Specification

Document No.: NMD-SPC- SK6813HV-09-4P

Product No.: SK6813HV-09-4P

Sample number.: NMD0187

Description: 5.4x5.0x1.6 mm 0.15W Intelligent external control surface mount SMD 12V LED

Rev. No.: A/0

Date: 2021-03-20

Customer approval			NMD approval		
Approval	Audit	Confirmation	Approval	Review	Confirmation
			朱更生	吴振雷	周 凯
☐Qualified ☐Disqualified Stamp			Stamp		

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***Official website: http://www.normandled.com**

Change History

Date	Rev. No.	Changes/Reason of changes	Signature
2019-04-12	01	Initial Document	KEVIN ZHU
2021-03-20	A/0	Modify product specifications andphotoelectric parameters	KAEN ZHOU

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1. Product Overview :

SK6813HV-09-4P is a smart LED control circuit and light emitting circuit in one controlled LED source, which has the shape of a 5050 LED chip. Each lighting element is a pixel, and the intensities of the pixels are contained within the intelligent digital interface input. The output is driven by patented PWM technology, which effectively guarantees high consistency of the color of the pixels. The control circuit consists of a signal shaping amplification circuit, a built-in constant current circuit, and a high precision RC oscillator.

The data protocol being used is unipolar NRZ communication mode. The 24-bit data is transmitted from the controller to DIN of the first element, and if it is accepted it is extracted pixel to pixel. After an internal data latch, the remaining data is passed through the internal amplification circuit and sent out on the DO port to the remaining pixels. The pixel is reset after the end of DIN. Using automatic shaping forwarding technology makes the number of cascaded pixels without signal transmission only limited by signal transmission speed.

The LED has a low driving voltage (which allows for environmental protection and energy saving), high brightness, scattering angle, good consistency, low power, and long life. The control circuit is integrated in the LED above.

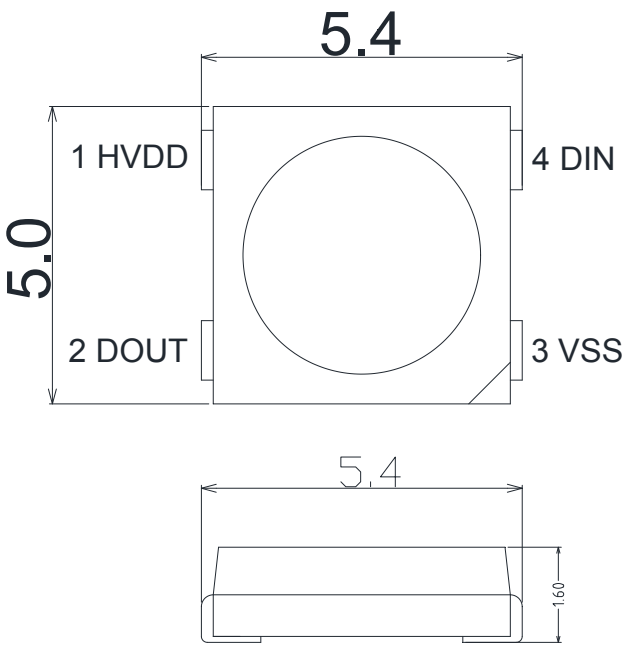
2. Main Application Field:

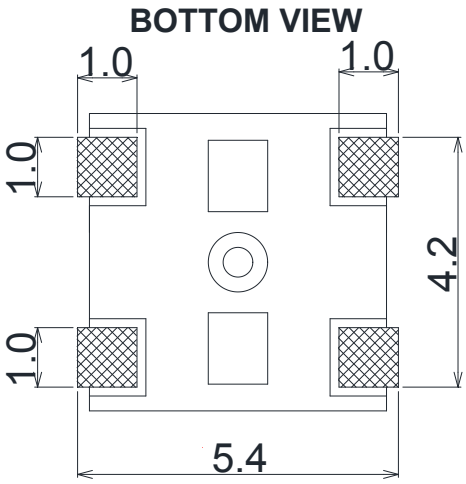
- **Full color LED string light, LED full color module, LED super hard and soft lights, LED guardrail tube, LED appearance / scene lighting**
- **LED point light, LED pixel screen, LED shaped screen, a variety of electronic products, electrical equipment etc..**

3. Description:

- **Top SMD internal integrated high quality external control line serial cascade constant current IC;**
- **control circuit and the RGB chip in SMD 5050 components, to form a complete control of pixel, color mixing uniformity and consistency;**
- **built-in data shaping circuit, a pixel signal is received after wave shaping and output waveform distortion will not guarantee a line;**
- **The built-in power on reset and reset circuit, the power does not work;**
- **gray level adjusting circuit (256 level gray scale adjustable);**
- **red drive special treatment, color balance;**
- **line data transmission;**
- **plastic forward strengthening technology, the transmission distance between two points over 10M;**
- **Using a typical data transmission frequency of 800 Kbps, when the refresh rate of 30 frames per sec**

4. Mechanical Dimensions:



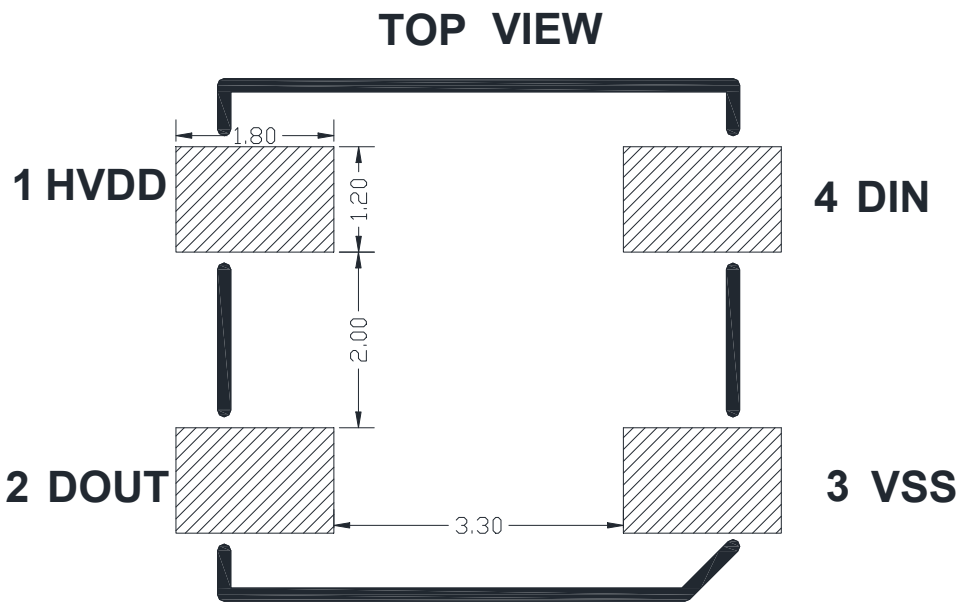


Notes:
1. All dimensions are in millimeters.
2. Tolerance is ±0.1mm unless otherwise noted

5. PIN configuration

NO.	Symbol	Function description
1	HVDD	Power supply LED
2	DOUT	Control data signal output
3	VSS	Ground
4	DIN	Control data signal input

6. Recommended dimensions for PCB



7. General description of product naming.

SK 6813HV-09-4P-X

① ② ③ ④

①	②	③	④
Series	IC series and current code	Foot position	Internal code
The default is to integrate the RGB chip with the IC in the 5.4x5.0x1.6mm package outline	Refers to 6813 series IC: 9ma current version; HV: refers to high voltage version	4P:4feet 6P:6feet	X: indicates internal code, which is different

8. Electrical parameters （Ta=25℃,VSS=0V）：

Parameter	Symbol	Range	Unit
Power supply voltage	HVDD	-0.4～+13	V
Logic input voltage	V_{IN}	-0.5～VDD+0.5	V
Working temperature	Topt	-40~+85	℃
Storage temperature	Tstg	-40~+85	℃
ESD pressure(HBM)	V_{ESD}	200	V
ESD pressure(DM)	V_{ESD}	2K	V

9. Electrical/Optical Characteristics:

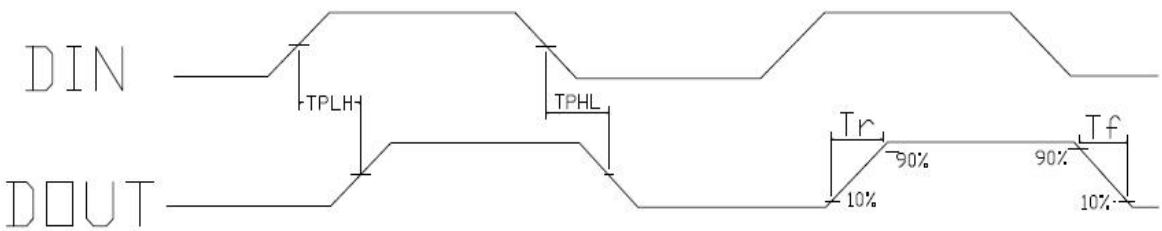
Color	SK6812HV-09-4P 9mA	
	Dominate Wavelength(nm)	Luminance(mcd)
Red	620-630	300-500
Green	520-535	1000-1500
Blue	460-475	200-300

10. The IC electrical parameters (unless otherwise specified, TA=-20 ~ +70 ℃, VDD=4.5 ~ 5.5V, VSS=0V):

Parmeter	Symbol	Min	Typical	Max	Unit	Test conditions
The chip supply voltage	HV_{DD}	---	12	---	V	---
The signal input flip threshold	V_{IH}	4.0	---	---	V	---
	V_{IL}	---	---	1.0	V	
The frequency of PWM	F_{PWM}	---	1.2	---	KHZ	---
Static power consumption	I_{DD}	---	2	---	mA	---

11. Switching characteristics(VCC=5V Ta=25 ℃):

Parameter	Symbol	Min	Typical	Max	Unit	Test conditions
The speed of data transmission	fDIN	---	800	---	KHZ	The duty ratio of 67% (data 1)
DOUT transmission delay	TPLH	---	---	500	ns	DIN→DOUT
	TPHL	---	---	500	ns	



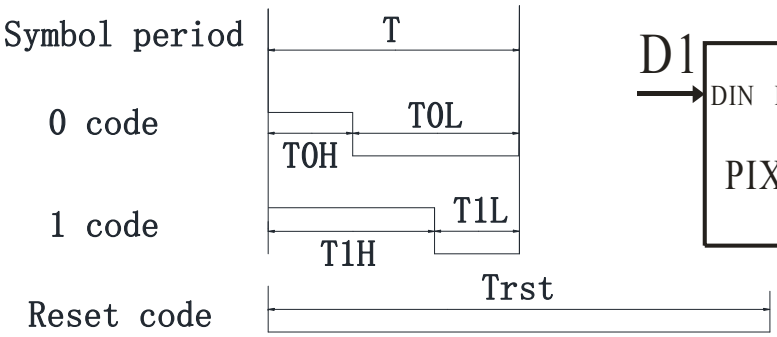
12. The data transmission time

Name		Min.	Standard value	Max.	Unit
T	**Code period**	**1.20**	**--**	**--**	**μs**
T0H	0 code, high level time	**0.2**	**0.25**	**0.4**	**μs**
T0L	0 code, low level time	**0.8**	**--**	**--**	**μs**
T1H	1 code, high level time	**0.65**	**0.75**	**1.0**	**μs**
T1L	1 code, low level time	**0.2**	**--**	**--**	**μs**
Trst	Reset code，low level time	**>80**	**--**	**--**	**μs**

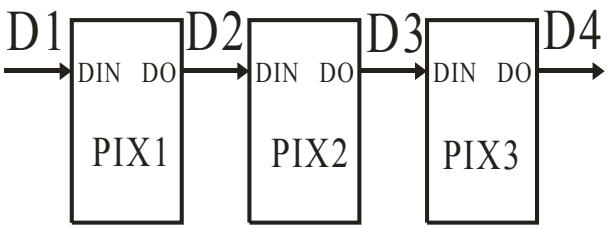
1. The protocol uses a unipolar zeroing code. Each symbol must have a low level. Each symbol in this protocol starts with a high level. The high time width determines the "0" or "1" code. .
2. When writing programs, the minimum symbol period is 1.2 μ s.
3. The high time of "0" code and "1" code should be in accordance with the stipulated range in the above table. The low time requirement of "0" code and "1" code is less than 20 μ s.

13. Timing waveform:

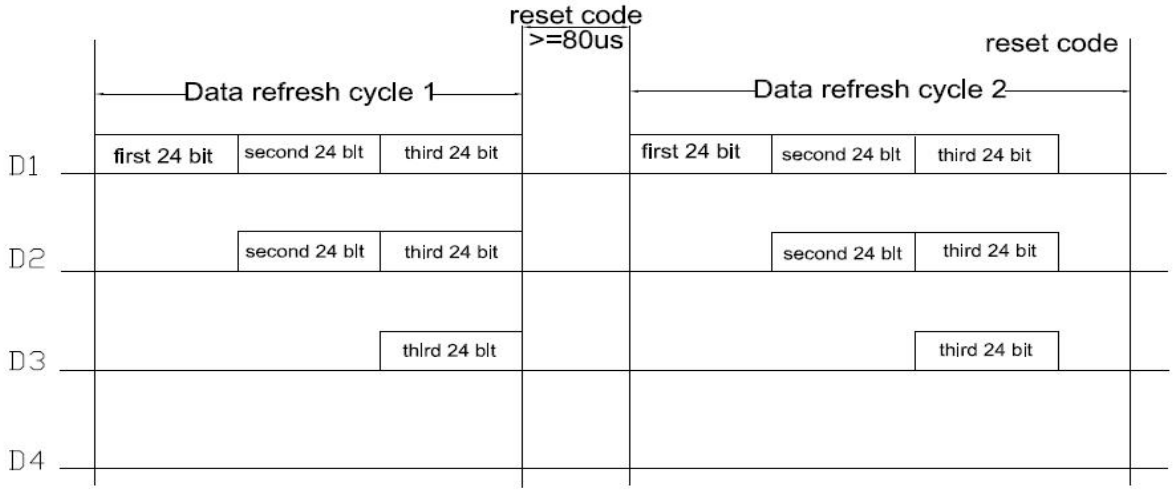
Input code:



Connection mode:



14. The method of data transmission:

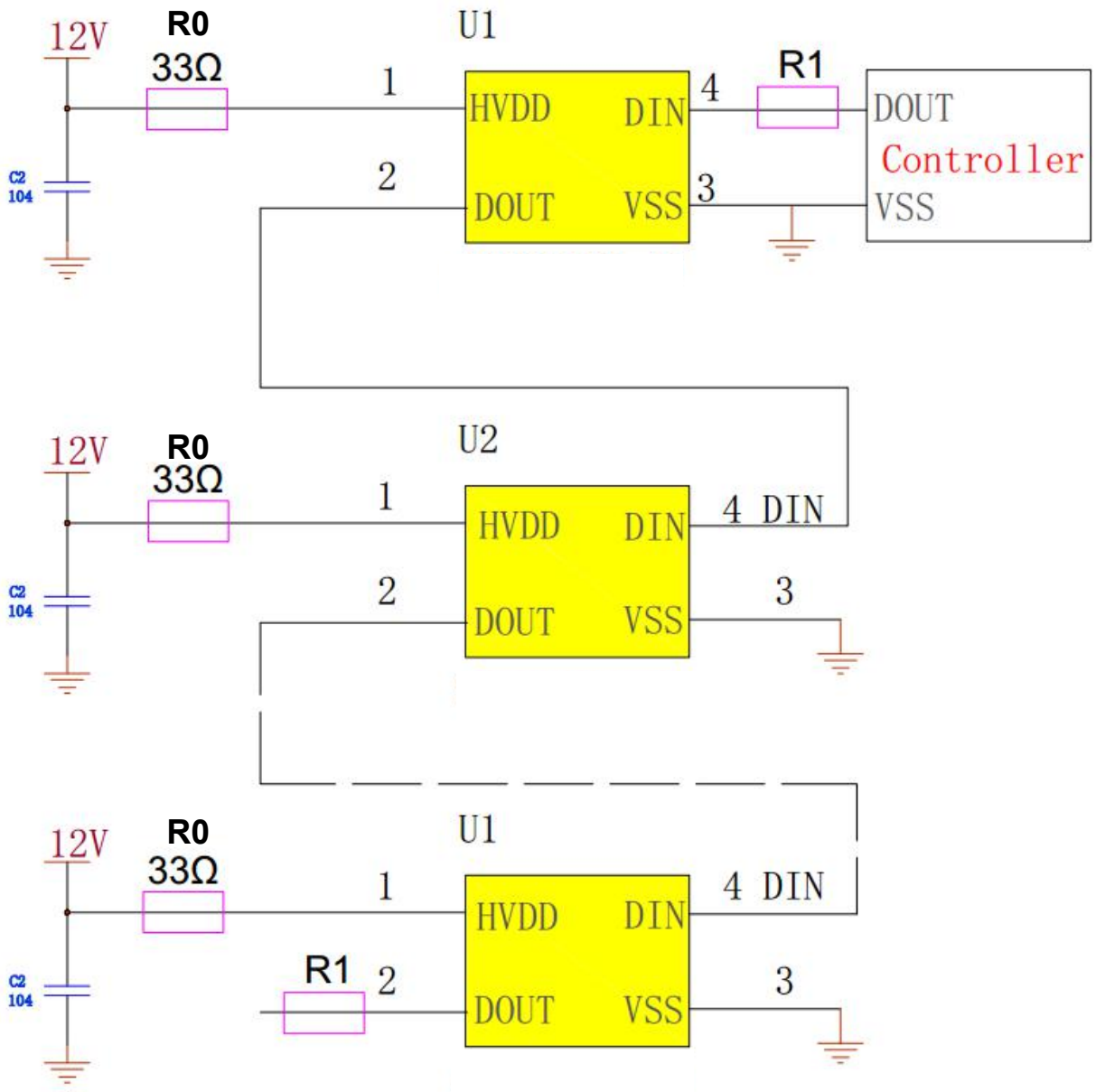


Note: the D1 sends data for MCU, D2, D3, D4 for data forwarding automatic shaping cascade circuit.

15. The data structure of 24bit:

R3	R2	R1	R0	B7	B6	B5	B4	B3	B2	B1	B0
Note: high starting, in order to send data (G7 - G6 - ....B0)											

16. The typical application circuit:



In the actual application circuit, in order to prevent the high-voltage damage IC internal signal input and output pin caused by the hot plugging during the test, the protection resistor should be connected in series at the signal input and output terminals. In addition, in order to make the IC chips work more stably, the decoupling capacitance between the lamp beads is indispensable;

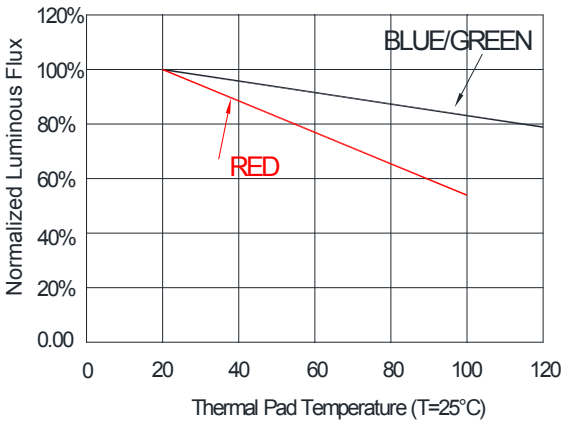
It is recommended to connect a 33 ohm resistor in series with the HVDD terminal to reduce the thermal loss of the IC itself.

Application 1: For soft light or hard light strip, the transmission distance between the light beads is short. It is recommended to connect the protection resistors in series with the signal and clock line input and output terminals, that is, R1=R2 is about 500 ohms;

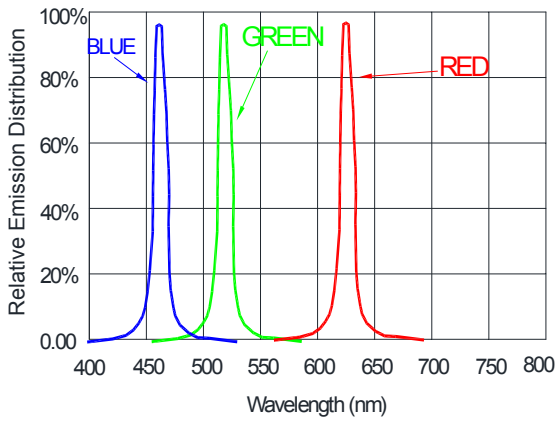
Application 2: For modules or general-shaped products, the transmission distance between the lamps is long. Due to the different wires and transmission distance, the protection resistances connected in series at both ends of the signal and clock lines will be slightly different;

17. Standard LED Performance Graph:

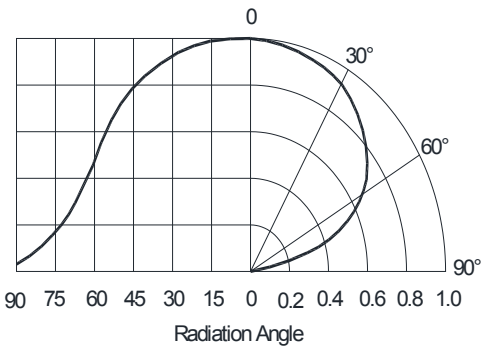
Thermal Pad Temperature vs. Relative Light Output



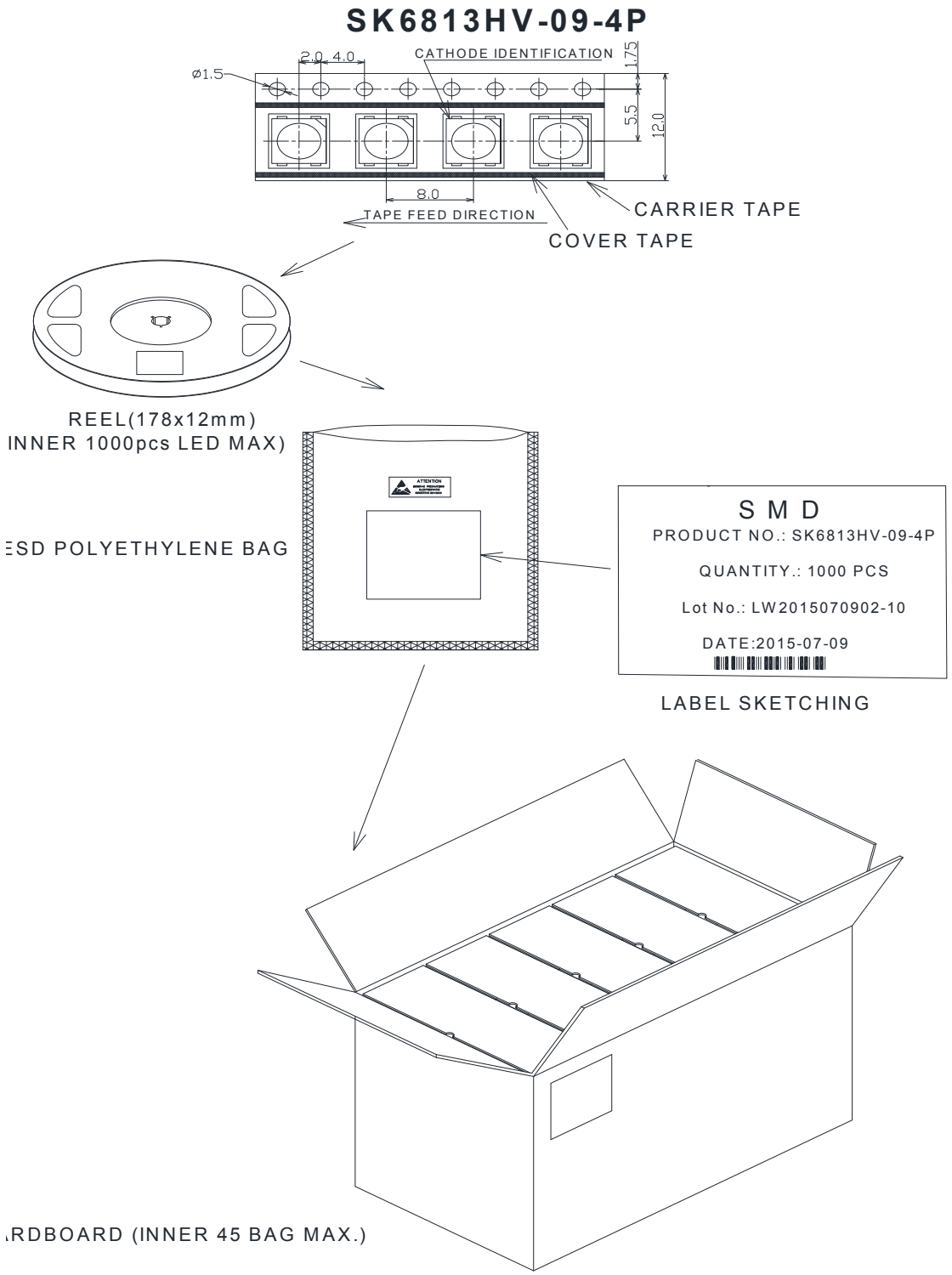
Wavelength Characteristics



Typical Radiation Pattern 120°



18. Packaging Standard:



The reel pack is applied in SMD LED. The LEDs are packed in cardboard boxes after packaging in normal or anti-electrostatic bags. cardboard boxes will be used to protect the LEDs from mechanical shocks during transportation. The boxes are not water resistant and therefore must be kept away from water and moisture.

19. Reliability Test :

NO.	Test item	Test Conditions	Reference	Criterion
1	Thermal Shock	100 ± 5° C ~ -40° C ± 5° C 15min~15min 100 cycles	MIL-STD-202G	0/22
2	High Temperature Storage	Ta= +100°C 1000hrs	JEITA ED-4701 200 201	0/22
3	Low Temperature Storage	Ta= -40°C 1000hrs	JEITA ED-4701 200 202	0/22
4	High Temperature High Humidity Storage	Ta=60°C RH=90% 1000hrs	JEITA ED-4701 100 103	0/22
5	Temperature Cycle	-40°C~25°C~100°C~25°C 30min~5min~30min~5min 100 cycles	JEITA ED-4701 100 105	0/22
6	Resistance to Soldering Heat	Tsld = 260° C, 10sec. 2 times	JEITA ED-4701 300 301	0/22
7	Room temp Life Test	25° C, IF: Typical current , 1000hrs	JESD22-A 108D	0/22

Criteria for Judging the Damage:

Item	Symbol	Test Condition	Limit	
			Min	Max
Luminous Intensity	IV	DC=12V, Typical current	Init. Value*0.7	---
Resistance to Soldering Heat	---	DC=12V, Typical current	No dead lights or obvious damage	