

KIT33988CEVBE evaluation board

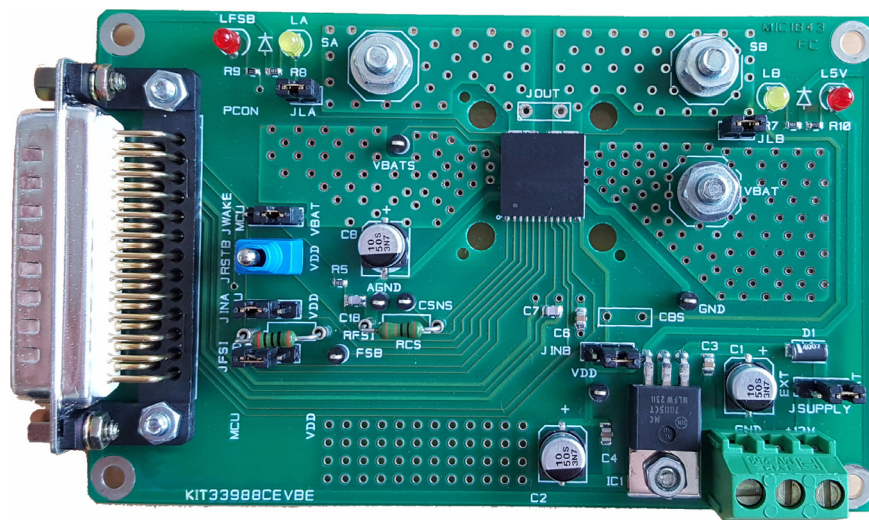


Figure 1. KIT33988CEVBE evaluation board

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1 Kit contents / packing list

- KIT33988CEVBE evaluation board (1)

2 Important notice

NXP 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 EVB 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 EVB 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.

The goods provided may not be complete in terms of required design, marketing, and or manufacturing related protective considerations, including product safety measures typically found in the end product incorporating the goods. Due to the open construction of the product, it is the user's responsibility to take any and all appropriate precautions with regard to electrostatic discharge. In order to minimize risks associated with the customers applications, adequate design and operating safeguards must be provided by the customer to minimize inherent or procedural hazards. For any safety concerns, contact NXP sales and technical support services.

Should this evaluation kit not meet the specifications indicated in the kit, it may be returned within 30 days from the date of delivery and will be replaced by a new kit.

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3 Introduction

3.1 EVB features

- Dual 8.0 mΩ max. high-side switches with parallel input or SPI control
- 6.0 V to 27V operating voltage with standby currents < 5.0 μA
- Output current monitoring with two SPI-selectable current ratios
- SPI control of overcurrent limit, overcurrent fault blanking time, output-off open load detection, output on/off control, watchdog timeout, slew rates, and fault status reporting
- SPI status reporting of overcurrent, open and shorted loads, overtemperature shutdown, undervoltage and overvoltage shutdown, fail-safe pin status, and program status
- Enhanced -16 V reverse polarity V_{PWR} protection

3.2 Required equipment

- Parallel port-enabled computer with Windows XP (or later) operating system
- Parallel cable
- Alternative: USB-enabled computer with Windows XP (or later) operating system and NXP's USB to SPI EVB Kit (reference: KITUSBSPIEVME)

3.3 If using the KITUSBSPIEVME, the dongle needs reworked on the SI connection as shown in Figure 2.

1. Remove the jumper between pins SI and 3.
2. Remove the jumper between pins Data1 and 6.
3. Connect a jumper between pin SI and pin 6

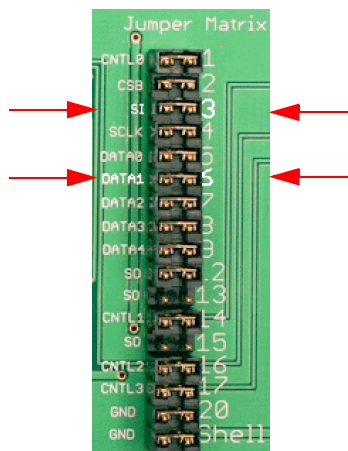


Figure 2. Jumper matrix on KITUSBSPIEVME converter board

4 Hardware description

The hardware in this evaluation kit includes an 33988 evaluation board. The evaluation board has three major blocks: the circuit related to the 33988, the remote control and accessory simulator (SPI Gen) and the parallel cable.

4.1 Using the EVB

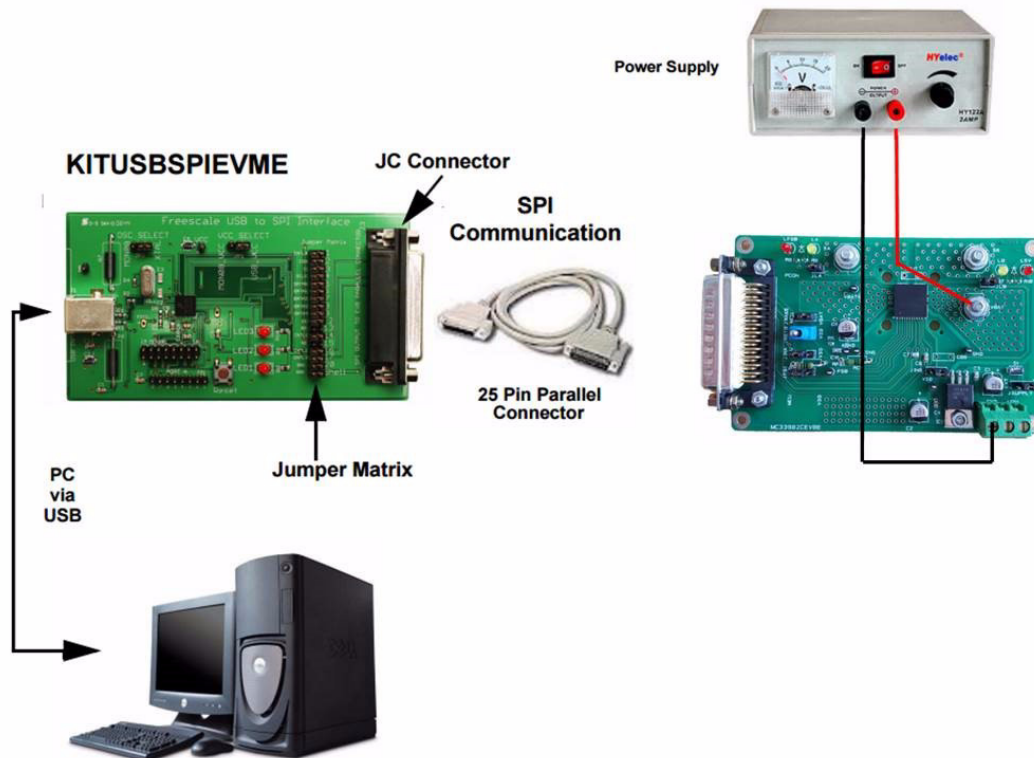


Figure 3. Setup for the 33988 EVB

Warning: Always wear safety glasses when working around electronic modules and when soldering.

Remove the capacitor, C8, when testing reverse supply voltage on VBAT. The thermal resistance from junction to ambience of this PCB is approximately 25 °/W.

1. The 33988 evaluation board allows the customer to quickly evaluate features of the device with a simple bench top setup. All switch inputs may be evaluated using the onboard switch banks or actual system switches connected to the switch input edge connector.
2. Using a standard 25 pin Sub-D parallel port cable and the enclosed SPIGen SPI driver software, use a personal computer to provide the serial peripheral interface (SPI) communication with this EVB.
3. Connect power supplies to the VBAT on the VBAT bolt. Connect GND, GNDBAT and +12 volt supply on connector X, EVB's power terminal. On-board 5 volt regulator supply can be either supplied through VBAT or +12V by selecting the jumper JSUPPLY. Make sure the voltages provided are in accordance with the device data sheet and that the supply currents are sufficient to supply the attached loads. The led L5V should light up indicating the presence of 5.0 volt regulated supply. Move IC from reset state by shorting jumper JRSTB to 2-3 position (It shorts RSTB PIN to VDD).
4. Connect the desired loads to (e.g. relay coils, LEDs, or panel lamps) SB and SA bolt.
5. For direct control of SA, put jumper, JINA, at position 2-3. For direct control of SB, put jumper, JINB, at position 2-3. Disable watchdog placing a jumper at JFSI on position 1-2 (shorting the PIN to GND) and not placing jumper on JWAKE. (Shorting PIN to GND). Led LA and LB should light up if jumper are placed on JLA and JLB.
6. To use SPIGen, Go to the Windows Start menu, then Programs, then SPIGen, and click on the SPIGen icon. The SPIGen "Generic SPI Generator" GUI will appear. Go to the File menu in the upper left hand corner of the GUI, and select Open, then browse the CD to find and select the 33988_EVB_CONFIGURATION_FILE.spi file for the KIT33988CEVBE. Click Open, and SPIGen will open a specifically configured SPI command generator for the KIT33988CEVBE. The configuration file will set all parameters for SPI signals from the PC and provide a list of commands that may be sent to the EVB.

Hardware description

7. To prepare the Evaluation card for SPIGen, Place jumper JINA, JINB, JRSTB, JWAKE to 1-2 position
8. To set up the 33988 device to read switch inputs the user may use the batch commands from the "Send a Batch of Commands" tab. In the "Send a Batch of Commands" window, the Full Initialize batch will appear. To send the batch of commands to the EVB, click the Send Once tab. To quickly evaluate the EVB and device, simply click on the "Send one Command at a Time" tab, select the switch status command from the Quick Commands list, and click the Send Continuous tab. The opening and closing of switches may now be seen on the Word Received bits window field. Refer to the device data sheet for detailed information on I/O communication and device operation.

5 Jumper Connections

| Name | Description |
|--------------------------|---|
| JSUPPLY | The selection between 1-2 allows the supply regulation of the 5.0 volt from battery while 2-3 allows independent supply. |
| Diode D1 | Diode protects against negative transients and reverse battery. |
| Capacitor C8 | Removed when doing reverse battery test. |
| JWAKE | Allows wake up function of IC. 1-2 selection gives control through PCON. 2-3 selection is used to wake-up from battery voltage, for example, in the case of ignition. |
| JINA | 1-2 position: control through PCON to SPIGEN 2-3 position: shorting IN0 to VDD Floating: IN0 is short to ground |
| JINB | NC |
| JRSTB | 1-2 position: control through PCON to SPIGEN/MCU 2-3 position: Short RSTB to VDD Floating: RSTB is ground. This means the IC is in reset mode |
| JFSI | 1-2 position: Short JFSI to ground 2-3 position: Connect to RFSI resistor Floating: JFSI is pulled to VDD |
| JLA | 1-2 position: connect to led, LA. LA lights up when IN is pulled to VDD Floating: Not connected to LA. |
| JLB | 1-2 position: connect to led, LB. LB lights up when IN is pulled to VDD Floating: Not connected to LB |
| Resistor RCS RFSI | Value to be change according. Value to be change according. |
| Test points CSNS-AGND | Several test points are present on the evaluation board to check some signals if necessary: To check the current recopy output |

6 Schematic drawing

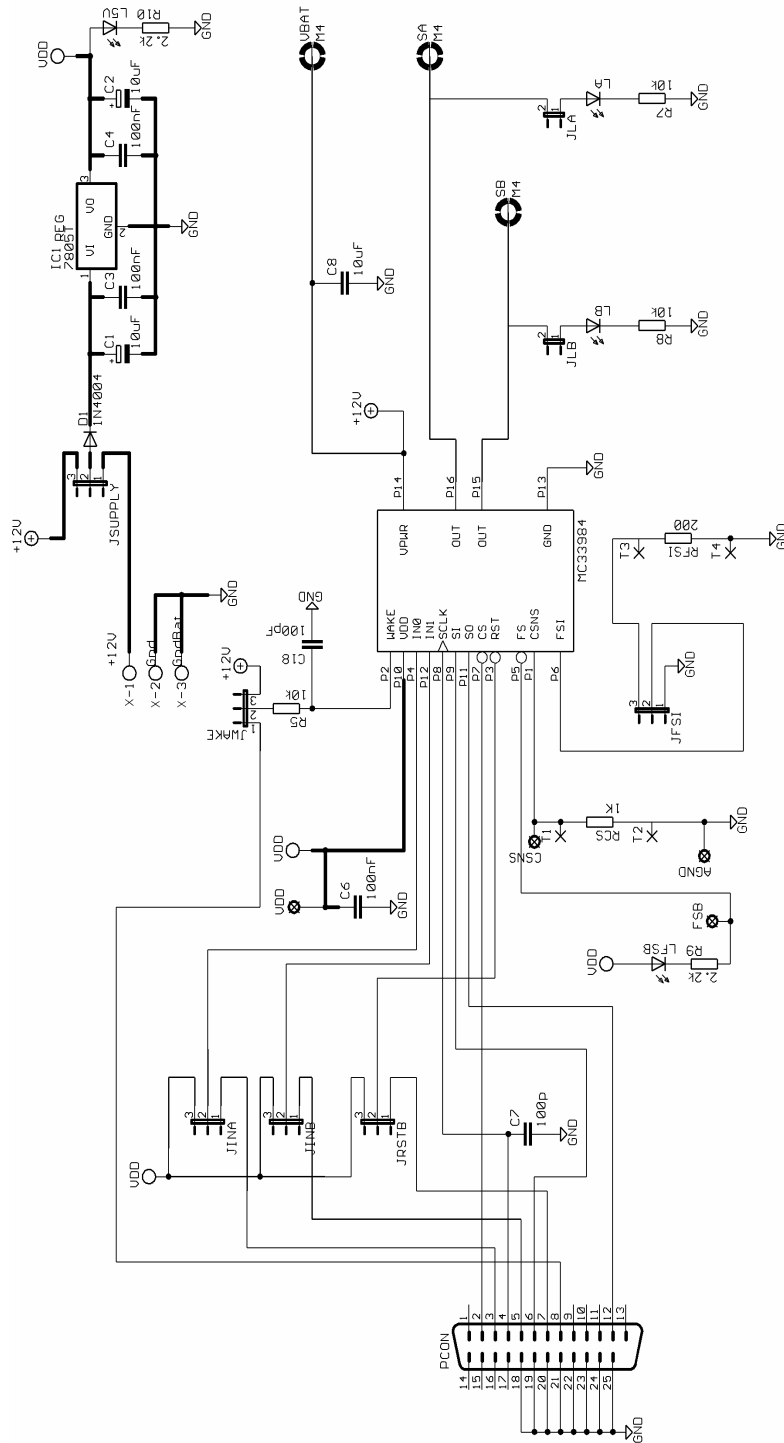


Figure 4. Evaluation board schematic

7 KIT33988CEVBE board layout

7.1 Assembly drawing

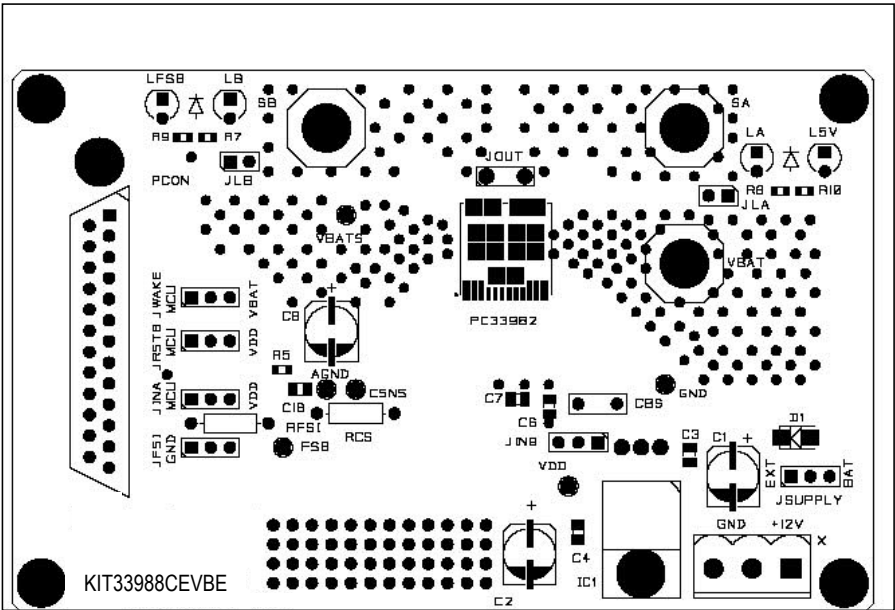


Figure 5. Assembly drawing

7.2 Top Layer

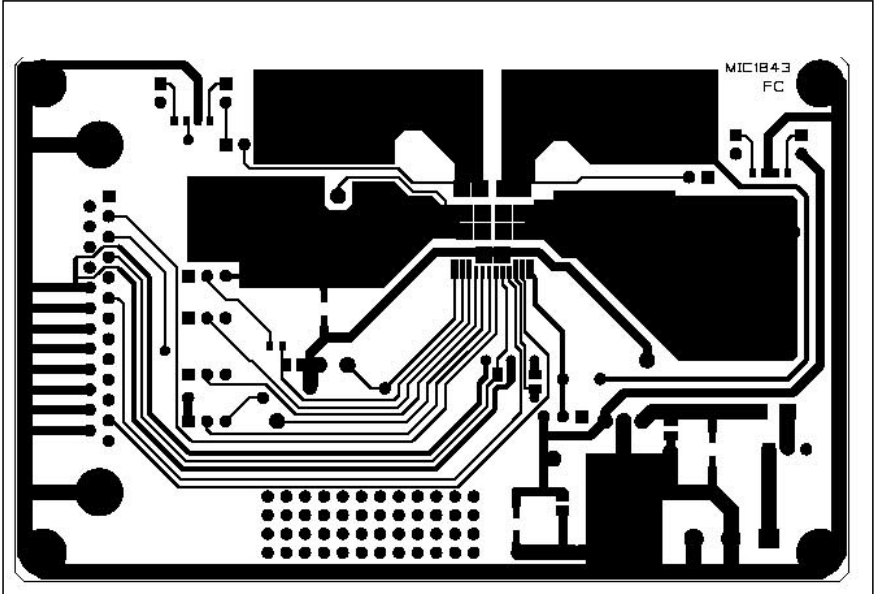


Figure 6. Top layer

7.3 Bottom Layer

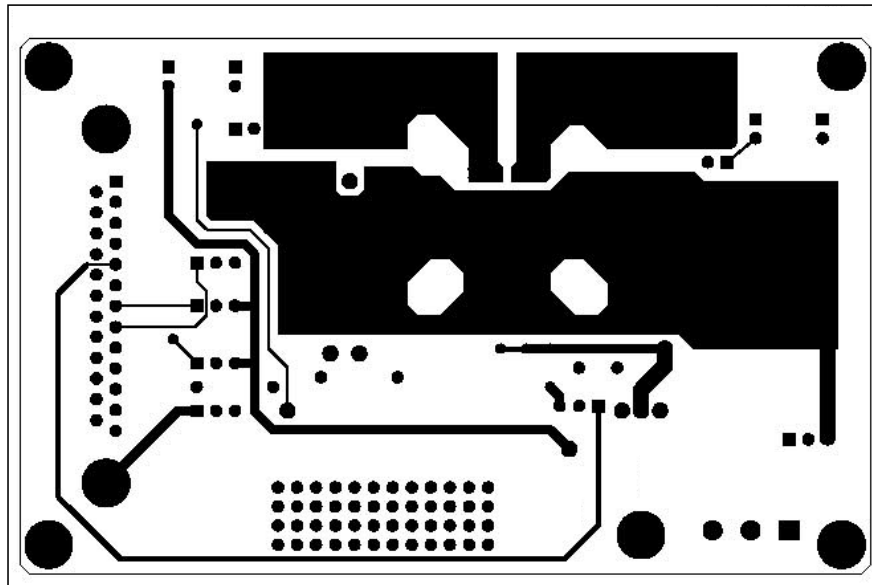


Figure 7. Bottom layer

8 Bill of material

| Qty | PN | Ref. Des | Package | Description |
|-----|-----------------|--|-----------------------|--|
| 1 | MC33988CPNA | MC33988 | PQFN | Dual 4.0 mOhm self-protected silicon switch |
| 1 | 7805 | REG | TO220 | 5.0 V regulator |
| 3 | ECEV1HA 100SP | C1, C2, C8 | CMS D | 10 uF 50 V capacitor |
| 3 | | C3, C4, C6 | 805 | 100 nF 50 V capacitor |
| 2 | | C7, C18 | 805 | 100 pF 50 V capacitor |
| 3 | | R5, R7, R8 | 603 | 10 k 5.0 % 0.1 W resistor |
| 2 | | R9, R10 | 603 | 2.0 k 5.0 % (or 2 k7) resistor |
| 1 | | RCS | Thru hole NON-CMS | 1.0 k 1/4 W 1.0 % resistor |
| 1 | | RFSI | Thru hole NON-CMS | 200 1/4 W 5.0 % resistor |
| 4 | H3192 | | Thru hole | Connector to hold resistor RCS and RFSI |
| 2 | HLMP1719 | LB, LA | Thru hole NON-CMS | 2.0 mA yellow leds |
| 2 | HLMP1700 | LFSB, L5V | Thru hole NON-CMS | 2.0 mA red leds |
| 1 | MRA4007T3 | D1 | SMA | DIODE MRA4007 (equiv. 1N4007) |
| 6 | Type1 5001 | FSB, CSNS, VDD, AGND, VBAT, GND | | Testpoints for clip |
| 1 | MKDS 1,5/3-5,08 | X | 5.08 mm | 3 terminal power connector standard 5.08 mm |
| 3 | | VBAT, SA, SB | Metal with 4 mm diam. | Screw connectors diam. 4.0 mm +1 Nut + 2 washers each for power connection |
| 1 | DB25P564TX | PCON | M25H | Connector, SubD, series D, male, bent barb, to solder 25 contacts |
| 6 | M7566-05 | JINA, JINB, JSUPPLY, JFSI, JWAKE, JRSTB | | JUMPER : 3 PINS + 1 jumper socket 2.54 mm |
| 2 | M7566-05 | JLA,JLB | | JUMPER : 2 PINS + 1 jumper socket 2.54 mm |

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9 References

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10 Revision history

| Revision | Date | Description of changes |
|----------|---------|---|
| 1.0 | 10/2010 | <ul style="list-style-type: none">Initial Release |
| 2.0 | 7/2016 | <ul style="list-style-type: none">Added section 3.3 If using the KITUSBSPIEVME, the dongle needs reworked on the SI connection as shown in Figure 2.Updated to NXP document form and style |

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