



Doc Number:

5. Hambor 1
Tentative Specification
Preliminary Specification
Approval Specification

MODEL NO.: M215HGE SUFFIX: L23

Customer: Comm	on Model	
APPROVED BY	SIGNATURE	
Name / Title Note Product version C1 Please return 1 copy for	your confirmation with you	_ _ _ ir
signature and comments.	year communation with year	

Approved By	Checked By	Prepared By	
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PRODUCT SPECIFICATION

REVISION HISTORY

Version	Date	Page	Description
1.0	Jun,08,2011	All	Spec Ver.1.0 was first issued.
			Note (1) Add LVDS connector type & vendor:
3.0	July,29,2011	8	WF13-422-3033(Fullconn) or 187098-30091(Ptwo) or
	3 , ,		GS23302-0311R-7H(Foxconn)
			4.3.1 LCD ELETRONICS SPECIFICATION
			Modify LVDS common input voltage spec
		9	Min: 1 → 0.05
			Typ: 1.2 →
			Max:1.4 → 2.85
			5.2 OPTICAL SPECIFICATIONS
		10	Modify Color Chromaticity spec (typ)
		18	Rx: 0.637 ->0.633 Ry:0.351 ->0.351
			Gx: 0.319 -> 0.322 Gy: 0.626 -> 0.630
			Bx: 0.145 ->0.152 By:0.061 ->0.050 4.5 DISPLAY TIMING SPECIFICATIONS
			Add Note (4)
3.1	Aug.25,2011	16	(The DCLK range at last line of V-blanking should be set in 0 to
			Hdisplay/2)
			4.3.1 LCD ELETRONICS SPECIFICATION
			Update Power supply current:
			Pattern typ max _ typ max White 0.42 0.47 0.39 0.45
			Black 1.2 1.4 1.17 1.45
3.2	Feb,22.2012	9	Vertical 0.69 0.71 0.75 1.0
			Power consumption:
			PLCD typ max _ typ max
			0.0 7.7 5.85 7.97
			4.3.3 BACKLIGHT UNIT
		11	Add Vp min value LED Light Bar Input Voltage min type min type
			Per Input Pin 34.1 _ 30.8 34.1
			5pat (iii
		12	Add connector type description(Wire Harness)
			4.3.4 LIGHTBAR Connector Pin Assignment
3.3	May.22,2012	12	update(1).Connector:CI1406M1HRF-NH(CviLux) or compatible
			→.Connector: WM13-406-063N(FCN) Update:Note(1) Connector(wire type):FCN(WM13-406-063N) or
			Entery(3707K-Q06N-08L) or CviLux(CI1406M1HRK-NH) or
			equivalent
		12	Note(2) User's mating connector part No.: FCN(WF1300106-B)
		'-	or Entery(H112K-P06N-01B or M001-E11N-00R) or
			CviLux(Cl1406SL000-NH) and hook width must be less than
			4.5mm 6. RELIABILITY TEST ITEM
			Update: Altitude Test Operation: 10000ft ft / 24hours
		21	→ Altitude Test Operation: 16404ft / 24hours

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Global LCD Panel Exchange Center

PRODUCT SPECIFICATION

1. GENERAL DESCRIPTION

1.1 OVERVIEW

M215HGE-L23 is a 21.5" TFT Liquid Crystal Display module with WLED Backlight unit and 30 pins 2ch-LVDS interface. This module supports 1920 x 1080 Full HD mode and can display up to 16.7M colors. The converter module for Backlight is not built in.

1.2 GENERAL SPECIFICATIONS

Item	Specification	Unit	Note
Screen Size	21.53" real diagonal		
Driver Element	a-si TFT active matrix	-	-
Pixel Number	1920 x R.G.B. x 1080	pixel	-
Pixel Pitch	0.2482 (H) x 0.2482 (V)	mm	-
Pixel Arrangement	RGB vertical stripe	-	-
Display Colors	16.7M	color	-
Transmissive Mode	Normally white	-	-
Surface Treatment	AG type, 3H hard coating, Haze 25	-	-
Luminance, White	200	Cd/m2	
Color Gamut	72% of NTSC(Typ.)	-	-
Power Consumption	Total 18.02 W (Max.) @ cell 7.7W (Max.), BL:10.3	2 W (Max.)	(1)

Note (1) The specified power consumption: Total= cell (reference 4.3.1)+BL (reference 4.3.3)

2. MECHANICAL SPECIFICATIONS

It	em	Min.	Тур.	Max.	Unit	Note
	Horizontal (H)	495.1	495.6	496.1	mm	
Module Size	Vertical (V)	291.7	292.2	292.7	mm	(1)
	Thickness (T)	-	11.0	11.5	mm	
Bezel Area	Horizontal	479.3	479.8	480.3	mm	
Dezei Alea	Vertical	270.8	271.3	271.8	mm	
Active Area	Horizontal		476.64	-	mm	
Active Area	Vertical		268.11	-	mm	
We	eight	-	1860	2050	g	

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

3. ABSOLUTE MAXIMUM RATINGS

3.1 ABSOLUTE RATINGS OF ENVIRONMENT

Item	Symbol	Va	Unit	Note	
item	Symbol	Min.	Max.	Offic	Note
Storage Temperature	TST	-20	60	ºC	(1)
Operating Ambient Temperature	TOP	0	50	ºC	(1), (2)

Note (1)

- (a) 90 %RH Max. ($Ta \le 40 \, {}^{\circ}C$).
- (b) Wet-bulb temperature should be 39 °C Max. (Ta > 40 °C).
- (c) No condensation.

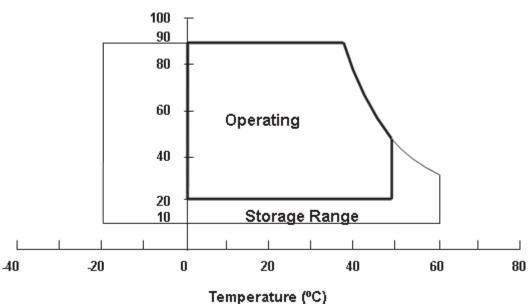
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Note (2) The temperature of panel surface should be 0 $^{\circ}$ C min. and 60 $^{\circ}$ C max.





3.2 ELECTRICAL ABSOLUTE RATINGS

3.2.1 TFT LCD MODULE

Item	Symbol		lue	Unit	Note
ite	- Cymbol	Min.	Max.	O i iii.	11010
Power Supply Voltage	VCCS	-0.3	6.0	V	(1)
Logic Input Voltage	V _{IN}	-0.3	3.6	V	(1)

3.2.2 BACKLIGHT UNIT

Item	Symbol		Value		Unit	Note
Item	Syllibol	Min.	Тур	Max.	0	Note
LED Forward Current Per Input Pin	IF		65	69	mA	(1), (2) Duty=100%
LED Pulse Forward Current Per Input Pin	IP		1	150	mA	(1), (2) Pulse Width≦10msec. and Duty≦30%

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.

Note (2) Specified values are for input pin of LED light bar at Ta=25 \pm 2 $^{\circ}$ C (Refer to 4.3.3 and 4.3.4 for further information).

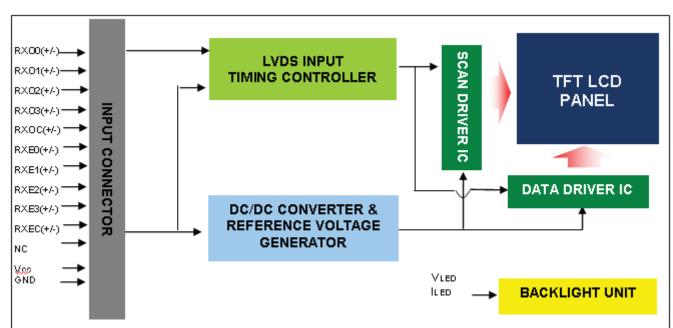
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4. ELECTRICAL SPECIFICATIONS

4.1 FUNCTION BLOCK DIAGRAM



4.2. INTERFACE CONNECTIONS

PIN ASSIGNMENT

	GINIVIEINI				
Pin	Name	Description			
1	RXO0-	Negative LVDS differential data input. Channel O0 (odd)			
2	RXO0+	Positive LVDS differential data input. Channel O0 (odd)			
3	RXO1-	Negative LVDS differential data input. Channel O1 (odd)			
4	RXO1+	Positive LVDS differential data input. Channel O1 (odd)			
5	RXO2-	Negative LVDS differential data input. Channel O2 (odd)			
6	RXO2+	Positive LVDS differential data input. Channel O2 (odd)			
7	GND	Ground			
8	RXOC-	Negative LVDS differential clock input. (odd)			
9	RXOC+	Positive LVDS differential clock input. (odd)			
10	RXO3-	Negative LVDS differential data input. Channel O3(odd)			
11	RXO3+	Positive LVDS differential data input. Channel O3 (odd)			
12	RXE0-	Negative LVDS differential data input. Channel E0 (even)			
13	RXE0+	Positive LVDS differential data input. Channel E0 (even)			
14	GND	Ground			
15	RXE1-	Negative LVDS differential data input. Channel E1 (even)			
16	RXE1+	Positive LVDS differential data input. Channel E1 (even)			
17	GND	Ground			
18	RXE2-	Negative LVDS differential data input. Channel E2 (even)			
19	RXE2+	Positive LVDS differential data input. Channel E2 (even)			
20	RXEC-	Negative LVDS differential clock input. (even)			
21	RXEC+	Positive LVDS differential clock input. (even)			
22	RXE3-	Negative LVDS differential data input. Channel E3 (even)			
23	RXE3+	Positive LVDS differential data input. Channel E3 (even)			
24	GND	Ground			
25	NC	For LCD internal use only, Do not connect			

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26	NC	For LCD internal use only, Do not connect
27	NC	For LCD internal use only, Do not connect
28	Vcc	+5.0V power supply
29	Vcc	+5.0V power supply
30	Vcc	+5.0V power supply

Note (1) Connector Part No.:

Fullconn WF13-422-3033 or P-Two 187098-30091 or Foxconn GS23302-0311R-7H or equivalent

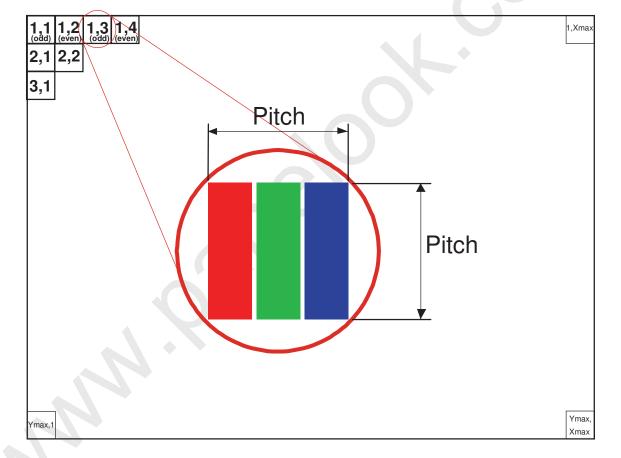
Note (2) User's connector Part No:

Mating Wire Cable Connector Part No.: FI-X30H(JAE) or FI-X30HL(JAE)

Mating FFC Cable Connector Part No.: 217007-013001 (P-TWO) or JF05X030-1 (JAE).

Note (3) The first pixel is odd.

Note (4) Input signal of even and odd clock should be the same timing.







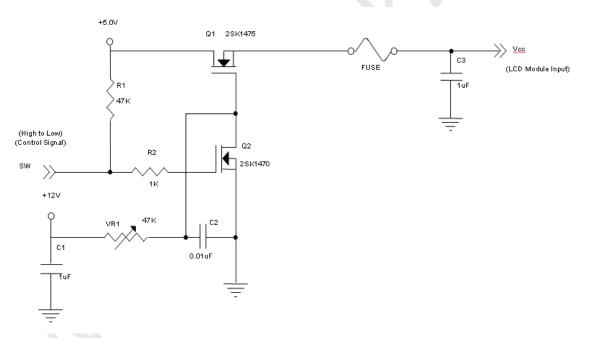
4.3 ELECTRICAL CHARACTERISTICS

4.3.1 LCD ELETRONICS SPECIFICATION

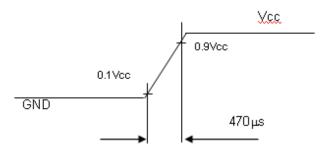
Parame	Parameter			Value		Unit	Note
i arame				Тур.	Max.	Offic	INOLE
Power Supply	y Voltage	Vcc	4.5	5.0	5.5	V	-
Ripple Vo	ltage	V_{RP}			300	mV	-
Rush Cu	I _{RUSH}			3	Α	(2)	
AC off Rus	AC off Rush Current				4	Α	(5)
	White	-	-	0.42	0.47	Α	(3)a
Power Supply Current	Black	-	-	1.2	1.4	Α	(3)b
	Vertical Stripe	-		0.69	0.71	Α	(3)c
Power Cons	PLCD	1	6.0	7.7	Watt	(4)	
LVDS differential	Vid	100	-	600	mV		
LVDS common in	nput voltage	Vic	0.05		2.85	V	

Note (1) The ambient temperature is $Ta = 25 \pm 2$ $^{\circ}C$.

Note (2) Measurement Conditions:



Vcc rising time is 470µs



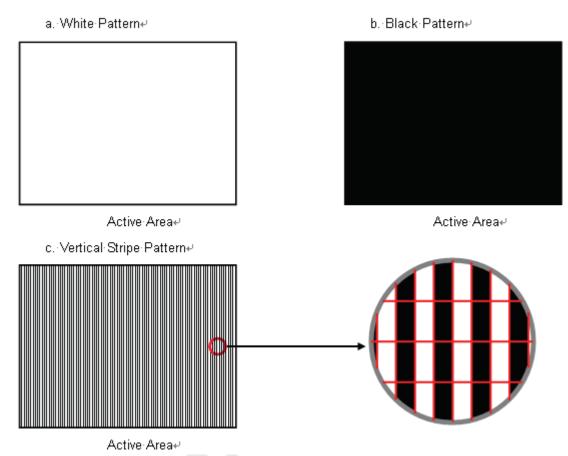
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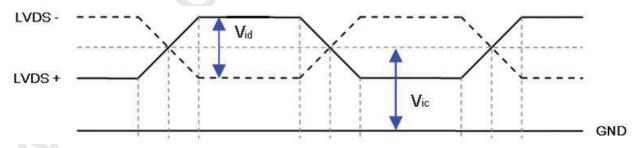


Note (3) The specified power supply current is under the conditions at Vcc = 5.0 V, $Ta = 25 \pm 2 \,^{\circ}\text{C}$, Fr = 60 Hz, whereas a power dissipation check pattern below is displayed.



Note (4) The power consumption is specified at the pattern with the maximum current.

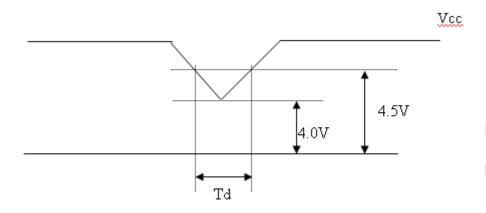
Note (5) The Rush current would be happened when system doesn't follow Power sequence in AC off status Note (6) VID waveform condition







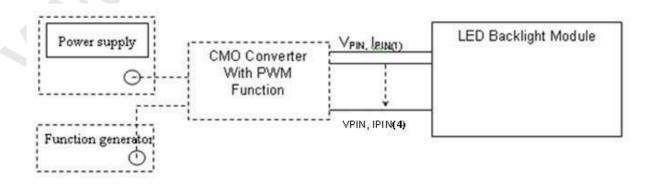
4.3.2 Vcc Power Dip Condition



4.3.3 BACKLIGHT UNIT

Parameter	Symbol		Value		Unit	Note
i arameter	Cyllibol	Min.	Тур.	Max.	Offit	TVOLE
LED Light Bar Input Voltage Per Input Pin	VPIN		34.1	37.4	V	(1), Duty=100%, IPIN=(65mA)
LED Light Bar Current Per Input Pin	IPIN		65	69	mA	(1), (2) Duty=100%
LED Life Time	LLED	40000			Hrs	(3)
Power Consumption	PBL		8.87	10.32	W	(1) Duty=100%, IPIN=(65mA)

- Note (1) LED light bar input voltage and current are measured by utilizing a true RMS multimeter as shown below:
- Note (2) $PBL = IPIN \times VPIN \times (4)$ input pins,
- Note (3) The lifetime of LED is defined as the time when LED packages continue to operate under the conditions at Ta = 25 \pm 2 $^{\circ}$ C and I= (65)mA (per chip) until the brightness becomes \leq 50% of its original value.
- Note (4) The max $\triangle Vf$ is 3.3V between each string.



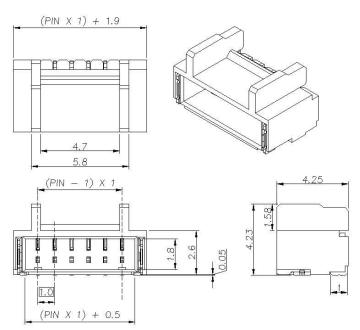
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4.3.4 LIGHTBAR Connector Pin Assignment

- $(1). Connector: FCN (WM13-406-063N) \ or \ equivalent.$
- (2) LB Connector drawing:



Other equivalents please refer to individual drawing

CN1

Pin number	Description
	Cathode of LED string
2	Cathode of LED string
3	VLED
4	VLED
5	Cathode of LED string
6	Cathode of LED string

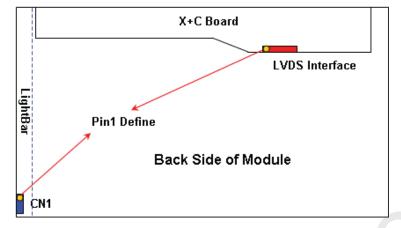
Note (1)Connector(wire type):FCN(WM13-406-063N) or Entery(3707K-Q06N-08L)or CviLux(Cl1406M1HRK-NH) or equivalent.

(2) User's mating connector part No.:

FCN(WF1300106-B) or Entery(H112K-P06N-01B or M001-E11N-00R) or CviLux(Cl1406SL000-NH) and hook width must be less than 4.5mm.







4.4 LVDS INPUT SIGNAL SPECIFICATIONS

4.4.1 LVDS DATA MAPPING TABLE

LVDS Channel O0	LVDS output	D7	D6	D4	D3	D2	D1	D0
LVD3 Charmer 00	Data order	OG0	OR5	OR4	OR3	OR2	OR1	OR0
LVDS Channel O1	LVDS output	D18	D15	D14	D13	D12	D9	D8
LVD3 Charmer O1	Data order	OB1	OB0	OG5	OG4	OG3	OG2	OG1
LVDS Channel O2	LVDS output	D26	D25	D24	D22	D21	D20	D19
LVD3 GHarifiel O2	Data order	DE	NA	NA	OB5	OB4	OB3	OB2
LVDS Channel O3	LVDS output	D23	D17	D16	D11	D10	D5	D27
LVD3 Charmer O3	Data order	NA	OB7	OB6	OG7	OG6	OR7	OR6
LVDS Channel E0	LVDS output	D7	D6	D4	D3	D2	D1	D0
LVD3 Ghanner Eu	Data order	EG0	ER5	ER4	ER3	ER2	ER1	ER0
LVDS Channel E1	LVDS output	D18	D15	D14	D13	D12	D9	D8
LVD3 GHariner LT	Data order	EB1	EB0	EG5	EG4	EG3	EG2	EG1
LVDS Channel E2	LVDS output	D26	D25	D24	D22	D21	D20	D19
LVD3 GHAHHELEZ	Data order	DE	NA	NA	EB5	EB4	EB3	EB2
LVDS Channel E3	LVDS output	D23	D17	D16	D11	D10	D5	D27
LVD3 GHaffilei E3	Data order	NA	EB7	EB6	EG7	EG6	ER7	ER6

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4.4.2 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of color versus data input.

	uata iriput.		Data Signal																						
	Color				Re	ed								reer	1						Blı	ле			
30.0 .		R7	R6	R5	R4		R2		R0	G 7	G 6	G 5	G 4	G3		G1	G0	B 7	B6	B5		ВЗ	B2	B 1	B 0
	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Basic	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
Colors	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Red(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray	Red(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scale	:		:	:	:	:	:		:	:	:		:		•		:	:	:	:	1	1	1	:	:
Of	Red(253)	1	1	1		1	4	:	4		0		:0		:		_	_		_		:	:		٠.
Red	Red(253)	1	1	1	1	1	1	0	1	0	0	0	.0	0	0	0	0	0	0	0	0	0	0	0	:0 0
	Red(254)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Gray	:	:	:	:	:	:				:	:	:	:	:	:		:	:	:	:					:
Scale	:		:							:			:		:		:	:		:		:	:	:	
Of	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
Green	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Grov	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Gray Scale	: 1	:			:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
Of	:	1:	•		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
Blue	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
Dide	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

Note (1) 0: Low Level Voltage, 1: High Level Voltage





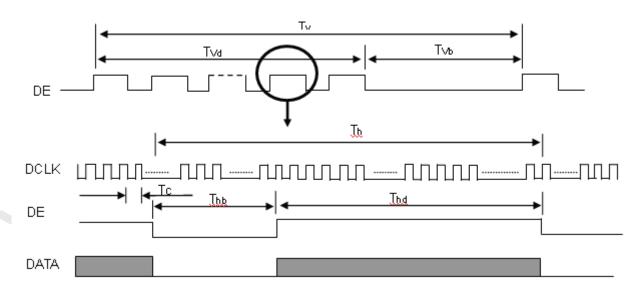
4.5 DISPLAY TIMING SPECIFICATIONS

The input signal timing specifications are shown as the following table and timing diagram.

Signal	Item	Symbol	Min.	Тур.	Max.	Unit	Note
_	Frequency	Fc	58.54	74.25	97.98	MHz	-
	Period	Tc	-	13.47	-	ns	
	Input cycle to cycle jitter	T_{rcl}	-	-	200	ns	(1)
	Input Clock to data skew	TLVCCS			400	ps	(2)
LVDS Clock	Spread spectrum modulation range	Fclkin_ mod	Fc*98%		Fc*102%	MHz	(2)
	Spread spectrum modulation frequency	F _{SSM}			200	KHz	(3)
	Frame Rate	Fr	50	60	75	Hz	-
	Total	Tv	1115	1125	1136	Th	Tv=Tvd+Tvb
Vertical Display Term	Active Display	Tvd	1080	1080	1080	Th	-
	Blank	Tvb	Tv-Tvd	45	Tv-Tvd	Th	-
	Total	Th	1050	1100	1150	Tc	Th=Thd+Thb
Horizontal Display Term	Active Display	Thd	960	960	960	Тс	-
	Blank	Thb	Th-Thd	140	Th-Thd	Tc	-

Note: Because this module is operated by DE only mode, Hsync and Vsync input signals are ignored.

INPUT SIGNAL TIMING DIAGRAM

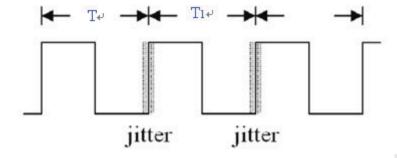


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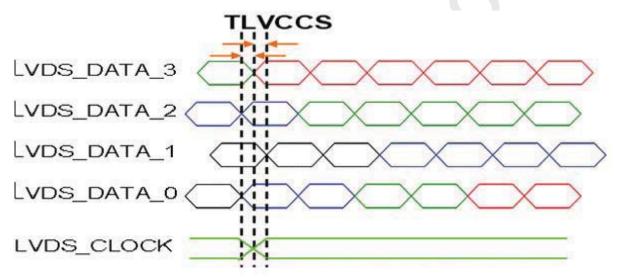




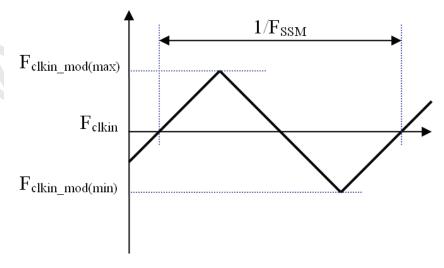
Note (1) The input clock cycle-to-cycle jitter is defined as below figures. Trcl = $IT_1 - TI$



Note (2) Input Clock to data skew is defined as below figures.



Note (3) The SSCG (Spread spectrum clock generator) is defined as below figures.



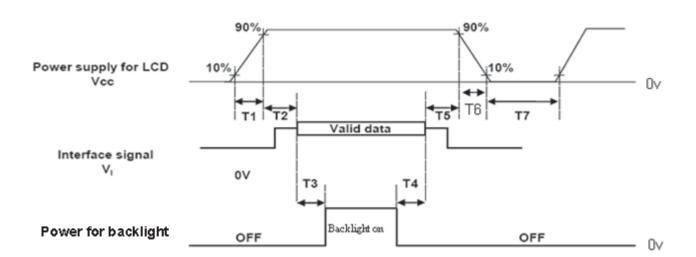
Note (4) The DCLK range at last line of V-blanking should be set in 0 to Hdisplay/2

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4.6 POWER ON/OFF SEQUENCE

The power sequence specifications are shown as the following table and diagram.



Timing Specifications:

Parameters		Values							
i arameters	Min	Тур.	Max	Units					
T1	0.5	-	10	ms					
T2	0	-	50	ms					
T3	450	-	-	ms					
T4	90	-	-	ms					
T5	0	-	50	ms					
T6	5	-	150	ms					
T7	500	-	-	ms					

- Note (1) The supply voltage of the external system for the module input should be the same as the definition of Vcc.
- Note (2) When the backlight turns on before the LCD operation of the LCD turns off, the display may momentarily become abnormal screen.
- Note (3) In case of VCC = off level, please keep the level of input signals on the low or keep a high impedance.
- Note (4) T4 should be measured after the module has been fully discharged between power off and on period.
- Note (5) Interface signal shall not be kept at high impedance when the power is on.
- Note (6) CMI won't take any responsibility for the products which are damaged by the customers not following the Power Sequence.
- Note (7) There might be slight electronic noise when LCD is turned off (even backlight unit is also off). To avoid this symptom, we suggest "Vcc falling timing" to follow "t6 spec".

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5. OPTICAL CHARACTERISTICS

5.1 TEST CONDITIONS

Item	Symbol	Value	Unit				
Ambient Temperature	Ta	25±2	оС				
Ambient Humidity	На	50±10	%RH				
Supply Voltage	VCC	5	V				
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"						
LED Light Bar Input Current Per Input Pin	IPIN	65 ± 1.95	mADC				
PWM Duty Ratio	D	100	%				
LED Light Bar Test Converter	Test OZ9998-8 Strings T4-8						

5.2 OPTICAL SPECIFICATIONS

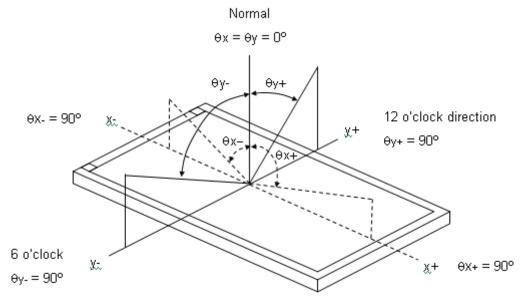
The relative measurement methods of optical characteristics are shown in 5.2. The following items should be measured under the test conditions described in 5.1 and stable environment shown in Note (5).

Iter	m	Symbol	Condition	Min.	Тур.	Max.	Unit	Note
	Red	Rx			0.633			
	neu	Ry			0.351			
	Green	Gx			0.322			
Color Chromaticity	Green	Gy		Typ – 0.03	0.630	Тур +	_	(1) (5)
(CIE 1931)	Blue	Bx	$\theta_x=0^\circ, \ \theta_Y=0^\circ$		0.152	0.03	_	(1), (5)
(3.2 1331)	blue	Ву	CS-2000 R=G=B=255		0.050			
	\\/ a:+a	Wx	Gray scale		0.313			
	White	Wy			0.329			
Center Lumina (Center of		Lc		150	200	-	cd/m ²	(4), (5)
Contras	t Ratio	CR		500	700	-	-	(2), (5)
Rosnons	o Timo	T_{R}	$\theta_x=0^\circ, \ \theta_Y=0^\circ$	-	1.5	2.5	ms	(3)
певрина	Response Time		$\sigma_X = 0$, $\sigma_Y = 0$	-	3.5	5.5	1115	(3)
White Va	White Variation		$\theta_x = 0^\circ, \ \theta_Y = 0^\circ$	70	-	-	%	(5), (6)
Viewing Angle	Horizontal	$\theta x - + \theta x +$	CR ≥ 10		90	-	Deg.	(1), (5)
Viewing Angle	Vertical	$\theta v - + \theta v +$	OII = 10		65	-	Deg.	(1), (3)

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Note (1) Definition of Viewing Angle (θx , θy):



Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

Contrast Ratio (CR) = L255 / L0

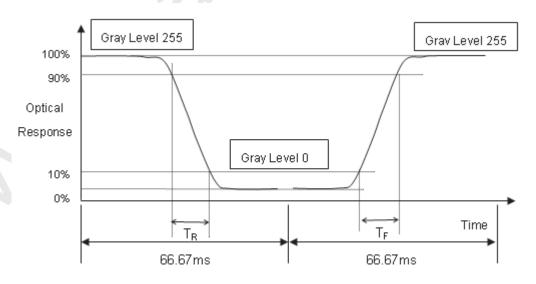
L255: Luminance of gray level 255

L 0: Luminance of gray level 0

CR = CR (5)

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (6).

Note (3) Definition of Response Time (T_R, T_F) :



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Note (4) Definition of Luminance of White (L_C) :

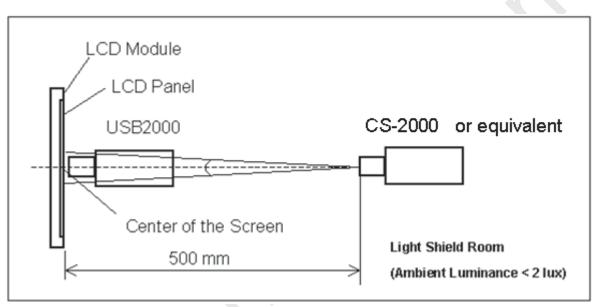
Measure the luminance of gray level 255 at center point

$$L_{C}=L\left(5\right)$$

L(x) is corresponding to the luminance of the point X at Figure in Note (6).

Note (5) Measurement Setup:

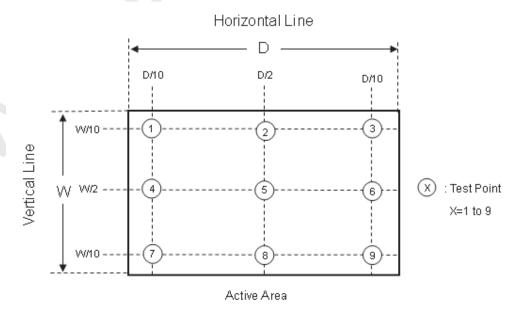
The LCD module should be stabilized at given temperature for 40 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 40 minutes in a windless room.



Note (6) Definition of White Variation (δW):

Measure the luminance of gray level 255 at 9 points

 $\delta W = (Minimum [L (1) \sim L (9)] / Maximum [L (1) \sim L (9)]) *100%$



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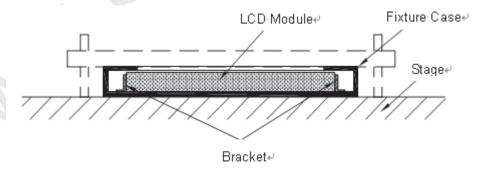


6. RELIABILITY TEST ITEM

Items	Required Condition	Note
Temperature Humidity Bias (THB)	Ta= 50°C , 80%RH, 240hours	-
High Temperature Operation (HTO)	Ta= 50°€ , 50%RH , 240hours	-
Low Temperature Operation (LTO)	Ta= 0°C , 240hours	-
High Temperature Storage (HTS)	Ta= 60° C , 240hours	-
Low Temperature Storage (LTS)	Ta= -20 $^{\circ}$ C , 240hours	-
Vibration Test (Non-operation)	Acceleration: 1.5 G Wave: sine Frequency: 10 - 300 Hz Sweep: 30 Minutes each Axis (X, Y, Z)	
Shock Test (Non-operation)	Acceleration: 50 G Wave: Half-sine Active Time: 11 ms Direction: ± X, ± Y, ± Z.(one time for each Axis)	
Thermal Shock Test (TST)	-20°C/30min , 60°C / 30min , 100 cycles	-
On/Off Test	25°C ,On/10sec , Off /10sec , 30,000 cycles	-
ESD (Electro Static Discharge)	Contact Discharge: ± 8KV, 150pF(330Ω)	-
	Air Discharge: ± 15KV, 150pF(330Ω)	-
Altitude Test	Operation:16404 ft / 24hours Non-Operation:30,000 ft / 24hours	-

- Note (1) criteria: Normal display image with no obvious non-uniformity and no line defect.
- Note (2) Evaluation should be tested after storage at room temperature for more than two hours.
- Note (3) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.

The fixing condition is shown as below:





CHIMEI INNOLUX

PRODUCT SPECIFICATION

7. PACKING

7.1 PACKING SPECIFICATIONS

- (1) 13 LCD modules / 1 Box
- (2) Box dimensions: 567(L) X 301(W) X 376(H) mm
- (3) Weight: approximately: 27.525kg (13 modules per box)

7.2 PACKING METHOD

(1) Carton Packing should have no failure in the following reliability test items.

Test Item	Test Conditions	Note
	ISTA STANDARD	
	Random, Frequency Range: 5 – 200 Hz	
Vibration	Top & Bottom: 15 minutes (+Z), 15 min (-Z),	PASS
	Right & Left: 10 minutes (X)	
	Back & Forth 10 minutes (Y)	
Dropping Test	1 Corner , 3 Edge, 6 Face, 46cm	PASS

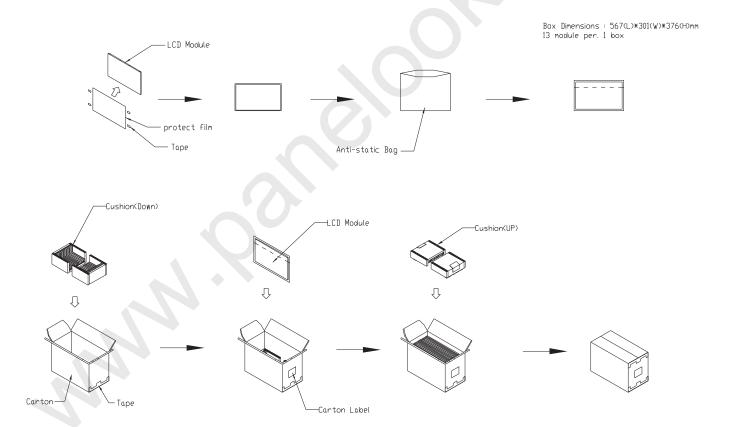
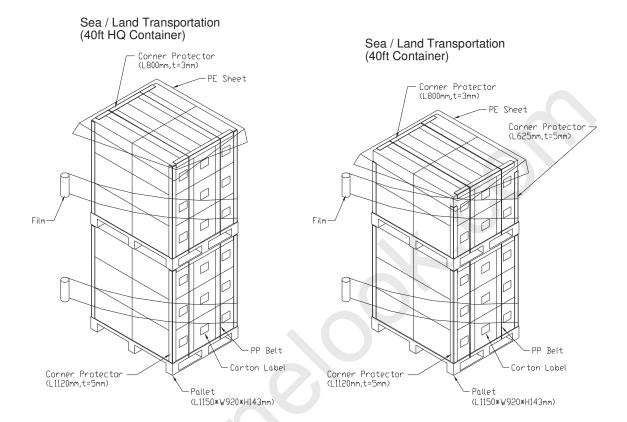


Figure. 7-1 Packing method





7.3 PALLET



Air Transportation

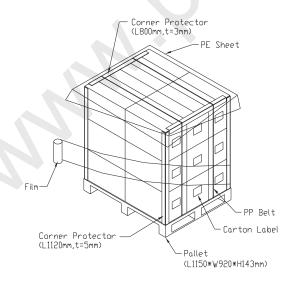


Figure. 7-2 Packing method

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8. CMI MODULE LABEL

The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.



(a) Model Name: M215HGE-L23

(b) Revision: Rev. XX, for example: A0, A1... B1, B2... or C1, C2...etc.

(c) CMI barcode definition:

Serial ID: XX-XX-X-XX-YMD-L-NNNN

Code	Meaning	Description
XX	CMI internal use	-
XX	Revision	Cover all the change
Х	CMI internal use	-
XX	CMI internal use	-
YMD	Year, month, day	Year: 0~9, 2001=1, 2002=2, 2003=32010=0, 2011=1, 2012=2 Month: 1~12=1, 2, 3, ~, 9, A, B, C Day: 1~31=1, 2, 3, ~, 9, A, B, C, ~, W, X, Y, exclude I, O, and U.
L	Product line #	Line 1=1, Line 2=2, Line 3=3,
NNNN	Serial number	Manufacturing sequence of product

(d) Customer's barcode definition:

Serial ID: CM- L5E23-X-X-X-XX-L-XX-L-YMD-NNNN

Serial ID. Givi- ESEZS-X-X-X-X-L-XX-E-TIVID-INIVIVI				
Code	Meaning	Description		
CM	Supplier code	CMI=CM		
L5E23	Model number	M215HGE-L23= L5E23		
Х	Revision code	Non ZBD: 1,2,~,8,9 / ZBD: A~Z		
Х	Source driver IC code	Century=1, CLL=2, Demos=3, Epson=4, Fujitsu=5, Himax=6, Hitachi=7, Hynix=8, LDI=9, Matsushita=A, NEC=B, Novatec=C,		
X	Gate driver IC code	OKI=D, Philips=E, Renasas=F, Samsung=G, Sanyo=H, Sharp=I, TI=J, Topro=K, Toshiba=L, Windbond=M, ILITEK=Q, Fiti=Y		
XX	Cell location	Tainan Taiwan=TN, Ningbo China=CN, Hsinchu Taiwan=SC		
L	Cell line #	1,2,~,9,A,B,~,Y,Z		
XX	Module location	Tainan, Taiwan=TN; Ningbo China=NP, Shenzhen China=SH		
L	Module line #	1,2,~,9,A,B,~,Y,Z		
YMD	Year, month, day	Year: 0~9, 2001=1, 2002=2, 2003=32010=0, 2011=1, 2012=2 Month: 1~12=1, 2, 3, ~, 9, A, B, C Day: 1~31=1, 2, 3, ~, 9, A, B, C, ~, T, U, V		
NNNN	Serial number	By LCD supplier		

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PRODUCT SPECIFICATION

(e) FAB ID(UL Factory ID):

Region	Factory ID
TWCMI	GEMN
NBCMI	LEOO
NBCME	CANO
NHCMI	CAPG

9. PRECAUTIONS

9.1 ASSEMBLY AND HANDLING PRECAUTIONS

- (1) Do not apply rough force such as bending or twisting to the module during assembly.
- (2) To assemble or install module into user's system can be only in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.
- (3) It's not permitted to have pressure or impulse on the module because the LCD panel and Backlight will be damaged.
- (4) Always follow the correct power sequence when LCD module is connecting and operating. This can prevent damage to the CMOS LSI chips during latch-up.
- (5) Do not pull the I/F connector in or out while the module is operating.
- (6) Do not disassemble the module.
- (7) Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.
- (8) It is dangerous that moisture come into or contacted the LCD module, because moisture may damage LCD module when it is operating.
- (9) High temperature or humidity may reduce the performance of module. Please store LCD module within the specified storage conditions.
- (10)When ambient temperature is lower than 10°C may reduce the display quality. For example, the response time will become slowly.

9.2 STORAGE PRECAUTIONS

- (1) Do not leave the module in high temperature, and high humidity for a long time. It is highly recommended to store the module with temperature from 0°C to 35°C and relative humidity of less than 70%
- (2) Do not store the TFT LCD module in direct sunlight
- (3) The module should be stored in dark place. It is prohibited to apply sunlight or fluorescent light in storing

9.3 OPERATION PRECAUTIONS

(1) The LCD product should be operated under normal condition.

Normal condition is defined as below:

Temperature : 20±15°C Humidity: 65±20%

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Display pattern: continually changing pattern(Not stationary)





(2) If the product will be used in extreme conditions such as high temperature, high humidity, high altitude, display pattern or operation time etc...lt is strongly recommended to contact CMI for application engineering advice. Otherwise, Its reliability and function may not be guaranteed.

9.4 SAFETY PRECAUTIONS

- (1) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.
- (2) After the module's end of life, it is not harmful in case of normal operation and storage.

9.5 SAFETY STANDARDS

The LCD module should be certified with safety regulations as follows:

- (1) UL60950-1 or updated standard.
- (2) IEC60950-1 or updated standard.

9.6 OTHER

When fixed patterns are displayed for a long time, remnant image is likely to occur.

Appendix. OUTLINE DRAWING

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