# 8051 Microcontroller IP Cores Family

Proven, capable, royalty-free 8/16-bit MCUs

| Features | L8051XC1 Legacy | R8051XC2 Fast, Mature | T8051XC3 Tiny | S8051XC3 Super-Fast |
|---|---|---|---|---|
| **Performance** | | | | |
| DMIPS/MHz vs Original 80C51 | 1x, 2x or 4x | 12.1x | 13.5x | 26.85x |
| 8x8 Multiply (Cycles) | 24 or 12 | 4 | 8 | 1 or 2 |
| 16x16 Multiply w/o MDU (Cycles) | 50 | 50 | 67 | 32 |
| 16x16 Multiply with MDU (Cycles) | 38 | 38 | N/A | N/A |
| 32-bit Code/Data Bus | X | X | X | ✓ |
| DPTR Arithmetic Acceleration | ✓ | ✓ | ✓ | ✓ |
| Advanced Execution Architecture | X | X | X | ✓ |
| Area (eq. NAND2 Gates @65nm) | X | X | X | X |
| Basic CPU | 3,000 | 3,000 | 2,000 | 3,000 |
| **Memory** | | | | |
| Program/Data Address Space | 64K Bytes | 64KB or 8MB | 64K Bytes | 64KB or 8MB |
| Configurable Set of Peripherals | ✓ | ✓ | ✓ | ✓ |
| 24-bit DPTR | X | X | X | X |
| Optional Extra 16-bit DPTRs | 1 to 7 | 1 to 7 | 0 to 1 | 0 to 1 |
| 32-bit Code/Data Bus | X | X | X | ✓ |
| Separate XDATA Bus | X | X | X | ✓ |
| **Peripherals: 80C51-Like** | | | | |
| TIMER 0 — 16-bit Counter/Timer | ✓ | ✓ | ✓ | ✓ |
| TIMER 1 — 16-bit Counter/Timer | ✓ | ✓ | ✓ | ✓ |
| SERIAL — Full duplex sync/async serial port | ✓ | ✓ | ✓ | ✓ |
| GPIO 0 — 8-bit Parallel Port | ✓ | ✓ | ✓ | ✓ |
| GPIO 1-3 — 8-bit Parallel Ports | ✓ | ✓ | ✓ | ✓ |
| ISR — Interrupt Controller: 6 sources and 2 priority levels | ✓ | ✓ | ✓ | ✓ |
| **Peripherals: SAB80C515-Like** | | | | |
| TIMER 2 — 16-bit Counter/ Timer/ Event Counter & Capture Compare Unit | ✓ | ✓ | X | X |
| WDT — 15-bit Watchdog timer | ✓ | ✓ | X | X |
| MDU — 32-bit Multiplication Division Unit | ✓ | ✓ | ✓ | ✓ |
| ISR — Interrupt Controller: 18 sources and 4 priority levels | ✓ | ✓ | X | X |
| GPIO 4,5,6 — 8-bit Parallel Ports | ✓ | ✓ | ✓ | ✓ |
| SERIAL 0 — Full duplex sync/async serial port | ✓ | ✓ | ✓ | ✓ |
| SERIAL 1 — Full duplex sync/async serial port | ✓ | ✓ | ✓ | ✓ |
| RTC — Real time clock | ✓ | ✓ | ✓ | ✓ |

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|---|---|---|---|---|
| TIMER 2 — 16-bit Timer | X | X | ✓ | ✓ |
| WDT — 14-bit Watchdog timer | ✓ | X | ✓ | ✓ |
| PCA — Programmable Counter Array: Five 16-bit PWM | ✓ | X | ✓ | ✓ |
| **Peripherals: Proprietary** | | | | |
| MAC — 40-bit Multiply Accumulator Unit | X | X | X | ✓ |
| PMU/DFS — Power Mgmt Unit with Dynamic Frequency Scaling | X | X | ✓ | ✓ |
| PMU — Power Mgmt Unit | ✓ | ✓ | ✓ | X |
| I2C 0, 1 — I2C Master/Slave with SMBUS extension | ✓ | ✓ | ✓ | ✓ |
| SPI_MS — SPI Master/Slave | ✓ | ✓ | ✓ | ✓ |
| DMA — DMA Controller | ✓ | ✓ | X | ✓ |
| OCDS — On Chip Debug Support | ✓ | ✓ | ✓ | ✓ |
| XWDT — Extended Watchdog Timer | X | ✓ | X | X |
| ISR — Interrupt Controller: 23 sources and 4 priority levels | X | X | ✓ | ✓ |
| CAN — CAN Bus Controller | ✓ | ✓ | ✓ | ✓ |
| LIN — LIN Bus Controller | ✓ | ✓ | ✓ | ✓ |
| LCD — LCD/TFT Display Controller | ✓ | ✓ | ✓ | ✓ |

✓ = Included or user-configurable option  ✓ = On request  **X** = Not supported

**Notes**
1. Performance data correspond to maximum speed configuration
2. DMIPS/MHz for original 80C51 is 0.00941
3. Basic Peripherals: 8-bit port, Timers 0 & 1, Serial 0, PMU, ISR (INT 0–1)