Product Specification

For Model : SK-2010
RF Wireless Mouse/ Receiver

Doc. No.:
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Department: HIS, WBU
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Silitek Corporation

Approval	Checked by	Prepared by
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1. GENERAL DESCRIPTION

The SM-2010 is a RF wireless product ,it support 3D Mouse function designed for the Standard USB interface to PC computer and it' s compatibles, especially the compact designed for Notebook computer. The operation characteristics of receiver is compatible with Low Power USB interface requirements and USB specification version 1.1.

This RF Mouse product consists of both Mouse transmitter and USB Receiver .They are designed with advance RF technology of 2.4GH transmission frequency band between device communication.

There have a compact and ergonomic designed in the product new function ,including thumb size of compact style and pure wireless that has no external explored antenna designed of receiver.

RF technology is one of the special designed of the product ,the Radio Frequency designed in this product is FSK 2.4GHz .There have a high performance in field operation of usage that can be used in a range of up to 10 feet at any directions around the receiver. Also, it offer a RF multi-channel supporting up to 32 channels that means more this RF products are able to be used respectively with different PC system in a nearby area at same while.

The mouse buttons provide tactile and audible feedback , and can be easily actuated without affecting the position of the mouse . The mouse ball mechanism can be easily accessed for cleaning without special tools. It' s 400 dots-per-inch (DPI) opto-mechanical encoder gives reliable control and accuracy. The mouse' s **3D** scrolling design , scroll wheel, lets you scroll up and down as desired under browsing documents.

The product also have some excellent designed with low power consumption such sleep mode and idle mode for save power, it' s operated with two R03 AAA batteries for mouse. The receiver have two LED indicators that for indicating at low battery power operating or receiving data..

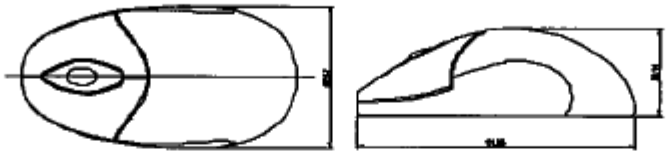
With numerous amazing functions and ergonomic design , the RF Mouse may offer user the best of usage and most convenience.

2. Mechanical Specifications

The following sections explain the physical specifications for product.

2.1 RF Mouse Transmitter :

Mouse Drawing:



Size and Weight of RF mouse :

Length 121.56 mm
Width 62.47 mm
Height 38.14 mm
Weight 96.9 gm ± 25 gm

Materials and Color of RF mouse:

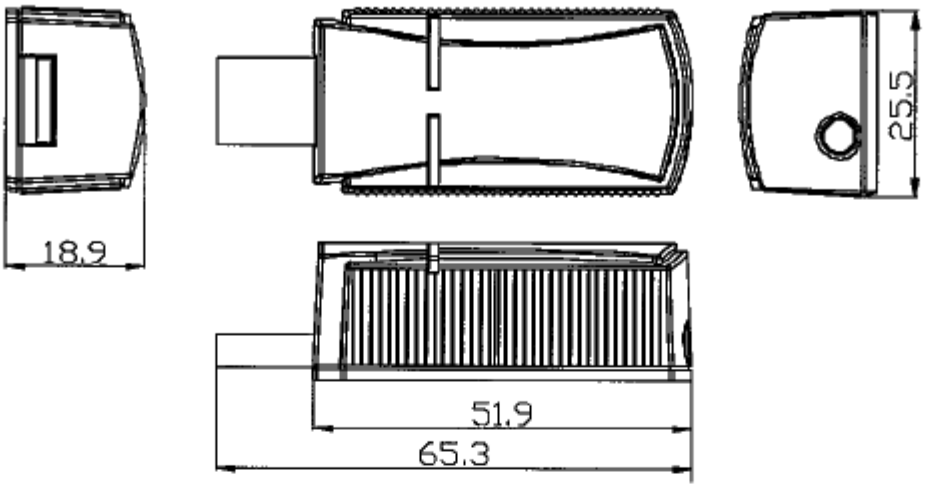
Top case	ABS 94 HB /Silver
Bottom case	ABS 94 HB /Silver
Right /Left button	ABS 94 HB /Dark Gary
Mouse ball cover	ABS 94 HB /Silver
Scroll wheel	Rubber /Gary
Channel Button	HI-PS 94 HB /Silver
Mouse ball	Rubber /Gary
Foot pad	Pom/White
Battery Cover	ABS 94 HB /Silver

2.2 RF Mouse Receiver

Size and Weight of RF Receiver :

Length 65.3mm
Width 25.5mm
Height 18.9mm
Weight 19 gm +/- 5gm

Receiver Drawing :



Materials and Color of Receiver:

Upper Case	ABS 94 HB /Silver
Lower Case	ABS 94 HB /Silver
Side handle case	ABS 94 HB /Dark Gary
Channel Button	ABS 94 HB /Silver
Led Lens	ACRYLIC

2.3 Packed Dimensions and Weight

Package :

Gift Box Contain : RF mouse/RF Receiver + PVC cover +Gift box

Carton Package Contain : 20 units G/B per carton packing

Dimensions: (Tolerance : ± 3 mm)

	Length	Width	Height
Gift box packing	165 mm	58 mm	223 mm
Carton packing	465mm	305 mm	350 mm

Weight:

Carton packing 8.0+/- 0.2 Kg (N.W)
9.5 +/- 0.2 Kg (G.W)

3. Electrical Specification

3.1 Mouse Operational Specifications

The following sections explain the operational specifications for mouse transmitter.

3.1.1 Tracking Engine & Controller Technology

Encoder

400 dots-per-inch opto-mechanical

Controller

3D USB interface Microcontroller IC.

Tracking Resolution

400 dots-per-inch in both *X*- and *Y*- axis.

3.1.2 Button Assembly

Switch Actuation Force

50 - 100 gram force

Minimum Actuation per Switch

500,000 actuation

Audible / Tactile Feedback

Yes

3.1.3 Wheel Assembly

Minimum turns

200,000 turns

3.1.4 Environmental

Operating Temperature Range

+ 5 to +45℃ at 10% to 85% relative humidity (non-condensing)

Storage Temperature Range

-20 to +70℃ at 10% to 85% relative humidity (non-condensing)

3.1.5 Electrical Specifications

Power

Operation Voltage : +DC 3V

Battery Type : AAA * 2 Pcs

Battery Consumption and Life

Operation Mode	14mA
Stand-by Mode	1mA
Sleeping Mode	0.2mA

Field Operation Features

RF Mouse operation distance is 10 feet .

Operation angle is 360°

Channel selectable

Thirty-two channels selectable by push button switch .

3.1.6 Electrostatic Discharge (ESD) Sensitivity

Tested to IEC 1000-4-2 for Electrostatic discharge.

Direct discharge:

Test Voltage : Not less than 8 KV for Air discharge

Not less than 4 KV for Contact discharge

Indirect discharge:

Test Voltage : Not less than 4 KV for HCP

Not less than 4 KV for VCP

3.1.7 Mouse Function Descriptions / Data Format :

Anytime the RF mouse changes its state , including the key_switches and the photo_couple sensors,it will detect the result and transmit to USB Interface

Mouse transmits the result with three bytes in 1.5 M bps . Each byte contains 8 bits The first byte represents the key_switches status , The second byte denotes the number counted by the horizontal counter ,The third byte conveys the number accumulated by the vertical counter.

Output bytes arrange

bit no.	7	6	5	4	3	2	1	0
1st byte	0	0	0	0	0	BM	BR	BL
2nd byte	X7	X6	X5	X4	X3	X2	X1	X0
3rd byte	Y7	Y6	Y5	Y4	Y3	Y2	Y1	Y0
4th byte	Z7	Z6	Z5	Z4	Z3	Z2	Z1	Z0

3.2 Electrical Specification of Mouse Receiver

3.2.1 Operating voltage

Power supply ,bus power from PC: 5+/-0.25 VDC

With ripple lower than 150mv, and capable of supply load current up to maximum with voltage drop less than 0.25 VDC

3.2.2 Current consumption

Typical current 36mA.

Wait for receiving data : 33mA.

Maximum current consumption : 50 mA

3.2.3 Power consumption

Under normal operation, the power consumption of total unit will be less than 0.2 Watt.

3.2.4 Signal timing and level

Level and timing of signals presented on data and clock Pins are compatible with both TTL or MOS termination on the host PC motherboard.

3.2.5 USB connector

4 pin A-type standard USB connector.

Compatible with USB spec V1.1.

3.2.6 LED indicators

There are two dual color LEDs on the two side of receiver ,they are designed with a Parallel connected and performing same function at same moment.

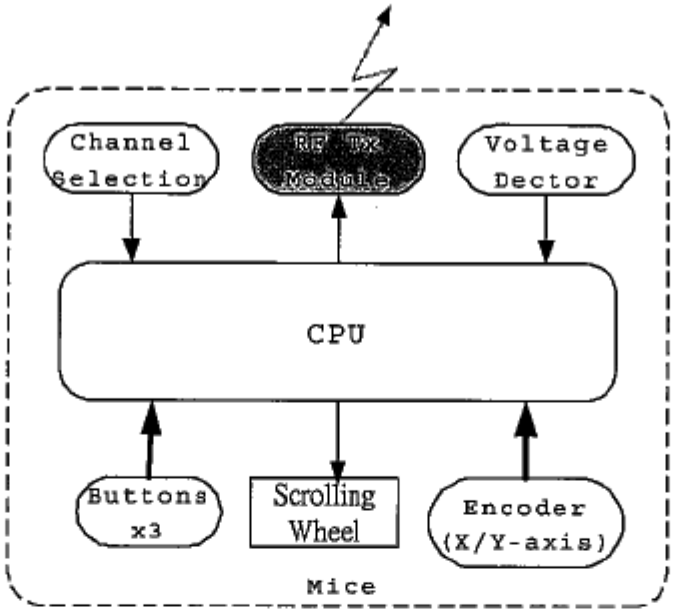
They will be flashing "green light" at same moment when receiving data and lit up "red light" when the mouse transmitter is operating at low battery power. Also they will be flashing "green light" slowly while channel selection.

3.2.7 PCB Assembly

Microprocessor Cypress 63743-24 pin and ATMEL 256 EEROM are applied.

The module is placed on top of PCB board. .

3.3 Function description



Block Diagram of Mice

3.3.1 RF Function Design

Control Chip and EEPROM

CPU: EM78P447SA (ELAN Microelectronics CORP.) for TX.

Cypress 63743-for RX

EEPROM: using ATC24C02 on RX, record the Channel No. and Device ID (Optional).

3.3.1.1 Channel and ID numbers

Multi-Channel : 32 channels are offered, from channel " 0" to channel " 31".

ID: There are 256 ID are offered, from binary digit 000000000 to 11111111 .

Note: The ID indication is to prevent one transmitter controlling more than one receiver when more than one set device are in the same channel.

Channel and ID default setting

	Channel	ID
Default value	0	0

Note: It have to be preset as default in the manufacturing process for finish goods setting before delivery

3.3.1.2 Power-on Setting

For Receiver : In order to reset the contents in the EPROM, user should press the C/S. button before connecting with PC host for use.

The "red light" indicator will be turn on during it in progressing of power on setting , will be turn OFF immediately after completed initialization setting, and the C/S button could be released.

For Transmitter : Just need to Remove batteries and reinstall.

**Manufacturer Note*--- Channel default setting

(It' s have to be done in manufacturing process of product before packaging)

RX : While pressing the C/S button, plug in the USB connector to the system and finish doing default setting.

TX : there is no need to reset.

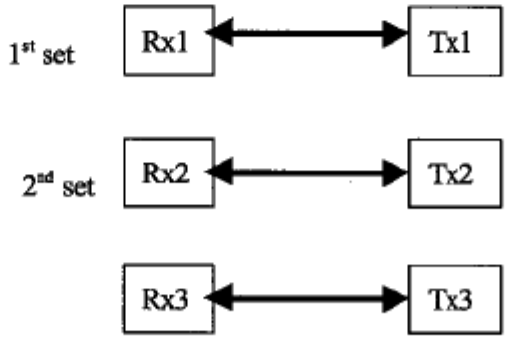
3.3.1.3 Channel Change

Initial use : Only one set of Mouse with the Receiver and channel is in the default setting ,no manual setting is required

Occasion : When there is interference suspected or want to configure more than one PC working station in nearby area at same while..

Procedure: Press the C/S channel button on the TX once for channel change. The RX receiver will be changed into new channel automatically. (The Data LED indicating on the RX flashes quickly and turns off when setting completed.)

The other case: For more than one set of same devices within available transmission distance



Follow the setting step shown below:

Step1.Follow the Channel Reset procedure from the first set and Consequently to performing channel change automatically.

Step2 . Repeat Step1 procedure for second set .

Step3 . Repeat Step1 procedure for more the other set.

3.3.1.4 Channel Reset

Channel Reset procedure are the same as Power on default setting

3.3.1.5 Broadcast for Channel Establish

User can execute broadcast function to establish channel when it' s broken off by external interference, it' s procedure shown below:

Step1: Press C/S button on the TX.

Step2: Press C/S button on the RX,the "green LED" shall be in slowly flashing.

Step3: Press mouse R/L button on the TX mouse, the "green LED" shall be in quickly flashing means process successfully.

3.3.2 Battery removal

When the batteries are removed from the mouse TX, the channel goes back to its default setting ,at this while the channel in Receiver is no change.

So that when batteries are removed and re-installed, the channel on the TX is reset back to default channel that may be different than the current channel on the RX, suppose this ,then a Channel Reset procedure for RX shall be bone.

3.3.3 Effective Transmission Distance

Effective transmission distance is 10 ft . Effective transmission is defined as the distance where no one character in a continuous **transmission of 40** characters is dropped.

3.3.4 Watch dog function

Watchdog reset CPU when error occurs.

3.3.5 Sleep function

There are two types of TX sleep modes for battery power saving.

. They are defined as following.

SP1: Idle , In this mode, the power of RF module is turned off. The period of scanning movements is delayed to about 3 ms.

SP2: In this mode, the system sleeps for 376 ms, then wakes up for about 38 ms. In this mode, the system sleeps for 376 ms, then wakes up for about 38 m if it doesn' t detect any mouse movement or button to be pressed, Else, it will enter normal operation mode .

3.3.6 Sleep Mode3

For the power saving purpose , the wireless mice is added with another function – SleepMode3. In this new sleep mode, the mice will not scan XYZ movement until the released condition occurs.

We may access this mode by pressing following button combinations :

Entering SleepMode3 : Press middle button and hold it , then press C/S button. (After 100us the C/S button been pressed, the mice will enter SleepMode3 immediately)

Rejecting SleepMode3: Press Right or Left button and hold it , then press CS button. (The combination buttons should be pressed over 3 sec.)

3.3.7 Low voltage warning

When the operating battery voltage of TX mouse is lower than 2.5 voltage, transmitter will send " warning message" to receiver and enable the LED on receiver flashing "red light".

3.3.8 USB Mode Protocol

USB Mouse interface meet the requirements of USB specification version 1.1.

4. RF Module

The Module is designed to meet the requirements of 2.4 GHz RF for RF PC, IA, and PC peripheral and communication market. Module designed in FSK technology to provided ISM band wireless data communication. Multi-channels are specially designed on the RF module. This section will make a description of the specification of this propriety design.

4.1 Receiver - Model Number: SR-2423M

SK-2423M is a 2.4GHz RF receiver module.The module is designed in compact size,low power consumption and stable RF operating characteristic.

This 2.4GHz RF receiver module is designed in FSK technology to provide ISM band wireless data communication. Multi channels are specially designed to enhance the function of automatic frequency turning as well as digital PLL technology.

4.1.1 Mechanical requirements

Top shield enclosure material: Ferrous

PCB dimension: 24 mm long x 37 mm wide x 7 mm high

Packing: TBD

4.1.2 Hardware requirements

No	Parameter	Specification	
1	Frequency band	2443.7 ~ 2459.2 MHz	
2	Channel	32 Channel	
3	Technology	PLL	
4	Channel spacing	1MHz / each device application	
5	Receive sensitivity (BER=0.1%)	-70dBm	
6	Demodulation mode	FSK	
7	Frequency deviation	60KHz	
8	Maximum data rate	30Kbit/s	
9	Power Consumption	Operation mode 25mA	
10	Selectivity	45dB	
11	EMI out of band spurious emission	Operation mode	Idle mode
	30MHz ~ 1 GHz	–36dBm	-57dBm
	1 GHz ~ 12.75GHz	-30dBm	-47dBm
	1.8GHz ~ 5.3GHz	-47dBm	-47dBm
12	Antenna	Track on board	

Operating angles: Omni-direction

ESD protection test: TBD

4.2 Transmitter - Model Number: SR-2412M

SR-2412M is a 2.4GHz RF transmitter module designed in FSK technology to provide ISM band wireless data communication. Multi channels are specially designed to enhance the function of automatic frequency turning as well as digital PLL technology.

4.2.1 Mechanical requirements

Top shield enclosure material: Ferrous

PCB dimension: 18 mm long x 20 mm wide x 6 mm high

4.2.2. Hardware requirements

No	Parameter	Specification	
1	Frequency band	2454.4 ~ 2469.9 MHz	
2	Channel	32 channels	
3	Technology	PLL	
4	Channel spacing	1 MHz / cach device application	
5	Transmission Power	-25dBm ± 5dBm	
6	Modulation mode	FSK	
7	Frequency deviation	60KHz +/-15KHz	
8	Maximum data rate	30Kbit/sec.	
9	Power Consumption	Operation mode 8mA Idle mode 0.08mA	
10	EMI in band spurious emission ±550KHz	-20dB	
11	EMI out of band spurious emission	Operation mode	Idle mode
	30MHz ~ 1 GHz	-36dBm	-57dBm
	1 GHz ~ 12.75GHz	-30dBm	-47dBm
	1.8GHz ~ 5.3GHz	-47dBm	-47dBm
12	Antenna	Track on board	

Operating angles: Omni-direction
ESD protection test: TBD

5. Environment performance

5.1 Temperature and humidity

5.1.1 High temperature and high humidity operation

50 Deg. C, 90% RH, 48 hours with operation mode.

5.1.2 Low temperature operation

0 Deg. C, 48 hours with operation mode.

5.1.3. High temperature storage

60 Deg. C, 48 hours with operation mode.

5.1.4 High temperature and high humidity storage

60 Deg. C, 95% RH, 96 hours with non-operation mode.

5.1.5 Low temperature storage

-40 Deg. C, 96 hours with non-operation mode.

5.1.6 Temperature Cycle storage

Step 1, -20 Deg. C, 2 hours

Step 2, 23 Deg. C, 2 hours

Step 3, 60 deg. C, 95% RH, 2 hours

Step 4, 23 Deg. C, 2 hours

Repeat step 1 to 4 for 10 cycles with non-operation mode.

5.1.7 Temperature Shock storage

Step 1, -40 Deg. C, 4 hours

Step 2, 65 Deg. C, 4 hours

(The temperature change rate should meet 20 Deg. C per minute minimum)

Repeat Step 1 to 2 for 2 cycles with non-operation mode.

5.2 Drop (2 unit each test)

The product shall withstand the following drop conditions without damage. No error shall occur in the operating mode.

Condition	Drop	Surface	Height
In carton packing	1 corner, 3 edges, 6 faces	Steel	76 cm
In gift box packing	3 corners, 6 faces	Concrete	76 cm
Bare unit	6 faces	Carpet	76 cm
Bare unit	6 faces	Carpet	76 cm
Operating	5 times, bottom only	Desk Top	20 cm

5.3 Vibration (2 unit each test)

The product shall be subjected to sinusoidal vibration per following frequency range for 30 minutes with each axis.

Condition	Vibration	Mode	Axis
In carton packing	10-55-10 Hz, 1 mm	Non-operation	X, Y, Z
Bare unit	10-500-10, 2.0G	Operation	X, Y, Z
Bare unit	10-500-10, 4.0G	Non-operation	X, Y, Z

5.4 Shock (2 unit each test)

The product shall be subjected to half sine shock per following test condition.

Condition	Shock	Mode	Axis
Bare unit (OP)	35 g, 2.5 ms	Operation	6 faces
Bare unit (Non-Op)	70 g, 2.5 ms	Non-operation	Bottom only

5.5 Altitude (1 unit each test)

The product shall be subjected to altitude per following test condition.

Condition	Altitude level	Mode
Operation	15,000 Feet, 4 hrs	Operation
Non-Operation	45,000 Feet, 4 hrs	Non-operation

5.6 Operation life

5.6.1 Mouse key

Force: 120 to 200g Travel: Full travel, Frequency: 2 to 3 times per second.
Life requirement: 3 KK Life minimum.

5.6.2 Battery cover test

100 cycles minimum of requirement.

5.6.3 Spill resistant

No through hole on links

5.7 Field performance

5.7.1 Direction angle and Distance

The product shall meet minimum of distance 10 ft.

5.7.2 Channel selection

Each of TX and Rx module's channel frequency shall within the specify frequency range (±100KHz).

5.7.3 RF Power

Each of TX and RX module' s RF power shall within specified frequency range.

5.7.4 Battery Life

The battery life should meet product Specification requirement (6 Months).

5.7.5 Error message rate test

On the maximum of distance requirement of product, no exceed 1% of lost letter or Error message.

5.8 MTBF Life

MTBF demonstration

Operation life test
Product proven meet 21,600 hours and not any of hardware failure.
Sample size: 30 Sets.

6 Regulation Conformance

- **EMC**
  - FCC Part 15, Class B
  - FCC Part 15 Class C
  - EN 300 440
  - ETS 300 683
  - VCCI
  - C-Tick
  - ESD 12 KV protection / IEC 801-2
  - DIN EN 60950
  - IEC 950, Second Edition plus amendments 1-4 (1996)
  - EN60950, Second Edition plus amendments 1-4 (1997)
  - BCIQ
- **SAFETY**
  - UL 1950, Third Edition
  - CSA C22.2 #0950-M89
  - TUV-GS ZH1/618
  -
- **Compatibility**
  - USB Specification HID 1.1 or higher
  - Microsoft Windows 98/2000/ME