

## SPECIFICATION FOR APPROVAL

<b>PACKAGE</b>	<b>3528 PINK</b>
<b>PART No.</b>	<b>HW-3528N2PT-PK1CZ</b>
<b>DATE</b>	2011-05-26

### COMMENT

<b>Prepared</b>				

<b>Approved</b>				

**INNOCEM SEMICONDUCTOR Co., Ltd.**  
**2-101,Gwangju-Technopark Sauphwa Blag.,**  
**958-3,Daechon-dong, Buk-gu, Gwangju, Korea**

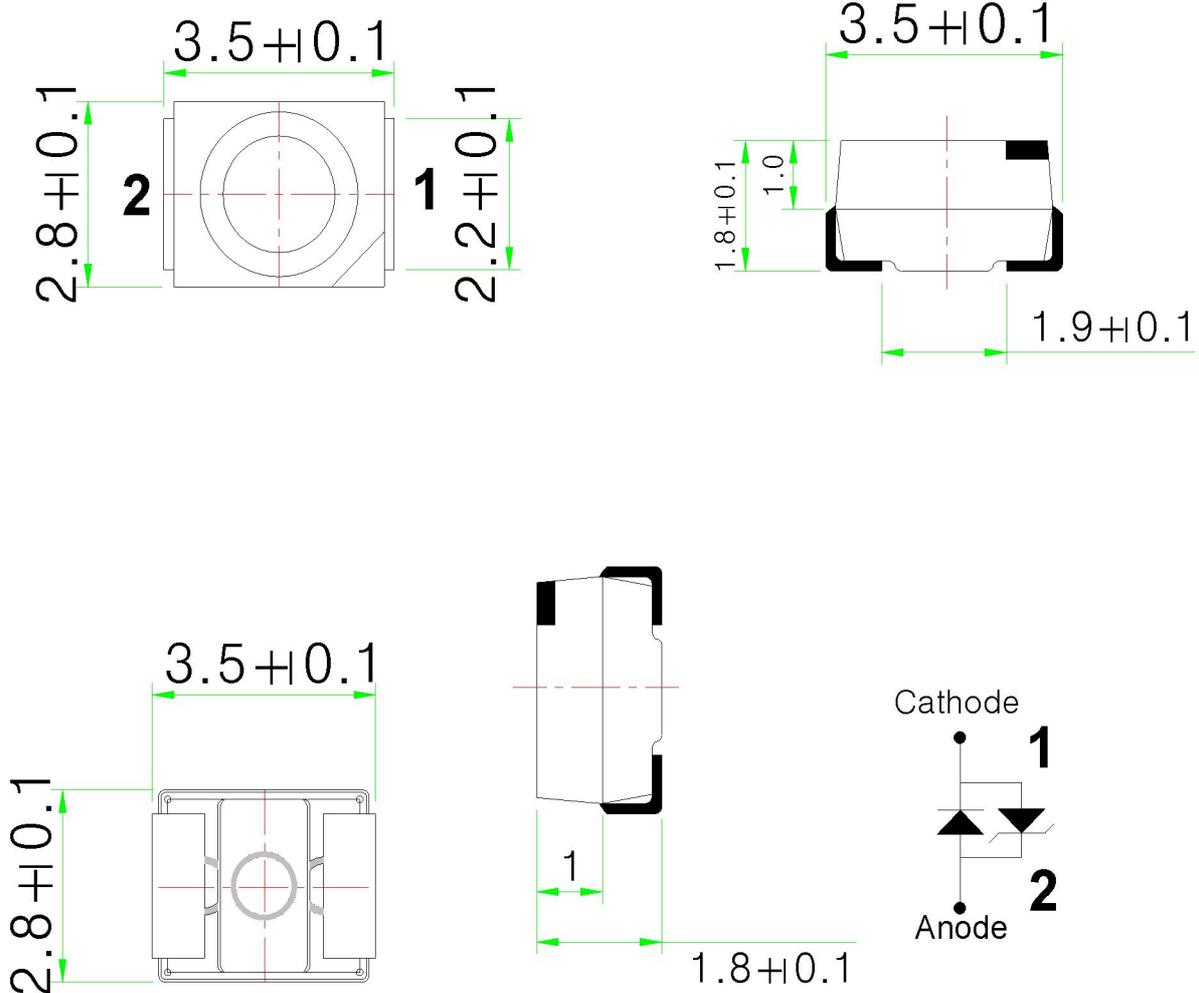
Tel : 82-62-602-7801 Fax : 82-62-602-7804

## 1. Features

- Surface-mount device
- Package : 3.5(L) x 2.8(W) x 1.8(H) mm
- Viewing angle:  $\pm 60^\circ$
- Technology: BLUE : AlInGaP
- Soldering Method: IR reflow soldering
- Taping: 8mm tape with 2,000pcs / reel ,  $\Phi 180$ mm
- Applications
  - Backlighting (LCD, Switches, Displays)
  - Signal and symbol luminary
  - Interior automotive light
  - Front panel indicator lamps

## 2. Package outline

(unit: mm , tolerance:  $\pm 0.1$ mm)



### 3. Maximum Ratings (Ta=25 °C)

PARAMETER	SYMBOL	RATINGS	UNIT
Power Dissipation	$P_D$	75	mW
Forward Current	$I_F$	30	mA
Peak Forward Current <sup>*1</sup> (1/10 Duty Cycle, 0.1ms Pluse Width)	$I_{FP}$	100	mA
Reverse Voltage	$V_R$	Zenner Protect	V
Operating Temperature Range	$T_{opr}$	-30 °C to +85 °C	°C
Storage Temperature Range	$T_{stg}$	-30 °C to +100 °C	°C
Lead Soldering Temperature	$Rth_{JS}$	240 °C for 5Seconds	-

\*1. Duty Ratio=1/10, Pulse Width=0.1ms

### 4. Electrical/Optical Characteristics (Ta=25 °C)

PARAMETER	SYMBOL	ST CONDITI	MIN.	TYP.	MAX.	UNIT
Luminous Intensity <sup>*1</sup>	$I_V$	$I_F=20mA$	500	-	700	mcd
Forward voltage <sup>*2</sup>	$V_F$	$I_F=20mA$	3.0	-	3.6	V
Reverse Current	$I_R$	$V_R=5V$	0.5	-	0.8	$\mu A$
Color Coordinate <sup>*3</sup>	Cx	$I_F=20mA$	0.25	-	0.29	
	Cy		0.08	-	0.17	
Half Angle <sup>*4</sup>	$\Theta_{1/2}$	$I_F=20mA$	-	$\pm 60$	-	deg

\*1. Luminous intensity was measured at the peak of the spatial pattern which may not be aligned with the mechanical axis of the LED package. Luminous intensity Measurement allowance is  $\pm 10\%$ .

\*2. Voltages are tested at a current pulse duration of 1ms and accuracy of  $\pm 0.05V$ .

\*3. Dominant wavelength is tested at a current pulse duration of 20ms and accuracy of  $\pm 2nm$ .

\*4.  $2\Theta_{1/2}$  is the off-axis angle where the luminous intensity is 1/2 the peak intensity.

5. Part Number Formation

Part Number : INC - ① ㉠㉡㉢ - ② ㉣㉤㉥

① Package External Information

㉣ Package Size

Description	Package Dimension (W x L x T)	Conventional Name
1608	1.6 x 0.8	Chip LED
1615	1.6 x 1.5	Full Color Chip LED
3020	3.0 x 2.0	Top LED
3528	3.5 x 2.8	Top LED
5450	5.4 x 5.0	Top LED

㉤ Package Thickness

Package	Description	Thickness	etc	Package	Description	Thickness	etc
1608/1615	4	0.4mm	Chip LED	3528	N	1.9mm	Normal Type
	5	0.55mm			B		Top Black Coating
	6	0.6mm			D		Black Body
	8	0.8mm			M		Medium Power
3020	L	1.3mm	Top View		E	1.6mm	6Pin Lead
5450	N	1.6mm	Normal Type	9090	P	3.0mm	Power Type
	B	1.8mm	Top Black Coating				
	M	1.2mm	Medium Power				

㉥ External Pin Quantity

Quantity	Description
2 Lead	2P
4 Lead	4P
6 Lead	6P

㉦ Buffer layer color

Description	Information
T	Transparent Type
D	Diffused Type

② Package Internal Information

㉣ Emission Color

- ㉠ White color
- ㉡ Mono-Color
- ㉢ Multi-Color

㉤ Chip Quantity

Description	Information	Description	Information
1	1 Chip	4	4 Chip
2	2 Chip	5	5 Chip
3	3 Chip	6	6 Chip

㉥ Polarity Mark

Description	Information
A	Common Anode
B	Anode & Cathode for each dice
C	Common Cathode

㉦ Zener Diode

Description	Information
Z	Include in Zener Diode
X	Non Zener Diode(Nomal)
E	Ion Zener Diode(ESD Chip)

### 6. Typical Electrical/Optical Characteristics Curves

Fig. 1>  $I_F-V_F$

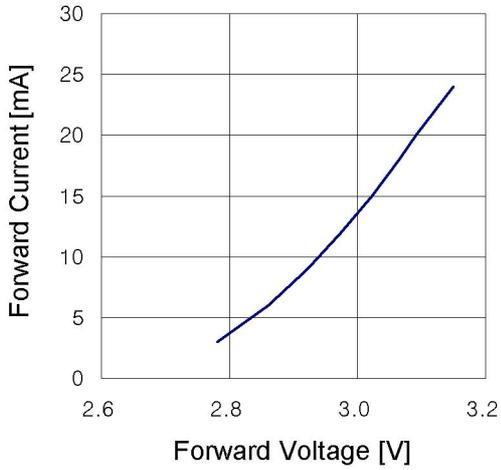


Fig. 2>  $I_F-T_a$

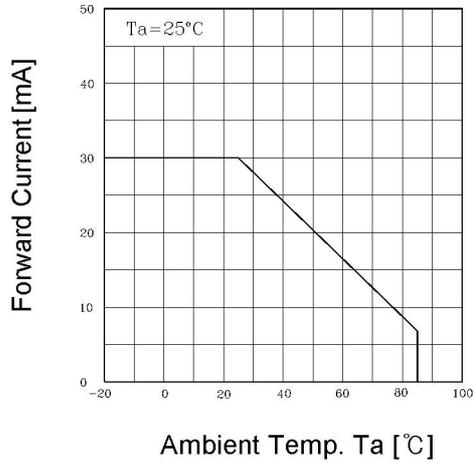


Fig. 3>  $I_v-I_F$

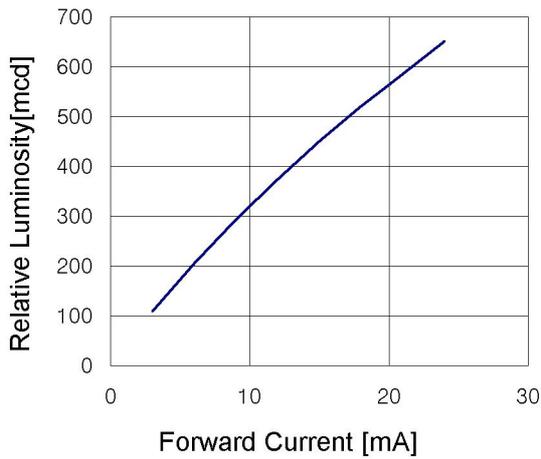


Fig. 4> Spectrum Distribution

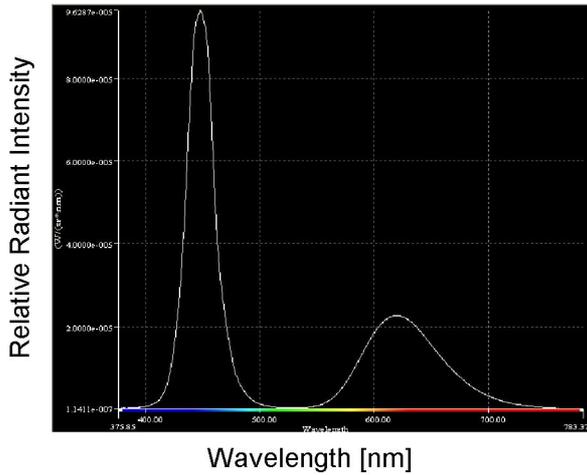
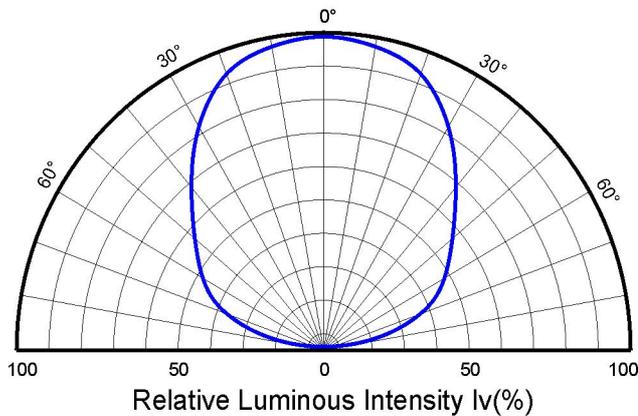
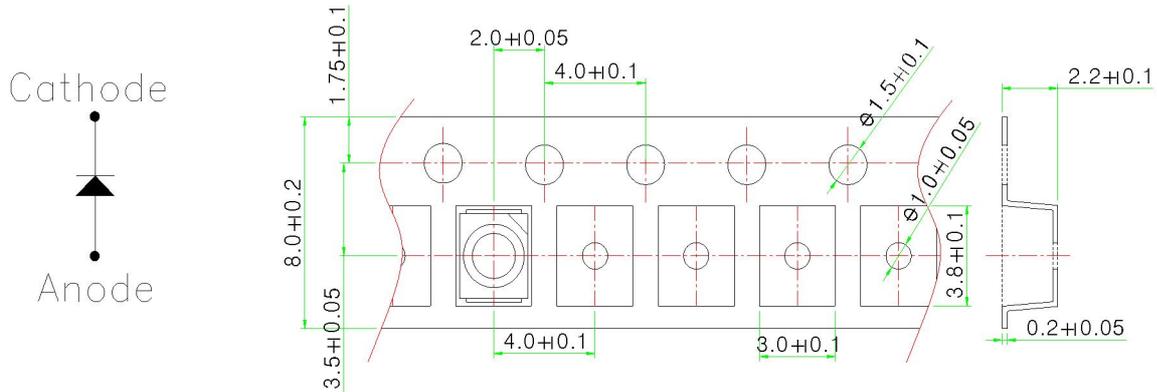


Fig. 5> Radiation Diagram

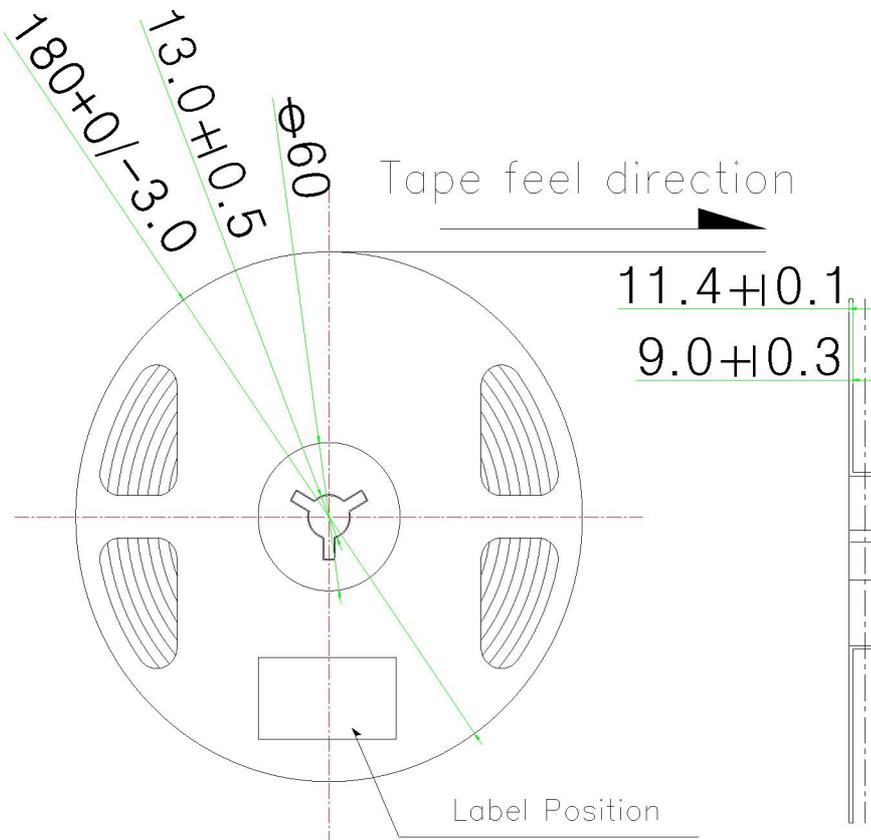


## 7. Packing Specifications

### 7-1. Carrier Tape Dimensions



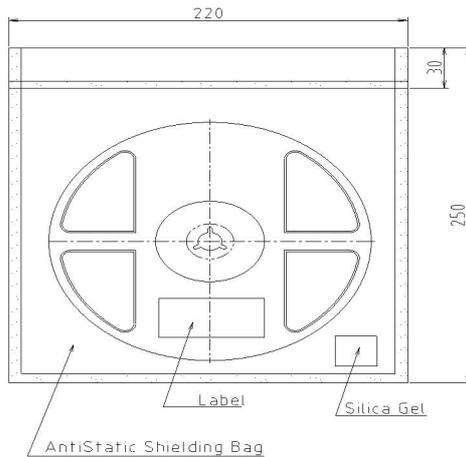
### 7-2. Reel Dimensions



7-3. Packing Method

\* Each reel is sealed in an antistatic shielding bag with silica gel.

LABEL



Packing unit	Size(WxLxD)	Quantity
Antistatic shielding bag (1 Reel)	220x250mm	2,000ea
Inner carton box (10 Reel)	220x220x145mm	20,000ea
Out carton box (40 Reel)	450x300x230mm	80,000ea

CAUTIONS

(1) Moisture Proof Package

The moisture proof package should be used to prevent moisture in the package as the moisture may cause damage to optical characteristics of the LEDs. for this reason, the moisture proof package is used to keep moisture to a minimum in the package. a package of a moisture absorbent material (silica gel) is inserted into the shielding bag.

(2) Storage

Storage conditions

Before opening the package:

The LEDs should be kept at 30°C or less than 90%RH or less. The LEDs should be used within a year. when storing the LEDs, moisture proof packaging with absorbent material is recommended.

After opening the package:

After open the package, the LED should be kept at 30°C, 60%RH or less. The LED should be soldered within 24 hours (1day) after opening the package. If unused LEDs remain, it should be stored in moisture proof condition.

If the moisture absorbent material (silica gel) has faded away or the LEDs have exceeded the storage time baking treatment should be performed using the following conditions.

Baking treatment : more than 48 hours at 60±5°C

Notabilia after using :

the remnants are left after using and the damage of aluminum pack is cause moisture absorption to faulty break out the principle is that it is vacuum packing with aluminum pack after enclosing silica gel when you can't follow this rules , you contact to this company .

## 8. IR Reflow Soldering

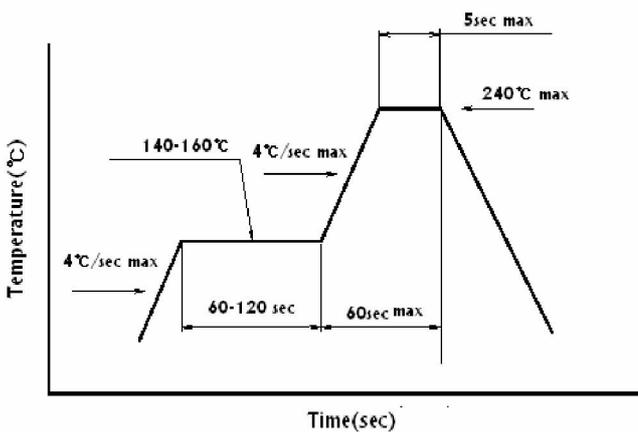
### 8-1. Solder conditions

Reflow Soldering				Hand Soldering			
Lead solder		Lead-free		Lead solder		Lead-free	
Pre-heat	140~160 °C	Pre-heat	180~200 °C	Temperature	300 °C Max.	Temperature	350 °C Max.
Pre-heat time	60~120sec	Pre-heat time	60~120sec	Soldering Time	3 seconds Max.	Soldering Time	3 seconds Max.
Peak temperature	240 °C Max.	Peak temperature	260 °C Max.	(one Time only)			
Soldering time	5 sec Max.	Soldering time	5 sec Max.				

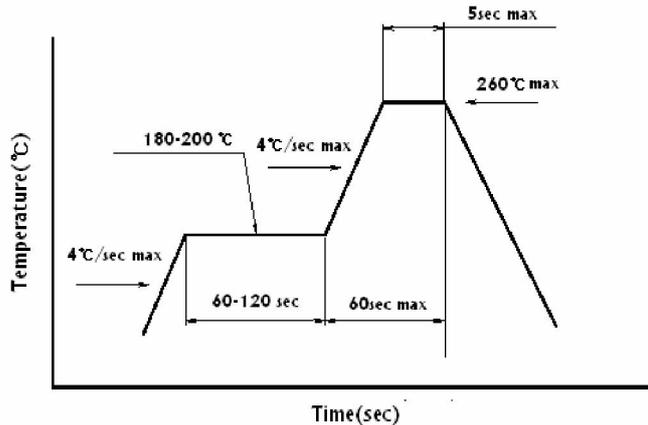
\*After reflow soldering rapid cooling should be avoided.

### 8-2. Temperature profile

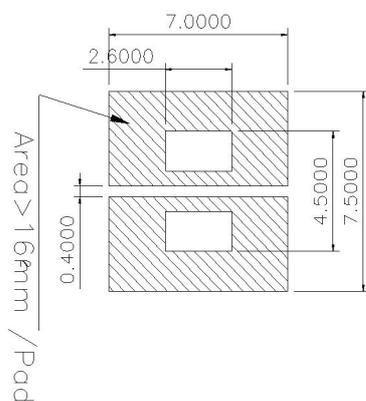
\* Lead Solder



\* Lead-Free Solder



### 8-3. Recommended soldering pattern



### 8-4. Precaution when mounting

Do not apply force to the plastic part of the LED under high-temperature conditions.

To avoid damaging the LED plastic do not apply friction using hard materials.

When installing the PCB in product, ensure that the device does not come into contact with other components.

## 9. Static Electricity

Static electricity or surge voltage damages the LEDs.

It's recommended that a wrist band or anti-electrostatic glove be used when handling the LEDs.

All devices, equipment and machinery should be properly grounded.

It's recommended that measures be taken against surge voltage to the equipment that mounts the LEDs.

When inspecting the final products in which LEDs were assembled, it is recommended to check whether the assembled LEDs be damaged by static electricity or not.

It is easy to find static-damaged LEDs by a light-on test or a VF test at a lower current.

(below 1mA is recommended)

Damaged LEDs will show some unusual characteristics such as the leak current remarkably increases, the forward voltage becomes lower, or the LEDs do not light at the low current.

## 10. Reliability Test

Test Item	Test Conditions	Sample Size(ea)
Solder Heating Test	T=260℃, 5sec	22
Solderability	T=250℃, 5sec	22
Thermal Cycle Test	-30℃~25℃~100℃~25℃ 30min 5min 30min 5min Time=50cycle	22
High Temperature Storage	Ta=100℃ Test time=1,000hr's	22
Low Temperature Storage	Ta=-30℃ Time=1,000hr's	22
Normal Temperature Life Test	Ta=25℃, I <sub>F</sub> =20mA Time=1,000hr's	22
High Temperature Life Test	Ta=85℃, I <sub>F</sub> =10mA Time=1,000hr's	22
High Humidity Heat Life Test	Ta=60℃ / RH=90% I <sub>F</sub> = 30mA , Time=500hr's	22
ESD(Electro-static Discharge)	HBM(Human Body Model) C=100pF , R=1.5KΩ Discharge times: 3times	22

Criteria of failure for the reliability

Test Item	Symbol	Test Condition	Judgment Criteria
Forward Voltage	V <sub>F</sub>	I <sub>F</sub> =20mA	V <sub>F</sub> > 1.1xU.S.L
Reverse Voltage	V <sub>R</sub>	I <sub>R</sub> =10μA	V <sub>F</sub> > 1.1xU.S.L
Luminous Intensity	I <sub>V</sub>	I <sub>F</sub> =20mA	I <sub>V</sub> < 0.5xInitial value
ESD Rating	ESD	HBM	Class 1 or more

\*1. U.S.L: Upper Standard Level

\*2. Reverse current is applied to Red only

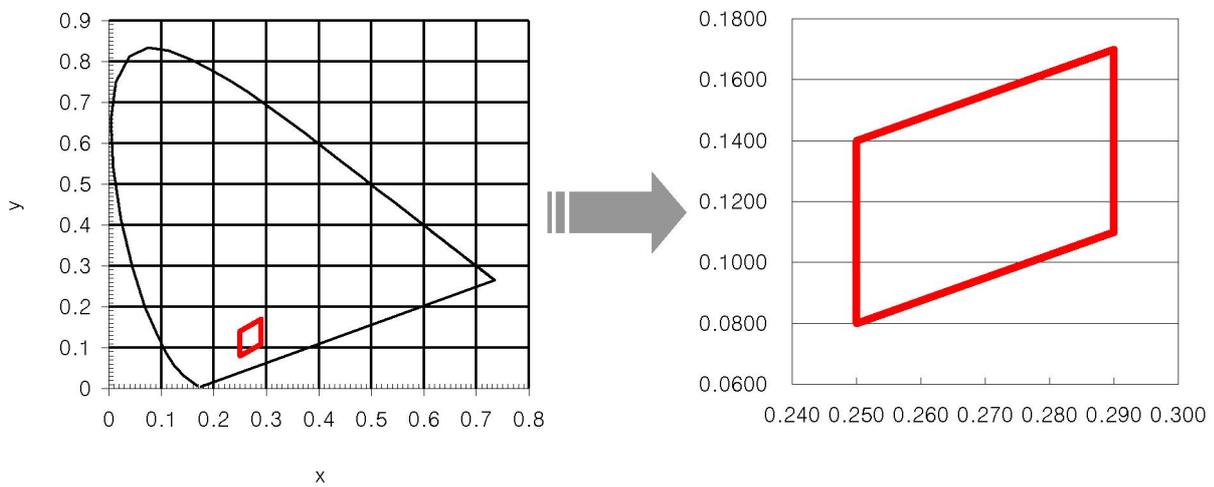
\*3. ESD Rating forward directed by HBM. (Human Body Model)

## 11. Rank Sheet

### 11-1. Chromaticity Coordinates \*1

Rank	1	
	Cx	Cy
Axis 1	0.250	0.0800
Axis 2	0.250	0.1400
Axis 3	0.290	0.1700
Axis 4	0.290	0.1100

\*1: The CIE(1931) standard colormetric System.



### 11-2. Luminous Intensity Rank.( $I_F=20\text{mA}$ ). (unit: mcd, $T_a=25^\circ\text{C}$ )

Rank	Min.	Typ.	Max.
A	500	-	700

### 11-3. Forward Voltage.( $I_F=20\text{mA}$ ). (unit: V, $T_a=25^\circ\text{C}$ )

Rank	Min.	Typ.	Max.
1	3.0	-	3.2
2	3.2	-	3.4
3	3.4	-	3.6

