DATA SHEET

# CITILED Standard CL-A160 Series

## Mono-color Type

# CL-A160-1W9-SD-T-0000000

CITILED
The Light Engine

CONTENTS




CITIZEN ELECTRONICS CO., LTD.
1-23-1, Kamikurechi, Fujiyoshida-shi, Yamanashi, 403-0001, Japan Tel. +81-555-23-4121 http://ce.citizen.co.jp

# 1. Scope of Application

These specifications apply to chip type LED lamp, CITILED, model CL-A160-1W9-SD-T

# 2. Part code

## 2-1. Part code

**Product Nomenclature**

CL - A160 - 1W9 - SD - T - 0000000
[1] [2] [3] [4] [5]

| | | | | |
|---|---|---|---|---|
| [1] | Series | : | A160 | Mono-color |
| [2] | Lighting color | : | 1W9 | 1 : Quantity of dies<br>W9 : High brightness white |
| [3] | Wide color gamut | : | SD | Diffused |
| [4] | Shipping mode | : | T | Taping (standard) |
| [5] | Specification number | : | 0 | Brightness type: A~ |
| | | | 0 | Number of chromaticity ranks<br>(6rank : 6, ･･･,9rank : 9, 10rank : A, 11rank : B, 12rank : C) |
| | | | 00 | Chromaticity rank |

## 2-2. RoHS Directive

No hazardous substance designated by RoHS Directive is contained in this product.



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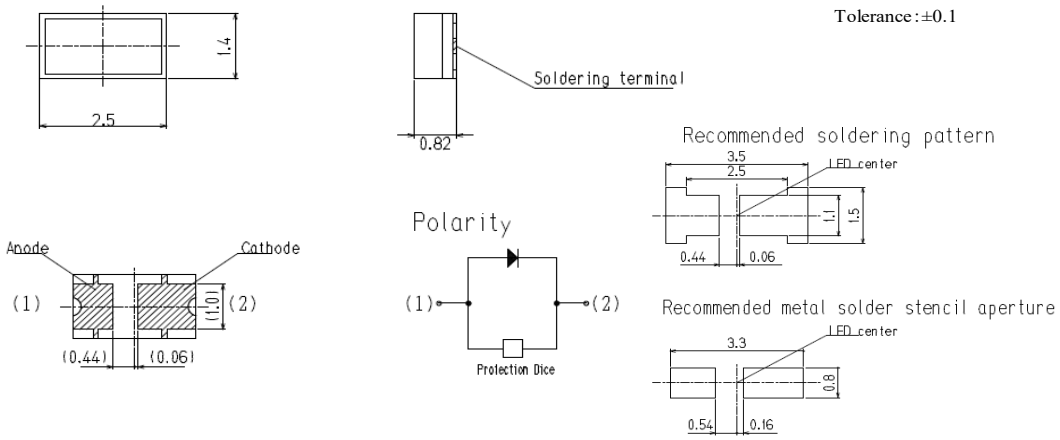
# 3. Outline drawing and marking descriptions

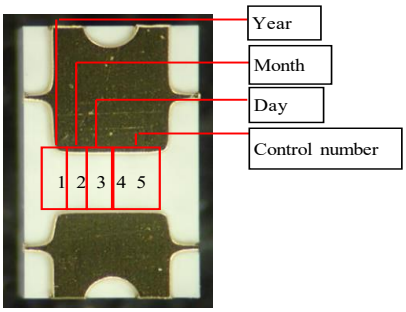
## 3-1. Outline drawing

Unit : mm
Tolerance : ±0.1




※ Dimensions in parentheses are reference values.
Any resin unevenness than has no effects on optical characteristics can be used without any quality problem.

## 3.2 Marking




[Year/Month]
Year 2024: Q, Year 2025: R, Year 2026: S ・・・
January: 1, ・・・September: 9, October: X, November: Y, December: Z
[Day]
Production starting date
Day 1 : 1, Day 2 : 2, ・・・Day 9 : 9, Day 10 : A, Day 11 : B,
[Control number]
Serial number



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# 4. Performance

## 4-1. Absolute Maximum Rating

| Parameter | Symbol | Rating | Rating |
|---|---|---|---|
| Power Dissipation | $P_d$ | (458) | mW |
| Forward Current | $I_F$ | (150) | mA |
| Forward Pulse Current | $I_{FP}$ | 200 | mA |
| Reverse Current | $I_R$ | 90 | mA |
| Junction Temperature | $T_j$ | 140 | ℃ |
| Operating Temperature | $T_{OP}$ | -40 ～ +100 | ℃ |
| Storage Temperature | $T_{ST}$ | -40 ～ +105 | ℃ |

* Duty ＜ 1/10, Pulse width ＜ 0.1 msec

## 4-2. Electro-optical Characteristic

( Ta=25℃ )

| Parameter | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Forward Voltage | $V_F$ | $I_F$=80mA | (2.65) | (2.90) | (3.05) | V |
| Luminous Intensity | $I_V$ | $I_F$=80mA | — | (14.0) | | cd |
| Total Luminous Flux | $\Phi_V$ | $I_F$=80mA | (27.50) | (35.9) | (43.3) | lm |
| Chromaticity coordinates | x | $I_F$=80mA | — | (0.290) | — | |
| | y | $I_F$=80mA | — | (0.275) | — | |

Note 1) The measurement tolerance of forward voltage is ±3% at our tester.
Note 2) The measurement tolerance of luminous intensity is ±10% at our tester.
Note 3) Based on the CIE1931 chromaticity chart.
The measurement tolerance of chromaticity is ±0.01 .
Note 4) The total luminous flux value and chromaticity value obtained from the integrating sphere measurement are not guaranteed value but reference one.
In accordance with NIST standard.
Note 5) For order quantity, the delivery ratio of rank-classified products is not taken into consideration.

## 4-3. Rank classification

Please refer to the appendix CL-A160-1W9-SD rank'.



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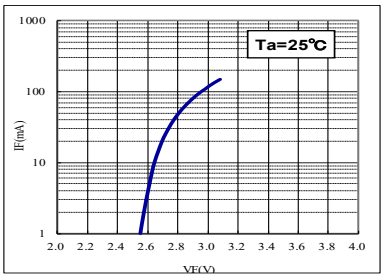
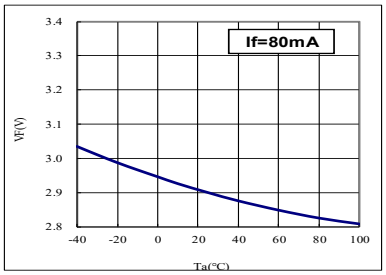
# 5. Characteristic (Typical characteristics)

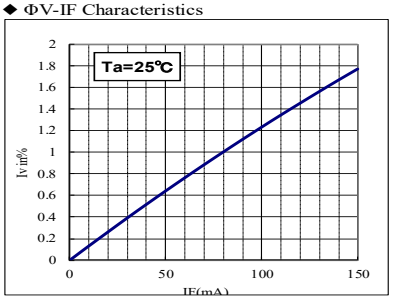
◆ IF-VF Characteristics



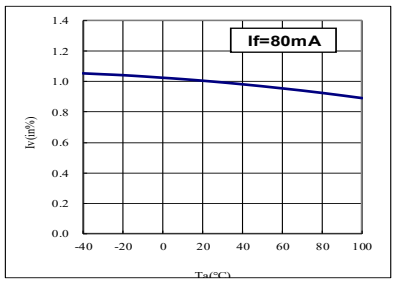

◆ VF-Ta Characteristics



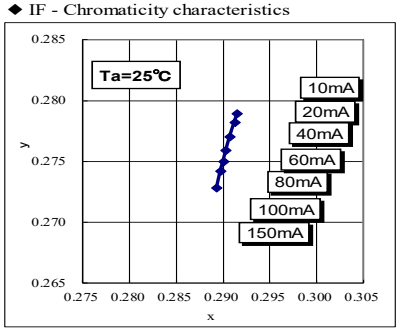

◆ ΦV-IF Characteristics



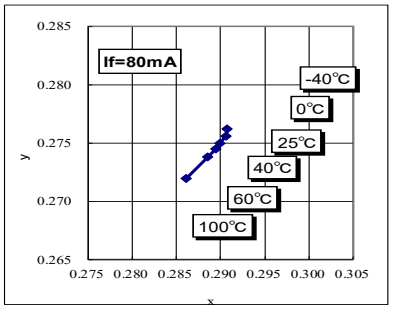

◆ Φ V-Ta Characteristics



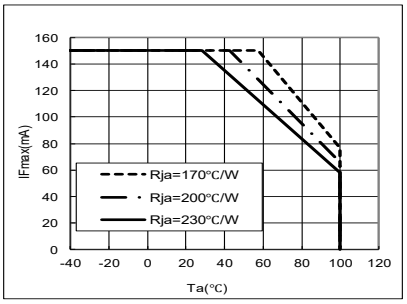

◆ IF - Chromaticity characteristics



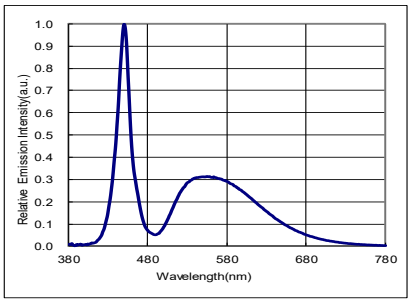

◆ Ta - Chromaticity characteristics



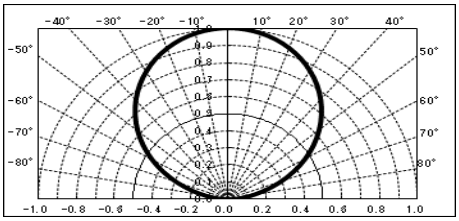

◆ IF-Max Ta Characteristics

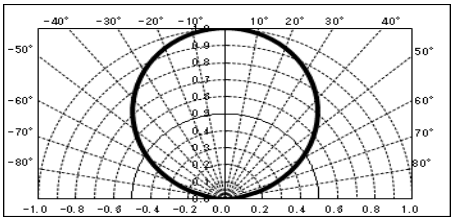



◆Spectral Distribution




◆ Directive Characteristics







CITIZEN ELECTRONICS CO., LTD.
1-23-1, Kamikurechi, Fujiyoshida-shi, Yamanashi, 403-0001, Japan
Tel. +81-555-23-4121 http://ce.citizen.co.jp

# 6. Reliability

## 6-1. Details of the tests

| Test Item | Test Condition | Time |
|---|---|---|
| Life Test in Continuous Operation | Ta=25±3°C, IF=80mA | $1000^{+24}_{-12}$ H |
| High Temperature Storage Test | Ta=100±3°C, IF=80mA | $1000^{+24}_{-12}$ H |
| Low Temperature Storage Test | Ta=-40±3°C,IF=80mA | $1000^{+24}_{-12}$ H |
| Wet and Hot temperature Operating Test | Ta=60±2°C 95±5%RH, IF=80mA | $1000^{+24}_{-12}$ H |
| High Temperature Storage Test | Ta=105 $^{+5}_{-3}$ °C | $1000^{+24}_{-12}$ H |
| Low Temperature Storage Test | Ta=40 $^{+5}_{-3}$ °C | $1000^{+24}_{-12}$ H |
| Wet and Hot temperature Storage Test | Ta=60±2°C 95±5%RH | $1000^{+24}_{-12}$ H |
| Thermal Shock Test | -40 °C × 30 minutes ～ 100°C × 30 minutes | 500cycle |
| Solder Heat Resistance Test | Recommended temperature profile (reflow soldering) × 2, (2nd test must be started after the samples are stabilized thermally.) | 2times |
| Static breaking test | R=1.5kΩ, C=100pF, Test Voltage=2kV<br>R=0Ω, C=200pF, Test Voltage=200V | Three times for each of forward and reverse voltage |
| Solvent resistance test | Isopropyl alcohol (30°C for five minutes) | 1 time |
| Vibration test | Frequency range: 8~33.3Hz, Total amplitude 1.3mm, Sweep rate: 33.3~400Hz, Acceleration: 29.2m/s2, Cycle: 15 minutes | 2 hours for each of x/y directions, 4 hours for z direction (Total: 8hours) |
| Shock test | 980m/s2, 6ms sine wave, ±x,±y, ±z | 3 times |
| Drop test | 100cm | 3 times |

* The above reliability tests are performed with our standard testing board (Material: FR-4 / Thickness: 1.2mm) Thermal resistance of the LED is checked with our standard reliability testing board: Rja≒ 140 °C/W

## 6-2. Judgment Criteria of Failure for Reliability Test

| Measuring Item | Symbol | Measuring Condition | Failure Criteria |
|---|---|---|---|
| Forward Voltage | Vf | IF=80mA | >U × 1.1 |
| Luminous Intensity | $I_V$ | IF=80mA | <S × 0.7 |

U means the upper limit of the specified characteristics.
S means the initial value.

Note: With a lighting-up sample visually confirmed in the tests, the above items are checked atambient temperature between two and 24 hours after completion of each test.



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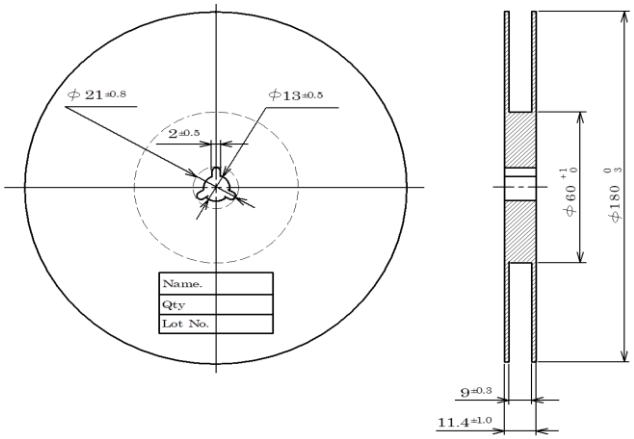
# 7. Taping Specifications (in accordance with JIS standard)

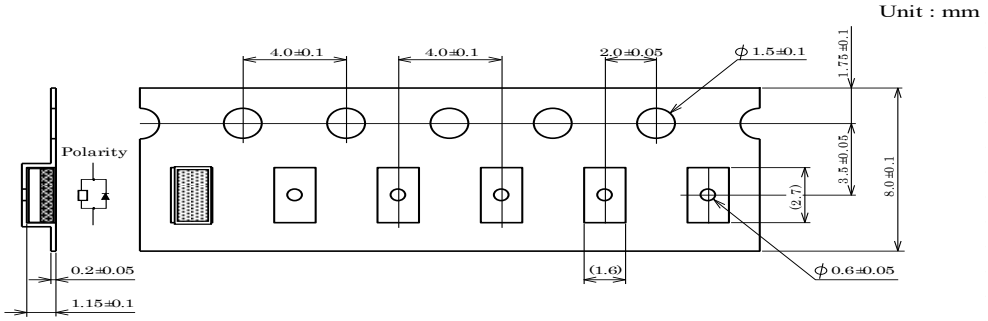
## 7-1. Shape and Dimensions of Reel

(Unit: mm)



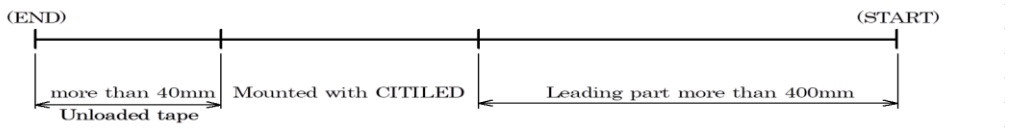

## 7-2. Dimensions of Tape

Unit : mm




※ Dimensions in parentheses are reference values.

## 7-3. Configuration of Tape




## 7-4. Quantity:3,000 pcs/reel

Please note that the quantity can be a fraction of a 100-piece basis depending on rank.
(Minimum quantity: 500 pieces)



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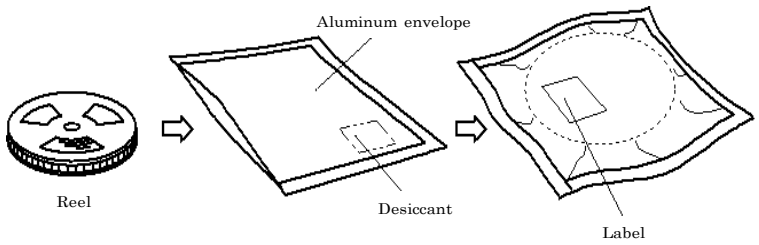
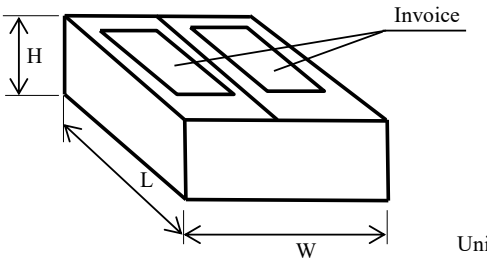
# 8. Packing Specifications

## 8-1. Moisture-proof Packing

To prevent moisture absorption during transportation and storage, reels are packed in aluminum envelopes.




## 8-2. Packing figure



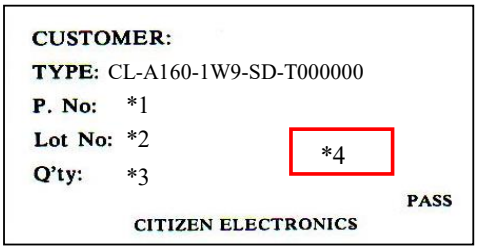

Unit:mm

Note: The size of a carton box depends on delivery quantity.

e.g. Packing size

| ( W × L × H ) | Quantity |
|---|---|
| 320×320×200 | ~ 10reels |
| 300×380×300 | ~ 18reels |
| 400×460×180 | ~ 20reels |
| 400×460×330 | ~ 34reels |
| 440×440×520 | ~ 64reels |
| 440×440×650 | ~ 84reels |
| 600×600×360 | ~ 124reels |

## 8-3. Label Description




This label is attached to both reel and aluminum bag.

*1 Code No.(Customer's part number)
e.g. 2411001
241(Production starting date),
5(Production sites･･･1=Japan,5=China),
Under 3-digit(Serial number)
*2 CE's lot No.
*3 Q'ty
*4 Rank
Described chromaticity rank
and VF rank, in this order
e.g. Chromaticity rank '08', VF rank 'W' [08W]



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## 8-4. Storage

To prevent moisture absorption, it is strongly recommended that reels (in bulk or taped) should be stored in the dry box (or the desiccator) with a desiccant as the appropriate storage place.If not, the following is recommended.

Temperature: 5～30℃
Humidity: 90%RH max.

The devices should be mounted as soon as possible after unpacking. If you store the unpacked reels, please store them in the dry box or seal them into the envelop again.

## 8-5. Baking

If the devices have been stored over 1 year or unpacked over 7 days, it should be baked under the following conditions.

Baking conditions: 55 ℃ × 12～24 hours or more (reeled one)
Baking times: Up to one time



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# 9. Precautions

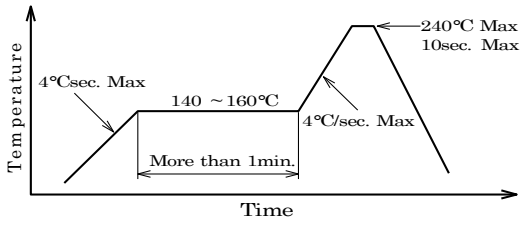
## 9-1. Soldering

( 1 ) Manual soldering

1) Use 6/4 solder or solder containing silver (Ag)
If using Pb-free solder, solder of 96.5Sn,3Ag,0.5Cu is recommended.
2) Before soldering every time, make baking to units. By manual soldering, it is the possibility of crack due to the moisture absorption in the resin portion.
3) Use a soldering iron of 25W or smaller. Adjust the temperature of the soldering iron below 350℃.
4) Force or stress must not be applied to the resin portion while soldering.
5) Finish soldering within 3 seconds.
6) Handle the devices only after temperature is cooled down.

( 2 ) Reflow soldering

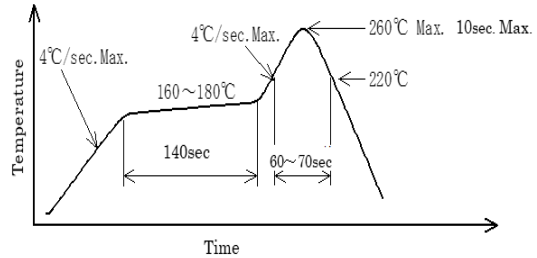
1) Following soldering paste is recommended
Melting temperature : 178 ~ 192℃
Composition : Sn 63 %, Pb 37 %
2) The temperature profile at the top surface of the parts is recommended as shown below.
3) It is requested that products should be handled after their temperature has dropped down to the normal room temperature.




Reflow soldering of the above profile is allowed two times.

( 3 ) Lead free soldering

1) Following soldering paste is recommended
Melting temperature : 216 ~ 220℃
Composition : 96.5Sn ,3Ag ,0.5Cu
2) The temperature profile at the top surface of the parts is recommended as shown below.
3) It is requested that products should be handled after their temperature has dropped down to the normal room temperature.



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## 9-2. Washing

When washing after soldering is needed, following conditions are requested.
a) Washing solvent: Pure Water
b) Temperature, time: 50°C or less × 30 seconds max. or 30°C or less × 3 minutes max.

## 9.3 Handling of static

(1) As the performance of this product can be damaged by static or surge voltage effects, some static measurements equal to CMOS LSI level (e.g. wearing of a wristband) are required when handling this product.

(2) As some unusual modes (e.g. decrease in the rise current in a forward voltage direction, lighting failure with low current and so on) occur in the LED damaged by static, the lighting inspection should be performed according to the following inpsection criterion.

CE's lighting inspection criterion

| Condition | Judgmental criterion |
|---|---|
| IF=1mA | VF＞2.0V |

## 9.4 Handling

Please avoid the application of any stress to this product.
Also, please avoid the application of any friction by a sharp metal nail or other materials.

## 9.5 Consideration for heat generation

Please be aware that heat can be produced when using an LED. As the LED die temperature (junction temperature) varies depending on surroundings such as the thermal resistance of an assembly board, ambient environment and so on, it is required to make a heat dissipation design and environmental setting that prevent junction temperature from exceeding a maximum rating.
[Reference value: Rjs (thermal resistance between an LED die junction and soldering portion) ≒ 55 °C/W]



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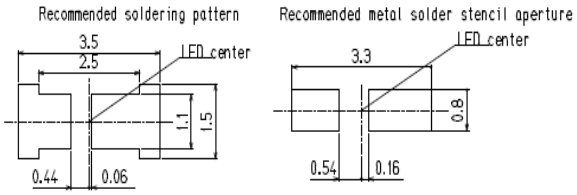
# 10. Designing precautions

( 1 ) The current limiting resistor should be placed in the circuit so that is driven within its rating.
Also avoid reverse voltage (over-current) applied instantaneously when ON or OFF.

( 2 ) When pulse driving current is applied, average current consumption should be within the rating.
Also avoid reverse voltage applied when put off.

( 3 ) Recommended soldering pattern

<For reflow soldering>

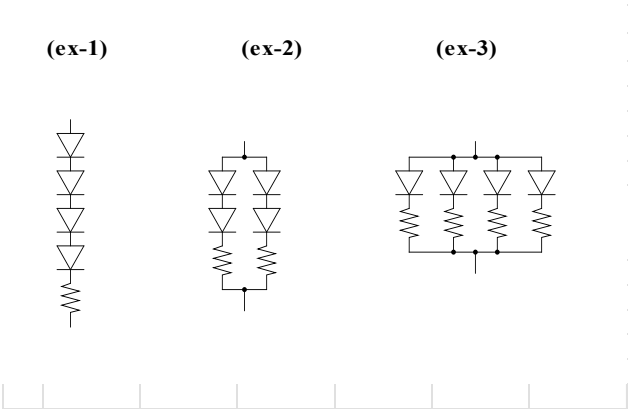



he above dimensions do not necessarily guarantee mountability.
This pattern needs to have comprehensive preliminary studies done on usage.

( 4 ) When assembling the circuit board into the finished products,
care must be taken to avoid the component parts from touching other parts.

( 5 ) When using multiple LEDs, it is required to connect a current limiting resistor on
each path which the current flows to the LEDs.

**(ex-1)** **(ex-2)** **(ex-3)**





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# 11. Other precautions

( 1 ) Please be aware that looking directly at a high-powered LED over a prolonged period may result in discomfort or harm to your eyes.

( 2 ) Our warranty does not cover situations where this product undergoes secondary fabrication such as changes in shape.

( 3 ) Warranty period is half a year from the day we delivered the product.

( 4 ) If any defect is found during the warranty period, do not disassemble or dismantle the product but contact our sales window to follow its instruction.

( 5 ) Do not reverse-engineer the product including disassemble or analyze without our approval.

( 6 ) The product is intended to be used for general electronic equipment such as general lighing, home appliances, and information-communication equipment.
It is not designed or manufactured to be used for special application (eg. automobiles, trains, ships, airplanes, spaceships, submarine repeaters, atomic energy control systems, combustion equipment, life-support systems, safety devices).
We will not guarantee any application suitability for goods like those described above that require special quality and reliability.
In cases where the product is used in special applications and it causes an extensive property damage, threatens human life or damages the human body, we will not be held liable.

( 7 ) The product is not in conformity to ISO/TS16949 or intended to be used for in-vehicle application.

( 8 ) This specification will become void if it is not retured or if no purchase order is made within one year from the issued date.

( 9 ) We will not be liable for any disadvantage, damage or cause of legal action, or any other damage or loss that arise from the use or nonuse of technical information or data of this specification.

( 10 ) This technical information and data is provided for users as is, and Citizen Elecrronics Co., Ltd. does not guarantee that it is free from errors or defect in technical information and data, or this technical information and data conform to special applications, or this technical information and data does not infringe any rights of the user or third parties other than the user, or any other contents thereof.

( 11 ) Citizen Elecrronics Co., Ltd. reserves a right to modify technical information and data without notice.

( 10 ) When exporting our products, please ensure conformance with applicable laws and regulations and take appropriate actions such as obtaining an export license.

( 12 ) Please do not use or supply our products for any weapons of mass destruction (WMD) or for any other military purposes.

( 13 ) If we do not receive standing orders, we may recommend another product. If this product is to be used for a different model or for a succeeding model continuously, please contact our sales staff.

( 14 ) The contents of this document is not guaranteed because the specification and appearance of the product may change without notice for improvement.
Please exchange formal specifications with us when adopting the product for mass production.



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1-23-1, Kamikurechi, Fujiyoshida-shi, Yamanashi, 403-0001, Japan
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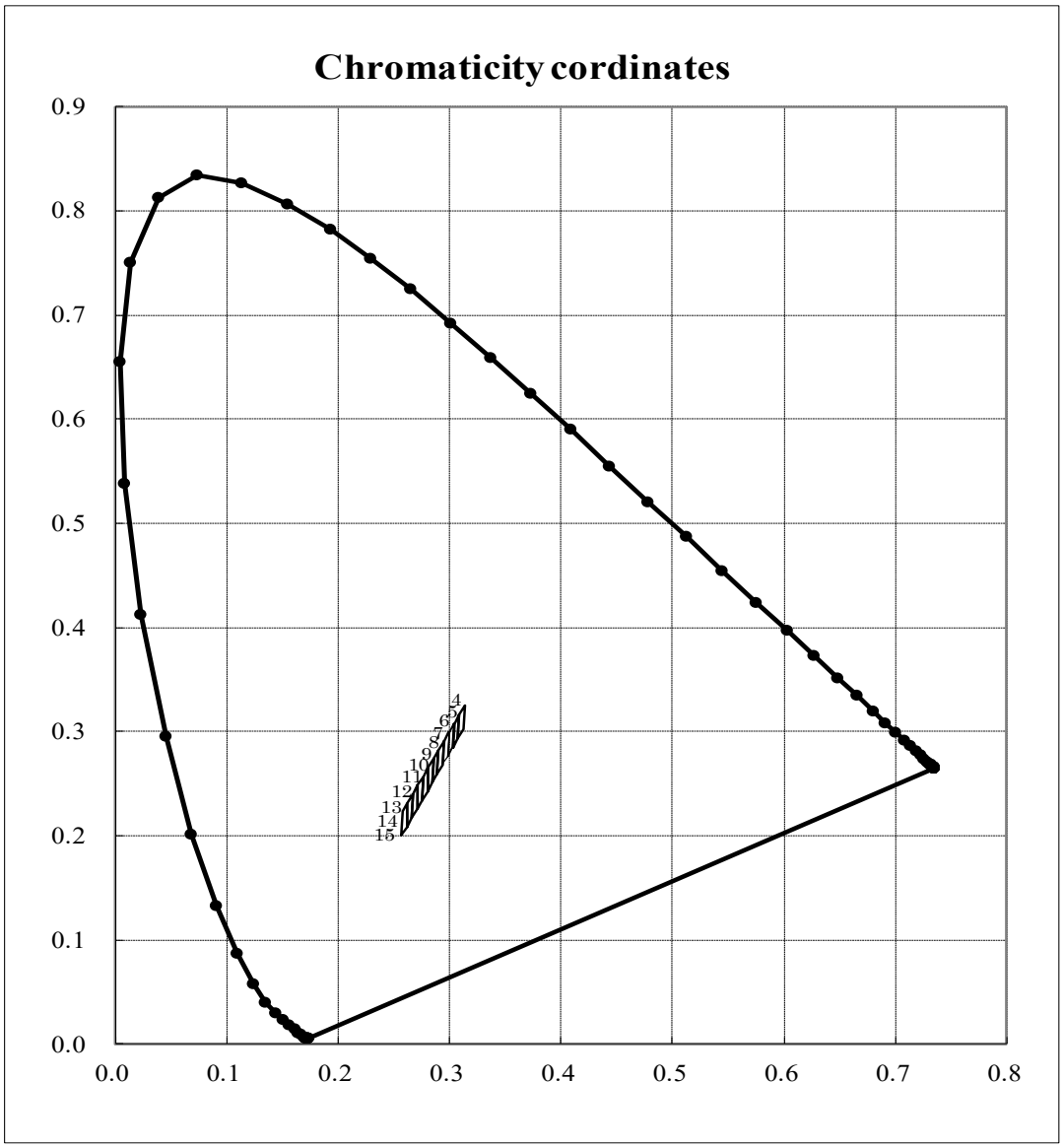
# 12. Chromaticity Cordinates



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# 13. CL-A160-1W9-SD-T Rank

## 13-1. CL-A160-1W9-SD-T93040506 Rank

**< Φv Rank >**

@If=80mA

| Φv rank | Chromaticity Rank | Min | Max |
|---|---|---|---|
| A | 04 | (35.46) | (43.34) |
| B | 05 | (34.65) | (42.35) |
| C | 06 | (33.85) | (41.37) |

Tolerance:±10% (lm)

**< VF Rank >**

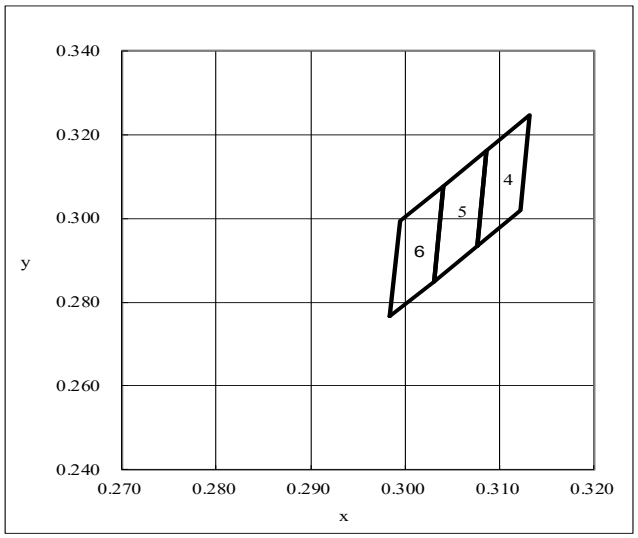
@If=80mA

| rank | Min | Max |
|---|---|---|
| W | 2.65 | 2.75 |
| X | 2.75 | 2.85 |
| Y | 2.85 | 2.95 |
| Z | 2.95 | 3.05 |

Tolerance:±3% (V)

< Chromaticity Rank >

@IF=80mA




| rank 4 | x | y |
|---|---|---|
| a | 0.308 | 0.294 |
| b | 0.309 | 0.316 |
| c | 0.313 | 0.325 |
| d | 0.312 | 0.302 |

| rank 5 | x | y |
|---|---|---|
| a | 0.303 | 0.285 |
| b | 0.304 | 0.308 |
| c | 0.309 | 0.316 |
| d | 0.308 | 0.294 |

| rank 6 | x | y |
|---|---|---|
| a | 0.298 | 0.277 |
| b | 0.299 | 0.299 |
| c | 0.304 | 0.308 |
| d | 0.303 | 0.285 |

Tolerance:±0.01



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## 13-2. CL-A160-1W9-SD-T93050607 Rank

**< Φv Rank >**

@If=80mA

| Φv rank | Chromaticity Rank | Min | Max |
|---|---|---|---|
| B | 05 | (34.65) | (42.35) |
| C | 06 | (33.85) | (41.37) |
| D | 07 | (33.07) | (40.42) |

Tolerance:±10% (lm)

**< VF Rank >**

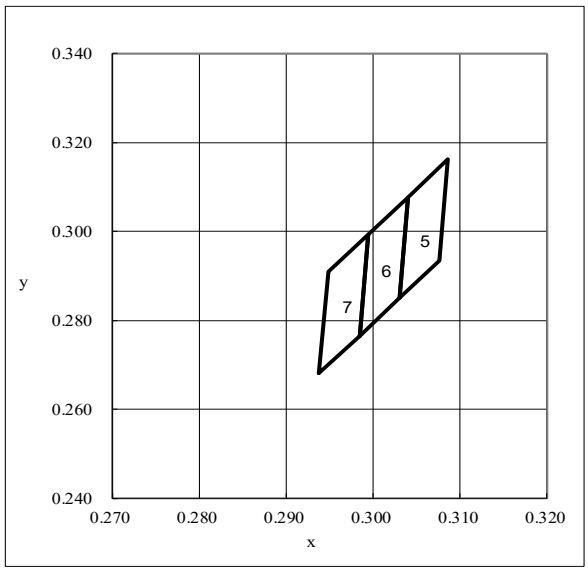
@If=80mA

| rank | Min | Max |
|---|---|---|
| W | 2.65 | 2.75 |
| X | 2.75 | 2.85 |
| Y | 2.85 | 2.95 |
| Z | 2.95 | 3.05 |

Tolerance:±3% (V)

< Chromaticity Rank >

@IF=100mA




| rank 5 | x | y |
|---|---|---|
| a | 0.303 | 0.285 |
| b | 0.304 | 0.308 |
| c | 0.309 | 0.316 |
| d | 0.308 | 0.294 |

| rank 6 | x | y |
|---|---|---|
| a | 0.298 | 0.277 |
| b | 0.299 | 0.299 |
| c | 0.304 | 0.308 |
| d | 0.303 | 0.285 |

| rank 7 | x | y |
|---|---|---|
| a | 0.294 | 0.268 |
| b | 0.295 | 0.291 |
| c | 0.299 | 0.299 |
| d | 0.298 | 0.277 |

Tolerance:±0.01



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## 13-3. CL-A136C-1W6-SD-TA3060708 Rank

**< Φv Rank >**

@If=80mA

| Φv rank | Chromaticity Rank | Min | Max |
|---|---|---|---|
| C | 06 | (33.85) | (41.37) |
| D | 07 | (33.07) | (40.42) |
| E | 08 | (32.31) | (39.49) |

Tolerance:±10% (lm)

**< VF Rank >**

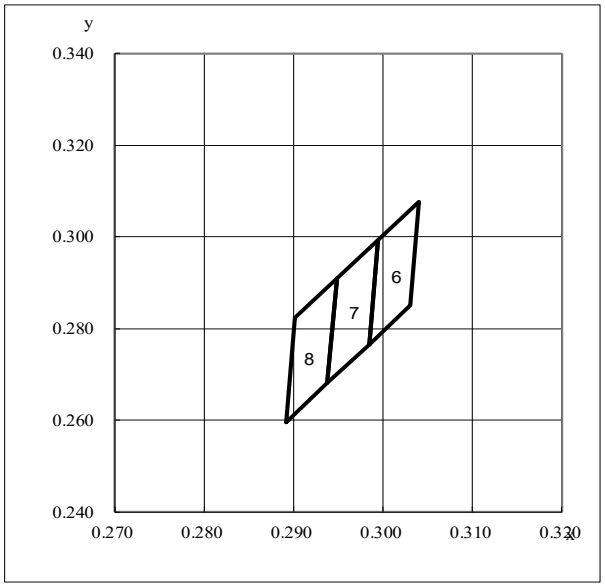
@If=80mA

| rank | Min | Max |
|---|---|---|
| W | 2.65 | 2.75 |
| X | 2.75 | 2.85 |
| Y | 2.85 | 2.95 |
| Z | 2.95 | 3.05 |

Tolerance:±3% (V)

< Chromaticity Rank >

@IF=100mA




| rank 6 | x | y |
|---|---|---|
| a | 0.298 | 0.277 |
| b | 0.299 | 0.299 |
| c | 0.304 | 0.308 |
| d | 0.303 | 0.285 |

| rank 7 | x | y |
|---|---|---|
| a | 0.294 | 0.268 |
| b | 0.295 | 0.291 |
| c | 0.299 | 0.299 |
| d | 0.298 | 0.277 |

| rank 8 | x | y |
|---|---|---|
| a | 0.289 | 0.260 |
| b | 0.290 | 0.282 |
| c | 0.295 | 0.291 |
| d | 0.294 | 0.268 |

Tolerance:±0.01



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## 13-4. CL-A136C-1W6-SD-TA3070809Rank

**< Φv Rank >**

@If=80mA

| Φv rank | Chromaticity Rank | Min | Max |
|---|---|---|---|
| D | 07 | (33.07) | (40.42) |
| E | 08 | (32.31) | (39.49) |
| F | 09 | (31.57) | (38.58) |

Tolerance:±10% (lm)

**< VF Rank >**

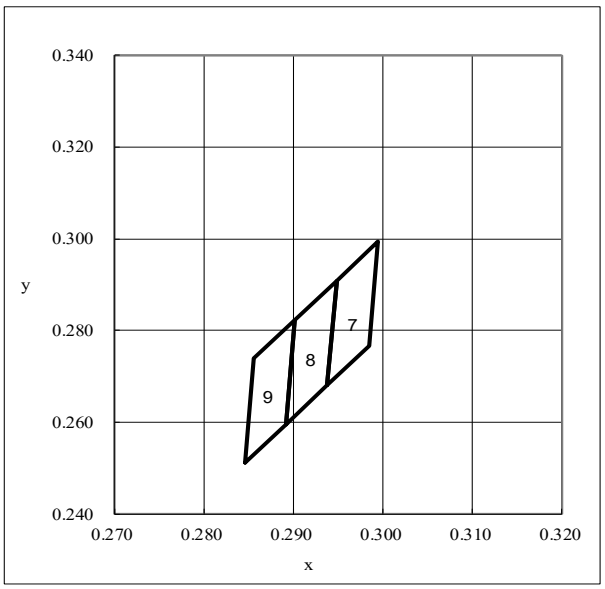
@If=80mA

| rank | Min | Max |
|---|---|---|
| W | 2.65 | 2.75 |
| X | 2.75 | 2.85 |
| Y | 2.85 | 2.95 |
| Z | 2.95 | 3.05 |

Tolerance:±3% (V)

< Chromaticity Rank >

@IF=100mA




| rank 7 | x | y |
|---|---|---|
| a | 0.294 | 0.268 |
| b | 0.295 | 0.291 |
| c | 0.299 | 0.299 |
| d | 0.298 | 0.277 |

| rank 8 | x | y |
|---|---|---|
| a | 0.289 | 0.260 |
| b | 0.290 | 0.282 |
| c | 0.295 | 0.291 |
| d | 0.294 | 0.268 |

| rank 9 | x | y |
|---|---|---|
| a | 0.285 | 0.251 |
| b | 0.286 | 0.274 |
| c | 0.290 | 0.282 |
| d | 0.289 | 0.260 |

Tolerance:±0.01



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## 13-5. CL-A136C-1W6-SD-TA3080910 Rank

**< Φv Rank >**

@If=80mA

| Φv rank | Chromaticity Rank | Min | Max |
|---|---|---|---|
| E | 08 | (32.31) | (39.49) |
| F | 09 | (31.57) | (38.58) |
| G | 10 | (30.84) | (37.69) |

Tolerance:±10% (lm)

**< VF Rank >**

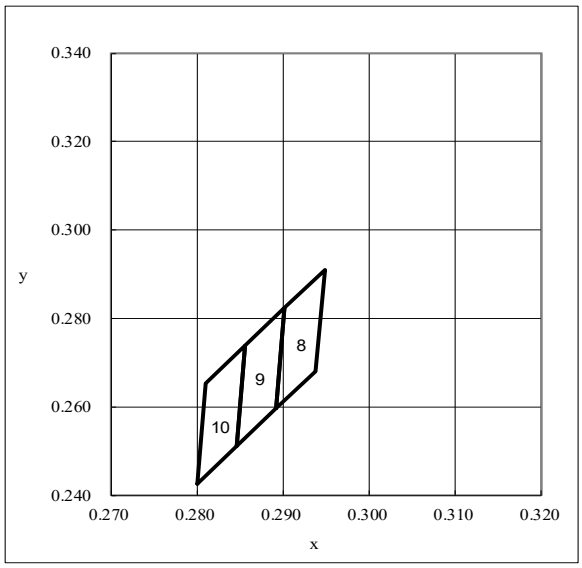
@If=80mA

| rank | Min | Max |
|---|---|---|
| W | 2.65 | 2.75 |
| X | 2.75 | 2.85 |
| Y | 2.85 | 2.95 |
| Z | 2.95 | 3.05 |

Tolerance:±3% (V)

< Chromaticity Rank >

@IF=100mA




| rank 8 | x | y |
|---|---|---|
| a | 0.289 | 0.260 |
| b | 0.290 | 0.282 |
| c | 0.295 | 0.291 |
| d | 0.294 | 0.268 |

| rank 9 | x | y |
|---|---|---|
| a | 0.285 | 0.251 |
| b | 0.286 | 0.274 |
| c | 0.290 | 0.282 |
| d | 0.289 | 0.260 |

| rank10 | x | y |
|---|---|---|
| a | 0.280 | 0.243 |
| b | 0.281 | 0.265 |
| c | 0.286 | 0.274 |
| d | 0.285 | 0.251 |

Tolerance:±0.01



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## 13-6. CL-A136C-1W6-SD-TA3091011 Rank

**< Φv Rank >**

@If=80mA

| Φv rank | Chromaticity Rank | Min | Max |
|---|---|---|---|
| F | 09 | (31.57) | (38.58) |
| G | 10 | (30.84) | (37.69) |
| H | 11 | (30.13) | (36.83) |

Tolerance:±10% (lm)

**< VF Rank >**

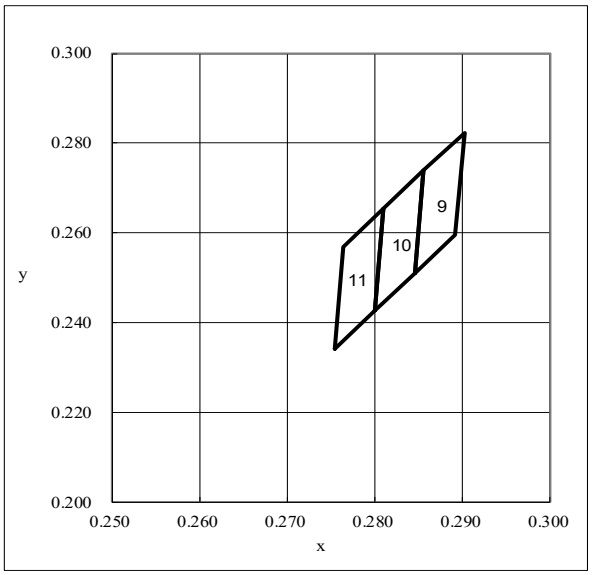
@If=80mA

| rank | Min | Max |
|---|---|---|
| W | 2.65 | 2.75 |
| X | 2.75 | 2.85 |
| Y | 2.85 | 2.95 |
| Z | 2.95 | 3.05 |

Tolerance:±3% (V)

< Chromaticity Rank >

@IF=100mA




| rank 9 | x | y |
|---|---|---|
| a | 0.285 | 0.251 |
| b | 0.286 | 0.274 |
| c | 0.290 | 0.282 |
| d | 0.289 | 0.260 |

| rank10 | x | y |
|---|---|---|
| a | 0.280 | 0.243 |
| b | 0.281 | 0.265 |
| c | 0.286 | 0.274 |
| d | 0.285 | 0.251 |

| rank11 | x | y |
|---|---|---|
| a | 0.275 | 0.234 |
| b | 0.276 | 0.257 |
| c | 0.281 | 0.265 |
| d | 0.280 | 0.243 |

Tolerance:±0.01



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## 13-7. CL-A136C-1W6-SD-TA3101112 Rank

**< Φv Rank >**

@If=80mA

| Φv rank | Chromaticity Rank | Min | Max |
|---|---|---|---|
| G | 10 | (30.84) | (37.69) |
| H | 11 | (30.13) | (36.83) |
| I | 12 | (29.44) | (35.98) |

Tolerance:±10% (lm)

**< VF Rank >**

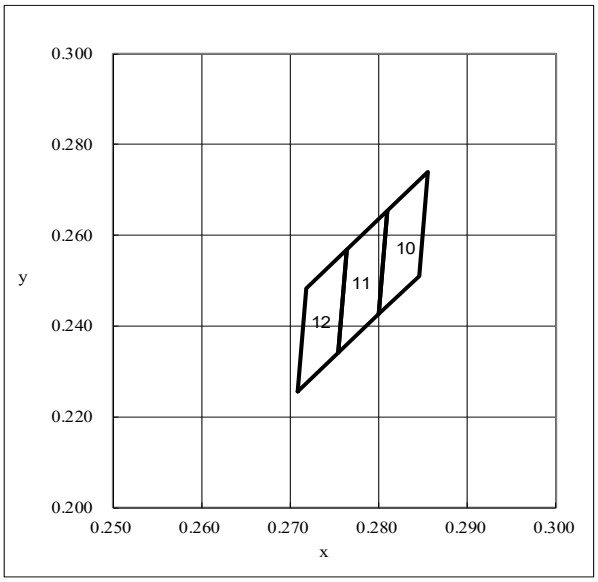
@If=80mA

| rank | Min | Max |
|---|---|---|
| W | 2.65 | 2.75 |
| X | 2.75 | 2.85 |
| Y | 2.85 | 2.95 |
| Z | 2.95 | 3.05 |

Tolerance:±3% (V)

< Chromaticity Rank >

@IF=100mA




| rank10 | x | y |
|---|---|---|
| a | 0.280 | 0.243 |
| b | 0.281 | 0.265 |
| c | 0.286 | 0.274 |
| d | 0.285 | 0.251 |

| rank11 | x | y |
|---|---|---|
| a | 0.275 | 0.234 |
| b | 0.276 | 0.257 |
| c | 0.281 | 0.265 |
| d | 0.280 | 0.243 |

| rank12 | x | y |
|---|---|---|
| a | 0.271 | 0.226 |
| b | 0.272 | 0.248 |
| c | 0.276 | 0.257 |
| d | 0.275 | 0.234 |

Tolerance:±0.01



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## 13-8. CL-A136C-1W6-SD-TA3111213 Rank

**< Φv Rank >**

@If=80mA

| Φv rank | Chromaticity Rank | Min | Max |
|---|---|---|---|
| H | 11 | (30.13) | (36.83) |
| I | 12 | (29.44) | (35.98) |
| J | 13 | (28.76) | (35.15) |

Tolerance:±10% (lm)

**< VF Rank >**

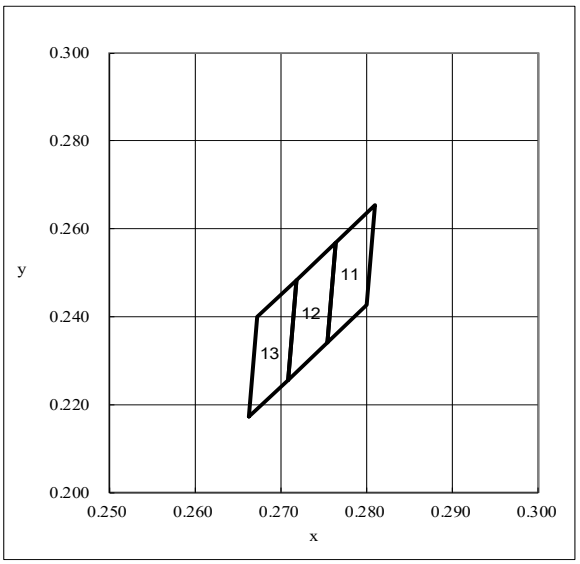
@If=80mA

| rank | Min | Max |
|---|---|---|
| W | 2.65 | 2.75 |
| X | 2.75 | 2.85 |
| Y | 2.85 | 2.95 |
| Z | 2.95 | 3.05 |

Tolerance:±3% (V)

< Chromaticity Rank >

@IF=100mA




| rank11 | x | y |
|---|---|---|
| a | 0.275 | 0.234 |
| b | 0.276 | 0.257 |
| c | 0.281 | 0.265 |
| d | 0.280 | 0.243 |

| rank12 | x | y |
|---|---|---|
| a | 0.271 | 0.226 |
| b | 0.272 | 0.248 |
| c | 0.276 | 0.257 |
| d | 0.275 | 0.234 |

| rank13 | x | y |
|---|---|---|
| a | 0.266 | 0.217 |
| b | 0.267 | 0.240 |
| c | 0.272 | 0.248 |
| d | 0.271 | 0.226 |

Tolerance:±0.01



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## 13-9. CL-A136C-1W6-SD-TA3121314 Rank

**< Φv Rank >**

@If=80mA

| Φv rank | Chromaticity Rank | Min | Max |
|---|---|---|---|
| I | 12 | (29.44) | (35.98) |
| J | 13 | (28.76) | (35.15) |
| K | 14 | (28.10) | (34.34) |

Tolerance:±10% (lm)

**< VF Rank >**

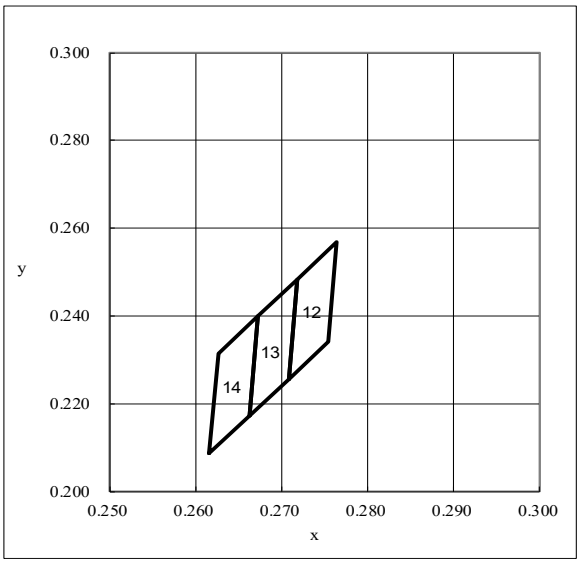
@If=80mA

| rank | Min | Max |
|---|---|---|
| W | 2.65 | 2.75 |
| X | 2.75 | 2.85 |
| Y | 2.85 | 2.95 |
| Z | 2.95 | 3.05 |

Tolerance:±3% (V)

< Chromaticity Rank >

@IF=100mA




| rank12 | x | y |
|---|---|---|
| a | 0.271 | 0.226 |
| b | 0.272 | 0.248 |
| c | 0.276 | 0.257 |
| d | 0.275 | 0.234 |

| rank13 | x | y |
|---|---|---|
| a | 0.266 | 0.217 |
| b | 0.267 | 0.240 |
| c | 0.272 | 0.248 |
| d | 0.271 | 0.226 |

| rank14 | x | y |
|---|---|---|
| a | 0.262 | 0.209 |
| b | 0.263 | 0.232 |
| c | 0.267 | 0.240 |
| d | 0.266 | 0.217 |

Tolerance:±0.01



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## 13-10. CL-A136C-1W6-SD-TA3131415 Rank

**< Φv Rank >**

@If=80mA

| Φv rank | Chromaticity Rank | Min | Max |
|---|---|---|---|
| J | 13 | (28.76) | (35.15) |
| K | 14 | (28.10) | (34.34) |
| L | 15 | (27.45) | (33.55) |

Tolerance:±10% (lm)

**< VF Rank >**

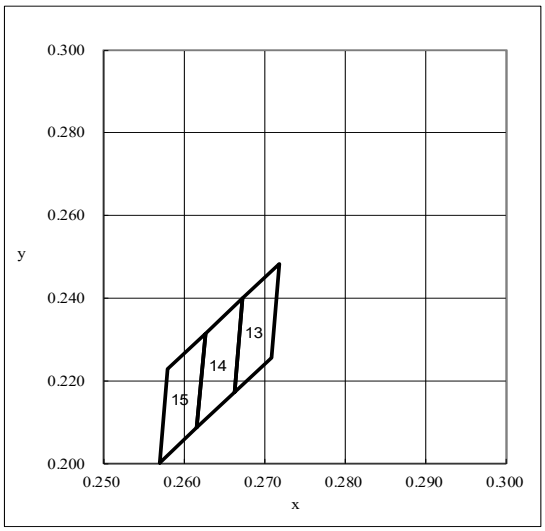
@If=80mA

| rank | Min | Max |
|---|---|---|
| W | 2.65 | 2.75 |
| X | 2.75 | 2.85 |
| Y | 2.85 | 2.95 |
| Z | 2.95 | 3.05 |

Tolerance:±3% (V)

< Chromaticity Rank >

@IF=100mA




| rank13 | x | y |
|---|---|---|
| a | 0.266 | 0.217 |
| b | 0.267 | 0.240 |
| c | 0.272 | 0.248 |
| d | 0.271 | 0.226 |

| rank14 | x | y |
|---|---|---|
| a | 0.262 | 0.209 |
| b | 0.263 | 0.232 |
| c | 0.267 | 0.240 |
| d | 0.266 | 0.217 |

| rank15 | x | y |
|---|---|---|
| a | 0.257 | 0.200 |
| b | 0.258 | 0.223 |
| c | 0.263 | 0.232 |
| d | 0.262 | 0.209 |

Tolerance:±0.01



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http://ce.citizen.co.jp

Requests / Inquiries
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