

Motorola (Freescale)

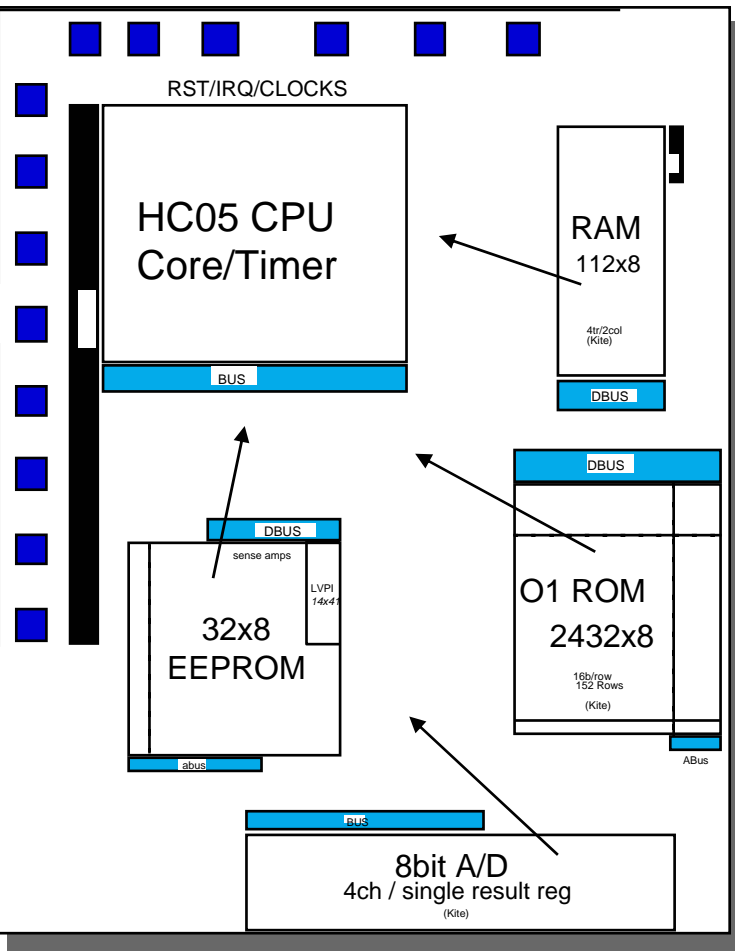
8/16/32Bits MCU Introduction

Do Select Best MCU for Your Application!

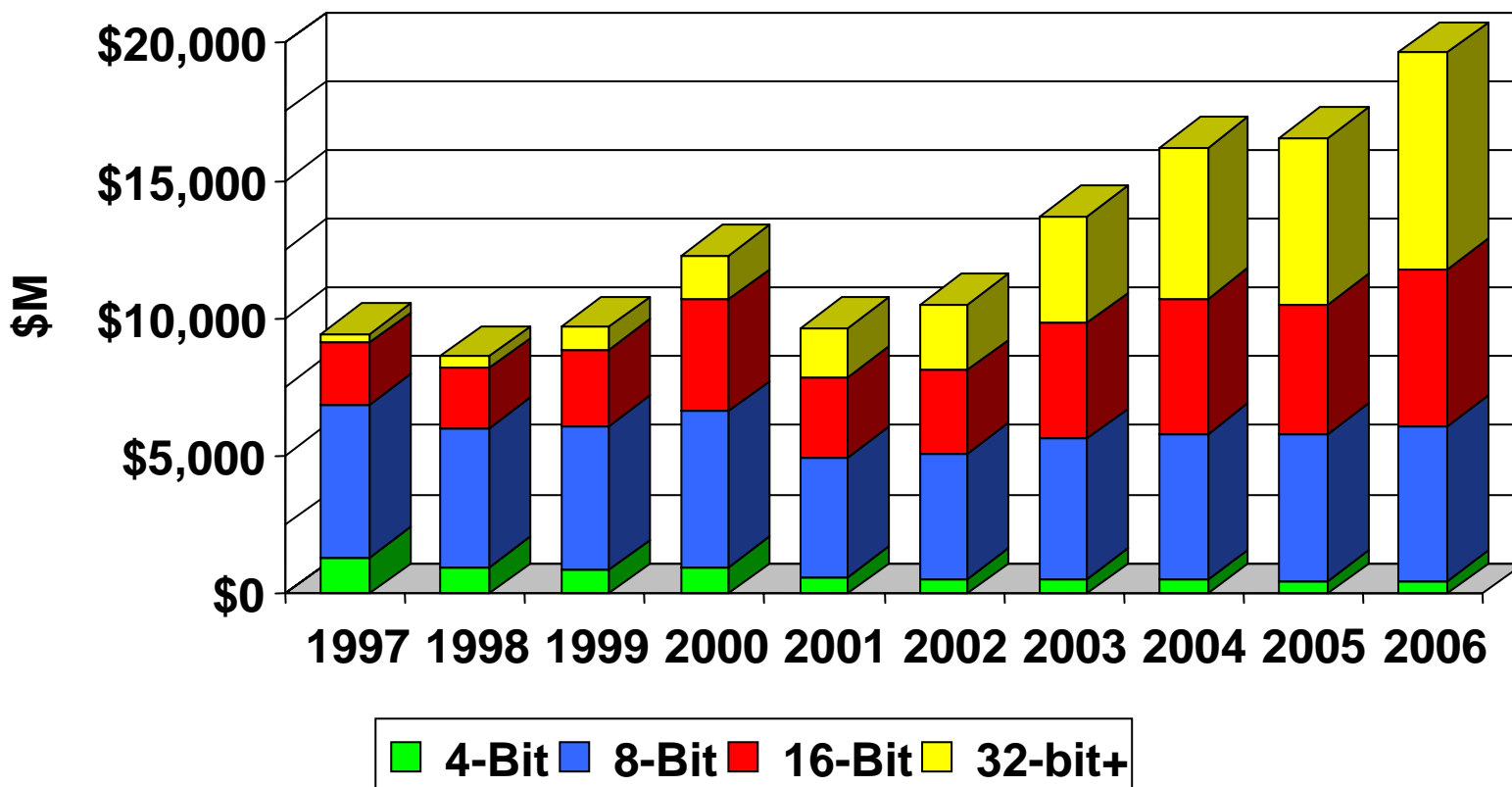
CUSTOMER SPECIFIC INTEGRATED CIRCUIT

Develop New MCU

- based on **PARTNERSHIP with Key Customer** to define feature set for customer application
- **Motorola does design** and is responsible for product introduction & qualification
- CSIC features a **Modular Design Methodology** to decrease Product Introduction Cycle
- Customer benefits from **Hand-packed Design** bringing Cost Benefit to High Vol. Application
- Motorola (normally) adds the device to Standard Product Catalogue

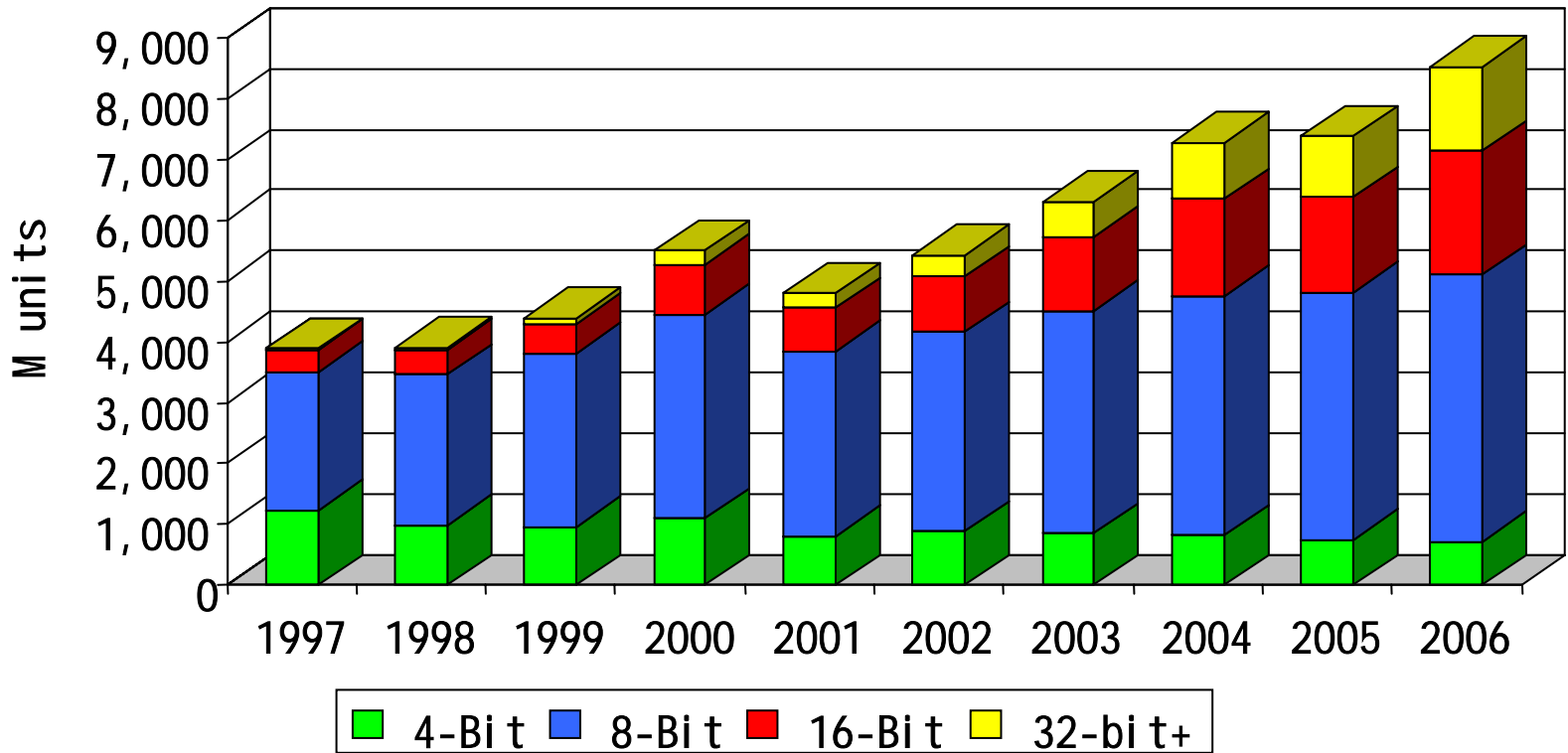


Total MCU Market (to 200 亿\$)



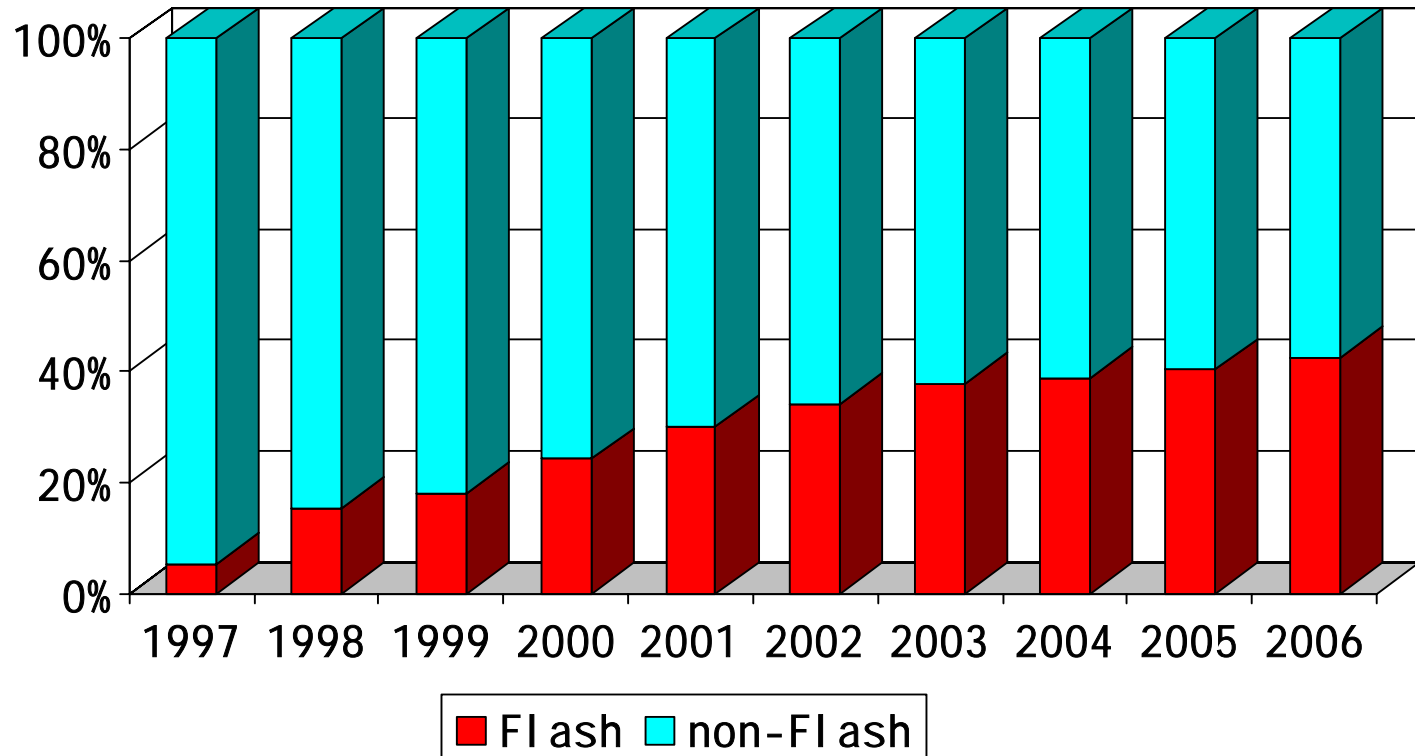
Resources from SEMICO Research Cooperation 2003

Total MCU Market (pieces)

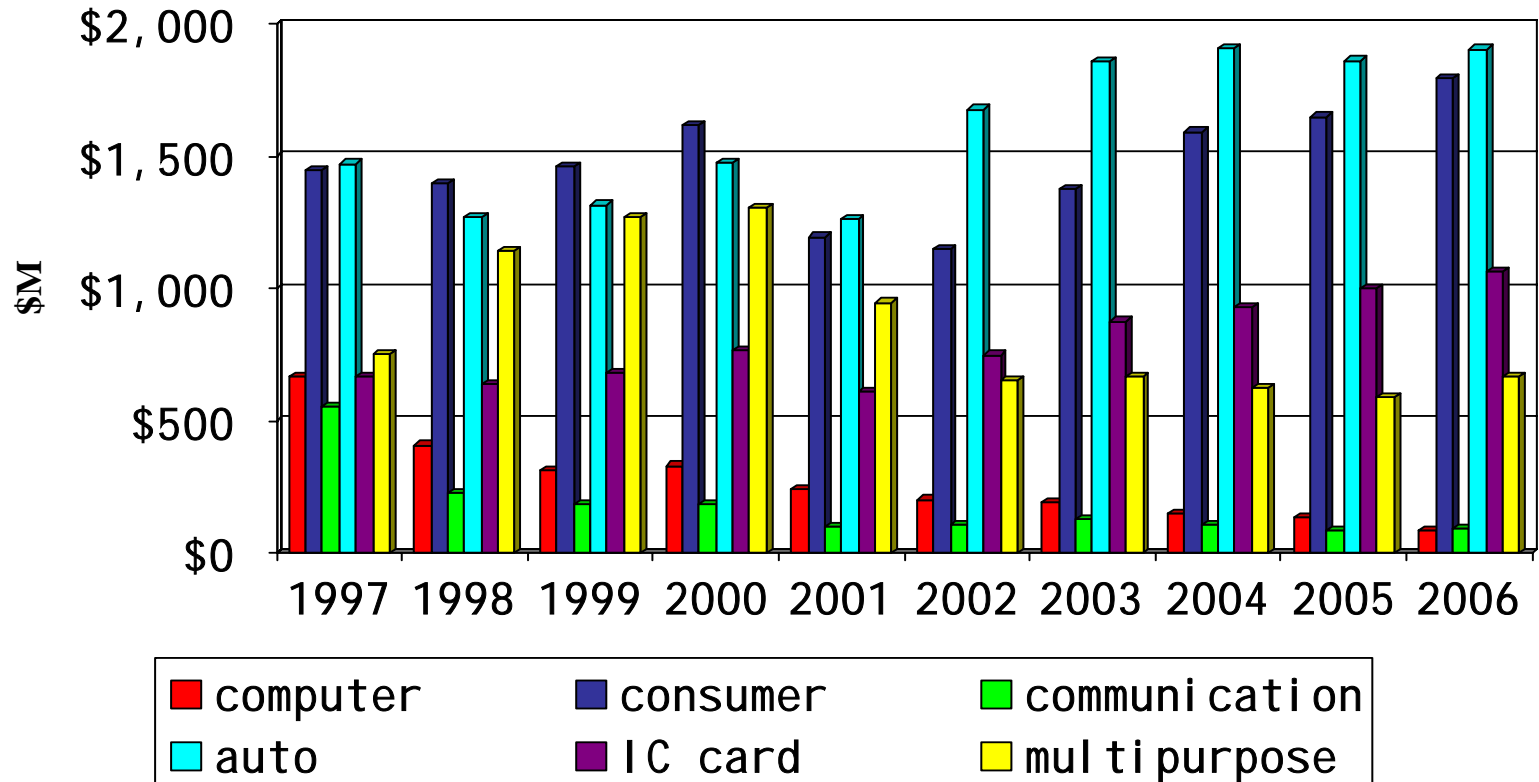


8-Bit Flash MCU

High Growth In Units

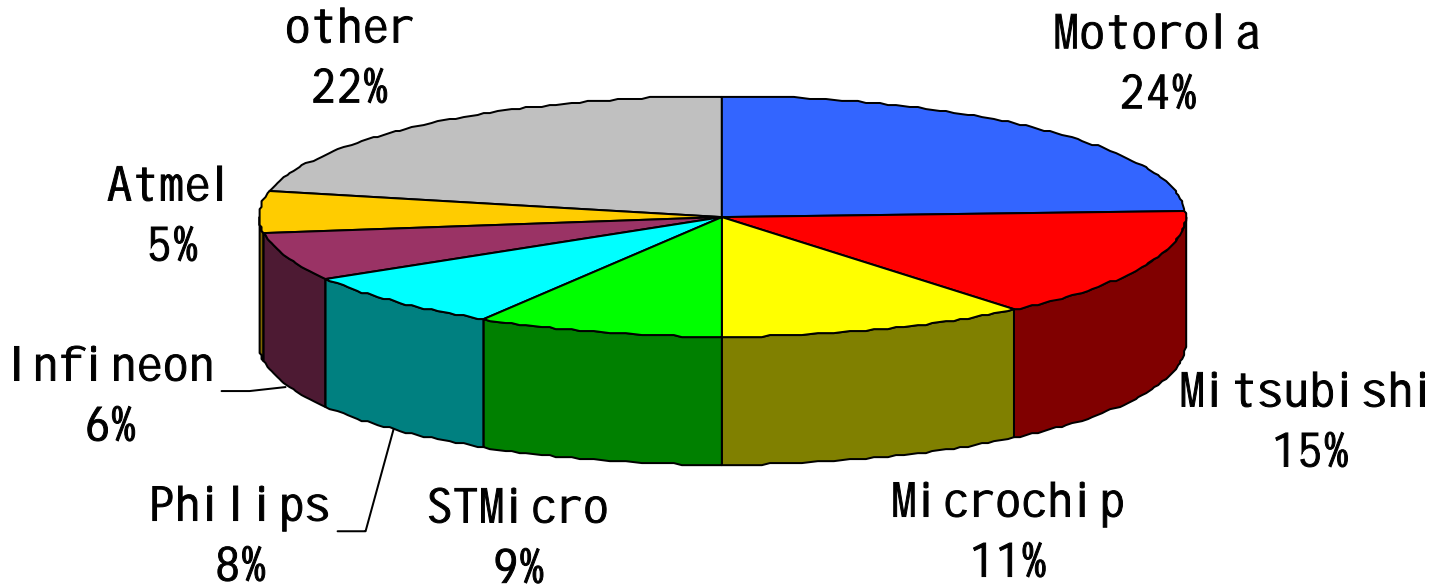


Where Do 8-Bit MCUs Go?



8-Bit MCU Market

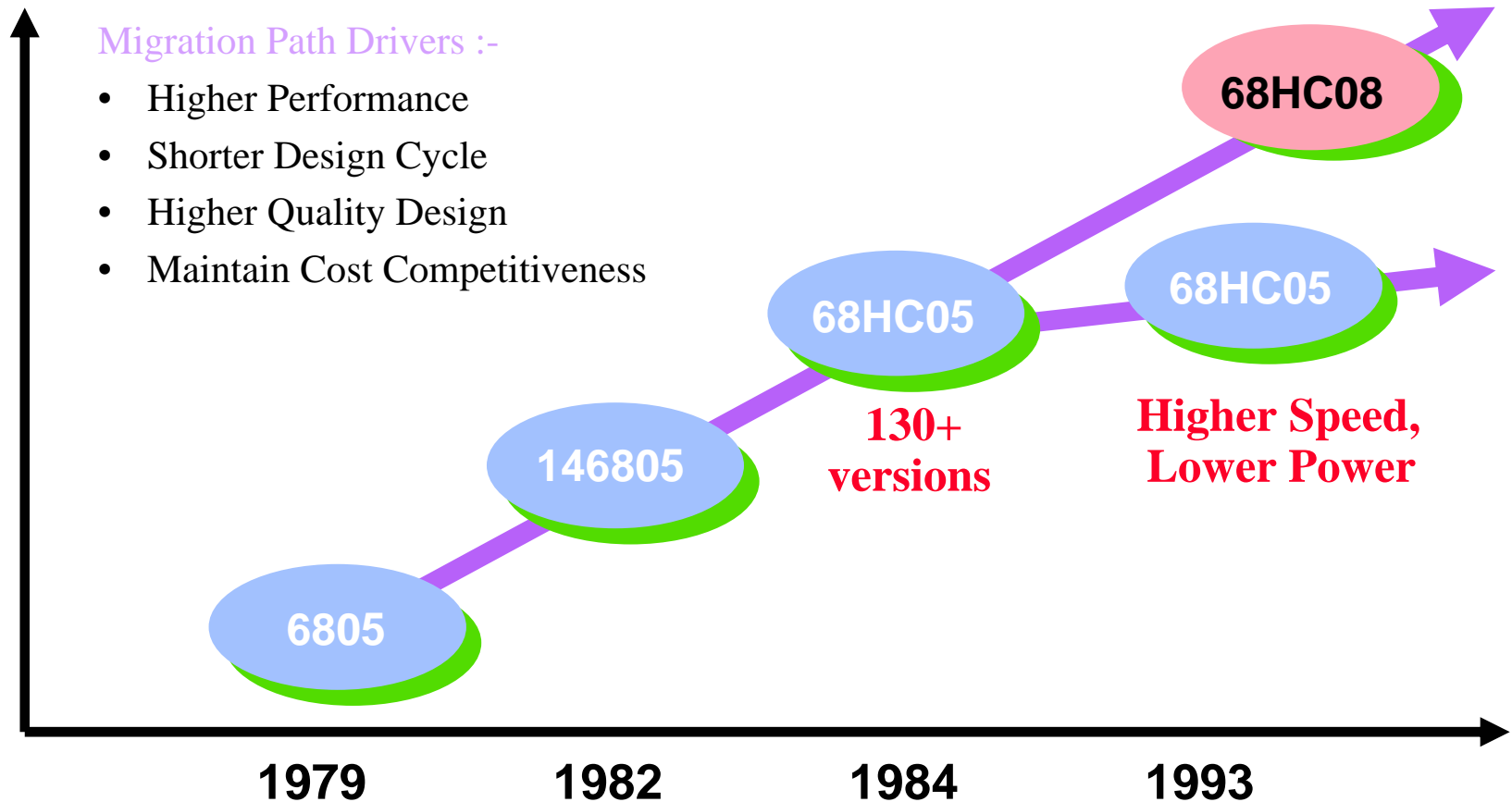
2001 Market Share (\$)



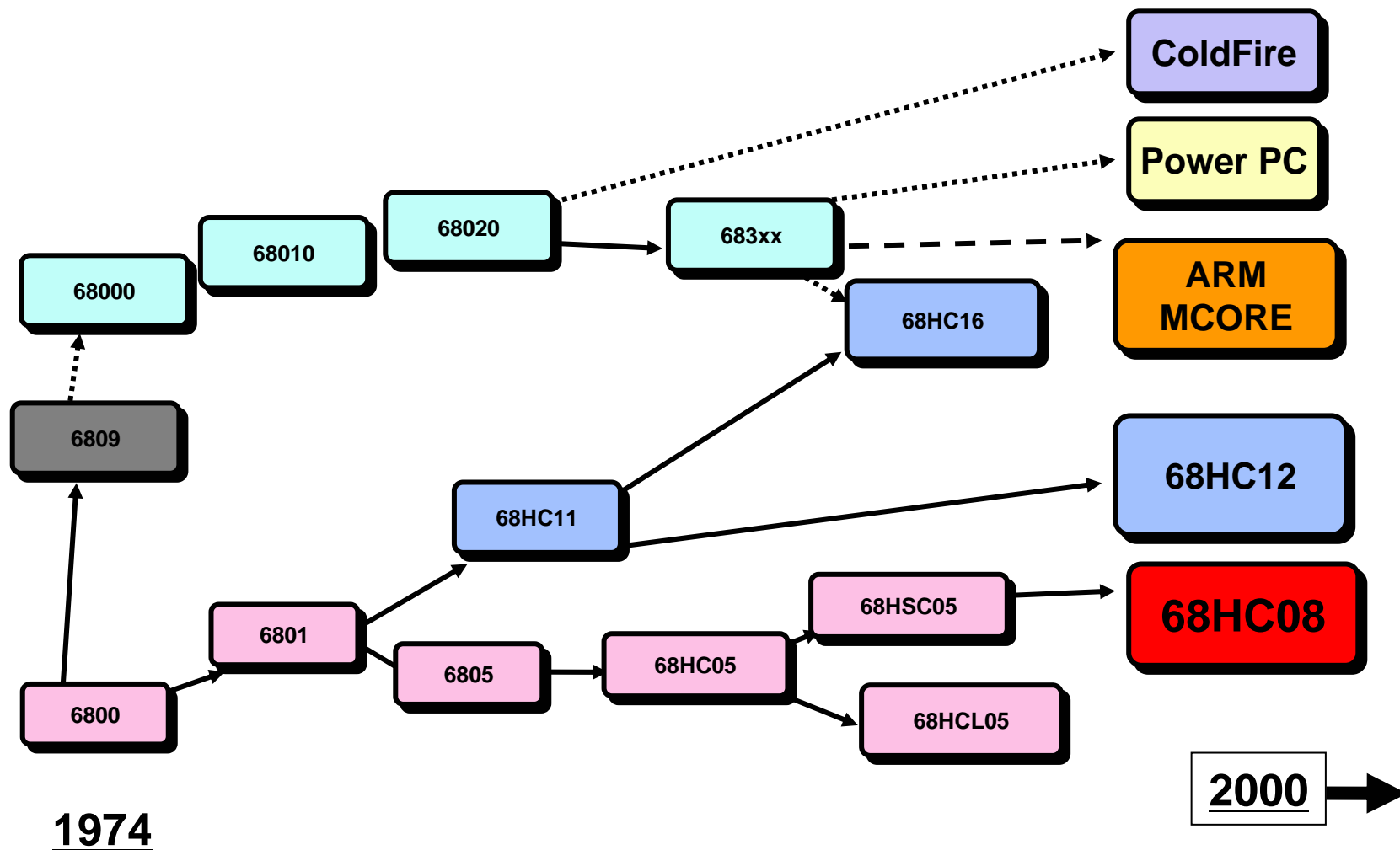
History of Motorola 8bits Family

Migration Path Drivers :-

- Higher Performance
- Shorter Design Cycle
- Higher Quality Design
- Maintain Cost Competitiveness

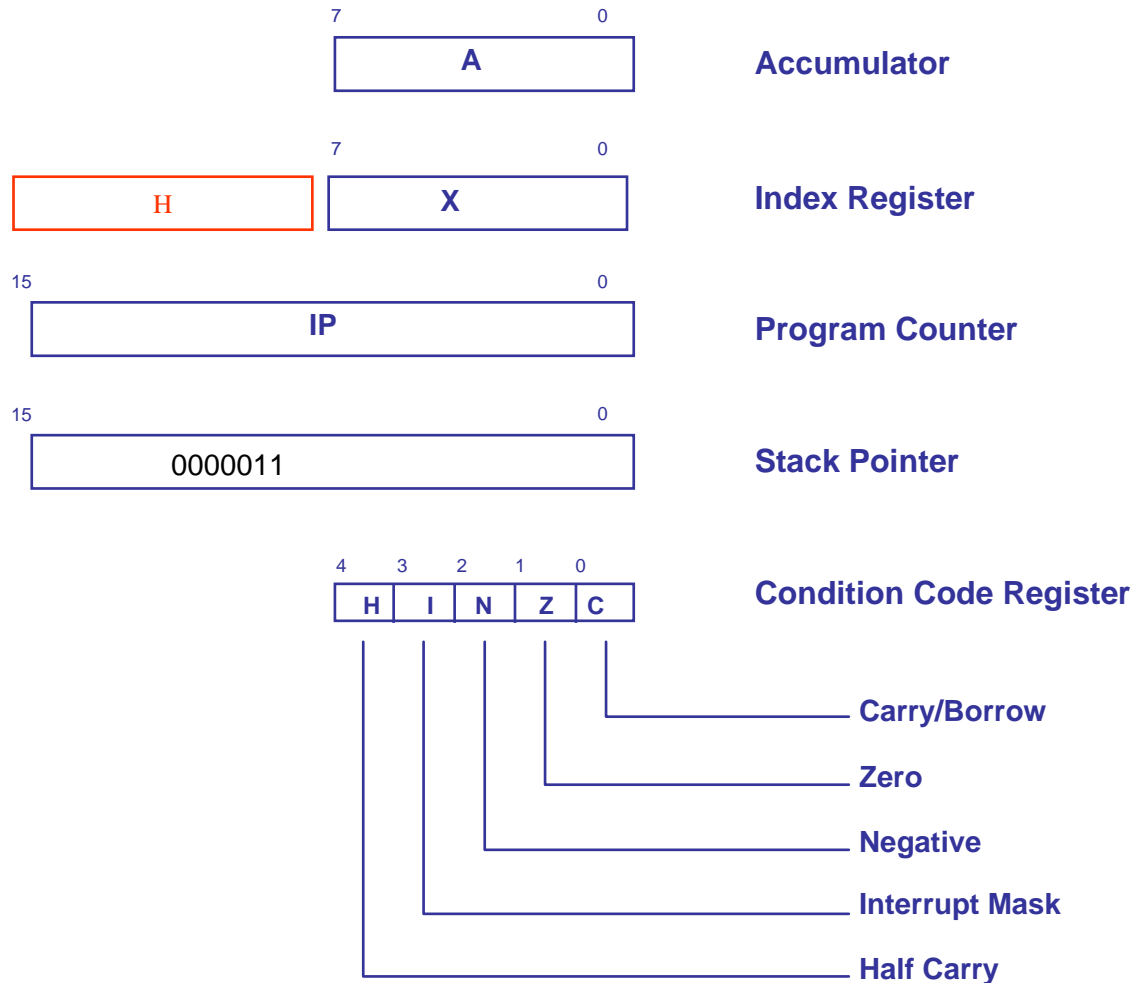


Motorola MCU Evolution



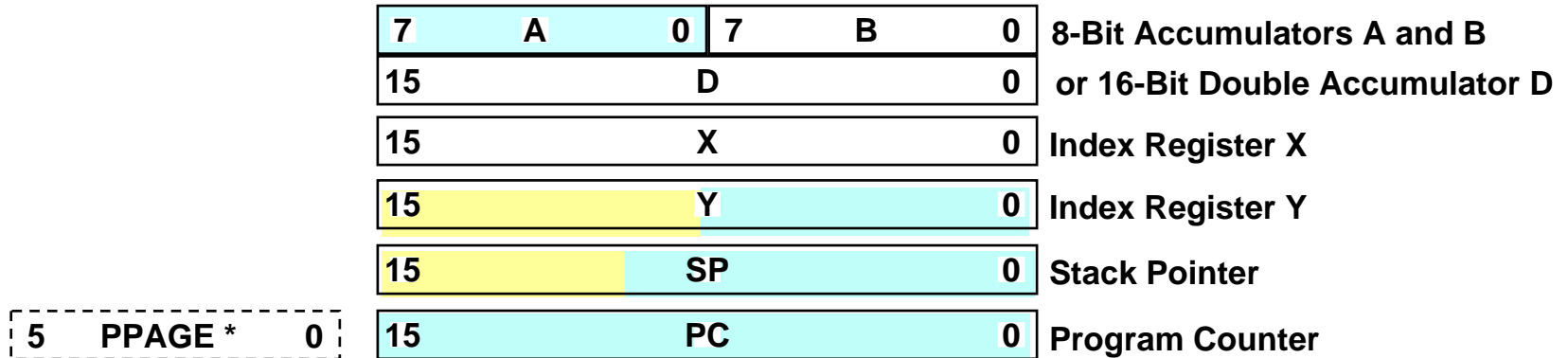
MC68HC05, 08 CPU Structure

Registers



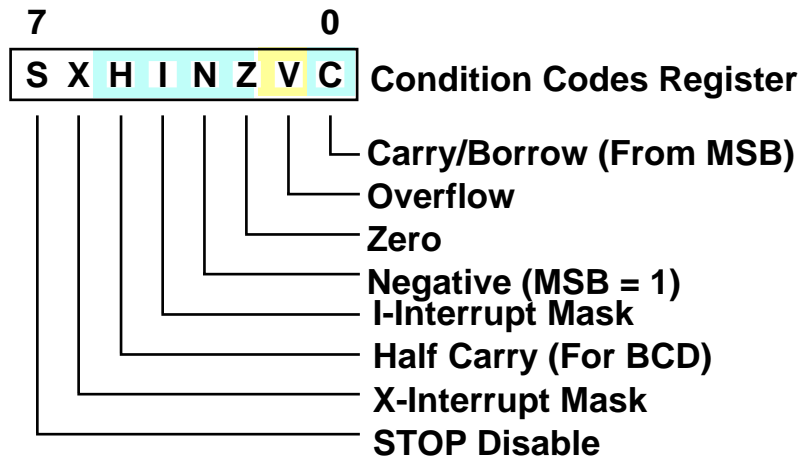
HCS12 CPU

68HC11 = 68HC12 = HCS12 Programmers Model

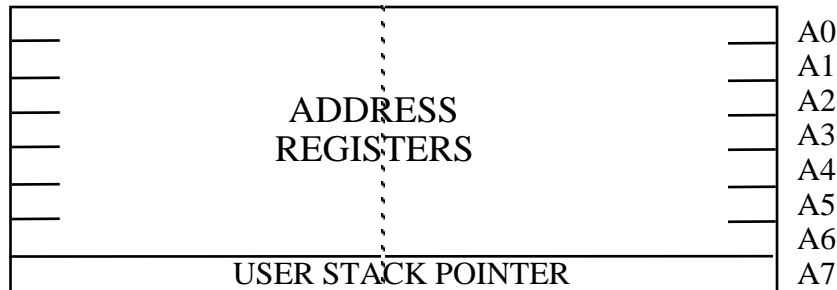
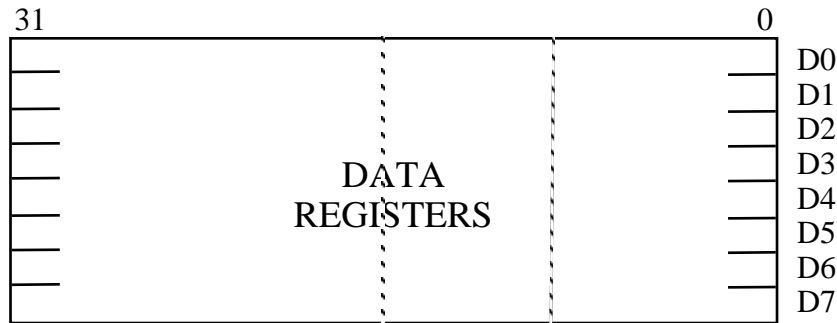


- ◆ Source code compatible
- ◆ Identical stack frame
- ◆ * PPAGE used by CALL & Return To Call (RTC).
(paged HC(S)12 only)

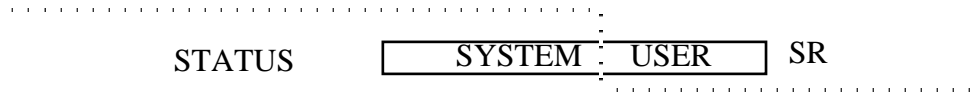
- HC05 / HC08 / HCS12
- HC08 / HCS12



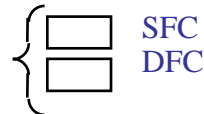
MC68K, CPU32, ColdFire CPU Structure



USER
MODEL

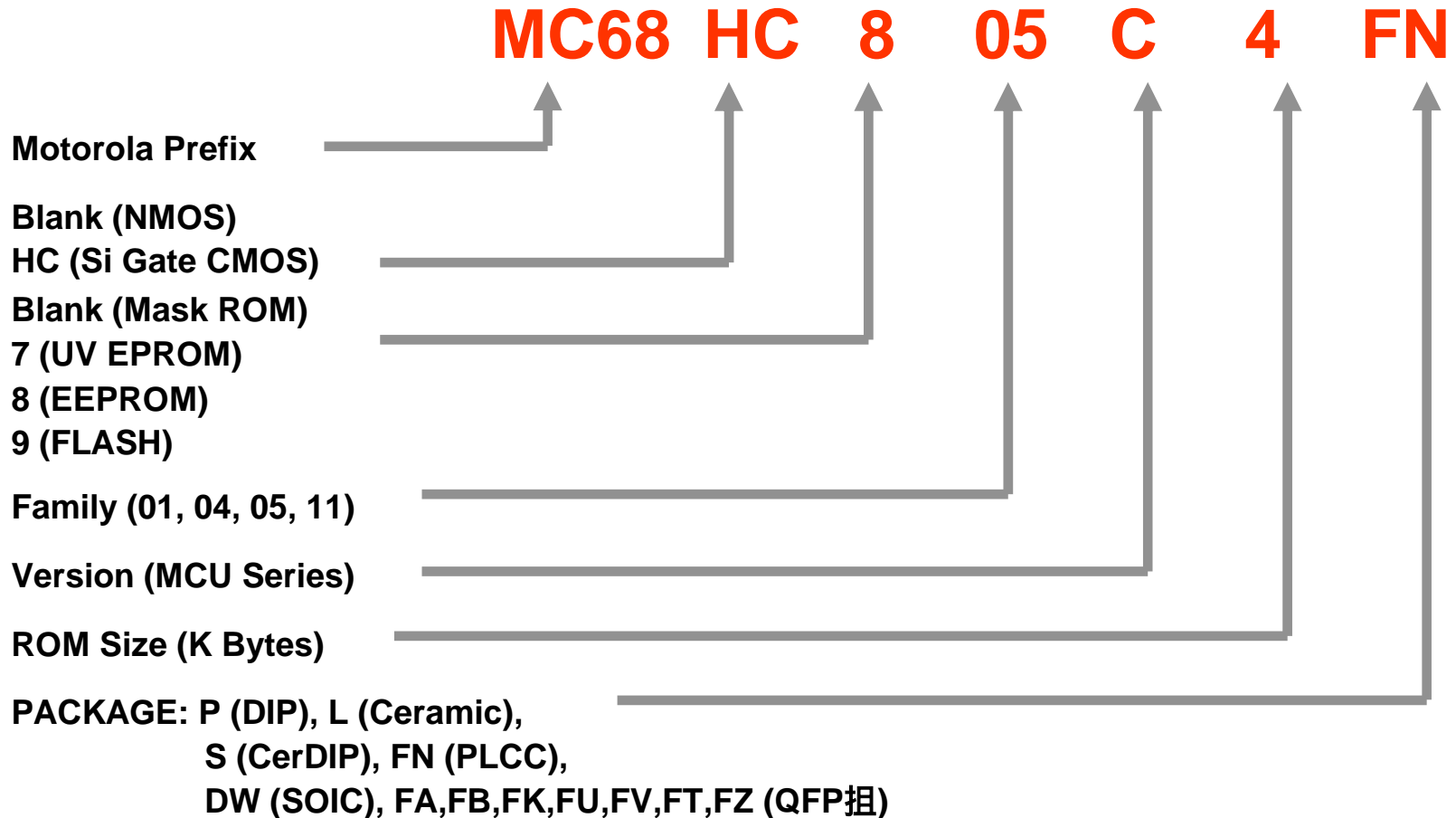


ALTERNATE FUNCTION
CODE REGISTERS

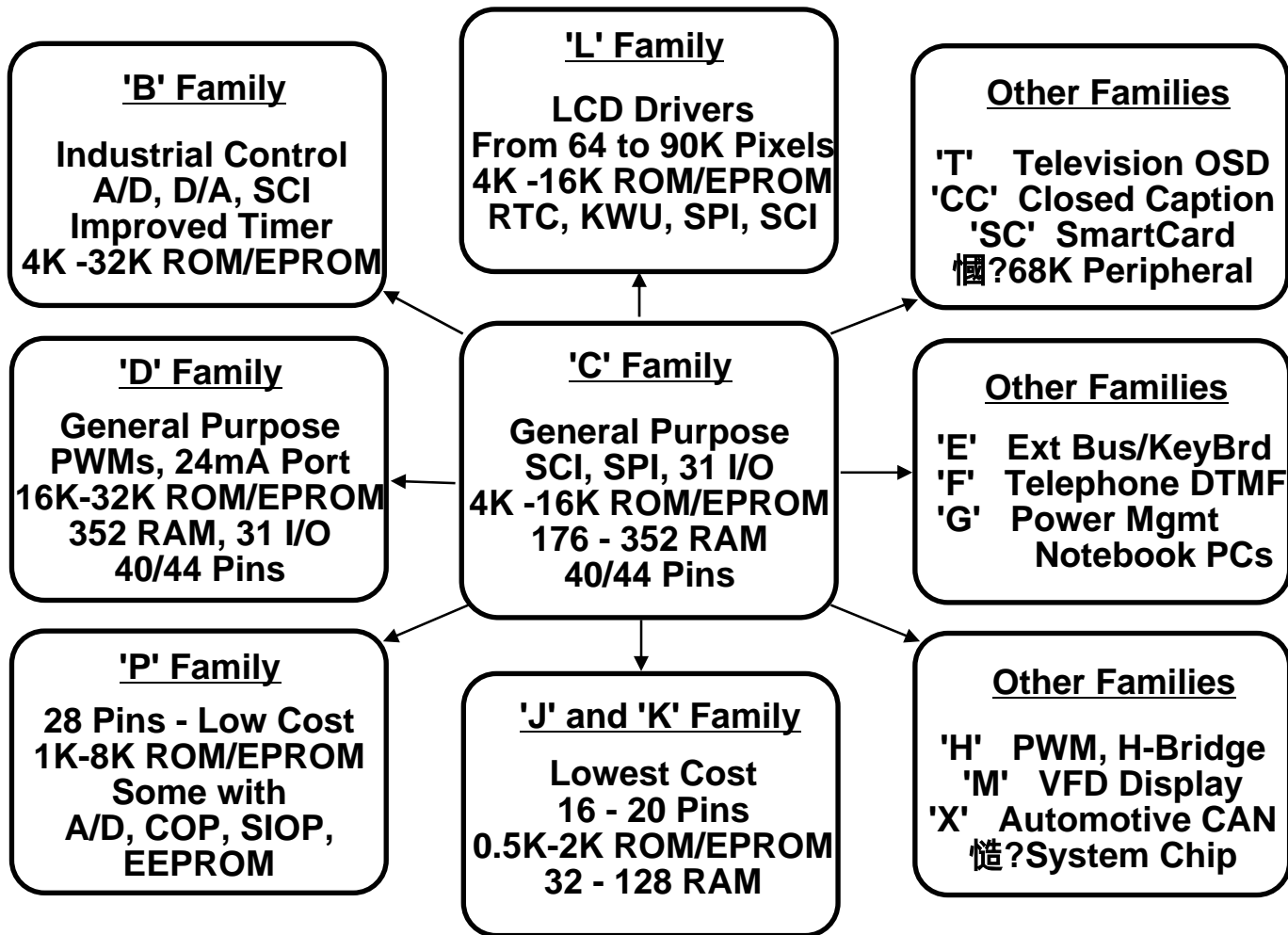


ADDITIONAL
SUPERVISOR
RESOURCES

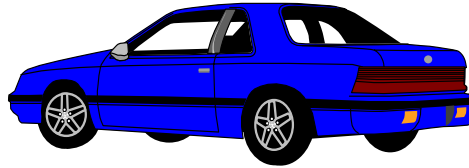
Motorola Part Numbering Scheme



HC05 family



HC05B family

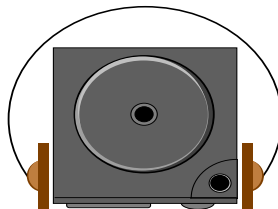


□ Industrial Control/Automotive MCU Applications

Device	ROM (bytes)	RAM (bytes)	EPROM (bytes)	EEPROM (bytes)	TIMER	I / O	SERIAL	A/D	PWM	COP	Package Options	OTP	Dev Sys	Comments
HC05B4	4K	176			16 BIT 2 I/C, 2 O/C	32	SCI	8-CH 8-BIT	2-CH 8-BIT		56SDIP - B 52PLCC - FN	705B5	EVS	4k without EEPROM
HC705B5		176	6K		16BIT 2 I/C, 2 O/C	32	SCI	8-CH 8-BIT	2-CH 8-BIT		56SDIP - B 52PLCC - FN	N/A	EVS	B6 EPROM emulation
HC05B6	6K	176		256	16 BIT 2 I/C, 2 O/C	32	SCI	8-CH 8-BIT	2-CH 8-BIT		56SDIP - B 52PLCC - FN 64QFP - FU	705B5	EVS	Double speed 4MHz available!
HC05B8	8K	176		256	16-BIT 2 I/C, 2 O/C	32	SCI	8-CH 8-BIT	2-CH 8-BIT		56SDIP - B 52PLCC - FN 64QFP - FU	705B16	EVS	4MHz available
HC05B16 (705B16)	16K (X)	352	X (16k)	256	16-BIT 2 I/C, 2 O/C	32	SCI	8-CH 8-BIT	2-CH 8-BIT		52PLCC - FN 64QFP - FU	705B16	EVS	
HC05B32 (705B32)	32K (X)	528	X (32k)	256	16-BIT 2 I/C, 2 O/C	32	SCI	8-CH 8-BIT	2-CH 8-BIT		52PLCC - FN 64QFP - FU	705B32	TBD	ROM sampling 1Q '94 705B32 adv. sampling

Versatility of EEPROM with A/D, Serial, and PWMs

HC05C family

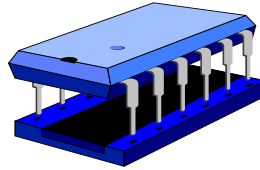


General Purpose 40/44 Pin MCUs













Device	ROM (bytes)	RAM (bytes)	EPROM (bytes)	EEPROM (bytes)	TIMER	I/O	SERIAL	A/D	PWM	COP	Package Options	OTP	Status	Comments
HC05CJ4 (705CJ4)	4k (X)	224	X (4K)		16-BIT 1 I/C, 1 O/C 15 stg MFT	31	SCI, SPI & slave IIC				40 DIP - P 44 QFP - FB	705CJ4	Contact Sales	C4 +IIC+COP 10mA sink port
HC05C0	0	512	X	X	16-BIT 1 I/C, 1 O/C 15 stg MFT	18	SCI	X	X		40 PDIP - P 42 - SDIP - B 44 PLCC - FN	Not needed	Contact Sales	16-bit external address, 8-bit data bus (mux or non mux), KBI
HC05C4	4K	176		X	16-BIT 1 I/C, 1 O/C	31	SCI & SPI				40 DIP - P 44 PLCC FN 44 QFP - FB 42 SDIP - B	705C8 (N/A)	Production	High speed & Low power
HC05C4A* (705C8A*)	4K (X)	176	X (8K)		16 BIT 1 I/C, 1 O/C	31	SCI & SPI				as HC05C4	705C8A (N/A)	Contact Sales	
HC05C5 (705C5)	5K (X)	176	X (5K)	128	16 BIT 1 I/C, 1 O/C	32	SIOP				40 DIP - P 44 PLCC FN	705C5 (N/A)	Production	LVPI, 10mA capability on one 8 bit port.
HC05C8 (705C8)	8K (X)	176 (352)	X (8K)		16-BIT 1 I/C, 1 O/C	31	SCI & SPI				as HC05C4	705C8	Production	High speed option. Low power option.
HC05C12	12K	176			16-BIT 1 I/C, 1 O/C	31	SCI & SPI				as HC05C4	705C9 no cop	Production	(HC05C4A features)
HC05C9 [A] (705C9) [705D32A]	16K (X) [(X)]	352	X (16K) [(32K)]		16-BIT 1 I/C, 1 O/C	31	SCI & SPI				as HC05C4	705C9 [TBD]	Production [contact Sales]	705C9 not in QFP 705D32A on hold

We have added some commonly asked for features to the HC05C family. The HC05C4A/C9A/C12
705C8A all have pull-up option on I/O, Keyboard wakeup, COP and high current port pin(25mA sink).

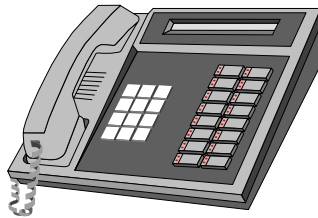
HC05D family



General Purpose 40/44 Pin MCUs with PWMs

Device	ROM (bytes)	RAM (bytes)	EPROM (bytes)	EEPROM (bytes)	TIMER	I / O	SERIAL	A / D	PWM	COP	Package Options	OTP	Status	Comments
HC05D9 (HC705D9)	16K (X)	352	X (16K)		16 BIT 1 I/C, 1 O/C	32	SCI		5 ch 6-bit		40 DIP - P 44 PLCC -FN 44 QFP - FB	705D9	Production	24mA port driver
HC05D24	24K	352			16 BIT 1 I/C, 1 O/C	32	SCI		5 ch 6-bit		40 DIP - P 44 PLCC -FN		Production	24mA port driver
HC05D32 (HC705D32)	32K (X)	352	X (32K)		16 BIT 1 I/C, 1 O/C	32	SCI		5 ch 6-bit		40 DIP - P 44 PLCC -FN		Production (Contact Sales)	24mA port driver 705D32 on hold

HC05E family



Device	ROM (bytes)	RAM (bytes)	EPROM (bytes)	EEPROM (bytes)	TIMER	I / O	SERIAL	A / D	PWM	COP	Package Options	OTP	Status	Comments
HC05E0	see comment	480			15 Stage Multi Function Timer	36	IIC				68PLCC - FN	Not Needed	Production	64K ext. memory Keyboard interrupt
HC05E1 (705E1)	4K (X)	368	X (4K)		15 Stage Multi Function Timer	20					28DIP - P 28SOIC - DW	705E1	Production	PLL, RTI , 15 stage multifunction timer
HC05E6 (705E6)	6k (X)	128	X (6k)	160	16 bit+15 stg 1 I/C, 1 O/C	36		4 Ch 8-Bit			28 SOIC -DW 44 QFP - FB	N/A	Contact Sales	Keyb/d IRQ, LVI
HC05E16 (705E24)	16K (X)	352	X (24K)	320	16-bit + 15 stg 2 I/C, 2 O/C	47+ 2	IIC	2 Ch 8-Bit			64 QFP - FU 44 QFP - FB	N/A	Contact Sales	PLL, RTI, KBI

HC05E0

- o External Memory
- o Double Internal Bus Speed (4MHz)
- o No MOQ

HC(7)05E1

- o Originally Designed As A PC Mouse Microcontroller
- o PLL To Reduce External Oscillator Costs
- o Real Time Interrupts

□ HC(7)05E6 / 16 / 24

- Originally Designed For Analog Telephone Applications
- o Keyboard Wake-up
- o Low Voltage Inhibit
- o EEPROM For Permanent Memory Storage

HC05H family

Motor Control MCU Applications

Device	ROM (bytes)	RAM (bytes)	EPROM (bytes)	EEPROM (bytes)	TIMER	I / O	SERIAL	A / D	PWM	COP	Package Options	OTP	Status	Comments
HC05H2	2K	96			15 stage multi-function	16	SIOP		2 ch 8-bit		40DIP - P 42SDIP - B 44PLCC - FN	705H2	Contact Sales	RTI, PWM'S & LDMOS (300mA)
HC705H2		96	2K		15 stage multi-function	16	SIOP		2 ch 8-bit		40DIP - P 42SDIP - B 44PLCC - FN	N/A	Contact Sales	RTI, PWM'S & LDMOS (300mA)

□ LDMOS

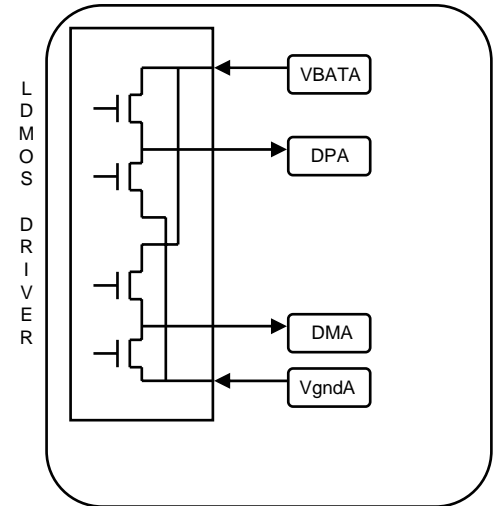
□ The 68HC(7)05H2 incorporates 4 power output drivers capable of sinking or sourcing up to 300 mA. The power drivers can operate in the following modes:

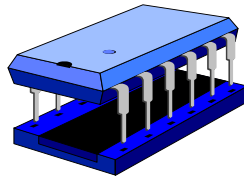
□ Switch Mode: 8 switching transistors allow direct static control of the 4 output pins.

□ Driver Mode: 4 transistor pairs allow direct static control of the 4 output pins as standard high current drivers.

□ H-bridge Mode: 2 H-bridges allow bidirectional current between the DPA and DMA pins and between the DPB and DMB pin

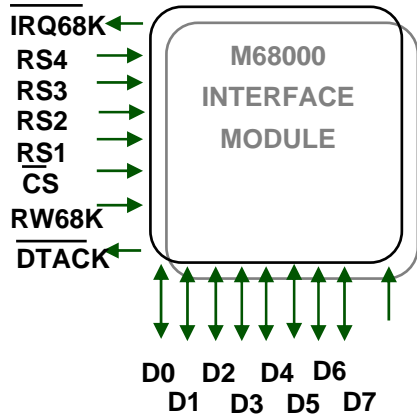
□ Mode selection of the group A transistors is independant of the mode selection of the group B transistors.





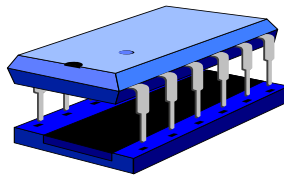
HC05 I family

Device	ROM (bytes)	RAM (bytes)	EPROM (bytes)	EEPROM (bytes)	TIMER	I / O	SERIAL	A / D	PWM	COP	Package Options	OTP	Status	Comments
HC0518	8K	224			16 BIT 2 I/C, 1 O/C	42	2 x SCI				64QFP - FU 68PLCC - FN 64SDIP - B	70518	Production	68000 family interface
HC70518		224	8K		16 BIT 2 I/C, 1 O/C	42	2 x SCI				64QFP - FU 68PLCC - FN 64SDIP - B	N/A	Production	68000 family interface

























68HC0518

- o M68000 Interface Module With 8-Bit Data Bus, 4 Register Select Lines & 4 Control Lines.
- o M68000 Interface Module has four pairs of independent transmit and receive channels, each with a 4 byte asynchronous FIFO buffer.
- o HC0518 Can Be Used As A Microcontroller That Uses A 68000 Family Member As A Slave Device Or As A Programmable Specialized Peripheral To A 68K System.



HC05K family

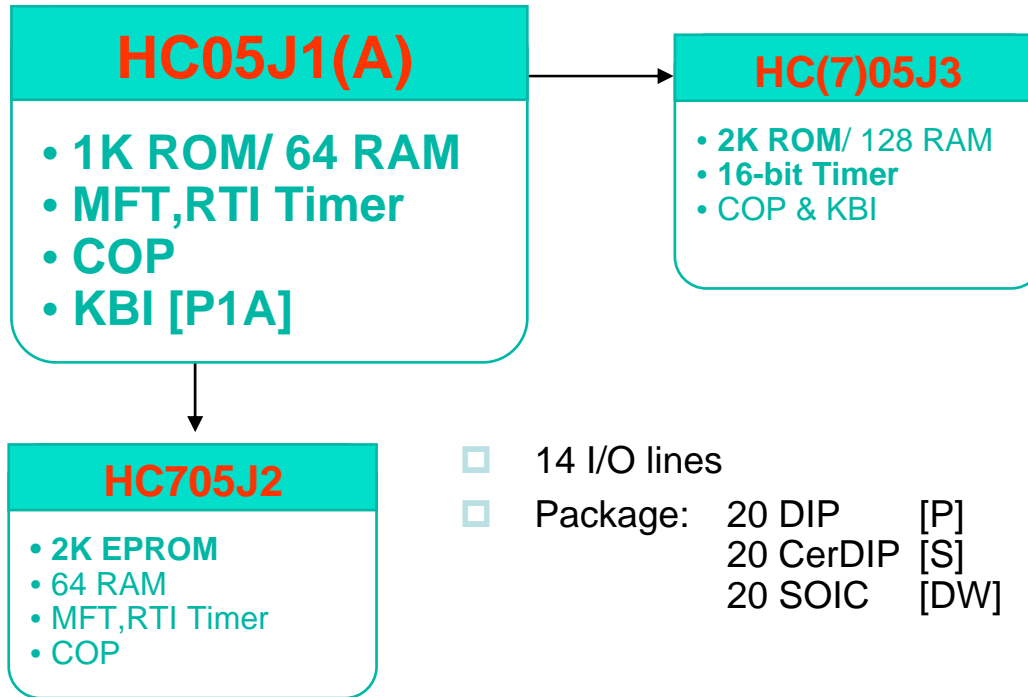
General Purpose 16 Pin MCUs

Device	ROM (bytes)	RAM (bytes)	EPROM (bytes)	EEPROM (bytes)	TIMER	I / O	SERIAL	A / D	PWM	COP	Package Options	OTP	Status	Comments
HC05K0	0.5K	32			15 stage multifunction timer	10					16DIP - P 16SOIC - DW	705K1	Production	
HC05K1	0.5K	32	64 bits		15 stage multifunction timer	10					16DIP - P 16SOIC - DW	705K1	Production	personality EPROM
HC705K1		32	0.5K + 64 bits		15 stage multifunction timer	10					16DIP - P 16SOIC - DW	N/A	Contact Sales	personality EPROM
HC05K3	920	64		128	15 stage multifunction timer	10					16DIP - P 16SOIC - DW	N/A	Contact Sales	personality EEPROM RTI,Keyboard scan

□ Applications:

- Car alarms
- Power Windows
- Airbags
- Keyless entry
- PC mouse

The J Family

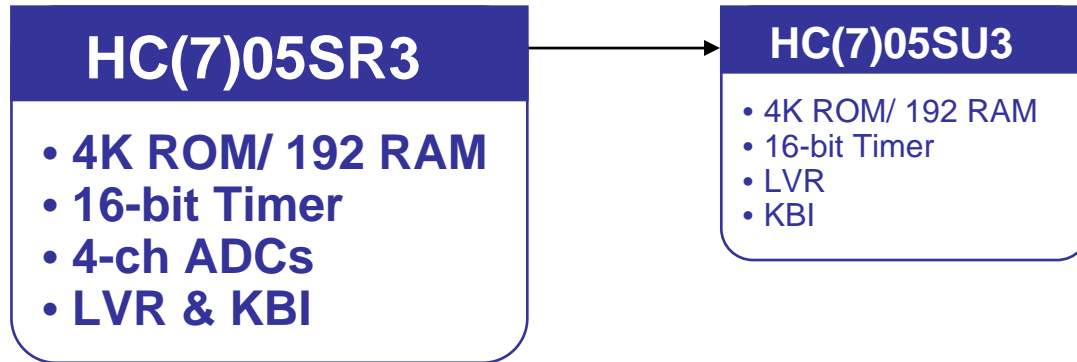


- 14 I/O lines
- Package: 20 DIP [P]
20 CerDIP [S]
20 SOIC [DW]

Applications :-

- **20-pin Low Cost General Purpose MCU**
- **Examples :-**
 - Mouse or Trackball
 - IR Remote Control Unit
- **Special Options**
 - High Speed(4MHz Bus Clock)
MC68HSC05J1A
 - Low Voltage
(1.8V min. at 500KHz Bus Clk.)
MC68HCL05J1A

The Spider - MC68HC(7)05SR3

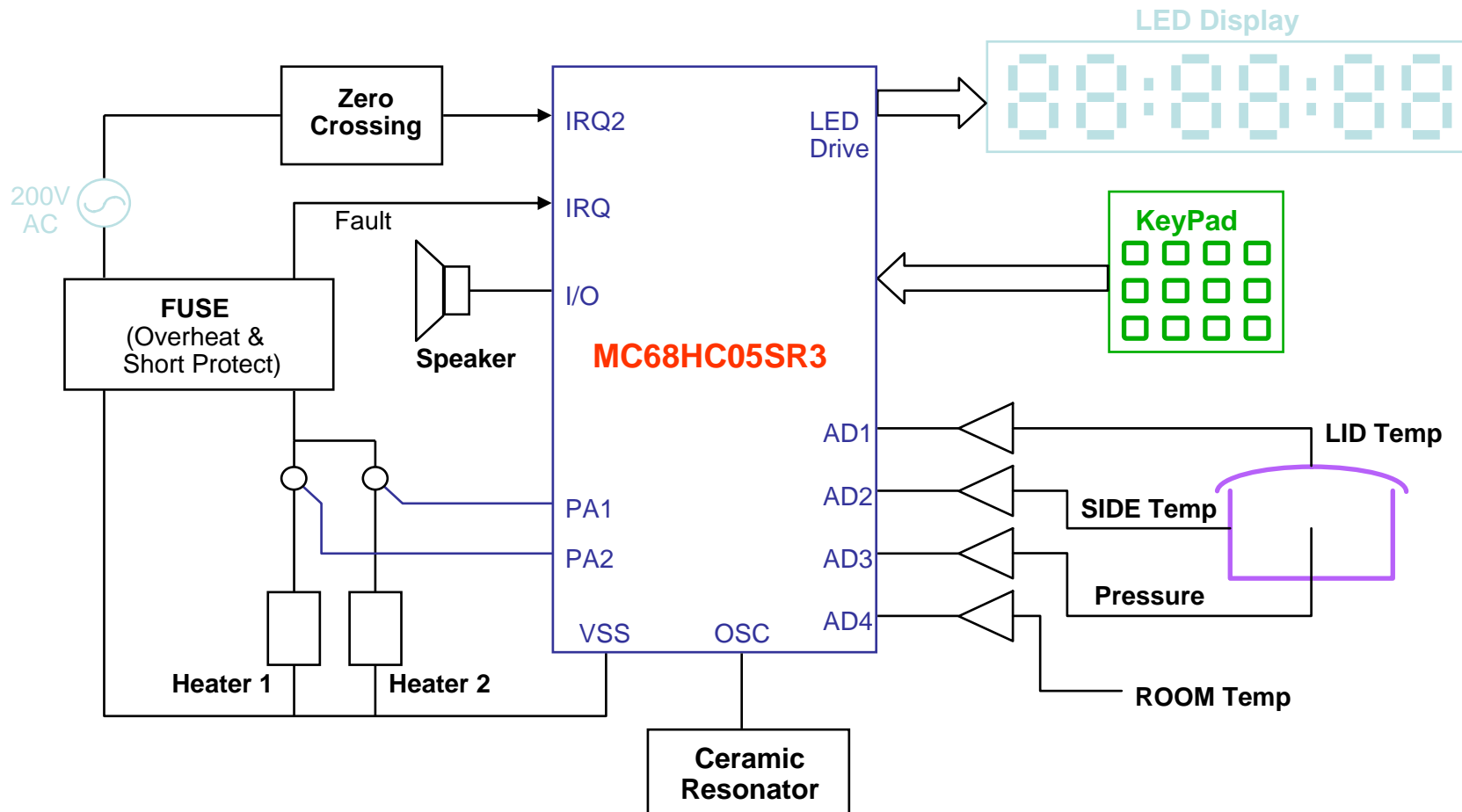


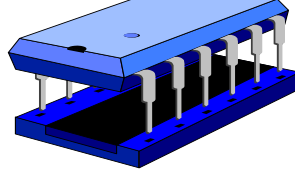
- **Upgrade from NMOS MC6805R3**
- **3.3V to 5.0V Operating Range**
- **32 I/O lines**
- **2 MHz Bus Clock**
- **Package:** 40 DIP [P]
44 QFP [FB]
42 SDIP [B]

Applications :-

- **General Purpose MCU**
- **Examples :-**
 - baserset of coreless phone (P1 in handset)
 - answering machine
 - pager
 - home appliances (washing machine, air conditioner, microwave oven)
 - computer (keyboard - SU3)

Application Example: Fuzzy Logic Rice Cooker





HC05P family

General Purpose 28 Pin MCUs

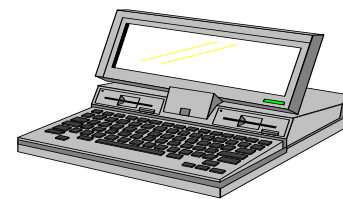
Device	ROM (bytes)	RAM (bytes)	EPROM (bytes)	EEPROM (bytes)	TIMER	I/O	SERIAL	A/D	PWM	COP	Package Options	OTP	Status	Comments
HC05P1[A]	2K	128			16 BIT 1 I/C, 1 O/C	21					28 DIP - P 28 SOIC- DW	705P9	Production	High current pin, KBI
HC05P2	3K	96			15-stage multifunction	22	IIC				28 DIP - P 28 SOIC- DW 32 PLCC- FN		Production	
HC05P3 (705P3)	3K (X)	128	X (6K)	128 (160)	16 BIT I/C, O/C & 15 stg MFT	22		X			28 DIP - P 28 SOIC- DW	705P3	Production (Contact Sales)	Keyboard interrupt
HC05P4	4K	176			16 BIT 1 I/C, 1 O/C	21	SIOP				as above	705P6	Production	mask option cop
HC05P5	3K	128			16 BIT 1 I/C, 1 O/C	21		see comment	2 ch 8 bit		as above		Production	Voltage Comparator
HC05P6 (705P6)	4.5K (X)	176	X (4.5)		16 BIT 1 I/C, 1 O/C	21	SIOP	4 CH 8-BIT			as above	705P6 (X)	Production	
HC05P7	2K	128			16 BIT 1 I/C, 1 O/C	21	SIOP				as above	705P9	Production	
HC05P8	2K	112		32	15 stage multifunction	20	SIOP	4 CH 8 BIT			as above	Piggy Back	Production	LVI option
HC05P9 (705P9)	2K (X)	128	X (2K)		16 BIT 1 I/C, 1 O/C	21	SIOP	4 CH 8 BIT			as above	705P9 (N/A)	Production	
HC05P10	4K	128			16 BIT 1 I/C, 1 O/C	21	SIOP				as above	705P9 (2K)	Contact Sales	pull-up resistor, high current on port
HC05P15	3K	128	64 bits		16 BIT 1 I/C, 1 O/C	21		see comment	2 ch 8 bit		as above		Production	Voltage Comparator
HC05PE0	2K	128			16 BIT 1 I/C, 1 O/C	20					as above		Samples	20mA sink pin, KBI, PEP (64 bits)



Designed Into..



Electronic Sunroof, Cordless Phone, Smoke Detectors, PC Mouse, Car Radio, CD Player.....



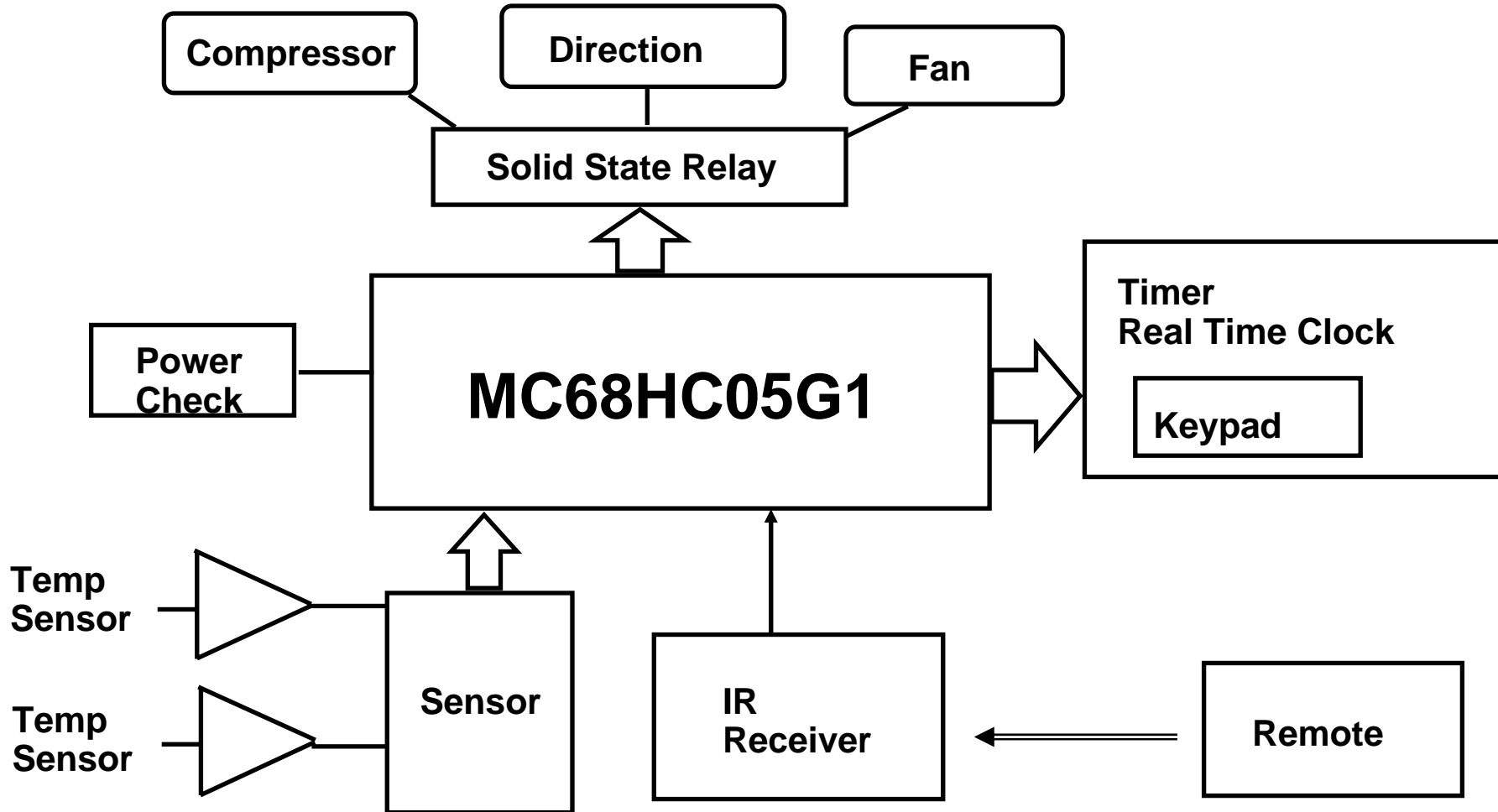
HC05G family

PC Power Management MCU Applications

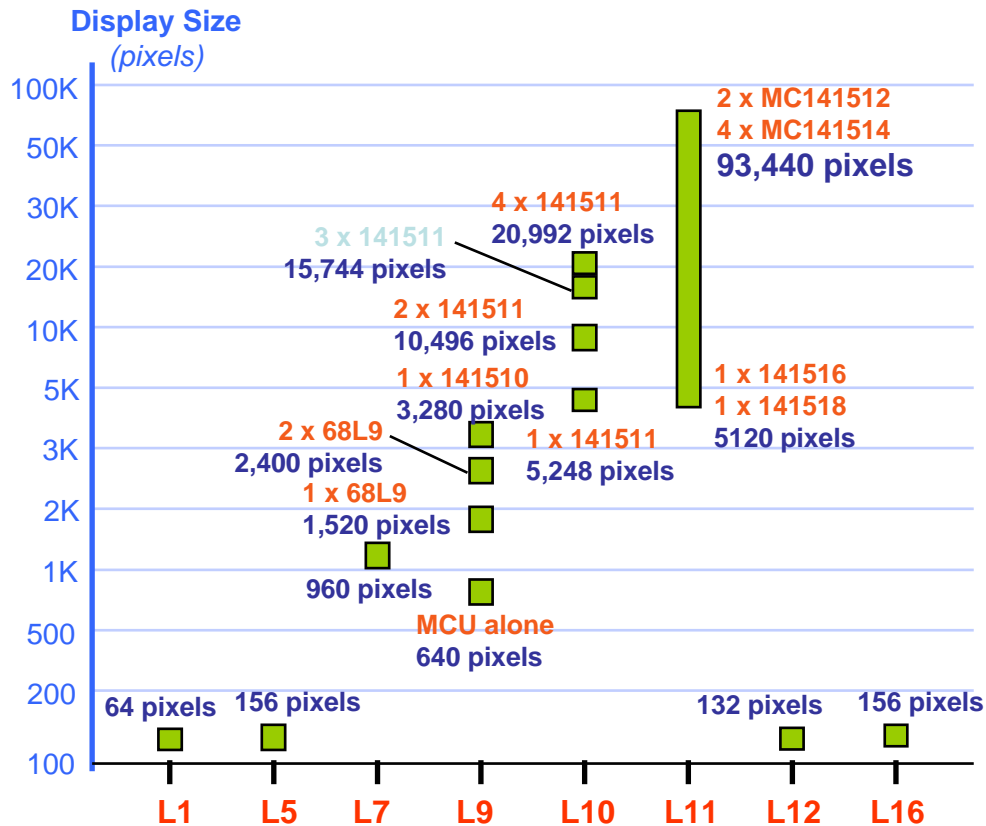
Device	ROM (bytes)	RAM (bytes)	EPROM (bytes)	EEPROM (bytes)	TIMER	I/O	SERIAL	A/D	PWM	COP	Package Options	OTP	Status	Comments
HC05G1 (705G1)	8K (X)	176	X (8K)		16 BIT 1 I/C, 1 O/C RTC	48	SPI	4 Ch 8- Bit			56 SDIP - B 64 QFP - FU	705G1	Production	32 Khz PLL
HC05G3 (705G4)	24K (X)	768	X (32K)		16 BIT 1 I/C, 1 O/C 8-bit Event Cntr	68	Dual SPI	8 Ch 8- Bit	4 Ch 8- Bit		80 QFP - FU	705G4	Production	KBI, Dual Osc Dual IRQ
HC05G9 (705G9)	12K (X)	304	X (12K)		15 stage multi- function timer RTC, tick timer	64	Dual SIO	8 Ch 8- Bit	4 Ch 8- Bit		160 QFP - FT	705G9	Production	KBI, key scan, IDE, 32Khz PLL, host addr decoder, PIO, chip se
HC05G10 (705G10)	12K (X)	304	X (12K)		15 stage multi- function timer RTC, tick timer	62		5 Ch 8- Bit	4 Ch 8- Bit		100 QFP - FU	705G10	Production	KBI, key scan, IDE, 32Khz PLL, host addr decoder, 4 chip select

Motorola has developed HC05G9/G10 demonstration software that can be customized to produce a working PC compatible notebook/laptop computer. The HC05G9 can be used to replace many standard parts in a conventional PC. The HC05G9 and our demonstration software replaces: RTC (MC146818), keyboard controller (8042/8048), battery & power management, PWM to control Brightness/contrast/volume/alarm and hard disk controller.

Application Example: G1 in Air Conditioner



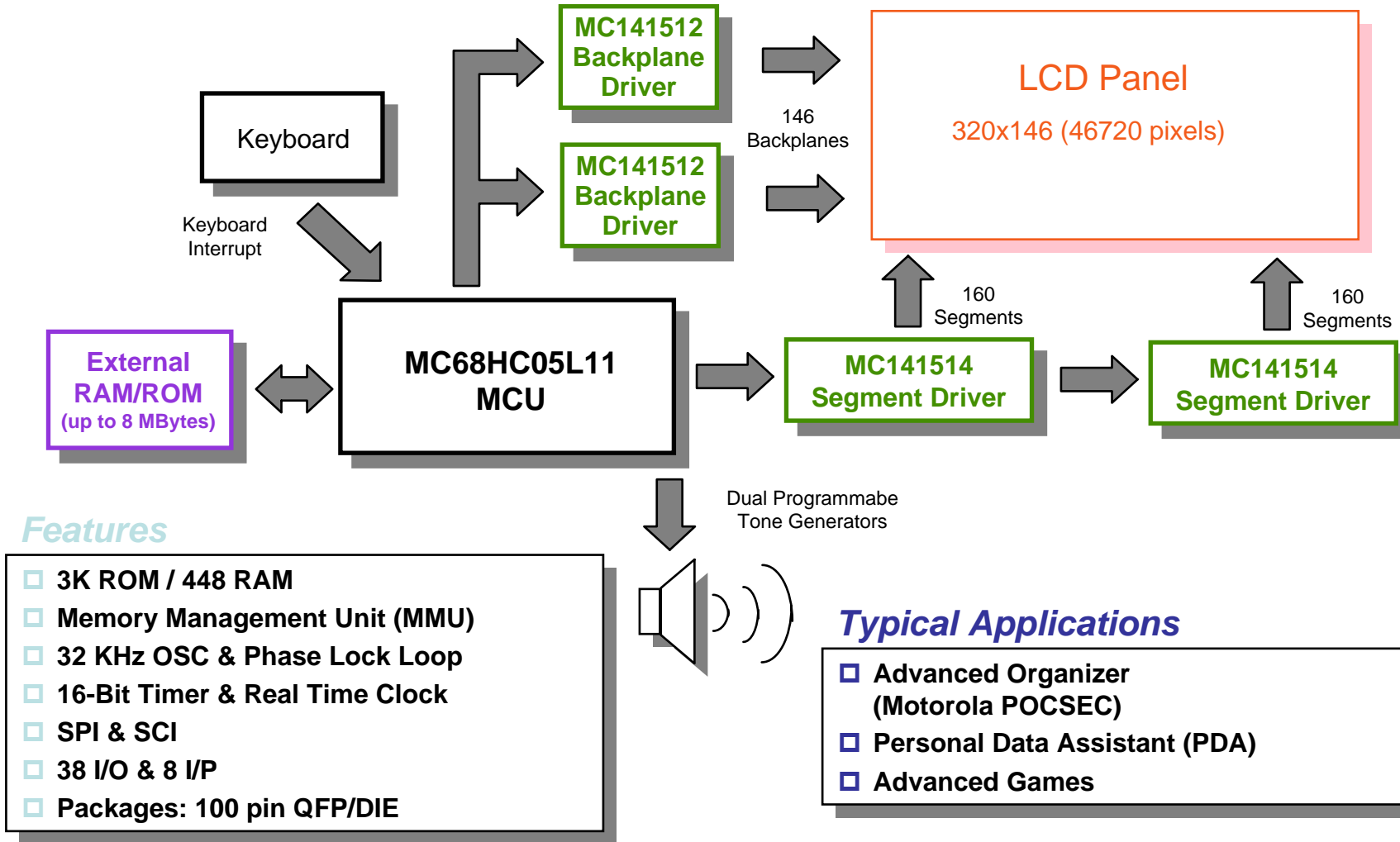
The L Family



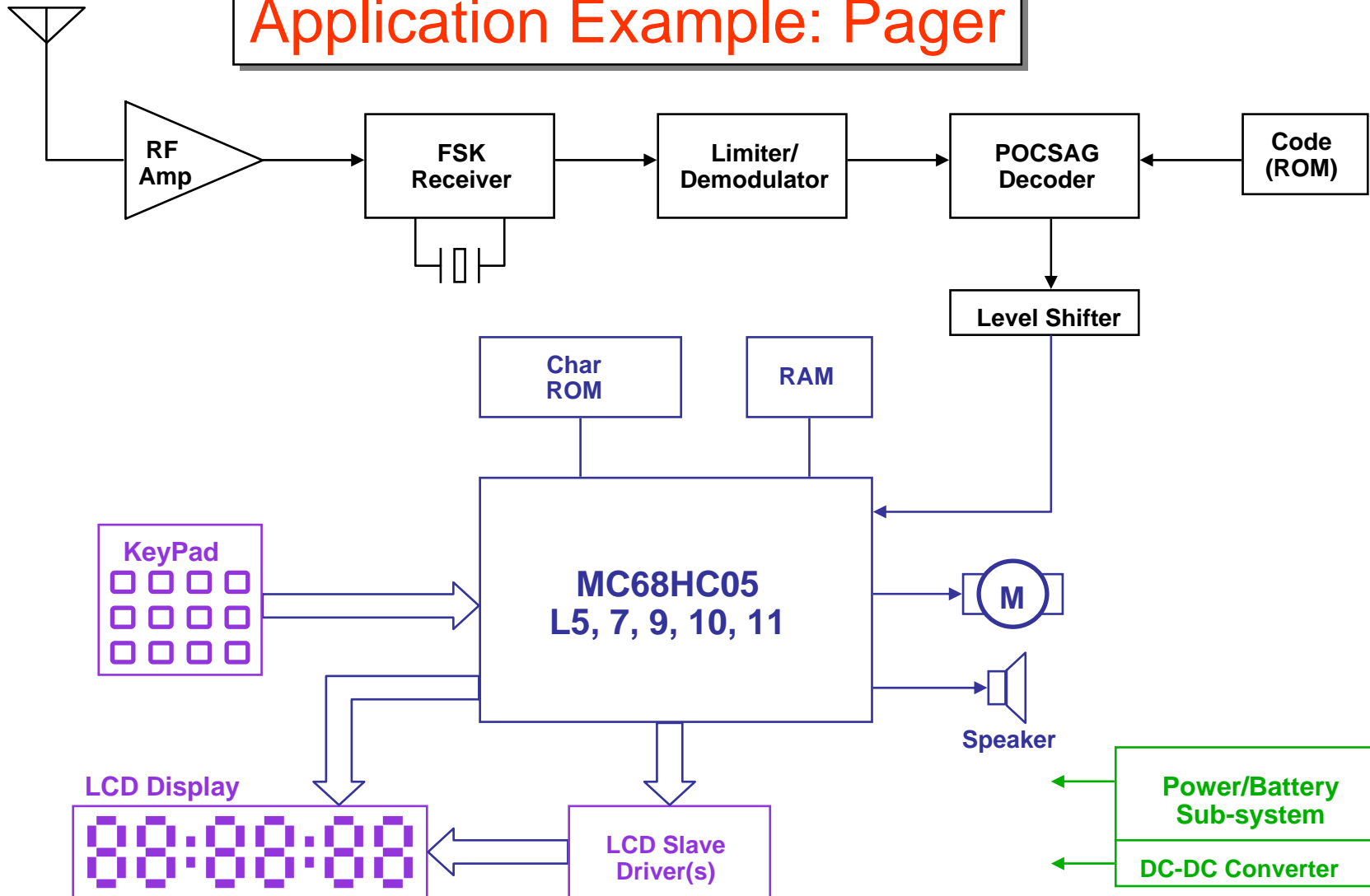
MCU with LCD Module

- External Memory access Capabilities
 - L7 16K bytes
 - L9 64K bytes
 - L10 1M bytes
- Various Peripherals
 - 16-bit Timer(w 1 IC & 1 OC)
 - SCI
 - RTC
 - KBI
 - Tone Generator
- Applications
 - Numeric, Alpha-numeric & Chinese Pagers
 - Organizers & Electronic Diaries
 - Electronic Meters
 - LCD Games
 - Education Computers

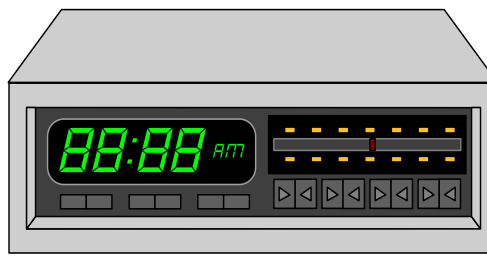
MC68HC05L11 (DragonKat II)














Application Example: Pager



HC05M family



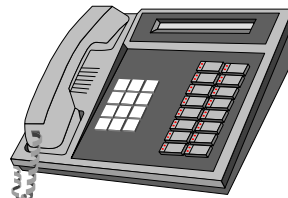
Vacuum Florescent Display MCU Applications

Device	ROM (bytes)	RAM (bytes)	EPROM (bytes)	EEPROM (bytes)	TIMER	I / O	SERIAL	A / D	PWM	COP	Package Options	Status	Comments
HC05M4	4K	128			16 BIT 1 I/C, 1 O/C 8-bit mod	32 + 8		6 ch 8 bit			52PLCC - FN	Contact Sales	High voltage Vacuum Florescent Drive (VFD)
HC05M6	7K	208			16 BIT 1 I/C, 1 O/C 15 stg MFT	50					64SDIP - B 68PLCC - FN 64QFP - FU	Production	High voltage Vacuum Florescent Drive (VFD)

□ HC05M4, M6

□ The high voltage ability of the Vacuum Florescent drives are capable of controlling the **-40 volts** required to operate standard **VFD displays**.

HC05F family



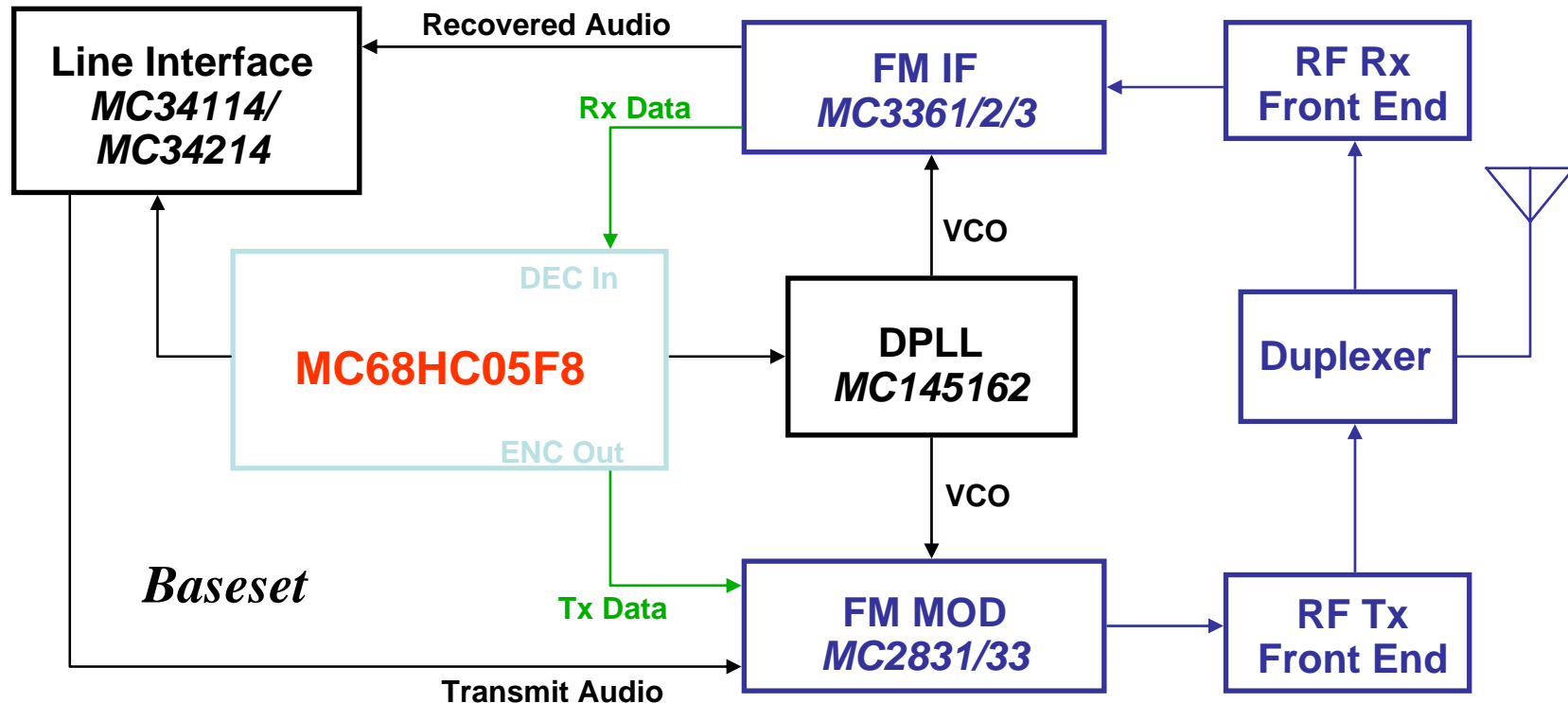
Telephone and Answering Machine Applications

Device	ROM (bytes)	RAM (bytes)	EPROM (bytes)	EEPROM (bytes)	TIMER	I/O	SERIAL	A/D	PWM	COP	Package Options	OTP	Status	Comments
HC05F2	2K	288	☐	☐	16 BIT 1 I/C, 1 O/C	26	☐	☐	☐	☐	42SDIP - B 44QFP - FB	705F6	Production	DTMF, LED drive
HC05F4 (705F4)	4K (X)	256	X (8K)	256	16 BIT 2 I/C, 2 O/C	32	☐	☐	☐	☐	44QFP - FB 28 SOIC - DW 28 DIP - P 44 PLCC - FN	705F4	Contact Sales	DTMF, K/b IRQ 8 open drain inputs
HC05F5	5.5K	224	☐	☐	15 Stage multi function timer	30	☐	☐	☐	☐	40 DIP - P 44 PLCC - FN	Piggy Back	Production	DTMF receiver, RTI
HC05F6 (705F6)	4.6K (X)	320	X (4.6K)	☐	16 BIT 1 I/C, 1 O/C	26	☐	☐	☐	☐	42SDIP - B 44QFP - FB (64QFP - FU)	705F6	Production	DTMF, LED drive
HC05F8	8K	320	☐	☐	2 x16 BIT 1 I/C, 1 O/C	50	SPI	☐	☐	☐	64 QFP - FU	705F8	Production	DTMF, LED, K/b IRQ Manchester enc/dec
HC05F12	12k	384	☐	256	16 Bit+15 stg 3 I/C, 3 O/C	50	☐	☐	☐	☐	100 QFP - FU	705F32	Contact Sales	DTMF, K/b IRQ, LCD 32 x 4 (128 seg)
HC05F32 (705F32)	32k (X)	924	X (32k)	256	16 Bit+15 stg 4 I/C, 4 O/C	80	SPI SCI	4 Ch 8- Bit	3 Ch 8- Bit	☐	100 QFP - FU	705F32	Contact Sales	DTMF, K/b IRQ, RTI LCD 40 x 4 (160seg), LVI

☐ DTMF

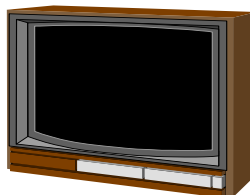
- ☐ The HC05F family's DTMF / melody generator is a multi-functional tone generator supporting DTMF dialing, melody-on-hold, and pacifier tone functions.
- ☐ The 68HC05F5 incorporates a DTMF receiver utilizing switched capacitor filters: a pre-emphasis filter for high frequency gain and eight bandpass filters for final frequency selection.

Application Example: F8 in Cordless Phone



- **Manchester Encoder/Decoder** for Digital Code Processing
 - avoid voice will be mistaken as command

HC05T/CC families



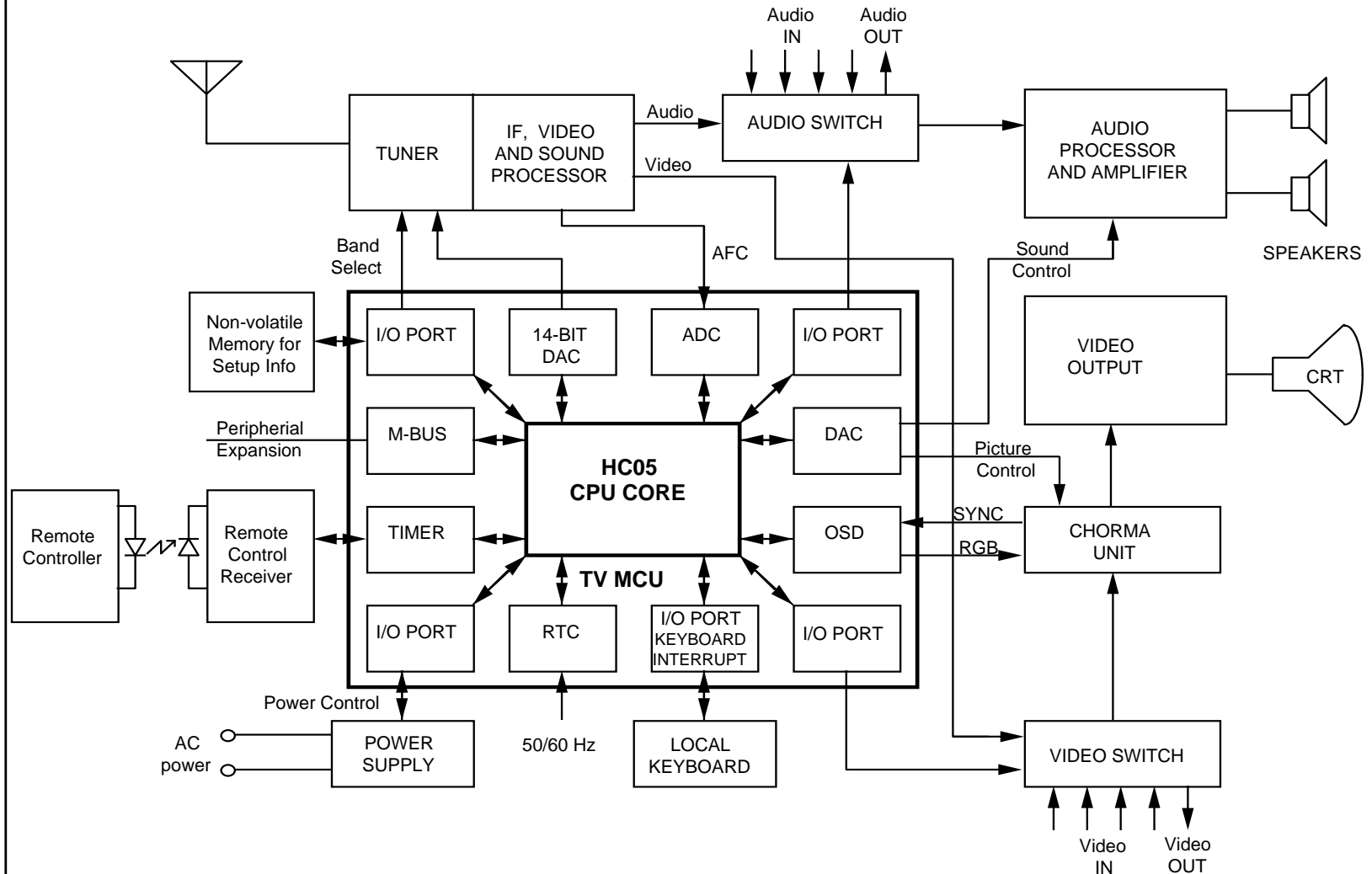
Television On Screen Display and Closed Captioning Applications

Device	ROM (bytes)	RAM (bytes)	EPROM (bytes)	TIMER	I/O	SERIAL	A/D	PWM	COP	Package Options	OTP	Status	Comments
HC05CC1	16K	544	□	16 Bit	31	SIOP IIC master	□	8 Ch 6 Bit	□	40 DIP - P	□	Production	OSD + 4Mhz Closed Caption
HC05T1 HC05T2	8k 16K	320	□	16 BIT 1 I/C, 1 O/C	30	SIOP	1 Ch 6 Bit	9 Ch 6 Bit	□	40 DIP - P 42 SDIP - B	705T3	Production	OSD system
HC05T3 (705T3)	24K (X)	512	X (24K)	16 BIT 1 I/C, 1 O/C	29	SIOP	1 Ch 6 Bit	9 Ch 6 Bit	□	40 DIP - P	705T3	Production	OSD system 112 Character Set
HC05T4 (705T4)	5K (X)	96	X (5K)	16 BIT 1 I/C, 1 O/C	17	□	1 Ch 4 Bit	see comments	□	42 SDIP - B	705T4	Production	OSD system 5 CH 6 BIT PWM 1 CH 14 BIT PWM
HC05T7	8K	320	□	16 BIT 1 I/C, 1 O/C	28	IIC	1 Ch 8 Bit	see comments	□	56 SDIP - B	705T10	Production	OSD system 8 CH 6 BIT PWM 1 CH 14 BIT PWM
HC05T10 (705T10)	12K (X)	320	X (12K)	16 BIT 1 I/C, 1 O/C	28	IIC	1 Ch 8 Bit	see comments	□	56 SDIP - B	705T10	Production	OSD system 8 CH 6 BIT PWM 1 CH 14 BIT PWM
HC05T12 (705T12)	8K	320	□	16 BIT 1 I/C, 1 O/C	36	IIC	1 Ch 4 Bit	see comments	□	56 SDIP - B	705T12	Production	OSD system 8 CH 6 BIT PWM 1 CH 14 BIT PWM
HC05T32	32K	512	□	16 BIT 1 I/C, 1 O/C	29	SIOP	1 Ch 6 Bit	9 Ch 6 Bit	□	40 DIP - P	see comment	Contact Sales	HC05T3 with 32k OTP suggest 705T3

- **OSD:** The HC05T family incorporate on screen display, A/D (Remote control input) & PWM (volume adjustment, contrast, etc.). The On Screen Display systems provide multi-color display capabilities. OSD character set of up to 112 characters can be stored in ROM with a display grid of 18 x 10.





Application Example

System Block Diagram of a TV Set with TV MCU



HC05BD family

□ Video Monitor MCU Applications

HC05BD6	6K	256 + 256	X	256	15 stg multi- function timer	50	X	4-CH 8-BIT	7ch 6-bit 8ch 8-bit		56 SDIP - B	N/A	EVS	available 1Q 94
HC705BD8		256 + 256	8k	256	15 stg multi- function timer	50		4-CH 8-BIT	7ch 6-Bit 8ch 8-Bit		56SDIP - B	N/A	EVS	EPROM Sampling now



HC05V/X family

Automotive/Industrial Mux MCU Applications

Device	ROM (bytes)	RAM (bytes)	EPROM (bytes)	EEPROM (bytes)	TIMER	I / O	SERIAL	A / D	PWM	COP	Package Options	OTP	Status	Comments
HC705V8	X	512	12K	128	16 bit	22	J1850 SPI	16 ch 8 bit	6 bit		56 SDIP - B 68 PLCC - FN 64 QFP - FU	N/A	Samples	26V to 5V regulator J1850 MUX
HC05X1	12k	336			16 Bit +15 stg 1 I/C, 2 O/C	24	SSI J1850				44 PLCC- FN		Production	SAE J1850 Presently exclusive
HC05X4	4K	176			16 BIT 1 I/C, 1 O/C	16	X CAN				28 SOIC - DW	705X4	Production	CAN module
HC705X4		176	4K		16 BIT 1 I/C, 1 O/C	16	X CAN				28 SOIC - DW	N/A	Production	CAN module
HC05X16	16K	352		256	16 BIT 2 I/C, 2 O/C	32	SCI CAN	8 CH 8 BIT	2 CH 8 BIT		68 PLCC - FN 64 QFP - FB	705X16	Production	HC05B16 with CAN
HC705X16		352	15K	256	16 BIT 2 I/C, 2 O/C	32	SCI CAN	8 CH 8 BIT	2 CH 8 BIT		68 PLCC - FN 64 QFP - FB 68 CLCC - FS	N/A	Samples	HC705B16 with CAN
HC705X32	32K	352	5	256	16 BIT 2 I/C, 2 O/C	32	SCI CAN	8 CH 8 BIT	2 CH 8 BIT		68 PLCC - FN 64 QFP - FB 68 CLCC - FS	N/A	Advanced Samples	32k HC05X16

- ❑ **MUX:** The HC05X family has built in multiplexing capability specifically designed (although not exclusively) for the automotive market. The Controller area network (CAN) module found on the HC05X4 and HC05X16 is a two wire (plus gnd) communication protocol that is designed to cut down the cost and weight of wiring looms within the automobile.



HC05SC family

Secure Smartcard MCUs

Device	ROM (bytes)	RAM (bytes)	EPROM (bytes)	EEPROM (bytes)	TIMER	I / O	SERIAL	A / D	PWM	COP	Package Options	Status	Comments
6805SC01	1.6K	36	1K	□	□	1	□	□	□	□	contact factory	Production	Security
HC05SC11	6K	128	8K	□	□	5	□	□	□	□	contact factory	Production	Security
HC05SC21	6K	128	□	3K	□	5	□	□	□	□	contact factory	Production	Security
HC05SC24	3K	128	□	1K	□	5	□	□	□	□	contact factory	Production	Security
HC05SC27	16K	240	□	3K	□	5	□	□	□	□	contact factory	Production	Security 3-6V operation
HC05SC28	12K	246	□	8K	□	5	□	□	□	□	contact factory	Contact Sales	Security 3-6V operation

- ?15 years ago, Motorola and Bull CP8 defined the chip necessary for a smartcard
- ?By 1980 the world's first secure single-chip micro MC6805SC01 was designed primarily to help combat rising fraud in French banking applications.
- ?SC01 has gone on to become one of the world's most successful micros with tens of millions sold to date.
- ?Motorola was then the first to incorporate low power HCMOS technology and EEPROM on smartcard chips.
- ?They have continued to expand their portfolio to meet market demands and remain dominant in world smartcard market

Host Computer (with Serial Port)
 (Run IASMO5
 - for EVS control
 - for ROM content download)

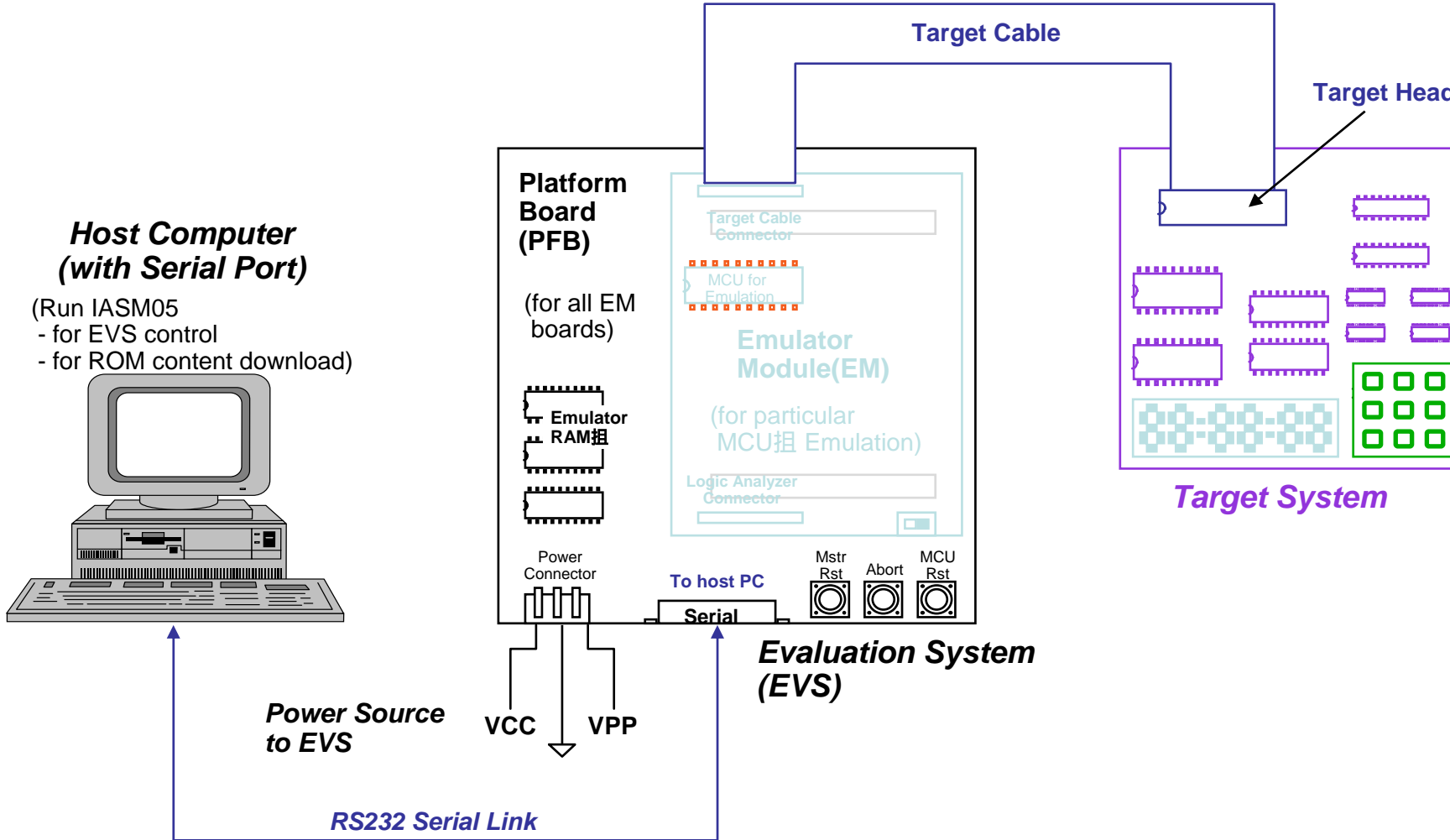
Platform Board (PFB)
 (for all EM boards)

Emulator Module (EM)
 (for particular MCU Emulation)

Target System

Evaluation System (EVS)

Connections:
 - **Target Cable:** Connects the Host Computer to the Target System.
 - **Power Source to EVS:** Provides power to the Platform Board.
 - **RS232 Serial Link:** Connects the Host Computer to the Platform Board.
 - **Internal Connections:** The Platform Board contains an Emulator Module (EM) which connects to a Target Cable Connector, MCU for Emulation, Logic Analyzer Connector, and a Serial connector. The Target Cable also connects to a Target Head on the Target System.



HC08 Technology Improvement

What and Why is HC08 CPU Core?

- Lower Cost - Down to 0.35um Technology
- Higher Performance - Up to 8MHz Bus Speed
- Lower Power - Low voltage operation
 - † 2.7 to 5.5 Volt Operation (standard)
 - † 2.0 Volt Operation (Optional)
- Higher Flexibility - Flash Technology
 - † In Circuit Programming (ICP)
 - † Multiple Field Firmware Upgrade (FFU)
- Better Noise Immunity and EMC Protection
 - † Oscillator with Electrical Fast Transient (EFT) Circuit
 - † More robust design & layout for better ESD and EMI

HC08 Performance Improvement

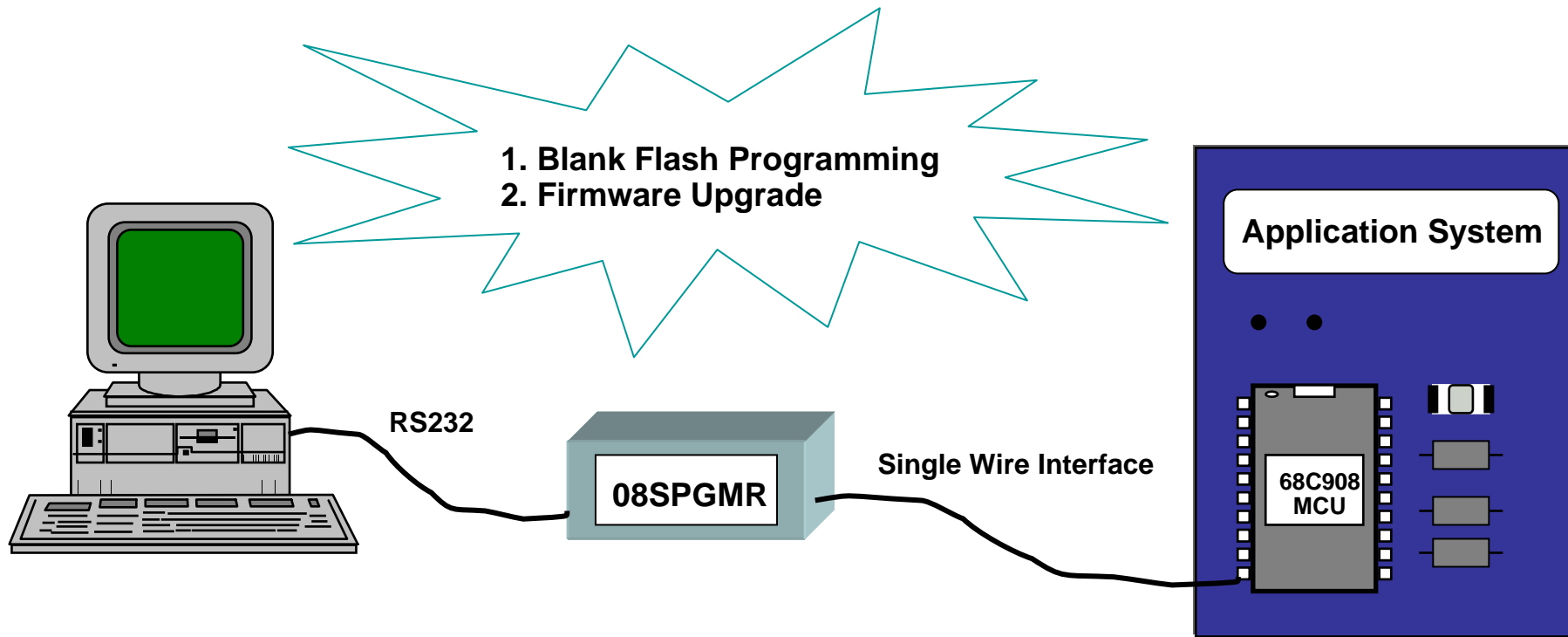
68HC08 CPU Design

- Provide 68HC05 **Object Code Compatibility**, HC08 core is an architecturally Enhanced 68HC05 CPU core
- Increased Bus Speed to 8Mhz at 5V, 4MHz at 3V
- 5X Average Performance Increase over HC05s
- Extend Index & Stack Pointer to 16-bits, **C support**
- 78 New Instructions
- New Module-Based CSIC Design Methodology
- Fully Static Low Voltage / Low Power Design
- Use **FLASH** to replace EPROM, OTP, ROM

68HC08 vs. 68HC05 Performance

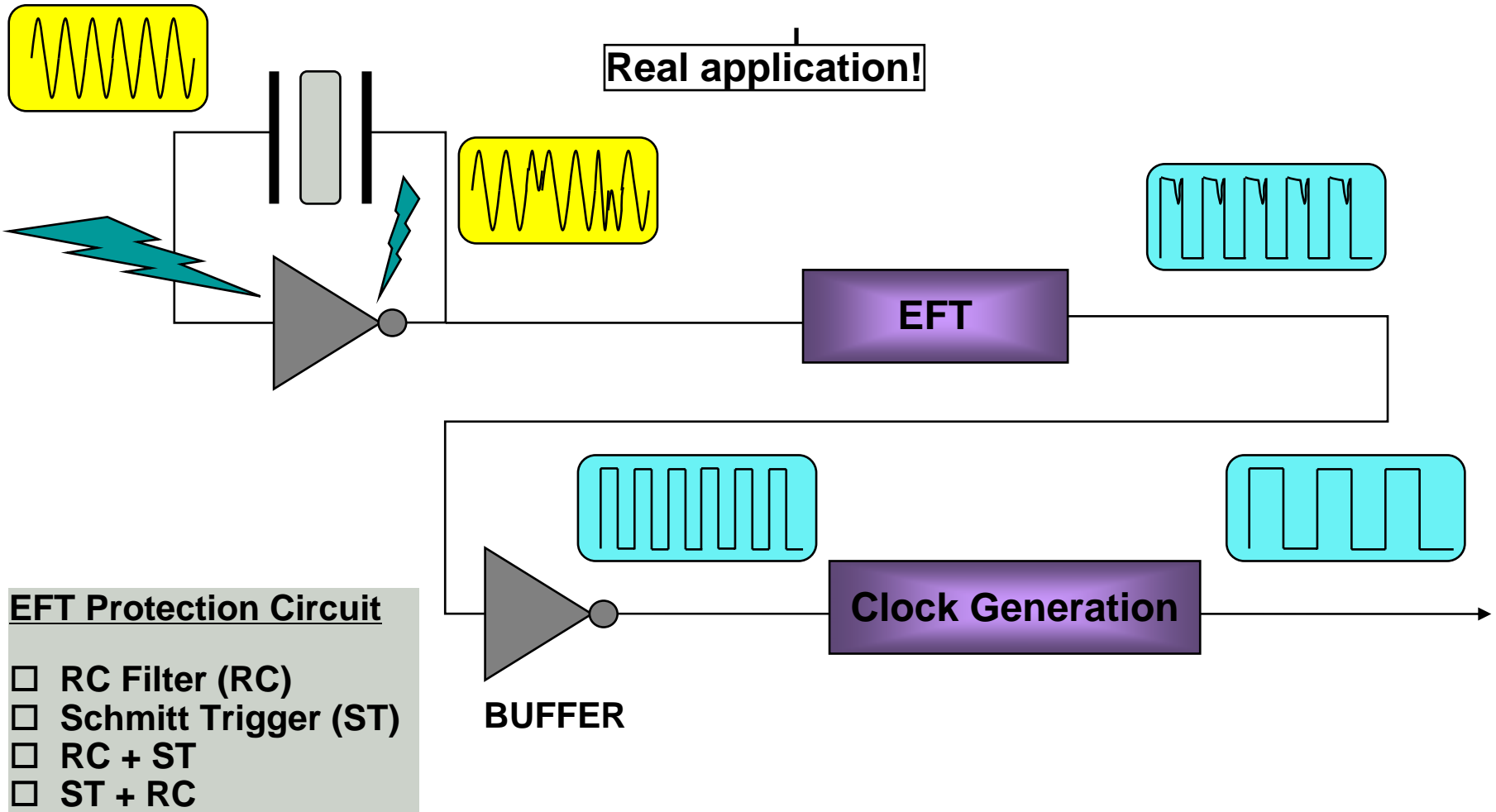
<u>Benchmark</u>	<u>8 MHz HC08</u>	<u>2 MHz HC05</u>
Interpolated Table Lookup	5.3	1.0
Character Search	6.2	1.0
Interrupt Driven I/O	5.6	1.0
Bit AND-OR	4.2	1.0
Vector Addition (Page 0)	6.3	1.0
Block Move	6.7	1.0
16 x 16 Multiply	5.6	1.0
Key Matrix Scan	4.6	1.0
Binary to BCD Conversion	<u>4.5</u>	<u>1.0</u>
Average	5.4	1.0

In Circuit Programming Application



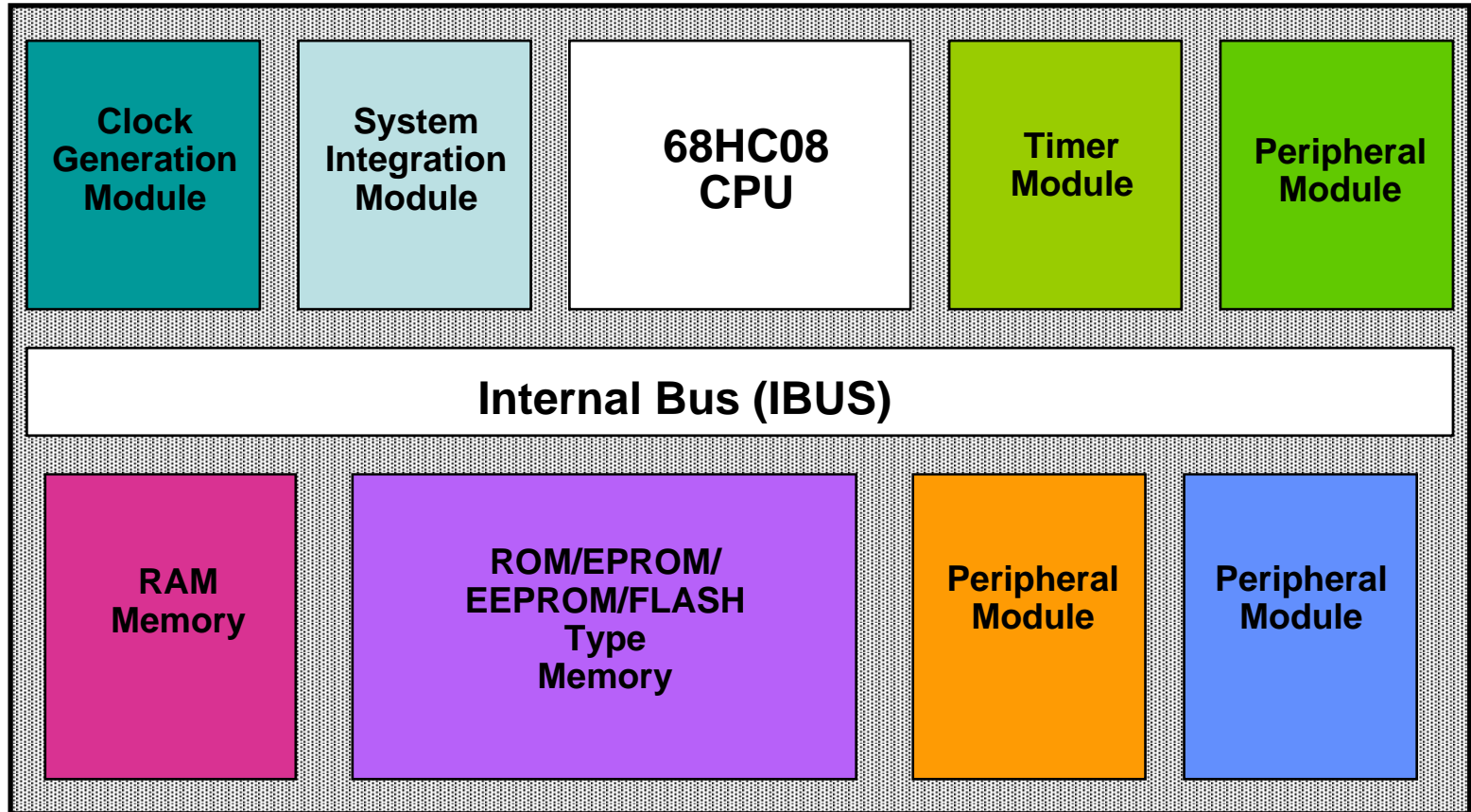
Only ONE single pin is required for programming

Improved Oscillator Circuit



HC08 Performance Improvement

68HC08 Modular Design Concept



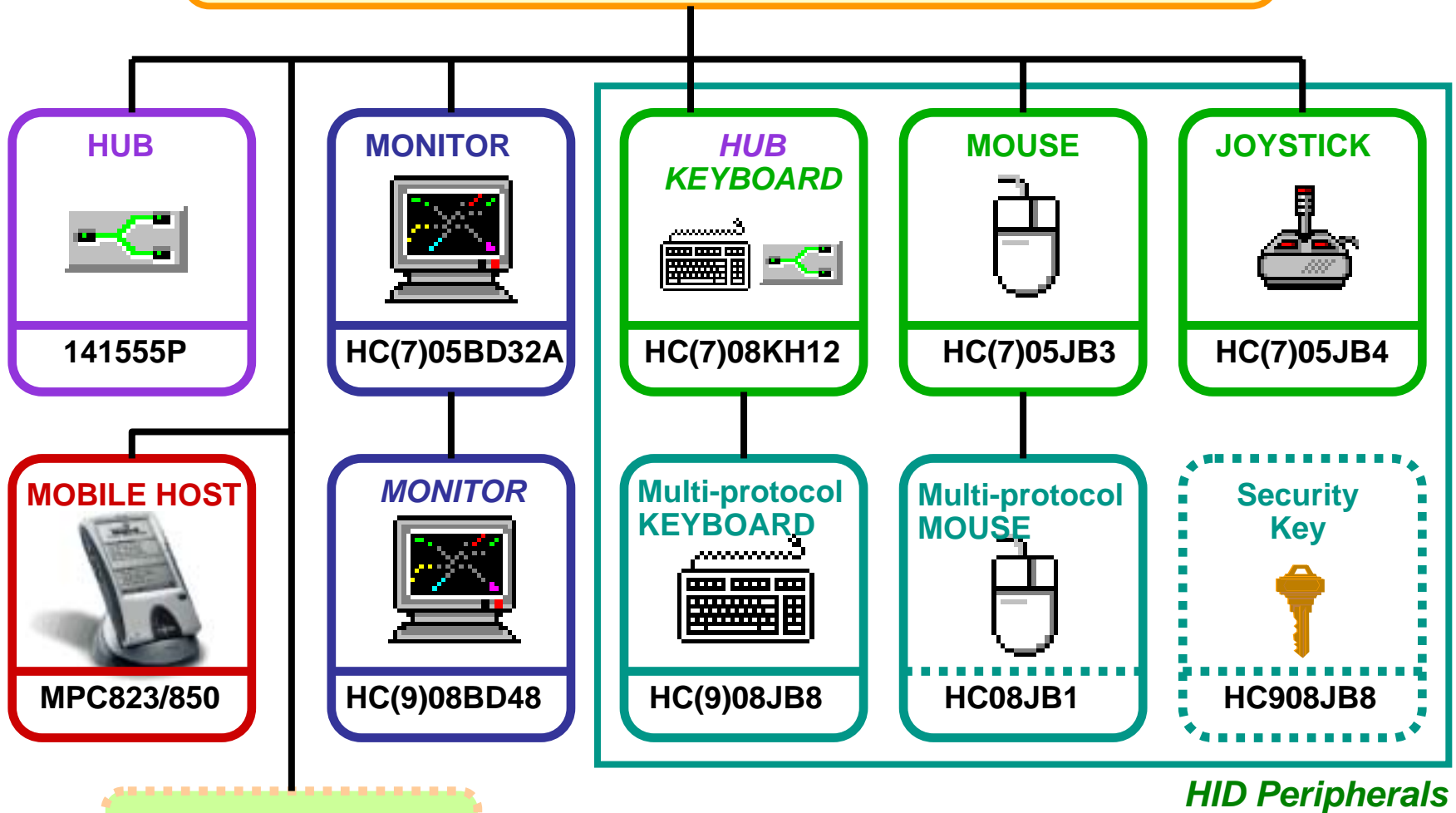
Motorola FLASH Advantage

Why use Motorola's 2nd Generation 8-bit FLASH?

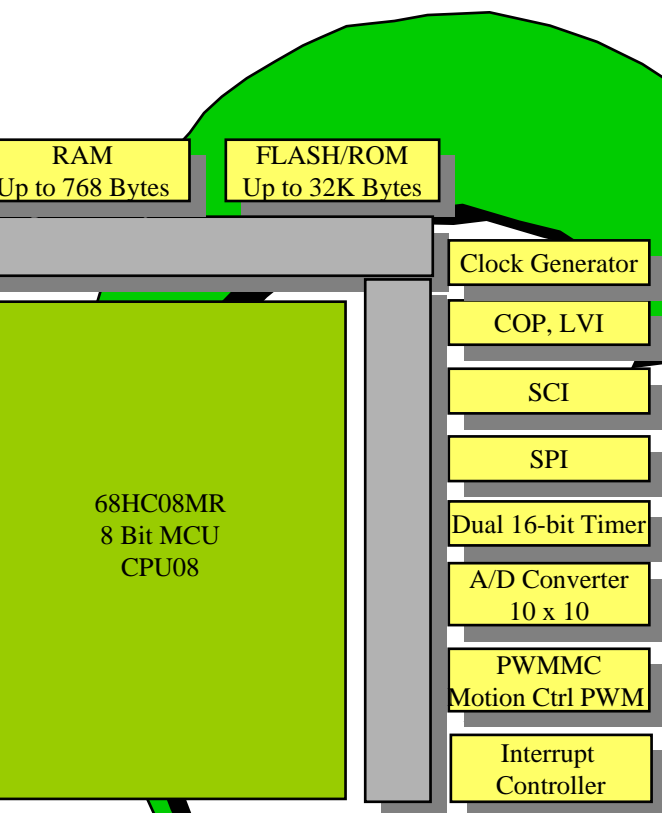
- ❖ In application re-programmability
- ❖ Reduced production programming costs
 - ❖ Up to 100 times faster than most embedded FLASH or OTP - 2msec for 64 bytes vs multiple ms/byte
- ❖ Use flash as data storage and save cost of EEPROM
 - ❖ 10K W/E cycles (demo code available for GP32/JL3)
 - ❖ Over 10K W/E cycles by Paging Method
- ❖ Programs across full operating voltage range
- ❖ Flexible block protection and security

0.35/0.5 micron FLASH 68HC08s shipping in volume at prices comparable or better than equivalent OTPs!

Family of Application Specific MCU's for USB Peripherals



Motion Control 8-bit MCU Portfolio



**68HC08 8-bit
eMotion Portfolio
Optimized for Motor Control**

	908MR32	908MR16	908MR8	08MR4
Target Market	Variable Speed 3-Phase Motion Control			
Operating Frequency	8MHz	8MHz	8MHz	8MHz
Core	CPU08	CPU08	CPU08	CPU08
Technology	0.50μ	0.50μ	0.50μ	0.5μ
Temp Range	-40 to 105	-40 to 105	-40 to 105	-40 to 105
I/O Voltage	5.0V	5.0V	5.0V	5.0V
Bus Width (bits)	8	8	8	8
Flash Memory (bytes)	32K	16K	8K	N/A
Read Only Memory	N/A	N/A	N/A	4K bytes
PLL	☐	☐	☐	☐
SCI	☐	☐	☐	☐
SPI	☐	☐		
COP WatchDog Timer	☐	☐	☐	☐
16-bit Timers	6 Channel	6 Channel	4 Channel	4 Channel
GPIO	44	44	16	16
Low Voltage Inhibit	☐	☐	☐	☐
Ext Interrupt Controller	☐	☐	☐	☐
PWM	6 Channel	6 Channel	6 Channel	6 Channel
Single Wire interface	☐	☐	☐	☐
ADC	10 x 10-bit	10 x 10-bit	7 x 10-bit	7 x 10-bit
Sample Production	Now	Now	July'01	Feb'01
Development Tool	Now	Now	Apr,'01	Apr,'01
Package	64 QFP 56 SDIP	64 QFP 56 SDIP	32 QFP 28 DIP/SOIC	32 QFP 28 DIP/SOIC

Electronic Motor Control

Application Notes

<http://www.mot-sps.com/motor>

AN1590	High Voltage Medium Power Board for 3 Phase Motors
AN1857	3 Phase AC Induction Motor Control System Based on the 68HC908MR32
AN1858	Sensorless Brushless DC Motor using 68HC908MR32
AN1712	"Get Your Motor Running" with the 68HC708MP16
AN1728	Making Low-Distortion Wave Forms Using the 68HC708MP16
AN1792	Using the 68HC908MR24 in Place of the 68HC708MP16
AN1844	Using the 68HC908MR32 in Place of the 68HC908MR24

Re-usable motion control design techniques may also be found in the following application notes:

AN1627	Low Cost High Efficiency Sensorless Drive for BLDC Motor Using the 68HC705MC4
AN1661	Low Cost Universal Motor Chopper Drive System Using the 68HC705MC4
AN1662	Low Cost Universal Motor Phase Angle Drive System Using the 68HC05JJ6/68HC705JJ7

ACMC Pre-programmed solution (08MR4):

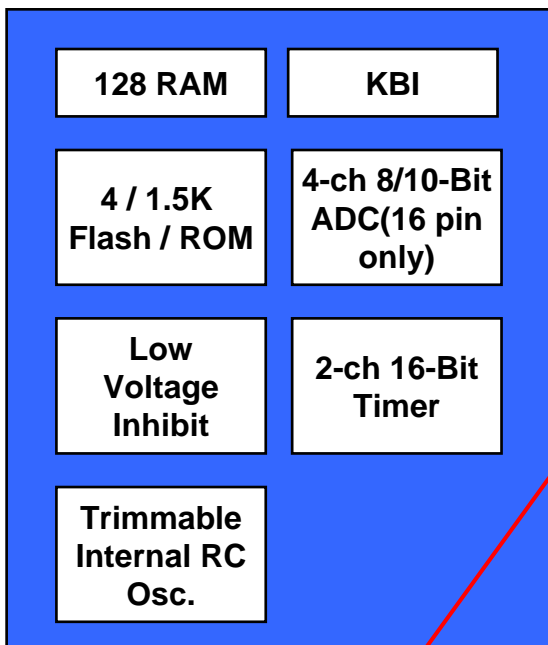
**The pre-programmed AC Motor Controller will be available in
This will be MMD's first pre-programmed Motor Control chip**

MC68HC908QY4/QY2/QY1(16Pin)

MC68HC908QT4/QT2/QT1(8Pin)

- Low Cost
- 1.5~4K Flash
- 128 Bytes RAM
- 4 Ch. 8Bits A/D (QY)
- Dimmable internal Oscillator (5%)
- 8Mhz internal Bus Clock
- 5V or 5V Power supply

MC68HC908QYx and QTx



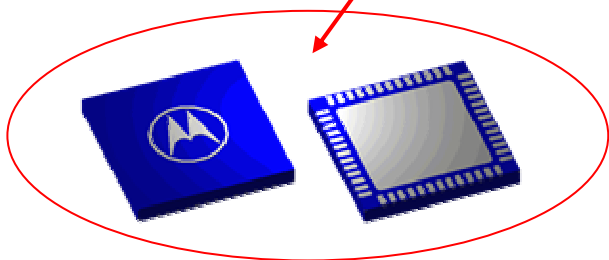
Advantages

- Trimmable Internal RC Oscillator BUS : 3.2MHz +-25% (factory trimmed at 3.2MHz)
 - (+/-5% up to 125degC)
- Smallest MCU package – 4mm x 4mm QFN
- Lots of Free / 25USD demo kit
- Free 4k memory size C compiler
- Continuous family development
 - 2V version (MC on Mar, May 2003 Production)
 - 10 bit ADC
 - Mask ROM

MC68HLC908QT/QYx

Applications

- Any low end feature light cost sensitive application
 - Charger
 - FAN
 - Small Home Appliance / Home Appliance
 - Auto Body Electronics

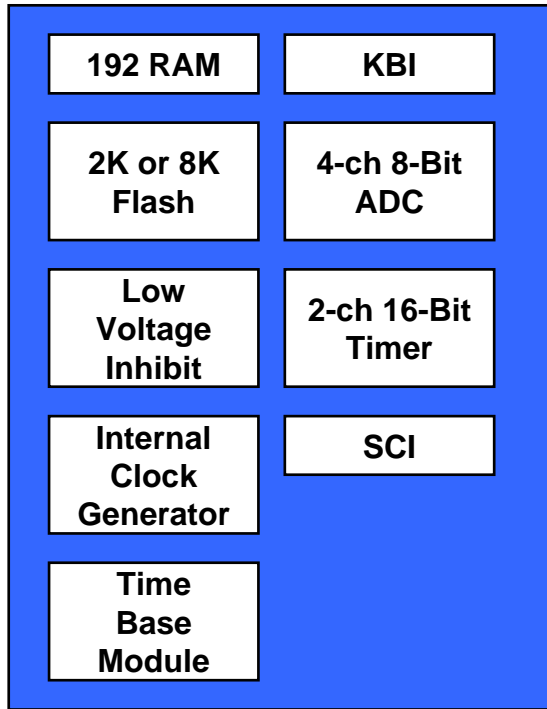


MC68HC908QT/QY Family

Low Voltage – MC68HLC908QT/QY

	Flash	ROM	RAM	Timer	I/O	ADC	Operating Voltage	Max Bus Frequency	Temp	Package	Status
908QT4	4k		128	2-ch 16-Bit IC, OC, PWM	6	4-ch 8-Bit	3 to 5	8MHz	C,M	8 SOIC 8 PDIP 8 QFN	MC
908QT2	1.5k		128	2-ch 16-Bit IC, OC, PWM	6	4-ch 8-Bit	3 to 5	8MHz	C,M	↓	MC
908QT1	1.5k		128	2-ch 16-Bit IC, OC, PWM	6	-	3 to 5	8MHz	C,M	↓	MC
908QY4	4k		128	2-ch 16-Bit IC, OC, PWM	14	4-ch 8-Bit	3 to 5	8MHz	C,M	16 SOIC 16 PDIP 16 SSOP	MC
908QY2	1.5k		128	2-ch 16-Bit IC, OC, PWM	14	4-ch 8-Bit	3 to 5	8MHz	C,M	↓	MC
908QY1	1.5k		128	2-ch 16-Bit IC, OC, PWM	14	-	3 to 5	8MHz	C,M	↓	MC

MC68HC908KXx



Advantages

- Internal Clock Generator eliminates need for external clock source, improves accuracy across temperature and voltage and allows programming at a target frequency
- Smallest IC with SCI in the portfolio

Applications

- Low pin count, feature rich applications

	Flash	ROM	RAM	Timer	I/O	Serial	ADC	Operating Voltage	Max Bus Frequency	Temp	Package	Status
908KX8	8k		192	2-ch 16-Bit IC,OC,PWM	13	SCI	4-ch 8-Bit	3 or 5	8 MHz	C, V, M	16 DIP 16 SOIC	MC
908KX2	2k		192	2-ch 16-Bit IC,OC,PWM	13	SCI	4-ch 8-Bit	3 or 5	8 MHz	C, V, M	16 DIP 16 SOIC	MC

MC68HC(9)08JLx and JKx

128 / 256 RAM	JL8 - SCI
1.5K, 4K, 8K Flash / ROM	12-ch 8-Bit ADC
Low Voltage Inhibit	1-2 x 2-ch 16-Bit Timer
XTAL or RC oscill	6 pin LED Drive

Advantages

Pin and feature compatible family from 20-32pin and 1.5K – 8K flash.

All 4k and 8k flash version has corresponding Mask ROM

Highest number of I/O in 32sdip package – 27 I/Os on 9JL8

Low voltage version – MC68HLC908JL3, JK3, JK1

Min 2V Vdd, Flash – read only, ADC 0.5-2 LSB

Applications

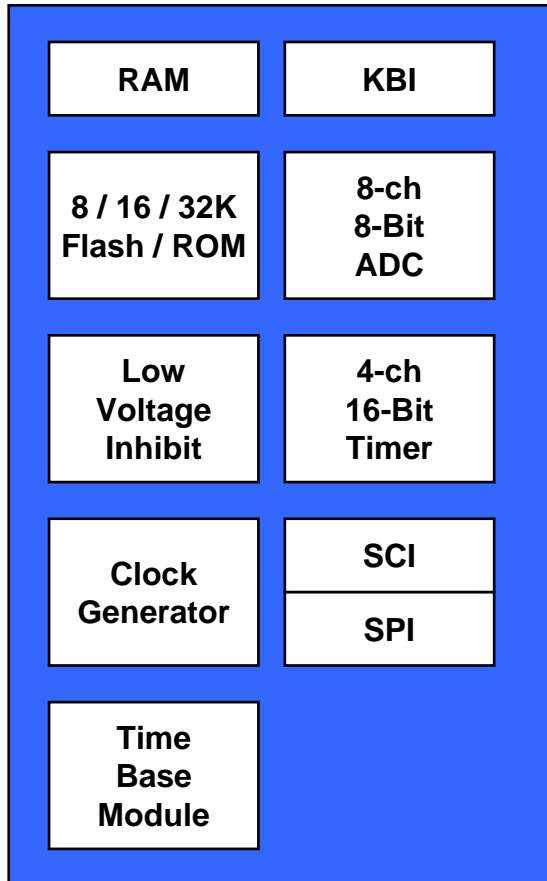
UPS, chargers

Aircond, refrigerator, W/M, heater, oven

Low End HC08 JL and JK-family

	Flash	ROM	RAM	Timer	I/O	Serial	ADC	Operating Voltage	Max Bus Frequency	Temp	Package	Status
908JL8	8k		256	2-ch 16-Bit IC,OC,PWM	23 / 27	SCI	12-ch 8-Bit	3 to 5	8MHz	C, M	LQFP 32 SDIP32 SOIC 28 DIP 28	MC
08JL8		8k	256	2-ch 16-Bit IC,OC,PWM	23 / 27	SCI	12-ch 8-Bit	3 to 5	8MHz	C, M	LQFP 32 SDIP32 SOIC 28 DIP 28	Under Develop
908JK8	8k		256	2-ch 16-Bit IC,OC,PWM	15	SCI	10-ch 8-Bit	3 to 5	8MHz	C, M	20 SOIC DIP 20	MC
08JK8		8k	256	2-ch 16-Bit IC,OC,PWM	15	SCI	10-ch 8-Bit	3 to 5	8MHz	C, M	20 SOIC DIP 20	Under Develop
908JL3	4k		128	2-ch 16-Bit IC,OC,PWM	23	None	12-ch 8-Bit	3 to 5	8 MHz	C, M	DIP 28 SOIC 48 LQFP 32	MC
08JL3		4k	128	2-ch 16-Bit IC,OC,PWM	23	None	12-ch 8-Bit	3 to 5	8 MHz	C, M	DIP 28 SOIC 48 LQFP 32	MC
908JK3	4k		128	2-ch 16-Bit IC,OC,PWM	15	None	10-ch 8-Bit	3 to 5	8 MHz	C, M	DIP 20 20SOIC	MC
908JK1	1.5k		128	2-ch 16-Bit IC,OC,PWM	15	None	10-ch 8-Bit	3 to 5	8 MHz	C, M	DIP 20 SOIC 20	MC
08JK3		4k	128	2-ch 16-Bit IC,OC,PWM	15	None	12-ch 8-Bit	3 to 5	8 MHz	C, M	DIP 20 SOIC 20	MC

MC68HC(9)08GP32 and GT8/16



Advantages

- Pin compatible family from 8K to 32K flash
- Time base module provides auto wake up from low power stop mode to maintain real-time clock or check external devices such as sensors.
- CGM and PLL provide high performance using low-cost low frequency reference crystals. Reduces noise while still providing high performance.

Applications

- General Purpose
- Home Appliance, Set top box

General Purpose HC08 G-family

	Flash	ROM	RAM	Timer	I/O	Serial	ADC	Operating Voltage	Max Bus Frequency	Temp	Package	Status
908GP32	32k		512	Dual 2-ch 16-Bit IC, OC, PWM	33	SCI, SPI	8-ch 8-Bit	3.0, 5.0	8MHz	C	40 DIP 44 QFP 42 SDIP	MC
08GP32		32k	512	Dual 2-ch 16-Bit IC, OC, PWM	33	SCI, SPI	8-ch 8-Bit	3.0, 5.0	8MHz	C	44 QFP 42 SDIP	MC
908GT16	16k		512	Dual 2-ch 16-Bit IC, OC, PWM	34 / 36	ESCI, SPI	8-ch 8-Bit	3.0, 5.0	8MHz	C	42 SDIP 44 QFP	MC
908GT8	8k		384	Dual 2-ch 16-Bit IC, OC, PWM	34 / 36	ESCI, SPI	8-ch 8-Bit	3.0, 5.0	8MHz	C	42 SDIP 44 QFP	MC
908GR16	16k		1K	Dual 16-Bit	21 / 37	ESCI, SPI	8-ch 10-Bit	3.0, 5.0	8MHz	C	32 QFP 48 QFP	MC in Mar03
908GR8	8k		384	Dual 16-Bit	17 / 23	ESCI, SPI	8-ch 8-Bit	3.0, 5.0	8MHz	C	28PDIP 42 SDIP	MC

68HC908GP32

Upward HC05 Object Code Compatible

512 Bytes RAM

32,292 Bytes Flash / ROM

Single-Wire Development Interface

Address-Match Hardware Breakpoints

Reset / Interrupt Priority Control

External Interrupt

Watchdog

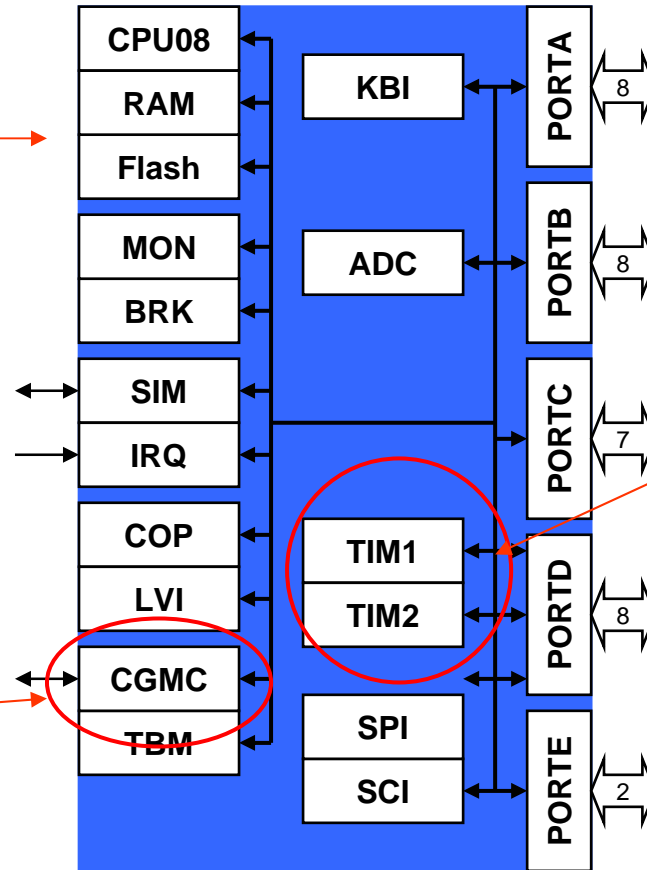
Low-Voltage Inhibit

32kHz Clock Generator Module/PLL

Time Base Module

DIP 40, SDIP 42, QFP 44

ROM MC Qualified



8 Keyboard Interrupts

8 Channel / 8-Bit
Analog-to-Digital Converter

33 Bi-directional I/O
All Ports Pins Rated for
• 10mA Sink
• 10mA Source

Dual 2 Channel 16-Bit Timer
• Input Capture
• Output Compare
• Pulse Width Modulation

Synchronous Serial
Peripheral Interface

Asynchronous Serial
Communications Interface

- Move Down to 2.4V Vdd Operation
- GP32 IDK from Tsinghua
- AN2105 - Power On, Clock Selection and Noise Reduction Technique

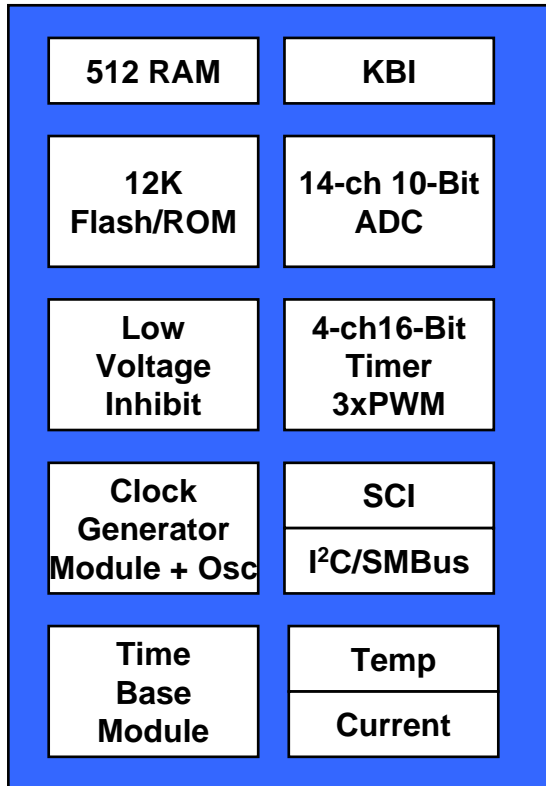
MC68HC(9)08SR12

Advantages

- Master I²C Bus which is SMBus compatible.
- Advanced analogue functions which provide cost savings. Better than 1 ° C resolution, amplifier gain up to 16X reduces need for op amps. Generates an interrupt when current is detected.

Applications

- Power management using SMBus ver 1.1
- Any application with need to read environmental details
- Any application that requires high number of ADC channels



	Flash	ROM	RAM	Timer	I/O	Serial	ADC	Operating Voltage	Max Bus Frequency	Temp	Package	Status
908SR12	12k		512	Dual 2-ch 16-Bit IC, OC, PWM	31	I ² C SCI	14-ch 10-Bit	3 or 5	8 MHz	C, M	48 QFP 42 SDIP	MC
08SR12		12k	512	Dual 2-ch 16-Bit IC, OC, PWM	31	I ² C SCI	14-ch 10-Bit	3 or 5	8 MHz	C, M	48 QFP 42 SDIP	MC

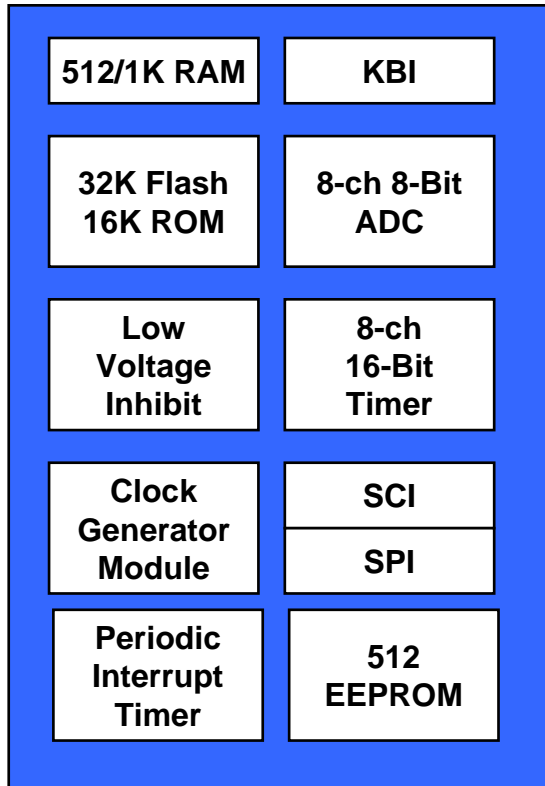
MC68HC908AB32 and AB16A

Advantages

- Integrated byte erasable EEPROM
- Big RAM size, up to 1K byte
- Lots of I/O pins - 51

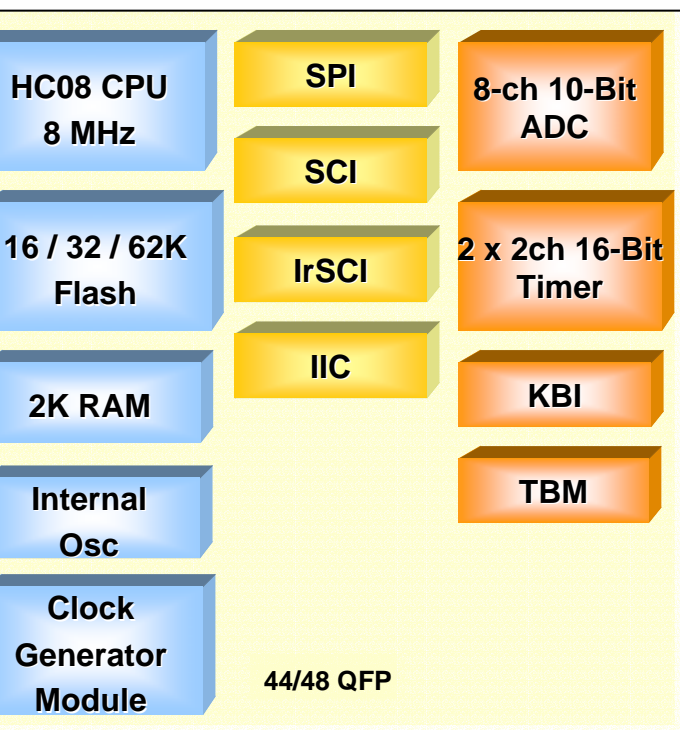
Applications

- Automotive
- High end Home Appliance
- Industrial Control



	Flash	ROM	RAM	Timer	I/O	Serial	ADC	Operating Voltage	Max Bus Frequency	Temp	Package	Status
908AB32	32k		1K	Dual 4-ch 16-Bit IC, OC, PWM	51	SCI SPI	8-ch 8-Bit	5	8MHz	C, V, M	64 QFP	MC
08AB16A		16k	512	Dual 4-ch 16-Bit IC, OC, PWM	51	SCI SPI	8-ch 8-Bit	5	8MHz	C, M	64 QFP	MC

MC68HC908AP16/32/64 Family



Advantages

- Most feature rich general purpose 44pin MCU
- Rich suite of Communications Peripherals 1 x SCI, 1 x IrSCI, SPI and IIC
- Lots of RAM 1-2k byte
- Flexible Oscillator / XTAL options
 - Separate Internal RC for COP Watchdog
- Firmware embedded in Monitor ROM for EEPROM emulation in Flash

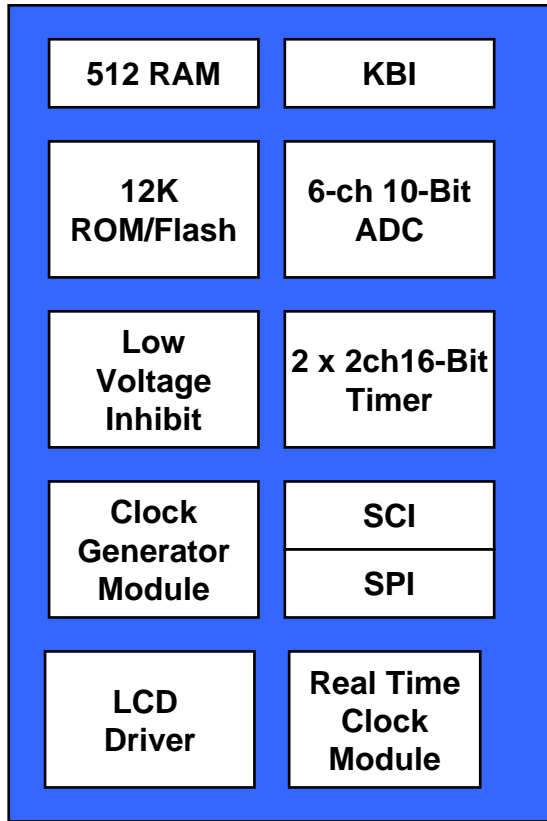
Applications

- Electronic power meters, Sensors, Wireless communications, Home appliances, Security systems

	Flash	ROM	RAM	EEPROM	Timer	I/O	Serial	ADC	Operating Voltage	Frequency	Temperature	Package	Status
MC68HC908AP64	62K	-	2K	-	2 x 2ch 16-Bit 1 x 8 bit	30 / 32	SCI, IrSCI, SPI, IIC	8ch 10bit ADC	3.0V or 5.0V	8MHz	C	42SDIP,44 QFP,48LQF P	MC in May 03
MC68HC908AP32	32K	-	2K	-	2 x 2ch 16-Bit 1 x 8 bit	30 / 32	SCI, IrSCI, SPI, IIC	8ch 10bit ADC	3.0V or 5.0V	8MHz	C	42SDIP,44 QFP,48LQF P	MC in May 03
MC68HC908AP16	16K	-	1K	-	2 x 2ch 16-Bit 1 x 8 bit	30 / 32	SCI, IrSCI, SPI, IIC	8ch 10bit ADC	3.0V or 5.0V	8MHz	C	42SDIP,44 QFP,48LQF P	MC in May 03

MC68HC(9)08LJ12

Advantages



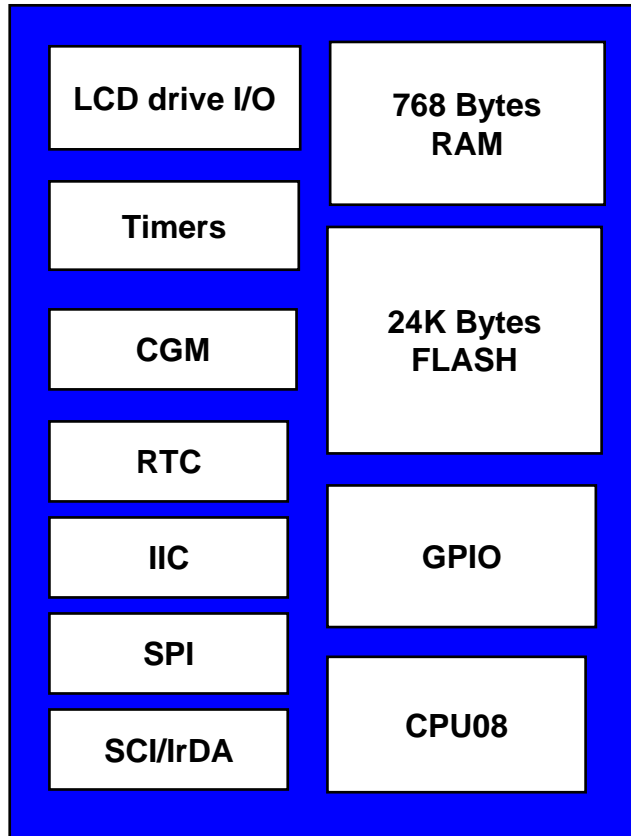
- Real Time Clock function enables calendar function and software chronograph counter. Selectable periodic interrupt request for seconds minutes, hours days, 2Hz, 4Hz and 100Hz.
- LCD Driver has maximum of 26 frontplane and static, three and four backplane drivers.
- Normal Vdd 3-5.5V, Low voltage MC68HLC908LJ12 Vdd 2.4V

Applications

- Home Appliance
- Power Meter
- Instrument (Blood Pressure Meter)

	Flash	ROM	RAM	Timer	I/O	Serial	ADC	Operating Voltage	Max Bus Frequency	Temp	Package	Status
908LJ12	12k		512	2 x 2ch 16-Bit	32	SCI SPI	6-ch 10-Bit	2.4 or 5	8MHz	C	64 QFP 52 LQFP	MC

MC68HC(9)08LJ24



Advantages

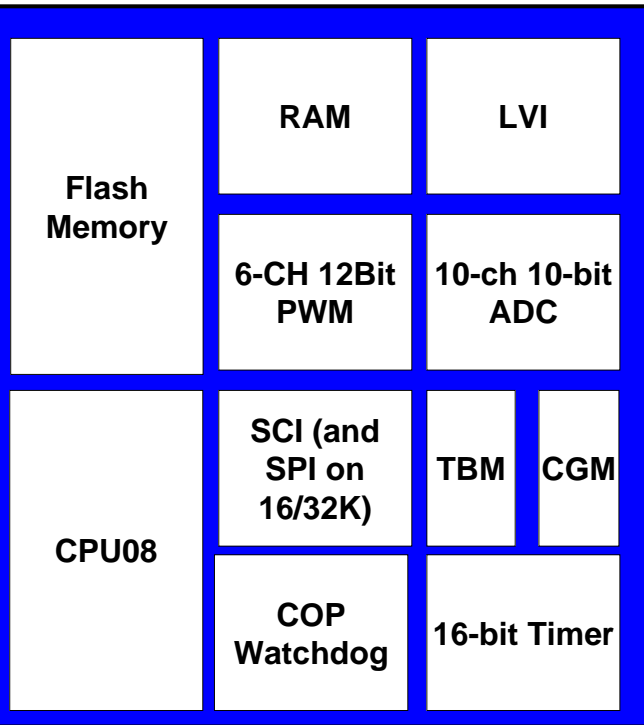
- Low Power RTC, under 5uA
- Serial communications interface module (SCI) with IR modulator/demodulator
- 22~30 direct LED source pins 15mA
- LCD Driver with
 - 64-QFP : 4 back plane and 26 front plane
 - 80-QFP : 4 back plane and 32 front plane
- Pin compatible with 64pin 9LJ12
- Normal Vdd 3-5.5V, Low voltage MC68HLC908LJ24 Vdd 2.4V

Applications

- Power Meter, Instrumentation, FRS, DSC

	Flash	RAM	Timer	I/O	LCD	Serial	ADC	Operating voltage	Max Bus Frequency	Temp	Package	Status
908LJ24	24k	768	Dual 2-ch 16-Bit	40	4 x 26	SCI, SPI, IIC	6-ch 10-Bit	2.4 -5.5	8MHz	C	64 QFP	Sample
				48	4 x 32						80 QFP	

MC68HC908MRxx



Advantages

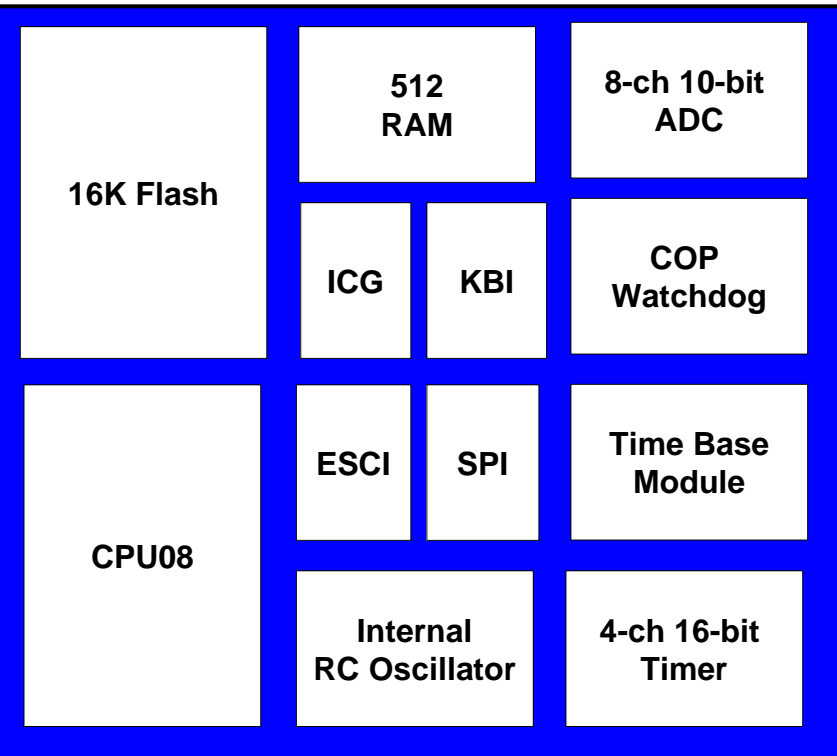
- 10-bit ADC and PWM designed specifically for 3 phase AC or BLDC Motor Control
- Industrial only 28/32 pin 3Phase control MCU – 9MR8
- Center or edge aligned PWM ideal for motor control

Applications

- 3-phase, variable speed motor control applications - HA
- Industrial Motor Control

	Flash	ROM	RAM	Timer	I/O	Serial	ADC	Operating Voltage	Max Bus Frequency	Temp	Package	Status
908MR32	32k	-	768	4-ch + 2-ch 16-Bit	44	SPI SCI	10-ch 10-Bit	5	8MHz	C,V	64 QFP 56 SDIP	MC
908MR16	16k	-	768	4-ch + 2-ch 16-Bit	44	SPI SCI	10-ch 10-Bit	5	8MHz	C,V	64 QFP 56 SDIP	MC
908MR8	8k	-	256	Dual 2-Ch 16-Bit	14	SCI	7-ch 10-Bit	5	8MHz	C,V	32 LQFP 28 DIP / SOIC	MC

MC68HC908EY16



Advantages

- On chip RC oscillator no external circuitry required
 - Trimmable to 5%
- Enhanced SCI with 13 Bit Break detect
- 10 Bit ADC
- Cyclic Wake Up feature via time base module

Applications

- Ideal for *LIN* automotive applications
- 32 QFP with small footprint for space sensitive application

	Flash	ROM	RAM	Timer	I/O	Serial	ADC	Operating Voltage	Max Bus Frequency	Temp	Package	Status
908EY16	16k	-	512	4-Ch 16-Bit	24	ESCI SPI	8-ch 10-Bit	3 or 5V	8MHz	M	32 QFP	MC

HC908GZ8/16 (Low Cost CAN)

MSCAN08		2x 2-ch 16 bit	1K RAM
4x10 bit ADC	8/16kB Flash	Monitor ROM	CPU08 Core
ESCI	SPI	CGM	

Advantages

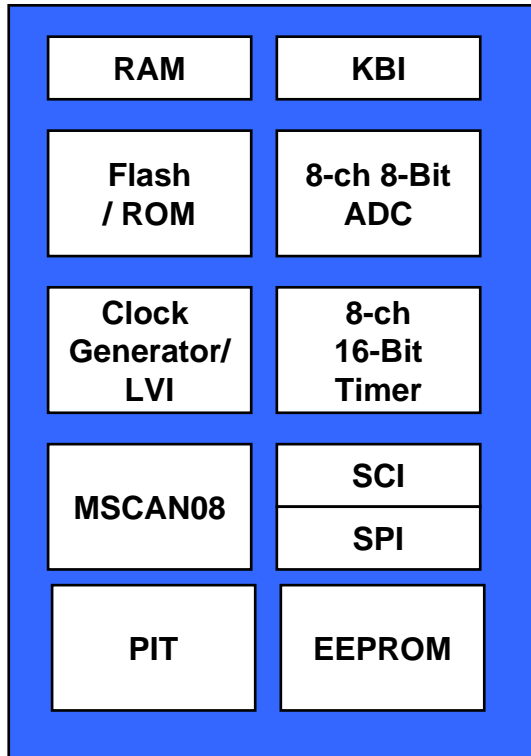
- Low cost CAN MCU to replace 05X family
- Clock Generation Module provides up to 8.4MHz bus clock from either PLL driven by 1-8MHz crystal or standard crystal/ceramic resonator with /4
- 2 x 16 bit free running timers 1 used as RTI generator

Applications

- Low end low cost Automotive and Industrial with CAN bus

	Flash	ROM	RAM	Timer	I/O	Serial	ADC	Operating Voltage	Max Bus Frequency	Temp	Package	Status
908GZ16	16k	-	1K	Dual 2-ch 16-Bit	21 / 37	ESCI SPI	4-Ch 10-Bit	3 or 5V	8MHz	M	32/48 QFP	MC on Mar03
908GZ8	8k	-	1K	Dual 2-ch 16-Bit	21 / 37	ESCI SPI	4-Ch 10-Bit	3 or 5V	8MHz	M	32/48 QFP	MC on Mar03

MC68HC(9)08AZxxA



Advantages

- Most popular Automotive CAN bus MCU in the industrial
- Integrated byte erasable EEPROM
- PIT provide programmable interrupt function.

Applications

- Automotive and Industrial
- Any application that benefits from on board EEPROM
 - (9)08AZ32A : 512 byte
 - (9)08AZ60A : 1K byte



	Flash	ROM	RAM	Timer	I/O	Serial	ADC	Operating Voltage	Max Bus Frequency	Temp	Package	Status
908AZ32A	32K		512	4-ch + 2-ch 16-Bit	50	CAN/SCI/ SPI	15-ch 8-Bit	5	8	C/V/M	64 QFP	Samples
08AZ32A		32K	512	6-ch + 2-ch 16-Bit	50	CAN/SCI/ SPI	15-ch 8-Bit	5	8	C/V/M	64 QFP	MC
908AZ60A	60K		1K	6-ch + 2-ch 16-Bit	50	CAN/SCI/ SPI	15-ch 8-Bit	5	8	C/V/M	64 QFP	MC
08AZ60		60K	1K	6-ch + 2-ch 16-Bit	48	CAN/SCI/ SPI	15-ch 8-Bit	5	8	C/V/M	64 QFP	MC

68HC908JB8, 08JB8, 08JT8, 08JB1

Upward HC05 Object Code Compatible

256 Bytes RAM

8K Bytes Flash / ROM

Single-Wire Development Interface

Address-Match Hardware Breakpoints

Reset / Interrupt Priority Control

External Interrupt

Watchdog

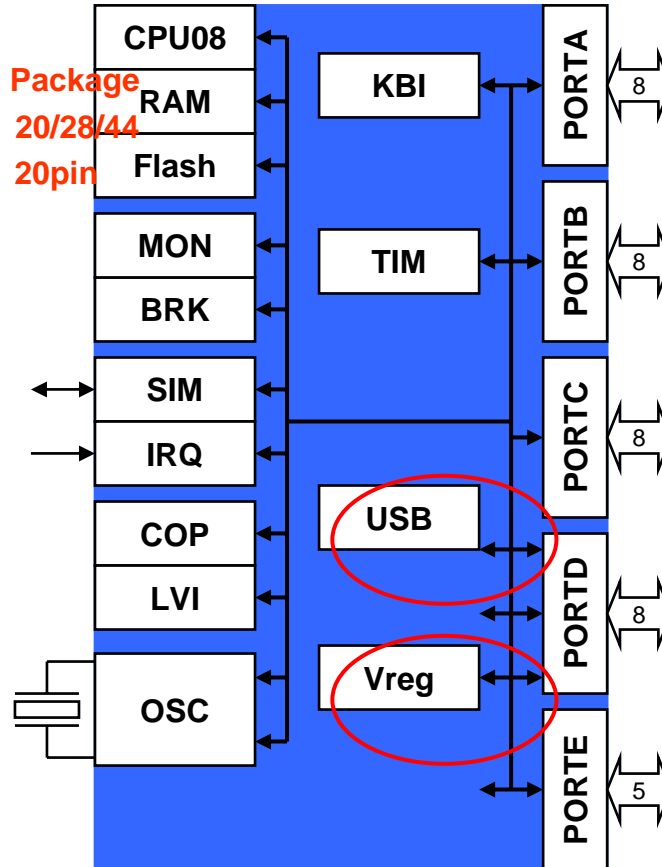
Low-Voltage Inhibit

Clock Oscillator

QFP 44, DIP 20, SOIC 28

3 ROMs - 08JB8/JT8 (8K) MC 'ed
08JB1 (5.5K) MC'ed

	ROM	RAM	Package
JB8	8K	256	20/28/44
JB1	5.5K	128	20pin



8 Keyboard Interrupts

2 Channel 16-Bit Timer

- Input Capture
- Output Compare
- Pulse Width Modulation

Up to 37 Bi-directional I/O

28pin - 21 I/O

20pin - 13 I/O

- 10 mA on 8 pins
- 25 mA on 2 pins

USB

- 1.5 Mbps

3.3 V Regulator

- 5V VDD, 3MHz Bus
- RESET, IRQ 0-5V operation
- I/Os are 0-3.3V operation
- 08JT8 1.8-3V Operation, NO USB, NO Vreg, NO LVI

New USB RF Receiver MCU - HC908JB16

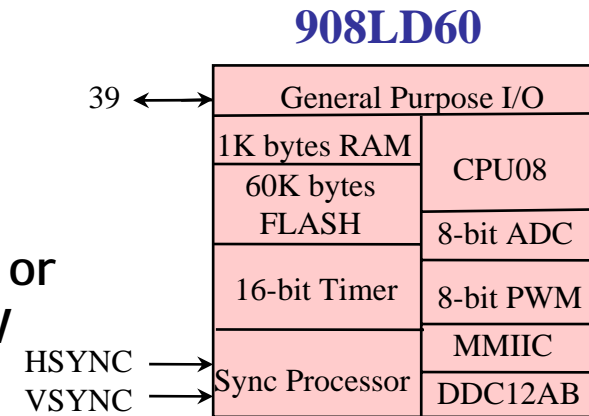
- HC08 CPU Core
 - external 12MHz XTAL and 6 MHz *CPU bus clock*
- 16384 bytes Flash Memory(*with security*) and 384 bytes RAM
- Fully Compliant Low Speed(1.5Mbps) USB 1.1 Interface
 - Control Endpoint 0 with separate 8-byte Tx/Rx FIFOs
 - Interrupt Endpoint 1 with 8-byte Tx FIFO and Endpoint 2 with separate 8-byte Tx/Rx FIFOs
 - suspend/resume operation and device remote wakeup
 - Vref(3.3V \pm 10%) for USB line pullup
 - USB port pins mux with 10mA High Current pins (with prog. pullup R) to switch between PS/2 & USB Interfaces [*Multiprotocol*]
- Two 16-bit 2-channel Timer Interface Modules(TIM) with rising and falling edges Input Capture/Output Compares
- Serial communication interface module (SCI)
- Up to 21 Bi-directional I/O Pins
 - 12 with programmable pullups at PTA0-7, PTC0-1, and PTE3-4
 - 8-bit keyboard interrupts at PTA0-7
 - LED Direct Drive Pin : 4 10mA pins at PTD2-5 and PTE3-4, and 2 25mA pins at PTD0-1.
- Dual clock generator modules (PLL) for 27MHz wireless HID application
- Packages : 32-pin LQFP, 28-pin SOIC

CRT/LCD Monitor MCU

HC908LD60/64/120

FEATURES :

- 6MHz Bus, 24MHz external crystal
- 60K Flash
- 1K Ram (2K Ram - 9LD64)
- Sync Processor which contains H/V, Composite, or digital SOG SYNC signal frequency counters, H/V polarity detection, (auto) polarity controlled, selectable H/V Sync outputs, and the CLAMP pulse output, fast Horizontal frequency measurement, low vertical frequency detect
- 8-Ch 8-bits PWM
- 8-bit ADC
- 39 General purpose I/O
- 2-Ch 16-bit Timer
- DDC12AB module
- Additional Multi-Master IIC
- USB HUB and OSD, 908LD64 Only



MC 68HC 11 单片机开发技术

Reference Book in Chinese

1995



1998



2000



2002

9S12D Family

HCS12 CPU	Dual 10bit, 8ch.
Up to 512K FLASH	Enhanced Capture Timer 16bit, 8ch.
	PWM 8bit 8ch./16bit 4ch
	2 x SCI
	3 x SPI
12K RAM	IIC
4K EEPROM	BDLC J1850 Interface
16 Key Wakeup IRQ Ports	Up to 5 Advanced MSCAN12
	Vreg 5V to 2,5V

- Advantages
- Up to 5 x enhanced msCAN 12
- J1850
- Fully compatible code and pin compatible family from 32KBytes to 512KBytes of Flash
- Applications
- Automotive, Industrial
- Any application requiring large I/O, memory (Flash RAM and EEPROM) and sophisticated communication.

	RAM	Flash	EEPROM	Speed	SCI	SPI	IIC	ADC	Vcc	I/O	CAN	Other	Timer	PWM	Package
9S12DP512	14K	512K	4K	25/33	2	3	1	16 Ch 10 Bit	5V	59 - 91	5	J1850	8Ch 16Bit (ECT)	8Ch 8Bit	112LQFP
9S12Dx256	12K	256K	4K	25MHz	2	3	1	16 Ch 10 Bit	5V	59 - 91	2->5	J1850	8Ch 16Bit (ECT)	8Ch 8Bit	112LQFP, 80QFP
9S12Dx128	8K	128K	2K	25MHz	2	2	1	16 Ch 10 Bit	5V	59 - 91	2->3	J1850	8Ch 16Bit (ECT)	8Ch 8Bit	112LQFP, 80QFP
9S12D64	4K	64K	1K	25MHz	2	1	1	16 Ch 10 Bit	5V	59 - 91	1	J1850	8Ch 16Bit (ECT)	8Ch 8Bit	112LQFP, 80QFP
9S12D32	2K	32K	1K	25MHz	2	1	-	8 Ch 10 Bit	5V	59	1	-	8Ch 16Bit (ECT)	7Ch 8Bit	80QFP

HCS912A Family - General purpose

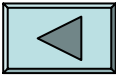
HCS12 CPU	Dual 10bit, 8ch.
Up to 512K FLASH	Enhanced Capture Timer 16bit, 8ch.
	PWM 8bit 8ch./16bit 4ch
	Up to 2 x SCI
12K RAM	Up to 3 x SPI
4K EEPROM	IIC
16 Key Wakeup IRQ Ports	Vreg 3V to 2.5V

Advantages

- Feature Rich Peripheral Set, flash base
- 3V - 5V Supply voltage
 - 3V to be introduced after 5V
 - 2.5V Internal core
- 2 x SCI, 3 x SPI, IIC

Applications

- Any application requiring high performance, I/O, memory at low cost and low voltage
- Industrial (Elevator, Petrol Pump), Line Card, Card Reader, Security



	RAM	Flash	EEPROM	Speed	SCI	SPI	IIC	ADC	Vcc	I/O	CAN	Other	Timer	PWM	Package
9S12A512	14K	512K	4K	25/33	2	3	1	16 Ch 10 Bit	3 or 5	59 - 91	-	-	8Ch 16Bit (ECT)	8Ch 8Bit	112LQFP
9S12A256	12K	256K	4K	25MHz	2	3	1	16 Ch 10 Bit	3 or 5	59 - 91	-	-	8Ch 16Bit (ECT)	8Ch 8Bit	112LQFP, 80QFP
9S12A128	8K	128K	2K	25MHz	2	2	1	16 Ch 10 Bit	3 or 5	59 - 91	-	-	8Ch 16Bit (ECT)	8Ch 8Bit	112LQFP, 80QFP
9S12A64	4K	64K	1K	25MHz	2	1	1	16 Ch 10 Bit	3 or 5	59 - 91	-	-	8Ch 16Bit (ECT)	8Ch 8Bit	112LQFP, 80QFP
9S12A32	2K	32K	1K	25MHz	2	1	-	8 Ch 10 Bit	3 or 5	59	-	-	8Ch 16Bit (ECT)	7Ch 8Bit	80QFP

HCS912B Family

HCS12 CPU	10bit, 8ch ADC
Up to 256K FLASH	Enhanced Capture Timer 16bit, 8ch
	PWM 8bit 8ch./16bit 4ch
	2 x SCI
	SPI
RAM	MSCAN12
EEPROM	Vreg 5V to 2,5V
16 Key Wakeup IRQ Ports	

Advantages

- Feature Rich Peripheral Set
- Enhanced msCAN 12

Applications

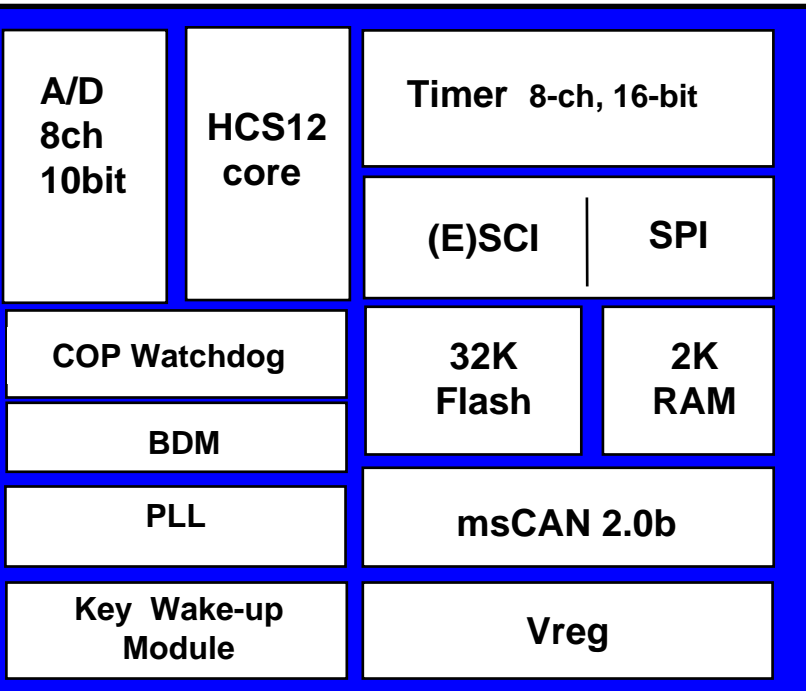
- Any application requiring high performance but fewer features and EEPROM than HCS12D-family offers



	RAM	Flash	EEPROM	Speed	SCI	SPI	IIC	ADC	Vcc	I/O	CAN	Other	Timer	PWM	Package
S12B256	8K	256K	2K	16Mhz	2	1	-	8 Ch 10 Bit	5V	59 - 91	1	-	8Ch 16Bit (TIM)	8Ch 8Bit	112LQFP, 80QFP
S12B128	4K	128K	1K	16Mhz	2	1	-	8 Ch 10 Bit	5V	59 - 91	1	-	8Ch 16Bit (TIM)	8Ch 8Bit	112LQFP, 80QFP
S12B64	2K	64K	1K	16Mhz	2	1	-	8 Ch 10 Bit	5V	59	1	-	8Ch 16Bit (TIM)	7Ch 8Bit	80QFP

HCS912C32 - Goldfish

The MC9S12C family is a **low-cost**, high performance version of the MC9S12 family of 16-bit microcontroller units (MCUs), utilising the enhanced MC9S12 core.



- Advantages
- 3V - 5V operation
- 16-Bit performance at 8-Bit price
- Entry level HCS12 Device
- Applications
- Application which require high performance but smaller memory and package that other HCS12
- Road in to HCS12 family for high end HC08 parts.



HCS912H Family

HCS12 CPU	ADC 10-bit, 8-ch
256K FLASH	PWM 8bit 6ch/16bit 2ch
12K RAM	2 x Advanced MsCAN12
4K EEPROM	2 x SCI
Vreg 5V to 2,5V	1 x SPI
4 x 32 LCD display driver	IIC
	Timer 16-bit 8-ch

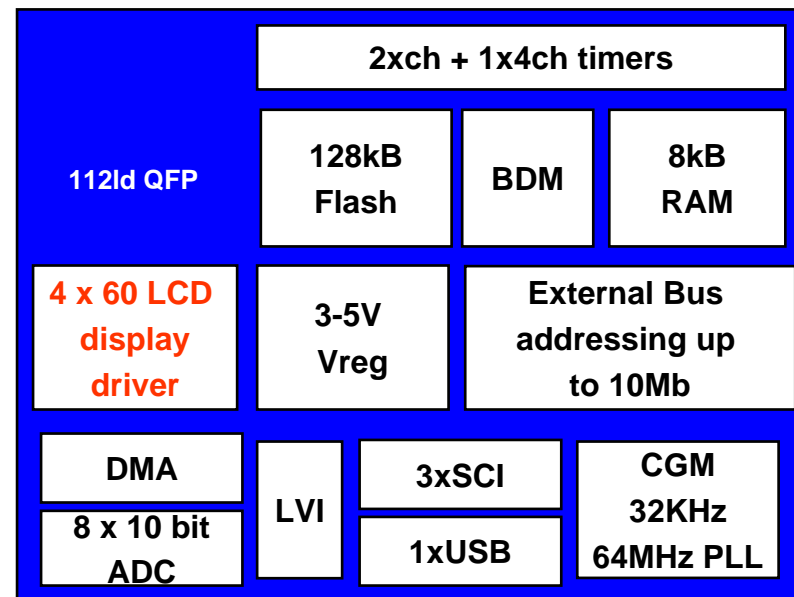
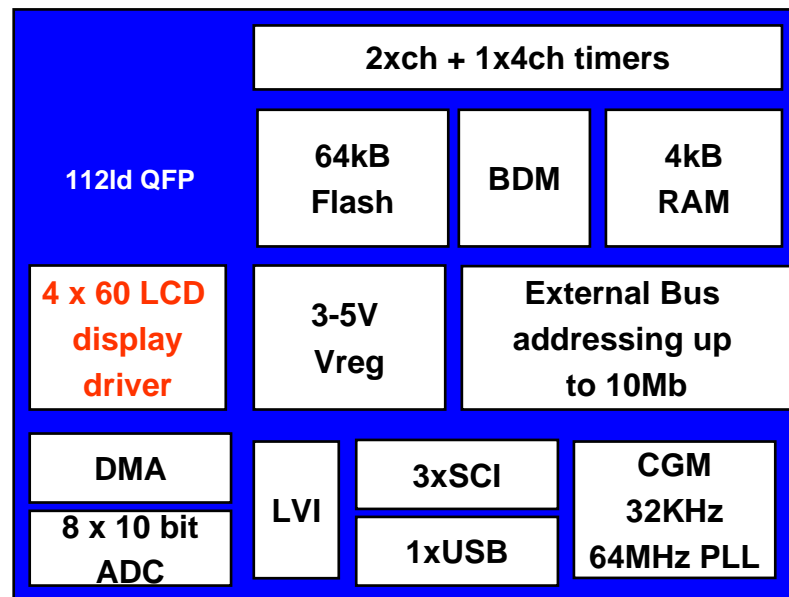
- Advantages
- 4 x 32 LCD display driver
- 24 high current drivers for PWM motor control which supports sin and cos drive, dithering and output slew limitation
- ADC with external conversion trigger capability
- Applications
- Any application that required some LCD drive I/O



	RAM	Flash	EEPROM	Speed	SCI	SPI	IIC	ADC	Vcc	I/O	CAN	Other	Timer	PWM	Package
9S12H256	12K	256K	4K	16Mhz	2 or 1	1	1	16-Ch 10-Bit	5V	93	2	32x4 LCD	8Ch 16Bit (TIM)	2 or 6 ch	112LQFP, 144LQFP
9S12H128	6K	128K	2K	16Mhz	1	1	-	8-Ch 10-Bit	5V	61	2	32x4 LCD	8Ch 16Bit (TIM)	2 or 6 ch	112LQFP

HCS912L Family - Display Family

- So many industrial applications have a user interface & instrumentation cluster, with parallels to automotive cluster needs.
- The partitioning option highlighted here has drivers on board to attack low multiplexed LCD displays which have less characters.
- External addressing maintained to access look-up tables.



9S12E128

S12 16-Bit CPU Core

8K Bytes RAM

128K Bytes FLASH EEPROM

Single-Wire Background Debug

Address-Match Hardware Breakpoints

Reset / Interrupt Priority Control

External Interrupt

Watchdog

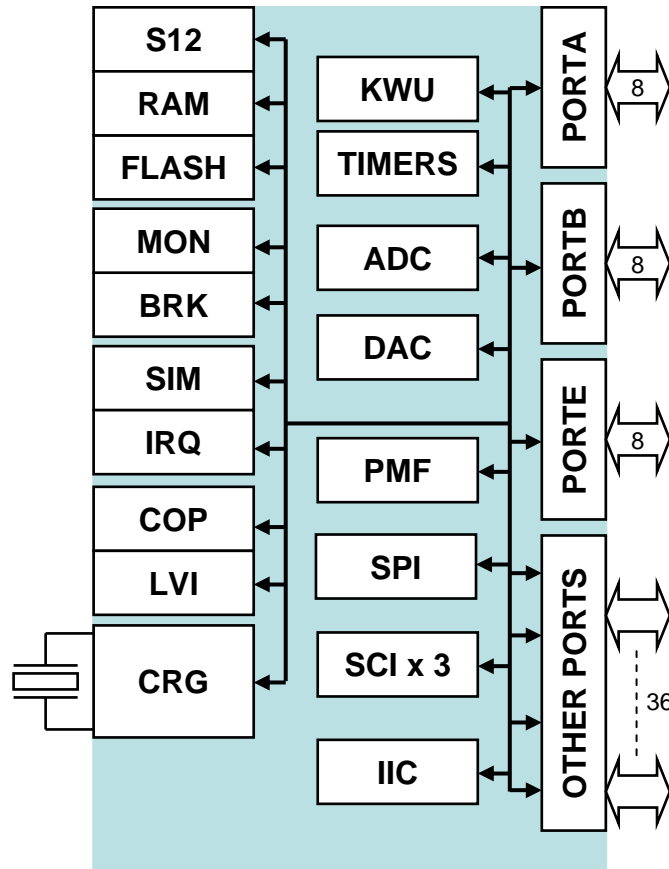
Low-Voltage Inhibit

Clock Generation and Reset Module

3.3V to 5V operating voltage

25MHz bus

80-QFP



60 Bi-directional I/O

20 Keypad Wakeup Inputs

3 x 4-Channel Timers

- 8-bit programmable with IC and OC channels
- 16-bit pulse accumulator

16-Channel 10-Bit ADC

2-Channel 10-Bit DAC

6-Channel Pulse Modulator with Fault Protection

Serial Peripheral Interface

3 x Serial Communications Interface

Inter-IC Bus



9S12NE64/32

S12 16-Bit CPU Core

8K Bytes RAM

64 Bytes FLASH EEPROM

Single-Wire Background Debug

Address-Match Hardware Breakpoints

Reset / Interrupt Priority Control

External Interrupt

Watchdog

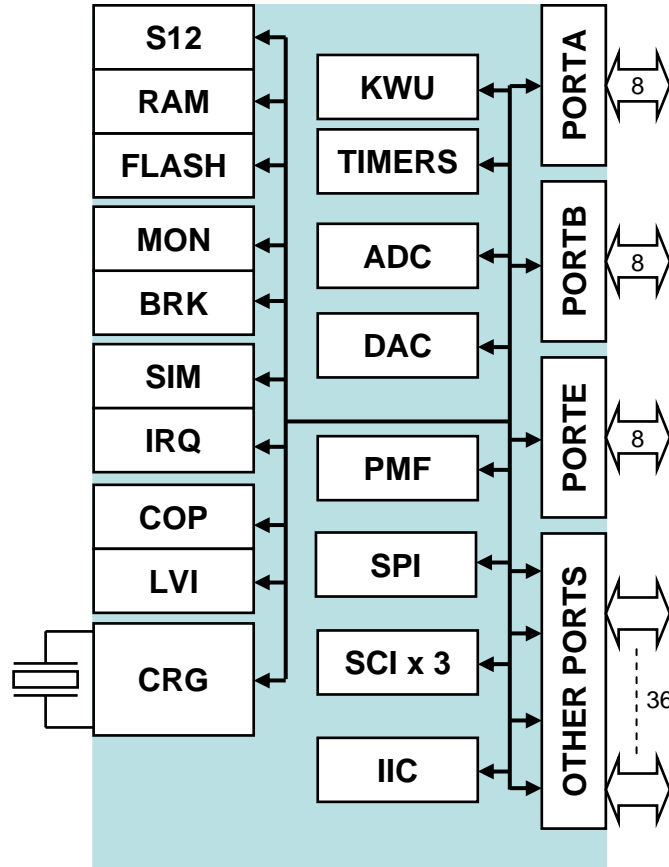
Low-Voltage Inhibit

Clock Generation and Reset Module

3.3V to 5V operating voltage

25MHz bus

80-QFP



60 Bi-directional I/O

20 Keypad Wakeup Inputs

3 x 4-Channel Timers

- 8-bit programmable with IC and OC channels
- 16-bit pulse accumulator

16-Channel 10-Bit ADC

2-Channel 10-Bit DAC

6-Channel Pulse Modulator with Fault Protection

Serial Peripheral Interface
3 x Serial Communications Interface

Ethernet interface

Inter-IC Bus

9S12UF32

81 Bi-directional I/O

Timer

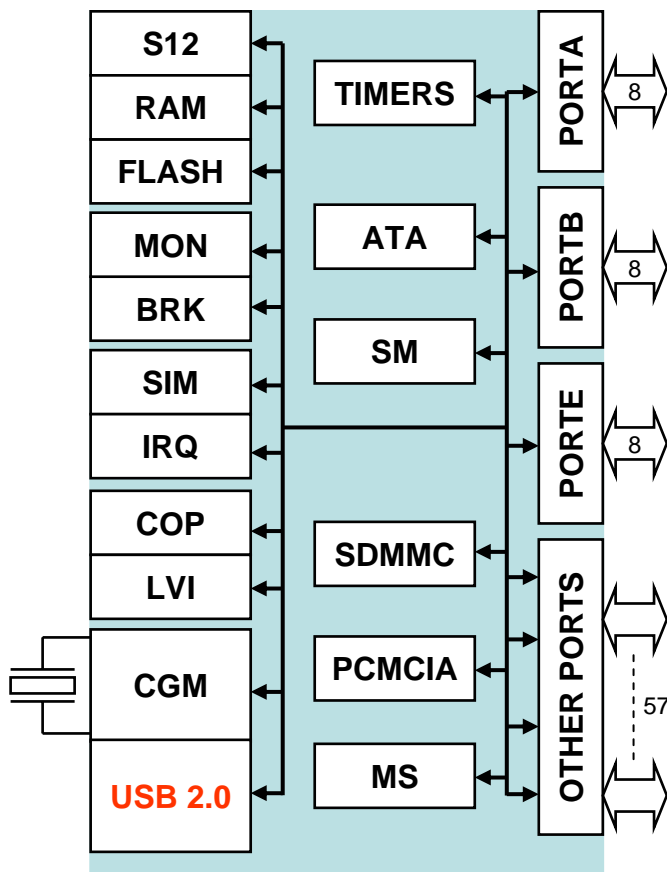
- 16-bit main counter
- 8-bit programmable with IC and OC channels
- 16-bit pulse accumulators

ATA Interface

Smart Media Interface

MMC System v2.1 and
SD Memory Card v1.0
Interface, Compact Flash

MemoryStick/MagicGate
Interface



S12 16-Bit CPU Core

1K Bytes RAM

32K Bytes FLASH EEPROM

Single-Wire Background Debug

Address-Match Hardware Breakpoints

Reset / Interrupt Priority Control

External Interrupt

Watchdog

Low-Voltage Inhibit

Clock Generation and Reset Module

Universal Serial Bus 2.0

3.3V to 5V operating voltage

25MHz bus

100-QFP

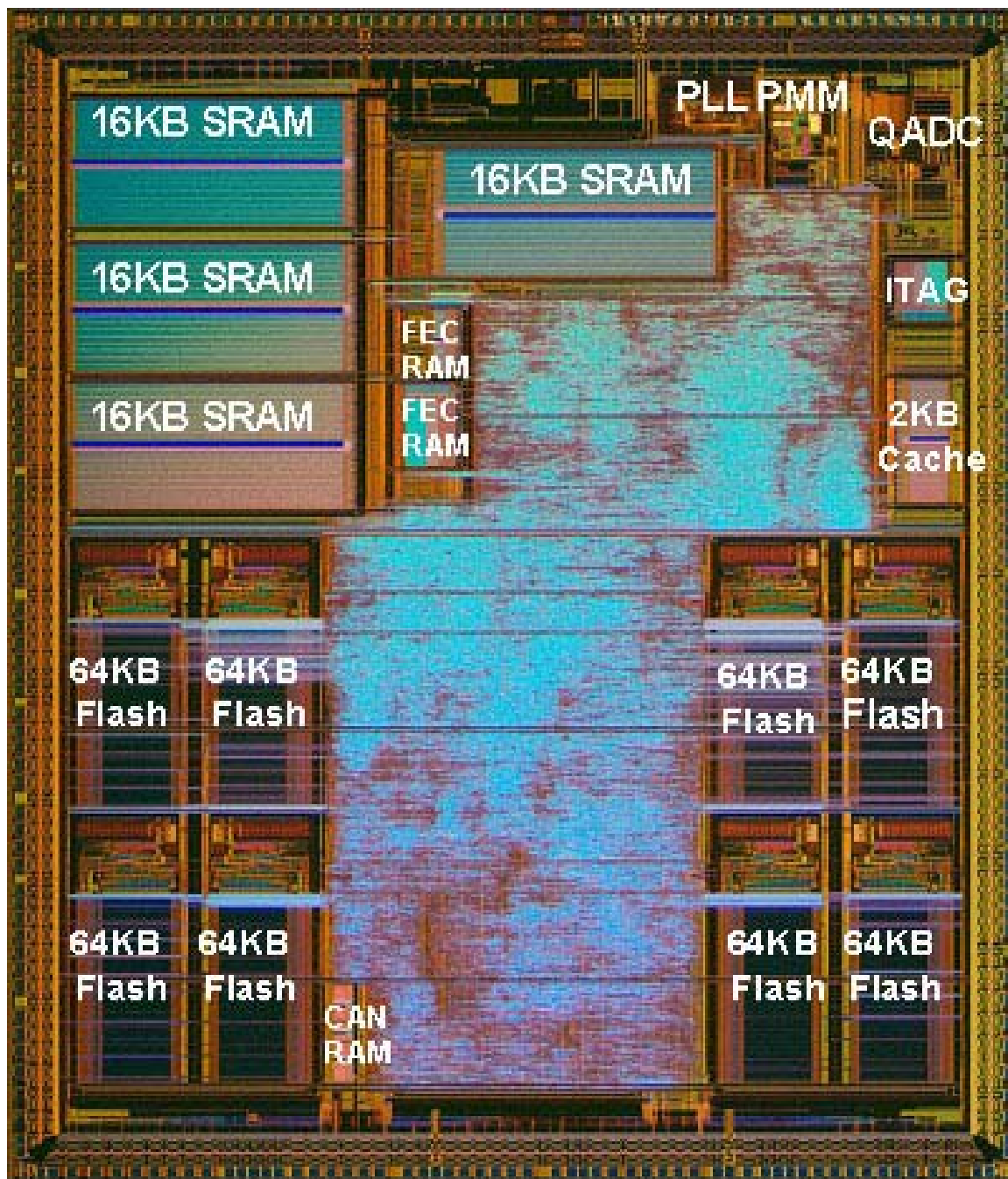
32b MCU: ColdFire

- **MCF5206**,5214,5216,5232,5233,5234,5235,
5249,5270,5271,**5272**,5274,5275,5280,5281,**5282**
- **MCF5307**
- **MCF5407**,5470,5471,5472,5473,5474,5475,5480,5481,5482,5483,5485

ColdFire 5282

- 66MHz or 80MHz V2 ColdFire CPU with **EMAC** support
- Internal 512KBytes Flash and 64KB SRAM running at 66MHz
- 3 UART; SPI; IIC; CAN; ADC and 100Mbps **Ethernet + PHY**
- GPIO and Timers
- **66 MIPS** 0.72W 256Pins

μClinux



ColdFire 5282

ColdFire 5484

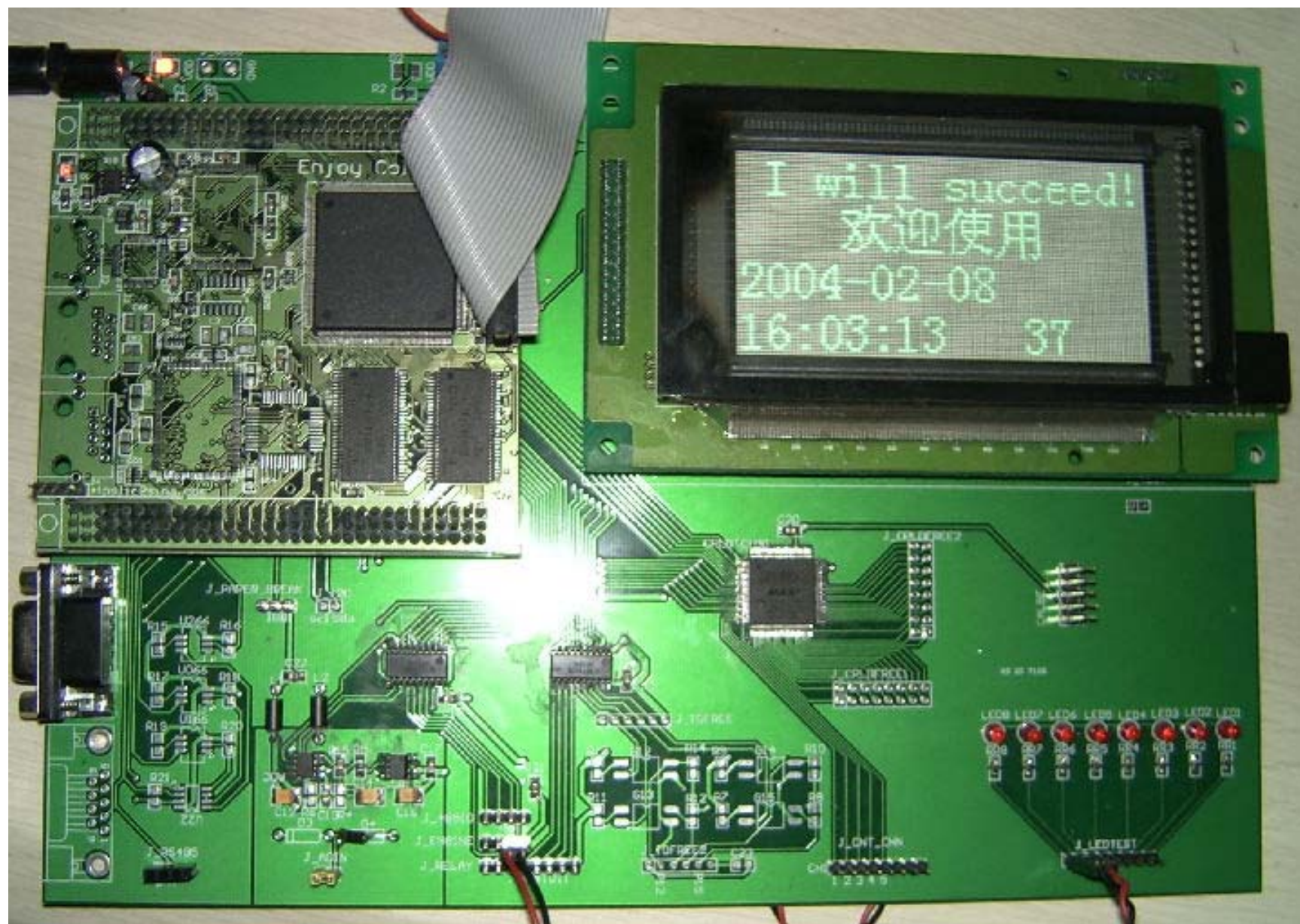
- FPU, MMU, DMA, FlexCAN, IIC, Integrated PHY,MAC (FEC) 10/100 Ethernet, PCI V2.2 Programmable Serial Controller,QSPI,USB 2.0
- 32 KB I-Cache, 32 KB D-Cache ,32 KB on-chip system SRAM
- **308MIPS**, 388BGA

μClinux

ColdFile 5307 Experiment Board







Other 32b MCU

- M68K:
 - 68301, 68302, 68331, 68336...
 - 68332, 68376, 68375...
- PowerPC
 - PPC821, 823, 860...
 - PPC555, 561/2/3/4/5...
- ARM
 - MX1, MXII...
- M.Core
 - 2104, 2107... C.Core

MCU Web Site



<http://www.mot.com/>

<http://www.Freescale.com/>

- Products and Service
- Semiconductor
- Products
- Microcontroller

8bits
16bits
32bits

- Selection Guides, new/Q
- FAQ knowledge database
- Application Note, example downloads
- Data Sheet
- Reference manual
- Development software downloads
- Searchable third party database

MCU Selector Guide (SG1006/D)

See Selection Guide 2004. 3

Do Select Best MCU for Your Application!