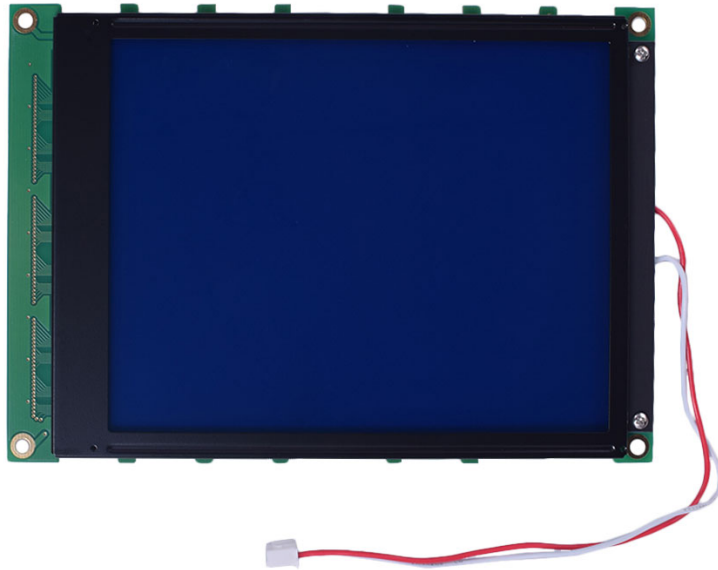


DisplayModule



DM-LCD320240-478
320240 STN(-) BLUE GRAPHIC LCD
WITH PARALLEL MPU INTERFACE

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1 Revision History

Date	Changes
2015-04-15	First release

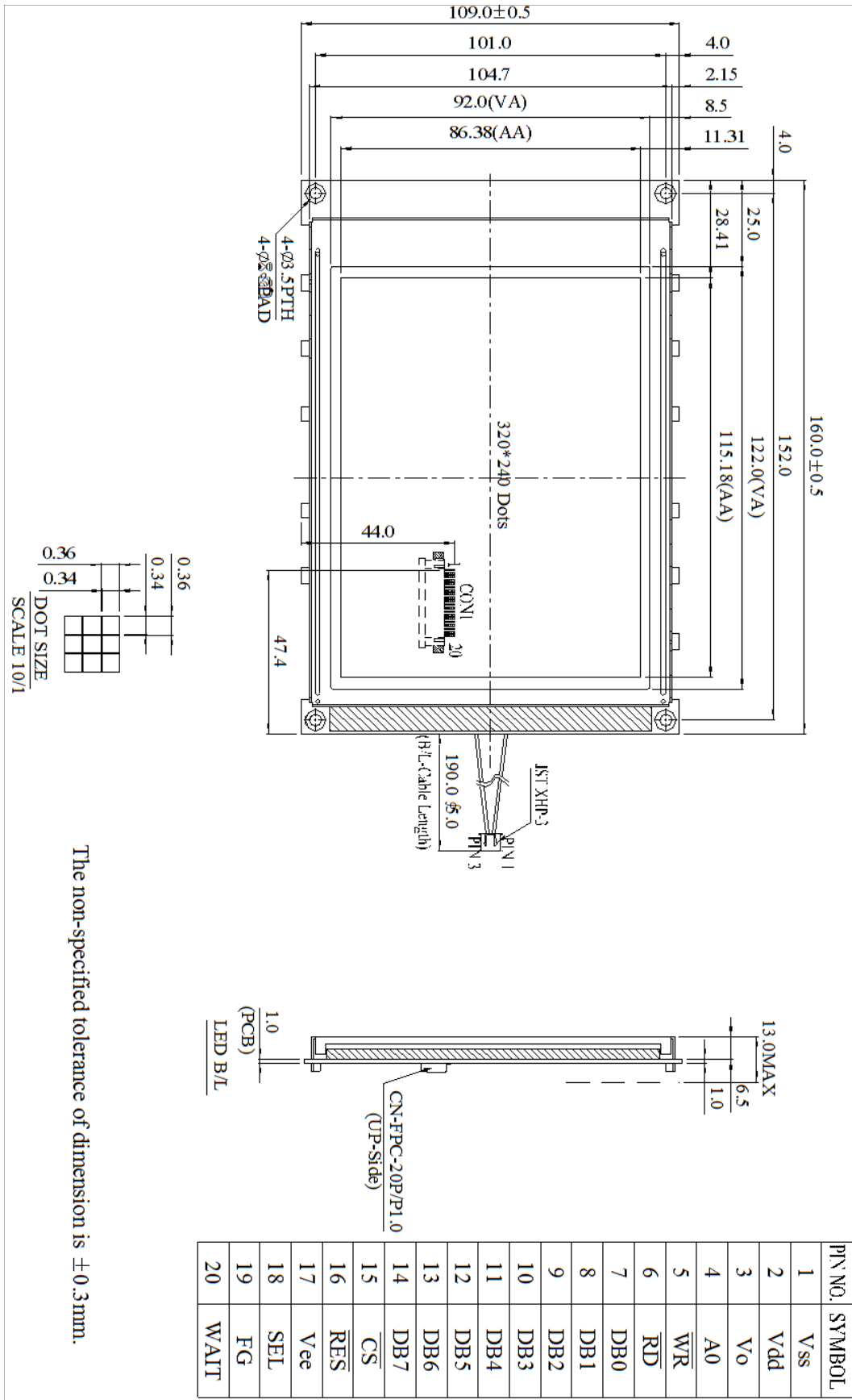
2 Main Features

Item	Specification	Unit
Resolution	320 x 240	dots
Display Mode	STN Negative, Blue, Transmissive	-
Module dimension	160.0 x 109.0 x 13.0(MAX)	mm
Controller IC	S1D13700	-
Interface	Parallel MPU Interface	-
Power Supply	5.0	V
View Direction	6:00	-
Duty	1/240	
Backlight	White LED	-
Weight	179.5	g

3 Pin Description

Pin No.	Symbol	Description
1	VSS	Ground
2	VDD	Power supply for Logic
3	Vo	Driving voltage for LCD(Variable)
4	A0	RD=L WR=H ,A0=L :Data Read AO=H :Status read RD=H WR=L ,A0=L :Data Write AO=H :Command write
5	/WR	8080 family: Write signal, 6800 family: R/W signal
6	/RD	8080 family: Read signal, 6800 family: Enable clock
7~14	DB0~DB7	Data bus line
15	/CS	Chip select ,Active L
16	/RES	Controller reset signal, Active L
17	Vee	Negative Voltage Output
18	SEL	8088,6800 interface selection 1:68, 0:80
19	FG	Frame Ground
20	WAIT	Check Busy

4 Mechanical Drawing



The non-specified tolerance of dimension is ±0.3mm.

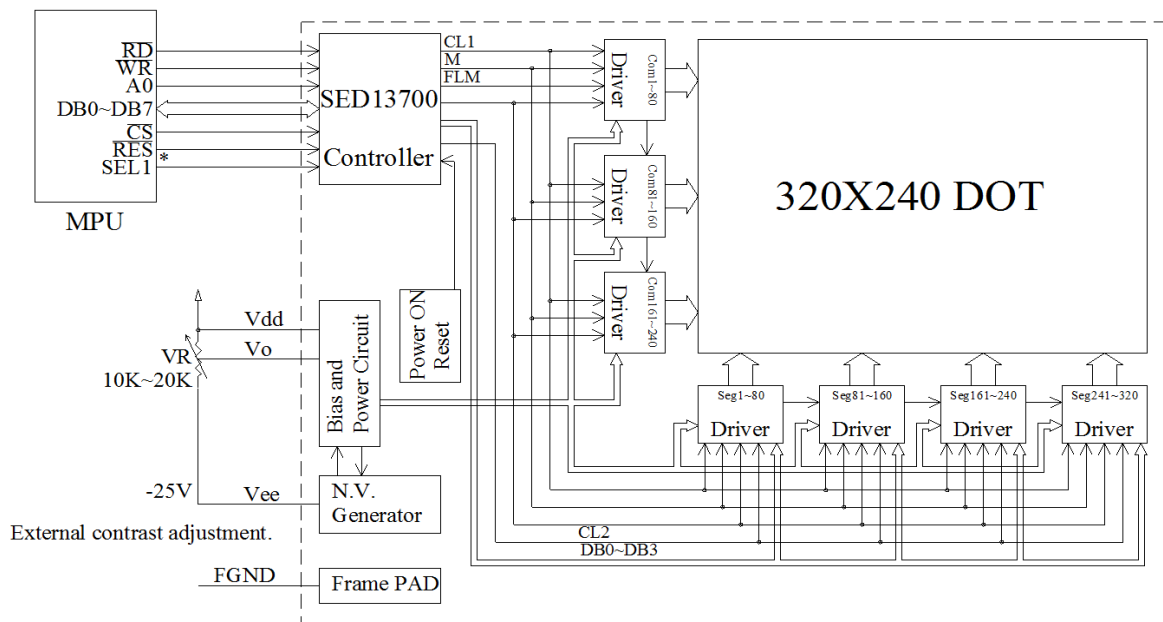
5 Electrical Characteristics

Item	Symbol	Condition	Min	Typ.	Max	Unit
Supply Voltage For Logic	VDD		4.5	5.0	5.5	V
Supply Current	IDD	VDD=5.0V	65.0	75.0	80.0	mA
Low Level Input Voltage	V _{IL}		-	-	1.0	V
High Level Input Voltage	V _{IH}		3.5	-	-	V
Low Level Output Voltage	V _{OL}		-	-	0.4	V
High Level Output Voltage	V _{OH}		VDD-0.4	-	-	V
Backlight Supply Voltage	V		3.4	3.5	3.6	V
Backlight Supply Current	I _{LED}			128	160	mA
Operating Temperature	TOP	Absolute Max	-20	-	+70	°C
Storage Temperature	TST	Absolute Max	-30	-	+80	°C

6 Optical Characteristics

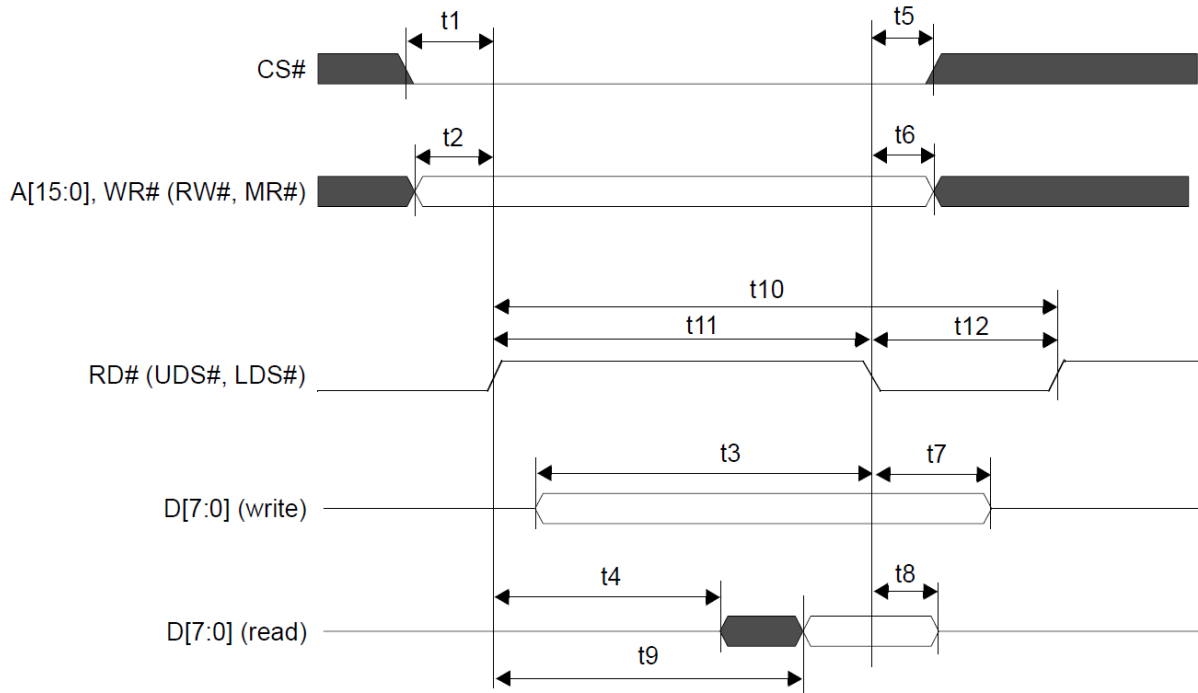
Item	Symbol	Min	Typ	Max	Unit	Note
View Angles Top	AV		20		°	
View Angles Bottom	AV		40		°	
View Angles Left	AH		30		°	
View Angles Right	AH		30		°	
Response Time (25°C)	Tr + Tf		300	400	ms	
Contrast Ratio	CR		3			
Luminance (Without LCD)	L _y	380	420		cd/m ²	

7 Block Diagram



*:6800 family or 8080family interface selectable.

8 Timing Characteristics



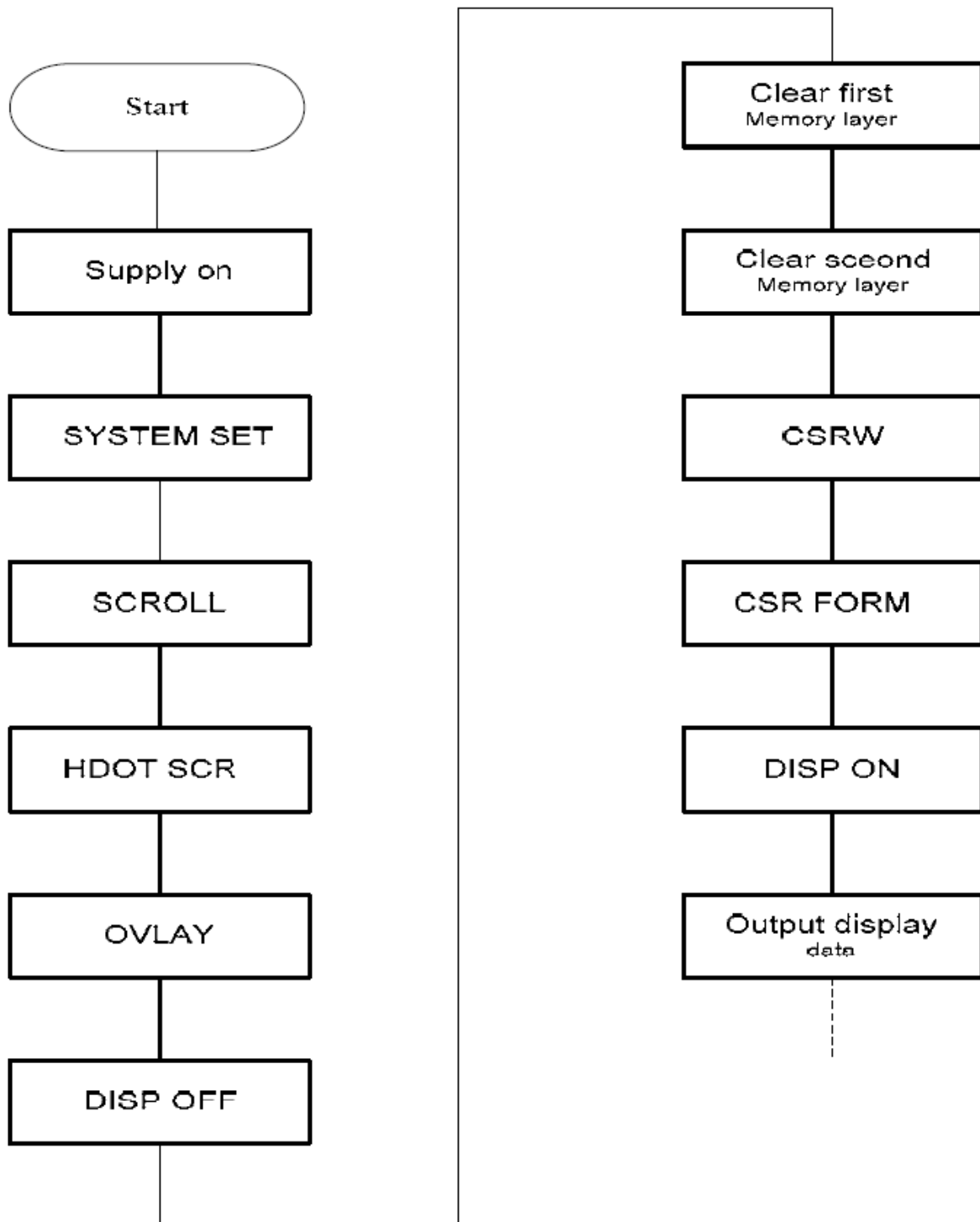
Symbol	Parameter	Min	Typ	Max	Unit
t1	CS# setup time	5	-	-	ns
t2	A[15:0] setup time	5	-	-	ns
t3	D[7:0] setup time to RD# falling edge (write cycle)	note2	-	-	ns
t4	RD# rising edge to D[7:0] driven (read cycle)	3	-	-	ns
t5	CS# hold time	7	-	-	ns
t6	A[15:0] hold time	7	-	-	ns
t7	D[7:0] hold time from RD# falling edge (write cycle)	5	-	-	ns
t8	D[7:0] hold time from RD# falling edge (read cycle)	2	-	55	ns
t9	RD# rising edge to valid Data	-	-	note3	ns
t10	RD# cycle time	note4	-	-	ns
t11	RD# pulse active time	5	-	-	Ts
t12	RD# pulse inactive time	note5	-	-	ns

1. Ts = System clock period
2. $t_{3min} = 2Ts + 5$
3. $t_{9max} = 4Ts + 18$ (for 3.3V)
 $= 4Ts + 20$ (for 5.0V)
4. $t_{10min} = 6Ts$ (for a read cycle followed by a read or write cycle)
 $= 7Ts + 2$ (for a write cycle followed by a write cycle)
 $= 10Ts + 2$ (for a write cycle followed by a read cycle)
5. $t_{12min} = 1Ts$ (for a read cycle followed by a read or write cycle)
 $= 2Ts + 2$ (for a write cycle followed by a write cycle)
 $= 5Ts + 2$ (for a write cycle followed by a read cycle)

9 Commands

Class	Register Address	Command	Register Description	Control Byte Value	No. of Bytes
System Control	8000h - 8007h	SYSTEM SET	Initializes device and display	40h	8
	8008h	POWER SAVE	Enters standby mode	53h	0
Display Control	8009h - 800A	DISP ON/OFF	Enables/disables display and display attributes	58h 59h	1
	800Bh - 8014h	SCROLL	Sets screen block start addresses and sizes	44h	10
	8015h - 8016h	CSRFORM	Sets cursor type	5Dh	2
	8017h	CSRDIR	Sets direction of cursor movement	4Ch - 4Fh	0
	8018h	OVLAY	Sets display overlay format	5Bh	1
	8019h - 801Ah	CGRAM ADR	Sets start address of character generator RAM	5Ch	2
	801Bh	HDOT SCR	Sets horizontal scroll position	5A	1
Drawing Control	801Ch - 801Dh	CSRW	Sets cursor address	46h	2
	801Eh - 801Fh	CSRR	Reads cursor address	47h	2
	8020h	GRAYSCALE	Sets the Grayscale depth (bpp)	60h	1
Memory Control		MEMWRITE	Writes to memory	42h	n/a
		MEMREAD	Reads from memory	43h	

10 Example Initialization Code



11 Built-in Font Table

		Character code bits 0 to 3															
		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Character code bits 4 to 7	2		!	"	#	\$	%	&	'	()	*	+	,	-	.	/
	3	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
	4	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
	5	P	Q	R	S	T	U	V	W	X	Y	Z	[\]	^	_
	6	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
	7	p	q	r	s	t	u	v	w	x	y	z	{	|	}	~	
	A		g	r	u	.	°	ª	»	¼	½	¾	¸	¸	¸	¸	¸
	B	—	²	³	´	µ	¶	·	¸	¹	º	»	¼	½	¾	¸	¸
	C	¸	¸	¸	¸	¸	¸	¸	¸	¸	¸	¸	¸	¸	¸	¸	¸
	D	¸	¸	¸	¸	¸	¸	¸	¸	¸	¸	¸	¸	¸	¸	¸	¸
1	¸	¸	¸	¸	¸	¸	¸	¸	¸	¸	¸	¸	¸	¸	¸	¸	

On-Chip Character Codes

Lower 4 bits	Upper 4 bits															
	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	■		0	@	P	'	p				—	夕	三			
1	■	!	1	A	Q	a	q			。	ア	チ	厶			
2	■	"	2	B	R	b	r			「	イ	ツ	メ			
3	■	#	3	C	S	c	s			」	ウ	テ	モ			
4	■	\$	4	D	T	d	t			、	エ	ト	ト			
5	■	%	5	E	U	e	u			・	オ	ナ	工			
6	■	&	6	F	V	f	v			ヲ	カ	ニ	ヨ			
7	■	'	7	G	W	g	w			ヲ	キ	ヌ	ラ			
8	■	(	8	H	X	h	x			イ	ク	ネ	リ		
9	■	)	9	I	Y	i	y			ち	ケ	ル	ル		
A	■	*	:	J	Z	j	z			エ	コ	ハ	レ			
B	■	+	;	K	[	k	{			オ	サ	ヒ	□		
C	■	,	<	L	¥	l	;			ハ	シ	フ	ワ			
D	■	.	=	M	]	m	}			ユ	ス	ハ	ン		
E	■	-	>	N	^	n	→			ヨ	セ	ホ	、			
F	■	/	?	O	_	o	←			ツ	リ	マ	マ			

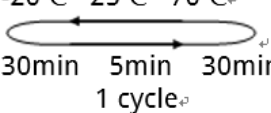
CGRAM1 ↑ ↑ CGRAM2 ↑ ↑

12 Driver/Controller Information

Built-in S1D13700 IC

<https://drive.google.com/file/d/0B5IkVYnewKTGbThvUHJMc0kwVXM/view?usp=sharing>

13 Reliability

Test Item	Content of Test	Test Condition	Note
High Temperature Storage	Endurance test applying the high storage temperature for a long time.	80°C 200hrs	2
Low Temperature Storage	Endurance test applying the high storage temperature for a long time.	-30°C 200hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	70°C 200hrs	-
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-20 °C 200hrs	1
High Temperature/ Humidity Operation	The module should be allowed to stand at 60°C,90%RH max, for 96hrs under no-load condition excluding the polarizer. Then taking it out and drying it at normal temperature.	60°C,90%RH 96hrs	1,2
Thermal Shock Resistance	The sample should be allowed stand the following 10 cycles of operation. 	-20°C/70°C 10 cycles	-
Vibration Test	Endurance test applying the vibration during transportation and using.	Total fixed amplitude: 15mm; Vibration: 10~55Hz; One cycle 60 seconds to 3 directions of X, Y, Z, for each 16 minutes.	3
Static Electricity Test	Endurance test apply the electric stress to the terminal.	VS=800V, RS=1.5kΩ, CS=100pF, 1 time.	-

Note1: No dew condensation to be observed.

Note2: The function test shall be conducted after 4 hours storage at the normal. Temperature and humidity after remove from the rest chamber.

Note3: Test performed on product itself, not inside a container

14 Warranty and Conditions

<http://www.displaymodule.com/pages/faq>