

D-TFD

Active-Matrix LCD Module

April/1999

Digital

Digital

Brighter and more brilliant

EPSON D-TFD active matrix LCD modules

Having improved our conventional MIM (Metal Insulator Metal) active matrix liquid crystal, Epson is currently promoting D-TFD (Digital Thin Film Diode) active matrix liquid crystal with concepts of low power consumption, digital technology and high definition.

Since this D-TFD employs digital gradation rather than analog gradation of TFT products, digitalization of a total system including the user interface is easily available.

Accompanying rapid digitalization of electronic equipment, digitalization of a system as a whole is strongly demanded.

D-TFD will help simplifying circuits, reducing equipment weight, enhancing image quality and cutting operating power, thus minimizing operation costs of the total system.

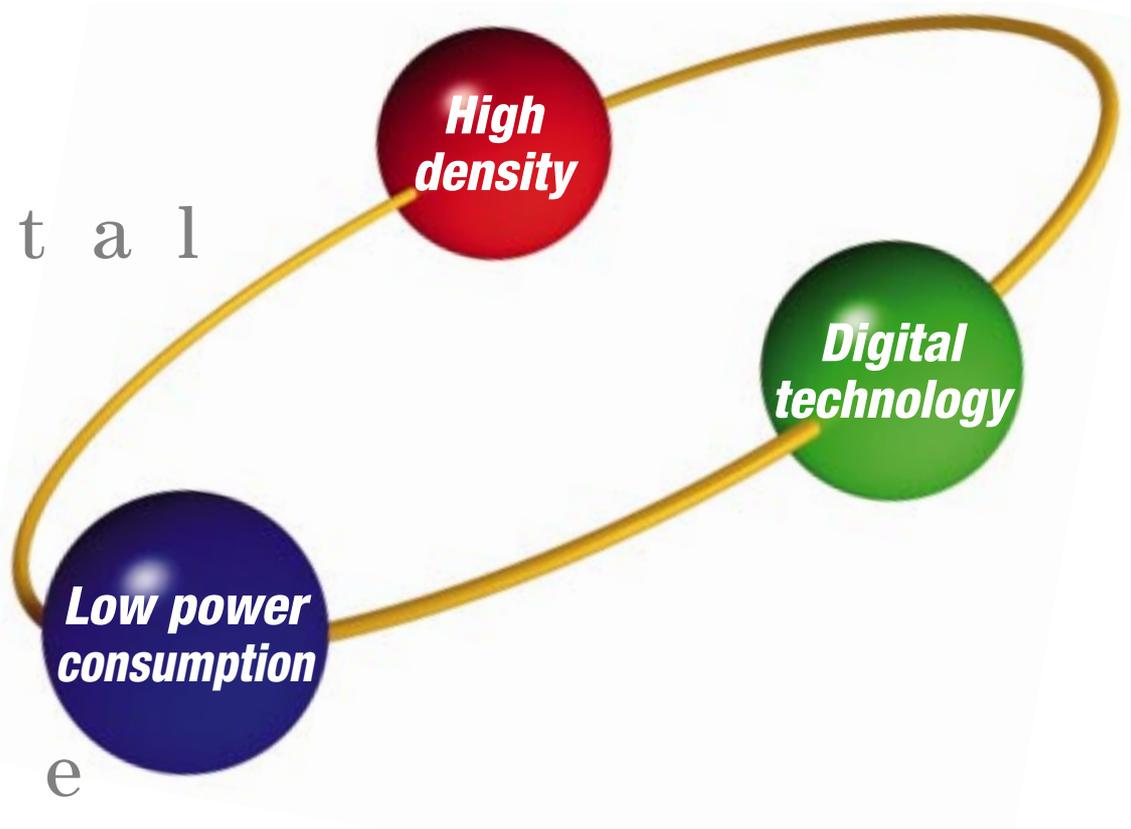
Our efforts for product improvement will never stop.

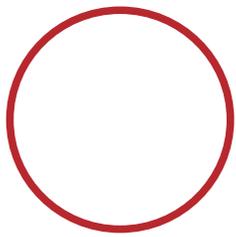
D i g i t a l

T h i n

F i l m

D i o d e





D-TFD Lineup

Transmissive type TN In normally white mode ○

Narrower frame width through use of COG ○

Picture reversing function ○

LB18DB-BC01



LB18DB-BD10



LB18DC2-BC00



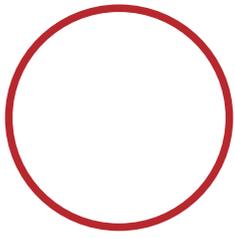
LB18DC2-BD00



	LB18DB-BC01 (Transmissive)	LB18DB-BD10 (Transmissive)	LB18DC2-BC00 (Transmissive)	LB18DC2-BD00 (Transmissive)
Diagonal size	4.4cm (1.8")	4.4cm (1.8")	4.4cm (1.8")	4.4cm (1.8")
Dots	312 × 230	312 × 230	474 × 234	474 × 234
Dot pitch (μm)	114 × 116	114 × 116	75 × 114	75 × 114
Outline dimensions (mm)	51.1 × 44.7 × 8.8	49.6 × 42.5 × 8.8	TBD	TBD
Interface	Analog RGB+C-Sync NTSC/PAL switching enabled	6bit digital RGB +Clock (FIN) +H-Sync+V-Sync	Analog RGB+C-Sync NTSC/PAL switching enabled	6-bit digital RGB +Clock (FIN) +H-Sync+V-Sync
Surface luminance (cd/m²)	240	240	200	200
Display colors	262, 144	262, 144	262, 144	262, 144
Contrast ratio (min.)	Up to 100 : 1			
Backlight	Cold-cathode tube side light	Cold-cathode tube side light	Cold-cathode tube side light	Cold-cathode tube side light
Power consumption (W) (Portions consumed by Back-light)	0.80 (0.57)	0.62 (0.57)	0.50 (0.42)	0.47 (0.42)
Dot layout	Delta	Delta	Delta	Delta
Viewing angle				
Vertically	+15°, -20°	+15°, -20°	+15°, -20°	+15°, -20°
Horizontally	±50°	±50°	±50°	±50°

The pictures show images.

Seiko Epson reserves the right to make changes to this material without notice.



D-TFD Lineup

LB31MC-BC00



LB46SQP-BC00



LB20DE-BC00



	LB20DE-BC00 (Transmissive)	LB20DE-BD00 (Transmissive)	LB31MC-BC00 (Transmissive)
Diagonal size	5.0cm (2.0")	5.0cm (2.0")	7.8cm (3.1")
Dots	640 × 234	640 × 234	474 × 234
Dot pitch (μm)	62 × 128	62 × 128	130 × 202
Outline dimensions (mm)	TBD	TBD	77.4 × 62.2 × 9.4
Interface	Analog RGB+C-Sync NTSC/PAL switching enabled	6bit digital RGB +Clock (FIN) +H-Sync+V-Sync	Analog RGB+C-Sync NTSC/PAL switching enabled
Surface luminance (cd/m²)	200	200	300
Display colors	262, 144	262, 144	262, 144
Contrast ratio (min.)	Up to 100 : 1	Up to 100 : 1	Up to 100 : 1
Backlight	Cold-cathode tube side light	Cold-cathode tube side light	Cold-cathode tube side light
Power consumption (W)	TBD	TBD	1.35
(Portions consumed by Back-light)	TBD	TBD	(1.12)
Dot layout	Delta	Delta	Diagonal Mosaic
Viewing angle			
Vertically	+15°, -20°	+15°, -20°	+20°, -15°
Horizontally	±50°	±50°	±50°

Transmissive type TN In normally white mode ○

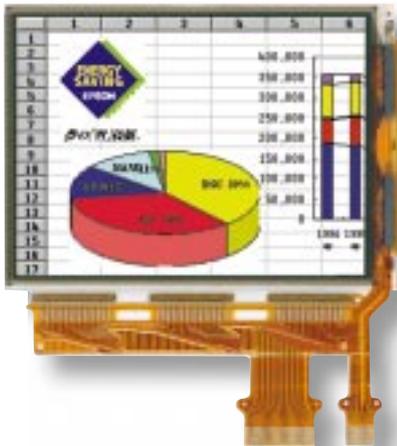
Miniature size, light weight and low power consumption ○

High purity Reflective Color LCD ○

Narrower frame width through use of COG ○

Picture reversing function ○

LF37SQR-000



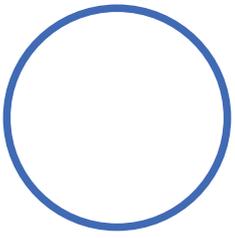
LB56SQX-BC00



LB46SQP-BC00 (Transmissive)	LB56SQX-BC00 (Transmissive)	LF37SQR-000 (Reflective)	LF26SCR-009 (Reflective)
11.8cm (4.6")	14.0cm (5.6")	9.4cm (3.7")	6.6cm (2.6")
960 × 234	960 × 240	320 × RGB × 240	160 × RGB × 240
98 × 300	118 × 354	78 × 234	76 × 228
113.9 × 91.2 × 16.36	145.0 × 118.0 × 18.0	85.7 × 67.0 × 1.9 (LCD Module glass)	46.1 × 65.2 × 1.9 (LCD Module glass)
Analog RGB+C-Sync NTSC/PAL switching enabled	Analog RGB+C-Sync NTSC/PAL switching enabled	Digital RGB Parallel 6bit each color (When exclusive control IC used)	Digital RGB Parallel 6bit each color (When exclusive control IC used)
250	300	Reflectance 25%	Reflectance 25%
262, 144	262, 144	262, 144	262, 144
Up to 100 : 1	Up to 100 : 1	12 : 1 (Typ.)	12 : 1 (Typ.)
Cold-cathode tube side light	Cold-cathode tube side light	-	-
4.1 (2.8)	5.0 (4.4)	40mW -	35mW -
Vertical Stripe	Vertical Stripe	Vertical Stripe	Vertical Stripe
+15°, 20° ±50°	+10°, 15° ±40°	TBD	TBD

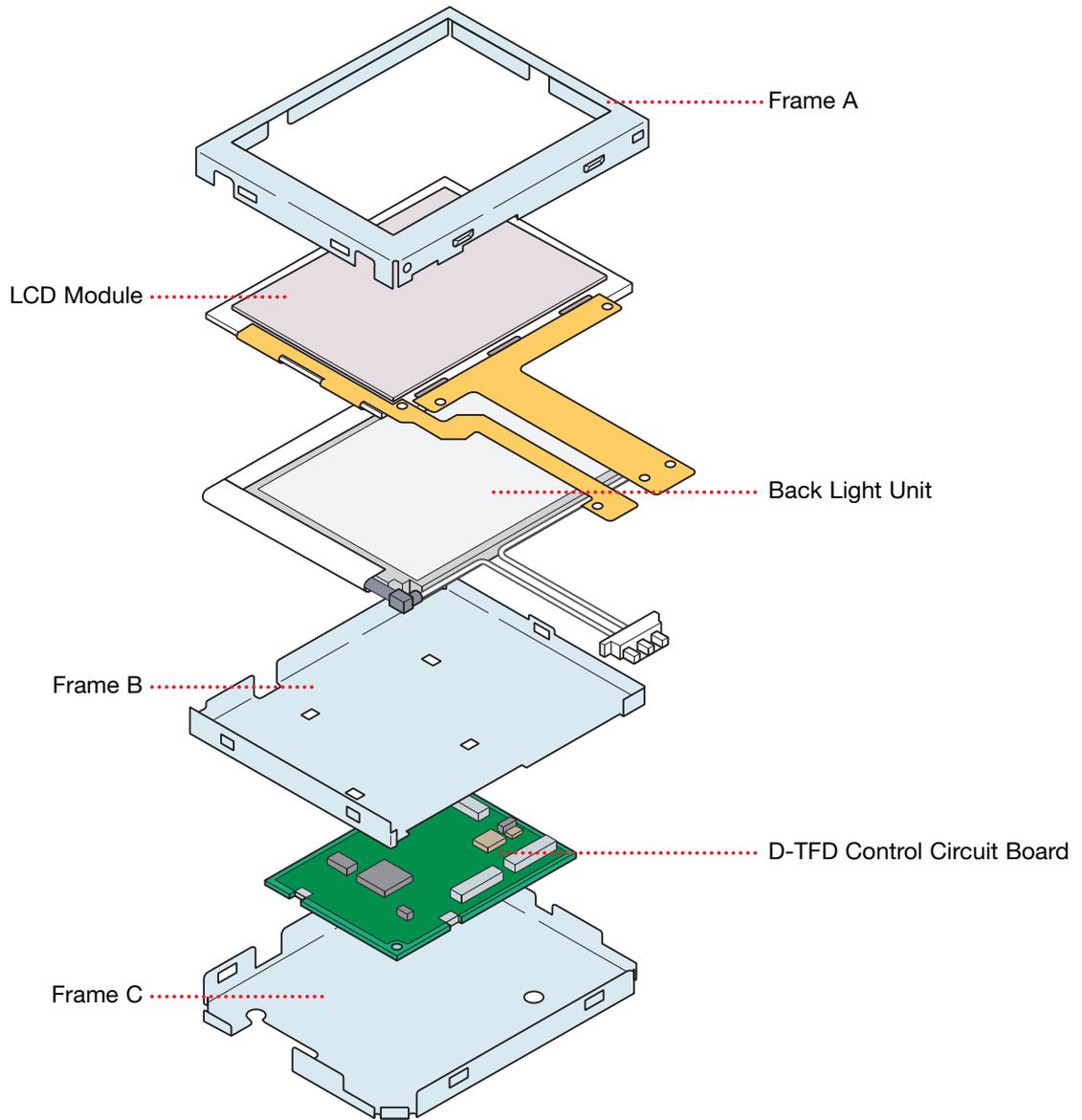
The pictures show images.

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D-TFD Block Assemble

(Transmissive)



Panel block
(Front view)



Panel block
(Top view)

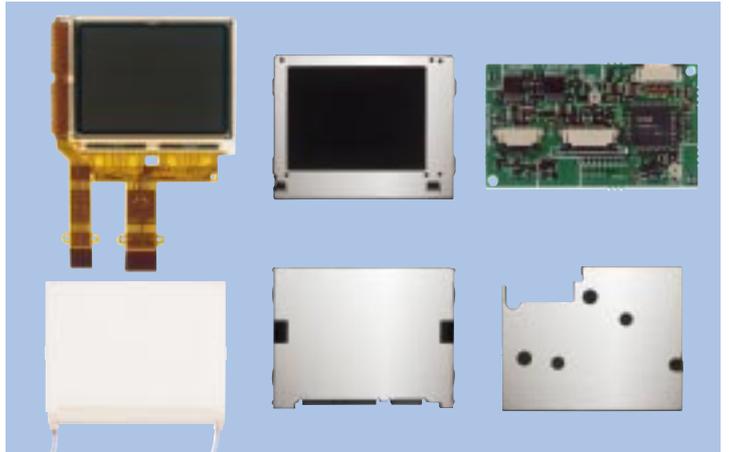
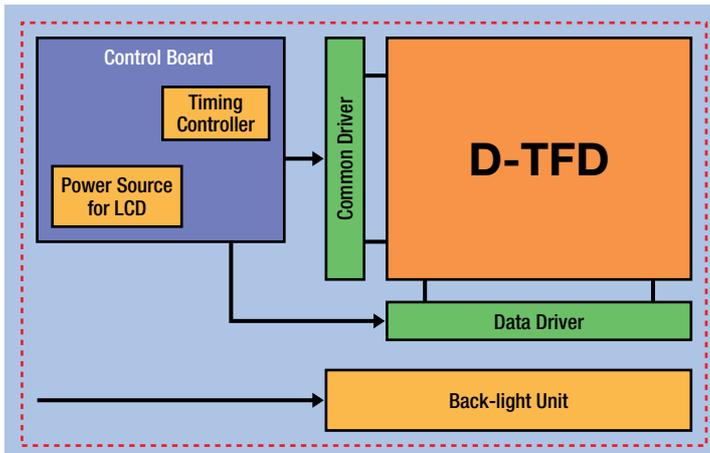


Panel module (Side view)
(COG assembling)

Forms of product supplied

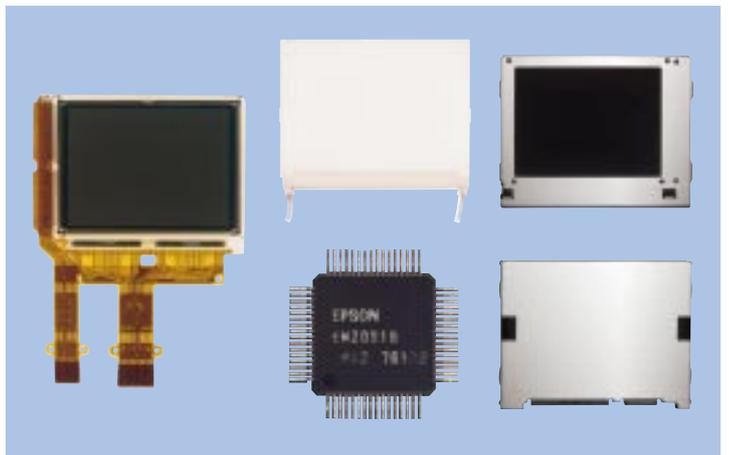
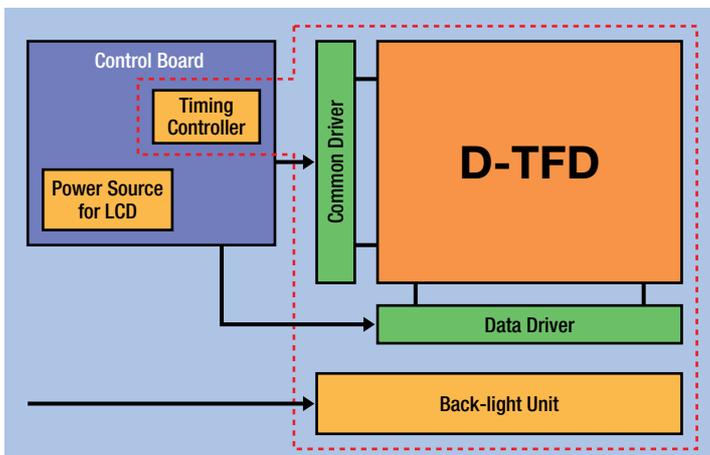
1 Panel module + control board + backlight unit

Standard module is equipped with panel module, control board and backlight unit.



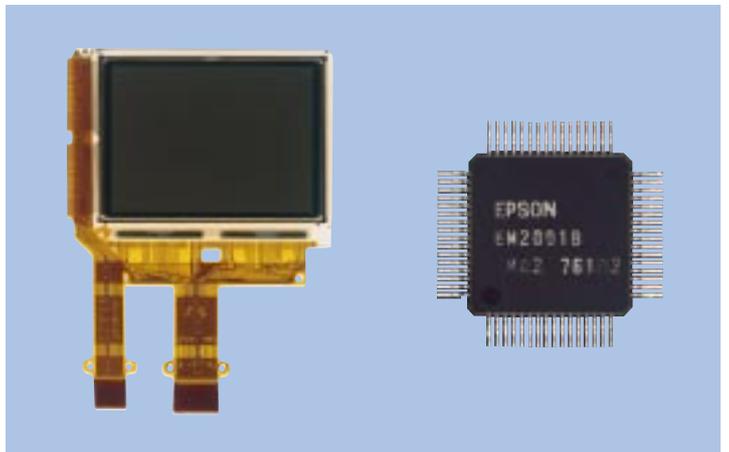
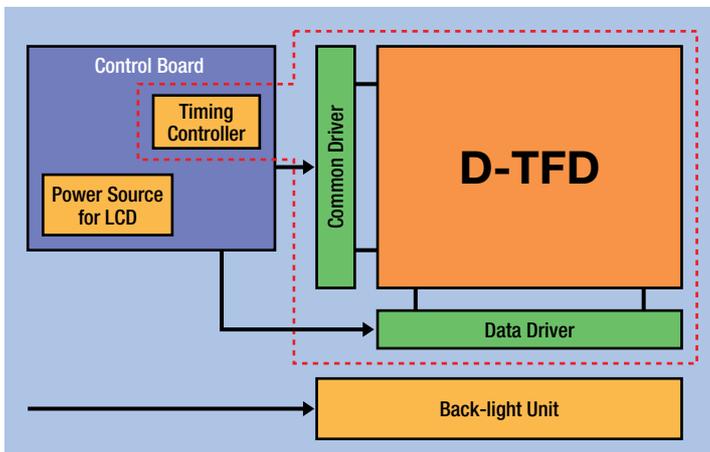
2 Panel module + backlight unit (+ timing control IC)

This module is not equipped control board. A separate timing control IC is also required.

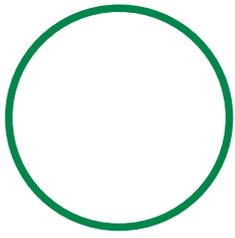


3 Panel module (+ timing control IC)

This is an T-TFD liquid crystal panel with a driver IC implemented on it. A separate timing control IC is also required.



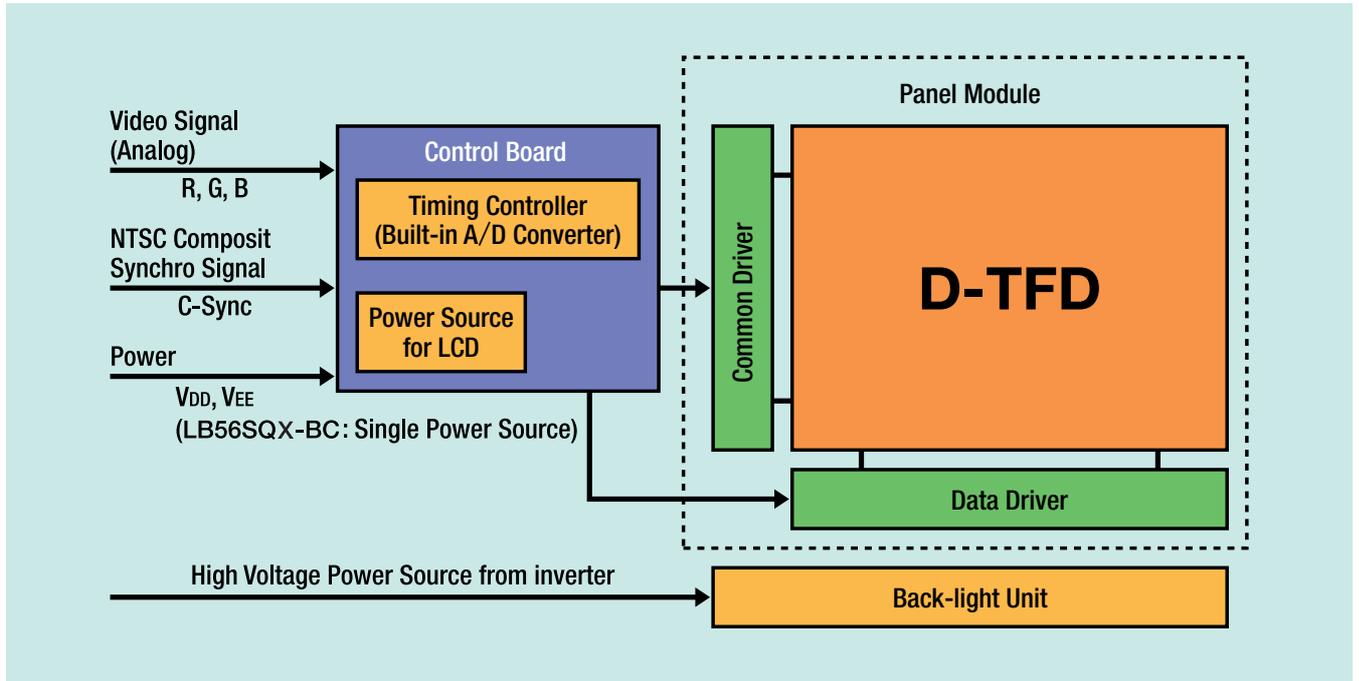
NOTE: In all configurations, the inverter for the backlight is not supplied, and must be provided by the customer. For evaluation purposes, however, Epson can supply a backlight inverter and chrominance circuit.



Interfaces

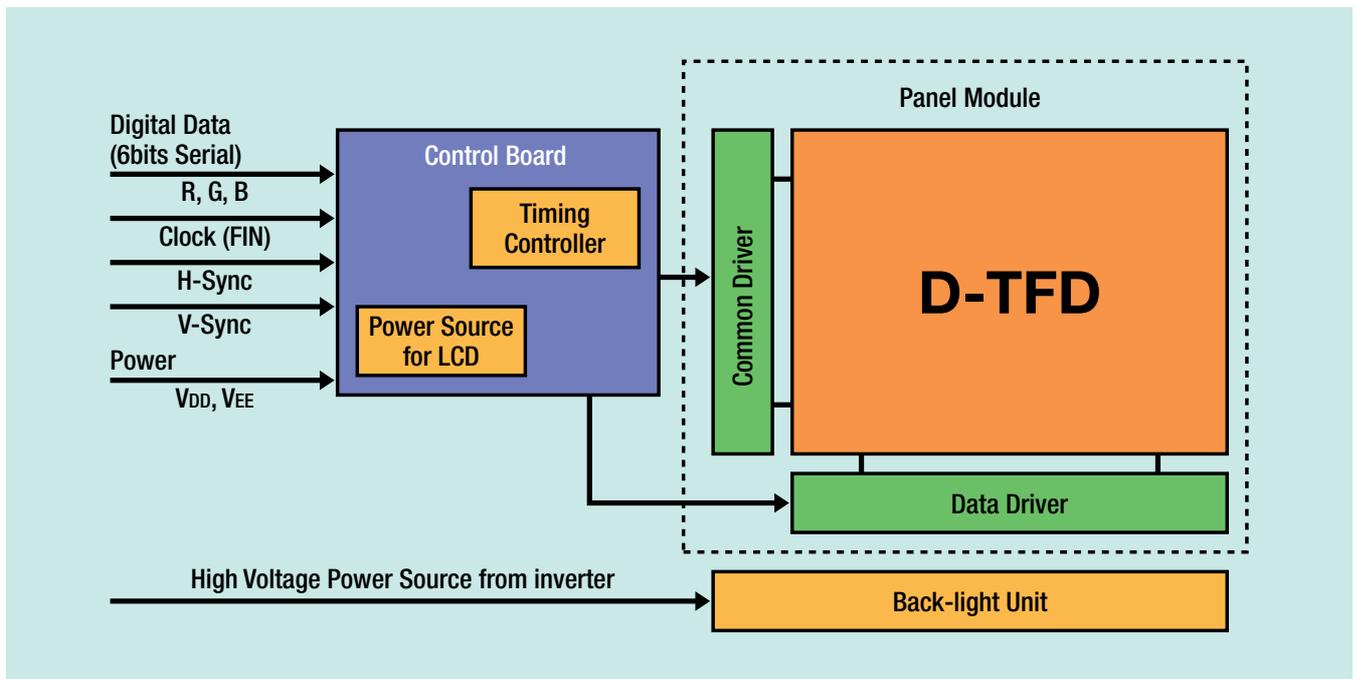
1 Analog Interface②

applicable to LB18DB-BC/LB18DC2-BC/LB20DE-BC/LB31MC-BC/LB46SQP-BC/LB56SQX-BC



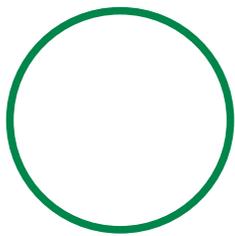
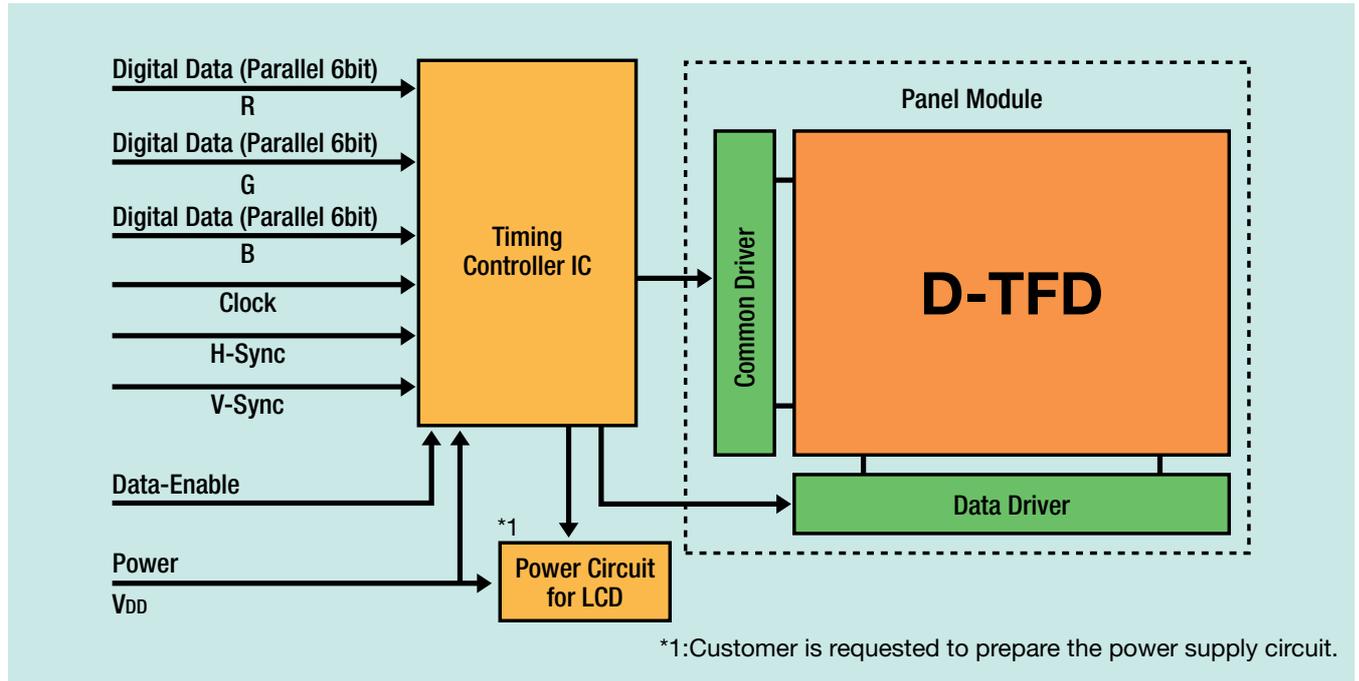
2 Digital Interface

applicable to LB18DB-BD/LB18DC2-BD/LB20DE-BD



3 VGA Interface

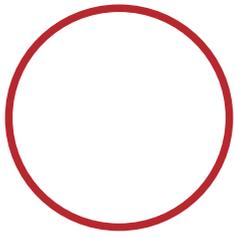
applicable to LF26SCR-000/LF37SQR-000 (When using specific controller IC)



Timing Controller IC

	LB18DB-BC01	LB18DB-BD10	LB18DC2-BC00	LB18DC2-BD00	LB20DE-BC00	LB20DE-BD00
IC Model	EM1811B(64pin) EM1811C(48pin)	EM1812B	EB1821D	TBD	TBD	TBD
Package Type	SQFP	SQFP	SQFP	SQFP	TBD	TBD
No. pins	64/48	64	48	TBD	TBD	TBD

	LB31MC-BC00	LB46SQP-BC00	LB56SQX-BC00	LF26SCR-000	LF37SQR-000
IC Model	EM3101B	EM6511A	EM4601C	TBD	ER3702A
Package Type	SQFP	SQFP	SQFP	TBD	TQFP
No. pins	64	100	64	TBD	64



Glossary

COG (Chip On Glass)

- ▶ The IC chip is mounted by bonding directly to the glass.

TN (Twisted Nematic)

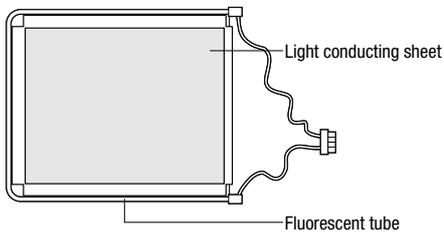
- ▶ A nematic liquid crystal with a configuration twisted through approximately 90°. Also used to refer to the liquid crystal display mode using such an arrangement.

Contrast ratio

- ▶ The ratio of black and white intensities.

Side light type

- ▶ A type of backlight.



Normally white mode

- ▶ When LCD power supply is turned off, display is white mode.

Image reversion function

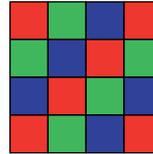
- ▶ The image can be independently reversed left-to-right and top-to-bottom.

Active matrix

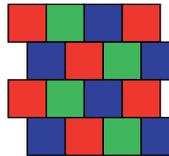
- ▶ Each pixel is switched individually, giving high display performance.

Dot layout

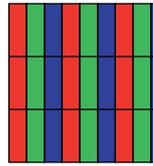
(A) Diagonal mosaic



(B) Delta mosaic



(C) Vertical stripe



Normal

- ▶ Surface untreated.

AG (Anti-glare)

- ▶ Reducing the reflected light by dispersion.

AR (Anti-reflection)

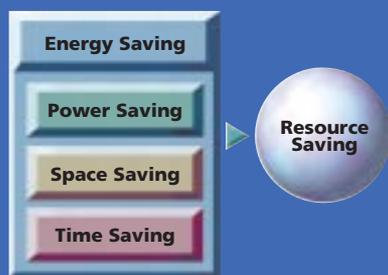
- ▶ Reducing the light reflected by the surface of the polarizing filter by the use of a multi-layered coating. Simultaneous treatment to improve the ability to wipe off dirt is also carried out.

Reflector

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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

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