

### Analog Peripherals

#### 10-Bit ADC

- $\pm 1$  LSB INL; no missing codes
- Programmable throughput up to 100 ksp/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 ( $\pm 3$  °C)

#### Two 12-Bit DACs

- Voltage output
- 10  $\mu$ sec settling time

#### Two Comparators

- 16 programmable hysteresis values
- Configurable to generate interrupts or reset

#### Internal Voltage Reference

#### V<sub>DD</sub> Monitor/Brown-out Detector

#### On-Chip JTAG Debug

- 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

### High-Speed 8051 $\mu$ C Core

- Pipelined instruction architecture; executes 70% of instructions in 1 or 2 system clocks
- Up to 20 MIPS throughput with 20 MHz clock
- Expanded interrupt handler; up to 21 interrupt sources

### Memory

- 256 bytes data RAM
- 32 kB Flash; in-system programmable in 512-byte sectors (512 bytes are reserved)

### Digital Peripherals

- 32 port I/O; all are 5 V tolerant
- Hardware SMBus™ (I2C™ compatible), SPI™, and UART serial ports available concurrently
- Programmable 16-bit counter/timer array with five capture/compare modules
- 4 general-purpose 16-bit counter/timers
- Dedicated watchdog timer; bidirectional reset

### Clock Sources

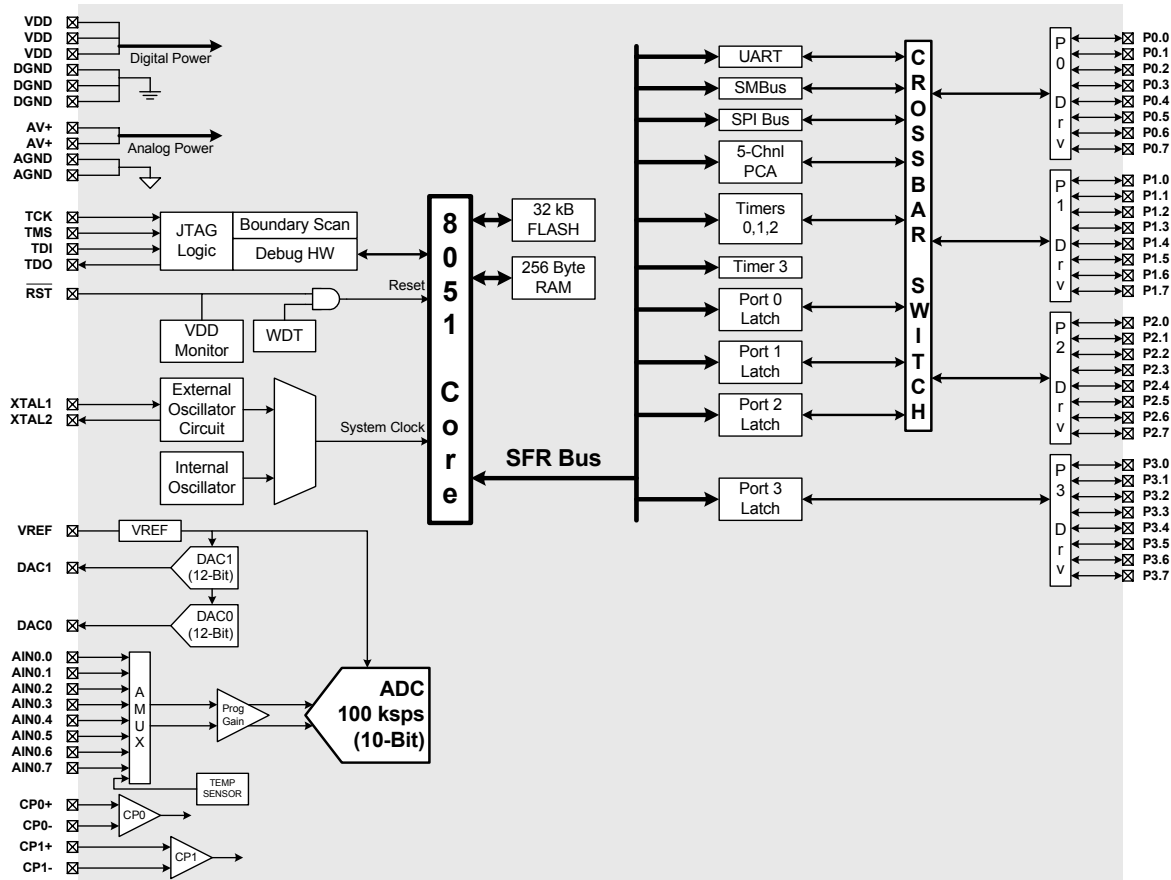
- Internal programmable oscillator: 2–16 MHz
- External oscillator: Crystal, RC, C, or Clock
- Can switch between clock sources on-the-fly

### Supply Voltage: 2.7 to 3.6 V

- Typical operating current: 10 mA at 20 MHz
- Multiple power saving sleep and shutdown modes

### 64-Pin TQFP

Temperature Range:  $-40$  to  $+85$  °C

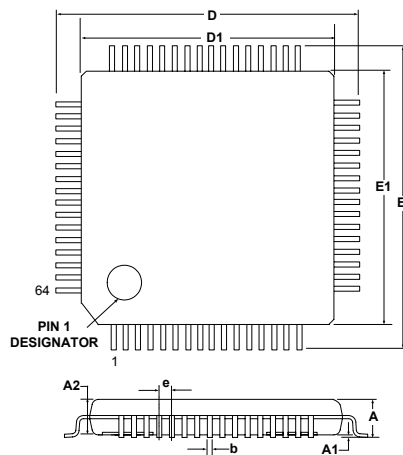


### Selected Electrical Specifications

( $T_A = -40$  to  $+85$  C°,  $V_{DD} = 2.7$  V 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               |                     | $\mu$ A             |
| Digital Supply Voltage                                 |   | 2.7                 |                 | 3.6                 | V                   |
| Digital Supply Current with CPU active                 | Clock = 20 MHz<br>Clock = 1 MHz<br>Clock = 32 kHz |                     | 10<br>0.5<br>20 |                     | mA<br>mA<br>$\mu$ A |
| Digital Supply Current (shutdown mode)                 | Oscillator not running                            |                     | 2               |                     | $\mu$ A             |
| $V_{DD}$ Data Retention Voltage                        | RAM remains valid                                 |                     | 1.5             |                     | V                   |
| <b>CPU &amp; DIGITAL I/O</b>                           |   |                     |                 |                     |                     |
| Clock Frequency Range                                  |   | DC                  |                 | 20                  | MHz                 |
| Port Output High Voltage                               | $I_{OH} = -3$ mA, Port I/O push-pull              | $V_{DD} - 0.7$      |                 |                     | V                   |
| Port Output Low Voltage                                | $I_{OL} = 8.5$ mA                                 |                     |                 | 0.6                 | V                   |
| Input High Voltage                                     |   | $0.8 \times V_{DD}$ |                 |                     | V                   |
| Input Low Voltage                                      |   |                     |                 | $0.2 \times V_{DD}$ | 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                                  |   |                     |                 | $\pm 1$             | LSB                 |
| Differential Nonlinearity                              | Guaranteed Monotonic                              |                     |                 | $\pm 1$             | LSB                 |
| Throughput Rate  |   |                     |                 | 100                 | ksps                |
| Input Voltage Range                                    |   | 0                   |                 | $V_{REF}$           | V                   |
| <b>D/A CONVERTERS</b>                                  |   |                     |                 |                     |                     |
| Resolution   |   | 12                  |                 |                     | bits                |
| Integral Nonlinearity                                  | Specified from Data Word 014h to FEBh             |                     | $\pm 4$         |                     | LSB                 |
| Differential Nonlinearity                              | Guaranteed Monotonic                              |                     |                 | $\pm 1$             | LSB                 |
| Offset Error   | Data Word = 014h                                  |                     | $\pm 3$         |                     | LSB                 |
| Output Settling Time                                   | To $\frac{1}{2}$ LSB of full-scale                |                     | 10              |                     | $\mu$ s             |
| Output Voltage Swing                                   |   | 0                   |                 | $V_{REF} - 1$ LSB   | V                   |
| <b>COMPARATORS</b>                                     |   |                     |                 |                     |                     |
| Supply Current   | (each Comparator)                                 |                     | 1.5             |                     | $\mu$ A             |
| Response Time  | $  (CP+) - (CP-)   = 100$ mV                      |                     | 4               |                     | $\mu$ s             |
| 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     | -        | 1.05     |
| b  | 0.17     | 0.22     | 0.27     |
| D  | -        | 12.00    | -        |
| D1 | -        | 10.00    | -        |
| e  | -        | 0.50     | -        |
| E  | -        | 12.00    | -        |
| E1 | -        | 10.00    | -        |

### C8051F005DK Development Kit

