EMITT Solutions
Update Your Knowledge

Microcontroller Market and Technology Analysis Report –2008 (Sample pages)

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Introduction

This report is prepared for design engineers to update their knowledge on microcontrollers released in the year 2006, 2007 and part of 2008. It covers detailed study of features available in the newly released products, technology trends, market trends, manufacturer ranking and the list of new microcontrollers released in the market.

The content of the report is designed for microcontroller user (both technology and managerial) to gain complete insight of market and technology trends in this key semiconductor component. This report is slightly different from other expensive market research reports available in the market. The focus is more on technology. The designer and final applications are kept in mind while preparing rather than considering too much of commercial parameters.

By reading this report, the reader gains knowledge on basic market and technology dynamics of microcontroller chip and as a designer, he/she can select the right vendor and the part easily for his design requirements.

Market Trends

Market facts and figures:

After experiencing nearly a flat growth in years 2004 and 2005, the microcontroller market started riding linear growth in the range of 10% from 2006 onwards. Bit-wise, 32-bit MCUs are experiencing little higher growth compared to 16-bit, but the 8-bit MCU market is no more growing. Due to falling ASP (Average Selling Price), the revenue growth is not proportional with unit shipment growth. The unit shipment growth is 15% more than revenue growth.

The key driving factors are,

- Demanding applications in automotive electronics
- Adaptation of smart and highly secure technologies in identification and security market.
- Demand for DSP capable MCUs in consumer applications
- Requirements of high power saving devices
- Requirements to save board space by using highly integrated feature-rich SOC type of MCUs.
- Requirement to use configurable or flexible hardware and software in embedded design.
- Low cost yet powerful processors for commodity type electronic gadgets

Key figures of MCU market:

⇧ The total market for 32-bit microcontroller is US$ 3.8 billion in 2007. The market has grown by around 10% compared to 2006.

⇧ The total market for 16-bit microcontroller is US$ 3.9 billion in 2007. There is no change in figures compared to 2006.

⇩ The total market for 8-bit microcontroller is US$ 4.9 billion in 2007. The market has shrunk by around 5% compared to 2006.

⇧ A total of 10 billion MCUs are shipped in year 2007. A growth of 25% compared to year 2006.

Driving Applications

Automotive:

Each and every key parts of car is monitored and controlled by Microcontrollers. From fuel saving to providing safety and entertainment to driver, MCUs work to provide lot of advanced features in new cars.
To withstand the harsh environment, highly reliable devices are only selected and from the vendors who have delivered hi-rel devices to leading auto customers.
As the car becoming more electrical controlled with hybrid, electric and other such non-gasoline driven technologies taking preference over gas-guzzlers, the role of microcontroller to save power increases. Even in petrol and diesel driven vehicles, microcontrollers play major role in increasing mileage and controlling emissions.

It can be estimated that, the total automotive market for MCU devices is in the range 6 billion USD per year and estimated to be growing at 15 to 20% in 2008. Europe, Japan, US, China, India are key markets in that priority.

The best vendors of MCUs for automotive market are,

- Renesas
- Freescale
- Infineon
- Fujitsu
- NEC
- NXP
- Atmel

32 and 16-bit devices are the commonly used MCUs in automotives; the 8-bit is less preferred in automotives.

The features specific to automotive MCUs are,

- Processing power
- Number of CAN, LIN, and other master/slave communication interfaces,
- Exclusive design of MCU for specific automotive sub-applications
- Component reliability issues such as temperature range, and other harsh environment withstanding parameters

However the requirement may vary depending on where the MCU is going to be used i.e. for engine control, body electronics or entertainment.

Interesting development in automotive electronics is, few companies such as Infineon and Freescale are launching MCUs exclusively for motorcycles. The key markets for these devices are India and China.

Please check in the new products table provided in chapter 4 for such products.

Vendor profiles

Renesas Technology Corp. (www.renesas.com)
Head Office: Japan

MCU Revenue: 2944 billion USD

The MCU offerings:

MCU type	Market Position
8 – bit	Strong
16 – bit	Strong
32 – bit	Strong

Renesas is formed after merging semiconductor operations of Hitachi and Mitsubishi. After merging, the new company emerged as one of the top ten semiconductor companies in the world. Renesas is ranked number one in MCU market by sales revenue. Renesas product offering includes complete range of MCUs for all types of applications. They ranked number one in every aspects of MCUs except for developer-support. In providing educative or guidance material or consultancy on Renesas products, Renesas can be ranked slightly below other competitors, but they are gearing up their effort in improving customer support.

The key strengths of Renesas MCUs are,

- Processor performance (Extremely good)
- Rich features
- Wide choice of MCU for every major to minor application

Geographical demand

Asia takes number one position in market share with a huge difference of nearly 10% compared to next big market of Europe. The China is taking number one focus of all MCU vendors. There is huge growing market demand. The China market can be estimated to be growing at more than 20%.
The Europe market is mainly automotive and smart-card.

The US market is not growing as it was earlier but expected to recover in the coming years.

The share of MCU market by geographical area

Area/ Region	Percentage of share
Asia (Including Japan)	37%
Europe	28%
North America	25%
Rest of the World	10%

Vendor ranking

MCU vendors are ranked here by their sales revenue announced in fiscal 2007 ending Dec 31 2007 and for few companies fiscal ending 31 March 2008. Wherever we not able to get exact MCU revenues we have estimated based on other available market data.

Here below is the list.

Name of the MCU Vendor	Sales-Revenue in 2007 (million USD)	Rank
Renesas	2944	1
Freescale	1878	2
NEC	1828	3
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
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[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]

Technology Trends

Architecture trends

The most used 8051-architecture is loosing importance. Its share and presence is declining and will further decline sharply in the coming years

The next most popular architecture, which has huge support and market is, ARM processor architecture. Good thing about ARM is, it's growing. New ARM Cortex is now a buzzword. Every ARM based MCU vendors have launched new devices based on ARM Cortex. Most interesting new Cortex vendor with very low cost offerings is Luminary Micro. It's worth to check this vendor's product at least once for any MCU professional.

ARM holds a huge market share of exceeding 55% in ASSP, and other processor-integrated devices. But in pure MCUs, the share of ARM is less compared to 8051 and other proprietary architectures of leading MCU vendors.

The below table displays market share of different architectures

Company	Core	Share (%)
Intel (8051)	8051	19
Renesas	740, H8/S, M32R	17
Freescale	68XX	15
PIC	PIC	12
ARM	ARM	10
NEC	V850, 78K0, K3/K4	9
ST	Proprietary 8-bit	6
Atmel	AVR	3
Infineon	C16X	3
Others	Others	6

Below table is showing top growing architectures in last two years (2006 and 2007)

Processor Core	Company developed
PIC	Microchip
ARM	ARM
V850	NEC Electronics Corp.
8051	Intel
HCS08/HCS12X	Freescale
C166SV2	Infineon Tech
T8K/0	NEC Electronics Corp.
E200Z (PowerPC)	Freescale
H8S/H8SX	Renesas
XC800	Infineon Tech

The major issue today is in the non-usability of same code across various different architectures by the same vendor or different vendor. 8051 still staying popular mainly because code written 5/10 years back can be reused with little change in memory mapping or other such physical device parameters or address. The code can be ported to a just released 8051 MCU with advanced features. The other such popular architecture providing code portability is ARM. ARM is advanced architecture with benefits of low power consumption, fast-execution, and higher data bus width. ARM is becoming designer's favorite.

On chip memory

Since from the launch of MCUs, the on-chip memory is continuously increasing in size and type. The designer has a wide choice both in memory size and memory type. Some of the vendors who have 90nm and below IC fabrication capabilities are offering generous SRAM, and Flash.

SRAM: SRAM is used for both cache and data storage. The size of SRAM is important in enhancing processing power.
LPC2400 from NXP with 2KB of battery back-up SRAM allows the RTC to work even when the chip's power is shut down.
Among the recently released 32-bit MCUs, developers can expect in the range of >50 KB in more than half of the new products released in last two years. In the recently released 16-bit MCUs, the average size is around 16KB. However in 8-bit MCUs, the average is around 8KB, but there are few 8-bit MCUs with SRAM of 64 KB.

32 Bit MCUs with highest SRAM

Manufacturer Name	Parts Generic No	SRAM in Bytes
Infineon Tech	TC1796	162000
Freescale Semiconductor	MPC5566	128000
Renesas	SH7263 / SH7203	112000
Atmel Corp	AT91SO100	96000

16-bit MCUs with highest SRAM

Manufacturer Name	Parts Generic No	SRAM in Bytes
Infineon Tech	XE166	82000
Freescale Semiconductor	S12XEP100	64000

8 –bit MCUs with highest SRAM

Manufacturer Name	Parts Generic No	SRAM in Bytes
ST Microelectronics Inc	uPSD3454E	32000
Cypress Semiconductor Corp	FX2LP18	16000

Flash Memory: There are hardly any newly released MCU with low flash memory capacity. The average flash memory capacity in recently released MCUs is around 350 KB.
Larger flash memories are the selling points of few MCU vendors. Each year the flash capacities are growing by 50%.

32 Bit MCUs with flash above 1000 KB

Manufacturer Name	Parts Generic No	Flash in KB
Freescale Semiconductor	MPC5566	3000
Infineon Tech	TC1796	2100
Freescale Semiconductor	MPC5567	2000
Toshiba Corp.	TMP19A64F20AXBG	2000
Freescale Semiconductor	MPC5510	1500
NEC Electronics Corp.	V850/JJ3	1024
NEC Electronics Corp.	V850ES/Fx3	1000
NEC Electronics Corp.	V850ES/SJ3	1000
NEC Electronics Corp.	V850ES/SG3	1000

16-bit MCUs with flash above 500 KB

Manufacturer Name	Parts Generic No	Flash in KB
Texas Instruments Inc	TMS470R1B1M	1000
Freescale Semiconductor	S12XEP100	1000
Infineon Tech	XE166	768
Infineon Tech	XC2200	768
Infineon Tech	XC2700	768
Infineon Tech	XC2300	576
PHILIPS	LPC2300 / LPC2400	512
Freescale Semiconductor	MC9S12XHZ512	512

8 –bit MCUs with flash above 100 KB

Manufacturer Name	Parts Generic No	Flash in KB
ST Microelectronics Inc	uPSD3454E	256
Freescale Semiconductor	MC9S08QE128	128
NEC Electronics Corp.	78K0/Fx2	128
Microchip Technology Inc	PIC18F87J11	128
Microchip Technology Inc	PIC18F87J50	128

FRAM: If you are familiar with the advantages and drawbacks of FRAM. There is an option to use Microcontroller with built in FRAM from RAMTRON. The simple advantage is, each memory cell can be written or erased without touching other memory cells and stores the data without power.

The VRS51L3074 from Ramtron is MCU with FRAM. This is the first microcontroller based entirely on FRAM, where FRAM will be used for program, data and register memory, eliminating the need for Flash and SRAM altogether.

FRAM simplifies the design cycle by eliminating the code overhead accompanying Flash data storage, and the limited endurance and drawn out write cycles of Flash/EEPROM. Unlike Flash, FRAM bytes can be modified without first erasing an entire sector, rendering it easier to use. FRAM provides virtually unlimited read/write cycles and fast data writes. The VRS51L3074 combines 8KB of FRAM memory, single-cycle 8051-core, 64KB Flash with In-System/In-Application Programming, and 4KB SRAM

Co-processors

Few 32-bit Microcontrollers are packing co-processors along with main processor core to handle additional timing functions, parallel control functions, or any such parallel computing jobs. These co-processors are very effective in case of high intensity computation, where multitasking is essential.

The latest MCUs with co-processors are,

Manufacturer Name	Parts Generic No	Co-processor
Freescale Semiconductor	S12XEP100	Xgate co-processor
Freescale Semiconductor	MC9S12XHZ512	Xgate co-processor
Infineon Tech	XC886 / XC888	Cordic co-processor
Atmel Corp	AT91SO100	Crypto -coprocessor
PHILIPS	LPC3180	Vector Floating Point (VFP) coprocessor
Renesas	RS-4	co-processors For DES and multiplication
ST Microelectronics Inc	ST19NR66	Modular Arithmetic Processor (MAP)

Communication Interface: USB

As the USB proliferated to every convergence device, the built-in USB is valuable feature for products addressing this market. USB2.0; the faster version is taken precedence over older version of USB.

The recently released devices with USB interface are,

Manufacturer Name	Parts Generic No	USB Version
Microchip Technology Inc	PIC18F87J50	2.00
Microchip Technology Inc	PIC18F4450/2450	2.00
Renesas	SH7205/7265	2.00
PHILIPS	LPC2300 / LPC2400	2.00
Renesas	SH7263 / SH7203	2.00
Atmel Corp	AT91SAM	2.00
Atmel Corp	AT91SO100	2.00
Renesas	H8SX	2.00
ST Microelectronics Inc	ST7GEM	2.00
Cypress Semiconductor Corp	FX2LP18	2.00
ST Microelectronics Inc	uPSD3454E	2.00
PHILIPS	LPC3180	2.00
Fujitsu Ltd	MB95F128	1.00
Infineon Tech	XC886 / XC888	1.00
Infineon Tech	TC1796	1.00
Texas Instruments Inc	TMS470R1B1M	1.00
SILICON STORAGE TECHNOLOGY	SST89V54RD-33-C-QIF	1.00
HOLTEK	HT48R062	1.00
HOLTEK	HT45R36	1.00
HOLTEK	HT46R51A/52A/53A/54A,	1.00
Toshiba Corp.	TMP19A64F20AXBG	1.00
NEC Electronics Corp.	PD78F0711/0712	1.00

IrDA:

Though IrDA is not a market trend, there are few applications, where IrDA is required. There are more than half dozen MCUs with IrDA interface. Here is the list.

Manufacturer Name	Parts Generic No
NEC Electronics Corp.	V850ES/SG3
Zilog Inc	FMC16100
Zilog Inc	ZNEO(TM) Z16F
Texas Instruments Inc	TMS470R1B1M
Atmel Corp	AT91SAM
Texas Instruments Inc	MSP430FG461X
Zilog Inc	F1680

LCD drivers

To save board space and additional time and cost, lot of MCU vendors are integrated LCD Drivers and controller as built-in feature in newly released products.
The LCD driver presently available is of low resolution and limited in features. How ever for some applications it's more than sufficient.

Below is the list of MCUs with LCD driver integrated.

Manufacturer Name	Parts Generic No	Bit size
Atmel Corp	AT91SAM	32
Atmel Corp	AT91SO100	32
PHILIPS	LPC2300 / LPC2400	16/32
Freescale Semiconductor	MC9S12XHZ512	16
Texas Instruments Inc	MSP430FG461x	16
Texas Instruments Inc	MSP430FG461X	16
Microchip Technology Inc	PIC18F85J90	8
Fujitsu Ltd	MB95F128	8
NEC Electronics Corp.	78K0/Lx3	8
Fujitsu Ltd	F2MC-8FX	8
HOLTEK	HT47R10A-1	8
HOLTEK	HT46RU66	8
HOLTEK	HT46R71D	8
ST Microelectronics Inc	ST7FLITEUS	8
HOLTEK	HT49R30A-1/ HT49R50A-1	8

List of new Microcontroller with detailed specifications

MCU Released in 2007 (full report will have detailed specs of each part)

Manufacturer Name	Parts Generic No	Bit size
Renesas	H8SX/1700	32
Atmel Corp	AT91SO100	32
Renesas	R32C/118	32
Atmel Corp	AT91SAM	32
Renesas	SH7205/7265	32
NEC Electronics Corp.	V850E/IG3/IF3/IX3	32
Renesas	H8SX/1668R	32
Infineon Tech	XC2700	16/32
Infineon Tech	XC2300	16/32
Infineon Tech	XC2200	16/32

Renesas	RS-4	16
Renesas	M16C/64	16
Infineon Tech	XE166	16
Renesas	R8C	16
Renesas	H8S/20223	16
Microchip Technology Inc	PIC24HJ12	16
s	AE41R	16
Microchip Technology Inc	PIC24FJ64GA002	16
Texas Instruments Inc	MSP430FG461X	16
ST Microelectronics Inc	ST21Y036/ ST21Y144	8/16
ST Microelectronics Inc	ST21F384	8/16
ST Microelectronics Inc	ST23YS02/ ST23YS08	8/16
SILICON STORAGE TECHNOLOGY	SST89V54RD-33-C-QIF	8
ST Microelectronics Inc	ST7LITE49M	8
Freescale Semiconductor	MC9S08QE128	8
ST Microelectronics Inc	ST7GEM	8
Microchip Technology Inc	PIC18F87J50	8
ST Microelectronics Inc	ST7FLITEU0	8
Microchip Technology Inc	PIC18F85J90	8
Fujitsu Ltd	MB95F128	8
Microchip Technology Inc	PIC18F87J11	8
Microchip Technology Inc	PIC16F88X	8
Infineon Tech	XC866	8
Infineon Tech	XC886 / XC888	8
NEC Electronics Corp.	78K0/Lx3	8
HOLTEK	HT82A850R/HT82A851R	8

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