

5.Features of L4052 Series

■ Basic Specifications

- 40 Characters × 2 lines
- STN gray type LCD is used
- 5 × 7 dot matrix + cursor
- 1/16 duty
- 5V single power supply

■ Line up

| Type | LCD panel | | LED backlight | | | Operating Temp |
|-------------|------------|---------------|---------------|-------|------|------------------|
| | Reflective | Transflective | yellow green | White | None | |
| L405200J000 | ● | | | | ● | Normal |
| L4052B1J000 | | ● | ● | | | |
| L405200P000 | ● | | | | ● | Wide temperature |
| L4052B1P000 | | ● | ● | | | |
| L4052D1J000 | | ● | | ● | | Normal |

Pin Function

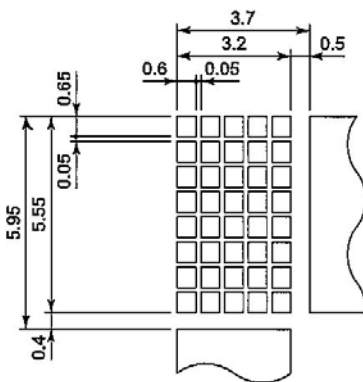
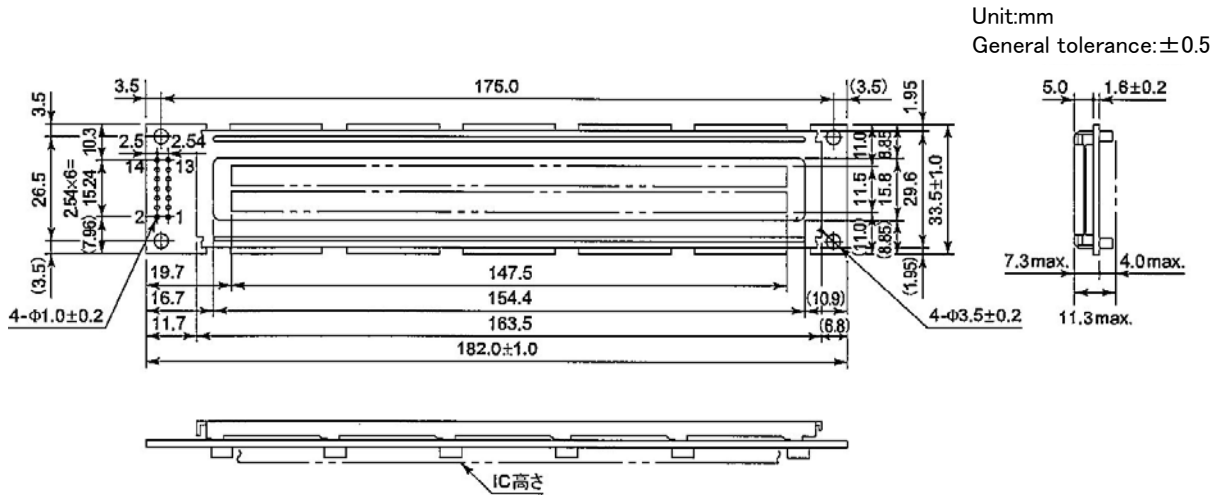
| No. | Name | Function |
|-----|-------|---|
| 1 | Vss | GND |
| 2 | VDD | Power supply voltage +5V |
| 3 | VLC | Liquid crystal driving voltage |
| 4 | RS | L: Instruction code input H: Data input |
| 5 | R/W | L: Data write (LCM→MPU) H: Data read (LCM→MPU) |
| 6 | E | Enable |
| 7 | DB0 | Data bus line |
| 8 | DB1 | Data bus line |
| 9 | DB2 | Data bus line |
| 10 | DB3 | Data bus line |
| 11 | DB4 | Data bus line |
| 12 | DB5 | Data bus line |
| 13 | DB6 | Data bus line |
| 14 | DB7 | Data bus line |
| 15 | Vss | GND |
| 16 | VLC | Liquid crystal driving voltage |
| - | VLED | Anode (1) |
| - | VLEDG | Cathode (1) |

Remark 1) LCD panel : NC as LCD Reflective type

L4052

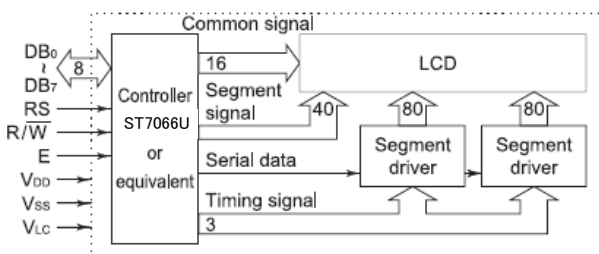
■ Dimensions (A)

| Type |
|-------------|
| L405200J000 |
| L405200P000 |

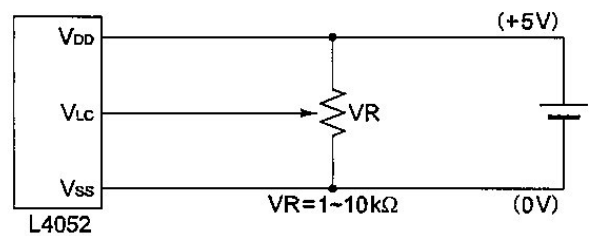


■ Block Diagram (B)

| Type |
|-------------|
| L405200J000 |
| L405200P000 |



■ Power supply (C)

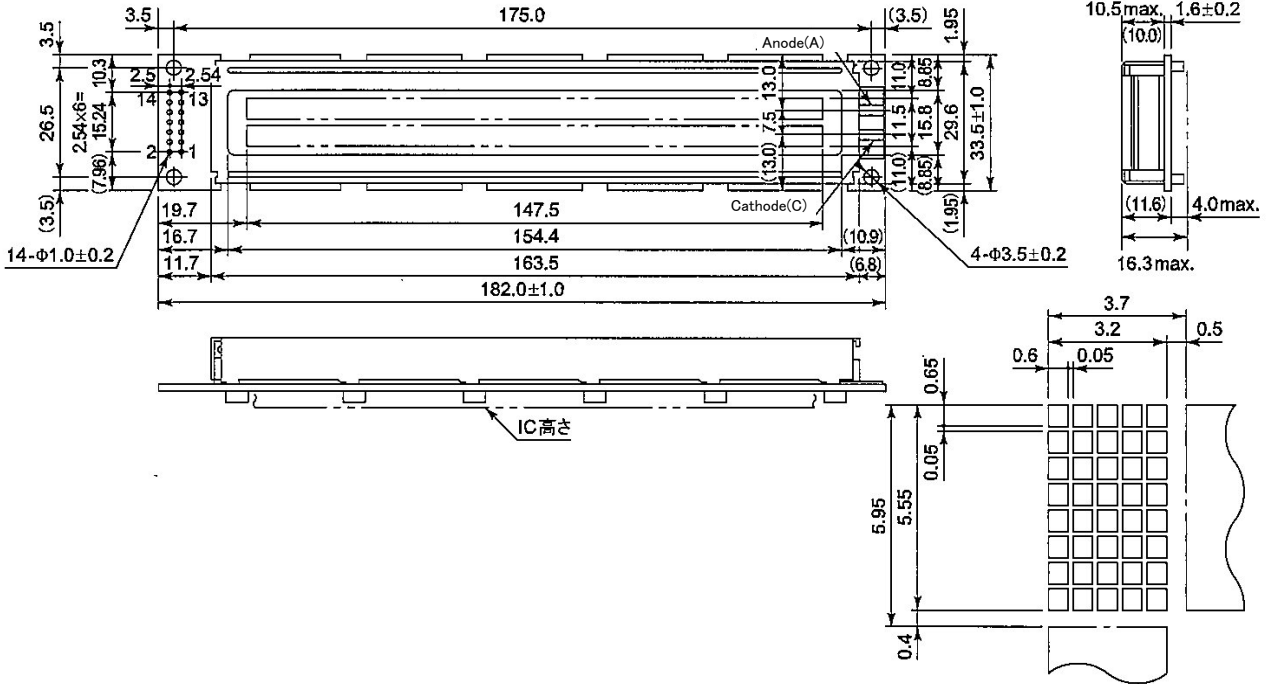


L4052

■ Dimensions (D)

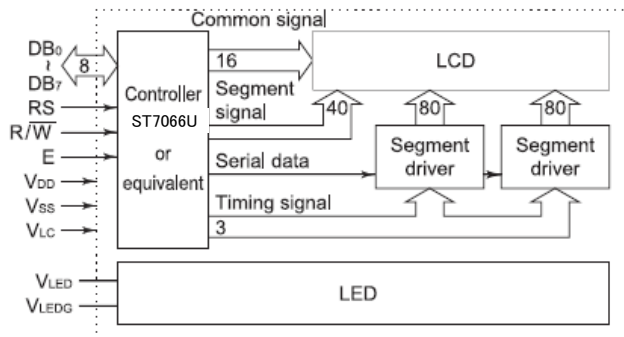
| Type |
|-------------|
| L4052B1J000 |
| L4052B1P000 |
| L4052D1J000 |

Unit:mm
General tolerance:±0.5

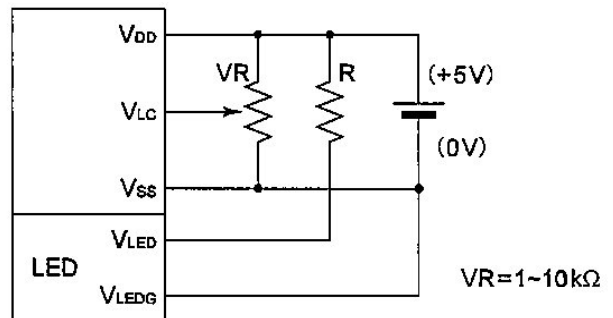


■ Block Diagram (E)

| Type |
|-------------|
| L4052B1J000 |
| L4052B1P000 |
| L4052D1J000 |



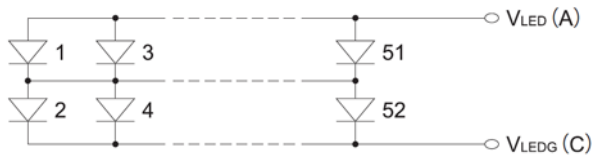
■ Power supply (F)



L4052

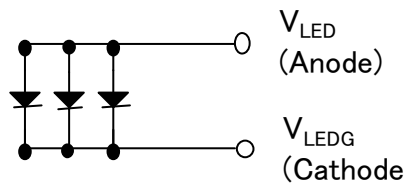
■ LED Backlight Circuit (G)

| Type |
|-------------|
| L4052B1J000 |
| L4052B1P000 |



■ LED Backlight Circuit (H)

| Type |
|-------------|
| L4052D1J000 |



Normal Temp. STN LCD Module

| |
|-------------|
| Type |
| L405200J000 |
| L4052B1J000 |

■ Electrical Characteristics

I. Absolute Maximum Ratings

VSS = 0V

| Item | Symbol | Conditions | Min. | Max. | Unit |
|-----------------------|--------|------------|--------|---------|------|
| Power supply voltage | VDD | | -0.3 | 7.0 | V |
| | VLC | | VDD-10 | VDD+0.3 | V |
| Input voltage | VIN | | -0.3 | VDD+0.3 | V |
| Operating temperature | Topr | | 0 | +50 | °C |
| Storage temperature | Tstg | | -20 | +60 | °C |
| Storage humidity | | ≤48hrs | +20 | +85 | %RH |
| | | ≤1000hrs | +20 | +65 | %RH |

J. Electrical Characteristics

VDD = 5V ± 5%, VSS = 0V, Ta = 0°C ~ 50°C

| Item | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|----------------------|---------|-------------------|------------|------|------|------|
| Power supply voltage | VDD | | 4.75 | 5.0 | 5.25 | V |
| | VDD-VLC | | | 4.75 | | V |
| Input voltage* | High | VIH1 | 0.7Vdd | - | VDD | V |
| | Low | VIL1 | -0.3 | - | 0.6 | V |
| Output voltage** | High | VOH1 | -IOH=0.1mA | 3.9 | VDD | V |
| | Low | VOL1 | IOL=0.1mA | - | 0.4 | V |
| Current consumption | IDD | Ta=25°C VDD=5V | - | 3.0 | 4.5 | mA |
| | ILC | Vopr=4.75V | - | 1.0 | 1.5 | mA |

* Applied to DB0 ~ DB7, E, R/W, RS

Vopr = VDD - VLC

** Applied to DB0 ~ DB7

K. Optical Characteristics

L405200J000

Viewing angle : 6 o'clock (φ = 0°), Ta = 25°C, Vopr = 4.75V

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---------------|---------------------------------|-------------------|------|------|------|------|
| Viewing angle | θ ₁ | C ≥ 2.0 φ = 0° | - | - | -15 | deg. |
| | θ ₂ | | 55 | - | - | |
| | θ ₂ - θ ₁ | | 70 | - | - | |

L4052B1J000

Viewing angle : 6 o'clock (φ = 0°), Ta = 25°C, Vopr = 4.75V, Backlight OFF

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---------------|---------------------------------|-------------------|------|------|------|------|
| Viewing angle | θ ₁ | C ≥ 2.0 φ = 0° | - | - | -10 | deg. |
| | θ ₂ | | 50 | - | - | |
| | θ ₂ - θ ₁ | | 60 | - | - | |

Common Optical Characteristics

Viewing angle : 6 o'clock (φ = 0°), Ta = 25°C, Vopr = 4.75V, (Backlight OFF)

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|----------------------|--------|---------------------------------------|------|------|------|------|
| Contrast | C | θ = 20°, φ = 0° | 2 | 4 | - | - |
| Response time (rise) | ton | θ = 0° φ = 0° | - | 270 | 400 | ms |
| Response time (fall) | toff | | - | 60 | 100 | |
| Response time (rise) | ton | θ = 0°, φ = 0° Ta=0°C Vopr=5.0V | - | 720 | 1100 | ms |
| Response time (fall) | toff | | - | 170 | 350 | |

■ Reference Drawing

| Item | L405200J000 | L4052B1J000 |
|-----------------------|-------------|-------------|
| Dimensions | A | D |
| Block Diagram | B | E |
| Power supply | C | F |
| LED Backlight Circuit | -- | G |

L. Recommended Operating Voltage

The Recommended Value of (Vopr) for an ambient temperature is as follows.

Vopr = VDD - VLC

| Temperature(°C) | - | 0 | 25 | 50 |
|-----------------|---|---|------|-----|
| Vopr(V) | - | 5 | 4.75 | 4.5 |

■ LED Backlight

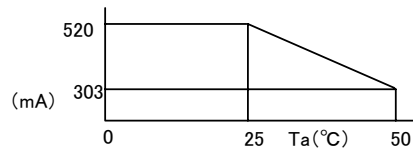
L4052B1J000

M-1 Absolute Maximum Ratings

Ta = 25°C

| Item | Symbol | Standard | Unit |
|----------------------------------|--------|----------|------|
| LED Forward current consumption* | IF | 520 | mA |
| LED Reverse DC voltage | VR | 8 | V |
| LED Allowable dissipation | PD | 2.24 | W |

* Ambient temperature VS allowable forward current



M-2 Optical Characteristics

Ta = 25°C

| Item | Symbol | Conditions | Standard | Unit |
|----------------------------------|--------|---------------------|-------------------|-------------------|
| Surface brightness (panel upper) | Bp | IF=260mA Vopr=0V | 8 min. 10 typ. | cd/m ² |
| LED reverse life | | | 50,000 typ. | h |
| LED color | | | Yellow green | |

LED forward current consumption and operating characteristics are as follows.

M-3 Electrical Characteristics

Ta = 25°C

| Item/Condition | Symbol | Min. | Typ. | Max. | Unit |
|---------------------------------------|--------|------|------|------|------|
| LED forward input Voltage If=260mA | VF | 3.8 | 4.1 | 4.4 | V |
| LED reverse current VR=8V | IR | - | - | 2.6 | mA |

Wide Temp. STN LCD Module

| |
|-------------|
| Type |
| L405200P000 |
| L4052B1P000 |

■ Electrical Characteristics

I. Absolute Maximum Ratings

VSS = 0V

| Item | Symbol | Conditions | Min. | Max. | Unit |
|-----------------------|--------|------------|--------|---------|------|
| Power supply voltage | VDD | | -0.3 | 7.0 | V |
| | VLC | | VDD-10 | VDD+0.3 | V |
| Input voltage | VIN | | -0.3 | VDD+0.3 | V |
| Operating temperature | Topr | | -20 | +70 | °C |
| Storage temperature | Tstg | | -30 | +80 | °C |
| Storage humidity | | ≤48hrs | +20 | +85 | %RH |
| | | ≤1000hrs | +20 | +65 | %RH |

J. Electrical Characteristics

VDD = 5V ± 5%, VSS = 0V, Ta = -20°C ~ 70°C

| Item | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|----------------------|---------|-------------------|------------|------|------|------|
| Power supply voltage | VDD | | 4.75 | 5.0 | 5.25 | V |
| | VDD-VLC | | | 4.8 | | V |
| Input voltage* | High | VIH1 | 0.7Vdd | - | VDD | V |
| | Low | VIL1 | -0.3 | - | 0.6 | V |
| Output voltage** | High | VOH1 | -IOH=0.1mA | 3.9 | - | VDD |
| | Low | VOL1 | IOL=0.1mA | - | - | 0.4 |
| Current consumption | IDD | Ta=25°C VDD=5V | - | 3.0 | 4.5 | mA |
| | ILC | Vopr=4.8V | - | 1.0 | 1.5 | mA |

* Applied to DB0 ~ DB7, E, R/W, RS

** Applied to DB0 ~ DB7

K. Optical Characteristics

L405200P000

Viewing angle : 6 o'clock (φ = 0°), Ta = 25°C, Vopr = 4.8V

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---------------|---------------------------------|-------------------|------|------|------|------|
| Viewing angle | θ ₁ | C ≥ 2.0 φ = 0° | - | - | 0 | deg. |
| | θ ₂ | | 50 | - | - | |
| | θ ₂ - θ ₁ | | 50 | - | - | |

L4052B1P000

Viewing angle : 6 o'clock (φ = 0°), Ta = 25°C, Vopr = 4.8V, Backlight OFF

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---------------|---------------------------------|-------------------|------|------|------|------|
| Viewing angle | θ ₁ | C ≥ 2.0 φ = 0° | - | - | 0 | deg. |
| | θ ₂ | | 50 | - | - | |
| | θ ₂ - θ ₁ | | 50 | - | - | |

Common Optical Characteristics

Viewing angle : 6 o'clock (φ = 0°), Ta = 25°C, Vopr = 4.8V, (Backlight OFF)

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|----------------------|--------|---|------|------|------|------|
| Contrast | C | θ = 20°, φ = 0° | 2 | 3 | - | - |
| Response time (rise) | ton | θ = 0° φ = 0° | - | 50 | 80 | ms |
| Response time (fall) | toff | | - | 100 | 160 | |
| Response time (rise) | ton | θ = 0°, φ = 0° Ta=0°C Vopr=4.9V | - | 200 | 320 | ms |
| Response time (fall) | toff | | - | 450 | 720 | |
| Response time (rise) | ton | θ = 0°, φ = 0° Ta=-20°C Vopr=5.0V | - | 1500 | 2400 | ms |
| Response time (fall) | toff | | - | 1500 | 2400 | |

■ Reference Drawing

| Item | L405200P000 | L4052B1P000 |
|-----------------------|-------------|-------------|
| Dimensions | A | D |
| Block Diagram | B | E |
| Power supply | C | F |
| LED Backlight Circuit | --- | G |

L. Recommended Operating Voltage

The Recommended Value of (Vopr) for an ambient temperature is as follows.

Vopr = VDD - VLC

| Temperature (°C) | -20 | 0 | 25 | 70 |
|------------------|-----|-----|-----|-----|
| Vopr (V) | 5.0 | 4.9 | 4.8 | 4.2 |

■ LED Backlight

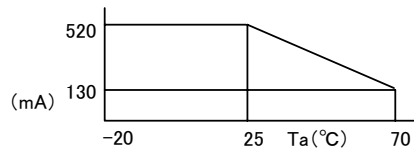
L4052B1J000

M-1 Absolute Maximum Ratings

Ta = 25°C

| Item | Symbol | Standard | Unit |
|----------------------------------|--------|----------|------|
| LED Forward current consumption* | IF | 520 | mA |
| LED Reverse DC voltage | VR | 8 | V |
| LED Allowable dissipation | PD | 2.24 | W |

* Ambient temperature VS allowable forward current



M-2 Optical Characteristics

Ta = 25°C

| Item | Symbol | Conditions | Standard | Unit |
|----------------------------------|--------|---------------------|------------------|-------------------|
| Surface brightness (panel upper) | Bp | IF=260mA Vopr=0V | 4 min. 5 typ. | cd/m ² |
| LED reverse life | | | 50,000 typ. | h |
| LED color | | | Yellow green | |

LED forward current consumption and operating characteristics are as follows.

M-3 Electrical Characteristics

Ta = 25°C

| Item/Condition | Symbol | Min. | Typ. | Max. | Unit |
|------------------------------------|--------|------|------|------|------|
| LED forward input Voltage If=260mA | VF | 3.8 | 4.1 | 4.4 | V |
| LED reverse current VR=8V | IR | - | - | 2.6 | mA |

L4052

Normal Temp STN LCD Module (White LED Backlight)

| |
|-------------|
| Type |
| L4052D1J000 |

Electrical Characteristics

I. Absolute Maximum Ratings

VSS = 0V

| Item | Symbol | Conditions | Min. | Max. | Unit |
|-----------------------|--------|------------|--------|---------|------|
| Power supply voltage | VDD | | -0.3 | 7.0 | V |
| | VLC | | VDD-10 | VDD+0.3 | V |
| Input voltage | VIN | | -0.3 | VDD+0.3 | V |
| Operating temperature | Topr | | 0 | +50 | °C |
| Storage temperature | Tstg | | -20 | +60 | °C |
| Storage humidity | | ≤48hrs | +20 | +85 | %RH |
| | | ≤1000hrs | +20 | +65 | %RH |

J. Electrical Characteristics

VDD = 5V ± 5%, VSS = 0V, Ta = 0°C ~ 50°C

| Item | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|----------------------|---------|-------------------|------------|------|------|------|
| Power supply voltage | VDD | | 4.75 | 5.0 | 5.25 | V |
| | VDD-VLC | | | 4.75 | | V |
| Input voltage* | High | VIH1 | 0.7Vdd | - | VDD | V |
| | Low | VIL1 | -0.3 | - | 0.6 | V |
| Output voltage** | High | VOH1 | -IOH=0.1mA | 3.9 | - | VDD |
| | Low | VOL1 | IOL=0.1mA | - | - | 0.4 |
| Current consumption | IDD | Ta=25°C VDD=5V | - | 3.0 | 4.5 | mA |
| | ILC | Vopr=4.75V | - | 1.0 | 1.5 | mA |

* Applied to DB0 ~ DB7, E, R/W, RS

Vopr = VDD - VLC

** Applied to DB0 ~ DB7

K. Optical Characteristics

Viewing angle : 6 o'clock (φ = 0°), Ta = 25°C, Vopr = 4.75V, Backlight OFF

| Item | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|----------------------|---------------------------------|---------------------------------------|------|------|------|------|
| Viewing angle | θ ₁ | C ≥ 2.0 φ = 0° | - | - | -10 | deg. |
| | θ ₂ | | 50 | - | - | |
| | θ ₂ - θ ₁ | | 60 | - | - | |
| Contrast | C | θ = 20°, φ = 0° | 2 | 4 | - | - |
| Response time (rise) | ton | θ = 0° φ = 0° | - | 270 | 400 | ms |
| Response time (fall) | toff | | - | 60 | 100 | |
| Response time (rise) | ton | θ = 0°, φ = 0° Ta=0°C Vopr=5.0V | - | 720 | 1100 | ms |
| Response time (fall) | toff | | - | 170 | 350 | |

Reference Drawing

| Item | L4052D1J000 |
|-----------------------|-------------|
| Dimensions | D |
| Block Diagram | E |
| Power supply | F |
| LED Backlight Circuit | H |

L. Recommended Operating Voltage

The Recommended Value of (Vopr) for an ambient temperature is as follows.

Vopr = VDD - VLC

| Temperature (°C) | - | 0 | 25 | 50 |
|------------------|---|---|------|-----|
| Vopr (V) | - | 5 | 4.75 | 4.5 |

LED Backlight

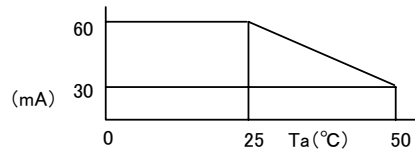
| |
|-------------|
| L4052D1J000 |
|-------------|

M-1 Absolute Maximum Ratings

Ta = 25°C

| Item | Symbol | Standard | Unit |
|---|--------|----------|------|
| LED Forward current consumption* | IF | 60 | mA |
| Pulse current consumption t=1mSec, 1/10 Duty | IFD | 144 | mA |
| LED Reverse DC voltage | VR | 5 | V |
| LED Allowable dissipation | PD | 180 | mW |

* Ambient temperature VS allowable forward current



M-2 Optical Characteristics

Ta = 25°C

| Item | Symbol | Conditions | Standard | Unit |
|-------------------------------------|--------|--------------------|---------------------------|-------------------|
| Surface brightness (panel upper) | Bp | IF=45mA Vopr=0V | 20 min. 40 typ. | cd/m ² |
| Color (panel upper side) | x,y | IF=45mA Vopr=0V | 0.26min 0.3typ 0.38max | --- |
| LED reverse life | | | 50,000 typ. | h |
| LED color | | | White | --- |

LED forward current consumption and operating characteristics are as follows

M-3 Electrical Characteristics

Ta = 25°C

| Item/Condition | Symbol | Min. | Typ. | Max. | Unit |
|--------------------------------------|--------|------|------|------|------|
| LED forward input Voltage If=45mA | VF | 3.2 | 3.6 | 4.0 | V |