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ELECTRONICS

Approval



TO : Dell / Compal

DATE : Feb.28.2012

SAMSUNG TFT-LCD

MODEL NO. : LTN133AT27-2

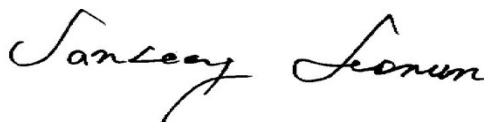
NOTE :

- Extension code [2]

→ LTN133AT27-2

- Surface type [Anti glare]

Any Modification of Specification is not allowed without SEC's Permission.



APPROVED BY : _____

PREPARED BY : Application Engineering Group, Development team

SAMSUNG ELECTRONICS CO., LTD.



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Doc.No.	LTN133AT27-2	Rev.No	04-A00-S-120228	Page	1 / 30
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REVISION HISTORY

Approval

Date	Rev. No.	Page	Summary
June.07, 2011	P00	All	. The specification was first issued.
Dec. 01. 2011	P01	P25	. The product label was updated.
Dec.08.2011	P02	P5	. Thickness measuring force for Cover PCB part changed from 500gf to 150gf.
Feb.28, 2012	A00	All	. The A00 specification was issued.

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GENERAL DESCRIPTION

DESCRIPTION

LTN133AT27 is a color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching devices. This model is composed of a TFT LCD panel, a driver circuit and a backlight unit. The resolution of a 13.3" contains 1,366 x 768 pixels and can display up to 262,144 colors. 6 O'clock direction is the Optimum viewing angle.

FEATURES

- High contrast ratio
- HD (1366 x 768 pixels) resolution
- Fast response time
- LED Back Light with embedded LED Driver
- DE (Data enable) only mode
- 3.3V LVDS Interface
- Onboard EEDID chip
- Green product (RoHS compliant)
- DBC enable

APPLICATIONS

- Notebook PC
- If the usage of this product is not for PC application, but for others, please contact SEC.

GENERAL INFORMATION

Item	Specification	Unit	Note
Display area	293.42(H) x 164.97(V) (13.3" diagonal)	mm	
Driver element	a-Si TFT active matrix		
Display colors	262,144		
Number of pixel	1366 x RGB(3) x 768	pixel	16 : 9
Pixel arrangement	RGB vertical stripe		
Pixel pitch	0.2148(H) x 0.2148(V) (TYP.)	mm	
Display Mode	Normally white		
Surface treatment	Haze 25%, Hardness 3H		AG

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Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module size	Horizontal (H)	305.8	306.3	306.8	mm	w/o bracket
		-	-	314.6	mm	w/ bracket
	Vertical (V)	177.2	177.7	178.2	mm	w/o PCB
		-	-	189.2	mm	w/ PCB
	Depth (D)	-	-	3.6	mm	
Weight		-	-	290	g	-

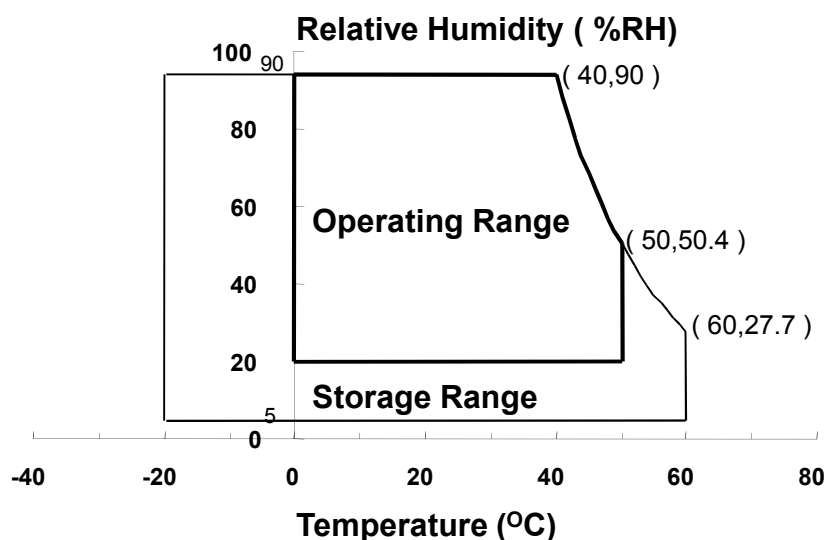
Note (1) Thickness measuring force condition w/ Vernier Calipers
 . 150gf(minimum) for Cover PCB part
 . 500gf(minimum) for other parts

1. ABSOLUTE MAXIMUM RATINGS

1.1 ENVIRONMENTAL ABSOLUTE RATINGS

Item	Symbol	Min.	Max.	Unit	Note
Storage temperate	TSTG	-20	60	°C	(1)
Operating temperate (Temperature of glass surface)	TOPR	0	50	°C	(1)
Shock (non-operating)	Snop	-	240	G	(2),(4)
Vibration (non-operating)	Vnop	-	2.41	G	(3),(4)

Note (1) Temperature and relative humidity range are shown in the figure below.
 90 % RH Max. ($40^{\circ}\text{C} \geq T_a$)
 Maximum wet - bulb temperature at 39°C or less. ($T_a > 40^{\circ}\text{C}$) No condensation



- (2) 2ms, half sine wave, one time for $\pm X$, $\pm Y$, $\pm Z$.
 (3) 5 - 500 Hz, random vibration, 30min for X, Y, Z.
 (4) At testing Vibration and Shock, the fixture in holding the Module to be tested have to be hard and rigid enough so that the Module would not be twisted or bent by the fixture.

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1.2 ELECTRICAL ABSOLUTE RATINGS

(1) TFT LCD MODULE

 $V_{DD} = 3.3V$, $V_{SS} = GND = 0V$

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	V_{DD}	$V_{SS} - 0.3$	$V_{DD} + 0.3$	V	(1)
Logic Input Voltage	V_{IN}	$V_{SS} - 0.3$	$V_{DD} + 0.3$	V	(1)

Note (1) Within T_a (25 ± 2 °C)

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2. OPTICAL CHARACTERISTICS

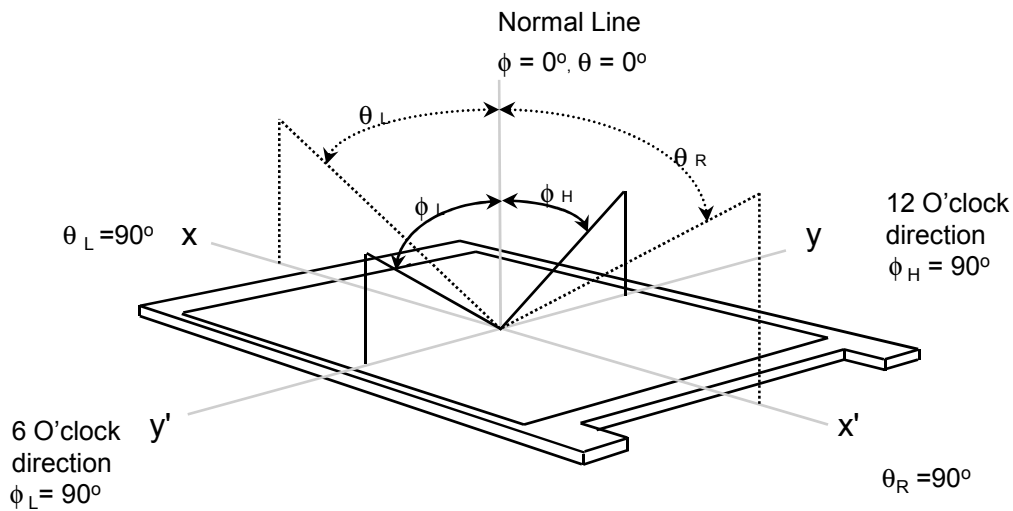
The following items are measured under stable conditions. The optical characteristics should be measured in a dark room or equivalent state with the methods shown in Note (5).
Measuring equipment : TOPCON BM-5A and PR-650

* Ta = 25 ± 2 °C, V_{DD}=3.3V, f_V= 60Hz, f_{DCLK}= 70.9MHz, I_L = 21mA

Item		Symbol	Condition	Min.	Typ.	Max	Unit	Note
Contrast Ratio (5 Points)		CR		300	450	-	-	(1), (2), (5)
Response Time at Ta (Rising + Falling)		T _{RT,B/W}		-	16	25	msec	(1), (3)
Average Luminance of White (5 Points)		Y _{L,AVE}	Normal Viewing Angle ϕ = 0 θ = 0	170	200	-	cd/m²	(1), (4)
Color Chromaticity (CIE)	Red	R _X		-0.030	0.566	+0.030	-	(1), (5) PR-650
		R _Y			0.347			
	Green	G _X			0.346			
		G _Y			0.562			
	Blue	B _X			0.167			
		B _Y			0.111			
	White	W _X			0.313			
		W _Y			0.329			
Color Gamut				-	45	-	%	
Viewing Angle	Hor.	θ _L		CR ≥ 10	40	-	-	Degrees
		θ _R	40		-	-		
	Ver.	ϕ _H	10		-	-		
		ϕ _L	30		-	-		
13 Points White Variation		δ _L		-	-	1.54	-	(6)

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Note 1) Definition of Viewing Angle : Viewing angle range($10 \leq C/R$)

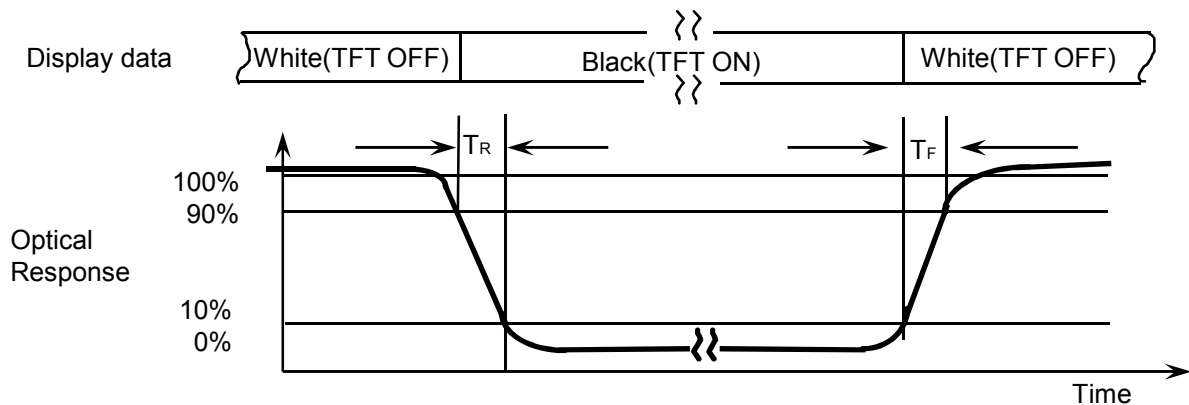


Note 2) Definition of Contrast Ratio (CR) : Ratio of gray max (Gmax) ,gray min (Gmin) at 5 points (33, 55, 77, 37, 73)

$$CR = \frac{CR(33) + CR(55) + CR(77) + CR(37) + CR(73)}{5}$$

Points : 33, 55, 77, 37, 73 at the figure of Note (6).

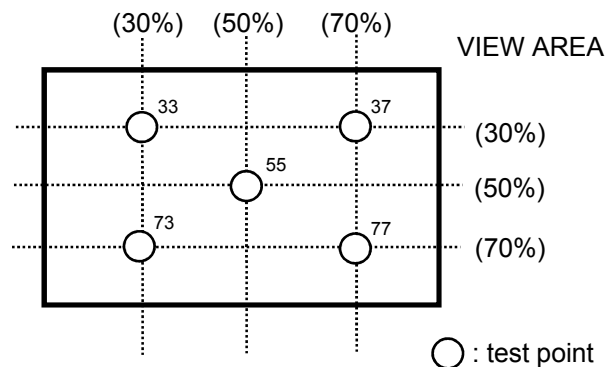
Note 3) Definition of Response time :



Note 4) Definition of Average Luminance of White : measure the luminance of white at 5 points.

Average Luminance of White ($Y_{L,AVE}$)

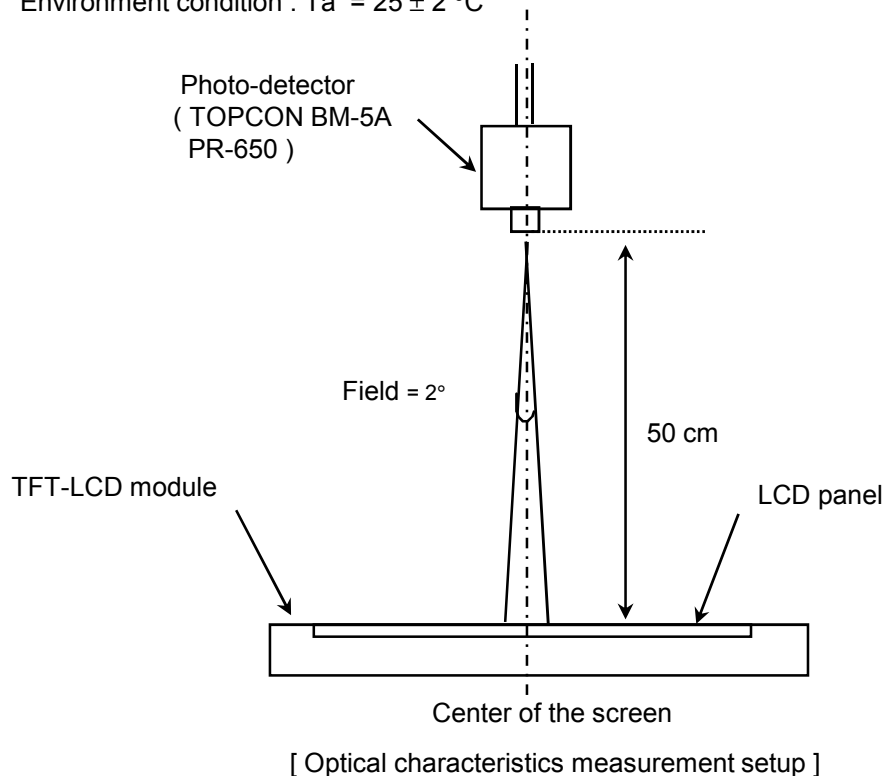
$$Y_{L,AVE} = \frac{Y_{L33} + Y_{L55} + Y_{L77} + Y_{L37} + Y_{L73}}{5}$$



○ : test point

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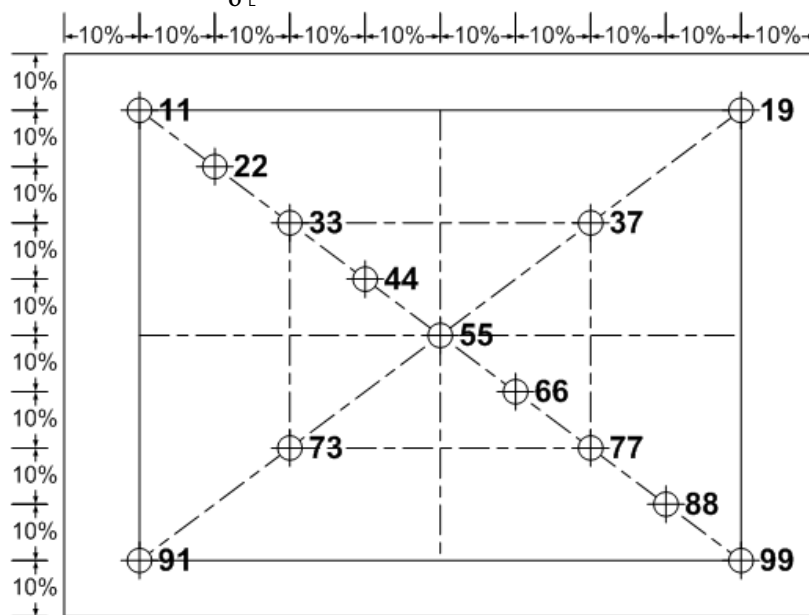
Note 5) After stabilizing and leaving the panel alone at a given temperature for 30 min , the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. 30 min after lighting the backlight. This should be measured in the center of screen.
Environment condition : $T_a = 25 \pm 2 \text{ }^{\circ}\text{C}$



Note 6) Definition of 13 points white variation (δ_L), [11 ~ 99]

$$\delta_L = \frac{\text{Maximum luminance of 13 points}}{\text{Minimum luminance of 13 points}}$$

$$\% \delta_L = 100 - \frac{100}{\delta_L}$$



○ : test point

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3. ELECTRICAL CHARACTERISTICS

3.1 TFT LCD MODULE

Ta= 25 ± 2°C

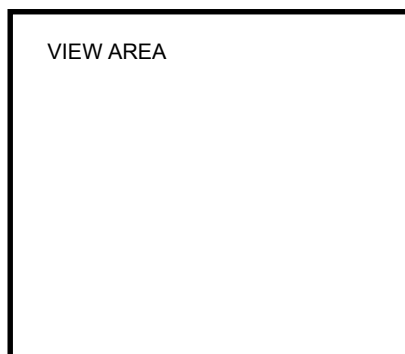
Item		Symbol	Min.	Typ.	Max.	Unit	Note
Voltage of Power Supply		V _{DD}	3.0	3.3	3.6	V	
Differential Input Voltage for LVDS Receiver Threshold	High	V _{IH}	-	-	+100	mV	V _{CM} = +1.2V
	Low	V _{IL}	-100	-	-	mV	
Vsync Frequency		f _v	-	60	-	Hz	
Hsync Frequency		f _h	-	47.6	-	KHz	f _v *793
Main Frequency		f _{DCLK}	-	70.9	-	MHz	f _h *1494
Rush Current		I _{RUSH}	-	-	1.5	A	(4)
Current of Power Supply	White	I _{DD}	-	250	-	mA	(2),(3)*a
	Mosaic		-	300	330	mA	(2),(3)*b

Note (1) Display data pins and timing signal pins should be connected.(GND = 0V)

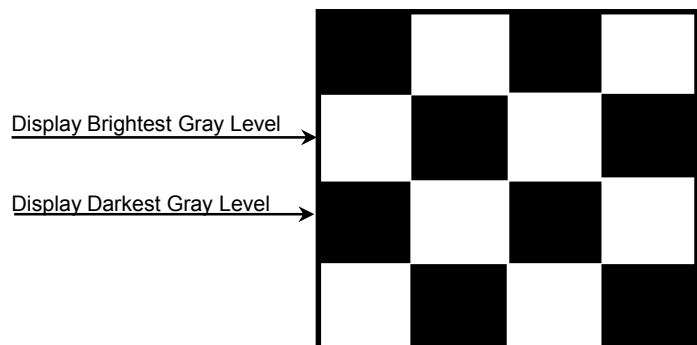
(2) f_v = 60Hz, f_{DCLK} = 70.9MHZ, V_{DD} = 3.3V , DC Current.

(3) Power dissipation pattern

*a) White Pattern

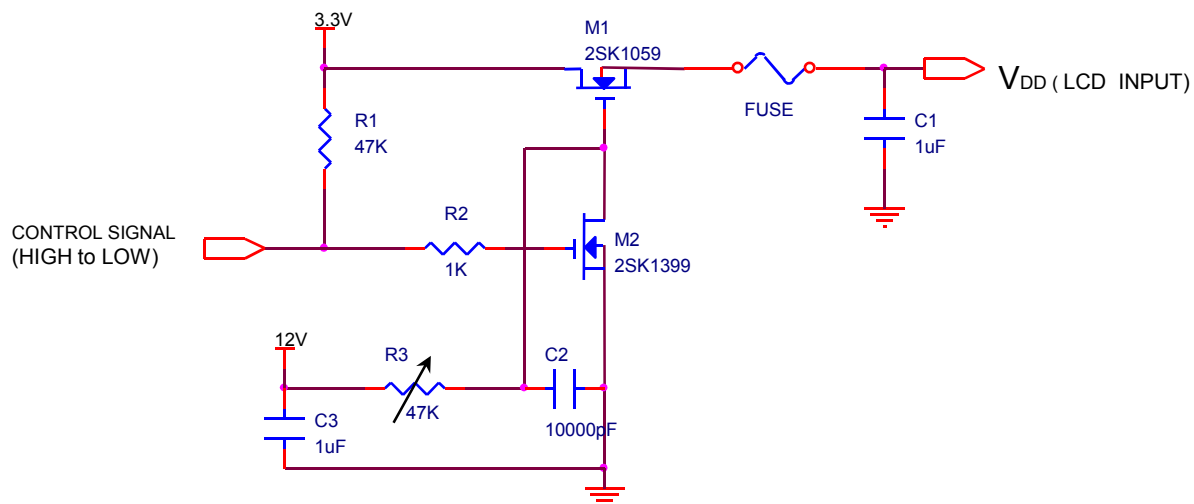


*b) Mosaic Pattern

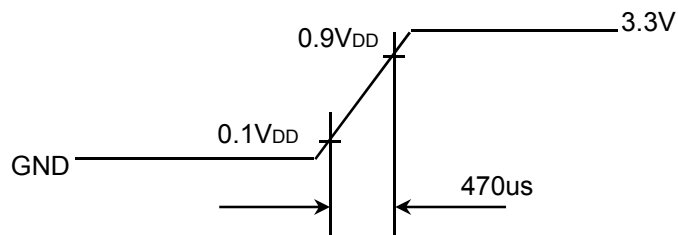


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4) Rush current measurement condition



V_{DD} rising time is 470us



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3.2 BACK-LIGHT UNIT

 $T_a = 25 \pm 2 \text{ }^{\circ}\text{C}$

Item	Symbol	Min.	Typ.	Max.	Unit	Note
LED Forward Current	IF	-	21	-	mA	
LED Forward Voltage	VF	-	3.2	-	V	
LED Array Voltage	VP	-	32	-	V	VF X 10 LEDs
Power Consumption	P	-	-	2.1	W	IF X VF X 30 LEDs
Operating Life Time	Hr	15000	-	-	Hour	(1)

Note (1) Life time (Hr) of LEDs can be defined as the time in which it continues to operate under the condition $T_a = 25 \pm 2 \text{ }^{\circ}\text{C}$ and $I_F = 21 \text{ mA}$ until one of the following event occurs.
When the brightness becomes 50% or lower than the original.

3.3 LED Driver

- On board LED Driver (Manufacturer : Richtech)

 $T_a = 25 \pm 2 \text{ }^{\circ}\text{C}$

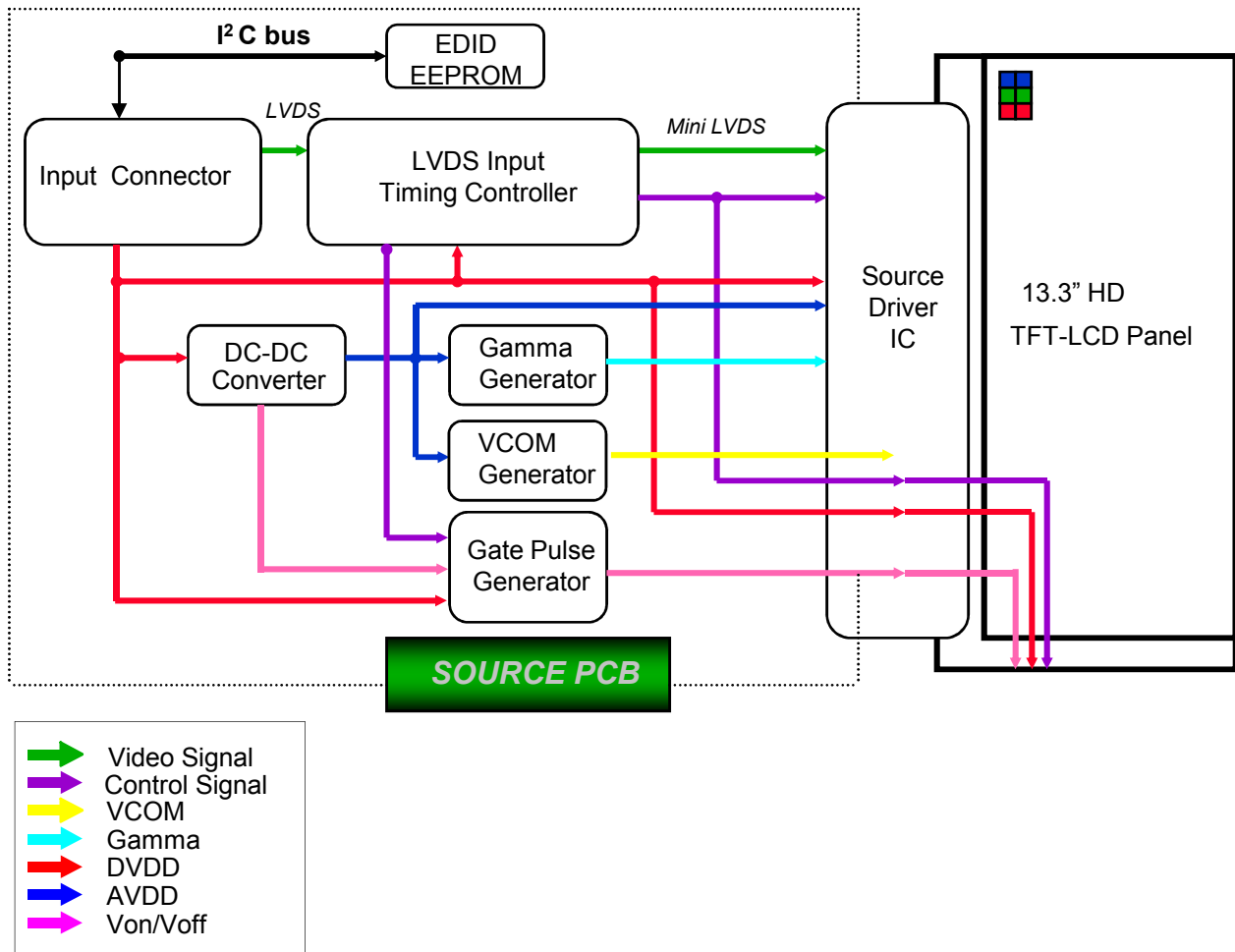
Item	Symbol	Min.	Typ.	Max.	Unit	Note
Input Voltage	V_{in}	7.5	12	21	V	
Output PWM Frequency	F_{PWM}	500	-	2000	kHz	No output PWM
PWM duty Ratio	D	10	-	100	%	PWM freq : 200Hz~10kHz
External PWM Dimming Control Frequency (BLIM)	F_{BLIM}	0.2	-	10	kHz	BLIM = PWM 0V ~ 3.3V

Note - Test Equipment : Fluke 45

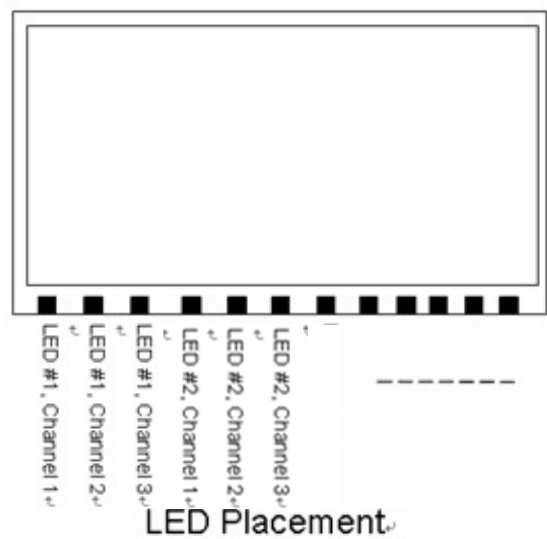
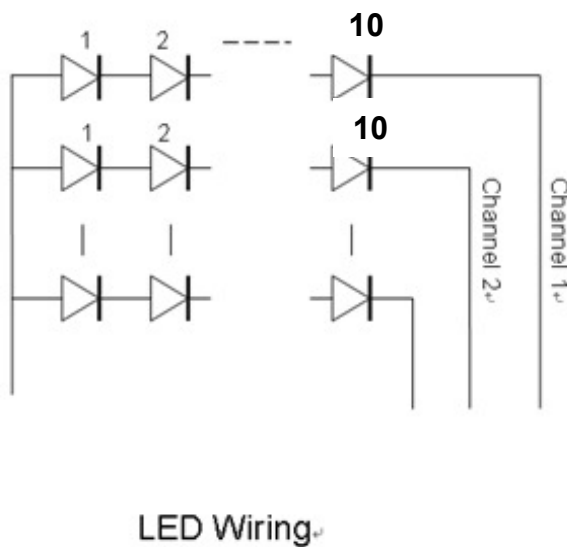
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4. BLOCK DIAGRAM

4.1 TFT LCD Module



4.2 LED connection and placement



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5. INPUT TERMINAL PIN ASSIGNMENT

5.1. Input Signal & Power

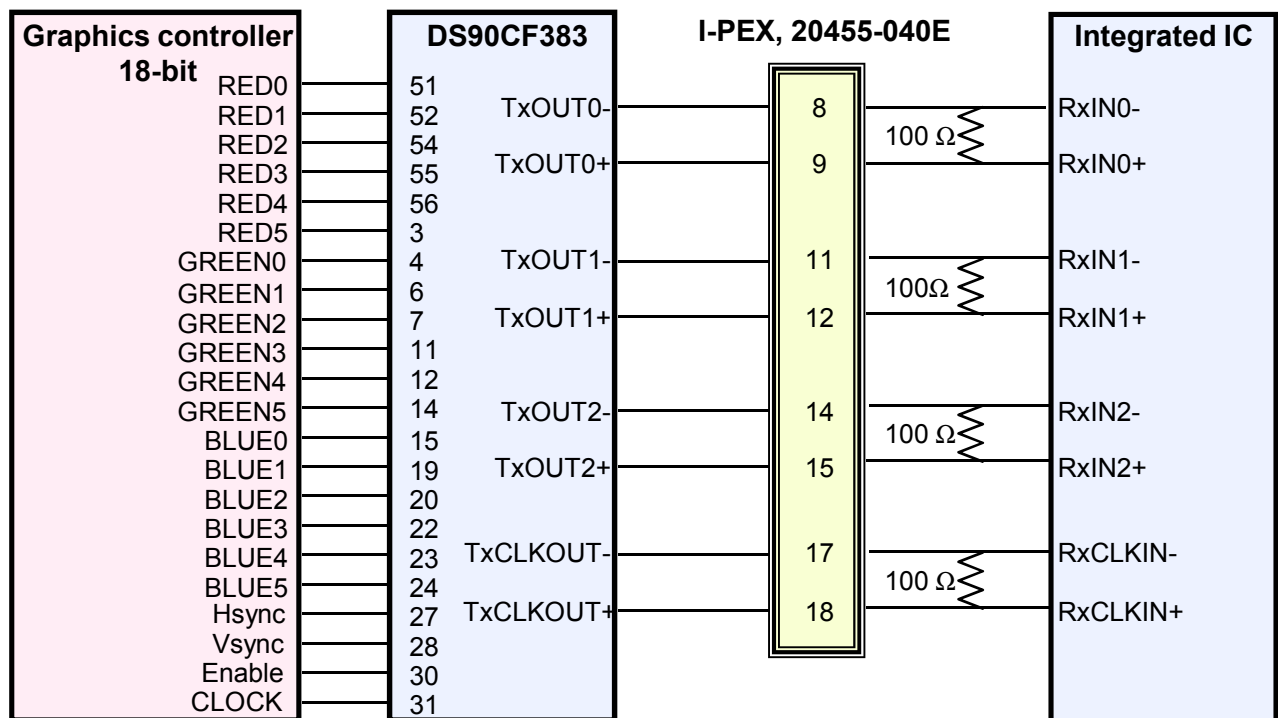
(LVDS, Connector : I-PEX, 20455-040E or equivalent – Locking type connector)

No.	Signal	Description
1	NC	No Connection
2~3	AVDD	Power Supply, 3.3V (typical)
4	DVDD	DDC 3.3V power
5	TEST	Panel Self Test
6	SCL	DDC Clock
7	SDA	DDC Data
8	Rin0-	-LVDS differential data input (R0-R5, G0)
9	Rin0+	+LVDS differential data input (R0-R5, G0)
10	GND	Ground
11	Rin1-	-LVDS differential data input (G1-G5, B0-B1)
12	Rin1+	+LVDS differential data input (G1-G5, B0-B1)
13	GND	Ground
14	Rin2-	-LVDS differential data input (B2-B5, HS, VS, DE)
15	Rin2+	+LVDS differential data input (B2-B5, HS, VS, DE)
16	GND	Ground
17	ClkIN-	-LVDS differential clock input
18	ClkIN+	+LVDS differential clock input
19	VSS	Ground - Shield
20~21	NC	No Connection
22	VSS	Ground
23~24	NC	No Connection
25	VSS	Ground
26~27	NC	No Connection
28	VSS	Ground
29~30	NC	No Connection
31~33	VSSLED	Ground - LED
34	NC	No Connection
35	PWM	System PWM Signal Input (+3.3V Swing)
36	LED_EN	LED enable pin (+3.3V Input)
37	DBC_EN	DBC enable from +2.5V to +3.3V ; DBC disable on Grounding
38~40	VBL+	LED Power Supply 7.5V~21V

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5.2 LVDS Interface : Transmitter DS90CF363 or Compatible

Pin No.	Name	RGB Signal	Pin No.	Name	RGB Signal
51	TxIN0	R0	14	TxIN14	G5
52	TxIN1	R1	15	TxIN15	B0
54	TxIN2	R2	19	TxIN18	B1
55	TxIN3	R3	20	TxIN19	B2
56	TxIN4	R4	22	TxIN20	B3
3	TxIN6	R5	23	TxIN21	B4
4	TxIN7	G0	24	TxIN22	B5
6	TxIN8	G1	27	TxIN24	Hsync
7	TxIN9	G2	28	TxIN25	Vsync
11	TxIN12	G3	30	TxIN26	DE
12	TxIN13	G4	31	TxCLKIN	Clock

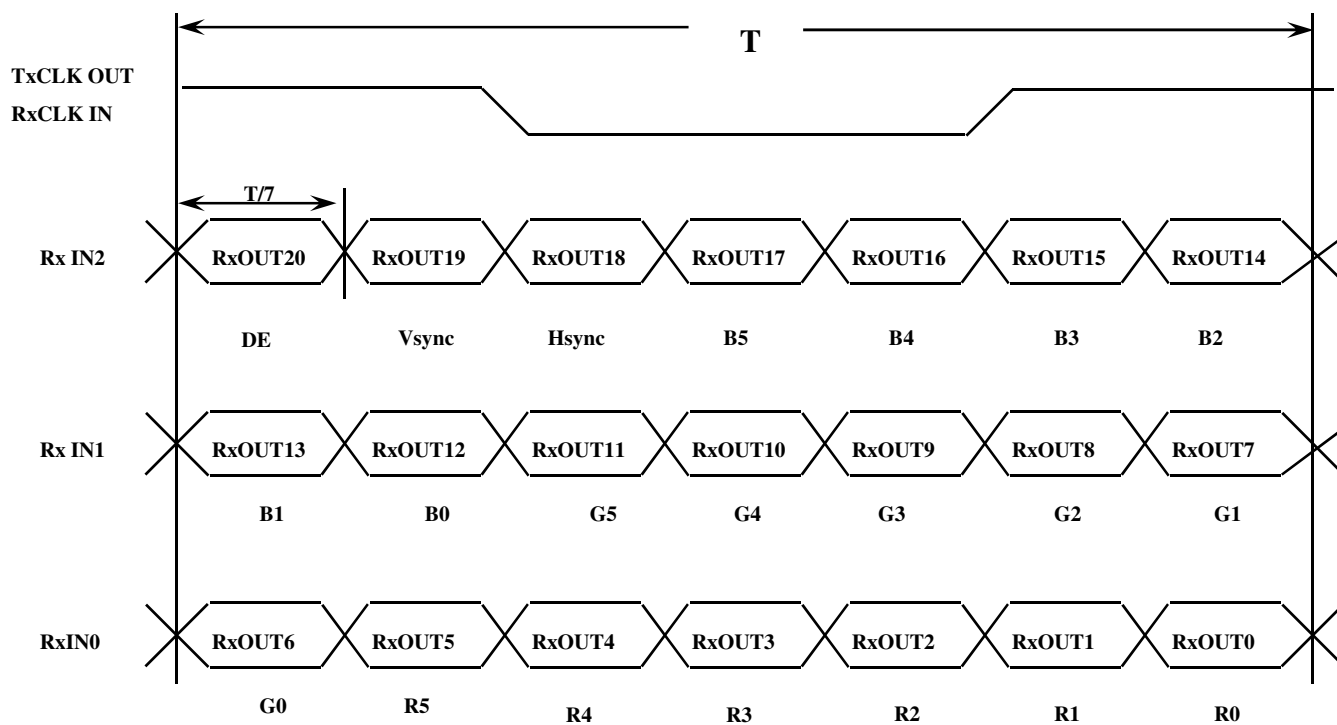
LVDS Interface

Note : The LCD Module uses a 100ohm resistor between positive and negative lines of each receiver input.

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5.3 Timing Diagrams of LVDS For Transmission

LVDS Receiver : Integrated T-CON



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5.4 Input Signals, Basic Display Colors and Gray Scale of Each Color

Color	Display	Data Signal																	Gray Scale Level	
		Red						Green						Blue						
		R0	R1	R2	R3	R4	R5	G0	G1	G2	G3	G4	G5	B0	B1	B2	B3	45		B5
Basic Colors	Black	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	1	1	1	1	1	1	-
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	-
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	-
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	-
	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	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R0
	Dark	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1
	↑	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R2
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	R3~R60
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	↓	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	R61
	Light	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	R62
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	R63
Gray Scale Of Green	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G0
	Dark	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	G1
	↑	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	G2
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	G3~G60
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	↓	0	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0	G61
	Light	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	G62
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	G63
Gray Scale Of Blue	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	B0
	Dark	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	B1
	↑	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	B2
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	B3~B60
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	↓	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	B61
	Light	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	B62
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	B63

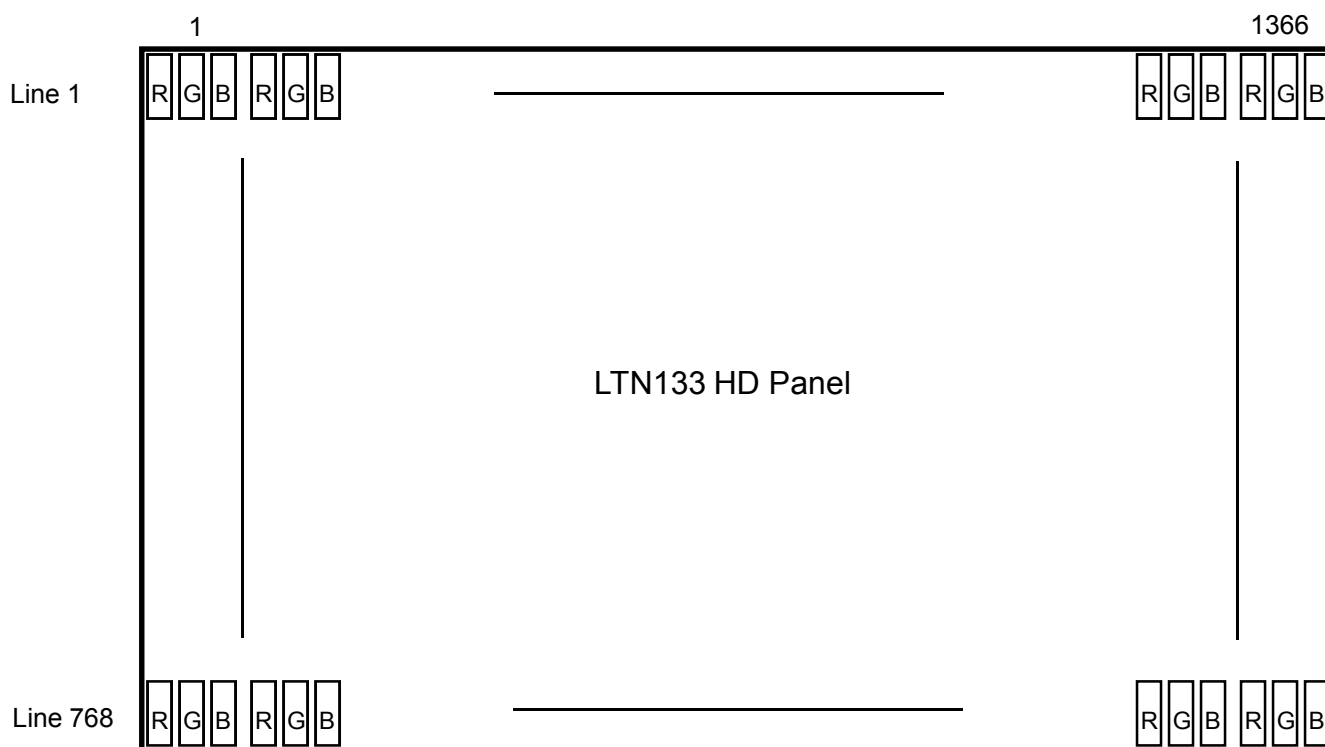
Note 1) Definition of gray :

Rn: Red gray, Gn: Green gray, Bn: Blue gray (n=gray level)

Note 2) Input signal: 0 =Low level voltage, 1=High level voltage

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5.5 Pixel Format in the display



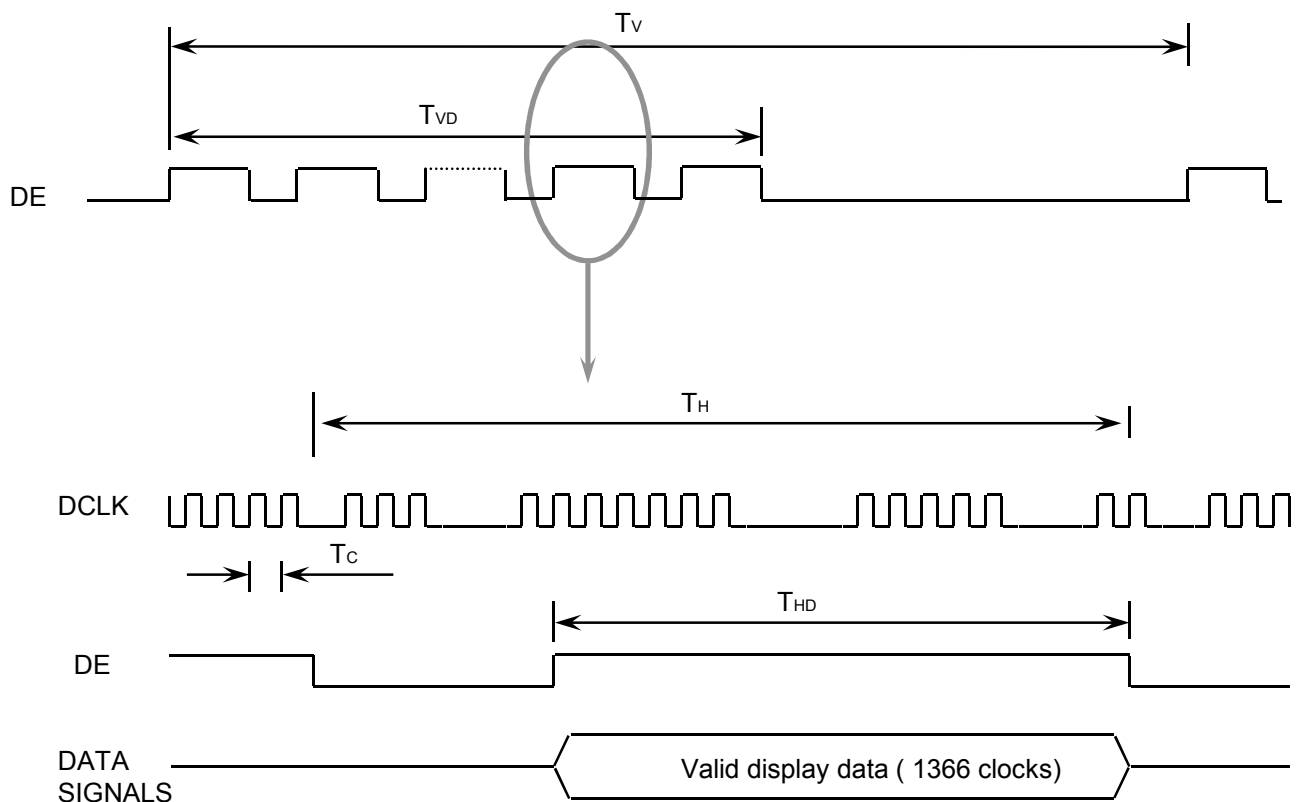
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6. INTERFACE TIMING

6.1 Timing Parameters

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
Frame Frequency	Cycle	T_V	773	793	974	Lines	
Vertical Active Display Term	Display Period	T_{VD}	-	768	-	Lines	
One Line Scanning Time	Cycle	T_H	1436	1494	1550	Clocks	
Horizontal Active Display Term	Display Period	T_{HD}	-	1366	-	Clocks	

6.2 Timing diagrams of interface signal

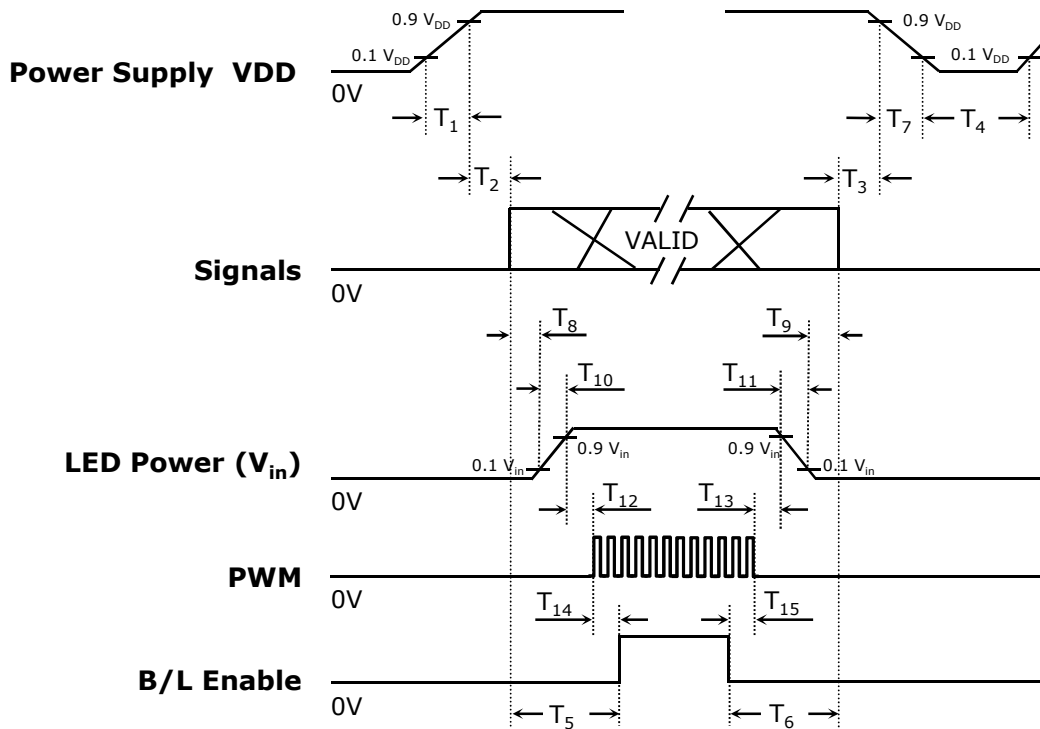


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6.3 Power ON/OFF Sequence

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: To prevent a latch-up or DC operation of the LCD module, the power on/off sequence should be as the diagram below.



Timing (ms)	Remarks
$0.5 < T_1 \leq 10$	V _{DD} rising time from 10% to 90%
$0 < T_2 \leq 50$	Delay from V _{DD} to valid data at power ON
$0 < T_3 \leq 50$	Delay from valid data OFF to V _{DD} OFF at power Off
$500 \leq T_4$	V _{DD} OFF time for Windows restart
$200 \leq T_5$	Delay from valid data to B/L enable at power ON
$200 \leq T_6$	Delay from valid data off to B/L disable at power Off
$0 < T_7 \leq 10$	V _{DD} falling time from 90% to 10%
$10 < T_8$	Delay from valid data on to LED driver Vin rising time 10%
$10 < T_9$	Delay from LED driver Vin falling time 10% to valid data Off
$0.5 < T_{10} \leq 10$	LED V _{in} rising time from 10% to 90%
$0.5 < T_{11} \leq 10$	LED V _{in} falling time from 90% to 10%
$10 < T_{12}$	Delay from LED driver Vin rising time 90% to PWM ON
$10 < T_{13}$	Delay from PWM Off to LED driver Vin falling time 10%
$10 < T_{14}$	Delay from PWM ON to B/L Enable ON
$10 < T_{15}$	Delay from B/L Enable Off to PWM Off

Note : Backlight may flash if interface signal remains floating state at invalid period.

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NOTE.

- (1) The supply voltage of the external system for the module input should be the same as the definition of V_{DD} .
- (2) Apply the lamp voltage within the LCD operation range. When the back-light turns on before the LCD operation or the LCD turns off before the back-light turns off, the display may momentarily become white.
- (3) In case of V_{DD} = off level, please keep the level of input signals on the low or keep a high impedance.
- (4) T4 should be measured after the module has been fully discharged between power off and on period.
- (5) Interface signal shall not be kept at high impedance when the power is on.

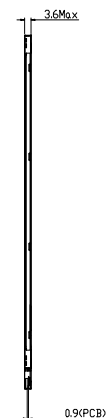
7. Mechanical Outline Dimension

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Refer to the next page

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1. SIGNAL INTERFACE CONNECTOR TO BE SPECIFIED AS BELOW:
- PART NO./MAKER : MOLEX 104062-4011 / MOLEX
2. LED CONNECTOR FOR BACKLIGHT TO BE SPECIFIED AS BELOW
- PART NO./MAKER : PT503-00B-C11/UJ1
3. MEASURING FORCE : 500gf
4. WEIGHT : 290g MAX
5. In order to avoid IC damage, it is not allow that overlapping of cables or antennas, camera, WLAN, WLAN over these CDF location

GENERAL TOLERANCE					REV	DATE	DESCRIPTION OF REVISION			REASON	CHK'D BY
STEP	LEVEL 1	LEVEL 2	LEVEL 3		UNIT	DRAWN BY	DESIGNED BY	CHK'D BY	APP'D BY		
0 < X < 4	±0.05	±0.1	±0.2		SCALE	1:1	Y.J.SID			MODEL NAME	PTN33AT27-202
4 < X < 16	±0.08	±0.15	±0.3		SCALE					PART/SHEET NAME	OUTLINE DIMENSION
16 < X < 64	±0.12	±0.25	±0.5								DET 1/1
64 < X < 256	±0.25	±0.4	±0.8							CODE NO.	VER 000
SAMSUNG ELECTRONICS											

8. PACKING

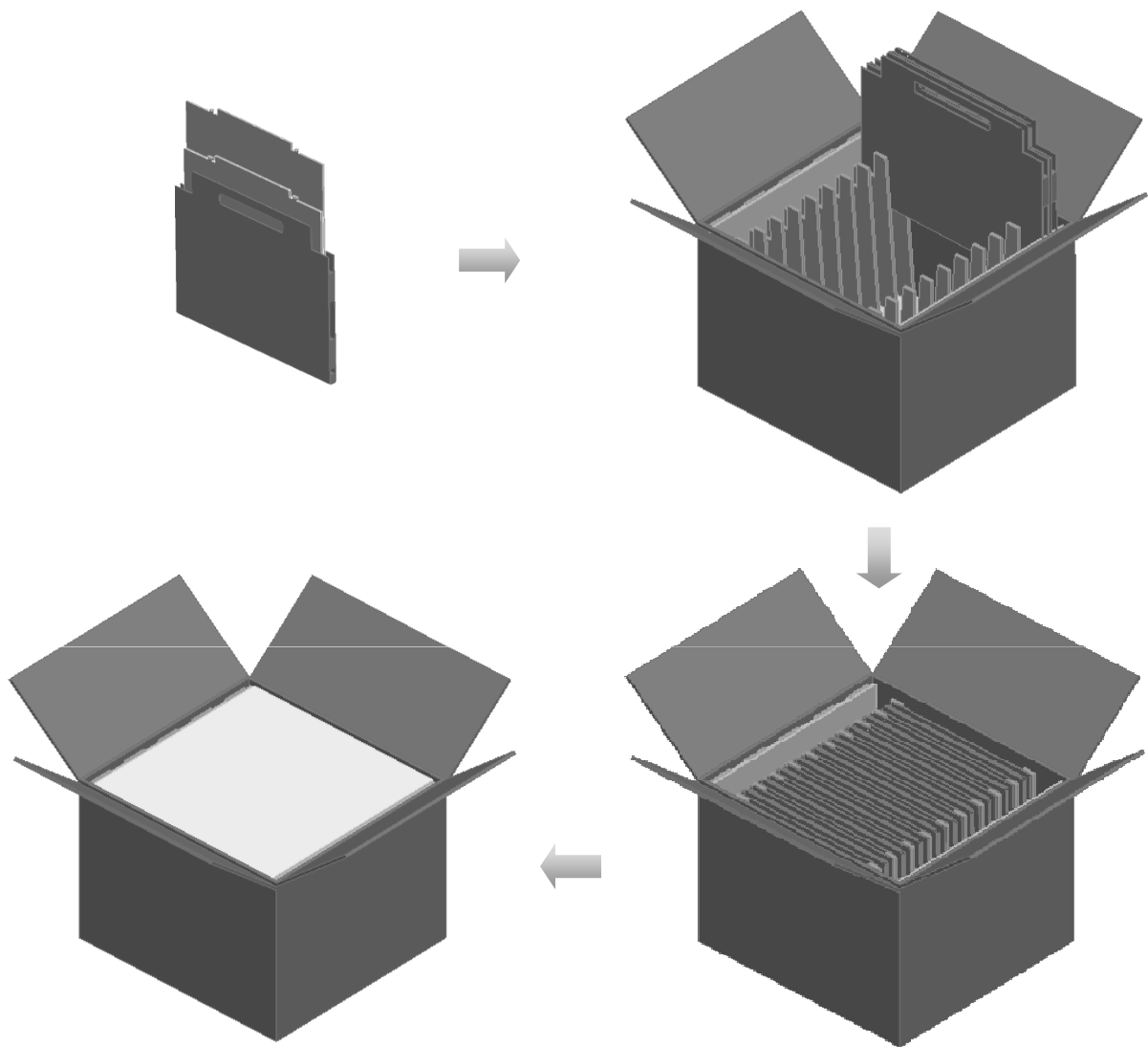
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1. CARTON(Internal Package)

(1) Packing Form

Corrugated Cardboard box and EPS form as shock absorber

(2) Packing Method



Note (1) Acceptance number of piling : 36EA / Box

(2) Weight : Approx. 13.5 kg / Box

(3) Packing box size: 373 X 392 X 288 mm

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No	Part name	Quantity
1	Static electric protective sack	36EA
2	Packing case (Inner box) included shock absorber	1 set

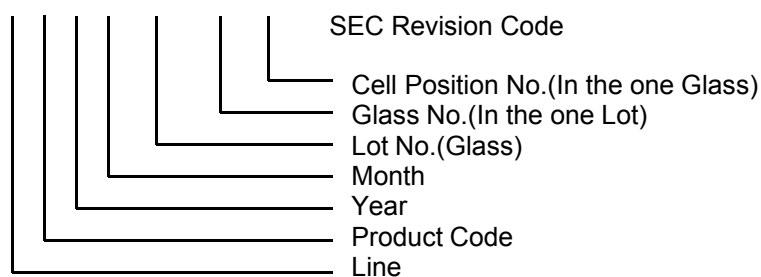
9. MARKINGS & OTHERS

A nameplate bearing followed by is affixed to a shipped product at the specified location on each product.

(1) Parts number : LTN133AT27-2

(2) Revision : Three letters

(3) Lot number : 6 H 8 J XXX XX X 202



(4) Nameplate Indication



Parts name : LTN133AT27-2

Lot number : 6H8Jxxxxxx

Inspected work week : 1209

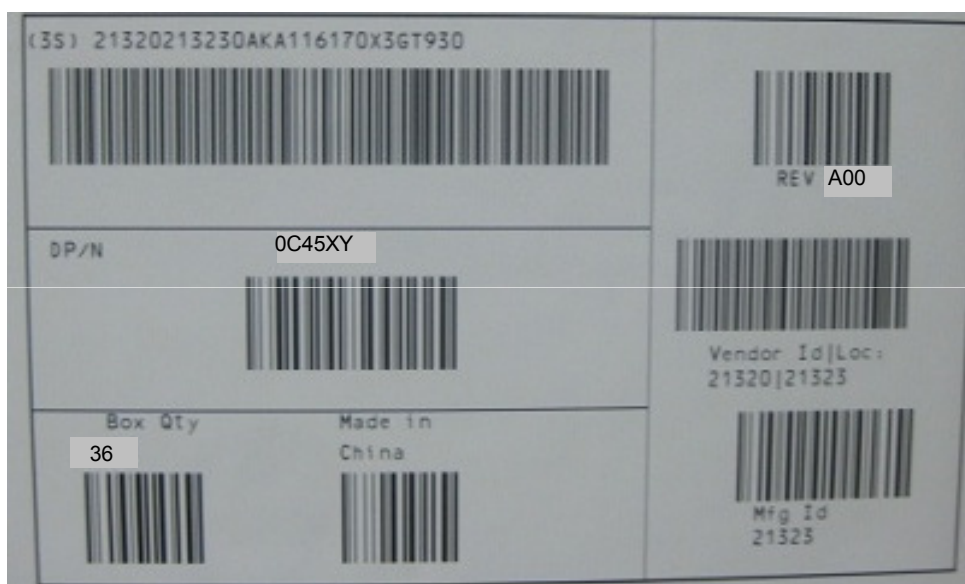
DP/N : Dell Part Number ("0C45XY" is for LTN133AT27-2)

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※ Panel revision code scheme

Build Name(s)	Revision Code(s)
SST (WS)	X00, X01, X02, ... X09
PT (ES)	X10, X11, X12, ... X19
ST (CS)	X20, X21, X23, ... X29
XB (MP)	A00, A01, A02, ... A99

(6) Packing box attach



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10. GENERAL PRECAUTIONS

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1. Handling

- (a) When the module is assembled, It should be attached to the system firmly using every mounting holes. Be careful not to twist and bend the modules.
- (b) Refrain from strong mechanical shock and / or any force to the module. In addition to damage, this may cause improper operation or damage to the module and CCFT back-light.
- (c) Note that polarizers are very fragile and could be easily damaged. Do not press or scratch the surface harder than a HB pencil lead.
- (d) Wipe off water droplets or oil immediately. If you leave the droplets for a long time, Staining and discoloration may occur.
- (e) If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.
- (f) The desirable cleaners are water, IPA (Isopropyl Alcohol) or Hexane.
Do not use Ketone type materials(ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.
- (g) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, legs or clothes, it must be washed away thoroughly with soap.
- (h) Protect the module from static, it may cause damage to the C-MOS Gate Array IC.
- (i) Use fingerstalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.
- (j) Do not disassemble the module.
- (k) Do not pull or fold the lamp wire.
- (l) Do not adjust the variable resistor which is located on the back side.
- (m) Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.
- (n) Pins of I/F connector shall not be touched directly with bare hands.

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2. STORAGE

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- (a) Do not leave the module in high temperature, and high humidity for a long time.
It is highly recommended to store the module with temperature from 5 to 40 °C and relative humidity of less than 70%.
- (b) Do not store the TFT-LCD module in direct sunlight.
- (c) The module shall be stored in a dark place. It is prohibited to apply sunlight or fluorescent light during the store.
- (d) Storage period is recommended not to exceed 1 year

3. OPERATION

- (a) Do not connect, disconnect the module in the “ Power On” condition.
- (b) Power supply should always be turned on/off by following item 6.3
“ Power on/off sequence “.
- (c) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.
- (d) The FPC cable between the LED chips and its converter power supply shall be a minimized length and be connected directly . The longer cable between the back-light and the converter may cause lower luminance of light source (LED).
- (e) The standard limited warranty is only applicable when the module is used for general notebook applications. If used for purposes other than as specified, SEC is not to be held reliable for the defective operations. It is strongly recommended to contact SEC to find out fitness for a particular purpose.

4. OTHERS

- (a) Ultra-violet ray filter is necessary for outdoor operation.
- (b) Avoid condensation of water. It may result in improper operation or disconnection of electrode.
- (c) Do not exceed the absolute maximum rating value. (the supply voltage variation, input voltage variation, variation in part contents and environmental temperature, so on)
Otherwise the module may be damaged.
- (d) If the module displays the same pattern continuously for a long period of time, it can be the situation when the image “sticks” to the screen.
- (e) This module has its circuitry PCB's on the rear side and should be handled carefully in order not to be stressed.

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11. EDID

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	Byte (hex)	Field Name and Comments	Value (hex)	Value (binary)
Header	0	Header	00	00000000
	1	Header	FF	11111111
	2	Header	FF	11111111
	3	Header	FF	11111111
	4	Header	FF	11111111
	5	Header	FF	11111111
	6	Header	FF	11111111
Vendor / Product EDID Version	7	Header	00	00000000
	8	EISA manufacture code = 3 Character ID	4C	01001100
	9	EISA manufacture code (Compressed ASCII)	A3	10100011
	0A	Panel Supplier Reserved – Product Code	41	01000001
	0B	Panel Supplier Reserved – Product Code	54	01010100
	0C	LCD module Serial No - Preferred but Optional (“0” if not used)	00	00000000
	0D	LCD module Serial No - Preferred but Optional (“0” if not used)	00	00000000
	0E	LCD module Serial No - Preferred but Optional (“0” if not used)	00	00000000
	0F	LCD module Serial No - Preferred but Optional (“0” if not used)	00	00000000
	10	Week of manufacture	00	00000000
	11	Year of manufacture	15	00010101
	12	EDID structure version # = 1	01	00000001
	13	EDID revision # = 4	04	00000100
Display Parameters	14	Video I/P definition = Digital I/P	90	10010000
	15	Max H image size = (Rounded to cm)	1D	00011101
	16	Max V image size = (Rounded to cm)	10	00010000
	17	Display gamma = (gamma ×100)-100= Example: (2.2×100) – 100 = 120	78	01111000
Panel Color Coordinates	18	Feature support (DPM (Standby, Suspend, Active), Color Type, Other Feature)	0A	00001010
	19	Red/Green Low bit (RxRy/GxGy)	4B	01001011
	1A	Blue/White Low bit (BxBY/WxWy)	C5	11000101
	1B	Red X Rx = 0.xxx	9C	10011100
	1C	Red Y Ry = 0.xxx	57	01010111
	1D	Green X Gx = 0.xxx	54	01010100
	1E	Green Y Gy = 0.xxx	8C	10001100
	1F	Blue X Bx = 0.xxx	27	00100111
	20	Blue Y By = 0.xxx	17	00010111
	21	White X Wx = 0.xxx	50	01010000
Established timings Standard Timing ID	22	White Y Wy = 0.xxx	54	01010100
	23	Established timings 1 (00h if not used)	00	00000000
	24	Established timings 2 (00h if not used)	00	00000000
	25	Manufacturer’s timings (00h if not used)	00	00000000
	26	Standard timing ID1 (01h if not used)	01	00000001
	27	Standard timing ID1 (01h if not used)	01	00000001
	28	Standard timing ID2 (01h if not used)	01	00000001
	29	Standard timing ID2 (01h if not used)	01	00000001
	2A	Standard timing ID3 (01h if not used)	01	00000001
	2B	Standard timing ID3 (01h if not used)	01	00000001
	2C	Standard timing ID4 (01h if not used)	01	00000001
	2D	Standard timing ID4 (01h if not used)	01	00000001
	2E	Standard timing ID5 (01h if not used)	01	00000001
	2F	Standard timing ID5 (01h if not used)	01	00000001
	30	Standard timing ID6 (01h if not used)	01	00000001
	31	Standard timing ID6 (01h if not used)	01	00000001
	32	Standard timing ID7 (01h if not used)	01	00000001
	33	Standard timing ID7 (01h if not used)	01	00000001
	34	Standard timing ID8 (01h if not used)	01	00000001
	35	Standard timing ID8 (01h if not used)	01	00000001

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Timing Descriptor #1	36	Pixel Clock/10,000 (LSB)	B2	10110010
	37	Pixel Clock/10,000 (MSB)	1B	00011011
	38	Horizontal Active = xxxx pixels (lower 8 bits)	56	01010110
	39	Horizontal Blanking (Thbp) = xxxx pixels (lower 8 bits)	82	10000010
	3A	Horizontal Active/Horizontal blanking (Thbp) (upper4:4 bits)	50	01010000
	3B	Vertical Active = xxxx lines	00	00000000
	3C	Vertical Blanking (Tvbp) = xxxx lines (DE Blanking typ. for DE only panels)	16	00010110
	3D	Vertical Active : Vertical Blanking (Tvbp) (upper4:4 bits)	30	00110000
	3E	Horizontal Sync, Offset (Thfp) = xxxx pixels	30	00110000
	3F	Horizontal Sync, Pulse Width = xxxx pixels	20	00100000
	40	Vertical Sync, Offset (Tvfp) = xx lines Sync Width = xx lines	55	01010101
	41	Horizontal Vertical Sync Offset/Width upper 2 bits	00	00000000
	42	Horizontal Image Size =xxx mm	25	00100101
	43	Vertical image Size = xxx mm	A5	10100101
	44	Horizontal Image Size / Vertical image size	10	00010000
	45	Horizontal Border = 0 (Zero for Notebook LCD)	00	00000000
	46	Vertical Border = 0 (Zero for Notebook LCD)	00	00000000
	47	Bit[7] 0: Non-interlace, 1: Interlace Bit[6:5] 00: Normal display, no stereo, XX: See table xx for definition Bit[4:3] 00: Analog composite, 01: Bipolar analog composite, 10: Digital composite, 11: Digital separate Bit[2:1] :The interpretation of bits 2 and 1 is dependent on the decode of bits 4 and 3 - see Table 3.18. Bit[0] :See Table VESA EDID spec for definition Referenced Default = 1Ah	1A	00011010
Timing Descriptor #2	48	Pixel Clock/10,000 (LSB)	B2	10110010
	49	Pixel Clock/10,000 (MSB)	1B	00011011
	4A	Horizontal Active = xxxx pixels (lower 8 bits)	56	01010110
	4B	Horizontal Blanking (Thbp) = xxxx pixels (lower 8 bits)	F8	11111000
	4C	Horizontal Active/Horizontal blanking (Thbp) (upper4:4 bits)	51	01010001
	4D	Vertical Active = xxxx lines	00	00000000
	4E	Vertical Blanking (Tvbp) = xxxx lines (DE Blanking typ. for DE only panels)	B4	10110100
	4F	Vertical Active : Vertical Blanking (Tvbp) (upper4:4 bits)	30	00110000
	50	Horizontal Sync, Offset (Thfp) = xxxx pixels	30	00110000
	51	Horizontal Sync, Pulse Width = xxxx pixels	20	00100000
	52	Vertical Sync, Offset (Tvfp) = xx lines Sync Width = xx lines	55	01010101
	53	Horizontal Vertical Sync Offset/Width upper 2 bits	00	00000000
	54	Horizontal Image Size =xxx mm	25	00100101
	55	Vertical image Size = xxx mm	A5	10100101
	56	Horizontal Image Size / Vertical image size	10	00010000
	57	Horizontal Border = 0 (Zero for Notebook LCD)	00	00000000
	58	Vertical Border = 0 (Zero for Notebook LCD)	00	00000000
	59	Bit[7] 0: Non-interlace, 1: Interlace Bit[6:5] 00: Normal display, no stereo, XX: See table xx for definition Bit[4:3] 00: Analog composite, 01: Bipolar analog composite, 10: Digital composite, 11: Digital separate Bit[2:1] :The interpretation of bits 2 and 1 is dependent on the decode of bits 4 and 3 - see Table 3.18. Bit[0] :See Table VESA EDID spec for definition Referenced Default = 1Ah	1A	00011010

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Timing Descriptor #3 Dell specific information	5A	Flag	00	00000000
	5B	Flag	00	00000000
	5C	Flag	00	00000000
	5D	Data Type Tag: Alphanumeric Data String (ASCII)	FE	11111110
	5E	Flag	00	00000000
	5F	Dell P/N 1 st Character	43	01000011
	60	Dell P/N 2 nd Character	34	00110100
	61	Dell P/N 3 rd Character	35	00110101
	62	Dell P/N 4 th Character	58	01011000
	63	Dell P/N 5 th Character	59	01011001
	64	LCD Supplier EEDID Revision # Bit[7] : 0=X, 1=A Bit[6:0] : 00, 01, 02... for SST 10, 11, 12... for PT 20, 21, 22... for ST 00, 01, 02... for X-Build (if Bit[7]=1)	80	10000000
	65	Manufacturer P/N	31	00110001
	66	Manufacturer P/N	33	00110011
	67	Manufacturer P/N	33	00110011
	68	Manufacturer P/N	41	01000001
	69	Manufacturer P/N	54	01010100
	6A	Manufacturer P/N	0A	00001010
	6B	Manufacturer P/N (If <13 char, then terminate with ASCII code 0Ah, set remaining char = 20h)	20	00100000
Timing Descriptor #4	6C	Flag	00	00000000
	6D	Flag	00	00000000
	6E	Flag	00	00000000
	6F	Data Type Tag: Manufacturer Specified Data 00	00	00000000
	70	Flag	00	00000000
	71	Color Management (True Color Depth, 2-bit FRC)	00	00000000
	72	Panel Type & Configurations (Bulb/LED string #, Structure Revision, Panel Structure)	41	01000001
	73	Frame Rate Details (SDRRS, DRRS, Max Frame Rate, Min Frame Rate)	21	00100001
	74	Light Controller Interface and Maximum Typical Luminance	94	10010100
	75	Front Surface / Polarizer and Pixel Structure (Transflective, AG/Glossy)	00	00000000
	76	Multi-Media Features (Dynamic Backlight Control, Color Management)	10	00010000
	77	Multi-Media Features (Active Gamma Control, Motion Blur)	00	00000000
	78	Special Features #1 (In-Cell Scanner, Wireless)	00	00000000
	79	Special Features #2 (In-Cell Touch, Interface, Over Drive, LVDS Channel or eDP Lane)	01	00000001
	7A	Special Features #3 (3D, E-Privacy, BIST Support)	01	00000001
Checksum	7B	(If <13 char, then terminate with ASCII code 0Ah, set remaining char = 20h)	0A	00001010
	7C	(If <13 char, then terminate with ASCII code 0Ah, set remaining char = 20h)	20	00100000
	7D	(If <13 char, then terminate with ASCII code 0Ah, set remaining char = 20h)	20	00100000
	7E	Extension flag (# of optional 128 EDID extension blocks to follow, Typ = 0)	00	00000000
	7F	Checksum (The 1-byte sum of all 128 bytes in this EDID block shall = 0)	14	00010100

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