

LIQUID CRYSTAL DISPLAY MODULE

Standard Product Specification

PRODUCT NUMBER	LR4218
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Product Mgr	Quality Mgr	Electrical Eng	Document Control
Date:	Date:	Date:	Date:

□ Approval for Specification only

□ Approval for Specification and Sample

Sample no.:

Date:

ISIR no.:

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REVISION RECORD

Rev.	Date	Page	Chapt.	Comment	ECN no.
А	01/31/06			New DCA Release	E3012

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1 MAIN FEATURES

Units : MM

ITEM	CONTENTS
Display Format	2 line x 40 characters
Character Font Format	5 (W) x 7 (H) with attached cursor
Colour	Monochrome
Overall Dimensions	182.0 (W) x 33.6 (H) x 14.0 Max. (D)
Viewing Area	152.2 (W) x 16.5 (H)
LCD Type	STN (-H)
Mode	See page 20 for options
Duty Ratio	1/16
Driver IC	ST7066U
Backlight Type	LED
Backlight Colour	See page 20 for options
DC/DC Converter	Built-In
Operating Temperature	$-20^{\circ}C \sim +70^{\circ}C$
Storage Temperature	$-30^{\circ}C \sim +80^{\circ}C$
RoHS Compliant	Yes

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2 MECHANICAL SPECIFICATION

2.1 MECHANICAL CHARACTERISTICS

ITEM	CHARACTERISTIC	UNIT
Display Format	Format 2 line x 40 characters	
Overall Dimensions	sions 182.0 (W) x 33.6 (H) x 14.0 Max. (D)	
Viewing Area	152.2 (W) x 16.5 (H)	mm
Active Area	147.5 (W) x 11.5 (H)	mm
Dot Size	0.6 (W) x 0.65 (H)	mm
Dot Pitch	0.65 (W) x 0.70 (H)	mm
IC Controller/Driver	ST7066U	

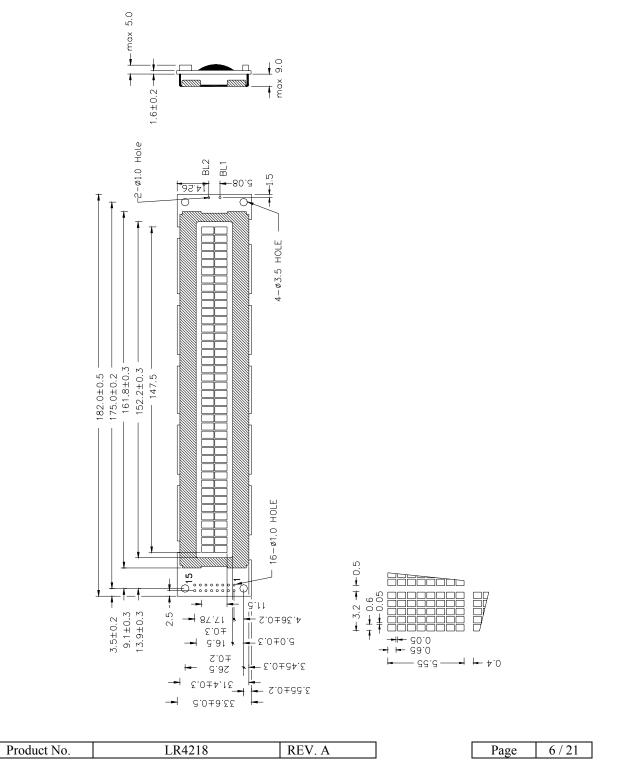
2.2 LABELLING & MARKING

DENSITRON LR4218 TAIWAN YYMM

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2.3 MECHANICAL DRAWING





3 ELECTRICAL SPECIFICATION

3.1 ABSOLUTE MAXIMUM RATINGS

Item	Symbol	STN-H		Unit
		Min.	Max.	
Logic supply voltage	VDD-VSS	0	7	V
LC driver supply	VDD-VO	0	10	V
voltage				
Operating temperature	ТОР	-20	+70 (Note 3)	°C
Storage temperature	TST	-30	+80	
(Note 1)				
Humidity:				
Operating (@40°C)	-	-	85%	RH (Note 2)
Non-operating (@40°C)	-	-	95%	RH (Note 2)

1: Tested to 100 hrs.

2: Refers to non-condensing conditions.

3. It is not recommended to operate EL lamp above 50°C.

3.2 ELECTRICAL CHARACTERISTICS

		VDD=5±0.25V; Ta=25°C				
Item	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Input "High" voltage	VIH	-	2.2	-	VDD	V
Input "Low" voltage	VIL	-	-	-	0.6	V
Output "High" voltage	Voh	IOH=0.205mA	2.4	-	-	V
Output "Low" voltage	VOL	IOL=1.2mA	-	-	0.4	V
Power supply current	IDD	VDD=5.0V	-	3	_	mA

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3.3 RECOMMENDED LC DRIVE VOLTAGE (VDD-VO)

VDD=5.0±0.25V

Temperature	STN-H
$T_a = -20^{\circ}C$	4.7
$T_a = 0^{\circ}C$	4.7
$T_a=25^{\circ}C$	4.7
$T_a = 50^{\circ}C$	4.6
Ta=70°C	4.5

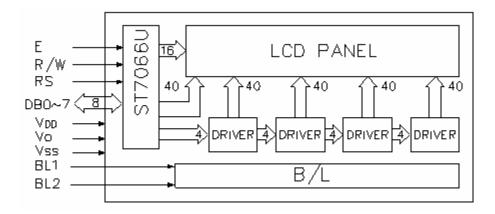
3.4 INTERFACE PIN ASSIGNMENT

Pin No.	Symbol	I/O	Function
1	Vss	-	Ground (OV)
2	Vdd	-	Logic Supply Voltage (+5V)
3	Vo	-	LC Drive voltage for contrast adjustment
4	RS	Ι	Register Select 0: Instruction Register
			1: Data Register
5	R/W	Ι	Read / Write 0: Data Write (Module←MPU)
			1: Data Read (Module→MPU)
6	E	Ι	Enable Signal Active High $(H \rightarrow L)$
7	DB0	I/O	Bi-directional data bus line 0
8	DB1	I/O	Bi-directional data bus line 1
9	DB2	I/O	Bi-directional data bus line 2
10	DB3	I/O	Bi-directional data bus line 3
11	DB4	I/O	Bi-directional data bus line 4
12	DB5	I/O	Bi-directional data bus line 5
13	DB6	I/O	Bi-directional data bus line 6
14	DB7	I/O	Bi-directional data bus line 7
15	V_{LED^+}	-	Anode (+): LED backlight input voltage
16	VLED-	-	Cathode (-): LED backlight input voltage
BL1	V_{LED^+}	-	Anode (+): LED backlight input voltage
BL2	VLED-	-	Cathode (-): LED backlight input voltage

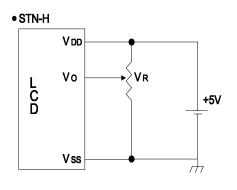
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3.5 BLOCK DIAGRAM



3.6 POWER SUPPLY CIRCUIT

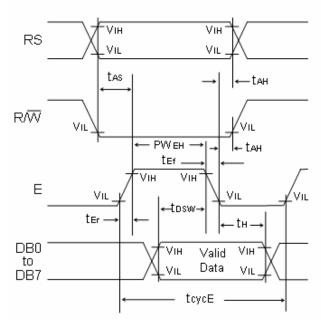


VR= 10K - 20K ohm



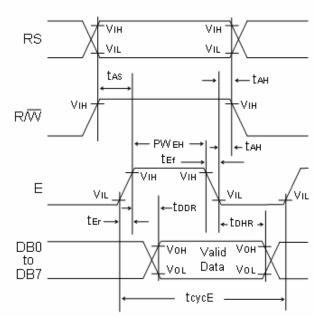
3.7 TIMING CHARACTERISTICS

Item	Symbol	Min.	Тур.	Max.	Unit
Enable cycle time	TcycE	1.0	-	-	nS
Enable pulse width	PWEH	450	-	-	nS
Enable rise / fall time	ter/tef	-	-	25	nS
Address set-up time	tas	140	-	-	nS
Address hold time	tah	10	-	-	nS
Data delay time	tddr	-	-	320	nS
Data hold time (Write)	tdhw	10	-	-	nS
Data hold time (Read)	tdhr	20	-	-	nS
Data set-up time	tdsw	195	-	-	nS



WRITE OPERATION

READ OPERATION



3.8 DDRAM ADDRESS vs. DISPLAY POSITION

Character	1	2	3	4	5	6	7	8	9	10	11	 38	39	40
Line 1	00	01	02	03	04	05	06	07	08	09	0A	 25	26	27
Line 2	40	41	42	43	44	45	46	47	48	49	4A	 65	66	67

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4 OPTICAL SPECIFICATION

4.1 OPTICAL CHARACTERISTICS

Item	Symbol	Condition	Min	Тур	Max	Unit	1a = 25 Note
	θ1 (down)	CR≥2		40		deg	1
Viewing Angle	θ2 (up)	CR≥2		40		deg	1
Viewing Angle	θ3 (right)	CR≥2		40		deg	2
	θ4 (left)	CR≥2		40		deg	2
Contrast Ratio	CR	Ta = 25 °C	5			-	3
Dognongo Timo	Tr	Ta = 25 °C		150	250	ma	4
Response Time	Tf	Ta = 25 °C		150	250	ms	4
Driving Method	Duty			1/16			

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$Ta = 25 \circ C$



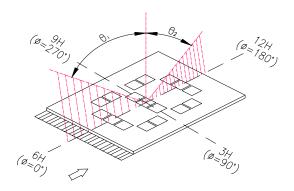
(a

(ø=124 (ø=180•)

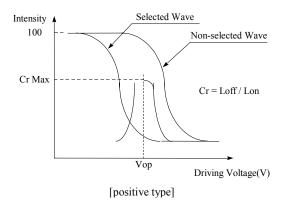
Note 1: definition of viewing angle $\theta 1 \& \theta 2$

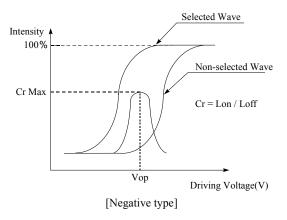
Note 2: definition of viewing angle θ 3 & θ 4

(ø.

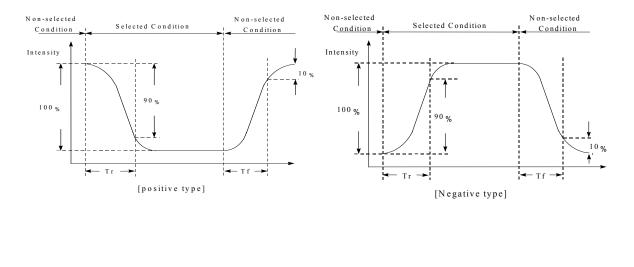


Note 3: definition of contrast ratio (CR)





Note 4: definition of response time



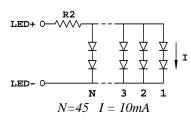
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5 BACKLIGHT SPECIFICATION

5.1 BACKLIGHT CHARACTERISTICS

			Ta=20°C,	60%RH, Darl	kroom
Item	Symbol	Тур.	Max.	Unit	
LED lamp input voltage	VLED	5	6	DC	
LED lamp input current	ILED	450	500	mA	
Build-in current limiting resistor	R1	-	-	Ohms, W	
External current limiting resistor (recommended)	R2	1.8 Ohms 1W	-	Ohms, W	
Number of nodes	N	45	-	-	



6 QUALITY ASSURANCE SPECIFICATION

6.1 CONFORMITY

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

6.2 DELIVERY ASSURANCE

6.2.1 Delivery inspection standards

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

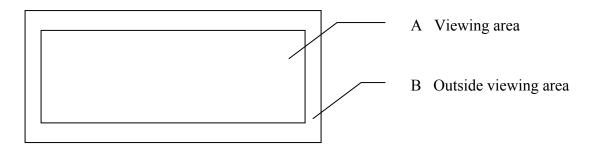
The quality assurance levels are shown below:

Class	AQL (%)
Critical defect	0.5%
Major defect	1.0%
Minor defect	1.5%
TOTAL	2.0%

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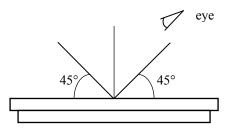


6.2.2 Zone definition



6.2.3 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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6.2.3.1 Standard of appearance inspection

Units: mm

Class	Item		Criteria	a			
Minor	Packing &	Outside & inside package	e Presence of pro	oduct no., lot no.,	quantity		
Critical	Label	Product must not be mixed	-				
		that indicated on the labe	1				
Major	Dimension	Product dimensions must	Product dimensions must be according to specification and drawing				
Major	Electrical	Product electrical charact	teristics must be ac	cording to specifi	cation		
Critical	LCD Display	Missing lines or wrong p	Missing lines or wrong patterns on LCD display are not allowed				
Minor	Black spot, white spot,	Round type: as per follow $\emptyset = (X+Y)/2$	ving drawing				
	dust		A	cceptable quantity	/		
			Size	Zone A	Zone B		
		+	Ø<0.1	Any number			
		Y	0.1<Ø<0.2	2			
			0.2<Ø<0.25	1	Any number		
		X	0.25<Ø	0			
		Line type: as per followin W Length L≤3.0 L≤2.5 Total accen	<u> </u>	ble quantity Zone A Any number 2 As round type	Zone B Any number		
Minor	Polariser scratch	Scratch on protective film Scratch on polariser: sam					
Minor	Polariser bubble	$\varnothing = (X+Y)/2$		accentable avantite			
	JUDDIE		A	cceptable quantity Zone A	Zone B		
			Ø<0.2	Any number			
		V V	0.2<Ø<0.5	2	{		
		Y Y	0.2<Ø<0.5	1	Any number		
		→ X ← '	0.5<Ø<1.0	0	{		
			Total acceptable	-	<u> </u>		
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Class	Item		Criteria	a	
Minor	Segment	1.a. Pin hole on segmented	l display		
	deformation	W: segment width			
		$\varnothing = (A+B)/2$		cceptable quantity	
			Width	Ø	
			<u>W≤0.4</u>	$\emptyset \leq 0.2$ and	
			W>0.4	$\emptyset \leq 0.25$ and	
		\forall	•	e quantity: 1 defect Ø under 0.10 mm a	
			T III HOICS WITH 2		
Minor	Segment	1b. Pin hole on dot matrix	display		
	deformation	₩ <0.	05	Acceptable	e quantity
				Size	A 1
)_d	a,b<0.1	Any number
				$\frac{(a+b)/2 \le 0.1}{0.5 < \emptyset < 1.0}$	Any number 3
				Total acceptable	5
		2. Segments / dots with di	fferent width	i otal acceptation	quality ?
		<u>a</u>	b		
				Accep	table
				a≥b	a/b≤4/3
				a <b< td=""><td>a/b>4/3</td></b<>	a/b>4/3
		3. Alignment layer defect $\emptyset = (a+b)/2$		Acceptable	quantity
		(a+b)/2		Size	quantity
				Ø≤0.4	Any number
				0.4<Ø≤1.0	5
				1.0<Ø≤1.5	3
				1.5<Ø≤2.0	2
				Total acceptable	quantity: 7
Minor	Colour uniformity	Level of sample for appro-	val set as limit sa	mple	
Critical	Backlight	The backlight colour shou	ld correspond to	the product specifi	ication
Critical		Flashing and or unlit back	*		
Minor	1	Dust larger than 0.25 mm	*		
Major	СОВ	Exposed wire bond pad is			
Major	1	Insufficient covering with		ved (wire bond line	e exposed)
Minor		Dust or bubble on the resi			• /
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Class	Item		Crit	teria	
Major	PCB	No unmelted solde	r paste should be pre	esent on PCB	
Critical		Cold solder joints, missing solder connections, or oxidation are not allowed			
Minor	And	No residue or solder balls on PCB are allowed			
Critical		Short circuits on components are not allowed			
Minor	Tray			Size	Quantity
	particles		On trav	Ø<0.2	Any number
			On tray		4
			On display	Ø≥0.25	2
			On utsplay	L = 3	1

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6.3 DEALING WITH CUSTOMER COMPLAINTS

6.3.1 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.

6.3.2 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 nonconforming 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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7 RELIABILITY SPECIFICATION

7.1 RELIABILITY TESTS

Test Item	Test Condition	Evaluation and assessment
High Temperature Operation	50°C±2°C for 240 hours	No abnormalities in function* and appearance
Low Temperature Operation	0°C±2°C for 240 hours	No abnormalities in function* and appearance
Thermal Shock Storage	-20°C (30 min.) ->25°C (5 min.) - >70°C (30 min.) ->25°C (5 min.) 5 cycles	No abnormalities in function* and appearance
Vibration	10 Hz ~ 55 Hz 0.3mm / 1 Octave 55 Hz ~500 Hz 3g / 1 Octave 20 cycles / per axis	No abnormalities in function* and appearance

7.2 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.

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8 PART NUMBER DESCRIPTIONS FOR AVAILABLE OPTIONS

LR4218022C40345

1	Polarizer Type B = Transflective: light background with LED backlight
2	Backlight Color G = Yellow-green (Standard)
3	Fluid Type and Power Supply H = STN-H with +5VDC operation
4	Fluid Type/TN Viewing Direction N = STN-H
5	Background Color for NTN or TN Temperature Range G = Gray background Y = Yellow background

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9 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 Trichlorotriflorothane. 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 $25^{\circ}C \pm 10^{\circ}C$ 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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