



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 an Al₂O₃ ceramic substrate and a 140/90/60/30 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.



Table of Contents

Characteristics	1
Mechanical Dimensions	8
Recommended Solder Pad Design.....	12
Relative Spectral Power Distribution.....	13
Typical Spatial Radiation Pattern	14
Typical Forward L-I Characteristics	16
Typical Forward I-V Characteristics	18
Recommended Soldering Profile	20
Thermal Design.....	21
Packing information.....	23

RoHS Compliant

Characteristics

Absolute Maximum Ratings (Tj = 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 ($V_R \leq 5V$)
Preconditioning	Acc. to JEDEC Level 1

Product Name

C 3535 X – IN X 1 – X X X X X X

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

Code 1: Substrate composition, C: Ceramic Al₂O₃

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: 60 degree, S: 30 degree

Code 10: Lens version

Code 11-16: Internal code



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

Part Number	Internal code	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	E1D11N	840	870	120	-2~-4	11.5
C3535X-INA1				80	-2~-4	11.5
C3535X-INF1				45	-2~-4	11.5
C3535X-INS1				30	-2~-4	11.5

Notes: The peak wavelength is measured with an accuracy of $\pm 2\text{nm}$ **General Characteristics at 700mA (C3535X-INx1-E1E11N series)**

Part Number	Internal code	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	E1E11N	840	870	135	-2~-4	11
C3535X-INA1				90	-2~-4	11
C3535X-INF1				60	-2~-4	11
C3535X-INS1				30	-2~-4	11

Notes: The peak wavelength is measured with an accuracy of $\pm 2\text{nm}$ **General Characteristics at 700mA (C3535X-INx1-EAH11N series)**

Part Number	Internal Code	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	840	870	140	-2~-4	11
C3535X-INA1				90	-2~-4	11
C3535X-INF1				60	-2~-4	11
C3535X-INS1				30	-2~-4	11

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

Radiometric Power and Forward Voltage (Tj = 25°C) (C3535X-INx1-E1D11N)

Part Number	Internal code	Performance at Test Current (350mA)					Performance at 600mA	
		Group	Radiometric Power (mW)		Vf		* Calculated Minimum Radiometric Power	
			Min	Max	Min	Max	mW	mW/sr
C3535X-INL1 (beam angle 120°)	E1D11N	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 (beam angle 80°)	E1D11N	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 (beam angle 45°)	E1D11N	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	
C3535X-INS1 (beam angle 30°)	E1D11N	NC2	120	140	1.4	2.4	212	370
		NC3	140	160	1.4	2.4	245	
		NC4	160	180	1.4	2.4	277	476
		NC5	180	200	1.4	2.4	310	
		ND1	200	240	1.4	2.4	359	634
		ND2	240	280	1.4	2.4	424	

Note: 1. Radiometric power is measured with an accuracy of $\pm 10\%$

2. The forward voltage is measured with an accuracy of $\pm 0.2V$

* Calculated values are for reference only.



Radiometric Power and Forward Voltage (Tj = 25°C) (C3535X-INx1-E1E11N series)

Part Number	Internal code	Performance at Test Current (700mA)					Performance at 1000mA	
		Group	Radiometric Power (mW)		Vf		* Calculated Minimum Radiometric Power	
			Min	Max	Min	Max	mW	mW/sr
C3535X-INL1 (beam angle 135°)	E1E11N	NE1	400	440	1.4	2.4	588	303
		NE2	440	480	1.4	2.4	644	
		NE3	480	520	1.4	2.4	700	359
		NE4	520	560	1.4	2.4	756	
		NE5	560	600	1.4	2.4	812	400
C3535X-INA1 (beam angle 90°)	E1E11N	ND5	360	400	1.4	2.4	532	391
		NE1	400	440	1.4	2.4	588	
		NE2	440	480	1.4	2.4	644	470
		NE3	480	520	1.4	2.4	700	
		NE4	520	560	1.4	2.4	756	528
C3535X-INF1 (beam angle 60°)	E1E11N	ND5	360	400	1.4	2.4	532	580
		NE1	400	440	1.4	2.4	588	
		NE2	440	480	1.4	2.4	644	696
		NE3	480	520	1.4	2.4	700	
		NE4	520	560	1.4	2.4	756	783
C3535X-INS1 (beam angle 30°)	E1E11N	ND4	320	360	1.4	2.4	475	815
		ND5	360	400	1.4	2.4	530	
		NE1	400	440	1.4	2.4	590	1000
		NE2	440	480	1.4	2.4	645	
		NE3	480	520	1.4	2.4	700	1180
		NE4	520	560	1.4	2.4	750	

Note: 1. Radiometric power is measured with an accuracy of $\pm 10\%$

2. The forward voltage is measured with an accuracy of $\pm 0.2V$

* Calculated values are for reference only.



Radiometric Power and Forward Voltage (T_j = 25°C) (C3535X-INx1-EAH11N series)

Part Number	Internal code	Performance at Test Current (700mA)					Performance at 1000mA	
		Group	Radiometric Power (mW)		V _f		*Calculated Minimum Radiometric Power	
			Min	Max	Min	Max	mW	mW/sr
C3535X-INL1 (beam angle 140°)	EAH11N	NE4	520	560	1.4	2.4	875	448
		NE5	560	600	1.4	2.4	945	
		NF1	600	650	1.4	2.4	1015	517
		NF2	650	700	1.4	2.4	1085	
		NF3	700	750	1.4	2.4	1155	586
		NF4	750	800	1.4	2.4	1225	
C3535X-INA1 (beam angle 90°)	EAH11N	NE2	440	480	1.4	2.4	812	589
		NE3	480	520	1.4	2.4	875	
		NE4	520	560	1.4	2.4	945	685
		NE5	560	600	1.4	2.4	1015	
		NF1	600	650	1.4	2.4	1085	783
		NF2	650	700	1.4	2.4	1155	
C3535X-INF1 (beam angle 60°)	EAH11N	NE2	440	480	1.4	2.4	812	TBD
		NE3	480	520	1.4	2.4	875	
		NE4	520	560	1.4	2.4	945	TBD
		NE5	560	600	1.4	2.4	1015	
		NF1	600	650	1.4	2.4	1085	TBD
		NF2	650	700	1.4	2.4	1155	
C3535X-INS1 (beam angle 30°)	EAH11N	NE1	400	440	1.4	2.4	750	TBD
		NE2	440	480	1.4	2.4	812	
		NE3	480	520	1.4	2.4	875	TBD
		NE4	520	560	1.4	2.4	945	
		NE5	560	600	1.4	2.4	1015	TBD
		NF1	600	650	1.4	2.4	1085	

Note: 1. Radiometric power is measured with an accuracy of $\pm 10\%$

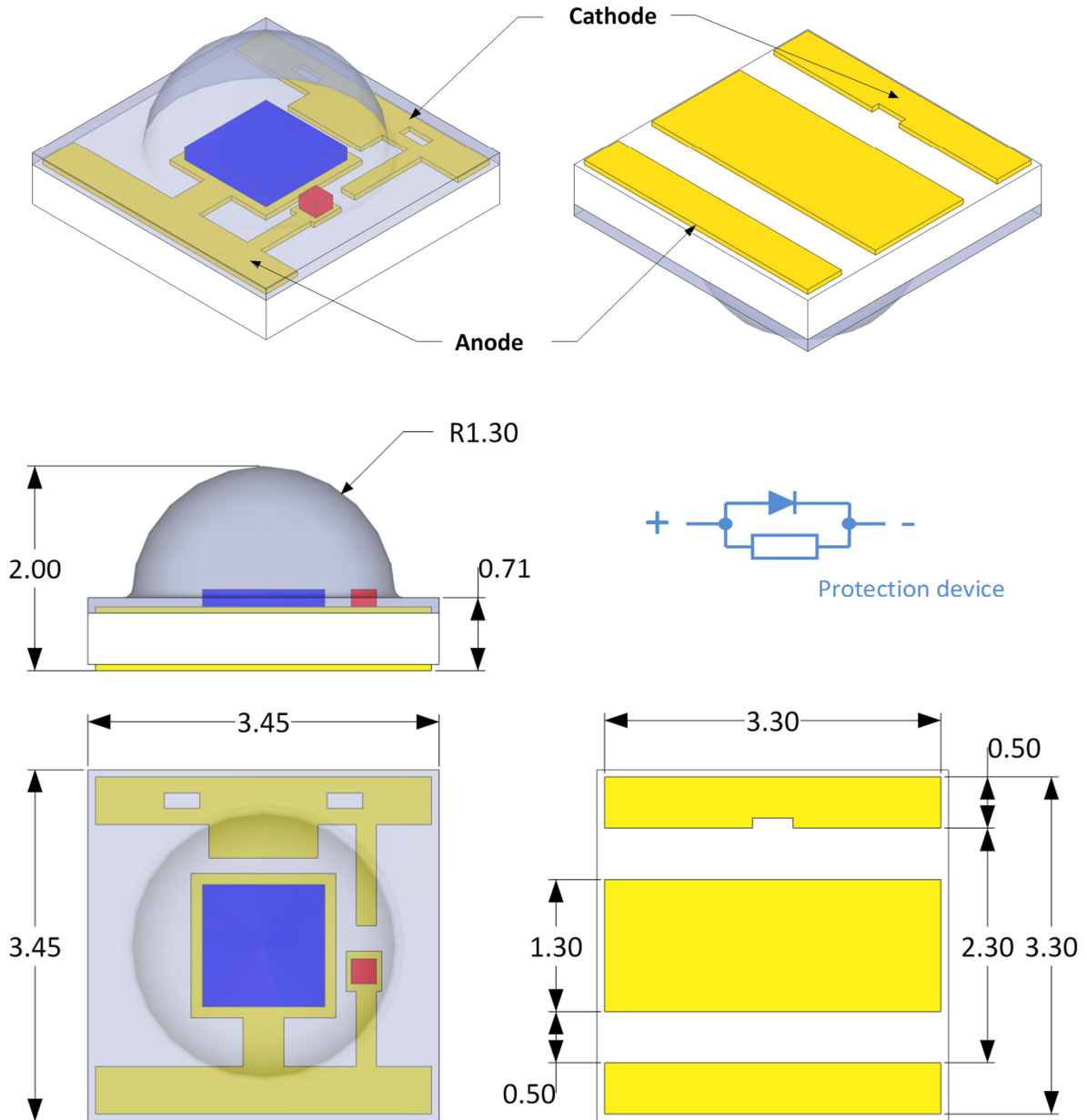
2. The forward voltage is measured with an accuracy of $\pm 0.2V$

* Calculated values are for reference only.



Mechanical Dimensions

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

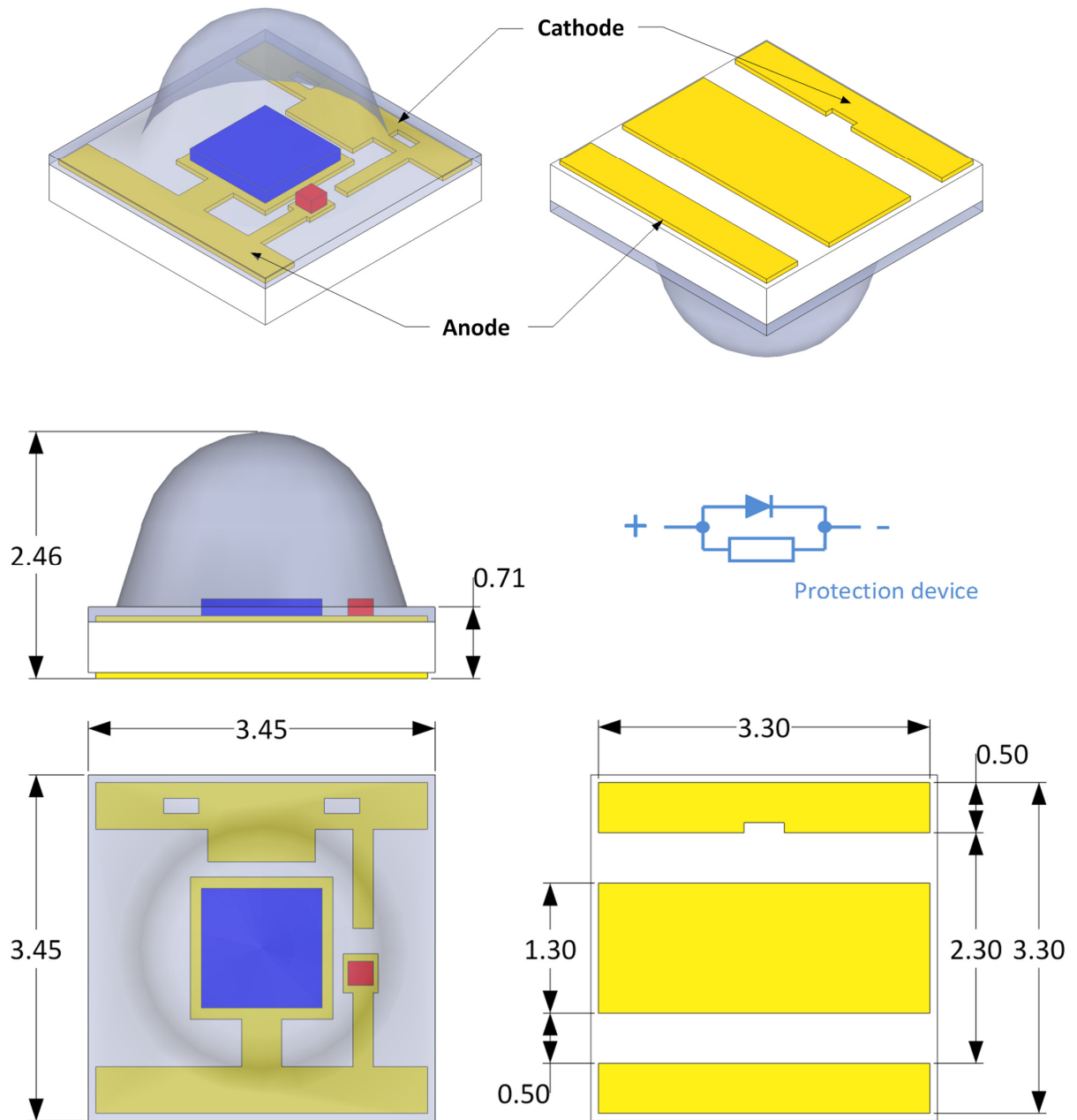


Notes:

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(80°), C3535X-INA1-E1E11N (90°),
C3535X-INA1-EAH11N (90°)

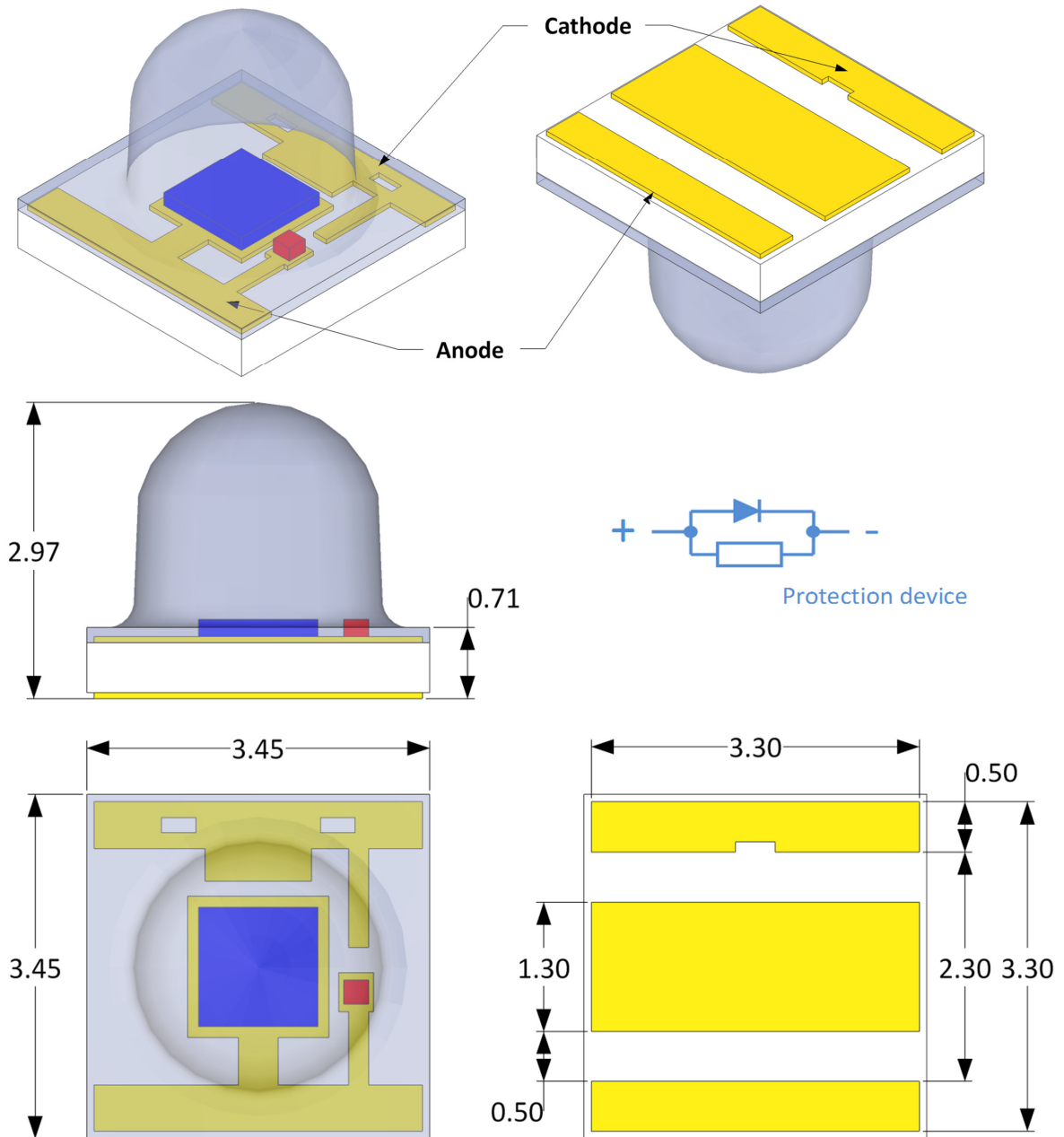


Notes:

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



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

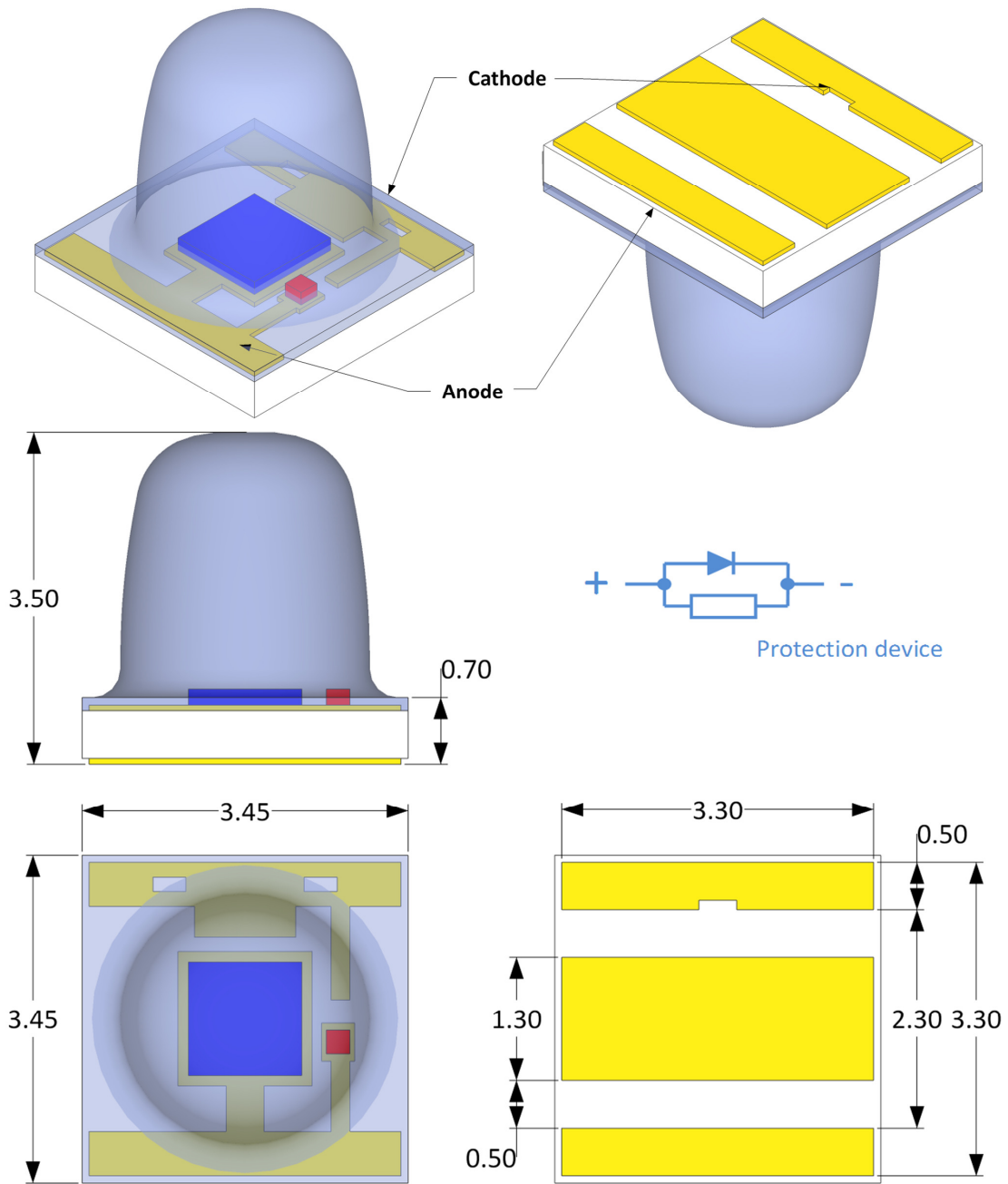


Notes:

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



C3535X-INS1-E1D11N (30°), C3535X-INS1-E1E11N (30°),
C3535X-INS1-EAH11N (30°)



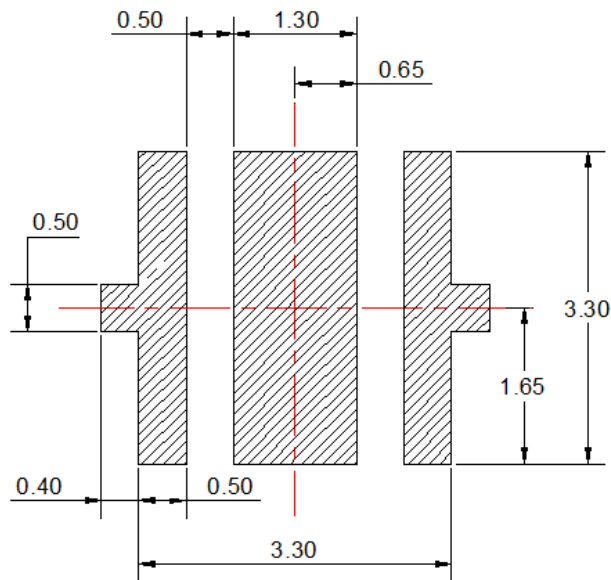
Notes:

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

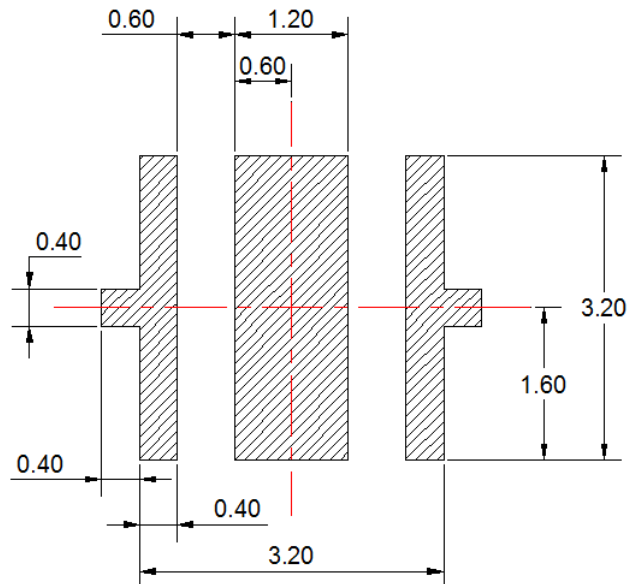


Recommended Solder Pad Design

Recommended Soldering Pad Design



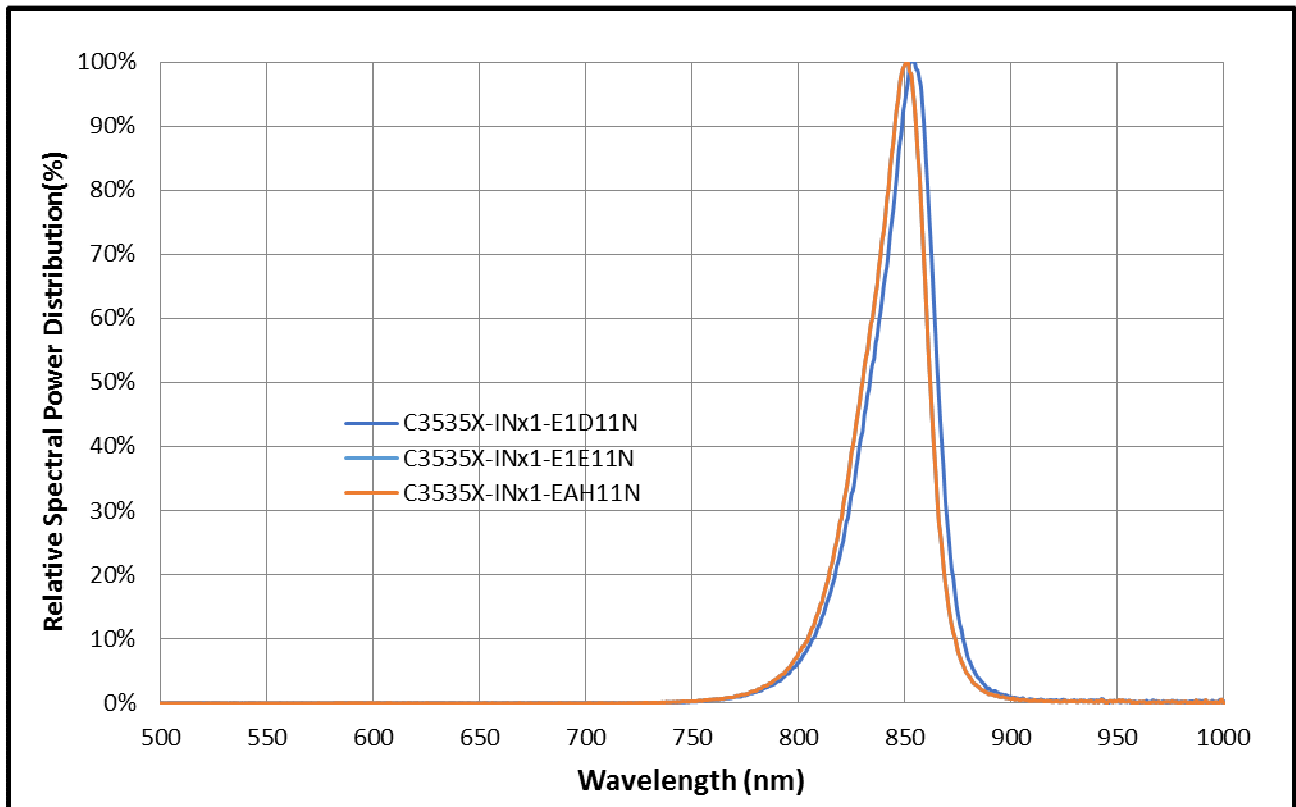
Recommended Stencil Pattern Design (Marked Area is Opening)

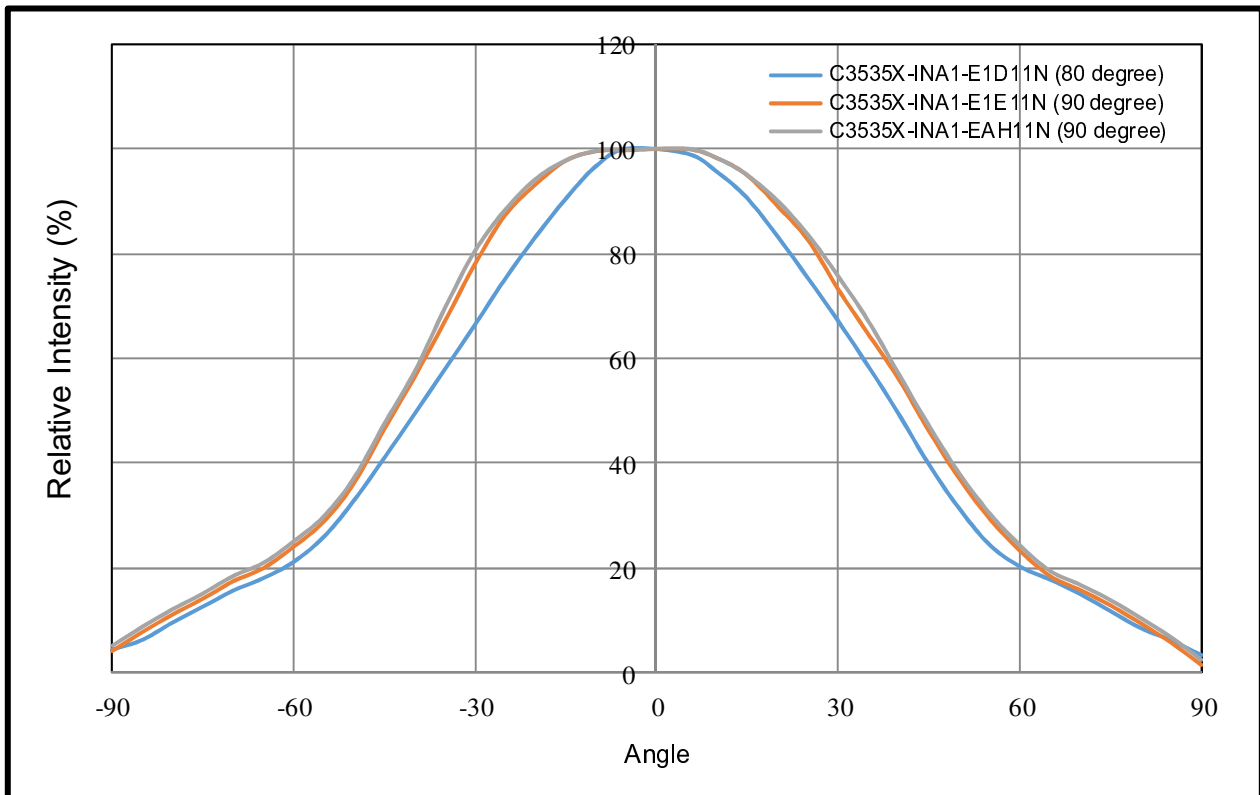
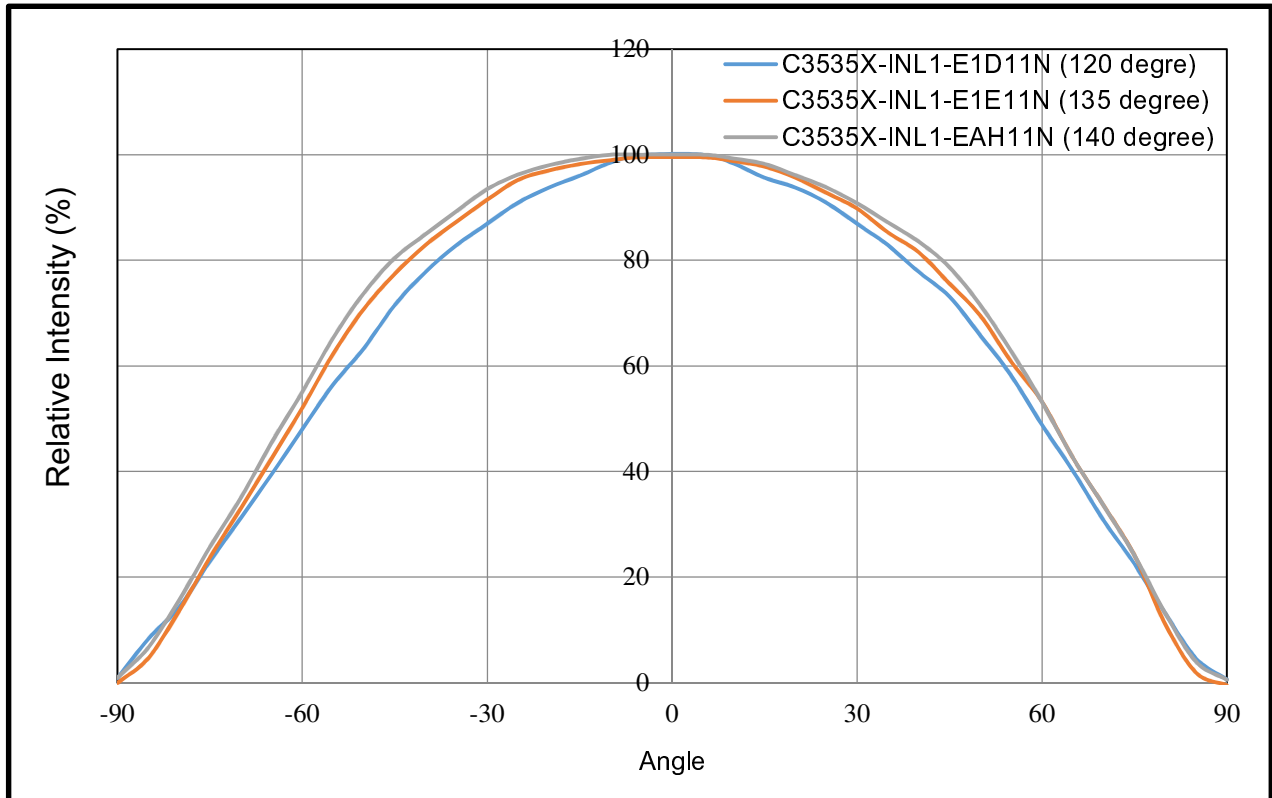


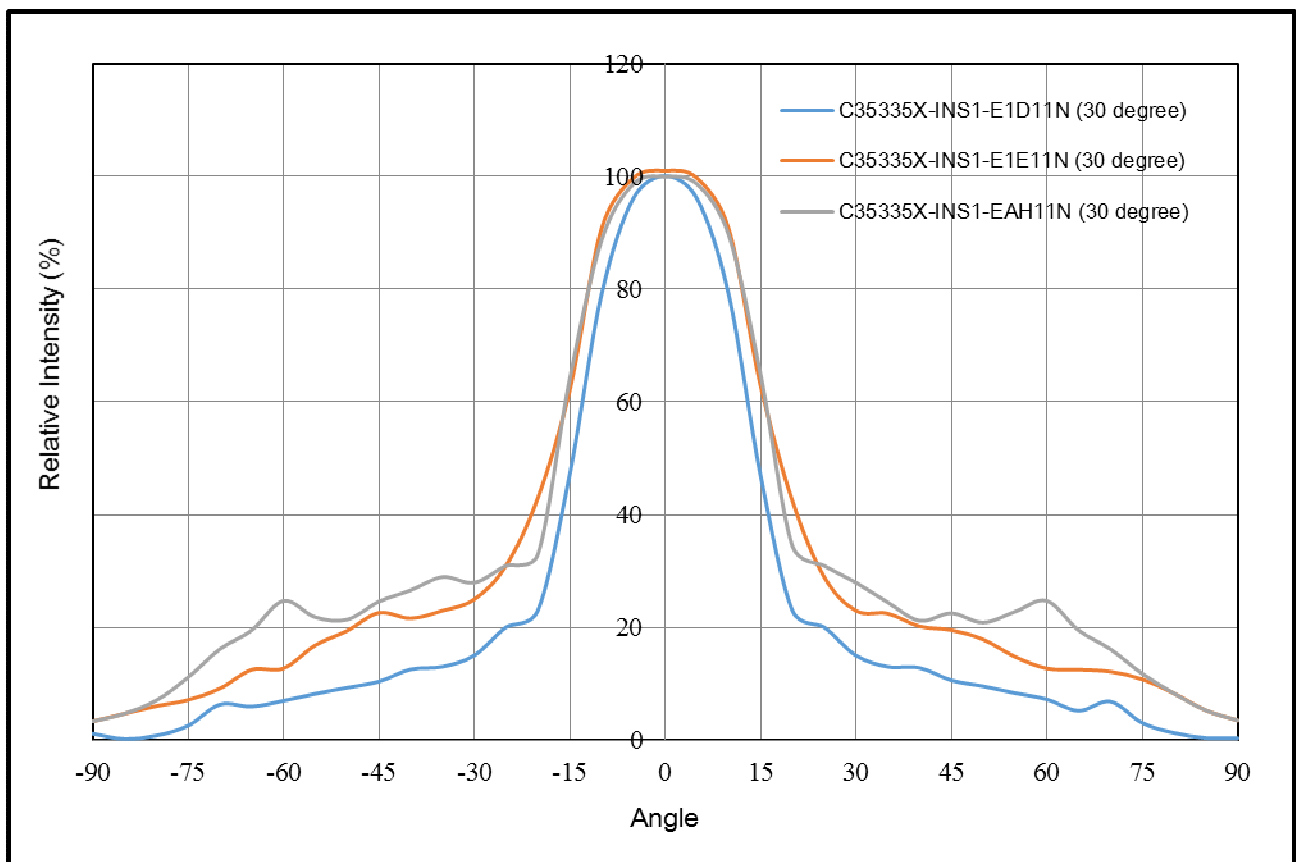
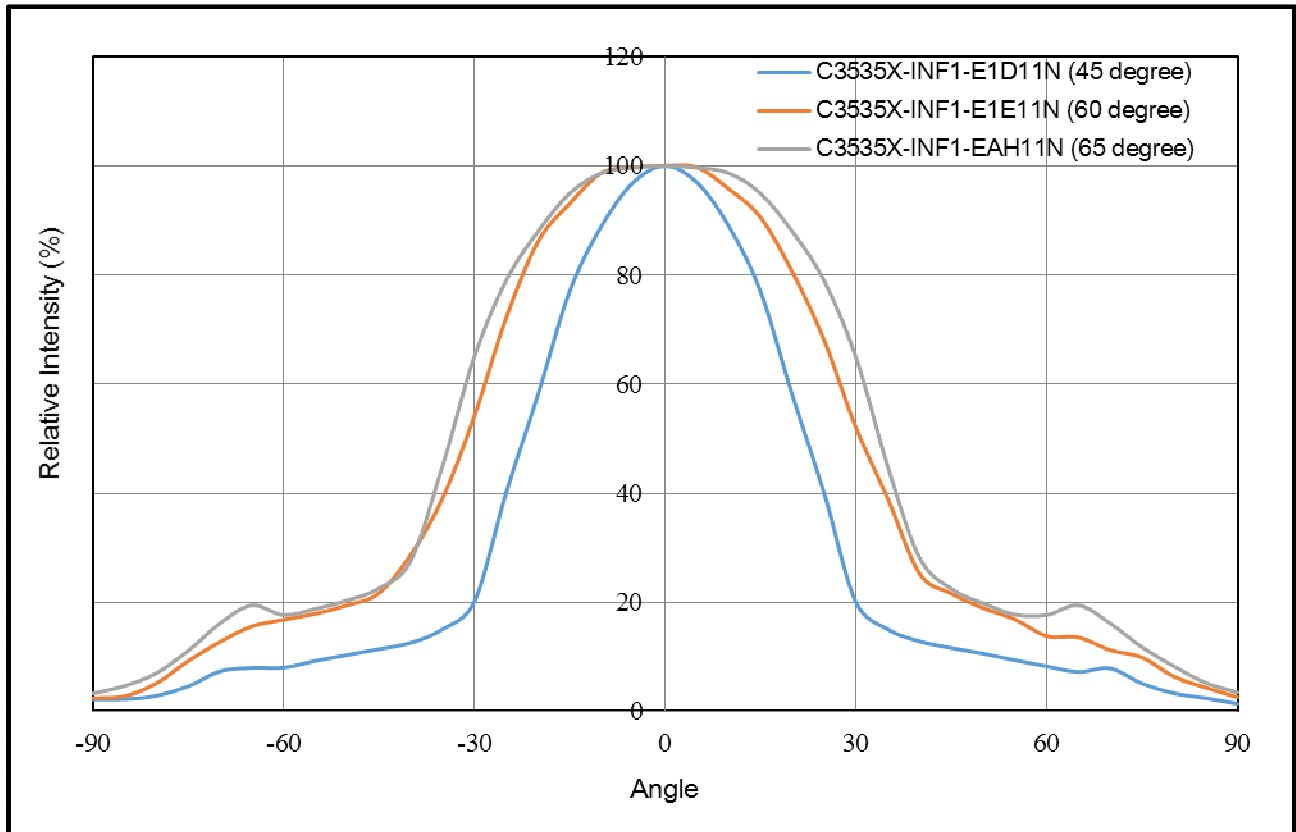
Notes:

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



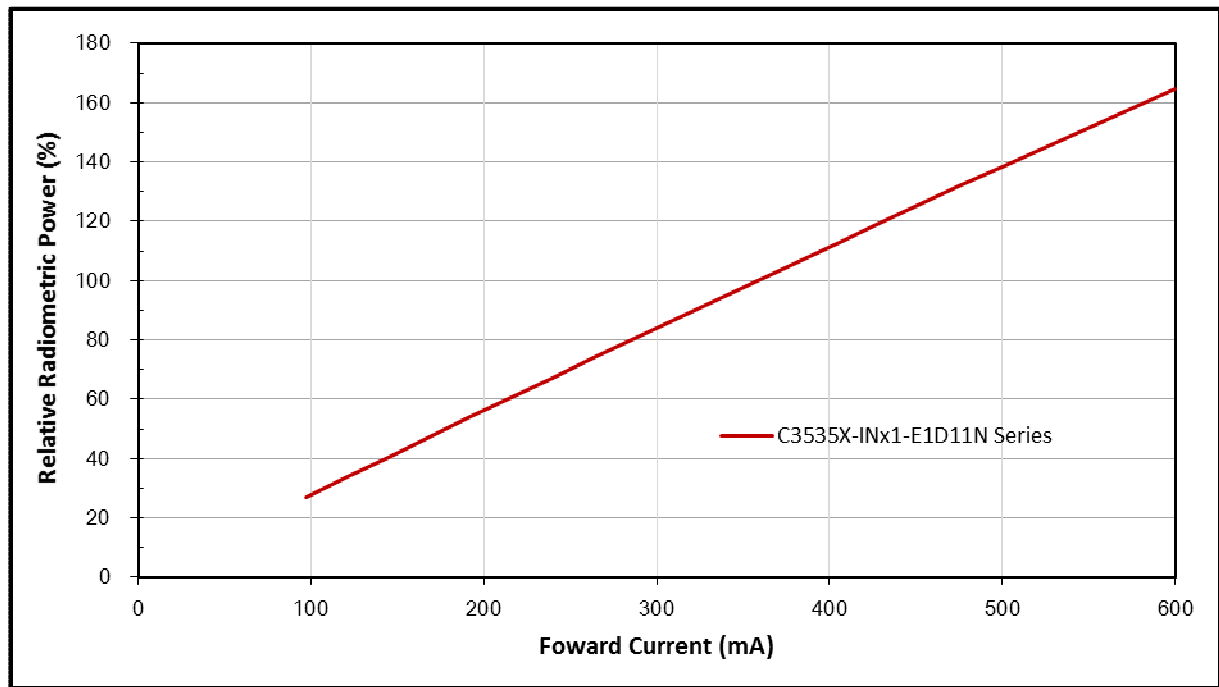
Relative Spectral Power Distribution, T_j=25 °C

Typical Spatial Radiation Pattern, $T_j=25\text{ }^{\circ}\text{C}$ 

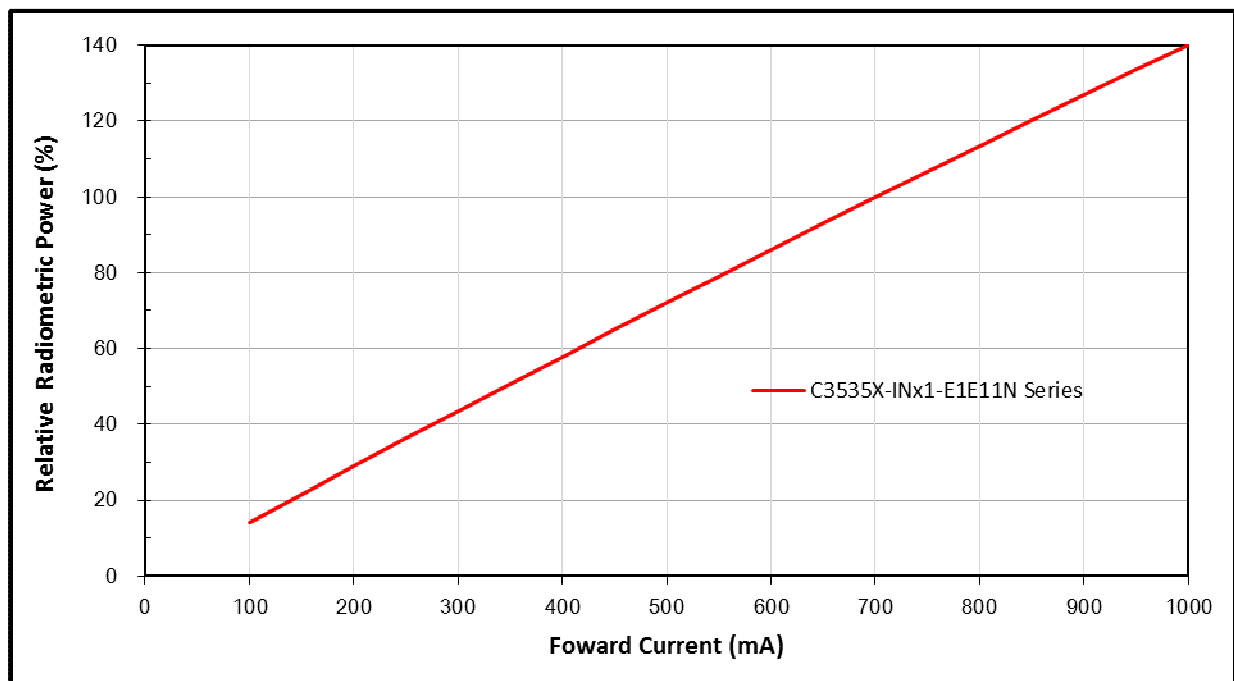


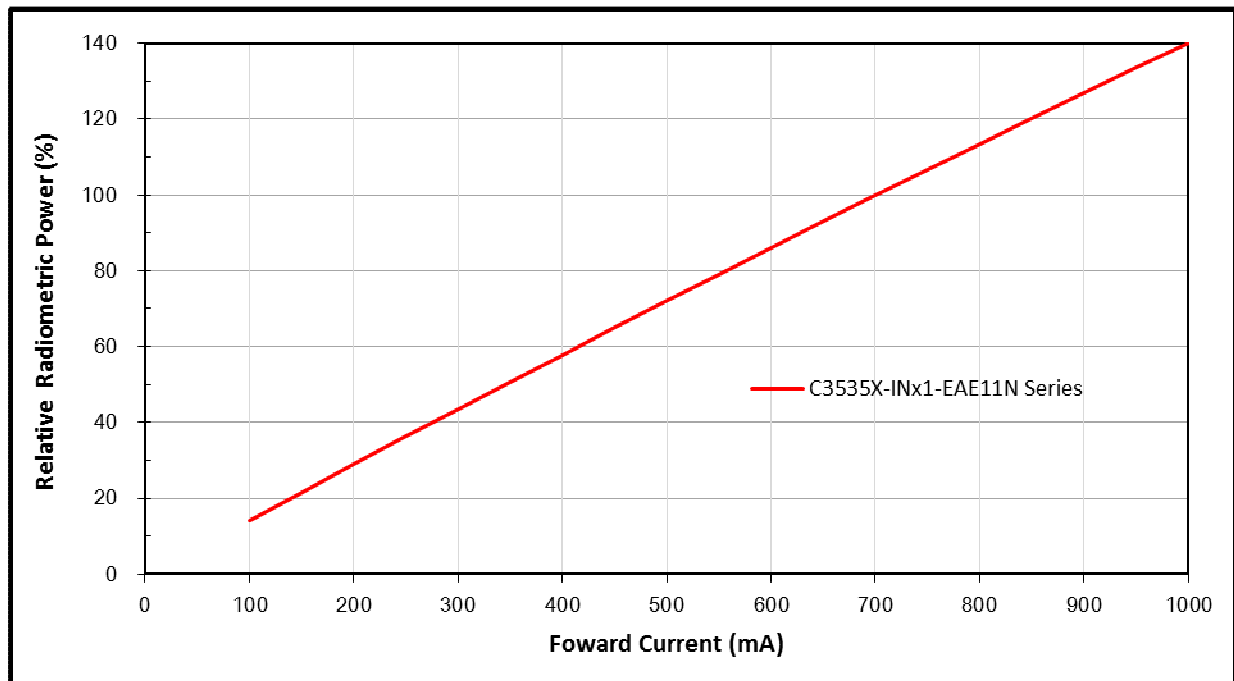
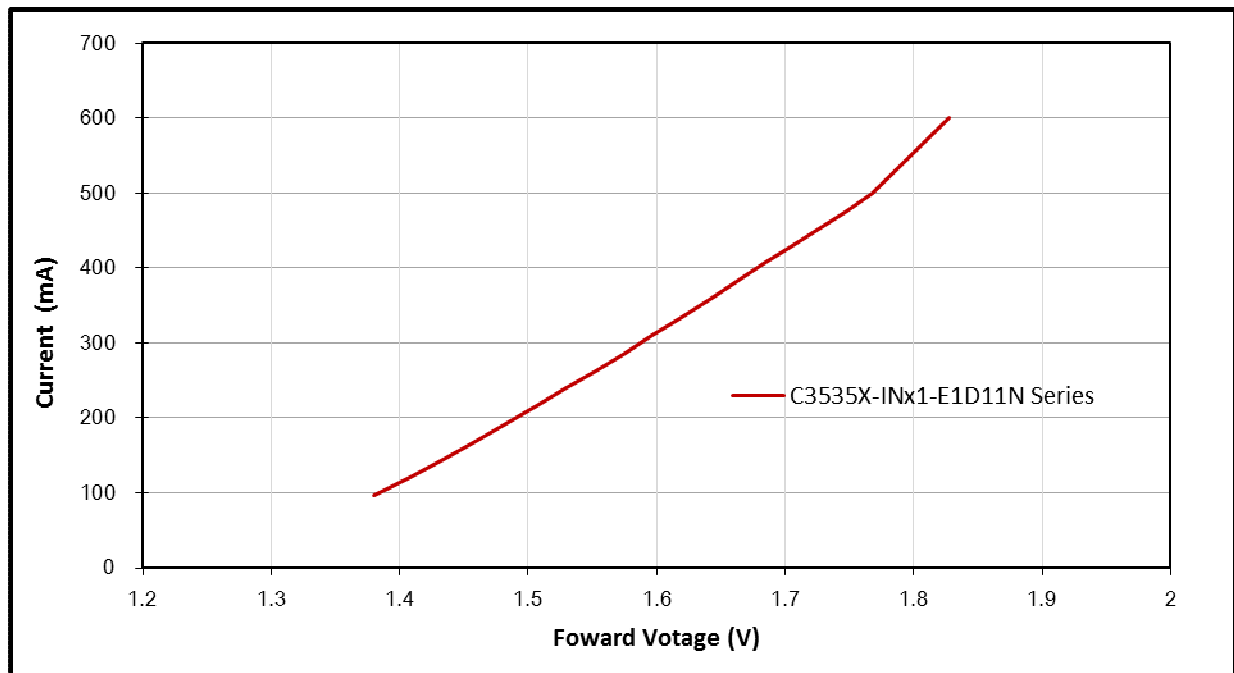
Typical Forward L-I Characteristics, $T_j=25\text{ }^{\circ}\text{C}$

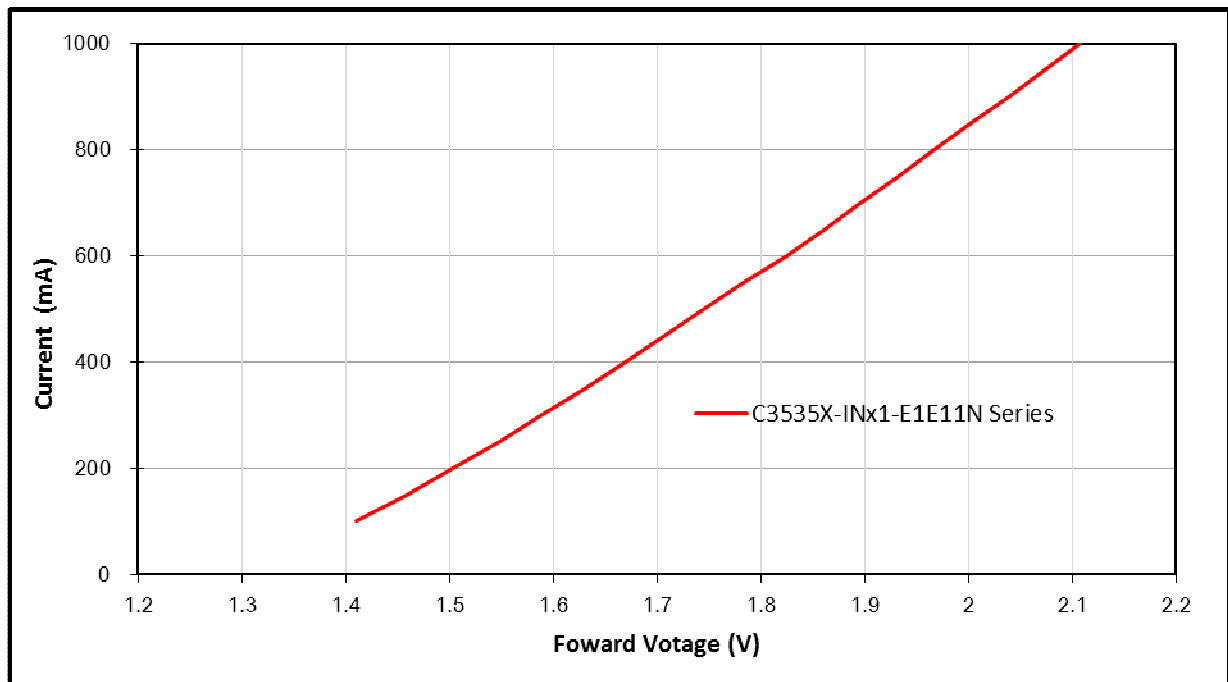
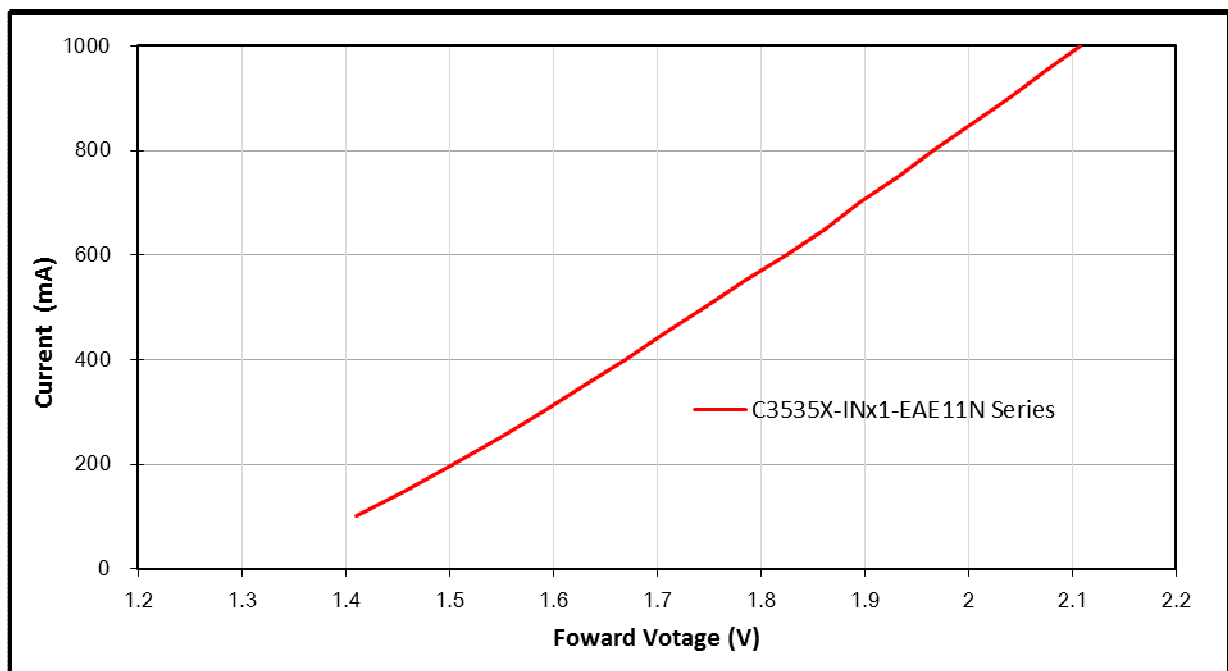
C3535X-INx1-E1D11N



C3535X-INx1-E1E11N series

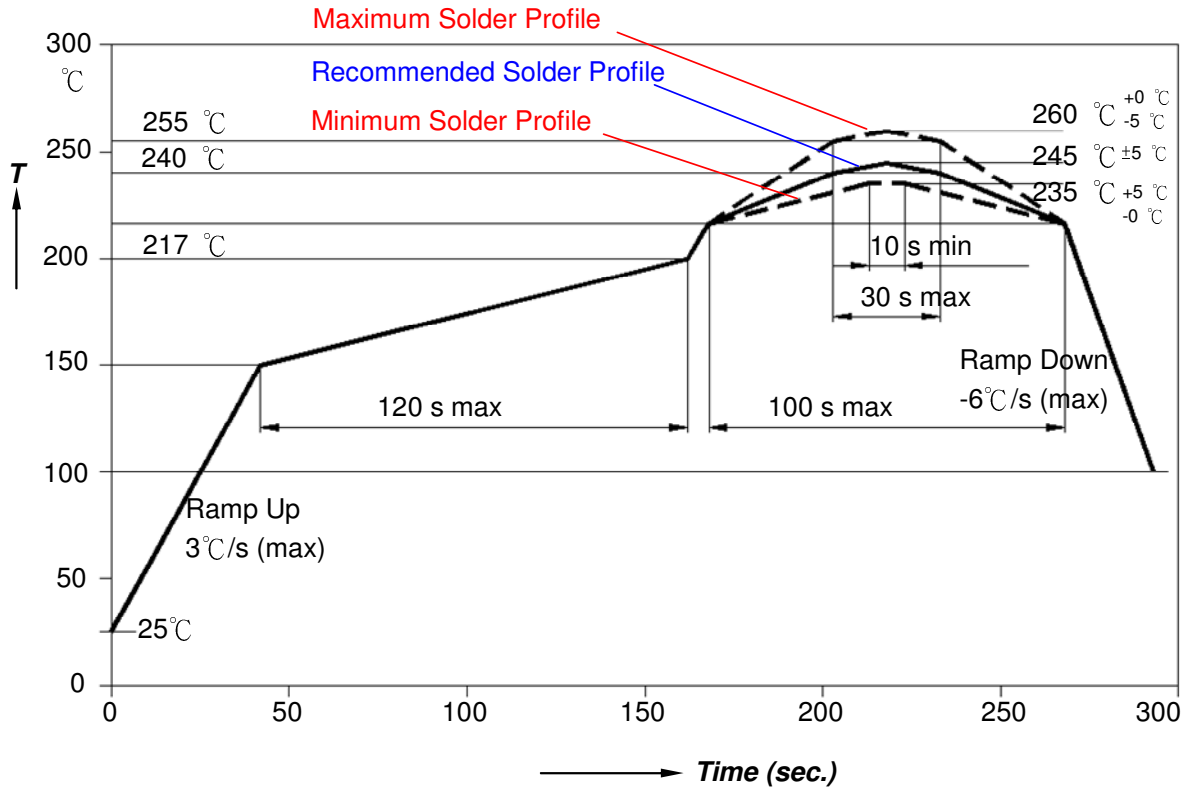


C3535X-INx1-EAH11N series**Typical Forward I-V Characteristics, $T_j=25\text{ }^{\circ}\text{C}$** **C3535X-INx1-E1D1N series**

C3535X-INx1-E1E11N series**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.



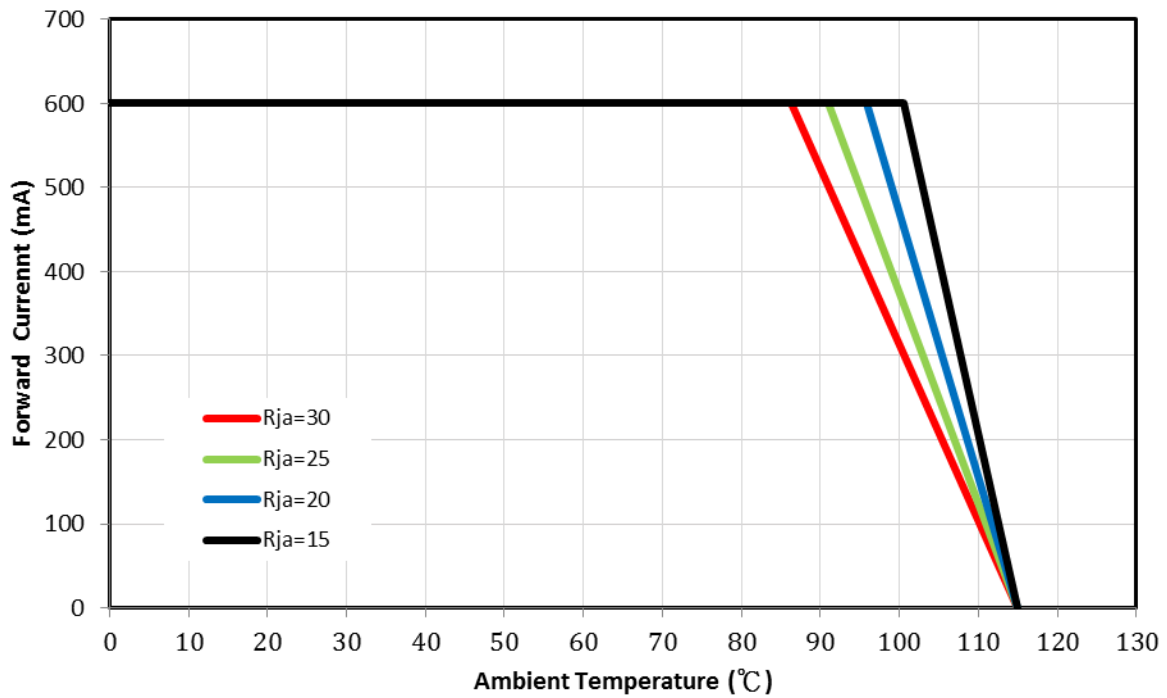
Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average Ramp-up Rate (Ts _{max} to Tp)	3°C/second max.	3°C/second max.
Preheat		
- Temperature Min(Ts _{min})	100°C	150°C
- Temperature Max(Ts _{max})	150°C	200°C
- Time(ts _{min} to ts _{max})	60-120 seconds	60-180 seconds
Time maintained above:		
- Temperature(T _L)	183°C	217°C
- Time(t _L)	60-150 seconds	60-150 seconds
Peak/classification Temperature(Tp)	215°C	260°C
Time within 5°C of actual Peak Temperature(tp)	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.



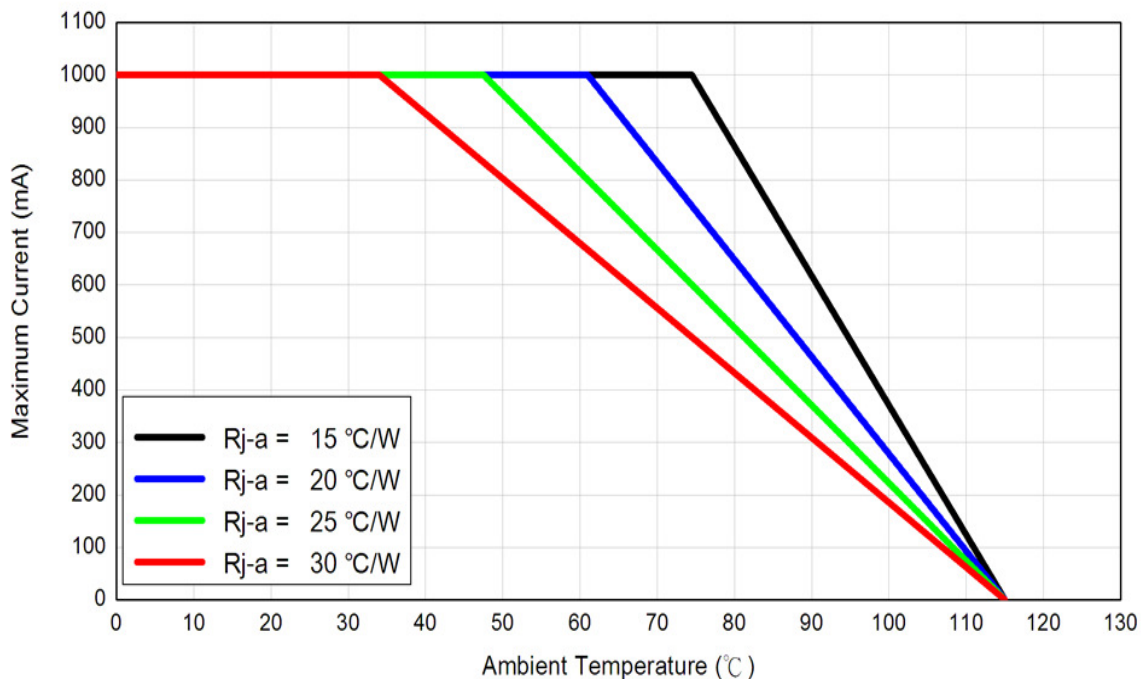
Thermal Design

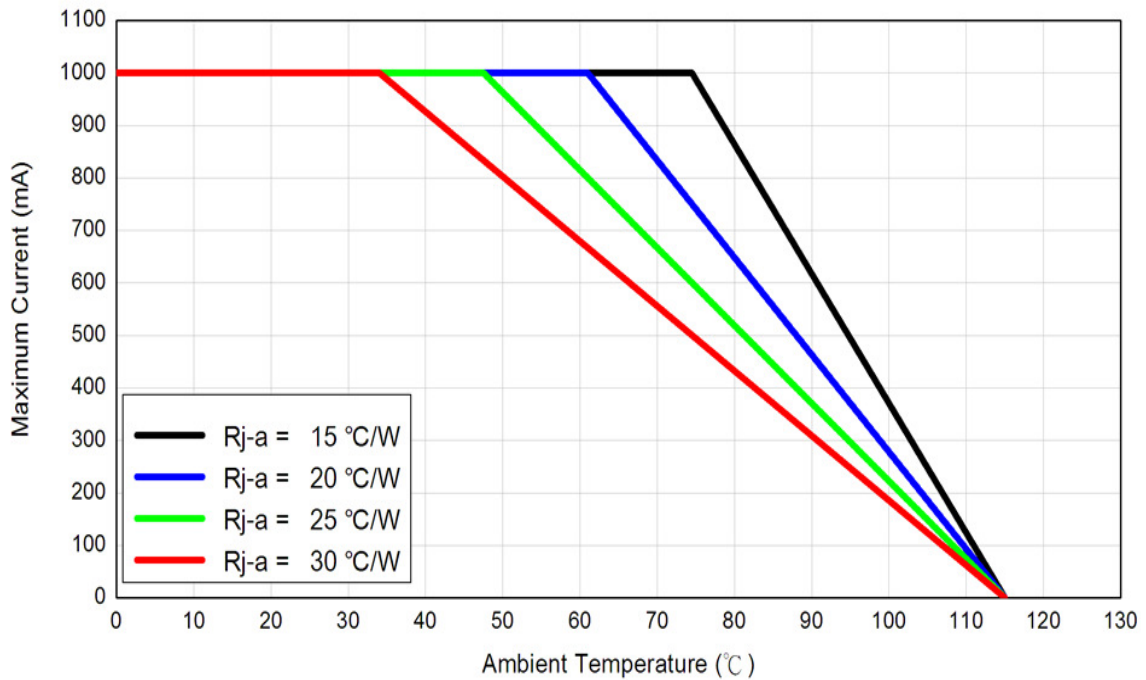
Thermal design of the end product is important. The thermal resistance between the junction and the solder point ($R_{\theta_{j-p}}$) and the end product should be designed to minimize the thermal resistance from the solder point to ambient in order to optimize the emitter life and optical characteristics.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

C3535X-INx1-E1D11N



C3535X-INx1-E1E1N series



C3535X-INx1-EAH11N series

The junction temperature can be correlated to the thermal resistance between the junction and ambient (R_{j-a}) by the following equation.

$$T_j = T_a + R_{j-a} \cdot W$$

T_j : LED junction temperature

T_a : Ambient temperature

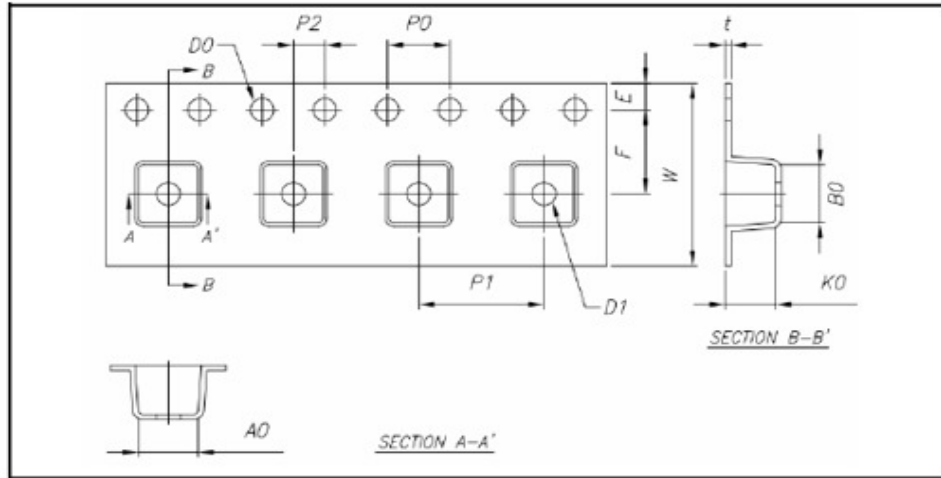
R_{j-a} : Thermal resistance between the junction and ambient

W : Input power ($I_F \cdot V_F$)



Packing Information

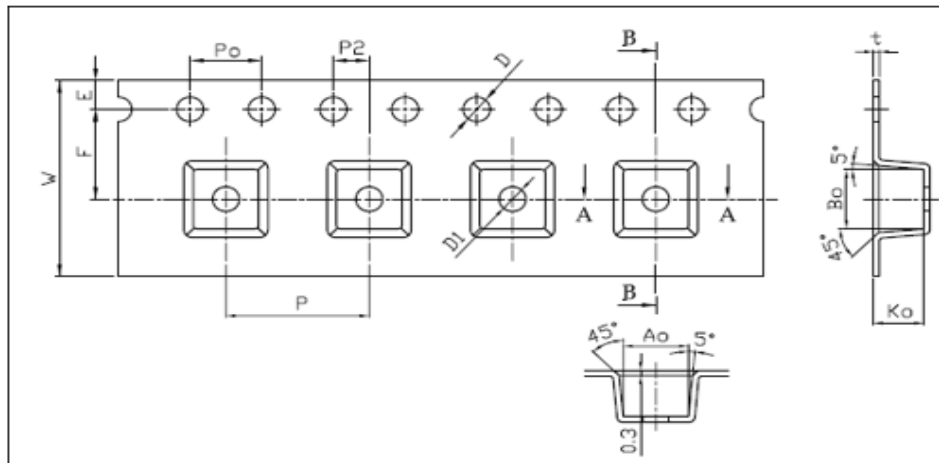
C3535X-INL1 series, Max QTY: 1000ea / roll



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

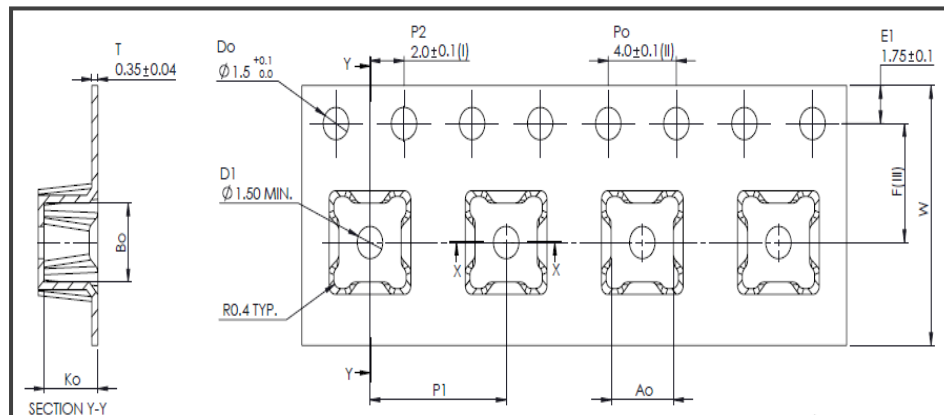
Item	Specification	Tol. (+/-)
t	0.25	±0.05
A0	3.80	±0.10
B0	3.80	±0.10
K0	2.20	±0.10

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



Symbol	Spec.	Tolerance
W	12.00	±0.30
E	1.75	±0.01
F	5.50	±0.01
D	1.50	+0.1/-0.0
D1	1.50	+0.1/-0.0
P0	4.00	±0.10
P	8.00	±0.10
P2	2.00	±0.10
P0*10	40.00	±0.20
A0	3.75	±0.10
B0	3.75	±0.10
K0	2.80	±0.10
t	0.35	±0.05

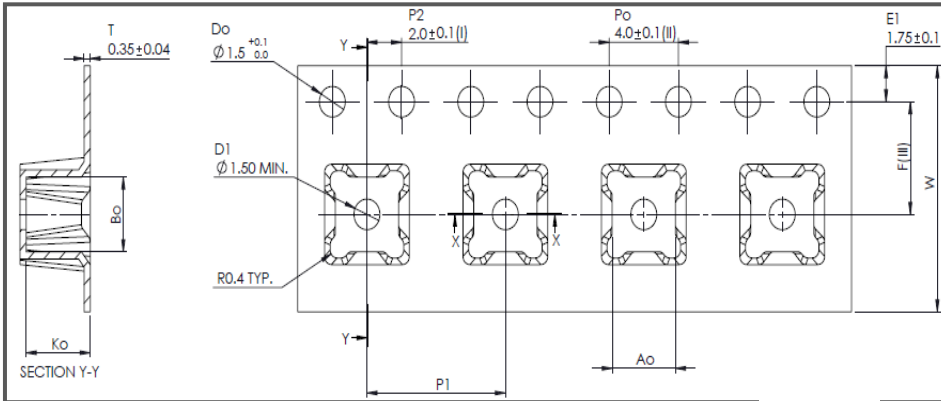
C3535X-INF1 series, Max QTY: 500ea / roll



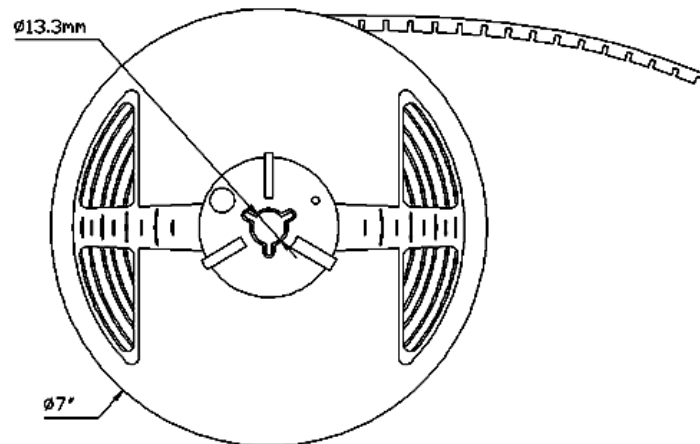
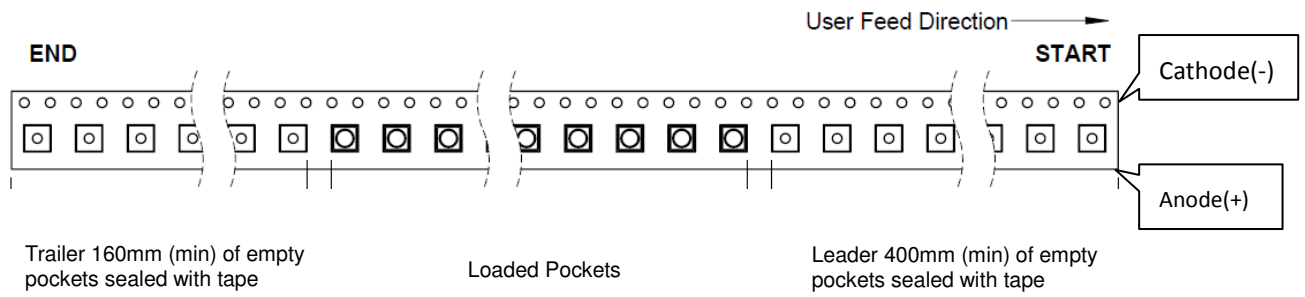
Ao	3.65	+/- 0.10
Bo	3.65	+/- 0.10
Ko	3.15	+/- 0.10
F	5.50	+/- 0.10
P1	8.00	+/- 0.10
W	12.00	+/- 0.30



C3535X-INS1 series, Max QTY: 500ea / roll



Ao	3.65	+/- 0.10
Bo	3.65	+/- 0.10
Ko	3.70	+/- 0.10
F	5.50	+/- 0.10
P ₁	8.00	+/- 0.10
W	12.00	+/- 0.30



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 or please contact sales@tslc.com.tw.



www.tslc.com.tw

ASIA PACIFIC

3F, No. 8, Xin An Road,
Hsinchu Science Park
Hsinchu City
Taiwan, ROC

Tel: +886-3-5789555

Fax: +886-3-5788111

sales@tslc.com.tw

