COILONE, LLC

CL3TC-NS

Custom 3T Integrated MRI Receive Coil Feed Board with Passive De-tuning (2-Board Configuration)

General Description

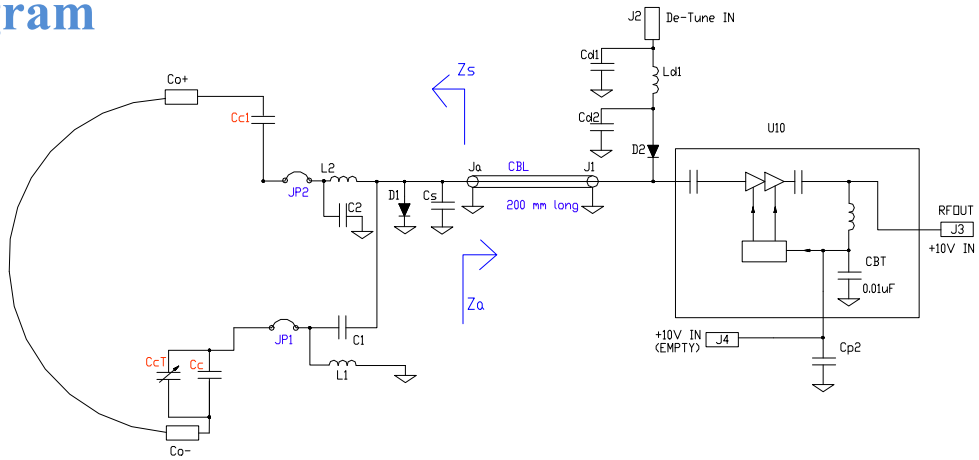
The CL3TC-NS is an 3T magnetic resonance imaging (MRI) receiving coil feed board assembly featuring no need the de-tuning The feed board contains (1) integrated Lattice Balun which provides common mode suppression and impedance transformation, (2) low input impedance pre-amp, (3) built-in pre-amp input protection, (5) 200 mm long non-magnetic AWG30 flex cable assembly between boards. The very large noise circles of the preamp allow a variety of coil types with little compromise SNR. Simply connect a coil loop and an output signal cable to complete each high-performance coil channel.

Key Features

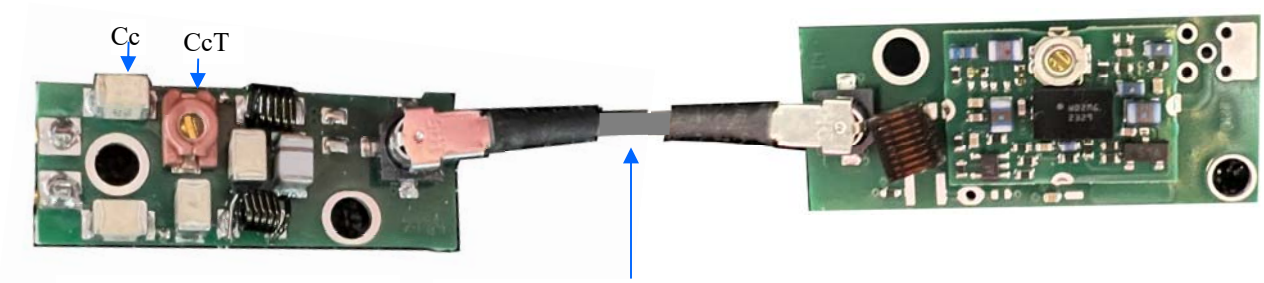
- For 3T MRI frequency of 123.2 MHz
- Designed for 2.5 Ω to 6 Ω loop impedance
- Typical Blocking Impedance: >1 k Ohm
- Common Mode Suppression: 45 dB
- Recovering Speed: 2 µS
- Integrated Lattice Balun
- Built-in Low Input Impedance Pre-amp
- Preamp Noise Figure: 0.25 dB
- Built-in limiter for preamp protection
- Maximum Input MRI TX power between Co- and Co+: 47 dBm
- Non-Magnetic
- RoHS Compliant
- Made In USA

Ordering: CL3TC-NS

Block Diagram



Product Picture



Loop module: 1.02”x 0.38” [25.91 mm x 9.53 mm]

200 mm Non-magnetic AWG30 flex cable with SMT Connectors

Amp Module: 1.20”x 0.50” [30.48 mm x 12.70 mm]

Absolute Maximum Ratings [1]

- 47 dBm Maximum Input MRI TX power between Co+ and Co-
- +7V ~ +12V DC Voltage (V_{dd})
- 2KV ESD Human Body Model
- Operating Temperature: +10 °C ~ +60 °C
- Storage Temperature: –40 °C ~ +85 °C

[1] Operating beyond these limits may cause permanent damages.

Electrical Performance

Parameter	Conditions	Min	Typical	Max	Unit
P_{IN}	123.2 MHz, TX signal, detuned, between Co+ and Co-			47	dBm
Z_B	Blocking Impedance, Ports CoT+ and CoT-		1200		Ω
Sco	Common Mode Suppression at 123.2 MHz, Between ports CoT- or CoT+ and Input of Preamp (J1)	40	45		dB
G_A	Preamplifier Gain at 123.2 MHz, Zs = 150 Ohm		28		dB
NF_A	Preamplifier Noise Figure at 123.2 MHz, Zs = 150 Ohm		0.25		dB
Z_a	Preamplifier Input Impedance at 123.2 MHz		1.0		Ω
S_{22}	Output Return Loss at 123.2 MHz	20			dB
OIP_3	Output IP_3, -3.0 dBm Each tone, 1 MHz separation	18	22		dBm
$P_{0.1dB}$	Output Power 0.1 dB Compression Point	0	3		dBm
P_{1dB}	Output Power 1 dB Compression Point	7	10		dBm
Tr	Recovering Speed, 20 dBm @ Input		2	4	µS
I_{DD}	Current Consumption		17		mA
V_{DD}	Power Supply Voltage	+7	+10	+12	V
$TEMP_O$	Operating Temperature	+10		+60	°C
TEMPs	Storage Temperature	–40		+80	°C

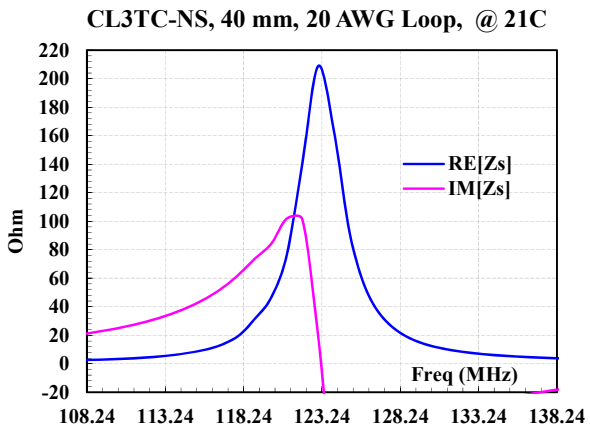
Performance and Application

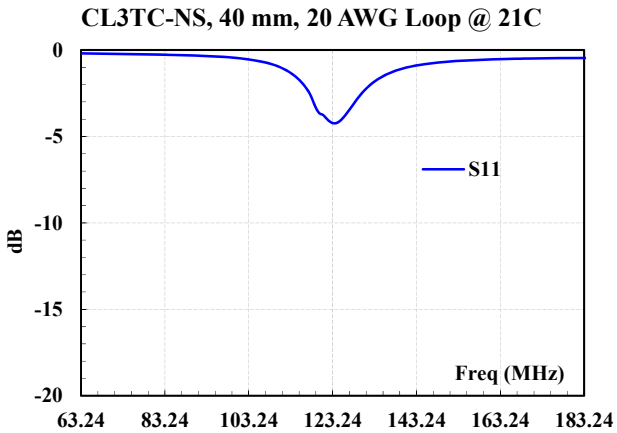
A. Cc/Cc1/CcT Selection

As shown in the Block Diagram, a coil loop can be connected between Co+ and Co- ports. The loop and on-board Cc, Cc1 and CcT together resonate at 123.2 MHz (3T MRI resonant frequency). Depending on the length or equivalent inductance of the loop, Cc & Cc1 may need to be replaced to achieve 123.2 MHz resonance for the loop; CcT is 6 ~ 20 pF and can be trimmed accordingly by the user.

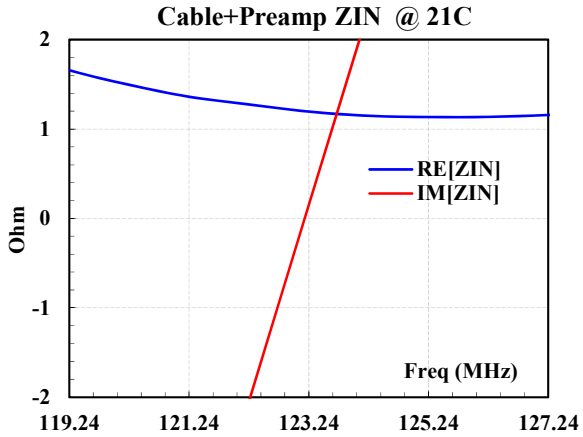
B. Source Impedance (Zs)

Sample Source impedance performance measured with an AWG 20 Diameter 40 mm Coil Loop soldered to Co+ and Co-.

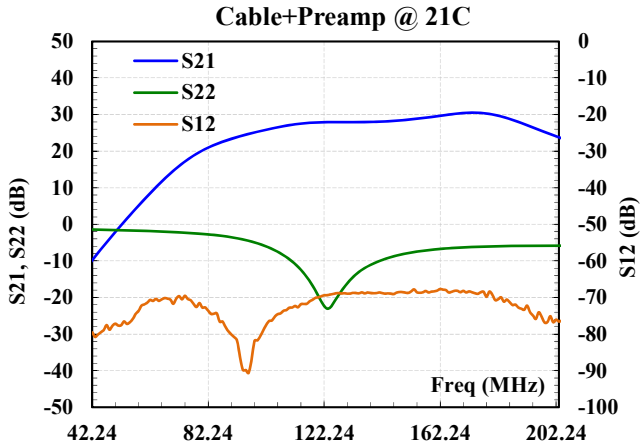




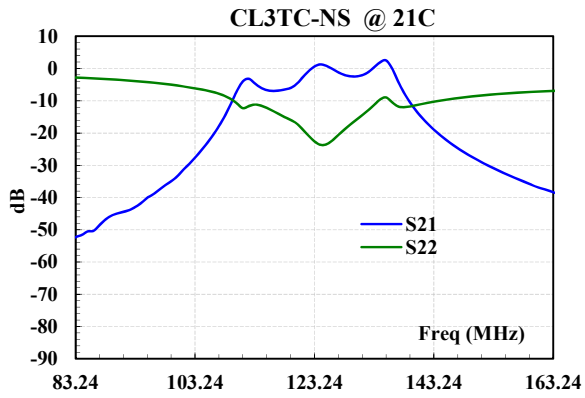
C. Cable+Preamp Input Impedance (Za)



D. Cable+Preamp Performance



D. Feed board's Overall Performance



E. Coil Loop Selection

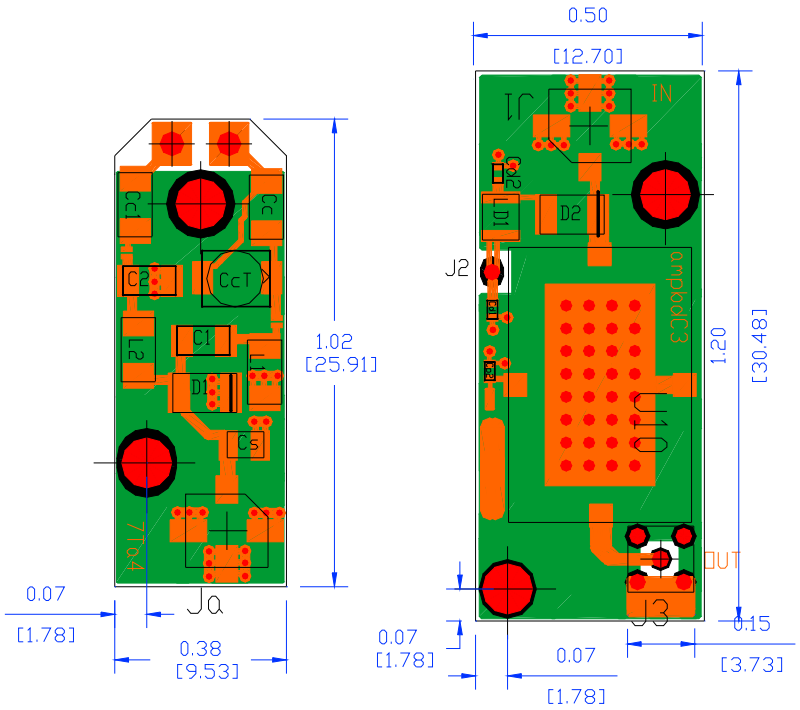
CL3TC-NS leaves the coil designer with easy high performance coil design. Any type of coil loops with the impedance from 2.5 Ohm to 6 Ohm can be used.

Very large noise circles of integrated on-board preamp forgive the large source impedance variation caused by the coil loop without degrading SNR.

Flexible loops, wire loops, etc. are suitable as long as loops resonate at the MRI frequency of 123.2 MHz with the on-board capacitors, Cc, Cc1 and CcT.

G. Outline

Coil Loop Board **Preamp Board**



PCB Material: FR-4 Unit: Inch
[mm]
Tolerance: X.XX ±0.01

Coil Loop Board: Ja: RF Output, Hirose H.FL/S-R-SMT
Preamp Board: J1: RF Input, Hirose H.FL/S-R-SMT
J3: RF Output, PCB Mount MMCX Connector, Straight Jack
Cable In Between: Hitachi UL1745-SB-CX-50 30 AWG TAD1.37, Gray