

# THCV213 / THCV214 Evaluation Kit



V-by-One® Single Link Evaluation Board  
 Parts Number: THEVA213-V3, THEVA214-V3

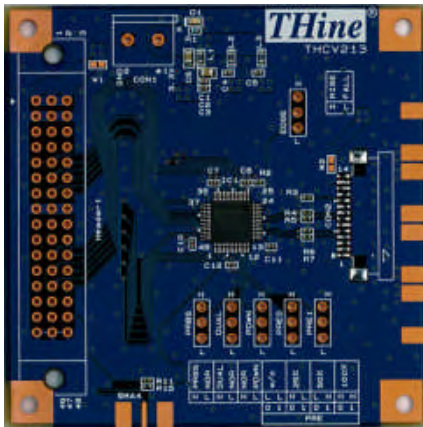
## 1. General Description

THEVA213-V3 and THEVA214-V3 boards are designed to support video data transmission between the host and display. One high-speed lane can carry up to 18bit data and 4bit of synchronizing signals at a pixel clock frequency from 5MHz to 40MHz.

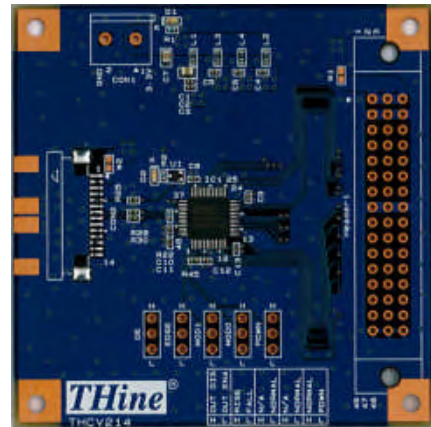
## 2. Features

- Transmit 18bit Data and 4bit Control Data via Single Differential Cable.
- Wide Frequency Range : 5MHz to 40MHz
- Support SYNC pattern and LOCK Indicator
- Pre-Emphasis Function
- Clock Edge Selectable
- Dual Display Mode
- Power Down Mode
- Low Power Single 3.3V CMOS Design
- AEC-Q100 ESD Protection

## 3. Overview

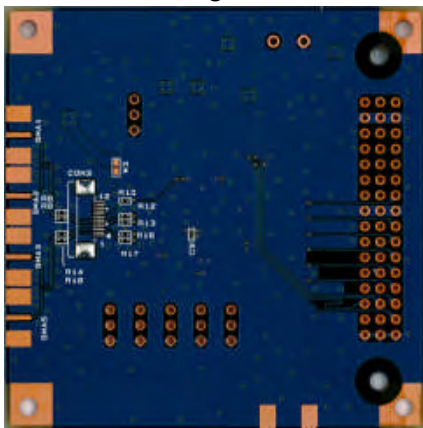


(a) THEVA213-V3

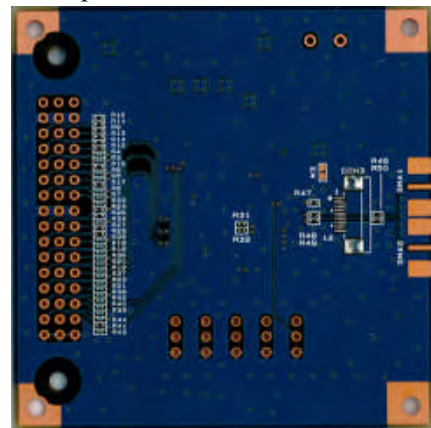


(b) THEVA214-V3

Figure 1 THEVA213-V3 and THEVA214-V3 Top Side View



(a) THEVA213-V3



(b) THEVA214-V3

Figure 2 THEVA213-V3 and THEVA214-V3 Bottom Side View

## 4. Power Supply Setup

This chapter shows power supply condition.

**Caution: Please check if there is no power-GND short on below red trace before supplying any power.**

### 3.3V Power Supply to Each Board

Each evaluation board requires 3.3V power supply. Please use “CON1” connector typically.

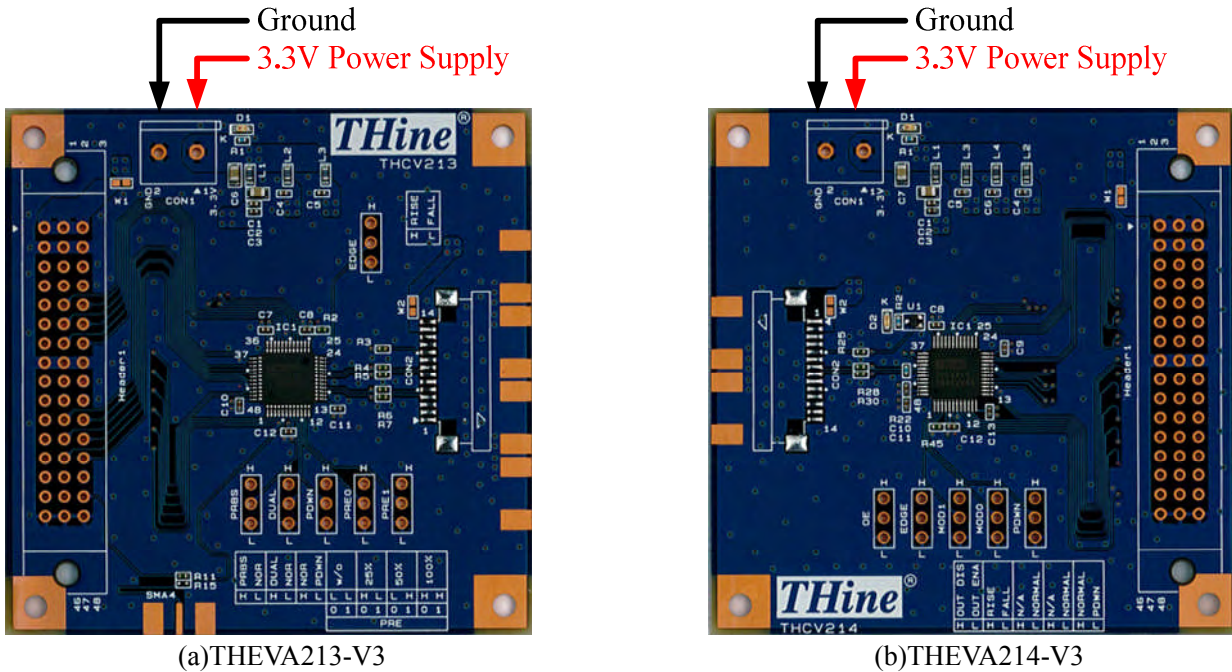


Figure 3 Power Supply for Evaluation Board

### Power Supply from / to Connector

3.3V power supply can be connected to Header1 and CON2 by using W1, W2 and W3 solder jumper.

#### THEVA213-V3

W1: Connect the 3.3V power supply with pin#1, 2 and 3 of Header1.

W2: Connect the 3.3V power supply with pin#13 and 14 of CON2.

W3: Connect the 3.3V power supply with pin#11 and 12 of CON3.

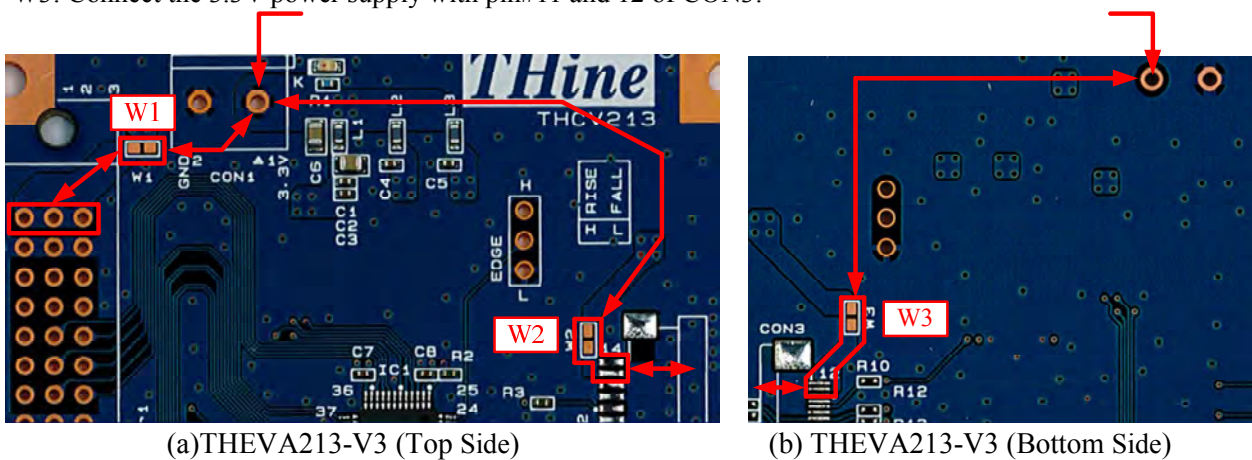


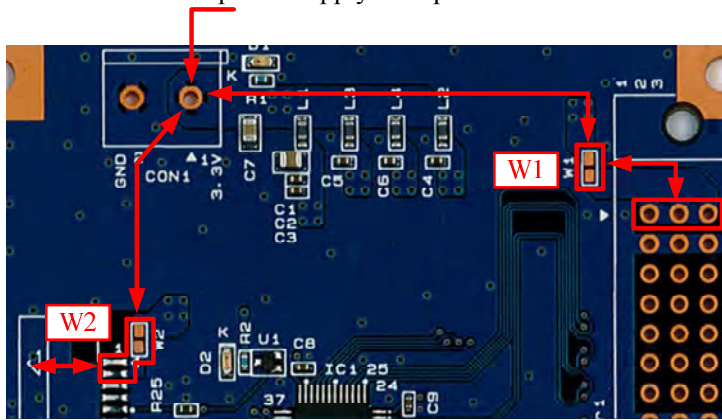
Figure 4 THEVA213-V3 Power Supply from / to Each Connector

**THEVA214-V3**

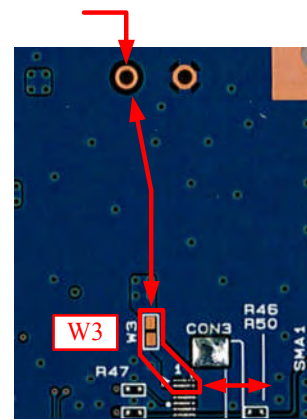
W1: Connect the 3.3V power supply with pin#1, 2 and 3 of Header1.

W2: Connect the 3.3V power supply with pin#1 and 2 of CON2.

W3: Connect the 3.3V power supply with pin#1 and 2 of CON3.



(a)THEVA214-V3 (Top Side)



(b) THEVA214-V3 (Bottom Side)

Figure 5 THEVA214-V3 Power Supply from / to Each Connector

**5. V-by-One® Input / Output Connector Select**

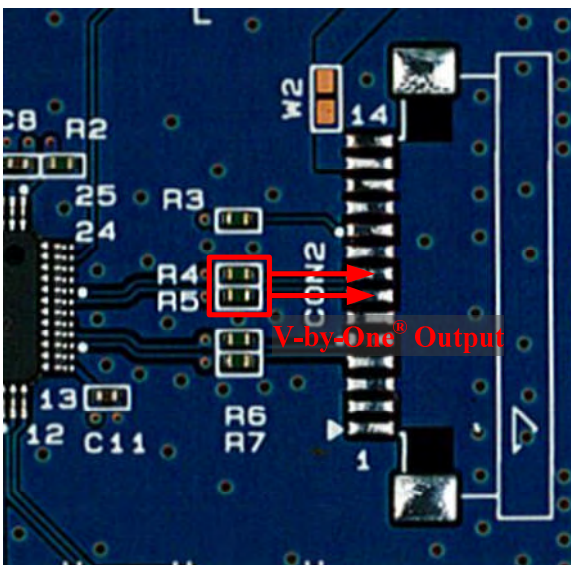
V-by-One® input / output connector can be selected by using 0ohm resistors.

**(1) 1mm Pitch Connector (Default Setting)**

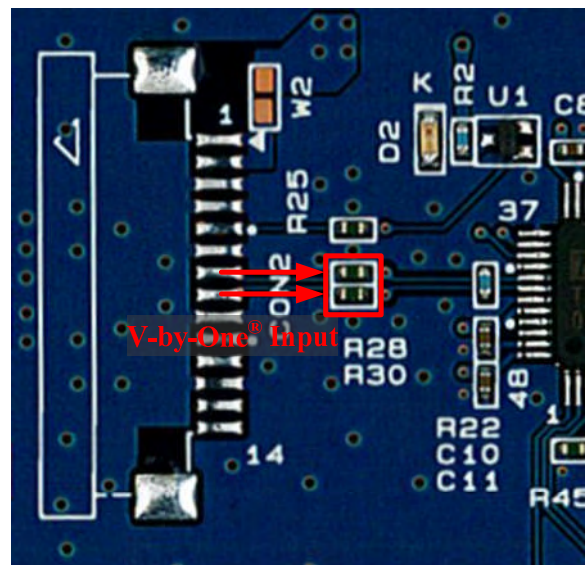
Please mount / unmount following 0ohm resistors to use 1mm pitch connector.

Table 1 Resistor Setting for 1mm Pitch Connector

	Mount	Unmount
THEVA213-V3	R4, R5	R12, R13
THEVA214-V3	R28, R30	R48, R49



(a)THEVA213-V3 (Top Side)



(b)THEVA214-V3 (Top Side)

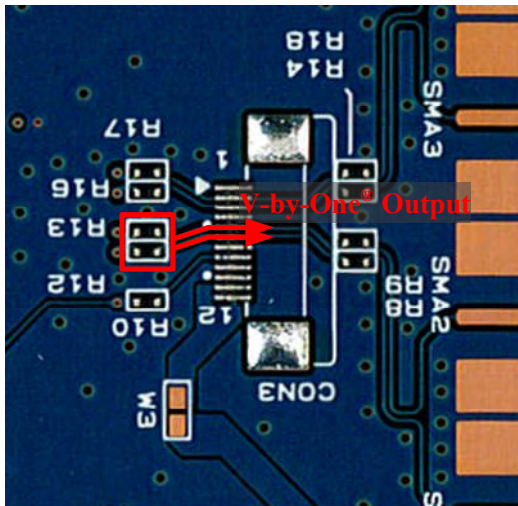
Figure 6 Resistor Mounting for 1mm Pitch Connector

**(2) 0.5mm Pitch Connector**

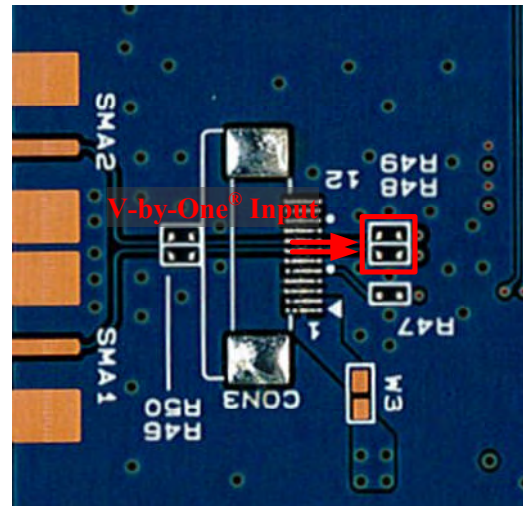
Please mount / unmount following 0ohm resistors to use 0.5mm pitch connector.

Table 2 Resistor Setting for 0.5mm Pitch Connector

	Mount	Unmount
THEVA213-V3	R12, R13	R4, R5, R8, R9
THEVA214-V3	R48, R49	R28, R30, R46, R50



(a)THEVA213-V3 (Bottom Side)



(b)THEVA214-V3 (Bottom Side)

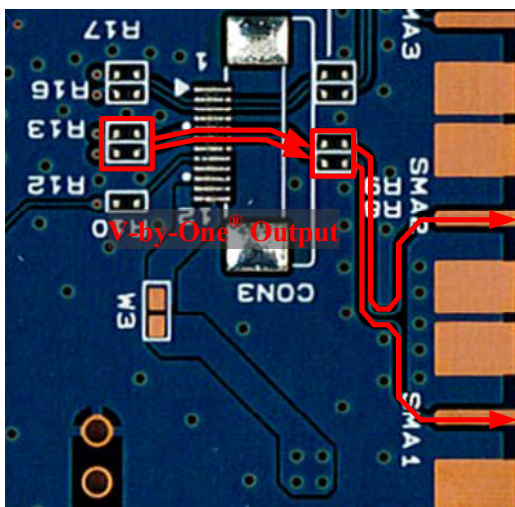
Figure 7 Resistor Mounting for 0.5mm Pitch Connector

**(3) SMA Connector**

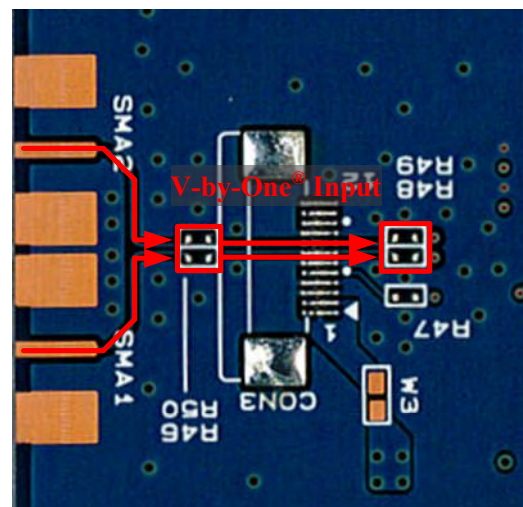
Please mount / unmount following 0ohm resistors to use SMA connector.

Table 3 Resistor Setting for SMA Connector

	Mount	Unmount
THEVA213-V3	R13, R14, R16, R17	R7, R8, R9, R10
THEVA214-V3	R44, R46, R47, R48	R12, R15, R20, R23



(a)THEVA213-V3 (Bottom Side)



(b)THEVA214-V3 (Bottom Side)

Figure 8 Resistor Mounting for SMA Connector

## 6. Function Setting

Setting pin of each board is shown in yellow area of Figure 9. Pin#2 of each 3HEADER is connected to IC's setting pin.

Each setting pin's high or low setting can set by connecting pin#2 of 3HEADER and high level or low level.

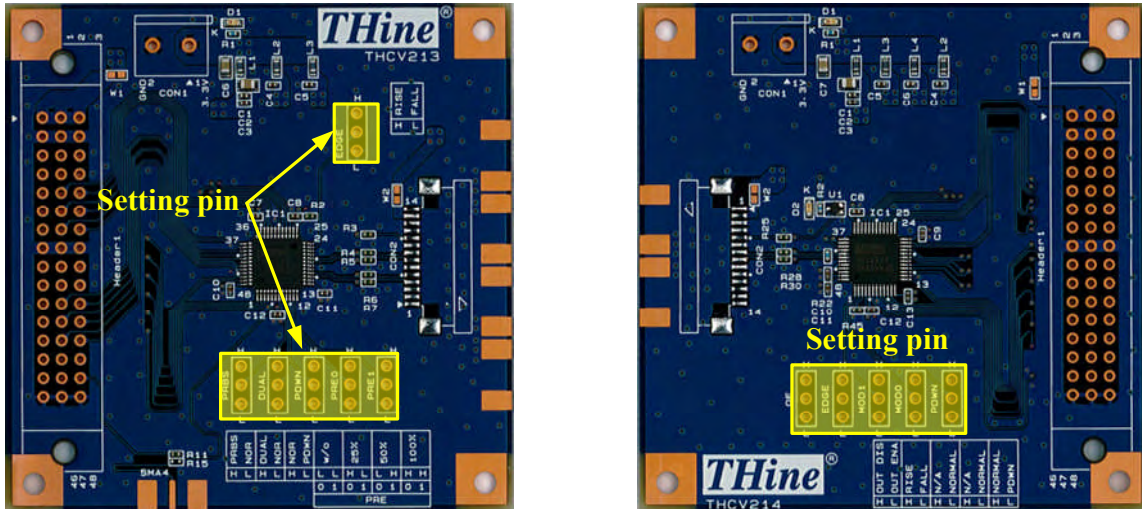
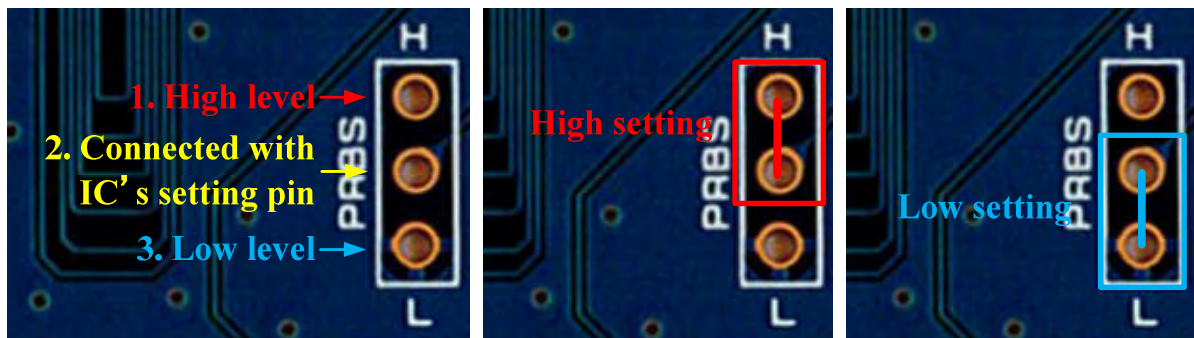


Figure 9 Position of Function Setting Pin



(a)3HEADER Description

(b)High Level Setting

(c)Low Level Setting

Figure 10 High / Low Setting Description

## 7. Clock Input from SMA Connector

THEVA213-V3 can also choose the TTL clock input from SMA connector by using 0ohm resistor.

If you want to use SMA connector for clock input, please change the 0ohm resistor mount from R15 to R18.

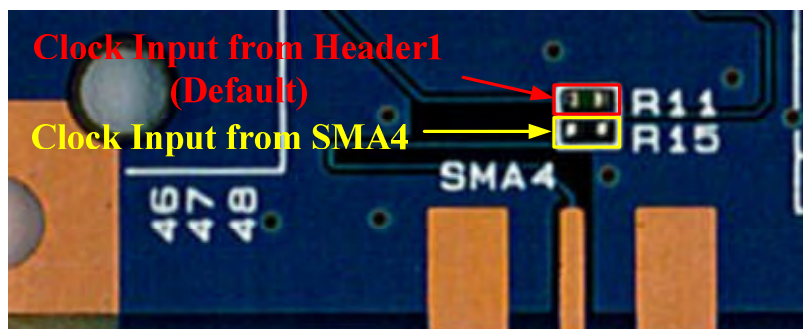


Figure 11 TTL Clock Input Connector Select

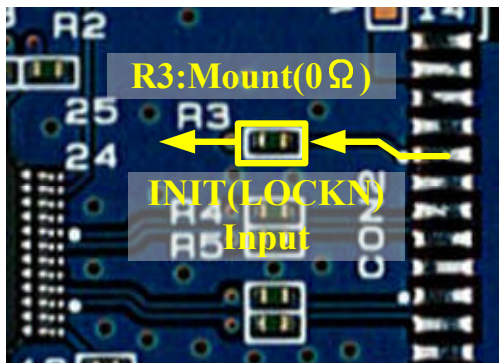
## 8. Shake Hand Mode

When you use this evaluation kit in “Shake Hand Mode”, Please mount following resistors to connect LOCKN signal between transmitter and receiver.

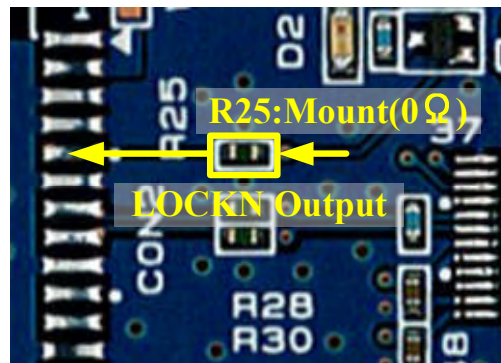
\*LOCKN signals doesn't have the connection from / to SMA connector.

Table 4 Resistor Setting for Shake Hand Mode

Connector	Eva Board	Mount
1mm Pitch Connector Using Case	THEVA213-V3	R3
	THEVA214-V3	R25
0.5mm Pitch Connector Using Case	THEVA213-V3	R10
	THEVA214-V3	R47

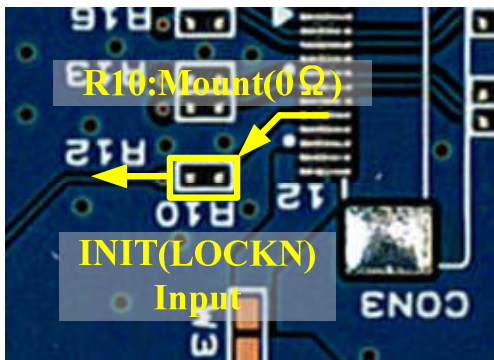


(a)THEVA213-V3 (Top Side)

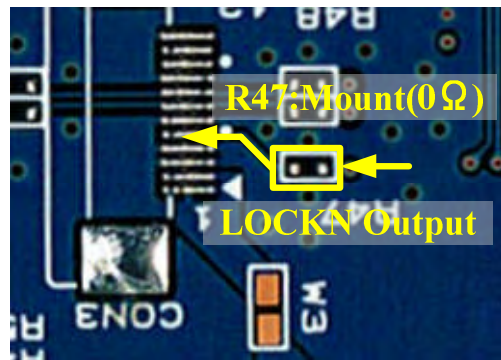


(b)THEVA214-V3 (Top Side)

Figure 12 LOCKN Connection (1mm Pitch Connector)



(a) THEVA213-V3 (Bottom Side)



(b) THEVA214-V3 (Bottom Side)

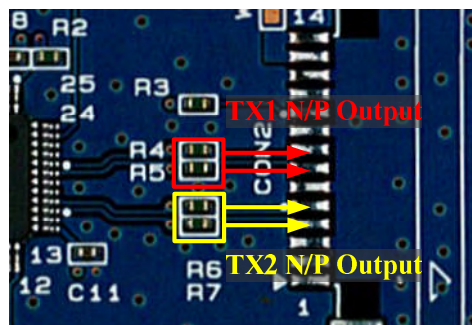
Figure 13 LOCKN Connection (0.5mm Pitch Connector)

## 9. Dual Display Mode

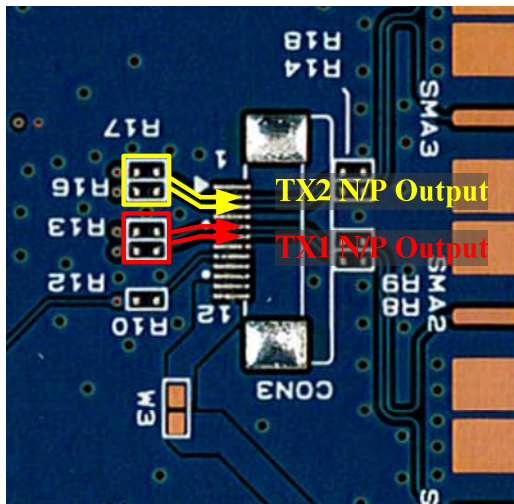
THEVA213-V3 supports dual display mode.  
When you use dual display mode, Please mount following resistors.

Table 5 Resistor Mounting for Dual Display Mode

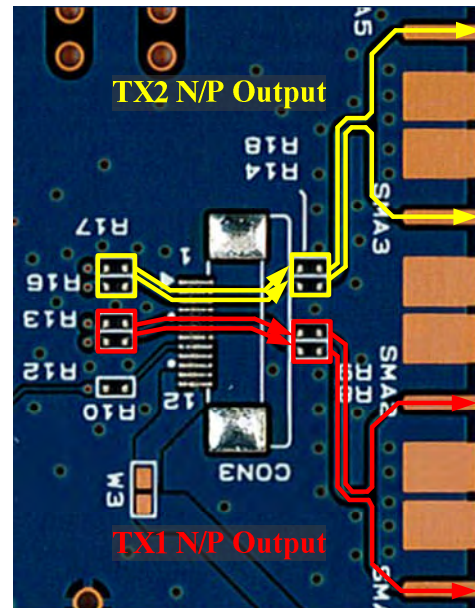
Connector	Mount	Unmount
1mm Pitch Connector Using Case	R4, R5, R6, R7	R12, R13, R16, R17
0.5mm Pitch Connector Using Case	R12, R13, R16, R17	R4, R5, R6, R7 R8, R9, R14, R18
SMA Connector Using Case	R8, R9, R12, R13 R14, R16, R17, R18	R4, R5, R6, R7



(a) 1mm Pitch Connector (Top Side)



(b) 0.5mm Pitch Connector (Bottom Side)



(c) SMA Connector (Bottom Side)

Figure 14 Dual Display Mode

## 10. Status Indicate LED

The following table shows indicating status of each LED.

Table 6 LED Description

	THEVA213-V3	THEVA214-V3
D1	3.3V Power Supply Indicator	
D2	LOCKN Status Indicator	

## 11. Function

This chapter shows function setting of THEVA213-V3 and THEVA214-V3.

Table 7 THEVA213-V3 Function Setting Description

Silk	Symbol	Function															
EDGE	EDGE	Input clock triggering edge select. H: Rising Edge L: Falling Edge															
PRBS	PRBS	PRBS (Pseudo Random Binary Sequence) generator is active for evaluation or debugging. H : PRBS Generator Enable L : Normal Operation															
DUAL	DUAL	Dual display mode enable. H: Dual Display Mode (TX1N/P and TX2N/P enabled) L: Normal Operation (Only TX1N/P enabled, TX2N/P is Hi-Z)															
PRE1	PRE1	Pre-Emphasis level select input.															
PRE0	PRE0																
<table border="1"> <thead> <tr> <th>PRE1</th> <th>PRE0</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>L</td> <td>L</td> <td>w/o Pre-Emphasis</td> </tr> <tr> <td>L</td> <td>H</td> <td>25% Pre-Emphasis</td> </tr> <tr> <td>H</td> <td>L</td> <td>50% Pre-Emphasis</td> </tr> <tr> <td>H</td> <td>H</td> <td>100% Pre-Emphasis</td> </tr> </tbody> </table>			PRE1	PRE0	Description	L	L	w/o Pre-Emphasis	L	H	25% Pre-Emphasis	H	L	50% Pre-Emphasis	H	H	100% Pre-Emphasis
PRE1	PRE0		Description														
L	L	w/o Pre-Emphasis															
L	H	25% Pre-Emphasis															
H	L	50% Pre-Emphasis															
H	H	100% Pre-Emphasis															
PDWN	PDWN	Power down mode H: Normal Operation L: Power Down Mode (TX1N/P and TX2N/P are Hi-Z)															

Table 8 THEVA214-V3 Function Setting Description

Silk	Symbol	Function								
EDGE	EDGE	Input clock triggering edge select. H: Rising Edge L: Falling Edge								
OE	OE	Output Enable H : Output Disable, All Outputs are Hi-Z L : Output Enable								
MOD1	MODE1	Both must be tied to GND.								
MOD0	MODE0									
<table border="1"> <thead> <tr> <th>MODE1</th> <th>MODE0</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>L</td> <td>L</td> <td>Normal Mode Shake Hand Mode</td> </tr> <tr> <td colspan="2">Other Setting</td> <td>Not Available</td> </tr> </tbody> </table>			MODE1	MODE0	Description	L	L	Normal Mode Shake Hand Mode	Other Setting	
MODE1	MODE0	Description								
L	L	Normal Mode Shake Hand Mode								
Other Setting		Not Available								
PDWN	PDWN	Power down mode. H: Normal Operation L: Power Down Mode (All outputs except LOCKN and CLKOUT are held to low)								





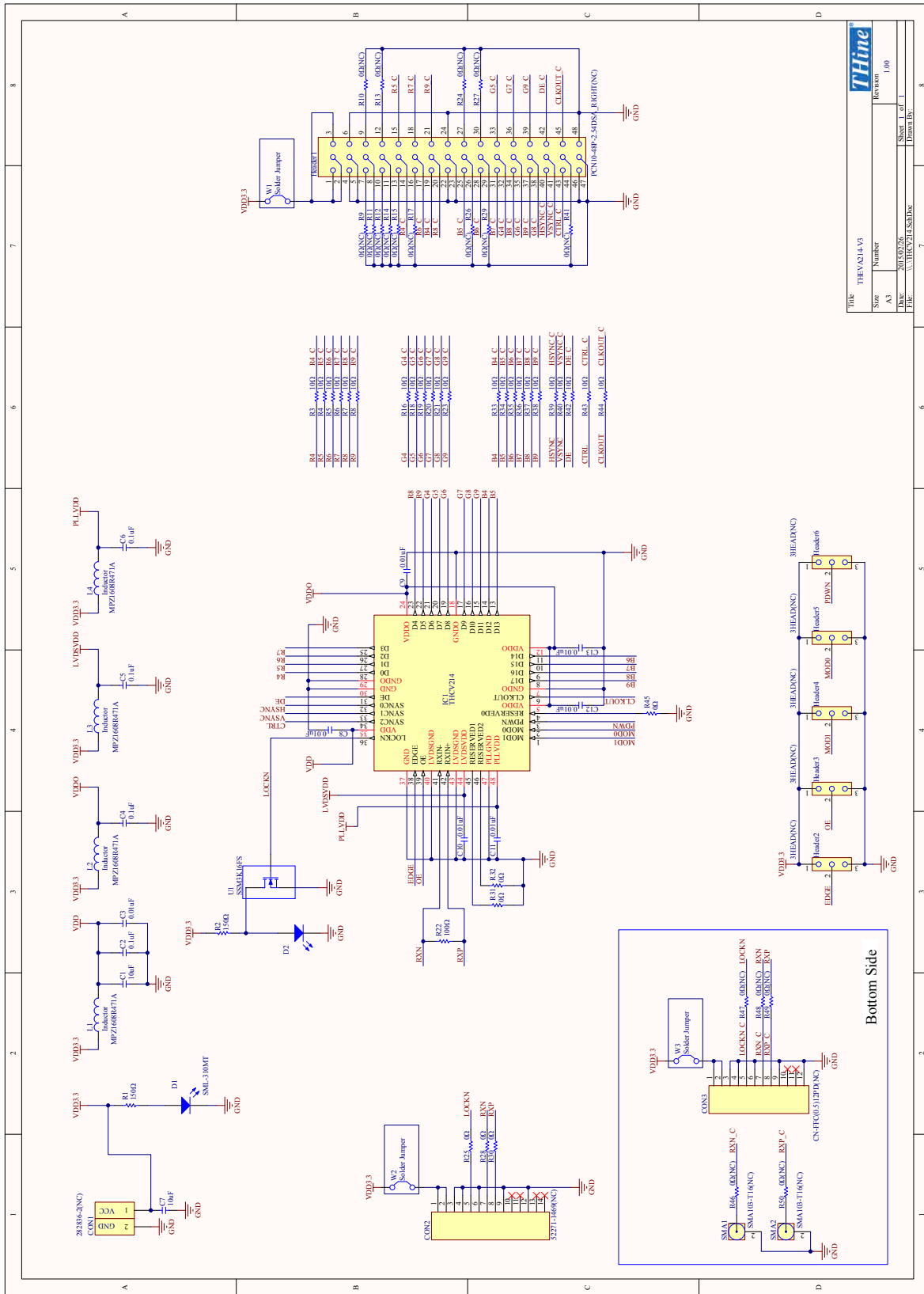


Figure 16 THEVA214-V3 Schematic

### 13. Bills of Materials

Table 9 THEVA213-V3 BOM

TYPE	Value / Part No.	Package	SPEC	Reference No.	Q'ty	Note
Capacitor	10uF	2012	16V	C1, C6	2	
Capacitor	0.1uF	1005	16V	C2, C4, C5	3	
Capacitor	0.01uF	1005	16V	C3, C7, C8, C9, C10, C11, C12	7	
Connector	282836-2(NC)	5mm pitch	2pin	CON1	1	
Connector	52271-1469(NC)	1mm pitch	14pin	CON2	1	
Connector	CN-FFC(0.5)12PD(NC)	0.5mm pitch	12pin	CON3	1	
Connector	PCN10-48P-2.54DSA LEFT(NC)	2.54mm pitch	48pin	Header1	1	
Connector	SMA103-T16(NC)	1.6mm	PCB End Jack	SMA1, SMA2, SMA3, SMA4, SMA5	5	
Header	3HEAD(NC)	2.54mm pitch	---	Header2, Header3, Header4, Header5, Header6, Header7	6	
IC	THCV213	TQFP48	---	IC1	1	
Inductor	MPZ1608R471A	1608	1.2A	L1, L2, L3	3	
LED	SML-310MT	1608	GREEN	D1	1	
Resistor	150	1005	0.1W	R1	1	
Resistor	0	1005	1A	R2, R3, R4, R5, R6, R7, R11	7	
Resistor	0(NC)	1005	1A	R8, R9, R10, R12, R13, R14, R15, R16, R17, R18	10	

Table 10 THEVA214-V3 BOM

TYPE	Value / Part No.	Package	SPEC	Reference No.	Q'ty	Note
Capacitor	10uF	2012	16V	C1, C7	2	
Capacitor	0.1uF	1005	16V	C2, C4, C5, C6	4	
Capacitor	0.01uF	1005	16V	C3, C8, C9, C10, C11, C12, C13	7	
Connector	SMA103-T16(NC)	1.6mm	PCB End Jack	SMA1, SMA2	2	
Connector	PCN10-48P-2.54DSA RIGHT(NC)	2.54mm pitch	48pin	Header1	1	
Connector	CN-FFC(0.5)12PD(NC)	0.5mm pitch	12pin	CON3	1	
Connector	52271-1469(NC)	1mm pitch	14pin	CON2	1	
Connector	282836-2(NC)	5mm pitch	2pin	CON1	1	
Header	3HEAD(NC)	2.54mm pitch	---	Header2, Header3, Header4, Header5, Header6	5	
IC	SSM3K16FS	SSM	RON15Ω	U1	1	
IC	THCV214	TQFP48	---	IC1	1	
Inductor	MPZ1608R471A	1608	1.2A	L1, L2, L3, L4	4	
LED0	SML-310MT	1608	GREEN	D1,D2	2	
Resistor	150Ω	1005	0.1W	R1, R2	2	
Resistor	100Ω	1005	0.1W	R22	1	
Resistor	10Ω	1005	0.1W	R3, R4, R5, R6, R7, R8, R16, R18, R19, R20, R21, R23, R33, R34, R35, R36, R37, R38, R39, R40, R42, R43, R44	23	
Resistor	0Ω(NC)	1005	1A	R9, R10, R11, R12, R13, R14, R15, R17, R24, R26, R27, R29, R41, R46, R47, R48, R49, R50	18	
Resistor	0Ω	1005	1A	R25, R28, R30, R31, R32, R45	6	

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## 14. Set Items

Table 11 Set Items

<b>TYPE</b>	<b>Part No.</b>
DC Connector	282836-2
FFC Connector for V-by-One <sup>®</sup> Link	52271-1469
FFC 14pin 1mm Pitch for V-by-One <sup>®</sup> Link	98267-0299
Pin Header	---

It's possible to mount these parts on this board and use.

---

## **15. Notices and Requests**

Please kindly read, understand and accept this “Notices and Requests” before using this product.

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2. The circuit diagrams described in this material are examples of the application which may not always apply to design of respective customers. THine Electronics, Inc. (“THine”) is not responsible for possible errors and omissions in this material. Please note if the errors or omissions should be found in this material, THine may not be able to correct them immediately.
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3. This product is not radiation-tolerant product.
4. This product is presumed to be used for general electric device, not for applications which require extremely high-reliability/safety (including medical device concerned with critical care, aerospace device, or nuclear power control device). Also, when using this product for any device concerned with control and/or safety of transportation mean, traffic signal device, or other various types of safety device, such use must be after applying appropriate measures to the product.
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