DATASHEET

11/2/2011

Fema Part Number

GM320240V-35-TTX2NLW	
Description	3.5" Full Color TFT
	320 x 240 Resolution
	Brightness 400 nits (Typical)
	Optional Resistive or Projected Capacitive Touch Panel Available

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1. BASIC SPECIFICATION

1.1 Mechanical specifications

Items	Nominal Dimension	Unit
Active screen size	3.5” diagonal	-
Dot Matrix	320*RGB*240	dots
Module Size (W x H x T)	76.9 x 63.9 x 3.2	mm.
Active Area (W x H)	70.08 x 52.56	mm.
Dot Pitch (W x H)	0.219 x 0.219	mm.
Color depth	262K	color
Interface	1. 8/ 9/ 16/ 18-bit 6800-series / 8080-series Parallel Interface 2. Serial Peripheral Interface (SPI) 3. 18-/6-bit RGB interface (DEN, DOTCLK, HSYNC, VSYNC, DB[17:0]) 4. VSYNC interface (system interface + VSYNC) 5. WSYNC interface (system interface + WSYNC)	-
Driving IC Package	COG	-
Module weight	32	g

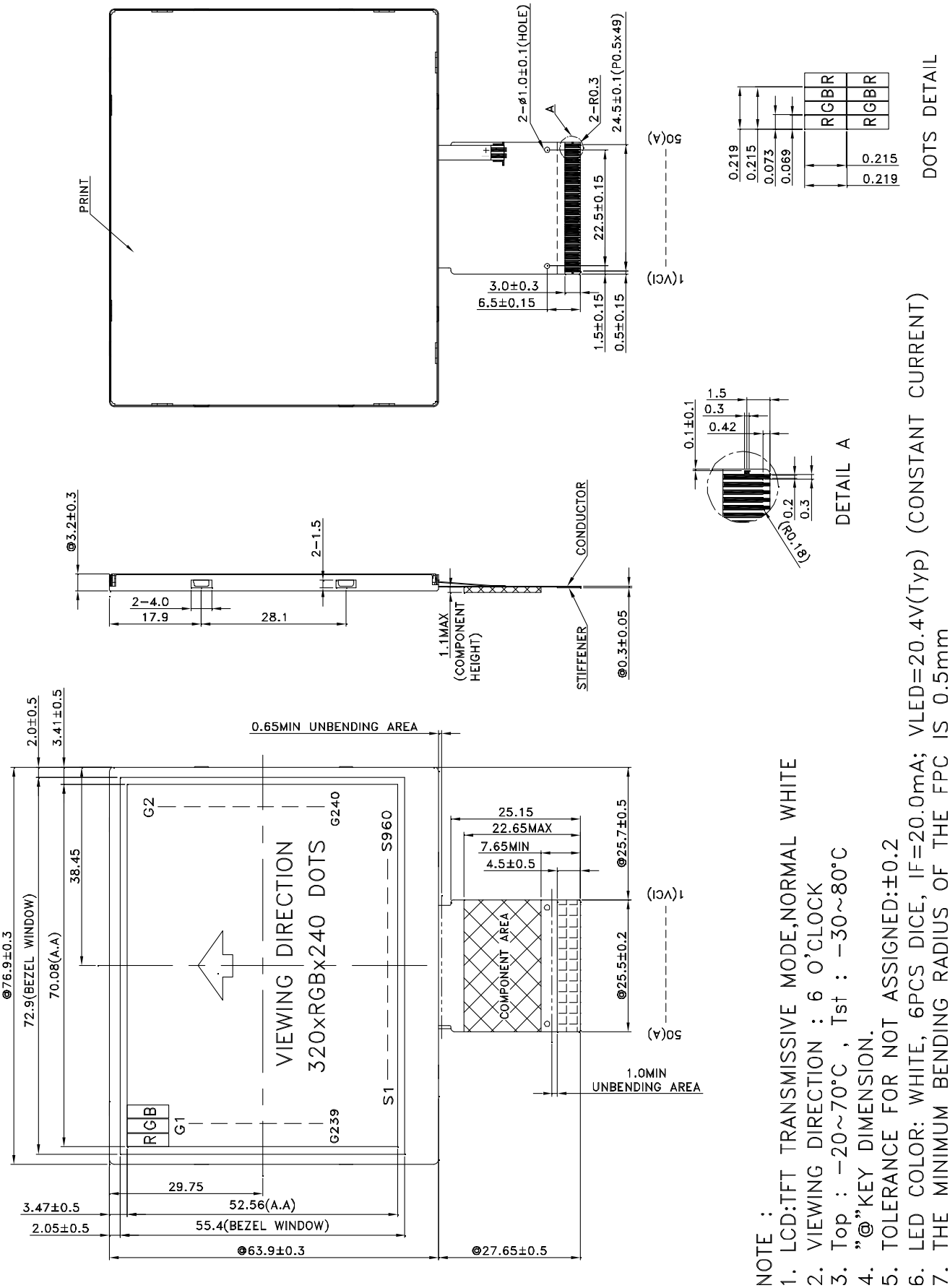
* The maximum color depth of this driver IC is 262K colors ,not 16.7M.

1.2 Display specification

Display	Descriptions	Note
LCD Type	a-Si TFT	-
LCD Mode	TN / Normal white	-
Polarizer Mode	Transmissive	-
Polarizer Surface	Normal	-
Pixel arrangement	RGB-stripe	-
Backlight Type	LED	-
Viewing Direction	6 O'clock Direction (Gray Inversion)	-

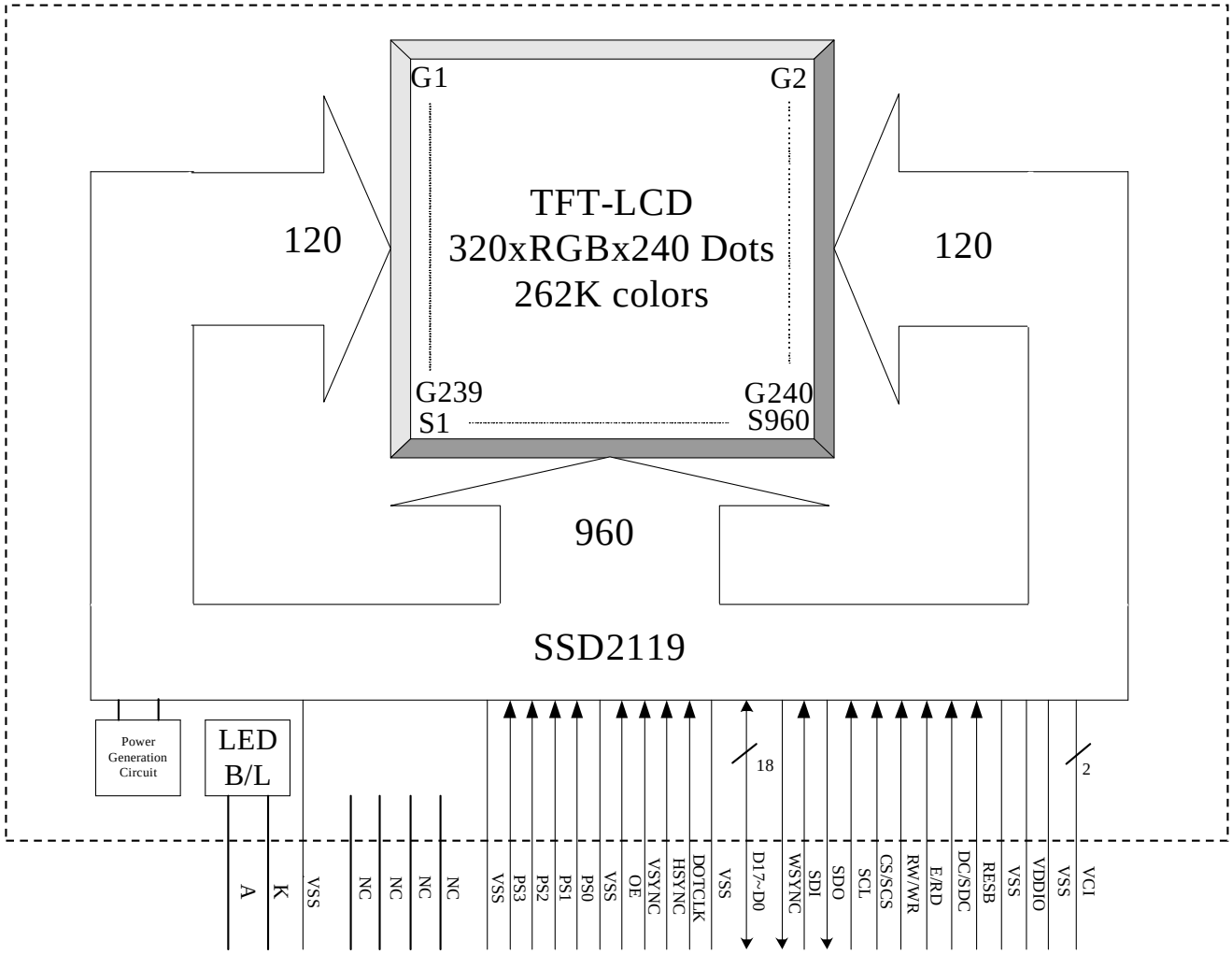
* Color tone is slightly changed by temperature and driving voltage.

1.3 Outline dimension



NOTE :
1. LCD:TFT TRANSMISSIVE MODE,NORMAL WHITE
2. VIEWING DIRECTION : 6 O'CLOCK
3. Top : −20~70°C , Tst : −30~80°C
4. "@"KEY DIMENSION.
5. TOLERANCE FOR NOT ASSIGNED:±0.2
6. LED COLOR: WHITE, 6PCS DICE, IF=20.0mA; VLED=20.4V(Typ) (CONSTANT CURRENT)
7. THE MINIMUM BENDING RADIUS OF THE FPC IS 0.5mm

1.4 Block diagram:



1.5 Interface pin :

Pin No.	Pin Name	I/O	Description
1~2	VCI	P	Booster input voltage pin.
3	VSS	P	System ground pin of the IC.
4	VDDIO	P	Voltage input pin for logic I/O.
5	VSS	P	System ground pin of the IC.
6	RESB	I	System reset pin. - An active low pulse at this pin will reset the IC, Connect to VDDIO in normal operation.
7	DC/SDC	I	Data or command. DC : Parallel Interface. SDC : Serial Interface.
8	E/RD	I	6800-system : E (enable signal) 8080-system : RD (read strobe signal) Serial mode : Not used and should be connected to VDDIO or Vss.
9	RW/WR	I	6800-system : RW (indicates read cycle when High, write cycle when Low) 8080-system : WR (write strobe signal)
10	CS/SCS	I	CS: Chip Select pin for 6800/8080 Parallel Interface. SCS: Chip Select pin for Serial Mode Interface.
11	SCL	I	Serial clock input.
12	SDO	O	Data output pin in serial interface.
13	SDI	I	Data input pin in serial interface.
14	WSYNC	O	Ram Write Synchronization output. -Leave it OPEN when not used.

Pin No.	Pin Name	I/O	Description
15	D17	I/O	For parallel mode, 8/9/16/18 bit interface. Please refer to Table 1. Unused pins should connect to VSS.
16	D16		
17	D15		
18	D14		
19	D13		
20	D12		
21	D11		
22	D10		
23	D9		
24	D8		
25	D7		
26	D6		
27	D5		
28	D4		
29	D3		
30	D2		
31	D1		
32	D0		
33	VSS	P	System ground pin of the IC.
34	DOTCLK	I	Dot-clock signal and oscillator source.
35	HSYNC	I	Line Synchronization input.
36	VSYNC	I	Frame/Ram Write Synchronization input.
37	OE	I	Display enable pin from controller.
38	VSS	P	System ground pin of the IC.
39	PS0	I	Please refer to Table 1.
40	PS1		
41	PS2		
42	PS3		
43	VSS	P	System ground pin of the IC.
44	NC	-	No connection.
45	NC	-	No connection.

Pin No.	Pin Name	I/O	Description
46	NC	-	No connection.
47	NC	-	No connection.
48	VSS	P	System ground pin of the IC.
49	K	P	Backlight LED's cathode.
50	A	P	Backlight LED's anode.

Table 1.

PS3	PS2	PS1	PS0	Interface Mode	Data bus input
0	0	0	0	16-bit 6800 parallel interface	D[17:10], D[8:1]
0	0	0	1	8-bit 6800 parallel interface	D[17:10]
0	0	1	0	16-bit 8080 parallel interface	D[17:10], D[8:1]
0	0	1	1	8-bit 8080 parallel interface	D[17:10]
0	1	0	0	9-bit generic D[9:16] (262k colour) + 3-wire SPI If 65K color, D12 shorts to D17 internally	
0	1	0	1	16-bit generic (262k colour) + 3-wire SPI	
0	1	1	0	18-bit generic (262k colour) + 3-wire SPI	
0	1	1	1	6-bit generic D[8:3] (262k colour) + 3-wire SPI	
1	0	0	0	18-bits 6800 parallel interface	D[17:0]
1	0	0	1	9-bits 6800 parallel interface	D[17:9]
1	0	1	0	18-bit 8080 parallel interface	D[17:0]
1	0	1	1	9-bit 8080 parallel interface	D[17:9]
1	1	1	0	3-wire SPI	
1	1	1	1	4-wire SPI	

2. ELECTRICAL CHARACTERISTICS

2.1 Absolute Maximum Ratings

Items	Symbol	Min.	Max.	Unit
Input voltage	VCI	VSS-0.3	5.0	V
Supply Voltage	VDDIO	VSS-0.3	4.0	V
Operate temperature range	TOP	-20	70	℃
Storage temperature range	TST	-30	80	℃

2.2 DC Characteristics

Items	Symbol	Min.	Typ.	Max.	Unit	Condition
Power supply voltage	VCI	2.5	3.3	3.6	V	
Power supply pin of IO pins	VDDIO	1.4	3.3	3.6	V	
Current consumption	IVCI+IVDDIO	-	-	10	mA	NOTE
Dot Clock	DCK	-	5.5	8.2	MHz	

NOTE : The method to illuminate the LCD panel is using the 2-5-4commend under the measuring condition.

Measuring Condition :

Standard Value MAX.

Ta = 25℃

VCI = 3.3V

VDDIO = 3.3V

Dot Clock = 5.5MHz

Display Patten = Checkered pattern



0 gray black pattern

2-2.1 Back-light Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Test Condition	Note
Supply Current	If	-	**20**	-	mA	Ta=25℃	-
Supply Voltage	VF	**18.6**	**20.4**	**22.2**	V	Ta=25℃	-
Half-Life Time	Lf	-	**50000**	-	hrs	Ta=25℃	1

Note1: The " Half-Life Time" is defined as the LED chip brightness decreases to 50% than original brightness, Based on Ta 25±2℃ ,60±10% RH condition .

2.3 Command

1. LCD_Initial_SSD2119:(for 16bit 8080 interface)

COMMAND	CODE	DESCRIPTION
R00H	0001	OSCEN=1
R10H	0000	Sleep=0
R07H	0033	Display control. CM=0
R11H	6870	65K color, X, Y auto increase ,updated in horizontal direction
R02H	0600	line inversion
R03H	4A38	VGH/VGL= 5/-3
R01H	72EF	Gate lines =240
R0FH	0000	Start scan line = 0
R25H	A000	Frame frequency
R28H	0006	Enable R25, R29 register
R12H	0999	Sleep mode
R26H	3800	Analogue setting
R0BH	5308	Frequency
R0CH	0003	VCIX2
R0DH	0009	VLCD63
R0EH	2300	VCOML
R1EH	0010	VCOMH
R44H	EF00	HAS and HEA station
R45H	0000	Vertical address start station
R46H	013F	Vertical address end station
R30H	0000	Gamma B control 1
R31H	0101	Gamma B control 2
R32H	0100	Gamma B control 3
R33H	0305	Gamma B control 4
R34H	0707	Gamma B control 5
R35H	0305	Gamma B control 6
R36H	0707	Gamma B control 7
R37H	0201	Gamma B control 8
R3AH	1200	Gamma B control 9
R3BH	0900	Gamma B control 10
R22H	--	Write data to RAM

2. LCD_Initial_SSD2119:(for 18bit+3wire SPI and 4wire SPI)

COMMAND	CODE	DESCRIPTION
R00H	0001	OSCEN=1
R10H	0000	Sleep=0
R07H	0033	Display control. CM=0
R11H	4E70	DFM[1:0] : 262k Color Mode DenMode = 1 : RGB interface ignore HSYNC, VSYNC pin and HBP, VBP WMode = 1 : Write RAM from Generic RGB data (POR, if PS:00xx)
R02H	0600	line inversion
R03H	6A38	VGH/VGL= 5/-3
R01H	72EF	Gate lines =240
R28H	0006	Enable R25, R29 register
R12H	0999	Sleep mode
R26H	3800	Analogue setting
R0CH	0005	VCIX2
R0DH	000D	VLCD63
R0EH	2300	VCOML
R1EH	0010	VCOMH
R15H	0058	Entry mode
R30H	0000	Gamma B control 1
R31H	0101	Gamma B control 2
R32H	0100	Gamma B control 3
R33H	0305	Gamma B control 4
R34H	0707	Gamma B control 5
R35H	0305	Gamma B control 6
R36H	0707	Gamma B control 7
R37H	0201	Gamma B control 8
R3AH	1200	Gamma B control 9
R3BH	0900	Gamma B control 10
R22H	--	Write data to RAM

2.5 AC Characteristics

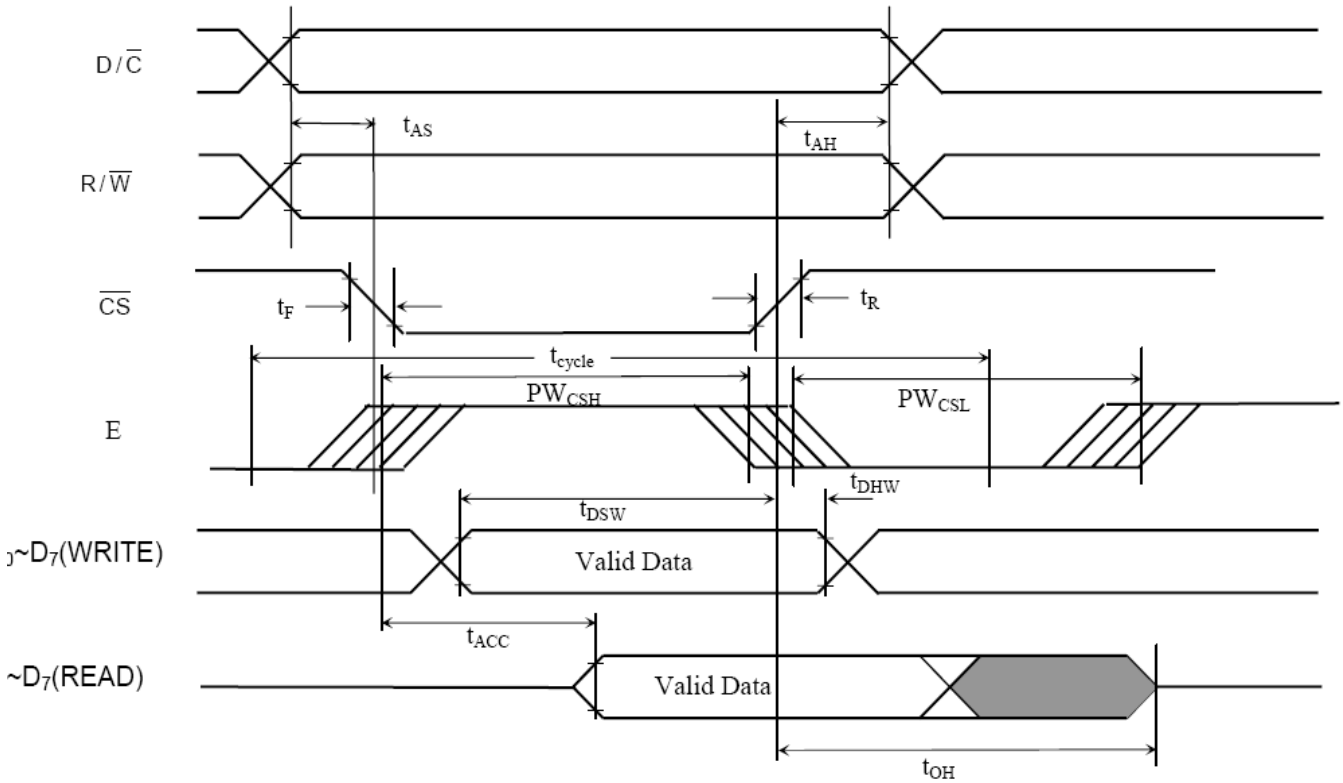
2-4-1 Parallel 6800 Timing Characteristics

(T_A = -40 to 85°C, V_{DDIO} = 1.4V to 3.6V)

Symbol	Parameter	Min	Typ	Max	Unit
t_{cycle}	Clock Cycle Time (write cycle)	75	-	-	ns
t_{cycle}	Clock Cycle Time (read cycle)	1000	-	-	ns
t_{AS}	Address Setup Time ($R/\overline{W}$)	0	-	-	ns
t_{AH}	Address Hold Time ($R/\overline{W}$)	0	-	-	ns
t_{DSW}	Data Setup Time (D0~D7, WRITE)	5	-	-	ns
t_{DHW}	Data Hold Time (D0~D7, WRITE))	5	-	-	ns
t_{ACC}	Data Access Time (D0~D7, READ)	250	-	-	ns
t_{OH}	Output Hold time (D0~D7, READ)	100	-	-	ns
PW_{CSL}	Pulse width /CS low (write cycle)	40	-	-	ns
PW_{CSH}	Pulse width /CS high (write cycle)	25	-	-	ns
PW_{CSL}	Pulse width /CS low (read cycle)	500	-	-	ns
PW_{CSH}	Pulse width /CS high (read cycle)	500	-	-	ns
t_R	Rise time (/CS)	-	-	4	ns
t_F	Fall time (/CS)	-	-	4	ns

Note: CS can be pulled low during the write cycle, only /RW is needed to be toggled

Parallel 6800-series Interface Timing Characteristics



2-4-2 Parallel 8080 Timing Characteristics

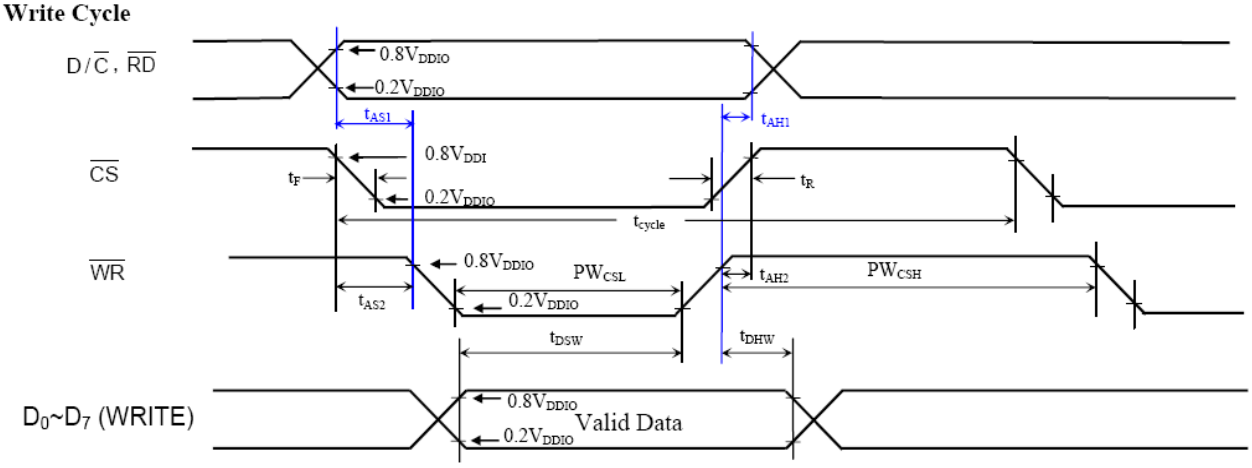
(T_A = -40 to 85°C, V_{DDIO} = 1.4V to 3.6V)

Symbol	Parameter	Min	Typ	Max	Unit
t_{cycle}	Clock Cycle Time (write cycle)	75	-	-	ns
t_{cycle}	Clock Cycle Time (read cycle)	1000	-	-	ns
t_{AS1}	Address Setup Time between (R/$\overline{W}$) and D/$\overline{C}$	0	-	-	ns
t_{AH1}	Address Hold Time between (R/$\overline{W}$) and D/$\overline{C}$	0	-	-	ns
t_{AS2}	Address Setup Time between (R/$\overline{W}$) and $\overline{CS}$	0	-	-	ns
t_{AH2}	Address Hold Time between (R/$\overline{W}$) and $\overline{CS}$	0	-	-	ns
t_{DSW}	Data Setup Time (D0~D7, WRITE)	5	-	-	ns
t_{DHW}	Data Hold Time (D0~D7, WRITE))	5	-	-	ns
t_{ACC}	Data Access Time (D0~D7, READ)	250	-	-	ns
t_{OH}	Output Hold time (D0~D7, READ)	100	-	-	ns
PW_{CSL}	Pulse width /CS low (write cycle)	40	-	-	ns
PW_{CSH}	Pulse width /CS high (write cycle)	25	-	-	ns
PW_{CSL}	Pulse width /CS low (read cycle)	500	-	-	ns
PW_{CSH}	Pulse width /CS high (read cycle)	500	-	-	ns
t_R	Rise time (/CS)	-	-	4	ns
t_F	Fall time (/CS)	-	-	4	ns

Note: CS can be pulled low during the write cycle, only /RW is needed to be toggled

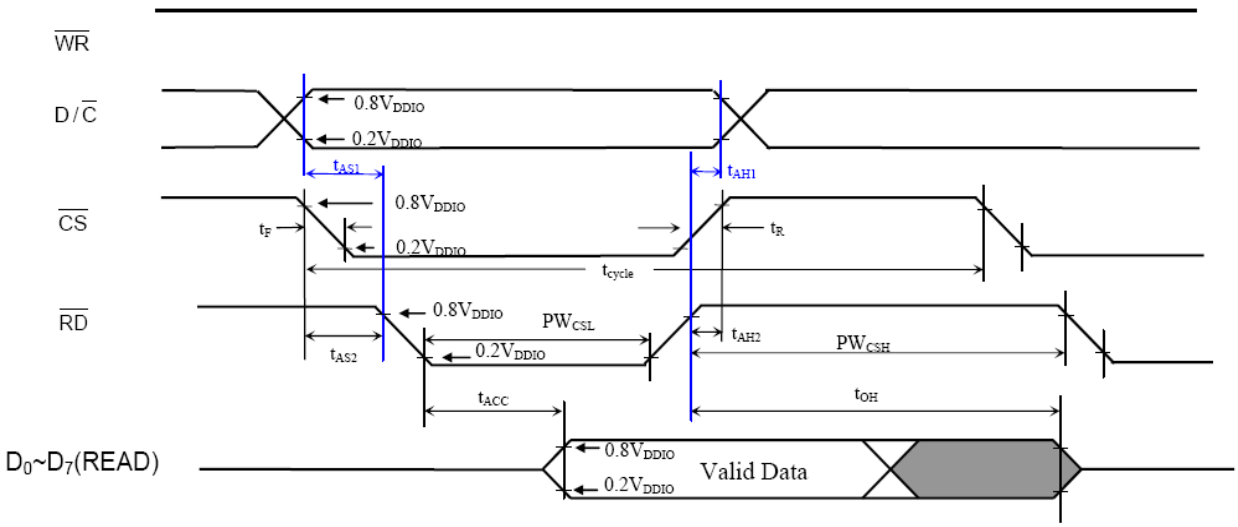
Parallel 8080-series Interface Timing Characteristics

Write Cycle



Remark: It's highly recommended that $\overline{RD}$ remains high for the whole write cycle

Read Cycle

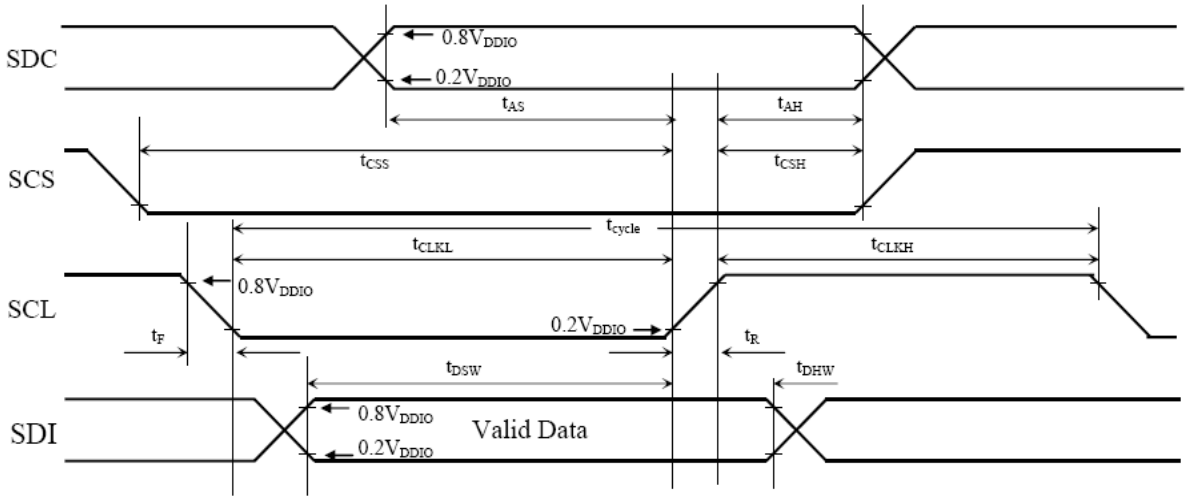


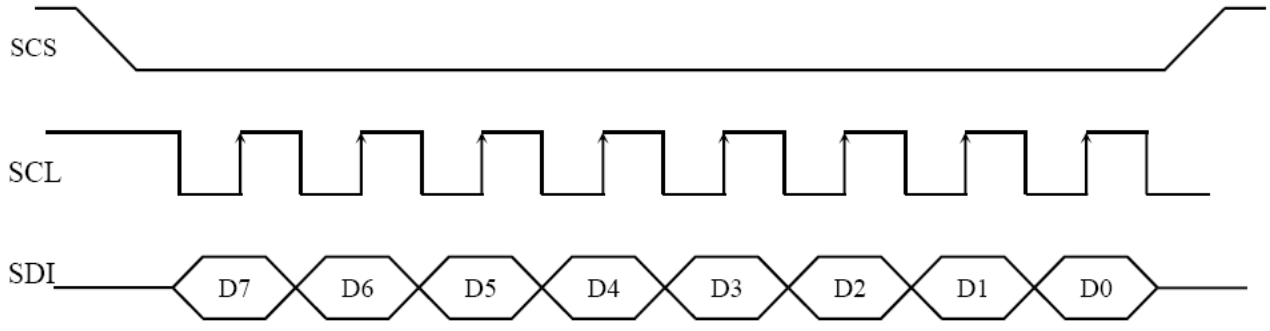
2-4-3 Serial Timing Characteristics

(T_A = -40 to 85°C, V_{DDIO} = 1.4V to 3.6V)

Symbol	Parameter	Min	Typ	Max	Unit
t_{cycle}	Clock Cycle Time	77	-	-	ns
f_{CLK}	Serial Clock Cycle Time SPI Clock tolerance = +/- 2 ppm	-	-	15	MHz
t_{AS}	Register select Setup Time	4	-	-	ns
t_{AH}	Register select Hold Time	5	-	-	ns
t_{CSS}	Chip Select Setup Time	2	-	-	ns
t_{CSH}	Chip Select Hold Time	10	-	-	ns
t_{DSW}	Write Data Setup Time	5	-	-	ns
t_{OHW}	Write Data Hold Time	10	-	-	ns
t_{CLKL}	Clock Low Time	38	-	-	ns
t_{CLKH}	Clock High Time	38	-	-	ns
t_R	Rise time	-	-	4	ns
t_F	Fall time	-	-	4	ns

4 wire Serial Timing Characteristics





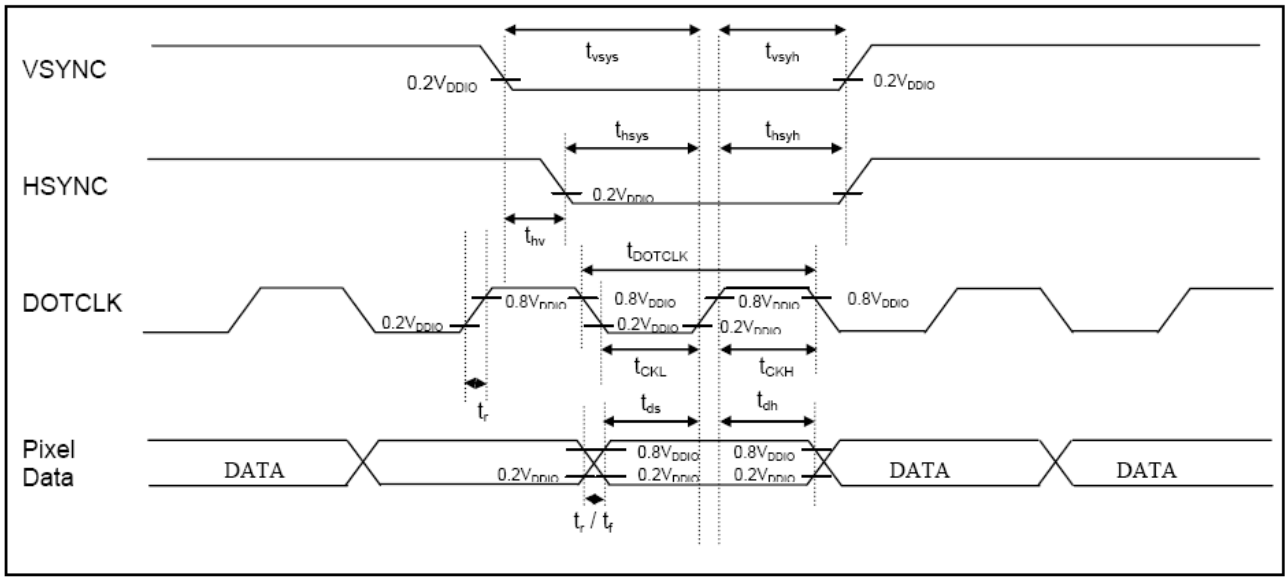
2-4-4 RGB Timing Characteristics

(T_A = -40 to 85°C, V_{DDIO} = 1.4V to 3.6V)

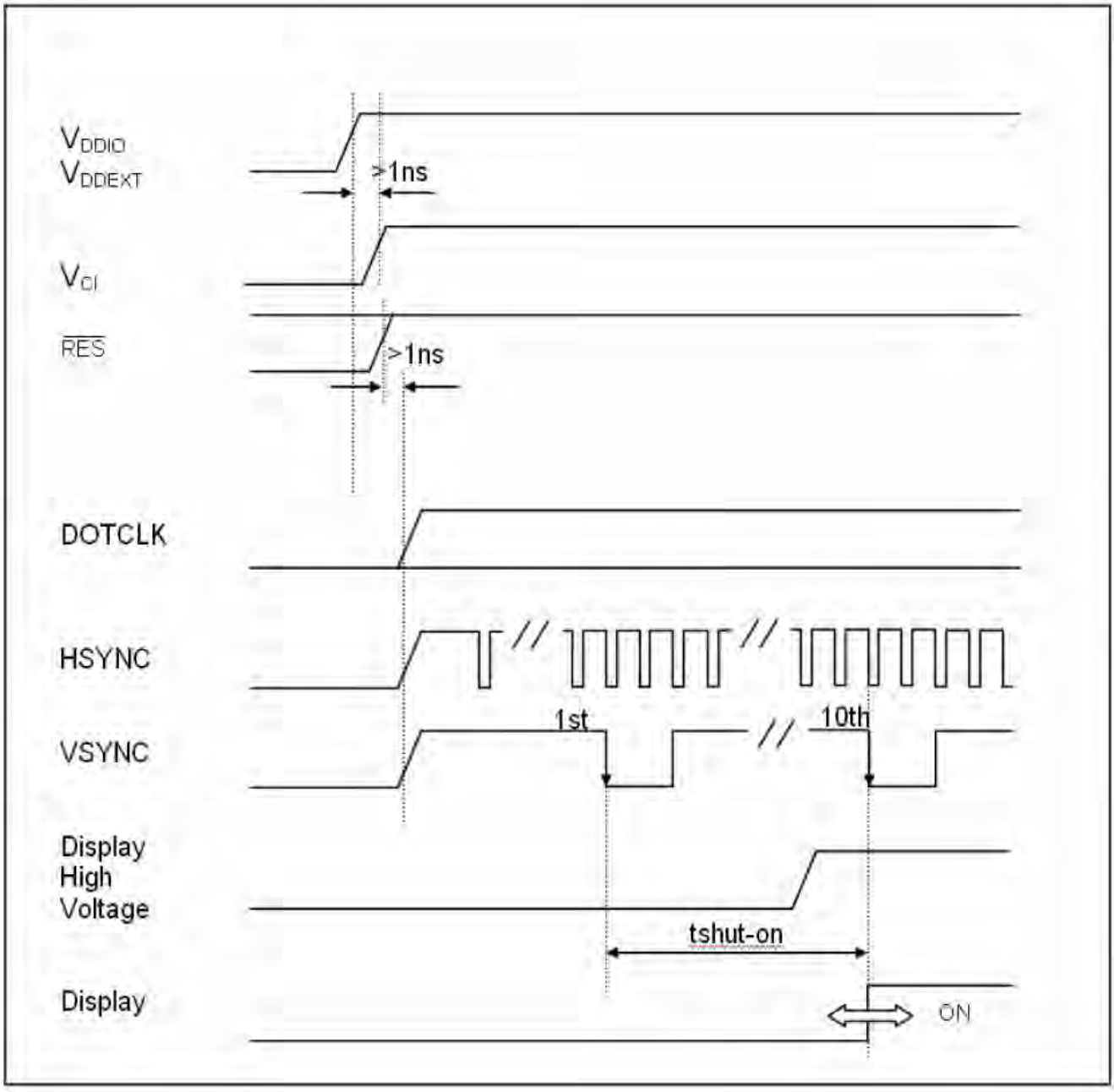
Symbol	Parameter	Min	Typ	Max	Unit
f_{DOTCLK}	DOTCLK Frequency (70Hz frame rate)	1	5.5	8.2	MHz
t_{DOTCLK}	DOTCLK Period	122	182	1000	us
t_{VSYS}	Vertical Sync Setup Time	20	-	-	ns
t_{VSYH}	Vertical Sync Hold Time	20	-	-	ns
t_{HSYS}	Horizontal Sync Setup Time	20	-	-	ns
t_{HSYH}	Horizontal Sync Hold Time	20	-	-	ns
t_{HV}	Phase difference of Sync Signal Falling Edge	0	-	320	t_{DOTCLK}
t_{CLK}	DOTCLK Low Period	61	-	-	ns
t_{CKH}	DOTCLK High Period	61	-	-	ns
t_{DS}	Data Setup Time	25	-	-	ns
t_{DH}	Data hold Time	25	-	-	ns
t_{RES}	Reset pulse width	8			ns

Note: External clock source must be provided to DOTCLK pin of SSD2119. The driver will not operate in absence of the clocking signal.

RGB Timing Characteristics

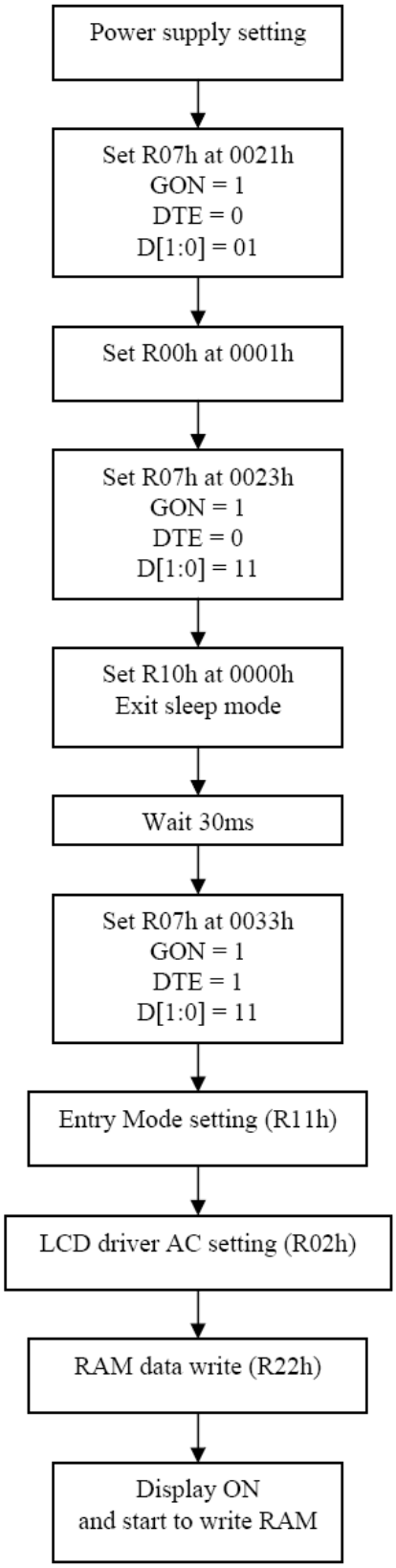


2-4-5 Power Up Sequence

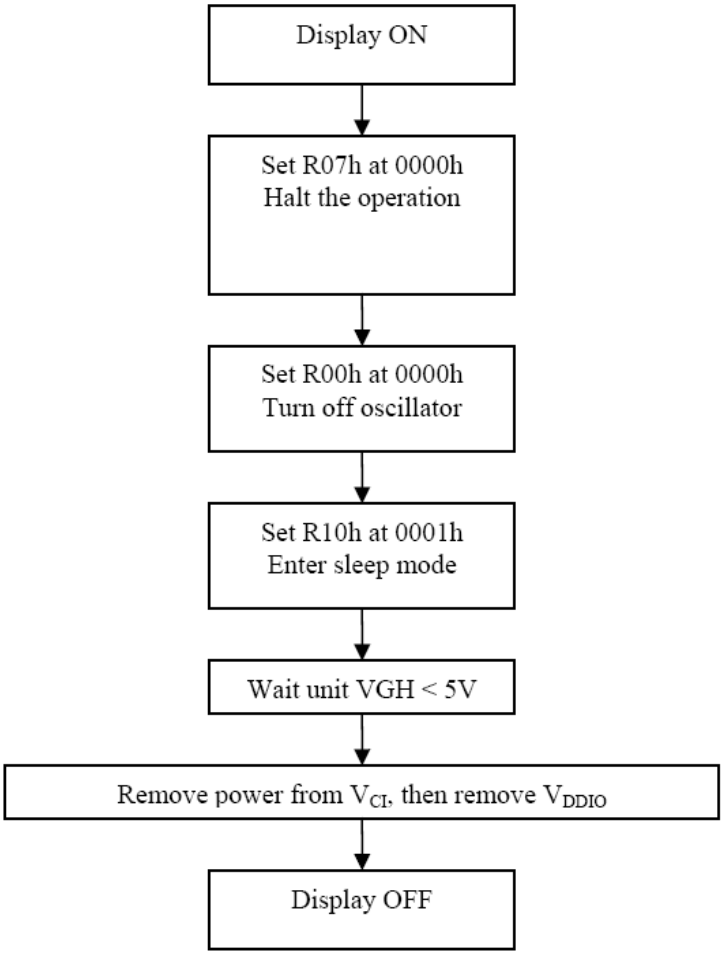


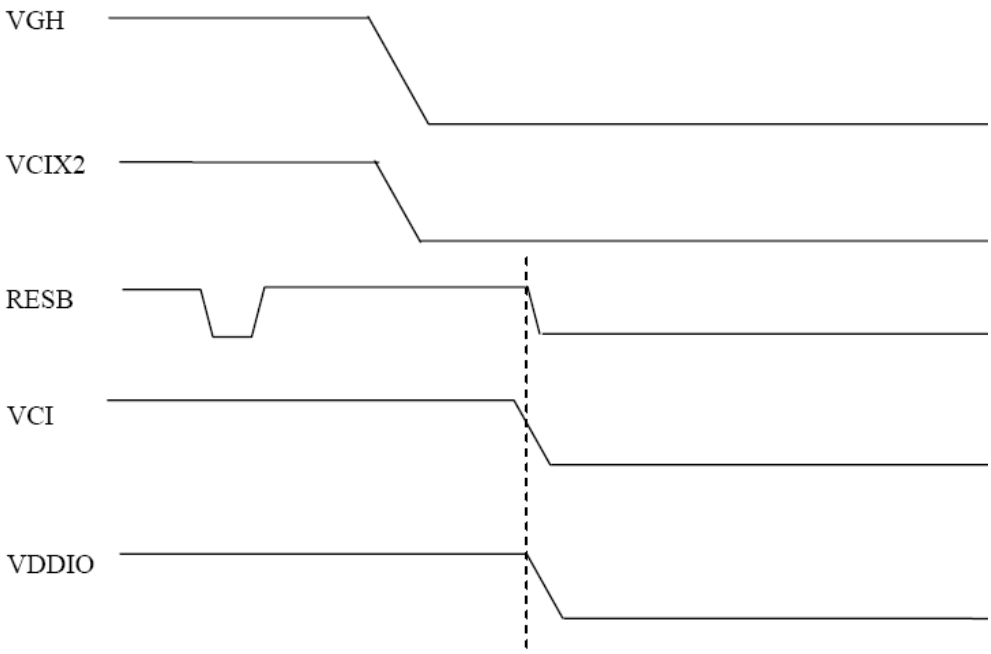
2-5 DISPLAY SETTING SEQUENCE

2-5-1 Display ON Sequence



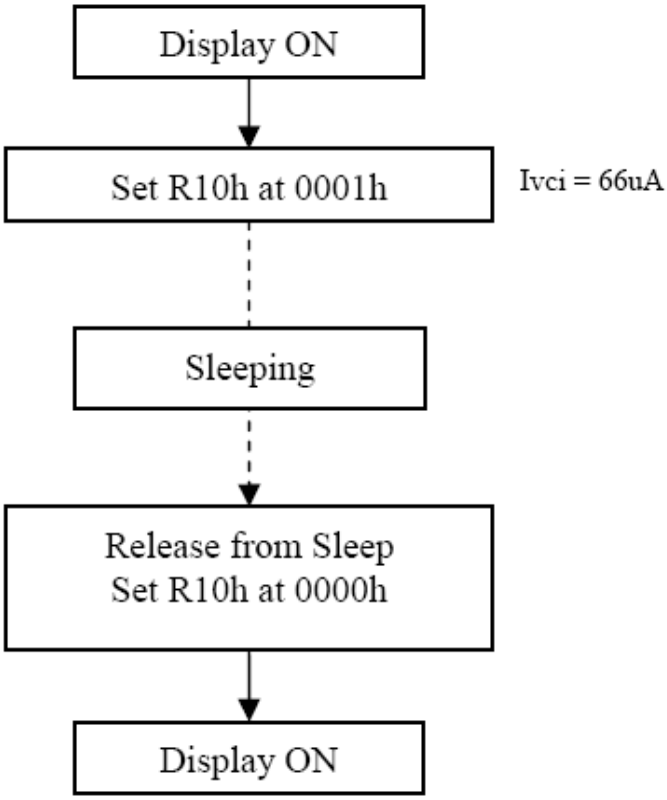
2-5-2 Display OFF Sequence





Note:
1. VDDIO should be the last to fall, or VCI/VDDIO could be power off at the same time
2. If OTP is active in the application, the OTP programming voltage should be turned off and cap

2-5-3 Sleep Mode Display Sequence



3. OPTICAL CHARACTERISTICS

3.1 Characteristics

Electrical and Optical Characteristics

No.	Item			symbol / temp.		Min.	Typ.	Max.	Unit	Note
1	Response Time			Tr+Tf	Θ=Ψ=0 °	-	25	-	ms	2
2	Viewing Angle	Hor.	Cr>=10	LEFT	0°	60	70	-	degree	3
				RIGHT	180°	60	70	-		
		Ver.		BOTTOM	270°	60	70	-		
				TOP	90°	45	60	-		
3	Contrast Ratio			Cr	25 ℃	300	700		-	4
4	Red x-code			Rx	25 ℃	0.55	0.60	0.65	-	5
	Red y-code			Ry		0.29	0.34	0.39		
	Green x-code			Gx		0.29	0.34	0.39		
	Green y-code			Gy		0.54	0.59	0.64		
	Blue x-code			Bx		0.09	0.14	0.19		
	Blue y-code			By		0.06	0.11	0.16		
	White x-code			Wx		0.27	0.32	0.37		
	White y-code			Wy		0.29	0.34	0.39		
	Brightness			Y		280	400	-	cd/m^2	
5	Brightness Uniformity				25 ℃	80	-	-	%	6

4. RELIABILITY :

Item No	Items	Condition
1	High temperature operating	70 °C , 200 hours
2	Low temperature operating	-20 °C , 200 hours
3	High temperature storage	80 °C , 200 hours
4	Low temperature storage	-30 °C , 200 hours
5	High temperature & humidity storage	60°C, 90%RH, 100 hours
6	Thermal Shock storage	-30°C, 30min.<=> 80°C, 30min. 10 Cycles
7	Vibration test	10 => 55 =>10 => 55 => 10 Hz , within 1 minute Amplitude : 1.5mm. 15 minutes for each Direction (X,Y,Z)
8	Drop test	Packed, 100CM free fall, 6 sides, 1 corner, 3edges
9	Life time	50,000 hours 25°C , 60%RH , specification condition driving

* One single product test for only one item.

* Judgment after test : keep in room temperature for more than 2 hours.

- Current consumption < 2 times of initial value
- Contrast > 1/2 initial value
- Function : work normally