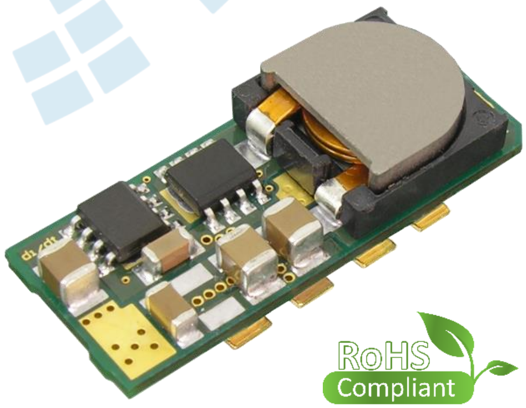
YS05S10 DC-DC Converter

3.0 - 5.5 VDC Input; 0.7525 - 3.63 VDC Programmable @ 10 A



Key Features & Benefits

- RoHS lead-free solder and lead-solder-exempted products are available
- Delivers up to 10 A (36 W)
- No derating up to 85 °C
- Surface-mount package
- Industry-standard footprint and pinout
- Small size and low profile: 1.30” x 0.53” x 0.314” (33.02 x 13.46 x 7.98 mm)
- Weight: 0.22 oz [6.12 g]
- Coplanarity less than 0.003”, maximum
- Synchronous Buck Converter topology
- Start-up into pre-biased output
- No minimum load required
- Programmable output voltage via external resistor
- Operating ambient temperature: -40 °C to 85 °C
- Remote output sense
- Remote ON/OFF (Positive or Negative)
- Fixed-frequency operation
- Auto-reset output overcurrent protection
- Auto-reset overtemperature protection
- High reliability, MTBF approx. 32.54 million hours
- calculated per Telcordia TR-332, Method I Case 1
- All materials meet UL94, V-0 flammability rating
- Safety approved to UL/CSA 62368-1 and EN/IEC 62368-1

Bel Power Solutions point-of-load converters are recommended for use with regulated bus converters in an Intermediate Bus Architecture (IBA). The YS05S10 non-isolated DC-DC converter delivers up to 10 A of output current in an industry-standard surface-mount package. Operating from a 3.0 – 5.5 V input, the YS05S10 converter is an ideal choice for Intermediate Bus Architectures where Point-of-Load (POL) power delivery is generally a requirement. It provides an extremely tightly-regulated programmable output voltage from 0.7525 V to 3.63 V.

The YS05S10 converter provides exceptional thermal performance, even in high temperature environments with minimal airflow. No derating is required up to 85 C, even without airflow at natural convection. This performance is accomplished through the use of advanced circuitry, packaging, and processing techniques to achieve a design possessing ultra-high efficiency, excellent thermal management, and a very low-body profile.

The low-body profile and the preclusion of heat sinks minimize impedance to system airflow, thus enhancing cooling for both upstream and downstream devices. The use of 100% automation for assembly, coupled with advanced power electronics and thermal design, results in a product with extremely high reliability.

Applications

- Intermediate Bus Architectures
- Telecommunications
- Data communications
- Distributed Power Architectures
- Servers, Workstations

Benefits

- High efficiency – no heat sink required
- Reduces Total Solution Board Area
- Tape and Reel Packing
- Compatible with Pick & Place Equipment
- Minimizes Part Numbers in Inventory
- Cost Effective

bel POWER SOLUTIONS & PROTECTION
a bel group

1. ELECTRICAL SPECIFICATIONS

Conditions: T_A = 25 °C, Airflow = 300 LFM (1.5 m/s), Vin = 5 VDC, Vout = 0.7525 – 3.63 V, unless otherwise specified.

PARAMETER	NOTES	MIN	TYP	MAX	UNITS
Absolute Maximum Ratings					
Input Voltage	Continuous	-0.3		6	VDC
Operating Ambient Temperature		-40		85	°C
Storage Temperature		-55		125	°C
Feature Characteristics					
Switching Frequency	Full Temperature Range	250	300	350	kHz
Output Voltage Trim Range[1, 4]	By external resistor, See Trim Table 1	0.7525		3.63	VDC
Remote Sense Compensation[1]	Percent of V_{OUT}(NOM)			0.5	VDC
Turn-On Delay Time[2]	Full resistive load				
With Vin = (Converter Enabled, then Vin applied)	From Vin = Vin(min) to Vo = 0.1* Vo(nom)	3	3.5	4.5	ms
With Enable (Vin = Vin(nom) applied, then enabled)	From enable to Vo = 0.1*Vo(nom)	3	3.5	4.5	ms
Rise time[2]	From 0.1*Vo(nom) to 0.9*Vo(nom)	3	3.5	5	ms
ON/OFF Control (Positive Logic)[3]	Converter Off	-5		0.8	VDC
	Converter On	2.4		5.5	VDC
ON/OFF Control (Negative Logic)[3]	Converter Off	2.4		5.5	VDC
	Converter On	-5		0.8	VDC
Input Characteristics					
Operating Input Voltage Range		3.0	5.0	5.5	VDC
Input Undervoltage Lockout					
Turn-on Threshold	Guaranteed by controller	1.95	2.05	2.15	VDC
Turn-off Threshold	Guaranteed by controller	1.73	1.9	2.07	VDC
Maximum Input Current					
V_{IN} = 4.5 VDC, I_{OUT} = 10 A	V_{OUT} = 3.3 VDC			7.9	ADC
V_{IN} = 3.0 VDC, I_{OUT} = 10 A	V_{OUT} = 2.5 VDC			9.1	ADC
V_{IN} = 3.0 VDC, I_{OUT} = 10 A	V_{OUT} = 2.0 VDC			7.3	ADC
V_{IN} = 3.0 VDC, I_{OUT} = 10 A	V_{OUT} = 1.8 VDC			6.7	ADC
V_{IN} = 3.0 VDC, I_{OUT} = 10 A	V_{OUT} = 1.5 VDC			5.7	ADC
V_{IN} = 3.0 VDC, I_{OUT} = 10 A	V_{OUT} = 1.2 VDC			4.7	ADC
V_{IN} = 3.0 VDC, I_{OUT} = 10 A	V_{OUT} = 1.0 VDC			4.0	ADC
V_{IN} = 3.0 VDC, I_{OUT} = 10 A	V_{OUT} = 0.7525 VDC			3.2	ADC
Input Stand-by Current (Converter disabled)	Vin = 5.0 VDC		3.0		mA
Input No Load Current (Converter enabled)	Vin = 5.5 VDC				
	V_{OUT} = 3.3 VDC		80		mA
	V_{OUT} = 2.5 VDC		80		mA
	V_{OUT} = 2.0 VDC		72		mA
	V_{OUT} = 1.8 VDC		68		mA
	V_{OUT} = 1.5 VDC		60		mA
	V_{OUT} = 1.2 VDC		55		mA
	V_{OUT} = 1.0 VDC		50		mA
	V_{OUT} = 0.7525 VDC		42		mA
Input Reflected-Ripple Current - i_s	See Fig. E for setup (BW = 20 MHz)		10		mA_{P-P}

© 2015 Bel Power Solutions, Inc.

PARAMETER	NOTES	MIN	TYP	MAX	UNITS
Output Characteristics					
Output Voltage Set Point (no load)		-1.5	Vout	+1.5	%Vout
Output Regulation[4]					
Over Line	Full resistive load		0.1	0.5	%Vout
Over Load	From no load to full load		0.1	0.5	%Vout
Output Voltage Range	Overall operating input voltage, resistive load and temperature conditions until end of life	-3		+3	%Vout
Output Ripple and Noise – 20 MHz bandwidth	Over line, load and temperature (Fig. E)				
Peak-to-Peak	V_{OUT} = 3.3 VDC		40	60	mV_{P-P}
Peak-to-Peak	V_{OUT} = 0.7525 VDC		25	35	mV_{P-P}
External Load Capacitance	Plus full load (resistive)				
Min ESR > 1 mΩ				1,000	µF
Min ESR > 10 mΩ				5,000	µF
Output Current Range		0		10	A
Output Current Limit Inception (I_{OUT})			18		A
Output Short-Circuit Current (Hiccup mode)	Short = 10 mΩ, continuous		2		Arms
Dynamic Response					
50% Load current change from 5 A -10 A - 5 A with di/dt = 5 A/µs[5]	Co = 100 µF tant. + 1 µF ceramic		150		mV
Settling Time (V_{OUT} < 10% peak deviation)[5]			60		µs
Efficiency	*Full load (10 A)*				
	V_{OUT} = 3.3 VDC		94.5		%
	V_{OUT} = 2.5 VDC		93.0		%
	V_{OUT} = 2.0 VDC		92.0		%
	V_{OUT} = 1.8 VDC		91.5		%
	V_{OUT} = 1.5 VDC		89.5		%
	V_{OUT} = 1.2 VDC		87.5		%
	V_{OUT} = 1.0 VDC		86.0		%
	V_{OUT} = 0.7525 VDC		83.0		%

Notes:

1 The output voltage should not exceed 3.63 V (taking into account both the programming and remote sense compensation).
2 Note that startup time is the sum of turn-on delay time and rise time.
3 The converter is on if ON/OFF pin is left open.
4 Trim resistor connected across the GND (pin 5) and TRIM (pin 3) pins of the converter.
5 See waveforms for dynamic response and settling time for different output voltages.

+1 866 513 2839
tech.support@psbel.com
belfuse.com/power-solutions

© 2015 Bel Power Solutions, Inc.

2. OPERATIONS

2.1. INPUT AND OUTPUT IMPEDANCE

The YS05S10 converter should be connected via a low impedance to the DC power source. In many applications, the inductance associated with the distribution from the power source to the input of the converter can affect the stability of the converter. The use of decoupling capacitors is recommended in order to ensure stability of the converter and reduce input ripple voltage. Internally, the converter has 44 µF (low ESR ceramics) of input capacitance.

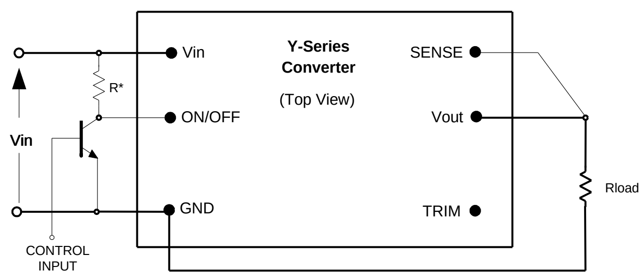
In a typical application, low - ESR tantalum or POS capacitors will be sufficient to provide adequate ripple voltage filtering at the input of the converter. However, very low ESR ceramic capacitors 100 - 200 µF are recommended at the input of the converter in order to minimize the input ripple voltage. They should be placed as close as possible to the input pins of the converter.

The YS05S10 has been designed for stable operation with or without external capacitance. Low ESR ceramic capacitors placed as close as possible to the load (minimum 100 µF) are recommended for improved transient performance and lower output voltage ripple.

It is important to keep low resistance and low inductance PCB traces for connecting load to the output pins of the converter in order to maintain good load regulation.

2.2. ON/OFF (PIN 1)

The ON/OFF pin is used to turn the power converter on or off remotely via a system signal. There are two remote control options available, positive logic (standard option) and negative logic, with ON/OFF signal referenced to GND. The typical connections are shown in Fig. A.



R* is for negative logic option only

Fig. A: Circuit configuration for ON/OFF function.

To turn the converter on the ON/OFF pin should be at a logic low or left open, and to turn the converter off the ON/OFF pin should be at a logic high or connected to Vin. See the Electrical Specifications for logic high/low definitions.

The positive logic version turns the converter on when the ON/OFF pin is at a logic high or left open, and turns the converter off when at a logic low or shorted to GND.

The negative logic version turns the converter on when the ON/OFF pin is at logic low or left open, and turns the converter off when the ON/OFF pin is at a logic high or connected to Vin.

The ON/OFF pin is internally pulled up to Vin for positive logic version, and pulled down for a negative logic version. A TTL or CMOS logic gate, open- collector (open-drain) transistor can be used to drive ON/OFF pin. This device must be capable of:

– sinking up to 1.2 mA at a low level voltage of ≤ 0.8 V
– sourcing up to 0.25 mA at a high logic level of 2.3 V - 5.5 V.

When using open-collector (open-drain) transistor with a negative logic option, add a pull-up resistor (R*) to Vin as shown in Fig. A:

– 20 K, if the minimum Vin is 4.5 V
– 10 K, if the minimum Vin is 3.0 V
– 5 K, if the undervoltage shutdown at 2.05 - 2.15 V is required.

© 2015 Bel Power Solutions, Inc.

2.3. REMOTE SENSE (PIN 2)

The remote sense feature of the converter compensates for voltage drops occurring only between Vout pin (Pin 4) of the converter and the load. The SENSE (Pin 2) pin should be connected at the load or at the point where regulation is required (see Fig. B). There is no sense feature on the output GND return pin, where the solid ground plane should provide a low voltage drop.

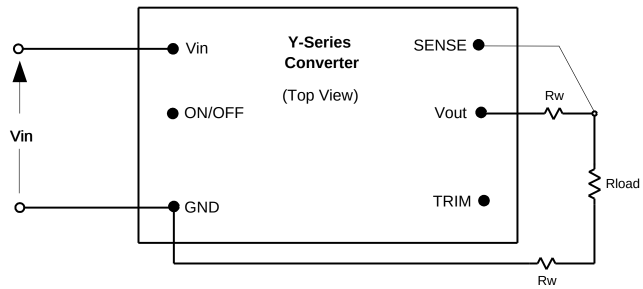


Fig. B: Remote sense circuit configuration.

If remote sensing is not required, the SENSE pin must be connected to the Vout pin (Pin 4) to ensure the converter will regulate at the specified output voltage. If these connections are not made, the converter will deliver an output voltage that is slightly higher than the specified value.

Because the sense lead carries minimal current, large trace on the end-user board are not required. However, sense trace should be located close to a ground plane to minimize system noise and ensure optimum performance.

When utilizing the remote sense feature, care must be taken not to exceed the maximum allowable output power capability of the converter, which is equal to the product of the nominal output voltage and the allowable output current for the given conditions.

When using remote sense, the output voltage at the converter can be increased up to 0.5 V above the nominal rating in order to maintain the required voltage across the load. Therefore, the designer must, if necessary, decrease the maximum current (originally obtained from the derating curves) by the same percentage to ensure the converter's actual output power remains at or below the maximum allowable output power.

2.4. OUTPUT VOLTAGE PROGRAMMING (PIN 3)

The output voltage can be programmed from 0.7525 V to 3.63 V by connecting an external resistor between TRIM pin (Pin 3) and GND pin (Pin 5); see Fig. C. Note that when a trim resistor is not connected, the output voltage of the converter is 0.7525 V.

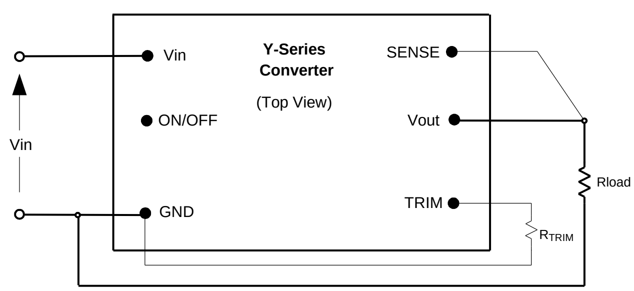


Fig. C: Configuration for programming output voltage.

A trim resistor, R_{TRIM}, for a desired output voltage can be calculated using the following equation:

$$R_{TRIM} = \frac{21.07}{(V_{O\text{-}REQ} - 0.7525)} - 5.11 \qquad [\text{k}\Omega]$$

where,

R_{TRIM} = Required value of trim resistor [kΩ]

$V_{O\text{-}REQ}$ = Desired (trimmed) output voltage [V]

© 2015 Bel Power Solutions, Inc.

Note that the tolerance of a trim resistor directly affects the output voltage tolerance. It is recommended to use standard 1% or 0.5% resistors; for tighter tolerance, two resistors in parallel are recommended rather than one standard value from Table 1.

Ground pin of the trim resistor should be connected directly to the converter GND pin (Pin 5) with no voltage drop in between. Table 1 provides the trim resistor values for popular output voltages.

$V_{0\text{-}REG}$ [V]	R_{TRIM} [kΩ]	The Closest Standard Value [kΩ]
0.7525	open	
1.0	80.0	80.6
1.2	41.97	42.2
1.5	23.1	23.2
1.8	15	15
2.0	11.78	11.8
2.5	6.95	6.98
3.3	3.16	3.16
3.63	2.21	2.21

Table 1: Trim Resistor Value

The output voltage can also be programmed by external voltage source. To make trimming less sensitive, a series external resistor Rext is recommended between TRIM pin and programming voltage source. Control Voltage can be calculated by the formula:

$$V_{CTRL} = 0.7 - \frac{(5.11 + R_{EXT})(V_{O\text{-}REQ} - 0.7525)}{30.1} \qquad [V]$$

where,

V_{CTRL} = Control voltage [V]

R_{EXT} = External resistor between TRIM pin and voltage source; the value can be chosen depending on the required output voltage range [kΩ].

Control voltages with $R_{EXT} = 0$ and $R_{EXT} = 15$ K are shown in Table 2.

$V_{0\text{-}REG}$ [V]	V_{CTRL} (R_{EXT} = 0)	V_{CTRL}(R_{EXT} = 15 K)
0.7525	0.700	0.700
1.0	0.658	0.535
1.2	0.624	0.401
1.5	0.573	0.201
1.8	0.522	-0.000
2.0	0.488	-0.133
2.5	0.403	-0.468
3.3	0.268	-1.002
3.63	0.257	-1.044

Table 2: Control Voltage [VDC]

3. PROTECTION FEATURES

3.1. INPUT UNDERVOLTAGE LOCKOUT

Input undervoltage lockout is standard with this converter. The converter will shut down when the input voltage drops below a pre-determined voltage; it will start automatically when Vin returns to a specified range.

The input voltage must be typically 2.05 V for the converter to turn on. Once the converter has been turned on, it will shut off when the input voltage drops below typically 1.9 V.

© 2015 Bel Power Solutions, Inc.

3.2. OUTPUT OVERCURRENT PROTECTION (OCP)

The converter is protected against overcurrent and short circuit conditions. Upon sensing an overcurrent condition, the converter will enter hiccup mode. Once over-load or short circuit condition is removed, Vout will return to nominal value.

3.3. OVERTEMPERATURE PROTECTION (OTP)

The converter will shut down under an overtemperature condition to protect itself from overheating caused by operation outside the thermal derating curves, or operation in abnormal conditions such as system fan failure. After the converter has cooled to a safe operating temperature, it will automatically restart.

3.4. SAFETY REQUIREMENTS

The converter meets North American and International safety regulatory requirements per UL/CSA 62368-1 and EN/IEC 62368-1. The maximum DC voltage between any two pins is Vin under all operating conditions. Therefore, the unit has ELV (extra low voltage) output; it meets ES1 requirements under the condition that all input voltages are ELV.

The converter is not internally fused. To comply with safety agencies' requirements, a recognized fuse with a maximum rating of 20 Amps must be used in series with the input line.

4. CHARACTERIZATION

4.1. GENERAL INFORMATION

The converter has been characterized for many operational aspects, to include thermal derating (maximum load current as a function of ambient temperature and airflow) for vertical and horizontal mountings, efficiency, startup and shutdown parameters, output ripple and noise, transient response to load step-change, overload, and short circuit.

The figures are numbered as Fig. x.y, where x indicates the different output voltages, and y associates with specific plots (y = 1 for the vertical thermal derating, …). For example, Fig. x.1 will refer to the vertical thermal derating for all the output voltages in general.

The following pages contain specific plots or waveforms associated with the converter. Additional comments for specific data are provided below.

4.2. TEST CONDITIONS

All data presented were taken with the converter soldered to a test board, specifically a 0.060" thick printed wiring board (PWB) with four layers. The top and bottom layers were not metalized. The two inner layers, comprised of two-ounce copper, were used to provide traces for connectivity to the converter.

The lack of metalization on the outer layers as well as the limited thermal connection ensured that heat transfer from the converter to the PWB was minimized. This provides a worst-case but consistent scenario for thermal derating purposes.

All measurements requiring airflow were made in the vertical and horizontal wind tunnels using Infrared (IR) thermography and thermocouples for thermometry.

Ensuring components on the converter do not exceed their ratings is important to maintaining high reliability. If one anticipates operating the converter at or close to the maximum loads specified in the derating curves, it is prudent to check actual operating temperatures in the application. Thermographic imaging is preferable; if this capability is not available, then thermocouples may be used. . The use of AWG #40 gauge thermocouple is recommended to ensure measurement accuracy. Careful routing of the thermocouple leads will further minimize measurement error. Refer to Fig. D for the optimum measuring thermocouple location.

© 2015 Bel Power Solutions, Inc.

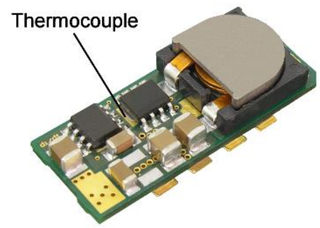


Fig. D: Location of the thermocouple for thermal testing.

4.3. THERMAL DERATING

Load current vs. ambient temperature and airflow rates are given in Figs. x.1 and Figs. x.2 for maximum temperature of 120°C. Ambient temperature was varied between 25 °C and 85 °C, with airflow rates from 30 to 500 LFM (0.15 m/s to 2.5 m/s), and vertical and horizontal mountings. The airflow during the testing is parallel to the short axis of the converter, going from pin 1 and pin 6 to pins 2–5.

For each set of conditions, the maximum load current is defined as the lowest of:

(i) The output current at which any MOSFET temperature does not exceed a maximum specified temperature (120°C) as indicated by the thermographic image, or

(ii) The maximum current rating of the converter (10 A).

During normal operation, derating curves with maximum FET temperature less than or equal to

120 °C should not be exceeded. Temperature on the PCB at the thermocouple location shown in Fig. D should not exceed 120 °C in order to operate inside the derating curves.

4.4. EFFICIENCY

Fig. x.3 shows the efficiency vs. load current plot for ambient temperature of 25 ºC, airflow rate of 200 LFM (1 m/s) and input voltages of 4.5V, 5.0V and 5.5V. Fig. x.4 is for input voltages of 3.0 V, 3.3V and 3.6 V and output voltages ≤ 2.5 V.

4.5. POWER DISSIPATION

Fig. 3.3V.4 shows the power dissipation vs. load current plot for Ta = 25 ºC, airflow rate of 200 LFM (1 m/s) with vertical mounting and input voltages of 4.5 V, 5.0 V and 5.5 V for 3.3 V output.

4.6. RIPPLE AND NOISE

The output voltage ripple waveform is measured at full rated load current. Note that all output voltage waveforms are measured across a 1 µF ceramic capacitor.

The output voltage ripple and input reflected-ripple current waveforms are obtained using the test setup, see Fig. E.

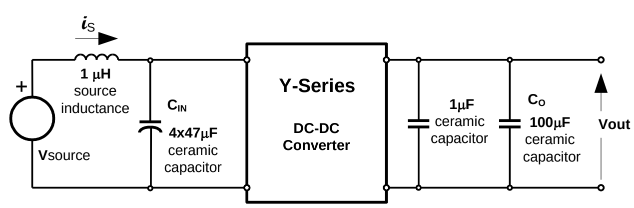


Fig. E: Test setup for measuring input reflected-ripple currents, is and output voltage ripple.

+1 866 513 2839
tech.support@psbel.com
belfuse.com/power-solutions

© 2015 Bel Power Solutions, Inc.

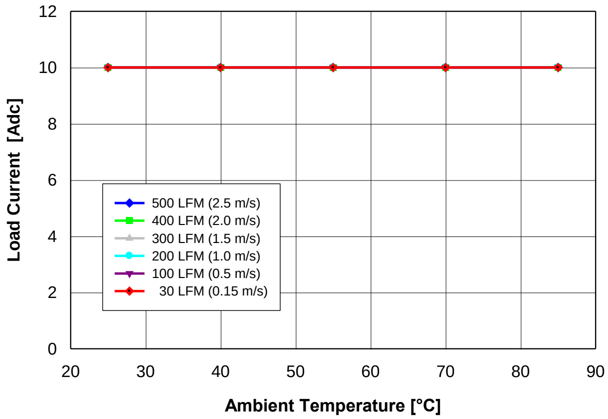


Fig. 3.3V.1: Available load current vs. ambient temperature and airflow rates for Vout = 3.3 V converter mounted vertically with Vin = 5 V, and maximum MOSFET temperature ≤ 120 °C.

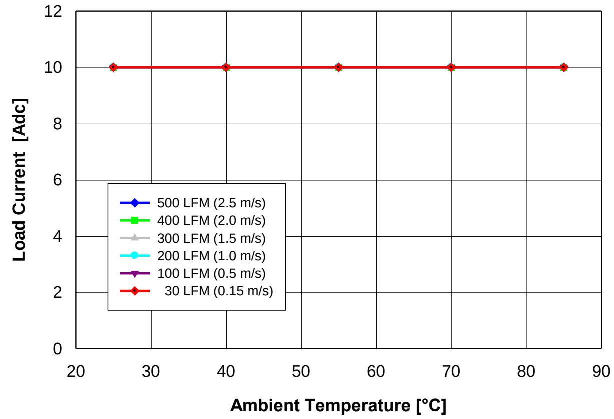


Fig. 3.3V.2: Available load current vs. ambient temperature and airflow rates for Vout = 3.3 V converter mounted horizontally with Vin = 5 V, and maximum MOSFET temperature ≤ 120 °C.

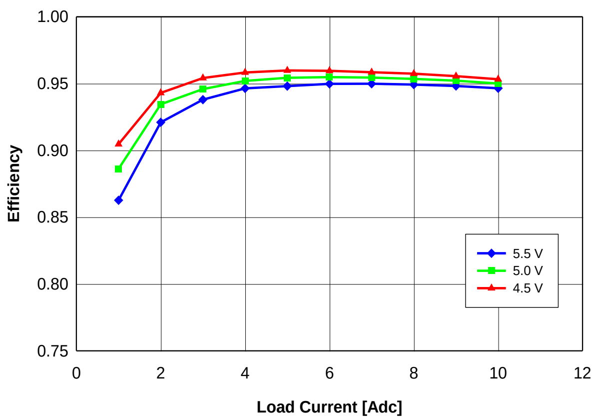


Fig. 3.3V.3: Efficiency vs. load current and input voltage for Vout = 3.3 V converter mounted vertically with air flowing at a rate of 200 LFM (1 m/s) and Ta = 25 °C.

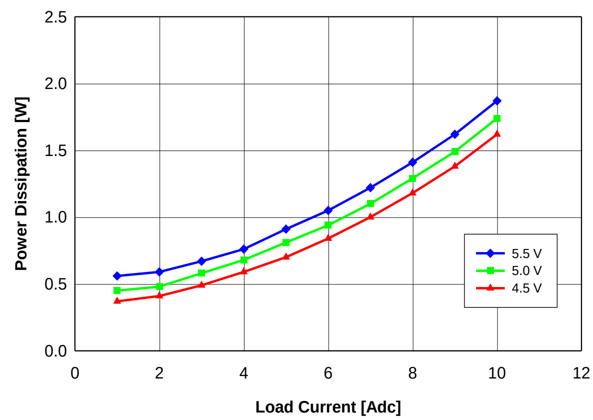


Fig. 3.3V.4: Power Loss vs. load current and input voltage for Vout = 3.3 V converter mounted vertically with air flowing at a rate of 200 LFM (1 m/s) and Ta = 25 °C.

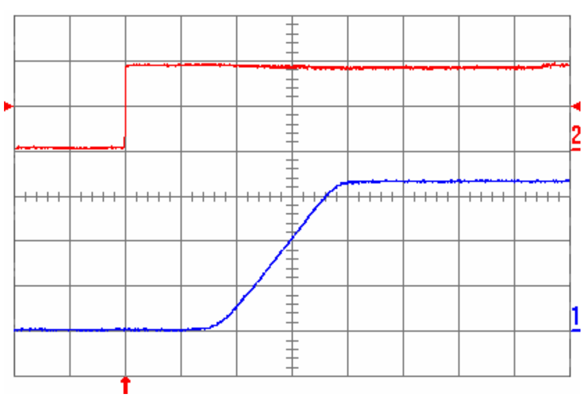


Fig. 3.3V.5: Turn-on transient for Vout = 3.3 V with the application of Enable signal at full rated load current (resistive) and 100 µF external capacitance at Vin = 5 V. Top trace: Enable signal (2 V/div.); Bottom trace: output voltage (1 V/div.); Time scale: 2 ms/div.

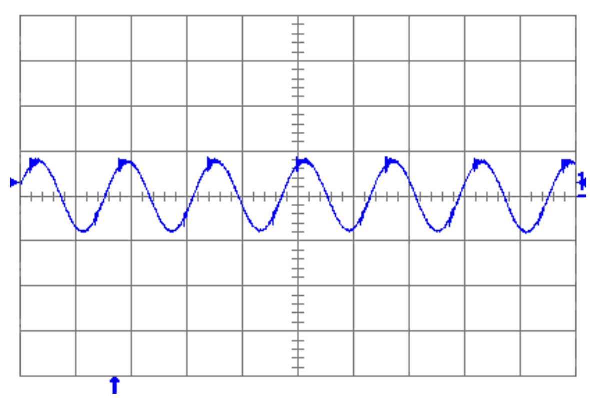


Fig. 3.3V.6: Output voltage ripple (20 mV/div.) at full rated load current into a resistive load with external capacitance 100 µF ceramic + 1 µF ceramic and Vin = 5 V for Vout = 3.3V. Time scale: 2 µs/div.

© 2015 Bel Power Solutions, Inc.

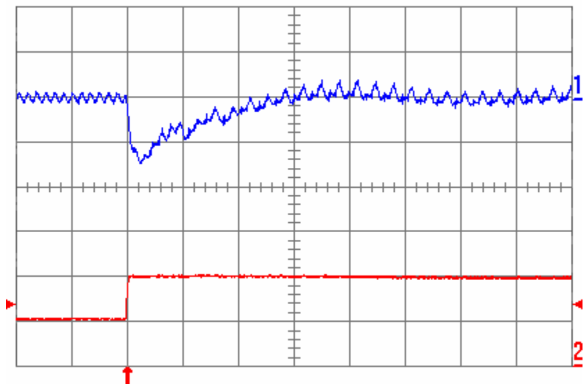


Fig. 3.3V.7: Output voltage for Vout = 3.3 V to positive load current step change from 5 A to 10 A with slew rate of 5 A/µs at Vin = 5 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (5 A/div.). Co = 100 µF ceramic + 1 µF ceramic. Time scale: 20 µs/div.

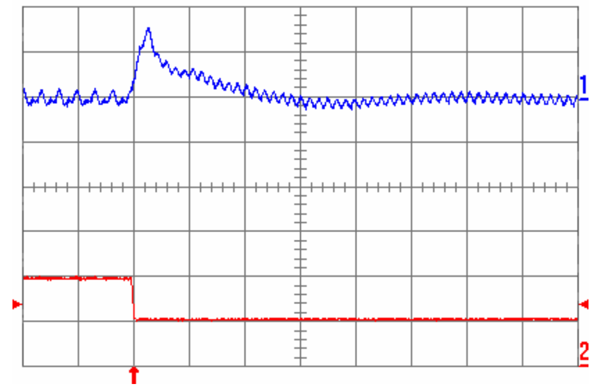


Fig. 3.3V.8: Output voltage response for Vout = 3.3 V to negative load current step change from 10 A to 5 A with slew rate of -5 A/µs at Vin = 5 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (5 A/div.). Co = 100 µF ceramic + 1 µF ceramic. Time scale: 20 µs/div.

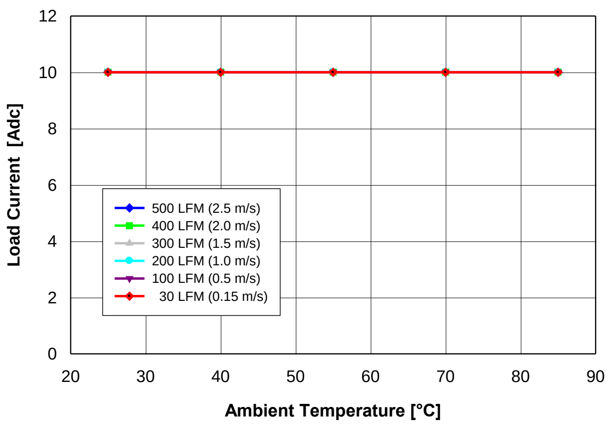


Fig. 2.5V.1: Available load current vs. ambient temperature and airflow rates for Vout = 2.5 V converter mounted vertically with Vin = 5 V, and maximum MOSFET temperature ≤ 120 °C.

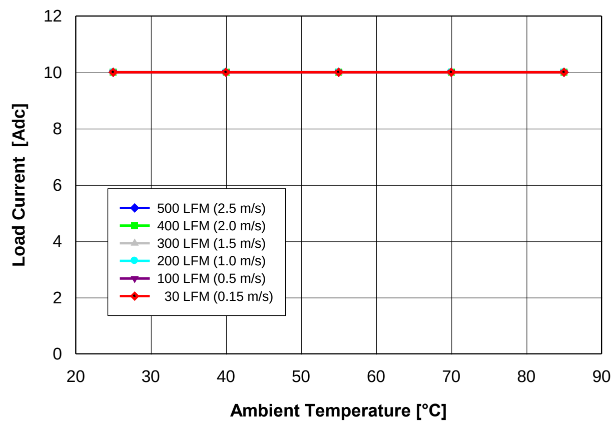


Fig. 2.5V.2: Available load current vs. ambient temperature and airflow rates for Vout = 2.5 V converter mounted horizontally with Vin = 5 V, and maximum MOSFET temperature ≤ 120 °C.

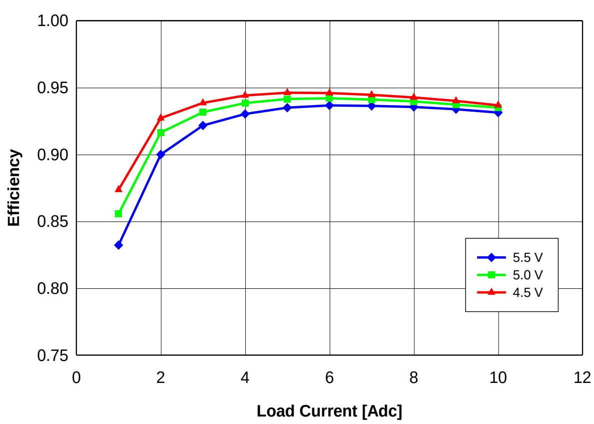


Fig. 2.5V.3: Efficiency vs. load current and input voltage for Vout = 2.5 V converter mounted vertically with air flowing at a rate of 200 LFM (1 m/s) and Ta = 25 °C.

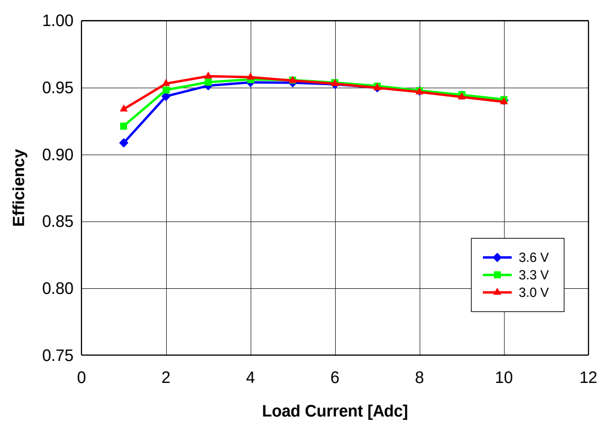


Fig. 2.5V.4: Efficiency vs. load current and input voltage for Vout = 2.5 V converter mounted vertically with air flowing at a rate of 200 LFM (1 m/s) and Ta = 25 °C.

© 2015 Bel Power Solutions, Inc.

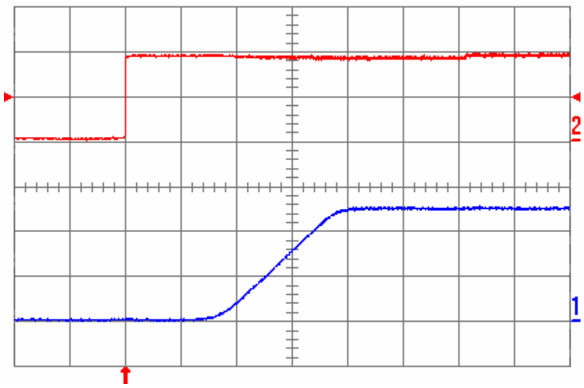


Fig. 2.5V.5: Turn-on transient for Vout = 2.5 V with the application of Enable signal at full rated load current (resistive) and 100 µF external capacitance at Vin = 5 V. Top trace: Enable signal (2 V/div.); Bottom trace: output voltage (1 V/div.); Time scale: 2 ms/div.

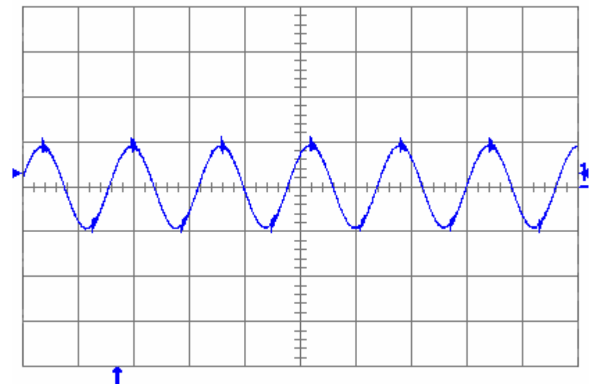


Fig. 2.5V.6: Output voltage ripple (20 mV/div.) at full rated load current into a resistive load with external capacitance 100 µF ceramic + 1 µF ceramic and Vin = 5 V for Vout = 2.5 V. Time scale: 2 µs/div.

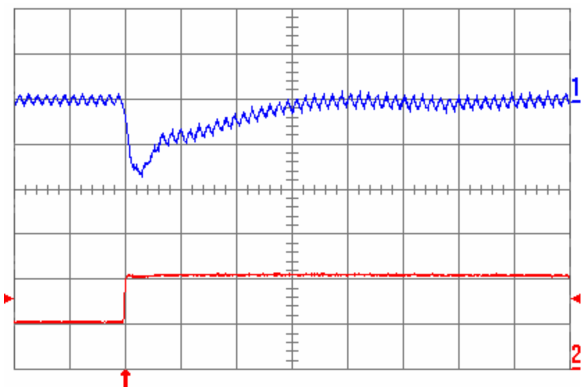


Fig. 2.5V.7: Output voltage response for Vout = 2.5 V to positive load current step change from 5 A to 10 A with slew rate of 5 A/µs at Vin = 5 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (5 A/div.). Co = 100 µF ceramic + 1 µF ceramic. Time scale: 20 µs/div.

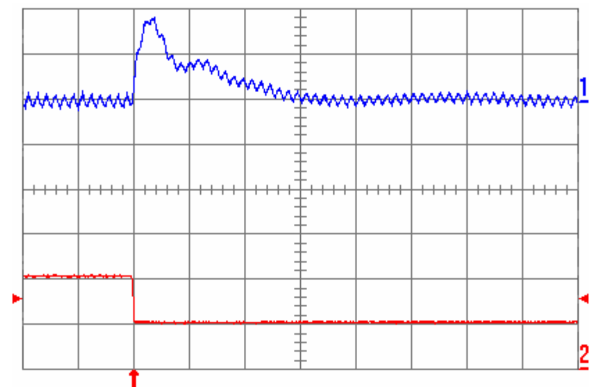


Fig. 2.5V.8: Output voltage response for Vout = 2.5 V to negative load current step change from 10 A to 5 A with slew rate of -5 A/µs at Vin = 5 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (5 A/div.). Co = 100 µF ceramic + 1 µF ceramic. Time scale: 20 µs/div.

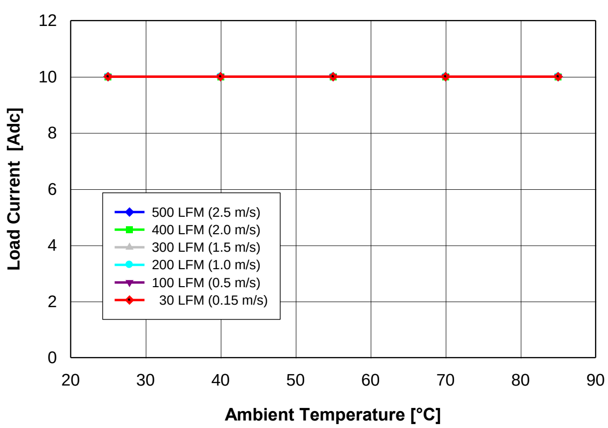


Fig. 2.0V.1: Available load current vs. ambient temperature and airflow rates for Vout = 2.0 V converter mounted vertically with Vin = 5 V, and maximum MOSFET temperature ≤ 120 °C.

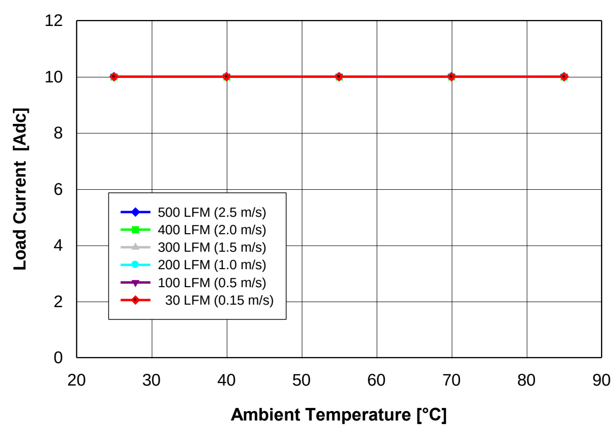


Fig. 2.0V.2: Available load current vs. ambient temperature and airflow rates for Vout = 2.0 V converter mounted horizontally with Vin = 5 V, and maximum MOSFET temperature ≤ 120 °C.

© 2015 Bel Power Solutions, Inc.

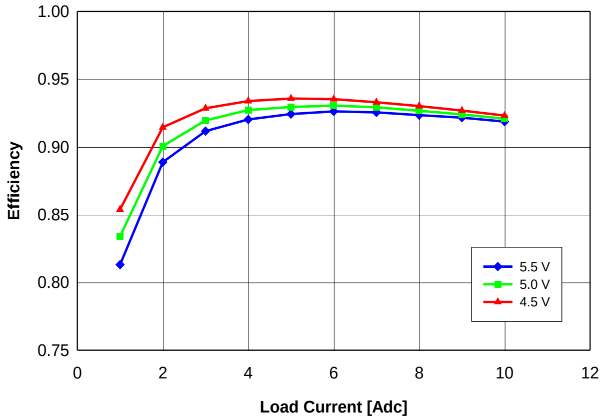


Fig. 2.0V.3: Efficiency vs. load current and input voltage for Vout = 2.0 V converter mounted vertically with air flowing at a rate of 200 LFM (1 m/s) and Ta = 25 °C.

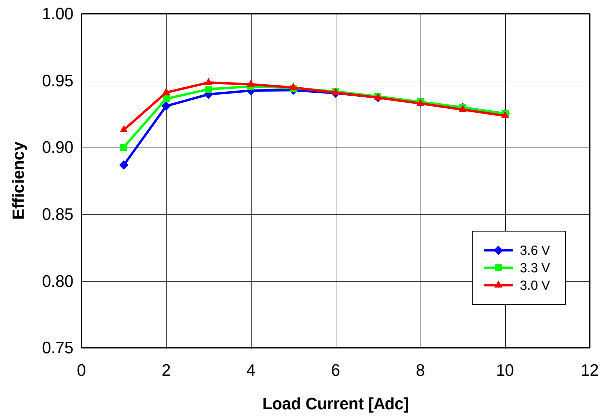


Fig. 2.0V.4: Efficiency vs. load current and input voltage for Vout = 2.0 V converter mounted vertically with air flowing at a rate of 200 LFM (1 m/s) and Ta = 25 °C.

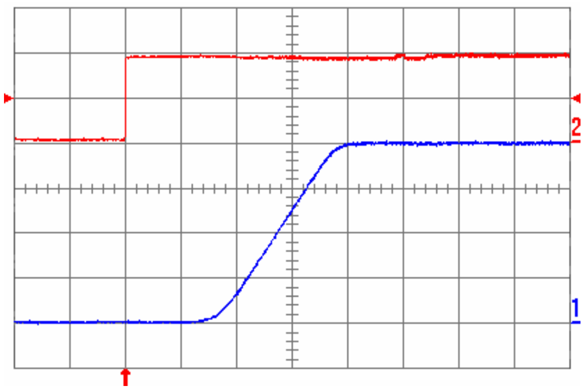


Fig. 2.0V.5: Turn-on transient for Vout = 2.0 V with the application of Enable signal at full rated load current (resistive) and 100 µF external capacitance at Vin = 5 V. Top trace: Enable signal (2 V/div.); Bottom trace: output voltage (500 mV/div.); Time scale: 2 ms/div.

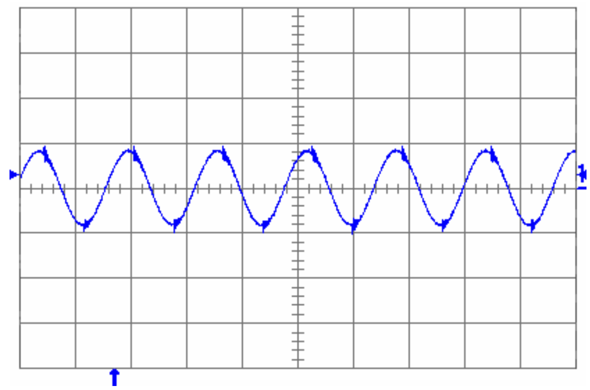


Fig. 2.0V.6: Output voltage ripple (20 mV/div.) at full rated load current into a resistive load with external capacitance 100 µF ceramic + 1 µF ceramic and Vin = 5 V for Vout = 2.0V. Time scale: 2 µs/div.

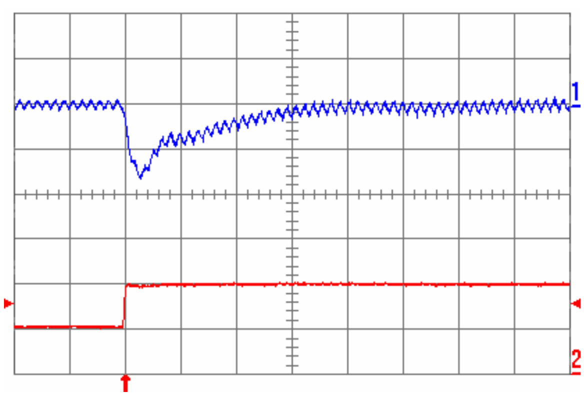


Fig. 2.0V.7: Output voltage response for Vout = 2.0 V to positive load current step change from 5 A to 10 A with slew rate of 5 A/µs at Vin = 5 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (5 A/div.). Co = 100 µF ceramic + 1 µF ceramic. Time scale: 20 µs/div.

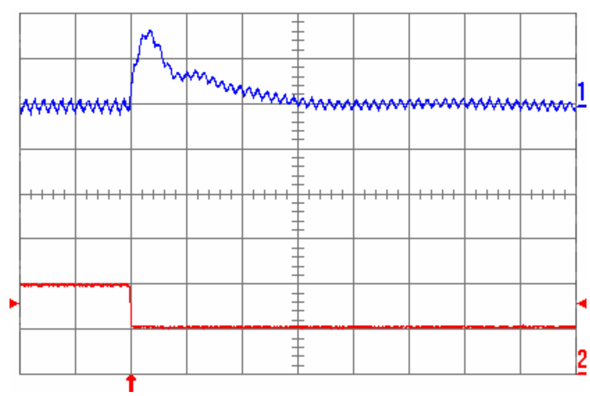


Fig. 2.0V.8: Output voltage response for Vout = 2.0 V to negative load current step change from 10 A to 5 A with slew rate of -5 A/µs at Vin = 5 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (5 A/div.). Co = 100 µF ceramic + 1 µF ceramic. Time scale: 20 µs/div.

+1 866 513 2839
tech.support@psbel.com
belfuse.com/power-solutions

© 2015 Bel Power Solutions, Inc.

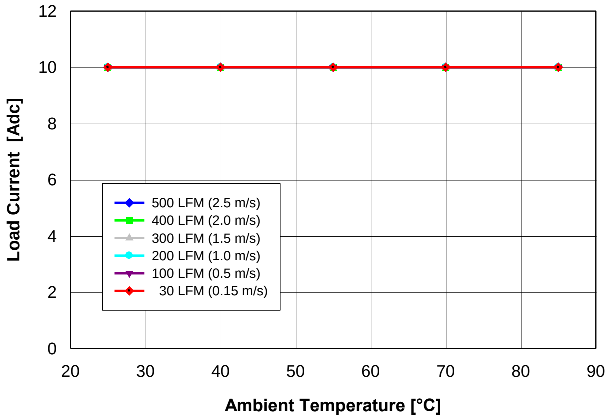


Fig. 1.8V.1: Available load current vs. ambient temperature and airflow rates for Vout = 1.8 V converter mounted vertically with Vin = 5 V, and maximum MOSFET temperature ≤ 120 °C.

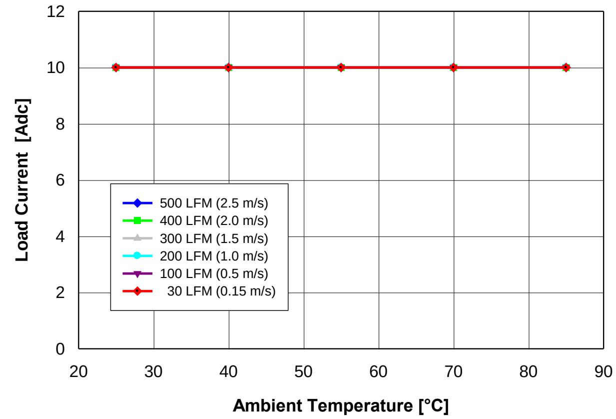


Fig. 1.8V.2: Available load current vs. ambient temperature and airflow rates for Vout = 1.8 V converter mounted horizontally with Vin = 5 V, and maximum MOSFET temperature ≤ 120 °C.

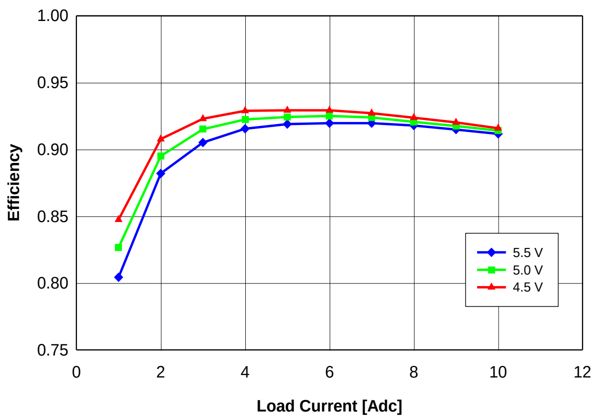


Fig. 1.8V.3: Efficiency vs. load current and input voltage for Vout = 1.8 V converter mounted vertically with air flowing at a rate of 200 LFM (1 m/s) and Ta = 25 °C.

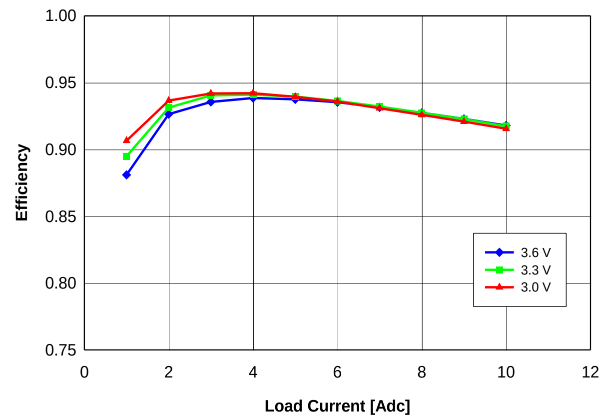


Fig. 1.8V.4: Efficiency vs. load current and input voltage for Vout = 1.8 V converter mounted vertically with air flowing at a rate of 200 LFM (1 m/s) and Ta = 25 °C.

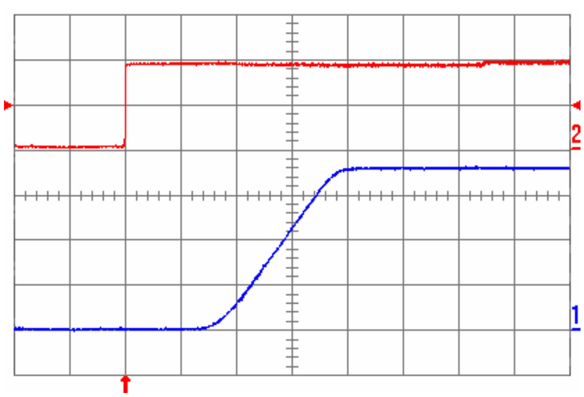


Fig. 1.8V.5: Turn-on transient for Vout = 1.8 V with the application of Enable signal at full rated load current (resistive) and 100 µF external capacitance at Vin = 5 V. Top trace: Enable signal (2 V/div.); Bottom trace: output voltage (500 mV/div.); Time scale: 2 ms/div.

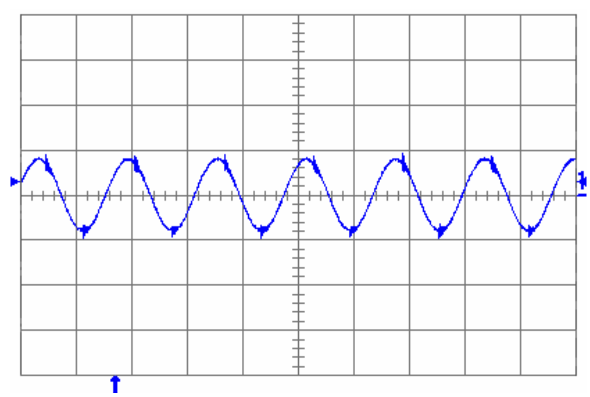


Fig. 1.8V.6: Output voltage ripple (20 mV/div.) at full rated load current into a resistive load with external capacitance 100 µF ceramic + 1 µF ceramic and Vin = 5 V for Vout = 1.8 V. Time scale: 2 µs/div.

© 2015 Bel Power Solutions, Inc.

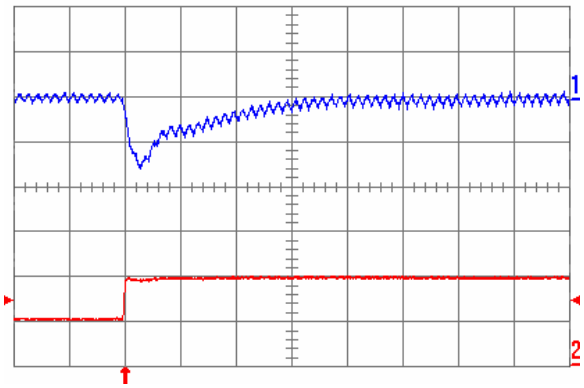


Fig. 1.8V.7: Output voltage response for Vout = 1.8 V to positive load current step change from 5 A to 10 A with slew rate of 5 A/µs at Vin = 5 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (5 A/div.). Co = 100 µF ceramic + 1 µF ceramic. Time scale: 20 µs/div.

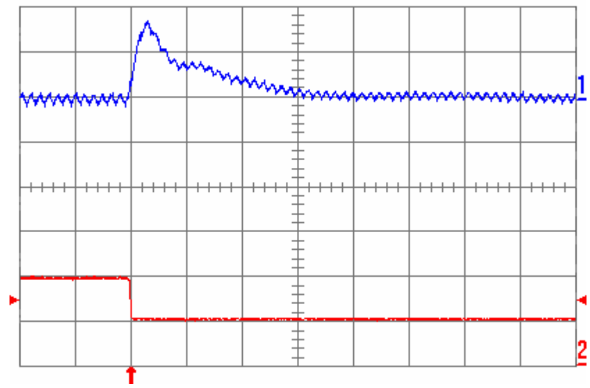


Fig. 1.8V.8: Output voltage response for Vout = 1.8 V to negative load current step change from 10 A to 5 A with slew rate of -5 A/µs at Vin = 5 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (5 A/div.). Co = 100 µF ceramic + 1 µF ceramic. Time scale: 20 µs/div.

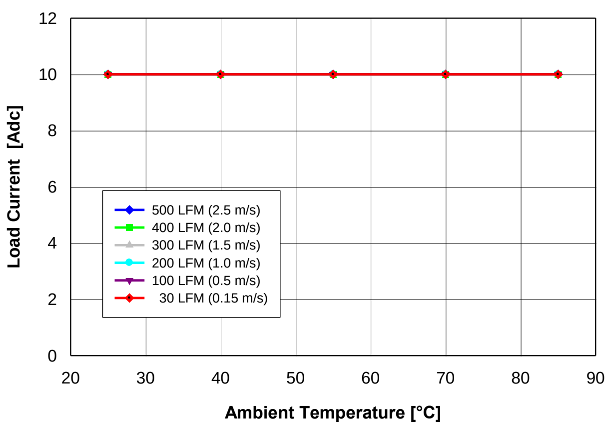


Fig. 1.5V.1: Available load current vs. ambient temperature and airflow rates for Vout = 1.5 V converter mounted vertically with Vin = 5 V, and maximum MOSFET temperature ≤ 120 °C.

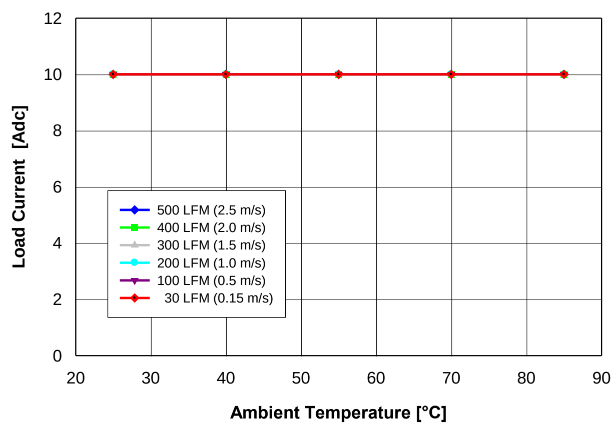


Fig. 1.5V.2: Available load current vs. ambient temperature and airflow rates for Vout = 1.5 V converter mounted horizontally with Vin = 5 V, and maximum MOSFET temperature ≤ 120 °C.

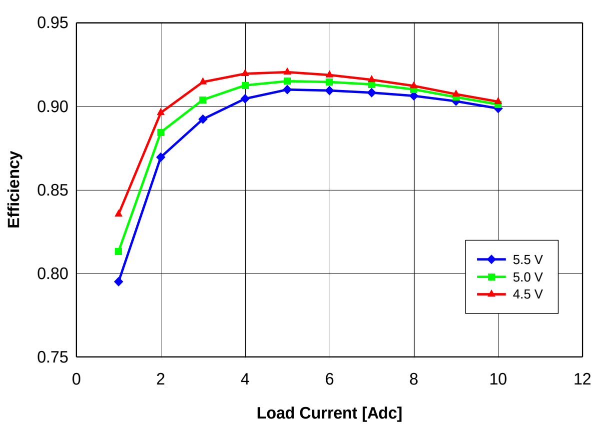


Fig. 1.5V.3: Efficiency vs. load current and input voltage for Vout = 1.5 V converter mounted vertically with air flowing at a rate of 200 LFM (1 m/s) and Ta = 25 °C.

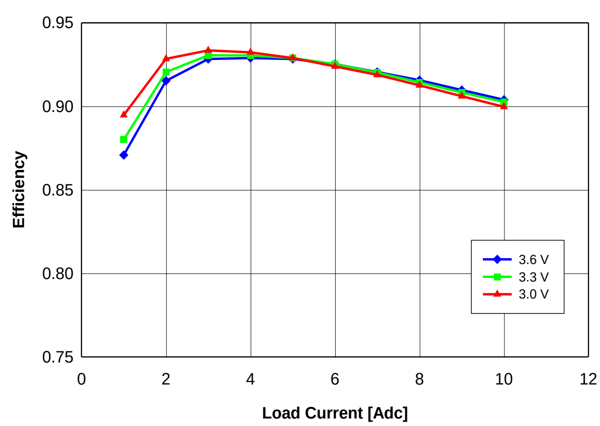


Fig. 1.5V.4: Efficiency vs. load current and input voltage for Vout = 1.5 V converter mounted vertically with air flowing at a rate of 200 LFM (1 m/s) and Ta = 25 °C.

© 2015 Bel Power Solutions, Inc.

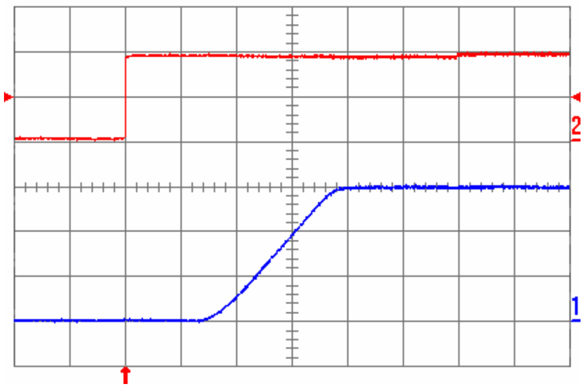


Fig. 1.5V.5: Turn-on transient for Vout = 1.5 V with the application of Enable signal at full rated load current (resistive) and 100 µF external capacitance at Vin = 5 V. Top trace: Enable signal (2 V/div.); Bottom trace: output voltage (500 mV/div.); Time scale: 2 ms/div.

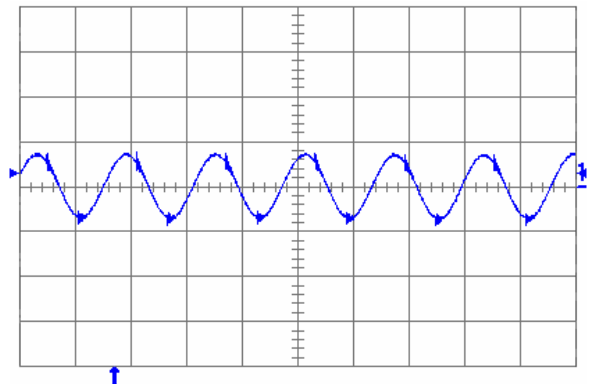


Fig. 1.5V.6: Output voltage ripple (20 mV/div.) at full rated load current into a resistive load with external capacitance 100 µF ceramic + 1 µF ceramic and Vin = 5 V for Vout = 1.5 V. Time scale: 2 µs/div.

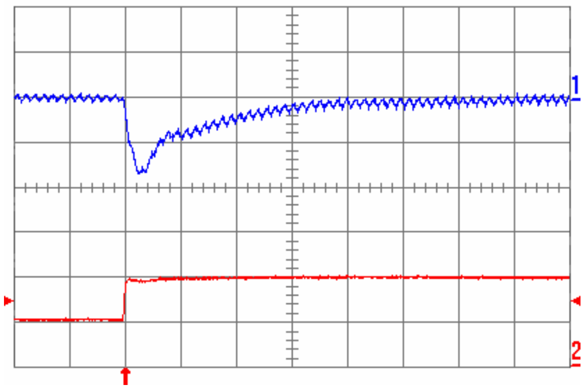


Fig. 1.5V.7: Output voltage response for Vout = 1.5 V to positive load current step change from 5 A to 10 A with slew rate of 5 A/µs at Vin = 5V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (5 A/div.). Co = 100 µF ceramic + 1 µF ceramic. Time scale: 20 µs/div.

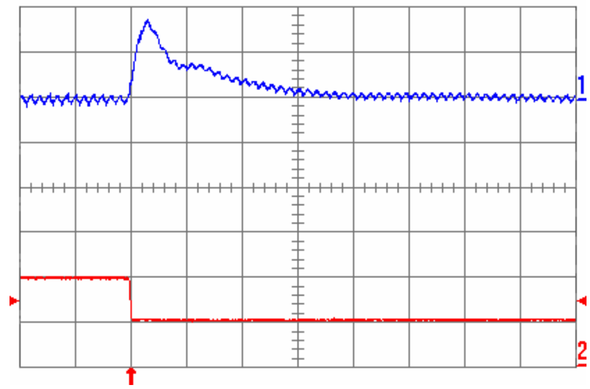


Fig. 1.5V.8: Output voltage response for Vout = 1.5 V to negative load current step change from 10 A to 5 A with slew rate of -5 A/µs at Vin = 5 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (5 A/div.). Co = 100 µF ceramic + 1 µF ceramic. Time scale: 20 µs/div.

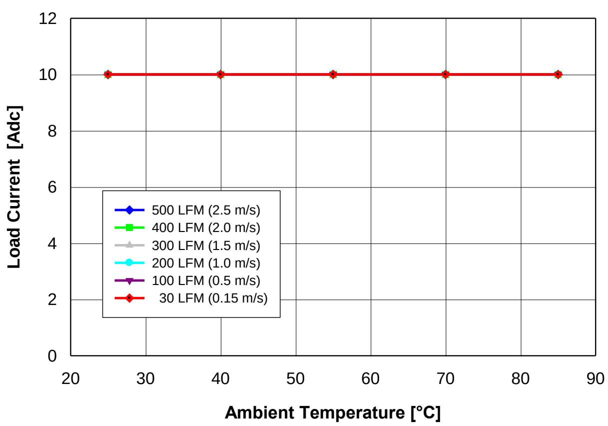


Fig. 1.2V.1: Available load current vs. ambient temperature and airflow rates for Vout = 1.2 V converter mounted vertically with Vin = 5 V, and maximum MOSFET temperature ≤ 120 °C.

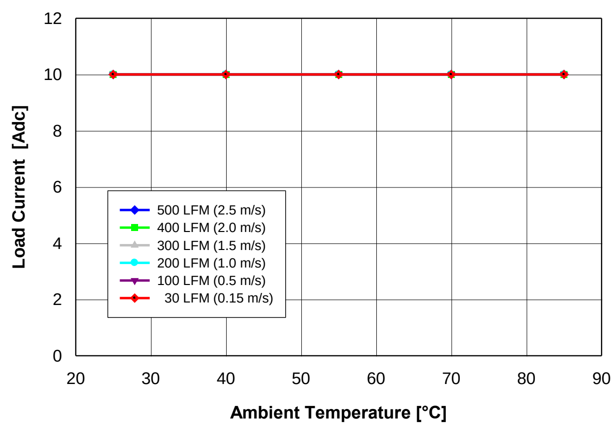


Fig. 1.2V.2: Available load current vs. ambient temperature and airflow rates for Vout = 1.2 V converter mounted horizontally with Vin = 5 V, and maximum MOSFET temperature ≤ 120 °C.

© 2015 Bel Power Solutions, Inc.

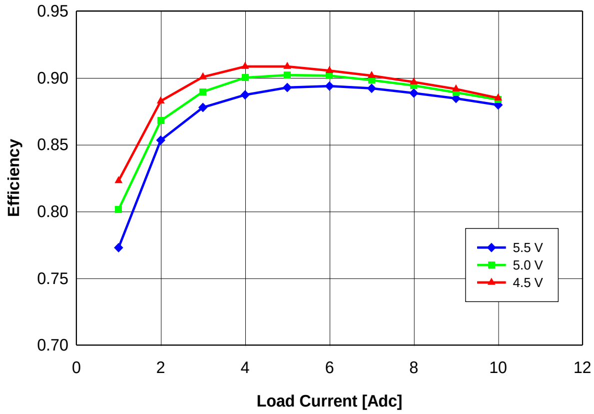


Fig. 1.2V.3: Efficiency vs. load current and input voltage for Vout = 1.2 V converter mounted vertically with air flowing at a rate of 200 LFM (1 m/s) and Ta = 25 °C.

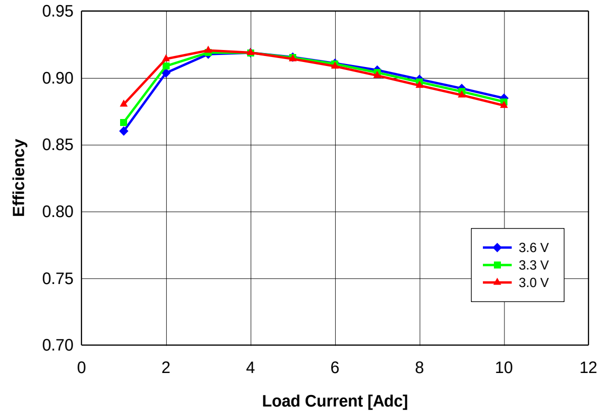


Fig. 1.2V.4: Efficiency vs. load current and input voltage for Vout = 1.2 V converter mounted vertically with air flowing at a rate of 200 LFM (1 m/s) and Ta = 25 °C.

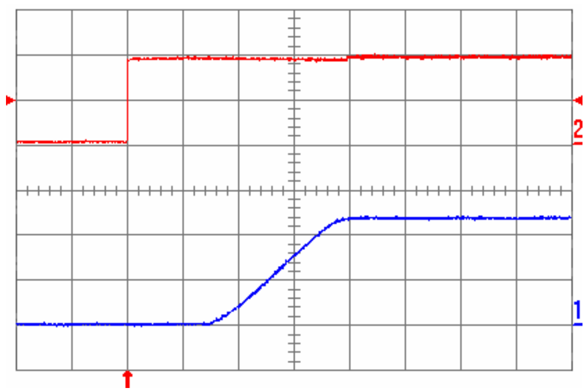


Fig. 1.2V.5: Turn-on transient for Vout = 1.2 V with the application of Enable signal at full rated load current (resistive) and 100 µF external capacitance at Vin = 5 V. Top trace: Enable signal (2 V/div.); Bottom trace: output voltage (500 mV/div.); Time scale: 2 ms/div.

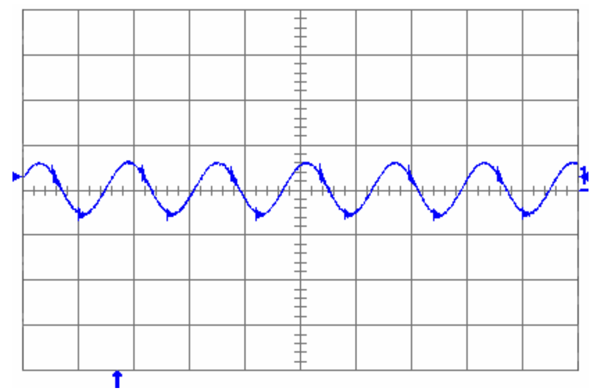


Fig. 1.2V.6: Output voltage ripple (20 mV/div.) at full rated load current into a resistive load with external capacitance 100 µF ceramic + 1 µF ceramic and Vin = 5 V for Vout = 1.2 V. Time scale: 2 µs/div.

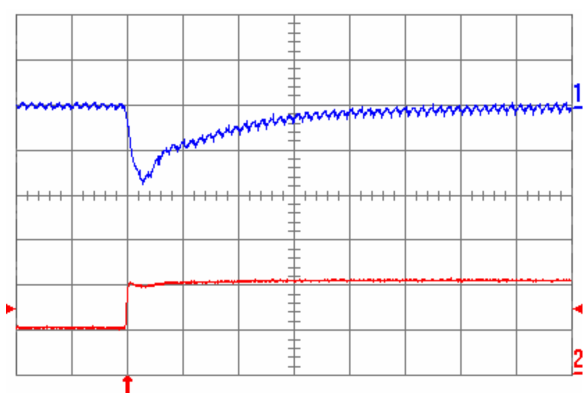


Fig. 1.2V.7: Output voltage response for Vout = 1.2 V to positive load current step change from 5 A to 10 A with slew rate of 5 A/µs at Vin = 5 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (5 A/div.). Co = 100 µF ceramic + 1 µF ceramic. Time scale: 20 µs/div.

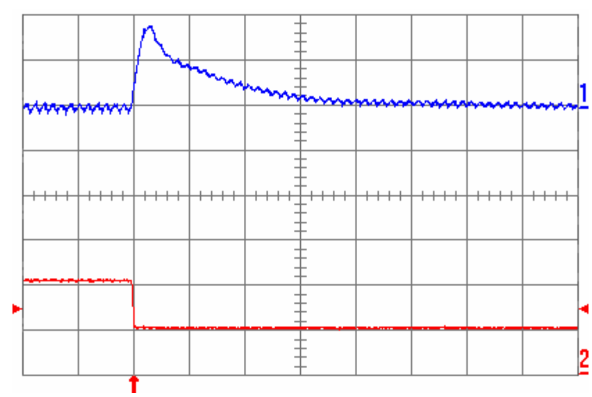


Fig. 1.2V.8: Output voltage response for Vout = 1.2 V to negative load current step change from 10 A to 5 A with slew rate of -5 A/µs at Vin = 5 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (5 A/div.). Co = 100 µF ceramic + 1 µF ceramic. Time scale: 20 µs/div.

© 2015 Bel Power Solutions, Inc.

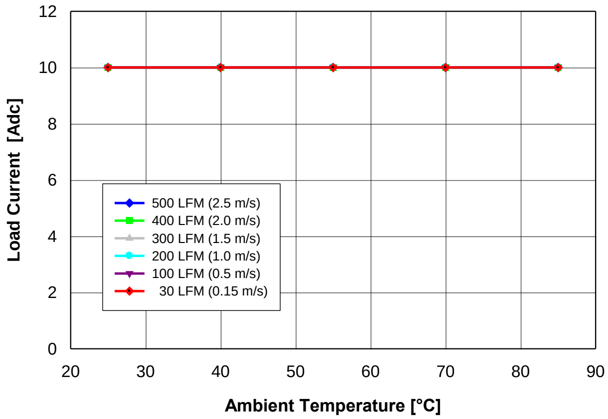


Fig. 1.0V.1: Available load current vs. ambient temperature and airflow rates for Vout = 1.0 V converter mounted vertically with Vin = 5 V, and maximum MOSFET temperature ≤ 120 °C.

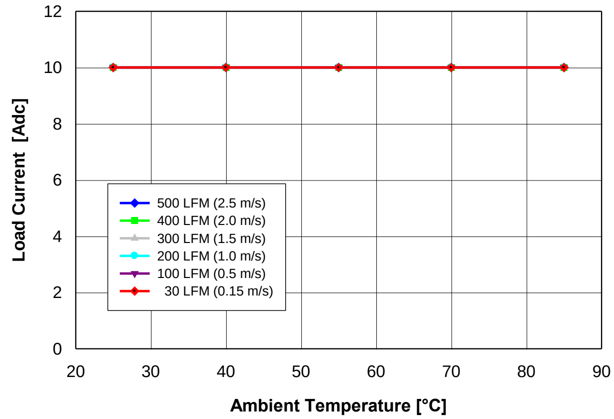


Fig. 1.0V.2: Available load current vs. ambient temperature and airflow rates for Vout = 1.0 V converter mounted horizontally with Vin = 5 V, and maximum MOSFET temperature ≤ 120 °C.

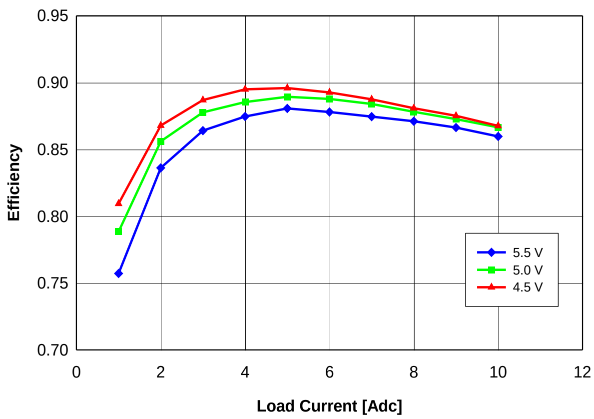


Fig. 1.0V.3: Efficiency vs. load current and input voltage for Vout = 1.0 V converter mounted vertically with air flowing at a rate of 200 LFM (1 m/s) and Ta = 25 °C.

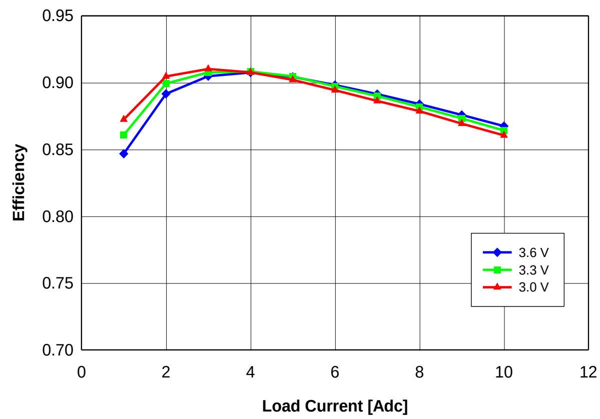


Fig. 1.0V.4: Efficiency vs. load current and input voltage for Vout = 1.0 V converter mounted vertically with air flowing at a rate of 200 LFM (1 m/s) and Ta = 25 °C.

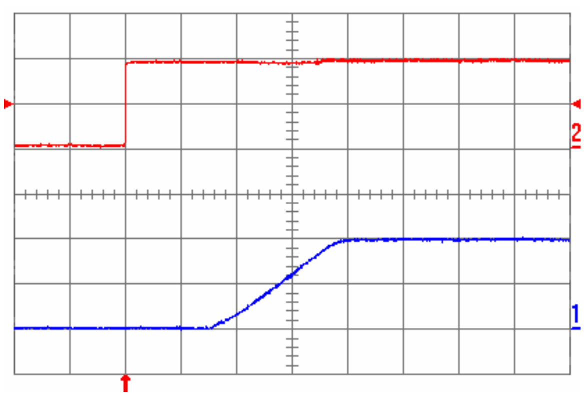


Fig. 1.0V.5: Turn-on transient for Vout = 1.0 V with the application of Enable signal at full rated load current (resistive) and 100 µF external capacitance at Vin = 5 V. Top trace: Enable signal (2 V/div.); Bottom trace: output voltage (500 mV/div.); Time scale: 2 ms/div.

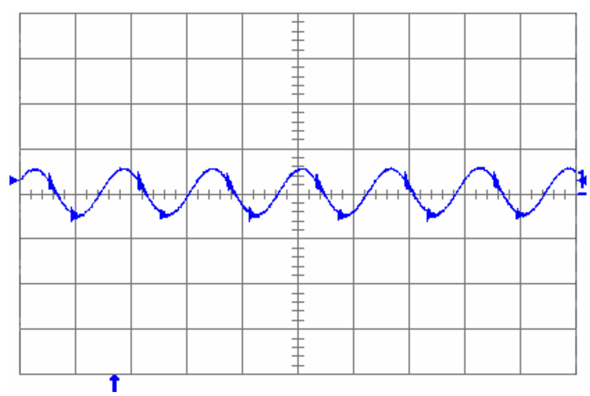


Fig. 1.0V.6: Output voltage ripple (20 mV/div.) at full rated load current into a resistive load with external capacitance 100 µF ceramic + 1 µF ceramic and Vin = 5 V for Vout = 1.0 V. Time scale: 2 µs/div.

+1 866 513 2839
tech.support@psbel.com
belfuse.com/power-solutions

© 2015 Bel Power Solutions, Inc.

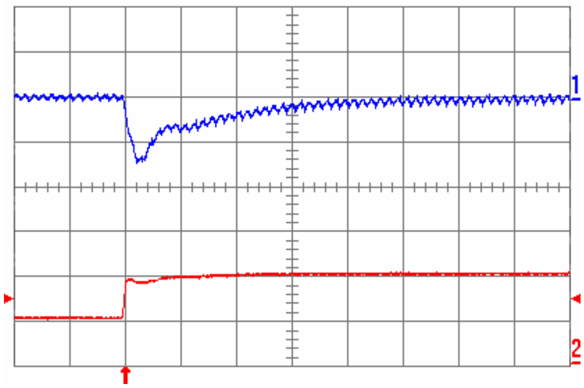


Fig. 1.0V.7: Output voltage response Vout = 1.0 V to positive load current step change from 5 A to 10 A with slew rate of 5 A/µs at Vin = 5 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (5 A/div.). Co = 100 µF ceramic + 1 µF ceramic. Time scale: 20 µs/div.

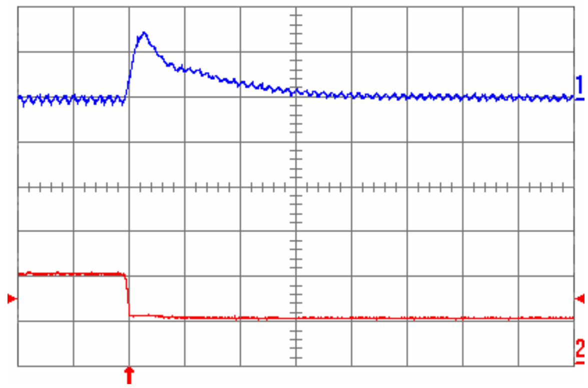


Fig. 1.0V.8: Output voltage response for Vout = 1.0 V to negative load current step change from 10 A to 5 A with slew rate of -5 A/µs at Vin = 5 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (5 A/div.). Co = 100 µF ceramic + 1 µF ceramic. Time scale: 20 µs/div.

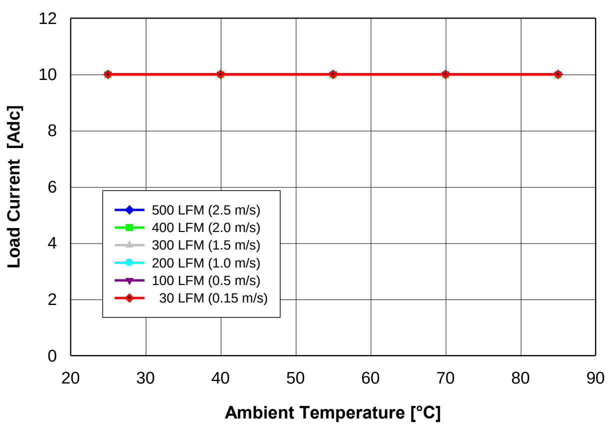


Fig. 0.7525V.1: Available load current vs. ambient temperature and airflow rates for Vout = 0.7525 V converter mounted vertically with Vin = 5 V, and maximum MOSFET temperature ≤ 120 °C.

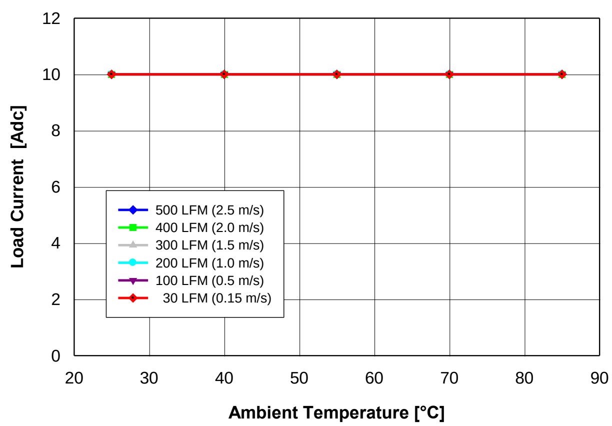


Fig. 0.7525V.2: Available load current vs. ambient temperature and airflow rates for Vout = 0.7525 V converter mounted horizontally with Vin = 5 V, and maximum MOSFET temperature ≤ 120 °C.

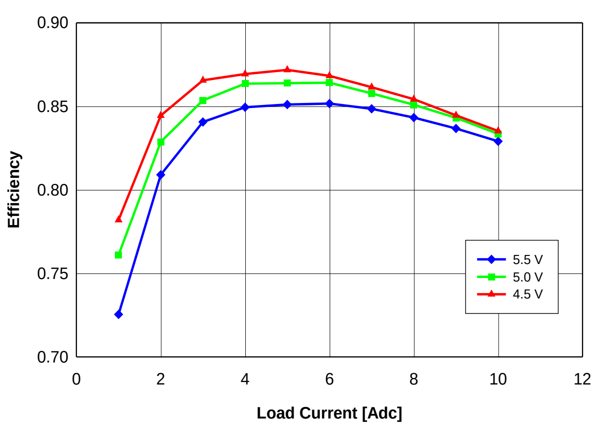


Fig. 0.7525V.3: Efficiency vs. load current and input voltage for Vout = 0.7525 V converter mounted vertically with air flowing at a rate of 200 LFM (1 m/s) and Ta = 25 °C.

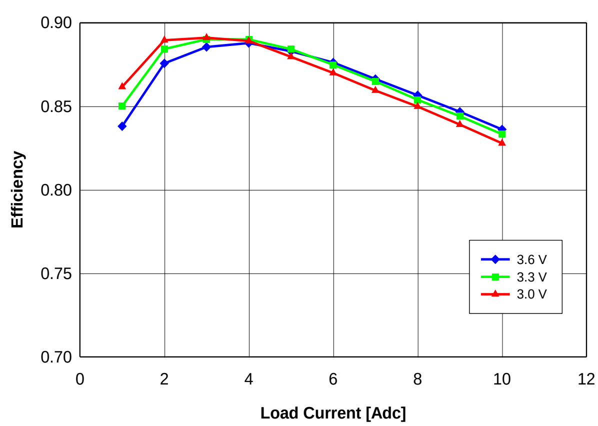


Fig. 0.7525V.4: Efficiency vs. load current and input voltage for Vout = 0.7525 V converter mounted vertically with air flowing at a rate of 200 LFM (1 m/s) and Ta = 25 °C.

© 2015 Bel Power Solutions, Inc.

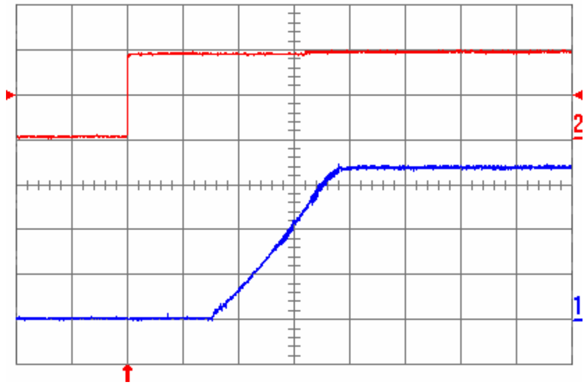


Fig. 0.7525V.5: Turn-on transient for Vout = 0.7525 V with the application of Enable signal at full rated load current (resistive) and 100 µF external capacitance at Vin = 5 V. Top trace: Enable signal (2 V/div.); Bottom trace: output voltage (200 mV/div.); Time scale: 2 ms/div.

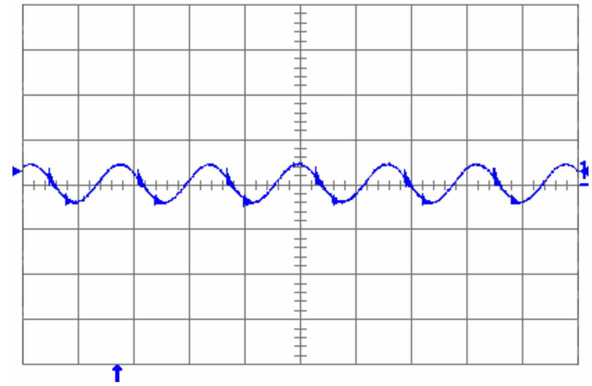


Fig. 0.7525V.6: Output voltage ripple (20 mV/div.) at full rated load current into a resistive load with external capacitance 100 µF ceramic + 1 µF ceramic and Vin = 5 V for Vout = 0.7525 V. Time scale: 2 µs/div.

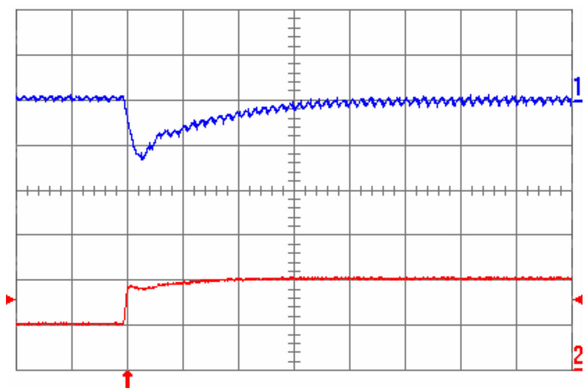


Fig. 0.7525V.7: Output voltage response for Vout = 0.7525 V to positive load current step change from 5 A to 10 A with slew rate of 5 A/µs at Vin = 5 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (5 A/div.). Co = 100 µF ceramic + 1 µF ceramic. Time scale: 20 µs/div.

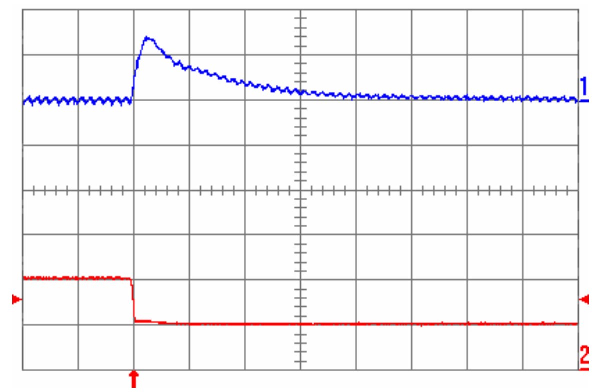
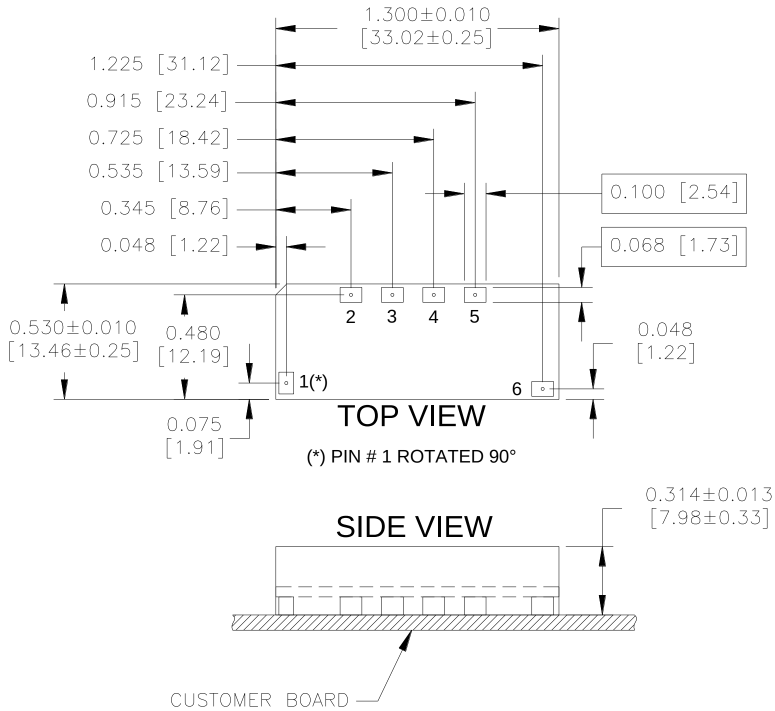


Fig. 0.7525V.8: Output voltage response for Vout = 0.7525 V to negative load current step change from 10 A to 8 A with slew rate of -5 A/µs at Vin = 5 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (5 A/div.). Co = 100 µF ceramic + 1 µF ceramic. Time scale: 20 µs/div.

© 2015 Bel Power Solutions, Inc.

5. PHYSICAL INFORMATION



YS05S Pinout (Surface-Mount)

PAD/PIN CONNECTIONS	
Pad/Pin #	***Function***
1	ON/OFF
2	SENSE
3	TRIM
4	Vout
5	GND
6	Vin

YS05S Platform Notes

- All dimensions are in inches [mm]
- Connector Material: Copper
- Connector Finish: Gold over Nickel
- Converter Weight: 0.22 oz [6.12 g]
- Converter Height: 0.327” Max., 0.301” Min.
- Recommended Surface-mount Pads:
  Min. 0.080” X 0.112” [2.03 x 2.84]

6. ORDERING INFORMATION

PRODUCT SERIES	INPUT VOLTAGE	MOUNTING SCHEME	RATED LOAD CURRENT		ENABLE LOGIC	ENVIRONMENTAL
YS	**05**	**S**	**10**	**–**	**0**	
Y-Series	3.0 – 5.5 V	S ⇒ Surface-Mount	10 A (0.7525 V to 3.63 V)		0 ⇒ Standard (Positive Logic) D ⇒ Opposite of Standard (Negative Logic)	No Suffix ⇒ RoHS lead-solder-exempt compliant G ⇒ RoHS compliant for all six substances

The example above describes P/N YS05S10-0: 3.0 – 5.5 V input, surface mount, 10 A at 0.7525 V to 3.63 V output, standard enable logic, and Eutectic Tin/Lead solder. Please consult factory for the complete list of available options.

For more information on these products consult: tech.support@psbel.com

NUCLEAR AND MEDICAL APPLICATIONS - Products are not designed or intended for use as critical components in life support systems, equipment used in hazardous environments, or nuclear control systems.
TECHNICAL REVISIONS - The appearance of products, including safety agency certifications pictured on labels, may change depending on the date manufactured. Specifications are subject to change without notice.

© 2015 Bel Power Solutions, Inc.