and noise at full load and 5Vdc input, 3.3Vdc output and Ta=25° C



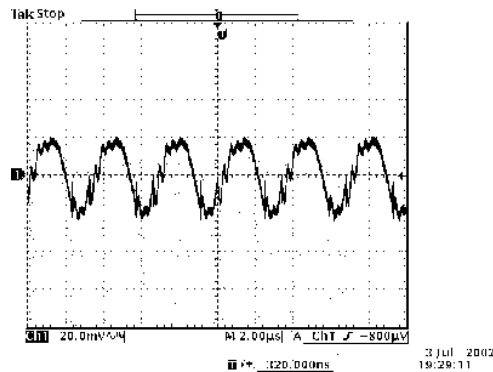
Ripple and noise at full load and 5Vdc input, 2.5Vdc output and Ta=25° C



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

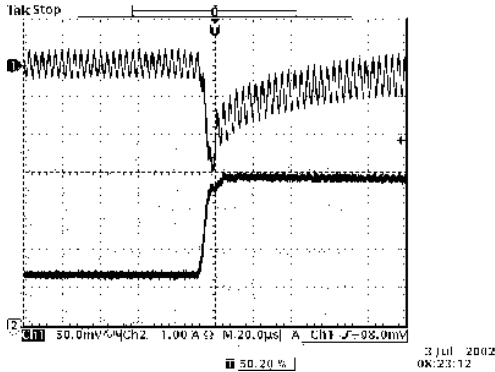


Ripple and noise at full load and 5Vdc input, 1.2Vdc output and Ta=25° C

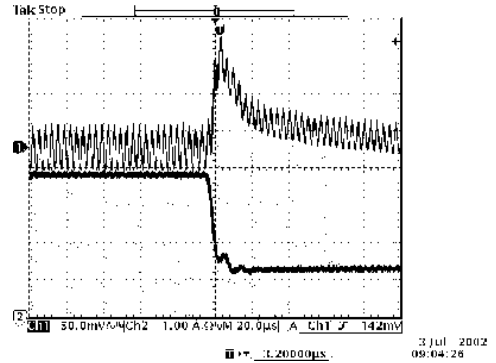
BP02x7AH-05B

Transient Response

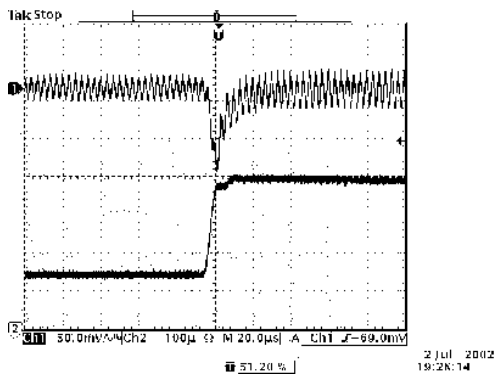
Transient response: $di/dt = 0.5A/\mu S$, no external load capacitance



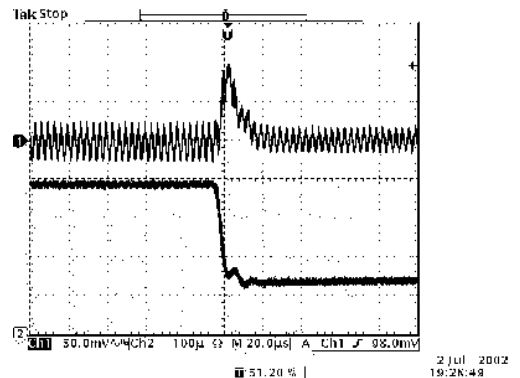
Vout=3.3V
50% to 100% load transients at 5V input and Ta=25° C



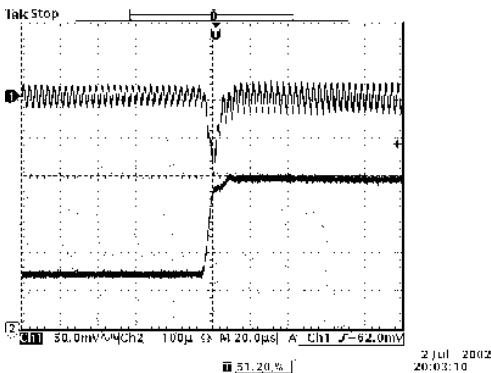
Vout=3.3V
100% to 50% load transients at 5V input and Ta=25° C



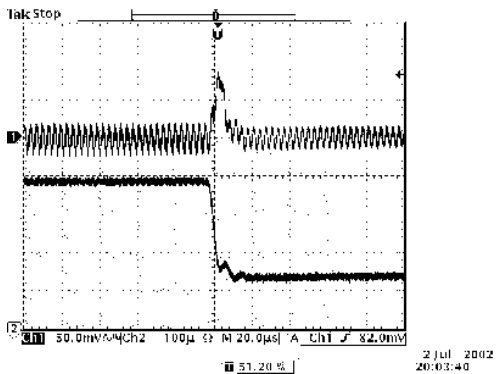
Vout=2.5V
50% to 100% load transients at 5V input and Ta=25° C



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

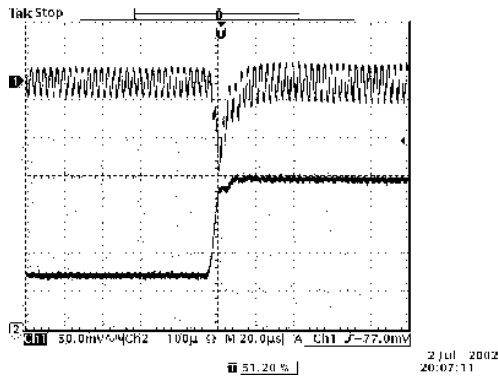
5V Input / 1.2V – 3.3V Output / 5A



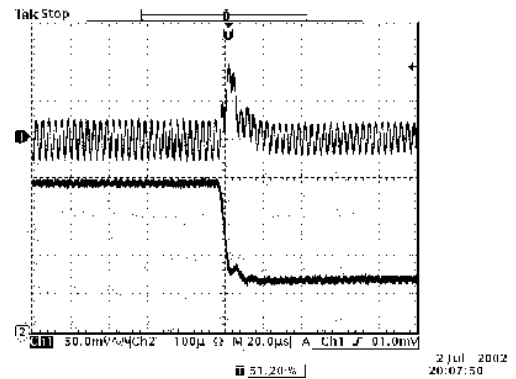
BP02x7AH-05B

Transient Response

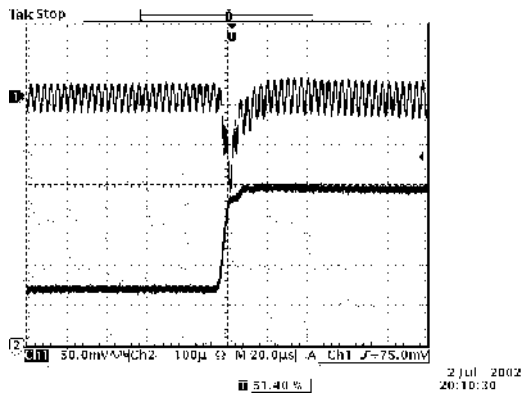
Transient response: $di/dt = 0.5A/\mu S$, no external load capacitance



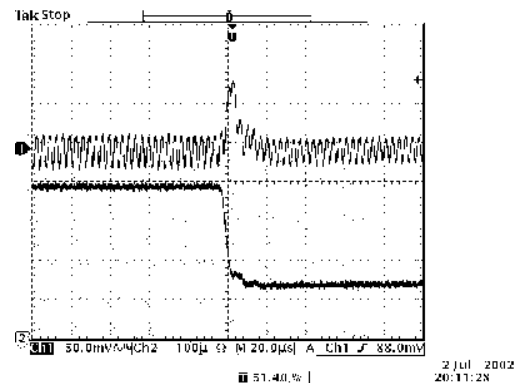
Vout=1.5V
50% to 100% load transients at 5V input and Ta=25° C



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

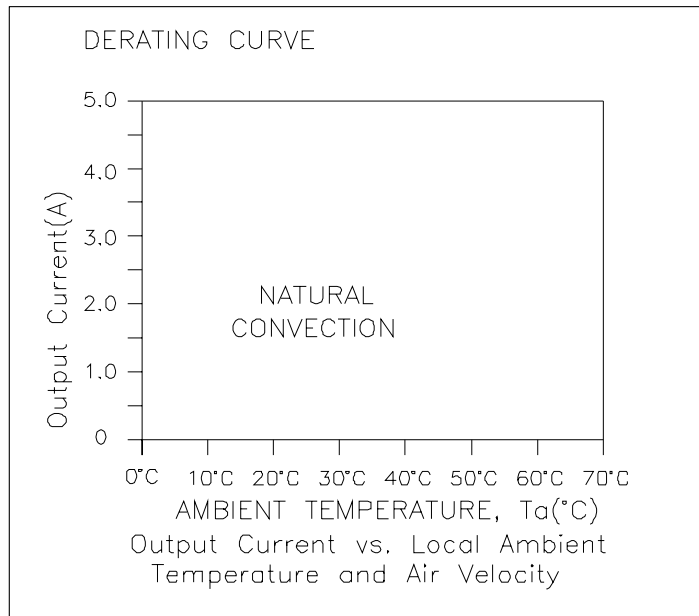


Vout=1.2V
100% to 50% load transients at 5V input and Ta=25° C

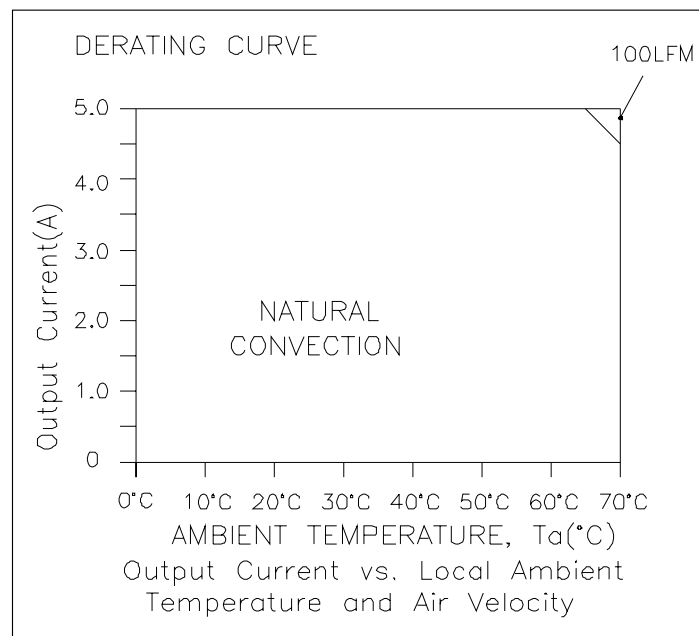
BP02x7AH-05B

Thermal Considerations

S7AH-05B



V7AH-05B



NON-ISOLATED DC/DC CONVERTERS

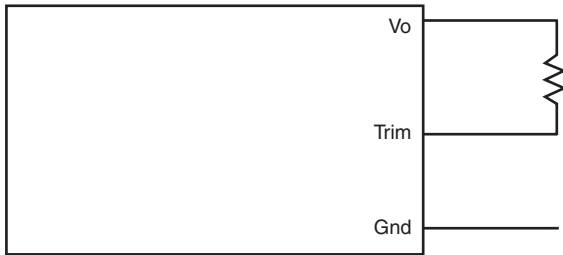
5V Input / 1.2V – 3.3V Output / 5A



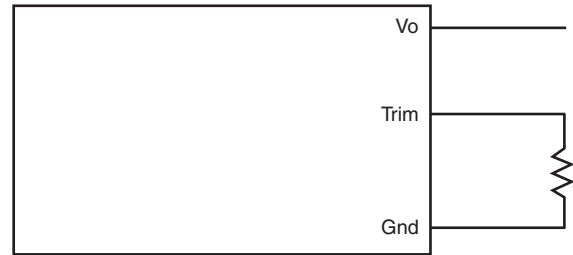
BP02x7AH-05B

Output Voltage Set-Point Adjustment

Trim Down Test Circuit



Trim Up Test Circuit

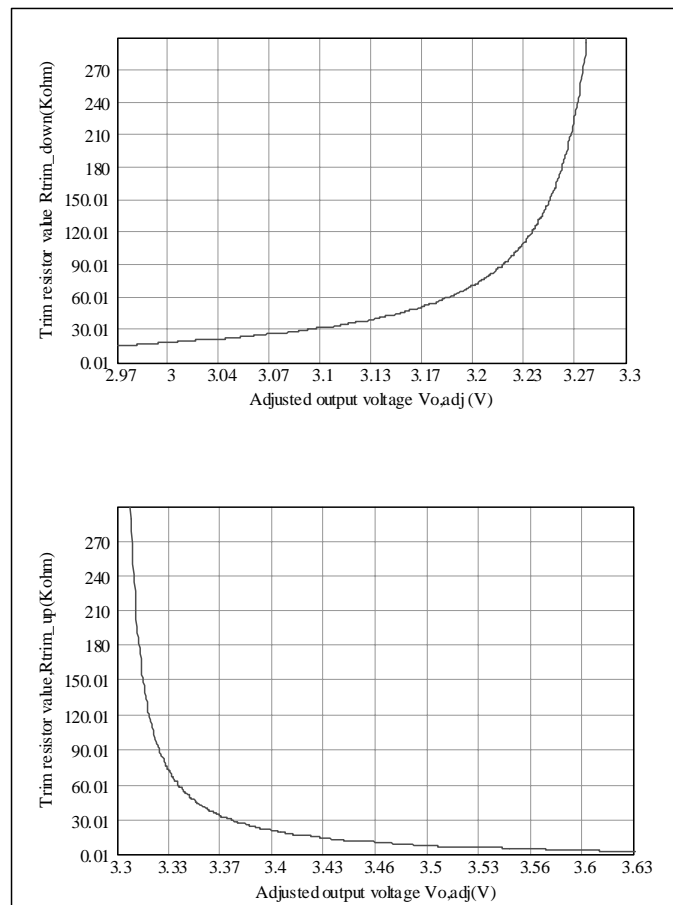


Output Voltage Set-Point Adjustment

x7AH-05B330 Trim Resistor Calculation

$$R_{\text{trim down}} = \left(\frac{7.914}{V_o - V_{o, \text{adj}}} - 8.27 \right) \text{ Kohm}$$

$$R_{\text{trim up}} = \left(\frac{2.528}{V_{o, \text{adj}} - V_o} - 5.11 \right) \text{ Kohm}$$



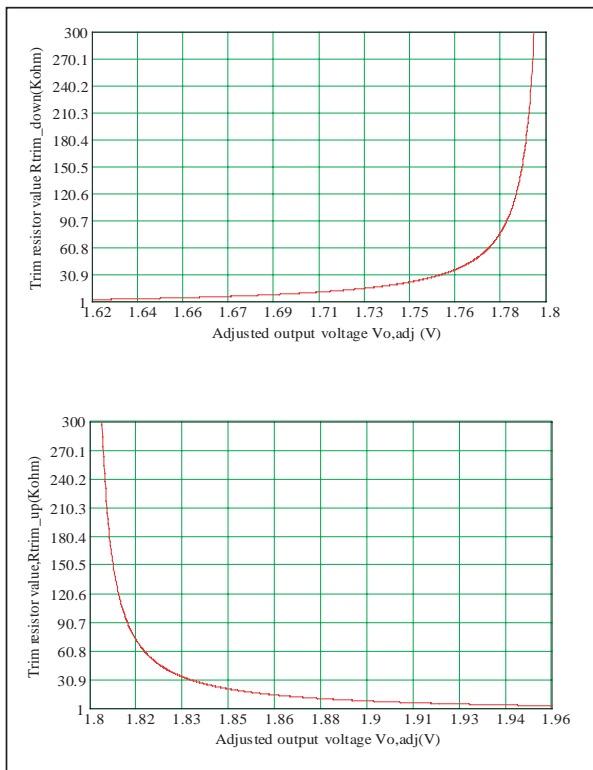
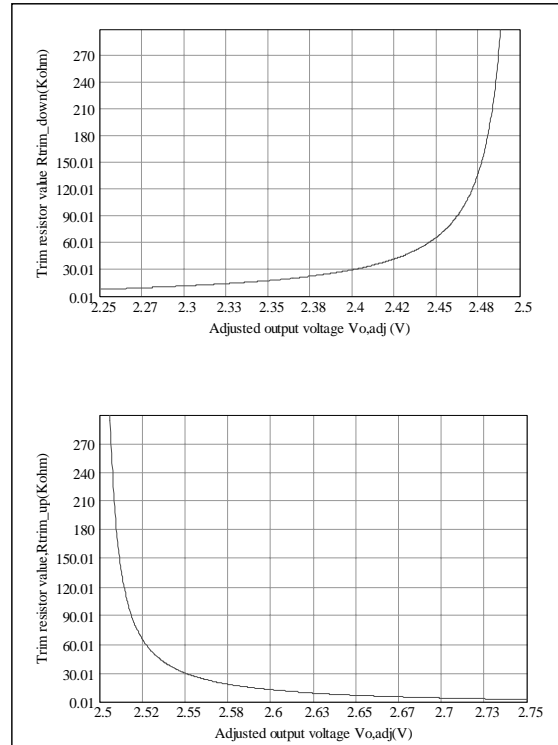
BP02x7AH-05B

Output Voltage Set-Point Adjustment

x7AH-05B250 Trim Resistor Calculation

$$R_{\text{trim down}} = \left(\frac{3.664}{V_o - V_{o, \text{adj}}} - 6.79 \right) \text{ Kohm}$$

$$R_{\text{trim up}} = \left(\frac{1.72}{V_{o, \text{adj}} - V_o} - 4.64 \right) \text{ Kohm}$$



x7AH-05B180 Trim Resistor Calculation

$$R_{\text{trim down}} = \left(\frac{1.509}{V_o - V_{o, \text{adj}}} - 5.52 \right) \text{ Kohm}$$

$$R_{\text{trim up}} = \left(\frac{1.2}{V_{o, \text{adj}} - V_o} - 4.02 \right) \text{ Kohm}$$

NON-ISOLATED DC/DC CONVERTERS

5V Input / 1.2V – 3.3V Output / 5A



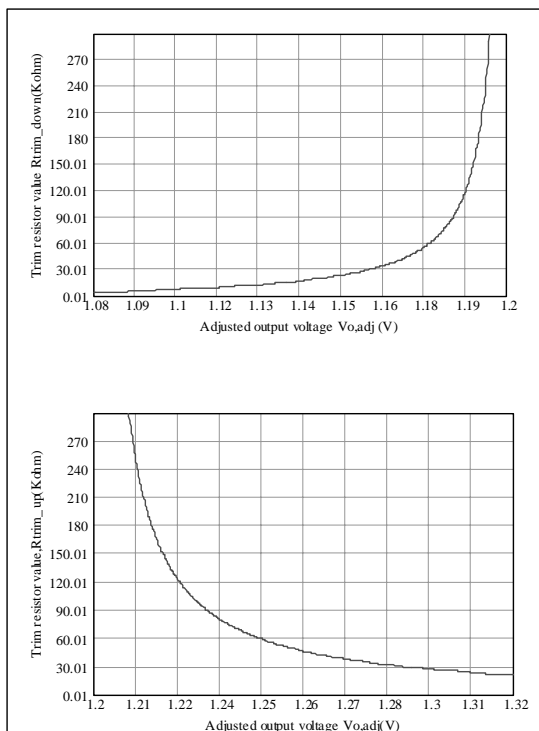
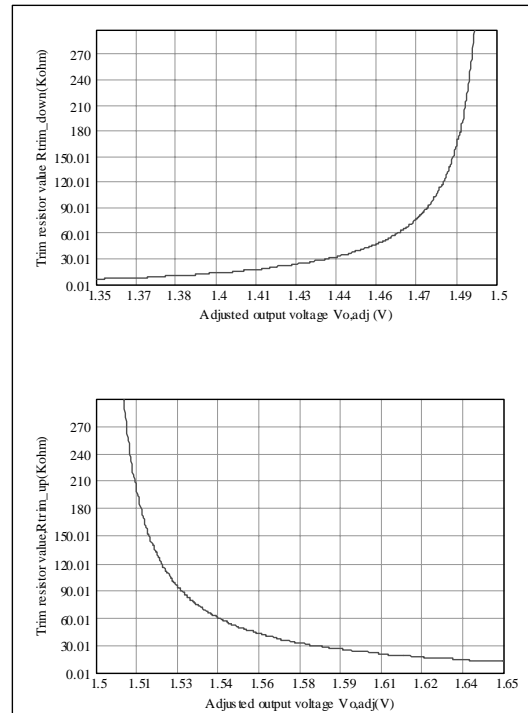
BP02x7AH-05B

Output Voltage Set-Point Adjustment

x7AH-05B150 Trim Resistor Calculation

$$R_{\text{trim down}} = \left(\frac{2.702}{V_o - V_{o, \text{adj}}} - 11.7 \right) \text{ Kohm}$$

$$R_{\text{trim up}} = \left(\frac{3.064}{V_{o, \text{adj}} - V_o} - 7.87 \right) \text{ Kohm}$$



x7AH-05B120 Trim Resistor Calculation

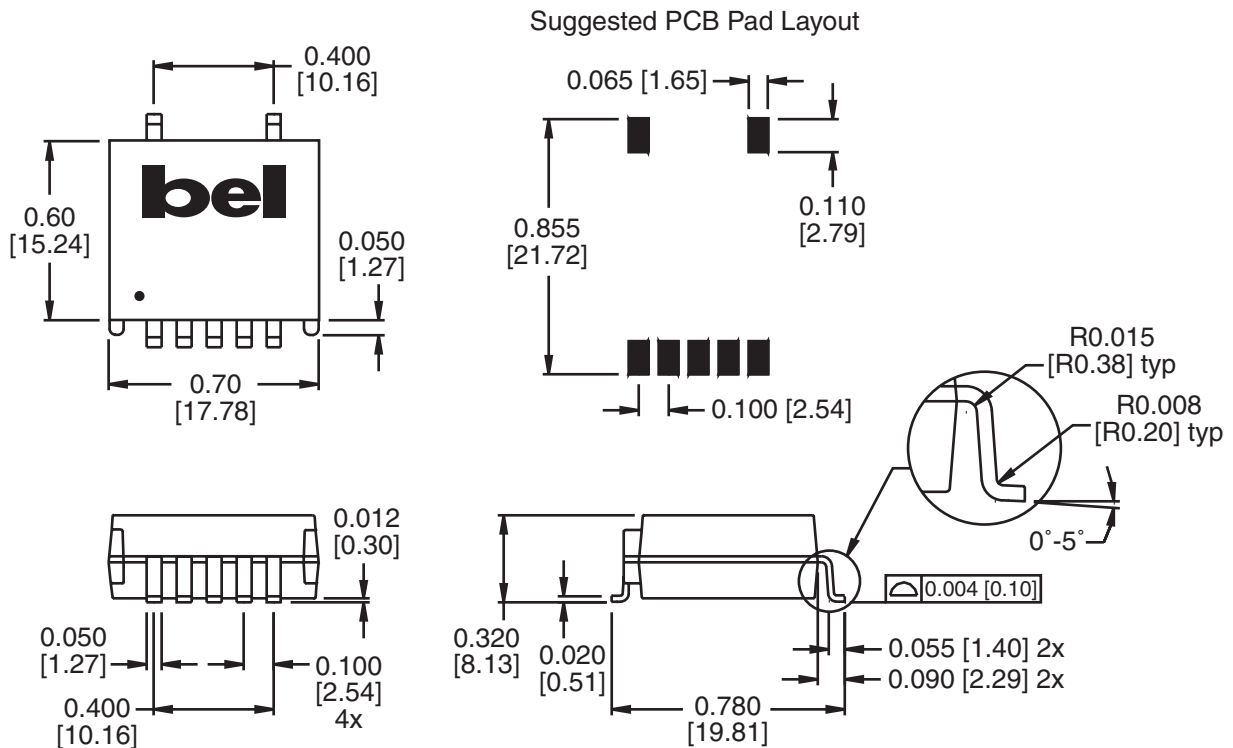
$$R_{\text{trim down}} = \left(\frac{1.545}{V_o - V_{o, \text{adj}}} - 8.47 \right) \text{ Kohm}$$

$$R_{\text{trim up}} = \left(\frac{3.064}{V_{o, \text{adj}} - V_o} - 4.64 \right) \text{ Kohm}$$

BP02x7AH-05B

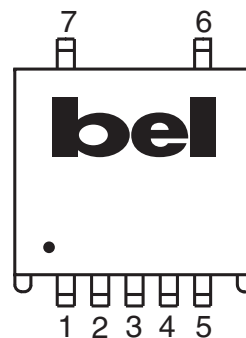
Mechanical

S7AH-05B



Dimensions are in inches [millimeters].
Standard dimension tolerance is ± 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



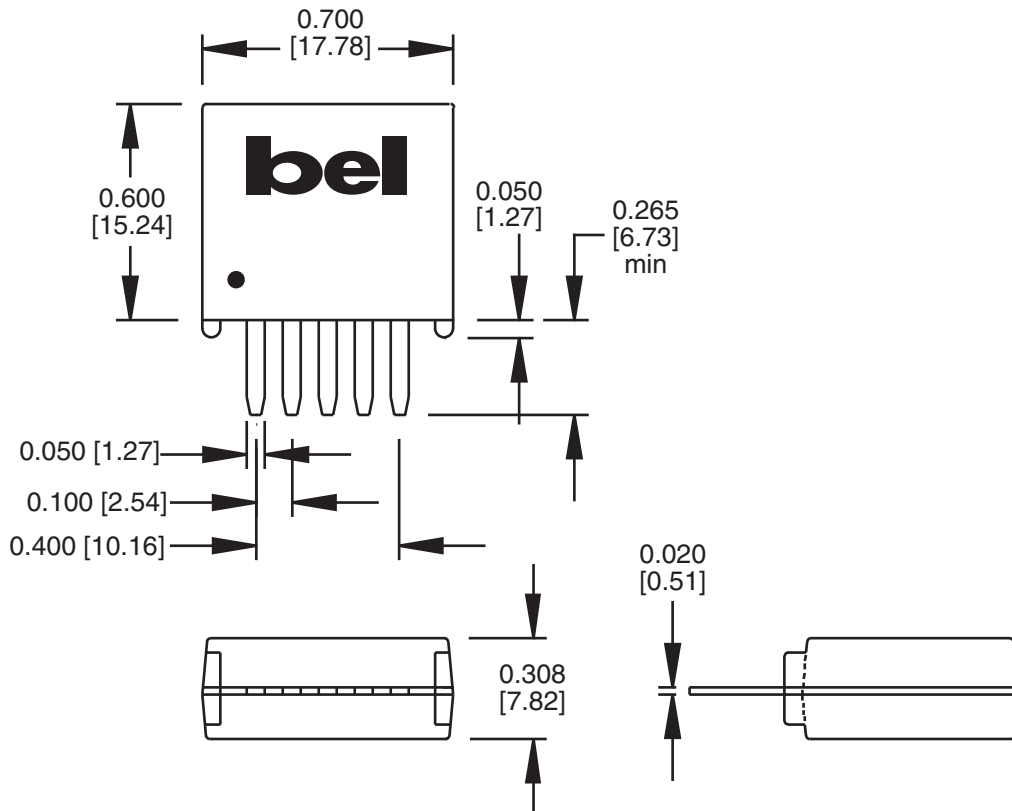
NON-ISOLATED DC/DC CONVERTERS
 5V Input / 1.2V – 3.3V Output / 5A



BP02x7AH-05B

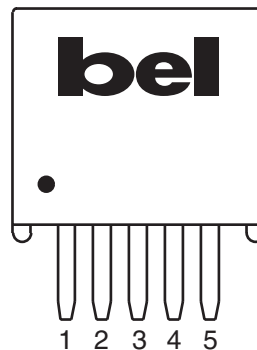
Mechanical

V7AH-05B



Dimensions are in inches [millimeters].
 Standard dimension tolerance is ± 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. 10.03

CORPORATE

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

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