

## Harvatek Surface Mount LED Data Sheet T1691DND--20P-000212

Official Product	HT Part No. T1691DND--20P-000212		
Tentative Product	*****	*****	*****
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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

Item	Specification	Material	Quantity
Luminous Intensity(Iv)	2250-3200 mcd @20 mA / T <sub>s</sub> = 25°C;Tolerance: ± 10%		
Chromaticity Coordinate	As page 7 & 8 @20 mA/ T <sub>s</sub> = 25°C;Tolerance: ± 0.005		
Vf	2.7-3.9 V (0.2 V/BIN) @20 mA/ T <sub>s</sub> = 25° C;Tolerance: ± 0.05V		
Ir	< 100 μA @ V <sub>R</sub> = 5 V		
CRI	CRI>80, Tolerance± 2		
Resin	Yellow	Silicon	
Carrier tape	EIA 481-1A specs	Conductive black tape	
Reel	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, CIE and Vf. Each reel has a label identifying its specification; the immediate box consists of a product label as well.

Note :This is shipped test conditions

※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.

**ATTENTION: Electrostatic Discharge (ESD) protection**

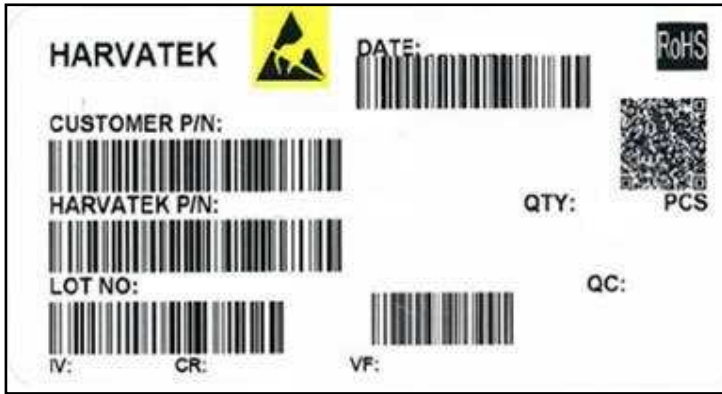


The symbol to the left denotes that ESD precaution is needed. ESD protection for GaP and AlGaAs based chips is necessary even though they are relatively safe in the presence of low static-electric discharge. Parts built with AlInGaP, GaN, or/and InGaN based chips are **STATIC SENSITIVE devices**. ESD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

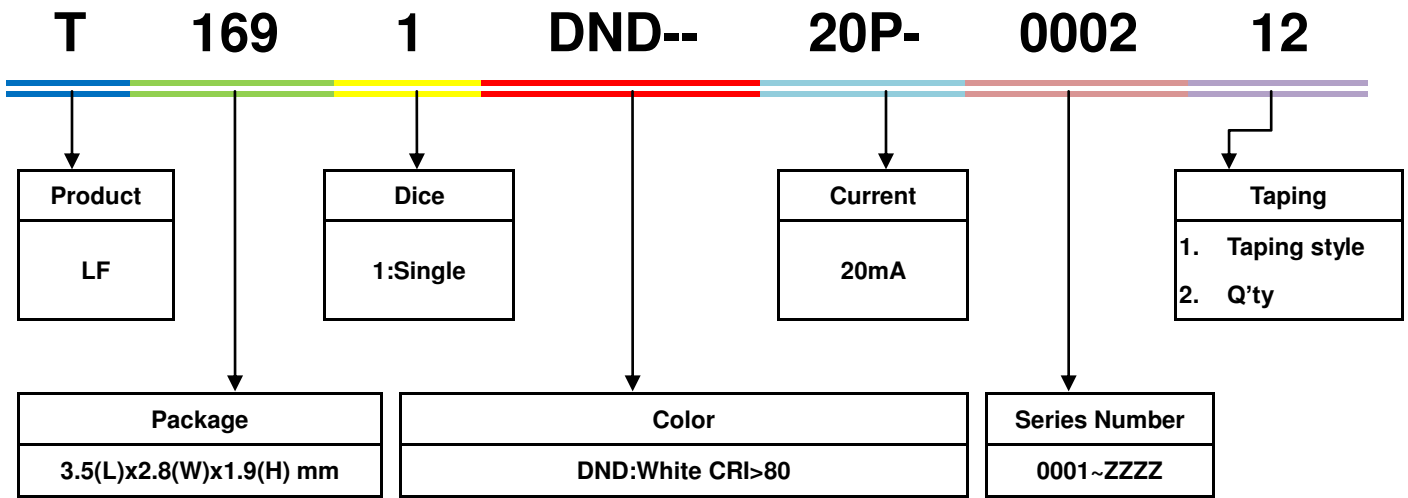
If manual work or processing is needed, please ensure the device is adequately protected from ESD during the process.

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## Label Specifications



### Harvatek P/N:



### Lot No.:

1	2	3	4	5	6	7	8	9	10
<b>E</b>	<b>1</b>	<b>A</b>	<b>1</b>	<b>A</b>	<b>2</b>	<b>2</b>	<b>L</b>	<b>1</b>	<b>2</b>
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		

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## Specifications Range

### ■ (Iv) Bin:

Color	Bin Code	Spec. Range
White	Z71	2250-2385 mcd
	Z72	2385-2530 mcd
	Z81	2530-2685 mcd
	Z82	2685-2850 mcd
	Z91	2850-3020 mcd
	Z92	3020-3200 mcd

Note: It maintains a tolerance of  $\pm 10\%$  on luminous intensity

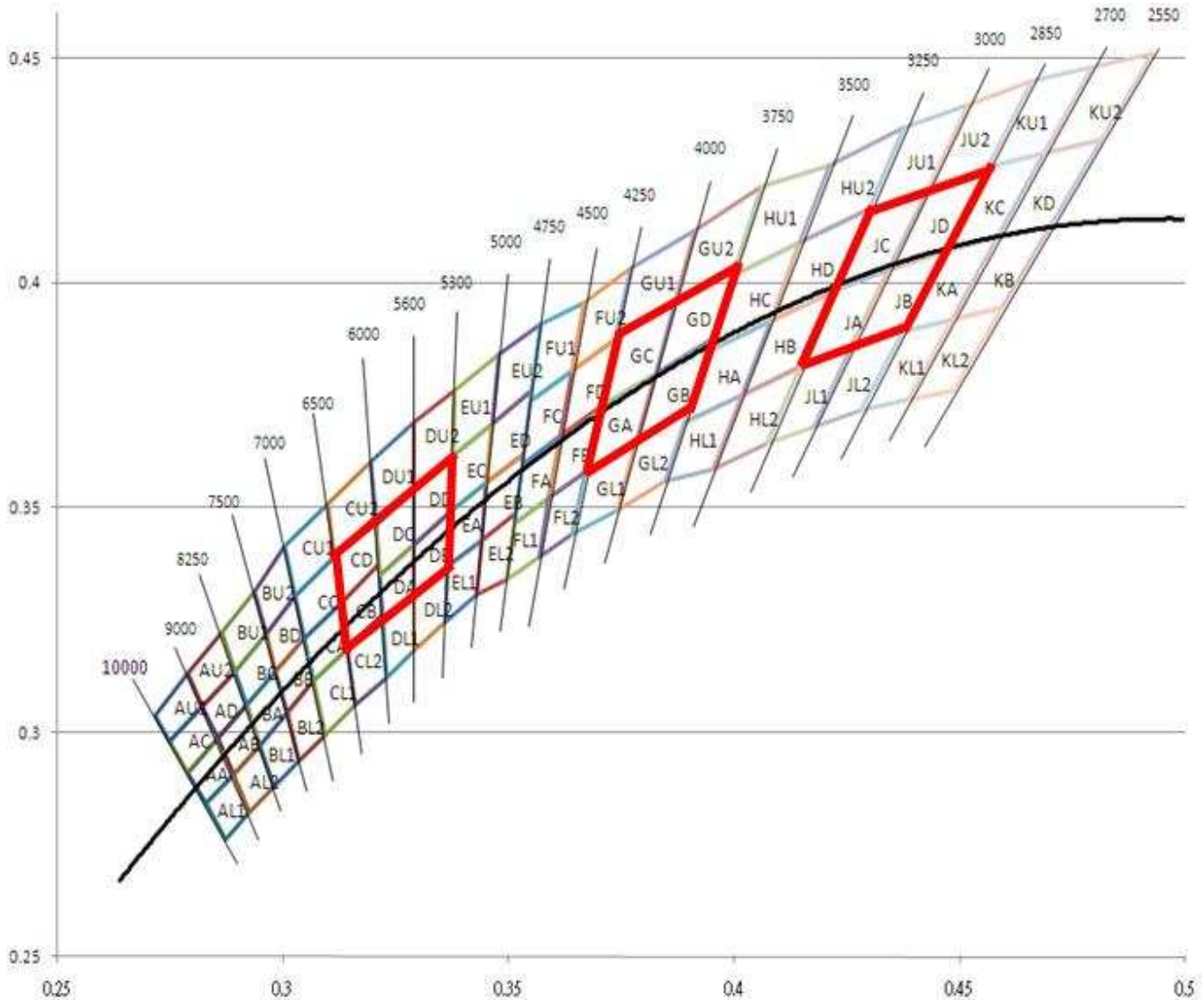
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**Color Bin:**

AA	0.283	0.284	BA	0.295	0.297	CA	0.3068	0.3113	DA	0.3222	0.3243	EA	0.3366	0.3369
	0.279	0.291		0.292	0.306		0.3048	0.3207		0.3215	0.335		0.3371	0.349
	0.2855	0.2985		0.2984	0.3133		0.313	0.329		0.329	0.3417		0.3451	0.3554
	0.289	0.2905		0.3009	0.3042		0.3144	0.3186		0.329	0.33		0.344	0.3427
	0.283	0.284		0.295	0.297		0.3068	0.3113		0.3222	0.3243		0.3366	0.3369
AB	0.289	0.2905	BB	0.3009	0.3042	CB	0.3144	0.3186	DB	0.329	0.33	EB	0.344	0.3427
	0.2855	0.2985		0.2984	0.3133		0.313	0.329		0.3417	0.3451		0.3554	
	0.292	0.306		0.3048	0.3207		0.3213	0.3373		0.3371	0.349		0.3533	0.362
	0.295	0.297		0.3068	0.3113		0.3221	0.3261		0.3366	0.3369		0.3515	0.3487
	0.289	0.2905		0.3009	0.3042		0.3144	0.3186		0.329	0.33		0.344	0.3427
	0.279	0.291		0.292	0.306		0.3048	0.3207		0.3215	0.335		0.3371	0.349
AC	0.275	0.298	BC	0.2895	0.3135	CC	0.3028	0.3304	DC	0.3207	0.3462	EC	0.3376	0.3616
	0.28225	0.30575		0.2962	0.322		0.3115	0.3391		0.329	0.3538		0.3463	0.3687
	0.2855	0.2985		0.2984	0.3133		0.313	0.329		0.329	0.3417		0.3451	0.3554
	0.279	0.291		0.292	0.306		0.3048	0.3207		0.3215	0.335		0.3371	0.349
	0.2855	0.2985		0.2984	0.3133		0.313	0.329		0.329	0.3417		0.3451	0.3554
	0.28225	0.30575		0.2962	0.322		0.3115	0.3391		0.329	0.3538		0.3463	0.3687
AD	0.2895	0.3135	BD	0.3028	0.3304	CD	0.3205	0.3481	DD	0.3376	0.3616	ED	0.3551	0.376
	0.292	0.306		0.3048	0.3207		0.3213	0.3373		0.3371	0.349		0.3533	0.362
	0.2855	0.2985		0.2984	0.3133		0.313	0.329		0.329	0.3417		0.3451	0.3554
	0.279	0.291		0.292	0.306		0.3048	0.3207		0.3215	0.335		0.3371	0.349
	0.2855	0.2985		0.2984	0.3133		0.313	0.329		0.329	0.3417		0.3451	0.3554
	0.28225	0.30575		0.2962	0.322		0.3115	0.3391		0.329	0.3538		0.3463	0.3687
AL1	0.2874	0.276	BL1	0.298	0.288	CL1	0.3093	0.2993	DL1	0.3231	0.312	EL1	0.3361	0.3245
	0.283	0.284		0.295	0.297		0.3068	0.3113		0.3222	0.3243		0.3366	0.3369
	0.289	0.2905		0.3009	0.3042		0.3144	0.3186		0.329	0.33		0.344	0.3428
	0.2925	0.282		0.3037	0.2937		0.3161	0.3059		0.329	0.318		0.3429	0.3307
	0.2874	0.276		0.298	0.288		0.3093	0.2993		0.3231	0.312		0.3361	0.3245
	0.2925	0.282		0.3037	0.2937		0.3161	0.3059		0.329	0.318		0.3429	0.3307
AL2	0.289	0.2905	BL2	0.3009	0.3042	CL2	0.3144	0.3186	DL2	0.329	0.33	EL2	0.344	0.3428
	0.295	0.297		0.3068	0.3113		0.3221	0.3261		0.3366	0.3369		0.3515	0.3487
	0.298	0.288		0.3093	0.2993		0.3231	0.312		0.3361	0.3245		0.3495	0.3339
	0.2925	0.282		0.3037	0.2937		0.3161	0.3059		0.329	0.318		0.3429	0.3307
	0.289	0.2905		0.3009	0.3042		0.3144	0.3186		0.329	0.33		0.344	0.3428
	0.295	0.297		0.3068	0.3113		0.3221	0.3261		0.3366	0.3369		0.3515	0.3487
AU1	0.298	0.288	BU1	0.3093	0.2993	CU1	0.3231	0.312	DU1	0.3361	0.3245	EU1	0.3495	0.3339
	0.2925	0.282		0.3037	0.2937		0.3161	0.3059		0.329	0.318		0.3429	0.3307
	0.275	0.298		0.2895	0.3135		0.3028	0.3304		0.3207	0.3462		0.3376	0.3616
	0.2718	0.3036		0.2864	0.3221		0.3005	0.3415		0.3196	0.3602		0.3381	0.3762
	0.2925	0.282		0.3037	0.2937		0.3161	0.3059		0.329	0.318		0.3429	0.3307
	0.289	0.2905		0.3009	0.3042		0.3144	0.3186		0.329	0.33		0.344	0.3428
AU2	0.295	0.297	BU2	0.3068	0.3113	CU2	0.3221	0.3261	DU2	0.3366	0.3369	EU2	0.3515	0.3487
	0.2925	0.282		0.3037	0.2937		0.3161	0.3059		0.329	0.318		0.3429	0.3307
	0.275	0.298		0.2895	0.3135		0.3028	0.3304		0.3207	0.3462		0.3376	0.3616
	0.2718	0.3036		0.2864	0.3221		0.3005	0.3415		0.3196	0.3602		0.3381	0.3762
	0.295	0.297		0.3068	0.3113		0.3221	0.3261		0.3366	0.3369		0.3515	0.3487
	0.2925	0.282		0.3037	0.2937		0.3161	0.3059		0.329	0.318		0.3429	0.3307
	0.275	0.298		0.2895	0.3135		0.3028	0.3304		0.3207	0.3462		0.3376	0.3616
	0.2718	0.3036		0.2864	0.3221		0.3005	0.3415		0.3196	0.3602		0.3381	0.3762
	0.279	0.313		0.2937	0.3312		0.3099	0.3509		0.329	0.369		0.348	0.384
	0.28225	0.30575		0.2962	0.322		0.3115	0.3391		0.329	0.3538		0.3463	0.3687
	0.275	0.298		0.2895	0.3135		0.3028	0.3304		0.3207	0.3462		0.3376	0.3616
	0.28225	0.30575		0.2962	0.322		0.3115	0.3391		0.329	0.3538		0.3463	0.3687
	0.279	0.313		0.2937	0.3312		0.3099	0.3509		0.329	0.369		0.348	0.384
	0.2864	0.3221		0.3005	0.3415		0.3196	0.3602		0.3381	0.3762		0.3571	0.3907
	0.2895	0.3135		0.3028	0.3304		0.3205	0.3481		0.3376	0.3616		0.3551	0.376
	0.28225	0.30575		0.2962	0.322		0.3115	0.3391		0.329	0.3538		0.3463	0.3687

FA	0.3512	0.3465	GA	0.367	0.3578	HA	0.3889	0.369	JA	0.4147	0.3814	KA	0.4373	0.3893
	0.353	0.3597		0.3702	0.3722		0.3941	0.3848		0.4221	0.3984		0.4465	0.4071
	0.3615	0.3659		0.3825	0.3798		0.408	0.3916		0.4342	0.4028		0.4582	0.4099
	0.359	0.3521		0.3783	0.3646		0.4017	0.3751		0.4259	0.3853		0.4483	0.3919
	0.3512	0.3465		0.367	0.3578		0.3889	0.369		0.4147	0.3814		0.4373	0.3893
FB	0.359	0.3521	GB	0.3783	0.3646	HB	0.4017	0.3751	JB	0.4259	0.3853	KB	0.4483	0.3919
	0.3615	0.3659		0.3825	0.3798		0.408	0.3916		0.4342	0.4028		0.4582	0.4099
	0.3702	0.3722		0.395	0.3875		0.4221	0.3984		0.4465	0.4071		0.47	0.4126
	0.367	0.3578		0.3898	0.3716		0.4147	0.3814		0.4373	0.3893		0.4593	0.3944
	0.359	0.3521		0.3783	0.3646		0.4017	0.3751		0.4259	0.3853		0.4483	0.3919
	0.3615	0.3659		0.3825	0.3798		0.408	0.3916		0.4342	0.4028		0.4582	0.4099
FC	0.3702	0.3722	GC	0.395	0.3875	HC	0.4221	0.3984	JC	0.4465	0.4071	KC	0.47	0.4126
	0.367	0.3578		0.3898	0.3716		0.4147	0.3814		0.4373	0.3893		0.4593	0.3944
	0.359	0.3521		0.3783	0.3646		0.4017	0.3751		0.4259	0.3853		0.4483	0.3919
	0.353	0.3597		0.3702	0.3722		0.3941	0.3848		0.4221	0.3984		0.4465	0.4071
	0.3548	0.3736		0.3736	0.3874		0.3996	0.4015		0.4299	0.4165		0.4562	0.426
FD	0.3641	0.3804	GD	0.3869	0.3958	HD	0.4146	0.4089	JD	0.443	0.4212	KD	0.4687	0.4289
	0.3736	0.3874		0.4006	0.4044		0.4299	0.4165		0.4562	0.426		0.4813	0.4319
	0.3702	0.3722		0.395	0.3875		0.4221	0.3984		0.4465	0.4071		0.47	0.4126
	0.3615	0.3659		0.3825	0.3798		0.408	0.3916		0.4342	0.4028		0.4582	0.4099
	0.3615	0.3659		0.3825	0.3798		0.408	0.3916		0.4342	0.4028		0.4582	0.4099
	0.3495	0.3339		0.364	0.344		0.3846	0.3557		0.4073	0.3715		0.4281	0.3715
FL1	0.3512	0.3465	GL1	0.367	0.3578	HL1	0.3889	0.369	JL1	0.4147	0.3814	KL1	0.4373	0.3893
	0.359	0.3521		0.3783	0.3646		0.4017	0.3751		0.4259	0.3853		0.4483	0.3919
	0.3567	0.3389		0.3741	0.3494		0.3954	0.3586		0.4176	0.3678		0.4384	0.3739
	0.3495	0.3339		0.364	0.344		0.3846	0.3557		0.4073	0.3644		0.4281	0.3715
	0.3567	0.3389		0.3741	0.3494		0.3954	0.3586		0.4176	0.3678		0.4384	0.3739
	0.359	0.3521		0.3783	0.3646		0.4017	0.3751		0.4259	0.3853		0.4483	0.3919
FL2	0.367	0.3578	GL2	0.3898	0.3716</									

**Chromaticity Coordinate:**



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■ Forward Voltage (Vf) Bin:

Color	Bin Code	Spec. Range
White	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

Note: It maintains a tolerance of  $\pm 0.05V$  on forward voltage measurements

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## Product Features

### Electro-Optical Characteristics

Series	Emitting Color	Material	V <sub>F</sub> (V)		Chromaticity Coordinate x,y	I <sub>v</sub> (mcd) Typical	Viewing Angle 2θ <sub>1/2</sub>
			typ	max			
T1691TX	White	InGaN	3.0	3.9	x=0.345,y=0.35	2500	120
T1691TX	Neutral White	InGaN	3.0	3.9	x=0.38,y=0.38	2400	120
T1691TX	Warm White	InGaN	3.0	3.9	x=0.435,y=0.405	2300	120

(T<sub>Soldering</sub>, 25 °C)

### Package Outline Dimension and Recommended Soldering Pattern for Reflow Soldering

Unit:mm Tolerance: +/-0.1

Outline Dim.	Soldering Pattern
Soldering terminals may shift in the x, y direction.	

### Absolute Maximum Ratings

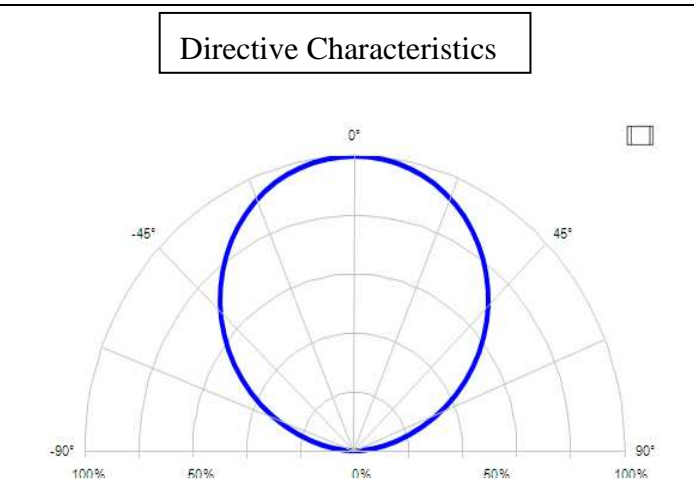
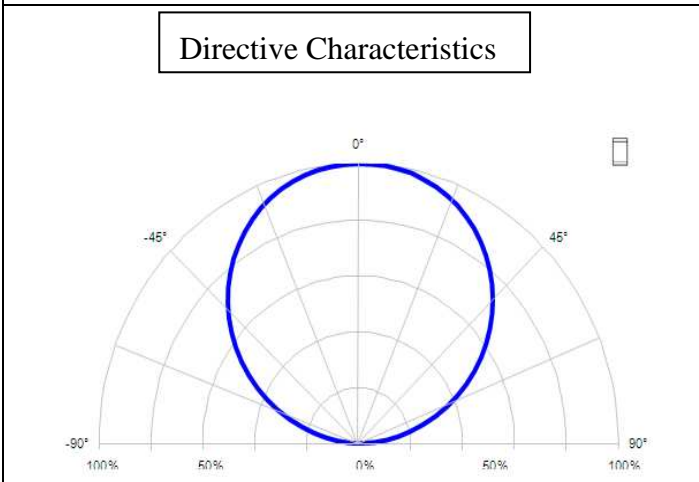
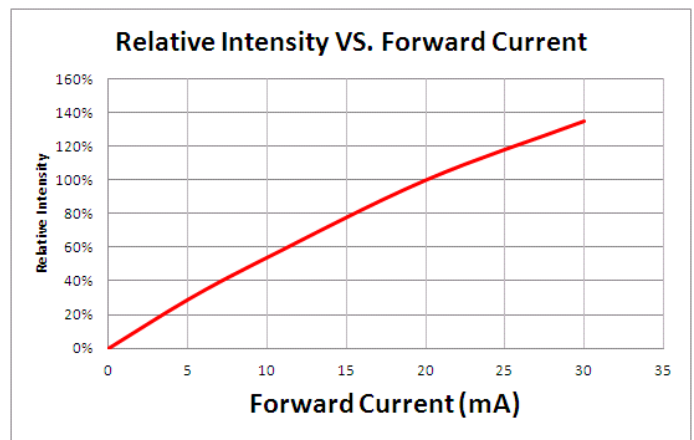
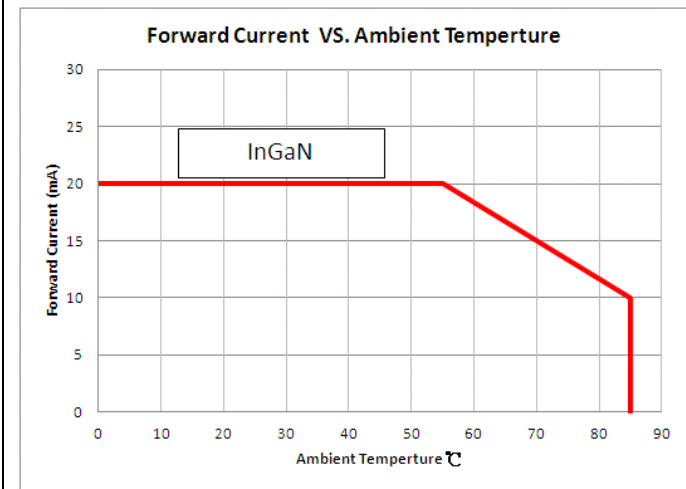
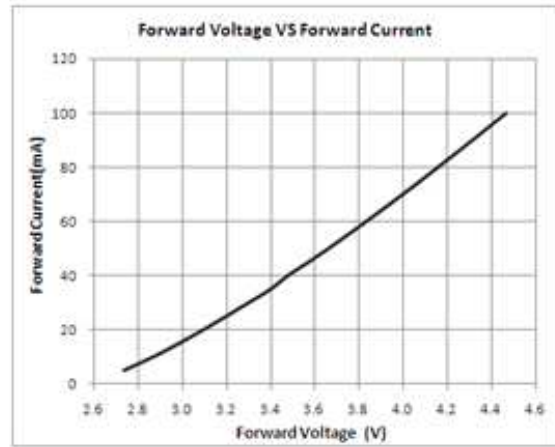
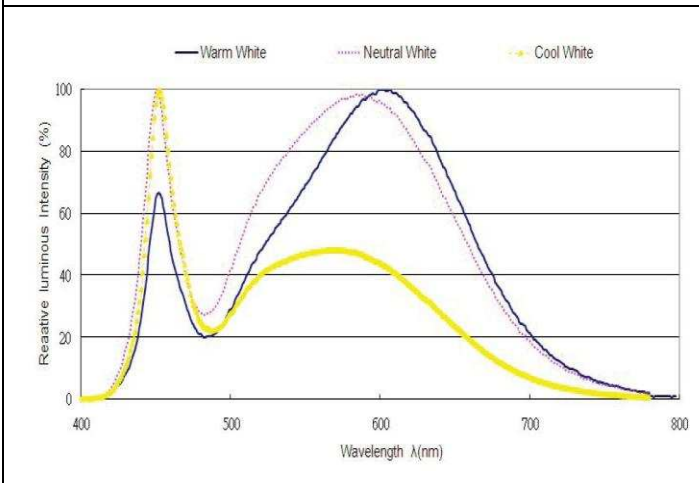
(T<sub>Soldering</sub> 25 °C)

Series	P <sub>D</sub> (mW)	I <sub>F</sub> (mA)	I <sub>FP</sub> (mA)*	T <sub>OP</sub> (°C)	T <sub>ST</sub> (°C)
Color	Power Dissipation	Forward Current	Pulse Forward Current	Operating Temperature	Storage Temperature
White	78	20	30	-40~+85	-40~+100
Neutral White	78	20	30	-40~+85	-40~+100
Warm White	78	20	30	-40~+85	-40~+100

\* Condition for I<sub>FP</sub> is pulse of 1/10 duty and 0.1msec width

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## Characteristics of T1691DND



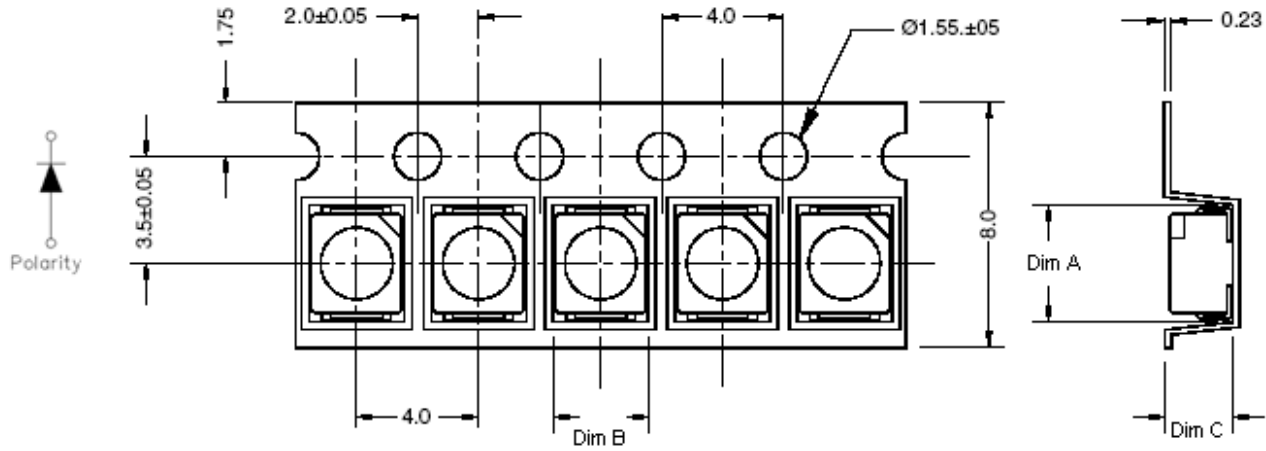
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## Precaution for Use

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.

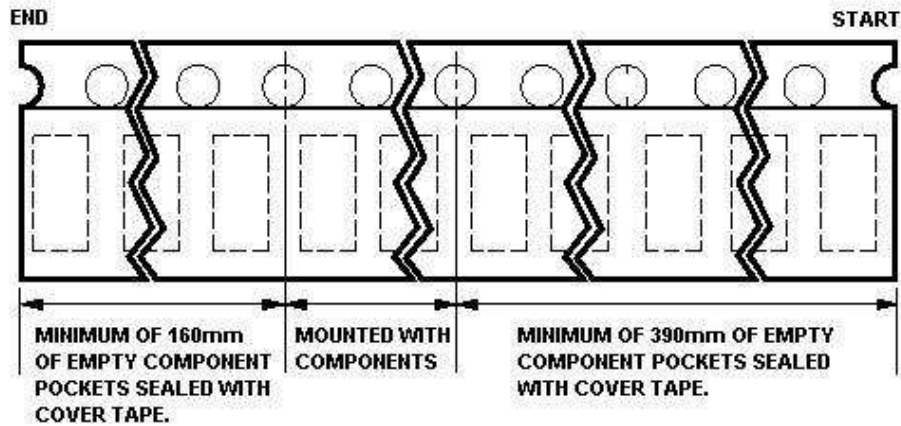
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## Packaging Tape Dimension



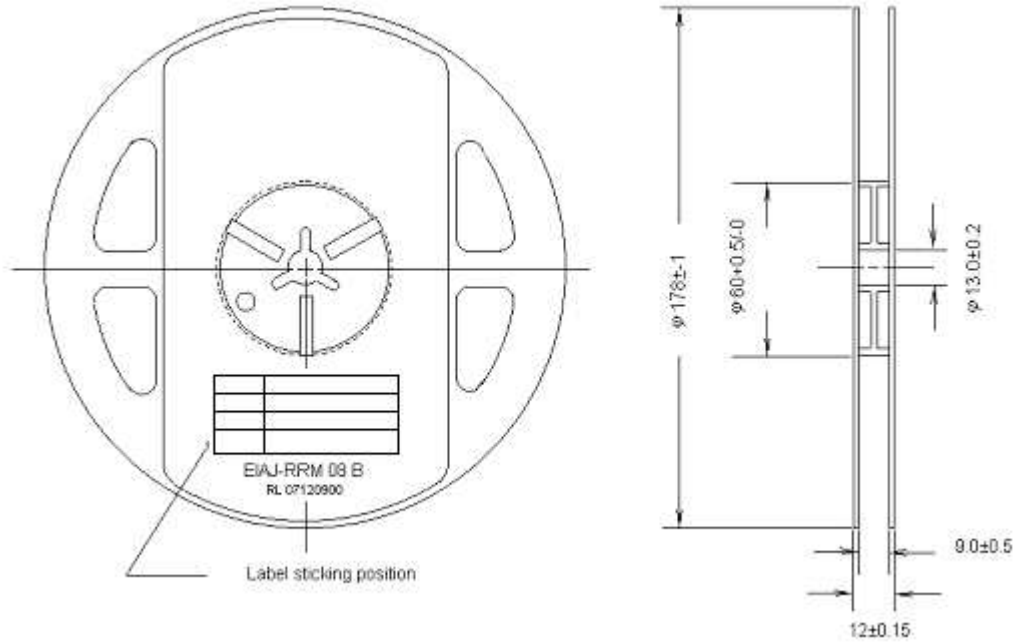
Dim. A	Dim. B	Dim. C	Q'ty/Reel
3.73±0.1	2.95±0.1	2.12±0.1	2K

Unit: mm

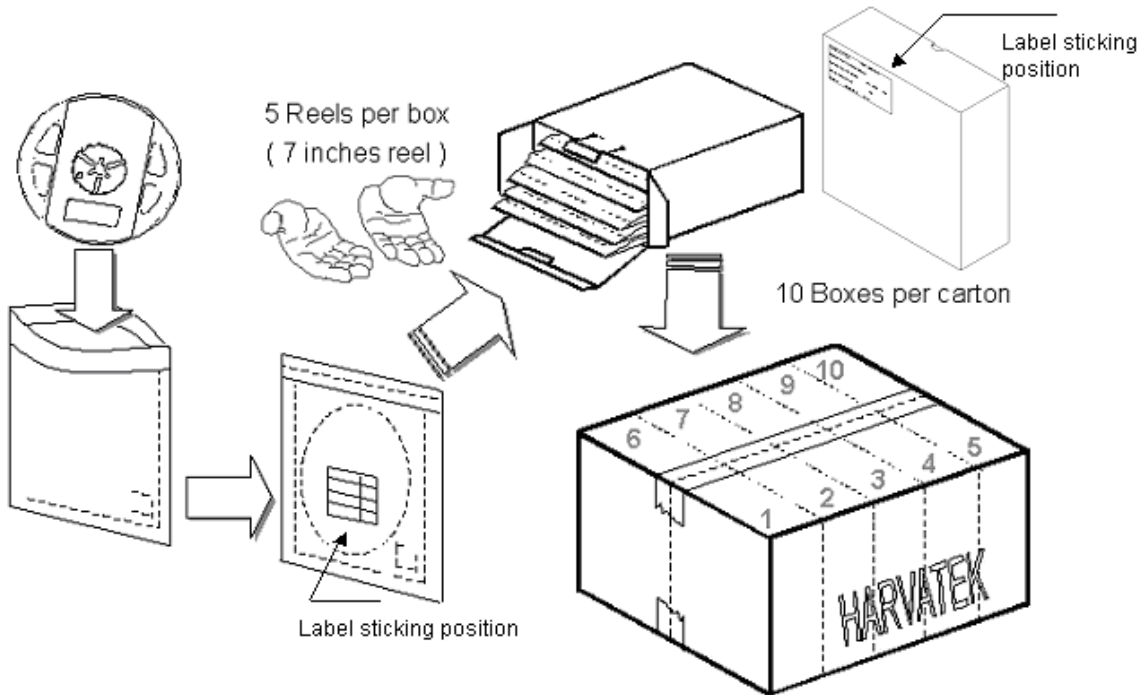


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## Reel Dimension



## Packing



5 boxes per carton is available depending on shipment quantity.

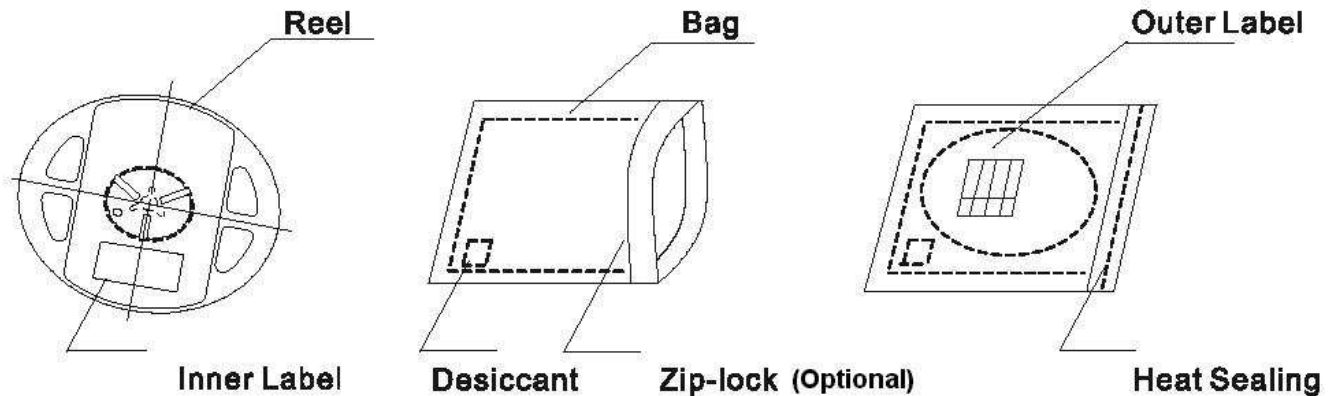
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## Dry Pack

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:



## Baking

Baking before soldering is recommended when the package has been unsealed for 72 hours.

The conditions are as followings:

1.  $60\pm 3^{\circ}\text{C} \times (12\sim 24\text{hrs})$  and  $<5\%RH$ , taped reel type.
2.  $100\pm 3^{\circ}\text{C} \times (45\text{min}\sim 1\text{hr})$ , bulk type.
3.  $130\pm 3^{\circ}\text{C} \times (15\text{min}\sim 30\text{min})$ , bulk type.

## 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.

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**Handling of Silicone Resin LEDs**

Handling Indications

During processing, mechanical stress on the surface should be minimized as much as possible.

Sharp objects of all types should not be used to pierce the sealing compound.



Figure 1

In general, LEDs should only be handled from the side. By the way ,this also applies to LEDs without a silicone sealant, since the surface can also become scratched.

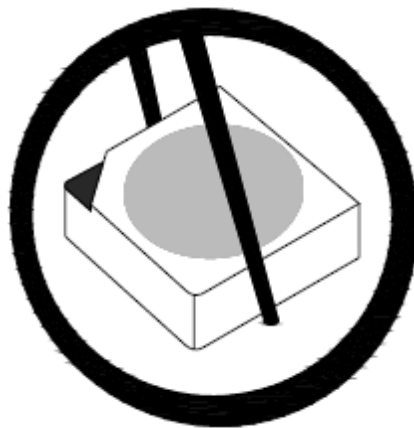


Figure 2

When populating boards in SMT production, there are basically no restrictions regarding the from of the pick and place nozzle, except that mechanical pressure on the surface of the resin must be prevented.

This is assured by choosing a pick and place nozzle which is large than LEDs reflector area.

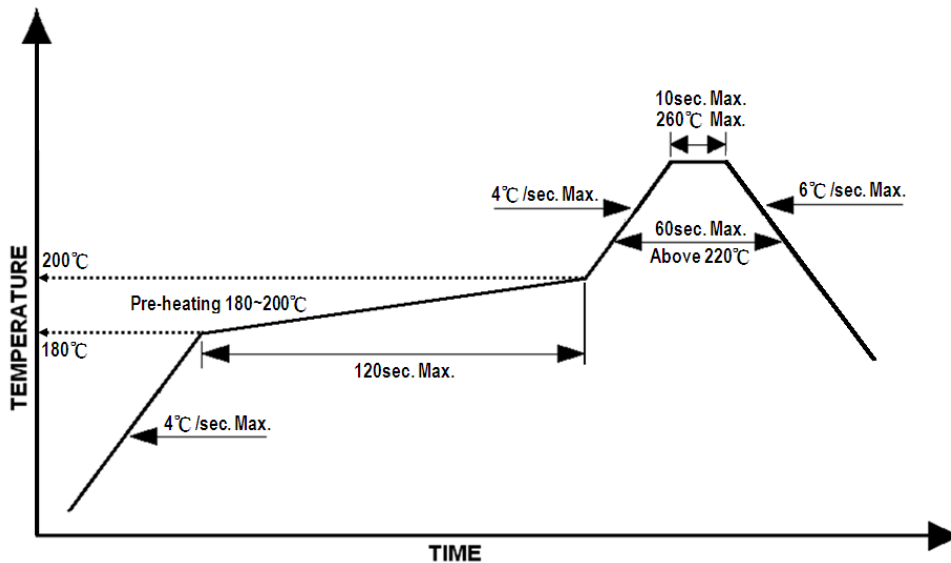
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## Reflow Soldering

Recommend soldering paste specifications:

1. Operating temp.: Above 220 °C ,60 sec.
2. Peak temp.:260 °CMax.,10sec Max.
3. Reflow soldering should not be done more than two times.
4. Never attempt next process until the component is cooled down to room temperature after reflow.
5. 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 °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
- Ultrasonic cleaning: < 15W/ bath; bath volume ≤ 1liter
- Curing: 100 °C max, <3min

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