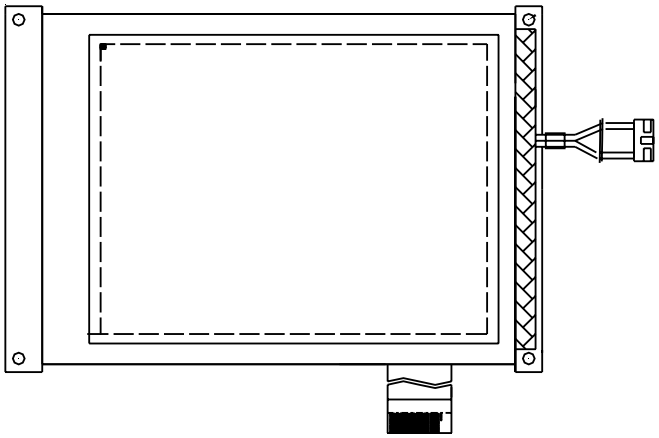
HANTRONIX

PRODUCT SPECIFICATION

HDM3224NL-1

320 x240 MONOCHROME GRAPHICS LCD DISPLAY MODULE



HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	Q.A.: ZW	REV.: 1.0	HDM3224NL-1	SHEET 1 OF 13 DATE: 5/7/09

.General Specifications

1. Features

A. Low power consumption 5.0V power supply

B.1/240 duty, 1/13 bias

C. Viewing direction: 6:00

D. Operating tempration: -20~70

E.Storage tempration: -30~85

F. Display mode: FSTN mode, positive type display

2.Mechanical Data and Conditions:

(1) Module Size----------160.0 w * 109.0 h mm
(2) Viewing Area ---------- 122.0 w * 92.0 h mm
(3) Dot Size ----------0.33 w * 0.33 h mm
(4) Dot Pitch ---------- 0.36 w * 0.36 h mm
(5) Number of Dots ----------320 * 240 Dots
(6) Outline Dimensions----------See Attached Drawing

3. Absolute Maximum Ratings

Characteristics	Symbol	Ratings
Operating Voltage	VDD	-0.3V to +7.0V
Input Voltage Range	V_{IN}	-0.3V to VDD+0.3V

4.Pin Connections:

Pin No.	Symbol	Function
1	Vss	Ground(0v)
2	Vdd	Logic Supply Voltage(+5.0v)
3	V0	Regulate LCD
4	A0	Data type select
5	R/W	Write signal
6	E	Read signal
7	D0	Data Bus Line
8	D1	Data Bus Line
9	D2	Data Bus Line
10	D3	Data Bus Line
11	D4	Data Bus Line
12	D5	Data Bus Line
13	D6	Data Bus Line
14	D7	Data Bus Line
15	/CS	Chip select
16	RES	Reset signal
17	Vee	Power Supply Voltage for LCD
18	SEL1	Interface select

5.Timing Characteristics: (VDD=5V)

(1). Display memory write timing

Ta = –20 to 75℃

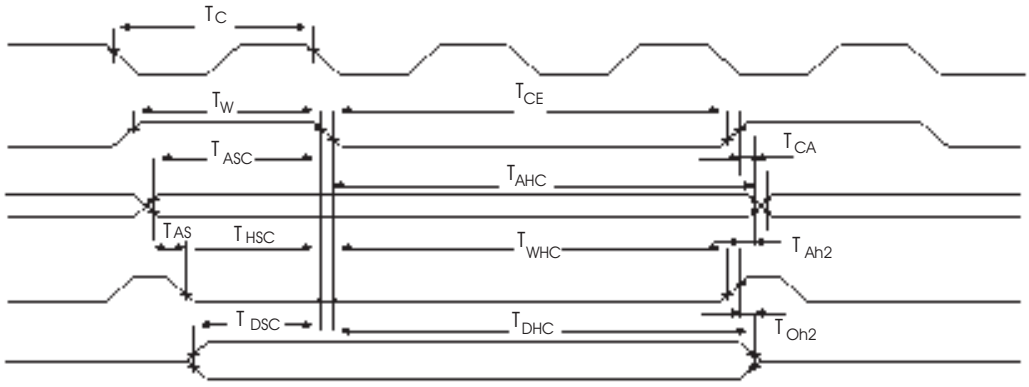
Signal	Symbol	Parameter	V_{DD} = 4.5 to 5.5V		V_{DD} = 2.7 to 4.5V		Unit	Condition
			Min.	Max.	Min.	Max.		
EXT Φ0	t_C	Clock period	100	—	125	—	ns	CL = 100 pF
$\overline{VCE}$	t_W	$\overline{VCE}$ HIGH-level pulse width	$t_C - 50$	—	$t_C - 50$	—	ns	
	t_{OE}	$\overline{VCE}$ LOW-level pulse width	$2t_C - 30$	—	$2t_C - 30$	—	ns	
VA0 to VA15	t_{CYW}	Write cycle time	3tC	—	$3t_C$	—	ns	
	t_{AHC}	Address hold time from falling edge of $\overline{VCE}$	$2t_C - 30$	—	$2t_C - 40$	—	ns	
	t_{ASC}	Address setup time to falling edge of $\overline{VCE}$	$t_C - 70$	—	$t_C - 110$	—	ns	
	t_{CA}	Address hold time from rising edge of $\overline{VCE}$	0	—	0	—	ns	
	t_{AS}	Address setup time to falling edge of $\overline{VWR}$	0	—	0	—	ns	
	t_{AH2}	Address hold time from rising edge of $\overline{VWR}$	10	—	10	—	ns	
$\overline{VWR}$	t_{WSC}	Write setup time to falling edge of $\overline{VCE}$	$t_C - 80$	—	$t_C - 115$	—	ns	
	t_{WHC}	Write hold time from falling edge of $\overline{VCE}$	$2t_C - 20$	—	$2t_C - 20$	—	ns	
VD0 to VD7	t_{DSC}	Data input setup time to falling edge of $\overline{VCE}$	$t_C - 85$	—	$t_C - 125$	—	ns	
	t_{DHC}	Data input hold time from falling edge of $\overline{VCE}$	$2t_C - 30$	—	$2t_C - 30$	—	ns	

(2). Display memory read timing

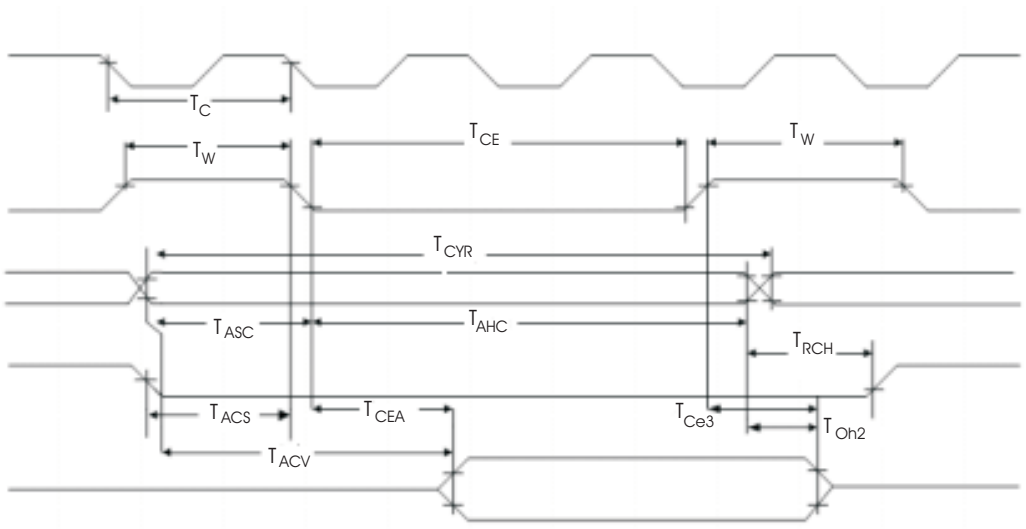
Ta = –20 to 75°C

Signal	Symbol	Parameter	V_{DD} = 4.5 to 5.5V		V_{DD} = 2.7 to 4.5V		Unit	Condition
			Min.	Max.	Min.	Max.		
EXT Φ0	t_C	Clock period	100	—	125	—	ns	CL = 100 pF
$\overline{VCE}$	t_W	$\overline{VCE}$ HIGH-level pulse width	t_C – 50	—	t_C – 50	—	ns	
	t_{CE}	$\overline{VCE}$ LOW-level pulse width	$2t_C$ – 30	—	$2t_C$ – 30	—	ns	
VA0 to VA15	t_{CYR}	Read cycle time	$3t_C$	—	$3t_C$	—	ns	
	t_{ASC}	Address setup time to falling edge of $\overline{VCE}$	t_C – 70	—	t_C – 100	—	ns	
	t_{AHC}	Address hold time from falling edge of $\overline{VCE}$	$2t_C$ – 30	—	$2t_C$ – 40	—	ns	
$\overline{VRD}$	t_{RCS}	Read cycle setup time to falling edge of $\overline{VCE}$	t_C – 45	—	t_C – 60	—	ns	
	t_{RCH}	Read cycle hold time from rising edge of $\overline{VCE}$	$0.5t_C$	—	$0.5t_C$	—	ns	
VD0 to VD7	t_{ACV}	Address access time	—	$3t_C$ – 100	—	$3t_C$ – 115	Ns	
	t_{CEA}	$\overline{VCE}$ access time	—	$2t_C$ – 80	—	$2t_C$ – 90	Ns	
	t_{OH2}	Output data hold time	0	—	0	—	ns	
	t_{CED}	$\overline{VCE}$ to data off time	0	—	0	—	ns	

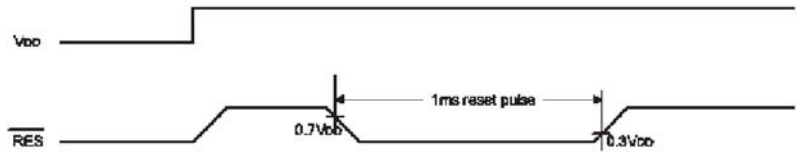
Write timing:



Read timing:



Reset:



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.The Characteristics and Reliability Test

1.Electro-Optic Characteristics

Condition:TEMP=(23 ± 3) °C

NO	Item		Symbol	Min.	Typ.	Max.	Unit	Condition
1	Supply Voltage(Logic)		Vdd-Vss	4.5	5.0	5.5	V	
2	LCD Operating Voltage		Vdd-V_0	21.8	22.4	23.0	V	0°C
				21.4	22.0	22.6	V	25°C
				21.0	21.6	22.2	V	70°C
3	Response Time		Ton	85	88	96	ms	
			Toff	243	248	261	ms	
4	Contrast		CR	2				
5	Viewing Angel	12H	1		56		Deg	(CR≥2.0)
		6H	2		66			
		3H	3		60			
		9H	4		60			

2. Characteristics of backlight (LED unit)

(1).Absolute Maximum Ratings:

Item	Symbol	Rating	Unit	Condition
Forward Current	IFM	200	mA	Ta=25°C
Reverse Voltage	VR	1.0	V	Ta=25°C
Power Dissipation	PD	600	mW	Ta=25°C

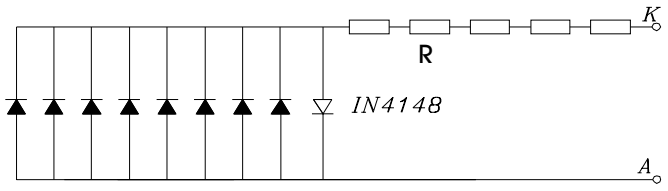
(2).Electrical-optical Characteristics:

Item	Symbol	Min	Typ	Max	Unit	Condition
Forward current	IF	80	120	160	mA	VF=5.0V
Reverse current	IR		50		uA	VF =5.0V
Color	WHITE					

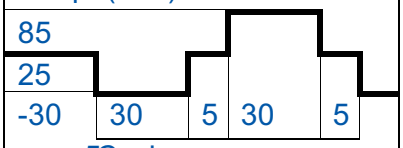
WARNING:

A BACKLIGHT IS A KIND OF CURRENT DEVICE,IT MUST CONNECT A RESISTANCE FOR LIMITING CURRENT ,OR IT WILL BE DAMAGED.

2.Circuit diagam LED 1X8=8 DIES

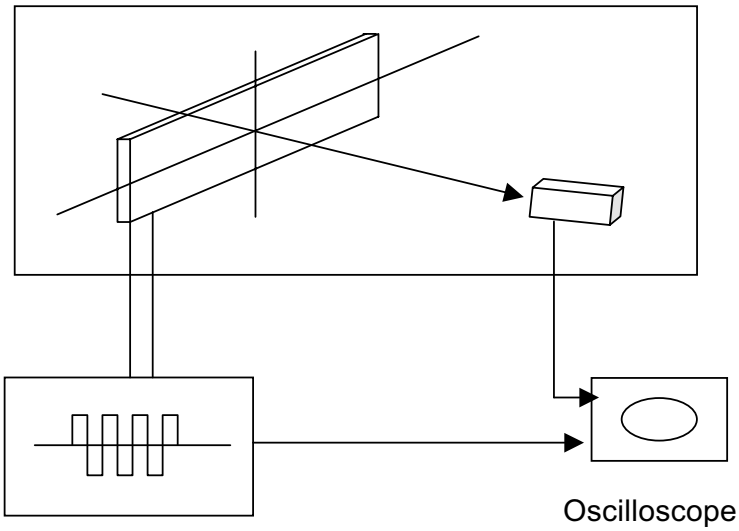


2.Reliability Test

No	Items	Test Condition	Equipment	Test Result
1	High Temp Storage	Temp:85 2 C Time:96h Restore:24h	Tenny	Passed
2	Low Temp Storage	Temp:-30 3 C Time:96h Restore:24h	Tenny	Passed
3	High Temp Static drive	Temp:70 2 C Vop:5V Time:24h Restore:24h	Tenny	Passed
4	Low Temp Static drive	Temp:-20 3 C Vop:5V Time:24h Restore:24h	Tenny	Passed
5	High Temp High Hum Storage	Temp:40 2 C Hum:95%Rh Time:96h Restore:24h	Tenny	Passed
6	Thermal Shock	Temp: (C)  5Cycles Restore:24h	Tenny	Passed

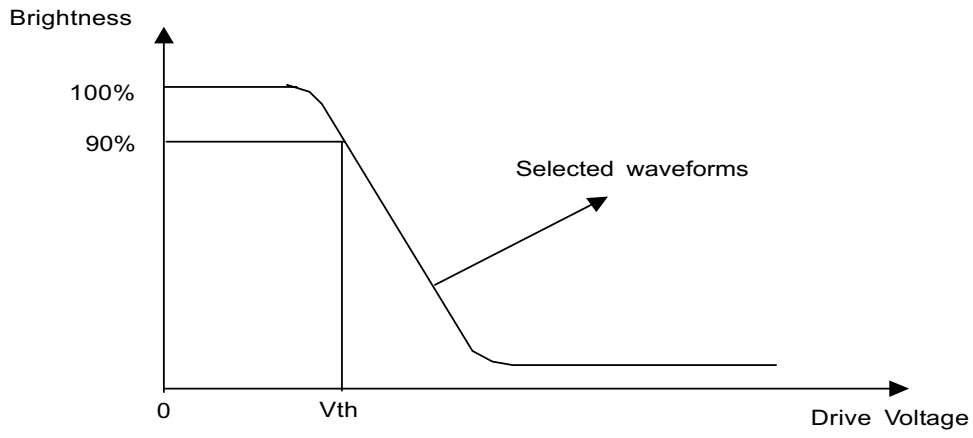
The Equipment and LCD Measuring Method

1. Equipment

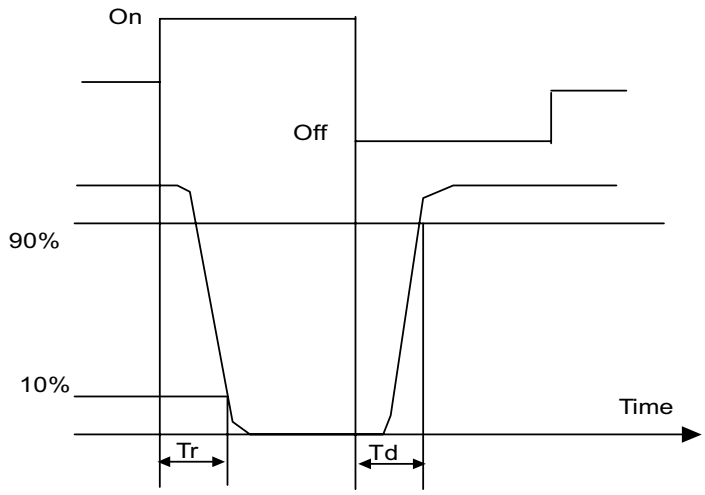


(2) Definition

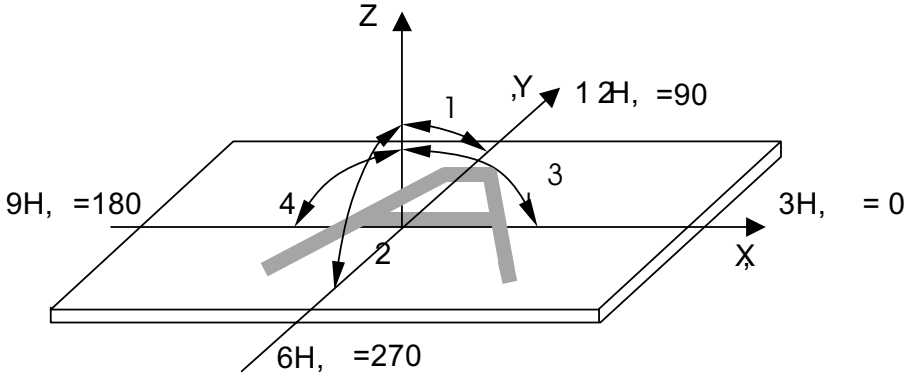
a. Threshold Voltage (Vth)



b. Response Time



a. Viewing Angle:



b. Contrast Ratio (positive)

$$CR = \frac{\text{Brightness of non-selected wave-form}}{\text{Brightness of selected wave-form}}$$

4. Reliability Test:

Equipment : Tenny

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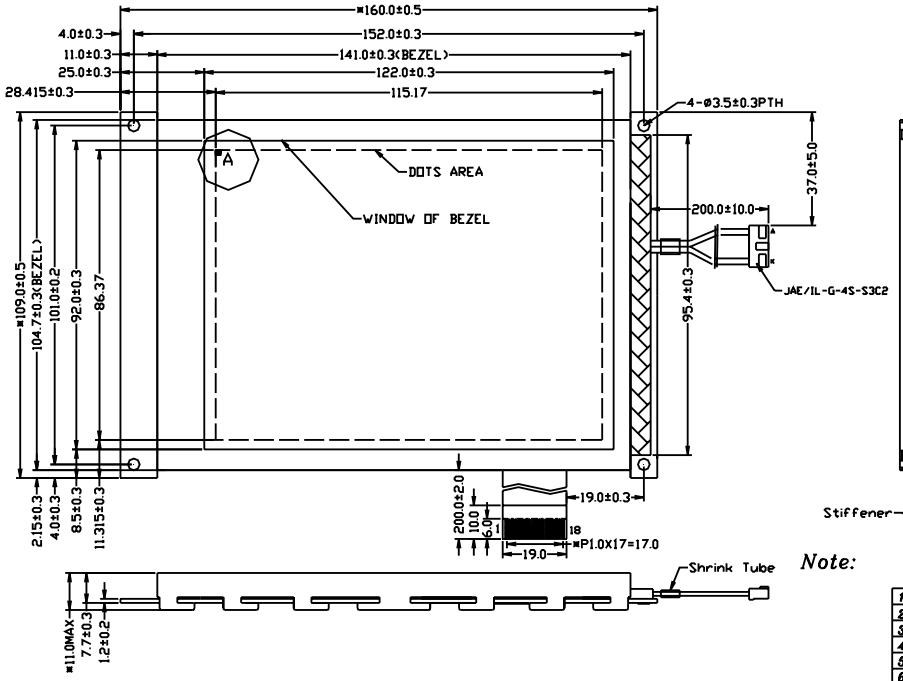
.Instruction Sets

Instruction Table

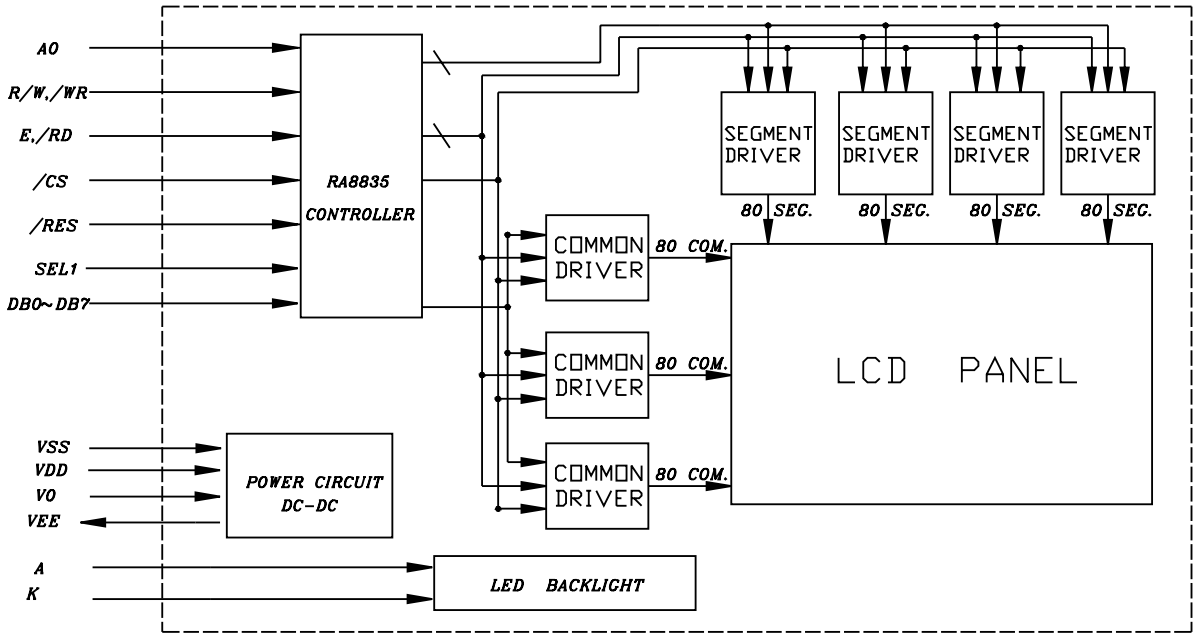
Class	Command	Code											Hex	Command Description	Command Read Parameters	
		RD	WR	A0	D7	D6	D5	D4	D3	D2	D1	D0			No. of Bytes	Section
System Control	SYSTEM SET	1	0	1	0	1	0	0	0	0	0	0	40	Initialize device and display	8	9-2-1
	SLEEP IN	1	0	1	0	1	0	1	0	0	1	1	53	Enter standby mode	0	9-2-2
Display Control	DISPLAY ON/OFF	1	0	1	0	1	0	1	1	0	0	D	58, 59	Enable and disable display and display flashing	1	9-3-1
	SCROLL	1	0	1	0	1	0	0	0	1	0	0	44	Set display start address and display regions	10	9-3-2
	CSRFORM	1	0	1	0	1	0	1	1	1	0	1	5D	Set cursor type	2	9-3-3
	CGRAM ADR	1	0	1	0	1	0	1	1	1	0	0	5C	Set start address of character generator RAM	2	9-3-6
	CSRDIR	1	0	1	0	1	0	0	1	1	CD 1	CD 0	4C to 4F	Set direction of cursor movement	0	9-3-4
	HDOT SCR	1	0	1	0	1	0	1	1	0	1	0	5A	Set horizontal scroll position	1	9-3-7
	OVLAY	1	0	1	0	1	0	1	1	0	1	1	5B	Set display overlay format	1	9-3-5
Drawing Control	CSRW	1	0	1	0	1	0	0	0	1	1	0	46	Set cursor address	2	9-r1
	CSRR	1	0	1	0	1	0	0	0	1	1	1	47	Read cursor address	2	9-4-2
Memory Control	MWRITE	1	0	1	0	1	0	0	0	0	1	0	42	Write to display memory	—	9-5-1
	MREAD	1	0	1	0	1	0	0	0	0	1	1	43	Read from display memory	—	9-5-2

. Attached Drawing



Note:

1	*Operating Voltage:*	*5.0V*
2	*Drive method:*	*1/240Duty,1/13Bias*
3	*Viewing Direction:*	*6:00*
4	*Operating Temp:*	*-20°C~70°C*
5	*Storage Temp:*	*-30°C~85°C*
6	*Display type:*	*FSTN,Positive,T/H*
7	*Unspecified tolerance:*	*±0.2*
8	*LCD controller/driver:*	*RA8835,SDN8080C*
9	*Backlight:*	*LED/W*
10	*Customer No.:*	
11	*Dimensions with mark"*" are important*	
12	*RoHS compliant*	



PIN NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
SYMBOL	VSS	VDD	V0	A0	R/W	E	D0	D1	D2	D3	D4	D5	D6	D7	/CS	RES	VEE	SEL1

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