Features

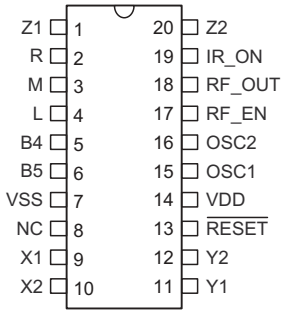
- Compatible with Microsoft Windows 2000 and 5-Button Wheel Mouse
- Compatible with Microsoft Intelli 3D PS/2 and IBM PS/2 mouse compatible
- Supports rolling buttons in 3D PS/2 mouse mode
- Supports five buttons (R,M,L,B4,B5) and three axes (X,Y,Z)input
- Z axis can support optomechanical and mechanical scroller input
- Crystal oscillator system frequency 6MHz for transmitter and 6MHz for receiver
- 27MHz Single Channel with 8 ID Code
- Transmitter 20-pin SOP and receiver 16-pin SOP package

General Description

The HT82M938T/HT82M938R is a Plug & Play 27MHz RF 5 Buttons 3D PS/2 mouse controller transmitter and receiver. It is compatible with Microsoft Intelli 3D PS/2 Wheel Mouse. The operation of the Z axis can support optomechanical and mechanical scroller input.

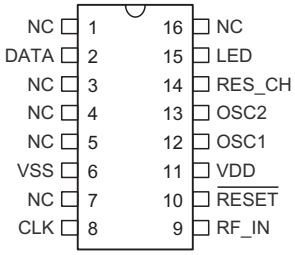
Pin Assignment

Transmitter



HT82M938T
−20 SOP-A

Receiver



HT82M938R
−16 SOP-A

Pin Description

Transmitter

Pin No.	Pin Name	I/O	Description
1, 20	Z1, Z2	I	Z-axis input supports two kinds of scroller input; optomechanical and mechanical.
2, 3, 4, 5, 6	R, M, L, B4, B5	I	Input ports with pull-high 12kΩ resistor. These pads can function as Left, Right, Middle, B4 and B5 button lines.
7	VSS	—	Negative power supply, ground
9, 10	X, X2	I	X-axis photo input
11, 12	Y1, Y2	I	Y-axis photo input
13	$\overline{\text{RESET}}$	I	Chip reset input, low active
14	VDD	—	5V positive power supply
15	OSC1	I	6MHz OSC input
16	OSC2	O	6MHz OSC output

Pin No.	Pin Name	I/O	Description
17	RF_EN	O	RF module enable
18	RF_OUT	O	RF data output
19	IR_ON	O	X, Y, Z photo input power control

Receiver

Pin No.	Pin Name	I/O	Description
2	DATA	I/O	PS/2 mouse ″DATA″ line with pull-high 12kΩ resistor
6	VSS	—	Negative power supply, ground
8	CLK	I/O	PS/2 mouse ″CLOCK″ line with pull-high 12kΩ resistor
9	RF_IN	I	RF data input
10	$\overline{\text{RESET}}$	I	Chip reset input, low active
11	VDD	—	5V positive power supply
12	OSC1	I	6MHz OSC input
13	OSC2	O	6MHz OSC output
14	RES_CH	I	Channel select reset switch with pull-high 12kΩ resistor
15	LED	O	Data transfer and change channel mode display LED

Electrical Characteristics

Transmitter

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V_{DD}	Conditions				
V_{DD}	Operating Voltage	—	—	2.4	—	5.5	V
I_{DD}	Operating Current (Crystal OSC)	3V	No load, f_{SYS}=6MHz	—	0.7	1.5	mA
I_{STB}	Standby Current	3V	No load, system HALT	—	—	8	μA
V_{IL}	Input Low Voltage (X1, X2, Y1, Y2, Z1, Z2, R, M, L, B4, B5)	3V	—	0	—	1	V
V_{IH}	Input High Voltage (X1, X2, Y1, Y2, Z1, Z2, R, M, L, B4, B5)	3V	—	2.1	—	3	V
V_{IL1}	Input Low Voltage ($\overline{\text{RESET}}$)	3V	—	0	—	0.7	V
V_{IH1}	Input High Voltage ($\overline{\text{RESET}}$)	3V	—	2.5	—	3	V

Receiver

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V_{DD}	Conditions				
V_{DD}	Operating Voltage	—	—	2.4	—	5.5	V
I_{DD}	Operating Current (Crystal OSC)	5V	No load, f_{SYS}=6MHz	—	2	5	mA
I_{STB}	Standby Current	5V	No load, system HALT	—	—	15	μA
V_{IL}	Input Low Voltage (RES_CH)	5V	—	0	—	1.5	V
V_{IH}	Input High Voltage (RES_CH)	5V	—	3.5	—	5	V
V_{IL1}	Input Low Voltage ($\overline{\text{RESET}}$)	5V	—	0	—	1.3	V
V_{IH1}	Input High Voltage ($\overline{\text{RESET}}$)	5V	—	4.1	—	5	V

Functional Description

Change ID procedure

- First press Receiver $\overline{\text{RESET}}$ key, the LED will blink very quickly.
- Now press Transmitter L, M, R button at least 3-minutes, the mouse will jump to change ID mode and output a change ID signal to the receiver.
- At the same time, the LED of the Receiver will blink slowly to wait the change ID information.
- The user can decide which ID to be changed by pressing M button. If the user wants to change ID to 4, just press the M button four time (This mouse support 8 ID).
- After deciding the ID number, the user can easy return to normal mode by pressing the L or R button once.
- After the Receiver receive the END signal of the change ID, the LED will no longer blink and the Receiver returns to normal mode.

PS/2 mouse

- PS/2 status byte
  Bit
  7: RESERVED
  6: 0=STREAM MODE, 1=REMOTE MODE
  5: 0=DISABLED, 1=ENABLED
  4: 0=SCALING 1:1, 1=SCALING 2:1
  3: RESERVED
  2: 1=LEFT BUTTON PRESSED
  1: 1=MIDDLE BUTTON PRESSED
  0: 1=RIGHT BUTTON PRESSED

- Standard PS/2 data format
  Variable rps, 0, 8, 1, bidirectional synchronous.

Bit No.	7	6	5	4	3	2	1	0
1st word	YV	XV	YS	XS	1	M	R	L
2nd word	X7	X6	X5	X4	X3	X2	X1	X0
3rd word	Y7	Y6	Y5	Y4	Y3	Y2	Y1	Y0

- Data format for 3D PS/2
  Variable rps, 0, 8, 1, bidirectional synchronous.

Bit No.	7	6	5	4	3	2	1	0
1st word	YV	XV	YS	XS	1	M	R	L
2nd word	X7	X6	X5	X4	X3	X2	X1	X0
3rd word	Y7	Y6	Y5	Y4	Y3	Y2	Y1	Y0
4th word	Z7	Z6	Z5	Z4	Z3	Z2	Z1	Z0

Note: The X/Y data report is 9-bit 2′s complement

The Z data report is 8-bit 2′s complement

X movement towards the right is positive, movement towards the left is negative

Y upward movement is positive, moving down is negative

Z rolling towards the user is positive, else negative

Button status: 1=pressed, 0=released

- Mouse mode changes between standard and 3D PS/2 mode
  - Sending the commands in the following sequence will set the mouse to 3D PS/2 mode.

Command	Response from mouse
F3h	FAh
C8h	FAh
F3h	FAh
64h	FAh
F3h	FAh
50h	FAh
F2h	Fah

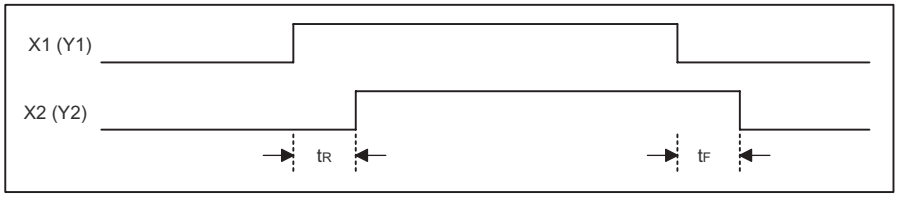
  - Any time the PC sends a reset 'FFh' command to the mouse, it will reset the mouse to standard PS/2 mode.
  - After power-on reset is initiated, the mouse is set to standard PS/2 mode.

5-button wheel mouse mode follows the 5-button activation method of Windows 2000 and 5-button wheel mouse specification.

Timing Diagrams

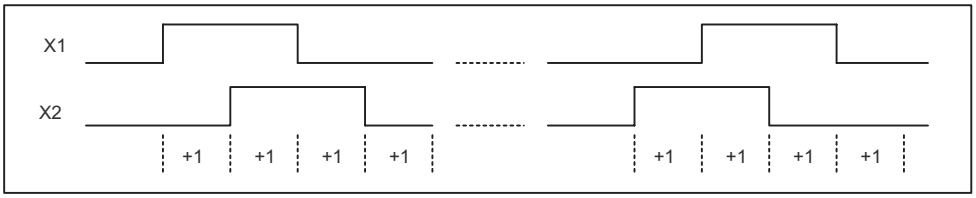
X, Y, Z input

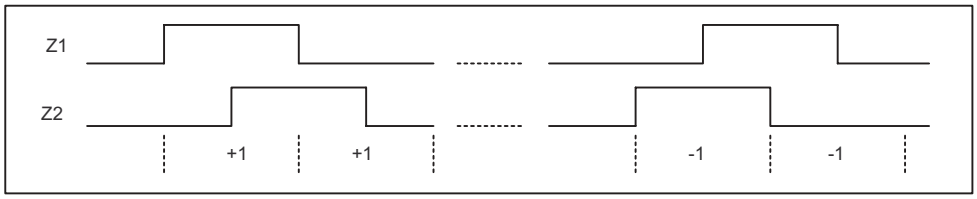
- X, Y Axis photo-coupler cross width



t_R, t_F>20μs

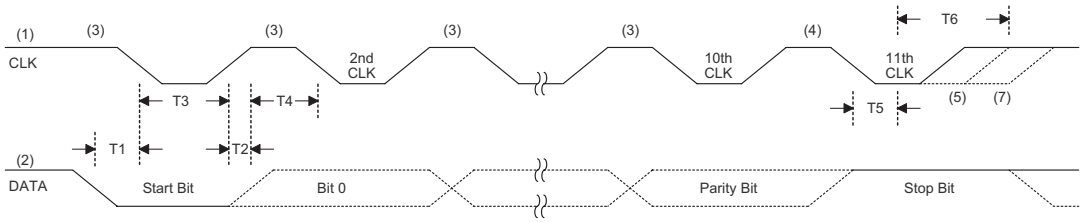
- X/Y/Z Axis counting





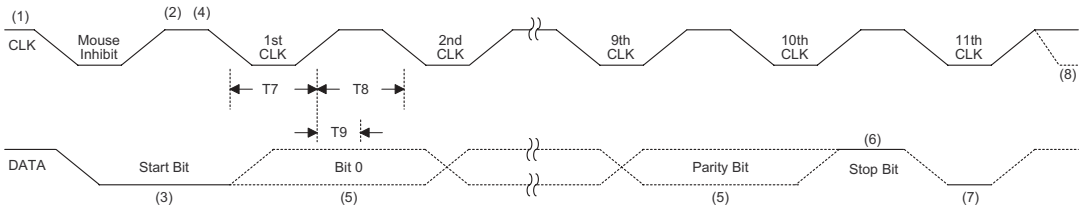
PS/2 mouse

- Data output



	Timing Parameter	Min/Max
T1	Data transition to the falling edge of CLOCK	5/25 μsec
T2	Rising edge of CLOCK to DATA transition	5/T4-5 μsec
T3	Duration of CLOCK low	30/50 μsec
T4	Duration of CLOCK high	30/50 μsec
T5	Minimum time to MOUSE inhibit after clock 11	>0 μsec
T6	Maximum time to MOUSE inhibit after clock 11 to ensure MOUSE does not start another transmission	<50 μsec

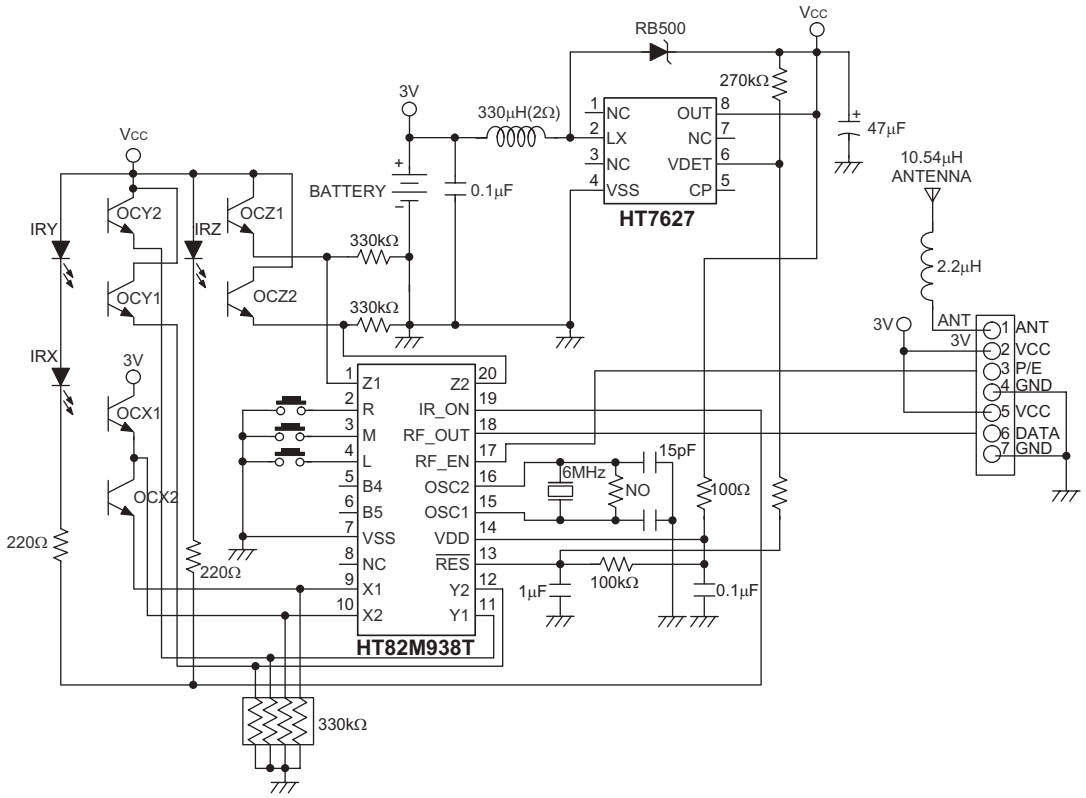
- Data input



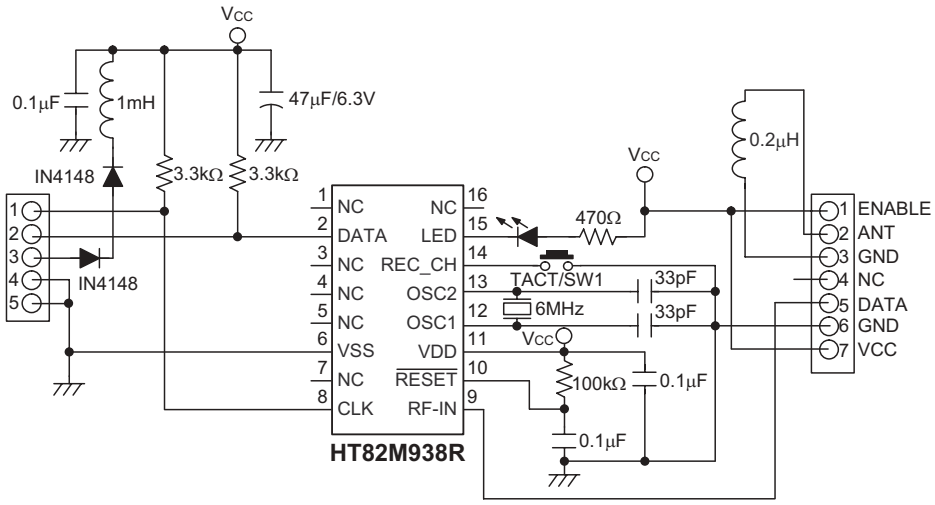
	Timing Parameter	Min/Max
T7	Duration of CLOCK low	30/50 μsec
T8	Duration of CLOCK high	30/50 μsec
T9	Time from low to high CLOCK transition to time when MOUSE samples DATA line	5/25 μsec

Application Circuits

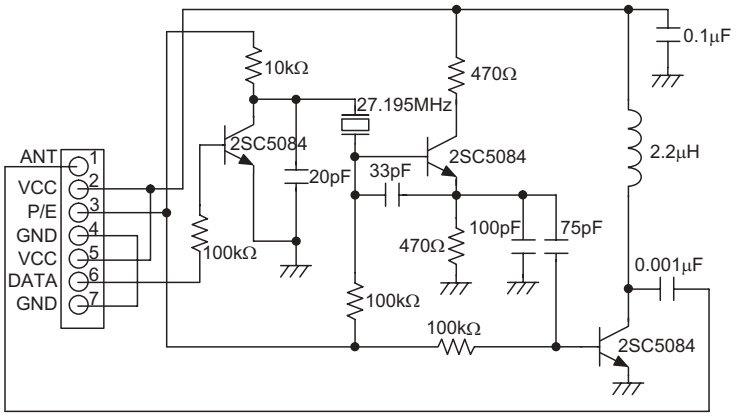
Transmitter application (This application circuit is for reference only)



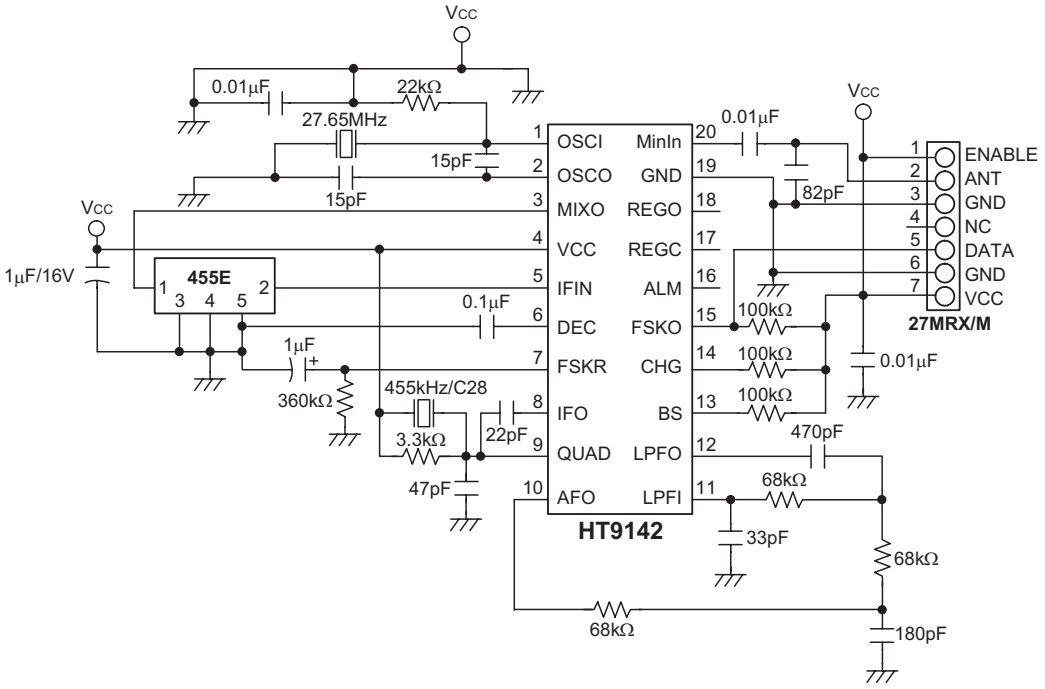
Receiver application (This application circuit is for reference only)



RF transmitter modules

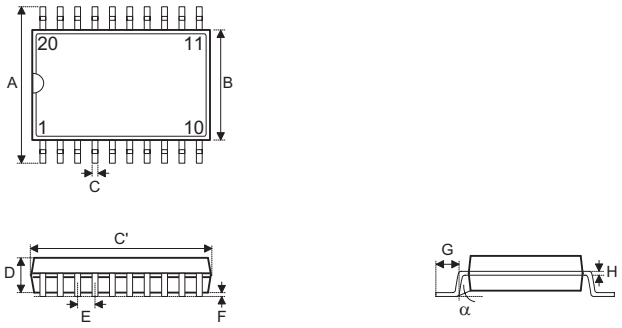


RF receiver modules



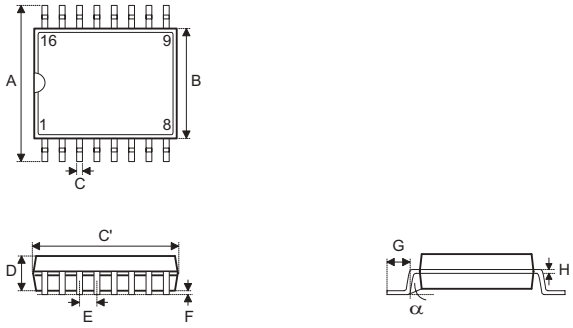
Package Information

20-pin SOP (300mil) outline dimensions



Symbol	Dimensions in mil		
	Min	Nom	Max
A	394	—	419
B	290	—	300
C	14	—	20
C′	490	—	510
D	92	—	104
E	—	50	—
F	4	—	—
G	32	—	38
H	4	—	12
α	0°	—	10°

16-pin SOP (300mil) outline dimensions



Symbol	Dimensions in mil		
	Min	Nom	Max
A	394	—	419
B	290	—	300
C	14	—	20
C′	390	—	413
D	92	—	104
E	—	50	—
F	4	—	—
G	32	—	38
H	4	—	12
α	0°	—	10°

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