

MDT0350D1SSR-RGB	320 x 240	RGB Interface	TFT Module
(MCT035T6TW320240LML)		Specification	
Version: 7		Date: 22/01/2016	
Revision			
1	18/04/2013	First issue.	
2	08/07/2013	Modify the packing diagram.	
3	15/11/2013	Modify Version, Modify Optical Characteristics, Modify Package Specification.	
4	01/07/2014	Add size & Surface.	
5	15/12/2014	Modify Interface (YU,YD,XR) & Block Diagram & Static electricity test. Modify	
6	28/04/2015	Reliability.	
7	21/01/2016	Modify Static electricity test.	

Display Features				
Display Size		3.5"		
Resolution		320 x 240		
Orientation		Landscape		
Appearance		RGB		
Logic Voltage		3.3V		
Interface		RGB		
Brightness		300 cd/m ²		
Touchscreen		RTP		
Module Size		76.90 x 63.90 x 4.37mm		
Operating Temperature		-20°C ~ +70°C		
Pinout		54 way FFC		
Pitch		0.5mm	Box Quantity	Weight / Display

Display Accessories	
Part Number	Description
MCIB-6	54 way FFC to 34 way IDC TFT Interface Board compatible with VBWV8 controller board.

Optional Variants	
Appearances	Voltage

Summary

This technical specification applies to 3.5' colour TFT-LCD panel. The 3.5' colour TFT-LCD panel is designed for camcorder, digital camera application and other electronic products which require high-quality flat panel displays. This module follows RoHS.

General Specifications

- Size: 3.5 inch
- Dot Matrix: 320 x RGBx240(TFT) dots
- Module dimension: 76.9x 63.9x 4.36 mm
- Active area: 70.08 x 52.56 mm
- Dot pitch: 0.073 x 0.219 mm
- LCD type: TFT, Normally White, Transmissive
- View Direction: 12 o'clock
- Gray Scale Inversion Direction: 6 o'clock
- Backlight Type: LED, Normally White
- With /Without TP: With RTP
- Surface: Anti-Glare

*Color tone slightly changed by temperature and driving voltage.



Interface

1. LCM PIN Definition

Pin	Symbol	Function	Remark
1	LED-	Power for LED backlight cathode	
2	LED-	Power for LED backlight cathode	
3	LED+	Power for LED backlight anode	
4	LED+	Power for LED backlight anode	
5	YU	Top electrode	
6	XL	Left electrode	
7	NC	No, connect	
8	/RESET	Hardware reset	
9	SPENA	Chip select pin of the serial interface	
10	SPCLK	Clock pin of the serial interface	
11	SPDAT	Data input pin in serial mode	
12	B0	Data bus	
13	B1	Data bus	
14	B2	Data bus	
15	B3	Data bus	
16	B4	Data bus	
17	B5	Data bus	
18	B6	Data bus	
19	B7	Data bus	
20	G0	Data bus	
21	G1	Data bus	
22	G2	Data bus	
23	G3	Data bus	
24	G4	Data bus	
25	G5	Data bus	
26	G6	Data bus	
27	G7	Data bus	
28	R0	Data bus	
29	R1	Data bus	
30	R2	Data bus	
31	R3	Data bus	
32	R4	Data bus	
33	R5	Data bus	
34	R6	Data bus	
35	R7	Data bus	
36	HSYNC	Line synchronization signal	
37	VSNC	Frame synchronization signal	
38	DCLK	Dot-clock signal and oscillator source	
39	NC	No, connect	
40	NC	No, connect	
41	VCC	Power Supply	
42	VCC	Power Supply	
43	YD	Bottom electrode	
44	XR	Right electrode	



45	NC	No, connect	
46	NC	No, connect	
47	NC	No, connect	
48	SEL2	Input pin to select input interface mode	
49	SEL1	Input pin to select input interface mode	
50	SEL0	Input pin to select input interface mode	
51	NC	No, connect	
52	DE	Display enable pin from the controller. Internal pull high Connect to VCCIO or floating if not used	
53	DGND	System ground pin of the IC. Connect to system ground.	
54	AVSS	Grounding for analogue circuit Connect to system ground	

Note:

1. The mode control (SEL2) not use, it can't control CCIR601 interface, If not use CCIR601, it can float.
2. For digital RGB input data format, both SYNC mode and DE+SYNC mode are supported. If the DE signal is fixed low, SYNC mode is used. Otherwise, DE+SYNC mode is used. Suggest used SYNC mode!!
3. Usually, pull high.
4. IF select serial RGB or CCIR601/656 input mode is selected, only DX0-DX7 used, and the other short to GND, Only selected serial RGB/CCIR601/656 interface, DX BUS will enable, Digital input mode DX0 is LSB and DX7 is MSB.
5. Control the input data format

SEL2	SEL1	SEL0	Format	Operating Frequency
0	0	0	Parallel-RGB data format (only support stripe type color filter)	6.5MHZ
0	0	1	Serial-RGB data format	19.5 MHZ
0	1	0	CCIR 656data format (640RGB)	24.54 MHZ
0	1	1	CCIR 656data format (720RGB)	27 MHZ
1	0	0	YUV mode A data format(Cr-Y-Cb-Y)	24.54 MHZ
1	0	1	YUV mode A data format(Cr-Y-Cb-Y)	27 MHZ
1	1	0	YUV mode B data format(Cr-Y-Cr-Y)	27 MHZ
1	1	1	YUV mode B data format(Cr-Y-Cr-Y)	24.54 MHZ

Input format	DOTCLK Ferg(MHz)	Display Data	Active Area (DOTCLK)
YUV mode	24.54	640	1280
	27	720	1440

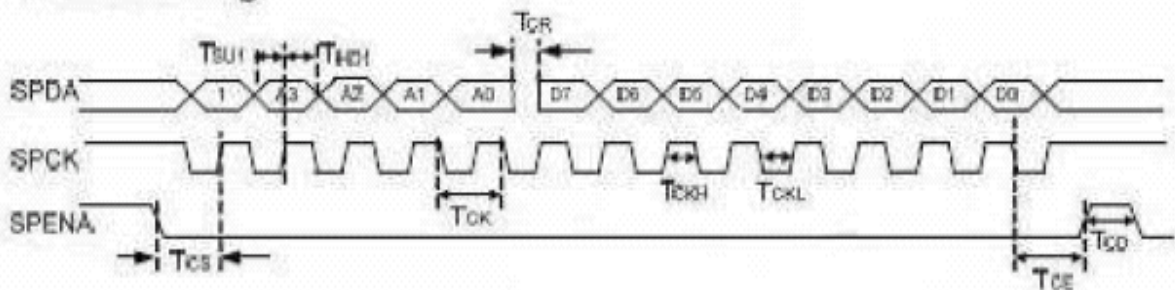


Mode	D[23:16]	D[15:8]	D[7:0]	IHS	IVS	DEN
ITU-R BT 656	D[23:16]	GND	GND	NC	NC	NC
ITU-R BT 601	D[23:16]	GND	GND	IHS	IVS	NC
8 bit RGB	D[23:16]	GND	GND	IHS	IVS	NC for HV Mode
						DEN for DEN Mode
24 bit RGB	R[7:0]	G[7:0]	B[7:0]	IHS	IVS	NC for HV Mode
						DEN for DEN Mode

2. SPI Timing Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit
SPCK period	Tcx	60	-	-	ns
SPCK high width	Tcxh	30	-	-	ns
SPCK low width	Tcxl	30	-	-	ns
Data setup time	Tsu1	12	-	-	ns
Data hold time	Thd1	12	-	-	ns
SPENA to SPCK setup time	Tcs	20	-	-	ns
SPENA to SPDA hold time	Tce	20	-	-	ns
SPENA high pulse width	Tcd	50	-	-	ns
SPDA output latency	Tcs	-	1/2	-	Tcx

● SPI read timing



● SPI write timing

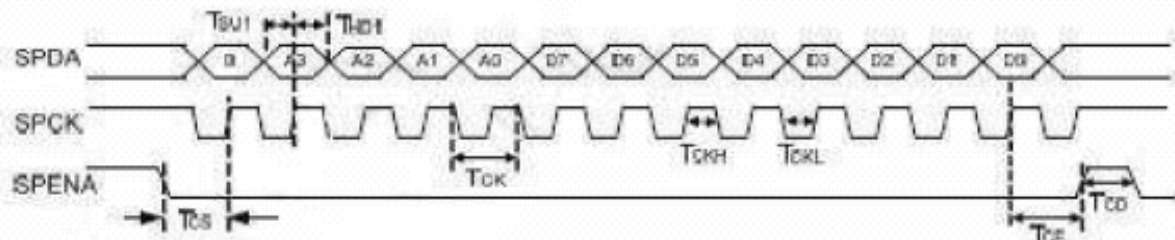


Figure11 SPI read and write timing

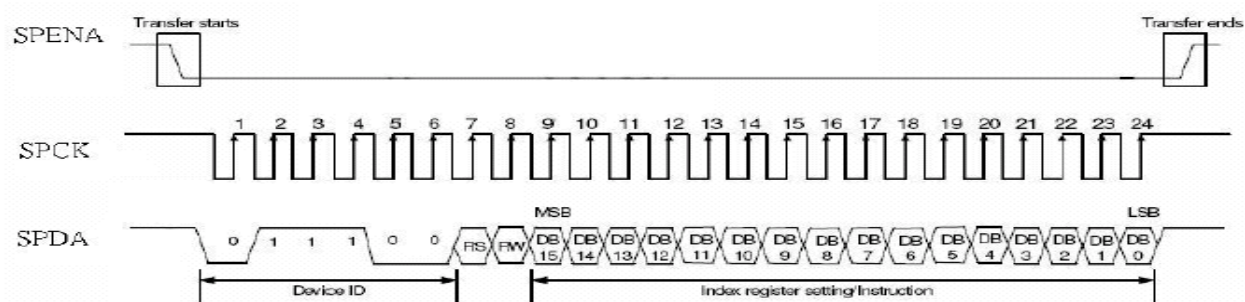


Figure12 SPI timing

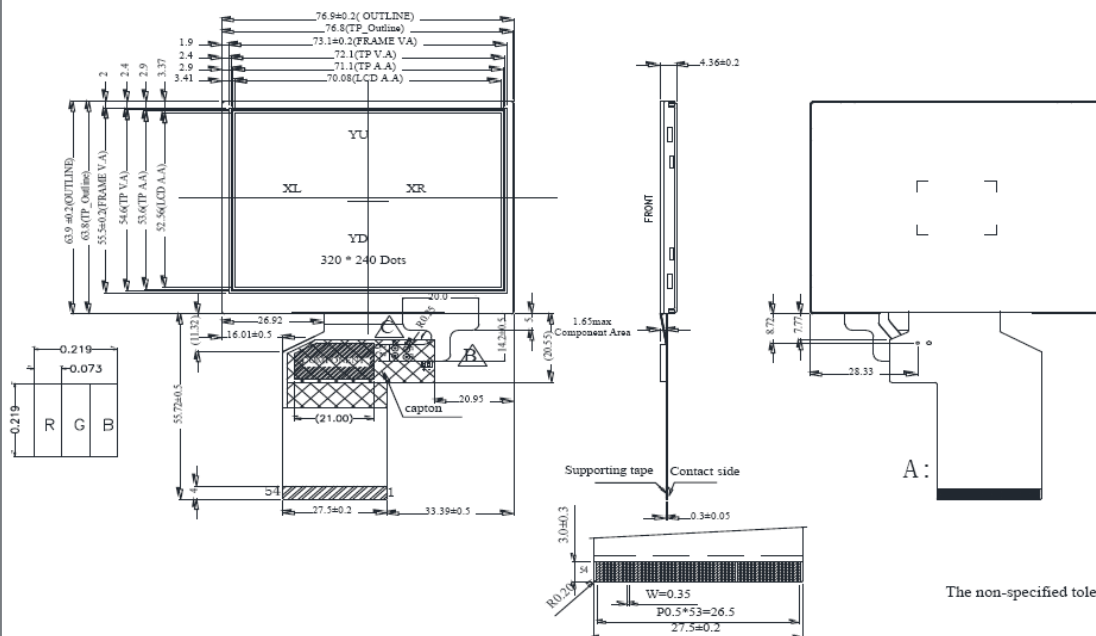
3. Basic Display Color and Gray Scale

Color		Input Color Data																							
		Red								Green								Blue							
		MSB						LSB		MSB						LSB		MSB							LSB
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	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(255)	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(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(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
	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	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
	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
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	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
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255) Bright	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	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	1	0	0	0	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(253)	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	Green(254)	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green(255) Bright	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Blue	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	1	0
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	1
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0
	Blue(255) Bright	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1



Contour Drawing

PIN NO.	SYMBOL	PIN NO.	SYMBOL
1	LED-	28	R0
2	LED-	29	R1
3	LED+	30	R2
4	LED+	31	R3
5	YU	32	R4
6	XL	33	R5
7	NC	34	R6
8	RESET	35	R7
9	SPENA	36	HSYNC
10	SPCLK	37	VSYNC
11	SPDAT	38	DCLK
12	B0	39	NC
13	B1	40	NC
14	B2	41	VCC
15	B3	42	VCC
16	B4	43	YD
17	B5	44	XR
18	B6	45	NC
19	B7	46	NC
20	G0	47	NC
21	G1	48	SEL2
22	G2	49	SEL1
23	G3	50	SEL0
24	G4	51	NC
25	G5	52	DE
26	G6	53	DGND
27	G7	54	AVSS

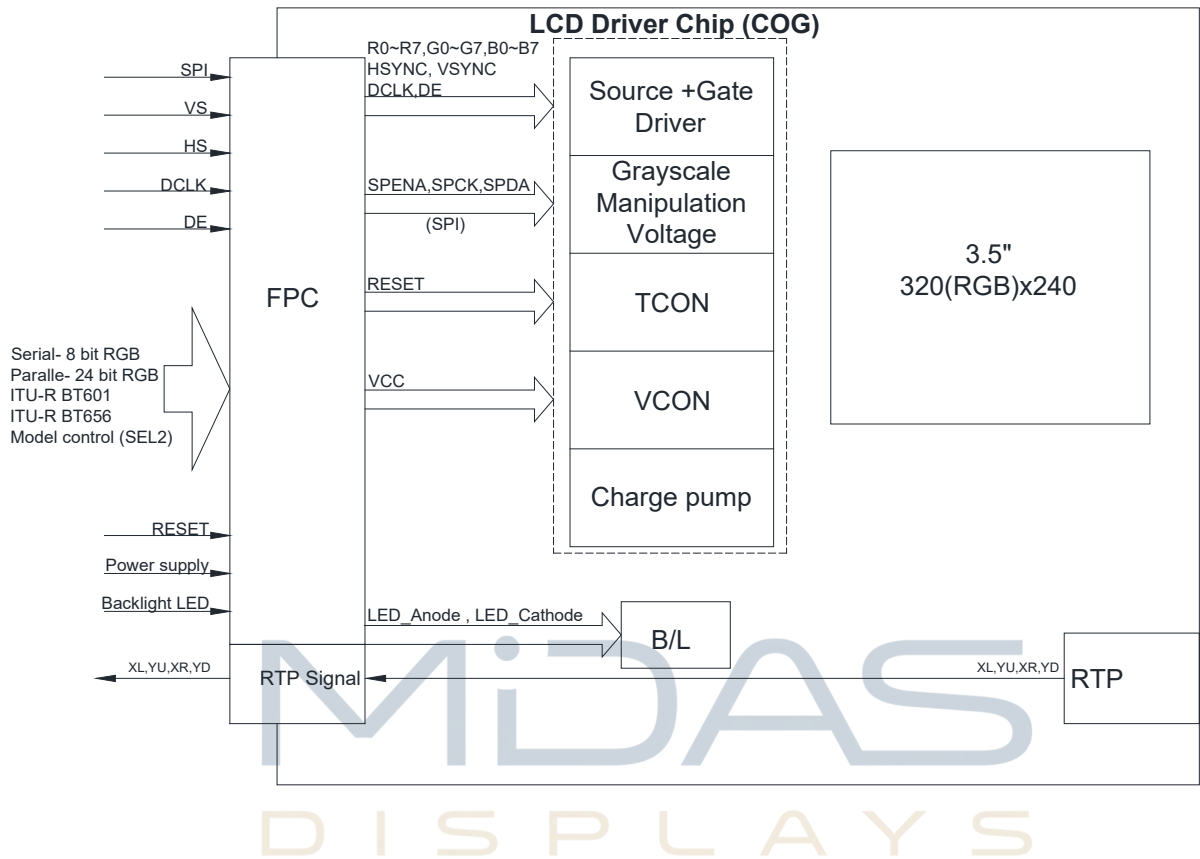


The non-specified tolerance of dimension is $\pm 0.3\text{mm}$.

DISPLAYS

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Block Diagram

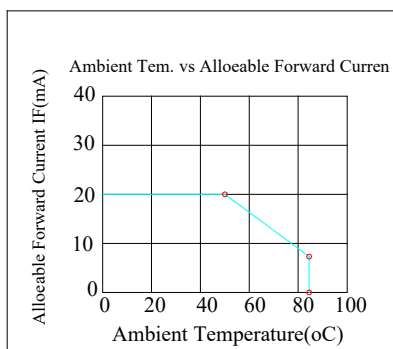


Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	TOP	-20	—	+70	°C
Storage Temperature	TST	-30	—	+80	°C

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

- 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



Electrical Characteristics

1. Operating conditions:

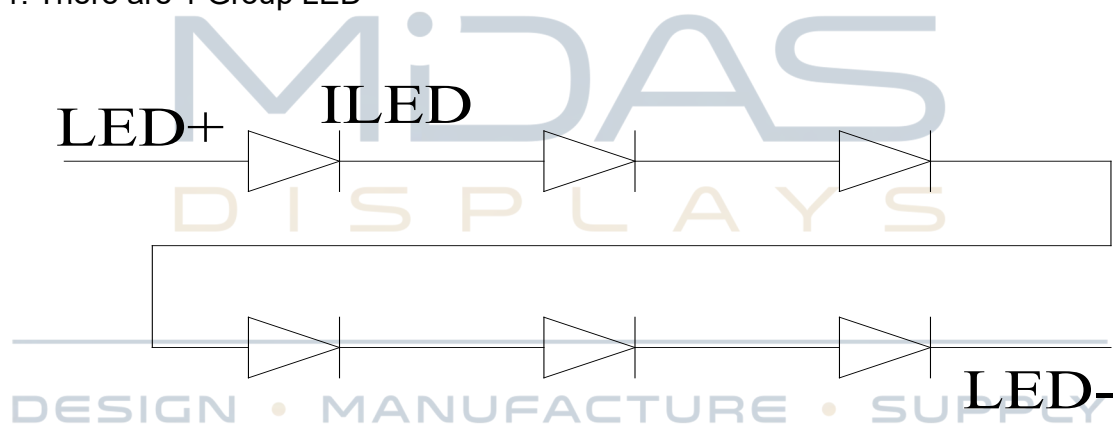
Item	Symbol	Condition	Min	Typ	Max	Unit	Remark
Supply Voltage For LCM	VCC	—	3.0	3.3	3.6	V	
Supply Current For LCM	ICC	—	—	8.6	15	mA	Note 1

Note 1: This value is tested for VCC =3.3V, Ta=25 °C only

2. LED driving conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED current		-	20	-	mA	
Power Consumption		348	384	408	mW	
LED voltage	LED+	17.4	19.2	20.4	V	Note 1
LED Life Time		-	50,000	-	Hr	Note 2,3,4

Note 1: There are 1 Group LED



Note 2 : Ta = 25 °C

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

Note 4: The single LED lamp case

DC CHARACTERISTICS

Parameter	Symbol	Rating			Unit	Condition
		Min	Typ	Max		
Low level input voltage	V _{IL}	0	-	0.3VCC	V	
High level input voltage	V _{IH}	0.7VCC	-	VCC	V	



AC Characteristics

Digital Parallel RGB interface

Signal	Item	Symbol	Min	Typ	Max	Unit
Dclk	Frequency	Tosc	-	6.5	10	MHz
	High Time	Tch	-	77	-	ns
	Low Time	Tcl	-	77	-	ns
Data	Setup Time	Tsu	12	-	-	ns
	Hold Time	Thd	12	-	-	ns
Hsync	Period	TH	-	408	-	Tosc
	Pulse Width	THS	5	30	-	Tosc
	Back-Porch	Thb	-	38	-	Tosc
	Display Period	TEP	-	320	-	Tosc
	Hsync-den time	THE	36	68	88	-
	Front-Porch	Thf	-	20	-	Tosc
Vsync	Period	Tv	-	262	-	TH
	Pulse Width	Tvs	1	3	5	TH
	Back-Porch	Tvb	-	15	-	TH
	Display Period	Tvd	-	240	-	TH
	Front-Porch	Tvf	2	4	-	TH

Note:

1. The $T_{HE} + T_{AB} = 68$, the user is made up by yourself.
2. $T_v = T_{VS} + T_{VB} + T_{VD} + T_{VF}$, the user is make up by yourself.
3. When SYNC mode is used, 1st data start from 68th Dclk after Hsync falling

CCIR601/656 Interface

Signal	Item	Symbol	Min	Typ	Max	Unit
Dclk	Frequency	Tosc	-	37	-	ns
	High Time	Tch	-	78	-	ns
	Low Time	Tcl	-	78	-	ns
Data	Setup Time	Tsu	12	-	-	ns
	Hold Time	Thd	12	-	-	ns



1. Waveform

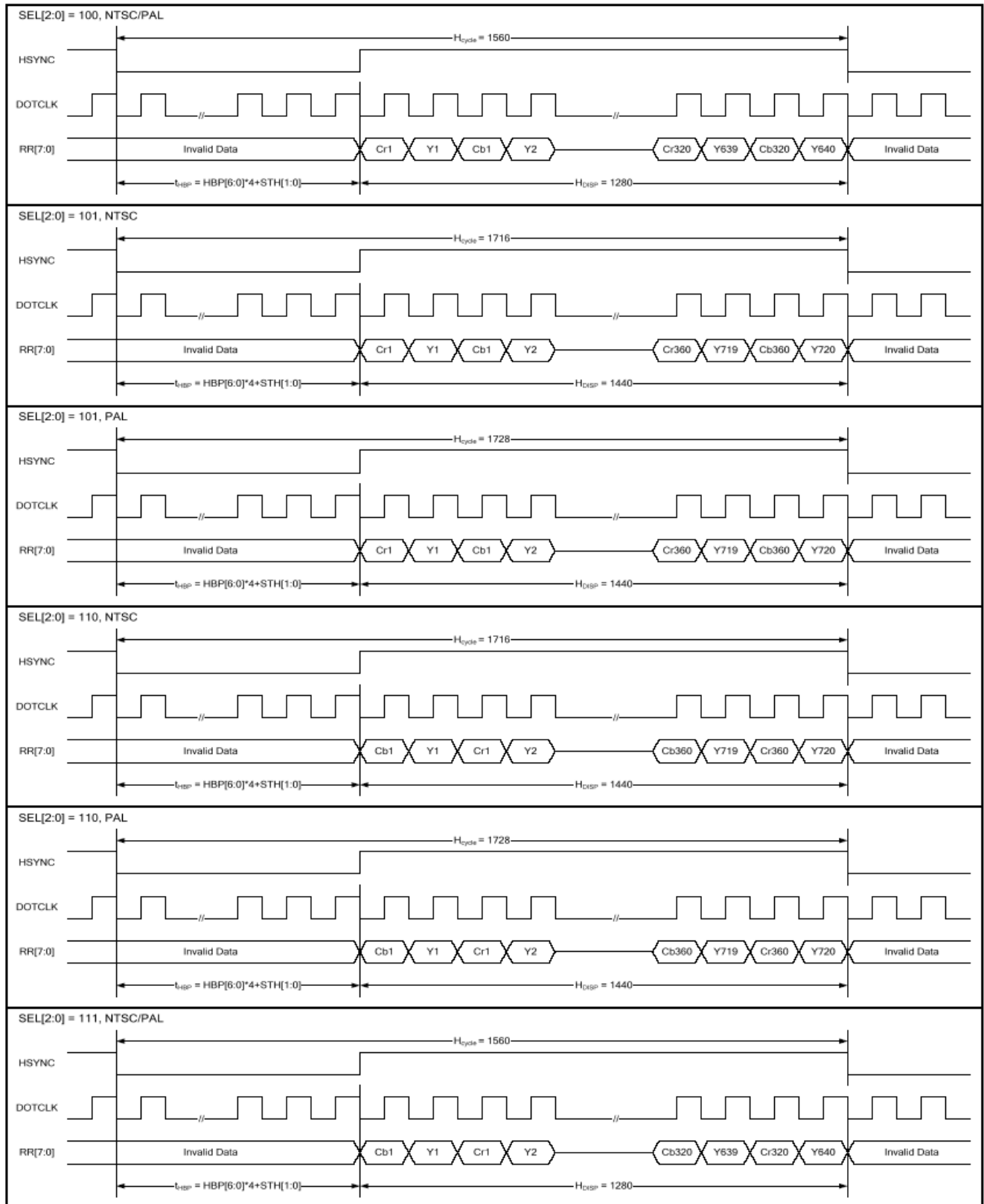


Figure 1 CCIR601 Horizontal Timing

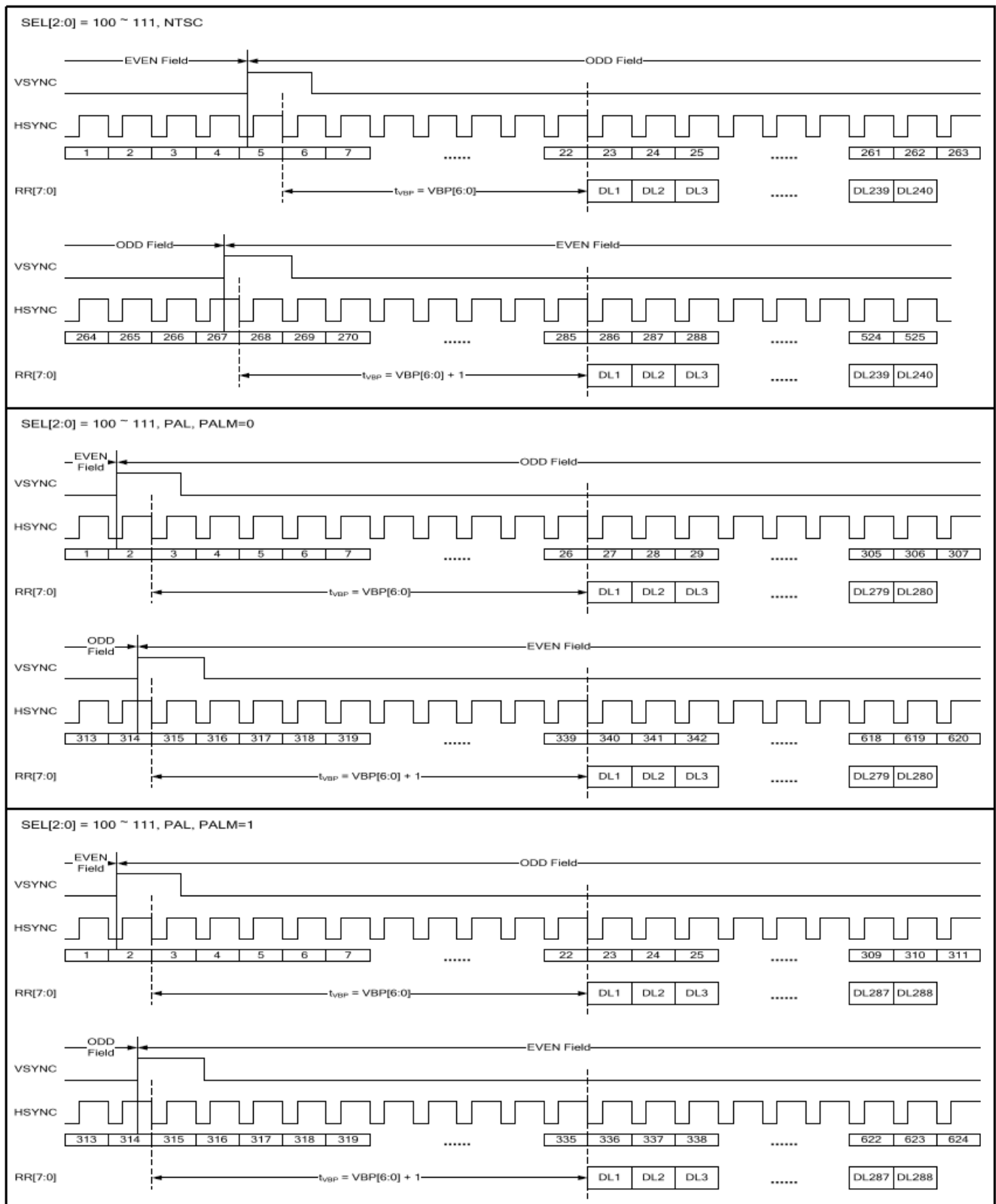


Figure 1 CCIR601 Vertical Timing

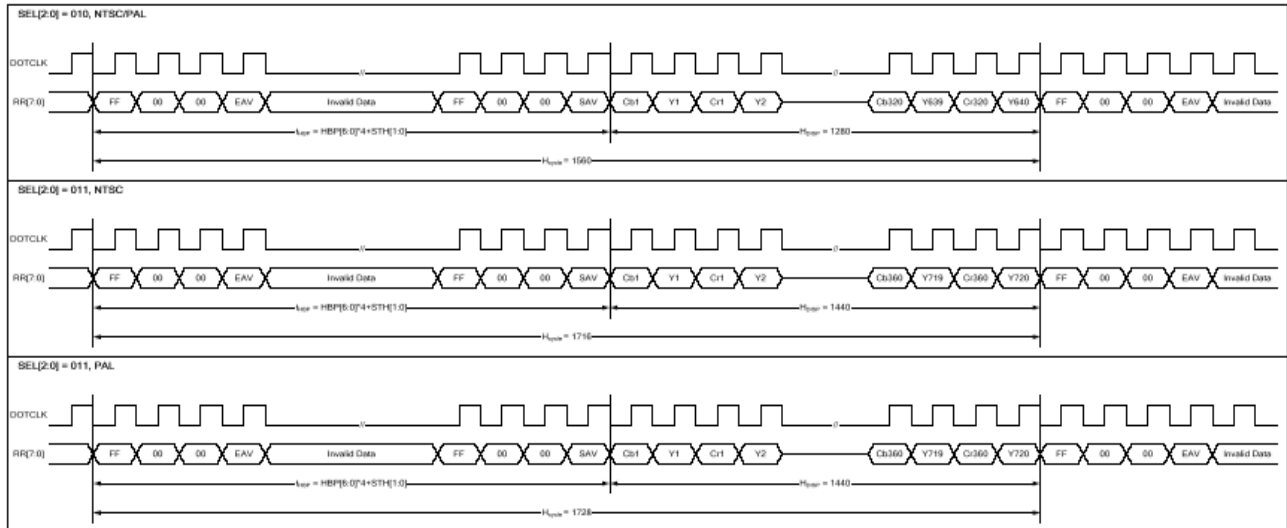


Figure 2 CCIR656 Horizontal Timing

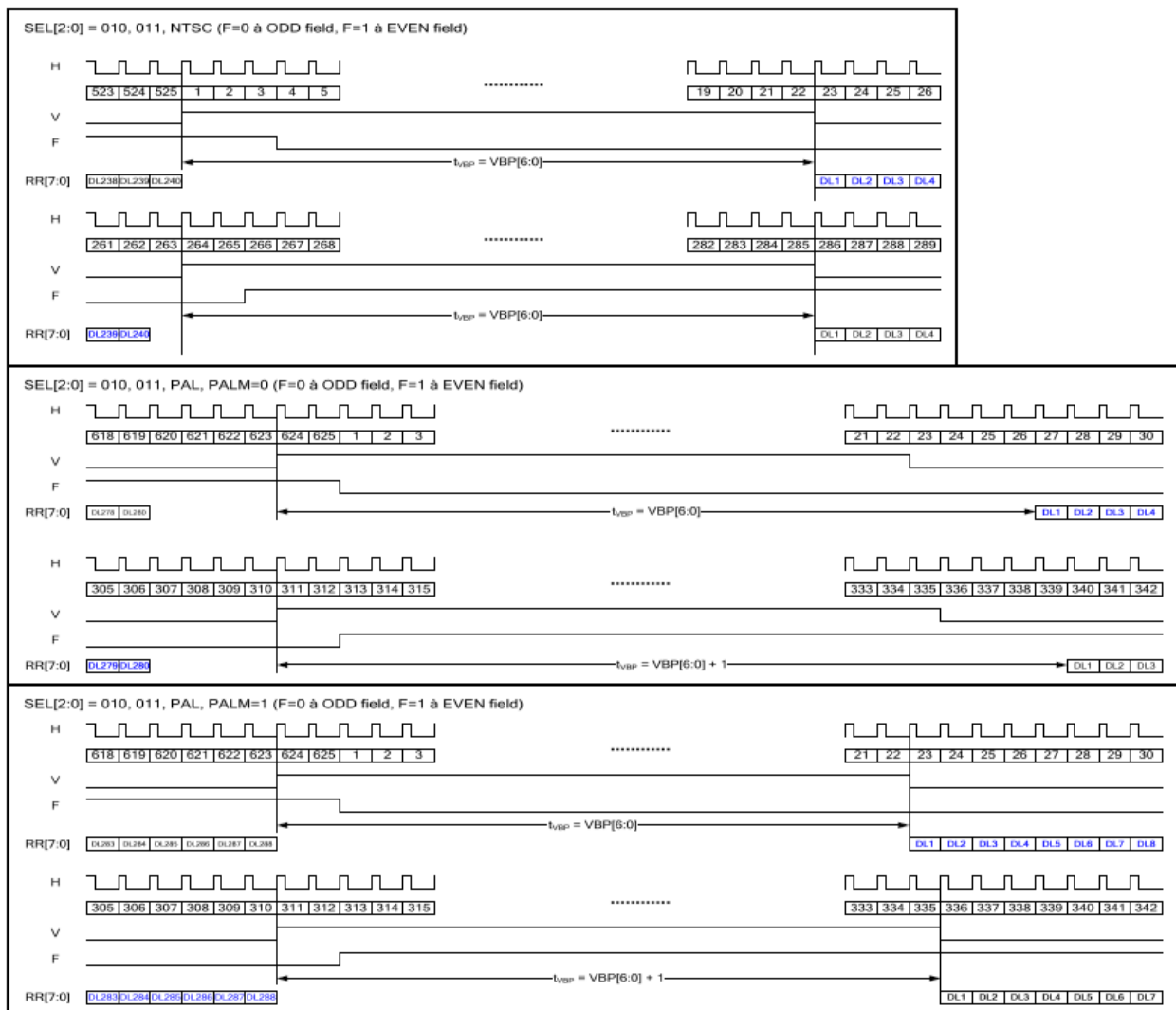


Figure 2 CCIR656 Vertical Timing

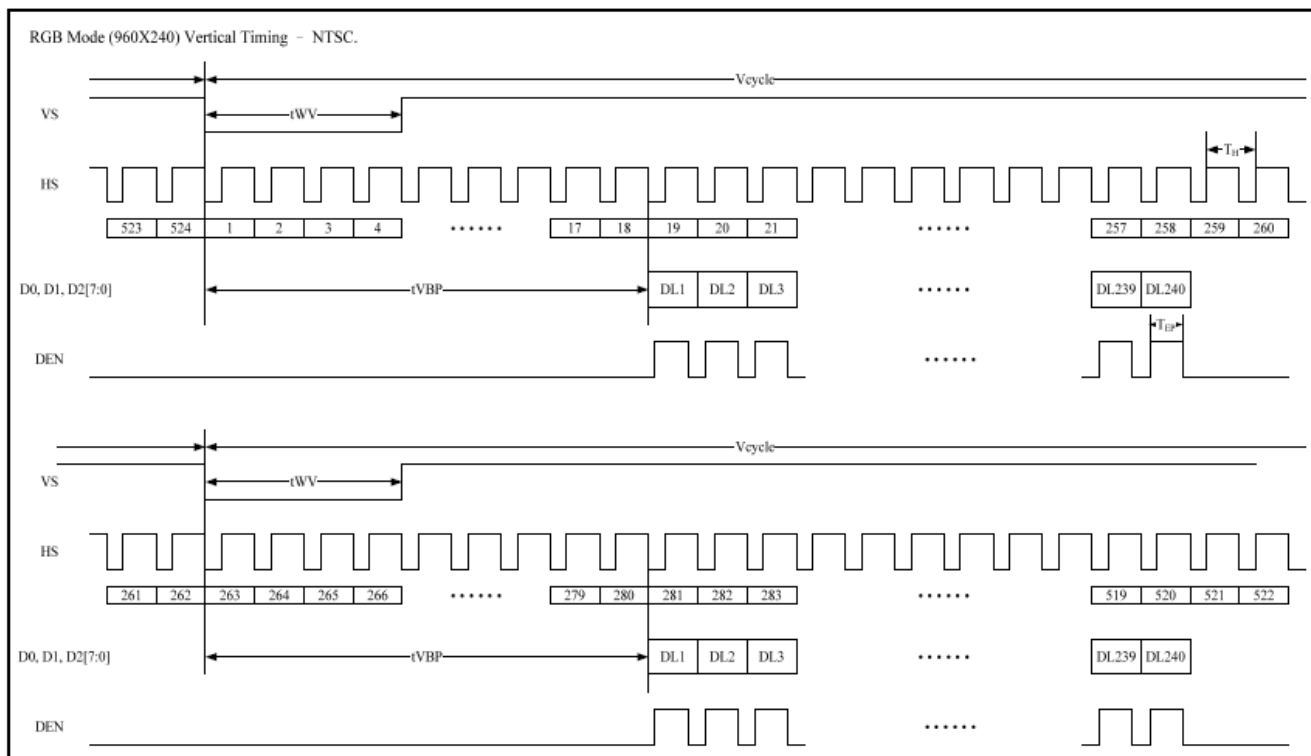
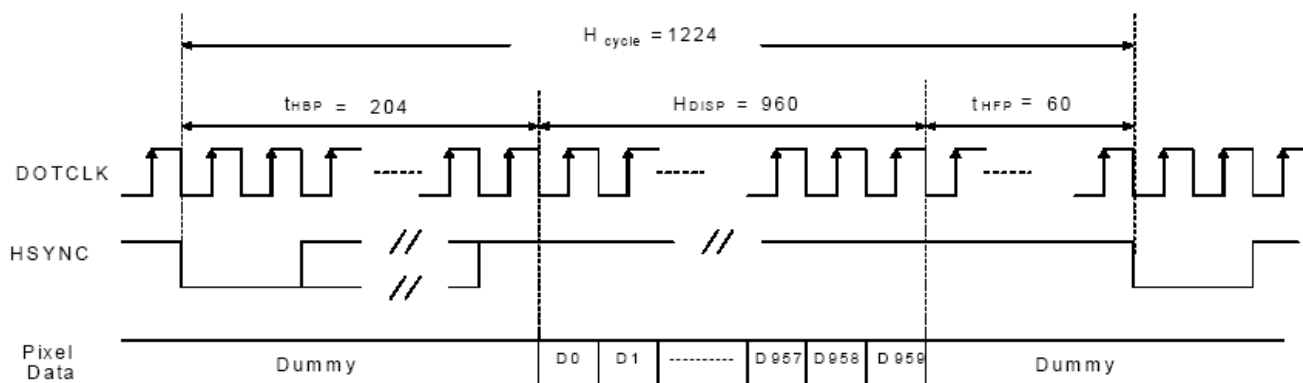
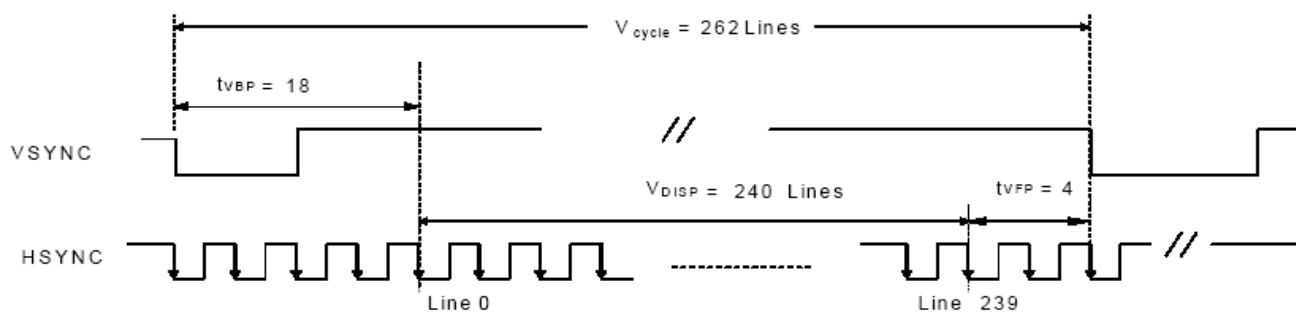


Figure 3 Digital RGB NTSC mode Vertical Data Format for 262T_H



a) Horizontal Data Transaction Timing



Vertical Data Transaction Timing

Figure 3 Data Transaction Timing in Serial RGB (8 bit) Interface (SYNC Mode)

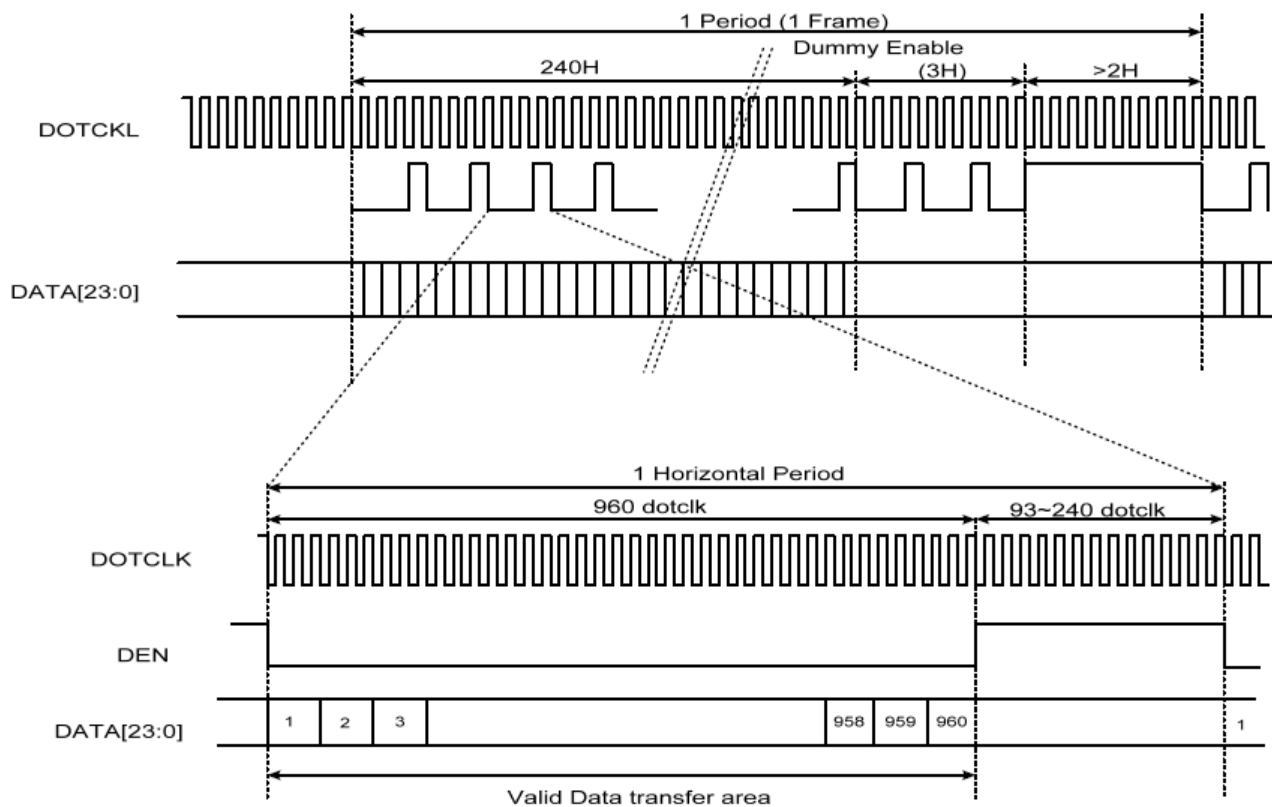
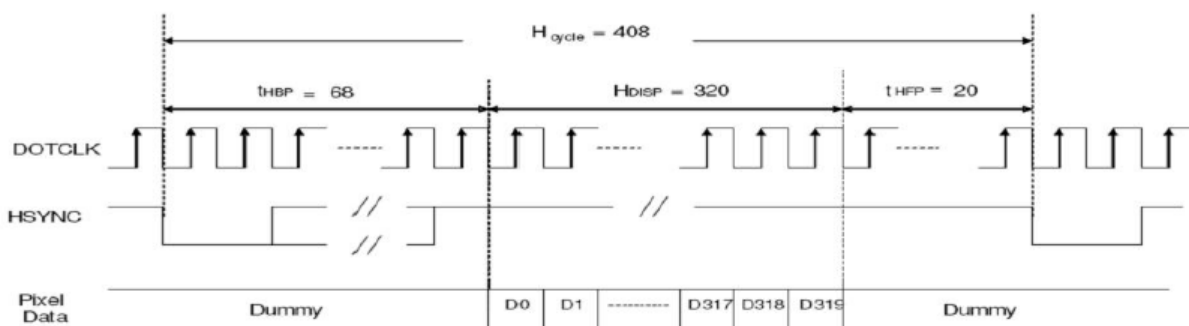
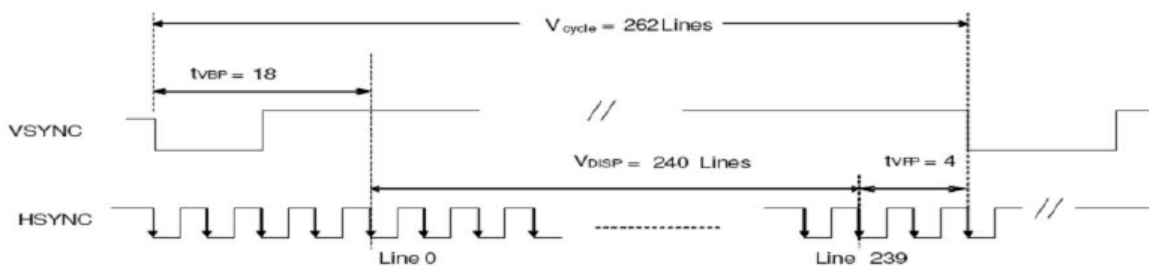


Figure 3 Data Transaction Timing in Serial RGB (8 bit) Interface (DE Mode)



a) Horizontal Data Transaction Timing



b) Vertical Data Transaction Timing

Figure 3 Data Transaction Timing in Parallel RGB (24 bit) Interface (SYNC Mode)

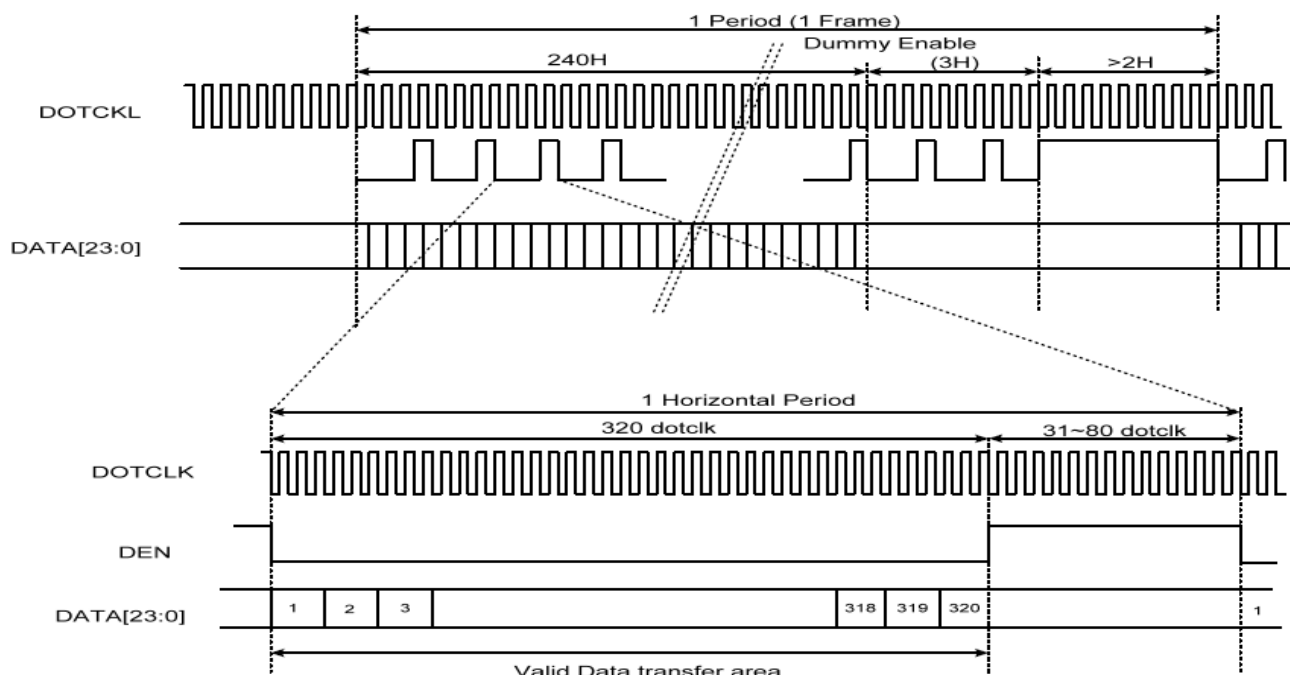


Figure 3 Data Transaction Timing in Parallel RGB (24 bit) Interface (DE Mode)

2. Clock and Sync waveforms

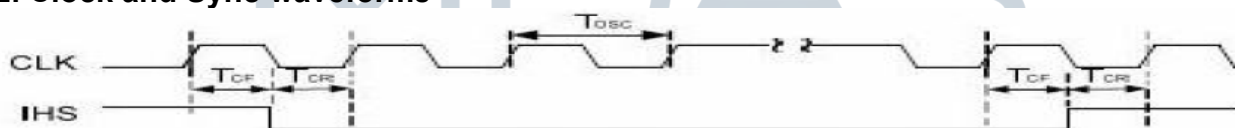


Figure 6 CLK and IHS timing waveform

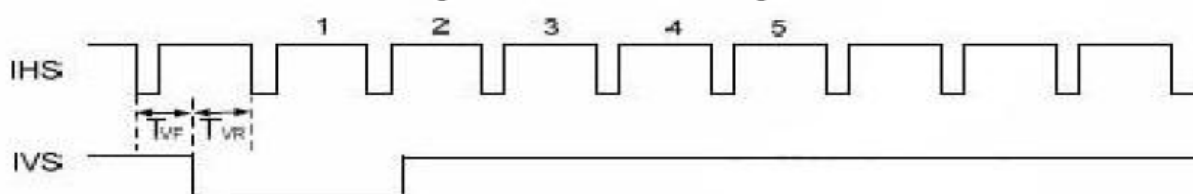
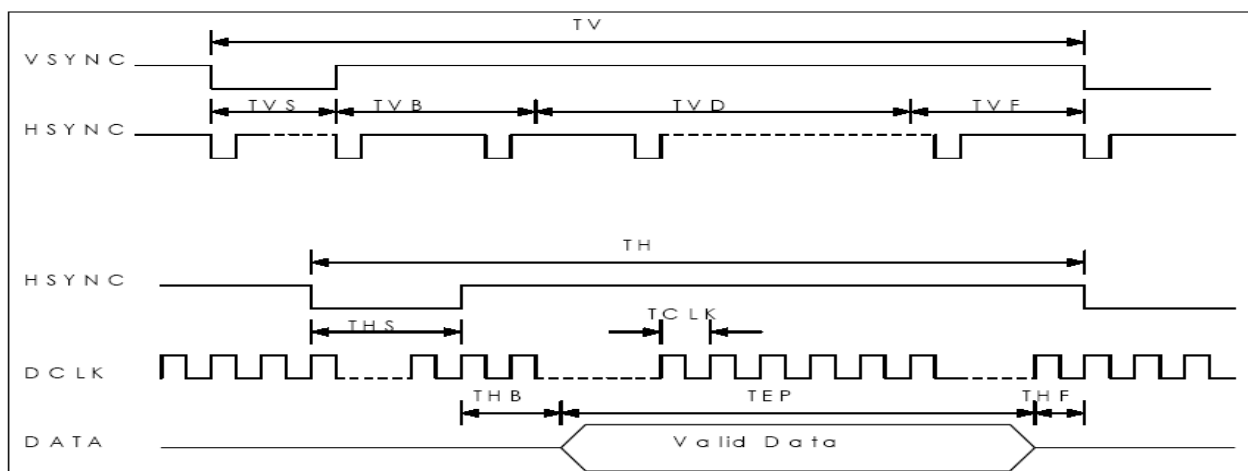
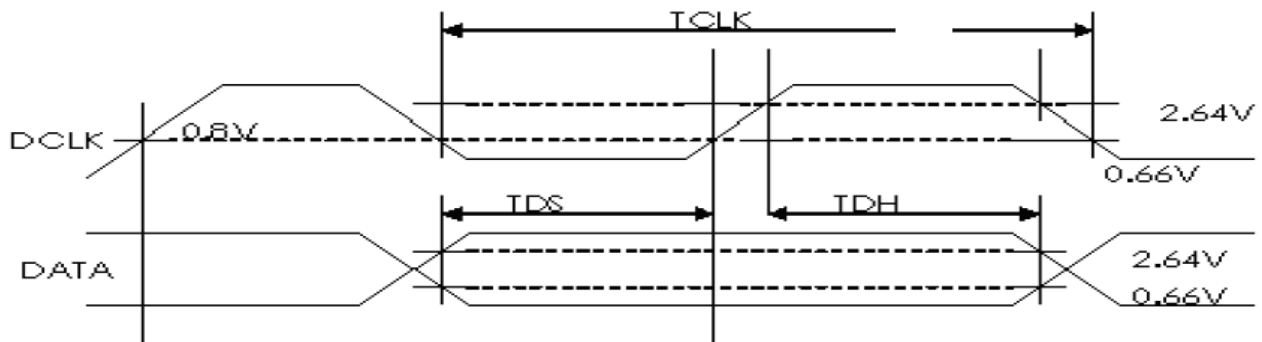


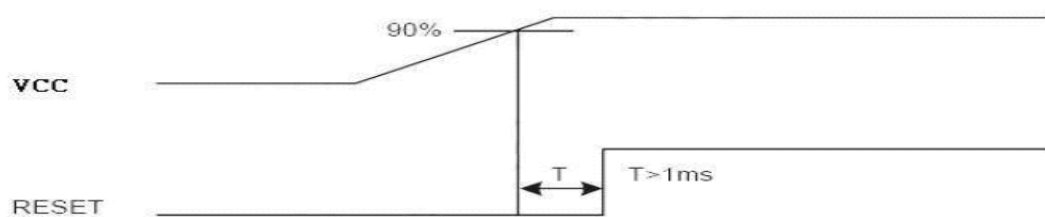
Figure 4 IHS and IVS timing waveforms





3. Reset Timing Chart

The RESET input must be held at least 1ms after power is stable



Reset timing

IVIDA
DISPLAYS

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Optical Characteristics

Item	Symbol	Condition.	Min	Typ.	Max.	Unit	Remark
Response time	Tr	$\theta=0^\circ$ 、 $\phi=0^\circ$	-	10	-	ms	Note 3,5
	Tf		-	15	-	ms	
Contrast ratio	CR	At optimized viewing angle	300	350	-	-	Note 4,5
Color Chromaticity	White	$\theta=0^\circ$ 、 $\phi=0^\circ$	0.26	0.31	0.36	-	Note 2,6,7
	Wy		0.28	0.33	0.38	-	-
Viewing angle (Gray Scale Inversion Direction)	Hor.	Θ_R	-	55	-	Deg.	Note 1
		Θ_L	-	55	-		
	Ver.	Φ_T	-	45	-		
		Φ_B	-	50	-		
Brightness	-	-	250	300	-	cd/m ²	Center of display

Ta=25±2°C, IL=20mA

Note 1: Definition of viewing angle

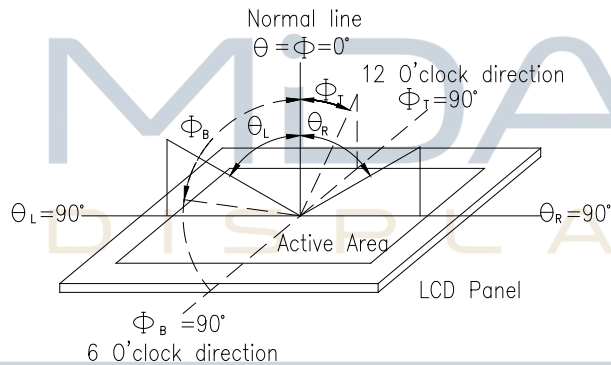


Fig. 1. Definition of viewing angle

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 or BM-5 luminance meter 1.0° field of view at a distance of 50cm and normal direction.

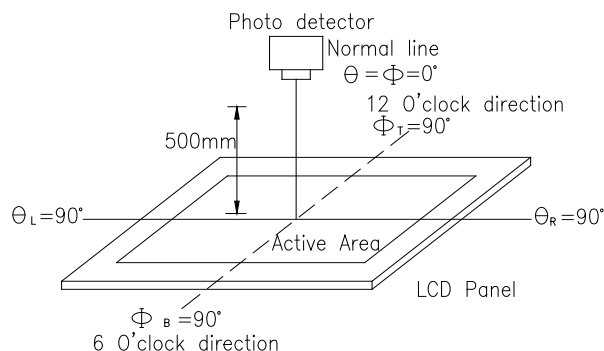
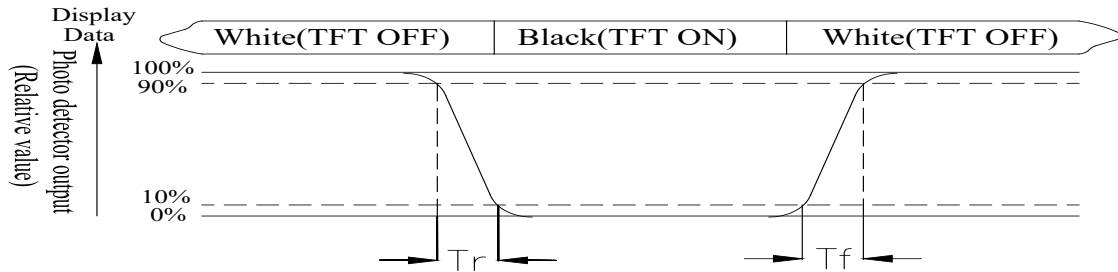


Fig. 2. Optical measurement system setup

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 photodetector output intensity changed from 90% to 10%. And fall time, T_f , is the time between photodetector 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 $V_i = V_{i50} \pm 2.0V$

" $\pm$ " means that the analogue input signal swings in phase with VCOM signal.

" $\pm$ " means that the analogue 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 the module are electrically opened.

Note 6: Definition of colour chromaticity (CIE 1931)

Colour coordinates measured at the centre point of LCD

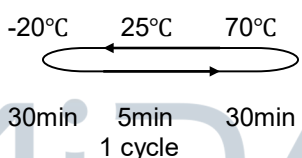
Note 7: Measured at the centre area of the panel when all the input terminals of the LCD panel are electrically opened.

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Reliability

Content of Reliability Test (Wide temperature, -20°C~70°C)

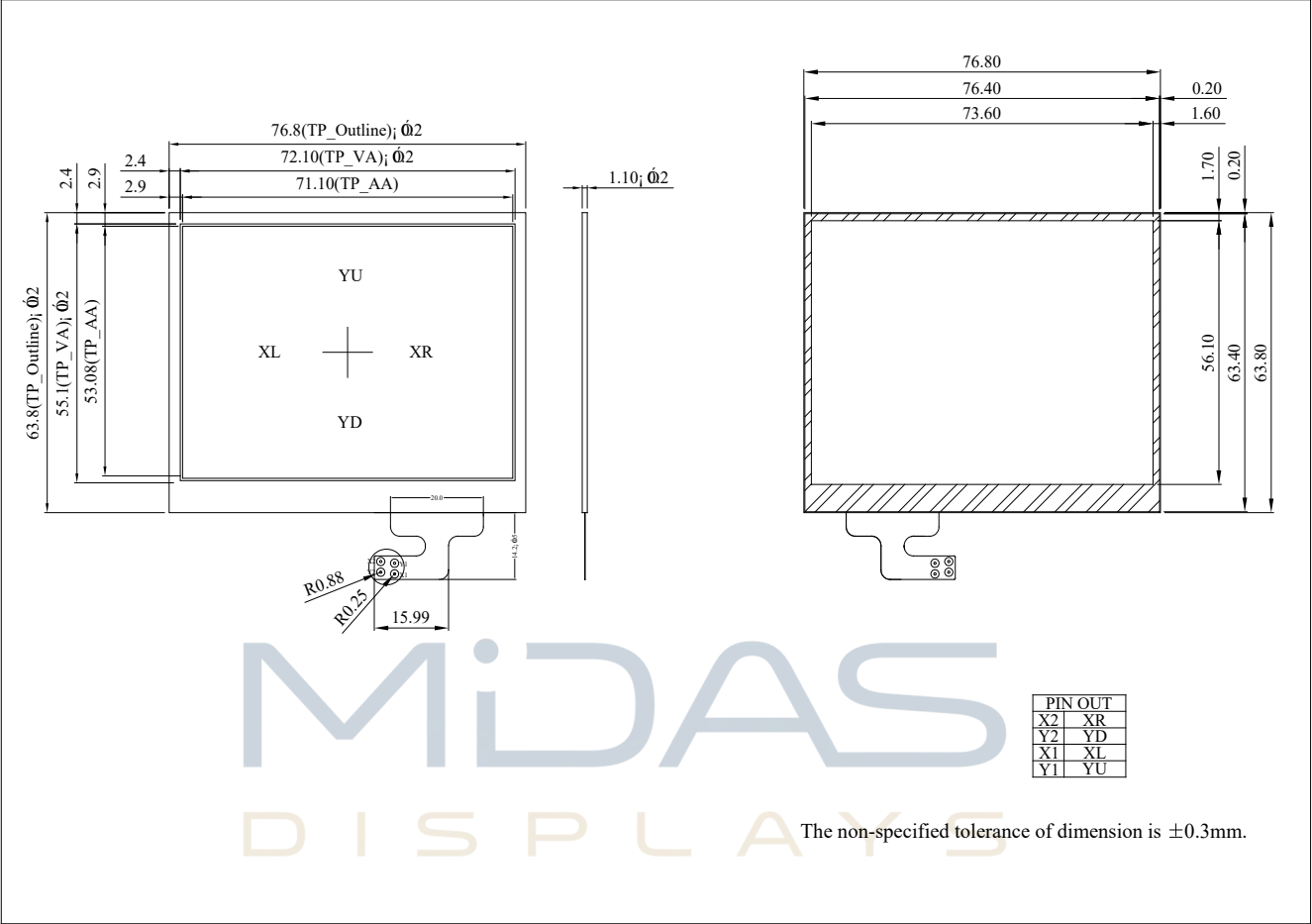
Environmental Test			
Test Item	Content of Test	Test Condition	Note
High-Temperature Storage	Endurance test applying the high storage temperature for a long time.	80°C 200hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C 200hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	70°C 200hrs	—
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-20°C 200hrs	1
High Temperature/Humidity Operation	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 to stand the following 10 cycles of operation 	-20°C/70°C 10 cycles	—
Vibration test	Endurance test applying the vibration during transportation and using.	Total fixed amplitude: 15mm 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 of storage at the normal Temperature and humidity after remove from the test chamber.

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

Touch Panel Information



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