Harvatek Surface Mount LED Data Sheet
HT-191 Series

DISCLAIMER

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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-191YG	Yellow Green	GaP	20	20 typ	2.2 typ	HT-191YG-YYYY
HT-191Y	Yellow	GaAsP	20	8 typ	2.1 typ	HT-191Y-YYYY
HT-191D	Orange	GaAsP	20	9 typ	2.1 typ	HT-191D-YYYY
HT-191SD	Red	GaAsP	20	11 typ	2.1 typ	HT-191SD-YYYY
HT-191UR	Bright Red	AlGaAs	20	16 typ	1.8 typ	HT-191UR-YYYY
HT-191URO	Ultra Deep Red	AlInGaP	20	120 typ	1.9 typ	HT-191URO-YYYY
HT-191UYG	Ultra Bright Yellow Green	AlInGaP	20	60 typ	2.0 typ	HT-191UYG-YYYY
HT-191UY	Ultra Bright Yellow	AlInGaP	20	140 typ	1.9 typ	HT-191UY-YYYY
HT-191UD	Ultra Bright Orange	AlInGaP	20	110 typ	1.9 typ	HT-191UD-YYYY
HT-191USD	Ultra Bright Red	AlInGaP	20	120 typ	1.9 typ	HT-191USD-YYYY
HT-191NB	Blue	InGaN	20	40 typ	3.3 typ	HT-191NB-YYYY
HT-191NG	True Green	InGaN	20	140 typ	3.3 typ	HT-191NG-YYYY
HT-191TW	White	InGaN	20	285 typ	3.3 typ	HT-191TW-YYYY

	Specification	Material	Quantity
Resin	Clear Diffused	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.

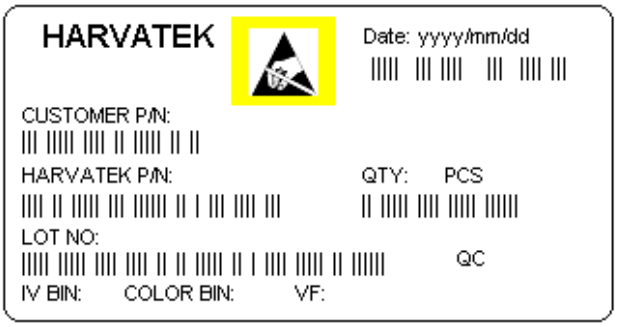
If manual work or processing is needed, please ensure the device is adequately protected from ESD during the process.

Compliance and Certified

ISO9002, QS9000 and ISO14001 Certified

RoHS Compliant

Label Specifications



■ Harvatek P/N:

H T - 1 9 1 XXX - YYYY

Series Name	Emitting Color	Customer Code
HT-191	**XXX**	**YYYY**
HT: Harvatek	**YG: Yellow Green**	**Customer Product Code (TBD)**
191: 0603 0.6mm series	**Y: Yellow**	
1.6 (L) x 0.8 (W) x 0.6 (H) mm	**D: Orange**	
Viewing Angle: 130°	**SD: Red**	
	UR: Bright Red	
	URO: Ultra Deep 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	

Lot No.:

1	2	3	4	5	6	7	8	9	10
P	1	2	2	3	0	A	-	D	T

Code 1	Code 2	Code 3	Code 4, 5	Code 6, 7	Code 9	Code 10
	Mfg. Year	Mfg. Month	Mfg. Date	Lots	Resin Color	Packaging
Internal Tracing Code	Z: 2000 1: 2001 2: 2002 3: 2003 …..	1: Jan. 2: Feb. …. 9: Sep. A: Oct. B: Nov. C: Dec.	1~31/ (30)	01~99, A,B,C…	C: Clear D: Diffused	T: Tape & Reel

■ Luminous Intensity (Iv) Bin:

Bin	Luminous Intensity Range (mcd)		Bin	Luminous Intensity Range (mcd)	
	Minimum	Maximum		Minimum	Maximum
H1	2.8	3.6	H2	3.6	4.5
J1	4.5	5.7	J2	5.7	7.2
K1	7.2	9.0	K2	9.0	11.2
L1	11.2	14.2	L2	14.2	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	57.0	P2	57.0	71.5
Q1	71.5	90.0	Q2	90.0	112.5
R1	112.5	142.0	R2	142.0	180.0
S1	180.0	227.0	S2	227.0	285.0
T1	285.0	360.0	T2	360.0	450.0
U1	450.0	570.0	U2	570.0	715.0

@20mA / Ta=25^{O} C, Tolerance: ± 10%

■ Wavelength (λ_D) Bin:

Bin	Wavelength Range (nm)											
	Bright Red (UR)		Red (SD)		Orange (D)		Yellow (Y)		Yellow Green (YG)		Red (USD)	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
-	620.0	650.0	615.0	635.0							615.0	630.0
A					597.0	600.0	582.0	584.5	561.5	564.5		
B					600.0	603.0	584.6	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^{O} C, Tolerance: $\pm$ 0.5nm

Bin	Wavelength Range (nm)											
	Deep Red (URO)		Orange (UD)		Yellow (UY)		Yellow Green (UYG)		True Green (NG)		Blue (NB)	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
-	630.0	650.0										
A			597.0	600.0	582.0	584.5	561.5	564.5	515.0	520.0	460.0	464.0
B			600.0	603.0	584.6	587.0	564.5	567.5	520.0	525.0	464.0	468.0
C			603.0	606.0	587.0	589.5	567.5	570.5	525.0	530.0	468.0	472.0
D			606.0	609.0	589.5	592.0	570.5	573.5	530.0	535.0	472.0	476.0
E			609.0	612.0	592.0	594.5	573.5	576.5	535.0	540.0	476.0	480.0
F			612.0	615.0	594.5	597.0					480.0	485.0
H												
J												

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

■ Forward Voltage (V_F) Bin:

Color	Bin Code	Spec. Range
Ultra Bright (UYG, UY, UD, USD, URO)	**-**	**2.4 V max**
Standard Bright (YG, Y, D, SD)	**-**	**2.6 V max**
Bright Red (UR)	**-**	**2.2 V max**
Blue (NB) Green (NG) White (TW)	**-**	**3.9V max**

@20mA / Ta=25℃, Tolerance: ± 0.05 V

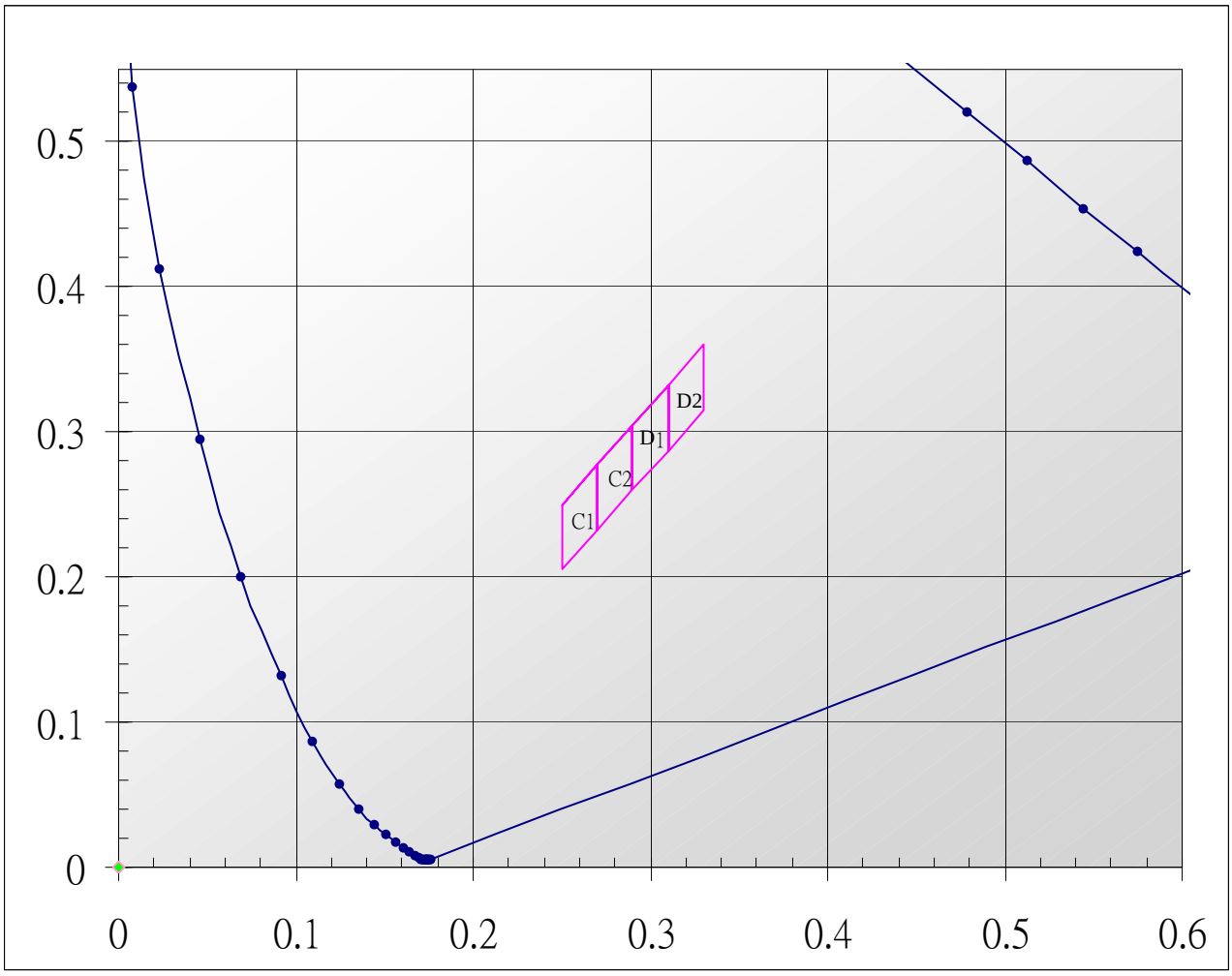
■ Chromaticity Bin (for TW only):

	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	P_d (mW)	I_F (mA)	I_{FP}* (mA)	V_R (V)	T_{OP} (°C)	T_{ST} (°C)
HT-191YG	Yellow Green	65	25	100	5	-30°C~+85°C	-40°C~+90°C
HT-191Y	Yellow						
HT-191D	Orange						
HT-191SD	Red						
HT-191UR	Bright Red	66	30	100			
HT-191URO	Ultra Deep Red	72	30	100			
HT-191UYG	Ultra Bright Yellow Green						
HT-191UY	Ultra Bright Yellow						
HT-191UD	Ultra Bright Orange						
HT-191USD	Ultra Bright Red						
HT-191NB	Blue	78	20	80	5	-30°C~+85°C	-40°C~+90°C
HT-191NG	True Green						
HT-191TW	White						

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

Electro-Optical Characteristics

(T_a 25 °C)

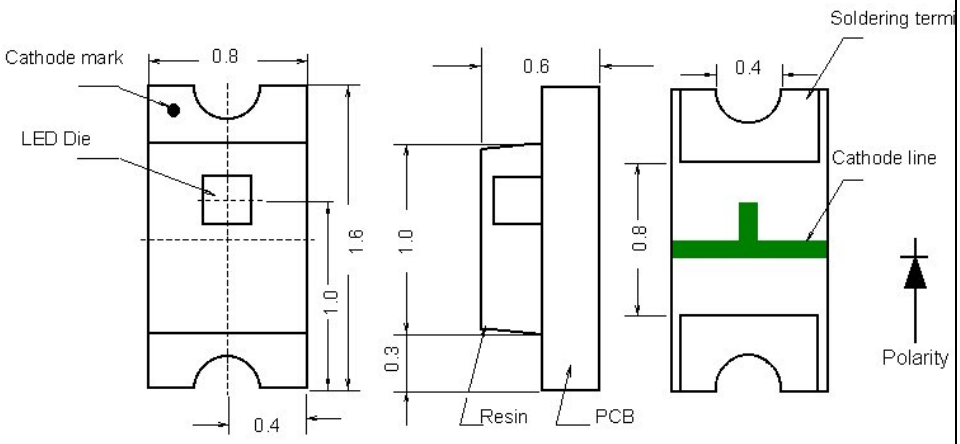
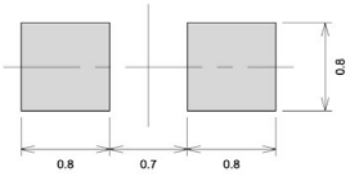
Product	Emission Color	I_F(mA)	V_F(V)		λ(nm)			I^*_V(mcd)	
			typ	max	λ_D	λ_P	△λ	min	typ
HT-191YG	Yellow Green	20	2.2	2.6	573	568	30	9	20
HT-191Y	Yellow	20	2.1	2.6	590	589	35	3.6	8
HT-191D	Orange	20	2.1	2.6	608	610	35	3.6	9
HT-191SD	Red	20	2.1	2.6	629	642	35	5.6	11
HT-191UR	Bright Red	20	1.8	2.2	643	660	20	9	16
HT-191URO	Ultra Deep Red	20	1.9	2.4	632	645	22	56	120
HT-191UYG	Ultra Bright Yellow Green	20	2.0	2.4	573	574	20	35	60
HT-191UY	Ultra Bright Yellow	20	1.9	2.4	591	593	15	35	140
HT-191UD	Ultra Bright Orange	20	1.9	2.4	605	609	17	25	110
HT-191USD	Ultra Bright Red	20	1.9	2.4	622	636	17	56	120
HT-191NB	Blue	20	3.3	3.9	470	468	40	25	40
HT-191NG	True Green	20	3.3	3.9	527	520	40	60	140
HT-191TW	White	20	3.3	3.9	X=0.29 Y=0.31	-	-	140	285

* Per NIST standards

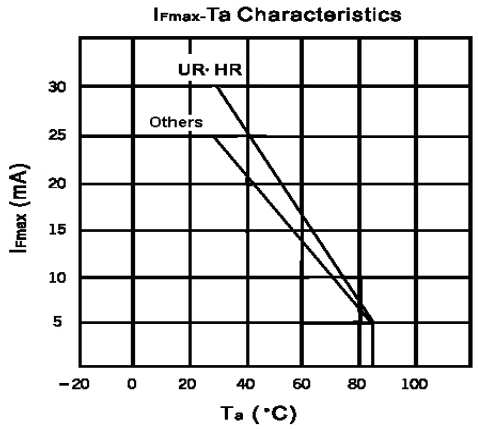
Package Outline Dimension

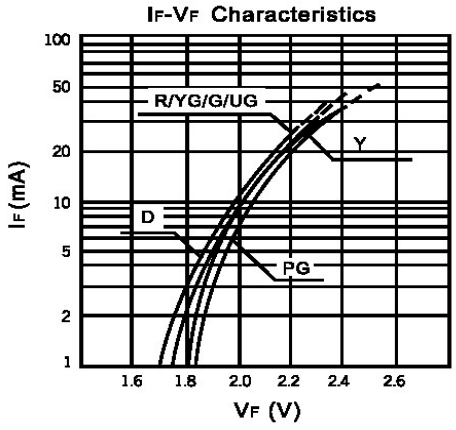
Recommended Soldering Pattern for Reflow Soldering

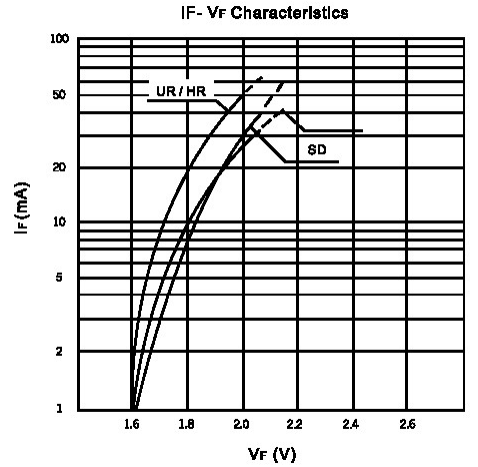
Unit: mm Tolerance: +/-0.1

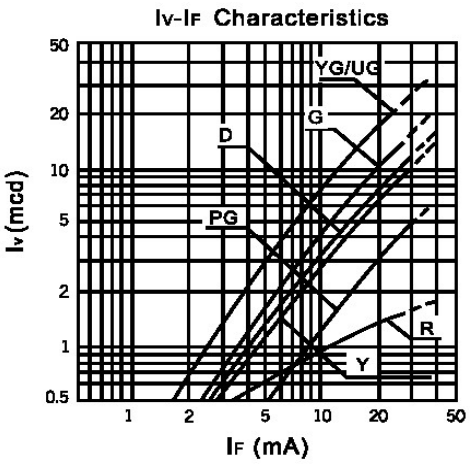
Outline Dimension	Solder Pattern
	
Soldering terminals may shift in the x, y direction.	Unit: mm

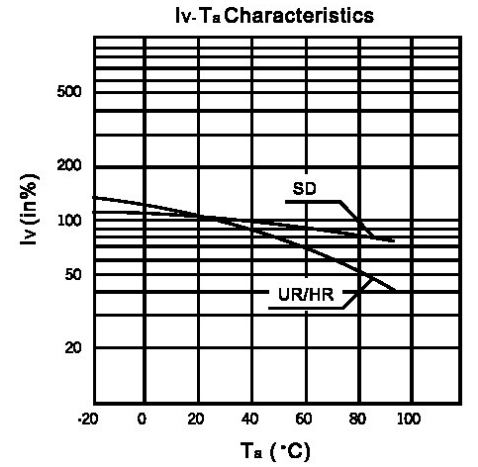
Characteristic Curves for YG, Y, D, SD and UR





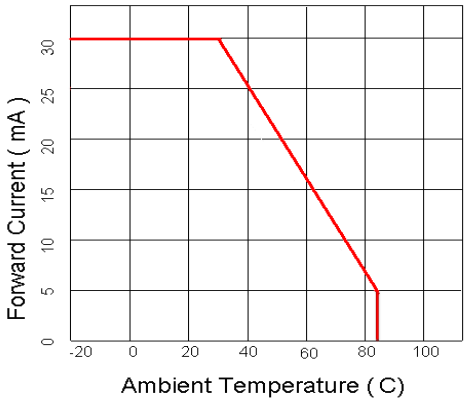




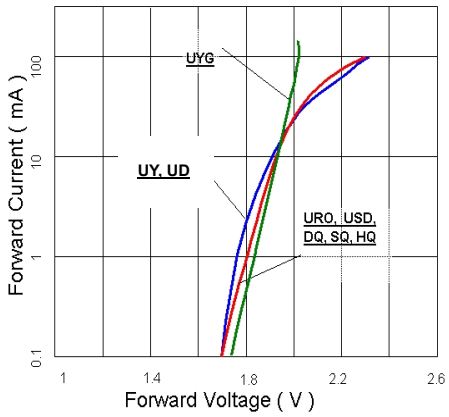


Characteristic Curves for UYG, UY, UD, USD, and URO

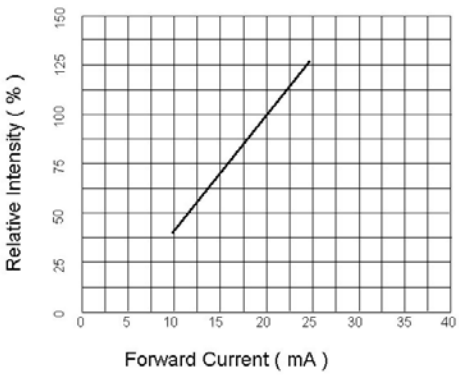
Forward Current vs. Ambient Temperature



Forward Voltage vs. Forward Current

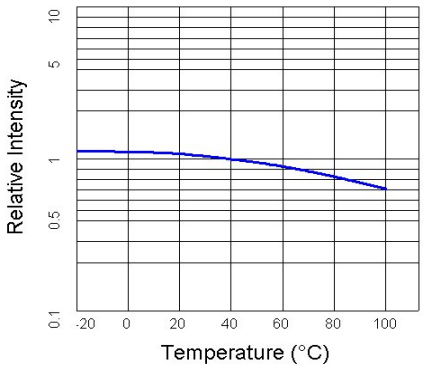


Relative Intensity vs. Forward Current

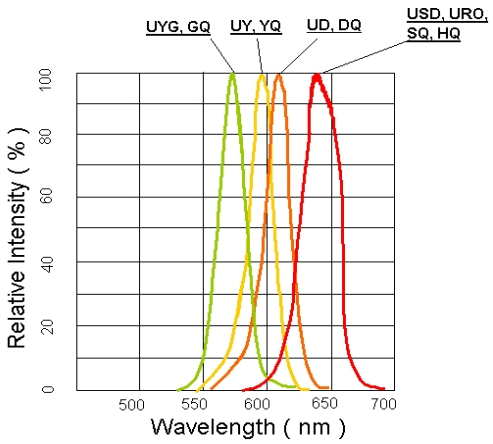


Relative Intensity vs. Ambient Temperature

Plused 20mA; 300us pulse, 10ms peroid

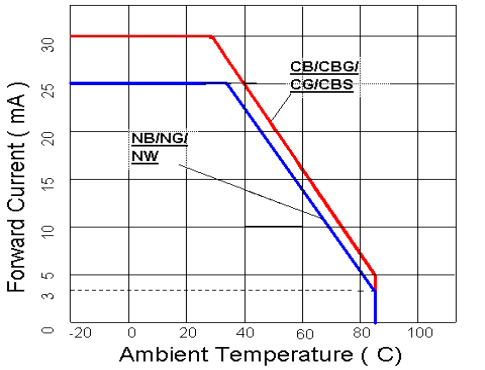


Relative Intensity vs. Wavelength

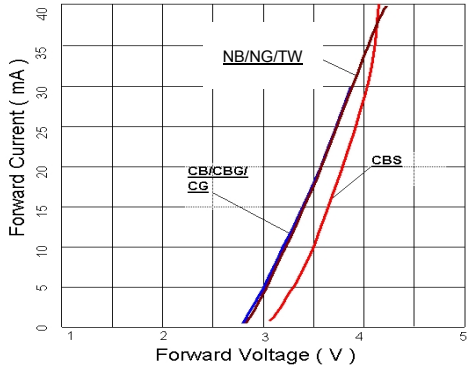


Characteristic Curves for NB, NG and TW

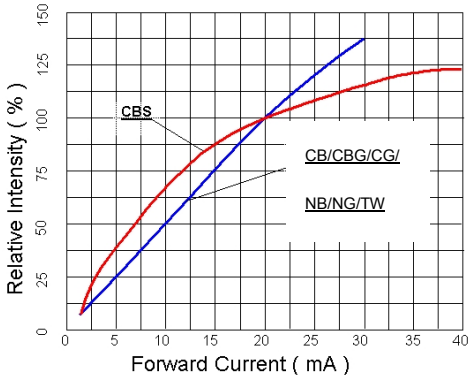
Forward Current vs. Ambient Temperature



Forward Voltage vs. Forward Current

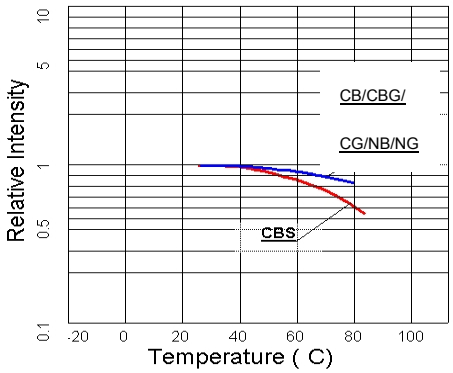


Relative Intensity vs. Forward Current

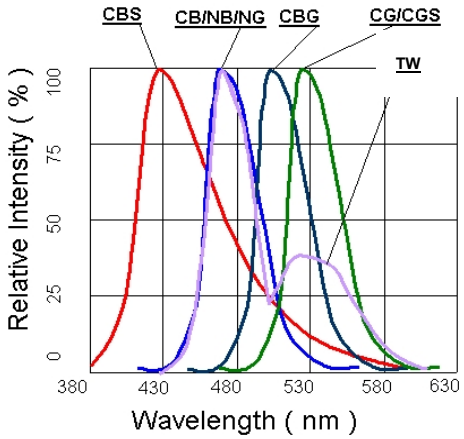


Relative Intensity vs. Ambient Temperature

Plused 20mA; 300us pulse, 10ms peroid

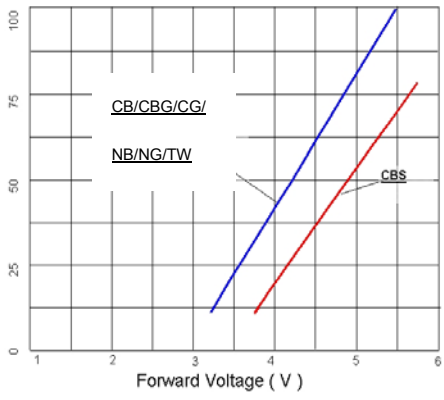


Relative Intensity vs. Wavelength



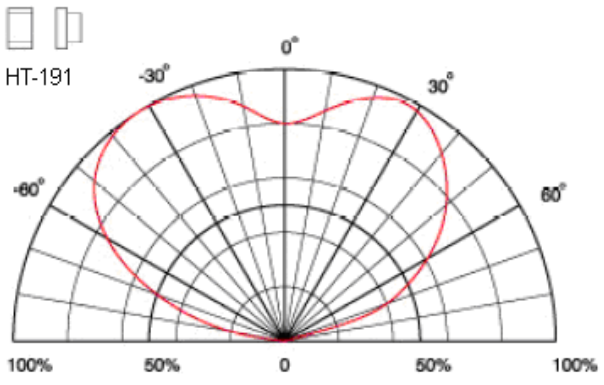
Peak Forward Voltage vs. Forward Current

100's test pulse, 1% duty cycle

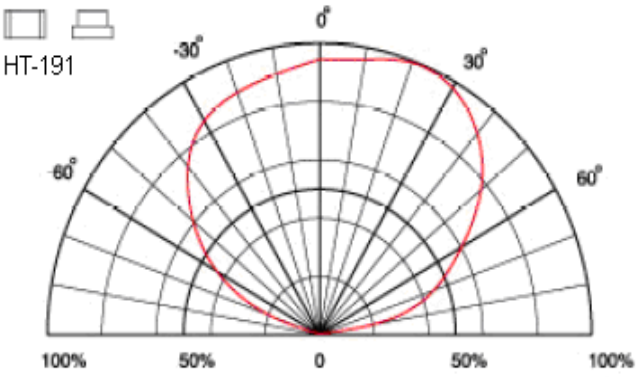


Characteristic Curves for All Colors (Radiation Pattern)

Directive Characteristics

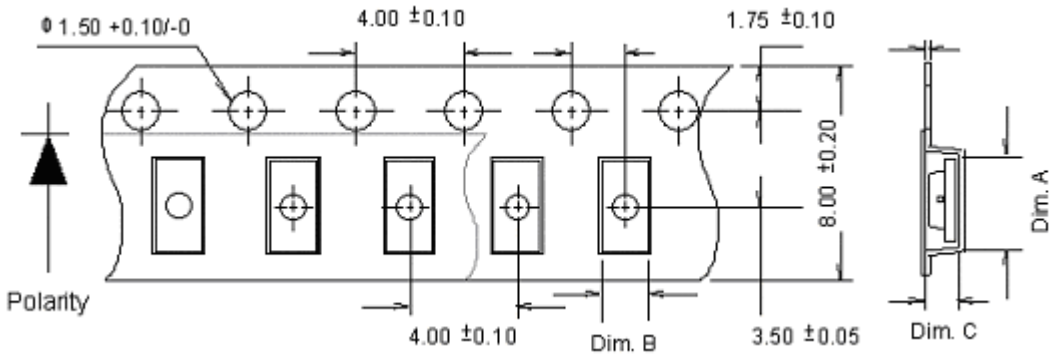


Directive Characteristics



Packaging

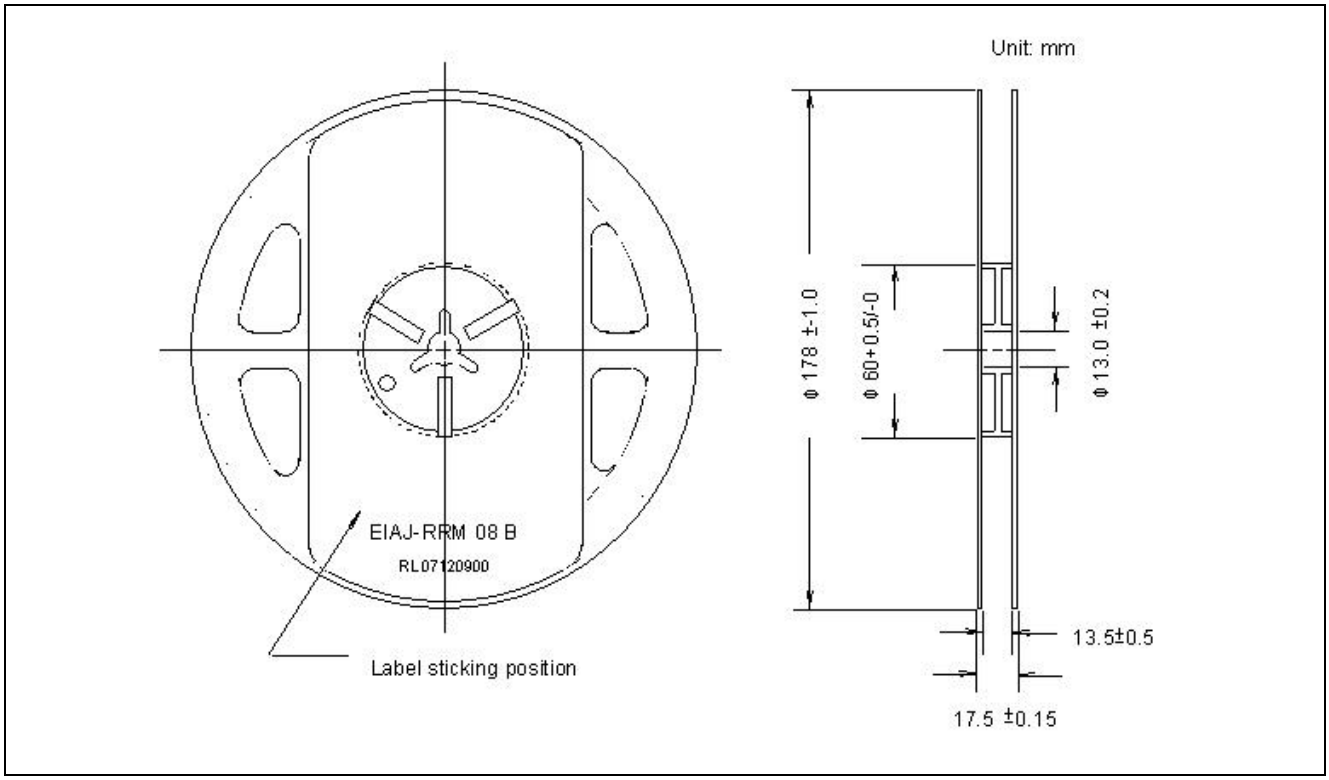
Tape Dimension



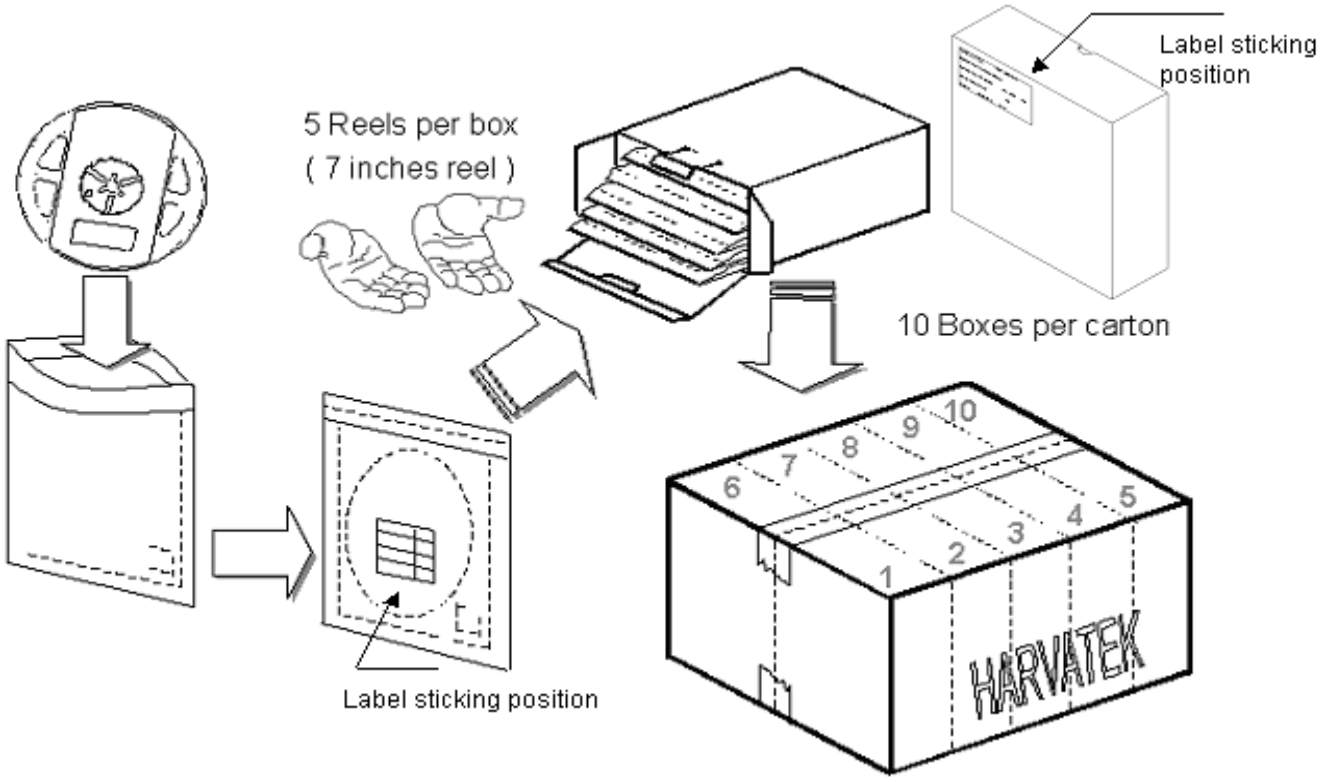
Part No.	Dim. A	Dim. B	Dim. C	Q'ty/Reel
HT-191	1.80±0.10	0.95±0.10	0.75±0.10	4K

Unit: mm

Reel Dimension



Packing



5 boxes per carton is available depending on shipment quantity.

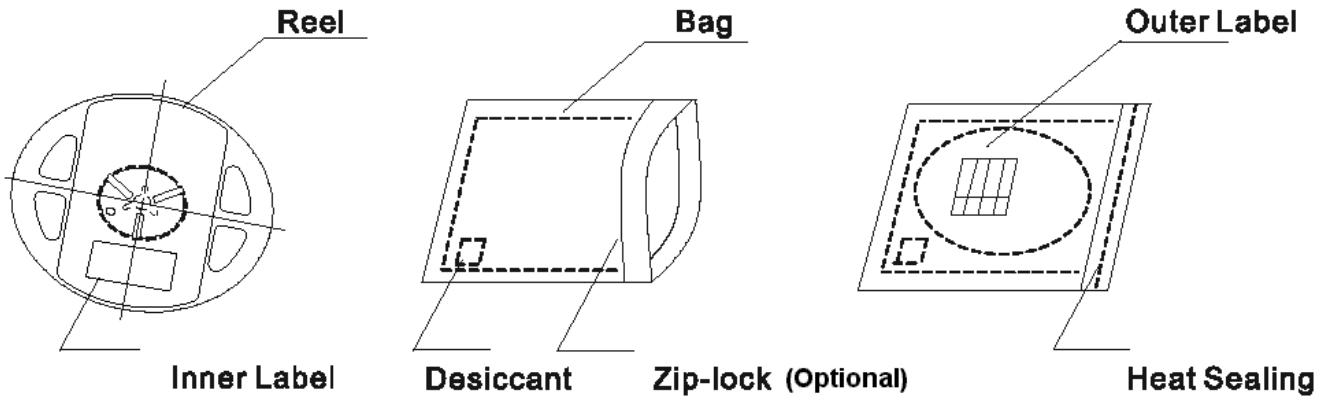
	Specification	Material	Quantity
Carrier tape	Per EIA 481-1A specs	Conductive black tape	4000pcs per reel
Reel	Per EIA 481-1A specs	Conductive black	
Label	HT standard	Paper	
Packing bag	220x240mm	Aluminum laminated bag/ no-zipper	One reel per bag
Carton	HT standard	Paper	Non-specified
Others: Each immediate 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.			

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.

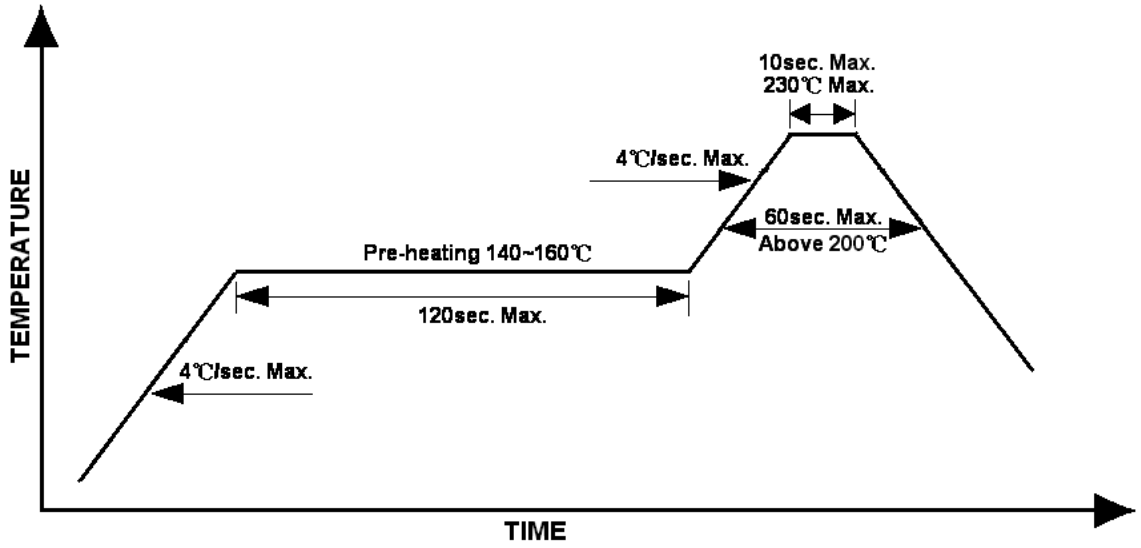
The packaging sequence is as follows:



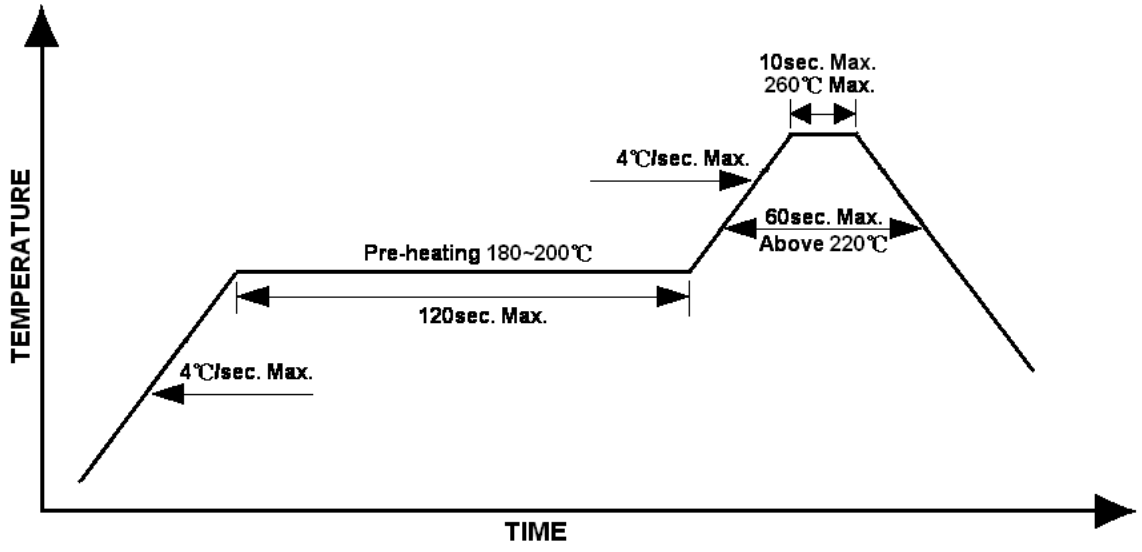
Reflow Soldering

- Recommended tin glue specifications: melting temperature in the range of 178~192 ^{O}C
- The recommended reflow soldering profile is as follows (temperatures indicated are as measured on the surface of the LED resin):

Lead Solder Profile



Lead-free Solder Profile



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.

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
- Ultra sonic 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.
- Electro-static may cause damage to the component. Please ensure that the equipment is properly grounded. Use of an ionizer fan is recommended.

Reliability

Item	Frequency/ lots/ samples/ failures	Standards Reference	Conditions
Precondition	For all reliability monitoring tests according to JEDEC Level 2	J-STD-020	1.) Baking at 85°C for 24hrs 2.) Moisture storage at 85°C/ 60% R.H. for 168hrs
Solderability	1Q/ 1/ 22/ 0	JESD22-B102-B And CNS-5068	Accelerated aging 155°C/ 24hrs Tinning speed: 2.5+0.5cm/s Tinning: A: 215°C/ 3+1s or B: 260°C/ 10+1s
Resistance to soldering heat		CNS-5067	Dipping soldering terminal only Soldering bath temperature A: 260+/-5°C; 10+/-1s B: 350+/-10°C; 3+/-0.5s
Operating life test	1Q/ 1/ 40/ 0	CNS-11829	1.) Precondition: 85°C baking for 24hrs 85°C/ 60%R.H. for 168hrs 2.) Tamb25°C; IF=20mA; duration 1000hrs
High humidity, high temperature bias	1Q/ 1/ 45/ 0	JESD-A101-B	Tamb: 85°C Humidity: 85% R.H., IF=5mA Duration: 1000hrs
High temperature bias	1Q/ 1/ 20	HT specs.	Tamb: 55°C IF=20mA Duration: 1000hrs
Pulse life test	1Q/ 1/ 40/ 0		Tamb25°C, If=20mA,, Ip=100mA, Duty cycle=0.125 (tp=125 μs,T=1sec) Duration 500hrs)
Temperature cycle	1Q/ 1/ 76/ 0	JESD-A104-A IEC 68-2-14, Nb	A cycle: -40 degree C 15min; +85 degree C 15min Thermal steady within 5 min.. 300 cycles 2 chamber/ Air-to-air type
High humidity storage test	1Q/ 1/ 40/ 0	CNS-6117	60+3°C 90+5/-10% R.H. for 500hrs
High temperature storage test	1Q/ 1/ 40/ 0	CNS-554	100+10°C for 500hrs
Low temperature storage test	1Q/ 1/ 40/ 0	CNS-6118	-40+5°C for 500hrs

Revision History

Changes since last revision	Page	Version No.	Revision Date
New format		1.0	10-17-2006
Added URO		1.1	01-29-2007
Added viewing angle	6	1.2	03-15-2007
Update to Clear Diffused Lens	5	1.3	09-08-2008
Add InGaN parts		1.4	01-14-2009