

Analog Peripherals

10-Bit ADC (C8051F380/1/2/3/8/9/A/B/C Only)

- Up to 500 ksp/s
- Built-in analog multiplexer with single-ended and differential mode
- VREF from external pin, internal reference, or V_{DD}
- Built-in temperature sensor
- External conversion start input option

Two Comparators

Internal Voltage Reference (C8051F380/1/2/3/8/9/A/B/C Only)

Brown-Out Detector and POR Circuitry

USB Function Controller (C8051F380/1/2/3/4/5/6/7/C)

- USB specification 2.0 compliant
- Full-speed (12 Mbps) or low-speed (1.5 Mbps) operation
- Integrated clock recovery; no external crystal required for full-speed or low-speed
- Supports eight flexible endpoints
- 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, and registers
- Superior performance to emulation systems using ICE-chips, target pods, and sockets

Supply Voltage: 1.8 to 3.6 V

- Voltages from 2.7 to 5.25 V supported using on-chip voltage regulators

Memory

- 4352 or 2304 Bytes RAM
- 64, 32, or 16 kB Flash; In-system programmable in 512-byte sectors

Temperature Range: -40 to +85 °C

High-Speed 8051 μ C Core

- Pipelined instruction architecture; executes 70% of instructions in 1 or 2 system clocks
- Up to 48 MIPS operation
- Expanded interrupt handler

Digital Peripherals

- 40/25 Port I/O; All 5 V tolerant with high sink current
- Hardware enhanced SPI™, two I²C/SMBus™, and two enhanced UART serial ports
- Six general purpose 16-bit counter/timers
- 16-bit programmable counter array (PCA) with five capture/compare modules
- External Memory Interface (EMIF)
- Clock Sources

Clock Sources

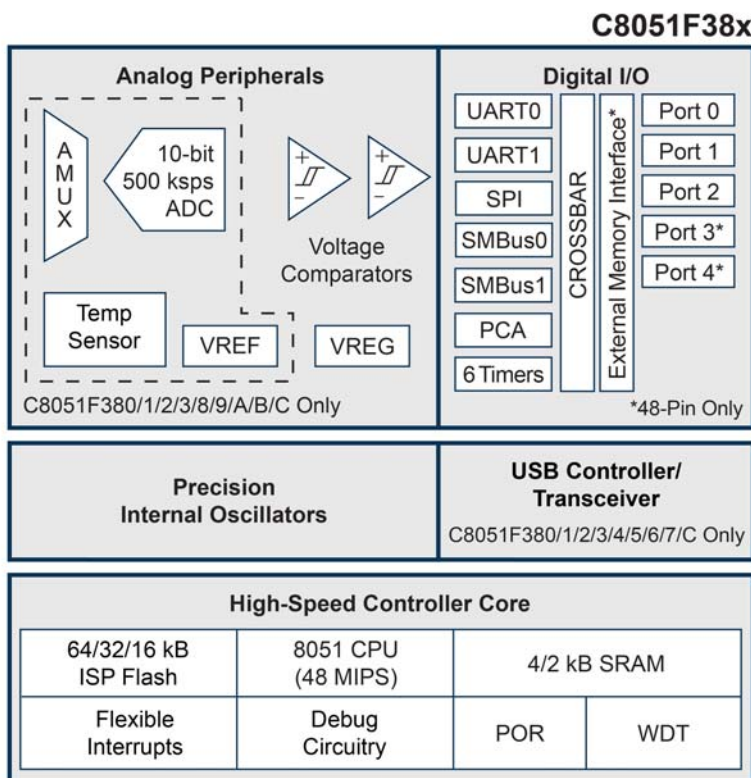
- Internal Oscillator: $\pm 0.25\%$ accuracy with clock recovery enabled. Supports all USB and UART modes
- External Oscillator: Crystal, RC, C, or clock (1 or 2 Pin modes)
- Low Frequency (80 kHz) Internal Oscillator
- Can switch between clock sources on-the-fly

Package

- 48-pin TQFP (C8051F380/2/4/6/8/A)
- 32-pin LQFP (C8051F381/3/5/9/B)
- 5x5 mm 32-pin QFN (C8051F381/3/5/9/B)
- Die sales available

Development Kits

- C8051F380DK: full-featured kit for full evaluation (MSRP \$99.00)
- ToolStick381DC: low-cost kit for quick and easy evaluation (MSRP \$9.90)
- ToolstickBA: base adapter for use with ToolStick daughter cards (MSRP \$17.50)



Product Selection Guide

Ordering Part Number	MIPS (Peak)	Flash Memory (Bytes)	RAM	Calibrated Internal Oscillator	Low Frequency Oscillator	USB with 1k Endpoint RAM	Supply Voltage Regulator	SMBus/I2C	Enhanced SPI	UARTs	Timers (16-bit)	Programmable Counter Array	Digital Port I/O	External Mem Interface (EMIF)	10-bit 500 ksp/s ADC	Temperature Sensor	Voltage Reference	Analog Comparators	Package
C8051F380-GQ	48	64k	4352	Yes	Yes	Yes	Yes	2	Yes	2	6	Yes	40	Yes	Yes	Yes	Yes	2	TQFP48
C8051F381-GQ	48	64k	4352	Yes	Yes	Yes	Yes	2	Yes	2	6	Yes	25	—	Yes	Yes	Yes	2	LQFP32
C8051F381-GM	48	64k	4352	Yes	Yes	Yes	Yes	2	Yes	2	6	Yes	25	—	Yes	Yes	Yes	2	QFN32
C8051F382-GQ	48	32k	2304	Yes	Yes	Yes	Yes	2	Yes	2	6	Yes	40	Yes	Yes	Yes	Yes	2	TQFP48
C8051F383-GQ	48	32k	2304	Yes	Yes	Yes	Yes	2	Yes	2	6	Yes	25	—	Yes	Yes	Yes	2	LQFP32
C8051F383-GM	48	32k	2304	Yes	Yes	Yes	Yes	2	Yes	2	6	Yes	25	—	Yes	Yes	Yes	2	QFN32
C8051F384-GQ	48	64k	4352	Yes	Yes	Yes	Yes	2	Yes	2	6	Yes	40	Yes	—	—	—	2	TQFP48
C8051F385-GQ	48	64k	4352	Yes	Yes	Yes	Yes	2	Yes	2	6	Yes	25	—	—	—	—	2	LQFP32
C8051F385-GM	48	64k	4352	Yes	Yes	Yes	Yes	2	Yes	2	6	Yes	25	—	—	—	—	2	QFN32
C8051F386-GQ	48	32k	2304	Yes	Yes	Yes	Yes	2	Yes	2	6	Yes	40	Yes	—	—	—	2	TQFP48
C8051F387-GQ	48	32k	2304	Yes	Yes	Yes	Yes	2	Yes	2	6	Yes	25	—	—	—	—	2	LQFP32
C8051F387-GM	48	32k	2304	Yes	Yes	Yes	Yes	2	Yes	2	6	Yes	25	—	—	—	—	2	QFN32
C8051F388-GQ	48	64k	4352	Yes	Yes	—	Yes	2	Yes	2	6	Yes	40	Yes	Yes	Yes	Yes	2	TQFP48
C8051F389-GQ	48	64k	4352	Yes	Yes	—	Yes	2	Yes	2	6	Yes	25	—	Yes	Yes	Yes	2	LQFP32
C8051F389-GM	48	64k	4352	Yes	Yes	—	Yes	2	Yes	2	6	Yes	25	—	Yes	Yes	Yes	2	QFN32
C8051F38A-GQ	48	32k	2304	Yes	Yes	—	Yes	2	Yes	2	6	Yes	40	Yes	Yes	Yes	Yes	2	TQFP48
C8051F38B-GQ	48	32k	2304	Yes	Yes	—	Yes	2	Yes	2	6	Yes	25	—	Yes	Yes	Yes	2	LQFP32
C8051F38B-GM	48	32k	2304	Yes	Yes	—	Yes	2	Yes	2	6	Yes	25	—	Yes	Yes	Yes	2	QFN32
C8051F38C-GQ	48	16k	2304	Yes	Yes	Yes	Yes	2	Yes	2	6	Yes	25	—	Yes	Yes	Yes	2	LQFP32
C8051F38C-GM	48	16k	2304	Yes	Yes	Yes	Yes	2	Yes	2	6	Yes	25	—	Yes	Yes	Yes	2	QFN32

Selected Electrical Specifications

Parameter	Conditions	Min	Typ	Max	Units
Global Electrical Characteristics					
Digital Supply Voltage		V_{RST}	3.3	3.6	V
Digital Supply RAM Data Retention Voltage		—	1.5	—	V
SYSCCLK (System Clock)		0	—	48	MHz
Specified Operating Temperature Range		-40	—	+85	°C
Voltage Regulator (REG0)					
Input Voltage Range		2.7	—	5.25	V
Output Voltage (V_{DD})	Output Current = 1 to 100 mA	3.0	3.3	3.6	V
Output Current		—	—	100	mA

Parameter	Conditions	Min	Typ	Max	Units
ADC-DC Accuracy					
Resolution		10			bits
SAR Conversion Clock		—	—	8.33	MHz
Throughput Rate		—	—	500	ksp/s
Voltage Reference					
Output Voltage	25 °C ambient	2.38	2.42	2.46	V
VREF Short-Circuit Current		—	—	7	mA
Comparators					
Response Time: Mode 0, $V_{cm}^* = 1.5$ V	$CP0+ - CP0- = 100$ mV	—	100	—	ns
	$CP0+ - CP0- = -100$ mV	—	250	—	ns