WHEC

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

CONTACT IMAGE SENSOR

LT6R216X-170728

Approved by customer		

A: 2017.07.28	original	Duanping
B: 2017.08.18	按照客户要求修改外观图尺寸标注	Duanping
C: 2017.08.21	改为详细版式样书	Duanping

1.Description

This specification is applied to LT6R216X-170728 Contact Image Sensor module .

2.Scope

This LT6R216X-170728 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		216 mm			
Sensor element density		200 DPI	300DPI	600DPI (WHEC TEST)	Switched by CNT H: 600DPI L: 300DPI SI:200DPI
Effective number of sensor elements		1700 elements 15# to 1714# (Full 1728 elements)	2552 elements 21# to 2572# (Full 2592 elements)	5102 elements 42# to 5143# (Full 5184 elements)	
Scanning Speed	Color	84×4 μsec/line (R/G/B/IR)	120×4 μsec/line (R/G/B/IR)	228×4 μsec/line (R/G/B/IR)	
	B&W	84μsec/line	120μsec/line	228μsec/line	
Clock speed		8MHz			
Rod lens array		One row			L22
Light source		Red λp = 630nm ± 15nm 60mA Green λp = 520nm ± 15nm 60mA Blue λp = 465nm ± 10nm 60mA IR λp = 940nm ± 20nm 99mA			
Power supply		+3.3V × 100 mA			
Data output 3 analog outputs		Block#1 576 pixels Block#2 576 pixels Block#3 576 pixels	Block#1 864 pixels Block#2 864 pixels Block#3 864 pixels	Block#1 1728 pixels Block#2 1728 pixels Block#3 1728 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.

200DPI: 576

300DPI: 864

600DPI:1728

tint: Scanning speed

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

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

In Color Mode

Item	Symbol	Light source specification				Note
		Red	Green	Blue	IR	
DC supply voltage	VDD	+3.3V				Detector, Logic
LED supply voltage	VLED	<3.0V	<5.0V	<5.0V	<2.0V	
LED supply current	ILED	60 mA	60 mA	60 mA	99 mA	
White image target		0.05 ~ 0.09 OD				
Timing diagram		Figure 6				
Video reference	Vref/Dref	800±200 mV				4.1
Dark output minimum	Vdmin	≥ -150 mV				4.2
Dark output maximum	Vdmax	≤ +150 mV				4.3
White output maximum	Vpmax	500± 100mV				4.4
White output uniformity	UEp	Less than 65%				4.5
MTF		30% MIN	30% MIN	30% MIN	15% MIN	4.6 142.697lppi
Linearity	Gamma	1.0 ± 0.05				4.7
Linearity uniformity	LU	Less than 7%				

In Black and White Mode

Item	Symbol	Specification				Note
		Red	Green	Blue	IR	
DC supply voltage	VDD	+3.3V				Detector, logic
LED supply voltage	VLED	<3.0V	0V	0V	0V	
LED supply current	ILED	60mA	0mA	0mA	0mA	
White image target		0.05 ~ 0.09 OD				
Timing diagram		Figure 6				
Video reference	Vref/Dref	800±200 mV				4.1
Dark output minimum	Vdmin	≥ -150 mV				4.2
Darkoutput maximum	Vdmax	≤ + 150 mV				4.3
White output maximum	Vpmax	500 ±100mV				4.4
White output uniformity	UEp	<65%				4.5
MTF		20% MIN				4.6 142.697lppi
Linearity	Gamma	1.05 ± 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 "ts" which described in section 6.A test target is set on the read position as outline in Figure 1.

4.1 Vref

Vref is the reference output.

Vref is outputted from connector pin #7. Vdmim output value is based on Vref.

Dref

Dark reference output. As shown in Figure 4, Dref appears from clock #75 to#79. Vdmin output value is based on Dref.

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.

4.3Vdmax

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

4.4Vpmax

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.

4.5UEp

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)

4.6MTF

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 .

4.7LU

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

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

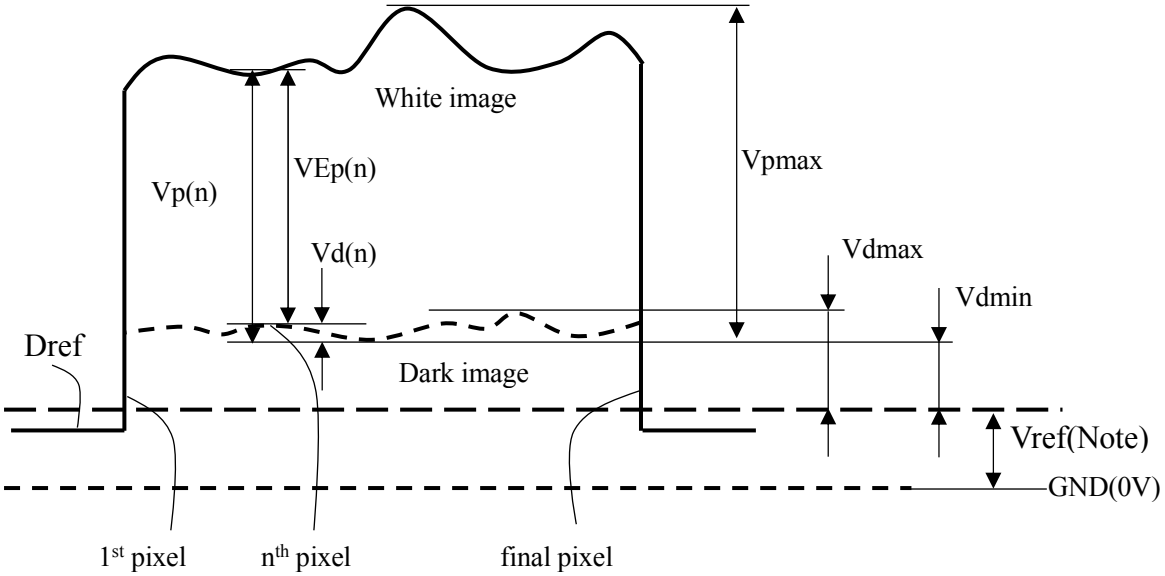
Step7. LED on time set

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

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

4.8Correction 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 instead of Vref.

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 ºC	Operating
		-20 ~ +60 ºC	Non-operating
Ambient humidity		10 ~ 90%RH	Avoid a build up condensation
Maximum operating Temperature		65 ºC 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	60 mA	60 mA	60 mA	
DC Reverse Voltage	VR	5.0 V	5.0V	5.0V	5.0V	

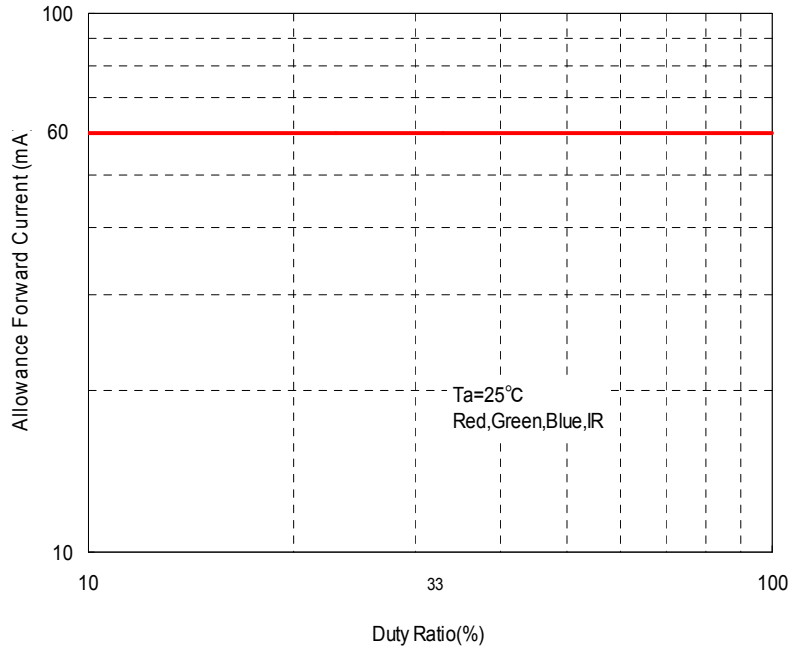
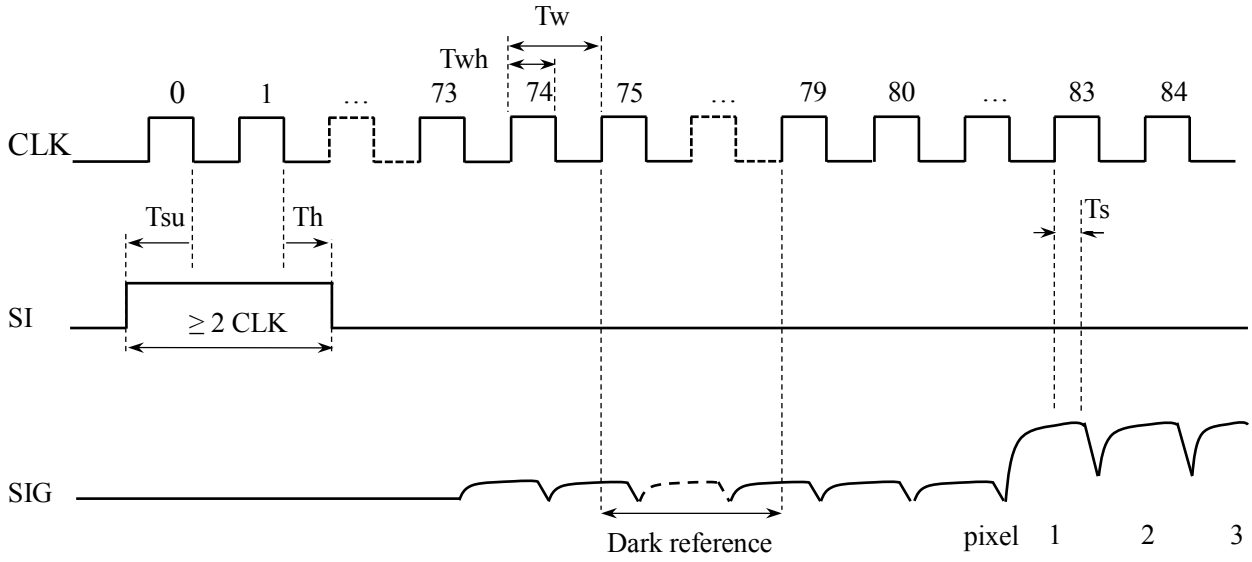


Figure 3. Duty Ratio vs Allowance Forward Current

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		100	120	mA
LED Forward Voltage	VFred	IF=20mA IF=30mA IF=40mA IF=60mA	1.8 2.1 2.1 2.3	2.0 2.3 2.4 2.5	2.2 2.5 2.6 2.7	V V V V
	VFgreen	IF=20mA IF=30mA IF=40mA IF=60mA	3.0 3.3 3.4 3.6	3.2 3.6 3.8 4.0	3.5 4.0 4.1 4.4	V V V V
	VFblue	IF=20mA IF=30mA IF=40mA IF=60mA	3.1 3.3 3.4 3.6	3.3 3.7 3.8 4.0	3.5 4.1 4.2 4.3	V V V V
	VFir	IF=20mA IF=30mA IF=40mA IF=60mA	1.1 1.2 1.2 1.4	1.22 1.4 1.4 1.5	1.4 1.5 1.6 1.6	V V V V
Input voltage (**Note1**)	VIH	SI,CLK	2.4			V
	VIL				0.5	V
Input Current (**Note1**)	IIH	SI,CLK			5	mA
	IIL		-0.5			μA
Clock frequency	f	CLK	7.5	8.0	8.5	MHz
Clock pulse duty		tw(T)/to; to=1/f	48	50	52	%
SI setup time	Tsu	SI-CLK	60		TW	ns
SI hold time	Th	SI-CLK	60		5×TW	ns
Data output stability time	ts2	CLK-SIG	20	30	40	ns

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



Dark reference for Dref appears between clock75# to 79#; Dark dummy stable time is as same as Ts.

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, LEDg, LEDb,LEDir 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 has not any 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	+4.0	V
Input voltage	Vin	SI,CLK	GND-0.4	VDD+0.4	V

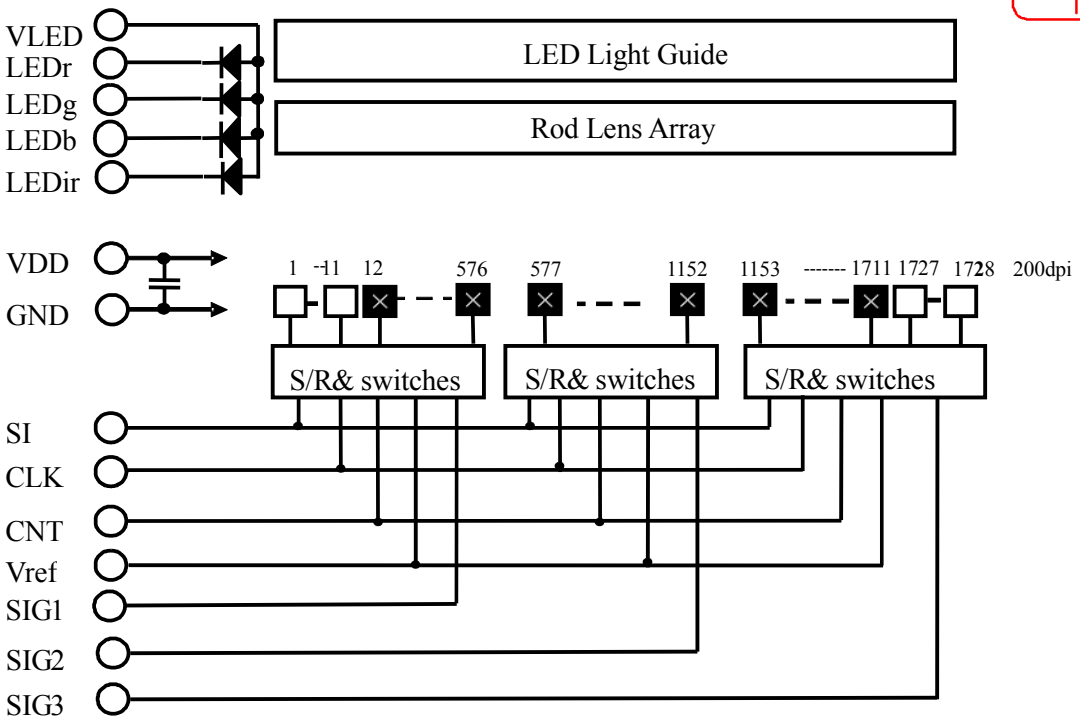
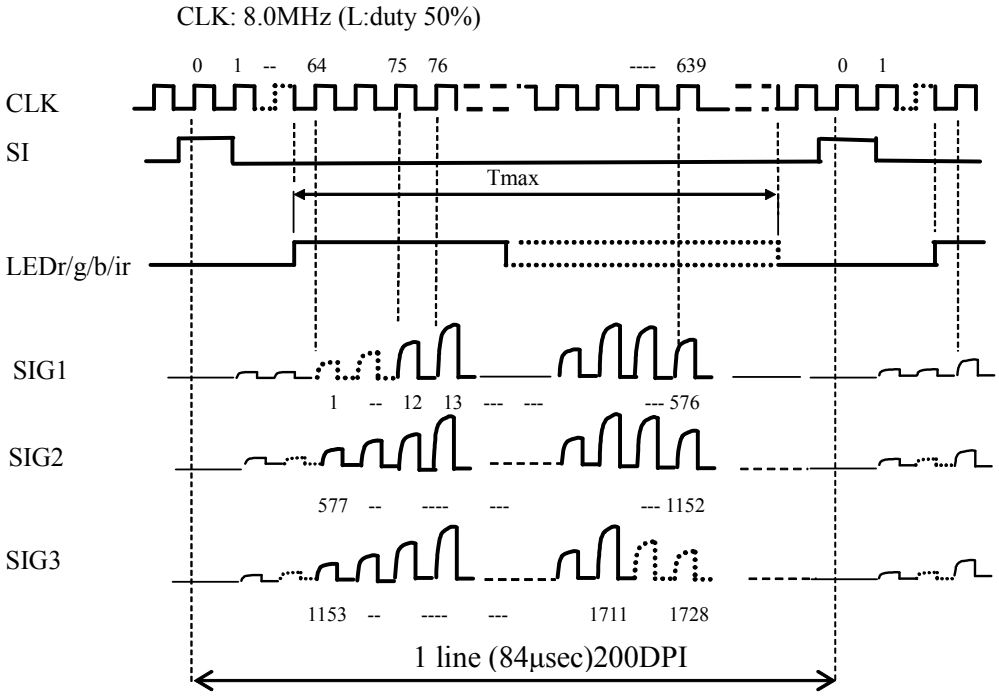


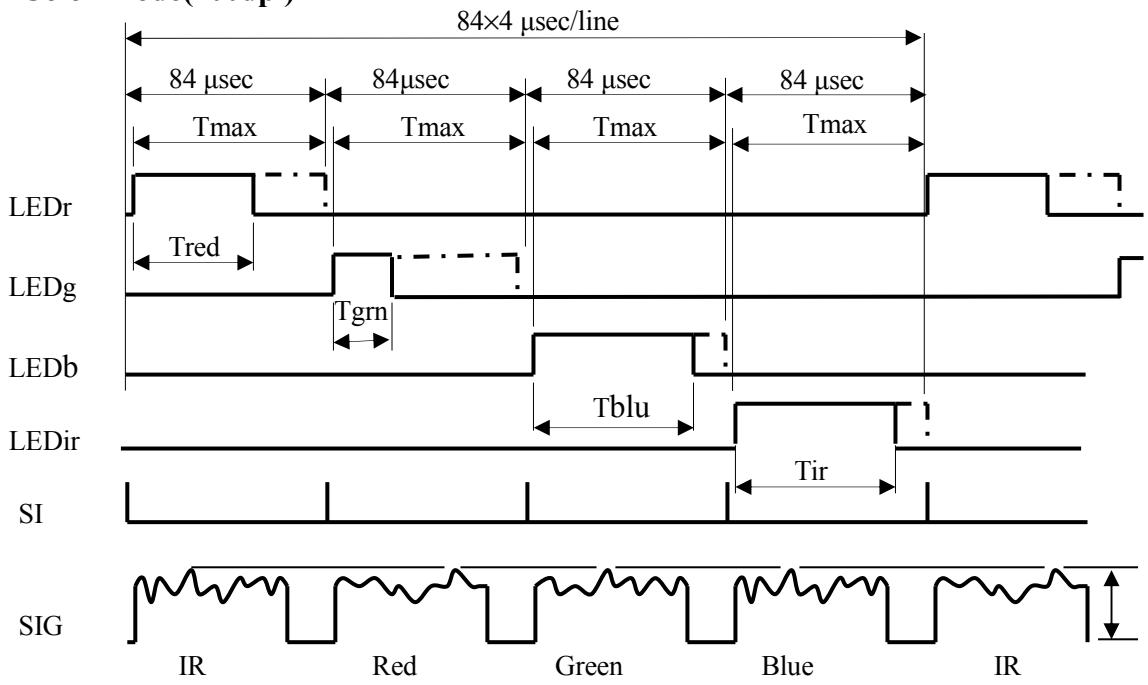
Figure 5. Block Diagram



Note: More than 7 clocks are needed after #576, #1,152 and #1,728 video SIG.

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

☐ **Color Mode(200dpi)**



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 SHEC shipping test condition)

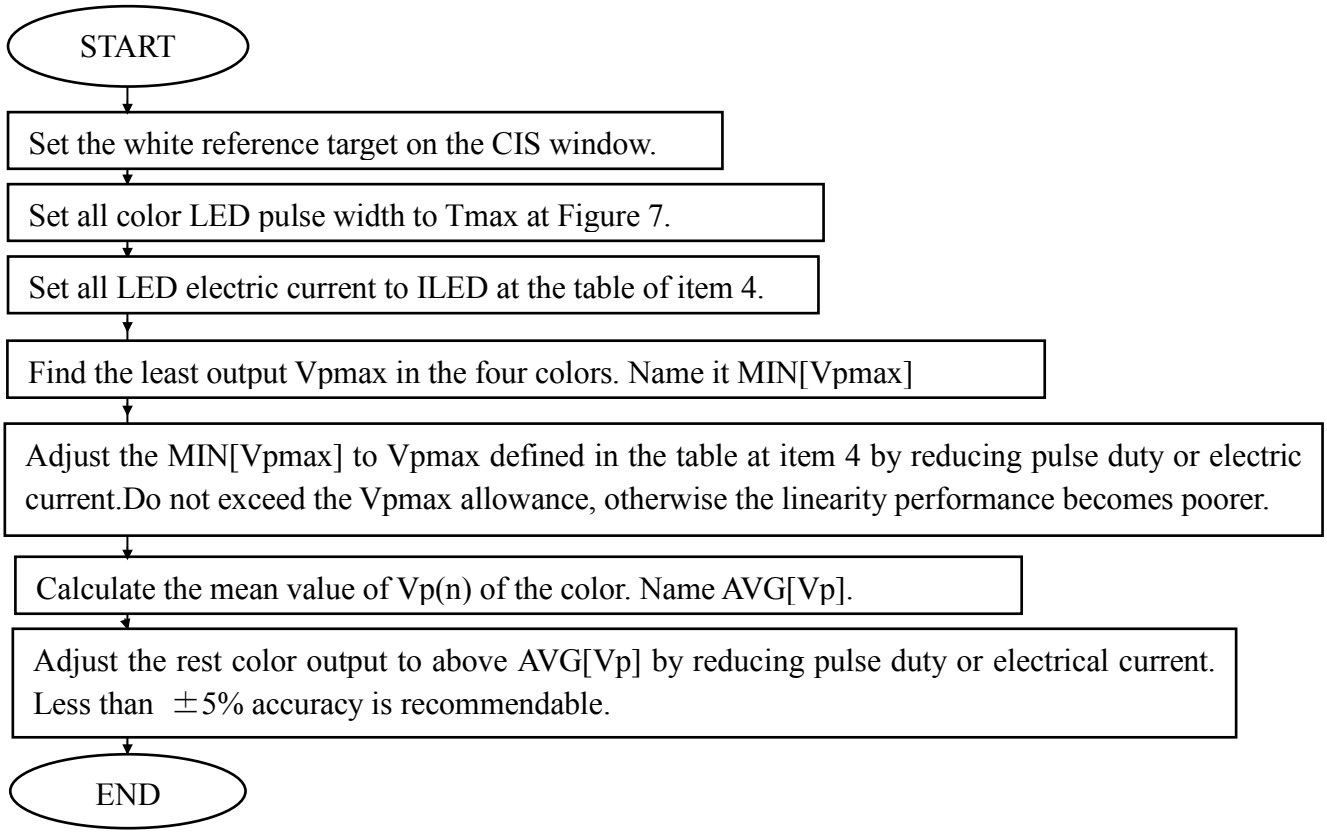
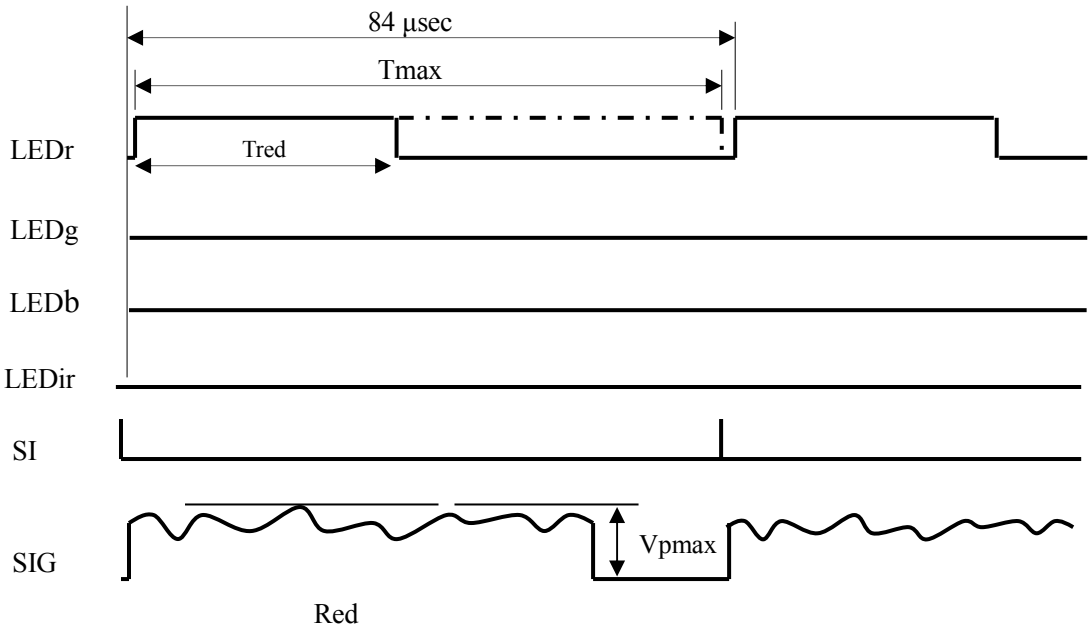


Figure 8. Flow Chart of Color mode Adjustment (This is the SHEC shipping test condition)

☐ **B&W Mode with Mono-Color Light Source (200dpi)**



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

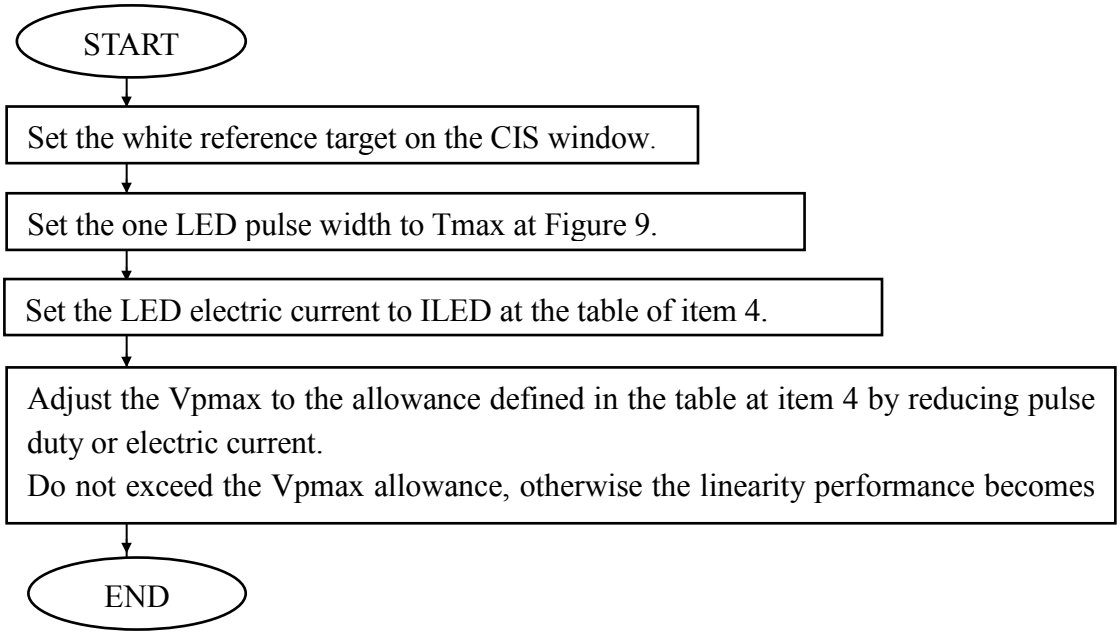
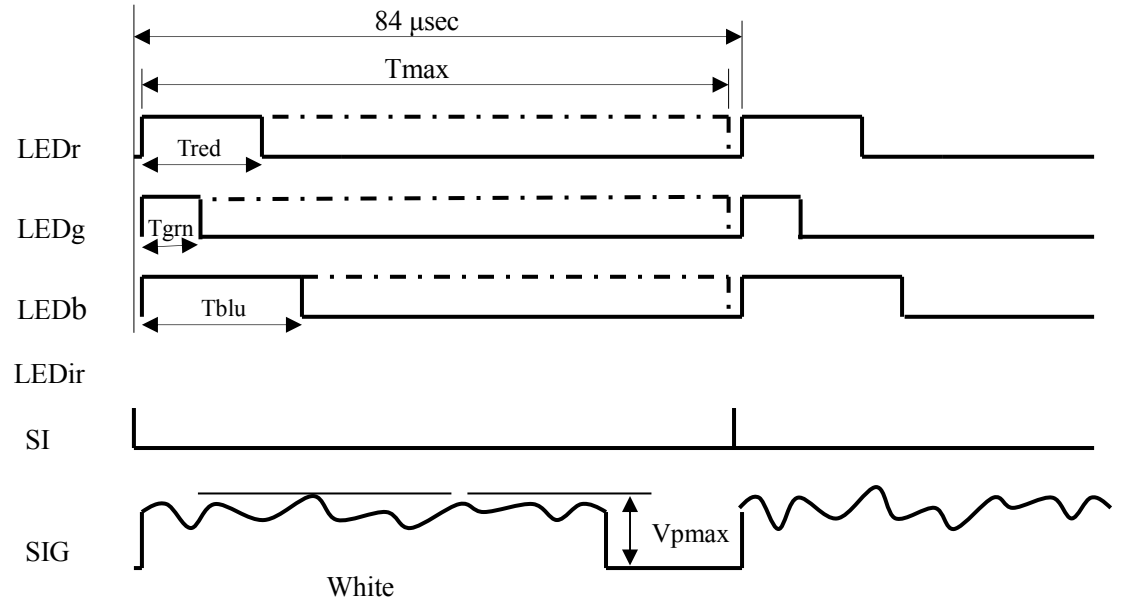


Figure 10. Flow chart of Mono-Color Adjustment

☐ **B&W Mode White Light Source (200dpi)**



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

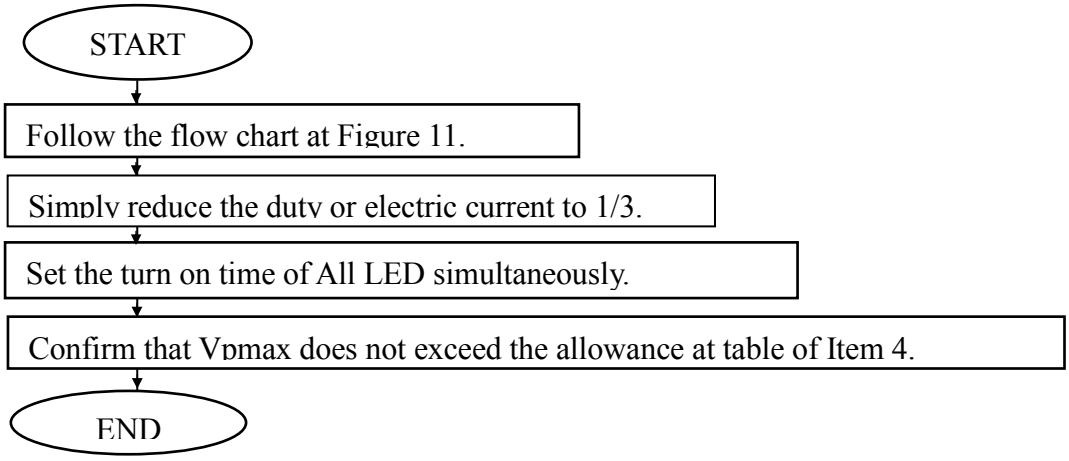


Figure 12. Flow Chart of B&W mode with White Light Source Adjustment

Figure 1 Dimensions