

NON-ISOLATED DC/DC CONVERTERS

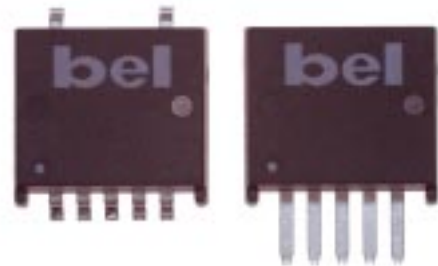
3.3V Input / 5V Output / 1.5A



BP03x7AH-02C

S7AH-02C / V7AH-02C Modules

- Nonisolated
- Compact, low profile surface mount package
- Fixed frequency*
- High efficiency means less power dissipation
- Excellent thermal performance
- Optimized for cost
- Allows burst mode operation at low load currents



Description

The Bel S7AH-02C and V7AH-02C modules are non-isolated, step up DC/DC power converters that operate from a nominal 3.3V source with an output voltage of 5V. They are packaged in a compact, overmolded package rated at 1.5A. Optional lead forming provides a vertical mount product for minimal footprint or a surface mount option for a very low profile. Standard features include output voltage adjust and industrial temperature range (-40° to +85° C). The output is closely regulated and the efficiency is typically 87% at full load. These products may be used almost anywhere low voltage silicon is employed and a 3.3V source is available. Typical applications include file servers, routers, line cards and other computing and communications equipment.

*Optional Burst/skip mode operating at light load or no load.

Applications

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

Options

- Trim function

Part Number Selection

| Output Voltage | Input Voltage | Max. Output Current | Max. Output Power | Typical Efficiency | Part Number Surface Mount | Part Number Vertical Mount |
|----------------|---------------|---------------------|-------------------|--------------------|---------------------------|----------------------------|
| 5V | 3.3V | 1.5A | 7.5W | 87% | S7AH-02C500 | V7AH-02C500 |

Note: For parts with Burst/skip mode disabled, change the last character to a B (e.g. S7AH-02C50B).

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Absolute Maximum Ratings

| Parameter | Symbol | Min | Typical | Max | Unit |
|--------------------------------|--------|-----|---------|-----|------|
| Continuous Input Voltage | Vin | 2.8 | | 4 | V |
| Output Enable Terminal Voltage | Vouten | | | | V |
| Ambient Temperature | Tamb | -40 | | 85 | °C |
| Storage Temperature | Tstor | -40 | | 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 | 3 | | 3.6 | V |
| Input Current | All | Iin | | | 3.3 | A |
| 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 | | | 2.8 | 2.9 | 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.

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Output Specifications

| Parameter | Module | Symbol | Min | Typical | Max | Units |
|---------------------------------------|--------|--------|-------|---------|-------|-------|
| Output Voltage Set Point ¹ | All | Vout | 4.825 | 5 | 5.175 | V |
| Load Regulation | All | | | 25 | 40 | mV |
| Line Regulation | All | | | 20 | 30 | mV |
| Regulation Over Temperature | All | | | 45 | 80 | mV |
| Total Output Voltage Regulation | All | | | | 150 | mV |
| 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 | | 1.5 | A |
| Overshoot at Turn On | All | | | 0 | 5 | % |
| Output Capacitance | All | Cout | 0 | | 600 | μF |
| Transient Response | | | | | | |
| ΔV 50% to 100% of Max Load | All | | | 100 | 150 | mV |
| Settling Time | | Ts | | 50 | 100 | μs |
| ΔV 100% to 50% of Max Load | | | | 100 | 150 | mV |
| Settling Time | | Ts | | 50 | 100 | μs |

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

1. Vin = 3.3V, Iout = full load, Ta = 25° C.
2. 0 - 20MHz, 1μF ceramic cap on output.

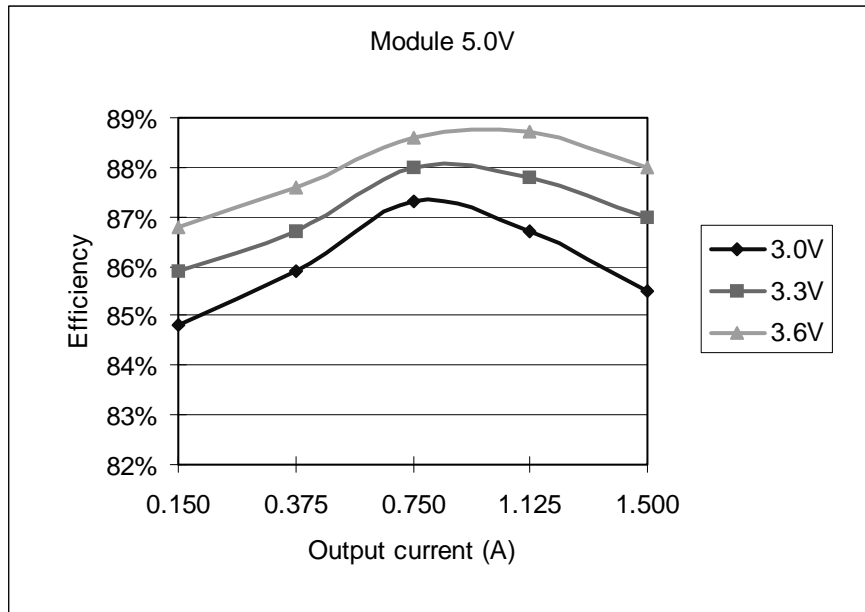
General Specifications

| Parameter | Module | Symbol | Min | Typical | Max | Units |
|----------------------------------------|--------|--------|-----|---------|-----|-------|
| Efficiency ¹ | All | η | 84 | 87 | | % |
| Switching Frequency | All | Fsw | 500 | 550 | 650 | kHz |
| Output Voltage Trim Range ² | All | | 95 | | 110 | % |
| Weight | All | | | 5.2 | | g |

1. Vin=3.3V, full load and Ta=25° C.
2. See graphs on page 6.

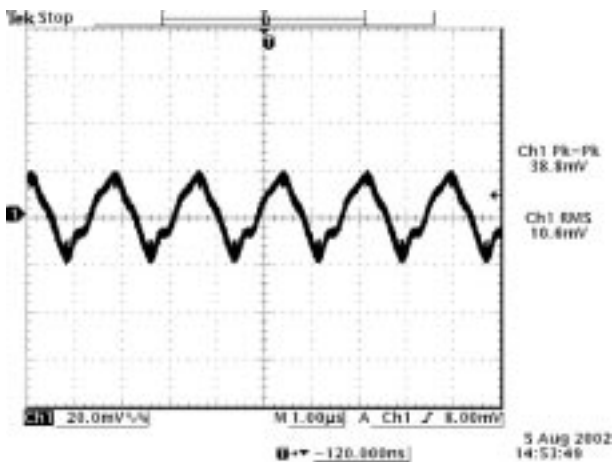
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Efficiency Data

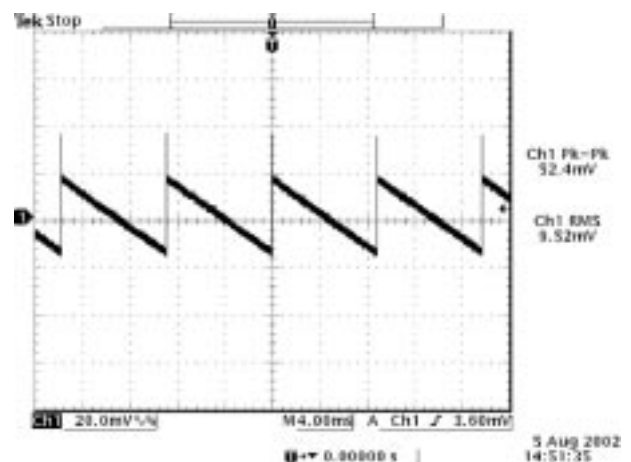


Ripple and Noise

1µF ceramic cap at the output.



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



Ripple and noise when operating in burst mode at no load and 3.3Vdc input, 5Vdc output and Ta=25° C

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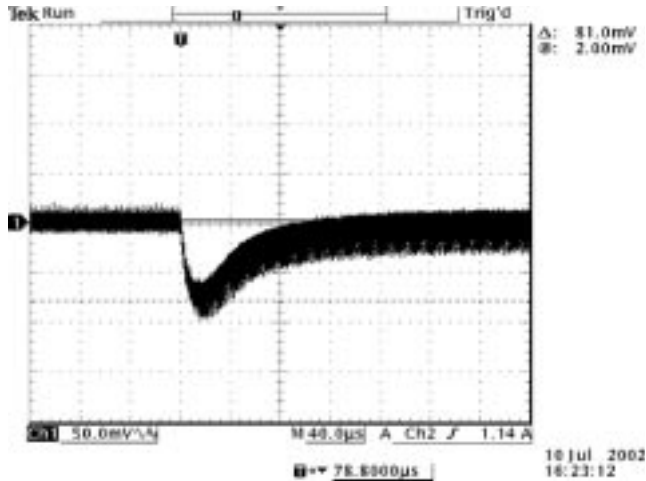
3.3V Input / 5V Output / 1.5A



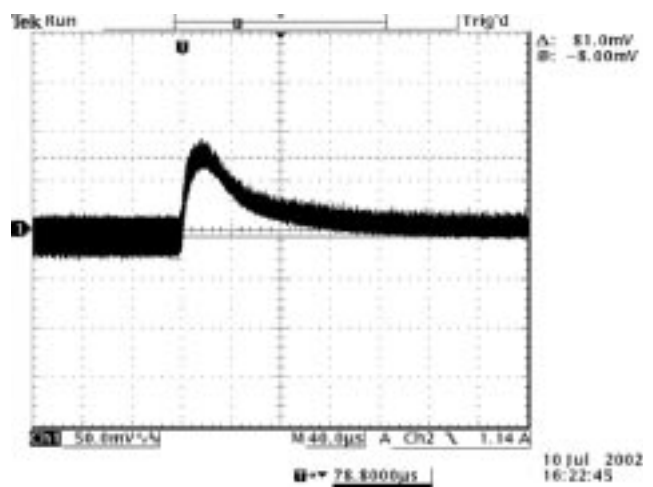
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Transient Response

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



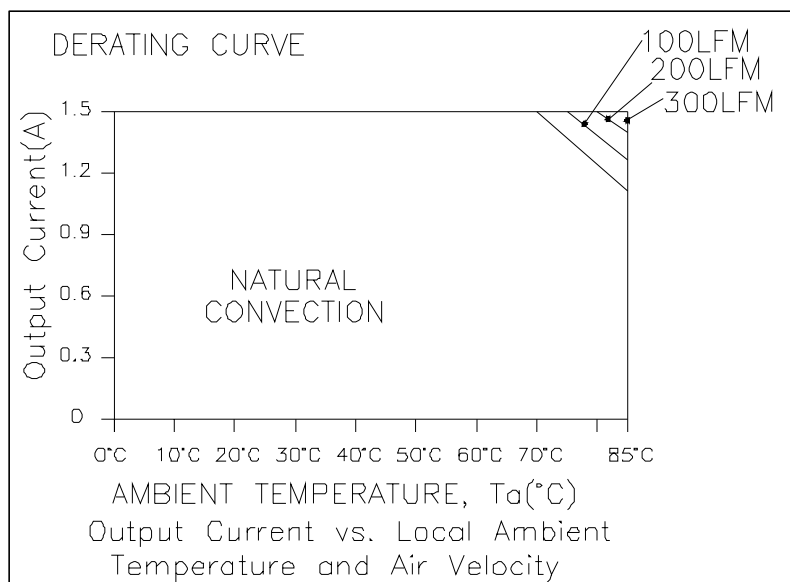
Vout=5V
50% to 100% load transients at 3.3V input and Ta=25° C



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

Thermal Considerations

x7AH-02C

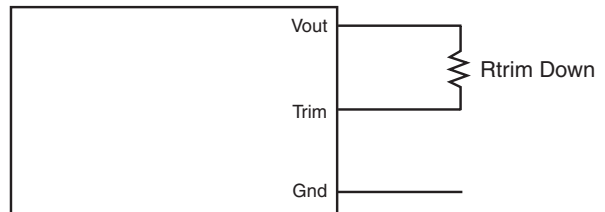


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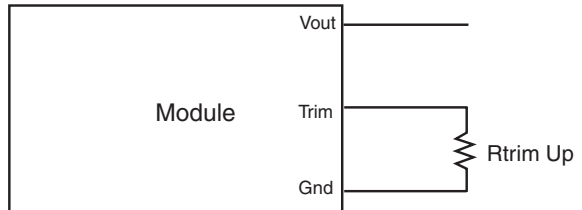
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Output Voltage Set-Point Adjustment

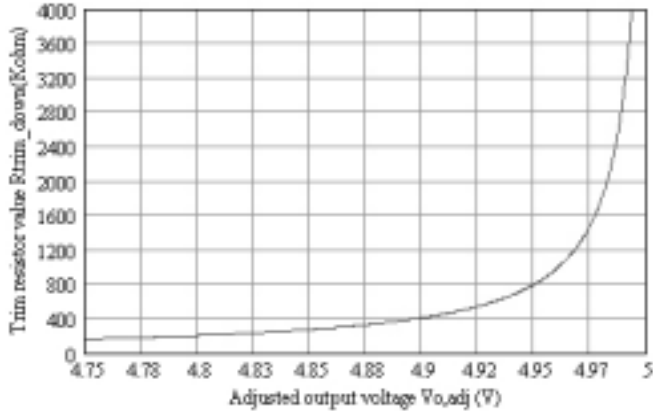
Trim Down Circuit



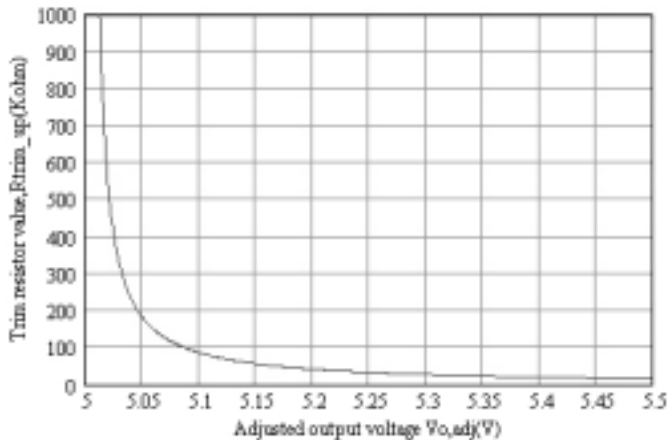
Trim Up Circuit



x7AH-02C Trim Resistor Calculation



$$R_{trim\ down} = \left(\frac{44.144}{V_o - V_{o, adj}} - 12.5 \right) \text{ Kohm}$$



$$R_{trim\ up} = \left(\frac{8.4}{V_{o, adj} - V_o} - 2 \right) \text{ Kohm}$$

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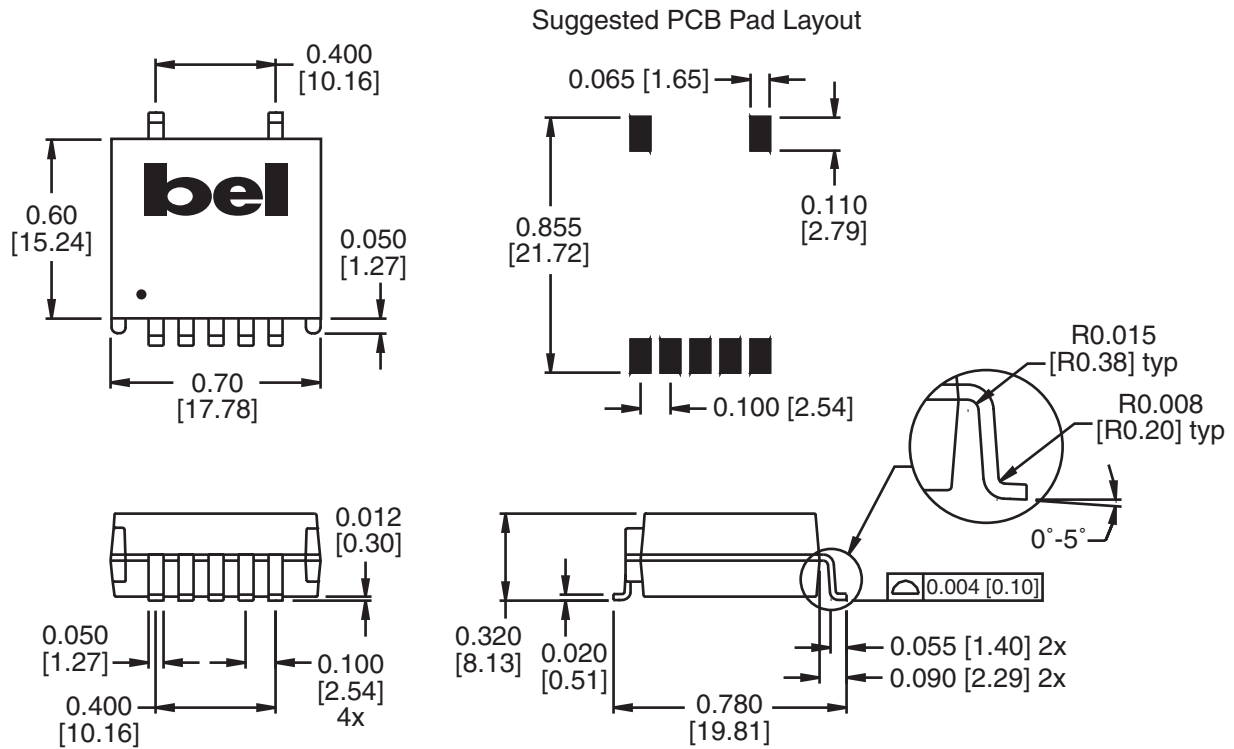
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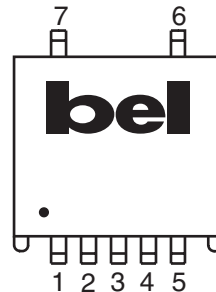
Mechanical

S7AH-02C



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

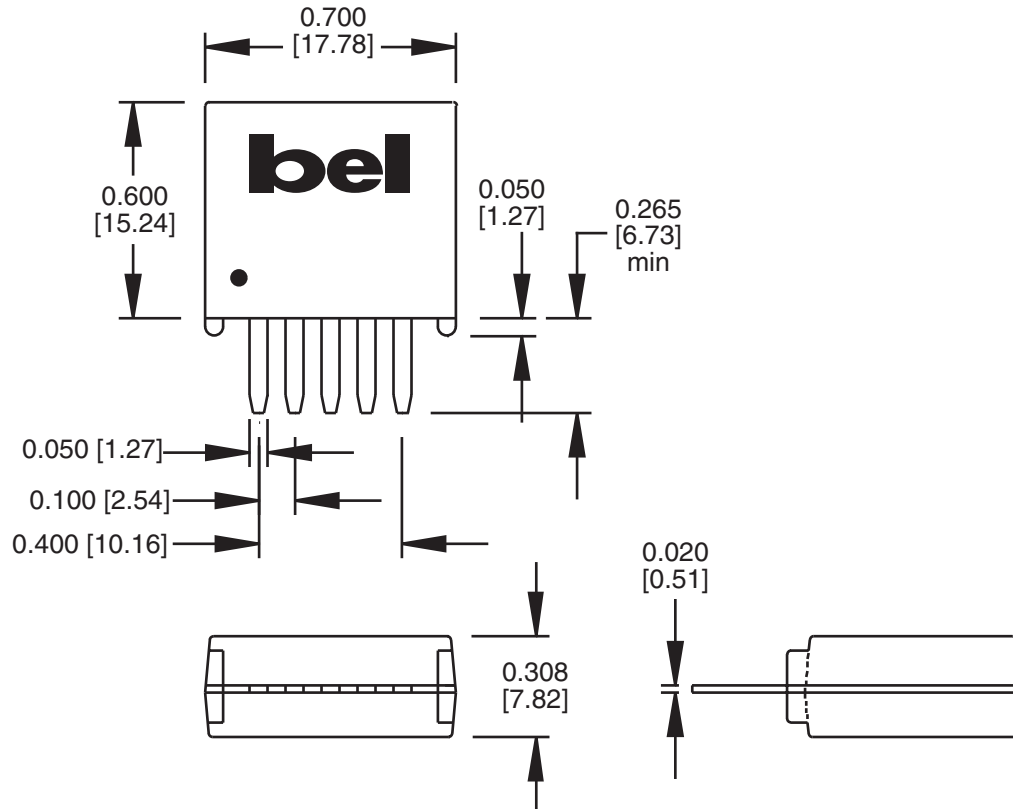
| Pin | Function |
|-----|----------|
| 1 | N/A |
| 2 | +Vin |
| 3 | Ground |
| 4 | +Vo |
| 5 | Trim |
| 6 | N/A |
| 7 | N/A |



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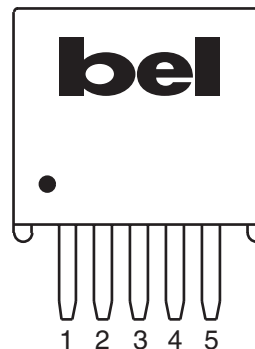
Mechanical

V7AH-02C



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

| Pin | Function |
|-----|----------|
| 1 | N/A |
| 2 | +Vin |
| 3 | Ground |
| 4 | +Vo |
| 5 | Trim |



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