

AMP DISPLAY INC.

SPECIFICATIONS

CUSTOMER	
CUSTOMER PART NO.	
AMP PART NO.	AM-240320D5TOQW-T04H(R)
APPROVED BY	
DATE	
☐ Approved For Specifications	1
Approved For Specifications	9 Cample

☐ Approved For Specifications & Sample

AMP DISPLAY INC

9856 SIXTH STREET RANCHO CUCAMONGA CA 91730 TEL: 909-980-13410 FAX: 909-980-1419 WWW.AMPDISPLAY.COM

CHECKED BY	ORGANIZED BY
	OHEORED D1

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RECORD OF REVISION

Revision Date	Page	Contents	Editor
2011/3/16	-	New Release	Patrick

1 Features

LCD 3.2 inch Amorphous-TFT-LCD (Thin Film Transistor Liquid Crystal Display) for mobile-phone or handy electrical equipments.

- (1) Construction: 3.2" a-Si color TFT-LCD, White LED Backlight, touch panel and FPCB.
- (2) Main LCD: 2.1 Amorphous-TFT 3.2 inch display, transmissive, Normally white type, 9 o'clock.
 - 2.2 240(RGB)X320 dots Matrix, 1/320 Duty.
 - 2.3 Narrow-contact ledge technique.
 - 2.4 Main LCD Driver IC: ILI9325C equivalent.
 - 2.5 262K: Red-6bit, Green-6bit, Blue-6bit (18-bit interface)
- (3) Low cross talk by frame rate modulation
- (4) Direct data display with display RAM
- (5) Partial display function: You can save power by limiting the display space.
- (6) Interface: MPU and RGB Interface. (Select by H/W Jumper). Default: MCU Interface.
- (7) SPI and Digital RGB 18-bit interface selectable.

` '						
IM3	IM2	IM1	IM0	MPU mode	DB Pin in use	Remark
PIN9	JP2	PIN8	PIN7			
0	0 (2,3Short)	1	0	80-16BIT	DB[17:10],DB[8:1]	
0	0 (2,3Short)	1	1	80-8BIT	DB[17:10]	MCU Interface.
1	0 (2,3Short)	1	0	80-18BIT	DB[17:0]	WICO IIILEITACE.
1	0 (2,3Short)	1	1	80-9BIT	DB[17:9]]	
0	1 (1,2Short)	0	ID	SPI	SDI ,SDO	Must change JP2;
						SPI, RGB Interface

^{*} Others setting invalid

(8) Abundant command functions:

Area scroll function

Display direction switching function

Power saving function

Electric volume control function: you are able to program the temperature compensation function.

2 Mechanical specifications

Dimensions and weight

Item		Specifications	Unit
Active Di	splay Size	3.2 inch diagonal(81.28mm)	mm
	Outline Dimension	55.64 (H) x 77.3(V)	mm
Main Pixel pitch		0.2025 (H) x 0.2025(V)	mm
LCD	Active area	48.6 (H) x 64.8 (V)	mm
	Number of Pixels	240(H)x320(V) pixels	mm

^{*1.} This specification is about External shape on shipment from AMPIRE.

3 Absolute max. ratings and environment

3-1 Absolute max. ratings

Ta=25°C GND=0V

Item	Symbol	Min.	Max.	Unit	Remarks
Power voltage	VDD – GND	-0.3	+3.3	V	
Power voltage	LED A – LED K	-0.5	+4.0	V	Parallel
Input voltage	VIN	-0.5	VDD	V	

3-2 Environment

Item	Specifications	Remarks
Storage temperature	Max. +80 °C Min30 °C	Note 1: Non-condensing
Operating temperature	Max. +70 °C Min10 °C	Note 1: Non-condensing

Note 1 : Ta≤+40 °C · · · · Max.85%RH

Ta>+40 $^{\circ}$ C · · · The max. humidity should not exceed the humidity with 40 $^{\circ}$ C 85%RH.

4 Electrical specifications

4-1 Electrical characteristics of LCM

 $(V_{DD}=3.0V, Ta=25 \,{}^{\circ}C)$

Item	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
IC power voltage	V_{DD}		2.6	2.8	3.3	V
High-level input voltage	V _{IHC}		0.8		V_{DD}	V
Low-level input voltage	V _{ILC}		-0.3		0.2V _{DD}	V
Consumption current of VDD	I _{DD}	LED OFF	-	10	-	mA
Consumption current of LED	I _{LED_ON}	V _{LED} =19.2V	-	15	20	mA

^{3. 1. 1/320} duty.

Date: 2011/3/16

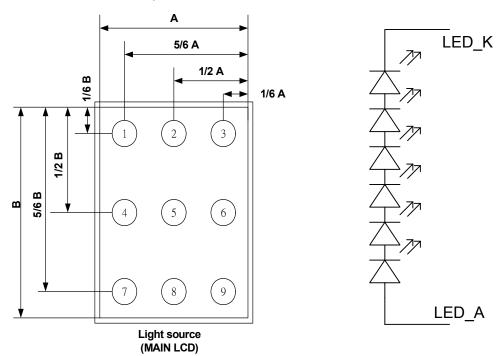
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4-2 LED back light specification

Item	Symbol Conditions		MIN.	TYP.	MAX.	Unit
Forward voltage	V _f I _f =15mA		-	(19)	-	V
Forward current	I _f	Ta=25C	-	(15)	(20)	mA
Uniformity (with L/G)	-	I _f =15mA	70%	-	-	
C.I.E.	Х		0.245	0.30	0.375	
G.I.E.	Υ		0.255	0.31	0.385	
Luminous color	White					
Chip connection		6 ch	nip serial c	onnection		

Note: (value), value=estimate value.

Bare LED measure position:



*1 Uniformity (LT): $\frac{Min(P1 \sim P9)}{Max(P1 \sim P9)} \times 100 \ge 80\%$

4.3 Touch Panel Electrical Specification

Parameter	Condition	Standard Value		
Terminal Resistance	X Axis	200Ω ~ 900Ω		
Terminal Resistance	Y Axis	200Ω ~ 900Ω		
Insulating Resistance	DC 25 V	More than $20 M\Omega$		
Linearity		±1.5 %		
Notes life by Pen	Note a	100,000 times(min)		
Input life by finger	Note b	1,000,000 times (min)		

Note A.

Hitting pad: Tip R8 mm Silicone rudder, & Tip R0.8 mm stylus pen(POM).

Load: 250 g.

Hitting speed: 2 times / sec.

Electric load: None.

Note B.

Hitting pad: Tip R0.8 mm stylus pen (POM).

Load : 250 g.

Sliding speed: 150mm / sec.

Sliding length: 25mm. Electric load: None.

	Symbol	Function	
1	XL	Touch Panel Left Signal in X Axis	
2 YD Touch Panel Bottom Signal in Y Axis			
3 XR Touch		Touch Panel Right Signal in X Axis	
4	YU	Touch Panel Top Signal in Y Axis	

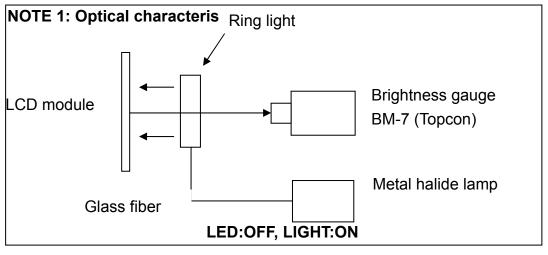
5 Main LCD

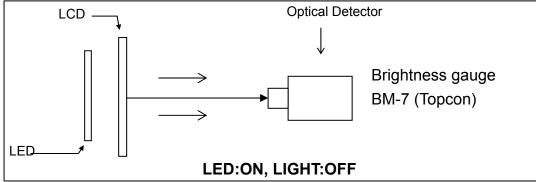
5-1 Optical characteristics

 $(1/320 \text{ Duty in case except as specified elsewhere Ta = }25^{\circ}\text{C})$

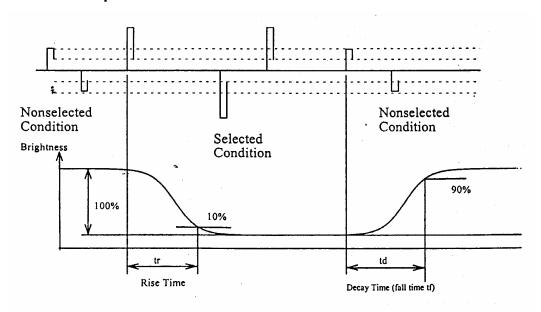
Item		Symbol	Min.	Std.	Max.	Unit	Conditions
Contrast	atio	CR	150	200	-	-	
Response	Rising	Tr	1	15	-	ms	
time	Faling	Tf	ı	35		1113	
White lumir (center of se		YL		160		cd/m2	θ=0°
	Red	Rx	0.54	0.59	0.63		Φ=0°
	Reu	RY	0.30	0.34	0.38		
Color	olor Green	Gx	0.29	0.33	0.37		Normal
		GY	0.56	0.60	0.64		viewing angle
chromaticity (CIE1931)	Blue	Bx	0.10	0.14	0.18		
(CIL 1931)	Diue	BY	0.02	0.06	0.10		
	White	Wx	0.26	0.30	0.37		
	vviile	WY	0.27	0.31	0.38		
	Hor.	θι		(38.7)			
Visual angle	1101.	θR	(15)			- Degree	CR>10
visual aligie	Ver.	Θf		(62.7)		Degree	010-10
	vei.	θь		(62.2)			

Note: (value), value=estimate value.

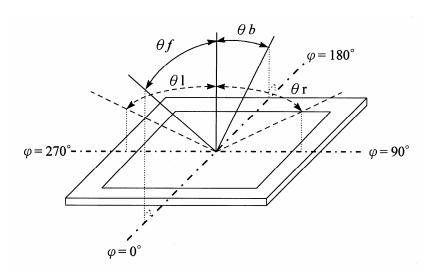




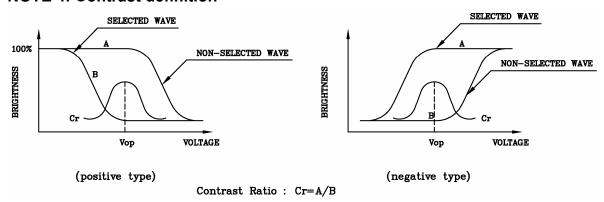
NOTE 2: Response tome definition



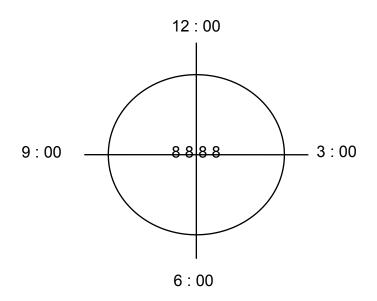
NOTE 3: $\phi \cdot \theta$ definition



NOTE 4: Contrast definition



NOTE 5: Visual angle direction priority

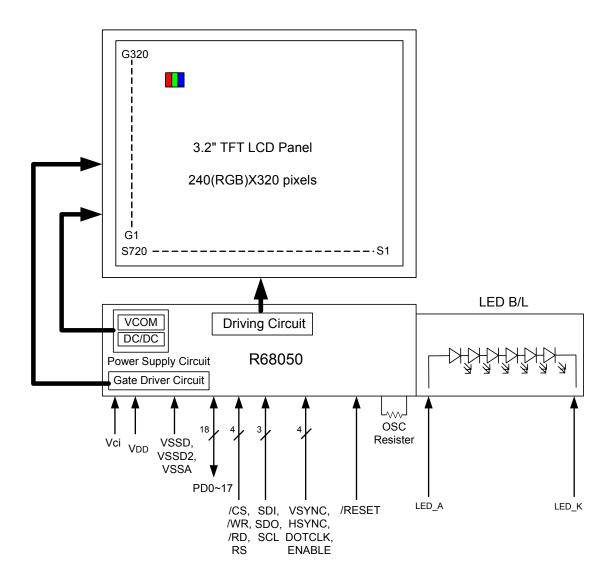


6 Block Diagram

Block diagram (Main LCD)

Display format: A-Si TFT transmissive, normally white type, 12 o'clock.

Display composition: 240 x RGB x 320 dots LCD Driver: RM68050 or equivalent.



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7 Interface specifications

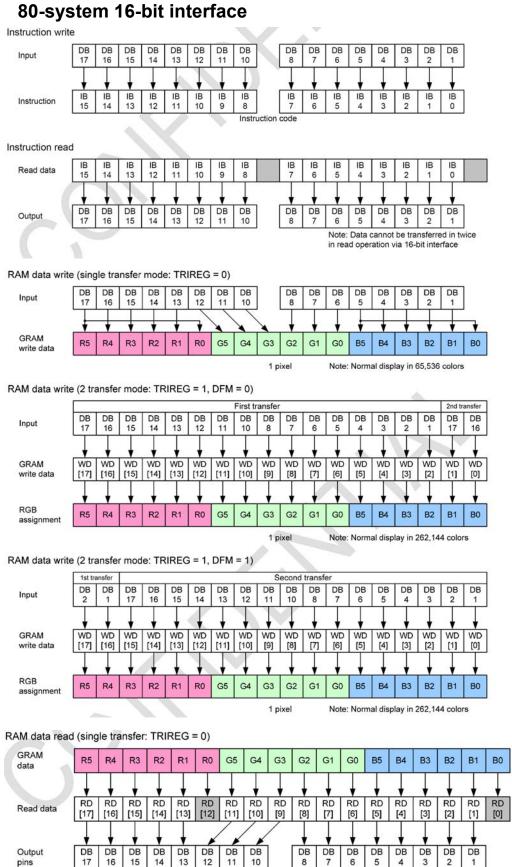
Connecter pitch:0.3mm

Recommend Connecter:	JAF FF0245S
recommend connector.	0/ 10 10 02 700

Pin No.	Terminal				Functions					
1	VSS	Ground pins.								
2	XL	Tou	Touch Panel Left Side.							
3	XR	Tou	Touch Panel Right Side.							
4	YD	Tou	Touch Panel Down Side.							
5	YU	Tou	Touch Panel Up Side.							
6	VSS	Gro	Ground pins.							
7	IM0/ID	IM3	IM1	IM0/ID	MPU-Interface Mode	DB Pin in use				
		0	1	0	i80-system 16-bit interface	DB[17:10], DB[8:1]; (JP1 2-3short)				
8	IM1	0	1	1	i80-system 8-bit interface	DB[17:10]; (JP1 2-3short)				
		1	1	0	i80-system 18-bit interface	DB[17:0]; (JP1 2-3short)				
9	IM3	1	1	1	i80-system 9-bit interface	DB[17:9]; (JP1 2-3short)				
3	IIVIO	0	0	ID	Serial Peripheral Interface	SDI, SDO; (JP1 1-2short)				
10	SDO	Ser	ial bu	us intei	face data output pin.					
11	NC	No	No Connection.							
12	SDI	Ser	Serial bus interface data input pin.							
13-30	D17-D0		18-bit bidirectional bus Connect to VSS when the serial interface is selected.							
31	/CS		Chip selection pin. The "L" level enables inputting commands and reading /writing							
32	/RESET		Switching to "L" initializes internally. Must be reset after the power is supplied.							
33	RS	Cor	Command/display Data Selection.							
34	WR/SCL	Writ	Write enable signal/Serial bus interface clock input pin.							
35	/RD	Read enable signal.								
36	VSYNC	Fra	Frame synchronizing signal in RGB I/F mode. (JP1 1-2short)							
37	HSYNC	Frame synchronizing signal in RGB I/F mode. (JP1 1-2short)								
38	DOTCLK	Dot	Dot clock signal in RGB I/F mode. (JP1 1-2short)							
39	ENABLE	A da	A data ENABLE signal in RGB I/F mode. (JP1 1-2short)							
40	VCC	Dow	ar eu	nnly fo	r Step-up circuit. (VC	I-2 5~3 3\/\				
41	VCC	1 Owe	51 SU	ірріў і	ir Step-up Circuit. (VC	1–2.5 3.3 V).				
42	VSS	Gro	und	pins.						
43	LED_K	Pov	ver s	upply f	or LED (Cathode).					
44	LED_A	Pov	ver s	upply f	or LED (Anode).					
45	VSS	Gro	und	pins.						

7-1 80-system 18-bit interface

Instruction write DB Input 16 15 14 13 12 11 10 8 6 5 3 0 IB IB IB IB IB ΙB IB Instruction 14 13 12 11 10 9 8 6 5 Instruction read IB 7 ΙB ΙB ΙB IB ΙB Read data 15 14 13 12 11 10 9 8 6 5 4 3 2 1 0 DB 17 DB 16 DB 15 DB 14 DB 12 DB 11 DB 3 DB 2 DB 1 DB DB DB DB DB 7 DB DB DB DB Output 4 13 10 8 6 5 9 RAM data read GRAM R5 R4 R3 R2 R1 R0 G5 G4 G3 G2 G1 G0 **B5 B4 B3** B2 B1 B0 data RD Read data [17] [16] [15] [14] [13] [12] [11] [9] [8] [7] [6] [5] [4] [3] [2] [1] [0] DB 7 DB Output DB 9 0 pins

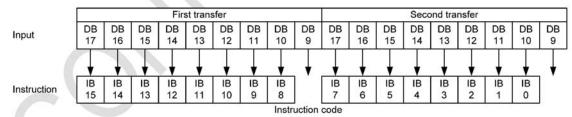


Note: Data cannot be transferred in twice in read operation via 16-bit interface

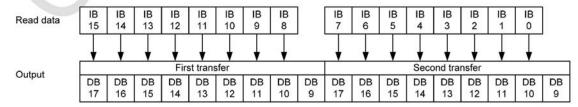
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7-3 80-system 9-bit interface

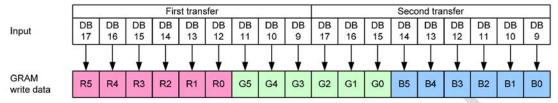
Instruction write



Device code read



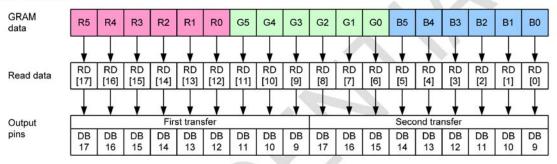
RAM data write



1 pixel

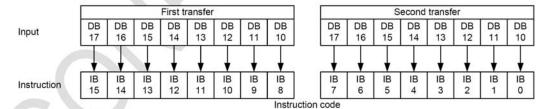
Note: Normal display in 262,144 colors

RAM data read

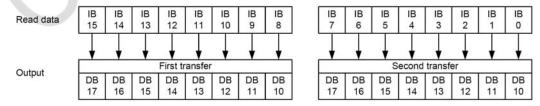


7-4 80-system 8-bit interface

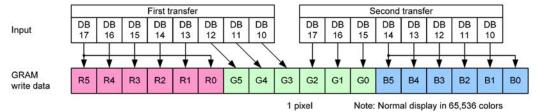
Instruction write



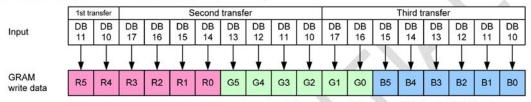
Device code read



RAM data write (2-transfer mode: TRIREG = 0)

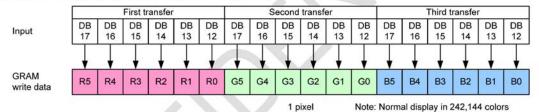


RAM data write (3-transfer mode: TRIREG = 1, DFM = 0)



1 pixel Note: Normal display in 242,144 colors

RAM data write (3-transfer mode: TRIREG = 1, DFM = 1)



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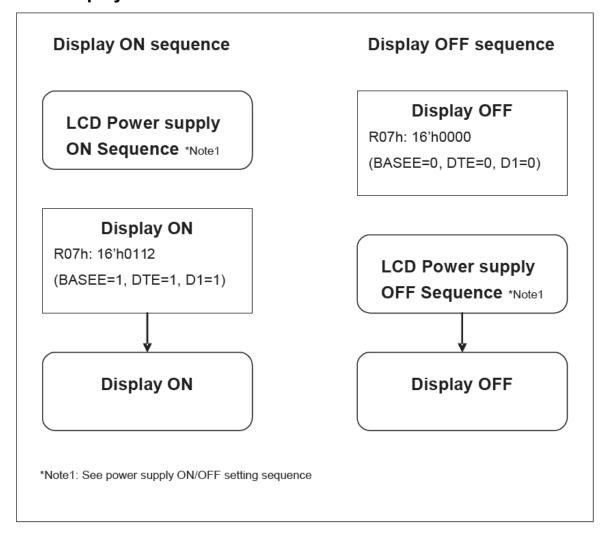
7-5 Instruction List

Main LCD Driver IC: ILI9325C

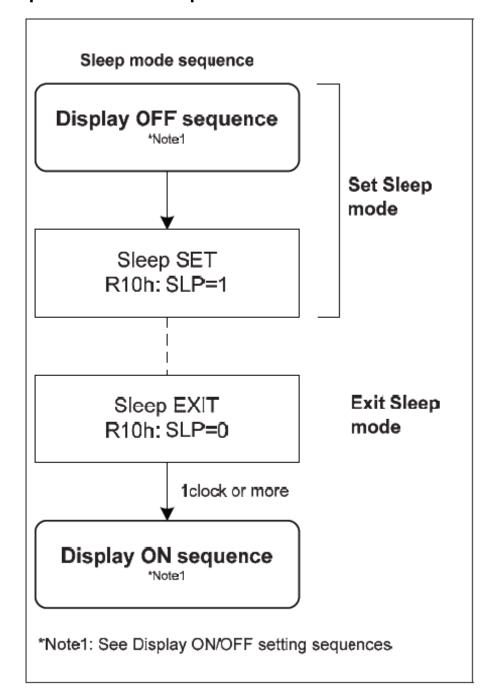
		_	_	_	_		_			_	_		_	_					
No.	Registers Name	R/W		D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
IR 00h	Index Register Driver Code Read	RO	1	1	0	0	1	0	0	1	1	1D7 0	ID6 0	ID5	1D4 0	1D3 0	ID2	ID1 0	1D0
01h	Driver Code Read Driver Output Control 1	W	1	0	0	0	0	0	SM	0	SS	0	0	0	0	0	0	0	0
02h	LCD Driving Control	W	1	0	0	0	0	0	0	B/C	0	0	0	0	0	0	0	0	0
03h	Entry Mode	W	1	TRI	DFM	0	BGR	0	0	0	0	ORG	0	I/D1	I/D0	AM	0	0	0
05h	16 bits data format control	W	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	EPF1	EPF0
07h	Display Control 1	W	1	0	0	PTDE1	PTDE0	0	0	0	BASEE	0	0	GON	DTE	CL	0	D1	D0
08h	Display Control 2	W	1	0	0	0	0	FP3	FP2	FP1	FP0	0	0	0	0	BP3	BP2	BP1	BP0
09h	Display Control 3	W	1	0	0	0	0	0	0	PTS1	PTS0	0	0	PTG1	PTG0	ISC3	ISC2	ISC1	ISC0
0Ah	Display Control 4	W	1	0	0	0	0	0	0	0	0	0	0	0	0	FMARKOE	FMI2	FMI1	FMI0
0Ch	RGB Display Interface Control	W	1	0	ENC2	ENC1	ENC0	0	0	0	RM	0	0	DM1	DM0	0	0	RIM1	RIMO
0Dh	Frame Maker Position	w	1	0	0	0	0	0	0	0	FMP8	FMP7	FMP6	FMP5	FMP4	FMP3	FMP2	FMP1	FMP0
	RGB Display Interface Control																		
0Fh	2	W	1	0	0	0	0	0	0	0	0	0	0	0	VSPL	HSPL	0	EPL	DPL
10h	Power Control 1	W	1	0	0	0	SAP	0	BT2	BT1	ВТО	APE	AP2	AP1	AP0	0	0	SLP	STB
11h	Power Control 2	W	1	0	0	0	0	0	DC12	DC11	DC10	0	DC02	DC01	DC00	0	VC2	VC1	VC0
12h	Power Control 3	W	1	0	0	0	0	0	0	0	0	VCIRE	0	0	0	VRH3	VRH2	VRH1	VRH0
13h	Power Control 4	W	1	0	0	0	VDV4	VDV3	VDV2	VDV1	VDV0	0	0	0	0	0	0	0	0
20h	Horizontal GRAM Address Set	W	1	0	0	0	0	0	0	0	0	AD7	AD6	AD5	AD4	AD3	AD2	AD1	AD0
21h	Vertical GRAM Address Set	W	1	0	0	0	0	0	0	0	AD16	AD15	AD14	AD13	AD12	AD11	AD10	AD9	AD8
22h	Write Data to GRAM	W	1	RAM w	rite data (1	WD17-0)	read data	a (RD17-0) b	its are tran	nsferred v	ia differen	t data bus li	nes accord	ding to the	selected int	terfaces.			
29h	Power Control 7	w	1	0	0	0	0	0	0	0	0	0	0	VCM5	VCM4	VCM3	VCM2	VCM1	VCM0
2Bh	Frame Rate and Color Control	w	1	0	0	0	0	0	0	0	0	0	0	0	0	FRS[3]	FRS[2]	FRS[1]	FRS[0]
30h	Gamma Control 1	W	1	0	0	0	0	0	KP1[2]	KP1[1]	KP1[0]	0	0	0	0	0	KP0[2]	KP0[1]	KP0[0]
31h	Gamma Control 2	W	1	0	0	0	0	0	KP3[2]	KP3[1]	KP3[0]	0	0	0	0	0	KP2[2]	KP2[1]	KP2[0]
32h	Gamma Control 3	W	1	0	0	0	0	0	KP5[2]	KP5[1]	KP5[0]	0	0	0	0	0	KP4[2]	KP4[1]	KP4[0]
35h	Gamma Control 4	W	1	0	0	0	0	0	RP1[2]	RP1[1]	RP1[0]	0	0	0	0	0	RP0[2]	RP0[1]	RP0[0]
36h	Gamma Control 5	W	1	0	0	0	VRP1[4]	VRP1[3]	VRP1[2]	VRP1[1]	VRP1[0]	0	0	0	0	VRP0[3]	VRP0[2]	VRP0[1]	VRP0[0]
37h	Gamma Control 6	W	1	0	0	0	0	0	KN1[2]	KN1[1]	KN1[0]	0	0	0	0	0	KN0[2]	KN0[1]	KN0[0]
38h	Gamma Control 7	W	1	0	0	0	0	0	KN3[2]	KN3[1]	KN3[0]	0	0	0	0	0	KN2[2]	KN2[1]	KN2[0]
39h	Gamma Control 8	W	1	0	0	0	0	0	KN5[2]	KN5[1]	KN5[0]	0	0	0	0	0	KN4[2]	KN4[1]	KN4[0]
3Ch	Gamma Control 9	W	1	0	0	0	0	0	RN1[2]	RN1[1]	RN1[0]	0	0	0	0	0	RN0[2]	RN0[1]	RN0[0]
No.	Registers Name	R/W	RS	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
3Dh	Gamma Control 10	W	1	0	0	0	VRN1[4]	VRN1[3]	VRN1[2]	VRN1[1]	VRN1[0]	0	0	0	0	VRN0[3]	VRN0[2]	VRN0[1]	VRN0[0]
J.Diii	Horizontal Address Start					0 1	V1.0.11[4]			70007	VICE TO								
50h	Position Position	W	1	0	0	0	0	0	0	0	0	HSA7	HSA6	HSA5	HSA4	HSA3	HSA2	HSA1	HSA0
	Horizontal Address End						_ "												
51h	Position	W	1	0	0	0	0	0	0	0	0	HEA7	HEA6	HEA5	HEA4	HEA3	HEA2	HEA1	HEA0
52h	Vertical Address Start Position	W	1	0	0	0	0	0	0	0	VSA8	VSA7	VSA6	VSA5	VSA4	VSA3	VSA2	VSA1	VSA0
53h	Vertical Address End Position	W	1	0	0	0	0	0	0	0	VEA8	VEA7	VEA6	VEA5	VEA4	VEA3	VEA2	VEA1	VEA0
ac.	Driver Output Control 2	W	1	GS	0	NL5	NL4	NL3	NL2	NL1	NLO	0	0	SCN5	SCN4	SCN3	SCN2	SCN1	SCND
60h		44			V	IAFO	NL4	INLO	NLZ	NLT	INCO		U	SUNS	SCN4	SCN3	SUIVE	0.0141	
60h 61h	Base Image Display Control	W	1	0	0	0	0	0	0	0	0	0	0	0	0	0 0	NDL	VLE	REV
61h	Base Image Display Control	W	1	0	0	0	0	0	0	0	0	0	0	0	0	0	NDL	VLE	REV R/WX
		w	1	_	- 22														
61h 66h 6Ah	Base Image Display Control SPI Read/Write Control Vertical Scroll Control	w w	1 1	0 0	0	0	0	0 0	0 0	0	0 0 VL8	0 0 VL7	0 0 VL6	0 0 VL5	0 0 VL4	0 0 VL3	NDL 0 VL2	VLE 0 VL1	R/WX (0) VL0
61h 66h	Base Image Display Control SPI Read/Write Control	w	1 1 1	0	0	0	0	0	0	0	0	0	0	0	0	0	NDL 0	VLE 0	R/WX (0)
61h 66h 6Ah	Base Image Display Control SPI Read/Write Control Vertical Scroll Control Partial Image 1 Display Position Partial Image 1 Area (Start	w w	1 1 1 1	0 0	0	0	0	0 0	0 0	0	0 VL8 PTDP08	0 0 VL7 PTDP07	0 0 VL6	0 0 VL5	0 0 VL4	0 VL3 PTDP03	NDL 0 VL2 PTDP02	VLE 0 VL1 PTDP01	(0) VL0 PTDP00
61h 66h 6Ah 80h	Base Image Display Control SPI Read/Write Control Vertical Scroll Control Partial Image 1 Display Position Partial Image 1 Area (Start Line)	W W W W	1 1 1	0 0 0	0 0 0 0	0 0 0 0	0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 VL8 PTDP08 PTSA08	0 VL7 PTDP07 PTSA07	0 VL6 PTDP06 PTSA06	0 VL5 PTDP05 PTSA05	0 VL4 PTDP04 PTSA04	0 VL3 PTDP03 PTSA03	NDL 0 VL2 PTDP02 PTSA02	VLE 0 VL1 PTDP01 PTSA01	VL0 PTDP00 PTSA00
61h 66h 6Ah 80h 81h	Base Image Display Control SPI Read/Write Control Vertical Scroll Control Partial Image 1 Display Position Partial Image 1 Area (Start Line) Partial Image 1 Area (End Line)	w w w w	1 1 1	0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0 0	0 0 0 0	0 0 0 0 0	0 VL8 PTDP08 PTSA08 PTEA08	0 VL7 PTDP07 PTSA07 PTEA07	0 VL6 PTDP06 PTSA06 PTEA06	0 VL5 PTDP05 PTSA05 PTEA05	0 VL4 PTDP04 PTSA04 PTEA04	0 VL3 PTDP03 PTSA03 PTEA03	NDL 0 VL2 PTDP02 PTSA02 PTEA02	VLE 0 VL1 PTDP01 PTSA01 PTEA01	R/WX (0) VL0 PTDP00 PTSA00 PTEA00
61h 66h 6Ah 80h	Base Image Display Control SPI Read/Write Control Vertical Scroll Control Partial Image 1 Display Position Partial Image 1 Area (Start Line) Partial Image 1 Area (End Line) Partial Image 2 Display Position	W W W W	1 1 1	0 0 0	0 0 0 0	0 0 0 0	0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 VL8 PTDP08 PTSA08	0 VL7 PTDP07 PTSA07	0 VL6 PTDP06 PTSA06	0 VL5 PTDP05 PTSA05	0 VL4 PTDP04 PTSA04	0 VL3 PTDP03 PTSA03	NDL 0 VL2 PTDP02 PTSA02	VLE 0 VL1 PTDP01 PTSA01	VL0 PTDP00 PTSA00
61h 66h 6Ah 80h 81h	Base Image Display Control SPI Read/Write Control Vertical Scroll Control Partial Image 1 Display Position Partial Image 1 Area (Start Line) Partial Image 1 Area (End Line) Partial Image 2 Display Position Partial Image 2 Area (Start	w w w w	1 1 1	0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0 0	0 0 0 0	0 0 0 0 0	0 VL8 PTDP08 PTSA08 PTEA08	0 VL7 PTDP07 PTSA07 PTEA07	0 VL6 PTDP06 PTSA06 PTEA06	0 VL5 PTDP05 PTSA05 PTEA05	0 VL4 PTDP04 PTSA04 PTEA04	0 VL3 PTDP03 PTSA03 PTEA03	NDL 0 VL2 PTDP02 PTSA02 PTEA02	VLE 0 VL1 PTDP01 PTSA01 PTEA01	R/WX (0) VL0 PTDP00 PTSA00 PTEA00
61h 66h 6Ah 80h 81h 82h 83h	Base Image Display Control SPI Read/Write Control Vertical Scroll Control Partial Image 1 Display Position Partial Image 1 Area (Start Line) Partial Image 1 Area (End Line) Partial Image 2 Display Position Partial Image 2 Area (Start Line)	w w w w w w	1 1 1 1 1 1	0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0	O VL8 PTDP08 PTSA08 PTEA08 PTDP18 PTSA18	0 VL7 PTDP07 PTSA07 PTEA07 PTDP17 PTSA17	0 VL6 PTDP06 PTSA06 PTEA06 PTDP16 PTSA16	0 VL5 PTDP05 PTSA05 PTEA05 PTDP15 PTSA15	0 VL4 PTDP04 PTSA04 PTEA04 PTDP14 PTSA14	0 VL3 PTDP03 PTSA03 PTEA03 PTDP13 PTSA13	NDL 0 VL2 PTDP02 PTSA02 PTEA02 PTDP12 PTSA12	VLE 0 VL1 PTDP01 PTSA01 PTEA01 PTDP11 PTSA11	PTSA10
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61h 66h 6Ah 80h 81h 82h 83h 84h 85h	Base Image Display Control SPI Read/Write Control Vertical Scroll Control Partial Image 1 Display Position Partial Image 1 Area (Start Line) Partial Image 1 Area (End Line) Partial Image 2 Display Position Partial Image 2 Area (Start Line) Partial Image 2 Area (Start Line) Partial Image 2 Area (End Line) Partial Image 2 Area (End Line)	W W W W W W	1 1 1 1 1 1	0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0	O VL8 PTDP08 PTSA08 PTEA08 PTDP18 PTSA18	0 VL7 PTDP07 PTSA07 PTEA07 PTDP17 PTSA17	0 VL6 PTDP06 PTSA06 PTEA06 PTDP16 PTSA16	0 VL5 PTDP05 PTSA05 PTEA05 PTDP15 PTSA15	0 VL4 PTDP04 PTSA04 PTEA04 PTDP14 PTSA14	0 VL3 PTDP03 PTSA03 PTEA03 PTDP13 PTSA13	NDL 0 VL2 PTDP02 PTSA02 PTEA02 PTDP12 PTSA12	VLE 0 VL1 PTDP01 PTSA01 PTEA01 PTDP11 PTSA11	PTSA10
61h 66h 6Ah 80h 81h 82h 83h 84h 85h	Base Image Display Control SPI Read/Write Control Vertical Scroll Control Partial Image 1 Display Position Partial Image 1 Area (Start Line) Partial Image 1 Area (End Line) Partial Image 2 Display Position Partial Image 2 Area (Start Line) Partial Image 2 Area (End Line) Partial Image 2 Area (End Line)	w w w w w w	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	VL8 PTDP08 PTSA08 PTEA08 PTEA18 PTSA18 PTEA18 DIVIO0	0 VL7 PTDP07 PTSA07 PTEA07 PTDP17 PTSA17 PTEA17 0	0 VL6 PTDP06 PTSA06 PTDP16 PTSA16 PTEA16 0	0 VL5 PTDP05 PTSA05 PTEA05 PTDP15 PTSA15 PTEA15 0	0 VL4 PTDP04 PTSA04 PTDP14 PTSA14 PTSA14 RTNI4	0 VL3 PTDP03 PTSA03 PTEA03 PTDP13 PTSA13 PTEA13 RTNI3	NDL VL2 PTDP02 PTSA02 PTEA02 PTDP12 PTSA12 PTEA12 RTNI2	VLE VL1 PTDP01 PTSA01 PTEA01 PTSA11 PTEA11 RTNI1	PWX (0) VL0 PTDP00 PTSA00 PTEA00 PTDP10 PTSA10 PTEA10 RTNI0
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61h 66h 6Ah 80h 81h 82h 83h 84h 85h 90h 92h 95h 97h	Base Image Display Control SPI Read/Write Control Vertical Scroll Control Partial Image 1 Display Position Partial Image 1 Area (Start Line) Partial Image 1 Area (End Line) Partial Image 2 Display Position Partial Image 2 Area (Start Line) Partial Image 2 Area (Start Line) Partial Image 2 Area (End Line) Partial Interface Control 1 Panel Interface Control 4 Panel Interface Control 5	W W W W W W W W W	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 NOWI2 0 NOWI2	0 0 0 0 0 0 0 0 0 0 0 DIVI1 NOWI1 DIVE1 NOWE1	VL8 PTDP08 PTSA08 PTSA08 PTSA18 PTSA18 DIVIO0 NOWIO DIVEO 0	0 0 VL7 PTDP07 PTSA07 PTEA07 PTDP17 PTSA17 PTEA17 0 0	VL6 PTDP06 PTSA06 PTEA06 PTDP16 PTSA16 O O O	0 VL5 PTDP05 PTSA05 PTEA05 PTDP15 PTSA15 PTEA15 0 0 0	0 VL4 PTDP04 PTSA04 PTEA04 PTSA14 PTEA14 RTNI4 0 0 0	0 VL3 PTDP03 PTSA03 PTEA03 PTDP13 PTSA13 PTEA13 RTNI3 0 0 0 0	NDL VL2 PTDP02 PTSA02 PTEA02 PTDP12 PTSA12 PTEA12 RTNI2 0 0 0	VLE VL1 PTDP01 PTSA01 PTEA01 PTSA11 PTEA11 RTNI1 0 0 0	PWX (0) VL0 PTDP00 PTSA00 PTEA00 PTDP10 PTSA10 PTEA10 RTNI0 0 0
61h 66h 6Ah 80h 81h 82h 83h 84h 85h 90h 92h 95h 97h	Base Image Display Control SPI Read/Write Control Vertical Scroll Control Vertical Scroll Control Partial Image 1 Display Position Partial Image 1 Area (Start Line) Partial Image 2 Display Position Partial Image 2 Display Position Partial Image 2 Display Position Partial Image 2 Area (Start Line) Partial Image 2 Area (End Line) Partial Image 2 Area (End Line) Partial Image 2 Control 1 Panel Interface Control 1 Panel Interface Control 2 Panel Interface Control 4 Panel Interface Control 5 OTP VCM Programming	W W W W W W W W W	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 NOWI2 0 NOWE2	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	VL8 PTDP08 PTSA08 PTEA08 PTEA18 PTSA18 PTEA18 DIVI00 NOWIO DIVEO NOWEO 0	0 0 VL7 PTDP07 PTSA07 PTEA07 PTDP17 PTSA17 PTEA17 0 0	VL6 PTDP06 PTSA06 PTEA06 PTDP16 PTSA16 O O O	0 VL5 PTDP05 PTSA05 PTEA05 PTSA15 PTEA15 0 0 0 VCM_	0 VL4 PTDP04 PTSA04 PTEA04 PTSA14 PTEA14 RTNI4 0 0 VCM_	0 VL3 PTDP03 PTSA03 PTEA03 PTDP13 PTSA13 PTEA13 RTNI3 0 0 0 VCM_	NDL VL2 PTDP02 PTSA02 PTEA02 PTSA12 PTSA12 PTEA12 RTNI2 0 0 VCM_	VLE 0 VL1 PTDP01 PTSA01 PTEA01 PTSA11 PTEA11 RTNI1 0 0 VCM_	PWX (0) VL0 PTDP00 PTSA00 PTEA00 PTDP10 PTSA10 PTSA10 0 0 0 VCM_ OTP0 VCM_
61h 66h 6Ah 80h 81h 82h 83h 84h 85h 90h 92h 95h 97h A1h	Base Image Display Control SPI Read/Write Control Vertical Scroll Control Partial Image 1 Display Position Partial Image 1 Area (Start Line) Partial Image 2 Area (End Line) Partial Image 2 Area (End Line) Partial Image 2 Area (Control 1 Panel Interface Control 2 Panel Interface Control 4 Panel Interface Control 5 OTP VCM Programming Control OTP VCM Status and Enable	W W W W W W W W W W	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 NOWI2 0 NOWE2 0 VCM_ D2 KEY	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	O VL8 PTDP08 PTSA08 PTEA08 PTSA18 PTSA18 DIVIOD NOWIO DIVEO NOWEO O VCM_ DO KEY	0 VL7 PTDP07 PTSA07 PTEA07 PTDP17 PTSA17 PTEA17 0 0 0 0 0 0 0 KEY	0 VL6 PTDP06 PTSA06 PTEA06 PTEA16 0 0 0 0 0 C KEY	0 VL5 PTDP05 PTSA05 PTEA05 PTSA15 PTEA15 0 0 0 VCM_OTP5 0 KEY	0 VL4 PTDP04 PTSA04 PTEA04 PTDP14 PTSA14 PTEA14 RTNI4 0 0 VCM_OTP4 0 KEY	0 VL3 PTDP03 PTSA03 PTEA03 PTSA13 PTSA13 PTEA13 RTNI3 0 0 VCM_OTP3 0 KEY	NDL VL2 PTDP02 PTSA02 PTEA02 PTSA12 PTEA12 RTNI2 0 0 VCM_OTP2 0 KEY	VLE 0 VL1 PTDP01 PTSA01 PTEA01 PTSA11 PTEA11 RTNI1 0 0 VCM_OTP1 0 KEY	PWX (0) VL0 PTDP00 PTSA00 PTEA00 PTSA10 PTSA10 PTEA10 0 0 0 VCM_ OTPO VCM_ EN KEY
61h 66h 6Ah 80h 81h 82h 83h 85h 90h 92h 95h 97h A1h A2h	Base Image Display Control SPI Read/Write Control Vertical Scroll Control Partial Image 1 Display Position Partial Image 1 Area (Start Line) Partial Image 2 Area (End Line) Partial Image 2 Area (End Line) Partial Interface Control 1 Panel Interface Control 2 Panel Interface Control 4 Panel Interface Control 5 OTP VCM Programming Control OTP VCM Status and Enable OTP Programming ID Key	W W W W W W W W W W W W	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 NOWI2 0 NOWE2 0 VCM_D2_KEP 10	0 0 0 0 0 0 0 0 0 0 DIVI1 NOWI1 DIVE1 0 VCM_D1 KEY 9	O VL8 PTDP08 PTSA08 PTEA08 PTSA18 PTSA18 DIVI00 NOWIO DIVEO O KEY 8	0 0 VL7 PTDP07 PTSA07 PTEA07 PTDP17 PTSA17 0 0 0 0 0 0 0 0 0	0 VL6 PTDP06 PTSA06 PTEA06 PTDP16 PTSA16 O O O C C C C C C C C C C C C C C C C	0 VL5 PTDP05 PTSA05 PTEA05 PTDP15 PTSA15 PTEA15 0 0 VCM_OTP5 0 KEY 5	0 VL4 PTDP04 PTSA04 PTEA04 PTDP14 PTSA14 RTNI4 0 0 VCM_OTP4 0 KEY 4	VL3 PTDP03 PTSA03 PTEA03 PTDP13 PTSA13 PTSA13 PTEA13 RTNI3 0 0 VCM_OTP3 0 KEY 3	NDL 0 VL2 PTDP02 PTSA02 PTEA02 PTDP12 PTSA12 PTEA12 RTNI2 0 0 VCM_OTP2 0 KEY 2	VLE 0 VL1 PTDP01 PTSA01 PTSA01 PTSA11 PTSA11 RTNI1 0 0 VCM_OTP1 0 KEY 1	PWX (0) VL0 PTDP00 PTSA00 PTEA00 PTDP10 PTSA10 PTEA10 O 0 0 VCM OTP0 VCM EN KEY 0
61h 66h 6Ah 80h 81h 82h 83h 84h 85h 90h 92h 97h A1h A2h A5h B1h	Base Image Display Control SPI Read/Write Control Vertical Scroll Control Partial Image 1 Display Position Partial Image 1 Area (Start Line) Partial Image 1 Area (End Line) Partial Image 2 Area (Start Line) Partial Image 2 Area (Start Line) Partial Image 2 Area (Start Line) Partial Image 2 Area (End Line) OTP VCM Programming Control OTP VCM Programming Control OTP VCM Status and Enable OTP Programming ID Key Write Display Brightness	W W W W W W W W W W W W W W W W W W W	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 VCM_D5 KEY 13 X	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 NOWI2 0 NOWE2 0 VCM_D2 KEY 10 X	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	O VL8 PTDP08 PTSA08 PTSA08 PTSA18 PTSA18 PTSA18 PTEA18 DIVIOO NOWIO DIVEO NOWEO O VCM_DO KEY EX X	0 VL7 PTDP07 PTSA07 PTEA07 PTSA17 PTEA17 0 0 0 0 KEY 7 DBV7	0 VL6 PTDP06 PTSA06 PTEA06 PTDP16 PTSA16 O O O C C C C C C C C C C C C C C C C	0 VL5 PTDP05 PTSA05 PTEA05 PTSA15 PTEA15 0 0 0 0 VCM_OTP5 0 KEY 5 DBV5	0 VL4 PTDP04 PTSA04 PTSA04 PTSA14 PTSA14 PTEA14 0 0 0 VCM_OTP4 0 KEY 4 DBV4	O VL3 PTDP03 PTSA03 PTEA03 PTSA13 PTSA13 PTEA13 RTNI3 O UCM_OTP3 O KEY 3 DBV3	NDL 0 VL2 PTDP02 PTSA02 PTSA02 PTSA12 PTSA12 0 0 VCM OTP2 0 KEY 2 DBV2	VLE 0 VL1 PTDP01 PTSA01 PTSA01 PTSA11 PTSA11 RTNI1 0 0 VCM OTP1 0 KEY 1 DBV1	PWX (0) VL0 PTDP00 PTSA00 PTEA00 PTDP10 PTSA10 PTEA10 O 0 VCM OTP0 VCM EN KEY 0 DBV0
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61h 66h 6Ah 80h 81h 82h 83h 84h 85h 90h 92h 97h A1h A2h A5h B1h B2h B3h	Base Image Display Control SPI Read/Write Control Vertical Scroll Control Partial Image 1 Display Position Partial Image 1 Area (Start Line) Partial Image 2 Area (End Line) Partial Image 2 Area (End Line) Partial Interface Control 1 Panel Interface Control 2 Panel Interface Control 4 Panel Interface Control 5 OTP VCM Programming Control OTP VCM Status and Enable OTP Programming ID Key Write Display Brightness Read Display Brightness Write CTRL Display value	W W W W W W W W W W W W W W W W W W W	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 NOWI2 0 NOWE2 0 VCM_D2- KEY 10 X	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	O VL8 PTDP08 PTSA08 PTEA08 PTSA18 PTEA18 DIVIOO NOWIO DIVEO NOWEO O VCM_DO KEY 8 X X	0 VL7 PTDP07 PTSA07 PTEA07 PTSA17 PTEA17 0 0 0 KEY 7 OBV7 DBV7 X	0 VL6 PTDP06 PTSA06 PTEA06 PTSA16 PTSA16 O 0 0 KEY 6 DBV6 DBV6 X	VL5 PTDP05 PTSA05 PTSA05 PTSA15 PTSA15 O O O KEY 5 DBV5 DBV5 BCTRL	0 VL4 PTDP04 PTSA04 PTEA04 PTSA14 PTEA14 RTNI4 0 0 VCM_OTP4 0 KEY 4 DBV4 X	O VL3 PTDP03 PTSA03 PTEA03 PTEA13 PTEA13 PTEA13 RTNI3 O O O COTP3 O KEY 3 DBV3 DBV3 DDV3 DDV3 DDV3	NDL VL2 PTDP02 PTSA02 PTEA02 PTSA12 PTSA12 PTEA12 RTNI2 0 0 VCM_OTP2 0 KEY 2 DBV2 BL	VLE 0 VL1 PTDP01 PTSA01 PTEA01 PTSA11 PTEA11 RTNI1 0 0 VCM_ OTP1 0 KEY 1 DBV1 DBV1 X	PWX (0) VL0 PTDP00 PTSA00 PTDP10 PTSA10 PTSA10 PTSA10 O O O VCM EN KEY O DBV0 X
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61h 66h 6Ah 80h 81h 82h 83h 84h 90h 92h A1h A2h A5h B1h B2h B3h B4h B5h No. B6h BFh C8h C9h CAh	Base Image Display Control SPI Read/Write Control Vertical Scroll Control Partial Image 1 Display Position Partial Image 1 Area (Start Line) Partial Image 1 Area (Start Line) Partial Image 2 Area (Start Line) Partial Image 2 Display Position Partial Image 2 Display Position Partial Image 2 Area (Start Line) Partial Image 2 Area (End Line) Partial Image 2 Area (End Line) Partial Image 2 Area (End Line) Partial Interface Control 1 Panel Interface Control 2 Panel Interface Control 5 OTP VCM Programming Control OTP VCM Programming ID Key Write Display Brightness Read Display Brightness Write CTRL Display value Write Content Adaptive Brightness Control value Write CABC Minimum Brightness CABC Control 1 CABC Control 2	W W W W W W W W W W W W W W W W W W W	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 NOW22 0 VCM_ D2 X X X X X X X X X X X X X X X	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	DE LES CONTROLLES CONT	0 VL7 PTDP07 PTSA07 PTEA07 PTDP17 PTSA17 PTSA17 0 0 0 0 KEY 7 DBV7 DBV7 X X X	0 0 VL6 PTDP06 PTSA06 PTEA06 PTDP16 PTSA16 0 0 0 0 KEY 6 DBV6 X X THRES_ 0 0	0 0 VL5 PTDP05 PTSA05 PTSA05 PTSA15 0 0 0 VCM OTP5 5 DBVS BCTRL X D5 X	0 VL4 PTDP04 PTSA04 PTEA04 PTSA14 PTSA14 O O VCM_ OTP4 OTP4 DBV4 X X X CMB	0 VL3 PTDP03 PTSA03 PTEA03 PTDP13 PTSA13 PTEA13 RTN13 0 0 0 VCM OTP3 0 KEY 3 DBV3 DBV3 DBV3 DD X D3 X [7:0]	NDL	VLE 0 VL1 PTDP01 PTSA01 PTSA01 PTSA11 RTNI1 0 0 VCM 0TP1 0 BV1 X X C[NWX (0) VL0 PTDP00 PTSA00 PTEA00 PTSA10 PTSA10 PTSA10 O 0
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61h 66h 6Ah 80h 81h 82h 83h 84h 85h 990h A1h A2h A5h B6h B6h B6h B6h C6h C6h C6h C0h C0h	Base Image Display Control SPI Read/Write Control Vertical Scroll Control Partial Image 1 Display Position Partial Image 1 Area (Start Line) Partial Image 1 Area (Start Line) Partial Image 2 Area (End Line) Partial Interface Control 1 Panel Interface Control 2 Panel Interface Control 5 OTP VCM Programming Control OTP VCM Status and Enable OTP Programming ID Key Write Display Brightness Read Obsplay Brightness Read CTRL Display value Write CTRL Display value Registers Name Read Control Adaptive Brightness Control value Write CABC Minimum Brightness CABC Control 1 CABC Control 1 CABC Control 2 CABC Control 3 CABC Control 4	W W W W W W W W W W W W W W W W W W W	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0	0 0 VL7 PTDP07 PTSA07 PTEA07 PTEA17 0 0 0 0 0 KEY OBV7 DBV7 X X X	0 0 VL6 PTDP06 PTSA06 PTSA06 PTDP16 0 0 0 0 KEY 6 C DBV6 C DBV6 X X THRES_ 0 DTH_M	0 0 VL5 PTDP05 PTSA05 PTSA05 PTDP05 0 0 0 VCM OTP5 S DBV5 BCTRL X D5 X	0 VL4 PTDP04 PTSA04 PTEA04 PTDP14 PTSA14 PTEA14 RTNI4 0 0 0 VCM OTP4 ODV4 A DBV4 X X X CMB PWM_C	0 0 VL3 PTDP03 PTSA03 PTEA03 PTEA03 PTEA03 PTSA13 PTEA13 RTN13 0 0 VCM OTP3 0 KEY 3 DBV3 DD DD X D3 X [7:0] [7:0] 0 (7:0]	NDL	VLE 0 VL1 PTDP01 PTSA01 PTSA01 PTPSA01 PTPSA01 PTPSA01 PTPSA01 O 0 0 CM OTP1 O CF CF TILL[3:0] LIL[3:0]	NWX (0) VL0 PTDP00 PTSA00 PTEA00 PTEA10 PTSA10 PTSA10 PTSA10 O 0 O O O O O O O O

8 Application

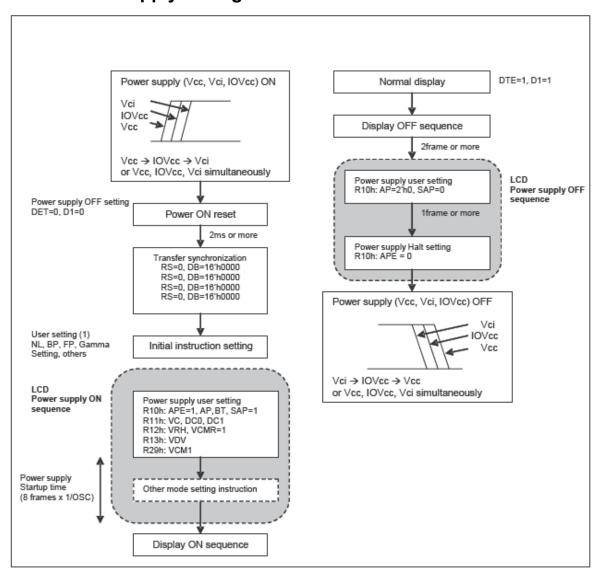
8-1 Display ON / OFF



8-2 Sequence to exit sleep mode



8-3 Power Supply Configuration

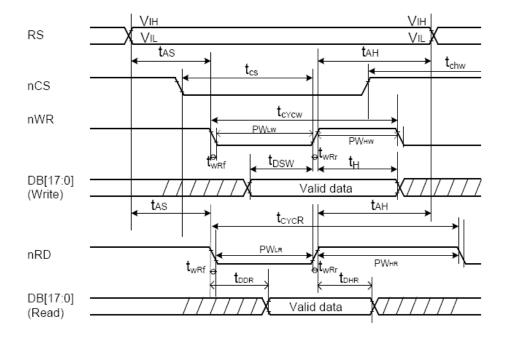


Power Supply ON/OFF Sequence

9 Electrical Characteristics

Normal Write Mode (IOVCC = 1.65~3.3V)

	Item	Symbol	Unit	Min.	Тур.	Max.	Test Condition
Due suele time	Write	toyow	ns	80	-		-
Bus cycle time	Read	toyca	ns	300	-	-	-
Write low-level pulse	width	PW _{LW}	ns	50	-	500	-
Write high-level pulse	width	PW _{HW}	ns	15	-	-	-
Read low-level pulse	PW _{LR}	ns	150	-	-	-	
Read high-level pulse	PW _{HR}	ns	150	-	-		
Write / Read rise / fall	Write / Read rise / fall time			-	-	25	
Catum time	Write (RS to nCS, E/nWR)		ns	10	-	-	
Setup time	Read (RS to nCS, RW/nRD)	t _{AS}		5	-	-	
Address hold time		t _{AH}	ns	5	-	-	
Write data set up time	Write data set up time			10	-	-	
Write data hold time	tн	ns	15	-	-		
Read data delay time	t _{DDR}	ns	-	-	100		
Read data hold time		t _{DHR}	ns	5	,	-	



10 QUALITY AND RELIABILITY

1. Scope

Specifications contain

- 1.1 Display Quality Evaluation
- 1.2 Mechanics Specification

2. Sampling Plan

Unless there is other agreement, the sampling plan for incoming inspection shall follow MIL-STD-105E LEVEL II.

- 2.1 Lot size: Quantity per shipment as one lot (different model as different lot).
- 2.2 Sampling type: Normal inspection, single sampling.
- 2.3 Sampling level: Level II.
- 2.4 AQL: Acceptable Quality Level

Major defect: AQL=0.65 Minor defect: AQL=1.0

3. Panel Inspection Condition

3.1 Environment:

Room Temperature: 25±5°C.

Humidity: 65±5% RH.

Illumination: 300 ~ 700 Lux.

3.2 Inspection Distance:

35-40 cm

3.3 Inspection Angle:

The vision of inspector should be perpendicular to the surface of the Module.

3.4 Inspection time:

Perceptibility Test Time: 20 seconds max.

4. Display Quality

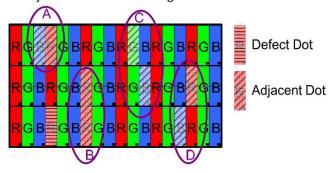
4.1 Function Related:

The function defects of line defect, abnormal display, and no display are considered Major defects.

4.2 Bright/Dark Dots:

Defect Type / Specification	G0 Grade	A Grade
Bright Dots	0	N≤ 1
Dark Dots	0	N≤ 3
Total Bright and Dark Dots	0	N≤ 3

[Note 1]
Judge defect dot and adjacent dot as following.

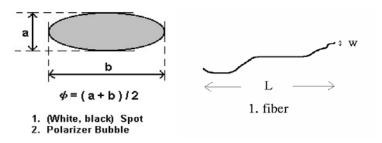


- (1) One pixel consists of 3 sub-pixels, including R,G, and B dot.(Sub-pixel = Dot)
- (2) The definition of dot: The size of a defective dot over 1/2 of whole dot is regarded as one defective dot.
- (3) Allow above (as A, B, C and D status) adjacent defect dots, including bright and dart adjacent dot. And they will be counted 2 defect dots in total quantity.
- (4) Defects on the Black Matrix, out of Display area, are not considered as a defect or counted.
- (5) There should be no distinct non-uniformity visible through 6% ND Filter within 2 sec inspection times.

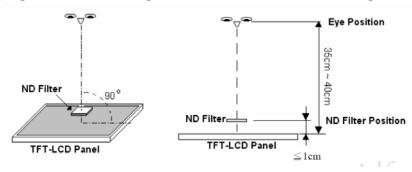
4.3 Visual Inspection specifications:

Defect Type	Specification	Count(N)
Dot Shape	D≤0.15mm	Ignored
(Particle、Scratch and Bubbles in	0.15mm < D≤ 0.3mm	N≤ 3
display area)	D > 0.3mm	N=0
Line Shape	W≤ 0.05mm	Ignored
(Particles、Scratch、Lint and	0.05mm <w≤ ,="" 0.1mm="" 3mm<="" l≤="" td=""><td>N≤ 3</td></w≤>	N≤ 3
Bubbles in display area)	W > 0.1mm , L > 3mm	N=0

[Note 2] W : Width[mm], L : Length[mm], N : Number, ϕ : Average Diameter



[Note 3] Bright dot is defined through 6% transmission ND Filter as following.



RELIABILITY

Test Item	Test Conditions	Note
High Temperature Operation	70±3°C , t=72 hrs	
Low Temperature Operation	-10±3°C , t=72 hrs	
High Temperature Storage	80±3°C , t=72hrs	1,2
Low Temperature Storage	-30±3°C , t=72 hrs	1,2
Temperature /Humidity Storage Test	60°C, Humidity 90%, 72 hrs	1,2
Temperature /Humidity Operation Test	40°C, Humidity 90%, 72 hrs	1,2
Thermal Shock Test	-20°C ~ 70°C 60 min 60 min. (1 cycle) Total 20 cycle	1,2

Note 1: Condensation of water is not permitted on the module.

Note 2 : The module should be inspected after 1 hour storage in normal conditions (15-35°C , 45-65%RH).

Definitions of life end point :

- Current drain should be smaller than the specific value.
- Function of the module should be maintained.
- Appearance and display quality should not have degraded noticeably.
- Contrast ratio should be greater than 50% of the initial value.

11 USE PRECAUTIONS

11-1 Handling precautions

- 1) The polarizing plate may break easily so be careful when handling it. Do not touch, press or rub it with a hard-material tool like tweezers.
- 2) Do not touch the polarizing plate surface with bare hands so as not to make it dirty. If the surface or other related part of the polarizing plate is dirty, soak a soft cotton cloth or chamois leather in benzine and wipe off with it. Do not use chemical liquids such as acetone, toluene and isopropyl alcohol. Failure to do so may bring chemical reaction phenomena and deteriorations.
- 3) Remove any spit or water immediately. If it is left for hours, the suffered part may deform or decolorize.
- 4) If the LCD element breaks and any LC stuff leaks, do not suck or lick it. Also if LC stuff is stuck on your skin or clothing, wash thoroughly with soap and water immediately.

11-2 Installing precautions

- 1) The PCB has many ICs that may be damaged easily by static electricity. To prevent breaking by static electricity from the human body and clothing, earth the human body properly using the high resistance and discharge static electricity during the operation. In this case, however, the resistance value should be approx. $1M\Omega$ and the resistance should be placed near the human body rather than the ground surface. When the indoor space is dry, static electricity may occur easily so be careful. We recommend the indoor space should be kept with humidity of 60% or more. When a soldering iron or other similar tool is used for assembly, be sure to earth it.
- 2) When installing the module and ICs, do not bend or twist them. Failure to do so may crack LC element and cause circuit failure.
- 3) To protect LC element, especially polarizing plate, use a transparent protective plate (e.g., acrylic plate, glass etc) for the product case.
- 4) Do not use an adhesive like a both-side adhesive tape to make LCD surface (polarizing plate) and product case stick together. Failure to do so may cause the polarizing plate to peel off.

11-3 Storage precautions

- 1) Avoid a high temperature and humidity area. Keep the temperature between 0°C and 35°C and also the humidity under 60%.
- Choose the dark spaces where the product is not exposed to direct sunlight or fluorescent light.
- 3) Store the products as they are put in the boxes provided from us or in the same conditions as we recommend.

11-4 Operating precautions

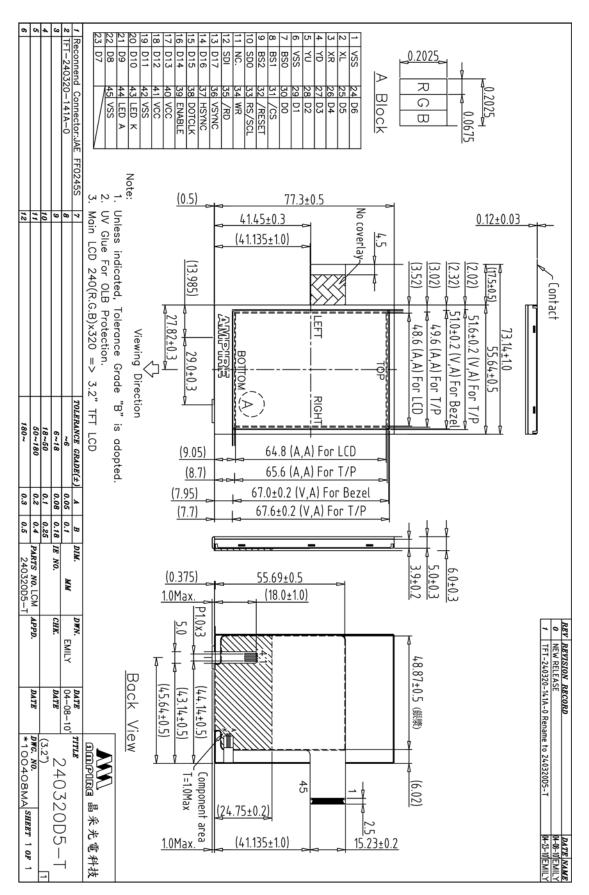
- 1) Do not boost the applied drive voltage abnormally. Failure to do so may break ICs. When applying power voltage, check the electrical features beforehand and be careful. Always turn off the power to the LC module controller before removing or inserting the LC module input connector. If the input connector is removed or inserted while the power is turned on, the LC module internal circuit may break.
- 2) The display response may be late if the operating temperature is under the normal standard, and the display may be out of order if it is above the normal standard. But this is not a failure; this will be restored if it is within the normal standard.
- 3) The LCD contrast varies depending on the visual angle, ambient temperature, power voltage etc. Obtain the optimum contrast by adjusting the LC dive voltage.
- 4) When carrying out the test, do not take the module out of the low-temperature space suddenly. Failure to do so will cause the module condensing, leading to malfunctions.
- 5) Make certain that each signal noise level is within the standard (L level: 0.2Vdd or less and H level: 0.8Vdd or more) even if the module has functioned properly. If it is beyond the standard, the module may often malfunction. In addition, always connect the module when making noise level measurements.
- 6) The CMOS ICs are incorporated in the module and the pull-up and pull-down function is not adopted for the input so avoid putting the input signal open while the power is ON.
- 7) The characteristic of the semiconductor element changes when it is exposed to light emissions, therefore ICs on the LCD may malfunction if they receive light emissions. To prevent these malfunctions, design and assemble ICs so that they are shielded from light emissions.
- 8) Crosstalk occurs because of characteristics of the LCD. In general, crosstalk

occurs when the regularized display is maintained. Also, crosstalk is affected by the LC drive voltage. Design the contents of the display, considering crosstalk.

11-5 Other

- 1) Do not disassemble or take the LC module into pieces. The LC modules once disassembled or taken into pieces are not the guarantee articles.
- 2) The residual image may exist if the same display pattern is shown for hours. This residual image, however, disappears when another display pattern is shown or the drive is interrupted and left for a while. But this is not a problem on reliability.
- 3) AMIPRE will provide one years warrantee for all products and three months warrantee for all repairing products.

12 MECHANICAL DRAWING



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