

### Analog Peripherals

#### 10-Bit ADC

- $\pm 1$  LSB INL; no missing codes
- Programmable throughput up to 200 ksp/s
- Up to 17 external inputs; programmable as single-ended or differential
- Built-in temperature sensor ( $\pm 3^\circ\text{C}$ )

#### Two Comparators

Internal Voltage Reference: 2.4 V

#### POR/Brown-out Detector

#### USB Function Controller

- USB specification 2.0 compliant
- Full-speed (12 Mbps) or low-speed (1.5 Mbps) operation
- Integrated clock recovery; no external crystal required for either full-speed or low-speed operation
- Supports eight flexible endpoints
- Dedicated 1 kB USB buffer memory
- Integrated transceiver; no external resistors required

### On-Chip Debug

- On-chip debug circuitry facilitates full speed, non-intrusive in-system debug (no emulator required)
- Provides breakpoints, single stepping
- Inspect/modify memory, registers, and USB memory
- Superior performance to emulation systems using ICE-chips, target pods, and sockets

Operating Voltage: 2.7 to 5.25 V

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

### High-Speed 8051 $\mu\text{C}$ Core

- Pipelined instruction architecture; executes 70% of instructions in 1 or 2 system clocks
- Up to 25 MIPS throughput with 25 MHz Clock
- Expanded interrupt handler

### Memory

- 1280 bytes data RAM
- 16 kB Flash; in-system programmable in 512-byte sectors (512 bytes are reserved)

### Digital Peripherals

- 25 port I/O; all are 5 V tolerant
- Hardware SMBus™ (I<sup>2</sup>C™ 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

### Clock Sources

- Internal oscillator: 0.25% accuracy with clock recovery enabled; supports all USB and UART modes
- External oscillator: Crystal, RC, C, or Clock
- On-chip clock multiplier for USB controller

### Voltage Regulator

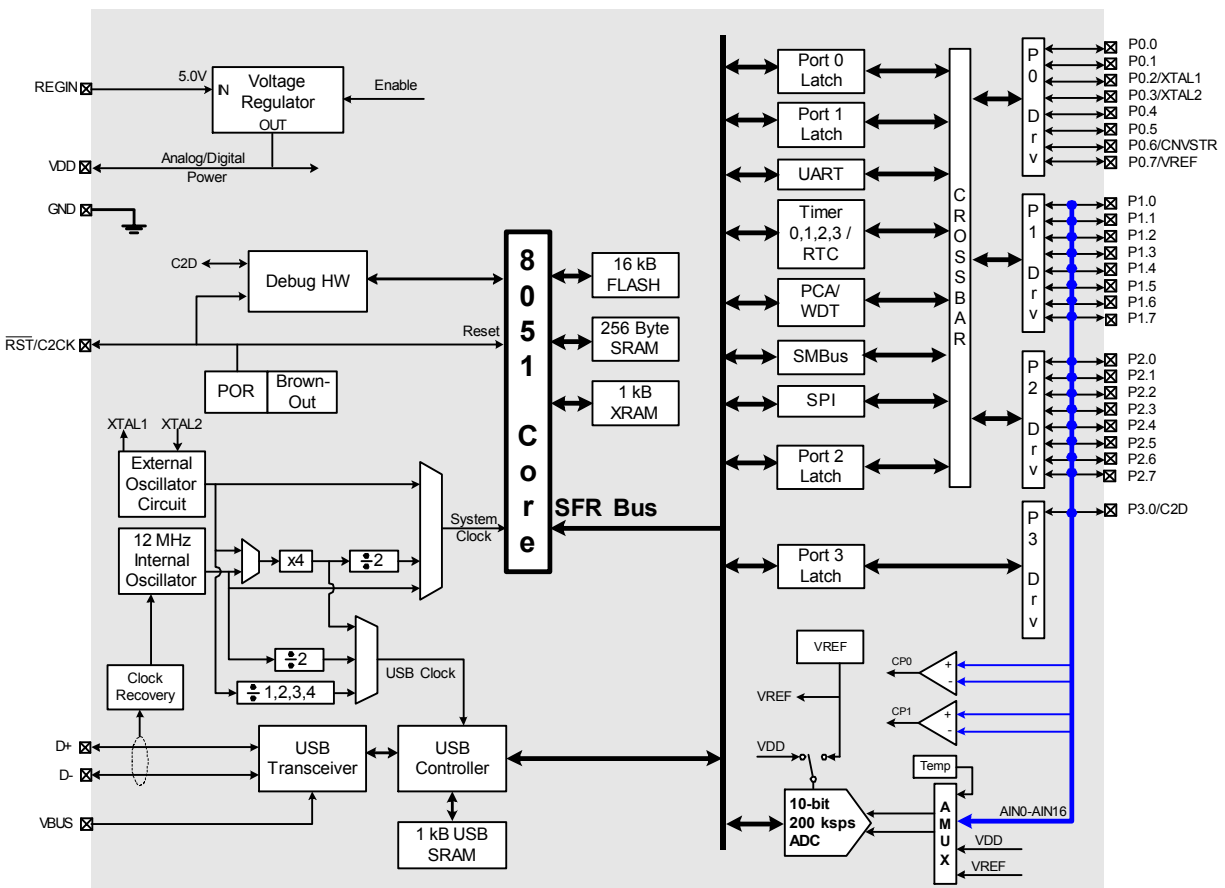
- On-chip voltage regulator supports USB bus-powered operation
- Regulator bypass mode supports USB self-powered operation

### Package

- 32-pin LQFP (lead-free package)

### Ordering Part Number

- C8051F320-GQ

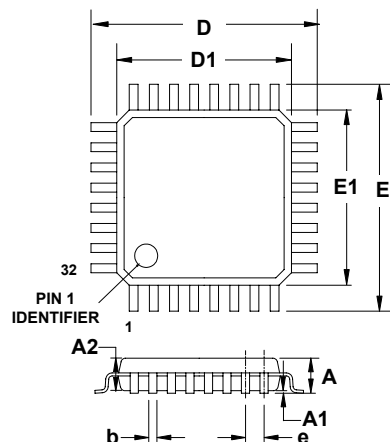


## Selected Electrical Specifications

(T<sub>A</sub> = 0 to +70 C°, V<sub>REG</sub> = 5.0 V unless otherwise specified)

| Parameter                                     | Conditions                                                  | Min   | Typ  | Max              | Units |
|-----------------------------------------------|-------------------------------------------------------------|-------|------|------------------|-------|
| <b>Global Characteristics</b>                 |                                                             |       |      |                  |       |
| Regulator Input Voltage (REGIN)               |                                                             | 4.0   | —    | 5.25             | V     |
| V <sub>DD</sub> (V <sub>REG</sub> Output)     |                                                             | 3.0   | 3.3  | 3.6              | V     |
| V <sub>REG</sub> Bias Current                 | V <sub>REG</sub> Enabled                                    | —     | 70   | —                | μA    |
| Supply Current with CPU and USB active        | CPU Clock = 24 MHz,<br>USB Clock = 48 MHz                   | —     | 18   | —                | mA    |
|                                               | CPU Clock = 12 MHz,<br>USB Clock = 6 MHz                    | —     | 9    | —                | mA    |
| Supply Current (suspend mode, Oscillator off) | V <sub>DD</sub> Monitor Enabled; V <sub>REG</sub> Disabled  | —     | 30   | —                | μA    |
|                                               | V <sub>DD</sub> Monitor Disabled; V <sub>REG</sub> Disabled | —     | <0.1 | —                | μA    |
| CPU System Clock Range                        |                                                             | DC    | —    | 25               | MHz   |
| <b>Internal Oscillator &amp; Clocks</b>       |                                                             |       |      |                  |       |
| Frequency                                     | Clock Recovery Enabled                                      | 11.97 | 12.0 | 12.03            | MHz   |
|                                               | Clock Recovery Disabled                                     | 11.82 | 12.0 | 12.18            | MHz   |
| USB Clock                                     | Full-Speed Operation                                        | 47.88 | 48.0 | 48.12            | MHz   |
|                                               | Low-Speed Operation                                         | 5.91  | 6.0  | 6.09             | MHz   |
| <b>A/D Converter</b>                          |                                                             |       |      |                  |       |
| Resolution                                    |                                                             | 10    |      |                  | bits  |
| Integral Nonlinearity                         |                                                             | —     | ±½   | ±1               | LSB   |
| Differential Nonlinearity                     | Guaranteed Monotonic                                        | —     | ±½   | ±1               | LSB   |
| Signal-to-Noise Plus Distortion               |                                                             | 53    | —    | —                | dB    |
| Throughput Rate                               |                                                             | —     | —    | 200              | ksps  |
| Input Voltage Range                           |                                                             | 0     | —    | V <sub>REF</sub> | V     |
| <b>Comparator</b>                             |                                                             |       |      |                  |       |
| Response Time Mode0                           | (CP+) – (CP-) = 100 mV                                      | —     | 0.1  | —                | μs    |
| Current Consumption Mode0                     |                                                             | —     | 7.6  | —                | μA    |
| Response Time Mode1                           | (CP+) – (CP-) = 100 mV                                      | —     | 0.18 | —                | μs    |
| Current Consumption Mode1                     |                                                             | —     | 3.2  | —                | μA    |
| Response Time Mode2                           | (CP+) – (CP-) = 100 mV                                      | —     | 0.32 | —                | μs    |
| Current Consumption Mode2                     |                                                             | —     | 1.3  | —                | μA    |
| Response Time Mode3                           | (CP+) – (CP-) = 100 mV                                      | —     | 1    | —                | μs    |
| Current Consumption Mode3                     |                                                             | —     | 0.4  | —                | μA    |

## Package Information



|    | MIN (mm) | NOM (mm) | MAX (mm) |
|----|----------|----------|----------|
| A  | -        | -        | 1.60     |
| A1 | 0.05     | -        | 0.15     |
| A2 | 1.35     | 1.40     | 1.45     |
| b  | 0.30     | 0.37     | 0.45     |
| D  | -        | 9.00     | -        |
| D1 | -        | 7.00     | -        |
| e  | -        | 0.80     | -        |
| E  | -        | 9.00     | -        |
| E1 | -        | 7.00     | -        |

## C8051F320DK Development Kit

