

Flash 8051 iMCU™ with EEPROM

OVERVIEW

The CW89FE6051/6052/6054 are 8-bit microcontrollers with 8/9/10KB on-chip flash memory and 256B on-chip RAM. The devices use the 8051 instruction set.

In addition, the CW89FE6051/6052/6054 provide 3/2/1KB on-chip EEPROM, and have the firmware and API functions that support Read, Write for the EEPROM.

The CW89FE6051/6052/6054 internally include many VML™ (Virtual Module Library) firmware, provide verified functions such as timer, interfaces, ADC etc.. They can help user shorting development time greatly.

The CW89FE6051/6052/6054 include unique BootLoader firmware, support ISP/IAP, no hardware programmer needed.

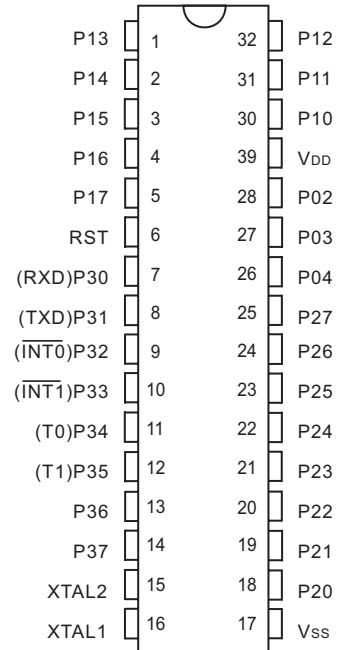
The CW89FE6051/6052/6054 also provide the following features: 27 I/O lines, Watchdog timer, two data pointers, two 16-bit timer/counters, a 6 vector four-level interrupt system, a full duplex serial port, and clock circuitry. Besides, the CW89FE6051/6052/6054 are designed with static logic for operation down to zero frequency and supports two software selectable power saving modes.

The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The Power-down mode saves the RAM contents but freezes the oscillator, disabling all other chip functions until the next external interrupt or hardware reset.

FEATURES

- 8051 Microcontroller, Software Compatible
- Operation Speed -- 0 to 24MHz
- 256 Bytes Internal RAM
- 8/9/10KB On-chip Flash
 - 4/5/6KB for User-code, 4KB for AFL™ (Application Function Library)
- 3/2/1KB On-chip EEPROM, API available
- VML™ Firmware
- ISP/IAP available
- Three High-Current Pins (16 mA)
- Two 16-bit Timers/Counters
- Full-Duplex, Enhanced UART
 - Framing error detection
 - Automatic address recognition
- Six Interrupt Sources at 4 Priority Levels
- Programmable Watchdog Timer (WDT)

PIN CONFIGURATION



(Top View)



FEATURES(CONTINUED)

- 27 I/O Pins, All bit-addressable
- Double DPTR register
- TTL- and CMOS-Compatible Logic Levels
- Low Power Modes
 - Power-down Mode with External Interrupt Wake-up
 - Idle Mode
- Selectable Operation Clock
 - Divide to 1/4, 1/16, 1/256, or 1/1024th
- Temperature Ranges: -40°C to +85°C
- Packages Available
 - 32-pin SDIP/SOP, Pb-free

ORDERING INFORMATION

Temperature Range	Package	Orderable Device	Package Qty.	
-40°C to +85°C	SOP32	CW89FE6051-32S	20 Units/Tube	
		CW89FE6052-32S		
		CW89FE6054-32S		
	SDIP32	Pb-Free	CW89FE6051-32P	17 Units/Tube
			CW89FE6052-32P	
			CW89FE6054-32P	

BLOCK DIAGRAM

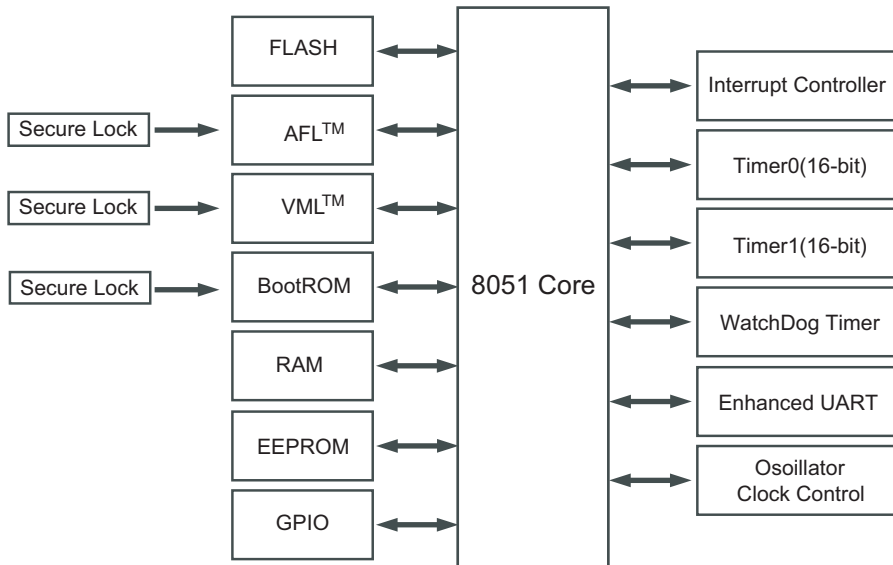


Figure 1. Block Diagram

PIN DESCRIPTION

Pin No.	Name	Type	Bit Address	Function Description	
				main	Alternate
30	P10	I/O	90H	Bidirectional I/O port with internal pull-up. The Port output buffer can drive LS TTL input. The Port pin is pulled high by the internal pull-up when '1's is written to it and can be used as input in this state. The P15, P16, P17 have high current drive of 16 mA.	
31	P11	I/O	91H		
32	P12	I/O	92H		
1	P13	I/O	93H		
2	P14	I/O	94H		
3	P15	I/O	95H		
4	P16	I/O	96H		
5	P17	I/O	97H		
6	RST	I	-	While the oscillator is running, a high on the pin for two machine cycles will reset the device.	
7	P30	I/O	B0H	Bidirectional I/O port with internal pull-up. The Port output buffer can drive LS TTL input. The Port pin is pulled high by the internal pull-up when '1's is written to it and can be used as input in this state.	RXD: UART Receive input.
8	P31	I/O	B1H		TXD: UART Transmit output.
9	P32	I/O	B2H		$\overline{\text{INT0}}$: External Interrupt Input.
10	P33	I/O	B3H		$\overline{\text{INT1}}$: External Interrupt Input.
11	P34	I/O	B4H		T0: External count input to Timer/Counter 0.
12	P35	I/O	B5H		T1: External count input to Timer/Counter 1.
13	P36	I/O	B6H		-
14	P37	I/O	B7H		-
15	XTAL2	O	-	Output from the inverting oscillator amplifier.	
16	XTAL1	I	-	Input to the inverting oscillator amplifier and to the internal clock.	
17	V _{SS}	P	-	Ground	
18	P20	I/O	A0H	Bidirectional I/O port with internal pull-up. The Port output buffer can drive LS TTL input. The Port pin is pulled high by the internal pull-up when '1's is written to it and can be used as input in this state.	
19	P21	I/O	A1H		
20	P22	I/O	A2H		
21	P23	I/O	A3H		
22	P24	I/O	A4H		
23	P25	I/O	A5H		
24	P26	I/O	A6H		
25	P27	I/O	A7H		
26	P04	I/O	84H	Open drain bidirectional I/O port. As an output pin it can sink several LS TTL inputs. The Port pin that has '1's written to it float, and in this state can be used as high-impedance input. External pull-up is required.	
27	P03	I/O	83H		
28	P02	I/O	82H		
29	V _{DD}	P	-	Power Supply	



ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
DC Voltage on Any Pin to Ground	V _{PIN}	-0.5 to V _{DD} +0.5	V
Transient Voltage (<20ns) on Any Pin to V _{SS}		-1.0 to V _{DD} +1.0	V
P1.5, P1.6, P1.7 Maximum Current	I _{OL}	20	mA
Maximum Current per I/O for All Other Pins	I _{OL}	15	mA
Power Dissipation (T _A = 25°C)		-1.5	W
Storage Temperature		-60 to +150	°C
Through Hole Lead Soldering Temperature (10 sec)		300	°C
Surface Mount Solder Reflow Temperature (10 sec)		260	°C
Output Short Circuit Current		50	mA

Note 1: Applied conditions greater than those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these conditions or conditions greater than those defined in the operational sections of this data sheet is not implied. Exposure to absolute maximum rating conditions may affect device reliability.

Note 2: All packages are 260°C capable in all solder versions.

Note 3: Outputs shorted for no more than one second. No more than one output shorted at a time.

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Min	Max	Unit
Supply Voltage	V _{DD}	3.3	5.5	V
Oscillator Frequency	f _{osc}	0	24	MHz
Operating Ambient Temperature	T _A	-40	+85	°C

PIN IMPEDANCE

(T_A=25°C, f=1 MHz, other pins open)

Parameter	Symbol	Test Conditions	Max	Unit
I/O Pin Capacitance	C _{I/O}	V _{I/O} = 0V	15	pF
Input Capacitance	C _{IN}	V _{IN} = 0V	12	pF
Pin Inductance	L _{PIN}		20	nH



DC ELECTRICAL CHARACTERISTICS

($T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$, $V_{DD} = 3.3\text{V}$, $V_{SS} = 0\text{V}$, $F = 24\text{MHz}$)

Parameter	Symbol	Test Conditions	Min	Max	Unit
Input Low Voltage	V_{IL}		-0.5	$0.2V_{DD} - 0.1$	V
Input High Voltage except RST, XTAL1	V_{IH}		$0.2V_{DD} + 0.9$	$V_{DD} + 0.5$	V
Input High Voltage (XTAL1, RST)	V_{IH1}		$0.7V_{DD}$	$V_{DD} + 0.5$	V
Output Low Voltage (P1, P2, P3)	V_{OL}	$I_{OL} = 0.8\text{mA}$		0.45	V
Output Low Voltage, P0	V_{OL}	$I_{OL} = 1.6\text{mA}$		0.45	V
Output High Voltage	V_{OH}	$I_{OH} = -10\mu\text{A}$	$0.9V_{DD}$		V
Logical 0 Input Current P1, P2, P3	I_{IL}	$V_{IN} = 0.45\text{V}$		-50	μA
Logical 1 to 0 Transition Current, P1, P2, P3	I_{TL}	$V_{IN} = 2\text{V}$		-650	μA
Input Leakage Current, P0	I_{LI1}	$0.45\text{V} < V_{IN} < V_{DD}$		± 10	μA
RST Pull-down Resistor	R_{RST}		40	225	$\text{k}\Omega$
Pin Capacitance	C_{IO}			10	pF
Power Supply Current	Active	I_{DD}		16	mA
	Idle			13	mA
	Power-down			50	μA

EXTERNAL CLOCK DRIVE

Parameter	Symbol	12 MHz		Variable		Unit
		Min	Max	Min	Max	
Frequency	f_{OSC}			0	24	MHz
Clock Period	T_{OSC}	83				ns
High Time	T_{HIGH}			$0.35T_{OSC}$	$0.65T_{OSC}$	ns
Low Time	T_{LOW}			$0.35T_{OSC}$	$0.65T_{OSC}$	ns
Rise Time	T_R		20			ns
Fall Time	T_F		20			ns

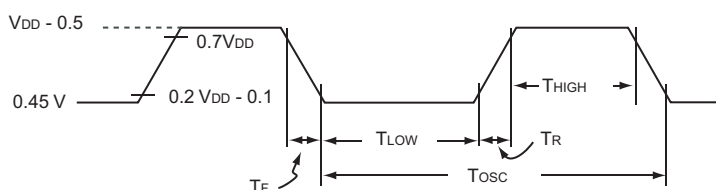


Figure 2. External Clock Drive Waveform

SERIAL PORT TIMING

Parameter	Symbol	12 MHz		Variable		Unit
		Min	Max	Min	Max	
Serial Port Clock Cycle Time	T_{XLXL}	1.0		$12T_{osc}$		μs
Output Data Setup to Clock Rising Edge	T_{QVXH}	700		$10T_{osc} - 133$		ns
Output Data Hold After Clock Rising Edge	T_{XHGX}	50		$2T_{osc} - 117$		ns
Input Data Hold After Clock Rising Edge	T_{XHDX}	0		0		ns
Clock Rising Edge to Input Data Valid	T_{XHDX}		700		$10T_{osc} - 133$	ns

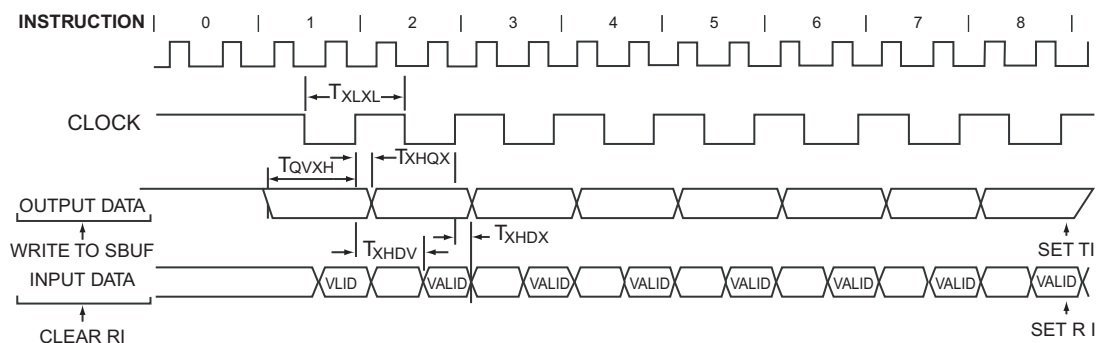
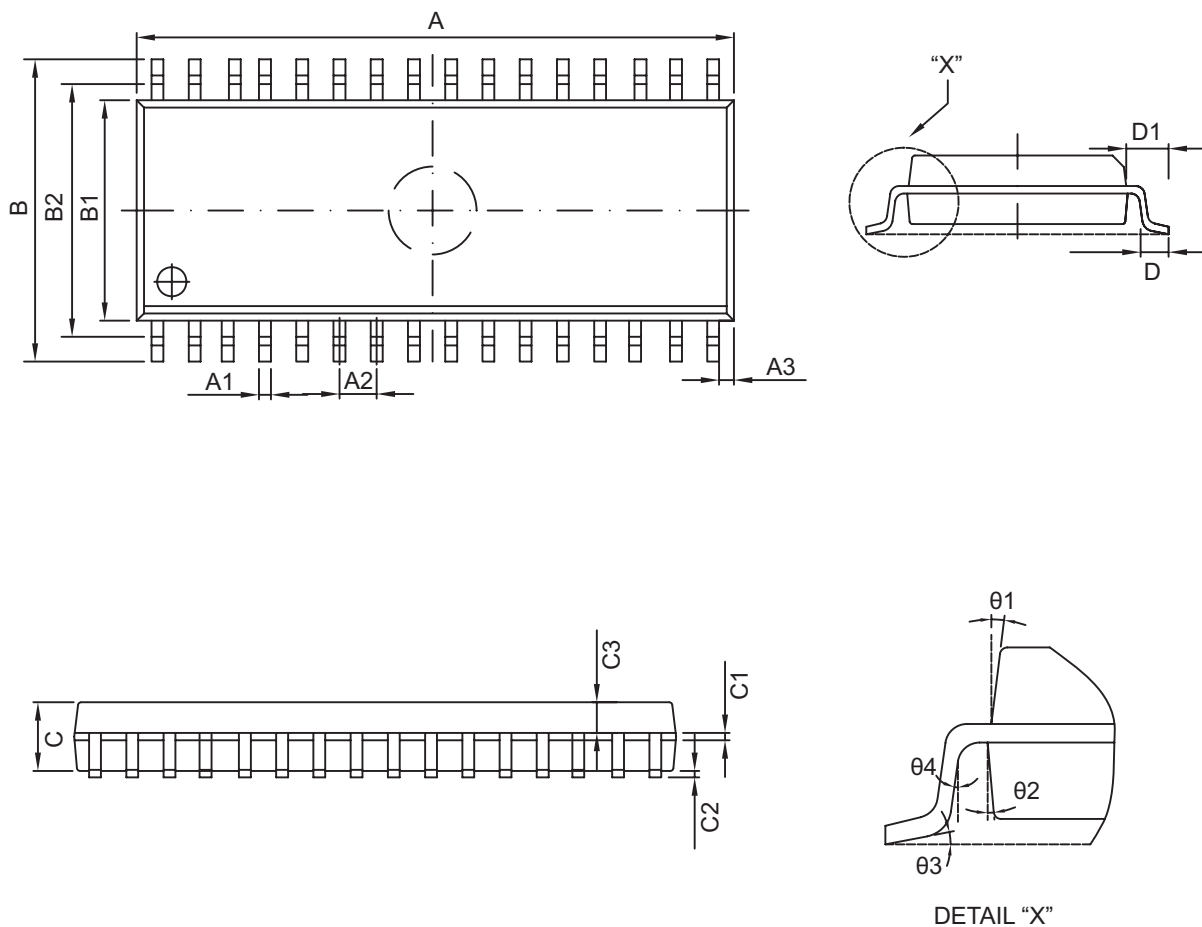


Figure 3. Shift Register Mode Timing Waveforms

PHYSICAL DIMENSIONS

SOP32

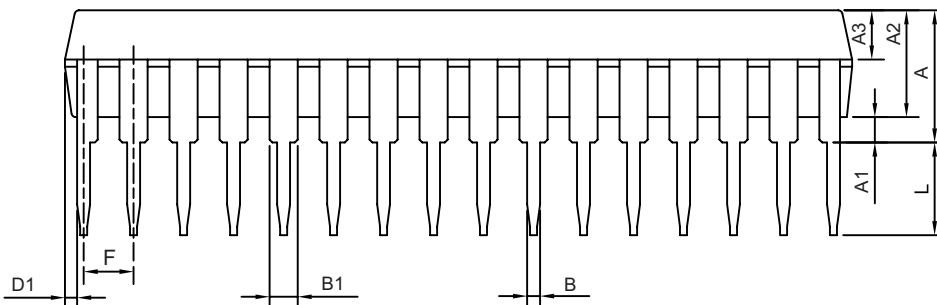
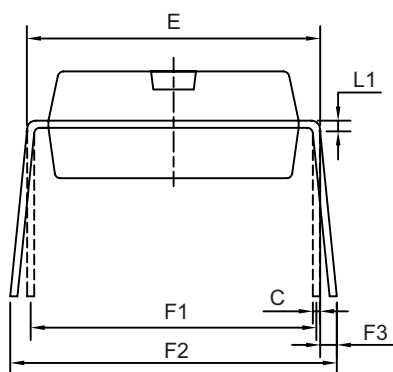
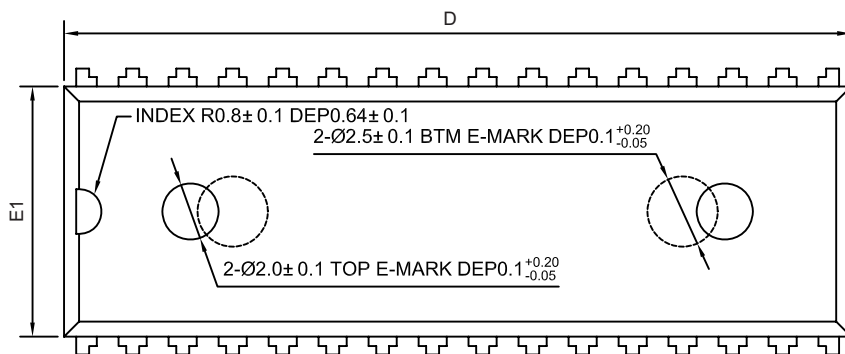


Symbol	Dimension(mm)		Symbol	Dimension(mm)	
	Min	Max		Min	Max
A	20.88	21.08	C2	0.10	0.25
A1	0.30	0.50	C3	0.99TYP	
A2	1.27TYP		D	0.55	0.95
A3	0.77TYP		D1	1.45TYP	
B	10.20	10.60	θ1	8° TYP	
B1	7.42	7.62	θ2	15° TYP	
B2	8.90TYP		θ3	4° TYP	
C	2.14	2.34	θ4	14° TYP	
C1	0.20	0.32			



CW89FE6051/6052/6054

SDIP32



Symbol	Dimension(mm)		Symbol	Dimension(mm)	
	Min	Max		Min	Max
A	4.70	5.00	E	10.00	10.80
A1	0.51		E1	8.79	8.99
A2	3.60	4.00	F	1.78(TYP)	
A3	1.65	1.85	F1	10.16(TYP)	
B	0.42	0.55	F2	10.90	11.90
B1	0.90	1.10	F3	0	1.40
C	0.21	0.35	L	3.00	3.80
D	27.90	28.10	L1	0.38(TYP)	
D1	0.13				



August 2008

Rev 1.00

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