



A Brighter Solution

# AMP DISPLAY INC.

## SPECIFICATIONS

### 2.8-in OLED Display Module

CUSTOMER:	
CUSTOMER PART NO.	
AMP DISPLAY PART NO.	AE-240320UOFET-00H
APPROVED BY:	
DATE:	

APPROVED FOR SPECIFICATIONS

APPROVED FOR SPECIFICATION AND PROTOTYPES

## AMP DISPLAY INC

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## RECORD OF REVISION

Revision Date	Page	Contents	Editor
2009/1/14	--	New Release	Edward

## 1. FEATURES

- (1) Driving Mode : Active Matrix.
- (2) Color Mode : Full Color (262K color)
- (3) Driver IC : S6E63D6, COG Assembly
- (4) Interface :
  - (a.) MPU i80-system 18 / 16 / 9 / 8 –bit bus interface.
  - (b.) MPU i68-system 18 / 16 / 9 / 8 –bit bus interface.
  - (c.) Serial data transfer interface
  - (d.) RGB 18/16/ 6 –bit bus interface (DOTCLK, VSYNC, HSYNC, DE, DB17-0)
- (5) RoHS Compatible

## 2. PHYSICAL SPECIFICATIONS

Item	Specifications	unit
Display size	2.83”	inch
Resolution	240 (W) x RGB x 320 (H)	dot
Pixel pitch	0.060 (W) x 0.18 (H)	mm
Active Area	43.2 (W) x 57.6 (H)	mm
Outline Area	49.1 (W) x 67.3 (H)	mm
Thickness	1.75(Typ.), 1.9(Max)	mm
Weight	16	g

## 3. ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Min.	Max.	Unit	Note
Power supply voltage 1	VDD3	-0.3	5	V	
Power supply voltage 2	VCI	-0.3	5	V	
Input Voltage range	Vin	-0.3	VDD+0.5	V	
Operating Temperature	Top	-40	60	°C	
Storage Temperature	Tstg	-40	85	°C	

Note 1: Absolute maximum rating is the limit value. When the IC is exposed operation environment beyond this range, the IC do not assure operations and may be damaged permanently, not be able to be recovered.

Note 2: Absolute maximum rating is guaranteed only when our company's package used.

#### 4. OPTICAL CHARACTERISTICS

Items	Symbol	Min	Typ.	Max	Unit	Note	
Operating Luminance	L	170	200	230	Cd/m <sup>2</sup>	(1)(5)	
Power Consumption	Pon	--	350	400	mW	30% pixels on (1)	
Max. Current	Icc	--	--	162	mA	(1)	
Response Time	Tres	--	--	50	us	(2)	
Color chromaticity	White	Wx	0.26	0.31	0.36	--	(5)
		Wy	0.28	0.33	0.38	--	(5)
	Red	Rx	0.62	0.66	0.70	--	(5)
		Ry	0.30	0.34	0.38	--	(5)
	Green	Gx	0.25	0.29	0.33	--	(5)
		Gy	0.62	0.66	0.70	--	(5)
	Blue	Bx	0.11	0.15	0.19	--	(5)
		By	0.12	0.16	0.20	--	(5)
Viewing Angle	VA	160	170	--	Degree	(3)	
Contrast	CR	5000:1	10000:1	--		(4)	
Operation Lifetime	LTop	20000	--	--	Hrs	(1)(6)	

Note:

Measuring surrounding : Dark room

Surrounding temperature : 25°C

IOVCC = 1.65V ~3.3V

1. Test condition :

a. AR\_VDD = 4.6V±0.03V, AR\_VSS = -4.4V±0.03V

b. IC Initial Register Setting:

R03h: 0x0030 // 16bit mode

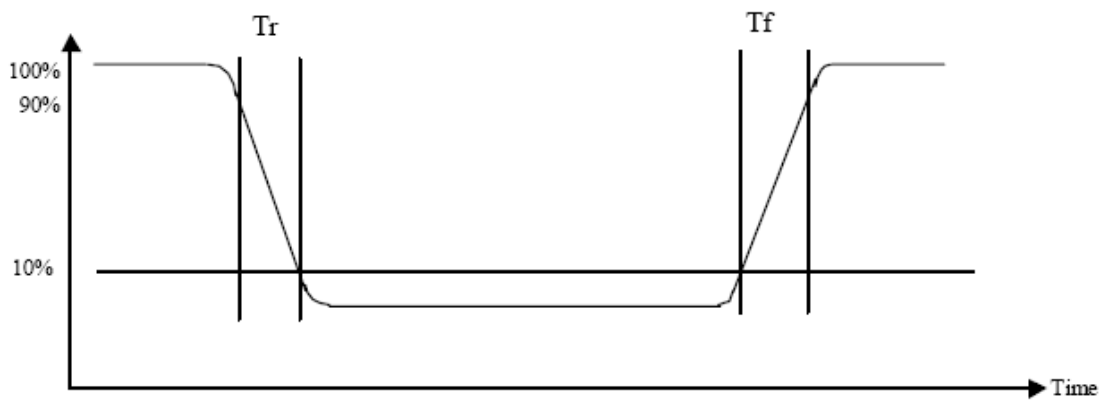
R10h: 0x0000 // IC standby off

R18h: 0x0028 // Frame Rate = 80 Hz  
 RF8h: 0x000F // VGH = +5V  
 RF9h: 0x000F // VGL = -5V  
 R05h: 0x0001 // display on

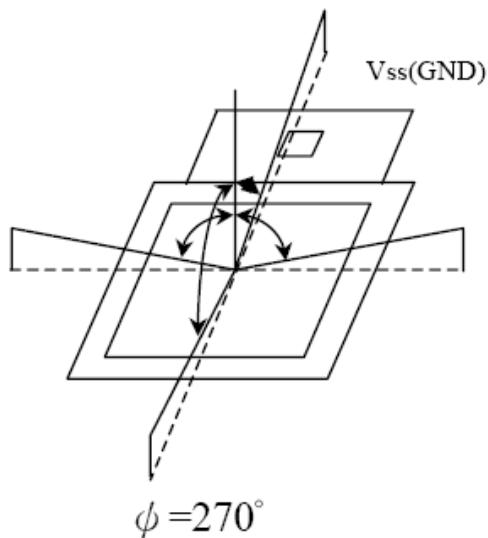
Gamma Register Setting:

R70h: 0x2580  
 R71h: 0x2780  
 R72h: 0x3380  
 R73h: 0x1D18  
 R74h: 0x1F11  
 R75h: 0x2419  
 R76h: 0x1A14  
 R77h: 0x211A  
 R78h: 0x2103

2. Response Time test condition :



3. Viewing angle test condition :



Viewing Angle = CR>10

4. Contrast :

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

5. Optical tester : CA210

6. Brightness of 30% power consumption. Operating Life Time is defined when the luminance has decayed to less than 50% of the initial measured luminance before life test.

## 5. ELECTRICAL CHARACTERISTICS

### 5.1 DC Characteristics

(Ta = -40°C ~ 85°C , VSS = 0V)

Item	Symbol	Condition	Min	Typ	Max	Unit	Note
Driving Voltage	VGH	--	3.0	--	8.0	V	
	VGL	--	-8.0	--	-3.0	V	
	VINT	--	-4.0	--	-1.0	V	
Logic Operating Voltage	RVDD	--	1.45	1.5	1.55	V	
Operating frequency	fosc	Frame frequency = 60Hz Display line = 320 line	1161.1	1290.2	1419.3	kHz	
1st booster input voltage	VCI1	-	2.1	--	2.75	V	
1st booster output voltage	VLOUT1	Without load	+4.6	--	+5.5	V	
1st booster output efficiency	VLOUT1	I_VLOUT1_LOAD = 2.3mA	90	95	--	%	
2nd booster output voltage	VLOUT2	Without load	--	7.8	--	V	
2nd booster output efficiency	VLOUT2	I_VLOUT2_LOAD = 0.1mA	90	93	--	%	

Item	Symbol	Condition	Min	Typ	Max	Unit	Note
3rd booster output voltage	VLOUT3	Without load	--	-10.6	--	V	
3rd booster output efficiency	VLOUT3	I_VLOUT3_LOAD = 0.1mA	90	93	--	%	
Source Output voltage deviation (channel to channel)	--	--	--	±5	--	mV	
Source Output voltage difference (nearest channel)	--	20 Gray Pattern	--	5	--	mV	
Output voltage deviation (Chip to Chip)	--	--	--	±15	--	mV	
Source driver output voltage range	Vso	--	0.3	--	4.2	V	
Driving voltage	dVGH	Voltage deviation	--	--	300	mV	
	dVGL	Voltage deviation	--	--	300	mV	
Current consumption during normal operation	IVDD3	No load, Ta = 25°C	--	1.0	5.0	uA	(1)
	IVCI		--	3.5	4.0	mA	
Stand by mode current	IVDD3	Ta = 25°C	--	0.1	5.0	uA	
	IVCI		--	10	20	uA	

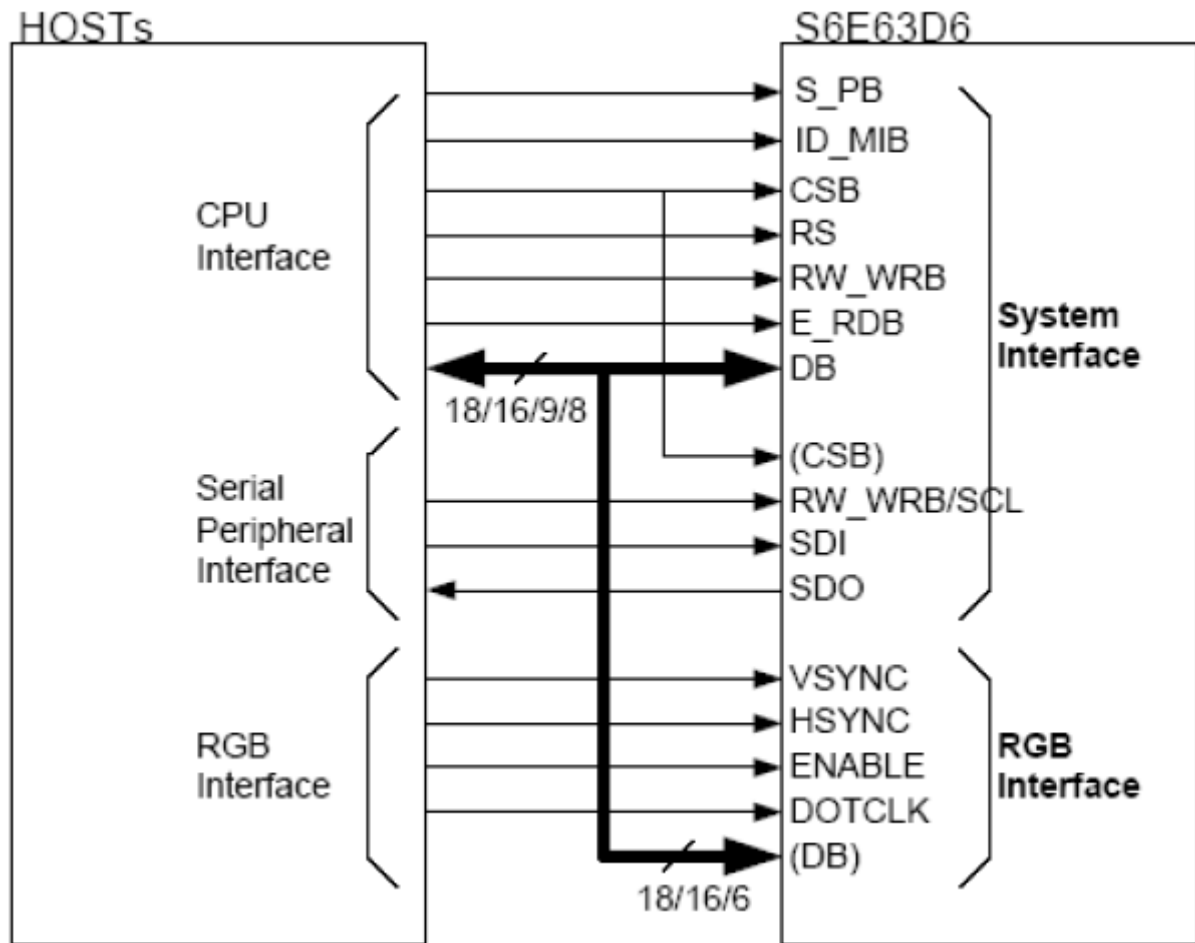
Note 1 : VDD3=1.8V, VCI=2.8V, fosc=1290.2KHz(320 display line), NL[5:0]="10\_1000",  
SAP[2:0]="101", DC22[2:0]="100", DC12[2:0]="010", BT[1:0]="10",  
VC[3:0]="1000", VGH[4:0]="10100", VGL[4:0]="10100", VINT[3:0]="0101"

Item	Symbol	Condition	Min	Typ	Max	Unit	Note
Power Supply Voltage	VCI	Operating Voltage	2.5	2.8	3.3	V	
Power Supply Voltage	VDD3	I/O supply Voltage	1.65	1.8	3.3	V	
Logic High level input voltage	VIH	--	0.7* VDD3	--	VDD3	V	
Logic Low level input voltage	VIL	--	0	--	0.3* VDD3	V	
Logic High level output voltage	VOH	IOUT = -1mA	0.8* VDD3	--	VDD3	V	
Logic Low level output voltage	VOL	IOUT = +1mA	0	--	0.2* VDD3	V	
Analog High level output voltage	EL_ONoH	8uA	1.8	--	VCI	V	
Analog Low level output voltage	EL_ONoL	8uA	0	--	0.3	V	

(VDD3 = 1.665~3.3V, VCI = 2.5~3.3V, Ta = 25°C)

Item	Symbol	Condition	Min	Typ	Max	Unit	Note
VREG1OUT			4.185	4.2	4.215	V	

## 6. System DIAGRAM



## 7. INTERFACE PIN ASSIGNMENT

Pin No	Symbol	I/O	Function
1	AR_VDD	I	Positive voltage for OLED(+4.6V)
2	AR_VSS	I	Negative voltage for OLED(-4.4V)
3	VCI	I	Power supply for analog circuit(2.5V~3.3V)
4	VCI1	O	A reference voltage for 1 <sup>st</sup> booster(connect a 1u/10V capacitance to GND)
5	GND	I	Ground
6	C12M	I	External capacitance connect pin between C12M and C12P (1u/10V)
7	C12P	I	
8	C11M	I	External capacitance connect pin between C11M and C11P (1u/10V)
9	C11P	I	
10	VLOUT1	O	1 <sup>st</sup> booster output pin. (1u/10V)
11	C31P	I	External capacitance connect pin between C31M and C31P (1u/10V)
12	C31M	I	
13	C32P	I	External capacitance connect pin between C32M and C32P (1u/10V)
14	C32M	I	
15	VLOUT3	O	3 <sup>rd</sup> booster output pin. (1u/16V)
16	VLOUT2	O	2 <sup>nd</sup> booster output pin. (1u/16V)
17	C21P	I	External capacitance connect pin between C21M and C21P (1u/10V)
18	C21M	I	
19	VGS	I	A reference level for the grayscale voltage generation circuit. (connect to GND)
20	IOVCC	I	I/O power supply
21	SPB	I	Select the CPU interface mode. (0=intel 80x-system 1=Motorola 68x-system)
22	ID_MIB	I	Select the CPU type (0=intel 80x-system 1=Motorola 68x-system)
23	DB17		BI-directional data bus. When CPU I/F, 18-bit interface : DB 17-0 16-bit interface : DB 17-10, DB 8-1 9-bit interface : DB 8-0 8-bit interface : DB 8-1
24	DB16		
25	DB15		
26	DB14		
27	DB13		
28	DB12		

29	DB11		When RGB I/F 18-bit interface : DB 17-0 16-bit interface : DB 17-10, DB8-1 6-bit interface : DB 8-3  Fix unused pin to the VSS level			
30	DB10					
31	DB9					
32	DB8					
33	DB7					
34	DB6					
35	DB5					
36	DB4					
37	DB3					
38	DB2					
39	DB1					
40	DB0					
41	VSYNC	I	Frame-synchronizing signal. (VSPL=0 Low active, VSPL=1 High active) Fix this pin at VSS level if the pin is not used.			
42	HSYNC	I	Line-synchronizing signal. (HSPL=0 Low active, HSPL=1 High active) Fix this pin at VSS level if the pin is not used.			
43	DOTCLK	I	Input pin for clock signal of external interface : dot clock. DPL=0 Display data is fetched at DOTCLK's rising edge DPL=1 Display data is fetched at DOTCLK's falling edge Fix this pin at VSS level if the pin is not used.			
44	ENABLE	I	Data enable signal pin for RBG interface			
			EPL	ENABLE	GRAM write	GRAM address
			0	0	Valid	Updated
			0	1	Invalid	Held
			1	0	Invalid	Held
1	1	Valid	Updated			
45	SDI	I	For a serial peripheral interface(SPI), input data is fetched at the rising edge for the SCL signal, Fix SDI pin at VSS level if the pin is not used.			
46	SDO	I	For serial peripheral interface(SPI), serves as the serial data output pin(SDO), Successive bits are output at the falling edge of the SCL signal.			
47	CSB	I	Chip select signal input pin. 0= driver IC is selected and can be accessed. 1= driver IC is not selected and cannot be accessed.			
48	RW_WRB	I	Pin function	CPU type	Pin description	
			RW	68-system	Read / Write operation selection pin 0 = write    1 = read	

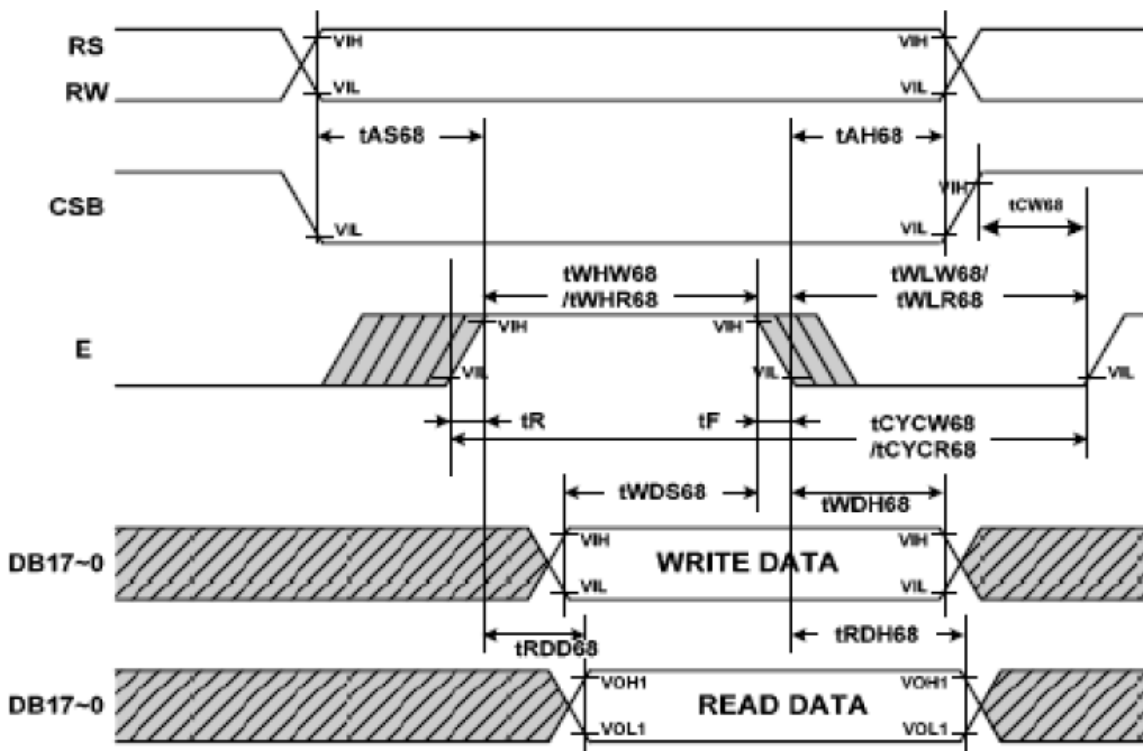
			WRB	80-system	Write strobe signal.(Input pin) Data is fetched at the rising edge.
			SCL	SPI	The synchronous clock signal
49	RS	I	Register select pin. 0= Index / status, 1= instruction parameter, GRAM data Must be fixed at VDD3 level when not used.		
50	E_RDB	I	Pin Function	CPU type	Pin description
			E	68-system	Read / Write operation enable pin
			RDB	80-system	Read strobe signal. Read out data at the low level
			When SPI mode is selected, fix this pin at VDD3 level		
51	RESETB	I	Reset pin initializes the IC when low. Should be reset after power-on.		
52	MVDD	O	Internal power for RAM. Connect a capacitance(1u/10V) to GND.		
53	VREG1OUT	O	A reference level for the grayscale voltage. Connect a capacitance(1u/10V) to GND.		
54	VCI	I	Power supply for analog circuit (2.5V ~3.3V)		
55	VGH	O	The positive voltage used in the gate driver. Connect a capacitance (1u/10V) to GND.		
56	VGL	O	The negative voltage used in the gate driver. Connect a capacitance (1u/10V) to GND.		
57	GND		Ground		
58	X-		For touch screen		
59	Y-		For touch screen		
60	X+		For touch screen		
61	Y+		For touch screen		

## 8. INTERFACE TIMING

### 8.1. CPU interface M68

(VDD = 1.5V, VDD3 = 1.65 to 3.3V, Ta = -40 to +85°C)

Item		Symbol	Min	Max	Unit
Cycle time	Write	tCYCW68	85	--	ns
	Read	tCYCR68	500	--	ns
Pulse rise / fall time		tR, tF	--	15	ns
Pulse width low	Write	tWLW68	27.5	--	ns
	Read	tWLR68	250	--	ns
Pulse width high	Write	tWHW68	27.5	--	ns
	Read	tWHR68	250	--	ns
RS, RW to CSB, E setup time		tAS68	10	--	ns
RS, RW to CSB, E hold time		tAH68	2	--	ns
CSB to E time		tCW68	15	--	ns
Write data setup time		tWDS68	40	--	ns
Write data hold time		tWDH68	15	--	ns
Read data delay time		tRDD68	--	200	ns
Read data hold time		tRDH68	5	--	ns

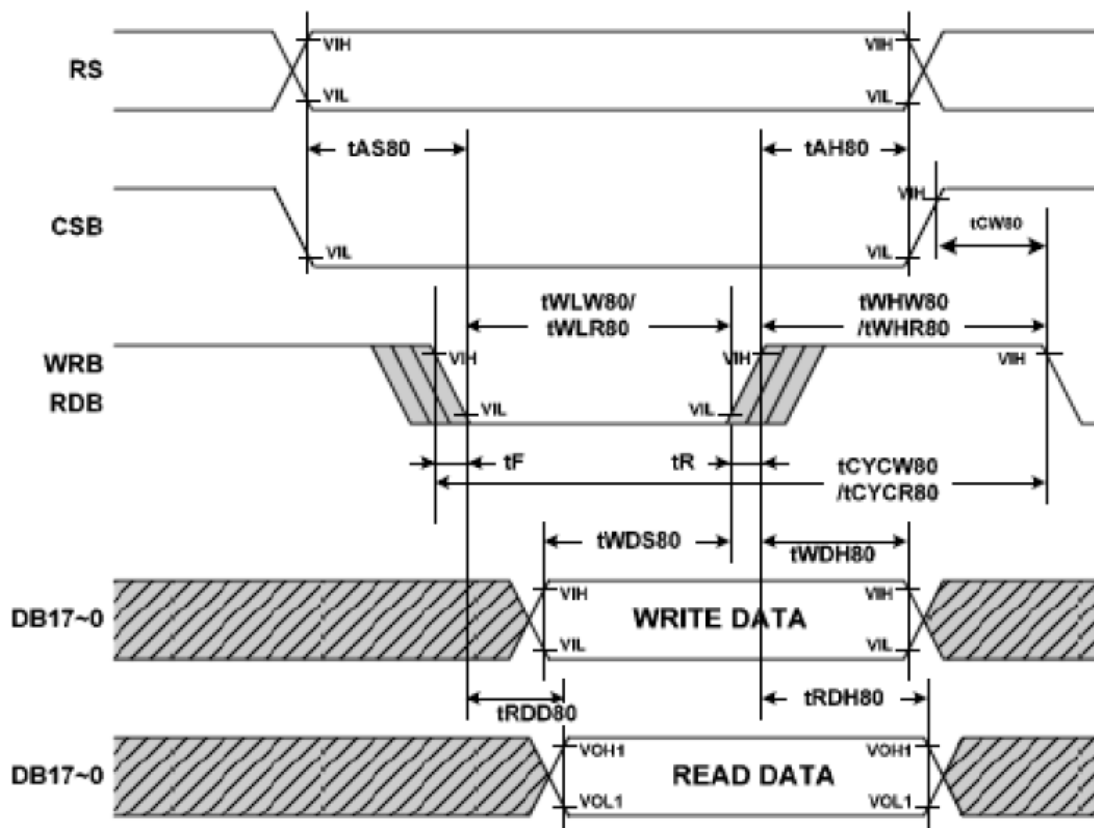


**Note :  $t_{WHW68}$  and  $t_{WHR68}$  are determined by the overlap period of low CSB and high E**

## 8.2. CPU interface M80

(VDD = 1.5V, VDD3 = 1.65 to 3.3V, Ta = -40 to +85°C)

Item	Symbol	Min	Max	Unit	
Cycle time	Write	tCYCW80	85	--	ns
	Read	tCYCR80	500	--	ns
Pulse rise / fall time	tR, tF	--	15	ns	
Pulse width low	Write	tWLW80	27.5	--	ns
	Read	tWLR80	250	--	ns
Pulse width high	Write	tWHW80	27.5	--	ns
	Read	tWHR80	250	--	ns
RS to CSB, WRB(RDB) setup time	tAS80	10	--	ns	
RS to CSB, WRB(RDB) hold time	tAH80	2	--	ns	
CSB to WRB(RDB) time	tCW80	15	--	ns	
Write data setup time	tWDS80	40	--	ns	
Write data hold time	tWDH80	15	--	ns	
Read data delay time	tRDD80	--	200	ns	
Read data hold time	tRDH80	5	--	ns	



**Note : tWLW80 and tWLR80 are determined by the overlap period of low CSB and low WRB or low CSB and low RDB**

Image Data format for 18bit CPU interface (262K color)

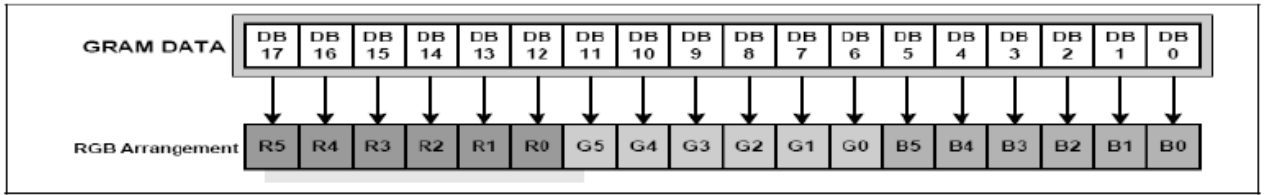


Image Data format for 16bit CPU interface (65K color)

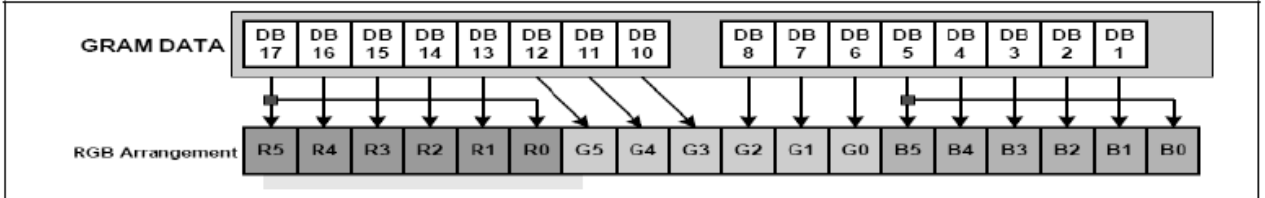


Image Data format for 9bit CPU interface (262K color)

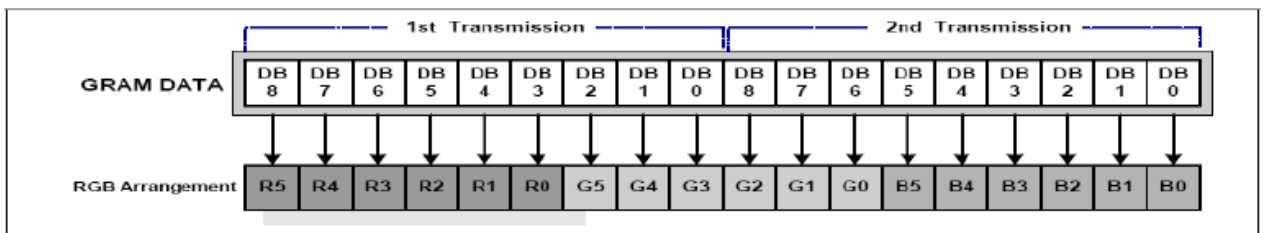
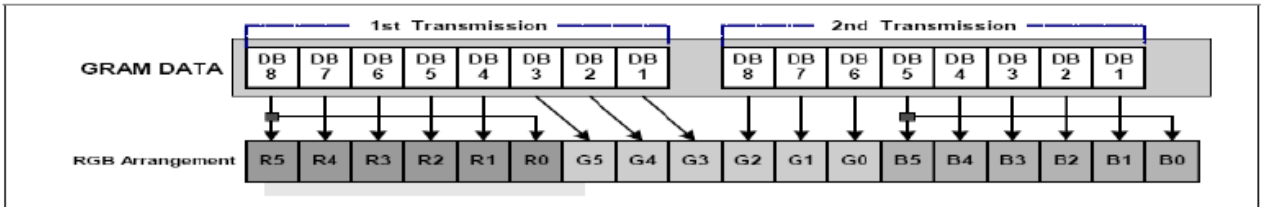


Image Data format for 8bit CPU interface (65K color)

Case 1:



Case 2:

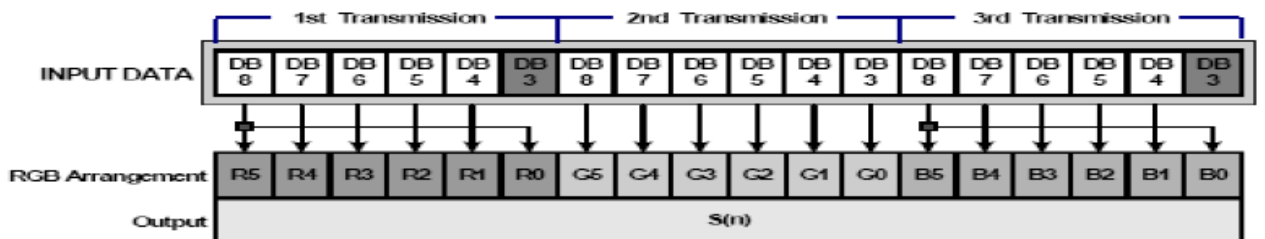
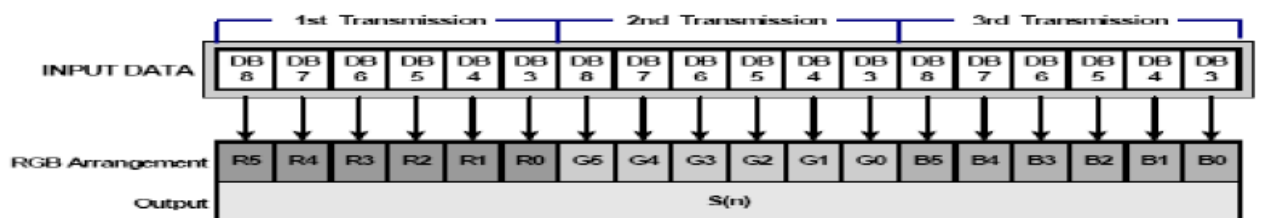


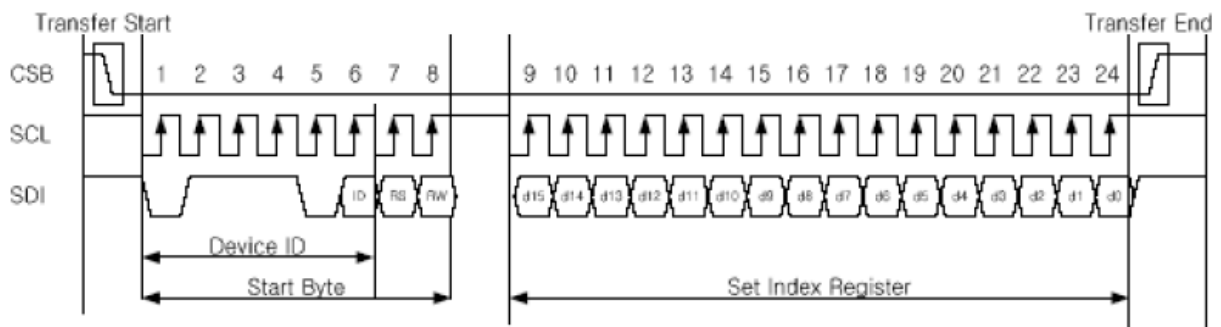
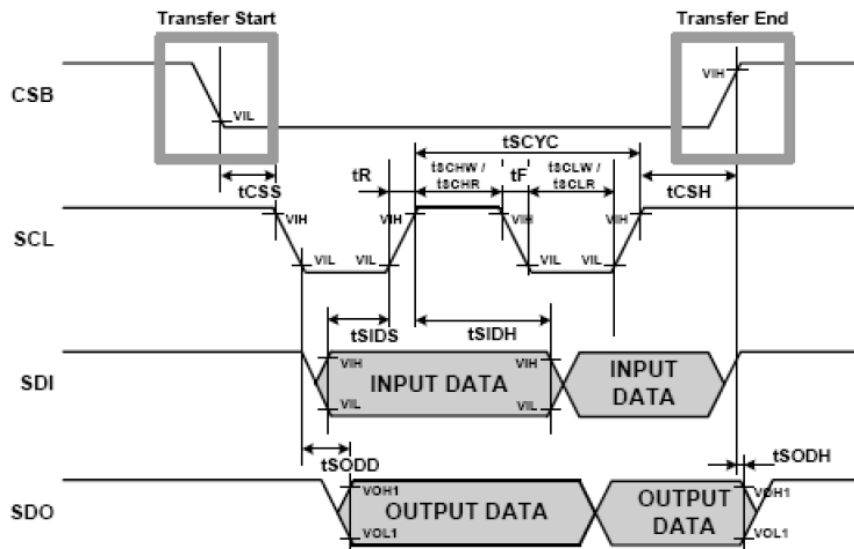
Image Data format for 8bit CPU interface (262K color)



### 8.3. SPI interface

(VDD = 1.5V, VDD3 = 1.65 to 3.3V, Ta = -40 to +85°C)

Item	Symbol	Min	Max	Unit
Serial clock write cycle time	tSCYC	130	--	ns
Serial clock read cycle time	tSCYC	250	--	ns
Serial clock rise / fall time	tR, tF	--	15	ns
Pulse width high for write	tSCHW	50	--	ns
Pulse width high to read	tSCHR	110	--	ns
Pulse width low for write	tSCLW	50	--	ns
Pulse width low for read	tSCLR	110	--	ns
Chip select setup time	tCSS	20	--	ns
Chip select hold time	tCSH	60	--	ns
Serial input data setup time	tSIDS	30	--	ns
Serial input data hold time	tSIDH	30	--	ns
Serial output data delay time	tSODD	--	130	ns
Serial output data hold time	tSODH	5	--	ns



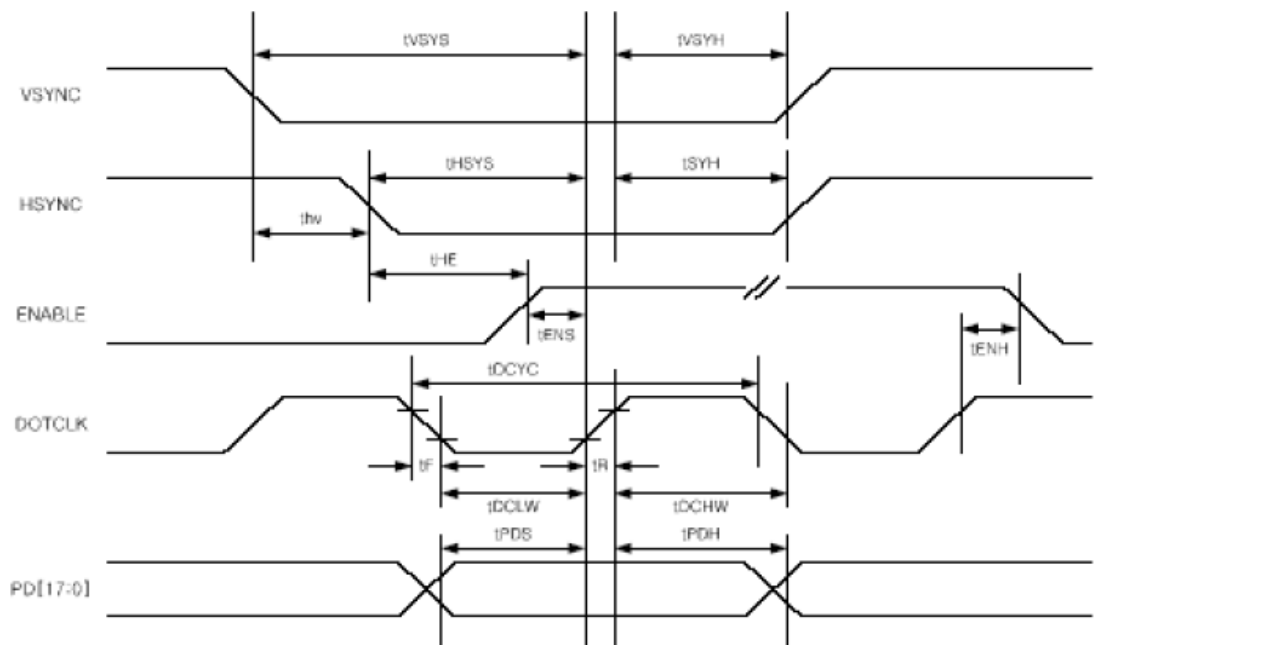
(Note) RS = " 0 " : Index data      RS = " 1 " : Instruction data

## 8.4. RGB interface

(VDD = 1.5V, VDD3 = 1.65 to 3.3V, Ta = -40 to +85°C)

Item	Symbol	Specification		Unit		Unit
		Min.	Max.	Min.	Max.	
DOTCLK cycle time	tDCYC	100	--	55	--	ns
DOTCLK rise / fall time	tR, tF	--	15	--	15	ns
DOTCLK pulse width high	tDCHW	40	--	25	--	ns
DOTCLK pulse width low	tDCLW	40	--	25	--	ns
Vertical sync setup time	tVSYs	30	--	30	--	ns
Vertical sync hold time	tVSYH	30	--	30	--	ns
Horizontal sync setup time	tHSYs	30	--	30	--	ns
Horizontal sync hold time	tHSYH	30	--	30	--	ns
ENABLE setup time	tENS	30	--	30	--	ns
ENABLE hold time	tENH	20	--	20	--	ns
PD data setup time	tPDS	30	--	30	--	ns
PD data hold time	tPDH	20	--	20	--	ns
HSYNC-ENABLE time	tHE	1	HBP	1	HBP	tDCYC
VSYSNC-HSYNC time	tHV	1	175	1	527	tDCYC

Note 1 : HBP is horizontal back-porch



(When VSPL=0, HSPL=0, DPL=0, EPL=1)

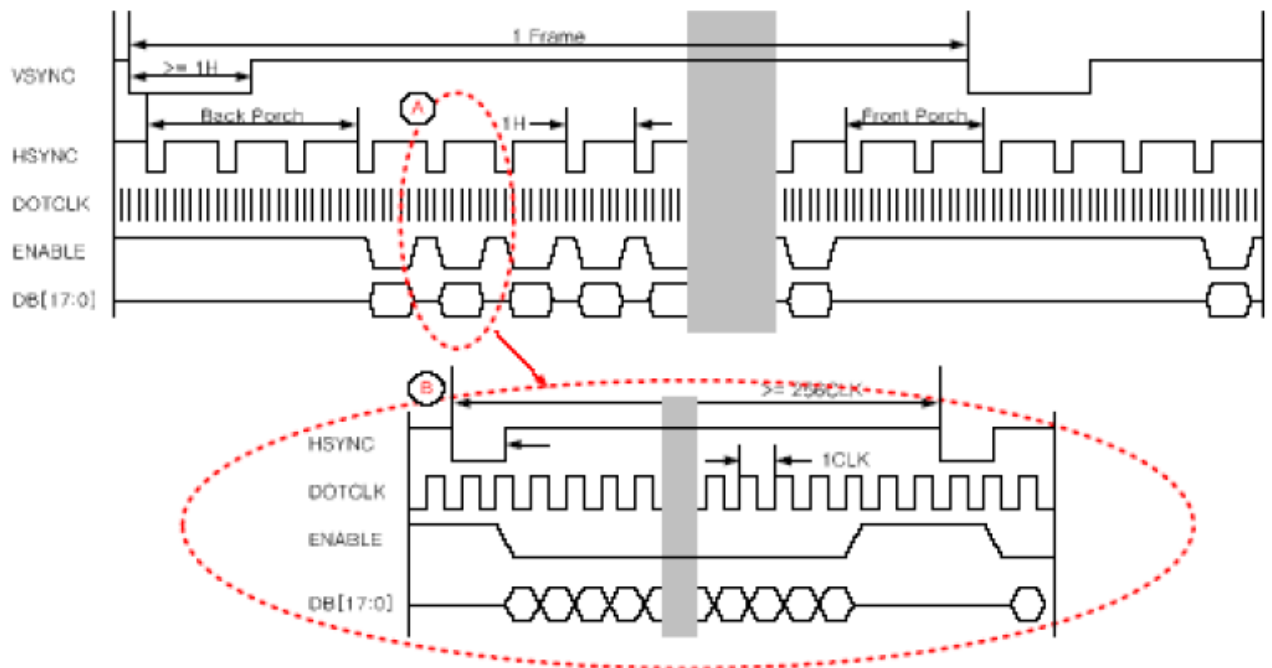


Image Data format for 18bit RGB interface (262K color)

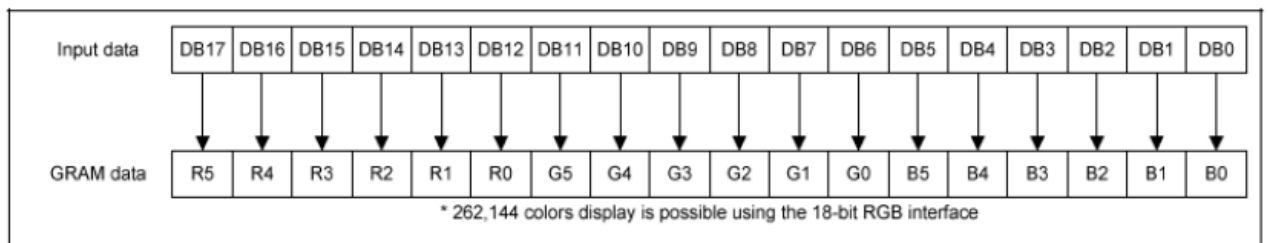


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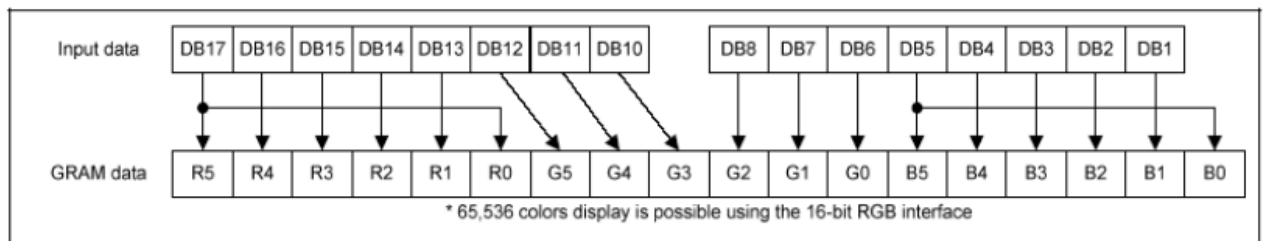
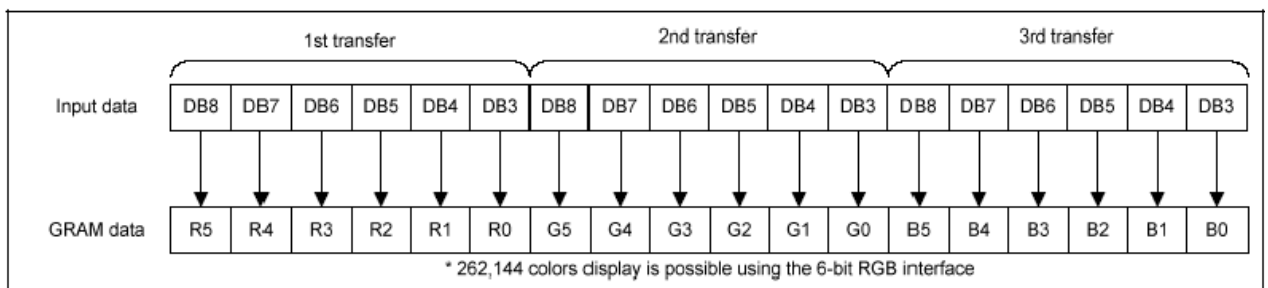


Image Data format for 6bit RGB interface (262K color)



## 9. DISPLAYED COLOR AND INPUT DATA

	Color & Gray Scale	DATA SIGNAL																	
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
Basic Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	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
Red	Black	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	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(31)	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Red(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	
Green	Black	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	1	0	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(31)	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
Green(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	
Blue	Black	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	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(31)	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
Blue(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	

## **10. QUALITY AND RELIABILITY**

### **10.1. Inspection provision**

MIL-STD-105E/inspection level II/normal inspection/single sample inspection  
AQL: Major 0.65; minor 1.0

### **10.2. The environmental condition of inspection**

The environmental condition and visual inspection shall be conducted as below.

- (1) Ambient temperature : 15~25°C
- (2) Humidity: 25~75 %RH
- (3) External appearance inspection shall be conducted by using a single 20W fluorescent lamp or equivalent illumination.
- (4) Panel visual inspection on the operation condition for cosmetic shall be conducted at the distance 30cm or more between the OLED module and eyes of inspector. And, the viewing angle shall be 90 degree to the front surface of display panel.  
Ambient Illumination: 400 ~ 500 Lux for external appearance inspection  
Ambient Illumination: 100 ~ 200 Lux for light on inspection

### **10.3. Classification of defects**

Defects are classified two types, major defect and minor defect according to the defect. And, the definition of defects is classified as below.









- (1) Major defect  
Any defect may result in functional failure, or reduce the usability of product for its purpose. For example, electrical failure, deformation and etc..
- (2) Minor defect  
A defect that is not to reduce the usability of product for its intended purpose and un-uniformity, dot defect and etc..  
The criteria on major and/or minor judgment will be according with the classification of defects.

## 10.4. Specification for quality check

### (1) Electrical/Outline characteristics

Level	Inspection item	Defect	Note
Major	Displaying	Non-displaying	
		Line defects	
		Power consumption	
		Malfunction	
	Panel	Glass cracked	
	FPC / COG	FPC dimension out of specification	
		Other function defects	
Outline dimension	Outline dimension out of specification		
Minor	Displaying	Dim spot 、 Bright spot 、 dust	
		Non-uniformity	
		Mura	
	Panel	Glass scratch	
		Glass cutting NG	
		Glass chip	
	Polarizer	Polarizer scratch	
		Stains on surface	
		Polarizer bubbles	
	FPC / COG	Damage	
		Foreign material	
	Metal Frame	Appearance	

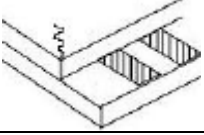
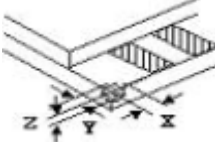

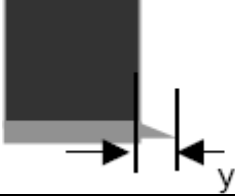
(2) Test Pattern

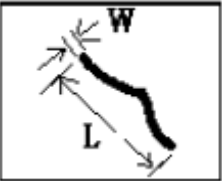

Item	Pattern
White	
Black	
Red	
Green	
Blue	
Border	
50% White	
Crosstalk	

(3) Definition of dot defect induced from the panel inside

- a) The definition of dot: The size of a defective dot over 1/2 of whole dot is regarded as one defective dot.
- b) Bright dot: Dots appear bright and unchanged in size in which module is displaying under black pattern.
- c) Dark dot: Dots appear dark and unchanged in size in which module is displaying under pure red, green, blue picture.

(4) External appearance defect

Item	Description	Criterion								
Panel	Glass scratch	0.05<W≤0.1mm, 0.3<L≤2.0mm , N≤2								
	Glass crack	Crack : Propagation crack is not acceptable 								
	Glass chip	Chip on corner	 <table border="1"> <tr> <td>X</td> <td>≤ 1.5 mm</td> </tr> <tr> <td>Y</td> <td>≤ 2.0 mm</td> </tr> <tr> <td>Z</td> <td>≤ t</td> </tr> </table> <p>1.) t = Glass thickness 2.) Chip on the corner extending into the ITO contact is not acceptable 3.) Chip on the corner is not acceptable when it extends into the seal or makes the exposure</p>		X	≤ 1.5 mm	Y	≤ 2.0 mm	Z	≤ t
		X	≤ 1.5 mm							
	Y	≤ 2.0 mm								
Z	≤ t									
	Lead & customer alignment mark can't be damaged.									
Glass burr		y ≤ 0.5mm								
Polarizer	Scratch	Line type in accordance with criteria of "Glass item"								
	Stains on surface	Stains which cannot be moved even when wiped lightly with a soft cloth or similar cleaning are not acceptable								
	Polarizer bubble	Size	Number of pieces permitted							
		φ ≤ 0.3mm	Ignore							
0.3mm < φ ≤ 0.5mm		1								
φ > 0.5mm	0									
Displaying	Power consumption	The module operating current consumption should not go beyond the standard indicated in product specification								
	Pixel size	The tolerance of display pixel dimension should be within ±25% of specification								
	Non-displaying	Not allowable								
	Line defect	Not allowable								

	Black line / White line / Particle / Scratch		$0.05 < W \leq 0.1 \text{ mm}, 0.3 < L \leq 2.0 \text{ mm}, N \leq 2$
	Color	Refer to the spec	
	Luminance	Refer to the spec	
	Dimming spot, Lighting spot, Dust		$0.1 \text{ mm} < D \leq 0.3 \text{ mm}, N \leq 2$ $D = (a+b)/2$
	Dot defect	Bright dot	$N \leq 0$
		Dark dot	$N \leq 4$
	Mura	Serious mura not allowable	
FPC / COG	Dimension out of spec.	FPC dimension out of spec	
	Damage	Crack on the FPC/COG deep scratch on the FPC/COG, deep fold on the FPC, deep pressure mark on the FPC/COG or other damage are not acceptable	
	Foreign material	Conductive foreign material sticking to the leads, foreign material and pin-hole between the FPC/COG and the glass are not acceptable.	
Metal Frame	Appearance	Any scratch or contamination outside the viewing can be ignored.	
Dimension	Dimension out of spec.	Refer to the drawing of the spec	

## 10.5. Reliability Test

Test Item	Test Conditions
High Temperature Storage	85°C, 240hrs
Low Temperature Storage	-40°C, 240hrs
High Temperature Operation	60°C, 240hrs
Low Temperature Operation	-40°C, 240hrs
High Temperature / Humidity Storage	85°C, 85%RH, 240hrs
High Temperature / Humidity Operation	60°C, 90%RH, 240hrs
Thermal Shock	-40°C~85°C (-40°C / 30min; transit/3min; 85°C /30min; transit /3min) 1 cycle : 66min, 100cycles
Vibration	Frequency : 5~50HZ, 0.5G Scan rate : 1 oct/min Time : 2 hrs/axis Test axis : X, Y, Z
Drop	Height : 76cm Sequence : 1 angle, 3 edges and 6 faces Cycles : 1
ESD	Air discharge model, ±8kV, 10 times

### Evaluation Criteria

- No damage to glass or encapsulation
- No drastic change to display
- Defects / Mura follow product specification
- Luminance : Within +/- 50% of initial value
- Current consumption : within +/- 50% of initial value

## 10.6. Other

AMIPRE will provide one year warrantee for all products and three months warrantee for all repairing products.

