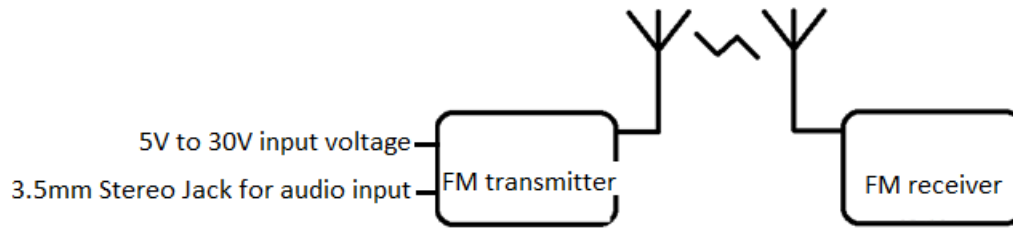


FM Transmitter (It is mandatory to read the entire document should you choose this assignment)



The FM transmitter design consists of a configurable FM transmitter, microcontroller, touch sensor, display and a DC/DC converter.

The microcontroller configures the FM transmitter, monitors the touch pads through the touch sensor and updates the display.

The FM transmitter will transmit the audio signal input on the 3.5mm stereo jack, and require an input voltage in the range 5V to 30V.

Your assignment will be the following:

- 1) Create a schematic drawing based on the schematics "fm_transmitter_v3.pdf", attached at the end of this document
- 2) Create a layout
- 3) Assemble at least one board (Assembly day at ELAB)
- 4) Verify that the board is functional or find eventual errors (Assembly day at ELAB)

Layout Recommendations:

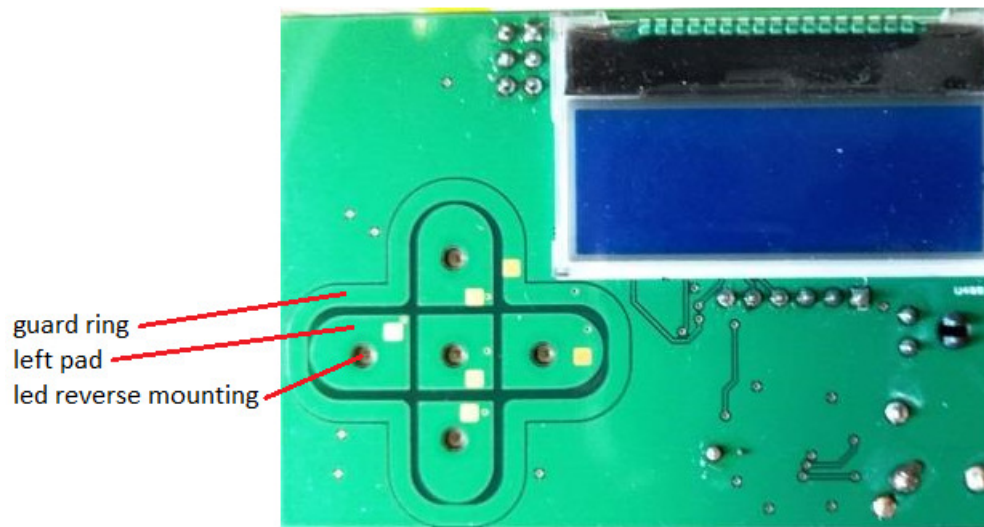
FM transmitter:

Refer to AN383 from Silicon Labs for Si4713:

["https://www.silabs.com/Support%20Documents/TechnicalDocs/AN383.pdf"](https://www.silabs.com/Support%20Documents/TechnicalDocs/AN383.pdf)

Pay special attention to antenna path, placing the 120nH inductor close to the TXO pin, place XTAL close to the transmitter and the tracks to RCLK/DCLK short and of equal length.

Touch pads:

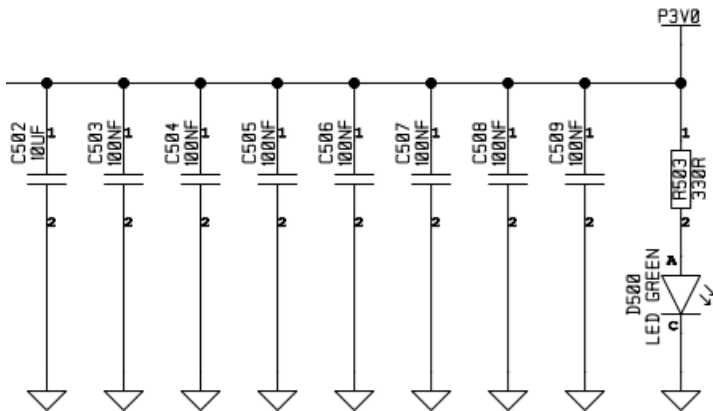


It is a requirement to mount all SMD components on the top side of the PCB. Light Emitting Diodes, "LED REV GREEN" in the schematics, are intended to indicate touch, and will emit light through holes in the PCB. The touch pads are drawn on the bottom side of the PCB.

When creating the touch pads, use templates and make sure you select the corresponding net name "TOUCH_GUARD", "TOUCH_LEFT" and so on, when editing "Signal Name" in the template properties.

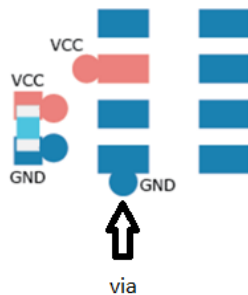
Decoupling capacitors:

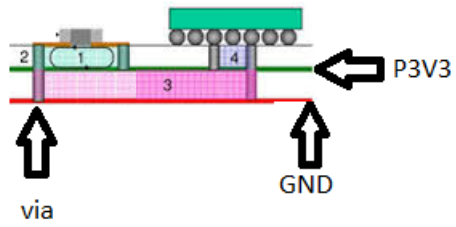
On the POWER page in the schematics, you will find all the P3V0 decoupling capacitors:



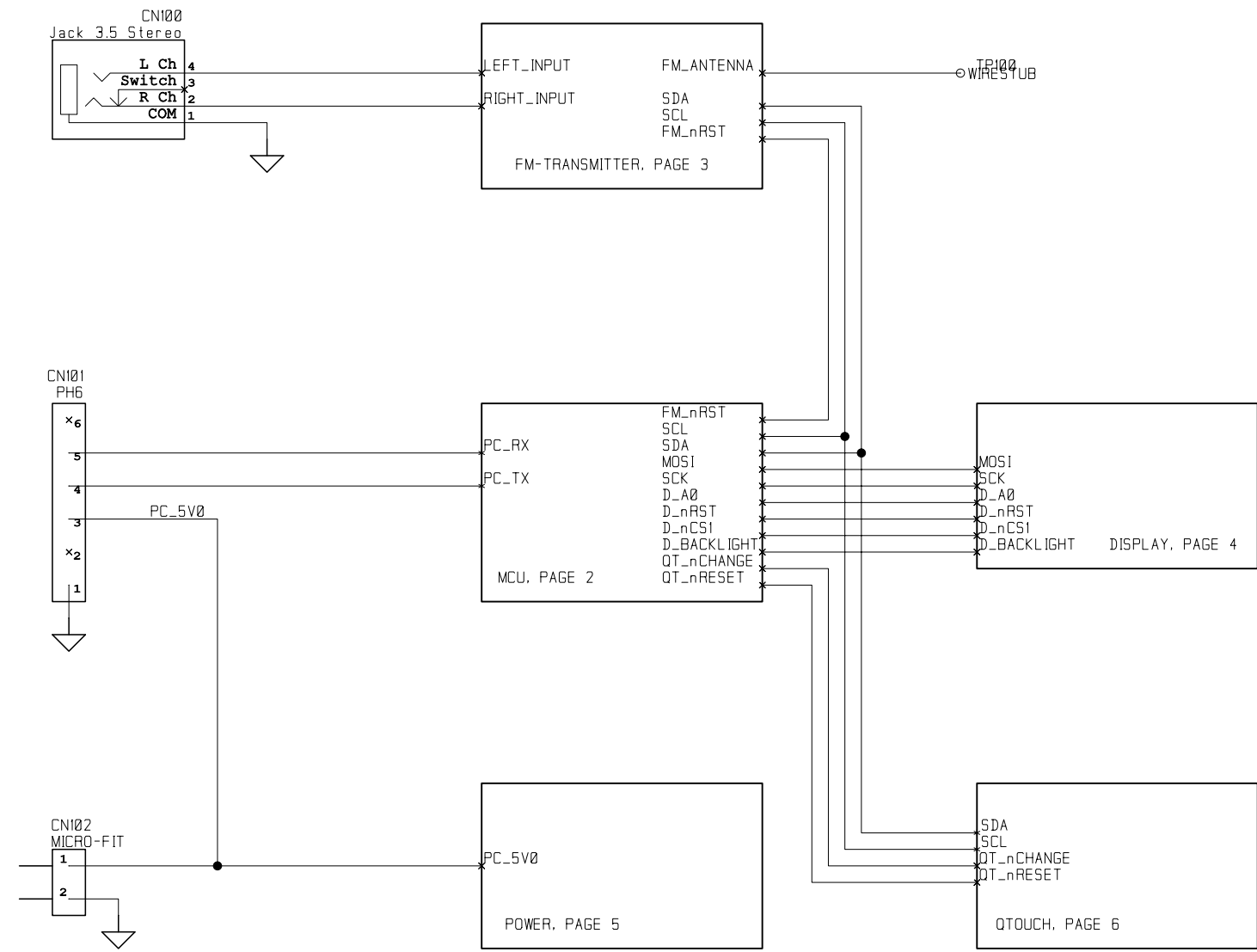
All devices using P3V0, shall have a decoupling capacitor placed close to its VCC/GND pins.

You are creating four layer boards, where most part of the board, excluding the antenna area shall be covered by P3V0 in one of the layers, and GND in at least one of the layers. Then all devices being supplied P3V0 to their VCC pins should have a P3V0 layer directly beneath their power pins and all GND pins should have a GND layer beneath their power pins. In this case, the best option for VCC and GND hook up for both the IC and the capacitor is a via directly into to the power layer beneath them through a minimal length, and thus minimal impedance, track.

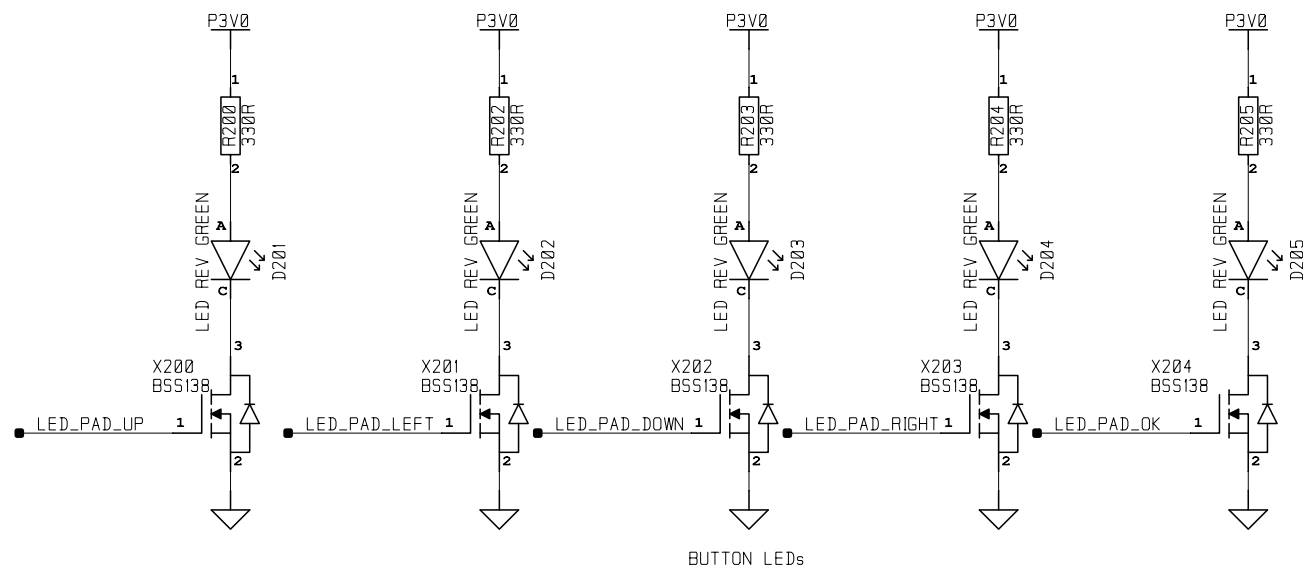
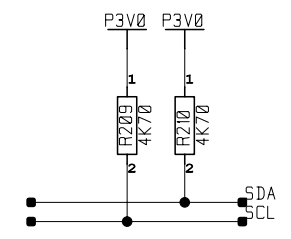
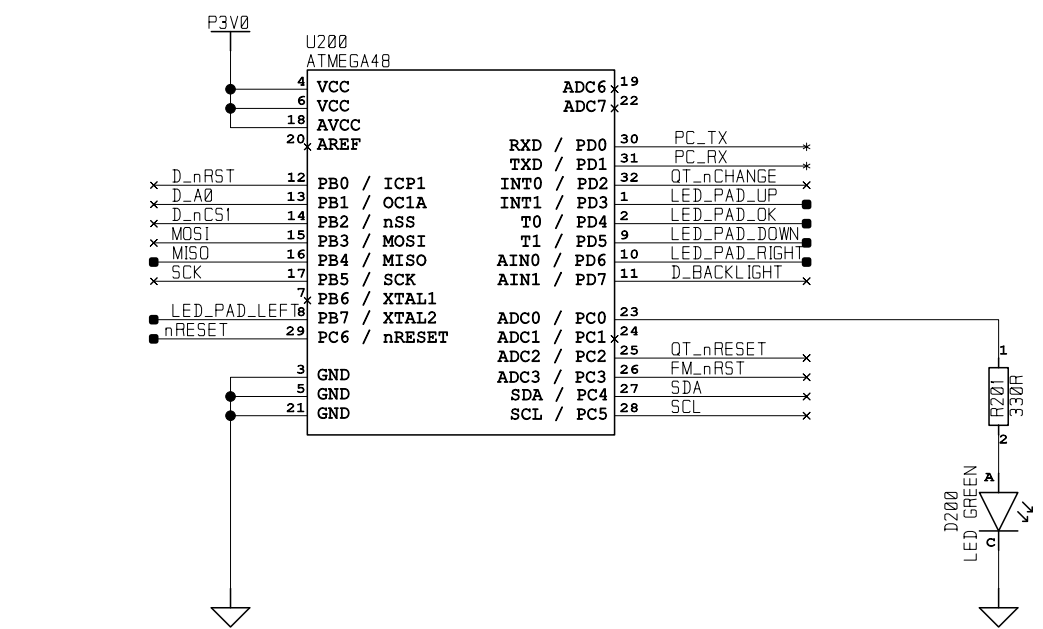




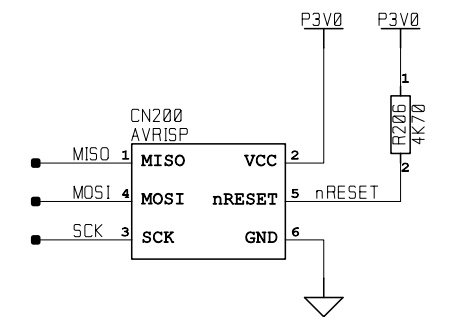
As short as possible distance between vias to the capacitor and between capacitor and IC. The plane capacitance (capacitor made up of P3V3 layer and GND layer) is more important for high frequency decoupling than the discrete capacitor



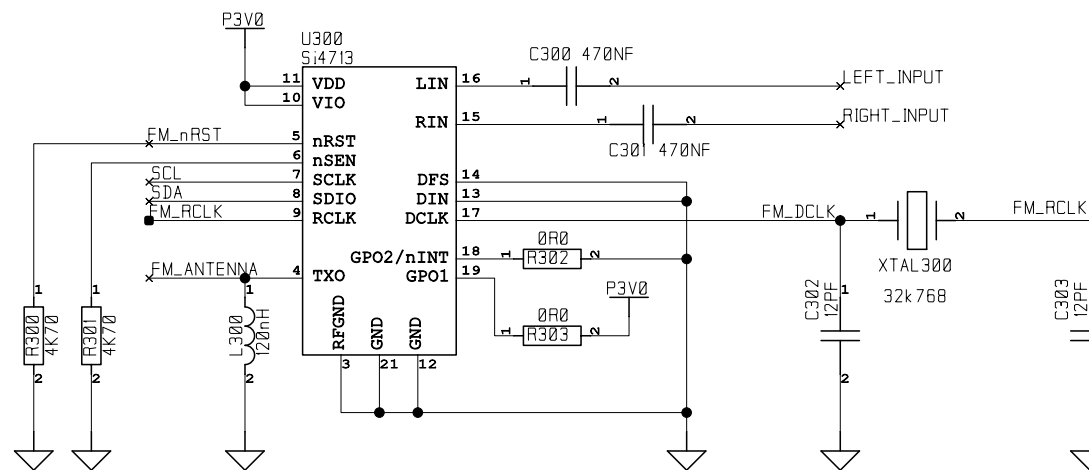
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|-------------|------------------------|
| PROJECT: | FM TRANSMITTER v2 |
| SHEET NAME: | TOP |
| DATE: | 14.10.2015 |
| SHEET: | ELAB, Dept. of Physics |
| USER: | UNIVERSITY OF OSLO |
| | 1 / 6 |



BUTTON LEDs

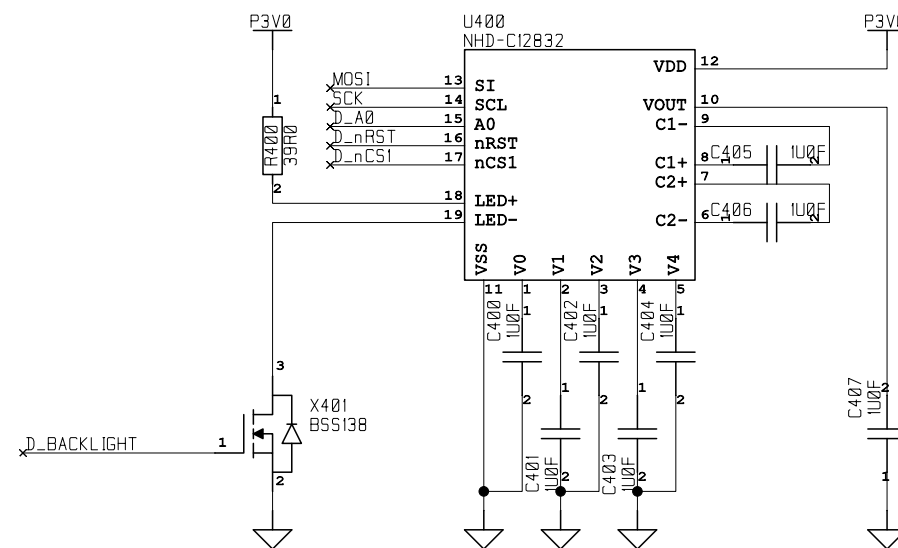


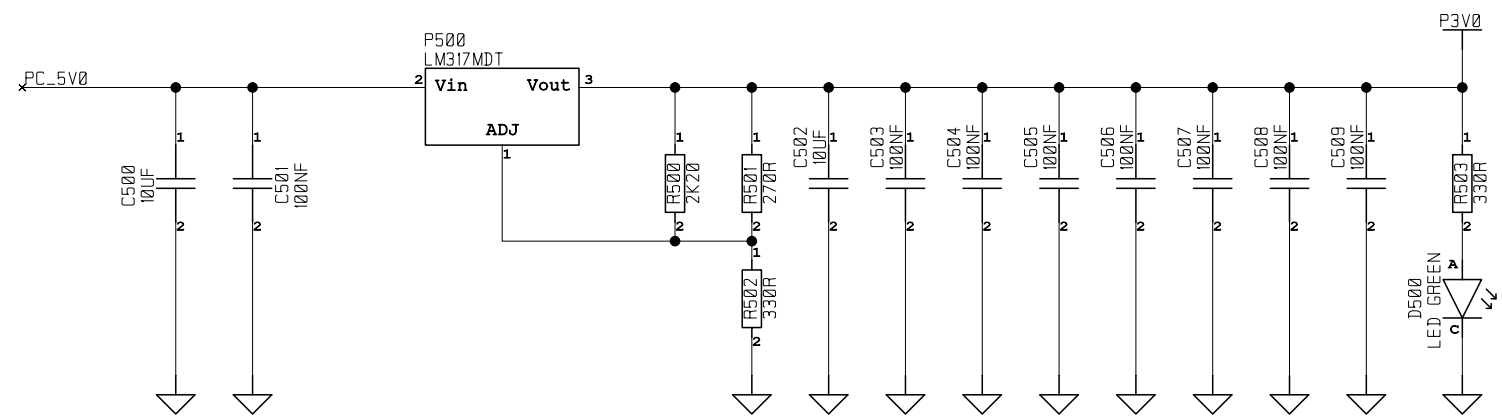
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| DATE: | 14.10.2015 |
| SHEET: | ELAB. Dept. of Physics |
| USER: | UNIVERSITY OF OSLO |
| | 2 / 6 |



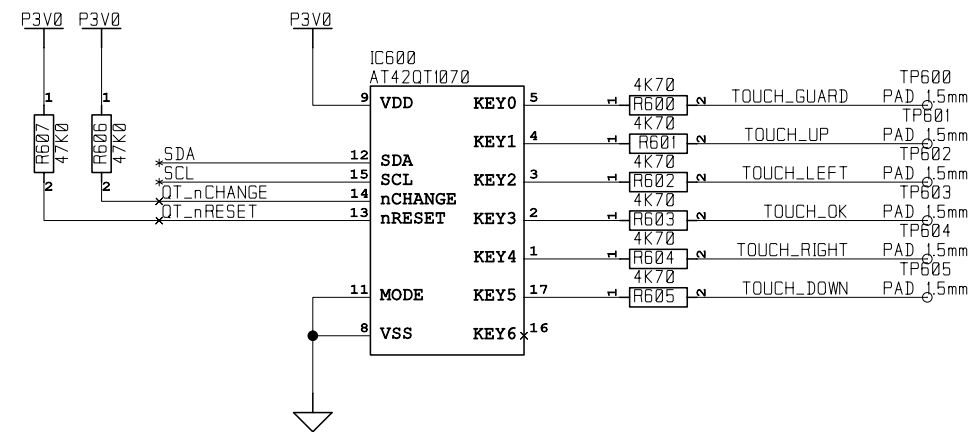
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| SHEET NAME: | FM-TRANSMITTER |
| DATE: | 14.10.2015 |
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| USER: | 3 / 6 |

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| PROJECT: | FM TRANSMITTER v2 |
| SHEET NAME: | POWER |
| DATE: | 14.10.2015 |
| SHEET: | |
| USER: | 5 / 6 |



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|--|-------------------|
| PROJECT: | FM TRANSMITTER v2 |
| SHEET NAME: | QTOUCH |
| DATE: | 14.10.2015 |
| SHEET: | 6 / 6 |
| USER: | |
| ELAB, Dept. of Physics UNIVERSITY OF OSLO | |