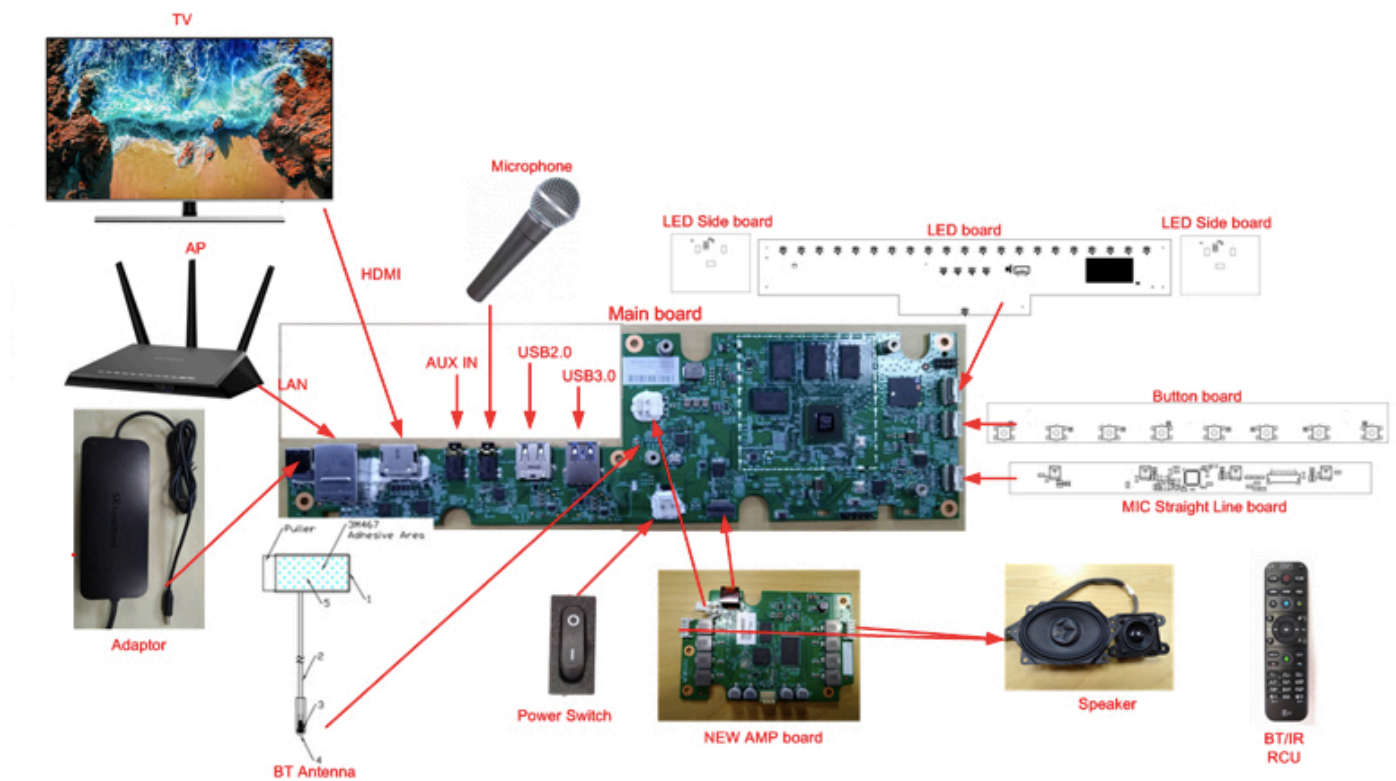


Hardware Unit Test Report

LED Test

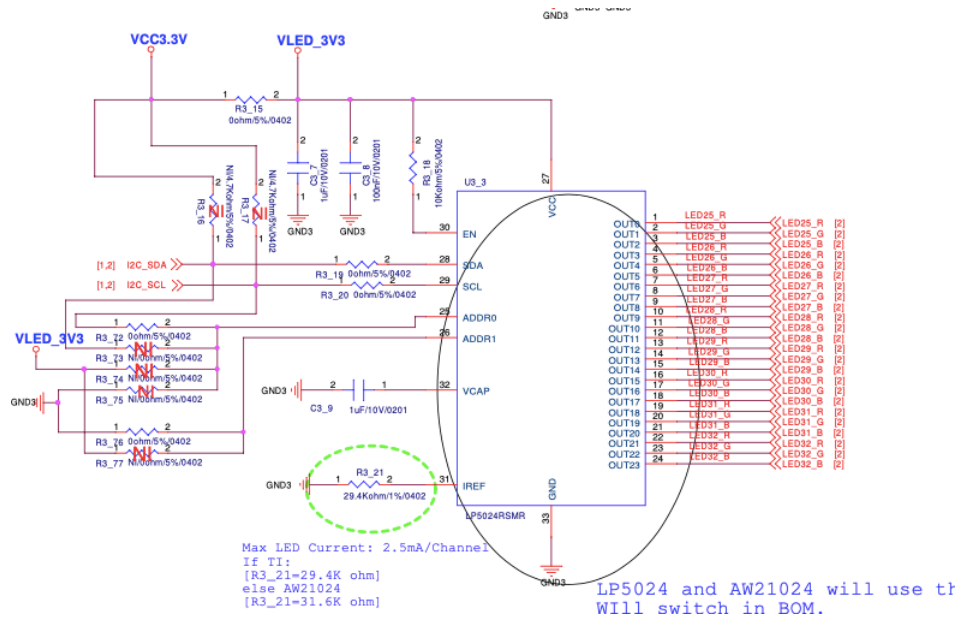
Hardware version	FW version	Sample No.	eMMC Flash P/N
V065	19.532.17	MAC: A8:93:4A:FE:95:D4	DDR: 1. K4A8G165WC-BCTD 2. K4A4G165WF-BCTD eMMC: KLM8G1GETF-B041

1. Test Setup



Test setup architecture

4. LED board schematic



AW21024 LED driver schematic-Side LED and Google LED

```

AW21036
IIC address setup
AD pin
-----|-----
GND      | 01101 00 0/1  [34h(Using), pipe 1-12]
VDD      | 01101 01 0/1  35h
SCL       | 01101 10 0/1  [36h(Using), pipe 13-21, Status]
SDA       | 01101 11 0/1  [37h(Using), Google, L/R side]
Broadcast: 0X1C
  
```

```

AW21024
IIC address setup
ADDR0    | ADDR1
-----|-----
GND      | GND  -->011 0000 0/1 30h
GND      | VDD  -->011 0001 0/1 31h
SCL       | GND  -->011 0010 0/1 [38h(Using), Google L/R side]
SCL       | VDD  -->011 1001 0/1 39h
SDA       | GND  -->011 0011 0/1 3ch
SDA       | VDD  -->011 0011 0/1 3dh
Broadcast: 0X1C
  
```

CURRENT SETTING

The average output current of LED_n (n=1, 2, ..., 24) can be expressed by the following formula,

$$I_{OUT(n)} = \frac{K}{R_{EXT}} \times \frac{GCC}{255} \times \frac{WB}{255} \times \frac{COL_n}{255} \times \frac{BR_n}{256} \quad n=1, 2, 3, \dots, 24$$

Where $K=80V$, R_{EXT} is the value of external resistor, GCC is the 8bit global current configured by the register GCCR (address 6Eh), WB is 8bit white balance parameter configured by the register WBR/WBG/WBB (address 90h/91h/92h), COL_n is 8bit individual constant current parameter, and BR_n is 8bit individual PWM modulated current parameter.

Note: GCC register is set at 0xF0 for maximum current for 2.5mA.

4.2 Test command example

Parameter setup: color

Echo 0x123456

Where:

0x12_ _ _ _ is Red LED bright and color

0x_ _34_ _ is Green LED bright and color

0x_ _ _ _56 is Blue LED bright and color

Red-LED

```
echo 0x120000 > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-0034/leds/aw21036_led:row1_led0/color
```

Green-LED

```
echo 0x003400 > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-0034/leds/aw21036_led:row1_led0/color
```

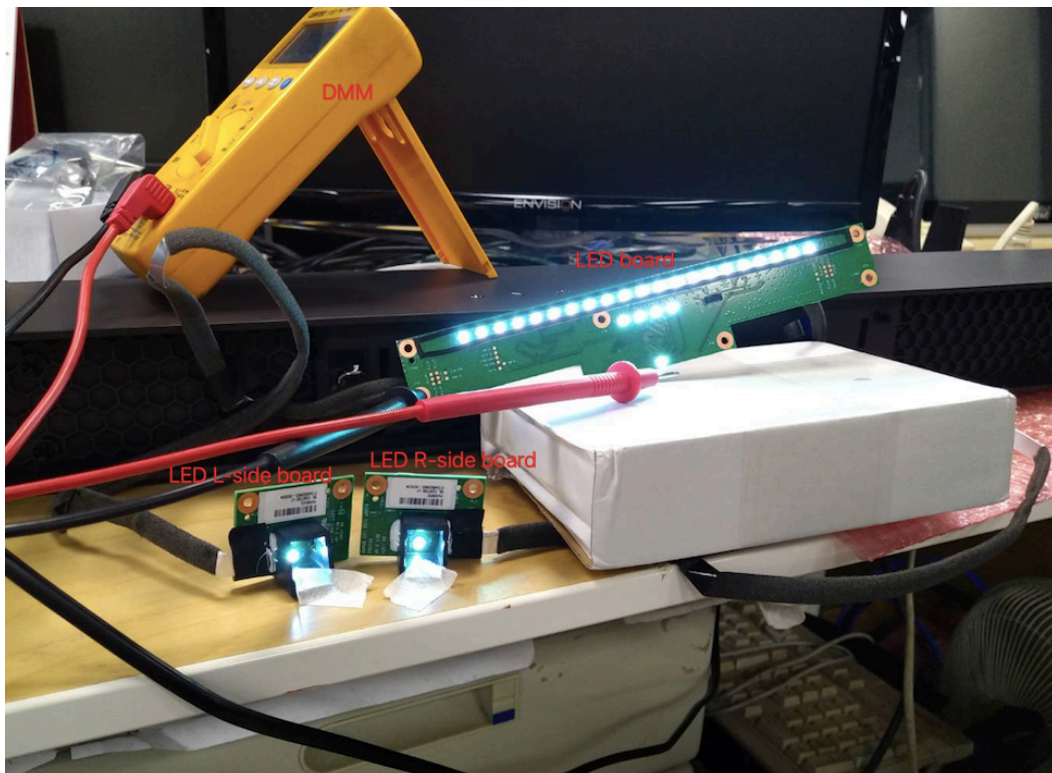
Blue-LED

```
echo 0x000056 > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-0034/leds/aw21036_led:row1_led0/color
```

Parameter setup: color

echo 255: means 00~255 levels for LED driving current.

```
echo 255> /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-0034/leds/aw21036_led:row1_led0/brightness
```



U3_5 command: AW21036

Color:

```
echo 0xffffffff > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-0034/leds/aw21036_led:row1_led0/color
echo 0xffffffff > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-0034/leds/aw21036_led:row1_led1/color
echo 0xffffffff > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-0034/leds/aw21036_led:row1_led2/color
echo 0xffffffff > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-0034/leds/aw21036_led:row1_led3/color
echo 0xffffffff > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-0034/leds/aw21036_led:row1_led4/color
echo 0xffffffff > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-0034/leds/aw21036_led:row1_led5/color
echo 0xffffffff > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-0034/leds/aw21036_led:row1_led6/color
echo 0xffffffff > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-0034/leds/aw21036_led:row1_led7/color
echo 0xffffffff > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-0034/leds/aw21036_led:row1_led8/color
echo 0xffffffff > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-0034/leds/aw21036_led:row1_led9/color
echo 0xffffffff > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-0034/leds/aw21036_led:row1_led10/color
echo 0xffffffff > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-0034/leds/aw21036_led:row1_led11/color
```

Brightness:

```
echo 255> /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-0034/leds/aw21036_led:row1_led0/brightness
echo 255> /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-0034/leds/aw21036_led:row1_led1/brightness
echo 255> /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-0034/leds/aw21036_led:row1_led2/brightness
echo 255> /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-0034/leds/aw21036_led:row1_led3/brightness
echo 255> /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-0034/leds/aw21036_led:row1_led4/brightness
echo 255> /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-0034/leds/aw21036_led:row1_led5/brightness
echo 255> /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-
```

0034/leds/aw21036_led:row1_led6/brightness

echo 255> /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-

0034/leds/aw21036_led:row1_led7/brightness

echo 255> /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-

0034/leds/aw21036_led:row1_led8/brightness

echo 255> /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-

0034/leds/aw21036_led:row1_led9/brightness

echo 255> /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-

0034/leds/aw21036_led:row1_led10/brightness

echo 255> /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-

0034/leds/aw21036_led:row1_led11/brightness

U3_6 command: AW21036

Color:

echo 0xffffffff > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-
0036/leds/aw21036_led:row1_led12/color

echo 0xffffffff > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-
0036/leds/aw21036_led:row1_led13/color

echo 0xffffffff > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-
0036/leds/aw21036_led:row1_led14/color

echo 0xffffffff > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-
0036/leds/aw21036_led:row1_led15/color

echo 0xffffffff > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-
0036/leds/aw21036_led:row1_led16/color

echo 0xffffffff > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-
0036/leds/aw21036_led:row1_led17/color

echo 0xffffffff > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-
0036/leds/aw21036_led:row1_led18/color

echo 0xffffffff > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-
0036/leds/aw21036_led:row1_led19/color

echo 0xffffffff > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-
0036/leds/aw21036_led:row1_led20/color

echo 0xffffffff > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-
0036/leds/aw21036_led:row3_led0/color

Brightness:

echo 255 > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-
0036/leds/aw21036_led:row1_led12/brightness

echo 255 > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-
0036/leds/aw21036_led:row1_led13/brightness

echo 255 > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-

0036/leds/aw21036_led:row1_led14/brightness

echo 255 > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-

0036/leds/aw21036_led:row1_led15/brightness

echo 255 > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-

0036/leds/aw21036_led:row1_led16/brightness

echo 255 > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-

0036/leds/aw21036_led:row1_led17/brightness

echo 255 > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-

0036/leds/aw21036_led:row1_led18/brightness

echo 255 > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-

0036/leds/aw21036_led:row1_led19/brightness

echo 255 > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-

0036/leds/aw21036_led:row1_led20/brightness

echo 255 > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-

0036/leds/aw21036_led:row3_led0/brightness

U3_3 command: AW21024

Color:

echo 0xffffffff > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-

0038/leds/aw21024_led:row2_led0/color

echo 0xffffffff > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-

0038/leds/aw21024_led:row2_led1/color

echo 0xffffffff > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-

0038/leds/aw21024_led:row2_led2/color

echo 0xffffffff > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-

0038/leds/aw21024_led:row2_led3/color

echo 0xffffffff > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-

0038/leds/aw21024_led:left_led0/color

echo 0xffffffff > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-

0038/leds/aw21024_led:left_led1/color

echo 0xffffffff > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-

0038/leds/aw21024_led:right_led0/color

echo 0xffffffff > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-

0038/leds/aw21024_led:right_led1/color

Brightness:

echo 255 > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-

0038/leds/aw21024_led:row2_led0/brightness

echo 255 > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-

0038/leds/aw21024_led:row2_led1/brightness

echo 255 > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-

```
0038/leds/aw21024_led:row2_led2/brightness
```

```
echo 255 > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-
```

```
0038/leds/aw21024_led:row2_led3/brightness
```

```
echo 255 > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-
```

```
0038/leds/aw21024_led:left_led0/brightness
```

```
echo 255 > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-
```

```
0038/leds/aw21024_led:left_led1/brightness
```

```
echo 255 > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-
```

```
0038/leds/aw21024_led:right_led0/brightness
```

```
echo 255 > /sys/devices/platform/soc/soc:apb@e80000/f7e81400.i2c/i2c-0/0-
```

```
0038/leds/aw21024_led:right_led1/brightness
```

5. Function Test Result

5.1 Result

The measurement of LED current and voltage is on U3_3/U3_5/U3_6 LED driver for verified if any voltage drop and record LED current record. U3_5/U3_6 are AW21036(for light bar and status LED), and U3_3 is AW21024(Google LED and Side LED). The measurement includes brightness and color tuning by command through I2C, see as table 1 which is brightest as command 0xffffffff for RGB LED.

Table1. LED measurement

Location	Driver	LED NO.	RGB	Voltage(V)		Current(mA)
				Anode	Cathode	Cathode
LED board	U3_5 AW21036QNR	D1	R	4.96	3.15	2.51
			G	4.98	2.24	2.53
			B	4.98	2.13	2.57
		D2	R	4.98	3.14	NA
			G	4.98	2.31	NA
			B	4.98	2.1	NA
		D3	R	4.98	3.14	NA
			G	4.98	2.26	NA
			B	4.98	2.12	NA
		D4	R	4.98	3.14	NA
			G	4.98	2.24	NA
			B	4.98	2.12	NA
		D5	R	4.98	3.15	NA
			G	4.98	2.24	NA
			B	4.98	2.13	NA
		D6	R	4.98	3.14	NA
			G	4.98	2.38	NA

BFX-UA300 V065 Hardware Unit Test Report

				B	4.98	2.12	NA
			D7	R	4.98	3.14	NA
				G	4.98	2.2	NA
				B	4.98	2.15	NA
			D8	R	4.98	3.14	NA
				G	4.98	2.28	NA
				B	4.98	2.1	NA
			D9	R	4.98	3.14	NA
				G	4.98	2.22	NA
				B	4.98	2.17	NA
			D10	R	4.98	3.14	NA
				G	4.98	2.27	NA
				B	4.98	2.16	NA
			D11	R	4.98	3.15	2.52
				G	4.98	2.31	2.53
				B	4.98	2.17	2.56
			D12	R	4.98	3.14	NA
				G	4.98	2.22	NA
				B	4.98	2.17	NA
	U3_6 AW21036QNR		D13	R	4.98	3.14	2.53
				G	4.98	2.32	2.51
				B	4.98	2.16	2.57
			D14	R	4.98	3.14	NA
				G	4.98	2.27	NA
				B	4.98	2.11	NA
			D15	R	4.98	3.14	NA
				G	4.98	2.22	NA
				B	4.98	2.15	NA
			D16	R	4.98	3.14	NA
				G	4.98	2.22	NA
				B	4.98	2.15	NA
			D17	R	4.98	3.14	NA
				G	4.98	2.23	NA
				B	4.98	2.17	NA
			D18	R	4.98	3.14	NA
				G	4.98	2.22	NA
				B	4.98	2.15	NA
			D19	R	4.98	3.14	NA
				G	4.98	2.22	NA
				B	4.98	2.14	NA

BFX-UA300 V065 Hardware Unit Test Report

LED side board			D20	R	4.98	3.15	NA
				G	4.98	2.15	NA
				B	4.98	2.15	NA
			D21	R	4.98	3.14	2.58
				G	4.98	2.14	2.45
				B	4.98	2.17	2.56
			D22	R	4.98	3.14	NA
				G	4.98	2.28	NA
				B	4.98	2.12	NA
	U3_3 AW21024		D29	R	4.98	3.14	2.5
				G	4.98	2.25	2.5
				B	4.98	2.13	2.57
			D30	R	4.98	3.15	NA
				G	4.98	2.2	NA
				B	4.98	2.15	NA
			D31	R	4.98	3.14	NA
				G	4.98	2.28	NA
				B	4.98	2.15	NA
			D32	R	4.98	3.14	NA
				G	4.98	2.31	NA
				B	4.98	2.17	NA
			D4_1	R	4.94	3.13	2.5
				G	4.94	2.28	2.5
				B	4.94	2.1	2.57
			D4_2	R	4.94	3.14	NA
				G	4.94	2.27	NA
				B	4.94	2.1	NA
			D5_1	R	4.94	3.13	2.5
				G	4.94	2.28	2.49
				B	4.94	2.15	2.56
			D5_2	R	4.94	3.14	NA
				G	4.94	2.27	NA
				B	4.94	2.15	NA

Note: The 0 ohm at LED RGB cathode side is for easy to measure the LED current. But only D1/D11/D13/D21/D29 and LED side board D4_1/D5_1 has 0 ohm for measurement current, so there is only 6 LEDs have current value.