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.	AR-09664CCJQW-00H
APPROVED BY	
DATE	

☑ **Approved For Specifications**

☐ Approved For Specifications & Sample

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RECORD OF REVISION

Revision Date	Contents	Editor
2002/11/12	New Release	Eric
2002/11/13	Modify the interface define (Page 10) Modify the Timing Characteristics (Page 12)	Eric
2003/1/29	Modify LCM outline dimension (Page 20) Modify the LCM brightness to 45Cd/m2 (Page 6)	Eric Eric
2003/1/30	Modify the LCM brightness to 80 Cd/m2 (Page 6) Added the LED drawing (Page 21,22) Added the application circuit (Page 23) Modify the LCM thickness (Page20)	Eric Eric Eric Eric
2003/2/6	Change LED dice to 3pcs & I_{LED} to 20mA(Page5,6,10) Modify the LED drawing (Page 22)	Eric Eric
2003/2/7	Modify the LCM & LED drawing (Page 20,22)	Eric
2003/2/13	Modify the LCM & LED drawing (Page 20,22)	Eric
2003/2/25	Modify LED dice to 2pcs (7.2V, 20mA) (Page 5,6,10)	Eric
2003/3/5	Added 4-post on LED backlight & Modify LED interface to solder type (Page 20,21,22)	Eric
2003/3/7	Change LED dices to 3pcs (Page 5,6,20,21)	Patrick
2003/3/12	Modify the FPC outline dimension (Page 20,21,22)	Eric
2003/5/8	Modify the FPC contact length to 2.5 (Page 25,26)	Eric
	Added the power ON/OFF sequence (Page 17~20)	Eric

1 FEATURES

(1) Color-STN 1” inch display module for Sub mobile-phones, or handy electrical equipments.

(2) Construction : 1” Color-STN LCD, Flexible Print Board, White LED backlight and COG technology.

(3) LCD type : 3.1 Color-STN 1 inch display, transflective, 12 O’clock, 1/64 Duty, 1/9 Bias.

3.2 96(RGB)X64 dots Matrix.

3.3 Narrow-contact ledge technique

3.4 LCD controller is HD66768.

3.5 Full 65K color display

(4) Low cross talk by frame rate modulation

(5) Direct data display with display RAM

(6) Partial display function: You can save power by limiting the display space.

(7) MPU interface: 8bit 80-series parallel and Three or Four-line Serial interface.

(8) Abundant command functions:

Area scroll function

Display direction switching function

Power saving function

Electric volume control function: you are able to program the temperature compensation function.

2 Mechanical specifications

Dimensions and weight

Item	Specifications	Unit
External shape dimensions	*1 27.2 (W) x 40.9 (H) x 2.7 (D)	mm
Pixel size	0.198 (W) x 0.20(H)	mm
Pixel pitch	0.21 (W) x 0.21(H)	mm
Active area	20.148 (W) x 13.43 (H)	mm
Viewing area	22.2 (W) x 15.5 (H)	mm
Weight	T.B.D.	g

*1. This specification is about External shape on shipment from AMPIRE.

3 Absolute max. ratings and environment

3-1 Absolute max. ratings

Ta=25°C GND=0V

Item	Symbol	Min.	Max.	Unit	Remarks
Power supply voltage (1)	V_{CC} – GND	-0.3	+4.6	V	1,2
Power supply voltage (2)	Vcil	-0.3	+4.6	V	1,3
Power supply voltage (3)	VLPS – GND	-0.3	+17.5	V	1,4
Power voltage	LED-A – LED-K	-0.3	+5.5	V	
Input voltage	VIN	-0.3	V_{CC}+0.3	V	1

Notes:

1. If the LSI is used above these absolute maximum ratings, it may become permanently Damaged. Using the LSI within the following electrical characteristics limit is strongly Exceeded, the LSI will malfunction and caused poor reliability.
2. V_{CC} ≧GND must be maintained.
3. Vcil ≧GND must be maintained.
4. VLPS≧GND must be maintained.

3-2 Environment

Item	Specifications	Remarks
Storage temperature	Max. +80°C Min. –30°C	Note 1: Non-condensing
Operating temperature	Max. +70°C Min. -20°C	Note 1: Non-condensing

Note 1：Ta≦+40°C Max.85%RH

Ta＞+40°C The max. Humidity should not exceed the humidity with 40°C 85%RH.

4 Electrical specifications

4-1 Electrical characteristics

In case except as specified elsewhere in these specifications

GND=0V, V_{CC} = 3.0V, VLPS= 13.0V and Ta=25°C

Item	Symbol	Conditions	MIN.	TYP.	MAX.	Unit	Applicable Pin
IC power voltage	V_{CC}		2.4	3.0	3.6	V	Vcc *1
High-level input voltage	V_{IHC}		0.7 V_{CC}		V_{CC}	V	*2
Low-level input voltage	V_{ILC}		-0.3		0.15V_{CC}	V	*2
High-level output voltage	V_{OH}	I_{OH}=-0.1mA	0.75 V_{CC}	-	-	V	*3
Low-level output voltage	V_{OL}	I_{OL}=+0.1mA	-	-	0.15 V_{CC}	V	*3
Input leakage current	I_{LI}	V_{IN}=V_{DD} or V_{SS}	-1.0		1.0	uA	*2-
Consumption current	I_{CC}	Electric VR value =T.B.D	-	1.3	-	mA	*4
Consumption current of LED	I_{LED}	V_{LED}=10.8V	-	15		mA	

Note :

1. Operation is warranted if radical voltage fluctuations occur while MPU is in process of access.
2. D8 to D0 (Input mode), A0, CS, RD, WR, and RES.
3. D8 to D0 (Input and Output mode)
4. The consumption current value comes from the conditions that the display contents are all surface halftone display and the electric VR value is T.B.D (decimal).

5 Optical characteristics

5-1 Optical characteristics

(1/64 Duty in case except as specified elsewhere Ta = 25°C)

LED backlight transflective module:

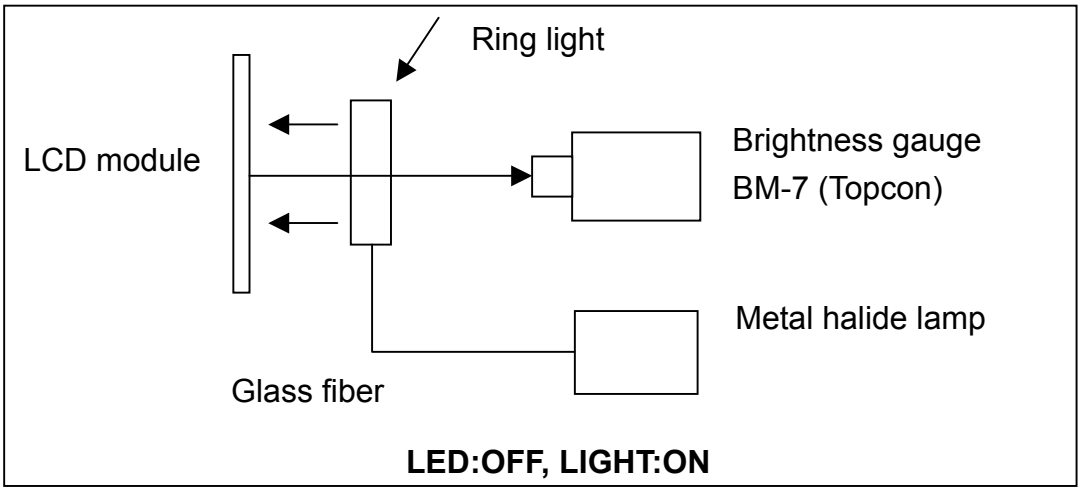
Item	Symbol	Mode	Min.	Std.	Max.	Unit	Conditions
Response time	tON tOFF	- -	- -	125 55	190 85	ms ms	θ =0° , φ =0° When CR Max.
	tON tOFF	- -	- -	1500 1100	2300 1500	ms ms	θ =0° , φ =0° -20°C When CR Max.
Contrast ratio	CR	Refl.	-	7	-		θ =0°, φ =0° LED:OFF, LIGHT:ON
		Trans.	-	30	-		θ =0°, φ =0° LED:ON, LIGHT:OFF
Visual angle range front and rear	θ 1	Refl.	-30		30	De-gree	φ = 0°, CR≧1.5 LED:OFF, LIGHT:ON
		Trans..	-35		50		φ = 0°, CR≧1.5 LED:ON, LIGHT:OFF
Visual angle range left and right	θ 2	Refl.	-30		30	De-gree	φ =90°, CR≧1.5 LED:OFF LIGHT:ON
		Trans..	-40		40		φ =90°, CR≧1.5 LED:ON, LIGHT:OFF
Visual angle direction priority			12:00				
Brightness			100 Min.			Cd/m2	V_{LED}=10.8V(Typ.) 15mA Full White pattern

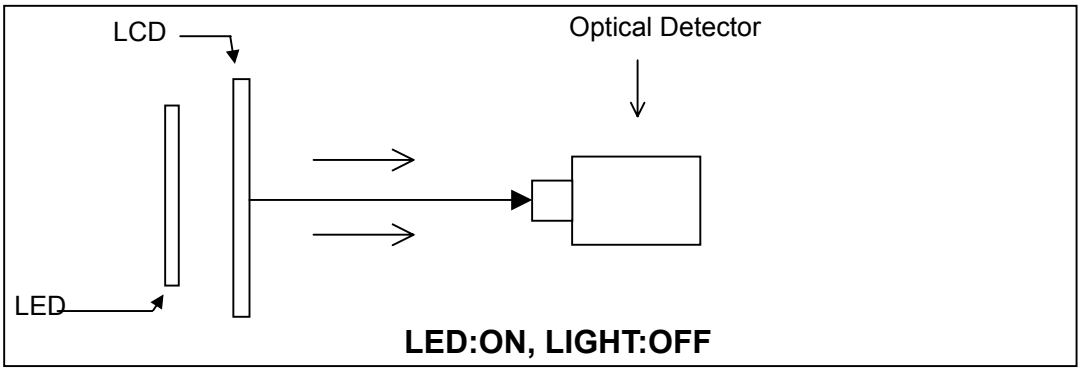
5-2 CIE (x, y) chromaticity (1/64 Duty Ta = 25°C)

Item	Symbol	Reflective			Conditions
		Min.	Std.	Max.	
Red	x	-	T.B.D	-	θ =0° , φ =0°
	y	-	T.B.D	-	
Green	x	-	T.B.D	-	θ =0° , φ =0°
	y	-	T.B.D	-	
Blue	x	-	T.B.D	-	θ =0° , φ =0°
	y	-	T.B.D	-	
White	x	-	T.B.D	-	θ =0° , φ =0°
	y	-	T.B.D	-	

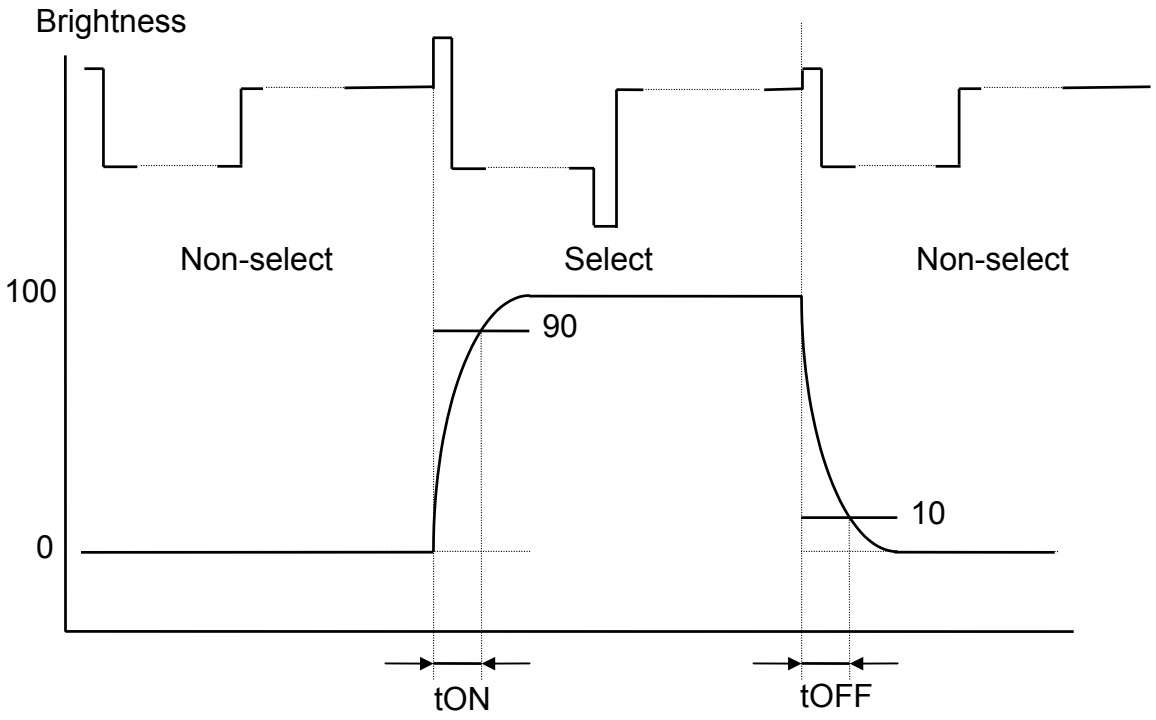
Item	Symbol	Min.	Std.	Max.	Conditions
Reflection Light source	x	-	T.B.D	-	θ =0° , φ =0°
	y	-	T.B.D	-	

NOTE 1: Optical characteristic measurement system

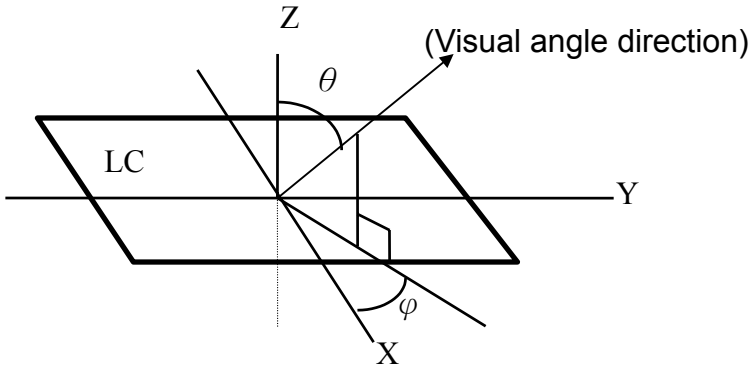




NOTE 2: Response time definition



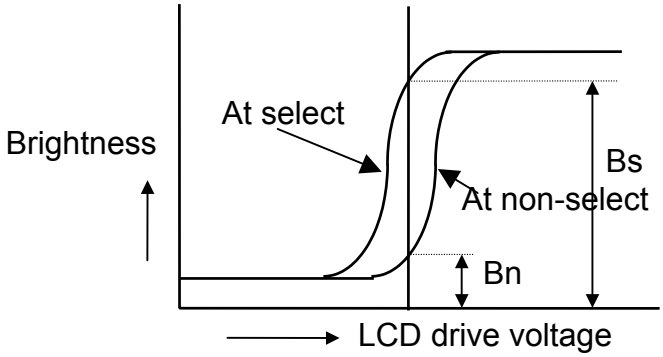
NOTE 3: φ 、θ **definition**



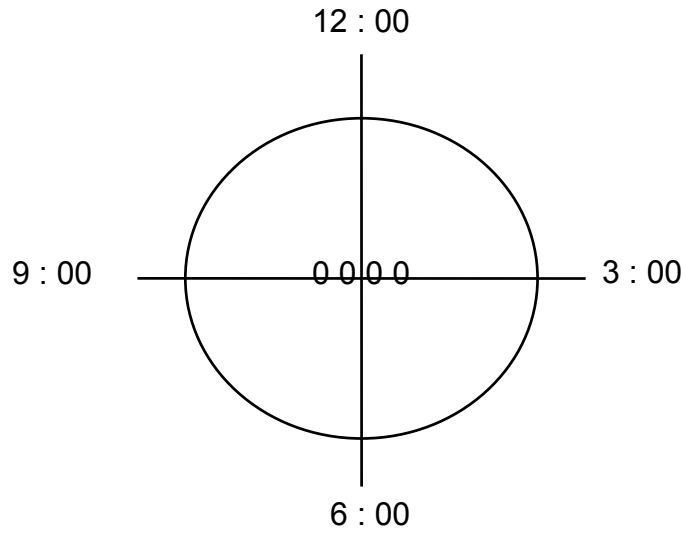
(6-o'clock visual angle direction)

NOTE 4: Contrast definition

CR = Brightness in select (Bs)／Brightness in non-select (Bns)



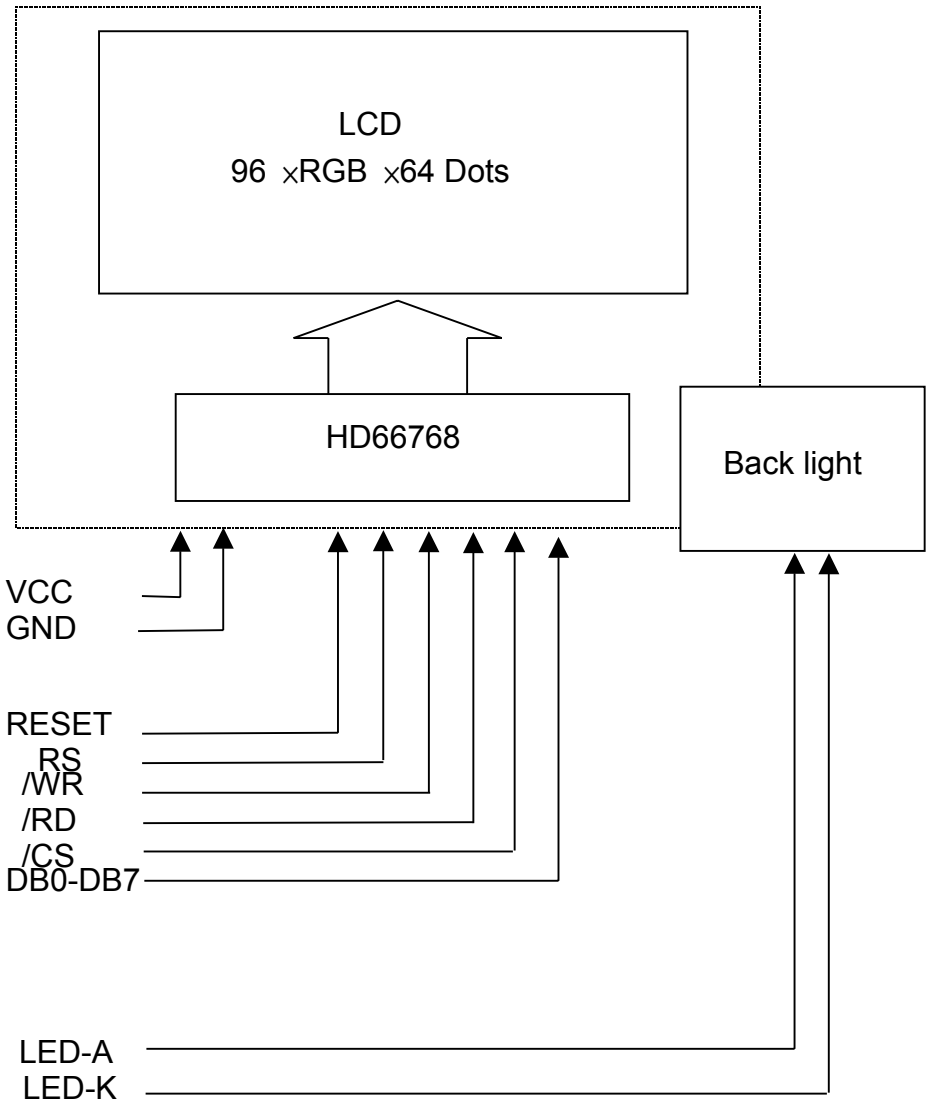
NOTE 5: Visual angle direction priority



6 Block Diagram

Display format:	Color-STN transflective negative type
Display composition:	96 x RGB x 64 dots
Drive system:	PWM grayscale drive.
Back light:	White LED x 3

Block diagram



7 Interface specifications

<table>
<tr><th>Pin No.</th><th>Terminal</th><th colspan="2">Functions</th></tr>
<tr><td>1</td><td>RESET1</td><td colspan="2">Reset terminal, active “L”</td></tr>
<tr><td>2</td><td rowspan="3">IM2
IM1
IM0/ID</td><td colspan="2">Select MPU Interface mode:
<table>
<tr><th>IM2</th><th>IM1</th><th>IM0</th><th>MPU interface Mode</th></tr>
<tr><td>GND</td><td>VCC</td><td>VCC</td><td>80-system 8-bit bus interface</td></tr>
<tr><td>VCC</td><td>GND</td><td>ID</td><td>Clock synchronized serial interface (Three-lines)</td></tr>
<tr><td>VCC</td><td>VCC</td><td>GND</td><td>Clock synchronized serial interface (four-lines)</td></tr>
</table></td></tr>
<tr><td>3</td></tr>
<tr><td>4</td></tr>
<tr><td>5</td><td>DB7</td><td rowspan="8">Data Bus for 8-bit,
80 series MPU</td><td rowspan="6">For a synchronous clock interface or unused pin, fixed to the VCC or VSS level.</td></tr>
<tr><td>6</td><td>DB6</td></tr>
<tr><td>7</td><td>DB5</td></tr>
<tr><td>8</td><td>DB4</td></tr>
<tr><td>9</td><td>DB3</td></tr>
<tr><td>10</td><td>DB2</td></tr>
<tr><td>11</td><td>DB1</td><td>For a synchronous clock interface, leave it open.</td></tr>
<tr><td>12</td><td>DB0</td><td>Serial data input pin (SDI)</td></tr>
<tr><td>13</td><td>/RD</td><td colspan="2">Read clock terminal, active ”L” (80 series interface)</td></tr>
<tr><td>14</td><td>/WR, SCL</td><td colspan="2">Write clock terminal, active “L” (80 series interface)</td></tr>
<tr><td>15</td><td>RS</td><td colspan="2">Selects the register.
”L”: Index/stats register, “H”: Control register</td></tr>
<tr><td>16</td><td>/CS</td><td colspan="2">Chip select terminal, active “L”</td></tr>
<tr><td>17</td><td>OSC2</td><td colspan="2" rowspan="2">Connect an external resistor for R-C oscillation.</td></tr>
<tr><td>18</td><td>OSC1</td></tr>
<tr><td>19</td><td>V_{CC}</td><td colspan="2" rowspan="2">Power supply terminal</td></tr>
<tr><td>20</td><td>RV_{CC}</td></tr>
<tr><td>21</td><td>VciL</td><td colspan="2">Power supply for an internal power supply circuit.</td></tr>
<tr><td>22</td><td>AGND</td><td colspan="2">GND for power supply circuit.</td></tr>
<tr><td>23</td><td>GND</td><td colspan="2">GND pin for logic circuit</td></tr>
<tr><td>24</td><td>Vci1</td><td colspan="2">Outputs internal reference voltage generated between VciL and GND.</td></tr>
<tr><td>25</td><td>Vci2</td><td colspan="2">Reference voltage of step up circuit 2.</td></tr>
<tr><td>26</td><td>VLPS</td><td colspan="2">A power supply for LCD driver.</td></tr>
<tr><td>27</td><td>C22+</td><td colspan="2" rowspan="2">When Step-up circuit is used. Connect an external capacitor.</td></tr>
<tr><td>28</td><td>C22-</td></tr>
<tr><td>29</td><td>C21+</td><td colspan="2" rowspan="2">When Step-up circuit is used. Connect an external capacitor.</td></tr>
<tr><td>30</td><td>C21-</td></tr>
<tr><td>31</td><td>C11+</td><td colspan="2" rowspan="2">When Step-up circuit is used. Connect an external capacitor.</td></tr>
<tr><td>32</td><td>C11-</td></tr>
</table>

33	VREFH	Output terminal for LCD driving voltage regulator circuit. Leave it open when not using.
34	V1OUT	They are output from an internal operation amplifier when using an internal operation amplifier. Connect V1OUT and V5OUT to a capacitor for stabilization.
35	V2OUT	
36	V3OUT	
37	V4OUT	
38	V5OUT	
39	CGND	GND pin for external capacitor and schottky diode. “GND”=0V
40	OGND	GND pin for an external thermistor circuit. “GND”=0V
41	VREFOUT	Outputs internal reference power supply voltage.
42	VREFLCD	Inputs reference voltage of LCD drive power supply.

LED backlight:

1	LED-A	Power input terminal for LED backlight (10.8V, 15mA)
2	LED-K	GND-terminal for LED backlight

8 Timing Characteristics

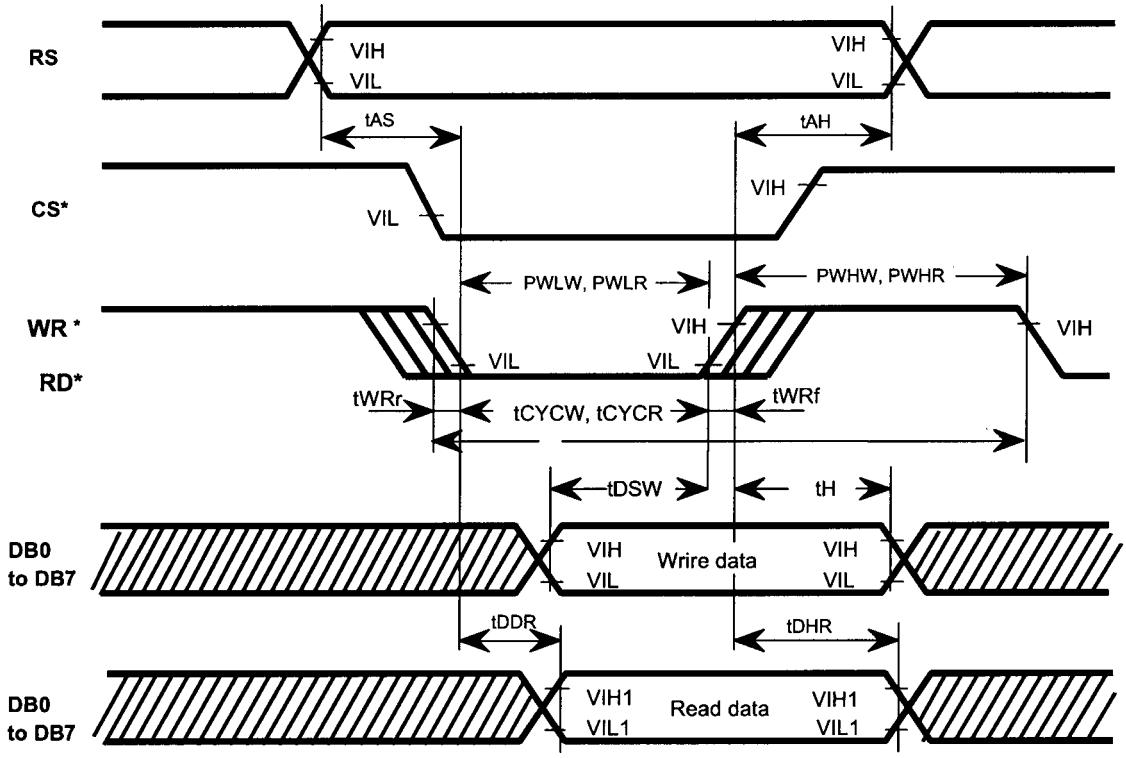
80-system Bus interface Timing Characteristics

Normal write mode (HWM=0) (Ta=25℃ VCC = 2.4~3.6V)

Item		Symbol	Conditions	MIN	MAX	Unit
Bus cycle time	Write	t_{CYCW}		300	-	ns
	Read	t_{CYCR}		500	-	ns
Write low-level pulse width		PW_{LW}		40	-	ns
Read low-level pulse width		PW_{LR}		250	-	ns
Write high-level pulse width		PW_{HW}		100		ns
Read high-level pulse width		PW_{HR}		200		ns
Write/Read rise/fall time		t_{WRr}, t_{WRf}		-	25	ns
Set up time (RS to CS,WR,RD)		t_{AS}		10	-	ns
Address hold time		t_{AH}		5	-	ns
Write data set up time		t_{DSW}		60	-	ns
Write data hold time		t_H		15	-	ns
Read data delay time		t_{DDR}		-	200	ns
Read data hold time		t_{DHR}		5	-	ns

High-speed Write mode (HWM=1) (Ta=25℃ VCC = 2.4~3.6V)

Item		Symbol	Conditions	MIN	MAX	Unit
Bus cycle time	Write	t_{CYCW}		100	-	ns
	Read	t_{CYCR}		500	-	ns
Write low-level pulse width		PW_{LW}		40	-	ns
Read low-level pulse width		PW_{LR}		250	-	ns
Write high-level pulse width		PW_{HW}		40		ns
Read high-level pulse width		PW_{HR}		200		ns
Write/Read rise/fall time		t_{WRr}, t_{WRf}		-	25	ns
Set up time (RS to CS,WR,RD)		t_{AS}		10	-	ns
Address hold time		t_{AH}		5	-	ns
Write data set up time		t_{DSW}		60	-	ns
Write data hold time		t_H		15	-	ns
Read data delay time		t_{DDR}		-	200	ns
Read data hold time		t_{DHR}		5	-	ns

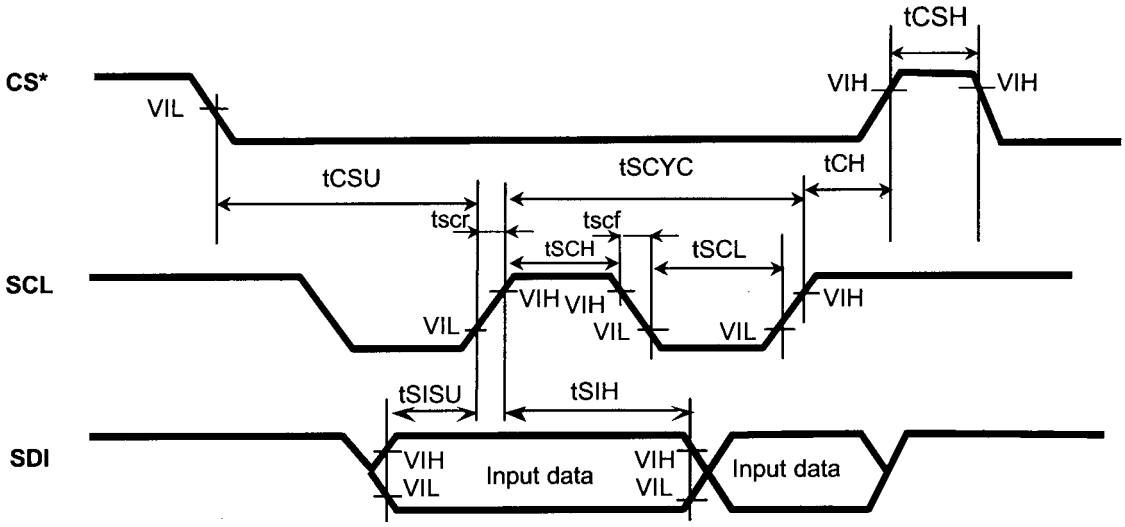


80-system Bus interface Timing Characteristics

Clock Synchronized Serial Interface Timing Characteristics
(Three lines system)

(Ta=25℃ VCC = 2.4~3.6V)

Item	Symbol	Conditions	MIN	MAX	Unit
Serial clock cycle time	t_{SCYC}		0.1	20	us
Serial clock high-level pulse width	t_{SCH}		40	-	ns
Serial clock low-level pulse width	t_{SCL}		40	-	ns
Serial clock rise/fall time	t_{scr}, t_{scf}		-	20	ns
Chip select set up time	t_{CSU}		20	-	ns
Chip select hold time	t_{CH}		200	-	ns
Serial input data set up time	t_{SISU}		40	-	ns
Serial input data hold time	t_{SIH}		40	-	ns
Chip select high-level pulse	t_{CSH}		100	-	ns

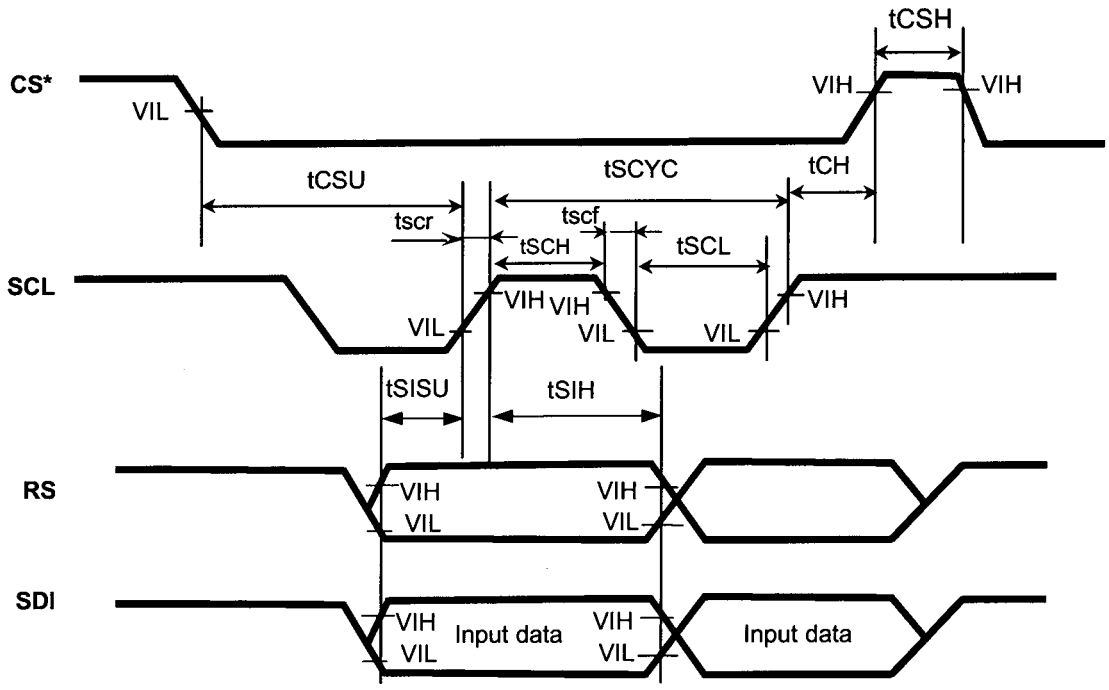


Clock Synchronized Serial Interface Timing Characteristics

Clock Synchronized Serial Interface Timing Characteristics
(Four lines system)

(Ta=25℃ VCC = 2.4~3.6V)

Item	Symbol	Conditions	MIN	MAX	Unit
Serial clock cycle time	t_{SCYC}		0.1	20	us
Serial clock high-level pulse width	t_{SCH}		40	-	ns
Serial clock low-level pulse width	t_{SCL}		40	-	ns
Serial clock rise/fall time	t_{scr}, t_{scf}		-	20	ns
Chip select set up time	t_{CSU}		20	-	ns
Chip select hold time	t_{CH}		200	-	ns
Serial input data set up time	t_{SISU}		40	-	ns
Serial input data hold time	t_{SIH}		40	-	ns
Chip select high-level pulse	t_{CSH}		100	-	ns



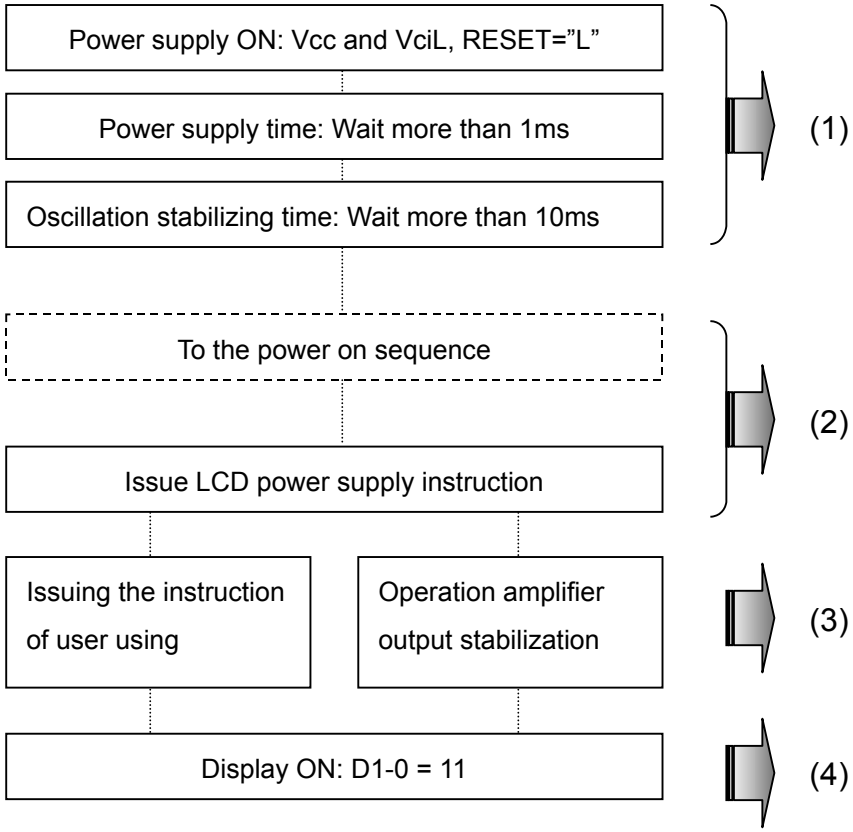
Clock Synchronized Serial Interface Timing Characteristics

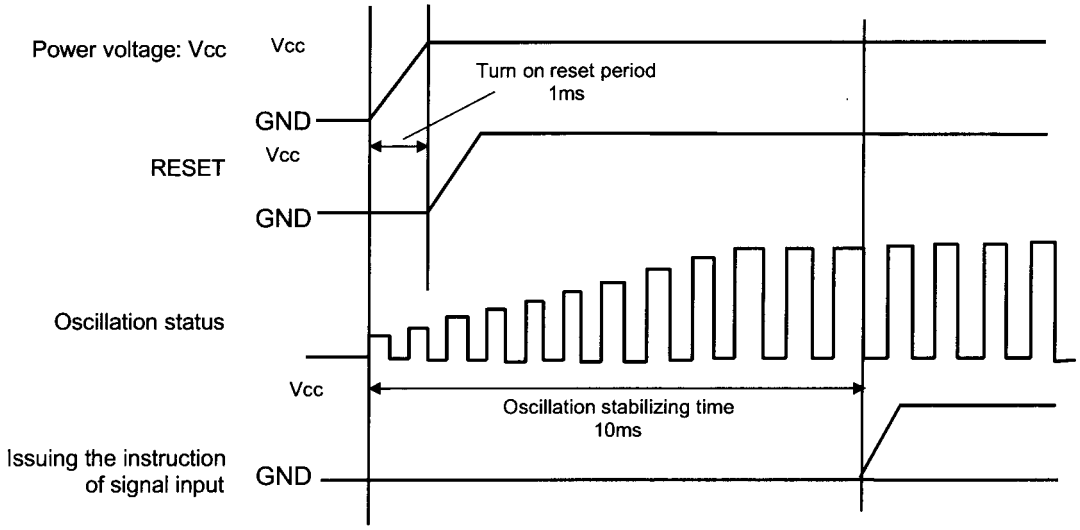
9 Timing Characteristics

Register No.	Register	Upper Code									Lower Code									Executing cycle
		R/W	RS	DB 15	DB 14	DB 13	DB 12	DB 11	DB 10	DB 9	DB 8	DB 7	DB 6	DB 5	DB 4	DB 3	DB 2	DB 1	DB 0	
IR	Index	0	0	*	*	*	*	*	*	*	*	*	ID6	ID5	ID4	ID3	ID2	ID1	ID0	0
SR	Status read	1	0	L7	L6	L5	L4	L3	L2	L1	L0	0	C6	C5	C4	C3	C2	C1	C0	0
R00h	Oscillation start	0	1	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	1	10ms
	Device code read	1	1	0	0	0	0	0	1	1	1	0	1	1	0	0	1	1	0	0
R01h	Driver output control	0	1	0	0	0	0	0	CSFT	CMS	SGS	0	0	4L	NL4	NL3	NL2	NL1	NL0	0
R02h	LCD opearating alternation control	0	1	0	0	0	0	0	RST	B/C	EOR	0	0	NW5	NW4	NW3	NW2	NW1	NW0	0
R03h	Power control (1)	0	1	0	0	BS2	BS1	BS0	0	BT1	BT0	DC2	DC1	DC0	AP2	AP1	AP0	SLP	STB	0
R04h	Contrast control	0	1	0	0	VRC NT	VR4	VR3	VR2	VR1	VR0	VRO N	CT6	CT5	CT4	CT3	CT2	CT1	CT0	0
R05h	Entry mode	0	1	SPR1	SPR0	0	0	0	0	HW M	0	0	0	I/D1	I/D0	AM	LG2	LG1	LG0	0
R06h	Conpare resistor	0	1	CP15	CP14	CP13	CP12	CP11	CP10	CP9	CP8	CP7	CP6	CP5	CP4	CP3	CP2	CP1	CP0	0
R07h	Display control	0	1	0	0	0	0	0	VLE2	VLE 1	SPT	0	0	0	0	B/W	REV	D1	D0	0
R08h	Flame cycle control	0	1	0	0	0	0	0	0	DIV1	DIV0	0	0	0	0	RTN 3	RTN 2	RTN 1	RTN 0	0
R0Ch	Power control (2)	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	VC2	VC1	VC0	0
R11h	Vertical scroll control	0	1	VL 27	VL 26	VL 25	VL 24	VL 23	VL 22	VL 21	VL 20	VL 17	VL 16	VL 15	VL 14	VL 13	VL 12	VL 11	VL 10	0
R14h	First screen operating position	0	1	SE 17	SE 16	SE 15	SE 14	SE 13	SE 12	SE 11	SE 10	SS 17	SS 16	SS 15	SS 14	SS 13	SS 12	SS 11	SS 10	0
R15h	Second screen operating position	0	1	SE 27	SE 26	SE 25	SE 24	SE 23	SE 22	SE 21	SE 20	SS 27	SS 26	SS 25	SS 24	SS 23	SS 22	SS 21	SS 20	0
R16h	Horizontal RAM address position	0	1	HEA 7	HEA 6	HEA 5	HEA 4	HEA 3	HEA 2	HEA 1	HEA 0	HAS 7	HAS 6	HSA 5	HAS 4	HAS 3	HAS 2	HAS 1	HAS 0	0
R17h	Vertical RAM address position	0	1	VEA 7	VEA 6	VEA 5	VEA 4	VEA 3	VEA 2	VEA 1	VEA 0	VSA 7	VSA 6	VSA 5	VSA 4	VSA 3	VSA 2	VSA 1	VSA 0	0
R20h	RAM write data mask	0	1	WM 15	WM 14	WM 13	WM 12	WM 11	WM 10	WM 9	WM 8	WM 7	WM 6	WM 5	WM 4	WM 3	WM 2	WM 1	WM 0	0
R21h	RAM address set	0	1	AD15-8 (Upper)								AD7-0 (Lower)								
R22h	RAM data write	0	1	Write Data (Upper)								Wrtie Data (Lower)								
	RAM data read	0	1	Read Data (Upper)								Read Data (Lower)								
R30h	Grayscale palette control (1)	0	1	0	0	0	PK 14	PK 13	PK 12	PK 11	PK 10	0	0	0	PK 04	PK 03	PK 02	PK 01	PK 00	0
R31h	Grayscale palette control (2)	0	1	0	0	0	PK 34	PK 33	PK 32	PK 31	PK 30	0	0	0	PK 24	PK 23	PK 22	PK 21	PK 20	0
R32h	Grayscale palette control (3)	0	1	0	0	0	PK 54	PK 53	PK 52	PK 51	PK 50	0	0	0	PK 44	PK 43	PK 42	PK 41	PK 40	0
R33h	Grayscale palette control (4)	0	1	0	0	0	PK 74	PK 73	PK 72	PK 71	PK 70	0	0	0	PK 64	PK 63	PK 62	PK 61	PK 60	0
R34h	Grayscale palette control (5)	0	1	0	0	0	PK 94	PK 93	PK 92	PK 91	PK 90	0	0	0	PK 84	PK 83	PK 82	PK 81	PK 80	0
R35h	Grayscale palette control (6)	0	1	0	0	0	PK 114	PK 113	PK 112	PK 111	PK 110	0	0	0	PK 104	PK 103	PK 102	PK 101	PK 100	0
R36h	Graysacle palette control (7)	0	1	0	0	0	PK 134	PK 133	PK 132	PK 131	PK 130	0	0	0	PK 124	PK 123	PK 122	PK 121	PK 120	0
R37h	Grayscale palette control (8)	0	1	0	0	0	PK 154	PK 153	PK 152	PK 151	PK 150	0	0	0	PK 144	PK 143	PK 142	PK 141	PK 140	0
R40h	E2PROM interface control (1)	0/1	1	0	0	0	TE	0	0	OP1	OP0	0	0	A5	A4	A3	A2	A1	A0	0
R41h	E2PROM interface control (2)	0	1	TD 15	TD 14	TD 13	TD 12	TD 11	TD 10	TD 9	TD 8	TD 7	TD 6	TD 5	TD 4	TD 3	TD 2	TD 1	TD 0	0
R42h	E2PROM interface control (3)	0	1	0	0	0	0	0	0	0	DPM	IDX 7	IDX 6	IDX 5	IDX 4	IDX 3	IDX 2	IDX 1	IDX 0	0

10 POWER ON/OFF SEQUENCE

10-1 Power ON Sequence





Note: When hardware reset is input during the power-off period, the D1-0 bits are cleared to "00" and SEG/COM output is forcibly lowered to the GND levels.

(1) Reset and power ON
(a) Power (VCC) ON by holding reset as low-level.
(b) Wait till power will be stabilize: more than 1 msec.
(c) Set 'RESET' terminal to high-level.
(d) Start oscillation: R00h=0001h;
(e) Wait time more than 10 msec for stabilizing the oscillation

(2) Power setting
(a) Power control 1
R03h=128Ch; BS2-0=010(1/9Bias),
BT1-0=10 (Vci1x2, Vci2x2.5)
DC2-0=100 (Boost1:16-divided clock,Boost2=32-divided clock)
AP2-0=011(Boost1,2=100%)
SLP=0(No sleep mode), STB=0(No sleep mode)

(b) Power Control 2
R0Ch=0000h; VC2-0=000 (Vci1=1.00xVcc),

(c) Contrast Control
R04h=1AE0h; VRCNT=0 (Connecting to an external thermistor circuit),
VR4-0=11010 (VREFH=VREFL x 7.5)
VRON=1 (Internal reference voltage)
CT6-0=1100000

(3) Mode setting
(a) Driver output control
R01h=0207h; CSFT=0,CMS=0 (COM84→COM83→COM82→…→COM21),
SGS (Segment driver direction: SEG1 to SEG288)
4L=0
NL4-0=00111 (1/64 Duty)

(b) LCD Driving waveform control
R02h=0000h; RST=0 (No reset),
B/C=0 (B pattern waveform) ,EOR=0 ,NW5-0=0

(c) Entry Mode
R05h=0230h; SPR1-0=00 (65,000 colors display),
HWM=1 (High speed),
I/D1-0=11(Horizontal: increment, Vertical: increment)
LG2-0=000 (Write mode)

(d) Compare resistor
R06h=0000h CP15-0=0000h

(e) Frame cycle control
R0Bh=0000h DIV1-0=00 (fosc/1),
RTN3-0=0000 (25+0 clock)

(f) 1st screen driving position
R14h=5300h SE17-10=53h, SS17-10=00h (COM1-84)

(g) Horizontal RAM address position
R16h=5F00h HEA7-0=5Fh (End address:SEG95)
HSA7-0=00h (Start address:SEG0)

(h) Vertical RAM address position
R17h=3F00h VEA7-0=3Fh (End address:COM63)
VSA7-0=00h (Start address:COM0)

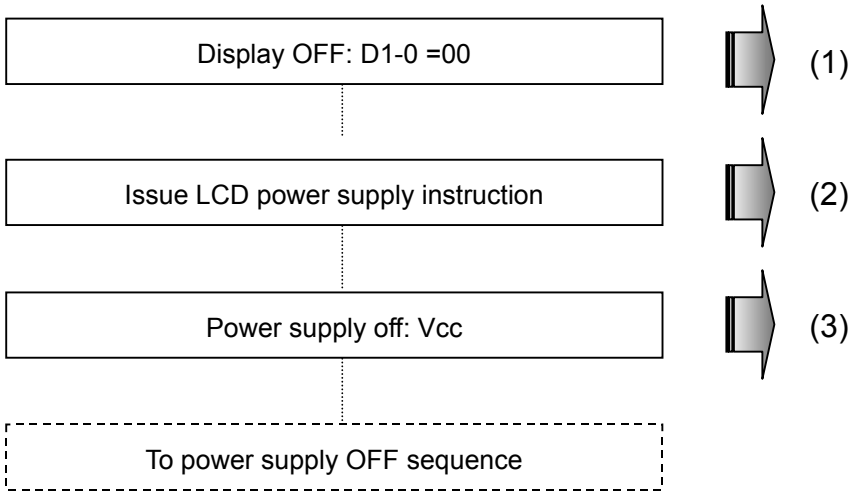
(i) RAM write data mask
R20h=0000h WM15-0=0000h (No mask)

(j) Display control
R07h=0002h VLE2-1=00h (No scroll)
SPT=0 (No screen division)
B/W=0, REV=0 (No all pixel on or off)

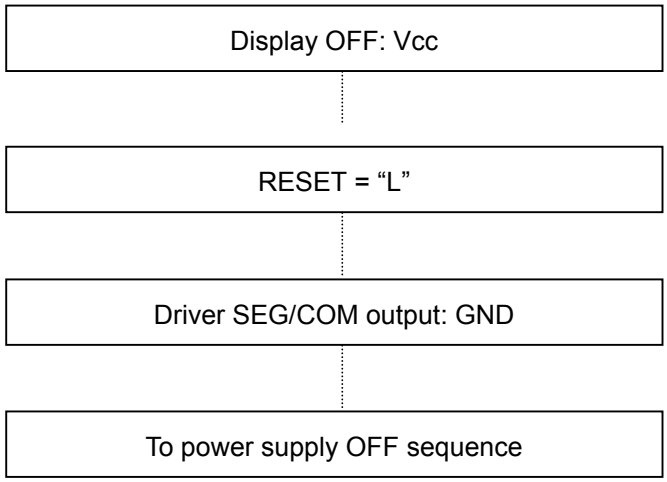
(4) Display ON
(a) Display control
R07h=0003h D1-0=11 (Display ON)

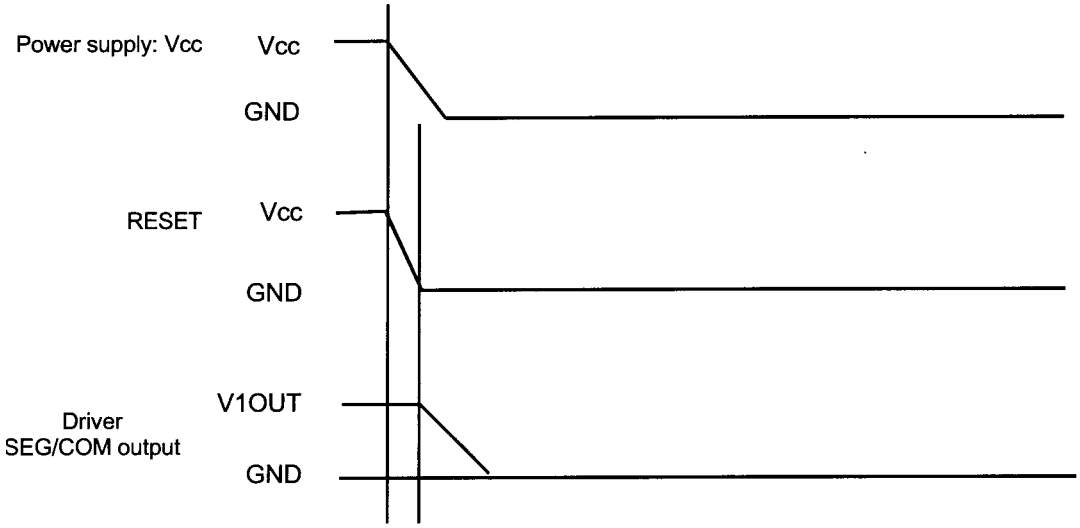
10-2 Power OFF Sequence

Normal operation



Emergency operation





Note: When executing hardware reset while power supply is off, D1-0 bit bemoces “00” at the timing of reaet.
Output level of SEG/COM is force to be set to GND level.

(1) Display OFF
R07h=0000h D1-0=00 (Display OFF)

(2) Power control
R03h=1280h BS2-0=010(1/9Bias),
BT1-0=10 (Vci1x2, Vci2x2.5)
DC2-0=100 (Boost1:16-divided clock,Boost2=32-divided clock)
AP2-0=000(Amplifier do not operate)
SLP=0(No sleep mode), STB=0(No sleep mode)

(3) Power supply OFF

11 Use precautions

11-1 Handling precautions

1) The polarizing plate may break easily so be careful when handling it. Do not touch, press or rub it with a hard-material tool like tweezers.
2) Do not touch the polarizing plate surface with bare hands so as not to make it dirty. If the surface or other related part of the polarizing plate is dirty, soak a soft cotton cloth or chamois leather in benzine and wipe off with it. Do not use chemical liquids such as acetone, toluene and isopropyl alcohol. Failure to do so may bring chemical reaction phenomena and deteriorations.
3) Remove any spit or water immediately. If it is left for hours, the suffered part may deform or decolorize.
4) If the LCD element breaks and any LC stuff leaks, do not suck or lick it. Also if LC stuff is stuck on your skin or clothing, wash thoroughly with soap and water immediately.

11-2 Installing precautions

1) The PCB has many ICs that may be damaged easily by static electricity. To prevent breaking by static electricity from the human body and clothing, earth the human body properly using the high resistance and discharge static electricity during the operation. In this case, however, the resistance value should be approx. 1MΩ and the resistance should be placed near the human body rather than the ground surface. When the indoor space is dry, static electricity may occur easily so be careful. We recommend the indoor space should be kept with humidity of 60% or more. When a soldering iron or other similar tool is used for assembly, be sure to earth it.
2) When installing the module and ICs, do not bend or twist them. Failure to do so may crack LC element and cause circuit failure.
3) To protect LC element, especially polarizing plate, use a transparent protective plate (e.g., acrylic plate, glass etc) for the product case.
4) Do not use an adhesive like a both-side adhesive tape to make LCD surface (polarizing plate) and product case stick together. Failure to do so may cause the polarizing plate to peel off.

11-3 Storage precautions

1) Avoid a high temperature and humidity area. Keep the temperature between 0°C and 35°C and also the humidity under 60%.
2) Choose the dark spaces where the product is not exposed to direct sunlight or fluorescent light.
3) Store the products as they are put in the boxes provided from us or in the same conditions as we recommend.

11-4 Operating precautions

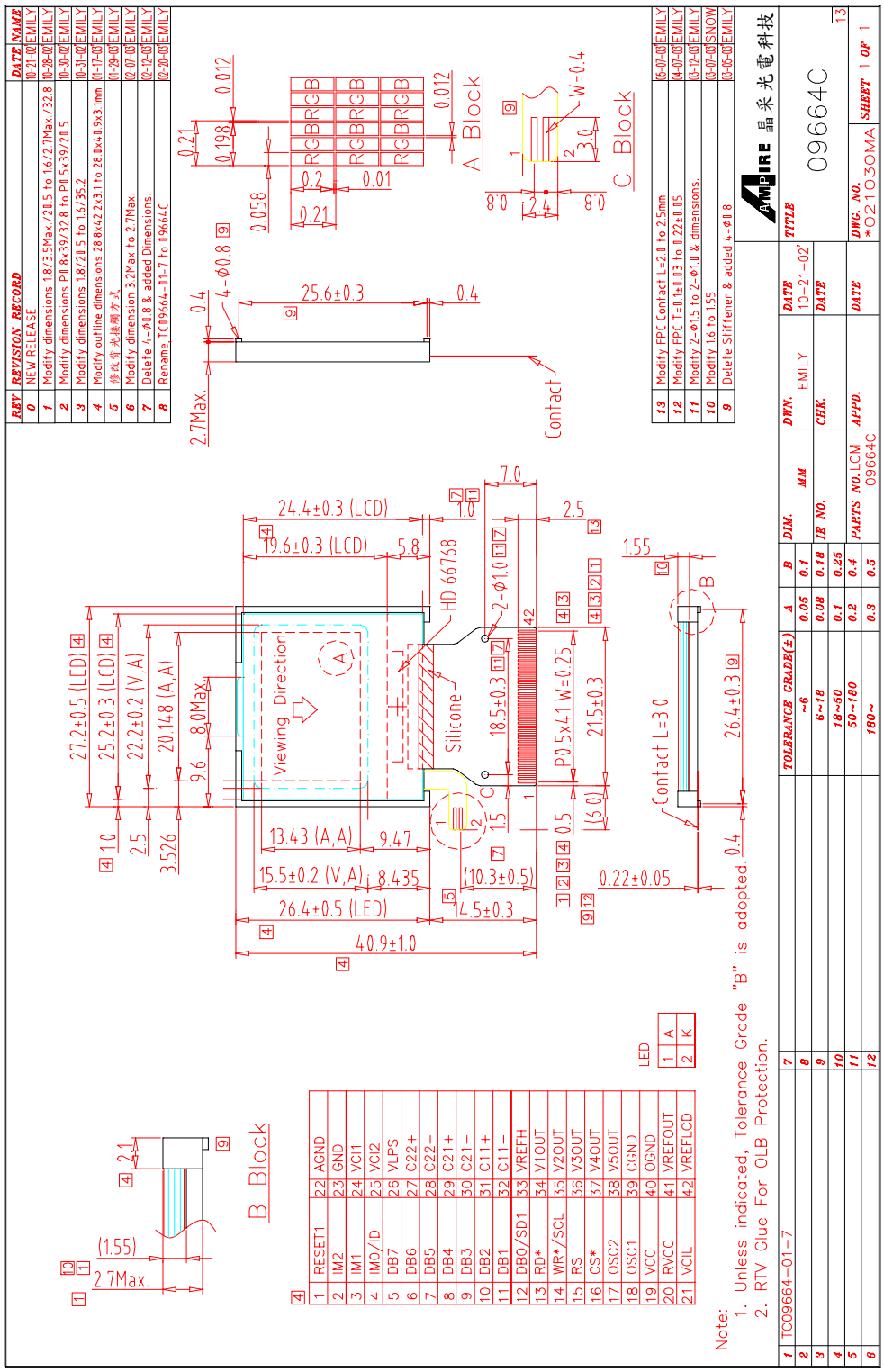
1) Do not boost the applied drive voltage abnormally. Failure to do so may break ICs. When applying power voltage, check the electrical features beforehand and be careful. Always turn off the power to the LC module controller before removing or inserting the LC module input connector. If the input connector is removed or inserted while the power is turned on, the LC module internal circuit may break.
2) The display response may be late if the operating temperature is under the normal standard, and the display may be out of order if it is above the normal standard. But this is not a failure; this will be restored if it is within the normal standard.
3) The LCD contrast varies depending on the visual angle, ambient temperature, power voltage etc. Obtain the optimum contrast by adjusting the LC dive voltage.
4) When carrying out the test, do not take the module out of the low-temperature space suddenly. Failure to do so will cause the module condensing, leading to malfunctions.
5) Make certain that each signal noise level is within the standard (L level: 0.2Vdd or less and H level: 0.8Vdd or more) even if the module has functioned properly. If it is beyond the standard, the module may often malfunction. In addition, always connect the module when making noise level measurements.
6) The CMOS ICs are incorporated in the module and the pull-up and pull-down function is not adopted for the input so avoid putting the input signal open while the power is ON.

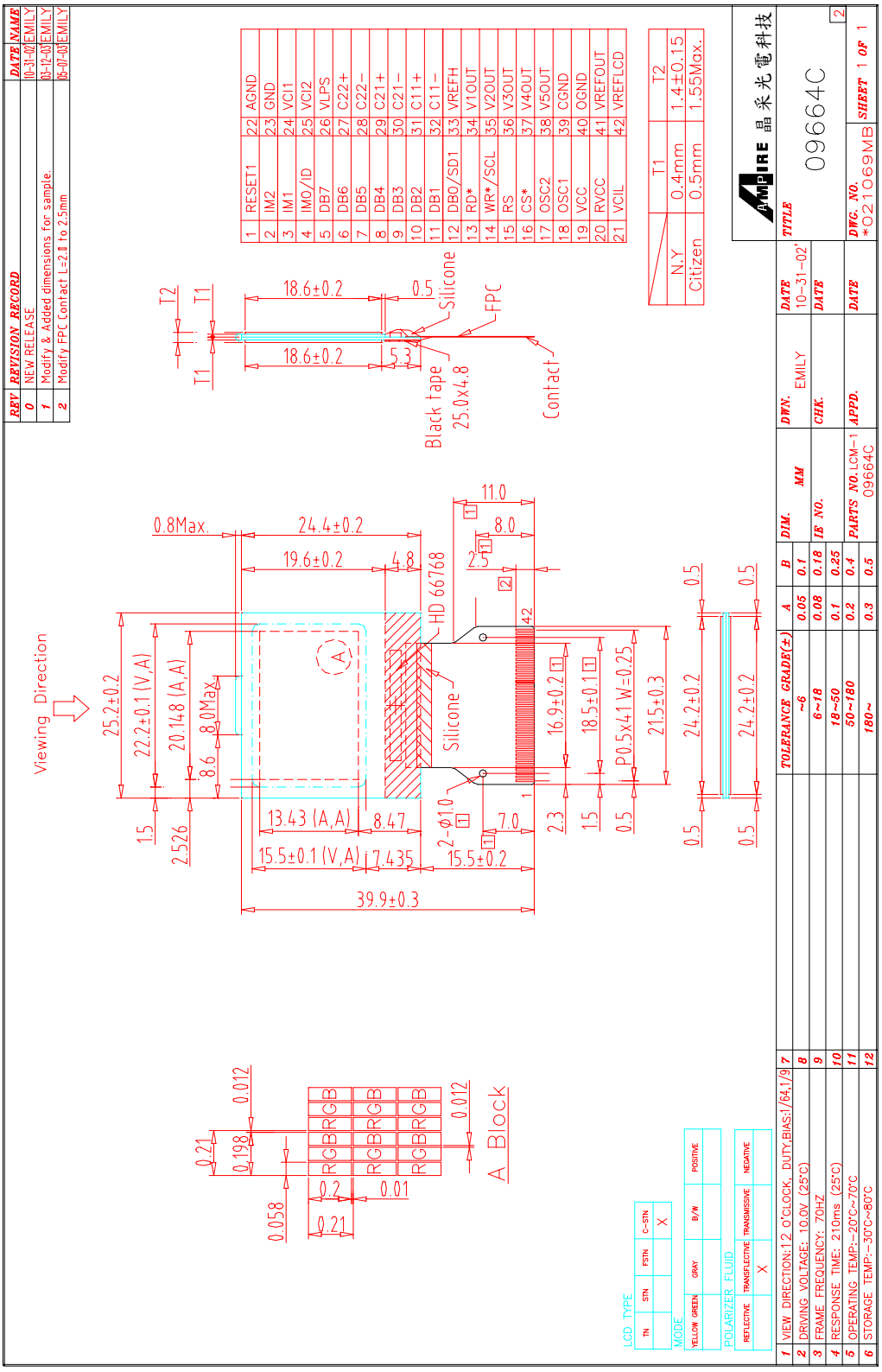
7) The characteristic of the semiconductor element changes when it is exposed to light emissions, therefore ICs on the LCD may malfunction if they receive light emissions. To prevent these malfunctions, design and assemble ICs so that they are shielded from light emissions.
8) Crosstalk occurs because of characteristics of the LCD. In general, crosstalk occurs when the regularized display is maintained. Also, crosstalk is affected by the LCD drive voltage. Design the contents of the display, considering crosstalk.

11-5 Other

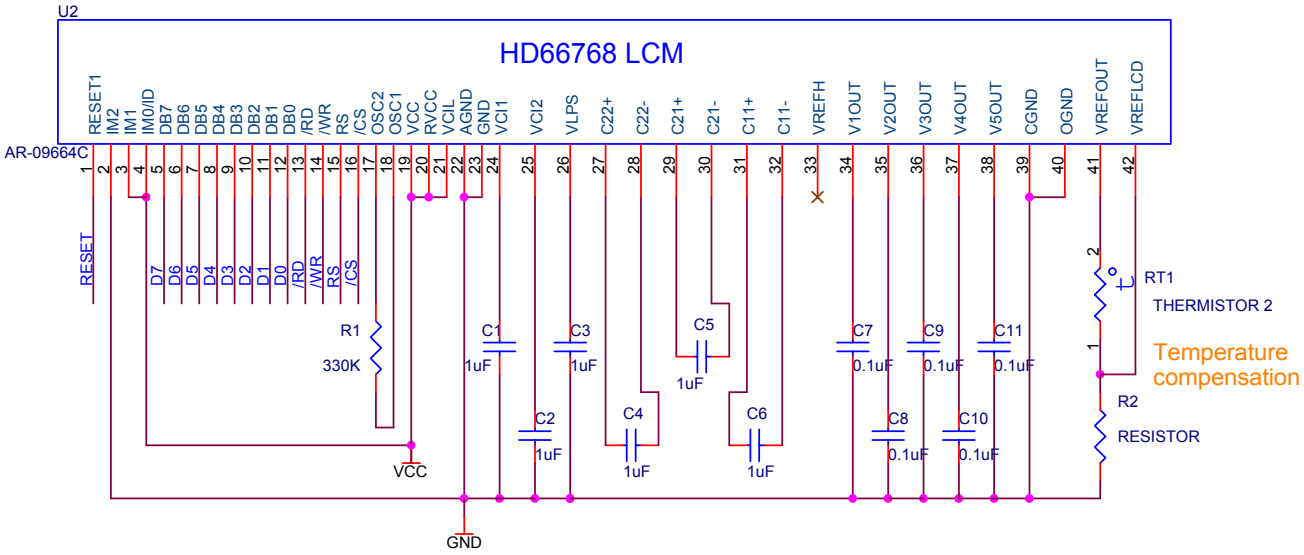
1) Do not disassemble or take the LC module into pieces. The LC modules once disassembled or taken into pieces are not the guarantee articles.
2) The residual image may exist if the same display pattern is shown for hours. This residual image, however, disappears when another display pattern is shown or the drive is interrupted and left for a while. But this is not a problem on reliability.

12 OUTLINE DIMENSION




REV. REVISION RECORD DATE NAME
0 NEW RELEASE 10-31-02 EMILY
1 Modify & Added dimensions for sample. 03-12-03 EMILY
2 Modify FPC Contact L=2.8 to 2.5mm 06-07-03 EMILY
1 RESET1 22 AGND
2 IM2 23 GND
3 IM1 24 VCI1
4 IMO/ID 25 VCI2
5 DB7 26 VLPS
6 DB6 27 C22+
7 DB5 28 C22-
8 DB4 29 C21+
9 DB3 30 C21-
10 DB2 31 C11+
11 DB1 32 C11-
12 DB0/SD1 33 VREFH
13 RD* 34 V1OUT
14 WR*/SCL 35 V2OUT
15 RS 36 V3OUT
16 CS* 37 V4OUT
17 OSC2 38 V5OUT
18 OSC1 39 CGND
19 VCC 40 OGND
20 RVCC 41 VREFOUT
21 VCIL 42 VREFLCD
T1 T2
N.Y 0.4mm 1.4±0.15
Citizen 0.5mm 1.55Max.
Viewing Direction
0.8Max.
24.4±0.2
19.6±0.2
HD 66768
Silicone
11.0
8.0
25.2±0.2
22.2±0.1 (V,A)
20.14 8 (A,A)
8.6 8.0Max
13.43 (A,A)
8.47
15.5±0.1 (V,A)
7.435
15.5±0.2
2-φ1.0
7.0
16.9±0.2
18.5±0.1
P0.5x41 W=0.25
21.5±0.3
39.9±0.3
1.5
2.526
2.3
0.5
24.2±0.2
T2
T1
18.6±0.2
0.5
Silicone
FPC
Black tape
25.0x4.8
Contact
A Block
0.012
0.21
0.198
RGBRGB
0.058
0.2
0.01
LCD TYPE
TN STN FSTN C-STN
MODE
YELLOW GREEN GRAY B/W POSITIVE
POLARIZER FLUID
REFLECTIVE TRANSFLECTIVE TRANSMISSIVE NEGATIVE
1 VIEW DIRECTION:12 O'CLOCK, DUTY,BIAS:1/64,1/9
2 DRIVING VOLTAGE: 10.0V (25°C)
3 FRAME FREQUENCY: 70HZ
4 RESPONSE TIME: 210ms (25°C)
5 OPERATING TEMP:-20°C~70°C
6 STORAGE TEMP:-30°C~80°C
TOLERANCE GRADE(±) A B
~6 0.05 0.1
6~18 0.08 0.18
18~50 0.1 0.35
50~180 0.2 0.4
180~ 0.3 0.5
DIM. MM
IE NO.
PARTS NO.LCM-1 09664C
DWN. EMILY DATE 10-31-02
CHK. DATE
APPD. DATE
TITTLE 09664C
DWG. NO. *021069MB
SHEET 1 OF 1
晶采光電科技

13 APPLICATION CIRCUIT



Data Bus for 8-bit, 80 series MPU

SAFETY CAUTIONS Strictly observe the following	
WARNING	● Always turn off the power when installing or removing this product. Otherwise, you may get an electrical shock.
CAUTION	● Do not cover this product with paper or cloth or make it approach to flammable. Failure to do so may cause fire. ● Do not fall, hit, force or damage this product. Failure to do so may cause injury. ● When handling this product, keep it away from water and oil and do not handle with dirty hands or gloves. Failure to do so may cause breakage. ● Do not paint this product. Failure to do so may lead to overheat. ● Do not use this product in rain and water dropping and high humidity spaces. Failure to do so may cause breakage.

Request and notice about the contents of the descriptions in these product specifications and the use of the products

(1). If the products described in these product specifications are applicable to the article “Foreign Exchange and Foreign Trade Control Act,” they must receive permission by the Japanese Government when they are exported or taken overseas.

(2). The products are intended for general applications — general electronic equipment (such as office equipment, communication equipment, measurement equipment and home appliances). If the special quality and reliability are required and the special applications (aircraft and space equipment, traffic-control equipment, combustion equipment, life-maintaining equipment, safety equipment etc) are planned — there is the possibility of danger that the human life will be threatened and the human body will be harmed when equipment breakdown or erroneous operation occurs — or any idea of use other than general applications is conceived, the customer shall be requested to ask us for this matter in advance.

(3). When developing the design, keep the spec items within the guarantee range such as the maximum ratings, operating power voltage and radiations. If adopted beyond the guarantee range, we will not be liable for any equipment failure resulting from the use of the improper quality product.