<u>To :</u>			
			Date · Jun 28 2016
			Date : Juli 28, 2010
	Tec	chnical Manual	
	Product Name	LPM316M132A	
(NOTES) 1. This docume 2. This docume	ent is tentative. ent may, wholly or partially	, be subject to change without notice	e.
	Japa	n Display Inc.	

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	RECORD OF REVISIONS								
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DESCRIPTION

Product Name : LPM316M132A

GENERAL SPECIFICATIONS

	Effective Displa	ay Area		: (H)69	9.84 × (V	/)393.66		(mm)			
	Number of Pixe	ls		: (H)1,9	$920 \times (V)$)1,080		(pixels)			
	Aspect ratio			: 16:9					\ \		
	Pixel Pitch			: (H)0.3	3645 × (N	/)0.3645		(mm)			
	Color Pixel Arra	angemen	ıt	: R+G+	B+W Sq	uare					
	Display Mode			: Full F Norm	Reflective ally Whi	e Mode ite Mode					
	Driving method			: Memo	ry In Pix	el					
	Frame frequency	у		: 30 Hz							
	Top Polarizer T	уре		: Hard (Coat						
	Number of Cold	ors		: 4,096	colors (1	RGBW eac	ch 3bi	t)			
	LCM Mode			: ECB							
	Input Signal			: LVDS	5						
	External Dimen	sions (Pa	anel)	: (H)70	2.44 × (N	/)401.06 ×	(t)1.4	(mm)			
	Weight			: TBD							
	RoHS			: TBD							
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<u>1. ABSOLUTE MAXIMUM RATINGS</u>

1.1 ENVIRONMENT ABSOLUTE MAXIMUM RATINGS

Itam	Oper	ating	Sto	rage	Unit	Note	
nem	Min.	Max.	Min.	Max.	Unit		
Panel surface Temperature	(-20)	(70)	(-30)	(80)	°C		
Humidity	TH	BD	TBD		%RH		

1.2 ELECTRICAL ABSOLUTE MAXIMUM RATINGS

(1) TFT-LCD Module

								V	ss = 0 V	r
	Item	l	,	Symbol	Min.	Max		Unit	Not	te
Po	ower Supply	y Voltage		VDD		TBD	M	V		
			Sh							
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2. INITIAL OPTICAL CHARACTERISTICS

The following optical characteristics are measured under stable conditions. It takes about 30 minutes to reach stable conditions. The measuring point is the center of display area unless otherwise noted. The optical characteristics should be measured in a dark room or equivalent environment with lamp.

2.1 SPECIFICATION

]	ltems		Condition	Min.	Тур.	Max.	Unit	Notes
Cont	rast ratio		$\theta = 0$	(15)	(30)	-	-	
Reflectance			$\theta = 0$	(13)	(16)	-	%	
N	ITSC		$\theta = 0$	(16)	(20)	Ż	%	
	Red x y				TBD			
					TBD			
	Green	Х			TBD			
Color	oreen	у	$\Theta = 0$		TBD			
chromaticity Bl	Blue	Х			TBD			
	Dide	У			TBD			
	White	Х			TBD			
	white	У		/	TBD			
	1	r		-	(4)	(7)		
Response time]	ſſ	$\theta = 0$	-	(6)	(10)	ms	
	Тс	otal		-	(10)	(17)		
	θ	L		(50)	(65)	-		
Viewing	θ	R	CR>5	(50)	(65)	-	deg.	
Angle	θ	Т		(50)	(65)	-		
	θ	B		(50)	(65)	-		

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0500 V

3. ELECTRICAL CHARACTERISTICS

3.1 TFT-LCD MODULE

					1a=25°C,	VSS=0V
Item	Symbol	Min.	Тур.	Max.	Unit	Note
Power Supply Voltage	VDD	11.4	12.0	12.6	V	Note1
Power Supply Current(Movie)	IDD	-	TBD	TBD	А	Note2
Power Supply Current(Still)	IDD	-	-	TBD	А	Note3
VDD(12V) rise time	TVDDR	1(TBD)	-	20(TBD)	msec	10-90%
VDD(12V) fall time	TVDDF	TBD	-	TBD	msec	90-10%
VDD(12V) off time	TVDDOFF	TBD	-	-	msec	10-10%

Note1: Maximum load condition

Note2: DC current at Frame rate=30Hz, VDD=12V, White image

Note3: DC current at Frame rate=(TBD)Hz(Still image mode), VDD=12V, LVDS transfer stop

DC An		eter VDD VSS	Iodule			
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4. BLOCK DIAGRAM

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(1) TFT Module



Symbol	I/O	Description
DC12V	I	Power supply
RESX	I	This signal resets the device and the value must be applied properly
	$\langle \rangle$	when initialize the chip. L=active
SPI or I2C	I/O	This signal is the interface for the command. Either SPI or I2C can be
		selected on circuit board.
CMDRDY	Ø	This signal detects the operation status of the System Controller.
		H=active(The command can be received)
		L=Power off
		Please reset the system when the command is not returned
		while "H" status.
LVDS	Ι	Either LVDS-1CH or LVDS-2CH* can be selected on circuit board.

*LVDS-2CH(Bch) of the LCD module is the custom. This sample is unsupported.

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5. INTERFACE

5.1 INTERNAL PIN CONNECTION

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INPUT CONNECTOR : JAE FI-RE51S-HF

No.	Signal	I/O	Function	Level	Connection when signal is unused
1	VSS	Р	Ground		-
2	I2C_SDA	I/O	Data signal for I2C	0 to 3.3V±5%	Not connect
3	I2C SCL	I/O	Clock signal for I2C	0 to 3.3V±5%	Not connect
4	SPI SDO	0	DATA signal for SPI	0 to 3.3V±5%	Not connect
5	SPI SDI	Ι	DATA signal for SPI	0 to 3.3V±5%	Not connect
6	SPL SCK	Ī	Clock signal for SPI	0 to 3.3V + 5%	Not connect
7	SPL SCS	Ī	Chip select signal for SPI	0 to 3 3V + 5%	Not connect
8	CMDRDY	0	Command ready signal	0 to 3 3V + 5%	-
9	RESERVED	Ι/Ο	(Please open this pin)	0 10 010 1 20 /0	Not connect
10	RESX	I	System reset signal	0 to 3 3V + 5%	-
11	VSS	P	Ground	0 10 5.5 1 25 /0	_
12	LVDS ARXON	I	Ach LVDS data0(-)		_
12	LVDS ARXOP	Ĭ	Ach LVDS data $0(+)$		_
13	LVDS_ARXIN	I I	Ach LVDS data1(-)		
14	LVDS_ARAIN	I	Ach LVDS data1(+)		-
15	LVDS_ARAIF	I	Ach LVDS data?(-)		-
10	LVDS_ARAZN	I T	Ach L VDS data $2(+)$		-
1/	LVDS_AKA2P		Ground		-
18	A 22	P I	Ach LVDS clock(A)		-
19	LVDS_ACLKN		Ach LVDS clock(-)		-
20	LVDS_ACLKP		Ground		-
21	VSS	P	Ach LVDS date 2()		-
22	LVDS_ARX3N		Acti $L VDS data3(-)$		-
23	LVDS_ARX3P	1	Acii L V DS data5(+)		-
24	NC	-	-		-
25	NC	-			-
26	VSS	P	Ground		-
27	NC	/	-		-
28	(LVDS_BRX0N)	I	Bch LVDS data0(-)		Not connect
29	(LVDS_BRX0P)	I	Bch LVDS data0(+)		Not connect
30	(LVDS_BRX1N)	I	Bch LVDS data1(-)		Not connect
31	(LVDS_BRX1P)	Ι	Bch LVDS data1(+)		Not connect
32	(LVDS_BRX2N)	Ι	Bch LVDS data2(-)		Not connect
33	(LVDS_BRX2P)	I	Bch LVDS data2(+)		Not connect
34	VSS	Р	Ground		-
35	(LVDS_BCLKN)	Ι	Bch LVDS clock(-)		Not connect
36	(LVDS_BCLKP)	Ι	Bch LVDS clock(+)		Not connect
37	VSS	Р	Ground		-
38	(LVDS_BRX3N)	Ι	Bch LVDS data3(-)		Not connect
39	(LVDS_BRX3P)	Ι	Bch LVDS data3(+)		Not connect
40	NC	-	-		-
41	NC	-	-		-
42	VSS	Р	Ground		-
43	VSS	Р	Ground		-
44	VSS	Р	Ground		_
45	VSS	P	Ground		-
46	VSS	P	Ground		-
47	VDD	P	Power supply(0.8A)	12V+5%	-
48	VDD	P	Power supply(0.8A)	12V+5%	_
49	VDD	P	Power supply(0.8A)	$12V \pm 5\%$	
50	VDD	P	Power supply(0.8A)	$12V \pm 5\%$	_
50		D	Power supply(0.8A)	$12V \pm 3/0$ $12V \pm 50/2$	-
51	עעי	ſ		1∠v±J70	-

*LVDS-2CH(Bch) of the LCD module is the custom. This sample is unsupported.

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5.3 COMMAND

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5.3.1 System control

System control

Write	Register		Parameter(Write Data)							
command	Address	D7	D6	D5	D4	D3	D2	D1	D0	Initial Value
00h	00h	0	0	0	1	Image processing mode[1:0]		Still On	Power On	00h

Command setting state for the LCD module

Power On	Still On	Detail	Command
0	0	Default(Reset release) Issue Sleep In commnad and shift to standby mode	Sleep In
0	1	Reserved	(Invalid)
1	0	Movie image mode Activate the all DC/DC converter, internal oscillator and start panel scanning	Sleep Out Still OFF
1	1	Still image Issue Still On command and Shift to still image mode. All of the unnecessary power is shut down and move to ultra-low power cousumption mode. Image data is hold on MIP.	Still On

Command setting mode for the image processing mode

Image processing mode		Detail
0	0	For static image
0	1	For partial movie image*
1	0	For movie image
1	1	reserved

Image processing mode are selectable for displaying good image quality.

When display static image, select "00"

When display partial movie image*, select "01"

When display movie image, select "10"

*Partial movie image



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5.3.2 Scan direction control(LCD setting command)

Parameter(Write Data) Write Register D7 D6 D5 D4 D3 D2 D0 Initial Value Address **D**1 command Scan Scan 00h 01h 0 0 0 03h 0 0 0 Η V

Scan direction control(LCD setting command)

Command setting scan direction mode for the LCD module

Scan V	Scan H	Detail	Initial Value
0	0	Under the FPC, Scan to Left -> Right	
0	1	Under the FPC, Scan to Right -> Left	
1	0	Top the FPC, Scan to Right -> Left	
1	1	Top the FPC, Scan to Left -> Right	0

This command is set befor sending Sleep Out Commnad and CMDRDY signal = H.



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5.3.3 Register Read Address

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Register Read Address

Write	Register		Parameter(Write Data)							
command	Address	D7	D6	D5	D4	D3	D2	D1	D0	Initial Value
00h	80h		Read Address[7:0]						00h	

Register read sequence

- 1. Read address setting to "80h" register(Register Read Address).
- 2. Command interface out the Read data from the command send.
 - <Case of SPI>

SDO signal out always the Read data.

If read the data only then, send to "command = 80h" + "Dummy 2bytes". Refet to "6-2. SPI I/F FORMAT"

5.3.4 Status Register

Status Register

8										
Write	Register					Stat	us			
command	Address	S7	S 6	S5	S4	S 3	S 2	S 1	S 0	Initial Value
-	-	0	Err1	Err2	Err3	Rese	rved	State	[1:0]	00h

This commad indicates the curent status of the LCD module as described in the table below.

State for the LCD module

State	e[1:0]	Detail
0	0	Standby mode
0	1	Reserved
1	0	For movie image
1	1	reserved

Error

Err1/Err2/Err3	Detail
0	Normal operate
1	Error issue

When Error bit = "1", Reset the system.

Error bit	Error mode
Err1	TBD
Err2	TBD
Err3	TBD

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			1,0,		1 1	

6. INTERFACE TIMING

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6.1 I2C I/F FORMAT

(1) Parameter write





6.2.1 SPI I/F AC characteristics Confidential

Item	Symbol	Min.	Тур.	Max	Unit	Remarks
SCS start low wait time	tcss	10		-		
SCS end low wait time	t csh	10	-	-		
SCS next cmd wait time	tcsw	50	-	-		
SCK cycle time	t ckp	1		-		
SCK low width	tckl	0.45	-	-	110	
SCK high width	tскн	0.45	-	-	us	
SDI setup time	tdis	0.25	-	-		
SDI hold time	tdiн	0.25	-	-		
SDO output start delay time	tdos	-	-	0.25		
SDO output end delay time	t doe	0.01	-	-		



6.3 LVDS I/F FORMAT

Confidential

6.3.1 LVDS receiver AC characteristics



	Item	Symbol	Min.	Тур.	Max	Unit	Remarks
RCLK	Parameter	1/trcip	TBD	-	TBD	MHz	
	Input Data Position0	t _{RIP1}	-0.25	0	+0.25		
	Input Data Position1	t _{RIP0}	^{1/7} trcip-0.25	1/7 trcip	^{1/7} trcip+0.25		
RinX (X=0,1,2,3)	Input Data Position2	trip6	^{2/7} trcip-0.25	2/7 trcip	^{2/7} t _{RCIP+} 0.25		
	Input Data Position3	trip5	^{3/7} trcip-0.25	3/7 trcip	$^{3/7}$ trcip+0.25	ns	
	Input Data Position4	trip4	^{4/7} trcip-0.25	4/7 trcip	$^{4/7}$ trcip+0.25		
	Input Data Position5	trip3	^{5/7} trcip-0.25	5/7 trcip	$^{5/7}$ trcip+0.25		
	Input Data Position6	trip2	^{6/7} trcip-0.25	^{6/7} trcip	^{6/7} trcip+0.25		

6.3.2 LVDS data mapping(Single Link/1CH)



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7. DIMENSIONAL OUTLINE

7.1 Panel Module OUTLINE





8. COSMETIC SPECIFICATIONS

8.1 CONDITIONS FOR COSMETIC INSPECTION

(1) Viewing zone



8.2 COSMETIC SPECIFICATIONS

When displaying conditions are not stable (ex. at turn on or off), the following specifications are not applied.

	No.			Item	Max. acceptable number A-zone	Unit	Note
Operating	1	Dot	Sparkle	1 pixel	TBD	pcs	1)
inspection		Defect	mode	sub pixel	Ignore	pcs	2)
				Density	TBD	pcs/ ϕ (TBD)mm	1)
				Total	TBD	pcs	1)
			Black	1 pixel	TBD	pcs	1)
			mode	sub pixel	Ignore	pcs	2)
				Density	TBD	pcs/ ϕ (TBD)mm	1)
				Total	TBD	pcs	1)
				Total	TBD	pcs	1)
	2		L	ine defect	0	—	
non- operating inspection	3 4 5 6 7	Stain Line W: wic L: leng Stain Dot D: ave. Scratch L: leng Scratch Dot L: leng Scratch Dot D: ave. Bubble in pola D: ave.	a inclusion e shape lth (mm) th (mm) a inclusion a shape dia. (mm) a on polarizer e shape lth (mm) th (mm) th (mm) a on polarizer shape dia. (mm) es, peeling rizer dia. (mm)		TBD		
	8	Wrinkles	on polarizer	<u> </u>	TBD		

Notes

Notes 1) 1 pixel: Color information (RGBW) unit

2) Sub pixel: RGBW each color unit

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9. PRECAUTION

Please pay close attention to the following precautions whilst using, handling and mounting the TFT module.

9.1 Precaution for handling and mounting

- (1) Applying excessive force to any part of the module may result in partial deformation of the frame or mould, which could result in permanent damage to the display.
- (2) The module should be held gently and firmly using both hands. In order to avoid internal damage never hold the module by just one hand. Also never drop or hit the module.
- (3) Uneven force such as twisted stress should not be applied directly to the module once it is mounted within the cover case. The cover case must have sufficient strength such that any external forces are not transmitted directly to the module.
- (4) A transparent protective plate should be added to the front of the display in order to protect both the polarizer and TFT cell. The transparent protective plate should have sufficient strength such that the plate can not be deformed, due to external forces, and touch the module. Polarizer surface hardness is 2H.
- (5) Materials containing acetic acid and chlorine should not be used for the cover case nor for other parts which are positioned in close proximity to the module. This is because the Acetic acid will attack the polarizer, whilst the chlorine will attack the electric circuits by way of electro-chemical reaction.
- (6) The front polarizer on the TFT cell should be handled carefully, due to its softness, and must not be touched, pushed or rubbed with glass, tweezers or anything harder than an HB pencil lead. The surface of the polarizer should not be touched nor rubbed with bare hands, greasy or dusty clothes.
- (7) If the surface of the polarizer becomes dirty it should be gently wiped using an absorbent cotton (Traysee CC clean cloth), chamois or other soft material, slightly dampened with petroleum benzene. IPA (isopropyl alcohol) is recommended to clean away the traces of adhesive which is used to attach the front/rear polarizers to the TFT cell. Other cleaning chemicals such as acetone, toluene and alcohol should not be used to clean adhesives because they cause chemical damage to the polarizer.
- (8) Saliva or water drops should be immediately wiped off. Otherwise, the affected portion of the polarizer may become deformed and its color may fade.
- (9) Please pay attention to the packing and handling not to apply strong Z axis vibration. Because during our vibration test, of course we didn't have any functional failure, but we observed very tiny bright dots (within spec though) at Z axis direction.

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9.2 Precaution to operation

(1) Spike noise could result in the mis-operation of this module. The level of spike noise should be as follows: -200mV \leq over- and under- shoot of VDD \leq +200mV

VDD including over- and under- shoot should not exceed the absolute maximum ratings.

- (2) Optical response times, luminance and chromaticity depend on the temperature of the TFT module.
- (3) Sudden temperature changes may cause dew on and/or in the module. Dew can cause damage to the polarizer and/or electrical contacting areas of the module. Dew causes fading of the image quality.
- (4) This module has high frequency circuits. Sufficient suppression to electromagnetic interference should be done by the system manufacturers. Grounding and shielding methods may be effective to minimize such interference.
- (5) The module should not be connected or disconnected whilst the main system is operating.
- (6) Connecting or disconnecting the I/F cables, whilst the power and data signals are present, could result in permanent damage to the module. The I/F connectors should only be connected and disconnected after the power supply and data signal have been turned off.
- (7) The ambient temperature near the operated module should be satisfied with the absolute maximum ratings. Unless it meets the specifications, sufficient cooling system should be adopted to system.

9.3 Electrostatic discharge control

- (1) This module consists of a TFT cell and electronic circuits with CMOS-ICs, which are very susceptible to electrostatic discharge. Persons who are handling the module should be grounded through adequate methods such as a wrist band. I/F connector pins should not be touched directly with bare hands.
- (2) The polarizer protective film should be removed slowly so as to avoid an excessive build-up of electrostatic charge.

9.4 Precaution to strong light exposure

(1) The module should not be exposed to strong light. Otherwise, characteristics of the polarizer and color filter, may be degraded.

9.5 Precaution to storage

When modules are stored, for long period's of time, the following precautions should be taken:

- (1) Modules should be stored in a dark place. It is prohibited to apply direct sunlight or fluorescent light during storage. Modules should be stored between 0 to 35°C at normal humidity (60%RH or less).
- (2) The surface of the polarizer should not come into direct contact with other objects.It is recommended that modules should be stored in the original Japan Display shipping box.

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9.6 Precaution to handling protection film

(1) The protective film for polarizers should be pealed off slowly and carefully by people who are electrically grounded with adequate methods such as wrist bands. Also ionized air should be blown over the module during the peeling process.

Dust on the polarizer should be blown off gently using an ionized nitrogen gun.

- (2) The protective film should be peeled off carefully to avoid it rubbing on the polarizer. If the film rubs together with the polarizer it is possible that a small amount of adhesive may remain on the polarizer.
- (3) The module with protective film should be stored under the conditions explained in 9.5 (1). However, in case's where the storage time is excessive, some adhesive may remain on the polarizer even after the protective film has been removed. In the case where a module is stored at higher temperatures and/or higher humidity, adhesive may remain on the polarizer. Any remaining adhesive may cause non-uniformity of the displayed image.

9.7 Safety

(1) Since both the TFT cell is made of glass, handling of any broken module's should be carried out with the utmost care so as to avoid any injury. Hands which have come into direct contact with liquid crystal material should be washed immediately and thoroughly.

9.8 Use restrictions and limitations

- (1) In no event shall Japan Display, Ltd. be liable for any incidental, indirect or consequential damages in connection with the installation or use of this product, even if informed of the possibility there of in advance. These limitations apply to all causes action in aggregate, including without limitation breach of contract, breach of warranty, negligence, strict liability, misrepresentation and other torts.
- (2) This product is not authorized for military applications or other applications which pose a significant risk of personal injury.

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10. PACKING SPECIFICATIONS

