

To all our customers

Regarding the change of names mentioned in the document, such as Mitsubishi Electric and Mitsubishi XX, to Renesas Technology Corp.

The semiconductor operations of Hitachi and Mitsubishi Electric were transferred to Renesas Technology Corporation on April 1st 2003. These operations include microcomputer, logic, analog and discrete devices, and memory chips other than DRAMs (flash memory, SRAMs etc.) Accordingly, although Mitsubishi Electric, Mitsubishi Electric Corporation, Mitsubishi Semiconductors, and other Mitsubishi brand names are mentioned in the document, these names have in fact all been changed to Renesas Technology Corp. Thank you for your understanding. Except for our corporate trademark, logo and corporate statement, no changes whatsoever have been made to the contents of the document, and these changes do not constitute any alteration to the contents of the document itself.

Note : Mitsubishi Electric will continue the business operations of high frequency & optical devices and power devices.

Renesas Technology Corp.
Customer Support Dept.
April 1, 2003

MITSUBISHI 16-BIT SINGLE-CHIP MICROCOMPUTER M16C FAMILY M32C/80 SERIES

M32C/80 GROUP

Draft Specification

Rev 0.10 : September 13, 2002

Rev 0.11 : September 19, 2002

Rev 0.12 : November 20, 2002

Specifications written in this manual are believed to be accurate, but are not guaranteed to be entirely free of error.
Specifications in this manual may be changed for functional or performance improvements. Please make sure your manual is the latest edition.

About M32C/80 Group

The M32C/80 group of single-chip microcomputers use the high-performance silicon gate CMOS process. They use the M32C/80 Series CPU core and are packaged in a 100-pin plastic molded QFP. This single-chip microcomputer operates using sophisticated instructions. With 16M bytes of address space, it is capable of executing instructions at high speed. Because of its high level of ROM efficiency, the size of external ROM can be reduced to about half. In addition, this microcomputer contains peripheral functions such as multiplier and DMAC which combined with fast instruction processing capability, makes it suitable for control of various OA, communication, and industrial equipment which requires high-speed arithmetic/logic operations.

Applications

Audio, cameras, office equipment, communications equipment, portable equipment, etc.

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Performance Outline

Table 1.1.1 shows a performance outline of M32C/80 group.

Table 1.1.1. Performance outline of M32C/80 group (100-pin version)

Item			Performance
CPU	Number of basic instructions		108 instructions
	Shortest instruction execution time		33 ns(f(XIN)=30MHz)
	Operation mode		Microprocessor mode
	Memory space		16 M bytes
	Memory capacity		See ROM/RAM expansion figure.
Peripheral function	I/O port		47 pins (8 bits separate bus P1, P6 to P10 except P85)
	Input port		1 pin (P85)
	Multifunction timer	Output	16 bits x 5 (TA0, TA1, TA2, TA3, TA4)
		Input	16 bits x 6 (TB0, TB1, TB2, TB3, TB4, TB5)
	Three phase motor control circuit		1 circuit
	HDLC data process		2 channels
	Serial I/O		5 channels (UART0 to UART4) IE Bus ^(Note 1) , I ² C Bus ^(Note 2)
	A-D converter		10 bits x 1 circuits, standard 8 input, max 26 input
	D-A converter		8 bits x 2 circuits
	DMAC		4 channels
	DMAC II		Start by all variable vector interrupt factors Immediate transfer, operation and chain transfer function
	CRC calculation circuit		CCITT-CRC
	X-Y converter		16 bits X 16 bits
	Watchdog timer		15 bits x 1 (with prescaler)
	Interrupt		41 internal and 8 external sources, 4 software sources, 7 interrupt priority levels
	Clock generating circuit		4 built-in clock generation circuits • Main clock • Subclock • PLL synthsizer • Ring oscillator clock
Electric characteristics	Supply voltage		3.0 to 5.5V (f(XIN)=30MHz without software wait)
	Power consumption		38mA (f(XIN)=30MHz without software wait,Vcc=5V)
	I/O characteristics	I/O withstand voltage	5V
		I/O current	5mA
Operating ambient temperature			−40 to 85°C, −20 to 85°C
Device configuration			CMOS high performance silicon gate
Package			100-pin plastic mold QFP

Note 1 :IE Bus is a trademark of NEC corporation.

Note 2 :I²C Bus is a registered trademark of Philips.

Group Expansion and Product type

Mitsubishi plans to release the following product options as the M32C/80 group:

- (1) ROM type : External ROM version and External ROM version with Boot loader
- (2) ROM/RAM variation : Figure 1.1.1
- (3) Package type
 - 100P6S-A : 0.65mm Pin Pitch Plastic molded QFP
 - 100P6Q-A : 0.5mm Pin Pitch Plastic molded QFP

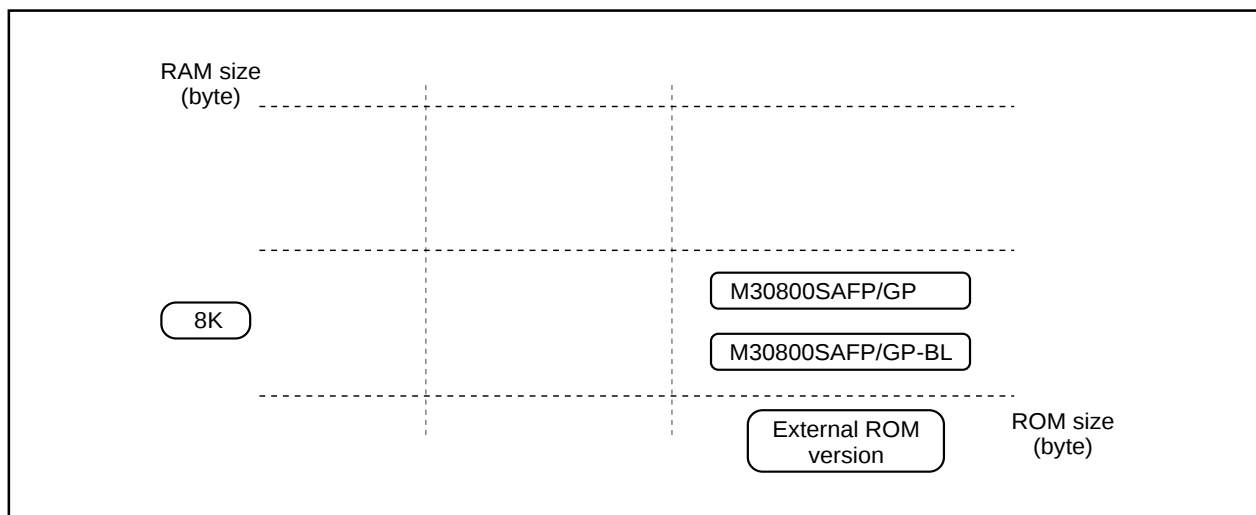


Figure 1.1.1. ROM expansion

The M32C/80 group products are listed in Table 1.1.2.

Table 1.1.2. M32C/80 group

As of September 2002

Type No	ROM capacity	RAM capacity	Package type	Remarks
M30800SAFP **	-	8K	100P6S-A	External ROM version
M30800SAGP **			100P6Q-A	
M30800SAFP-BL ***			100P6S-A	External ROM version with Boot Loader
M30800SAGP-BL ***			100P6Q-A	

** :Under development

*** :Under planning

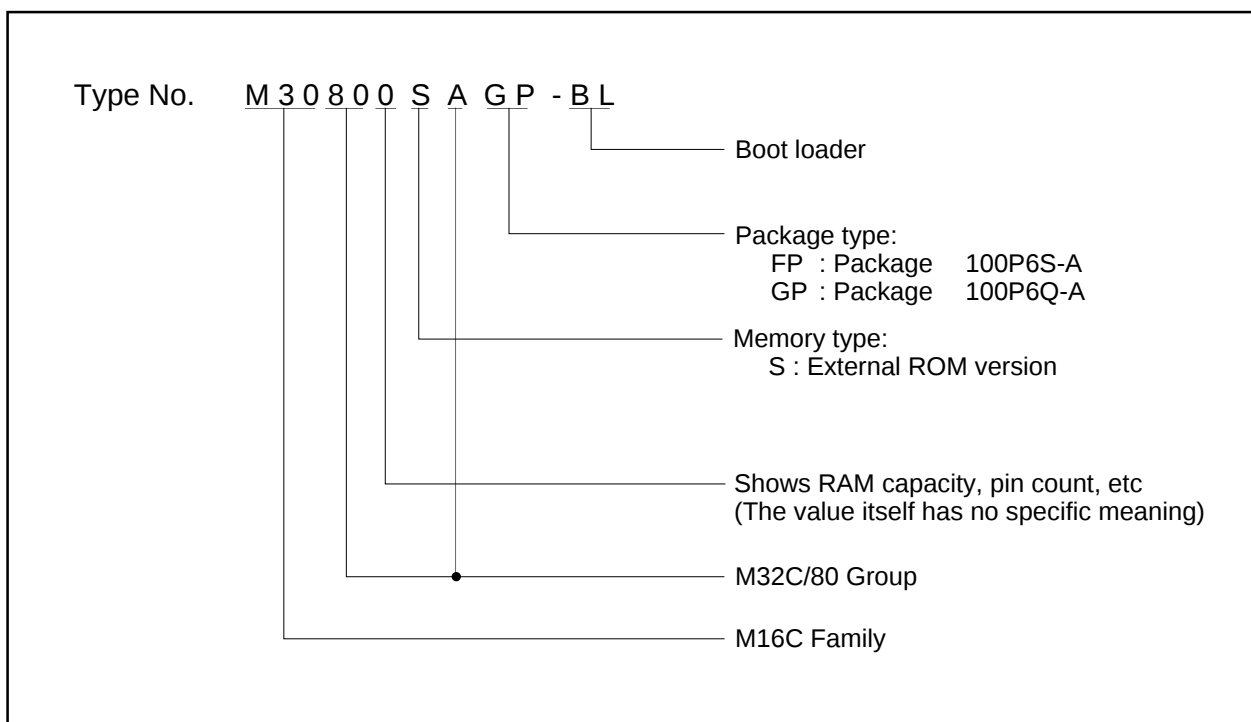
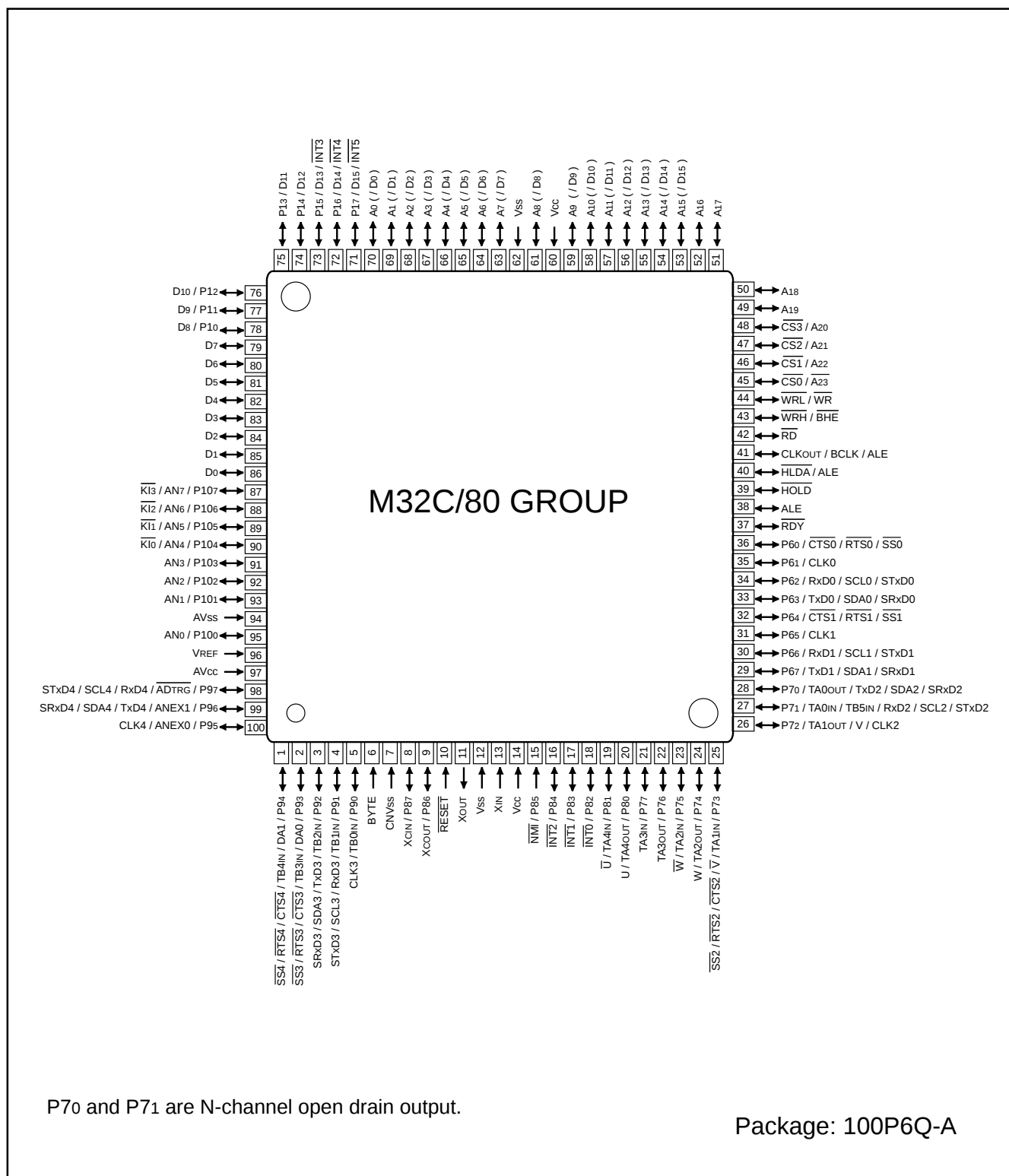


Figure 1.1.2. Part numbering configuration :series/group, ROM/RAM, package, etc.

Pin Configuration and Pin Description

Figure 1.1.3 to 1.1.4 show the pin configurations (top view), table 1.1.3 list pin names.



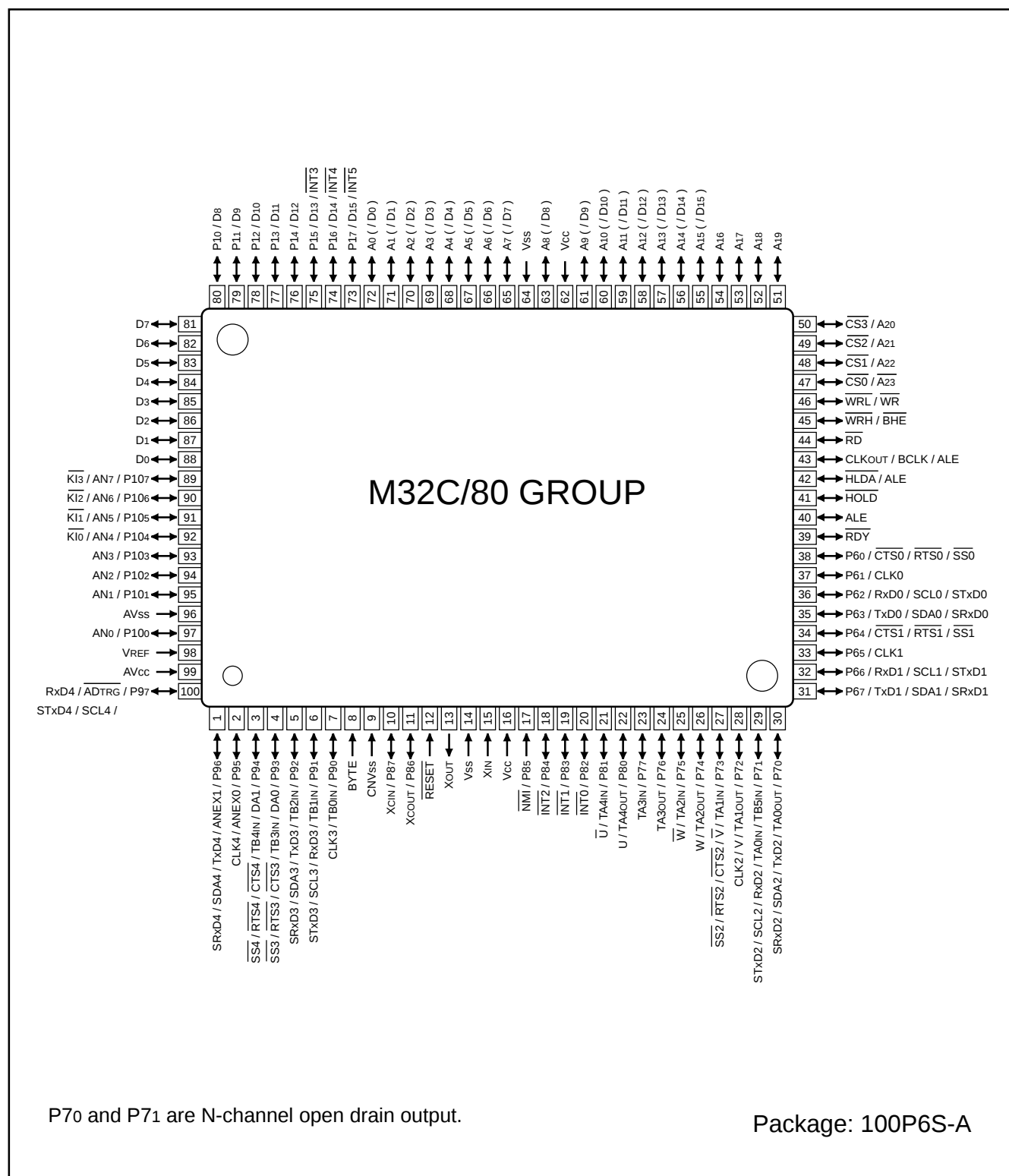


Figure 1.1.4. 100-pin version pin configuration (top view)

Table 1.1.3. 100-pin version pin description (1/2)

Package Pin No		Control	Port	Interrupt	Timer	UART	Analog	Bus control
FP	GP							
1	99		P96			TxD4/SDA4/SRx4D4	ANEX1	
2	100		P95			CLK4	ANEX0	
3	1		P94		TB4IN	CTS4/RTS4/SS4	DA1	
4	2		P93		TB3IN	CTS3/RTS3/SS3	DA0	
5	3		P92		TB2IN	TxD3/SDA3/SRx4D3		
6	4		P91		TB1IN	RxD3/SCL3/STxD3		
7	5		P90		TB0IN	CLK3		
8	6	BYTE						
9	7	CNVSS						
10	8	XCIN/VCONT	P87					
11	9	XCOUT	P86					
12	10	RESET						
13	11	XOUT						
14	12	VSS						
15	13	XIN						
16	14	VCC						
17	15		P85	NMI				
18	16		P84	INT2				
19	17		P83	INT1				
20	18		P82	INT0				
21	19		P81		TA4IN/ $\bar{U}$			
22	20		P80		TA4OUT/U			
23	21		P77		TA3IN			
24	22		P76		TA3OUT			
25	23		P75		TA2IN/ $\bar{W}$			
26	24		P74		TA2OUT/W			
27	25		P73		TA1IN/ $\bar{V}$	CTS2/RTS2/SS2		
28	26		P72		TA1OUT/V	CLK2		
29	27		P71		TB5IN/TA0IN	RxD2/SCL2/STxD2		
30	28		P70		TA0OUT	TxD2/SDA2/SRx4D2		
31	29		P67			TxD1/SDA1/SRx4D1		
32	30		P66			RxD1/SCL1/STxD1		
33	31		P65			CLK1		
34	32		P64			CTS1/RTS1/SS1		
35	33		P63			TxD0/SDA0/SRx4D0		
36	34		P62			RxD0/SCL0/STxD0		
37	35		P61			CLK0		
38	36		P60			CTS0/RTS0/SS0		
39	37							$\bar{RDY}$
40	38							ALE
41	39							HOLD
42	40							HLD $\bar{A}$ /ALE
43	41							CLKout/BCLK/ALE
44	42							$\bar{RD}$
45	43							WRH/BHE
46	44							WRL/WR
47	45							CS0/A23
48	46							CS1/A22
49	47							CS2/A21
50	48							CS3/A20

P70 and P71 are N-channel open drain output.

Table 1.1.3. 100-pin version pin description (2/2)

Package pin No		Control	Port	Interrupt	Timer	UART	Analog	Bus control
FP	GP							
51	49							A19
52	50							A18
53	51							A17
54	52							A16
55	53							A15(/D15)
56	54							A14(/D14)
57	55							A13(/D13)
58	56							A12(/D12)
59	57							A11(/D11)
60	58							A10(/D10)
61	59							A9(/D9)
62	60	V _{CC}						
63	61							A8(/D8)
64	62	V _{SS}						
65	63							A7(/D7)
66	64							A6(/D6)
67	65							A5(/D5)
68	66							A4(/D4)
69	67							A3(/D3)
70	68							A2(/D2)
71	69							A1(/D1)
72	70							A0(/D0)
73	71		P17	$\overline{\text{INT5}}$				D15
74	72		P16	$\overline{\text{INT4}}$				D14
75	73		P15	$\overline{\text{INT3}}$				D13
76	74		P14					D12
77	75		P13					D11
78	76		P12					D10
79	77		P11					D9
80	78		P10					D8
81	79							D7
82	80							D6
83	81							D5
84	82							D4
85	83							D3
86	84							D2
87	85							D1
88	86							D0
89	87		P107	$\overline{\text{KI3}}$			AN7	
90	88		P106	$\overline{\text{KI2}}$			AN6	
91	89		P105	$\overline{\text{KI1}}$			AN5	
92	90		P104	$\overline{\text{KI0}}$			AN4	
93	91		P103				AN3	
94	92		P102				AN2	
95	93		P101				AN1	
96	94	AV _{SS}						
97	95		P100				AN0	
98	96	V _{REF}						
99	97	AV _{CC}						
100	98		P97			RxD4/SCL4/STxD4	$\overline{\text{ADTRG}}$	

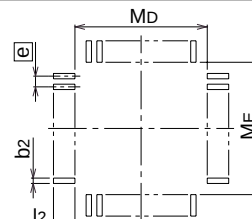
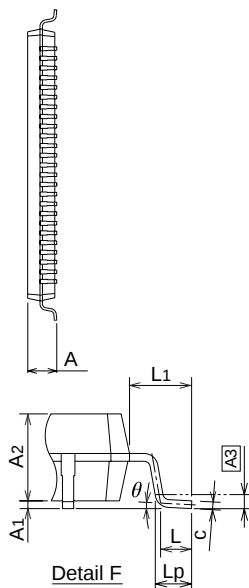
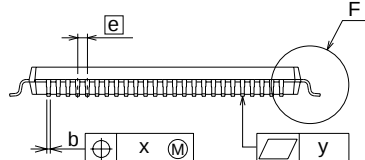
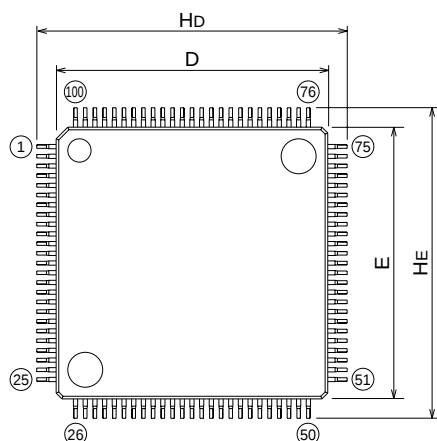
Outline Figure

100P6Q-A

(MMP)

Plastic 100pin 14X14mm body LQFP

EIAJ Package Code	JEDEC Code	Weight(g)	Lead Material
LQFP100-P-1414-0.50	—	0.63	Cu Alloy



Recommended Mount Pad

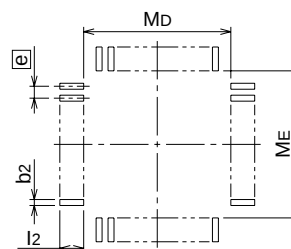
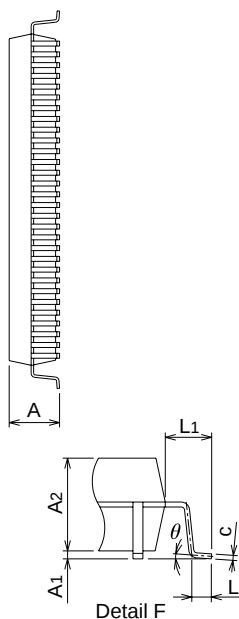
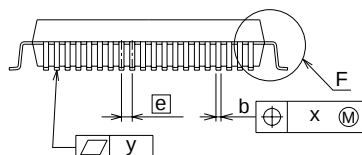
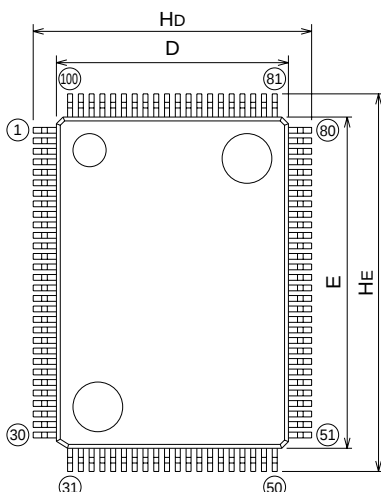
Symbol	Dimension in Millimeters		
	Min	Nom	Max
A	—	—	1.7
A1	0	0.1	0.2
A2	—	1.4	—
b	0.13	0.18	0.28
c	0.105	0.125	0.175
D	13.9	14.0	14.1
E	13.9	14.0	14.1
e	—	0.5	—
Hd	15.8	16.0	16.2
HE	15.8	16.0	16.2
L	0.3	0.5	0.7
L1	—	1.0	—
Lp	0.45	0.6	0.75
A3	—	0.25	—
x	—	—	0.08
y	—	—	0.1
θ	0°	—	10°
b2	—	0.225	—
l2	0.9	—	—
Md	—	14.4	—
ME	—	14.4	—

100P6S-A

(MMP)

Plastic 100pin 14X20mm body QFP

EIAJ Package Code	JEDEC Code	Weight(g)	Lead Material
QFP100-P-1420-0.65	—	1.58	Alloy 42



Recommended Mount Pad

Symbol	Dimension in Millimeters		
	Min	Nom	Max
A	—	—	3.05
A1	0	0.1	0.2
A2	—	2.8	—
b	0.25	0.3	0.4
c	0.13	0.15	0.2
D	13.8	14.0	14.2
E	19.8	20.0	20.2
e	—	0.65	—
Hd	16.5	16.8	17.1
HE	22.5	22.8	23.1
L	0.4	0.6	0.8
L1	—	1.4	—
x	—	—	0.13
y	—	—	0.1
θ	0°	—	10°
b2	—	0.35	—
l2	1.3	—	—
Md	—	14.6	—
ME	—	20.6	—

Revision History

Rev.0.10 -- September 13, 2002

Rev.0.11 -- September 19, 2002

Rev.0.12 -- November 20, 2002

New document

•Page 3 Table 1.1.1 "CAN" deleted.

•Page 2 "About M32C/80 Group" changed.

•Page 3 Table 1.1.1

"4.2 to 5.5V" --> "3.0 to 5.5V"

"3.0 to 3.6V (f(XIN)=20MHz without software wait)." deleted.

"26mA (f(XIN)=20MHz without software wait,Vcc=3.3V)" deleted.