TSA-OP-IC101

User's Manual

Issued：October 20, 2014(Version 1.0)

Tessera Technology Corporation

TS-TUM02272

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- Make sure all test and measurement equipment, including the work station, is properly grounded.
- The user should wear an ESD wrist strap to prevent any buildup of static electricity.

Revision History

Version	Date	Description
Ver 1.0	14/10/20	Initial version

Table of contents

1. Overview

1.1 Document Overview

This user's manual explains the hardware specifications for the Smart Analog IC101 Renesas Starter Kit Option Board.

1.2 Related Terminology

This document uses the following terms in explanations of hardware specifications.

Table 1-1 Terminology

Term	Definition
SAIC101	Abbreviation for Smart Analog IC101
RSK	Abbreviation for Renesas Starter Kit
SPI	Abbreviation for Serial Peripheral Interface communications
UART	Abbreviation for Universal Asynchronous Receiver Transmitter

1.3 RSK Board Features

- Offers RSK application headers and compatible connectors for evaluating any Renesas MCU used with SAIC101.
- Comes mounted with temperature sensor (thermistor) for quick and easy operations confirmation.

1.4 Product Overview

This product is configured with the following components.

Some parts are not bundled with the kit and must be purchased and mounted on the board by the user.

- TSA-OP-IC101
  - RSK-OP-IC101 board
  - Test pins: 6
  - Read me first

The board's external picture is shown in Figure 1.

Figure 1. RSK-OP-IC101 External Picture

1.5 Hardware Specifications

Table 1-2 shows the hardware specifications for the RSK board.

Table 1-2 Hardware Specifications for RSK Board

Spec Item	Description
Mounted Smart Analog IC	Renesas Electronics SAIC101 (RAA730101) 16-bit A/D ΔΣconverter IC with programmable gain amplifier
Interface	External power-supply connection I/F CPU board connection I/F External sensor I/F Pattern (oscillator/BNC) for MCLK (SAIC101) external input circuit Sampling I/F
Supply Voltage	+5.0V/+3.3V (from CPU board or external power supply
Display	LED (Power)
Mounted sensor	Temperature sensor NXFT15XH103FA2 (Murata)
Dimensions	Board dimensions 100 x 105mm (W x D)

1.6 Board Block Diagram

The RSK-OP-IC10 board block diagram is shown below.

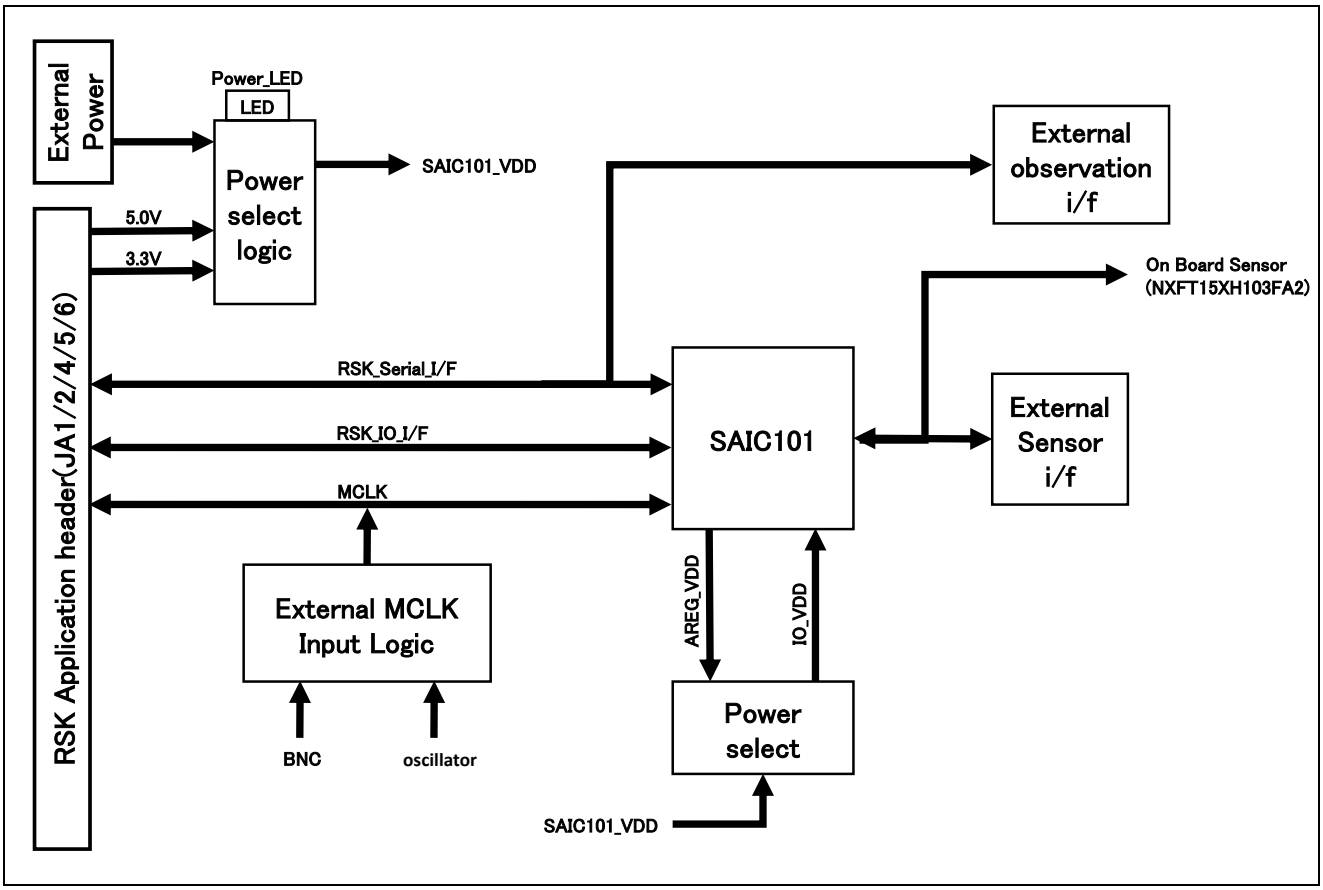


Figure 2. RSK-OP-IC101 Board Block Diagram

1.7 Description of Key Components

Key components comprising the RSK-OP-101 board are described below.

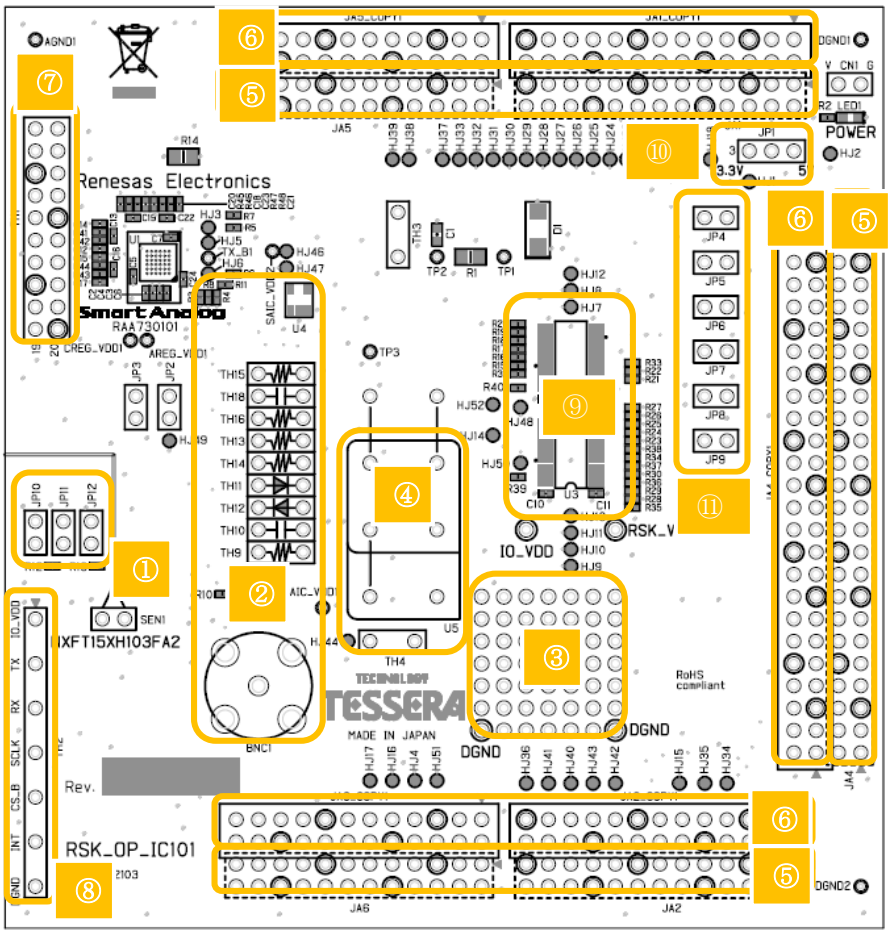


Figure 3. RSK-OP-IC101 Board Component Names

Key Component Positions

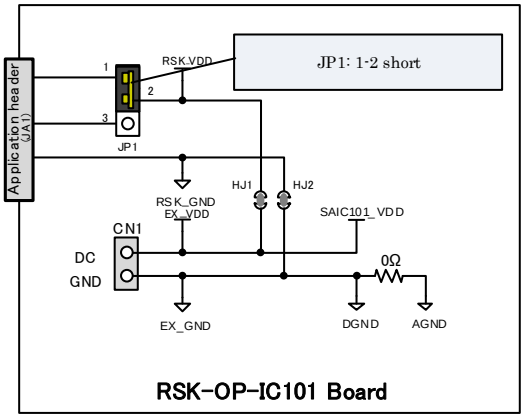
No	Reference	Parts	Function
①	JP10, JP11, JP12	Jumper	For on-board sensor connection
②	-	BCN expansion pattern	Component mounting positions when inputting MCLK through BNC
③	-	Universal pattern	General pattern
④	U5	Oscillator extension pattern	Component mounting positions when inputting MCLK through oscillator
⑤	JA1/JA2/JA4/JA5/JA6	RSK connection pattern	RSK application header connection
⑥	JA1_COPY/JA2_COPY JA4_COPY/JA5_COPY JA6_COPY	RSK signal pattern	For other RSK application header compatible option board connections
⑦	TH1	Sensor expansion pin	Used for Smart Analog IC analog input, power supply pin and sensor expansion.
⑧	TH2	Serial signal monitor pin	For serial signal monitoring
⑨	U2, U3	Level shifter	Power supply signal conversion
⑩	JP1	Jumper	For power supply 5V/3.3V switch
⑪	JP4/JP5/JP6 JP7/JP8/JP9	Jumper	For serial send/receive pin switch

2. Function

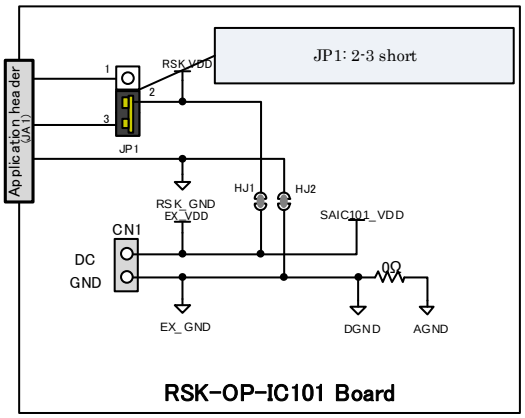
2.1 Power Supply Switch Setting

Various power sources can be used to power the RSK board, as shown below.

① Supply 5V (CON_5V) from RSK to RSK-OP-IC101 board (default state): Configuration 1



② Supply 3.3V (CON_3V3) from RSK to RSK-OP-IC101 board: Configuration 3



③ Supply 5V/3.3V from RSK-OP-IC101 board to RSK side: Configuration 1 or 3

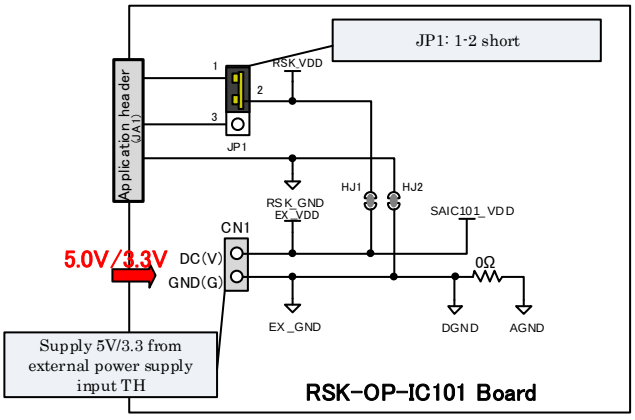
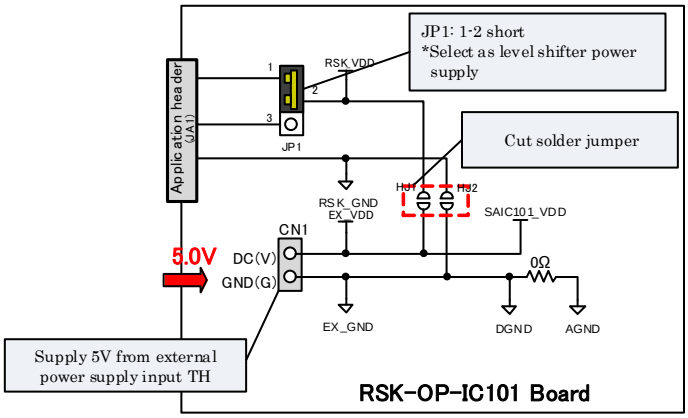


Figure 4. Power Supply Settings (1/2)

④ Supply 5V directly to RSK-OP-IC101 board and isolate power from RSK board(when MCU power supply =CON_5V): Configuration 1



⑤ Supply 5V/3/3V directly to RSK-OP-IC101 board and isolate power from RSK board (when MCU power supply =CON_3V3): Configuration 2 or 3

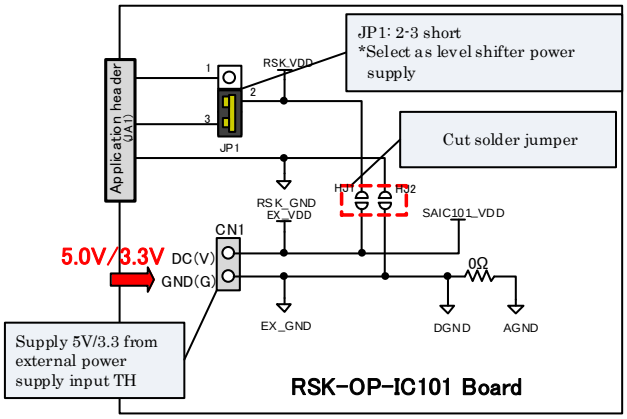


Figure 5. Power Supply Settings (2/2)

2.2 Consumption Current Measurement Pin

The RSK board is equipped with a pin for measuring consumption current. To measure consumption current, remove the 0 Ohm resister (R1) and measure the current flow between TP1 and TP2.

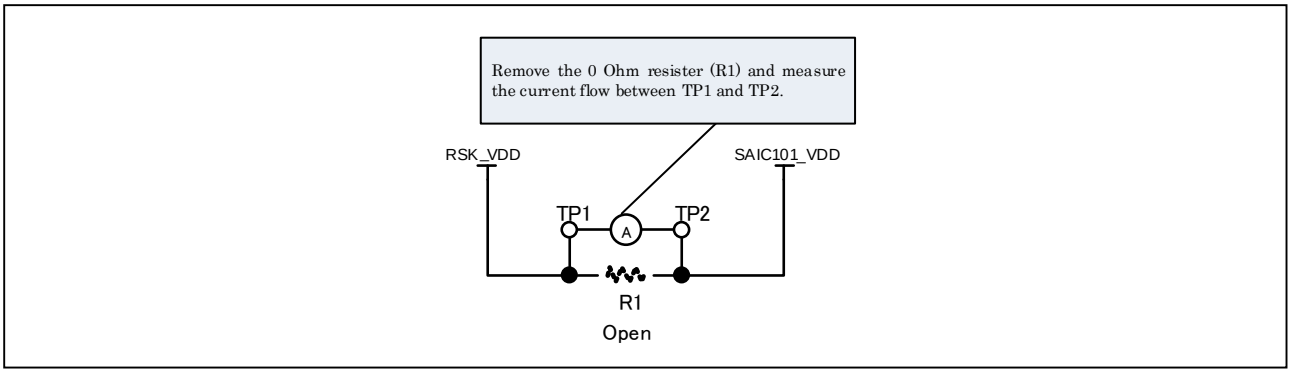


Figure 6. Circuit Structure when Measuring Current

2.3 SAIC101 Power Supply Configuration

SAIC01 supports three power supply configurations.

Configuration 1: external power supply (3.3V-5.5V) = RVDD = IOVDD, AREG = AVDD, CREG = ADVDD = DVDD

Configuration 2: external power supply (3.3V-5.5V) = RVDD, AREG = AVDD = IOVDD, CREG = ADVDD = DVDD

Configuration 2: external power supply (2.7V-3.6V) = RVDD = AVDD= IOVDD, AREG disabled (AREGPD=1), CREG = ADVDD = DVDD

2.3.1 SAIC101 Power Supply Configuration Switch Circuit

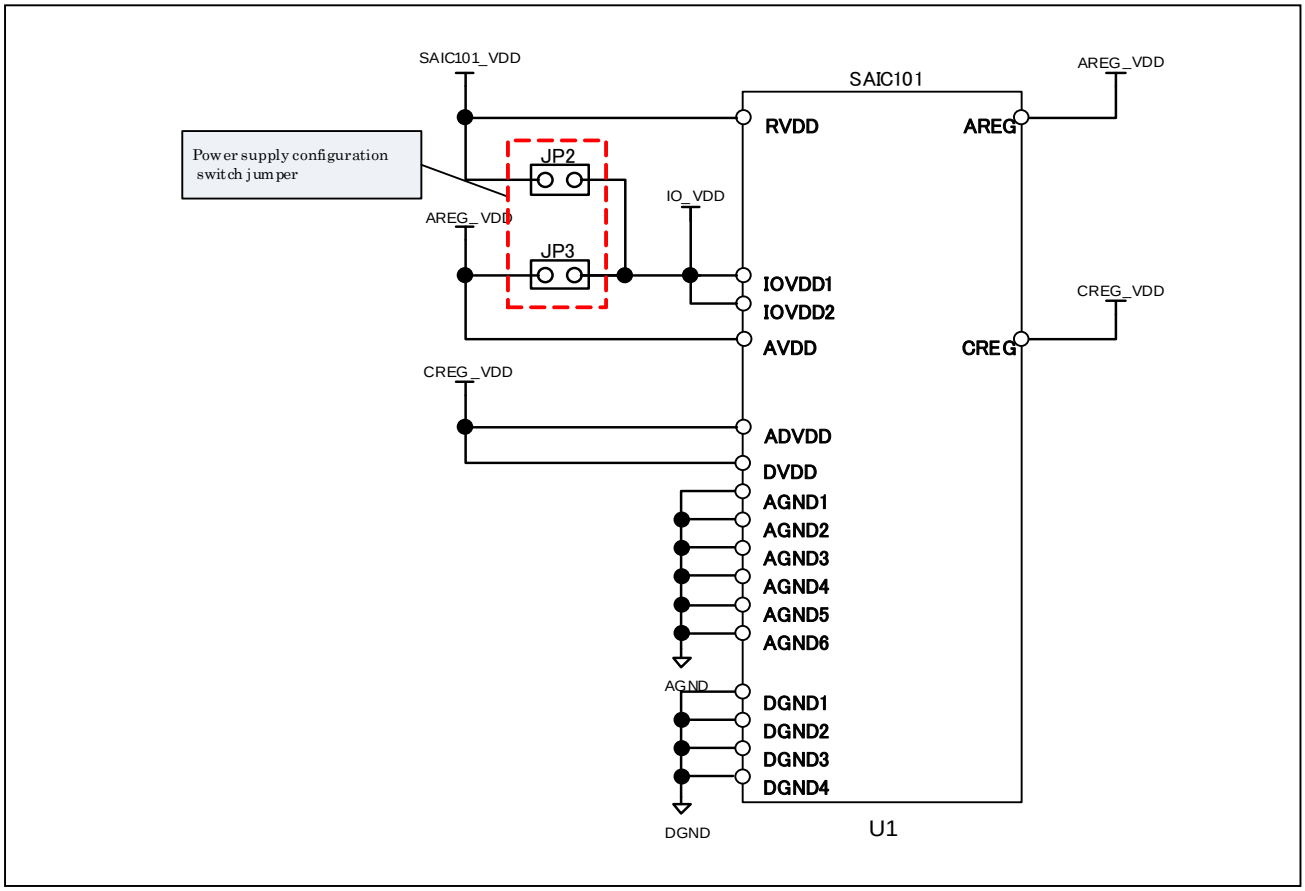
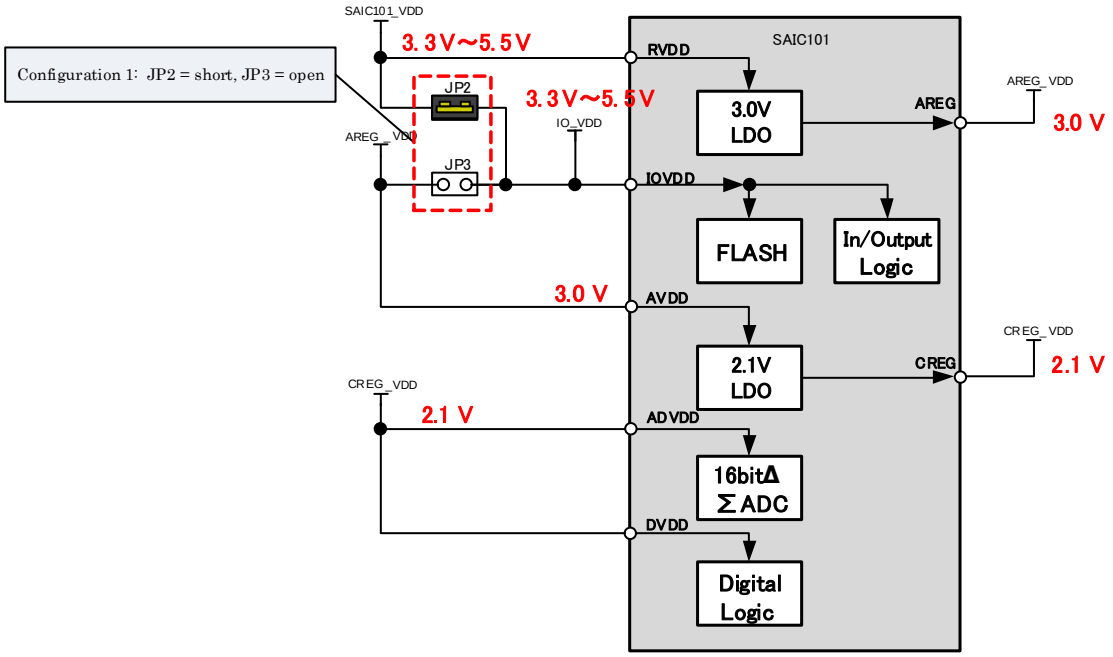


Figure 7. Power supply constitution change circuit

2.3.2 SAIC101 Power Supply Configuration Switch Circuit Explanation

① Configuration 1: settings and supply voltages (default setting)



② Configuration 2: settings and supply voltages

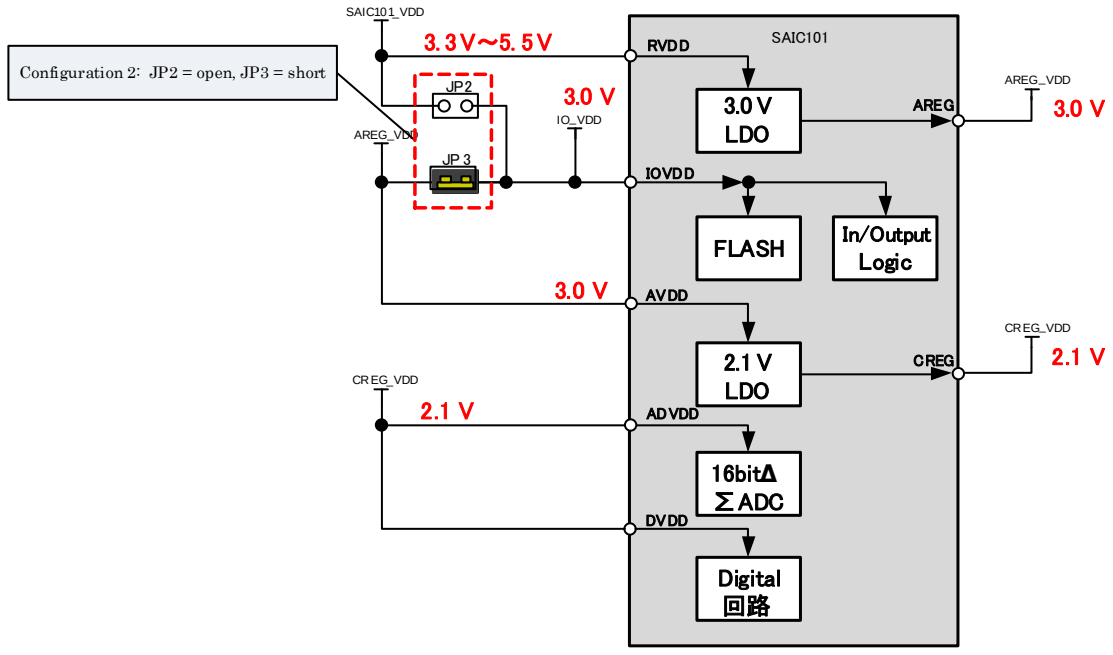


Figure 8. Power Supply Configuration Switch Circuit Settings (1/2)

③ Configuration 3: settings and supply voltages

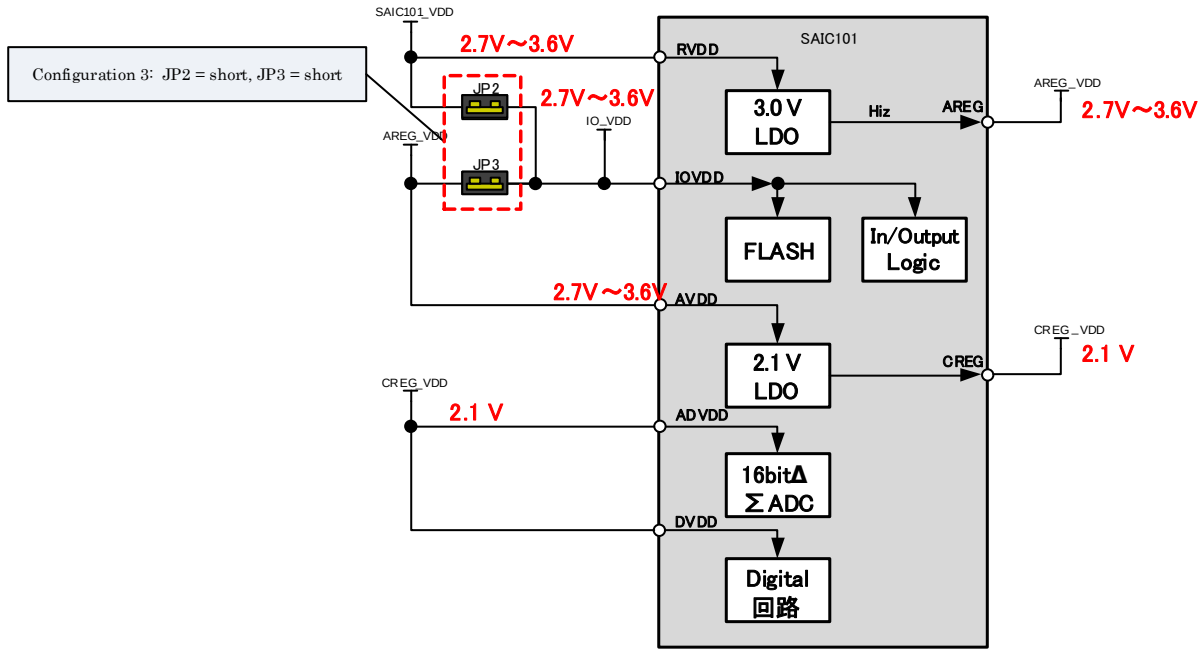


Figure 9. Power Supply Configuration Switch Circuit Settings (2/2)

2.4 RSK Interface

2.4.1 RSK-OP-IC101 Board and RSK Interface

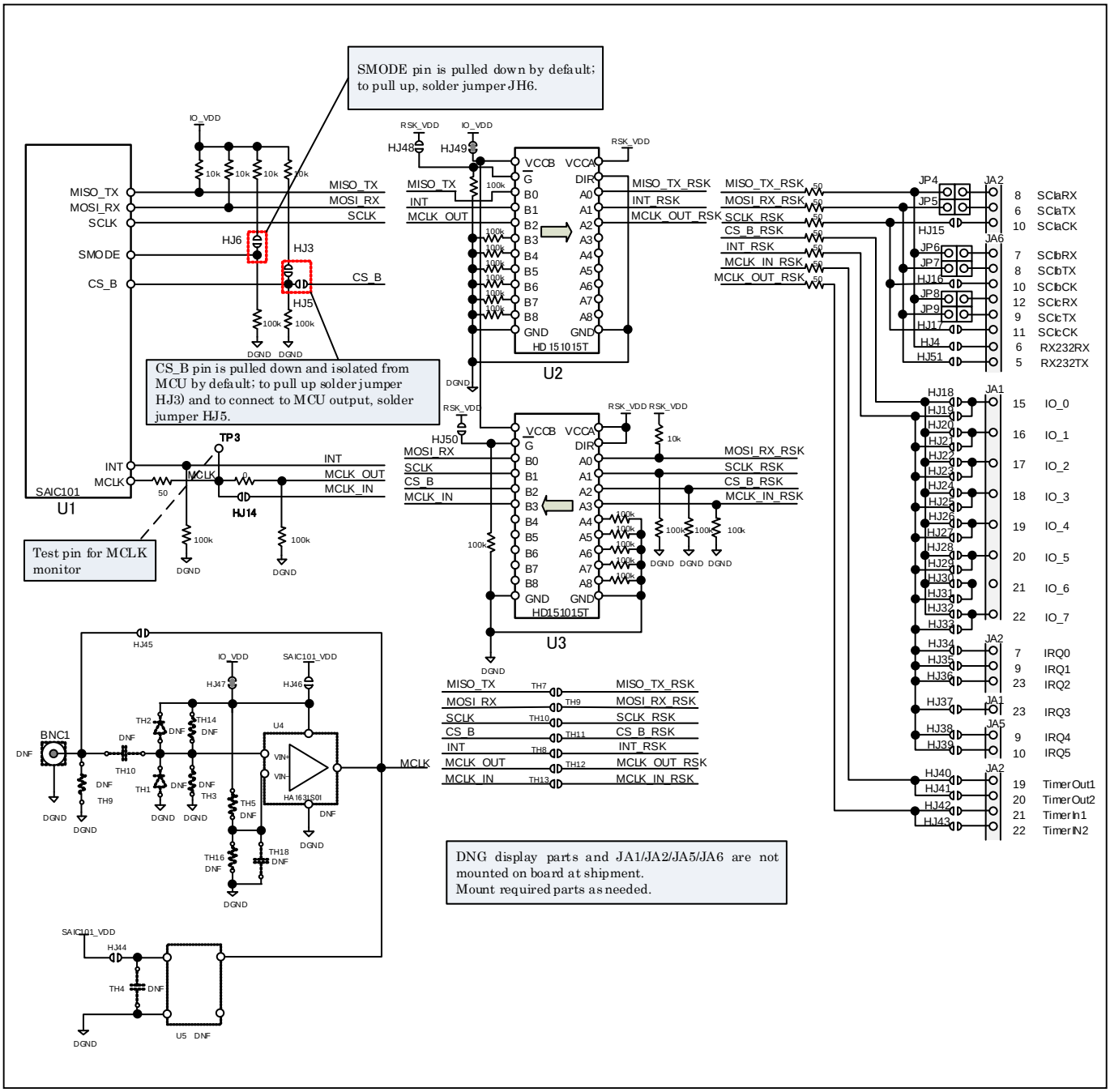


Figure 10. RSK-OP-IC101 Board and RSK Interface

2.5 How to Set Serial I/F

① UART Setting Example

*When using serial pins SCIcRX (JA6:12) and SCIcTX (JA6:9)

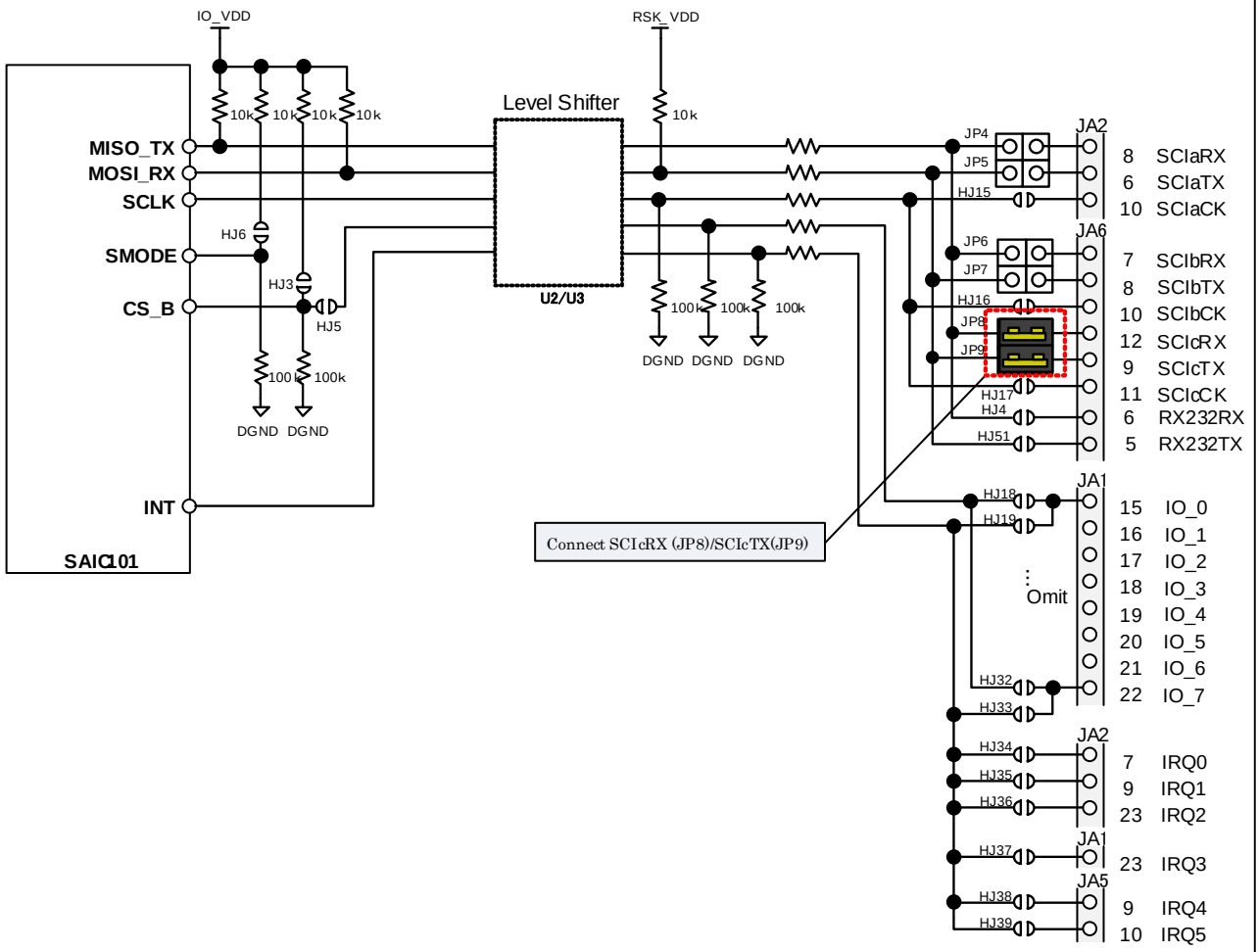


Figure 11. Serial I/F Setting (UART)

② SPI Setting Example

Conditions: When using serial pins SCIcRX, SCIcTX, and SCIcCK, and connecting CS_B pin to IO_6 and INT pin to IO_7.

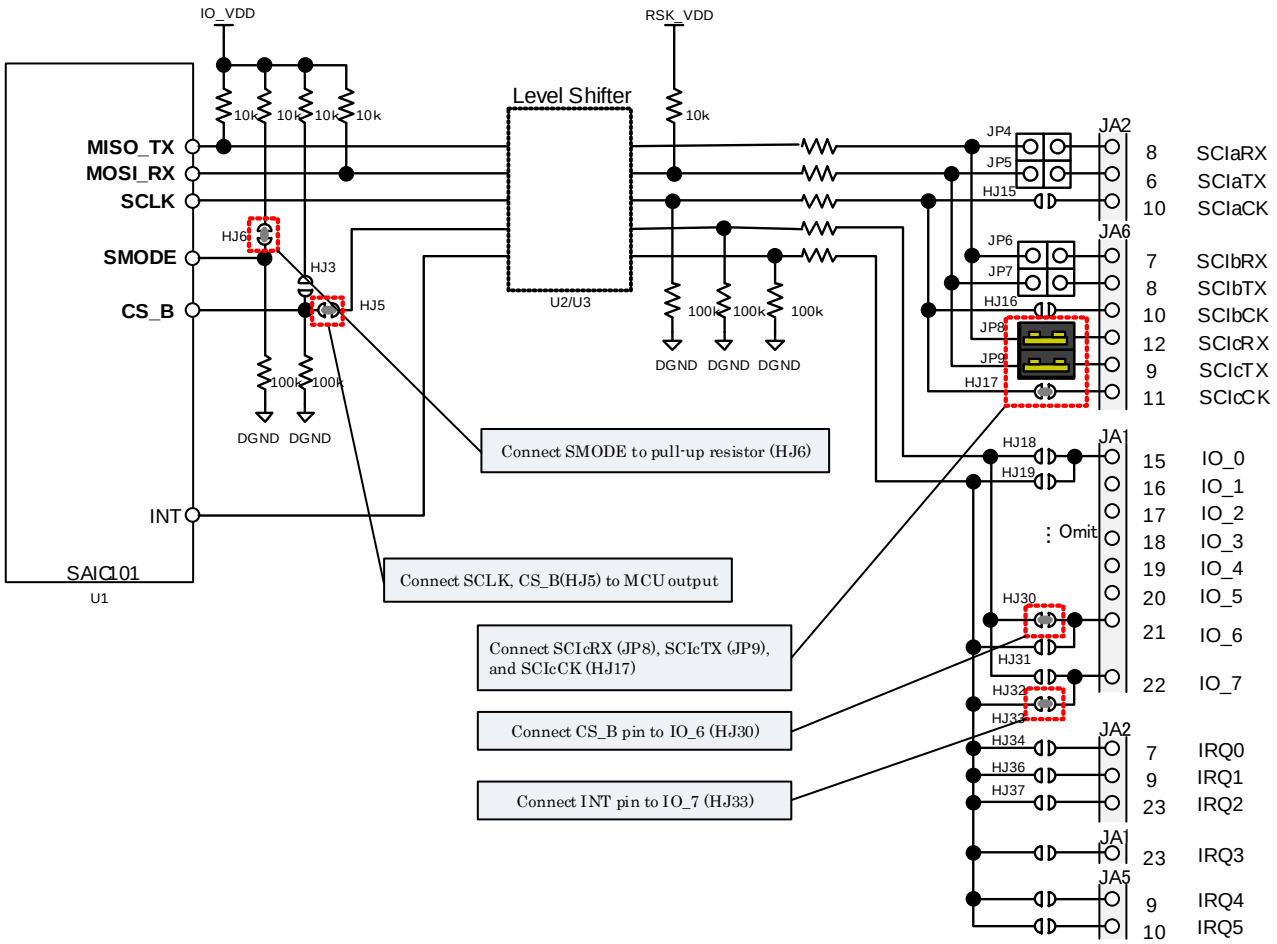


Figure 12. Serial I/F Setting (SPI)

2.6 How to Bypass Level Shifter

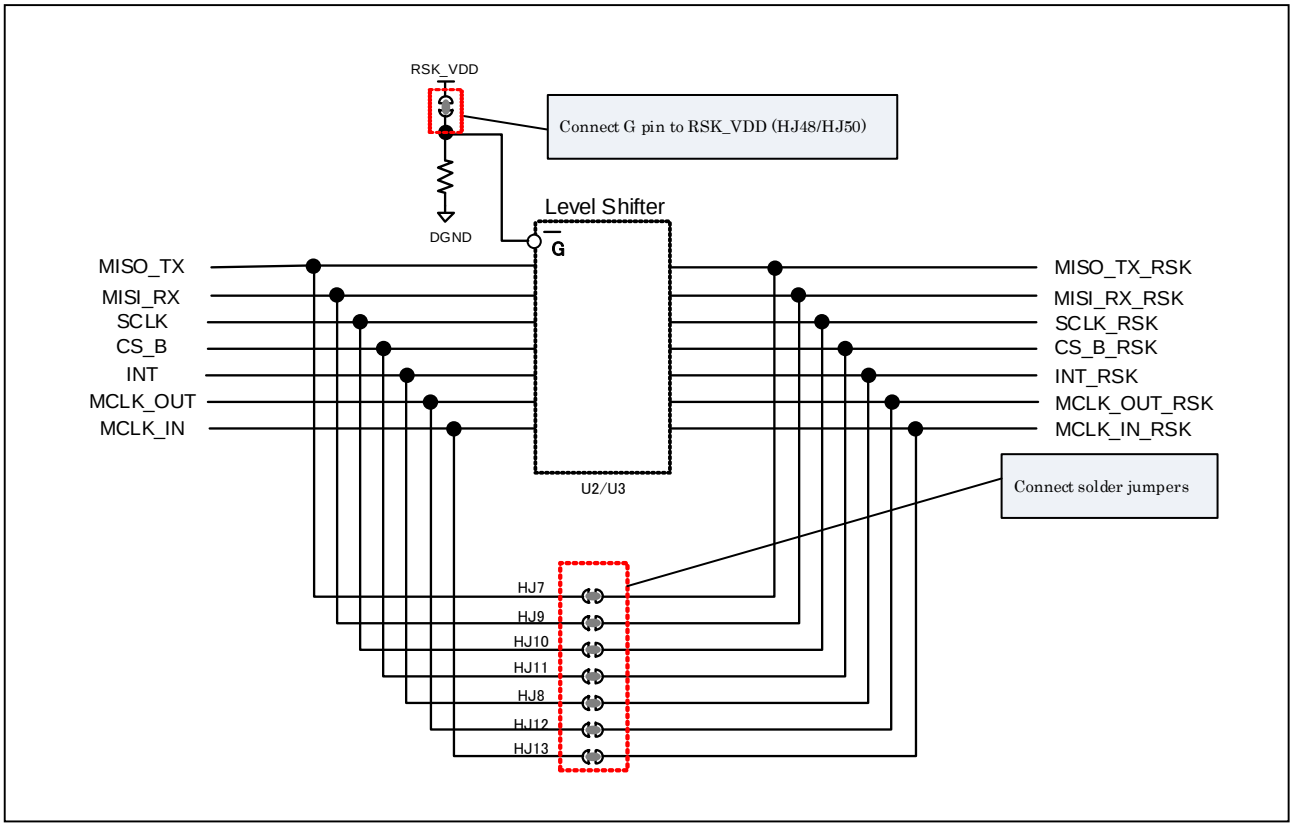


Figure 13. How to Bypass Level Shifter

2.7 MCLK Setting

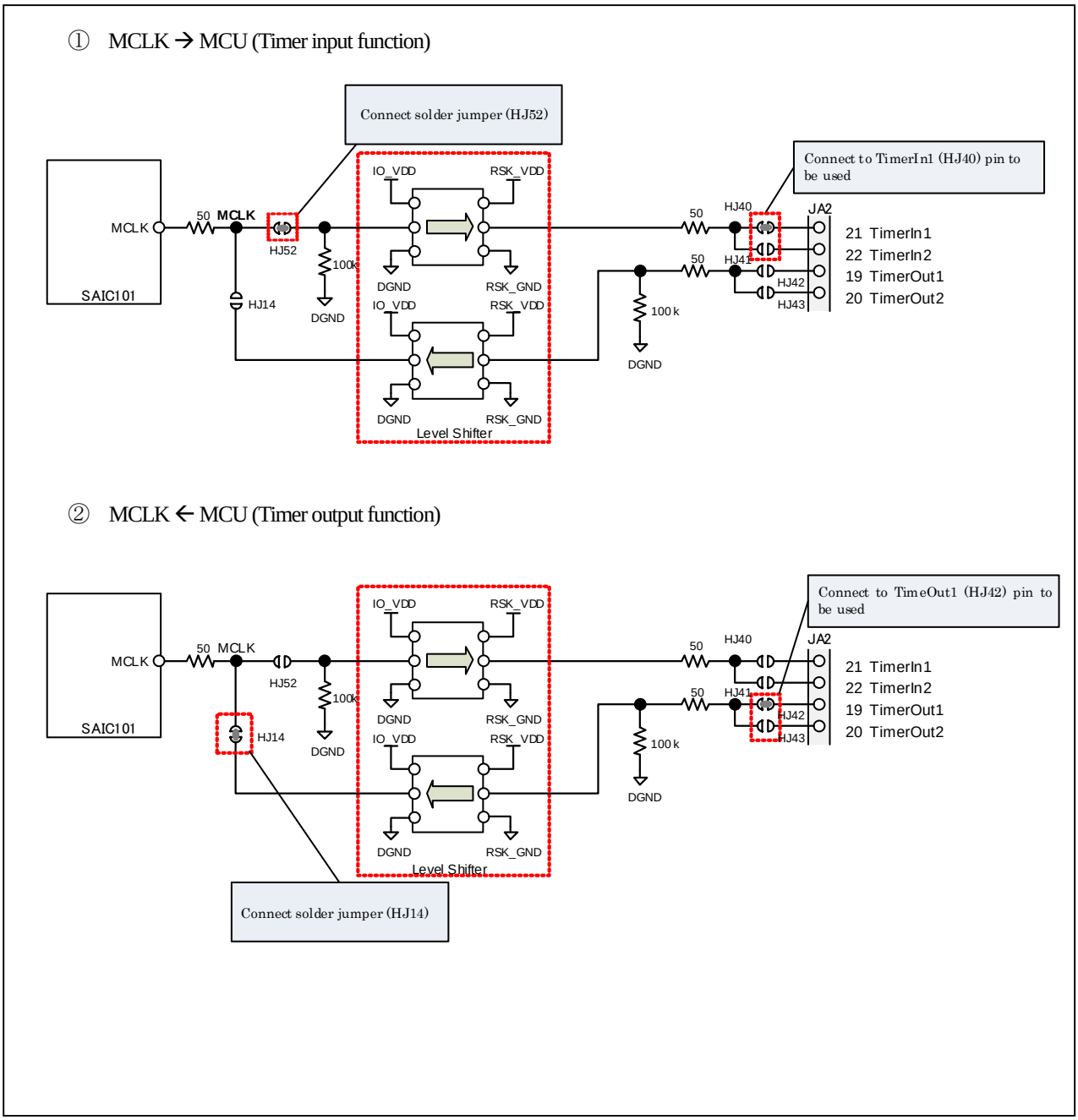
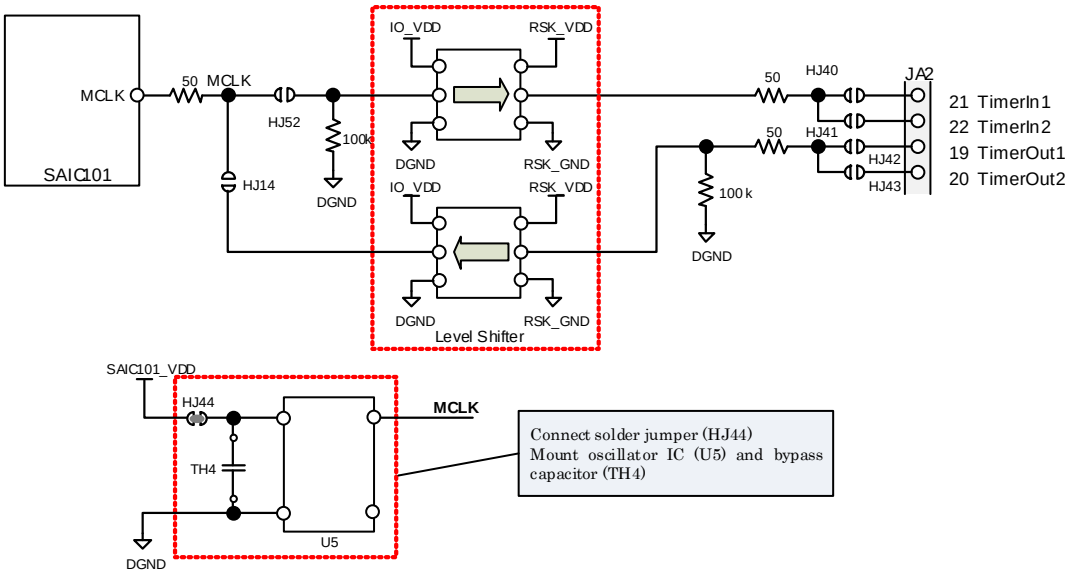


Figure 14. MCLK Control Circuit (1/2)

③ MCLK ← Oscillator



④ MCLK←BNCコネクタ MCLK ← BNC Connector

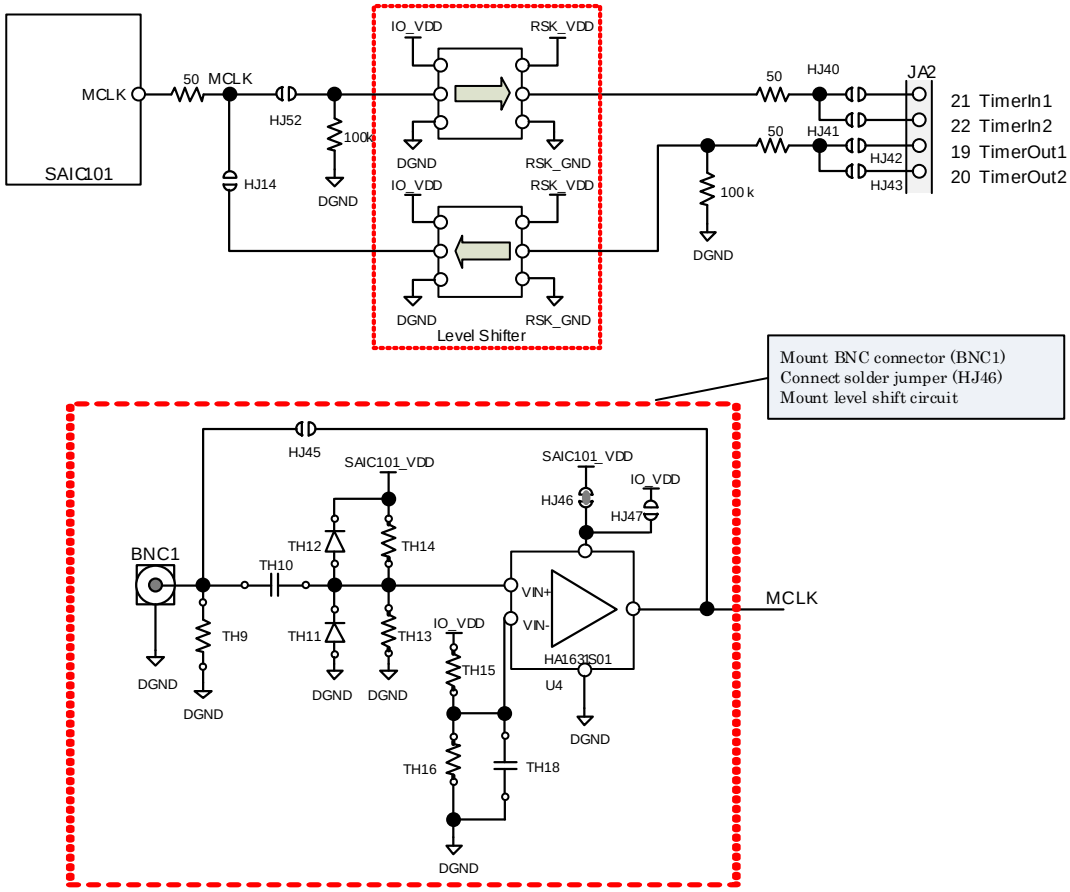


Figure 15. MCLK Control Circuit (2/2)

2.8 Sensor Interface

2.8.1 Sensor Interface Circuit

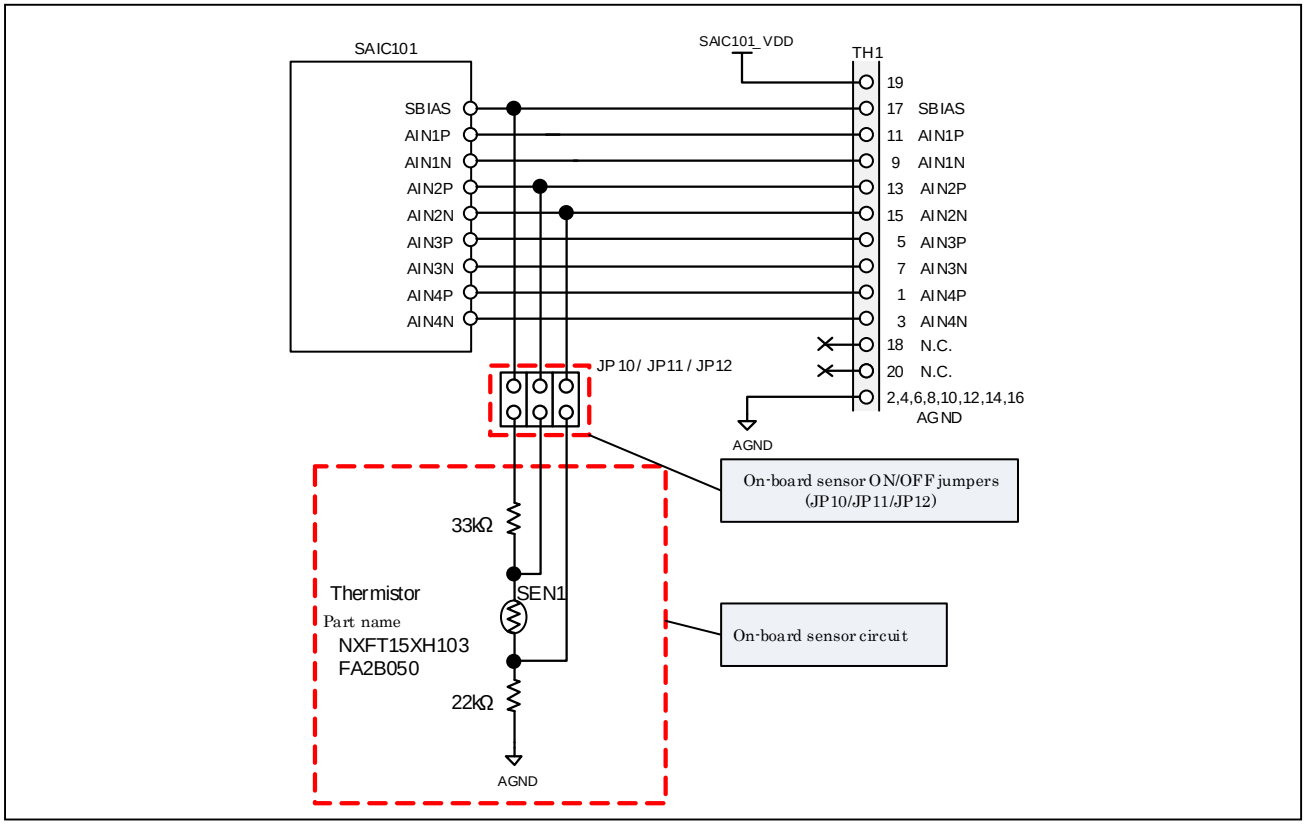


Figure 16. Sensor I/F Circuit

2.8.2 On-board Sensor Circuit Setting

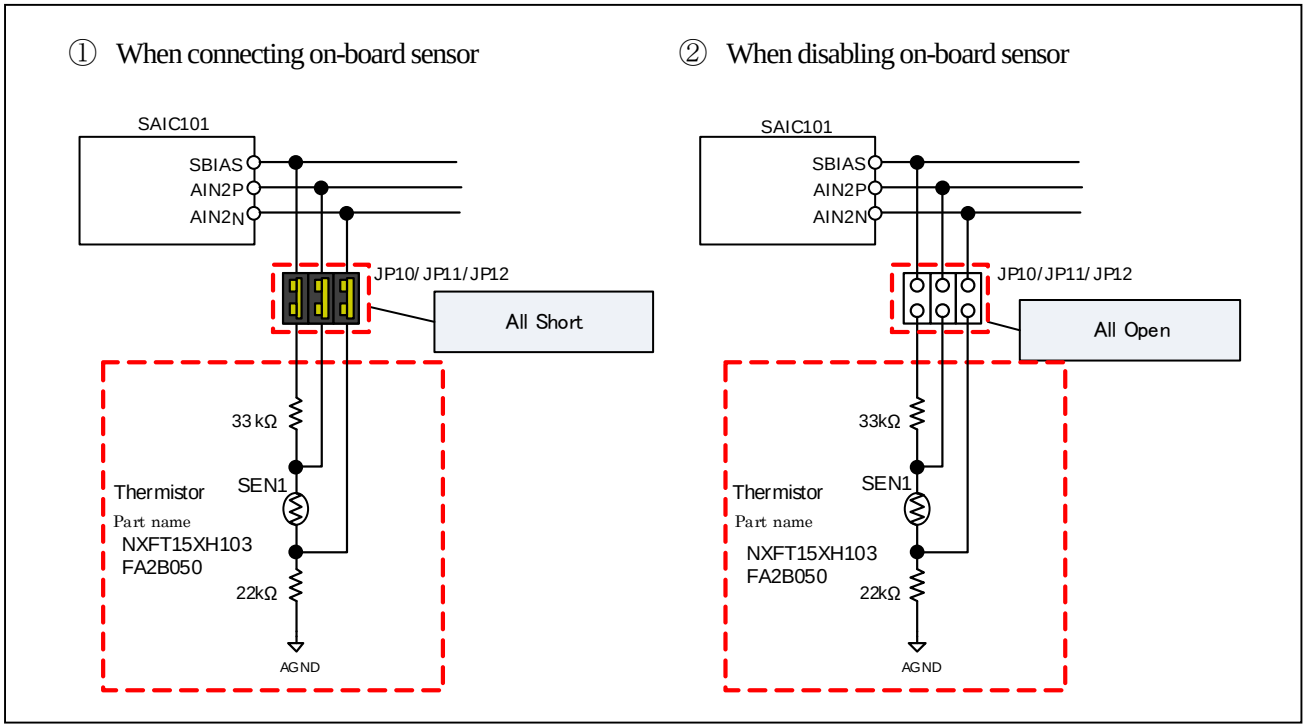


Figure 17. On-board sensor Setting

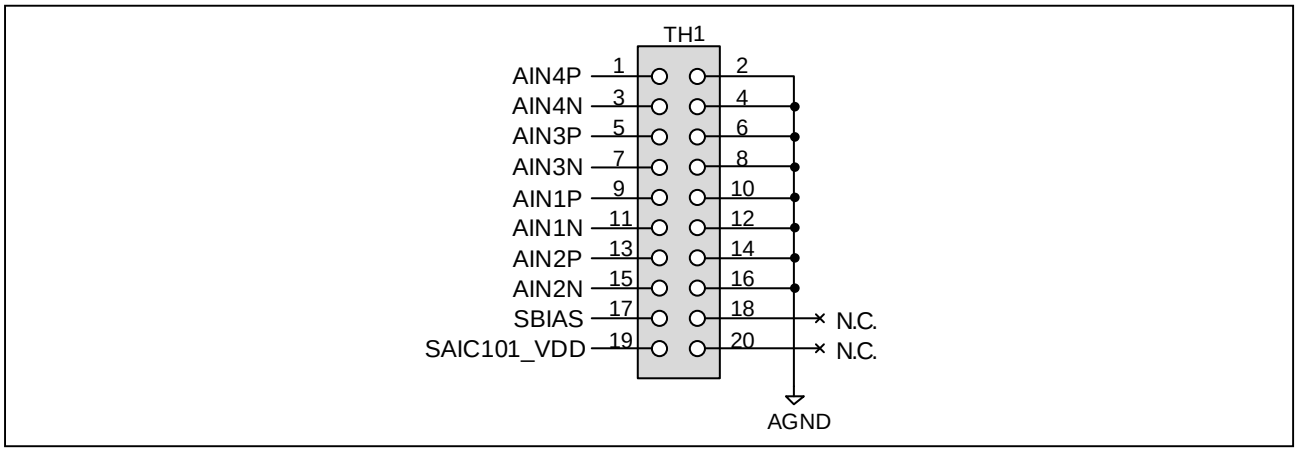
2.9 Through-holes

2.9.1 Through-holes for RSK Application Header

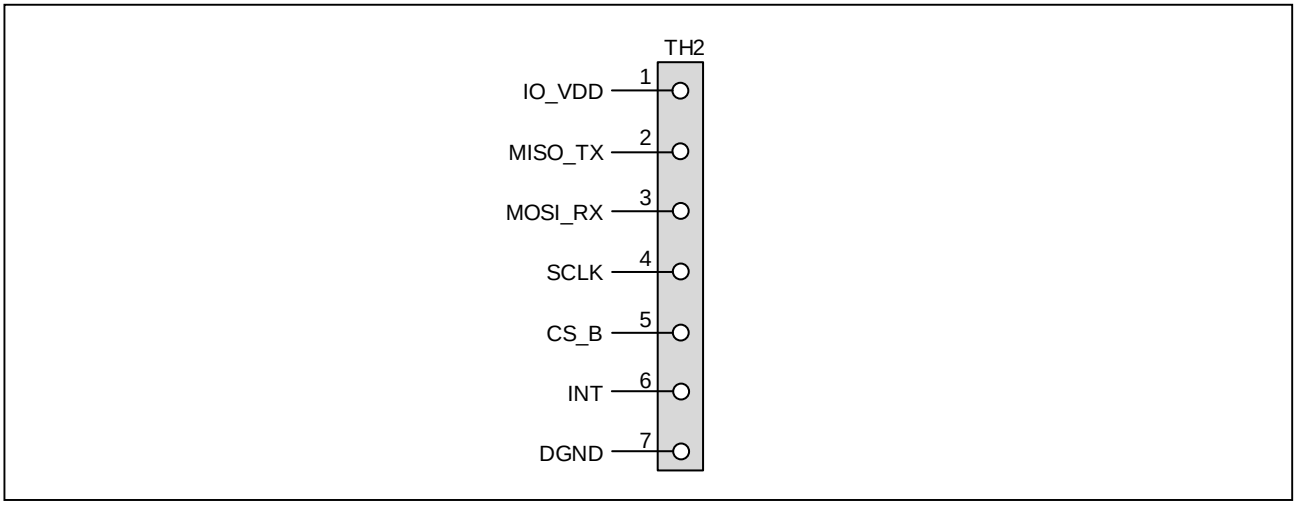
The RSK-OP-IC101 board is equipped with through-holes (JA*) for mounting RSK (connector is not mounted) as well as through-holes (JA*_COPY) to connect an optional board compatible with the RSK application headers.

RSK side	RSK-OP-IC101 board silk	
JA1	JA1	JA1_COPY
JA2	JA2	JA2_COPY
JA5	JA5	JA5_COPY
JA6	JA6	JA6_COPY

2.9.2 Through-hole (TH1) for External Sensor Board Connection



2.9.3 Through-hole (TH2) for Serial Signal Monitoring



2.10 Test Pads

List of test pads

Silk	Description
TP1	Consumption Current Measuring Pad 1
TP2	Consumption Current Measuring Pad 2
TP3	MCLK Monitoring Pad
TX_B1	UART Send Data Pad
SAIC_VDD1	SAIC_VDD Pad
SAIC_VDD2	SAIC_VDD Pad
AREG_VDD1	AREG_VDD Pad
CREG_VDD	CREG_VDD Pad
DGND1	DGND Pad
DGND2	DGND Pad
AGND	AGND Pad

2.11 Jumper Pin/Solder Pin Default Settings

Jumper Pins

Silk	Default Setting
JP1	1-2：shortened
JP2	shortened
JP3	open
JP4	open
JP5	open
JP6	open
JP7	open
JP8	shortened
JP9	shortened
JP10	shortened
JP11	shortened
JP12	shortened

Solder Pins

Silk	Default Setting
HJ1,HJ2,HJ47,HJ49	shortened
HJ3 to HJ46,HJ48, HJ50 to HJ52	open

2.12 Recommended Parts for Non-mounted Connectors

The following are recommendations for parts to mount on connector through-holes.

Through-hole Silk	Part Number	Manufacturer
JA1	PPPC132LFBN-RC	Sullins Connector Solutions
JA2	PPPC132LFBN-RC	Sullins Connector Solutions
JA4	PPTC252LFBN-RC	Sullins Connector Solutions
JA5	PPTC122LFBN-RC	Sullins Connector Solutions
JA6	PPTC122LFBN-RC	Sullins Connector Solutions

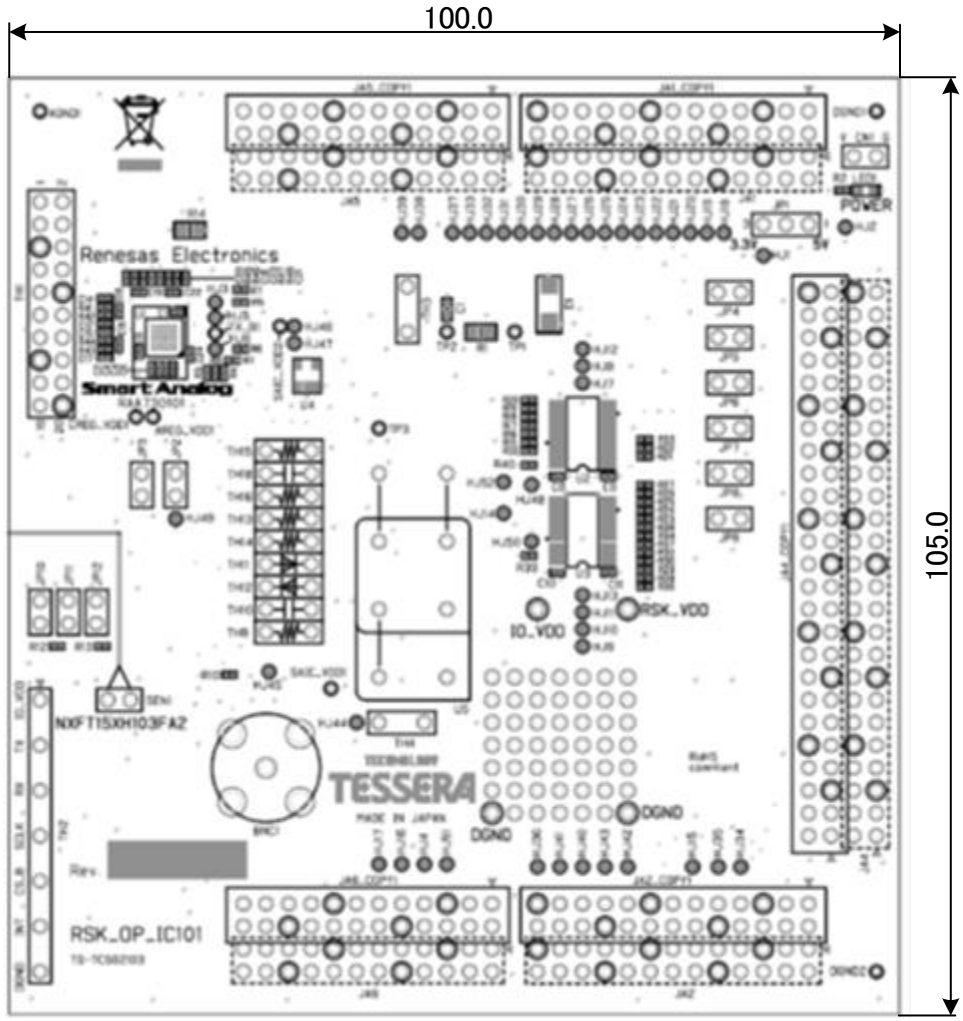
*Connector parts should be mounted on the soldering side.

3. Bill of Materials

Parts included on this board are shown below.

No.	quantity	mounted reference	unmounted reference	Classification	Names of parts	Makers
1	0		TX_B1,TP1,SAIC_VDD1,	Through hall		
			DGND1,CREG_VDD1,			
			AREG_VDD1,AGND1,TP2,			
			SAIC_VDD2,DGND2,AGND2,			
			TP3,DGND3,AGND3,DGND4,			
			AGND4			
2	0		BNC1	BNC connectord	BNC-R-PC-2(40)	HRS
3	0		TH4,TH9,TH10,TH11,TH12,	Through hall		
			TH13,TH14,TH15,TH16,TH18,			
			TH3			
4	0		CN1	Through hall		
5	0		TH5,TH6,TH7,TH8	Through hall		
6	1	C1		Chip Capacitor	GRM188R71C105KA12D	MURATA
7	6	C2,C7,C8,C9,C10,C11		Chip Capacitor	GCM155R71C104KA55D	MURATA
8	2	C3,C6		Chip Capacitor	C1005X7S1A474K050BC	TDK
9	2	C5,C4		Chip Capacitor	GRM155R71C224KA12D	MURATA
10	0		C12,C13,C14,C15,C16,C17,	Chip Capacitor		
			C18,C19,C20,C21,C22,C23,			
			C24			
11	1	D1		DIODE	GF1A-E3/67A	VISHAY
12	0		HJ1,HJ2,HJ47,HJ49	Solder jacket		
13	0		HJ3,HJ4,HJ5,HJ6,HJ7,HJ8,	Solder jacket		
			HJ9,HJ10,HJ11,HJ12,HJ13,			
			HJ14,HJ15,HJ16,HJ17,HJ18,			
			HJ19,HJ20,HJ21,HJ22,HJ23,			
			HJ24,HJ25,HJ26,HJ27,HJ28,			
			HJ29,HJ30,HJ31,HJ32,HJ33,			
			HJ34,HJ35,HJ36,HJ37,HJ38,			
			HJ39,HJ40,HJ41,HJ42,HJ43,			
			HJ44,HJ45,HJ46,HJ48,HJ50,			
			HJ51,HJ52			
14	0		JA2,JA1	Pin Header	FFC-26BMEP1	HTK
15	0		JA4	Pin Header	FFC-50BMEP1	HTK
16	0		JA6,JA5	Pin Header	FFC-24BMEP1	HTK
17	0		JA2_COPY1,JA1_COPY1	Connector	HIF3H-26DA-2.54DSA(71)	HRS
18	0		JA4_COPY1	Connector	HIF3H-50DA-2.54DSA(71)	HRS
19	0		JA6_COPY1,JA5_COPY1	Connector	HIF3H-24DA-2.54DSA(71)	HRS
20	1	JP1		Pin Header	FFC-3AMEP1	HTK
21	11	JP2,JP3,JP4,JP5,JP6,JP7,		Pin Header	FFC-2AMEP1	HTK
		JP8,JP9,JP10,JP11,JP12				
22	1	LED1		LED	SML-D12P8W	ROHM
23	2	R14,R1		Chip Resistor	RK73Z2ATTD	KOA
24	1	R2		Chip Resistor	RK73B1ETTP162J	KOA
25	5	R3,R4,R5,R6,R35		Chip Resistor	RK73B1ETTP103J	KOA
26	8	R7,R21,R22,R28,R29,R30,		Chip Resistor	RK73B1ETTP510J	KOA
		R33,R34				
27	20	R8,R10,R11,R15,R16,R17,		Chip Resistor	RK73B1ETTP104J	KOA
		R18,R19,R20,R23,R24,R25,				
		R26,R27,R32,R36,R37,R38,				
		R39,R40				
28	1	R12		Chip Resistor	RK73B1ETTP333J	KOA
29	1	R13		Chip Resistor	RK73B1ETTP223J	KOA
30	8	R41,R42,R43,R44,R45,		Chip Resistor	RK73Z1ETTP	KOA
		R46,R47,R48				
31	1	SEN1		Thermistor	NXFT15XH103FA2B050	MURATA
32	0		TH1	Pin Header	FFC-20BMEP1	HTK
33	0		TH2	Through hall		
34	1	U1		SAIC101	RAA730101	RENESAS
35	2	U2,U3		Level Shifter	HD151015	RENESAS
36	0		U4	Comparator	HA1631S01LP	RENESAS

4. External Configuration Size



Unit: mm

Figure 20 External Configuration Size

5. Circuit diagram

SAIC101 Application Board Schematics

Revision history

Rev.	Contents	Date
1.0	New creation	2014/09/25

TSSR TECHNOLOGY

SAIC101 Application Board

TS-TCS02103

Size	CAGE Code	DWG NO	Rev
A4			

Wednesday, October 08, 2014

Scale

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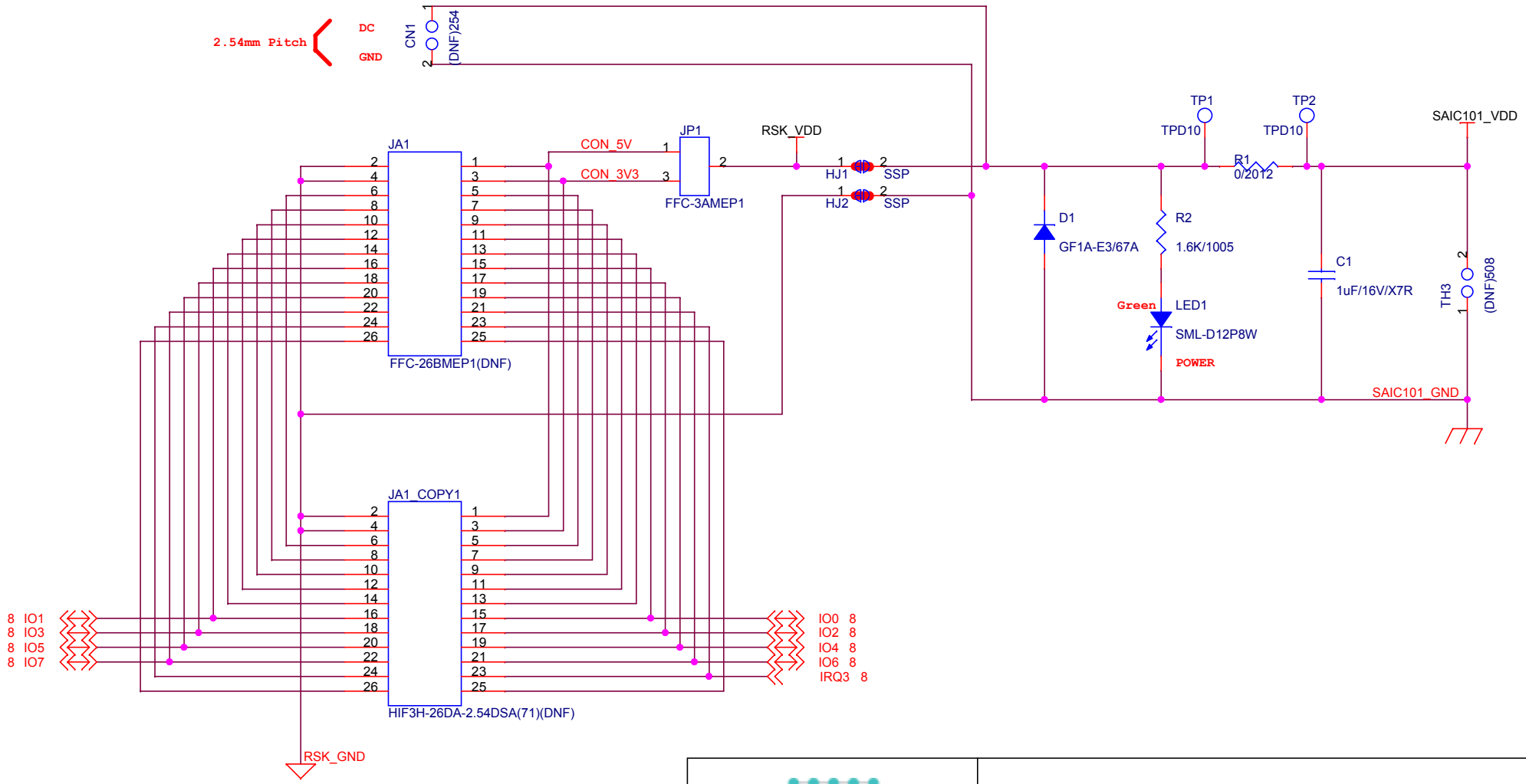

SAIC101 Application Board

TS-TCS02103

Size	CAGE Code	DWG NO	Rev
A4			

Wednesday, October 08, 2014

Scale

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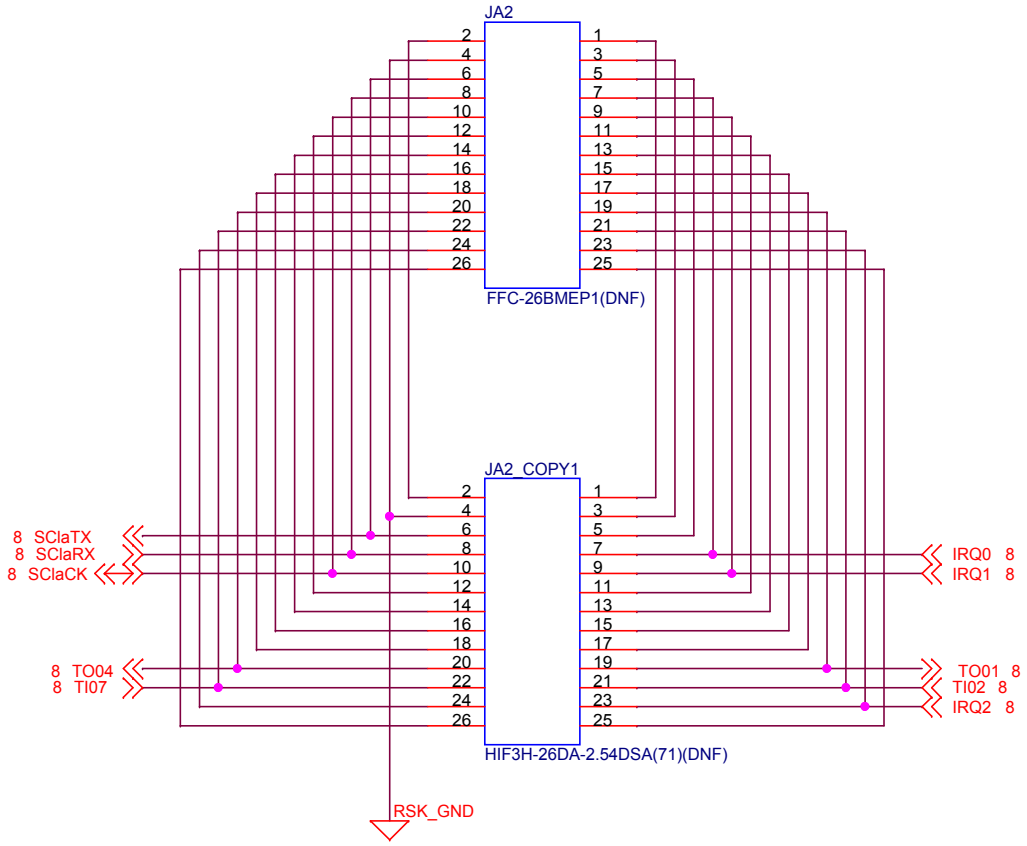

SAIC101 Application Board

TS-TCS02103

Size	CAGE Code	DWG NO	Rev
A4			

Wednesday, October 08, 2014

Scale

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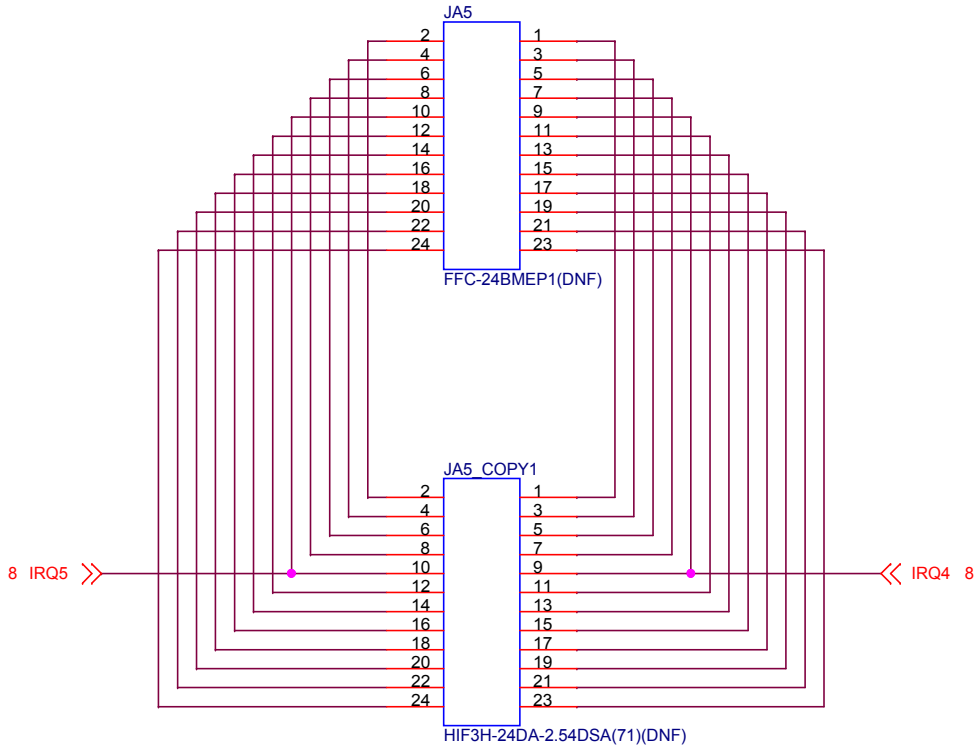

SAIC101 Application Board

TS-TCS02103

Size	CAGE Code	DWG NO	Rev
A4			

Wednesday, October 08, 2014

Scale

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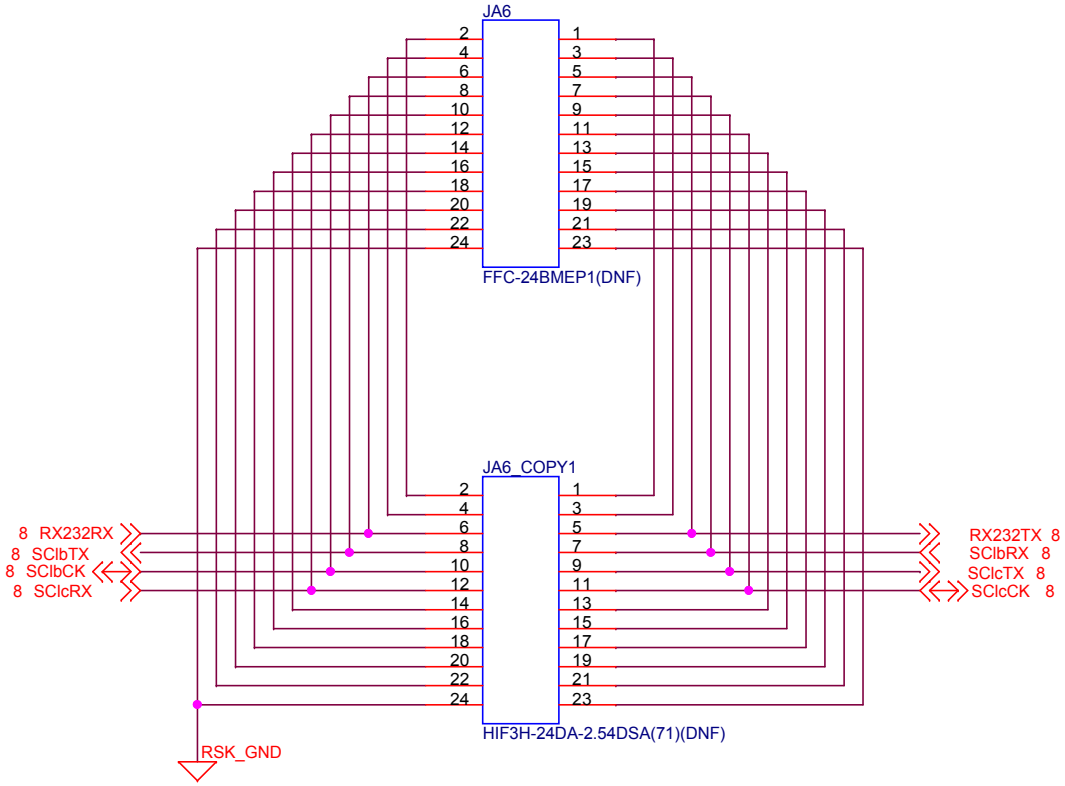

TSSR TECHNOLOGY

SAIC101 Application Board

TS-TCS02103

Size	CAGE Code	DWG NO	Rev
A4			

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Scale

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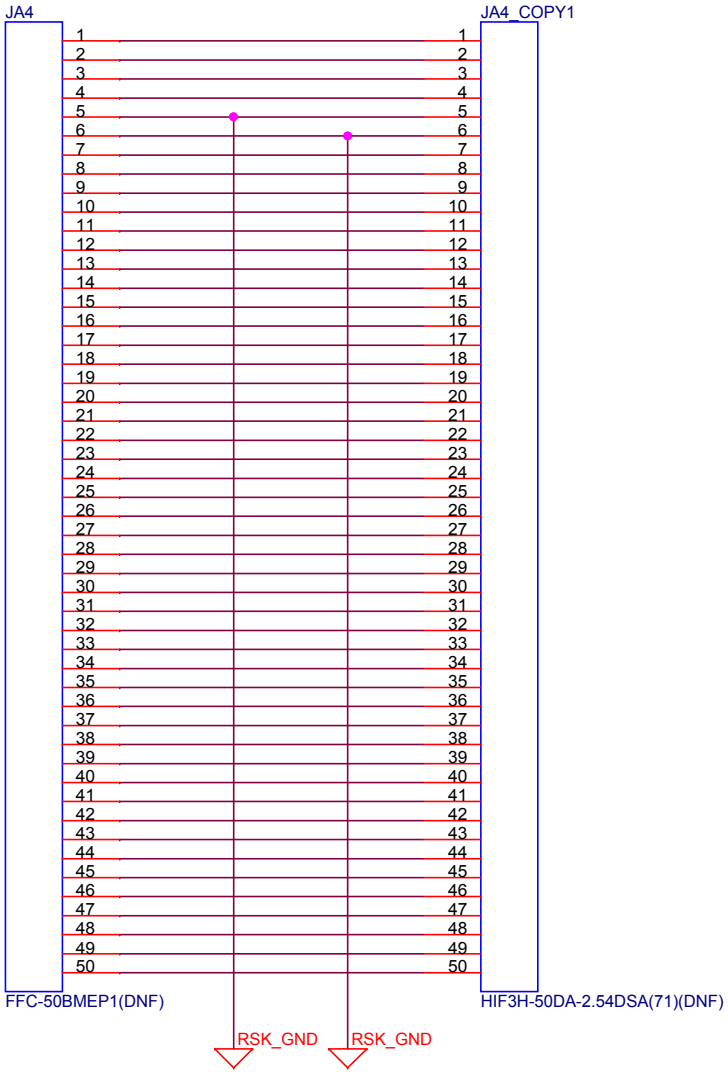

TSSR TECHNOLOGY

SAIC101 Application Board

TS-TCS02103

Size	CAGE Code	DWG NO	Rev
A4			

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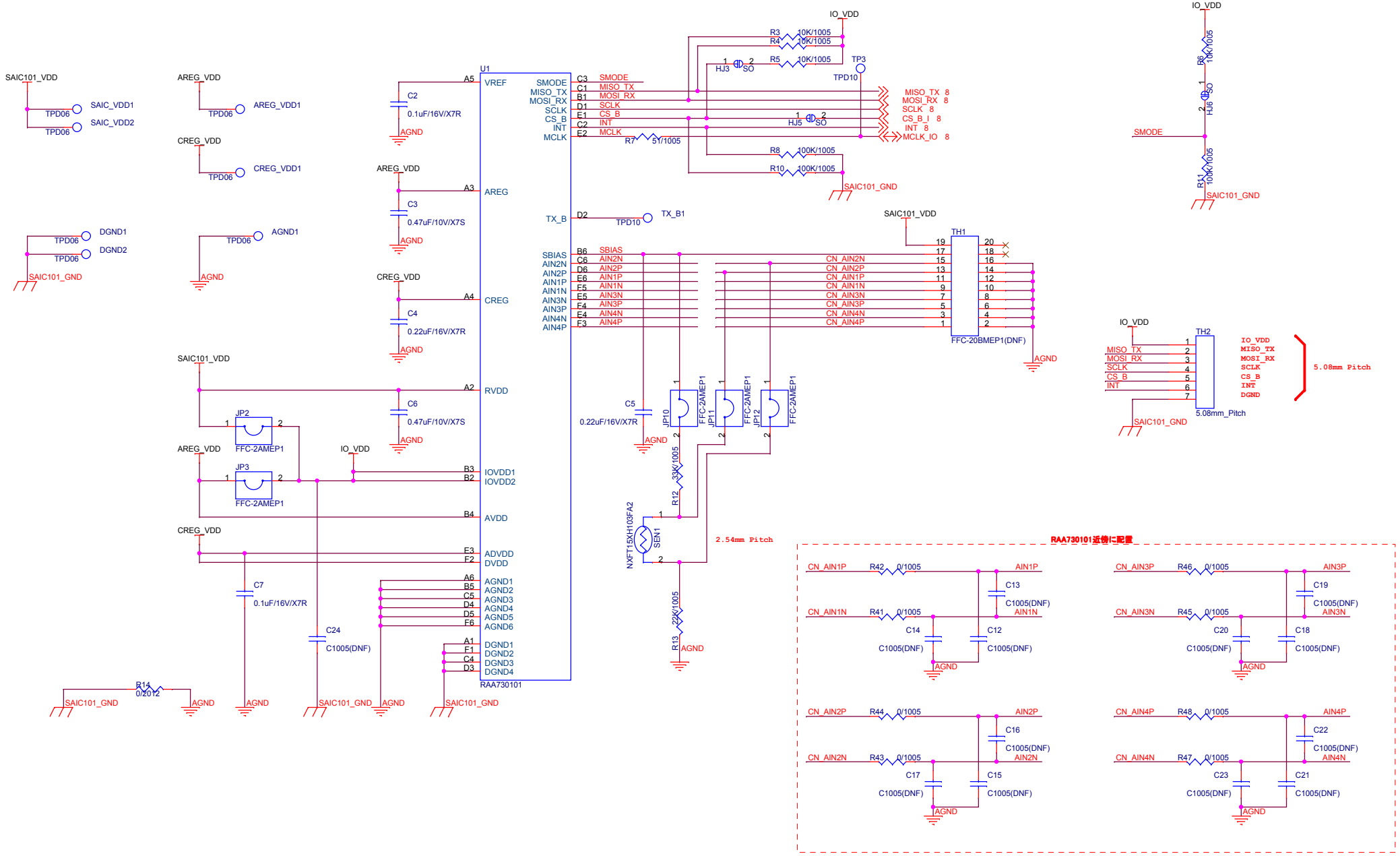

TSSR	SAIC101 Application Board			
	TS-TCS02103			
	Size A3	CAGE Code	DWG NO	Rev
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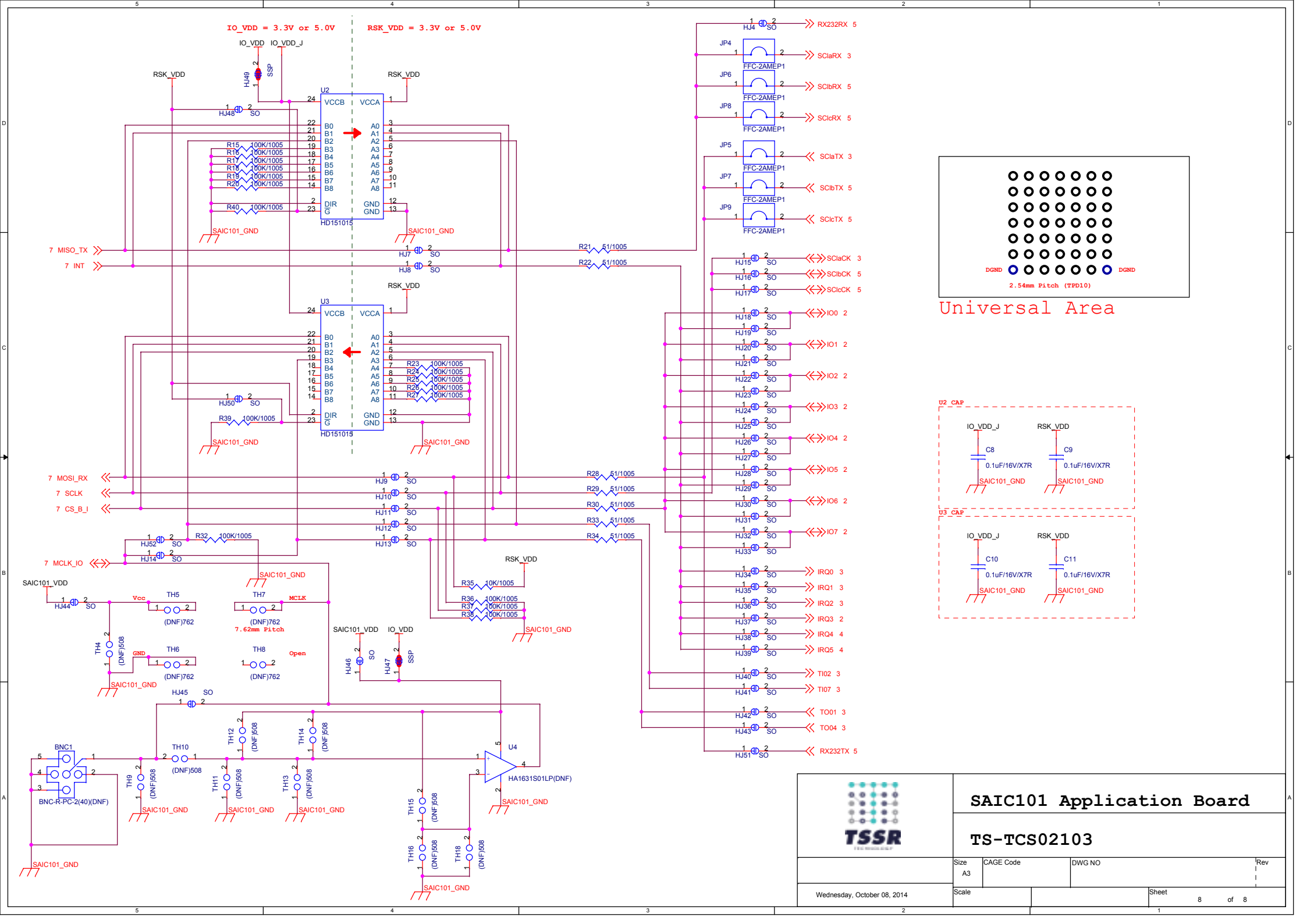
IO_VDD = 3.3V or 5.0V
RSK_VDD = 3.3V or 5.0V
IO_VDD
IO_VDD_J
RSK_VDD
HJ49
SSP
HJ48
SO
U2
VCCB
VCCA
HD151015
DIR
GND
SAIC101_GND
R15 100K/1005
R16 100K/1005
R17 100K/1005
R18 100K/1005
R19 100K/1005
R20 100K/1005
R40 100K/1005
U3
R23 100K/1005
R24 100K/1005
R25 100K/1005
R26 100K/1005
R27 100K/1005
HJ50
R39 100K/1005
7 MISO_TX
7 INT
HJ7
HJ8
R21 51/1005
R22 51/1005
7 MOSI_RX
7 SCLK
7 CS_B_I
7 MCLK_IO
HJ9
HJ10
HJ11
HJ12
HJ13
HJ52
HJ14
R32 100K/1005
R28 51/1005
R29 51/1005
R30 51/1005
R33 51/1005
R34 51/1005
SAIC101_VDD
HJ44
Vcc
TH5
(DNF)762
TH7
MCLK
7.62mm Pitch
TH4
(DNF)508
GND
TH6
TH8
Open
R35 10K/1005
R36 100K/1005
R37 100K/1005
R38 100K/1005
HJ46
HJ47
HJ45
BNC1
BNC-R-PC-2(40)(DNF)
TH10
TH9
TH11
TH12
TH13
TH14
TH15
TH16
TH18
U4
HA1631S01LP(DNF)
HJ4
RX232RX 5
JP4
SClaRX 3
JP6
SClbRX 5
JP8
SClcRX 5
JP5
SClaTX 3
JP7
SClbTX 5
JP9
SClcTX 5
FFC-2AMEP1
HJ15
SClaCK 3
HJ16
SClbCK 5
HJ17
SClcCK 5
HJ18
IO0 2
HJ20
IO1 2
HJ22
IO2 2
HJ24
IO3 2
HJ26
IO4 2
HJ28
IO5 2
HJ30
IO6 2
HJ32
IO7 2
HJ34
IRQ0 3
HJ35
IRQ1 3
HJ36
IRQ2 3
HJ37
IRQ3 2
HJ38
IRQ4 4
HJ39
IRQ5 4
HJ40
TI02 3
HJ41
TI07 3
HJ42
TO01 3
HJ43
TO04 3
HJ51
RX232TX 5
DGND
DGND
2.54mm Pitch (TPD10)
Universal Area
U2_CAP
U3_CAP
C8
C9
C10
C11
0.1uF/16V/X7R
TSSR
SAIC101 Application Board
TS-TCS02103
Size
A3
CAGE Code
DWG NO
Rev
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