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587 SERIES

5050 ADDRESSABLE RGB LED

SMD LED + IC

MECHANICAL / SPECIFICATIONS

PART NUMBER:
587-2056-247F

DIMENSIONS:
5.0 x 5.0 x 1.60mm

LENS COLOR: Clear

LENS MATERIAL: Silicone

CONTROL WIRES:
Dual Wire

STANDARD PACKAGING:
1000 pcs on 7 inch Reel

MOISTURE SENSITIVITY LEVEL: 5a

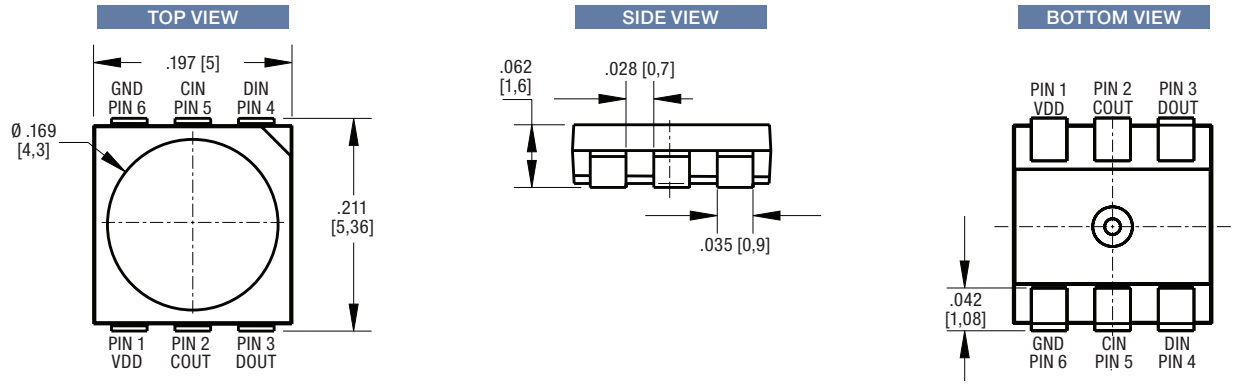
CERTIFICATIONS & RATINGS

ROHS Compliant

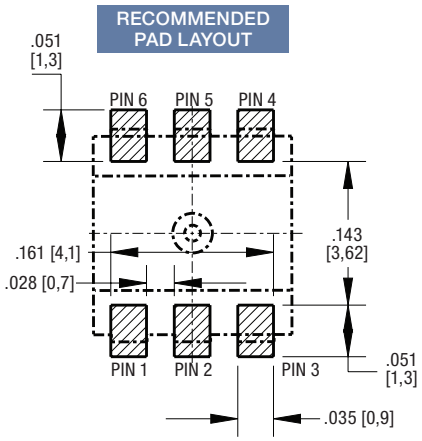
FEATURES & BENEFITS

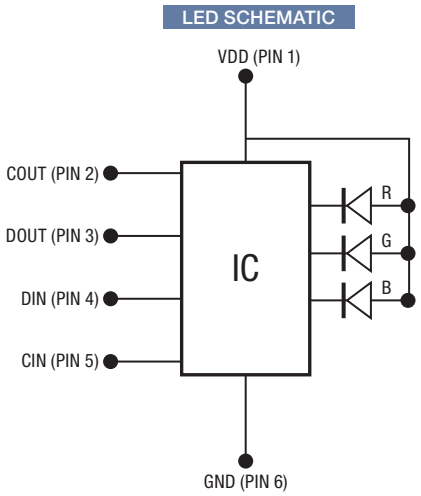
- Support signal reshaping to pass control waveforms to next adjacent driver
- Cascading port transmission by dual-wire (clock and data) lines
- Built-in current regulator, three-way drive
- Optional maximal drive current: 20mA
- 256-step gray-scale output to allow 16,777,216 color display
- 32-step dimming control
- Built-in oscillator 20MHz
- Maximum serial input data/clock frequency 15MHz
- LED driver port maximum withstand Voltage 6.5V
- Built-in power-on-reset (2.6V) (@VDD=5V)
- Built-in brown-out reset
- Operating Voltage Range: 3.3~5.5V
- Support sleep and wake up mode for power-saving

DIMENSIONS inches [mm]



DIMENSIONS inches [mm]





ELECTRICAL - OPTICAL CHARACTERISTICS **($T_{Soldering}$ 25°C)**

Testing Condition: IC@5V, RGB@20mA, Ts= 25°C; Tolerance ±10%

Emitting Color	Material	Dominant Wavelength (nm)		Luminous Intensity (mcd)			Viewing Angle
		Min.	Max.	Min.	Typ.	Max.	
R	AlInGaP	615	630	560	800	1125	120
G	InGaN	515	535	1125	1800	2850	120
B	InGaN	460	476	285	400	715	120

ABSOLUTE MAXIMUM RATINGS **(TA=25°C)**

Symbol	Parameter	Range	Units
V_{DD}	Supply Voltage	6.5	V
P_D	Power Dissipation	<400	mW
I_{LEDOUT}	Maximum Output Current	25	mA
T_{OPR}	Operating Temperature Range	-40~85	°C
T_{STO}	Storage Temperature Range	-65~125	°C

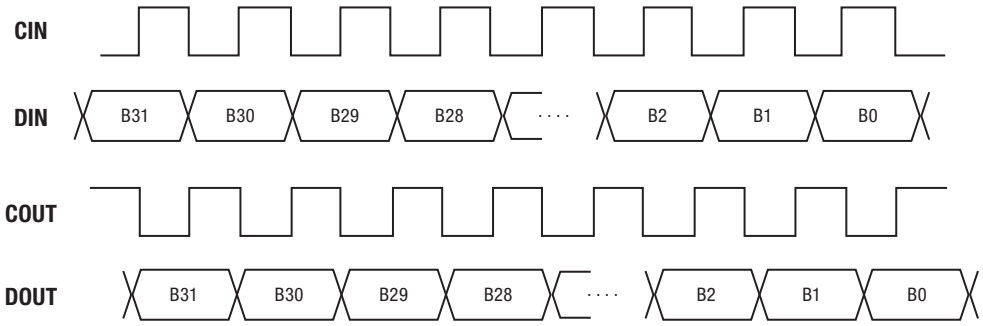
ELECTRICAL CHARACTERISTICS **(unless otherwise specified, Temperature= 25°C & V_{DD}=5.0V)**

Symbol	Parameter	Min.	Typ.	Max.	Units	Note
V_{DD}	Supply Voltage	3.3	5.0	5.5	V	-
I_{dyn}	Operation Current			1.5	mA	R,G,B no load (off)
I_{sleep}	Standby Current		1		μA	-
Logic input control DIN/CIN						
V_{IH}	Input High “H”	2.7		V_{DD}+0.4	V	-
V_{IL}	Input Low “L”	-0.4		1.0	V	-
R_{IN}	DIN Pull-up resistance @ normal mode		80k		Ω	-
C_{FREQ}	CIN Frequency			15	MHz	-
T_{CKH}	CIN Low pulse width	30			ns	-
T_{CKL}	CIN Low pulse width	30			ns	-
T_{SETUP}	DIN to CIN setup	10			ns	-
T_{HOLD}	DIN to CIN hold time	5			ns	-
Logic output DOUT/COUT						
V_{OH}	Output High “H”	4.5			V	I_{OH}=4mA
V_{OL}	Output Low “L”			0.4	V	I_{OL}=4mA
Sink Current R/G/B						
I_{SINK}	Sink Current	19	20	21	mA	@V_{DD} Vf_{LED} ≥ 1.5V

CASCADING DATA STRUCTURE

32-bit 0's	FLAG[2:0]	DIMMING[4:0]	BLUE[7:0]	GREEN[7:0]	RED[7:0]	FLAG[2:0]	----	---	FLAG[2:0]	DIMMING[4:0]	----	RED[7:0]	32-bit 1
Start	LED 1					LED 2		N-1	LED N				End of Frame

32 consecutive 0's denote the start of a command for an RGB LED. After receiving 32 0's, IC gets the following 32 bits as the received command, including FLAG, DIMMING, BLUE, GREEN and RED fields.



The serial command is transmitted with MSB first, DIN is latched at the rising edge of CIN clock. COUT and DOUT are re-generated for the next RGB LED. COUT is inverted from CIN. When 32 consecutive 0's are encountered, the next 1 is expected to start a 32-bit command, i.e., FLAG [2:0]=111. When FLAG [2:0]=111, then DIMMING, BLUE, GREEN and RED fields are latched respectively. While the current 32-bit command is got, IC passes remaining command bits to the next RGB LED.

After the last one command is issued for the last LED (LED n), the following 32 consecutive 1's denote the end of the current command for an RGB LED(End of Frame) and wait for next 32 consecutive 0's to start a new command set. (Note: IC is workable either with or without "End of Frame" command, but MCU should issue the extra N/2 numbers of clocks signal if there are N LED lamps totally connected in the strip to make sure the data transfer and display of the last one LED lamp is complete and correct).

LED1	32-bit 0's	LED1	LED2	LED3	---	32-bit 0's	LED1	LED2
LED2		32-bit 0's	LED2	LED3	---		32-bit 0's	LED2

FLAG [2:0] : 111 to start a 32-bit command

DIMMING [4:0] : 32-level current control for R/G/B drivers

BLUE [7:0] : 256 gray levels for blue LED

GREEN [7:0] : 256 gray levels for green LED

RED [7:0] : 256 gray levels for red LED

Sleep and power saving mode

IC supports the sleep/wake-up modes for power-saving purpose. In sleep mode, the built-in oscillator and associated circuitry will be disabled. The quiescent current of IC is approximately 1uA (typ.).

Command Setup to enable sleep or wake up mode

When receiving 24-bit 0's BGR data (that is BLUE [7:0]=8h00, G [7:0]=8h00, R [7:0]=8h00), in the meantime, both of the data in 3-bits' flag and 5-bits' DIMMING is 8h'A0' (that is FLAG [2:0]=3b101 and DIMMING [4:0]=5b00000), IC will enter sleep mode.

IC will wake up from sleep mode once receiving the new data with the data of Flag [2:0], DIMMING [4:0] is not 8h"A0"; after wake-up, all sleeping circuits in IC return to normal working mode within 1ms. Since it takes 1ms for a sleeping IC returning to normal function mode, it is recommended for a host to wait for 1ms to send display data and command after issuing a wake-up command.

Sleep power-saving mode example:

32-bits 0	Flag[2:0]=3'b101	Dimming[4]=5'b00000	Blue[8'h00]	Green[8'h00]	Red[8'h00]	Sleep mode

Case 1:

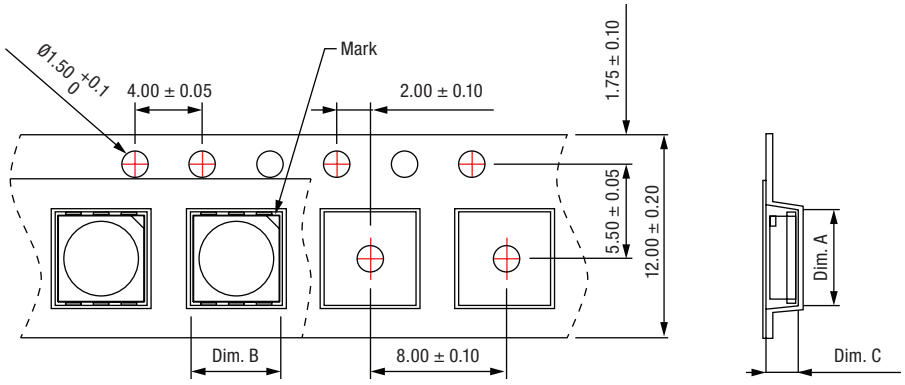
Lamp 1	Lamp 2	Lamp 3
1xx111118hFF8hFF8hFF	101000008h008h008h00	101000008h008h008h00
Normal mode	Sleep mode	Sleep mode

Case 2:

Lamp 1	Lamp 2	Lamp 3
1xx111118hFF8hFF8hFF	101000008h008h008h00	1xx111118h1F8h1F8h1F
Normal mode	Sleep mode	Sleep mode

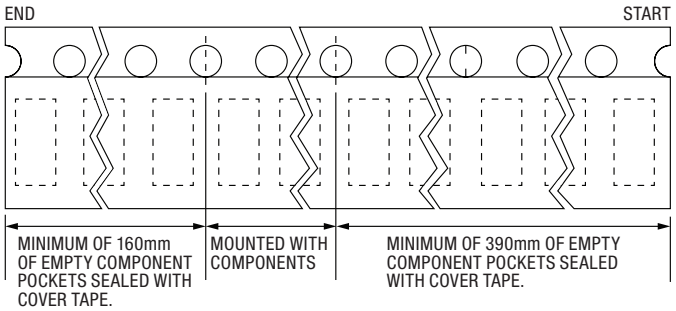
In case 2, while lamp2 is under sleep mode, in the following data transfer process, the state of lamp 2 will be not changed as long as the 32 bits data for lamp 2 is received with data of Flag [2:0]、DIMMING [4:0] being 8h"A0". It means lamp2 will keep in sleep mode as well. In the situation, lamp2 can pass through the remaining data to lamp 3 (32bits) to change the display data of lamp 3. In other words, the sleeping chip is able to pass the data to the next chips.

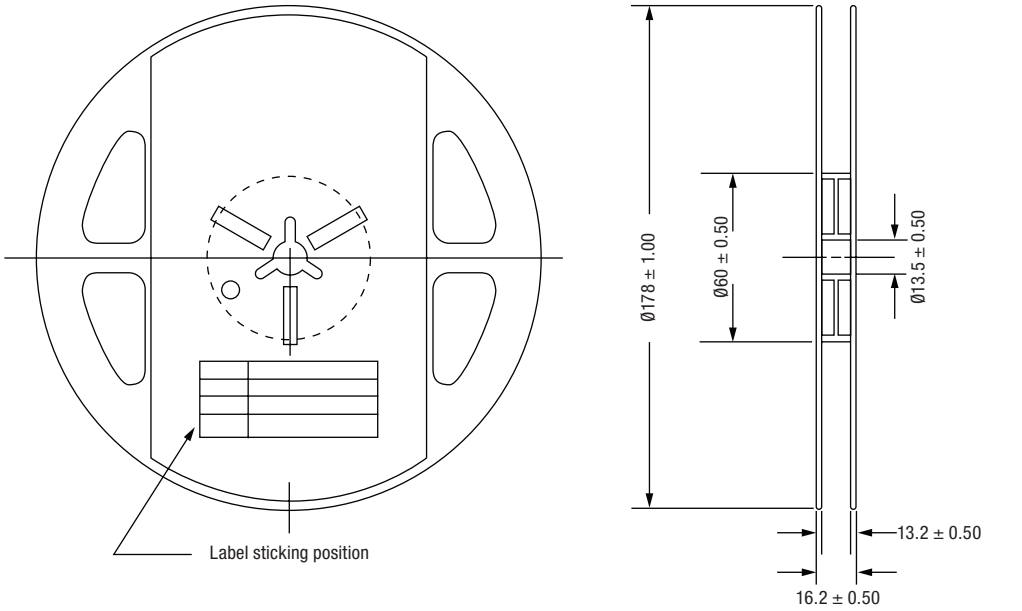
TAPE AND REEL SPECIFICATION



Dim A	Dim B	Dim C	Quantity/Reel
5.70±0.10	5.30±0.10	1.80±0.10	1000

Unit: mm





Unit: mm

REFLOW SOLDERING

Recommended soldering paste specifications:

1. Operating temp.: Above 217 °C, 60~150 sec.
2. Peak temp.: 260 °C max, 10 sec 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