NEWSTAR LED CO., LIMITED

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Tel: 0755-29405686 www.addressableledstrip.com info@newstarleds.com

Specification

HD105 RGBW LED

Document No.:SPCNSD/HD105-RGBW

Model No.: HD105 RGBW 5050 LED

Description: 5.0*5.0*1.6MM

Rev. No.: 01

Date: 2025-05-15

ATTENTION

OBSERVE PRECAUTIONS
ELECTROSTATIC
SENSITIVE DEVICES

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Product Overview

HD105 is a 4-channel high-voltage DC12v LED with built-in IC. It integrates:

- Data latch circuit
- Data shaping & processing circuit
- Data forwarding circuit
- Dual oscillators
- PWM modulation circuit
- R/G/B/W 4-channel constant-current LED driver circuits.

HD105 adopts single-wire return-to-zero (RZ) code which is designed by newstar. After power-on reset, the DI pin receives data frames from the MCU. The first 32 bits are latched and sent to the PWM circuit to control R/G/B/W LED drivers. After the first 32 bits of the data frame are latched, the remaining data is shaped by an internal data shaping and amplification circuit and forwarded to the next level HD105 chip through the DO port via a data forwarding circuit. Every time a data frame passes through an HD105 chip, the data is reduced by 32 bits..

Features

- Input Voltage: 9 – 14V
- R/G/B/W Constant Current: 12mA
- PWM Frequency: 16kHz
- Data Rate: 900Kbps
- Grayscale Levels: 256 per channel
- Default State: Outputs OFF at power-on
- Data Protocol: Unipolar RZ code (SID)
- Serial transmission of data signals
- Cascading: Data reshaped for anti-attenuation;
- Supports breakpoint resume (single IC/LED failure won’t affect other LEDs working)

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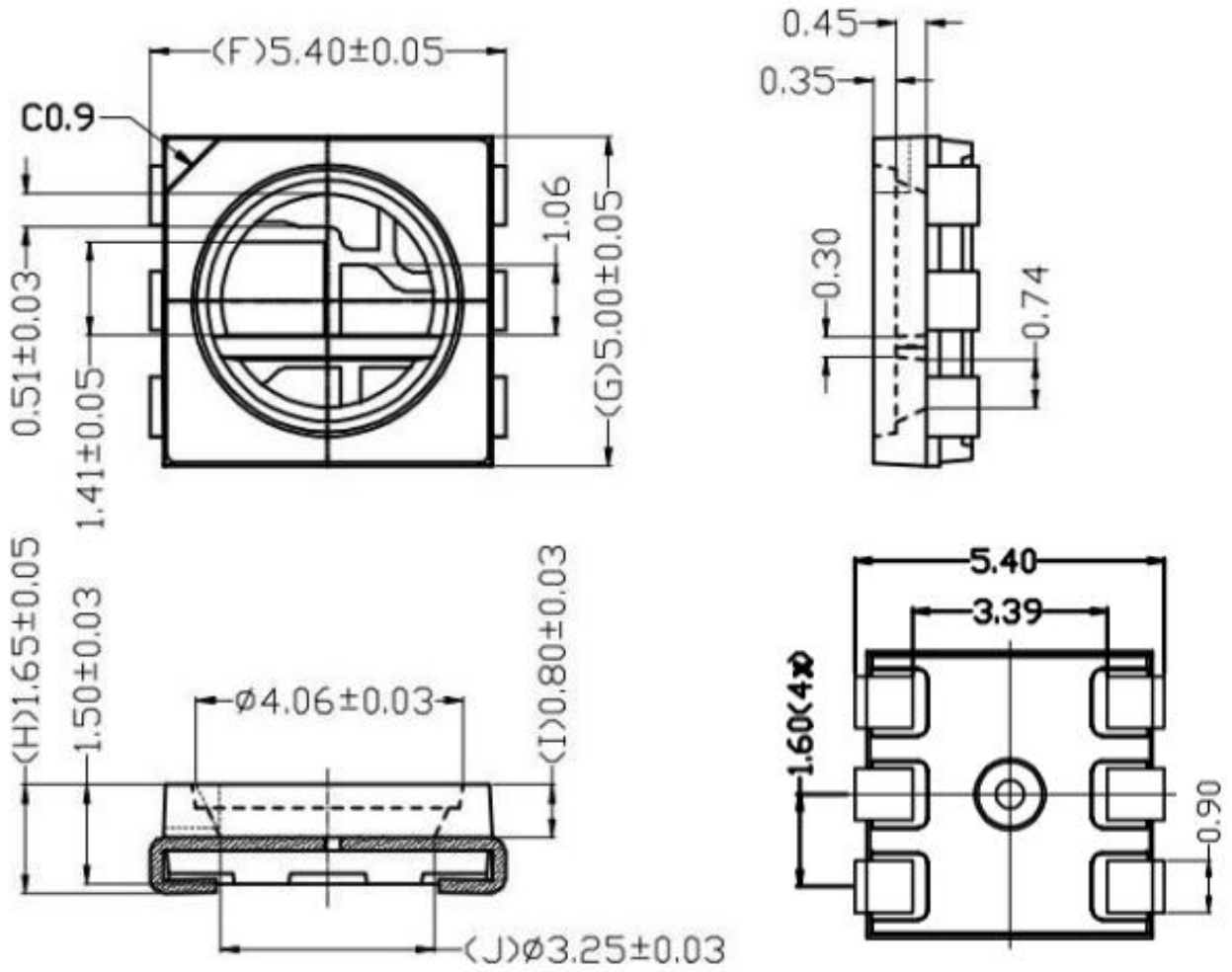
- Synchronized refresh of data displayed in the same frame
- Integrated driver for iridescent light source with built-in IC 5050SMD LED

Dimension



(Remark: all dimensions in mm, tolerance ±0.2mm unless specified.)

Applications

1. Full-color LED signage, modules
2. RGB flexible/rigid light strips
3. Marquee lights for appliances
4. Smart speakers, fans
5. Displays, pixel screens, point light sources
6. Custom electronics

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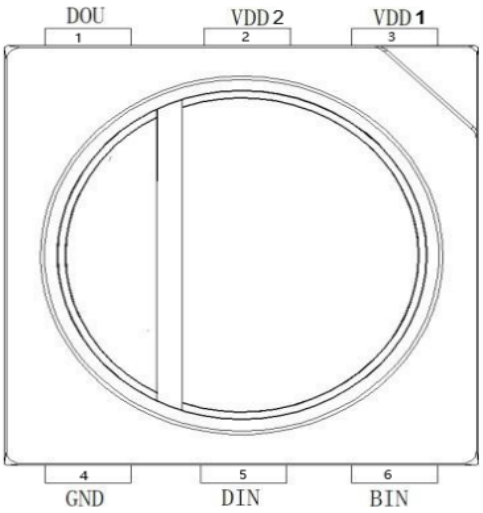
Pin Configuration



Symbol	Pin name	Function
DOU	Data Output	Signal data output
VDD2	Power	Hanging processing
VDD1	Power	Positive wire of chip
GND	Ground	Grounding
DIN	Data Input	Signal data input
BIN	Auxiliary signal	Auxiliary signal output

Maximum rated value (TA=25℃)

Symbol	Data	Range	Unit
Vin	Logic Voltage	-0.4~14.0	V
Vds	RGBW Output Withstand	18	V
V_{DI}	Logic input voltage	-0.4~7.0	V
L_{LED}	RGBW Output Current	12	mA
T_{OP}	Working Temp.	-40~100	℃
T_{STG}	Storage Temp.	-40~100	℃
V_{ESD}	ESD Tolerance	2K	V

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Electrical Characteristics (TA=25℃)

Symbol	Data	Min.	Typ.	Max.	Unit
Vin	Input Vol	9	12	14	V
Vds	RGBW Output Withstand			18	V
I_{LED}	RGBW Output Current		12		mA
V_{IH}	High Level Input Voltage	2.7			V
V_{IL}	Low Level Input Voltage			1.5	V
Fpwm	PMW Rate		16		
LDD	Static power consumption		0.26		mA

Chip Data (TA=25℃)

Data	Symbol	Color	Min.	Typ.	Max.	Unit	Condition
Brightness	IV	R	200	/	400	mcd	12mA
		G	600	/	1000	mcd	12mA
		B	150	/	250	mcd	12mA
Lumen	Φ	W	4		10	LM	12mA/90Ra
Wavelength	WD	R	615		630	nm	12mA
		G	525		535	nm	12mA
		B	465		475	nm	12mA
Color temperature	CCT	W	2700		3200	K	12mA/90Ra
			3800		4500		
			4700		5500		
			5800		6500		

Coded Description

Newstar's HD105 protocol uses a unipolar zeroing code, and each symbol must have a low level. this agreement each symbol starts at a high level,
The high-level time width determines the "0" code or "1"

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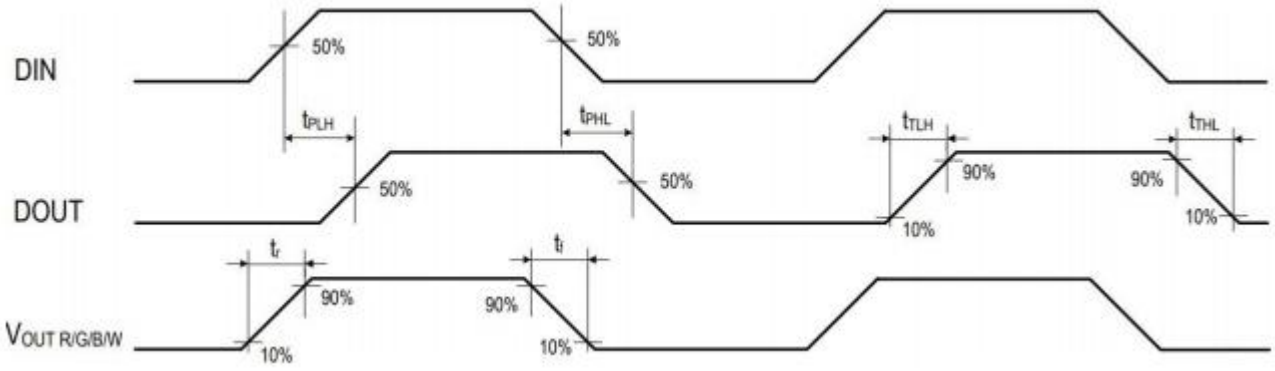
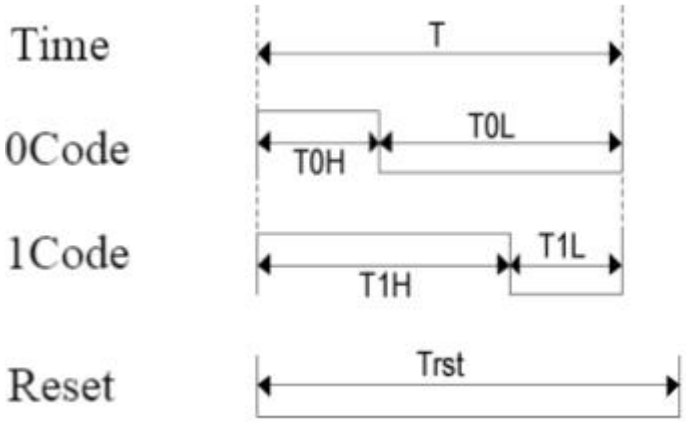
Time series waveform diagram



Input code type



Code time

Symbol	Data	Min.	Typ.	Max.	Unit
T	Code Time	1000	1200	2000	ns
TOH	0 code, high level time	200	300	400	ns
TOL	0 code, low level time	600	900		ns
T1H	1 code, high level time	600	900		ns
T1L	1 code, low level time	200	300		ns
Trst	Reset code, low level time	200	-		ns

Note 1: When writing programs, the high-level time of "0" code and "1" code should be strictly written according to the specified range in the table above. The low level time of code "1" should be less than 20us

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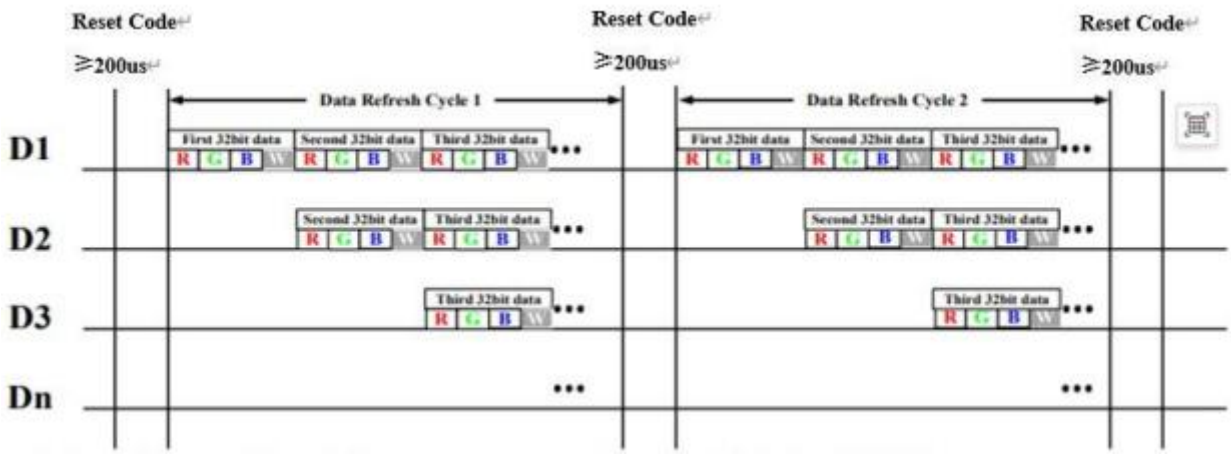
Protocol Data Format

Trst+32bits of data from the first chip+32bits of data from the second chip+...+Nth chip
32bits of data+Trst

R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0	W7	W6	W5	W4	W3	W2	W1	W0

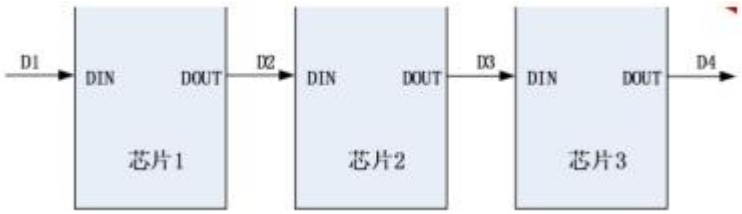
32-bit grayscale data structure: high-order bits are sent in RGBW order

Data transmission method

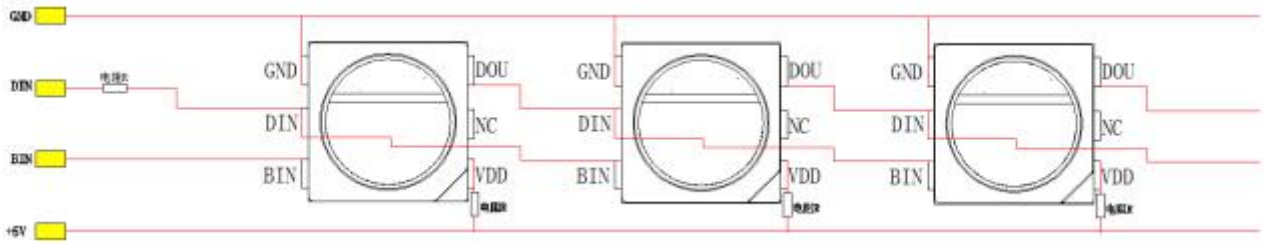


Remark: Among them, D1 is the data sent by the MCU end, and D2, D3, Dn are the data automatically shaped and forwarded by the cascaded chip

Connection method



Line Application Diagram



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Remarks:
In practical application circuits, in order to prevent the instantaneous high voltage damage caused by live plugging and unplugging of products during testing, newstar recommends that IC internal signal input and the power pin should be connected in series with a protective resistor R=300-1K ohms at the signal input end, and a protective resistor should also be connected in series with the power supply end R=33-100 euros; In addition, in order to ensure more stable operation between various IC chips, decoupling capacitors between each lamp bead are essential. The capacitor is commonly connected to a 104 chip capacitor.

Reliability Test

No.	Test item	Test Conditions	Reference	Criterion
1	Reflow-soldering heat resistance test	Tsld(Reflow-soldering temperature)=260℃， 10sec	JESD22-B106	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 ℃ 30min ↑ ↓ 100℃ 30min	JESD22-4701 100 105	0/22
6	Resistance to Soldering Heat	Tsld = 260° C, 10sec. 3 times	JEITA ED-4701 300 301	0/22
7	Room temp Life Test	25° C, IF: Typical current , 1000hrs	JESD22-A 108D	0/22
8	Thermal Shock	-40 ℃ 15min ↑ ↓ 100℃ 15min	JESD22-4701 106	0/22
9	Aging Test	1000hours Ta=25℃ IF =12V	JESD22-4701 108	0/22
10	High-temp. and high humidity aging test	1000hours 60℃RH=90% IF =12V	JESD22-4701 101	0/22

Item	Symbol	Test Condition	Judgment criteria	
			Min.	Max.
Luminous intensity	I V	DC=12V Typical current specifications	No dead lights or obvious damage	-
Resistance to Soldering Heat	- -	IP20/IP65/IP67/IP68	No dead lights or obvious damage	-

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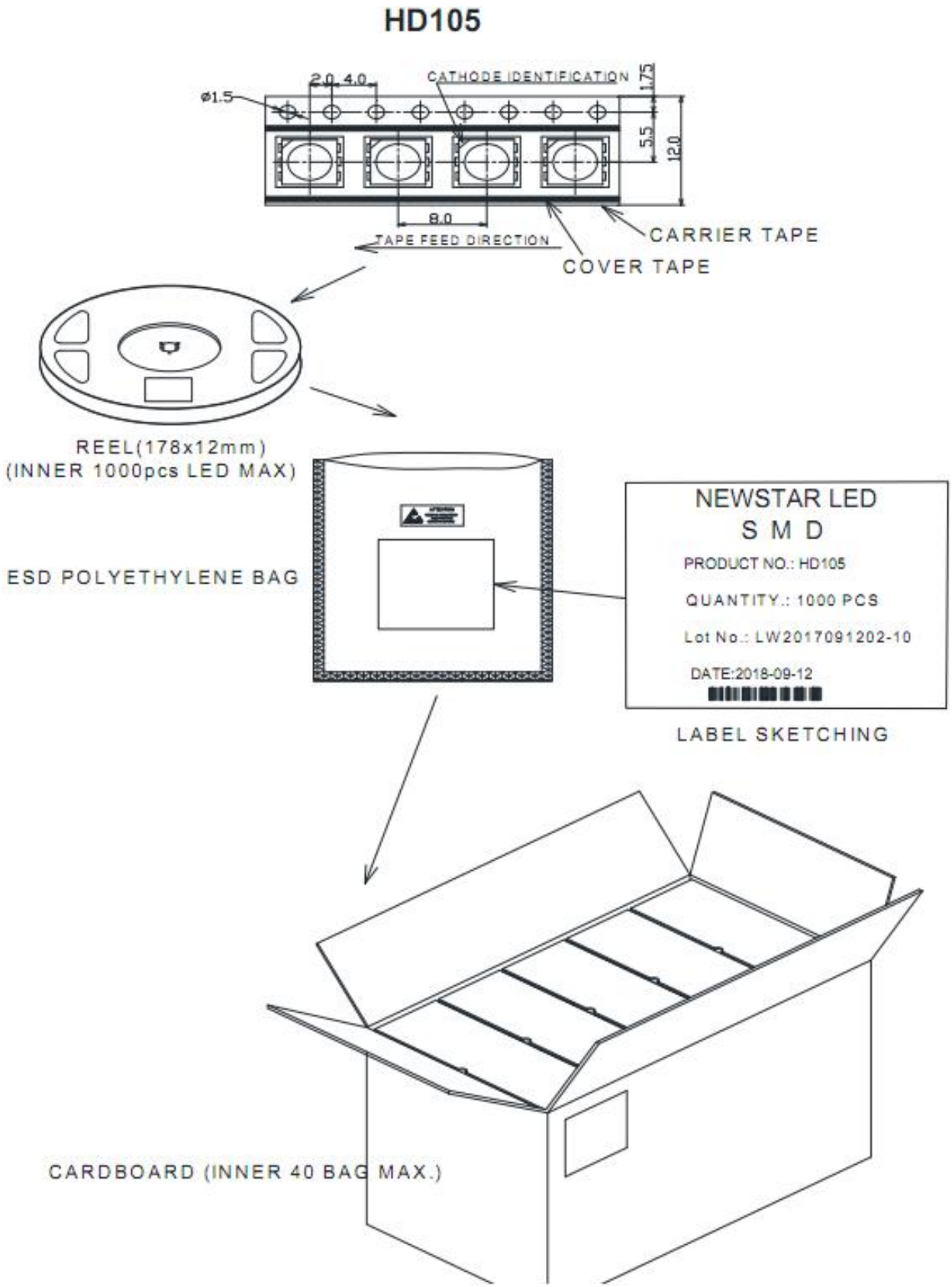
Package



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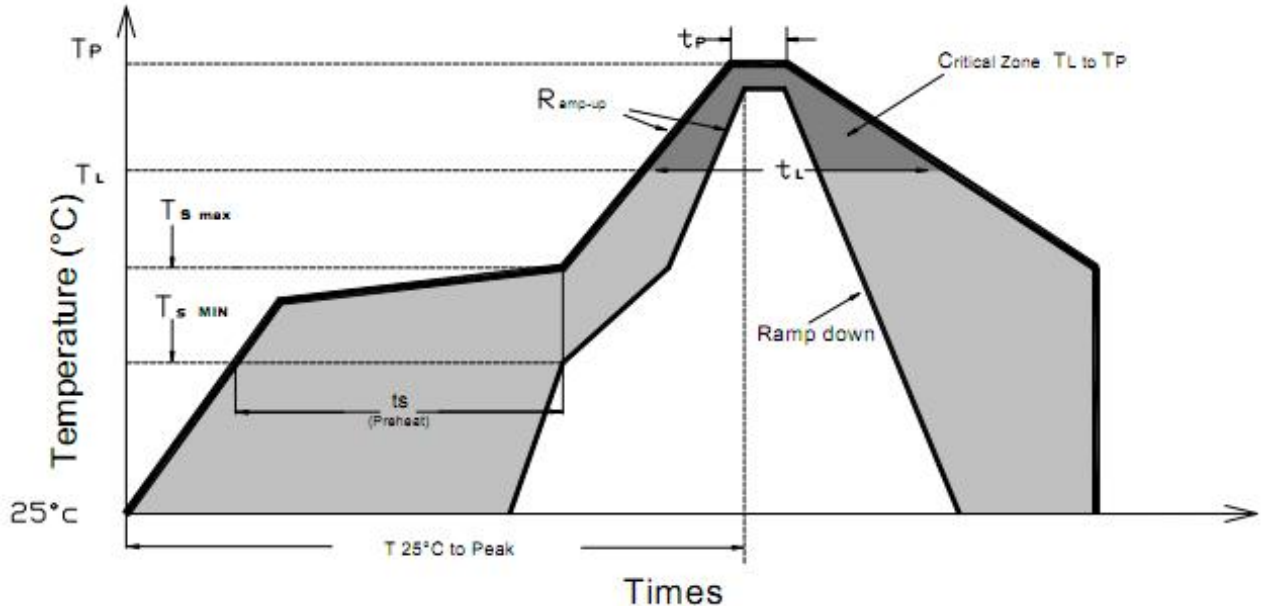
Reflow Soldering Characteristics

In testing, newstar has found S50 LEDs to be compatible with JEDEC J-STD-020E,using the parameters listed below. As a general guideline Newstar recommends that users follow the recommended soldering profile provided by the manufacturer of solder paste used.
Note that this general guideline is offered as a starting point and may require adjustment for certain PCB designs and Configurations of reflow soldering equipment.

When welding manually, the temperature of the soldering iron should be kept below 315 degrees Celsius, and the welding time should be less than 3 seconds.
b. Manual welding can only be performed once.
c. Electric soldering iron should not come into contact with colloids
Double headed soldering iron is preferred.



Profile Feature	Lead-Based Solder	Lead-Free Solder
Average Ramp-Up Rate (Ts_{max} to Tp)	3℃/second max.	3℃/second max.
Preheat: Temperature Min (Ts_{min})	100℃	150℃
Preheat: Temperature Min (Ts_{max})	150℃	200℃
Preheat: Time (ts_{min} to ts_{max})	60-120 seconds	60-180 seconds
Time Maintained Above: Temperature (T_L)	183 ℃	217 ℃
Time Maintained Above: Time (t_L)	60-150 seconds	60-150 seconds
Peak/Classification Temperature (T_P)	215 ℃	240 ℃
Time Within 5℃ of Actual Peak Temperature (tp)	<10 seconds	<10 seconds
Ramp-Down Rate	6℃/second max.	6℃/second max.
Time 25 ℃ to Peak Temperature	<6 minutes max.	<6 minutes max.

Note: All temperatures refer to topside of the package, measured on the package body surface.

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Suggested pad heat dissipation design:

Refer to the solder pad design in the appearance diagram.
a. After welding is completed, do not modify the welding surface. If modification is required, please replace the removed LED with a good product of the same batch and grade.
b. Reflow soldering should be completed in one time and cannot be done multiple times.
c. During the reflow soldering process, the product cannot be compressed.
d. The welded product needs to be cooled to room temperature before it can be packaged..

Storage

a. The storage conditions for sealed packaging bags are temperature<30 ℃, humidity<60% RH, and a shelf life of 60 working days. When the shelf life is exceeded, it is necessary to re bake at high temperature.
b. Before opening the packaging, please check if there is any air leakage in the packaging bag. If there is any air leakage, please return it to our company for high-temperature dehumidification and re sorting.
c. After opening, please use under the following conditions: temperature<30 ℃, humidity below 60% RH; If the usage time exceeds 8 hours, high-temperature dehumidification treatment must be carried out again before use.
d. If not used in a timely manner after opening, the product must be stored in an oven at a temperature of 65 ℃± 5 ℃; Relative humidity ≤ 10% RH, time: 168 hours.

Clean

a. Do not use unknown chemical liquids to clean SMD LEDs: Unknown chemical liquids may damage SMD LEDs. When cleaning is necessary, use a cotton swab dipped in alcohol to clean the SMD LED. Clean at normal room temperature for less than 1 minute and let it dry naturally for 15 minutes before starting to use.
b. Do not use a solution with solubility to clean the LED. Instead, use an isopropyl solution. Before using any cleaning solution, it should be confirmed whether it will dissolve the LED
c. Please do not use ultrasonic methods to clean the LED. If the product must use ultrasonic waves, it is necessary to evaluate some parameters that affect the LED, such as ultrasonic power, baking time, and assembly conditions. Before cleaning, a trial run must be conducted to confirm whether it will affect the LED.

Static electricity

a. These products are sensitive to static electricity and users must handle them carefully. Especially, if the current and voltage exceed the absolute maximum rated values or may cause electrical damage, customers require appropriate measures to be taken when holding the product to prevent static electricity and surges.
b. The product is properly grounded, using conductive pads, conductive work clothes and shoes, and

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conductive containers to effectively prevent static electricity and surges.
c. The product should have a conductive pad (surface resistance of 106-108 ohms) when in contact with areas with low grounding resistance, such as metal surfaces and work platforms.
d. Grounding is required for soldering with a soldering iron. Ionic fans need to be installed in areas with high static electricity.
e. Electrostatic discharge (ESD) or pulsed current (EOS) may damage SMD LEDs.
f. SMD LED production can only be carried out after wearing static wrist straps, static shoes or anti-static gloves.
g. All mechanical equipment must be grounded.

Heat treatment

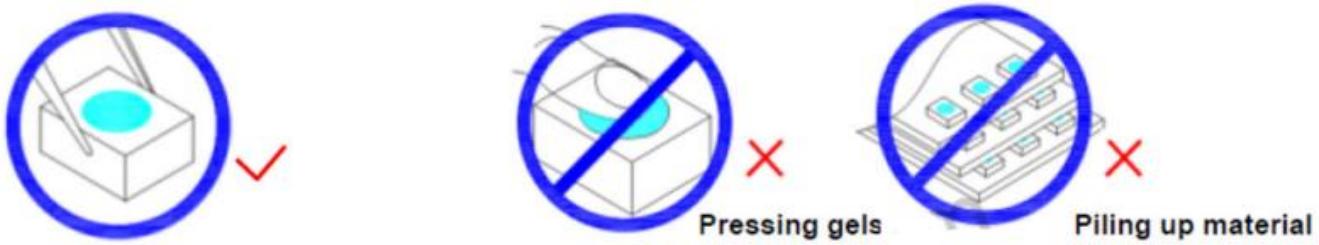
The heat treatment of SMD products should be carefully considered in SMD circuit design, and the current should be appropriately reduced. Please refer to the current temperature curve corresponding to the specifications of each product for specific details.

Selection of solder wire and solder paste

Do not use solder wires and pastes containing sulfides or bromides, as sulfides or bromides will react chemically with the silver layer electroplated on the surface of the bracket, causing the silver layer to turn black and the LED beads to decay more.

Material retrieval method:

Use tweezers to pick up the material, do not press the colloid or sharp objects to prick the colloid, and the material cannot be stacked and placed;



When designing PCB wiring for products, for soft boards and boards below 0.5T, the direction of the solder pads should be kept perpendicular to the direction of PCB extension to reduce the stress generated by PCB bending on the LED pins, which may cause failure hazards of LED products due to stretching caused by stress;

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Material moisture-proof control

a. If a roll of material is not used up in one go, and the temperature and humidity in the workshop are within the limited conditions (<30 ° C/60% RH), and the exposure time of the components in the air does not exceed 2 hours, the remaining materials should be vacuum sealed and stored together with desiccants. Otherwise, the materials must be baked and stored at low temperatures; Re vacuum packaging can only be repeated once; The materials stored in low-temperature baking must also be used up within 168 hours; Moisture control shall be applied to the assembled components;
b. If the components that have been assembled onto the PCB board do not need to undergo high-temperature processes or reflow soldering processes, no special treatment will be carried out;
c. For products that require protective treatment such as glue filling, dripping, or wrapping, it is recommended to perform necessary dehumidification before applying the corresponding protective process. The product should be baked in an oven at 120 ℃ -160 ℃ for no less than 6 hours to remove the water absorbed by the product during testing and aging, in order to prevent the moisture on the surface of the material from slowly entering the product after protective treatment, which may cause product failure;
d. If you purchase newstar's LED and have not used them for 60 working days, you need to remove the tape and re dehumidify them at high temperature.

Others

a. If used beyond the specifications. We will not be held responsible for any problems that arise.
b. Before your mass production, please communicate with newstars sales to understand more detailed specification requirements
c. Please communicate with newstar promptly if there are any abnormalities before use
d. Before mass production of each batch of products, newstar suggests conducting sample testing, and only after it is OK can normal production be carried out