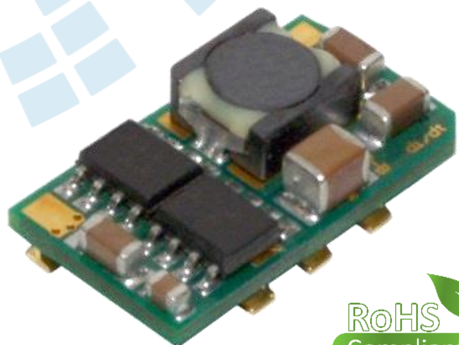
The YNM12S05 converter is not recommended for new designs and has been replaced by the YM12S05. Please refer to the YM12S05 data sheet for new product specifications.

YNM12S05 DC-DC Converter

9.6 - 14 VDC Input; 0.7525 – 5.5 VDC Programmable @ 5 A



RoHS Compliant

Bel Power Solutions point-of-load converters are recommended for use with regulated bus converters in an Intermediate Bus Architecture (IBA). The YNM12S05 non-isolated DC-DC converters deliver up to 5 A of output current in an industry-standard surface-mount package. Operating from a 9.6 to 14 VDC input, the YNM12S05 converters are ideal choices for Intermediate Bus Architectures where Point-of-Load power (POL) delivery is generally a requirement. They provide an extremely tight regulated, programmable output voltage of 0.7525 to 5.5 VDC.

The YNM12S05 converters provide exceptional thermal performance, even in high temperature environments with minimal airflow. No derating is required up to 85 C (up to 70 C for 5 VDC and 3.3 VDC outputs), 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.

Key Features & Benefits

- RoHS lead-free solder and lead-solder-exempted products are available
- Delivers up to 5 A (28 W)
- Extended input range 9.6 to 14 VDC
- No derating up to 85 °C (70 °C for 5 V and 3.3 V)
- Surface-mount package
- Industry-standard footprint and pinout
- Small size and low-profile: 0.80” x 0.45” x 0.247” (20.32 mm x 11.43 mm x 6.27 mm)
- Weight: 0.08 oz [2.26 g]
- Co-planarity < 0.003"
- 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 ON/OFF
- Fixed-frequency operation
- Auto-reset output overcurrent protection
- Auto-reset overtemperature protection
- High reliability, MTBF = 71.8 million hours
- calculated per Telcordia TR-332, Method I Case 1
- All materials meet UL94, V-0 flammability rating
- Approved to the latest edition and amendment of ITE Safety standards, UL/CSA 60950-1 and IEC60950-1

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

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1. ELECTRICAL SPECIFICATIONS

Conditions: T_A = 25 °C, Airflow = 300 LFM (1.5 m/s), Vin = 12 VDC, Vout = 0.7525 - 5.5 VDC, unless otherwise specified.

PARAMETER	NOTES	MIN	TYP	MAX	UNITS
Absolute Maximum Ratings					
Input Voltage	Continuous	-0.3		15	VDC
Operating Ambient Temperature		-40		85	°C
Storage Temperature		-55		125	°C
Feature Characteristics					
Switching Frequency			480		kHz
Output Voltage Trim Range[1]	By external resistor, See Trim Table 1	0.7525		5.5	VDC
Turn-On Delay Time	Full resistive load				
With Vin (Converter Enabled, then Vin applied)	From Vin = Vin(min) to Vo = 0.1* Vo(nom)		7.5		ms
With Enable (Vin = Vin(nom) applied, then enabled)	From enable to Vo = 0.1*Vo(nom)		7.5		ms
Rise time (Full resistive load)	From 0.1*Vo(nom) to 0.9*Vo(nom)		7		ms
ON/OFF Control[2]	Converter Off	2.4		Vin	VDC
	Converter On	-5		0.8	VDC
Input Characteristics					
Operating Input Voltage Range		9.6	12	14	VDC
Input Under Voltage Lockout	Turn-on Threshold		9.2		VDC
	Turn-off Threshold		8.4		VDC
Maximum Input Current	5 ADC Out @ 9.6 VDC In				
	V_{OUT} = 5.0 VDC			2.9	ADC
	V_{OUT} = 3.3 VDC			2.0	ADC
	V_{OUT} = 2.5 VDC			1.6	ADC
	V_{OUT} = 2.0 VDC			1.4	ADC
	V_{OUT} = 1.8 VDC			1.25	ADC
	V_{OUT} = 1.5 VDC			1.0	ADC
	V_{OUT} = 1.2 VDC			0.8	ADC
	V_{OUT} = 1.0 VDC			0.7	ADC
Input Stand-by Current (Converter disabled)			2.8		mA
Input No Load Current (Converter enabled)	V_{OUT} = 5.0 VDC		85		mA
	V_{OUT} = 3.3 VDC		65		mA
	V_{OUT} = 2.5 VDC		55		mA
	V_{OUT} = 2.0 VDC		45		mA
	V_{OUT} = 1.8 VDC		40		mA
	V_{OUT} = 1.5 VDC		35		mA
	V_{OUT} = 1.2 VDC		30		mA
	V_{OUT} = 1.0 VDC		27		mA
Input Reflected-Ripple Current - i_s	See Fig. D for setup. (BW = 20 MHz)				
	V_{OUT} = 5.0 VDC		53		mA$_{P-P}$
	V_{OUT} = 3.3 VDC		44		mA$_{P-P}$
	V_{OUT} = 2.5 VDC		39		mA$_{P-P}$
	V_{OUT} = 2.0 VDC		36		mA$_{P-P}$
	V_{OUT} = 1.8 VDC		35		mA$_{P-P}$
	V_{OUT} = 1.5 VDC		32		mA$_{P-P}$
	V_{OUT} = 1.2 VDC		29		mA$_{P-P}$
	V_{OUT} = 1.0 VDC		27		mA$_{P-P}$
Input Voltage Ripple Rejection	120 Hz		72		dB

Output Characteristics					
Output Voltage Set Point (no load)		-1.5	Vout	+1.5	%Vout
Output Regulation[3]					
Over Line	Full resistive load		1		mV
Over Load	From no load to full load		0.25		%Vout
Output Voltage Range	Over all operating input voltage, resistive load and temperature conditions until end of life.	-2.5		+2.5	%Vout
Output Ripple and Noise – 20 MHz bandwidth	Over line, load and temperature (Fig. D)				
Peak-to-Peak			40	80	mV_{P-P}
RMS			10	25	mV_{RMS}
External Load Capacitance	Plus full load (resistive)				
Min ESR > 1mΩ				1,000	µF
Min ESR > 10 mΩ				2,000	µF
Output Current Range		0		5	ADC
Output Current Limit Inception (I_{OUT})			8.5		ADC
Output Short-Circuit Current	Short = 10 mΩ, continuous		2		Arms
Dynamic Response					
Iout step from 2.5 A to 5 A with di/dt = 5 A/µs[4]	Co = 47 µF ceramic. + 1 µF ceramic		85		mV
Settling Time (V_{OUT} < 10% peak deviation)[4]			30		µs
Iout step from 5 A to 2.5 A with di/dt = -5 A/µs[4]	Co = 47 µF ceramic + 1 µF ceramic		80		mV
Settling Time (V_{OUT} < 10% peak deviation)[4]			30		µs
Iout step from 2.5 A to 5 A with di/dt = 5 A/µs[4]	Co = 2x150 µF polymer capacitors		55		mV
Settling Time (V_{OUT} < 10% peak deviation)[4]			40		µs
Iout step from 5 A to 2.5 A with di/dt = -5 A/µs[4]	Co = 2x150 µF polymer capacitors		60		mV
Settling Time (V_{OUT} < 10% peak deviation)[4]			60		µs
Efficiency	*Full load (5 A)*				
	V_{OUT} = 5.0 VDC		92.0		%
	V_{OUT} = 3.3 VDC		88.5		%
	V_{OUT} = 2.5 VDC		86.5		%
	V_{OUT} = 2.0 VDC		84.5		%
	V_{OUT} = 1.8 VDC		83.5		%
	V_{OUT} = 1.5 VDC		81.5		%
	V_{OUT} = 1.2 VDC		79.0		%
	V_{OUT} = 1.0 VDC		76.0		%

Notes:

1 The output voltage should not exceed 5.5 VDC.
2 The converter is ON if the ON/OFF pin is left open.
3 Trim resistor connected across the GND and TRIM pins of the converter.
4 See the waveforms section for dynamic response and settling time for different output voltages.

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2. OPERATIONS

2.1. INPUT AND OUTPUT IMPEDANCE

Y-Series 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. It is recommended to use decoupling capacitors (minimum 47 µF) placed as close as possible to the converter's input pins in order to ensure stability of the converter and reduce input ripple voltage. Internally, the converter has 3.2 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
47-100 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 YNM12S05 has been designed for stable operation with or without external capacitance. Low ESR ceramic capacitors placed as close as possible to the load (minimum 47 µF) are recommended for better transient performance and lower output voltage ripple.

It is important to keep low resistance and low inductance PCB traces for connecting your load to the output pins of the converter. This is required to maintain good load regulation since the converter does not have a SENSE pin for compensating voltage drops associated with the power distribution system on your PCB.

2.2. ON/OFF (PIN 1)

The ON/OFF pin (Pin 1) is used to turn the power converter on or off remotely via a system signal that is referenced to GND (Pin 4). The typical connections are shown in Fig. A.

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 logic high or connected to Vin.

The ON/OFF pin is internally pulled down. A TTL or CMOS logic gate, open-collector (open-drain) transistor can be used to drive the ON/OFF pin. When using open-collector (open-drain) transistor, add a pull-up resistor (R*) of 75 kΩ to Vin as shown in Fig. A.

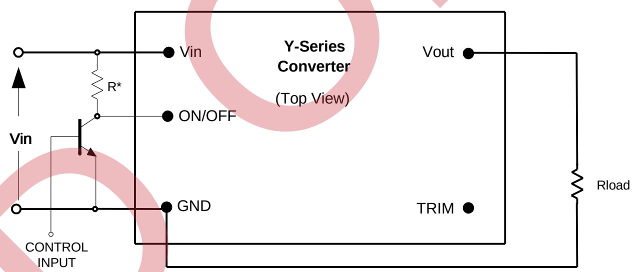

Fig. A. Circuit configuration for ON/OFF function.

This device must be capable of:

- sinking up to 0.2 mA at a low level voltage of ≤ 0.8 V
- sourcing up to 0.25 mA at a high logic level of 2.3 to 5 V
- sourcing up to 0.75 mA when connected to Vin.

2.3. OUTPUT VOLTAGE PROGRAMMING (PIN 3)

The output voltage can be programmed from
0.7525 to 5.5 V by connecting an external resistor between TRIM pin (Pin 3) and GND pin (Pin 4); see Fig. B. Note that when trim resistor is not connected, output voltage of the converter is 0.7525 V.

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

$$R_{TRIM} = \frac{10.5}{(V_{O-REQ} - 0.7525)} - 1 \qquad [k\Omega]$$

where,

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

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

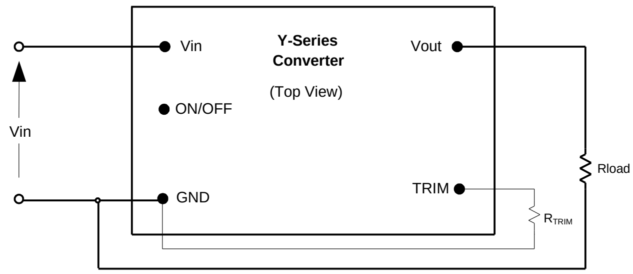

Fig. B. Configuration for programming output voltage.

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.

The ground pin of the trim resistor should be connected directly to the converter GND pin with no voltage drop in between. Table 1 provides the trim resistor values for popular output voltages.

$V_{O\text{-}REG}$ [V]	R_{TRIM} [kΩ]	The Closest Standard Value [kΩ]
0.7525	open	
1.0	41.42	41.2
1.2	22.46	22.6
1.5	13.05	13.0
1.8	9.02	9.09
2.0	7.42	7.50
2.5	5.01	4.99
3.3	3.12	3.09
5.0	1.47	1.47
5.5	1.21	1.21

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 R_{EXT} is recommended between TRIM pin and programming voltage source. Control Voltage can be calculated by the formula:

$$V_{CTRL} = 0.7 - \frac{(1+R_{EXT})(V_{O\text{-}REQ} - 0.7525)}{15} \quad [V]$$

where

V_{CTRL} = Control voltage [V]

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

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

$V_{O\text{-}REG}$ [V]	V_{CTRL} (R_{EXT} = 0)	V_{CTRL}(R_{EXT} = 15 kΩ)
0.7525	0.700	0.700
1.0	0.684	0.436
1.2	0.670	0.223
1.5	0.650	-0.097
1.8	0.630	-0.417
2.0	0.617	-0.631
2.5	0.584	-1.164
3.3	0.530	-2.017
5.0	0.417	-3.831
5.5	0.384	-4.364

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 9.2 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 8.4 V.

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 overload 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 UL60950 and EN60950. 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 SELV 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 15 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 thermocouples is recommended to ensure measurement accuracy. Careful routing of the thermocouple leads will further minimize measurement error. Refer to Fig. C for the optimum measuring thermocouple location.

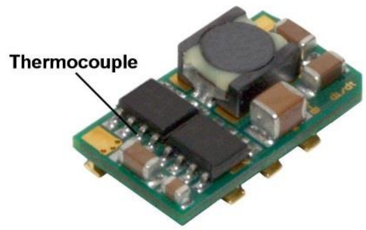

Fig. C. Location of the thermocouple for thermal testing.

4.3. THERMAL DERATING

Load current vs. ambient temperature and airflow rates are given in Figs. x.1 to 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 converter mountings. The airflow during the testing is parallel to the long axis of the converter, going from input pins to output pins.

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 (5 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. C should not exceed 120 °C in order to operate inside the derating curves.

4.4. EFFICIENCY

Figure 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 9.6 V, 12 V, and 14 V.

4.5. POWER DISSIPATION

Fig. x.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 9.6 V, 12 V, and 14 V.

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 Figure D.

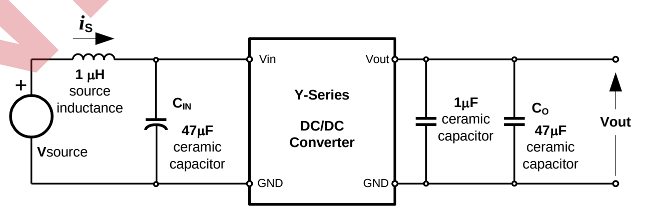

Fig. D. Test Setup for measuring input reflected-ripple currents, is and output voltage ripple.

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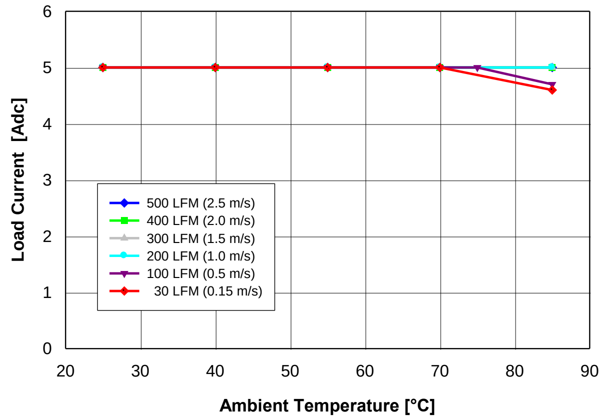


Fig. 5.0V.1: Available load current vs. ambient temperature and airflow rates for Vout = 5.0 V converter mounted vertically with Vin = 12 V, and maximum MOSFET temperature ≤ 120 °C.

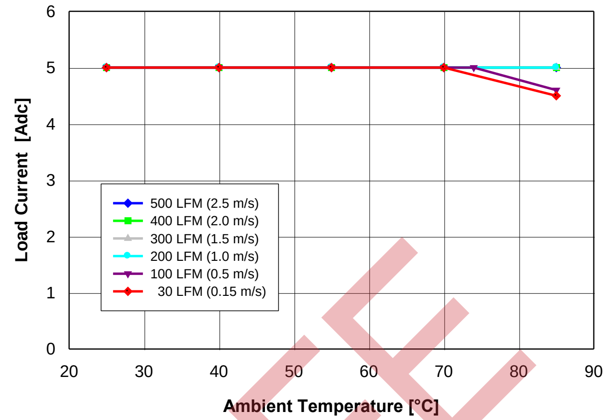


Fig. 5.0V.2: Available load current vs. ambient temperature and airflow rates for Vout = 5.0 V converter mounted horizontally with Vin = 12 V, and maximum MOSFET temperature ≤ 120 °C.

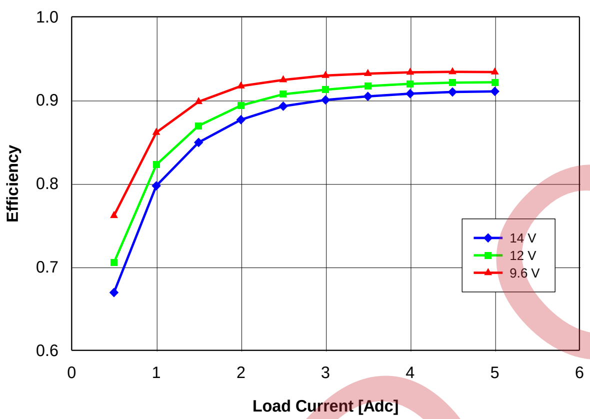


Fig. 5.0V.3: Efficiency vs. load current and input voltage for Vout = 5.0 V converter mounted vertically with air flowing at a rate of 200 LFM (1 m/s) and Ta = 25 °C.

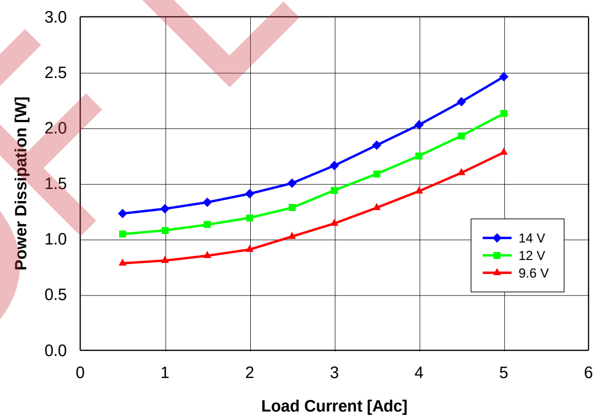


Fig. 5.0V.4: Power Loss vs. load current and input voltage for Vout = 5.0 V converter mounted vertically with air flowing at a rate of 200 LFM (1 m/s) and Ta = 25 °C.

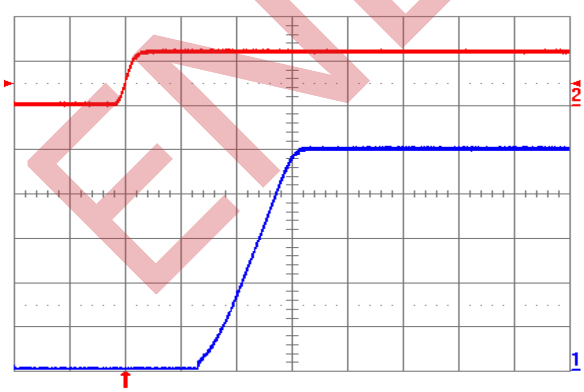


Fig. 5.0V.5: Turn-on transient for Vout = 5.0 V with application of Vin at full rated load current (resistive) and 47 µF external capacitance at Vin = 12 V. Top trace: Vin (10 V/div.); Bottom trace: output voltage (1 V/div.); Time scale: 5 ms/div.

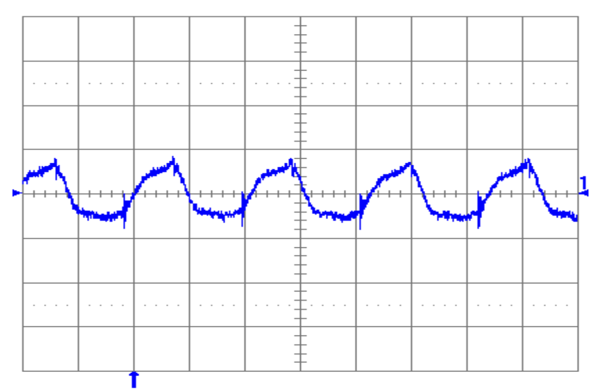


Fig. 5.0V.6: Output voltage ripple (20 mV/div.) at full rated load current into a resistive load with external capacitance 47 µF ceramic + 1 µF ceramic, and Vin = 12 V for Vout = 5.0 V. Time scale: 1 µs/div.

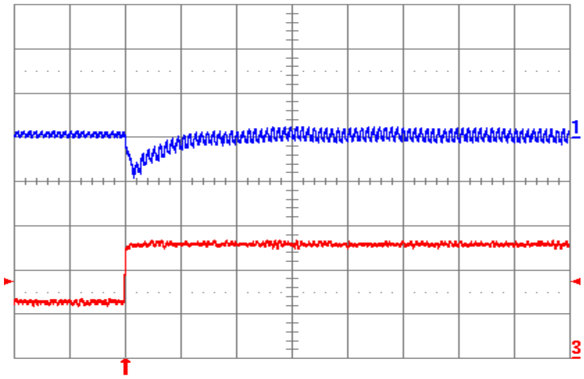


Fig. 5.0V.7: Output voltage response for Vout = 5.0 V to positive load current step change from 2.5 A to 5 A with slew rate of 5 A/µs at Vin = 12 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (2 A/div.). Co = 47 µF ceramic. Time scale: 20 µs/div.

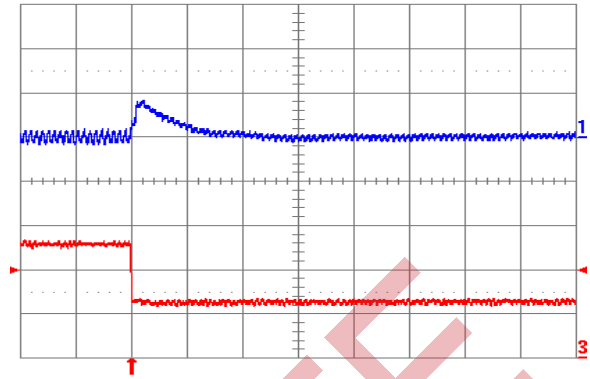


Fig. 5.0V.8: Output voltage response for Vout = 5.0 V to negative load current step change from 5 A to 2.5 A with slew rate of -5 A/µs at Vin = 12 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (2 A/div.). Co = 47 µF ceramic. Time scale: 20 µs/div.

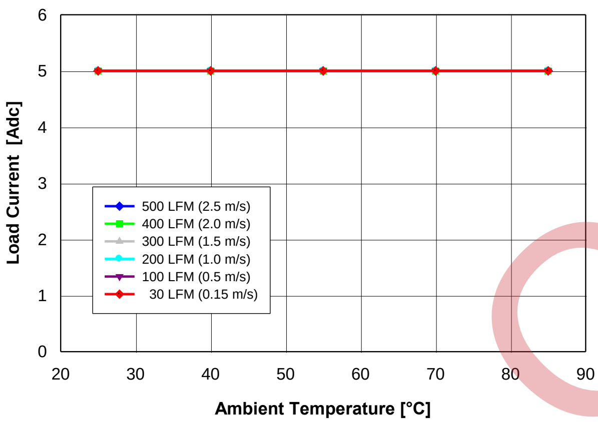


Fig. 3.3V.1: Available load current vs. ambient temperature and airflow rates for Vout = 3.3 V converter mounted vertically with Vin = 12 V, and maximum MOSFET temperature ≤ 120 °C.

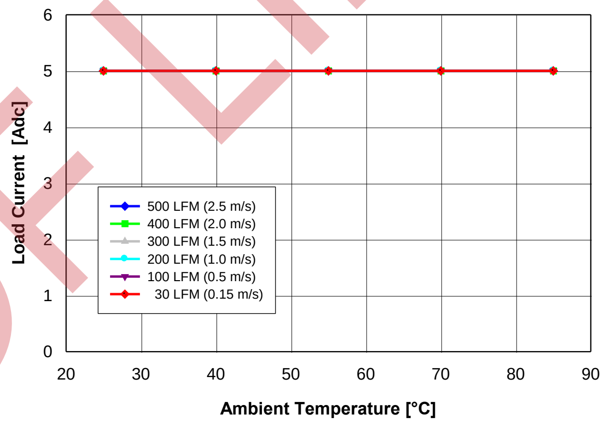


Fig. 3.3V.2: Available load current vs. ambient temperature and airflow rates for Vout = 3.3 V converter mounted horizontally with Vin = 12 V, and maximum MOSFET temperature ≤ 120 °C.

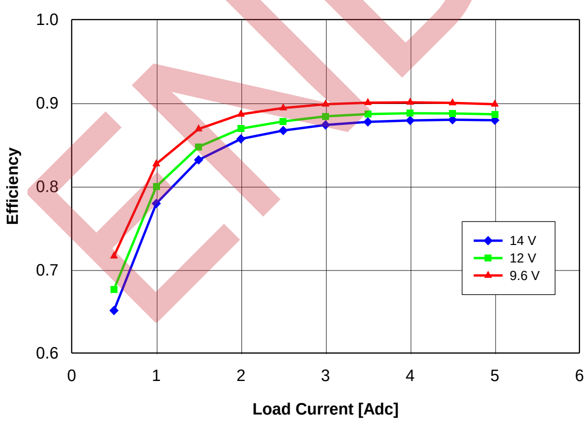


Fig. 3.3V.3: Efficiency vs. load current and input voltage for Vout = 3.3 V converter mounted vertically with air flowing at a rate of 200 LFM (1 m/s) and Ta = 25 °C.

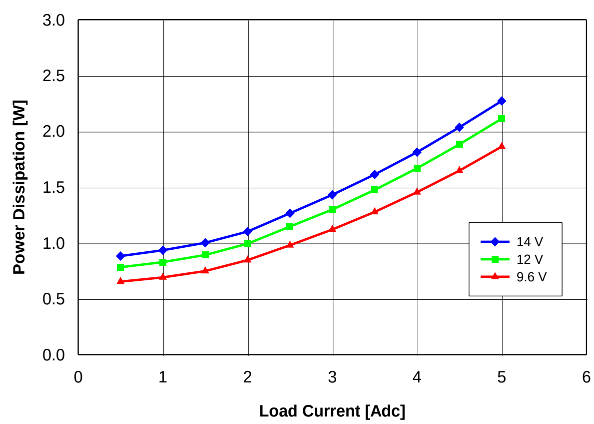


Fig. 3.3V.4: Power Loss vs. load current and input voltage for Vout = 3.3 V converter mounted vertically with air flowing at a rate of 200 LFM (1 m/s) and Ta = 25 °C.

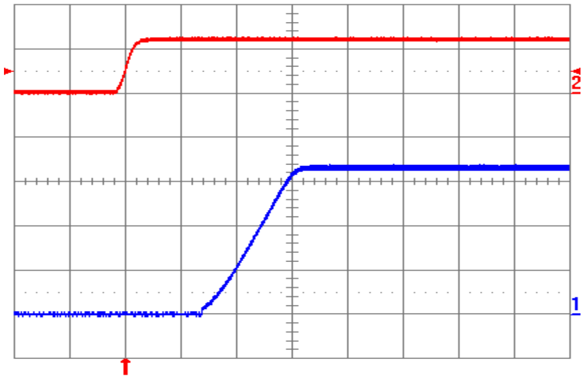


Fig. 3.3V.5: Turn-on transient for Vout = 3.3 V with application of Vin at full rated load current (resistive) and 47 µF external capacitance at Vin = 12 V. Top trace: Vin (10 V/div.); Bottom trace: output voltage (1 V/div.); Time scale: 5 ms/div.

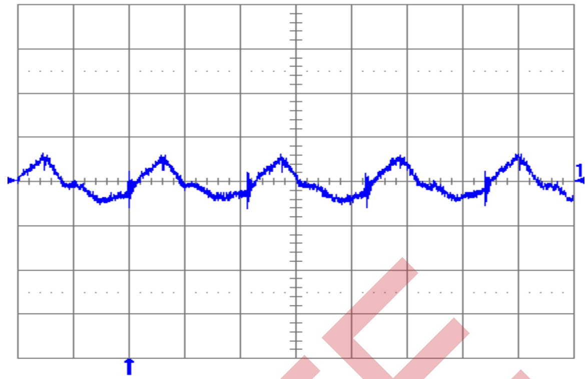


Fig. 3.3V.6: Output voltage ripple (20 mV/div.) at full rated load current into a resistive load with external capacitance 47 µF ceramic + 1 µF ceramic, and Vin = 12 V for Vout = 3.3 V. Time scale: 1 µs/div.

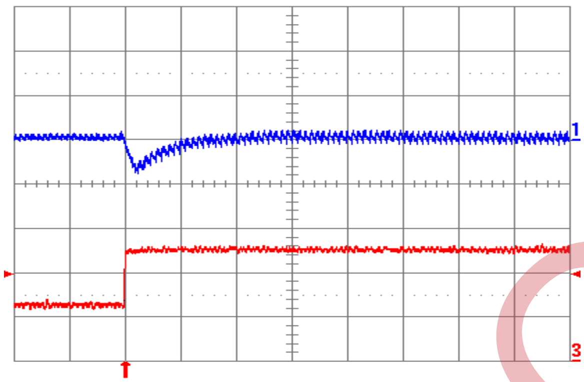


Fig. 3.3V.7: Output voltage response for Vout = 3.3 V to positive load current step change from 2.5 A to 5 A with slew rate of 5 A/µs at Vin = 12 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (2 A/div.). Co = 47 µF ceramic. Time scale: 20 µs/div.

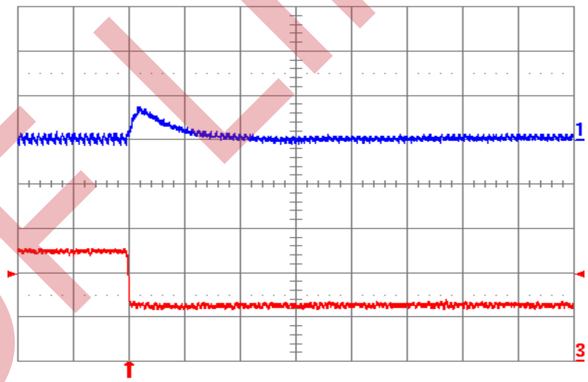


Fig. 3.3V.8: Output voltage response for Vout = 3.3 V to negative load current step change from 5 A to 2.5 A with slew rate of -5 A/µs at Vin = 12 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (2 A/div.). Co = 47 µF ceramic. Time scale: 20 µs/div.

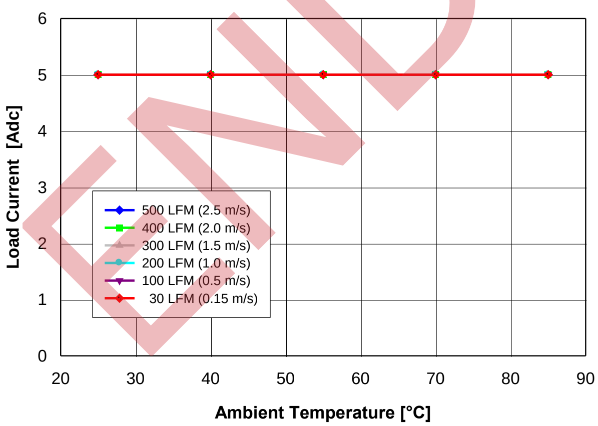


Fig. 2.5V.1: Available load current vs. ambient temperature and airflow rates for Vout = 2.5 V converter mounted vertically with Vin = 12 V, and maximum MOSFET temperature ≤ 120 °C.

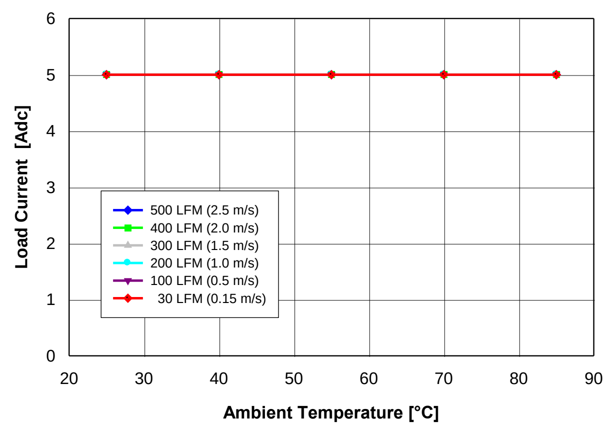


Fig. 2.5V.2: Available load current vs. ambient temperature and airflow rates for Vout = 2.5 V converter mounted horizontally with Vin = 12 V, and maximum MOSFET temperature ≤ 120 °C.

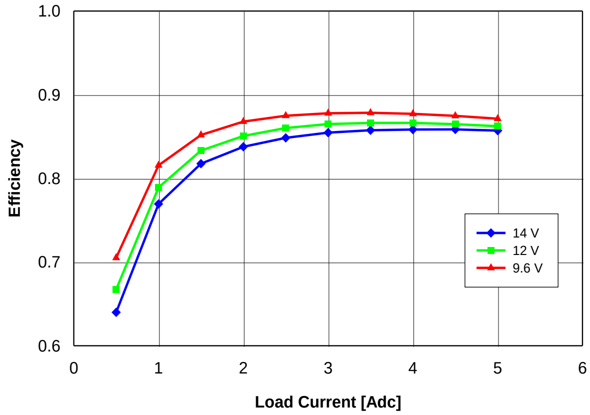


Fig. 2.5V.3: Efficiency vs. load current and input voltage for Vout = 2.5 V converter mounted vertically with air flowing at a rate of 200 LFM (1 m/s) and Ta = 25 °C.

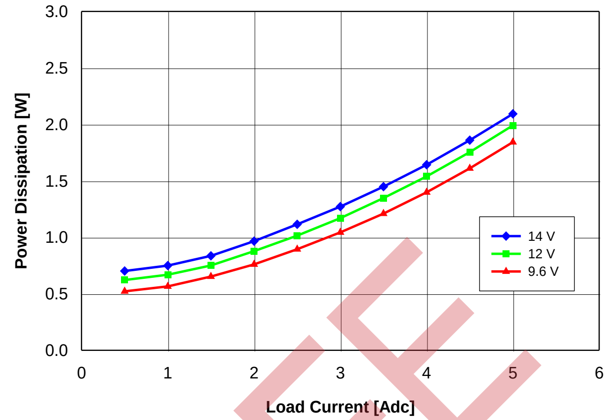


Fig. 2.5V.4: Power Loss vs. load current and input voltage for Vout = 2.5 V converter mounted vertically with air flowing at a rate of 200 LFM (1 m/s) and Ta = 25 °C.

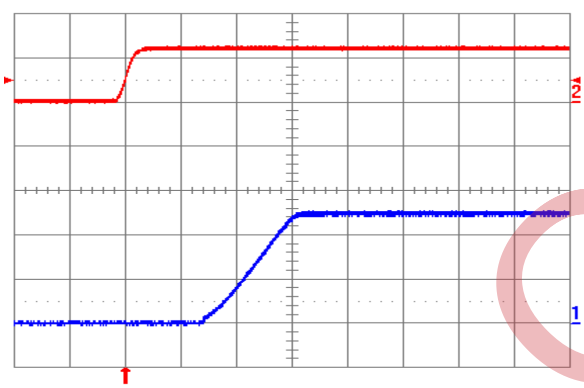


Fig. 2.5V.5: Turn-on transient for Vout = 2.5 V with application of Vin at full rated load current (resistive) and 47 µF external capacitance at Vin = 12 V. Top trace: Vin (10 V/div.); Bottom trace: output voltage (1 V/div.); Time scale: 5 ms/div.

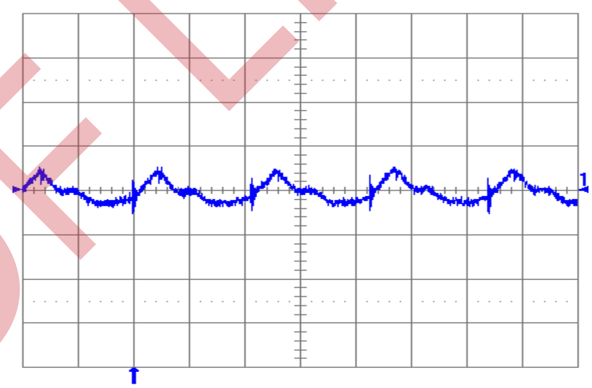


Fig. 2.5V.6: Output voltage ripple (20 mV/div.) at full rated load current into a resistive load with external capacitance 47 µF ceramic + 1 µF ceramic, and Vin = 12 V for Vout = 2.5 V. Time scale: 1 µs/div.

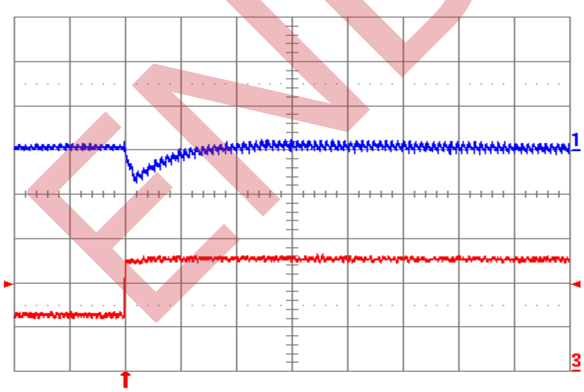


Fig. 2.5V.7: Output voltage response for Vout = 2.5 V to positive load current step change from 2.5 A to 5 A with slew rate of 5 A/µs at Vin = 12 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (2 A/div.). Co = 47 µF ceramic. Time scale: 20 µs/div.

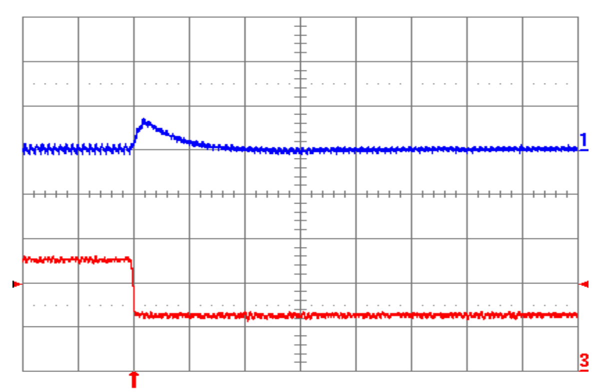


Fig. 2.5V.8: Output voltage response for Vout = 2.5 V to negative load current step change from 5 A to 2.5 A with slew rate of -5 A/µs at Vin = 12 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (2 A/div.). Co = 47 µF ceramic. Time scale: 20 µs/div.

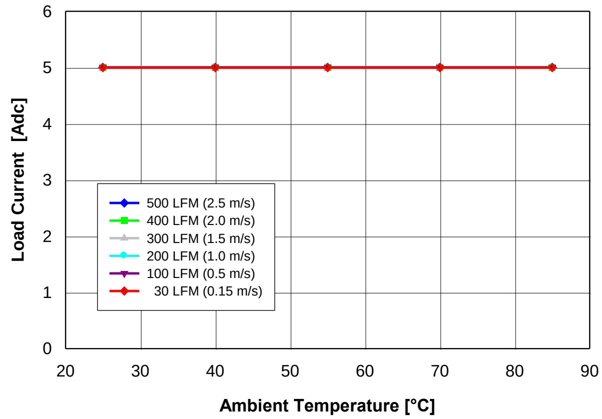


Fig. 2.0V.1: Available load current vs. ambient temperature and airflow rates for Vout = 2.0 V converter mounted vertically with Vin = 12 V, and maximum MOSFET temperature ≤ 120 °C.

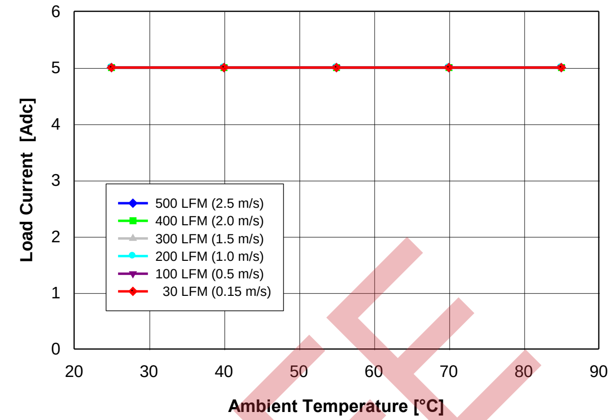


Fig. 2.0V.2: Available load current vs. ambient temperature and airflow rates for Vout = 2.0 V converter mounted horizontally with Vin = 12 V, and maximum MOSFET temperature ≤ 120 °C.

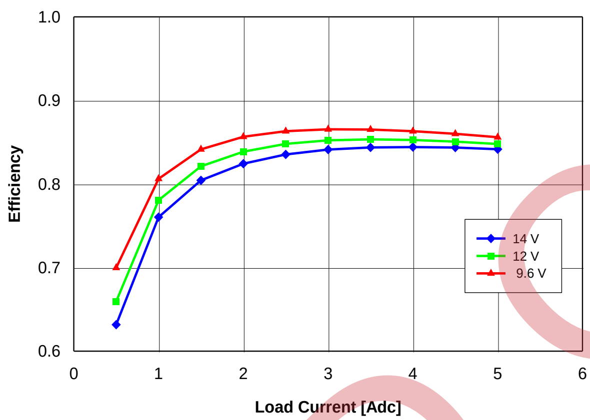


Fig. 2.0V.3: Efficiency vs. load current and input voltage for Vout = 2.0 V converter mounted vertically with air flowing at a rate of 200 LFM (1 m/s) and Ta = 25 °C.

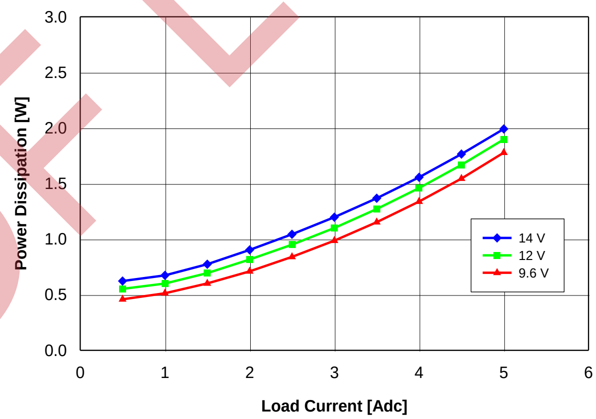


Fig. 2.0V.4: Power Loss vs. load current and input voltage for Vout = 2.0 V converter mounted vertically with air flowing at a rate of 200 LFM (1 m/s) and Ta = 25 °C.

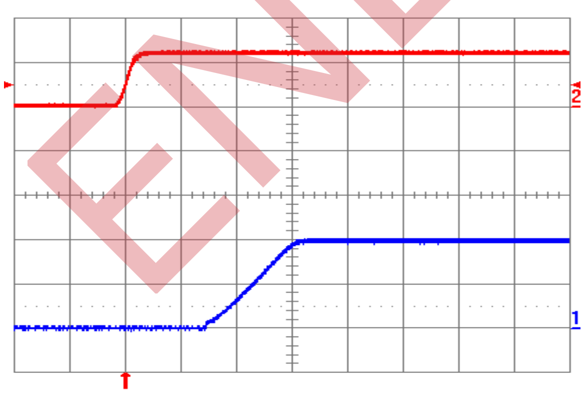


Fig. 2.0V.5: Turn-on transient for Vout = 2.0 V with application of Vin at full rated load current (resistive) and 47 μF external capacitance at Vin = 12 V. Top trace: Vin (10 V/div.); Bottom trace: output voltage (1 V/div.); Time scale: 5 ms/div.

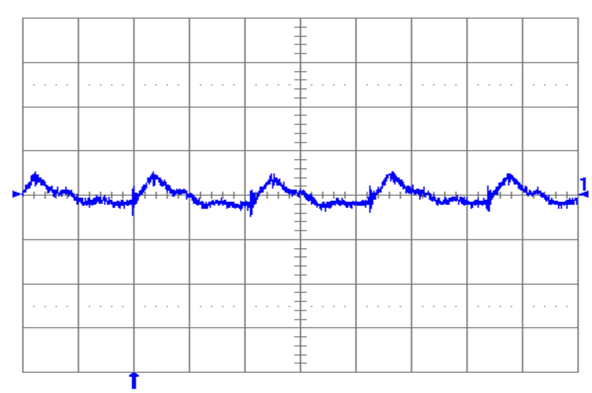


Fig. 2.0V.6: Output voltage ripple (20 mV/div.) at full rated load current into a resistive load with external capacitance 47 μF ceramic + 1 μF ceramic, and Vin = 12 V for Vout = 2.0 V. Time scale: 1 μs/div.

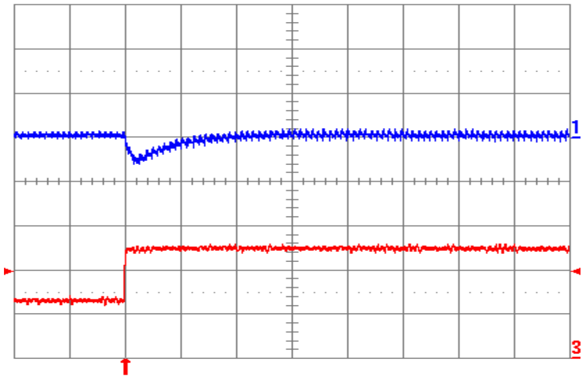


Fig. 2.0V.7: Output voltage response for Vout = 2.0 V to positive load current step change from 2.5 A to 5 A with slew rate of 5 A/µs at Vin = 12 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (2 A/div.). Co = 47 µF ceramic. Time scale: 20 µs/div.

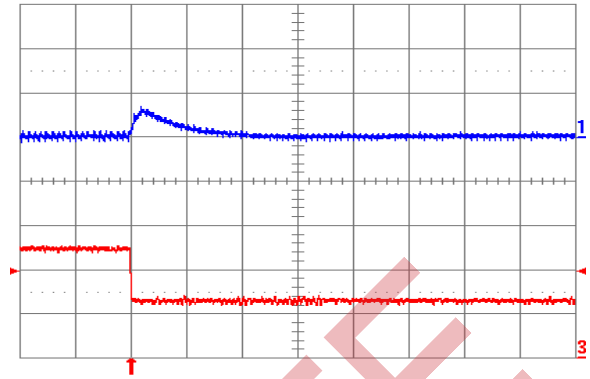


Fig. 2.0V.8: Output voltage response for Vout = 2.0 V to negative load current step change from 5 A to 2.5 A with slew rate of -5 A/µs at Vin = 12 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (2 A/div.). Co = 47 µF ceramic. Time scale: 20 µs/div.

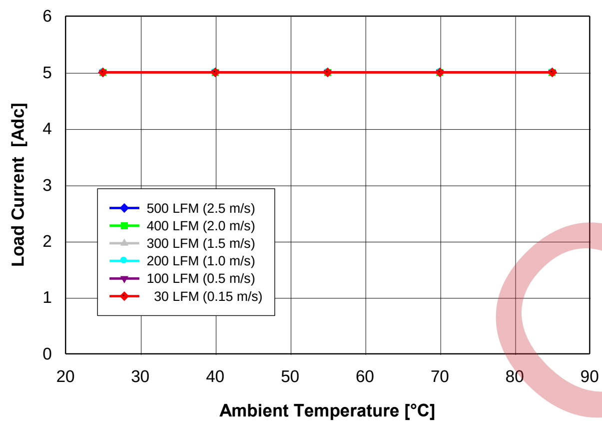


Fig. 1.8V.1: Available load current vs. ambient temperature and airflow rates for Vout = 1.8 V converter mounted vertically with Vin = 12 V, and maximum MOSFET temperature ≤ 120 °C.

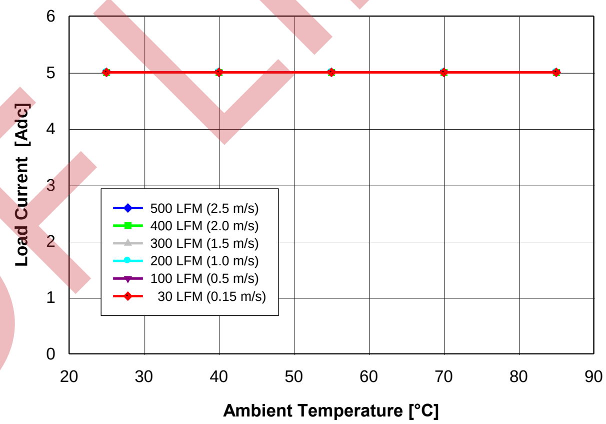


Fig. 1.8V.2: Available load current vs. ambient temperature and airflow rates for Vout = 1.8 V converter mounted horizontally with Vin = 12 V, and maximum MOSFET temperature ≤ 120 °C.

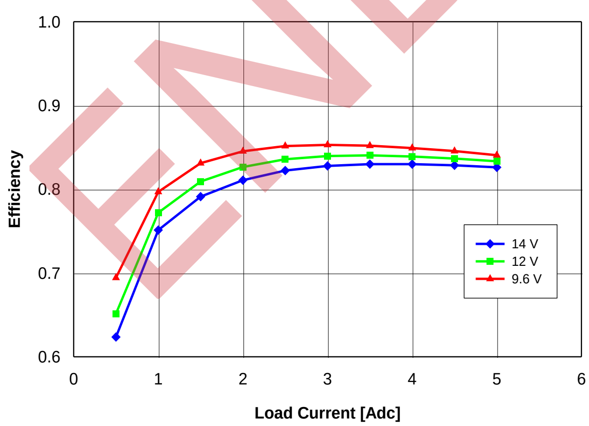


Fig. 1.8V.3: Efficiency vs. load current and input voltage for Vout = 1.8 V converter mounted vertically with air flowing at a rate of 200 LFM (1 m/s) and Ta = 25 °C.

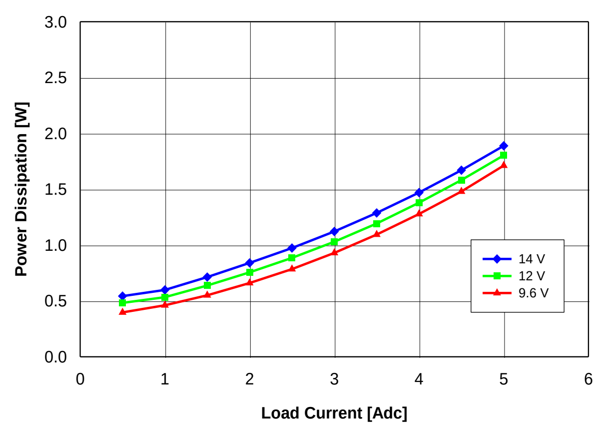


Fig. 1.8V.4: Power Loss vs. load current and input voltage for Vout = 1.8 V converter mounted vertically with air flowing at a rate of 200 LFM (1 m/s) and Ta = 25 °C.

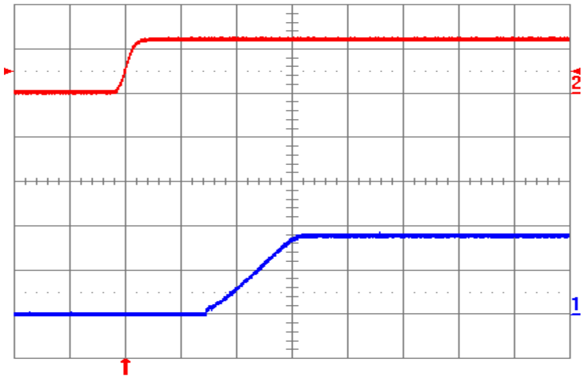


Fig. 1.8V.5: Turn-on transient for Vout = 1.8 V with application of Vin at full rated load current (resistive) and 47 µF external capacitance at Vin = 12 V. Top trace: Vin (10 V/div.); Bottom trace: output voltage (1 V/div.); Time scale: 5 ms/div.

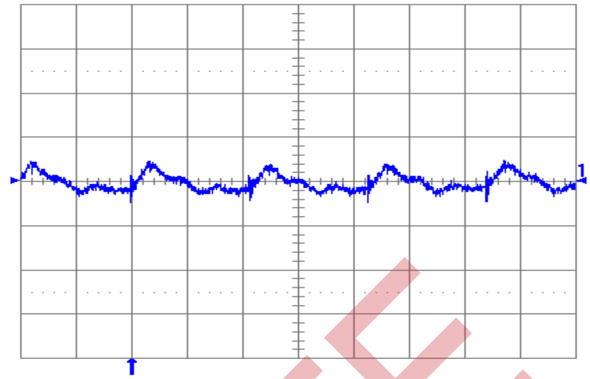


Fig. 1.8V.6: Output voltage ripple (20 mV/div.) at full rated load current into a resistive load with external capacitance 47µF ceramic + 1µF ceramic, and Vin = 12 V for Vout = 1.8 V. Time scale: 1 µs/div.

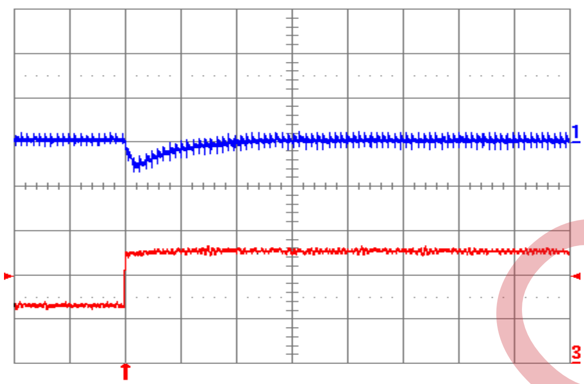


Fig. 1.8V.7: Output voltage response for Vout = 1.8 V to positive load current step change from 2.5 A to 5 A with slew rate of 5 A/µs at Vin = 12 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (2 A/div.). Co = 47 µF ceramic. Time scale: 20 µs/div.

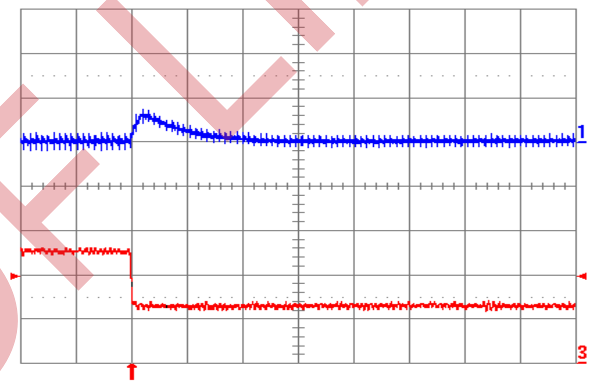


Fig. 1.8V.8: Output voltage response for Vout = 1.8 V to negative load current step change from 5 A to 2.5 A with slew rate of -5 A/µs at Vin = 12 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (2 A/div.). Co = 47 µF ceramic. Time scale: 20 µs/div.

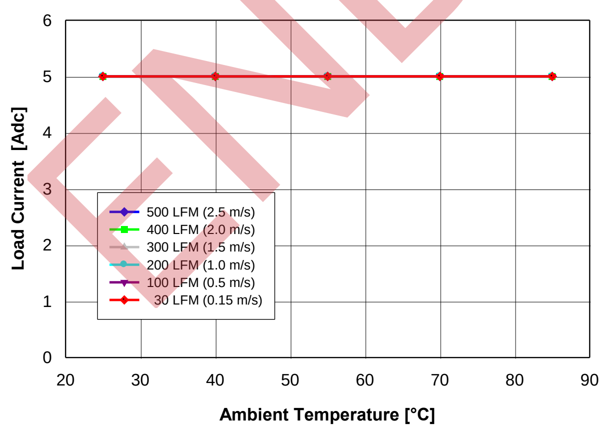


Fig. 1.5V.1: Available load current vs. ambient temperature and airflow rates for Vout = 1.5 V converter mounted vertically with Vin = 12 V, and maximum MOSFET temperature ≤ 120 °C.

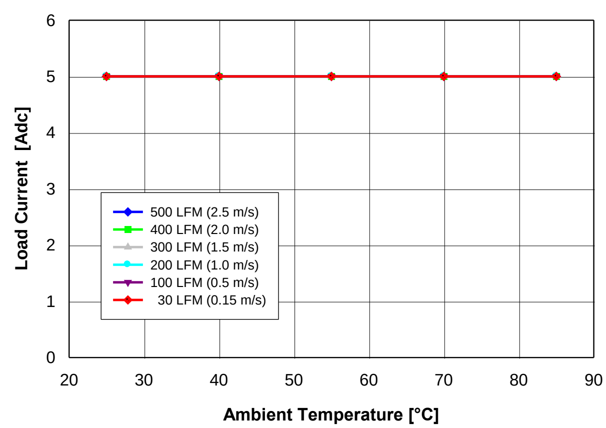


Fig. 1.5V.2: Available load current vs. ambient temperature and airflow rates for Vout = 1.5 V converter mounted horizontally with Vin = 12 V, and maximum MOSFET temperature ≤ 120 °C.

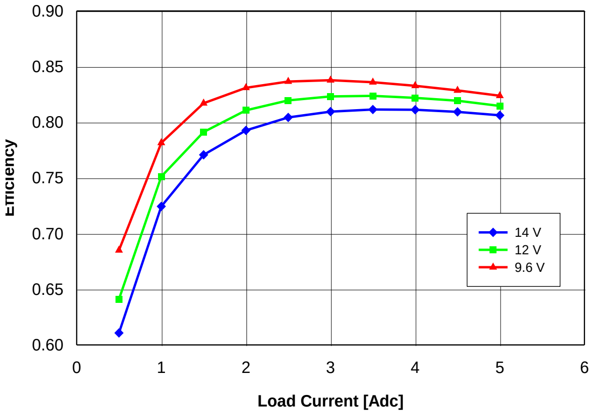


Fig. 1.5V.3: Efficiency vs. load current and input voltage for Vout = 1.5 V converter mounted vertically with air flowing at a rate of 200 LFM (1 m/s) and Ta = 25 °C.

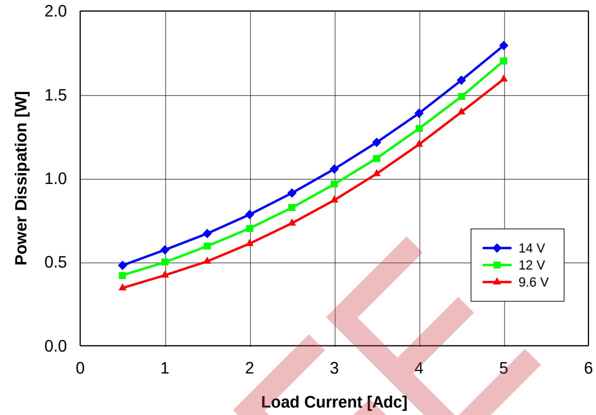


Fig. 1.5V.4: Power Loss vs. load current and input voltage for Vout = 1.5 V converter mounted vertically with air flowing at a rate of 200 LFM (1 m/s) and Ta = 25 °C.

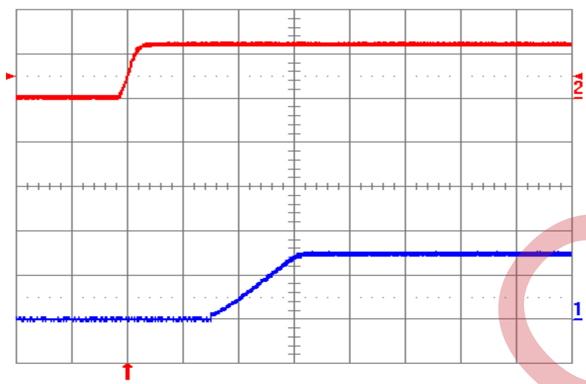


Fig. 1.5V.5: Turn-on transient for Vout = 1.5 V with application of Vin at full rated load current (resistive) and 47 µF external capacitance at Vin = 12 V. Top trace: Vin (10 V/div.); Bottom trace: output voltage (1 V/div.); Time scale: 5 ms/div.

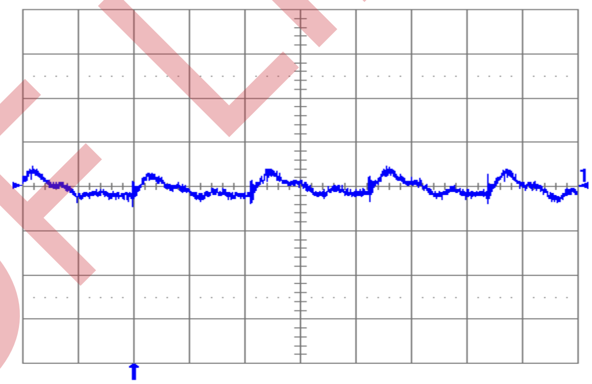


Fig. 1.5V.6: Output voltage ripple (20 mV/div.) at full rated load current into a resistive load with external capacitance 47 µF ceramic + 1 µF ceramic, and Vin = 12 V for Vout = 1.5 V. Time scale: 1 µs/div.

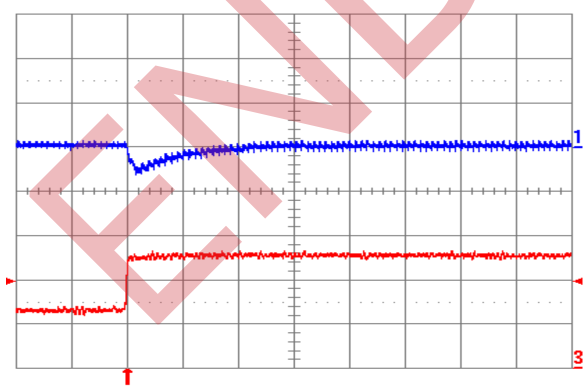


Fig. 1.5V.7: Output voltage response for Vout = 1.5 V to positive load current step change from 2.5 A to 5 A with slew rate of 5 A/µs at Vin = 12 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (2 A/div.). Co = 47 µF ceramic. Time scale: 20 µs/div.

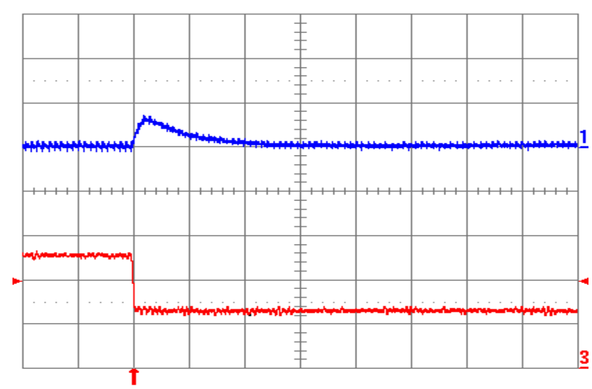


Fig. 1.5V.8: Output voltage response for Vout = 1.5 V to negative load current step change from 5 A to 2.5 A with slew rate of -5 A/µs at Vin = 12 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (2 A/div.). Co = 47 µF ceramic. Time scale: 20 µs/div.

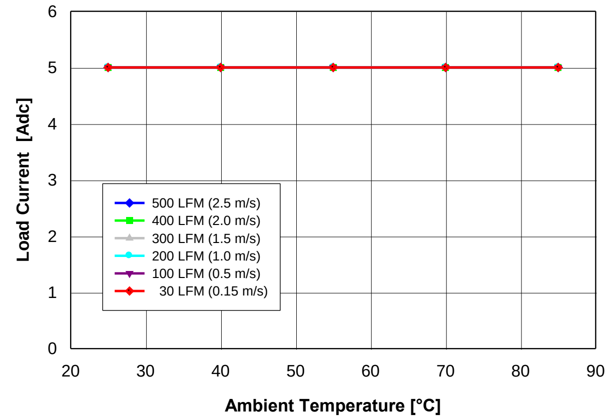


Fig. 1.2V.1: Available load current vs. ambient temperature and airflow rates for Vout = 1.2 V converter mounted vertically with Vin = 12 V, and maximum MOSFET temperature ≤ 120 °C.

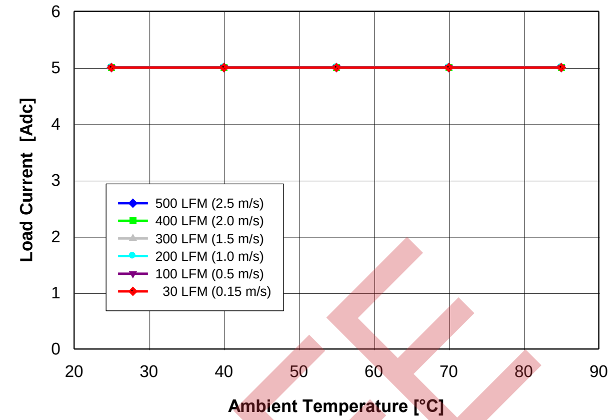


Fig. 1.2V.2: Available load current vs. ambient temperature and airflow rates for Vout = 1.2 V converter mounted horizontally with Vin = 12 V, and maximum MOSFET temperature ≤ 120 °C.

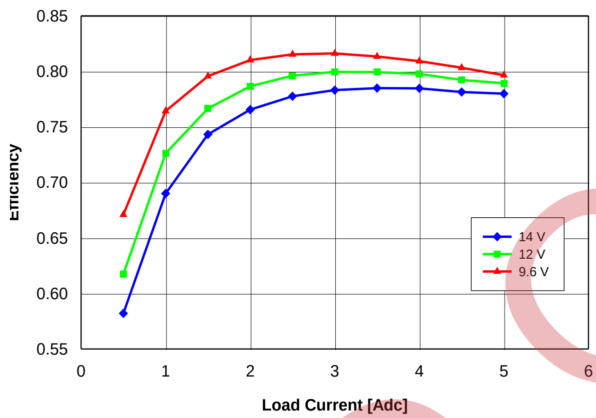


Fig. 1.2V.3: Efficiency vs. load current and input voltage for Vout = 1.2 V converter mounted vertically with air flowing at a rate of 200 LFM (1 m/s) and Ta = 25 °C.

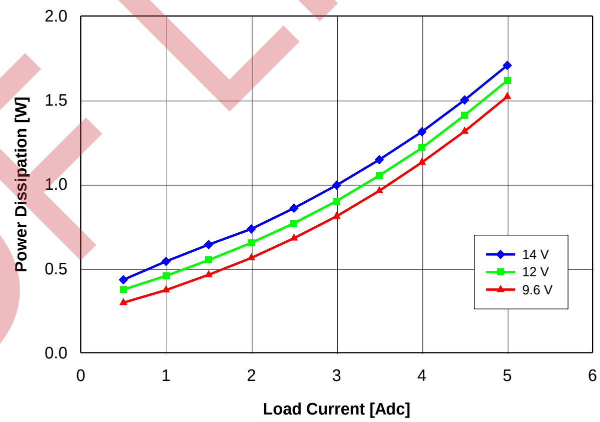


Fig. 1.2V.4: Power Loss vs. load current and input voltage for Vout = 1.2 V converter mounted vertically with air flowing at a rate of 200 LFM (1 m/s) and Ta = 25 °C.

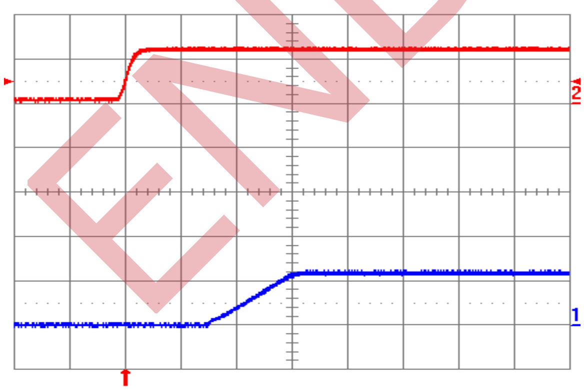


Fig. 1.2V.5: Turn-on transient for Vout = 1.2 V with application of Vin at full rated load current (resistive) and 47 µF external capacitance at Vin = 12 V. Top trace: Vin (10 V/div.); Bottom trace: output voltage (1 V/div.); Time scale: 5 ms/div.

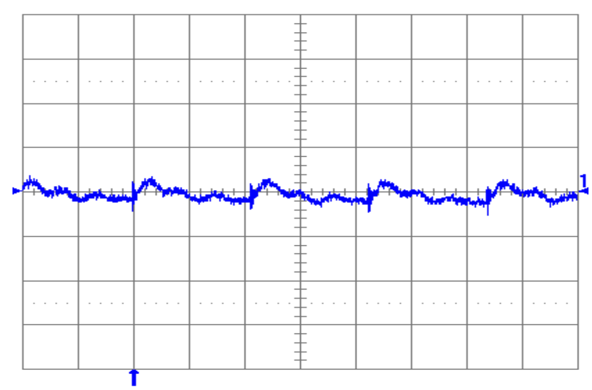


Fig. 1.2V.6: Output voltage ripple (20 mV/div.) at full rated load current into a resistive load with external capacitance 47 µF ceramic + 1 µF ceramic, and Vin = 12 V for Vout = 1.2 V. Time scale: 1 µs/div.

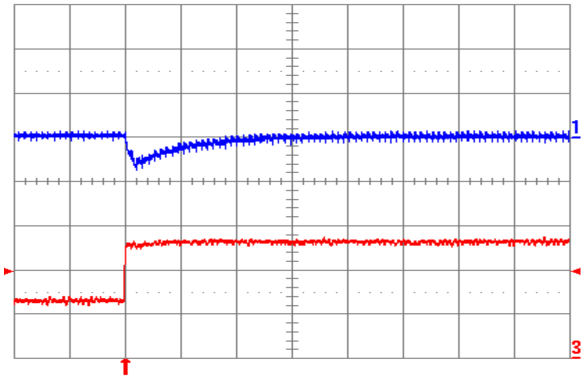


Fig. 1.2V.7: Output voltage response for Vout = 1.2 V to positive load current step change from 2.5 A to 5 A with slew rate of 5 A/µs at Vin = 12 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (2 A/div.). Co = 47 µF ceramic. Time scale: 20 µs/div.

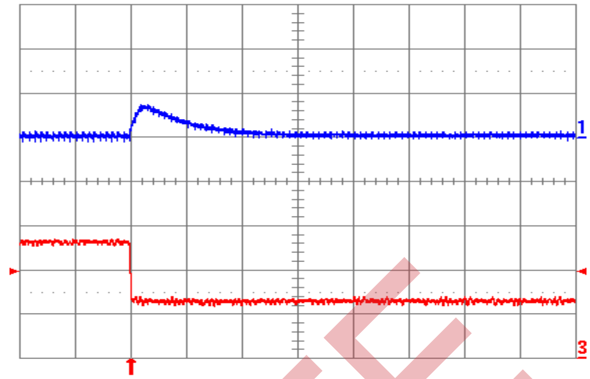


Fig. 1.2V.8: Output voltage response for Vout = 1.2 V to negative load current step change from 5 A to 2.5 A with slew rate of -5 A/µs at Vin = 12 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (2 A/div.). Co = 47 µF ceramic. Time scale: 20 µs/div.

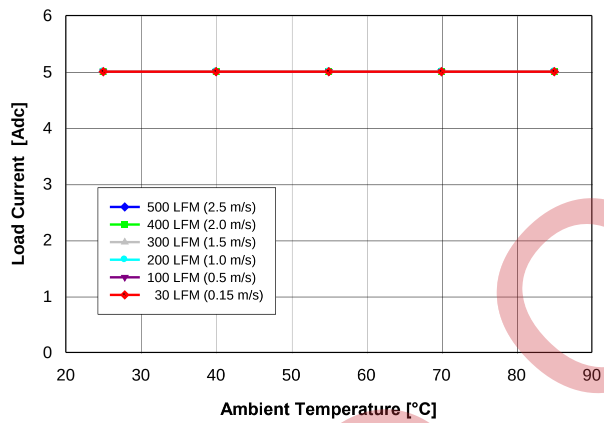


Fig. 1.0V.1: Available load current vs. ambient temperature and airflow rates for Vout = 1.0 V converter mounted vertically with Vin = 12 V, and maximum MOSFET temperature ≤ 120 °C.

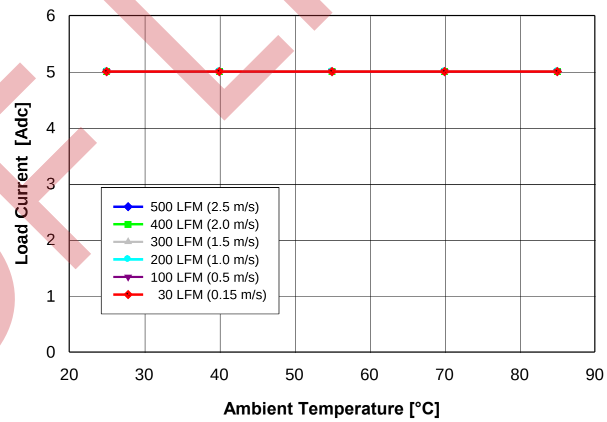


Fig. 1.0V.2: Available load current vs. ambient temperature and airflow rates for Vout = 1.0 V converter mounted horizontally with Vin = 12 V, and maximum MOSFET temperature ≤ 120 °C.

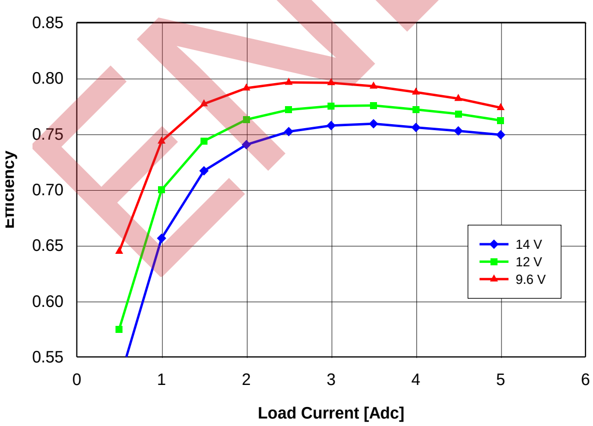


Fig. 1.0V.3: Efficiency vs. load current and input voltage for Vout = 1.0 V converter mounted vertically with air flowing at a rate of 200 LFM (1 m/s) and Ta = 25 °C.

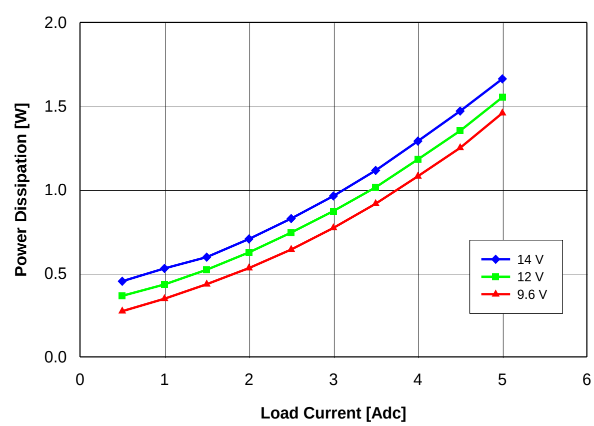


Fig. 1.0V.4: Power Loss vs. load current and input voltage for Vout = 1.0 V converter mounted vertically with air flowing at a rate of 200 LFM (1 m/s) and Ta = 25 °C.

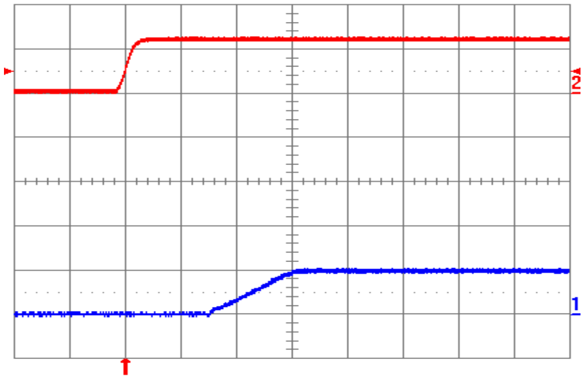


Fig. 1.0V.5: Turn-on transient for Vout = 1.0 V with application of Vin at full rated load current (resistive) and 47 µF external capacitance at Vin = 12 V. Top trace: Vin (10 V/div.); Bottom trace: output voltage (1 V/div.); Time scale: 5 ms/div.

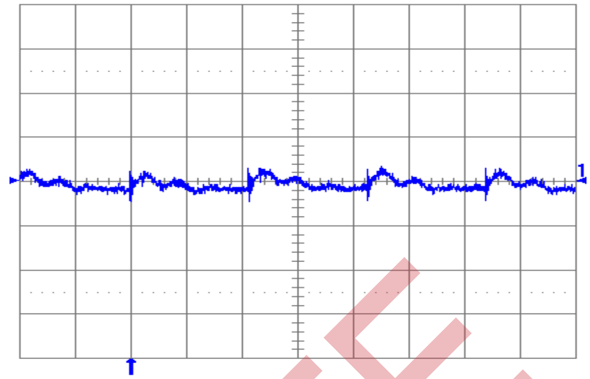


Fig. 1.0V.6: Output voltage ripple (20 mV/div.) at full rated load current into a resistive load with external capacitance 47 µF ceramic + 1 µF ceramic, and Vin = 12 V for Vout = 1.0 V. Time scale: 1 µs/div.

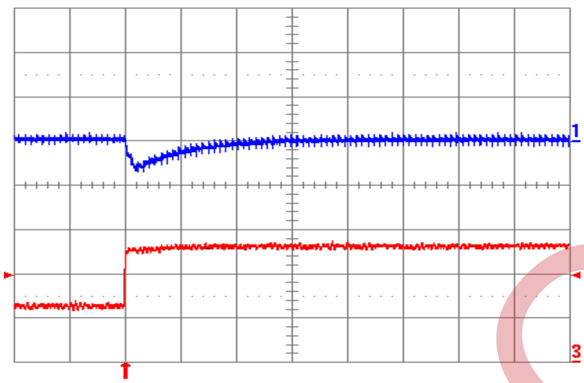


Fig. 1.0V.7: Output voltage response for Vout = 1.0 V to positive load current step change from 2.5 A to 5 A with slew rate of 5 A/µs at Vin = 12 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (2 A/div.). Co =47 µF ceramic. Time scale: 20 µs/div.

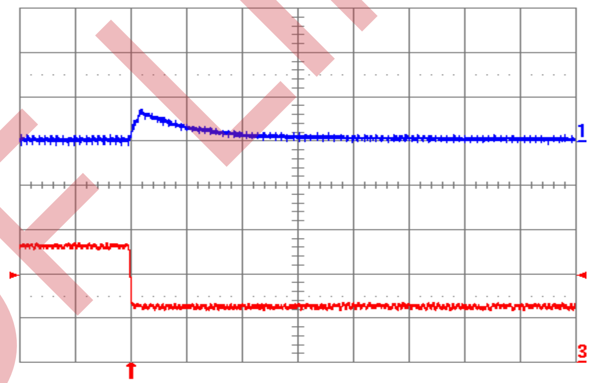
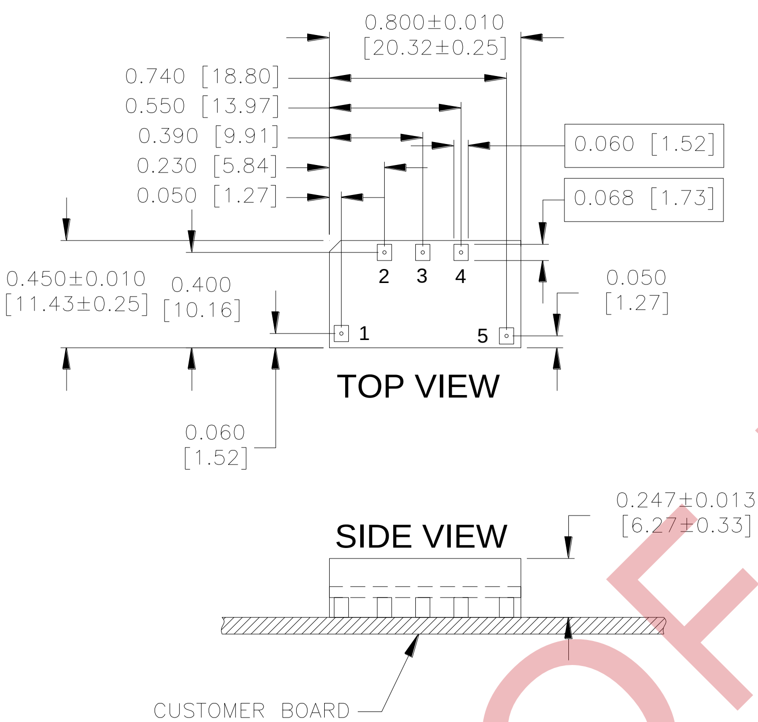


Fig. 1.0V.8: Output voltage response for Vout = 1.0 V to negative load current step change from 5 A to 2.5 A with slew rate of -5 A/µs at Vin = 12 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (2 A/div.). Co = 47 µF ceramic. Time scale: 20 µs/div.

5. PHYSICAL INFORMATION



YNM12S Pinout (Surface Mount)

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

<u>YNM12S Platform Notes</u>

- All dimensions are in inches [mm]
- Connector Material: Copper
- Connector Finish: Gold over Nickel
- Converter Weight: 0.08 oz [2.26 g]
- Converter Height: 0.260" Max., 0.234" 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		ROHS COMPATIBLE
YNM	**12**	**S**	**05**	–	
Y-Series	9.6 to14 VDC	S ⇒ Surface-Mount	5 A (0.7525 V to 5.5 V)		No Suffix ⇒ RoHS lead-solder-exempt compliant G ⇒ RoHS compliant for all six substances

The example above describes P/N YNM12S05: 9.6 to 14 VDC input, surface-mount, 5 A at 0.7525 to 5.5 VDC output, and Eutectic Tin/Lead solder. Please consult factory regarding availability of a specific version.

The YNM12S05 is not recommended for new designs and has been replaced by the YM12S05. Please refer to the YM12S05 data sheet for new product specifications.

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.

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