

LIGHTWIDOW

FRSLEB040 RFID PCB ANTENNA

This RFID PCB antenna was designed to be integrated into the FRS-Light V1 matte box. It was developed and tested with the ST25R391X series RFID reader



This PCB incorporates 3 matched antennas. Only ONE antenna can be activated at any given time. The desired antenna is selected using an RF switch in between the antenna and matching circuit.

ELECTRICAL SPECIFICATIONS	
Operating Frequency [MHz]*	13.56
Inductance [nH]**	327 ± 5
DC Resistance [$\text{m}\Omega$]**	1113 ± 2
Parallel Resistance [Ω]**	755 ± 10
Self Resonance Frequency [MHz]**	26.38 ± 0.01
Q Factor**	15
Matched Q Value	13

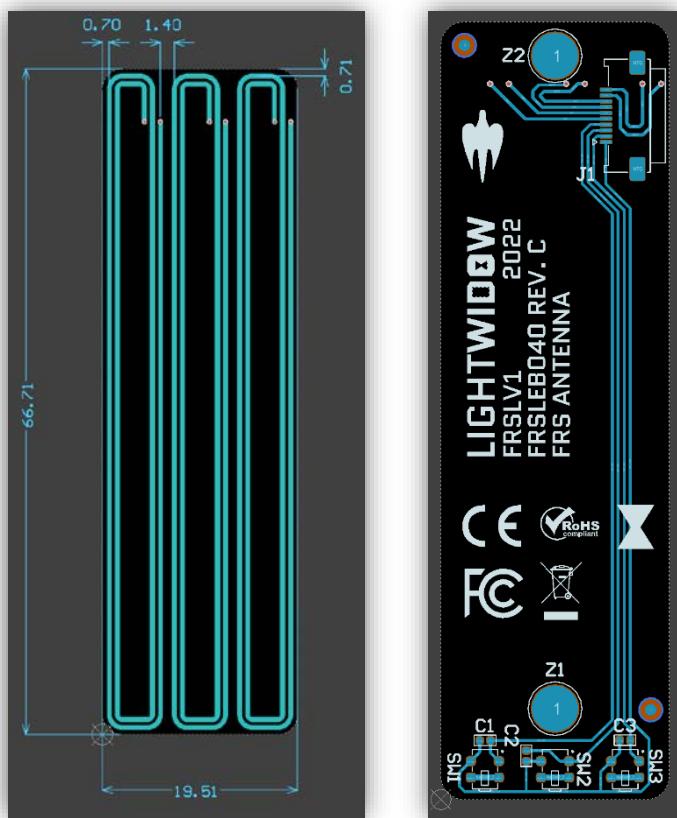
NOTE: This table includes the expected variation between all 3 matched antennas (denoted by the \pm tolerance values)

* With matching circuit

** Without matching circuit

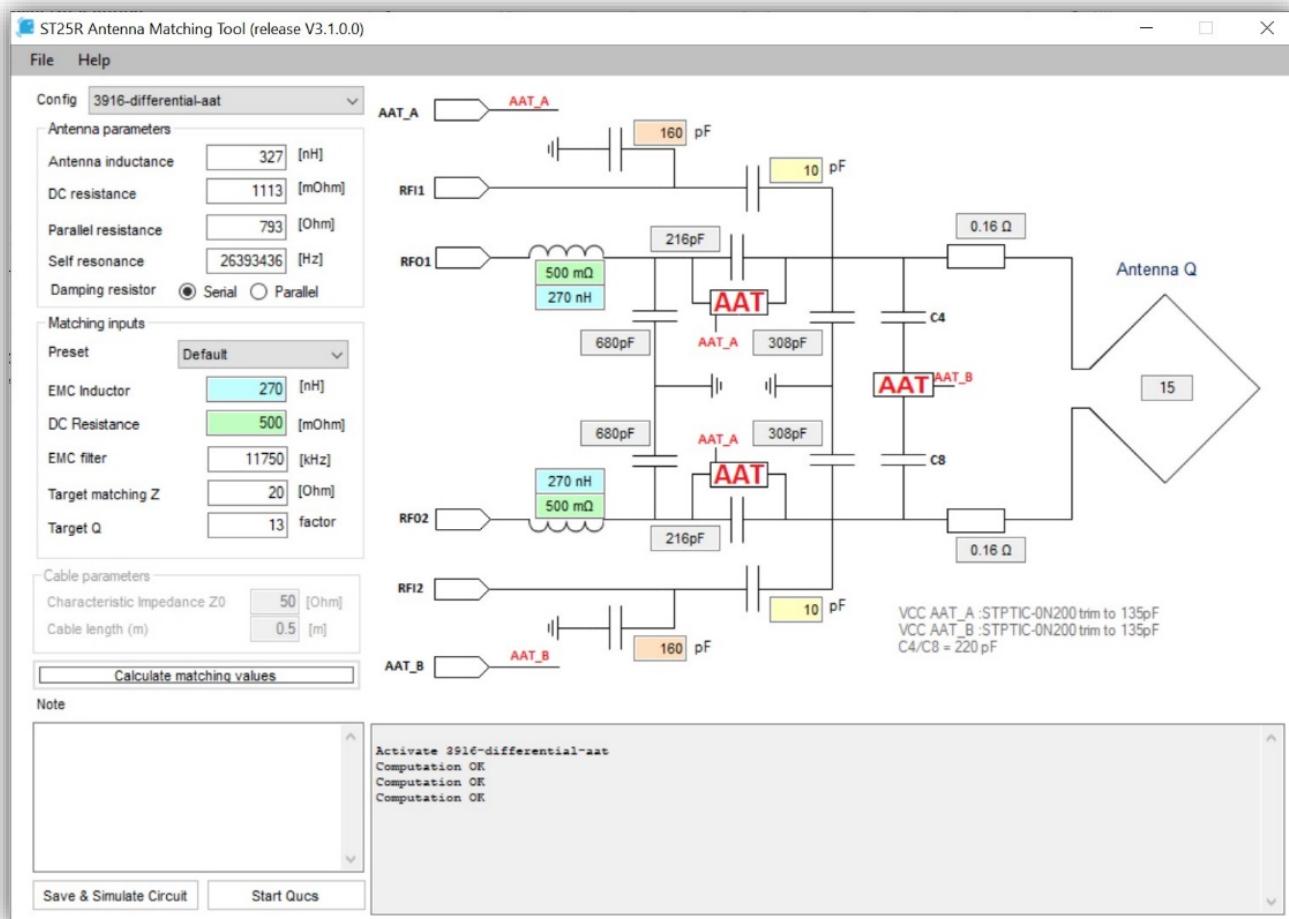
PCB SPECIFICATIONS	
Trace Width [mm]	0.5
Trace Spacing [mm]	0.3
Loop Count	2
Loop Trace Length [mm]	290.91 ± 0.09
Connector Part Number	Molex 5051101097

NOTE: This table includes the expected variation between all 3 matched antennas (denoted by the \pm tolerance values)



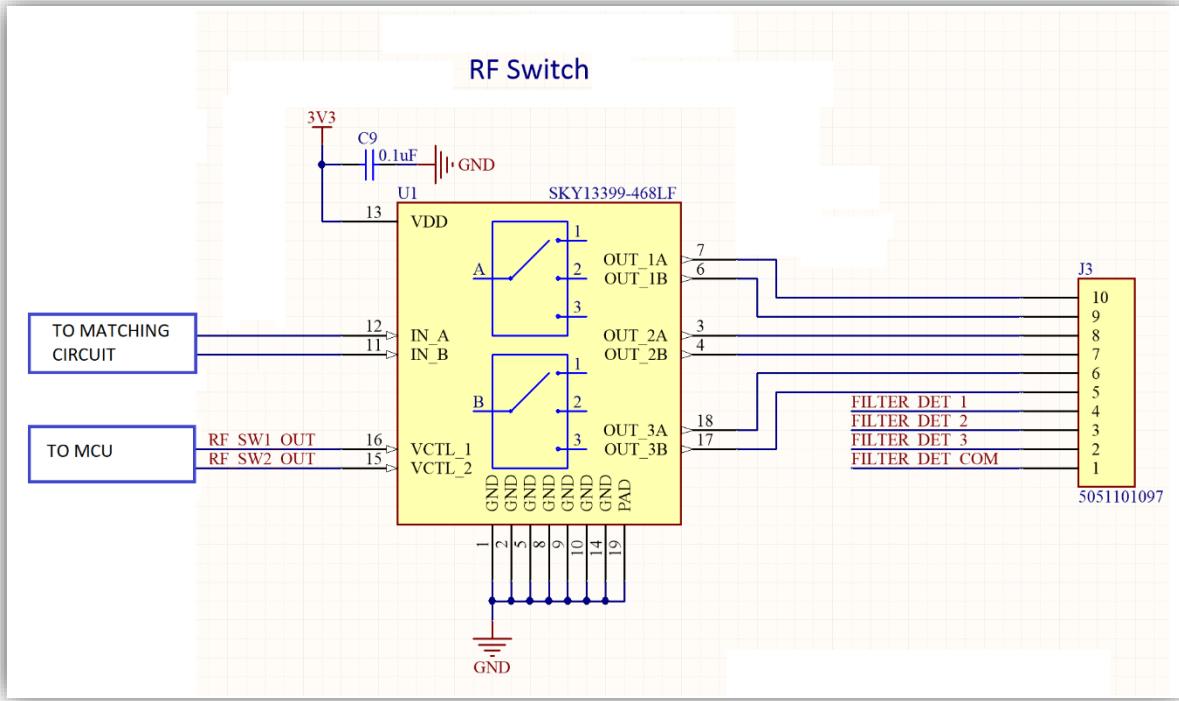
PCB CONSTRUCTION		
Layer	Thickness [mm]	Dielectric Constant
Top Soldermask	0.0254	3.5
Top Copper	0.0356 (1oz Copper)	
Dielectric	1.524	4.6
Bottom Copper	0.0356 (1oz Copper)	
Bottom Soldermask	0.0254	3.5
Total PCB Thickness	1.646	

MATCHING CIRCUIT AND REFERENCE VALUES	
Component	Value
EMC Inductor	270 nH, 500 mΩ
EMC Capacitor	680 pF
Series Capacitors	220 pF
Parallel Capacitors	300 pF
Series Shunt Resistors	0.16 Ω
Variable Capacitor	100pF to 200pF
Variable Capacitor PN	LXRW0YV201-059

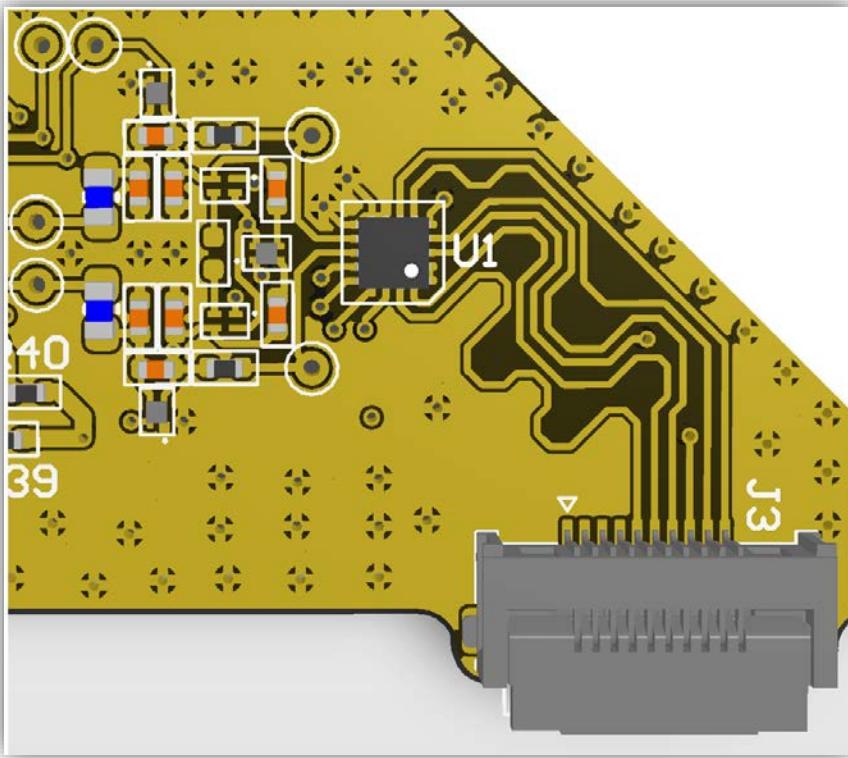


Because of the slight variation between the 3 antennas, variable capacitors have been included which enables automatic antenna tuning (AAT). The capacitors are trimmed to 135pF.

The system requires 3 separate antennas. Only one antenna may be active at any given time so an RF switch is placed in series between the antenna and the matching circuit.



Matching Circuit and RF Switch PCB Layout on the main PCB:



VECTOR NETWORK ANALYZER MEASUREMENTS

