

4. Application

This specification is applied to the 5.7 inch VGA supported TFT-LCD module, and can display true 262,144 colors(6 bit/ color). The module is designed for OA, Car TV application and other electronic products which require flat panel display of digital signal interface. This module is composed of a 5.7" TFT-LCD panel, a driver circuit and LED backlight unit and used as the input devices for general electric appliances via both finger and pen-entry.

5. Features

- VGA (640×480 pixels) resolution.
- LVDS Receiver 18 bit Interface
- Dot inversion mode with stripe type.
- Transparent Touch panel
 - 4-Wire
 - Analog Resistive

6. General Specifications

Item	Specifications	Unit
Screen Size	5.7 (Diagonal)	inch
Display Format	640RGB(H)×480(V)	dot
Active Area	115.2(H)×86.4(V)	mm
Dot Size	0.060(H)×0.180(V)	mm
Pixel Configuration	RGB Vertical Stripe	-
Display Mode	TN Type Transmissive Mode Normally White	-
Surface Treatment	Anti-Glare and Hard Coating(3H)	-
Viewing Direction	6 O'clock (The Gray Inversion will appear at this direction)	-
Outline Dimension	144.0(W)×104.6(H)×14.5(D)	mm
LVDS Receiver IC	THine THC63LVDF84A	-
Weight	194	g

7. Absolute Maximum Ratings

7.1 Absolute Ratings of Environment

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T _{ST}	-30	+80	℃	(1)
Operating Ambient Temperature	T _{OP}	-20	+70	℃	(1)

Note (1) Temperature and relative humidity range are shown in the figure below.

(a) 90%RH Max. (Ta≤40℃).

(b) Wet-bulb temperature should be 39℃ Max. (Ta>40℃).

(c) No condensation.

7.2 Electrical Absolute Ratings

7.2.1 TFT-LCD Module

(Ta=25±2℃, GND=V_{SS}=0V)

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	V _{CC}	-0.3	4.0	V	-
LVDS Driver Output Voltage	-	-0.3	V _{CC} + 0.3	V	-

7.2.2 Backlight Unit

(Ta=25±2℃)

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Current of Backlight Unit	I _B	-	250	mA	(1)
Reverse voltage	V _R	-	15	V	(1)

Note (1) Permanent damage to the device may occur if maximum values are exceeded or reverse voltage is loaded.

8. Electrical Characteristics

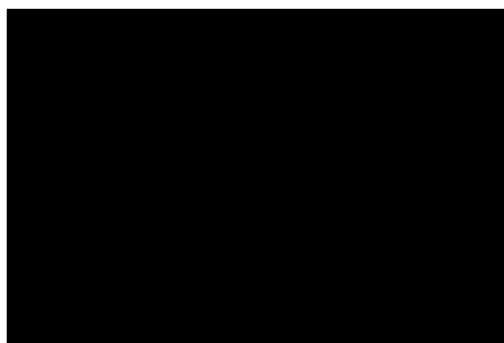
8.1 TFT-LCD Module

(Ta=25±2℃)

Item	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Power Supply Voltage	V _{CC}	3.0	3.3	3.6	V	-
Power Supply Current	I _{CC}	-	225	315	mA	-
Differential Input High Threshold Voltage	V _{TH}	-	-	100	mV	-
Differential Input Low Threshold Voltage	V _{TL}	-100	-	-	mV	-
Power Consumption	P _L	-	(742.5)	1040	mW	(1)
Frame Frequency	F _V	-	60	-	Hz	-
Dot Clock	DCLK	-	25.175	-	MHz	-

Note (1) The specified power consumption is under the conditions at V_{CC}=3.3V, F_V=60Hz, whereas a power dissipation check pattern below is displayed.

Black Pattern / 0 Gray



Active Area

8.2 Backlight Unit

(Ta=25±2℃)

Item	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Current of Backlight Unit	I _B	-	200	-	mA	-
Voltage of Backlight Unit	V _B	-	9.9	-	V	I _B =200mA
Power Consumption	P _{BL}	-	(1.98)	-	W	I _B =200mA

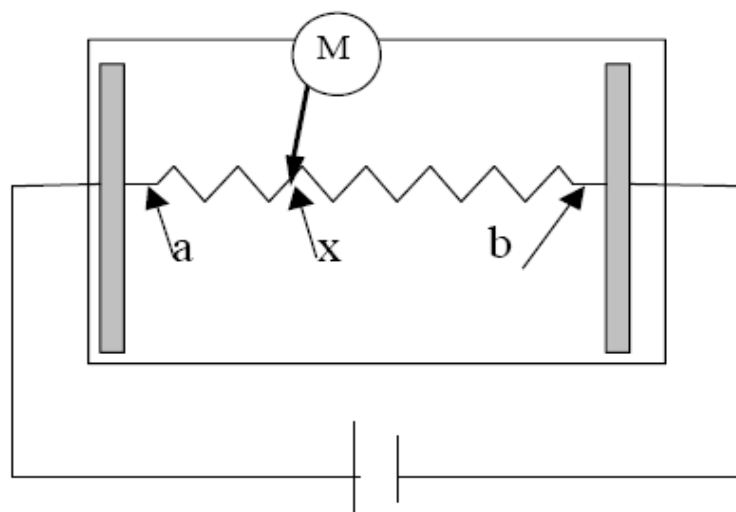
8.3 Transparent Touch panel

Electrical characteristics

Item		Value			Unit	Note
		Min.	Typ.	Max.		
Operating Voltage		-	5	7	V	-
Terminal Resistance	X-direction	290	-	880	Ω	At connector
	Y-direction	260	-	530	Ω	At connector
Insulation Resistance		$\geq 20M\Omega$				At DC25V
Linearity		$\leq 1.5\%$				(1)
Chatting		$\leq 10 \text{ ms}$				At connector

Note 1: Measurement condition of Linearity

Linearity Definition



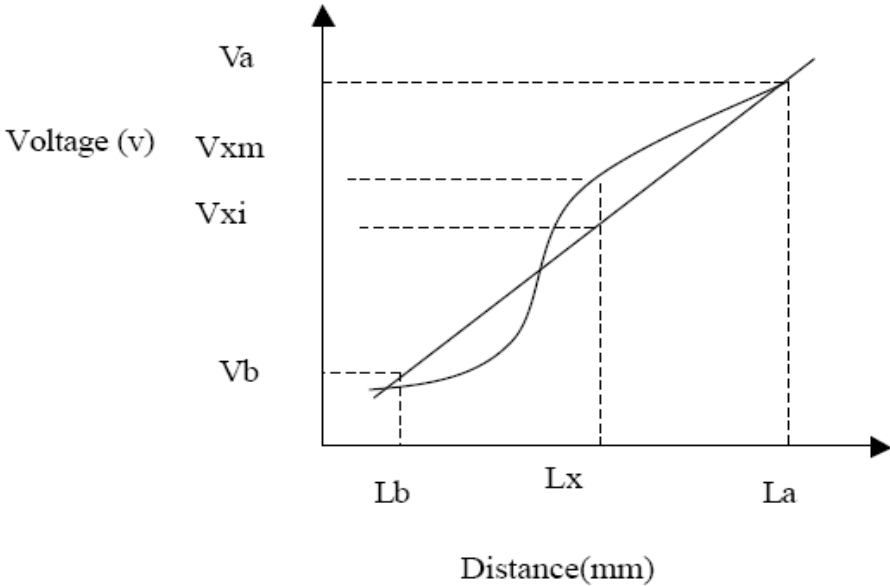
V_a : maximum voltage in the active area of touch panel

V_b : minimum voltage in the active area of touch panel

X : random measuring point

V_{xm} : Actual voltage of L_x point

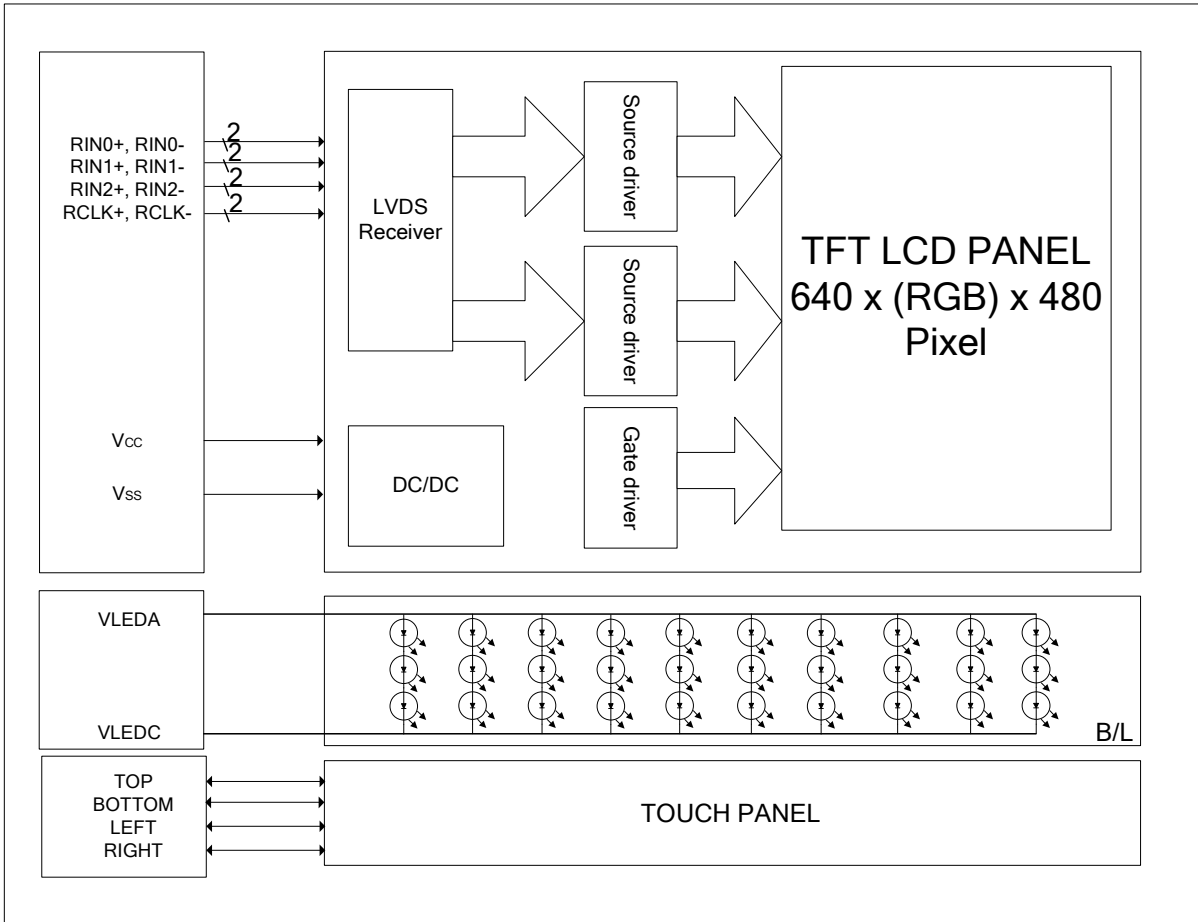
V_{xi} : Theoretical voltage of L_x point



Linearity : $[| V_{xi} - V_{xm} | / (V_a - V_b)] * 100\%$

9. Block Diagram

9.1 TFT-LCD Module with Backlight Unit



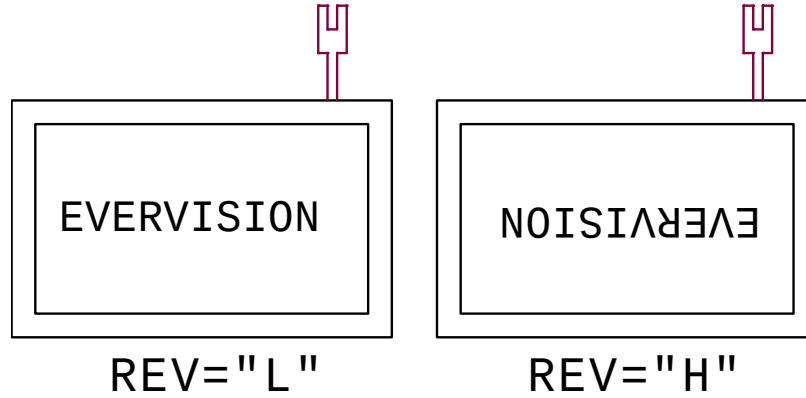
10. Input / Output Terminals Pin Assignment

10.1 TFT-LCD Module

Connector: HIROSE DF19G-20P-1H

Pin No.	Symbol	I/O	Description
1	V _{CC}	I	+3.3V power supply
2	V _{CC}	I	+3.3V power supply
3	V _{SS}	I	Ground
4	V _{SS}	I	Ground
5	RIN0-	I	Negative LVDS differential data input
6	RIN0+	I	Positive LVDS differential data input
7	V _{SS}	I	Ground
8	RIN1-	I	Negative LVDS differential data input
9	RIN1+	I	Positive LVDS differential data input
10	V _{SS}	I	Ground
11	RIN2-	I	Negative LVDS differential data input
12	RIN2+	I	Positive LVDS differential data input
13	V _{SS}	I	Ground
14	RCLK-	I	Negative LVDS differential clock input
15	RCLK+	I	Positive LVDS differential clock input
16	V _{SS}	I	Ground
17	NC	I	Not connection
18	NC	I	Not connection
19	REV	I	Selection signal for horizontal/ vertical scanning direction. Note (1)
20	V _{SS}	I	Ground

Note (1)



10.2 Backlight Unit

Connector: JST BHSR-02VS-1(N)

Pin No.	Symbol	I/O	Description	Wire Color
1	VLEDA	I	Backlight LED Anode.	Red
2	VLEDC	I	Backlight LED Cathode.	Black

10.3 Transparent Touch Panel

Connector: CVILUX CF25041D0R0-10

Pin No.	Symbol
1	TOP
2	RIGHT
3	BOTTOM
4	LEFT

10.3 Color Data Input Assignment

The brightness of each primary color(red, green and blue) is based on the 6 bit gray scale data input for the color. The higher the binary input, the brighter the color. The table provides the assignment of color versus data input.

Color		Data Signal																	
		Red						Green						Blue					
		D05	D04	D03	D02	D01	D00	D15	D14	D13	D12	D11	D10	D25	D24	D23	D22	D21	D20
Basic Colors	Black	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	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue	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
Gray Scale Of RED	Red(0) / Dark	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(61)	1	1	1	1	0	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
Gray Scale Of Green	Green(0) / Dark	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	1	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(61)	0	0	0	0	0	0	1	1	1	1	0	1	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
Gray Scale Of Blue	Blue(0) / Dark	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(61)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	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

11. Interface Timing

11.1 Input Signal Characteristics

PARAMETER	Symbol	Min.	Typ.	Max.	Unit
HS setup time	T_{hst}	10	-	-	ns
HS hold time	T_{hhd}	10	-	-	ns
VS setup time	T_{vst}	10	-	-	ns
VS hold time	T_{vhd}	10	-	-	ns
Data setup time	T_{dsu}	10	-	-	ns
Data hold time	T_{dhd}	10	-	-	ns
DEN setup time	T_{esu}	10	-	-	ns
VS falling to HS falling time on odd field @ RGB mode	T_{HV_O}	-4	0	+4	T_{CPH}
VS falling to HS falling time on even field @ RGB mode	T_{HV_E}	0.4	0.5	0.6	T_H

PARAMETER	Symbol	Min.	Typ.	Max.	Unit
CLK frequency	F_{CPH}	-	25.175	-	MHz
CLK period	T_{CPH}	-	39.7	-	ns
CLK pulse duty	T_{CWH}	40	50	60	%
HS period	T_H	-	800	-	T_{CPH}
HS pulse width	T_{WH}	5	30	-	T_{CPH}
HS-DEN time	T_{HS}	112	144	175	T_{CPH}
DEN pulse width	T_{EP}	-	640	-	T_{CPH}
VS pulse width	T_{WV}	1	3	5	T_H
VS-DEN time	T_{STV}	-	35	-	T_H
VS period	T_V	-	525	-	T_H

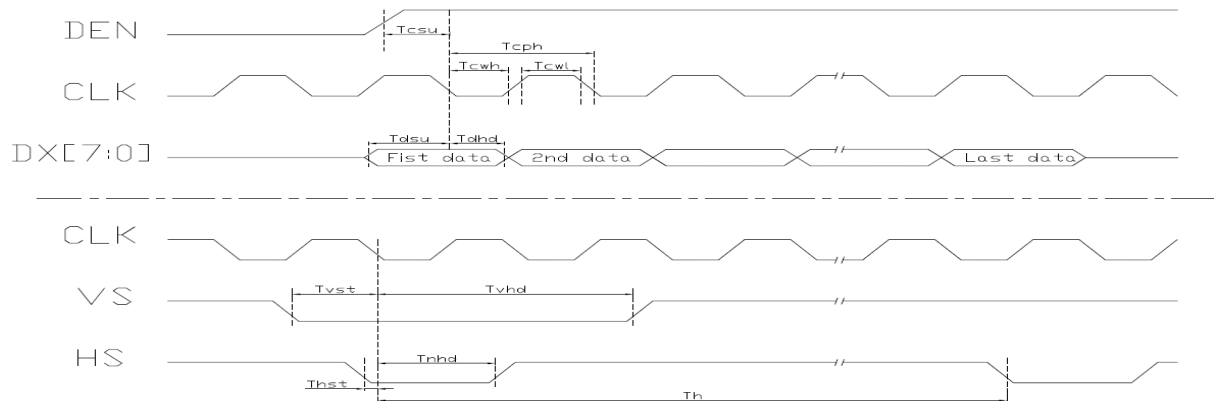
Note: When SYNC mode is used, 1st data start from 144th CLK after HS falling (when $STHD[5:0]=00000$)

11.2 LVDS Switching Characteristics

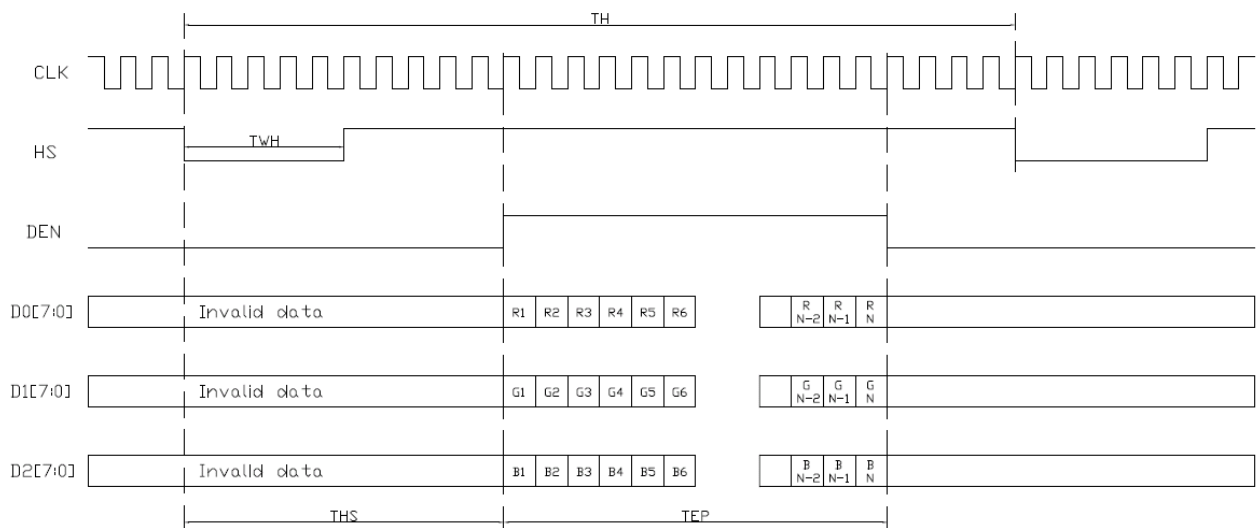
Symbol	Parameter		Min.	Typ.	Max.	Unit
t _{RCP}	CLK OUT Period	VCC = 3.0 - 3.6V	11.76	T	50.0	ns
		VCC = 2.5 - 3.6V	14.28	T	50.0	ns
t _{RCH}	CLK OUT High Time			4T/7		ns
t _{RCL}	CLK OUT Low Time			3T/7		ns
t _{RCD}	RCLK +/- to CLK OUT Delay			5T/7		ns
t _{RS}	TTL Data Setup to CLK OUT		0.35T-0.3			ns
t _{RH}	TTL Data Hold from CLK OUT		0.45T-1.6			ns
t _{TLH}	TTL Low to High Transition Time			2.0	3.0	ns
t _{THL}	TTL High to Low Transition Time			1.8	3.0	ns
t _{RIP1}	Input Data Position0 (T = 11.76ns)		-0.4	0.0	0.4	ns
t _{RIP0}	Input Data Position1 (T = 11.76ns)		T/7-0.4	T/7	T/7+0.4	ns
t _{RIP6}	Input Data Position2 (T = 11.76ns)		2T/7-0.4	2T/7	2T/7+0.4	ns
t _{RIP5}	Input Data Position3 (T = 11.76ns)		3T/7-0.4	3T/7	3T/7+0.4	ns
t _{RIP4}	Input Data Position4 (T = 11.76ns)		4T/7-0.4	4T/7	4T/7+0.4	ns
t _{RIP3}	Input Data Position5 (T = 11.76ns)		5T/7-0.4	5T/7	5T/7+0.4	ns
t _{RIP2}	Input Data Position6 (T = 11.76ns)		6T/7-0.4	6T/7	6T/7+0.4	ns
t _{RPLL}	Phase Lock Loop Set				10.0	ms

11.2 Waveform

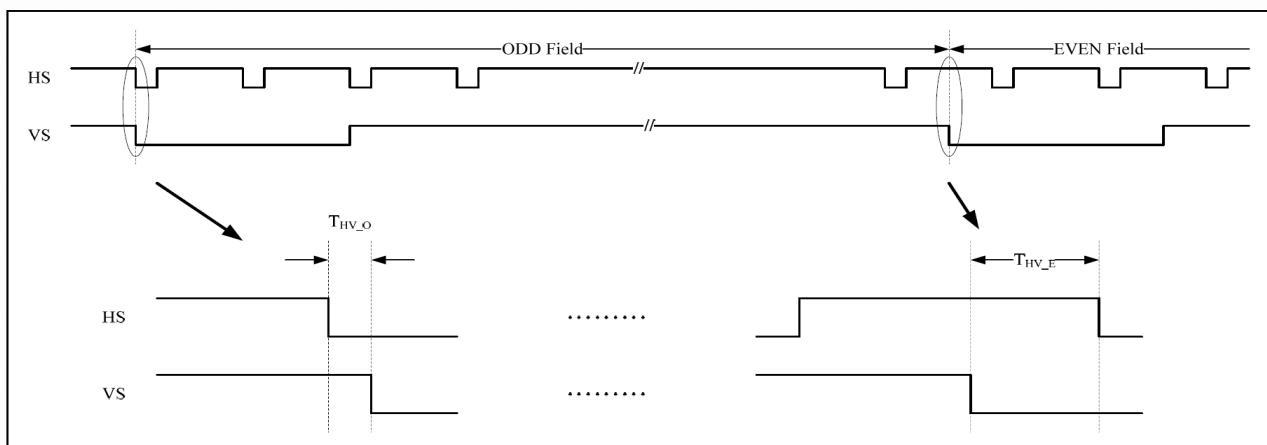
11.2.1 Clock and Data input waveforms



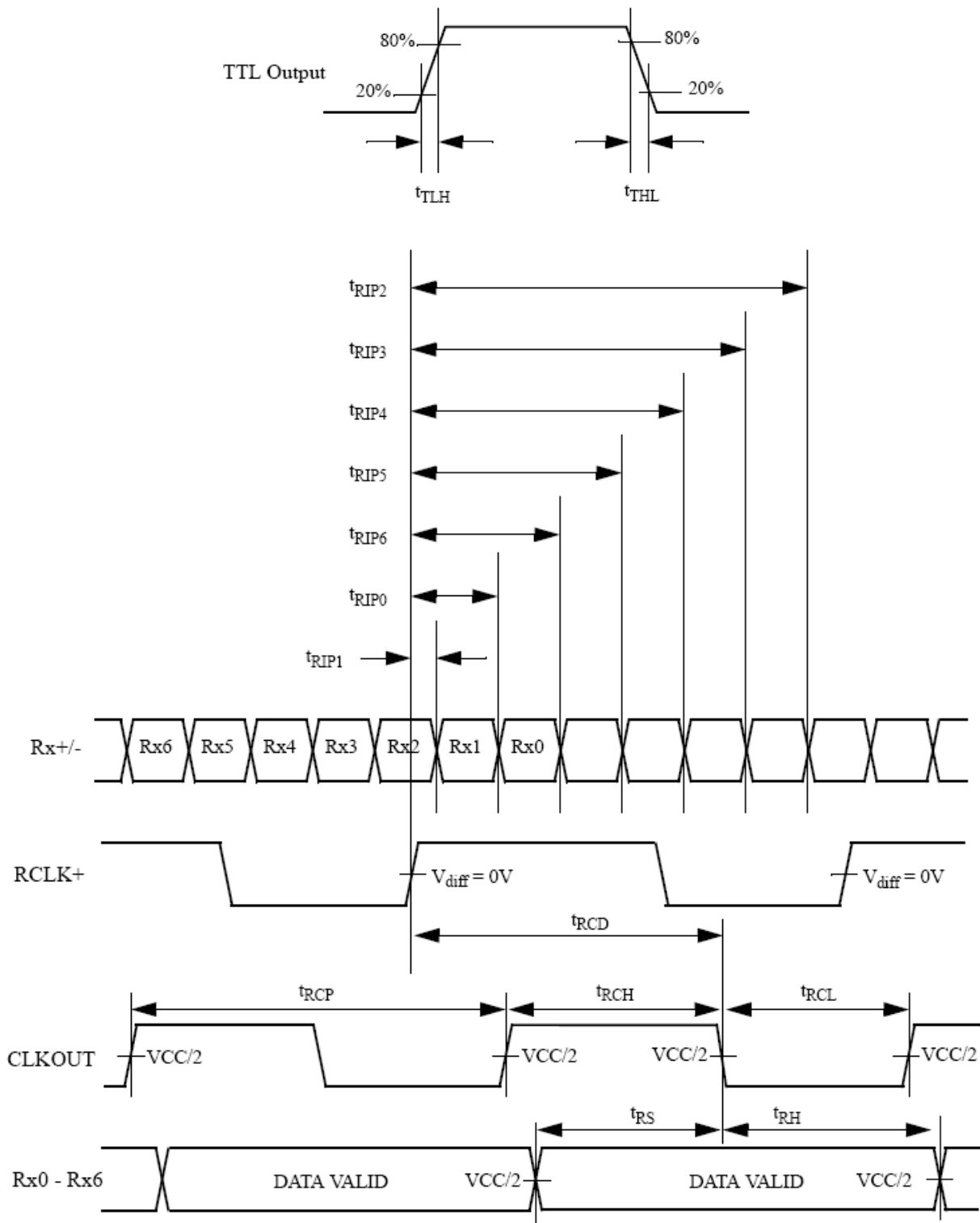
11.2.2 Data input format for RGB Mode



11.2.3 The HS & VS timing of the ODD/EVEN field.



11.2.4 LVDS AC Timing



Note:

1) $V_{diff} = (RA+) - (RA-), \dots, (RCLK+) - (RCLK-)$

12. Optical Characteristics

The optical characteristics should be measured in a dark environment (≤ 1 lux) or equivalent state with the methods shown in Note (4).

Item		Symbol	Conditions	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR	$\theta_x=0^\circ, \theta_y=0^\circ$ Viewing Normal Angle	200	(350)	-	-	(2)
Response Time		T_R		-	15	-	ms	(3)
		T_F		-	35	-	ms	
Luminance(Center)		Y		480	(560)	-	cd/m ²	(4)
Brightness uniformity		BUNI		80	(85)	-	%	(5)
Color Chromaticity	Red	R _x		0.550	0.600	0.650	-	(1),(4)
		R _y		0.300	0.350	0.400	-	
	Green	G _x		0.270	0.320	0.370	-	
		G _y		0.500	0.550	0.600	-	
	Blue	B _x		0.090	0.140	0.190	-	
		B _y		0.100	0.150	0.200	-	
	White	W _x		0.280	0.320	0.380	-	
		W _y		0.330	0.380	0.430	-	
Viewing Angle	Horizontal	θ_{x+}	CR $\geq$ 10	55	65	-	deg.	
		θ_{x-}		55	65	-		
	Vertical	θ_{y+}		45	55	-		
		θ_{y-}		55	65	-		

16.Outline Drawing

