



# C3535X-INx1 Series High Power Infrared LED

## Introduction

The C3535X-INx1 series LED from TSLC brings industry leading technology to the infrared applications market with its high reliability and performance. With a ceramic substrate and a 140/90/60 degree view angle primary lens, the C3535X-INx1 series LED is a perfect solution for security cameras, surveillance systems, machine vision and general purpose IR applications.



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RoHS Compliant



## Characteristics

### Absolute Maximum Ratings (T<sub>j</sub> = 25°C)

Parameter	Rating
	IR Series
DC Forward Current (mA)	350 mA (C3535X-INx1-E1D11N series) 700 mA (C3535X-INx1-E1E11N series) 700 mA (C3535X-INx1-EAH11N series)
Maximum Forward Current (mA)	600 mA (C3535X-INx1-E1D11N series) 1000 mA (C3535X-INx1-E1E11N series) 1000 mA (C3535X-INx1-EAH11N series)
LED Junction Temperature	115°C
LED Operating Temperature	-40°C~85°C
Storage Temperature	-40°C~115°C
Soldering Temperature	Max. 260°C / Max. 10sec. (JEDEC 020)
ESD Sensitivity	2,000 V HBM (JESD-22A-114-B)
Reverse Voltage	Not designed to be driven in reverse bias (V <sub>R</sub> ≤ 5V)
Preconditioning	Acc. to JEDEC Level 1

### Product Name

**C 3535 X - IN    L 1 - X X X X X X**

1    2~5    6    7~8    9    10    11 - 16

Code 1: Substrate composition, C: Ceramic Al<sub>2</sub>O<sub>3</sub>

Code 2.3.4.5: Package size, 3535: 3.5\*3.5mm

Code 6: X: Product Class, IR (>700nm)

Code 7.8: Wavelength Class, IN: IR (840~870nm)

Code 9: Lens type, L: 140 degree, A: 90 degree, F: 65 degree

Code 10: Lens version

Code 11-16: Internal code



**General Characteristics at 350mA (C3535X-INx1-E1D11N series)**

Part Number	Color	Peak Wavelength Wp		2θ <sub>1/2</sub>	Temperature Coefficient of Vf (mV/°C)	Thermal Resistance Junction to Pad (°C/W)
		Min	Max		ΔVF /ΔTJ	RΘ <sub>J-L</sub>
C3535X-INL1-E1D11N	I4X	840	870	120	-2~-4	15
C3535X-INA1-E1D11N	I4X	840	870	80	-2~-4	15
C3535X-INF1-E1D11N	I4X	840	870	45	-2~-4	15

Notes: The peak wavelength is measured with an accuracy of ±2nm

**General Characteristics at 700mA (C3535X-INx1-E1E11N series)**

Part Number	Color	Peak Wavelength Wp		2θ <sub>1/2</sub>	Temperature Coefficient of Vf (mV/°C)	Thermal Resistance Junction to Pad (°C/W)
		Min	Max		ΔVF /ΔTJ	RΘ <sub>J-L</sub>
C3535X-INL1-E1E11N	I4X	840	870	135	-2~-4	10
C3535X-INA1-E1E11N	I4X	840	870	90	-2~-4	10
C3535X-INF1-E1E11N	I4X	840	870	60	-2~-4	10

Notes: The peak wavelength is measured with an accuracy of ±2nm



**General Characteristics at 700mA (C3535X-INx1-EAH11N series)**

Part Number	Color	Peak Wavelength Wp		$2\theta_{1/2}$	Temperature Coefficient of Vf (mV/°C)	Thermal Resistance Junction to Pad (°C/W)
		Min	Max		$\Delta V_f / \Delta T_J$	$R\theta_{J-L}$
C3535X-INL1-EAH11N	I4X	840	870	140	-2~-4	10
C3535X-INA1-EAH11N	I4X	840	870	90	-2~-4	10
C3535X-INF1-EAH11N	I4X	840	870	65	-2~-4	10

Notes: The peak wavelength is measured with an accuracy of  $\pm 2\text{nm}$



Radiometric Power and Forward Voltage (T<sub>j</sub> = 25°C) (C3535X-INx1-E1D11N)

Part Number	Color	Performance at Test Current (350mA)					Performance at 600mA	
		Group	Radiometric Power (mW)		V <sub>f</sub>		* Calculated Minimum Radiometric Power	
			Min	Max	Min	Max	mW	mW/sr
C3535X- INL1-E1D11N (beam angle 120°)	I4X	NC5	180	200	1.4	2.4	310	165
		ND1	200	240	1.4	2.4	360	
		ND2	240	280	1.4	2.4	425	225
		ND3	280	320	1.4	2.4	490	
		ND4	320	360	1.4	2.4	555	290
		ND5	360	400	1.4	2.4	620	
C3535X- INA1-E1D11N (beam angle 80°)	I4X	NC4	160	180	1.4	2.4	275	205
		NC5	180	200	1.4	2.4	310	
		ND1	200	240	1.4	2.4	360	275
		ND2	240	280	1.4	2.4	425	
		ND3	280	320	1.4	2.4	490	365
		ND4	320	360	1.4	2.4	555	
C3535X- INF1-E1D11N (beam angle 45°)	I4X	NC3	140	160	1.4	2.4	245	270
		NC4	160	180	1.4	2.4	275	
		NC5	180	200	1.4	2.4	310	345
		ND1	200	240	1.4	2.4	360	
		ND2	240	280	1.4	2.4	425	475
		ND3	280	320	1.4	2.4	490	

Note: 1. Radiometric power is measured with an accuracy of ±10%

2. The forward voltage is measured with an accuracy of ±0.2V

\* Calculated values are for reference only.



Radiometric Power and Forward Voltage (T<sub>j</sub> = 25°C) (C3535X-INx1-E1E11N series)

Part Number	Color	Performance at Test Current (700mA)					Performance at 1000mA	
		Group	Radiometric Power (mW)		V <sub>f</sub>		* Calculated Minimum Radiometric Power	
			Min	Max	Min	Max	mW	mW/sr
C3535X-INL1-E1E11N (beam angle 135°)	I4X	NE3	480	520	1.4	2.4	700	350
		NE4	520	520	1.4	2.4	730	
		NE5	560	560	1.4	2.4	785	410
		NF1	600	650	1.4	2.4	875	
		NF2	650	700	1.4	2.4	945	485
		NF3	700	750	1.4	2.4	1015	
C3535X-INA1-E1E11N (beam angle 90°)	I4X	NE2	440	480	1.4	2.4	645	470
		NE3	480	520	1.4	2.4	700	
		NE4	520	560	1.4	2.4	755	550
		NE5	560	600	1.4	2.4	810	
		NE5	600	650	1.4	2.4	875	635
		NF1	650	700	1.4	2.4	945	
C3535X-INF1-E1E11N (beam angle 60°)	I4X	ND5	360	400	1.4	2.4	530	580
		NE1	400	440	1.4	2.4	590	
		NE2	440	480	1.4	2.4	645	695
		NE3	480	520	1.4	2.4	700	
		NE4	520	560	1.4	2.4	755	819
		NE5	560	600	1.4	2.4	810	

Note: 1. Radiometric power is measured with an accuracy of ±10%

2. The forward voltage is measured with an accuracy of ±0.2V

\* Calculated values are for reference only.



Radiometric Power and Forward Voltage (T<sub>j</sub> = 25°C) (C3535X-INx1-EAH11N series)

Part Number	Color	Performance at Test Current (700mA)				Performance at 1000mA		
		Group	Radiometric Power (mW)		V <sub>f</sub>		*Calculated Minimum Radiometric Power	
			Min	Max	Min	Max	mW	mW/sr
C3535X- INL1-EAH11N (beam angle 140°)	I4X	NF3	700	750	1.4	2.4	1015	515
		NF4	750	800	1.4	2.4	1085	
		NF5	800	850	1.4	2.4	1155	585
		NG1	850	900	1.4	2.4	1225	
		NG2	900	950	1.4	2.4	1295	655
		NG3	950	1000	1.4	2.4	1365	
		NH1	1000	1100	1.4	2.4	1470	725
C3535X- INA1-EAH11N (beam angle 90°)	I4X	NF2	650	700	1.4	2.4	945	685
		NF3	700	750	1.4	2.4	1015	
		NF4	750	800	1.4	2.4	1085	785
		NF5	800	850	1.4	2.4	1155	
		NG1	850	900	1.4	2.4	1225	880
		NG2	900	950	1.4	2.4	1295	
		NG3	950	1000	1.4	2.4	1365	955
C3535X- INF1-EAH11N (beam angle 65°)	I4X	NF1	600	650	1.4	2.4	875	942
		NF2	650	700	1.4	2.4	945	
		NF3	700	750	1.4	2.4	1015	1085
		NF4	750	800	1.4	2.4	1085	
		NF5	800	850	1.4	2.4	1155	1230
		NG1	850	900	1.4	2.4	1225	
		NG2	900	950	1.4	2.4	1295	1375
		NG3	950	1000	1.4	2.4	1365	

Note: 1. Radiometric power is measured with an accuracy of ±10%

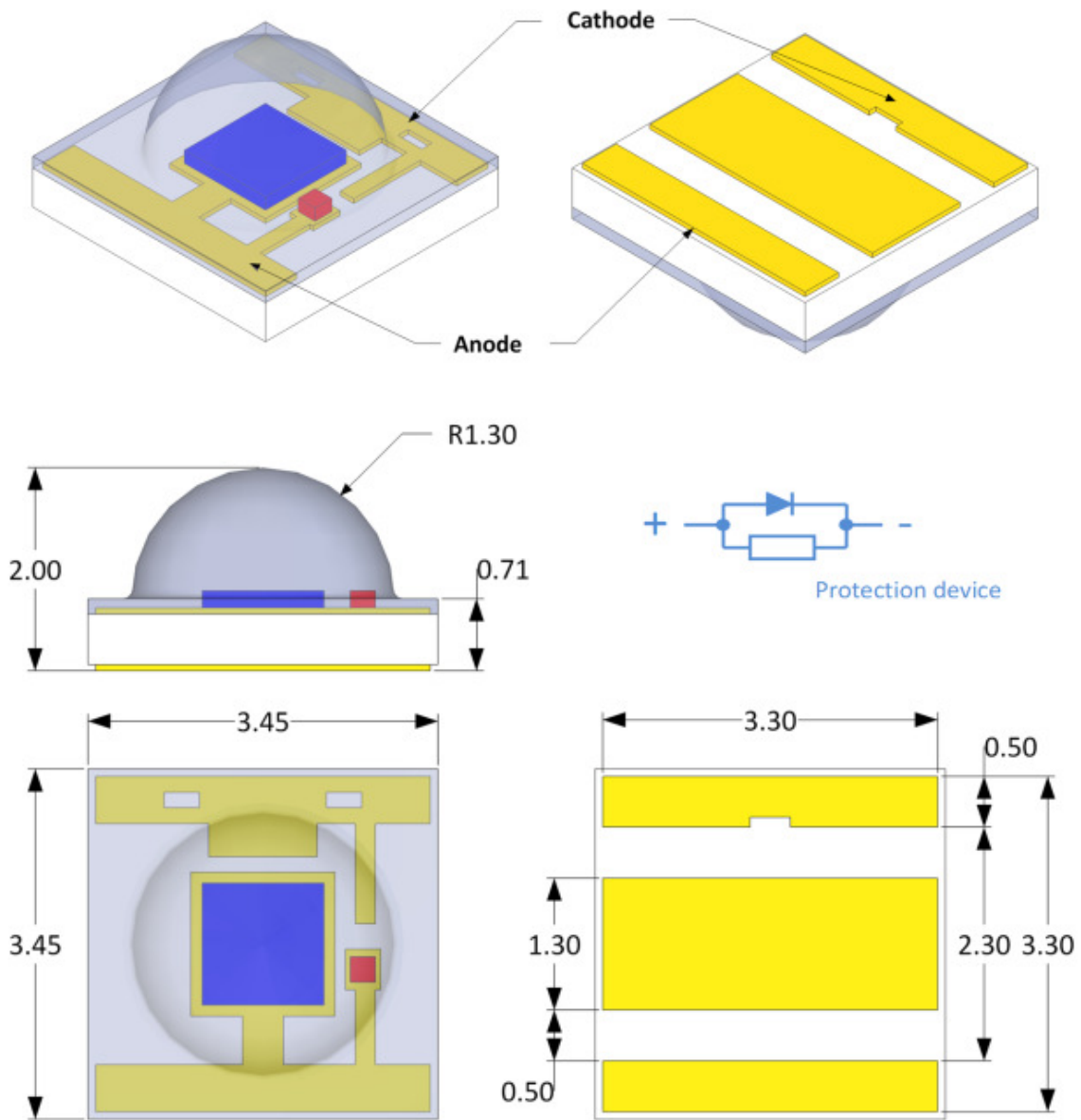
2. The forward voltage is measured with an accuracy of ±0.2V

\* Calculated values are for reference only.



## Mechanical Dimensions

C3535X-INL1-E1D11N (beam angle 120°), C3535X-INL1-E1E11N (beam angle 135°),  
 C3535X-INL1-EAH11N (beam angle 140°)



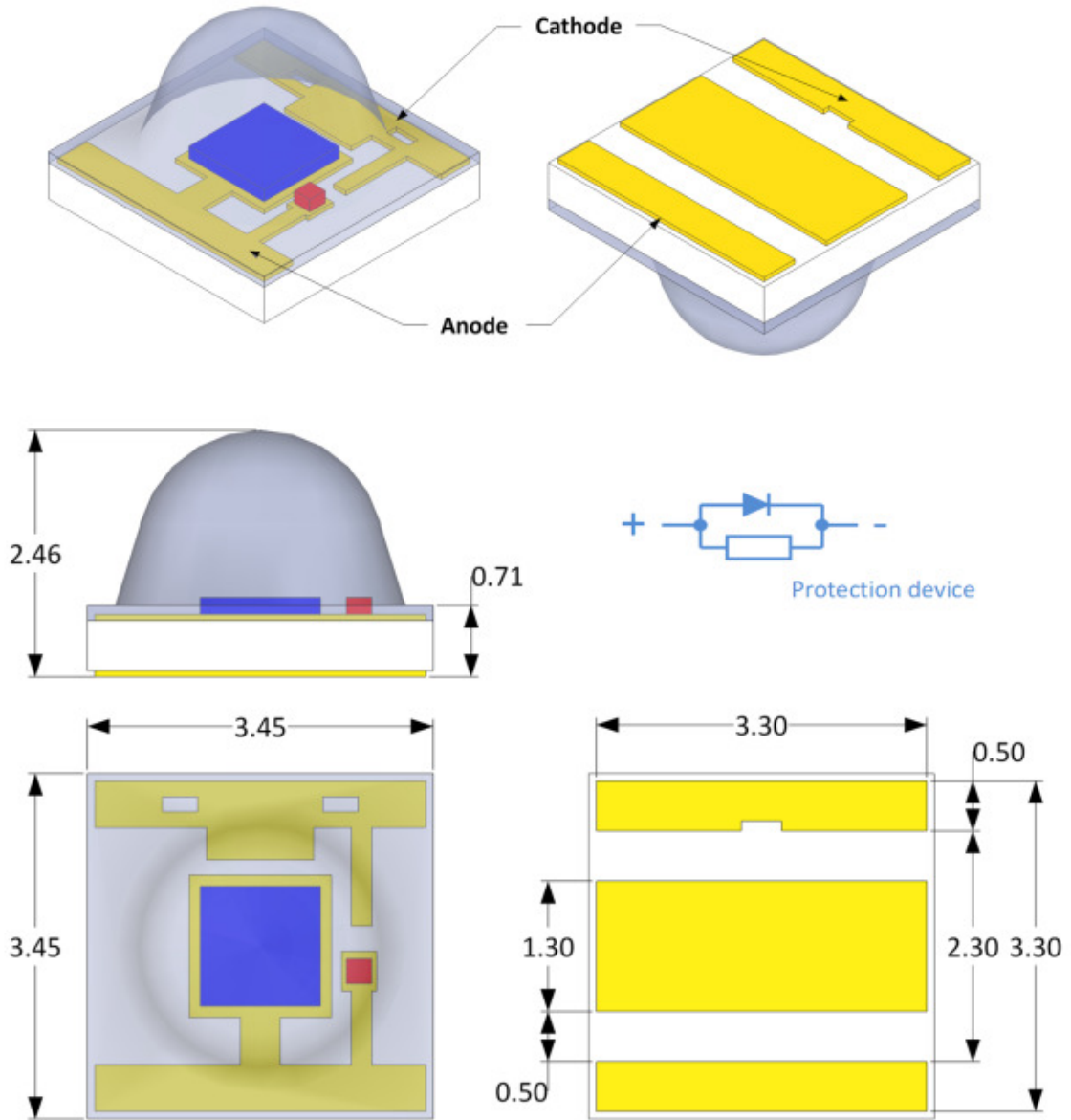
Notes:

1. Drawing is not to scale
2. All dimensions are in millimeter
3. Dimensions are  $\pm 0.13\text{mm}$  unless otherwise indicated





C3535X-INA1-E1D11N (beam angle 80°), C3535X-INA1-E1E11N (beam angle 90°),  
 C3535X-INA1-EAH11N (beam angle 90°)

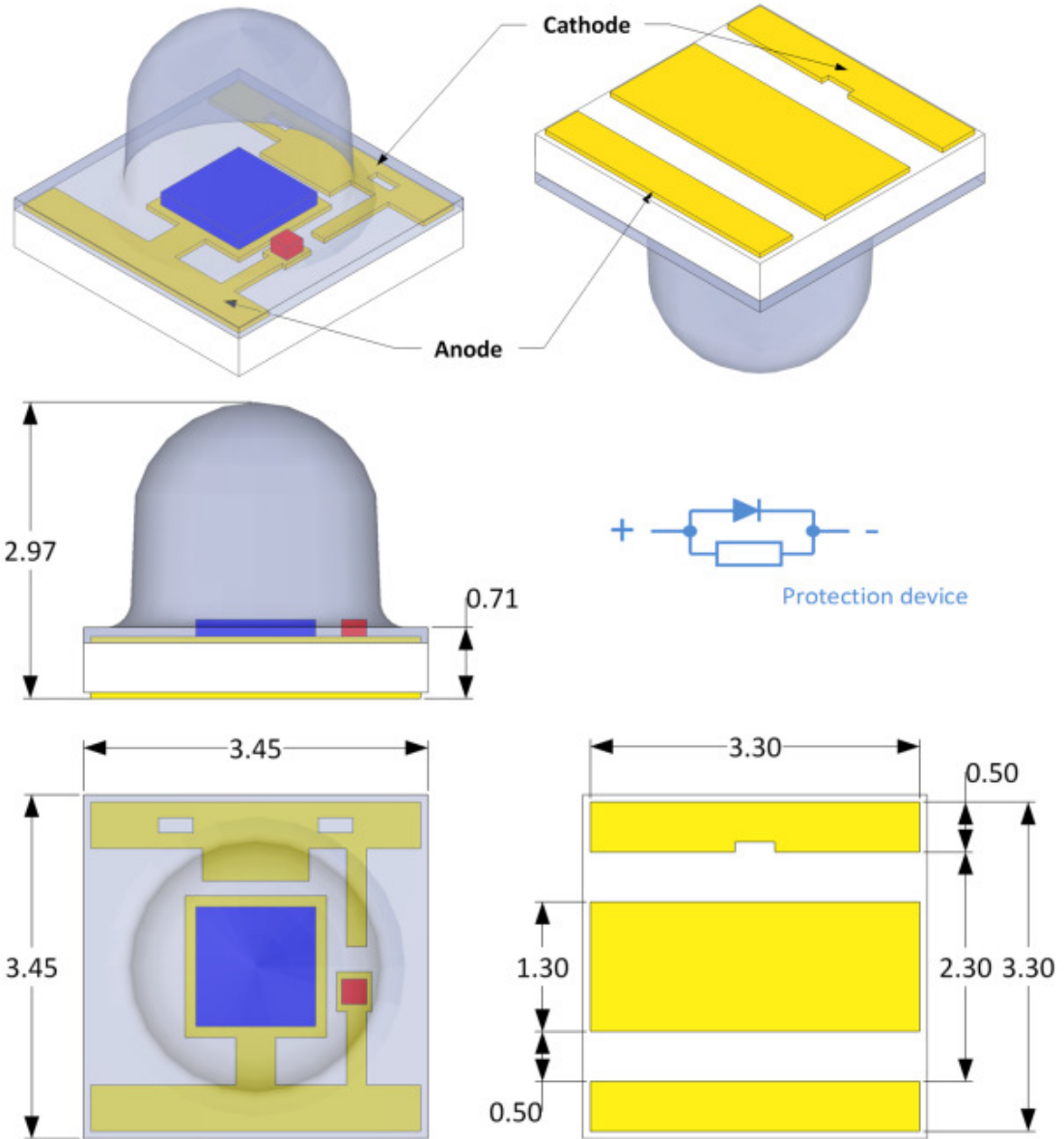


Notes:

4. Drawing is not to scale
5. All dimensions are in millimeter
6. Dimensions are  $\pm 0.13\text{mm}$  unless otherwise indicated



C3535X-INF1-E1D11N (beam angle 45°), C3535X-INF1-E1E11N (beam angle 60°),  
 C3535X-INF1-EAH11N (beam angle 60°)



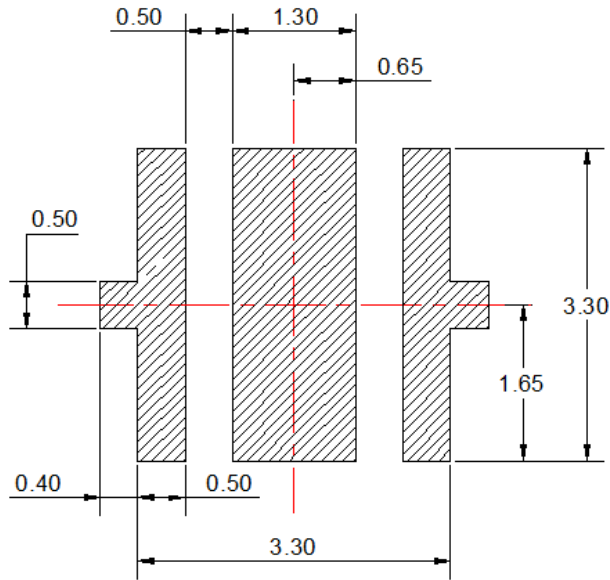
Notes:

1. Drawing is not to scale
2. All dimensions are in millimeter
3. Dimensions are  $\pm 0.13\text{mm}$  unless otherwise indicated

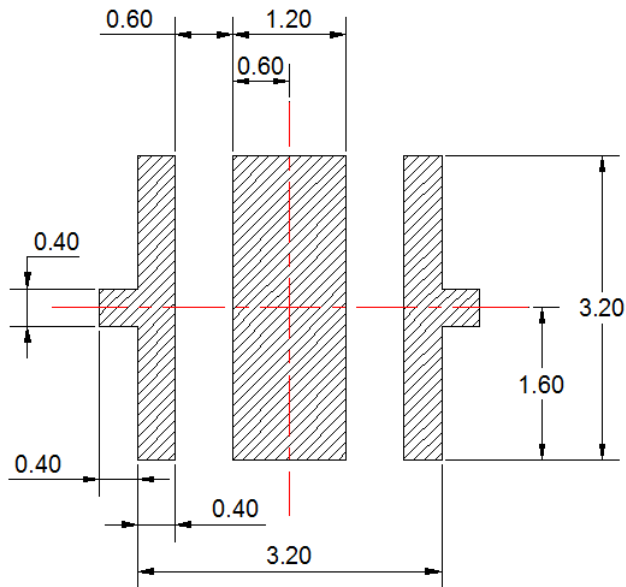


## Recommended Solder Pad Design

### Recommended Soldering Pad Design



### Recommended Stencil Pattern Design (Marked Area is Opening)

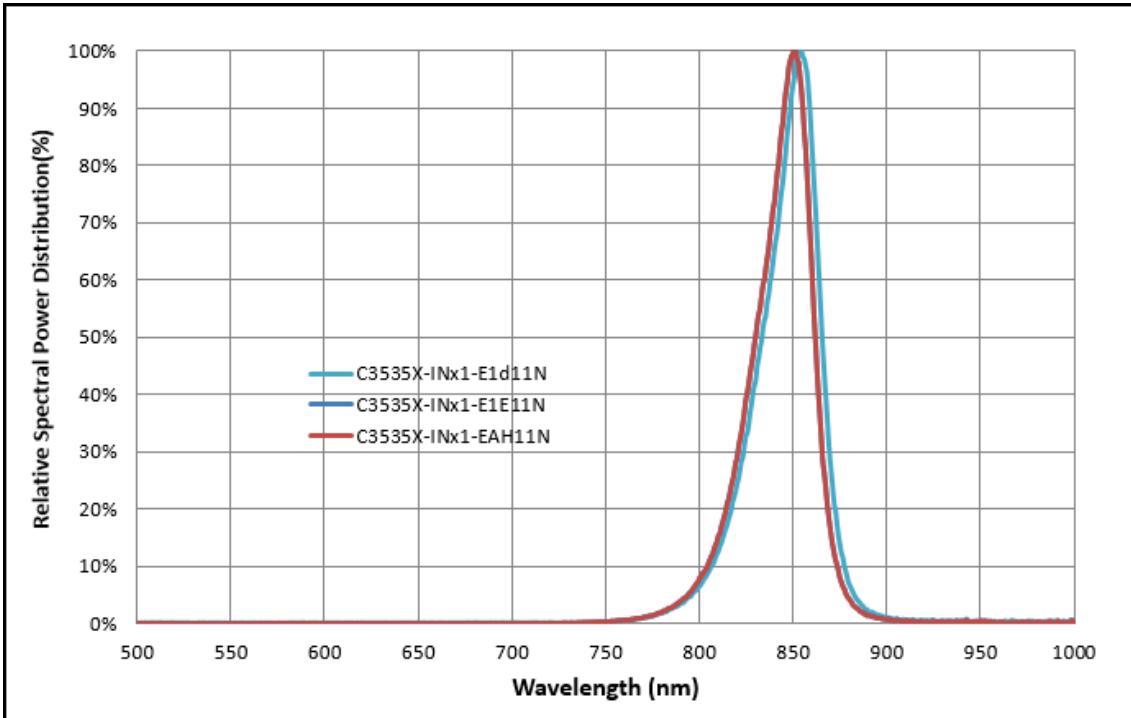


Notes:

1. Drawing is not to scale
2. All dimensions are in millimeter

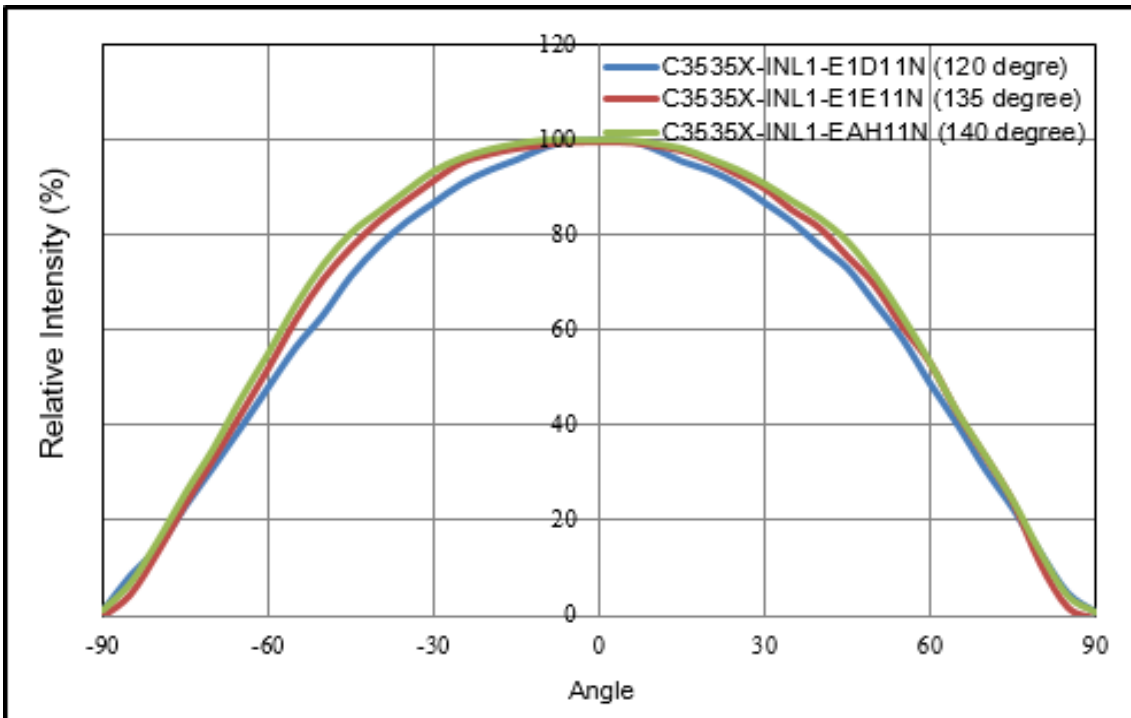


### Relative Spectral Power Distribution, T<sub>j</sub>=25 °C

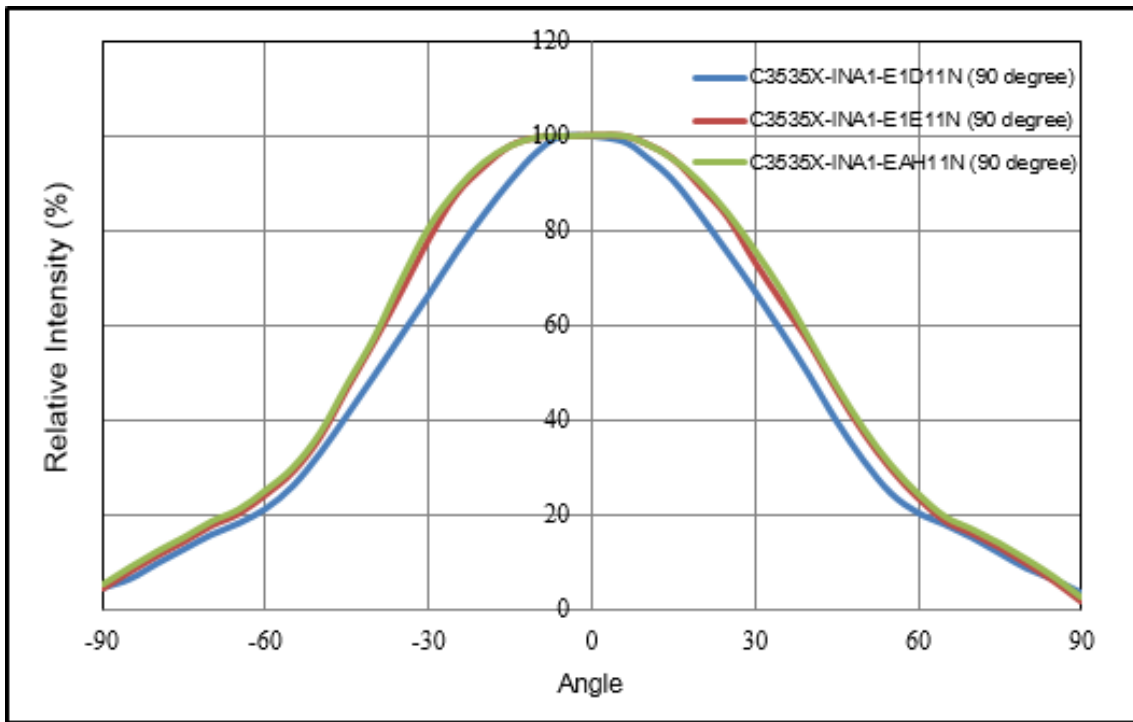


### Typical Spatial Radiation Pattern, T<sub>j</sub>=25 °C

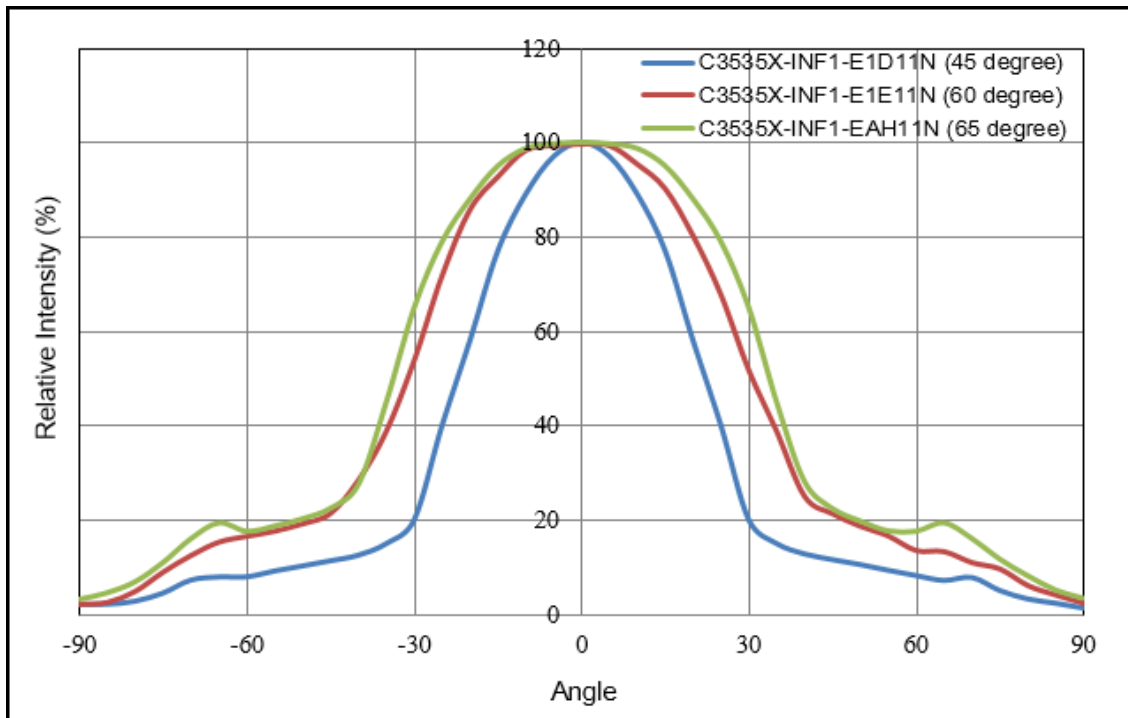
C3535X-INL1-E1D11N (beam angle 120°), C3535X-INL1-E1E11N (beam angle 135°),  
 C3535X-INL1-EAH11N (beam angle 140°)



C3535X-INA1-E1D11N (beam angle 80°), C3535X-INA1-E1E11N (beam angle 90°),  
 C3535X-INA1-EAH11N (beam angle 90°)

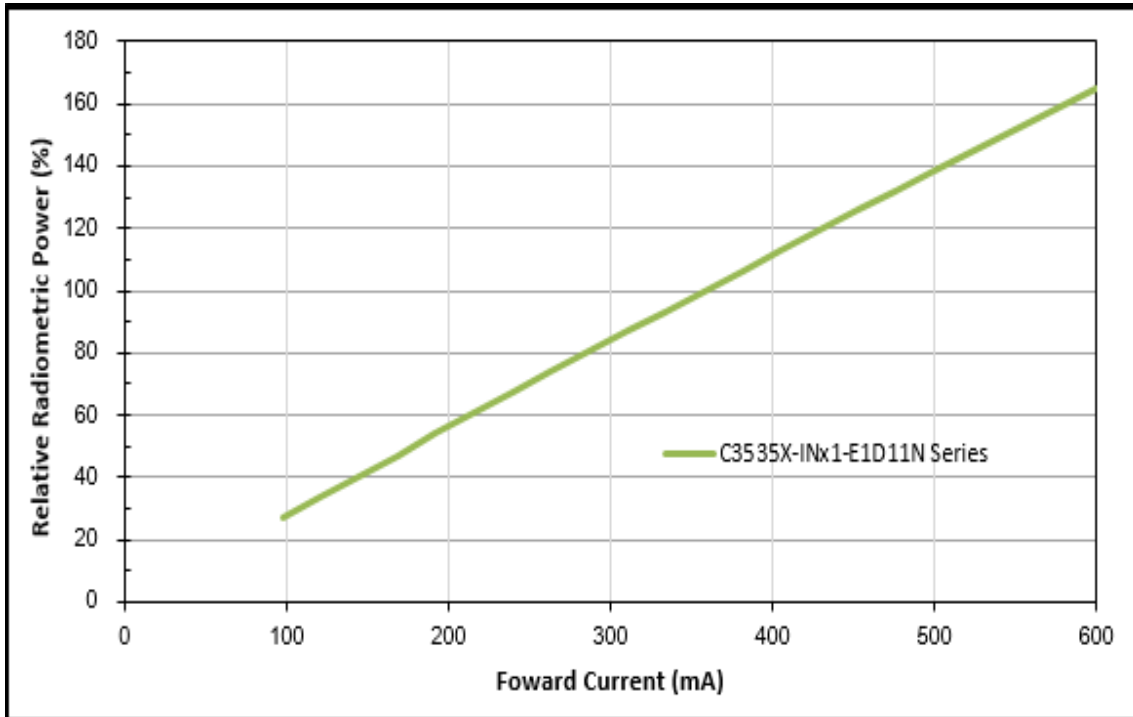


C3535X-INF1-E1D11N (beam angle 45°), C3535X-INF1-E1E11N (beam angle 60°),  
 C3535X-INF1-EAH11N (beam angle 65°)

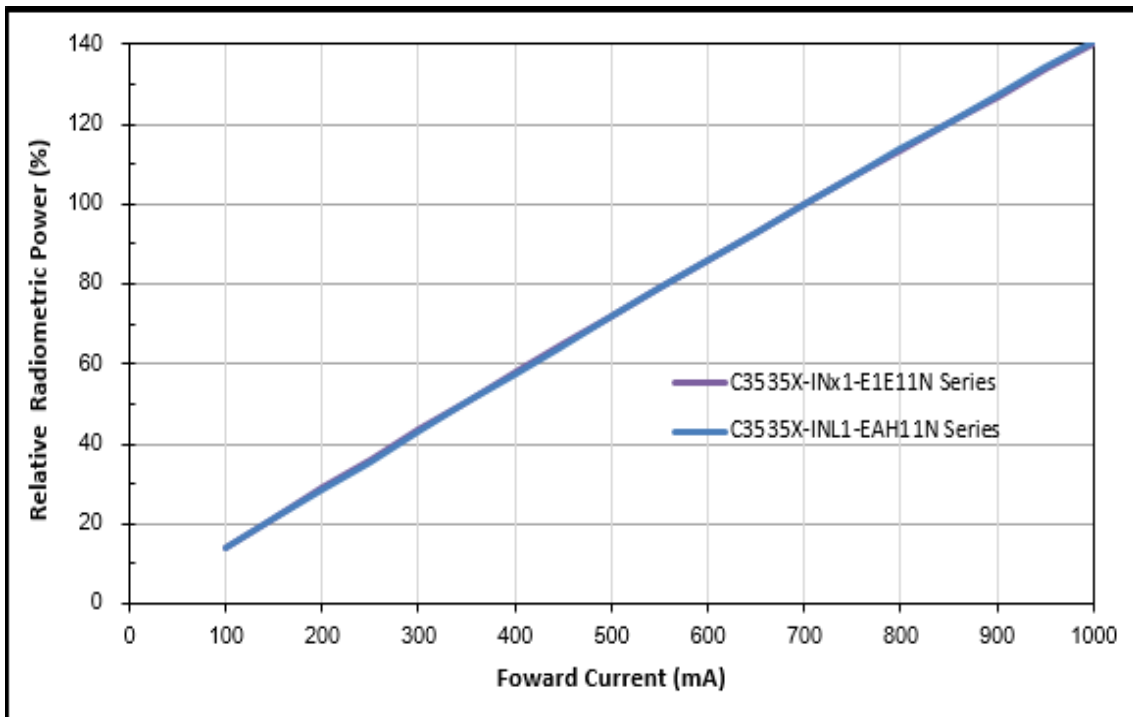


## Typical Forward L-I Characteristics, $T_j=25\text{ }^\circ\text{C}$

### C3535X-INx1-E1D1N series

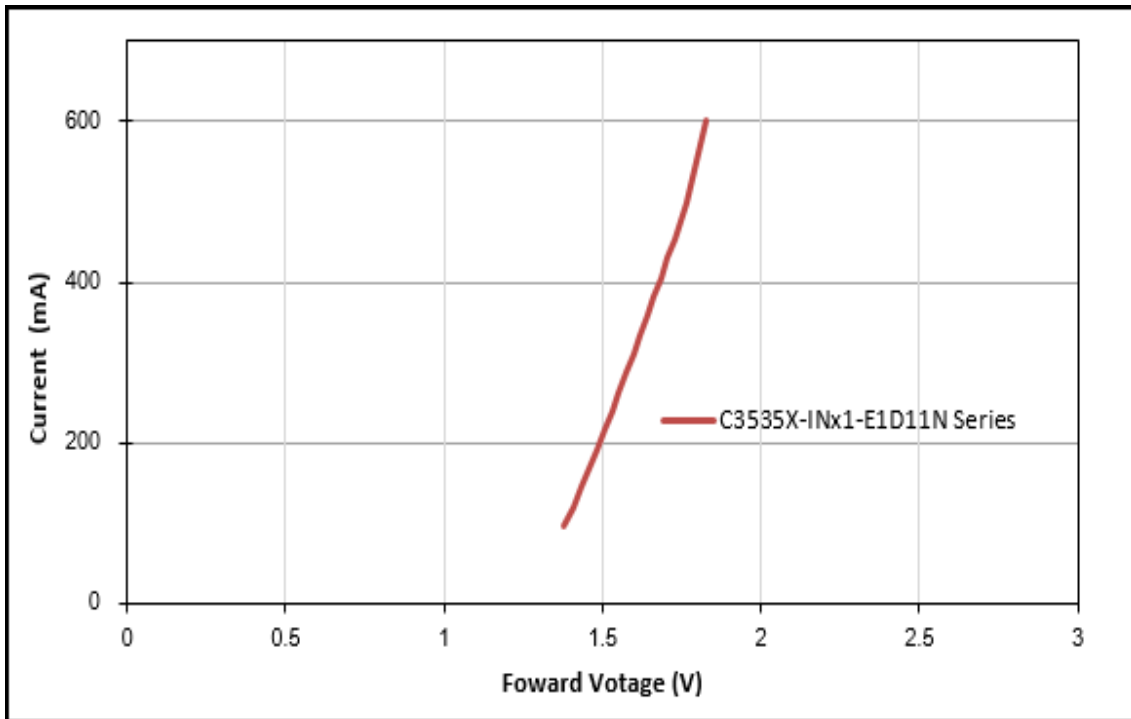


### C3535X-INx1-E1E1N series and C3535X-INx1-EAH11N series

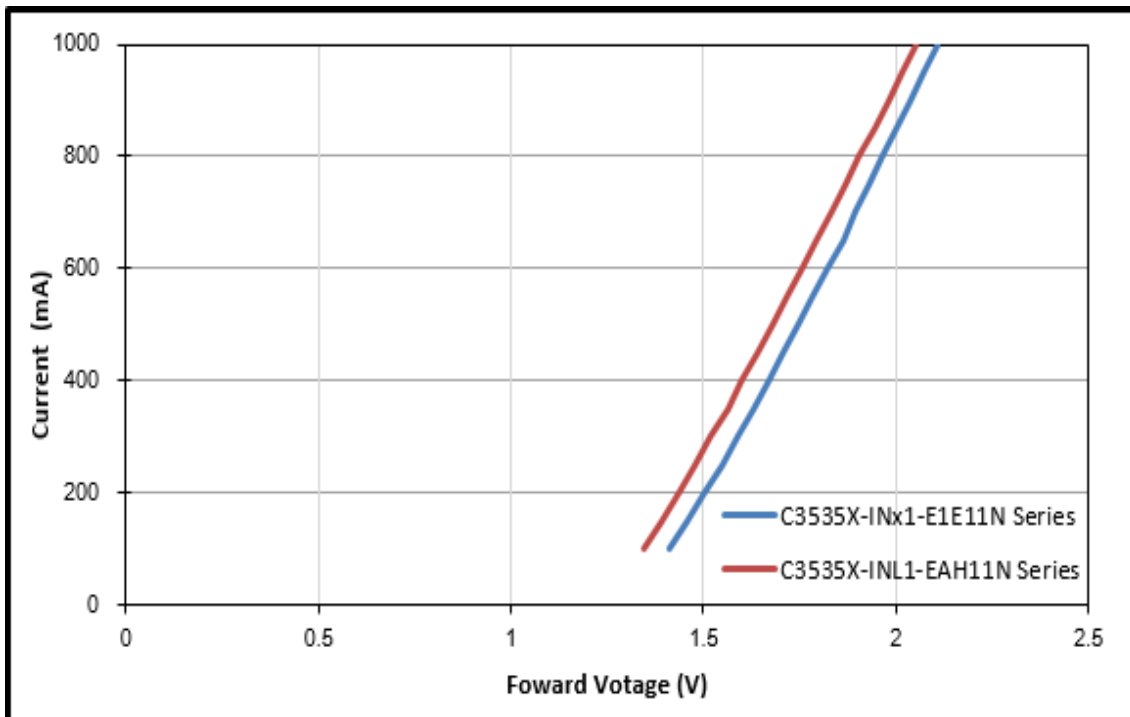


## Typical Forward I-V Characteristics, $T_j=25\text{ }^\circ\text{C}$

### C3535X-INx1-E1D1N series

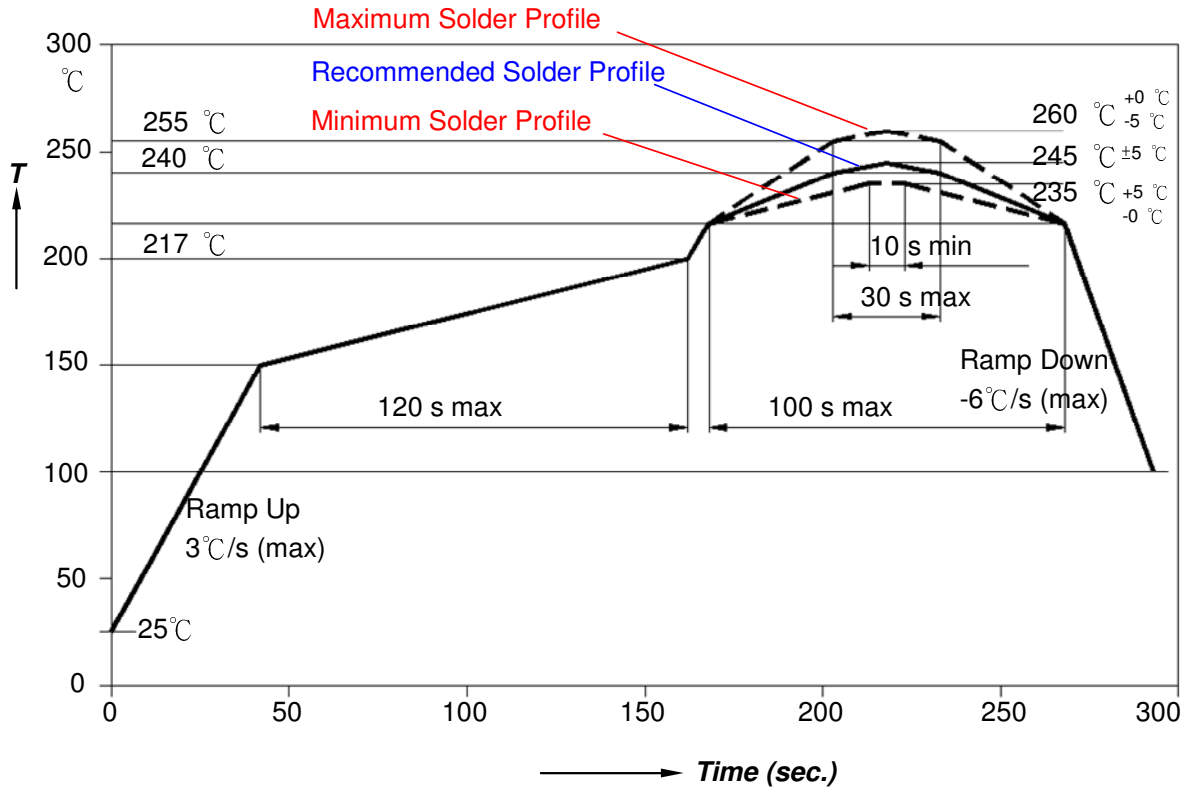


### C3535X-INx1-E1E1N series and C3535X-INx1-EAH11N series



## Recommended Soldering Profile

The LEDs can be soldered using the parameters listed below. As a general guideline, the users are suggested to follow the recommended soldering profile provided by the manufacturer of the solder paste. Although the recommended soldering conditions are specified in the list, reflow soldering at the lowest possible temperature is advised for the LEDs.



Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average Ramp-up Rate ( $T_{s_{max}}$ to $T_p$ )	3°C/second max.	3°C/second max.
Preheat		
- Temperature Min( $T_{s_{min}}$ )	100°C	150°C
- Temperature Max( $T_{s_{max}}$ )	150°C	200°C
- Time( $t_{s_{min}}$ to $t_{s_{max}}$ )	60-120 seconds	60-180 seconds
Time maintained above:		
- Temperature( $T_L$ )	183°C	217°C
- Time( $t_L$ )	60-150 seconds	60-150 seconds
Peak/classification Temperature( $T_p$ )	215°C	260°C
Time within 5°C of actual Peak Temperature( $t_p$ )	10-30 seconds	20-40 seconds
Ramp-Down Rate	6°C/second max.	6°C/second max.
Time 25°C to Peak Temperature	6 minutes max.	8 minutes max.

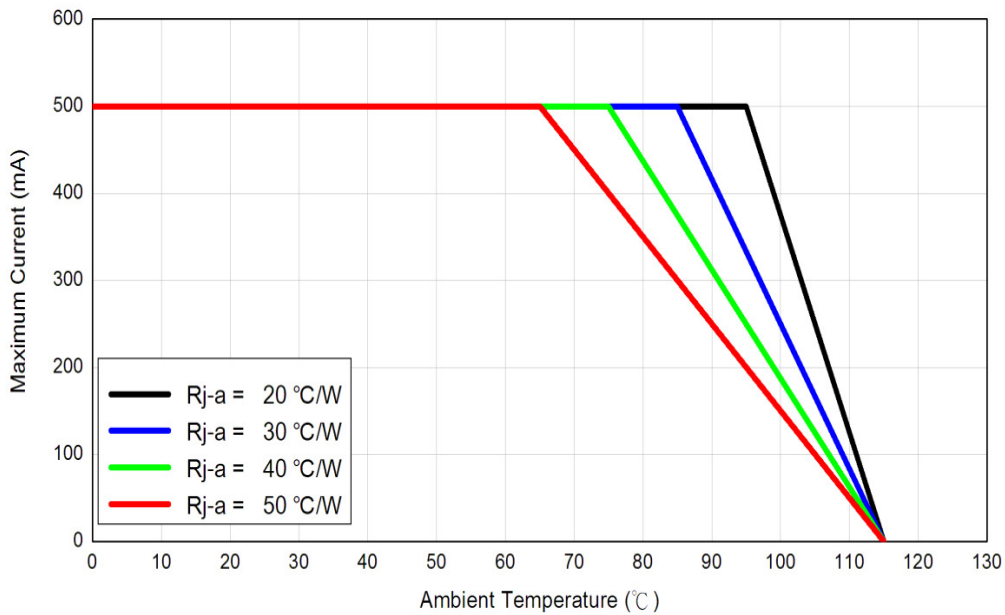




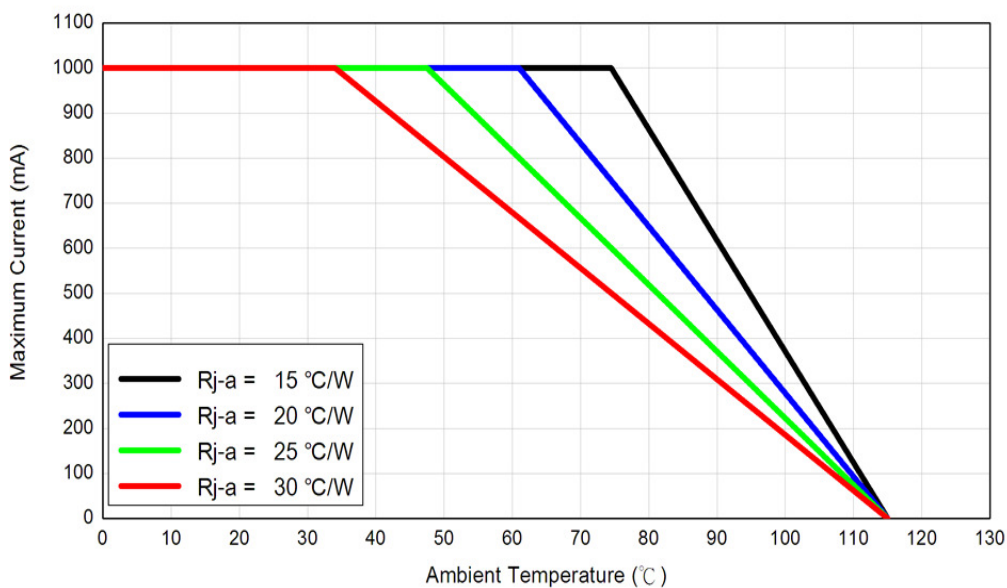
## Thermal Design

Thermal design of the end product is important. The thermal resistance between the junction and the solder point ( $R_{\theta_{j-p}}$ ) and the end product should be designed to minimize the thermal resistance from the solder point to ambient in order to optimize the emitter life and optical characteristics. The maximum operation current is determined by the plot of Allowable Forward Current vs. Ambient Temperature.

### C3535X-INx1-E1D1N series



### C3535X-INx1-E1E1N series and C3535X-INx1-EAH11N series



The junction temperature can be correlated to the thermal resistance between the junction and ambient (Rja) by the following equation.

$$T_j = T_a + R_{ja} * W$$

Tj: LED junction temperature

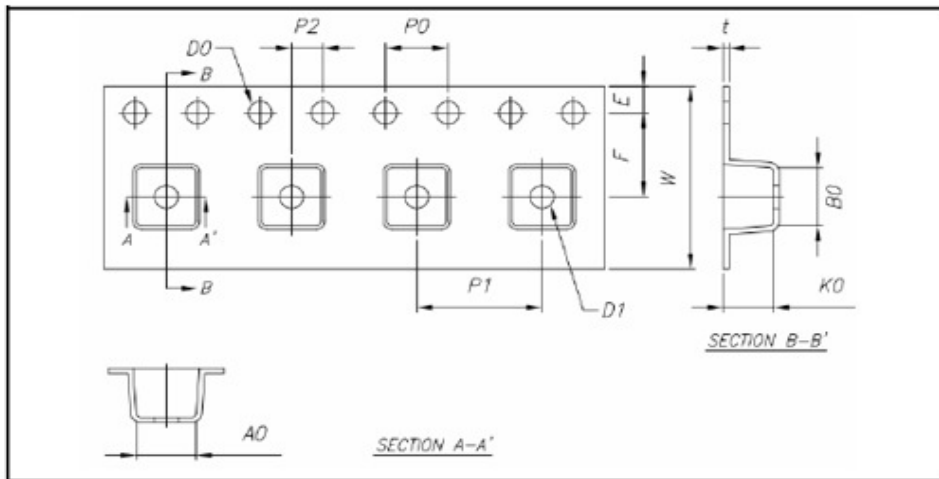
Ta: Ambient temperature

Rja: Thermal resistance between the junction and ambient

W: Input power ( $I_f * V_f$ )

## Packing Information

C3535X-INL1 series, Max QTY: 1000ea / roll

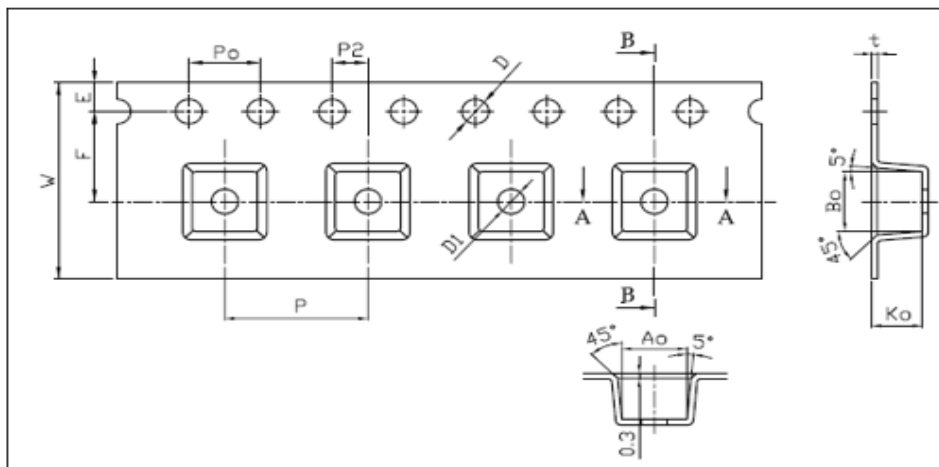


Item	Specification	Tol. (+/-)
W	12.00	± 0.30
E	1.75	± 0.10
F	5.50	± 0.10
D0	1.50	+0.10,-0
D1	1.50	+0.10,-0
P0	4.00	± 0.10
P1	8.00	± 0.10
P2	2.00	± 0.10
P0 x10	40.00	± 0.20

Item	Specification	Tol. (+/-)
t	0.25	±0.05
A0	3.80	±0.10
B0	3.80	±0.10
K0	2.20	±0.10

C3535X-INA1 series, Max QTY: 500ea / roll



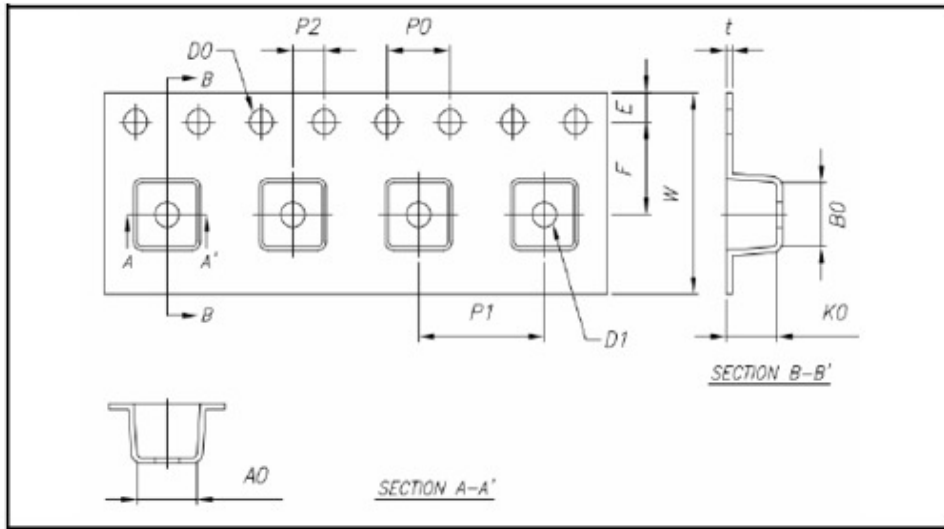
外觀	規格	公差
W	12.00	±0.30
P	8.00	±0.10
E	1.75	±0.10
F	5.50	±0.10
P2	2.00	±0.10
D	1.50	+0.10 -0.00
D1	1.50	±0.10
Po	4.00	±0.10
10Po	40.00	±0.20

外觀	規格	公差
Ao	3.75	±0.10
Bo	3.75	±0.10
Ko	2.80	±0.10
t	0.35	±0.05

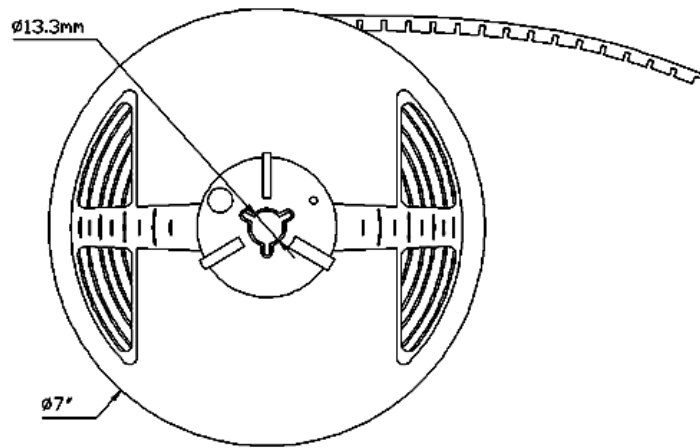
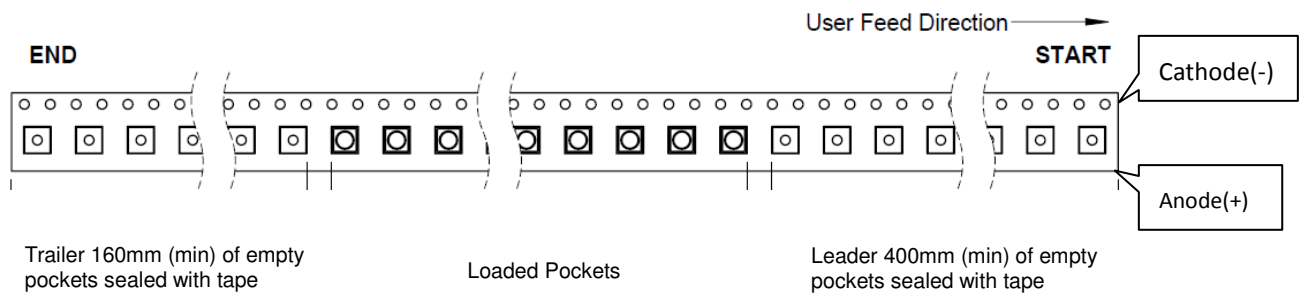


C3535X-INF1 series, Max QTY: 500ea / roll



Item	Specification	Tol. (+/-)
W	12.00	± 0.30
E	1.75	± 0.10
F	5.50	± 0.10
D0	1.50	+0.10,-0
D1	1.50	+0.10,-0
P0	4.00	± 0.10
P1	8.00	± 0.10
P2	2.00	± 0.10
P0x10	40.00	± 0.20

Item	Specification	Tol. (+/-)
t	0.35	±0.05
A0	3.80	±0.10
B0	3.80	±0.10
K0	3.20	±0.10



Note:  
All dimensions are in millimeter.



## About Us

**TSLC Corporation** is devoted to developing high-density and multi-size emitters with powerful output to satisfy the needs of every customer.

**TSLC Corporation** is the leader in LED solutions. Unlimited design flexibility for interior and exterior spaces with high-end lighting effect; energy-efficient for UV curing to improve the quality of medical care; horticulture solutions create a better environment for everyone; high-intensity rotatable lightings for the entertainment industry, TSLC is always there for your lighting needs.

For further company or product information, please visit us at [www.tslc.com.tw](http://www.tslc.com.tw) or please contact [sales@tslc.com.tw](mailto:sales@tslc.com.tw).

