



RAYSTAR

曜凌光電股份有限公司

住址: 42878 台中市大雅区科雅路 25 號 5F WEB: <http://www.Raystar-Optronics.com>
5F., No.25, Keya Rd., Daya Dist., Taichung E-mail: sales@raystar-optronics.com
City 428, Taiwan Tel:886-4-2565-0761 Fax : 886-4-2565-0760

RFJ350W-AWH-DNN

SPECIFICATION

CUSTOMER:

APPROVED BY	
PCB VERSION	
DATE	

FOR CUSTOMER USE ONLY

SALES BY	APPROVED BY	CHECKED BY	PREPARED BY

Release DATE:

Revision History

VERSION	DATE	REVISED PAGE NO.	Note
0	2018/06/08		First issue

RAYSTAR OPTRONICS

Contents

1.Module Classification Information

2.Summary

3.General Specification

4.Interface

5.Contour Drawing

6.Block Diagram

7.Absolute Maximum Ratings

8.Electrical Characteristics

9.DC Characteristics

10.AC Characteristics

11.Optical Characteristics

12.Reliability

13.Other

1.Module Classification Information

R	F	J	35	0W	-	A	W	H	-	D	N	N
1	2	3	4	5	-	6	7	8	-	9	10	11

Item	Description	
1	R : Raystar Optonics Inc.	
2	Display Type : F→TFT Type, J→ Custom TFT	
3	Solution: A: 128x160 B:320x234 C:320x240 D:480x234 E:480x272 F:800x480 G:640x480 H:1024x600 I:320x480 J:240x320 K:1280x800 L:240x400 M:1024x768 N:128x128 O:480x800 P:640x320 Q:800x600 S:480x128 T:800x320	
4	Display Size : 3.5" TFT	
5	Version Code.	
6	Model Type: A : TFT LCD E : TFT+FR+CONTROL BOARD J : TFT+FR+A/D BOARD N : TFT+FR+A/D BOARD+CONTROL BOARD S : TFT+FR+POWER BOARD (DC TO DC) 1 : TFT+CONTROL BOARD	6 : TFT+FR H : TFT+D/V BOARD I : TFT+FR+D/V BOARD B : TFT+POWER BD
7	Polarizer Type, Temperature range, View direction	I→Transmissive, W. T, 6:00 ; C→Transmissive, N. T, 6:00 L→Transmissive, W.T,12:00 ; F→Transmissive, N.T,12:00 Y→Transmissive,W.T, IPS TFT ; A→Transmissive, N.T, IPS TFT Z→Transmissive, W.T, O-TFT R→Transmissive, Super W.T, O-TFT N→Transmissive, Super W.T, 6:00; Q→Transmissive, Super W.T, 12:00 V→Transmissive, Super W.T, VA TFT
8	Backlight	W : LED, White H : LED, High Light White F : CCFL, White
9	Driver Method	D: Digital A: Analog L : LVDS M:MIPI
10	Interface	N : without control board A : 8Bit B : 16Bit S:SPI Interface R: RS232 U:USB I: I2C
11	TS	N : Without TS S : resistive touch panel C : capacitive touch panel capacitive touch panel (G-F-F) G : capacitive touch panel(G-G)

2.Summary

TFT 3.5 is a IPS transmissive type color active matrix TFT liquid crystal display that use amorphous silicon TFT as switching devices. This module is a composed of a TFT_LCD module, It is usually designed for industrial application and this module follows RoHs.

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RAYSTAR OPTRONICS

3.General Specifications

- Size: 3.5 inch
- Dot Matrix: 240 x RGXBx 320(TFT) dots
- Module dimension: 61.8 (W) x88.5 (H) x 4.71(D) mm
- Active area: 53.28 x 71.04 mm
- LCD type: TFT, Normally Black, Transmissive
- View Direction: Wide View
- Aspect Ratio: Portrait
- TFT Driver IC: HX8347-A Or Equal
- TFT Interface: MCU 8/16/18-bit
- \Backlight Type: LED,Normally White
- With /Without TP: Without TP
- Surface: Anti-Glare

*Color tone slight changed by temperature and driving voltage.

4.Interface

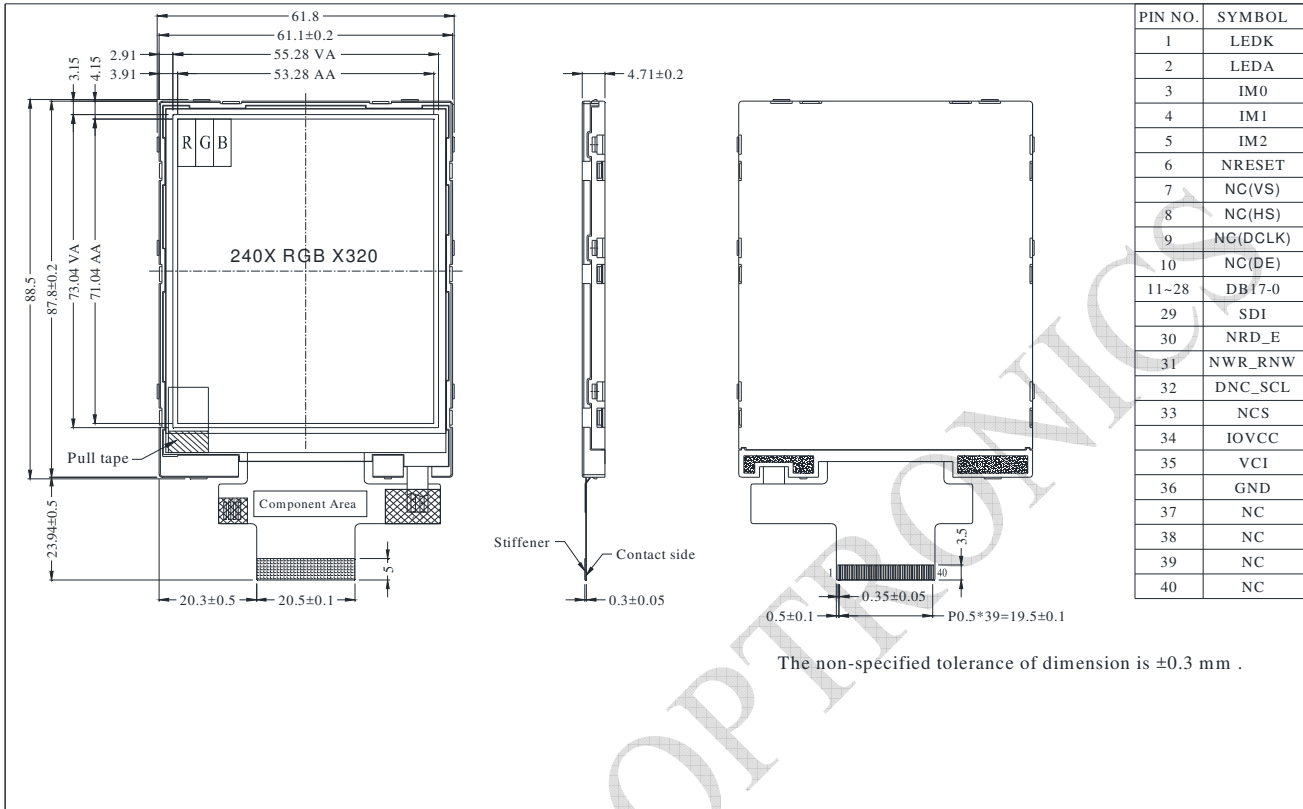
LCM PIN Definition

NO	Symbol	Function	I/O
1	LEDK	Cathode of LED backlight	P
2	LEDA	Anode of LED backlight.	P
3	IM0	Note 1	I
4	IM1	Note 1	I
5	IM2	Note 1	I
6	NRESET	System reset pin.	I
7	NC(VS)	No Connection (Vrtical Sync signal option)	I
8	NC(HS)	No Connection (Horizontal Sync signal option)	I
9	NC(DCLK)	No Connection (Pixel clock signal option)	I
10	NC(DE)	No Connection (Data Enable option)	I
11-28	DB17-0	Data bus	I/O
29	SDI	Serial data input/output bi-direction pin	I/O
30	NRD_E	Read strobe signal. Read out data when RDX is Low.	I
31	NWR_RNW	Write data when WRX is Low.	I
32	DNC_SCL	Register select	I
33	NCS	Chip select signal	I
34	IOVCC	Power supply	P
35	VCI	Power supply	P
36	GND	Ground	P
37	NC	No Connection	
38	NC	No Connection	
39	NC	No Connection	
40	NC	No Connection	

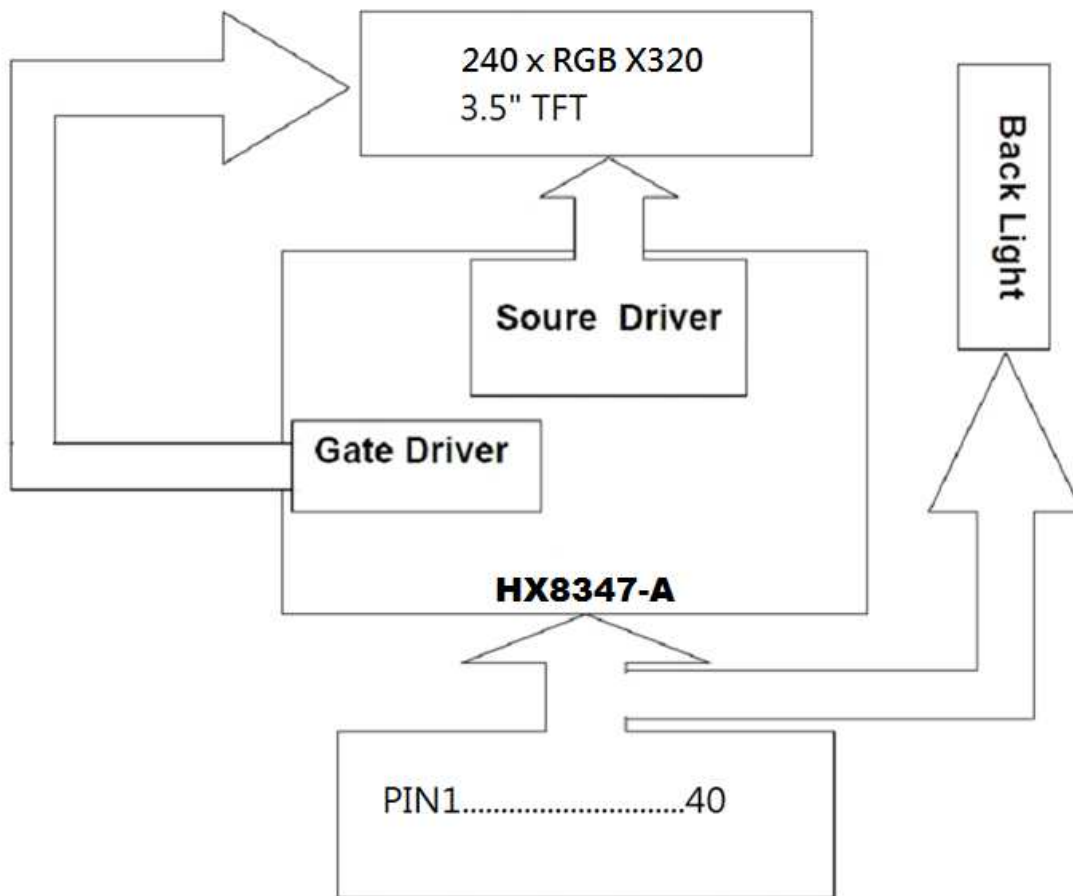
Note 1:

IM2	IM1	IM0	Interface mode	DB pins
0	0	0	16-bit bus interface, 80-system,65K-Color	D17-D16: Unused D15-D0: Data
0	0	1	16-bit bus interface, 80-system,262K-Color	D17-D16: Unused D15-D0: Data
0	1	0	18-bit bus interface, 80-system,262K-Color	D17-D0: Data
0	1	1	8-bit bus interface, 80-system,262K-Color	D17-D8: Unused D7-D0: Data
1	0	0	16-bit bus interface, 80-system,262K-Color	D17-D16: Unused D15-D0: Data
1	0	1	18-bit bus interface, 80-system,262K-Color	D17-D0: Data

5. Contour Drawing



6. Block Diagram



7. Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	TOP	-30	—	+80	°C
Storage Temperature	TST	-30	—	+80	°C

Note: Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above

1. Temp. $\leq 60^{\circ}\text{C}$, 90% RH MAX. Temp. $> 60^{\circ}\text{C}$, Absolute humidity shall be less than 90% RH at 60°C

8. Electrical Characteristics

8.1. Operating conditions:

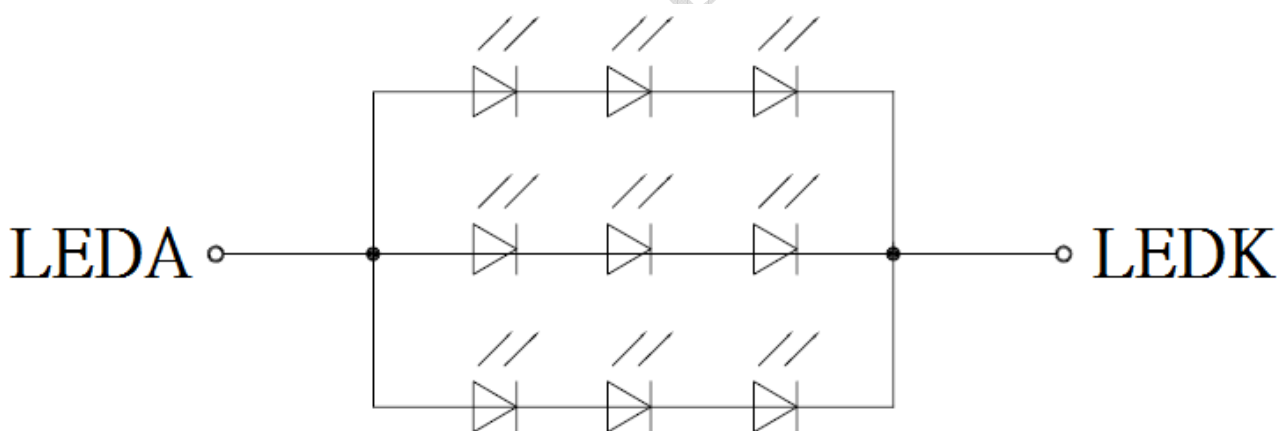
Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage for digital	IOVCC	—	1.65	—	3.3	V
Supply Voltage for analog	VCI	—	2.3	—	3.3	V
Power Supply for Current	ICC	IOVCC=VCI =VCC=3.28V	—	10	—	mA

8.2. LED driving conditions

Parameter	Symbol	Min	Typ	Max	Unit	Remark
LED current	—	—	270	—	mA	—
LED voltage	LEDA	8.1	9.6	10.8	V	Note 1
LED Life Time	—	50000	—	—	Hr	Note 2,3

Note 1 : There are 1 Groups LED

Note 2 : Ta = 25°C



Note 3 : Brightness to be decreased to 50% of the initial value

9.DC CHARATERISTICS

Parameter	Symbol	Rating			Unit	Condition
		Min	Typ	Max		
Low level input voltage	VIL	0	-	0.3*IOVCC	V	Input
High level input voltage	VIH	0.7*IOVCC	-	IOVCC	V	

10.AC CHARATERISTICS

10.1. Parallel Interface Characteristics (8080-serial MCU)

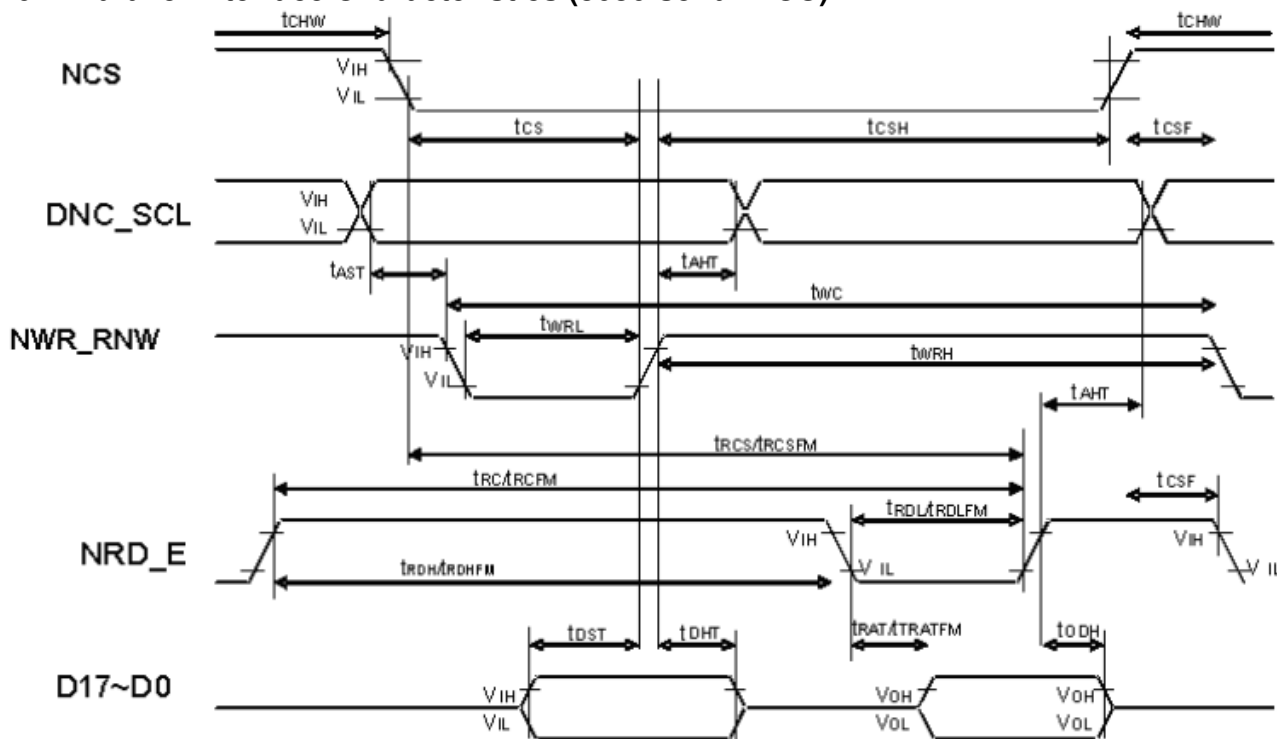


Figure 1: Parallel Interface Characteristics (8080-series MCU)

IOVCC=1.65V to 3.3V, VCI=2.3VV to 3.3V, Ta = -40 to 85°C

Signal	Symbol	Parameter	Min.	Max.	Unit	Description
DNC_SCL	t _{AST}	Address setup time	10	-	ns	-
	t _{AHT}	Address hold time (Write/Read)	10	-	ns	-
NCS	t _{CHW}	Chip select "H" pulse width	0	-	-	-
	t _{CS}	Chip select setup time (Write)	35	-	-	-
	t _{RCFSM}	Chip select setup time	180	-	ns	-
	t _{CSF}	Chip select wait time (Write/Read)	10	-	-	-
NWR_RNW	t _{CSH}	Chip select hold time	10	-	-	-
	t _{WC}	Write cycle	100	-	ns	-
	t _{WRH}	Control pulse "H" duration	15	-	-	-
NRD_E	t _{WRL}	Control pulse "L" duration	20	-	-	-
	t _{RCFM}	Read cycle	250	-	-	-
	t _{RDHF}	Control pulse "H" duration	15	-	ns	When read from GRAM
D17 to D0	t _{RDLF}	Control pulse "L" duration	180	-	-	-
	t _{DST}	Data setup time	10	-	-	-
	t _{DHT}	Data hold time	10	-	-	-
	t _{RAT}	Read access time (ID)	-	180	ns	For maximum C _L =30pF
	t _{TRATFM}	Read access time (FM)	-	340	-	For minimum C _L =8pF
	t _{ODH}	Output disable time	20	80	-	-

Note: The input signal rise time and fall time (tr, tf) is specified at 15 ns or less.

Logic high and low levels are specified as 30% and 70% of IOVCC for Input signals.

Table 1 AC Characteristic of 8080-series Interface

10.2. 16-bit Parallel Bus System Interface

The 80-system 16-bit parallel bus interface in command-parameter interface mode can be used by setting external pin IM [2:0] as "000", "001", "100". Figure 2 is the example of interface with 80-system microcomputer interface.

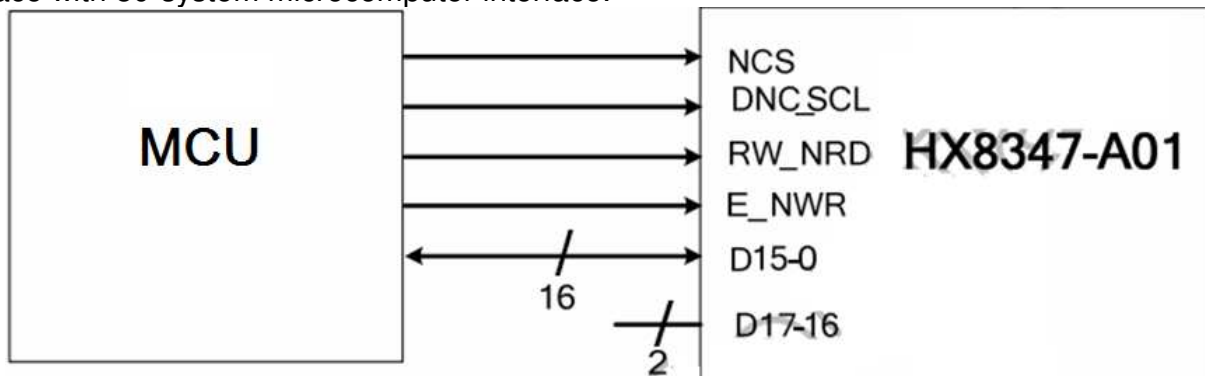


Figure 2: Example of 80-system 16-bit Parallel Bus Interface

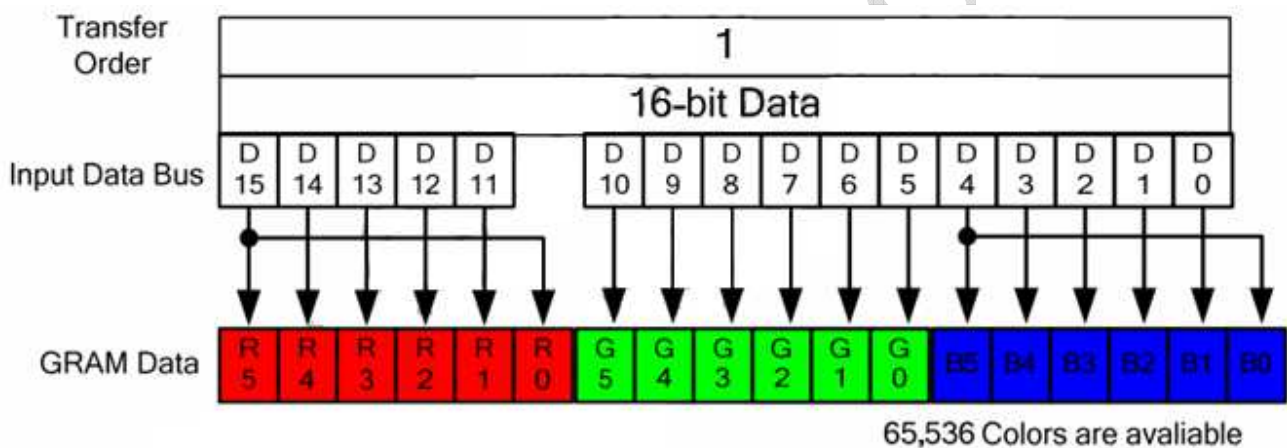


Figure 3: Input Data Bus and GRAM Data Mapping in 16-Bit Bus System Interface with 16 Bit-Data Input (IM [2:0] as "000")

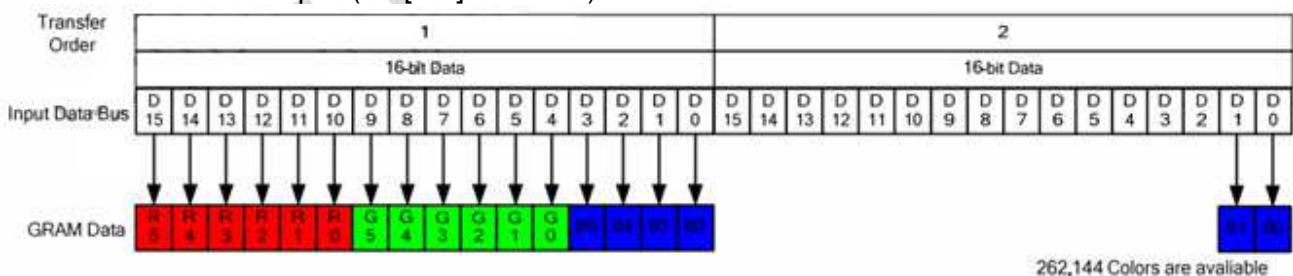


Figure 4: Input Data Bus and GRAM Data Mapping in 16-Bit Bus System Interface with 18(16+2) Bit-Data Input (IM [2:0] as "001")

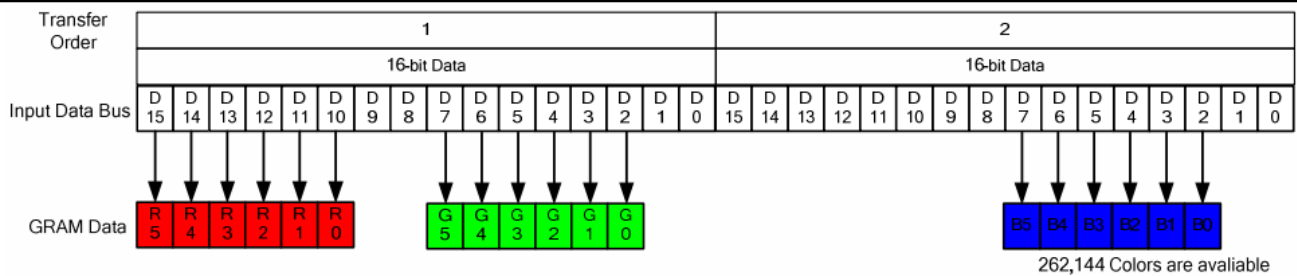


Figure 5: Input Data Bus and GRAM Data Mapping in 16-Bit Bus System Interface with 18(6+6+6) Bit-Data Input(IM [2:0] as "100")

10.3. 8-bit Parallel Bus System Interface

The 80-system 8-bit parallel bus interface in register-content interface mode can be used by setting external pin IM [2:0] as "011". Figure 6 is the example of interface with 80-system microcomputer interface.

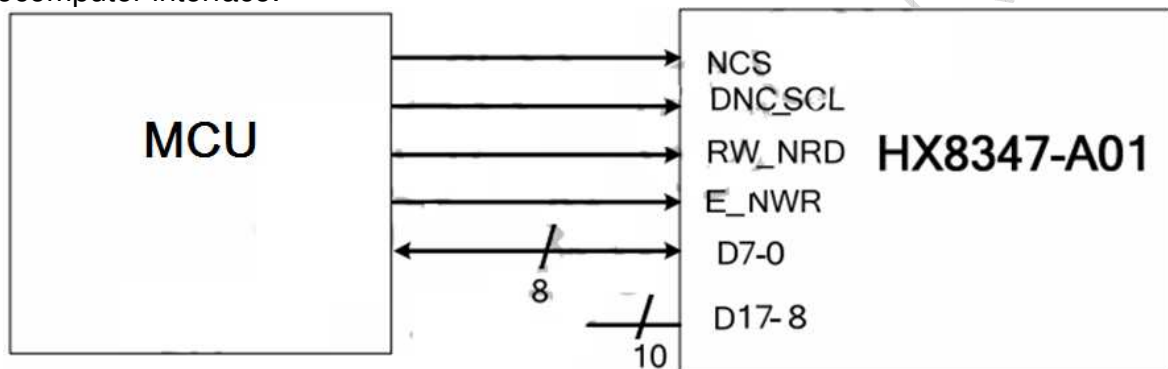


Figure 6: Example of 80-system 16-bit Parallel Bus Interface

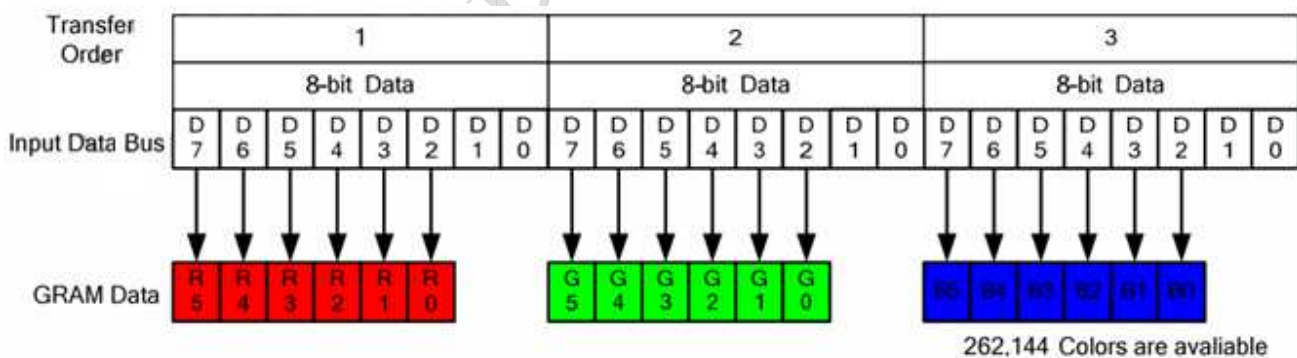


Figure 7: Input Data Bus and GRAM Data Mapping in 8-Bit Bus System Bit-Data Input(IM [2:0] as "011")

10.4. 18-bit Parallel Bus System Interface

The 80-system 18-bit parallel bus interface in command-parameter interface can be used by setting IM [2:0] as "010". Figure 8 is the example of interface with 80-system microcomputer interface.

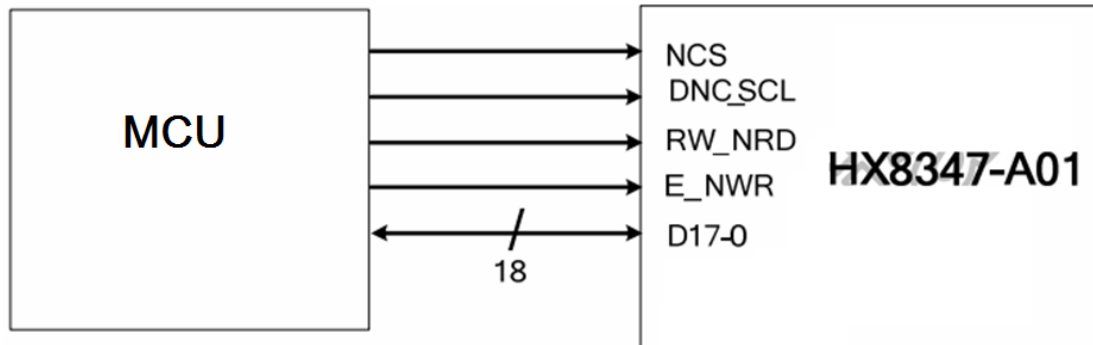


Figure 8: Example of 80-system 18-bit Parallel Bus Interface

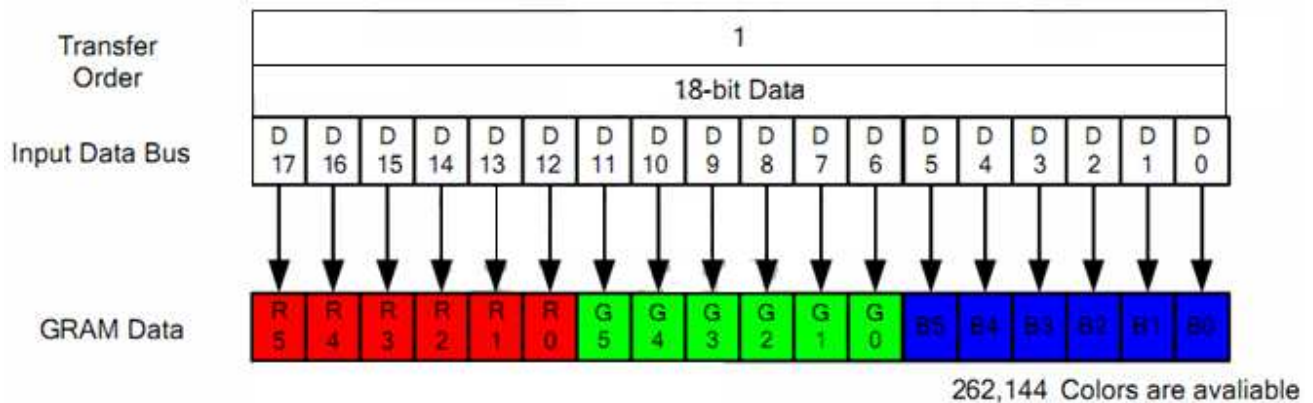


Figure 9: Input Data Bus and GRAM Data Mapping in 18-Bit Bus System (IM [2:0] as "010")

10.5. Other command, display data format...,Please reference the HX8347-A Spec

11. Optical Characteristics

Item	Symbol	Condition.	Min	Typ.	Max.	Unit	Remark
Response time	Tr	$\theta=0^\circ$ 、 $\Phi=0^\circ$	-	-	40	.ms	Note 3,5
	Tf						
Contrast ratio	CR	At optimized viewing angle	500	800	-	-	Note 4,5
Color Chromaticity	White	$\theta=0^\circ$ 、 $\Phi=0$	0.3	0.35	0.4		Note 2,6,7
	Wy						
Viewing angle	Hor.	$CR \geq 10$	-	89	-	Deg.	Note 1
			-	89	-		
	Ver.		-	89	-		
			-	89	-		
Brightness	-	-	800	1000	-	cd/m ²	Center of display

Ta=25±2℃,ILED=270mA

Note 1: Definition of viewing angle range

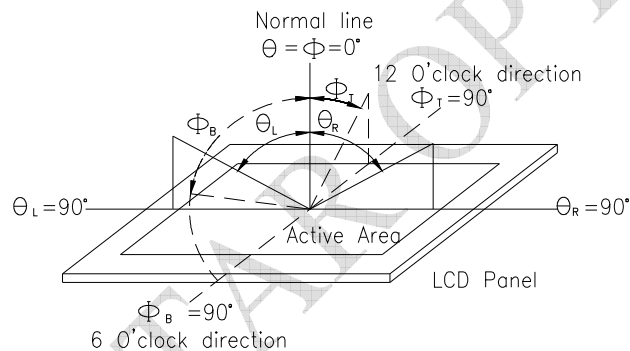


Fig. 11.1. Definition of viewing angle

Note 2: Test equipment setup:

After stabilizing and leaving the panel alone at a driven temperature for 10 minutes, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7 luminance meter 1.0° field of view at a distance of 50cm and normal direction.

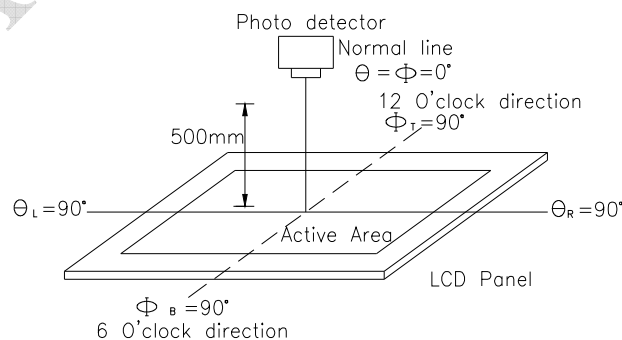
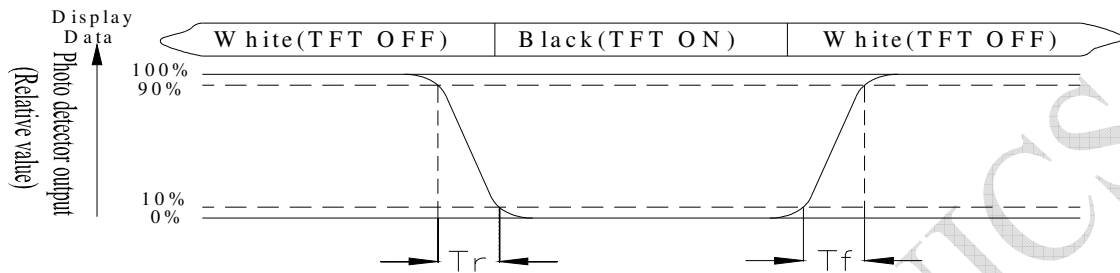


Fig. 11.2. Optical measurement system setup

Note 3: Definition of Response time:

The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time, T_r , is the time between photo detector output intensity changed from 90% to 10%. And fall time, T_f , is the time between photo detector output intensity changed from 10% to 90%



Note 4: Definition of contrast ratio:

The contrast ratio is defined as the following expression.

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

Note 5: White $V_i = V_{i50} \pm 1.5V$

Black $V_i = V_{i50} \pm 2.0V$

“±” means that the analog input signal swings in phase with VCOM signal.

“±” means that the analog input signal swings out of phase with VCOM signal.

The 100% transmission is defined as the transmission of LCD panel when all the input terminals of module are electrically opened.

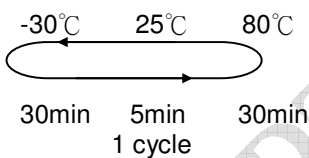
Note 6: Definition of color chromaticity (CIE 1931)

Color coordinates measured at the center point of LCD

Note 7: Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

12. Reliability

Content of Reliability Test (Super Wide temperature, -30°C~80°C)

Environmental Test			
Test Item	Content of Test	Test Condition	Note
High Temperature storage	Endurance test applying the high storage temperature for a long time.	80°C 200hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C 200hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	80°C 200hrs	—
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-30°C 200hrs	1
High Temperature/Humidity storage	The module should be allowed to stand at 60°C,90%RH max	60°C,90%RH 96hrs	1,2
Thermal shock resistance	The sample should be allowed stand the following 10 cycles of operation 	-30°C/80°C 10 cycles	—
Vibration test	Endurance test applying the vibration during transportation and using.	Total fixed amplitude : 1.5mm Vibration Frequency : 10~55Hz One cycle 60 seconds to 3 directions of X,Y,Z for Each 15 minutes	3
Static electricity test	Endurance test applying the electric stress to the terminal.	VS=±600V(contact) ,±800v(air), RS=330Ω CS=150pF 10 times	—

Note1: No dew condensation to be observed.

Note2: The function test shall be conducted after 4 hours storage at the normal Temperature and humidity after remove from the test chamber.

Note3: The packing have to including into the vibration testing.

LCM Sample Estimate Feedback Sheet		
Module Number : _____		
1 、 <u>Panel Specification</u> :		
1. Panel Type :	☐ Pass	☐ NG , _____
2. View Direction :	☐ Pass	☐ NG , _____
3. Numbers of Dots :	☐ Pass	☐ NG , _____
4. View Area :	☐ Pass	☐ NG , _____
5. Active Area :	☐ Pass	☐ NG , _____
6. Operating Temperature :	☐ Pass	☐ NG , _____
7. Storage Temperature :	☐ Pass	☐ NG , _____
8. Others : _____		
2 、 <u>Mechanical Specification</u> :		
1. PCB Size :	☐ Pass	☐ NG , _____
2. Frame Size :	☐ Pass	☐ NG , _____
3. Material of Frame :	☐ Pass	☐ NG , _____
4. Connector Position :	☐ Pass	☐ NG , _____
5. Fix Hole Position :	☐ Pass	☐ NG , _____
6. Backlight Position :	☐ Pass	☐ NG , _____
7. Thickness of PCB :	☐ Pass	☐ NG , _____
8. Height of Frame to PCB :	☐ Pass	☐ NG , _____
9. Height of Module :	☐ Pass	☐ NG , _____
10. Others :	☐ Pass	☐ NG , _____
3 、 <u>Relative Hole Size</u> :		
1. Pitch of Connector :	☐ Pass	☐ NG , _____
2. Hole size of Connector :	☐ Pass	☐ NG , _____
3. Mounting Hole size :	☐ Pass	☐ NG , _____
4. Mounting Hole Type :	☐ Pass	☐ NG , _____
5. Others :	☐ Pass	☐ NG , _____
4 、 <u>Backlight Specification</u> :		
1. B/L Type :	☐ Pass	☐ NG , _____
2. B/L Color :	☐ Pass	☐ NG , _____
3. B/L Driving Voltage (Reference for LED Type) : ☐ Pass ☐ NG , _____		
4. B/L Driving Current :	☐ Pass	☐ NG , _____
5. Brightness of B/L :	☐ Pass	☐ NG , _____
6. B/L Solder Method :	☐ Pass	☐ NG , _____
7. Others :	☐ Pass	☐ NG , _____

>> Go to page 2 <<

Module Number : _____

5 、 Electronic Characteristics of Module :

1.Input Voltage :	☐ Pass	☐ NG , _____
2.Supply Current :	☐ Pass	☐ NG , _____
3.Driving Voltage for LCD :	☐ Pass	☐ NG , _____
4.Contrast for LCD :	☐ Pass	☐ NG , _____
5.B/L Driving Method :	☐ Pass	☐ NG , _____
6.Negative Voltage Output :	☐ Pass	☐ NG , _____
7.Interface Function :	☐ Pass	☐ NG , _____
8.LCD Uniformity :	☐ Pass	☐ NG , _____
9.ESD test :	☐ Pass	☐ NG , _____
10.Others :	☐ Pass	☐ NG , _____

6 、 Summary :
Sales signature : _____

Customer Signature : _____

Date : / /