

S6SAL211A94SA2001

Intelligent LED Lighting Starter Kit for BLE Communication
4ch 72W LED Driver Board

Operation Manual





Preface

This manual explains how to use the evaluation board. Be sure to read this manual before using the product. For this product, please consult with sales representatives or support representatives.

Handling and Use

Handling and use of this product and notes regarding its safe use are described in the manuals.

Follow the instructions in the manuals to use this product.

Keep this manual at hand so that you can refer to it anytime during use of this product.



Notice on this Document

All information included in this document is current as of the date it is issued. Such information is subject to change without any prior notice.


Please confirm the latest relevant information with the sales representatives.

Caution of the Products Described in this Document

The following precautions apply to the product described in this manual.

 WARNING	Indicates a potentially hazardous situation which could result in death or serious injury and/or a fault in the user's system if the product is not used correctly.
 WARNING	Do not look directly at LED. There is a possibility that your eye is hurt.

Electric Shock, Damage	Before performing any operation described in this manual, turn off all the power supplies to the system. Performing such an operation with the power on may cause an electric shock or device fault.
Electric Shock, Damage	Once the product has been turned on, do not touch any metal part of it. Doing so may cause an electric shock or device fault.

 CAUTION	Indicates the presence of a hazard that may cause a minor or moderate injury, damages to this product or devices connected to it, or may cause to loose software resources and other properties such as data, if the device is not used appropriately.
--	--

Cuts, Damage	Before moving the product, be sure to turn off all the power supplies and unplug the cables. Watch your step when carrying the product. Do not use the product in an unstable location such as a place exposed to strong vibration or a sloping surface. Doing so may cause the product to fall, resulting in an injury or fault.
Cuts	The product contains sharp edges that are left unavoidably exposed, such as jumper plugs. Handle the product with due care not to get injured with such pointed parts.
Damage	Do not place anything on the product or expose the product to physical shocks. Do not carry the product after the power has been turned on. Doing so may cause a malfunction due to overloading or shock.
Damage	Since the product contains many electronic components, keep it away from direct sunlight, high temperature, and high humidity to prevent condensation. Do not use or store the product where it is exposed to much dust or a strong magnetic or electric field for an extended period of time. Inappropriate operating or storage environments may cause a fault.
Damage	Use the product within the ranges given in the specifications. Operation over the specified ranges may cause a fault.
Damage	To prevent electrostatic breakdown, do not let your finger or other object come into contact with the metal parts of any of the connectors. Before handling the product, touch a metal object (such as a door knob) to discharge any static electricity from your body.
Damage	When turning the power on or off, follow the relevant procedure as described in this document. Before turning the power on, in particular, be sure to finish making all the required connections. Furthermore, be sure to configure and use the product by following the instructions given in this document. Using the product incorrectly or inappropriately may cause a fault.
Damage	Because the product has no casing, it is recommended that it be stored in the original packaging. Transporting the product may cause a damage or fault. Therefore, keep the packaging materials and use them when re-shipping the product.

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S6SAL211A94SA2001

Intelligent LED Lighting Starter Kit for BLE Communication 4ch 72W LED Driver Board

Operation Manual



1. Description

S6SAL211A94SA2001 is the starter kit tool for BLE (*1) communication.

This kit is assumed for the application such as ceiling lights.

The tool has an evaluation board and a BLE board.

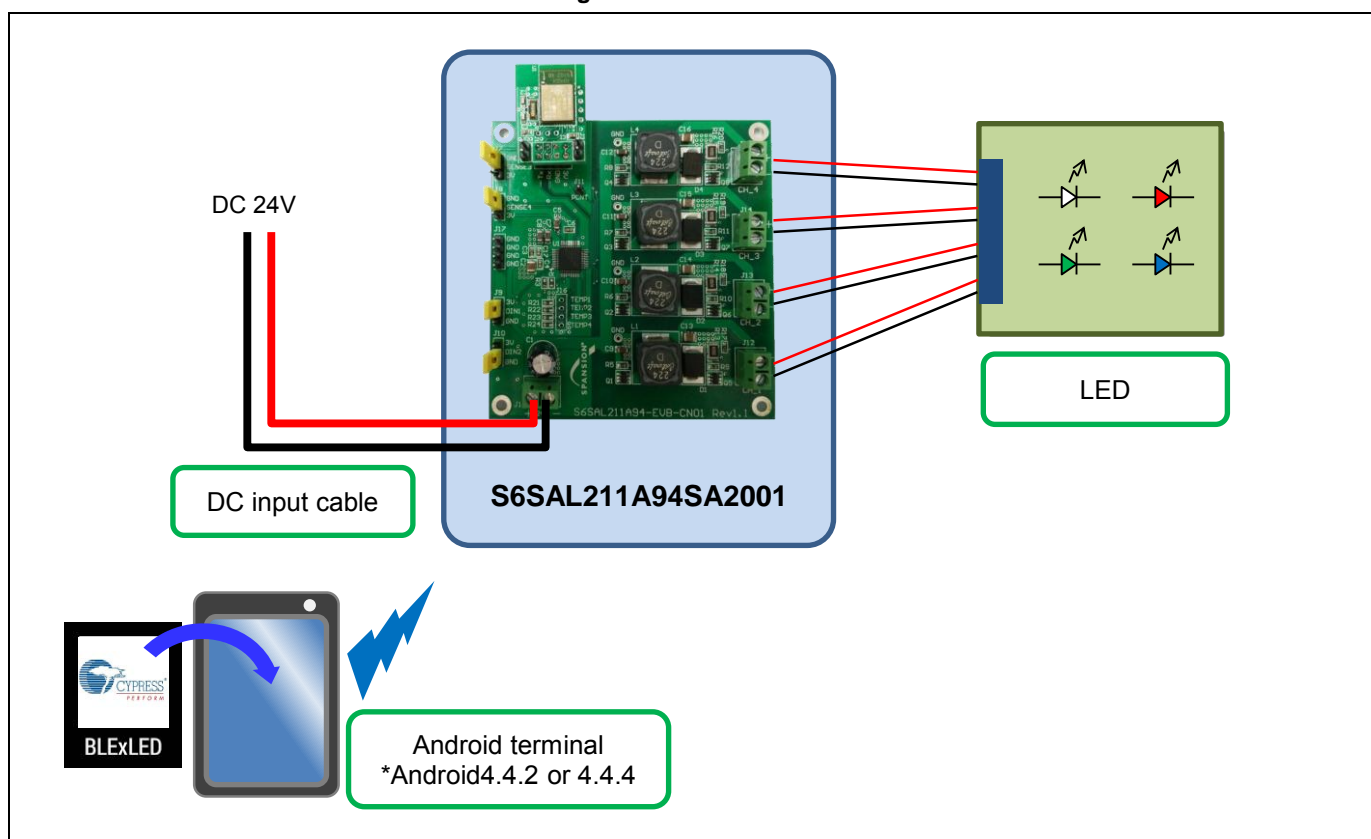
The evaluation board implements S6AL211A94, and LED driver controlled by BLE communication.

It is necessary to prepare DC 24V power supply, DC input cable, Android terminal (*2), Application software, LED module and connection cable.

*1: BLE: Bluetooth® Low Energy

*2: Prepare an Android terminal with Android OS 4.4.2 or 4.4.4.

Figure 1-1 Board Outline



2. Evaluation Board Specification

Figure 2-1 Evaluation Board Specification

Item	Symbol	Min.	Typ.	Max.	Unit
Input voltage	24V VIN	22	24	26	V
Output LED voltage	VLEDout	-	18	-	V
Output LED current	CH 1: ILEDout(W) CH 2: ILEDout(R) CH 3: ILEDout(G) CH 4: ILEDout(B)	-	-	1000 1000 1000 1000	mA
Board size	-	90 × 85			mm

3. Pin Descriptions

3.1 Input/Output Connector Descriptions

Table 3-1 Input/Output Pin Descriptions

Connector Symbol	I/O	Function Description	Initial Setting
J1	I	24Vdc power supply terminal, 24V VIN	-
J12,J13,J14,J15	O	CH1 -CH4 LED terminal, connect the LED	-
J6	I/O	UART communication terminal for BLE module, ZigBee module, MCU or the communication module with UART 3V : Power for external module GND: GND terminal RX: Read terminal of S6AL211A94 TX: Transmission terminal of S6AL211A94	-
J7	I/O	SENSE3: Ambient light sensor input terminal 3V: Power for external module GND: GND terminal	SENSE3 connect to GND
J8	I/O	SENSE4: Human sensor detect input terminal 3V: Power for external module GND: GND terminal	SENSE4 connect to GND
J9	I/O	Mode setting 3V: Power for external module GND: GND terminal Connect to VO pin output of S6AL211A94 level	DIN1 connect to 3V
J10	I/O	Mode setting 3V: Power for external module GND: GND terminal Connect to GND level	DIN2 connect to GND
J11	O	IC status output pin	-
J16	I	Temperature sensor connection	-
J17	-	GND terminal for Temperature sensor	-

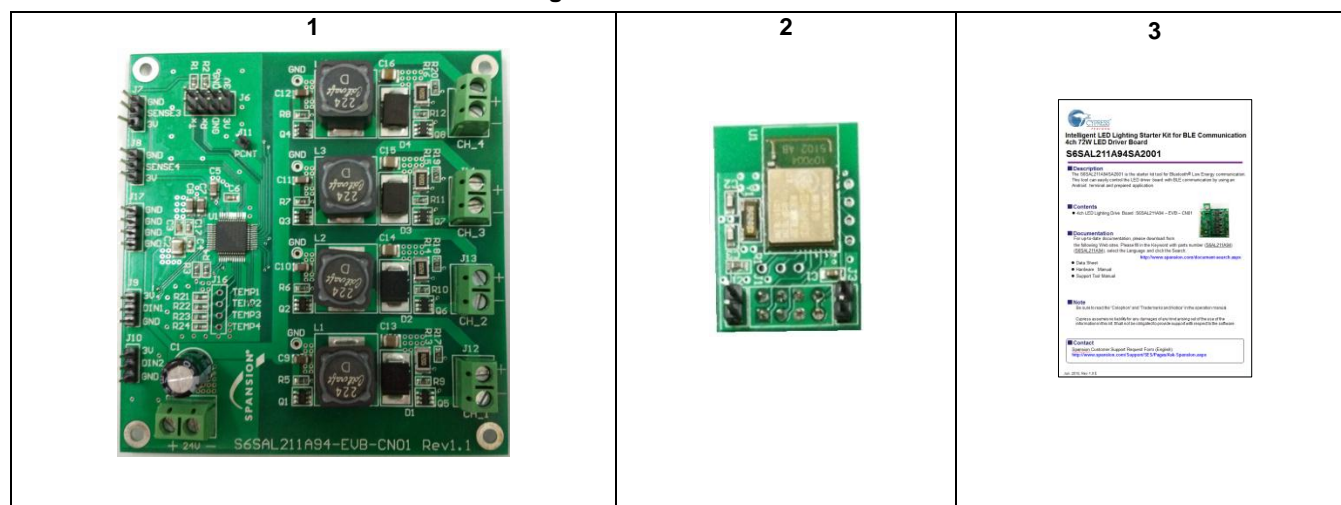
4. Setup and Verification

4.1 Contents in a Package

Table 4-1 S6SAL211A94SA2001 Contents List

No.	Contents	Description	Quantity	Notes
1	S6SAL211A94-EVB-CN01	Evaluation board of 4CH 72W with S6AL211A94	1	-
2	BLE Board	BLE board with MBH7BLZ02	1	-
3	Leaflet	Described startup information	1	-

Figure 4-1 Contents Picture



4.2 Evaluation with BLE Communication

Using Items for Evaluation with BLE Communication

- Evaluation board 1pic (*1)
- BLE Board 1pic (*1)
- DC power supply (24V) 1pic (*2)
- Android terminal with Android OS 4.4.2 or 4.4.4. 1pic (*2)
- Application software 1pic (*3)
- LED module(5 series × 4ch) 1set (*2)
- Connection cable 1set (*2)

*1: Included in a package.

*2: Please prepare. Refer to 4.2.1 Operation.

*3: Please download it from our device home page.

URL:

<http://www.spansion.com/Products/Analog/Power-Management-ICs/Pages/category-led.aspx#S6AL211A>

S6AL211A94: BLE Application software file BLeXLED.apk in S6AL211_BLEXLED.cab

4.2.1 Operation

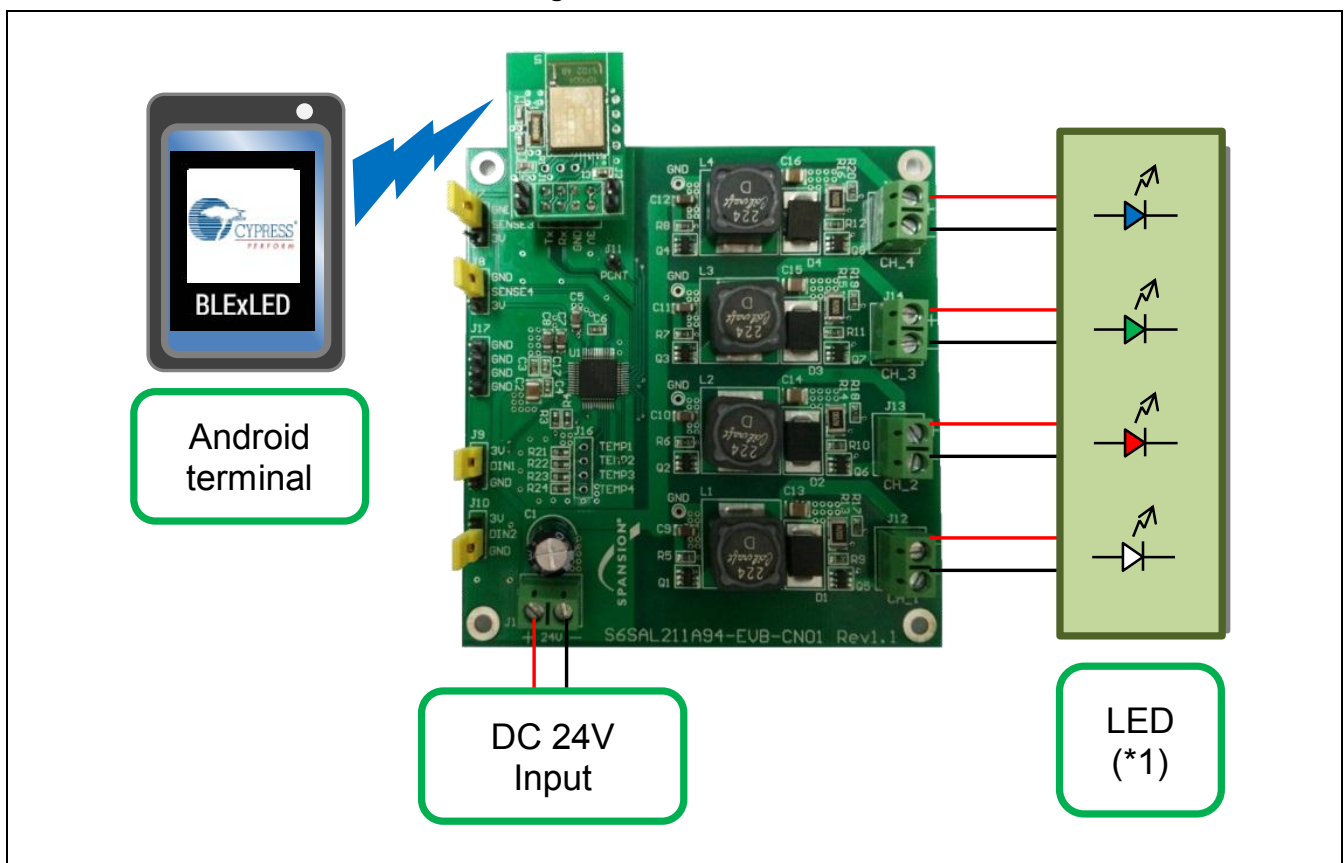


WARNING

Do not look directly at LED. There is a possibility that your eye is hurt.

1. Connect DIN1 to 3V (J9) and DIN2 to GND (J10), connect SENSE3 and SENSE4 to GND (J7, J8).
2. Connect BLE Board to J6 of the evaluation board. (*4)
3. Connect the 4 channels LED to J12, J13, J14, J15. (*1)
4. Set some attributes in the application of Android terminal. (*2)
5. Connect J1 of the evaluation board to DC power supply.
6. Connect Android terminal to BLE module by BLE communication. (*2)
7. When connection succeeds, it is possible to make them do various movement by application. (*3)
8. When ending operation, make the brightness level of the LED "0" and tap "Disconnect" button of "HOME" tab and cut power supply.

Figure 4-2 Board Connection



*1: Refer to 4.2.1.1 Connection of the Evaluation Board and LED.

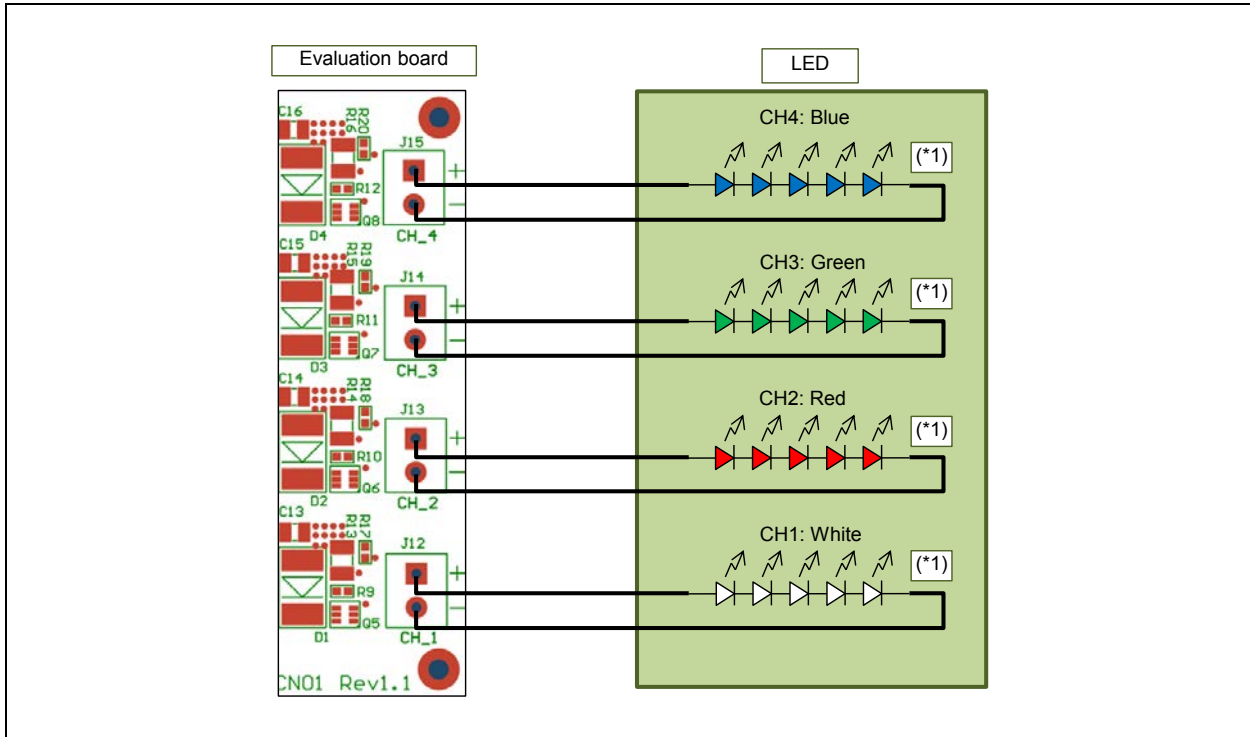
*2: Refer to 4.2.1.2 Setup with BLE Communication.

*3: Refer to 4.3 Function of Application.

*4: Direction Caution

4.2.1.1 Connection of the Evaluation Board and LED

Figure 4-3 Connection of the Evaluation Board and LED



*1: Connect LED to J12, J13, J14, J15.

Driver's output channel and color of LED are fixing by application software. To indicate correct color, connect each channel exactly.

Specification of LED module: 5-series.

White: $I_F \geq 1A$, $V_F \approx 3.2V$

Red: $I_F \geq 1A$, $V_F \approx 2.2V$

Green: $I_F \geq 1A$, $V_F \approx 3.3V$

Blue: $I_F \geq 1A$, $V_F \approx 3.2V$

Be careful about polarity.

Ex: LUW W5AM (OSRAM)

Ex: LR W5AM (OSRAM)

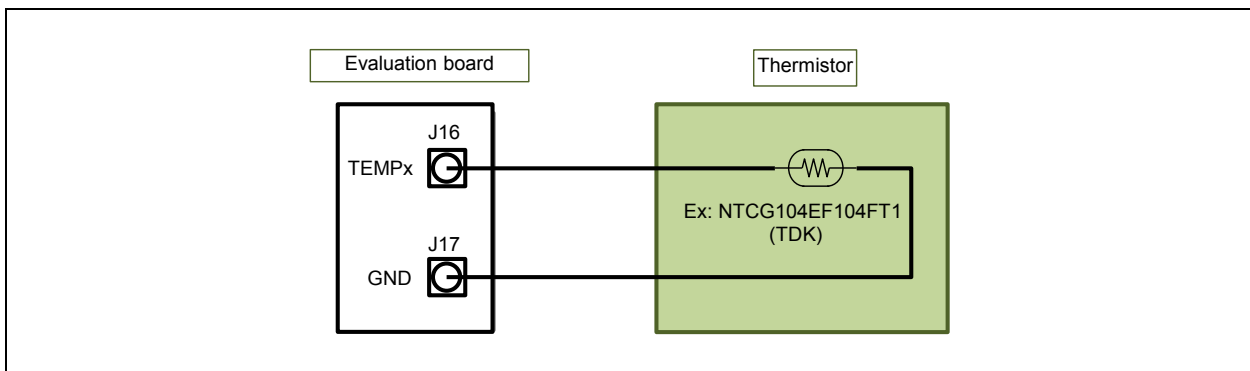
Ex: LT W5AM (OSRAM)

Ex: LB W5AM (OSRAM)

When using thermistor, refer to Figure 4-4.

Thermistor is an option. Even if that isn't connected, a board operates.

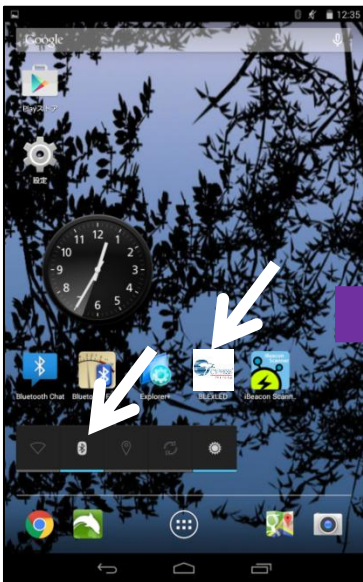
Figure 4-4 Connection of the Evaluation Board and Thermistor



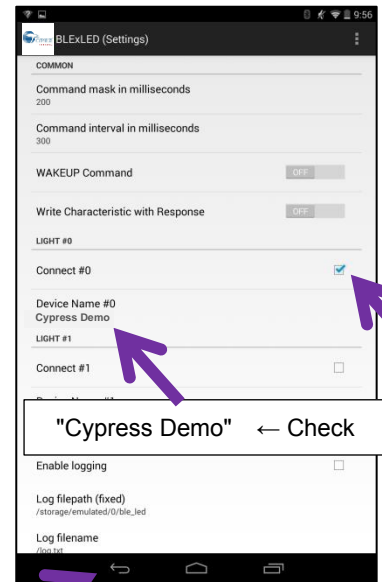
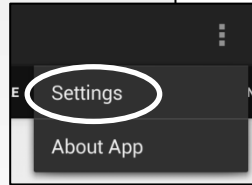
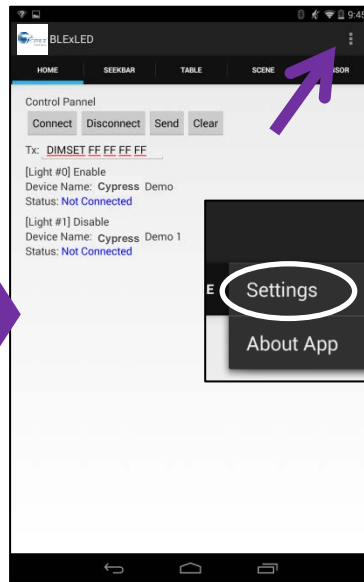
4.2.1.2 Setup with BLE Communication

1. Start "BLExLED" by tapping icon in android tablet. (In advance, set on Bluetooth in Android OS)
Set some attributes in the application. (Device Name #0)
2. Connect AC plug to AC power supply.
3. Tap "Connect" button in "HOME" tab. If connection succeeds, "BLE Connection SUCCESS!" is indicated in the display.
4. Refer to 4.3 Function of Application and operate.

Starting App

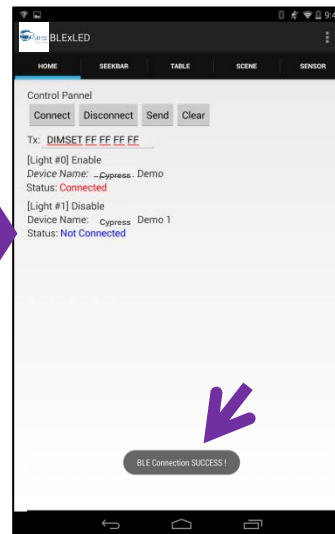


Setting of the Attribute (In Setting Page)



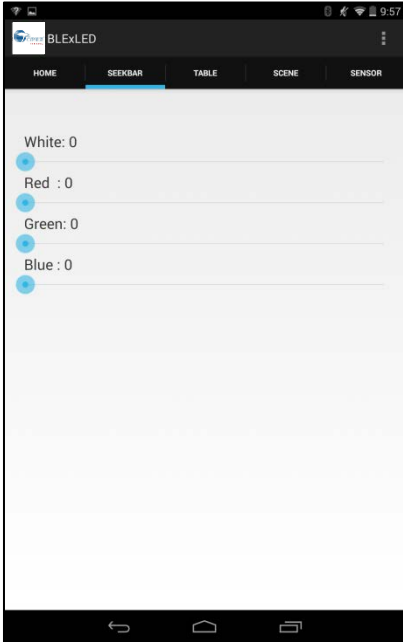
Return to "HOME" tab

Connecting to BLE Module with BLE Communication



4.3 Function of Application

4.3.1 "SEEKBAR" Tab



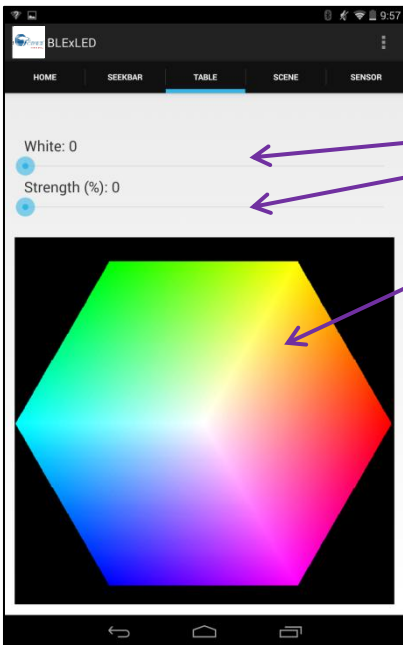
It is possible to change the brightness of each LED by swiping level of seek bar. When releasing a finger, brightness of LED changes.

Total maximum Output power is about 72W.

When lighting White LED, make the lighting level of RGB LED "0".

When lighting RGB LED, make the lighting level of White LED "0".

4.3.2 "TABLE" Tab



It's possible to change the brightness of the White LED by swiping level of White Seek bar.

It's possible to change color brightness of the RGB LED by swiping level of Strength Seek bar.

It's possible to change the color of LED by tapping color table.

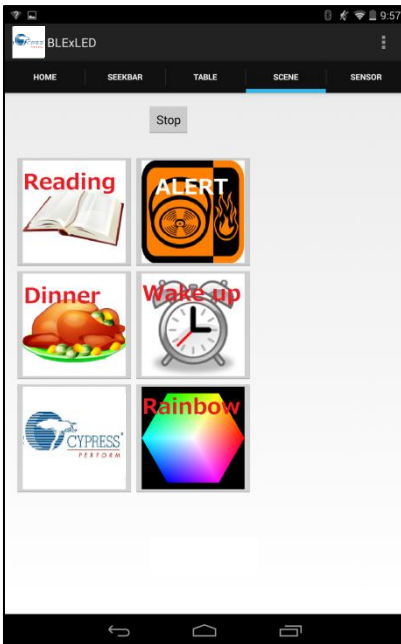
When Strength Seek bar level is "0", RGB LED goes out.

Total maximum Output power is about 72W.

When lighting White LED, make the lighting level of RGB LED "0".

When lighting RGB LED, make the lighting level of White LED "0".

4.3.3 "SCENE" Tab

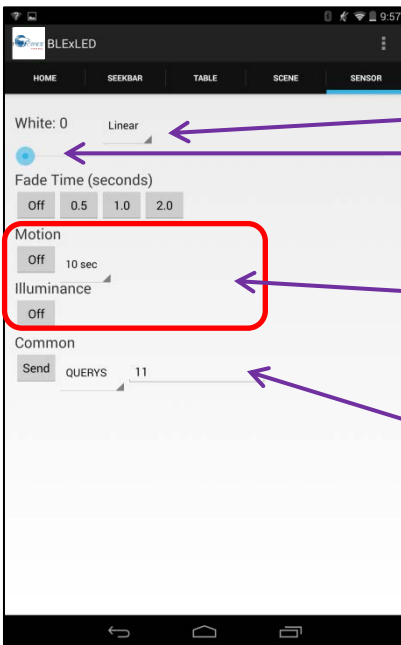


"Preset Lighting" is operated by this table.

- Reading: Bright white lighting
- Dinner: Warm white lighting
- CYPRESS: Cypress blue color
- ALERT: Switching white and red (Sequence per second)
- Wakeup: gradually brighter (5 seconds sequence)
- Rainbow: Automatic color control

Stop: Stop sequence of "ALERT", "Wake up" and "Rainbow".

4.3.4 "SENSOR" Tab



It's possible to set a sensor setting and dimming curve at this table.

Dimming curve type select "Linear" or "Log"

It's possible to change the brightness of the white LED by swiping level of white seek bar.

Fade Time: Setting of fade time

When installing a sensor, below is used. (*1)

Motion: Motion sensor on/off, stand-by detection time select "10sec" or "5min"

Illuminance: Illuminance sensor on/off (*2)

Common: It's used for setting change. The following item can be chosen by a pull-down.

- QUERYS: S6AI211A94 memory reading command (*3)
- MEMSET: S6AI211A94 memory writing in command (*3)
- BLEGET: BLE module memory reading command (*4)
- BLESET: BLE module memory writing in command (*4)

*1: Refer to 4.3.4.1 Example of Sensor Use.

*2: When using a motion sensor, illumination sensor can not be used.

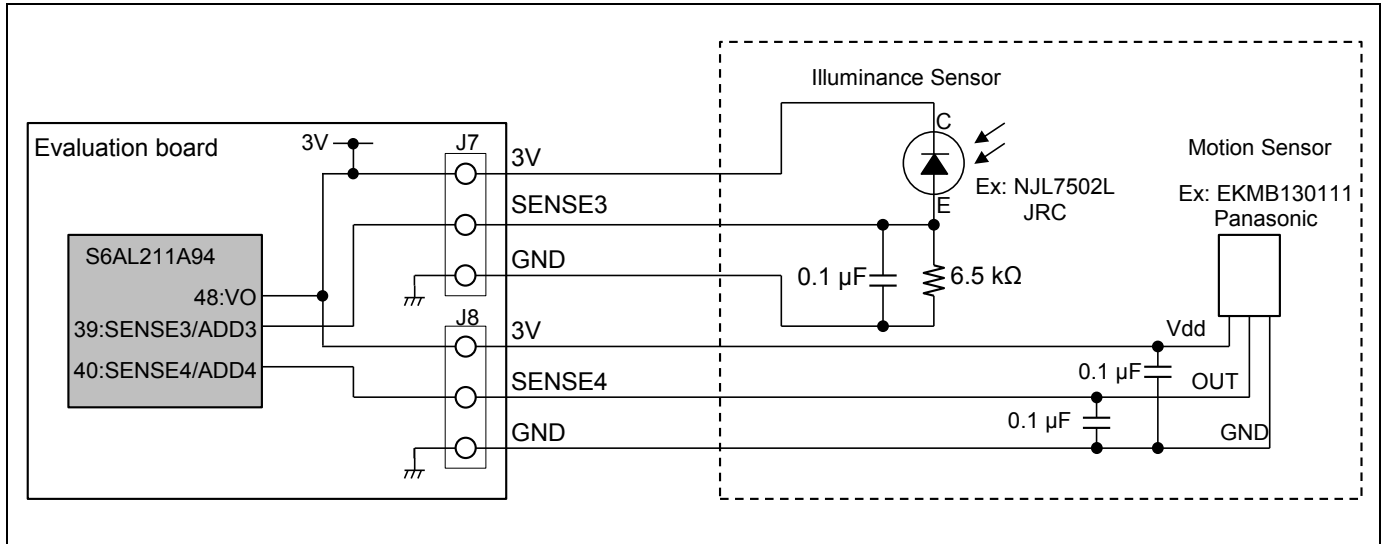
*3: Refer to 4.3.4.2 S6AI211A94 Control Command.

*4: Refer to 4.3.4.3 BLE Module Control Command.

4.3.4.1 Example of Sensor Use

When using the sensor function of the application, prepare the outside sensor parts.
The recommended parts are as follows.

Figure 4-5 Example of Sensor Use



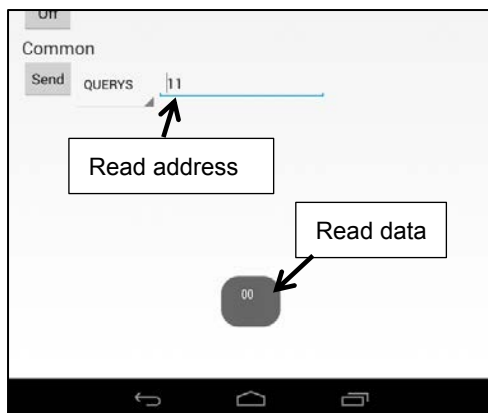
4.3.4.2 S6AL211A94 Control Command

QUERYs: "1st argument: read address" is input, and "Send" button is pushed.
Data or "TRUE" or "FALSE" of memory is indicated.

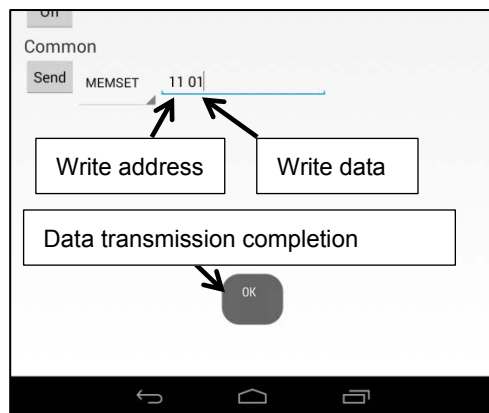
MEMSET: "1st argument: write address" and "2nd argument: write data" is input, and "Send" button is pushed.
"OK" is indicated.

Note: Refer to hardware manual of S6AL211A94 for details of the address and write data.

Ex: QUERYs



Ex: MEMSET



4.3.4.3 BLE Module Control Command

Table 4-2 BLEGET Command

Command	1st Argument Address	2nd Argument Data	Function	Response	Initial Value
BLEGET	00	00	Turning on the lights threshold reading of illumination sensor	HH LL<CR><LF> (*1)	00 02
		01	Turning off the lights threshold reading of illumination sensor		00 08
	01	-	Reply interval time reading of illumination sensor	HH LL<CR><LF> (*2)	00 05

Table 4-3 BLESET Command

Command	1st Argument Address	2nd Argument Address/Data	3rd Argument Data	4th Argument Data	Function	Response
BLESET	00	00	HH (*1)	LL (*1)	Turning on the lights threshold writing of illumination sensor	OK<CR><LF>
		01			Turning off the lights threshold writing of illumination sensor	
	01	HH (*2)	LL (*2)	-	Reply interval time writing of illumination sensor	OK<CR><LF>

*1: Threshold (hexadecimal number). HH: Upper 2bit data, LL: Lower 8bit data

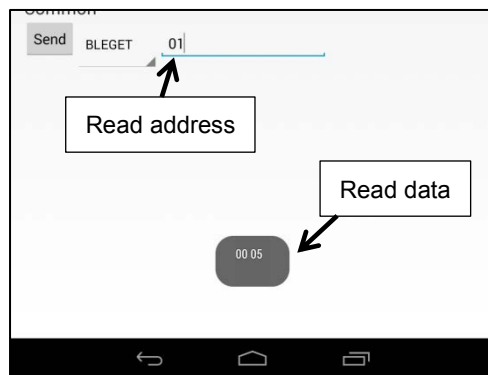
Only lower rank 2bit is effective for HH data.

Set Turning on the lights threshold smaller than Turning off the lights threshold.

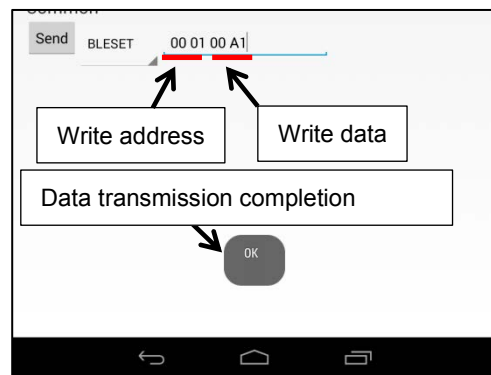
*2: Reply interval time (hexadecimal number). HH: Upper 2bit data, LL: Lower 8bit data

Unit: 0.1 ms, Setting area: 0.1 ms to 6553.5 ms

Ex: BLEGET



Ex: BLESET



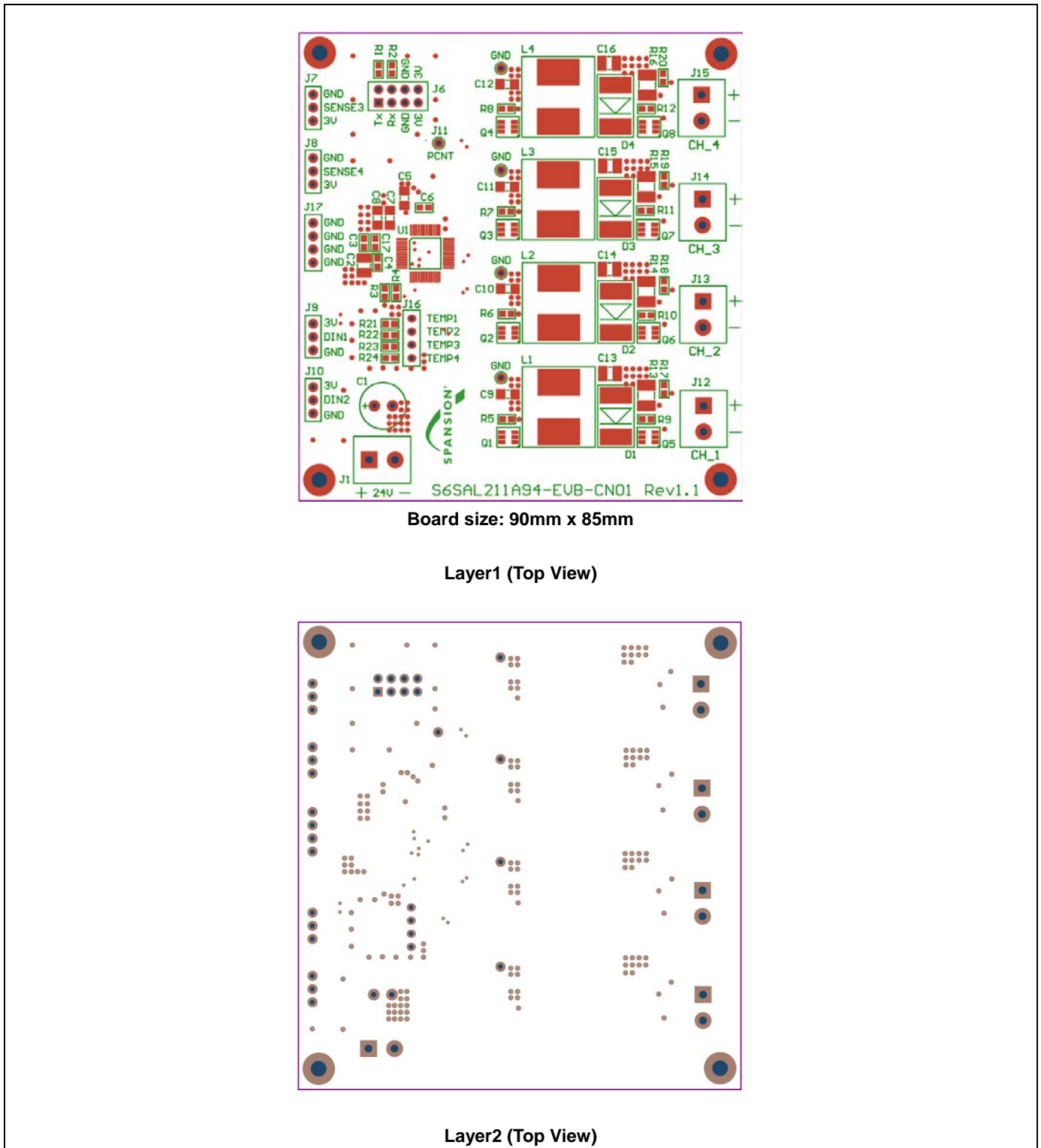
4.4 How to Do When LED Lighting can not be Controlled.

1. Turn off DC power supply.
2. Exit "BLExLED" application.
3. Turn off Bluetooth indicator in Android OS.
4. Turn on Bluetooth indicator in Android OS.
5. Turn on DC power supply.
6. Start "BLExLED". (Continue as above-mentioned)

5. Layout

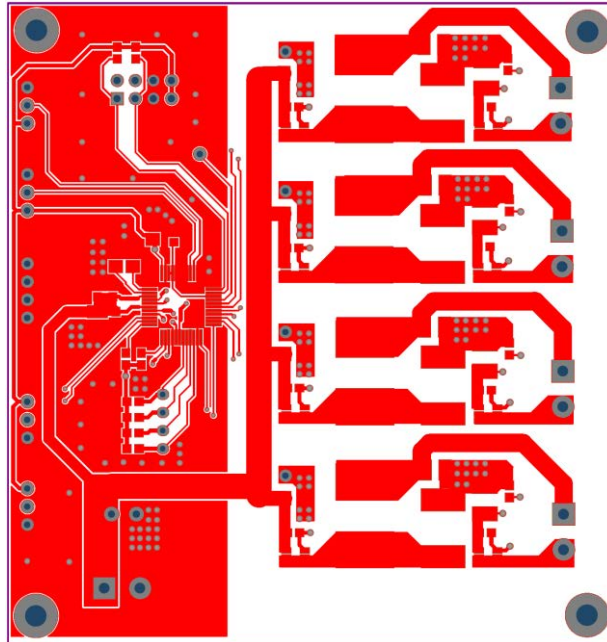
5.1 Component Layout

Figure 5-1 Evaluation Board Component Layout

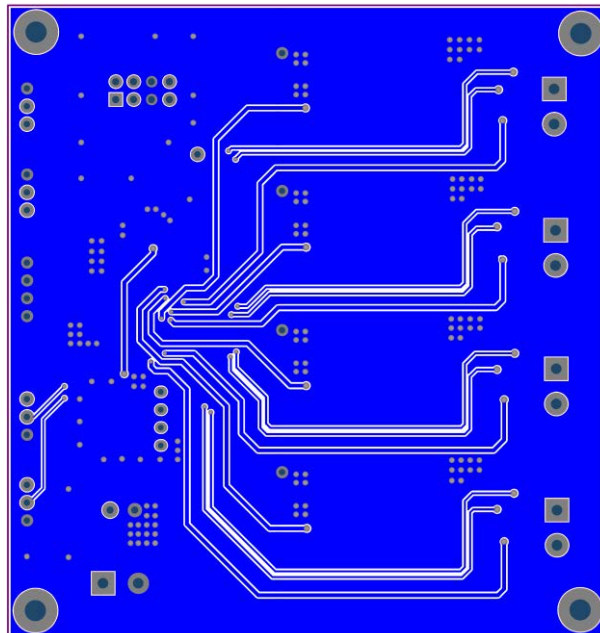


5.2 Wiring Layout

Figure 5-2 Evaluation Board Wiring Layout



Layer 1 (Top View)



Layer 2 (Top View)

6. Circuit Schematic

Figure 6-1 Evaluation Board Circuit Schematic

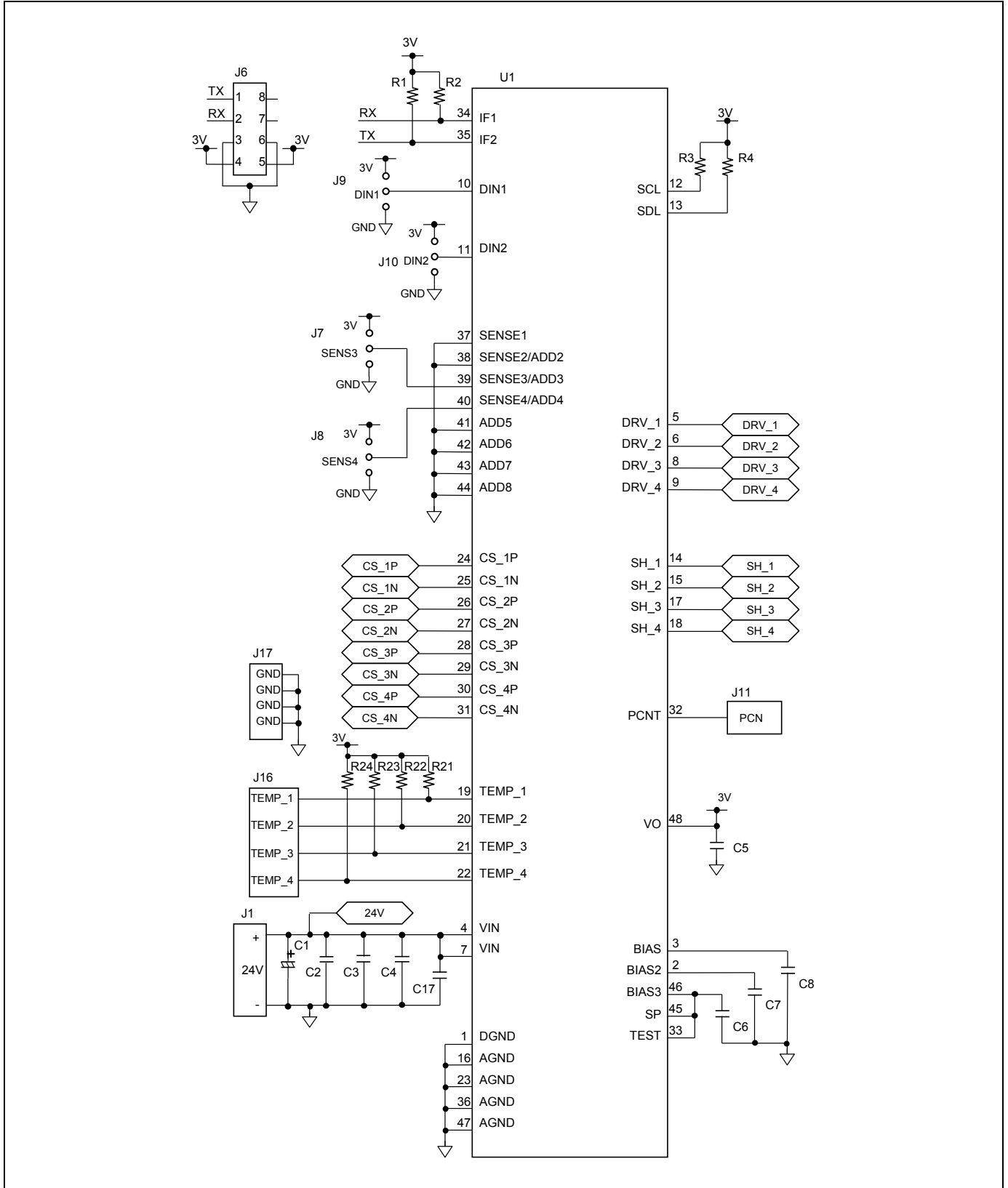
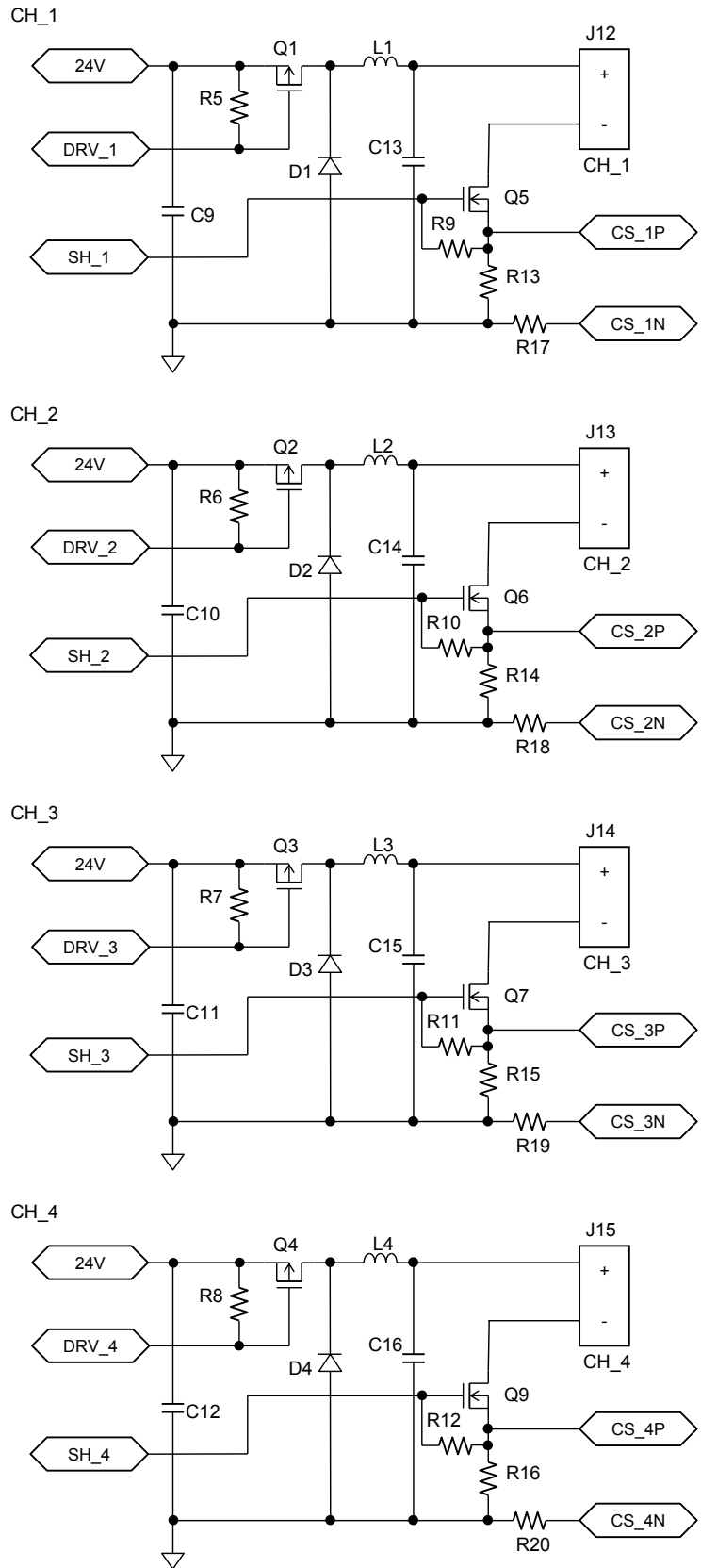


Figure 6-2 Evaluation Board Circuit Schematic



7. Component List

Table 7-1 Evaluation Board Component List

Amount	Component	Description	Package	Parts Number	Vendor	Remarks
1	C1	Electrolytic capacitor, 100 μ F, 50V	ϕ 8 mm \times 12 mm	-	-	-
5	C2, C13, C14, C15, C16	Ceramic capacitor, 10 μ F, 50V	1210	-	-	-
2	C3, C6	Ceramic capacitor, 0.1 μ F, 50V	0603	-	-	-
2	C4, C17	Ceramic capacitor, 100 pF, 50V	0603	-	-	-
7	C5, C7, C8, C9, C10, C11, C12	Ceramic capacitor, 4.7 μ F, 50V	1206	-	-	-
4	L1, L2, L3, L4	Inductance, 220 μ H, 2.1A	12 mm \times 12 mm	MSS1210-224KED	Coilcraft	-
4	R1, R2, R3, R4	Resistor, 100 k Ω , 5%	0603	-	-	-
8	R5, R6, R7, R8, R9, R10, R11, R12	Resistor, 1 M Ω , 5%	0603	-	-	-
4	R13, R14, R15, R16	Resistor, 0.2 Ω , 1%	1812	-	-	-
4	R17, R18, R19, R20	Resistor, 0 Ω	0603	-	-	-
4	R21, R22, R23, R24	Resistor, 7.5 k Ω , 5%	0603	-	-	-
4	D1, D2, D3, D4	Super-fast recovery diode, 30V, 3A	SMC	SK33-7-F	DIODES	-
4	Q1, Q2, Q3, Q4	Single P-Channel MOSFET, 30V, 4A	SuperSOT-6	FDC658AP	FAIRCHILD	-
4	Q5, Q6, Q7, Q8	Single N-Channel MOSFET, 30V, 6.5A	SuperSOT-6	FDC8886	FAIRCHILD	-
5	J1, J12, J13, J14, J15	Connection terminals (5.08 mm), 2P	-	-	-	-
5	J7, J8, J9, J10, J17	3 PIN header, (2.54 mm)	-	-	-	-
1	J6	8 PIN header, (2.54 mm)	-	-	-	-
1	J11	1 PIN header, (2.54 mm)	-	-	-	-
1	J16	4 PIN header, (2.54 mm)	-	-	-	NMT
1	J17	4 PIN header, (2.54 mm)	-	-	-	-
1	U1	LED driver IC	LQFP48	S6AL211A94	Cypress	-

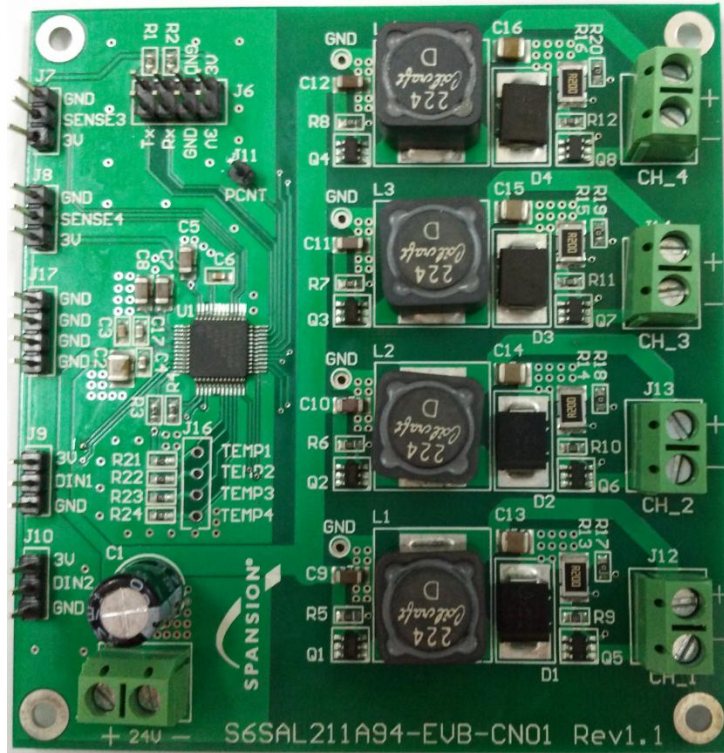
Coilcraft : Coilcraft Inc.
 DIODES : Diodes Incorporated
 FAIRCHILD : Fairchild Semiconductor International, Inc.
 Cypress : Cypress Semiconductor Corp

NMT: No mount.

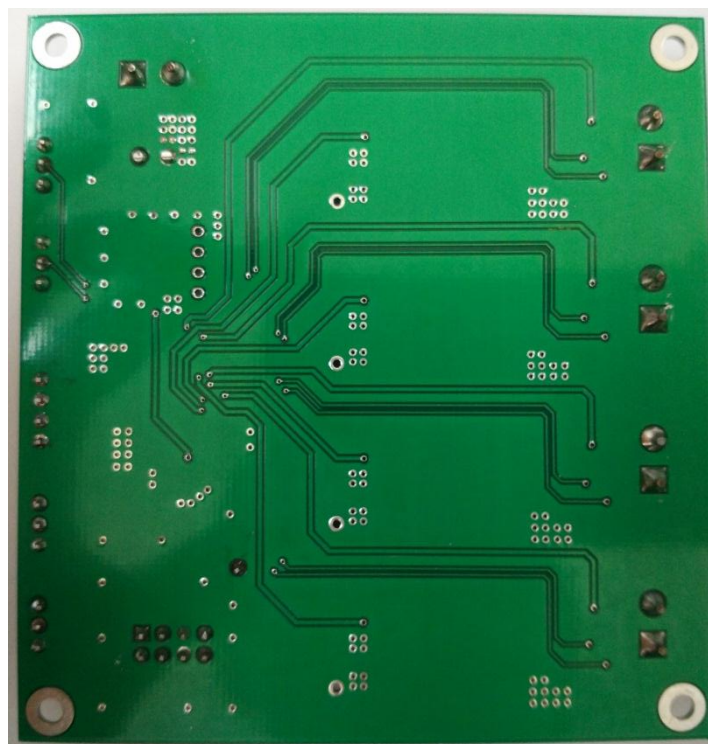
These components are compliant with RoHS, and please ask each vendor for details if necessary.

8. Board Picture

Figure 8-1 Evaluation Board Picture



(Top View)



(Bottom View)

9. Ordering Information

Table 9-1 Ordering Information

Part Number	EV B Revision	Note
S6SAL211A94SA2001	S6SAL211A94-EVB-CN01 Rev1.1	-

10. Major Changes

Table 10-1 Major Changes

Page	Section	Change Results
Revision 1.0		
-	-	Initial release

SS901-00042-1v0-E

Cypress • Support Tool Manual

S6SAL211A94SA2001
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4ch 72W LED Driver Board
Operation Manual

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Colophon

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