

LTC3865EUH-1

DUAL 5A SYNCHRONOUS BUCK CONVERTER with PIN SELECTABLE OUTPUTS

DESCRIPTION

Demonstration circuit 1480A is a dual output synchronous buck DC/DC converter featuring the LTC3865EUH-1. The input voltage range is from 4.5V to 14V. The outputs are 3.3V/5A and 1.8V/5A. Each output voltage can be precisely programmed to a preset value within 1% error with the VID pins. The demo board uses a high density, two sided drop-in layout. The package of LTC3865EUH-1 is a small, low thermal impedance 5mm x 5mm 32-Lead QFN.

The light load operation mode of the converter is determined with the MODE/PLLIN pin. Use JP1 jumper to select burst mode, pulse skipping mode or forced continuous mode operation. Switching frequency is

pre-set at about 500KHz. This frequency can be modified by changing R5 value at the FREQ pin. The converter can also be externally synchronized from 250kHz to 770kHz through MODE/PLLIN pin (SYNC terminal on the board). To shut down a channel, force its RUN pin below 1.2V (Jumper: OFF). The power good output (PGOOD1 or PG00G2 terminal) is low when that channel output exceeds +/-10% regulation window.

Design files for this circuit board are available. Call the LTC factory.

Table 1. Performance Summary ($T_A = 25^\circ\text{C}$)

PARAMETER	CONDITION	VALUE
Input Voltage Range		4.5V to 14V
Output Voltage, V_{OUT1}	$V_{IN} = 4.5\text{-}14\text{V}$, $I_{OUT1} = 0\text{A to } 5\text{A}$	$3.3\text{V} \pm 1\%$
Output Voltage, V_{OUT2}	$V_{IN} = 4.5\text{-}14\text{V}$, $I_{OUT2} = 0\text{A to } 5\text{A}$	$1.8\text{V} \pm 1\%$
Maximum Output Current, I_{OUT1}	$V_{IN} = 4.5\text{-}14\text{V}$, $V_{OUT1} = 3.3\text{V}$	5A
Maximum Output Current, I_{OUT2}	$V_{IN} = 4.5\text{-}14\text{V}$, $V_{OUT2} = 1.8\text{V}$	5A
Typical full load Efficiency, channel 1	$V_{IN} = 12\text{V}$, $V_{OUT1} = 3.3\text{V}$, $I_{OUT1} = 5\text{A}$	91.6%
Typical full load Efficiency, channel 2	$V_{IN} = 12\text{V}$, $V_{OUT2} = 1.8\text{V}$, $I_{OUT2} = 5\text{A}$	86.6%
Typical Switching Frequency		500kHz

QUICK START PROCEDURE

Demonstration circuit 1480A is easy to set up to evaluate the performance of the LTC3865EUH-1. Refer to Figure 1 for the proper measurement equipment setup and follow the procedure below:

Jumper positions:

JP1 (MODE): PS

JP2,3 (RUN1/RUN2): ON

1. With power off, connect the input power supply to Vin (4.5V-14V) and GND (input return).
2. Connect the load #1 between Vout1 and GND (Initial load: no load); connect the load #2 between Vout2 and GND (Initial load: no load).
3. Connect the DVMs to the input and outputs.
4. Turn on the input power supply and check for the proper output voltages. With current VID pin setting, Vout1 should be 3.3V+/-1%; Vout2 should be 1.8V+/-1%.
5. Once the proper output voltages are established, adjust the loads within the operating range and observe the output voltage regulation, ripple voltage and other parameters.
6. If necessary, change the resistor options on VID pins for other output voltages according to table 2.

oscilloscope probe. See Figure 2 for the proper scope probe technique. Short, stiff leads need to be soldered to the (+) and (-) terminals of an output capacitor. The probe's ground ring needs to touch the (-) lead and the probe tip needs to touch the (+) lead.

Note: 2. To accurately measure the output voltages and efficiency, measure Vout1 and Vout2 on output capacitors Cout2 and Cout4 directly.

Note: 1. When measuring the output or input voltage ripple, do not use the long ground lead on the

LTC3865EUH-1

OUTPUT VOLTAGE PROGRAMMING

The output voltages of both channels can be programmed to preset values. There are two VID pins for

each channel: VID11, VID12 for Vout1, and VID21, VID22 for Vout2. See Table 2 for details.

Table 2. Output voltage programming

VID11/VID21	VID12/VID22	VOUT1/VOUT2 (V)
INTVCC	INTVCC	5.0 ($V_{in} > 5V$)
INTVCC	FLOAT	3.3
INTVCC	GND	2.5
FLOAT	INTVCC	1.8
FLOAT	FLOAT	0.6 or external divider
FLOAT	GND	1.5
GND	INTVCC	1.2
GND	FLOAT	1.0
GND	GND	1.1

RAIL TRACKING

Demonstration circuit 1480A is configured for independent turn-on of VOUT1 and VOUT2. The ramp-rate for VOUT1 is determined by the TRK/SS1 cap at C6 and the ramp-rate for VOUT2 is determined by the TRK/SS2 cap at C14. This board can be modified on the bench to allow VOUT1 to track an external signal.

It can also be modified to allow VOUT2 to track VOUT1 or to allow VOUT2 to track an external signal. Tables 3 and 4 cover the rail tracking options for each rail.

Table 3. V_{OUT1} Tracking Options (3.3V)

CONFIGURATION	TRACK1 DIVIDER		TRK/SS1 CAP
	R7	R9	C6
Soft Start Without Tracking (original board)	0 Ω	Not stuffed	0.1 μ F
External Coincident Tracking	45.3k Ω	10.0k Ω	Not Stuffed

Table 4. V_{OUT2} Tracking Options (1.8V)

CONFIGURATION	TRACK2 DIVIDER			TRK/SS2 CAP
	R15	R14	R17	C14
Soft Start Without Tracking (original board)	0 Ω	Not stuffed	Not stuffed	0.1 μ F
Coincident Tracking to V _{OUT1} (3.3V)	0 Ω	20.0k Ω	10.0k Ω	Not Stuffed
External Coincident Tracking	20.0k Ω	Not stuffed	10.0k Ω	Not Stuffed

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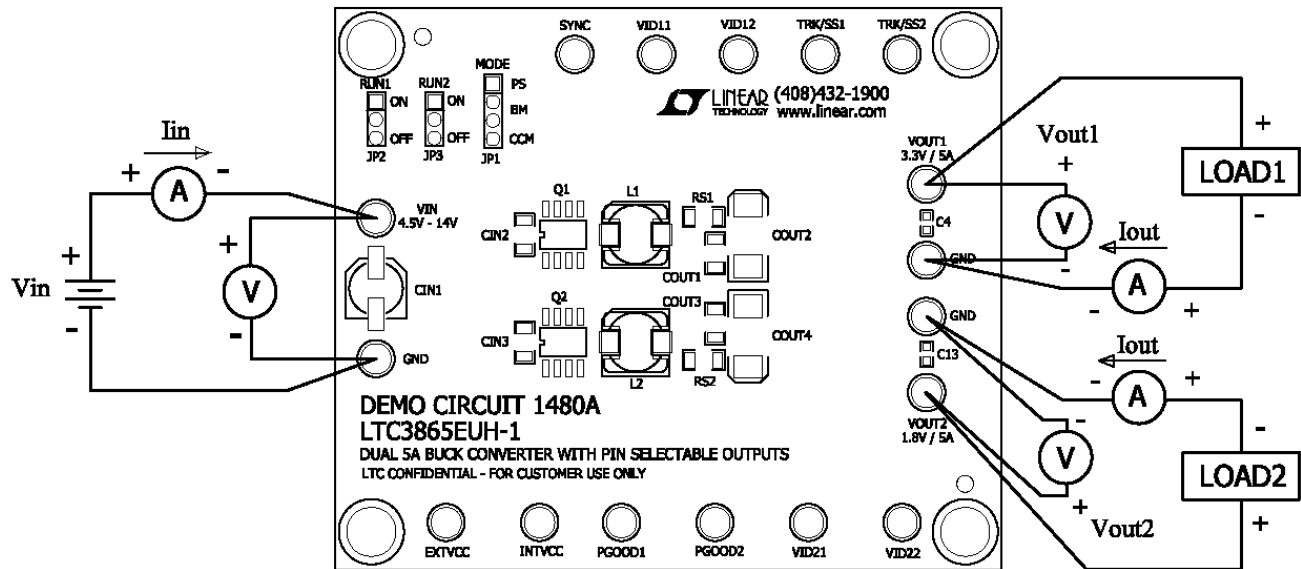


Figure 1. Proper Measurement Equipment Setup

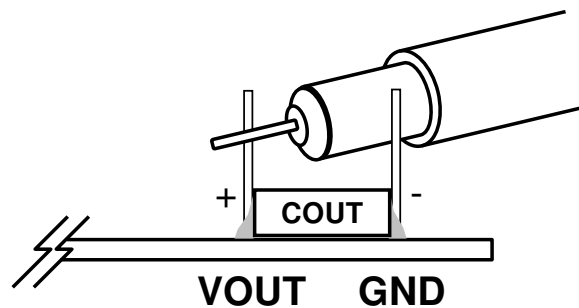


Figure 2. Measuring Output Voltage Ripple

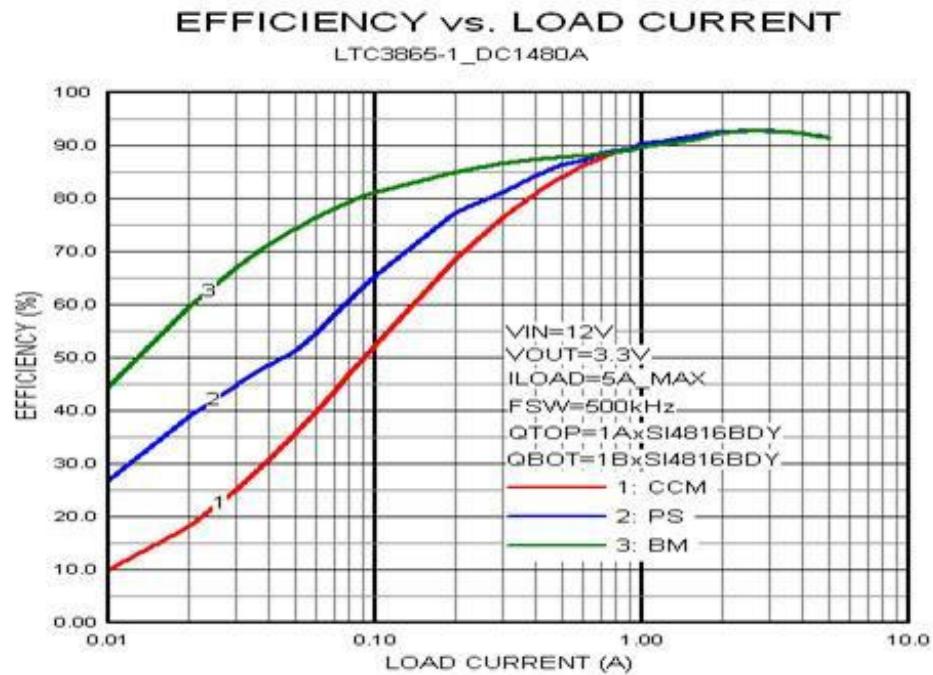


Figure 3. Efficiency vs load current (Vin=12V, Vout1=3.3V, 500kHz)

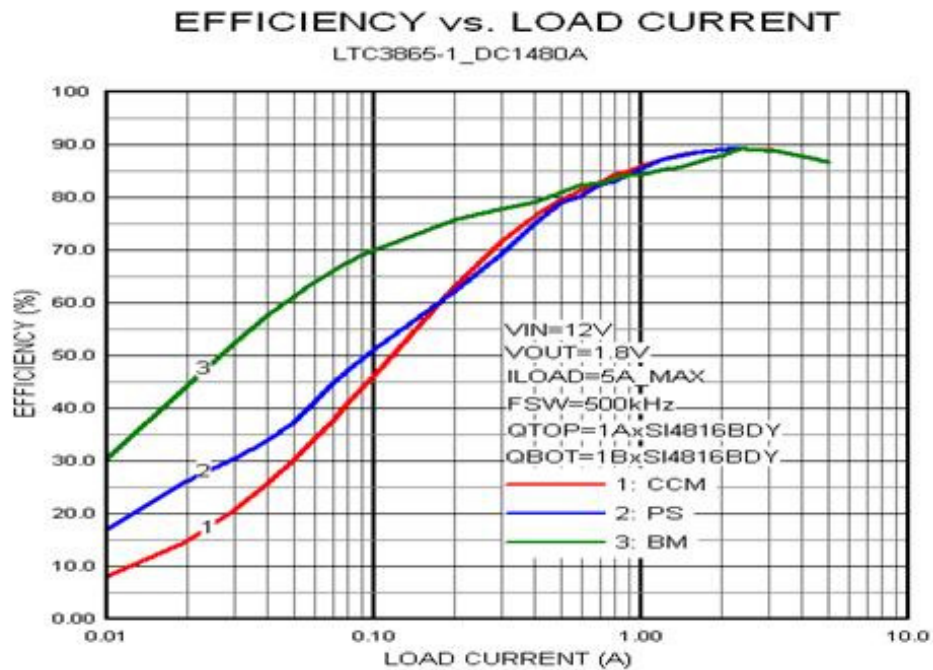
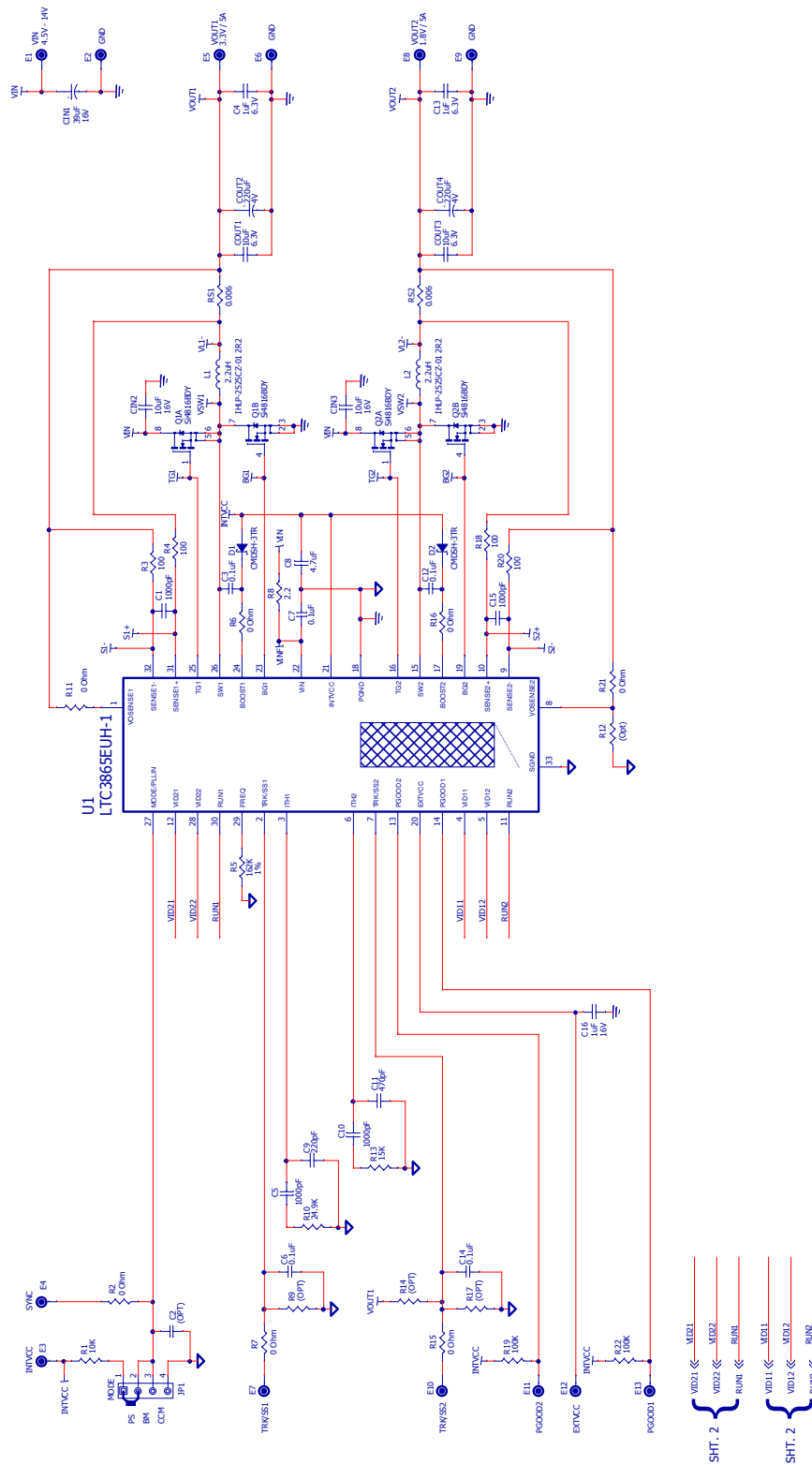
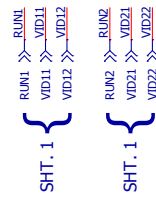


Figure 4. Efficiency vs load current (Vin=12V, Vout2=1.8V, 500kHz)

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VID11/VID21	VID12/VID22	VOUT1/VOUT2 (V)
INTVCC	INTVCC	5.0
INTVCC	FLOAT	3.3
INTVCC	GND	2.5
FLOAT	INTVCC	1.8
FLOAT	FLOAT	0.5 or External Divider
FLOAT	GND	1.5
GND	INTVCC	1.2
GND	FLOAT	1.0
GND	GND	1.1

