DESCRIPTION

Demonstration circuit DC1477A features the LTM®4609EV, the high voltage, high efficiency, high density switch mode Buck-Boost power module. The LTM4609EV can regulate its output voltage from input voltage both above and below the output. The input voltage range of DC1477A is from 10V to 36V. The output voltage is 30V. The rated load current is 3A, while de-rating is necessary for certain V_{IN}, V_{OUT}, and thermal conditions. Integrated input and output filters enable a simple PCB layout. Only the inductor, sensing resistor, bulk input and output capacitors are needed to externally. An input π filter is added on the DC1477A to minimize the input ripple. The LTM4609EV can be frequency synchronized to external frequency from 200 kHz to 400 kHz. This PLL can be used not only to reduce undesirable frequency harmonics but also to parallel LTM4609 to provide high output current. Other features include soft-start control, power good indicator, over voltage protection and foldback current protection.

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

Table 1. Performance Summary (T_A = 25°C)

PARAMETER	CONDITION	VALUE
Minimum Input Voltage		10V
Maximum Input Voltage		36V
Output Voltage V_{OUT}		30V± 2%
Maximum Continuous Output Current	De-rating is necessary for certain V_{IN}, V_{OUT}, and thermal conditions	$3A_{DC}$ @10VIN $8A_{DC}$ @24VIN $10A_{DC}$ @VIN > 30V
Default Operating Frequency		300KHz
Efficiency	V_{IN}=20V, V_{OUT} =30V, I_{OUT} =3A	96.3%, See Figure 3 for more information
Load Transient		See Figure 4 for details

QUICK START PROCEDURE

Demonstration circuit DC1477A is easy to set up to evaluate the performance of the LTM4609EV. Please refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

1. Place jumpers in the following positions for a typical $30V_{OUT}$ application:

RUN	START	MODE	CLOCK
ON	SSO	CCM	PROG

2. With power off, connect the input power supply, load and meters as shown in Figure 1. Preset the load to 0A and Vin supply to be less than 36V.

3. Turn on the power at the input. The output voltage should be 30V ± 2%.

4. Once the proper output voltage is established, adjust the load within the operating range and observe the output voltage regulation, ripple voltage, efficiency and other parameters. Cooling fan or heat sink are necessary for V_{IN} <10V and I_{OUT}=3A.

5. To measure input and output ripple, please refer to Figure 2 for proper setup.

6. The voltage of pin PLLFLTR determines the switching frequency. Adjust R6 and R7 to adjust switching frequency. Do not allow voltage at pin PLLFLTR exceed 2.4V.

7. Inductor and Rsense should be modified to accommodate certain input and output condition. Please refer to the datasheet.

8. The input filter formed by Cin2, L2 & L3, Cin3 and Cin4 is for the purpose of reducing the input voltage ripple. The magnetic beads L2 & L3 are not necessary, but they help to reduce the high frequency ringings on the input supply significantly. See Figure 5 for details.

9. The optional components Rsnb1 and Csnb1, Rsnb2 and Csnb2 can be used to form RC snubber circuits on the switching nodes, which may help to reduce the output ripple. Please refer to the datasheet.

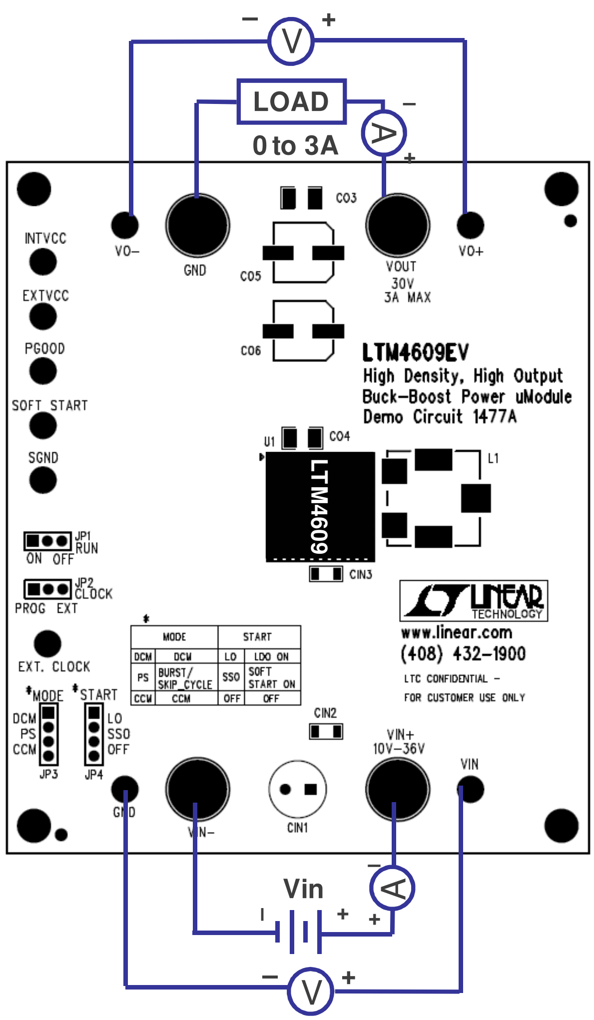


Figure 1. Test Setup of DC1477A

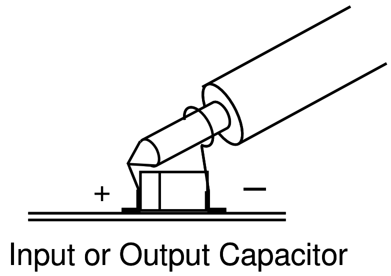


Figure 2. Proper Scope Probe Placement for Measuring Input or Output Ripple.

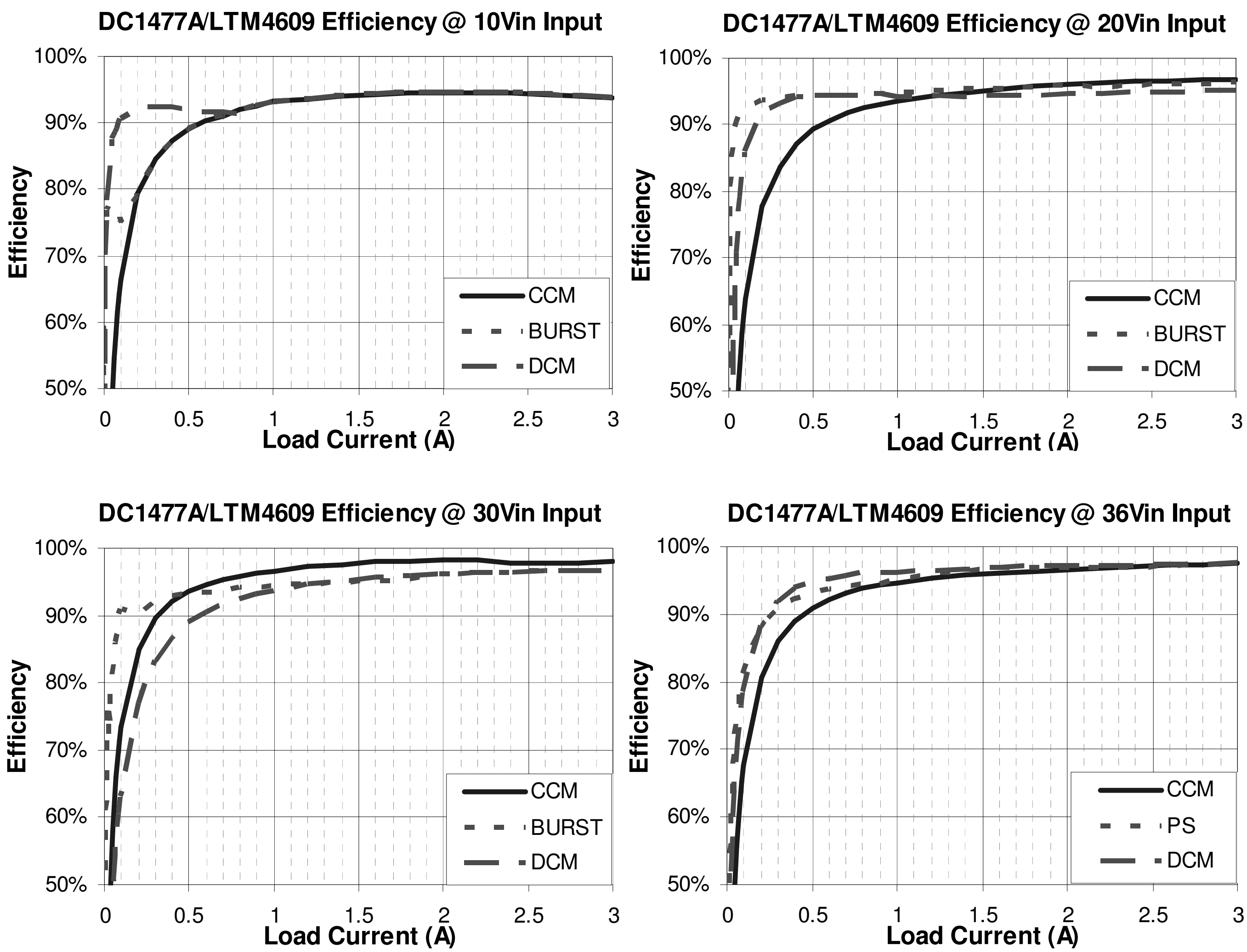
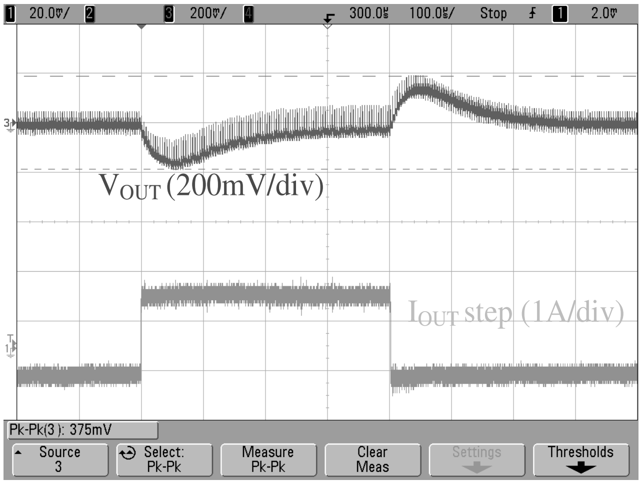
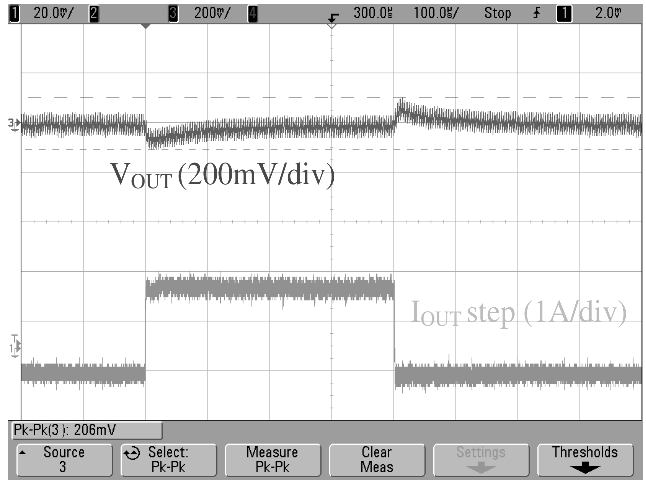


Figure 3. Measured Efficiency at Different V_{IN}.

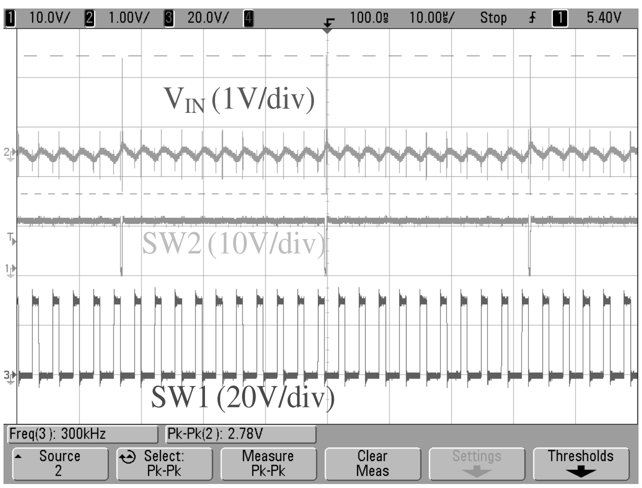


V_{IN}=10V, V_{OUT}=30V, CCM mode
1.5A to 3A load step
C_{OUT}=2×10uF ceramic + 2×100uF Alum

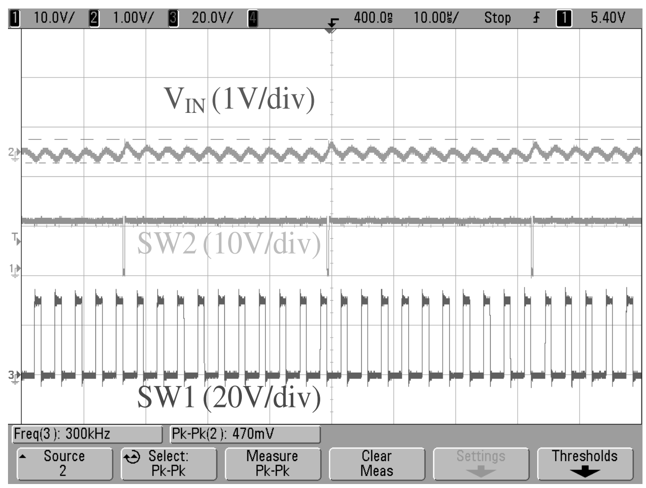


V_{IN}=36V, V_{OUT}=30V, CCM mode
1.5A to 3A load step
C_{OUT}=2×10uF ceramic + 2×100uF Alum

Figure 4. Measured Load Transient Response (1.5A Step, 50% to 100%).



V_{IN}=10V, V_{OUT}=30V, I_{OUT}=3A
W/O input filter: short L2 & L3, remove Cin2
V_{IN} peak-to-peak ripple=2.78V



V_{IN}=10V, V_{OUT}=30V, I_{OUT}=3A
W/ input filter: stuff L2, L3 and Cin2
V_{IN} peak-to-peak ripple=0.47V

Figure 5. Input voltage ripple measured at Cin1 with 300MHz bandwidth probe, W/O vs. W/ the input filter.