Bluetooth3.0 Mouse Controller

1 General Description

IS1652N(M) is a Bluetooth v3.0 controller for Bluetooth v3.0 application, especial for mouse application. The IS1652N(M) includes the RF and control unit in Bluetooth v3.0, 1T 8051, SPI control interface, PMU, general purpose IO, wheel encoder control unit, LED control unit and ADC for application.

2 Feature

- **Bluetooth v3.0 host certificated**
- **Bluetooth v3.0 HID module certificated**
- **Bluetooth v3.0 class1/class2 RF and control unit**
- **1T-8051 and Flash Memory/SRAM integrated**
- **Build in Bluetooth HID profile**
- **1.8V/3.0V Master/Slave SPI control unit for optical and laser sensor control**
- **Hardware encoder control unit for wheel encoder**
- **Two LED driver with dynamic gain control for status indicated**
- **PMU unit**
  - **3V PMU Output for application**
  - **1.8V PMU unit**
- **ADC for Battery voltage level detect**
- **2 ADC for application**
- **9 specific IO with internal pull-up resistor to supports the L, M, R, Previous, Next, Scroll-L, Scroll-R, cpi control and pairing key**

3 Package

8x8mm^2 QFN56

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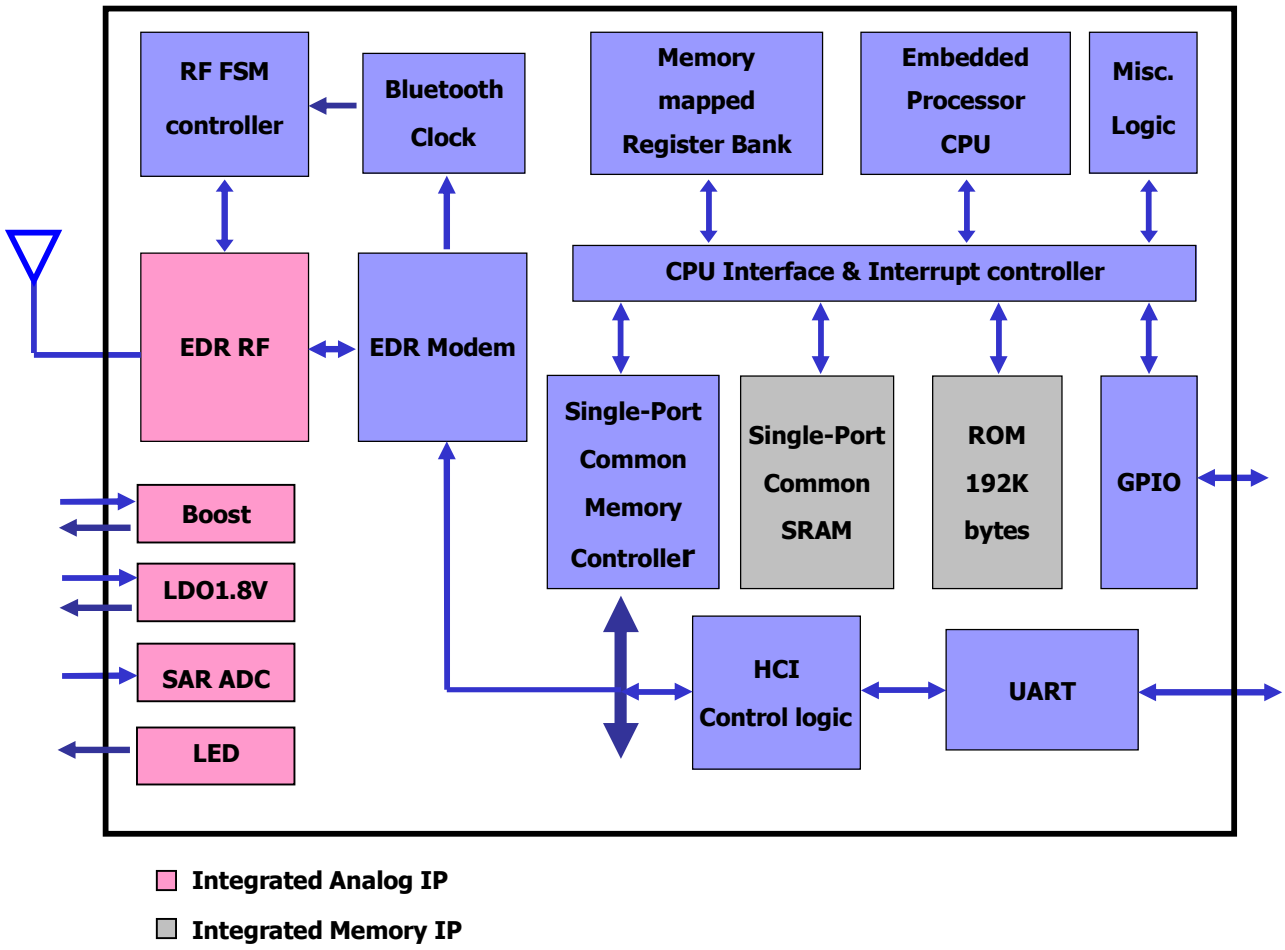
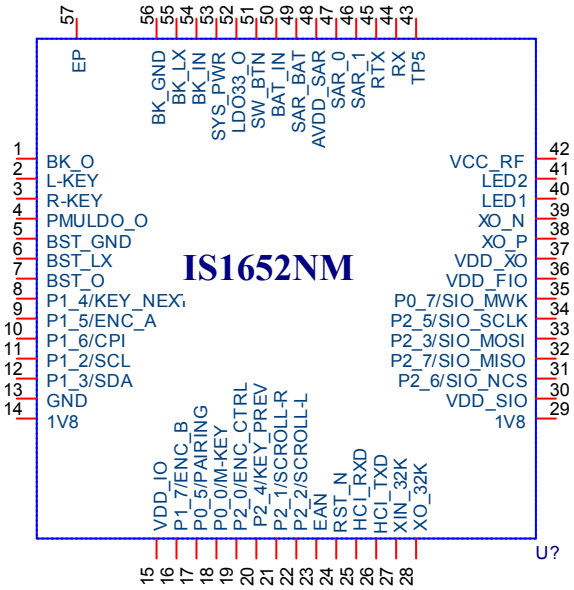
4 Block Diagram



5 Pin Diagram



6 Pin Description

Pin No.	Pin type	Name	Description
1	I	BK_O	The feedback pin for BUCK.
2	I	L_key	L-key for mouse application.
3	I	R_key	R-key for mouse application.
4	P	PMULDO_O	Output of PMULDO, connected to VDD_PMU logic and VDD_RC1024 internally. (they will be divided in test chip)
5	P	BST_GND_P	Boost ground pin.
6	P	BST_LX	Boost input node connected to external inductor.
7	P	BST_O	Boost output node.
8	I/O	P1_4	Key-Next, default pull-high input.
9	I/O	P1_5	Encoder-A for scroll wheel.
10	I/O	P1_6	Key-CPI
11	I/O	P1_2	EEPROM SCL.
12	I/O	P1_3	EEPROM SDA.

Pin No.	Pin type	Name	Description
13	P	GND	Digital ground.
14	P	1V8	Core 1.8V power input
15	P	VDD_IO	Main power supply
16	I/O	P1_7	Encoder-B for scroll wheel.
17	I/O	P0_5	Pairing key.
18	I/O	P0_0	M-key for mouse application.
19	I/O	P2_0	Encoder-Ctrl for scroll wheel. System configuration, refer to P2_4.
20	I/O	P2_4	Key-Prev, default pull-high input. P2_0/P2_4: HH at power on
21	I/O	P2_1	R-key of scroll wheel.
22	I/O	P2_2	L-key of scroll wheel.
23	I/O	EAN	ROM/Flash selection. H: ROM code; L: Flash code
24	I/O	RST	External reset input.
25	I	HCI_RXD	HCI RX data
26	O	HCI_TXD	HCI TX data
27	I	XIN_32K	Positive node of 32K oscillator.
28	I	XO_32K	Negative node of 32K oscillator.
29	P	VDD_S_CORE	Sensor core power input.
30	P	VDD_SIO	VDD_IO for GPIO (sensor IO when mouse application).
31	I/O	P2_6	SIO : Sensor SPI NCS
32	I/O	P2_7	SIO : Sensor SPI MISO
33	I/O	P2_3	SIO : Sensor SPI MOSI (SDIO)
34	I/O	P2_5	SIO : Sensor SPI SCLK
35	I/O	P0_7	SIO : Sensor motion wakeup
36	P	VDD_FIO	VDD_IO for FLASH.
37	P	VDD_XO	VDD for RF external 16MHz crystal.
38	I	XO_P	Positive node for RF crystal input.
39	I	XO_N	Negative node for RF crystal input.
40	O	LED1	LED1 driver.
41	O	LED2	LED2 driver.
42	RP	VCC_RF	Power input for VCO and RF
43	I	TP5	RF test point

Pin No.	Pin type	Name	Description
44	I	RX	RX path for Class1
45	I/O	RTX	Class 2 RTX path (TR combiner active); Class1/Class2 TX path
46	I	SAR_1	Analog input1 of SAR_ADC.
47	I	SAR_0	Analog input1 of SAR_ADC.
48	P	AVDD_SAR	Power supply of SAR_ADC.
49	I	SAR_BAT	Battery detection input of SAR_ADC.
50	P	BAT_IN	Battery input for mouse application.
51	I	SW_BTN	Input for software button.
52	P	LDO33_O	3V3 LDO output.
53	P	SYS_PWR	Output of UVP, which is connected to PMULDO_IN internally.
54	P	BK_IN	LDO18/Buck input node.
55	P	BK_LX	LDO18/Buck output node connected to external inductor.
56	P	BK_GND_P	Buck ground pin.
57	P	EP	EP GND

7 Electric Characteristics

Absolute Maximum Ratings

Parameter	Min	Max	Unit
Operating Temperature	-20	+70	℃
Storage Temperature	-45	+125	℃
3V Supply Voltage	-0.3	3.6	V
1.8V Supply Voltage	-0.3	1.95	V
IO Input Voltage	-0.3	VddIO	V

DC Specification (OSC=16MHz, Operating Temp.=25℃)

Parameter	Min	Typical	Max	Unit
Supply Voltage (V_{DD})	1.9		3.3	V
IO High Level Input Voltage (VDD_SIO=1.8V)		1.5		V
IO Low Level Input Voltage (VDD_SIO=1.8V)		0.3		V
IO High Level Input Voltage		0.8 V_{DD}		V
IO Low Level Input Voltage		0.2 V_{DD}		V

Power Consumption (OSC=16MHz, V_{DD}=3.0V, Operating Temp.=25℃)

Parameter	Min	Typical	Max	Unit
Pairing		30		mA
Sniff Mode (11.25ms)		4.5		mA
Sniff Subrating				mA
Standby1		160		μA
Standby2		140		μA
Standby3		15	30	μA
Power Down		1		μA

8 Radio Characteristics

Transmitter Performance Basic Data Rate (25℃)

	Min	Typ	Max	Bluetooth specification	Unit
Maximum RF transmit power		3	4.0	-6 to 4	dBm
RF power variation over temperature range with compensation enabled		±2			dB

Receiver Performance Basic Data Rate (25℃)

	Frequency (GHz)	Min	Typ	Max	Bluetooth specification	Unit
Sensitivity at 0.1% BER for all basic rate packet types	2.402		-90		≤-70	dBm
	2.441		-90			
	2.480		-90			

Receiver Performance Enhanced Data Rate (25℃)

	Frequency (GHz)	Modulation	Min	Typ	Max	Bluetooth specification	Unit
Sensitivity at 0.01% BER	2.402	π/4 DQPSK		-90		≤-70	dBm
	2.441	π/4 DQPSK		-90			
	2.480	π/4 DQPSK		-90			
	2.402	8DPSK		-83		≤-70	dBm
	2.441	8DPSK		-83			
	2.480	8DPSK		-83			