

Reference Document For LCD Module

<i>Product No</i>	172BA00
<i>Document No</i>	SPC172BA00V100
<i>Version</i>	<i>Ver.1.00</i>



REPRO ELECTRONICS CORPORATION

Maruwa Building 2F,2-2-19
Sotokanda,Chiyoda-ku,Tokyo 1001-0021 Japan
TEL: +81-3-3255-9600 / FAX: +81-50-3488-4718

Revision History

Version	Date	by	Description	Comments
1.00	18/Nov/2008	Jeffrey	Initial Version	

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1. General Specifications

Table1-1 General specifications description

Items	Specification	Unit
Panel Type	TFD	-
Display size(Diagonal)	2.0	inch
Dot Configuration	132×RGB(Horizontal) ×162(Vertical)	Dot
Guaranteed appearance area(Panel display surface)	32.5(Horizontal) × 39.8(Vertical)	mm
Module External Dimensions	42.5(W) ×58.5 (H) × 4.4(D)	mm
Dot Pitch	0.08(Horizontal) × 0.24(Vertical)	mm
Colors	4096 colors(R-4bit, G-4bit, B-4bit)	-
Pixel Array	Red, Green, Blue stripe array	-
Signal lines	14, except Power and GND	
Power lines	6 (Vcc 2,GND: 4)	
Backlight LED lines	2 (LED+ 1, LED- 1)	
Backlight LED current	typical 15mA each	
Weight	10	G
Interface	8 Bit MPU	

2. Outline Structure

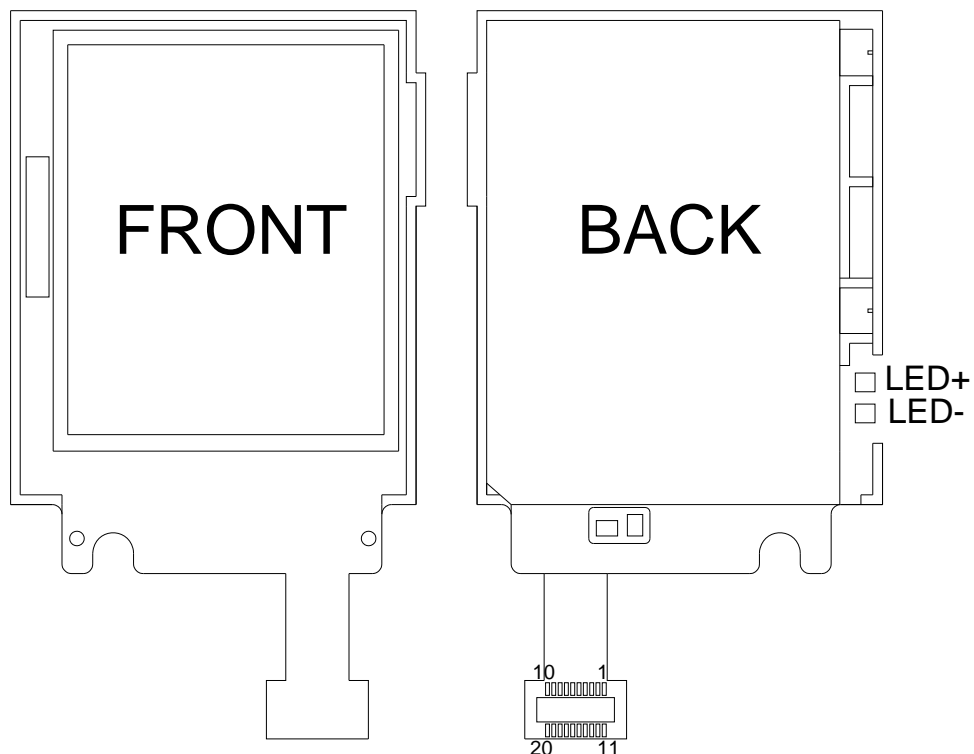


Fig. 1 LCD outline and I/F connector

3. Interface Signals

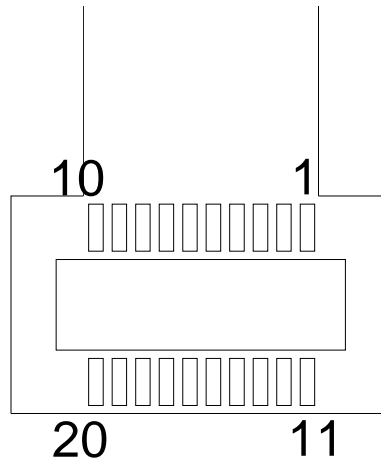


Fig. 2 LCD signals interface

Table 3-1 Signal description

Pin	Symbol	Description	I/O	Pin	Symbol	Description	I/O
1	GND	Ground		11	GND	Ground	
2	D0	Data signal 0	IO	12	VSYNC	VSYNC signal	O
3	D1	Data signal 1	IO	13	*CS	Chip select	I
4	D2	Data signal 2	IO	14	RS	Select the register or the data	I
5	D3	Data signal 3	IO	15	Vcc	Logic Power (+3.0V)	
6	D4	Data signal 4	IO	16	Vcc	Logic Power (+3.0V)	
7	D5	Data signal 5	IO	17	*WR	Write signal	I
8	D6	Data signal 6	IO	18	RESET	Reset signal	I
9	D7	Data signal 7	IO	19	RD	Read signal	I
10	GND	Ground		20	GND	Ground	

Note: I Input
O Output

4. Electrical Specification and Environmental Condition

(4-1) Electrical Maximum Rating

Table 4-1 Electrical maximum rating

Items	Min.	Max.	Unit	Remarks
Logic Supply Voltage	-0.3	+3.0	V	Reference of voltage is GND(=0V)
Signal Voltage	-0.3	Vcc+0.3	V	

(4-2) Appropriate use condition

Table 4-2 Appropriate use condition

GND = 0V, Ta = 25

Items	Symbol	Min.	Typ.	Max.	Unit	Remarks
Supply Voltage	Vcc	2.9	3.0	3.0	V	For System Logic interface
	Icc	-	3.20	-	mA	Logic power consumption current(during operation)
Signal "H" Level		0.8Vcc	-	Vcc	V	
Signal "L" Level		0	-	0.2Vcc	V	

(4-3) Backlight driving

The backlight system has 4 LEDs.

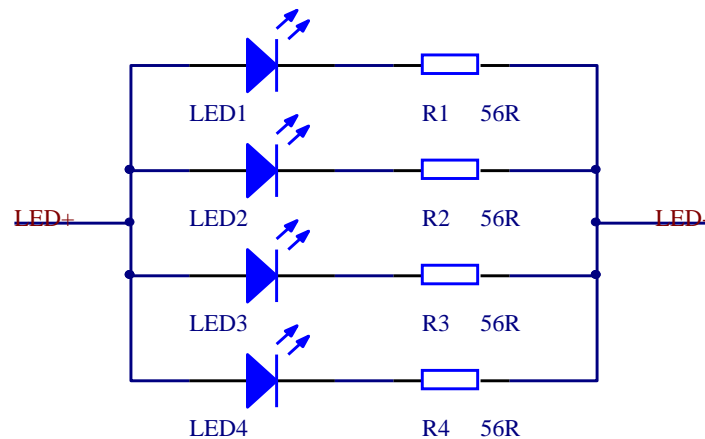


Fig. 3 Backlight connections

Table 4-3 Backlight electrical specification

Parameter	Min.	Typ.	Max.	Unit	Remarks
Rated Voltage	-	6.0	-	V	
Rated Current	-	15	-	mA	

5. Timing Chart

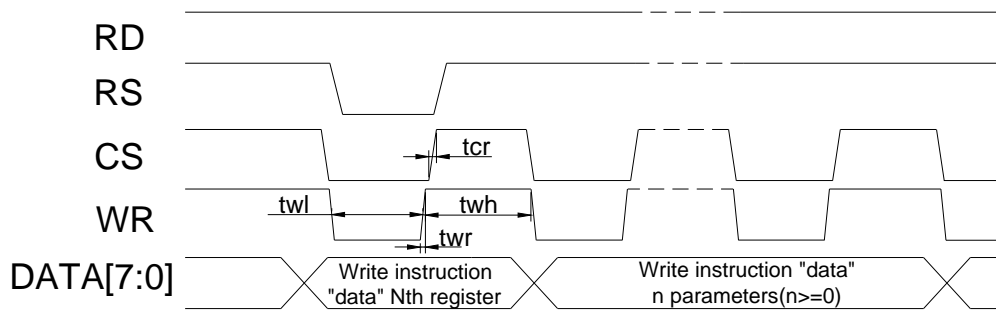


Fig. 4 The timing chart to write an instruction

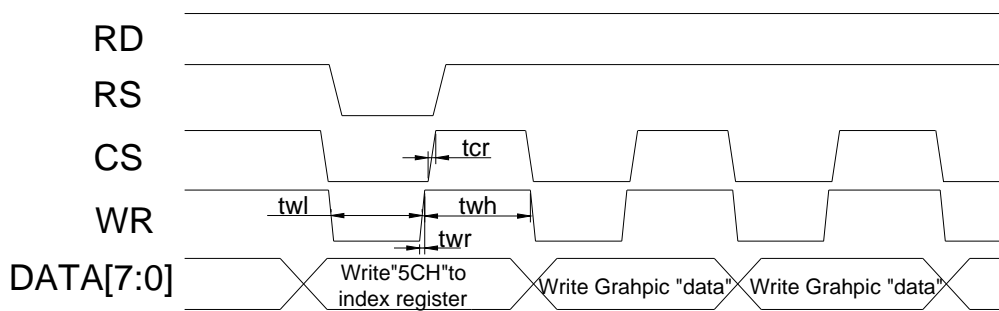


Fig. 5 The timing chart to write GRAM

Table 5-1 Timing chart

Description	Symbol	Typical Value(ns)
Write control signal pulse width	twl	90
	twh	100
WR setup time	twr	25
CS setup time	tcr	25

6. Input signals, basic display colors and gray scale

Table 6-1 Input graphic data (8-bits system interface (4096 colors))

INPUT DATA	First data								Second data								Third data							
Data Bit	D 7	D 6	D 5	D 4	D 3	D 2	D 1	D 0	D 7	D 6	D 5	D 4	D 3	D 2	D 1	D 0	D 7	D 6	D 5	D 4	D 3	D 2	D 1	D 0
graphic Bit	R 3	R 2	R 1	R 0	G 3	G 2	G 1	G 0	B 3	B 2	B 1	B 0	R 3	R 2	R 1	R 0	G 3	G 2	G 1	G 0	B 3	B 2	B 1	B 0

Table 6-2 Input instruction data

INPUT DATA	data							
Data Bit	D7	D6	D5	D4	D3	D2	D1	D0
Instruction Bit	IB 7	IB 6	IB 5	IB 4	IB 3	IB 2	IB 1	IB 0

7. Register function description

(1) Horizontal RAM address position (R15H)

Vertical RAM address position (R75H)

R/W	RS	IB7	IB6	IB5	IB4	IB3	IB2	IB1	IB0
W	1	HSA7	HSA6	HSA5	HSA4	HSA3	HSA2	HSA1	HSA0
W	1	'0'	'0'	'0'	'0'	'0'	'0'	'0'	'0'
W	1	HEA7	HEA6	HEA5	HEA4	HEA3	HEA2	HEA1	HEA0
W	1	'0'	'0'	'0'	'0'	'0'	'0'	'0'	'0'

HSA7- 0/HEA7- 0: Specify the horizontal start/end positions of a window for access in memory. Data can be written to the GRAM from the address specify by HEA7-0 from the address specified by HSA7-0. Note that an address must be set before RAM is written to. Ensure $03h \leq HSA7-0 \leq HEA7-0 \leq 0C8h$.

Note: The LCD is 4096 colors, two pixels need three bytes.

R/W	RS	IB7	IB6	IB5	IB4	IB3	IB2	IB1	IB0
W	1	VSA7	VSA6	VSA5	VSA4	VSA3	VSA2	VSA1	VSA0
W	1	VEA7	VEA6	VEA5	VEA4	VEA3	VEA2	VEA1	VEA0

VSA7- 0/VEA7- 0: Specify the vertical start/end positions of a window for access in memory. Data can be written to the GRAM from the address specified by VEA8-0 from the address specify by VSA8-0. Note that an address must be set before RAM is written to. Ensure $01h \leq VSA7-0 \leq VEA7-0 \leq 0A2h$.

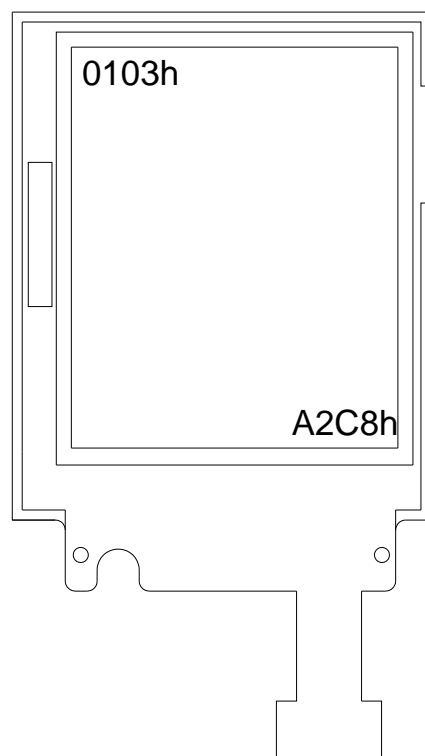


Fig.6 The window address in memory

(2)Entry Mode (R0BCH)

R/W	RS	IB7	IB6	IB5	IB4	IB3	IB2	IB1	IB0
W	1	0	0	0	0	RGB	0	0	0

BGR: Reverses the order of RGB dots to BGR when writing “1” to this bit.

8. Recommended Sequences**(8-1) Initial Sequence**

Step	Register	data
0	Power on and Reset	
1	R94h	*
2	Delay 25ms	
3	R0C6h	98h
4	Delay 98ms	
5	R0C6h	42h
6	R0CAh	4Fh
7		00h
8		1Ah
9		00h
10		51h
11		51h
12		00h
13	R0CBh	0Dh
14		1Dh
15		28h
16		30h
17		35h
18		39h
19		3Dh
20		40h
21		43h
22		45h
23		47h
24		49h
25		4Bh
26		4Dh
27		64h
28	R0AAh	00h

29		51h
30		51h
31		03h
32	R0ABh	00h
33	R75h	01h
34		A2h
35	R15h	03h
36		00h
37		C8h
38		00h
39	R0BCh	08h
40	R0A6h	*
41	R0A9h	*
42	Delay 363ms	
43	R5Ch	*
44	Clean screen	
45	R0AFh	*
46	R75h	02h
47		A2h
48	Delay 343ms	
49	R0C6h	38h
50	Delay 148ms	
51	R94h	*
52	Delay 25ms	
53	R0C6h	98h
54	Delay 98ms	
55	R0C6h	42h
56	R0CAh	4Fh
57		00h
58		1Ah
59		00h
60		51h
61		51h
62		00h
63	R0CBh	0Dh
64		1Dh
65		28h
66		30h
67		35h
68		39h

69		3Dh
70		40h
71		43h
72		45h
73		47h
74		49h
75		4Bh
76		4Dh
77		64h
78	R0AAh	00h
79		51h
80		51h
81		03h
82	R0ABh	00h
83	R75h	01h
84		A2h
85	R15h	03h
86		00h
87		C8h
88		00h
89	R0BCh	08h
90	R0A6h	*
91	R0A9h	*
92	Delay 363ms	
93	R5Ch	*
94	Send graphic data	

(8-2) Power off Sequence

Step	Register	Data
1	R94h	*
2	Delay 25ms	
3	R0C6h	98h
4	Delay 98ms	
5	R0C6h	42h
6	R0CAh	4Fh
7		00h
8		1Ah
9		00h
10		51h

11		51h
12		00h
13	R0CBh	0Dh
14		1Dh
15		28h
16		30h
17		35h
18		39h
19		3Dh
20		40h
21		43h
22		45h
23		47h
24		49h
25		4Bh
26		4Dh
27		64h
28	R0AAh	00h
29		51h
30		51h
31		03h
32	R0ABh	00h
33	R75h	01h
34		A2h
35	R15h	03h
36		00h
37		C8h
38		00h
39	R0BCh	08h
40	R0A6h	*
41	R0A9h	*
42	R0AEh	*
43	Delay 365ms	
44	R095h	*
45	Power off	

9. Reference code

(9-1)Initial code

```
LCD_Command(0x94);
Delay1ms(25);
LCD_Command(0xC6);
LCD_Data(0x98);
Delay1ms(98);
LCD_Command(0xC6);
LCD_Data(0x42);
LCD_Command(0xCA);
LCD_Data(0x4F);
LCD_Data(0x00);
LCD_Data(0x1A);
LCD_Data(0x00);
LCD_Data(0x51);
LCD_Data(0x51);
LCD_Data(0x00);
LCD_Command(0xCB);
LCD_Data(0x0D);
LCD_Data(0x1D);
LCD_Data(0x28);
LCD_Data(0x30);
LCD_Data(0x35);
LCD_Data(0x39);
LCD_Data(0x3D);
LCD_Data(0x40);
LCD_Data(0x43);
LCD_Data(0x45);
LCD_Data(0x47);
LCD_Data(0x49);
LCD_Data(0x4B);
LCD_Data(0x4D);
LCD_Data(0x64);
LCD_Command(0xAA);
LCD_Data(0x00);
LCD_Data(0x51);
LCD_Data(0x51);
LCD_Data(0x03);
LCD_Command(0xAB);
LCD_Data(0x00);
LCD_Command(0x75);
```

```
LCD_Data(0x01);
LCD_Data(0xA2);
LCD_Command(0x15);
LCD_Data(0x03);
LCD_Data(0x00);
LCD_Data(0xC8);
LCD_Data(0x00);
LCD_Command(0xBC);
LCD_Data(0x08);
LCD_Command(0xA6);
LCD_Command(0xA9);
Delay1ms(363);
LCD_Command(0x5C);
    for (i=0; i<32076; i++) //132*162/2*3
        LCD_Data(0xFF);
LCD_Command(0xAF);
LCD_Command(0x75);
LCD_Data(0x02);
LCD_Data(0xA2);
Delay1ms(343);
LCD_Command(0xC6);
LCD_Data(0x38);
Delay1ms(148);
LCD_Command(0x94);
Delay1ms(25);
LCD_Command(0xC6);
LCD_Data(0x98);
Delay1ms(98);
LCD_Command(0xC6);
LCD_Data(0x42);
LCD_Command(0xCA);
LCD_Data(0x4F);
LCD_Data(0x00);
LCD_Data(0x1A);
LCD_Data(0x00);
LCD_Data(0x51);
LCD_Data(0x51);
LCD_Data(0x00);
LCD_Command(0xCB);
LCD_Data(0x0D);
LCD_Data(0x1D);
LCD_Data(0x28);
```

```
LCD_Data(0x30);
LCD_Data(0x35);
LCD_Data(0x39);
LCD_Data(0x3D);
LCD_Data(0x40);
LCD_Data(0x43);
LCD_Data(0x45);
LCD_Data(0x47);
LCD_Data(0x49);
LCD_Data(0x4B);
LCD_Data(0x4D);
LCD_Data(0x64);
LCD_Command(0xAA);
LCD_Data(0x00);
LCD_Data(0x51);
LCD_Data(0x51);
LCD_Data(0x03);
LCD_Command(0xAB);
LCD_Data(0x00);
LCD_Command(0x75);
LCD_Data(0x01);
LCD_Data(0xA2);
LCD_Command(0x15);
LCD_Data(0x03);
LCD_Data(0x00);
LCD_Data(0xC8);
LCD_Data(0x00);
LCD_Command(0xBC);
LCD_Data(0x08);
LCD_Command(0xA6);
LCD_Command(0xA9);
Delay1ms(363);
LCD_Command(0x5C);
for (i=0; i<32076; i++) //132*162/2*3
    LCD_Data(0xFF);
```

(9-2) Power off code

```
LCD_Command(0x94);
Delay1ms(25);
LCD_Command(0xC6);
LCD_Data(0x98);
Delay1ms(98);
LCD_Command(0xC6);
LCD_Data(0x42);
LCD_Command(0xCA);
LCD_Data(0x4F);
LCD_Data(0x00);
LCD_Data(0x1A);
LCD_Data(0x00);
LCD_Data(0x51);
LCD_Data(0x51);
LCD_Data(0x00);
LCD_Command(0xCB);
LCD_Data(0x0D);
LCD_Data(0x1D);
LCD_Data(0x28);
LCD_Data(0x30);
LCD_Data(0x35);
LCD_Data(0x39);
LCD_Data(0x3D);
LCD_Data(0x40);
LCD_Data(0x43);
LCD_Data(0x45);
LCD_Data(0x47);
LCD_Data(0x49);
LCD_Data(0x4B);
LCD_Data(0x4D);
LCD_Data(0x64);
LCD_Command(0xAA);
LCD_Data(0x00);
LCD_Data(0x51);
LCD_Data(0x51);
LCD_Data(0x03);
LCD_Command(0xAB);
LCD_Data(0x00);
LCD_Command(0x75);
LCD_Data(0x01);
LCD_Data(0xA2);
```

```

LCD_Command(0x15);
LCD_Data(0x03);
LCD_Data(0x00);
LCD_Data(0xC8);
LCD_Data(0x00);
LCD_Command(0xBC);
LCD_Data(0x08);
LCD_Command(0xA6);
LCD_Command(0xA9);
LCD_Command(0xAE);
Delay1ms(365);
LCD_Command(0x95);

```

(9-3) Set windows function

```

Void SetWindow(unsigned int x0, unsigned int y0, unsigned int x1, unsigned int y1,)
{
    LCD_Command(0x75);
    LCD_Data(0x01+y0);           //0x01
    LCD_Data(0x01+y1);           //0xA2
    LCD_Command(0x15);
    LCD_Data(0x03+(x0+1)/2*3);    //0x03
    LCD_Data(0x00);               //0x00
    LCD_Data(0x03+(x1+1)/2*3-1); //0xC8
    LCD_Data(0x00);               //0x00
}

```

Note: x0, x1 Specify the horizontal start/end positions. Ensure $00 \leq x0 \leq x1 \leq 131$.

The LCD is 4096 colors, two pixels need three bytes. So one time display two pixels.

y0, y1 Specify the vertical start/end positions. Ensure $00 \leq y0 \leq y1 \leq 161$

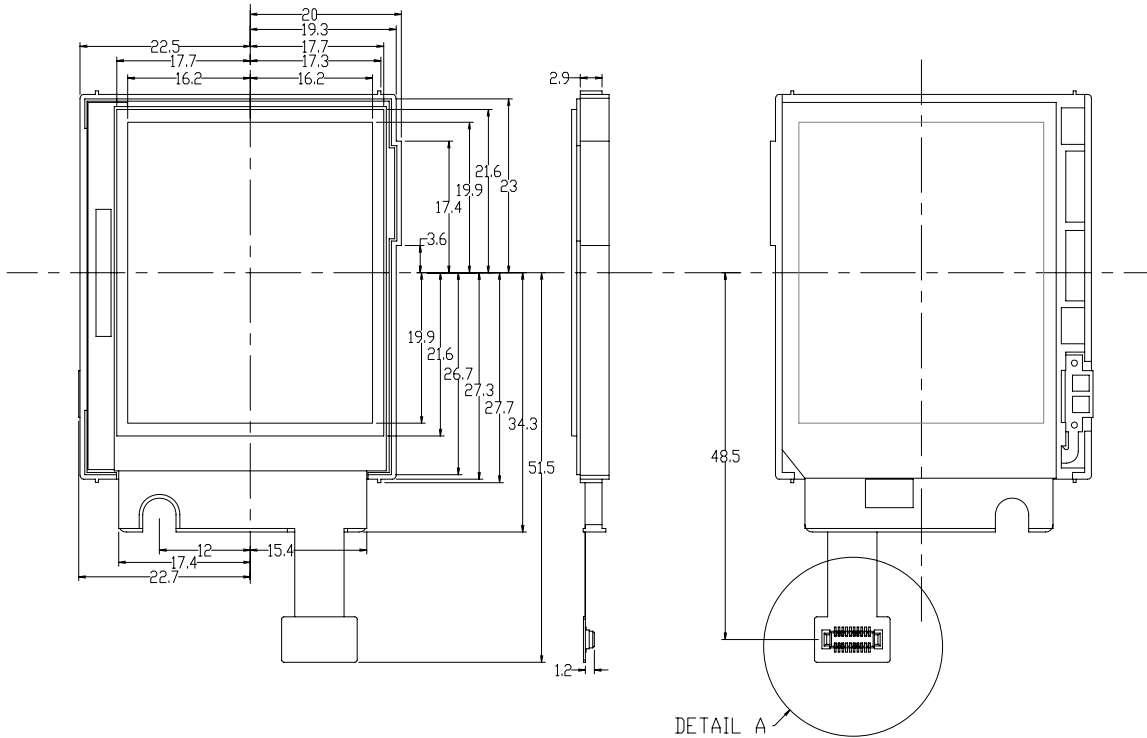
(9-4) Sub Function Description

- (1) void Delay1ms (unsigned int time)
Function: Delay time.
- (2) void LCD_Command (unsigned int reg)
Function: Send the register of LCD driver.
Para1: reg -----the register of LCD driver
- (3) void LCD_Data (unsigned int data)
Function: Send data to registers or ram.
Para1: data -----that will be sent.

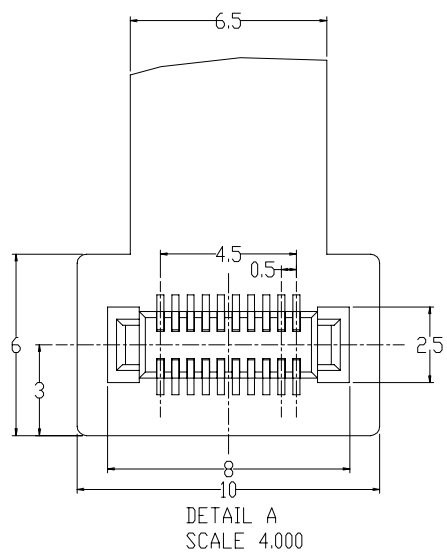
A



B



C



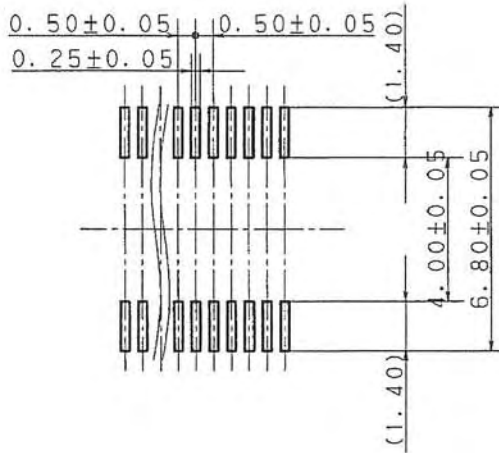
D

				172BA00		172BA00	
						View	Scale
Marker	Number	Name	Date	Material			1.000
Designed		Date	25-Jun-09				1/1
Checked		Tolerance	± 0.1	REPRO ELECTRONICS			
Approved		Edition	1.0				
Technics		Unit	mm				

プリント基板及びメタルマスク開口率の推奨仕様図

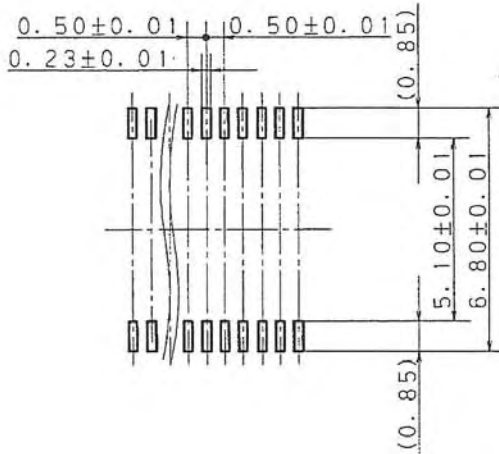
対象商品：狭ピッチコネクタP5KFソケット (品番：AXK5F○○○○○)

プリント基板推奨加工図 (マウントパット配置図)

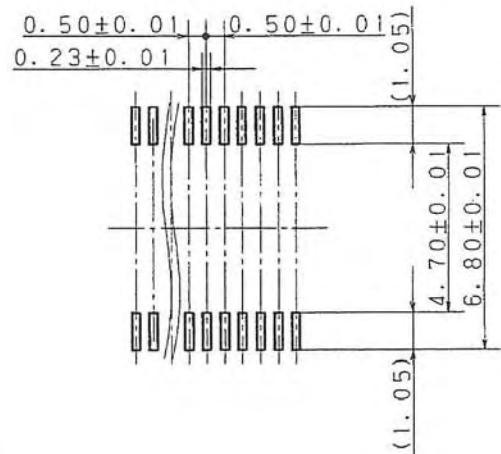





メタルマスク開口部推奨加工図

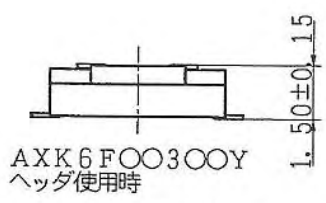
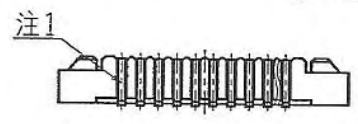
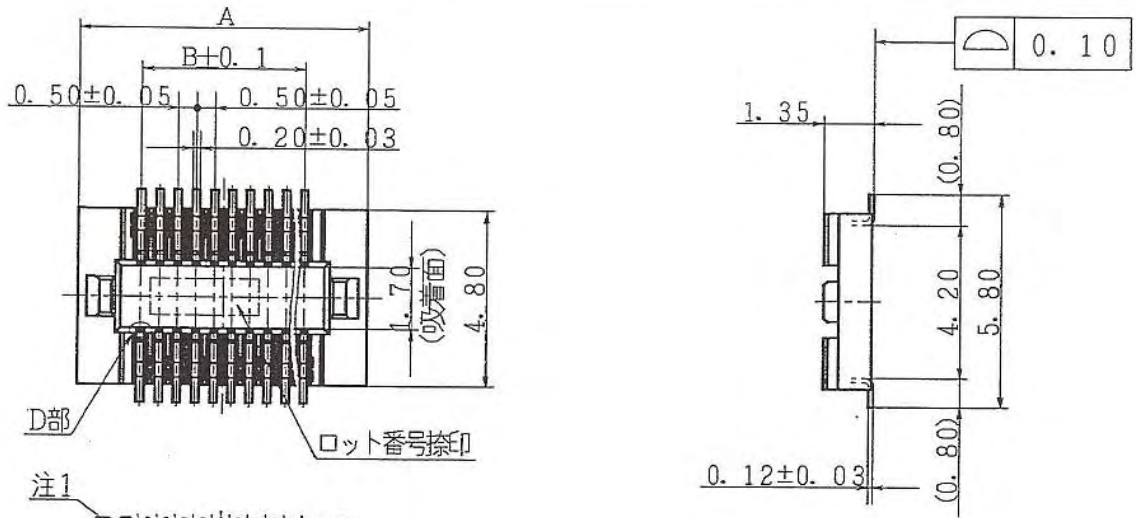
メタルマスク厚さ：150 μ mの場合
(開口率：56%)



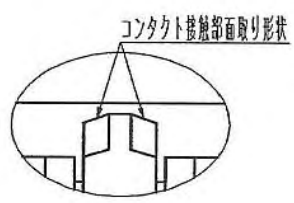
メタルマスク厚さ：120 μ mの場合
(開口率：69%)



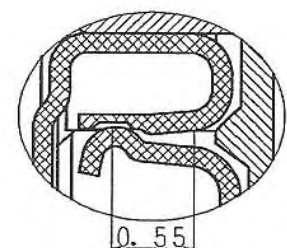
AXK5F2034BK1	 名 プリント基板及びメタルマスク 推奨仕様図	 番  液晶市場
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スタッキング接続嵌合図

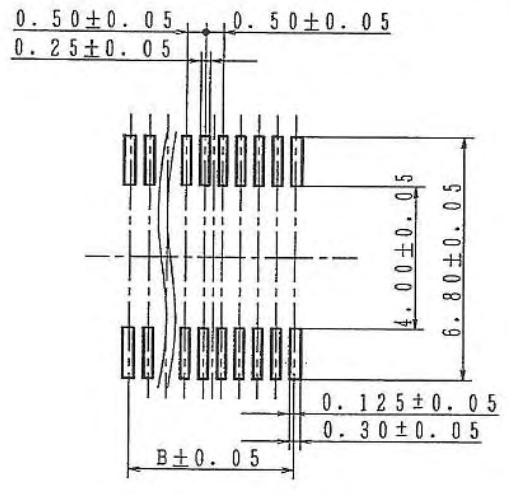


D部図



(有効嵌合長)

プリント基板推奨加工図 (マウントパット配置図)
(TOP VIEW)



寸法	A	B
芯数 20	8.00	4.50
芯数 30	10.50	7.00

注1) はんだ付端子部近傍ニッケルバリア加工 (ニッケル露出処理)

AXK5F2034BK1	図名	商品仕様図	図番	液晶市場
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