YM05S05 DC-DC Converter

3.0-5.5 VDC Input; 0.7525-3.63 VDC Programmable @ 5 A

Bel Power Solutions point-of-load converters are recommended for use with regulated bus converters in an Intermediate Bus Architecture (IBA). The YM05S05 non-isolated dc-dc converters deliver up to 5 A of output current in an industry-standard surface-mount package. Operating from a 3.0 – 5.5 V input, these converters are ideal choices for Intermediate Bus Architectures where Point-of-Load (POL) power delivery is generally a requirement. They provide an extremely tight regulated programmable output voltage from 0.7525 V to 3.63 V.

The Y-Series of converters 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.

Key Features & Benefits

- RoHS lead free and lead-solder-exempted products are available
- Delivers up to 5 A
- No derating up to 85 °C
- 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 [2.22 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 ON/OFF
- Fixed frequency operation
- Auto-reset output over-current protection
- Auto-reset over-temperature protection
- High reliability, MTBF approx. 69 Million Hours calculated per Telcordia TR-332, Method I Case 1
- All materials meet UL94, V-0 flammability rating
- UL60950 recognition in U.S. & Canada, and DEMKO certification per IEC/EN60950

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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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			300		kHz
Output Voltage Trim Range[1]	By external resistor, See Trim Table 1	0.7525		3.63	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)		3.5		ms
With Enable (Vin = Vin(nom) applied, then enabled)	From enable to Vo = 0.1*Vo(nom)		3.5		ms
Rise time[2] (Full resistive load)	From 0.1*Vo(nom) to 0.9*Vo(nom)		3.5		ms
ON/OFF Control [3]	Converter Off	2.4		5.5	VDC
	Converter On	-5		0.8	VDC
Input Characteristics					
Operating Input Voltage Range	For Vout 2.5 V	4.5	5.0	5.5	VDC
	For Vout 2.5 V	3.0	5.0	5.5	VDC
Input Undervoltage Lockout					
Turn-on Threshold			2.3	2. 5	VDC
Turn-off Threshold		2	2.2		VDC
Maximum Input Current					
V_{IN} = 4.5 VDC, I_{OUT} = 5 A	V_{OUT} = 3.3 VDC			4.2	ADC
V_{IN} = 3.0 VDC, I_{OUT} = 5 A	V_{OUT} = 2.5 VDC			4.5	ADC
V_{IN} = 3.0 VDC, I_{OUT} = 5 A	V_{OUT} = 2.0 VDC			3.7	ADC
V_{IN} = 3.0 VDC, I_{OUT} = 5 A	V_{OUT} = 1.8 VDC			3.4	ADC
V_{IN} = 3.0 VDC, I_{OUT} = 5 A	V_{OUT} = 1.5 VDC			2.9	ADC
V_{IN} = 3.0 VDC, I_{OUT} = 5 A	V_{OUT} = 1.2 VDC			2.35	ADC
V_{IN} = 3.0 VDC, I_{OUT} = 5 A	V_{OUT} = 1.0 VDC			2.0	ADC
V_{IN} = 3.0 VDC, I_{OUT} = 5 A	V_{OUT} = 0.7525 VDC			1.6	ADC
Input Standby Current (Converter disabled)	Vin = 5.0 VDC		2		mA
Input No Load Current (Converter enabled)	Vin = 5.5 VDC				
	V_{OUT} = 3.3 VDC		70		mA
	V_{OUT} = 2.5 VDC		65		mA
	V_{OUT} = 2.0 VDC		60		mA
	V_{OUT} = 1.8 VDC		55		mA
	V_{OUT} = 1.5 VDC		50		mA
	V_{OUT} = 1.2 VDC		40		mA
	V_{OUT} = 1.0 VDC		35		mA
	V_{OUT} = 0.7525 VDC		30		mA
Input Reflected-Ripple Current - i_s	See Fig. D for setup. (BW = 20 MHz)		TBD		mA_{P-P}

Notes:

1 The output voltage should not exceed 3.63 V.

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.

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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	Vin = 3.0 V – 5.5 V, Full resistive load		0.1	0.2	%Vout
Over Load	From no load to full load		0.3	0.4	%Vout
Output Voltage Tolerance (Over all 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				
Peak-to-Peak	V_{OUT} = 3.3 VDC Full load		50	70	mV_{P-P}
Peak-to-Peak	V_{OUT} = 0.7525 VDC Full load		30	50	mV_{P-P}
External Load Capacitance	Plus full load (resistive)				
Min ESR > 1 mΩ				1,000	µF
Min ESR > 10 mΩ				2,000	µF
Output Current Range		0		5	A
Output Current Limit Inception (I_{OUT})			10	14	A
Output Short-Circuit Current (Hiccup mode)	Short = 10 mΩ, continuous		3	5	Arms
Dynamic Response					
Load current change from 2.5 A – 5 A, di/dt = 5 A/µs	Co = 47 µF ceramic. + 1 µF ceramic		110		mV
Settling Time (V_{OUT} < 10% peak deviation)			35		µs
Unloading current change 5 A – 2.5 A, di/dt = -5 A/µs	Co = 47 µF ceramic + 1 µF ceramic		110		mV
Settling Time (V_{OUT} < 10% peak deviation)			35		µs
Efficiency	Full load (5 A)				
	V_{OUT} = 3.3 VDC		94.0		%
	V_{OUT} = 2.5 VDC		92.0		%
	V_{OUT} = 2.0 VDC		90.0		%
	V_{OUT} = 1.8 VDC		89.5		%
	V_{OUT} = 1.5 VDC		87.0		%
	V_{OUT} = 1.2 VDC		85.5		%
	V_{OUT} = 1.0 VDC		83.5		%
	V_{OUT} = 0.7525 VDC		80.0		%

Notes:

4 Trim resistor connected across the GND and TRIM pins of the converter.

Operations

Input and Output Impedance

The **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 in order to ensure stability of the converter and reduce input ripple voltage. Internally, the converter has 20 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 **YM05S05** 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 improved 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.

ON/OFF (Pin 1)

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

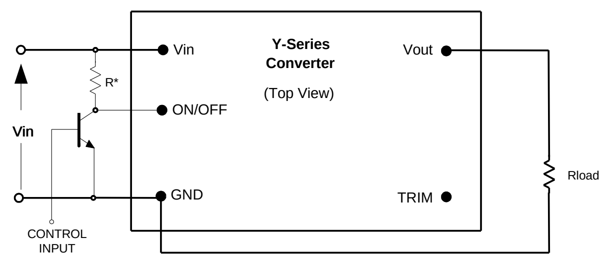

***Fig. A**: Circuit configuration for ON/OFF function.*

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.
ON/OFF pin is internally pulled-down. A TTL or CMOS logic gate, open collector (open drain) transistor can be used to drive ON/OFF pin. When using open collector (open drain) transistor, add a pull-up resistor (R*) of 5 K to Vin as shown in Fig. A. The external pull-up resistor can be increased to 10K if the minimum input voltage is more than 3.0 V and to 20K if the minimum voltage is more than 4.5 V. 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

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 4); see Fig. B. Note that when a trim resistor is not connected, the output voltage of the converter is 0.7525 V.

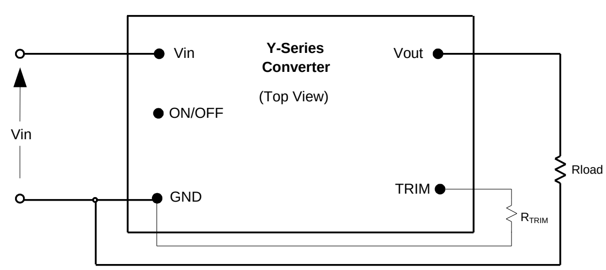

***Fig. B:** Configuration for programming output voltage.*

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

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

where,

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

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

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 with no voltage drop in between. Table 1 provides the trim resistor values for popular output voltages.

Table 1: Trim Resistor Value

$V_{0\text{-}REG}$ [V]	R_{TRIM} [kΩ]	The Closest Standard Value [kΩ]
0.7525	open	
1.0	80.02	80.6
1.2	41.97	42.2
1.5	23.08	23.2
1.8	15.00	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

The output voltage can also be programmed by an external voltage source. To make trimming less sensitive, a series external resistor Rext is recommended between the TRIM pin and the 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 $R_{EXT} = 15K$ are shown in Table 2.

Table 2: Control Voltage [VDC]

$V_{0\text{-}REG}$ [V]	V_{CTRL} (R_{EXT} = 0)	V_{CTRL}(R_{EXT} = 15K)
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	0.212	-1.223

Protection Features

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 2.3 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 2.2 V.

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.

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.

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.

Characterization

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 mounting, 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.

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, comprising two-ounce copper, were used to provide traces for connectivity to the converter.
The lack of metallization 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 tunnel facilities 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. . It is recommended the use of AWG #40 gauge thermocouples to ensure measurement accuracy. Careful routing of the thermocouple leads will further minimize measurement error. Refer to Fig. C for optimum measuring thermocouple location.

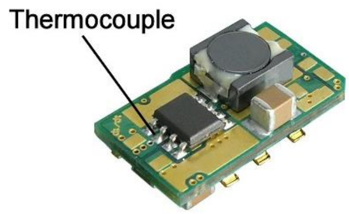

Fig. C: *Location of the thermocouple for thermal testing.*

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 mounting.

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 of 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.

Efficiency

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

Power Dissipation

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

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 shown in Fig. D.

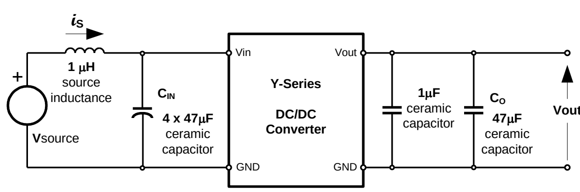

Fig. D: *Test Setup for measuring input reflected ripple currents, is and output voltage ripple.*

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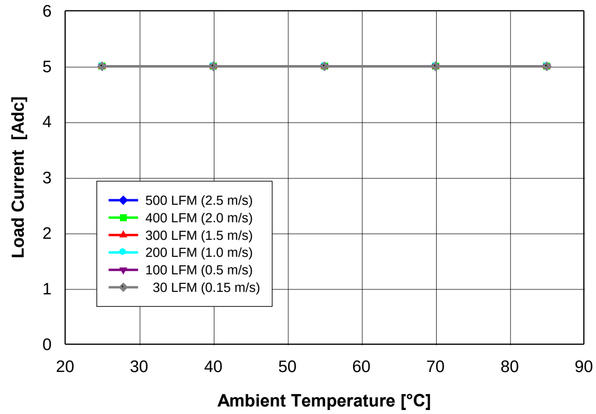

Fig. 3.3V.1: *Available load current vs. ambient temperature and airflow rates for Vout = 3.3 V converter mounted vertically with Vin = 5 V, air flowing from pin 5 to pin 1 and maximum MOSFET temperature ≤ 120 °C.*

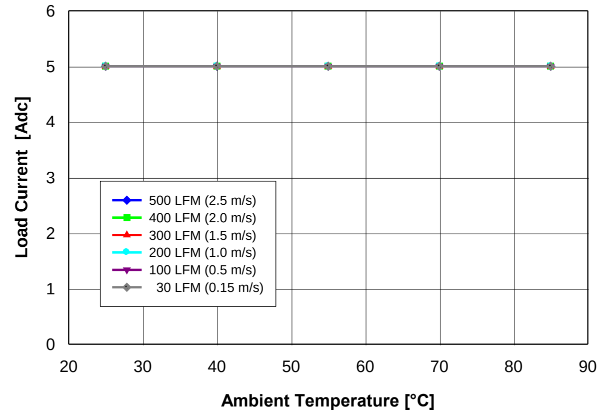

Fig. 3.3V.2: *Available load current vs. ambient temperature and airflow rates for Vout = 3.3 V converter mounted horizontally with Vin = 5 V, air flowing from pin 5 to pin 1 and maximum MOSFET temperature ≤ 120 °C.*

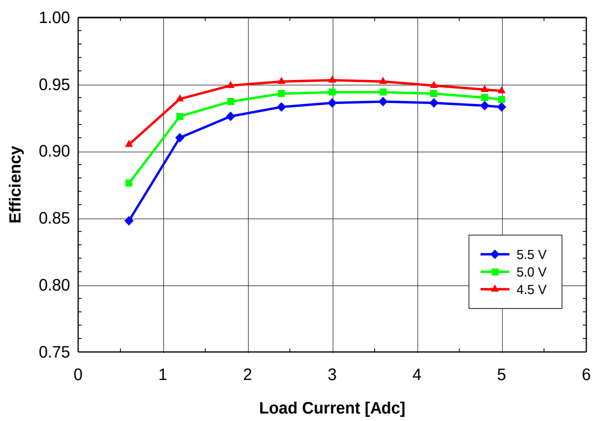

Fig. 3.3V.3: *Efficiency vs. load current and input voltage for Vout = 3.3 V converter mounted vertically with air flowing from pin 5 to pin 1 at a rate of 200 LFM (1 m/s) and Ta = 25 °C.*

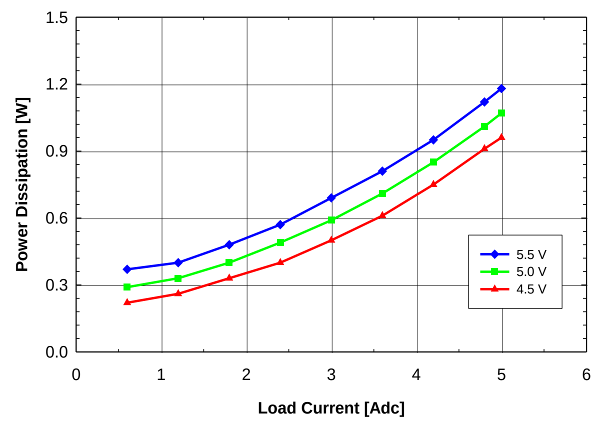

Fig. 3.3V.4: *Power Loss vs. load current and input voltage for Vout = 3.3 V converter mounted vertically with air flowing from pin 5 to pin 1 at a rate of 200 LFM (1 m/s) and Ta = 25 °C.*

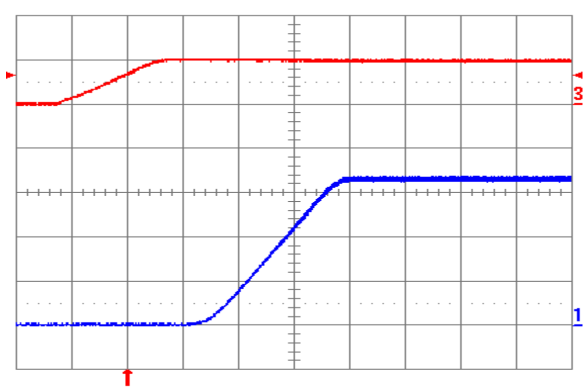

Fig. 3.3V.5: *Turn-on transient for Vout = 3.3 V with application of Vin at full rated load current (resistive) and 47 µF external capacitance at Vin = 5 V. Top trace: Vin (5 V/div.); Bottom trace: output voltage (1V/div.); Time scale: 2 ms/div.*

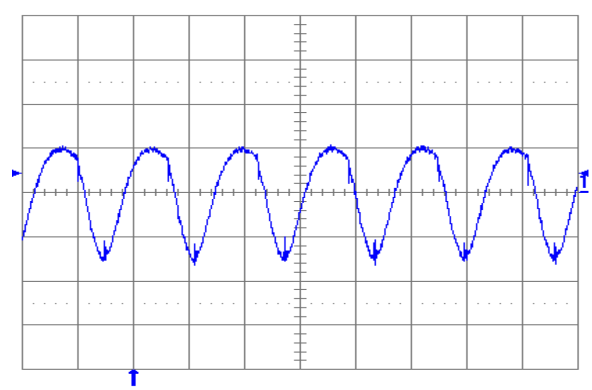

Fig. 3.3V.6: *Output voltage ripple (20 mV/div.) at full rated load current into a resistive load with external capacitance 10 µF ceramic + 1 µF ceramic and Vin = 5 V for Vout = 3.3 V. Time scale: 2 µs/div.*

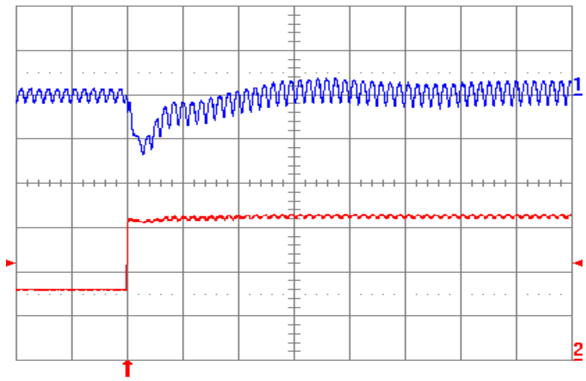

Fig. 3.3V.7: *Output voltage response for Vout = 3.3 V to positive load current step change from 2.5 A to 5 A with slew rate of 5 A/µs at Vin = 5 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (2 A/div.). Co = 47 µF ceramic + 1 µF ceramic. Time scale: 20 µs/div.*

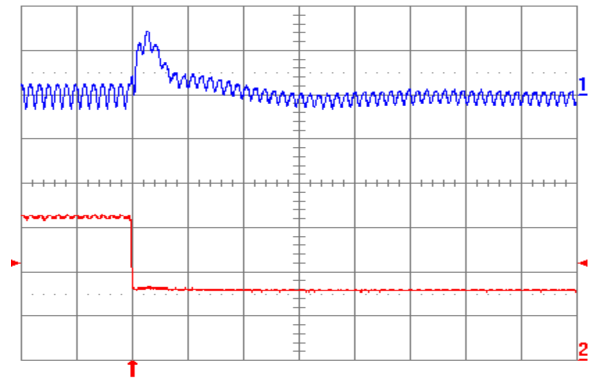

Fig. 3.3V.8: *Output voltage response for Vout = 3.3 V to negative load current step change from 5 A to 2.5 A with slew rate of -5 A/µs at Vin = 5 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (2 A/div.). Co = 47 µF ceramic + 1 µF ceramic. Time scale: 20 µs/div.*

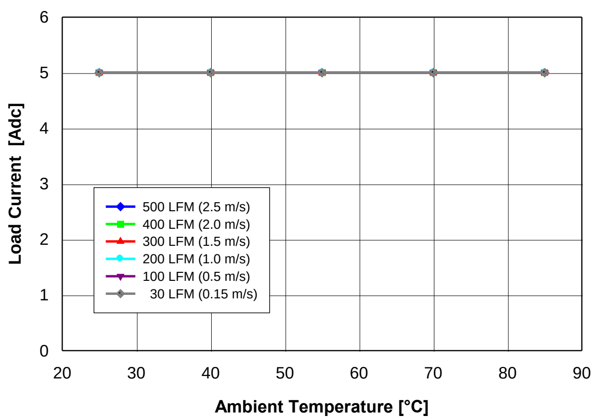

Fig. 2.5V.1: *Available load current vs. ambient temperature and airflow rates for Vout = 2.5 V converter mounted vertically with Vin = 5 V, air flowing from pin 5 to pin 1 and maximum MOSFET temperature ≤ 120 °C.*

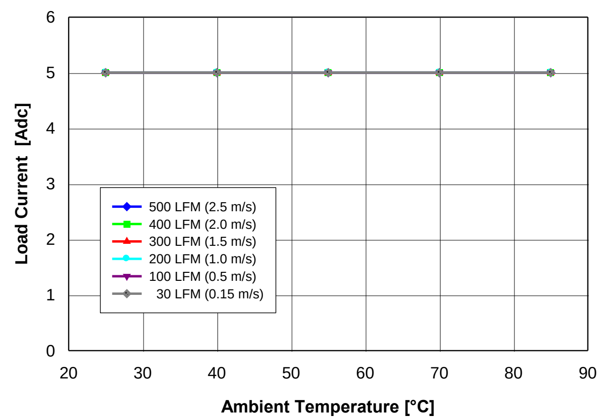

Fig. 2.5V.2: *Available load current vs. ambient temperature and airflow rates for Vout = 2.5 V converter mounted horizontally with Vin = 5 V, air flowing from pin 5 to pin 1 and maximum MOSFET temperature ≤ 120 °C.*

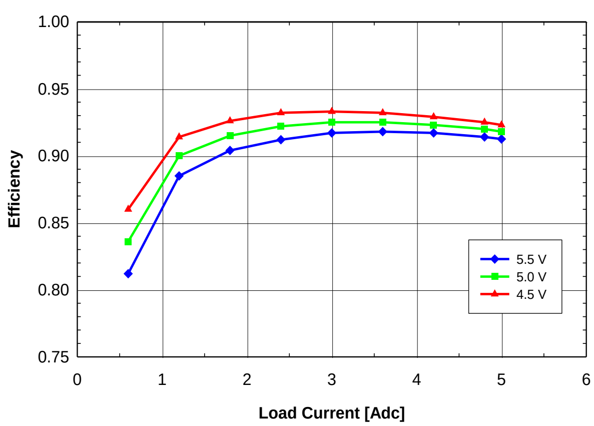

Fig. 2.5V.3: *Efficiency vs. load current and input voltage for Vout = 2.5 V converter mounted vertically with air flowing from pin 5 to pin 1 at a rate of 200 LFM (1 m/s) and Ta = 25 °C.*

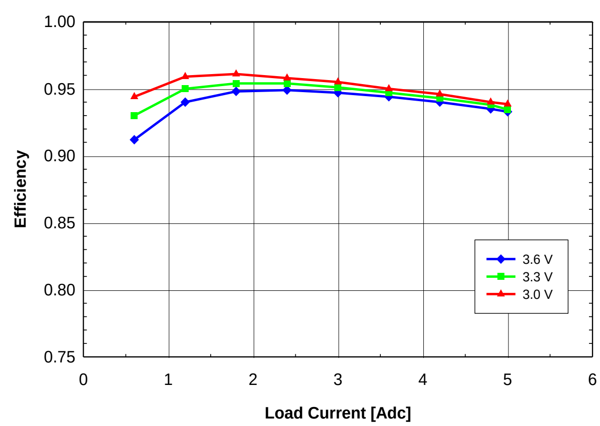

Fig. 2.5V.4: *Efficiency vs. load current and input voltage for Vout = 2.5 V converter mounted vertically with air flowing from pin 5 to pin 1 at a rate of 200 LFM (1 m/s) and Ta = 25 °C.*

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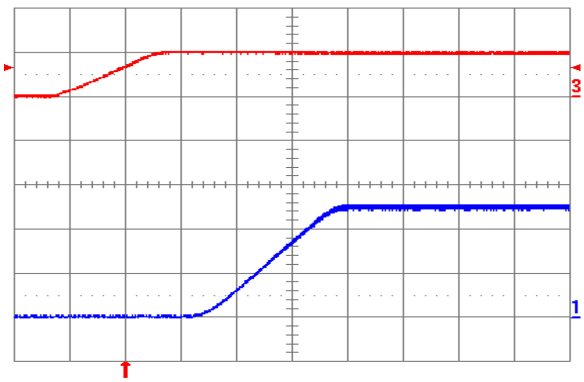

Fig. 2.5V.4: *Turn-on transient for Vout = 2.5 V with application of Vin at full rated load current (resistive) and 47 µF external capacitance at Vin = 5 V. Top trace: Vin (5 V/div.); Bottom trace: output voltage (1V/div.); Time scale: 2 ms/div.*

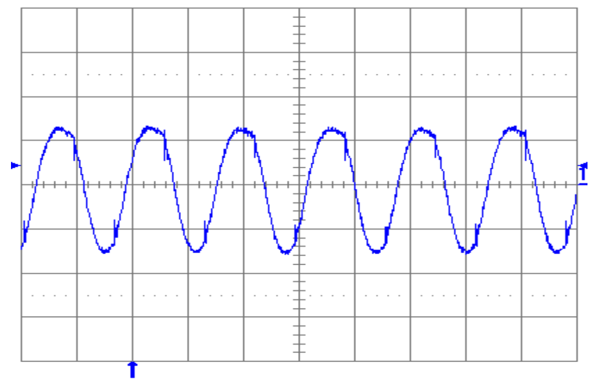

Fig. 2.5V.5: *Output voltage ripple (20 mV/div.) at full rated load current into a resistive load with external capacitance 10 µF ceramic + 1 µF ceramic and Vin = 5 V for Vout = 2.5 V. Time scale: 2 µs/div.*

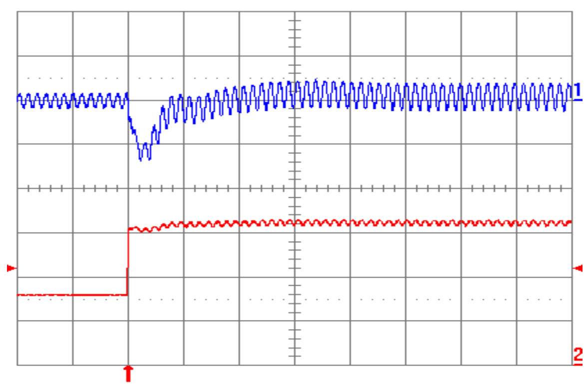

Fig. 2.5V.7: *Output voltage response for Vout = 2.5 V to positive load current step change from 2.5 A to 5 A with slew rate of 5 A/µs at Vin = 5 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (2 A/div.). Co = 47 µF ceramic + 1 µF ceramic. Time scale: 20 µs/div.*

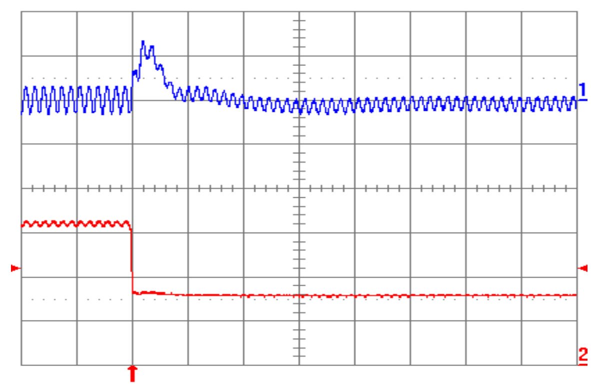

Fig. 2.5V.8: *Output voltage response for Vout = 2.5 V to negative load current step change from 5 A to 2.5 A with slew rate of -5 A/µs at Vin = 5 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (2 A/div.). Co = 47 µF ceramic + 1 µF ceramic. Time scale: 20 µs/div.*

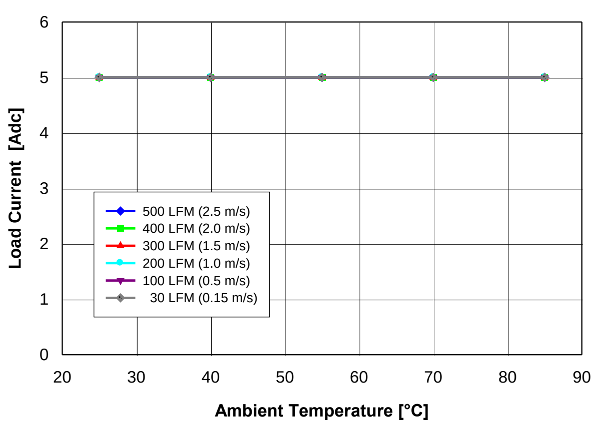

Fig. 2.0V.1: *Available load current vs. ambient temperature and airflow rates for Vout = 2.0 V converter mounted vertically with Vin = 5 V, air flowing from pin 5 to pin 1 and maximum MOSFET temperature ≤ 120 °C.*

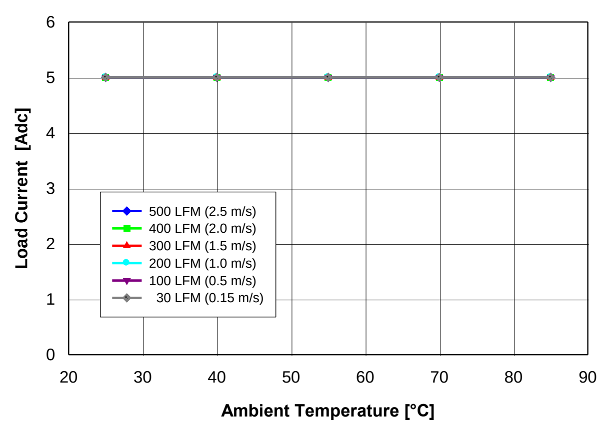

Fig. 2.0V.2: *Available load current vs. ambient temperature and airflow rates for Vout = 2.0 V converter mounted horizontally with Vin = 5 V, air flowing from pin 5 to pin 1 and maximum MOSFET temperature ≤ 120 °C.*

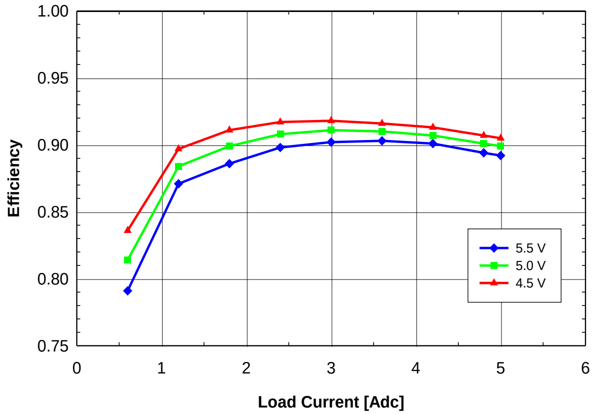

Fig. 2.0V.3: *Efficiency vs. load current and input voltage for Vout = 2.0 V converter mounted vertically with air flowing from pin 5 to pin 1 at a rate of 200 LFM (1 m/s) and Ta = 25°C.*

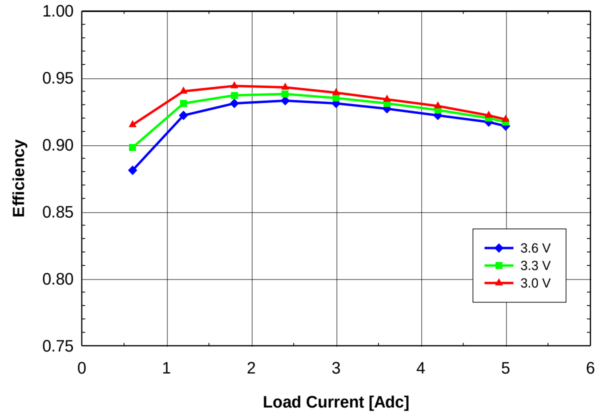

Fig. 2.0V.4: *Efficiency vs. load current and input voltage for Vout = 2.0 V converter mounted vertically with air flowing from pin 5 to pin 1 at a rate of 200 LFM (1 m/s) and Ta = 25°C.*

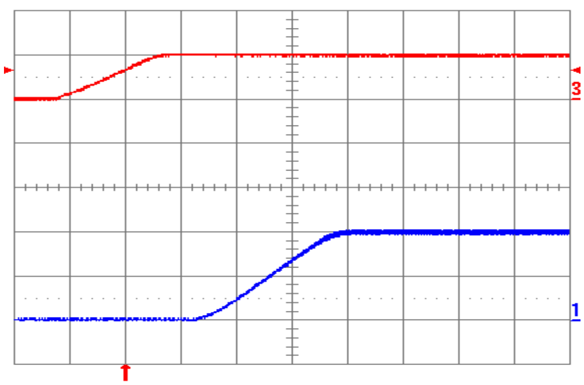

Fig. 2.0V.5: *Turn-on transient for Vout = 2.0 V with application of Vin at full rated load current (resistive) and 47 µF external capacitance at Vin = 5 V. Top trace: Vin (5 V/div.); Bottom trace: output voltage (1 V/div.); Time scale: 2 ms/div.*

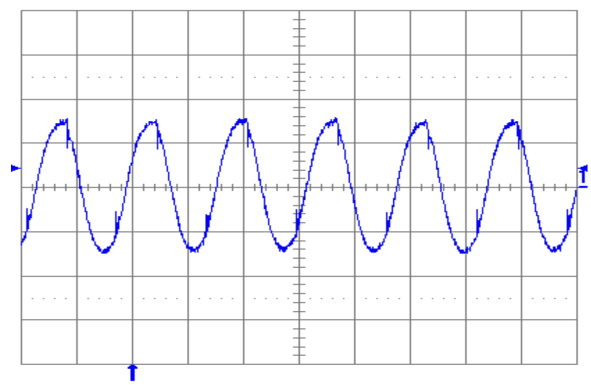

Fig. 2.0V.6: *Output voltage ripple (20 mV/div.) at full rated load current into a resistive load with external capacitance 10 µF ceramic + 1 µF ceramic and Vin = 5 V for Vout = 2.0 V. Time scale: 2 µs/div.*

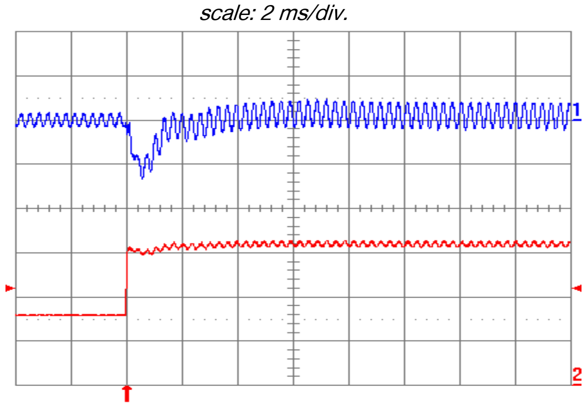

Fig. 2.0V.7: *Output voltage response for Vout = 2.0 V to positive load current step change from 2.5 A to 5 A with slew rate of 5 A/µs at Vin = 5 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (2 A/div.). Co = 47 µF ceramic + 1 µF ceramic. Time scale: 20 µs/div.*

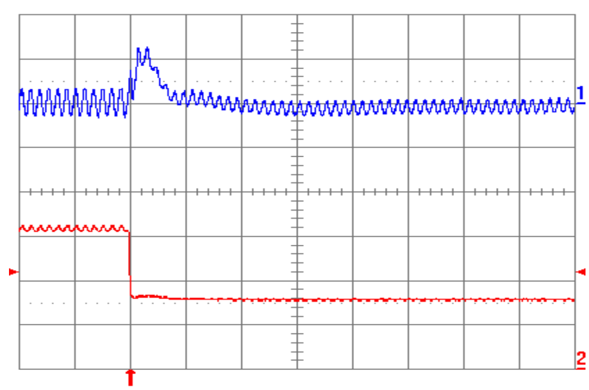

Fig. 2.0V.8: *Output voltage response for Vout = 2.0 V to negative load current step change from 5 A to 2.5 A with slew rate of -5 A/µs at Vin = 5 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (2 A/div.). Co = 47 µF ceramic + 1 µF ceramic. Time scale: 20 µs/div.*

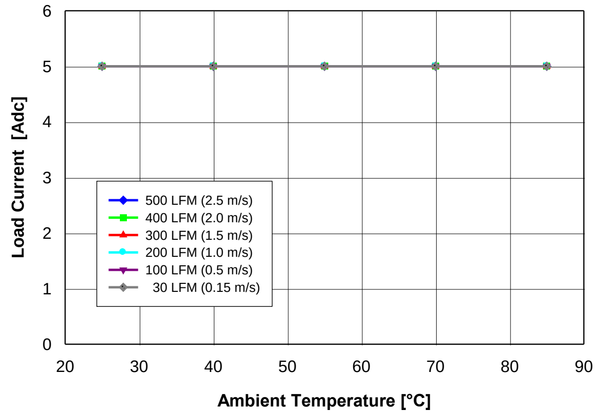

Fig. 1.8V.1: *Available load current vs. ambient temperature and airflow rates for Vout = 1.8 V converter mounted vertically with Vin = 5 V, air flowing from pin 5 to pin 1 and maximum MOSFET temperature ≤ 120 °C.*

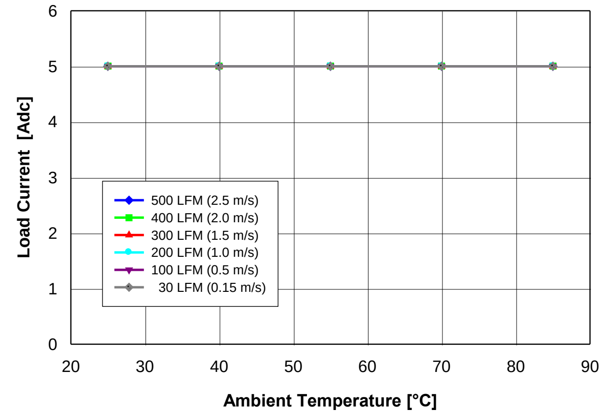

Fig. 1.8V.2: *Available load current vs. ambient temperature and airflow rates for Vout = 1.8 V converter mounted horizontally with Vin = 5 V, air flowing from pin 5 to pin 1 and maximum MOSFET temperature ≤ 120 °C.*

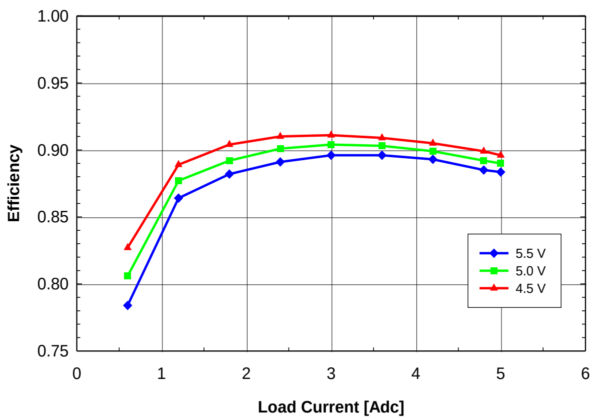

Fig. 1.8V.3: *Efficiency vs. load current and input voltage for Vout = 1.8 V converter mounted vertically with air flowing from pin 5 to pin 1 at a rate of 200 LFM (1 m/s) and Ta = 25 °C.*

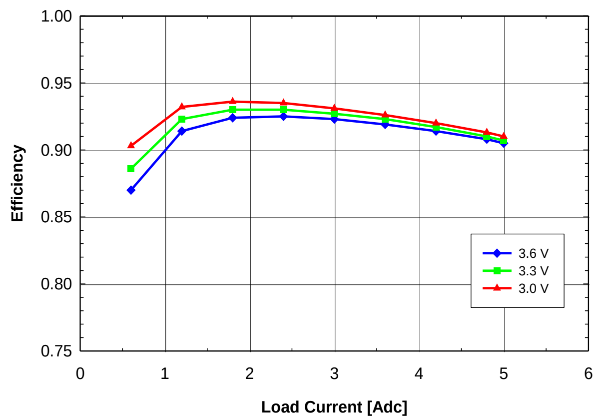

Fig. 1.8V.4: *Efficiency vs. load current and input voltage for Vout = 1.8 V converter mounted vertically with air flowing from pin 5 to pin 1 at a rate of 200 LFM (1 m/s) and Ta = 25 °C.*

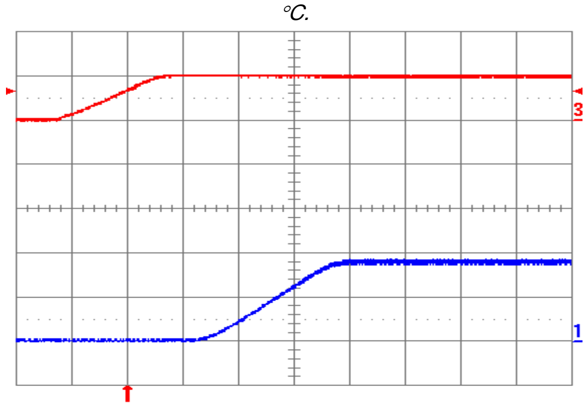

Fig. 1.8V.5: *Turn-on transient for Vout = 1.8 V with application of Vin at full rated load current (resistive) and 47 µF external capacitance at Vin = 5 V. Top trace: Vin (5 V/div.); Bottom trace: output voltage (1 V/div.); Time scale: 2 ms/div.*

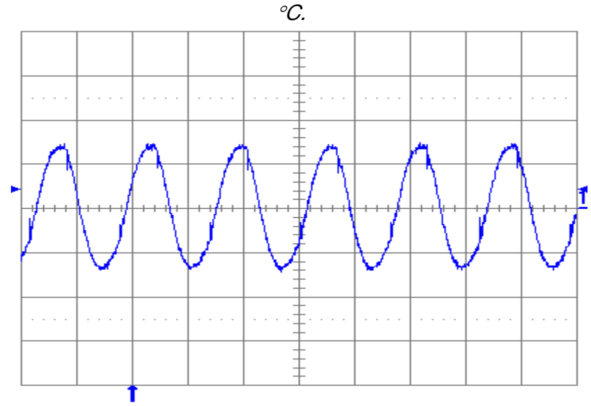

Fig. 1.8V.6: *Output voltage ripple (20 mV/div.) at full rated load current into a resistive load with external capacitance 10 µF ceramic + 1 µF ceramic and Vin = 5 V for Vout = 1.8 V. Time scale: 2 µs/div.*

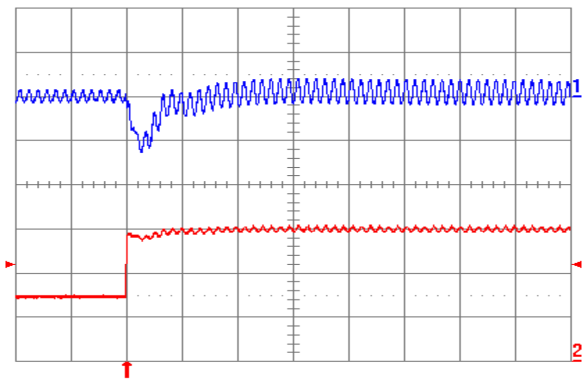

Fig. 1.8V.7: *Output voltage response for Vout = 1. 8V to positive load current step change from 2.5 A to 5 A with slew rate of 5 A/µs at Vin = 5 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (2 A/div.). Co = 47 µF ceramic + 1 µF ceramic. Time scale: 20 µs/div.*

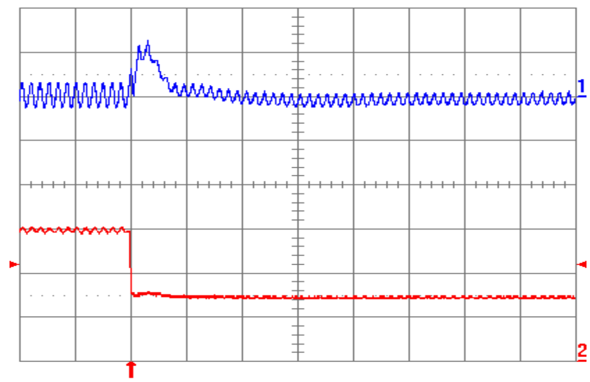

Fig. 1.8V.8: *Output voltage response for Vout = 1.8 V to negative load current step change from 5 A to 2.5 A with slew rate of -5 A/µs at Vin = 5 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (2 A/div.). Co = 47 µF ceramic + 1 µF ceramic. Time scale: 20 µs/div.*

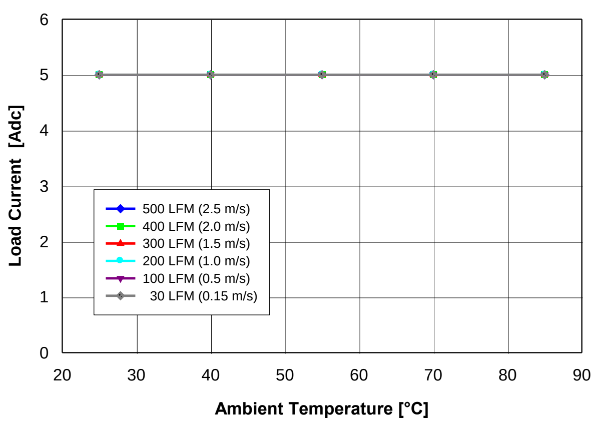

Fig. 1.5V.1: *Available load current vs. ambient temperature and airflow rates for Vout = 1.5 V converter mounted vertically with Vin = 5 V, air flowing from pin 5 to pin 1 and maximum MOSFET temperature ≤ 120 °C.*

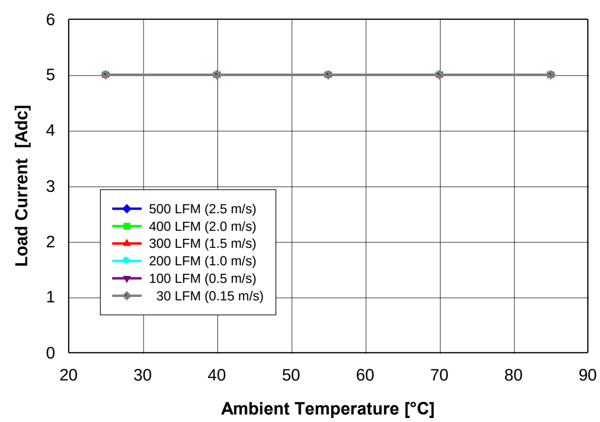

Fig. 1.5V.2: *Available load current vs. ambient temperature and airflow rates for Vout = 1.5 V converter mounted horizontally with Vin = 5 V, air flowing from pin 5 to pin 1 and maximum MOSFET temperature ≤ 120 °C.*

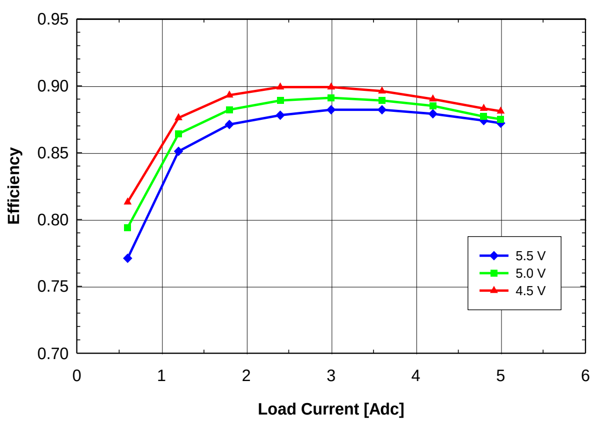

Fig. 1.5V.3: *Efficiency vs. load current and input voltage for Vout = 1.5 V converter mounted vertically with air flowing from pin 5 to pin 1 at a rate of 200 LFM (1 m/s) and Ta = 25 °C.*

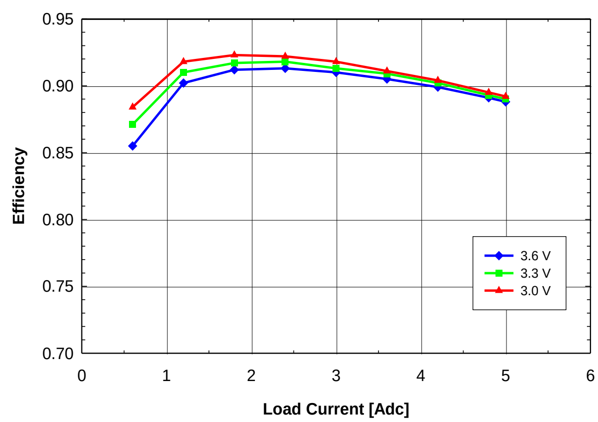

Fig. 1.5V.4: *Efficiency vs. load current and input voltage for Vout = 1.5 V converter mounted vertically with air flowing from pin 5 to pin 1 at a rate of 200 LFM (1 m/s) and Ta = 25 °C.*

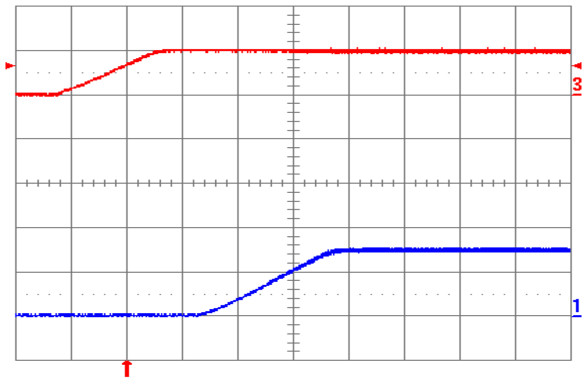

Fig. 1.5V.5: *Turn-on transient for Vout = 1.5 V with application of Vin at full rated load current (resistive) and 47 µF external capacitance at Vin = 5 V. Top trace: Vin (5 V/div.); Bottom trace: output voltage (1 V/div.); Time scale: 2 ms/div.*

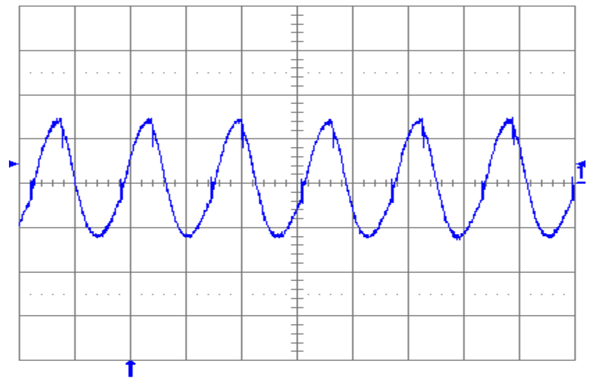

Fig. 1.5V.6: *Output voltage ripple (20 mV/div.) at full rated load current into a resistive load with external capacitance 10 µF ceramic + 1 µF ceramic and Vin = 5 V for Vout = 1.5 V. Time scale: 2 µs/div.*

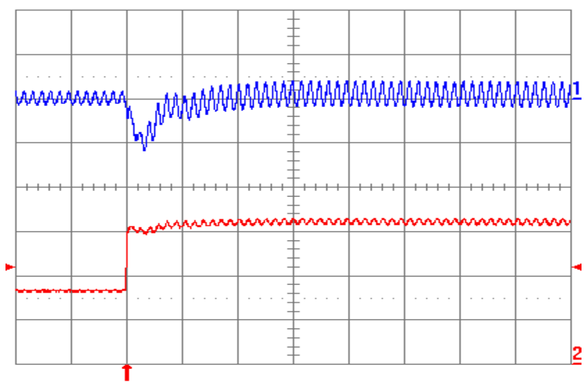

Fig. 1.5V.7: *Output voltage response for Vout = 1.5 V to positive load current step change from 2.5 A to 5 A with slew rate of 5 A/µs at Vin = 5 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (2 A/div.). Co = 47 µF ceramic + 1 µF ceramic. Time scale: 20 µs/div.*

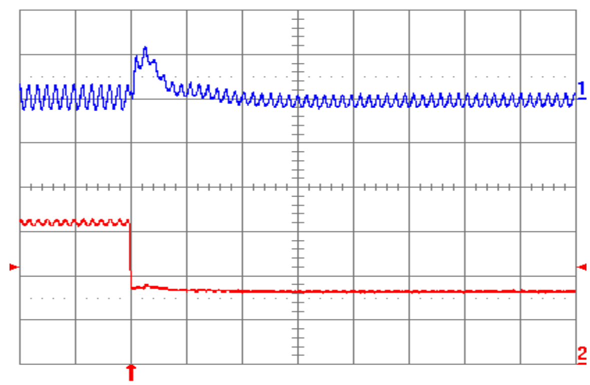

Fig. 1.5V.8: *Output voltage response for Vout = 1.5 V to negative load current step change from 5 A to 2.5 A with slew rate of -5 A/µs at Vin = 5 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (2 A/div.). Co = 47 µF ceramic + 1 µF ceramic. Time scale: 20 µs/div.*

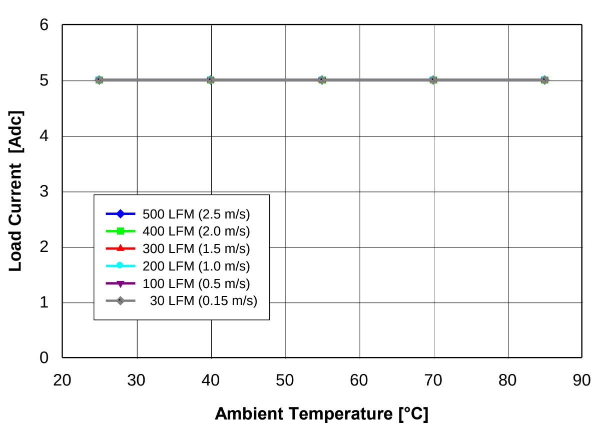

Fig. 1.2V.1: *Available load current vs. ambient temperature and airflow rates for Vout = 1.2 V converter mounted vertically with Vin = 5 V, air flowing from pin 5 to pin 1 and maximum MOSFET temperature ≤ 120 °C.*

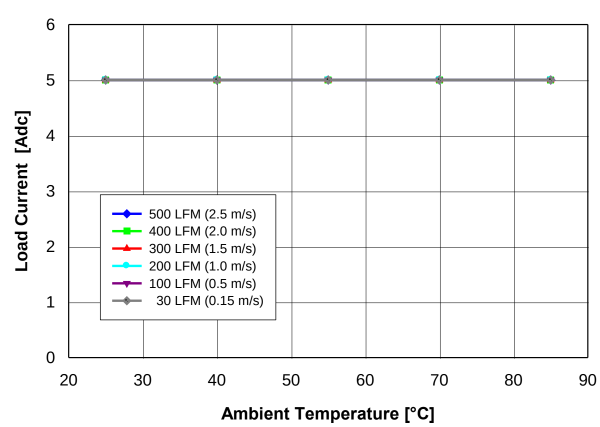

Fig. 1.2V.2: *Available load current vs. ambient temperature and airflow rates for Vout = 1.2 V converter mounted horizontally with Vin = 5 V, air flowing from pin 5 to pin 1 and maximum MOSFET temperature ≤ 120 °C.*

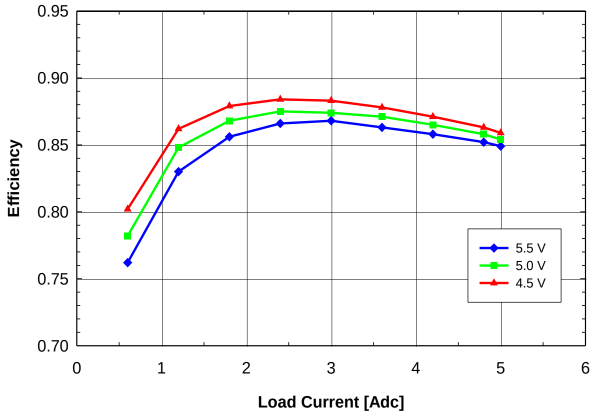

Fig. 1.2V.3: *Efficiency vs. load current and input voltage for Vout = 1.2 V converter mounted vertically with air flowing from pin 5 to pin 1 at a rate of 200 LFM (1 m/s) and Ta = 25 °C.*

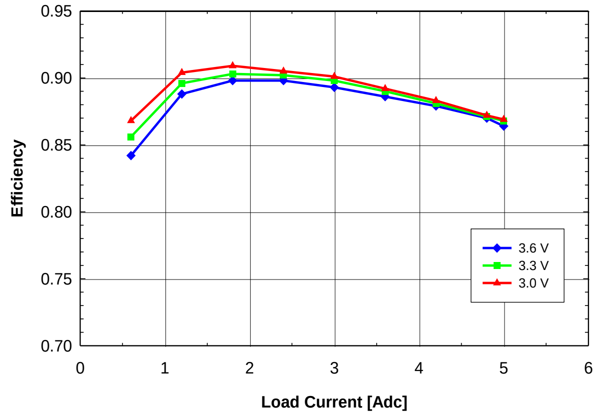

Fig. 1.2V.4: *Efficiency vs. load current and input voltage for Vout = 1.2 V converter mounted vertically with air flowing from pin 5 to pin 1 at a rate of 200 LFM (1m/s) and Ta = 25 °C.*

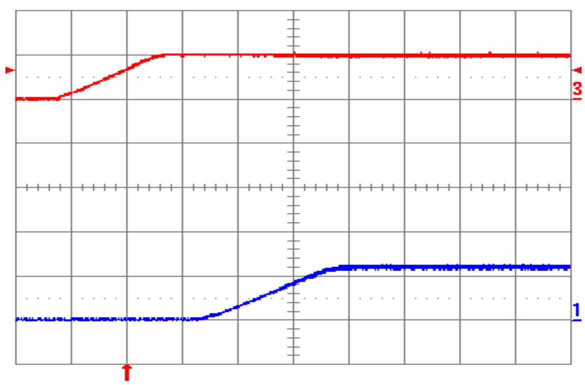

Fig. 1.2V.5: *Turn-on transient for Vout = 1.2 V with application of Vin at full rated load current (resistive) and 47 µF external capacitance at Vin = 5 V. Top trace: Vin (5 V/div.); Bottom trace: output voltage (1 V/div.); Time scale: 2 ms/div.*

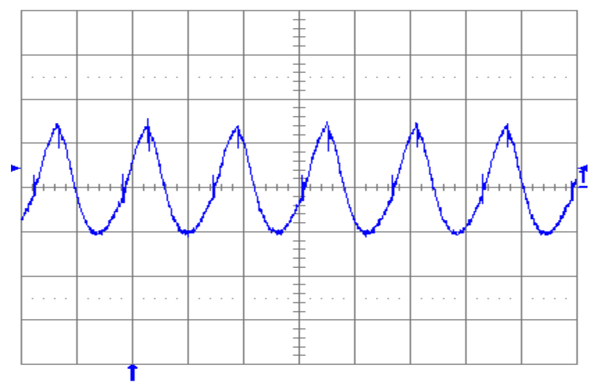

Fig. 1.2V.6: *Output voltage ripple (20 mV/div.) at full rated load current into a resistive load with external capacitance 10 µF ceramic + 1 µF ceramic and Vin = 5 V for Vout = 1.2 V. Time scale: 2 µs/div.*

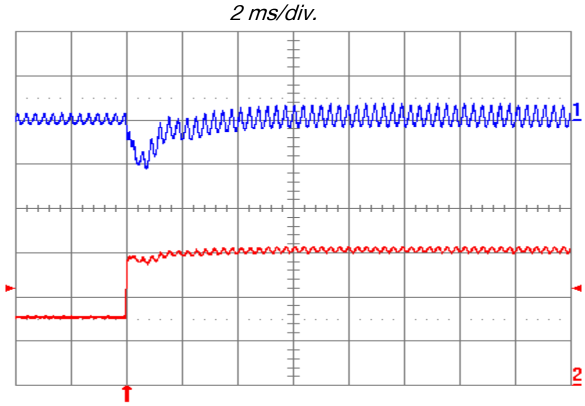

Fig. 1.2V.6: *Output voltage response for Vout = 1.2 V to positive load current step change from 2.5 A to 5 A with slew rate of 5 A/µs at Vin = 5 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (2 A/div.). Co = 47 µF ceramic + 1 µF ceramic. Time scale: 20 µs/div.*

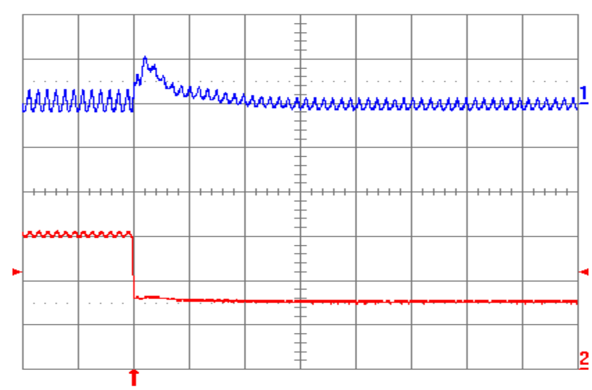

Fig. 1.2V.8: *Output voltage response for Vout = 1.2 V to negative load current step change from 5 A to 2.5 A with slew rate of -5 A/µs at Vin = 5 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (2 A/div.). Co = 47 µF ceramic + 1 µF ceramic. Time scale: 20 µs/div.*

YM05S05 DC-DC Converter

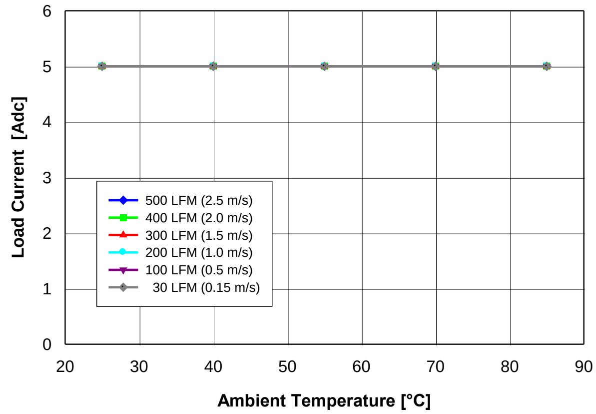

Fig. 1.0V.1: *Available load current vs. ambient temperature and airflow rates for Vout = 1.0 V converter mounted vertically with Vin = 5 V, air flowing from pin 5 to pin 1 and maximum MOSFET temperature ≤ 120 °C.*

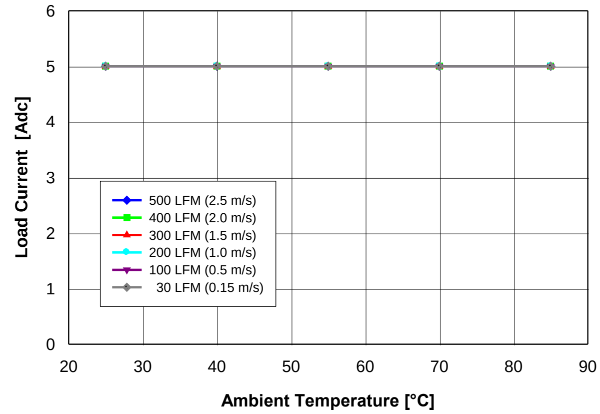

Fig. 1.0V.2: *Available load current vs. ambient temperature and airflow rates for Vout = 1.0 V converter mounted horizontally with Vin = 5 V, air flowing from pin 5 to pin 1 and maximum MOSFET temperature ≤ 120 °C.*

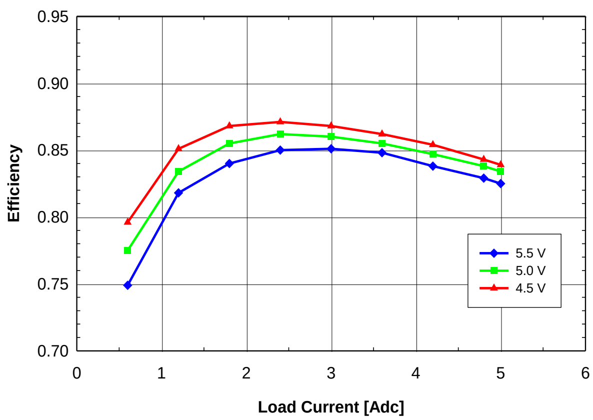

Fig. 1.0V.3: *Efficiency vs. load current and input voltage for Vout = 1.0 V converter mounted vertically with air flowing from pin 5 to pin 1 at a rate of 200 LFM (1 m/s) and Ta = 25 °C.*

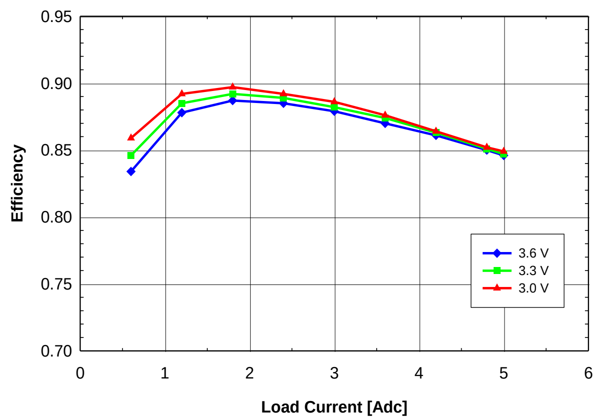

Fig. 1.0V.4: *Efficiency vs. load current and input voltage for Vout = 1.0 V converter mounted vertically with air flowing from pin 5 to pin 1 at a rate of 200 LFM (1m/s) and Ta = 25 °C.*

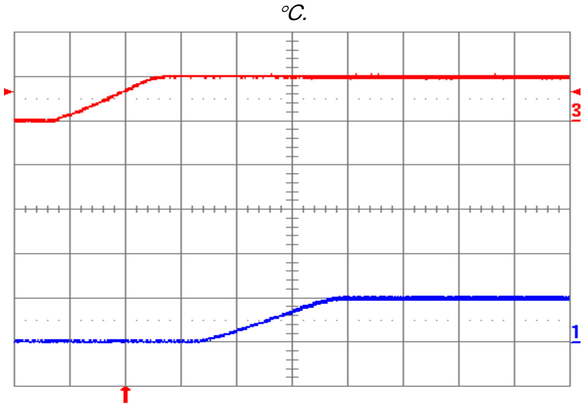

Fig. 1.0V.5: *Turn-on transient for Vout = 1.0 V with application of Vin at full rated load current (resistive) and 47 μF external capacitance at Vin = 5 V. Top trace: Vin (5 V/div.); Bottom trace: output voltage (1 V/div.); Time scale: 2 ms/div.*

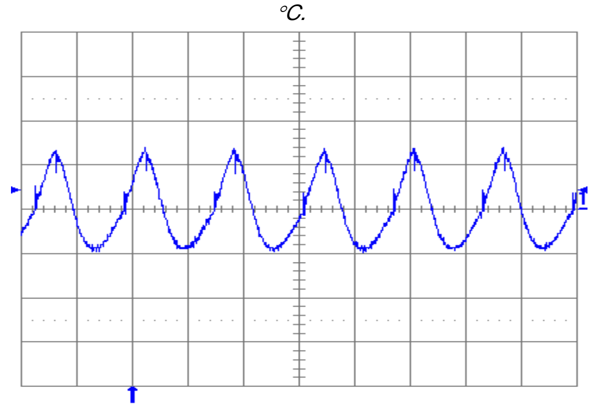

Fig. 1.0V.6: *Output voltage ripple (20 mV/div.) at full rated load current into a resistive load with external capacitance 10 μF ceramic + 1 μF ceramic and Vin = 5 V for Vout = 1.0 V. Time scale: 2 μs/div.*

YM05S05 DC-DC Converter

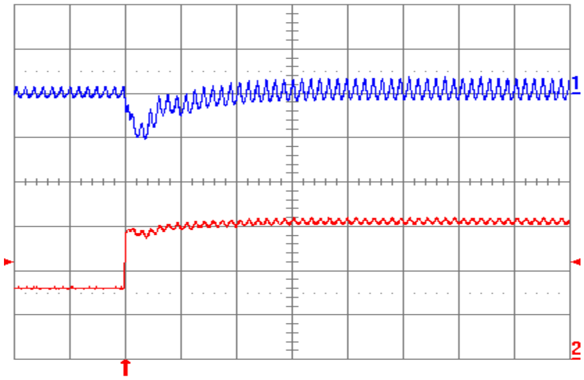

Fig. 1.0V.7: *Output voltage response for Vout = 1.0 V to positive load current step change from 2.5 A to 5 A with slew rate of 5 A/µs at Vin = 5 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (2 A/div.). Co = 47 µF ceramic + 1 µF ceramic. Time scale: 20 µs/div.*

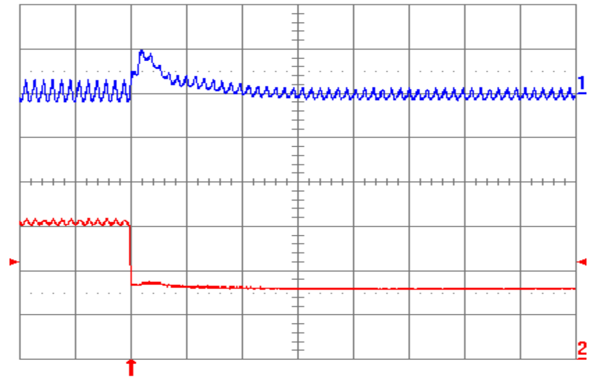

Fig. 1.0V.8: *Output voltage response for Vout = 1.0 V to negative load current step change from 5 A to 2.5 A with slew rate of -5 A/µs at Vin = 5 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (2 A/div.). Co = 47 µF ceramic + 1 µF ceramic. Time scale: 20 µs/div.*

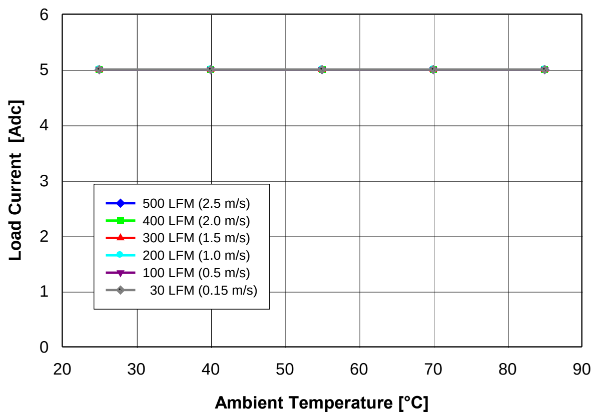

Fig. 0.7525V.1: *Available load current vs. ambient temperature and airflow rates for Vout = 0.7525 V converter mounted vertically with Vin = 5 V, air flowing from pin 5 to pin 1 and maximum MOSFET temperature ≤ 120 °C.*

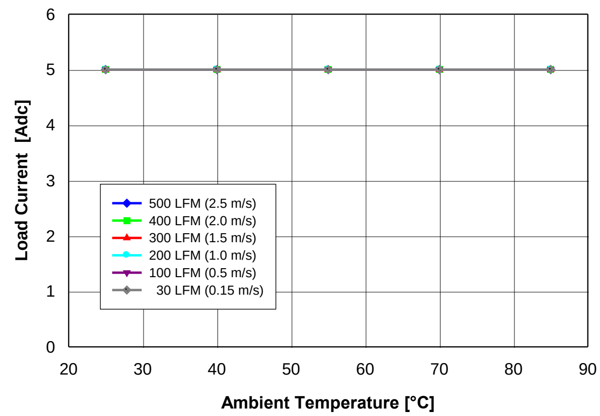

Fig. 0.7525V.2: *Available load current vs. ambient temperature and airflow rates for Vout = 0.7525 V converter mounted horizontally with Vin = 5 V, air flowing from pin 5 to pin 1 and maximum MOSFET temperature ≤ 120 °C.*

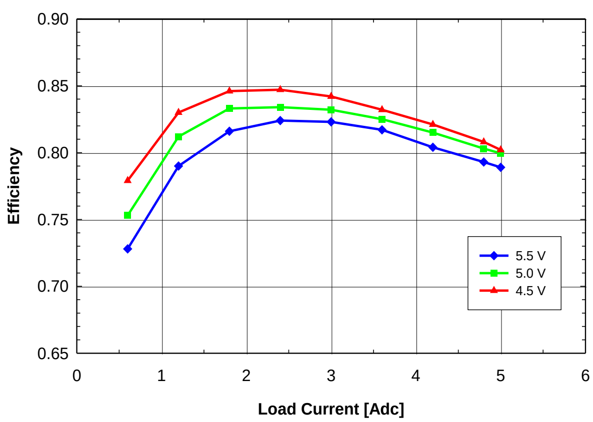

Fig. 0.7525V.3: *Efficiency vs. load current and input voltage for Vout = 0.7525 V converter mounted vertically with air flowing from pin 5 to pin 1 at a rate of 200 LFM (1 m/s) and Ta = 25 °C.*

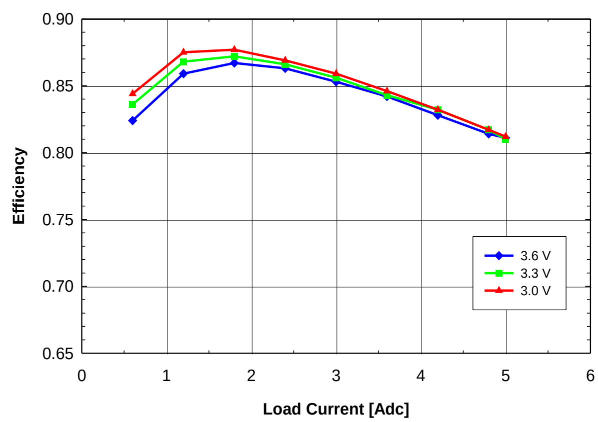

Fig. 0.7525V.4: *Efficiency vs. load current and input voltage for Vout = 0.7525 V converter mounted vertically with air flowing from pin 5 to pin 1 at a rate of 200 LFM (1 m/s) and Ta = 25 °C.*

YM05S05 DC-DC Converter

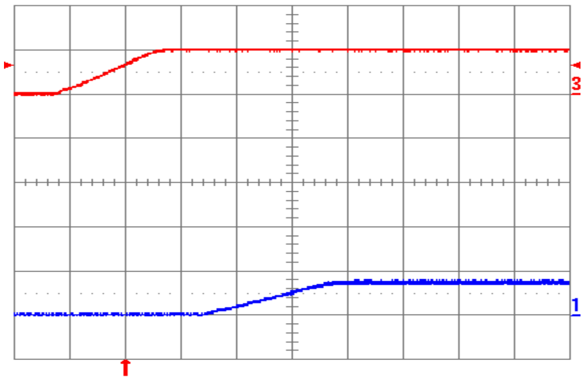

Fig. 0.7525V.4: *Turn-on transient for Vout = 0.7525 V with application of Vin at full rated load current (resistive) and 47 µF external capacitance at Vin = 5 V. Top trace: Vin (5 V/div.); Bottom trace: output voltage (1 V/div.); Time scale: 2 ms/div.*

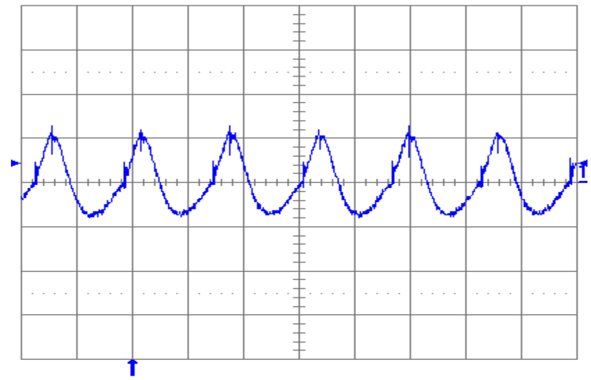

Fig. 0.7525V.5: *Output voltage ripple (20 mV/div.) at full rated load current into a resistive load with external capacitance 10 µF ceramic + 1 µF ceramic and Vin = 5 V for Vout = 0.7525 V. Time scale: 2 µs/div.*

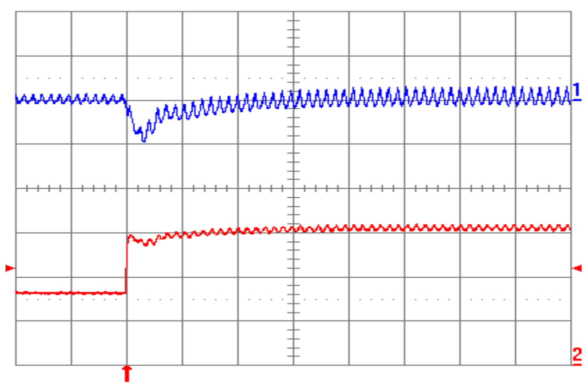

Fig. 0.7525V.7: *Output voltage response for Vout = 0.7525 V to positive load current step change from 2.5 A to 5 A with slew rate of 5 A/µs at Vin = 5 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (2 A/div.). Co = 47 µF ceramic + 1 µF ceramic. Time scale: 20 µs/div.*

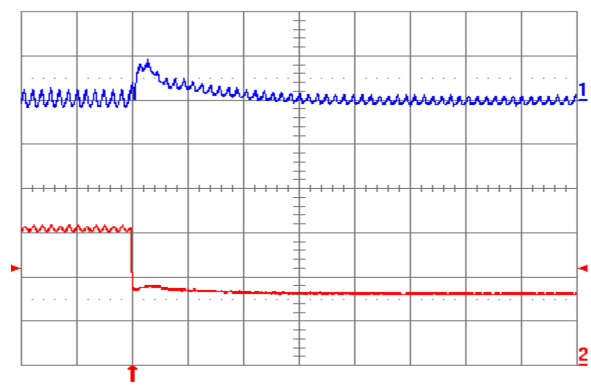

Fig. 0.7525V.8: *Output voltage response for Vout = 0.7525 V to negative load current step change from 5 A to 2.5 A with slew rate of -5 A/µs at Vin = 5 V. Top trace: output voltage (100 mV/div.); Bottom trace: load current (2 A/div.). Co = 47 µF ceramic + 1 µF ceramic. Time scale: 20 µs/div.*

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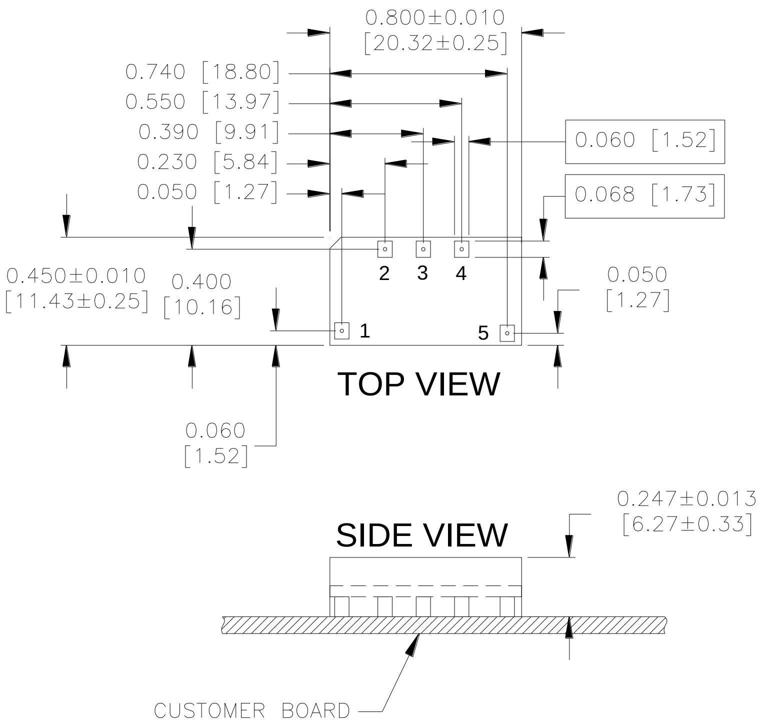
YM05S05 DC-DC Converter

Physical Information



YM05S Pinout (Surface Mount)

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

YM05S Platform Notes

- All dimensions are in inches [mm]
- Connector Material: Copper
- Connector Finish: Gold over Nickel
- Converter Weight: 0.08 oz [2.22 g]
- Converter Height: 0.260” Max., 0.234” Min.
- Recommended Surface-Mount Pads: Min. 0.080” X 0.072” [2.03 x 1.83]

Ordering Information

Product Series	Input Voltage	Mounting Scheme	Rated Load Current		RoHS Compatible
YM	**05**	**S**	**05**	–	
Y-Series	3.0 – 5.5 V	S ⇒ Surface-Mount	5 A (0.7525 V to 3.63 V)		No Suffix ⇒ RoHS lead-solder-exempt compliant G ⇒ RoHS compliant for all six substances

The example above describes P/N YM05S05: 3.0 – 5.5 V input, surface-mount, 5 A at 0.7525 V to 3.63 V output.
Please consult factory regarding availability of a specific (including RoHS compliant with Pb free solder) version.

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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