Document Number: KTTWR34933EVBUG
Rev. 1.0, 6/2015

# TWR-34933EVB Tower System Platform

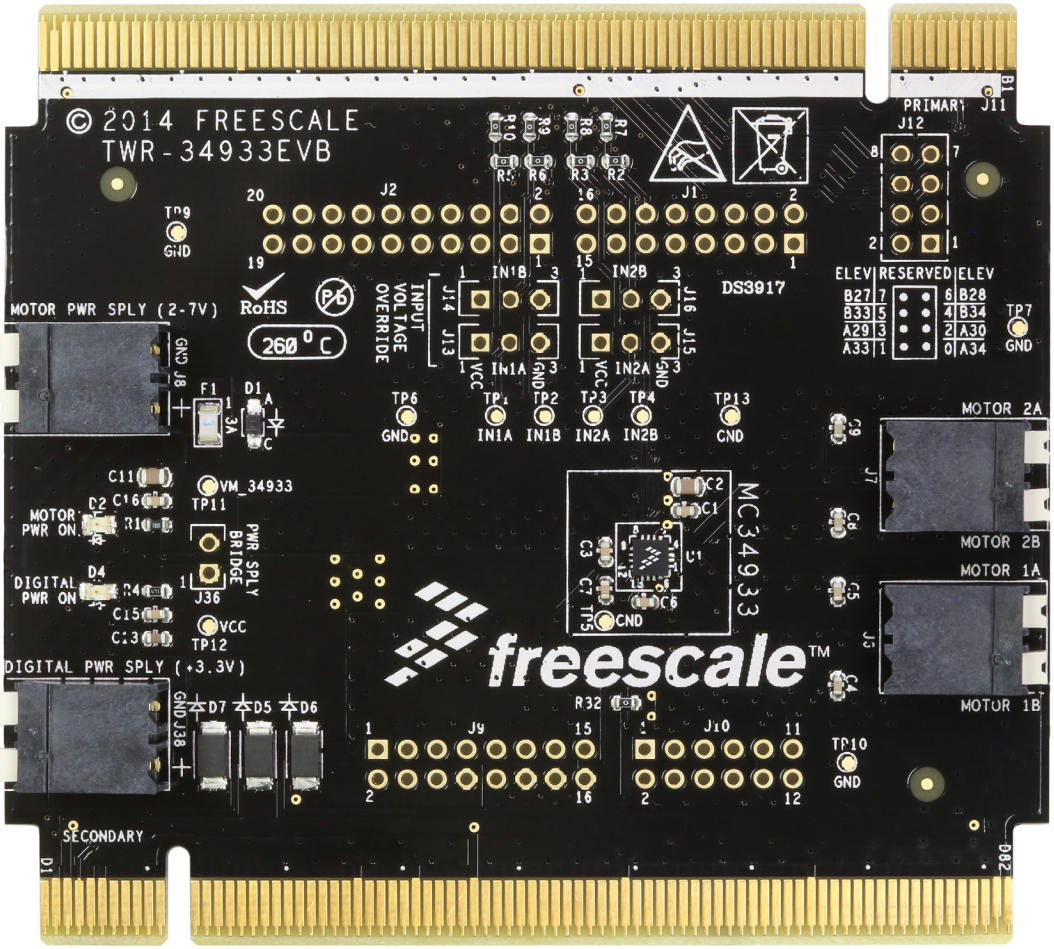


**Figure 1. TWR-34933EVB**

# Contents

# 1 Important Notice

Freescale provides the enclosed product(s) under the following conditions:

This evaluation kit is intended for use of ENGINEERING DEVELOPMENT OR EVALUATION PURPOSES ONLY. It is provided as a sample IC pre-soldered to a printed circuit board to make it easier to access inputs, outputs, and supply terminals. This evaluation board may be used with any development system or other source of I/O signals by simply connecting it to the host MCU or computer board via off-the-shelf cables. This evaluation board is not a Reference Design and is not intended to represent a final design recommendation for any particular application. Final device in an application will be heavily dependent on proper printed circuit board layout and heat sinking design as well as attention to supply filtering, transient suppression, and I/O signal quality.

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# 2 Getting Started

## 2.1 Kit Contents/Packing List

The **TWR-34933EVB** contents include:

- Assembled and tested evaluation board in anti-static bag
- Quick Start Guide
- Warranty card

## 2.2 Jump Start

Freescale's analog product development boards help to easily evaluate Freescale products. These tools support analog mixed signal and power solutions including monolithic ICs using proven high-volume SMARTMOS mixed signal technology, and system-in-package devices utilizing power, SMARTMOS and MCU dies. Freescale products enable longer battery life, smaller form factor, component count reduction, ease of design, lower system cost and improved performance in powering state of the art systems.

- Click on www.freescale.com/TWR-34933EVB
- Review your Tool Summary Page
- Look for


- Download documents, software and other information

Once the files are downloaded, review the user guide in the bundle. Jump start bundles are available on each tool summary page with the most relevant and current information. The information includes everything needed for design.

## 2.3 Required Equipment and Software

To use this kit, you need:

- DC Power supply (2.0 V to 7.0 V, 0.1 A to 1.0 A, depending on stepper motor requirements)
- Typical loads (stepper motor, brushed DC motors, or power resistors)
- Wire cables for power supply and load connection
- (Optional) Signal Generator
- (Optional) Other Tower modules (MCU Tower, ELEV, etc.) if used: http://www.freescale.com/tower
- (Optional) Other Freedom modules (MCU Freedom, etc.) if used: http/www.freescale.com/freedom
- Arduino™ R3 Connectors (only required if the FRDM-KL25Z board is used)
- Processor Expert (or other) software development interface (if an MCU is used)

# 3 Understanding the Platform

The Freescale Tower System is a modular development platform for 8-, 16- and 32-bit MCUs and MPUs enabling advanced development through rapid prototyping. Featuring more than fifty development boards or modules, the Tower System provides designers with building blocks for entry-level to advanced MCU development. For additional information, go to: http://www.freescale.com/tower.

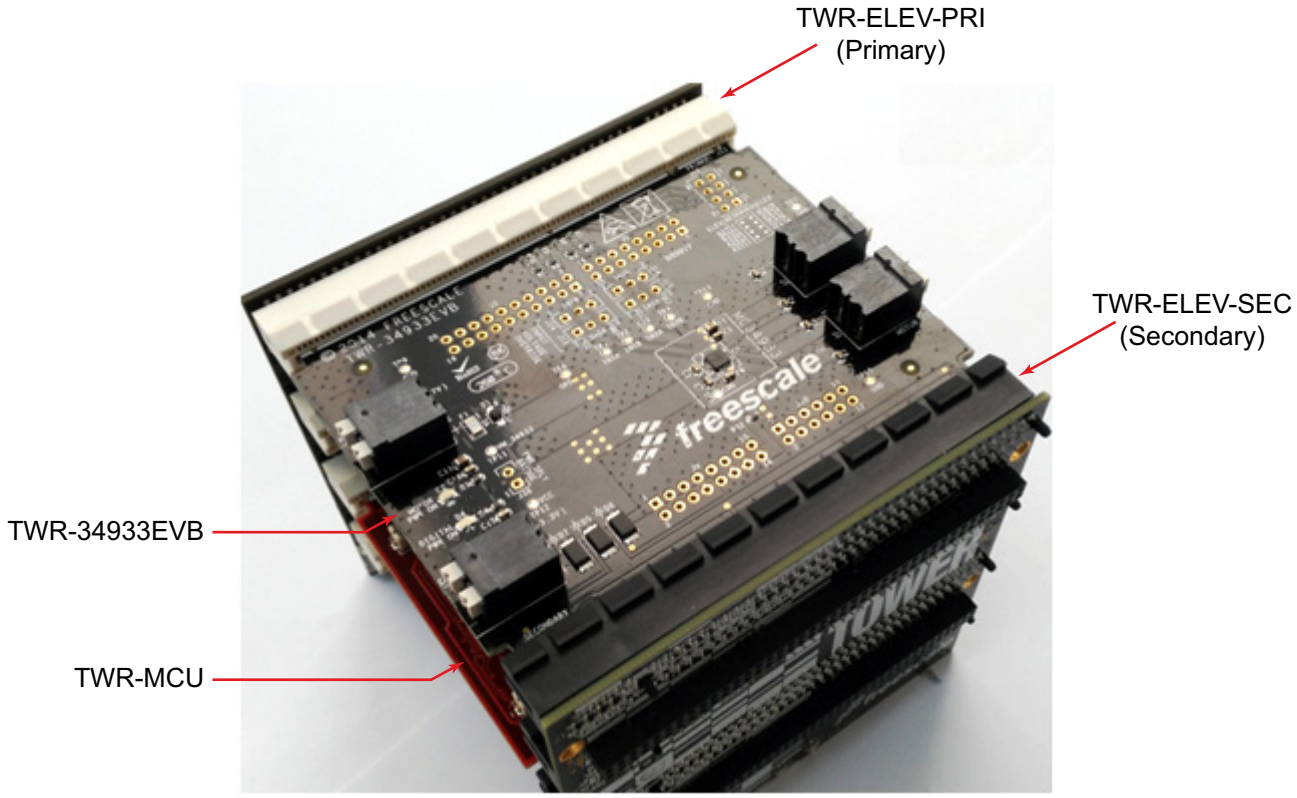


**Figure 2. Tower System**

**Table 1. Tower Description**

| Name | Description |
|---|---|
| TWR-34933EVB | TWR-34933 Evaluation Board |
| TWR-MCU | Additional Freescale Tower/Freedom modules (Optional) |
| TWR-ELEV-PRI | Tower System Elevator Primary Module |
| TWR-ELEV-SEC | Tower System Elevator Secondary Module |

## 3.1 Block Diagram

Figure 3 shows the hardware block diagram.

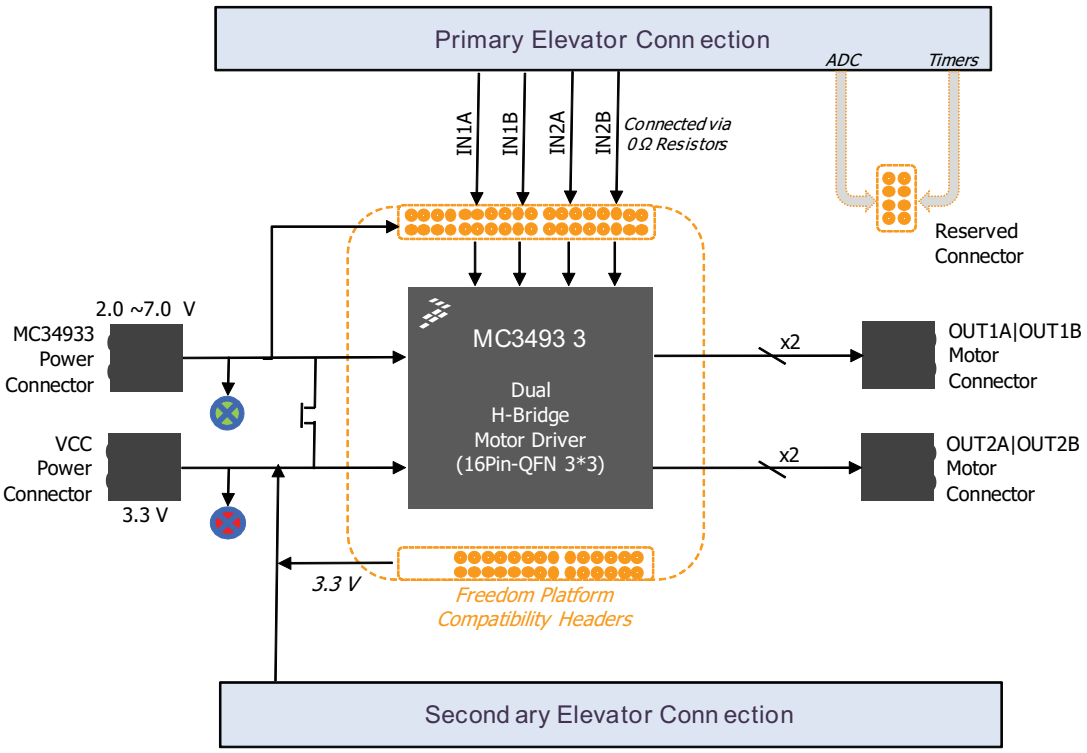


**Figure 3. Block Diagram**

### 3.1.1 Device Features

The board features the following Freescale products:

**Table 2. Device Features**

| Device | Description | Features |
|---|---|---|
| MC34933 | Dual H-Bridge motor driver IC intended for operating stepper motors | • Voltage range of operation from 2.0 V to 7.0 V<br>• Output Current of 1.0 A (DC) continuous, 1.4 A peak<br>• 700 mΩ $R_{DS(on)}$ H-Bridge MOSFET outputs<br>• 3.3/5.0 V TTL/CMOS compatible inputs<br>• PWM frequencies up to 200 kHz<br>• Undervoltage shutdown<br>• Cross conduction (shoot through) suppression |

# 4 Getting to Know the Hardware

## 4.1 Board Overview

The TWR-34933EVB module is an easy-to-use development board allowing the user to exercise all the functions of the H-Bridge motor driver IC MC34933EP. The TWR-34933EVB can operate as a standalone tool or can be combined and used as part of the modular Tower and Freedom System development platform.

## 4.2 Board Features

The board features are as follows:

- Compatibility with Freescale Tower system and Freedom development platform
- LEDs to indicate the supply status
- Transient voltage suppressor to handle system level transients
- Test points to allow probing of signals

## 4.3 Board Description

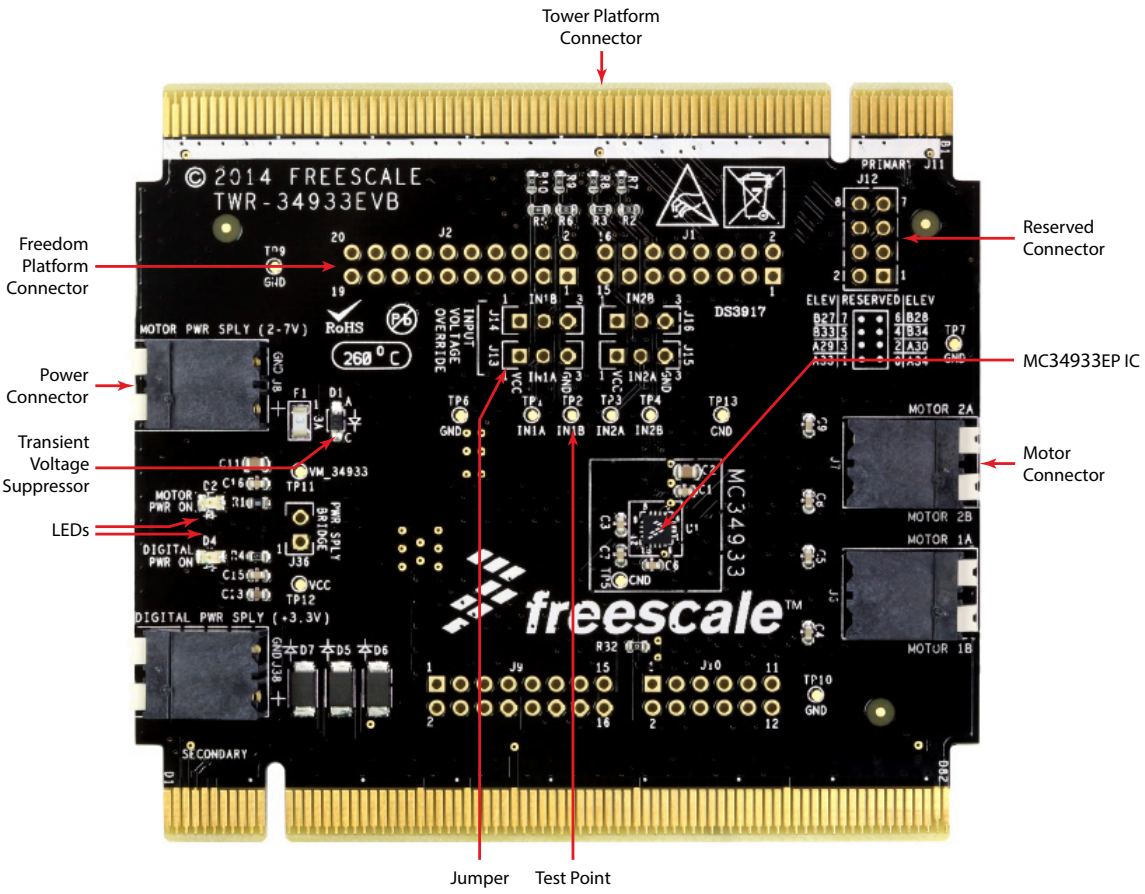


**Figure 4. TWR-34933EVB Description**

**Table 3. TWR-34933EVB Board Description**

| Name | Description |
|---|---|
| Tower Platform Connectors | Plug into Tower primary / secondary elevators. Interface with the Tower board MCU |
| Freedom Platform Connectors | Plug into Freedom board Arduino™ R3 connectors. Interface with the Freedom board MCU |
| LEDs | Indicate power supply ON/OFF status |
| Transient Voltage Suppressor | Shields components from system level transients |
| Test Points | Allow signal probing |
| Power Connectors | Connects to digital and analog power supplies |
| Motor Connectors | Connects to motors |
| Reserved Connector | Provides connections for MCU ADC/PWM function expansion |
| Jumper | Provides a means of shorting to VCC or GND when the MCU is not connected |

## 4.4 LED Display

The following LEDs are provided as visual output devices for the TWR-34933EVB.

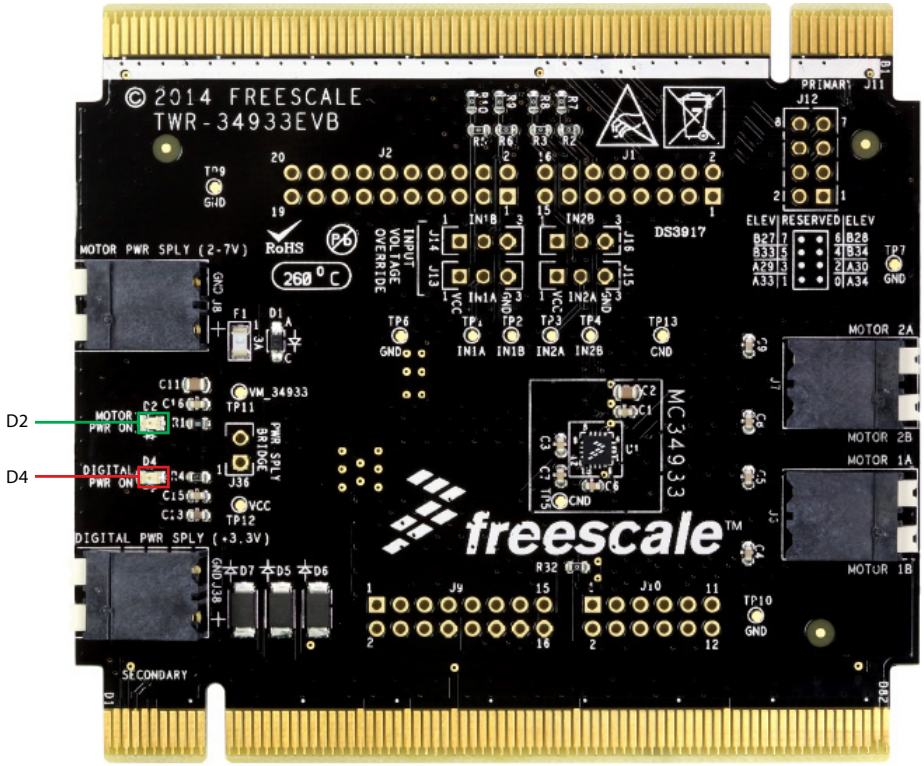


**Figure 5. LEDs**

**Table 4. LEDs**

| Schematic Label | Name | Description |
|---|---|---|
| D2 | Green LED | Indicates when the motor power supply VM is connected to the MC34933EP |
| D4 | Red LED | Indicates when the digital power supply VCC is connected to the MC34933EP |

## 4.5 Connectors

Figure 6 and Table 5 identify the input/output connectors on the TWR-34933EVB.

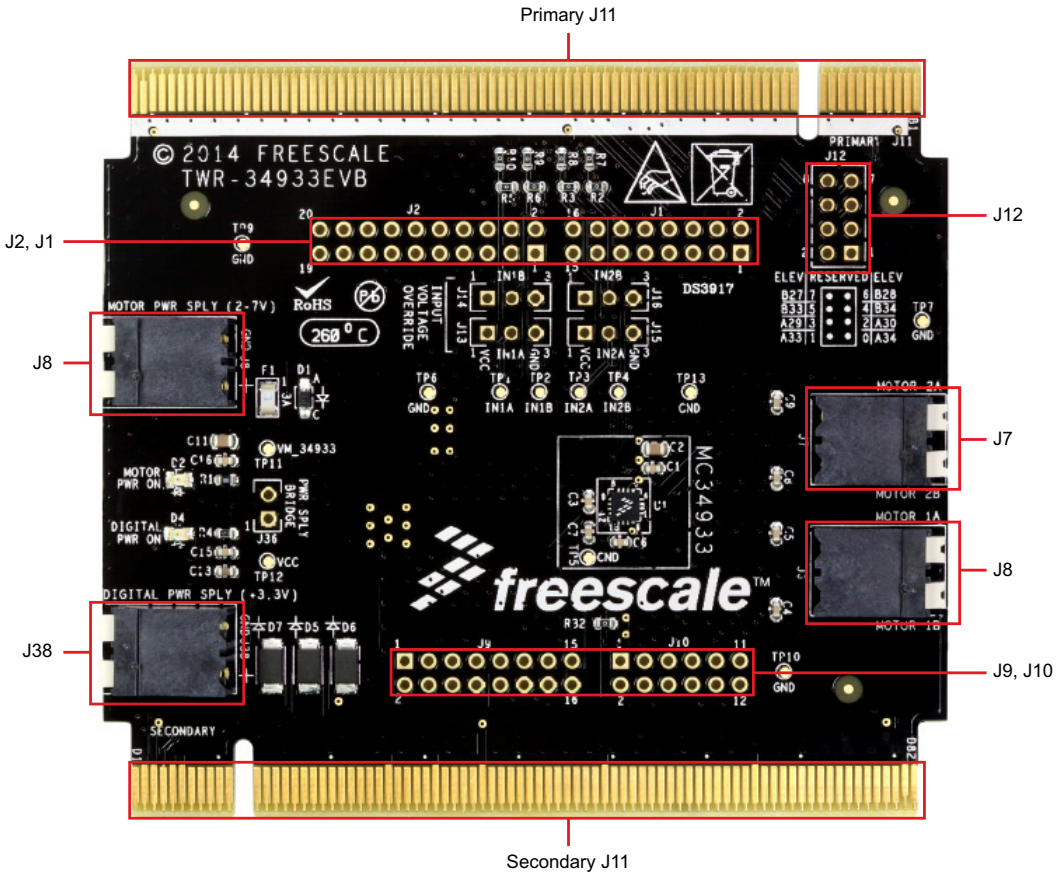


**Figure 6. Connectors**

### Table 5. Connectors

| Schematic Label | Name | Description |
|---|---|---|
| Primary J11 | Primary Tower Platform Connector | Plugs into primary Tower Elevator connector TWR-ELEV-PRI |
| Secondary J11 | Secondary Tower Platform Connector | Plugs into secondary Tower Elevator connector TWR-ELEV-SEC (No electrical connections with TWR-34933EVB) |
| J1/J2 | Freedom Platform Connectors | Arduino™ R3 connectors for mounting to Freescale Freedom boards |
| J9/J10 | | |
| J6 | OUT1A/OUT1B Motor Connector | Connector for MC34933 H-Bridge Channel 1 |
| J7 | OUT2A/OUT2B Motor Connector | Connector for MC34933 H-Bridge Channel 2 |
| J8 | MC34933 VM Power Supply | Power supply connector for MC34933 VM |
| J38 | MC34933 VCC Power Supply | Digital power supply connector for MC34933 VCC |
| J12 | Reserved Connector | Reserved for MCU ADC/PWM interface |

## 4.6 Test Point Definitions

The following test-point jumpers provide access to signals on the TWR-34933EVB.

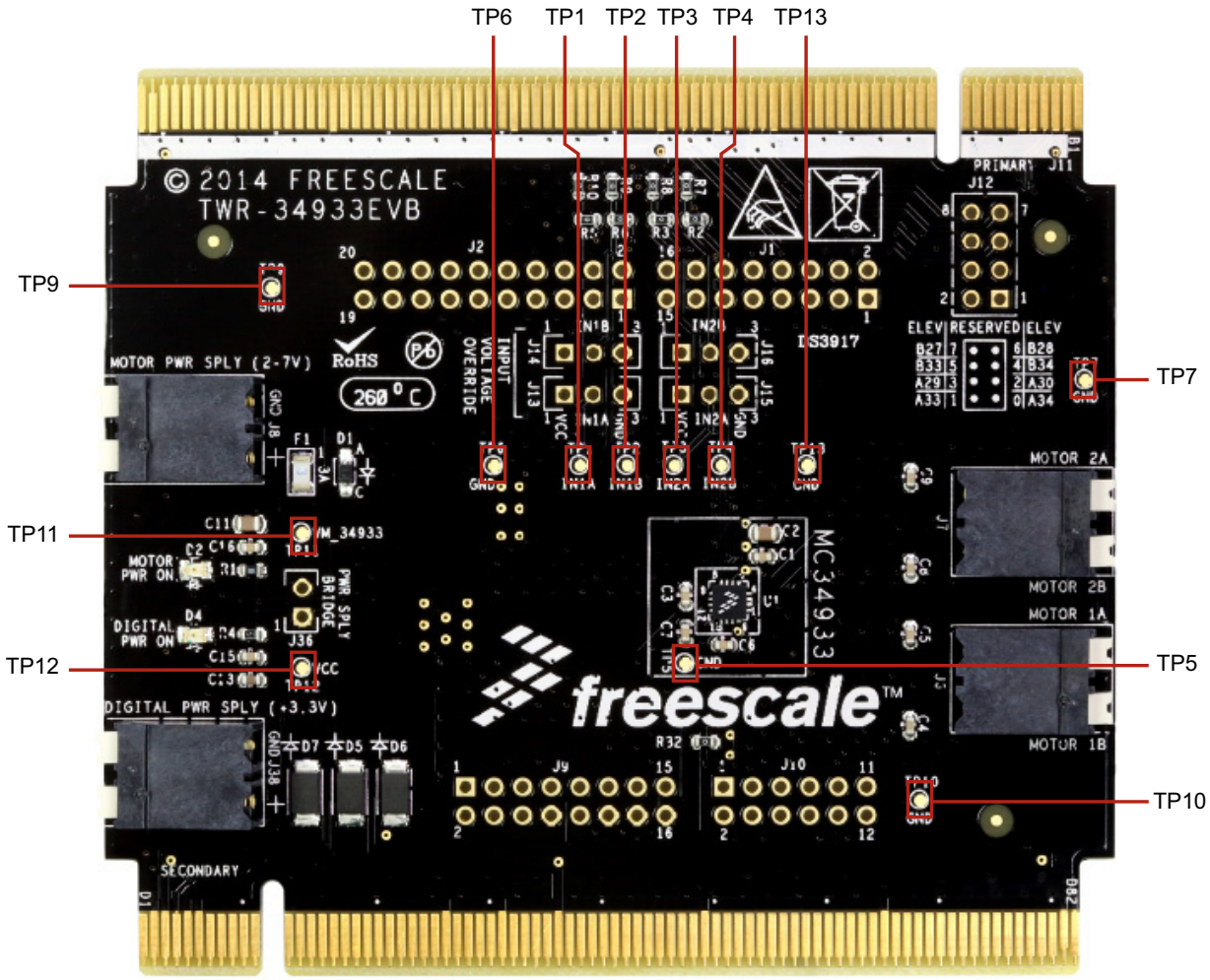


**Figure 7. Test Points**

**Table 6. Test Points**

| Schematic Label | Name | Description |
|---|---|---|
| TP1 | IN1A | Logic input control of OUT1A |
| TP2 | IN1B | Logic input control of OUT1B |
| TP3 | IN2A | Logic input control of OUT2A |
| TP4 | IN2B | Logic input control of OUT2B |
| TP5 | GND | In-circuit Test GND Probing/Debug Ground Hook |
| TP6 | GND | In-circuit Test GND Probing/Debug Ground Hook |
| TP7 | GND | In-circuit Test GND Probing/Debug Ground Hook |
| TP9 | GND | In-circuit Test GND Probing/Debug Ground Hook |
| TP10 | GND | In-circuit Test GND Probing/Debug Ground Hook |

**Table 6. Test Points (continued)**

| Schematic Label | Name | Description |
|---|---|---|
| TP11 | VM_34933 | Motor Power Supply |
| TP12 | VCC | Digital Power Supply |
| TP13 | GND | Ground |

## 4.7 Jumper Definitions

Table 7 defines the evaluation board jumper positions and explains their functions.

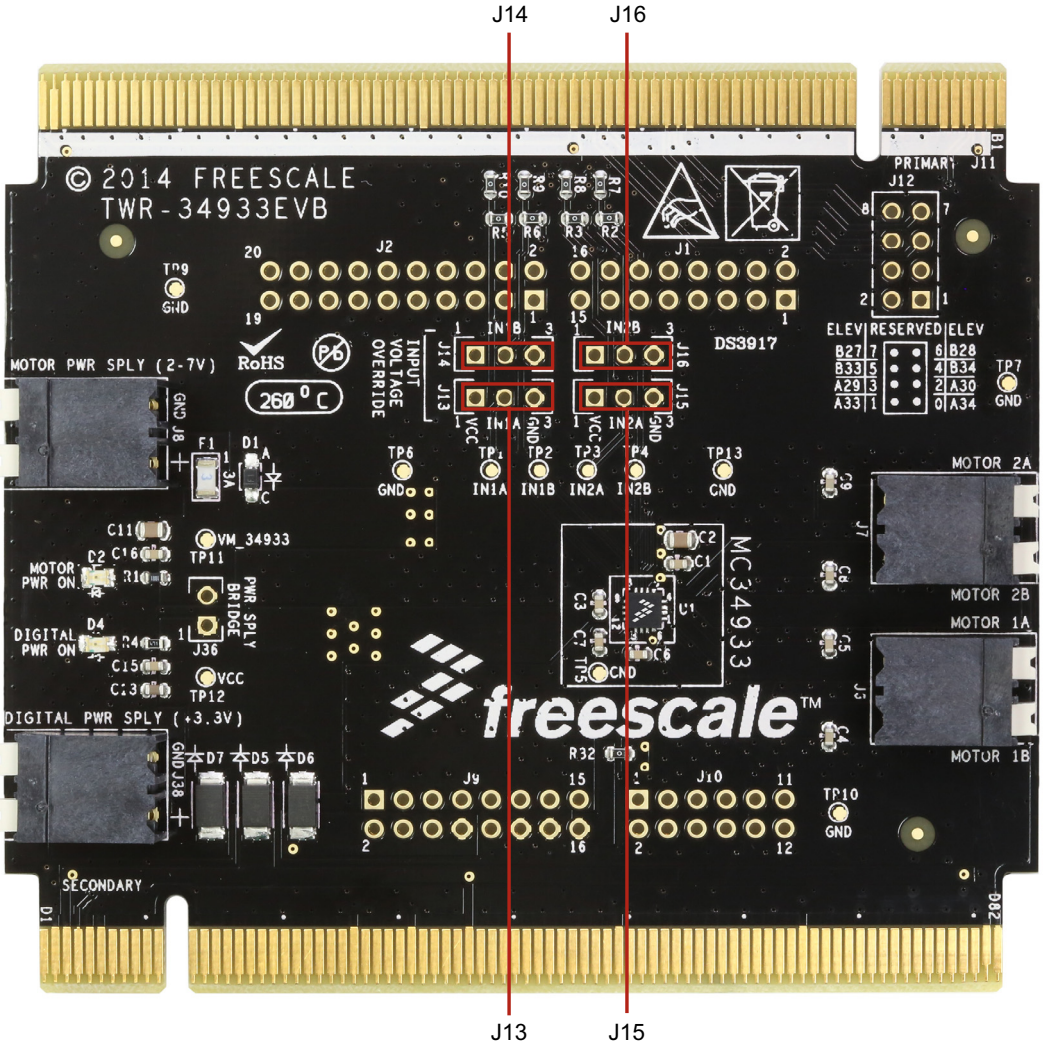


**Figure 8. Jumpers**

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**Table 7. Jumpers**

| Jumper | Description | Setting | Connection |
|---|---|---|---|
| J13 | IN1A short to VCC/GND selection | 1-2 | IN1A connected to VCC 3.3 V |
| | | **2-3** (1) | IN1A connected to Ground |
| J14 | IN1B short to VCC/GND selection | 1-2 | IN1B connected to VCC 3.3 V |
| | | **2-3** (1) | IN1B connected to Ground |

**Table 7. Jumpers (continued)**

| Jumper | Description | Setting | Connection |
|---|---|---|---|
| J15 | IN2A short to VCC/GND selection | 1-2 | IN2A connected to VCC 3.3 V |
| | | **2-3** (1) | IN2A connected to Ground |
| J16 | IN2B short to VCC/GND selection | 1-2 | IN2B connected to VCC 3.3 V |
| | | **2-3** (1) | IN2B connected to Ground |

Notes
1. These are the default settings, also shown in bold.

## 4.8 Tower Elevator Connections

The TWR-34933EVB features two expansion card edge connectors that interface to elevator boards in a Tower System: the Primary and Secondary Elevator Connectors. Table 8 provides the pinouts for the Primary Elevator Connector (TWR-ELEV-PRI). There are no electrical connections to the Secondary Elevator Connector (TWR-ELEV-SEC.)

**Table 8. Primary Elevator Connector Pinouts**

| Side B | | | | | Side A | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Pin #** | **Name** | **Group** | **Usage** | **Jumper** | **Pin #** | **Name** | **Group** | **Usage** | **Jumper** |
| B1 | **5V** | **Power** | **5.0 V Power** | | | **5V** | **Power** | **5.0 V Power** | |
| B2 | **GND** | **Power** | **Ground** | | A2 | **GND** | **Power** | **Ground** | |
| B3 | **3.3V** | **Power** | **3.3 V Power** | | A3 | **3.3V** | **Power** | **3.3 V Power** | |
| B4 | ELE_PS_SENSE | Power | Elevator Power Sense | | A4 | **3.3V** | **Power** | **3.3 V Power** | |
| B5 | **GND** | **Power** | **Ground** | | A5 | **GND** | **Power** | **Ground** | |
| B6 | **GND** | **Power** | **Ground** | | A6 | **GND** | **Power** | **Ground** | |
| B7 | SDHC_CLK / SPI1_CLK | SDHC / SPI 1 | | | A7 | SCL0 | $I^2C$ 0 | | |
| B8 | SDHC_CS1_D3 / SPI1_CS1 | SDHC / SPI 1 | | | A8 | SDA0 | $I^2C$ 0 | | |
| B9 | SDHC_CS0_D3 / SPI1_CS0 | SDHC / SPI 1 | | | A9 | GPIO9 /CTS1 | GPIO / UART | | |
| B10 | SDHC_CMD / SPI1_MOSI | SDHC / SPI 1 | | | A10 | GPIO8 / SDHC_D2 | GPIO / SDHC | | |
| B11 | SDHC_D0 / SPI1_MISO | SDHC / SPI 1 | | | A11 | GPIO7 / SD_WP_DET | GPIO / SDHC | | |
| **Mechanical Key** | | | | | | | | | |
| B12 | ETH_COL | Ethernet | | | A12 | ETH_CRS | Ethernet | | |
| B13 | ETH_RXER | Ethernet | | | A13 | ETH_MDC | Ethernet | | |
| B14 | ETH_TXCLK | Ethernet | | | A14 | ETH_MDIO | Ethernet | | |
| B15 | ETH_TXEN | Ethernet | | | A15 | ETH_RXCLK | Ethernet | | |
| B16 | ETH_TXER | Ethernet | | | A16 | ETH_RXDV | Ethernet | | |
| B17 | ETH_TXD3 | Ethernet | | | A17 | ETH_RXD3 | Ethernet | | |
| B18 | ETH_TXD2 | Ethernet | | | A18 | ETH_RXD2 | Ethernet | | |
| B19 | ETH_TXD1 | Ethernet | | | A19 | ETH_RXD1 | Ethernet | | |
| B20 | ETH_TXD0 | Ethernet | | | A20 | ETH_RXD0 | Ethernet | | |
| B21 | GPIO1 / RTS1 | GPIO / UART | | | A21 | SSI_MCLK | SSI | | |
| B22 | GPIO2 / SDHC_D1 | GPIO / SDHC | | | A22 | SSI_BCLK | SSI | | |
| B23 | GPIO3 | GPIO | | | A23 | SSI_FS | SSI | | |
| B24 | CLKIN0 | Clock | | | A24 | SSI_RXD | SSI | | |
| B25 | CLKOUT1 | Clock | | | A25 | SSI_TXD | SSI | | |
| B26 | **GND** | **Power** | **Ground** | | A26 | **GND** | **Power** | **Ground** | |
| B27 | AN7 | ADC | Reserved 7 | | A27 | AN3 | ADC | | |
| B28 | AN6 | ADC | Reserved 6 | | A28 | AN2 | ADC | | |
| B29 | AN5 | ADC | | | A29 | AN1 | ADC | Reserved 3 | |
| B30 | AN4 | ADC | | | A30 | AN0 | ADC | Reserved 2 | |
| B31 | **GND** | **Power** | **Ground** | | A31 | **GND** | **Power** | **Ground** | |

**Table 8. Primary Elevator Connector Pinouts (continued)**

| Side B | | | | |
|---|---|---|---|---|
| **Pin #** | **Name** | **Group** | **Usage** | **Jumper** |
| B32 | DAC1 | DAC | | |
| B33 | TMR3 | Timer | Reserved 5 | |
| B34 | TMR2 | Timer | Reserved 4 | |
| B35 | GPIO4 | GPIO | | |
| B36 | **3.3V** | **Power** | **3.3 V Power** | |
| B37 | PWM7 | PWM | | |
| B38 | PWM6 | PWM | | |
| B39 | PWM5 | PWM | | |
| B40 | PWM4 | PWM | | |
| B41 | CANRX | CAN | | |
| B42 | CANTX | CAN | | |
| B43 | 1WIRE | 1-Wire | | |
| B44 | SPI0_MISO | SPI 0 | | |
| B45 | SPI0_MOSI | SPI 0 | | |
| B46 | SPI0_CS0 | SPI 0 | | |
| B47 | SPI0_CS1 | SPI 0 | | |
| B48 | SPI0_CLK | SPI 0 | | |
| B49 | **GND** | **Power** | **Ground** | |
| B50 | SCL1 | I2C 1 | | |
| B51 | SDA1 | I2C 1 | | |
| B52 | GPIO5 / SD_CARD_ DET | GPIO/ SDHC | | |
| B53 | USB0_DP_PD OWN | USB 0 | | |
| B54 | USB0_DM_PD OWN | USB 0 | | |
| B55 | IRQ_H | Interrupt | | |
| B56 | IRQ_G | Interrupt | | |
| B57 | IRQ_F | Interrupt | | |
| B58 | IRQ_E | Interrupt | | |
| B59 | IRQ_D | Interrupt | | |
| B60 | IRQ_C | Interrupt | | |
| B61 | IRQ_B | Interrupt | | |
| B62 | IRQ_A | Interrupt | | |
| B63 | EBI_ALE/EBI_ CS1_b | EBI | | |
| B64 | EBI_CS0_b | EBI | | |
| B65 | **GND** | **Power** | **Ground** | |
| B66 | EBI_AD15 | EBI | | |
| B67 | EBI_AD16 | EBI | | |
| B68 | EBI_AD17 | EBI | | |

| Side A | | | | |
|---|---|---|---|---|
| **Pin #** | **Name** | **Group** | **Usage** | **Jumper** |
| A32 | DAC0 | DAC | | |
| A33 | TMR1 | Timer | Reserved 1 | |
| A34 | TMR0 | Timer | Reserved 0 | |
| A35 | GPIO6 | GPIO | | |
| A36 | **3.3V** | **Power** | **3.3 V Power** | |
| A37 | PWM3 | PWM | MC34933_IN2B | (2) |
| A38 | PWM2 | PWM | MC34933_IN2A | (2) |
| A39 | PWM1 | PWM | MC34933_IN1B | (2) |
| A40 | PWM0 | PWM | MC34933_IN1A | (2) |
| A41 | RXD0 | UART 0 | | |
| A42 | TXD0 | UART 0 | | |
| A43 | RXD1 | UART 1 | | |
| A44 | TXD1 | UART 1 | | |
| A45 | GPIO10 | GPIO | VSSA | |
| A46 | GPIO11 | GPIO | VDDA | |
| A47 | GPIO12 | GPIO | | |
| A48 | GPIO13 | GPIO | | |
| A49 | **GND** | **Power** | **Ground** | |
| A50 | GPIO14 | GPIO | | |
| A51 | GPIO15 | GPIO | | |
| A52 | GPIO16 | GPIO | | |
| A53 | GPIO17 | GPIO | | |
| A54 | USB0_DM | USB 0 | | |
| A55 | USB0_DP | USB 0 | | |
| A56 | USB0_ID | USB 0 | | |
| A57 | USB0_VBUS | USB 0 | | |
| A58 | TMR7 | Timer | | |
| A59 | TMR6 | Timer | | |
| A60 | TMR5 | Timer | | |
| A61 | TMR4 | Timer | | |
| A62 | RSTIN_b | Reset | | |
| A63 | RSTOUT_b | Reset | | |
| A64 | CLKOUT0 | Clock | | |
| A65 | **GND** | **Power** | **Ground** | |
| A66 | EBI_AD14 | EBI | | |
| A67 | EBI_AD13 | EBI | | |
| A68 | EBI_AD12 | EBI | | |

**Table 8. Primary Elevator Connector Pinouts (continued)**

| Side B | | | | | Side A | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Pin #** | **Name** | **Group** | **Usage** | **Jumper** | **Pin #** | **Name** | **Group** | **Usage** | **Jumper** |
| B69 | EBI_AD18 | EBI | | | A69 | EBI_AD11 | EBI | | |
| B70 | EBI_AD19 | EBI | | | A70 | EBI_AD10 | EBI | | |
| B71 | EBI_R/W_b | EBI | | | A71 | EBI_AD9 | EBI | | |
| B72 | EBI_OE_b | EBI | | | A72 | EBI_AD8 | EBI | | |
| B73 | EBI_D7 | EBI | | | A73 | EBI_AD7 | EBI | | |
| B74 | EBI_D6 | EBI | | | A74 | EBI_AD6 | EBI | | |
| B75 | EBI_D5 | EBI | | | A75 | EBI_AD5 | EBI | | |
| B76 | EBI_D4 | EBI | | | A76 | EBI_AD4 | EBI | | |
| B77 | EBI_D3 | EBI | | | A77 | EBI_AD3 | EBI | | |
| B78 | EBI_D2 | EBI | | | A78 | EBI_AD2 | EBI | | |
| B79 | FB_D1 | Flexbus | | | A79 | FB_AD1 | Flexbus | | |
| B80 | FB_D0 | Felxbus | | | A80 | FB_AD0 | Felxbus | | |
| B81 | **GND** | **Power** | **Ground** | | A81 | GND | Power | **Ground** | |
| B82 | **3.3V** | **Power** | **3.3 V Power** | | A82 | 3.3V | Power | **3.3 V Power** | |

Notes

2. One 0 Ω resistor is connected between the pin and the connector to create a flexible connection.

## 4.9 Freedom Platform Connections

The TWR-34933EVB features four connectors interfacing to the Freedom System. Table 9 provides the pinouts for the connectors.

**Table 9. Freedom Connector Pinouts**

| I/O Header & Pin Num | Arduino™ R3 Pin Name | FRDM Pin Name | Used | Jumper |
|---|---|---|---|---|
| J9 08 | 3.3V | P3V3_VCC | X | (3) |
| J9 10 | 5V | | | |
| J10 02 | A0 | | | |
| J10 04 | A1 | | | |
| J10 06 | A2 | | | |
| J10 08 | A3 | | | |
| J10 10 | A4 | | | |
| J10 12 | A5 | | | |
| J2 16 | AREF | | | |
| J1 02 | D0 | | | |
| J1 04 | D1 | | | |
| J2 06 | D10 | | | |
| J2 08 | D11 | | | |
| J2 10 | D12 | | | |
| J2 12 | D13 | | | |
| J2 20 | D14 | | | |
| J2 18 | D15 | | | |
| J1 06 | D2 | MC34933_IN1A | X | (3) |

**Table 9. Freedom Connector Pinouts (continued)**

| I/O Header & Pin Num | Arduino™ R3 Pin Name | FRDM Pin Name | Used | Jumper |
|---|---|---|---|---|
| J1 08 | D3 | MC34933_IN1B | X | (3) |
| J1 10 | D4 | MC34933_IN2A | X | (3) |
| J1 12 | D5 | MC34933_IN2B | X | (3) |
| J1 14 | D6 | | | |
| J1 16 | D7 | | | |
| J2 02 | D8 | | | |
| J2 04 | D9 | | | |
| J9 12 | GND | GND | X | (3) |
| J9 14 | GND | GND | X | (3) |
| J2 14 | GND | | | |
| J9 04 | IOREF | | | |
| J9 02 | RFU | | | |
| J9 16 | VIN | | | |

Notes

3. One 0 Ω resistor is connected between the pin and the connector to create a flexible connection.

# 5 Setting Up the Hardware

## 5.1 Setting Up the TWR-34933EVB with an External Signal Resource

The following procedure describes how to set up the hardware when the TWR-34933EVB is used with no MCU board connected.

1. Connect the load to connectors J7 (Motor 2A & Motor 2B) and J6 (Motor 1A & Motor 1B).
2. Connect the 2.0 V to 7.0 V DC power supply to connector J8 (motor power supply) and a 3.3 V DC power supply to connect J38 (digital power supply).
3. Connect signal generator to IN1A/IN1B & IN2A/IN2B with the PWM signal.
4. Turn on the power supply and signal generator and evaluate the performance.

Figure 9 illustrates the procedure.

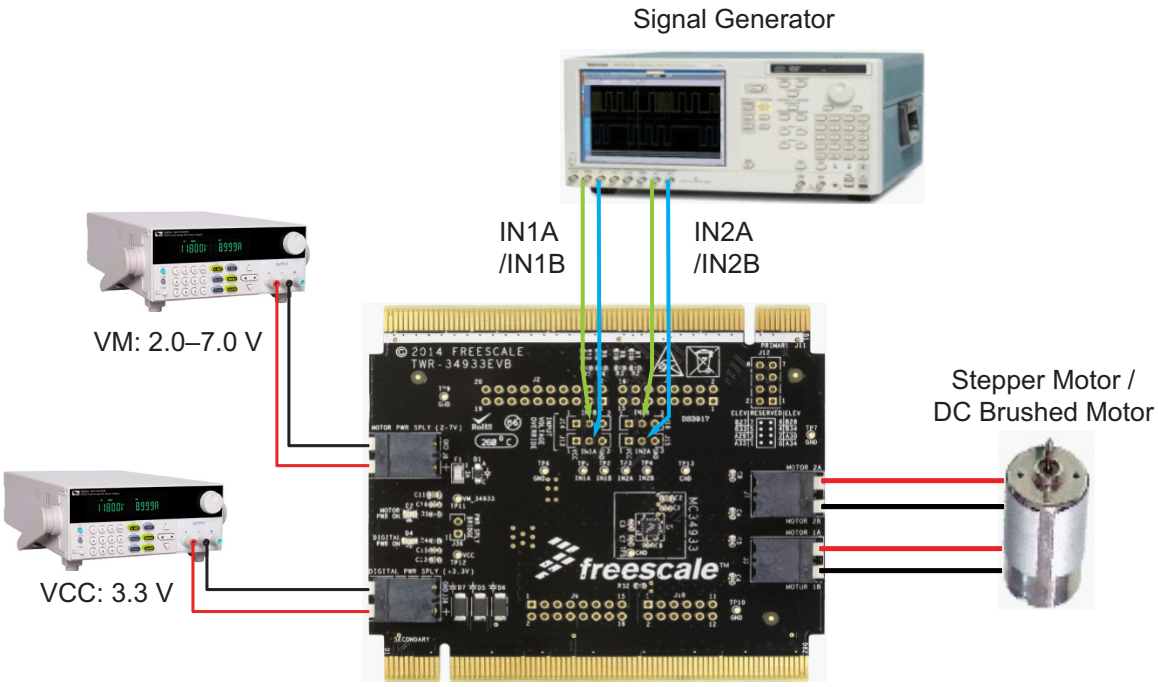


**Figure 9. TWR-34933EVB Hardware Configuration with External Signal Resource**

## 5.2 Setting Up the TWR-34933EVB with the Tower Platform

When configured as a Tower platform module, the TWR-34933EVB must be used in conjunction with another Tower MCU evaluation board (available at http://www.freescale.com/tower). The following procedure describes how to set up the hardware when the TWR-34933EVB is used with the TWR-KV10Z32 board, as an example:

1. Assemble the Tower platform by sliding the TWR-34933EVB elevator connectors into the top slots on the Tower Elevator modules. Insert the Tower MCU evaluation board in the Tower Elevator modules in a set of slots below the TWR-34933EVB.
2. Connect the USB cable between the PC and the USB port on the Tower MCU evaluation board.
3. Connect the load to connectors J7 (Motor 2A & Motor 2B) and J6 (Motor 1A & Motor 1B) on the TWR-34933EVB.
4. Connect the 2.0 V to 7.0 V DC power supply to connector J8 (motor power supply) on the evaluation board.
5. Launch the software application used to communicate with the board (for example, Processor Expert).

Figure 10 illustrates the procedure.

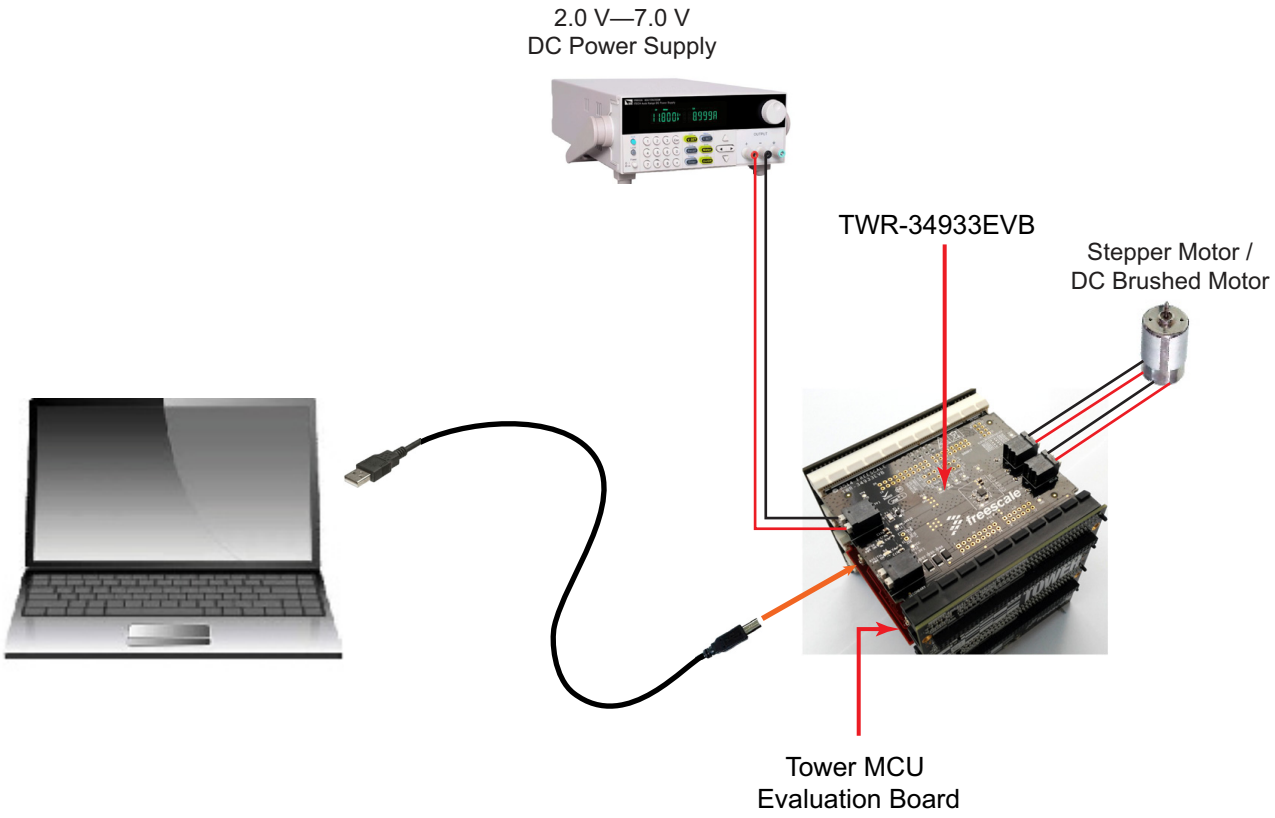


**Figure 10. TWR-34933EVB Tower Platform Hardware Configuration**

## 5.3 Setting up the TWR-34933EVB with the Freedom Platform

The TWR-34933EVB is compatible with Freescale's Freedom Platform. When used in this configuration, the TWR-34933EVB must interface with the Freedom EVB (available at http://www.freescale.com/freedom). The TWR-34933EVB should not be used with other Tower modules when connected to a Freedom board.

The following procedure describes how to set up the hardware when the TWR-34933EVB is used with the FRDM-KL25Z board, as an example:

1. Connect the load to connectors J7 (Motor 2A & Motor 2B) and J6 (Motor 1A & Motor 1B) on the TWR-34933EVB evaluation board.
2. Insert the Arduino™ R3 header connectors into connector J1/J2 and J9/J10 on the evaluation board.
3. Mount the FRDM-KL25Z board to the Arduino™ connectors on the evaluation board.
4. Connect the 2.0 V to 7.0 V DC power supply to connector J8 (motor power supply) on the evaluation board.
5. Insert the Mini-B plug of the USB cable into the USB port labelled USBKL25Z on the FRDM-KL25Z board.
6. Insert the standard A plug of the USB cable into the PC.
7. Launch the software application used to communicate with the board (for example, Processor Expert).

Figure 11 illustrates the procedure.

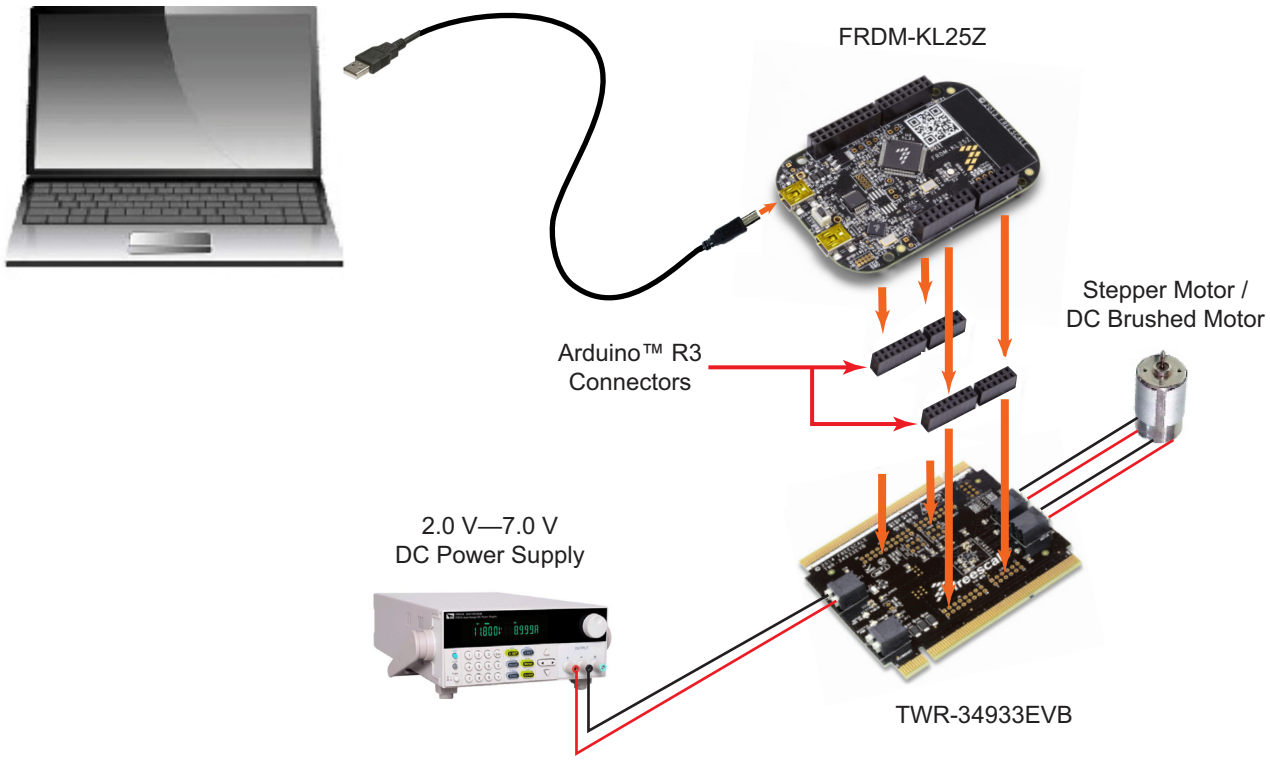


**Figure 11. TWR-34933EVB Freedom Platform Hardware Configuration**

# 6 Schematic

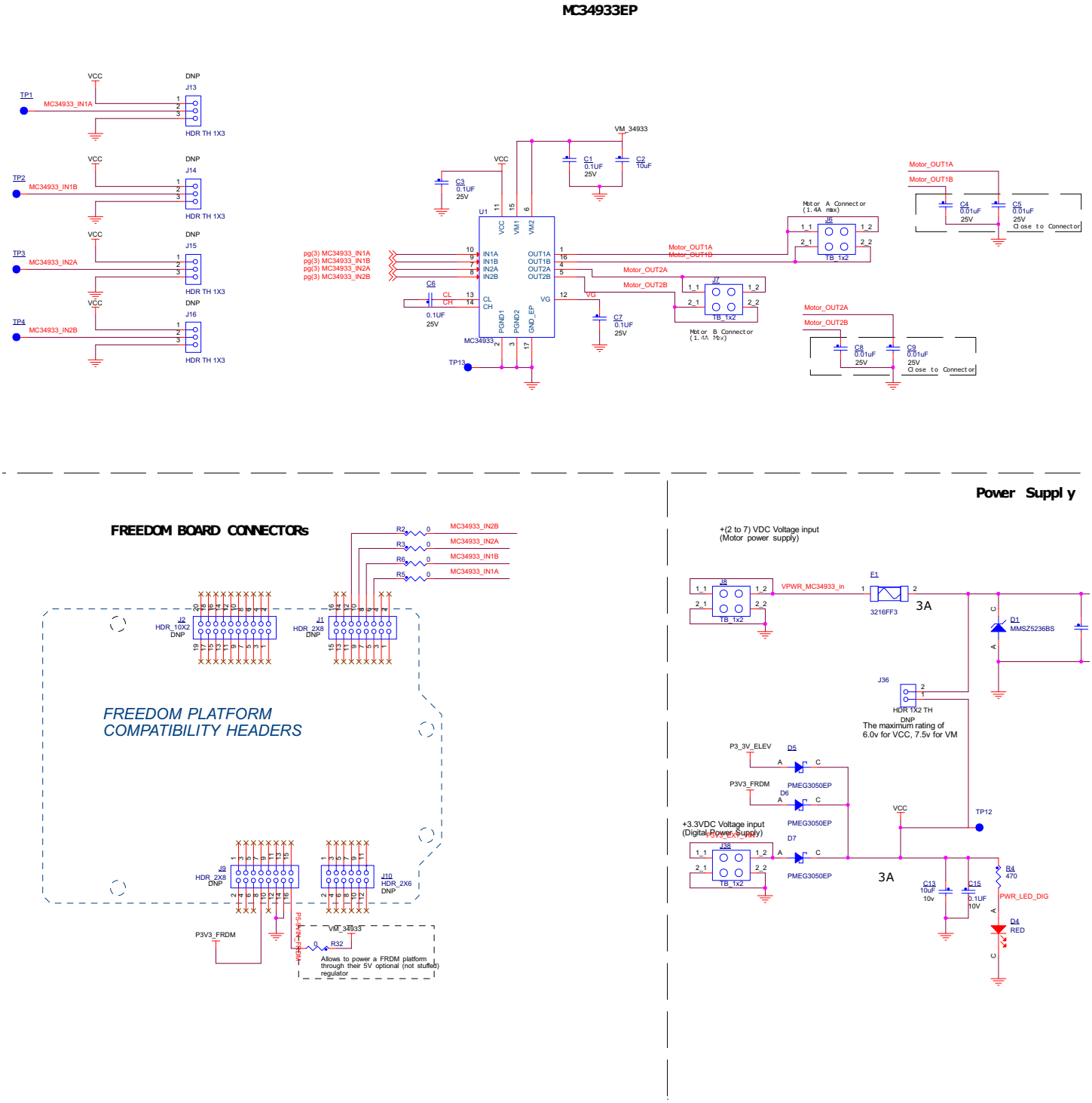


**Figure 12. TWR-34933EVB Schematic**

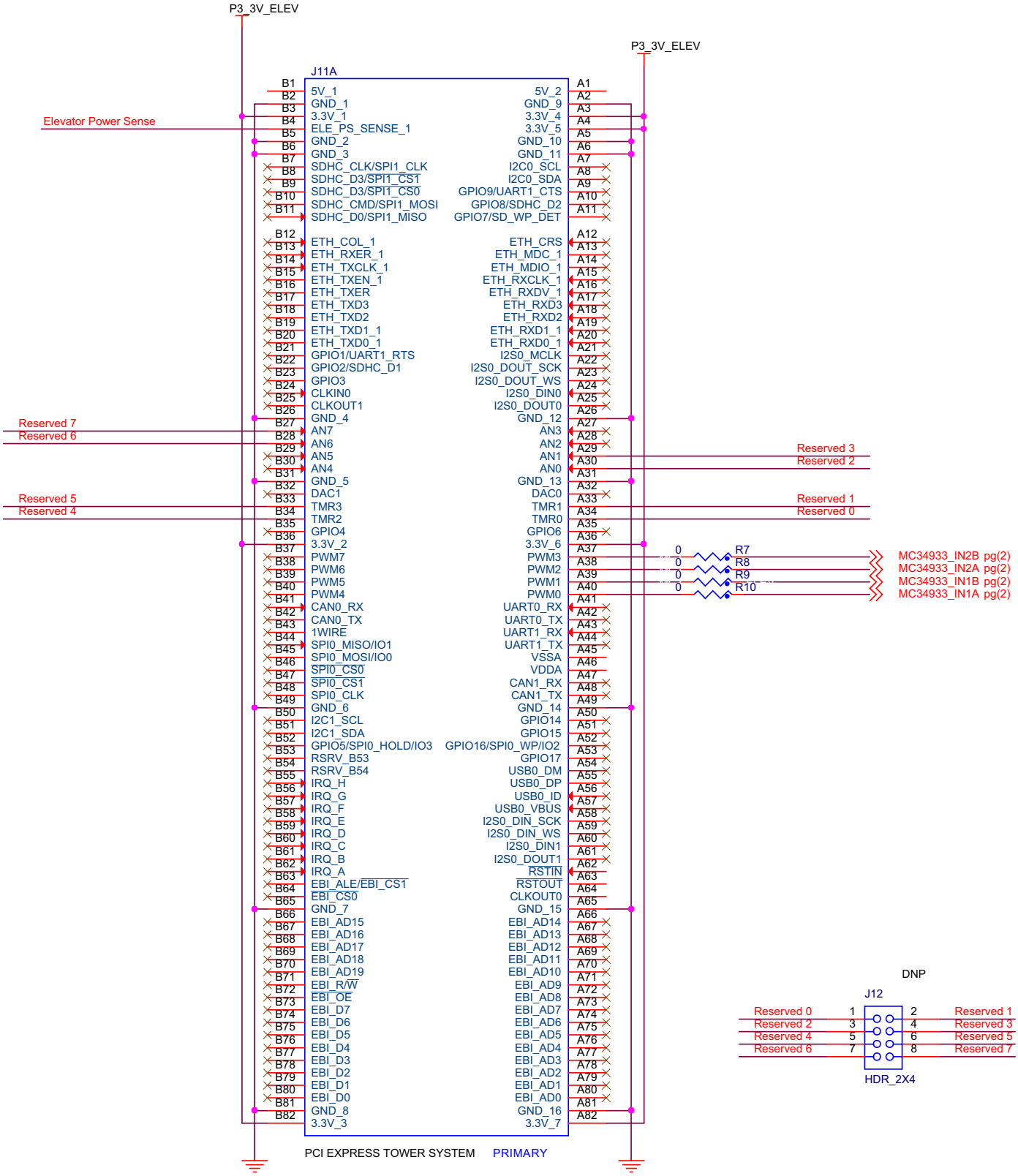


**Figure 13. PCI Express Tower System Primary Connector**

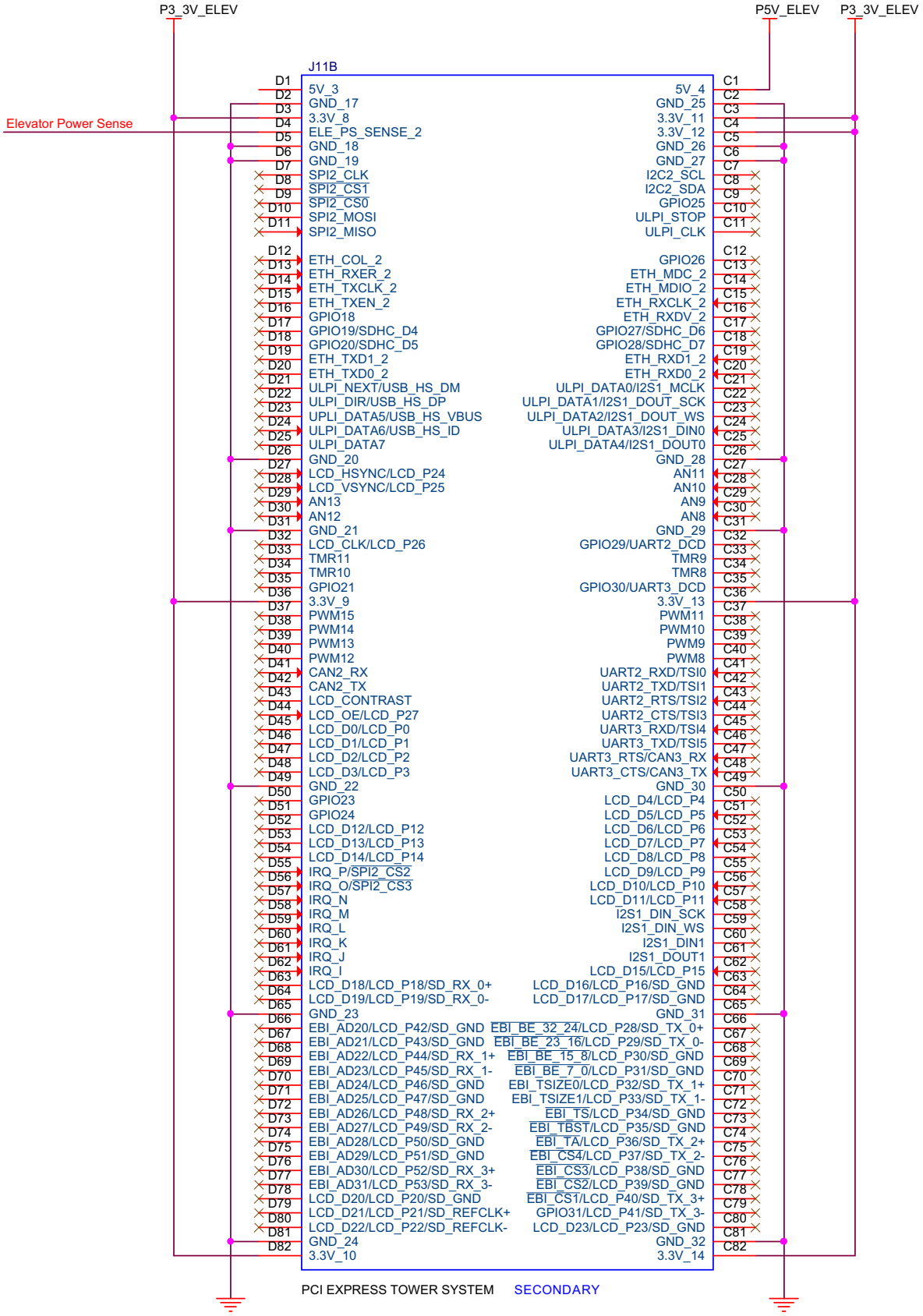


**Figure 14. PCI Tower Express System Secondary Connector (not connected in the TWR-34933EVB)**

# 7 Board Layout

## 7.1 Silkscreen

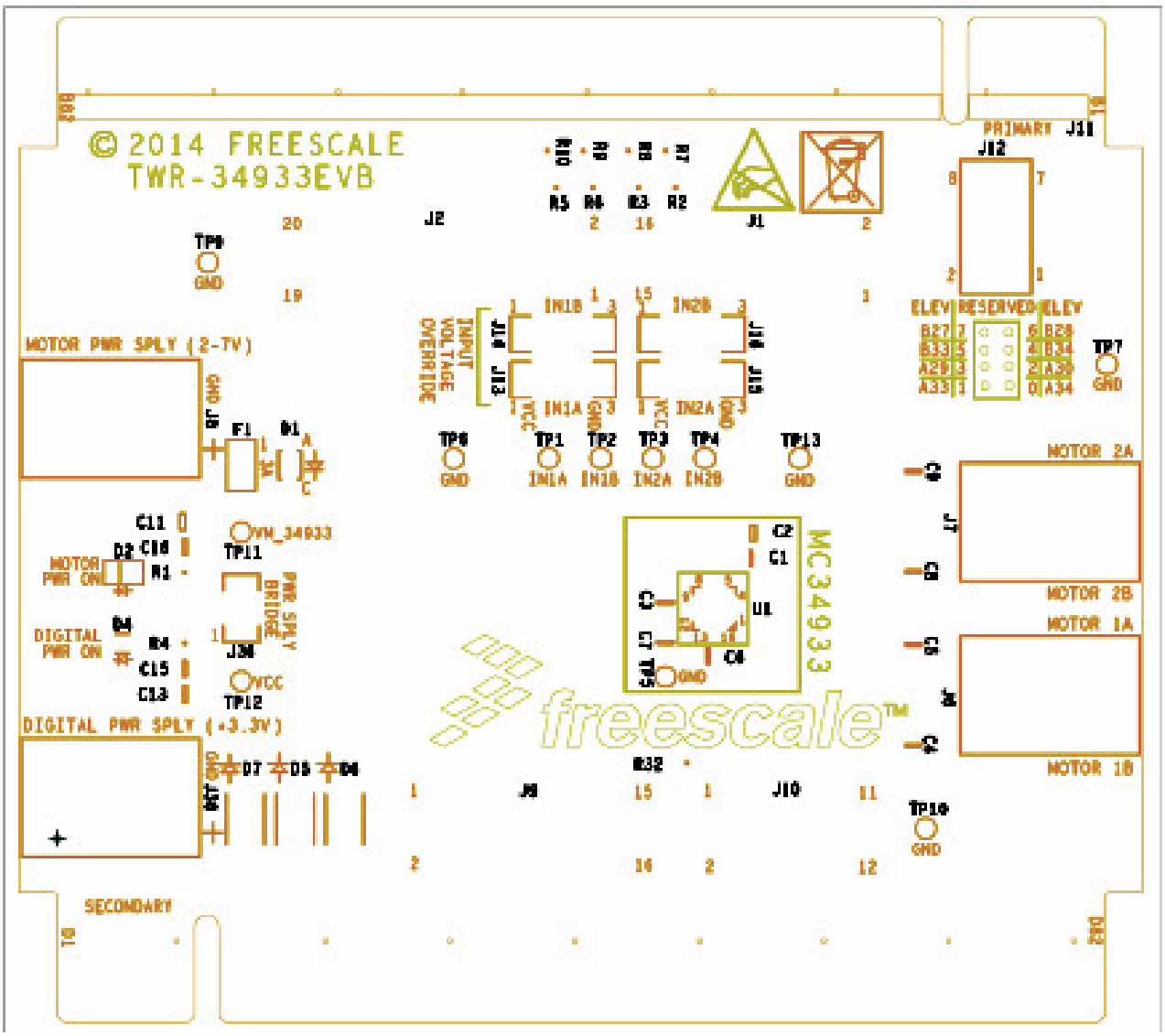


**Figure 15. Evaluation Board Silkscreen**

# 8 Board Bill of Materials

**Table 10. Bill of Materials [4]**

| Item | Qty | Schematic Label | Value | Description | Part Number | Assy Opt |
|---|---|---|---|---|---|---|
| **Freescale Components** | | | | | | |
| 1 | 1 | U1 | | IC DRV DUAL H-BRIDGE 1 A 2-7 V UQFN16 | MC34933EP | |
| **Diodes & Transistors** | | | | | | |
| 2 | 1 | D1 | | DIODE ZNR 20 mA 7.5 V 0.2 W SOD-323 | MMSZ5236BS-7-F | |
| 3 | 1 | D2 | GREEN | LED GRN SGL 30 mA SMT 0805 | LTST-C171KGKT | |
| 4 | 1 | D4 | RED | LED RED CLEAR SGL 30 mA SMT 0805 | LTST-C171KRKT | |
| 5 | 3 | D5-D7 | | DIODE SCH RECT 5 A 30 V AEC-Q101 SOD128 | PMEG3050EP,115 | |
| **Capacitors** | | | | | | |
| 6 | 5 | C1,C3,C6,C7,C16 | 0.1 µF | CAP CER 0.10 µF 25 V 10% X7R 0603 | C0603C104K3RAC | |
| 7 | 2 | C2,C11 | 10 µF | CAP CER 10 µF 25 V 10% X5R 0805 | C2012X5R1E106K | |
| 8 | 4 | C4,C5,C8,C9 | 0.01 µF | CAP CER 0.01 µF 25 V 10% X7R 0603 | CC0603KRX7R8BB103 | |
| 9 | 1 | C13 | 10 µF | CAP CER 10 µF 10 V 10% X5R 0603 | C1608X5R1A106K | |
| 10 | 1 | C15 | 0.1 µF | CAP CER 0.10 µF 10 V 10% X7R 0603 | C0603X7R100-104KNE | |
| **Resistors** | | | | | | |
| 11 | 1 | R1 | 1.0 kΩ | RES MF 1.0 Ω 1/10 W 1% 0603 | AR03FTNX1001 | |
| 12 | 9 | R2,R3,R5-R10,R32 | 0 Ω | RES MF ZERO Ω 1/10 W -- 0603 | CRCW06030000Z0EA | |
| 13 | 1 | R4 | 470 Ω | RES MF 470 Ω 1/10 W 5% 0603 | CR0603-10W-471JT | |
| **Switches, Connectors, Jumpers and Test Points** | | | | | | |
| 14 | 1 | F1 | | FUSE FAST 3.0 A 63 V SMT | 3216FF3-R | |
| 15 | 2 | J1,J9 | | HDR 2X8 TH 100 MIL CTR 330H AU | TSW-108-07-G-D | [5] |
| 16 | 1 | J10 | | HDR 2X6 TH 100 MIL CTR 330H AU | TSW-106-07-S-D | [5] |
| 17 | 1 | J11 | | CON DUAL 2X82 Edge PCI Express SMT 1.0 MM SP 591H FOR TOWER SYSTEM NOT A PART TO ORDER | EDGE PCI EXPRESS 164 | |
| 18 | 1 | J2 | | HDR 2X10 TH 100 MIL CTR 330H AU 100L | TSW-110-07-S-D | [5] |
| 19 | 4 | J6-J8,J38 | | CON 1x2 TB TH RA 5 MM SP 335H SN 138L | 1824740000 | |
| 20 | 1 | J12 | | HDR 2X4 TH 100 MIL CTR 330H AU 100L | TSW-104-07-G-D | [5] |
| 21 | 4 | J13-J16 | | HDR 1X3 TH 100 MIL SP 339H AU 100L | TSW-103-07-G-S | [5] |
| 22 | 1 | J36 | | HDR 1X2 TH 100 MIL SP 339H AU 98L | TSW-102-07-G-S | [5] |
| 23 | 13 | TP1-TP13 | | TEST POINT PAD 40 MIL DIA SMT, NO PART TO ORDER | | |

Notes

4. Freescale does not assume liability, endorse, or warrant components from external manufacturers referenced in circuit drawings or tables. While Freescale offers component recommendations in this configuration, it is the customer's responsibility to validate their application.
5. Do not populate

# 9 References

Following are URLs where you can obtain information on related Freescale products and application solutions:

| Freescale.com Support Pages | Description | URL |
|---|---|---|
| TWR-34933EVB | Tool Summary Page | http://www.freescale.com/webapp/sps/site/prod_summary.jsp?code=TWR-34933EVB |
| MC34933 | Product Summary Page | http://www.freescale.com/webapp/sps/site/prod_summary.jsp?code=MC34933 |
| Processor Expert | Processor Expert Software | http://www.freescale.com/webapp/sps/site/prod_summary.jsp?code=PE_DRIVER_SUITE |
| Tower System Platform | Tool Summary Page | http://www.freescale.com/tower |
| Freedom Development Boards | Tool Summary Page | http://www.freescale.com/freedom |
| FRDM-KL25Z | Tool Summary Page | http://www.freescale.com/webapp/sps/site/prod_summary.jsp?code=FRDM-KL25Z |

## 9.1 Support

Visit www.freescale.com/support for a list of phone numbers within your region.

## 9.2 Warranty

Visit www.freescale.com/warranty for submitting a request for tool warranty.

# 10 Revision History

| Revision | Date | Description of Changes |
|---|---|---|
| 1.0 | 6/2015 | • Initial release |

***How to Reach Us:***

**Home Page:**
freescale.com

**Web Support:**
freescale.com/support



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