Product specification

Document number: NMD-SPC-SK9826-EC20

Product model: SK9826-EC20-000

Sample number: EP000017-000

Product description: 2.0x2.0x0.65mm Type 0.1Watt Power Embedded (MSL：4a)

Version number: 02

Time: 2021-05-04

Customer approval			NMD approval		
Approval	Audit	Confirmation	Approval	Audit	Confirmation
			KEVIN ZHU	TONI WU	ZHENLEI WU
□Qualified □Disqualified Stamp			Stamp		

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***Website：http://www.normandled.com**

Change History

Date	Rev. No.	Changes/Reason of changes	Signature
2018-10-30	01	Initial Document	KEVIN ZHU
2021-05-04	02	Revision of Specification Format	ZHENLEI WU

CONTENTS

1、 Product overview.....4
2、 Main Application Field.....4
3、 Description.....4
4、 Mechanical Dimensions..... 4
5、 PIN configuration.....5
6、 Recommended dimensions for PCB products.....5
7、General description of product naming.....6
8、 Electrical parameters.....6
9、 Electrical/Optical Characteristics.....6
10、 The IC electrical parameters.....7
11、 Switching characteristics.....7
12、 The data transmission time .....8~9
13、 The typica l application circuit.....10
14、 Standard LED Performance Graph.....11
15、 Packaging Standard.....12
16、 Reliability Test.....13

1. Product Overview :

SK9826-EC20 is a two-wire transmission three-channel (RGB) drive control circuit and light-emitting circuit in one of the intelligent external control LED light source. Built-in constant current circuit and RC oscillator; internal integrated current gain control module, CMOS process, low voltage, low power consumption; when REXT is floating, the three-channel constant current driver default output of 18mA, the product is equipped with signal decoding module, Can also be REXT external resistor to adjust the required current, each output channel can output 16 (65536 level) gray adjustable linear current; using two-wire output, DATA data and synchronous CLK signal, so that the series chip The output action synchronization; refresh rate up to 4KHz, showing more delicate and smooth, the default power does not light.

2. Main Application Field:

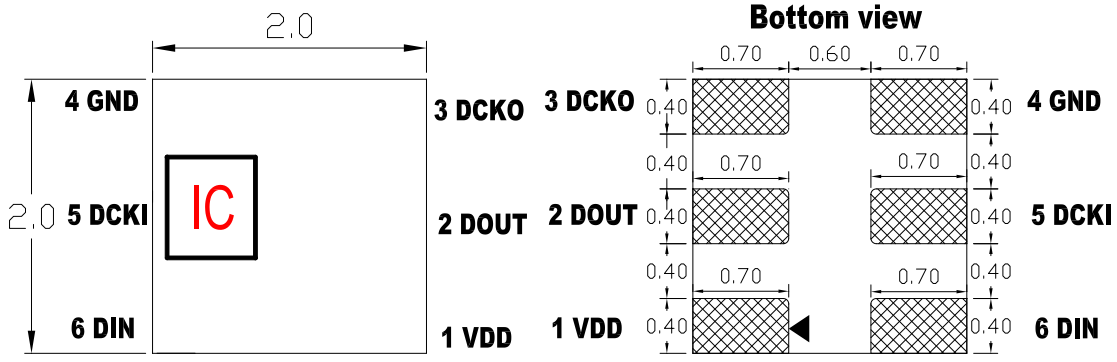
● Full color LED string light, LED full color module, LED super hard and soft lights, LED guardrail tube, LED appearance / scene lighting

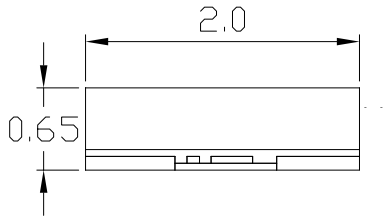
● LED point light, LED pixel screen, LED shaped screen, a variety of electronic products, electrical equipment etc..

3. Description:

● Chip SMD internal integrated high quality external control line serial cascade constant current IC; 5V application; default on electric lights;
● Control circuit and the RGB chip in EC20 components, to form a complete control of pixel, color mixing uniformity and consistency;
● The Two-wire synchronous control, built-in bi-directional transmission function.
●RGB three-color output control, 64Bit (65536 level) color settings; each set of data are 1bit start code +15 Bit (32) brightness adjustment (red, green, blue three ports each 5bits, corresponding to S4 ~ S0) ; 48bits gray data (red, green, blue 16bits) composition.
● Three-way constant current drive, built-in high-precision and high stability of the oscillator, current error <± 5%.
● The maximum serial data input frequency 30MHZ, refresh rate of up to 4KHz, cascade up to 1024 points.
● REXT external resistance adjusting current (REXT floating, OUTR / G / B to about 18mA; REXT external resistor to adjust the maximum current of 60mA).

4. Mechanical Dimensions:



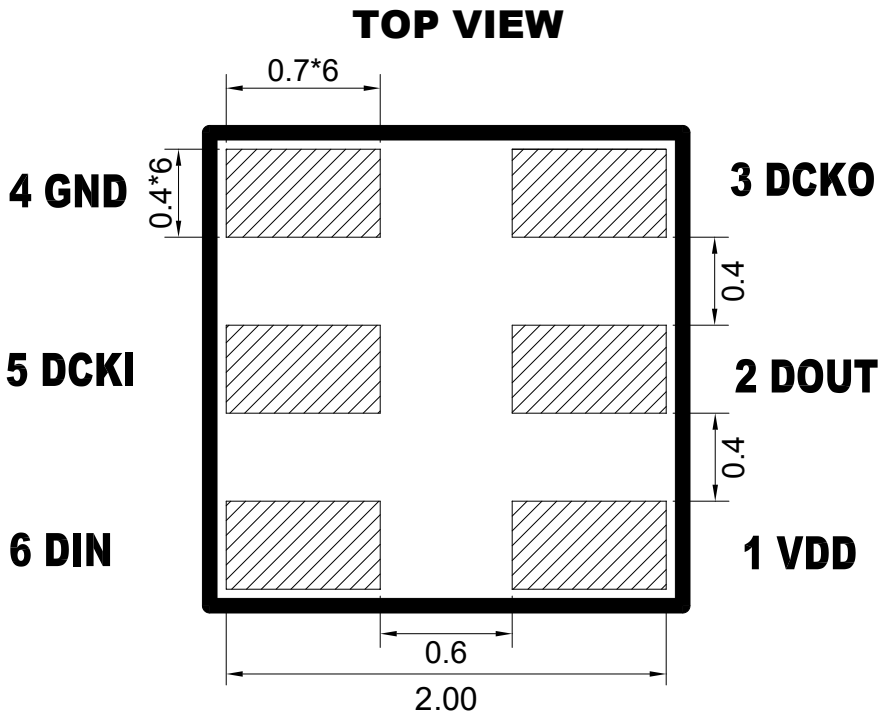


Notes:
1. All dimensions are in millimeters.
2. Tolerance is ±0.1mm unless otherwise noted

5. PIN configuration

Item	Symbol	Pin Name	Function description
1	VDD	Power	power supply pin
2	DOUT	Data Output	Series data output and internal strong drive output
3	DCKO	CLK Output	Clock signal output terminal connected in series, via the internal lock regeneration and strong drive output
4	GND	Ground	The signal and power supply and grounding
5	DCKI	CLK Input	control signal Input Clock data
6	DIN	Data Input	control signal Input data

6. Recommended dimensions for PCB products



7. General description of product naming.

SK 9826-EC20

① ② ③

①	②	③
Series	IC series and current code	Packaging Shape
The default is to integrate the RGB chip with the IC	Refers to the 98 series IC 18MA current version 65536	2.0x2.0x0.65mm PCB bracket package

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

Parameter	Symbol	Range	Unit
Power supply voltage	VDD	-0.5～+5.5	V
Logic input voltage	V_{IN}	-0.5～VDD+5.5	V
Working temperature	Topt	-20~+80	℃
Storage temperature	Tstg	-20~+80	℃
Power dissipation	PD	550	mW
ESD pressure(HBM)	V_{ESD}	200	V
ESD pressure(DM)	V_{ESD}	4K	V

9. Electrical/Optical Characteristics:

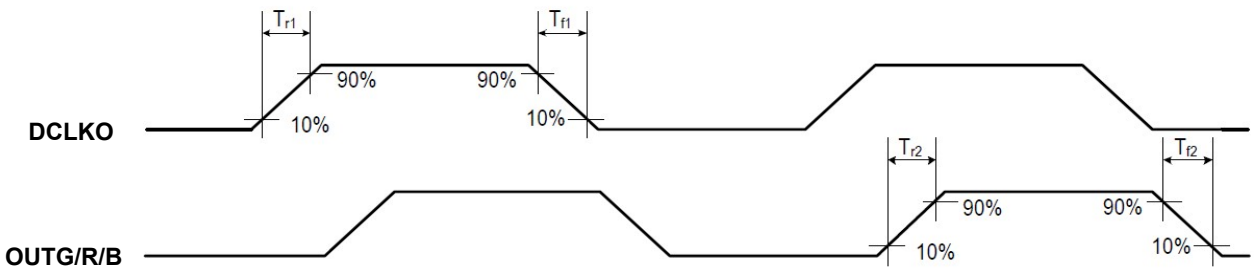
Color	SK9826-EC20 12mA		
	Dominate avelength(nm)	Luminance(mcd)	luminous flux(lm)
Red	620-630	300-600	1.0-2.0
Green	515-530	1000-1500	3.0-4.0
Blue	460-475	200-400	0.3-1.0

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	VDD	---	5.1	5.5	V	---
The signal input flip threshold	VIH	3.0	---	---	V	VDD=5.0V
	VIL	---	---	1.6	V	
The biggest LED output current	I_{max}	---	18	---	mA	V_{DS} =2V,REXT Vacant
The frequency of PWM	FPWM	---	4.0	---	KHZ	---
Static power consumption	I_{DD}	---	3.6	---	mA	---
OUTR / G / B port current variation	%VS.V_{DS}	---	0.5	---	%	V_{DS} =1~5V, I_{OUT} =18mA
	%VS.VDD	---	2.5	---	%	VDD =4~6V, I_{OUT} =18mA
	%VS . Temp.	---	5.0	---	%	I_{OUT} =18mA,Temp=-40~+85℃

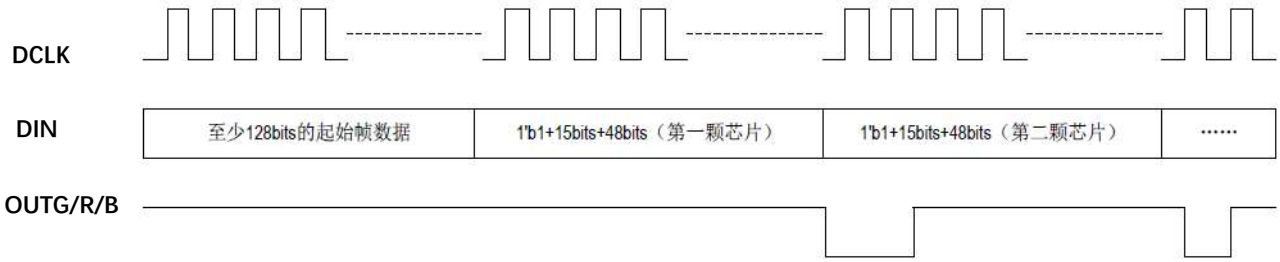
11. Switching characteristics (VCC = 5V ± 5%, Ta = 25 ° C):

Parameter	Symbol	Min	Typical	Max	Unit	Test conditions
The speed of data transmission	fDIN	---	4.15	---	KHZ	50% duty cycle gain adjustment 10001
DCLKO conversion time	T_{r1}	---	6.8	---	ns	DCLKO port load capacitance 30pF
	T_{f1}	---	5.5	---	ns	
DOUT conversion time	T_{r2}	---	60	---	ns	50% duty cycle gain adjustment 10001
	T_{f2}	---	50	---	ns	



12. Data communication protocol:

(1) 16bits grayscale data format input :



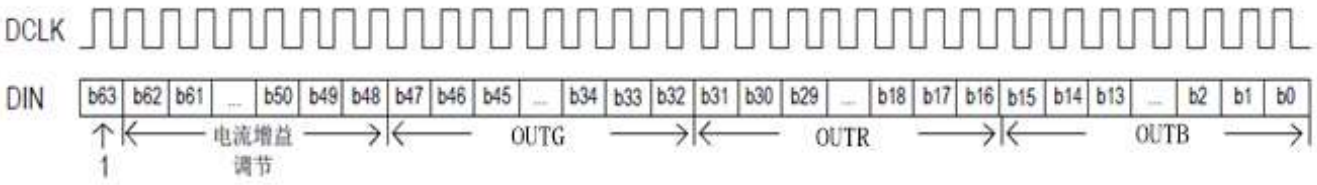
(A) first into at least 128bits "0" as the starting frame, and then moved into the data frame, the starting frame and the data frame are high first move in, DCLK rising edge sampling data:

(B) Each set of gray scale data is composed of 1bit start code + 15bits current gain adjustment value (red and green blue three ports each 5bits) + 48bits gray data (red, green and blue lights 16bits)

(C) the first data frame is the corresponding distance from the end of the nearest LED driver chip;

(D) After the completion of the gray data transmission, additional pulse corresponding to the number of chips need to add additional DCLK (that is, 512 chips in cascade, need to send additional 512 DCLK), DIN remains high, the new data that comes into effect;

(2) Each chip gradation data format :



(3) Product output structure: GRB order to light, optimize the product color mixing effect (adjust the IC default RGB sequential chip position);

(4) **Current gain adjustment parameters:**

Current gain function Data transmission format:

Red and blue lights a total of 15bits current gain adjustment bit, respectively, corresponding to 5bits (S4 ~ S0), the system is the first order to send red light 5bits, and then the green light 5bits, the last blue light 5bits, starting high S4, S0.

Current gain parameter transmission format		
Green（G)	Red（R)	Blue（B)
S4 , S3 , S2 , S1 , S0	S4 , S3 , S2 , S1 , S0	S4 , S3 , S2 , S1 , S0

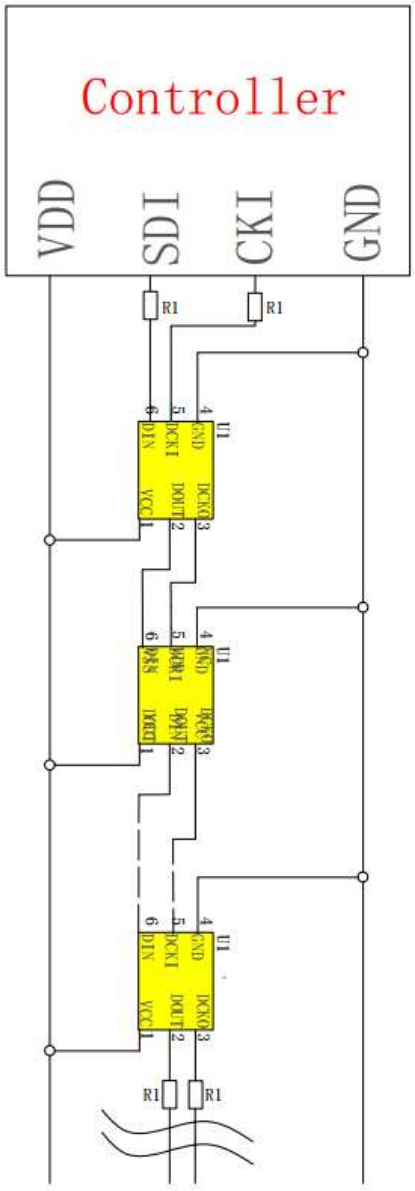
Specific current setting table ：

Current regulation level	Current gain adjustment bit					Corresponding current value（mA)
	S4	S3	S2	S1	S0	
1	0	0	0	0	0	1.68
2	0	0	0	0	1	2.24
3	0	0	0	1	0	2.80
4	0	0	0	1	1	3.36
5	0	0	1	0	0	Based on the product heat dissipation, the current of this product is recommended to be used at maximum: 3.34 mA. Current regulation level 5-32 is not recommended.
6	0	0	1	0	1	
7	0	0	1	1	0	
8	0	0	1	1	1	
9	0	1	0	0	0	
10	0	1	0	0	1	
11	0	1	0	1	0	
12	0	1	0	1	1	
13	0	1	1	0	0	
14	0	1	1	0	1	
15	0	1	1	1	0	
16	0	1	1	1	1	
17	1	0	0	0	0	
18	1	0	0	0	1	
19	1	0	0	1	0	
20	1	0	0	1	1	
21	1	0	1	0	0	
22	1	0	1	0	1	
23	1	0	1	1	0	
24	1	0	1	1	1	
25	1	1	0	0	0	
26	1	1	0	0	1	
27	1	1	0	1	0	
28	1	1	0	1	1	
29	1	1	1	0	0	
30	1	1	1	0	1	
31	1	1	1	1	0	
32	1	1	1	1	1	

Note: 1. Suggested Current: 1~4 Current Regulation Level

2. Based on the heat dissipation of the product, the current of this product is recommended to be used as maximum as 3.36 mA. Current regulation grades 5-32 are not recommended.

13. The typical application circuit:



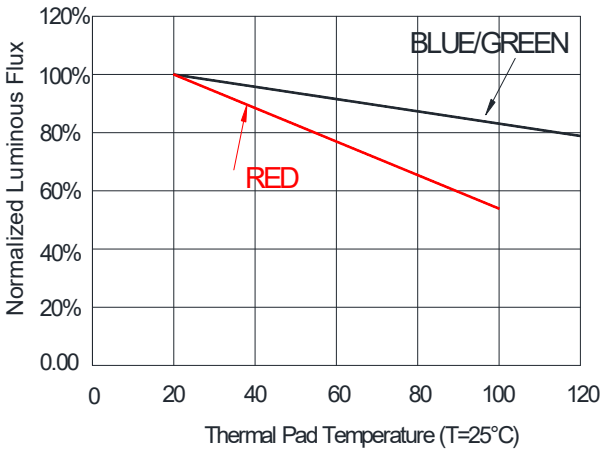
In the practical application circuit, the signal input and output pins of the IC signal input and output pins should be connected to the signal input and output terminals. In addition, in order to make the IC chip is more stable, even the capacitance between beads is essential back;

Application: used for soft lamp strip or hard light, lamp beads transmission distance is short, suggested in signal in time the clock line input and output end of each connected in series protection resistors, R1 of about 500 ohms.

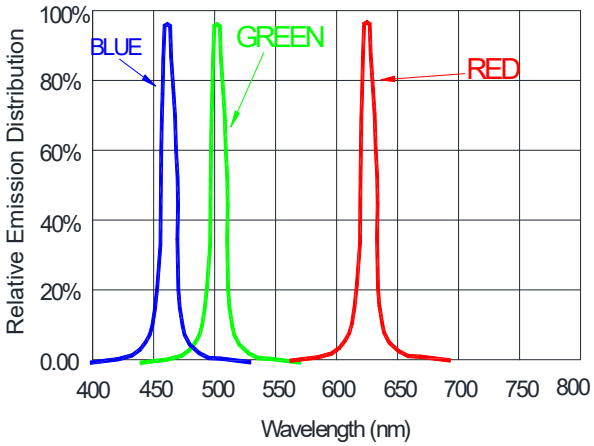
Application: for module or general special-shaped products, lamp beads transmission distance is long, because of different wire and transmission distance, in the signal in time clock at both ends of the line on grounding protection resistance will be slightly different; to the actual use of fixed;

14. Standard LED Performance Graph:

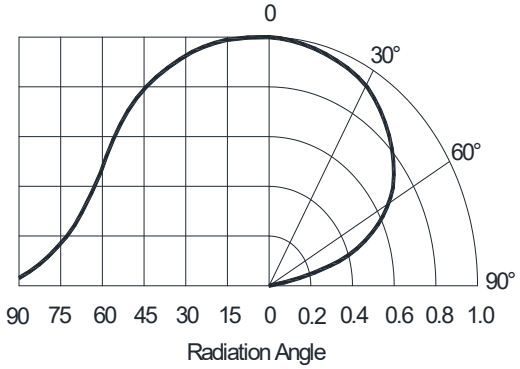
Thermal Pad Temperature vs. Relative Light Output



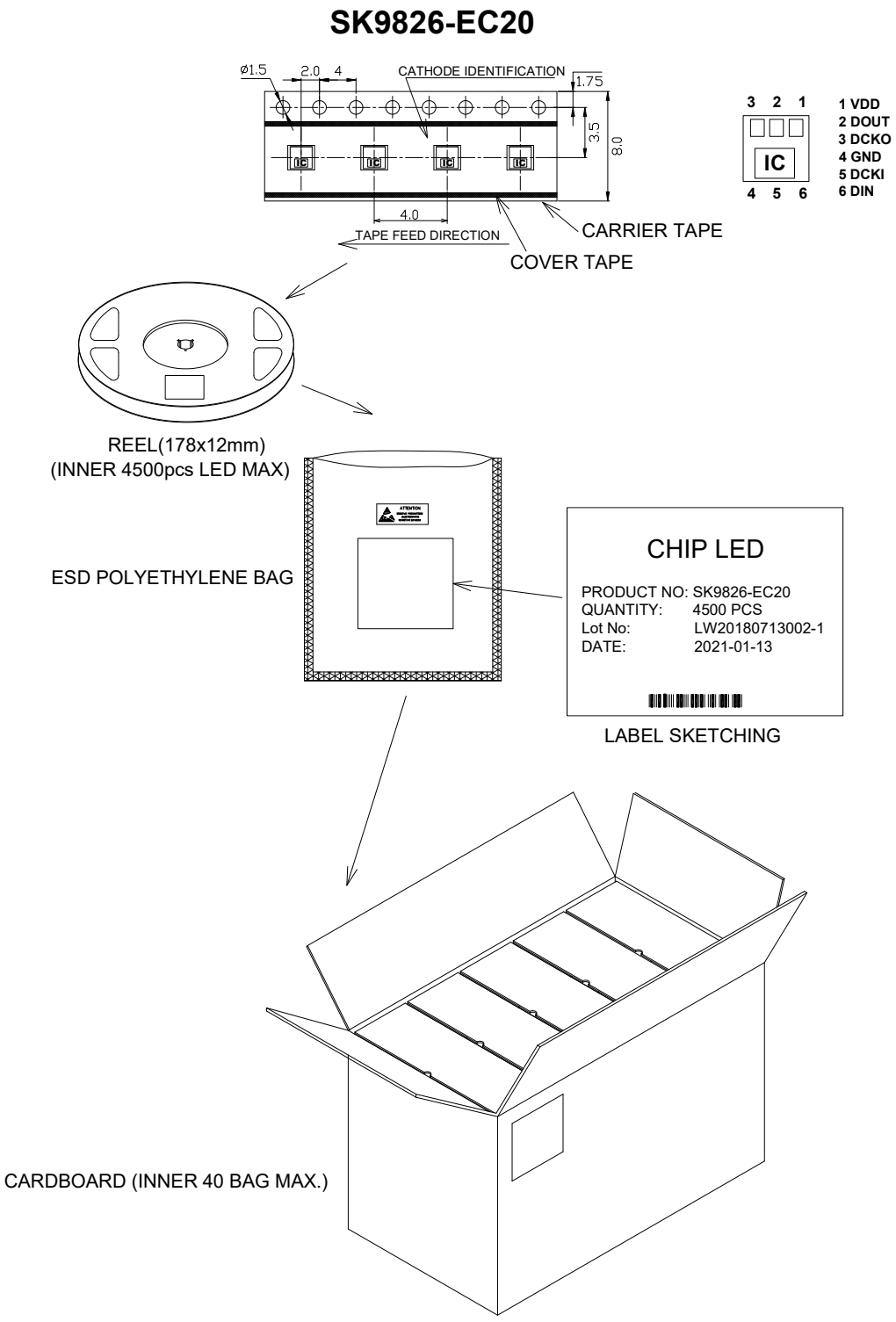
Wavelength Characteristics



Typical Radiation Pattern 120°



15. 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.

16. Reliability Test :

NO.	Test item	Test Conditions	Reference	Criterion
1	Thermal Shock	-40℃*15min～100℃*15min 100cycles	MIL-STD-202G	0/64
2	High Temperature Storage	Ta= 85℃ 1000hrs	JEITA ED-4701 200 201	0/64
3	Low Temperature Storage	Ta= -40℃ 1000hrs	JEITA ED-4701 200 202	0/64
4	High Temperature High Humidity Storage	Ta=85℃ RH=85% 1000hrs	JEITA ED-4701 100 103	0/64
5	Temperature Cycle	-40℃~25℃~100℃~25℃ 30min~5min~30min~5min 100 cycles	JEITA ED-4701 100 105	0/64
6	Resistance to Soldering Heat	Tsld = 260℃, 10sec. 2times	JEITA ED-4701 300 301	0/64
7	Room temp Life Test	Ta＜35℃, IF:Typical current, 3000hrs	/	0/22

Criteria for Judging the Damage:

Item	Symbol	Test Condition	Limit	
			Min	Max
Luminous Intensity	IV	DC=5V, Typical current	Init. Value*0.7	---
Resistance to Soldering Heat	---	DC=5V, Typical current	No dead lights or obvious damage	