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Official Product	Product: HT-T168 Ultra-bright Series		Data Sheet No.
Tentative Product	*****		HT-T168 series
Specifications are subject to change without notice. Data and drawings herein are copyrighted.	Nov 05, 2007	Version of 1.1	Page 2/24

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.

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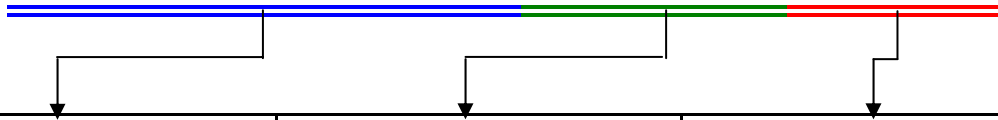
Product Specifications

Product	Emission Color	Technology	Test Current	Luminous Intensity I_v (mcd)	Flux Φ_v (mlm)	Orderable Part Number
HT-T168UROD	Deep Red	AlInGaP	50	224.0-900.0	1700 typ	HT-T168UROD-YYY0
				224.0-900.0	1200 typ	HT-T168UROD-YYY1
				355.0-900.0	1900 typ	HT-T168UROD-YYY2
HT-T168USDD	Red	AlInGaP	50	355.0-1400.0	2650 typ	HT-T168USDD-YYY0
				355.0-900.0	1900 typ	HT-T168USDD-YYY1
				560.0-1400.0	2950 typ	HT-T168USDD-YYY2
HT-T168UDD	Orange	AlInGaP	50	355.0-1400.0	2650 typ	HT-T168USDD-YYY0
				355.0-900.0	1900 typ	HT-T168USDD-YYY1
				560.0-1400.0	2950 typ	HT-T168USDD-YYY2
HT-T168UYD	Yellow	AlInGaP	50	355.0-1400.0	2650 typ	HT-T168UYD-YYY0
				355.0-900.0	1900 typ	HT-T168UYD-YYY1
				560.0-1400.0	2950 typ	HT-T168UYD-YYY2
HT-T168NGF	True Green	InGaN	30	280.0-1120.0	2100 typ	HT-T168NGF-YYY0
				280.0-750.0	1500 typ	HT-T168NGF-YYY1
				450.0-1120.0	2400 typ	HT-T168NGF-YYY2
HT-T168NBGF	Blue Green	InGaN	30	227.0-570.0	1200 typ	HT-T168NBGF-YYY0
HT-T168NBF	Blue	InGaN	30	71.0-280.0	520 typ	HT-T189NBF-YYY0
				71.0-180.0	380 typ	HT-T168NBF-YYY1
				112.0-280.0	600 typ	HT-T168NBF-YYY2
HT-T168TWF	White	InGaN	30	280.0-1200.0	2100 typ	HT-T168TWF-YYY0
				355.0-900.0	1900 typ	HT-T168TWF-YYY1
				560.0-1120.0	2400 typ	HT-T168TWF-YYY2

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■ Harvatek P/N:

H T - T 1 6 8 XXXX - YYY Z



Series Name	Emitting Color	Customer Code
HT-T168 HT: Harvatek T168: tLED series 3.5 (L) x 2.7 (W) x 1.8 (H) mm	XXXX UROD: Deep Red @ 50mA USDD: Red @ 50mA UDD: Orange @ 50mA UYD: Yellow @ 50mA NGF: True Green @ 30mA NBGF: Blue Green @ 30mA NBF: Blue @ 30mA TWF: White @ 30mA	YYY Customer Product Code (TBD) Z 0: Luminous intensity range 0 1: Luminous intensity range 1 2: Luminous intensity range 2

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

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■ Luminous Intensity (lv) Bin:

Bin	Luminous Intensity Range (mcd)		Bin	Luminous Intensity Range (mcd)	
	Minimum	Maximum		Minimum	Maximum
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	320.0	T2	320.0	360.0
U1	360.0	400.0	U2	400.0	450.0
V1	450.0	500.0	V2	500.0	560.0
W1	560.0	630.0	W2	630.0	715.0
X1	715.0	800.0	X2	800.0	900.0
Y1	900.0	1000.0	Y2	1000.0	1125.0
Z1	1125.0	1270.0	Z2	1270.0	1440.0
AA1	1440.0	1610.0	AA2	1610.0	1800.0

AllInGaP@50mA / InGaN@30mA, Ta=25°C, ± 10%

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■ Wavelength (λ_D) Bin:

Bin	Wavelength Range (nm)							
	Deep Red (UROD)		Red (USDD)		Orange (UDD)		Yellow (UYD)	
	Min	Max	Min	Max	Min	Max	Min	Max
-	635.0	650.0	615.0	630.0				
A							582.0	585.0
B					600.0	603.0	585.0	588.0
C					603.0	606.0	588.0	591.0
D					606.0	609.0	591.0	594.0
E					609.0	612.0		
F								
G								
H								

Bin	Wavelength Range (nm)					
	True Green (NGF)		Blue Green (NBGF)		Blue (NBF)	
	Min	Max	Min	Max		
-						
A	515.0	520.0	495.0	500.0	460.0	464.0
B	520.0	525.0	500.0	505.0	464.0	468.0
C	525.0	530.0	505.0	510.0	468.0	472.0
D	530.0	535.0	510.0	515.0	472.0	476.0
E	535.0	540.0			476.0	480.0
F					480.0	485.0
H						
J						

AllInGaP@50mA / InGaN@30mA, Ta=25°C, ± 0.5nm

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■ Forward Voltage (V_F) Bin:

Bin	Forward Voltage Range (V)							
	Deep Red (UROD)		Bin	Red (USDD), Orange (UDD), Yellow (UYD)		Bin	True Green (NGF), Blue Green (NBGF), Blue (NBF), White (TWF)	
	Min	Max		Min	Max		Min	Max
-	1.6	2.4						
			E5	1.6	1.8	G8	2.7	2.9
			E6	1.8	2.0	H7	2.9	3.1
			F5	2.0	2.2	H8	3.1	3.3
			F6	2.2	2.4	J7	3.3	3.5
						J8	3.5	3.7
						K7	3.7	3.9

AllInGaP@50mA / InGaN@30mA, Ta=25°C, ± 0.05 V

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■ XY Chromaticity Bin (for TWF only):

		Rank A0			
x		0.280	0.264	0.283	0.296
y		0.248	0.267	0.305	0.276

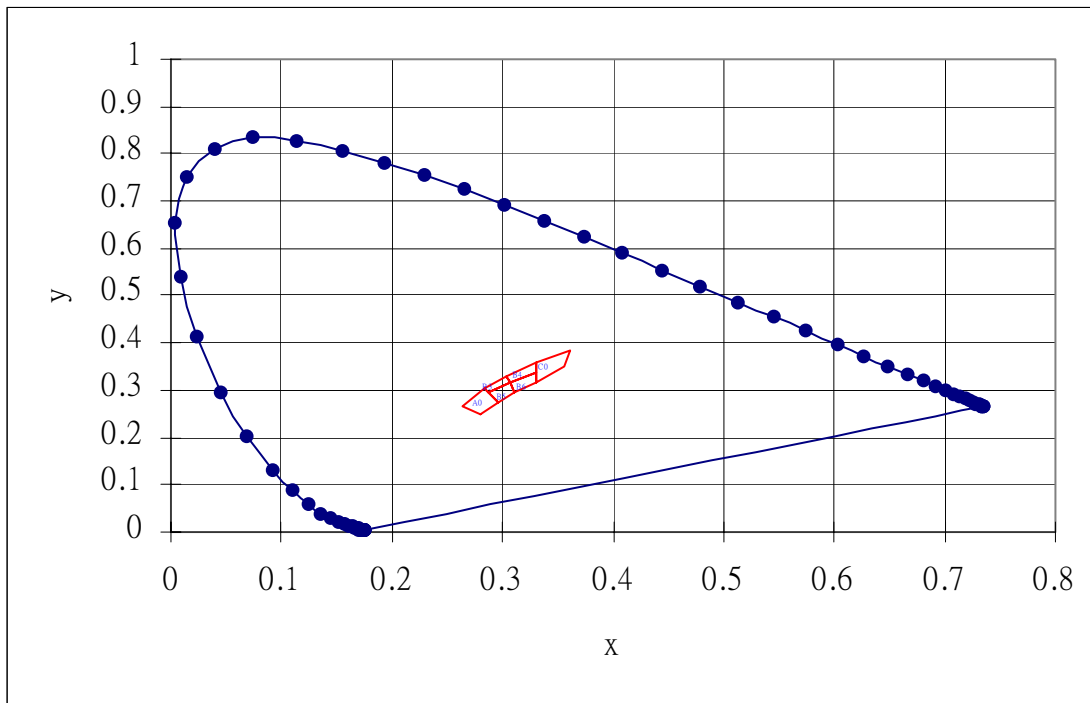
		Rank B3			
x		0.287	0.283	0.304	0.307
y		0.295	0.305	0.330	0.315

		Rank B4			
x		0.307	0.304	0.330	0.330
y		0.315	0.330	0.360	0.339

		Rank C0			
x		0.330	0.330	0.361	0.356
y		0.318	0.360	0.385	0.351

		Rank B5			
x		0.296	0.287	0.307	0.311
y		0.276	0.295	0.315	0.294

		Rank B6			
x		0.311	0.307	0.330	0.330
y		0.294	0.315	0.339	0.318



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Product Characteristics

Absolute Maximum Ratings

Product	Emission Color	Material	P _d (mW)	I _F (mA)	I _{FP} * (mA)	V _R (V)	T _{OP} (°C)	T _{ST} (°C)
HT-T168UROD	Deep Red	AllnGap	225	70	1000	12	-40°C~+100°C	-40°C~+100°C
HT-T168USD	Red	AllnGaP	225	70	1000	12	-40°C~+100°C	-40°C~+100°C
HT-T168UDD	Orange	AllnGaP	225	70	1000	12	-40°C~+100°C	-40°C~+100°C
HT-T168UYD	Yellow	AllnGaP	225	70	200	12	-40°C~+100°C	-40°C~+100°C
HT-T168NGF	True Green	InGaN	135	50	250	5	-40°C~+100°C	-40°C~+100°C
HT-T168NBGF	Blue Green	InGaN	135	50	250	5	-40°C~+100°C	-40°C~+100°C
HT-T168NBF	Blue	InGaN	135	50	200	5	-40°C~+100°C	-40°C~+100°C
HT-T168TWF	White	InGaN	135	50	200	5	-40°C~+100°C	-40°C~+100°C

- Condition for I_{FP} is pulse of 0.005 duty and 0.01msec width

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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	Δλ	Typ.
HT-T168UROD	Deep Red	50	1.9	2.4	632	639	17	500
HT-T168USDD	Red	50	1.9	2.4	622	632	17	850
HT-T168UDD	Orange	50	1.9	2.4	606	609	17	850
HT-T168UYD	Yellow	50	1.9	2.4	587	593	15	850
HT-T168NGF	True Green	30	3.3	3.9	532	527	30	400
HT-T168NBGF	Blue Green	30	3.3	3.9	505	503	30	400
HT-T168NBF	Blue	30	3.3	3.9	470	468	40	100
HT-T168TWF	White	30	3.3	3.9	X=0.31 Y=0.32	-	-	1000

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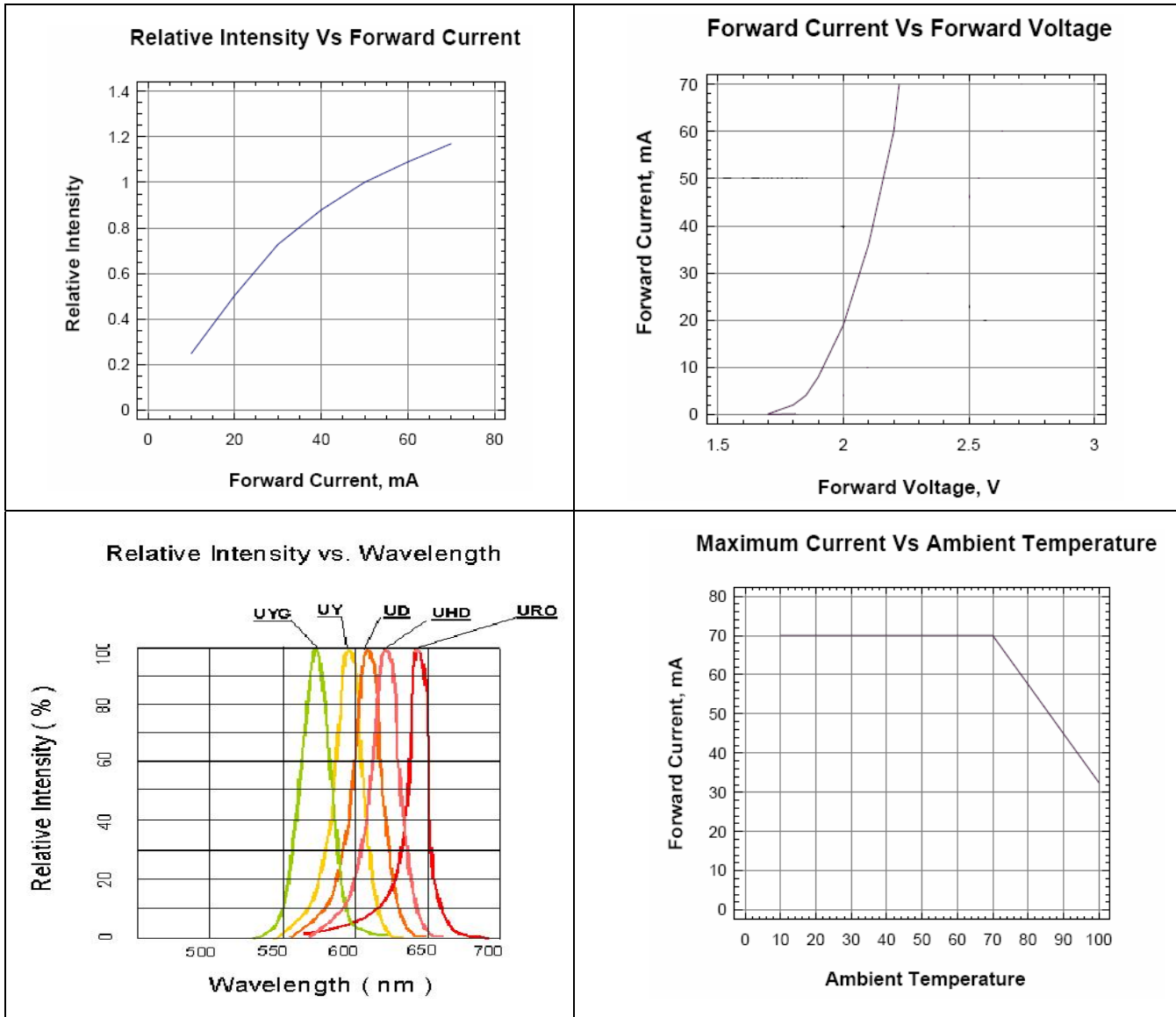
Package Outline Dimension
Recommended Soldering Pattern for Reflow Soldering

Unit: mm Tolerance: +/-0.1

Outline Dim.	Soldering Pattern
<p>Package marking.</p>	<p>Additional Cu area for improved heat dissipation. Cu area >16 mm sq/ per pad. Electrolytically isolated with solder mask.</p>
<p>Soldering terminals may shift in the x, y direction.</p>	

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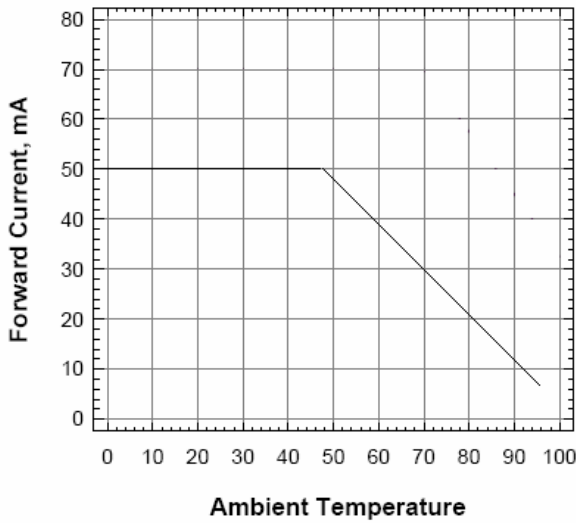
Characteristic Curves for UROD, USDD, UDD, UYD



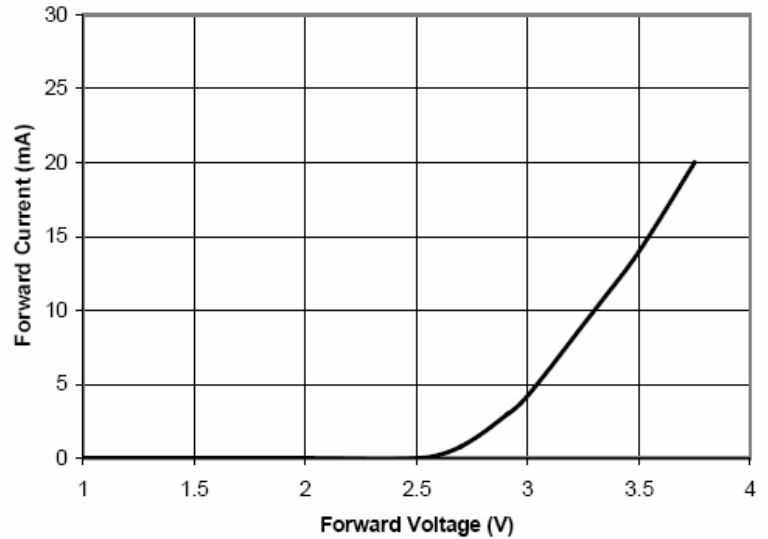
Official Product	Product: HT-T168 Ultra-bright Series	Data Sheet No.
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Characteristic Curves for NGF, NBGF, NBF, and TWF

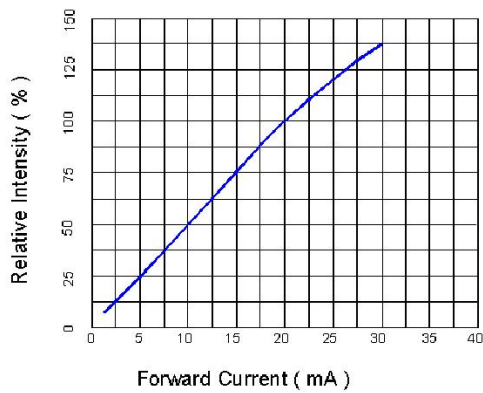
Maximum Current Vs Ambient Temperature



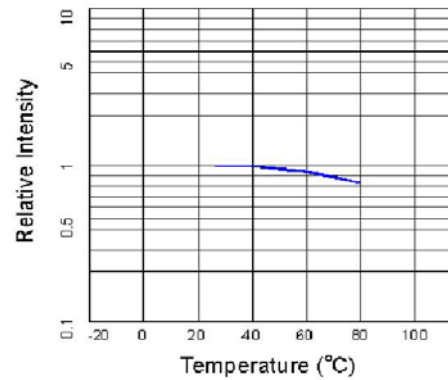
Forward Current (mA) vs. Forward Voltage



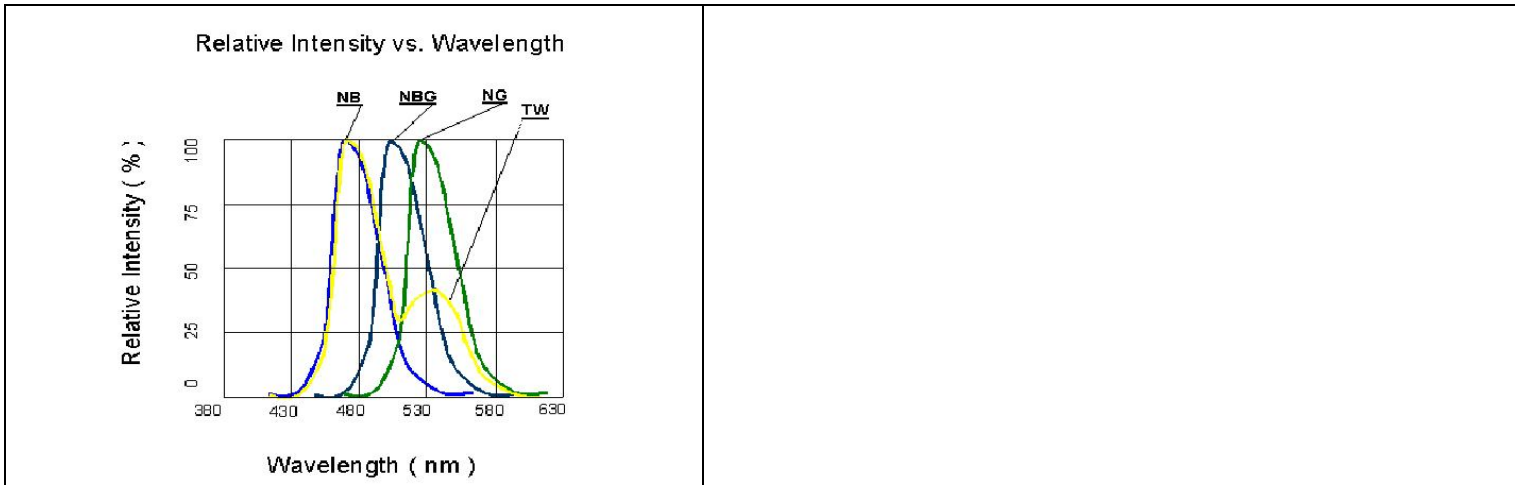
Relative Intensity vs. Forward Current



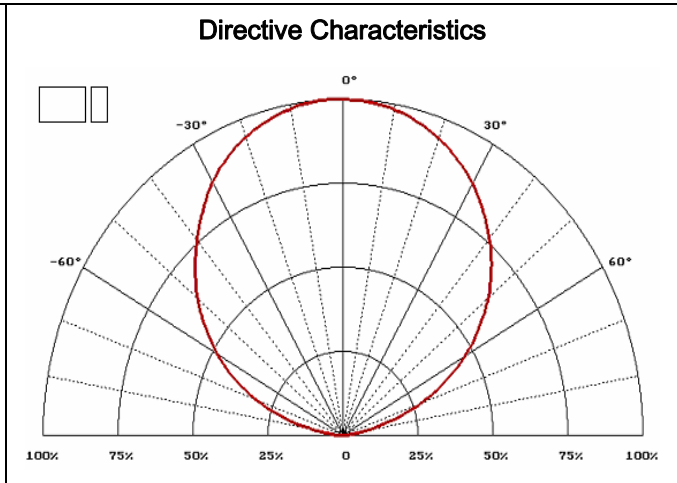
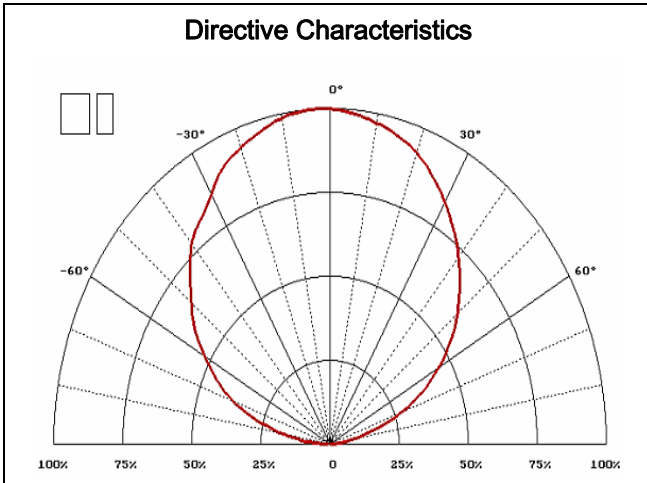
Relative Intensity vs. Ambient Temperature
Pulsed 20mA, 300us pulse, 10ms period



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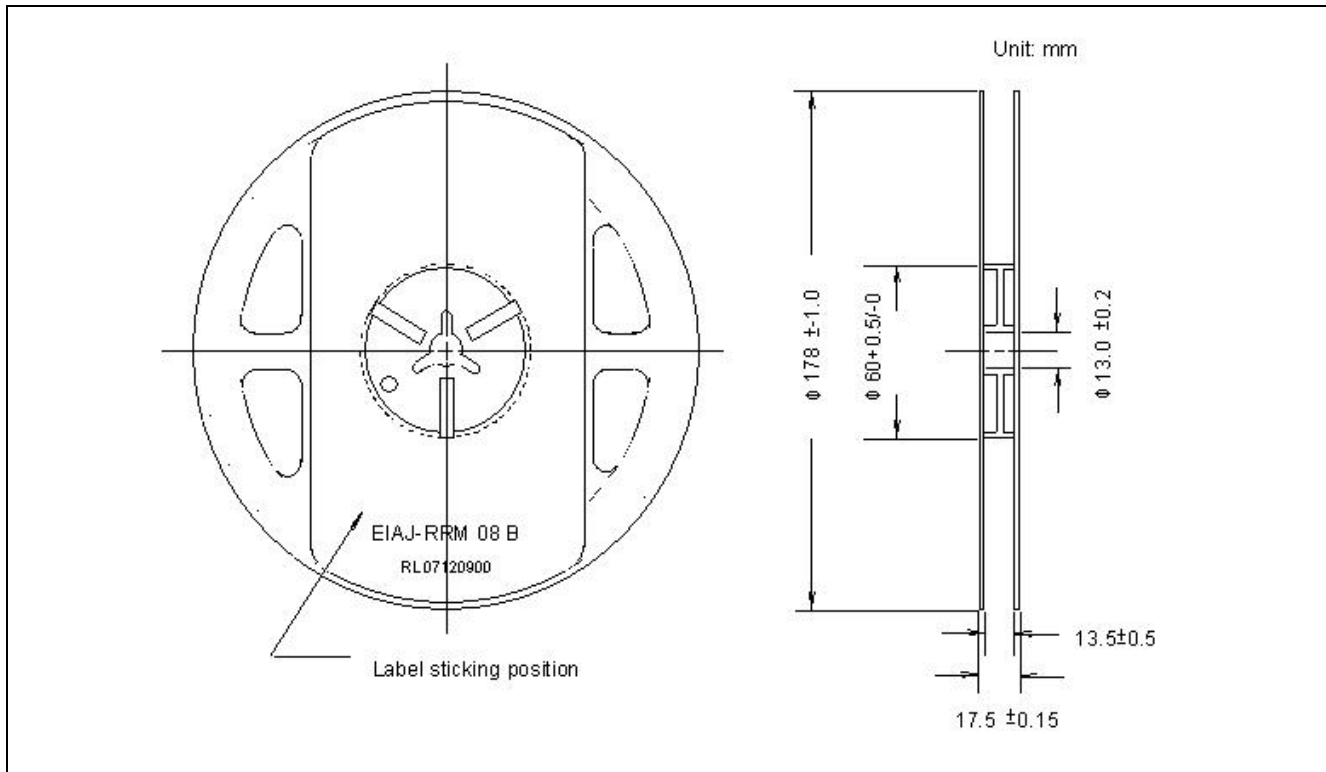


Radiation Pattern



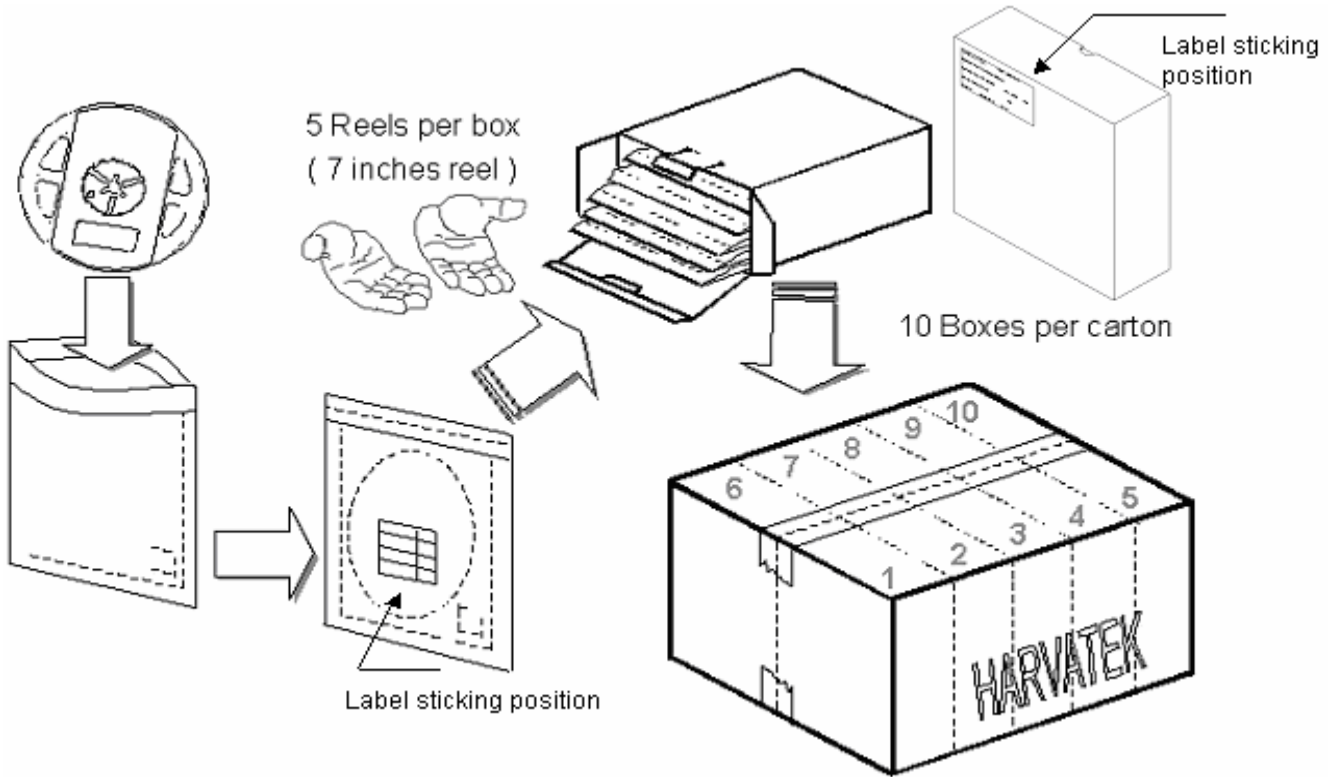
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Reel Dimension



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Packing



5 boxes per carton are available depending on shipment quantity.

	Specification	Material	Quantity
Carrier tape	Per EIA 481-1A specs	Plastic tape	2000pcs per reel
Reel	Per EIA 481-1A specs	Plastic white	
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, λD and Vf. Each reel has a label identifying its specification; the immediate box consists of a product label as well.

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ATTENTION: Electrostatic Discharge (ESD) protection



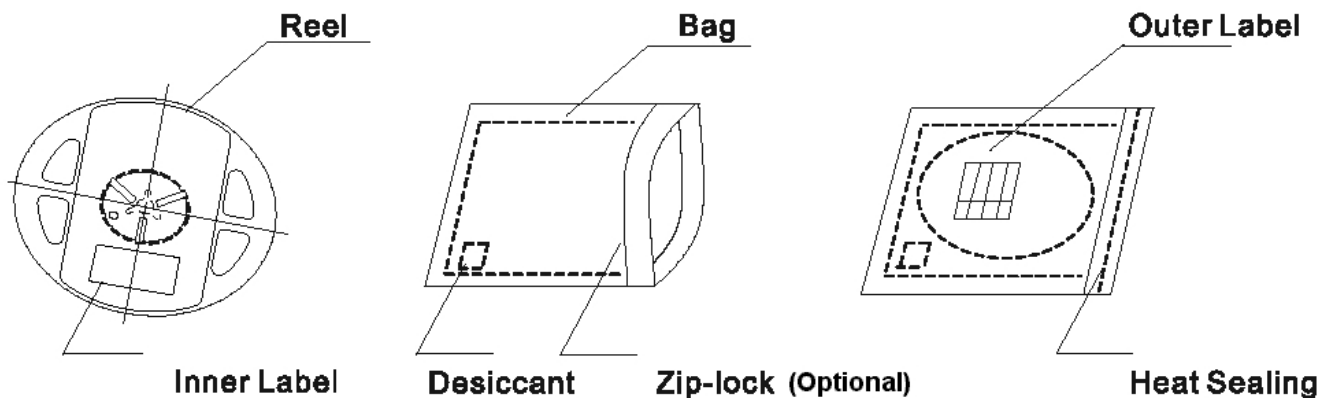
The symbol to the left denotes that ESD precaution is needed. ESD protection for GaP and AlGaAs based chips is necessary even though they are relatively safe in the presence of low static-electric discharge. Parts built with AlInGaP, GaN, or/and InGaN based chips are **STATIC SENSITIVE devices**. ESD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

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:

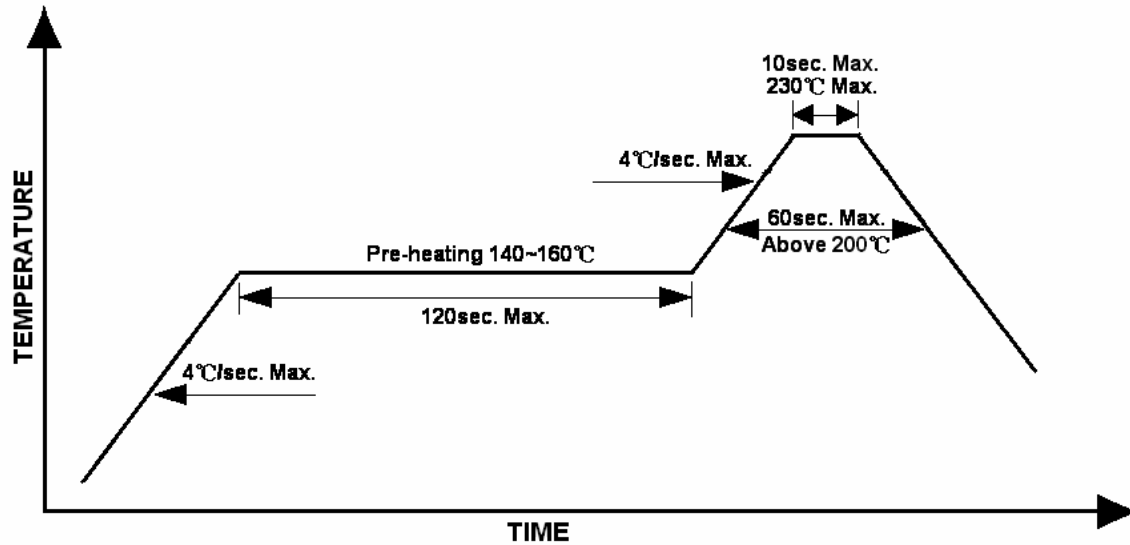


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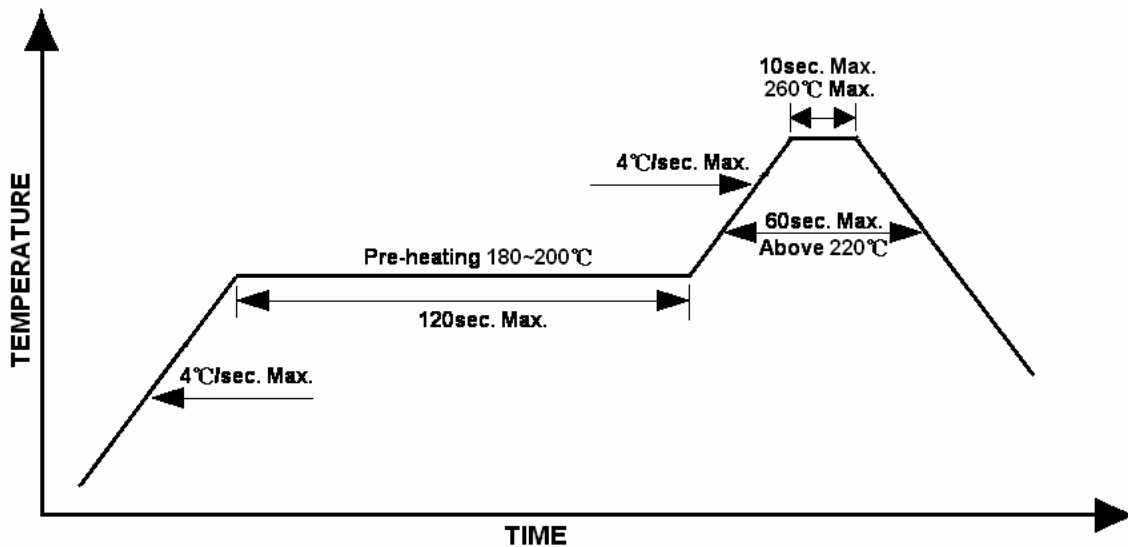
Reflow Soldering

- Recommended tin glue specifications: melting temperature in the range of 178~192 °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



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

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Reliability

Package Reliability Test

Test Item	Test Condition	Note	Sample size
Solder Heat Resistance I	260°C, 10sec, once	Dip Soldering	22
Solder Heat Resistance II	240°C, 10sec, twice (Storage:30°C, 60%RH, 168h)	Reflow Soldering	77
Solderability	230°C, 5sec, once	>90% (using flux)	22
Vibration	100-2000Hz/20G, 4 min-sweep Three directions (X, Y, Z), 5 times each		40
Shock	1500G, Three directions (X, Y, Z), 5 times each		40
Drop	1m		40
Temperature Cycling	-40°C/15 min, 25°C/5 min, 100°C/15 min	300 cycles	77
High Temperature Storage	Ta = 100°C	1000h	77
Low Temperature Storage	Ta = -40°C	1000h	77
High Temp/Humidity Storage	Ta = 60°C, RH = 90%	1000h	77
Electrostatic Discharge	R = 1.5k., C = 100pF, Test voltage = 2KV	3 times, -/+	40
COQ		300 cycles	300
PCT		96h	100
JEDEC Level I			100

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Revision History

Revision	Page	Version No.	Revision Date
New Format HT-T168 series		1.0	05-08-2007
Revise graphics		1.1	11-05-2007

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