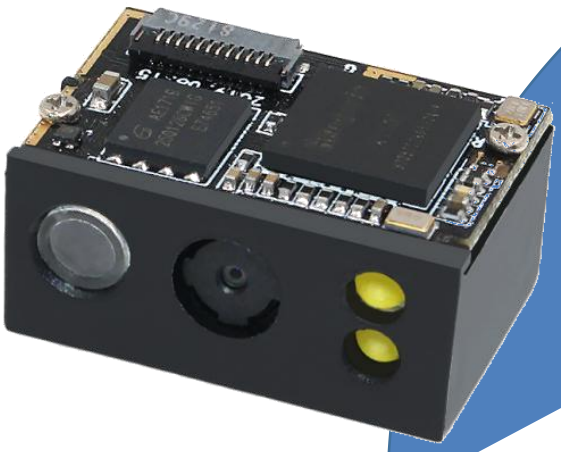
YidaScan

ES20 OEM Scan Engine

Integration Guide



About This User Guide

Please read all the content of the user guide carefully to use the products safely and effectively. You are advised of keeping it properly for your using reference.

Disclaimer

Please do not dismantle the product or tear up the seal on it, otherwise we won't provide warranty or replacement service.

The pictures in this user guide are for reference only. If there are any pictures which not match the actual product, please take actual products as the standard. Updated information is subject to change without notice.

Service Information

For technical assistant or product service and repair, please contact YidaScan. Visit our website to learn more: www.yidascan.com

Revision

Version	Description	Date
V1.0.1	Initial Release	2021.08.18
V1.2		2021.09.17

Table of Content

About the Manual

Introduction

The ES20 barcode reading engine uses the world's leading intelligent image recognition technology to combine advanced image recognition algorithms with advanced chip design and manufacturing technology, which greatly simplifies the design difficulty of one-dimensional barcode reading products and establishes one-dimensional images. An excellent benchmark for high performance, high reliability and low power consumption.

Symbologies

1D	(Codabar)、(Code 39)、(Code 32)、(Interleaved 2 of 5)、(Industrial 2 of 5)、(Matrix 2 of 5)、(Code 93)、(Code 11)、(Code 128)、(GS1-128)、(ISBT 128)、(UPC-A)、(UPC-E)，(EAN/JAN-8)、(EAN/JAN-13)、(GS1 DataBar(RSS14))、(Standard 2 of 5)、(Qlessey)、(Msiplessey)
2D	(PDF417)、(Micro PDF417)、(QR Code)、(Micro QR)、(Data Matrix)、(Aztec)、(Hanxi code)

Aimer

The ES20's aiming is to aim with a red strip of red light, white illumination.

Chapter Description

《Chapter1 About ES20 》	Gives a general description
《Chapter2 Installation》	Describes how to install the engine, including installation information, housing design, optical, grounding, ESD, and environmental considerations.
《Chater3 Electrical Specification》	Includes the electrical characteristics for the engine and timing sequences.
《Chapter4 Interface》	Includes interface pinout and connector specifications.
《Chapter5 External Circuit》	Provide external driver circuit diagrams.
《Chapter6 Development Kit》	

Explanation of Icons

- This symbol indicates lists of required steps

※ This symbol indicates something important to the readers. Failure to read the notice will not lead to harm to the reader, device or data.

⚠ This symbol indicates caution that, if ignored, may cause data or device damage or even personal injury.

Chapter1 About ES20

Introduction

The ES20 includes an aiming LED and an illumination LED. LED Compliance Statement

The ES20 complies with IEC 62471:2006 for LED safety.

The ES20 contains:

- a CMOS image sensor and its lens
- two LED based illumination system
- an LED aiming system

The ES20 can be connected to a host device via its 12-pin FPC connector. For more information about this connector, please see Chapter 4.

Illumination

The ES20 has two white LEDs for supplementary lighting, making it possible to scan barcodes even in complete darkness. The illumination can be programmed On or Off.

Aimer

The ES20 contains a red LED aimer to help the user to easily position the target barcode within the engine's field of view to increase scan efficiency. The aiming pattern can be turned On or Off.

Chapter2 Installation

Introduction

This chapter explains how to install the ES20, including general requirements, housing design, and physical and optical information

⚠Caution: Do not touch the imaging lens when installing the engine. Be careful not to leave fingerprints on the lens.

⚠Caution: Do not touch the illumination LED during handling. Improper handling may damage the LED.

General Requirement

ESD

ESD protection has been taken into account when designing the ES20. However, due to limited board space, additional ESD protection, such as TVS protection, is not provided on the engine's I/O interface. It is advised to take corresponding protection measures when integrating the engine. The engine is shipped in ESD safe packaging. Always exercise care when handling the engine outside its package. Be sure grounding wrist straps and properly grounded work areas are used.

Hot Swap

Due to limited board space, additional hot swap protection is not provided on the engine's I/O interface. It is advised to connect or disconnect the FPC or FFC without power.

Dust and Dirt

The ES20 must be sufficiently enclosed to prevent dust particles from gathering on the lens and circuit board. Dust and other external contaminants will eventually degrade the engine's performance

Environment

The following environmental requirements should be met to ensure good performance of the ES20.

Table2-1

Operating Temperature	-10℃ to +60℃
Storage Temperature	-40℃ to +70℃
Humidity	5% ~95% (non-condensing)

Thermal Consideration

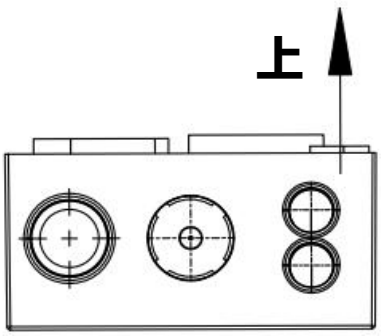
Electronic components in the ES20 will generate heat during the course of their operation. Operating the ES20 in continuous mode for an extended period may cause temperatures to rise on CPU, CIS, LEDs, DC-DC, etc. Overheating can degrade image quality and affect scanning performance. Given that, the following precautions should be taken into consideration when integrating the ES20:

- Reserve sufficient space for good air circulation in the design.
- Avoid wrapping the N1 with thermal insulation materials such as rubber.

External Optical Elements

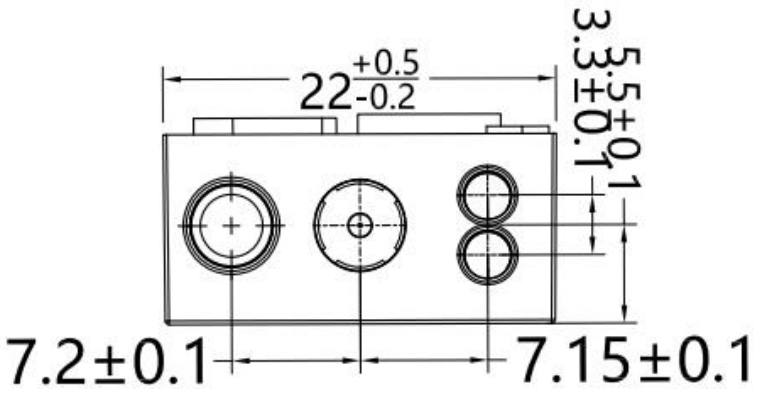
Do not subject external optical components on the engine to any external force. Do not hold the engine by an external optical component, which may cause the mechanical joints that secure the components to crack or break due to excessive stress.

Mounting



figure

The illustrations below show the mechanical mounting dimensions (unit: mm) for the ES20



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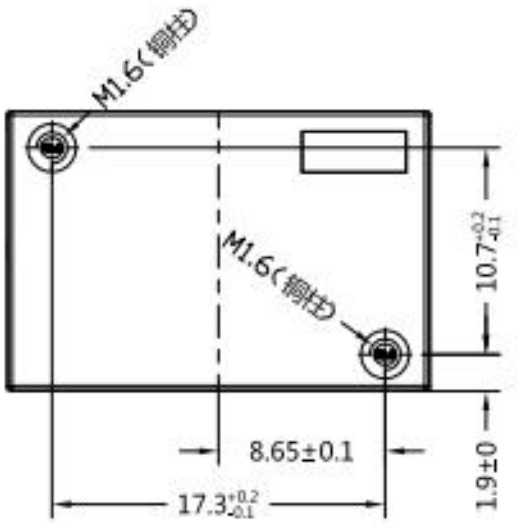

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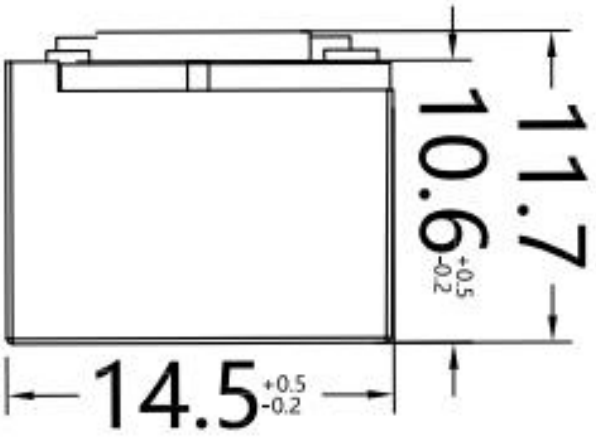


figure

Housing Design

※Note: Conduct an optical analysis for the housing design to ensure optimal scanning and imaging performance.

Housing design should make sure that internal reflections from the aiming and illumination system are not directed back to the engine. The reflections from the housing or window can cause problems. Avoid any highly reflective objects around the engine that can cause bright spots to appear in the captured image. It is recommended to use baffles or matte-finished dark internal housing colors.

Optics

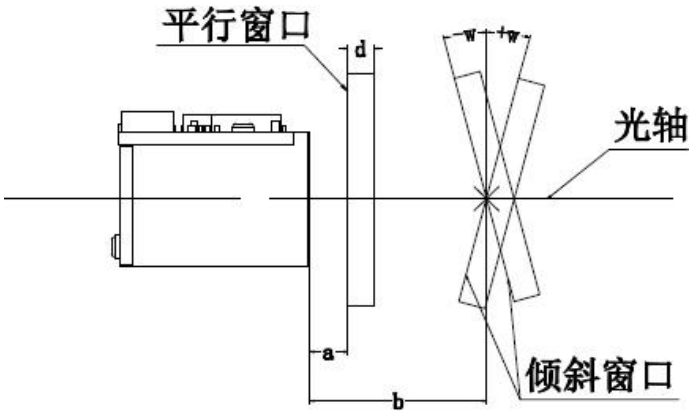
The ES20 uses a sophisticated optical system. An improperly designed internal housing or improper selection of window material can degrade the engine's performance.

Window Placement

The window should be positioned properly to let the illumination and aiming beams pass through as much as possible and no reflections back into the engine (reflections can degrade the reading performance of the engine). There are two window placement options.

• Parallel window – Primary option for imager engines. The following window distance requirements should be satisfied: The maximum distance is measured from the front of the engine housing to the furthest surface of the window. In order to reach better reading performance, the distance from the front of the engine housing to the nearest surface of the window should not exceed a (a=0.1mm) and the distance from the front of the engine housing to the furthest surface of the window should not exceed a+d (a=0.1mm, d=2mm), as shown in Figure 2-5.

• Tilted window - This option is for laser/imager engines. For the tilted window distance requirements, please see Table below.



figure

Minimum Angle(Tilted Window)	Distance from the front of the engine housing (b)			
	5mm	10mm	15mm	20mm
Uncoated, minimum window positive tilt (+w)	30°	25°	22°	18°
Uncoated, minimum window negative tilt (-w)				
AR coated, minimum window positive tilt (+w)	25°	22°	20°	16°
AR coated, minimum window negative tilt (-w)				
AR coated, 2 windows, minimum window positive tilt (+w)	22°	20°	18°	15°
AR coated, 2 windows, minimum window negative tilt (-w)				

Window Material and Color

Window material must be clear. Use only cell-cast plastics or optical glass. PMMA and chemically tempered glass are recommended. Window material selected for the engine should meet or exceed the specifications specified in Table 2-3. When using a clear plastic window, it is recommended to apply anti-reflection (AR) coating on it.

Table 2-3

Specification	Description
Thickness	0.8-2.0mm
Light Wave	PV within 0.2λ; RMS within 0.04λ;
Clear Aperture	1.0mm to edges
Surface Quality	60-20 scratch/dig

Pay extra attention to the light wavelength when using plastic materials. Colored windows are not recommended if the engine is used to scan barcodes on moving objects.

PMMA

When fabricated by cell-casting, has very good optical quality and low initial cost, but surface must be protected from the environment due to its susceptibility to attack by chemcials, mechanical stresses, and UV light. Reasonably good impact resistance.

Chemically Tmperated

Glass is a hard material which provides excellent scratch and abrasion resistance. But unannealed glass is brittle. Increased flexibility strength with minimal optical distortion requires chemical tempering. Glass is hard to be cut into odd shapes and cannot be ultrasonically welded.

Coating and Scratch Resistance

Scratch Resistance Coating

Scratch on the window can greatly reduce engine performance. It is suggested to use abrasion resistant window material or coating.

Chapter3 Electrical Specifications

Power Supply

Do not power up the ES20 until it is properly connected. Be sure the power is cut off before connecting a cable to or disconnecting a cable from the host interface connector.

Hot-plugging could damage the engine. Unstable power supply or sharp voltage drops or unreasonably short interval between power-ons may lead to unstable performance of the engine. Do not resupply the power immediately after cutting it off.

Ripple Noise

To ensure the image quality, a power supply with low ripple noise is needed. Acceptable ripple range (peak-to-peak) :≤80mV

DC Characters

Operating Voltage/Current

Table 3-1 (T=23℃)

Parameter	Description	Minimum	Typical	Maximum	Unit
Operating Voltage	VIN（12 PIN-FPC ）	3.13	3.30	3.46	V
Current(@3.3V)	Operating Current	-	245	320	mA
	Idle Current	-	30	-	mA

I/O Voltage

Table 3-2 (VDD=3.3V, GND=0V, T=23°C)

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

Power Up Timing Sequence

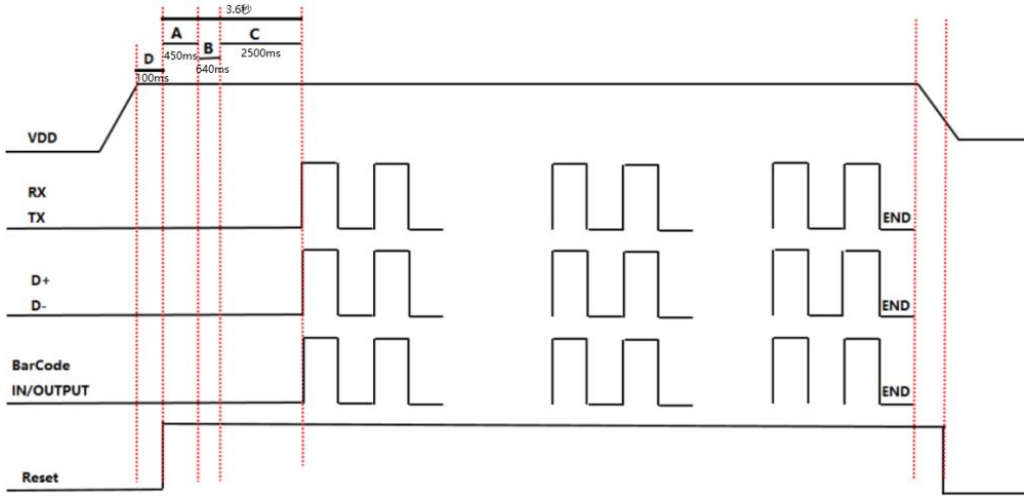


Table 3-2

In the diagram above, it takes A+B+C (about 3.6 seconds) for the engine to power up: A is bootloader execution time (450ms), B is kernel boot time (640ms) and C is decoding chip initialization time(2500ms).

2. D is reset time (100ms). If the Reset signal is not operated when powered on, the startup time should be calculated after VCC_3V3 reaches 3.3V.

3. Ensure that all communication interface data has been transmitted before powering off.

Chapter4 Interface

Interface Pinouts

The physical interface of the ES20 consists of a 12-pin FPC connector: • 12-pin FPC connector can be used as TTL-232 interface or USB interface. The figure below illustrates the position of the connector on the ES20, as well as the pin 1.

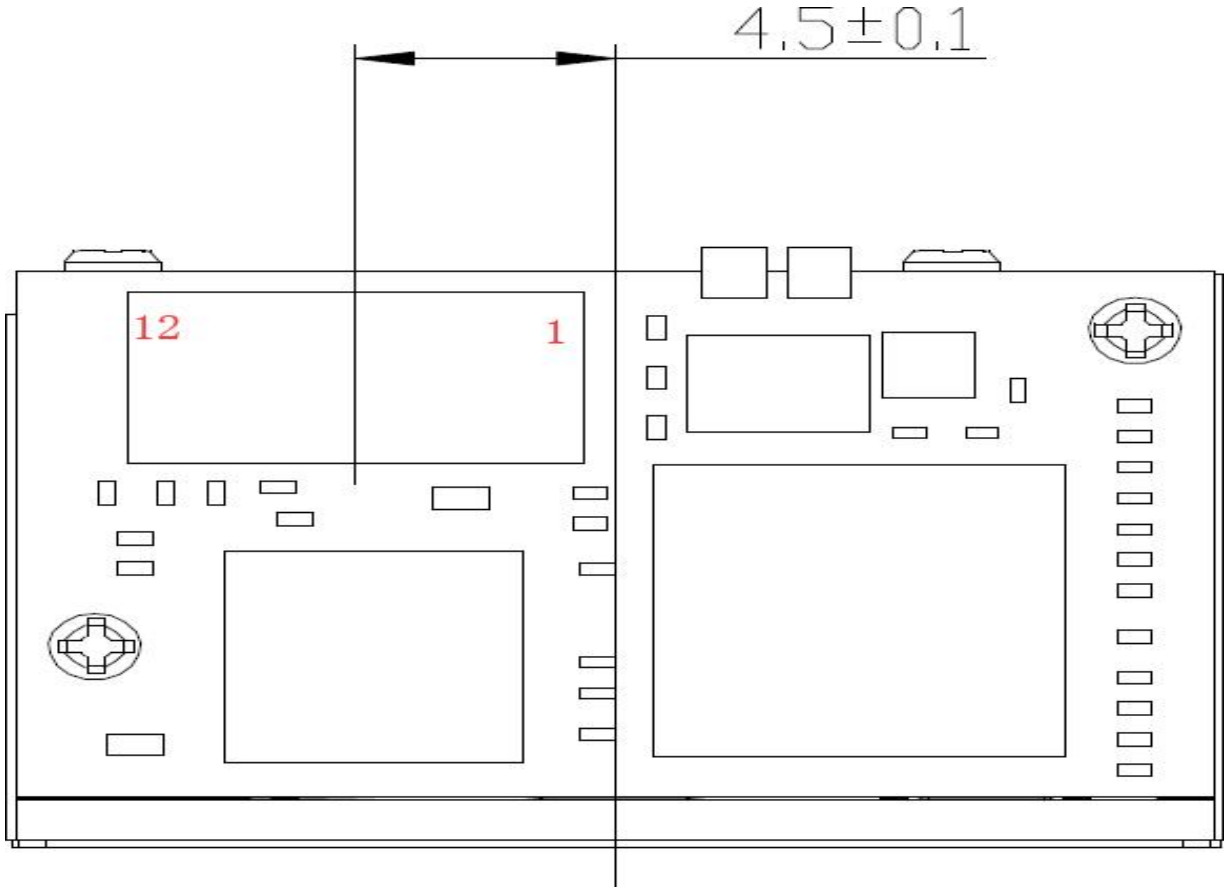


figure 4-1

12-PIN FPC Connector

I = Input，O = Output.

Table 4-1

PIN#	Signal Name	I/O 类型	Function
1	NC	-	Not Connected
2	VIN	-	3.3V power supply
3	GND	-	Power-supply Ground
4	RXD	I	TTL level 232 receive data
5	TXD	O	TTL level 232 transmit data
6	USB_DN	I/O	USB D-Signal
7	USB_DP	I/O	USB D+Signal
8	PIN 8	-	Not Connected
9	Buz	O	Beeper output
10	LED	O	LED Output
11	nRESET	I	Reset signal input
12	nTRIG	I	Trigger signal input

Connector Specification

12-PIN FPC Connector

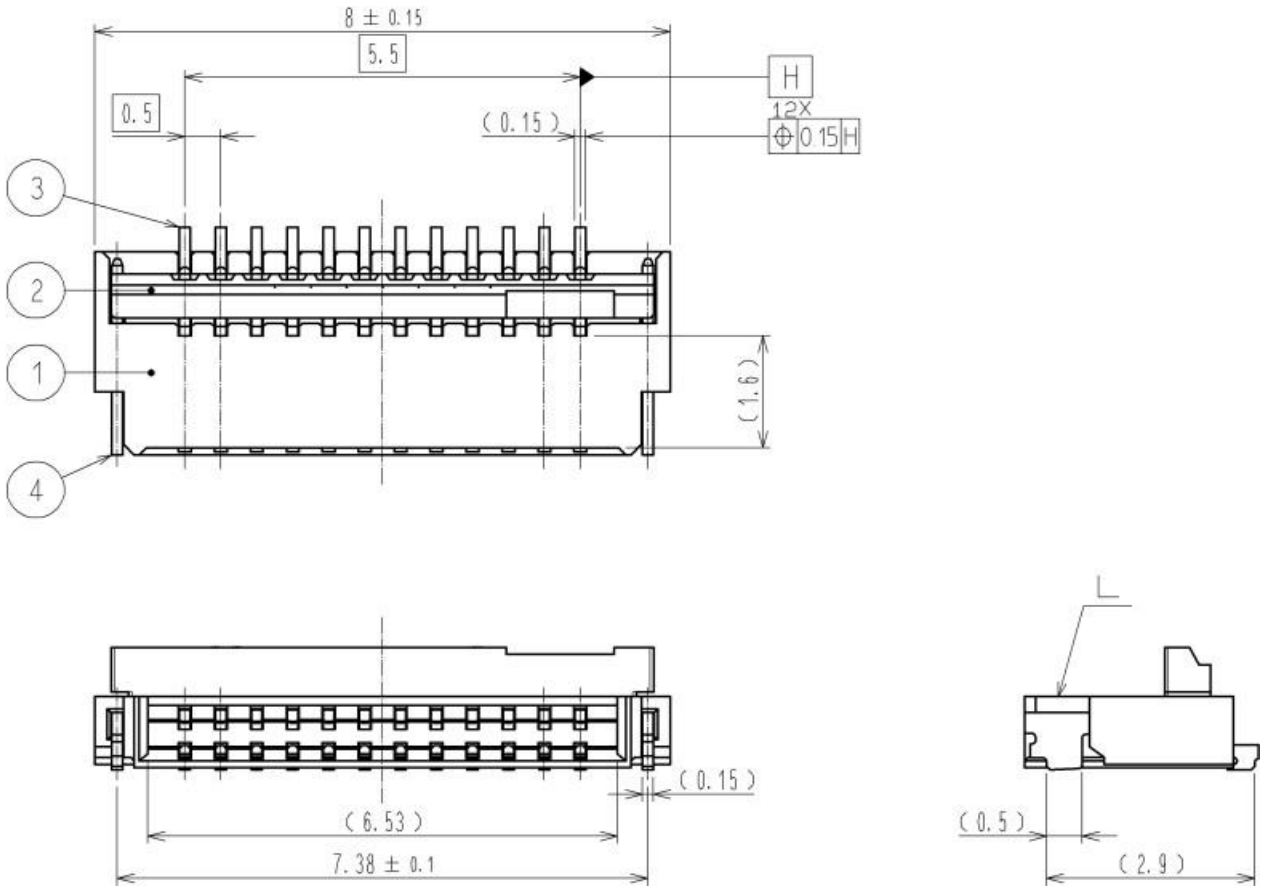
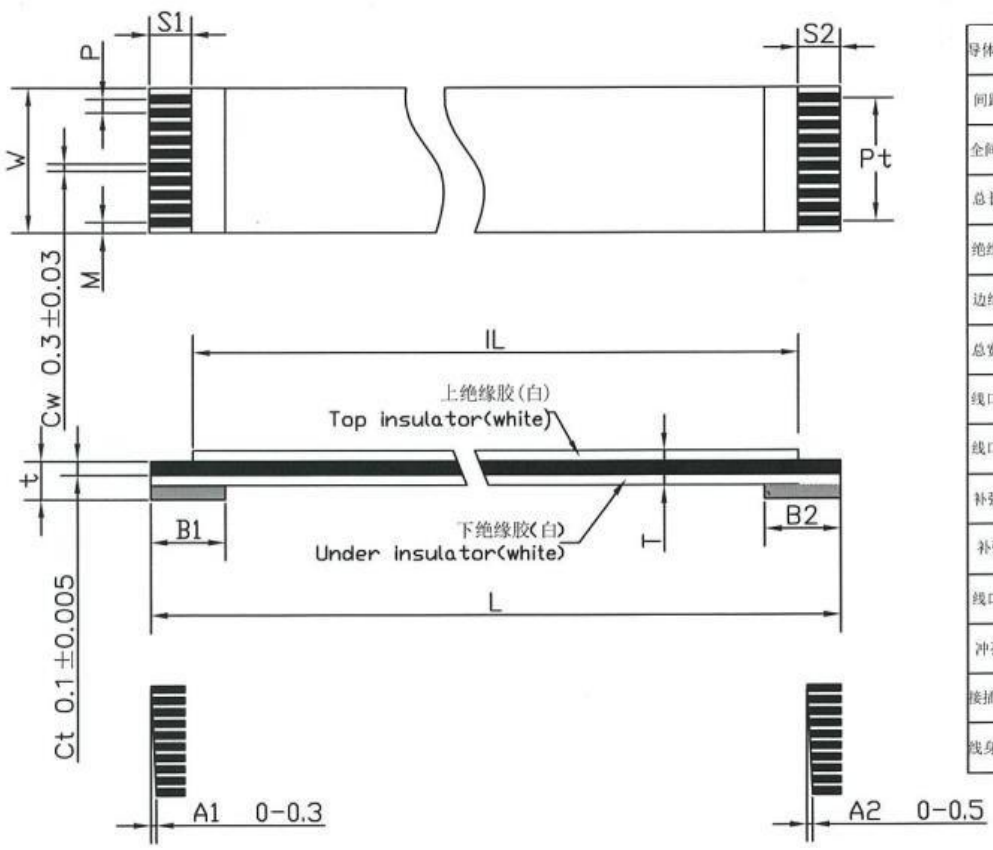


figure 4-2

12-PIN Cable



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

Chapter5 External Reference Circuit

External Circuit Design

Good Read LED Circuit

The circuit below is used to drive an external LED for indicating good read. The nGoodRead signal is from PIN 10 of the 12-pin FPC connector

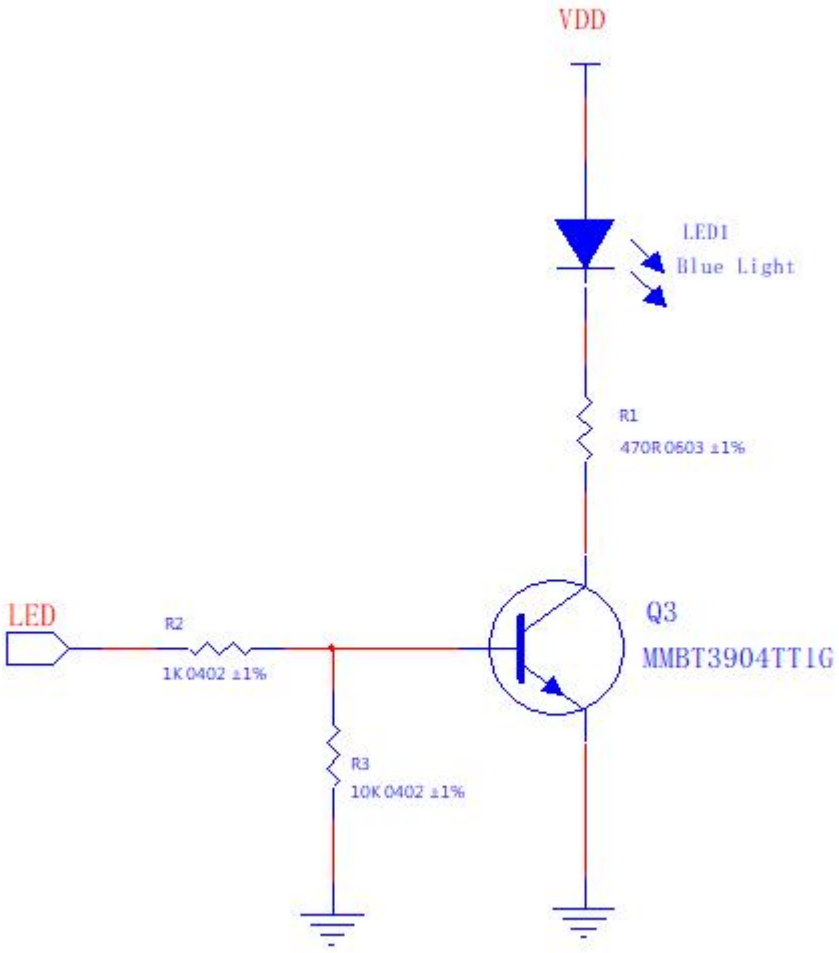


figure 5-1

Beeper Circuit

The circuit below is used to drive an external beeper. The nBEEPER signal is from PIN 5 of the 13-pin FPC connector.

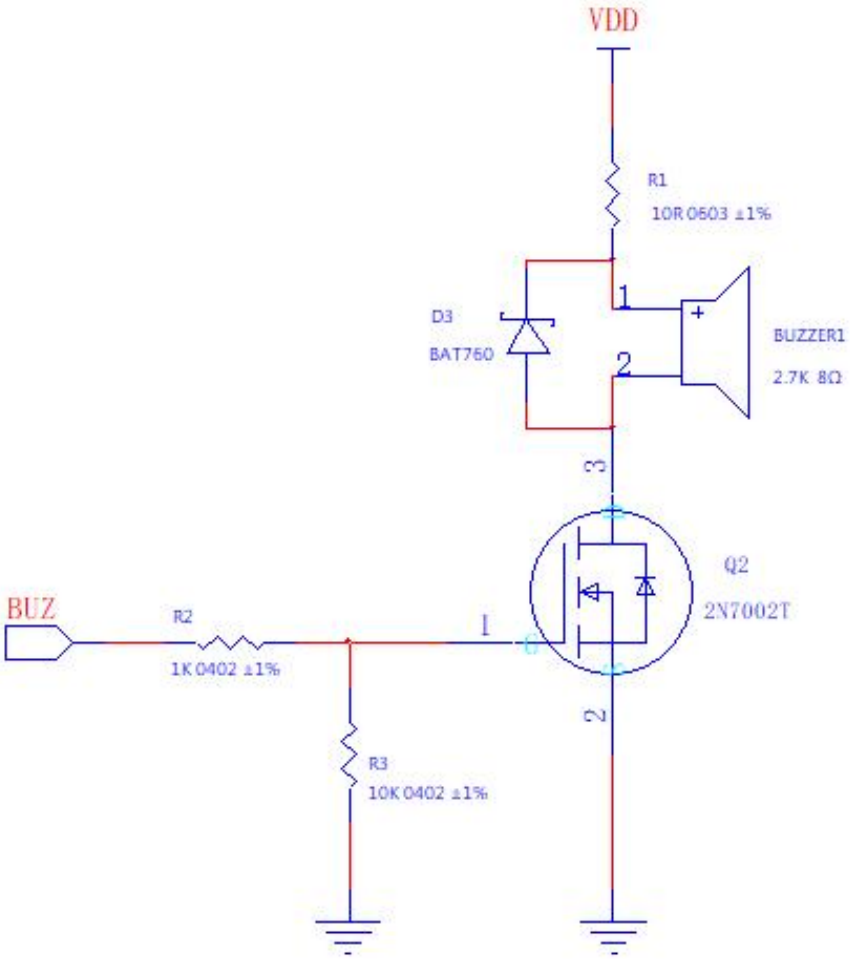


figure 5-2

Trigger Circuit

The circuit below is used to provide the engine with a signal to trigger a scan and decode session. The nTRIG signal is from PIN 12 of the 12-pin FPC connecto:

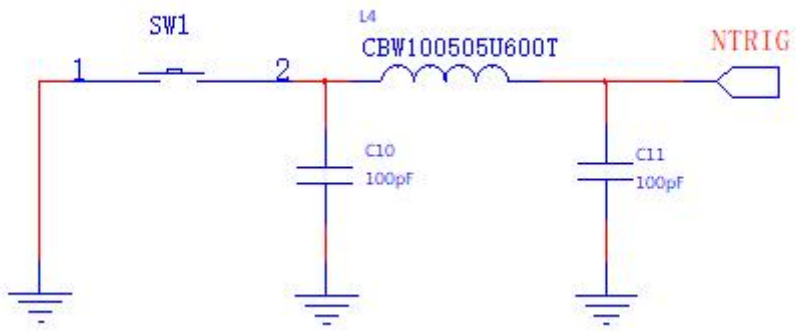


figure 5-3

Reset Circuit

The circuit below is used to provide the engine with a signal to reset. The nRESET signal is from ES20 of the 12-pin FPC connector. The low-level effective pulse width of the nRESET signal is not less than 300us, and the RESET signal can come from the GPIO of the host computer.:

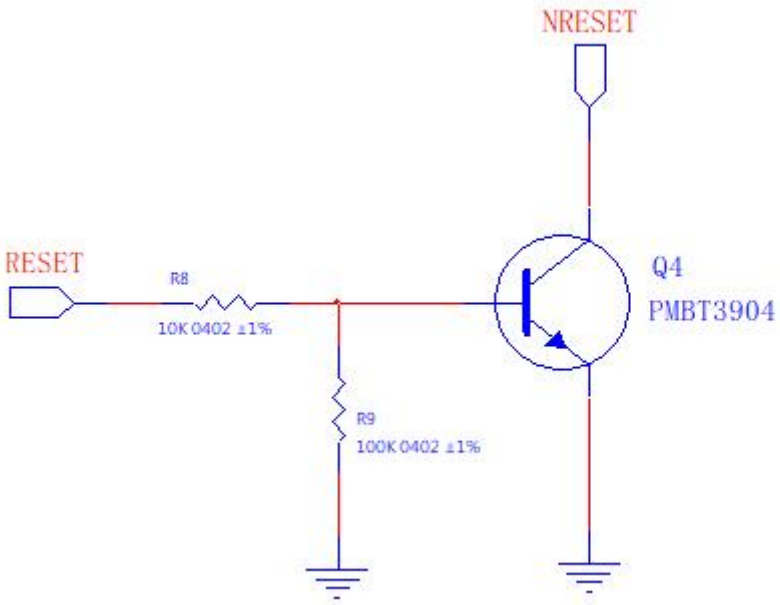


figure 5-4

Chapter6 Development Kit

The ES20 provides the following the development kit tool to assist users in engine performance evaluation and application development.

EVK

The EVK is provided to help users to test and evaluate the ES20, which contains beeper & beeper driver circuit, LED & LED driver circuit, and trigger, TTL-232 to RS-232 converter, RS-232 & USB interfaces, reserved signal debugging interface, etc.