SAMSUNG ELECTRONICS

KS88C4116
8-Bit CMOS Microcontroller

Product Specification

OVERVIEW

The KS88C4116 single-chip 8-bit microcontroller is fabricated using a highly advanced CMOS process. Its fast and reliable CPU is based on Zilog's Super8® architecture. With six 8-bit I/O ports, a full-duplex serial port, two 8-bit and two 16-bit timer/counters, PWM with data capture, and A/D converter, the KS88C4116 offers an excellent design solution for a wide range of general-purpose electronics applications.

FEATURES

CPU

- SAM8 CPU core

Memory

- 1040-byte internal register file
- 16-Kbyte internal program memory

External Interface

- 64-Kbyte external data memory area
- 64-Kbyte external program memory (ROM-less mode)

Instruction Set

- 79 instructions, including IDLE and STOP instructions for power-down modes

Instruction Execution Time

- 500 ns at 12 MHz f_{OSC} (min.)

Interrupts

- 21 interrupt sources with 20 vectors and eight levels
- Fast interrupt processing (levels 0 and 3–7 only)

General I/O

- Six 8-bit general I/O ports
- One 8-bit n-channel, open-drain output port (port 6)
- One 8-bit input port (ADC input or port 7)

Timer Module 0

- Two 8-bit timers with interval or PWM mode
- Timer output pins (TA, TB)

Timer Module 1

- Two 16-bit timer/counters with four selectable modes

Serial Port

- One synchronous operating mode and three full-duplex asynchronous UART modes

PWM/Capture Module

- Two outputs (PWM0, PWM1)
- 8-bit resolution, 2-bit prescaler
- Frequency: 46.87 kHz with 12-MHz CPU clock
- Capture module with input pin

A/D Converter

- Eight analog input pins
- 8-bit resolution
- 16-µs conversion speed with an 12-MHz CPU clock
- End-of-conversion (EOC) signal output pin

Backup Timer

- 28-bit backup timer

Operating Temperature Range

- – 20°C to + 85°C

Operating Voltage Range

- 4.5 V to 6.0 V

Package Type

- 80-pin QFP

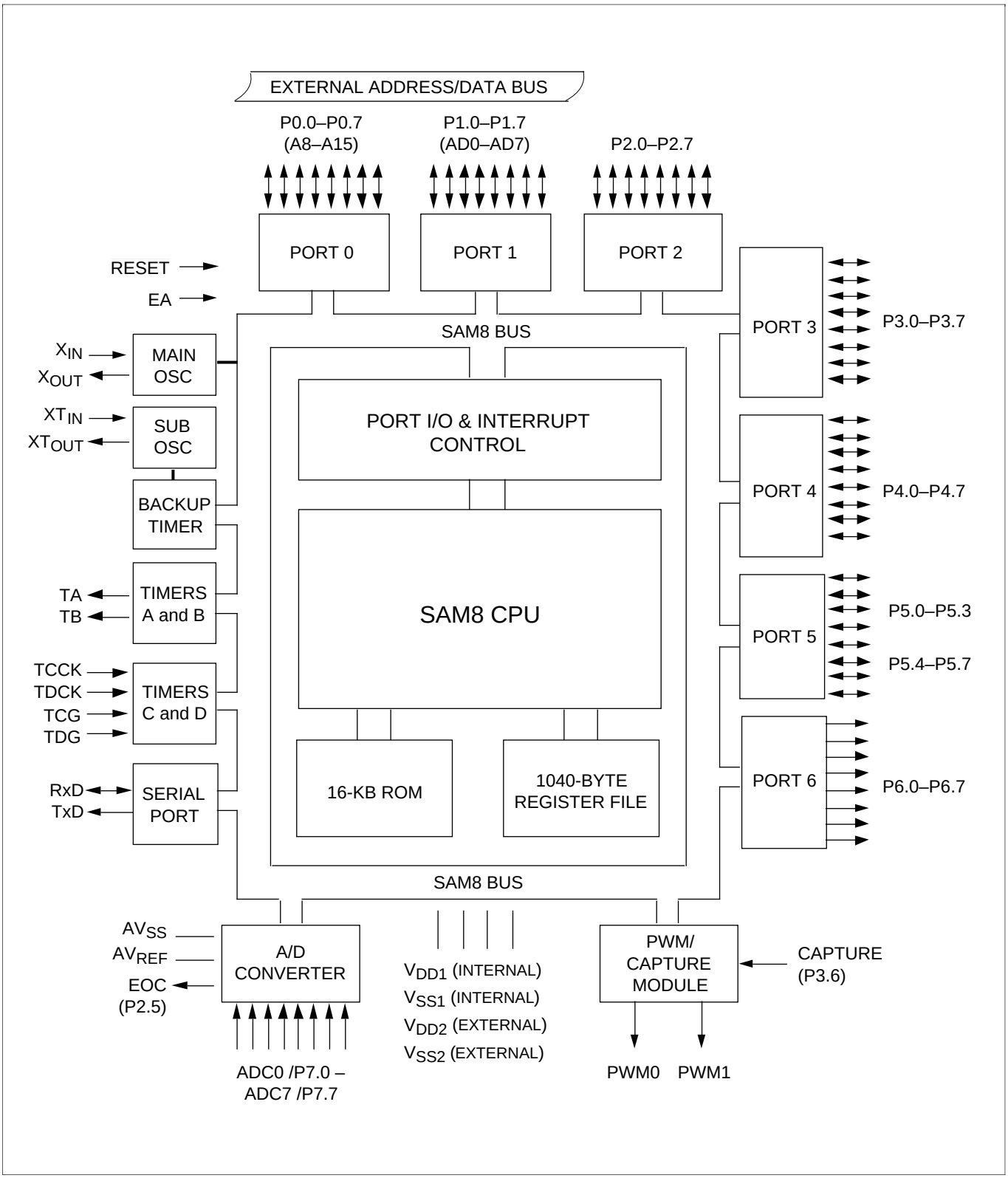

Figure 1. KS88C 4116 Block Diagram

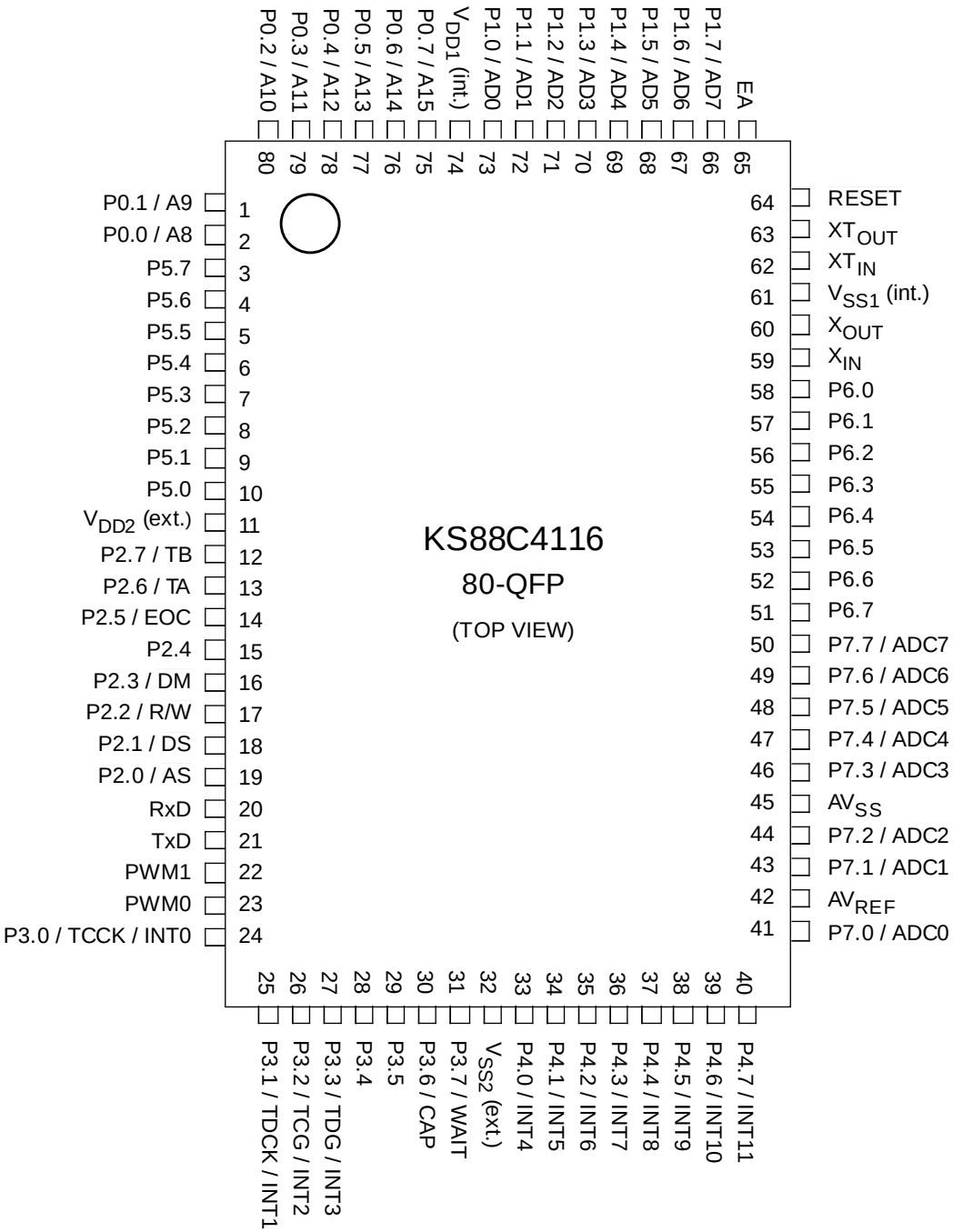

Figure 2. KS88C4116 Pin Assignments (80-Pin QFP)

Table 1. KS88C4116 Pin Descriptions

Pin Name	Pin Type	Pin Description	Circuit Type	QFP Pin Number	Share Pins
P0.0–P0.7	I/O	Nibble programmable port; input or output mode selected by software; Schmitt trigger input or push-pull, open-drain output with software assignable pull-ups; alternately configurable as external interface address lines A8–A15	3	2–1 80–75	A8–A15
P1.0–P1.7	I/O	Same general characteristics as port 0; alternately configurable as external interface address/data lines AD0–AD7; high current drive capability (15-mA typical value)	3	73–66	AD0–AD7
P2.0–P2.7	I/O	General I/O port with Schmitt trigger input or push-pull output; bit programmable: P2.0 / address strobe (AS) P2.1 / data strobe (DS) P2.2 / read/write (R/W) P2.3 / data memory select (DM) P2.5 / End of ADC comparator output P2.6 / timer A output P2.7 / timer B output	5	19–12	AS, DS, DM, R/W; EOC; TA, TB
P3.0–P3.7	I/O	General I/O port with bit programmable pins; Schmitt trigger input or push-pull output with software assignable pull-ups; input/output mode selectable by software; P3.0–P3.3 are alternately used for external interrupt input (noise filters, interrupt enable and pending control); P3.0 / timer C clock input (TCCK) / INT0 P3.1 / timer D clock input (TDCK) / INT1 P3.2 / timer C gate input (TCG) / INT2 P3.3 / timer D gate input (TDG) / INT3 P3.6 / Capture data input (CAP) P3.7 / WAIT for slow memory interface	4	24–31	TCCK / INT0, TDCK / INT1, TCG / INT2, TDG / INT3, CAP, WAIT
P4.0–P4.7	I/O	General I/O port with bit programmable pins; Schmitt trigger input or push-pull, open-drain output; software assignable pull-ups; input/output mode selectable by software; P4.0–P4.7 can alternately be used as inputs for external interrupts INT4–INT11; noise filters, interrupt control	4	33–40	INT4 – INT11
P5.0–P5.7	I/O	General I/O port with nibble programmable pins; Schmitt trigger input or push-pull, open-drain output; software assignable pull-ups; input/output mode selectable by software; high current drive capability (15-mA typical value)	3	10–3	–

Table 1. KS88C4116 Pin Descriptions (Continued)

Pin Name	Pin Type	Pin Description	Circuit Type	QFP Pin Number	Share Pins
P6.0–P6.7	O	Output port; n-channel, open-drain output pins; up to 9-volt capacity	8	58–51	–
ADC0–ADC7	I	Analog input pins for A/D converter module; alternately, general-purpose input port 7	2	41, 43–44, 46–50	P7.0–P7.7
RESET	I	System reset pin (pull-up resistor: 280 kΩ)	1	64	–
EA	I	External access (EA) pin with three modes: 0 V: Normal operation (connect to V_{SS}) 5 V: ROM-less operation (external interface) 9–10 V input: Factory test mode	–	65	–
RxD	I/O	Serial data RxD pin; receive input, transmit output (mode 0)	6	20	–
TxD	O	Serial data TxD pin; transmit output, shift clock (mode 0)	7	21	–
PWM0, PWM1	O	Pulse width modulation output pins	7	23, 22	–
V_{DD1}, V_{SS1}	–	Power input pins for CPU operation (internal)	–	74, 61	–
V_{DD2}, V_{SS2}	–	Power input pins for port output (external)	–	11, 32	–
X_{IN}, X_{OUT}	–	Main oscillator pins	–	59, 60	–
XT_{IN}, XT_{OUT}	–	Suboscillator pins for backup timer	–	62, 63	–
AV_{REF}, AV_{SS}	–	A/D converter reference voltage and ground	–	42, 45	

Table 2. Pin Circuit Assignments for the KS88C4116

Circuit Number	Circuit Type	KS88C4116 Assignments
1	Input	RESET pin
2	Input	A/D converter input pins ADC0–ADC7
3	I/O	Ports 0, 1, and 5
4	I/O	Ports 3 and 4, TCCK, TDCK, TCG, TDG, CAP, WAIT, INT0–INT11
5	I/O	Port 2, AS, DS, DM, R/W, TA, and TB
6	I/O	Serial port RxD pin
7	O	Serial port TxD pin, PWM0, PWM1
8	O	Port 6, n-channel, open-drain output with high current capability