LTM4620 Performance Measurement

Measurement goal

The goal of the measurement was to determine whether the performance of the Linear Technology LTM4620 micromodule regulator, mounted on the Cosylab FTRN_PMC_BETA PCB is in the expected range.

Measurement scope

To verify that the efficiency of the above mentioned DC/DC module is in its expected limits, power consumption, input and output of the module was measured in several combinations:

- LTM4620 mounted on fully assembled PMC PCB (serial number: 89282)
- LTM4620 mounted on PMC PCB only with the components that the module needs for its own operation.
- LTM4620 evaluation board.
- LTM4619 mounted on PMC PCB only with the components that the module needs for its own operation.

Additionally, temperature of the in operation module was measured when the module was under significant load.

Equipment used

Equipment part	**Manufacturer and model**
Current meter	Agilent U1252B
Voltage meter	Agilent U1242B
Temperature meter	Agilent U1242B
Power supply	Rigol DP832A
Oscilloscope	Tektronix DPO4054
Variable resistor	Contrex PRN162

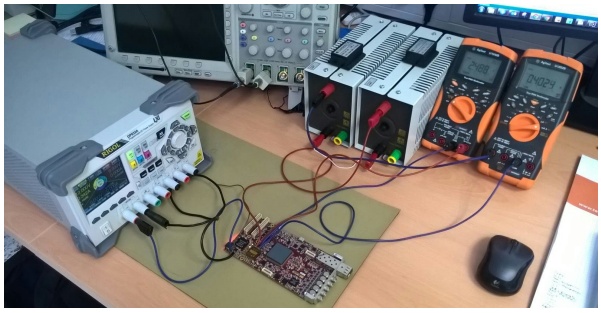
Preparations

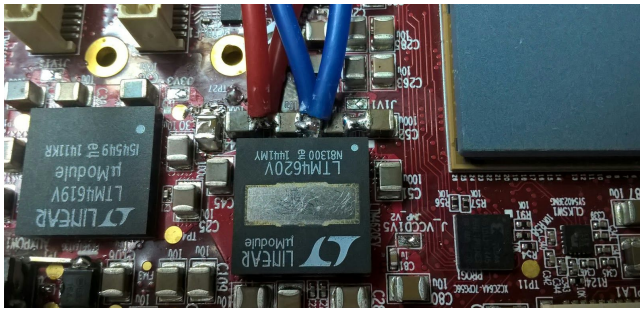
Prior to the measurement, all capacitors and resistors that are needed by LTM4620 for its normal operation were measured to confirm that their values are according to the schematic. It was discovered that while all components were assembled correctly, there was a problem with fuse F2, which was blown. It was replaced with a solder bridge.

All power output solder bridges were removed to make sure no additional current is drawn from the power module.
In order to gain the ability to observe pins SW1 and SW2, two holes were drilled in the PCB from the bottom side. This modification was only made on PMC 4620 board.

On the **PMC 4620** it needs to be noted that there was no external voltage on EXTVcc pin present. Instead, module used its internal voltage regulator. Quick comparison showed there is absolutely no difference in power consumption because of such setup.

Measurement setup





To avoid measurement error due to voltage drop on the output wires, two parallel wire pairs were used. One pair was used for current measurement and other one was used for output voltage measurement. Photo above was taken during 2V5 output measurement; when measuring 1V1 output, output wires (red wires) were soldered between capacitors on the right side of the GND wires.

Original wires were replaced with thicker and shorter ones to eliminate voltage drop on the input wires.

Two precision variable load resistors allowed accurate measurement across wide output current range.

Since LTM4620 evaluation board is a good reference, it was first measured without any modifications, meaning that its output was same as provided. Later, it was modificated in such way that its schematic was identical as the one on PMC.

Results of the measurement

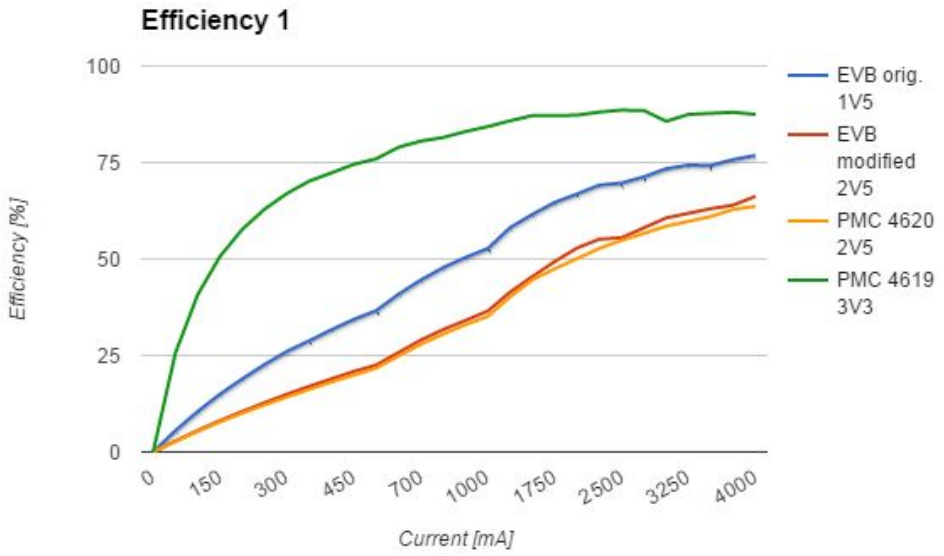
Names of different boards in tables below are as follows:
PMC orig. - Fully assembled PMC PCB,
PMC 4620 - PMC PCB with only LTM4620 and its external components fitted,
PMC 4619 - PMC PCB with only LTM4619 and its external components fitted,
EVB orig. - LTM4620 Evaluation board in its default configuration,
EVB mod. - LTM4620 Evaluation board in its modified configuration (same schematic as PMC).

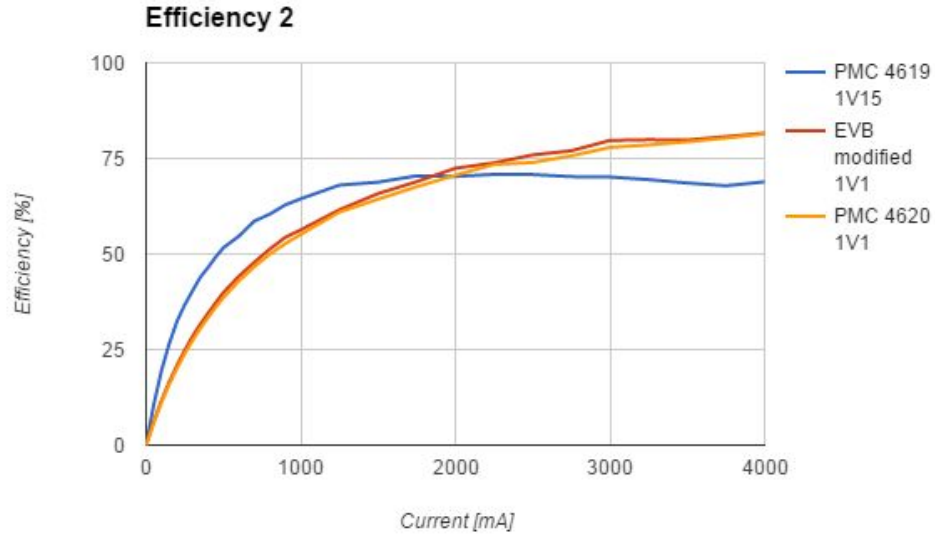
Note: **PMC orig.** board has greater power dissipation since it has a lot of external components like LTM4619, some LDOs and LEDs. Whole consumption of those components is estimated at approximately 1W. This value was not subtracted in any of the below measurements.
Note: Only one output was measured at one time except otherwise noted. Other output was not under load when measuring.

All measurements were performed at Vin = 12V.
Below are results of measurement of several boards in their idle state (no load on any of the outputs):

	PMC orig.	**PMC 4620**	**EVB orig.**	**EVB mod.**	**PMC 4619**
Dissipation	3.19W	1.96W	1.28W	1.89W	0.48W

From those measurements, it is clearly noticeable that even in idle state big power dissipation is expected and this dissipation even increases in configuration on the PMC for more than 0.5W. Most probable setting that causes this is output voltage.
Further, efficiency of the LTM4620 module was measured at different output currents. Results are shown in the tables below.





Temperature was only measured on PMC PCB, not on evaluation board. Evaluation board has much bigger power planes which help keep power module cool, so that measurement wouldn't be relevant.

Board	**PMC orig.**		**PMC 4620**		**PMC 4619**	
Output	**1V1**	**2V5**	**1V1**	**2V5**	**1V15**	**3V3**
@4A	63°C	57°C	57°C	54°C	45°C	46°C

With both outputs under 2.5A load, power module on the PMC 4620 board heats to 60°C.

Conclusion

From all the measurements taken, it can be concluded that LTM4620 on the **PMC org.** operates within the expected range. Power efficiency on the **PMC 4620** board is practically identical as on the **EVB mod.**. However, at low output currents efficiency is very poor since LTM4620 is not optimised for low output current. Such behavior is expected and normal.

Difference between fully assembled PMC and partially assembled PMC is present due to extra current consumption of LDOs, LEDs and switchers.

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