

Product Overview

Developed specifically for HD image display applications, the new generation of HuaCaiWei digital LEDs feature port refresh rates up to 10kHz, up to 16bit grayscale data per channel, and internal 4bit gamma calibration for 20bit displays.

Highly integrated digital LEDs without any external electronic components including capacitors; dual input and output signals with automatic switching to ensure reliability.

The data protocol uses a single line zero code communication method, after the pixel is reset at power on, the DIN terminal accepts the data transmitted from the controller, the first 48bit data is extracted by the first pixel and sent to the pixel's internal data latch, the remaining data is shaped and amplified by the internal shaping circuit and then forwarded to the next cascade of pixels through the DO port. The pixel is automatically shaped and forwarded, so that the number of cascades of the pixel is not limited by the signal transmission, but only by the signal transmission speed.

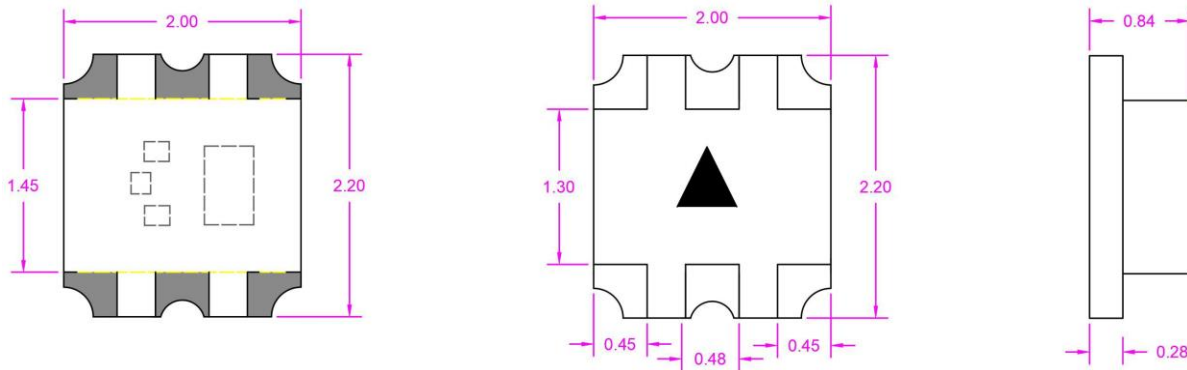
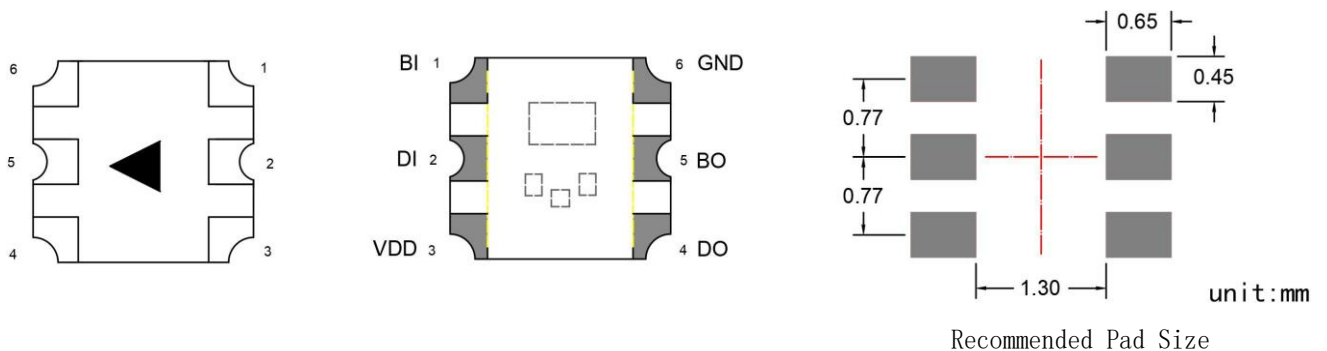
Key Features

- The IC control circuit shares a common power supply with the LED point source.
- The control circuitry is integrated with the RGB chip in a 2020 packaged component that forms a complete external control pixel point.
- Built-in signal shaping circuit, any pixel point received signal after waveform shaping and then output, to ensure that the line waveform distortion will not accumulate.
- Built-in power-up reset and power-down reset circuits.

- OUT R/G/B output gray level: 65536 levels (Digital 16Bit 3-channel Constant Current)
- Port scan frequency 10KHz.
- Serial cascade interface, capable of receiving and decoding data through a single signal line.
- 2.2mm*2.0mm*0.84mm super small size.

Main application areas

- LED transparent display
- LED Pixel Screen
- LED shaped screen

16Bit 3-channel Constant Current
Digital LED Breakpoint Continuity LED Light Source
Mechanical dimensions (in mm)

Lead-end arrangement

Pin
Function
n

pin position	symbolic	footnote	Function Description
1	BI	Auxiliary signal input	Auxiliary Signal Input Pins
2	DI	Mains signal input	Mains signal input pins
3	VDD	power supply	Power supply pins
4	DO	Mains signal output	Control signal output pins
5	BO	Auxiliary signal output	Auxiliary Signal Output Pins
6	GND	place	Signal Ground and Power Ground Pins

Maximum rating (TA=25°C, VSS=0V)

parameters	symbolic	coverage	unit
Supply voltage	VDD	+3.3~+5.5	V
Logic input voltage	VI	-0.3V to VDD+0.7	V
Static current	IDD	<0.8	mA
Operating temperature	Topt	-40 to +65	°C
Storage temperature	Tstg	-40~+85	°C

Electrical parameters (TA=25°C, VDD=5V, VSS=0V)

parameters	symbolic	minimum	typical	largest	unit	Test conditions
Port Output Current	Iout	--	20	--	mA	OUTR+OUTG+OUTB
Input current	II	--	--	±1	μA	VI=VDD/VSS
High level input voltage	VIH	0.7VDD	--	--	V	
Low level input voltage	VIL	--	--	0.3 VDD	V	
Hysteresis voltage	VH	--	0.35	--	V	
Dynamic current consumption	IDDdyn	--	0.7	1	mA	OUTR,OUTG,OUTB =OFF DO = open circuit
Power consumption	PD	--	--	250	mW	Ta = 25°C
Signal output potting current	Iodo	--	--	45	mA	

Switching characteristics (TA=25°C, VDD=5V, VSS=0V)

parameters	symbolic	minimum	typical	largest	unit	Test conditions
Transmission delay time	tPLZ	--	--	300	ns	CL=15pF, DIN→DOUT, RL=10KΩ
Time of descent	tTHZ	--	--	120	μs	CL=300pF, OUTR/OUTG/OUTB
Input Capacitance	CI	--	--	15	pF	--

LED Characteristic Parameters

parameters	symbolic	color	Test conditions: VDD=5V			
			minimum value	typical value	maximum value	unit
		Red	210	285	360	

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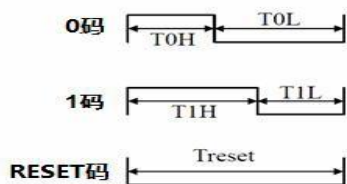
luminous intensity	IV	Green	400	520	650	mcd
		Blue	570	90	120	
wavelength	λ_d	Red	620	623	625	nm
		Green	522	525	527	
		Blue	467	469	472	
color coordinate	CIE		-	0.30	-	/
			-	0.33	-	/
luminous angle	$\theta_{1/2}$		-	120	-	Deg

Data transmission time

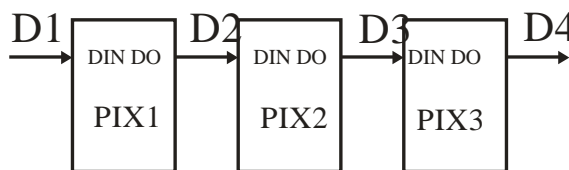
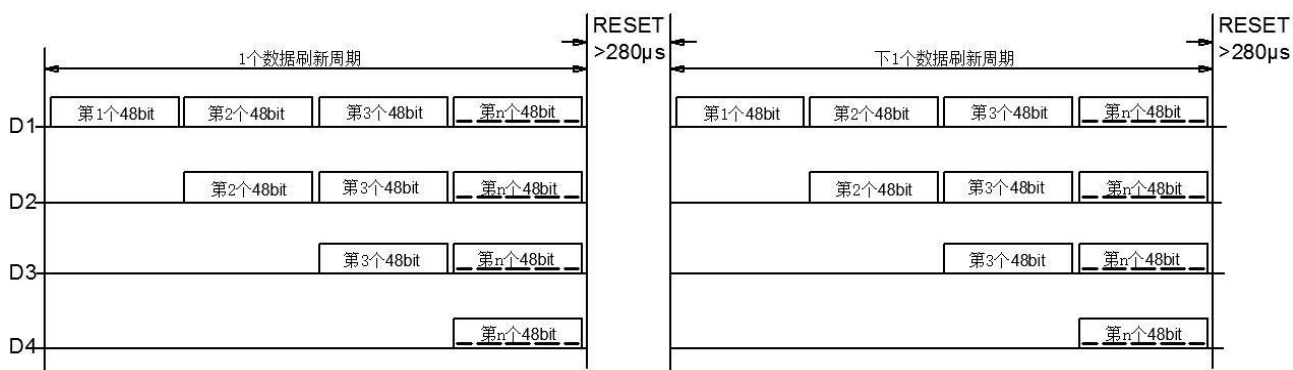
T0H	0 yards, high level time	200ns~320ns
T1H	1 Code, High Level Time	520ns~800ns
T0L	0 Code, Low Level Time	800ns~1.2μs
T1L	1 Code, Low Level Time	480ns~1μs
RES	Frame Units, Low Level Time	280μs or more
Data period: T0H+T0L≥1.25μs; T1H+T1L≥1.25μs		

Timing Waveform Diagram

Input code type :



Connection method.


Data transmission method


Note: Where D1 is the data sent from the MCU side, and D2, D3 and D4 are the data automatically shaped and forwarded by the cascade circuit.

48bit data structure

G15	G14	G13	G12	G11	G10	G9	G8	G7	G6	G5	G4	G3	G2	G1	G0	... take over...	
... pick up...	R15	R14	R13	R12	R11	R10	R9	R8	R7	R6	R5	R4	R3	R2	R1	R0	... take over...

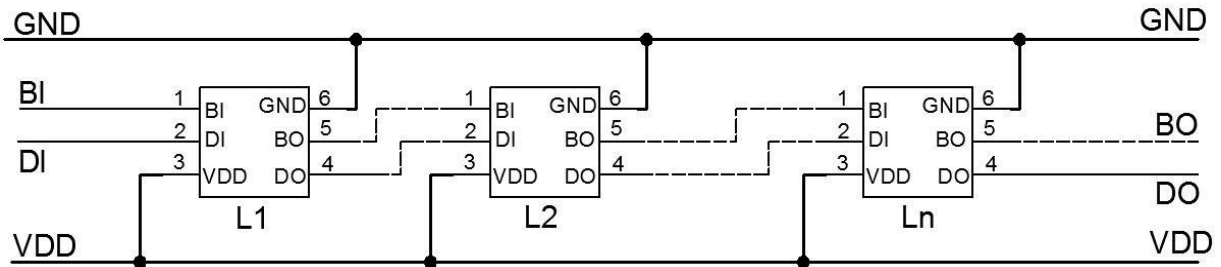


...pick up...	B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
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Light Source

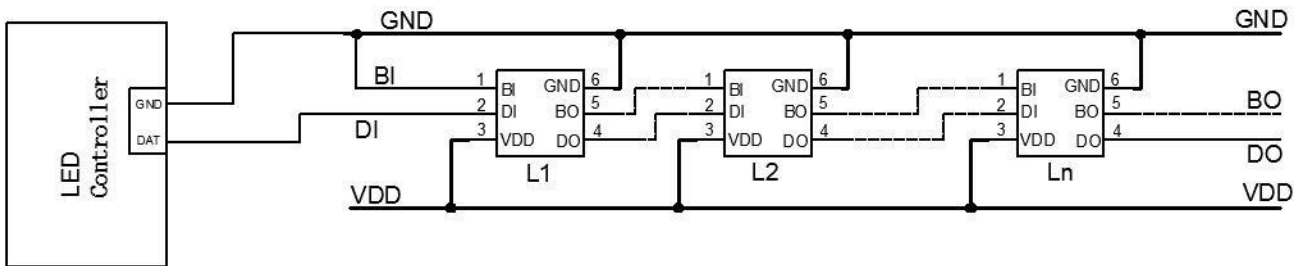
Note: High first sends the data in the order of the GRB.

Typical Application Circuits

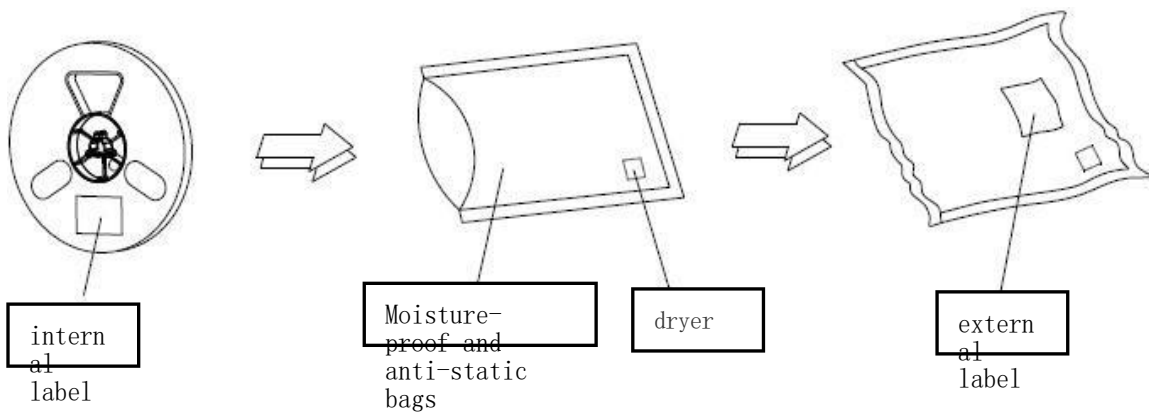


The peripheral circuit can be used without any components.

Signal wiring diagram: First LED BI to GND



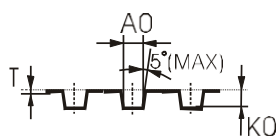
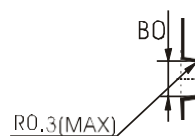
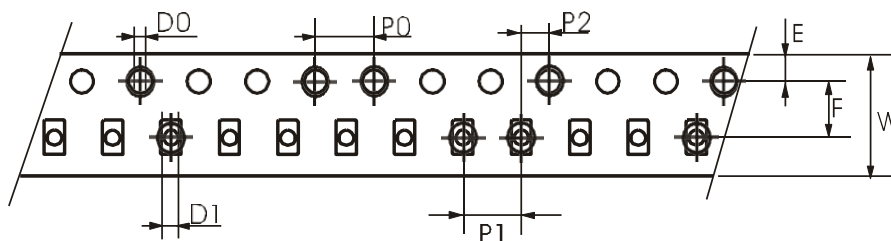
Packaging method



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Carrier tape specification (unit: mm)

Inspector:



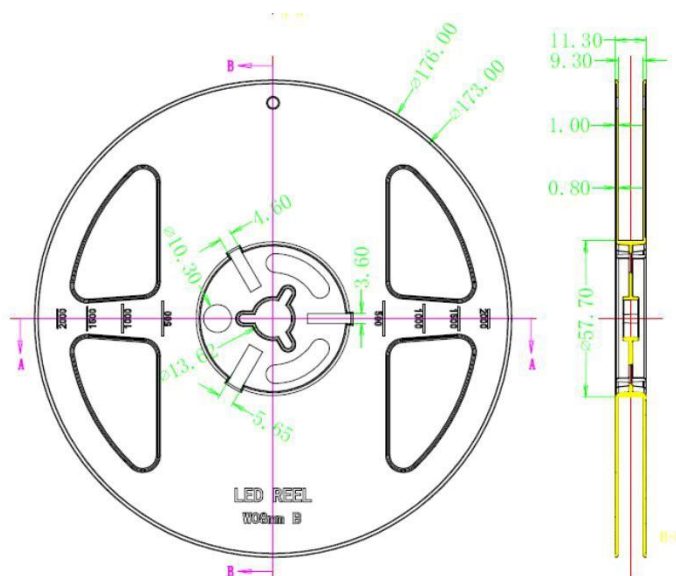
UNIT:mm

CARRIER TAPES TEST REPORTS

SYMBOL	A0	B0	K0	P0	P1	P2	T	E	F	D0	D1	W
SPEC	2.20	2.40	1.01	4.00	4.00	2.00	0.18	1.75	3.50	1.50	1.00	8.00

Reel Size

Unit: mm



Surface Mount LEDs Precautions for Use

1. Description:

Usually LEDs are used in the same way as other electronic components, so please refer to the following LED protection precautions for better use.

2. Caution:

2.1. Dust and Cleaning

The surface of the LED is encapsulated with modified epoxy adhesive, which plays a good role in protecting the optical system and anti-aging properties of the LED. Epoxy adhesive is easy to stick dust and keep the operating environment clean. When there is a certain limit of dust on the LED surface, it will not affect the luminous brightness, but we should still avoid dust falling on the LED surface. When the LED surface needs to be cleaned, if a solution such as triamcinolone or acetone is used, the LED surface will be dissolved. Please do not use ultrasonic methods to clean the LED, if the product must use ultrasonic, then we must evaluate some parameters that affect the LED, such as ultrasonic power, baking time and assembly conditions, etc., before cleaning must be test run to confirm whether it will affect the LED.

2.2. Damp-proof treatment

LEDs are moisture-sensitive components. The LEDs are packaged in bags of aluminum film to avoid the LEDs from absorbing moisture during transport and storage, and desiccants are placed in the bags to absorb moisture. If the LED absorbs moisture, it will evaporate and expand when the LED is reflowed, potentially detaching the gel from the holder as well as damaging the LED's optical system. For this reason, the moisture-proof packaging is designed to keep moisture out of the bag, but usually the protection only lasts for 1 to 2 months. This product has a moisture resistance level (MSL) of: **5a**. For SMT, please refer to the definition of Material Moisture Level (MSL) as specified in IPC/JEDECJ-STD-020 for MSL control.

Moisture resistance level	Workshop life after package unpacking	
	times	conditions
LEVEL1	limitless	≤30°C/85%RH
LEVEL 2	1 year	≤30°C/60%RH

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LEVEL2a	4 weeks	≤30°C/60%R H
LEVEL 3	168 hours	≤30°C/60%R H
LEVEL 4	72 hours	≤30°C/160%R H
LEVEL5	48 hours	≤30°C/60%R H
LEVEL5a	24 hours	≤30°C/60%R H
LEVEL 6	ready-to-use	≤30°C/60%R H

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2.3 SMT patching requirements.

2.3.1 It is recommended that LEDs be unpacked prior to SMT and placed in the oven as a whole roll for dehumidification and drying (baking at 70 to 75° C for ≥24H).

2.3.2 The time period between the removal of the product from the oven and the completion of high temperature soldering (including multiple reflow, solder dipping, wave soldering, heated repair and other high temperature operations/operations) is controlled to within 24 (at T<30° C, RH<60%).

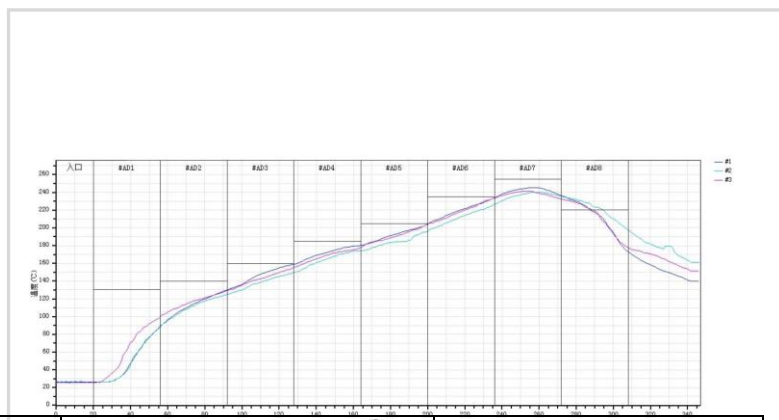
2.3.3 LED patches should be SMT on the PCBA as soon as possible after printing the solder paste, which is recommended to be no more than 1H.

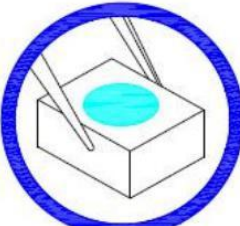

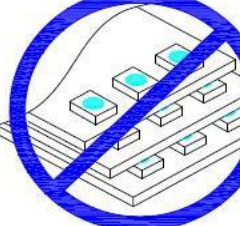

2.3.4 Production surplus, machine throwing material, maintenance material and other bulk material LED, if exposed to air for a long time, should not be used directly, it is recommended to dehumidify and dry before being used. Whole roll baking : 70~75°C* ≥24H or Bulk material baking : 120°C*4H.

3. welding

As a general guideline, it is recommended to follow the solder temperature profile recommended by the manufacturer of the solder paste used, or use our recommended solder temperature profile below.

Temperature profile description	coverage
30° C to 150° C preheat slope	1 to 4 °C/s
30°C~150°C Preheating time	60 to 120 s
150° C to 200° C constant temperature slope	0~3 °C/s
150°C~200°C constant temperature time	60 to 120 s



1. Clamped from the side of the material by using an appropriate tool Reflow Slope Reflow Time cooling rate Room temperature to peak temperature dwell	2. Do not press the surface of the gel directly with your hand or sharp metal, it may damage internal circuitry. 217° C 249° C 0~3 °C/s 45-90 s 4~0 °C/s 6min	3. Do not stack module materials together, as it may damage the internal circuitry	4. Not for use in acidic locations with PH < 7
			



joint of the package body. 4. Precautions for

product assembly process

Document change log

version number	status	Summary of changes	Date of revision	reviser (of a document)	ratifier
V1.0	N	newly built	20211206	Yu Xinghui	Yin Huaping