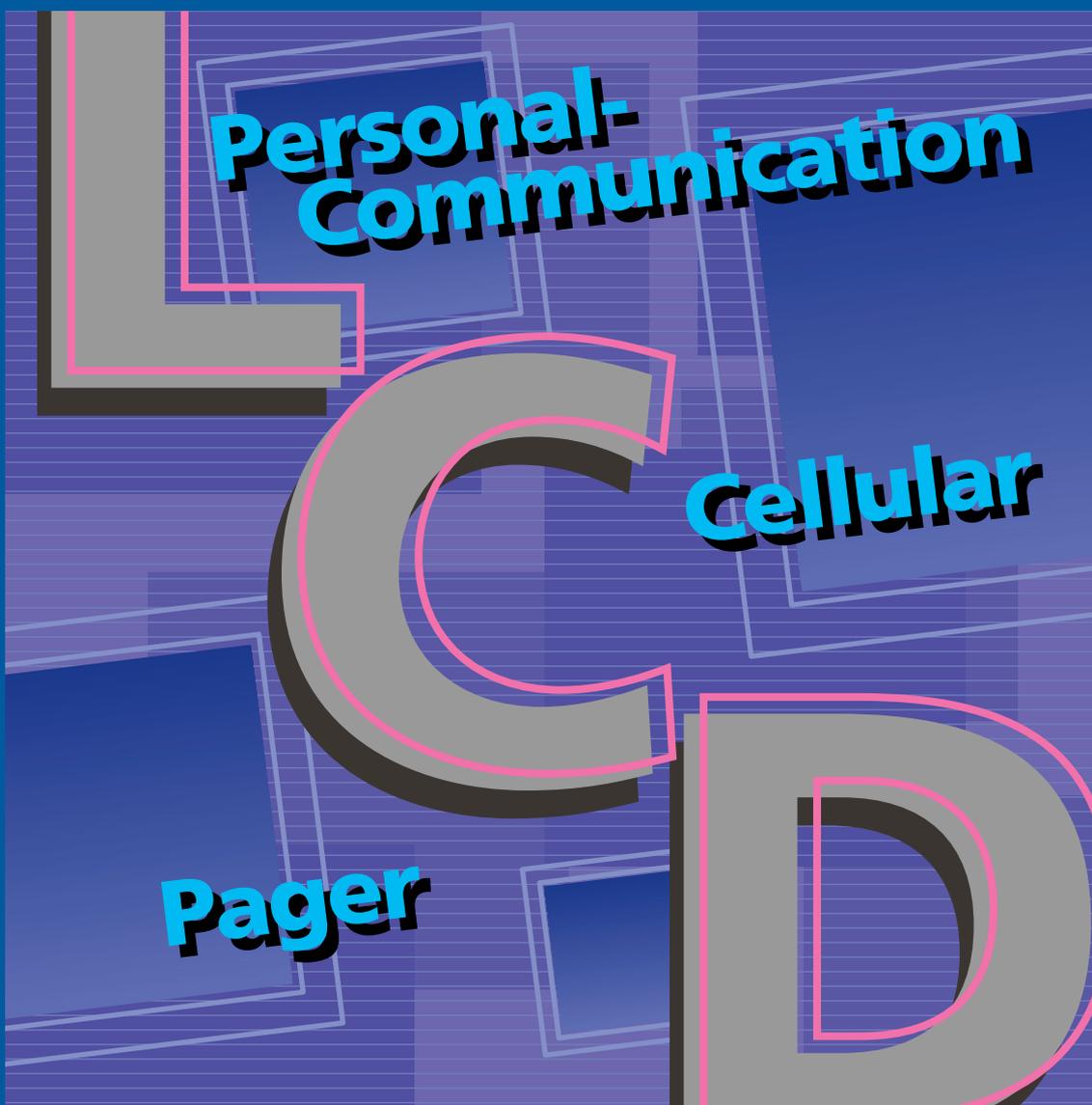


LCD Modules for Mobile Communications

Product Catalog



April/2001

SEIKO EPSON CORPORATION



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Epson is introducing a new product lineup of LCD modules specifically targeting at the information communication equipment market. In the portable information communication equipment market where drastic expansion of demands are prominent recently, request for lower prices, smaller sizes, thinner shapes and low power consumption will be increasing day by day.

To comply with these market requirements, Epson will be providing LCD modules which are being assembled using low power consumption and low voltage type LCD drivers which have been developed which are being manufactured by ourselves and have been developed taking full advantage of the ultra-precision techniques fostered through our development works for quartz watches and the liquid crystal display panels, using the high density installation techniques such as the TCP and COF.

LCD modules manufactured by Epson have thus achieved substantial sales in the cellular phone market and PDA market where market expansion is outstanding among different categories of the portable information communication equipment.

Moreover, Epson will be providing new LCD module products featuring ultra-low power consumption and high-quality indications, such features being most suitable for the portable information communication equipment market where adoption of colored displays is progressing rapidly.

Also, in an attempt to satisfy diverse requirements of our customers, Epson is making propositions for custom-designed modules combining many different parts to Seiko-Epson's abundant device products from their initial planning stage, providing complete supports from the development stage, design stage through production stage on the basis of abundant experiences of Epson.

The information of the product number change

Starting April 1, 2001 the product number will be changed as listed below.
 To order from now on please use the new product numbers.
 For further information, please contact Epson sales representative.

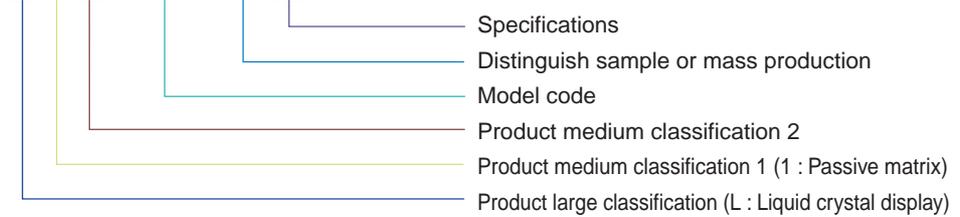
How to describe the product number on this document

Product numbers are basically described with previous numbers, such as Product numbers (Previous numbers).

Product number explanation

● Passive matrix LCD module

L 1 F 90003 P 01

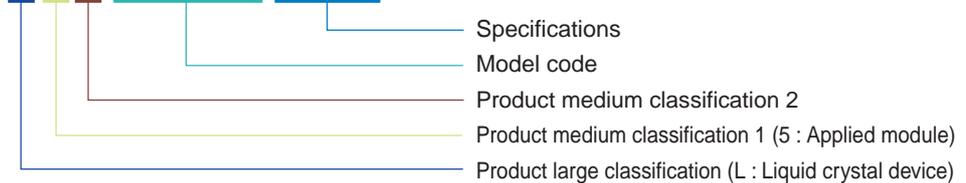


Previous number	New number
EG2202	L1F90000P
EG6201	L1F90001P
EG7014	L1F90002P
EG7502	L1F90003P
EG7503	L1F90004P

Previous number	New number
EG8504	L1F90006P
TCM-A1167	L1F10003T
TCM-A1207	L1F01207T
TCM-A1215	L1F01215T
TCM-A1269	L1F01269T

● LCD applied module

L 5 4 1104900 10000

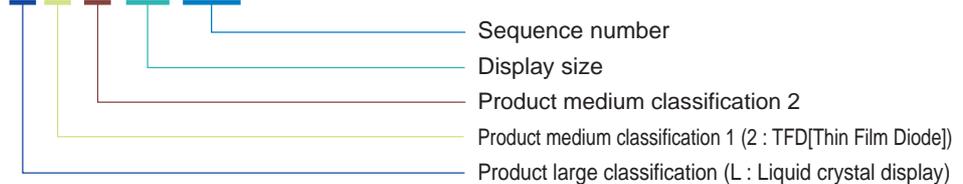


Previous number	New number
SEK1049B0A	L54110490010000
SEK1049B1A	L54110490020000
SEK1054B0A	L54110540010000
SEK1054B1A	L54110540020000
SEK1054B7A	L54110540060000

Previous number	New number
SEK1055B0A	L54110550010000
SEK1055B1A	L54110550020000
SEK2001B0A	L54120010010000
SEK2005B0A	L54120050010000

● Active matrix LCD module (TFD)

L 2 M 20 001



Previous number	New number
MD20SBT	L2M20001
MD22SDT	TBD

Lineup of Standard Modules

Lineup of LCD Modules for Cellular Phones and Pagers



Graphics

S1D15XXX(S1D15XX) Series

- Low power consumption
- Full graphics
- Built-in electrical volume and booster

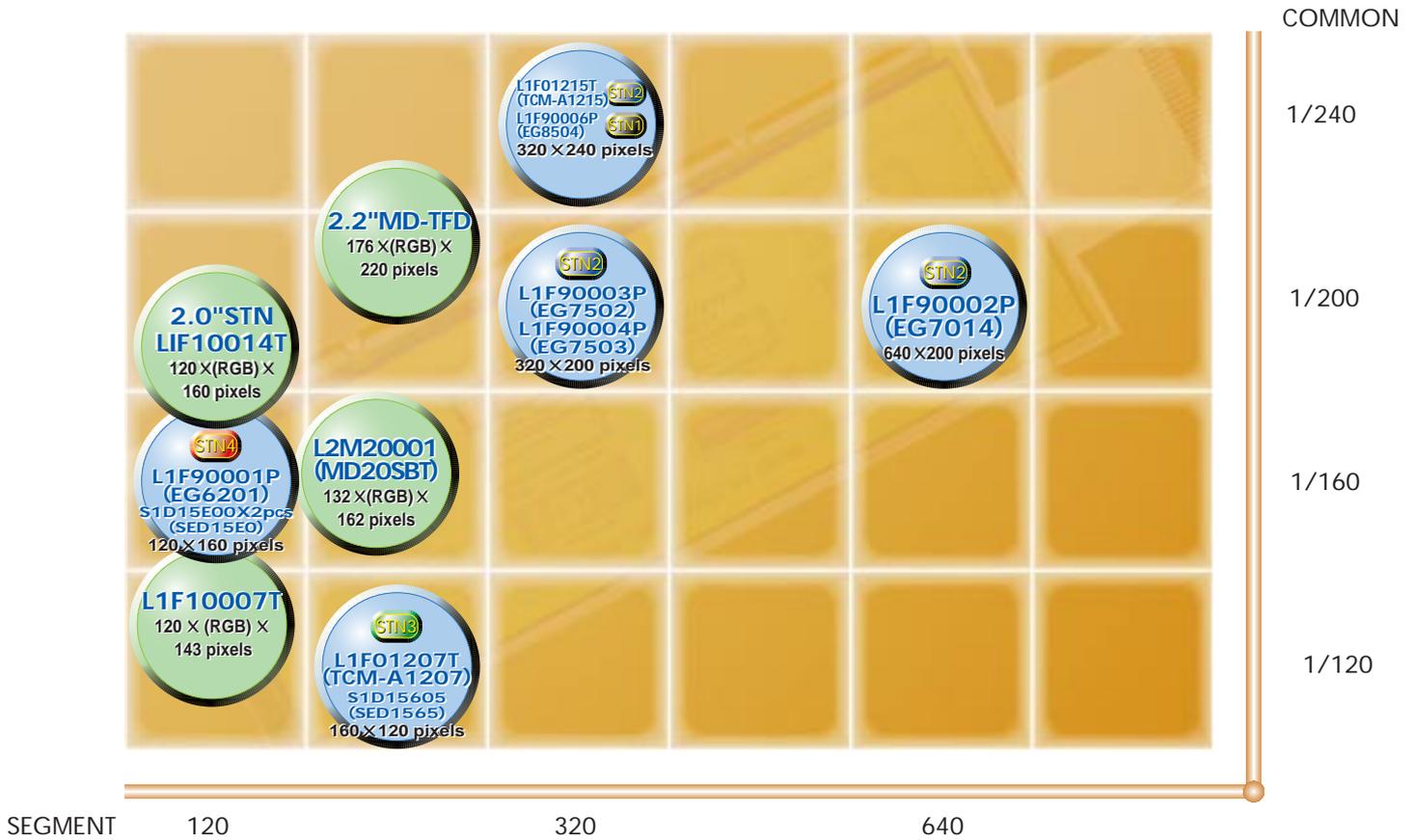


Characters

S1D12XXX(S1D12XX) Series

- Low power consumption
- Static icons
S1D12205/S1D12400 (S1D1225)
- Scroll function
S1D12400 (S1D1240)





Lineup of LCD Modules for Web Phones, PDAs and HPCs



STN1/2/3/4

- Low power consumption
- High contrast
- MPU Interface



Transflective Color LCD

- High density color LCD
- Low power consumption

LCD Module Lineup

LCD modules for Cellular phones and pagers



Graphic displays

- Including LCD power supply (doubler, tripler and quadrupler)
- Extremely low current
- Including high-capacity RAM
- Maximum available character display is 8 characters x 4 lines (in case of 16 x 16 Chinese character font)

Product number (Previous number)	Driving method	Display format	Module structure	Page
L54110550010000 (SEK1055B _{0A})	Passive matrix	80 x 16 pixels + icons (STN)	LCD + heat seal + TCP	8
L54110550020000 (SEK1055B _{1A})	Passive matrix	80 x 16 pixels + icons (FTN)	LCD + heat seal + TCP	8
L54110540010000 (SEK1054B _{0A})	Passive matrix	97 x 32 pixels + icons (STN)	LCD + heat seal + TCP	9
L54110540020000 (SEK1054B _{1A})	Passive matrix	97 x 32 pixels + icons (FTN)	LCD + heat seal + TCP	9
L54110540060000 (SEK1054B _{7A})	Passive matrix	97 x 32 pixels + icons (FTN)	LCD + heat seal + TCP + LED Backlight	9
L1F90000P (EG2202)	Passive matrix	112 x 64 pixels (FTN)	LCD + TCP	11
L54120010010000 (SEK2001B _{0A})	Passive matrix	128 x 64 pixels (FTN)	LCD + COF	12
L1F10003T (TCM-A1167)	Passive matrix	128 x 96 pixels (FTN)	LCD + M-TAB	13

LCD Modules Corresponding to VICS

L5411049 (SEK1049) Series

- 15 characters x 2 lines display of mixed Chinese characters, corresponding to VICS level 1
- Including LCD power supply (tripler)
- Low current (700 μ A is typical during operation)
- High-capacity built-in RAM

Product number (Previous number)	Driving method	Display format	Module structure	Page
L54110490010000 (SEK1049B _{0A})	Passive matrix	248 x 60 pixels (STN transmissive positive)	LCD + heat seal + TCP + PCB	26
L54110490020000 (SEK1049B _{1A})	Passive matrix	248 x 60 pixels (STN transmissive negative)	LCD + heat seal + TCP + PCB	26

LCD Modules for web phones, PDAs and HPCs



Web phone (Transflective Monochrome LCD module)

- Ultra-low power consumption
- Single 3.3-V driver
- High contrast

STN4

STN3

STN2

STN2

Product number (Previous number)	Driving method	Display format	Module structure	Page
L1F9001P (EG6201)	Passive matrix	120 × 160 pixels (FTN positive)	LCD + TCP + FPC + plastic case + backlight (LED)	14
L1F01207T (TCM-A1207)	Passive matrix	160 × 120 pixels (FTN positive)	LCD + TCP + backlight (LED)	15
L1F9003P/L1F9004P (EG7502/7503)	Passive matrix	320 × 200 pixels (FTN positive)	LCD + TCP + PCB + plastic case (*1)	21
L54120050010000 (SEK2005B _{0A})	Passive matrix	160 × 240 pixels (FTN positive)	LCD + TCP + PCB + plastic case + backlight (EL) + FFC	22

*1: Optional electroluminescent backlight or LED backlight

Web phone (Transflective Color LCD module)

- Bright transflective color LCD module
- Including LCD power supply
- Compact and thin module by Multi Chip Mounting (MD-TFD)

STN Transflective
color LCD moduleSTN Transflective
color LCD moduleSTN Transflective
color LCD moduleMD-TFD Transflective
color LCD moduleMD-TFD Transflective
color LCD module

Product number (Previous number)	Driving method	Display format	Module structure	Page
L1F10007T	Passive matrix	120 × RGB × 143 Dots	LCD + MCM (*2)+COF	16
L1F10014T	Passive matrix	120 × RGB × 160 Dots	LCD + TCP + FPC + plastic case + backlight (LED)	17
2.0"STN Transflective (*1)	Passive matrix	120 × RGB × 160 Dots	LCD + TCP + FPC + plastic case + backlight (LED)	18
L2M20001 (MD20SBT)	MD-TFD Active matrix	132 × RGB × 162 Dots	LCD + COG + MCM (*2)	19
2.2"MD-TFD (*1)	MD-TFD Active matrix	176 × RGB × 220 Dots	LCD + COG + MCM (*2)	20

*1: Under development *2: MCM : Multi Chip Mounting

Mobile information terminals (PDAs/HPCs)

- Ultra-low power consumption
- Single 3.3-V driver (L1F90002P)
- High contrast

Product number (Previous number)	Driving method	Display format	Module structure	Page
L1F01215T (TCM-A1215)	Passive matrix	320 × 240 pixels (FTN positive)	LCD + TCP + PCB + backlight (EL)	23
L1F90006P (EG8504)	Passive matrix	320 × 240 pixels (FTN positive)	LCD + TCP + PCB + plastic case (*1)	24
L1F90002P (EG7014)	Passive matrix	640 × 200 pixels (FTN positive)	LCD + TCP + PCB + plastic case	25

*1: Optional electroluminescent backlight *2: Optional LED backlight

Note: Please contact to Epson sales office about the specification of the mass product.

LCD Modules for Cellular Phones and Pagers

Graphic Displays

This LCD module displays Chinese characters with 16 × 16 fonts, which is suitable ideal for cellular phones and pagers (max. 8 characters × 4 lines + icons). Using S1D15206 (SED1526), S1D15300 (SED1530), S1D15605 (SED1565) series or SED 15E0 series drivers, low voltage liquid crystal drive, and 0.4 t glass, current and voltage requirements are kept extremely low, and dimensions and thickness are minimized.

Since the LCD drive power circuit is built in (doubler, tripler, or quadrupler voltage booster), external drive circuitry is not required. This contributes to simplicity of circuit design, and helps reduce costs.

L54110550010000 (SEK1055B_{0A})
(STN positive)

L54110550020000 (SEK1055B_{1A})
(FTN positive)

Photograph shows L54110550020000 (SEK1055B_{1A})



* Photograph of the monitor is its image

■ Features

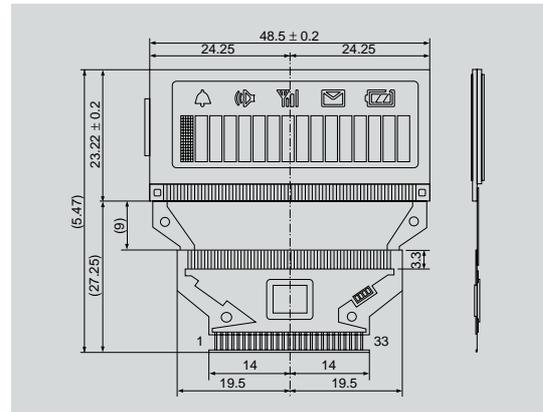
- Maximum 16 characters × 2 lines (5 × 8 font)
- Low current of 60 μA (typical value when illuminated, when V_{DD} = 3.0 V, and with voltage doubler).
- Use of standard module contributes customers' reduced development time and cost.
- Module constructed by connecting LCD and TCP with a heat seal in order to minimize size and weight.

■ Specifications

Driving method	Passive matrix
Module structure	LCD + heat seal + TCP
Display format	80 × 16 pixels + icons
Display mode	STN / FTN transfective (t = 0.7 mm)
LCD driver	S1D15206T00A0 (SED1526T _{0A})
Interface	8-bit parallel (68/80 series) or serial
Power supply voltage	2.4 to 6.0 V
Liquid crystal drive power supply	Voltage booster (doubler, tripler)
Current	60 μA (*1)
Outline dimensions	48.5 × 23.22 mm
Operating temperature	-20 to 70°C (STN), -20 to 60°C (FTN)
Storage temperature	-30 to 80°C (STN), -30 to 70°C (FTN)

*1 Typical value when illuminated, when V_{DD} = 3.0 V, with voltage doubler, and with internal power switched on.

■ Outline dimensions



L54110540010000 (SEK1054B_{0A})

<STN positive without B/L*>

L54110540020000 (SEK1054B_{1A})

<FTN positive without B/L*>

L54110540060000 (SEK1054B_{7A})

<FTN positive with B/L*>

Photograph Shows L54110540020000 (SEK1054B_{1A})
*B/L : Backlight



* Photograph of the monitor is its image

■ Features

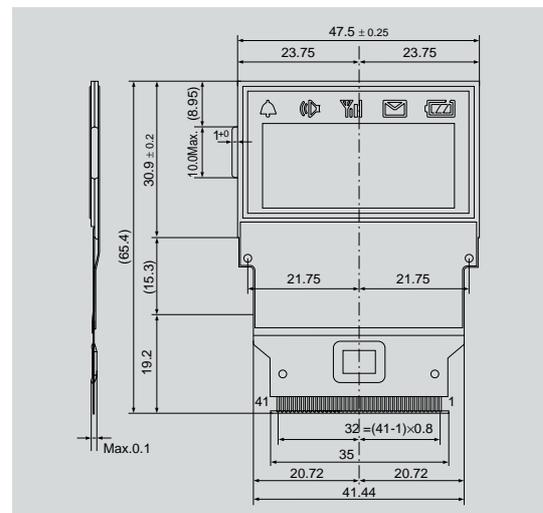
- Chinese characters ('kanji') display: 6 characters × 2 lines (16 × 16 font characters).
- Low current of 150 μA available (typical value when illuminated, when V_{DD} = 3.0 V, and with voltage tripler).
- Use of standard module contributes customers' reduced development time and cost.
- Module constructed by connecting LCD and TCP with a heat seal in order to minimize size and weight.

■ Specifications

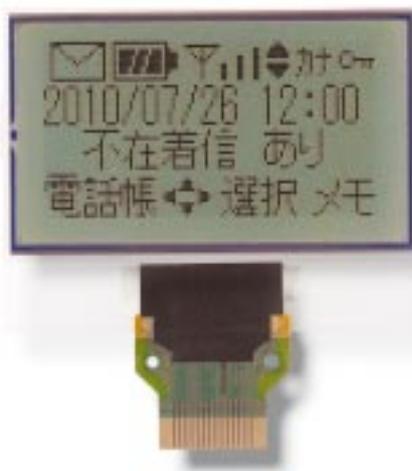
Driving method	Passive matrix
Module structure	LCD + heat seal + TCP
Display format	97 × 32 pixels + icons
Display mode	STN / FTN transfective (t = 0.7 mm)
LCD driver	S1D15300T10A0 (SED1530T _{AA})
Interface	8-bit parallel (68/80 series) or serial
Power supply voltage	2.4 to 6.0 V
Liquid crystal drive power supply	Voltage booster (doubler, tripler, quadrupler)
Current	150 μA (*1)
Outline dimensions	47.5 × 30.9 mm
Operating temperature	-20 to 70°C (STN), -20 to 60°C (FTN)
Storage temperature	-30 to 80°C (STN), -30 to 70°C (FTN)

*1 Typical value when illuminated, when V_{DD} = 3.0 V, with voltage tripler, and with internal power switched on.

■ Outline dimensions



L1F01269T
 <Sample number>



* Photograph of the monitor is its image

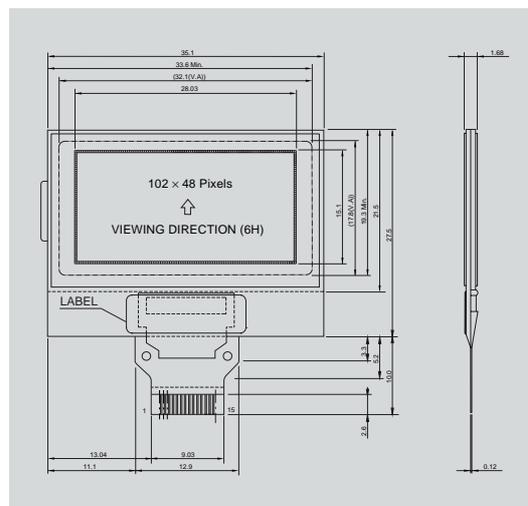
■ Features

- Display employs 102 x 48 pixels for single chip making it most suitable for the cellular and pager.
- This module is constructed with LCD and COG, and is thus a simple LCD module.
- Ultra-low power consumption.
- High contrast by MLS driving.

■ Specifications

Driving method	Passive matrix
Module construction	LCD + COG
Display format	102 x 48 pixels
Display mode	FTN transfective (t = 0.4 mm)
Pixel pitch	0.275 x 0.295 mm
Duty ratio	1/55
Interface	Serial
Power supply voltage	2.7 to 3.3 V
Liquid crystal drive power supply	Voltage booster (doubler, tripler)
Current	140 μA (V _{DD} = 3.0V, text indications)
Outline dimensions	35.1 x 27.5 x 1.68 mm
Operating temperature	-20 to 70°C
Storage temperature	-30 to 80°C

■ Outline dimensions



**Note: This product is for evaluation sample.
 So, please consult to Epson sales office about the specification of the mass product.**

L1F9000P (EG2202) series



* Photograph of the monitor is its image

■ Features

- Display employs 112 x 64 pixels making it most suitable for the cellular and pager.
- This module is constructed with LCD and TCP, and is thus a simple standard module.
- Built-in LCD drive power circuit and oscillator circuit gives low power consumption.

■ Specifications

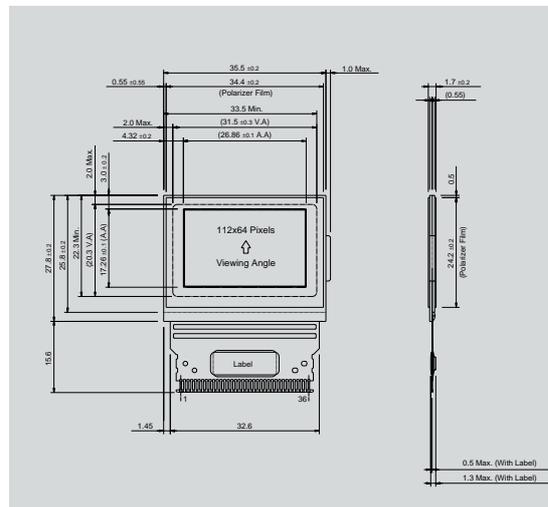
Driving method	Passive matrix
Module construction	LCD + TCP
Display format	112 x 64 pixels
Display mode	FTN transfective (t = 0.55 mm)
LCD driver	S1D15605 (SED1565D)
Duty ratio	1/64
Interface	8bit parallel (68/80 series) or serial
Power supply voltage	2.7 to 3.6 V (recommended)
Liquid crystal drive power supply	Voltage booster (doubler, tripler, quadrupler)
Current	170 μA (Typ.) (*1)
Outline dimensions	35.5 x 43.4 x 1.7 mm
Operating temperature	-20 to 70°C
Storage temperature	-30 to 80°C

*1 Typical value while display text, with V_{DD} = 3.0 V, voltage quadrupler, high power mode, internal power ON.

■ Lineup

Product number (Previous number)	Display mode
L1F9000P00 (EG2202C-KR)	FTN, Transfective

■ Outline dimensions



L54120010010000 (SEK2001B_{0A})



(Front)

* Photograph of the monitor is its image



(Back)

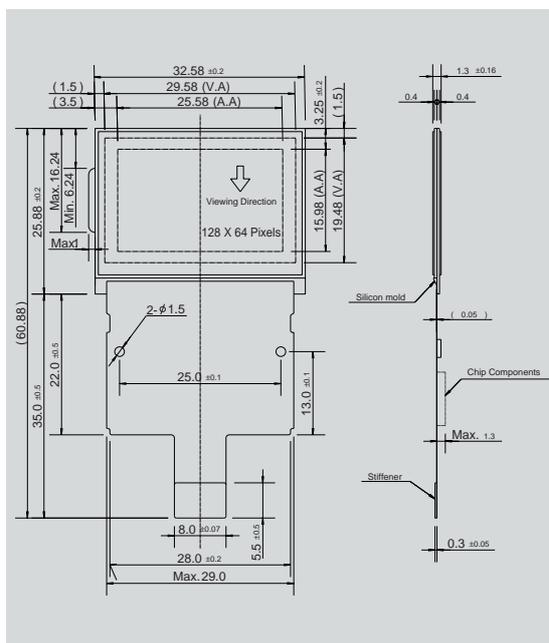
■ Features

- Display employs 128 × 64 pixels making it most suitable for the cellular.
- This module is constructed with LCD and COF, and is thus a simple standard module.
- Built-in LCD drive power circuit and oscillator circuit gives low power consumption.

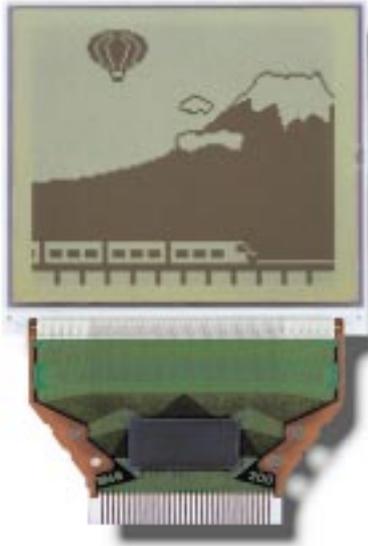
■ Specifications

Driving method	Passive matrix
Module construction	LCD + COF
Display format	128 × 64 pixels
Display mode	FTN transfective (t = 0.4 mm)
LCD driver	S1D15605D (SED1565D)
Pixel pitch	0.20 × 0.25 mm
Duty ratio	1/65
Contrast ratio	4.0 Typ.
Power supply voltage	2.7 to 3.3 V
Liquid crystal drive power supply	Voltage booster (quadrupler)
Current (25°C)	260 μA (3.0 V, checkered pattern indications)
Outline dimensions	32.58 × 60.88 × 1.3 mm
Operating temperature	-20 to 70°C
Storage temperature	-30 to 80°C

■ Outline dimensions



L1F10003T
 <Sample number>



* Photograph of the monitor is its image

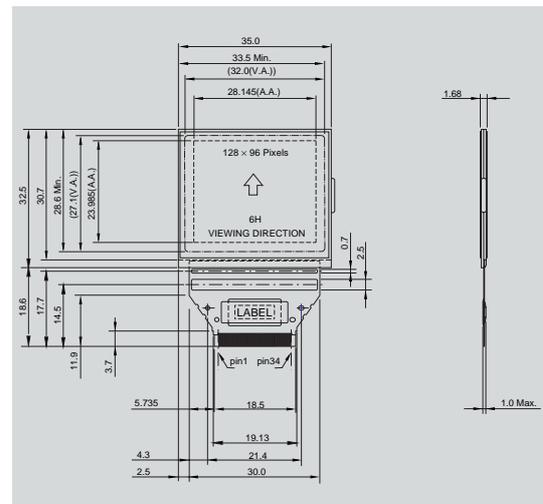
■ Features

- Display employs 128 x 96 pixels for single chip making it most suitable for the cellular and pager.
- This module is constructed with LCD and M-TAB, and is thus a simple LCD module.
- Ultra-low power consumption.
- High contrast by MLS driving.

■ Specifications

Driving method	Passive matrix
Module construction	LCD + M-TAB
Display format	128 x 96 pixels
Display mode	FTN transfective (t = 0.4 mm)
Pixel pitch	0.22 x 0.25 mm
Duty ratio	1/100
Interface	8-bit parallel (68/80 series) or serial
Power supply voltage	2.7 to 3.3 V
Liquid crystal drive power supply	Voltage booster (doubler, tripler)
Current	TBD
Outline dimensions	35.0 x 32.5 x 1.68 mm
Operating temperature	-20 to 70°C
Storage temperature	-30 to 80°C

■ Outline dimensions



**Note: This product is for evaluation sample.
 So, please consult to Epson sales office about the specification of the mass product.**

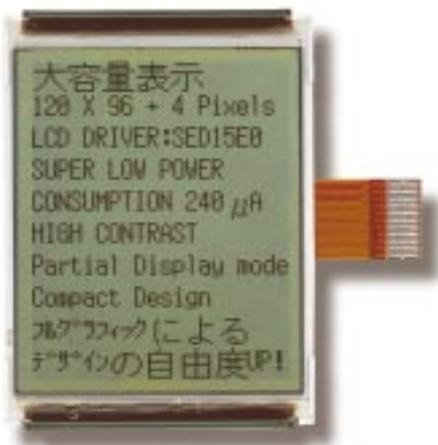
LCD Modules for Web Phones, PDA and HPCs

Full dot displays / Trasflective color LCD

Our original power supply circuit allow these LCD modules to feature the lowest power consumption in the industry, making them suitable for web phones, PDAs and HPCs requiring low power use. MLS drivers and high aperture ration by refined panel process help to achieve high contrast.

Also, we are now providing new LCD modules products featuring ultra-low power consumption and high-quality indications, such features being most suitable for the portable information communication equipment market where adoption of colored displays is progressing rapidly.

L1F90001P
(EG6201) series 



* Photograph of the monitor is its image

Features

- 120 × 160 pixel display, ideal for web phones and cellular phones.
- Large capacity (120 × 160) display with slim module structure.
- Ultra-low power consumption.
- High contrast by MLS driving.

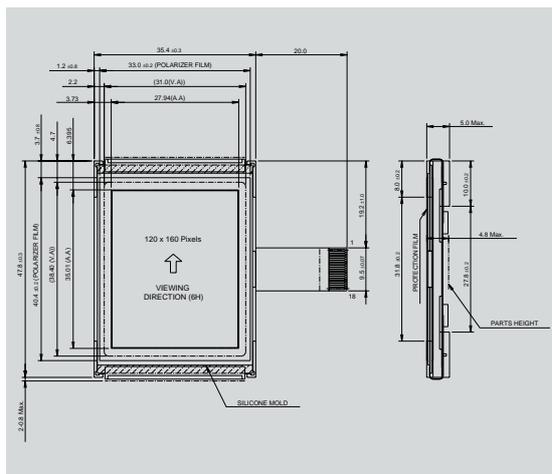
Specifications

Driving method	Passive matrix
Module structure	LCD + TCP + FPC + plastic case + backlight (LED)
Display format	120 × 160 pixels
Display mode	FTN transfective
LCD driver	S1D15E00 (SED15E0D) × 2pcs
Duty ratio	1/84
Interface	8-bit parallel (80series)
Power supply voltage	2.7 to 3.3V
Liquid crystal drive power supply	Voltage booster (doubler, tripler)
Current (Typ.)	210µA (VDD = 3.0V, text indications)
Outline dimensions	35.4 × 49.8 × 5.0 mm
Operating temperature	-20 to 70°C
Storage temperature	-30 to 80°C

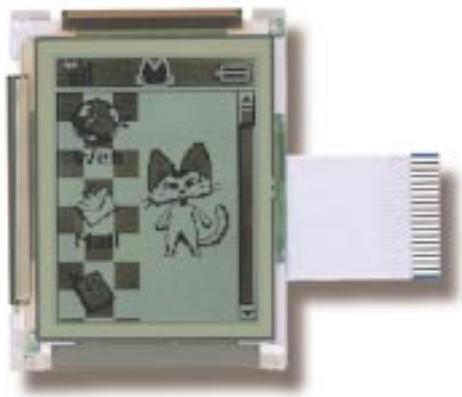
Lineup

Product number (Previous number)	Display mode
L1F90001P00 (EG6201-RS)	FTN, Transfective, LED (YG)

Outline dimensions



L1F01207T
 <Sample number>
 (TCM-A1207)



* Photograph of the monitor is its image

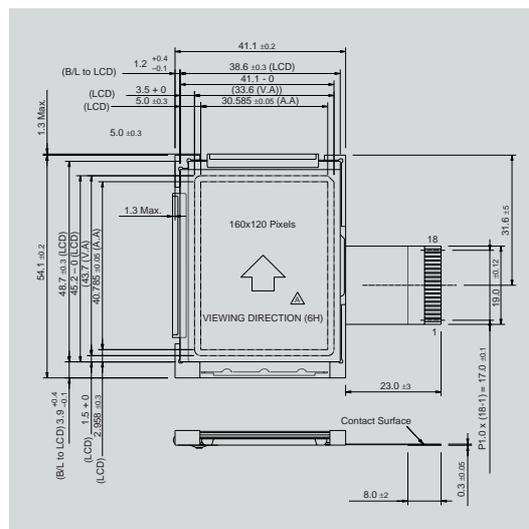
■ Features

- 160 × 120 pixel display, ideal for web phones.
- Improve your ability of expression with 4 gray scale.
- Low power consumption with a newly released power circuit and drive system.
- Uses a bus interface for direct coupling with the CPU.
- High contrast by MLS drivers have been realized.

■ Specifications

Driving method	Passive matrix
Module structure	LCD + TCP + backlight (LED)
Display format	160 × 120 pixels
Display mode	FTN transfective
Pixel pitch	0.255 × 0.255 mm
Pixel size	0.24 × 0.24 mm
Duty ratio	1/120
Contrast ratio	10 : 1
Power supply voltage	3.3V single supply voltage
Liquid crystal drive power supply	Built -in DC/DC converter
Current (25°C)	0.8mA (VDD=3.0V, all ON display, Typ.)
Outline dimensions	41.1 × 54.1 × 5.0 mm
Operating temperature	-20 to 70°C *Scale display shows -10 to 60°C
Storage temperature	-30 to 80°C

■ Outline dimensions



**Note: This product is for evaluation sample.
 So, please consult to Epson sales office about the specification of the mass product.**

L1F010007T
 <Sample number>

STN Transflective
 color LCD module



(Front)

* Photograph of the monitor is its image



(Back)

Features

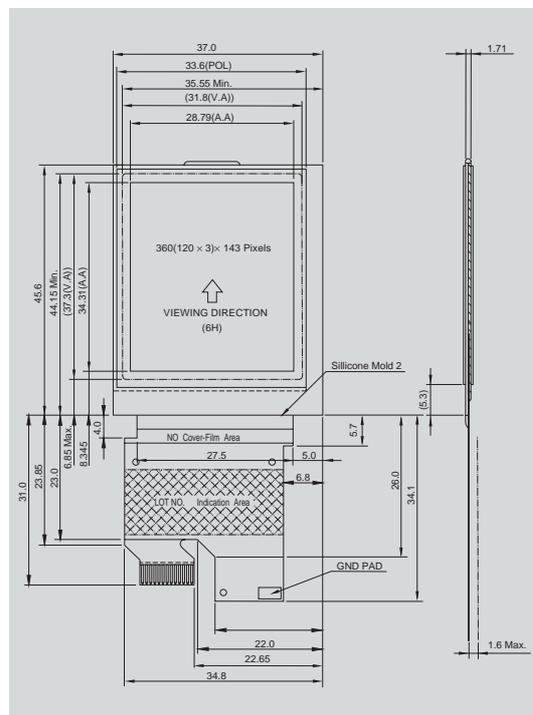
- High picture quality STN transflective color LCD modules.
- Low current with the built-in LCD drive power circuit and oscillation circuit.

Specifications

Driving method	Passive matrix
Display size	4.5 cm (1.7 inch)
Module structure	LCD + MCM (*1) + COF
Display format	120 × RGB × 143 Dots
Display mode	STN transflective color
Display number of colors	256
Color dot layout	Vertical stripes
Reflectance (at 25°C)	35%
Contrast ratio (at 25°C)	13 : 1
Dot pitch	0.080 × 0.240 mm
Duty ratio	1/148
Power supply voltage	2.7 to 3.0 V
Liquid crystal drive power supply	Built -in
Power consumption	1.5 mW (Predicted value when indicating a still picture all over the screen) 0.3 mW (Predicted value when making 24 lines partly indication)
External glass dimensions	37.0 × 45.6 × 1.71 mm
Operating temperature	-20 to 70°C
Storage temperature	-30 to 80°C

*1: MCM : Multi Chip Mounting

External dimensions



**Note: This product is for evaluation sample.
 So, please consult to Epson sales office about the specification of the mass product.**

L1F10014T
<Sample number>

STN Transflective
color LCD module



* Photograph of the monitor is its image

■ Features

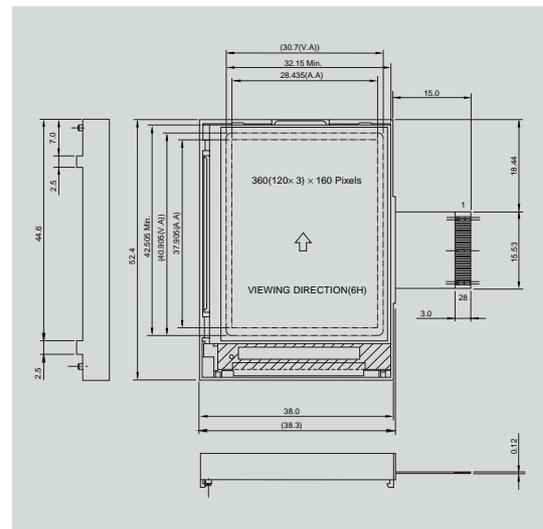
- High picture quality STN transflective color LCD modules.
- Driver with internal RAM, and built-in oscillator circuits realize ultra low power consumption.
- Natural color reproduction by 4,096 colors.

■ Specifications

Driving method	Passive matrix
Display size	4.7cm (1.9 inch)
Module structure	LCD + TCP + COF + plastic case + backlight (LED)
Display format	120 × RGB × 160 Dots
Display mode	STN Transflective color
Display number of colors	4,096
Dot pitch	0.79 × 0.237 mm
Color dot layout	Vertical stripes
Reflectance (at 25°C)	TBD
Contrast ratio (at 25°C)	TBD
Duty ratio	1/164
Power supply voltage	2.7 to 3.0V
Liquid crystal drive power supply	Built-in voltage booster circuit
Power consumption	TBD
Outline dimensions	38.0 × 52.4 × 6.2 mm
Operating temperature	-20 to 70°C
Storage temperature	-30 to 80°C

*1 MCM:Multi Chip Mounting

■ Outline dimensions



**Note: This product is for evaluation sample.
So, please consult to Epson sales office about the specification of the mass product.**

2.0"STN Transflective
(Under development)

STN Transflective
color LCD module



* Photograph of the monitor is its image

■ Features

- High picture quality STN transflective color LCD modules.
- Low power consumption with the built-in LCD drive power circuit and oscillation circuit.

■ Specifications

Driving method	Passive matrix
Display size	5.0cm (2.0")
Module structure	LCD + TCP + COF + plastic case + backlight (LED)
Display format	120 × RGB × 160 Dots
Display mode	STN transflective color
Display number of colors	256
Color dot layout	Vertical stripes
Reflectance (at 25°C)	35%
Contrast ratio (at 25°C)	14:1
Pixel pitch	0.084 × 0.252 mm
Duty ratio	1/164
Power supply voltage	2.7 to 3.0V
Liquid crystal drive power supply	Built-in
Power consumption	2.0mW (Predicted value when indicating a still picture all over the screen)
	0.3mW (Predicted value when making 24 lines partly indication)
External dimensions	39.6 × 53.6 × 5.0 mm
Operating temperature	-20 to 70°C
Storage temperature	-30 to 80°C

**L2M20001
(MD20SBT) Series**

MD-TFD Transflective
color LCD module



* Photograph of the monitor is its image

Features

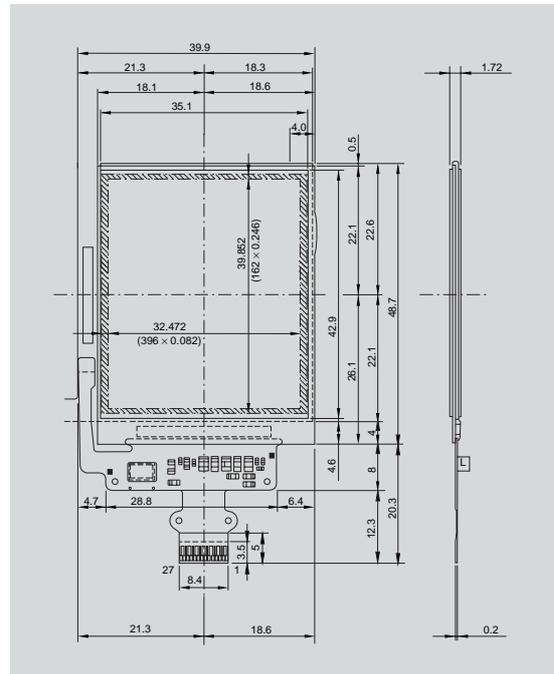
- High picture quality MD-TFD transflective color LCD modules.
- Driver with internal RAM, and built-in oscillator circuits realize ultra low power consumption.
- Compact and thin module by Multi Chip Mounting.

Specifications

Driving method	MD-TFD active matrix
Display size	5.1cm (2.0 inch)
Module structure	LCD + COG + MCM(*1)
Display format	132 × RGB × 162 Dots
Display mode	TN Transflective color
Display number of colors	4,096
Color dot layout	Vertical stripes
Reflectance (at 25°C)	TBD
Contrast ratio (at 25°C)	TBD
Dot pitch	0.082 × 0.246 mm
Interface	16-bit parallel (80 series)
Power supply voltage	2.6 to 3.15V
Liquid crystal drive power supply	Built-in voltage booster circuit
Power consumption	2.5 mW (Predicted value when indicating a still picture all over the screen)
	1.0 mW (Predicted value when making 24lines partly indication)
Outline dimensions	45.9 × 65.5 × 1.71 mm
Operating temperature	-20 to 70°C
Storage temperature	-30 to 80°C

*1 MCM:Multi Chip Mounting

Outline dimensions



**Note: This product is for evaluation sample.
So, please consult to Epson sales office about the specification of the mass product.**

**2.2"MD-TFD
Color LCD module**
(Under development)

MD-TFD Transflective
color LCD module



* Photograph of the monitor is its image

■ **Features**

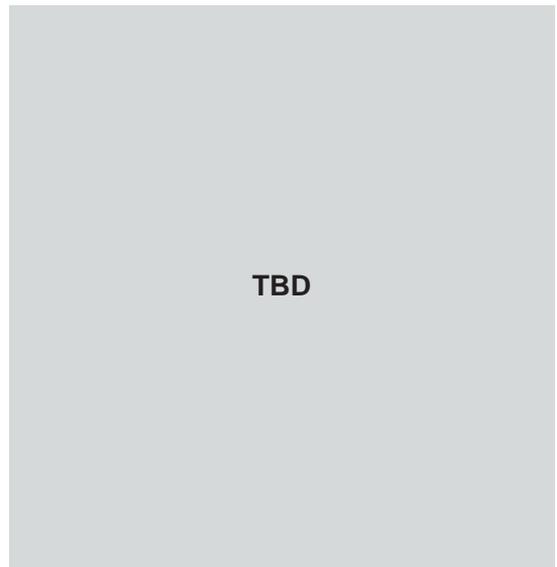
- High picture quality MD-TFD transflective color LCD modules.
- Driver with internal RAM, and built-in oscillator circuits realize ultra low power consumption.
- Compact and thin module by Multi Chip Mounting.
- Natural color reproduction by 260,000 colors

■ **Specifications**

Driving method	MD-TFD active matrix
Display size	5.6cm (2.2 inch)
Module structure	LCD + COG + MCM(*1)
Display format	176 × RGB × 220 Dots
Display mode	TN Transflective color
Display number of colors	262,144
Dot pitch	0.66 × 0.198 mm
Color dot layout	Vertical stripes
Reflectance (at 25°C)	TBD
Contrast ratio (at 25°C)	TBD
Interface	16-bit parallel (80 series) or 18-bit parallel/serial(DSP)
Power supply voltage	2.6 to 3.15V
Liquid crystal drive power supply	Built-in voltage booster circuit
Power consumption	TBD
Outline dimensions	42.412 × 55.6 × 1.74 mm
Operating temperature	-20 to 70°C
Storage temperature	-30 to 80°C

*1 MCM:Multi Chip Mounting

■ **Outline dimensions**



TBD

**L1F90003P/L1F90004P
(EG7502/EG7503) series**



* Photograph of the monitor is its image

Features

- Newly-developed power supply circuit realize ultra low power consumption.
- Built-in DC/DC converter allows operation from a single 3.3V power supply.
- High contrast by MLS driving.
- Use of standard module contributes customers' reduced development time and cost.

Specifications

Driving method	Passive matrix
Module structure	LCD + TCP + PCB + plastic case (*1)
Display format	320 × 200 pixels
Pixel pitch	0.18 × 0.18 mm
Pixel size	0.165 × 0.165 mm
Duty ratio	1/200
Contrast ratio	8:1
Interface	8-bit parallel
Power supply voltage	3.3 V single supply voltage
Liquid crystal drive power supply	Built-in DC/DC converter
Power consumption (Typ.)	3.0 mW
Outline dimensions	71.1 × 49.0 × 5.5 mm (*2)
Operating temperature	0 to 50°C
Storage temperature	-20 to 70°C

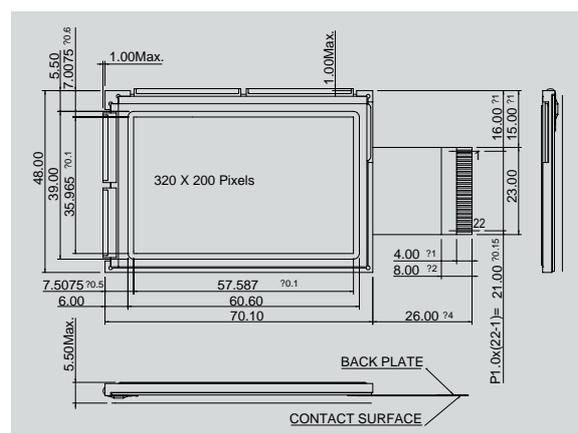
*1: Optional electroluminescent backlight or LED backlight.
*2: Height differs when the optional LED backlight is fitted.

Lineup

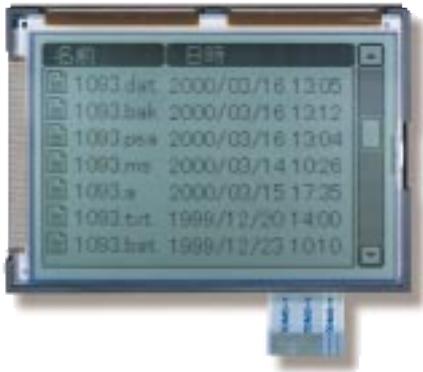
Product number (Previous number)	Display mode
L1F90003P01 (EG7502C-AS)	FTN Reflective
L1F00822T ** <Sample number>	FTN HSR
L1F90003P00 (EG7502C-RS)	FTN Transflective LED
L1F90004P01 (EG7503C-ES-1)	FTN Transflective EL (BG)
L1F90004P00 (EG7503C-ES)	FTN HSR-J (EL)

* An optional setting allows touch panel support.

Outline dimensions



L54120050010000 (SEK2005B0A)



* Photograph of the monitor is its image

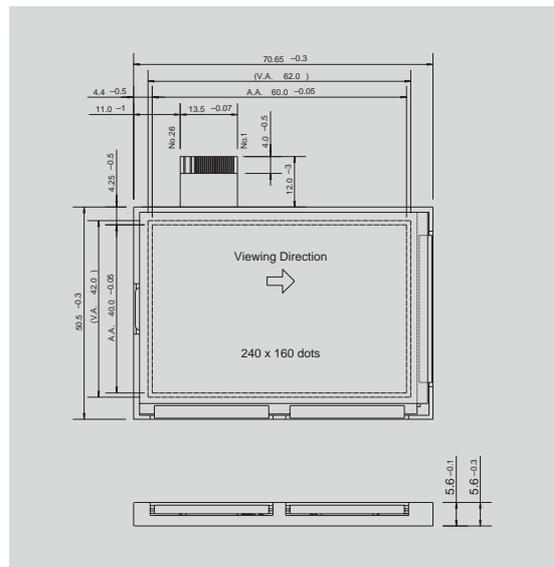
■ Features

- Display employs 160 × 240 pixels making it most suitable for the PDA.
- Newly-developed power supply circuit and drive system ensure industry-leading ultra low power consumption.
- High contrast by MLS driving.
- Use of standard module contributes customers' reduced development time and cost.

■ Specifications

Driving method	Passive matrix
Module structure	LCD + TCP + PCB + plastic case + EL backlight + FFC
Display format	160 × 240 pixels
Display mode	FTN transfective
LCD driver	S1D15900(SED1590) + S1D17501(SED1751) × 2 pcs
Pixel pitch	0.25 × 0.25 mm
Duty ratio	1/240
Contrast ratio	5.0 Typ.
Power supply voltage	2.7 to 3.3 V
Liquid crystal drive power supply	Built-in DC/DC converter
Current (25°C)	1.2 mA (3.0 V, checker pattern indications)
Outline dimensions	50.5 × 70.65 × 5.6 mm
Operating temperature	-20 to 70°C
Storage temperature	-30 to 80°C

■ Outline dimensions



L1F01215T
 <Sample number>
 (TCM-A1215)



* Photograph of the monitor is its image

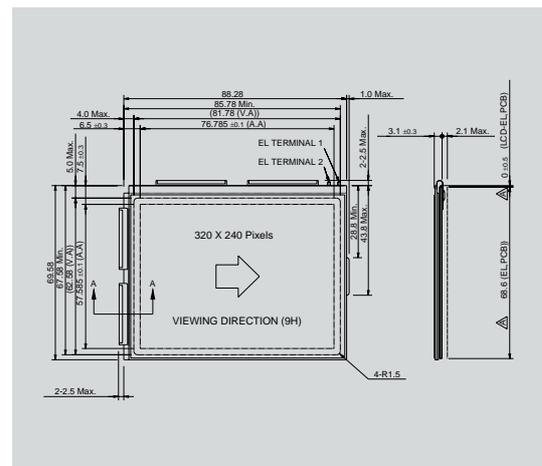
■ Features

- 320 × 240 pixel display, ideal for PDA's and other portable data devices.
- Low power consumption with a newly released power circuit.
- High contrast by MLS drivers have been realized.
- Using this standard module contributes to customers' reduced development time and cost.

■ Specifications

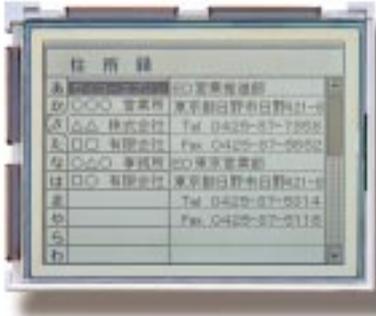
Driving method	Passive matrix
Module structure	LCD + TCP + PCB + EL backlight
Display format	320 × 240 pixels
Display mode	FTN transfective
Pixel pitch	0.24 × 0.24 mm
Pixel size	0.225 × 0.225 mm
Duty ratio	1/240
Contrast ratio	10 : 1
Power supply voltage	3.3V single supply voltage
Liquid crystal drive power supply	Built-in DC/DC converter
Current (Typ.)	1.4mA (VDD=3.3V, fFR=60Hz)
Outline dimensions	91.28 × 71.58 × 5.2 mm
Operating temperature	0 to 50°C
Storage temperature	-20 to 70°C

■ Outline dimensions



Note: This product is for evaluation sample.
 So, please consult to Epson sales office about the specification of the mass product.

**L1F90006P
(EG8504) series**



* Photograph of the monitor is its image

Features

- Newly-developed power supply circuit and low-voltage liquid crystal ensure low power consumption.
- Ideal for low-power consumption products such as portable information display devices.
- Use of standard module contributes customers' reduced development time and cost.

Specifications

Driving method	Passive matrix
Module structure	LCD + TCP + PCB + plastic case (*1)
Display format	320 × 240 pixels
Dot pitch	0.24 × 0.24 mm
Dot size	0.225 × 0.225 mm
Duty ratio	1/240
Interface	4-bit parallel (*2)
Power supply voltage	2.75 to 5.25 V
Liquid crystal drive power supply	35 V (max.)
Power consumption	9.0 mW
Outline dimensions	94.0 × 73.6 × 7.1 mm
Operating temperature	0 to 50°C
Storage temperature	-20 to 60°C

*1: Optional electroluminescent backlight

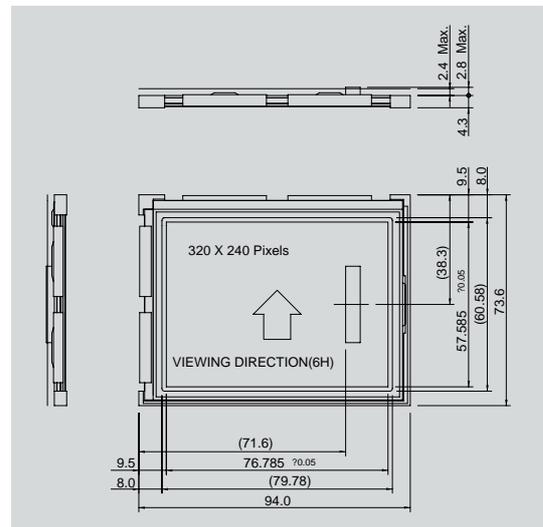
*2: 8-bit support is possible with driver support

Lineup

Product number (Previous number)	Display mode
L1F90006P02 (EG8504C-AZ)	FTN reflective
L1F90006P04 (EG8504C-AZ-1)	FTN HRS
L1F90006P03 (EG8504C-FZ-1)	FTN transreflective EL (white)
L1F00813T30 <Sample number>	FTN HSR/P-J EL (BG)

* A touch panel is optional.

Outline dimensions



**L1F90002P
(EG7014) series**



* Photograph of the monitor is its image

**Winner of the
"Commendation from the Chair-man of
the Energy Conservation Center"**
at 7th "Energy Conservation Vanguard 21" in 1996

Features

- Newly-developed power supply circuit ensures industry-leading ultra-low power consumption.
- Built-in DC/DC converter allows operation from a single 3.3 V power supply.
- Use of standard module contributes customers' reduced development time and cost.
- High contrast by MLS drivers have been realized.

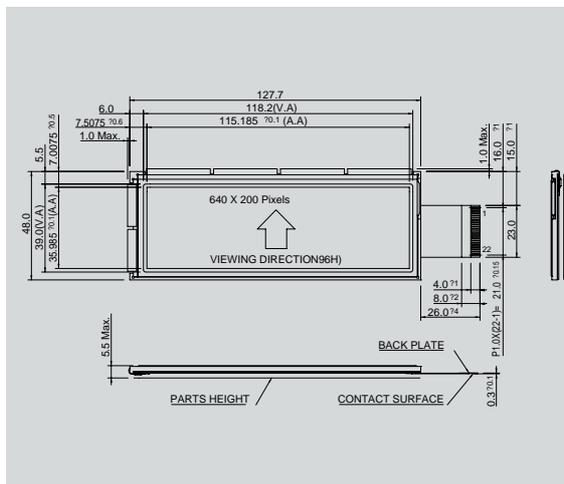
Specifications

Driving method	Passive matrix
Module structure	LCD + TCP + PCB + plastic case
Display format	640 × 200 pixels
Pixel pitch	0.18 × 0.18 mm
Pixel size	0.165 × 0.165 mm
Duty ratio	1/200
Contrast ratio	8:1
Interface	8-bit parallel
Power supply voltage	3.3 V single supply voltage
Liquid crystal drive power supply	Built-in DC/DC converter
Power consumption (Typ.)	5.0 mW
Outline dimensions	128.7 × 49.0 × 5.5 mm
Operating temperature	0 to 50°C
Storage temperature	-20 to 70°C

Lineup

Product number (Previous number)	Display mode
L1F90002P00 (EG7014C-AS)	FTN Reflective
L1F00824T13 <Sample number>	FTN HSR

Outline dimensions



LCD Modules Corresponding to VICS

Full dot displays

This LCD module is capable of graphic display on a field of 248 × 60 pixels (Chinese characters ('kanji'): 15 characters × 2 lines). It supports VICS level 1 FM multiplex broadcasting, and is particularly suitable for text information services applications. By using two S1D15600 (SED1560) series TCPs as LCD drivers, we have achieved low power consumption and supply voltage, in addition to compactness and thickness.

Moreover, since an LCD power supply (tripler) is included, an external drive circuit is not required, and the liquid crystal display can be operated using a single 5V power supply.

L54110490010000 (SEK1049B_{0A})
<STN transmissive positive>

L54110490020000 (SEK1049B_{1A})
<STN transmissive negative>

Photograph shows L54110490010000 (SEK1049B_{0A})



* Photograph of the monitor is its image

Features

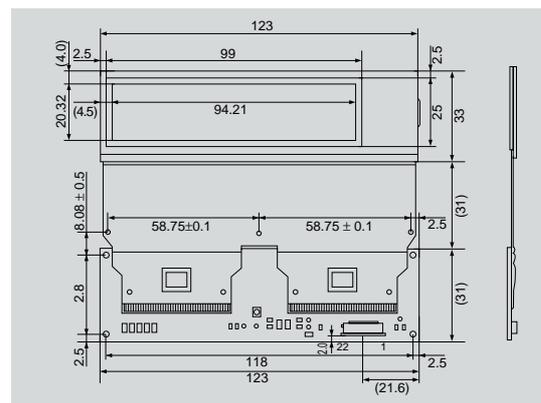
- By using a 248 × 60 pixel display screen, FM multiplex broadcasting / VICS level 1 is supported, and 15 characters × 2 lines of Japanese text can be displayed.
- Low current of 700 μA (typical value when illuminated, with V_{DD} = 5.0 V, and with voltage tripler).
- Use of standard module contributes customers' reduced development time and cost.
- This module is constructed with LCD and PCB connected together using TCP and a heat seal, and is especially adapted to minimize device size and weight.

Specifications

Driving method	Passive matrix
Module structure	LCD + heat seal + TCP + PCB
Display format	248 × 60 pixels
Display mode	STN (FTN) (transflective, t = 1.1 mm)
LCD driver	S1D15600T00B0 (SED1560T _{0B} × 2)
Interface	8-bit parallel (68/80 series)
Power supply voltage	Single 5V input
Liquid crystal drive power supply	Internal (typical V _{OPR} = 13.2 V)
Current	700 μA (*1)
Outline dimensions	123 × 96 mm
Operating temperature	-20 to 70°C
Storage temperature	-40 to 80°C

*1 Typical value when illuminated, with V_{DD} = 5.0 V, and with voltage tripler
* This module does not have a built-in backlight.

Outline dimensions



Connector type: 52745-22XX (Molex)

GLOSSARY

Term	Explanation
COB (chip on board)	Wire bonding is used to mount IC chips onto printed circuit boards.
COF (chip on FPC)	Chip parts are mounted onto a TCP.
D-TFD (digital Thin Film Diode)	Diode (two terminals) formed on the glass circuit board like thin film of all the active device. Digital of D-TFD expresses its special merit by adopting the digital interface as far as our drive system is concerned.
EL (electro luminescence)	Light is generated by an electric field. An EL layer is formed on a film with high-molecular weight, and is used as an EL light source for liquid crystal displays.
FTN (formulated STN)	Optically compensated film is added to an STN, and is used as a monochrome display.
LED (light emitting diode)	A light-emitting diode
MD-TFD (mobile digital thin film diode)	D-TFD most suitable for mobile communications.
M-TAB (Mounted TAB)	Assembly technology that chip mounted on TCP. Using this technology, reduce the number of parts on application products and the number of pins.
PCB (print circuit board)	Printed circuit board
QFP (quad flat package)	A package with leads mounted in four directions.
QTP (quad tape carrier package)	Four-directional type TCP.
SMT (surface mount technology)	Surface mounting.
STN (super twisted nematic)	A nematic liquid crystal twisted by approximately 180 to 270 degrees, and the type of display used with it.
TCP (tape carrier package)	A flexible board printed with a circuit pattern, and mounted with IC chips
t_f (fall time)	Response time: Falling edge time.
TN (twisted nematic)	A nematic liquid crystal twisted by approximately 90 degrees, and the type of display used with it.
t_r (rise time)	Response time: Rising edge time.
V_{op} (operating voltage)	LCD drive voltage / liquid crystal drive voltage
V_{th} (threshold voltage)	Threshold voltage.

Technical Information on Epson Color Modulation

The software image processing technologies can realize high-quality images equivalent to 260 thousands colors. ^(*1)

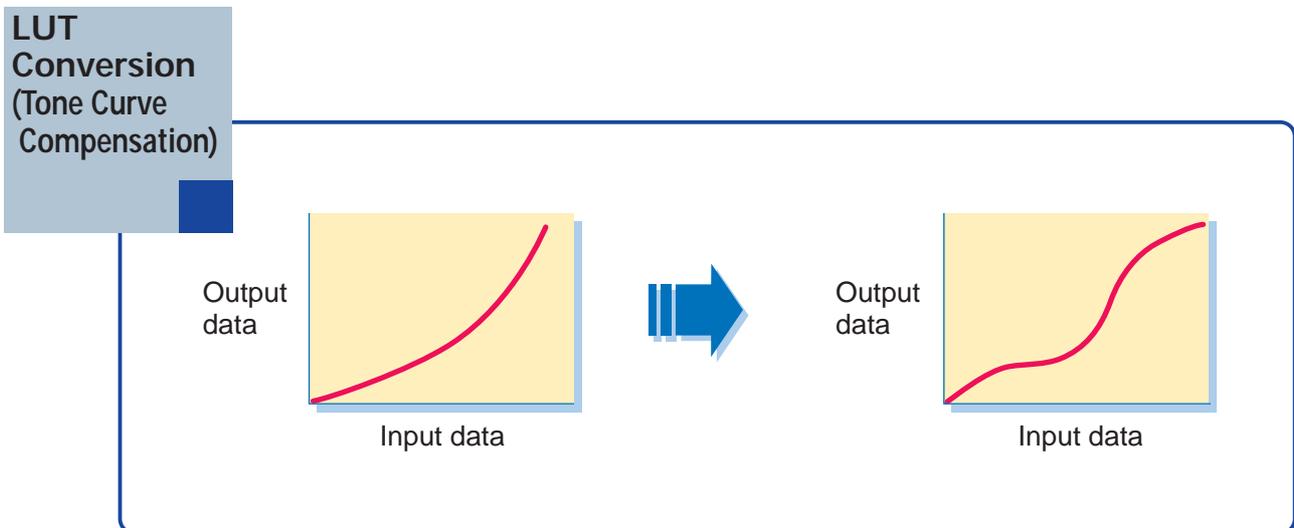
As the display quality of contents is increasing more rapidly on cellular phones, the LCD modules allowing more color and higher quality image display are expected.

Generally, if the module memory size is increased for better gradation display, more smooth images can be displayed in a larger number of colors. However, the power consumption and manufacturing cost of the module increase. We have solved these problems by developing "Epson Color Modulation", the software image processing technologies based on our experience of ink-jet printer development. Now, we can display vivid and sharp images by utilizing the highest performance of LCD. We can display an image equivalent to 260 thousands colors ^(*1) using a 4,096-color LCD module with very low power consumption.

The Epson Color Modulation is constituted of the following two basic technologies:

① LUT^(*2) conversion (tone curve compensation) based on accurate measurement of LCD performance

LUT conversion obtained by our experiencing of ink-jet printer technology can realize the vivid and impressive color images such as clear sky and human skins with utilizing the highest LCD module performance.



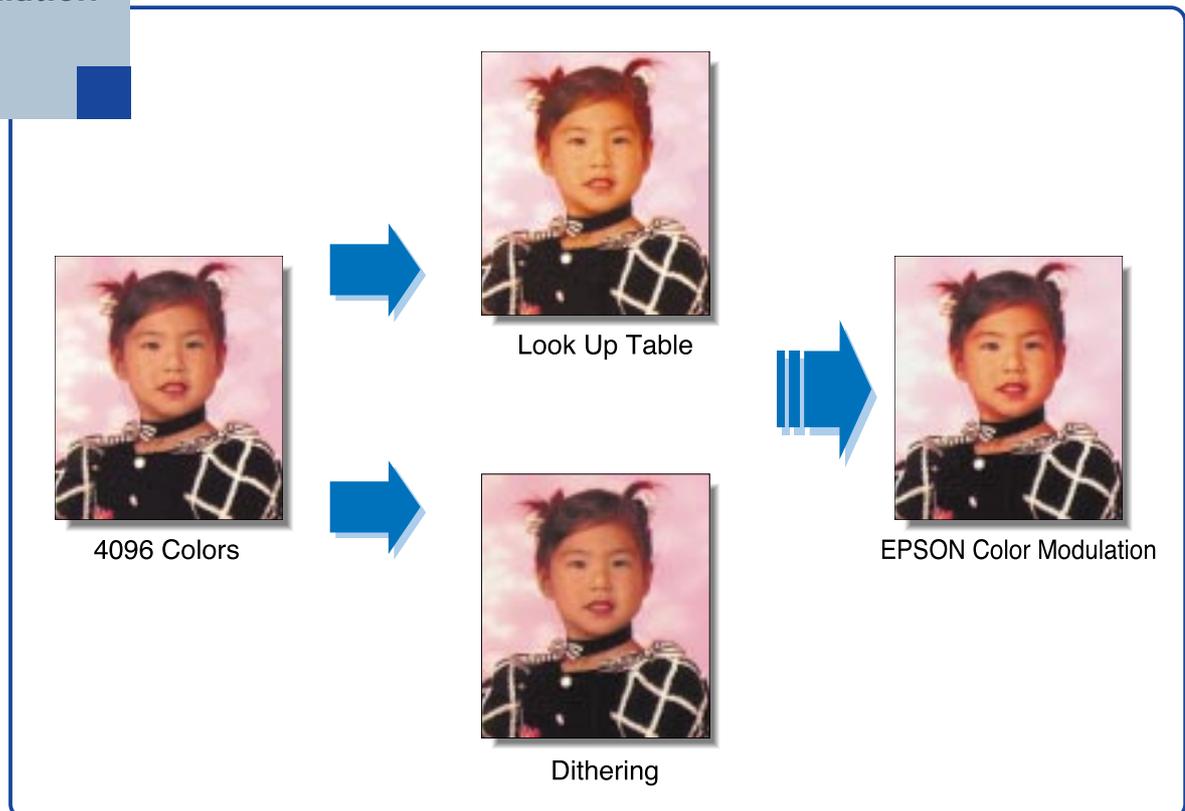
*1 This is a theoretical value obtained by software processing. It is different from the actual 260 thousands color images.

*2 Lookup table.

② Color modulation by pseudo half-tone image processing dithering .

When the blue sky or human skin is displayed with a small number of colors, contour lines called false contouring may appear. However, if the number of colors is increased by pseudo half-tone image processing, the false contouring can be eliminated.

EPSON
Color
Modulation





ENERGY SAVING EPSON

EPSON offers effective savings to its customers through a wide range of electronic devices, such as semiconductors, liquid crystal display (LCD) modules, and crystal devices. These savings are achieved through a sophisticated melding of three different efficiency technologies.

Power saving technology provides low power consumption at low voltages.

Space saving technology provides further reductions in product size and weight through super-precise processing and high-density assembly technology.

Time saving technology shortens the time required for design and development on the customer side and shortens delivery times.



Our concept of Energy Saving technology conserves resources by blending the essence of these three efficiency technologies. The essence of these technologies is represented in each of the products that we provide to our customers.

In the industrial sector, leading priorities include measures to counter the greenhouse effect by reducing CO₂, measures to preserve the global environment, and the development of energy-efficient products. Environmental problems are of global concern, and although the contribution of energy-saving technology developed by EPSON may appear insignificant, we seek to contribute to the development of energy-saving products by our customers through the utilization of our electronic devices. EPSON is committed to the conservation of energy, both for the sake of people and of the planet on which we live.



SEIKO EPSON CORP.LCD OPERATIONS DIVISION acquired ISO9001 and ISO14001 certification.

LCD module for Mobile Communication Product Catalog

April/2001

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**SEIKO EPSON WWW Server
Electronic Device Information**

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