

## L2462

### ■ Features of L2462 Series

- 24 characters × 2 lines
- 5 × 7 dot matrix + cursor
- 1/16 duty
- 5V single power supply

### ■ Specification

#### A. Mechanical Characteristics

Item	Specifications	Unit
Module size (H × V × T) (Reflective/built-in EL backlight type)	118.0 × 36.0 × 11.3	mm
Module size (H × V × T) (Built-in LED backlight type)	118.0 × 36.0 × 15.8	mm
Viewing area (H × V)	94.5 × 17.8	mm
Character size (5 × 7 dot, H × V)	3.20 × 4.85	mm
Dot size (H × V)	0.60 × 0.65	mm
Dot space	0.05	mm
Center to center dimension of mounting holes (H × V)	113.0 × 31.0	mm
Weight (Reflective type)	40	g
Weight (Built-in LED backlight type)	60	g
Weight (Built-in EL backlight type)	45	g

H : Horizontal, V : Vertical, T : Thickness (max.)

#### B. Absolute Maximum Ratings

V<sub>SS</sub> = 0V

Item	Symbol	Conditions	Min.	Max.	Unit
Power supply voltage	V <sub>DD</sub>		-0.3	7.0	V
	V <sub>LC</sub>		V <sub>DD</sub> -7.0	V <sub>DD</sub> +0.3	V
Input voltage	V <sub>IN</sub>		-0.3	V <sub>DD</sub> +0.3	V
Operating temp.	T <sub>opr</sub>		0	+50	°C
Storage temp.	T <sub>stg</sub>		-20	+60	°C
Storage humidity		≤48hrs	+20	+85	%RH
		≤1000hrs	+20	+65	%RH

#### C. Electrical Characteristics

V<sub>DD</sub> = 5V ± 5%, V<sub>SS</sub> = 0V, Ta = 0°C to 50°C

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Power supply voltage	V <sub>DD</sub>		4.75	5.00	5.25	V
	V <sub>DD</sub> -V <sub>LC</sub>		3.0	—	6.0	V
Input voltage	High	V <sub>IH1</sub>	2.2	—	V <sub>DD</sub>	V
	Low	V <sub>IL1</sub>	0	—	0.6	V
Output voltage	High	V <sub>OH1</sub>	-I <sub>OH</sub> = 0.205mA	2.4	—	V
	Low	V <sub>OL1</sub>	I <sub>OL</sub> = 1.2mA	—	—	0.4
Current consumption	I <sub>DD</sub>	Ta = 25°C V <sub>DD</sub> = 5V V <sub>LC</sub> ***	—	2.5	4.0	mA
	I <sub>LC</sub>		—	0.5	1.0	mA
Clock oscillation frequency	f <sub>osc</sub>	Resistance oscillation	190	270	350	kHz

\* Applied to DB<sub>0</sub> ~ DB<sub>7</sub>, E, R/W, RS

\*\* Applied to DB<sub>0</sub> ~ DB<sub>7</sub>

\*\*\* TN LCD module : V<sub>LC</sub> = 0.4V, STN LCD module : V<sub>LC</sub> = 0.25V

#### D. Optical Characteristics

##### D-1 TN LCD module (reflective type)

Viewing angle : 6 o'clock (∅ = 0°), Ta = 25°C, V<sub>opr</sub> = 4.6V

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Viewing angle	θ <sub>1</sub>	C ≥ 2.0 ∅ = 0°	—	—	10	deg.
	θ <sub>2</sub>		45	—	—	
	θ <sub>2</sub> - θ <sub>1</sub>		35	—	—	
Contrast	C	θ = 30°, ∅ = 0°	5	8	—	—
Response time (rise)	t <sub>on</sub>	θ = 0° ∅ = 0°	—	40	80	ms
Response time (fall)	t <sub>off</sub>		—	120	160	
Response time (rise)	t <sub>on</sub>	θ = 0°, ∅ = 0° Ta = 0°C V <sub>opr</sub> = 4.8V	—	240	330	ms
Response time (fall)	t <sub>off</sub>		—	425	650	

##### D-2 STN LCD module (gray)

###### D-2-1 Reflective type

Viewing angle : 6 o'clock (∅ = 0°), Ta = 25°C, V<sub>opr</sub> = 4.75V

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Viewing angle	θ <sub>1</sub>	C ≥ 2.0 ∅ = 0°	—	—	-15	deg.
	θ <sub>2</sub>		55	—	—	
	θ <sub>2</sub> - θ <sub>1</sub>		70	—	—	
Contrast	C	θ = 25°, ∅ = 0°	2	4	—	—
Response time (rise)	t <sub>on</sub>	θ = 0° ∅ = 0°	—	270	400	ms
Response time (fall)	t <sub>off</sub>		—	60	100	
Response time (rise)	t <sub>on</sub>	θ = 0°, ∅ = 0° Ta = 0°C V <sub>opr</sub> = 5.0V	—	720	1100	ms
Response time (fall)	t <sub>off</sub>		—	170	350	

###### D-2-2 Transflective type

Viewing angle : 6 o'clock (∅ = 0°), Ta = 25°C, V<sub>opr</sub> = 4.75V, Backlight OFF

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Viewing angle	θ <sub>1</sub>	C ≥ 2.0 ∅ = 0°	—	—	-10	deg.
	θ <sub>2</sub>		50	—	—	
	θ <sub>2</sub> - θ <sub>1</sub>		60	—	—	
Contrast	C	θ = 25°, ∅ = 0°	2	4	—	—
Response time (rise)	t <sub>on</sub>	θ = 0° ∅ = 0°	—	270	400	ms
Response time (fall)	t <sub>off</sub>		—	60	100	
Response time (rise)	t <sub>on</sub>	θ = 0°, ∅ = 0° Ta = 0°C V <sub>opr</sub> = 5.0V	—	720	1100	ms
Response time (fall)	t <sub>off</sub>		—	170	350	

#### E. Recommended Operating Voltage

The recommended value of (V<sub>opr</sub>) for an ambient temperature is as follows.

##### E-1 TN LCD module

V<sub>opr</sub> = V<sub>DD</sub>-V<sub>LC</sub>

Temperature (°C)	0	25	50
V <sub>opr</sub> (V)	4.8	4.6	4.1

##### E-2 STN LCD module (gray)

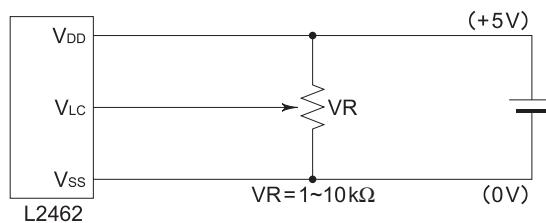
V<sub>opr</sub> = V<sub>DD</sub>-V<sub>LC</sub>

Temperature (°C)	0	25	50
V <sub>opr</sub> (V)	5.00	4.75	4.50

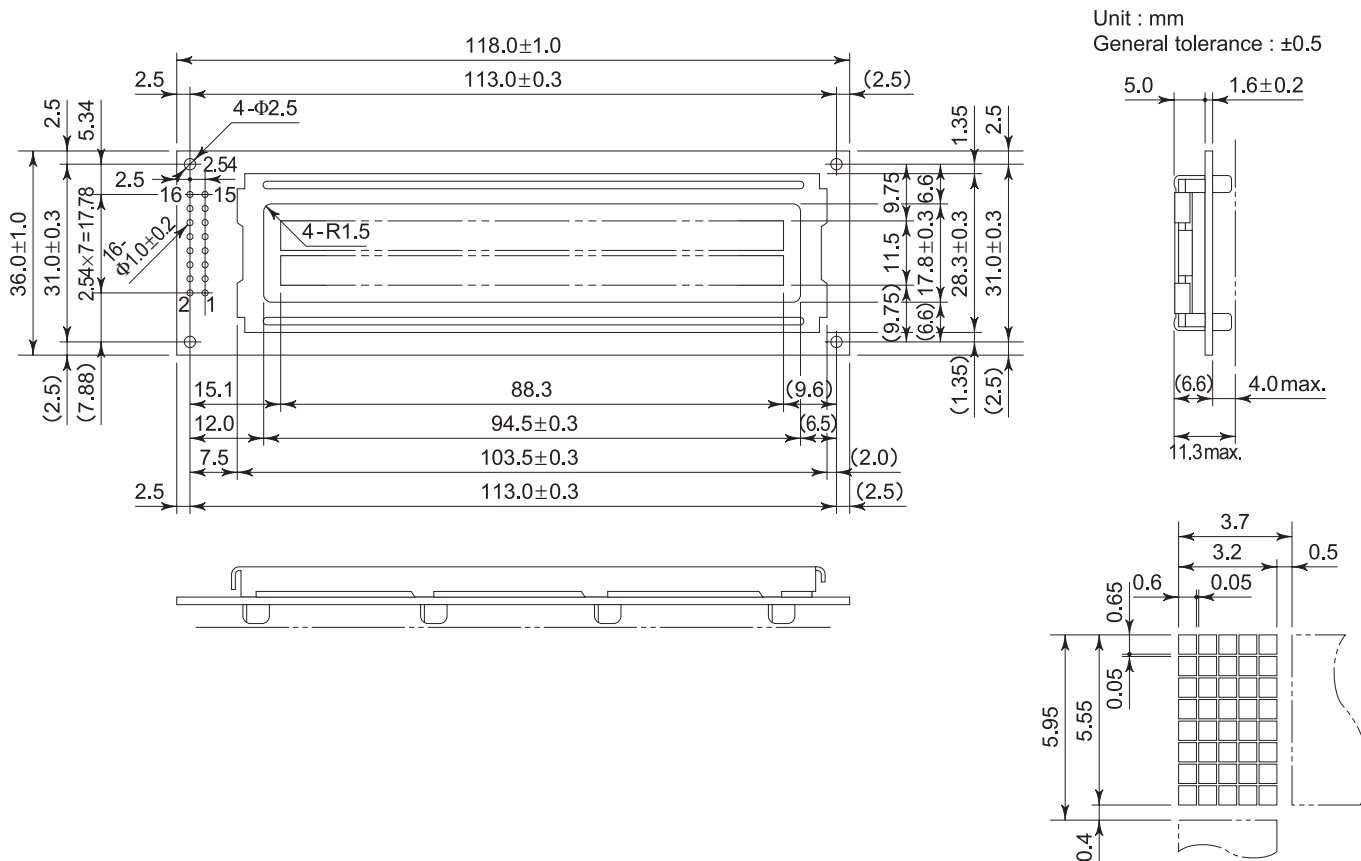
■ TN/STN Reflective type

Item	L2462000000	L246200J000
Mechanical Characteristics	A	A
Absolute Maximum Ratings	B	B
Electrical Characteristics	C	C
Optical Characteristics	D-1	D-2-1
Recommended Operating Voltage	E-1	E-2

F-1 Power Supply



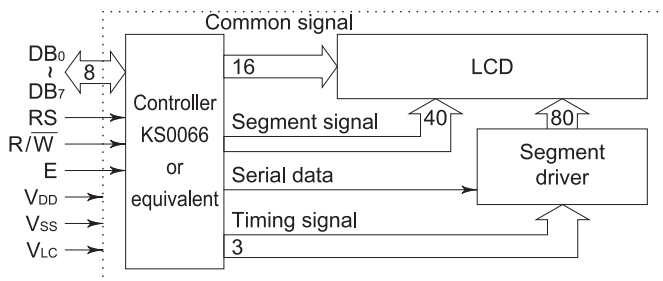
F-2 Dimensions



F-3 Pin Functions

No.	Name	Function
1	V <sub>SS</sub>	GND
2	V <sub>DD</sub>	Power supply voltage +5V
3	V <sub>Lc</sub>	Liquid crystal driving voltage
4	RS	L : Instruction code input H : Data input
5	R/W	L : Data write (LCM←MPU) H : Data read (LCM→MPU)
6	E	Enable
7	DB <sub>0</sub>	Data bus line
8	DB <sub>1</sub>	Data bus line
9	DB <sub>2</sub>	Data bus line
10	DB <sub>3</sub>	Data bus line
11	DB <sub>4</sub>	Data bus line
12	DB <sub>5</sub>	Data bus line
13	DB <sub>6</sub>	Data bus line
14	DB <sub>7</sub>	Data bus line
15	NC	—
16	NC	—

F-4 Block Diagram

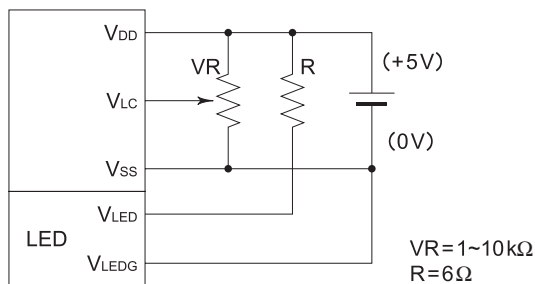


# L2462

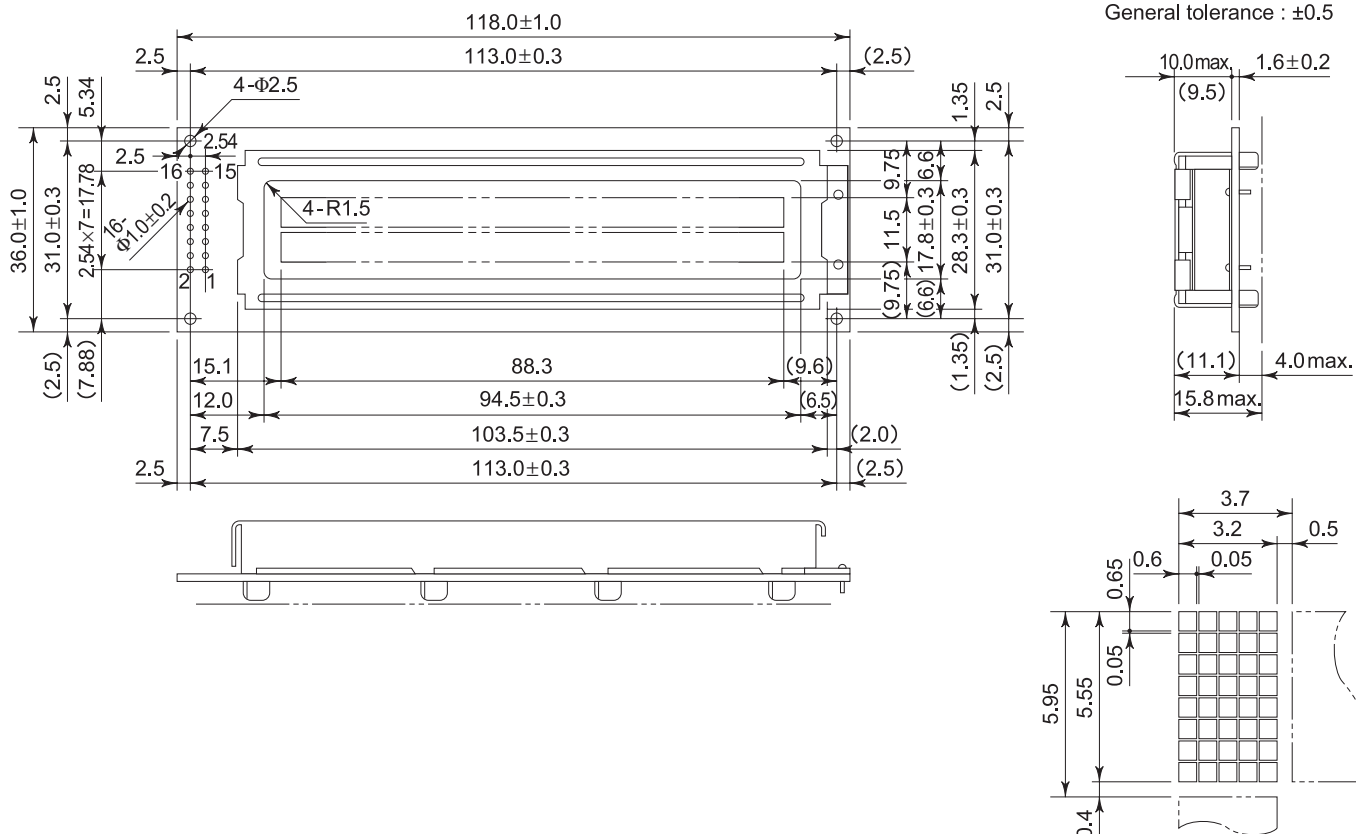
## ■ STN Transflective, Built-in LED Backlight type

Item	L2462B1J000
Mechanical Characteristics	A
Absolute Maximum Ratings	B
Electrical Characteristics	C
Optical Characteristics	D-2-2
Recommended Operating Voltage	E-2

### G-1 Power Supply



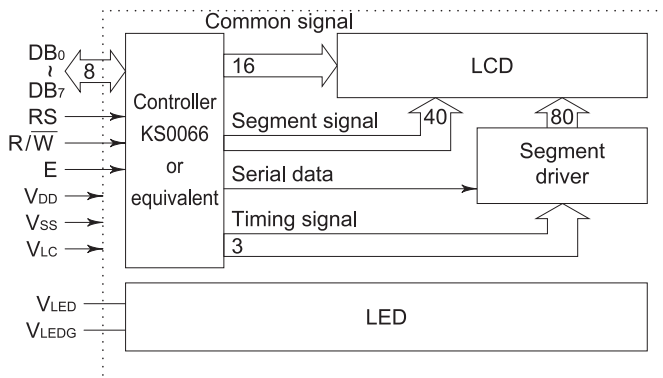
### G-2 Dimensions



### G-3 Pin Functions

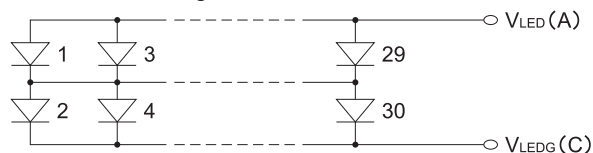
No.	Name	Function
1	VSS	GND
2	VDD	Power supply voltage +5V
3	VLc	Liquid crystal driving voltage
4	RS	L : Instruction code input H : Data input
5	R/W	L : Data write (LCM←MPU) H : Data read (LCM→MPU)
6	E	Enable
7	DB <sub>0</sub>	Data bus line
8	DB <sub>1</sub>	Data bus line
9	DB <sub>2</sub>	Data bus line
10	DB <sub>3</sub>	Data bus line
11	DB <sub>4</sub>	Data bus line
12	DB <sub>5</sub>	Data bus line
13	DB <sub>6</sub>	Data bus line
14	DB <sub>7</sub>	Data bus line
15	VLED	Anode
16	VLEDG	Cathode

### G-4 Block Diagram



### G-5 LED Backlight

#### G-5-1 LED Circuit Diagram

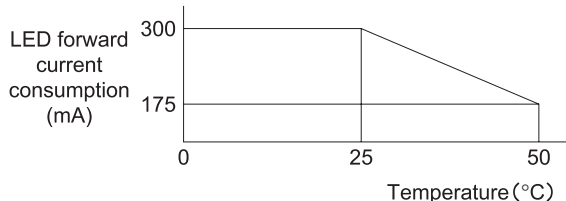


**G-5-2 Absolute Maximum Ratings**

Ta = 25°C

Item	Symbol	Specifications	Unit
LED forward current consumption*	IF	300	mA
LED reverse voltage	VR	8	V
LED allowable dissipation	PD	1.3	W

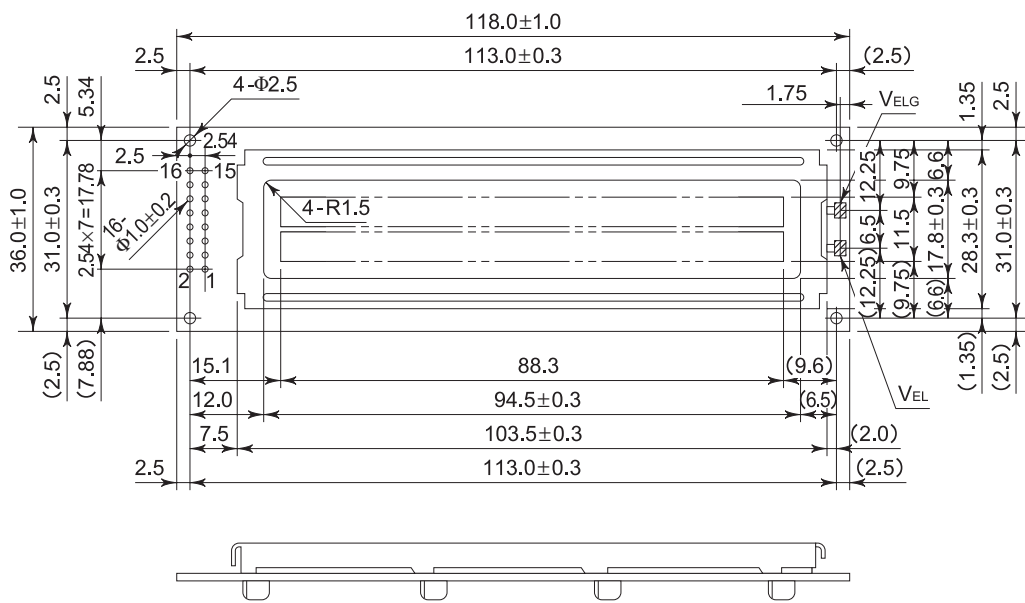
\* LED forward current consumption and operating temperature characteristics are as follows.



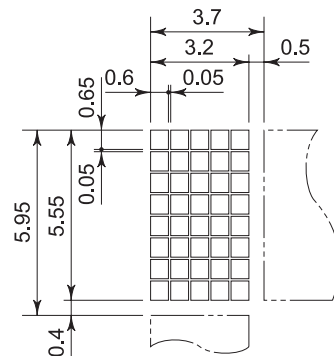
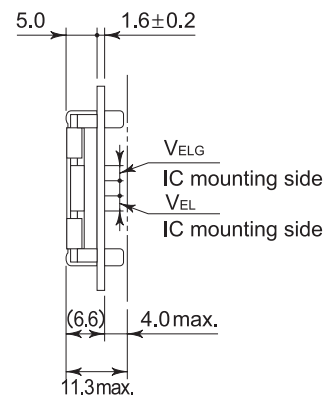
**■ STN Transflective, Built-in EL Backlight type**

Item	L246221J000
Mechanical Characteristics	A
Absolute Maximum Ratings	B
Electrical Characteristics	C
Optical Characteristics	D-2-2
Recommended Operating Voltage	E-2

**H-2 Dimensions**



Unit : mm  
General tolerance : ±0.5



**G-5-3 Electrical Characteristics**

Ta = 25°C

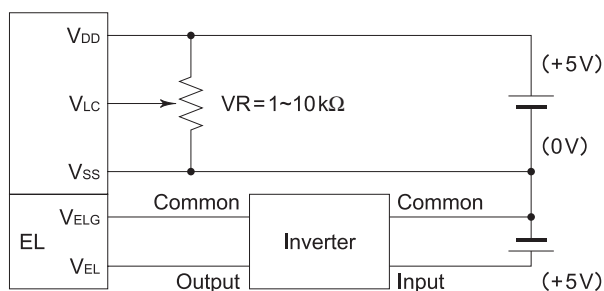
Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
LED forward input voltage	VF	IF = 150mA	3.8	4.1	4.4	V
LED reverse current	IR	VR = 8V	—	—	1.5	mA

**G-5-4 Optical Characteristics**

Ta = 25°C

Item	Symbol	Conditions	Specifications	Unit
Surface brightness (panel upper side)	Bp	IF = 150mA Vopr = 0V	8 min. 10 typ.	cd/m <sup>2</sup>
LED brightness	L	IF = 150mA	40 min. 50 typ.	cd/m <sup>2</sup>
LED service life			50,000 typ.	h
LED color			Yellowgreen	

**H-1 Power Supply**

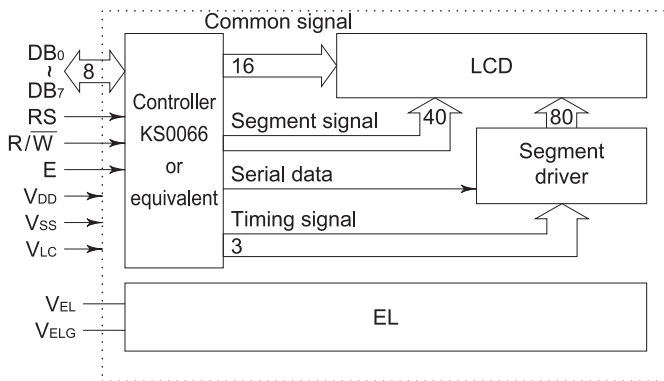


# L2462

## H-3 Pin Functions

No.	Name	Function
1	V <sub>SS</sub>	GND
2	V <sub>DD</sub>	Power supply voltage +5V
3	V <sub>Lc</sub>	Liquid crystal driving voltage
4	RS	L : Instruction code input H : Data input
5	R/W	L : Data write (LCM←MPU) H : Data read (LCM→MPU)
6	E	Enable
7	DB <sub>0</sub>	Data bus line
8	DB <sub>1</sub>	Data bus line
9	DB <sub>2</sub>	Data bus line
10	DB <sub>3</sub>	Data bus line
11	DB <sub>4</sub>	Data bus line
12	DB <sub>5</sub>	Data bus line
13	DB <sub>6</sub>	Data bus line
14	DB <sub>7</sub>	Data bus line
15	NC	—
16	NC	—

## H-4 Block Diagram



## H-5 EL Lamp (white)

### H-5-1 Environmental Characteristics

Item	Symbol	Conditions	Specifications
Operating temperature range	T <sub>opr</sub>		-20°C to +50°C
Storage temperature range	T <sub>stg</sub>		-20°C to +60°C
Soldering heat-resistance		270°C ± 5°C, 3 s max.	No terminal abnormality
Thermal shock		-20°C 30 min. ↔ +60°C 30 min. 5 cycles	No defect on appearance

### H-5-2 Electrical Characteristics

Item	Symbol	Conditions	Spec.	Unit
Electrostatic capacity	C <sub>EL</sub>	f = 1 kHz (in darkroom) 2 VAC	5.5 typ.	nF
Current	I <sub>EL</sub>	When applying rated voltage, 20°C, 70%RH	3.0 max. 2.2 typ.	mA
Maximum rated voltage	V <sub>EL1</sub>	Sine wave, 1 kHz	150	V <sub>rms</sub>
Rated voltage	V <sub>EL2</sub>	Sine wave, 400 Hz	100	V <sub>rms</sub>
Isolation voltage		Between lead and film Sine wave, 50 Hz, 1 min.	1500	V <sub>rms</sub>

## H-5-3 Emission Characteristics

Item	Conditions	Specifications	Unit
Initial brightness (B)	When applying rated voltage 20°C, 70%RH (in darkroom)	30 min. 35 typ.	cd/m <sup>2</sup>
Service life when applying rated voltage	Used continuously down to half of initial brightness 20°C, 70%RH	1500	h
Service life when used with an inverter	Used continuously down to half of initial brightness 20°C, 70%RH	4000	h
Color of light		White	—
Chromaticity coordinates	When applying rated voltage 20°C, 70%RH (in darkroom)	x = 0.315 typ. y = 0.375 typ. x = 0.285 min. y = 0.345 min. x = 0.355 max. y = 0.415 max.	—

## H-6 Suitable Inverter 5A

### H-6-1 Electrical Characteristics (when combined with EL lamp)

Item	Symbol	Conditions	Specifications	Unit
Oscillating frequency	f <sub>INV</sub>	T <sub>a</sub> = 25°C, V <sub>IN</sub> = 5 VDC	350 typ.	Hz
Output voltage	V <sub>OUT</sub>	T <sub>a</sub> = 25°C, V <sub>IN</sub> = 5 VDC	95 typ.	V
Output current	I <sub>OUT</sub>	T <sub>a</sub> = 25°C, V <sub>IN</sub> = 5 VDC	1.5 typ.	mA
Input current	I <sub>IN</sub>	T <sub>a</sub> = 25°C, V <sub>IN</sub> = 5 VDC	45 typ.	mA
Input voltage	V <sub>IN</sub>		5 typ.	V DC
Initial brightness	B	T <sub>a</sub> = 25°C, V <sub>IN</sub> = 5 VDC	35 typ.	cd/m <sup>2</sup>
Surface brightness (panel upper side)	B <sub>p</sub>	T <sub>a</sub> = 25°C, V <sub>IN</sub> = 5 VDC V <sub>opr</sub> = 0V	7 typ.	cd/m <sup>2</sup>

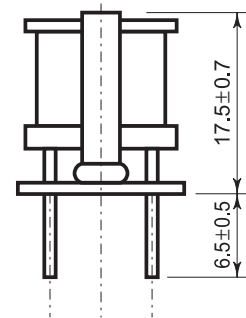
### H-6-2 Tolerance (inverter only)

Item	Specifications	Unit
Input voltage	3.0 to 6.0	V
Load range	5 to 20	cm <sup>2</sup>

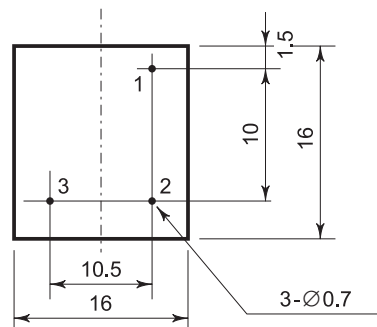
### H-6-3 Maximum ratings (inverter only)

Item	Specifications	Unit
Input voltage	7.0	V
Load range	25	cm <sup>2</sup>
Operating temperature range	-10 to +60	°C
Storage temperature range	-20 to +70	°C

### H-6-4 Dimensions (Unit : mm)



Pin No.	Functions
1	Input : 5V DC
2	Common : GND
3	Output



## Wide Temperature Range STN LCD Module

### ■ Specification

#### J. Absolute Maximum Ratings

V<sub>SS</sub> = 0V

Item	Symbol	Conditions	Min.	Max.	Unit
Power supply voltage	V <sub>DD</sub>		-0.3	7.0	V
	V <sub>LC</sub>		V <sub>DD</sub> -7.0	V <sub>DD</sub> +0.3	V
Input voltage	V <sub>IN</sub>		-0.3	V <sub>DD</sub> +0.3	V
Operating temp.	T <sub>opr</sub>		-20	+70	°C
Storage temp.	T <sub>stg</sub>		-30	+80	°C
Storage humidity		≤48hrs	+20	+85	%RH
		≤1000hrs	+20	+65	%RH

#### K. Electrical Characteristics

V<sub>DD</sub> = 5V ± 5%, V<sub>SS</sub> = 0V, T<sub>a</sub> = -20°C to +70°C

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Power supply voltage	V <sub>DD</sub>		4.75	5.00	5.25	V
	V <sub>DD</sub> -V <sub>LC</sub>		3.0	—	6.0	V
Input voltage *	High	V <sub>IH1</sub>	2.2	—	V <sub>DD</sub>	V
	Low	V <sub>IL1</sub>	0	—	0.6	V
Output voltage **	High	V <sub>OH1</sub>	-I <sub>OH</sub> = 0.205mA	2.4	—	V
	Low	V <sub>OL1</sub>	I <sub>OL</sub> = 1.2mA	—	—	0.4
Current consumption	I <sub>DD</sub>	T <sub>a</sub> = 25°C V <sub>DD</sub> = 5V V <sub>LC</sub> = 0.2V	—	2.5	4.0	mA
	I <sub>LC</sub>		—	0.5	1.0	mA
Clock oscillation frequency	f <sub>osc</sub>	Resistance oscillation	190	270	350	kHz

\* Applied to DB<sub>0</sub> ~ DB<sub>7</sub>, E, R/W, RS\*\* Applied to DB<sub>0</sub> ~ DB<sub>7</sub>

#### L. Optical Characteristics

The background color is affected by ambient temperature, and the response characteristics deteriorates at low temperature.

#### • Reflective/transflective type

Viewing angle : 6o'clock(∅ = 0°), T<sub>a</sub> = 25°C, V<sub>opr</sub> = 4.8V, Backlight OFF

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Viewing angle	∅ <sub>1</sub>	C ≥ 2.0 ∅ = 0°	—	—	0	deg.
	∅ <sub>2</sub>		50	—	—	
	∅ <sub>2</sub> - ∅ <sub>1</sub>		50	—	—	
Contrast	C	∅ = 20°, ∅ = 0°	2	3	—	—
Response time (rise)	t <sub>on</sub>	∅ = 0°	—	50	80	ms
Response time (fall)	t <sub>off</sub>	∅ = 0°	—	100	160	
Response time (rise)	t <sub>on</sub>	∅ = 0°, ∅ = 0° T <sub>a</sub> = 0°C	—	200	320	ms
Response time (fall)	t <sub>off</sub>	V <sub>opr</sub> = 4.9V	—	450	720	
Response time (rise)	t <sub>on</sub>	∅ = 0°, ∅ = 0° T <sub>a</sub> = -20°C	—	1500	2400	ms
Response time (fall)	t <sub>off</sub>	V <sub>opr</sub> = 5.0V	—	1500	2400	

#### M. Recommended Operating Voltage

The recommended value of (V<sub>opr</sub>) for an ambient temperature is as follows.

V<sub>opr</sub> = V<sub>DD</sub>-V<sub>LC</sub>

Temperature (°C)	-20	0	25	70
V <sub>opr</sub> (V)	5.0	4.9	4.8	4.2

#### ■ Reflective type

Item	L246200P000
Mechanical Characteristics	A
Absolute Maximum Ratings	J
Electrical Characteristics	K
Optical Characteristics	L
Recommended Operating Voltage	M
Reflective type	
Power Supply	F-1
Dimensions	F-2
Pin Functions	F-3
Block Diagram	F-4

#### ■ Built-in LED Backlight type

Item	L2462B1P000
Mechanical Characteristics	A
Absolute Maximum Ratings	J
Electrical Characteristics	K
Optical Characteristics	L
Recommended Operating Voltage	M
Transflective Built-in LED Backlight type	
Dimensions	G-2
Pin Functions	G-3
Block Diagram	G-4
LED Circuit Diagram	G-5-1
Electrical Characteristics (LED)	G-5-3

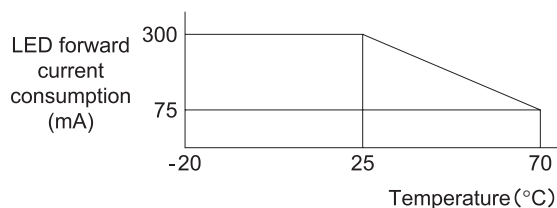
#### P. LED Backlight

##### P-1 Absolute Maximum Ratings

T<sub>a</sub> = 25°C

Item	Symbol	Specifications	Unit
LED forward current consumption*	I <sub>F</sub>	300	mA
LED reverse voltage	V <sub>R</sub>	8	V
LED allowable dissipation	P <sub>D</sub>	1.3	W

\* LED forward current consumption and operating temperature characteristics are as follows.



##### P-2 Optical Characteristics

T<sub>a</sub> = 25°C

Item	Symbol	Conditions	Specifications	Unit
Surface brightness (panel upper side)	B <sub>p</sub>	I <sub>F</sub> = 150mA* V <sub>opr</sub> = 0V	4 min. 5 typ.	cd/m <sup>2</sup>
LED brightness	L	I <sub>F</sub> = 150mA*	40 min. 50 typ.	cd/m <sup>2</sup>
LED service life			50,000 typ.	h
LED color			Yellowgreen	

\* The forward current depends upon the temperature. Especially, it must be decreased at high temperature. For temperature dependence, refer to forward current reduction characteristics.