Vcare

ultra-low power consumption,I2Cinterface

High precision heart rate detection sensor

user's Guide VC31B

characteristic

ultra low power consumption

Analog Power Range:3.0V~3.6V

Digital Power Range:1.8V~3.6V

Working current:25μA @25Hz(includingled) Unworn

power consumption: ~2μA

Sleep current: ~400nA

Sampling and detection are configurable

Signal sampling period10~1KHz

ledThe current adjustment range is1.25mA~155mA Infrared is

used for wearing identification

Built-in FIFO

128Byte

I2Cinterface

I2CThe highest clock support400KHz

I2C 7bit device address is0x33 On-

Chip Optics Integration

integrated1a high sensitivityPhotodiodes

skin tone

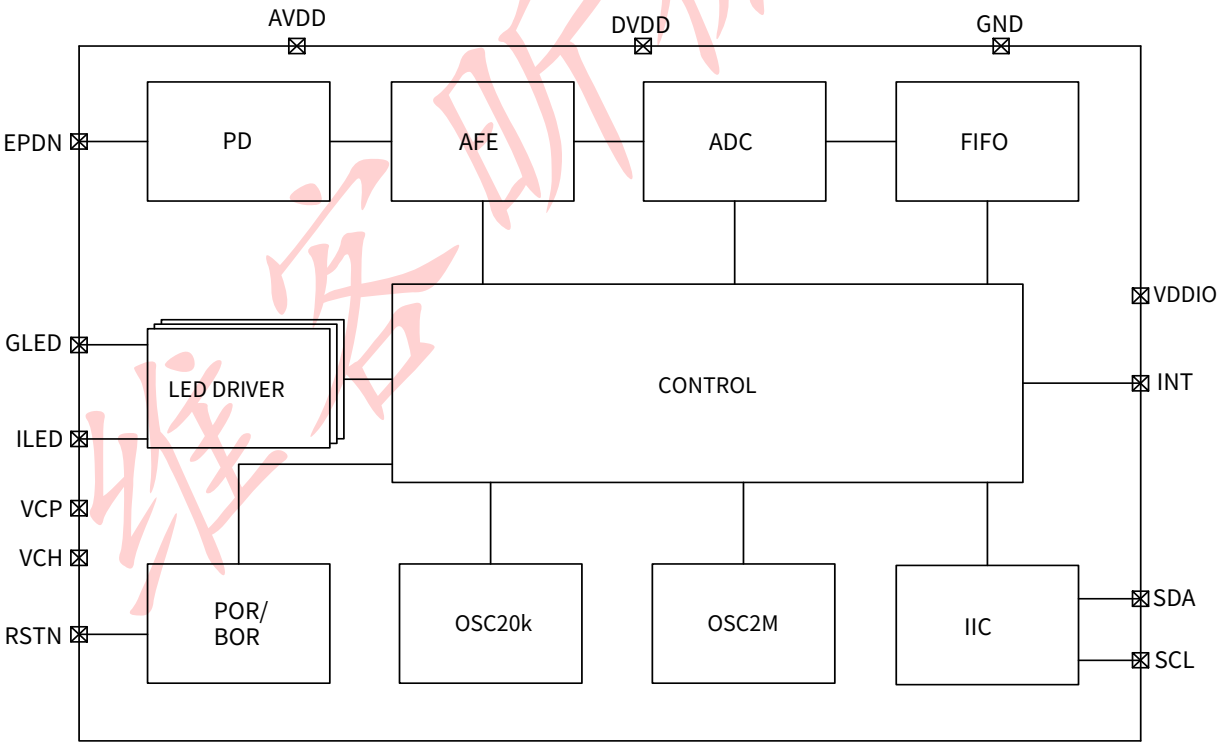
heart rate:13.5class

refer to[PANTONE Skin Tone Guide]

Package Features

LGA22(3mmx4.2mmx1.0mm) package conforming

toRoHSstandard



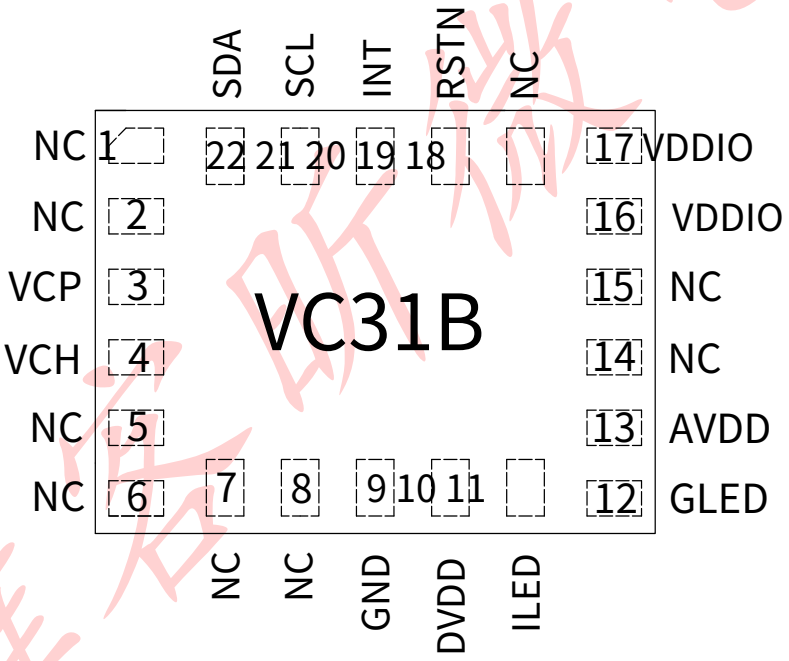
picture1 VC31BFunctional block diagram

1revise history

surface1revise history

version number	Major revisions	revision time
V1.0	first draft	July 22, 2020
V1.1	Modify the recommended circuit and increase the thermal pad	2020/8/8
V1.2+	IncreaseledPerformance parameter requirements + modification recommended circuit	September 25, 2020
V1.3	Model renamedVC31B	2020/10/10
V1.3+	Modify the pin diagram	2020/10/22
V1.4	Add functional block diagram	2020/12/1
V1.5	Modify the recommended circuit	2020/12/25
V1.51	Modify the recommended circuitled	2021/1/7
V1.52	Modify recommended silk screen layout	2021/3/18
V1.53	Add design requirements for wristbands	2021/5/18
V1.54	Add skin color grading standard reference	2021/10/20

2pin configuration

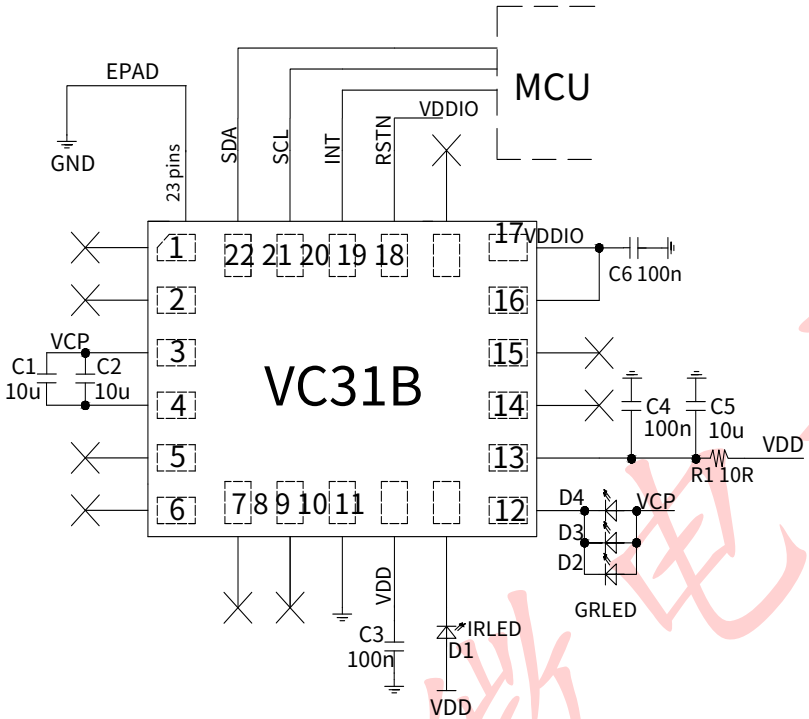


picture2 VC31BPin diagram (top view)

surface2 VC31BPin Description

serial number	pin name	describe
1	NC	NC(Floating, not connected to power or ground)
2	NC	NC(Floating, not connected to power or ground)
3	VCP	Green power supply
4	VCH	— —
5	NC	NC(Floating, not connected to power or ground)
6	NC	NC(Floating, not connected to power or ground)
7	NC	NC(Floating, not connected to power or ground)
8	NC	NC(Floating, not connected to power or ground)
9	GND	power ground
10	DVDD	Power supply; must be connected100nFcapacitor to ground
11	ILED	Infrared cathode
12	GLED	Green light negative
13	AVDD	Power supply; must be connected100nFcapacitor to ground
14	NC	NC(Floating, not connected to power or ground)
15	NC	NC(Floating, not connected to power or ground)
16	VDDIO	Power supply; must be connected100nFcapacitor to ground
17	VDDIO	Power supply; must be connected100nFcapacitor to ground
18	NC	NC(Floating, not connected to power or ground)
19	RSTN	Reset: recommended connectionVDDIO, can also be connectedMCU
20	INT	interrupt output
twenty one	SCL	I_2Cclock inputSCL
twenty two	SDA	I_2Cdata lineSDA
twenty three	EPAD	power ground

3Recommended Application Circuit



picture3 VC31BRecommended Application Circuit Diagram

Recommended application circuit design considerations:

a, It is recommended that the heart rate board (module) use a separateLDOspowered by;

b,likeMCUcommunication, interrupt, resetIOuse1.8Vvoltage, thenVDDIONeed to pick up separately1.8Vpower supply; such as MCUcommunication, interrupt, resetIOuse3.3Vvoltage, thenVDDIOandVDDCan be combined to connect to the same 3.3Vpower supply;

c, decoupling capacitorC3,C4,C5 PCBplace as close as possible toVC31BCorresponding pin;

d, If the heart rate board layout,VC31BThe decoupling capacitors of each pin are far away from the chip, it is recommended that the heart rate small boardLDOs Output configuration10uFand100nFCapacitor combination to increase the stability of heart rate work;

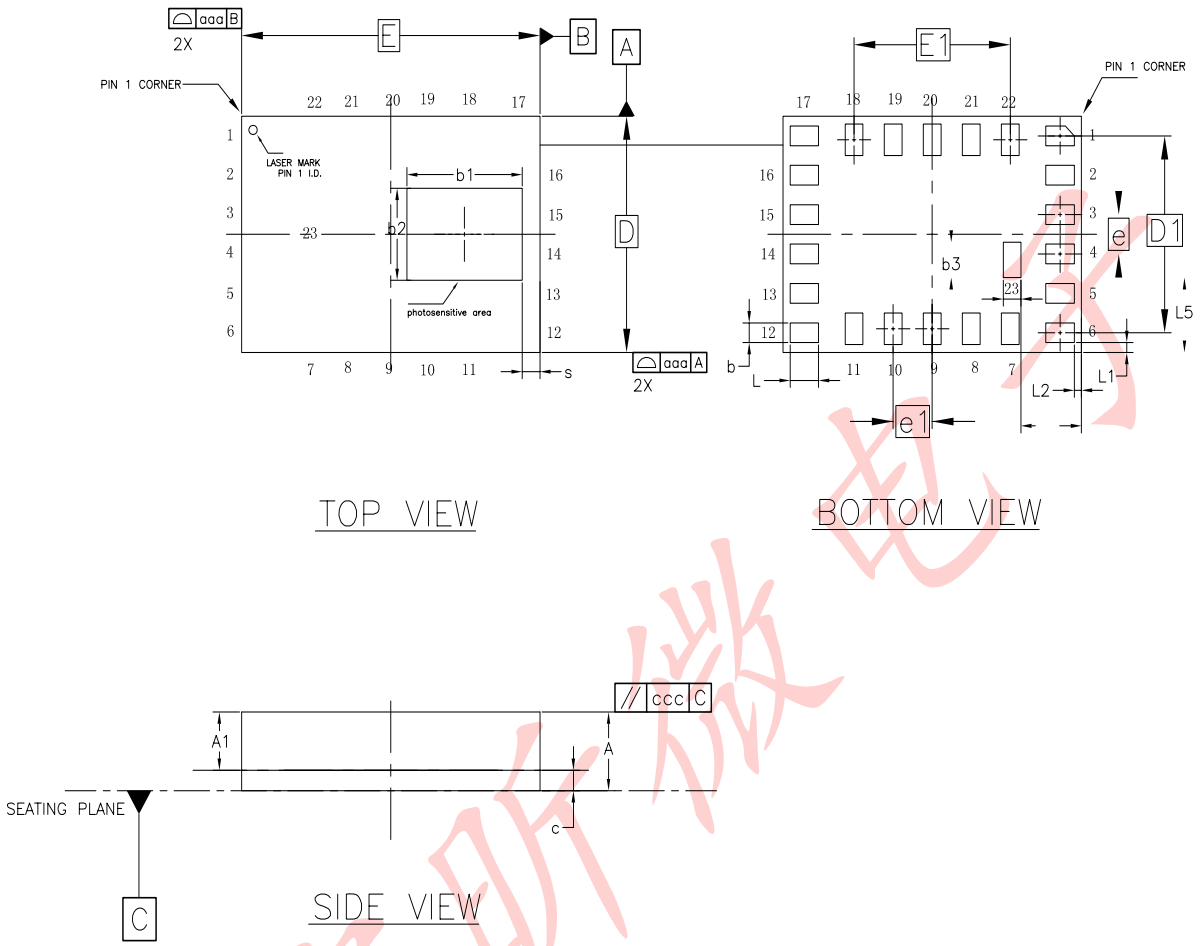
e, recommended circuitGreen,IRThere are corresponding requirements and cannot be used at will.ledPlease refer to the end of the document for parameters, such as If the parameters do not meet the requirements, Wiki does not guarantee the working performance of the chip;

4 LDOsperformance requirements

VC31BThe typical supply voltage of the analog power supply is3.3V,RequireLDOsThe peak-to-peak output power ripple should be less than40mV; Additional requirementsLDOsload transient response: current from1mATransient to100mAhour,LDOsThe output settling time should be less than50μs, the steady pressure drop should be less than10mV.

Note: The power supply for the heart rate moduleLDOsThe output cannot have a value greater than3.6VContinuous voltage and pulse voltage.

5Package Dimensions



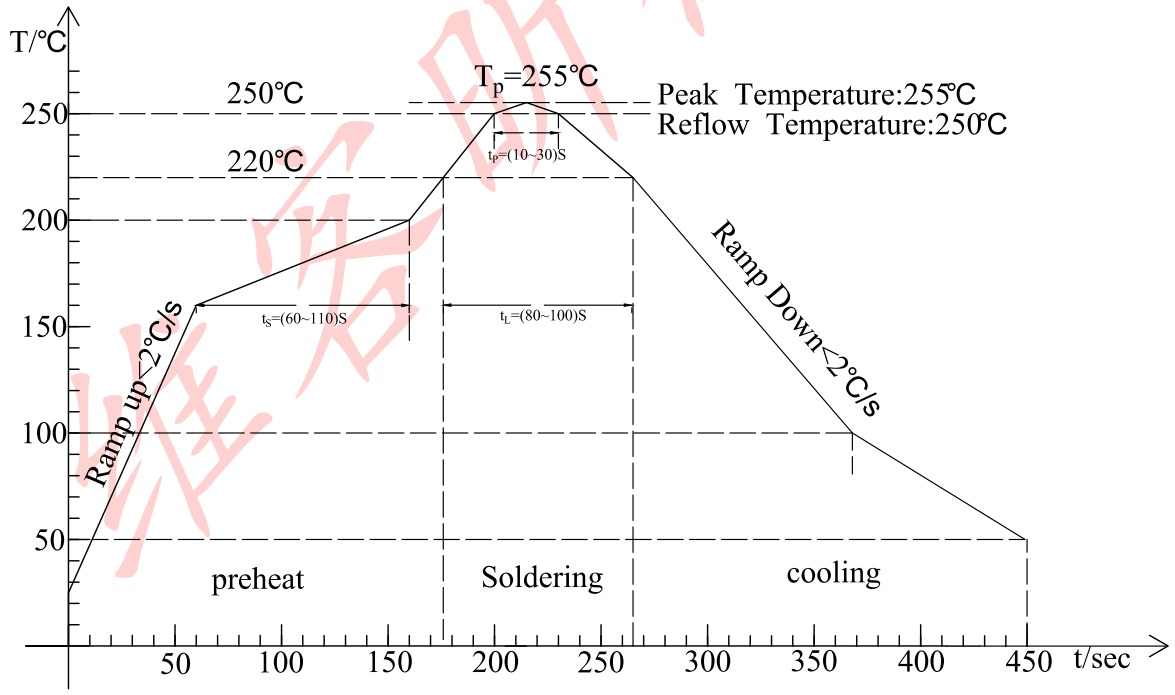
picture4 LGA22Package Outline Drawing

surface3 LGA22Package Size Table

symbol	minimum value	typical value	maximum value	unit
A	0.94	1.00	1.06	mm
A1		0.740 BASIC		mm
c	0.22	0.26	0.30	mm
D.	2.90	3.00	3.10	mm
D1		2.50 BASIC		mm
E.	4.10	4.20	4.30	mm
E1		2.20 BASIC		mm
e		0.50 BASIC		mm
e1		0.55 BASIC		mm

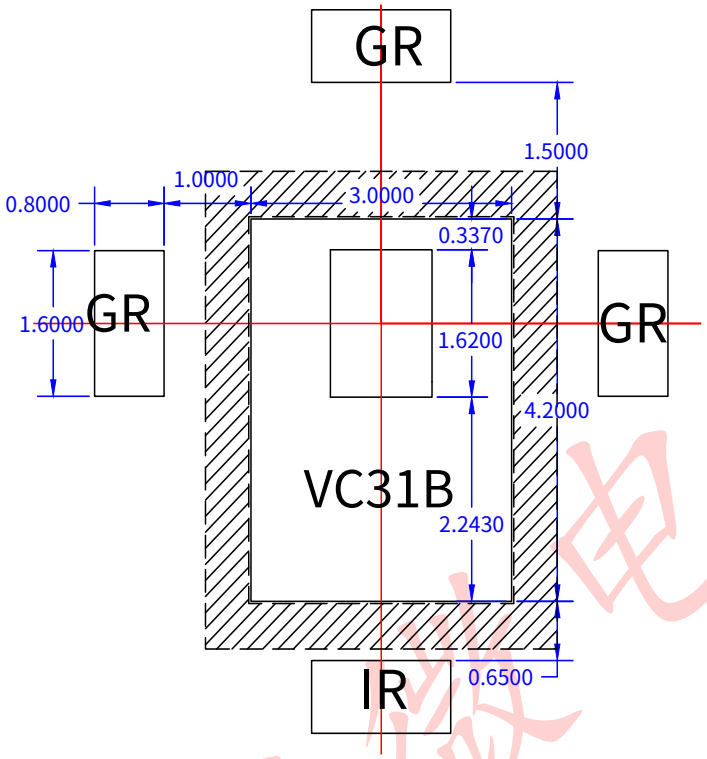
b	0.20	0.25	0.30	mm
L	0.45	0.50	0.55	mm
L1	0.125 REF			mm
L2	0.100 REF			mm
L3	0.25 REF			mm
L4	0.85 REF			mm
L5	0.950 REF			mm
b1	1.624 REF			mm
b2	1.170 REF			mm
b3	0.450 REF			
thes	0.337 REF			mm
aaa	0.10			mm
ccc	0.15			mm

6Recommended Reflow Profile

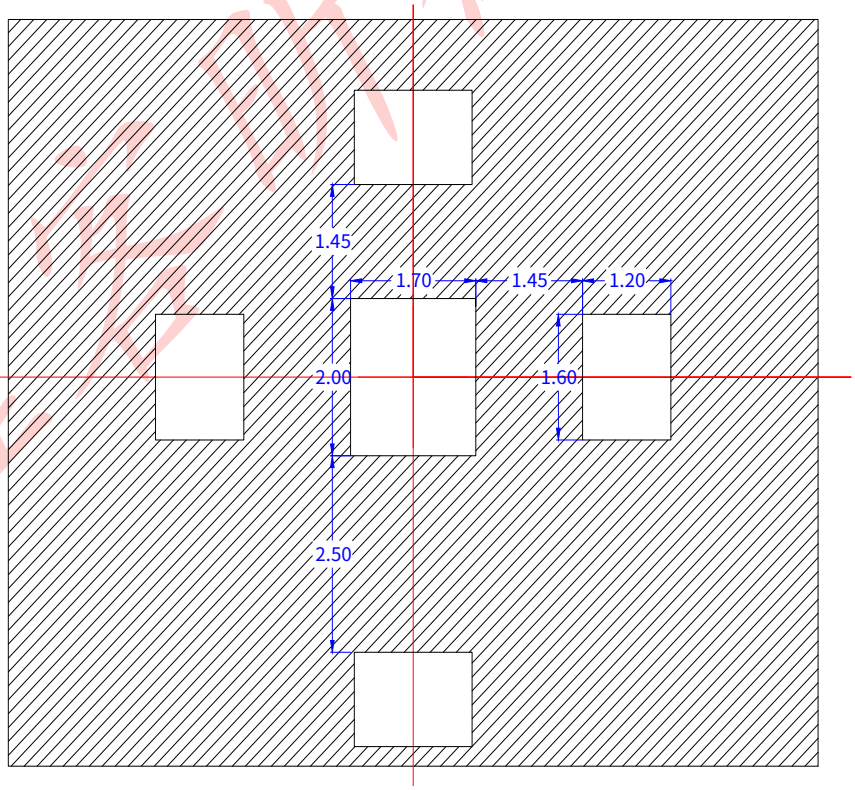


picture5Recommended reflow soldering temperature profile

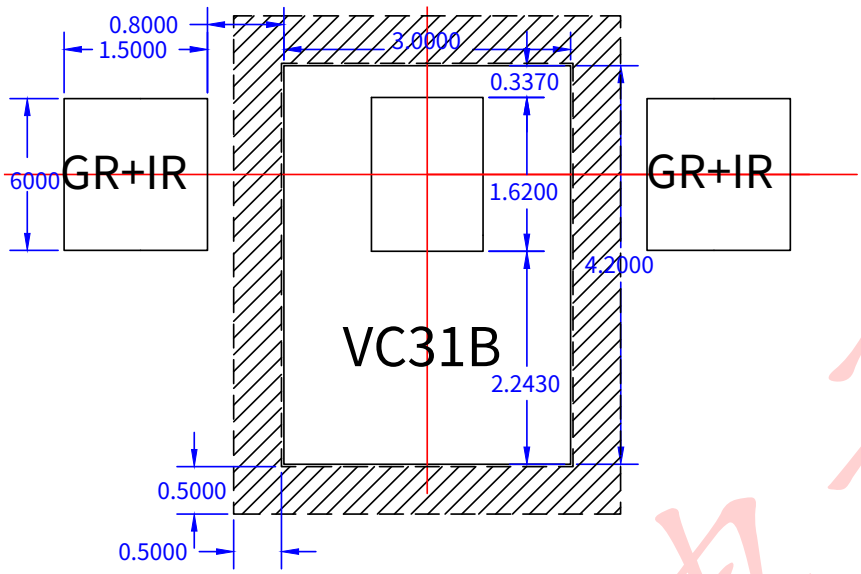
7Optical Structure Solution Recommendation



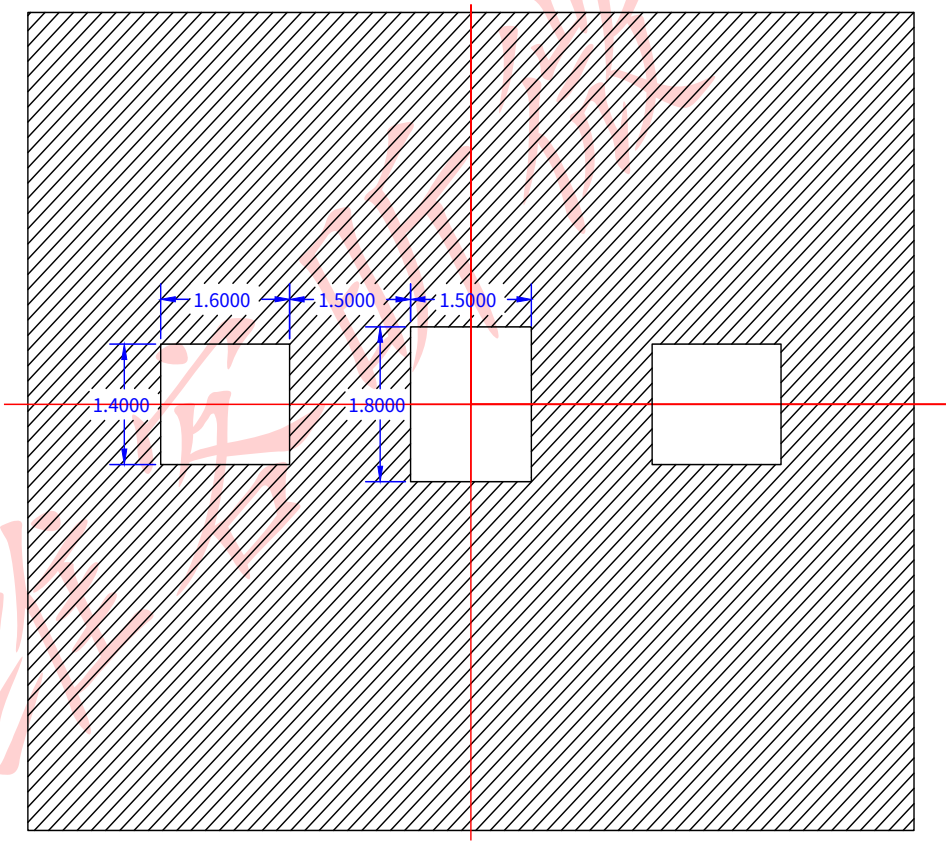
picture6 ledsLayout (1) and size



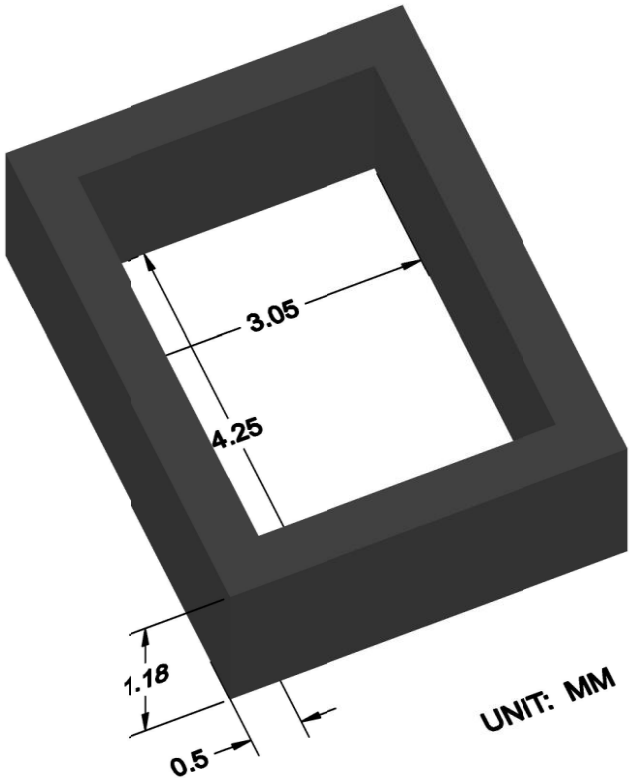
picture7 ledsLayout (1) corresponds to the screen printing window size



picture8 ledLayout (2) and size



picture9 ledsLayout (2) Corresponding to the screen printing window size



every other

Layout instructions and notes

1, This layout is for the sports version solution, so the light leakage treatment is stricter:

a,RequireVC31BThe distance from the lens is not more than0.1mm(preferably zero);

b,picture6,8middleVC31BThe black dotted frame around it is the light-proof auxiliary material of the silicone frame designed by our company.

Material size as above10As shown, the silicone frame should be slightly squeezed to ensure the effect of light isolation; 2,picture7,9The outside of the silk screen is an undefined border, and the internal window is required to be consistent with the above picture;

3,removeVC31BandledIn addition to the fixed layout, the rest of the RC components should not be placed in the light isolation auxiliary material area, so as not to affect the silicone installation effect (VC31Baround0.6mmNo components are placed inside);; 4, Screen printing lens requirements are as follows:

a, Recommended lens window light transmittance: more than 90%;

b, Recommended lens window transmission wavelength: 400 to 1000nm;

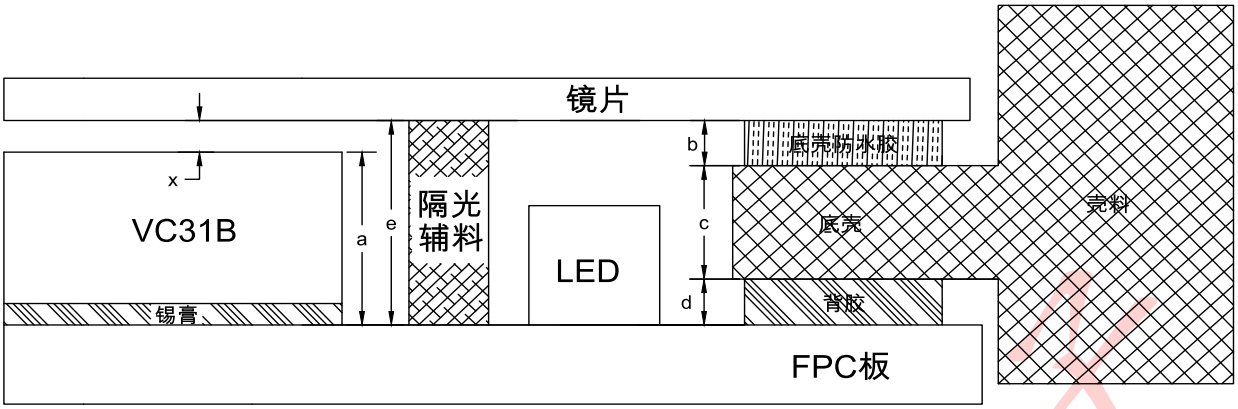
c, The thickness of the lens does not exceed 0.5mm, and it is recommended to use hard, non-deformable glass or acrylic;

5、If any structural changes are required outside the above diagram, you need to communicate with the wiki, and the performance can only be guaranteed after the wiki evaluation; 6, bracelet design requirements:

a, heart rate, blood oxygen boss recommendations1.0mm;

b, If the accuracy of the bracelet's exercise heart rate is high, the overall weight of the bracelet should not exceed36g(excluding table bring);

6, Structural design points



picture11Structural design points

According to the picture above11,xforVC31Bthe distance from the lens,aforVC31BThe height of the solder paste,bis the height of the waterproof glue between the bottom shell and the lens,cDesign thickness for bottom case,dforFPCAdhesive height between bottom shell and bottom case,eis the height of light-shielding accessories; knowna,b,dheight, reasonable designc,ethe height can make1middleVC31Bdistance from lensxexist 0.1mmleft and right, andeslightly larger thanb+c+d,The structural design has the following points to pay attention to:

a,waterproof gluebThe height is related to the specific glue type and waterproof level, and it should be communicated in advance; b, Solder paste thickness approx.0.05mm,VC31Bthick1.0mm;

c, if fixed with plastic columnFPC,Sodequal0, if fixed with double-sided tapeFPC,Sodfor double Surface glue thickness, generally0.1mm;

d, final designx=b+c+da, according to the specifica,b,dRational designcthe height of;

e, according to the general rule, calculatecanddthe height of theVC31Bflush with the bottom shell, i.e.a=c+dabout,this hourxEqual to the thickness of waterproof glue, so that the lens andVC31BSpacing no more than10a thread;

f, Because the light-shielding auxiliary material is soft, it needseslightly larger thanb+c+d, after the assembly is completed, it can better isolateledand VC31Bflashing between

* Note: If the above structure, hardware, and optical path do not use the recommended solution, Wiki does not guarantee the performance; it does not support the use of dual-color mode andIML craft.

8 ledsPerformance parameters and excipients description

VC31BHeart rate chip pairGreen,IRThe luminous efficacy and pressure drop requirements are shown in the table below, which can be based on the table belowled Parameters are self-selectedledsupplier;

surface4 ledsPerformance parameter table

ledtype	wavelength(nm)	Luminous efficiency	forward voltage drop	forward maximum current
Green	525	2000mcd@20mA	less than3.2V@20mA	100mA
IR	940	2.5mW/sr@20mA _	less than1.65V@20mA	100mA

if not suitableledSupplier, wiki has corresponding parametersledRecommended model.

VC31B ICandledCompletely isolated from light, Fig.10Wiki has completed the mold opening of the light-proof accessories for the medium silicone frame, and can be purchased directly, or according to the diagram11Explain self-design and use of light-shielding accessories;