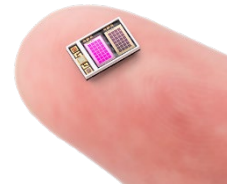


E64E508M10

25uA low Power, Low Height, SpO2 and HRV Sensor for Health



Overview

The E508 is a PPG module with 3 LEDs (Green, Red, InfraRed) and 2 photodiodes. This PPG module can measure pulse, pulse wave, and SpO2.

Features

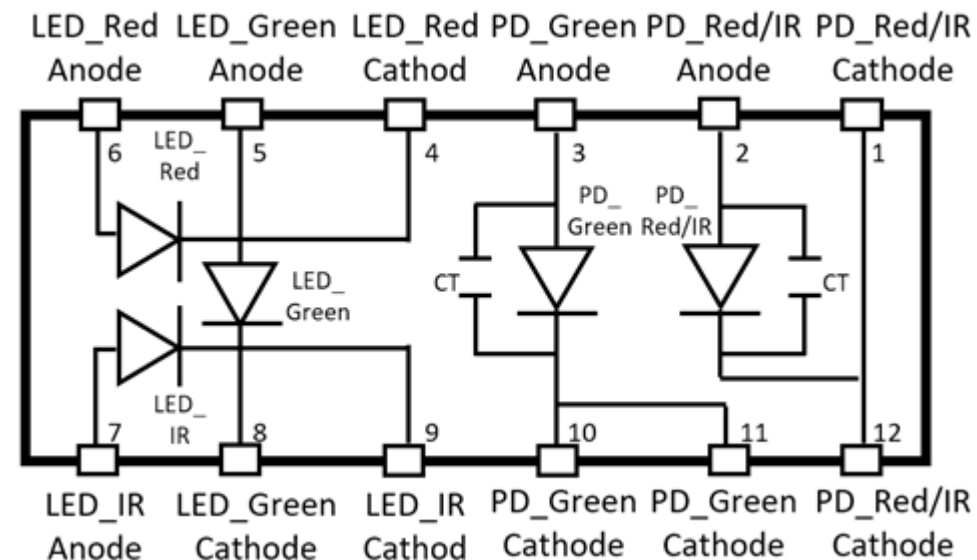
- Small and thin package
5.65mm × 3.60mm × 0.85mm 12pin package
- Low power consumption
 - HR, HRV : 25uA
 - SpO2 : 600uA
- SDK support
SDK is provided to convert the pulse wave into various information
 - HR, HRV, SpO2
 - Steps, Calories burned, HR zone, Sleep Analysis, Stress Analysis, Behavior discrimination, Sedentary Detection
- Operating temperature range : -20°C~+70°C
- ESD : ±1kV(HBM), ±200V(MM)

Applications

- Wearable Devices (Smart watch, Fitness band, etc.)
- Hearable Devices (Earphone, Headphone, etc.)
- Healthcare Products

1 Block Diagram, Pin Assignment

This PPG module has 3 LEDs (green, red, infrared) and 2 photodiodes.



No.	Pin	I/O
1	PD_Red/IR_Cathode	
2	PD_Red/IR_Anode	
3	PD_Green_Anode	
4	LED_Red_Cathode	
5	LED_Green_Anode	Power
6	LED_Red_Anode	Power
7	LED_IR_Anode	Power
8	LED_Green_Cathode	
9	LED_IR_Cathode	
10	PD_Green_Cathode	
11	PD_Green_Cathode	
12	PD_Red/IR_Cathode	

2 Electrical Characteristics

2.1 Absolute maximum rating

Item	Symbol	Value	Unit	Note
Reverse voltage (Green LED)	Vr_G	5.0	V	
Reverse voltage (Red LED)	Vr_R	10.0	V	
Reverse voltage (Infrared LED)	Vr_IR	10.0	V	
Forward current (Green LED)	If_G	300	mA	
Forward current (Red LED)	If_R	40	mA	
Forward current (Infrared LED)	If_IR	150	mA	
Pulse forward current (Green LED)	Ifp_G	300	mA	1
Pulse forward current (Red LED)	Ifp_R	80	mA	1
Pulse forward current (Infrared LED)	Ifp_IR	1000	mA	1
Operating temperature range	Topr	-20~+70	°C	
Storage temperature range	Tstg	-30~+85	°C	
ESD(HBM)	—	±1	kV	
ESD(MM)	—	±200	V	

1. IFP Conditions--Pulse Width \leq 100 μ s and Duty \leq 1%.

2.2 Recommended operating conditions

Ta=25°C

Item	Symbol	Min	Typ	Max	Unit	Applicable Pin
Forward current (Green)	If_G	15			mA	LED_Green_Anode
Forward current (Red)	If_R	20	-	-	mA	LED_Red_Anode
Forward current (Infrared)	If_IR	20	-	-	mA	LED_IR_Anode

2.3 Current consumption

Ta=25°C

Item	Min	Typ	Max	Unit	Remarks
HR, HRV measurement	-	25	-	μ A	※1
HR, SpO2 measurement	-	600	-	μ A	※1

※1: Include AFE (ADPD1080 manufactured by Analog Devices, Inc) current consumption

3 Optical Characteristics

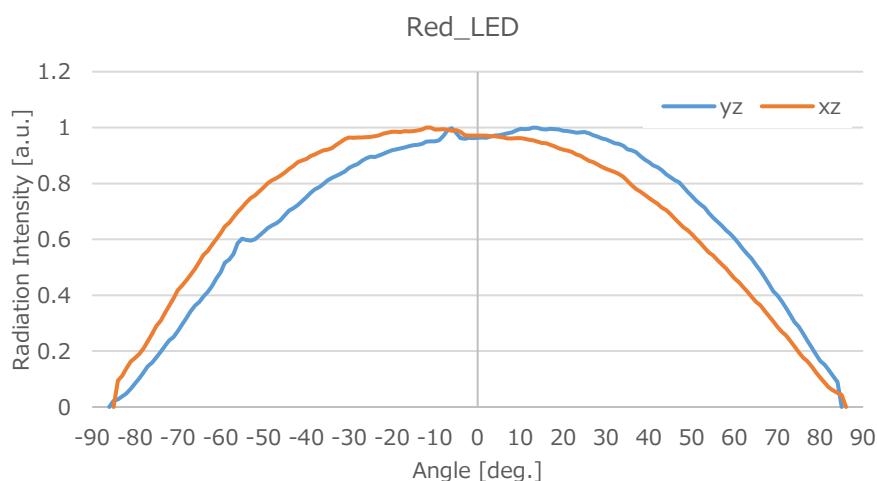
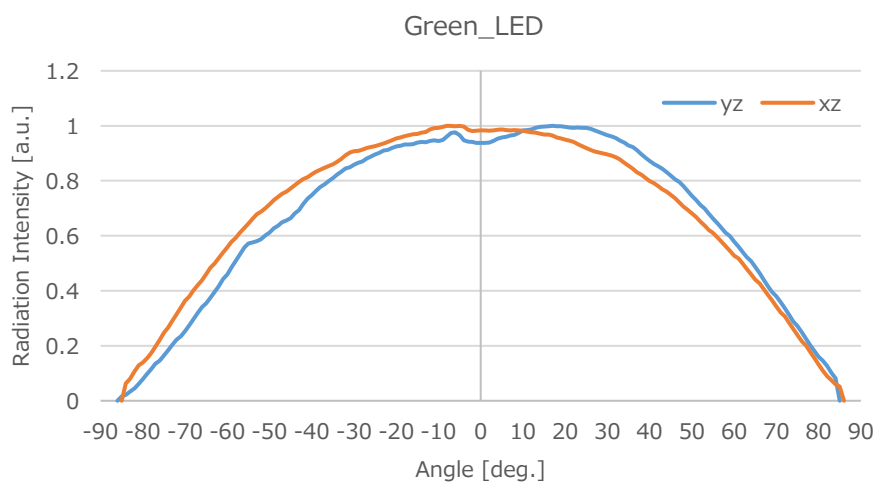
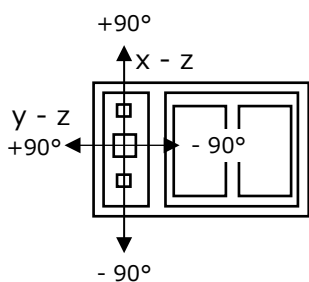
3.1 LED characteristics

Ta=25°C

Item	Symbol	Min	Typ	Max	Unit	Remarks
Forward voltage (Green)	Vf_G			2.8	V	If=20mA
Forward voltage (Red)	Vf_R	-	-	2.2	V	If=20mA
Forward voltage (Infrared)	Vf_IR	-	-	1.4	V	If=20mA
LED Power (Green)	Lp	-	1.5	-	mW/sr	If=20mA
LED Power (Red)	Lp	-	2.5	-	mW/sr	If=20mA
LED Power (Infrared)	Lp	-	2.0	-	mW/sr	If=20mA
Peak wavelength (Green)	Lpw	-	525	-	nm	If=150mA
Peak wavelength (Red)	Lpw	-	660	-	nm	If=20mA
Peak wavelength (Infrared)	Lpw	-	905	-	nm	If=20mA

3.2 LED radiation angle characteristics *(Reference data)

Ta=25°C

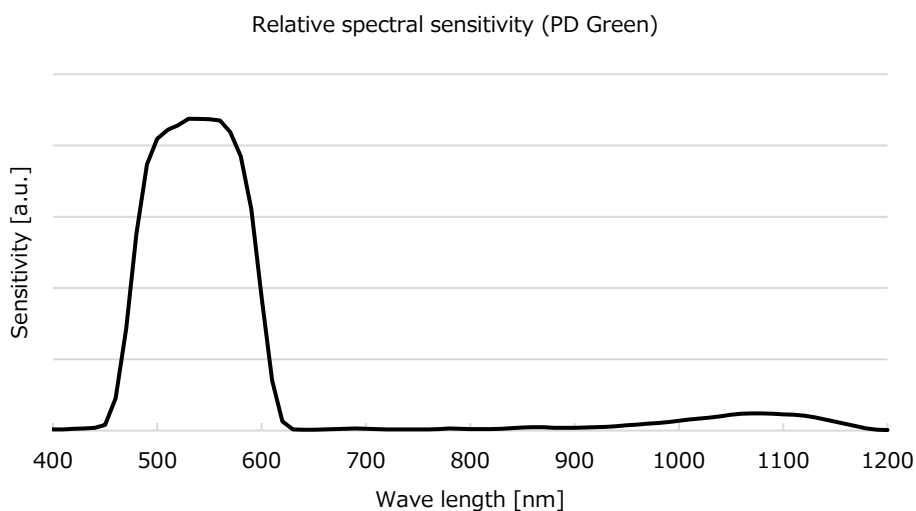


3.3 Photodiode characteristics (PD_Green)

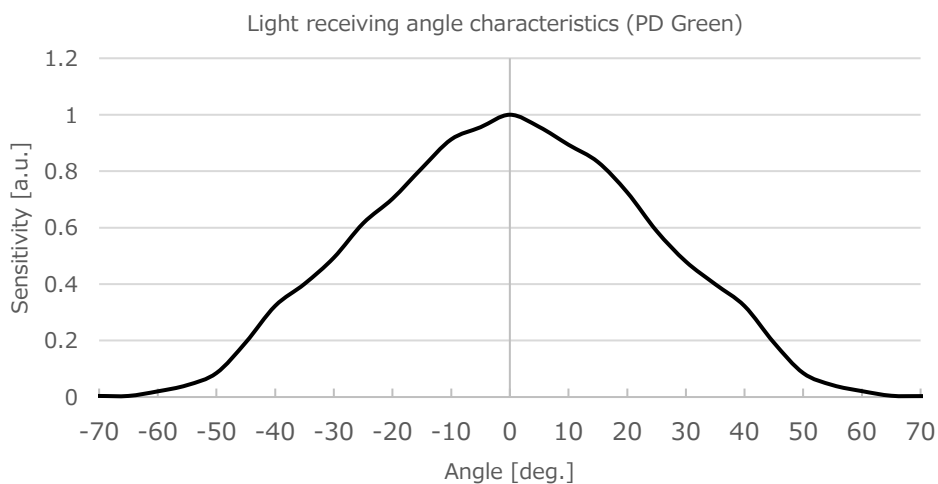
Ta=25°C

Item	Symbol	Min.	Typ.	Max.	Unit	Remarks
Wavelength of max sensitivity	λ_{max1}	-	530	-	nm	-
Spectral range of sensitivity	$\lambda_{50\%1}$	480	-	600	nm	-
Sensitivity	S_2	-	0.19	-	A/W	$\lambda=530nm$
Half angle	Θ_2	-	27.5	-	°	$S_1/2$
Capacitance	CT2	-	85	-	pF	VR=0.2V

Relative spectral sensitivity (PD_Green) *(Reference data)



Light receiving angle characteristics (PD_Green) *(Reference data)

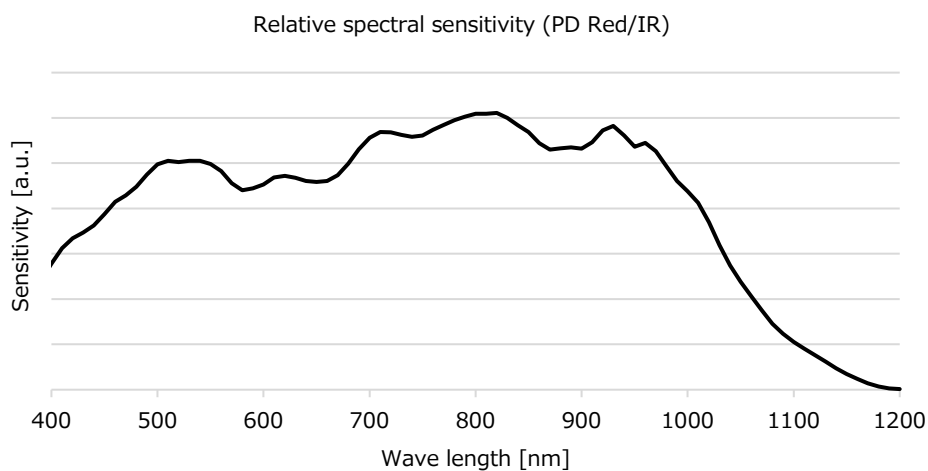


3.4 Photodiode characteristics (PD_Red/IR)

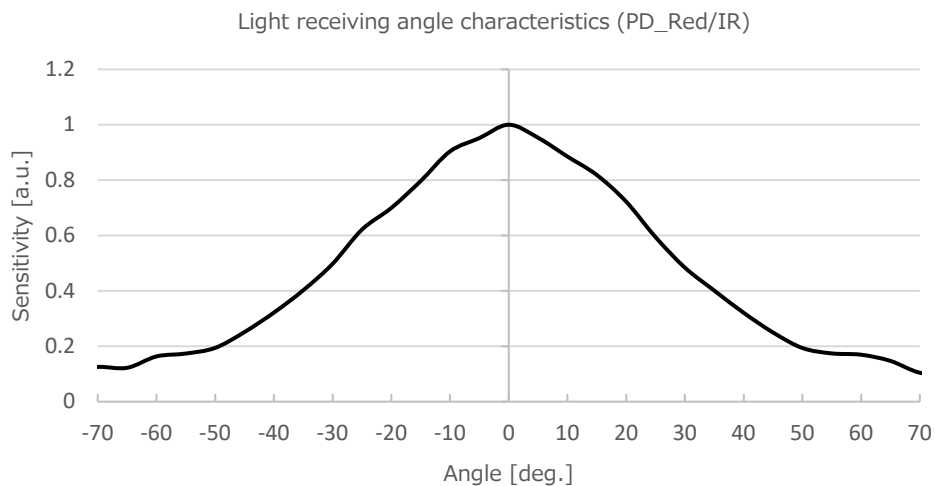
Ta=25°C

Item	Symbol	Min.	Typ.	Max.	Unit	Remarks
Wavelength of max sensitivity	λ_{max2}	-	820	-	nm	-
Spectral range of sensitivity	$\lambda_{50\%2}$	405		1,045	nm	-
Sensitivity	S_1	-	0.21	-	A/W	$\lambda=660\text{nm}$
Sensitivity	S_1	-	0.24	-	A/W	$\lambda=905\text{nm}$
Half angle	θ_1	-	27.5	-	°	$S_2/2$
Capacitance	CT1	-	85	-	pF	VR=0.2V

Relative spectral sensitivity (PD_Red/IR) *(Reference data)



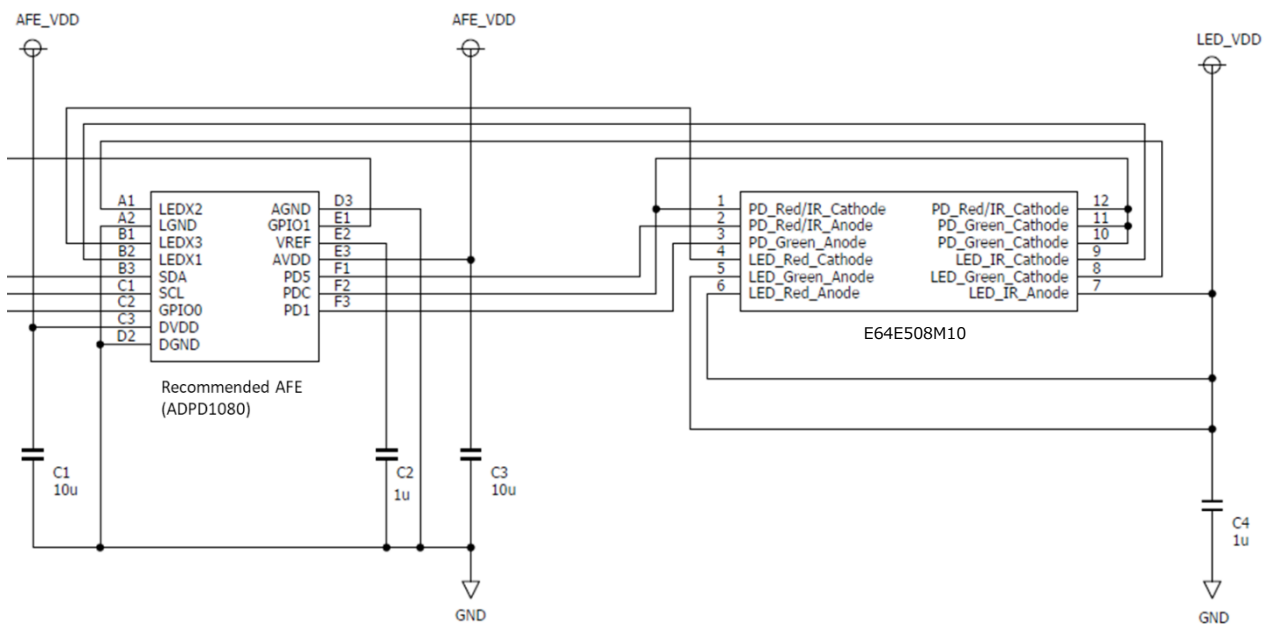
Light receiving angle characteristics (PD_Red/IR) *(Reference data)



4 Circuit design guide

It is recommended to use ADPD1080 (made by Analog Devices) for AFE (Analog Front End).
 Please refer to the following precautions.

- Decoupling caps should be placed as close to power pin as possible. (AFE : 10uF, Others : 1uF)
- The impedance of power supply line should keep low.
- AFE should be placed as close to the E508 as possible.



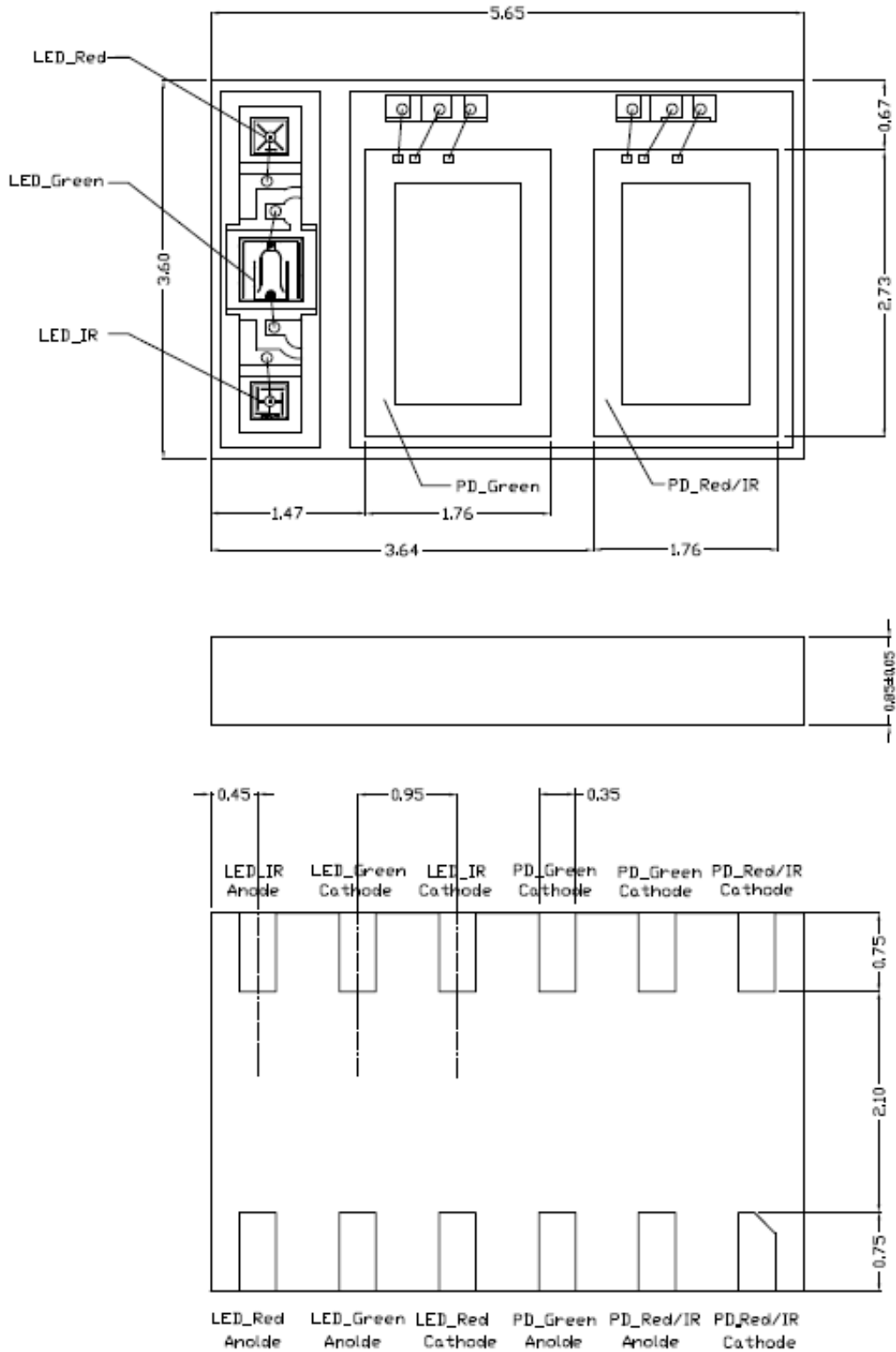
5 Mechanical design guide

Please refer to the following precautions in mechanical design for maximum performance.
 Please see CAD data and Rayfile. (in preparation)

- Outer case should be designed to prevent the LED light leakage or outside light enters.
- Place the product in the center of the surface in contact with the skin as much as possible.
- Distance between the E508 and outer case should be designed as close as possible.
- Don't mount high components around the E508.

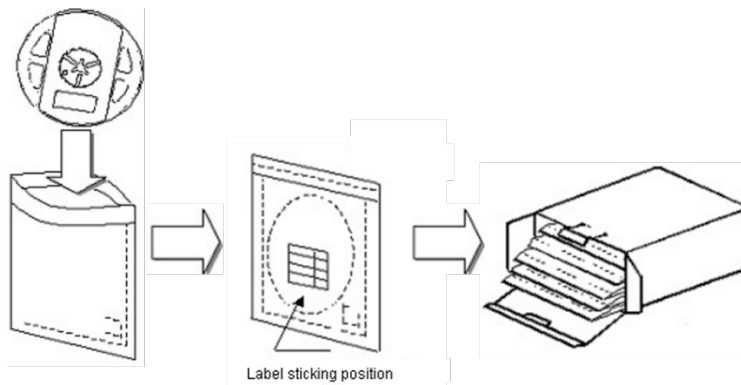
6 Dimensional drawing

Unit : mm



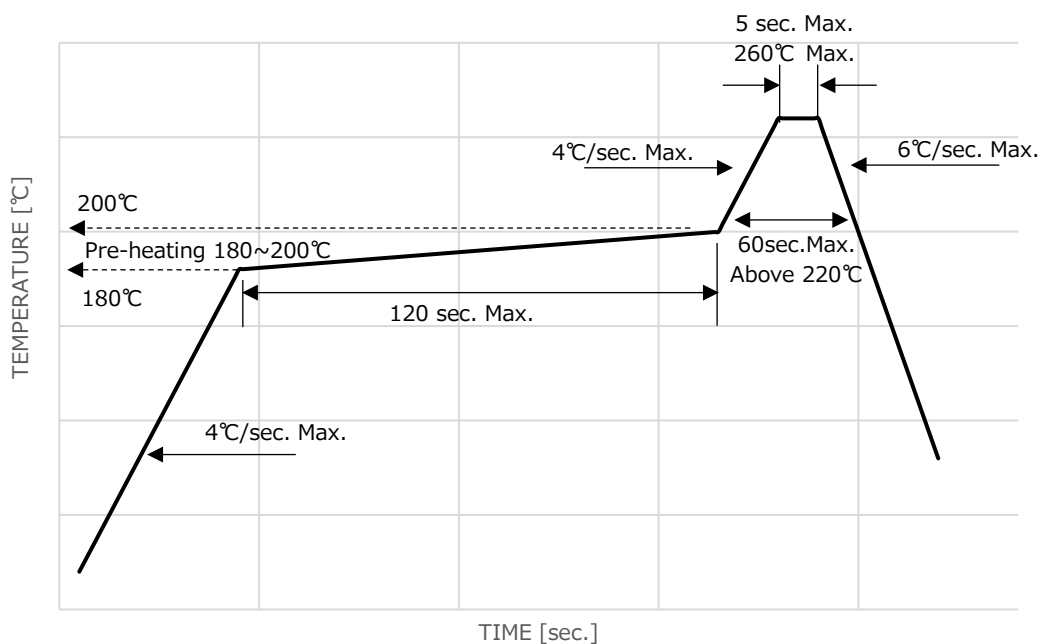
7 Package

1,000pcs/Reel
 MBB Bag

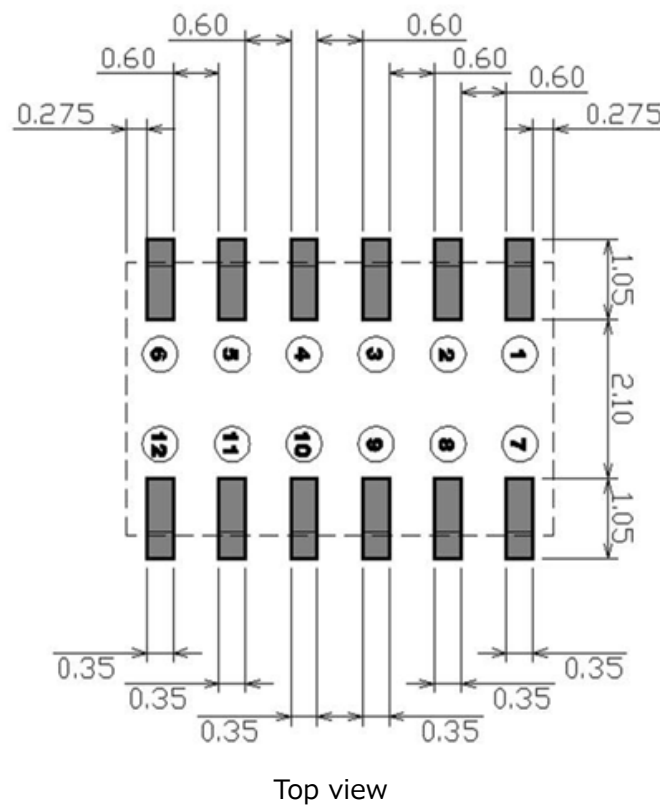


Item	Specification	Material	Quantity
Reel	EIA 481-1A specs	Conductive black	
Label	HT standard	Paper	
Packing bag	220x240mm	Aluminum laminated bag/ no-zipper	One reel per bag
Carton	HT standard	Cellulose pulp	Non-specified
Desiccant	70x70 ± 3mm	Bentonite Clay	1ea per bag
Humidity indicator	40x63mm	Paper	1ea per bag

8 Reflow soldering profile



9 Soldering pattern



10 Ordering information

Ordering code	Pcs	Package
E64E508M10	5,000	Tape & Reel

11 Revision history

Rev.	Date	Header	Comment
Draft	6th Dec. 2021	All	First edition
1.0	24th Jun. 2022	1. Block diagram, Pin assignment 2. Electrical Characteristic 3. Optical Characteristic 6. Dimensional drawing 7. Package 9. Soldering pattern 10. Ordering code	Revise: The features section Revise: Pin assignment Revise: Absolute maximum rating Recommended operation conditions Current consumption Revise: LED characteristics Revise: Photodiode characteristics (PD_Red/IR) Revise: Dimensional drawing Revise: Package specification Add: 9. Soldering pattern Add: Ordering code
1.1	28 th Sep. 2022	Features 3. Optical Characteristic 4. Circuit design guide 7. Package 8. Reflow soldering profile	Revise: SDK Revise: 3. LED characteristics Feature, 2.3 section Typo: 4. Sensor name Typo: 7. MBB bag Typo: 8. Reflow soldering profile
1.2	17 th Apr. 2023	Change corporate logo	Change corporate logo