# LC717A30UJGEVK Electrostatic Capacitive Sensor Evaluation Kit User's Manual

### Contents

Electrostatic capacitive sensor kit (LC717A30UJGEVK) has both several evaluation boards to evaluate the operation of various switch patterns and the communication facility for PC because of changing some registers. This manual explains configuration, usage and specification.

### Features

- Evaluation of 8ch Touch Switch
- Evaluation of 2ch Proximity Sensor
- Evaluation of Liquid Level Sensing
- Evaluation of Electrode Sheet of Film Type
- Evaluation of Customer's Sensor Board
- Communication Module between this Kit and PC through USB



### **ON Semiconductor®**

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### EVAL BOARD USER'S MANUAL

### **Equipment Used**

- Electrostatic Capacitive Sensor Evaluation Kit "LC717A30UJGEVK"
- PC (Installed GUI and USB Power Supply)



Figure 1. Photo of LC717A30UJGEVK Evaluation Kit

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### LC717A30UJGEVK Content

1 Main Control Board "LC717A30UJ00GEVB" 0 @ 2 Touch Switch Board 3 Proximity Sensor Board "ELECTRODE00GEVB" "ELECTRODE01GEVB" 5 DIP Conversion Board 6 FPC Conversion Board 7 2ch Sensor Board "LC717A30UJDIPGEVB" "LC717A30UJFPCGEVB" "LC717A30UJ2CH00GEVB" 8 Sensor Key Sheet 9 Plastic Bottle 10 Funnel Liquid Level Sensing Board 4 11 Pin Header (7pin) "ELECTRODE02GEVB" 12 Jump Wire 14 USB Conversion Module 13 USB Cable Type mini-B "SPP-150" "MM-FT232H"

### SET UP

(1) Install the Device Driver for USB Conversion Module (MM-FT232H)

The system uses the MM–FT232H interface module to communicate to PC USB port and needs the device drivers of FTDI to be installed into PC. Refer to InstallationGuides of FTDI (http://www.ftdichip.com/). Install the device driver before using GUI software.

(2) Install the Evaluating Software (GUI)

Unzip GUI software (e.g. LC717A30A\_SOFT.ZIP) to an arbitrary folder from website LC717A30UJ product.

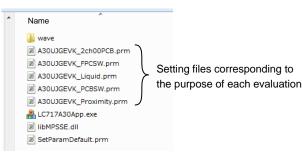
The file contains:

Name	
퉬 wave	Wave file folder
船 LC717A30App.exe	GUI execution file
IIbMPSSE.dll	DLL file
SetParamDefault.prm	Generic evaluation setting file

Unzip the setting file (e.g. LC717A30\_PARAMETER. ZIP) corresponding to the purpose of each evaluation from website LC717A30UJGEVB.

The setting files need to be stored into the same folder as the GUI software LC717A30App.exe.

The file contains:



- A30UJGEVK\_2ch00PCB.prm: Setting-file for 2ch sensor board
- A30UJGEVK\_FPCSW.prm: Setting-file for sensor key sheet
- A30UJGEVK\_Liquid.prm: Setting-file for liquid level sensing on Cin4
- A30UJGEVK\_PCBSW.prm: Setting-file for touch switch PCB
- A30UJGEVK\_Proximity.prm: Setting-file for proximity sensor board

# (3) Connect USB Conversion Module to PC (with GUI-installed) by USB Cable

USB conversion module MM–FT232H's LEDPWR lights up green. USB conversion module can select power-supply voltage for I/O 3.3 V or 5.0 V by jumper setup. Refer <u>"USB Conversion Module Operation Guide"</u> in detail. 3.3 V draws less power than 5.0 V.

(4) Connect USB Conversion Module to Touch Switch Board

(5) Execute Evaluation Software LC717A30App.exe

Refer application software user's manual about how to operate.

(6) Load the Proper Setting (File Extension ".prm") for Corresponding to the Target Touch Sensor Board (Evaluation Purpose)

(7) Use "Reset-Button" when the Behavior of Sensor Evaluation Operation Fails

Do not push and hold the "Reset-Button".

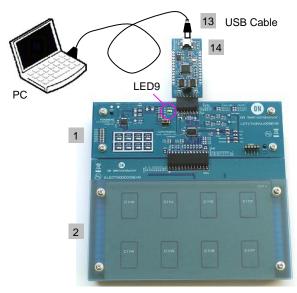
### SETTING PROCESS CORRESPONDING TO EVALUATION PURPOSE

#### **Touch Evaluation**

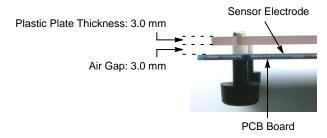
#### (1) Configuration

Connect the main control board

<sup>••</sup> 1 LC717A30UJ00GEVB" to the touch switch board
<sup>••</sup> 2 ELECTRODE00GEVB", connect USB conversion module "<sup>••</sup> 14 MM-FT232H". LED9 on the main control board will light up red by connecting PC.

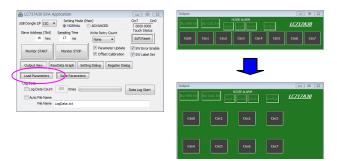


Cross Section:



### (2) GUI Software Setup

Execute GUI software "LC717A30App.exe". Push button "Load Parameters" and open the setting file of PCB touch evaluation "A30UJGEVK\_PCBSW.prm". Output window pattern will match the pattern on the touch switch electrode board and the register values will be loaded.



Register settings can be reviewed by pushing "Setting Dialog" to display Initial Setting Window.

Slave Addres	hex ART	pplication Setting NOR Samping Tr 17 m Monitor S WDatt Graph	me Write IS Ne STOP	VANCED e Retry Count one • Parameter U Offset Calibr	on To pdate	i7 C 0000 0000 ouch Status ioft Reset SW Error Ei SW Label S	s j nable					
Load Paran	eters ]	Save Para	ameters	~								
Log Data					_							
📃 Log Dat	a Count	100 time	5		Data	Log Start						
Auto Fil							_					
FI	e Name	LogData.txt										
Initial Settin	g Windo	IW										
							Setting Mode	(Sub)		Pin Configuration	Cin0-Cin3 Cref	
							(i) Normal				Creforly	Cref+CrefAd
										CMAdd4(opp:Hiz)	Cin4-Cin7 Cref	
										CMAdd0(opp:Hiz)	Crefonly	Cref+CrefAd
					0.0		Cdac / Digi C	iffset		Gain(1et)	Dynamic Offset Caliby	ation
Setting Regi			Cin0-Cin3 Use Ch	Gain(2nd)	-Cin0 Touch Thr.	Off Thr.	Cdac / Digi C CdacP	CdacM	Cin0-Cin3 Digi Offset	Gain(1st) Cin0-Cin3	Dynamic Offset Calibr	
00 FF	12 07	28 80				Off Thr.					Cycle (Short Interval)	0 sb
00 FF 01 C4	12 07 13 07	28 80 2 <sup>6</sup> 0 <sup>6</sup>	Use Ch	Gain(2nd)	Touch Thr.		CdacP	CdadM	Digi Offset	Cin0-Cin3 1600(Min) • Cin4-Cin7	Cycle (Short Interval) Plus Data Time	0 st 2000 n
00 FF 01 C4 02 00	12 07 13 07 14 07	28 80 2 <sup>#</sup> 0 <sup>#</sup> 30 40	Use Ch	Gain(2nd)	Touch Thr.	7	CdacP 0	CdadM 0	Digi Offset 0	Cin0-Cin3 1600(Min) •	Cycle (Short Interval)	0 st
00 FF 01 C4 02 00 03 00	12 07 13 07	28 80 2 <sup>6</sup> 0 <sup>6</sup>	Use Ch Cin0 Cin1 Cin2	Gain(2nd) 1(Min) • 1(Min) • 1(Min) •	Touch Thr. 10	7	CdacP 0 0	CdadM 0 0	Digi Offset 0 0	Cin0-Cin3 1600(Min) • Cin4-Cin7	Cycle (Short Interval) Plus Data Time	0 st 2000 m
00 FF 01 C4 02 00 03 00 04 00	12 07 13 07 14 07 15 07	28 80 2 <sup>#</sup> 0 <sup>#</sup> 30 40 31 02	Use Ch Cin0	Gain(2nd) 1(Min) * 1(Min) *	Touch Thr. 10 10 10	7 7 7	CdacP 0 0	CdadM 0 0	Digi Offset 0 0	Cn0-Cn3 1600(Min) • Cn4-Ch7 1600(Min) •	Cycle (Short Interval) Plus Data Time Minus Data Time DynamicCalTh Plus	0 st 2000 m 300 m 4(init) •
00 FF 01 C4 02 00 03 00 04 00 05 00	12 07 13 07 14 07 15 07 16 07	28 80 2 <sup>H</sup> 0 <sup>H</sup> 30 40 31 02 32 01	Use Ch Cin0 Cin1 Cin2	Gain(2nd) 1(Min) • 1(Min) • 1(Min) • 1(Min) •	Touch Thr. 10 10 10 10 10 10 10 10	7 7 7 7	CdacP 0 0	CdadM 0 0 0	Digi Offset 0 0	Cin0-Cin3 1600(Min) • Cin4-Cin7 1600(Min) •	Cycle (Short Interval) Plus Data Time Minus Data Time DynamicCalTh Plus DynamicCalTh Minus	0 st 2000 m 300 m 4(Init) •
00 FF 01 C4 02 00 03 00 04 00 05 00 06 00	12 07 13 07 14 07 15 07 16 07 17 07	28 80 24 04 30 40 31 02 32 01 33 01	Use Ch Cin0 Cin1 Cin2 Cin3	Gain(2nd) 1(Min) • 1(Min) • 1(Min) • 1(Min) •	Touch Thr. 10 10 10 10	7 7 7 7	CdacP 0 0	CdadM 0 0 0	Digi Offset 0 0 0 0	Cn0-Cn3 1600(Min) • Cn4-Cn7 1600(Min) • Acoursecy Average count 64 times •	Cycle (Short Interval) Plus Data Time Minus Data Time DynamicCalTh Plus DynamicCalTh Minus PDCLP(Dynamic Offic	0 st 2000 n 300 n 4(Init) • -4(Init) •
00 FF 01 C4 02 00 03 00 04 00 05 00 05 00 06 00 07 00	12 07 13 07 14 07 15 07 16 07 17 07 18 07	28 80 2 <sup>#</sup> 0 <sup>#</sup> 30 40 31 02 32 01 33 01 34 05	Use Ch Cn0 Cn1 Cn2 Cn3 Cn4-Cn7	Gain(2nd) 1(Min) • 1(Min) • 1(Min) • 1(Min) •	Touch Thr. 10 10 10 10 10 10 10 10	7 7 7 7	CdadP 0 0 0	CdadM 0 0 0	Digi Offset 0 0 0 0 0 0 0 0 0 0 0 0 0	Cin0-Cin3 1600(Min) • Cin4-Cin7 1600(Min) • Accuracy Average count	Cycle (Short Interval) Plus Data Time Minus Data Time DynamicCalTh Plus DynamicCalTh Minus	0 st 2000 m 300 m 4(Init) • -4(Init) •
00 FF 01 C4 02 00 03 00 04 00 05 00 05 00 06 00 07 00 08 00	12 07 13 07 14 07 15 07 16 07 17 07 18 07 19 07	28 80 2 <sup>4</sup> 0 <sup>4</sup> 30 40 31 02 32 01 33 01 34 05 35 01	Use Ch Cin0 Cin1 Cin2 Cin3 Cin4-Cin7 Use Ch	Gain(2nd) 1(Min) • 1(Min) • 1(Min) • 1(Min) • Gain(2nd)	Touch Thr. 20 10 10 10 20 20 20 20 20 20 20 20 20 2	7 7 7 7 0ff Thr.	CdadP 0 0 0 0 CdadP	CdadM 0 0 0 CdadM	Digi Offset 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Crit-Cris 1600(Min) • Crit-Crit 1600(Min) • Accaracy Average count 64 times • CritPlan measure) Low •	Cycle (Short Interval) Plus Data Time Minus Data Time DynamicCalTh Plus DynamicCalTh Minus PDCLP(Dynamic Offic	0 st 2000 m 300 m 4(Init) • -4(Init) •
00 FF 01 C4 02 00 03 00 04 00 05 00 06 00 07 00 08 00 09 00	12 07 13 07 14 07 15 07 16 07 17 07 18 07 19 07 22 00	28 80 24 0f 30 40 31 02 32 01 33 01 34 05 35 01 36 00	Use Ch V Cn0 V Cn1 V Cn2 V Cn3 Cin4-Cin7 Use Ch V Cn4	Gain(2nd) 1(Min) • 1(Min) • 1(Min) • 1(Min) • Gain(2nd) 1(Min) •	Touch Thr. 10 10 10 10 10 10 10 10 10 10	7 7 7 7 0ff Thr. 7	CdacP 0 0 0 0 0 0 0 0 0 0	CdadM 0 0 0 0 0 CdadM 0	Digi Offset 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Cn0-Cn3 1500(Mn) • Cn4-Cn7 1500(Mn) • Accuracy Accuracy Accuracy Cn(Non measure) Low • Debounce Counts	Cycle (Short Interval) Plus Data Time Mirus Data Time DynamicCaTh Plus DynamicCaTh Minus POCLP(Dynamic Off @ All Touch Off	0 st 2000 m 300 m 4(Init) • -4(Init) •
00 FF 01 C4 02 00 03 00 04 00 05 00 06 00 07 00 08 00 09 00 04 0A	12 07 13 07 14 07 15 07 16 07 17 07 18 07 19 07 22 00 23 00	28 80 24 04 30 40 31 02 32 01 33 01 34 05 35 01 36 00 37 03	Use Ch V Ch0 V Ch1 V Ch2 V Ch2 V Ch3 Ch4-Ch7 Use Ch V Ch4 V Ch4 V Ch4 V Ch5 Ch4-Ch7 Use Ch5 V Ch5 V Ch5 V Ch5 V Ch5 V Ch5 V Ch5 V Ch5 V Ch5 V Ch5 V	Gain(2nd) 1(Min) • 1(Min) • 1(Min) • 1(Min) • Gain(2nd) 1(Min) • 1(Min) •	Touch Thr. 50 10 10 50 20 20 20 20 10 10 10 10 10 10 10 10 10 1	7 7 7 7 0ff Thr. 7 7	CdacP 0 0 0 0 0 0 0 0	CdadM 0 0 0 0 0 CdadM 0 0	Digi Offset 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Cro-Cros 10000/4m) * Cro+Cro7 16000/4m) * Accuracy Average count (d-times * Crofton measure) Low * Debounce Counts for (OPF->ON)	Cycle (Short Interval) Plus Data Time Minus Data Time DynamicCalTh Plus DynamicCalTh Plus POCLP(Dynamic Off All Touch Off 2 times	0 st 2000 m 300 m 4(Init) • -4(Init) •
00 FF 01 C4 02 00 03 00 04 00 05 00 05 00 06 00 07 00 08 00 09 00 04 0A 06 0A	12 07 13 07 14 07 15 07 16 07 17 07 18 07 19 07 22 00 23 00 24 00	28 80 27 07 30 40 31 02 32 01 33 01 34 05 35 01 36 00 37 03 38 03	Use Ch 2 Cm0 2 Cm1 2 Cm2 2 Cm3 Cm4-Cm7 Use Ch 2 Cm4 2 Cm4 2 Cm5 2 Cm6 2 Cm6 2 Cm7	Gain(2nd) 104m) * 104m) * 104m) * 104m) * Gain(2nd) 104m) * 104m) * 104m) * 104m) *	Touch Thr. 10 10 10 10 10 10 10 10 10 10	7 7 7 7 0ff Thr. 7 7 7	CdacP 0 0 0 0 0 0 0 0 0 0	CdadM 0 0 0 0 CdadM 0 0	Digi Offset 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Cn0-Cn3 1500(Mn) • Cn4-Cn7 1500(Mn) • Accuracy Accuracy Accuracy Cn(Non measure) Low • Debounce Counts	Cycle (Short Interval) Plus Data Time Mirus Data Time DynamicCaTh Plus DynamicCaTh Minus POCLP(Dynamic Off @ All Touch Off	0 st 2000 n 300 n 4(Init) • -4(Init) •
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00 FF 01 C4 02 00 03 00 04 00 05 00 06 00 00 00 00 00 00 00 00 00 00 00 00 00	12 07 13 07 14 07 15 07 16 07 17 07 18 07 19 07 22 00 23 00 24 00 25 00 25 00 26 00 27 00	28 80 27 07 30 40 31 02 32 01 33 01 34 05 35 01 36 00 37 03 38 03 39 80 34 00 38 00	Use Ch V Cm0 V Cm1 V Cm2 V Cm3 Cm4-Cm7 Use Ch V Cm4 V Cm5 V Cm5 V Cm7 Sleep / In Sleep / In	Gain(2nd) 104m) + 104m) + 104m) + 104m) + 104m) + Gain(2nd) 104m) + 104m) + 104m) + 104m) + 104m) + 104m) +	Touch Thr. 10 10 10 10 10 10 10 10 10 10	7 7 7 7 7 0ff Thr. 7 7 7 7	Cdad9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	CdadM 0 0 0 0 0 0 CdadM 0 0 0 0 0	Digi Offset 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Cro-Cros 10000/4m) * Cro+Cro7 16000/4m) * Accuracy Average count (d-times * Crofton measure) Low * Debounce Counts for (OPF->ON)	Cycle (Short Interval) Plus Data Time Minus Data Time DynamicCalTh Plus DynamicCalTh Plus POCLP(Dynamic Off All Touch Off 2 times	0 st 2000 n 300 n 4(Init) • -4(Init) •
00 FF 01 C4 02 00 03 00 04 00 05 00 06 00 00 00 00 00 00 00 00 00 00 00 00 00	12 07 13 07 14 07 15 07 16 07 17 07 18 07 19 07 22 00 23 00 24 00 25 00 26 00 27 00 28 00	28 80 27 0P 30 40 31 02 32 01 33 01 34 05 35 01 36 00 37 03 38 03 39 80 34 00 38 00 39 80 30 05	Use Ch V Cm0 V Cm1 V Cm2 V Cm3 Cm4-Cm7 Use Ch V Cm4 V Cm5 V Cm5 V Cm7 Sleep / In Sleep / In	Gain(2nd) 104m) * 104m) *	Touch Thr. 10 10 10 10 10 10 10 10 10 10	7 7 7 7 7 7 7 7 7 7	Cdad <sup>p</sup> 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	CdadM 0 0 0 0 0 0 CdadM 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Digi Offset           0	Cro-Cros 10000/4m) * Cro+Cro7 16000/4m) * Accuracy Average count (d-times * Crofton measure) Low * Debounce Counts for (OPF->ON)	Cycle (Short Interval) Plus Data Time Minus Data Time DynamicCalTh Plus DynamicCalTh Plus POCLP(Dynamic Off All Touch Off 2 times	0 st 2000 n 300 n 4(Init) • -4(Init) •

### (3) Start Operation

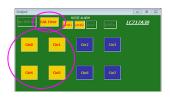
Push "Monitor Start" on Main Window. Static offset calibration will be performed.

	rtting Mode (M NORMAL	ain) D ADVANCED	Cin7 Cin0
lave Address (7bit) Sampli 16 hex 17	ing Time ms	Write Retry Count	Touch Status Soft Reset
Monitor START Mon	nitor STOP	Parameter Update     Offset Calibration	
		g Dialog Register Dial	99
Load Parameters Save	e Parameters	1	
log Data Log Data Count 100	trres		Data Log Start
Auto File Name			
File Name LogDate	. but		

Correct operation; Cin0 to Cin7 become blue button. Noise alarm display might be yellow by around noise.

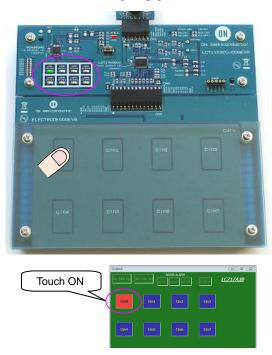
Output	-	$\frown$		- G 22
No SYS En Il				<u>1C717A30</u>
Cin0	Cin1	Cin2	On3	
Cin4				

Incorrect operation; CAL Error displays yellow, Error channels become yellow.



### (4) Touch Switch Operation Check

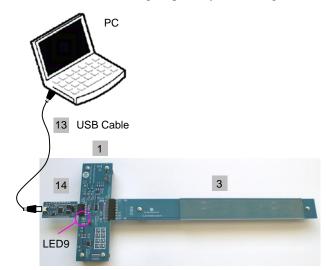
The target channel on "Output Window" becomes red when a finger touches above Cin0 to Cin7 on the top of Touch Switch Board. LED1 (Cin0) to LED8 (Cin7) on the main control board will light up green.



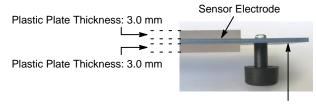
### **Proximity Sensor Evaluation**

### (1) Configuration

Connect the main control board " 1 LC717A30UJ00GEVB" to the proximity sensor board " 3 ELECTRODE01GEVB", connect USB conversion module " <sup>14</sup> MM–FT232H". LED9 on the main control board will light up red by connecting PC.



Cross Section:



PCB Board

### (2) GUI Software Setup

Execute GUI software "LC717A30App.exe". Push button "Load Parameters" and open the setting file of proximity sensor evaluation "A30UJGEVK\_ Proximity.prm" Output window pattern will match the pattern on the proximity sensor board and the register values will be loaded.

S8 Dongle I/F 12C	Setting Mode (     NORMAL	fain) () ADVANCED	Cin7 Cin0	lio SVS Err
Slave Address (7bit) 16 hex	Sampling Time 17 ms	Write Retry Count	Touch Status Soft Reset	Cin0
Monitor START	Monitor STOP	Parameter Update	SW Error Enable	
Load Parameters Log Data Log Data Count Auto File Name File Name	100 times		Data Log Start	Output No SVS En



Register settings can be reviewed by pushing "Setting Dialog" to display Initial Setting Window.

LC217ADD EVA Application
 adminytook (Max)
 adminytook (Max)



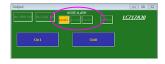
### (3) Start Operation

Push "Monitor Start" on Main Window. Static offset calibration will be performed.

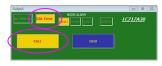
	📥 LC717A30 EVA A	pplication		- 6 %
	USB Dongle I/F I2C	Setting Mode (	Main) Main ADVANCED	Cin7 Cin0
	Slave Address (7bit) 16 hex	Sampling Time 17 ms	Write Retry Count	Touch Status Soft Reset
$\langle$	Monitor START	Monitor STOP	Parameter Update	SW Error Enable
	Output View Ra	wData Graph Set	ting Dialog Register Diak	xg
	Load Parameters	Save Parameters	1	
	Log Data	100 times		Data Log Start
		LogData.txt		

Correct operation;

Cin0 or Cin1 become blue button. Noise alarm display might be yellow by around noise.

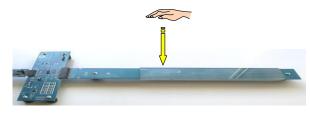


Incorrect operation; CAL Error displays yellow, Error channel becomes yellow.



### (4) Proximity Sensor Operation Check

The target channel on "Output Window" becomes red when a hand approaches within 10 cm above the proximity sensor electrode Cin0 or Cin1. LED1 (Cin0) or LED2 (Cin1) on the main control board will light up green.



Output	- B 22
Ho SYS Err Ho CAL Err Level Level DOPCH	LCZ1ZA30
Cint	

### Liquid Level Sensing Evaluation

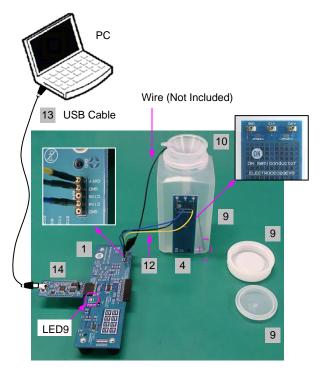
### (1) Configuration

Confirm whether the liquid level sensing board " 4 ELECTRODE02GEVB" was pasted to 9 the plastic bottle firmly. Make sure to stick both the plastic bottle and the electrode board by pushing when adhesion clearance is not small.



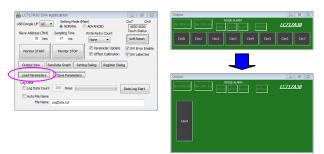
Connect the main control board " 1 LC717A30UJ00GEVB" to each terminal on the liquid level sensing board " 4 ELECTRODE02GEVB" by 12 Jump wires; GND–GND, Cin4–Cin, Cdrv–Cdrv.

Open the cap, lead a wire (not included in this kit) from GND pin on the main control board into the tank bottom and settle <sup>10</sup> the funnel. Connect USB conversion module " <sup>14</sup> MM–FT232H". LED9 on the main control board will light up red by connecting PC.



### (2) GUI Software Setup

Execute GUI software "LC717A30App.exe". Push button "Load Parameters" and open the setting file of liquid level sensing evaluation "A30UJGEVK\_Liquid.prm". Output window pattern will match the pattern on the liquid level sensing board and the register values will be loaded.



Register settings can be reviewed by pushing "Setting Dialog" to display Initial Setting Window.

LC717A30 EVA Application			- 6 %
USB Dongle I/F 12C    Slave Address (7bit) Sampling  16 hex 17  Monitor START Monitor START Output View RawData Ca	r STOP	tetry Count arameter Update ffset Calibration	Cin7 Cin0 [0000 0000 Touch Status Soft Reset V SW Error Enable SW Label Set 19
Log Data Log Data Count 100 b Auto File Name File Name LogData.t			Data Log Start

											Setting Mode (ii) Normal	(Sub)			Pin Configuration	Cin0-Cin3 Cref	Cref+Cre	FAdd
															CMAdd4(opp:Hiz)	Cin4-Cin7 Cref Crefonly	Cref+Cre	fadd
Catti	ng Re	nieter	Devi			001-003		F	-Cn0		Cdac / Digi C	iffset 🧷	0.000	in3	Gain(1st)	Dynamic Offset Calibra	tion	
00	10	12	07	28	90	Use Ch	Gair	(2nd)	Touch Thr.	Off Thr.	CdacP	CdacM	Digi C		Cin0-Cin3	Cycle (Short Interval)	0	
	C4	12		20	90	Cin0	5	•	10	7	0	0		0	1600(Min) -	Plus Data Time		ste
01	44	13		2° 30	40	[] On1	5	-	10	7	0	0			Cin4-Cin7		2000	m
02	44	19	07		40	Cin2	5	-	10	7	0	0			1600(Min) -	Minus Data Time	300	
03	40	15	07		01	Cin2	_		10	7		0				DynamicCalTh Plus	4(Init)	a
04	40	10	07	32	01	Cin3	5	•	10		0	0		0	Accuracy			_
		19	07	34	05	Cin4-Cin7		- 1	-Cin4					in7	Average count 64 times ·	DynamicCalTh Minus	-4(Init) •	
		19	07	35	01	Use Ch	Gali	1(2nd)	Touch Thr	Off Thr.	CdacP	CdadM	Dial C	Offset		PDCLP(Dynamic OffC	al condition	0
07	00	22	07	35	01	Cin4	10%	1) -	10	7	0	0		D	Cin(Non measure)	All Touch Off	) Not all O	ff
		22	00	30	03	CinS	5	-	10	7	0	0		0				
	00 0A		00	38	03	Cin6	5	-	10	7	0	0	-		Debounce Counts			
	0A 0A	24 25	00	38	80										for (OFF->ON)	2 times		
	0A A	25	00	39 3A	80	Cin7	5	•	10	7	0	0		D	for (ON->OFF)	2 times		
	0A 0A	25	00	3A 38	00	Seep / In	terval r	node			Interval Time							
	0A 0A	27	00	38	57	() Slee	p mode		Interval m	ode	Short Inter	val Time	5	ms				
						Slee	o Time	1	6 ms		Long Inter	val Time	101	ns				
	AD AD	29	00	30	00													
	AD AD										Long Interval St	art Count	350	step				
·• [	0A		Texto	it set	100													

### (3) Start Operation

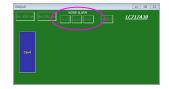
Push "Monitor Start" on Main Window. Static offset calibration will be performed.

USB Dongle I/F I2C	Setting Mode     NORMAL	(Main) (Main) ADVANCED	Cin7 Cin0
Slave Address (7bit) 16 hex Monitor START	Sampling Time 17 ms Monitor STOP	Write Retry Count None Parameter Update Offset Calibration	Soft Reset
Output View R	awData Graph Se	tting Dialog Register Dialo	g
Log Data	100 times		Data Log Start

Correct operation;

Cin4 becomes blue button.

Noise alarm display might be yellow by around noise.

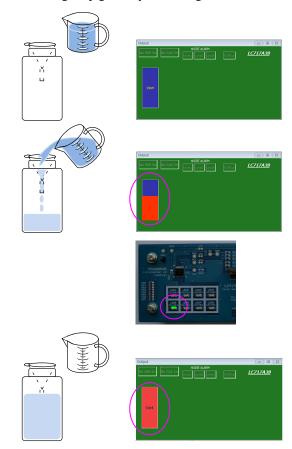


Incorrect operation; CAL Error displays yellow, Error channel becomes yellow.



### (4) Liquid Level Sensing Operation Check

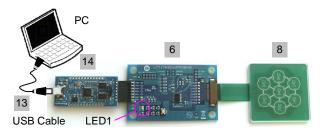
Pour water from the funnel. The level display of Cin4 on "Output Window" becomes red corresponding to the amount of poured water. LED5 (Cin4) on the main control board will light up green by exceeding the threshold.



### **Sensor Key Sheet Evaluation**

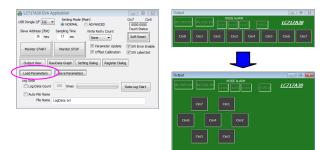
### (1) Configuration

Connect the FPC conversion board " 6 LC717A30UJFPCGEVB" to 8 the sensor key sheet, connect USB conversion module " <sup>14</sup> MM–FT232H". LED1 on the FPC conversion board will light up red by connecting PC.



### (2) GUI Software Setup

Execute GUI software "LC717A30App.exe". Push button "Load Parameters" and open the setting file of sensor key sheet evaluation "A30UJGEVK\_FPCSW.prm". Output window pattern will match the pattern on the sensor key sheet and the register values will be loaded.



Register settings can be reviewed by pushing "Setting Dialog" to display Initial Setting Window.

LC717A30 EVA Application			- 0	23					
i8 Dongle I/F I2C   Setting M  NORM	lode (Main) AL 💿 ADVANCED	Cini T	7 Ca	n0					
Slave Address (7bit) Sampling Time	Write Retry Cou	N (***	uch Status	1					
16 hex 17 ms	None 💌	s	oftReset						
Monitor START Monitor ST	OP Parameter		W Error En W Label Se						
Output View RawData Graph	Setting Dialog Reg	ter Dialog							
Load Parameters Save Param	neters								
Log Data									
Log Data Count 100 times		Data	Log Start						
Auto File Name									
File Name LogData.txt									
tial Setting Window									
aar becong window							Pin Configuration	Cin0-Cin3 Cref	
				Setting Mode I     (     Normal	(Sub)		Cdrv_Bar(opp:Hiz)		Cref+CrefAdd
				(e) Normai			CMAdd4(opp:Hz)	Cin4-Cin7 Cref	Cref+CrefAdd
									Cref+CrefAdd
					<i></i>		CMAdd0(opp:Hiz)	. Gerony	_ createradu
letting Register [hex]	Cin0-Cin3	-Cin0		Cdac / Digi O	mset @	Cin0-Cin3	Gain(1st)	Dynamic Offset Calib	ration
etong kegister [nex]									
	Use Ch Gain(2nd)			CdadP	CdadM	Digi Offset	Cin0-Cin3	Cycle (Short Interval	0 0 step
0 FE 12 07 28 80	Cin0 1(Min) -	50	7	0	0	0	1600(Min) -	Cycle (Short Interval Plus Data Time	0 0 step 2000 ms
00         FE         12         07         28         80           01         C4         13         07         2#         0#           02         00         14         07         30         40	Cin0 1(Min) •	10 10	7	0	0	0			2000 ms
00         FE         12         07         28         80           01         C4         13         07         2#         0P           02         00         14         07         30         40           03         00         15         07         31         02	Cin0 1(Min) • V Cin1 1(Min) • V Cin2 1(Min) •	10 10	7 7 7	0	0	0	1600(Min) - Cin4-Cin7	Plus Data Time Minus Data Time	2000 ms 300 ms
00         FE         12         07         28         80           01         C4         13         07         2#         0*           02         00         14         07         30         40           03         00         15         07         31         02           04         00         16         07         32         01	Cin0 1(Min) •	10 10	7	0	0	0	1600(Min) • Cin4-Cin7 1600(Min) •	Plus Data Time Minus Data Time DynamicCalTh Plus	2000 ms 300 ms 4(trit) •
00         F€         12         07         28         80           01         C4         13         07         29         01           02         00         14         07         30         40           03         00         15         07         31         02           04         00         16         07         32         01           05         00         17         07         33         01	Cin0 1(Min) • Cin1 1(Min) • Cin2 1(Min) • Cin2 1(Min) • Cin3 1(Min) •	30 30 30 30	7 7 7	0	0 0 0	0 0 0 0 0	1600(Min) • Ch4-Cin7 1600(Min) • Accuracy Average count	Plus Data Time Minus Data Time	2000 ms 300 ms 4(trit) •
00         FE         12         07         28         80           11         C-4         13         07         24         0F           12         C0         14         07         36         40           13         C0         15         07         31         02           14         07         32         0.1         13         02         0.1           15         07         32         0.1         17         07         32         0.1           15         50         17         07         32         0.1         0.5           16         07         32         0.1         0.5         0.5         0.5	Cin0 1(Min) • Cin1 1(Min) • Cin2 1(Min) • Cin2 1(Min) • Cin3 1(Min) •	30 30 30 30 30 20 20	7 7 7 7	0	0 0 0	0	1600(Min) ▼       Cin4-Cin7       1600(Min) ▼       Accuracy       Average count       64 times ▼	Plus Data Time Minus Data Time DynamicCalTh Plus	2000 ms 300 ms 4(Init) • s -4(Init) •
0         FE         12         07         28         80           11         C4         13         07         29         0F           12         C4         13         07         29         0F           13         00         15         07         31         02           14         00         16         07         32         01           15         00         17         07         33         01           16         00         18         07         34         05           17         00         19         07         35         01	Cn0 1(Min) • VOn1 1(Min) • VOn2 1(Min) • VOn3 1(Min) • Cin4-Cin7	30 30 30 30 30 20 20	7 7 7 7	0 0 0	0	0 0 0 0 0 0 0 0 0	16000(4in) ▼ Cin4-Cin7 16000(4in) ▼ Accuracy Average count 64 times ▼ Cin(kion measure)	Plus Data Time Minus Data Time DynamicCalTh Plus DynamicCalTh Minus	2000 ms 300 ms 4(Init) • s -4(Init) • KCal condition)
0         FE         12         07         28         80           11         64         13         07         24'         04'           12         00         14         07         31         02'           14         07         31         02'         01'         14'         07         33         02'           14         00         16'         07         32         01'         15'         00'         18'         07'         33         01'           15         00         17'         07'         33         01'         15'         01'         19'         14'         10'         14''         10''         11''         10'''         11'''         11'''         11'''         11'''         11'''         11''''         11''''         13''''         11''''         11''''         11''''         11'''''         11'''''         11'''''         11''''''         11''''''         11''''''         11'''''''''''''''''''''''''''''''''''	Cn0         1(Min) •           Image: Cn1         1(Min) •           Image: Cn2         1(Min) •           Image: Cn3         1(Min) •           Cn4-Cn7         Use Ch           Gan(2nd)         Gan(2nd)	20 30 30 30 30 30 30 30 30 30 3	7 7 7 7 0ff Thr.	0 0 0 CdacP	0 0 0 0 CdedM	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	16000(Hin) ▼ Cin4-Cin7 16000(Hin) ▼ Accuracy Average count 64 times ▼ Cin(Non measure)	Plus Data Time Minus Data Time DynamicCalTh Plus DynamicCalTh Minus PDCLP(Dynamic Off	2000 ms 300 ms 4(Init) • s -4(Init) • KCal condition)
0         FE         12         0.7         28         60           1         C+         13         0.7         29         0.4         0.1           12         C+         13         0.7         29         0.4         0.1           30         D+         15         0.7         31         0.2         1.4         0.1           30         D+         15         0.7         32         0.1         1.5         0.7         33         0.1           36         0.0         1.6         0.7         32         0.1         1.5         1.7         33         0.1           36         0.0         1.8         0.7         34         0.5         1.7         35         0.1           36         0.0         1.9         0.7         35         0.1         3.9         0.1         3.9         0.1         3.9         0.1         3.9         0.1         3.9         0.1         3.9         0.1         3.9         0.1         3.9         0.1         3.9         0.1         3.9         0.1         3.9         0.1         3.9         0.1         3.9         0.1         3.9         0.1         3.9	Cin0         104in) •           VCin1         104in) •           VCin2         104in) •           VCin3         104in) •           Cin4-Cin7         Use Ch           Gan(2nd)         VCin4           VCin4         104in) •	30           30           30           30           30           30           30           30           30           30	7 7 7 7 0ff Thr. 7	0 0 0 0 CdacP	0 0 0 0 CdadM	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	16000(4in) ▼ Cin4-Cin7 16000(4in) ▼ Accuracy Average count 64 times ▼ Cin(kion measure)	Plus Data Time Minus Data Time DynamicCalTh Plus DynamicCalTh Minus PDCLP(Dynamic Off @ All Touch Off	2000 ms 300 ms 4(Init) • s -4(Init) • KCal condition)
No         Term         12         OT         28         Bot           01         C4         30         7         26         Bot         Gat         Sat         <	Cn0         104m) •           VCn1         104m) •           VCn2         604m) •           VCn3         104m) •           VCn4         604m) •           VCn4         604m) •           VCn5         104m) •           VCn5         104m) •	20 10 10 20 20 20 20 10 10 10 10 10 10 10 10 10 1	7 7 7 7 0ff Thr. 7 7	0 0 0 0 CdacP 0	0 0 0 0 CdacM 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1000(Mm) * Cn4-Cn7 1600(Mm) * Accuracy Average count 64 times * Cn(Non measure) Low * Debounce Counts for (OFF->ON)	Plus Data Time Minus Data Time DynamicCalTh Plus DynamicCalTh Minus PDCLP(Dynamic Off @ All Touch Off 2 times	2000 ms 300 ms 4(Init) • s -4(Init) • Kal condition)
bit         Tel         12         07         28         00           10         C4         30         0         20<	Cn0         104m) +           V Cn1         104m) +           V Cn2         104m) +           V Cn3         104m) +           V Cn4         104m) +           V Cn4         104m) +           V Cn5         104m) +           V Cn5         104m) +           V Cn6         104m) +           V Cn6         104m) +           V Cn6         104m) +	20 10 10 20 20 20 20 10 10 10 10 10 10 10 10 10 1	7 7 7 7 0ff Thr. 7 7 7 7 7	0 0 0 0 0 0 0	0 0 0 0 0 CdedM 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	ISOUMIN + Cri-LCn7 ISOUMIN + Accuracy Average count (64 times + Cn(Non measure) Low + Debounce Counts	Plus Data Time Minus Data Time DynamicCalTh Plus DynamicCalTh Minus POCLP/Dynamic Off I All Touch Off	2000 ms 300 ms 4(Init) • s -4(Init) • Kal condition)
NO         Tell         12         0.7         28         0.7           01         C4         31         07         36         0           01         C4         31         07         36         0           01         C4         35         07         34         0           05         00         35         07         34         0           05         00         36         07         34         0           06         00         36         07         34         0           06         00         36         07         34         0           06         00         36         07         34         0           07         03         07         35         0         0           08         00         22         00         36         0           09         02         00         39         00         0           04         42         00         38         0         0           06         04         25         00         36         0	Cno         104m) +           VCn1         104m) +           VCn2         404m) +           VCn3         104m) +           VCn4         104m) +           VCn5         104m) +           VCn4         6an(2nd)           VCn4         104m) +           VCn4         104m) +           VCn4         104m) +           VCn5         104m) +           VCn6         104m) +           VCn7         104m) +           VCn7         104m) +	30         10           10         10           10         10           10         10           10         10           10         10           10         10           10         10           10         10           10         10           10         10           10         10           10         10           10         10	7 7 7 7 0ff Thr. 7 7 7 7	0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 CdsdM 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1000(Mm) * Cn4-Cn7 1600(Mm) * Accuracy Average count 64 times * Cn(Non measure) Low * Debounce Counts for (OFF->ON)	Plus Data Time Minus Data Time DynamicCalTh Plus DynamicCalTh Minus POCLP(Dynamic Off @ All Touch Off 2 times	2000 ms 300 ms 4(Init) • s -4(Init) • Kal condition)
bit         Tex         12         07         28         00           10         C+1         30         0         20         0	On0         104m) =           VOn1         104m) =           VOn2         104m) =           VOn3         104m) =           Cn4-On         104m) =           VOn4         104m) =           VOn5         104m) =           VOn7         104m) =           Seep /Interval mode         Seep mode	30         10           10         10           10         10           10         10           10         10           10         10           10         10           10         10           10         10           10         10           10         10           10         10           10         10	7 7 7 7 0ff Thr. 7 7 7 7	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1000(Mm) * Cn4-Cn7 1600(Mm) * Accuracy Average count 64 times * Cn(Non measure) Low * Debounce Counts for (OFF->ON)	Plus Data Time Minus Data Time DynamicCalTh Plus DynamicCalTh Minus POCLP(Dynamic Off @ All Touch Off 2 times	2000 ms 300 ms 4(Init) • s -4(Init) • Kal condition)
b)          12         -0.7         18         100           12          12         0.7         16         0.7           10          13         0.7         90         0.7           10          15         0.7         90         0.7           10         0.7         15         0.7         33         0.7           10         0.7         17         0.7         33         0.7           10         0.7         0.7         0.7         35         0.7           10         0.7         0.7         0.7         35         0.7           10         0.7         0.7         0.7         35         0.7           10         0.7         0.7         0.7         30         0.7           10         0.7         0.7         0.7         30         0.7           10         0.7         0.7         0.7         30         0.7           10         0.7         0.7         30         0.7         0.7           10         0.7         0.7         30         0.7         0.7           10         0.	On0         104m) =           VOn1         104m) =           VOn2         104m) =           VOn3         104m) =           Cn4-On         104m) =           VOn4         104m) =           VOn5         104m) =           VOn7         104m) =           Seep /Interval mode         Seep mode	30         10           10         10           10         10           10         10           10         10           10         10           10         10           10         10           10         10           10         10           10         10           10         10           10         10           10         10	7 7 7 7 0ff Thr. 7 7 7 7	0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1000(Mm) * Cn4-Cn7 1600(Mm) * Accuracy Average count 64 times * Cn(Non measure) Low * Debounce Counts for (OFF->ON)	Plus Data Time Minus Data Time DynamicCalTh Plus DynamicCalTh Minus POCLP(Dynamic Off @ All Touch Off 2 times	2000 ms 300 ms 4(Init) • s -4(Init) • Kal condition)
No         Tell         12         72         88         80           01         C4         31         07         38         07           01         C4         31         07         38         02           01         C4         35         07         33         02           05         01         35         07         33         02           06         02         37         07         33         02           07         02         19         07         35         02           08         02         20         03         00         03         07           08         02         20         03         03         02         03         03           08         02         20         03         03         03         03         03           08         02         03	On0         104m) =           VOn1         104m) =           VOn2         104m) =           VOn3         104m) =           Cn4-On         104m) =           VOn4         104m) =           VOn5         104m) =           VOn7         104m) =           Seep /Interval mode         Seep mode	30         10           10         10           10         10           10         10           10         10           10         10           10         10           10         10           10         10           10         10           10         10           10         10           10         10	7 7 7 7 7 7 7 7 7 7 7	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 CdadM 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1000(Mm) * Cn4-Cn7 1600(Mm) * Accuracy Average count 64 times * Cn(Non measure) Low * Debounce Counts for (OFF->ON)	Plus Data Time Minus Data Time DynamicCalTh Plus DynamicCalTh Minus POCLP(Dynamic Off @ All Touch Off 2 times	2000 ms 300 ms 4(init) • s -4(init) • Kel condition)

#### (3) Start Operation

Push "Monitor Start" on Main Window. Static offset calibration will be performed.

LC717A30 EVA Application	
	Cin7 Cin0 Con00 0000 Touch Status Soft Reset V SW Error Enable V SW Label Set
Log Data Log Data Log Data Log Data Count Log Data Count Log Data Count Log Data Count File Name File Name LogData.bt	Nata Log Start

Correct operation;

Cin1 to Cin7 become blue button. Noise alarm display might be yellow by around noise.

Output	$\sim$	D G X
No SYS En No CALLER	NOSE ALARM	<u>1C717A30</u>
Cin7	Cin1	
Cin6 Cin4	Qn2	
Cans	Qn3	

Incorrect operation; CAL Error displays yellow, Error channel becomes yellow.

Output	NOISE ALAAM ni Lunnii Lunnii Doffical	
Can7 Can6 Can4	ant Cm2	
045	cm3	

### (4) Sensor Key Operation Check

The target channel on "Output Window" becomes red when a finger touches above Cin1 to Cin7 on the top of the sensor key sheet.



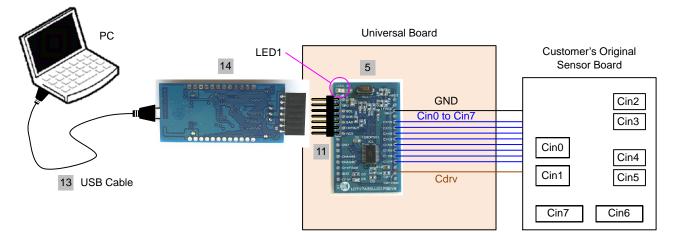


### **Evaluation of Using DIP Conversion Board**

### (1) Configuration

DIP Conversion Board " **5** LC717A30UJDIPGEVB" is an evaluation board for customer to confirm whether its original sensor board works correctly. Make sure to complete the evaluation preparation by soldering **11** the 7 pin header (included) or generic pin header/connecter. Connect USB conversion module " **14** MM–FT232H". LED1 on the DIP conversion board will light up red by connecting PC.

Take care of the direction of connector between USB conversion module and this evaluation board because of opposite direction of other boards.



### (2) GUI Software Setup

Execute GUI software "LC717A30App.exe". When GUI starts, "SetParamDefault.prm" is loaded as configuration file.

LC717A30 EVA Application	- 6 %	Output	
USB Dongle I/F 12C  Setting Mode (Main) NORMAL  ADVANCED	Cin7 Cin0	NOISE ALARM No CAL En Level Level DOffice	<u>LC717A30</u>
Slave Address (7bit) Sampling Time Write Retry Count 16 hex 27 ms None V Monitor START Monitor STOP Praemeter Update Parameter Update	Soft Reset	Cint Cin2 Cin3 Cin4 Cin5	Cin6 Cin7
Output View RawData Graph Setting Dialog Register Dialo	_		
Load Parameters Save Parameters			
Log Data Log Data Count 100 times	Data Log Start		
File Name LogData.txt			

Register settings can be reviewed by pushing "Setting Dialog" to display Initial Setting Window.

SB Dongle I/F I2C	Setting Mode ( NORMAL	Main) (C) ADVANCED	Cin7 Cin0 0000 0000
Slave Address (7bit) 16 hex	Sampling Time 17 ms	Write Retry Count	Touch Status Soft Reset
Monitor START	Monitor STOP	Parameter Update	SW Error Enabl
Output View Ra	wData Goph Set	ting Dialog Register Diale	99
Load Parameters	100 times		Data Log Start
Auto File Name			

(3) Start Operation

Push "Monitor Start" on Main Window. Static offset calibration will be performed.

LC717A30 EVA A	pplication		
S8 Dongle I/F 12C	Setting Mode ( NORMAL	Main)	Cin7 Cin0
Slave Address (7bit) 16 hex Monitor START	Sampling Time 17 ms Monitor STOP	Write Retry Count	Soft Reset
	munitur STOP	Coffset Calibration	SW Label Set
	Save Parameters		
Log Data	100 times	(	Data Log Start
Auto File Name			
File Name	LogData.txt		

Correct operation;

Cin0 to Cin7 become blue button. Noise alarm display might be yellow by around noise.

Output 🖂 🖼 🖾										
	No CAL	tevel				<u>1C717</u>	<u>A30</u>			
Cin0	Cin1	Cin2	Cin3	Cin4	Cin5	Cin6	Cin7			

Incorrect operation; CAL Error displays yellow, Error channel becomes yellow.

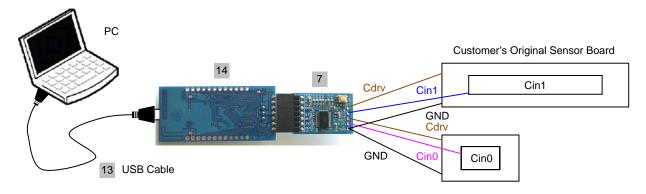


### **2ch Sensor Board Evaluation**

#### (1) Configuration

2ch sensor board " 7 LC717A30UJ2CH00GEVB" is an evaluation board for customer to confirm whether its original sensor board works correctly in small space. Connect USB conversion module " <sup>14</sup> MM–FT232H".

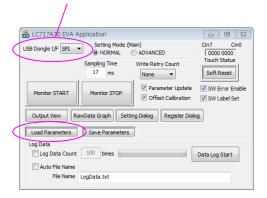
Take care of the direction of connector between USB conversion module and this 2ch evaluation board because of opposite direction of other boards.

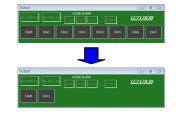


#### (2) GUI Software Setup

Execute GUI software "LC717A30App.exe". Push button "Load Parameters" and open the setting file of the 2ch00PCB board "A30UJGEVK\_2ch00PCB.prm". Output window pattern will match the pattern on the 2ch sensor board and the register values will be loaded.

NOTE: Make sure to select SPI but I<sup>2</sup>C on "USB Dongle I/F".





Register settings can be reviewed by pushing "Setting Dialog" to display Initial Setting Window.



										Setting Mode (i) Normal	(Sub)			Pin Configuration	Cin0-Cin3 Cref	) Cref+Cref	Add
														CMAdd4(opp:Hiz)	Cin4-Cin7 Cref		
														CMAdd0(opp:Hiz)	Crefonly	Cref+Cref	add
						000-003		-Cin0		Cdac / Digi C	ffset	0.000		Gain(1st)	Dynamic Offset Calibr	ation	
	ng Re	-				Use Ch	Gain(2nd)		. Off Thr.	CdacP	CdadM	Digi C		Cin0-Cin3	Cycle (Short Interval)		
00	03 C4	12	07		80 0F	V Cin0	1(Min) -	10	7	0	0			1600(Min) -	Plus Data Time	0	ste
01	00	13	07	-	40	V On1	1(Min) -	10	7	0	0		0	Cin4-Cin7		2000	ms
02	00	19	07		40	Cin2	10Min) -	10	7	0	0	-	0	1600(Min) *	Minus Data Time	300	ms
04	00	15	07		02	Cin2		10	7	-	0				DynamicCalTh Plus	4(Init)	
04		10	07		01	Cin3	1(Min) -	30		0	0			Accuracy			-
05		18	07		05	Cin4-Cin7		-Cin4			e	On+c	in7	Average count 64 times *	DynamicCalTh Minus	-4(Init) •	1
05	00	18	07	34		Use Ch	Gain(2nd)	Touch Th	r. Off Thr.	CdacP	CdadM	Dial	Offset		PDCLP(Dynamic Off	al condition	)
08	00	22	00		01	Cin4	10Min) -	10	7	0	0		D	Cin(Non measure)	All Touch Off	Not all O	ff
09	00	22	00		03	CinS	1(Min) *	10	7	0	0			- COW			
0A	0.4	24	00	38	03	Cin6	1(Min) -	10	7	0	0			Debounce Counts			
08	0A	25	00	39	40	Cino 1007		10	7	0	0		-	for (OFF->ON)	2 times		
00	04	25	00		00	E Cin7	1(Min) 🔻	20			0		·	for (ON->OFF)	2 times		
00	0A 0A	27	00	38	00	Sleep / Int	erval mode			Interval Time							
0D	0A 0A	28	00	30	00	O Sleep	mode @	Interval n	node	Short Inter	val Time	5	ms				
0E	0A 0A	29	00		00	Sleep	Time 1	5 m	s	Long Inter	val Time	101	ms				
10	0A A0	29															
	0A AO									Long Interval St	rt Count	20	step				
-	wa		Texto	ut set	req.												

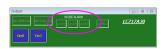
### (3) Start Operation

Push "Monitor Start" on Main Window. Static offset calibration will be performed.

LC717A30 EVA Application USB Dongle I/F SPL  Setting Mode (Mr NORMAL	ain) ) ADVANCED	Cin7 Cin0 0000 0000
Sampling Time 17 ms Monitor START Output/View RewData Graph Settin	Write Retry Count None  Parameter Update  Offset Calibration  g Dialog Register Dialo	Touch Status Soft Reset
Load Parameters Save Parameters	]	
Log Data Count 100 times		Data Log Start

Correct operation;

Cin0 or Cin1 become blue button. Noise alarm display might be yellow by around noise.



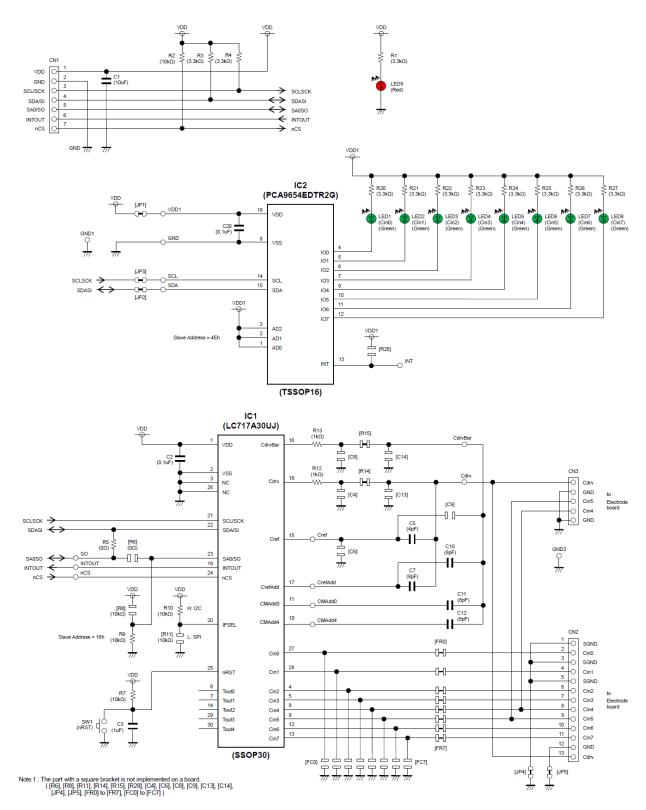
Incorrect operation; CAL Error displays yellow, Error channels become yellow.



### FUNCTION EXPLANATION

### Main Control Board (LC717A30UJ00GEVB)

(1) Schematic





### (2) BOM

### Table 1. BILL OF MATERIALS OF LC717A30UJ00GEVB EVALUATION BOARD

Designator	Qty.	Description	Part Number	Value	Manufacturer
IC1	1	Capacitive Touch Sensors LSI	LC717A30UJ	8ch, SSOP30	ON Semiconductor
IC2	1	I/O Expander LSI	PCA9654EDTR2G	8ch, TSSOP16	ON Semiconductor
LED1-LED8	8	LED	KP-2012ZGC	Green LED	Kingbright
LED9	1	LED	KP-2012SURCK	Red LED	Kingbright
R5	1	Resistor	MCR03EZPJ000	0 Ω	ROHM
R12, R13	2	Resistor	MCR03EZPJ102	1.0 kΩ ±5%, 0.1 W	ROHM
R1, R3, R4, R20–R27	11	Resistor	MCR03EZPJ332	3.3 k $\Omega$ ±5%, 0.1 W	ROHM
R2, R7, R9, R10	4	Resistor	RK73B1JTTD103J	10.0 kΩ ±5%, 0.1 W	KOA
C5	1	Multilayer Ceramic Capacitor	GRM1885C1H4R0CA01D	4 pF ±0.25 pF, 50 V	Murata
C7, C10–C12	4	Multilayer Ceramic Capacitor	GRM1885C1H8R0DA01D	8 pF ±0.5 pF, 50 V	Murata
C2, C20	2	Multilayer Ceramic Capacitor	GRM188B11E104KA01D	0.1 $\mu F$ ±10%, 25 V	Murata
C3	1	Multilayer Ceramic Capacitor	GRM188B31E105KA75D	1.0 $\mu F$ ±10%, 25 V	Murata
C1	1	Multilayer Ceramic Capacitor	GRM21BB31C106KE15L	10.0 $\mu\text{F}$ ±10%, 16 V	Murata
SW1	1	Push Button Switch	DTSM-31N-V-T/R		Diptronics Manufacturing
CN1	1	Connector	2545B-1x7G	7 pin, Right Angle	HO CHIEN
CN2	1	Connector	FSR-41085-13	13 pin, Right Angle	Hirosugi–Keiki
CN3	1	Socket Pin	PM-1-5P	5 pin-cut, Gold-Su	MAC8
Cdrv, CdrvBar	2	Check Terminal	LC-3-G-Skyblue	1 pin, Skyblue	MAC8
GND1, GND2	2	Check Terminal	LC-3-G-Black	1 pin, Black	MAC8
	1	Printed Circuit Board	LC717A30UJ00GEVB	160.0 mm x 50.0 mm, 2-levels, t = 1.6 mm	ON Semiconductor
	4	Screw		M3 x 18.0 mm	
	4	Nut		M3	
	4	Washer		M3, 6.0 mm, in Rubber Foot	
	4	Washer		M3, 7.0 mm, Top Side	
	4	Plastic Spacer	EB-10	Black, M3 x 10.0 mm	MAC8
	4	Natural Rubber Foot	BU-692-A	Black, M15 x 7.5 mm	SATO PARTS

### (3) Printed Circuit Board Layout

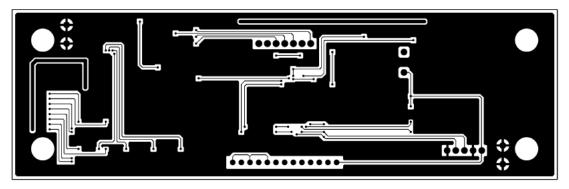


Figure 3. Pattern 1 Layer (Solder Side)

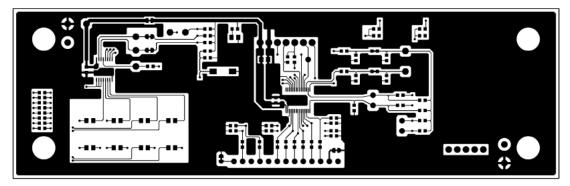


Figure 4. Pattern 2 Layer (Parts Side)

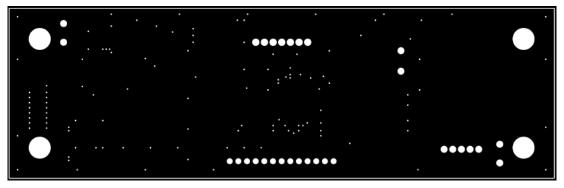


Figure 5. Resist 1 Layer (Solder Side)

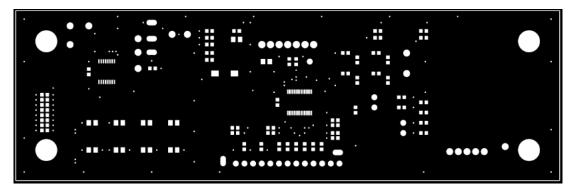


Figure 6. Resist 2 Layer (Parts Side)

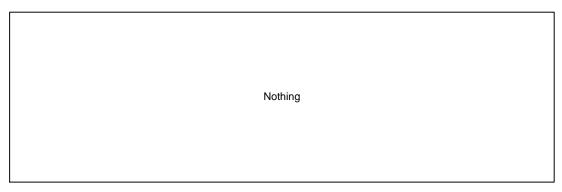


Figure 7. Silk 1 Layer (Solder Side)

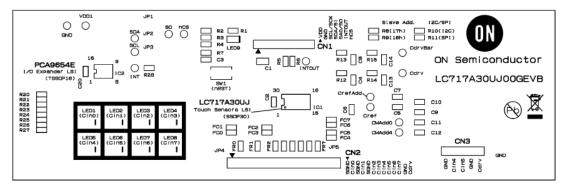


Figure 8. Silk 2 Layer (Parts Side)

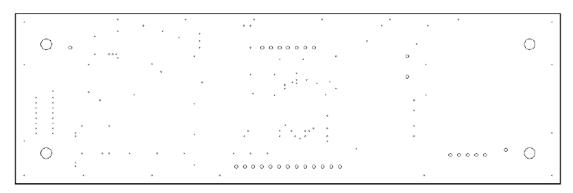


Figure 9. Hole

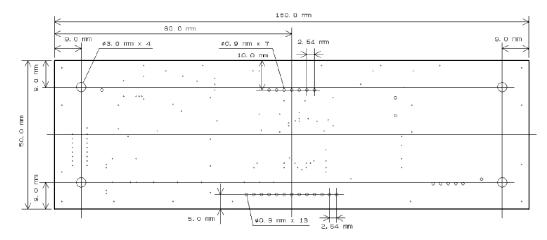
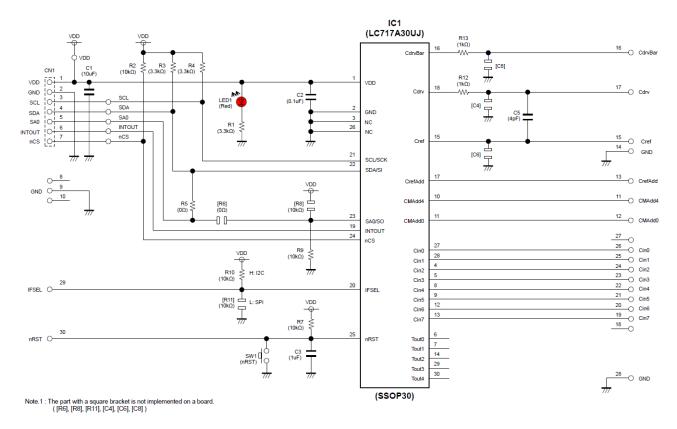


Figure 10. Outline

### DIP Conversion Board (LC717A30UJDIPGEVB)

(1) Schematic





### (2) BOM

### Table 2. BILL OF MATERIALS OF LC717A30UJDIPGEVB EVALUATION BOARD

Designator	Qty.	Description	Part Number	Value	Manufacturer
IC1	1	Capacitive Touch Sensors LSI	LC717A30UJ	8 ch, SSOP30	ON Semiconductor
LED1	1	LED	KP-2012SURCK	Red LED	Kingbright
R5	1	Resistor	MCR03EZPJ000	0 Ω	ROHM
R12, R13	2	Resistor	MCR03EZPJ102	1.0 kΩ ±5%, 0.1 W	ROHM
R1, R3, R4	3	Resistor	MCR03EZPJ332	3.3 k $\Omega$ ±5%, 0.1 W	ROHM
R2, R7, R9, R10	4	Resistor	RK73B1JTTD103J	10.0 kΩ ±5%, 0.1 W	KOA
C5	1	Multilayer Ceramic Capacitor	GRM1885C1H4R0CA01D	4 pF ±0.25 pF, 50 V	Murata
C2	1	Multilayer Ceramic Capacitor	GRM188B11E104KA03D	0.1 $\mu F$ ±10%, 25 V	Murata
C3	1	Multilayer Ceramic capacitor	GRM188B31E105KA75D	1.0 $\mu F$ ±10%, 25 V	Murata
C1	1	Multilayer Ceramic Capacitor	GRM21BB31C106KE15L	10.0 μF ±10%, 16 V	Murata
SW1	1	Push Button Switch	DTSM-31N-V-T/R		Diptronics Manufacturii
	1	Printed Circuit Board	LC717A30UJDIPGEVB	50.0 mm x 30.0 mm, 2-levels, t = 1.6 mm	ON Semiconductor

(3) Printed Circuit Board Layout

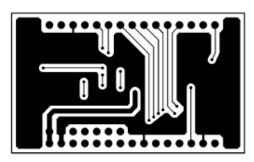


Figure 12. Pattern 1 Layer (Solder Side)

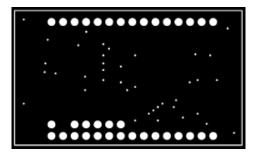


Figure 14. Resist 1 Layer (Solder Side)



Figure 16. Silk 1 Layer (Solder Side)

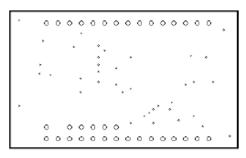


Figure 18. Hole

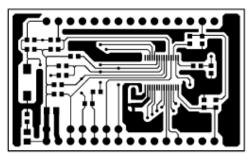


Figure 13. Pattern 2 Layer (Parts Side)

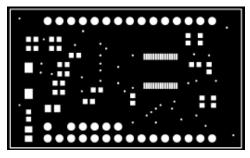


Figure 15. Resist 2 Layer (Parts Side)

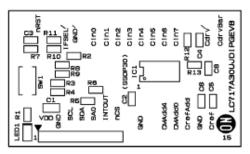


Figure 17. Silk 2 Layer (Parts Side)

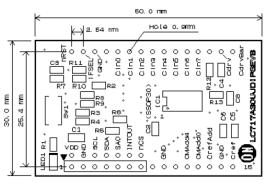


Figure 19. Outline

### FPC Conversion Board (LC717A30UJFPCGEVB)

(1) Schematic

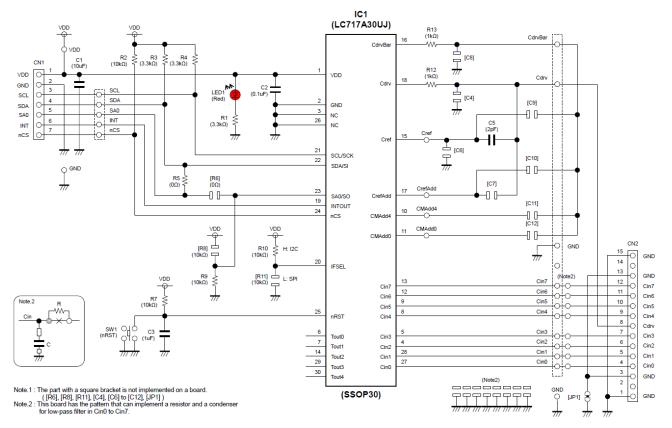


Figure 20. FPC Conversion Board – Schematic

(2) BOM

#### Table 3. BILL OF MATERIALS OF LC717A30UJFPCGEVB EVALUATION BOARD

Designator	Qty.	Description	Part Number	Value	Manufacturer
IC1	1	Capacitive Touch Sensors LSI	LC717A30UJ	8 ch, SSOP30	ON Semiconductor
LED1	1	LED	KP-2012SURCK	Red LED	Kingbright
R5	1	Resistor	MCR03EZPJ000	0 Ω	ROHM
R12, R13	2	Resistor	MCR03EZPJ102	1.0 kΩ ±5%, 0.1 W	ROHM
R1, R3, R4	3	Resistor	MCR03EZPJ332	3.3 kΩ ±5%, 0.1 W	ROHM
R2, R7, R9, R10	4	Resistor	RK73B1JTTD103J	10.0 kΩ ±5%, 0.1 W	KOA
C5	1	Multilayer Ceramic Capacitor	GRM1885C1H2R0CA01D	2 pF ±0.25 pF, 50 V	Murata
C2	1	Multilayer Ceramic Capacitor	GRM188B11E104KA01D	0.1 μF ±10%, 25 V	Murata
C3	1	Multilayer Ceramic Capacitor	GRM188B31E105KA75D	1.0 μF ±10%, 25 V	Murata
C1	1	Multilayer Ceramic Capacitor	GRM21BB31C106KE15L	10.0 μF ±10%, 16 V	Murata
SW1	1	Push Button Switch	SKRPACE010		ALPUS
CN1	1	Connector	2545B-1x7G	7 pin, Right Angle	HO CHIEN
CN2	1	FFC/FPC Connector	00 6224 015 001 800+	15 pin, Right Angle	Kyocera Connector Products
	1	Printed Circuit Board	LC717A30UJFPCGEVB	80.0 mm x 50.0 mm, 2-levels, t = 1.6 mm	ON Semiconductor

(3) Printed Circuit Board Layout

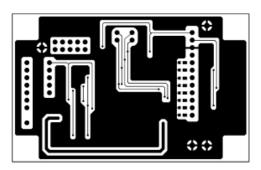


Figure 21. Pattern 1 Layer (Solder Side)

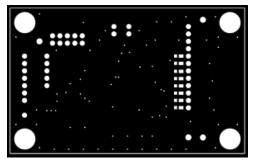


Figure 23. Resist 1 Layer (Solder Side)

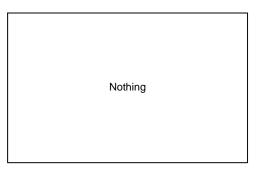


Figure 25. Silk 1 Layer (Solder Side)

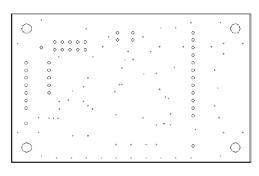


Figure 27. Hole

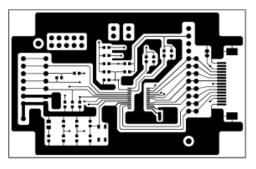


Figure 22. Pattern 2 Layer (Parts Side)

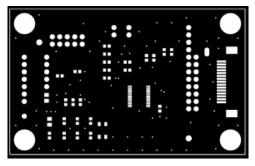


Figure 24. Resist 2 Layer (Parts Side)

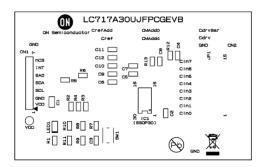


Figure 26. Silk 2 Layer (Parts Side)

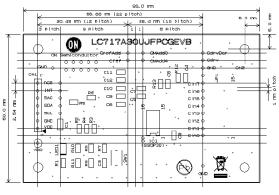


Figure 28. Outline

### 2ch Sensor Board (LC717A30UJ2CH00GEVB)

(1) Schematic

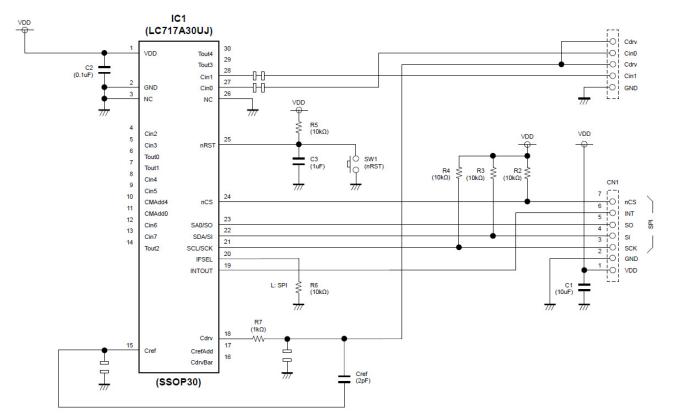


Figure 29. 2ch Sensor Board – Schematic

### (2) BOM

### Table 4. BILL OF MATERIALS OF LC717A30UJ2CH00GEVB EVALUATION BOARD

Designator	Qty.	Description	Part Number	Value	Manufacturer
IC1	1	Capacitive Touch Sensors LSI	LC717A30UJ	8 ch, SSOP30	ON Semiconductor
R7	1	Resistor	MCR03EZPJ102	1.0 kΩ ±5%, 0.1 W	ROHM
R2-R6	5	Resistor	RK73B1JTTD103J	10.0 kΩ ±5%, 0.1 W	KOA
Cref	1	Multilayer Ceramic Capacitor	GRM1885C1H2R0CA01D	2 pF ±0.25 pF, 50 V	Murata
C2	1	Multilayer Ceramic Capacitor	GRM188B11E104KA01D	0.1 $\mu F$ ±10%, 25 V	Murata
C3	1	Multilayer Ceramic Capacitor	GRM188B31E105KA75D	1.0 $\mu F$ ±10%, 25 V	Murata
C1	1	Multilayer Ceramic Capacitor	GRM21BB31C106KE15L	10.0 $\mu F$ ±10%, 16 V	Murata
SW1	1	Push Button Switch	SKRPACE010		ALPUS
CN1	1	Connector	2545B-1x7G	7 pin, Right Angle	HO CHIEN
	1	Printed Circuit Board	LC717A30UJ2CH00GEVB	30.0 mm x 20.0 mm, 2-levels, t = 1.6 mm	ON Semiconductor

### (3) Printed Circuit Board Layout

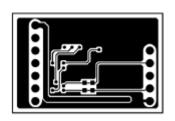


Figure 30. Pattern 1 Layer (Solder Side)

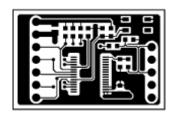


Figure 31. Pattern 2 Layer (Parts Side)

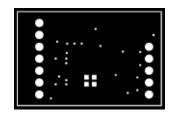


Figure 32. Resist 1 Layer (Solder Side)

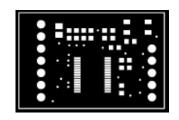


Figure 33. Resist 2 Layer (Parts Side)

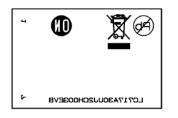


Figure 34. Silk 1 Layer (Solder Side)



Figure 36. Hole

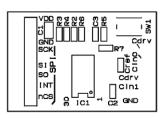


Figure 35. Silk 2 Layer (Parts Side)

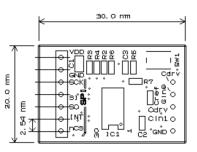


Figure 37. Outline

### Touch Switch Board (ELECTRODE00GEVB)

### (1) Schematic

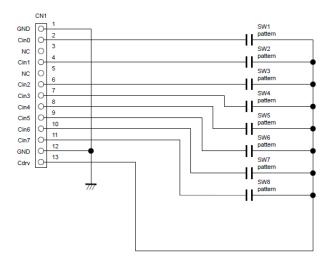


Figure 38. Touch Switch Board – Schematic

### (2) BOM

### Table 5. BILL OF MATERIALS OF ELECTRODE00GEVB EVALUATION BOARD

Designator	Qty.	Description	Part Number	Value	Manufacturer
CN1	1	Connector	2545B-1x13G	13 pin, Right Angle	HO CHIEN
	1	Printed Circuit Board	ELECTRODE00GEVB	160.0 mm x 100.0 mm, 2-levels, t = 1.6 mm	ON Semiconductor
	1	Plastic Prate		160.0 mm x 80.0 mm, t = 3.0 mm	
	4	Screw		M3 x 25.0 mm	
	4	Nut		M3	
	4	Washer		M3, 6.0 mm, in Rubber Foot	
	4	Washer		M3, 7.0 mm, Top Side	
	4	Plastic Spacer	EB-10	Black, M3 x 10.0 mm	MAC8
	4	Plastic Spacer	EP-3	White, M3 x 3.0 mm	MAC8
	4	Natural Rubber Foot	BU-692-A	Black, M15 x 7.5 mm	SATO PARTS

### (3) Printed Circuit Board Layout

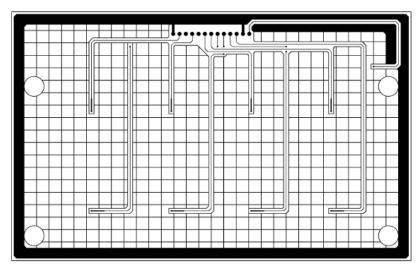


Figure 39. Pattern 1 Layer (Solder Side)

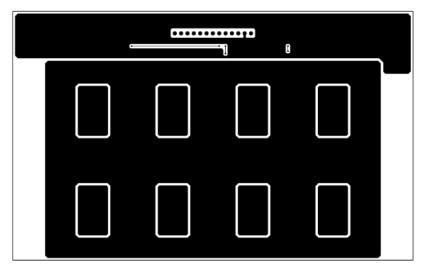


Figure 40. Pattern 2 Layer (Parts Side)

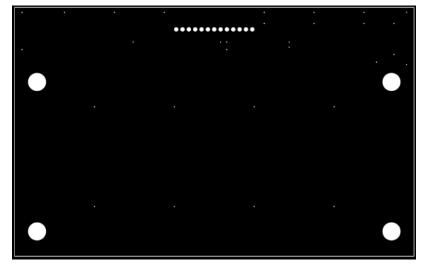


Figure 41. Resist 1 Layer (Solder Side)

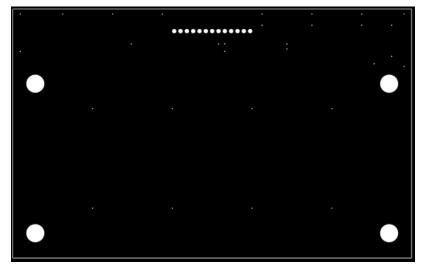


Figure 42. Resist 2 Layer (Parts Side)

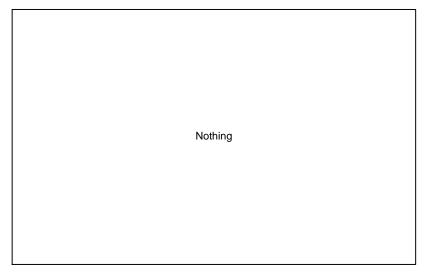


Figure 43. Silk 1 Layer (Solder Side)

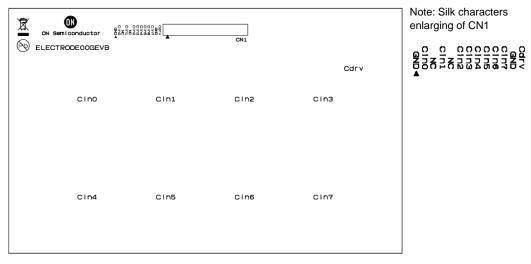
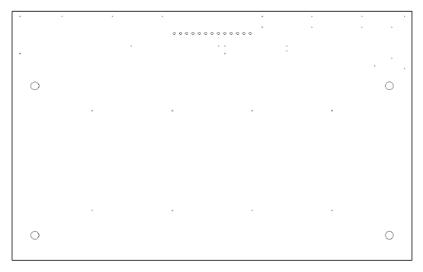


Figure 44. Silk 2 Layer (Parts Side)





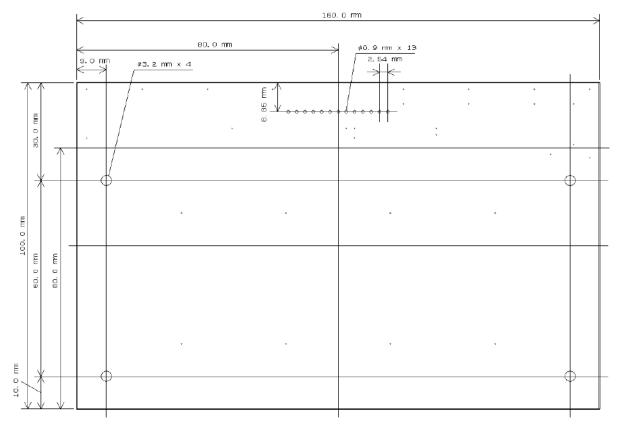


Figure 46. Outline

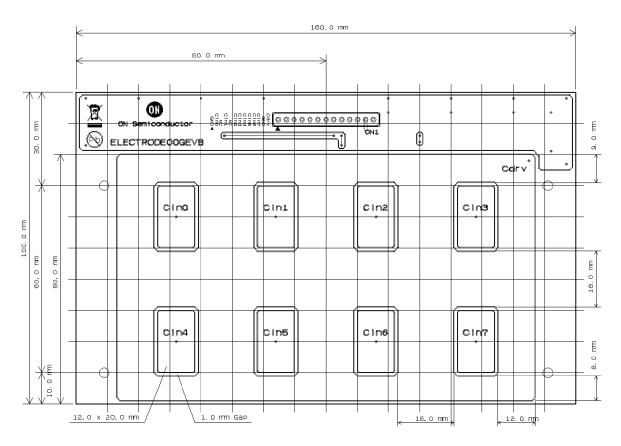


Figure 47. Electrode Pattern

### Proximity Sensor Board (ELECTRODE01GEVB)

(1) Schematic

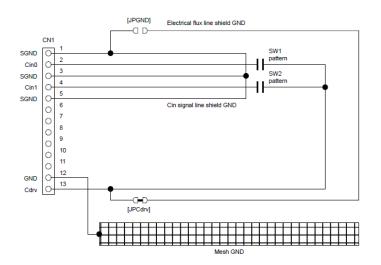


Figure 48. Proximity Sensor Board – Schematic

### (2) BOM

### Table 6. BILL OF MATERIALS OF ELECTRODE01GEVB EVALUATION BOARD

Designator	Qty.	Description	Part Number	Value	Manufacturer
CN1	1	Connector	2545B-1x13G	13 pin, Right Angle	HO CHIEN
	1	Printed Circuit Board	ELECTRODE01GEVB	340.0 mm x 35.0 mm, 2-levels, t = 1.6 mm	ON Semiconductor
	2	Plastic Prate		210.0 mm x 35.0 mm, t = 3.0 mm	
	2	Screw		M3 x 18.0 mm	
	2	Nut		M3	
	2	Washer		M3, 6.0 mm, in Rubber Foot	
	2	Washer		M3, 7.0 mm, Top Side	
	2	Plastic Spacer	EB-10	Black, M3 x 10.0 mm	MAC8
	2	Natural Rubber Foot	BU-692-A	Black, M15 x 7.5 mm	SATO PARTS
	2	Double-face Tape		Clear, 210.0 mm x 35.0 mm	

### (3) Printed Circuit Board Layout

-		Þ	Γ	Τ	Τ			Γ	Τ	Τ			Γ	Т	Τ	Γ	Т	Т			Τ	Т	Т			Τ	Τ	Т			Γ	Т	Т		Τ	Т	Т			Γ	Τ	Τ			Γ	Τ	Τ			Τ	Т	Т			Τ	Т			Γ	Т	Т		Γ	Γ	Т			T	T	7
		Γ		Т	Т			Г	Т	Т			Г	Т		Γ	Т				Γ	Т				Τ		Т							Т	Т	Т			Г	Т	Т			Г	Т	Т			Т	Т	Т			Т	Т				Т			Γ	Τ				Г	Т	7
	Г			Т	Т	Т	ſ	I	ц	Л			Г	Т	Т	Г	Т			Г	Г	Т	Τ			Т	Τ	Т			Г	Т	Т		Т	Т	Т		Γ	Г	Т	Т			Г	Т	Т		Γ	Т	Т	Т			Т	Т			Γ	Т	Т		Г	Т	Т	C		5	Т	7
																		Т		Г		Т						Т			Г	I	n		Т	Т	Т			Г	Т	Т			Г	Т	Т		Γ	Т	Т	Т		Γ	Г	Т	n		Γ	Т	Т					1				7
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### Figure 49. Pattern 1 Layer (Solder Side)

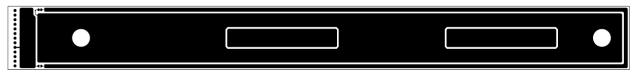


Figure 50. Pattern 2 Layer (Parts Side)



Figure 51. Resist 1 Layer (Solder Side)



Figure 52. Resist 2 Layer (Parts Side)

### Figure 53. Silk 1 Layer (Solder Side)

Cerv			1	1
and .	JPOdrv		Cdrv	Cdrv
	X	0	CIDI	CINO
50HD	8	ON Semiconductor		
SSND CINO	JINGHO	ELECTRODE01GEVB		

### Figure 54. Silk 2 Layer (Parts Side)



### Figure 55. Hole

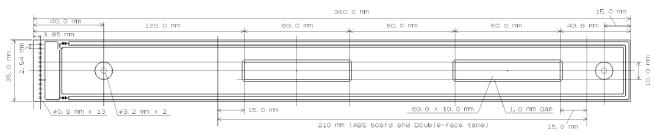


Figure 56. Outline and Electrode Pattern

### Liquid Level Sensing Board (ELECTRODE02GEVB)

(1) Schematic

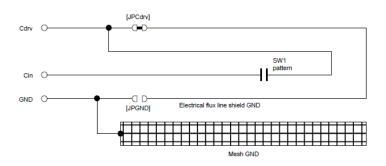


Figure 57. Liquid Level Sensing Board – Schematic

### (2) BOM

### Table 7. BILL OF MATERIALS OF ELECTRODE02GEVB EVALUATION BOARD

Designator	Qty.	Description	Part Number	Value	Manufacturer
Cin, Cdrv, GND	3	Socket Pin	PE-1	1pin	MAC8
	1	Printed Circuit Board	ELECTRODE02GEVB	100.0 mm x 30.0 mm, 2-levels, t = 1.6 mm	ON Semiconductor

### (3) Printed Circuit Board Layout



Figure 58. Pattern 1 Layer (Solder Side)



Figure 60. Resist 1 Layer (Solder Side)

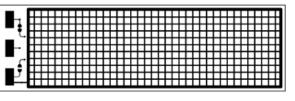


Figure 59. Pattern 2 Layer (Parts Side)



Figure 61. Resist 2 Layer (Parts Side)

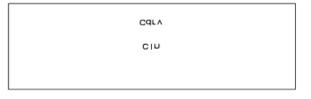


Figure 62. Silk 1 Layer (Solder Side)

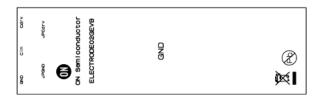


Figure 63. Silk 2 Layer (Parts Side)

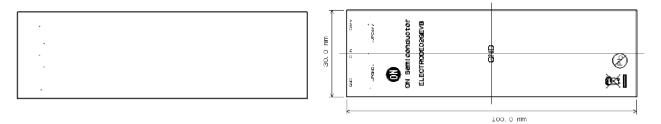




Figure 65. Outline

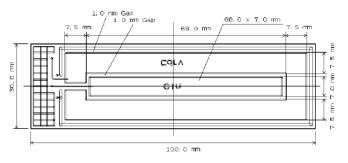
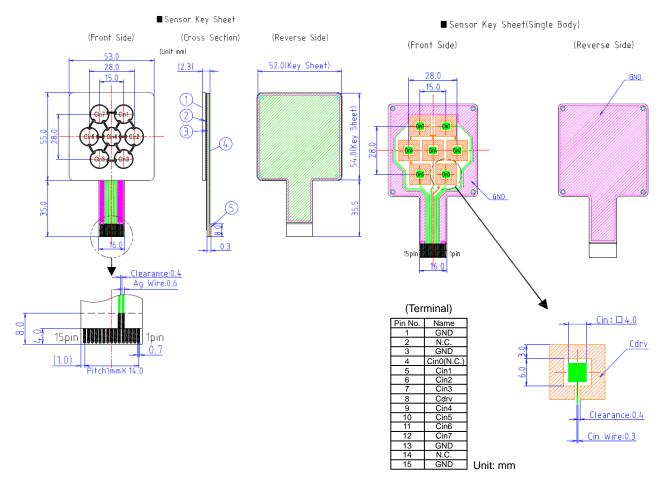


Figure 66. Electrode Pattern

### Sensor Key Sheet

(1) Product Drawing





### (2) BOM

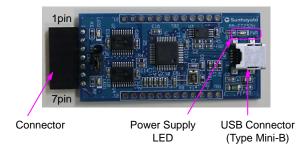
### Table 8. BILL OF MATERIALS OF SENSOR KEY SHEET

Designator	Qty.	Description	Part Number	Value	Manufacturer
(1)	1	Top Panel		Plastic, t = 2000 µm	K&D
(2)	1	Glue Sheet		Polyester, t = 50 μm	K&D
(3)	1	Sensor Key Sheet		Polyester, t = 100 µm	K&D
(4)	1	Bottom Sheet		Polyester, t = 50 μm	K&D
(5)	1	Reinforcing Plate		Polyester, t = 213 μm	K&D

NOTE: K&D Co., Ltd. Refer to URL; http://www.kandd.co.jp or http://www.kandd.co.jp/en/.

### USB CONVERSION MODULE OPERATION GUIDE

USB Conversion Module (MM–FT232H: Sunhayato) in this kit is made of FTDI's IC (FT232H) and can change USB interface into various interfaces. It can output the power-supply voltage from USB port to the connecter terminal and it is possible to change a voltage level to 3.3 V or 5.0 V by jumper setup.



### Table 9.

No.	I <sup>2</sup> C I/F Terminal	SPI I/F Terminal
1	VDD	VDD
2	GND	GND
3	SCL	SCK
4	SDA	SI
5	SDA (Note 1)	SO
6	N.C. (open)	N.C. (open)
7	N.C. (open)	nCS

1. Make sure to connect both 4 pin and 5 pin as the common terminal on customer's board side at  $l^2C$  interface.



Voltage Selectable Jumper

### Table 10.

Jumper Location	Voltage Level
3 <sup>3V3</sup> 5 <sup>V</sup> CN2	5.0 V
3 <sup>3</sup> 3 5√ CN2	3.3 V

### NOTE

Refer to the application note on ON Semiconductor touch sensor page for sensor patterns of the design rule and usage of LSI.

Refer to the user's manual of the application-software for usage of the software and installing the device driver.

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