Rework List for the WCT-15W1COILTX Rev.3 Board

1. Introduction

In the WCT-15W1COILTX solution, the Q factor detection is implemented to meet the Qi Medium Power V1.2.2 specification requirements. The external driver Q factor detection method is used in the WCT-15W1COILTX V3.0 release. To reduce the BOM cost and enhance the solution competitiveness, the free resonance Q factor detection method is implemented in the WCT-15W1COIL TX V3.1 release, which requires less external parts and leaves more WCT resources for customers' applications.

This document describes how to rework the WCT-15W1COILTX Rev.3 board (PCB no.: 170-28122 REV C, EVK board no.:700-28122 REVA) to support the WCT-15W1COILTX V3.1 release. The customer can rework the EVK board according to the rework list.

Contents

According to the Qi Medium Power V1.2.2 specification, Q factor detection is preferred to detect the FO before power transfer. When the medium RX is put on the interface of the transmitter (TX), the TX starts to detect the Q factor of the coil. If the Q factor is lower than the threshold, which is determined by the receiver (RX) reported Q factor, the FO is detected.

2. Q Factor Detection

Many methods can be used to detect the Q factor. In the WCT-15W1COILTX V3.1 release, the external driver Q factor detection and free resonance Q factor detection are supported.

2.1. External driver Q factor detection

Applying the external driver source on the resonant network, the Q factor can be calculated by the formula $Q = V_2/V_1$, where V1 is the external driver source and V2 is the resonant voltage.
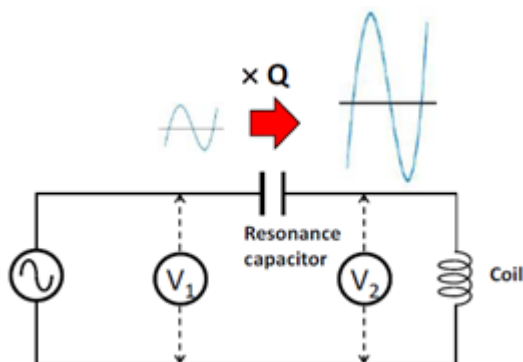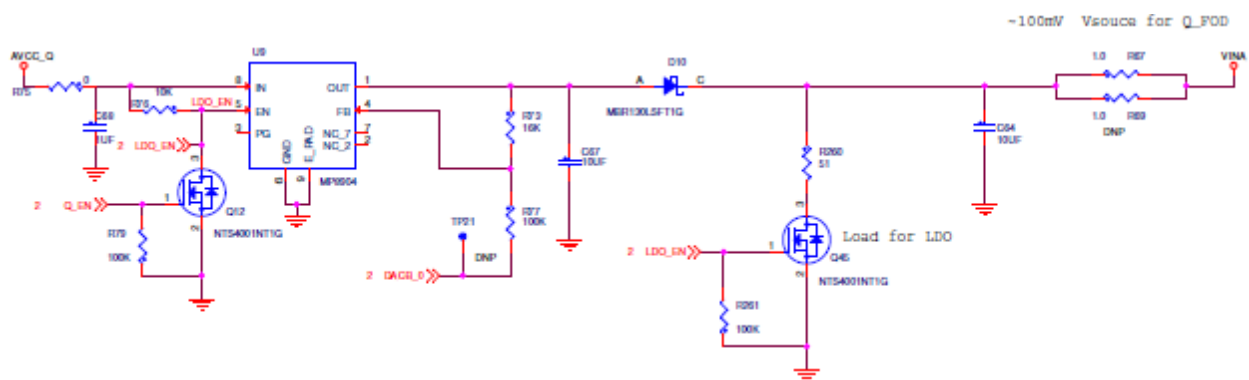

Figure 1. External driver Q factor method

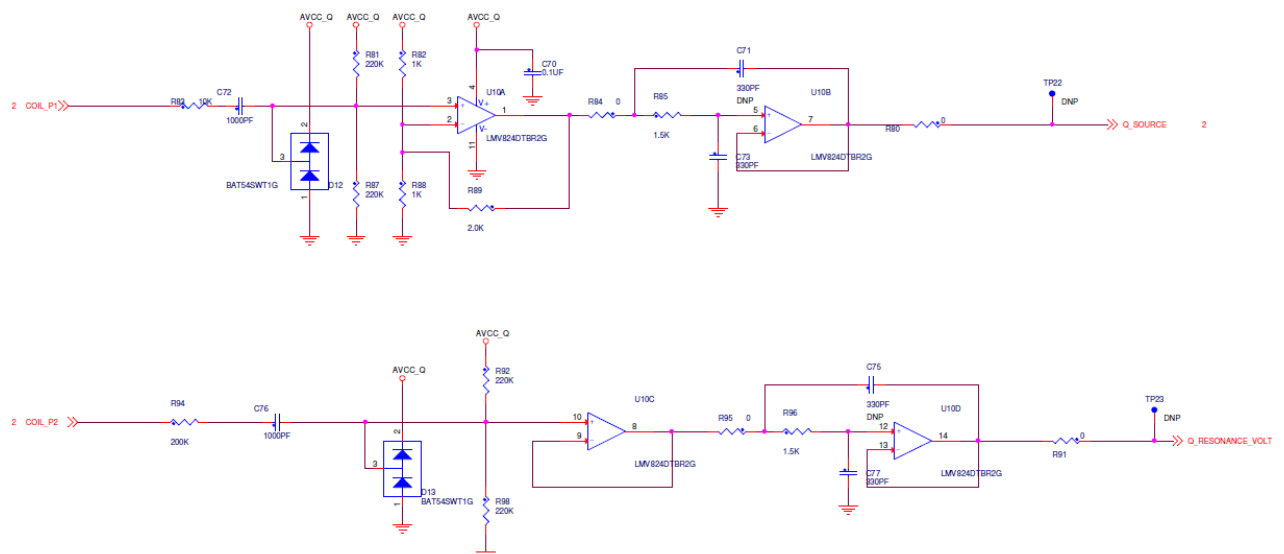The external driver source is produced with LDO.

Figure 2. External driver source

The external source voltage and resonant voltage are sent to ADC ports after conditioning and filtering.

Figure 3. External driver Q factor measurement circuit

2.2. Free resonance Q factor detection

Applying a narrow pulse driver on the resonant network, and monitoring the time and value of the free resonance after removing the narrow pulse driver, the Q factor can be achieved by the formula $Q=\pi/(-\ln(Rate))$, in which Rate is the decay rate value of the resonance signal.
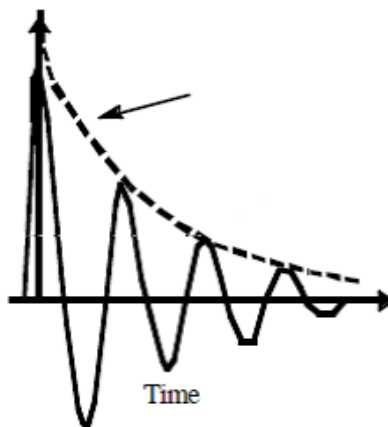

Figure 4. Free resonance signal

With free resonance Q factor method, the narrow pulse driver can be produced with the input voltage and no more circuits are needed, which saves on cost compared with the external driver Q factor detection method.

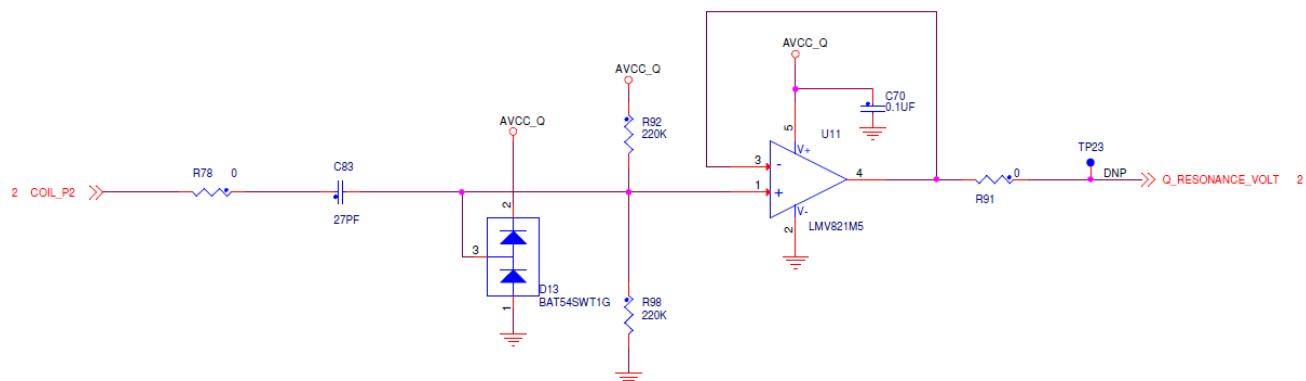Only one analog signal should be sent to the ADC port after conditioning and filtering.

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Figure 5. Free resonance Q factor measurement circuit

3. Rework List for the WCT-15W1COILTX Rev.3 Board

The WCT-15W1COILTX Rev.3 board is available on the NXP website:

www.nxp.com/products/power-management/wireless-charging-ics/wct-15w1coiltx-15-watt-single-coil-wireless-charging-transmitter-reference-platform:RDWCT-15W1COILTX

By default, the WCT-15W1COILTX EVK board supports the external driver source Q factor detection method. As the free resonance Q factor detection method is supported with the lower BOM cost by default in the V3.1 release, the WCT-15W1COILTX Rev.3 board needs to rework some parts to support the V3.1 release.

Table 1. Rework list for the V3.1 release

Part Reference	Initial value	Action	Updated value
R94	200 k	change to	0R
C76	1000 pF	change to	27pF
R90	DNP	change to	0R
R99	DNP	change to	0R
R102	DNP	change to	0R
R91	0R	delete	/

The locations of the reworked parts are marked in the following figure.
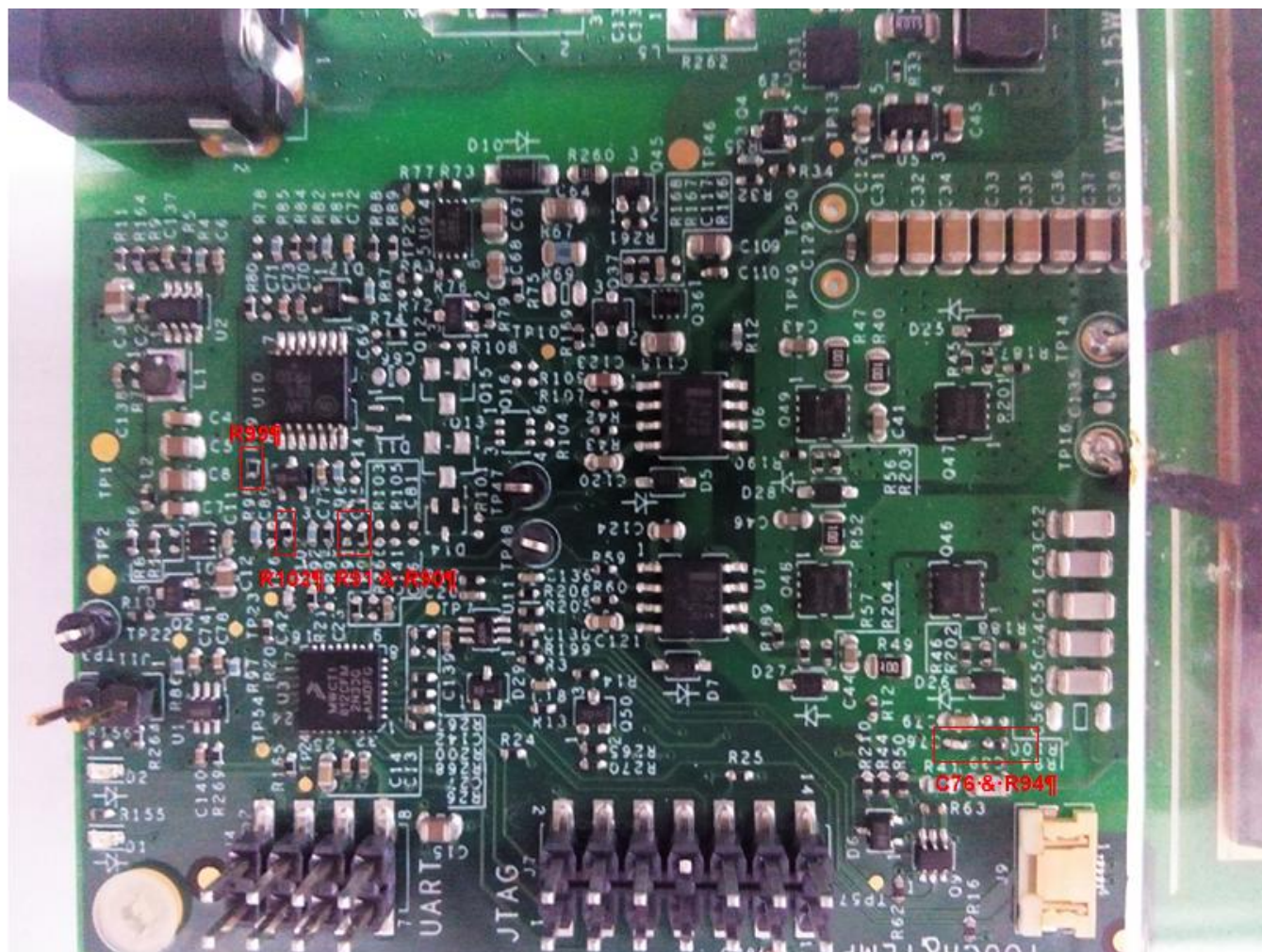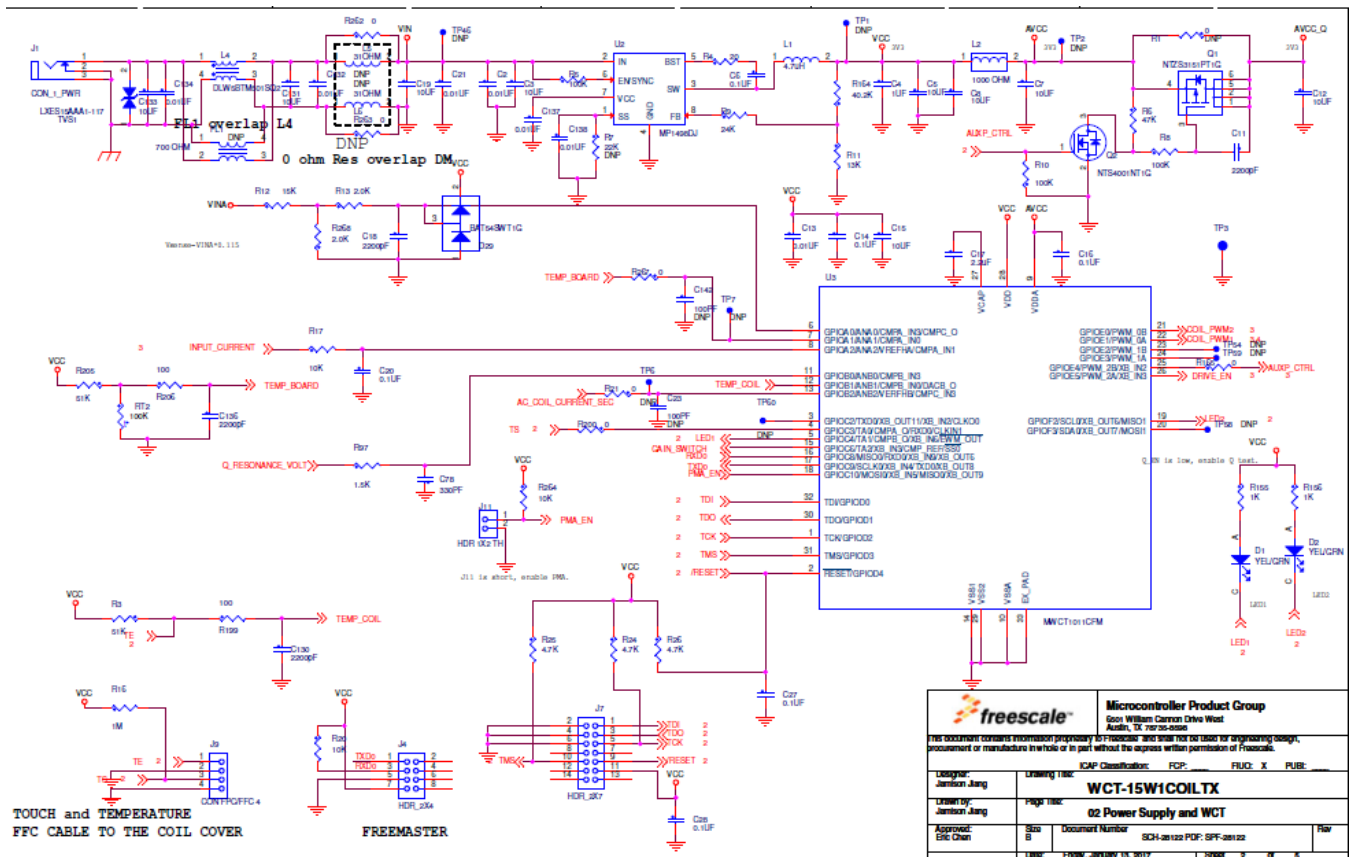
Figure 6. Rework work parts locations

4. Reference Schematic for New Design

If the customer wants to apply the free resonance Q factor detection method in a new design, the following schematic can be taken as a reference.
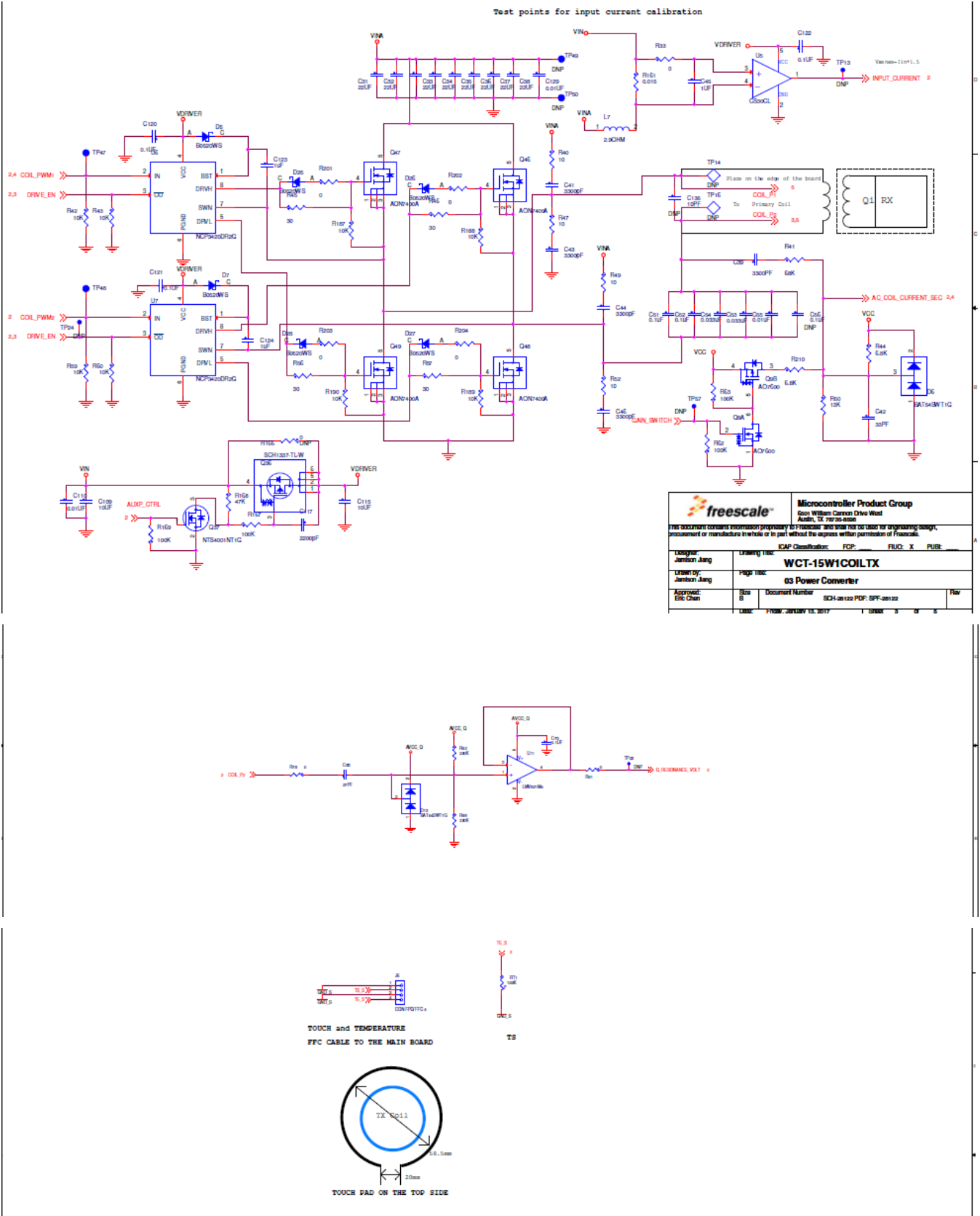
Figure 7. Reference schematic

5. References

- NXP wireless charging solution page:
  www.nxp.com/products/power-management/wireless-charging-ics
- WPC page:
  www.wirelesspowerconsortium.com
- WCT1012 Documents:
  - *WCT1012 15W Single Coil TX V3.1 Reference Design System User's Guide* (WCT1012V31SYSUG)
  - *WCT1012 TX V3.1 Library User's Guide* (WCT1012V31LIBUG)
  - *WCT1012 15W Single Coil TX V3.1 Runtime Debugging User's Guide* (WCT1012V31RTDUG)
  - *WCT1012 15W1COILTX V3.1 Release Notes* (WCT1012V31RN)

6. Revision History

Table 2. Revision history

Revision number	Date	Substantive changes
0	02/2017	Initial release.

Document Number: WCT1012V31RLAN
Rev. 0
02/2017