



# C8051F016

# Mixed-Signal 32KB ISP FLASH MCU

## ANALOG PERIPHERALS

### 10-bit, 100 KSPS ADC

- $\pm 1$ LSB INL
- No Missing Codes
- Programmable Throughput up to 100ksp/s
- 8 External Inputs; Programmable as Single-Ended or Differential
- Programmable Amplifier Gain: 16, 8, 4, 2, 1, 0.5
- Data Dependent Windowed Interrupt Generator
- Built-in Temperature Sensor ( $\pm 3^\circ\text{C}$ )

### Two 12-bit DACs

- Voltage Output
- 10 $\mu\text{s}$  Settling Time

### Two Comparators

- 16 Programmable Hysteresis Values
- Configurable to Generate Interrupts or Reset

### Reference

- 2.4V; 15 ppm/ $^\circ\text{C}$
- External Reference Input

### VDD Monitor and Brown-out Detector

### ON-CHIP JTAG EMULATION

- On-Chip Emulation Circuitry Facilitates Full Speed, Non-Intrusive In-Circuit Emulation
- Supports Breakpoints, Single Stepping, Watchpoints
- Inspect/Modify Memory and Registers
- Superior Performance to Emulation Systems Using ICE-Chips, Target Pods, and Sockets
- Fully Compliant with IEEE 1149.1 Specification
- \$99 Emulation Kit (C8051F015DK)

## 8051-COMPATIBLE $\mu\text{C}$ Core

- Pipelined Instruction Architecture; Executes 70% of Instructions in 1 or 2 System Clocks
- Up to **25MIPS** Throughput with 25MHz Clock
- Expanded Interrupt Handler; Up to 22 Interrupt Sources

## MEMORY

- 2304 Bytes Data RAM
- 32k Bytes FLASH; In-System Programmable in 512 byte Sectors

## DIGITAL PERIPHERALS

- 16 Port I/O; All are 5V tolerant
- Hardware I2C<sup>TM</sup>/SMBus<sup>TM</sup>, SPI<sup>TM</sup>, and UART Serial Ports Available Concurrently
- 16-bit Programmable Counter/Timer Array with 5 Capture/Compare Modules (Each Configurable as an 8-Bit PWM)
- 4 General Purpose 16-bit Counter/Timers
- Dedicated Watch-Dog Timer; Bi-directional Reset

## CLOCK SOURCES

- Internal Programmable Oscillator: 2-to-16MHz
- External Oscillator: Crystal, RC,C, or Clock
- Can Switch Between Clock Sources on-the-fly; Useful in Power Saving Modes

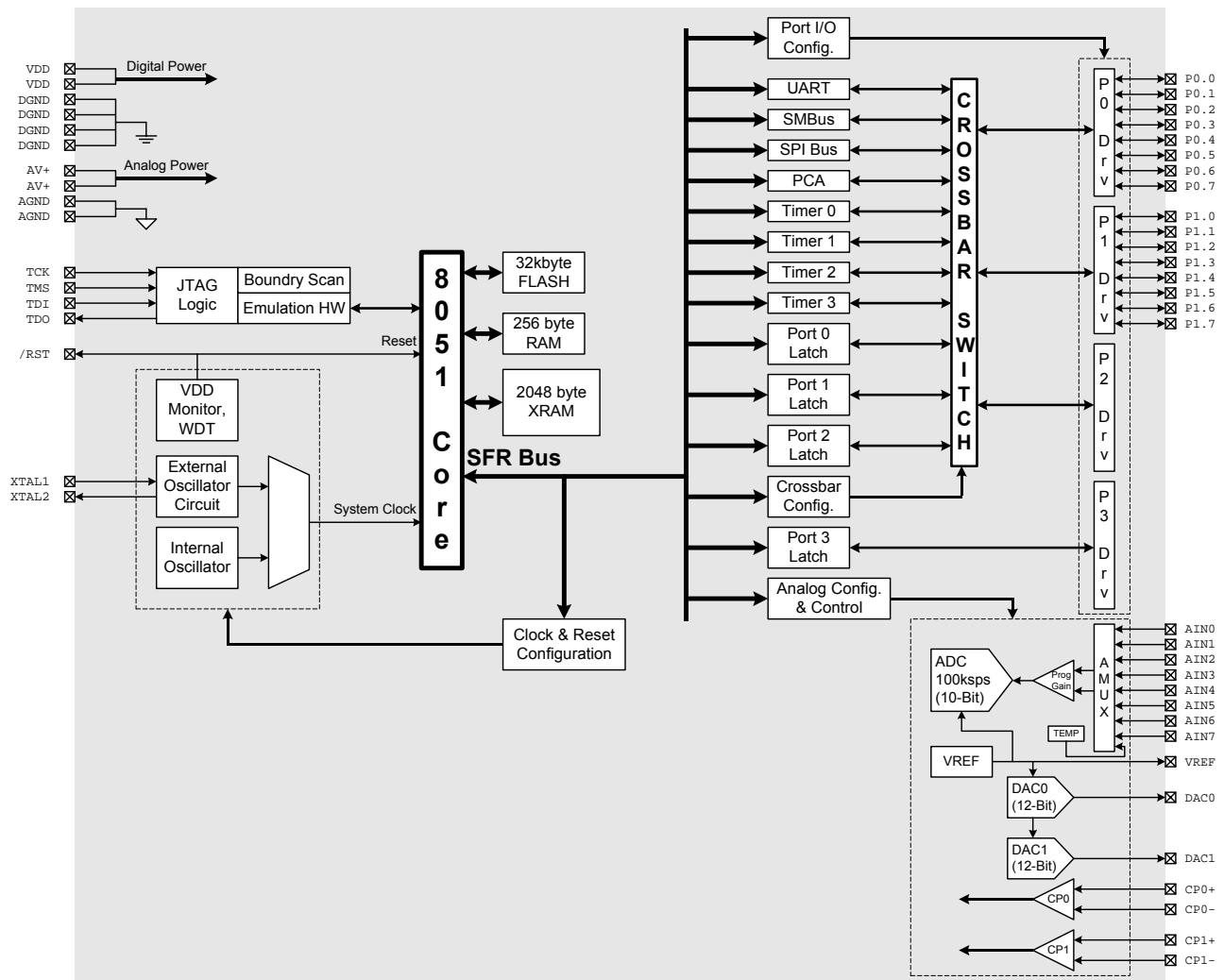
## SUPPLY VOLTAGE ..... 2.7V to 3.6V

- Typical Operating Current: 12mA @ 25MHz
- Multiple Power Saving Sleep and Shutdown Modes

## 48-Pin TQFP Package

## Temperature Range: $-40^\circ\text{C}$ to $+85^\circ\text{C}$

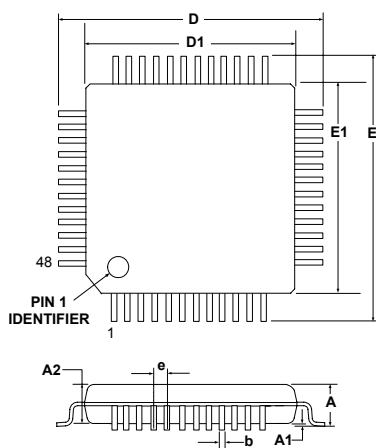
I2C is a trademark of Philips Semi.; SMBus is a trademark of Intel Corp.; SPI is a trademark of Motorola, Inc.



SELECTED ELECTRICAL SPECIFICATIONS TA = -40°C to +85°C unless otherwise specified.

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
<b>GLOBAL CHARACTERISTICS</b>					
Analog Supply Voltage		2.7		3.6	V
Analog Supply Current	Internal REF, ADC, DAC, Comparators all active		0.8		mA
Analog Supply Current with analog sub-systems inactive	Internal REF, ADC, DAC, Comparators all disabled		5		μA
Digital Supply Voltage		2.7		3.6	V
Digital Supply Current with CPU active	Clock=25MHz Clock=1MHz Clock=32kHz		12 0.5 20		mA mA μA
Digital Supply Current (shutdown mode)	Oscillator not running		2		μA
VDD Data Retention Voltage	RAM remains valid		1.5		V
<b>CPU &amp; DIGITAL I/O</b>					
Clock Frequency Range		DC		25	MHz
Port Output High Voltage	I <sub>OH</sub> = -3mA, Port I/O push-pull	VDD - 0.7			V
Port Output Low Voltage	I <sub>OL</sub> = 8.5mA			0.6	V
Input High Voltage		0.8 x VDD			V
Input Low Voltage				0.2 x VDD	V
SMBus SCL Frequency	SYSClk = MCU system clock			SYSClk/8	MHz
SPI Bus Clock Frequency	SYSClk = MCU system clock			SYSClk/2	MHz
<b>A/D CONVERTER</b>					
Resolution		10			bits
Integral Nonlinearity				±1	LSB
Differential Nonlinearity	Guaranteed Monotonic			±1	LSB
Throughput Rate				100	ksps
Input Voltage Range		0		VREF	V
<b>D/A CONVERTERS</b>					
Resolution		12			bits
Integral Nonlinearity	Specified from Data Word 014h to FEBh		±4		LSB
Differential Nonlinearity	Guaranteed Monotonic			±1	LSB
Offset Error	Data Word = 014h		±3		LSB
Output Settling Time	To ½ LSB of full-scale		10		μs
Output Voltage Swing		0		VREF - 1LSB	V
<b>COMPARATORS</b>					
Supply Current	(each Comparator)		1.5		μA
Response Time	CP+ - CP-  = 100mV		4		μs
Input Voltage Range		-0.25		(AV+) + 0.25	V
Input Bias Current		-5	0.001	+5	nA
Input Offset Voltage		-10		+10	mV

### PACKAGE INFORMATION



	MIN (mm)	NOM (mm)	MAX (mm)
A	-	-	1.20
A1	0.05	-	0.15
A2	0.95	1.00	1.05
b	0.17	0.22	0.27
D	-	9.00	-
D1	-	7.00	-
e	-	0.50	-
E	-	9.00	-
E1	-	7.00	-

### C8051F016DK DEVELOPMENT KIT (\$99)

