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What is "Embedded - Microcontrollers"?

"Embedded - Microcontrollers" refer to small, integrated circuits designed to perform specific tasks within larger systems. These microcontrollers are essentially compact computers on a single chip, containing a processor core, memory, and programmable input/output peripherals. They are called "embedded" because they are embedded within electronic devices to control various functions, rather than serving as standalone computers. Microcontrollers are crucial in modern electronics, providing the intelligence and control needed for a wide range of applications.

Applications of "Embedded - Microcontrollers"

Details	
Product Status	Active
Core Processor	M32C/80
Core Size	16/32-Bit
Speed	32MHz
Connectivity	CANbus, I²C, IEBus, SIO, UART/USART
Peripherals	DMA, WDT
Number of I/O	85
Program Memory Size	384KB (384K x 8)
Program Memory Type	FLASH
EEPROM Size	4K x 8
RAM Size	24K x 8
Voltage - Supply (Vcc/Vdd)	3V ~ 5.5V
Data Converters	A/D 26x10b; D/A 2x8b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 85°C (TA)
Mounting Type	Surface Mount
Package / Case	100-BQFP
Supplier Device Package	100-QFP (14x20)
Purchase URL	https://www.e-xfl.com/product-detail/renesas-electronics-america/m30853fhfp-u3

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Rev.1.21
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1. Overview

The M32C/85 group (M32C/85, M32C/85T) microcomputer is a single-chip control unit that utilizes high-performance silicon gate CMOS technology with the M32C/80 series CPU core. The M32C/85 group (M32C/85, M32C/85T) is available in 144-pin and 100-pin plastic molded LQFP/QFP packages.

With a 16-Mbyte address space, this microcomputer combines advanced instruction manipulation capabilities to process complex instructions by less bytes and execute instructions at higher speed.

It includes a multiplier and DMAC adequate for office automation, communication devices and industrial equipments, and other high-speed processing applications.

1.1 Applications

Automobiles, audio, cameras, office equipment, communications equipment, portable equipment, etc.

1.2 Performance Overview

Tables 1.1 and 1.2 list performance overview of the M32C/85 group (M32C/85, M32C/85T).

Table 1.1 M32C/85 Group (M32C/85, M32C/85T) Performance (144-Pin Package)

Characteristic		Performance	
		M32C/85	M32C/85T
CPU	Basic Instructions	108 instructions	
	Minimum Instruction Execution Time	31.3 ns (f(BCLK)=32 MHz, V_{CC1}=4.2 V to 5.5 V) 41.7 ns (f(BCLK)=24 MHz, V_{CC1}=3.0 V to 5.5 V)	31.3 ns (f(BCLK)=32 MHz, V_{CC1}=4.2 V to 5.5 V)
	Operating Mode	Single-chip mode, Memory expansion mode and Microprocessor mode	Single-chip mode
	Address Space	16 Mbytes	
	Memory Capacity	See Table 1.3	
Peripheral Function	I/O Port	123 I/O pins and 1 input pin	
	Multifunction Timer	Timer A: 16 bits x 5 channels, Timer B: 16 bits x 6 channels Three-phase motor control circuit	
	Intelligent I/O	Time measurement function or Waveform generating function: 16 bits x 8 channels Communication function (Clock synchronous serial I/O, Clock asynchronous serial I/O, HDLC data processing)	
	Serial I/O	5 Channels Clock synchronous serial I/O, Clock asynchronous serial I/O, IEBus(1), I^2C bus(2)	
	CAN Module	2 channels Supporting CAN 2.0B specification	
	A/D Converter	10-bit A/D converter: 1 circuit, 34 channels	
	D/A Converter	8 bits x 2 channels	
	DMAC	4 channels	
	DMAC II	Can be activated by all peripheral function interrupt sources Immediate transfer, Calculation transfer and Chain transfer functions	
	CRC Calculation Circuit	CRC-CCITT	
	X/Y Converter	16 bits x 16 bits	
	Watchdog Timer	15 bits x 1 channel (with prescaler)	
	Interrupt	39 internal and 8 external sources, 5 software sources Interrupt priority level: 7	
	Clock Generation Circuit	4 circuits Main clock oscillation circuit(*), Sub clock oscillation circuit(*), On-chip oscillator, PLL frequency synthesizer (*)Equipped with a built-in feedback resistor. Ceramic resonator or crystal oscillator must be connected externally	
	Oscillation Stop Detect Function	Main clock oscillation stop detect function	
	Voltage Detection Circuit	Available (optional)	Not available(4)
Electrical Characteristics	Supply Voltage	V_{CC1}=4.2 V to 5.5 V, V_{CC2}=3.0 V to V_{CC1} (f(BCLK)=32 MHz) V_{CC1}=3.0 V to 5.5 V, V_{CC2}=3.0 V to V_{CC1} (f(BCLK)=24 MHz)	V_{CC1}=V_{CC2}=4.2 V to 5.5 V, (f(BCLK)=32 MHz)(3)
	Power Consumption	28 mA (V_{CC1}=V_{CC2}=5 V, f(BCLK)=32 MHz) 22 mA (V_{CC1}=V_{CC2}=3.3 V, f(BCLK)=24 MHz) 10µA (V_{CC1}=V_{CC2}=5 V, f(BCLK)=32 kHz, in wait mode)	28 mA (V_{CC1}=V_{CC2}=5 V, f(BCLK)=32 MHz) 10µA (V_{CC1}=V_{CC2}=5 V, f(BCLK)=32 kHz, in wait mode)
Flash Memory	Program/Erase Supply Voltage	3.3 V ± 0.3 V or 5.0 V ± 0.5 V	5.0 V ± 0.5 V
	Program and Erase Endurance	100 times (all space)	
Operating Ambient Temperature		–20 to 85°C –40 to 85°C (optional)	–40 to 85°C (T version)
Package		144-pin plastic molded LQFP	

NOTES:
1. IEBus is a trademark of NEC Electronics Corporation.
2. I^2C bus is a trademark of Koninklijke Philips Electronics N. V.
3. The supply voltage of M32C/85T (High-reliability version) must be V_{CC1}=V_{CC2}.
4. The cold start-up/warm start-up determine function is available only at the user's option.

All options are on a request basis.

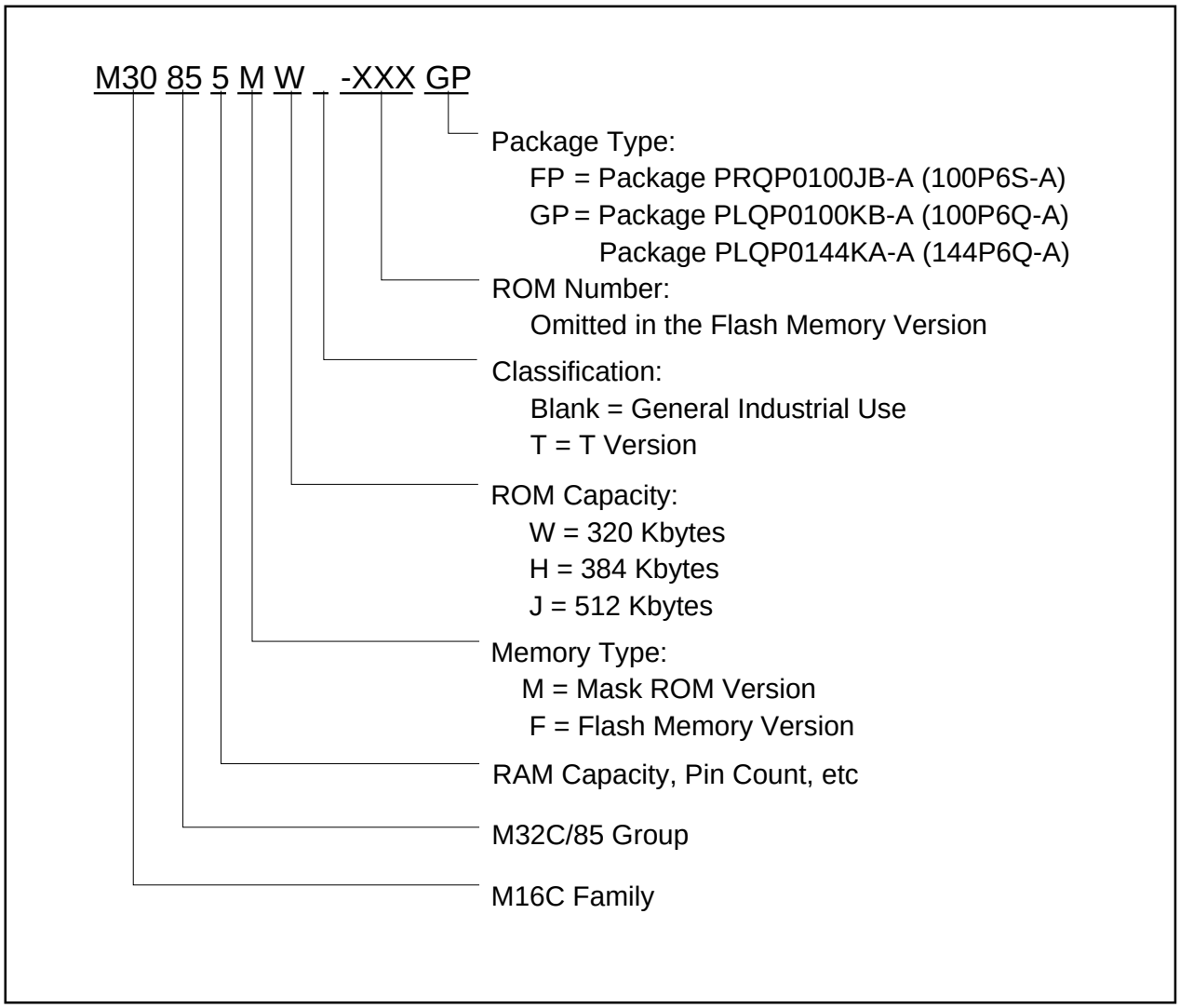
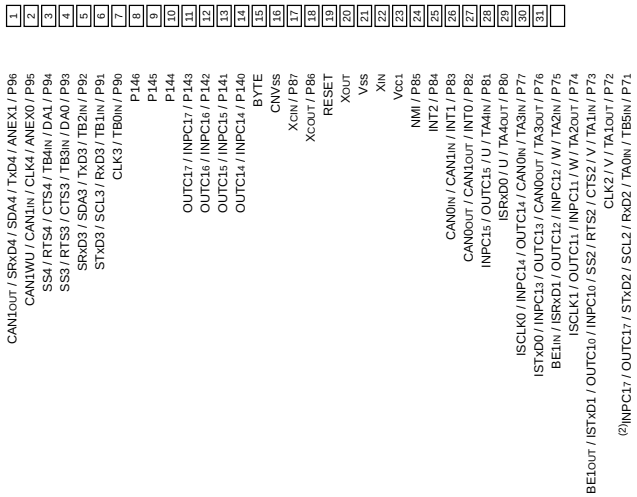


Figure 1.2 Product Numbering System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CAN1OUT / SRxD4 / SDA4 / TxD4 / ANEX1 / P96
CAN1WU / CAN1IN / CLK4 / ANEX0 / P95
SS4 / RTS4 / CTS4 / TB4IN / DA1 / P94
SS3 / RTS3 / CTS3 / TB3IN / DA0 / P93
SRxD3 / SDA3 / TxD3 / TB2IN / P92
STxD3 / SCL3 / RxD3 / TB1IN / P91
CLK3 / TB0IN / P90
P146
P145
P144
OUTC17 / INPC17 / P143
OUTC16 / INPC16 / P142
OUTC15 / INPC15 / P141
OUTC14 / INPC14 / P140
BYTE
CNVSS
XCIN / P87
XCOUT / P86
RESET
XOUT
VSS
XIN
VCC1
NMI / P85
INT2 / P84
CAN0IN / CAN1IN / INT1 / P83
CAN0OUT / CAN1OUT / INT0 / P82
INPC15 / OUTC15 / U / TA4IN / P81
ISRxD0 / U / TA4OUT / P80
ISCLK0 / INPC14 / OUTC14 / CAN0IN / TA3IN / P77
ISTxD0 / INPC13 / OUTC13 / CAN0OUT / TA3OUT / P76
BE1IN / ISRxD1 / OUTC12 / INPC12 / W / TA2IN / P75
ISCLK1 / OUTC11 / INPC11 / W / TA2OUT / P74
BE1OUT / ISTxD1 / OUTC10 / INPC10 / SS2 / RTS2 / CTS2 / V / TA1IN / P73
CLK2 / V / TA1OUT / P72
(2)INPC17 / OUTC17 / STxD2 / SCL2 / RxD2 / TA0IN / TB5IN / P71

REVISION HISTORY	M32C/85 Group (M32C/85, M32C/85T) Datasheet

Rev.	Date	Description	
		Page	Summary
			Electrical Characteristics
		50	• **Table 5.3 Electrical Characteristics** Maximum values for Power Supply Current modified
		52	• **Table 5.6 Flash Memory Version Electrical Characteristics** Note 1. 100-cycle Products (D3, D5, U3, U5) deleted; Note 4 modified
			• **Table 5.7 Flash Memory Version Program and Erase Voltage and Read Operation Voltage Characteristics (at Topr=0 to 60°C)** deleted
		63	• **Table 5.22 Electrical Characteristics** Maximum values for Power Supply Consumption modified and standard values when "Topr=85°C while clock is stopped" deleted
1.00	Jun.01, 2004	-	**M32C/85T (High-reliability version)** added
		All Pages	Words standardized: On-chip oscillator, A/D converter and D/A converter
			Overview
		1	• **1.1 Applications** Automobiles added
		2, 3	• **Table 1.1** and **Table 1.2 M32C/85 Group (M32C/85, M32C/85T) Performance** M32C/85T added; note 3 added
		4	• **Figure 1.1 M32C/85 Group (M32C/85, M32C/85T) Block Diagram** Note 3 added
		5	• **1.4 Product Information** Description modified
			• **Figure 1.2 ROM/RAM Capacity** figure modified
		5, 6	• **Table 1.3 M32C/85 Group** M32C/85T added
		6	• **Figure 1.3 Product Numbering System** M32C/85T added
		7	• **Figure 1.4 Pin Assignment for 144-Pin Package** Note 3 added
		12	• **Figure 1.6 Pin Assignment for 100-Pin Pacakage** Note 5 added
		8 to 10	• **Table 1.5 Pin Characteristics for 144-Pin Package** Note 1 added
		13, 14	• **Table 1.6 Pin Characteristics for 100-Pin Package** Note 1 added
		15 to 18	• **Table 1.7 Pin Description** Notes added
			Memory
		22	• **Figure 3.1 Memory Map** Tables of internal ROM/internal RAM modified; note 2 modified; notes 4 and 5 added
			SFR
		23	• Note 2 added
		24	• PWCR0 and PWCR1 registers deleted
			• "Values after RESET" of the masked ROM version added to the FMR0 register
			• Note 1 added
			Electrical Characteristics
		46	• **Table 5.2 Recommended Operating Conditions** $f_{(ripple)}$, $V_{p-p(ripple)}$, V_{CC}, SV_{CC} and note 1 deleted
		47	• **Table 5.3 Electrical Characteristics** R_{PULLUP} value for the masked ROM version added