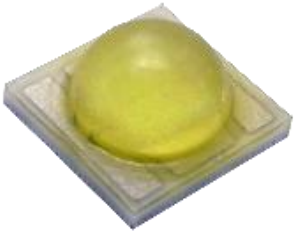
Harvatek Surface Mount CHIP LED Data Sheet
HT-C3501BPU Standard Datasheet



CONTENTS

Introduction

- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by HARVATEK for any infringements of intellectual property or other rights of the third parties which may result from it use.
- HARVATEK is continually making an effort to improve the quality of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing HARVATEK products, to comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such HARVATEK products cause loss of human life, bodily injury or damage to property.
- The HARVATEK products listed in this document are intended for usage in general electronics (computer, personal equipment, office equipment, industrial robotics, domestic, etc…) These products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury.
- In developing your designs, please ensure that HARVATEK products are used within specified operating ranges as set forth in the most recent HARVATEK products specifications.
- Also, please keep in mind of the precautions listed in this document.

Product Specification

	Specification	Material	Quantity
Total Flux	Typical 108 lm @350mA/ Ta= 25℃		
Correlated Color Temperature	2550K~10000K @350mA/ Ta=25℃		
V_F	3.03-3.99V @350mA/ Ta=25℃		
I_R	HT standard		
Resin	Yellow	Silicone resin	
Carrier tape	EIA 481-1A specs	Conductive black tape	200pcs per reel
Reel	EIA 481-1A specs	Conductive black	
Label	HT standard	Paper	
Packing bag	HT standard	Aluminum laminated bag/ no-zipper	One reel per bag
Carton	HT standard	Paper	Non-specified

Others:

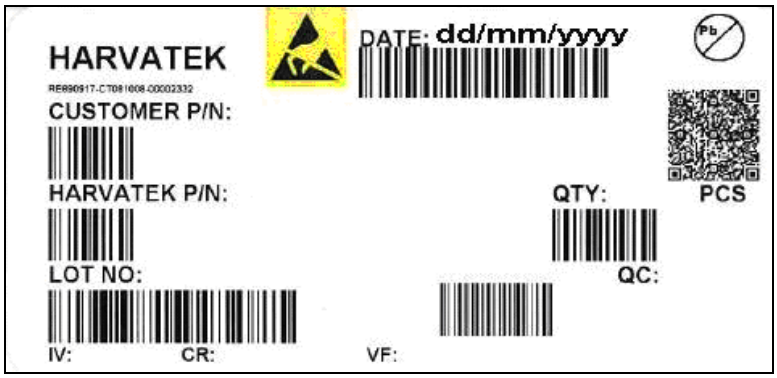
ATTENTION: Electric Static Discharge (ESD) protection

The symbol shown on the page herein to introduce 'Electro-Optical Characteristics'. ESD protection for GaP and AlGaAs based chips is still necessary even though they are safe in low static-electric discharge. Parts built with AlInGaP, GaN, or/and InGaN based chips are **STATIC SENSITIVE devices**. ESD protection has to considered and taken in the initial design stage. If manual work/process is needed, please ensure the device is well protected from ESD during all the process.

Compliance and Certificatio

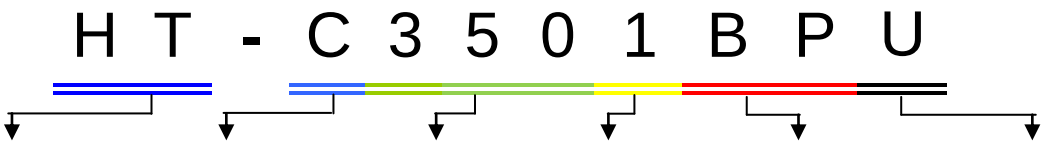
RoHS compliant and IS9002, QS9000 and ISO14001 certified.

Label spec.



Description of Model No. and Lot No.

Model No.



Company	Product Name	Package	Dice	Emitter Color	Current code
HT: For Harvatek	C:Ceramic substrate	Outline dimension	1: Single 2: Twin	BP: White	U:350mA

Lot No.

1	2	3	4	5	6	7	8	9	10
E	1	A	1	A	2	2	L	1	2
Code 1 2		Code 3	Code 4	Code 5	Code 6	Code 7	Code 8	Code 9	Code 10
		Mfg. Year	Mfg. Month	Mfg. Date	Consecutive number		Special code		
Internal Tracing Code		2010-A 2011-B 2012-C 2013-D . .	1:Jan. 2:Feb. .... A:Oct. B:Nov. C:Dec.	1:A 2:B 3:C ... 26:Z 27:7 28:8 29:9 30:3 31:4	01~ZZ		000~ZZZ		

Product Feature

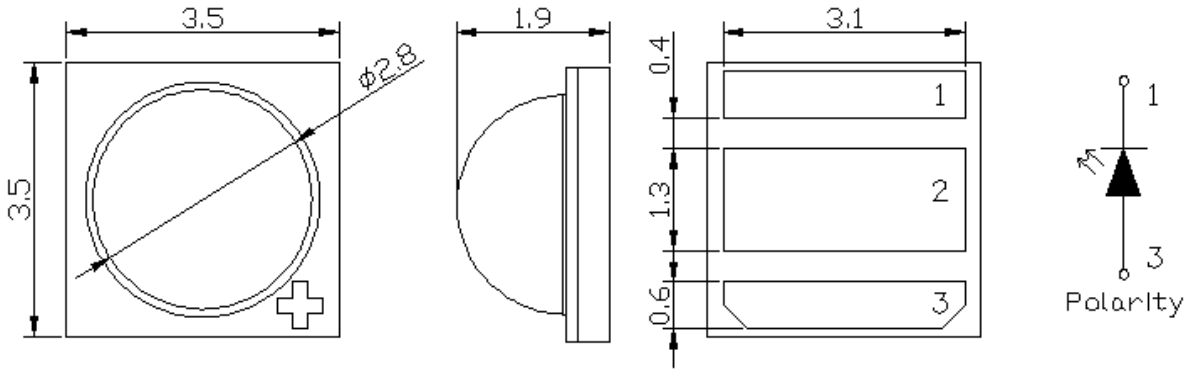
- small package with high efficiency
- Wide view angle
- Easy to fixed
- No UV
- Long operating time (Up to 50,000hrs)
- point source with color uniformity
- Lower forward voltage operated
- More energy efficient than incandescent and most halogen lamps
- ESD with 1KV
- Instant light (less than 100nS)

Application

- Reading lights (car, bus, aircraft)
- Portable (flashlight, bicycle)
- Task lighting
- Garden lighting
- Rail lighting
- Wayside lighting
- LCD Backlights
- Light Guides
- Traffic signaling
- Architectural lighting

Product Out Line Dimension

Tolerance: +/-0.1



Unit: mm

Electro-Optical

Absolute Maximum Ratings

(T_a =25°C)

Parameter	Rating	Unit	Conditions
DC Forward Current*1	350	mA	-
Peak Pulsed Forward Current *2	1000	mA	-
Reverse Voltage	5	V	-
LED junction Temperature	120	°C	-
Operating Temperature	-30~+85	°C	-
Storage Temperature	-40~+120	°C	-
Soldering Temperature	260	°C	For 5 sec. Max.

*1: Proper current derating must be observed to maintain junction temperature below the maximum

*2:tp≦10μs, Duty cycle=0.01

Electro-Optical Characteristics

(T_a =25°C)

Parameter	Symbol	Min.	TYP.	Max.	Unit
Viewing angle	2θ ½	115	-	130	Deg.
Forward Voltage (I_F=350mA)	V_F	3.03	-	3.99	V
Luminous Flux	Flux	-	108	-	lm
Correlated Color Temperature	CCT	2550	-	10000	K
Temperature Coefficient of Forward Voltage	$\Delta V_F/\Delta T$	-	2	-	mV/°C
Thermal Resistance Junction to Board (I_F=350mA)	$R\theta_{J-B}$	-	9	-	°C/W
CRI			70		

Luminous Flux Rank

Rank Code	Symbol	Condition	Min.	Typ.	Max.	Unit
Full	ΦV	I_F=350mA	67.2	-	147.2	lm
PT1			67.2	-	76.6	
PT2			76.6	-	87.4	
PU1			87.4	-	99.6	
PU2			99.6	-	113.6	
PV1			113.6	-	129.5	
PV2			129.5	-	147.2	

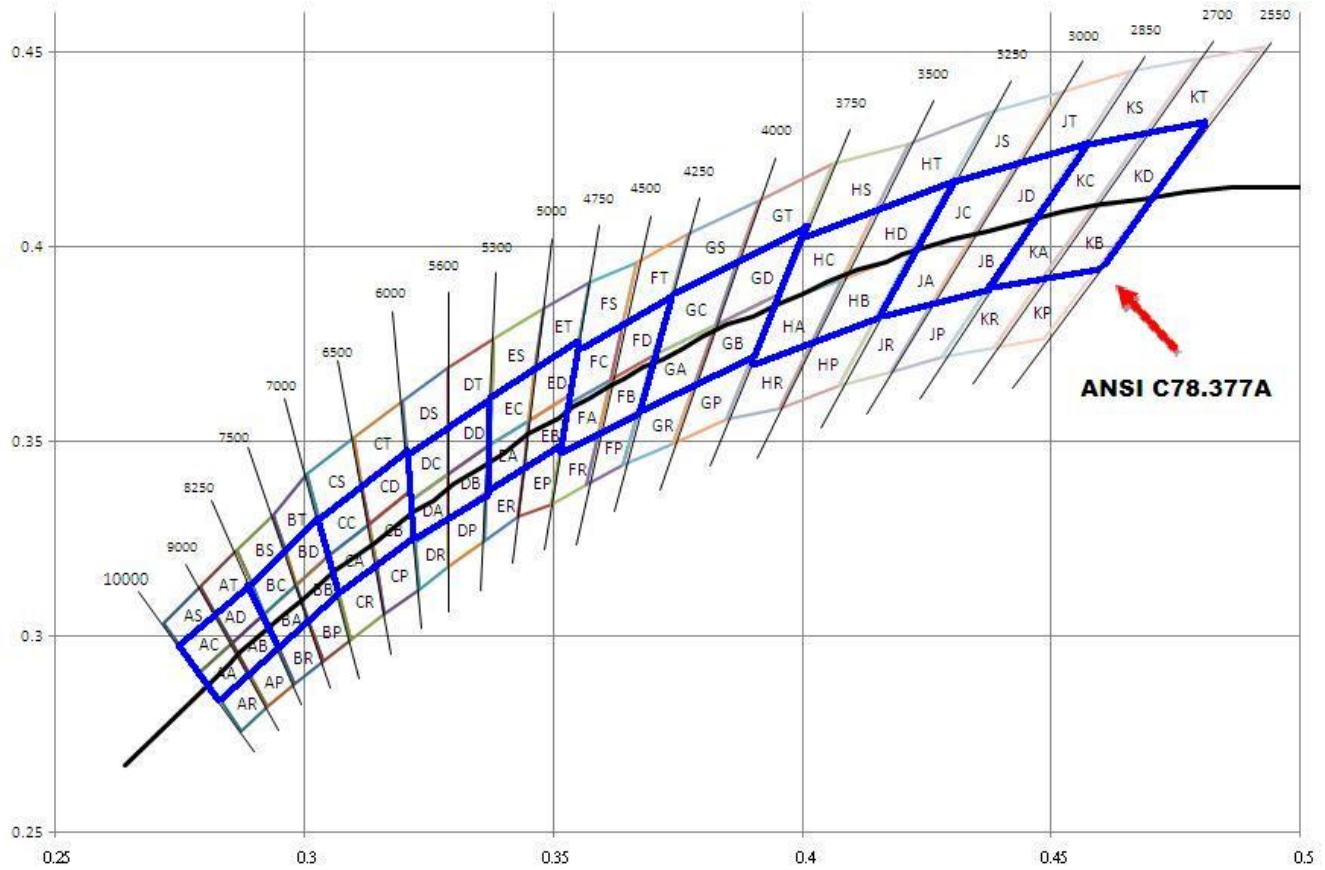
Note: It maintains a tolerance of ±10% on flux

Electrical Rank

Rank Code	Symbol	Condition	Min.	Typ.	Max.	Unit
Full	V_F	I_F=350mA	3.03	-	3.99	V
P05			3.03	-	3.27	
P06			3.27	-	3.51	
P07			3.51	-	3.75	
P08			3.75	-	3.99	

Note: It maintains a tolerance of ±0.1V on forward voltage measurements

Color Temperature Coordinates



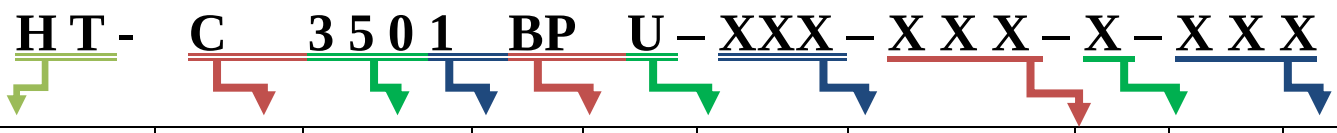
Correlated Color Temperature Rank

Condition	Color	Bin Code	Min.	Typ.	Max.	Unit
I_F=350mA	Warm White	KD	2550	-	2700	K
		KB	2550	-	2700	
		KC	2700	-	2850	
		KA	2700	-	2850	
		JD	2850	-	3000	
		JB	2850	-	3000	
		JC	3000	-	3250	
		JA	3000	-	3250	
		HD	3250	-	3500	
		HB	3250	-	3500	
		HC	3500	-	3750	
		HA	3500	-	3750	
	Neutral White	GD	3750	-	4000	
		GB	3750	-	4000	
		GC	4000	-	4250	
		GA	4000	-	4250	
		FD	4250	-	4500	
		FB	4250	-	4500	
		FC	4500	-	4750	
		FA	4500	-	4750	
		ED	4750	-	5000	
		EB	4750	-	5000	
		EC	5000	-	5300	
		EA	5000	-	5300	
	Pure White	DD	5300	-	5600	
		DB	5300	-	5600	
		DC	5600	-	6000	
		DA	5600	-	6000	
		CD	6000	-	6500	
		CB	6000	-	6500	
		CC	6500	-	7000	
		CA	6500	-	7000	
	Cold white	BD	7000	-	7500	

		BB	7000	-	7500	
		BC	7500	-	8250	
		BA	7500	-	8250	
		AD	8250	-	9000	
		AB	8250	-	9000	
		AC	9000	-	10000	
		AA	9000	-	10000	

BIN AND ORDER CODE FORMAT

Bin codes and order codes are configured in the following manner:



Company	Product	Package	Dice	Color	Current	CCT	LM	VF	CRI
Harvatek	Ceramic Substrate	Outline Dimension	1: Single	BP: White	U: 350mA	**WW**: Warm White (Ka Kb Kc Kd Ja Jb Jc Jd Ha Hb Hc Hd) **WJ**: Warm White (Ja Jb Jc Jd) **NW**: Neutral White (Ga Gb Gc Gd Ea Eb Ec Ed Fa Fb Fc Fd) **NG**: Neutral White (Ga Gb GC GD) **NGF**: Neutral White (Ga Gc Fb Fd) **NEF**: Neutral White (Ea Eb Ec Ed Fa Fb Fc Fd) **PW**: Pure white (Ca Cb Cc Cd Da Db Dc Dd) **PDE**: Pure White (Da Db Dc Dd Ea Ec)	PT1 PT2 PU1 PU2 PV1 PV2	F: FULL (P05-P08)	CR1: Typ. 70 CR2: Typ. 75

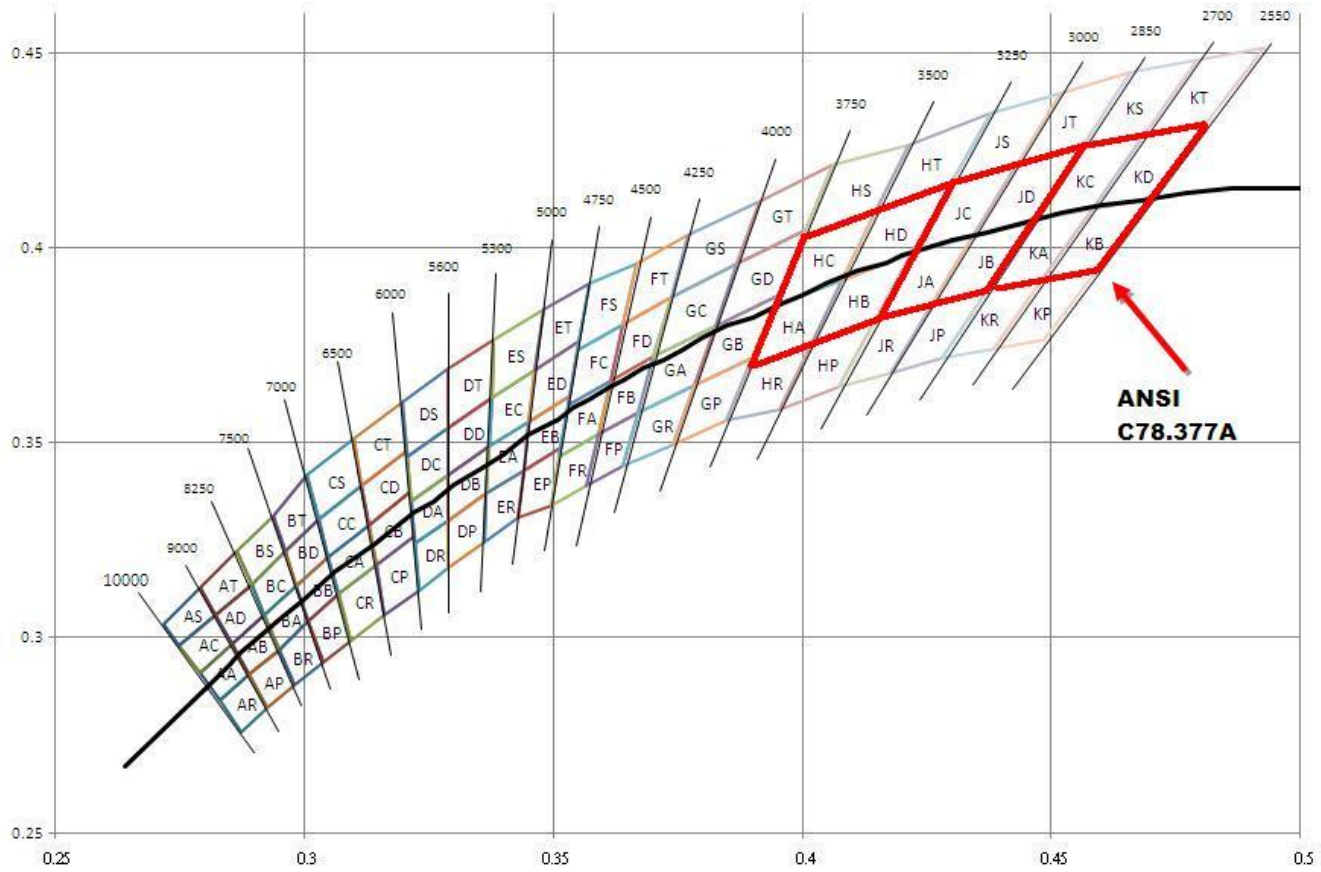
						CW: Cold White (Aa Ab Ac Ad Ba Bb Bc Bd)			

Standard Order Codes and Bins (HT-C3501BPU Warm White)

The following tables of order codes list Correlated Color Temperature, Luminous Flux, Forward Voltage and CRI regions for the various categories of HT-C3501BPU. For other combinations, contact Harvatek or an authorized distributor.

HT-C3501BPU Standard Order Codes - Warm White					
Condition	Correlated Color Temperature	Luminous Flux	Forward Voltage	CRI	Order Code
I_F=350mA	Ka Kb Kc Kd Ja Jb Jc Jd Ha Hb Hc Hd (2550-3750°K)	PT1 PT2	Full P05 P06 P07 P08	75	HT-C3501BPU-WW-PT1-F-CR2
	Ja Jb Jc Jd (2850-3250°K)	PT1 PT2	Full P05 P06 P07 P08	75	HT-C3501BPU-WJ-PT1-F-CR2

Color Temperature Coordinates



Correlated Color Temperature Rank

Condition	Color	Bin Code	Min.	Typ.	Max.	Unit
I_F=350mA	Warm White	KD	2550	-	2700	K
		KB	2550	-	2700	
		KC	2700	-	2850	
		KA	2700	-	2850	
		JD	2850	-	3000	
		JB	2850	-	3000	
		JC	3000	-	3250	
		JA	3000	-	3250	
		HD	3250	-	3500	
		HB	3250	-	3500	
		HC	3500	-	3750	
		HA	3500	-	3750	

Luminous Flux Rank

Rank Code	Symbol	Condition	Min.	Typ.	Max.	Unit
Full	ΦV	I_F=350mA	67.2	-	87.4	lm
PT1			67.2	-	76.6	
PT2			76.6	-	87.4	

Note: It maintains a tolerance of ±10% on flux

Electrical Rank

Rank Code	Symbol	Condition	Min.	Typ.	Max.	Unit
Full	V_F	I_F=350mA	3.03	-	3.99	V
P05			3.03	-	3.27	
P06			3.27	-	3.51	
P07			3.51	-	3.75	
P08			3.75	-	3.99	

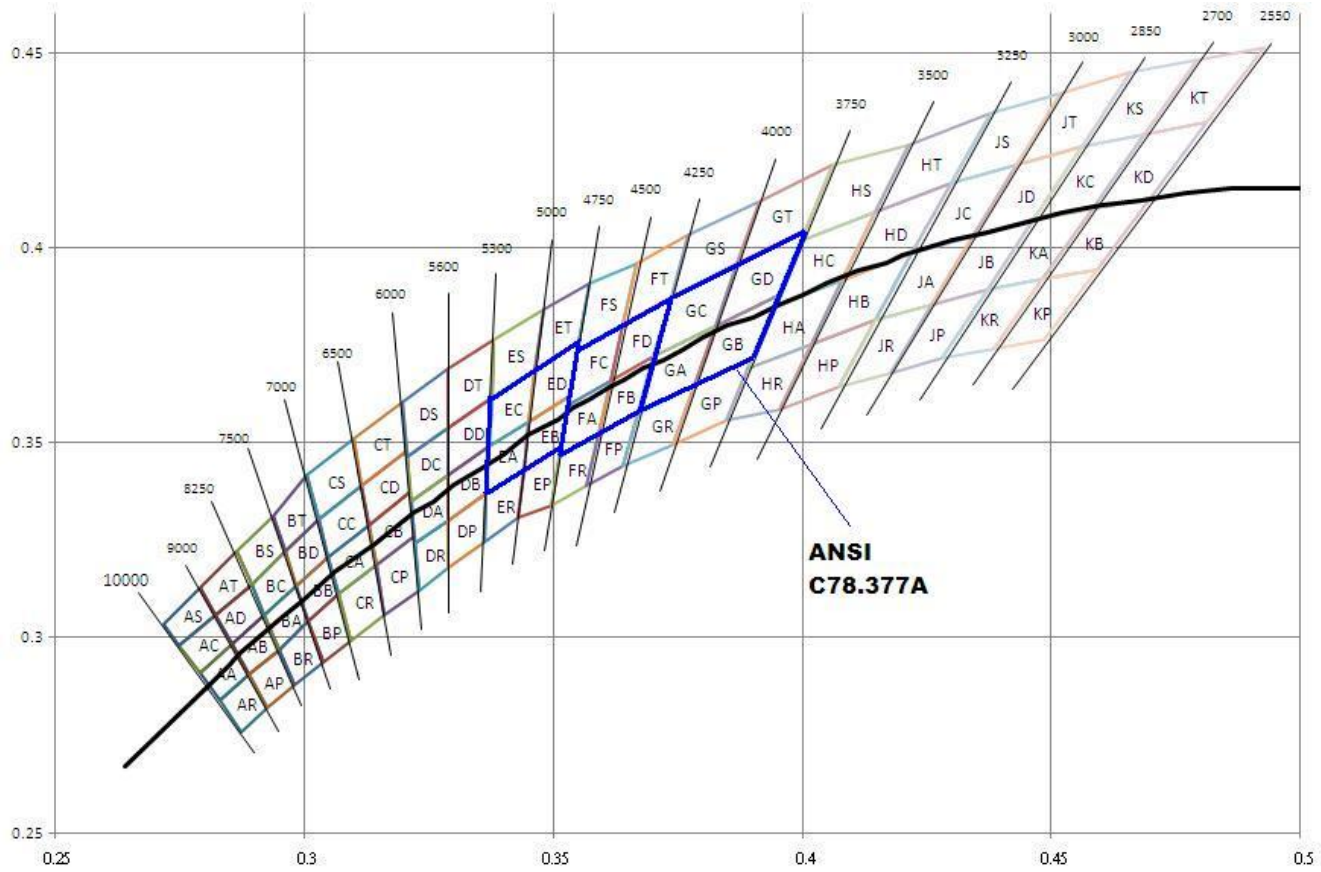
Note: It maintains a tolerance of ±0.1V on forward voltage measurements

Standard Order Codes and Bins (HT-C3501BPU Neutral White)

The following tables of order codes list Correlated Color Temperature, Luminous Flux, Forward Voltage and CRI regions for the various categories of HT-C3501BPU. For other combinations, contact Harvatek or an authorized distributor.

HT-C3501BPU Standard Order Codes - Neutral White					
Condition	Correlated Color Temperature	Luminous Flux	Forward Voltage	CRI	Order Code
I_F=350mA	Ga Gb Gc Gd Ea Eb Ec Ed Fa Fb Fc Fd (3750-5300°K)	PT2 PU1 PU2	Full P05 P06 P07 P08	70	HT-C3501BPU-NW-PT2-F-CR1
	Ga Gc FB FD (4000-4500°K)	PT2 PU1 PU2	Full P05 P06 P07 P08	75	HT-C3501BPU-NGF-PT2-F-CR2
	Ga Gb Gc Gd (3750-4250°K)	PT2 PU1 PU2	Full P05 P06 P07 P08	75	HT-C3501BPU-NG-PT2-F-CR2
	Ea Eb Ec Ed Fa Fb Fc Fd (4250-5300°K)	PT2 PU1 PU2	Full P05 P06 P07 P08	70	HT-C3501BPU-NEF-PT2-F-CR1

Color Temperature Coordinates



Correlated Color Temperature Rank

Condition	Color	Bin Code	Min.	Typ.	Max.	Unit
I_F=350mA	Neutral White	GD	3750	-	4000	K
		GB	3750	-	4000	
		GC	4000	-	4250	
		GA	4000	-	4250	
		FD	4250	-	4500	
		FB	4250	-	4500	
		FC	4500	-	4750	
		FA	4500	-	4750	
		ED	4750	-	5000	
		EB	4750	-	5000	
		EC	5000	-	5300	
		EA	5000	-	5300	

Luminous Flux Rank

Rank Code	Symbol	Condition	Min.	Typ.	Max.	Unit
Full	ΦV	IF=350mA	76.6	-	113.6	lm
PT2			76.6	-	87.4	
PU1			87.4	-	99.6	
PU2			99.6	-	113.6	

Note: It maintains a tolerance of ±10% on flux

Electrical Rank

Rank Code	Symbol	Condition	Min.	Typ.	Max.	Unit
Full	V_F	I_F=350mA	3.03	-	3.99	V
P05			3.03	-	3.27	
P06			3.27	-	3.51	
P07			3.51	-	3.75	
P08			3.75	-	3.99	

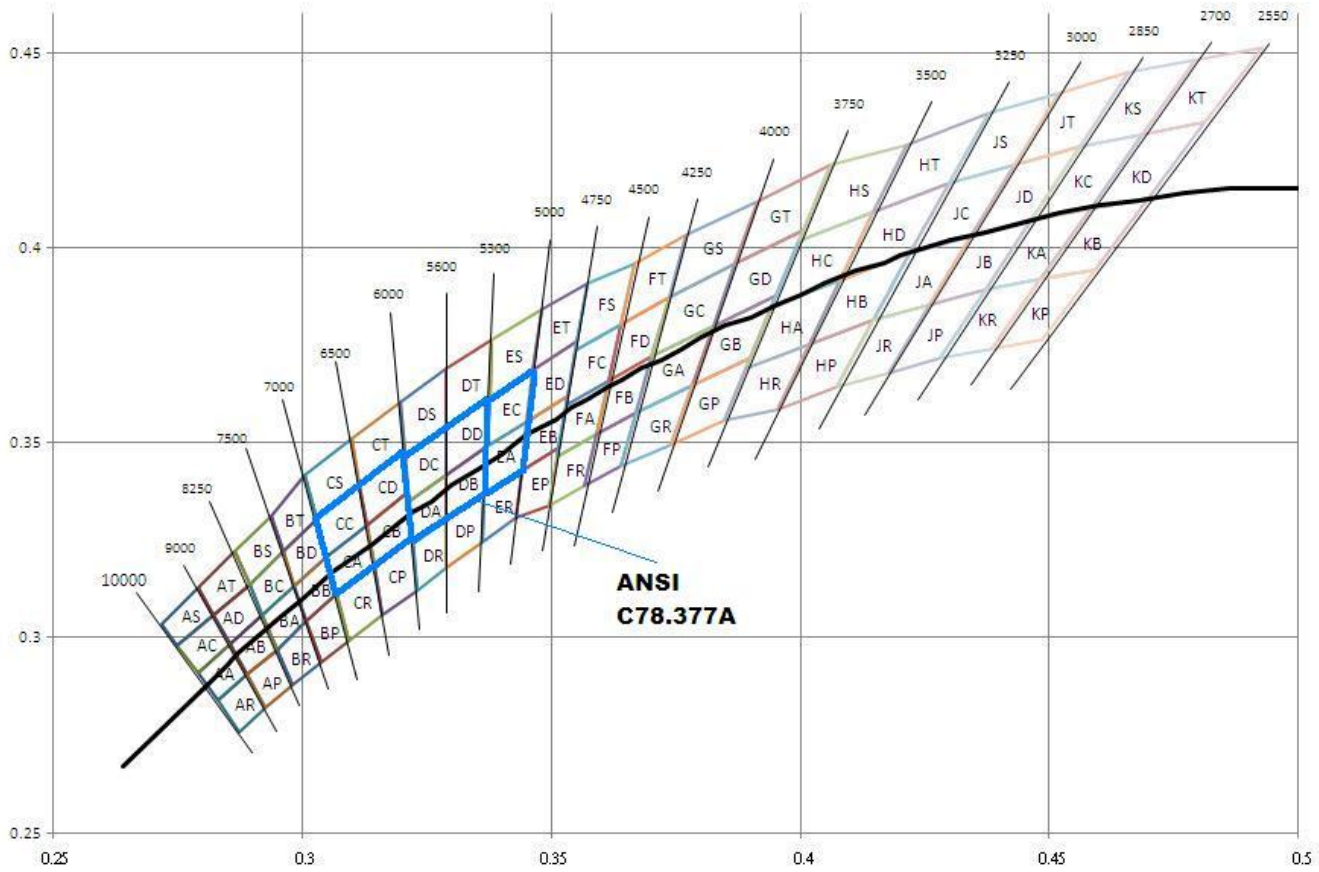
Note: It maintains a tolerance of ±0.1V on forward voltage measurements

Standard Order Codes and Bins (HT-C3501BPU Pure White)

The following tables of order codes list Correlated Color Temperature, Luminous Flux, Forward Voltage and CRI regions for the various categories of HT-C3501BPU. For other combinations, contact Harvatek or an authorized distributor.

HT-C3501BPU Standard Order Codes - Pure White					
Condition	Correlated Color Temperature	Luminous Flux	Forward Voltage	CRI	Order Code
I_F=350mA	Ca Cb Cc Cd Da Db Dc Dd (5300-7000°K)	PU2 PV1 PV2	Full P05 P06 P07 P08	70	HT-C3501BPU-PW-PU2-F-CR1
	Da Db Dc Dd Ea Ec (5000-6000°K)	PU1 PU2 PV1 PV2	Full P05 P06 P07 P08	70	HT-C3501BPU-PDE-PU1-F-CR1

Color Temperature Coordinates



Correlated Color Temperature Rank

Condition	Color	Bin Code	Min.	Typ.	Max.	Unit
I_F=350mA	Pure White	EC	5000	-	5300	K
		EA	5000	-	5300	
		DD	5300	-	5600	
		DB	5300	-	5600	
		DC	5600	-	6000	
		DA	5600	-	6000	
		CD	6000	-	6500	
		CB	6000	-	6500	
		CC	6500	-	7000	
		CA	6500	-	7000	

Luminous Flux Rank

Rank Code	Symbol	Condition	Min.	Typ.	Max.	Unit
Full	ΦV	I_F=350mA	87.4	-	147.2	lm
PU1			87.4	-	99.6	
PU2			99.6	-	113.6	
PV1			113.6	-	129.5	
PV2			129.5	-	147.2	

Note: It maintains a tolerance of ±10% on flux

Electrical Rank

Rank Code	Symbol	Condition	Min.	Typ.	Max.	Unit
Full	V_F	I_F=350mA	3.03	-	3.99	V
P05			3.03	-	3.27	
P06			3.27	-	3.51	
P07			3.51	-	3.75	
P08			3.75	-	3.99	

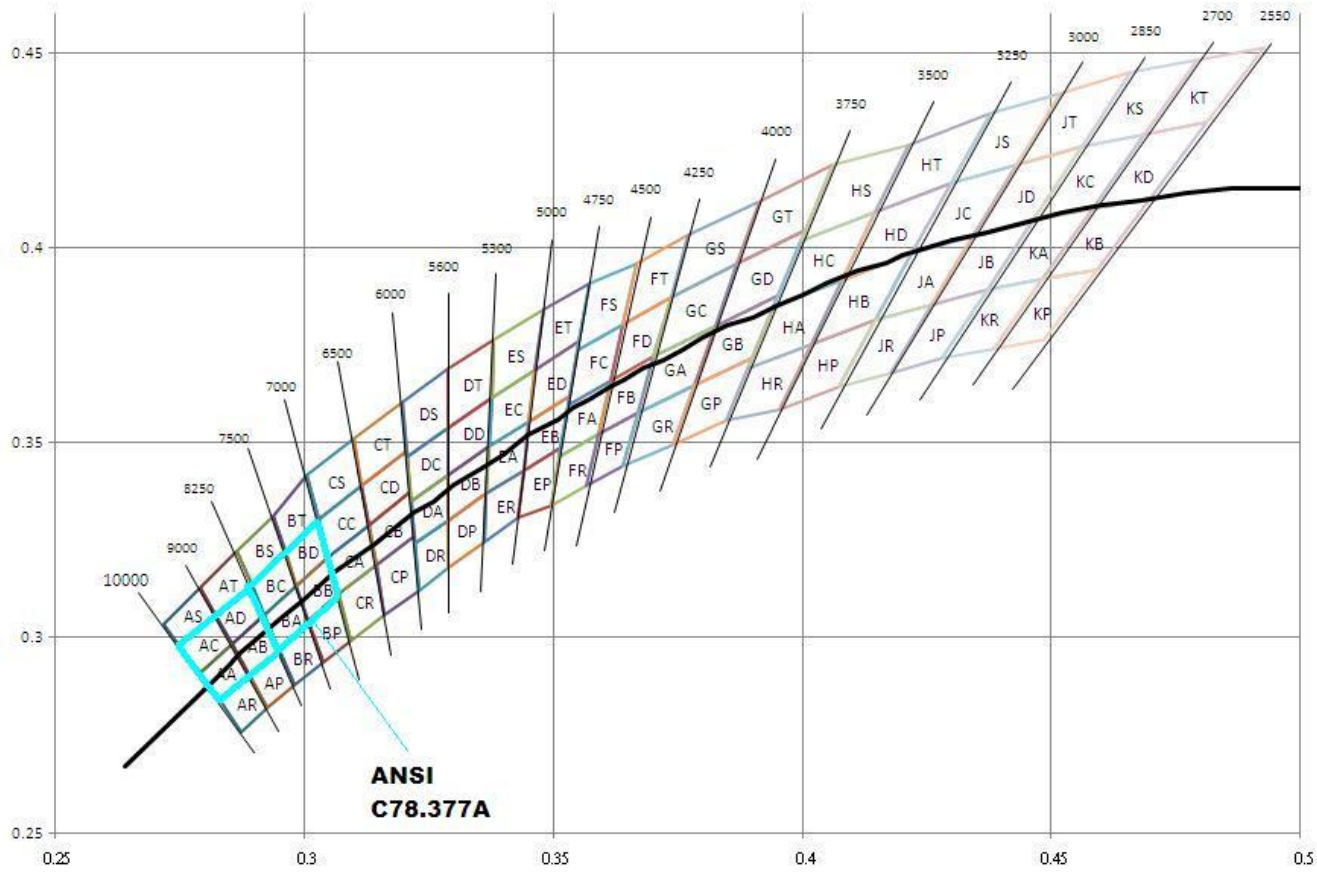
Note: It maintains a tolerance of ±0.1V on forward voltage measurements

Standard Order Codes and Bins (HT-C3501BPU Cold White)

The following tables of order codes list Correlated Color Temperature, Luminous Flux, Forward Voltage and CRI regions for the various categories of HT-C3501BPU. For other combinations, contact Harvatek or an authorized distributor.

HT-C3501BPU Standard Order Codes - Cold White					
Condition	Correlated Color Temperature	Luminous Flux	Forward Voltage	CRI	Order Code
I_F=350mA	Aa Ab Ac Ad Ba Bb Bc Bd (7000-10000˚K)	PU1 PU2 PV1 PV2	Full P05 P06 P07 P08	70	HT-C3501BPU-CW-PU1-F-CR1

Color Temperature Coordinates



Correlated Color Temperature Rank

Condition	Color	Bin Code	Min.	Typ.	Max.	Unit
I_F=350mA	Cold white	BD	7000	-	7500	K
		BB	7000	-	7500	
		BC	7500	-	8250	
		BA	7500	-	8250	
		AD	8250	-	9000	
		AB	8250	-	9000	
		AC	9000	-	10000	
		AA	9000	-	10000	

Luminous Flux Rank

Rank Code	Symbol	Condition	Min.	Typ.	Max.	Unit
Full	ΦV	I_F=350mA	87.4	-	147.2	lm
PU1			87.4	-	99.6	
PU2			99.6	-	113.6	
PV1			113.6	-	129.5	
PV2			129.5	-	147.2	

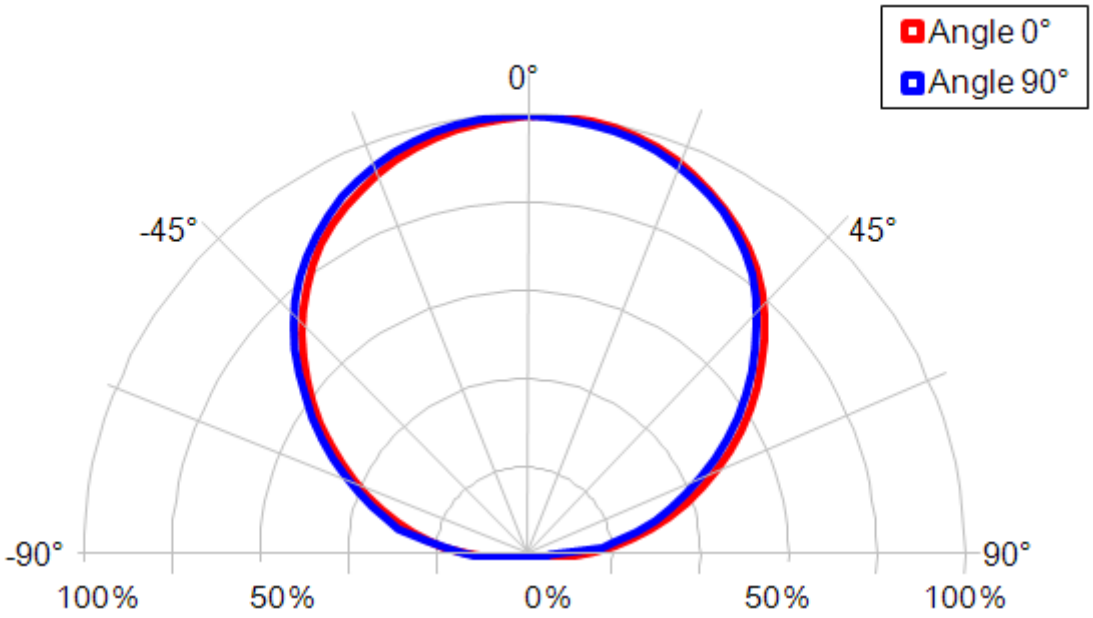
Note: It maintains a tolerance of ±10% on flux

Electrical Rank

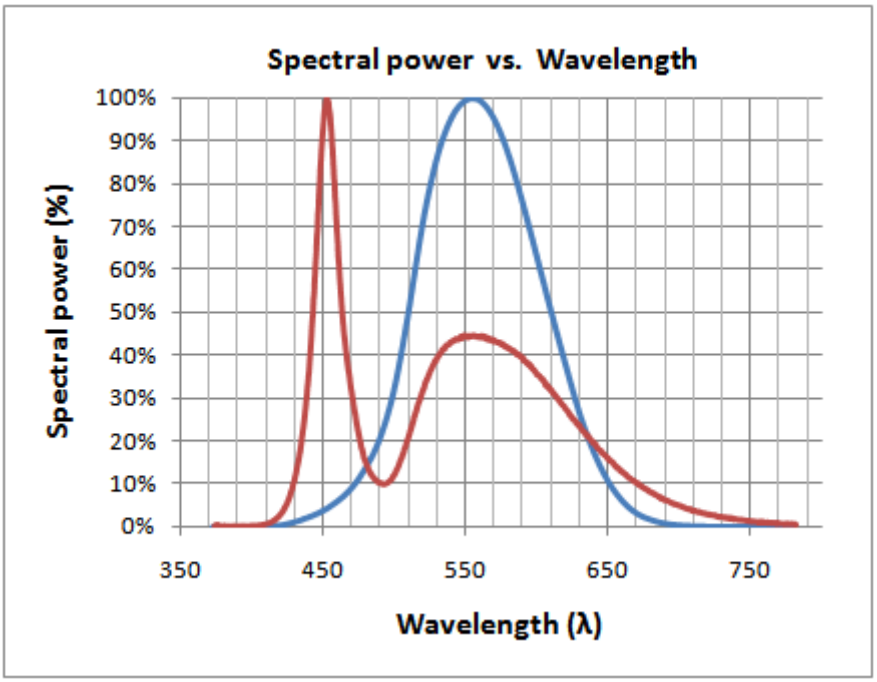
Rank Code	Symbol	Condition	Min.	Typ.	Max.	Unit
Full	V_F	I_F=350mA	3.03	-	3.99	V
P05			3.03	-	3.27	
P06			3.27	-	3.51	
P07			3.51	-	3.75	
P08			3.75	-	3.99	

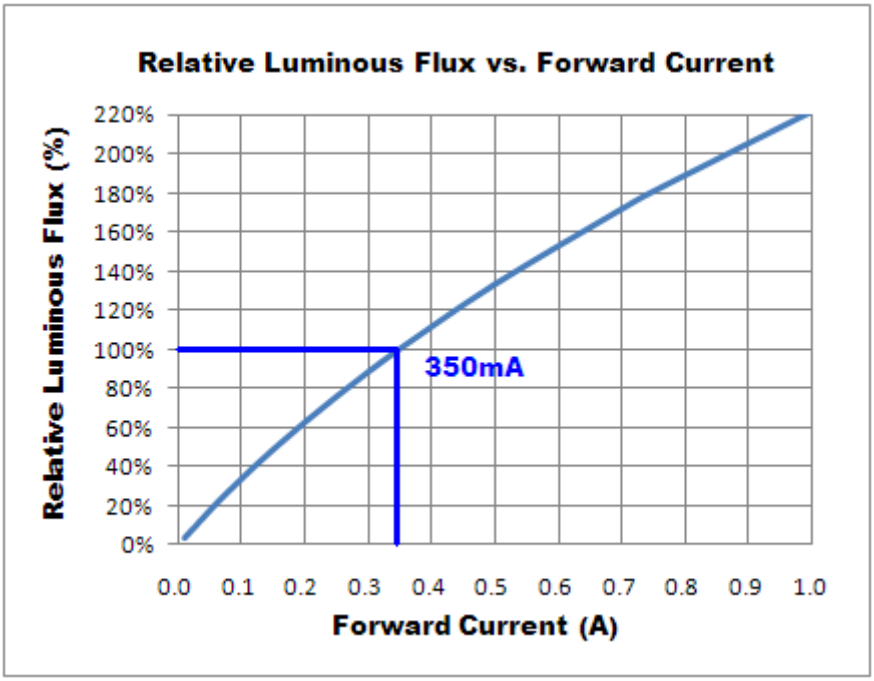
Note: It maintains a tolerance of ±0.1V on forward voltage measurements

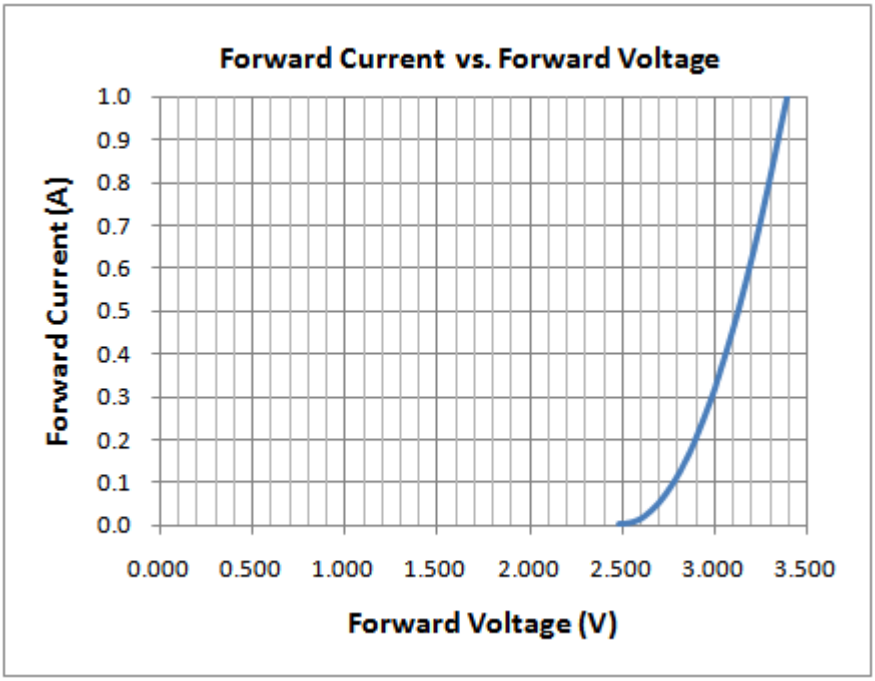
Color Temperature Coordinates

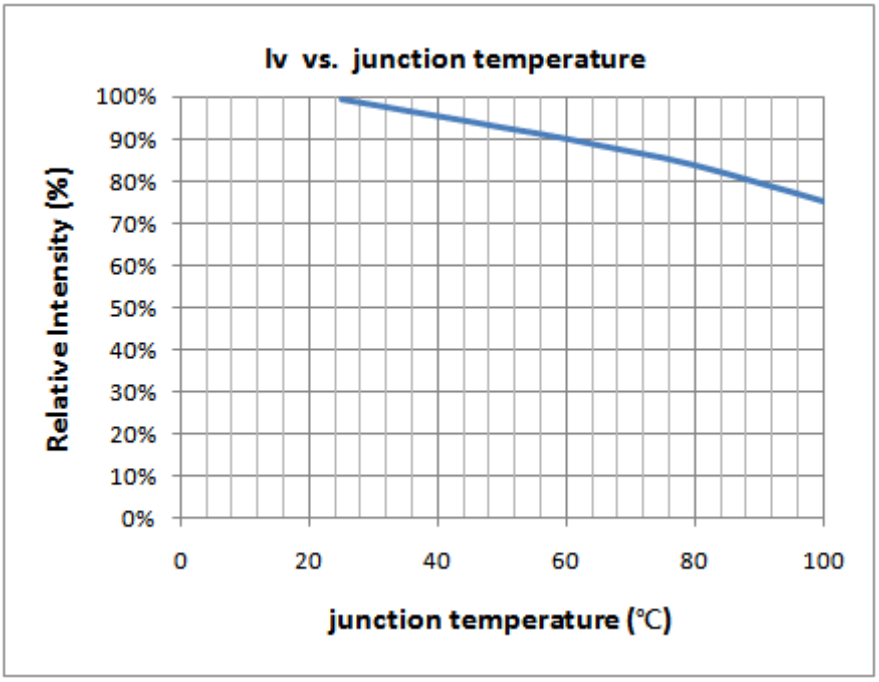


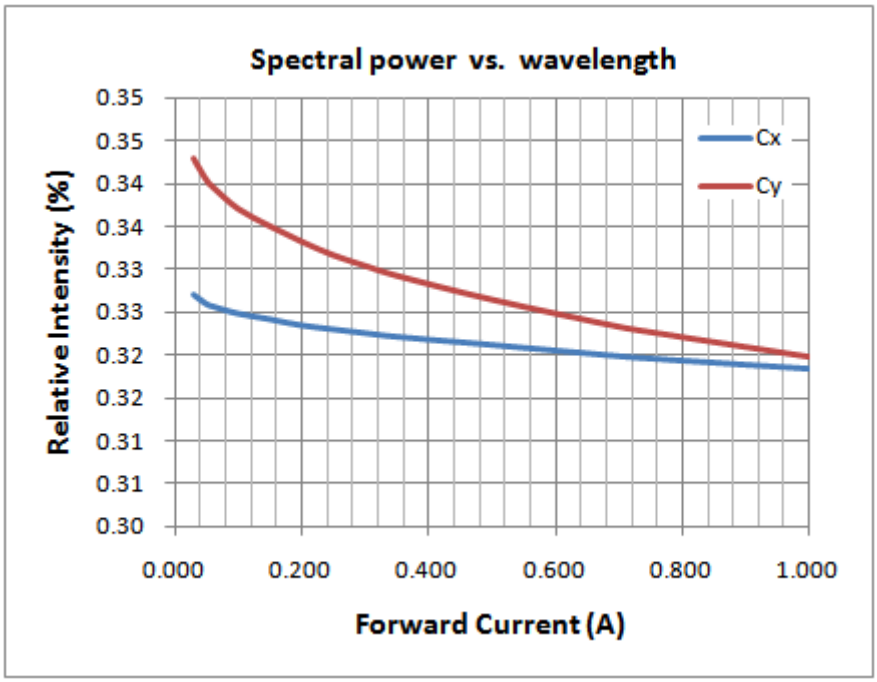
Characteristics Curve

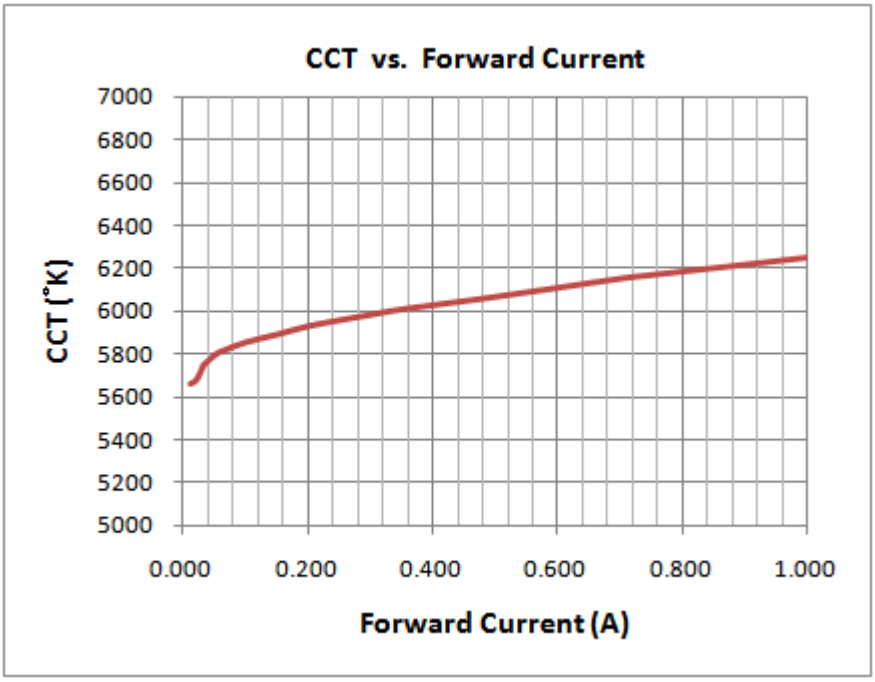


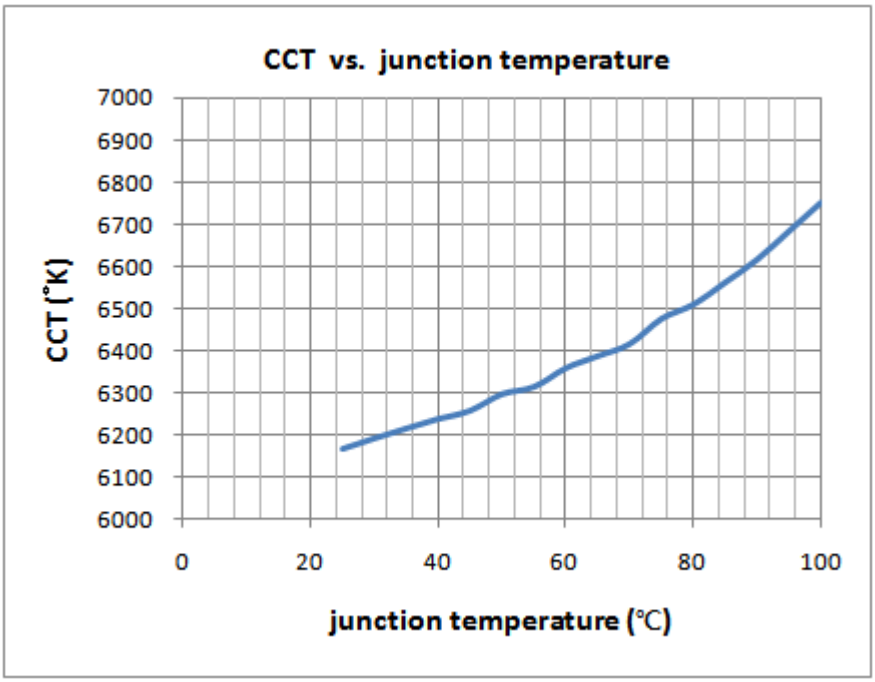


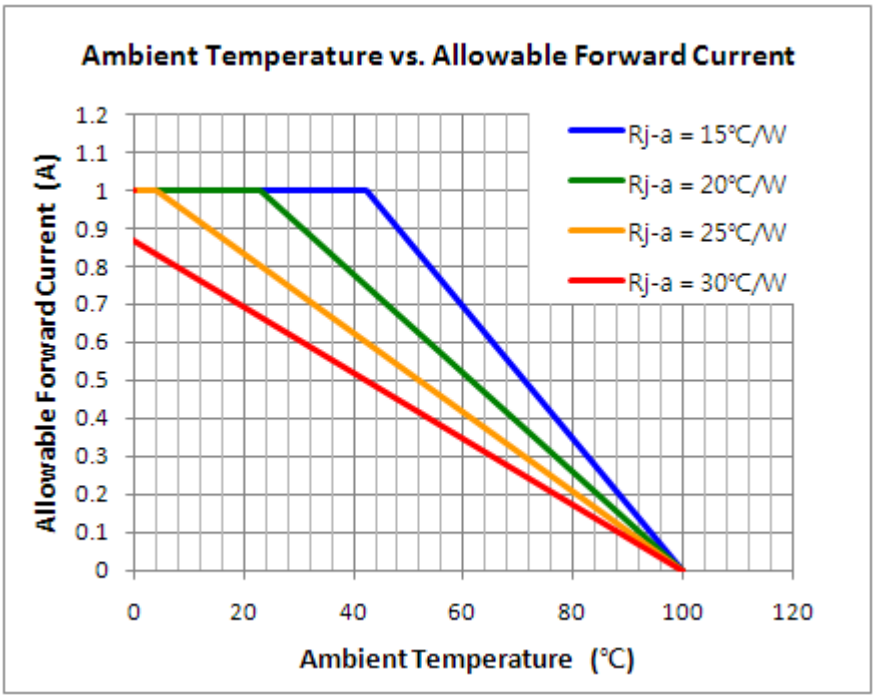






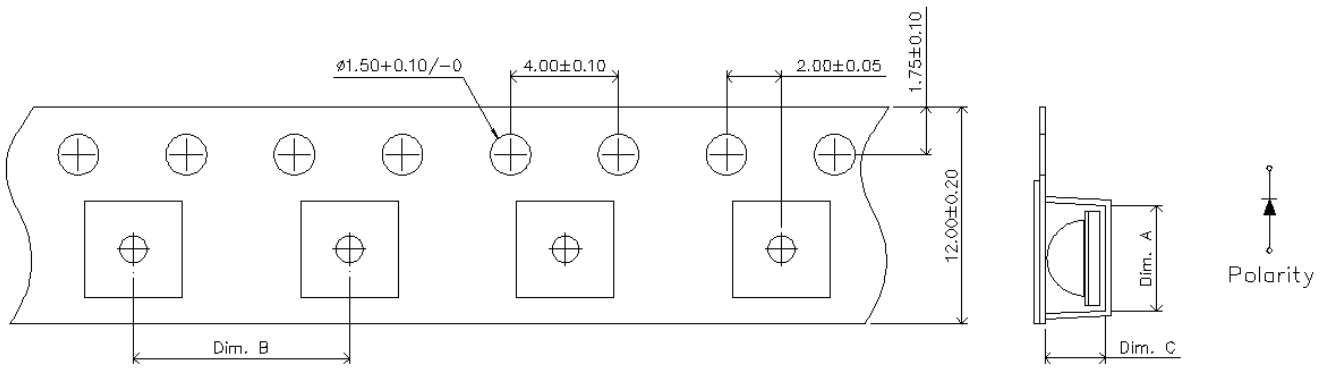






Tape & Packing

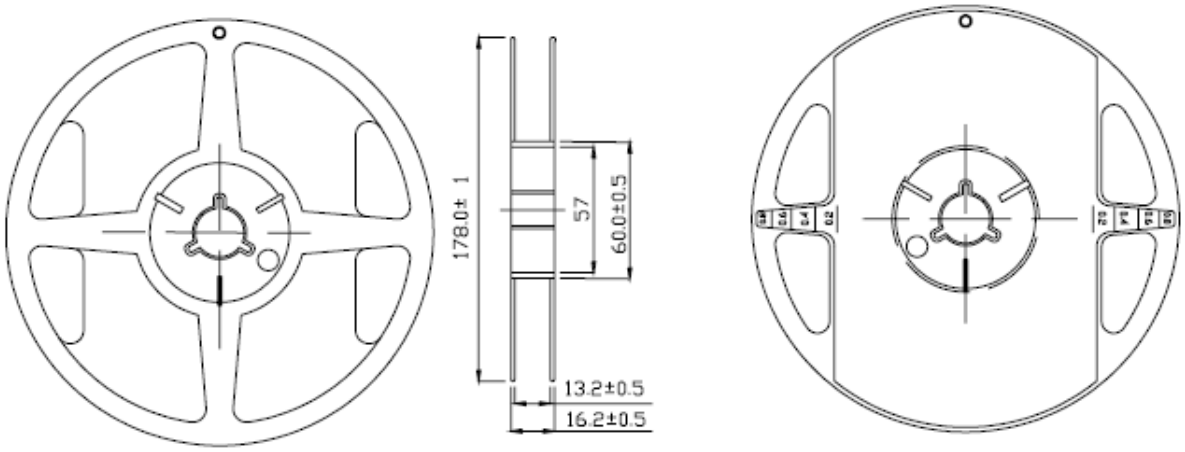
Tape Dimension



Part No.	Dim. A	Dim. B	Dim. C	Q'ty/Reel
HT-C3501	3.8	8.0	2.5	500

Unit: mm +/-0.1mm

Reel Dimension

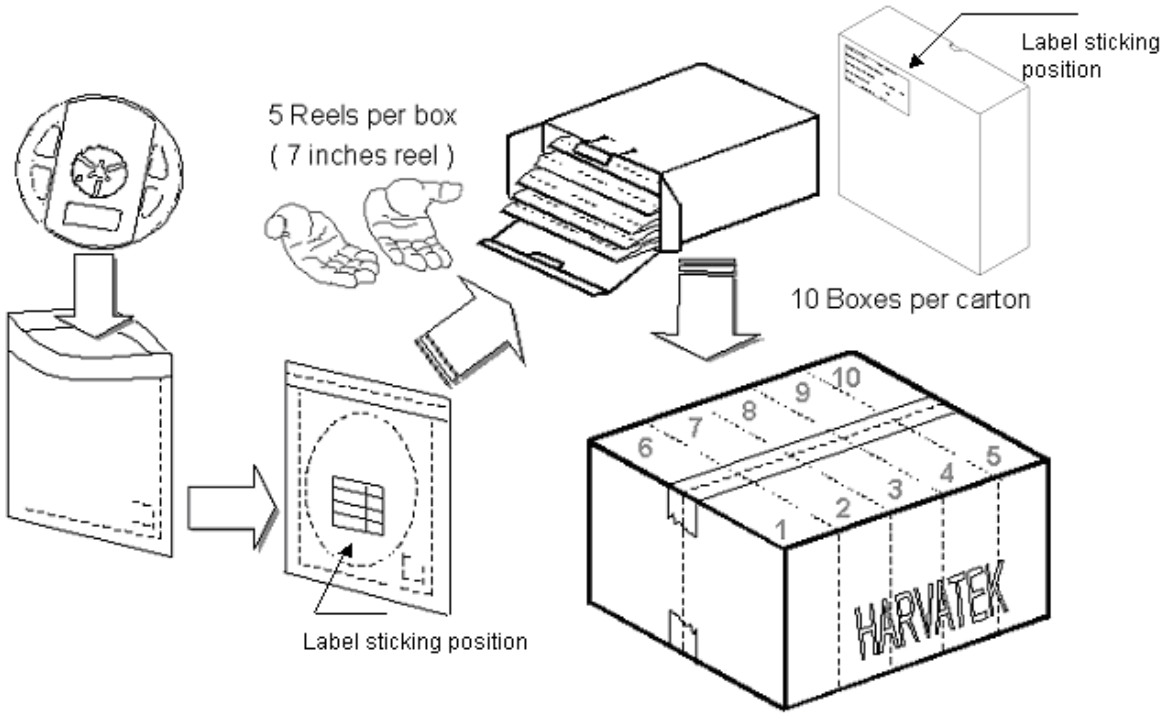


Notes:

1.All dimensions are in mm, tolerance is±2.0mm unless otherwise noted.

2.Specifications are subject to change without notice.

Packing



5 boxes per carton is available depending on shipment quantity.

Dry Pack

All SMD optical devices are **MOISTURE SENSITIVE**. Avoid exposure to moisture at all times during transportation or storage. Every reel is packaged in a moisture protected anti-static bag. Each bag is properly sealed prior to shipment.

Upon request, a humidity indicator will be included in the moisture protected anti-static bag prior to shipment.

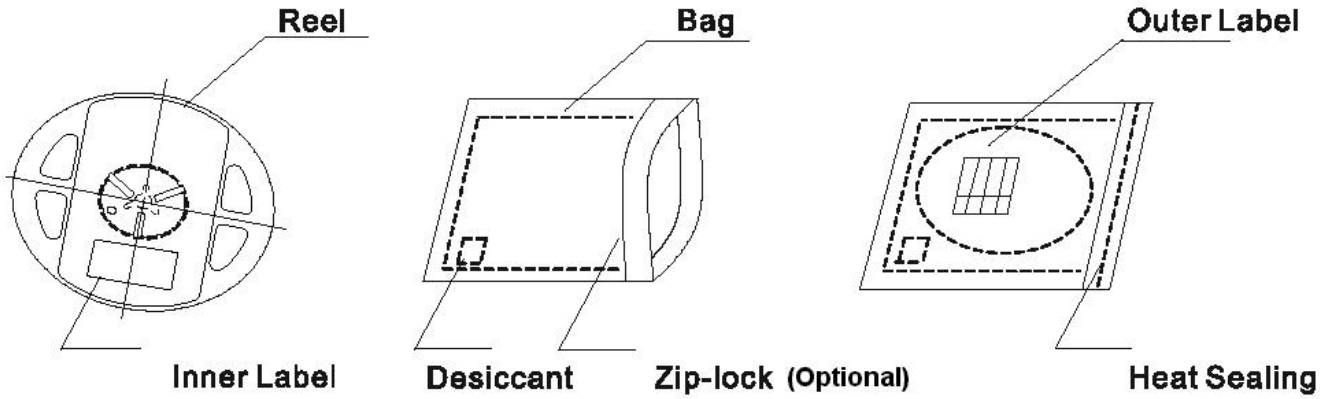
Storage

It's recommended to store the products in the following conditions:

Humidity: 60 %RH Max.

Temperature: 5℃ ~30℃ (41℉~86℉)

The packaging sequence is as follows

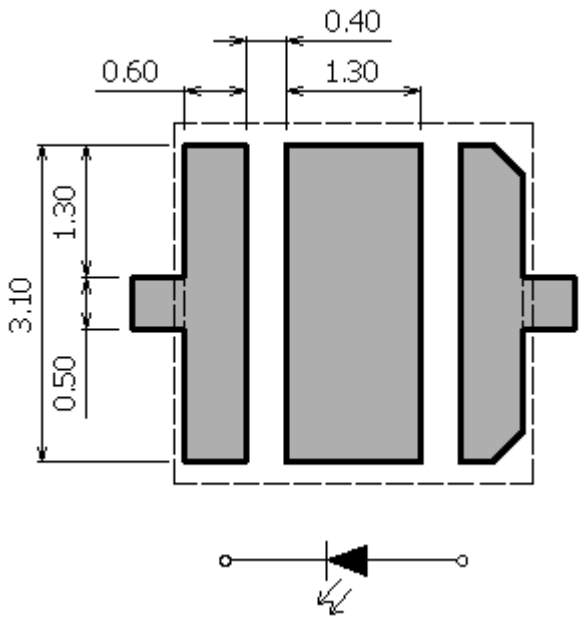


PRECAUTIONS

1. Avoid exposure to moisture at all times during transportation or storage.
2. Anti-Static precaution must be taken when handling GaN, InGaN, and AlInGaP products.
3. It is suggested to connect the unit with a current limiting resistor of the proper size. Avoid applying a reverse voltage beyond the specified limit.
4. Avoid operation beyond the limits as specified by the absolute maximum ratings.
5. Avoid direct contact with the surface through which the LED emits light.
6. If possible, assemble the unit in a clean room or dust-free environment.

Soldering Pattern

The dimensions of the recommended soldering pattern may not meet every user. Please confirm and study first before designing the soldering pattern in order to obtain the best performance of soldering. Recommended soldering pattern is listed below:



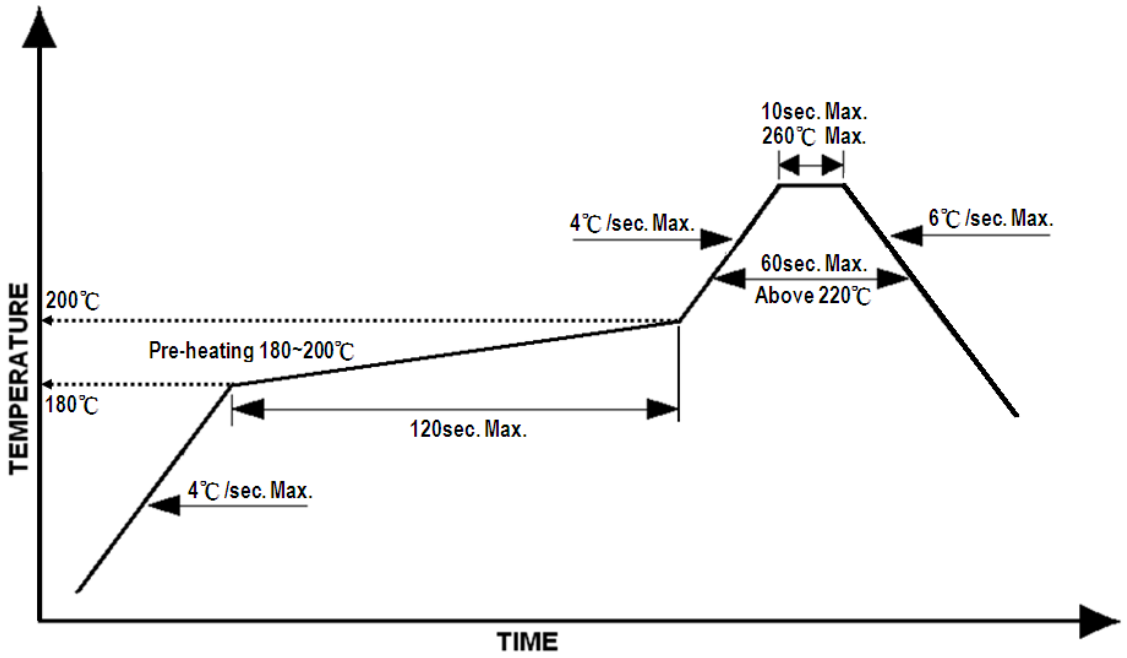
Unit: mm

Reflow Soldering

Recommend soldering paste specifications:

1. Operating temp.: Above 220 ^{O}C ,60sec
2. Peak temp.:260 ^{O}CMax.,10sec Max.
3. Never take next process until the component is cooled down to room temperature after reflow.
4. The recommended reflow soldering profile (measuring on the surface of the LED terminal) is following:

   Lead-free Solder Profile



Cleaning

Following are cleaning procedures after soldering:

- An alcohol-based solvent such as isopropyl alcohol (IPA) is recommended.
- Temperature x Time should be 50°C x 30sec. or <30°C x 3min
- Ultra sonic cleaning: < 15W/ bath; bath volume ≤ 1liter
- Curing: 100 °C max, <3min
-

Cautions of Pick and Place

- Avoid stress on the resin at elevated temperature.
- Avoid rubbing or scraping the resin by any object.
- Electric-static may cause damage to the component. Please ensure that the equipment is properly grounded. Use of an ionizer fan is recommended.

LEDs and Eye Safety:

In the 1993 edition of IEC-60825-1, LEDs were included: “Throughout this part 1 light emitting diodes (LED) are included whenever the word “laser” is used.”The CENELEC document EN 60825-1 contains all the technical content of the IEC standard.

The scope of the IEC standard status that “…products which are sold to other manufacturers for use as components of any system for subsequent sale are not subject to IEC 60825-1, since the final product will itself be subject to this standard. ”Therefore, it is important to determine the Laser Safety Class of the final product. However, it is important that employees working with LEDs are trained to use them safely.

Most of the products containing LEDs will fall in either Class 1 or Class 2. A Class 1 label is optional:

CLASS 1 LED PRODUCT

If a label is not used, this description must be included in the information for the user.

Amendment 2 to IEC 60825-1 is expected to be published in January 2001. The CENELEC equivalent is expected to follow three months after the IEC publication. This document contains increased Class 1 and Class 2 limits, as well as the introduction of less restrictive Class 1M and Class 2M.

For the exact classification and further information, the IEC document can be used:

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