LC717A00ARGEVK

Capacitance-Digital-Converter IC for Electrostatic Capacitive Touch Sensors Evaluation Board User's Manual

ON Semiconductor®

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EVAL BOARD USER'S MANUAL

Introduction

This manual contains configuration, usage, setup guide (page 12), and main specifications regarding Capacitance touch sensor Evaluation board set (LC717A00ARGEVK).

For the latest edition of this manual, please refer to ON Semiconductor homepage.

Product Outline

This set includes four (4) different Evaluation boards that can evaluate Capacitance touch sensor operation in various switch patterns and Communication tools to make register setting changes on PC.

- Capacitance Touch Sensor Evaluation Board "LC717A00AR01GEVB"
- Capacitance Touch Sensor Evaluation Board "LC717A00AR02GEVB"
- Capacitance Touch Sensor Evaluation Board "LC717A00AR03GEVB"
- Capacitance Touch Sensor Conversion Module "LC717A00ARGPGEVB"
- Multi-functional USB−I^2C Conversion Module "MM−FT232H"
- USB Cable

EVALUATION BOARDS

LC717A00AR01GEVB Evaluation Board

This Evaluation board has 4×2 switch pattern with an LED on the center. Acrylic board is mounted on the board with a space of approx. 1.5 mm. When the user touches the Green light, which is lit under this acrylic board, the color will change to Red.

Configuration

1. Connector for Multifunctional USB−I^2C Conversion module:
   This is used to connect Multifunctional USB−I^2C conversion module "MM−FT232H". By using this module, user can connect the Evaluation board and PC. By connecting this Evaluation board to PC and activating Touch sensor evaluation application "LC717A00AR Software" on PC, user can change the parameter of touch sensor LSI, or can monitor an operation condition. Also, power will be supplied from this connector.
2. Power source switching jumper:
   This is used to set a supplier of the power source. If this is set on "PC" side, power is supplied from Multifunctional USB conversion module. If this is set on "AC ADAPTER" side, power is supplied from DC jack.
3. DC Jack:
   This is used to connect AC adopter (+5 V). (Note: Using wrong polarity will damage this jack)
4. RESET switch:
   This is used to RESET Capacitance touch sensor LSI. Use this switch when Error LED is lit or if any abnormality is found during operation.
5. Error LED:
   This will light up when error is occurring in Capacitance touch sensor LSI. When this LED is lit, press RESET switch to release the error.
6. Capacitance touch sensor LSI:
   Please do not touch this during operation – It may cause malfunction or breakdown.
7. Touch switch area:
   An area where Touch switch is located. Touch switch is Green at power ON. When the user touches the Green light, Touch sensor will react and change the color to Red.

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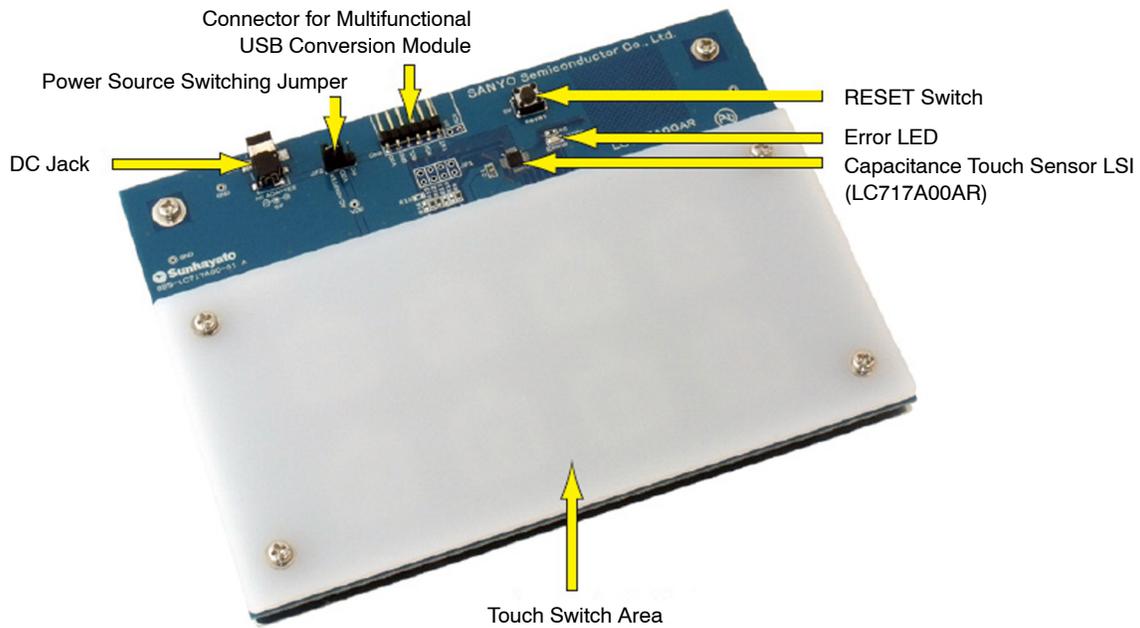
LC717A00ARGEVK

Figure 1. Configuration of LC717A00AR01GEVB

How to Use

1. When receiving power from PC, set Power switching jumper to "PC" side and connect "MM−FT232H" to the connector for Multifunctional USB conversion module (See Figure 2). If receiving power from optional AC adapter, set the jumper to "AC ADAPTER" side and connect AD adapter to DC jack.

2. Press RESET switch.
3. Red LED will light up by touching Green LED light (See Figure 3).
4. Press RESET switch in case of error LED light up or when Evaluation board is acting strange.
5. Please note: If the user directly touches the IC on the Evaluation board or patterns with their finger, it may cause malfunction or breakdown.
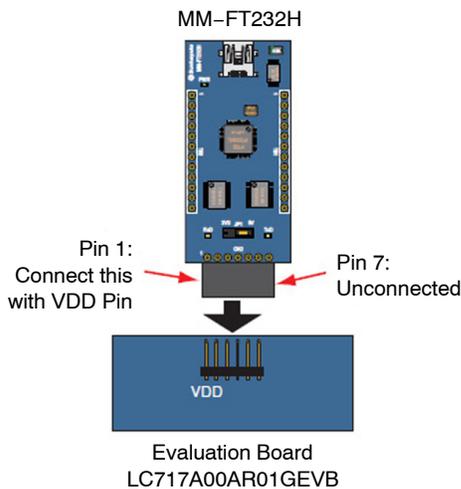
Figure 2. MM−FT232H Connection
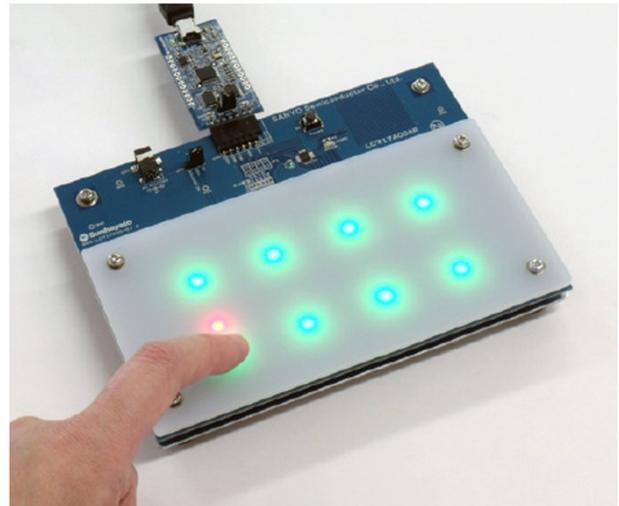
Figure 3. Red Turns On by Touching Green Light

CAUTION: When supplying power from Multifunctional conversion module while having Power switch jumper on "AC ADAPTER" side, Green LED will slightly light up. This is because the current flows via I^{2}C signal line and Pull-up resistor. PLEASE DO NOT USE IN THIS CONDITION − It may cause equipment failure.
Also, please DO NOT supply power from both AD adapter and Multifunctional USB conversion module while having Power switch jumper on "AC ADAPTER" side − This may also cause equipment failure.

LC717A00AR02GEVB Evaluation Board

This Evaluation board has 8×1 switch pattern with an acrylic board placed on top of it. Touching the acrylic board will turn Red LED light on.

Configuration

1. Connector for Multifunctional USB−I^{2}C conversion module:
   A connector to connect "MM−FT232H". By connecting this module, user can connect this Evaluation board with PC. By connecting this board to PC and activating Touch sensor Evaluation application "LC717A00AR software" on PC, user can change the parameter of touch sensor LSI, or can monitor an operation condition. Also, power will be supplied from this connector.
2. RESET switch:
   This is used to RESET Capacitance touch sensor LSI. Press this when error LED is lit or any abnormality is found during operation.
3. Error LED:
   This will light up when error is occurring in Capacitance touch sensor LSI. When this LED is lit, press RESET switch to release an error.
4. Capacitance Touch sensor LSI:
   Please do not touch this during operation – It may cause malfunction or breakdown.
5. Touch Switch Area:
   An area where Touch switch is located. Touch switch is Green at power ON. When the user touches the Green light, touch sensor will react and the color changes to Red.

How to Use

1. Connect "MM−FT232H" (See Figure 2).
2. Press RESET switch.
3. Red LED will light up by touching silk prints on the board.
4. Press RESET switch if error LED is lit or when Evaluation board is operating strange.
5. Please note: If the user directly touches the IC on the Evaluation board or patterns with their finger, it may cause malfunction or breakdown.
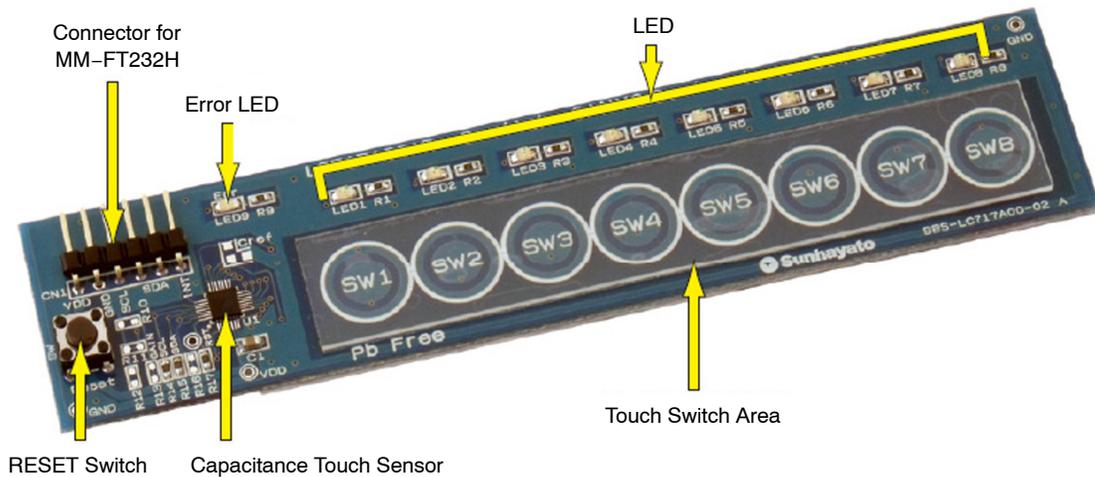
Figure 4. Configuration of LC717A00AR02GEVB

LC717A00AR03GEVB Evaluation Board

This Evaluation board has 4×2 switch pattern with an acrylic board placed on back side of the board. Red LED will light up by touching silk print area (SW1 ~ SW8) of the Touch switch.

Configuration

1. Pin for Multi-functional USB conversion module:
   This is a pin to solder Pin header of 2.54 mm pitch and connect "MM−FT232H". By connecting this module, parameter change of Touch sensor LSI and the operation condition can be monitored by using Touch sensor evaluation application "LC717A00AR Software" on PC.
2. USB Connector:
   This is used for PC connection. This connector does power delivery only and PC does not identify this connector as USB device. In case of using "LC717A00AR Software", please use pins for "MM−FT232H".
3. Error LED:
   This will light up when error is occurring in Capacitance touch sensor LSI. When this LED is lit, unplug Evaluation board from PC and plug back again.
4. Capacitance Touch sensor LSI:
   Please do not touch this during operation – It may cause malfunction or breakdown.
5. Touch Switch Area, LED:
   An area where Touch switch is located. Red LED will light up by touching silk print area (SW1 ~ SW8) of the Touch switch.

How to Use

1. Connect USB connector of the Evaluation board to USB connector of the PC.
2. Red LED light will light up by touching silk print on the board.

3. When error LED is on or having strange Evaluation board operation, unplug the Evaluation board from PC, and plug back again.
4. Please note: If the user directly touches the IC on the Evaluation board or patterns with their finger, it may cause malfunction or breakdown.
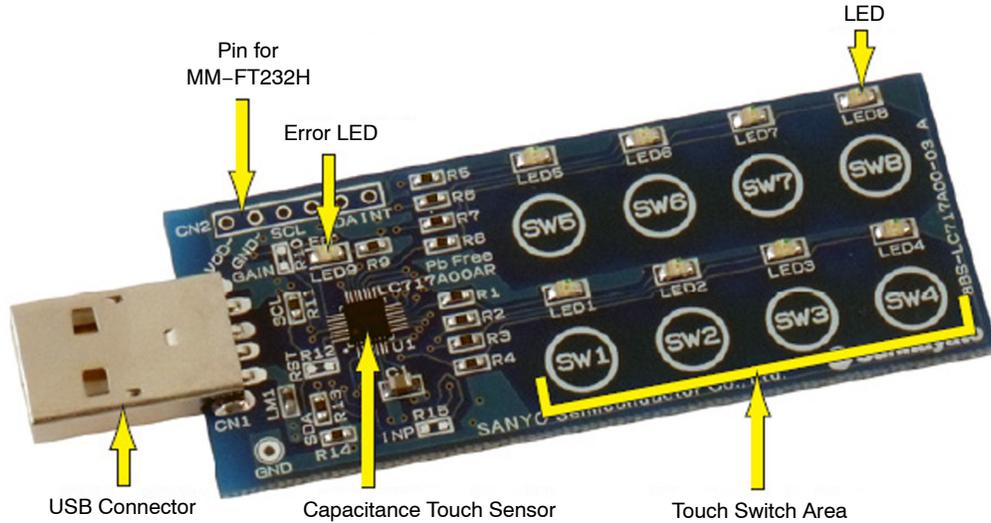
Figure 5. Configuration of LC717A00AR03GEVB

LC717A00ARGPGEVB Conversion Module

This is a sensor module with Capacitance touch sensor LSI "LC717A00AR" on DIP IC form of board that has 28 pins with 600 mil width. This is used to evaluate self-produced switch patterns.
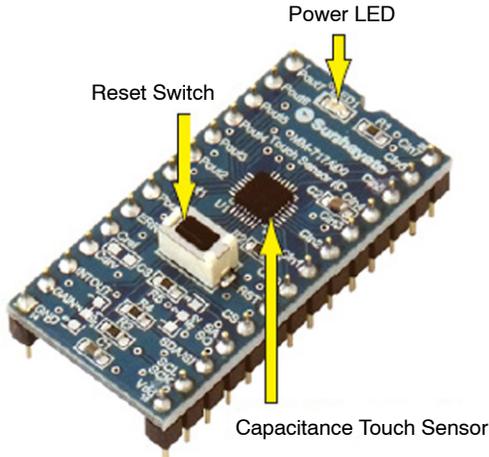
Figure 6. LC717A00ARGPGEVB

Please refer to Detail Description of LC717A00ARGPGEVB section for more detail.

MM−FT232H Multifunctional USB−I²C Conversion Module

This is a module for USB Interface and I²C™ Interface conversion. This is used when connecting each Evaluation board and PC. When connecting to the Evaluation board, please set I/O switching jumper on 5 V side.
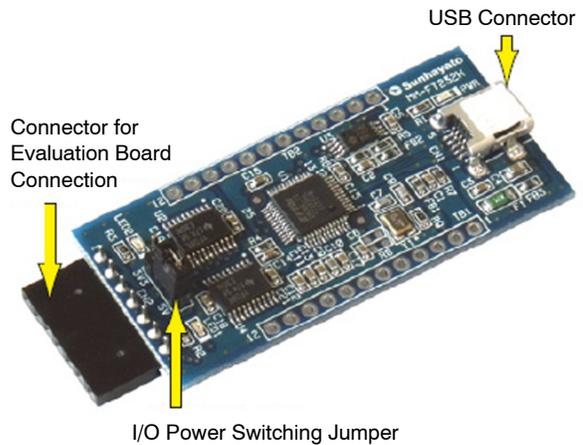
Figure 7. Configuration of MM−FT232H

LC717A00ARGEVK

MAIN SPECIFICATIONS

Main specifications of each device are as listed below:

Table 1. MAIN SPECIFICATIONS OF LC717A00AR01GEVB

Parameter	Conditions	Ramarks
Board Size	155 × 115 (mm)	
Board Material	Glass Epoxy (FR4)	Copper Foil 35 μm, Thickness 1.6 mm, Double-sided Board
Supply Voltage	5 V	Provided from either DC Jack or MM−FT232H
Capacitance Touch Sensor	LC717A00AR	
External RESET Circuit	With Manual REWSET Switch	
Switch Pattern	4 × 2 Configuration	
Connector	6 Pins × 1 Row, DC Jack	

Table 2. MAIN SPECIFICATIONS OF LC717A00AR02GEVB

Parameter	Conditions	Ramarks
Board Size	127 × 28.5 (mm)	
Board Material	Glass Epoxy (FR4)	Copper Foil 35 μm, Thickness 1.6 mm, Double-sided Board
Supply Voltage	5 V	Provided from MM−FT232H
Capacitance Touch Sensor	LC717A00AR	
External RESET Circuit	With Manual REWSET Switch	
Switch Pattern	8 × 1 Configuration	
Connector	6 Pins × 1 Row	

Table 3. MAIN SPECIFICATIONS OF LC717A00AR03GEVB

Parameter	Conditions	Ramarks
Board Size	29 × 69 (mm)	
Board Material	Glass Epoxy (FR4)	Copper Foil 35 μm, Thickness 1.6 mm, Double-sided Board
Supply Voltage	5 V	Provided from USB Connector
Capacitance Touch Sensor	LC717A00AR	
External RESET Circuit	N/A	
Switch Pattern	4 × 2 Configuration	
Connector	USB A Type	

Table 4. MAIN SPECIFICATIONS OF LC717A00ARGPGEVB

Parameter	Conditions	Ramarks
Board Size	17.78 × 35.56 (mm)	
Board Material	Glass Composite (CEM3)	Copper Foil 35 μm, Thickness 1.6 mm, Double-sided Board
Supply Voltage	2.6 to 5.5 V	
Capacitance Touch Sensor	LC717A00AR	
External RESET Circuit	With Manual REWSET Switch	
Switch Pattern	4 × 2 Configuration	
Connector	Connector 600 mil Width 28 Pins DIP Type	

CIRCUIT DIAGRAMS
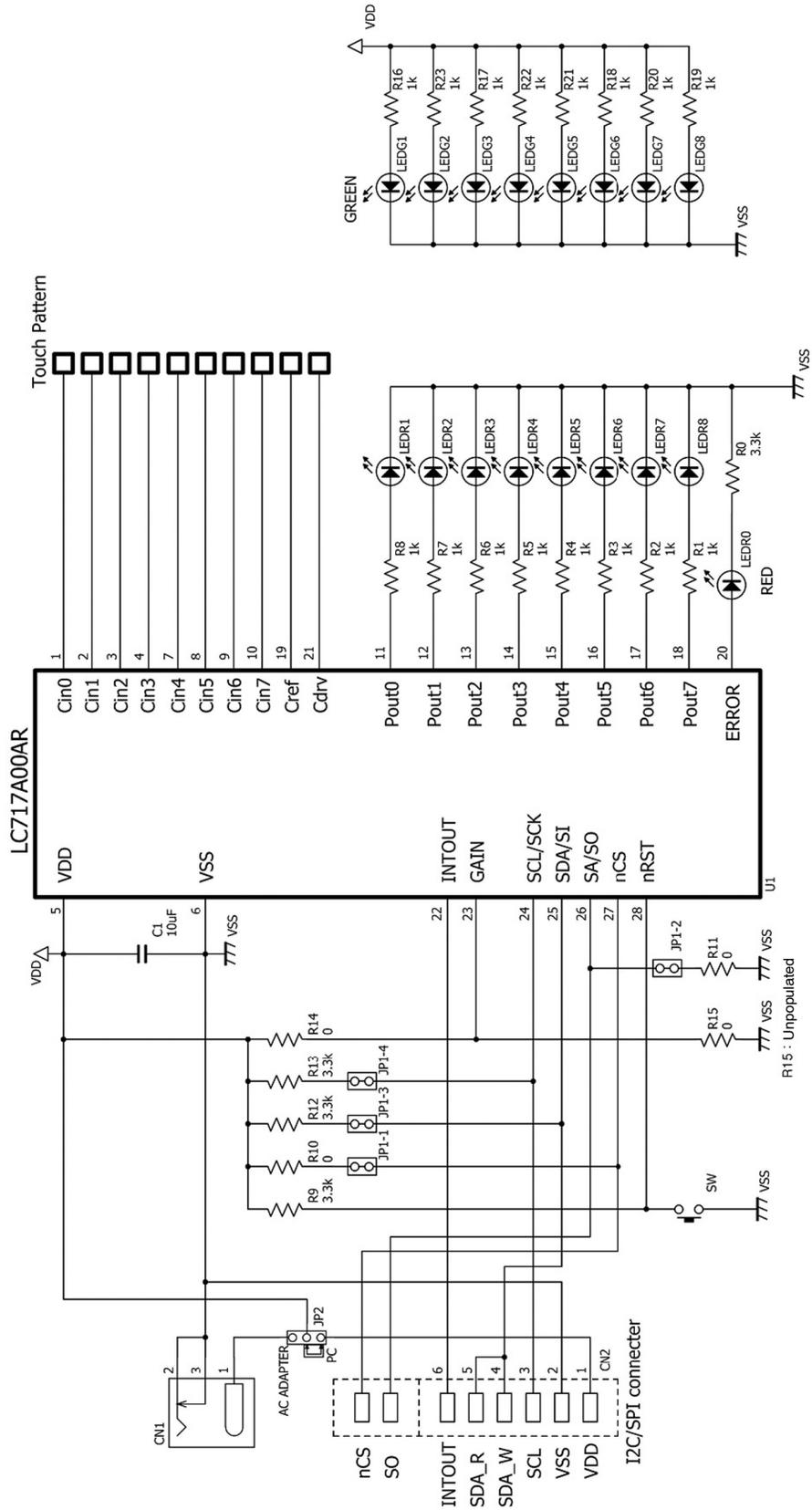
Figure 8. LC717A00AR01GEVB
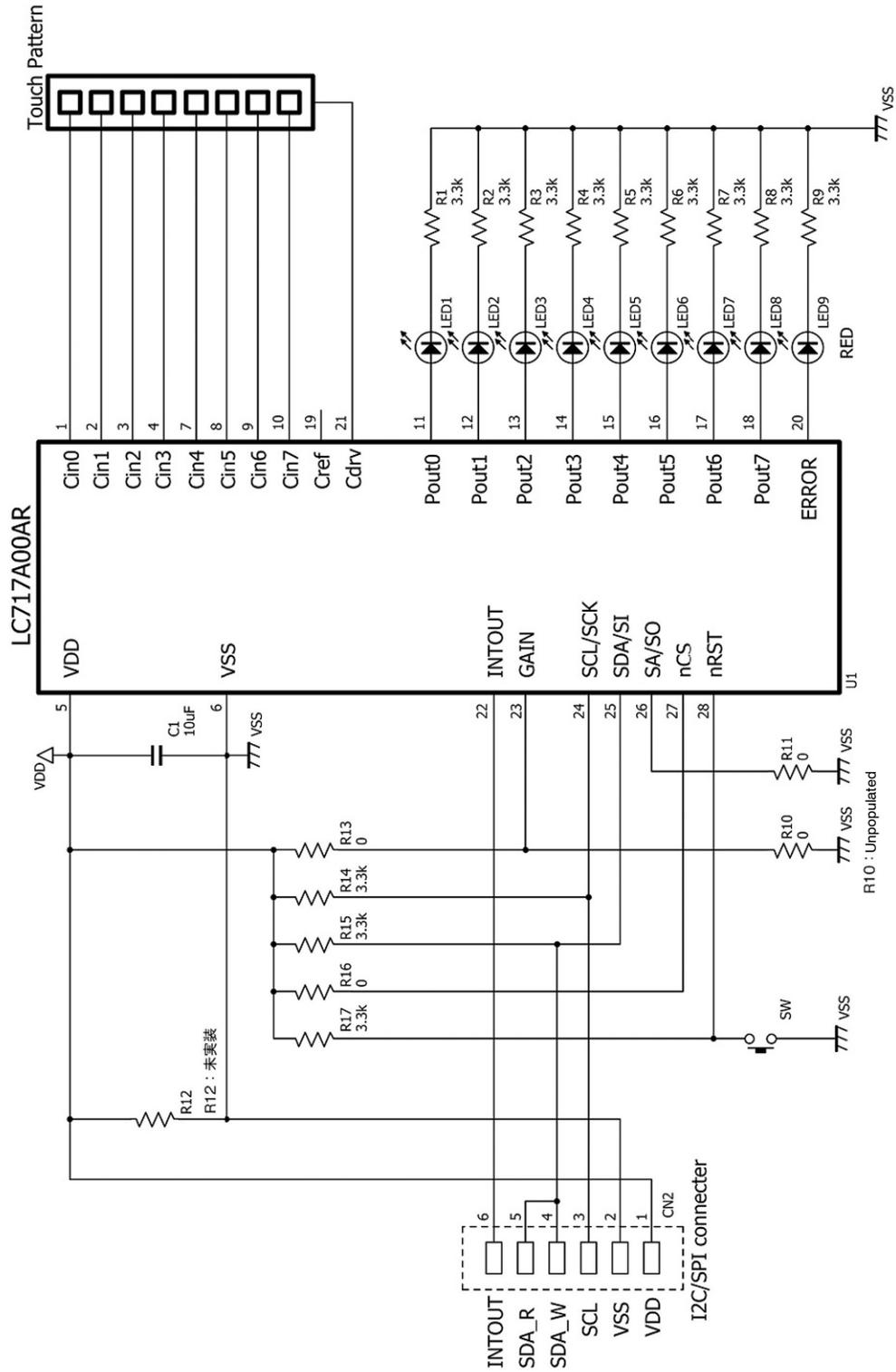
Figure 9. LC717A00AR02GEVB
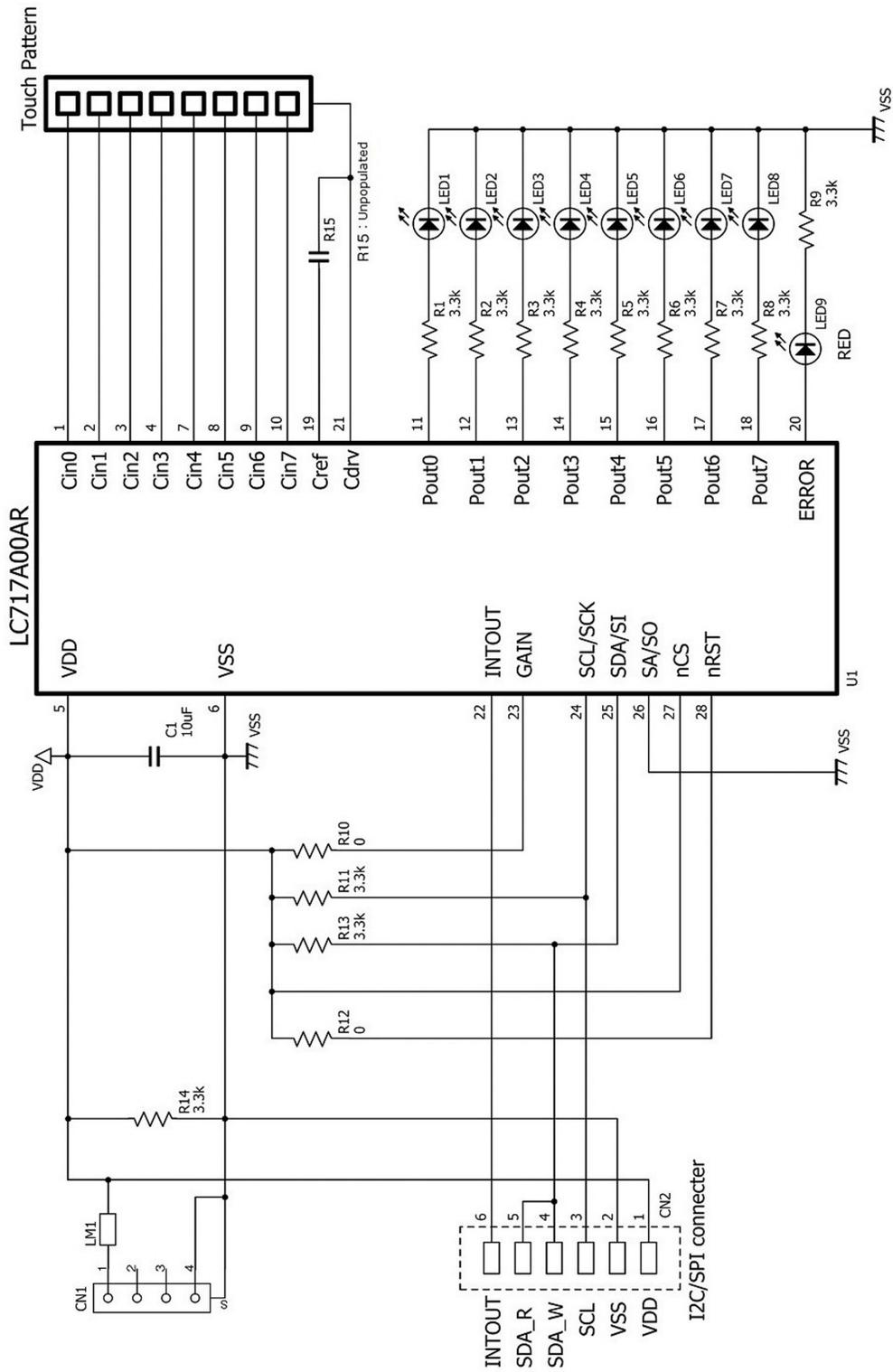
Figure 10. LC717A00AR03GEVB
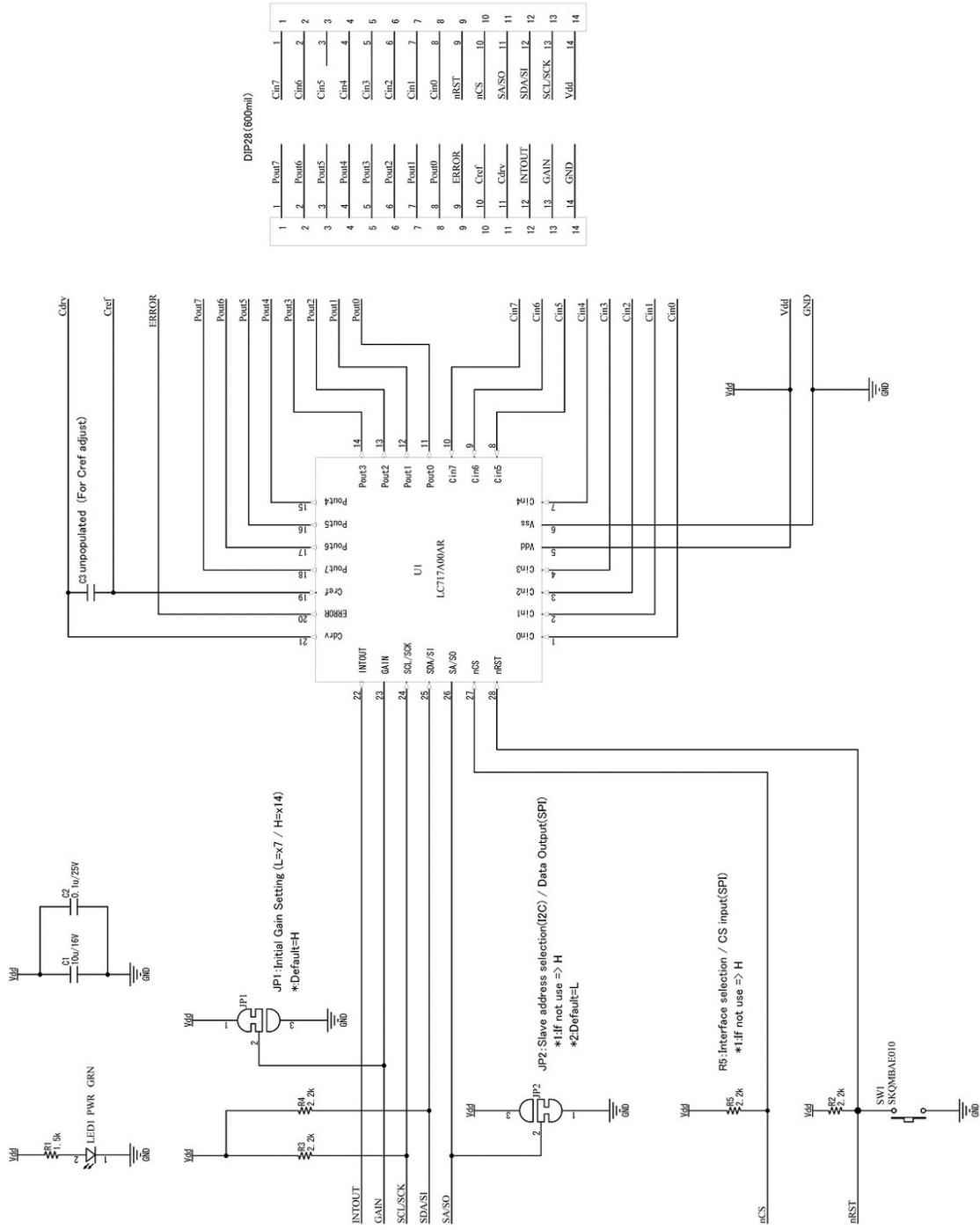
Figure 11. LC717A00ARGPGEVB

DETAIL DESCRIPTION OF LC717A00ARGPGEVB

Configuration
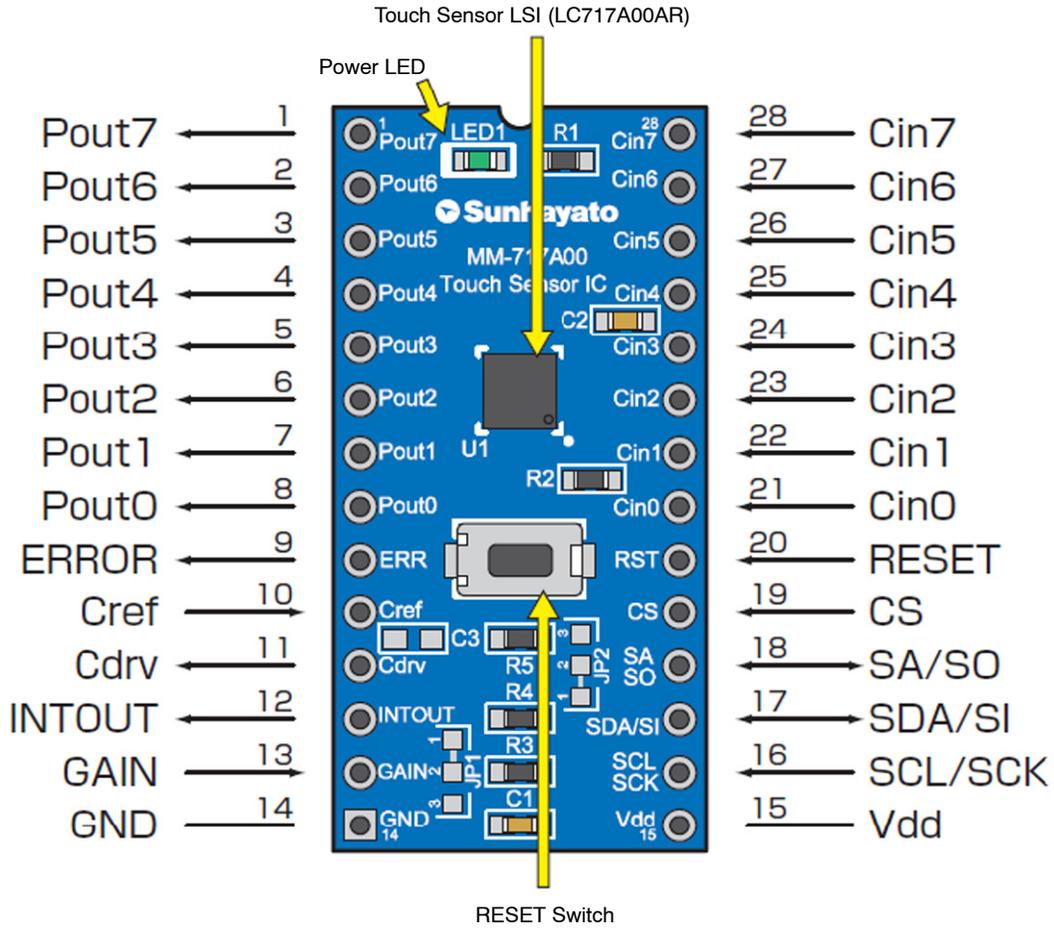
Figure 12. Configuration of LC717A00ARGPGEVB

Table 5. SIGNAL PIN FUNCTIONS

No	Name	I/O	Functions
1	Pout7	Output	Cin0 Evaluation Result Output
2	Pout6	Output	Cin1 Evaluation Result Output
3	Pout5	Output	Cin2 Evaluation Result Output
4	Pout4	Output	Cin3 Evaluation Result Output
5	Pout3	Output	Cin4 Evaluation Result Output
6	Pout2	Output	Cin5 Evaluation Result Output
7	Pout1	Output	Cin6 Evaluation Result Output
8	Pout0	Output	Cin7 Evaluation Result Output
9	ERROR	Output	ERROR State Output
10	Cref	Input	Reference Capacity Input Pin
11	Cdrv	Output	Output for Capacitive Sensor Drive
12	INTOUT	Output	Interruption Output
13	GAIN	Input	Pin for Gain Initial Value Selection (JP1 Initialization : H Level = ×14)
14	GND	–	GND (EARTH)
15	Vdd	–	Power Source
16	SCL/SCK	Input	Clock Input (I^2C)/Clock Input (SPI) (2.2 kΩ Pull-up)
17	SDA/SI	I/O	Data I/O (I^2C)/Data Input (SPI) (2.2 kΩ Pull-up)
18	SA/SO	I/O	Slave Address Selection (I^2C)/Data Output (SPI) (JP2 Initialization : L Level)
19	CS	Input	Interface Selection/Chip Select Inverting Input (SPI)
20	RESET	Input	External RESET Signal Inverting Input (2.2 kΩ Pull-up, with Switch)
21	Cin0	I/O	Capacitive Sensor Input
22	Cin1	I/O	Capacitive Sensor Input
23	Cin2	I/O	Capacitive Sensor Input
24	Cin3	I/O	Capacitive Sensor Input
25	Cin4	I/O	Capacitive Sensor Input
26	Cin5	I/O	Capacitive Sensor Input
27	Cin6	I/O	Capacitive Sensor Input
28	Cin7	I/O	Capacitive Sensor Input

*For evaluation result output of Pout0~7; Evaluation result (ON/OFF) after removing Capacitive sensor input's chattering will come out. Capacitive sensor's measurement will become readable by connecting I^2C compatible bus or SPI.

Table 6. JUMPER, PATTERN FOR ADDITIONAL PARTS

Pattern	Parameter	Set Contents
JP1	Initial Gain Setting	H Level (1-2 Short) = High-sensitivity (×14) *: Initial Setting: H Level L Level (2-3 Short) = Low-sensitivity (×7)
JP2	Slave Address Selection (I^2C) / Data Output (SPI)	When Interface is Selected as I^2C Compatible Bus by CS Pin; H Level (2-3 Short) = 0x16 (7 Bits) L Level (1-2 Short) = 0x17 (7 Bits) *: Initial Setting: L Level
C3	Pattern for Cref Capacity Adjustment	Implement Capacitor of any Capacity as Needed (Size: 1608)

PRECAUTION FOR USE

1. For approach in the use of IC and the design rule of the sensor pattern that will become the switch: Please refer to the User's manual and FAQ pages in ON Semiconductor homepage.
2. Regarding ON/OFF output change in accordance with long press of the switch: This happens with "Auto OFF function". As a fail-safe function, if LSI is initial setting, output will be OFF after holding the switch for 10 seconds. By using Switch ON Count Lower/Higher Register in I^2C™ compatible bus or SPI connection, the time to set OFF will be adjustable.

LC717A00ARGEVK

SETUP GUIDE

Thank you for purchasing our "LC717A00ARGEVK", the Capacitance touch sensor Evaluation board.

Necessary Operational Environment

Following operational environment is necessary in order to use "LC717A00AR Software", the Touch sensor Evaluation board application.

- Correspondence OS: Windows® XP (32 bit), Windows® 7 (32 bit)
- Memory capacity: More than 16 MB
- Hard disc capacity: Amount of space → more than 500 kB (Application size). Need additional size (optional) for obtaining Log file.
- Interface: USB2.0

Setup

1. Download the "D2XX drivers" from the corporate home page of FTDI (http://www.ftdichip.com).
2. Decompress the zipped file.
3. Connect the "MM−FT232H" and the PC with USB Cable.
4. Install of "D2XX drivers" for "MM−FT232H". Once the installation is done, disconnect "MM−FT232H" from PC.
5. Connect the "MM−FT232H" and the Touch sensor Evaluation board (LC717A00AR01GEVB or LC717A00AR02GEVB). Next, connect the "MM−FT232H" and the PC with USB Cable.
6. Download the LC717A00AR Software, from http://www.sanyosemi.com/en/touch-sensor/pdf/LC717A00_Software.zip, and store on your PC.
7. Decompress the zipped file into the any directory.
8. Run the LC717A00AR Software "LC717A00ARApp.exe" in the above directory.
9. Please refer to the documents and tools at http://www.sanyosemi.com/en/touch-sensor/index.php.

Connecting Multifunctional USB Conversion Module

Where appropriate, please connect Capacitance touch sensor Evaluation board and Multifunctional USB conversion module as shown in the Figure 2.

When connecting Multifunctional USB conversion module, make sure to have USB cable unplugged. When unplugging Multifunctional USB conversion module, please unplug USB cable before the module.

Use of AC Adapter

Please use 5 V AC adapter when using LC717A00AR01GEVB without connecting to PC.

NOTE: Please take extra care for polarity − Using wrong polarity may cause IC damage.
Some AC adapter with large anti-ground noise may not be used.

Usage Advisory

- When using AC adapter, please switch the jumper of LC717A00AR01GEVB to AC adapter side.
- If error is displayed when starting "LC717A00AR Software", please check the following:
  - ♦ Please make sure that Device driver is operating correctly:
    If "!" is shown at "USB Serial Port" in Windows' "Device manager", Device driver is not operating correctly. In such a case, disconnect the device from PC and reconnect it again. If "!" still shows up on the screen after disconnecting so many times, please reinstall the Device driver.
- Additional documents, FAQ, and any updates regarding this set are posted on ON Semiconductor homepage. We recommend all users to check the homepage regularly.

ON Semiconductor Touch sensor webpage:
http://www.sanyosemi.com/en/touch-sensor/index.php

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