

# TCB1335-1

## LCD Module Controller Board User Manual

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0.1	New release	2004-06-21

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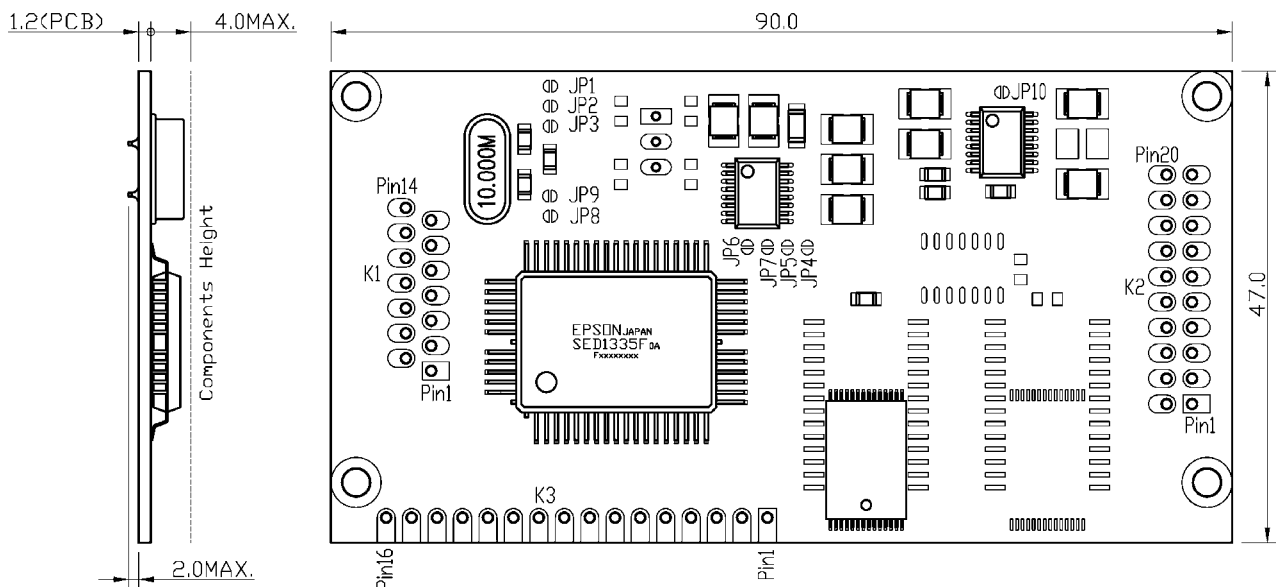
## 1. Basic Specifications

### 1.1 Product Highlight

- 1) TCB1335-1 is a LCD Module Controller Board using EPSON SED1335 LCD controller
- 2) For Speeding up the development of using SED1335 controller
- 3) Suitable for large size (4-bit data stream) LCD module
- 4) Direct interface with (8-bit) MCU and LCD module
- 5) Designed for TOPWAY LM2028 and EPSON EG-8503B-NZ LCD module or equivalent
- 6) Also suitable for large size (4bit data stream) LCD module
- 7) Built in DC-DC converter for VLCD supply
- 8) On board SRAM

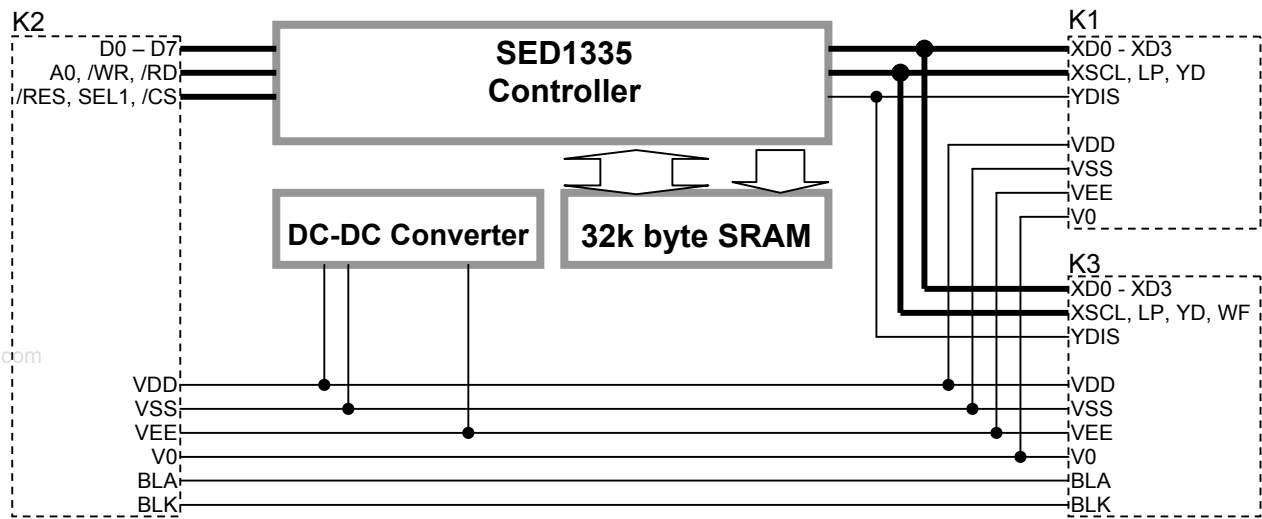
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### 1.2 Mechanical Specifications



- K1 : suitable for 14pin FFC (through hole type) connector (P1.25mm)
- K2 : suitable for 20pin IDC connector (P2.54mm)
- K3 : suitable for 16pin SIL header (P2.54mm)

**1.3 Block Diagram**



**1.4 Terminal Functions**

**1.4.1 MCU Terminal (K2)**

Pin No.	Pin Name	I/O	Descriptions
1	VSS	Power Input	Power Supply GND (0V)
2	VDD	Power Input	Positive Power Supply
3	V0	Passive	LCD Module Contrast Reference Direct connected to K1.1 & K3.5 (V0)
4	VEE	Power Output	DC-DC Booster Power Output
5	A0	Input	Register Select A0=HIGH: data on D0 to D7 is display data A0=LOW: data on D0 to D7 is control data
6	/WR(R/W)	Input	In 8080 interface mode: Write enable input, active LOW In 6800 interface mode: R/W=HIGH: Read mode selected R/W=LOW: Write mode selected
7	/RD(E)	Input	In 8080 interface mode: Read enable input, active LOW In 6800 interface mode: Enable Clock Signal, active HIGH
8	D0	Bi-directional I/O	8-bit bi-directional data bus
:	:		
15	D7		
16	/CS	Input	Chip Select Inputs /CS=LOW: Data IO is enabled
17	/RES	Input	Reset Signal Input /RES=LOW: Reset the controller /RES=HIGH: Normal
18	SEL1	Input	Microprocessor interface select pin. SEL1 = HIGH : 6800 series microprocessor interface SEL1 = LOW : 8080 series microprocessor interface
19	BLA	Passive	Backlight Positive power supply Direct connected to K3.15(BLA)
20	BLK	Passive	Backlight Negative power supply Direct connected to K3.16(BLK)

### 1.4.2 LCD Module Terminal for EG8503B-NZ (K1)

Pin No.	Pin Name	I/O	Descriptions
1	V0	Passive	LCD Module Contrast Reference Direct connected to K2.3 & K3.5 (V0)
2	VEE	Power Output	DC-DC Booster Power Output
3	XD3	Output	x-driver data
:	:		
6	XD0		
7	VEE	Power Output	DC-DC Booster Power Output
8	VSS	Power Output	Power supply GND (0V)
9	VDD	Power Output	Positive Power Supply
10	XSCL	Output	x-driver data shifting clock
11	LP	Output	Latch Pulse
12	YD	Output	Scan Start Pulse
13	NC	-	No connection, leave open
14	YDIS	Output	Display On signal

Note:

- Only one of the LCD Module Terminals could be used at a time.
- Never connect two LCD modules to the controller board at the same time.

### 1.4.3 LCD Module Terminal for LM2028 (K3)

Pin No.	Pin Name	I/O	Descriptions
1	YD	Output	Scan Start Pulse
2	LP	Output	Latch Pulse
3	XSCL	Output	x-driver data shifting clock
4	WF	Output	Frame AC Signal
5	V0	Passive	LCD Module Contrast Reference Direct connected to K2.3 & K1.1 (V0)
6	VDD	Power Output	Positive Power supply
7	VSS	Power Output	Power supply GND (0V)
8	VEE	Power Output	DC-DC Booster Power Output
9	XD0	Output	x-driver data
:	:		
12	XD3		
13	YDIS	Output	Display On signal
14	NC	-	No connection, leave open
15	BLA	Passive	Backlight Positive power supply Direct connected to K1.19(BLA)
16	BLK	Passive	Backlight Negative power supply Direct connected to K1.20(BLK)

Note:

- Only one of the LCD Module Terminals could be used at a time.
- Never connect two LCD modules to the controller board at the same time.

## 2. Absolute Maximum Ratings

Items	Symbol	Min.	Max.	Unit	Condition
Supply Voltage	$V_{DD}$	-0.3	6.0	V	$V_{SS} = 0V$
Input Voltage	$V_{IN}$	-0.3	$V_{DD}+0.3$	V	$V_{SS} = 0V$
DC-DC Booster Output	$I_{EE}$	-	15	mA	-
Operating Temperature	$T_{OP}$	0	50	°C	No Condensation
Storage Temperature	$T_{ST}$	-10	60	°C	No Condensation

Cautions:

Any Stresses exceeding the Absolute Maximum Ratings may cause substantial damage to the device. Functional operation of this device at other conditions beyond those listed in the specification is not implied and prolonged exposure to extreme conditions may affect device reliability.

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## 3. Electrical Characteristics

### 3.1 DC Characteristics

$V_{SS}=0V, V_{DD}=5V, T_{OP}=25^{\circ}C$

Items	Symbol	MIN.	TYP.	MAX.	Unit	Applicable Pin
Operating Voltage	$V_{DD}$	4.5	5.0	5.5	V	VDD
DC-DC Booster Output	$V_{EE}$	-	-20.2	-	V	VEE (*1)
Input High Voltage	$V_{IHT}$	0.6VDD	-	VDD	V	Input pins, Bi-direction pins
Input Low Voltage	$V_{ILT}$	VSS	-	0.1VDD	V	Input pins, Bi-direction pins
Output High Voltage	$V_{OHT}$	2.3	-	-	V	Bi-direction pins (*2)
Output Low Voltage	$V_{OLT}$	-	-	VSS+0.5	V	Bi-direction pins (*3)
Output High Voltage	$V_{OHC}$	VDD-0.5	-	-	V	Output pins (*4)
Output Low Voltage	$V_{OLC}$	-	-	VSS+0.5	V	Output pins (*5)
Operating Frequency	$f_{OSC}$	-	10.0	-	MHz	-
Operating Current	$I_{DD}$	-	13	33	mA	VDD (*6)

Note:

\*1. No load condition

$V_{EE}$  vary with the temperature. It depends on the internal temperature coefficient.

\*2.  $I_{OH}=-5.0mA$

\*3.  $I_{OL}= 5.0mA$

\*4.  $I_{OH}=-2.0mA$

\*5.  $I_{OH}= 1.6mA$

\*4. No load condition

### 3.2 AC Characteristics

Please refer to EPSON SED1335 datasheet for details.

## 4. Function Specifications

TOPWAY TCB1335-1 is using EPSON SED1335. Please refer to its datasheet for full functional details.

### 4.1 Hard-wired Setting

The following is the list of Jumpers on TCB1335-1:

JP	Default	Descriptions																
JP1	CLOSE	Connect the on board DC-DC power supply to the VEE terminals																
JP8	OPEN	On board jumper for Microprocessor interface select																
JP9	OPEN																	
			<table border="1"> <thead> <tr> <th>JP8</th> <th>JP9</th> <th>Function Discription</th> </tr> </thead> <tbody> <tr> <td>open</td> <td>open</td> <td>default, depends on terminal pin K1.18 (SEL1)</td> </tr> <tr> <td>open</td> <td>close</td> <td>SEL1=H, 6800 mode selected</td> </tr> <tr> <td>close</td> <td>open</td> <td>SEL1=L, 8080 mode selected</td> </tr> <tr> <td>close</td> <td>close</td> <td>NEVER use this option. It may damage the system</td> </tr> </tbody> </table>	JP8	JP9	Function Discription	open	open	default, depends on terminal pin K1.18 (SEL1)	open	close	SEL1=H, 6800 mode selected	close	open	SEL1=L, 8080 mode selected	close	close	NEVER use this option. It may damage the system
JP8	JP9		Function Discription															
open	open		default, depends on terminal pin K1.18 (SEL1)															
open	close	SEL1=H, 6800 mode selected																
close	open	SEL1=L, 8080 mode selected																
close	close	NEVER use this option. It may damage the system																
JP2	OPEN	Reserved																
JP3	OPEN	Reserved																
JP4	CLOSE	Reserved																
JP5	OPEN	Reserved																
JP6	CLOSE	Reserved																
JP7	OPEN	Reserved																
JP10	CLOSE	Reserved																

Note: Never try to change the reserved jumper. It may damage the system

### 4.2 Command and Data format

Please refer to EPSON SED1335 for details.

### 4.3 Temperature Compensation

The on board DC-DC convert is containing temperature compensation feature. Its temperature coefficient about -0.16%/°C.

## 5. Design and Handling Precaution

- Any mechanical shock (eg. dropping form high place) will damage the device.
- Do not add excessive force on the device.
- Never attempt to disassemble or rework the device.
- When mounting the device, make sure that it is free form twisting, warping and distortion.
- Only hold the device by its side.
- Never add force to component of the device. It may cause invisible damage or degrade of the reliability.
- This could be easily damaged by static electricity. Be careful to maintain an optimum anti-static work environment to protect it.
- Take care and prevent get hurt by the device sharp edge.
- Never operate the device exceed the absolute maximum ratings.
- Keep the signal line as short as possible to prevent noisy signal applying to the device.
- Never apply signal to the device without power supply.
- Device reliability may be reduced by temperature shock.
- When storing the device, avoid exposure to the direct sunlight, high humidity, high temperature or low temperature.