# LINEAR TECHNOLOGY

## Shield Board for Use with DC2321A Dust Demo Board

# DESCRIPTION

Demonstration circuit DC2510A is a shield board for use with the DC2321A Dust application demo board. This board is designed to allow users to built their own custom application circuits directly on the DC2321A with access to all pins of the LTP5901-IPM Dust mote.

The board offers footprints of common sensor and IC packages as well as prototyping space for routing. The following footprints are included on the board:

**TOP**
- MSSOP-10 (×2)
- TS8 (×2)
- SOIC-20 (×2)
- DFN-20 (×2)

**BOTTOM**
- SOT-23 (×4)
- TSOT-23-8 (×2)
- SSOP-20 (×2)

Power rails and grids of copper pads (in both 2mm and 2.54mm pitch) form a solderable breadboard, and the IC footprints allow easy mounting of surface-mount packages. Each pin on the footprints and headers also connects to a copper-plated hole for easy wiring.

Each energy harvesting circuit on the DC2510A hosts input turrets for connecting solar panels, thermoelectric generators, piezoelectric devices, or any other high impedance source.

The headers on the board are designed to fit into the LTP5901-IPM header layout on the DC2321A. The long pins of the headers allow wiring below the board and give users a place to clip grabber leads.

The headers are also stackable, allowing multiple DC2510A boards to be connected vertically, all with access to the pins on the DC2321A. This allows a user to create different applications on multiple DC2510A boards and swap them out or combine them as desired.

Please refer to the DC2321A demo manual and LTP5901-IPM data sheet for operation information and input limits. The application section of this demo manual describes the system level functionality of this board and the various ways it can be used in early design prototyping.

**Design files for this circuit board are available at http://www.linear.com/demo/DC2510A**

# BOARD PHOTO
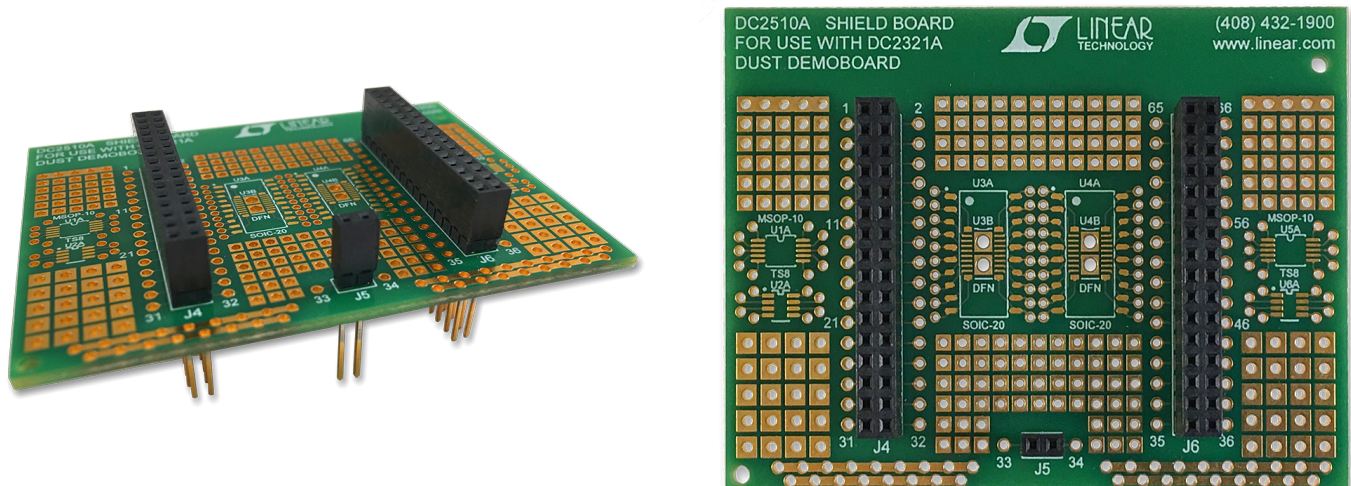


**Figure 1. DC2510A**

dc2510af

# ABSOLUTE MAXIMUM RATINGS

Supply Voltage on VSUPPLY ................................................................................................................... 4.20V
Input Voltage on ADC Inputs ..................................................................................................................1.98V
Voltage on Any Digital I/O Pin ............................................................................................−0.3V to VSUPPLY + 0.3V

# SPECIFICATIONS

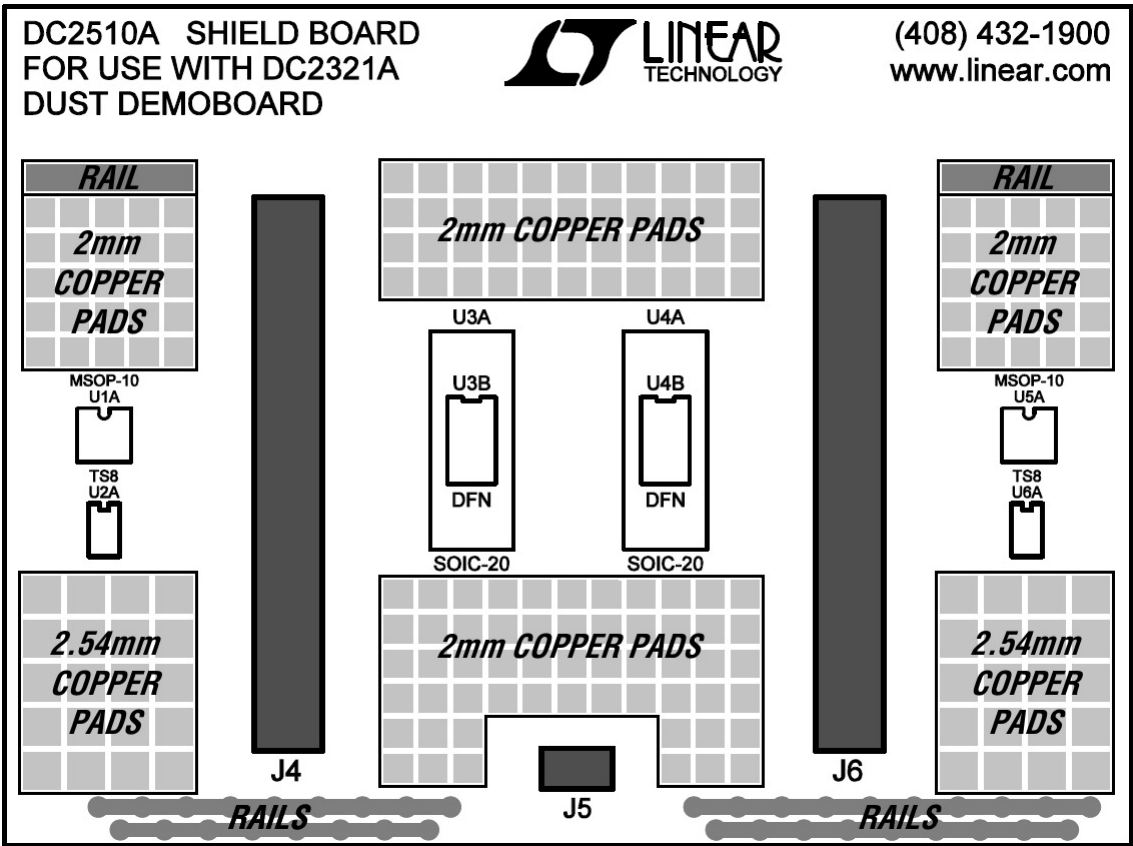| PIN TYPE | PIN | PARAMETER | MIN | TYPICAL/ DEFAULT | MAX | UNITS |
|----------|-----|-----------|-----|------------------|-----|-------|
| Power | VSUPPLY | | 2.1 | 3.3 | 3.76 | V |
| I/O | ADCs | Input Voltage Range | 0 | | 1.8 | V |
| | GPIO, UART, $I^2C$, SPI | Low Input Voltage | −0.3 | | 0.6 | V |
| | | High Input Voltage | VSUPPLY −0.3 | | VSUPPLY +0.3 | V |
| | | Low Output Voltage | | | 0.4 | V |
| | | High Output Voltage | VSUPPLY −0.3 | | VSUPPLY +0.3 | V |
| | | Pull-Up/Pull-Down Resistance | | 50 | | kΩ |



Figure 2. Board Layout Organization Diagram
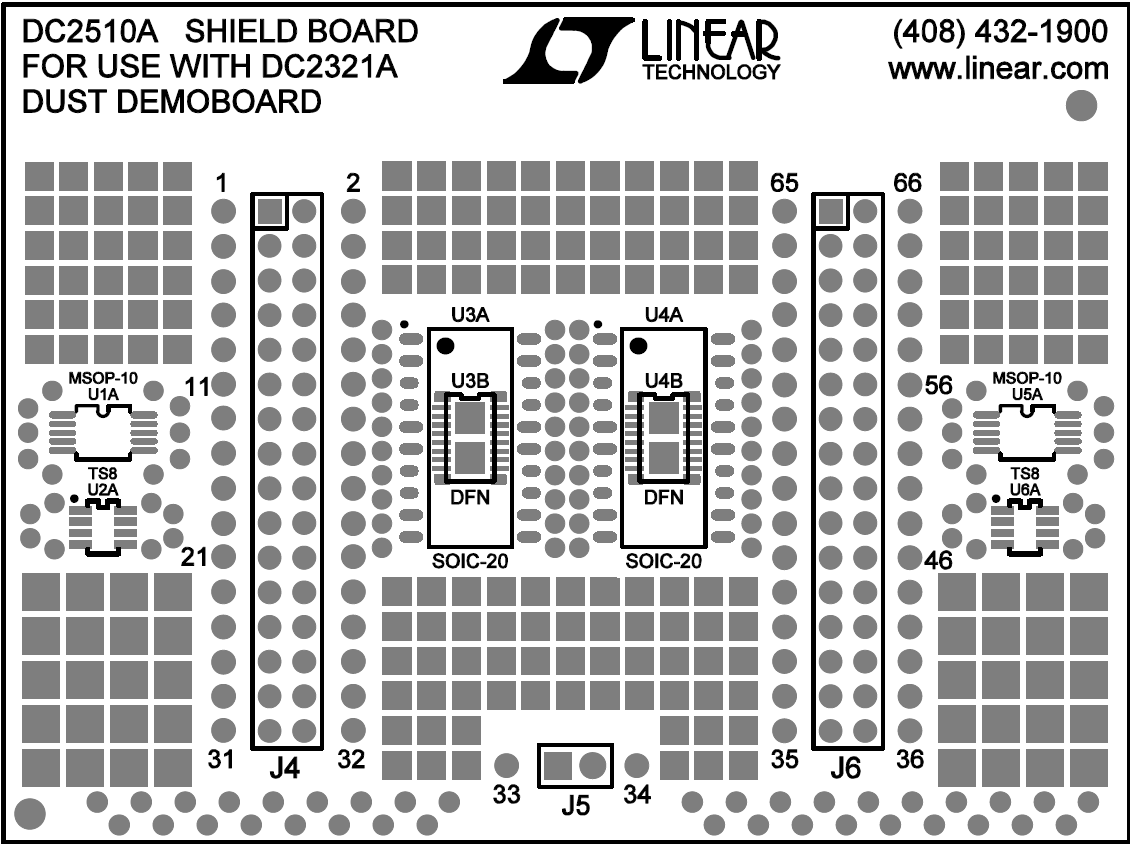
# SPECIFICATIONS



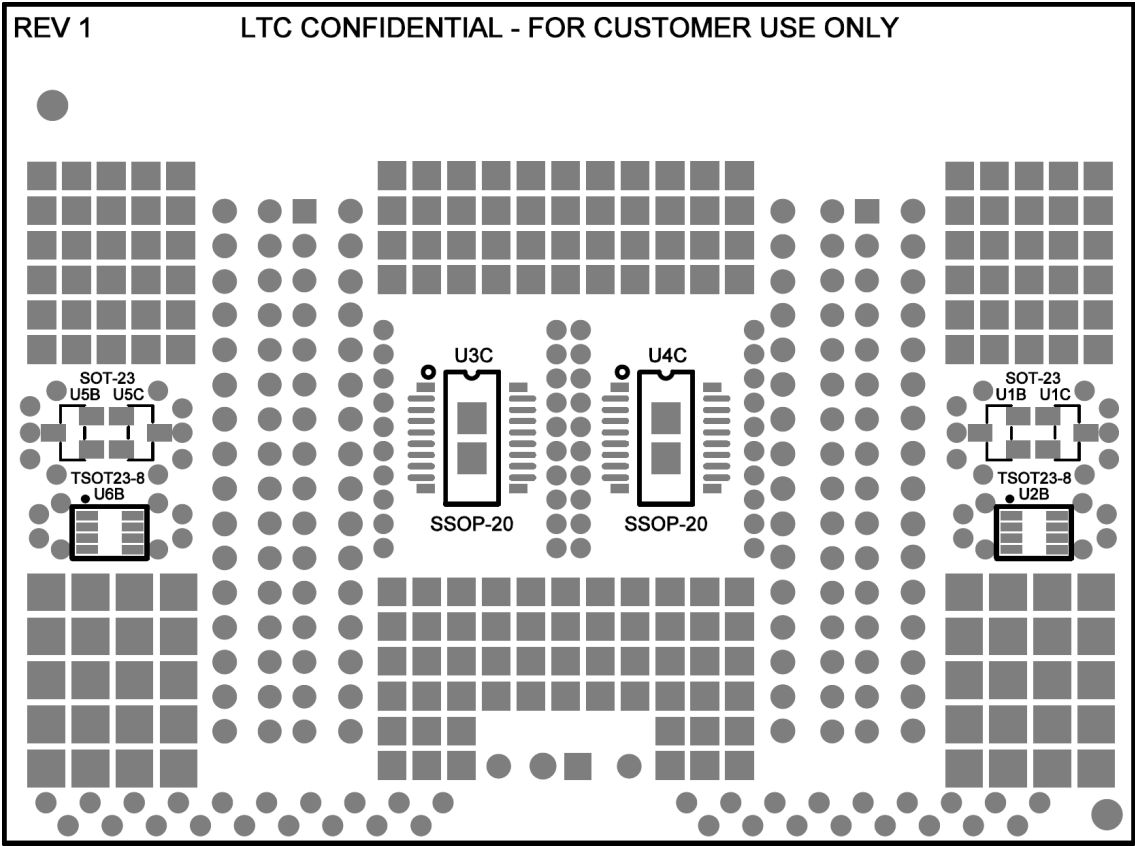Figure 3. DC2510A Top Assembly Drawing

## SPECIFICATIONS



**Figure 4. DC2510A Bottom Assembly Drawing**

# QUICK START PROCEDURE

### Instructions

To use DC2510A, you will need to connect a sensor to the board. This device can be soldered onto the grid of copper pads, attached to one of the provided SMD footprints, or inserted into the headers directly (if it is a through-hole part such as a thermistor).

There are a few inputs and interfaces for receiving data:

1. UART

2. $I^2C$

3. SPI

4. ADC (×4)

5. GPIO (×4 default, up to 18)

Table 1 shows which of these inputs can be read from the DC2321A GUI through the Mote Measurement Settings dialog. This allows users to start taking sensor measurements out-of-the-box without reprogramming the DC2321A. However, any of these inputs can be used if a custom program is written.

Some sensors can output a voltage that is suitable for ADC measurements (ADC abs max = 1.98V), or may have an integrated serial port. However, other sensors may require an additional IC to read the measurement and communicate with the mote.

### General Notes

- The copper rails on DC2510A are not connected to anything by default, and must be wired by the user.

- SMD footprints on the top and bottom of the PCB share plated holes. Only one IC per each set of plated holes should be populated at any time.

- Do not connect USB power to any pin on the mote.

- Pull-up resistors should be pulled to VSUPPLY.

- Any input with a voltage applied when VSUPPLY is not powered can power the mote through a sneak path.

### Combining Application Circuits

Because DC2510A is stackable, a user can make custom applications on several different boards and connect all of the boards together to combine the circuits. This can be useful if a user runs out of routing space on a board, or if an additional SMD footprint is needed.

Additionally, if a different GPIO pin is tied high on each of these boards, data from these circuits can be read from a single program which checks the state of a GPIO to determine if a particular sensor circuit is present.

### SMD Soldering Instructions

The footprints for U3 and U4 allow ICs with GND paddles to be mounted using a soldering iron rather than a heat gun. The recommended procedure is as follows:

1. Place the IC onto the footprint as it will be soldered; solder the four corner pins into place on the copper pads.

2. Turn the board over and touch the soldering iron to both the paddle and the plated hole. Quickly apply solder to the junction.

3. Turn the board back to the original orientation and solder the rest of the pins.

4. Wire the paddle to its destination on the board.

5. Wire the pins to their destinations on the board.

# QUICK START PROCEDURE

Table 1. Inputs and Interfaces Key

| Pin Type | Pin Function | Readable Though GUI | Notes |
|---|---|---|---|
| Power | GND | – | – |
| | 5VUSB | No | – |
| | 3V3USB | No | – |
| | VSUPPLY | Yes | Abs Max is 4.20V |
| Serial Communication | UART | No | – |
| | I$^2$C | Yes | – |
| | SPI | No | Remove R1 on DC2321A to Free SS |
| Input/Output | ADC | Yes | Full-Scale Voltage is 1.8V, Abs Max is 1.98V |
| | GPIO | No | – |
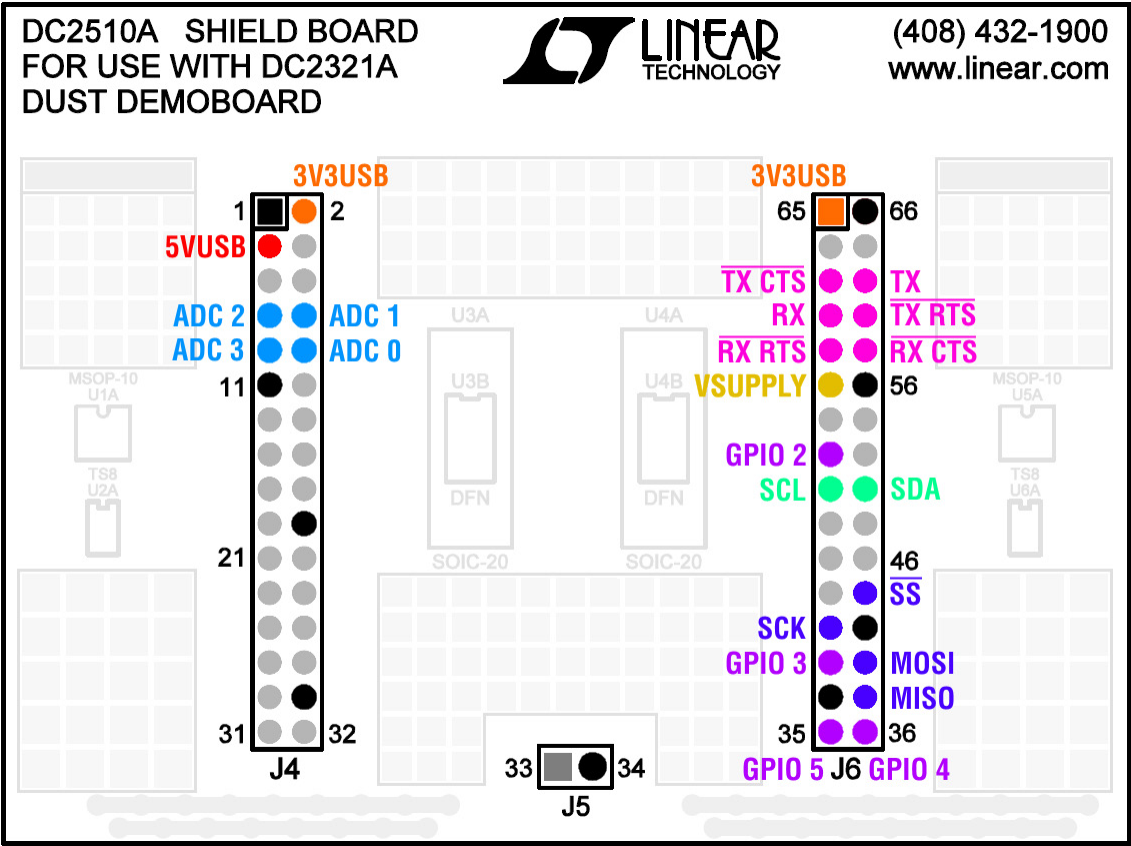


Figure 5. DC2321A Routing Guide

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# PARTS LIST

| ITEM | QTY | REFERENCE | PART DESCRIPTION | MANUFACTURER/PART NUMBER |
|------|-----|-----------|------------------|--------------------------|
| **Required Circuit Components** | | | | |
| 1 | 2 | J4, J6 | 2×16, 2mm PITCH, VERTICAL STACKABLE SOCKET | SAMTEC, ESQT-116-02-GF-D-310 |
| 2 | 1 | J5 | 2 PIN, 2mm PITCH, VERTICAL STACKABLE SOCKET | SAMTEC, ESQT-102-02-GF-S-310 |
| 3 | 1 | --- | FAB, PRINTED CIRCUIT BOARD | DEMO CIRCUIT 2510A-1 |

# SCHEMATIC DIAGRAM
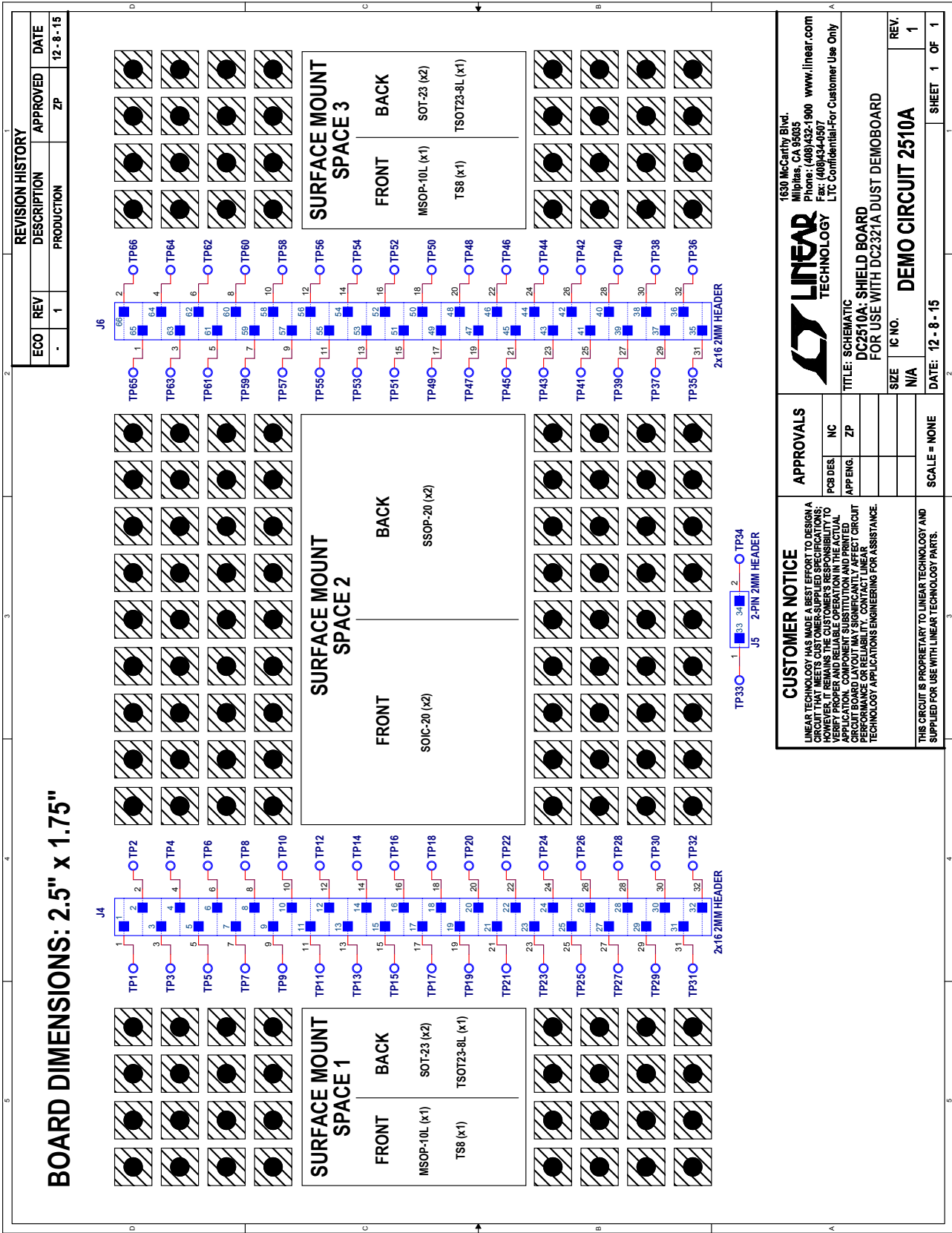
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# SCHEMATIC DIAGRAM
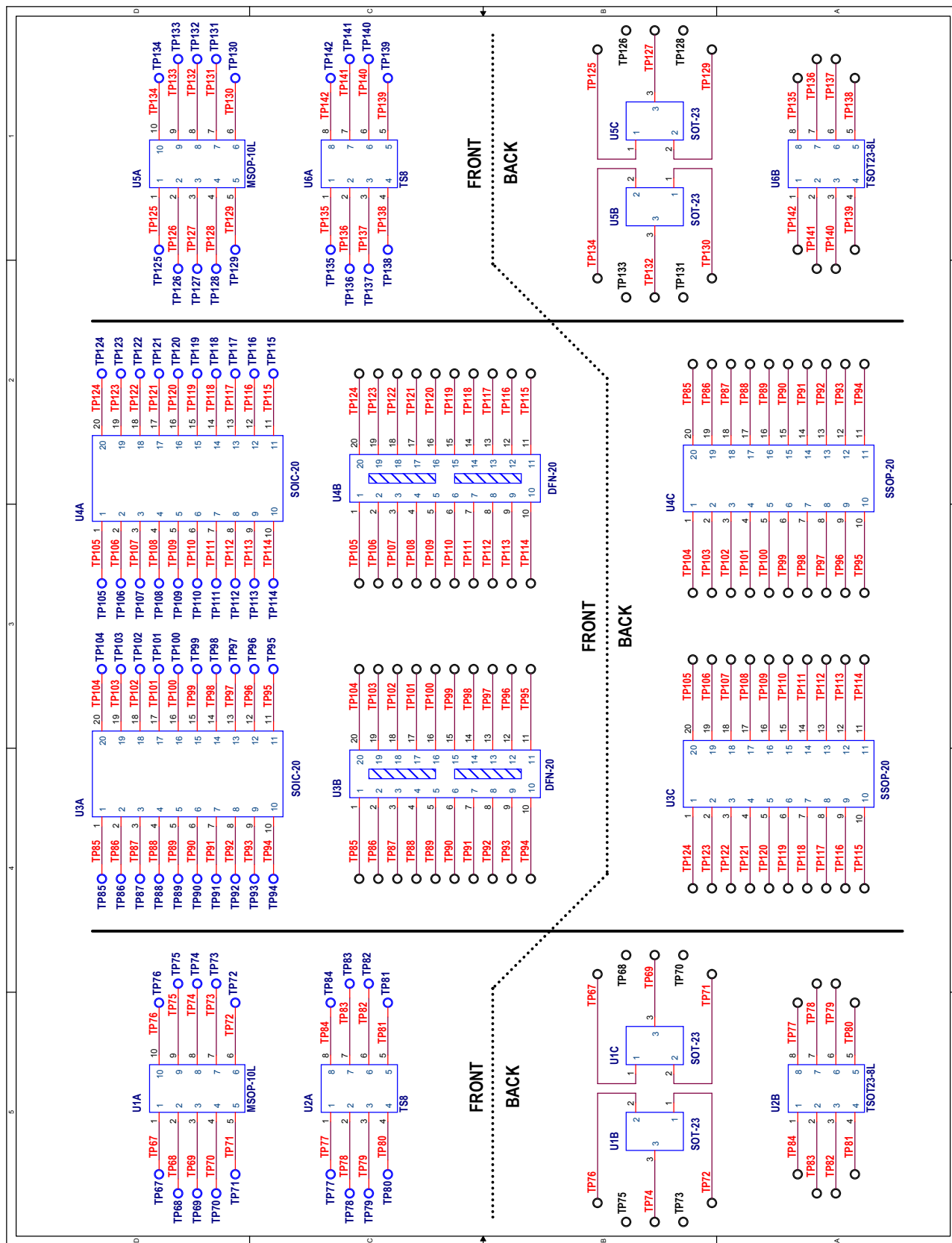
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DEMONSTRATION BOARD IMPORTANT NOTICE

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