E2100 barcode reading engine

Integration Manual

Disclaimers

Please read all the contents of this manual carefully before using the products described in this manual to ensure safe and effective use of the products. It is recommended that this manual be kept in a safe place for the next time you use it for reference.

Warnings

Please do not disassemble the product or tear the seal label on the product by yourself, otherwise our company will not be responsible for warranty or replacement of the product.

The pictures in this manual are for reference only. If there is any discrepancy between individual pictures and actual products, please refer to the actual products. For product improvement and update, the company reserves the right to modify the document at any time without notice.

Our company has the final right to interpret this manual.

Service Information

If you need more technical support, please call or email us and we will be glad to serve you.

Version Record

Version number	Release Notes	Release Date
V1.0	Initial Version	2022/3/23

Catalog

About this integration brochure

Introduction

E2100 barcode reading engine, which applies intelligent image recognition technology, perfectly integrates advanced image recognition algorithm with advanced chip design and manufacturing technology, extremely simplifies the design difficulty of the scanner, and sets the excellent benchmark of high performance, high reliability and low power consumption of the scanner.

Supported barcode types

One Dimension	Codabar, Code 39, Code 32, Interleaved 2 of 5, Industrial 2 of 5, Matrix 2 of 5, Code 93, Code 11, Code 128, UPC-A, UPC-E, EAN -8, EAN -13, MSI, ISSN, ISBN, GS1 DataBar
Two-dimensional	PDF417, Micro PDF417, QR Code, Micro QR, Data Matrix, Aztec

Aiming Instructions

The E2100 is aimed with a circular red light for aiming and a white LED for illumination.

Chapter outline

Chapter 1 About E2100	Introducing the Engine Module
Chapter 2 Installation	Provides how to install the engine, including installation information, housing design, optics, environment, etc.
Chapter 3 Electrical Characteristics	Provides electrical characteristics of the engine, technical specification information and power supply timing
Chapter 4 Interface	Provides interface definition, connector specification dimensions
Chapter 5 External Reference Circuits	External drive circuit design is provided
Chapter 6 Supporting Development Tools	Auxiliary tool description

Symbol Description

The following symbols are used to illustrate this document.

- Indicates that the items are listed, but not necessarily in order.

* Indicates cautions and important contents. If this message is ignored, the device and data will not be damaged.

⚠ Indicates a warning: This symbol indicates that data or material damage may result if this message is ignored.

Chapter 1 About E2100

Introduction

The E2100 is an ultra-compact area imaging engine designed to optimize barcode reading. the engine decodes through image capture. the E2100 includes an LED targeting system and two LED illumination systems.

LED safety test, fill in the LED safety number of E2100 V1.1: IEC 62471:2006.

E2100 includes.

- 1 integrated lens with SENSOR
- 1 white LED fill light
- 1 red LED focus

The E2100 is connected to the host computer via a 12-PIN FPC cable. See Chapter 4, 12-PIN FPC Receptacle Definitions for more information on the 12-PIN FPC cable.

Lighting

The E2100 itself is illuminated by a white LED (wavelength range 445~465nm) to provide exposure assistance. In complete darkness, it can still rely on its own auxiliary illumination to read barcode targets quickly. The illumination function can be selected on or off by setting.

Aiming Instructions

The aiming light on the E2100 can be used to assist in aiming at the target, facilitating better recognition of barcode targets and improving work efficiency. The aiming indicator function

can be turned on or off by setting, and it is recommended to use the aiming indicator function in daily applications.

Chapter 2 Installation

Introduction

This chapter provides information about the E2100 installation, including physical and electrical information, precautions, and recommended E2100 window properties.

⚠Warning: Do not touch the imaging lens when installing the engine to avoid leaving fingerprints on the lens.

⚠Warning: Please be careful not to touch the lighting LEDs during handling. improper handling can damage the LEDs and lenses.

General Requirements

Electrostatic Protection (ESD)

E2100 due to module size limitations, and the client interface part of the electrostatic protection of the signal can not be handled in place, the client needs to consider the design of the module electrostatic protection. The module uses anti-static packaging, but in the process of unpacking and use still need to pay attention to anti-static measures, such as the use of grounded wrist straps and work area grounding.

No hot-plugging

Due to the module size limitation, the E2100 cannot handle the thermal unplugging protection of connector interface signals in place, involving the unplugging of FPC or FFC lines need to be completed under power down, and does not support powered

unplugging.

Anti-dust and anti-fouling

The E2100 must be adequately sealed during storage and use to avoid dust, particles or other contaminants from gathering and adhering to the lens, circuit board and other components. Dust particles or contaminants can reduce the performance of the engine, and even affect the use of the engine.

Environment

The normal use of the E2100 is subject to the following environmental requirements.

Table 2-1

Operating temperature	-10℃ to +60℃
Storage temperature	-40℃ to +70℃
Relative Humidity	5% ~95% (no condensation)

Heat dissipation considerations

The thermal design of the E2100 reading engine needs to be considered in any product where there are several high power devices on the E2100 reading engine that emit a lot of heat during continuous operation. When the temperature is too high will affect the reading performance.

In integrated applications, the power consumption and heat of the E2100 can be reduced as follows.

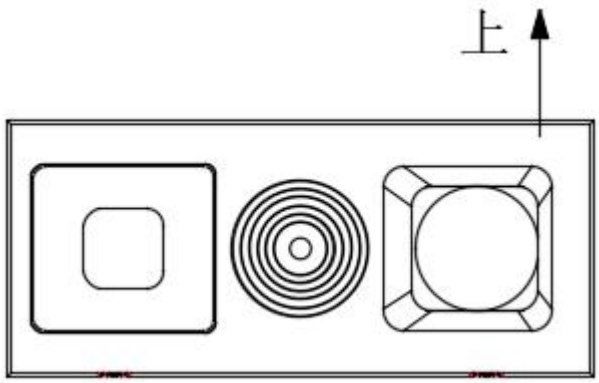
- Avoid using the continuous working mode for a long time.
- The design allows space for natural or forced convection for the E2100.
- Avoid tightly wrapping E2100 with insulating substances such as rubber.
- Suitable insulating thermal conductive materials can be designed to conduct the heat from the E2100 to the product housing.

External optics (LED lenses and pattern forming elements)

Do not subject the external optical components on the E2100 to any external forces. Do not pinch one of the external optical components of the engine by hand, as this may create excessive stress at the mechanical joints, which may cause its fixed components to fail to function properly, such as device breakage or cable breakage.

Installation orientation

When the E2100 is properly placed or installed, its front view appearance is shown below. The lens is in the center, the illumination and aiming are on either side, the decoding circuit board is at the rear, and the screw mounting holes are located below. The relative orientation of the images captured by the E2100 at this point corresponds correctly to its orientation.



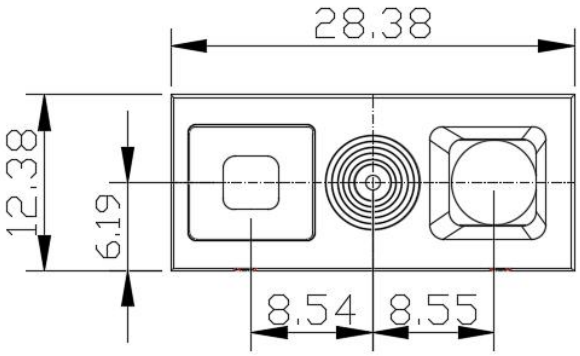
Figure

Mounting

When integrating the E2100 into an application, the following physical size specifications can be referred to. The structure should be designed in such a way that other components do not compress the E2100's device.

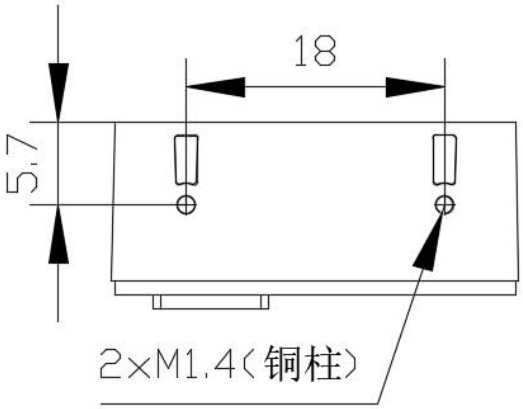
Assembling reference parameters (unit: mm)

Front View



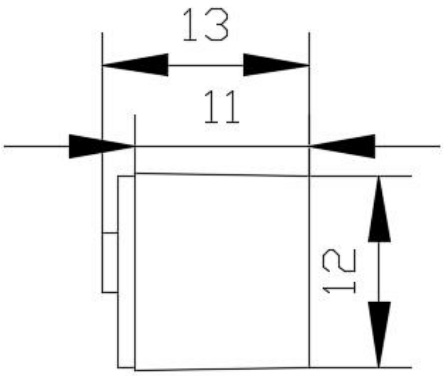
Figure

Elevation view



Figure

Side view



Figure

External Design

*Note: Optical analysis of the housing design is performed to ensure optimal scanning or imaging performance.

Design the engine enclosure so that the aiming and lighting system does not reflect internally. Reflections from windows or housings can cause problems. For special window tilt angles, these reflections can bounce off the top or bottom of the housing and reach the engine. Do not place bright objects around the engine to prevent reflections from tilted windows from being reflected into the engine's field of view and appearing in the captured

image.

Consider using a baffle or a frosted black material for the interior of the housing.

Optical Related

The E2100 uses a complex optical system. Improper housing design or window material can affect the performance of the E2100.

Window Positioning

Position the window so that light reflected from the interior of the window does not reflect back into the engine. Improper window positioning can significantly reduce performance. So if the design of the housing does not match the recommended window angle, please contact us to discuss positioning requirements.

There are two options for window positioning.

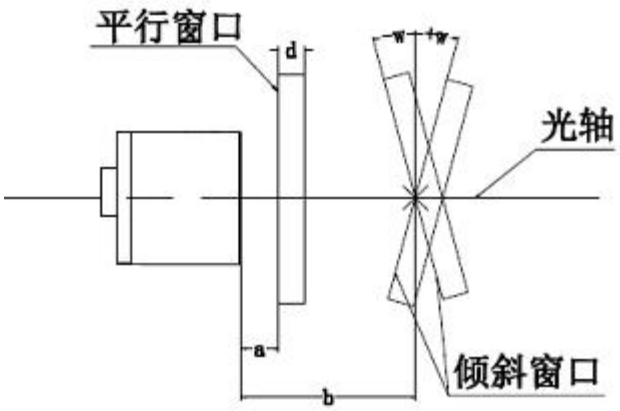
- Parallel Window - This is the preferred method for imaging engines.
- Tilted window - for laser or imaging engines. Refer to Table 2-2 for window distances.

Table 2-2

Minimum angle of tilting window	Distance to front surface of engine (b) Unit is mm			
	5mm	10mm	15mm	20mm
No coating, minimum window positive tilt (+ w)	30°	25°	22°	18°
No coating, minimum window negative tilt (-w)				
AR coating, one side, minimum window positive tilt (+ w)	25°	22°	20°	16°
AR Plating, one side, minimum window negative tilt (-w)				
AR coating, both sides, minimum window	22°	20°	18°	15°

positive tilt (+ w)				
AR plating, both sides, minimum window negative tilt (-w)				

※ Note: For barcode reading, use a parallel or tilted window. For tilted windows, dust, contaminants and scratches on the window may cause visible defects in the image. The window is a transparent medium mounted in front of the E2100 engine to separate the interior of the product from the exterior and to preserve the light path for the E2100 to read bar codes. The window should be placed so that the illumination and targeting beams emanate as much as possible and prevent reflection into the engine. If the illumination beam is reflected into the engine, it will reduce the engine's readability. The window should be mounted as close as possible to the front of the E2100 engine and parallel to the front plane of the E2100, the distance being obtained by measuring the distance between the front plane of the E2100 and the farthest plane of the window. In order to get good reading performance, it is necessary to avoid reflecting light from the E2100 engine into the engine through the window, so the thickness of the window material should be reduced as much as possible. As shown in Figure 2-5 below, the perpendicular distance between the distal plane of the window and the front plane of the E2100 should not exceed a+d mm, while the perpendicular distance between the proximal plane of the window and the front plane of the E2100 should not exceed a mm (a=1mm, d=2mm), preferably in close proximity to each other.



Figure

If the window needs to be tilted design, the requirements of the distance and parallel installation of the same, the tilt angle should ensure that the lighting beam is reflected by the glass can not reflect the light into the lens.

Window material and color

The choice of window material and color should take into account the wavelength of the E2100 lighting light wave (mainly red and white wavelengths), so that the light transmission rate is as high as possible, while ensuring that the blur is as low as possible and the refractive index is uniform. Usually PMMA or optical glass can be used, the window material red light transmission rate of more than 90%, blurred degree of less than 1%. Whether or not a transmission-enhancing coating is applied to the window material depends on the specific material and application. Table 2-3 summarizes the recommended window properties.

Table 2-3

Characteristic	Description
Thickness	Universal value 0.8-2.0mm
Wavefront distortion (transmission)	The following criteria are met in the effective aperture range. PV (peak and valley) standard control within 0.2λ. RMS (root mean square) standard controlled to within 0.04λ.
Light Passing Aperture	Extends the effective area outward by 1.0mm
Surface quality	60-20 scratch/dig

Special attention should be paid to the wavefront distortion recommendations mentioned above when using plastic materials. Since surface scratches can cause image artifacts, it is recommended that plastic not be used for tinted windows. Tinted windows in motion mode can reduce the sensitivity of the engine to moving targets and are not recommended. and whether or not a transparency-enhancing coating is used on the window material depends on the specific material and application. The following are descriptions of three common window materials: PMMA, ADC (CR-39 TM), and chemically tempered glass.

PMMA

Plexiglass (PMMA) is manufactured by casting acrylic between two precision thin sheets. This material has the advantages of good optical properties, high impact resistance and low cost, but the material is brittle and prone to cracking, and the surface hardness is low and easily scratched and loses its luster. Therefore, it is recommended to be coated with a film layer of polysiloxane. Plexiglass can be laser cut into strange shapes and ultrasonically welded.

ADC

Allyl diglycol polycarbonate (ADC), also known as CR-39TM, is a thermosetting plastic produced by a casting process. The vast majority of plastic eyewear on the market is uncoated CR-39. This material has good chemical stability, environmental suitability and fairly good impact resistance. It also has a fairly good surface hardness, so there is no need to require a coating. However, coating is required for use in harsh environments, and this material cannot be ultrasonically welded.

Chemically tempered glass

Glass is a hard material with good scratch and abrasion resistance. However, unannealed glass is brittle in texture. The flexibility of glass can be improved by tempering. Glass cannot be ultrasonically welded and is difficult to cut into odd shapes.

Window anti-scratch and coating

Anti-reflection coating

Anti-reflective coatings are effective in controlling stray light or achieving maximum working range and are applied to the inner and outer sides of windows to reduce light reflection. However, they are expensive and less resistant to abrasion and scratches.

Polysiloxane coating

Polysiloxane-based coatings are applied to plastic surfaces to improve scratch and abrasion resistance of the surface. If anti-reflective (AR) coatings are used, the

specifications in Table 2-4 apply. A polysiloxane coating is not required and the window is grooved to reduce scratching.

Table 2-4

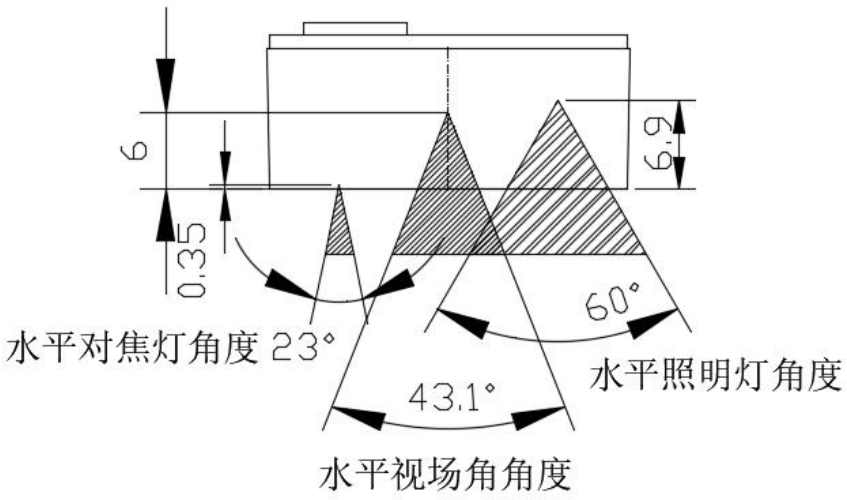
Specification	Description
Materials	Anti-reflective coatings are available for both tempered glass and plastic windows. Glass with anti-reflective coatings is more durable because the glass structure has better adhesion properties. In addition, coatings on glass are more cost-effective than plastic.
AR Coating Specifications	Single-sided AR coating: minimum transmittance of 92% in the spectral range 420-730 nm. Double-sided AR coating: Minimum transmittance of 97% in the spectral range 420-730nm. For parallel windows, see Figure 2-5.

Note: Scratches on the window can significantly reduce the readability of the E2100. It is recommended that the window be designed with a grooved shape, or that a wear-resistant coating be used.

Window size

The size of the window is designed to ensure that the field of view is not blocked as a basic requirement, and on this basis, the lighting area is not blocked as much as possible. The size of the window can be designed by referring to the following diagram of each optical area Figure 2-6.

Optical area for lenses, illumination and aiming.



Figure

Ambient light

The E2100 can achieve better performance in the presence of ambient light, but when used in an environment with high-frequency pulse flashes, performance may be reduced due to interference.

Human Eye Safety

E2100 has the use of red light-emitting diodes (LED) to form the targeting indicator graphics and white light-emitting diodes illumination, LED in the usual use of the

wavelength range of light waves generated is safe, but in the use of the process should still avoid looking directly at the LED or the beam of light into the human eye to avoid discomfort.

Chapter 3 Electrical Characteristics

Power requirements

Power input is allowed only after the E2100 is connected. Plugging or unplugging the E2100 while the cable is powered (powered hot-plug) will damage the electronic components of the E2100, so be sure to disconnect power when plugging or unplugging the cable. Bad power connection, or too short interval power off and on operation, or too large voltage drop pulse may cause the E2100 can not be in a stable and normal operation, need to maintain the power input stability.

Ripple noise

For reliable operation, a low-noise power supply is required. Proper attention to power supply quality and testing is required to ensure that the E2100 achieves optimal performance. Therefore, the input ripple of the E2100 module power supply must not exceed 80mV.

DC Characteristics

Operating voltage/current

Table 3-1 (T=23℃)

Parameters	Symbols	Minimum value	Standard value	Maximum value	Unit
Operating Voltage	VIN (12 PIN-FPC socket)	3.13	3.30	3.46	V

Operating Current(@3.3V)	Operating Current	-	190	220	mA
	Idle Current	-	17	-	mA

I/O operation requirements

Table 3-2 (VDD=3.3V, GND=0V, T=23°C)

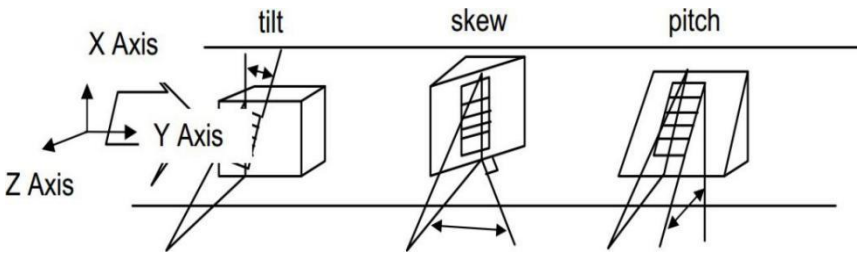
Parameters	Minimum value	Typical values	Maximum value	Unit
VIL	-0.3	0	0.7	V
VIH	2.0	3.3	3.6	V
VOL	-	-	0.45	V
VOH	1.35	-	-	V

Technical specification value

Please contact our sales for technical specification index, where the tilt, roll and tilt test methods are shown below.

Note: The tilt, deflection and rotation test conditions in the technical specification values are shown in Figure 3-1 below and are to be measured at a distance of 2.5 inches or more.

The angle of deflection along the X-axis is the X-axis deflection angle (skew). The angle of deflection along the Y-axis is the Y-axis deflection angle (pitch). The angle of deflection in the Z-axis direction is the Z-axis deflection angle (tilt).



Figure

Power Timing

Up and down power timing

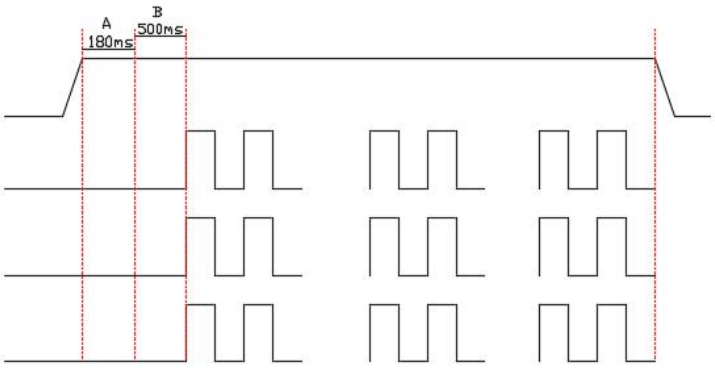


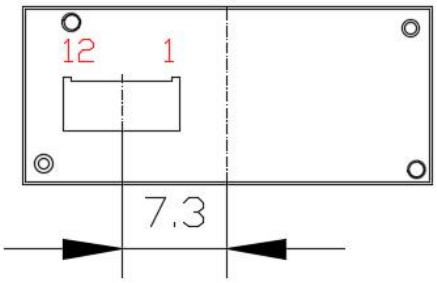
Figure 3-2 Up and

In the above figure, A is the system start-up completion time of 180ms, B is the buzzer sound completion time of 500ms, and the total power-on completion time is about 0.68 seconds. In the above figure, the system power-on time is counted from the time VDD rises to 3.3V. The tail end of the above figure indicates all the voltage drop time of the module, i.e. the communication stops and the level signals are all low. At the next power-up, to ensure that the voltage is completely down, as well as the individual interface levels are low, an interval of at least 2s is required before the power input can be turned on again.

Chapter 4 Interface

Interface Definition

The physical interface of E2100 is 12-PIN FPC interface. 12-PIN FPC can be multiplexed into two communication forms: TTL-232 communication form and USB communication form. Figure 4-1 shows the locations of the 12-PIN FPC interface on the E2100 decoder board, where the PIN 1 and PIN 12 locations on the 12-PIN FPC are also marked, in the order of PIN 1 ~ PIN 12.



Figure

12-PIN FPC Interface Definition

The specific signals for the 12-PIN FPC are defined in Table 4-1 below, where I = Input and O = Output.

Table 4-1

PIN#	Signal Name	I/O Type	Function Description	Remarks
1	NC	-	Hanging in the air	See Note 1 for details
2	VIN	-	Power input +3.3V	
3	GND	-	ground	
4	RXD	I	TTL level reception	
5	TXD	O	TTL level sending	
6	USB_DN	I/O	USB D-Signal	
7	USB_DP	I/O	USB D+ signal	
8	PIN 8	-	Reserved functions	See Note 2 for details
9	Buzzer	O	Buzzer signal output	See Note 3 for details
10	LED	O	Decoding success indication signal output	See Note 4 for details
11	PIN 11	I	Reserved functions	See Note 5 for details
12	nTRIG	I	Read code trigger signal	See Note 6 for

				details

※ 1、PIN reserved, can be overhung

※ 2, reserved mode burn-in mirror control, internal default pull up, pull this PIN 8 low at startup, the module will enter the burn-in mirror state, external recommended overhang.

※ 3. There are four buzzer signal output states.

When the power is turned on: Five PWM signals are output, each with a duration of 100ms and a frequency of 2.083KHz, 2.50KHz, 2.083KHz, 2.50KHz and 2.083KHz, the duration and frequency of which are fixed. This power-on tone can be set on or off by sweeping the code, please refer to the user manual of E2100 for setting.

When the decoding is successful: After the decoding is successful, the PWM signal will be output with the length of 60ms and the frequency of 2.70KHz. The length and frequency are default, you can set the frequency and volume by sweeping the code, refer to the user manual of E2100 for setting.

When the menu is set successfully: two PWM signals are output, each with a length of 100ms and a frequency of 3.3KHz and 6.5KHz, and the length and frequency are fixed at this time. This power-on tone can be set on or off by scanning the code, please refer to the E2100 user manual for details.

In case of error or recognition failure: two PWM signals are output, both of which are 120ms in length and 1.5KHz in frequency, of which the interval length is 130ms, and the length and frequency are default, which are only set on and off, refer to the user manual of E2100 for details.

The hardware external driver circuit can be found in the section Buzzer Reference Circuit in Chapter 5. When this pin is not used, it can be left dangling.

When this pin is not used, it can be left dangling.

※ 4, LED decoding success indication only one

When the decoding is successful, the output level is high and the duration is 100ms, which is the default duration. This decoding success indication can be set on or off by sweeping the code, please refer to the user manual of E2100 for setting.

The hardware external driver circuit can be referred to the decoding success LED indication reference circuit in Chapter 5.

When this pin is not used, it can be left dangling.

※ 5. Wake-up control is reserved, and external overhang is recommended.

※ 6. Level trigger.

nTRIG needs to be held low for continuous decoding (default pull-up inside the module), and decoding is successful, then reading is stopped.

The hardware external drive circuit can be referred to the trigger function reference circuit in Chapter 5.

When this pin is not used, it can be left dangling.

Connector Specifications Size

The connector on the E2100 has a 12-PIN FPC block.

12-PIN FPC Connectors

The specifications used for the 12-PIN FPC connectors are shown in Figure 4-2 below.

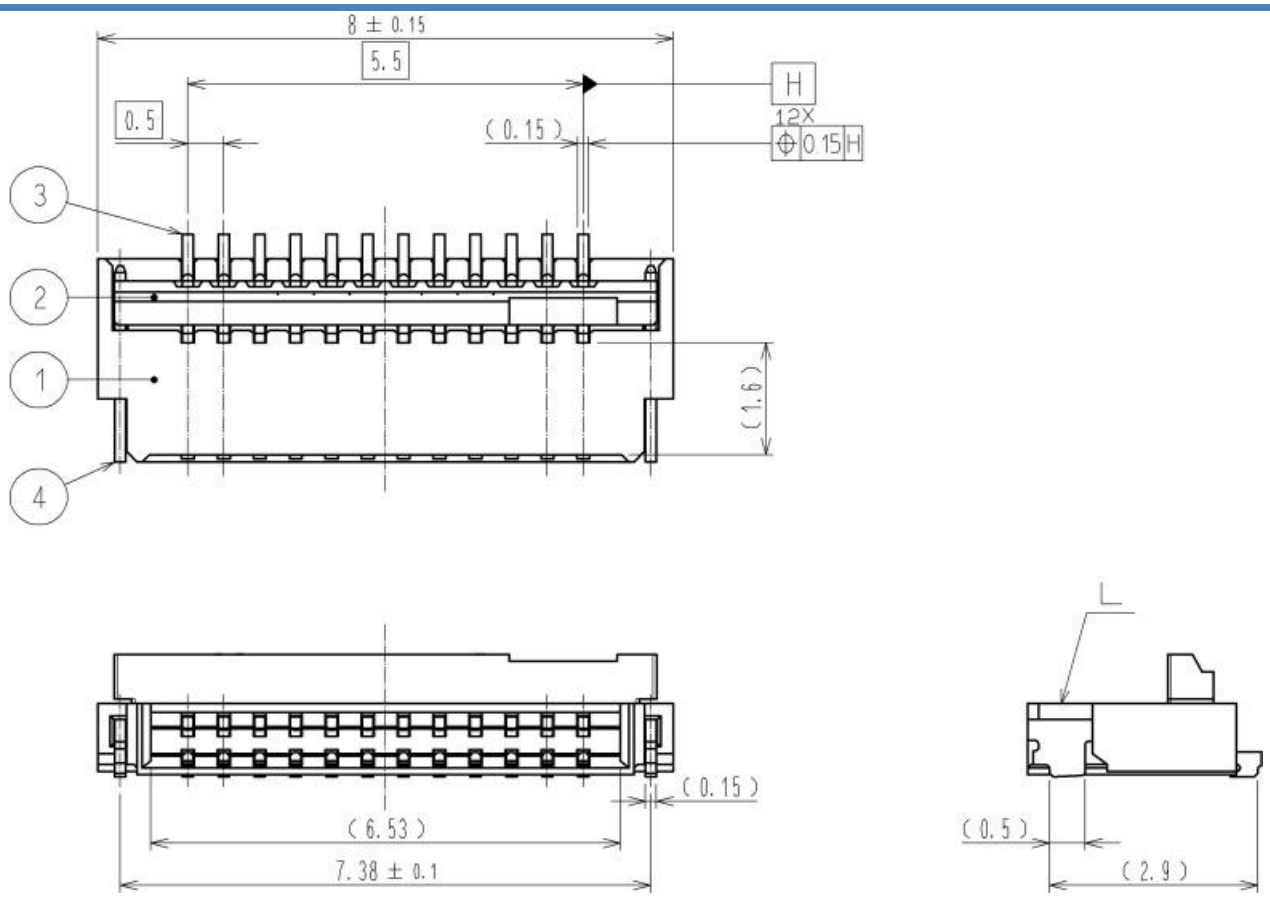
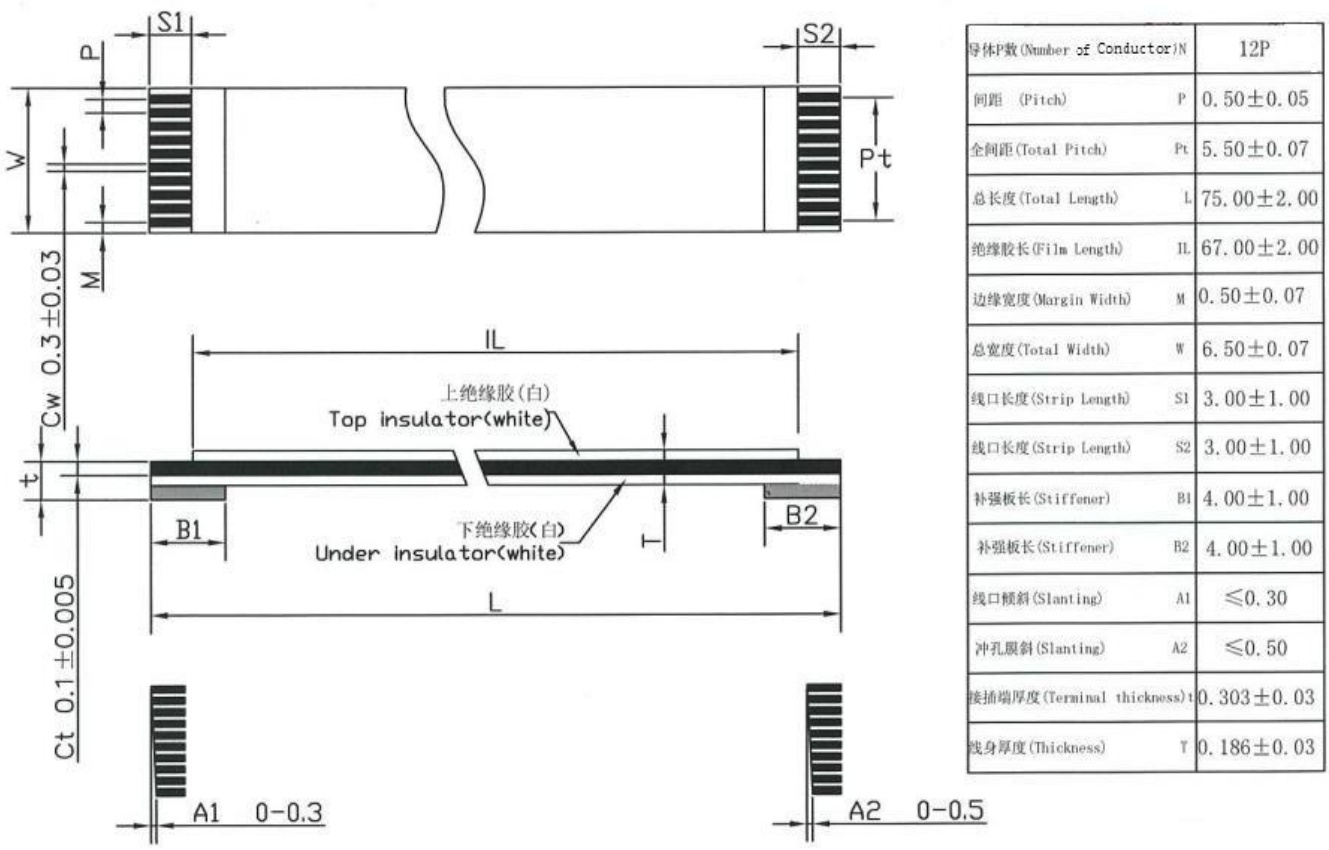


Figure 4-2

12-PIN Cable

The 12-PIN cable corresponds to the 12-PIN FPC holder used to connect to the user's device, and the specifications are described in Figure 4-3 .



导体P数(Number of Conductor)	N	12P
间距 (Pitch)	P	0.50±0.05
全间距(Total Pitch)	Pt	5.50±0.07
总长度(Total Length)	L	75.00±2.00
绝缘胶长(Film Length)	IL	67.00±2.00
边缘宽度(Margin Width)	M	0.50±0.07
总宽度(Total Width)	W	6.50±0.07
线口长度(Strip Length)	S1	3.00±1.00
线口长度(Strip Length)	S2	3.00±1.00
补强板长(Stiffener)	B1	4.00±1.00
补强板长(Stiffener)	B2	4.00±1.00
线口倾斜(Slanting)	A1	≤0.30
冲孔膜斜(Slanting)	A2	≤0.50
接插端厚度(Terminal thickness)	t	0.303±0.03
线身厚度(Thickness)	T	0.186±0.03

Figure 4-3

Chapter 5 External Reference Circuits

External Circuit Reference Design

Read Success LED Indication Reference Circuit Figure 5-1 provides the reference design of the external circuit for the LED indication to implement the LED indication function for read success. The LED signal in the figure is derived from PIN 10 on the 12 PIN-FPC. VDD depends on the scenario used by the customer.

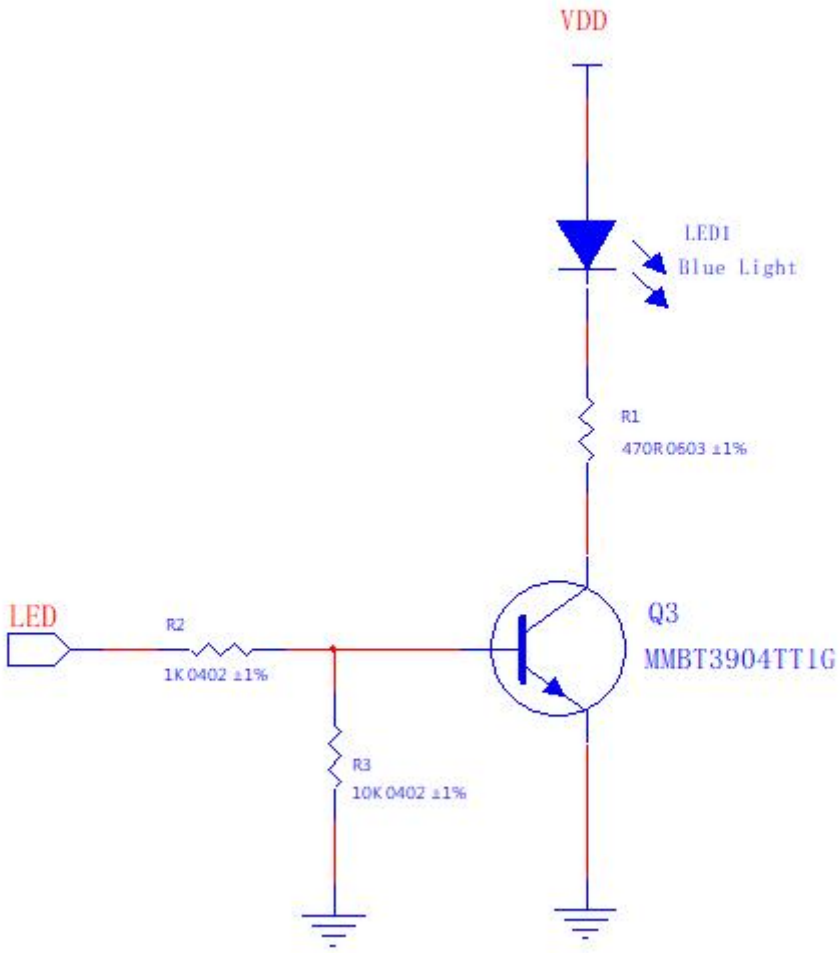


Figure 5-1

Buzzer Reference Circuit

Figure 5-2 provides the external circuit reference design of the buzzer for implementing the buzzer sounding function. The application simply uses the following reference design with the BUZ signal coming from Pin 9 on the 12 PIN-FPC holder. vdd is dependent on the scenario used by the customer.

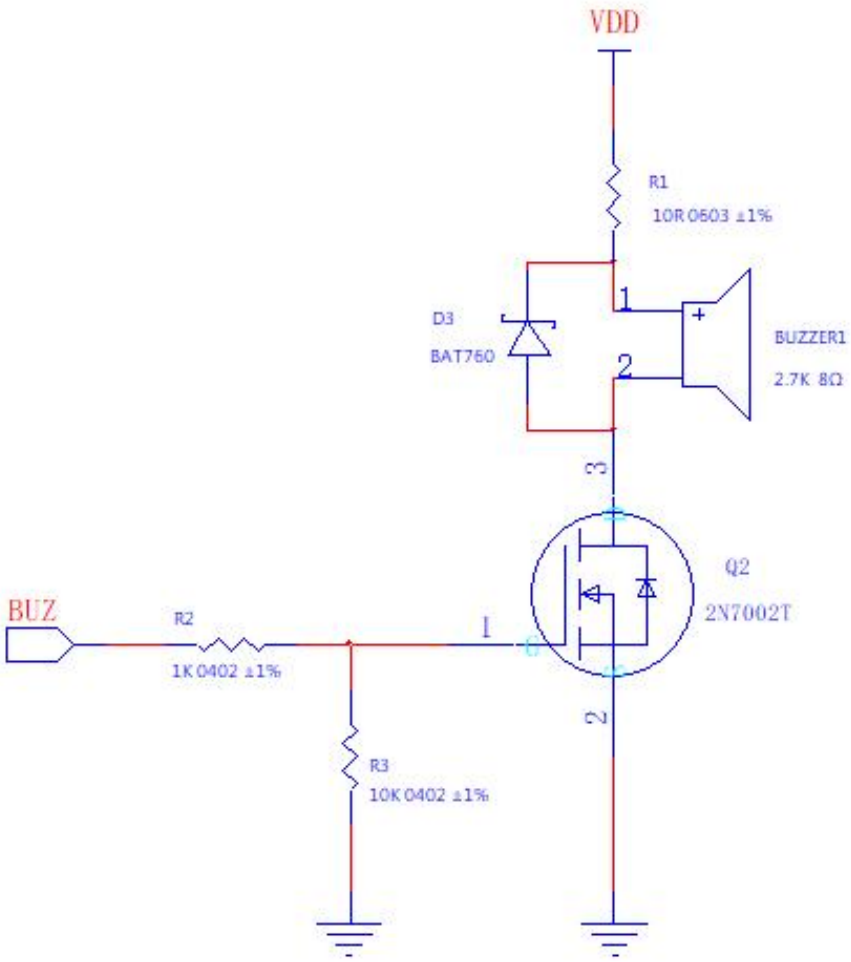


Figure 5-2

Trigger Function Reference Circuit

Figure 5-3 provides an external circuit reference design for the trigger function to provide a valid trigger signal level to the E2100 to generate a read action. The following reference design can be used in the application, with the trigger signal connected to PIN 12 on the 12 PIN-FPC.

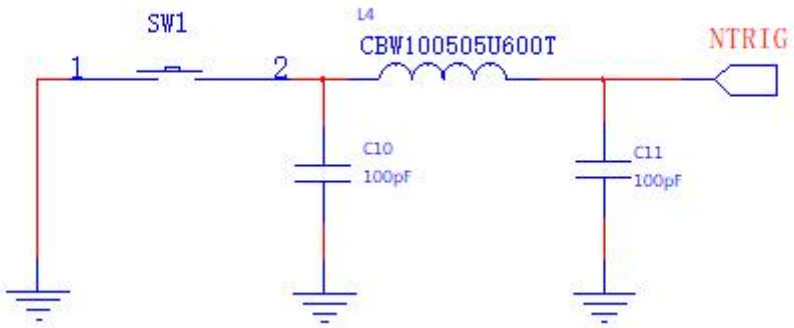


Figure 5-3

Chapter 6 Supporting development tools

Introduction

The E2100 has both hardware-assisted and software-assisted tools to quickly support application development. Both meet the need for rapid evaluation and development, as well as rapid functional configuration and deployment for specific applications.

Scan Engine Development Board

The EVK includes a buzzer and its driver circuit, an LED prompt and its driver circuit, a trigger button, a reset button, a TTL-232 to RS-232 and interface, and a TTL-232 to USB and interface. Users can install the E2100 on the EVK and use the same side 12-pin flexible cable to connect, and can choose to use USB connection or RS-232 connection for the host computer.