

DATA SHEET

1. Scope of Application

These specifications are applied to the chip type LED lamp , model CL-824-MU1D-T.

2. Part code

C L - 8 2 4 - M U 1 D - T

Series

824 : White LED for general lighting.

Special specifications

M : General Color Rendering Index Typ. 85 Type.

Watt class

U1 : Under 1 watt package.

Lighting color

D : Correlated Color Temperature 6300(K)

Shipping mode

Non-coded : Bulk

T : Taping (standard)

Symbol	CITILED
Name	CL-824-MU1D
CITIZEN ELECTRONICS CO.,LTD. JAPAN	

DATA SHEET

(2) Electro-optical Characteristics

Ts=25C

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage	V _F	I _F =20mA	2.8	3.2	3.5	V
Reverse Current	I _R	V _R =5V	-	-	100	μA
Thermal Resistance	R _{j-s} ^{*2}	Junction-solder	-	175	-	C/W
Luminous Intensity ^{*1}	I _v	I _F =20mA	1240	1730	-	med
Luminous Flux	φ _V	I _F =20mA	-	(4.8)	-	lm
General Color Rendering Index	R _a	I _F =20mA	80	85	-	-

*1 In accordance with NIST standard

*2 Thermal Resistance : Junction - Solder terminal (Anode)

Ranking (Condition : I_F=20mA , Ts=25C)

Parameter	Symbol	Rank	Min.	Max.	Unit
Forward Voltage	V _F	Q	2.8	3.0	V
		R	3.0	3.2	
		S	3.2	3.5	
Luminous Intensity	I _v	B	1240	1404	med
		C	1404	1900	
		D	1900	2571	

Chromaticity coordinates (Condition : I_F=20mA , Ts=25C)

Color Rank	x	y	Color Rank	x	y
MDc	0.317	0.327	MDe	0.319	0.311
	0.317	0.331		0.317	0.327
	0.331	0.353		0.331	0.340
	0.331	0.340		0.331	0.322

Color Rank	x	y
MDd	0.310	0.302
	0.307	0.316
	0.317	0.331
	0.319	0.311

*1 The tolerance of measurement at our tester is VF±3% , φv±10% , Chromaticity(x,y)±0.01.

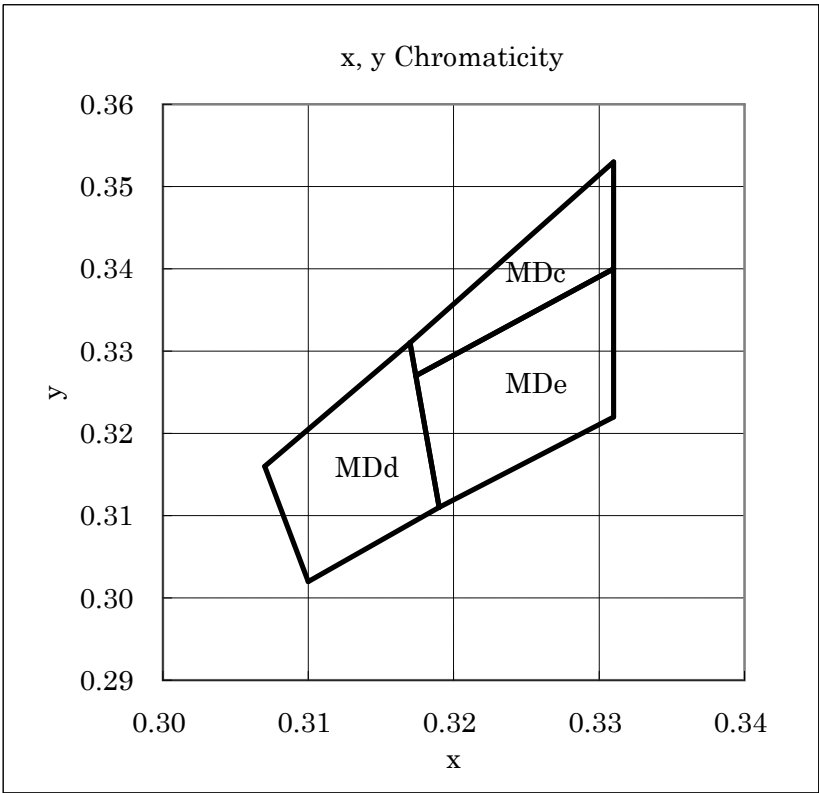
*2 For handling ,please apply CMOS LSI or equivalent any electrostatic effect.

Measurement Conditions

- 1) Chip is mounted on board(size 100mm×40mm)
- 2) Board material is FR-4, covered with green color resist and thickness of copper is 18μm.

Symbol	CITLED
Name	CL-824-MU1D
CITIZEN ELECTRONICS CO.,LTD. JAPAN	

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Rank information

CUSTOMER:
TYPE: CL-824-MU1D
P.NO:
Lot No: XXXXXX
Q'ty: XXX



PASS

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e.g. B MDd Q

↓

B

MDd

Q

△△△

: Ranking by Luminous Intensity

△△△

 : Ranking by Chromaticity coordinates

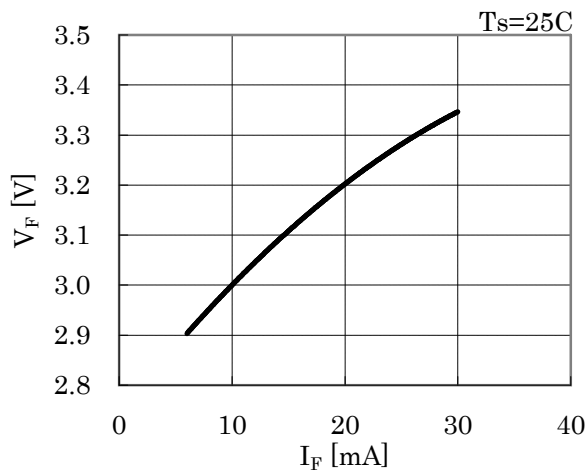
: Ranking by Forward Voltage

Symbol	CITILED
Name	CL-824-MU1D
CITIZEN ELECTRONICS CO.,LTD. JAPAN	

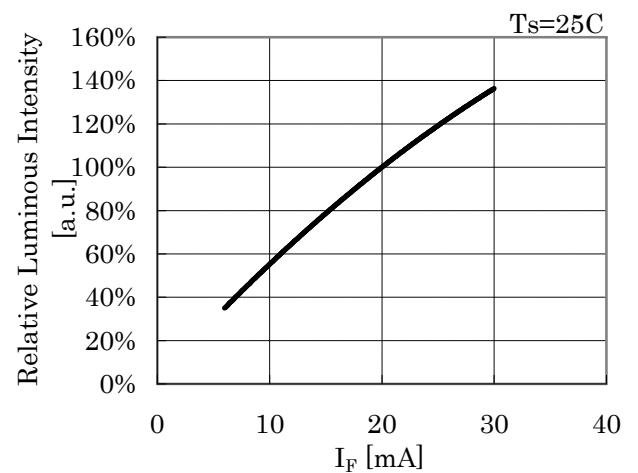
DATA SHEET

5. Characteristics

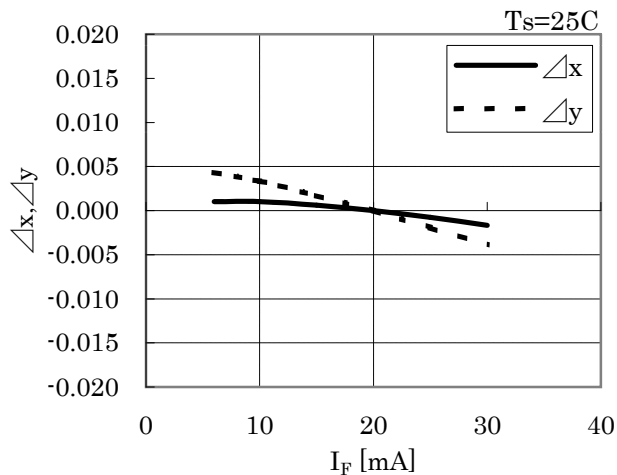
• Forward Current vs. Forward Voltage



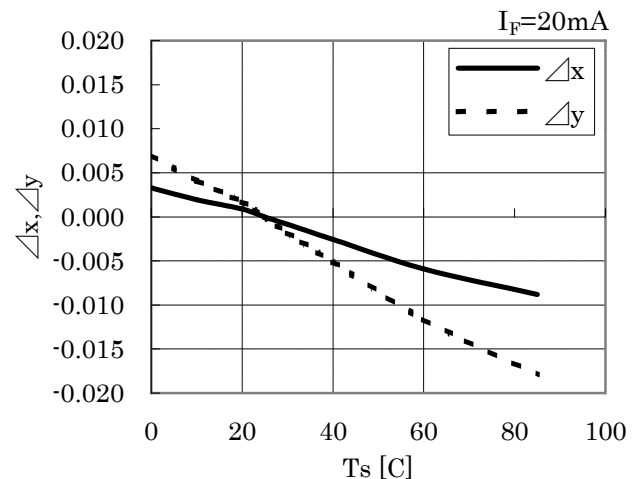
• Forward Current vs. Relative Luminous Intensity



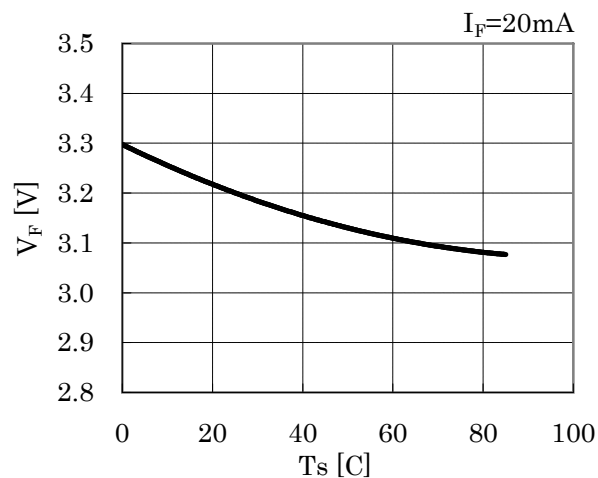
• Forward Current vs. Chromaticity Coordinate



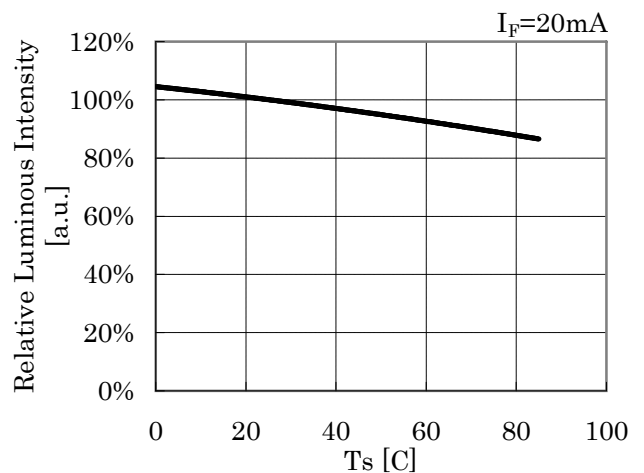
• Solder Temperature vs. Chromaticity Coordinate



• Solder Temperature vs. Forward Voltage



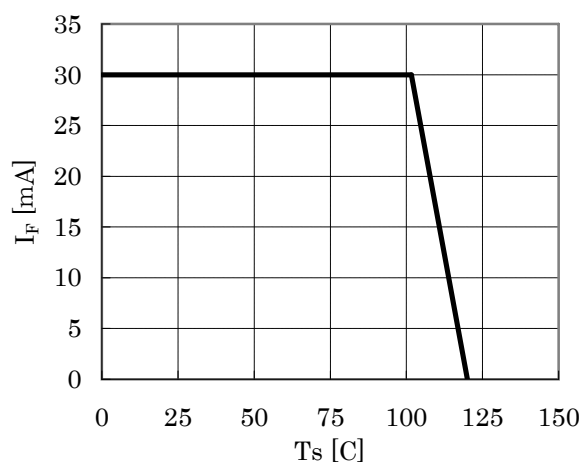
• Solder Temperature vs. Relative Luminous Intensity



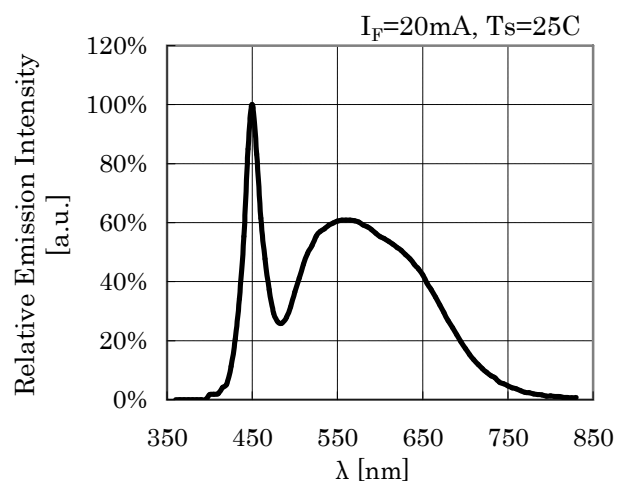
Symbol	CITLED
Name	CL-824-MU1D
CITIZEN ELECTRONICS CO.,LTD. JAPAN	

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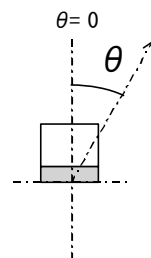
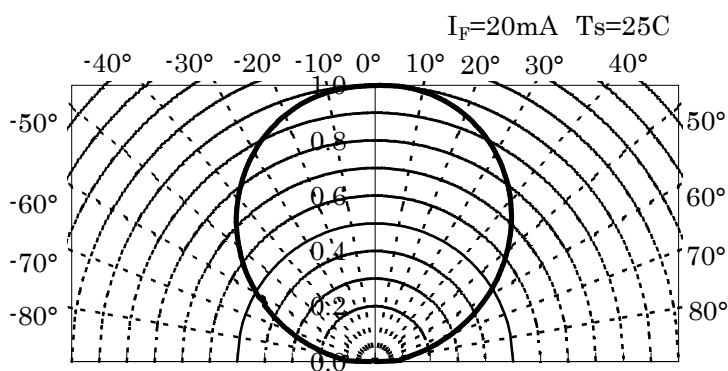
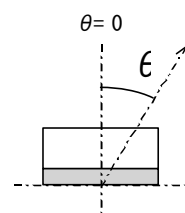
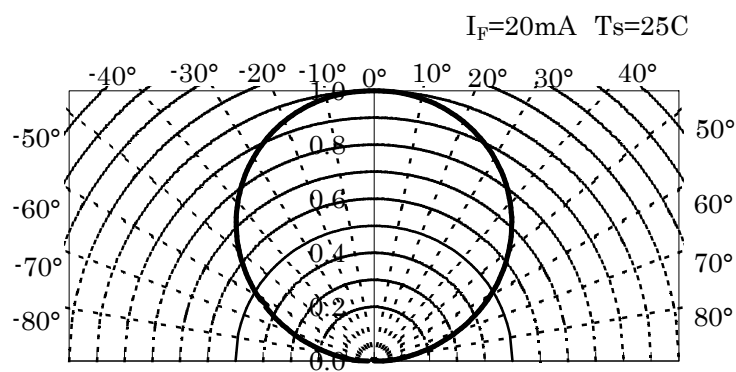
•Solder Temperature vs. Allowable Forward Current



•Spectrum



•Directive Characteristic



*Measurement condition (Directive characteristic)
LED chip is mounted on black color PCB.

Symbol	CITLED
Name	CL-824-MU1D
CITIZEN ELECTRONICS CO.,LTD. JAPAN	

DATA SHEET

1. Scope of Application

These specifications are applied to the chip type LED lamp , model CL-824-MU1L1-T.

2. Part code

C L - 8 2 4 - M U 1 L 1 - T

Series

824 : White LED for general lighting.

Special specifications

M : General Color Rendering Index Typ. 85 Type.

Watt class

U1 : Under 1 watt package.

Lighting color

L1 : Energy Star Correlated Color Temperature 3000(K)

Shipping mode

Non-coded : Bulk

T : Taping (standard)

Symbol	CITILED
Name	CL-824-MU1L1
CITIZEN ELECTRONICS CO.,LTD. JAPAN	

DATA SHEET

(2) Electro-optical Characteristics

Ts=25C

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage	V _F	I _F =20mA	2.8	3.2	3.5	V
Reverse Current	I _R	V _R =5V	-	-	100	μA
Thermal Resistance	R _{j-s} ^{*2}	Junction-solder	-	175	-	C/W
Luminous Intensity ^{*1}	I _v	I _F =20mA	1100	1670	-	mcd
Luminous Flux	φ _V	I _F =20mA	-	(4.6)	-	lm
General Color Rendering Index	R _a	I _F =20mA	80	85	-	-

*1 In accordance with NIST standard

*2 Thermal Resistance : Junction - Solder terminal (Anode)

Ranking (Condition : I_F=20mA , Ts=25C)

Parameter	Symbol	Rank	Min.	Max.	Unit
Forward Voltage	V _F	Q	2.8	3.0	V
		R	3.0	3.2	
		S	3.2	3.5	
Luminous Intensity	I _v	B	1100	1251	mcd
		C	1251	1693	
		D	1693	2291	

Chromaticity coordinates (Condition : I_F=20mA ,Ts=25C)

Color Rank	x	y	Color Rank	x	y
L1a	0.443	0.421	L1b	0.456	0.426
	0.430	0.417		0.443	0.421
	0.422	0.399		0.435	0.403
	0.435	0.403		0.447	0.408

Color Rank	x	y	Color Rank	x	y
L1c	0.435	0.403	L1d	0.447	0.408
	0.422	0.399		0.435	0.403
	0.415	0.381		0.426	0.385
	0.426	0.385		0.437	0.389

*1 The tolerance of measurement at our tester is VF±3% , φv±10% , Chromaticity(x,y)±0.01.

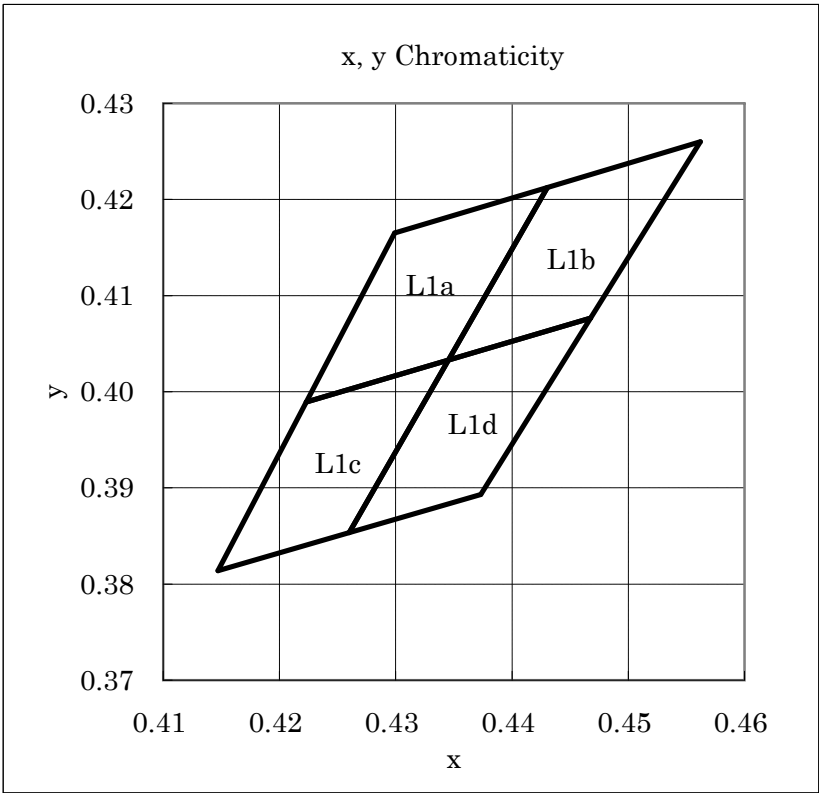
*2 For handling ,please apply CMOS LSI or equivalent any electrostatic effect.

Measurement Conditions

- 1) Chip is mounted on board(size 100mm×40mm)
- 2) Board material is FR-4, covered with green color resist and thickness of copper is 18μm.

Symbol	CITLED
Name	CL-824-MU1L1
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DATA SHEET



Rank information

CUSTOMER:
TYPE: CL-824-MU1L1
P.NO:
Lot No: XXXXXX
Q'ty: XXX

 **PASS**



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e.g. B L1a Q

↓
B L1a Q
  

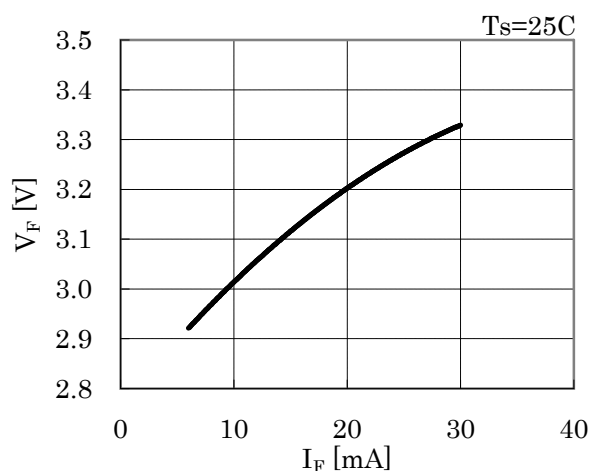
-  : Ranking by Luminous Intensity
 : Ranking by Chromaticity coordinates
 : Ranking by Forward Voltage

Symbol	CITLED
Name	CL-824-MU1L1
CITIZEN ELECTRONICS CO.,LTD. JAPAN	

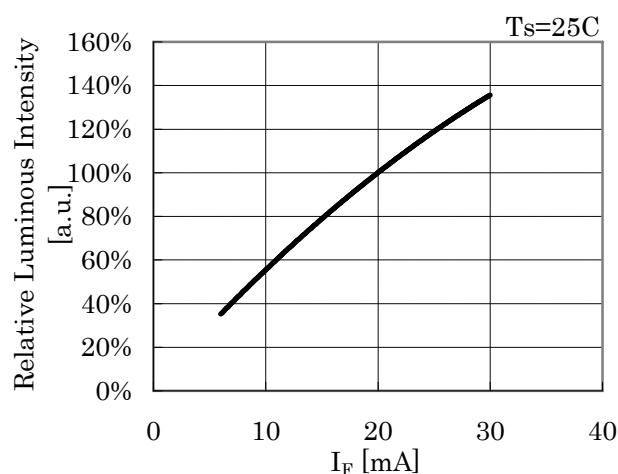
DATA SHEET

5. Characteristics

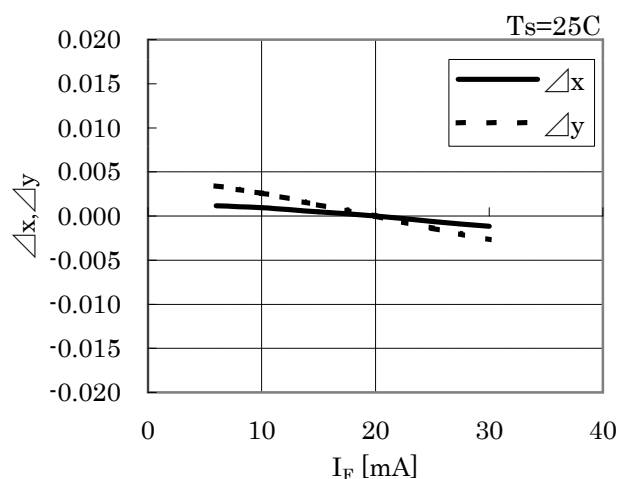
• Forward Current vs. Forward Voltage



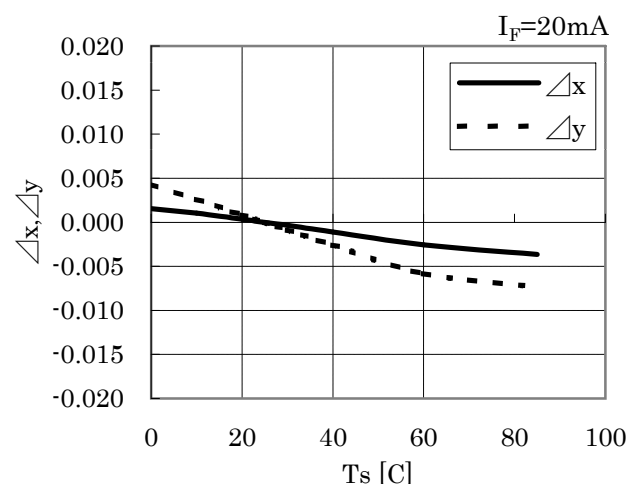
• Forward Current vs. Relative Luminous Intensity



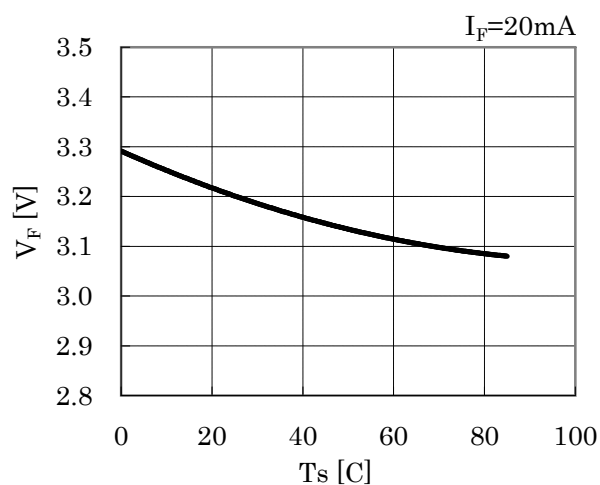
• Forward Current vs. Chromaticity Coordinate



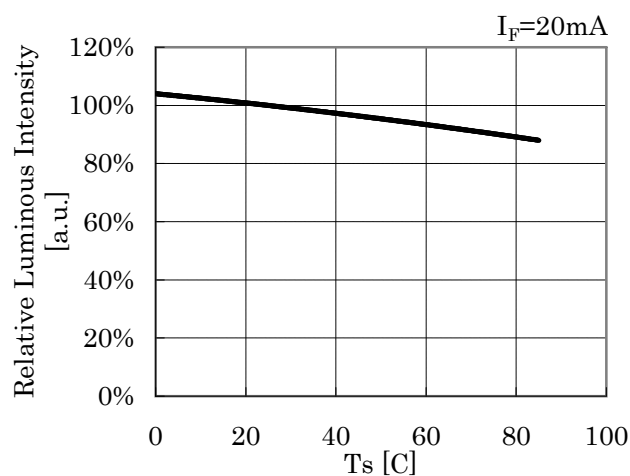
• Solder Temperature vs. Chromaticity Coordinate



• Solder Temperature vs. Forward Voltage



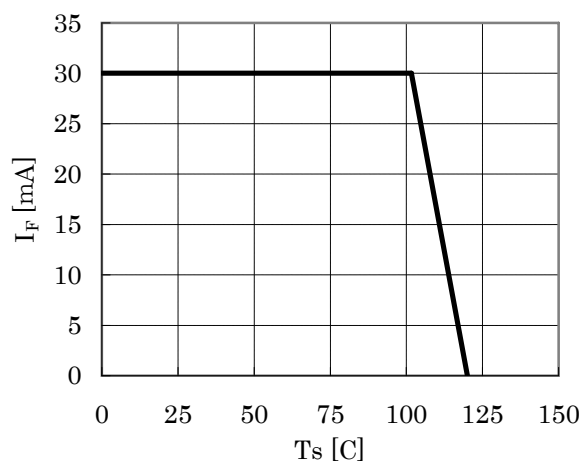
• Solder Temperature vs. Relative Luminous Intensity



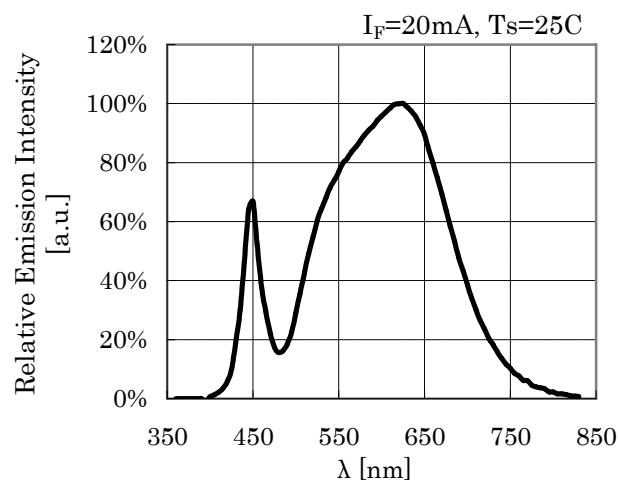
Symbol	CITLED
Name	CL-824-MU1L1
CITIZEN ELECTRONICS CO.,LTD. JAPAN	

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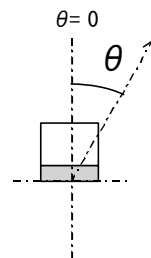
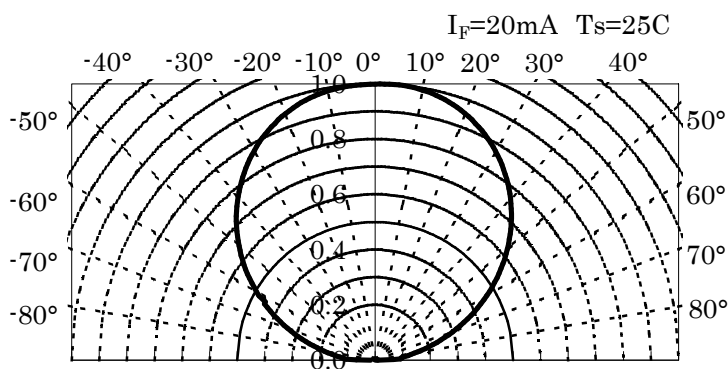
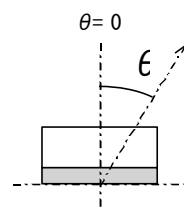
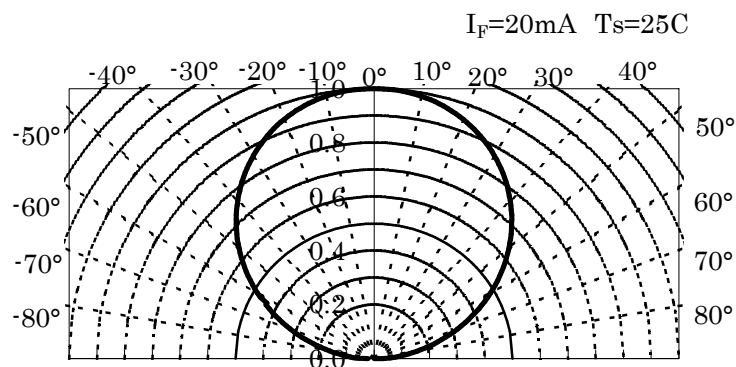
•Solder Temperature vs. Allowable Forward Current



•Spectrum



•Directive Characteristic



*Measurement condition (Directive characteristic)
LED chip is mounted on black color PCB.

Symbol	CITLED
Name	CL-824-MU1L1
CITIZEN ELECTRONICS CO.,LTD. JAPAN	

DATA SHEET

1. Scope of Application

These specifications are applied to the chip type LED lamp , model CL-824-MU1L2-T.

2. Part code

C L - 8 2 4 - M U 1 L 2 - T

Series

824 : White LED for general lighting.

Special specifications

M : General Color Rendering Index Typ. 85 Type.

Watt class

U1 : Under 1 watt package.

Lighting color

L2 : Energy Star Correlated Color Temperature 2700(K)

Shipping mode

Non-coded : Bulk

T : Taping (standard)

Symbol	CITILED
Name	CL-824-MU1L2
CITIZEN ELECTRONICS CO.,LTD. JAPAN	

DATA SHEET

(2) Electro-optical Characteristics

Ts=25C

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage	V _F	I _F =20mA	2.8	3.2	3.5	V
Reverse Current	I _R	V _R =5V	-	-	100	μA
Thermal Resistance	R _{j-s} ^{*2}	Junction-solder	-	175	-	C/W
Luminous Intensity ^{*1}	I _v	I _F =20mA	1040	1650	-	mcd
Luminous Flux	φ _V	I _F =20mA	-	(4.6)	-	lm
General Color Rendering Index	R _a	I _F =20mA	80	85	-	-

*1 In accordance with NIST standard

*2 Thermal Resistance : Junction - Solder terminal (Anode)

Ranking (Condition : I_F=20mA , Ts=25C)

Parameter	Symbol	Rank	Min.	Max.	Unit
Forward Voltage	V _F	Q	2.8	3.0	V
		R	3.0	3.2	
		S	3.2	3.5	
Luminous Intensity	I _v	B	1040	1178	mcd
		C	1178	1593	
		D	1593	2154	

Chromaticity coordinates (Condition : I_F=20mA , Ts=25C)

Color Rank	x	y	Color Rank	x	y
L2a	0.469	0.429	L2b	0.481	0.432
	0.456	0.426		0.469	0.429
	0.447	0.408		0.459	0.410
	0.459	0.410		0.470	0.413

Color Rank	x	y	Color Rank	x	y
L2c	0.459	0.410	L2d	0.470	0.413
	0.447	0.408		0.459	0.410
	0.437	0.389		0.448	0.392
	0.448	0.392		0.459	0.394

*1 The tolerance of measurement at our tester is VF±3% , φv±10% , Chromaticity(x,y)±0.01.

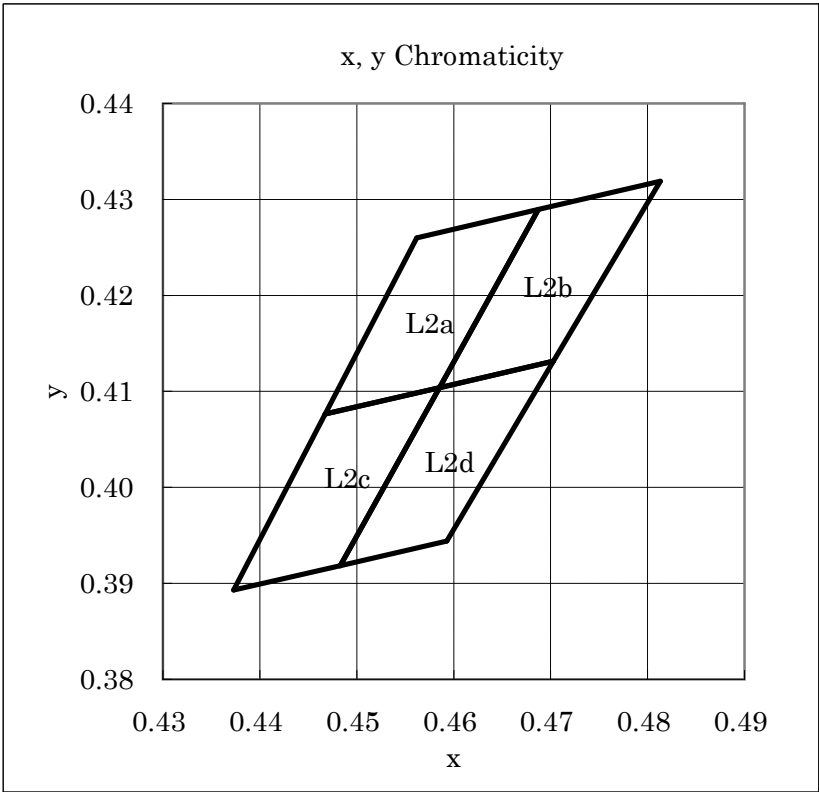
*2 For handling ,please apply CMOS LSI or equivalent any electrostatic effect.

Measurement Conditions

- 1) Chip is mounted on board(size 100mm×40mm)
- 2) Board material is FR-4, covered with green color resist and thickness of copper is 18μm.

Symbol	CITLED
Name	CL-824-MU1L2
CITIZEN ELECTRONICS CO.,LTD. JAPAN	

DATA SHEET



Rank information

CUSTOMER:
TYPE: CL-824-MU1L2
P.NO:
Lot No: XXXXXX
Q'ty: XXX

 **PASS**



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e.g. B L2a Q

↓
B L2a Q
□ △△△ ■

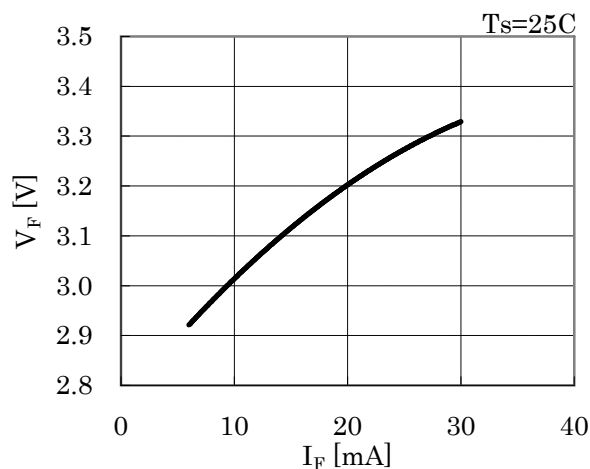
- : Ranking by Luminous Intensity
△△△ : Ranking by Chromaticity coordinates
■ : Ranking by Forward Voltage

Symbol	CITILED
Name	CL-824-MU1L2
CITIZEN ELECTRONICS CO.,LTD. JAPAN	

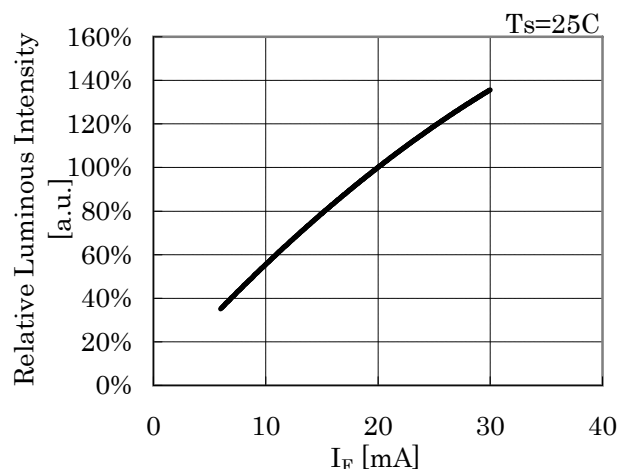
DATA SHEET

5. Characteristics

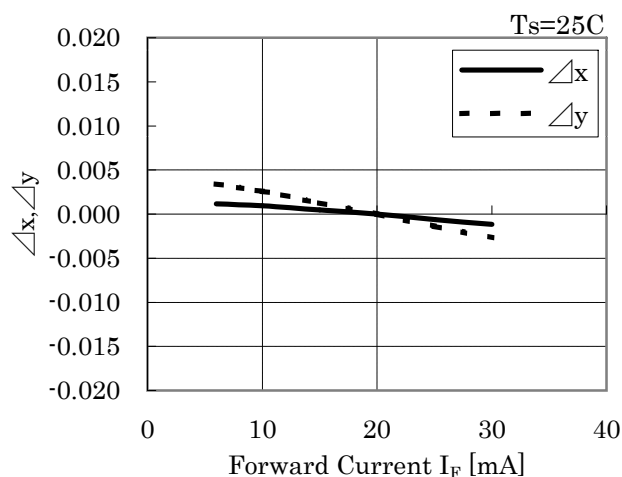
• Forward Current vs. Forward Voltage



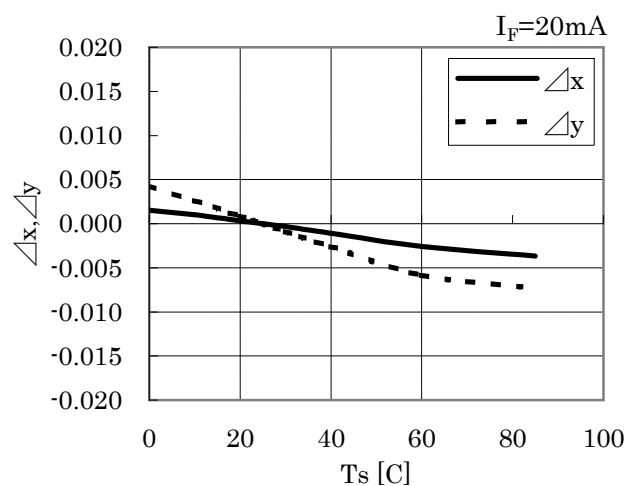
• Forward Current vs. Relative Luminous Intensity



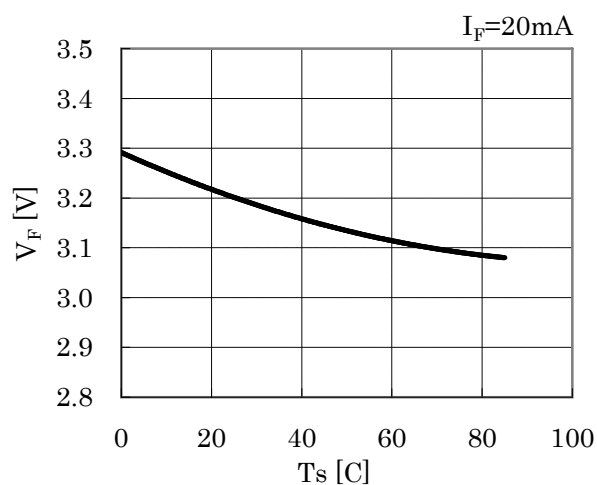
• Forward Current vs. Chromaticity Coordinate



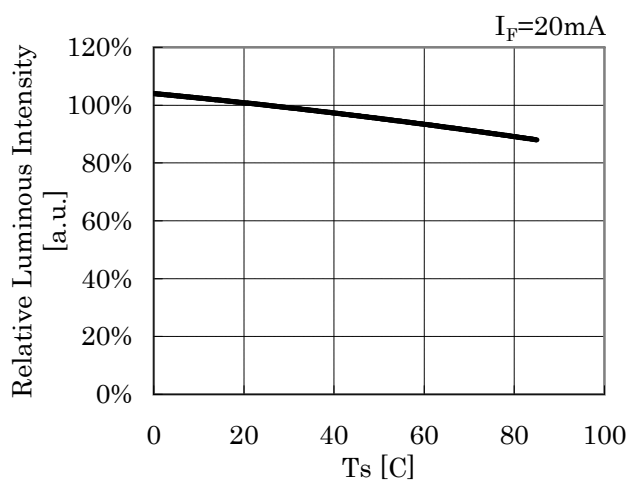
• Solder Temperature vs. Chromaticity Coordinate



• Solder Temperature vs. Forward Voltage



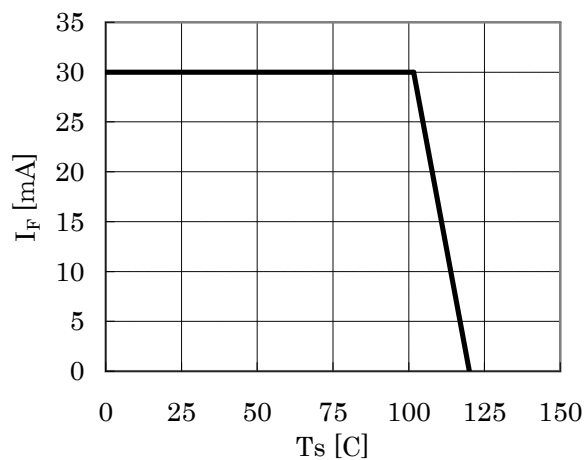
• Solder Temperature vs. Relative Luminous Intensity



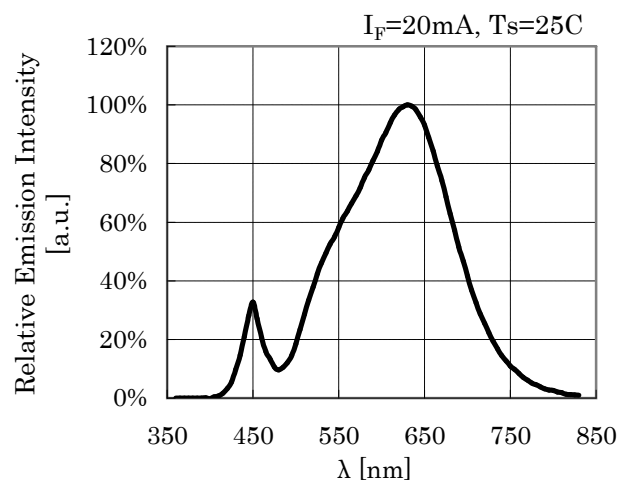
Symbol	CITLED
Name	CL-824-MU1L2
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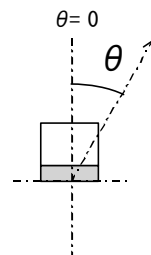
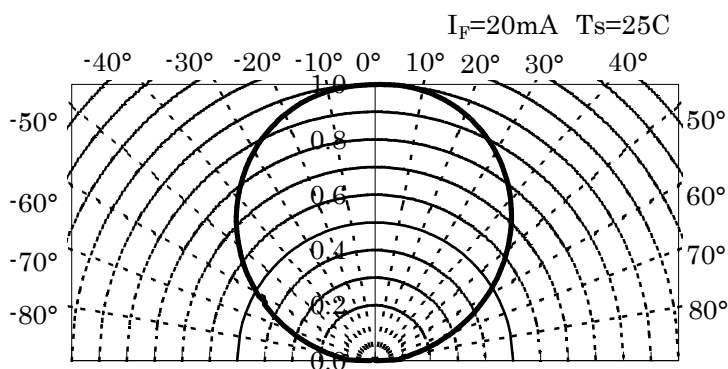
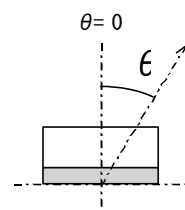
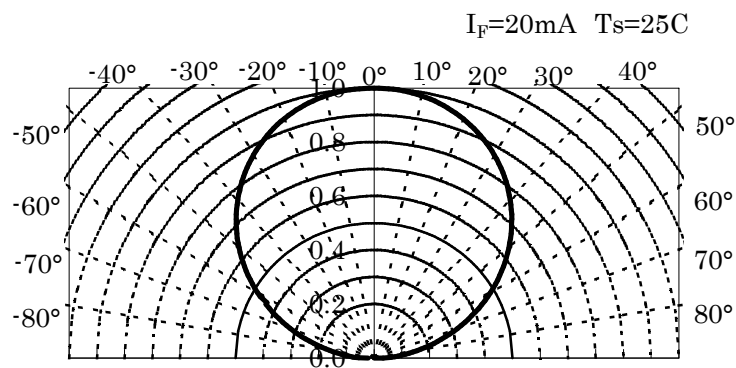
•Solder Temperature vs. Allowable Forward Current



•Spectrum



•Directive Characteristic



*Measurement condition (Directive characteristic)
LED chip is mounted on black color PCB.

Symbol	CITLED
Name	CL-824-MU1L2
CITIZEN ELECTRONICS CO.,LTD. JAPAN	

DATA SHEET

1. Scope of Application

These specifications are applied to the chip type LED lamp , model CL-824-MU1N-T.

2. Part code

C L - 8 2 4 - M U 1 N - T

Series

824 : White LED for general lighting.

Special specifications

M : General Color Rendering Index Typ. 85 Type.

Watt class

U1 : Under 1 watt package.

Lighting color

N : Correlated Color Temperature 5000(K)

Shipping mode

Non-coded : Bulk

T : Taping (standard)

Symbol	CITILED
Name	CL-824-MU1N
CITIZEN ELECTRONICS CO.,LTD. JAPAN	

DATA SHEET

(2) Electro-optical Characteristics

Ts=25C

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage	V _F	I _F =20mA	2.8	3.2	3.5	V
Reverse Current	I _R	V _R =5V	-	-	100	μA
Thermal Resistance	R _{j-s} ^{*2}	Junction-solder	-	175	-	C/W
Luminous Intensity ^{*1}	I _v	I _F =20mA	1210	1750	-	mcd
Luminous Flux	φ _v	I _F =20mA	-	(4.8)	-	lm
General Color Rendering Index	R _a	I _F =20mA	80	85	-	-

*1 In accordance with NIST standard

*2 Thermal Resistance : Junction - Solder terminal (Anode)

Ranking (Condition : I_F=20mA , Tc=25C)

Parameter	Symbol	Rank	Min.	Max.	Unit
Forward Voltage	V _F	Q	2.8	3.0	V
		R	3.0	3.2	
		S	3.2	3.5	
Luminous Intensity	I _v	B	1210	1376	mcd
		C	1376	1861	
		D	1861	2517	

Chromaticity coordinates (Condition : I_F=20mA ,Tc=25C)

Color Rank	x	y	Color Rank	x	y
Na	0.343	0.366	Nb	0.355	0.376
	0.331	0.356		0.343	0.366
	0.331	0.339		0.342	0.347
	0.342	0.347		0.352	0.356

Color Rank	x	y	Color Rank	x	y
Nc	0.342	0.347	Nd	0.352	0.356
	0.331	0.339		0.342	0.347
	0.331	0.322		0.340	0.329
	0.340	0.329		0.350	0.336

*1 The tolerance of measurement at our tester is VF±3% , φv±10% , Chromaticity(x,y)±0.01.

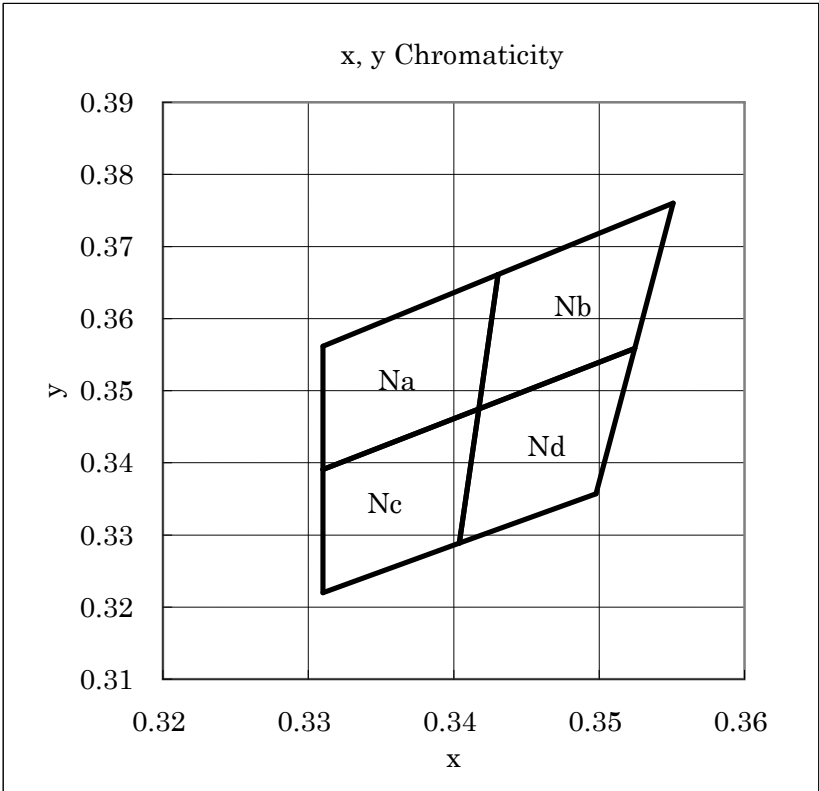
*2 For handling ,please apply CMOS LSI or equivalent any electrostatic effect.

Measurement Conditions

- 1) Chip is mounted on board(size 100mm×40mm)
- 2) Board material is FR-4, covered with green color resist and thickness of copper is 18μm.

Symbol	CITLED
Name	CL-824-MU1N
CITIZEN ELECTRONICS CO.,LTD. JAPAN	

DATA SHEET



Rank information

CUSTOMER:
TYPE: CL-824-MU1N
P.NO:
Lot No: XXXXXX
Q'ty: XXX


PASS



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e.g.

B	Na	Q
↓		
B	Na	Q
□	△△	■

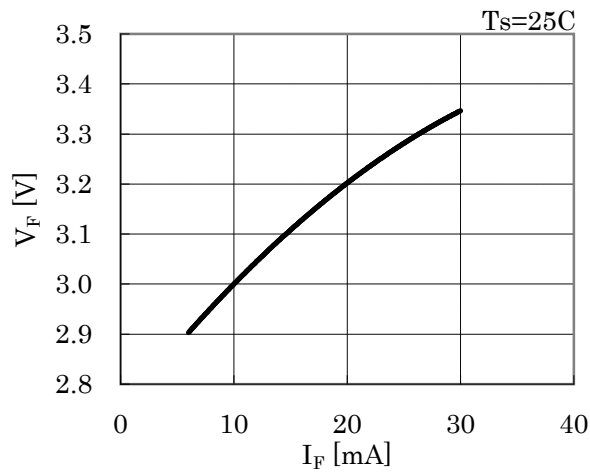
- : Ranking by Luminous Intensity
- △△ : Ranking by Chromaticity coordinates
- : Ranking by Forward Voltage

Symbol	CITILED
Name	CL-824-MU1N
CITIZEN ELECTRONICS CO.,LTD. JAPAN	

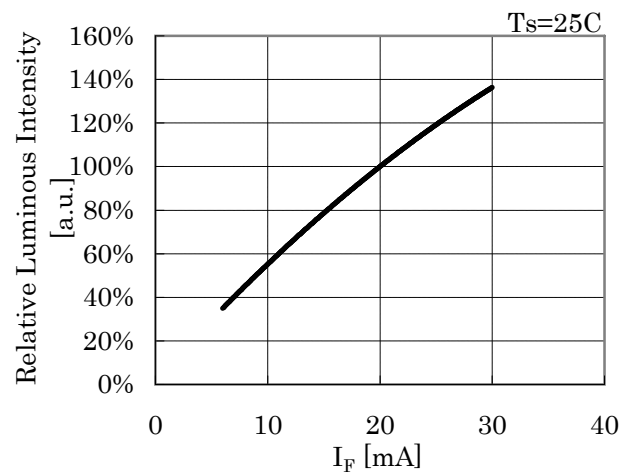
DATA SHEET

5. Characteristics

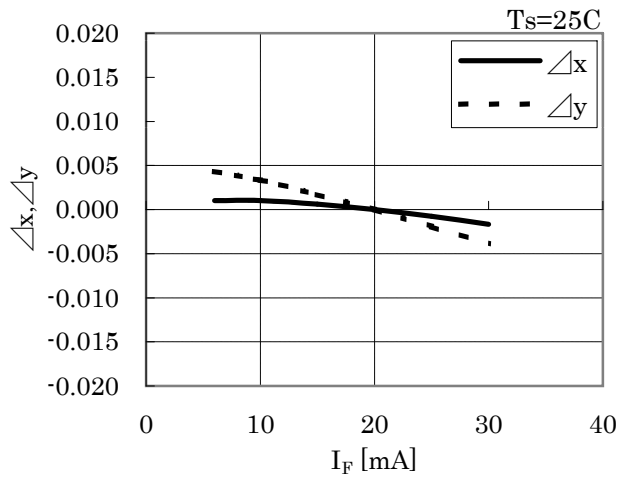
• Forward Current vs. Forward Voltage



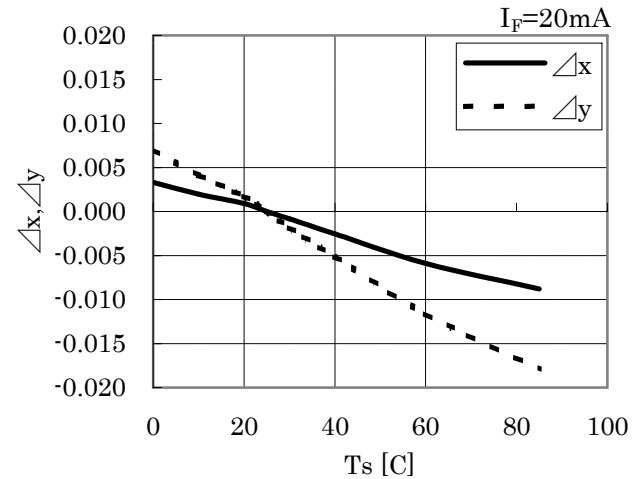
• Forward Current vs. Relative Luminous Intensity



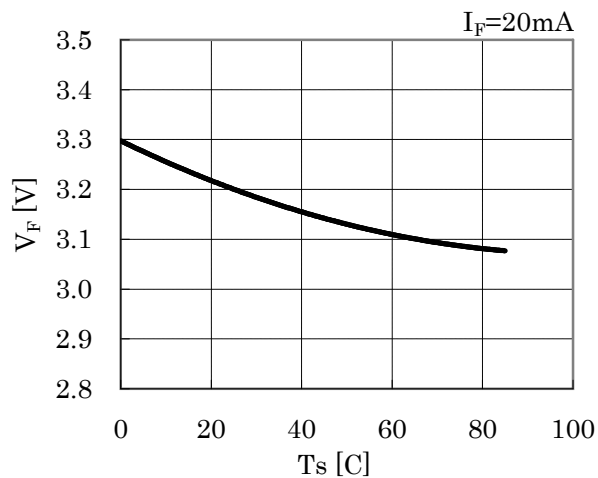
• Forward Current vs. Chromaticity Coordinate



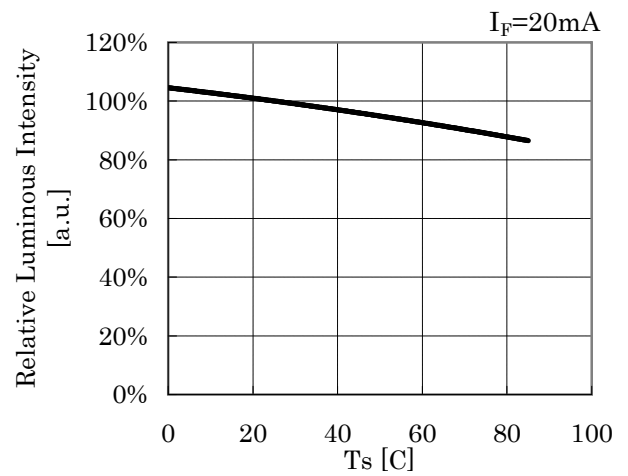
• Solder Temperature vs. Chromaticity Coordinate



• Solder Temperature vs. Forward Voltage



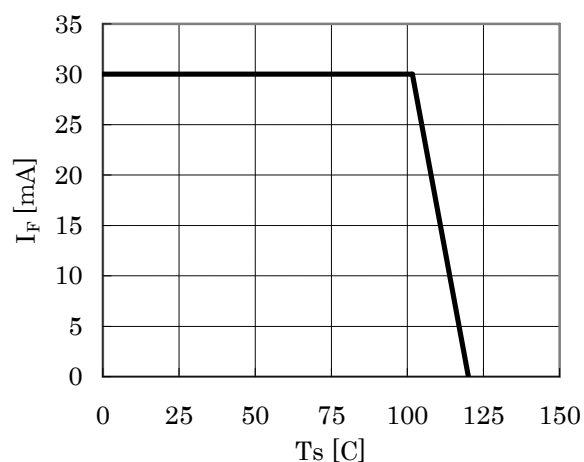
• Solder Temperature vs. Relative Luminous Intensity



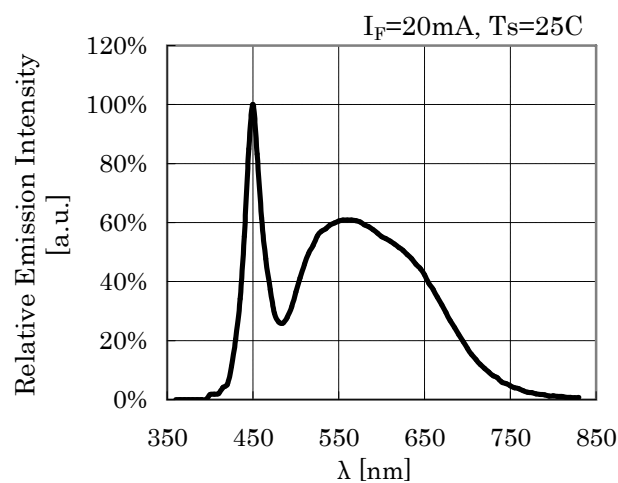
Symbol	CITLED
Name	CL-824-MU1N
CITIZEN ELECTRONICS CO.,LTD. JAPAN	

DATA SHEET

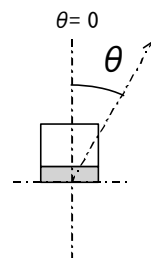
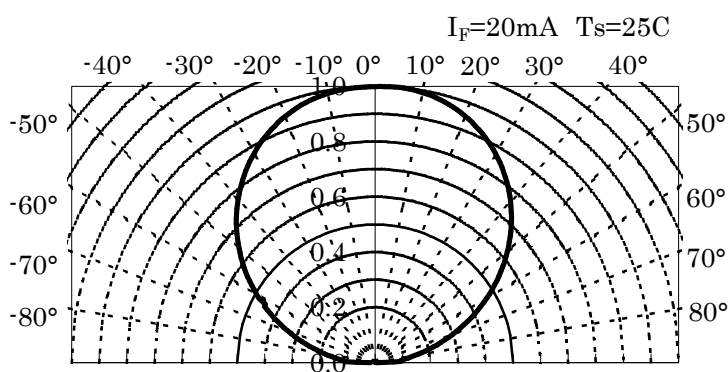
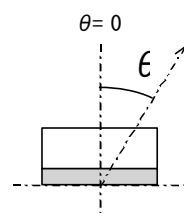
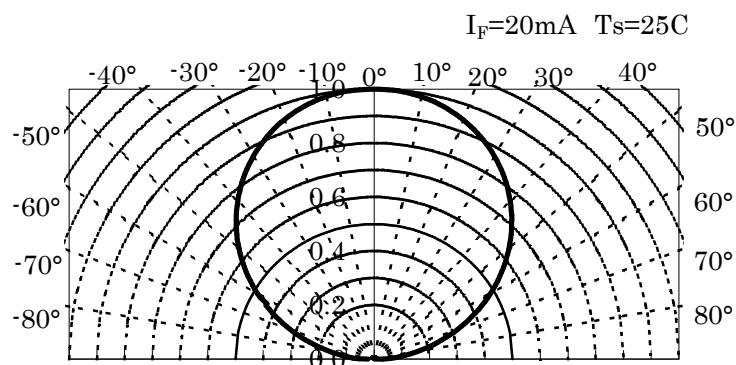
•Solder Temperature vs. Allowable Forward Current



•Spectrum



•Directive Characteristic



*Measurement condition (Directive characteristic)
LED chip is mounted on black color PCB.

Symbol	CITLED
Name	CL-824-MU1N
CITIZEN ELECTRONICS CO.,LTD. JAPAN	

DATA SHEET

1. Scope of Application

These specifications are applied to the chip type LED lamp , model CL-824-MU1W1-T.

2. Part code

C L - 8 2 4 - M U 1 W 1 - T

Series

824 : White LED for general lighting.

Special specifications

M : General Color Rendering Index Typ. 85 Type.

Watt class

U1 : Under 1 watt package.

Lighting color

W1 : Energy Star Correlated Color Temperature 4000(K)

Shipping mode

Non-coded : Bulk

T : Taping (standard)

Symbol	CITILED
Name	CL-824-MU1W1
CITIZEN ELECTRONICS CO.,LTD. JAPAN	

DATA SHEET

(2) Electro-optical Characteristics

Ts=25C

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage	V _F	I _F =20mA	2.8	3.2	3.5	V
Reverse Current	I _R	V _R =5V	-	-	100	μA
Thermal Resistance	R _{j-s} ^{*2}	Junction-solder	-	175	-	C/W
Luminous Intensity ^{*1}	I _v	I _F =20mA	1240	1730	-	mcd
Luminous Flux	φ _V	I _F =20mA	-	(4.8)	-	lm
General Color Rendering Index	R _a	I _F =20mA	80	85	-	-

*1 In accordance with NIST standard

*2 Thermal Resistance : Junction - Solder terminal (Anode)

Ranking (Condition : I_F=20mA , Ts=25C)

Parameter	Symbol	Rank	Min.	Max.	Unit
Forward Voltage	V _F	Q	2.8	3.0	V
		R	3.0	3.2	
		S	3.2	3.5	
Luminous Intensity	I _v	B	1240	1405	mcd
		C	1405	1900	
		D	1900	2569	

Chromaticity coordinates (Condition : I_F=20mA , Ts=25C)

Color Rank	x	y	Color Rank	x	y
W1a	0.387	0.396	W1b	0.401	0.404
	0.374	0.387		0.387	0.396
	0.370	0.373		0.383	0.380
	0.383	0.380		0.395	0.388

Color Rank	x	y	Color Rank	x	y
W1c	0.383	0.380	W1d	0.395	0.388
	0.370	0.373		0.383	0.380
	0.367	0.358		0.378	0.365
	0.378	0.365		0.390	0.372

*1 The tolerance of measurement at our tester is VF±3% , φv±10% , Chromaticity(x,y)±0.01.

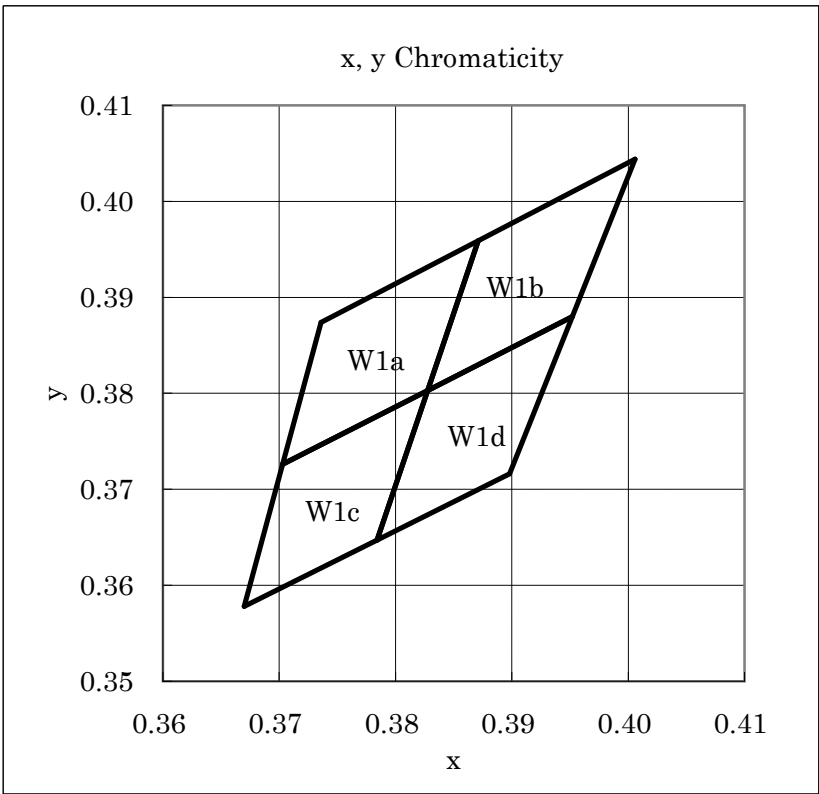
*2 For handling ,please apply CMOS LSI or equivalent any electrostatic effect.

Measurement Conditions

- 1) Chip is mounted on board(size 100mm×40mm)
- 2) Board material is FR-4, covered with green color resist and thickness of copper is 18μm.

Symbol	CITLED
Name	CL-824-MU1W1
CITIZEN ELECTRONICS CO.,LTD. JAPAN	

DATA SHEET



Rank information

CUSTOMER:
TYPE: CL-824-MU1W1
P.NO:
Lot No: XXXXXX
Q'ty: XXX

 **PASS**



CITIZEN ELECTRONICS

e.g.

B	W1a	Q
↓		
B	W1a	Q
	  	

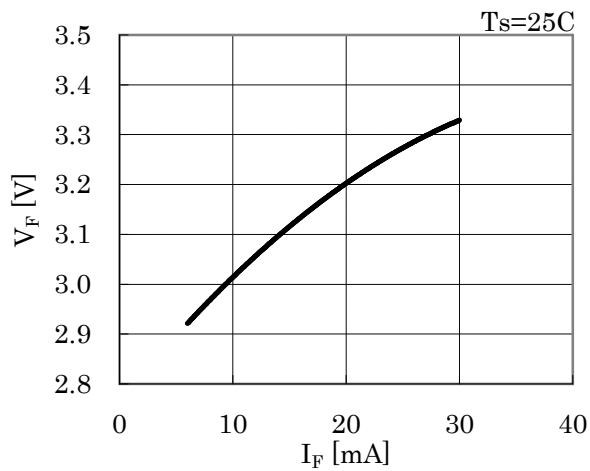
 : Ranking by Luminous Intensity
 : Ranking by Chromaticity coordinates
 : Ranking by Forward Voltage

Symbol	CITILED
Name	CL-824-MU1W1
CITIZEN ELECTRONICS CO.,LTD. JAPAN	

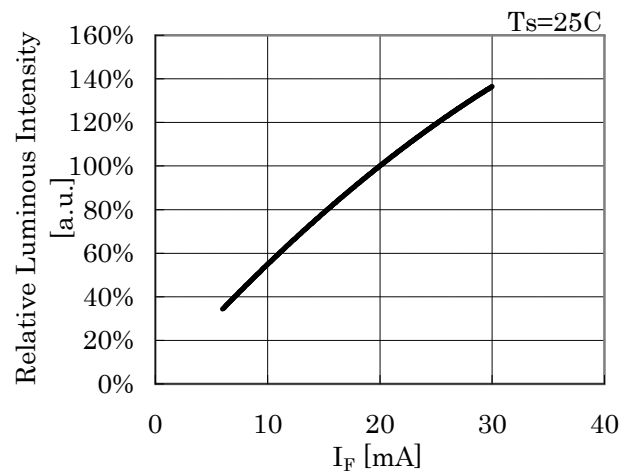
DATA SHEET

5. Characteristics

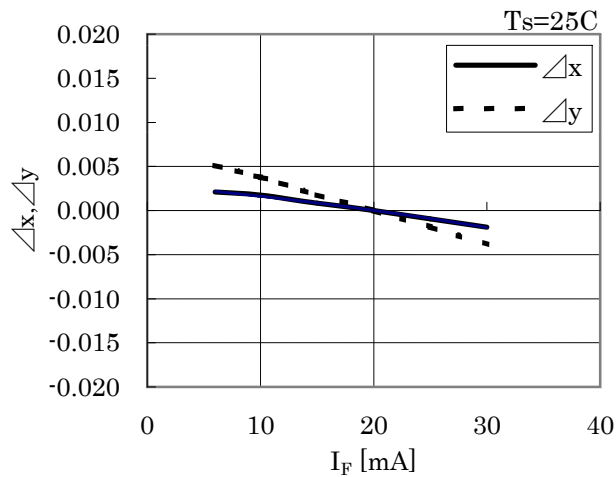
• Forward Current vs. Forward Voltage



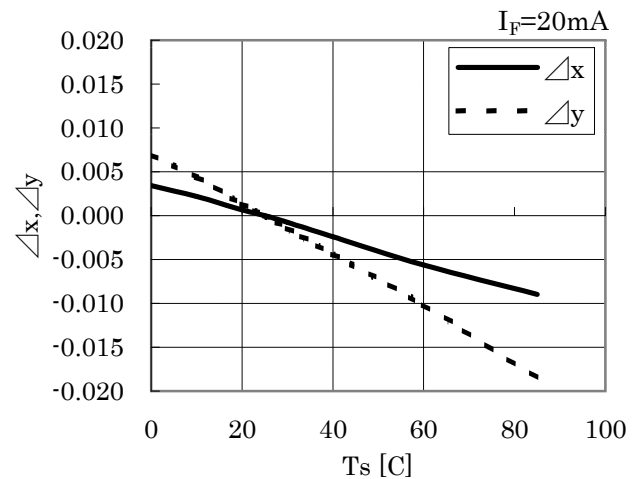
• Forward Current vs. Relative Luminous Intensity



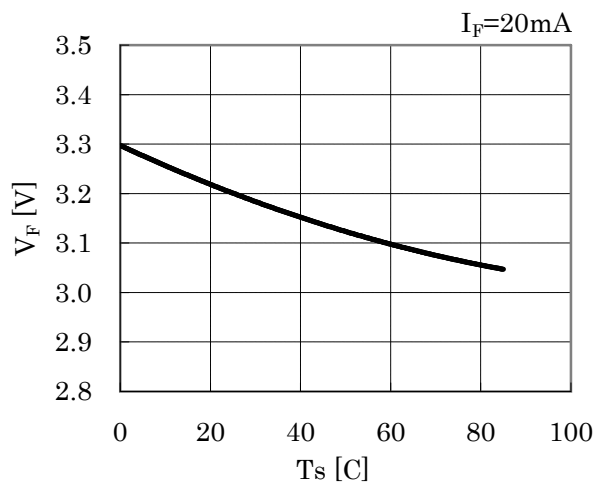
• Forward Current vs. Chromaticity Coordinate



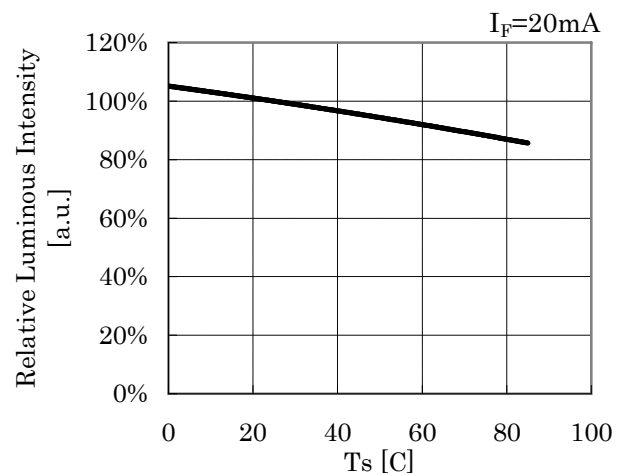
• Solder Temperature vs. Chromaticity Coordinate



• Solder Temperature vs. Forward Voltage



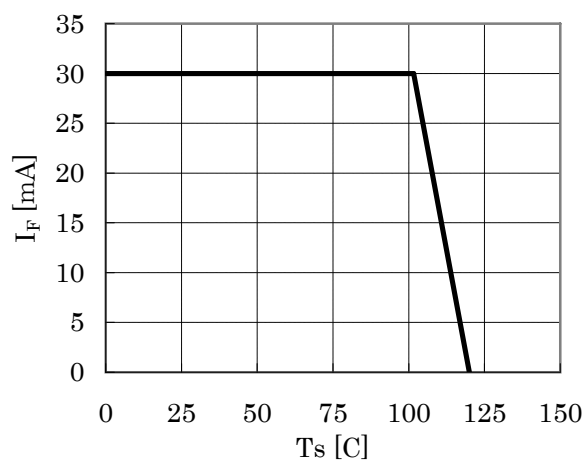
• Solder Temperature vs. Relative Luminous Intensity



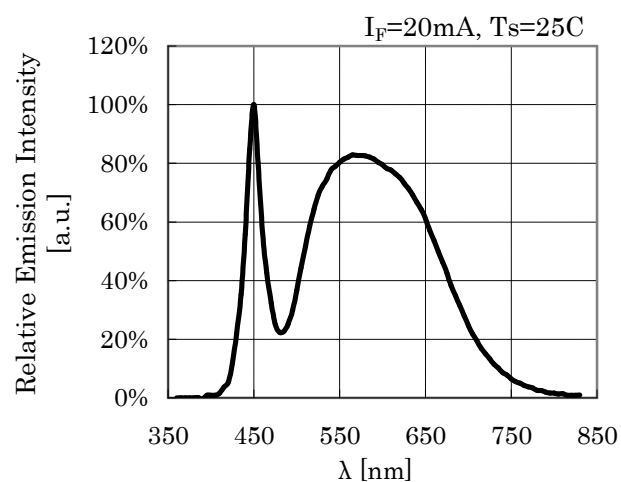
Symbol	CITLED
Name	CL-824-MU1W1
CITIZEN ELECTRONICS CO.,LTD. JAPAN	

DATA SHEET

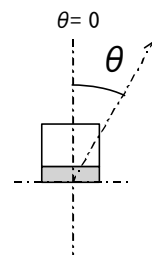
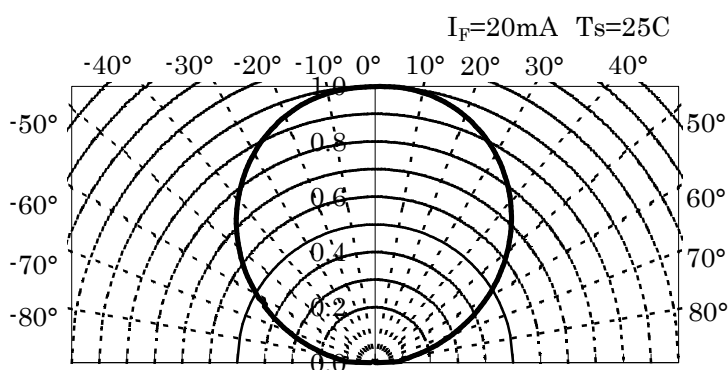
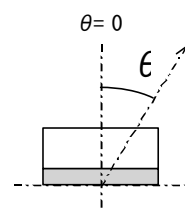
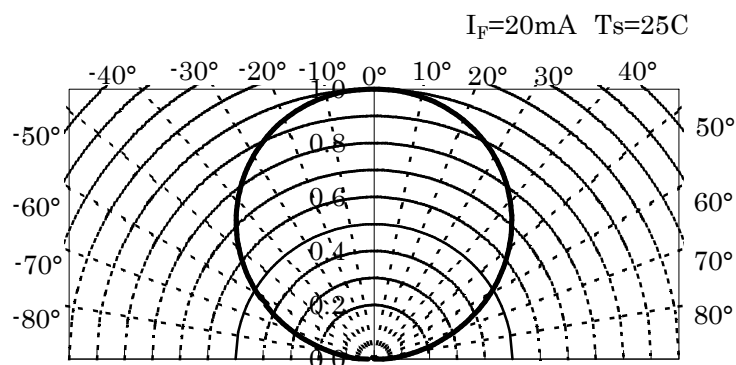
•Solder Temperature vs. Allowable Forward Current



•Spectrum



•Directive Characteristic



*Measurement condition (Directive characteristic)
LED chip is mounted on black color PCB.

Symbol	CITLED
Name	CL-824-MU1W1
CITIZEN ELECTRONICS CO.,LTD. JAPAN	

DATA SHEET

1. Scope of Application

These specifications are applied to the chip type LED lamp , model CL-824-MU1WW1-T.

2. Part code

C L - 8 2 4 - M U 1 W W 1 - T

Series

824 : White LED for general lighting.

Special specifications

M : General Color Rendering Index Typ. 85 Type.

Watt class

U1 : Under 1 watt package.

Lighting color

WW1 : Energy Star Correlated Color Temperature 3500(K)

Shipping mode

Non-coded : Bulk

T : Taping (standard)

Symbol	CITLED
Name	CL-824-MU1WW1
CITIZEN ELECTRONICS CO.,LTD. JAPAN	

DATA SHEET

(2) Electro-optical Characteristics

Ts=25C

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage	V _F	I _F =20mA	2.8	3.2	3.5	V
Reverse Current	I _R	V _R =5V	-	-	100	μA
Thermal Resistance	R _{j-s} ^{*2}	Junction-solder	-	175	-	C/W
Luminous Intensity ^{*1}	I _v	I _F =20mA	1140	1670	-	mcd
Luminous Flux	φ _V	I _F =20mA	-	(4.7)	-	lm
General Color Rendering Index	R _a	I _F =20mA	80	85	-	-

*1 In accordance with NIST standard

*2 Thermal Resistance : Junction - Solder terminal (Anode)

Ranking (Condition : I_F=20mA , Ts=25C)

Parameter	Symbol	Rank	Min.	Max.	Unit
Forward Voltage	V _F	Q	2.8	3.0	V
		R	3.0	3.2	
		S	3.2	3.5	
Luminous Intensity	I _v	B	1140	1300	mcd
		C	1300	1759	
		D	1759	2380	

Chromaticity coordinates (Condition : I_F=20mA , Ts=25C)

Color Rank	x	y	Color Rank	x	y
WW1a	0.415	0.409	WW1b	0.430	0.417
	0.400	0.402		0.415	0.409
	0.394	0.385		0.408	0.392
	0.408	0.392		0.422	0.399

Color Rank	x	y	Color Rank	x	y
WW1c	0.408	0.392	WW1d	0.422	0.399
	0.394	0.385		0.408	0.392
	0.389	0.369		0.402	0.375
	0.402	0.375		0.415	0.381

*1 The tolerance of measurement at our tester is VF±3% , φv±10% , Chromaticity(x,y)±0.01.

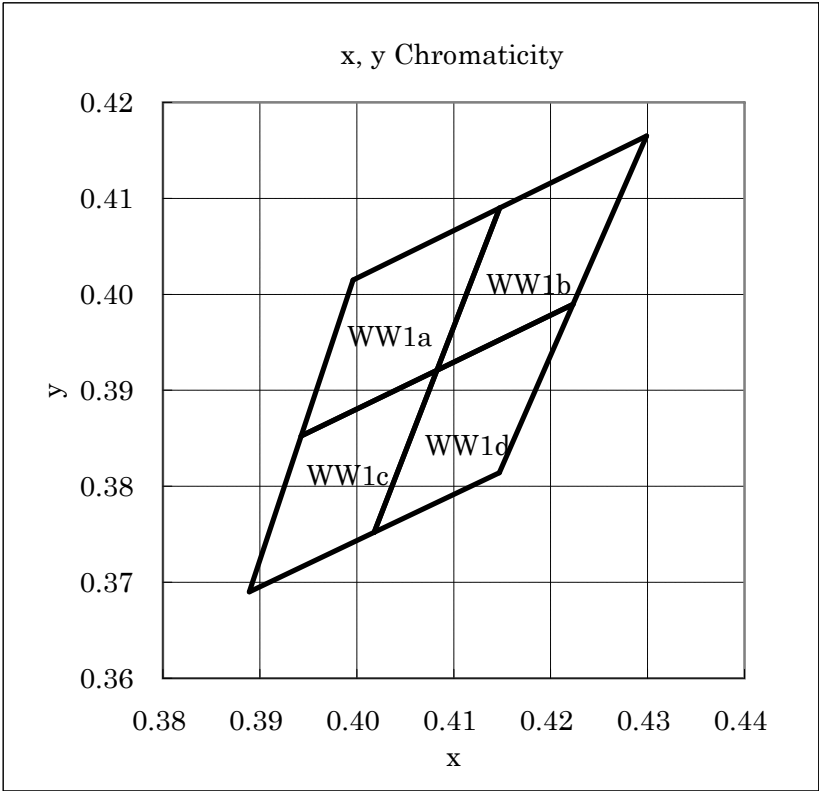
*2 For handling ,please apply CMOS LSI or equivalent any electrostatic effect.

Measurement Conditions

- 1) Chip is mounted on board(size 100mm×40mm)
- 2) Board material is FR-4, covered with green color resist and thickness of copper is 18μm.

Symbol	CITLED
Name	CL-824-MU1WW1
CITIZEN ELECTRONICS CO.,LTD. JAPAN	

DATA SHEET



Rank information

CUSTOMER:
TYPE: CL-824-MU1WW1
P.NO:
Lot No: XXXXXX
Q'ty: XXX

 **PASS**



CITIZEN ELECTRONICS

e.g. B WW1a Q
↓
B WW1a Q
  

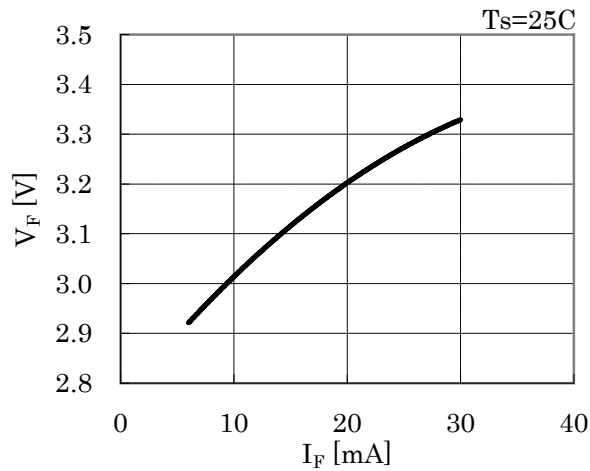
-  : Ranking by Luminous Intensity
-  : Ranking by Chromaticity coordinates
-  : Ranking by Forward Voltage

Symbol	CITILED
Name	CL-824-MU1WW1
CITIZEN ELECTRONICS CO.,LTD. JAPAN	

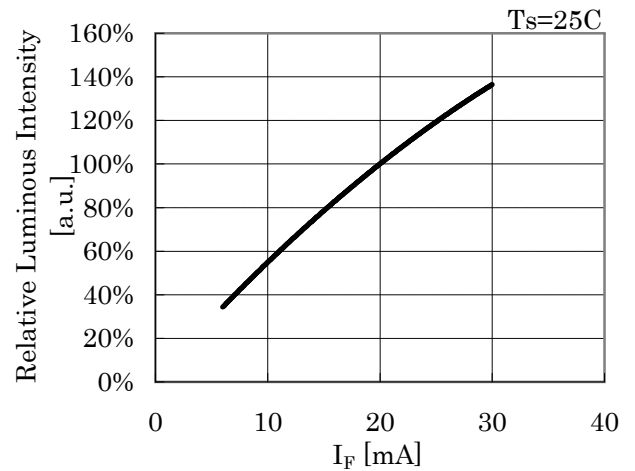
DATA SHEET

5. Characteristics

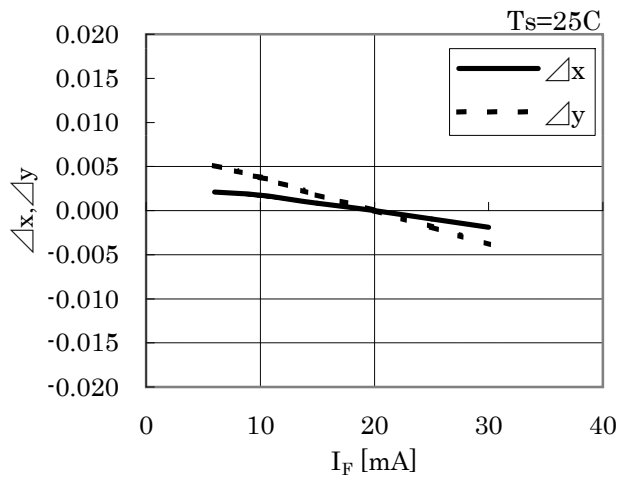
• Forward Current vs. Forward Voltage



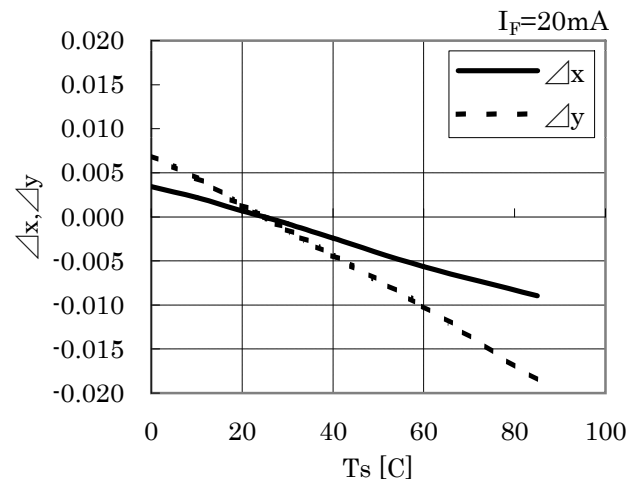
• Forward Current vs. Relative Luminous Intensity



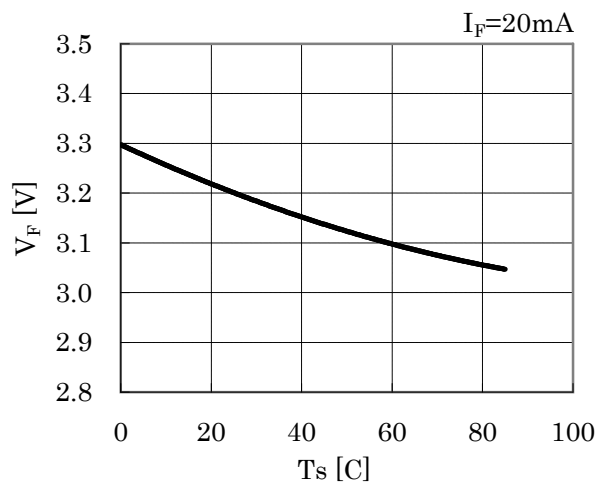
• Forward Current vs. Chromaticity Coordinate



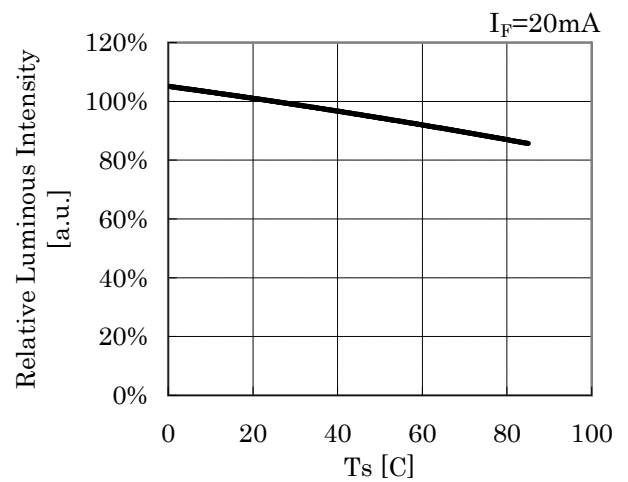
• Solder Temperature vs. Chromaticity Coordinate



• Solder Temperature vs. Forward Voltage



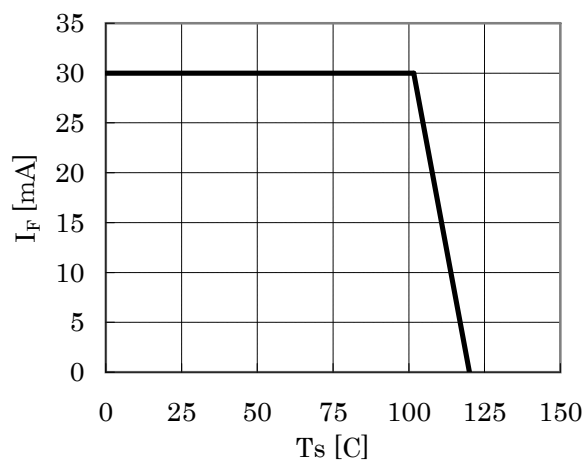
• Solder Temperature vs. Relative Luminous Intensity



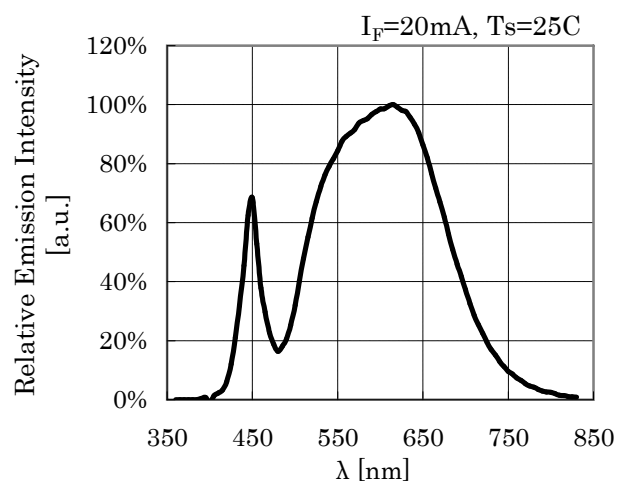
Symbol	CITLED
Name	CL-824-MU1WW1
CITIZEN ELECTRONICS CO.,LTD. JAPAN	

DATA SHEET

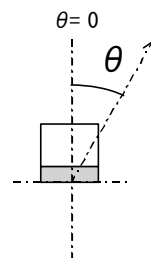
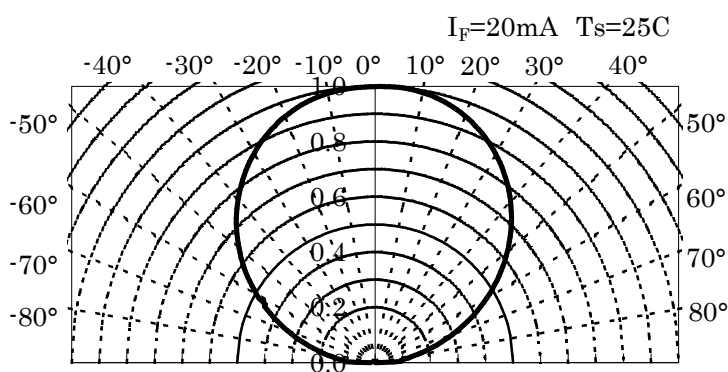
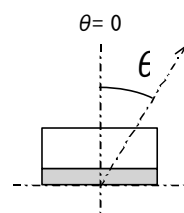
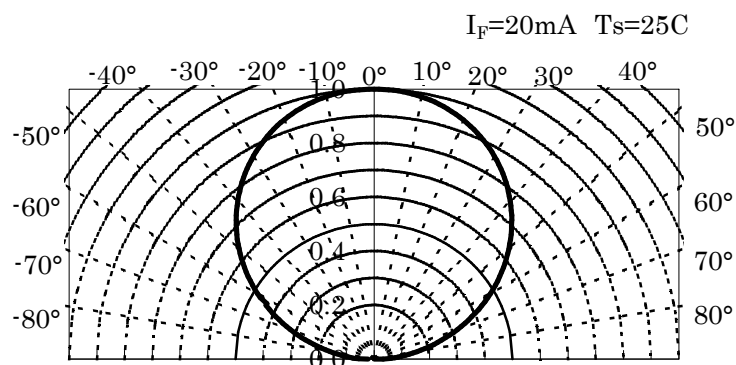
•Solder Temperature vs. Allowable Forward Current



•Spectrum



•Directive Characteristic



*Measurement condition (Directive characteristic)
LED chip is mounted on black color PCB.

Symbol	CITLED
Name	CL-824-MU1WW1
CITIZEN ELECTRONICS CO.,LTD. JAPAN	

DATA SHEET

1. Scope of Application

These specifications are applied to the chip type LED lamp , model CL-824-U1D-T.

2. Part code

C L - 8 2 4 - U 1 D - T

Series

824 : White LED for general lighting.

Watt class

U1 : Under 1 watt package.

Lighting color

D : Correlated Color Temperature 6300(K)

Shipping mode

Non-coded : Bulk

T : Taping (standard)

Symbol	CITILED
Name	CL-824-U1D
CITIZEN ELECTRONICS CO.,LTD. JAPAN	

DATA SHEET

(2) Electro-optical Characteristics

Ts=25C

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage	V _F	I _F =20mA	2.8	3.2	3.5	V
Reverse Current	I _R	V _R =5V	-	-	100	μA
Thermal Resistance	R _{j-s} ^{*2}	Junction-solder	-	175	-	C/W
Luminous Intensity ^{*1}	I _v	I _F =20mA	1420	2050	-	med
Luminous Flux	φ _V	I _F =20mA	-	(5.7)	-	lm
General Color Rendering Index	R _a	I _F =20mA	-	70	-	-

*1 In accordance with NIST standard

*2 Thermal Resistance : Junction - Solder terminal (Anode)

Ranking (Condition : I_F=20mA , Ts=25C)

Parameter	Symbol	Rank	Min.	Max.	Unit
Forward Voltage	V _F	Q	2.8	3.0	V
		R	3.0	3.2	
		S	3.2	3.5	
Luminous Intensity	I _v	B	1420	1611	med
		C	1611	2179	
		D	2179	2947	

Chromaticity coordinates (Condition : I_F=20mA , Ts=25C)

Color Rank	x	y	Color Rank	x	y
Dc	0.317	0.327	De	0.319	0.311
	0.317	0.331		0.317	0.327
	0.331	0.353		0.331	0.340
	0.331	0.340		0.331	0.322

Color Rank	x	y
Dd	0.310	0.302
	0.307	0.316
	0.317	0.331
	0.319	0.311

*1 The tolerance of measurement at our tester is VF±3% , φv±10% , Chromaticity(x,y)±0.01.

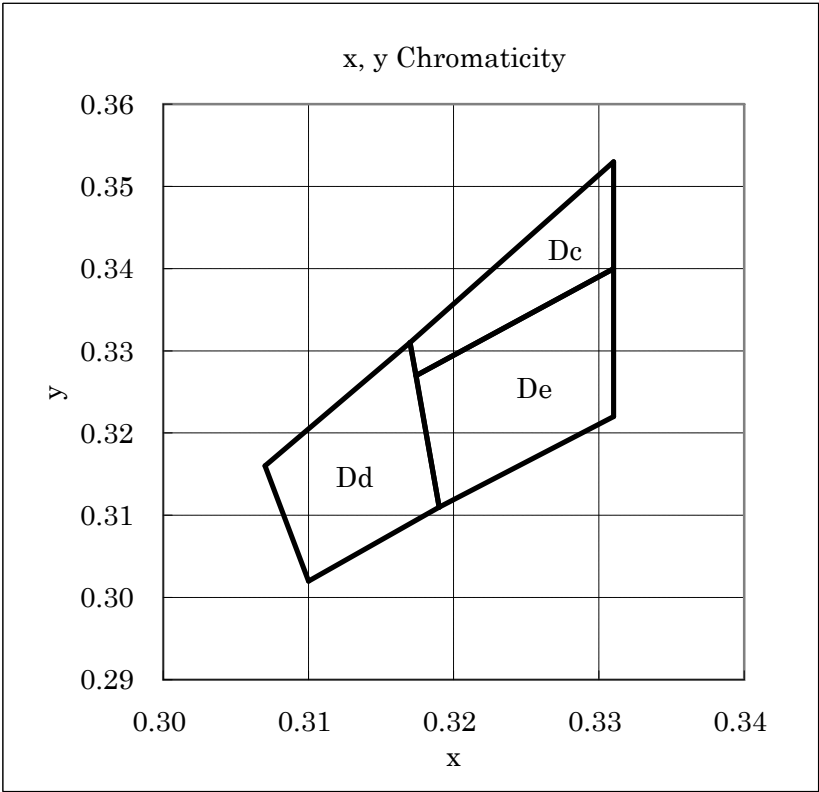
*2 For handling ,please apply CMOS LSI or equivalent any electrostatic effect.

Measurement Conditions

- 1) Chip is mounted on board(size 100mm×40mm)
- 2) Board material is FR-4, covered with green color resist and thickness of copper is 18μm.

Symbol	CITLED
Name	CL-824-U1D
CITIZEN ELECTRONICS CO.,LTD. JAPAN	

DATA SHEET



Rank information

CUSTOMER:
TYPE: CL-824-U1D
P.NO:
Lot No: XXXXXX
Q'ty: XXX

PASS

CITIZEN ELECTRONICS

e.g. B Dc Q

↓

B Dc Q

△△

■

△△

■

: Ranking by Luminous Intensity

: Ranking by Chromaticity coordinates

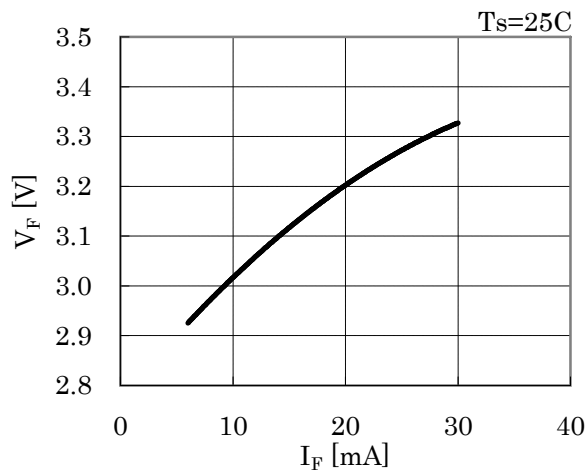
: Ranking by Forward Voltage

Symbol	CITILED
Name	CL-824-U1D
CITIZEN ELECTRONICS CO.,LTD. JAPAN	

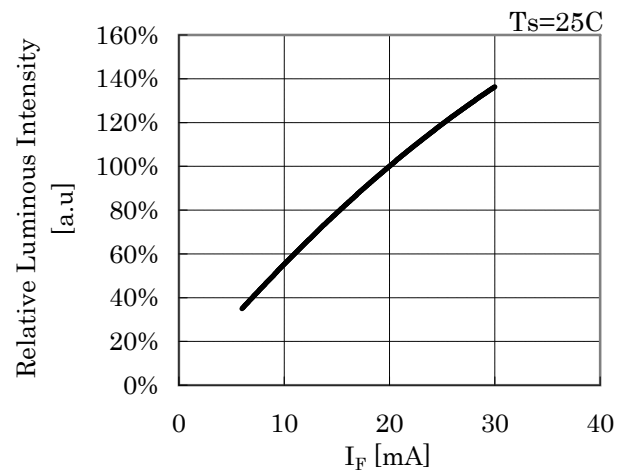
DATA SHEET

5. Characteristics

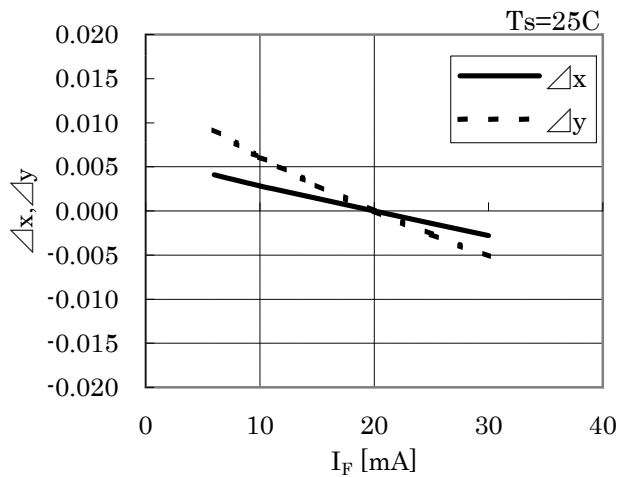
• Forward Current vs. Forward Voltage



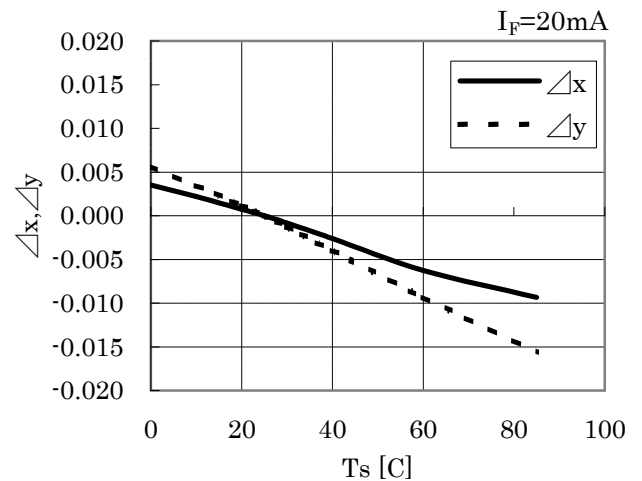
• Forward Current vs. Relative Luminous Intensity



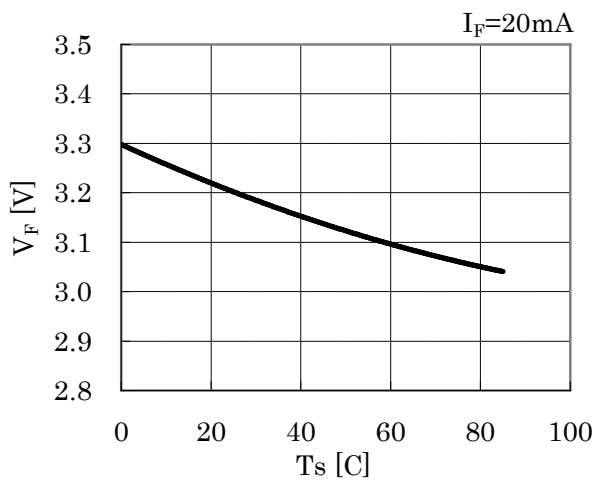
• Forward Current vs. Chromaticity Coordinate



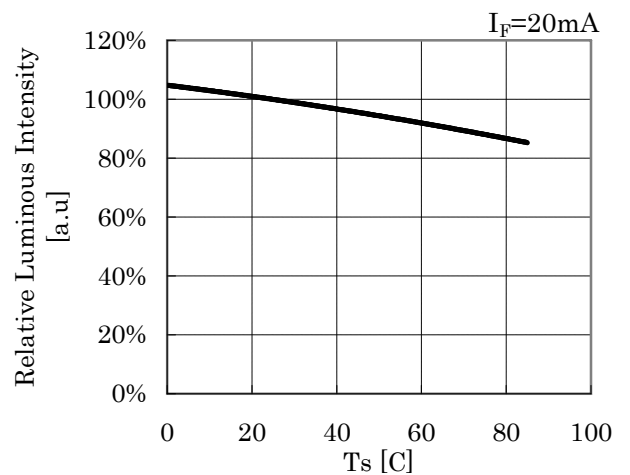
• Solder Temperature vs. Chromaticity Coordinate



• Solder Temperature vs. Forward Voltage



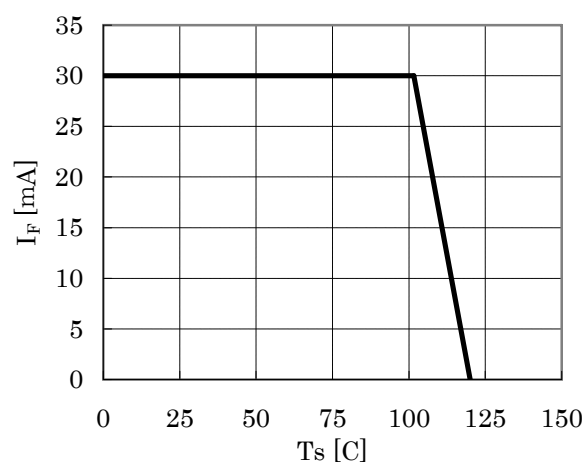
• Solder Temperature vs. Relative Luminous Intensity



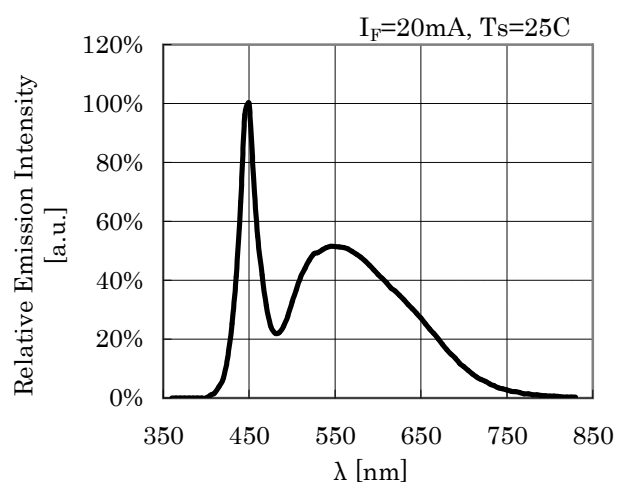
Symbol	CITLED
Name	CL-824-U1D
CITIZEN ELECTRONICS CO.,LTD. JAPAN	

DATA SHEET

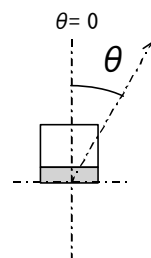
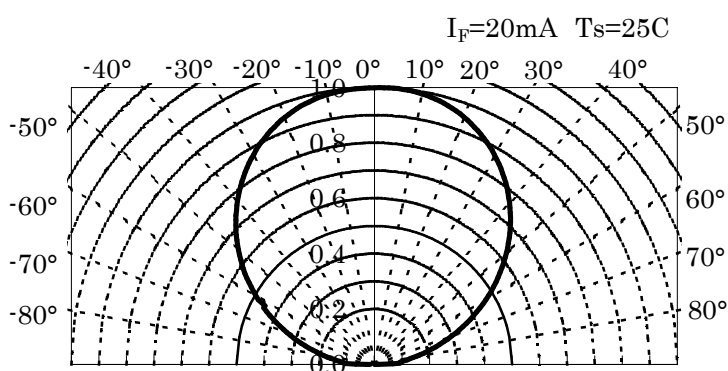
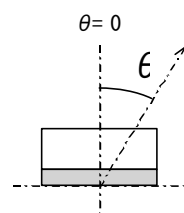
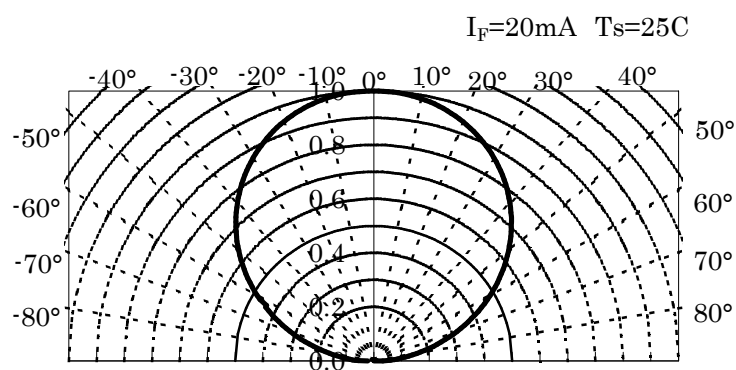
•Solder Temperature vs. Allowable Forward Current



•Spectrum



•Directive Characteristic



*Measurement condition (Directive characteristic)
LED chip is mounted on black color PCB.

Symbol	CITLED
Name	CL-824-U1D
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DATA SHEET

1. Scope of Application

These specifications are applied to the chip type LED lamp , model CL-824-U1N-T.

2. Part code

C L - 8 2 4 - U 1 N - T

Series

824 : White LED for general lighting.

Watt class

U1 : Under 1 watt package.

Lighting color

N : Correlated Color Temperature 5000(K)

Shipping mode

Non-coded : Bulk

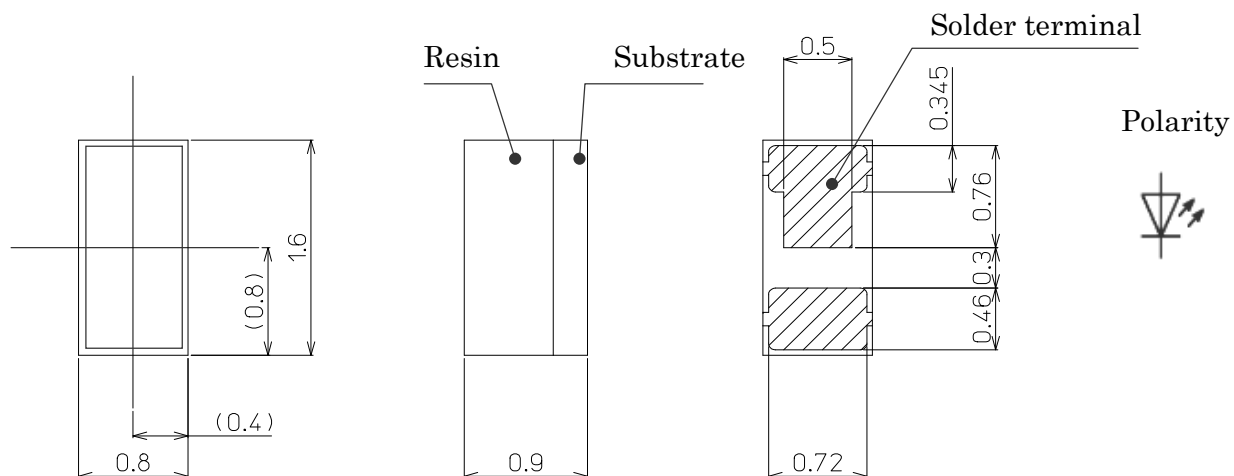
T : Taping (standard)

Symbol	CITLED
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3. Outline drawing

Unit : mm
Tolerance : ± 0.1



4. Performance

(1) Absolute Maximum Rating

Parameter	Symbol	Rating Value	Unit
Power Dissipation	P_D	105	mW
Forward Current	I_F	30	mA
Forward Pulse Current	I_{FP}	100	mA
Reverse Voltage	V_R	5	V
Operating Temperature	T_{OP}	-30 ~ +85	C
Storage Temperature	T_{ST}	-40 ~ +100	C
Junction Temperature	$T_{j \text{ Max}}$	120	C

*1 Forward Current : Duty $\leq 1/10$, Pulse Width ≤ 10 msec

*2 D.C. Current : $T_j = T_c + R_{j-c} \times P_D$

Pulse Current : $T_j = T_c + R_{j-c} \times P_w$ (Power Dissipation / One-Pulse) $\times$ Duty

*Ts : Solder terminal(Anode)temperature

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(2) Electro-optical Characteristics

Ts=25C

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage	V _F	I _F =20mA	2.8	3.2	3.5	V
Reverse Current	I _R	V _R =5V	-	-	100	μA
Thermal Resistance	R _{j-s} ^{*2}	Junction-solder	-	175	-	C/W
Luminous Intensity ^{*1}	I _v	I _F =20mA	1480	2130	-	mcd
Luminous Flux	φ _v	I _F =20mA	-	(5.9)	-	lm
General Color Rendering Index	R _a	I _F =20mA	65	70	-	-

*1 In accordance with NIST standard

*2 Thermal Resistance : Junction - Solder terminal (Anode)

Ranking (Condition : I_F=20mA , Ts=25C)

Parameter	Symbol	Rank	Min.	Max.	Unit
Forward Voltage	V _F	Q	2.8	3.0	V
		R	3.0	3.2	
		S	3.2	3.5	
Luminous Intensity	I _v	B	1480	1681	mcd
		C	1681	2275	
		D	2275	3079	

Chromaticity coordinates (Condition : I_F=20mA , Ts=25C)

Color Rank	x	y	Color Rank	x	y
NR1	0.331	0.358	NR2	0.347	0.373
	0.331	0.373		0.348	0.387
	0.348	0.387		0.367	0.402
	0.347	0.373		0.364	0.388

Color Rank	x	y	Color Rank	x	y
NR3	0.331	0.338	NR4	0.345	0.351
	0.331	0.358		0.347	0.373
	0.347	0.373		0.364	0.388
	0.345	0.351		0.360	0.363

Color Rank	x	y	Color Rank	x	y
NR5	0.331	0.322	NR6	0.343	0.331
	0.331	0.338		0.345	0.351
	0.345	0.351		0.360	0.363
	0.343	0.331		0.357	0.341

*1 The tolerance of measurement at our tester is VF±3% , φv±10% , Chromaticity(x,y)±0.01.

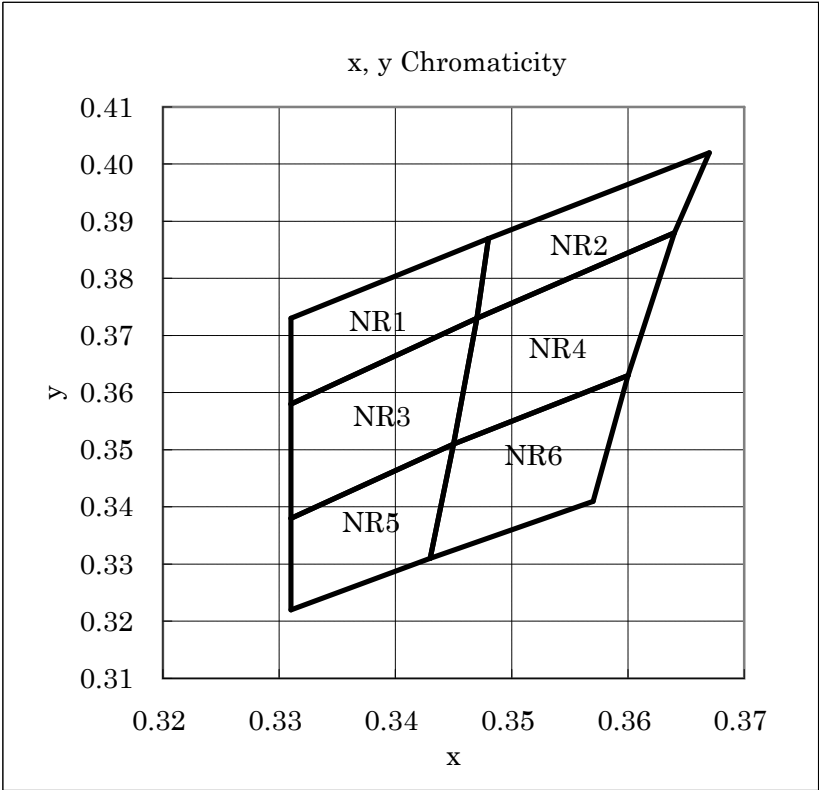
*2 For handling ,please apply CMOS LSI or equivalent any electrostatic effect.

Measurement Conditions

- 1) Chip is mounted on board(size 100mm×40mm)
- 2) Board material is FR-4, covered with green color resist and thickness of copper is 18μm.

Symbol	CITLED
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Rank information

CUSTOMER:
TYPE: CL-824-U1N
P.NO:
Lot No: XXXXXX
Q'ty: XXX


PASS



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e.g. B NR1 Q

B N1 Q
  

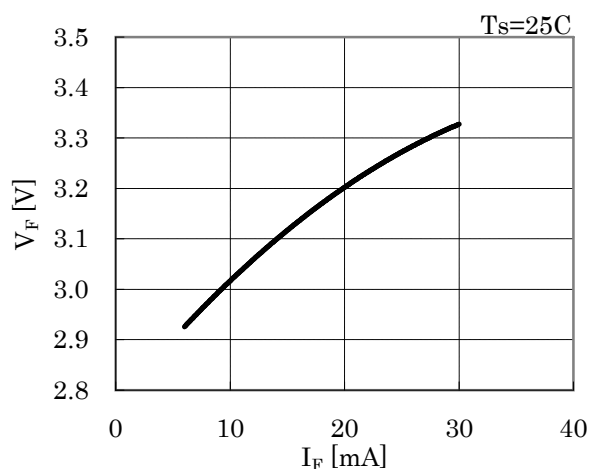
-  : Ranking by Luminous Intensity
  : Ranking by Chromaticity coordinates
 : Ranking by Forward Voltage

Symbol	CITLED
Name	CL-824-U1N
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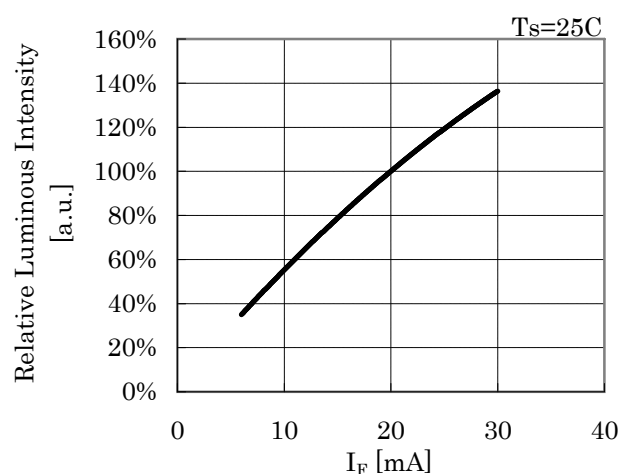
DATA SHEET

5. Characteristics

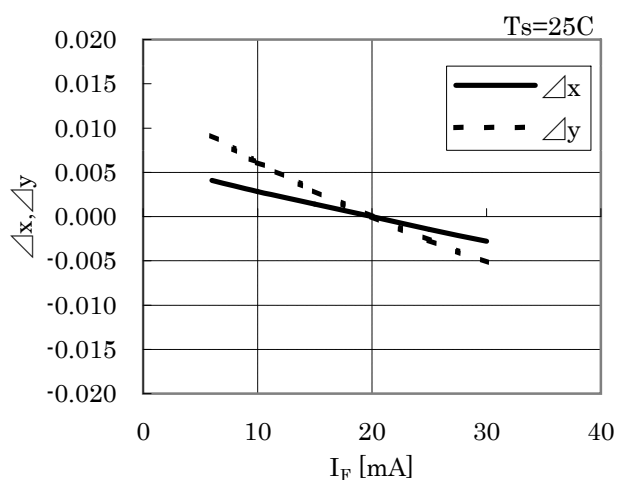
• Forward Current vs. Forward Voltage



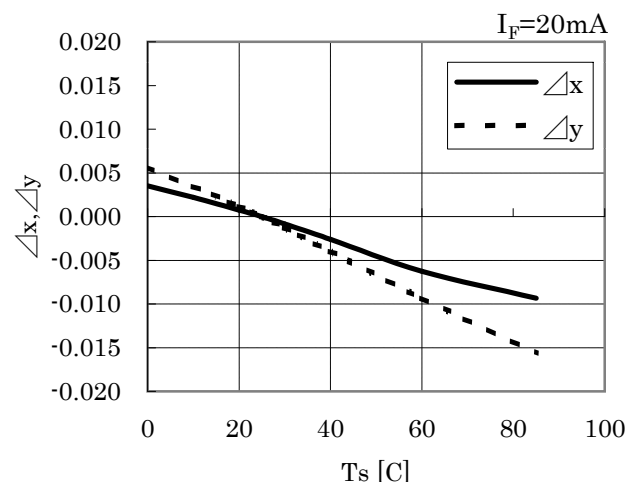
• Forward Current vs. Relative Luminous Intensity



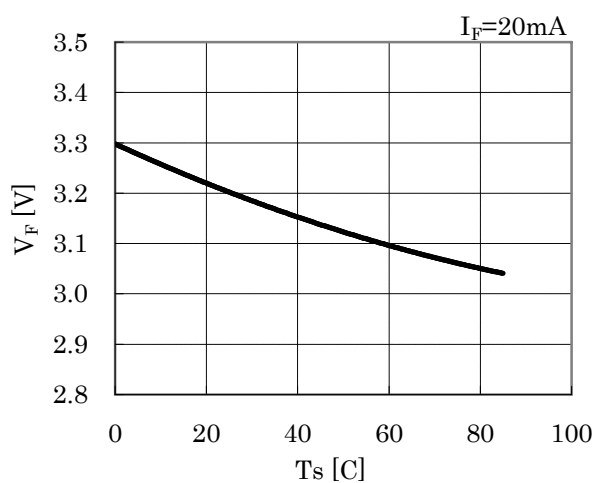
• Forward Current vs. Chromaticity Coordinate



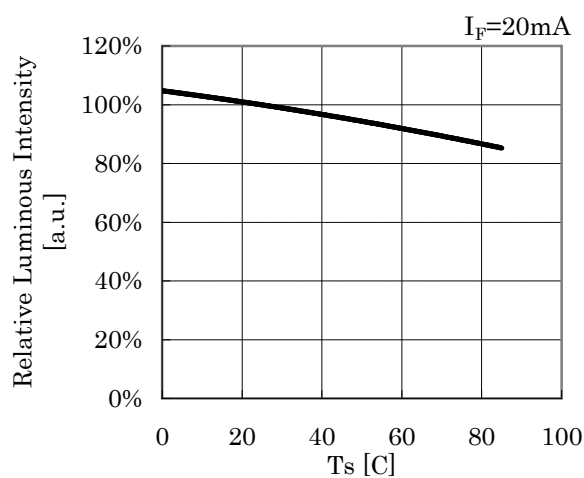
• Solder Temperature vs. Chromaticity Coordinate



• Solder Temperature vs. Forward Voltage



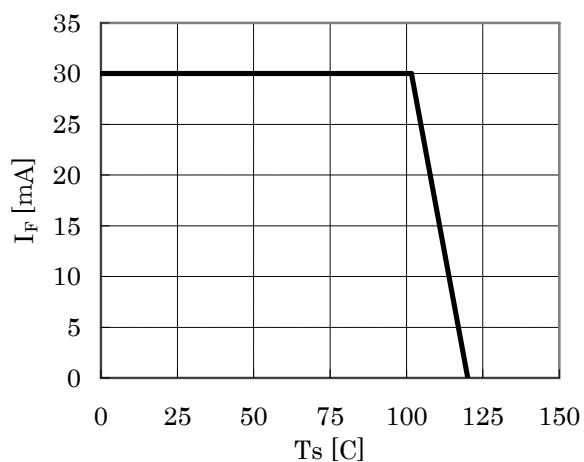
• Solder Temperature vs. Relative Luminous Intensity



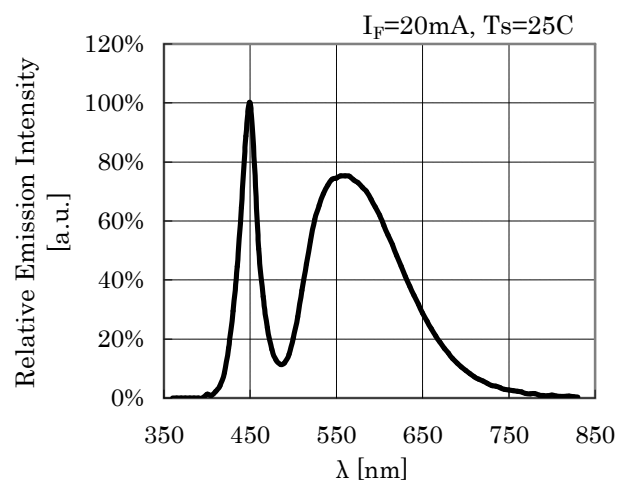
Symbol	CITLED
Name	CL-824-U1N
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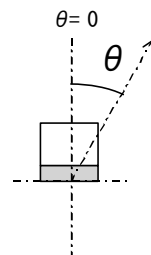
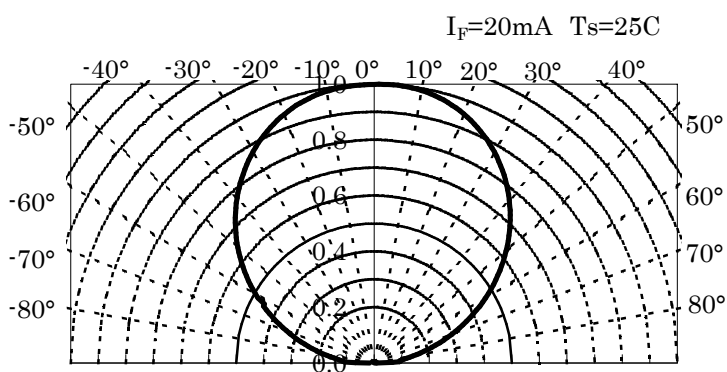
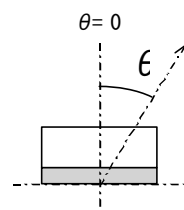
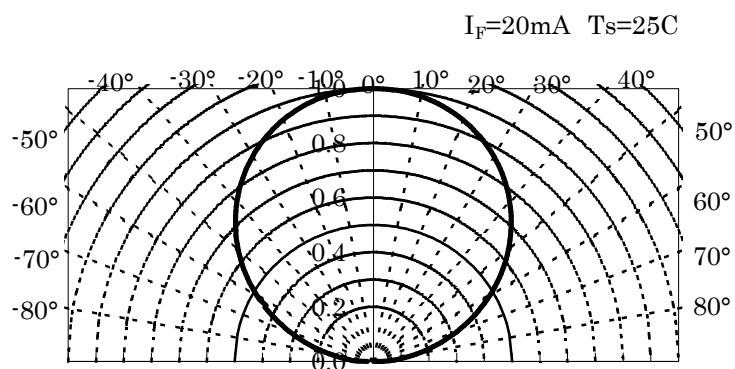
•Solder Temperature vs. Allowable Forward Current



•Spectrum



•Directive Characteristic



*Measurement condition (Directive characteristic)
LED chip is mounted on black color PCB.

Symbol	CITLED
Name	CL-824-U1N
CITIZEN ELECTRONICS CO.,LTD. JAPAN	

DATA SHEET

6. Reliability

(1) Details of the tests

Test Item	Test Condition
Continuous Operation Test	Ta=-30C, I _F =20mA , 1000 hours(with Al-fin)
	Ta=25C, I _F =20mA , 1000 hours(with Al-fin)
	Ta=85C, I _F =20mA , 1000 hours(with Al-fin)
Low Temperature Storage Test	Ta=-40C , 1000 hours
High Temperature Storage Test	Ta=100C, 1000 hours
Moisture-proof Test	Ta=60C, 90%RH, 1000 hours
Thermal Shock Test	Ta=-40C 30minutes~100C 30minuets, 100cycle
Solder Heat Resistance Test	Recommended temperature profile (reflow soldering) × 2, (2nd test must be started after the samples are stabilized thermally.)

(2) Judgment Criteria of Failure for Reliability Test

Ta=25C

Measuring Item	Symbol	Measuring Condition	Judgment Criteria for Failure
Forward Voltage	V _F	I _F =20mA	> U×1.2
Reverse Current	I _R	V _R =5V	> U×2
Luminous Intensity	I _V	I _F =20mA	< S×0.7

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

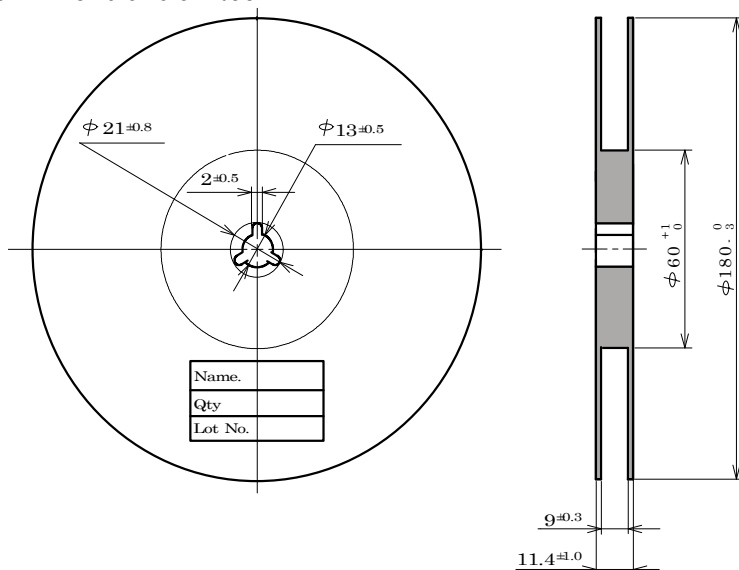
* Measurement shall be taken between 2 hours and 24 hours, and the test pieces should be returned to the normal ambient conditions after the completion of each test.

DATA SHEET

7. Taping Specifications (in accordance with JIS standard)

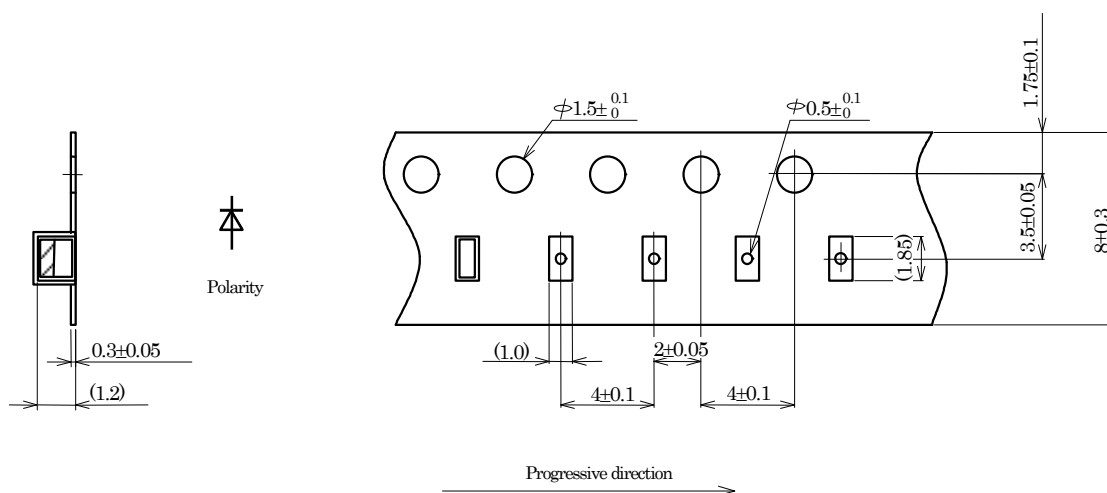
(1) Shape and Dimensions of Reel

(Unit: mm)

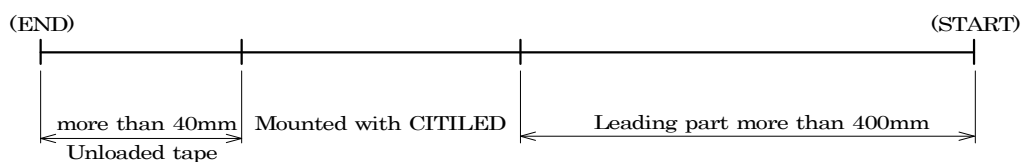


(2) Dimensions of Tape

(Unit: mm)



(3) Configuration of Tape



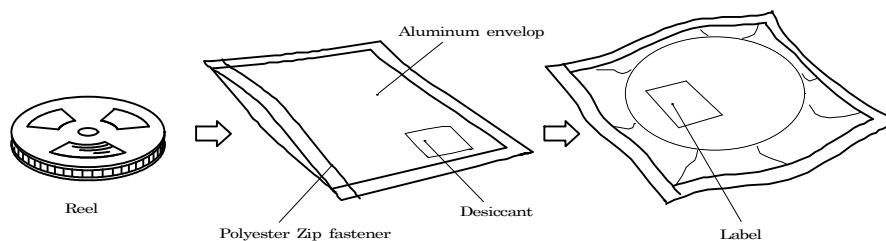
(4) Quantity: 2500pcs/reel

DATA SHEET

8. Packing Specifications

8-1. Moisture-proof Packing

To prevent moisture absorption during transportation and storage, reels are packed in aluminum envelopes which contain a desiccant with a humidity indicator.



8-2. 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 :	5~30C
Humidity :	60%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.
MSL 1 (IPC/JEDEC J-STD-020C)

DATA SHEET

9. Precautions

9-1. Soldering

(1) Lead free soldering

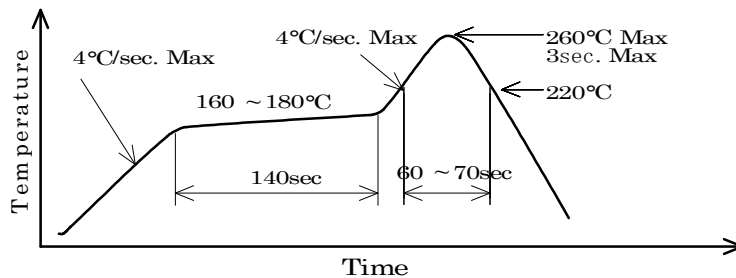
1) Following soldering paste is recommended

Melting temperature : 216 ~ 220°C.

Composition : Sn 3.5Ag 0.75Cu

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



9-2. Washing

(1) 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.

c) Ultrasonic washing: 300W or less

9-3. Other directions

(1) It is requested to avoid any stress added to the resin portion while it is heated.

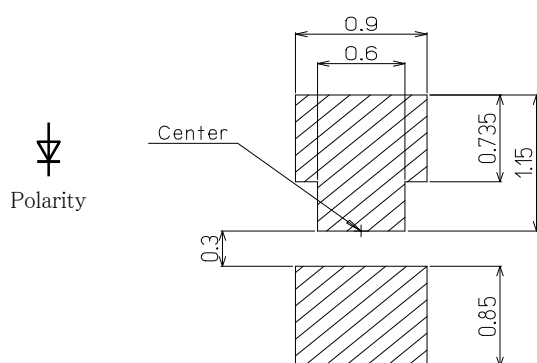
(2) It is requested to avoid any friction by sharp metal nail etc. to the resin portion.

DATA SHEET

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 >

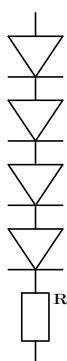


Unit : mm

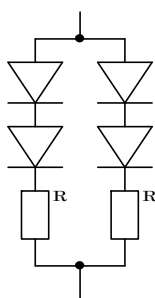
The above dimensions are not the one which guarantee the performance of mount ability.
The use of the above pattern is recommended to use after deep study at your site.

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.

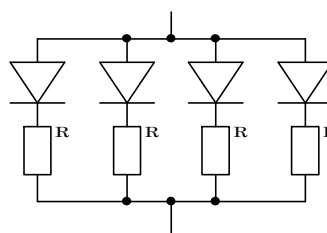
(ex-1)



(ex-2)



(ex-3)



6. Other

This product complies with RoHS directives.

DATA SHEET

11. Precautions with regard to product use

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