

**Harvatek Surface Mount LED Data Sheet****HT-P378 Series**

Official Product	HT Part No. HT-P378 Series	Your Part No.	Data Sheet No.
Tentative Product	*****	*****	HT-P378 Series
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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**

	Specification	Material	Quantity
Total Flux	Red: 55lm typical @900mA/ Ta= 25°C, $\pm$ 10% Yellow: 55lm typical @900mA/ Ta= 25°C, $\pm$ 10% Green: 70lm typical @1050mA/ Ta= 25°C, $\pm$ 10% Blue: 18lm typical @1050mA/ Ta= 25°C, $\pm$ 10% White: 105lm typical @1050mA/ Ta= 25°C, $\pm$ 10%		
Dominant Wavelength	Red: 625nm typical @900mA/ Ta= 25°C, $\pm$ 0.5nm Yellow: 592nm typical @900mA/ Ta= 25°C, $\pm$ 0.5nm Green: 525nm typical @1050mA/ Ta= 25°C, $\pm$ 0.5nm Blue: 470nm typical @1050mA/ Ta= 25°C, $\pm$ 0.5nm		
Correlated Color Temperature	White: 3000K~9000K @700mA/ Ta=25°C, $\pm$ 5%		
$V_F$	Green, blue, white: 3.03-3.99V @700mA/ Ta=25°C, $\pm$ 0.1 V Red, yellow: 2.07-2.79V @600mA/ Ta=25°C, $\pm$ 0.1 V		
$I_R$	HT standard		
Resin	Clear	Epoxy resin	
Tube	HT standard	Conductive	50pcs per tube
Label	HT standard	Paper	
Carton	HT standard	Paper	

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**Compliance and Certification**

RoHS compliant and IS9002, QS9000 and ISO14001 certified.

**Electric Static Discharge (ESD) protection**

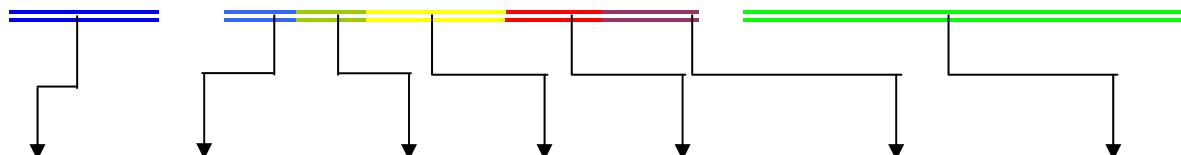
The symbol to the left denotes that ESD precaution is needed. ESD protection for GaP and AlGaAs based chips is necessary even though they are relatively safe in the presence of low static-electric discharge. Parts built with AlInGaP, GaN, or/and InGaN based chips are **STATIC SENSITIVE devices**. ESD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

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**Description of Part Number and Lot Number****Part Number**

**H T - P 3 7 8 X<sub>A</sub> X<sub>B</sub> - X<sub>C</sub> X<sub>D</sub> - X<sub>E</sub> X<sub>F</sub>**



Company	Series Code	Dice / Power	Package Code	Emitter Color	Current Code	Bin Code
HT: Harvatek	P: Power	2: Three dice	Outline Dimension	USD: Red UY: Yellow NG: Green NB: Blue TW: White	Y : 900mA W : 1050mA	Brightness Range X <sub>C</sub> : Minimum bin X <sub>D</sub> : Maximum bin  Color Range: X <sub>E</sub> : Minimum bin X <sub>F</sub> : Maximum bin

**Lot Number**

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 .....	1: Jan. .... 9: Sep. A: Oct.	1~31/ (30)	01~99, A,B,C...	D: Milky White	T: Taped Reel

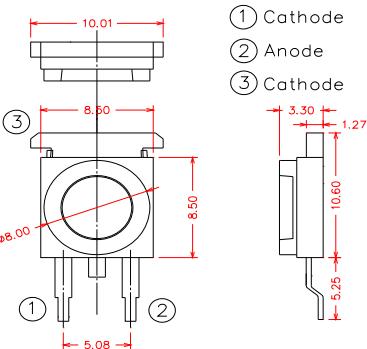
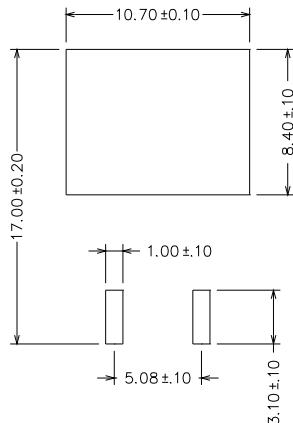
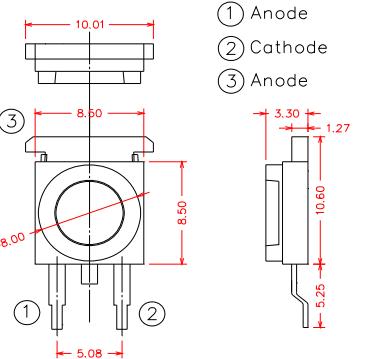
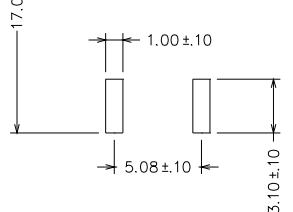
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**Orderable Part Number**

Orderable Part Number	Color	Brightness Intensity Bin	Color Bin
HT-P378USDY-PRPS-13	Red	39.8-67.2 lm	613.5-645.0 nm
HT-P378USDY-PRPS-23		39.8-67.2 lm	620.5-645.0 nm
HT-P378UYY-PRPS-35	Yellow	39.8-67.2 lm	589.5-597.0 nm
HT-P378UYY-PRPS-45		39.8-67.2 lm	592.0-597.0 nm
HT-P378NBW-PLPN-36	Blue	10.7-23.5 lm	460.0-480.0 nm
HT-P378NBW-PMPN-45		13.9-23.5 lm	465.0-475.0 nm
HT-P378NGW-PSPT-35	True Green	51.7-87.4 lm	520.0-535.0 nm
HT-P378NGW-PSPT-45		51.7-87.4 lm	525.0-535.0 nm
HT-P378TWW-PUPV-HL	Warm White	87.4-147.7 lm	2750-4500 K
HT-P378TWW-PUPV-KL		87.4-147.7 lm	2750-3750 K
HT-P378TWW-PUPV-DG	Pure White	87.4-147.7 lm	4750-6750 K
HT-P378TWW-PUPV-FG		87.4-147.7 lm	4750-5750 K
HT-P378TWW-PUPV-AC	Cold White	87.4-147.7 lm	6750-9500 K
HT-P378TWW-PUPV-BC		87.4-147.7 lm	6750-8500 K

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**Package Dimensions and Recommended Soldering Pattern**

Package Dimensions	Soldering Pattern
<b>Blue, Green, and White</b>  <p>① Cathode ② Anode ③ Cathode</p>	
<b>Red, Yellow</b>  <p>① Anode ② Cathode ③ Anode</p>	

Tolerance: +/-0.1mm (unless otherwise noted)

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**Absolute Maximum Ratings**

Parameter	Red, Yellow	Green, Blue, White	Unit	Conditions <sup>2</sup>
DC Forward Current	900	1050	mA	-
Peak Pulsed Forward Current <sup>1</sup>	1200	1500	mA	-
Average Forward Current	900	1050	mA	-
Reverse Voltage	5		V	-
LED Junction Temperature	120		°C	-
Operating Temperature	-40 ~ +85		°C	-
Storage Temperature	-40 ~ +120		°C	-
Soldering Temperature	260		°C	5 sec. Max.

<sup>1</sup> tp≤10μs, Duty cycle=10%<sup>2</sup> All at Ta=25°C<sup>3</sup> Part should not be subjected to IR reflow.

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**Electro-Optical Characteristics**

Parameter	Symbol	Color	Min.	Typ.	Max.	Unit	Condition <sup>3</sup>
Forward Voltage	V <sub>F</sub>	Green	3.03	-	3.99	V	I <sub>F</sub> =1050mA
		Blue	3.03	-	3.99	V	
		White	3.03	-	3.99	V	
		Red	2.07	-	2.79	V	I <sub>F</sub> =900mA
		Yellow	2.07	-	2.79	V	
Color	λ <sub>D</sub>	Green	510	-	550	nm	I <sub>F</sub> =1050mA
	λ <sub>D</sub>	Blue	450	-	490	nm	
	CCT	White	3000	-	9000	K	
	λ <sub>D</sub>	Red	610	-	645	nm	I <sub>F</sub> =900mA
	λ <sub>D</sub>	Yellow	585	-	600	nm	
Total Flux	Φv	Green	-	70	-	lm	I <sub>F</sub> =1050mA
		Blue	-	18	-	lm	
		White	-	105	-	lm	
		Red	-	55	-	lm	I <sub>F</sub> =900mA
		Yellow	-	55	-	lm	
View Angle	2θ <sup>1/2</sup>	-	110	-	-	°	-
Temperature Coefficient of Forward Voltage	ΔV <sub>F</sub> /ΔT	Green Blue White Red Yellow	-	-2	-	mV/°C	-
Thermal Resistance Junction to Board	R <sub>θ<sub>J-B</sub></sub>	Red Yellow	-	11	-	°C/W	I <sub>F</sub> =900mA
		Green Blue White	-	10	-		I <sub>F</sub> =1050mA

<sup>3</sup> All at Ta=25°C

 λ<sub>D</sub> represents Dominant Wavelength

CCT represents Correlated Color Temperature

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**Luminous Flux Rank (X<sub>C</sub>,X<sub>D</sub>)**

Rank Code	Symbol	Condition	Min.	Typ.	Max.	Unit
PH	ΦV	I <sub>F</sub> =1050mA (Blue & Green)	4.9	-	6.3	lm
PJ			6.3	-	8.2	
PK			8.2	-	10.7	
PL			10.7	-	13.9	
PM			13.9	-	18.1	
PN			18.1	-	23.5	
PP		I <sub>F</sub> =900mA (Red & Yellow)	23.5	-	30.6	
PQ			30.6	-	39.8	
PR			39.8	-	51.7	
PS			51.7	-	67.2	
PT			67.2	-	87.4	
PU			87.4	-	113.6	
PV			113.6	-	147.7	

Tolerance: ±10%

**Dominant Wavelength Rank (X<sub>E</sub>,X<sub>F</sub>)**

Red

Rank Code	Symbol	Condition	Min.	Typ.	Max.	Unit
Full	λ <sub>D</sub>	I <sub>F</sub> =900mA	613.5	-	645.0	nm
1			613.5	-	620.5	
2			620.5	-	631.0	
3			631.0	-	645.0	

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**Yellow**

Rank Code	Symbol	Condition	Min.	Typ.	Max.	Unit
1	$\lambda_D$	$I_F=900\text{mA}$	584.5	-	587.0	nm
2			587.0	-	589.5	
3			589.5	-	592.0	
4			592.0	-	594.5	
5			594.5	-	597.0	

**Blue**

Rank Code	Symbol	Condition	Min.	Typ.	Max.	Unit
1	$\lambda_D$	$I_F=1050\text{mA}$	450		455	nm
2			455	-	460	
3			460	-	465	
4			465	-	470	
5			470	-	475	
6			475	-	480	
7			480	-	485	
8			485	-	490	

**Green**

Rank Code	Symbol	Condition	Min.	Typ.	Max.	Unit
Full	$\lambda_D$	$I_F=1050\text{mA}$	510	-	550	nm
1			510	-	515	
2			515	-	520	
3			520	-	525	
4			525	-	530	
5			530	-	535	
6			535	-	540	
7			540	-	545	
8			545	-	550	

Tolerance:  $\pm 0.5\text{nm}$ 

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**Electrical Rank**

Rank Code	Symbol	Condition	Min.	Typ.	Max.	Unit
P01	V <sub>F</sub>	I <sub>F</sub> =1050mA (Blue & Green)	2.07	-	2.31	V
P02			2.31	-	2.55	
P03			2.55	-	2.79	
P04			2.79	-	3.03	
P05		I <sub>F</sub> =900mA (Red & Yellow)	3.03	-	3.27	
P06			3.27	-	3.51	
P07			3.51	-	3.75	
P08			3.75	-	3.99	

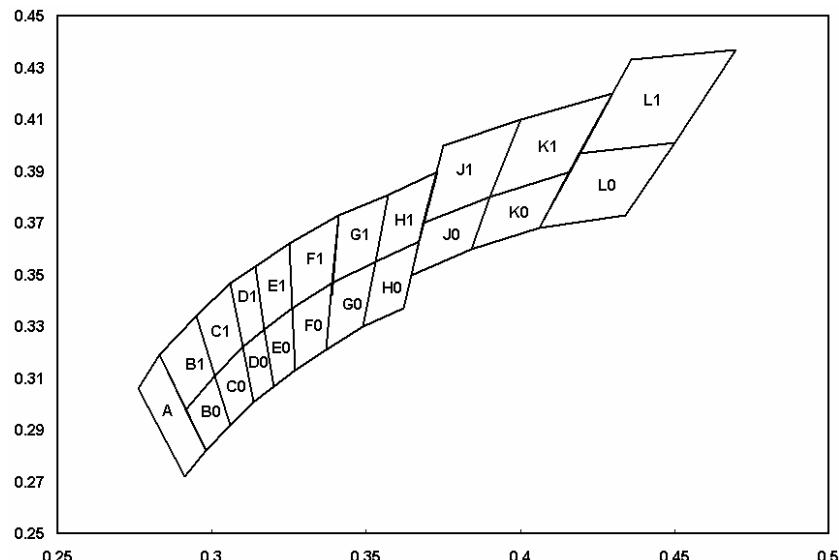
Tolerance:  $\pm 0.1V$ **Correlated Color Temperature Rank for White (X<sub>E</sub>, X<sub>F</sub>)**

Color	Condition	Bin Code	Min.	Typ.	Max.	
Warm White	I <sub>F</sub> =1050mA	L1	2,750	3,000	3,250	
		L0	2,750	3,000	3,250	
		K1	3,250	3,500	3,750	
		K0	3,250	3,500	3,750	
		J1	3,750	4,000	4,250	
		J0	3,750	4,000	4,250	
		H1	4,250	4,500	4,750	
		H0	4,250	4,500	4,750	
		G1	4,750	5,000	5,250	
		G0	4,750	5,000	5,250	
Pure White		F1	5,250	5,500	5,750	
		F0	5,250	5,500	5,750	
		E1	5,750	6,000	6,250	
		E0	5,750	6,000	6,250	
		D1	6,250	6,500	6,750	
		D0	6,250	6,500	6,750	

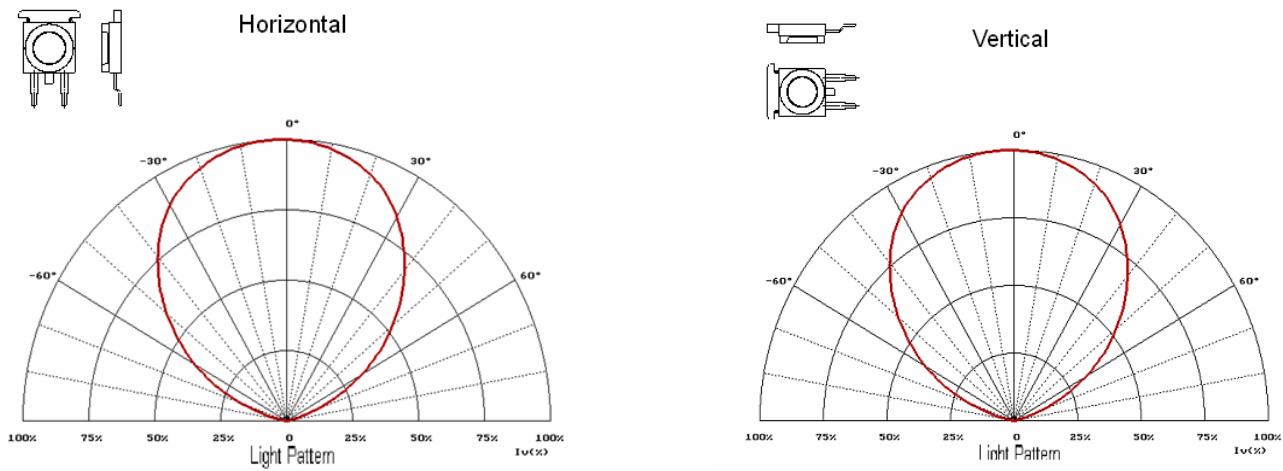
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Cold White	I <sub>F</sub> =1050mA	C1	6,750	7,000	7,500
		C0	6,750	7,000	7,500
		B1	7,500	8,000	8,500
		B0	7,500	8,000	8,500
		A	8,500	9,000	9,500

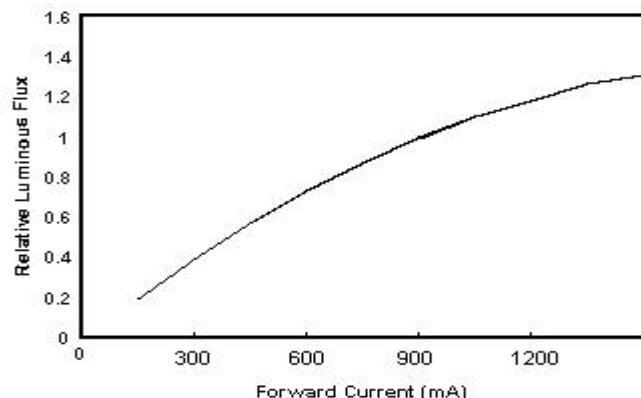
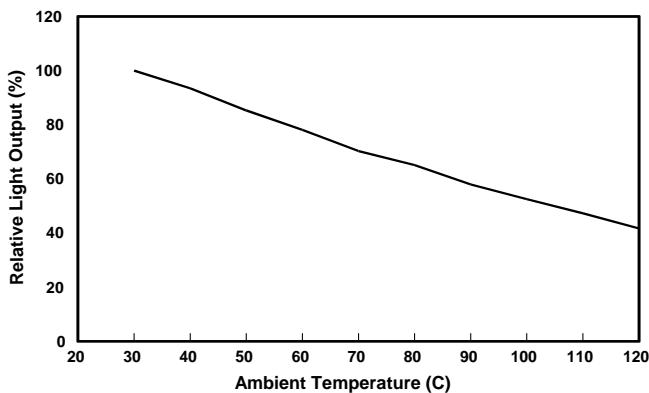
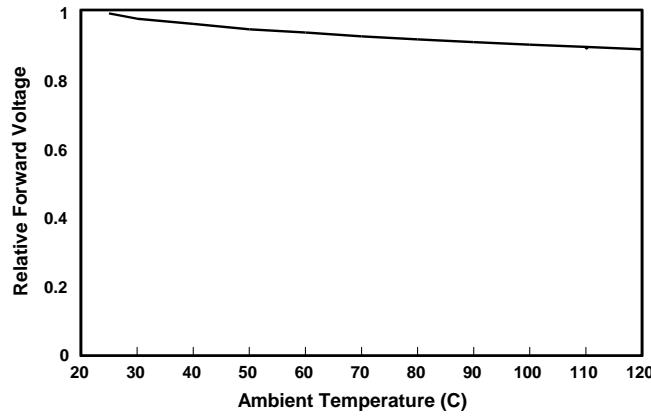
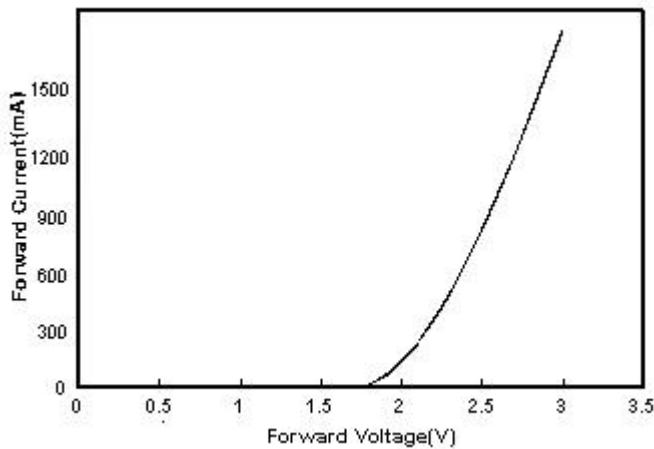
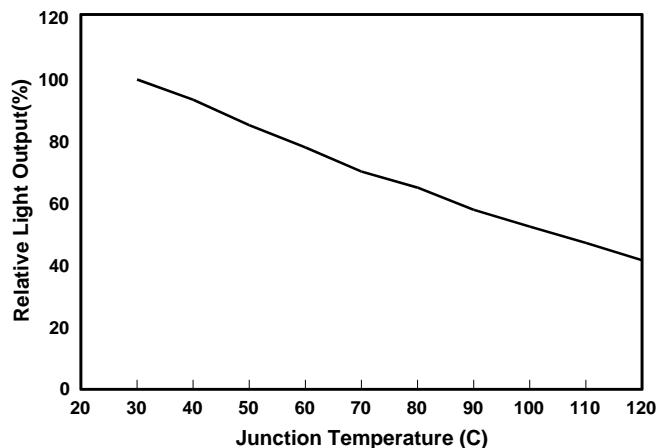
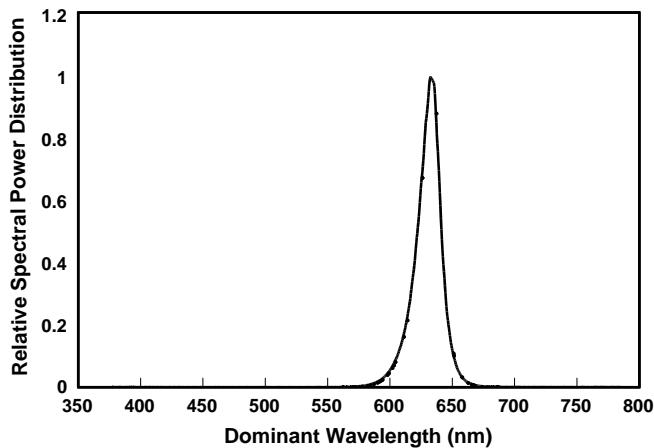
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**Correlated Color Temperature and Chromaticity Correlation (for White)**

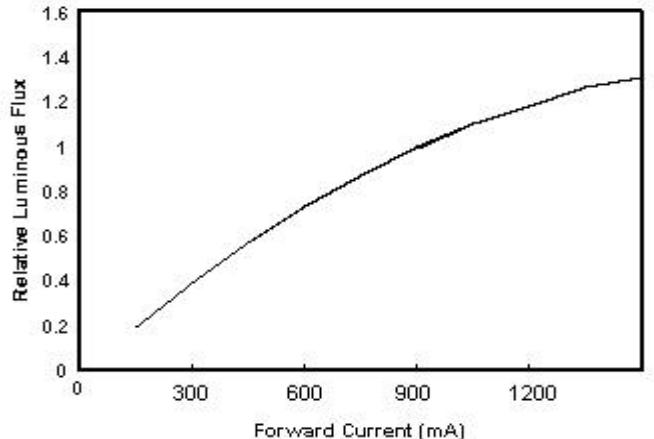
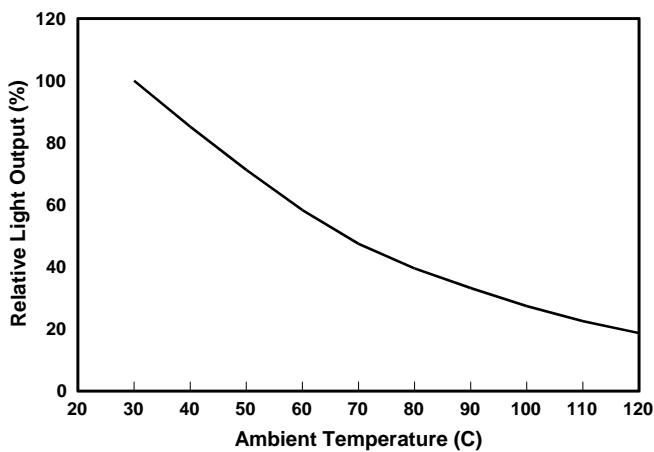
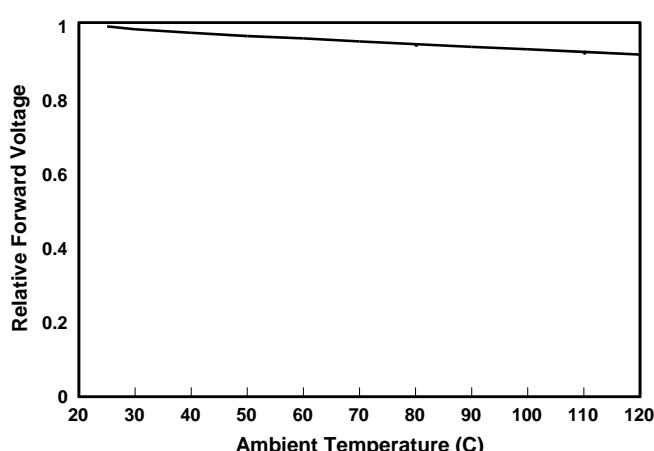
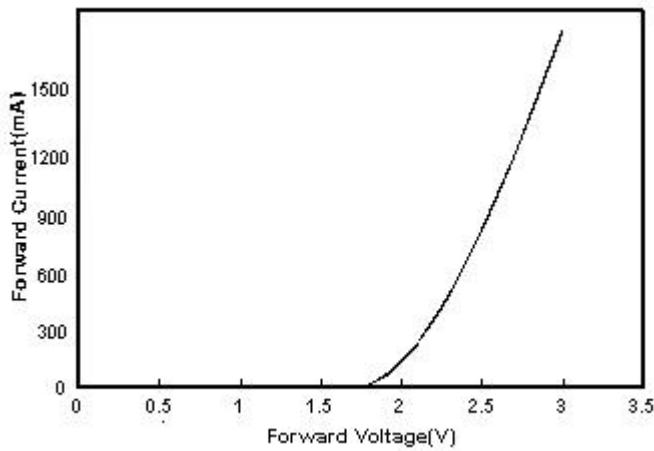
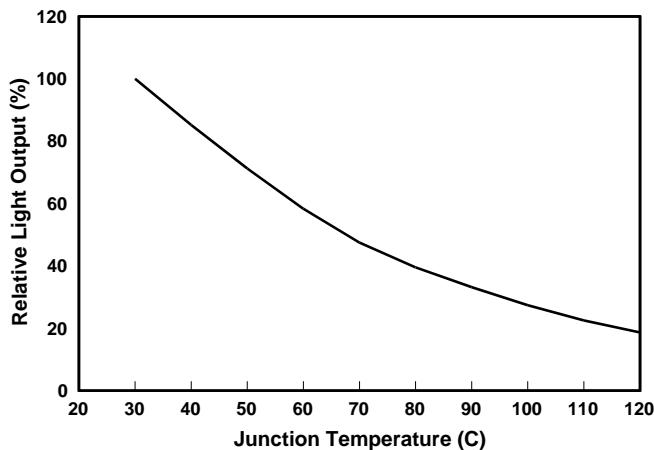
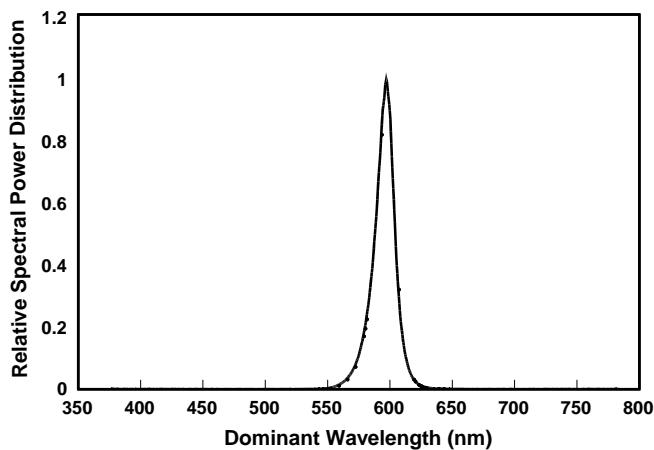
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**Characteristics Curves**

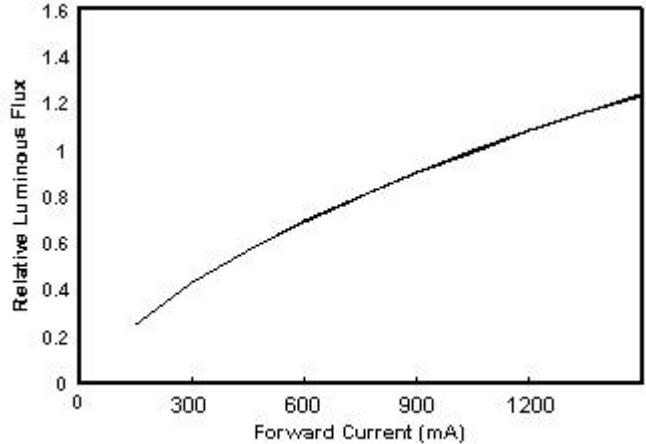
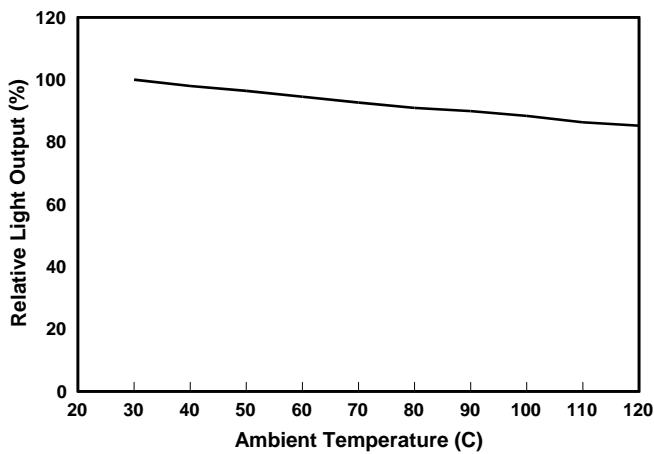
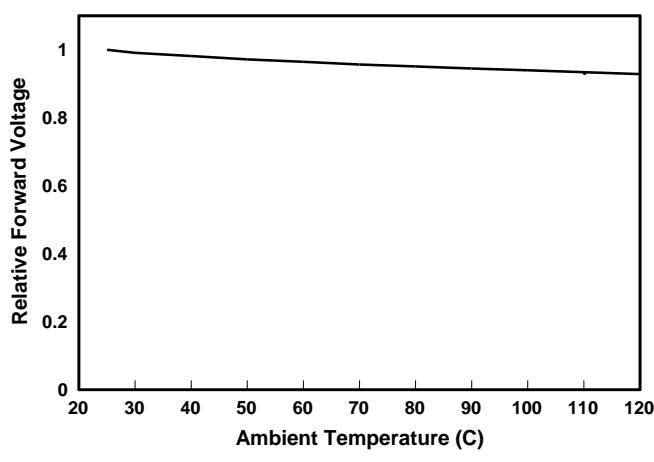
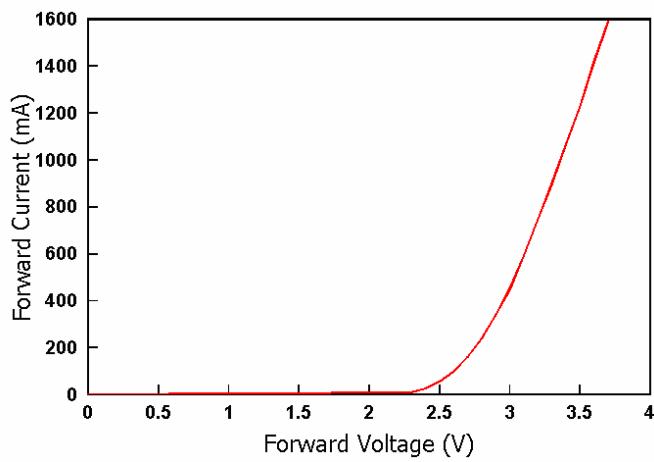
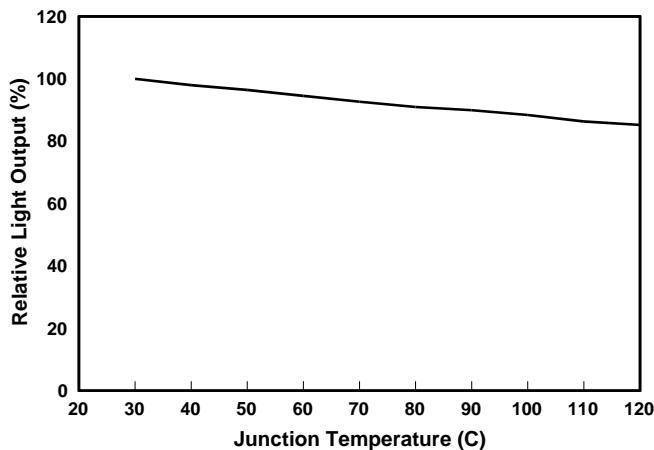
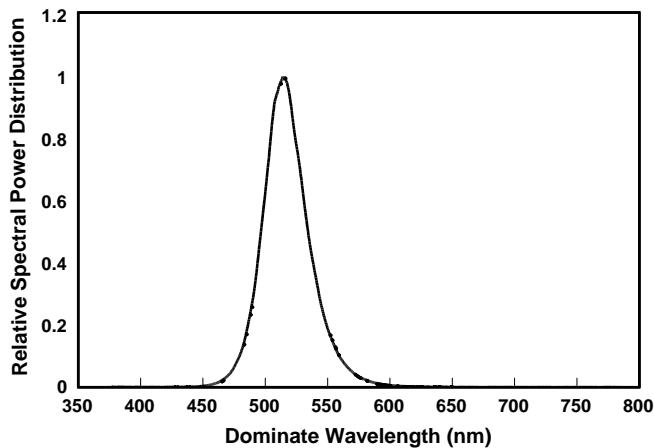
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**Characteristics Curves (Red)**

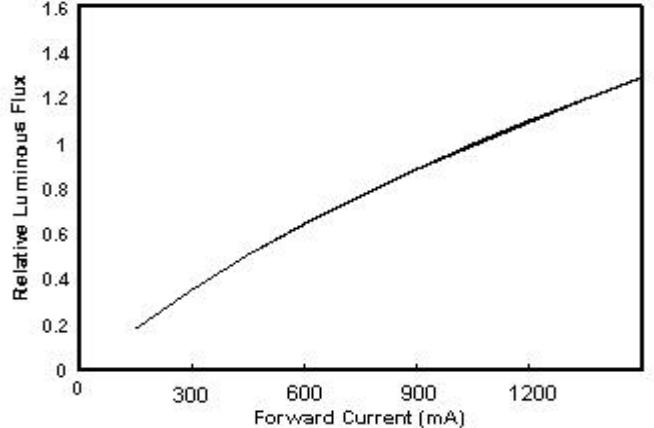
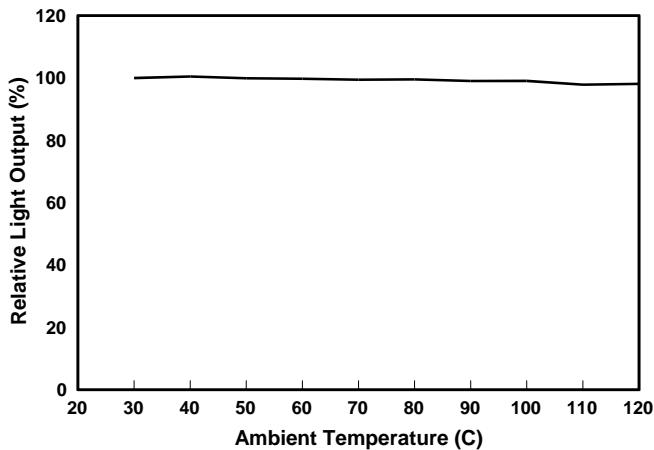
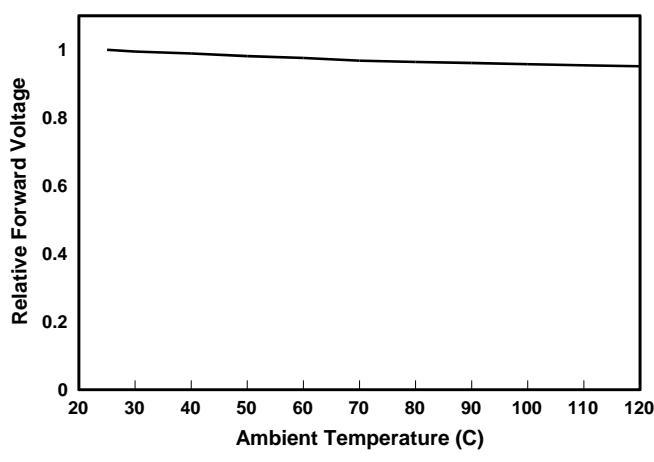
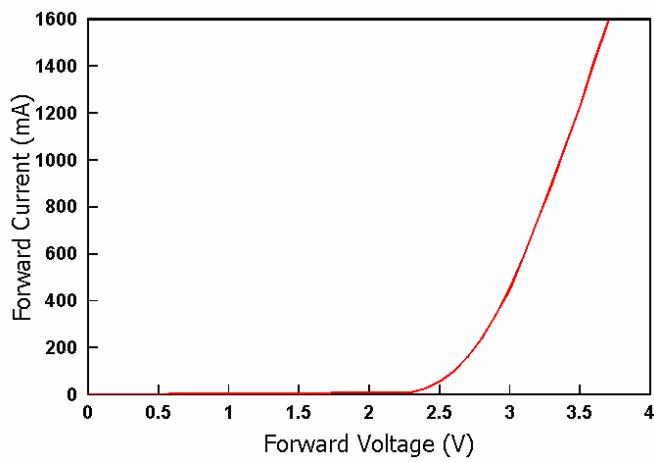
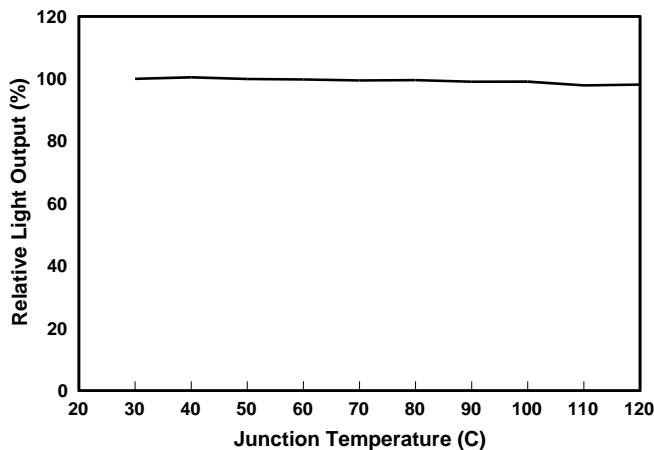
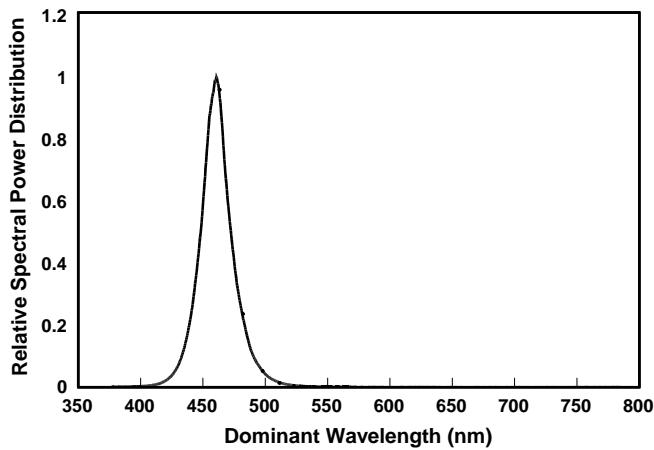
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**Characteristics Curves (Yellow)**

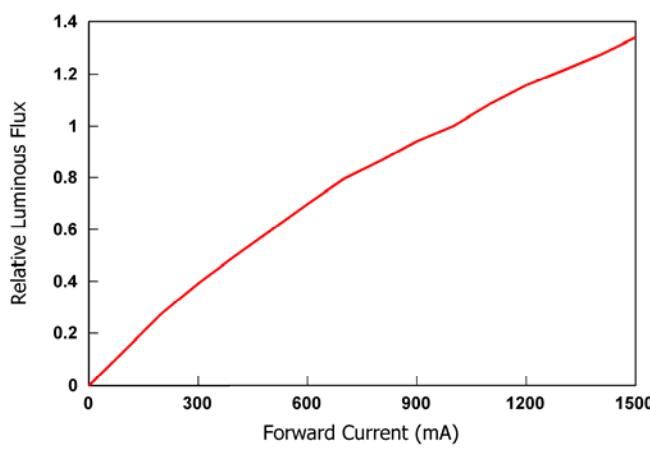
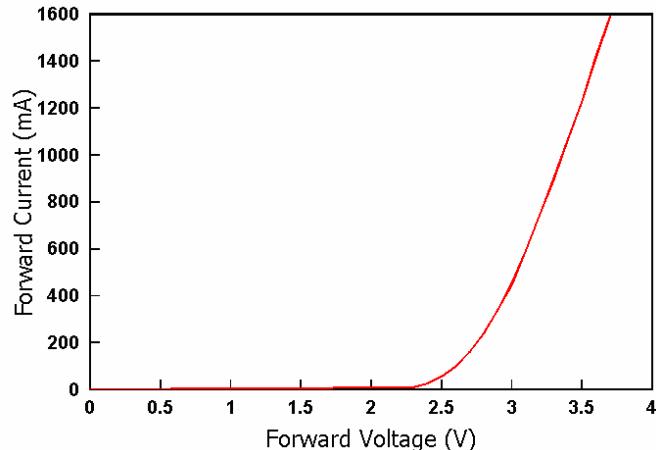
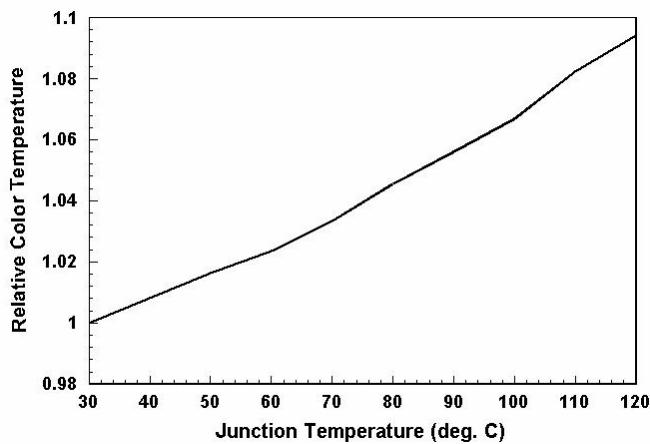
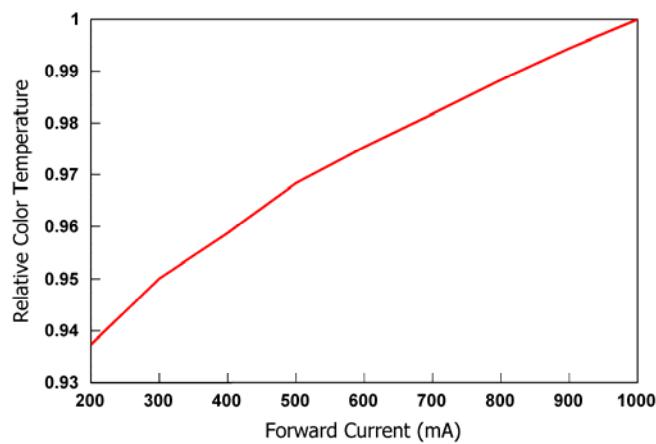
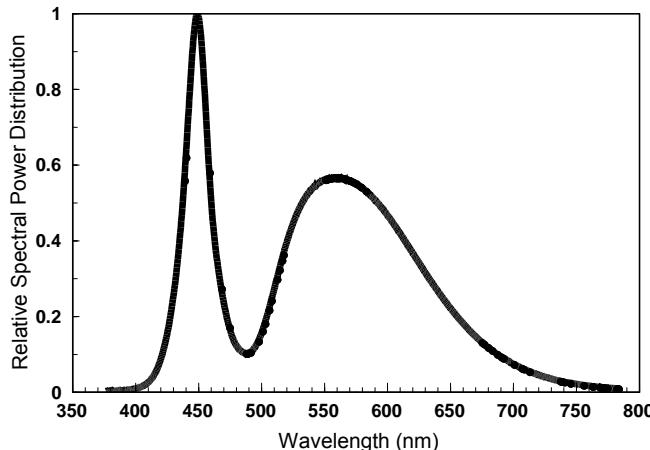
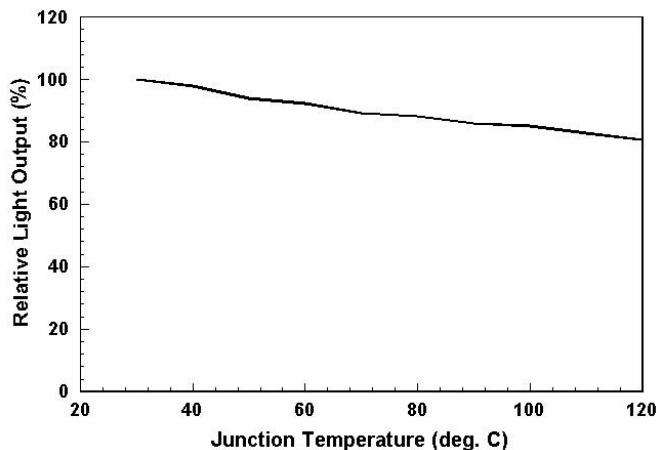
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**Characteristics Curves (Green)**

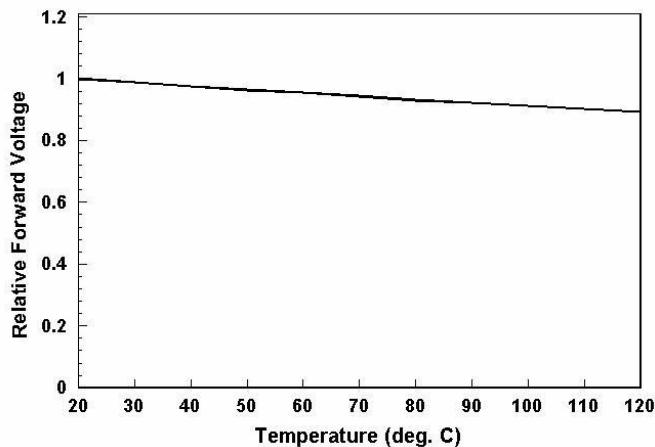
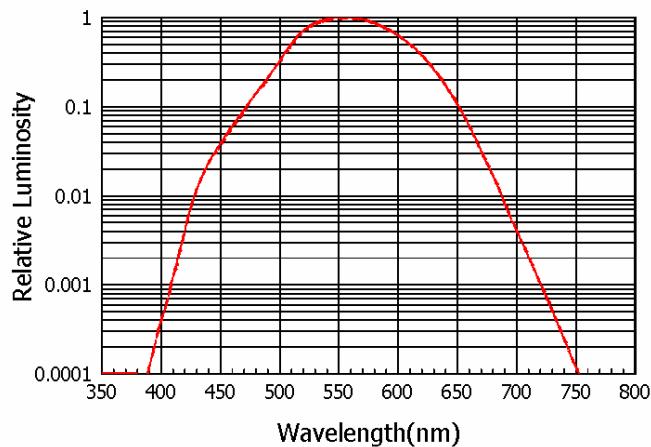
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**Characteristics Curves (Blue)**

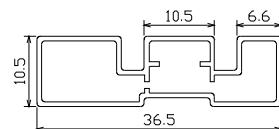
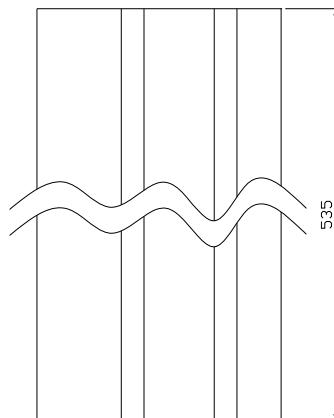
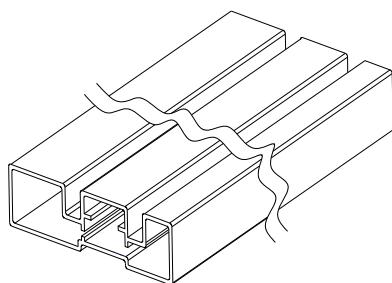
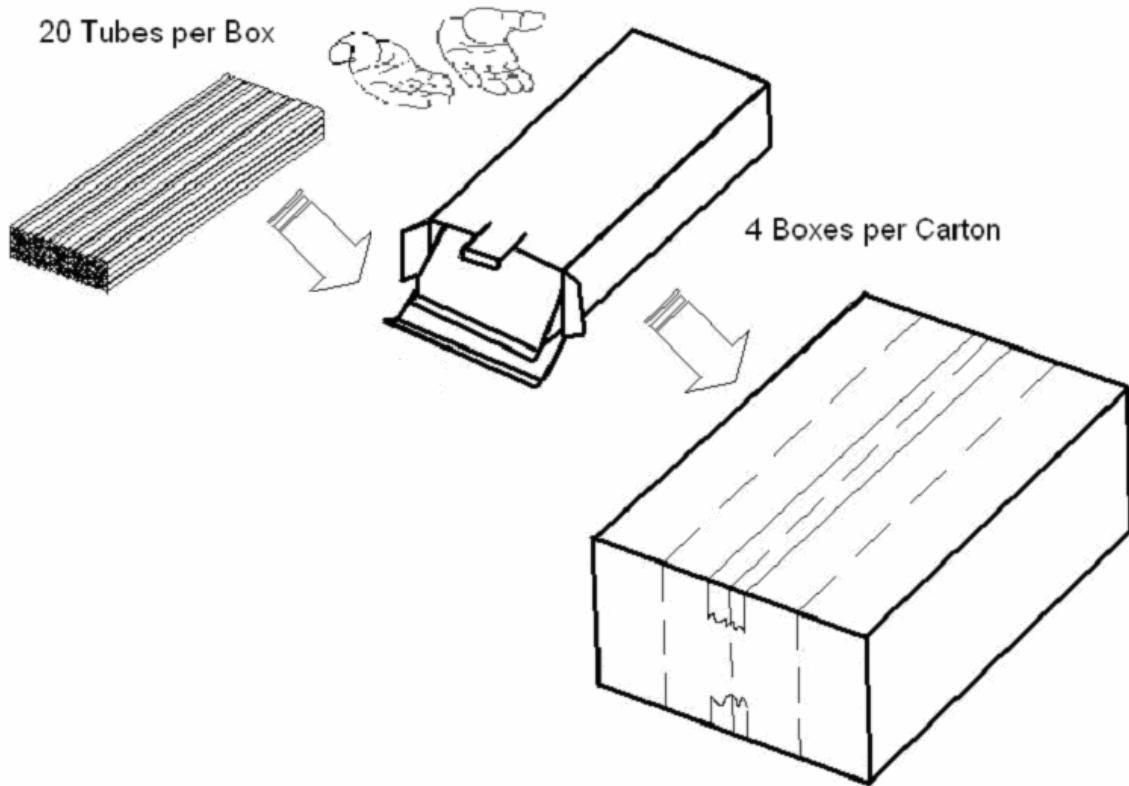
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**Characteristics Curves (White)**

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**Tube and Packing****Tube Dimension****Packing Model**

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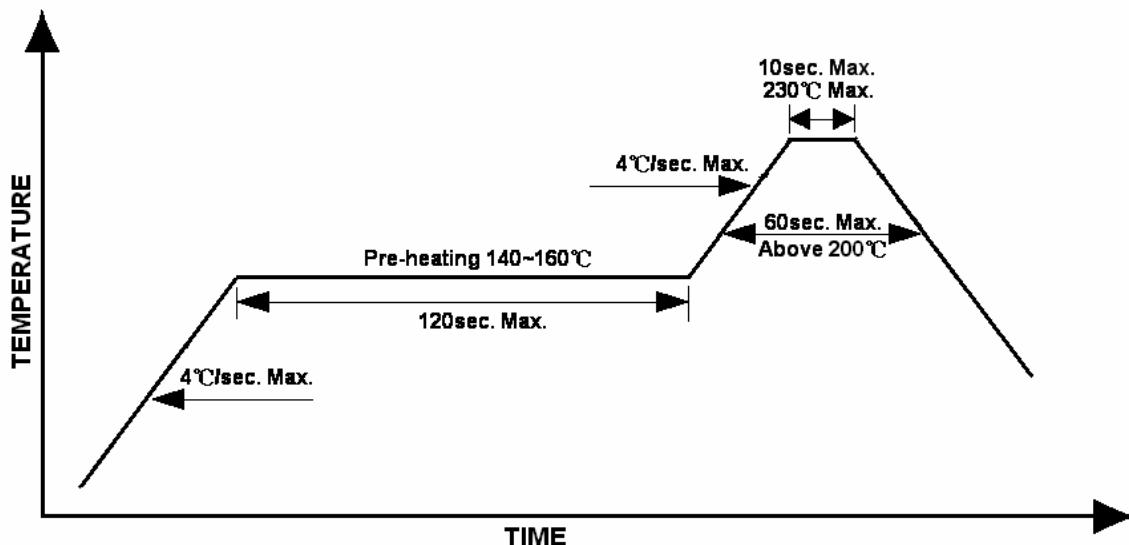
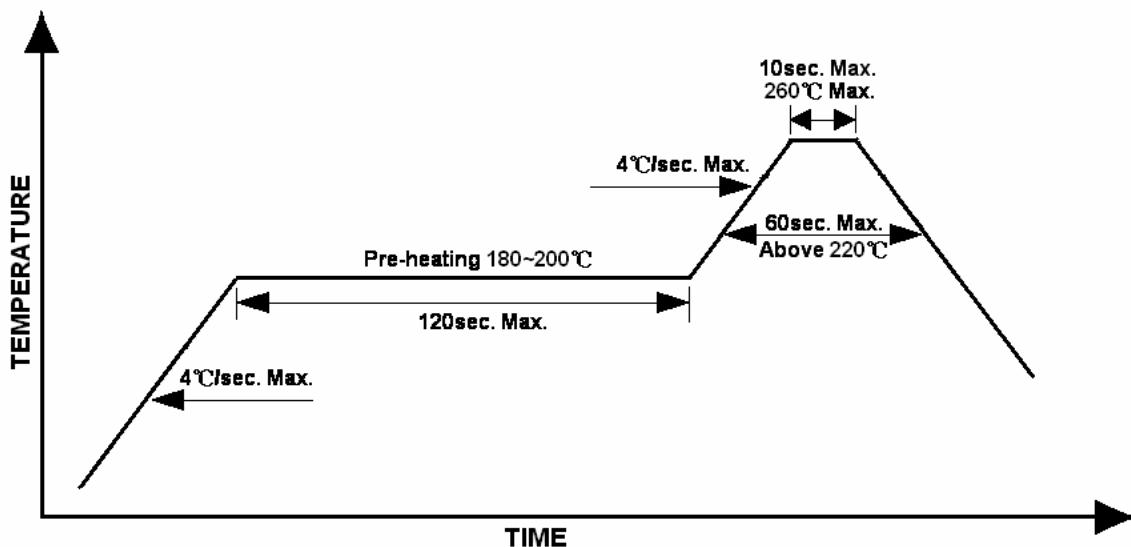
**Precautions**

1. Avoid exposure to moisture at all times during transportation or storage.
2. Anti-Static precaution must be taken when handling GaN, InGaN, and AlInGaN 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.

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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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## Reworking

- Rework should be completed within 5 seconds under 260 °C.
- Manual soldering (not recommended):  
Soldering tin material: tin 6/4 alloy or contained Ag.  
To prevent cracking, bake before manual soldering.  
Temperature of iron tip: 300 °C±5 °C maximum (25W)  
Soldering duration: 3sec±1sec

## 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.

## Storage

- It is recommended that products be stored under the following conditions:  
Humidity: 60%R.H. maximum  
Temperature: 5°C ~ 30°C (41°F ~ 86°F)
- Shelf life in sealed bag: 6 months at <40°C and <90%R.H.
- After opening the bag, devices that will be subjected to soldering or equivalent processing should be used within one year at a condition of ≤30°C / 60%R.H.

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**Reliability Test**

Item	Duration	Standards Reference		Conditions	Criteria
		MIL-STD 883 Ref	JIS C 7021 Ref		
High Temperature Operating Life (HTOL)	1000 Hours			55°C, $I_F$ =max DC (Note 1)	Note 2
Room Temperature Operating Life (RTOL)	1000 Hours			25°C, $I_F$ =max DC (Note 1)	Note 2
Low Temperature Operating Life (LTOL)	1000 Hours			-40°C, $I_F$ =max DC	Note 2
Wet High Temperature Operating Life (WHTOL)	1000 Hours	Method B-11, Condition C		85°C/85%RH, $I_F$ =max DC	Note 2
Powered Temperature Cycle (PTMCL)	200 Cycles			-40°C/85°C, 18min dwell, 42min xfer (2 hours cycle), 5min ON/ 5min OFF, $I_F$ =max DC	Note 2
Non Operating Temperature Cycle (TMCL)	200 Cycles	1010	Method A-4	-40°C/120°C, 30min dwell/ 5 min xfer	No Catastrophic
High Temperature Storage Life (HTSL)	1000 Hours	1005	Method B-10	110°C, non operating	Note 2
Low Temperature Storage Life (LTSL)	1000 Hours	1005	Method B-12	-40°C, non operating	Note 2
Non Operating Thermal Shock (TMSK)	200 Cycles			-40°C/110°C, 20min dwell/<20 sec xfer	No Catastrophic
Non Operating Thermal Shock (TMSK)	200 Cycles			-40°C/120°C, 20min dwell/<20 sec xfer	No Catastrophic
Mechanical Shock	5 Shocks	2002	Method A-7 Condition F	1500G, 0.5 sec pulse, 5shocks each 6 axis	No Catastrophic
Natural Drop	3X		Method A-8	On concrete from 1.2m	No Catastrophic
Variable Vibration Frequency		2007	Method A-10 Condition D	10-2000-10 Hz, log or linear sweep rate 20G about 1min, 1.5mm, 3X/axis	No Catastrophic
Variable Vibration Frequency		2007	Method A-10 Condition D	10-55-10 Hz, ±0.75mm, 55-2000, 10G, 1 octave/min, 3X/axis	No Catastrophic
Random Vibration				6G RMS from 10 to 2KHz, 10min/axis	No Catastrophic
Solder Heat Resistance (SHR)				260°C±5°C, 10 sec	No Catastrophic
Solder ability				Steam age for 16hr, then solder dip at 245 °C for 5sec	Solder Coverage
Lead Strength				1 lb, 30sec	No Catastrophic
Lead Fatigue				1 lb, 3X45° bend	No Catastrophic
Salt Atmosphere	48 Hours	1009		35°C	No Catastrophic

Note 1: Dependent upon the maximum de-rating curve

Note 2: Failure criteria includes units with catastrophic failure, or units with greater than 50%  $I_V$  degradation at 1000 hours, or an average  $I_V$  degradation for the test of greater than 35% at 1000 hours

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**Revision History**

<b>Changes since last revision</b>	<b>Page</b>	<b>Version No.</b>	<b>Revision Date</b>
New format	-	1.0	05-22-2006
Amend orderable part number and characteristic curves	All	1.1	06-01-2006
Thermal resistance junction to board update	10	1.2	12-19-2006

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