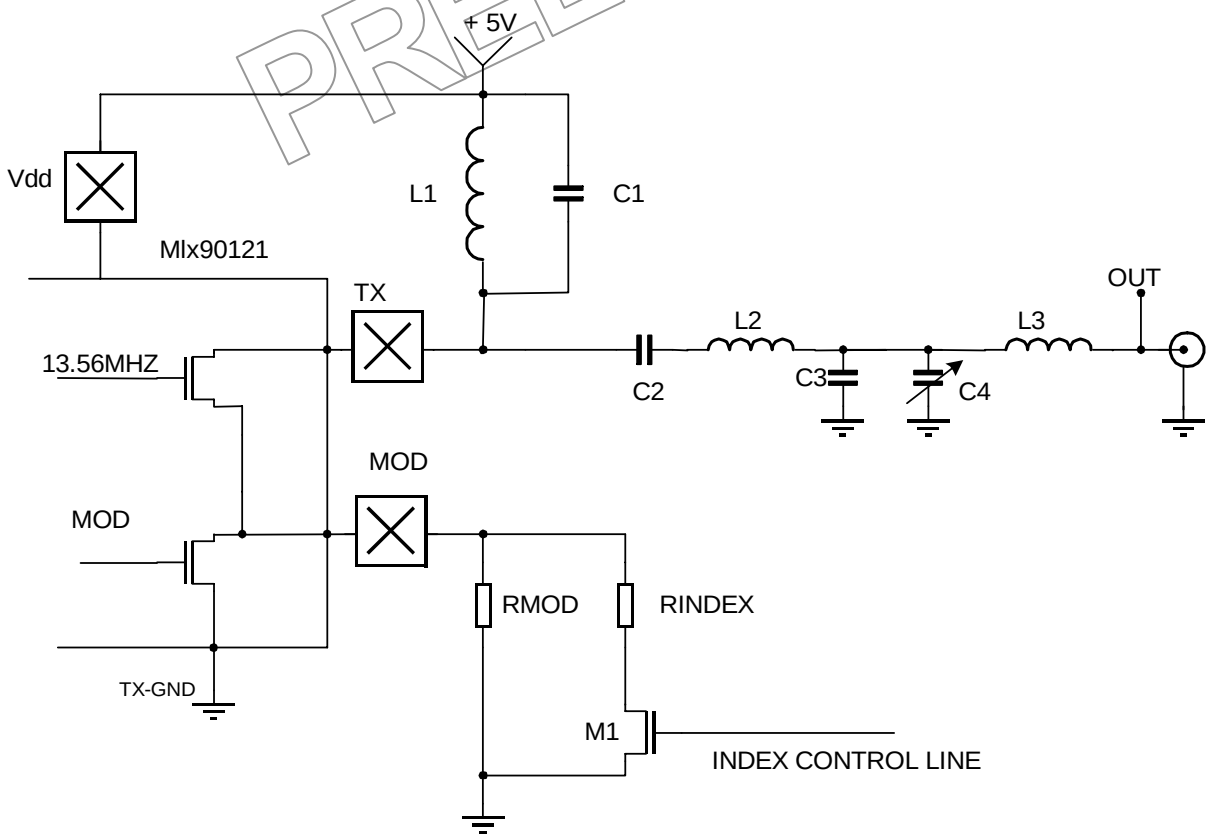
1 Scope:

This document is a design guide to adjust the modulation depth of the MLX 90121. In the low modulation index mode, the ISO 14443 standard requires a typical modulation depth of 11 %, whereas the ISO 15693 standard requires 15 %. In order to make a multipurpose reader, one should be able to switch between these two modulation indexes. Two different designs will be considered. The first one is the standard application schematic with 200 mW output power @ 5 Volts. The second is the 1 Watt power booster described in the MLX90121 application note APN90121-1.

2 Standard design (200 mW @ 5 Volts):

2.1 Application schematic:



2.2 Recommended Components:

Reference	Value	Comments
RMOD	12 ohms	1% or better
RINDEX	51 ohms	1% or better
M1	BS 170 or PMBF 170	

Note: Other components values do not differ from the standard recommended reader schematic.

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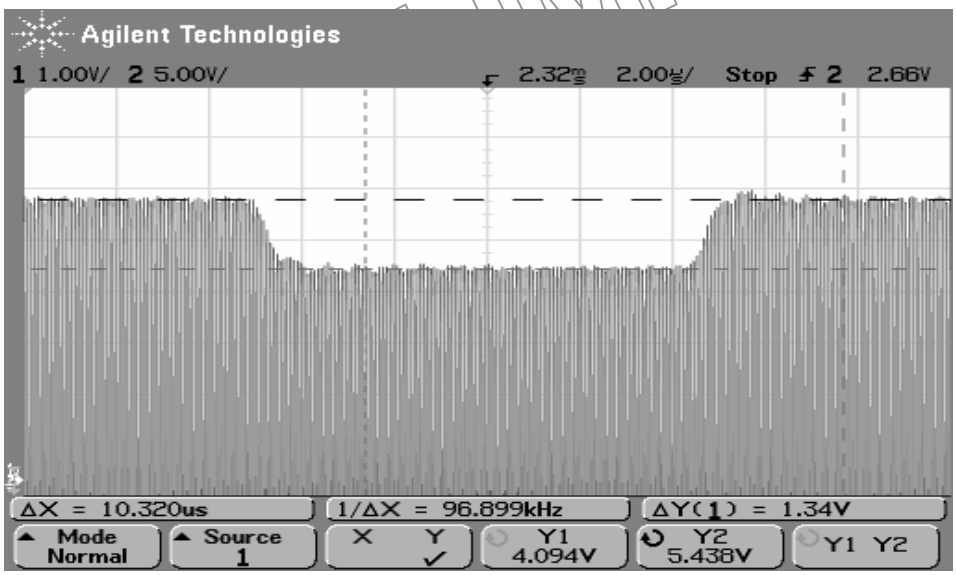
2.3 Theory of operation and design guidelines:

When M1 is switched on, it places RINDEX in parallel to RMOD, thereby effectively reducing the modulation depth. RMOD should be selected to achieve the typical modulation depth for the ISO 15693 standard (15 %) with M1 switched off. RINDEX should be selected to reach the typical modulation depth of the ISO 14443 standard (11 %) with M1 switched on. The index control line, that is the gate of M1, should be driven by a dedicated micro controller line under appropriate software control.

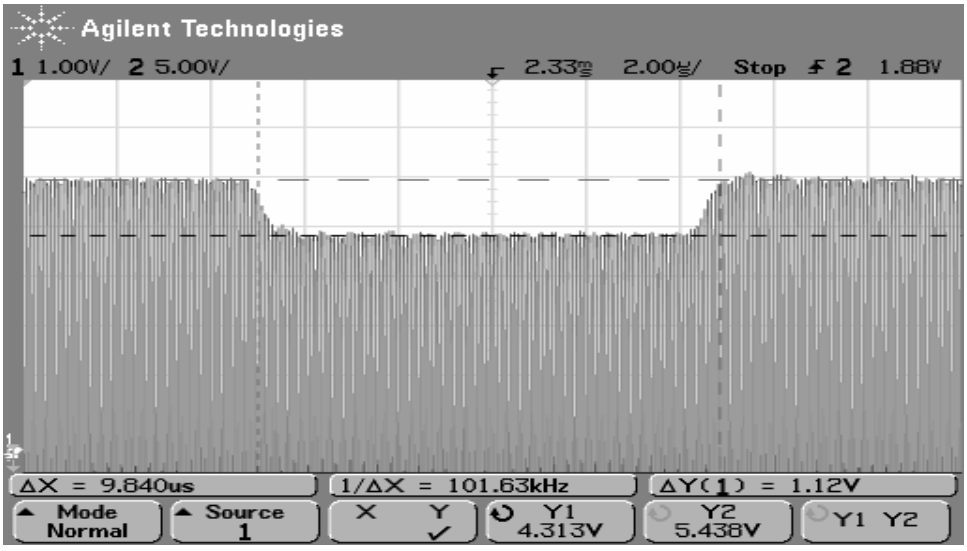
2.4 Waveforms at the antenna connector:

2.4.1 ISO 15693, M1 switched off:



Modulation depth according to scope cursors measurements: m = (Y2-Y1)/(Y2+Y1) = 14.1 %

2.4.2 ISO 14443, M1 switched on:



Modulation depth according to scope cursors measurements: m = (Y2-Y1)/(Y2+Y1) = 11.5 %

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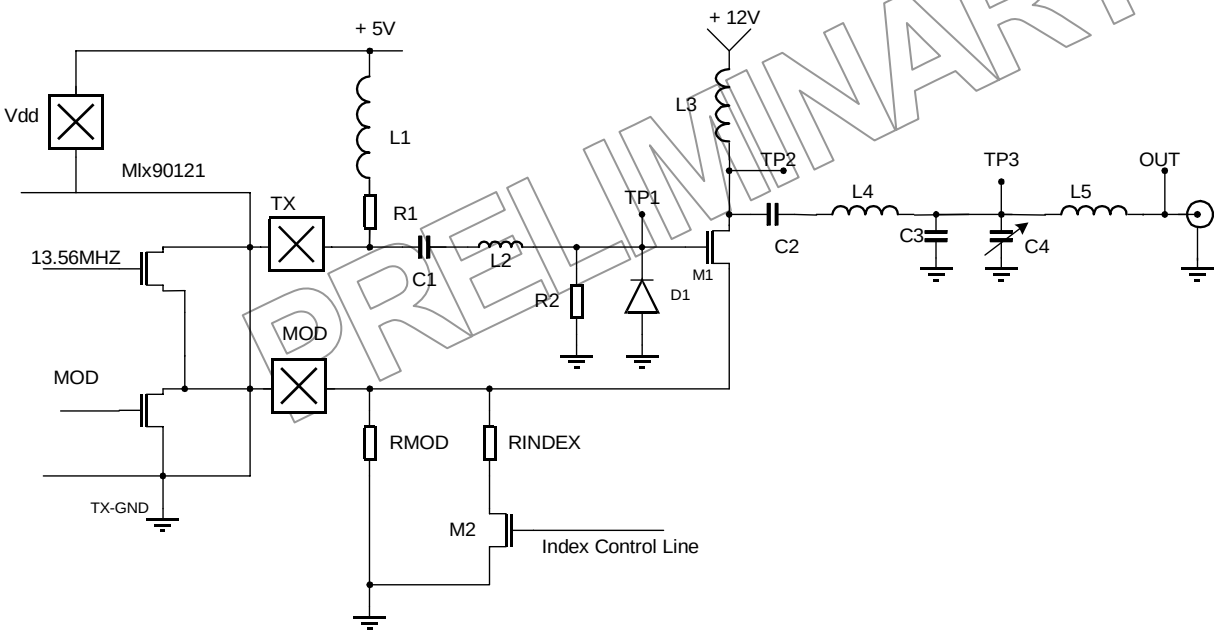
3 Power booster configuration (1 Watt @ 12 Volts)

For the description of the MLX90121 12V power booster we refer to the application note APN90121-1.

3.1 Application schematic:



3.2 Recommended Components:

Reference	Value	Comments
RMOD	7.5 ohms	1% or better
RINDEX	27 ohms	1% or better
M1	BS 170 or PMBF 170	

Notes: Other components values do not differ from the passive matching power boost reader schematic.
Values for RMOD and RINDEX are valid only for a 12 Volts booster stage supply. Other supply voltages will require different values for RMOD and RINDEX.

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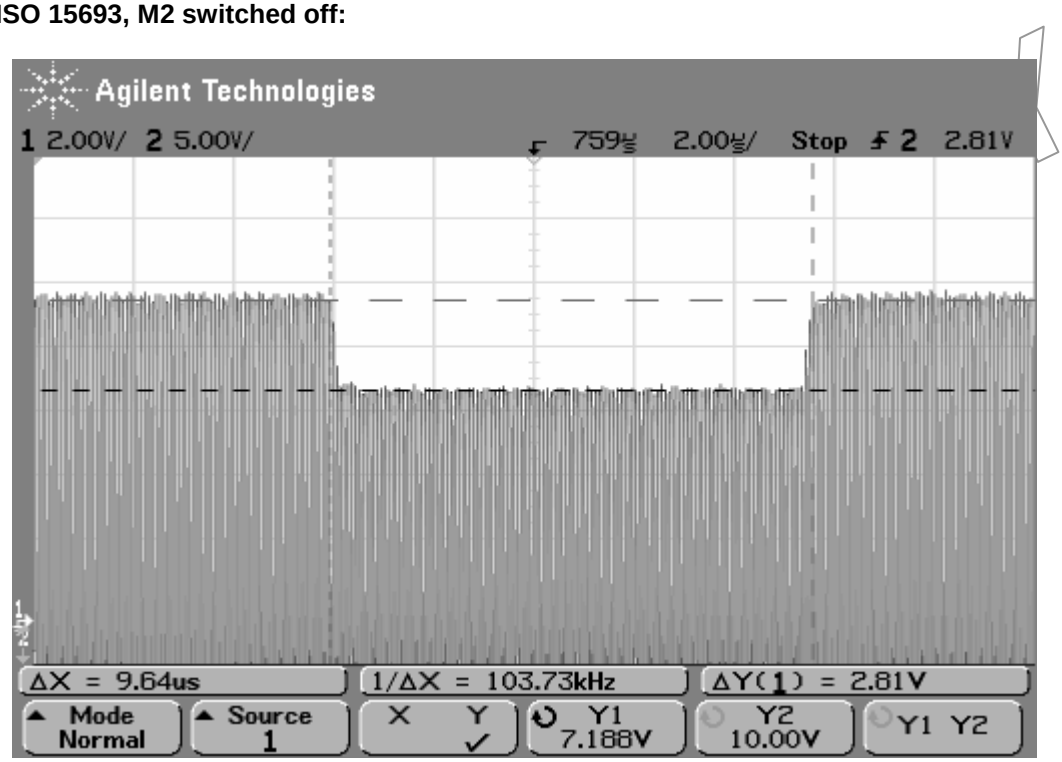
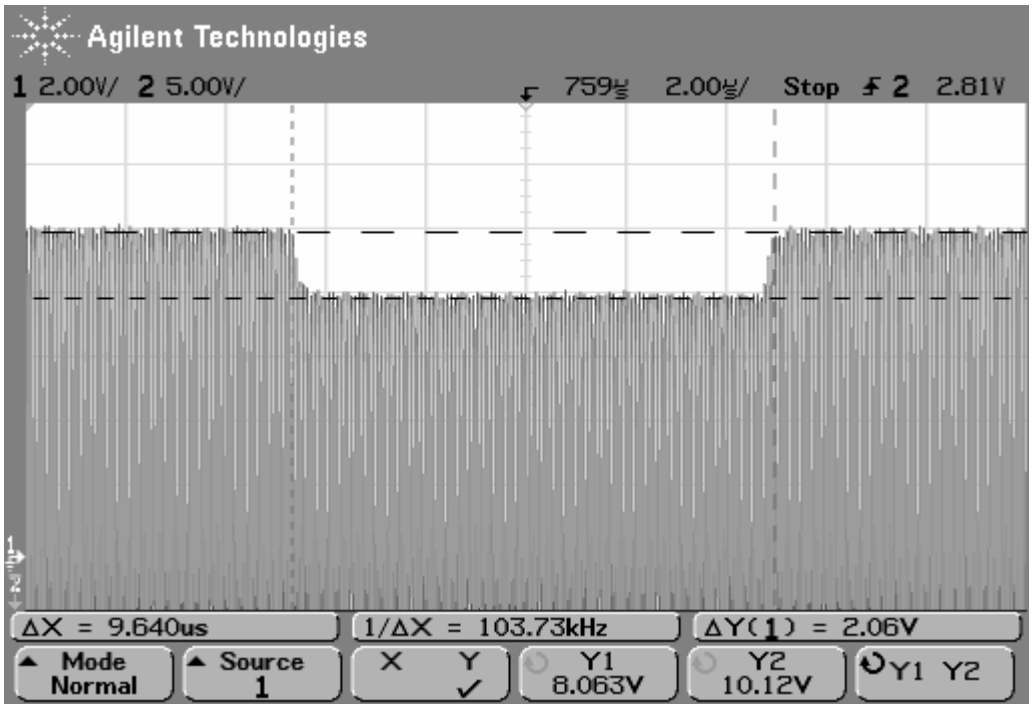
3.3 Waveforms at the antenna connector:

3.3.1 ISO 15693, M2 switched off:



Modulation depth according to scope cursors measurements: m = (Y2-Y1)/(Y2+Y1) = 16.36 %

3.3.2 ISO 14443, M1 switched on:



Modulation depth according to scope cursors measurements: m = (Y2-Y1)/(Y2+Y1) = 11.31 %

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