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DISCLAIMER

HARVATEK reserves the right to make changes without further notice to any products herein to improve reliability, function or design. HARVATEK does not assume any liability arising out of the application or use of any product or circuit described herein; neither does it convey any license under its patent rights, nor the rights of others.

LIFE SUPPORT POLICY

HARVATEK's products are not authorized for use as critical components in life support devices or systems without the express written approval of the President of HARVATEK or HARVATEK INTERNATIONAL. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.

2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

Product Specifications

Product	Emission Color	Technology	Test Current I_F (mA)	Luminous Intensity I_V (mcd)	Forward Voltage V_F (V)	Orderable Part Number
HT-170YG	Yellow Green	GaP	20	18 typ	2.2 typ	HT-170YG-YYYY
HT-170Y	Yellow	GaAsP	20	9 typ	2.1 typ	HT-170Y-YYYY
HT-170D	Orange	GaAsP	20	9 typ	2.1 typ	HT-170D-YYYY
HT-170SD	Red	GaAsP	20	14 typ	2.1 typ	HT-170SD-YYYY
HT-170UR	Bright Red	AlGaAs	20	21 typ	1.8 typ	HT-170UR-YYYY
HT-170UYG	Ultra Bright Yellow Green	AlInGaP	20	50 typ	2.0 typ	HT-170UYG-YYYY
HT-170UY	Ultra Bright Yellow	AlInGaP	20	90 typ	1.9 typ	HT-170UY-YYYY
HT-170UD	Ultra Bright Orange	AlInGaP	20	90 typ	1.9 typ	HT-170UD-YYYY
HT-170USD	Ultra Bright Red	AlInGaP	20	60 typ	1.9 typ	HT-170USD-YYYY
HT-170NB	Blue	InGaN	20	80 typ	3.3 typ	HT-170NB-YYYY
HT-170NG	True Green	InGaN	20	140 typ	3.3 typ	HT-170NG-YYYY
HT-170TW	White	InGaN	20	220 typ	3.3 typ	HT-170TW-YYYY

	Specification	Material	Quantity
Resin	Water clear	Epoxy resin	
Carrier tape	Per EIA 481-1A specs	Conductive black tape	4000pcs per reel
Reel	Per EIA 481-1A specs	Conductive black	
Label	HT standard	Paper	
Packing bag	220x240mm	Aluminum laminated bag/ no-zipper	One reel per bag
Carton	HT standard	Paper	

Others:

Each immediate box consists of 5 reels. The 5 reels may not necessarily have the same lot number or the same bin combinations of Iv, λ_D and Vf. Each reel has a label identifying its specification; the immediate box consists of a product label as well.

ATTENTION: Electrostatic Discharge (ESD) protection

The symbol to the left denotes that ESD precaution is needed. ESD protection for GaP and AlGaAs based chips is necessary even though they are relatively safe in the presence of low static-electric discharge. Parts built with AlInGaP, GaN, or/and InGaN based chips are **STATIC SENSITIVE devices**. ESD precaution must be taken during design and assembly.

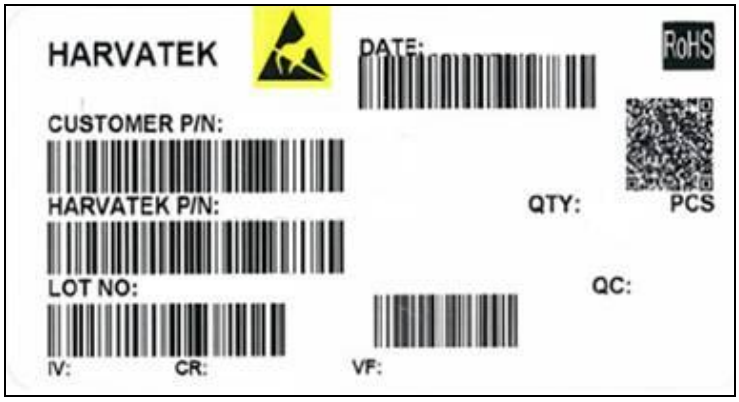
If manual work or processing is needed, please ensure the device is adequately protected from ESD during the process.

Compliant and Certified

ISO9002, QS9000 and ISO14001 Certified

RoHS Compliant

Label Specifications



Harvatek P/N:

H T - 1 7 0 XXX - YYYY

Series Name	Emitting Color	Customer Code
HT-170 **HT: Harvatek** **170: 0805 series** **2.0 (L) x 1.3 (W) x 0.8 (H) mm**	**XXX** **YG: Yellow Green** **Y: Yellow** **D: Orange** **SD: Red** **UR: Bright Red** **UYG: Ultra Bright Yellow Green** **UY: Ultra Bright Yellow** **UD: Ultra Bright Orange** **USD: Ultra Bright Red** **NB: Blue** **NG: True Green** **TW: White**	**YYYY** **Customer Product Code (TBD)**

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		

■ Luminous Intensity (Iv) Bin:

Bin	Luminous Intensity Range (mcd)		Bin	Luminous Intensity Range (mcd)	
	Minimum	Maximum		Minimum	Maximum
H1	2.85	3.6	H2	3.6	4.5
J1	4.5	5.6	J2	5.6	7.15
K1	7.15	9.0	K2	9.0	11.25
L1	11.25	14.00	L2	14.0	18.0
M1	18.0	22.5	M2	22.5	28.5
N1	28.5	36.0	N2	36.0	45.0
P1	45.0	56.0	P2	56.0	71.5
Q1	71.5	90.0	Q2	90.0	112.5
R1	112.5	140.0	R2	140.0	180.0
S1	180.0	226.0	S2	226.0	285.0
T1	285.0	320.0	T2	320.0	360.0
U1	360.0	400.0	U2	400.0	450.0

@20mA / Ta=25°C, Tolerance: ± 10%

Product specifications

■Dominant Wavelength (Λd) Bin:

Bin	Wavelength Range (nm)									
	Bright Red (UR)		Red (SD)		Orange (D)		Yellow (Y)		Yellow Green (YG)	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
-	620.0	650.0	615.0	635.0						
A					597.0	600.0	582.0	584.5	561.5	564.5
B					600.0	603.0	584.	587.0	564.5	567.5
C					603.0	606.0	587.0	589.5	567.5	570.5
D					606.0	609.0	589.5	592.0	570.5	573.5
E					609.0	612.0	592.0	594.5	573.5	576.5
F					612.0	615.0	594.5	597.0		
H										
J										

@20mA / Ta=25°C, Tolerance: ± 0.5nm

Bin	**Wavelength Range (nm)**							
	Red (USD)		**Orange (UD)**		**Yellow (UY)**		**Yellow Green (UYG)**	
	Min	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**
-	**615.0**	**630.0**						
A			597.0	600.0	582.0	584.5	561.5	564.5
B			600.0	603.0	584.	587.0	564.5	567.5
C			603.0	606.0	587.0	589.5	567.5	570.5
D			606.0	609.0	589.5	592.0	570.5	573.5
E			609.0	612.0	592.0	594.5	573.5	576.5
F			612.0	615.0	594.5	597.0		
H								
J								

@20mA / Ta=25°C, Tolerance: ± 0.5nm

Bin	Wavelength Range (nm)			
	True Green (NG)		Blue (NB)	
	Min	Max	Min	Max
-				
A	515.0	520.0	460.0	464.0
B	520.0	525.0	464.0	468.0
C	525.0	530.0	468.0	472.0
D	530.0	535.0	472.0	476.0
E	535.0	540.0	476.0	480.0
F			480.0	484.0
H				
J				

@20mA / Ta=25^{O}C, Tolerance: ± 0.5nm

■Forward Voltage (V_F) Bin:

Color	Bin Code	Spec. Range
Blue (NB) Green (NG) White (TW)	G8	2.7-2.9 V
	H7	2.9-3.1 V
	H8	3.1-3.3 V
	J7	3.3-3.5 V
	J8	3.5-3.7 V
	K7	3.7-3.9 V
Ultra Bright (UYG, UY, UD, USD)	-	2.6 V max
Standard Bright (YG, Y, D, SD)	-	2.6 V max
Bright Red (UR)	-	2.6 V max

@20mA / Ta=25℃, Tolerance: ± 0.05 V

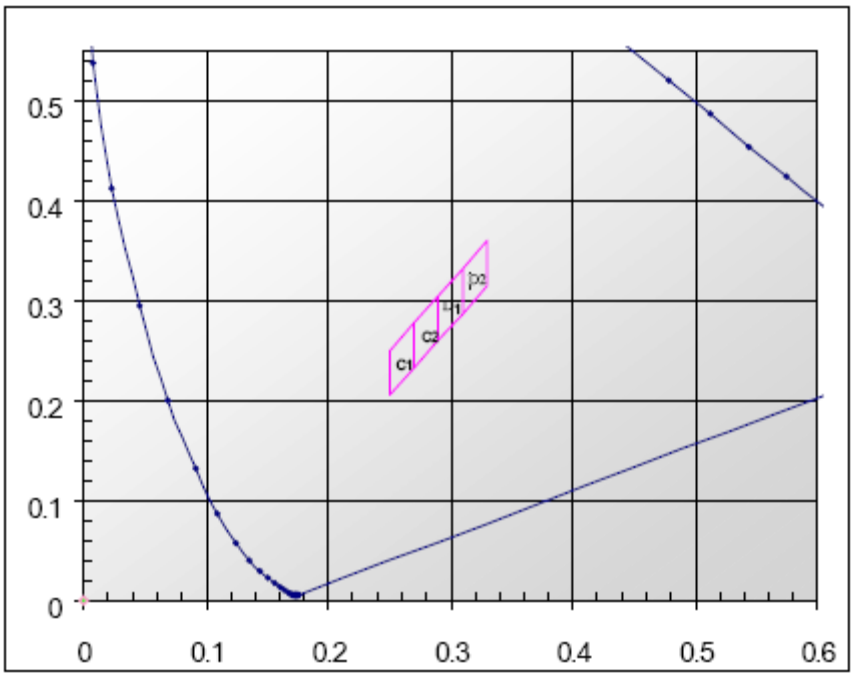
Chromaticity Bin (for TW only):

	Rank C1			
x	0.2500	0.2700	0.2700	0.2500
y	0.2500	0.2775	0.2325	0.2050

	Rank C2			
x	0.2700	0.2900	0.2900	0.2700
y	0.2775	0.3050	0.2600	0.2325

	Rank D1			
x	0.2900	0.3100	0.3100	0.2900
y	0.3050	0.3325	0.2875	0.2600

	Rank D2			
x	0.3100	0.3300	0.3300	0.3100
y	0.3325	0.3600	0.3150	0.2875



@20mA / Ta=25℃, Tolerance: ± 0.01

Product Characteristics

Absolute Maximum Ratings

Product	Emission Color	IF (mA)	IFP* (mA)	VR (V)	T_{OP} (^{o}C)	T_{ST} (^{o}C)
HT-170YG	Yellow Green	20	100	5	-30~+80	-40~+85
HT-170Y	Yellow					
HT-170D	Orange					
HT-170SD	Red					
HT-170UR	Bright Red	20	100			
HT-170UYG	Ultra Bright Yellow Green	20	100			
HT-170UY	Ultra Bright Yellow					
HT-170UD	Ultra Bright Orange					
HT-170USD	Ultra Bright Red					
HT-170NB	Blue	20	100			
HT-170NG	True Green					
HT-170TW	White					

** Condition for I_{FP} is pulse of 1/10 duty and 0.1msec width

Remarks:This product should be operated in forward bias.If a reverse voltage is continuously applied to the product, such operation can cause migration resulting in LED damage.

Precaution for Use

1. The chips should not be used directly in any type of fluid such as water, oil, organic solvent, etc.
2. When the LEDs are illuminating, the maximum ambient temperature should be first considered before operation.
3. LEDs must be stored in a clean environment. A sealed container with a nitrogen atmosphere is necessary if the storage period is over 3 months after shipping.
4. The LEDs must be used within seven days after unpacked. Unused products must be repacked in an anti-electrostatic package, folded to close any opening and then stored in a dry and cool space.
5. The appearance and specifications of the products may be modified for improvement without further notice.
6. The LEDs are sensitive to the static electricity and surge. It is strongly recommended to use a grounded wrist band and anti-electrostatic glove when handling the LEDs. If a voltage over the absolute maximum rating is applied to LEDs, it will damage LEDs. Damaged LEDs will show some abnormal characteristics such as remarkable increase of leak current, lower turn-on voltage and getting unlit at low current.

Electro-Optical Characteristics

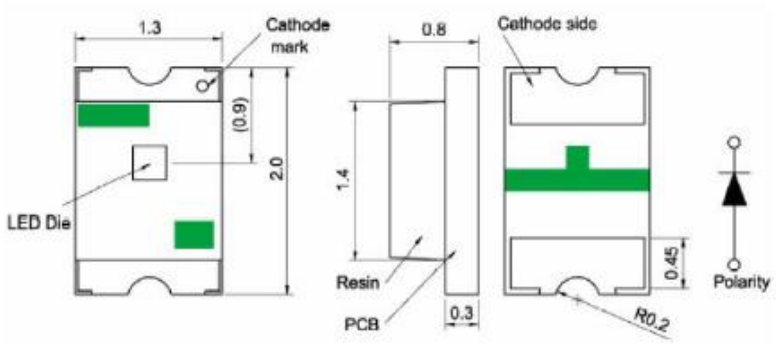
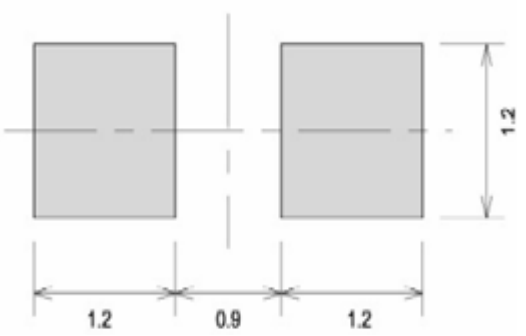
(T_a 25 °C)

Product	Lighting Color	I_F(mA)	V_F(V)		λ(nm)			I^*_V(mcd)	
			typ	max	λ_D	λ_P	△λ	min	typ
HT-170YG	Yellow Green	20	2.2	2.6	573	568	30	9	18
HT-170Y	Yellow	20	2.1	2.6	590	589	35	3.6	9
HT-170D	Orange	20	2.1	2.6	608	610	35	5.6	9
HT-170SD	Red	20	2.1	2.6	629	642	35	6.2	14
HT-170UR	Bright Red	20	1.8	2.2	643	660	20	9	21
HT-170UYG	Ultra Bright Yellow Green	20	2.0	2.4	573	574	20	25	50
HT-170UY	Ultra Bright Yellow	20	1.9	2.4	591	593	15	25	90
HT-170UD	Ultra Bright Orange	20	1.9	2.4	605	609	17	35	90
HT-170USD	Ultra Bright Red	20	1.9	2.4	622	636	17	35	60
HT-170NB	Blue	20	3.3	3.9	470	468	40	35	80
HT-170NG	True Green	20	3.3	3.9	527	520	40	90	140
HT-170TW	White	20	3.3	3.9	X=0.29 Y=0.31	-	-	100	220

* Per NIST standards

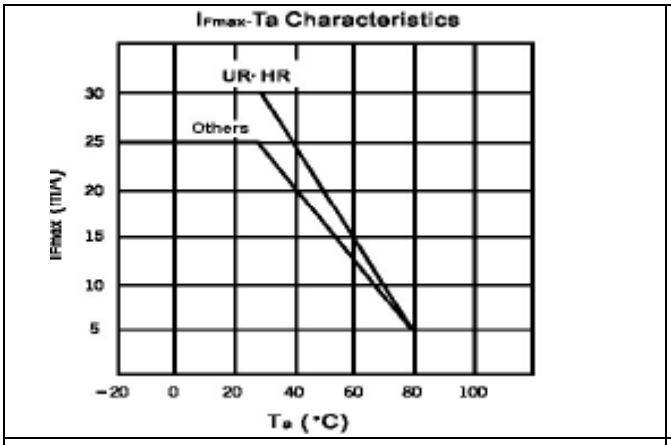
Package Outline Dimension and Recommended Soldering Pattern for Reflow Soldering

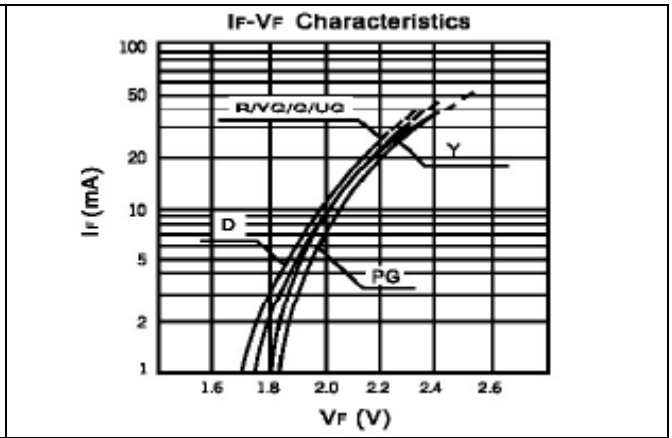
Unit: mm Tolerance: +/-0.1

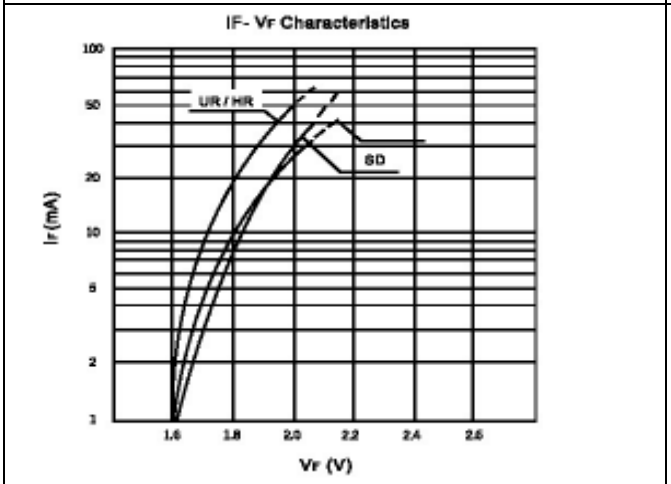
Outline Dim.	Solder Pattern
	

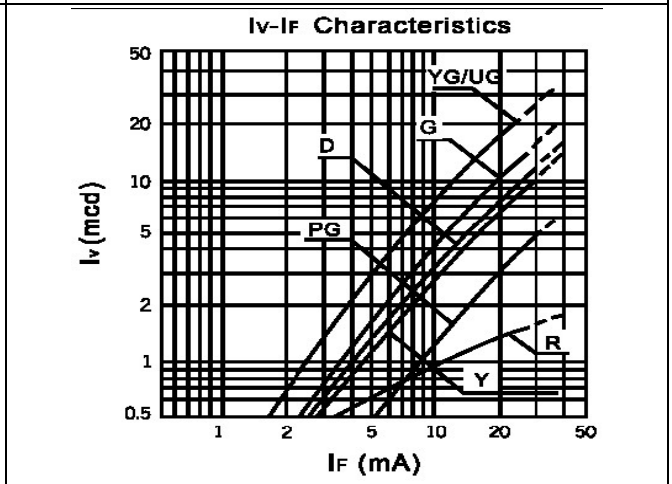
Soldering terminals may shift in the x, y direction.

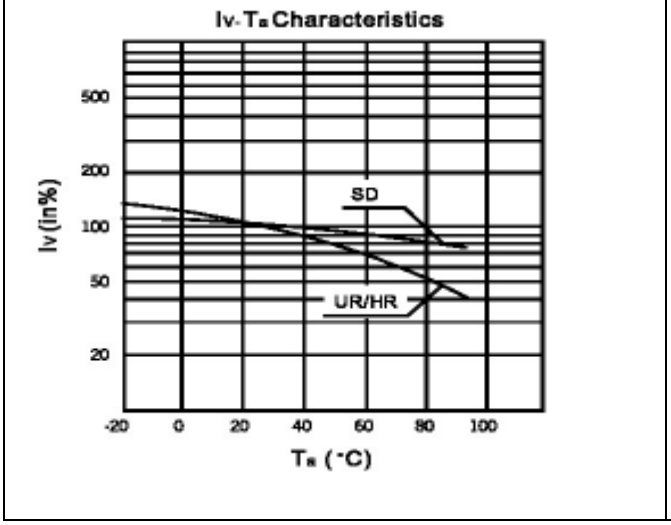
Characteristic Curves for YG, Y, D, SD and UR





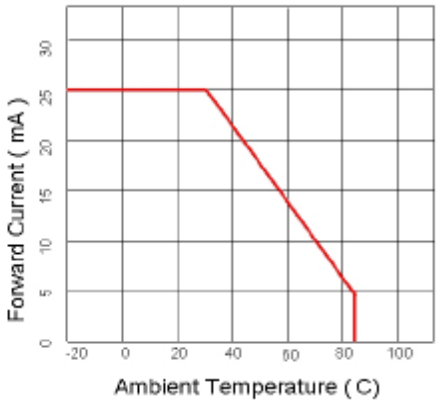




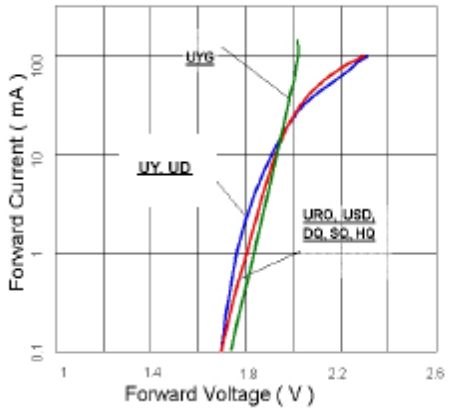


Characteristic Curves for UYG, UY, UD and USD

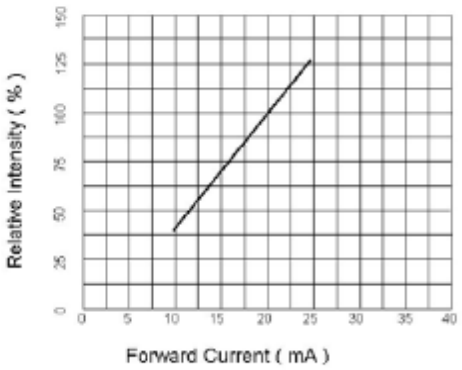
Forward Current vs. Ambient Temperature



Forward Voltage vs. Forward Current

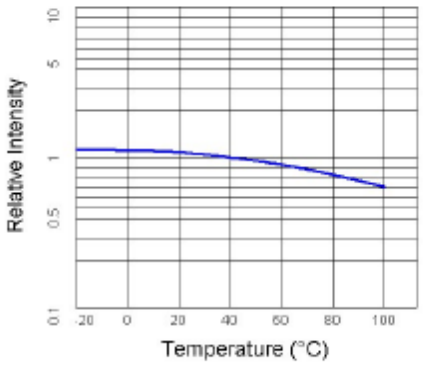


Relative Intensity vs. Forward Current

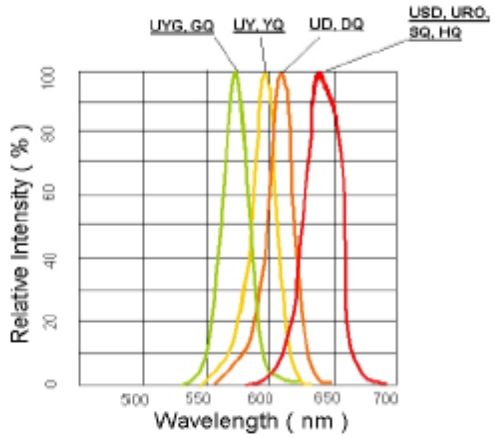


Relative Intensity vs. Ambient Temperature

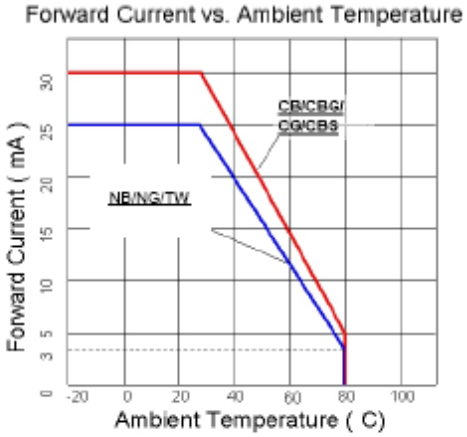
Plused 20mA, 300us pulse, 10ms period

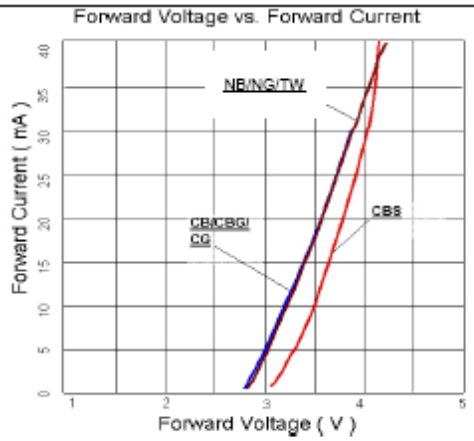


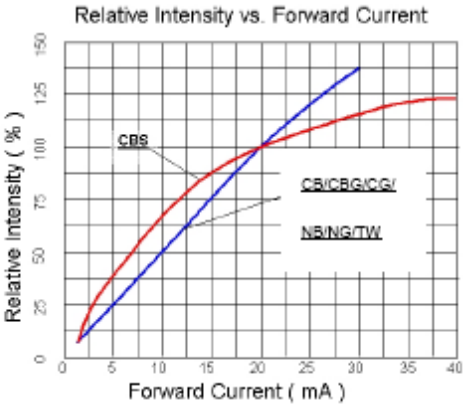
Relative Intensity vs. Wavelength

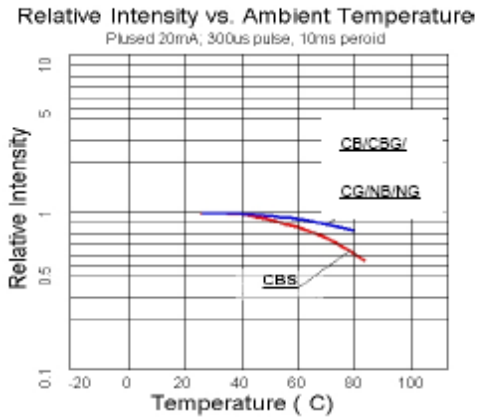


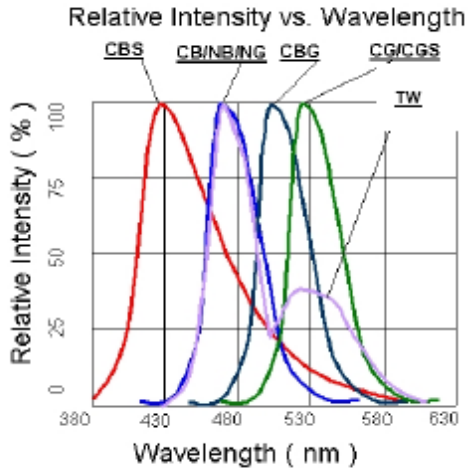
Characteristic Curves for NB, NG and TW

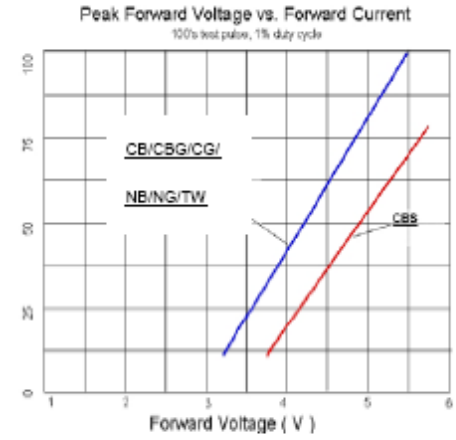




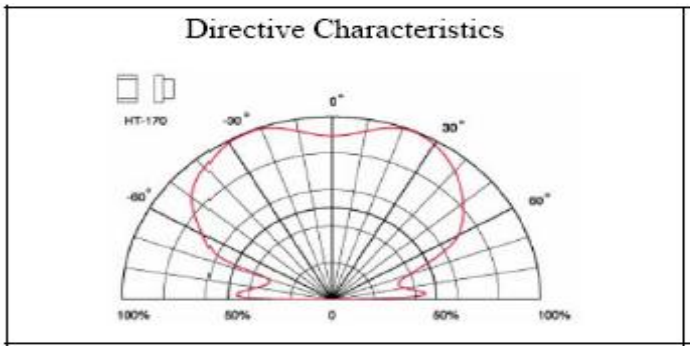


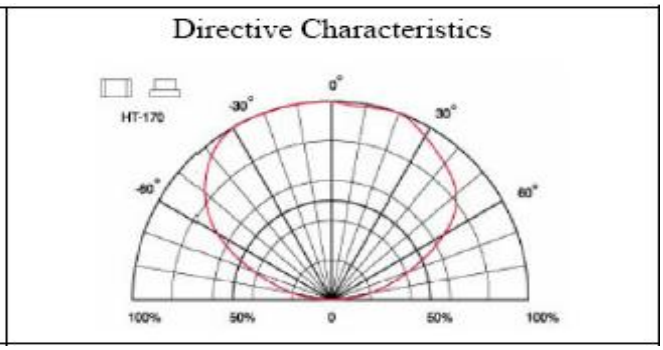






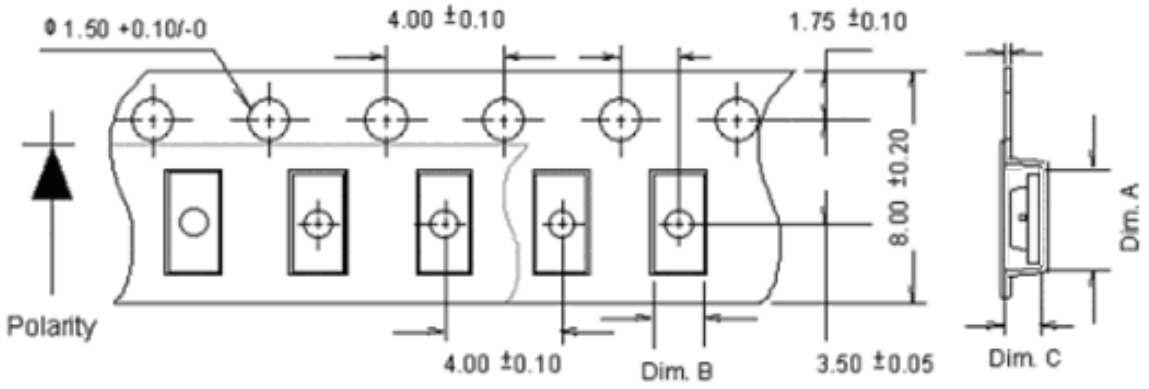
Characteristic Curves for All Colors (Radiation Pattern)





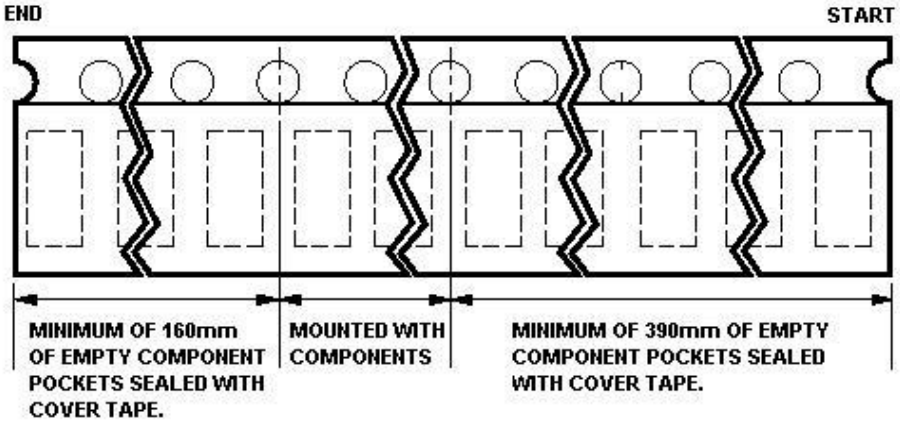
Packaging

Tape Dimension

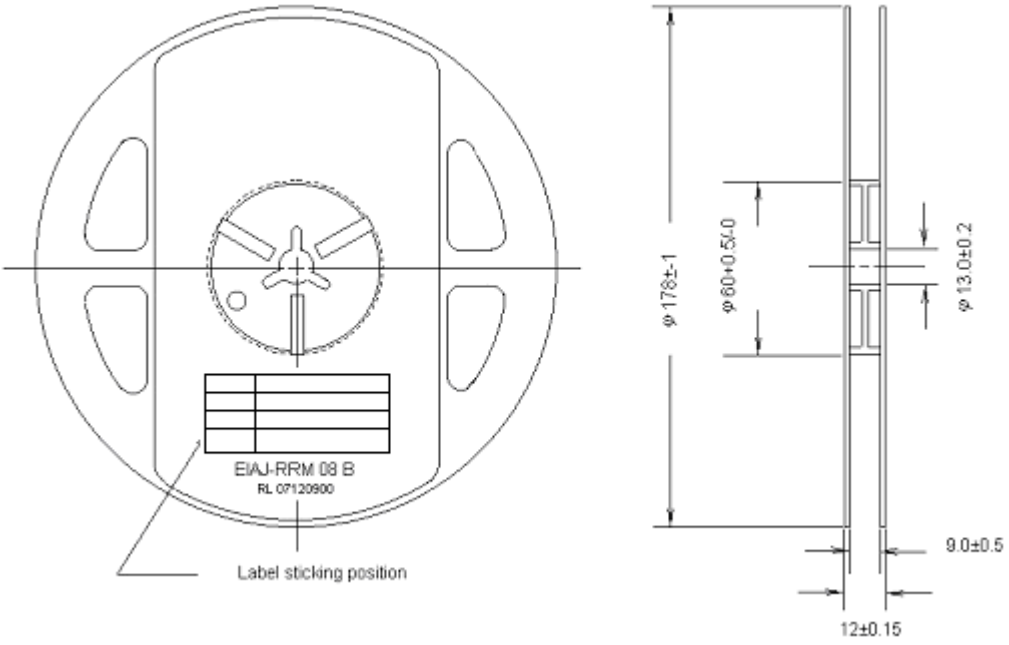


Part No.	Dim. A	Dim. B	Dim. C	Q'ty/Reel
HT-170	2.30±0.10	1.45±0.10	0.95±0.10	4K

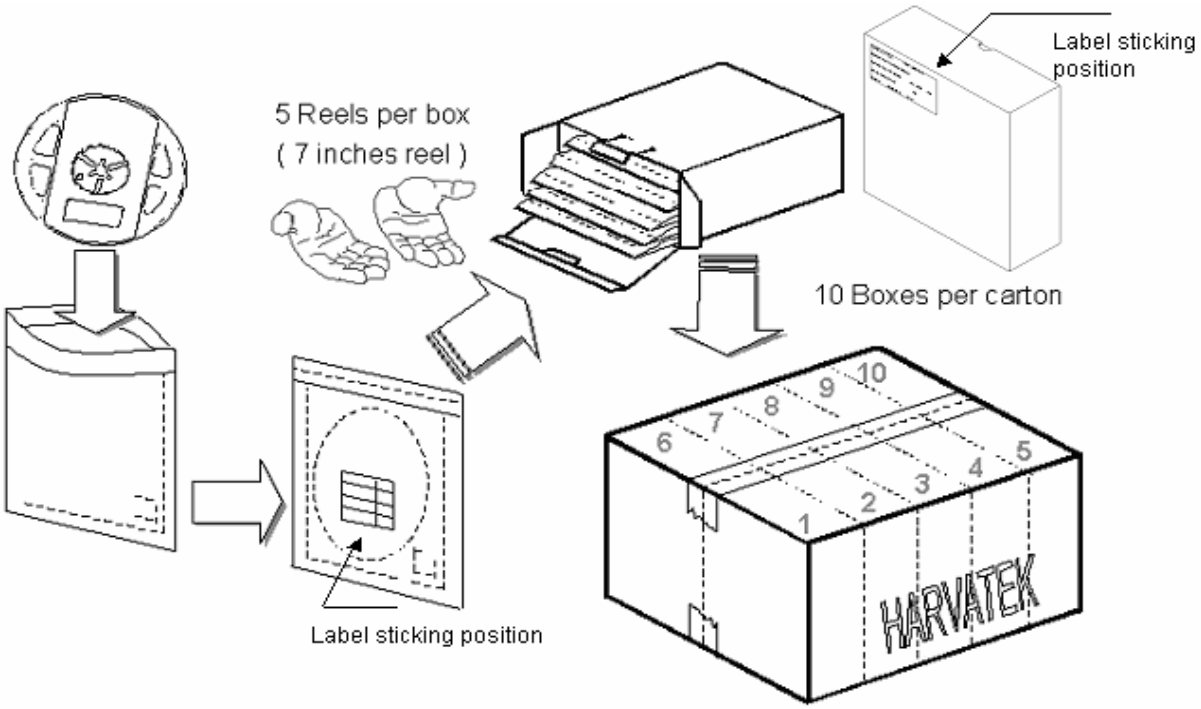
Unit: mm



Reel Dimension



Packing



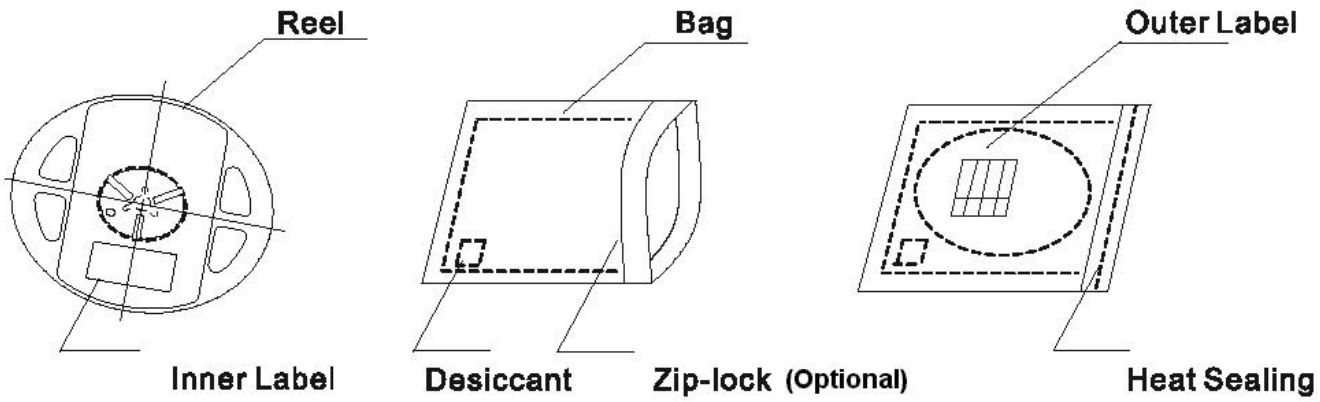
5 boxes per carton is available depending on shipment quantity.

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.

The packaging sequence is as follows:



PRECAUTIONS

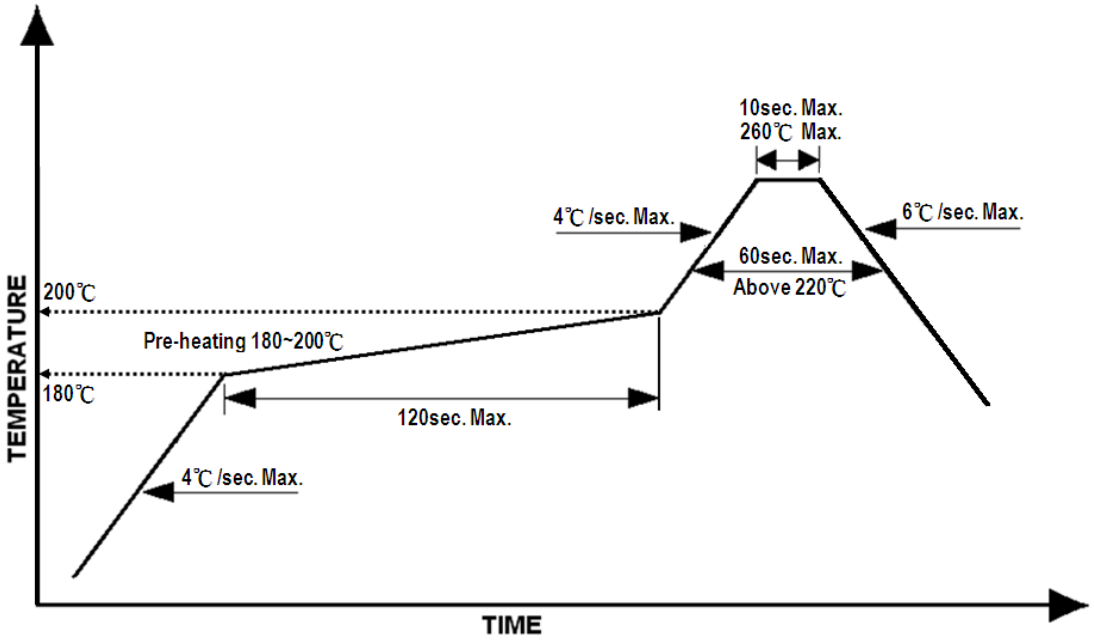
1. Avoid exposure to moisture at all times during transportation or storage.
2. Anti-Static precaution must be taken when handling GaN, InGaN, and AlInGaP products.
3. It is suggested to connect the unit with a current limiting resistor of the proper size. Avoid applying a reverse voltage beyond the 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.

Reflow Soldering

Recommend soldering paste specifications:

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

Lead-free Solder Profile



Reworking

- Rework should be completed within 5 seconds under 260 ^{O}C.
- The iron tip must not come in contact with the copper foil.
- Twin-head type is preferred.

Cleaning

Following are cleaning procedures after soldering:

- An alcohol-based solvent such as isopropyl alcohol (IPA) is recommended.
- Temperature x Time should be 50^{o}C x 30sec. or <30^{o}C x 3min
- Ultrasonic cleaning: < 15W/ bath; bath volume ≤ 1liter
- Curing: 100 ^{O}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.

Revision History

Changes since last revision	Page	Version No.	Revision Date
New format		1.0	06-14-2005
Compliant and Certified	5	1.1	10-19-2005
Renew Lot NO	7	1.2	03-27-2012