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System solutions

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Custom Display

Production Custom designs Installation

Mechanical design



APPLICATION NOTE AGREEMENT SHEET

Company Name

MODEL

ET014WVC01-G

CUSTOMER

Title :

AGREED

Name :

☐ **CUSTOMER REMARK :**

YOURITECH
Prepared By:
Approved By:

RD 驗證者	RD 主管確認	測試驗證者	測試主管確認

Doc. version :	0.0
Total pages :	14
Date :	2019/12/04

Application Note

1.39" COLOR AMOLED MODULE

MODEL NAME: ET014WVC01-G

< ◆ > Preliminary Specification
< > Final Specification

Note: The content of this specification is subject to change.

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Record of Revision

Version	Revise Date	Page	Content
0.0	Dec. 04, 2019		New creation
0.1	Dec.16, 2019	4	Add 0xFE-0x07, 0x15-0x04, Modified step19

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A. Recommended Operating Sequence

1. Display Initial code

Recommended Power On Initial Sequence							
Step	Instruction/Parameters	Delay Time	R/W	MIPI Data Type	MIPI Address	Data	Description
<u>1</u>	<u>Turn on VBAT</u>						
<u>2</u>	<u>Turn on VDDI</u>						<u>VDDI = 1.8V</u>
<u>3</u>	<u>Delay</u>	<u>> 200us</u>					
<u>4</u>	<u>VCI EN Enable</u>	—	—	—	—	—	<u>High Active</u>
<u>5</u>	<u>REST pin low</u>	<u>> 10ms</u>					
<u>6</u>	<u>REST pin high</u>						
<u>7</u>	<u>Delay</u>	<u>> 10 ms</u>					
<u>8</u>			<u>W</u>	<u>0x15</u>	<u>0xFE</u>	<u>0x07</u>	
<u>9</u>			<u>W</u>	<u>0x15</u>	<u>0x15</u>	<u>0x04</u>	
			<u>W</u>	<u>0x15</u>	<u>0xFE</u>	<u>0x00</u>	
<u>10</u>			<u>W</u>	<u>0x29</u>	<u>0x2A</u>	<u>0x00</u>	<u>Note 1</u>
						<u>0x0A</u>	
						<u>0x01</u>	
						<u>0xCF</u>	
<u>11</u>			<u>W</u>	<u>0x29</u>	<u>0x2B</u>	<u>0x00</u>	
						<u>0x00</u>	
						<u>0x01</u>	
						<u>0xC5</u>	
<u>12</u>			<u>W</u>	<u>0x29</u>	<u>0x30</u>	<u>0x00</u>	
						<u>0x00</u>	
						<u>0x01</u>	
						<u>0xC5</u>	
<u>13</u> <u>14</u>			<u>W</u>	<u>0x29</u>	<u>0x31</u>	<u>0x00</u>	
						<u>0x0A</u>	
						<u>0x01</u>	
						<u>0xCF</u>	
<u>15</u>			<u>W</u>	<u>0x05</u>	<u>0x12</u>	<u>0x00</u>	
<u>16</u>			<u>W</u>	<u>0x15</u>	<u>0x35</u>	<u>0x00</u>	
<u>17</u>			<u>W</u>	<u>0x15</u>	<u>0x53</u>	<u>0x20</u>	
<u>18</u>			<u>W</u>	<u>0x15</u>	<u>0x63</u>	<u>0xE6</u>	
<u>19</u>			<u>W</u>	<u>0x15</u>	<u>0x51</u>	<u>0xFF</u>	
<u>20</u>	<u>Sleep Out (SLPOUT)</u>		<u>W</u>	<u>0x05</u>	<u>0x11</u>	<u>0x00</u>	
<u>21</u>	<u>Delay</u>	<u>> 120 ms</u>	—	—	—	—	
<u>22</u>	<u>Display On (DISPON)</u>	—	<u>W</u>	<u>0x05</u>	<u>0x29</u>	<u>0x00</u>	

Recommended Power Off Mode Sequence							
Step	Instruction/Parameters	Delay time	R/W	MIPI Data Type	MIPI Address	Data	Description
1	Display Off (DISPOFF)		W	0x05	0x28	0x00	
2	Sleep In (SLPIN)		W	0x05	0x10	0x00	
3	Delay	>120ms					
4	RESX pin low						
5	Delay	> 0 ms					
6	Pull Low VCI_EN						
7	Delay	>10 ms					
8	Turn off VDDIO						

- Note 1 : When resolution 454RGB x 454 : Please refer to 0x2A and 0x2B on Driver IC product specification document, or check Page 8 for exapleme.

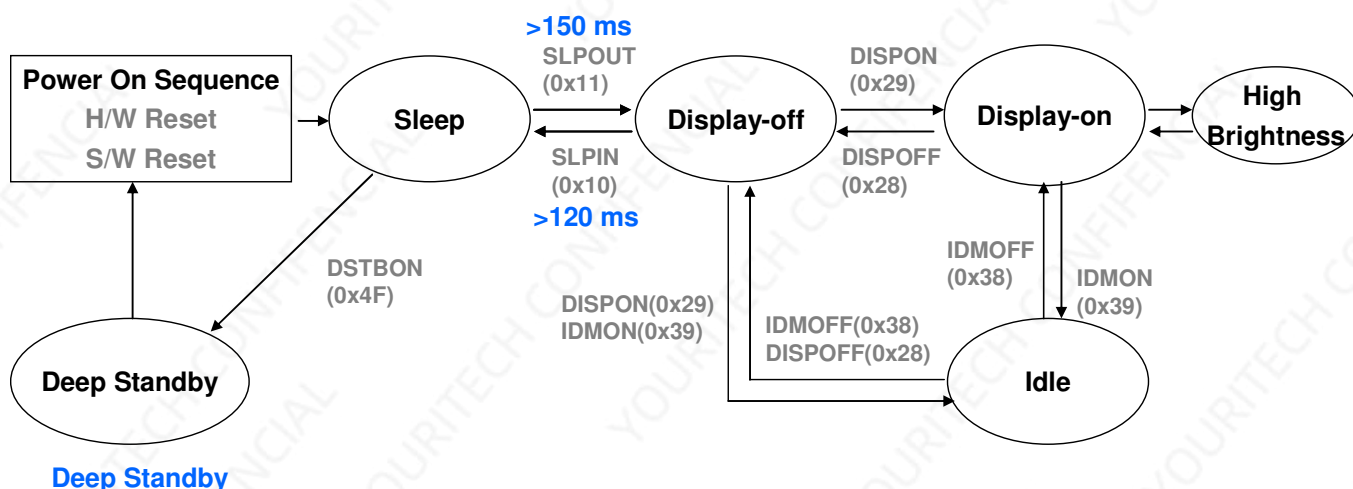
Read OLED Material Verification CMD as below

Step	Instruction/Parameters	Delay time	R/W	MIPI Data Type	MIPI Address	Data hex.	Description
1	Read CMD		W	0x15	FE	00	
			R	0x15	DC	XY	回讀參數 XY XY = 00 (New OLED) XY = 01 (Old OLED)

- Note 2 : New OLED Material and Old OLED Material was used different HBM CMD

B. Mode Function

1. Mode State Machine



For MIPI IF, if deep standby mode is used,
please pull HSSI_CLK_P/N & HSSI_D0~D1_P/N to GND after executing deep standby command

Note : After H/W Reset or S/W Reset command, it's must be re-start Power On Sequence flow again.

2. Enter/Exit Idle Mode Command

Recommended Power on Initial Sequence							
Step	Instruction/Parameters	Delay time	R/W	MIPI Data Type	MIPI Address	Data hex.	Description
1	Enter Idle mode		W	0x05	0x39	00	Idle mode 15Hz
2	Idle mode Off		W	0x05	0x38	00	Normal mode 45Hz

3. Brightness Control Command

Recommended Power on Initial Sequence							
Step	Instruction/Parameters	Delay time	R/W	MIPI Data Type	MIPI Address	Data hex.	Description
1	Brightness Control		W	0x15	0x51	Value	Value form 0~255(0xFF)

4. High Brightness Control

(1) Normal to High Brightness

Recommended Power on Initial Sequence							
Step	Instruction/Parameters	Delay time	R/W	MIPI Data Type	MIPI Address	Data hex.	Description
1	Enter HBM	—	W	0x15	0x66	02	

(2) High Brightness to Normal

Recommended Power on Initial Sequence							
Step	Instruction/Parameters	Delay time	R/W	MIPI Data Type	MIPI Address	Data hex.	Description
1	Exit HBM	—	W	0x15	0x66	00	

Note 1: High brightness mode (HBM) will cause higher risk of image sticking, brightness decay and CIE shift by wrong operation.

Note 2: For power saving and lift-time concern, we suggest:

- The HBM mode CANNOT be turned on over 15 seconds continuously.
- The HBM mode CANNOT be turned on over 15% in whole period when panel display for a long time.

Note 3: Only normal mode could turn on high brightness mode directly. It is forbidden to through by Idle, Sleep and Deep standby mode.

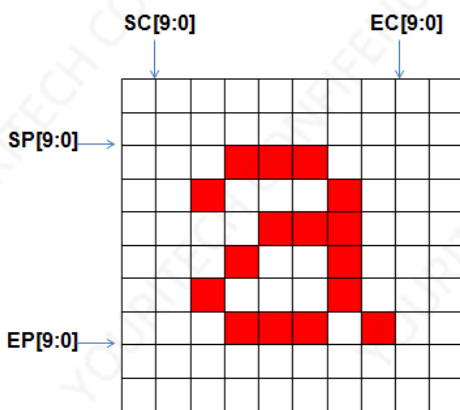
Note 4: Once High brightness mode is operated, vIrofTECe only guarantee brightness and White coordinate specification on Gray level 255.

5. Frame Memory Control Command

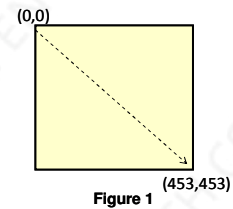
Frame Memory Control

Step	Instruction/Parameters	Delay time	R/W	MIPI Data Type	MIPI Address	Data	Description
1	Set Column Address		W	0x29	0x2A	0x00	SC[9:8]
						0x0A	SC[7:0]
						0x01	EC[9:8]
						0xCF	EC[7:0]
2	Set Row Address		W	0x29	0x2B	0x00	SP[9:8]
						0x00	SP[7:0]
						0x01	EP[9:8]
						0xC5	EP[7:0]

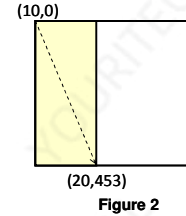
- **IMPORTANT:** Memory Address of column has to be offset (+10) .



When write (0,0) to (453,453) as Figure 1
 SC[9:0] = 0 + 10 = 10 (0x00A)
 EC[9:0] = 453 + 10 = 463 (0x1CF)
 SP[9:0] = 0
 EP[9:0] = 453 (0x1C5)



When write (10,0) to (20,453) as Figure 2
 SC[9:0] = 10 + 10 = 20 (0x014)
 EC[9:0] = 20 + 10 = 30 (0x01E)
 SP[9:0] = 0
 EP[9:0] = 453 (0x1C5)



6. Pixel Format

Pixel Format							
Step	Instruction/Parameters	Delay Time	R/W	MIPI Data Type	MIPI Address	Data	Description
1	Pixel Format		W	0x15	0x3A	0x77	0x71 : SPI 256 Gray 0x72 : SPI 3-3-2 0x73 : SPI 1-1-1 0x75 : 16 bits/pixel 0x76 : 18 bits/pixel 0x 77: 24 bits/pixel

6. —

7. SPI I/F Memory Write Enable

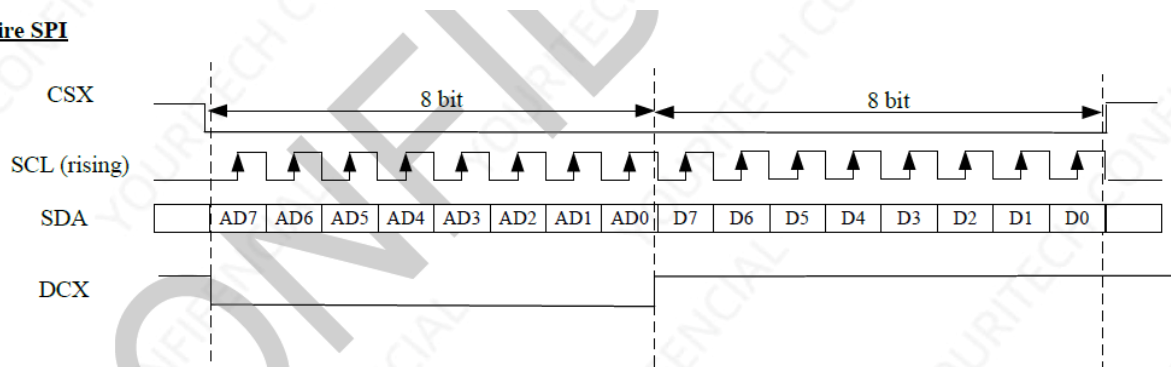
SPI protocol is set for data format 3-3-2 (R/G/B)

SPI Memory Write Enable I							
Step	Instruction/Parameters	Delay Time	R/W	MIPI Data Type	MIPI Address	Data	Description
1	Enter SPI I/F		W	0x15	0xFE	0x01	
			W	0x15	0x04	0x80	
			W	0x15	0xFE	0x00	
			W	0x15	0x3A	0x72	SPI Pixel Format
2	Exit SPI I/F		W	0x15	0xFE	0x01	
			W	0x15	0x04	0x00	
			W	0x15	0xFE	0x00	
			W	0x15	0x3A	0x77	MIPI Format

◆ SPI Instruction/Parameters

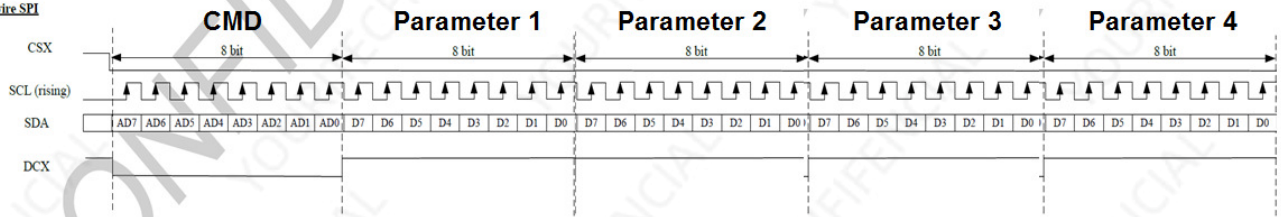
1. CMD/1parameter Timing Flow :

4-wire SPI



2. CMD/4 parameter Timing FLOW :

4-wire SPI

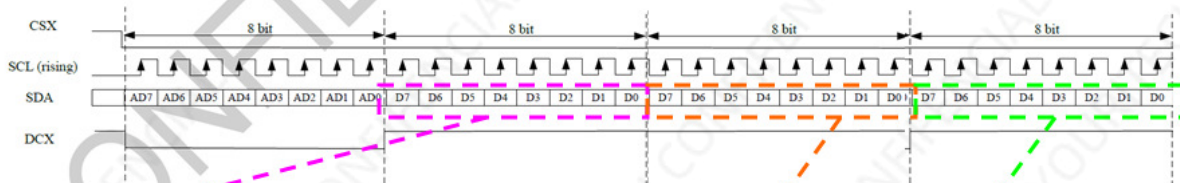


◆ SPI 3-3-2 Data Type Example

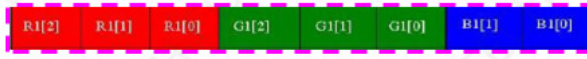
SPI 3-3-2

RGB 3-3-2 Bit	DCX	D[7]	D[6]	D[5]	D[4]	D[3]	D[2]	D[1]	D[0]	Note
CMDWR	0	0	0	0	0	0	0	0	0	0x2C for GRAM Write
1st RAM Data Write	1	R1[2]	R1[1]	R1[0]	G1[2]	G1[1]	G1[0]	B1[1]	B1[0]	1st pixel Data Write
2nd RAM Data Write	1	R2[2]	R2[1]	R2[0]	G2[2]	G2[1]	G2[0]	B2[1]	B2[0]	2nd pixel Data Write
3rd RAM Data Write	1	R3[2]	R3[1]	R3[0]	G3[2]	G3[1]	G3[0]	B3[1]	B3[0]	3rd pixel Data Write
So on...										

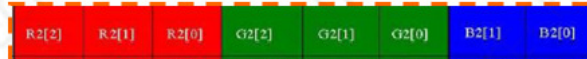
4-wire SPI



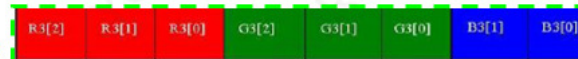
1st Ram Data write



2nd Ram Data write



3rd Ram Data write

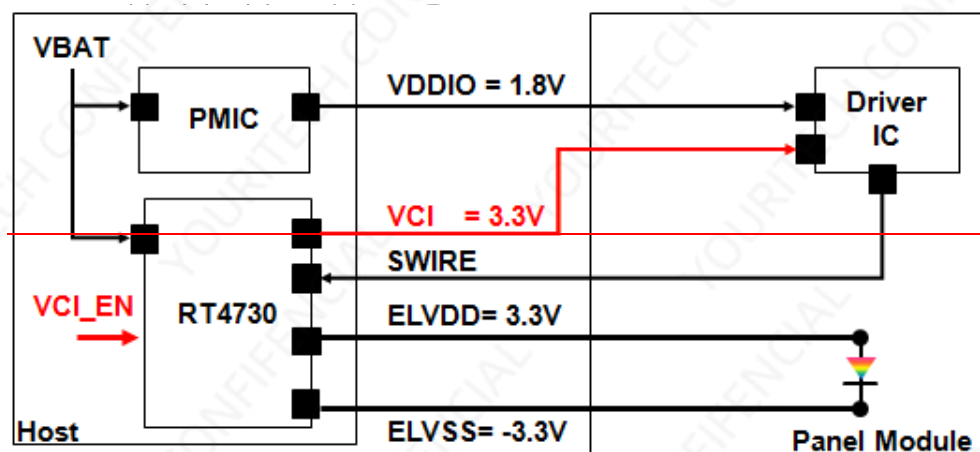
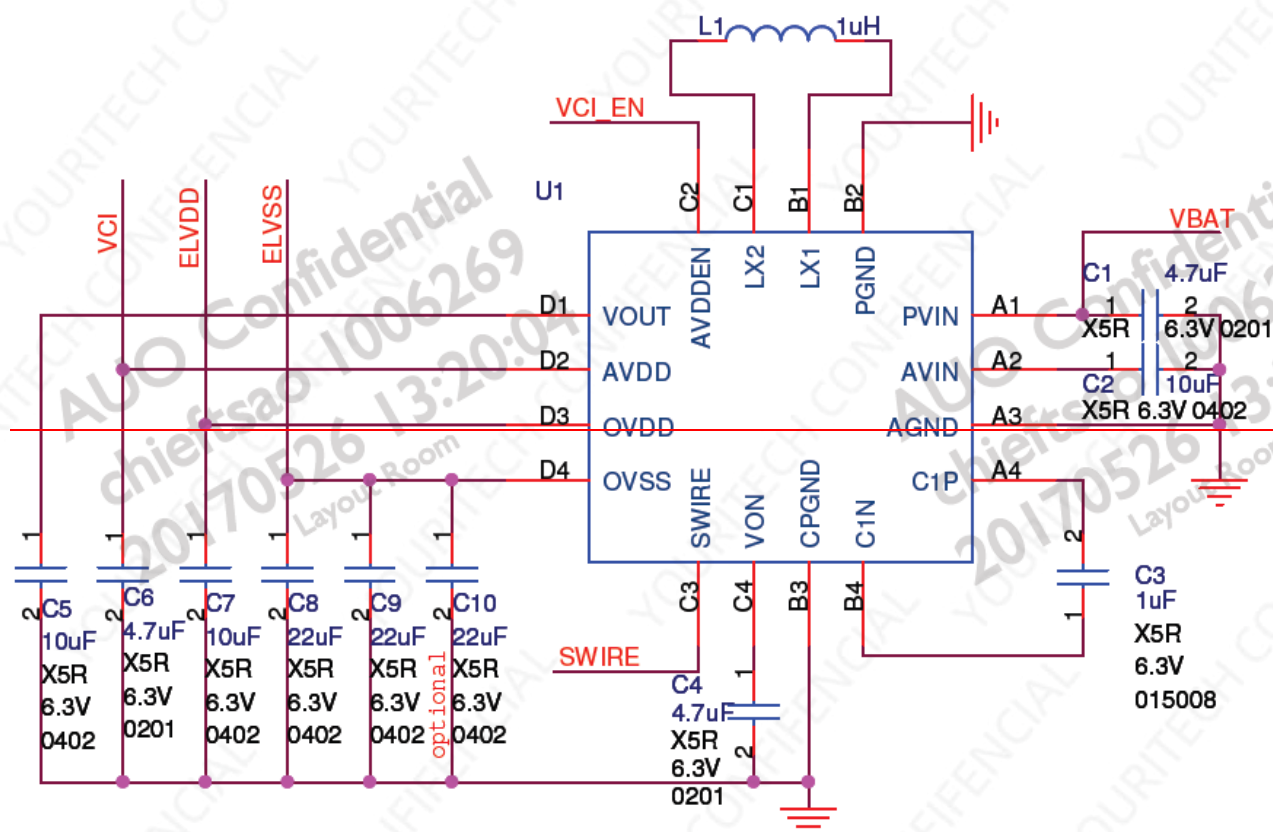


8. Enter/Exit Deep Idle Mode Command

Enter/ Exit Idle Mode							
Step	Instruction/Parameters	Delay time	R/W	MIPI Data Type	MIPI Address	Data	Description

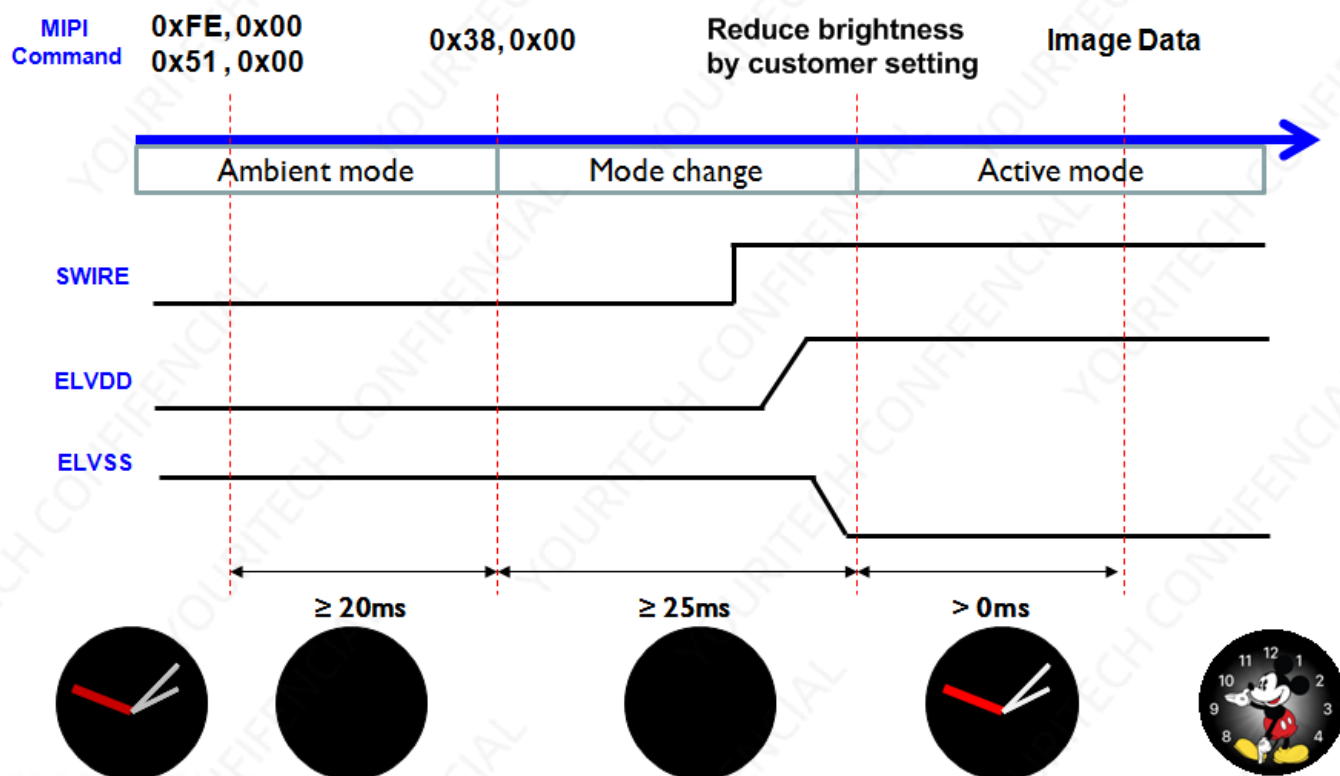
1	<u>Enter Deep Idle mode</u>	—	<u>W</u>	<u>0x05</u>	<u>0x39</u>	<u>0x00</u>	
			<u>W</u>	<u>0x15</u>	<u>0xFE</u>	<u>0x00</u>	
			<u>W</u>	<u>0x15</u>	<u>0x67</u>	<u>0x01</u>	
2	<u>Exit Deep Idle mode</u>	—	<u>W</u>	<u>0x15</u>	<u>0xFE</u>	<u>0x00</u>	
			<u>W</u>	<u>0x15</u>	<u>0x67</u>	<u>0x00</u>	
			<u>W</u>	<u>0x05</u>	<u>0x38</u>	<u>0x00</u>	

C. Application Circuit

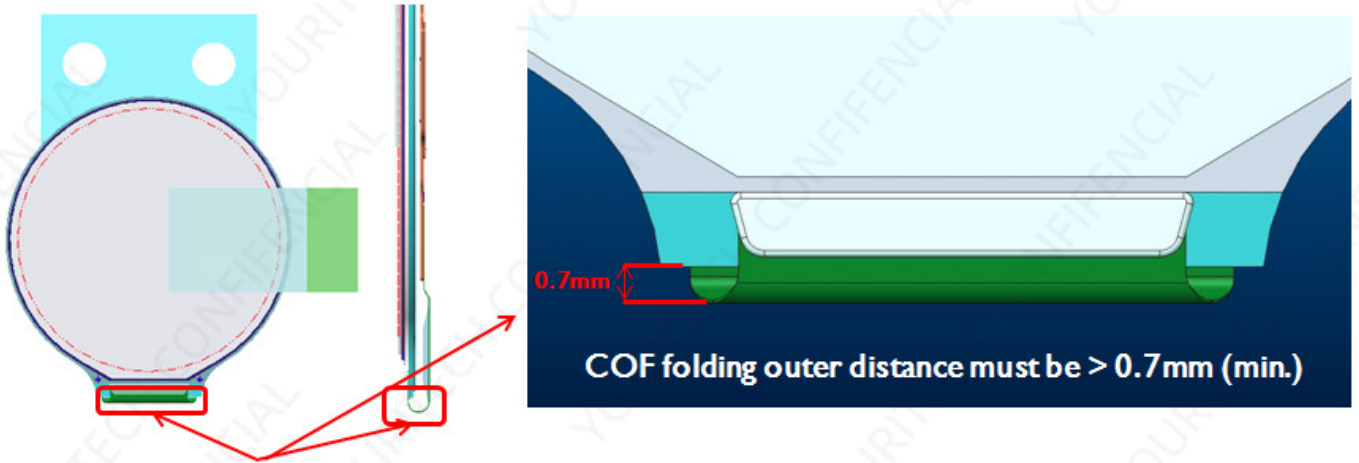


Mode change suggestions scheme

Recommended Mode change Sequence							
Step	Instruction/Parameters	Delay time	R/W	MIPI Data Type	MIPI Address	Data hex.	Description
1			W	0x15	FE	00	
2			W	0x15	51	00	
3	Delay	>20 ms					
4			W	0x15	38	00	
5	Delay	>25 ms					
6			W	0x15	FE	00	
7			W	0x15	51	1A	Depend on customer brightness setting
8	Delay	>0 ms					
9	Image Write						



D.C. FPC/COF Fold Suggestion



- 1.The minimum COF folding outer distance "A" (from glass edge to folding edge) must be larger than 0.7mm.
- 2.Do not fold COF by strong force in assembling process.
- 3.YOURITECH suggest using folding tooling in assembling process so that we can avoid a risk of COF broken/peeling