

## 587 SERIES

# 1616 Addressable RGB LED

SMD LED + IC

### MECHANICAL / SPECIFICATIONS

PART NUMBER:

[587-1016-247F](#)

DIMENSIONS:

1.60 x 1.60 x 0.9mm

LENS COLOR: Clear

LENS MATERIAL: Epoxy

# CONTROL WIRES:

Dual Wire

STANDARD PACKAGING:

3000 pcs on 7 inch Reel

MOISTURE SENSITIVITY LEVEL: 3

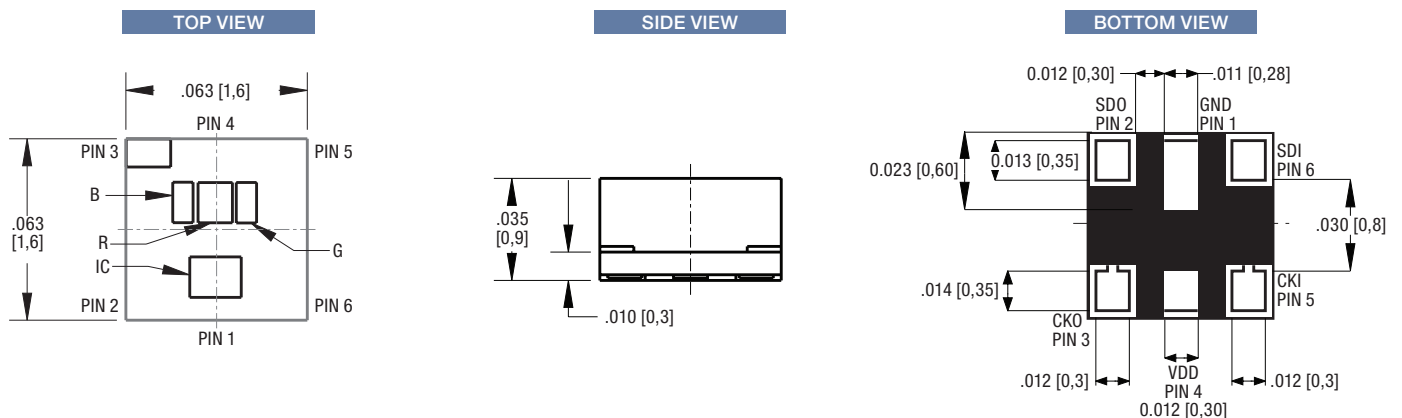
### CERTIFICATIONS & RATINGS

ROHS Compliant

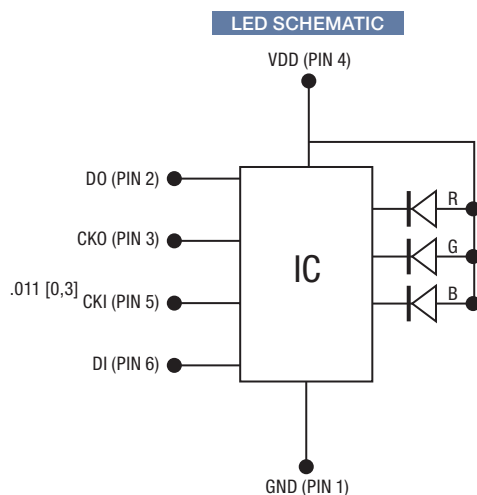
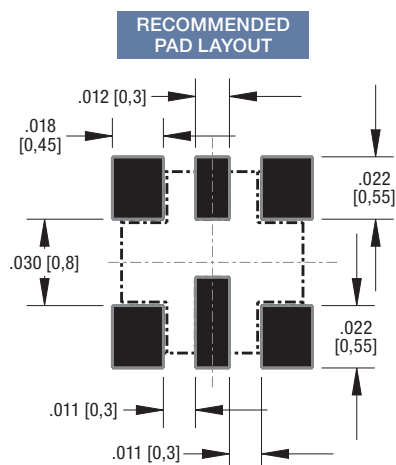
### FEATURES & BENEFITS

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

### DIMENSIONS inches [mm]



DIMENSIONS inches [mm]



**ELECTRICAL - OPTICAL CHARACTERISTICS (T<sub>Soldering</sub> 25°C)**  
**Testing Condition: IC@5V, R/G/B@5mA, Ts= 25°C; Tolerance ±10%**

Emitting Color	Material	Dominant Wavelength (nm)		Luminous Intensity (mcd)			Viewing Angle
		Min.	Max.	Min.	Typ.	Max.	
R	AlInGaP	618	625	40	65	120	120
G	InGaN	518	535	60	85	180	120
B	InGaN	460	474	15	20	60	120

**ABSOLUTE MAXIMUM RATINGS (T<sub>Soldering</sub> 25°C)**

Symbol	Parameter	Rating	Units
V <sub>DD</sub>	Supply Voltage	6.5	V
P <sub>D</sub>	Power Dissipation	<400	mW
I <sub>LEDOUT</sub>	Maximum Output Current	25	mA
T <sub>M</sub>	Welding Temperature	300(8S)	°C
T <sub>OPR</sub>	Operating Temperature Range	-40~85	°C
T <sub>STO</sub>	Storage Temperature Range	-40~105	°C

## ELECTRICAL CHARACTERISTICS

Symbol	Characteristic	Condition	Limit			Units
			Min.	Typ.	Max.	
$V_{DD}$	Supply Voltage	-	3.3	5.0	5.5	V
$I_{dyn}$	Operation Current	VDD=5V ` RGB off			1.5	mA
$I_{sleep}$	Standby Current	-		1		uA

### Logic input control DIN/CIN

$V_{IH}$	Input High "H"	-	2.7	-	VDD+0.4	V
$V_{IL}$	Input High "L"	-	-0.4	-	1.0	V
$R_{IN}$	DIN Pull-up resistance @normal mode			80K		$\Omega$
$C_{FREQ}$	CIN Frequency				15	MHz
$T_{CKH}$	CIN High 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"	4mA @VDD=5V	4.5	-	-	V
$V_{OL}$	Output Low "L"	4mA @VDD=5V	-	-	0.4	V

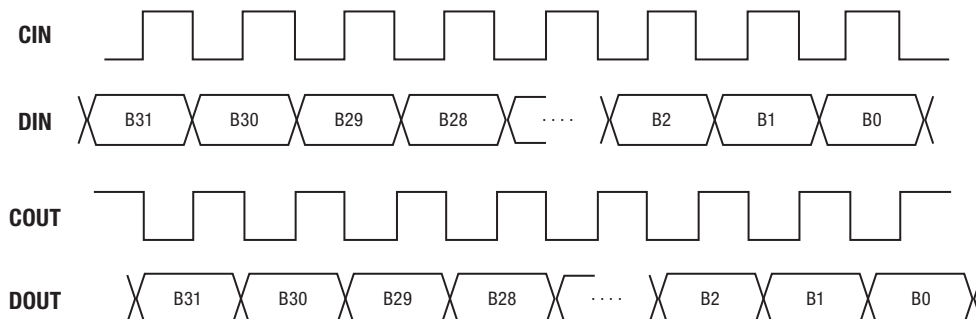
### Sink Current R/G/B

$I_{SINK}$	R, G, B Sink Current	@VDD-Vf <sub>LED</sub> ≥1.0V	1.75	5	5.25	mA
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## DATA TRANSFER PROTOCOL

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]	N/2 # of dummy data ("1" or "0")
Start	LED 1					LED 2		N-1	LED N				Need extra N/2 of clocks

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

while the current 32-bit command is got, the 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: the 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

**GREEN [7:0]** : 256 gray levels for blue LED

**BLUE [7:0]** : 256 gray levels for green LED

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

## Sleep and power saving mode

The 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 the IC is approximately 1uA(typ.).

### Command Setup to enable sleep or wake up mode

When receiving 24-bit 0's GBR data (that is GREEN [7:0]=8h00, BLUE [7:0]=8h00, RED[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), the IC will enter sleep mode.

The 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 the IC return to normal working mode within 1ms. Since it takes 1ms for a sleeping the 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	Green[8'h00]	Blue[8'h00]	Red[8'h00]	Sleep mode
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Case 1:

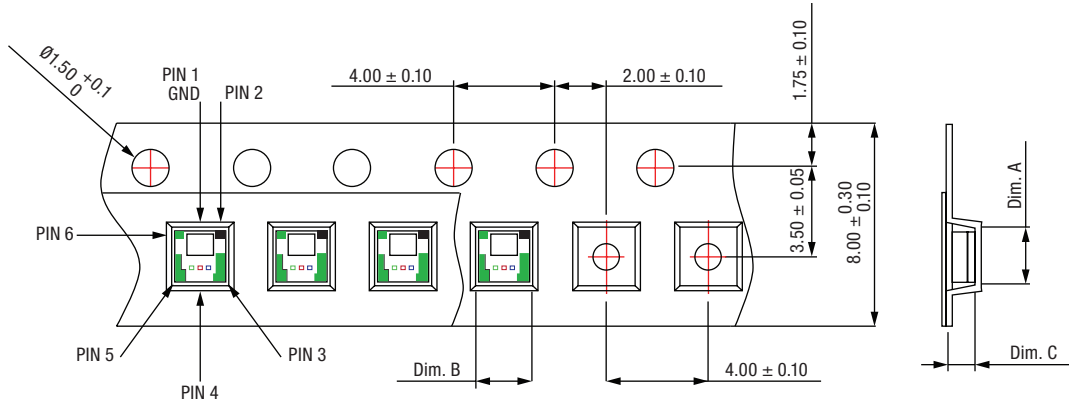
Lamp 1	Lamp 2	Lamp 3
1xx11118hFF8hFF8hFF	101000008h008h008h00	101000008h008h008h00
Normal mode	Sleep mode	Sleep mode

Case 2:

Lamp 1	Lamp 2	Lamp 3
1xx11118hFF8hFF8hFF	101000008h008h008h00	1xx11118h1F8h1F8h1F
Normal mode	Sleep mode	Normal mode

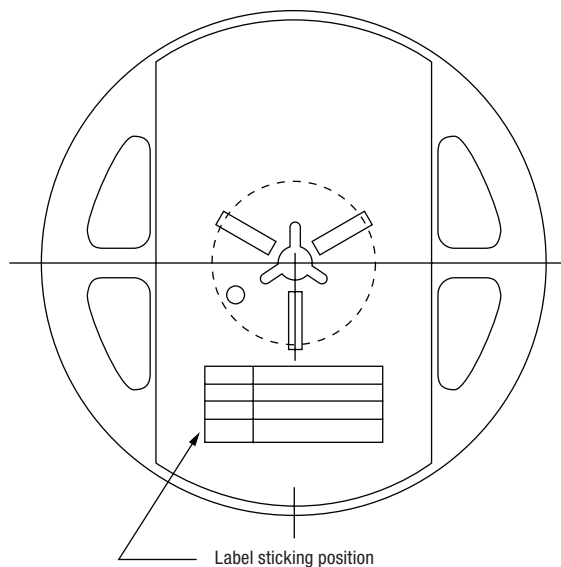
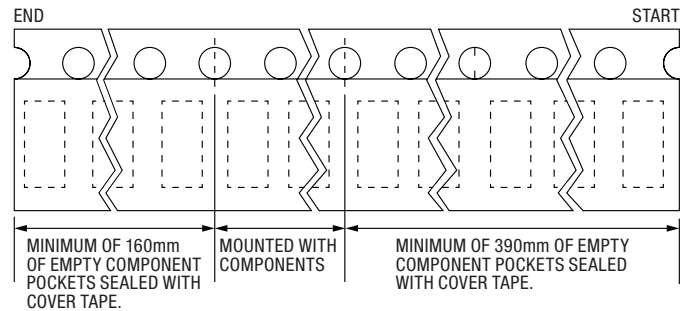
In case 2, while lamp2 is under sleep mode, in the following data transfer process, the state of lamp 2 will be not changed as long as the 32 bits data for lamp 2 is received with data of Flag[2:0]·DIMMING[4:0] being 8h'A0'. It means lamp2 will keep in sleep mode as well. In the situation, lamp2 can 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

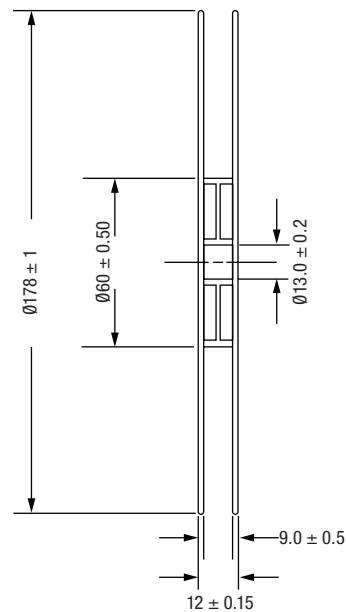


Dim A	Dim B	Dim C	Quantity/Reel
1.73±0.05	1.73±0.05	1.10±0.05	3K

Unit: mm



Label sticking position



Unit: mm

## REFLOW SOLDERING

Recommend soldering paste specifications:

1. Operating temp.: Above 220°C ,60 sec.
2. Peak temp.:260°C Max.,10sec 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

