



LITEMAX LF1745

Sunlight Readable 17" LCD Display

(1st Edition 12/30/2005)

All information is subject to change without notice.

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Contents

Introduction and Overview...3

General Specifications...4

Functional Block Diagram

Optical Characteristics

Pixel format image.

Electrical characteristics...9

Absolute Maximum Ratings

Connectors

Signal Pin

Signal Description

Signal Electrical Characteristics

Interface Timing

Timing Characteristics

Timing Definition

Power Consumption

Power ON/OFF Sequence

Backlight Characteristics...17

Signal for Lamp connector

Reliability and Lifetime...18

Mechanical Characteristics...19

Litemax LI1017A Inverter...20

INTRODUCTION AND OVERVIEW

This is a product specification that specifies form, fit, and function of the 17" TFT LCD monitor and its options. The LF1745 products are a family of high bright LCD monitors intended for use in a variety of industrial and commercial applications. Some of these applications include automatic teller machines (ATMs), fuel dispensing systems, ticketing and information kiosks, and intelligent vending machines. The LCD panel for LF1745 has a particularly fast response time of 16ms and consequently very well suited for video applications. The LF1745 is a 17" active matrix TFT LCD with a native resolution of 1280X1024. It has a typical luminance of 1000 nits with a +12VDC input. The video interface is through a standard 15 pin analog input with an integrated On-Screen Display (OSD).

OUTLINE

STRUCTURE AND PRINCIPLE

LF1745 module is composed of the driver LSIs for driving the TFT (Thin Film Transistor) array with an amorphous silicon thin film transistor liquid crystal display (a-Si TFT LCD) panel structure and a backlight. The a-Si TFT LCD panel structure is injected liquid crystal material into the narrow gap between a TFT array glass substrate and a color filter glass substrate.

RGB (Red, Green, and Blue) data signals from a source system are modulated into a form suitable for active matrix addressing by the onboard signal processor and sent to the driver LSIs which in turn address the individual TFT cells.

Working as an electro-optical switch, each TFT cell regulates transmitted light from the backlight assembly when worked by the data source. Color images are created by regulating the amount of transmitted light through the array of red, green and blue dots.

APPLICATIONS

. Kiosk, Public, Health Application, LCD TV, POI, Ticketing, Advertising, Gaming, Industrial Computing, Signage...

FEATURES

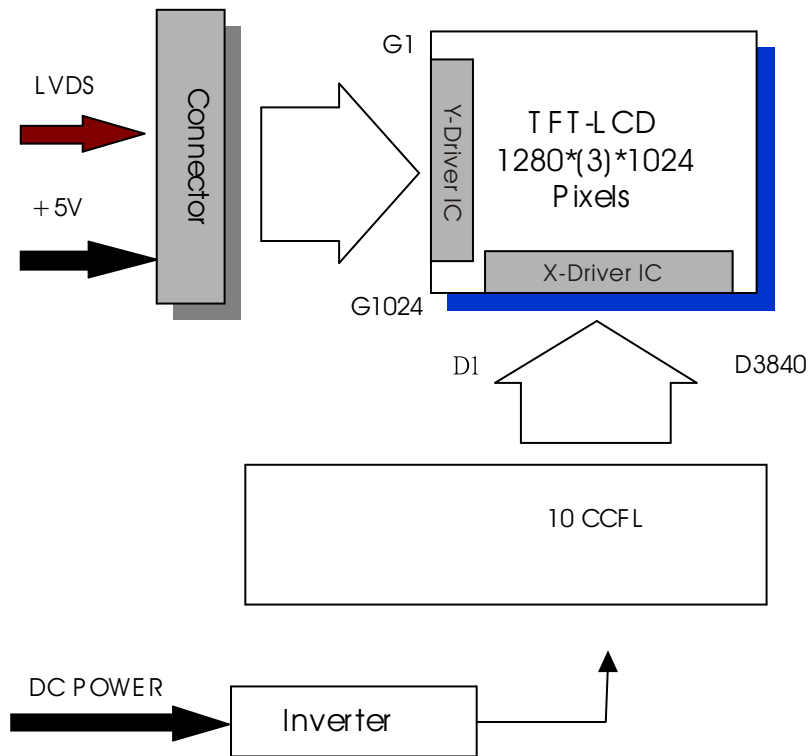
- . wide viewing angle
- . Fast response time
- . High luminance
- . High contrast
- . Wide color gamut
- . Luminance control
- . Small foot prints

GENERAL SPECIFICATIONS

Display area	337.92 (H) x 270.336 (V) mm
Drive system	a-Si TFT active matrix
Display colors	16.2M(262K+FRCdata)
Number of pixels	1280 (H) x 1024 (V) pixel
Pixel arrangement	RGB (Red, Green, Blue) vertical stripe
Pixel pitch	0.264 (H) x 0.264 (V) mm
Module size	358.5(H) x 296.5 (V) x 29(D) mm
Weight	1670 g (typ.)
Contrast ratio	500:1 (typ.)
Viewing angle	At the contrast ratio 10:1 . Horizontal: Left side 80° (typ.), Right side 80° (typ.) . Vertical: Up side 75° (typ.), Down side 75° (typ.)
Designed viewing direction	. Optimum grayscale (=2.2): perpendicular
Polarizer pencil-hardness	3H (min.) [by JIS K5400]
Color gamut	At LCD panel center 60% (typ.) [against NTSC color space] Ton (black 10% white 90%)
Response time	16 ms (typ.)
Luminance	1000 cd/m ² (typ.)
Backlight	. Backlight unit: AU 1745 . Inverter: LI1017A
Power consumption	At maximum luminance and checkered flag pattern 55 W (typ.)

Functional Block Diagram

The following diagram shows the functional block of the 17.0 inches Color TFT-LCD Module:

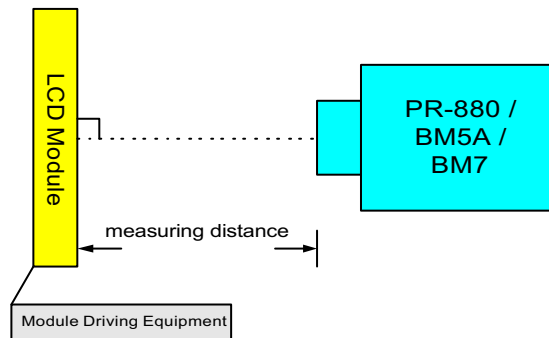


Optical Characteristics

The optical characteristics are measured under stable conditions at 25 (Room Temperature) :

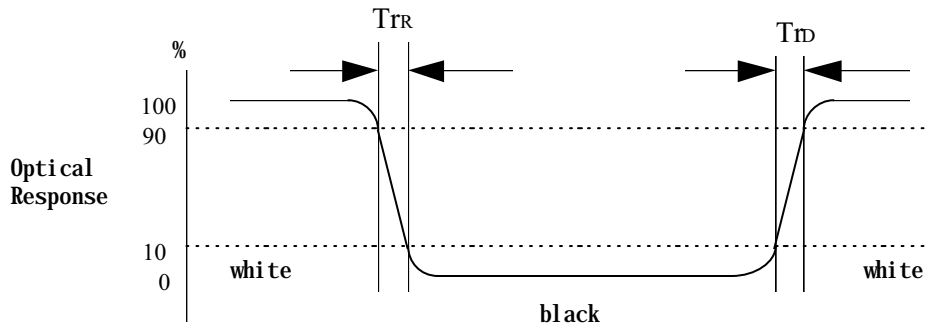
Item	Unit	Conditions	Min.	Typ.	Max.
Viewing Angle	[degree]	Horizontal (Right) CR = 10 (Left)	60 60	80 80	-
		Vertical (Up) CR = 10 (Down)	60 60	75 75	-
		Horizontal (Right) CR = 5 (Left)	70 70	85 85	-
		Vertical (Up) CR = 5 (Down)	70 70	80 80	-
Contrast ratio		Normal Direction	-	500	-
Response Time (Note 1)	[msec]	Raising Time	-	4	5
		Falling Time	-	12	20
		Raising + Falling	-	16	25
Color / Chromaticity Coordinates (CIE)		Red x	0.61	0.64	0.67
		Red y	0.31	0.34	0.37
		Green x	0.26	0.29	0.32
		Green y	0.58	0.61	0.64
		Blue x	0.11	0.14	0.17
Color Coordinates (CIE) White		White x	0.28	0.31	0.34
		White y	0.30	0.33	0.36
White Luminance @ CCFL 7.0mA (center)	[cd/m ²]		-	1000	-
Luminance Uniformity (Note 2)	[%]		75	80	-
TCO99 1.5.2B luminance uniformity (Note 3)					1.7
Crosstalk (in 75Hz) (Note 4)	[%]				1.5

Equipment Pattern Generator, Power Supply, Digital Voltmeter, Luminance meter (PR 880, BM-5A)
 Aperture 1 ° with 100cm VD or 2 ° with 50cm viewing distance
 Test Point Center (ISO point 22)
 Environment < 1 lux

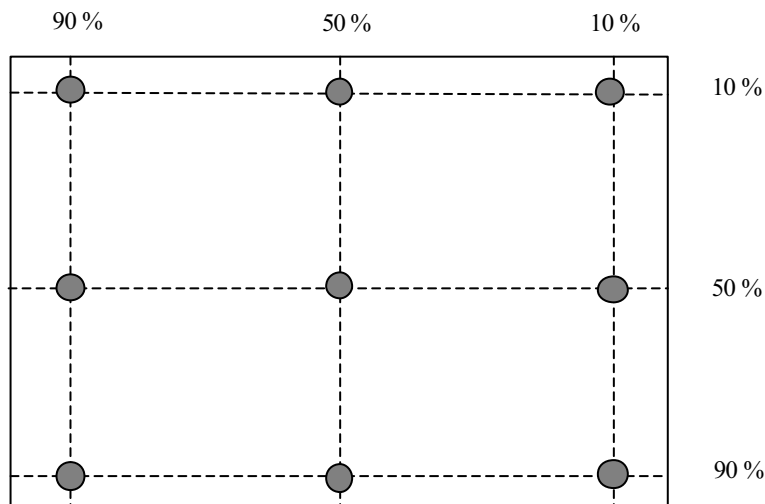


Note 1: Definition of Response time:

The output signals of photodetector are measured when the input signals are changed from “ Black” to “ White” (falling time), and from “ White” to “ Black” (rising time), respectively. The response time is interval between the 10% and 90% of amplitudes.



Note 2: Brightness uniformity of these 9 points is defined as below:



$$\text{Uniformity} = \frac{\text{Minimum Luminance in 9 Points (1-9)}}{\text{Maximum Luminance in 9 Points (1-9)}}$$

Note 3: TCO ' 99 Certification Requirements and test methods for environmental labeling of Display Report No. 2 defines Luminance uniformity as below:

$$((L_{\text{max},+30\text{deg.}} / L_{\text{min},+30\text{deg.}}) + (L_{\text{max},-30\text{deg.}} / L_{\text{min},-30\text{deg.}})) / 2$$

This panel is compatible with TCO99 approbation in luminance uniformity ≤ 1.7 , luminance contrast > 0.5

Electrical characteristics

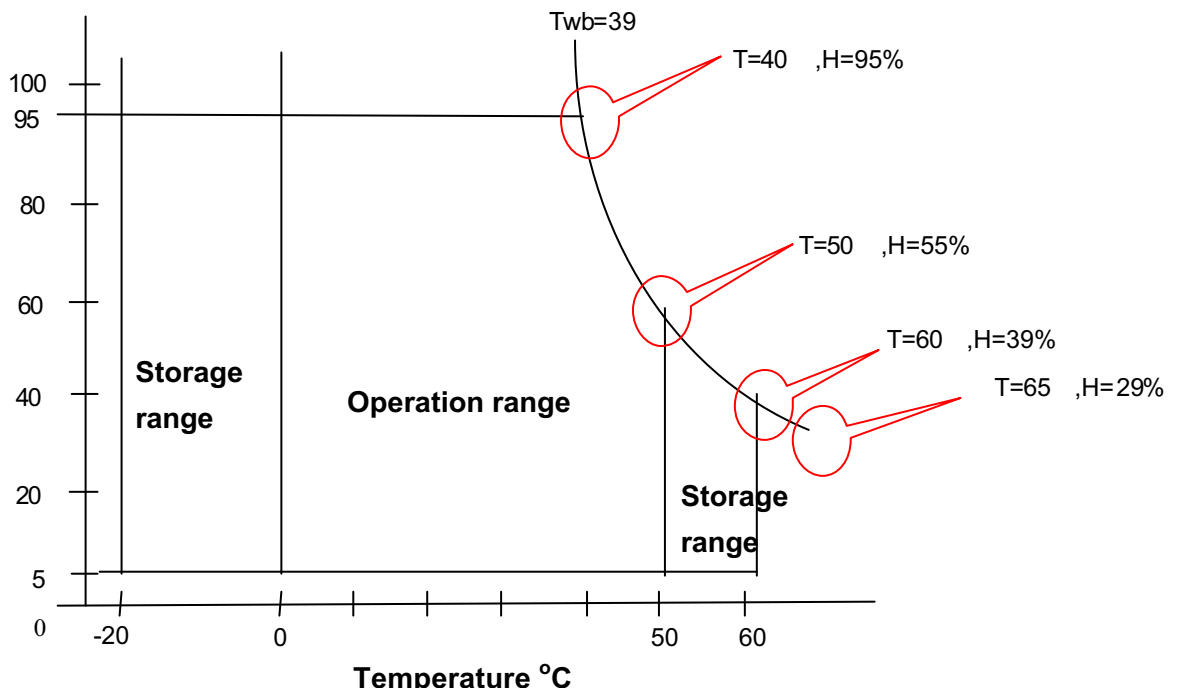
Absolute Maximum Ratings

Absolute maximum ratings of the module is as following:

Item	Symbol	Min	Max	Unit	Conditions
Logic/LCD Drive Voltage	VIN	-0.3	+5.5	[Volt]	
Select LVDS data order	SELLVDS	NC	NC	[Volt]	
CCFL Inrush current	ICFLL	-	38	[mA]	
CCFL Current	ICFL	-	6.0	[mA] rms	
Operating Temperature	TOP	0	+50	[°C]	Note 1
Operating Humidity	HOP	8	95	[%RH]	Note 1
Storage Temperature	TST	-20	+60	[°C]	Note 1
Storage Humidity	HST	8	95	[%RH]	Note 1

Note 1 : Maximum Wet-Bulb should be 39 and No condensation.

Relative Humidity %



Connectors

Physical interface is described as for the connector on module.

These connectors are capable of accommodating the following signals and will be following components.

Connector Name / Designation	Interface Connector / Interface card
Manufacturer	JAE or compatible
Type Part Number	FI-X30S-HF
Mating Housing Part Number	FI-X30S-H

Connector Name / Designation	Lamp Connector / Backlight lamp
Manufacturer	JST
Type Part Number	BHR-04VS-1
Mating Type Part Number	SM04(4.0)B-BHS-1-TB

Signal Pin

Pin#	Signal Name	Pin#	Signal Name
1	RxO0-	2	RxO0+
3	RxO1-	4	RxO1+
5	RxO2-	6	RxO2+
7	GND	8	RxOC-
9	RxOC+	10	RxO3-
11	RxO3+	12	RxE0-
13	RxE0+	14	GND
15	RxE1-	16	RxE1+
17	GND	18	RxE2-
19	RxE2+	20	RxEC-
21	RxEC+	22	RxE3-
23	RxE3+	24	GND
25	NC	26	NC
27	NC	28	Power
29	Power	30	Power

Signal Description

The module using a pair of LVDS receiver SN75LVDS82 (Texas Instruments) or compatible. LVDS is a differential signal technology for LCD interface and high speed data transfer device. Transmitter shall be SN75LVDS83(negative edge sampling) or compatible. The first LVDS port(RxOxxx) transmits odd pixels while the second LVDS port(RxExxx) transmits even pixels.

PIN #	SIGNAL NAME	DESCRIPTION
1	RxO0-	Negative LVDS differential data input (Odd data)
2	RxO0+	Positive LVDS differential data input (Odd data)
3	RxO1-	Negative LVDS differential data input (Odd data)
4	RxO1+	Positive LVDS differential data input (Odd data)
5	RxO2-	Negative LVDS differential data input (Odd data, H-Sync,V-Sync,DSPTMG)
6	RxO2+	Positive LVDS differential data input (Odd data, H-Sync,V-Sync,DSPTMG)
7	GND	Power Ground
8	RxOC-	Negative LVDS differential clock input (Odd clock)
9	RxOC+	Positive LVDS differential clock input (Odd clock)
10	RxO3-	Negative LVDS differential data input (Odd data)
11	RxO3+	Positive LVDS differential data input (Odd data)
12	RxE0-	Negative LVDS differential data input (Even clock)
13	RxE0+	Positive LVDS differential data input (Even data)
14	GND	Power Ground
15	RxE1-	Positive LVDS differential data input (Even data)
16	RxE1+	Negative LVDS differential data input (Even data)
17	GND	Power Ground
18	RxE2-	Negative LVDS differential data input (Even data)
19	RxE2+	Positive LVDS differential data input (Even data)
20	RxEC-	Negative LVDS differential clock input (Even clock)
21	RxEC+	Positive LVDS differential clock input (Even clock)
22	RxE3-	Negative LVDS differential data input (Even data)
23	RxE3+	Positive LVDS differential data input (Even data)
24	GND	Power Ground
25	NC	-
26	NC	-
27	NC	-
28	POWER	Power
29	POWER	Power
30	POWER	Power

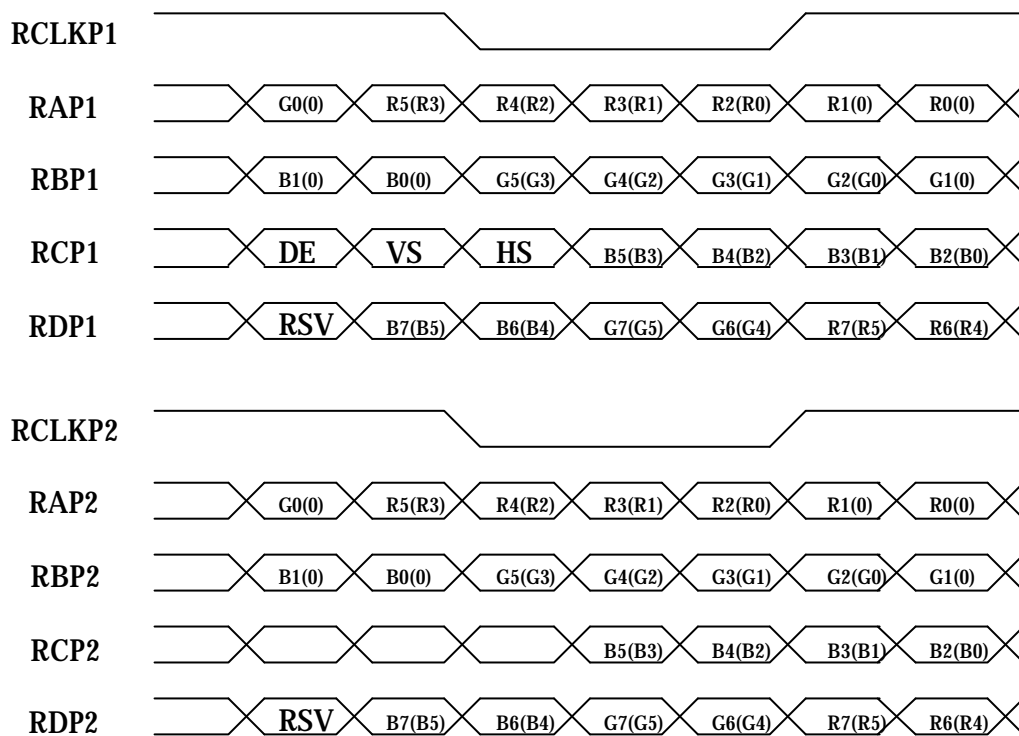
Note: Input signals of odd and even clock shall be the same timing.

LVDS DATA Name	Description
DSP	Display Timing: When the signal is high, the pixel data shall be valid to be displayed
V-S	Vertical Sync: Both Positive and Negative polarity are acceptable
H-S	Horizontal Sync: Both Positive and Negative polarity are acceptable

Interface connection

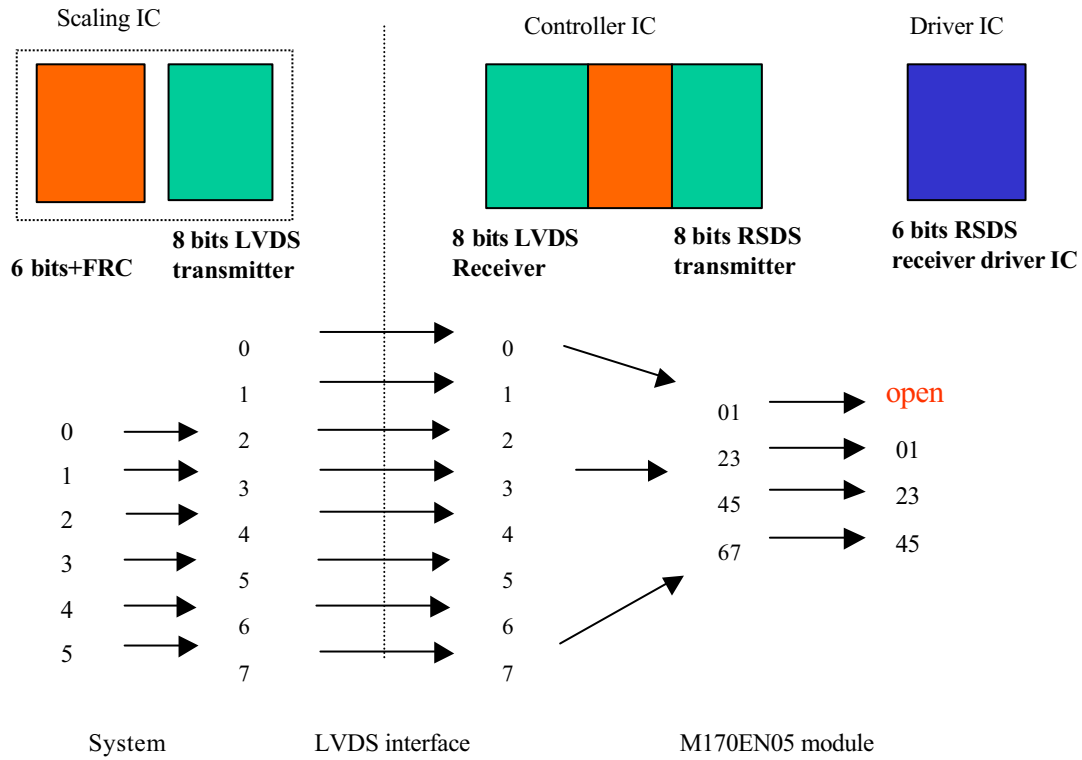
TI LVDS X' mitter SN75LVDS83	Module LVDS signal (interface connector pin7)
Signal Name	Low(open)
D0	Red0
D1	Red1
D2	Red2
D3	Red3
D4	Red4
D5	Red7
D6	Red5
D7	Green0
D8	Green1
D9	Green2
D10	Green6
D11	Green7
D12	Green3
D13	Green4
D14	Green5
D15	Blue0
D16	Blue6
D17	Blue7
D18	Blue1
D19	Blue2
D20	Blue3
D21	Blue4
D22	Blue5
D23	NA
D24	H Sync
D25	V Sync
D26	Display Timing
D27	Red6

8bits input: M170EN05 only catch bit 2 to bit 7 for 6 bit display
 6bits input data format marked with ().



Note: R/G/B data 7:MSB, R/G/B data 0:LSB

O = "First Pixel Data"
 E = "Second Pixel Data"



Signal Electrical Characteristics

Input signals shall be low or Hi-Z state when Vin is off

It is recommended to refer the specifications of SN75LVDS82DGG (Texas Instruments) in detail.

Each signal characteristics are as follows;

Parameter	Condition	Min	Max	Unit
Vth	Differential Input High Voltage(Vcm=+1.2V)		100	[mV]
Vtl	Differential Input Low Voltage(Vcm=+1.2V)	-100		[mV]

Interface Timings

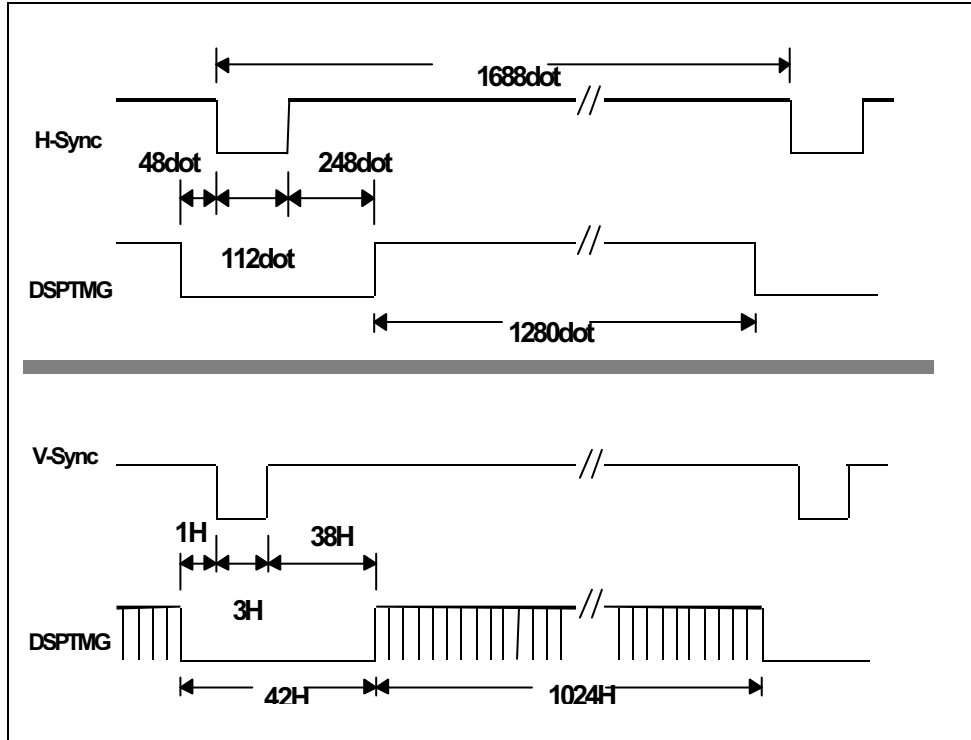
Basically, interface timings described here is not actual input timing of LCD module but output timing of SN75LVDS82DGG (Texas Instruments) or equivalent.

Timing Characteristics

Signal	Item	Symbol	MIN	TYP	MAX	Unit
DTCLK	Freq.	Fdck	50	67.5	70	MHz
DTCLK	Cycle	Tck	14.2	14.8	20	ns
+V-Sync	Frame Rate	1/Tv	56.25	75	77	Hz
+V-Sync	Cycle	Tv	13	13.33	17.78	ms
+V-Sync	Cycle	Tv	1035	1066	2047	lines
+V-Sync	Active level	Tva	3	3		lines
+V-Sync	V-back porch	Tvb	7	38	63	lines
+V-Sync	V-front porch	Tvf	1	1		lines
+DSPTMG	V-Line	m	-	1024	-	lines
+H-Sync	Scan rate	1/Th	-	80.06	-	KHz
+H-Sync	Cycle	Th	800	844	1023	Tck
+H-Sync	Active level	Tha (*1)	4	56		Tck
+H-Sync	Back porch	Thb (*1)	4	124		Tck
+H-Sync	Front porch	Thf	4	24		Tck
+DSPTMG	Display Pixels	n	-	640	-	Tck

Note: Typical value refer to VESA STANDARD (*1) Tha+Thb should be less than 1024 Tck.

Timing Definition



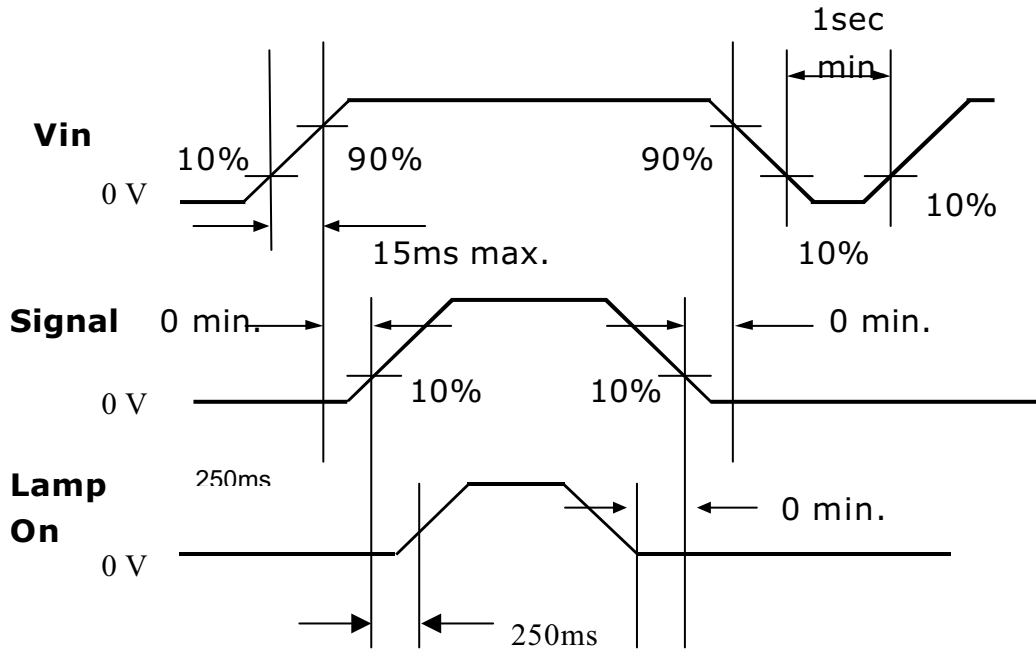
Power Consumption

Input power specifications are as follows;

Symbol	Parameter	Min	Typ	Max	Units	Condition
VDD	Logic/LCD Drive Voltage	4.5	5	5.5	[Volt]	
IDD	VDD current		950	1200	[mA]	
PDD	VDD Power		4.75	6.6	[Watt]	Vin=5V, All Black Pattern
VDDrp	Allowable Logic/LCD Drive Ripple Voltage			100	[mV] p-p	
VDDns	Allowable Logic/LCD Drive Ripple Noise			100	[mV] p-p	

Power ON/OFF Sequence

Vin power and lamp/on/off sequence is as follows. Interface signals are also shown in the chart. Signals from any system shall be Hi-Z state or low level when Vin is off.



Backlight Characteristics

Signal for Lamp connector

Pin #	Signal Name
1	Lamp High Voltage
2	No Connection
3	Lamp High Voltage

Output connector

Pin #	Signal Name
1	Lamp Voltage
2	Lamp Voltage

Note: Lamp High Voltage and Output Connector please refer to page 19.

Reliability and Lifetime

Monitor Reliability

Demonstrated MTTF testing in progress

Backlight Reliability and Lifetime

CCF lamps; 40,000 hour rated lifetime @ 25°C

CCF lamp life is defined as time to 50% of initial brightness

Backlight end-of-life for this 1745 product is defined as 1000 nits center luminance at 25°C

Typical values indicated for luminance and uniformity are indicative of typical steady state values measured at initial use at 25°C after warm-up to steady state. Actual luminance and uniformity values are directly dependent on the environmental usage profile. Repeated cold temperature start-up can cause accelerated aging of the backlight lamps resulting in reduced luminance and uniformity.

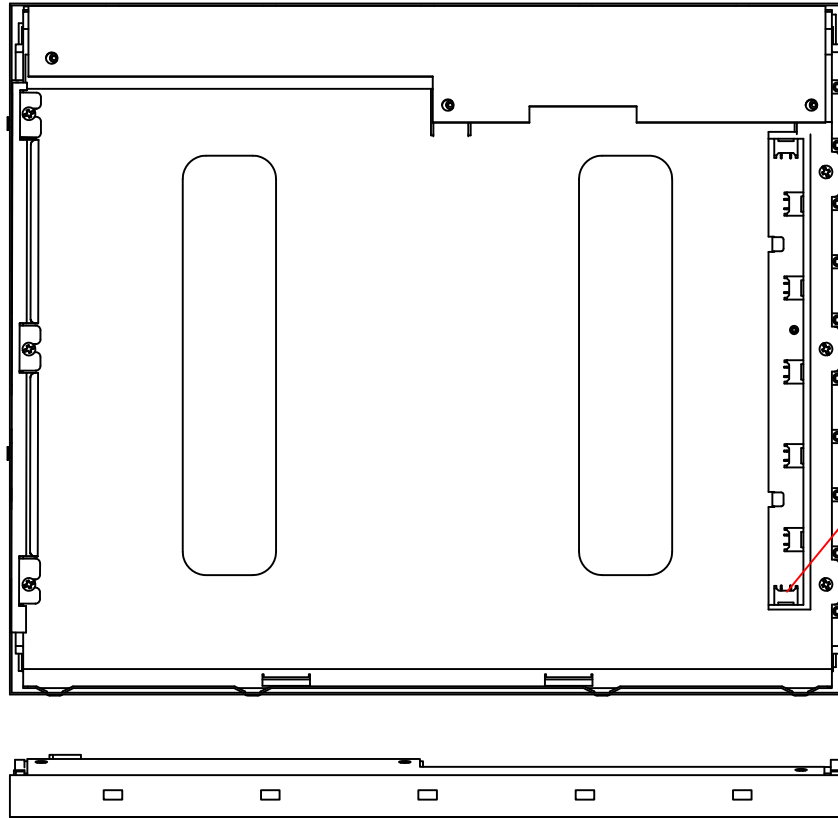
Extended High Temperatures and Solar Loading

Extended operation at the upper temperature extreme or in conjunction with extended direct solar loading can cause permanent mura or localized pixel non-uniformity effects. Other side effects could include latent image and flicker. These effects are not covered under Litemax warranty. Please consult Litemax for further guidance on system design to effectively manage environments requiring extended high temperatures or direct sun-loading. Cooling kit and CEG vandal glass options can effectively address these issues.

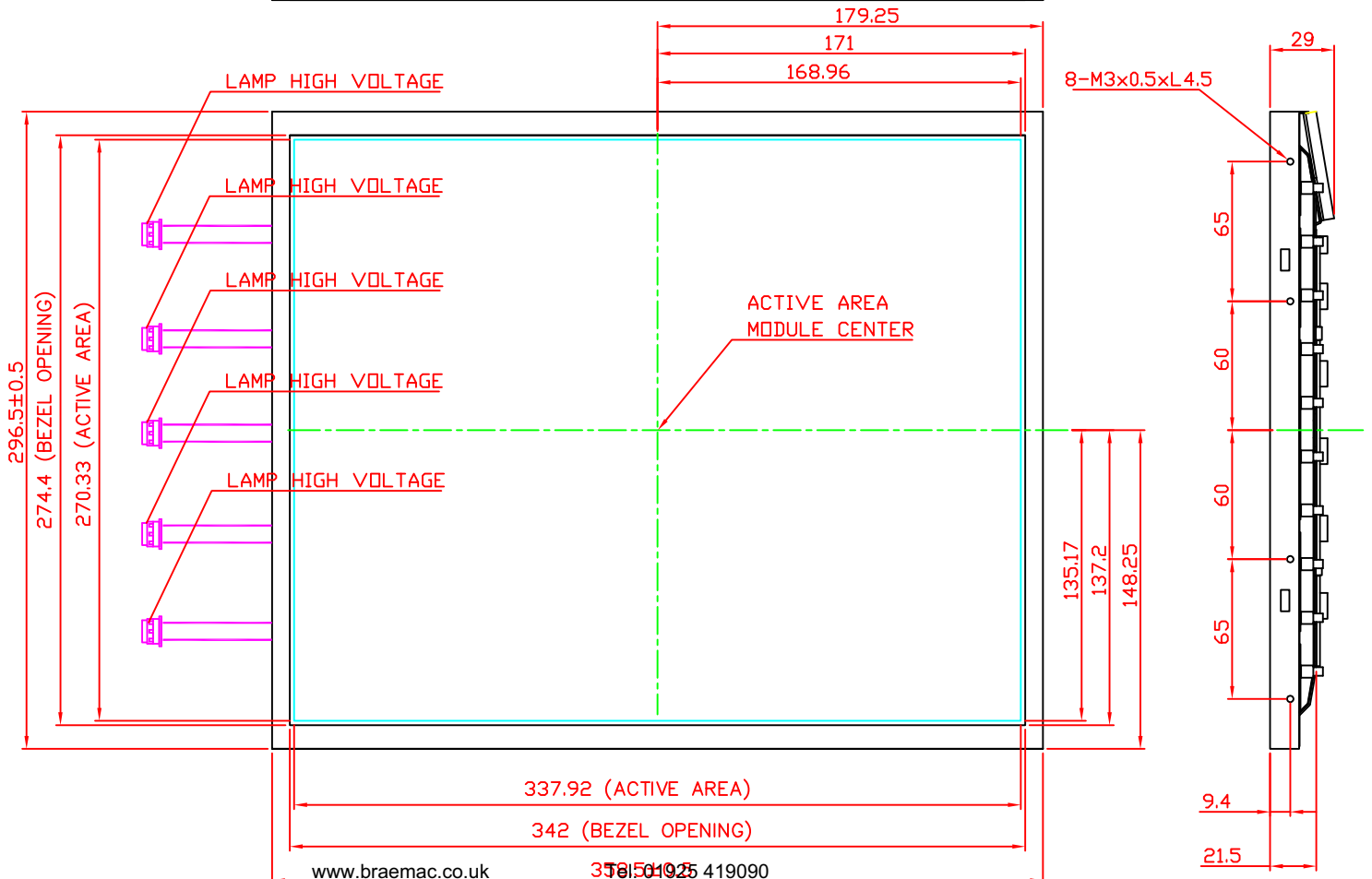
Reliability Test

Test Item	Test condition	Judgement
High temperature/humidity operation	1. 60±2°C, RH=60%, 240 hours, 2. Display data is white.	Note 1
Heat cycle (operation)	1. 0°C±3°C..1 hour 2. 55°C±3°C..1 hour 3. 50 cycles, 4 hours/cycle 4. Display data is white.	Note 1
Thermal shock (non-operation)	1. -20°C±3°C..1 hour 2. 60°C±3°C..1 hour 3. 100 cycles, 4 hours/cycle 4. Temperature transition time is within 5 min.	Note 1
Vibration (non-operation)	5-100Hz, 11.76m/s ² , 1 minute/cycle, XYZ direction 10 times each direction	Note 1
ESD (non-operation)	150pF, 150Ω, ±10kV 9 places on a panel (Note 3) 10 times each place at one-second intervals	Note 1
Dust (non-operation)	Sample dust: No.15 Hourly 15 seconds stir, 8times repeat	Note 1
Low pressure	operation 53.3 kPa 0°C±3°C. 24 hours 55°C±3°C. 24 hours	Note 1
	non-operation 15 kPa -20°C±3°C. 24 hours -60°C±3°C. 24 hours	Note 1

Mechanical Characteristics



GROUND CONNECTOR



LI-1017A INVERTER ELECTRIC SPECIFICATION

1. APPLICATION

This specification is applied to CCFL inverter unit for 17" 10 Lamp LCD backlight.

2. ELECTRICAL CHARACTERISTICS

No.	Item	Symbol	Condition	Min.	Typ.	Max.	Unit
1	Input Voltage	Vin		10.8	12.0	13.2	V
2	Input Current	Iin	Vin= 12 V, Vadj = 0.5 V (10 Lamp)	---	---	3.6	A
3	Input Power	Pin	Vin= 12 V, Vadj = 0.5 V (10 Lamp)	---	---	45	W
4	Backlight ON/OFF Control	Von	Normal Operation	2.4	---	5.0	V
		Voff	Shutdown	0	---	1.2	V
		Ion	Von = 2.4V ~ 5.0V	15	---	45	μ A
		Ioff	Voff = 0 V~1.2V	0	---	5	μ A
5	Brightness Adjust (Lamp Current Control)	Vadj	Normal Operation	0	---	5.0	V
		Iadj	Vadj = 0.5 V	-25	---	---	μ A
		Iadj	Vadj = 5.0V	---	---	25	μ A
5	Output Voltage	Vout	Vin= 12 V, Iout= 6.0 mA (1 Lamp) (REF,VALUE)	---	600	---	Vrms
6	Output Current (Each connector)	Iout(Min)	Vin= 12 V, Vadj = 5.0 V (1 Lamp) Ta= 25 , After running 30min.	---	0	---	mArms
		Iout(Max)	Vin= 12 V, Vadj = 0.5 V (1 Lamp) Ta= 25 , After running 30min.	6.1	6.5	6.8	mArms
7	Frequency	Freq	Normal Operation	50	55	60	KHz
8	Open Lamp Voltage	Vopen	No Load, Vin=12V , Ta=0	1700	---	---	Vrms
9	Efficiency	η	Vin=12V, Load=100kΩ	82	----	----	%
10	Striking time	Tscp	Vin=12V , Vadj=0V	1	---	2	Sec
11	Current Balancing		± 0.5 (resistive load)				mArms
12	Open Lamp Protection		Latched				
13	Short Lamp Protection		Latched				

Note 1: The kick – off voltage is tested under all lamps opened circuit.

3. Interface Specification

Input Connector : CON1

: FCN PJH2-40-0848 or equ.

Pin No.	Signal	Description
1,2,3	Vin	Input Voltage
4,5,6	GND	Power System Return
7	Vadj	Lamp Control
8	ON/OFF	ON / OFF Control

Output Connector : CN101,102,103,104,105

: FCN WH2-08540-0228or equ.

Pin No.	Signal	Description
1	Lamp High	High Voltage Output For High Side CCFL
3,4,5	N.C	N.C
2	Lamp Low	Low Voltage Output For Low Side CCFL

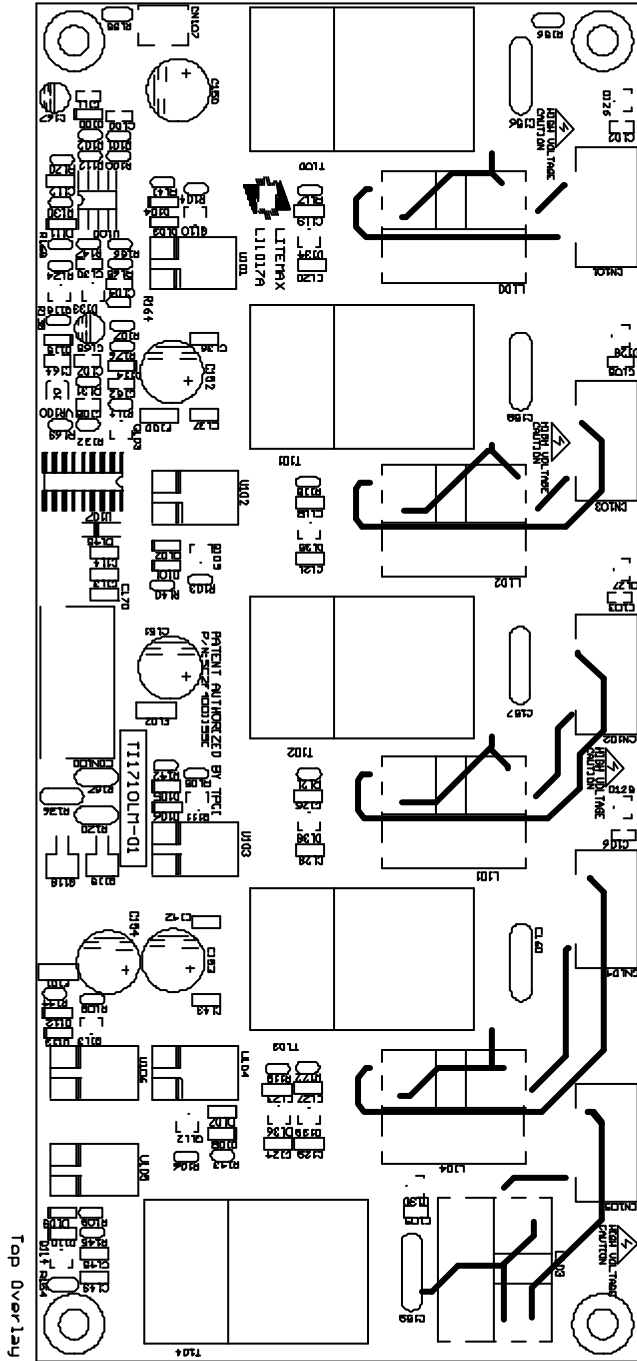
Output Connector : CN107

: UNE LM212-002-TX-1or equ.

Pin No.	Signal	Description
1	Lamp Low	Low Voltage Output For Low Side CCFL
2	Lamp Low	Low Voltage Output For Low Side CCFL

4. Environment

Operation Temperature	-10 ~ 60
Operation Humidity	90 % Max. RH
Storage Temperature	-10 ~ 85
Storage Humidity	95 % Max. RH



TOLÉRANCE	
DIM	
X.	+/-0.5
X.X	+/-0.25
X.XX	+/-0.12
X.XXX	+/-0.08

