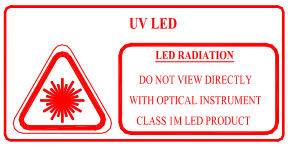
Notice: This is not a final specification.
Outline, some parametric limits and figures are subject to be changed.



CSL2R89XUV-141211

Approved by customer		

A.2014/12/11 original Julihui
B.2015/03/18 detailed specification Julihui
C.2015/05/05 P15,black ink was added Julihui

1. Description

This specification is applied to CSL2R89XUV-141211 color Contact Image Sensor module.

2. Scope

This CSL2R89XUV-141211 is a color CIS consists of a Rod Lens Array, a color LED light source and an array of linear MOS image sensor.

3.Outline

Item		Specification	Note
Scanning width		89 mm	
Sensor element density		600DPI	CNT=VDD
Effective number of sensor elements		2,102 elements 30# to 2,131# (Full 2,160elements)	
Scanning speed	Color	120×4 μsec/line (R/G/B/IR)	
	B&W	120 μsec/line	
	UV	120 μsec/line	
Clock speed		8.0 MHz	
Rod lens array		Tow rows	L19
Light source		Red λp = 630nm ± 15nm 60mA Green λp = 520nm ± 15nm 60mA Blue λp = 465nm ± 10nm 60mA IR λp = 810nm ± 20nm 60 mA UV λp = 365nm ± 15nm 100 mA	
Filter		Filter4	
Power supply		+3.3V ×150 mA	
Data output 3 analog output		Block#1 864 pixels Block#2 864pixels Block#3 432 pixels	Synchronous
Dimensions		Figure 1	

Note 1) Clock Speed f must satisfy the following status:

$f > (n + 92) / tint$

f: Clock speed

n: Full sensor elements number of every block.
600DPI:864

tint: Scanning speed

4.Image Data Output Characteristics (Ta = 25ºC)

The shipment test of WHEC is done on the condition of this table.

In Color Mode

Item	Symbol	Specification					Note
		Red	Green	Blue	IR	UV	
DC supply voltage	VDD	+3.3V					Detector, Logic
LED supply voltage	VLED	<3.0V	<5.0V	<5.0V	<2.0V	+12V	UV test99mA
LED upply current	ILED	60mA	60mA	60mA	60mA	25 mA×4	
White image target		0.05~0.09 OD(RGBIR)			Whec test chart (UV)		
Timing diagram		Figure6					
Video Reference	Vref	800±200mV					4.1
Dark output minimum	Vdmin	≥ - 150 mV					4.2
Dark output maximum	Vdmax	≤ + 200 mV					4.3
White output maximum	Vpmax	300 ± 100 mV **T .B.D**					4.4
White output uniformity	UEp	Less than 65% **T .B.D**					4.5
MTF		20% MIN	30% MIN	15% MIN	5% MIN	----------	4.6 142.697 lppi
Linearity	Gamma	0.95~1.05					
Linearity Uniformity	LU	Less than 7%					4.7

In Black and White Mode

Item	Symbol	Specification					Note
		Red	Green	Blue	IR	UV	
DC supply voltage	VDD	+3.3V					Detector, Logic
LED supply voltage	VLED	<3.0V	0V	0V	0V	0V	
LED supply current	ILED	60mA	0mA	0mA	0mA	0mA	
White image target		0.05~0.09 OD					
Timing diagram		Figure6					
Video Reference	Vref	800±200mV					4.1
Dark output minimum	Vdmin	≥ - 150 mV					4.2
Dark output maximum	Vdmax	≤ + 200 mV					4.3
White output maximum	Vpmax	300 ± 100 mV **T .B.D**					4.4
White output uniformity	UEp	Less than 65%					4.5
MTF		20%MIN					4.6 142.697 lppi
Linearity	Gamma	0.95~1.05					
Linearity Uniformity	LU	Less than 7%					4.7

The output level of image signal like white and dark and MTF is defined at the point of "ts" which described in section 6.A test target is set on the reading position as outlined in Figure 1.

4.1 Vref

Video reference voltage.

Vref is outputted from connector pin #7.Vdmin and Vdmax are based on vref.

Dref

Dark reference voltage

As shown in Figure 4, Dref appears from clock #75 to #79.Dref voltage is almost equal to Vref voltage.

4.2 Vdmin

As shown in Figure 2, Vdmin is the minimum in the dark output signal (turning off the LED). Every other parameter is defined by Vdmin as a reference.

4.3 Vdmax

As shown in Figure 2, Vdmax is the maximum in the dark output signal (turning off the LED).

4.4 Vpmax

As shown in Figure 2, Vpmax is the maximum white output signal of effective pixels and is defined by:

Vpmax=MAX [Vp (n)]

Vp (n) is the output signal of the nth pixel using a white image target.

Under the LED constant current condition,Vpmax can reach to specified value by adjusting the light-emitting time of LED(LED pulse width should be 5%～95% of Tmax)

4.5 UEp

UEp is the white output non-uniformity with dark signal subtracted and is defined by:

UEp = ((VEpmax – VEpmin) / (VEpmax)) x 100%

VEpmax = MAX [VEp (n)]; is the maximum effective output signal

VEpmin = MIN [VEp (n)]; is the minimum effective output signal

VEp (n) is the effective output signal of every pixel and is defined by:

VEp (n) = Vp (n) – Vd (n)

4.6 MTF

MTF is defined by:

MTF = MIN {[(Vmax-Vmin) / VEp]} x 100%

Vmax is the maximum output signal using the MTF image target

Vmin is the minimum output signal using the MTF image target

VEp is the effective output signal.

4.7 **Linearity Uniformity**

LUg is measured following procedure and defined;

Step1. Test Target

The white image target is used as a test target. This target must not be moved while this test is being operated.

Step2. LED adjustment

Tred, Tgrn ,Tblu ,Tir and Tuv should be adjusted according to Figure 8 procedure.

Step3. Dark and White correction

Dark and White correction must be done for every each pixel.

Step4. LED on time set

Tred, Tgrn ,Tblu and Tir should be changed as following;

Tred/2, Tgrn/2, Tblu/2, Tir/2, Tuv/2

Step5. Compute LUg

LUg should be computed for each color as;

$LUg = |Dgave - Dgextm|$

Dgave is the average of Vg (n). Vg (n) should be got more than 8 times sampling.

Step6. LED on time set

Tred, Tgrn ,Tblu and Tir should be changed as followed and compute LUg regarding to Step5;

Tred/4, Tgrn/4, Tblu/4, Tir/4, Tuv/4

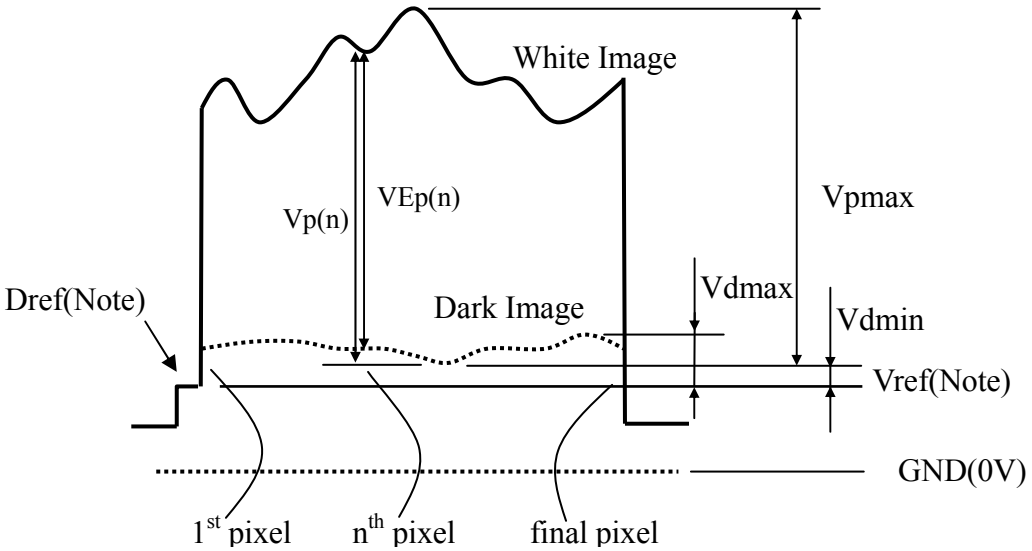
Step7. LED on time set

Tred, Tgrn ,Tblu and Tir should be changed as followed and compute LUg regarding to Step5;

Tred/8, Tgrn/8, Tblu/8, Tir/8, Tuv/8

4.8 Correction of Dark and White uniformity

For the best performance two points correction (dark and white) is strongly recommended.



Note1: Vref or Dref is the reference voltage for video signals that is outputted from connector PIN #7 as DC signal. Do not use the GND as video signal reference in stead of Vref or Dref .

Note2: For the best performance of IR mode,make compensation coefficient ,and start image reading after lighting IR for approximately 2 seconds is recommended.

Figure 2. Output Signals Waveform

5.Maximum Rating

Item	Symbol	Specification	Note
DC supply voltage	VDD	+3.3V ± 0.17V	
Input voltage	VIN	-0.4 ~ VDD+0.4V	SI, CLK
Ambient temperature	Ta	0 ~ +50 ℃	Operating
		-20 ~ +60 ℃	Non-operating
Ambient humidity		10 ~ 90%RH	Avoid a build up condensation
Maximum operating Temperature		65 ℃ 30minuts MAX	

LED

Parameter	Symbol	Red	Green	Blue	Ir	UV	Notes
DC Forward Current	IF	60 mA	60 mA	60 mA	60 mA	25mA×5	Uv array
Pulse Forward Current	IFP	60 mA	60 mA	60 mA	60 mA	25mA	One led
DC Reverse Voltage	VR	5.0 V	5.0V	5.0V	5.0V	+12V	

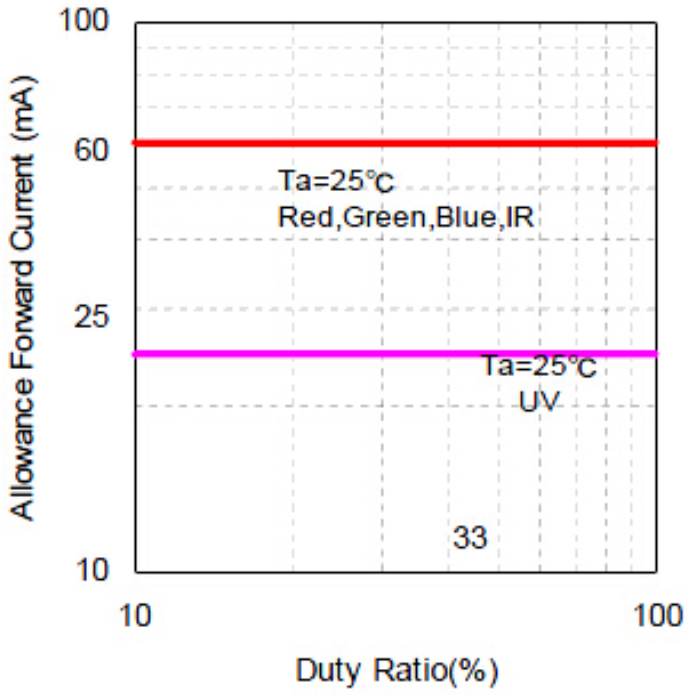


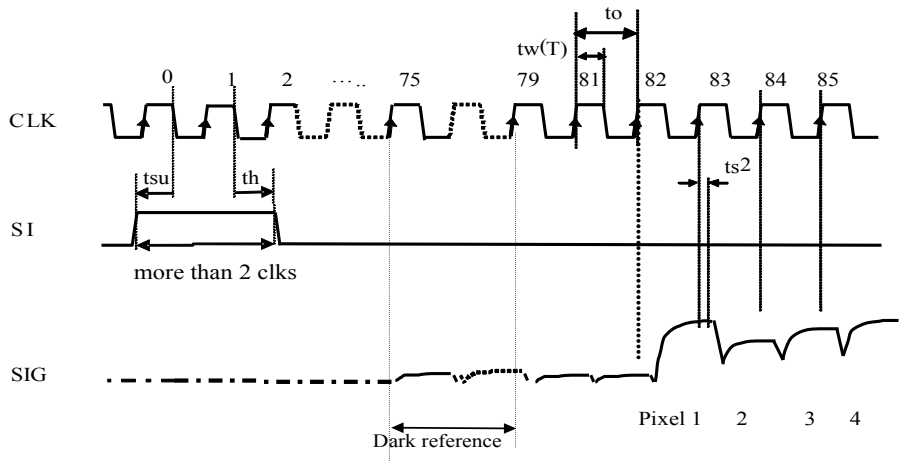
Figure 3. Duty Ratio VS Allowance Forward Current

6. Electrical Characteristics (Ta = 25 ºC)

Item	Symbol	Condition		Specification			Unit
				Min.	Typ.	Max.	
DC Supply Voltage	VDD	GND reference		3.13	3.3	3.47	V
DC Supply Current	IDD	VDD = 3.3V			130	150	mA
LED Forward Voltage	VFred	IF=30mA IF=40mA IF=60mA		2.1 2.1 2.3	2.3 2.4 2.5	2.5 2.6 2.7	V V V
	VFgreen	IF=30mA IF=40mA IF=60mA		3.3 3.4 3.6	3.6 3.8 4.0	4.0 4.1 4.4	V V V
	VFblue	IF=30mA IF=40mA IF=60mA		3.3 3.4 3.6	3.7 3.8 4.0	4.1 4.2 4.3	V V V
	VFir	IF=30mA IF=40mA IF=60mA		1.2 1.2 1.4	1.4 1.4 1.5	1.5 1.6 1.6	V V V
Input voltage (**Note1**)	VIH	SI,CLK		2.4			V
	VIL					0.5	V
Input Current (**Note1**)	IIH	SI,CLK VIH=3.3V				5	mA
	IIL			-0.5			µA
Clock frequency	f				8		MHz
Clock pulse duty		tw(T)/to; to=1/f		48	50	52	%
SI setup time	tsu	SI-CLK	**Note2**	60		to	ns
SI hold time	th	SI-CLK		60		5×to	ns
Data output stability time	ts2	CLK-SIG		20	30	40	ns

Note1): 74HC244 or equivalent is recommended for input signal.

Note2): These are reference values,tsu、th、ts2 are determined according to the evaluation of user's device.



Dark reference for Dref appears between clock 75# to 79#; Dark dummy stable time is as same as ts2.

Figure4: Timing Diagram

7.Reliability

The following table satisfies the reliability when the CIS is operated continuously under standard operating conditions as specified in section 4.

Item	Variable Amount (%)	Note
White output	Initial level +10% -20%	1000Hr
	Initial level +10% -30%	5000Hr

8. Precautions before use:

8.1 Polycarbonate sheet surface

The Glass surface should be kept clean. Don't wipe the glass surface with hand. If the glass surface gets dirty, wipe the glass surface gently with a clean cloth soaked in alcohol. The glass surface should be wiped very carefully.

8.2 Extracting / Inserting the connector

The maximum number of times that the connector should be extracted and connected is 10. If the connector is inserted / extracted more than 10 times, the connector 'burrs' will be eroded, thereby making the connector ineffective.

8.3 Stable operation

(1) The connector pins should not be touched by bare hand or electrostatic charge materials.

(2) Noise

a. Insert a low frequency noise suppressing capacitor (100uF) between VDD (+3.3V) and GND. A high frequency noise suppressing capacitor is already integrated into the circuit.

b. Ensure that the sensor connecting cables are 30cm or less in length. The CLK and GND, SIG and GND and VLED and LEDr, LEDg, LEDb, LEDir, LEDuv respectively should form twisted cable pairs.

(3) Latch up

When the supply voltage is higher than the absolute maximum, latch up will cause the sensor to break, even if the voltage is caused by a surge. If the current varies rapidly in the external circuit, or when the power is turned on an off very frequently, ensure that the voltage of each terminal does not exceed the values indicated in below.

(4) LED circuit

As shown in Figure.5 R/G/B/IR circuit has not any resistance. Be careful not to connect the LED circuit to power supply directly without current limit resistors.

(5) Absolute maximum ratings

Item	Symbol	Condition	Specification		Unit
			Min	Max	
Supply Voltage	VDD	GND reference	-0.4	+4.0	V
Input voltage	Vin	SI,CLK	GND-0.4	VDD+0.4	V

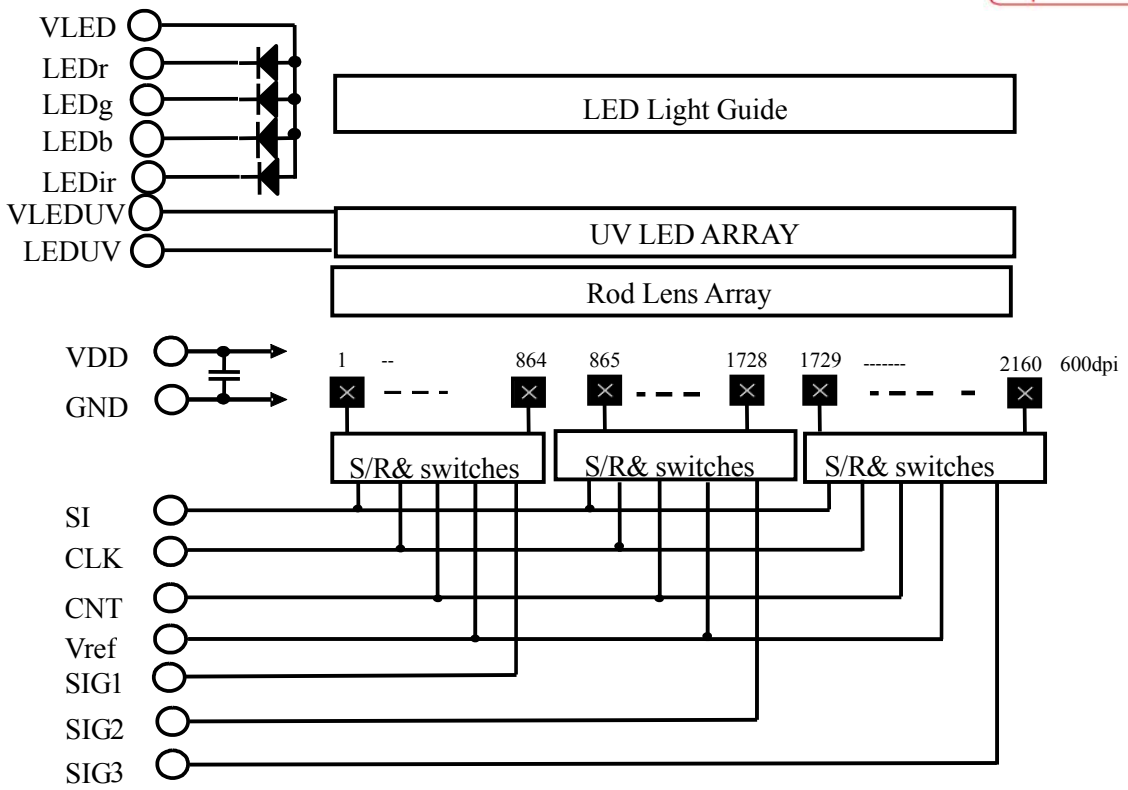
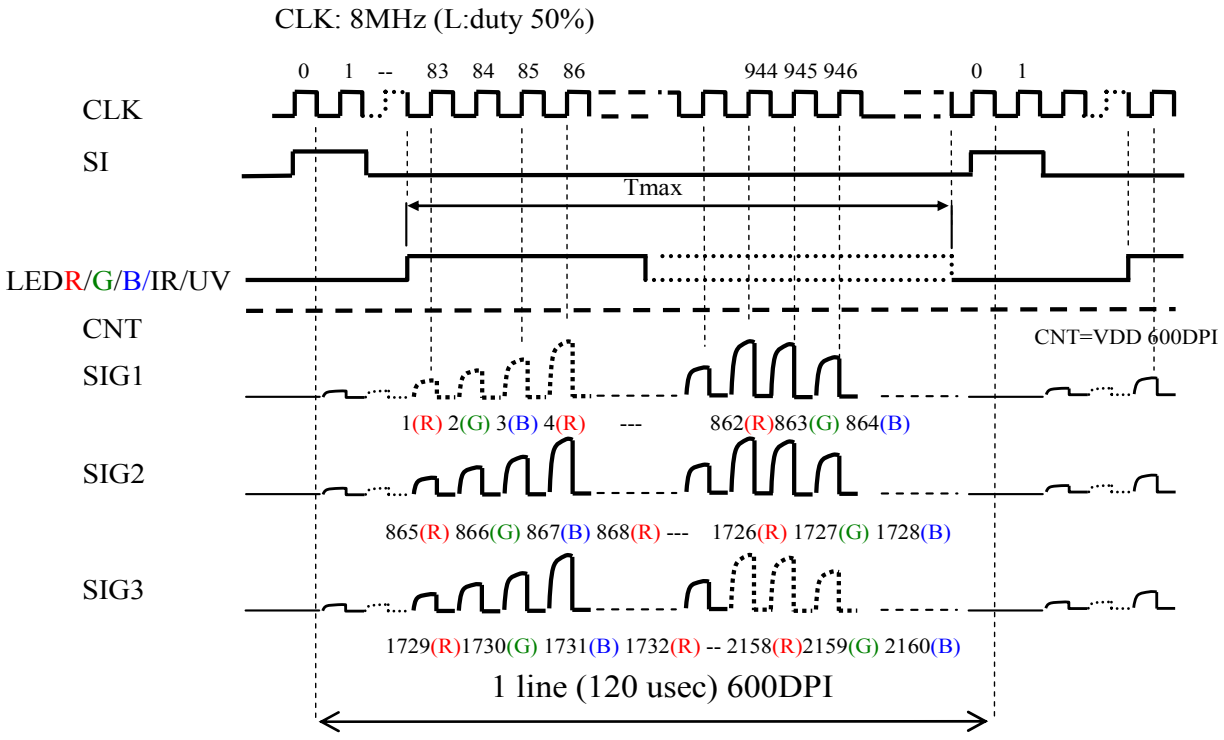


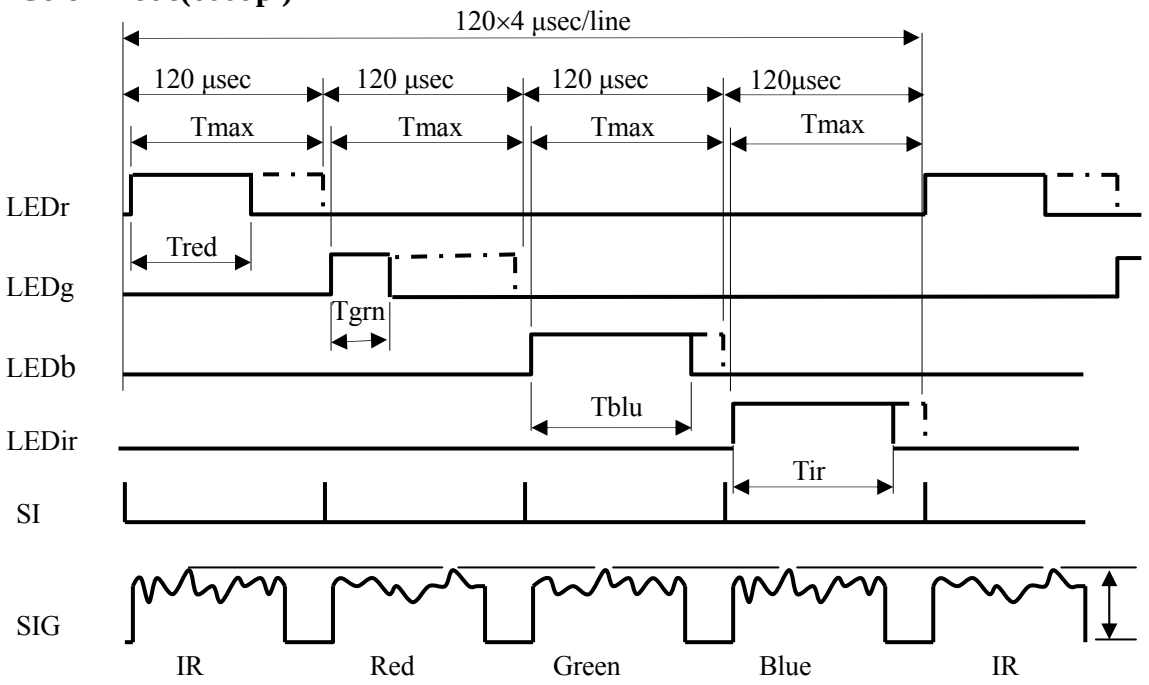
Figure 5. Block Diagram



Note: More than 7 clocks are needed after #864, #1728 and #2160 video SIG.

Figure 6. Timing Diagram

☐ **Color Mode(600dpi)**



Vpmax and the mean of VEp(n) of all color have to be adjusted to nearly equal. Refer the adjustment flow at Figure 8.

Figure 7. Color mode Timing Diagram(This is the WHEC shipping test condition)

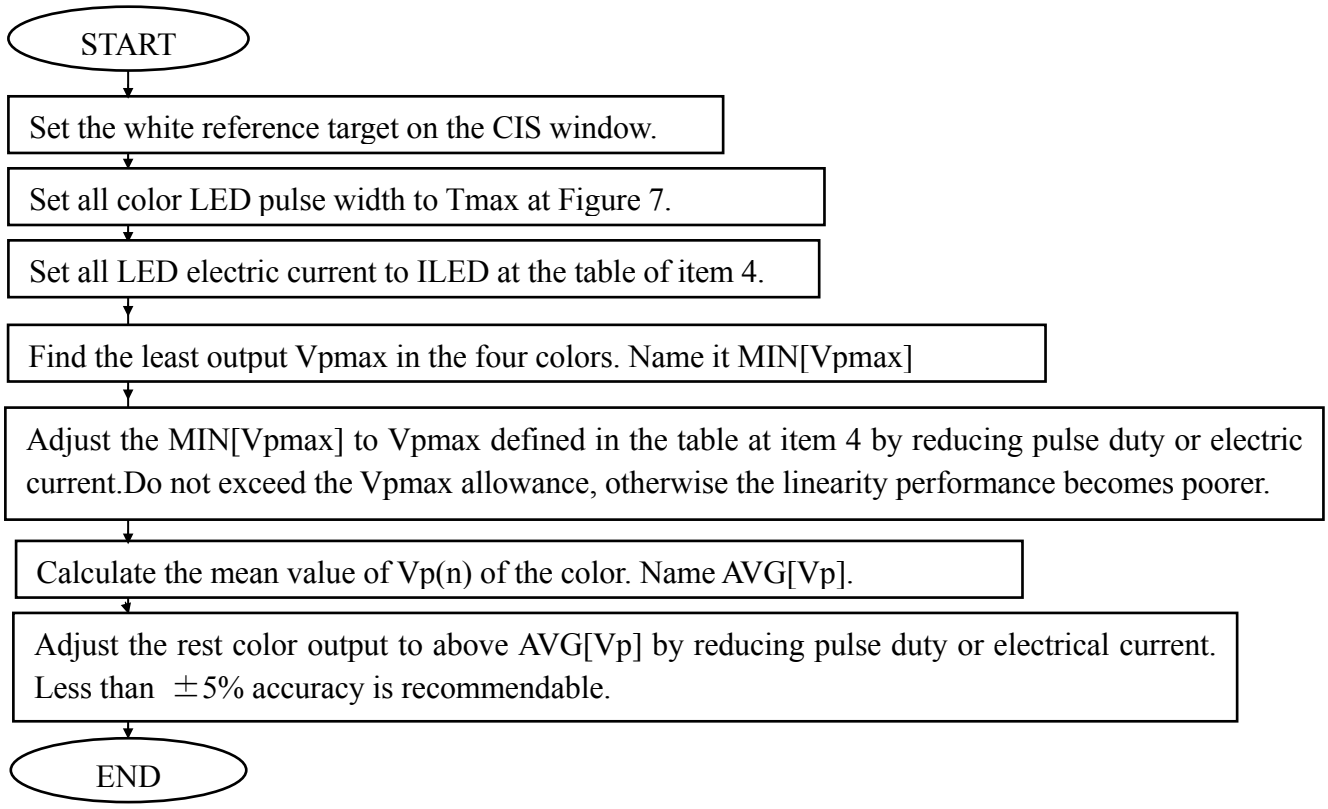
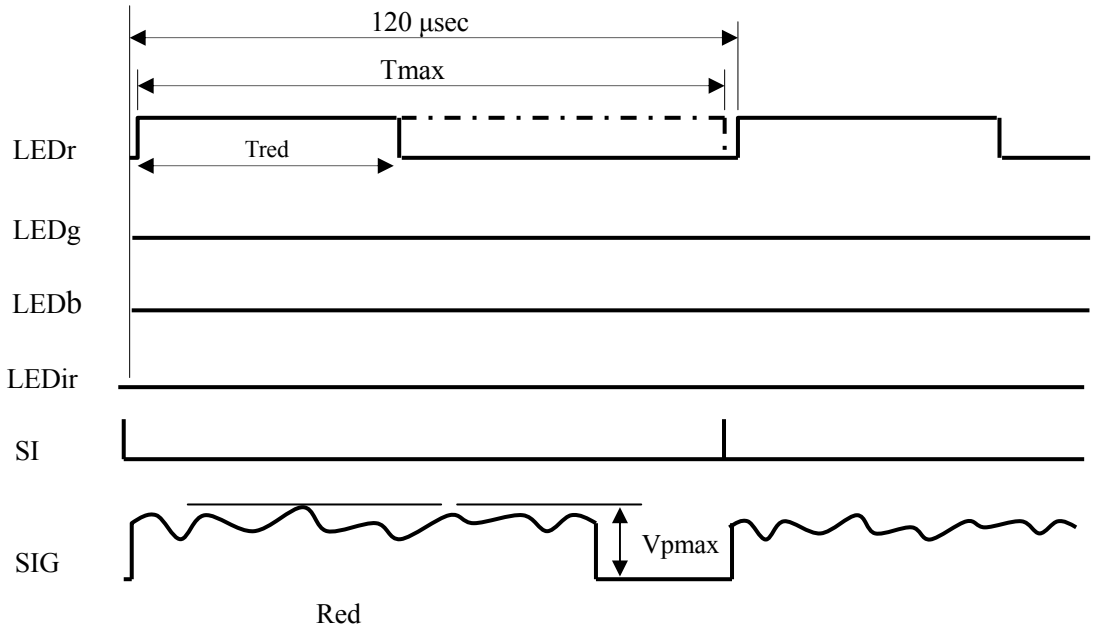


Figure 8. Flow Chart of Color mode Adjustment (This is the WHEC shipping test condition)

☐ **B&W Mode with Mono-Color Light Source (600dpi)**



This is the example for Red mono-color application. Refer the adjustment flow chart at Figure 10.

Figure 9. Mono-Color Light Source Timing Diagram

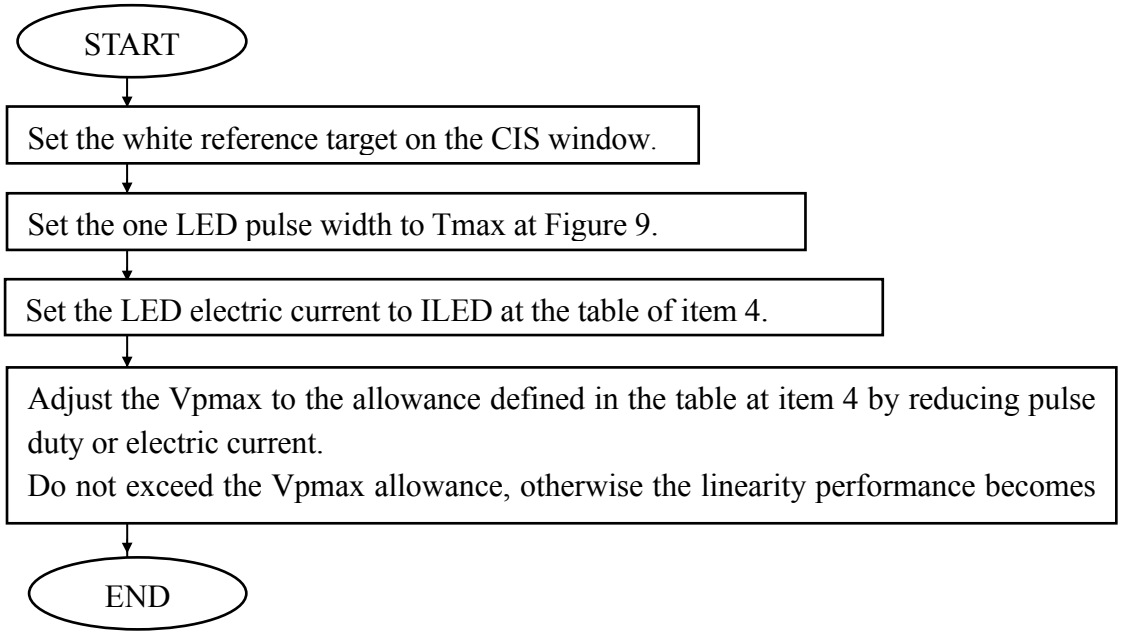
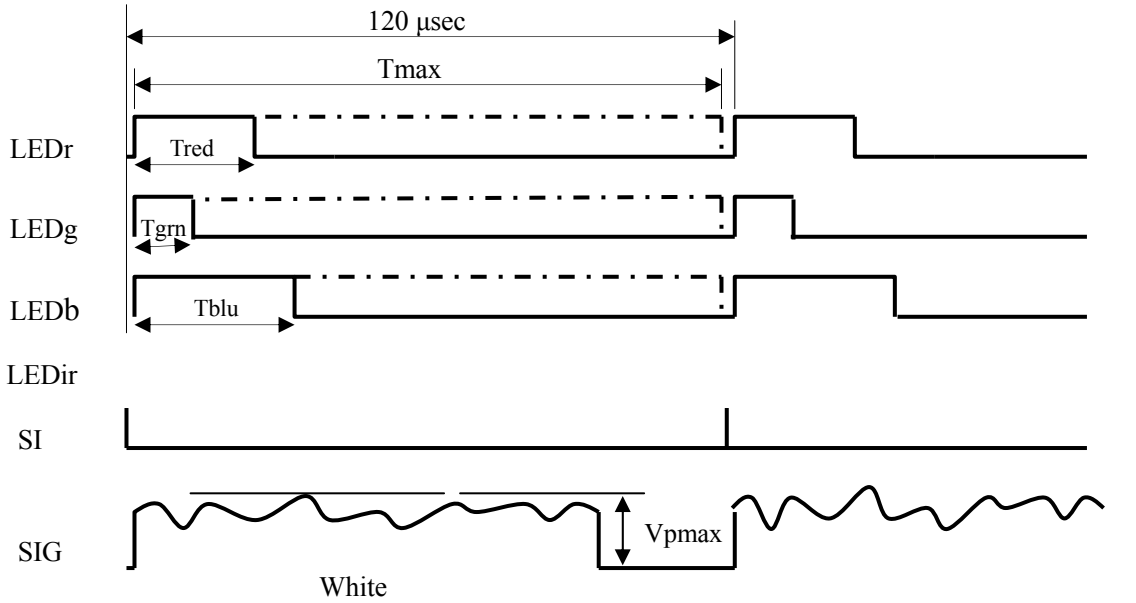


Figure 10. Flow chart of Mono-Color Adjustment

B&W Mode White Light Source (600dpi)



This is the example for white light source application. Refer the adjustment flow chart at Figure 12.

Figure 11. B&W mode with White Light Source Timing Diagram

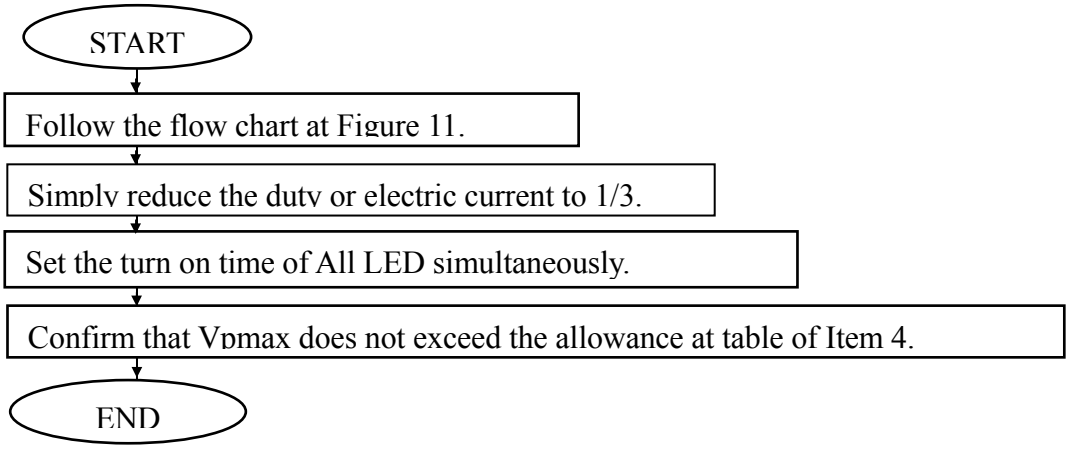
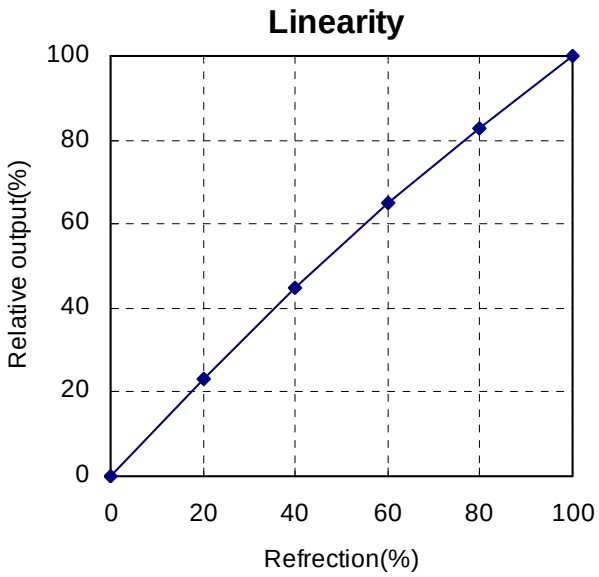
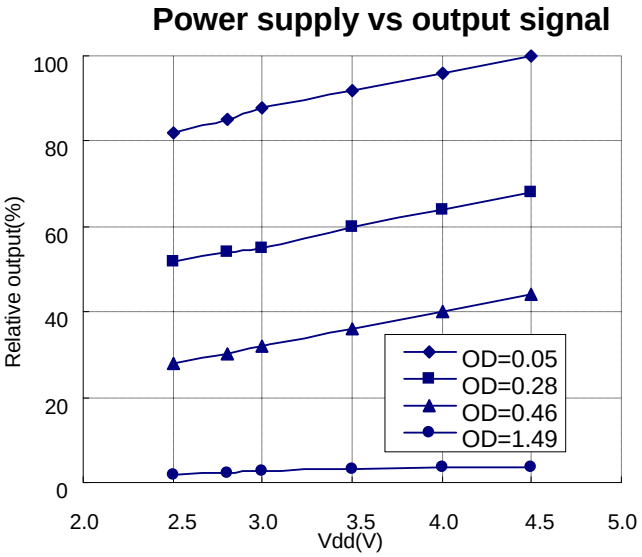


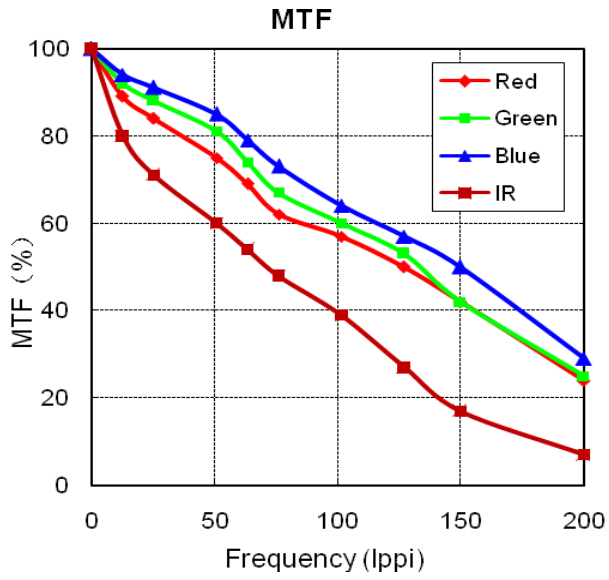
Figure 12. Flow Chart of B&W mode with White Light Source Adjustment

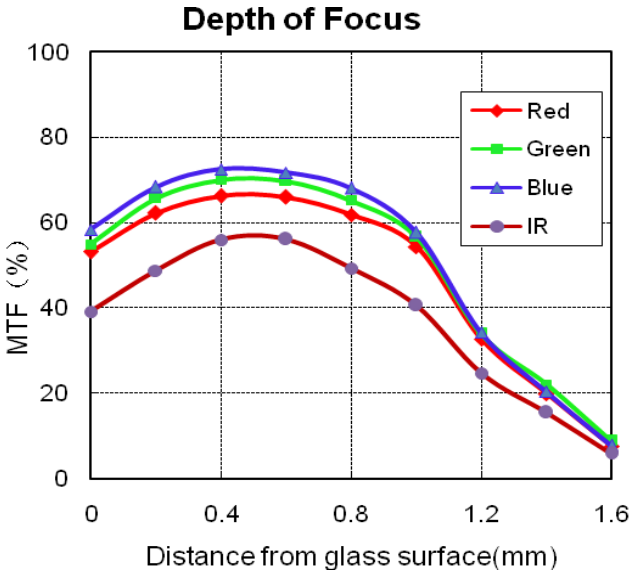
Figure 13. Typical Performance Curve

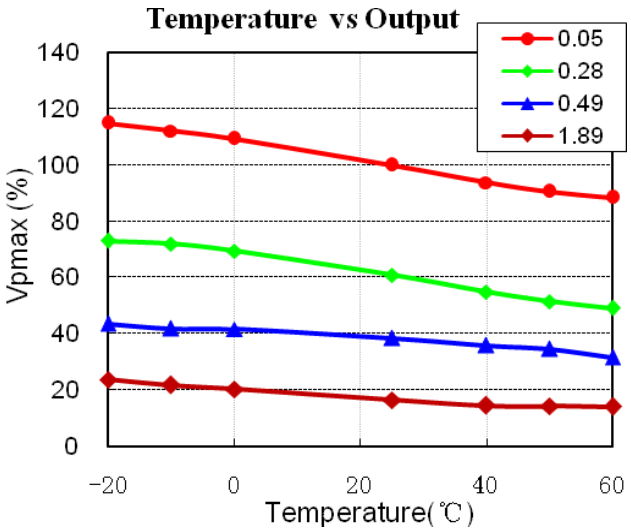
Unless otherwise specified,Ta=25℃











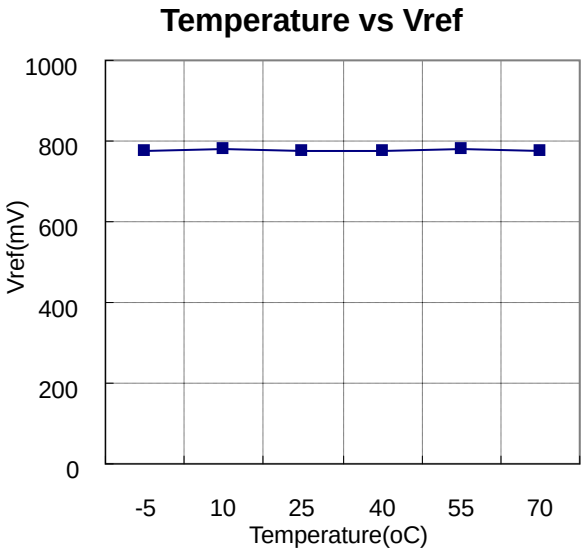
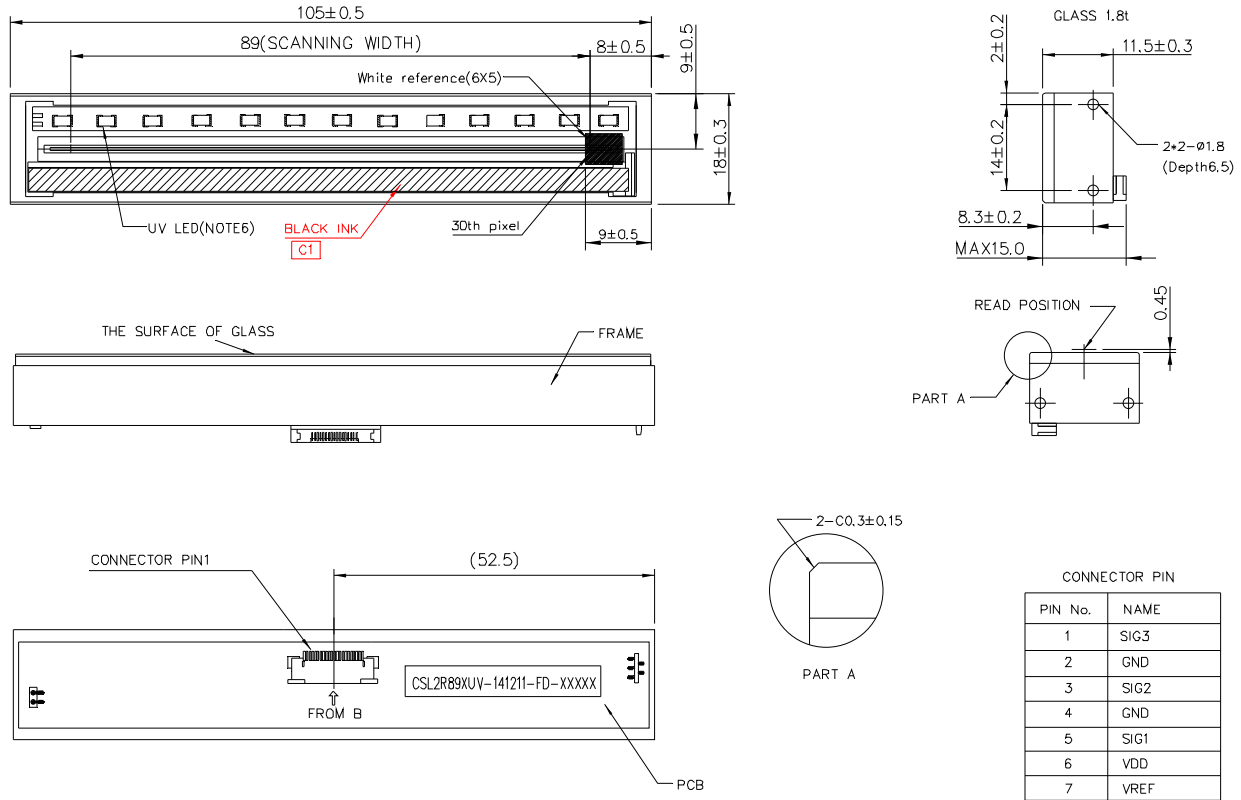


Figure 1. Dimensions



NOTE:

1.CONNECTOR: 22FLZ-SM1-GB-TB(LF)(SN) OR EQUIVALENT.

2.CIS TYPE AND LOT NUMBER PASTED ON THE PCB BOTTOM.

CSL2R89XUV-141211-F D - XXXXX

(CIS TYPE) (2014)(DEC) (SERIES No.)

3.WHEN ATTACHING THE HOLDERS TO THE CIS,USE ST(2.2) TAPPING SCREWS.

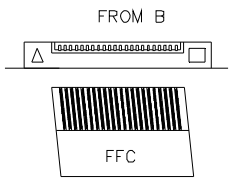
4.GLASS SHOULD NOT PROTRUDE FROM BOTH SIDE EDGE OF FRAME.

5.CNT=VDD.600DPI

6.DO NOT LOOK DIRECTLY INTO THE UV LED DURING OPERATION.

Month	10	11	12
	A	B	D

Year	10	11	12	13	14	15	16	17	18	19	20
	A	B	D	E	F	H	J	K	L	M	N
Year	21	22	23	24	25	26	27	28	29	30	31
	O	P	R	S	T	U	V	W	X	Y	Z



CONNECTOR PIN

PIN No.	NAME
1	SIG3
2	GND
3	SIG2
4	GND
5	SIG1
6	VDD
7	VREF
8	CNT
9	VDD
10	SI
11	GND
12	CLK
13	VLED
14	LEDg
15	LEDr
16	LEDb
17	LEDir
18	VLEDuv
19	NC
20	LEDuv
21	NC
22	NC