



新諾亞顯示技術股份有限公司  
NEW NOAH DISPLAY TECHNOLOGY SHARES CO., LTD.

**SPECIFICATION**

MODULE NO	KNY12864-20MSDBTSW-5FPWN
VERSION	
CUSTOMER	
APPROVE by	

Sale by	Check by	Prepare by

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**ISSUE RECORD**

NO.	VER.	DATE	MODIFY REASON	MODIFY CONTENTS
1	A	2008/5/29	New issued	

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## **1. Precaution in use of LCD Module**

- (1) Avoid applying excessive shocks to the module or making any alterations or modifications to it.
- (2) Don't make extra holes on the printed circuit board, modify its shape or change the components of LCD module.
- (3) Don't disassemble the LCM.
- (4) Don't operate it above the absolute maximum rating.
- (5) Don't drop, bend or twist LCM.
- (6) Soldering: only to the I/O terminals.
- (7) Storage: please storage in anti-static electricity container and clean environment.
- (8) Don't touch the elastomer connector, especially insert a backlight panel (EL or CCFL)

## **2. General Specification**

### 2.1 Mechanical Dimension

Item	Dimension	Unit
Number of Dots	128 x 64	dots
Module dimension (L x W x H)	93.0 x 70.0 x 11.0(MAX)	mm
View area	73.1 x 39.1	mm
Active area	66.52 x 33.24	mm
Dot size	0.48x 0.48	mm
Dot pitch	0.52 x 0.52	mm
LCD TYPE	STN Blue	
Viewing Direction	6H	
Backlight	LED White	
Controller IC	ST7920 controller or equivalent	

### 3. Electrical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage For Logic	Vdd-Vss	—	2.7	—	5.5	V
Supply Voltage For LCD	Vo	Ta=-20°C	—	7.0	—	V
		Ta=25°C	—		—	V
		Ta=+70°C	—		—	V
Input High Volt.	V <sub>IH</sub>	—	0.7Vdd	—	Vdd	V
Input Low Volt.	V <sub>IL</sub>	—	-0.3	—	0.6Vdd	V
Output High Volt.	V <sub>OH</sub>	—	0.8Vdd	—	—	V
Output Low Volt.	V <sub>OL</sub>	—	0	—	0.1Vdd	V
Supply Current	I <sub>dd</sub>	Vdd=5V	0.45	—	0.75	mA

#### 3.1 Electrical Absolute Maximum Ratings

(V<sub>ss</sub>=0V, Ta=25°C)

Item		Symbol	Min	Max	Unit
Supply Voltage (Logic)		Vdd- Vss	2.7	5.5	V
Supply Voltage(LCD driver)		Vo	—	7.0	V
Input Voltage		V <sub>I</sub>	V <sub>ss</sub>	Vdd	V
Normal Temp. Type	Operation Temp.	TOP	-20	70	°C
	Storage Temp.	TSTG	-30	80	°C
Wide Temp. Type	Operation Temp.	TOP	-30	80	°C
	Storage Temp.	TSTG	-40	90	°C

## 4. Interface Description

Pin No.	Symbol	Level	Description
1	Vss	0V	Ground
2	Vdd	5.0V	Supply voltage for logic (option +3.3V)
3	V0	—	Operating voltage for LCD
4	RS(CS)	H/L	Register select L:select instruction write, busy flag read, address counter read. H:select data write, read. (Chip select) for serial L:chip enable, H:chip disable.
5	RW(SID)	H/L	Read write control L: write, H:read. (Serial data input)
6	E(SCLK)	H/L	Enable trigger (Serial Clock)
7	DB0	H/L	Data bus for 0
8	DB1	H/L	Data bus for 1
9	DB2	H/L	Data bus for 2
10	DB3	H/L	Data bus for 3
11	DB4	H/L	Data bus for 4
12	DB5	H/L	Data bus for 5
13	DB6	H/L	Data bus for 6
14	DB7	H/L	Data bus for 7
15	PSB	H/L	Interface selection L:serial mode, H:8/4-bits parallel bus mode.
16	NC	—	No connection
17	RST	H/L	System reset low active
18	NC(VEE)	—	No connection(Output voltage for LCD)
19	BLA	3.0-5.5V	Power supply for LED+
20	BLK	0V	Power supply for LED-

**Note: the module's contrast has been adjusted, the "3" and "18" foot generally don't need an external circuit. If because of voltage deviation caused by contrast problem, you just need to adjust the R6 resistance. About the “PSB” if you have requirements, we will set up on the module.**

## 5. Backlight Information

### 5.1 Specification

- LED edge white

Parameter	Symbol	Min	Typical	Max	Unit	Test Condition
Supply Current	I <sub>LED</sub>	—	70	—	mA	V <sub>LED</sub> =3.0V
Supply Voltage	V		2.8	3.3	V	—
Reverse Voltage	V <sub>R</sub>	—	—	5	V	—
Luminous Intensity	I <sub>V</sub>	>100	—	—	cd/m <sup>2</sup>	I <sub>LED</sub> =70mA
Chromaticity	X	—	0.30	—		I <sub>LED</sub> =70mA
	Y		0.31			
Life Time	—	—	35,000	—	Hr.	V ≤ 3.3V
Color	white					

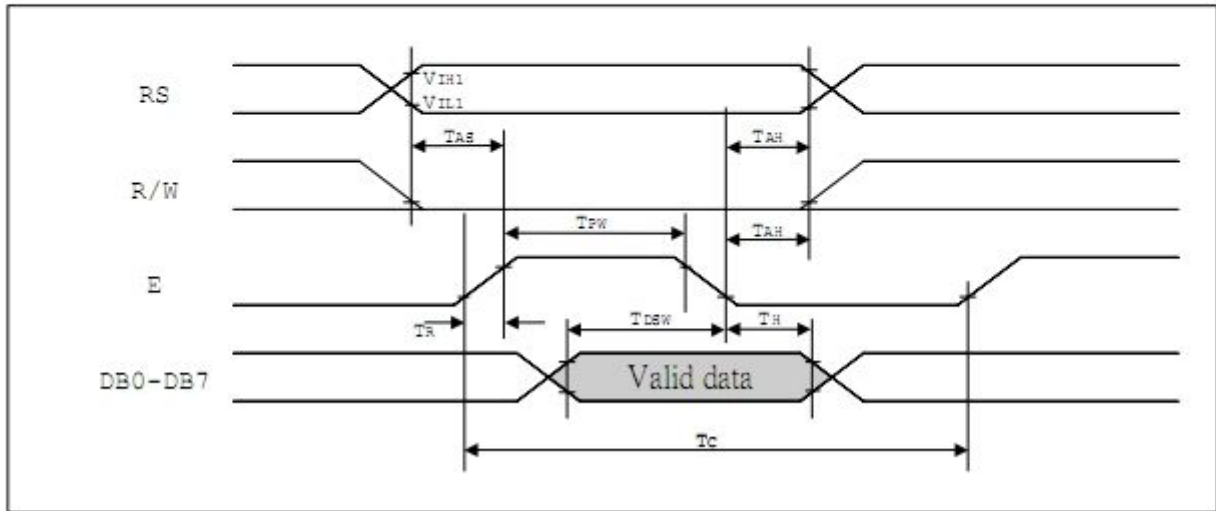
### 5.2 Backlight driving methods

LED B/L drive from pin1 (LED+) VSS(LED-) OR pin BLA (LED+) pin BLK(LED-).

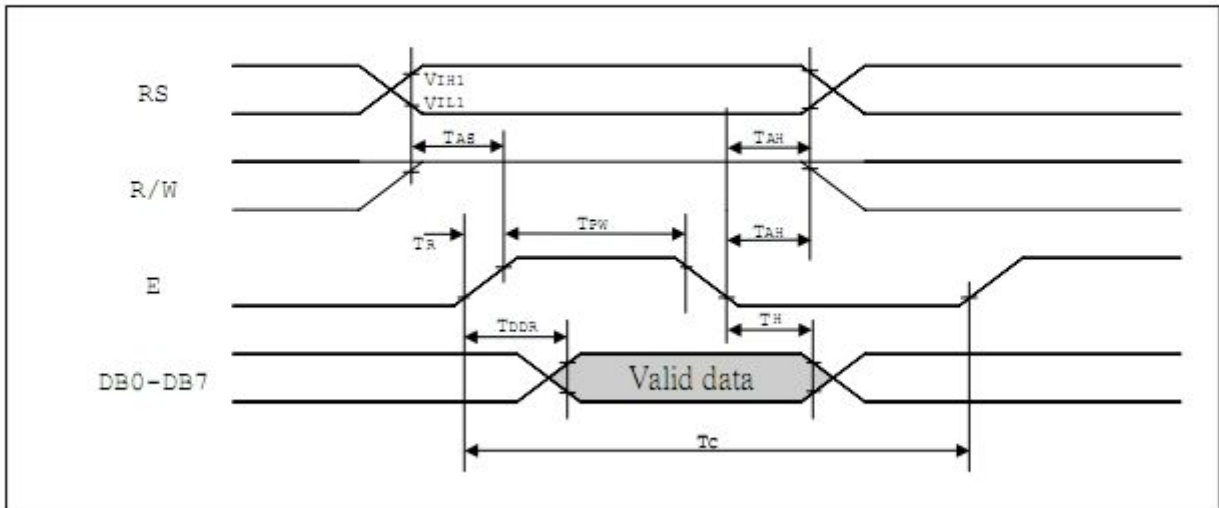
## 6. Timing Characteristics

### 8 bit interface timing diagram

- MPU write data to ST7920



- MPU read data from ST7920





AC Characteristics ( $T_A = 25^{\circ}\text{C}$ ,  $V_{DD} = 4.5\text{V}$ ) Parallel Mode Interface

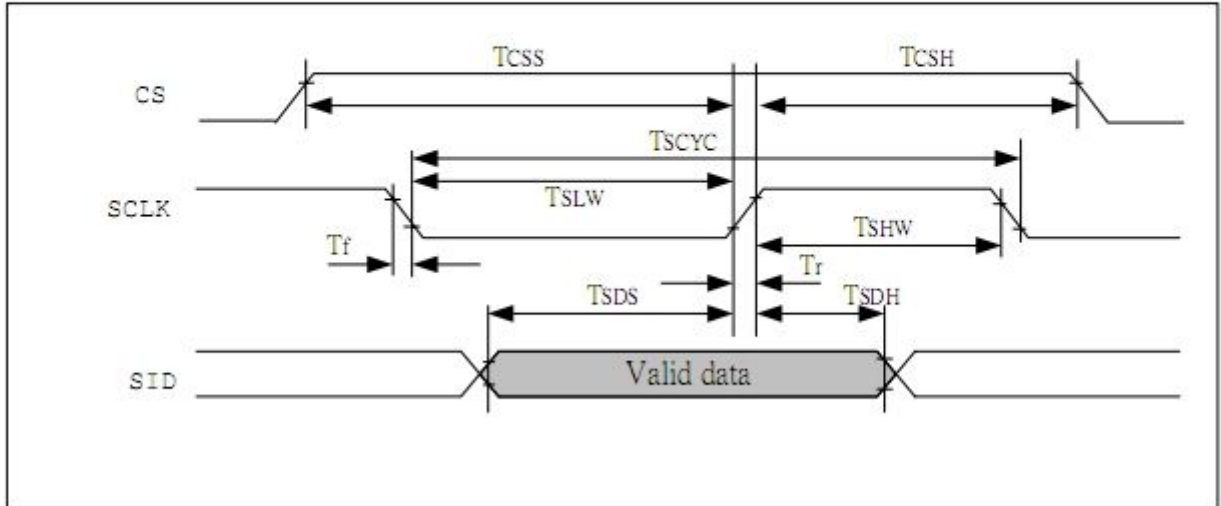
Symbol	Characteristics	Test Condition	Min.	Typ.	Max.	Unit
<i>Internal Clock Operation</i>						
$f_{OSC}$	OSC Frequency	R = 33K $\Omega$	480	540	600	KHz
<i>External Clock Operation</i>						
$f_{EX}$	External Frequency	-	480	540	600	KHz
	Duty Cycle	-	45	50	55	%
$T_R, T_F$	Rise/Fall Time	-	-	-	0.2	$\mu\text{s}$
<i>Write Mode (Writing data from MPU to ST7920)</i>						
$T_C$	Enable Cycle Time	Pin E	1200	-	-	ns
$T_{PW}$	Enable Pulse Width	Pin E	140	-	-	ns
$T_R, T_F$	Enable Rise/Fall Time	Pin E	-	-	25	ns
$T_{AS}$	Address Setup Time	Pins: RS, RW, E	10	-	-	ns
$T_{AH}$	Address Hold Time	Pins: RS, RW, E	20	-	-	ns
$T_{DSW}$	Data Setup Time	Pins: DB0 - DB7	40	-	-	ns
$T_H$	Data Hold Time	Pins: DB0 - DB7	20	-	-	ns
<i>Read Mode (Reading Data from ST7920 to MPU)</i>						
$T_C$	Enable Cycle Time	Pin E	1200	-	-	ns
$T_{PW}$	Enable Pulse Width	Pin E	140	-	-	ns
$T_R, T_F$	Enable Rise/Fall Time	Pin E	-	-	25	ns
$T_{AS}$	Address Setup Time	Pins: RS, RW, E	10	-	-	ns
$T_{AH}$	Address Hold Time	Pins: RS, RW, E	20	-	-	ns
$T_{DDR}$	Data Delay Time	Pins: DB0 - DB7	-	-	100	ns
$T_H$	Data Hold Time	Pins: DB0 - DB7	20	-	-	ns
<i>Interface Mode with LCD Driver(ST7921)</i>						
$T_{CWH}$	Clock Pulse with High	Pins: CL1, CL2	800	-	-	ns
$T_{CWL}$	Clock Pulse with Low	Pins: CL1, CL2	800	-	-	ns
$T_{CST}$	Clock Setup Time	Pins: CL1, CL2	500	-	-	ns
$T_{SU}$	Data Setup Time	Pin: D	300	-	-	ns
$T_{DH}$	Data Hold Time	Pin: D	300	-	-	ns
$T_{DM}$	M Delay Time	Pin: M	-1000	-	1000	ns

AC Characteristics ( $T_A = 25^{\circ}\text{C}$ ,  $V_{DD} = 2.7\text{V}$ ) Parallel Mode Interface

Symbol	Characteristics	Test Condition	Min.	Typ.	Max.	Unit
<i>Internal Clock Operation</i>						
$f_{\text{OSC}}$	OSC Frequency	$R = 18\text{K}\Omega$	470	530	590	KHz
<i>External Clock Operation</i>						
$f_{\text{EX}}$	External Frequency	-	470	530	590	KHz
	Duty Cycle	-	45	50	55	%
$T_R, T_F$	Rise/Fall Time	-	-	-	0.2	$\mu\text{s}$
<i>Write Mode (Writing data from MPU to ST7920)</i>						
$T_C$	Enable Cycle Time	Pin E	1800	-	-	ns
$T_{PW}$	Enable Pulse Width	Pin E	160	-	-	ns
$T_R, T_F$	Enable Rise/Fall Time	Pin E	-	-	25	ns
$T_{AS}$	Address Setup Time	Pins: RS, RW, E	10	-	-	ns
$T_{AH}$	Address Hold Time	Pins: RS, RW, E	20	-	-	ns
$T_{DSW}$	Data Setup Time	Pins: DB0 - DB7	40	-	-	ns
$T_H$	Data Hold Time	Pins: DB0 - DB7	20	-	-	ns
<i>Read Mode (Reading Data from ST7920 to MPU)</i>						
$T_C$	Enable Cycle Time	Pin E	1800	-	-	ns
$T_{PW}$	Enable Pulse Width	Pin E	320	-	-	ns
$T_R, T_F$	Enable Rise/Fall Time	Pin E	-	-	25	ns
$T_{AS}$	Address Setup Time	Pins: RS, RW, E	10	-	-	ns
$T_{AH}$	Address Hold Time	Pins: RS, RW, E	20	-	-	ns
$T_{DDR}$	Data Delay Time	Pins: DB0 - DB7	-	-	260	ns
$T_H$	Data Hold Time	Pins: DB0 - DB7	20	-	-	ns
<i>Interface Mode with LCD Driver(ST7921)</i>						
$T_{CWH}$	Clock Pulse with High	Pins: CL1, CL2	800	-	-	ns
$T_{CWL}$	Clock Pulse with Low	Pins: CL1, CL2	800	-	-	ns
$T_{CST}$	Clock Setup Time	Pins: CL1, CL2	500	-	-	ns
$T_{SD}$	Data Setup Time	Pin: D	300	-	-	ns
$T_{DH}$	Data Hold Time	Pin: D	300	-	-	ns
$T_{DM}$	M Delay Time	Pin: M	-1000	-	1000	ns

## Serial interface timing diagram

- MPU write data to ST7920



## AC Characteristics ( $T_A = 25^\circ\text{C}$ , $V_{DD} = 4.5\text{V}$ ) Serial Mode Interface

Symbol	Characteristics	Test Condition	Min.	Typ.	Max.	Unit
<i>Internal Clock Operation</i>						
$f_{\text{OSC}}$	OSC Frequency	R = 33K $\Omega$	470	530	590	KHz
<i>External Clock Operation</i>						
$f_{\text{EX}}$	External Frequency	-	470	530	590	KHz
	Duty Cycle	-	45	50	55	%
$T_{\text{R}}, T_{\text{F}}$	Rise/Fall Time	-	-	-	0.2	$\mu\text{s}$
TSCYC	Serial clock cycle	Pin E	400	-	-	ns
TSHW	SCLK high pulse width	Pin E	200	-	-	ns
TSLW	SCLK low pulse width	Pin E	200	-	-	ns
TSDS	SID data setup time	Pins RW	40	-	-	ns
TSDH	SID data hold time	Pins RW	40	-	-	ns
Tcss	CS setup time	Pins RS	60	-	-	ns
Tcsh	CS hold time	Pins RS	60	-	-	ns

**AC Characteristics ( $T_A = 25^\circ\text{C}$ ,  $V_{DD} = 2.7\text{V}$ ) Serial Mode Interface**

Symbol	Characteristics	Test Condition	Min.	Typ.	Max.	Unit
<i>Internal Clock Operation</i>						
$f_{OSC}$	OSC Frequency	R = 18K $\Omega$	470	530	590	KHz
<i>External Clock Operation</i>						
$f_{EX}$	External Frequency	-	470	530	590	KHz
	Duty Cycle	-	45	50	55	%
$T_R, T_F$	Rise/Fall Time	-	-	-	0.2	$\mu\text{s}$
TSCYC	Serial clock cycle	Pin E	600	-	-	ns
TSHW	SCLK high pulse width	Pin E	300	-	-	ns
TSLW	SCLK low pulse width	Pin E	300	-	-	ns
TSDS	SID data setup time	Pins RW	40	-	-	ns
TSDH	SID data hold time	Pins RW	40	-	-	ns
TCSS	CS setup time	Pins RS	60	-	-	ns
TCSH	CS hold time	Pins RS	60	-	-	ns

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## 7.ST7920 controller data

### System interface

ST7920 supports 3 kinds of bus interface to MPU. 8 bits parallel, 4 bits parallel and clock synchronized serial interface. Parallel interface is selected by PSB="1" and serial interface by PSB="0". 8 bit / 4 bit interface is selected by function set instruction DL bit.

Two 8 bit registers (data register DR, instruction register IR) are used in ST7920's write and read operation. Data Register (DR) can access DDRAM/CGRAM/GDRAM and IRAM's data through the address pointer implemented by Address Counter (AC). Instruction Register (IR) stores the instruction by MPU to ST7920.

4 modes of read/write operation specified by RS and RW :

RS	RW	description
L	L	MPU write instruction to instruction register (IR)
L	H	MPU read busy flag (BF) and address counter (AC)
H	L	MPU write data to data register (DR)
H	H	MPU read data from data register (DR)

### Busy Flag (BF)

Internal operation is in progress when BF="1", ST7920 is in busy state. No new instruction will be accepted until BF="0". MPU must check BF to determine whether the internal operation is finished and new instruction can be sent.

### Address counter (AC)

Address counter (AC) is used for address pointer of DDRAM/CGRAM/IRAM/GDRAM. (AC) can be set by instruction and after data read or write to the memories (AC) will increase or decrease by 1 according to the setting in "entry mode set". When RS= "0" and RW= "1" and E="1" the value of (AC) will output to DB6~DB0.

### 16x16 character generation ROM (CGROM) and 8x16 half height ROM (HCGROM)

ST7920 provides character generation ROM supporting 8192 16 x 16 character fonts and 126 8 x 16 alphanumeric characters. It is easy to support multi languages application such as Chinese and English. Two consecutive bytes are used to specify one 16x16 character or two 8x16 half-height characters. Character codes are written into DDRAM and the corresponding fonts are mapped from CGROM or HCGROM to the display drivers.

### Character generation RAM (CGRAM)

ST7920 provides RAM to support user-defined fonts. Four sets of 16x16 bit map area are available. These user-defined fonts are displayed the same ways as CGROM fonts through writing character cod data to DDRAM.

### ICON RAM (IRAM)

ST7920 provides 240 ICON display. It consists of 15 sets of IRAM address. Each IRAM address has 16 bits data. IRAM address should be set first before writing to the IRAM. Two bytes for each address. First higher byte (D15~D8) and then lower byte (D7~D0).

**Display data RAM (DDRAM)**

There are 64x2 bytes for display data RAM area. Can store display data for 16 characters(16x16) by 4 lines or 32 characters(8x16) by 4 lines. However, only 2 lines can be displayed at a time. Character codes stored in DDRAM point to the fonts specified by CGROM · HCGROM and CGRAM. ST7920 display half height HCGROM fonts, user-defined CGRAM fonts and full 16x16 CGROM fonts. Data codes 0000H~0006H are for CGRAM user-defined fonts. Data codes 02H~7FH are for half height alpha numeric fonts. Data codes ( A140~D75F ) are for BIG5 code and (A1A0~F7FF) are for GB code.

1. display HCGROM fonts : Write 2 bytes data to DDRAM to display two 8x16 fonts. Each byte represents 1 character font. The data of each byte is 02H~7FH.
2. display CGRAM fonts : Write 2 bytes data to DDRAM to display one 16x16 font. Only 0000H · 0002H · 0004H · 0006H are allowed.
3. display CGROM fonts : Write 2 bytes data to DDRAM to display one 16x16 font.  
A140H~D75FH are for (BIG5) code, A1A0H~F7FFH are for (GB) code.

Higher byte ( D15~D8 ) are written first and then lower byte ( D7~D0 ) .

Refer to Table 5 for address map

CGRAM fonts and CGROM fonts can only be displayed in the start position of each address. (Refer to Table 4)

80	81	82	83	84	85	86	87	88	89	8A	8B	8C	8D	8E	8F						
H	L	H	L	H	L	H	L	H	L	H	L	H	L	H	L	H	L	H	L	H	L
S	i	t	r	o	n	i	x														
矽	創	電	子	.	.	中	文	編	碼	(	正	確	)								
矽	創	電	子	.	.	.	中	文	編	碼											

Table 4

Incorrect position

### **Graphic RAM (GDRAM)**

Graphic display RAM supports 64x256 bits bit-mapped memory space. GDRAM address is set by writing 2 consecutive bytes for vertical address and horizontal address. Two-bytes data write to GDRAM for one address. Address counter will automatically increase by one for the next two-byte data. The procedure is as followings.

1. Set vertical address (Y) for GDRAM
2. Set horizontal address (X) for GDRAM
3. Write D15~D8 to GDRAM 中(first byte)
4. Write D7~D0 to GDRAM 中(second byte)

Graphic display memory map please refer to Table-8

### **LCD driver**

LCD driver have 33 common and 64 segments to drive the LCD panel. Segment data from CGRAM /CGROM /HCGROM are shifted into the 64 bits segment latches to display. Extended segment driver ST7921 can be used to extend the segment drivers to 256.



## 8. Optical Characteristics

### 8.1 OPTICAL CHARACTERISTICS

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
View Angle	(V) $\theta$	$CR \geq 2$	10		45	deg
	(H) $\varphi$	$CR \geq 2$	-30		30	deg
Contrast Ratio	CR	—		3		—
Response Time 25°C	T rise	—		100	150	ms
	T fall	—		150	200	ms

#### Conditions :

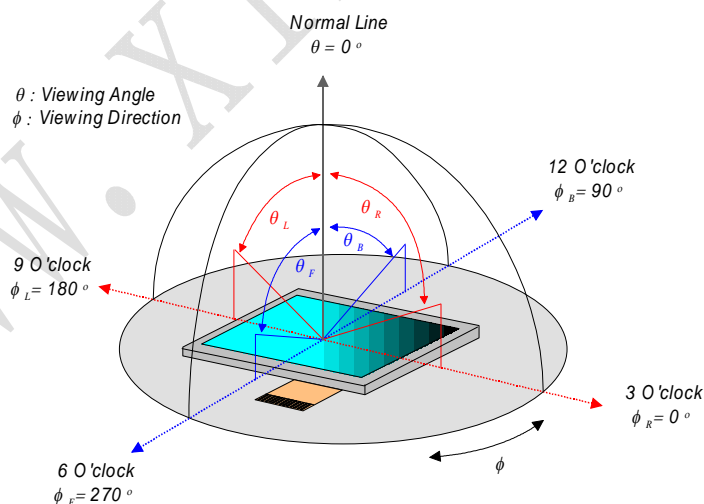
Operating Voltage : Vop

Viewing Angle( $\theta$  ,  $\varphi$ ) : 0° , 0°

Frame Frequency : 64 HZ

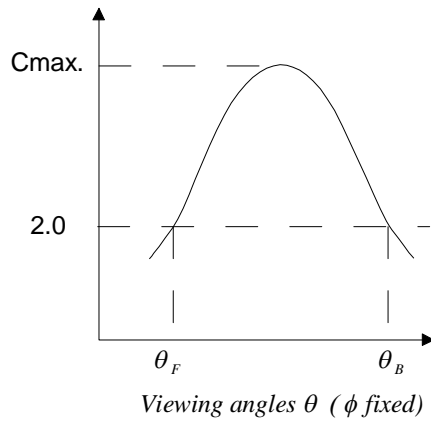
Driving Waveform : 1/N duty , 1/a bias

### 8.2 Definition of Viewing Angle and Optimum Viewing Area





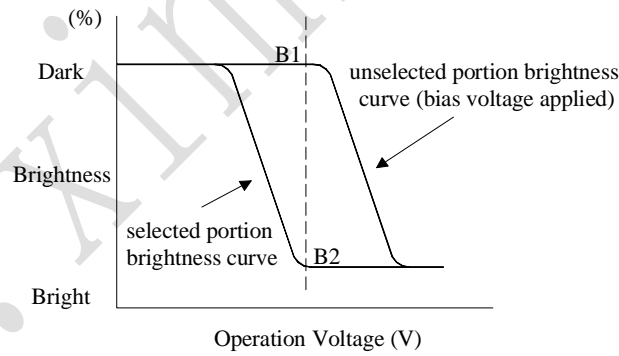
### 8.3 Definition of Viewing Angle $\theta_F$ and $\theta_B$



Optimum viewing angle with the naked eye and viewing angle  $\theta$  at  $C_{max}$ . Above are not always the same.

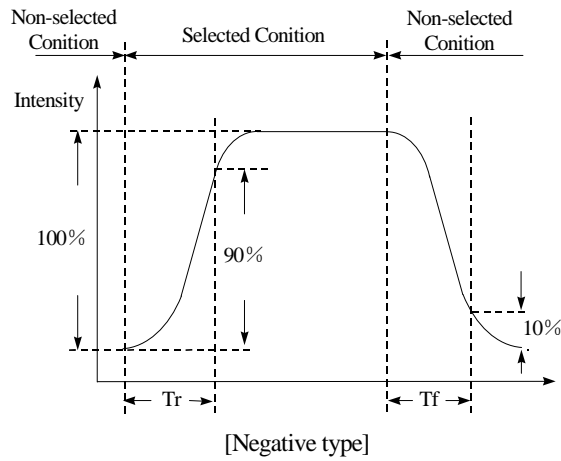
### 8.4 Definition of Contrast CR

$CR = \text{Brightness of selected dot (B1)} / \text{Brightness of unselected dot (B2)}$

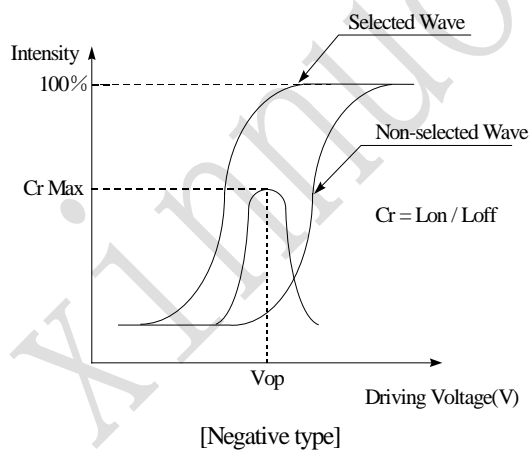


### 8.5 Definition of Response Time

( Tr , Tf )

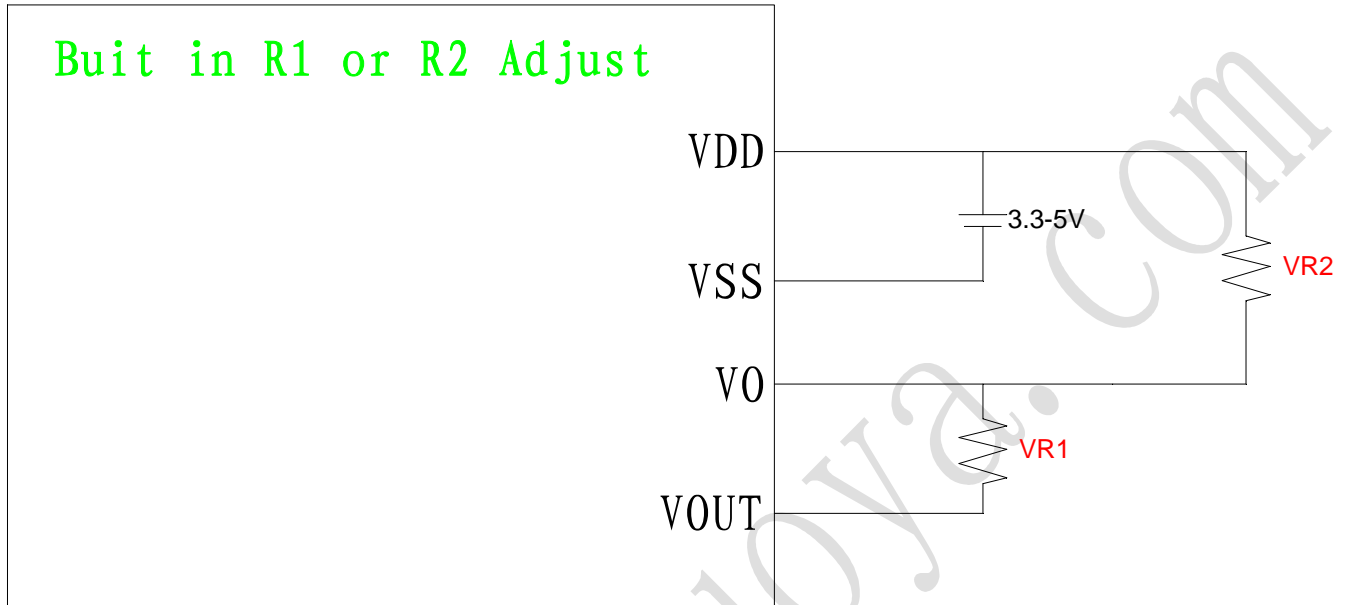


### 8.6 Definition of Operation Voltage (Vop)



## 9. Power Supply for LCD Module and LCD Operating Voltage

### Adjustment



**Note:** because "VO" and "VOUT" have been hidden, the module USES R6 to adjust contrast adjustment only (R6 resistance increased, become weak contrast; R6 resistance is reduced, the contrast thicken.)

## 10. Reliability

### Content of Reliability Test

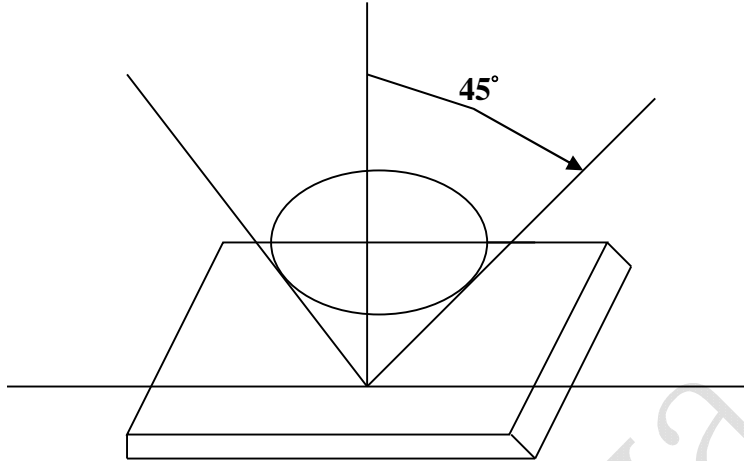
Environmental Test				
No.	Test Item	Content of Test	Test Condition	Applicable Standard
1	High Temperature storage	Endurance test applying the high storage temperature for a long time.	60°C 96hrs	—
2	Low Temperature storage	Endurance test applying the high storage temperature for a long time.	-10°C 96hrs	—
3	High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	50°C 96hrs	—
4	Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	0°C 96hrs	—
5	High Temperature/ Humidity Storage	Endurance test applying the high temperature and high humidity storage for a long time.	70°C,90%RH 96hrs	—
6	High Temperature/ Humidity Operation	Endurance test applying the electric stress (Voltage & Current) and temperature / humidity stress to the element for a long time.	40°C,90%RH 96hrs	—
7	Temperature Cycle	Endurance test applying the low and high temperature cycle. <div style="text-align: center;"> <math>\leftarrow -10^{\circ}\text{C} \quad 25^{\circ}\text{C} \quad 60^{\circ}\text{C} \rightarrow</math>                      30min      5min      30min                      1 cycle                 </div>	-10°C/60°C 10 cycles	—
Mechanical Test				
8	Vibration test	Endurance test applying the vibration during transportation and using.	10~22Hz→1.5mmp-p 22~500Hz→1.5G Total 0.5hrs	—
9	Shock test	Constructional and mechanical endurance test applying the shock during transportation.	50G Half sign wave 11 msdc 3 times of each direction	—
10	Atmospheric pressure test	Endurance test applying the atmospheric pressure during transportation by air.	115mbar 40hrs	—
Others				
11	Static electricity test	Endurance test applying the electric stress to the terminal.	VS=800V,RS=1.5kΩ CS=100pF 1 time	—

\*\*\*Supply voltage for logic system=5V. Supply voltage for LCD system =Operating voltage at 25°C

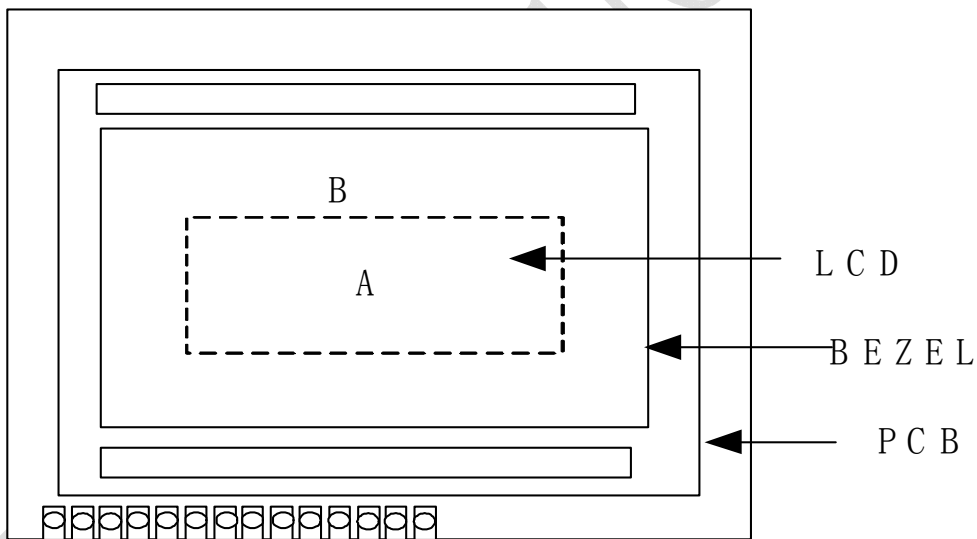
## 11. Quality Assurance

### 11.1 Inspection conditions

The LCD shall be inspected under 40W white fluorescent light.



Definition of applicable Zones

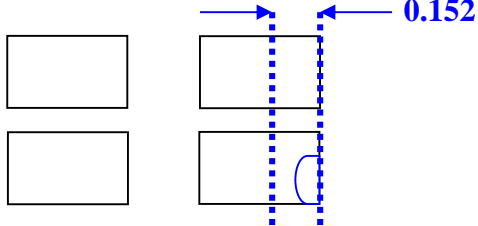
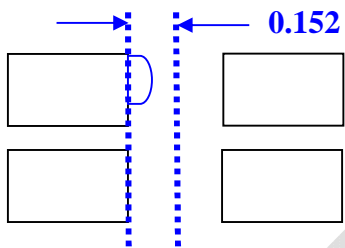
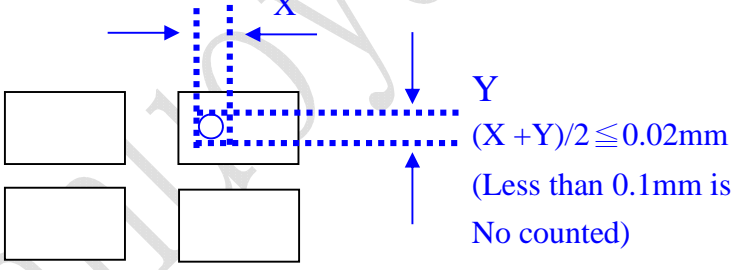
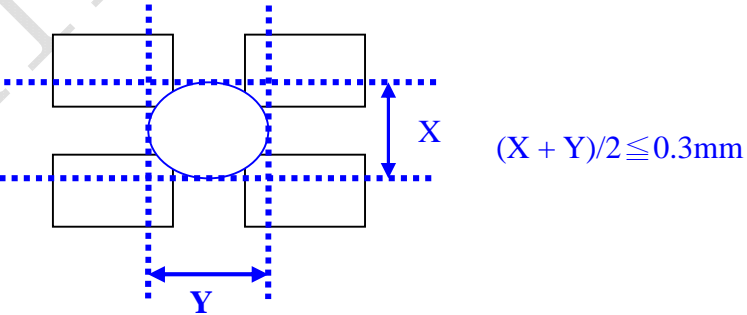


A : Display Area

B : Non-Display Area

### 11.2 Inspection Parameters

NO.	Parameter	Criteria																								
1	Black or White spots	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2" style="width: 20%;">Zone Dimension</th> <th colspan="2" style="width: 20%;">Acceptable Number</th> <th rowspan="2" style="width: 20%;">Class Of Defects</th> <th rowspan="2" style="width: 20%;">Acceptable Level</th> </tr> <tr> <th style="width: 10%;">A</th> <th style="width: 10%;">B</th> </tr> </thead> <tbody> <tr> <td><math>D &lt; 0.15</math></td> <td style="text-align: center;">*</td> <td style="text-align: center;">*</td> <td rowspan="4" style="text-align: center;">Minor</td> <td rowspan="4" style="text-align: center;">2.5</td> </tr> <tr> <td><math>0.15 \leq D \leq 0.2</math></td> <td style="text-align: center;">4</td> <td style="text-align: center;">4</td> </tr> <tr> <td><math>0.2 \leq D \leq 0.25</math></td> <td style="text-align: center;">2</td> <td style="text-align: center;">2</td> </tr> <tr> <td><math>D \leq 0.3</math></td> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> </tr> </tbody> </table> <p><math>D = (\text{Long} + \text{Short})/2</math>      *: Disregard</p>	Zone Dimension	Acceptable Number		Class Of Defects	Acceptable Level	A	B	$D < 0.15$	*	*	Minor	2.5	$0.15 \leq D \leq 0.2$	4	4	$0.2 \leq D \leq 0.25$	2	2	$D \leq 0.3$	0	1			
Zone Dimension	Acceptable Number			Class Of Defects	Acceptable Level																					
	A	B																								
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$D \leq 0.3$	0	1																								
2	Scratch, Substances	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2" style="width: 20%;">Zone X(mm)/Y(mm)</th> <th colspan="2" style="width: 20%;">Acceptable Number</th> <th rowspan="2" style="width: 20%;">Class Of Defects</th> <th rowspan="2" style="width: 20%;">Acceptable Level</th> </tr> <tr> <th style="width: 10%;">A</th> <th style="width: 10%;">B</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">*</td> <td style="text-align: center;"><math>0.04 \geq W</math></td> <td style="text-align: center;">*</td> <td style="text-align: center;">*</td> <td rowspan="4" style="text-align: center;">Minor 2.5</td> </tr> <tr> <td style="text-align: center;"><math>3.0 \geq L</math></td> <td style="text-align: center;"><math>0.06 \geq W</math></td> <td style="text-align: center;">4</td> <td style="text-align: center;">4</td> </tr> <tr> <td style="text-align: center;"><math>2.0 \geq L</math></td> <td style="text-align: center;"><math>0.08 \geq W</math></td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> </tr> <tr> <td style="text-align: center;">—</td> <td style="text-align: center;"><math>0.1 &lt; W</math></td> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> </tr> </tbody> </table> <p>X: Length    Y: Width    *: Disregard Total defects should not exceed 4/module</p>	Zone X(mm)/Y(mm)	Acceptable Number		Class Of Defects	Acceptable Level	A	B	*	$0.04 \geq W$	*	*	Minor 2.5	$3.0 \geq L$	$0.06 \geq W$	4	4	$2.0 \geq L$	$0.08 \geq W$	2	3	—	$0.1 < W$	0	1
Zone X(mm)/Y(mm)	Acceptable Number			Class Of Defects	Acceptable Level																					
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3	Air Bubbles ( between glass & polarizer)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2" style="width: 20%;">Zone Dimension</th> <th colspan="2" style="width: 20%;">Acceptable Number</th> <th rowspan="2" style="width: 20%;">Class Of Defects</th> <th rowspan="2" style="width: 20%;">Acceptable Level</th> </tr> <tr> <th style="width: 10%;">A</th> <th style="width: 10%;">B</th> </tr> </thead> <tbody> <tr> <td><math>D \leq 0.15</math></td> <td style="text-align: center;">*</td> <td style="text-align: center;">*</td> <td rowspan="3" style="text-align: center;">Minor</td> <td rowspan="3" style="text-align: center;">2.5</td> </tr> <tr> <td><math>0.15 &lt; D \leq 0.25</math></td> <td style="text-align: center;">2</td> <td style="text-align: center;">*</td> </tr> <tr> <td><math>0.25 &lt; D</math></td> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> </tr> </tbody> </table> <p>*: Disregard Total defects shall not excess 3/module.</p>	Zone Dimension	Acceptable Number		Class Of Defects	Acceptable Level	A	B	$D \leq 0.15$	*	*	Minor	2.5	$0.15 < D \leq 0.25$	2	*	$0.25 < D$	0	1						
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4.	Uniformity	<p>(1)Pixel shape (with Dent)</p>  <p>(2)Pixel shape (with Projection)</p>  <p>(3)Pin hole</p>  <p>(4) Deformation</p>  <p>Total acceptable number: 1/pixel ;.5/cell</p>
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## 12.Numbering system

**KNY 12864 -20M S D B T S W - 5 A P W N**  
 1 2 3 4 5 6 7 8 9 10 11 12 13 14

### 1. Display Type:

KNY	New Noah company's brand
LCM	Neutral type
Other	The customer designated named

### 2. Number of Pixels:

Character Module	Characters per line × Lines
Graphic Module	Row Dots × Column Dots

### 3. Series number:

(A-Z) - (1-20)	Series Number
----------------	---------------

### 4.LCD type:

TN	HTN	STN	FSTN	DFSTN
T	H	S	F	D

### 5.LCD Polarize:

6:00	12:00	3:00	9:00
D	U	E	W

### 6.LCD Mode:

	Positive	Negative	Black
TN/HTN/FSTN/ DFSTN	P	N	V
	Yellow	Blue	Gray
STN	Y	B	G



7.LCD pervious to light :

Transmissive	Transfiective	Reflective
T	F	R

8. Backlight type:

None	EL	LED	LED	CCFL
N	E	M	S	C
No backlight	EL backlight	The bottom of the LED light	The LED side light	Bulb light

9. Backlight color:

None	White	Green	Yellow	Red	Amber	Blue
N	W	G	Y	R	A	B

10. Module voltage

3	Module power supply to 3.3 V
5	Module power supply to 5.0 V
Other	The customer request module power supply

11. Contrast

N	Without Negative Voltage
A	Contrast external regulation
F	Fixed on module
T	Temperature Compensation
S	Customer special requirement

11. Module interface

S	serial port
P	Parallel port
N	Don't choose

13. Module temperature

R	Work environment 0 to 40 °C
W	Work environment -20 to 70 °C
O	Work environment -30 to 80 °C

14. Touch screen

C	With touch screen
N	Without a touch screen

# 13. Dimensional Outlines

REV.	DESCRIPTION	NAME	DATE																																												
	<p style="text-align: center; color: green; font-weight: bold;">128x64DOTS</p>																																														
			<p style="color: green; font-weight: bold;">UNIT : mm</p>																																												
	<table border="1" style="width:100%; border-collapse: collapse; text-align: center;"> <tr> <td>Pin</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> <td>7</td> <td>8</td> <td>9</td> <td>10</td> </tr> <tr> <td>Symbol</td> <td>VSS</td> <td>VDD</td> <td>VO</td> <td>RS</td> <td>RW</td> <td>E</td> <td>DB0</td> <td>DB1</td> <td>DB2</td> <td>DB3</td> </tr> <tr> <td>Pin</td> <td>11</td> <td>12</td> <td>13</td> <td>14</td> <td>15</td> <td>16</td> <td>17</td> <td>18</td> <td>19</td> <td>20</td> </tr> <tr> <td>Symbol</td> <td>DB4</td> <td>DB5</td> <td>DB6</td> <td>DB7</td> <td>PSB</td> <td>NC</td> <td>RST</td> <td>VOUT</td> <td>BLA</td> <td>BLK</td> </tr> </table> <p style="text-align: center; color: green; font-weight: bold;">VIEWING DIRECTION</p>	Pin	1	2	3	4	5	6	7	8	9	10	Symbol	VSS	VDD	VO	RS	RW	E	DB0	DB1	DB2	DB3	Pin	11	12	13	14	15	16	17	18	19	20	Symbol	DB4	DB5	DB6	DB7	PSB	NC	RST	VOUT	BLA	BLK	<p style="color: green; font-weight: bold;">新諾亞顯示技術股份有限公司</p>	
Pin	1	2	3	4	5	6	7	8	9	10																																					
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1. DISPLAY TYPE	5. DRIVE METHOD	DWN : XXJ	2008-05-29	MODEL NO.	KNY12864-20M	UNITS :	mm																																								
2. POLARIZER MODE	6. OPERATING TEMP	CHK :		TEL:	86-755-29440039	SCALE :	NTS																																								
3. VIEWING DIRECTION	7. STORAGE TEMP	APP :		FAX:	86-755-81752033	ANGLES:	±0.5°																																								
4. OPERATING VOLTAGE	8. CONNECTOR	TOLERANCES UNLESS OTHERWISE SPECIFIED:±0.2				SHEET :	1 OF 1																																								