



晶采光電科技股份有限公司
AMPIRE CO., LTD.

SPECIFICATIONS FOR LCD MODULE

CUSTOMER	
CUSTOMER PART NO.	
AMPIRE PART NO.	AF-09632HFIEB-00H
APPROVED BY	
DATE	

☐ Approved For Specifications

☒ Approved For Specifications & Sample

AMPIRE CO., LTD.

**TOWER A, 4F, No.114, Sec. 1, HSIN-TAI 5th RD., HIS-CHIH,
TAIPEI HSIEN, TAIWAN(R.O.C.)**

台北縣汐止鎮新台五路一段114號4樓(東方科學園區A棟)

TEL:886-2-26967269, FAX:886-2-26967196 or 886-2-26967270

APPROVED BY	CHECKED BY	ORGANIZED BY

RECORD OF REVISION

Revision Date	Contents
2001/12/6	New Release
2002/1/4	Modify the block diagram & add the default setting (Page 6)
2002/4/15	Modify the mechanical dimension of EL part (Page 15~17)
2002/5/29	Modify LCM outline dimension & Black tape size(Page 15~16)
2002/7/22	Modify LCM black tape size, added a protect tape on OLB (Page 15,16)

1 FEATURES

- (1) Display format : 96×32 dot-matrix, 1/32 duty, 1/6 Bias.
- (2) Construction : LCD panel, Blue EL backlight and COF.
- (3) Display type : FSTN, Transflective, Positive, 6 o'clock view
- (4) LCD driver : NJU6578
- (5) Interface for 8-bits 80 series MPU.
- (6) Extended temperature type.

2 MECHANICAL DATA

Parameter	Stand Value	Unit
Dot size	$0.18(W) \times 0.2(H)$	mm
Dot pitch	$0.195(W) \times 0.215(H)$	mm
Viewing area	$18.705(W) \times 6.865(H)$	mm
Module size	$30.4(W) \times 29.7(H) \times 2.1 \text{ max (T)}$	mm

3 ABSOLUTE MAXIMUM RATINGS

Parameter		Symbol	Min	Max	Unit
Logic Circuit Supply Voltage		VDD	-0.3	3.6	V
LCD Driving Voltage		V5	VDD-11.0	VDD+0.3	V
		V1~V4	V5	VDD+0.3	V
Input Voltage		VI	-0.3	VDD+0.3	V
Extended temp. type	Operating Temp.	TOP	-20	70	°C
	Storage Temp.	TSTG	-30	80	°C

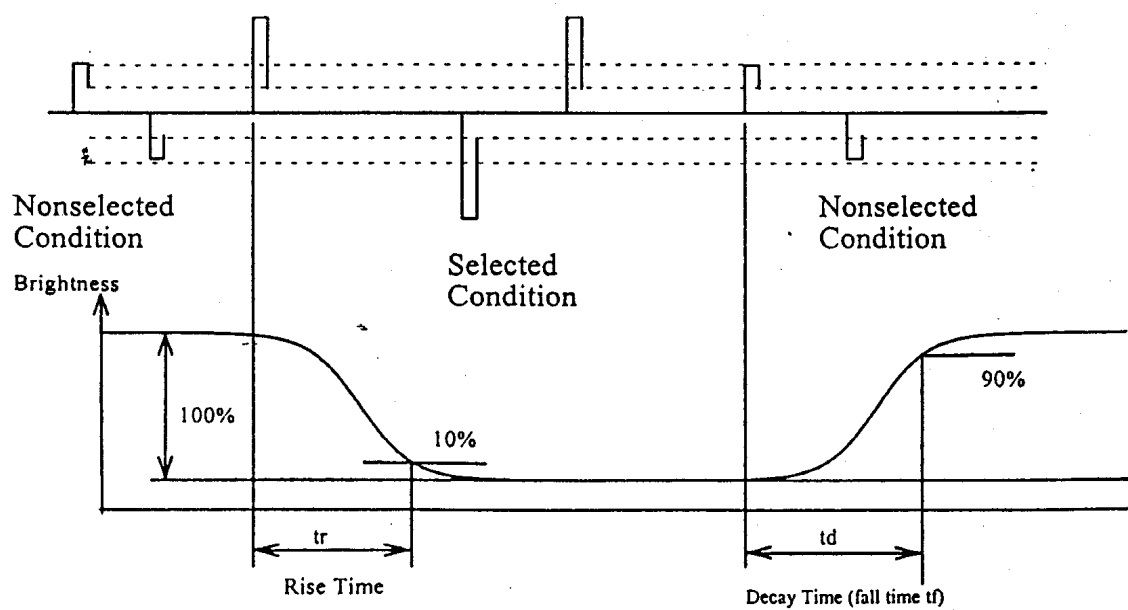
4 ELECTRO-OPTICAL CHARACTERISTICS

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
----- Electronic Characteristics -----							
Logic Circuit Supply Voltage	VDD-VSS	--	2.4	3.0	3.3	V	
LCD Driving Voltage	V0-VSS	-20 °C	--	--	--	V	
		25 °C	--	7.3	--		
		70 °C	--	--	--		
Input Voltage	VIH	--	0.8 VDD	--	VDD	V	
	VIL	--	VSS	--	0.2VDD	V	
Logic Supply Current	IDD	VDD = 3.0V	--	400	800	uA	
----- Optical Characteristics -----							
Contrast	CR	FSTN type	--	7	--		Note 1
Rise Time	tr	25°C	--	200	--	ms	Note 2
Fall Time	tf	25°C	--	200	--	ms	
Viewing Angle Range	θ f	25°C & CR≥2	--	40	--	Deg.	Note 3
	θ b		--	35	--		
	θ l		--	40	--		
	θ r		--	40	--		
Frame Frequency	fF	25°C	--	70	--	Hz	

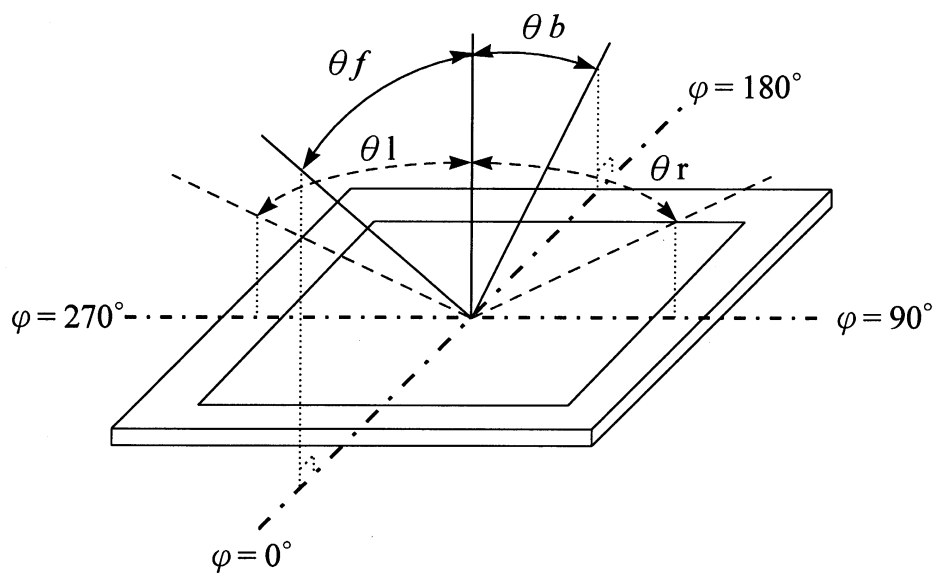
(NOTE 1) Contrast ratio :

CR = (Brightness in OFF state) / (Brightness in ON state)

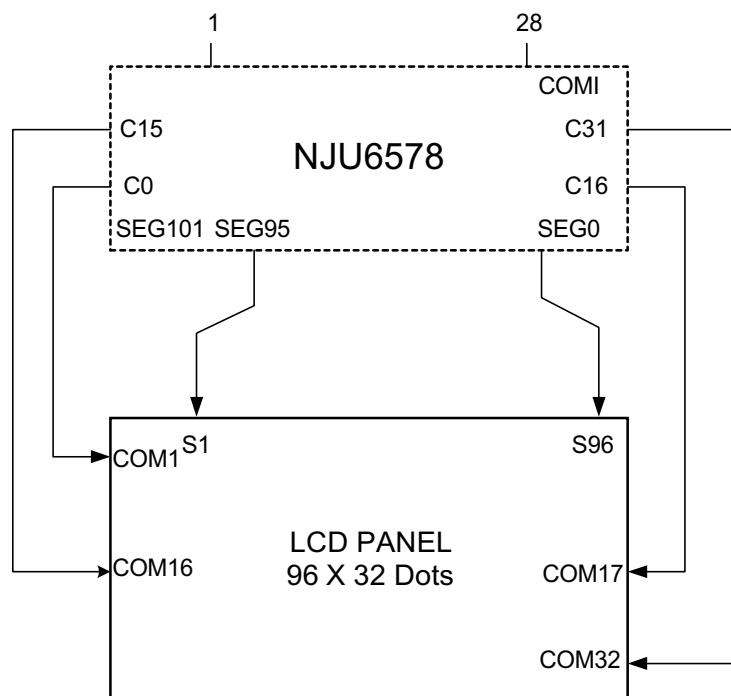
(NOTE 2) Response time :



(NOTE 3) Viewing angle



5 BLOCK DIAGRAM



Default Setting:

Symbol	H/L	Description
P/S	H	Parallel data input
C86	L	8080 Series MPU interface.
T1,T2	L , L	Internal power supply
SCL , SI	L , L	Serial interface not used.
OSC1	NC	Test pin.

6 INTERFACE

No.	Symbol	Function
1	DUMMY	No connection
2	V1	LCD driver supply voltage: Voltages should have the following relationship; $VDD \geq V1 \geq V2 \geq V3 \geq V4 \geq V5$
3	V2	
4	V3	
5	V4	
6	V5	
7	VR	V0 voltage adjustment pin. V5 level is adjusted by external bleeder resistance connect between VDD and V5 terminal.
8	VDD	Power Supply for Logic
9	VOOUT	Voltage converter input / output pin
10	C2-	Capacitor 2 negative connection pin for voltage converter
11	C2+	Capacitor 2 positive connection pin for voltage converter
12	C1-	Capacitor 1 negative connection pin for voltage converter
13	C1+	Capacitor 1 positive connection pin for voltage converter
14	VSS	Ground (0V)
15	DB7	8-bit data bus for 80 series MPU
16	DB6	
17	DB5	
18	DB4	
19	DB3	
20	DB2	
21	DB1	
22	DB0	
23	/RD	80 series: RD signal of 80 type MPU input terminal. Active "L", D0 to D7 terminal are output
24	/WR	80 series: Connect to the 80 type MPU /WR signal. Active "L", the data on the data bus input synchronizing the rise edge of this signal.
25	A0	RS="H": Indicates that D0 to D7 are Display Data RS="L": Indicates that D0 to D7 are Instruction Data
26	CS	Data Input/Output are available during CS="L"
27	RESETB	Reset operation is executing during "L"

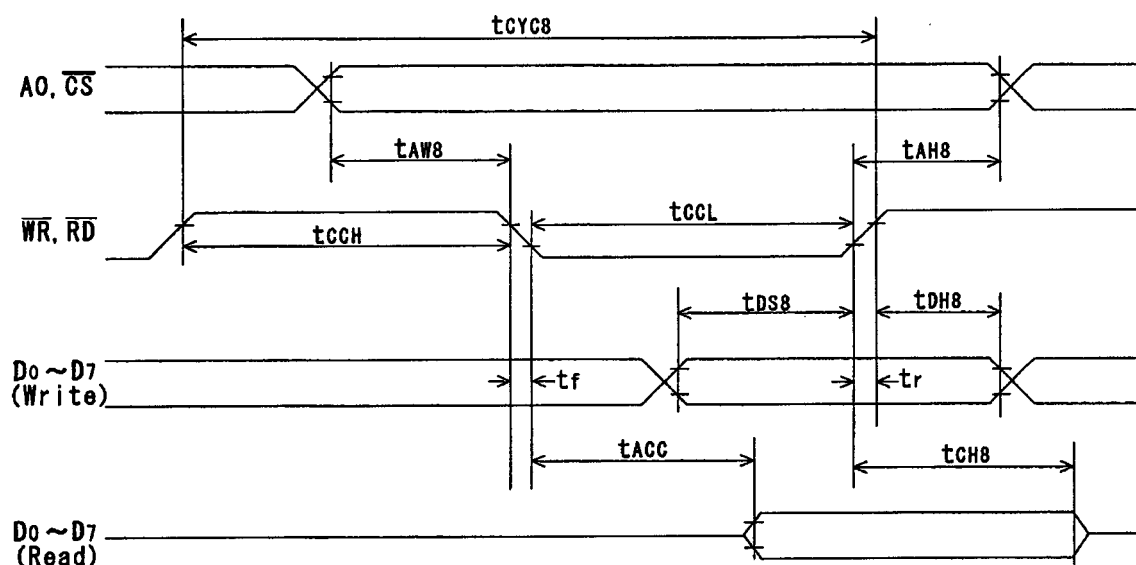
7 INSTRUCTION SET

Instruction		Code												Description
		A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0		
(1)	Display ON/OFF	0	1	0	1	0	1	0	1	1	1	0	LCD Display ON/OFF 0:OFF 1:ON	
(2)	Page Address Set	0	1	0	1	0	1	1	*	Page Address			Set the page of DD RAM to the Page Address Register	
(3)	Column Address Set High Order 3bits	0	1	0	0	0	0	1	0	High Order Column Add.			Set the Higher order 3 bits Column Address to the Reg.	
(4)	Column Address Set Lower Order 4bits	0	1	0	0	0	0	0	Lower Order Column Add.			Set the Lower order 4 bits Column Address to the Reg.		
(5)	Status Read	0	0	1	Status				0	0	0	0	Read out the internal Status	
(6)	Write Display Data	1	1	0	Write Data							Write the data into the Display Data RAM		
(7)	Read Display Data	1	0	1	Read Data							Read the data from the Display Data RAM		
(8)	ADC Select	0	1	0	1	0	1	0	0	0	0	0	Set the DD RAM vs Segment 0:Normal 1:Inverse	
(9)	Normal or Inverse of ON/OFF Set	0	1	0	1	0	1	0	0	1	1	0	Inverse the ON and OFF Display 0:Normal 1:Inverse	
(10)	Whole Display ON /Normal Display	0	1	0	1	0	1	0	0	1	0	0	Whole Display Turns ON 0:Normal 1:Whole Disp. ON	
(11)	Icon Display	0	1	0	1	0	1	0	1	0	1	0	Set the Duty Ratio 0:No Icon 1:With Icon	
(12)	Read Modify Write	0	1	0	1	1	1	0	0	0	0	0	Increment the Column Address Register when writing but no-change when reading	
(13)	End	0	1	0	1	1	1	0	1	1	1	0	Release from the Read Modify write Mode	
(14)	Reset	0	1	0	1	1	1	0	0	0	1	0	Initialize the internal Circuits	
(15)	Output Assignment Register Set	0	1	0	1	1	0	0	A3	*	*	*	Set the scanning order of common drivers to the Register	
(16)	Internal Power Supply ON/OFF	0	1	0	0	0	1	0	0	1	0	0	0:Int. Power Supply OFF 1:Int. Power Supply ON	
(17)	LCD Driving Voltage Set	0	1	0	1	1	1	0	1	1	0	1	Set LCD Driving Voltage after the internal (external) power supply is turned on	
(18)	EVR Register Set	0	1	0	1	0	0	0	Setting Data			Set the V5 output level to the EVR register		
(19)	Power Save (Dual Command)	0	1	0	1	0	1	0	1	1	1	0	Set the Power Save Mode	
		0	1	0	1	0	1	0	0	1	0	1		

(*:Don't Care)

8 TIMING CHARACTERISTICS

8.1 Read/Write operation sequence (80-Series MPU)



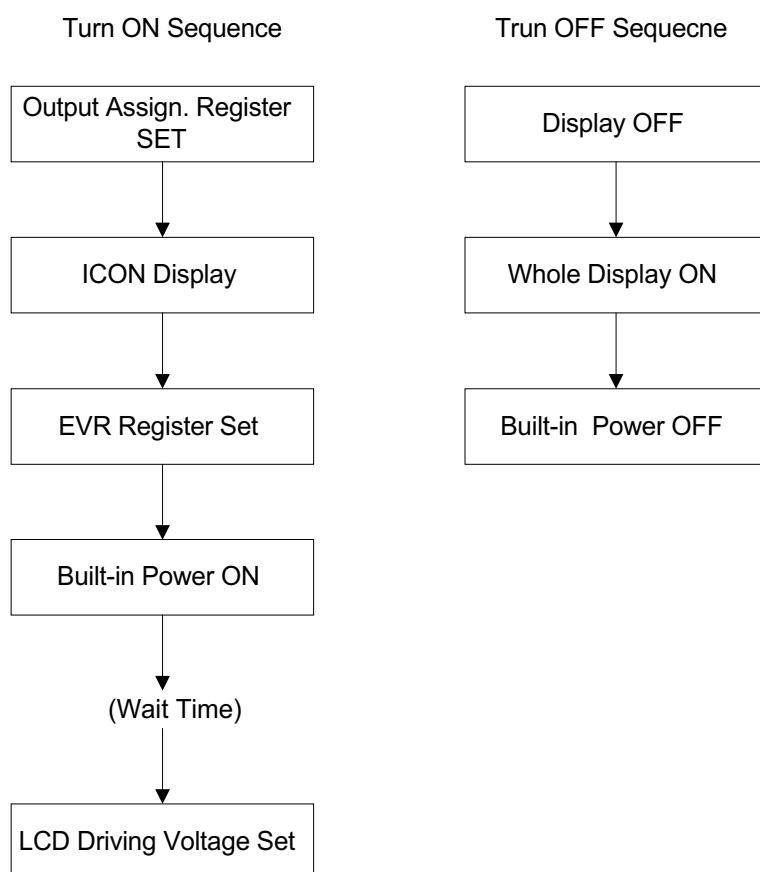
Read/Write Characteristics (80-series MPU)

(VDD = 2.7 to 4.5V, Ta = -20 to +75°C)

PARAMETER		SYMBOL	Min.	Max.	Remark	Unit	
Address Hold Time		A0, /CS Terminals	t_{AH8}	25		Ns	
Address Set Up time			t_{AW8}	25		Ns	
System Cycle Time		/WR, /RD Terminals	t_{AH8}	450		Ns	
Control Pulse Width	WR,"L"		t_{CYC8}	50		Ns	
	RD,"L"		$t_{CCL}(W)$	200		Ns	
	"H"		$t_{CCL}(R)$	220		Ns	
Data Set Up Time		D0~D7 Terminals	t_{DS8}	120		Ns	
Data Hold time			t_{DH8}	35		Ns	
/RD Access Time			t_{ACC8}		140	CL = 100 pF	Ns
Output Disable Time			t_{CH8}		35		Ns
Rise Time, Fall Time		/CS, /WR, /RD, A0,D0~D7 Terminals	t_r, t_f		15	Ns	

8.2 Power OFF Software Sequence

Please maintain the blow sequence when turning off the power supply of the module, turn it off after making the system into the standby mode. If not, the DC component will be supplied to the LCD panel. This may cause damage the LCD module.



9 QUALITY AND RELIABILITY

9.1 TEST CONDITIONS

Tests should be conducted under the following conditions :

Ambient temperature : $25 \pm 5^{\circ}\text{C}$

Humidity : $60 \pm 25\% \text{ RH}$.

9.2 SAMPLING PLAN

Sampling method shall be in accordance with MIL-STD-105E , level II, normal single sampling plan .

9.3 ACCEPTABLE QUALITY LEVEL

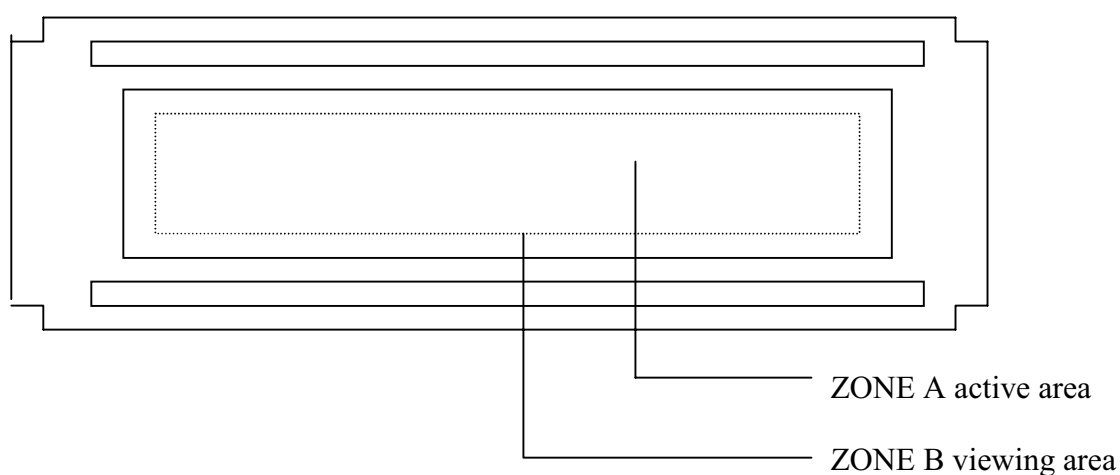
A major defect is defined as one that could cause failure to or materially reduce the usability of the unit for its intended purpose. A minor defect is one that does not materially reduce the usability of the unit for its intended purpose or is an infringement from established standards and has no significant bearing on its effective use or operation.

9.4 APPEARANCE

An appearance test should be conducted by human sight at approximately 30 cm distance from the LCD module under fluorescent light. The inspection area of LCD panel shall be within the range of following limits.

9.5 INSPECTION QUALITY CRITERIA

Item	Description of defects				Class of Defects	Acceptable level (%)
Function	Short circuit or Pattern cut				Major	0.65
Dimension	Deviation from drawings				Major	1.5
Black spots	Ave . dia . D	area A	area B		Minor	2.5
	D≤0.2	Disregard				
	0.2<D≤0.3	3	4			
	0.3<D≤0.4	2	3			
	0.4<D	0	1			
Black lines	Width W, Length L		A	B	Minor	2.5
	W≤0.03		disregard			
	0.03<W≤0.05		3	4		
	0.05<W≤0.07 , L≤3.0		1	1		
	See line criteria					
Bubbles in polarizer	Average diameter D 0.2 < D < 0.5 mm for N = 4 , D > 0.5 for N = 1				Minor	2.5
Color uniformity	Rainbow color or newton ring.				Minor	2.5
Glass Scratches	Obvious visible damage.				Minor	2.5
Contrast ratio	See note 1				Minor	2.5
Response time	See note 2				Minor	2.5
Viewing angle	See note 3				Minor	2.5



9.6 RELIABILITY

Test Item	Test Conditions	Note
High Temperature Operation	70±3°C , t=96 hrs	
Low Temperature Operation	-20±3°C , t=96 hrs	
High Temperature Storage	80±3°C , t=96 hrs	1,2
Low Temperature Storage	-30±3°C , t=96 hrs	1,2
Thermal Shock Test	-30°C ~ 25°C ~ 80°C 30 min. 5 min. 30 min. (1 cycle) Total 5 cycle	1,2
Vibration Test (Packing)	Sweep frequency : 10~55~10 Hz/1min Amplitude : 0.75mm Test direction : X.Y.Z/3 axis Duration : 30min/each axis	2

Note 1 : Condensation of water is not permitted on the module.

Note 2 : The module should be inspected after 1 hour storage in normal conditions
(15-35°C , 45-65%RH).

Definitions of life end point :

- Current drain should be smaller than the specific value.
- Function of the module should be maintained.
- Appearance and display quality should not have degraded noticeably.
- Contrast ratio should be greater than 50% of the initial value.

10 HANDLING PRECAUTIONS

- (1) An LCD module is a fragile item and should not be subjected to strong mechanical shocks.
- (2) Avoid applying pressure to the module surface. This will distort the glass and cause a change in color.
- (3) Under no circumstances should the position of the bezel tabs or their shape be modified.
- (4) Do not modify the display PCB in either shape or positioning of components.
- (5) Do not modify or move location of the zebra or heat seal connectors.
- (6) The device should only be soldered to during interfacing. Modification to other areas of the board should not be carried out.
- (7) In the event of LCD breakage and resultant leakage of fluid do not inhale, ingest or make contact with the skin. If contact is made rinse immediately.
- (8) When cleaning the module use a soft damp cloth with a mild solvent, such as Isopropyl or Ethyl alcohol. The use of water, ketone or aromatic is not permitted.
- (9) Prior to initial power up input signals should not be applied.
- (10) Protect the module against static electricity and observe appropriate anti-static precautions.

Date : 2002/7/22

AMPIRE CO., LTD.

