National/Panasonic

No. 1M1T-0337

DATE: 01 Sep 2000

REFERENCE SPECIFICATION

Description : 56cm W-VGA TFT Liquid Crystal Display

Customer's Parts Number EDTCF08QAF

Model Number EDTCF08QAF

Notice: This Specification is "Preliminary".
The contents described in this specification may be changed without notice. Please ask us to send final version and reconfirm before you start to design.

Liquid Crystal Display Division		ISSUE
Product Designing Dept.		
Approval	Check	
Check	Design	

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J12-116Z990715

NAME OF SPECIFICATION: REFERENCE SPECIFICATION		SPEC. No.
PARTS No.:	EDTCF08QAF	1M1T-0337 1/20

Record of revision

R/V No	Change of date	R/V Notification No.	Page	Contents of R/V
				First edition. Revision number is 01A.

Matsushita Electric Industrial Co.,Ltd LCD Division

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NAME OF SPECIFICATION: REFERENCE SPECIFICATION	SPEC.No.
PARTS No.: EDTCF08QAF	1M1T-0337
	2/20

Change of notice

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2.Part No : EDTCF08 QAF

3.Customer's Applied Model or Specification No. :

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1. Application

This specification applied to the 56cm,6 bit driver 16.19 million Colors and 854xRGBx480 dots Color TFT Liquid Crystal Display Module(inverter to operate lamp is not included) manufactured by Matsushita Electric Industrial Co.,Ltd.Liquid Crystal Display Division.

Production Code (Parts No) : EDTCF08 QAF

2. General Specification

CHARACTERISTIC ITEM	SPECIFICATION
(1)Display technology	a-Si TFT active-matrix
(2)Display mode	NW(normally white)
(3)Module outer dimension (note2-1)	539.0(W) × 308.6(H) × 25.8 (T) ㎜ max
(4) Effective display area	486.78 × 273.60 ㎜
(5)Number of dots	854(W) × 3(RGB) × 480(H)
Number of pixels	854 × 480 (409,920 pixcels)
Pixel pitch	0.570 ㎜ × 0.570 ㎜
(6)Colors	16.19 million Colors
(6)Color-filter-array	RGB vertical stripes
(7)Backlight	CCFL × 6
(8)Power Consumption	32.2 W (Typ) (note2-2)
(9)Weight	4250g ±100 g
(10)Front Surface	Low Reflection & Anti-glare hard coat (haze ratio 6%)
(11)appearance	There is not a remarkable defects.

note 2-1: Excluding backlight cable.
Detailed dimension are shown as per attached drawing.

note 2-2: Including backight power.

3. Absolute Maximum Ratings

Ta=25℃

CHARACTERISTICS	SYMBOL		MIN. MAX.	UNIT	REMARKS
1.Input voltage	V_I		-0.3 ～ VDD+ 0.3	V	
2.Power supply voltage	VDD		-0.3 ～ + 6.0	V	
3.Panel surface temp.			-20 ～ + 60	℃	note 3-1

note 3-1… Maximum value in any place on LCD panel surface.

note: Absolute maximum ratings are the limited value which must not be applied to the product even a second,and the product will have a permanent damage when it is exceeded. Accordingly, please pay attention to the surge of input voltage, fluctuation and/or ripple of supply voltage, ambient temperature and so on.

4.Environmental Conditions

Humidity min. 5%RH max.90%RH

CHARACTERISTICS	SYMBOL	MIN.	MAX.	UNIT	REMARKS
1.Operating Temperature	T OPE.	0	+ 50	℃	note4-1
2.Storage Temperature	T STG	-20	+ 60	℃	

note 4-1 :

1)Temperature at 5mm from LCD module.

2)Ta ≦ 40℃ : 90%RH Max.

Ta ＞ 40℃ : Absolute humidity shall be less than Ta=40℃ 90%RH

3)These shall be no dew condensation.

5.Electro-optical Specification

(Ta=25℃)

CHARACTERISTICS		SYMBOL	CONDITION θ	CONDITION φ	CONDITION CR	STANDARD VALUE MIN.	STANDARD VALUE TYP.	STANDARD VALUE MAX.	UNIT	measurement method
(1)Brightness (at 30min. after)		B	0°	0°		360	450	-	cd/㎡	note 5-1
(2)Contrast Ratio		CR	0°	0°		300	400	-		A-1
(3)Color Chroma-ticity note-5-2	White	X	0°	0°		0.260	0.280	0.300		
		Y	0°	0°		0.268	0.288	0.308		
	Red	X	0°	0°		-	0.632	-		
		Y	0°	0°		-	0.340	-		
	Green	X	0°	0°		-	0.267	-		
		Y	0°	0°		-	0.592	-		
	Blue	X	0°	0°		-	0.142	-		
		Y	0°	0°		-	0.065	-		
(4)Brightness uniformity		-	0°	0°		-	1.35	1.5		A-2
(5)Vertical viewing Angle		θ u	-	0°	≧10	50	80	-	deg.	A-3
		θ u	-	0°	≧5	-	80	-	deg.	
		θ D	-	0°	≧10	45	70	-	deg.	
		θ D	-	0°	≧5	-	80	-	deg.	
(6)Horizontal Viewing Angle note 5-3		ΦL	0°	-	≧10	50	80	-	deg.	
		ΦL	0°	-	≧5	-	80	-	deg.	
		ΦR	0°	-	≧10	50	80	-	deg.	
		ΦR	0°	-	≧5	-	80	-	deg.	
(7)Response Time		τ r	0°	0°		-	4	6	ms	A-4
		τ d	0°	0°		-	12	15	ms	
(8)Surface Glare Ratio		H				2.5	6.0	9.5	%	Depends on JIS K 7105

note 5-1… Fluorescence current is 6.0mA
note 5-2… Color Chromaticity value of Red, Green and Blue is reference.

●Measuring condition:

◇ Measuring surroundings :Dark room or its coordinate
◇ Measuring temperature :25±5℃
◇ Measuring humidity :40～70%RH
◇ Wait 30 minutes after turning on backlight,then adjust operating voltage to get optimum contrast at the center of the display.
◇ Inverter for measuring:ECXF6626A(Made by Matsushita Electric Ind.Co., Ltd..)

A - 1.Measuring method

A-1-(1)Measuring method for brightness

(1)Measuring instrument

Topcon BM-5A or BM-7 (measuring field=2°)

(2)Measuring Point

center of the display area (θ =0°, ϕ =0°)

θ : viewing angle against normal in vertical axis

ϕ : viewing angle against normal in horizontal axis

(3)Measuring method

Measure the brightness B(cd/m^2)supplying signal voltage to get maximum brightness

The distance from screen to "BM-5A"is 500mm.

A-1-(2),(3)Measuring method for contrast, White Color Chromaticity

(1)Measuring instrument

Topcon BM-5A or BM-7 (measuring field=2°)

(2)Measuring Point

center of the display area

(3)Measuring method

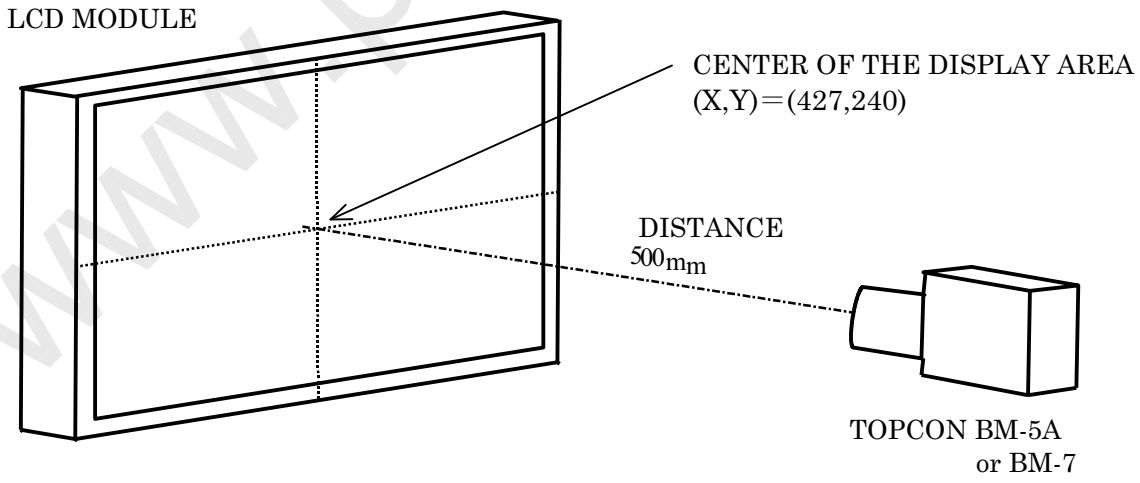
・Set the LCD module at θ =0°, ϕ =0°

θ : viewing angle against normal in vertical axis

ϕ : viewing angle against normal in horizontal axis

・Measure maximum brightness "Y1"and minimum brightness 'Y2'

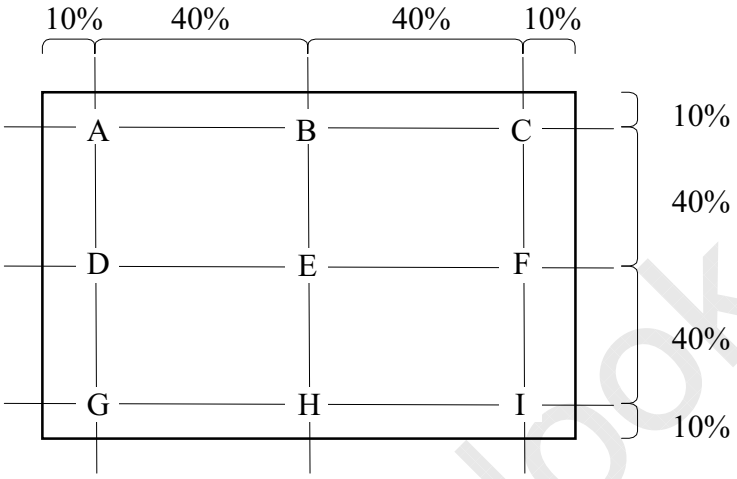
・ The contrast ratio CR is Y1/Y2.



A-2. Definition of the brightness uniformity.

Measure 9 point(A-I)and define the brightness uniformity using the following formula.

(The maximum brightness among A-I)／(The minimum brightness among A-I)



A-3.Measuring method for viewing angle

(1)Measuring instrument

Otsuka Electric. LCD evaluation equipment LCD-7000

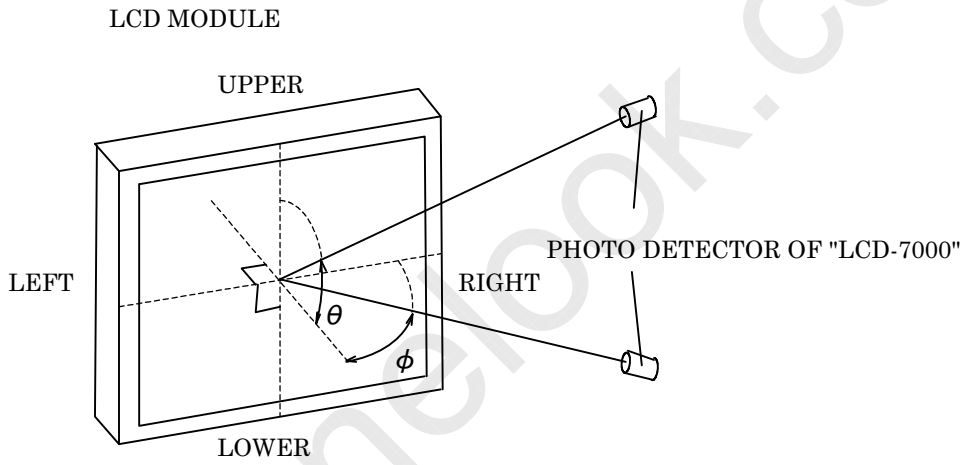
Measuring spot size(aperture size)is ϕ 12 mm.

(2)Measuring point

center of the display area

(3)Measuring angle

Measuring distance form screen to 'LCD-7000' is 200 mm.



θ : viewing angle against normal in vertical axis
ϕ : viewing angle against normal in horizontal axis

(4)Measuring method

- Set LCD module at ϕ =0° and measure the contrast ratio changing θ according to the "measuring method for contrast".
- Define the maximum | θ |(CR≧10) as θ_u, θ_D.
- Set LCD module at θ =0° and measure the contrast ratio changing ϕ according to the "measuring method for contrast".
- Define the maximum | ϕ |(CR≧10) as ϕ_L, ϕ_R.

θ_u: Upper side viewing angle θ_D:Lower side viewing angle
ϕ_L: Left side viewing angle ϕ_R:Right side viewing angle

A-4. Measuring method for response time

(1) Measuring instrument

Otsuka.Electric. LCD evaluation equipment LCD-7000

Measuring spot size (aperture size) is ϕ 12 mm.

(2) Measuring point

center of the display area

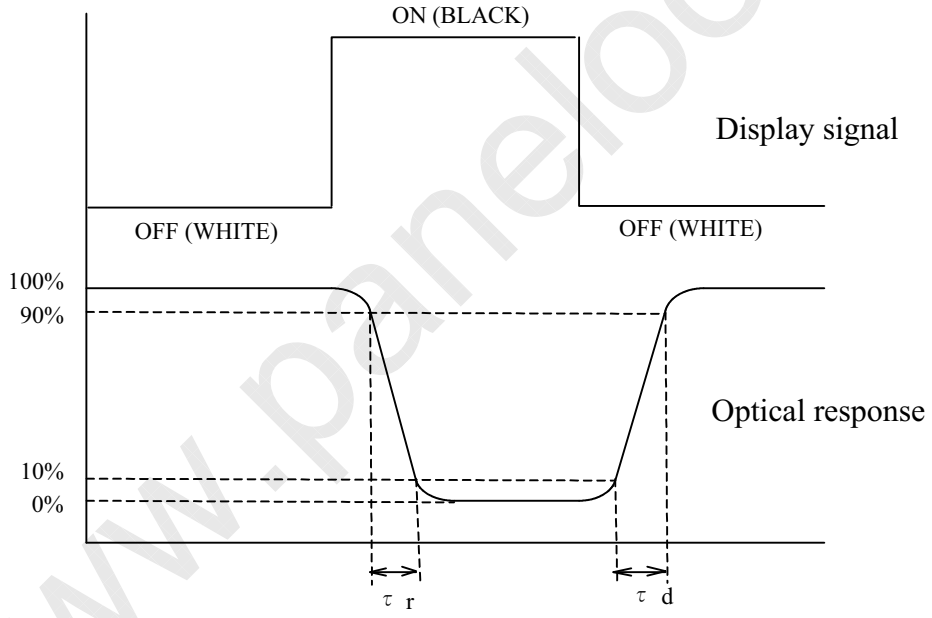
(3) Measuring method

・Set LCD module at ϕ=0° and θ=0°.

・Apply the signal voltage at maximum contrast ratio and switch LCD-cell off/on/off.

(screen status: white =＞ black ＝＞ white)

When normalizing each brightness level corresponding to the display signal "OFF" and "ON" as shown in the figure below, the rise time τ r is defines as the time until the brightness level goes to 10% after 90% point of brightness, and also fall-time τ d is defines as the time until the brightness level goes up to 90% after 10% point of brightness.



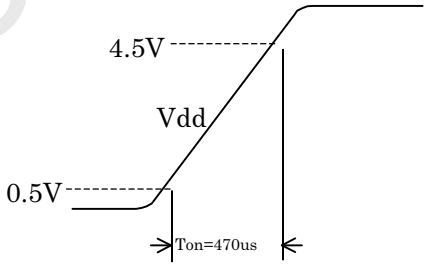
6.Electrical Specification

6-1 TET LCD module operating condition Ta=25℃

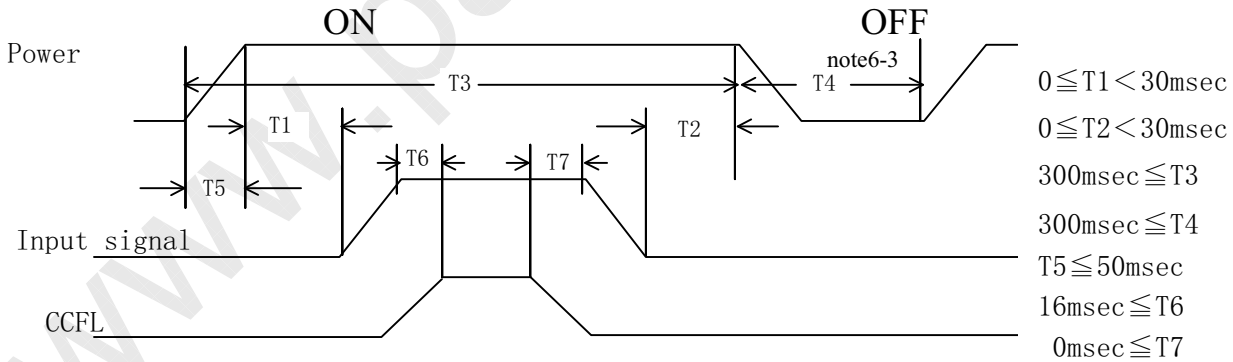
CHARACTERISTICS		SYMBOL	MIN	TYP	MAX	UNIT	REMARKS
Power supply voltage	input voltage	VDD	+ 4.75	+ 5.00	+ 5.25	V	
	Current consumption	IDD	-	325	350	mArms	note 6-1
	Inrush current	I RUSH	-	-	650	mApeak	note 6-2
Allowable Ripple voltage		VRP	-	-	100	mVp-p	
Input Low Voltage		VIL	0	-	0.7	V	VDD=+5.0V
Input High Voltage		VIH	2.2	-	VDD	V	
Input leakage current		IIL	-100	-	-	μA	VI=0V
		IIH	-	-	100	μA	VI=VDD

note 6-1: Effective value (mArms) at VDD = 5.0V.
Typical value under 8-color-bar displaying condition.
Max value under vertical stripes pattern(at one-line intervals) displaying condition.

note 6-2: Reference value under the following figure for turning on condition.



Sequence for Power-on/off and signal on/off



○ Keep the above sequence of timing.

note 6-3: OFF time of T4(≦0.5V) should be maintained more than 150msec.

Caution

○ In case of handling, Please turn off the power before connecting or removing the signal cable.

6-2. Backlight

CHARACTERISTICS	SYMBOL	MIN	TYP	MAX	UNIT		REMARKS
Lamp current	IL	5	6	8	mArms		note 6-4
Lamp voltage	VL	765	850	935	Vrms		note 6-5
Lamp power consumption	PL	4.6	5.1	5.6	W		note 6-6
Possible lighting frequency	FL	30	-	70	kHz		note 6-7
Starting Voltage	VS	-	-	2375	Vrms	Ta=0℃	note 6-5
Life time		30,000	50,000	-	Hour		note 6-8
Lamp exchange number of times		-	-	10	Time		note 6-9

note 6-4: Panel surface temperature should be kept less than 60℃ when lamp current is maximum. (Maximum lamp current should be less then 8.0 mA / 1 tube.)
note 6-5: Reference value, subject to lamp spec.
note 6-6: Inverter should be designed to be matched with lamp characteristic. Please refer to lamp specification.
note 6-7: The lamp frequency should be selected as different as possible from display horizontal and vertical synchronous signal to avoid "Beat" interference which may be observed on the screen as horizontal stripes like moving wave.
This phenomenon is caused by interference between lamp lighting frequency and LCD horizontal and vertical scanning frequency (Including harmonic frequency of this scanning frequency.)
note 6-8: In case brightness to be decreased 50 % of initial value.
(continuous lighting at Ta = 25℃)
note 6-9: Please take care of dust and garbage, when you are exchanging the lamp.
(Exchanging under clean atmosphere.)

○ CN2.5(Upper Side Lamp Connecto CONNECTOR:BHR-03VS-1(JST)

Pin No.	SYMBOL	FUNCTION	REMARKS
1	H	CCFL power supply(High voltage)	cable color:light Pink
2	H	CCFL power supply(High voltage)	cable color:light Pink
3	H	CCFL power supply(High voltage)	cable color:light Pink

○ CN3.4(Under Side Lamp Connecto CONNECTOR:BHR-04VS-1(JST)

Pin No.	SYMBOL	FUNCTION	REMARKS
1	H	CCFL power supply(High voltage)	cable color:light Pink
2	H	CCFL power supply(High voltage)	cable color:light Pink
3	H	CCFL power supply(High voltage)	cable color:light Pink

6-3.Input signal interface

CN1 (50P) CONNECTOR : FHI2S-50S-0.5SH(HIROSE ELECTRIC CO.,LTD.)

	symbol	Function	Remarks
1	GND	Signal Ground	
2	CLK	Clock	Pick up each signal at negative edge
3	GND	Signal Ground	
4	Vs	Vertical sync.	
5	Hs	Horizontal sync.	
6	DE	Data Enable	Specifies the display position of the picture
7	GND	Signal Ground	
8	R0	Red Display Data(LSB)	
9	R1	Red Display Data	
10	R2	Red Display Data	
11	R3	Red Display Data	
12	GND	Signal Ground	
13	R4	Red Display Data	
14	R5	Red Display Data	
15	R6	Red Display Data	
16	R7	Red Display Data(MSB)	
17	GND	Signal Ground	
18	G0	Green Display Data(LSB)	
19	G1	Green Display Data	
20	G2	Green Display Data	
21	G3	Green Display Data	
22	GND	Signal Ground	
23	G4	Green Display Data	
24	G5	Green Display Data	
25	G6	Green Display Data	
26	G7	Green Display Data(MSB)	
27	GND	Signal Ground	
28	B0	Blue Display Data(LSB)	
29	B1	Blue Display Data	
30	B2	Blue Display Data	
31	B3	Blue Display Data	
32	GND	Signal Ground	
33	B4	Blue Display Data	
34	B5	Blue Display Data	
35	B6	Blue Display Data	
36	B7	Blue Display Data(MSB)	
37	GND	Signal Ground	
38	GND	Signal Ground	
39	GND	Signal Ground	
40	GND	Signal Ground	
41	GND	Signal Ground	
42	Vdd	Power Supply	
43	Vdd	Power Supply	

to be continued

	symbol	Function	Remarks
44	Vdd	Power Supply	
45	Vdd	Power Supply	
46	Vdd	Power Supply	
47	Vdd	Power Supply	
48	NC		Do not connect anything to this terminal.
49	NC		Do not connect anything to this terminal.
50	GND	Signal Ground	

6-4.Timing characteristics of input signals

CHARACTERISTICS		SYMBOL	MIN	TYP	MAX	UNIT	REMARKS
1.Clock (dCLK)	Frequency	Fck	25	34	40	MHz	
	High time	Tch	10	–	–	ns	
	Low time	Tcl	10	–	–	ns	
2.Data (DATA)	Setup time	Tds	6	–	–	ns	
	Hold time	Tdh	7	–	–	ns	
3.Enable signal(ENAB)	Polarity			Positive		-	
	Setup time	Tes	6	–	–	ns	
	Hold time	Teh	7	–	–	ns	
4.Horizontal (Hs)	Polarity			Negative		-	
	Setup time	Ths	6	–	–	ns	
	Hold time	Thh	7	–	–	ns	
	Period including blanking	TH	900	1079	1200	Fck	note 6-10
			30.0	32.0	–	μs	
	Data width	Thd	854	854	854	Fck	
note 6-11	Pulse width	Thp	2	100	–	Fck	
	Back porch	Thb	1	80	–	Fck	
	Front porch	Thf	1	45	–	Fck	
5.Vertical (Vs)	Polarity			Negative		-	
	Phase shift	TVpd	-1	0	1	Fck	
	Period including blanking	TV	490	525	750	TH	
			–	16.6	20.0	ms	
	Data width	Tvd	400	480	480	TH	
	Pulse width	Tvp	1	2	-	TH	
note 6-11	Back porch	Tvb	1	40	-	TH	
	Front porch	Tvf	1	3	-	TH	

○ Vertical Centering function

Vertical Centering function is valid in the case of less than 480 vertical enable line by ENAB signal setting.(The number of Vertical enable line must be set multiple of 4.)

Example Case : Vertical enable lines 440

Top and Bottom 20 lines are set "BLACK" display state.

note 6-10 : 25MHz,TH=31.8us

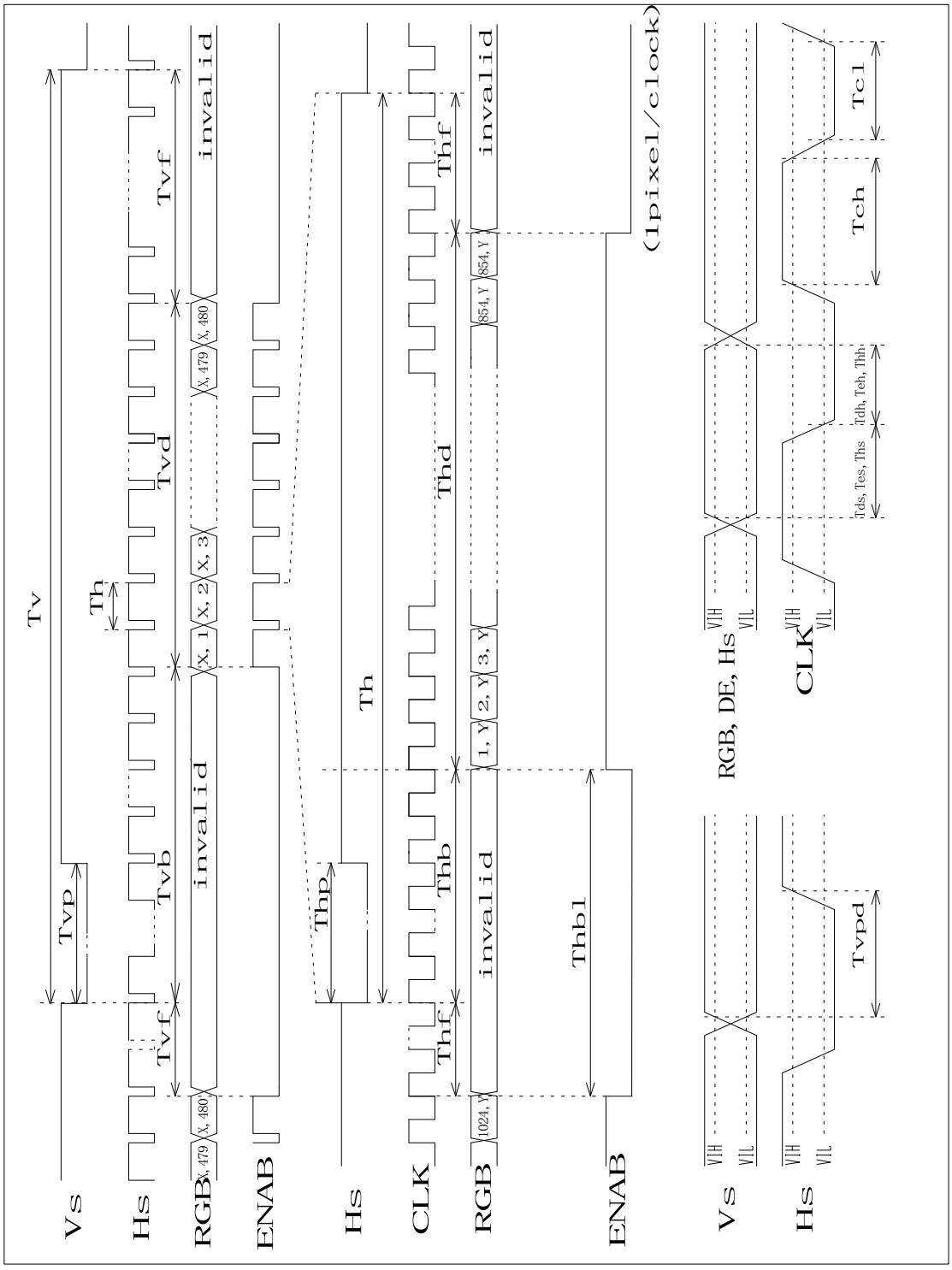
38MHz,TH=29.6us

6-5.Data Signal VS. Display Color Gray Scale

	Display	Data Signal(0:Low Level, 1:High Level)																							
		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 Color	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
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	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
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	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
	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
Gray Scale of Red	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
	Dark	0	0	0	0	0	0	0	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:								:								:							
	↓	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Bright	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	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale of Green	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
	Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	0	0	0	0	0	0	0	0
	:	:								:								:							
	↓	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	Bright	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray Scale of Blue	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
	Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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
	:	:								:								:							
	↓	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
	Bright	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

16.2 million colors are available by combining red,green and blue signal of 8 bits（256th gray scale）for each.

6-6.Timing diagram



7. Block diagram