1 PRODUCT OVERVIEW

SAM87RI PRODUCT FAMILY

Samsung's SAM87RI family of 8-bit single-chip CMOS microcontrollers offer fast and efficient CPU, a wide range of integrated peripherals, and supports OTP device.

A dual address/data bus architecture and bit- or nibble-configurable I/O ports provide a flexible programming environment for applications with varied memory and I/O requirements. Timer/counters with selectable operating modes are included to support real-time operations.

KS86C6104/P6104 MICROCONTROLLER

The KS86C6104/P6104 microcontroller with USB function can be used in a wide range of general purpose applications. It is especially suitable for mouse or joystick controller and is available in 20-pin DIP and 20-pin SOP package.

The KS86C6104/P6104 single-chip 8-bit microcontroller is fabricated using an advanced CMOS process. It is built around the powerful SAM87RI CPU core.

Stop and Idle power-down modes were implemented to reduce power consumption. To increase on-chip register space, the size of the internal register file was logically expanded. The KS86C6104/P6104 has 4 Kbytes of program memory on-chip and 144 bytes of RAM including 16 bytes of working register.

Using the SAM87Ri design approach, the following peripherals were integrated with the SAM87Ri core:

— Two configurable I/O ports (11 pins)
— 7 bit-programmable pins for external interrupts
— 8-bit timer/counter with two operating modes

OTP

The KS86C6104 microcontroller is also available in OTP (One Time Programmable) version, KS86P6104. KS86P6104 microcontroller has an on-chip 4-Kbyte one-time-programmable EPROM instead of masked ROM. The KS86P6104 is comparable to KS86C6104, both in function and in pin configuration.

FEATURES

CPU

- SAM87RI CPU core

MEMORY

- 4-Kbyte internal program memory (ROM)
- 128-byte RAM
- 16 bytes of working register

INSTRUCTION SET

- 41 instructions
- IDLE and STOP instructions added for power-down modes

INSTRUCTION EXECUTION TIME

- 1.0 μs at 6 MHz f_{OSC}

INTERRUPTS

- 12 interrupt sources with one vector
- One level, one vector interrupt structure

OSCILLATION CIRCUIT OPTIONS

- 6 MHz crystal/ceramic oscillator
- External clock source

GENERAL I/O

- 11 bit-programmable I/O pins

TIMER/COUNTER

- One 8-bit basic timer for watchdog function and programmable oscillation stabilization interval generation function
- One 8-bit timer/counter with Compare/Overflow counter

USB SERIAL BUS

- Compatible to USB low speed (1.5 Mbps) device 1.0 specification.
- Serial bus interface engine (SIE)
    — Packet decoding/generation
    — CRC generation and checking
    — NRZI encoding/decoding and bit-stuffing
- Two 8-byte receive/transmit USB buffer

OPERATING TEMPERATURE RANGE

- -40°C to $+85^{\circ}$C

OPERATING VOLTAGE RANGE

- 4.5 V to 5.5 V

PACKAGE TYPES

- 20-pin DIP
- 20-pin SOP

COMPARATOR

- 4-channel mode, 4-bit resolution
- 3-channel mode, external reference

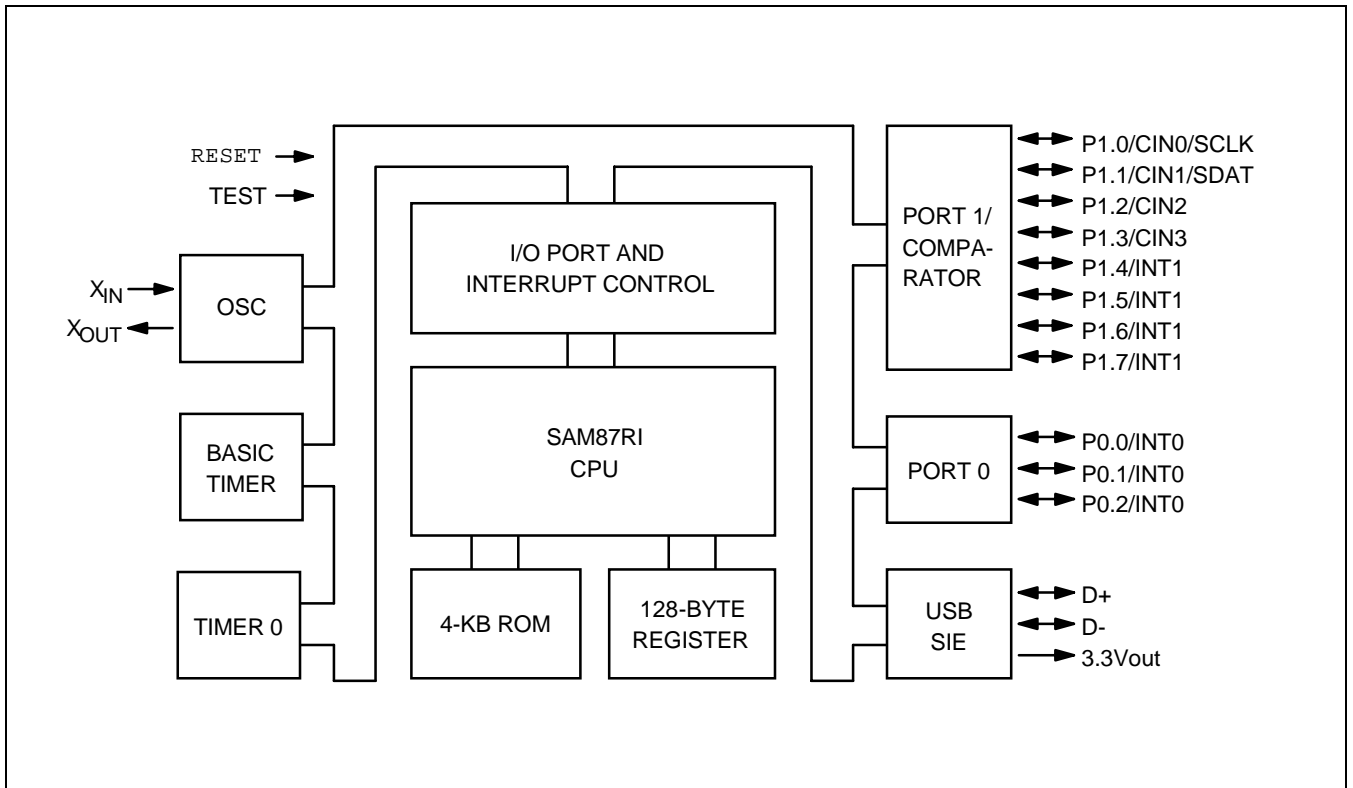SAMSUNG
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BLOCK DIAGRAM

Figure 1-1. Block Diagram

PIN ASSIGNMENTS
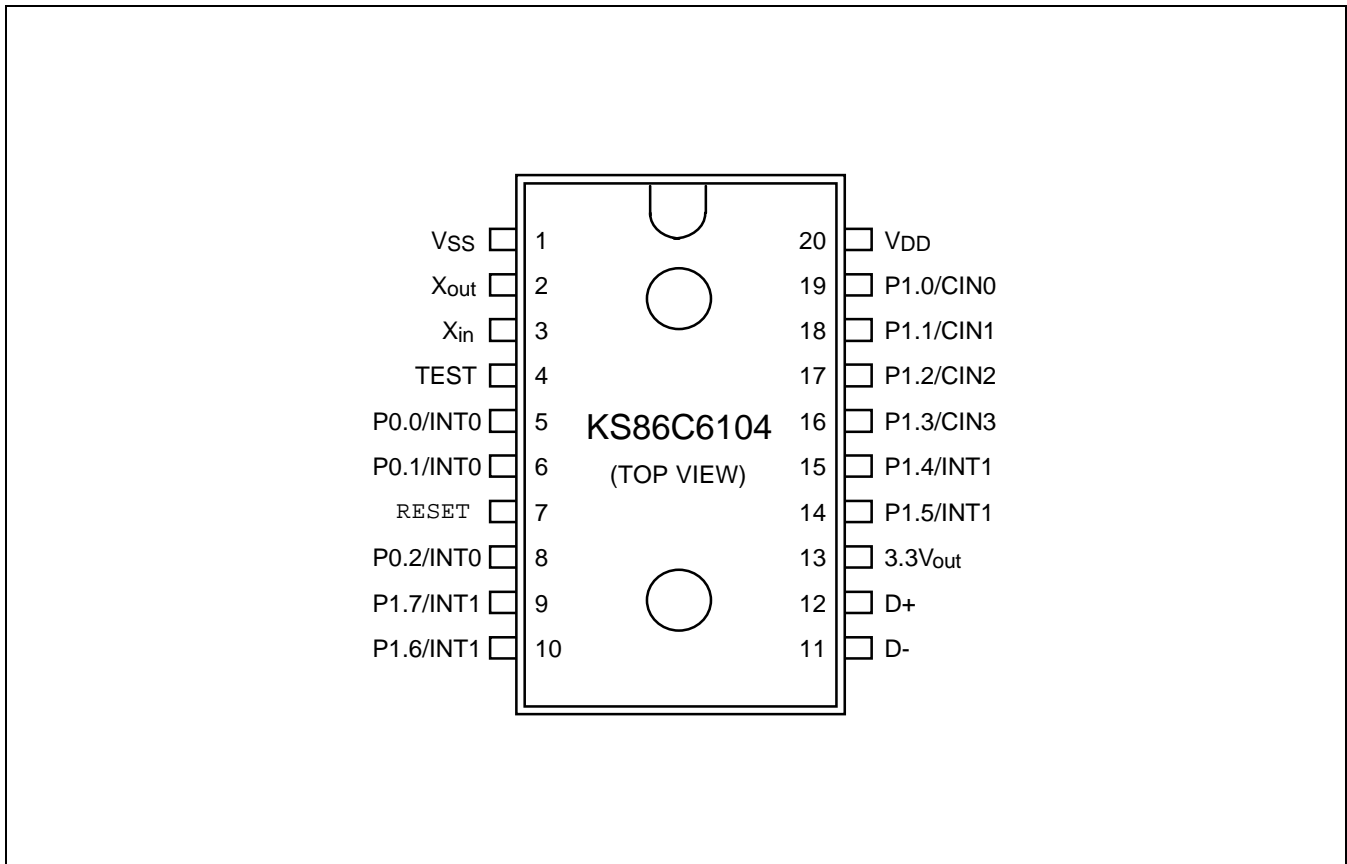
Figure 1-2. Pin Assignment Diagram (20-Pin DIP/SOP Package)

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PIN DESCRIPTIONS

Table 1-1. KS86C6104/P6104 Pin Descriptions

Pin Names	Pin Type	Pin Description	Circuit Number	Pin Numbers	Share Pins
P0.0–P0.2	I/O	Bit-programmable I/O port for Schmitt trigger input or push-pull output. Pull-up resistors are individually assignable to input pins by software and are automatically disable for output pins. Port0 can be individually configured as external interrupt inputs.	D	5, 6, 8	INT0
P1.0–P1.3	I/O	Bit-programmable I/O port for Schmitt trigger input or push-pull output. Pull-up resistors are individually assignable to input pins by software. Port1.0–1.3 can be configured as comparator input	F-8	19–16	CIN0–CIN3
P1.4-P1.7	I/O	Bit-programmable I/O port for Schmitt trigger input or push-pull output. Pull-up resistors are individually assignable to input pins by software and are automatically disabled for output pins. Port1.4–1.7 can be individually configured as external interrupt inputs.	D	15, 14, 10, 9	INT1
D+/D-	I/O	Only used as USB tranceive/receive port.	–	12–11	–
3.3VOUT	O	Internal regulator 3.3 V output pin for referencing the voltage	–	13	–
X_{IN}, X_{OUT}	–	System clock input and output pin (crystal/ceramic oscillator, or external clock source)	–	3–2	–
INT0	I	External interrupt for bit-programmable port0.	D	5, 6, 8	Port0
INT1	I	External interrupt for bit-programmable port1	D	9, 10, 14, 15	Port1
RESET	I	RESET signal input pin. Schmitt trigger input with internal pull-up resistor.	B	7	–
TEST	I	Test signal input pin (for factory use only; must be connected to V_{SS})	–	4	–
V_{DD}	–	Power input pin	–	20	–
V_{SS}	–	VSS is a ground power for CPU core.	–	1	–

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PIN CIRCUITS

Table 1-2. Pin Circuit Assignments for the KS86C6104/P6104

Circuit Number	Circuit Type	KS86C6104/P6104 Assignments
B	I	RESET signal input
C	O	
D	I/O	Port0, Port1.4–1.7, INT0, INT1
F-8	I/O	Port1.0–1.3

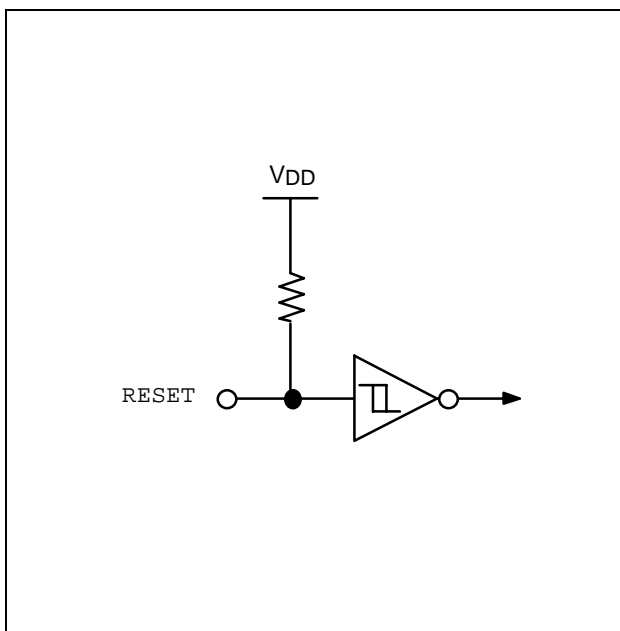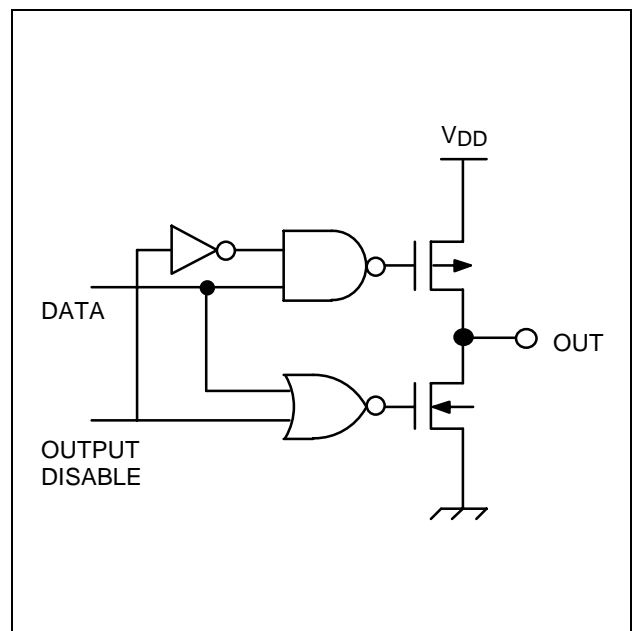**NOTE**:   Diagrams of circuit types B–D, and F-8 are presented below.

Figure 1-3. Pin Circuit Type B

Figure 1-4. Pin Circuit Type C