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Notice: This is not a final specification.
Some parameters are subject to change

COLOR CONTACT IMAGE SENSOR

SML12R89-141031

Approved by customer		

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REVISION					Approved
Rev	Description	Date	Approved	Designed	
A	---	2015.03.24	Liuzhenxiang	Duanping	
B	改为正式版本	2015.03.30	Liuzhenxiang	Duanping	
C	P15:C1 玻璃印刷黑油墨 P5/8:C2、C3 去掉 Dref P9: C4 原为 6.5V	2015.05.06	Liuzhenxiang	Duanping	Checked
					Designed

1. Description

This specification is applied to SML12R89-141031 Contact Image Sensor module .

2. Scope

This SML12R89-141031 is a CIS consists of a Rod Lens Array, two LED light sources and an array of linear MOS image sensor.

3. Outline

Item		Specification	Note
Scanning width		89 mm	
Sensor element density		1,200 DPI	CNT=VDD
Effective number of sensor elements		4,204 elements $59^{\#}$~$4,263^{\#}$ (full 4,320 elements)	
Scanning speed	color	0.23×4 msec/line (R/G/B/IR)	
	B&W	0.23 msec/line	
Clock speed		8.0 MHz	
Rod lens array		Two rows	L19
Light source		Red λp = 630nm ± 15nm 100mA Green λp = 520nm ± 15nm 100mA Blue λp = 465nm ± 10nm 100mA IR λp = 810nm ± 20nm 100 mA	
Power supply		+3.3V x 120 mA	
Data output		3 analog output Block #1 1,728 pixels Block #2 1,728 pixels Block #3 864 pixels	Synchronous
Dimensions		Figure 1	

Note: Clock Speed f must satisfy the following status:

f > (n +92) / tint

f : Clock speed

n: Full sensor elements number of every Block

1,200DPI: 1,728

tint: Scanning speed

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

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

Item	Symbol	Specification				Note
		Red	Green	Blue	Ir	
DC supply voltage	VDD	+3.3V				
LED supply voltage	VLED	<3.0V	<5.0V	<5.0V	<2.0V	
LED supply current	ILED	50mA×2	50mA×2	50mA×2	50mA×2	
White image target		0.05 ~ 0.09 OD				
Timing diagram		Figure 6				
Dark reference	Vref	800±200mV				4.1
Dark output minimum	Vdmin	-150mV~+150mV				4.2
White output maximum	Vpmax	400± 100 mV				4.3
Dark output uniformity	Ud	Less than Vpmax/2				4.4
White output uniformity	UEp	Less than50%				4.5
MTF		30% MIN	30% MIN	30% MIN	20% MIN	4.6 142.697 lppi
Linearity	Gamma	1.0 ± 0.05				
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 "ts2" which described in section 6.A test target is set on the read position as outline in Figure 1.

4.1 Vref

Video reference voltage. Vref outputted from connector pin 7. Vdmin and Vdmax are based on vref.

4.2 Vdmin

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

4.3 Vpmax

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

Vpmax=MAX[Vp(n)]

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

4.4 Ud

As shown in Figure 2, Ud is the output signal in the dark (turning off the LED) and is defined by:

Ud=Vdmax-Vdmin

Vdmax is the maximum output signal of the n-th pixel in the dark

Vdmin is the minimum output signal of the n-th pixel in the dark

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 LU

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 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,Tir should be changed as following:

Tred/2, Tgrn/2, Tblu/2,Tir/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,Tir should be changed as followed and compute LUg regarding to Step5:

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

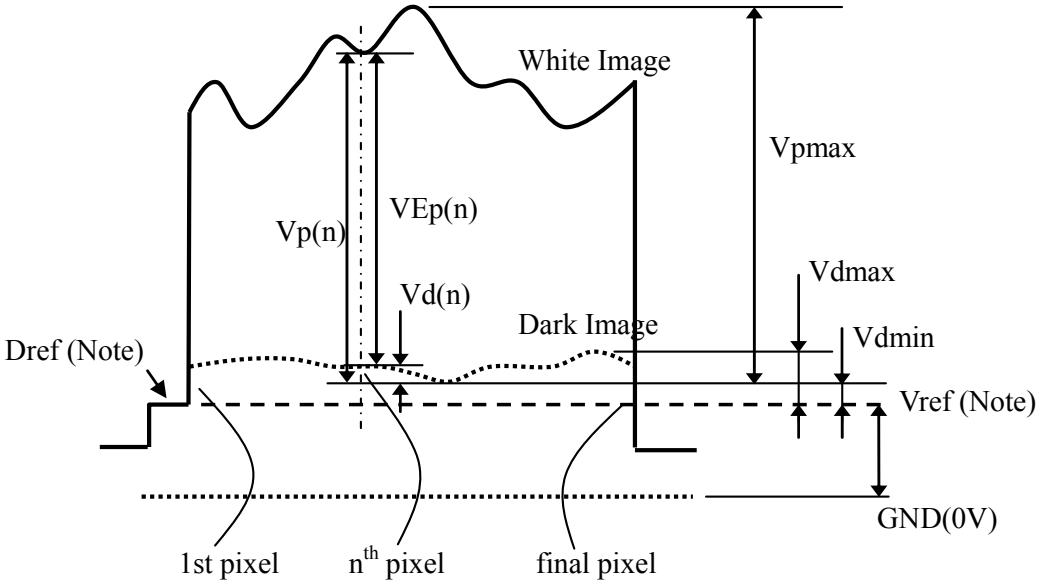
Step7. LED on time set

Tred should be changed as followed and compute LUg regarding to Step5:

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

4.8 Correction of Dark and White uniformity

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



Note: Vref is the reference voltage for video signals. It can be used as the reference voltage. Do not use the GND in stead of Vref.

C2

Figure 2. Output Signals Waveform

5. Maximum Rating

Item	Symbol	Specification	Note
DC supply voltage	VDD	+3.3V ± 0.17V	
Input voltage	VIN	0 ~ VDD+0.3V	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	Notes
DC Forward Current	IF	60 mA	60 mA	60 mA	60 mA	
Pulse Forward Current	IFP	60 mA	60mA	60mA	60mA	
DC Reverse Voltage	VR	5 V	5V	5V	5V	

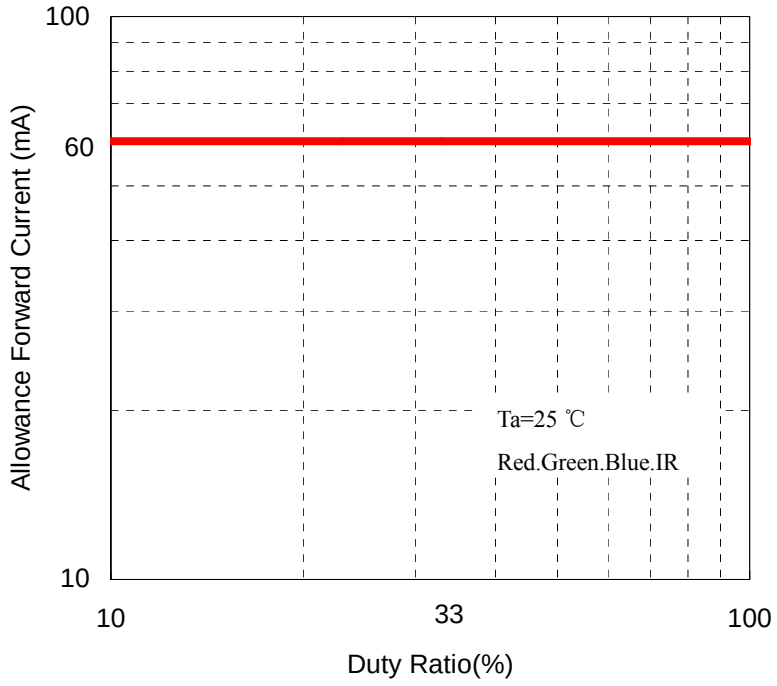


Figure 3. Duty Ratio vs Allowable Forward Current

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		100	120	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 **(Note 1)**	VIH	SI,CLK	2.4			V
	VIL				0.5	V
Input Current **(Note 2)**	IIH	SI,CLK VIH=5.0V			5	mA
	IIL		-0.5			μA
Clock frequency	f	CLK	7.5	8.0	8.5	Hz
SI setup time	tsu	SI-CLK	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.

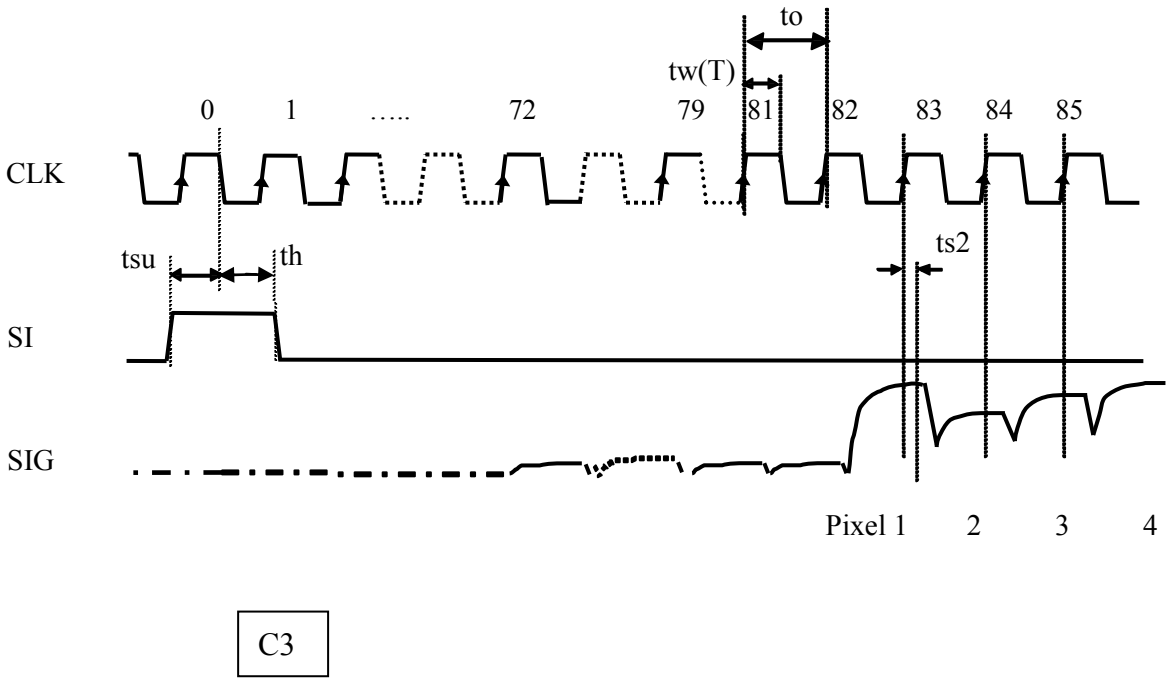


Figure 4. Timing diagram

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 Glass surface

The glass surface should be kept clean. Don't wipe the glass surface with hand. Don't use the CIS module in a dust-polluted environment. 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 , 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, LED circuit just has 2 and 10 ohm resistance. Be careful not to connect the LED circuit to power supply directly without current limit resisters.

(5) Absolute maximum ratio

Item	Symbol	Condition	Specification		Unit
			Min	Max	
Supply Voltage	VDD	GND reference	-0.3	+4.5 C4	V
Input voltage	Vin	SI,CLK	GND-0.3	VDD+0.3	V

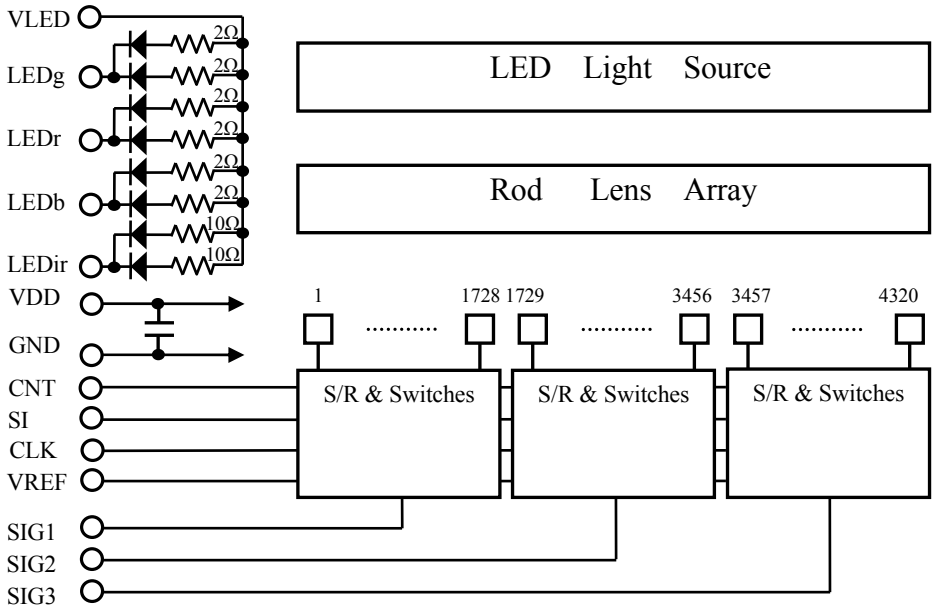
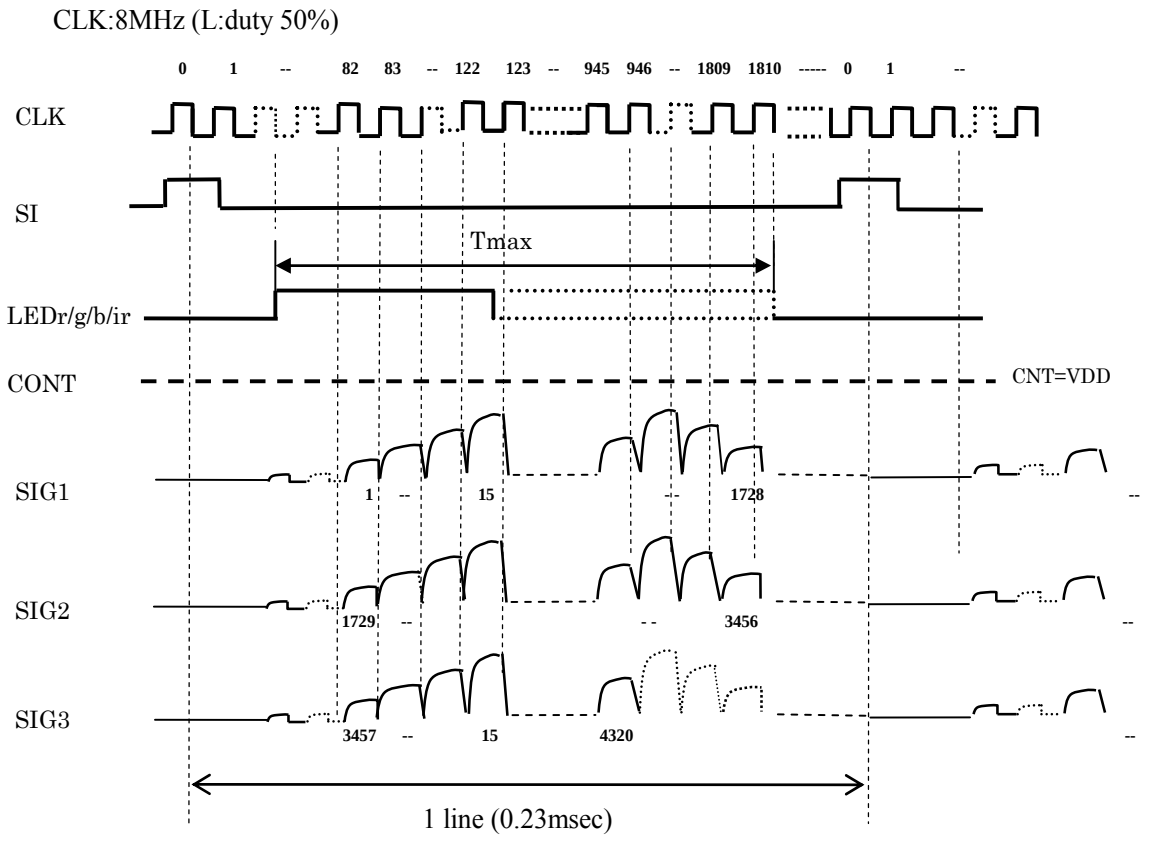


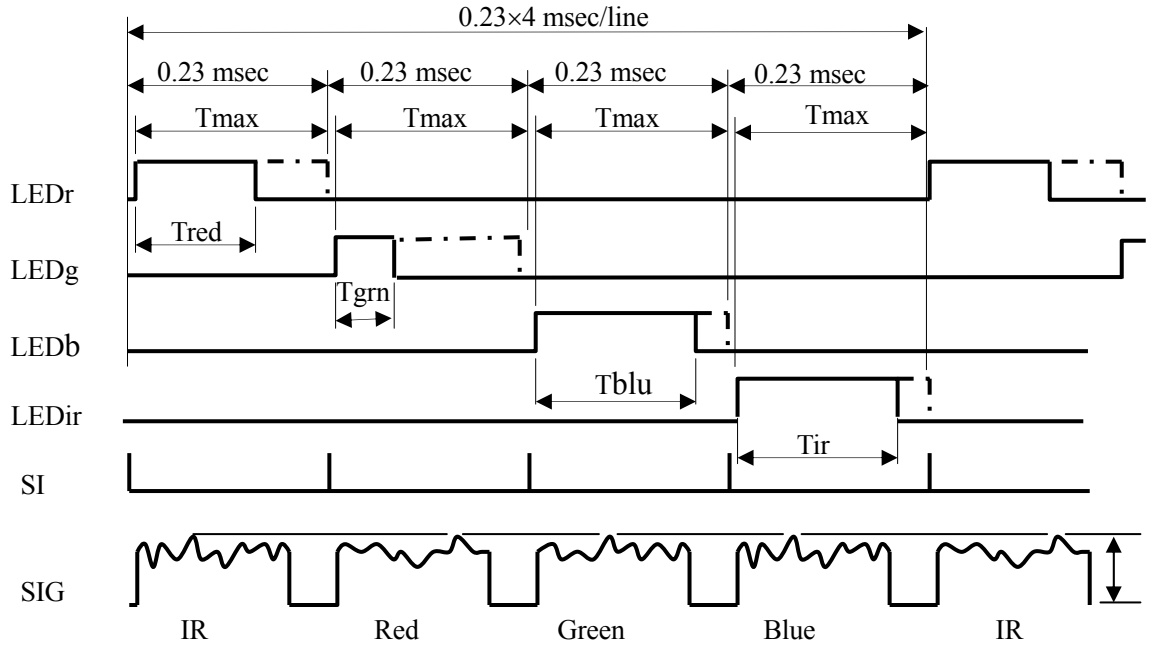
Figure 5. Block Diagram



Note:After 1728th ,3456th,4320th signal,at least 8 clocks needed.

Figure 6. Timing Diagram (This is the WHEC shipping test condition.)

☐ **Color Mode**



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)

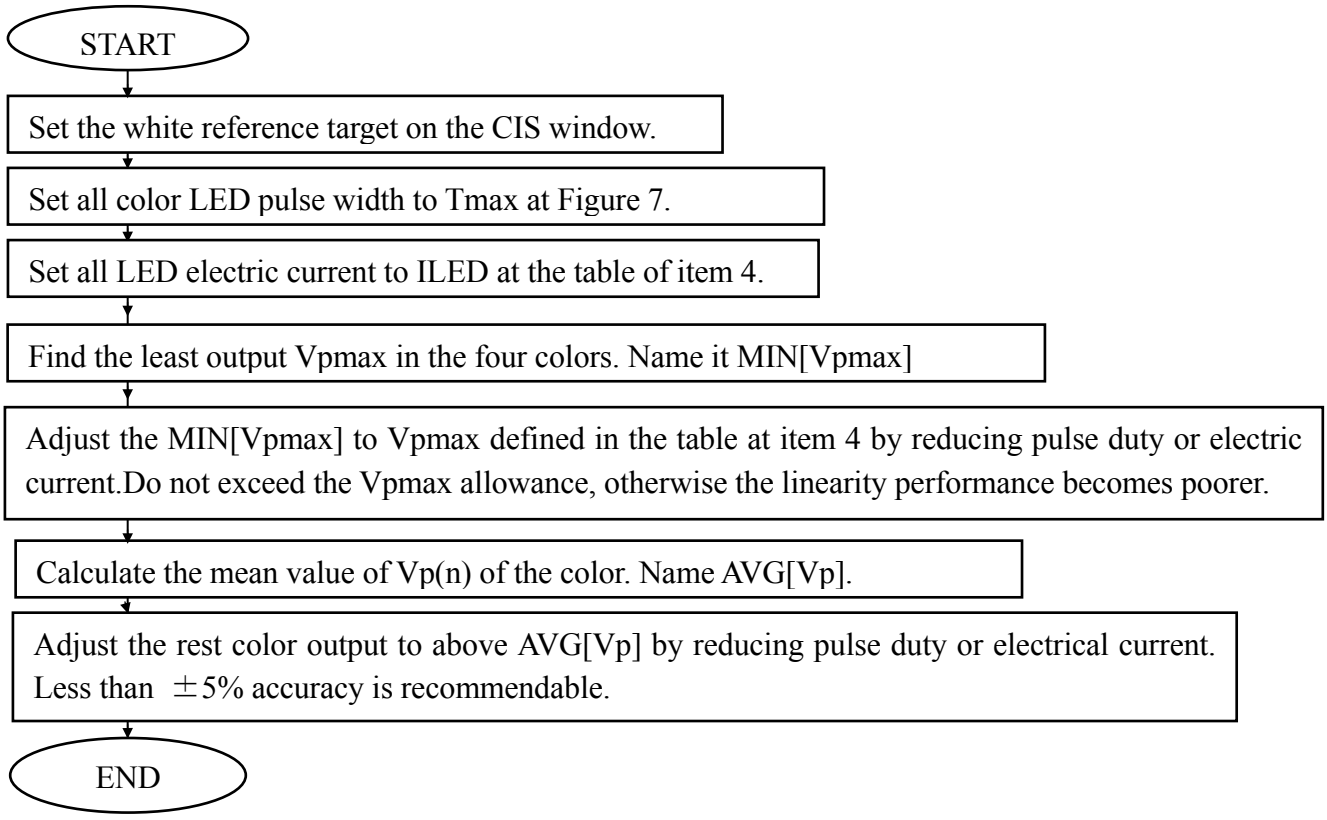
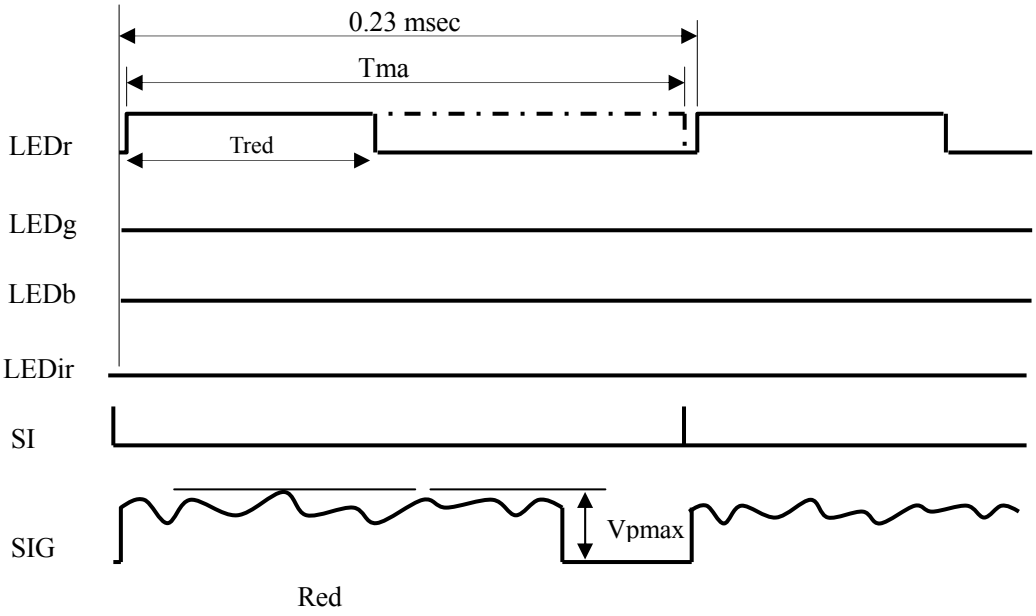


Figure 8. Flow Chart of Color mode Adjustment (This is the WHEC shipping test condition)

☐ **B&W Mode with Mono-Color Light Source**



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

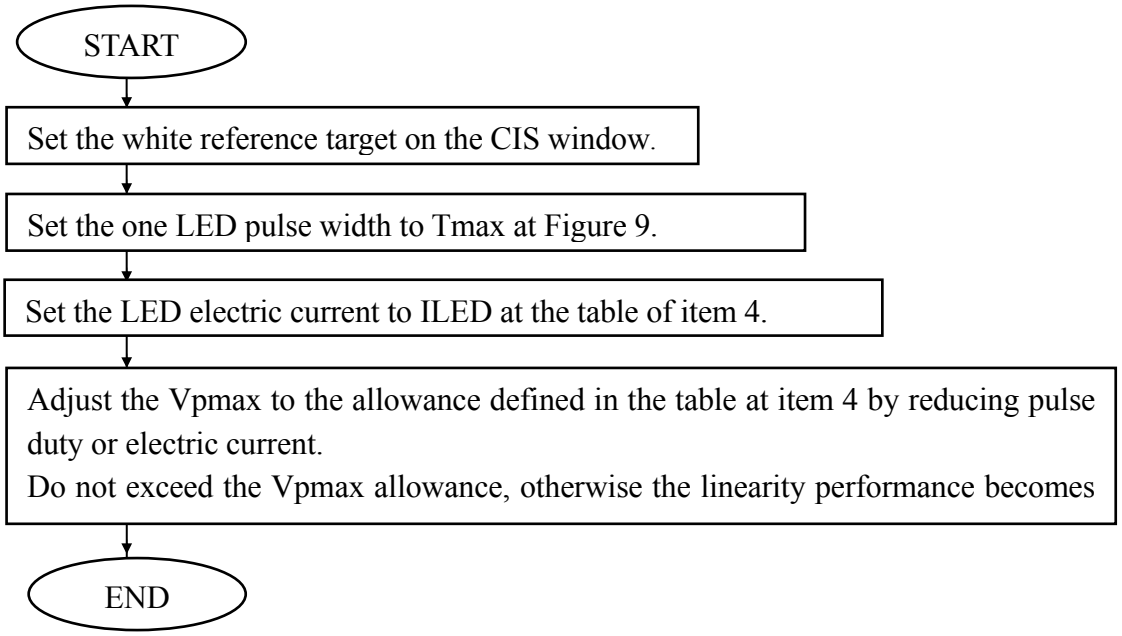
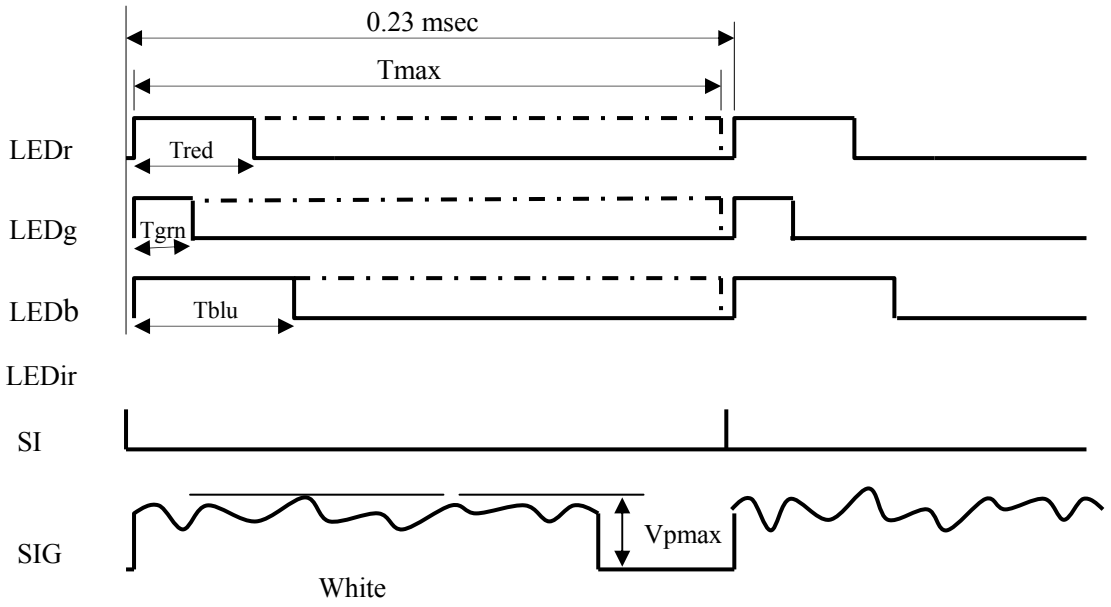


Figure 10. Flow chart of Mono-Color Adjustment

☐ **B&W Mode White Light Source**



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

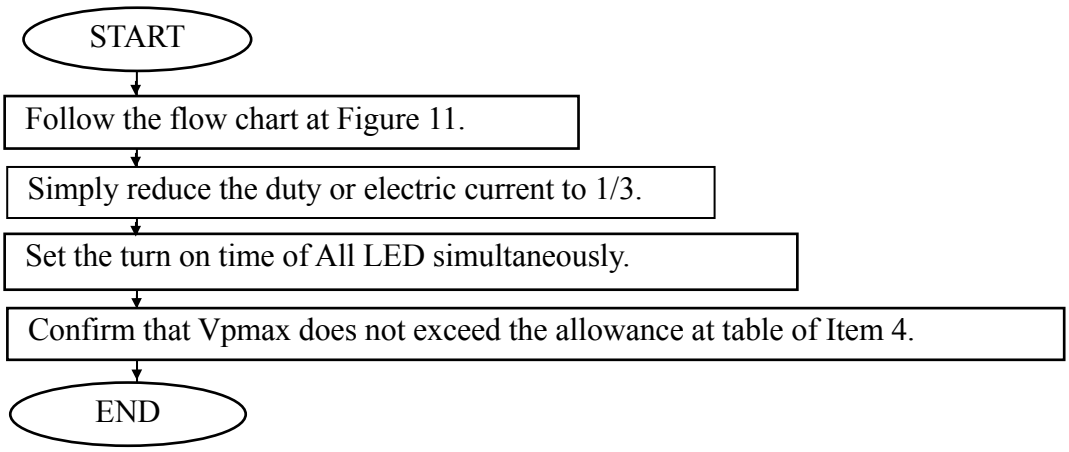


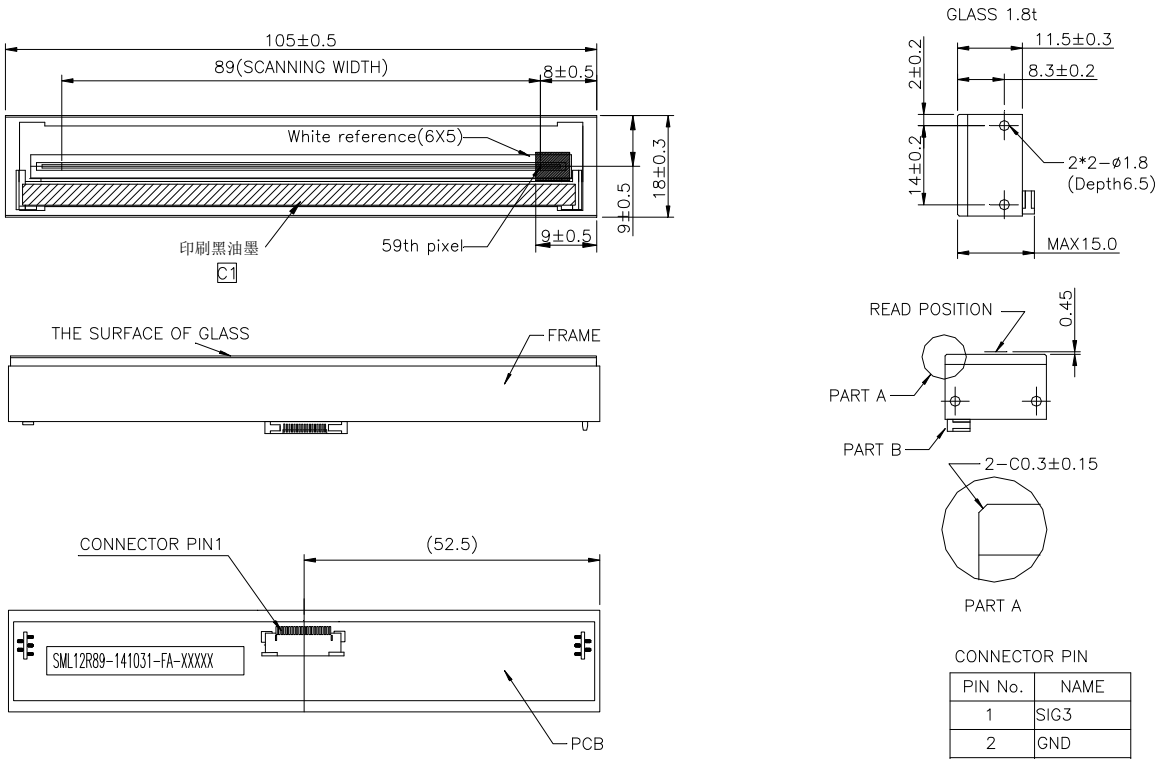
Figure 12. Flow Chart of B&W mode with White Light Source Adjustment

Figure 13. Typical Performance Curve

Unless otherwise specified,Ta=25℃

T.B.D

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.

SML12R89 -141031- F A - XXXXX

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

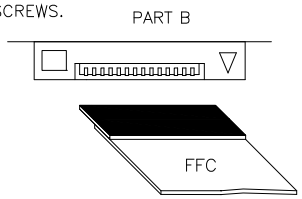
3.WHEN ATTACHING THE HOLDERS TO THE CIS,USE ST(2.2) TAPPING SCREWS.

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

5.CNT=VDD,1200DPI

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	NC
19	NC
20	NC
21	NC
22	NC