THCV235 / THCV236 Evaluation Kit

SerDes Single Link Evaluation Board

Parts Number: THEVA235, THEVA236

1. General Description

THEVA235 and THEVA236 boards are designed to evaluate THCV235 and THCV236 for transmission of Video data between the host and display.

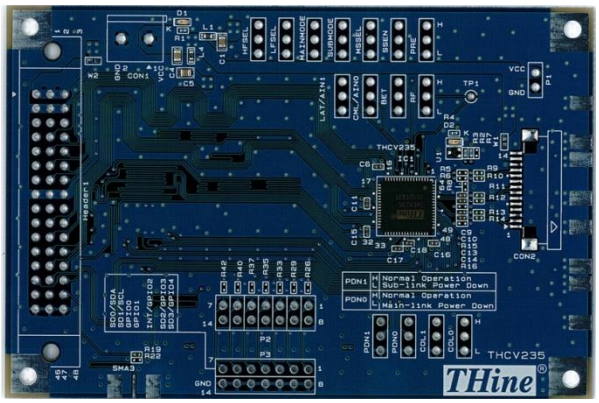
One high-speed lane can carry up to 32bit data and 3bits of synchronizing signals at a pixel clock frequency from 6MHz to 160MHz with converting RGB444 to YCbCr422.

The chipset, which has one high-speed data lane, can transmit video data up to 1080p/60Hz.
The maximum serial data rate is 4.00Gbps/lane.

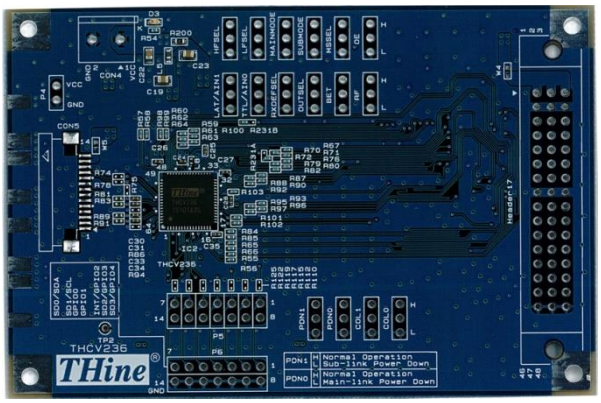
2. Features

- Color depth selectable:24/32bit
- RGB ⇔ YCbCr422 color space conversion function
- Wide frequency range
- AC coupling for high-speed lanes
- CDR requires no external frequency reference
- Wide Range Supply Voltage from 1.7V to 3.6V
- Additional SSCG on data stream
- 2-wire serial I/F bridge function(400kbps)
- Remote side GPIO control and monitoring
- Low Speed Data Bridge function

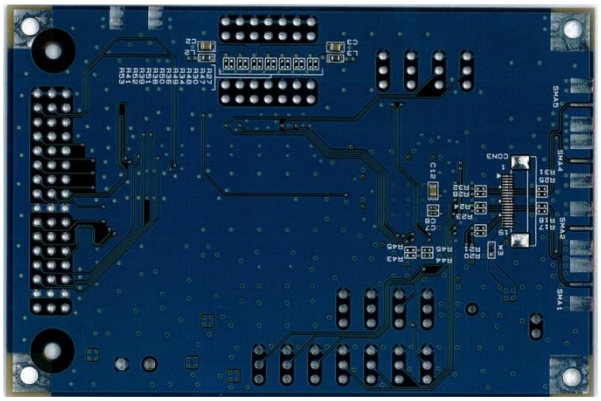
3. Overview



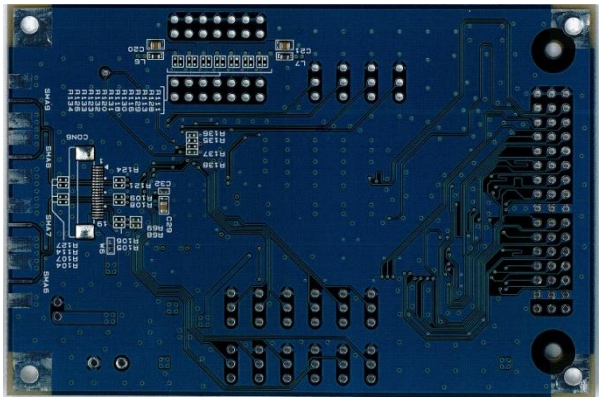
(a) THEVA235 (Top Side)



(b) THEVA236 (Top Side)



(c) THEVA235 (Bottom Side)



(d) THEVA236 (Bottom Side)

Figure 1 THEVA235 and THEVA236 View

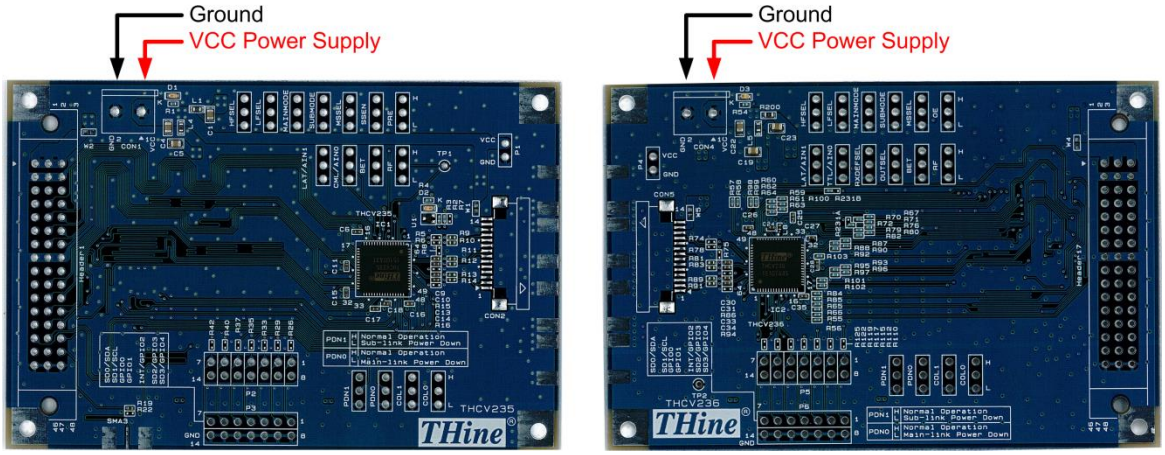
4. Power Supply Set Up

This chapter shows power supply condition.

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

VCC Power Supply to Each Board

Each evaluation board requires VCC power supply. Use “CON1” and “CON4” connector typically.



(a) THEVA235 (b) THEVA236

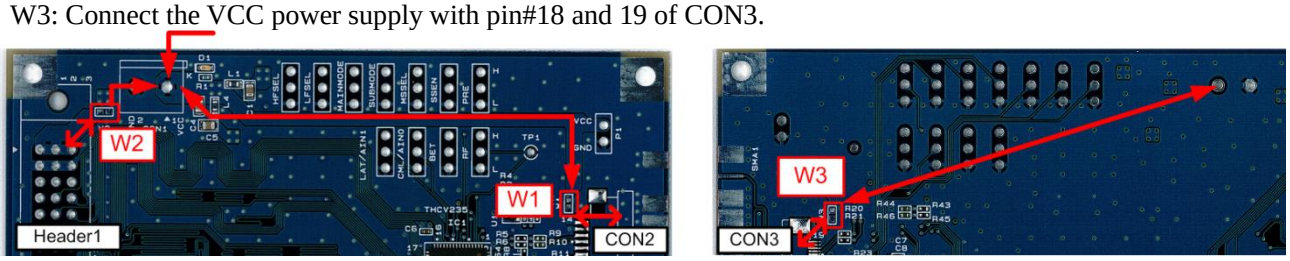
Figure 2 Power Supply for Evaluation Board

Power Supply from / to Connector

VCC power supply can be connected to each connector by using solder jumper.

THEVA235

W1: Connect the VCC power supply with pin#13 and 14 of CON2.
W2: Connect the VCC power supply with pin#1, 2 and 3 of Header1.
W3: Connect the VCC power supply with pin#18 and 19 of CON3.

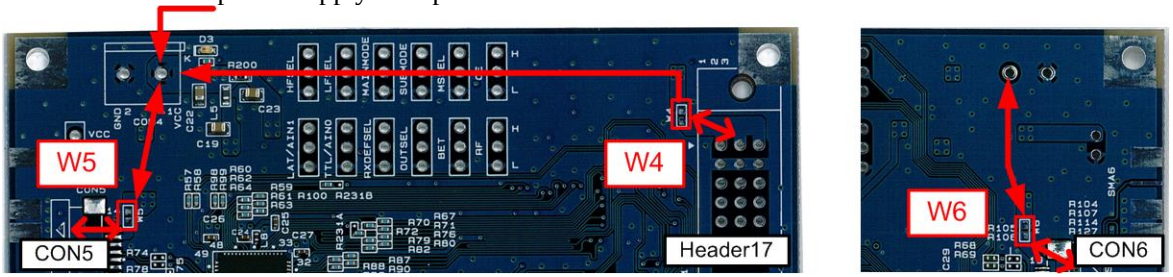


(a)THEVA235 (Top Side) (b) THEVA235 (Bottom Side)

Figure 3 THEVA235 Power Supply from / to Each Connector

THEVA236

W4: Connect the VCC power supply with pin#1, 2 and 3 of Header17.
W5: Connect the VCC power supply with pin#13 and 14 of CON5
W6: Connect the VCC power supply with pin#18 and 19 of CON6.



(a)THEVA236 (Top Side) (b) THEVA236 (Bottom Side)

Figure 4 THEVA236 Power Supply from / to Each Connector

5. CML Line Input / Output Connector Select

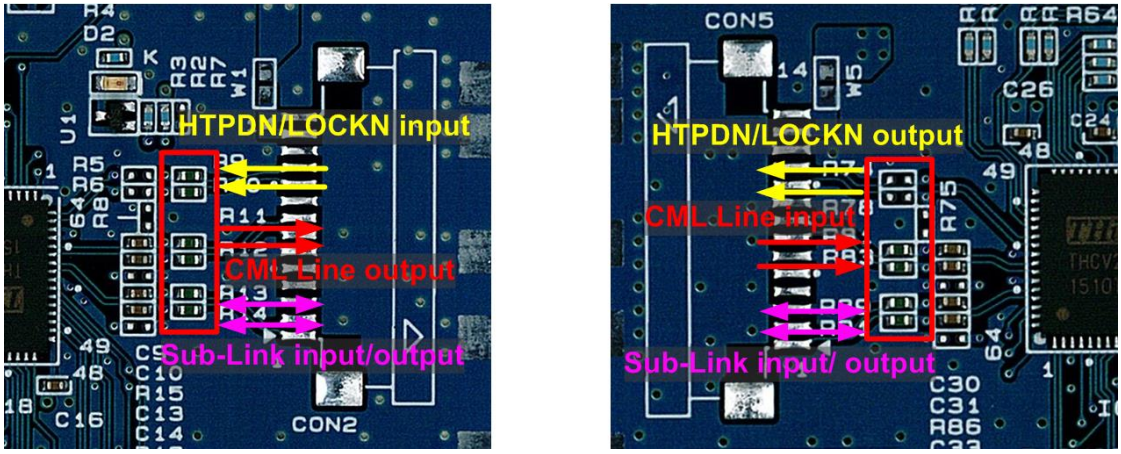
CML line input / output connector can be selected by using 0Ω resistors.

1mm Pitch Connector

Mount / unmount following 0Ω resistors to use 1mm pitch connector.

Table 1 Mount / unmount resistors for using 1mm pitch connector

	Mount	Unmount
THEVA235	R9, R10, R11, R12, R13, R14	R15, R16, R17, R18, R20, R21, R23, R24, R25, R28, R31, R32
THEVA236	R74, R78, R81, R83, R89, R91	R86, R94, R104, R105, R106, R107, R108, R109, R114, R121, R124, R127



(a)THEVA235 (Top Side) (b)THEVA236 (Top Side)

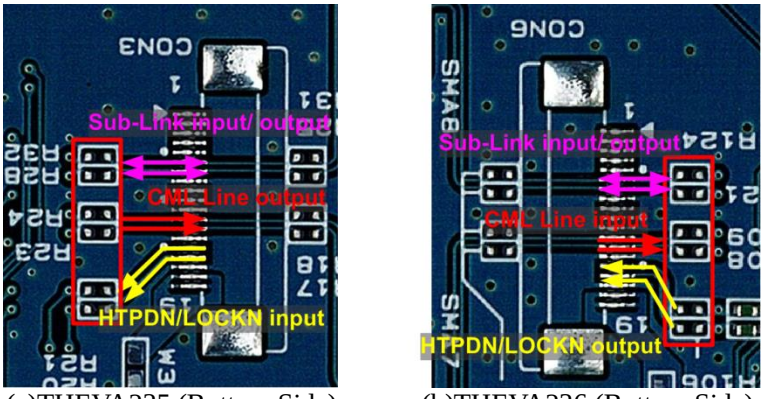
Figure 5 Resistors Mounting for 1mm Pitch Connector

0.5mm Pitch Connector

Mount / unmount following 0Ω resistors to use 0.5mm pitch connector.

Table 2 Mount / unmount resistors for using 0.5mm pitch connector

	Mount	Unmount
THEVA235	R20, R21, R23, R24, R28, R32	R9, R10, R11, R12, R13, R14, R15, R16, R17, R18, R25, R31
THEVA236	R105, R106, R108, R109, R121, R124	R74, R78, R81, R83, R86, R89, R91, R94, R104, R107, R114, R127



(a)THEVA235 (Bottom Side) (b)THEVA236 (Bottom Side)

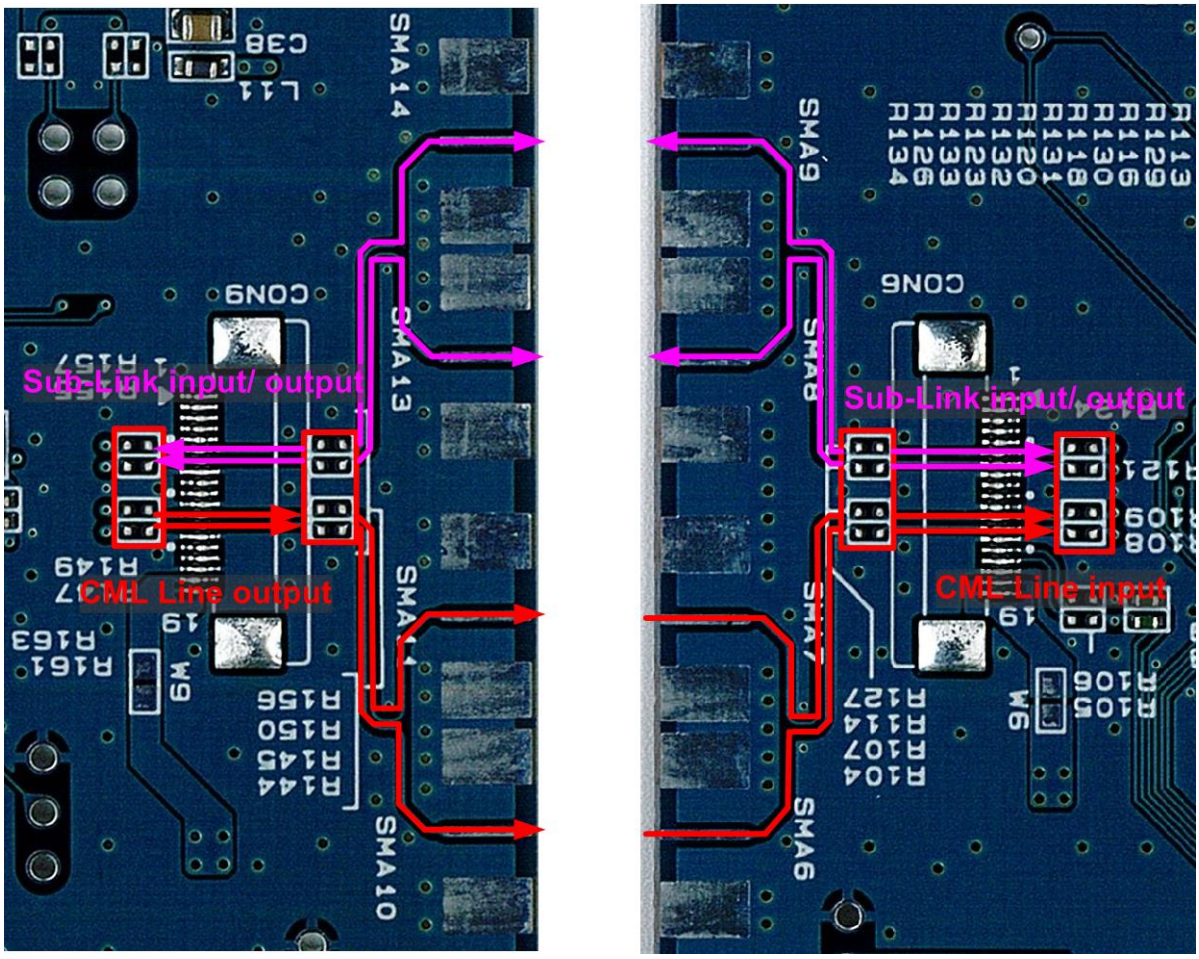
Figure 6 Resistors Mounting for 0.5mm Pitch Connector

SMA connector

Mount / unmount following 0Ω resistors to use SMA connector.
*HTPDN and LOCKN signals don't have SMA connector input / output connection.

Table 3 Mount / unmount resistors for using SMA connector

	Mount	Unmount
THEVA235	R17, R18, R23, R24, R25, R28, R31, R32	R9, R10, R11, R12, R13, R14, R15, R16, R20, R21
THEVA236	R104, R107, R108, R109, R114, R121, R124, R127	R74, R78, R81, R83, R86, R89, R91, R94, R105, R106



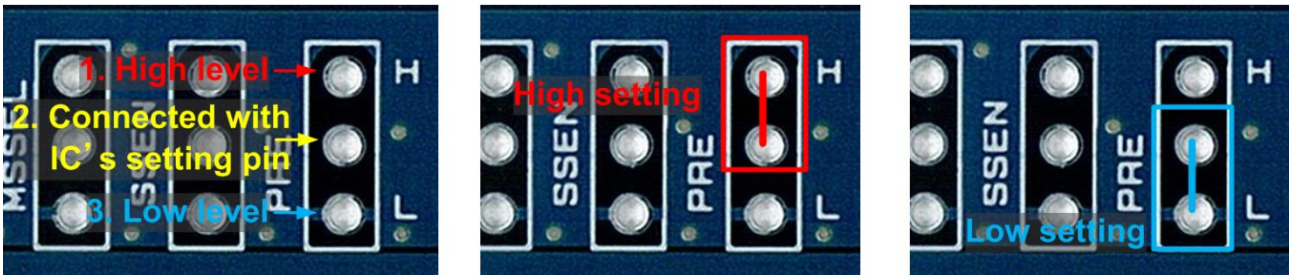
(a)THEVA235 (Bottom Side) (b)THEVA236 (Bottom Side)

Figure 7 Resistors Mounting for SMA Connector

6. Function setting

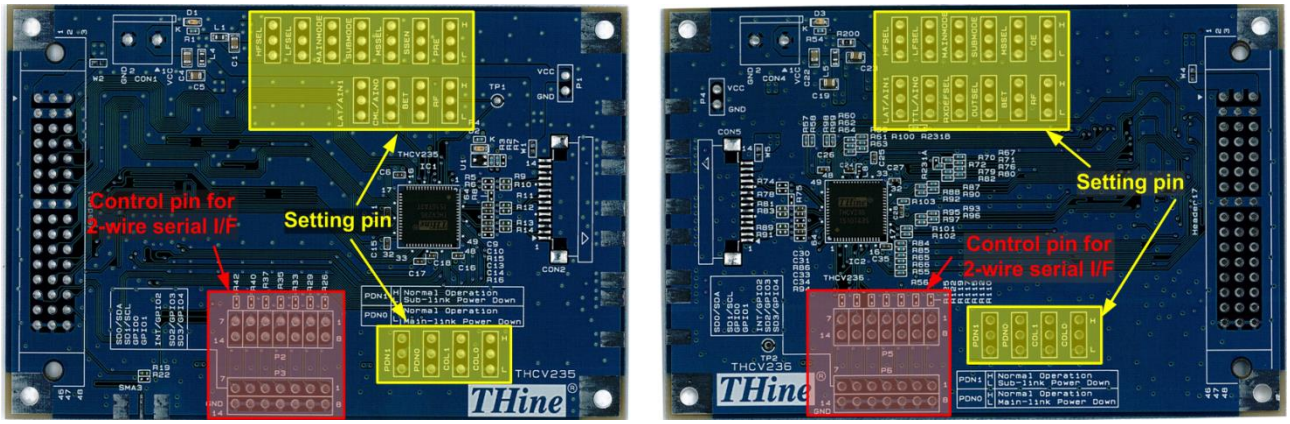
Pin#2 of each 3HEADER is connected to IC's setting pin. Each setting pin's high or low setting can set by connecting pin#2 of 3HEADER and VCC or GND level. Setting pin is yellow area in Figure 9.

P3 and P6 of control pin use to control 2-wire serial I/F. P2 and P5 of control pin can select Pull-up or Open. Control pin is red area in Figure 9.



(a)3HEADER Description (b)High Level Setting (c)Low Level Setting

Figure 8 High / Low Setting Description with 3HEADER



(a) THEVA235 (Top Side) (b) THEVA236 (Top Side)

Figure 9 Position of Function Setting pin and Control pin

Header setting description

Table 4 THEVA235 Function Setting Description

Silk	Pin Name	Function
PDN1	PDN1	Sub-Link power down control H: Normal Operation, L: Power Down
PDN0	PDN0	Main-Link power down control H: Normal Operation, L: Power Down
COL1	COL1/SD0	Color Space Converter and Data Width Setting(*1)(*2) When PDN1=**H**, this pin must be **Open**.
COL0	COL0/INT/GPIO2	Data Width Setting(*1)(*2) When PDN1=**H**, this pin must be **Open**.
HFSEL	HFSEL/TCMN	High Frequency mode select(*1) H: Enable, L: Disable When PDN1=**H**, this pin must be **Open**.
LFSEL	LFSEL	Low Frequency mode select H: Enable, L: Disable
MAINMODE	MAINMODE/TCMP	Main-Link Mode Setting(*1) H: Sync Free Mode, L: V-by-One®HS Mode When PDN1=**H**, this pin must be **Open**.
SUBMODE	HTPDN/SUBMODE	Sub-Link Mode Setting(*1) H: Low Speed Data Bridge Mode, L: 2-wire serial I/F Mode When PDN1=**L**, this pin must be **Open**. (*3)
MSSEL	LOCKN/MSSEL	Sub-Link Master/Slave Setting(*1) H: Sub-Link Master side, L: Sub-Link Slave side When PDN1=**L**, this pin must be **Open**.
SSEN	SSEN/GPIO0	Spread Spectrum Clock Setting(*1) H: Enable, L: Disable When PDN1=**H**, this pin must be **Open**.
PRE	PRE/SD1	Pre-Emphasis Level Select(*1) H: Enable, L: Disable When PDN1=**H**, this pin must be **Open**.
LAT/AIN1	LATEN/SD3/AIN1/GPIO4	Field BET Latch Select and Address Setting(*1) (*4) When Sub-Link Field BET Mode and MSSEL=**H**, this pin must be **H**. When PDN1=**H** and MSSEL=**H** (Sub-Link Slave side), this pin must be **Open**.
CML/AIN0	CMLDRV/SD2/AIN0/GPIO3	CML Output Drive Strength Select and Address Setting(*1) (*4) H: Normal, L: Weak When PDN1=**H** and MSSEL=**H** (Sub-Link Slave side), this pin must be **Open**.
BET	BET/GPIO1	Field BET Entry(*1) H: Field BET Entry, L: Normal Operation When PDN1=**H**, this pin must be **Open**.
RF	RF/BETOUT	Input clock triggering edge select(*1) H: Rising Edge, L: Falling Edge When Sub-Link Field BET Mode, this pin must be **Open**.

(*1)A pin function changes by operation mode. Carry out appropriate transact. (THCV235_THCV236_Rev.1.00_E.pdf and up)
(*2)Data Width Setting refers to data sheet for details.
(*3)HTPDN connection is option. Refer to data sheet for details.
(*4)Address Setting for 2-wire serial I/F

Table 5 THEVA236 Function Setting Description

Silk	Pin Name	Function
PDN1	PDN1	Sub-Link power down control H: Normal Operation, L: Power Down
PDN0	PDN0	Main-Link power down control H: Normal Operation, L: Power Down
COL1	COL1/SD0	Color Space Converter and Data Width Setting(*1)(*2) When PDN1=**H**, this pin must be **Open**.
COL0	COL0/INT/GPIO2	Data Width Setting(*1)(*2) When PDN1=**H**, this pin must be **Open**.
HFSEL	HFSEL/RCMN	High Frequency mode select(*1) H: Enable, L: Disable When PDN1=**H**, this pin must be **Open**.
LFSEL	LFSEL	Low Frequency mode select H: Enable, L: Disable
MAINMODE	MAINMODE/RCMP	Main-Link Mode Setting(*1) H: Sync Free Mode, L: V-by-One®HS Mode When PDN1=**H**, this pin must be **Open**.
SUBMODE	HTPDN/SUBMODE	Sub-Link Mode Setting(*1) H: Low Speed Data Bridge Mode, L: 2-wire serial I/F Mode When PDN1=**L**, this pin must be **Open.**(*3)
MSSEL	LOCKN/MSSEL	Sub-Link Master/Slave Setting(*1) H: Sub-Link Master side, L: Sub-Link Slave side When PDN1=**L**, this pin must be **Open**.
OE	OE	Output Enable Control H: LVCMOS output enable, L: LVCMOS output disable
LAT/AIN1	LATEN/SD3/AIN1/GPIO0	Field BET Latch Select and Address Setting(*1) (*4) When Sub-Link Field BET Mode and MSSEL=**H**, this pin must be **H**. When PDN1=**H** and MSSEL=**H** (Sub-Link Slave side), this pin must be **Open**.
TTL/AIN0	TTLDRV/SD2/AIN0/GPIO1	CML Output Drive Strength Select and Address Setting(*1) (*4) H: Normal, L: Weak When PDN1=**H** and MSSEL=**H** (Sub-Link Slave side), this pin must be **Open**.
RXDEFSEL	RXDEFSEL	Internal Register Default Setting Select. H: For THCV235, L: For THCV231
OUTSEL	OUTSEL/SD1	Permanent Clock Output Control(*1) H: Enable, L: Disable When PDN1=**H**, this pin must be **Open**.
BET	BET	Field BET Entry H: Field BET Entry, L: Normal Operation
RF	RF/BETOUT	Input clock triggering edge select(*1) H: Rising Edge, L: Falling Edge When Sub-Link Field BET Mode, this pin must be **Open**.

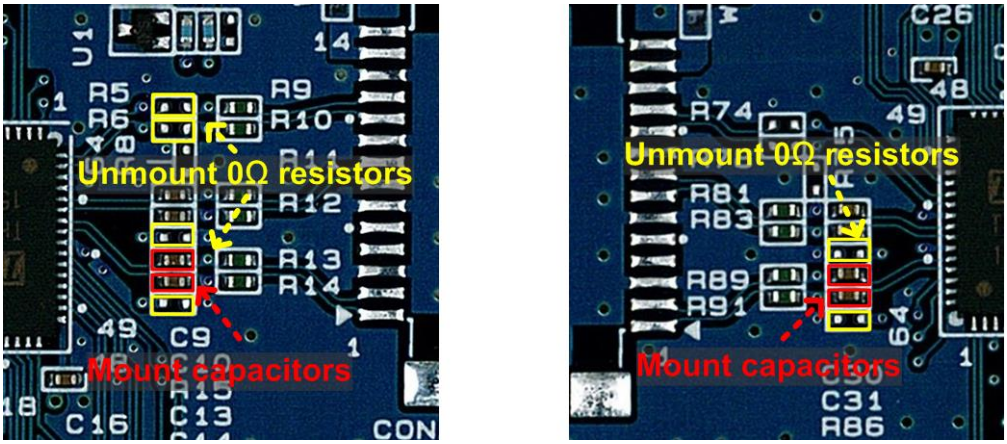
(*1)A pin function changes by operation mode. Carry out appropriate control. (THCV235_THCV236_Rev.1.00_E.pdf and up)
(*2)Data Width Setting refers to data sheet for details.
(*3)HTPDN connection is option. Refer to data sheet for details.
(*4)Address Setting for 2-wire serial I/F

Main-Link and Sub-Link are active

Mount(red line) / unmount(yellow line) following 0Ω resistors and capacitors to use Main-Link and Sub-Link.

	Mount	Unmount
THEVA235	C9, C10, C13, C14	R5(*1), R6(*1), R15, R16
THEVA236	C30, C31, C33, C34, R68(*1), R69(*1)	R86, R94

(*1) For control MSSEL and SUBMODE



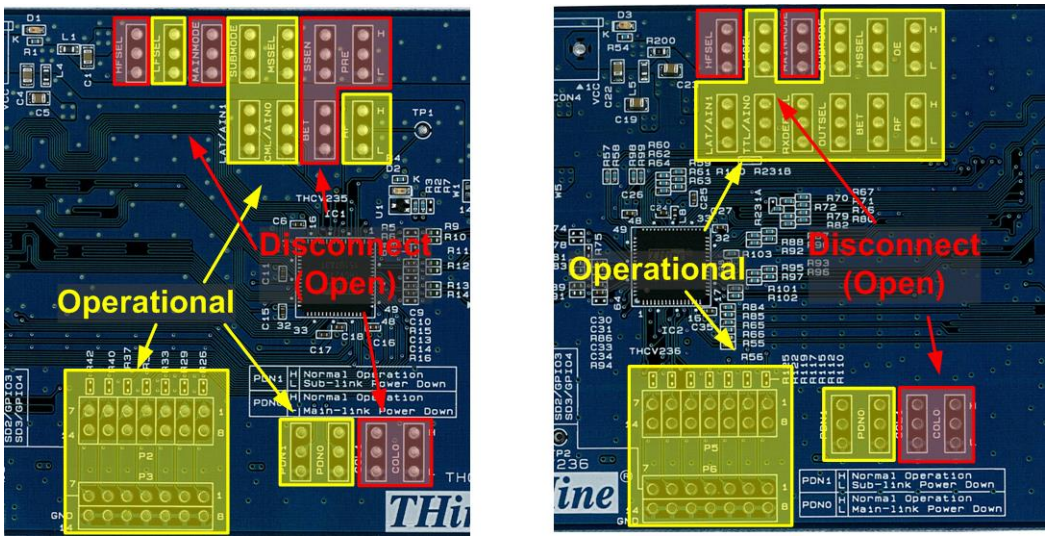
(a) THEVA235 (Top Side) (b) THEVA236 (Top Side)

Figure 10 Mounting resistors and capacitors when Main-Link and Sub-Link are active

If IC's pins are used as open-drain output, connect with pull-up resistors (e.g. 10kΩ) and connect P2 and P5 of header.

	Mount	Unmount
THEVA235	R27, R30, R34, R36, R38, R39, R41	R47, R48, R49, R50, R51, R52, R53
THEVA236	R111, R113, R116, R118, R120, R123, R126	R128, R129, R130, R131, R132, R133, R134

Furthermore, operational (yellow area) / disconnect (red area) following header.



(a) THEVA235 (Top Side) (b) THEVA236 (Top Side)

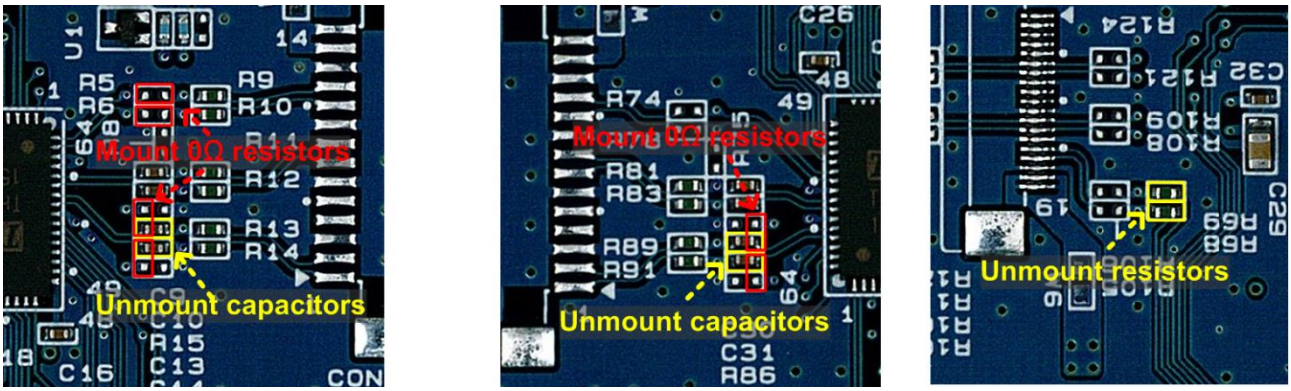
Figure 11 Operational / disconnect header when Main-Link and Sub-Link are active

Only Main-Link is active

Mount(red line) / unmount(yellow line) following 0Ω resistors and capacitors to use only Main-Link.

	Mount	Unmount
THEVA235	C9, C10, R5(*1), R6(*1), R15(*2), R16(*2)	C13, C14
THEVA236	C30, C31, R86(*2), R94(*2)	C33, C34, R68(*1), R69(*1)

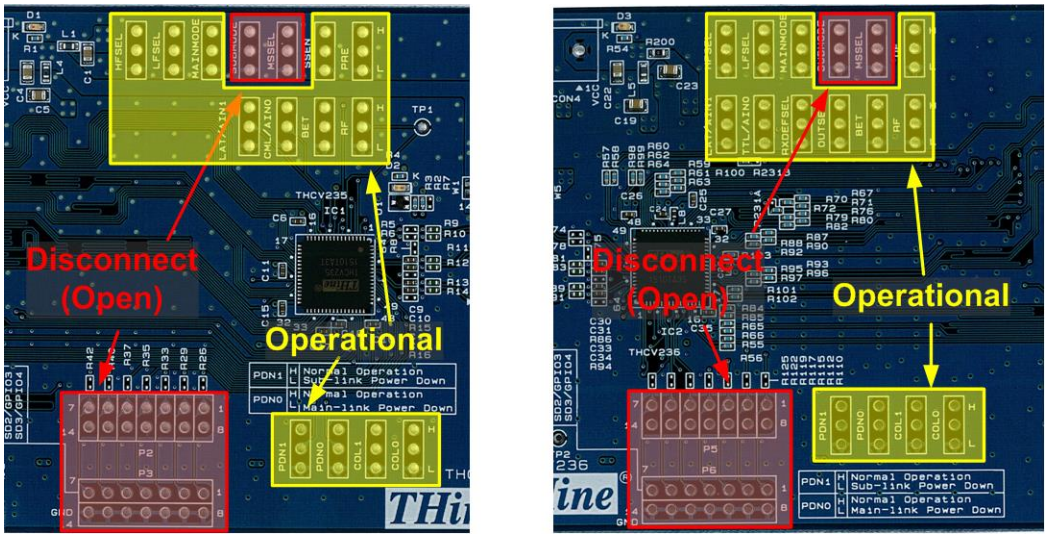
(*1) For connect HTPDN and LOCKN.
(*2) Connect IC pin side, refer in below.



(a) THEVA235 (Top Side) (b) THEVA236 (Top Side) (c) THEVA236 (Bottom Side)

Figure 12 Mounting resistors and capacitors when only Main-Link is active

Furthermore, operational (yellow area) / disconnect (red area) following header.

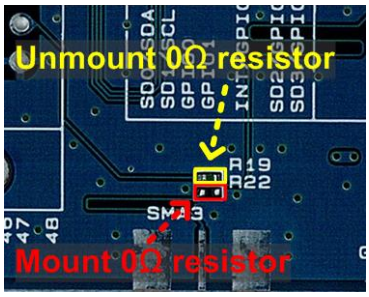


(a) THEVA235 (Top Side) (b) THEVA236 (Top Side)

Figure 13 Operational / disconnect header when only Main-Link is active

7. Clock Input from SMA Connector

THEVA235 can also choose the clock input from SMA connector by using 0Ω resistors. If you want to use SMA connector for clock input, Mount the 0Ω resistors on R22 and unmount on R19. This input function is to use Field BET operation in mainly.



THEVA235 (Top side)

Figure 14 Clock input from SMA connector

8. Status Indicate LED

The following show indicating status of each LED. (*1)

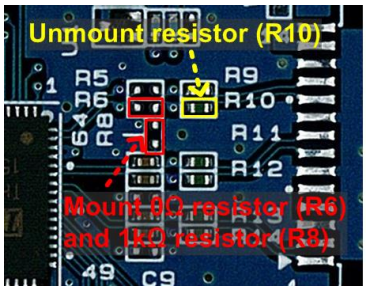
D1: VCC Power Supply Indicator for THEVA235
D2: LOCKN Status Indicator (*2)
D3: VCC Power Supply Indicator for THEVA236

(*1) When VCC is over 2.0V, LED indicator will be valid.
(*2) When only Main-Link is active, LOCKN indicator will be valid.

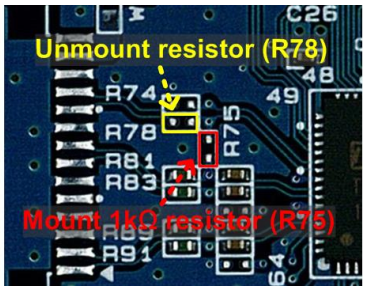
9. LOCKN Sharing and HTPDN Omission

LOCKN Sharing

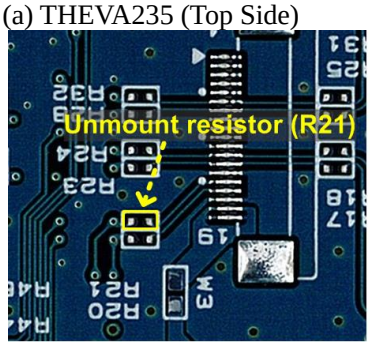
LOCKN connection can be shared with CML trace when only Main-Link is active. Mount 1kΩ resistors to share the LOCKN signal, and unmount the 0Ω resistors shown in Figure 15.



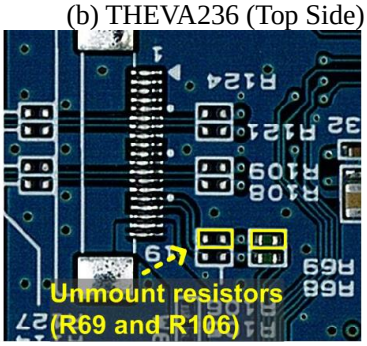
(a) THEVA235 (Top Side)



(b) THEVA236 (Top Side)



(c) THEVA235 (Bottom Side)

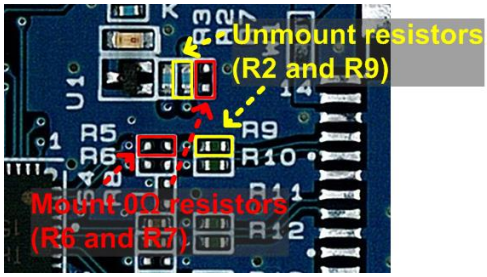


(d) THEVA236 (Bottom Side)

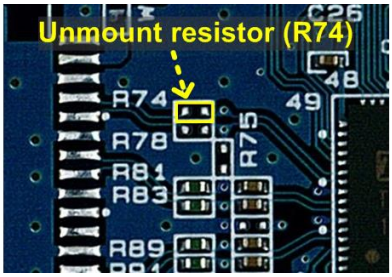
Figure 15 LOCKN Sharing

HTPDN Signal Omission

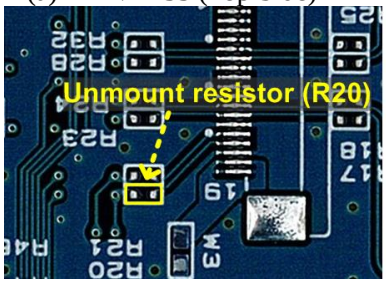
HTPDN signal can be omitted by using 1kΩ resistor when only Main-Link is active. Mount 1kΩ resistor to pull down the HTPDN signal at transmitter side, and unmount the 0Ω resistors shown in Figure 16. When the HTPDN omission using, HTPDN output from receiver side is open connection.



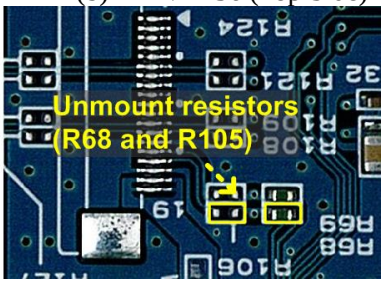
(a)THEVA235 (Top Side)



(b)THEVA236 (Top Side)



(c)THEVA235 (Bottom Side)



(d)THEVA236 (Bottom Side)

Figure 16 HTPDN Omission

10.Schematic

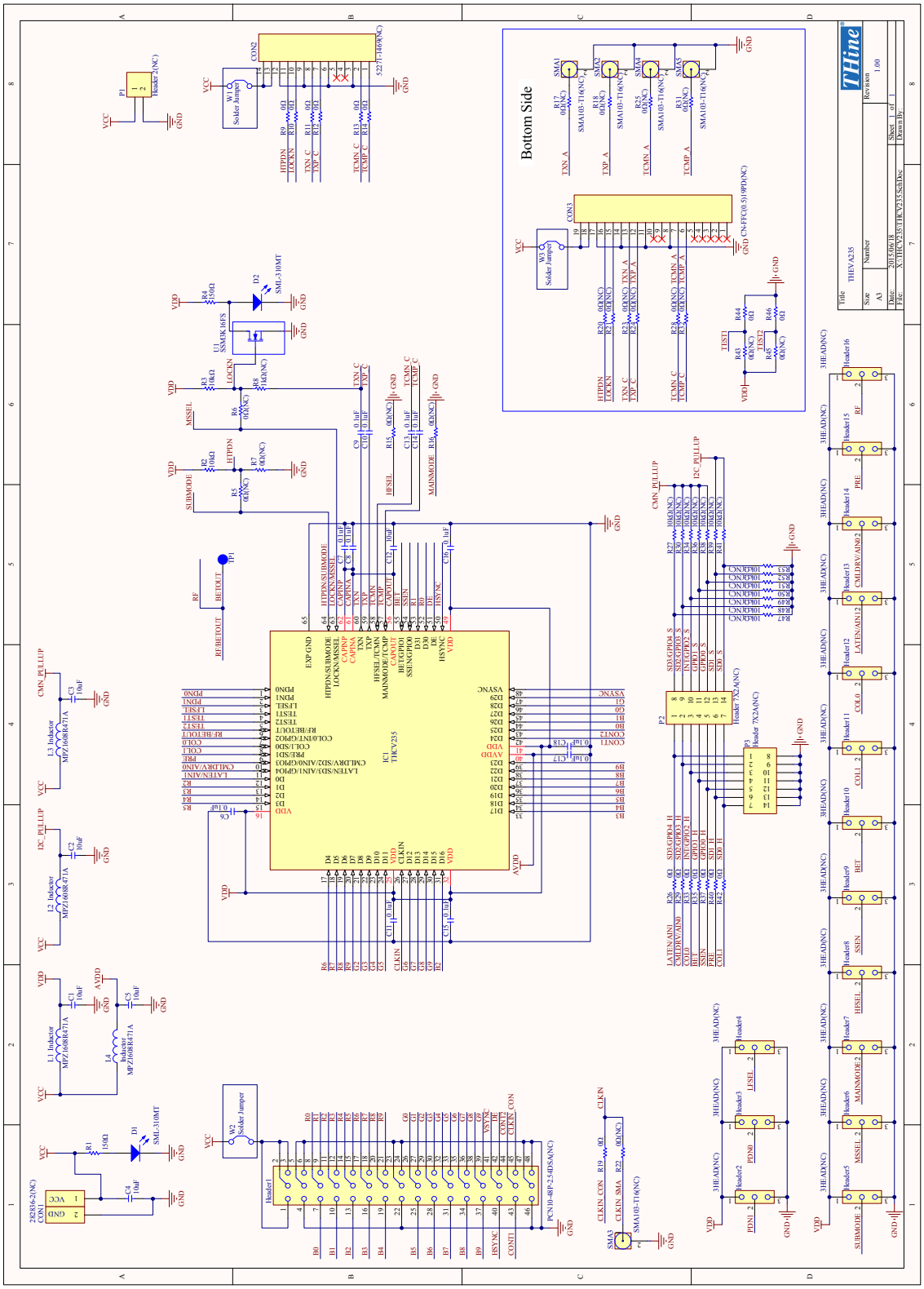


Figure 17 THEVA235 Schematic

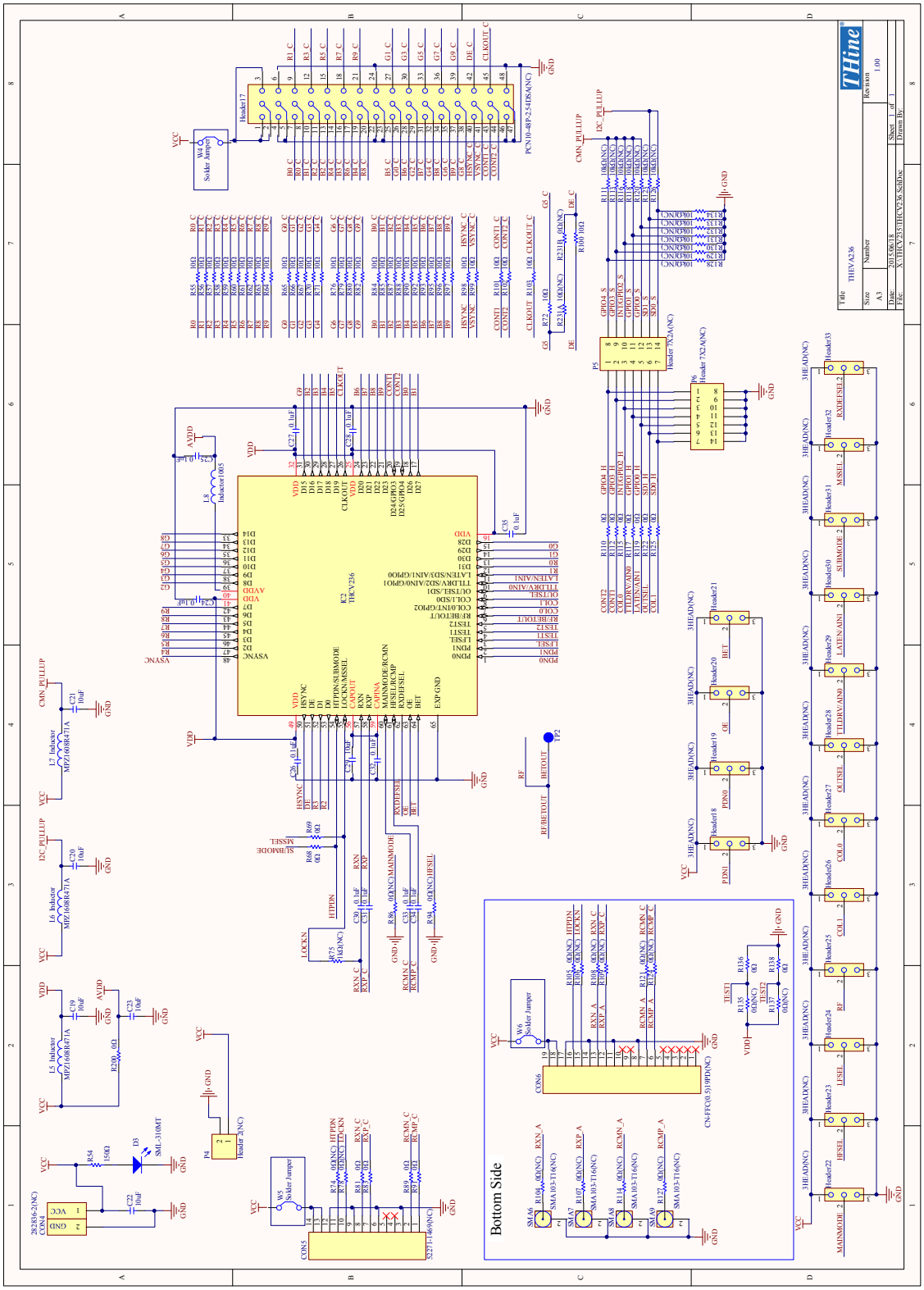


Figure 18 THEVA236 Schematic

11.Bills of Materials

Table 6 THEVA235 BOM

Type	Value / Part No.	Package	Spec	Reference No.	Quantity	Note
Capacitor	10uF	2012	16V	C1, C2, C3, C4, C5, C12	6	-
Capacitor	0.1uF	1005	16V	C6, C7, C8, C9, C10, C11, C13, C14, C15, C16, C17, C18	12	-
Connector	282836-2(NC)	5mm pitch	2pin	CON1	1	-
Connector	52271-1469(NC)	1mm pitch	14pin	CON2	1	-
Connector	CN-FFC(0.5)19PD(NC)	0.5mm pitch	12pin	CON3	1	-
Connector	PCN10-48P-2.54DSA(NC)	2.54mm pitch	48pin	Header1	1	-
Connector	SMA103-T16(NC)	1.6mm	PCB End Jack	SMA1, SMA2, SMA3, SMA4, SMA5	5	-
Header	Header, 3X1	2.54mm pitch	-	Header2, Header3, Header4, Header5, Header6, Header7, Header8, Header9, Header10, Header11, Header12, Header13, Header14, Header15, Header16	15	-
Header	Header, 2X1	2.54mm pitch	-	P1	1	-
Header	Header, 7X2	2.54mm pitch	-	P2, P3	2	-
IC	THCV235	QFN64	-	IC1	1	-
IC	SSM3K16FS	SSM	RON15Ω	U1	1	-
Inductor	MPZ1608R471A	1608	1.2A	L1, L2, L3, L4	4	-
LED	SML-310MT	1608	Green	D1, D2	2	-
Resistor	150Ω	1005	0.1W	R1, R4	2	-
Resistor	10kΩ	1005	0.1W	R2, R3	2	-
Resistor	0Ω(NC)	1005	1A	R5, R6, R7, R15, R16, R17, R18, R20, R21, R22, R23, R24, R25, R28, R31, R32, R43, R45	18	-
Resistor	1kΩ(NC)	1005	0.1W	R8	1	-
Resistor	0Ω	1005	1A	R9, R10, R11, R12, R13, R14, R19, R26, R29, R33, R35, R37, R40, R42, R44, R46	16	-
Resistor	10kΩ(NC)	1005	0.1W	R27, R30, R34, R36, R38, R39, R41, R47, R48, R49, R50, R51, R52, R53	14	-

Table 7 THEVA236 BOM

Type	Value / Part No.	Package	Spec	Reference No.	Quantity	Note
Capacitor	10uF	2012	16V	C19, C20, C21, C22, C23, C29	6	-
Capacitor	0.1uF	1005	16V	C24, C25, C26, C27, C28, C30, C31, C32, C33, C34, C35	11	-
Connector	282836-2(NC)	5mm pitch	2pin	CON4	1	-
Connector	52271-1469(NC)	1mm pitch	14pin	CON5	1	-
Connector	CN-FFC(0.5)19PD(NC)	0.5mm pitch	12pin	CON6	1	-
Connector	PCN10-48P-2.54DSA(NC)	2.54mm pitch	48pin	Header17	1	-
Connector	SMA103-T16(NC)	1.6mm	PCB End Jack	SMA6, SMA7, SMA8, SMA9	4	-
Header	Header, 3X1	2.54mm pitch	-	Header18, Header19, Header20, Header21, Header22, Header23, Header24, Header25, Header26, Header27, Header28, Header29, Header30, Header31, Header32, Header33	16	-
Header	Header, 2X1	2.54mm pitch	-	P4	1	-
Header	Header, 7X2	2.54mm pitch	-	P5, P6	2	-
IC	THCV236	QFN64	-	IC2	1	-
Inductor	MPZ1608R471A	1608	1.2A	L5, L6, L7	3	-
Inductor	MPZ1005S331ET000	1005	700mA	L8	1	-
LED	SML-310MT	1608	Green	D3	1	-
Resistor	150Ω	1005	0.1W	R54	1	-
Resistor	10Ω	1005	0.1W	R55, R56, R57, R58, R59, R60, R61, R62, R63, R64, R65, R66, R67, R70, R71, R72, R76, R79, R80, R82, R84, R85, R87, R88, R90, R92, R93, R95, R96, R97, R98, R99, R100, R101, R102, R103	36	-
Resistor	0Ω	1005	1A	R68, R69, R81, R83, R89, R91, R110, R112, R115, R117, R119, R122, R125, R136, R138	15	-
Resistor	0Ω(NC)	1005	1A	R74, R78, R86, R94, R104, R105, R106, R107, R108, R109, R114, R121, R124, R127, R135, R137, R231B	17	-
Resistor	1kΩ(NC)	1005	0.1W	R75	1	-
Resistor	10kΩ(NC)	1005	1A	R111, R113, R116, R118, R120, R123, R126, R128, R129, R130, R131, R132, R133, R134	14	-
Resistor	0Ω	1608	0.1W	R200	1	-
Resistor	10Ω(NC)	1005	0.1W	R231A	1	-

12.Set Items

Table 8 Set Items

TYPE	Part No.
DC Connector	282836-2
FFC Connector for V-by-One®HS Link	52271-1469
FFC 14pin 1mm pitch for V-by-One®HS Link	98267-0299
Pin Header	-

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

13.Notices and Requests

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

For the Material:

1. The product specifications described in this material are subject to change without prior notice.

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 even if the errors or omissions should be found in this material, THine may not be able to correct them immediately.

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For the Product:

1. This product is solely designed for evaluation purpose, and other purposes including mass production and distribution are not intended.

2. This product has been solely manufactured for electric design engineers but not for end-users.

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 means, traffic signal device, or other various types of safety device, such use must be after applying appropriate measures to the product.

5. This product has been designed with the utmost care to accomplish the purpose of evaluation of IC products manufactured by THine Electronics, Inc. (“THine”); however, THine MAKES NO WARRANTIES OR REPRESENTATIONS WITH REGARD TO ANY PERFORMANCE OR FUNCTION OF THIS PRODUCT IN ANY CIRCUMSTANCES.

6. This product has been manufactured with the utmost care in quality control and product reliability; however, there may be faults or defects with a low but fixed probability, as inevitable phenomenon concerned with semiconductor manufacturing processes. Therefore, customers are encouraged to have sufficiently redundant or error-preventive design applied to the use of the product so as not to have THine’s product cause any social or public damage. Neither replacement nor failure analysis of the product is available in any case of defects with the product and/or the product’s components.

7. Customers are asked, if required, to judge by themselves on whether this product falls under the category of strategic goods under the Foreign Exchange and Foreign Trade Act.

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9. Developing, designing and manufacturing of customers’ own products, equipment or system by using of this product is strictly prohibited in any way.

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