

LIQUID CRYSTAL DISPLAY MODULE

Product Specification

CUSTOMER	Standard	
PRODUCT NUMBER	LMR4755	
CUSTOMER APPROVAL		Date 22 June 2006

INTERNAL APPROVALS		
Product Mgr	Doc Control	Electr. Eng
Bruno Recaldini	Anthony Perkins	Luo Luo
Date:22/06/06	Date: 22/06/06	Date: 22/06/06

- Approval for Specification only**
- Approval for Specification and Sample**

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REVISION RECORD

Rev.	Date	Page	Chapt.	Comment	ECR no.
A	07/03/04			Product release	
B	10/04/06	9	3	New Controller chip	
C	21/02/07	16	6	Modified brightness figure	
D	20/04/12	4	1	Change the driver IC to NT7086	
E	24/05/12	16	6	1. Change to brighter LED B/L 2. The current consumption is changed to 160mA (5V)	

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1 MAIN FEATURES

ITEM	CONTENTS
Display Format	320 x 240 dots
Overall Dimensions	165.5 x 109 x 14
Viewing Area	122 x 92
LCD type	STN Blue mode or FSTN
Mode	Transflective or Transmissive
Viewing Angle	6 O clock
Duty ratio	1 / 240
Driver IC	Neotec NT7086
Backlight type	LED
Backlight colour	White
DC/DC converter	Optional
Operating temperature	-20 ~ +70°C
Storage temperature	-30 ~ +80°C
RoHS status	Compliant

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2 MECHANICAL SPECIFICATION

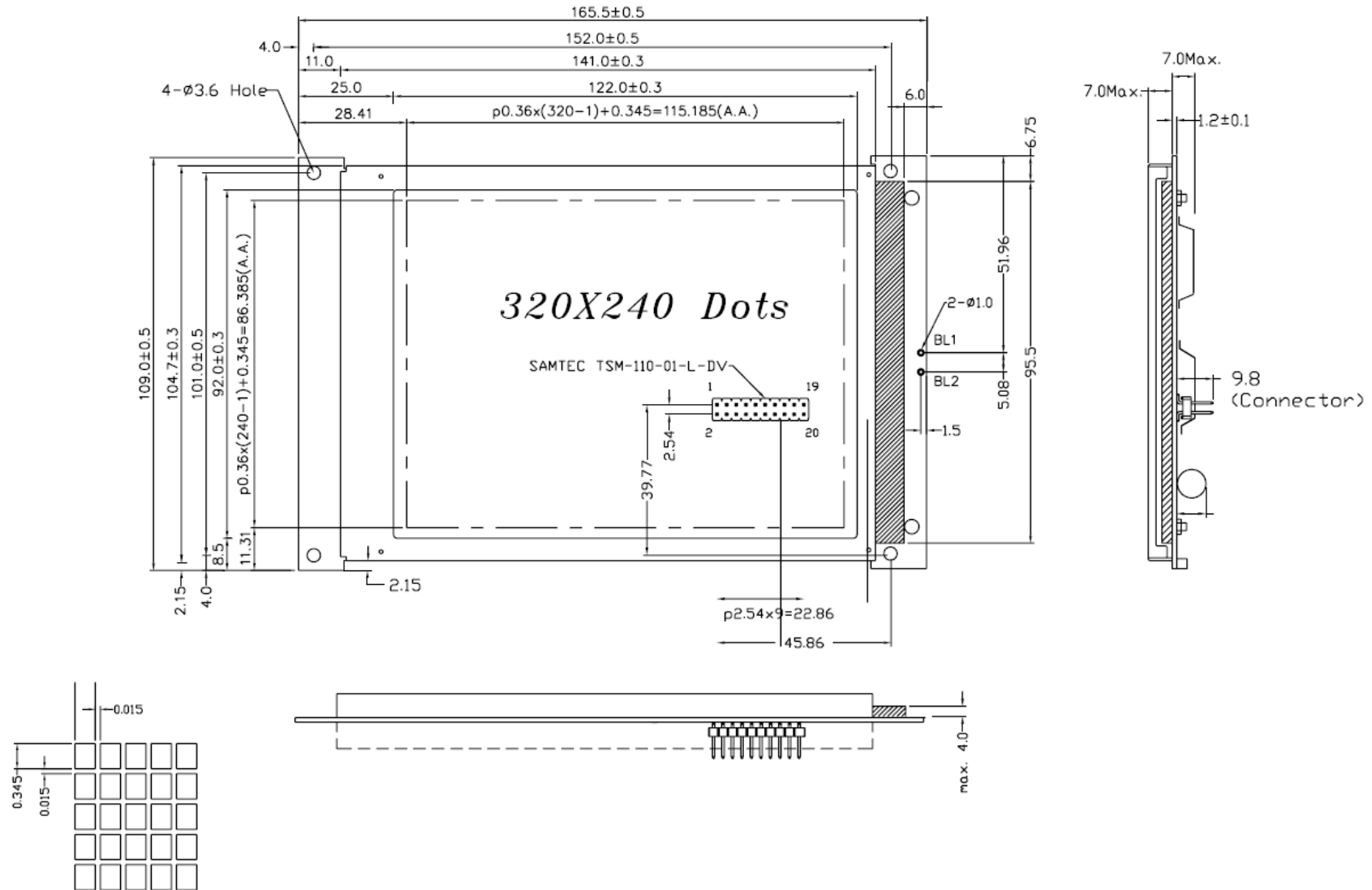
2.1 MECHANICAL CHARACTERISTICS

ITEM	CHARACTERISTIC	UNIT
Display Format	320 x 240 dots	
Overall Dimensions	165.5 x 109 x 14	mm
Viewing Area	122 x 92	mm
Active Area	115.185 x 86.385	mm
Dot Size	0.345 x 0.345	mm
Dot Pitch	0.360 x 0.360	mm
IC Controller/Driver	NT7086	

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2.2 MECHANICAL DRAWING



3 ELECTRICAL SPECIFICATION

3.1 ABSOLUTE MAXIMUM RATINGS

VSS = 0 V, Ta = 25 °C

Item	Symbol	Min	Max	Unit	Note
Power Supply Voltage	V _{DD}	0	7	V	
Input Voltage	V _{in}	0	V _{DD}	V	
Operating Temperature	T _{opr}	-20	+70	°C	Note 1
Storage Temperature	T _{st}	-30	+80	°C	Note 2
Static Electricity	Be sure that you are grounded when handling displays.				

Note 1: Background colour changes slightly depending on ambient temperature. This phenomenon is reversible. Ta ≤ 70 °C: 75% RH max

Note 2: Ta ≤ 80 °C: 75% RH max

3.2 ELECTRICAL CHARACTERISTICS

VSS = 0 V, Ta = 25 °C

Item	Symbol	Condition	Min	Typ	Max	Unit
Input Voltage	V _{ILc}	V _{DD} = 5.0±5%	3.8	--	V _{DD}	V
	V _{IHc}		0	--	1	V
LCD Module Driving Voltage	V _{OP}	Ta = 25 °C	22.2	--	22.8	V
Current Consumption	* I _{DD}	Single +5v operation	--	85	--	mA
Current Consumption	*I _{DD}		--	10	--	mA
Current Consumption	I _{EE}		--	6	--	mA
Supply Voltage	V _{EE}		--	-22	--	V

* I_{DD} measurement condition is for all pattern ON

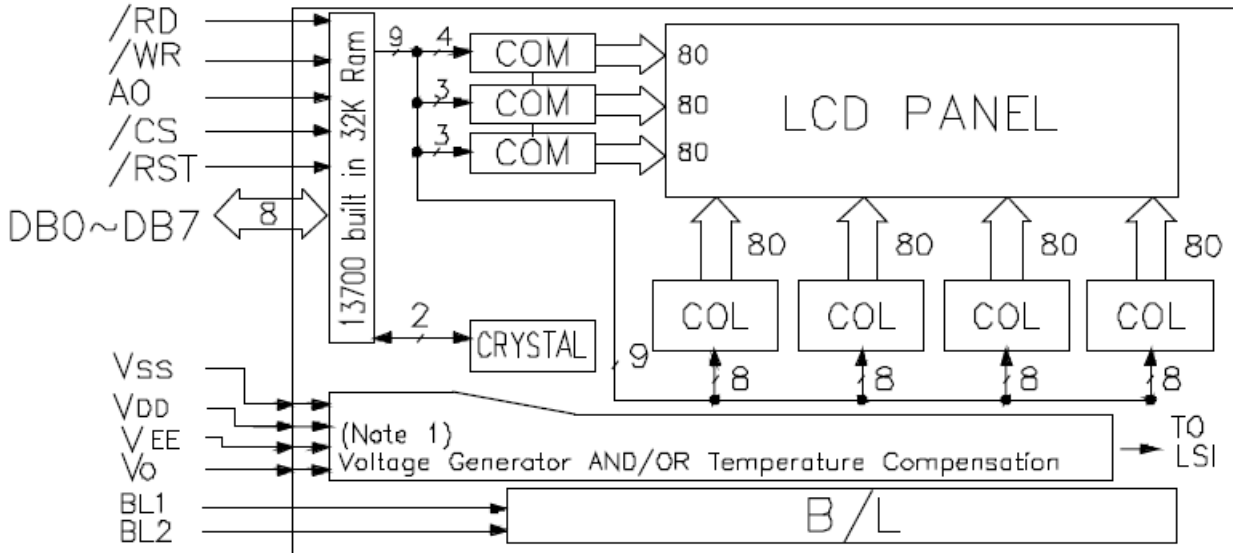
3.3 INTERFACE PIN ASSIGNMENT

No.	Symbol	Function
1	V _{SS}	Ground
2	V _{DD}	Power supply for logic
3	V ₀	Voltage level for LCD Control adjustment
4	/RD	Generic host bus interface when the signal is active low
5	/WR	Generic host bus interface when the signal is active low
6	A0	Indirect addressing mode
7	DB0	Display data
8	DB1	Display data
9	DB2	Display data
10	DB3	Display data
11	DB4	Display data
12	DB5	Display data
13	DB6	Display data
14	DB7	Display data
15	/CS	Chip select
16	/RST	Reset signal
17	V _{ee}	Alternative power supply
18	N/C	No connection
19	N/C	No connection
20	N/C	No connection
BL1	LED+	Anode for LED backlight
BL2	LED-	Cathode for LED backlight

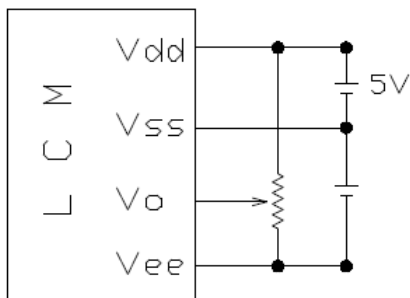
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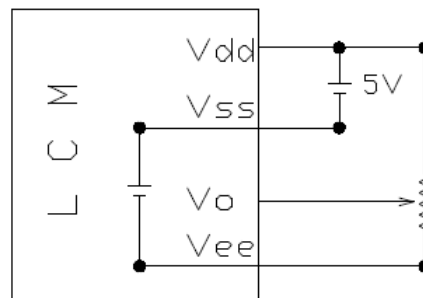
3.4 BLOCK DIAGRAM



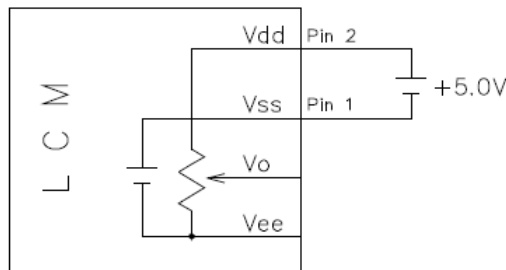
3.5 POWER SUPPLY CIRCUIT



NEGATIVE VOLTAGE
NOT BUILT IN



NEGATIVE VOLTAGE
BUILT IN



NEGATIVE VOLTAGE & TEMPERATURE
COMPENSATION BUILT IN

Recommended VR: 10k _20k Ohm

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3.6 CHARACTER GENERATOR ROM MAP

The following figure shows the character codes and the codes allocated to CGRAM. All codes can be used by the CGRAM if not using the internal ROM, but the CGRAM address must be set to 0.

Note

If either of CGRAM1 or CGRAM2 are used, only 1 bpp is supported.

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				ー	夕	三			
1	■	!	1	A	Q	a	q				。	ア	チ	凵		
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	ヤ		
5	■	%	5	E	U	e	u				・	オ	ナ	ユ		
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				ウ	ケ	ル	ル		
A	■	*	:	J	Z	j	z				エ	コ	ハ	レ		
B	■	+	;	K	[	k	{				オ	ケ	ヒ	□		
C	■	,	<	L	¥	l	;				ヤ	シ	コ	ワ		
D	■	.	=	M	]	m	}				ユ	ス	ハ	ン		
E	■	-	>	N	^	n	→				ヨ	セ	ホ	、		
F	■	/	?	O	_	o	←				ッ	リ	マ	□		

CGRAM1 ↑ ↑
CGRAM2 ↑ ↑

4 TIMING CHARECTERISTICS

4.1 Input Clock

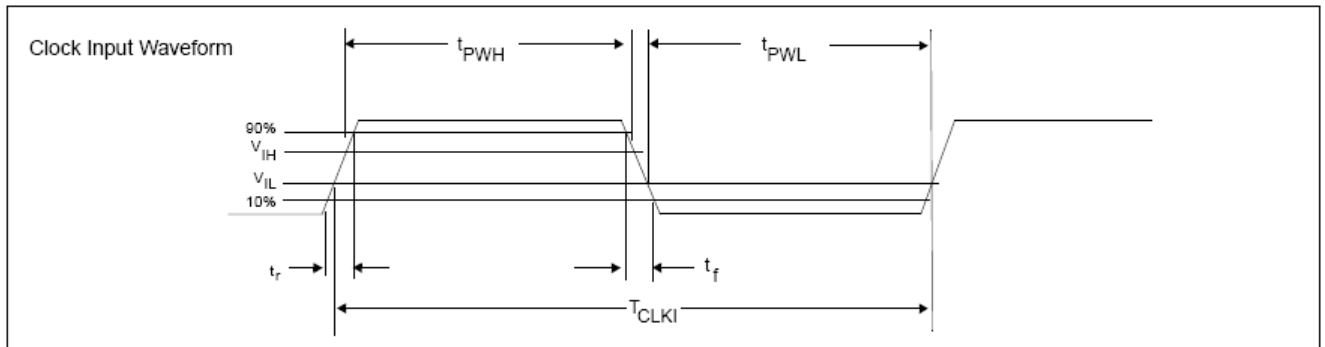


Figure 7-1 Clock Input Requirements

Table 7-1 Clock Input Requirements

Symbol	Parameter	3.0V		5.0V		Units
		Min	Max	Min	Max	
f_{CLKI}	Input Clock Frequency (CLKI)	—	60	—	60	MHz
T_{CLKI}	Input Clock period (CLKI)	$1/f_{OSC}$	—	$1/f_{OSC}$	—	ns
t_{PWH}	Input Clock Pulse Width High (CLKI)	$0.4T_{CLKI}$	—	$0.4T_{CLKI}$	—	ns
t_{PWL}	Input Clock Pulse Width Low (CLKI)	$0.4T_{CLKI}$	—	$0.4T_{CLKI}$	—	ns
t_f	Input Clock Fall Time (10% - 90%)	—	2	—	2	ns
t_r	Input Clock Rise Time (10% - 90%)	—	2	—	2	ns

Note

Maximum internal requirements for clocks derived from CLKI must be considered when determining the frequency of CLKI. For further details on internal clocks, see Section 9, “Clocks” on page 41.

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4.2 Reset Timing

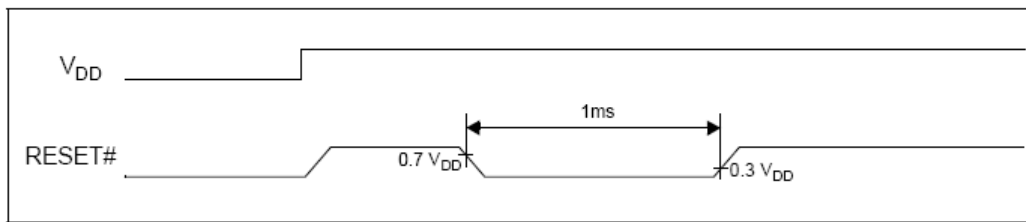


Figure 7-2 Reset Timing

The S1D13700F01 requires a reset pulse of at least 1 ms after power-on in order to re-initialize its internal state. For maximum reliability, it is not recommended to apply a DC voltage to the LCD panel while the S1D13700F01 is reset. Turn off the LCD power supplies for at least one frame period after the start of the reset pulse.

During the reset period the S1D13700F01 cannot receive commands. Commands to initialize the internal registers should be issued soon after a reset. During reset, the LCD drive signals FPDAT, FPLINE and FR are halted.

A delay of 3 ms (maximum) is required following the rising edges of both RESET# and VDD to allow for system stabilization. This delay allows the clock used by the internal oscillator circuit to become stable before use.

Table 7-2 Generic Bus Direct/Indirect Interface with WAIT# Timing

Symbol	Parameter	3.3 Volt		5.0 Volt		Units
		Min	Max	Min	Max	
t1	CS# setup time	5	—	5	—	ns
t2	AB[15:0] setup time	5	—	5	—	ns
t3	WR#, RD# falling edge to WAIT# driven low	2	15	2	15	ns
t4	DB[7:0] setup time to WR# rising edge (write cycle)	Note 2	—	Note 2	—	ns
t5	RD# falling edge to DB[7:0] driven (read cycle)	3	—	3	—	ns
t6	CS# hold time	7	—	7	—	ns
t7	AB[15:0] hold time	7	—	7	—	ns
t8	RD#, WR# rising edge to WAIT# high impedance	2	10	2	10	ns
t9	DB[7:0] hold time from WR# rising edge (write cycle)	5	—	5	—	ns
t10	DB[7:0] hold time from RD# rising edge (read cycle)	3	14	3	14	ns
t11	WAIT# rising edge to valid Data	—	Note 3	—	Note 3	ns
t12	RD#, WR# pulse inactive time	Note 4	—	Note 4	—	ns
t13	WAIT# pulse active time	—	Note 5	—	Note 5	ns

1. T_s = System clock period
2. t_{4min} = $2T_s + 5$
3. t_{11max} = $1T_s + 5$ (for 3.3V)
= $1T_s + 7$ (for 5.0V)
4. t_{12min} = $1T_s$ (for a read cycle followed by a read or write cycle)
= $2T_s + 2$ (for a write cycle followed by a write cycle)
= $5T_s + 2$ (for a write cycle followed by a read cycle)
5. t_{13max} = $4T_s + 2$

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5 OPTICAL SPECIFICATION

5.1 OPTICAL CHARACTERISTICS

5.1.1 STN Negative

Ta = 25 °C

Item	Symbol	Condition	Min	Typ	Max	Unit	Note
Viewing Angle	θ1	CR≥2		45		deg	1
	θ2	CR≥2		40		deg	1
	θ3	CR≥2		35		deg	2
	θ4	CR≥2		35		deg	2
Contrast Ratio	CR	Ta = 25 °C		7.33	7.41	-	3
Response Time	Tr	Ta = 25 °C		48.2	300	ms	4
	Tf	Ta = 25 °C		98.7	300		
Driving Method	Duty	1/240					
	Bias	1/13					
LCD Type	STN – Negative						
Viewing Direction	6 O’CLOCK						

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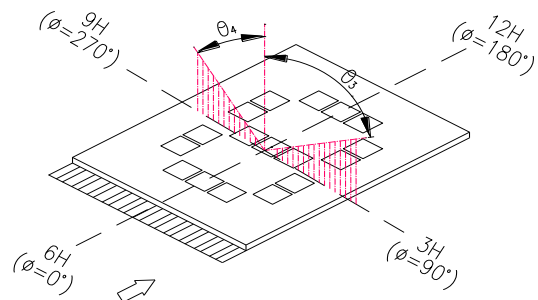
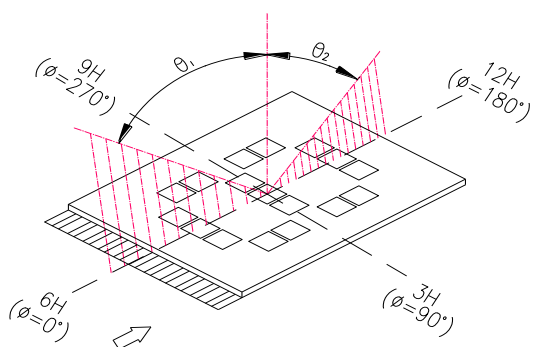
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5.1.2 FSTN Positive

Item	Symbol	Condition	Min	Typ	Max	Unit	Note
Viewing Angle	θ_1	$CR \geq 2$		30		deg	1
	θ_2	$CR \geq 2$		25		deg	1
	θ_3	$CR \geq 2$		25		deg	2
	θ_4	$CR \geq 2$		25		deg	2
Contrast Ratio	CR	$T_a = 25\text{ }^\circ\text{C}$	4.5	6.5	8.5	-	3
Response Time	Tr	$T_a = 25\text{ }^\circ\text{C}$	200	250	380	ms	4
	Tf	$T_a = 25\text{ }^\circ\text{C}$	120	150	230		
Driving Method	Duty	1/240					
	Bias	1/13					
LCD Type	FSTN-Positive / Transflective						
Viewing Direction	6 O'CLOCK						

Note 1: definition of viewing angle θ_1 & θ_2

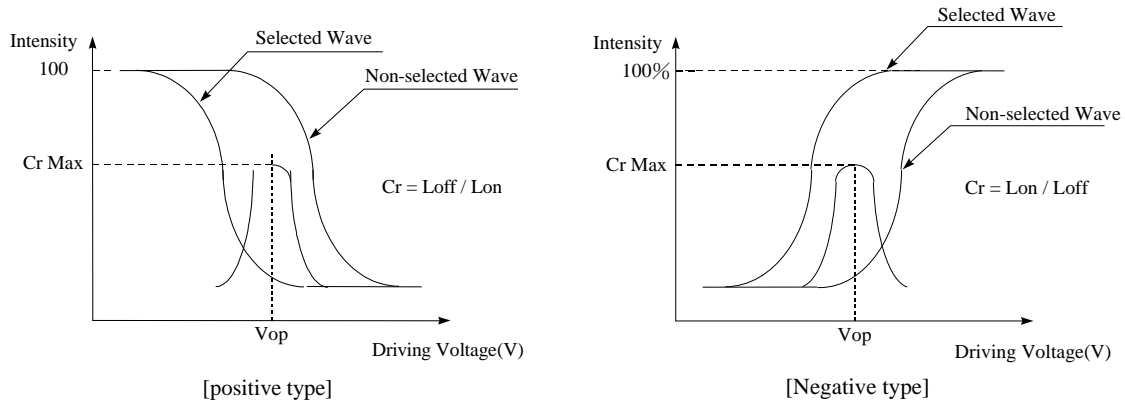
Note 2: definition of viewing angle θ_3 & θ_4



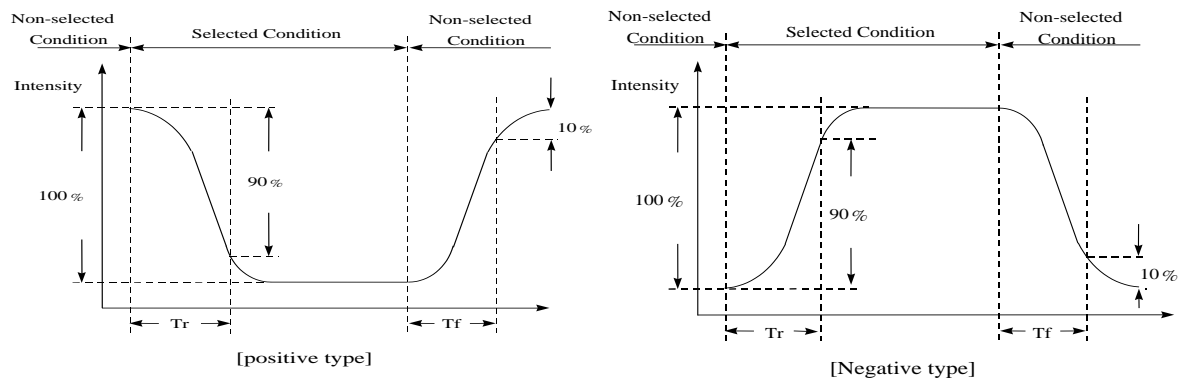
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Note 3: definition of contrast ratio (CR)



Note 4: definition of response time



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6 BACKLIGHT SPECIFICATION

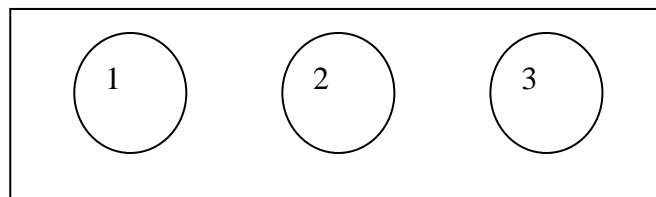
6.1 BACKLIGHT CHARACTERISTICS

Ta=25°C

Item	Symbol	Condition	Min	Typ	Max	Unit	Note
LED Input Voltage	V _{LED}	I _{LED} = 120mA	--	5	--	V	
LED Input Current	I _{LED}		--	160	--	mA	
Average Brightness Ta=25°C IL=160mA		Test when connecting after 3min. (max contrast) White LED	450	550	--	cd/m ²	3
Brightness Uniformity		I _{LED} = 160mA	80	--	--	%	1, 3
Life time		I _{LED} = 160mA	--	40000	--	hrs	2
Colour	White						

Note:

1. Brightness uniformity = (MAX-MIN) / MAX x 100
2. Half of the original brightness
3. Average brightness of 3 points when the B/L is used at the beginning.



6.2 LABELLING & MARKING

DENSITRON LMR4755 Taiwan YYMM

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7 QUALITY ASSURANCE SPECIFICATION

7.1 CONFORMITY

The performance, function and reliability of the shipped products conform to the Product Specification.

7.2 DELIVERY ASSURANCE

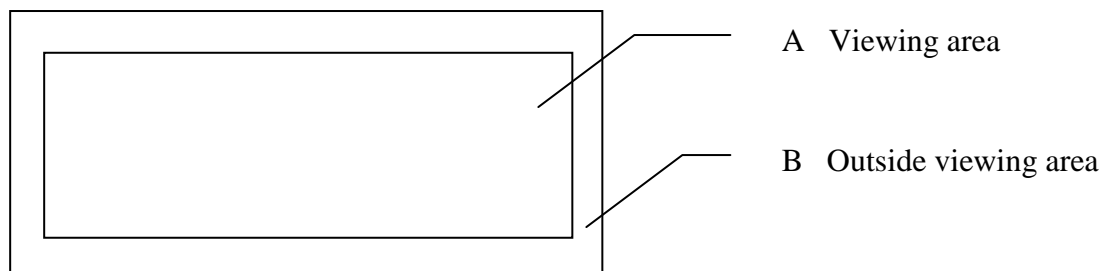
7.2.1 Delivery inspection standards

- MIL-STD-105E, general inspection level II, single sampling level;
- IPC-AA610 rev. C, class 2 electronic assemblies standard

The quality assurance levels are shown below:

Class	AQL (%)
Critical defect	0.65%
Major defect	1.0%
Minor defect	2.5%
TOTAL	2.5%

7.2.2 Zone definition

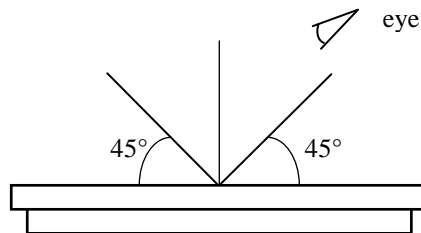


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7.2.3 Visual inspection

- Inspect under 2x20W or 40W fluorescent lamp (approximately 3000 lux) leaving 25 to 30 cm between the module and the lamp and 30 cm between the module and the eye (measuring position).
- Appearance is inspected at the best contrast voltage (best contrast is adjusted considering clearness and crosstalk on screen).
- Inspect the module at 45° right and left, top and bottom.
- Use the optimum viewing angle during the contrast inspection.

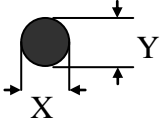
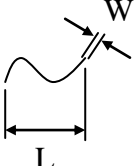
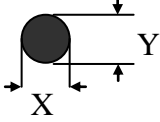


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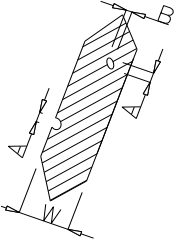
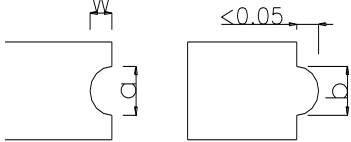
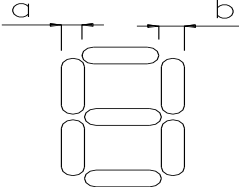
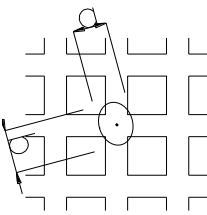
7.2.3.1 Standard of appearance inspection

Units: mm

Class	Item	Criteria																																				
Minor	Packing & Label	Outside & inside package Presence of product no., lot no., quantity																																				
Critical		Product must not be mixed with others and quantity must not be different from that indicated on the label																																				
Major	Dimension	Product dimensions must be according to specification and drawing																																				
Major	Electrical	Product electrical characteristics must be according to specification																																				
Critical	LCD Display	Missing lines or wrong patterns on LCD display are not allowed																																				
Minor	Black spot, white spot, dust	<p>Round type: as per following drawing $\varnothing = (X+Y)/2$</p>  <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="3">Acceptable quantity</th> </tr> <tr> <th>Size</th> <th>Zone A</th> <th>Zone B</th> </tr> </thead> <tbody> <tr> <td>$\varnothing < 0.1$</td> <td>Any number</td> <td rowspan="4">Any number</td> </tr> <tr> <td>$0.1 < \varnothing < 0.2$</td> <td>2</td> </tr> <tr> <td>$0.2 < \varnothing < 0.25$</td> <td>1</td> </tr> <tr> <td>$0.25 < \varnothing$</td> <td>0</td> </tr> </tbody> </table> <p>Line type: as per following drawing</p>  <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="4">Acceptable quantity</th> </tr> <tr> <th>Length</th> <th>Width</th> <th>Zone A</th> <th>Zone B</th> </tr> </thead> <tbody> <tr> <td>--</td> <td>$W \leq 0.02$</td> <td>Any number</td> <td rowspan="4">Any number</td> </tr> <tr> <td>$L \leq 3.0$</td> <td>$0.02 < W \leq 0.03$</td> <td>2</td> </tr> <tr> <td>$L \leq 2.5$</td> <td>$0.03 < W \leq 0.05$</td> <td>As round type</td> </tr> <tr> <td>--</td> <td>$0.05 < W$</td> <td>As round type</td> </tr> </tbody> </table> <p style="text-align: center;">Total acceptable quantity: 3</p>	Acceptable quantity			Size	Zone A	Zone B	$\varnothing < 0.1$	Any number	Any number	$0.1 < \varnothing < 0.2$	2	$0.2 < \varnothing < 0.25$	1	$0.25 < \varnothing$	0	Acceptable quantity				Length	Width	Zone A	Zone B	--	$W \leq 0.02$	Any number	Any number	$L \leq 3.0$	$0.02 < W \leq 0.03$	2	$L \leq 2.5$	$0.03 < W \leq 0.05$	As round type	--	$0.05 < W$	As round type
Acceptable quantity																																						
Size	Zone A	Zone B																																				
$\varnothing < 0.1$	Any number	Any number																																				
$0.1 < \varnothing < 0.2$	2																																					
$0.2 < \varnothing < 0.25$	1																																					
$0.25 < \varnothing$	0																																					
Acceptable quantity																																						
Length	Width	Zone A	Zone B																																			
--	$W \leq 0.02$	Any number	Any number																																			
$L \leq 3.0$	$0.02 < W \leq 0.03$	2																																				
$L \leq 2.5$	$0.03 < W \leq 0.05$	As round type																																				
--	$0.05 < W$	As round type																																				
Minor	Polariser scratch	Scratch on protective film is permitted Scratch on polariser: same as No. 1																																				
Minor	Polariser bubble	<p>$\varnothing = (X+Y)/2$</p>  <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="3">Acceptable quantity</th> </tr> <tr> <th>Size</th> <th>Zone A</th> <th>Zone B</th> </tr> </thead> <tbody> <tr> <td>$\varnothing < 0.2$</td> <td>Any number</td> <td rowspan="4">Any number</td> </tr> <tr> <td>$0.2 < \varnothing < 0.5$</td> <td>2</td> </tr> <tr> <td>$0.5 < \varnothing < 1.0$</td> <td>1</td> </tr> <tr> <td>$1.0 < \varnothing$</td> <td>0</td> </tr> </tbody> </table> <p style="text-align: center;">Total acceptable quantity: 3</p>	Acceptable quantity			Size	Zone A	Zone B	$\varnothing < 0.2$	Any number	Any number	$0.2 < \varnothing < 0.5$	2	$0.5 < \varnothing < 1.0$	1	$1.0 < \varnothing$	0																					
Acceptable quantity																																						
Size	Zone A	Zone B																																				
$\varnothing < 0.2$	Any number	Any number																																				
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$0.5 < \varnothing < 1.0$	1																																					
$1.0 < \varnothing$	0																																					

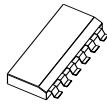
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Class	Item	Criteria																												
Minor	Segment deformation	<p>1.a. Pin hole on segmented display</p> <p>W: segment width $\varnothing = (A+B)/2$</p>  <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">Acceptable quantity</th> </tr> <tr> <th>Width</th> <th>\varnothing</th> </tr> </thead> <tbody> <tr> <td>$W \leq 0.4$</td> <td>$\varnothing \leq 0.2$ and $\varnothing \leq 1/2W$</td> </tr> <tr> <td>$W > 0.4$</td> <td>$\varnothing \leq 0.25$ and $\varnothing \leq 1/3W$</td> </tr> </tbody> </table> <p>Total acceptable quantity: 1 defect per segment Pin holes with \varnothing under 0.10 mm are acceptable</p>	Acceptable quantity		Width	\varnothing	$W \leq 0.4$	$\varnothing \leq 0.2$ and $\varnothing \leq 1/2W$	$W > 0.4$	$\varnothing \leq 0.25$ and $\varnothing \leq 1/3W$																				
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Minor	Segment deformation	<p>1b. Pin hole on dot matrix display</p>  <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">Acceptable quantity</th> </tr> <tr> <th>Size</th> <th></th> </tr> </thead> <tbody> <tr> <td>$a, b < 0.1$</td> <td>Any number</td> </tr> <tr> <td>$(a+b)/2 \leq 0.1$</td> <td>Any number</td> </tr> <tr> <td>$0.5 < \varnothing < 1.0$</td> <td>3</td> </tr> </tbody> </table> <p>Total acceptable quantity: 7</p> <p>2. Segments / dots with different width</p>  <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">Acceptable</th> </tr> </thead> <tbody> <tr> <td>$a \geq b$</td> <td>$a/b \leq 4/3$</td> </tr> <tr> <td>$a < b$</td> <td>$a/b > 4/3$</td> </tr> </tbody> </table> <p>3. Alignment layer defect</p> <p>$\varnothing = (a+b)/2$</p>  <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">Acceptable quantity</th> </tr> <tr> <th>Size</th> <th></th> </tr> </thead> <tbody> <tr> <td>$\varnothing \leq 0.4$</td> <td>Any number</td> </tr> <tr> <td>$0.4 < \varnothing \leq 1.0$</td> <td>5</td> </tr> <tr> <td>$1.0 < \varnothing \leq 1.5$</td> <td>3</td> </tr> <tr> <td>$1.5 < \varnothing \leq 2.0$</td> <td>2</td> </tr> </tbody> </table> <p>Total acceptable quantity: 7</p>	Acceptable quantity		Size		$a, b < 0.1$	Any number	$(a+b)/2 \leq 0.1$	Any number	$0.5 < \varnothing < 1.0$	3	Acceptable		$a \geq b$	$a/b \leq 4/3$	$a < b$	$a/b > 4/3$	Acceptable quantity		Size		$\varnothing \leq 0.4$	Any number	$0.4 < \varnothing \leq 1.0$	5	$1.0 < \varnothing \leq 1.5$	3	$1.5 < \varnothing \leq 2.0$	2
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Minor	Colour uniformity	Level of sample for approval set as limit sample																												
Critical	Backlight	The backlight colour should correspond to the product specification																												
Critical		Flashing and or unlit backlight is not allowed																												
Minor		Dust larger than 0.25 mm is not allowed																												
Major	COB	Exposed wire bond pad is not allowed																												
Major		Insufficient covering with resin is not allowed (wire bond line exposed)																												
Minor		Dust or bubble on the resin are not allowed																												

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Class	Item	Criteria													
Major		No unmelted solder paste should be present on PCB													
Critical		Cold solder joints, missing solder connections, or oxidation are not allowed													
Minor		No residue or solder balls on PCB are allowed													
Critical		Short circuits on components are not allowed													
Minor	Tray particles	<table border="1"> <thead> <tr> <th></th> <th>Size</th> <th>Quantity</th> </tr> </thead> <tbody> <tr> <td rowspan="2">On tray</td> <td>$\varnothing < 0.2$</td> <td>Any number</td> </tr> <tr> <td>$\varnothing > 0.25$</td> <td>4</td> </tr> <tr> <td rowspan="2">On display</td> <td>$\varnothing \geq 0.25$</td> <td>2</td> </tr> <tr> <td>L = 3</td> <td>1</td> </tr> </tbody> </table>		Size	Quantity	On tray	$\varnothing < 0.2$	Any number	$\varnothing > 0.25$	4	On display	$\varnothing \geq 0.25$	2	L = 3	1
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	L = 3	1													

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7.3 DEALING WITH CUSTOMER COMPLAINTS

7.3.1 Non-conforming analysis

Purchaser should supply Densitron with detailed data of non-conforming sample.
 After accepting it, Densitron should complete the analysis in two weeks from receiving the sample.
 If the analysis cannot be completed on time, Densitron must inform the purchaser.

7.3.2 Handling of non-conforming displays

If any non-conforming displays are found during customer acceptance inspection which Densitron is clearly responsible for, return them to Densitron.
 Both Densitron and customer should analyse the reason and discuss the handling of non-conforming displays when the reason is not clear.
 Equally, both sides should discuss and come to agreement for issues pertaining to modification of Densitron quality assurance standard.

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8 RELIABILITY SPECIFICATION

8.1 RELIABILITY TESTS

Test Item	Test Condition	Evaluation and assessment
High Temperature Operation	70°C ±2°C for 240 hours	No abnormalities in function* and appearance
Low Temperature Operation	-20°C ±2°C for 240 hours	No abnormalities in function* and appearance
Thermal Shock Storage	-30°C (30 min) ->25°C (5 min) - >80°C (30 min) - >25°C (5 min) 5 cycles	No abnormalities in function* and appearance
Vibration	10Hz ~ 55Hz 0.3mm / 1 Octave 55Hz ~ 500Hz 3g / 1 Octave 20 cycle / per axis	No abnormalities in function* and appearance

* Current consumption 3 times initial value

* Contrast > ½ initial value

8.2 LIFE TIME

Item	Description
1	Function, performance, appearance, etc. shall be free from remarkable deterioration within 50,000 hours under ordinary operating and storage conditions of room temperature (25±10 °C), normal humidity (45±20% RH), and in area not exposed to direct sunlight.
2	Function, performance, appearance, etc. shall be free from remarkable deterioration within 5,000 hours under ordinary operating and storage conditions of 70 °C temperature, normal humidity (45±20% RH), and in area not exposed to direct sunlight.

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9 PART NUMBER DESCRIPTIONS FOR AVAILABLE OPTIONS

LMR4755①②240G320③④⑤

- ① **POLARIZER TYPE**
 B = Transflective: light background with LED backlight
 E = Transmissive: dark background with white LED backlight
- ② **BACKLIGHT COLOUR**
 W = White
- ③ **FLUID TYPE AND POWER SUPPLY**
 W = Wide Temperature Range; on-board negative supply voltage generator
 H = Wide Temperature Range
- ④ **TEMPERATURE COMPENSATION**
 C = with on board temperature compensation circuitry
 N = **No** on board temperature compensation and NTN Fluid
- ⑤ **FLUID TYPE**
 F = FSTN
 B = STN (Blue Mode)

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10 HANDLING PRECAUTIONS

Safety

If the LCD panel breaks, be careful not to get the liquid crystal fluid in your mouth or in your eyes. If the liquid crystal touches your skin or clothes, wash it off immediately using soap and plenty of water.

Mounting and Design

Place a transparent plate (e.g. acrylic, polycarbonate or glass) on the display surface to protect the display from external pressure. Leave a small gap between the transparent plate and the display surface.

When assembling with a zebra connector, clean the surface of the pads with alcohol and keep the surrounding air very clean.

Design the system so that no input signal is given unless the power supply voltage is applied.

Caution during LCD cleaning

Lightly wipe the display surface with a soft cloth soaked with Isopropyl alcohol, Ethyl alcohol or Trichlorotrifluoroethane.

Do not wipe the display surface with dry or hard materials that will damage the polariser surface.

Do not use aromatic solvents (toluene and xylene), or ketonic solvents (ketone and acetone).

Caution against static charge

As the display uses C-MOS LSI drivers, connect any unused input terminal to VDD or VSS. Do not input any signals before power is turned on.

Also, ground your body, work/assembly table and assembly equipment to protect against static electricity.

Packaging

Displays use LCD elements, and must be treated as such. Avoid strong shock and drop from a height. To prevent displays from degradation, do not operate or store them exposed directly to sunshine or high temperature/humidity.

Caution during operation

It is indispensable to drive the display within the specified voltage limit since excessive voltage shortens its life.

Direct current causes an electrochemical reaction with remarkable deterioration of the display quality. Give careful consideration to prevent direct current during ON/OFF timing and during operation.

Response time is extremely delayed at temperatures lower than the operating temperature range while, at high temperatures, displays become dark. However, this phenomenon is reversible and does not mean a malfunction or a display that has been permanently damaged.

If the display area is pushed on hard during operation, some graphics will be abnormally displayed but returns to a normal condition after turning off the display once.

Even a small amount of condensation on the contact pads (terminals) can cause an electro-chemical reaction which causes missing rows and columns. Give careful attention to avoid condensation.

Storage

Store the display in a dark place where the temperature is 25°C ± 10°C and the humidity below 50%RH.

Store the display in a clean environment, free from dust, organic solvents and corrosive gases.

Do not crash, shake or jolt the display (including accessories).

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