

Notification about the transfer of the semiconductor business

The semiconductor business of Panasonic Corporation was transferred on September 1, 2020 to Nuvoton Technology Corporation (hereinafter referred to as "Nuvoton"). Accordingly, Panasonic Semiconductor Solutions Co., Ltd. became under the umbrella of the Nuvoton Group, with the new name of Nuvoton Technology Corporation Japan (hereinafter referred to as "NTCJ").

In accordance with this transfer, semiconductor products will be handled as NTCJ-made products after September 1, 2020. However, such products will be continuously sold through Panasonic Corporation.

Publisher of this Document is NTCJ.

If you would find description "Panasonic" or "Panasonic semiconductor solutions", please replace it with NTCJ.

※ Except below description page

"Request for your special attention and precautions in using the technical information and semiconductors described in this book"

Nuvoton Technology Corporation Japan



1.1 Overview

The MN1M7 function is a 32-bit micro controller with internal Flash memory. It is intended for development of the C programming language with object-oriented program and is easy to use. It has fast feedback processing required for control of power supply and motor.

This LSI adopts the Arm Cortex-M7 to the 32-bit micro controller part and are equipped with internal memory(Flash and RAM) to instruction / data, DMA controller, clock generator, bus controller, interrupt controller, standard peripheral circuits (timer and serial interface and so on), PWM control circuit specialized for power supply and motor control, and high accuracy / high speed analog circuit.

As system safety design, this LSI has the various safety mechanisms (Memory-ECC, clock error detection, power supply voltage detection, window watchdog timer, etc.).

1.2 Product Summary

The LSI shown in Table [Table 1.2-1](#) is described in this manual.

Table 1.2-1 Product Summary

LSI series	LSI product number	Pins	ROM [KB]		RAM [KB]		VGA	Package
			Instruc- tion	Date	Instruc- tion	Date		
MN1M7BF0 series	MN1M7BF00N	144	512	64	64	64	O	144 pins HQFP 20 mm x 20 mm
	MN1M7BF00M		384			48		
	MN1M7BF00K		256			32		
	MN1M7BF01N	128	512			64		128 pins HQFP 18 mm x 18 mm
	MN1M7BF01M		384			48		
	MN1M7BF01K		256			32		
	MN1M7BF02N	100	512			64		100pins HQFP 14 mm x 14 mm
	MN1M7BF02M		384			48		
	MN1M7BF02K		256			32		
	MN1M7BF03N	80	512			64		80 pins HQFP 14 mm x 14 mm
	MN1M7BF03M		384			48		
	MN1M7BF03K		256			32		
MN1M7BF1 series	MN1M7BF10N	144	512	64	64	64	-	144 pins HQFP 20 mm x 20 mm
	MN1M7BF10M		384			48		
	MN1M7BF10K		256			32		
	MN1M7BF11N	128	512			64		128 pins HQFP 18 mm x 18 mm
	MN1M7BF11M		384			48		
	MN1M7BF11K		256			32		
	MN1M7BF12N	100	512			64		100 pins HQFP 14 mm x 14 mm
	MN1M7BF12M		384			48		
	MN1M7BF12K		256			32		
	MN1M7BF13N	80	512			64		80 pins HQFP 14 mm x 14 mm
	MN1M7BF13M		384			48		
	MN1M7BF13K		256			32		



Hint:

In this manual, the product names are classified as follows.

MN1M7BF_{xyz} (x = 0, 1 y = 0, 1, 2, 3 z = N, M, K)



1.2.1 Function Summary

Table 1.2-2 shows the functions of each product.

Table 1.2-2 The List of Function

Function		MN1M7BFx0z	MN1M7BFx1z	MN1M7BFx2z	MN1M7BFx3z
Pins		144 pins	128 pins	100 pins	80 pins
CPU		Arm Cortex-M7			
General purpose pin		123	110	82	62
Operation mode	Active mode	NORMAL			
	Standby mode	SLEEP, DEEPSLEEP			
Debugger I/F	Interface	SWD			
DMA	Module/CH number	2 / 16			
Interrupt	External interrupt	20		18	15
Timer	16-bit timer (timer 0 to 13)	14			
	16-bit timer (timer 20 to 25)	6			5
	Power control PWM (GPWM 0 to B)	12		10	8
Noise filter	Target pin	External interrupt, Timer input			
Communication I/F	Clock synchronous/IIC (serial 0)	1			
	Clock synchronous/ UART/LIN (serial 1)	1			
	Clock synchronous/ UART (serial 2, 5, 6)	3		2	
	Clock synchronous/SPI/ UART (serial 3, 4)	2			1
	Clock synchronous/SPI/ UART/IIC (serial 7)	1			
	SM Bus	1		-	
12-bit A/D	AD0 CH number	16	14	12	11
	AD1 CH number	16	16	11	9
	AD2 CH number	16	16	13	9
	Total CH number	32	30	23	18
Programmable gain amplifier(VGA)	Module number/CH number	5 / 5 (*1)			
Comparator	Module number/CH number	10 / 5			
8-bit D/A	Module number	10 (for generating comparator reference voltage) 5 (for generating VGA reference voltage) (*1)			



Function		MN1M7BFx0z	MN1M7BFx1z	MN1M7BFx2z	MN1M7BFx3z
10-bit D/A	Module number/CH number	2 / 2			1 / 1
Safety function	Flash memory	ECC, Data protection			
	RAM	ECC			
	Access area	MPU (Area management, Protection), Register protect (Protection)			
	System	Window watchdog timer			
	Clock	Clock monitoring (External oscillation, PLL error detection)			
	Communication	CRC calculation function			
	A/D converter	A/D converter error detection			
	Power supply voltage	POR, Power supply voltage detection			
	Reset	Detection of reset factor immediately before by reset factor register			

Note:

*1 Only MN1M7BF0 series is included.



1.3 Features

The features of this LSI are described.

Functions	Features
CPU	<ul style="list-style-type: none"> - Arm Cortex-M7 Equipped with FPU: Double precision floating point unit, IEEE754 compliant Equipped with MPU: Memory protect unit, 16 area can be set - Cache Instruction: 4 KB, Data: 4 KB
Memory	<ul style="list-style-type: none"> - ROM access I-FLASH area: 160 MHz 2 wait access D-FLASH area: 160 MHz 8 wait access - RAM access ITCM/DTCM area: 160 MHz No-wait access
Clock	<ul style="list-style-type: none"> - Base clock(BASECLK) External oscillation (4 to 20 MHz), Internal oscillation(10 MHz) Multiplication by PLL circuit - CPU clock(CPUCLK) 1 to 8 dividing of base clock - Peripheral clock(IOCLK) 2 to 16 dividing of CPU clock Clock operation/stop can be selected for each peripheral module
Reset	<ul style="list-style-type: none"> - Hardware reset Power-on reset - System reset Reset by external pin(NRST) Reset by register setting Reset by error detection(WDT overflow, Clock error detection) - CPU generation reset Reset by writing to AIRCR, Reset by CPU Lockup - Reset factor can be monitored
Low power consumption	<ul style="list-style-type: none"> - SLEEP mode: Stop CPU clock only - DEEP SLEEP mode: Stop clocks including BASECLK
Interrupt	<ul style="list-style-type: none"> - Interrupt level: 16 levels - External interrupt: High/Low level, Rising/Falling/Both edge
DMA	<ul style="list-style-type: none"> - Transfer mode: Single word transfer mode, Burst transfer mode - Transfer unit: 8 bits/16 bits/32 bits - Maximum transfer count: 65535 words - Transfer factor: External interrupt, Peripheral module factor - Register reload count: Maximum 65535 times - Interrupt: DMA completion, reload count completion, bus error, transfer request overflow, invalid DMA transfer request
Noise filter	<ul style="list-style-type: none"> - External interrupt, sampling type noise filter is inserted to timer input - Select sampling clock



Functions	Features
16-bit timer (timer 0 to timer 13)	<ul style="list-style-type: none"> - Interval timer count, Event count, Up-down pulse count, Phase difference pulse count - Timer Output, PWM/complement Output(wave mode: saw-tooth waves), 1-shot Output - Input capture by external input - Timer count start by start trigger - A/D conversion start trigger Output(only for timer 0 to 2) - 32-bit cascade connection - Output protection: High/Low/Hi-z Output can be selected - Timer interrupt Output control
16-bit timer (timer 20 to timer 25)	<ul style="list-style-type: none"> - Interval timer count, Event count, Up-down pulse count, Phase difference pulse count - Timer Output, PWM/Complementary PWM Output (Wave mode: saw-tooth waves), 1-shot Output - Input capture by external input - Timer count start by start trigger - A/D conversion start trigger Output - 32-bit cascade connection - Output protection: H/L/Hi-z Output can be selected, reading edge blanking can be set - Timer interrupt Output control - Task overflow detection function - PWM Output: Dead time insert, Output shift, Duty cut, Period cut
Power control PWM (GPWM0 to GPWMB)	<ul style="list-style-type: none"> - Complementary PWM Output (Wave mode: Triangular and saw-tooth waves) - Dead time insert, Output shift, H/L level Output can be set - Synchronous A/D conversion trigger - Interrupt Output control - Output protection: H/L/Hi-z Output can be select - Duty cut, period cut - Double buffer update
Synchronous SIF/SPI	<ul style="list-style-type: none"> - 2-wire/3-wire(4-wire can be selected only at serial 3, 4, 7) - Transfer bits(2 bits to 8 bits) - MSB/LSB transfer - Clock polarity selection - Continuous communication - Output level after the final bit transmission(H/L/final data) - Maximum transfer rate: 5.0 Mbps, 10 Mbps(only for serial 7 master)
UART	<ul style="list-style-type: none"> - 1-wire/2-wire - Character bits(7-bit/8-bit) - Stop bits(1-bit/2-bit) - Parity bit: Enabled/Disabled, Parity bit type: 0/1/Even parity/Odd parity - MSB/LSB transfer - Maximum transfer rate: 2.5 Mbps, 3.3 Mbps(only for serial 7) - Output communication data which corresponding AMI driver IC(only for serial 5)
IIC	<ul style="list-style-type: none"> - Master/Slave communication - Start condition selection: Enable/Disable - MSB/LSB transfer selection - Transfer format: 7-bit address format, 10-bit address format(only for serial 7) - Maximum transfer rate: Standard Mode: 100 kbps, Fast Mode: 400 kbps, Fast Mode Plus: 1 Mbps(only for serial 7)
SMBus interface	<ul style="list-style-type: none"> - Conform to System Management Bus v2.0 - Timeout detection, Packet error detection - Return from CPU standby mode by detecting start condition - Maximum transfer rate: 100 kHz



Functions	Features
LIN controller	<ul style="list-style-type: none"> - Master/Slave communication - Wake Up signal transmission/reception - Synch Break field transmission/reception - Synch field transmission/reception - ID field transmission/reception - Error detection: Check sum error, Bit error, Timeout
12-bit A/D	<ul style="list-style-type: none"> - Timer 20 to 25, GPWM0 to B etc can be started synchronously - Conversion error detection - Conversion state Output - Start trigger reduction function
VGA	<ul style="list-style-type: none"> - Gain selection(1, 2, 3, 4, 5, 6, 8, 10, 20 times) - Set Output offset voltage by 8-bit DAC - Offset cancellation by input Short-circuit
Comparator	<ul style="list-style-type: none"> - Hysteresis ON/OFF - Set reference voltage by 8-bit DAC - Sampling type noise filter is inserted to comparator Output
8-bit D/A	<ul style="list-style-type: none"> - VGA Output offset voltage can be generated - Comparator reference voltage can be generated
10-bit D/A	<ul style="list-style-type: none"> - Output the set DC voltage
Multi feedback assist	<ul style="list-style-type: none"> - Set the start timing of timer 20 to 25, GPWM 0 to B individually - Detect/Automatically avoid the competition of timer 20 to 25, GPWM 0 to B and AD conversion start - Mask(Blanking) the external interrupt detection, comparator of GPWM0 to B Output
CRC calculation	<ul style="list-style-type: none"> - CRC-32, CRC-16-CCITT, CRC-16, CRC-8-ATM symbol can be generated
Safety function	<ul style="list-style-type: none"> - ECC function Check area: Cache, I-FLASH, D-FLASH, ITCM, DTCM, Message RAM for CAN 1 bit correction, 2 bit random error detection - Flash Erase/Program protect function - Function to protect write access to main register - Clock monitor function - Window watchdog timer(internal oscillation count) - Power supply voltage detection - ADC fault diagnosis function which is used for internal power supply



1.4 Pins

The specifications of pins in this LSI are described as follows.

- Pin configuration
- Pin function

1.4.1 Pin Configuration

Figure 1.4-1 shows the pin configuration of MN1M7BFx0z(144 pins).

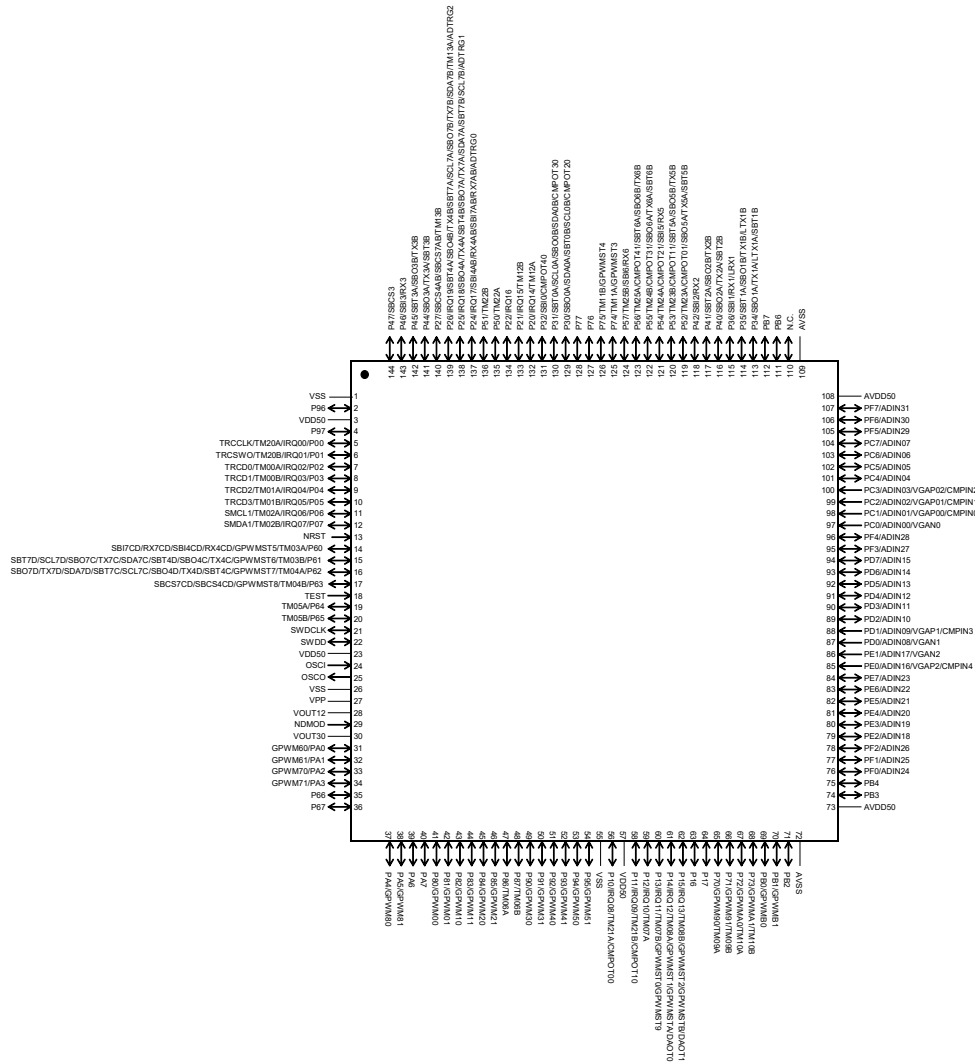


Figure 1.4-1 Pin Configuration of MN1M7BFx0z(144 pins)



Figure 1.4-3 shows the pin configuration of MN1M7BFx2z(100 pins).

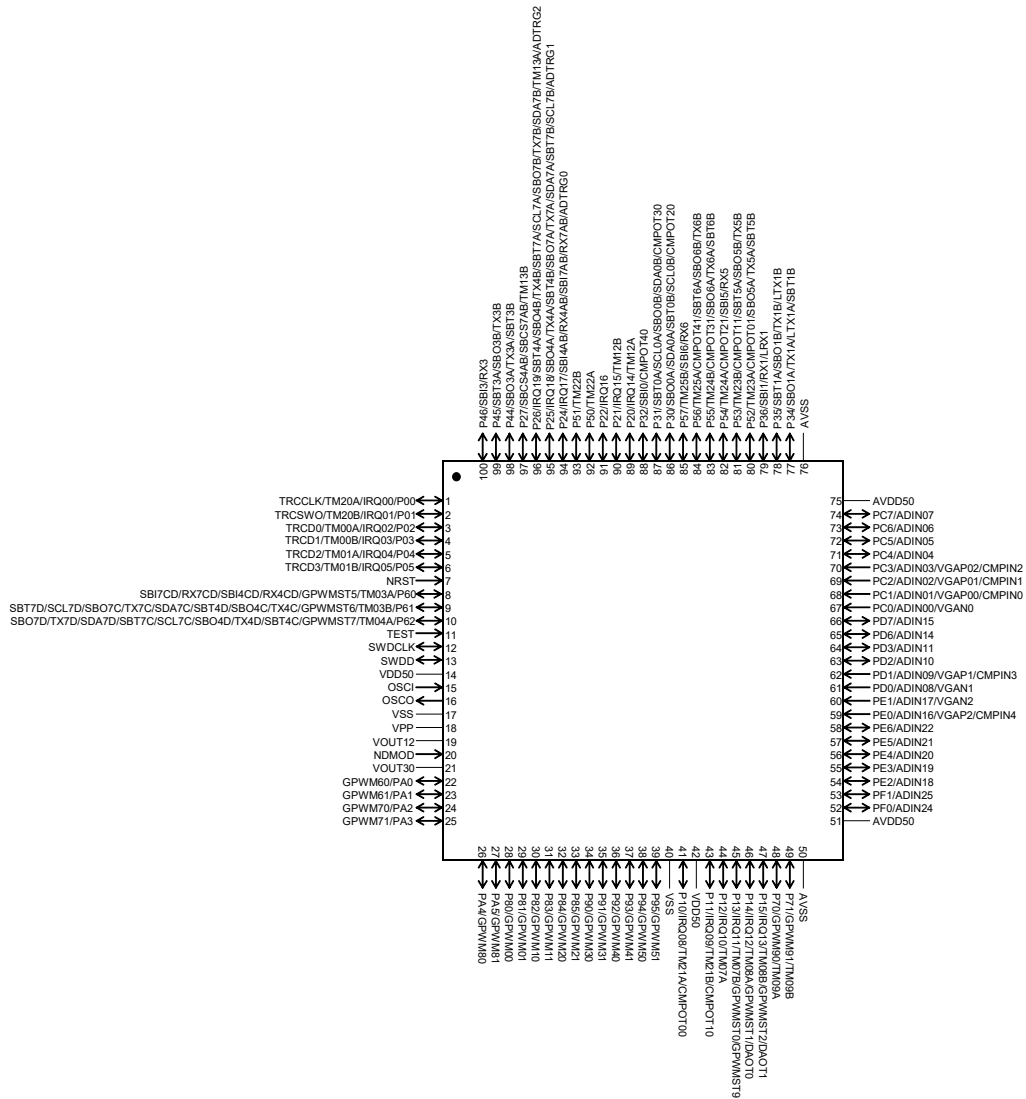


Figure 1.4-3 Pin Configuration Figure of MN1M7BFx2z(100 pins)



Figure 1.4-4 shows the pin configuration of MN1M7BFx3z(80 pins).

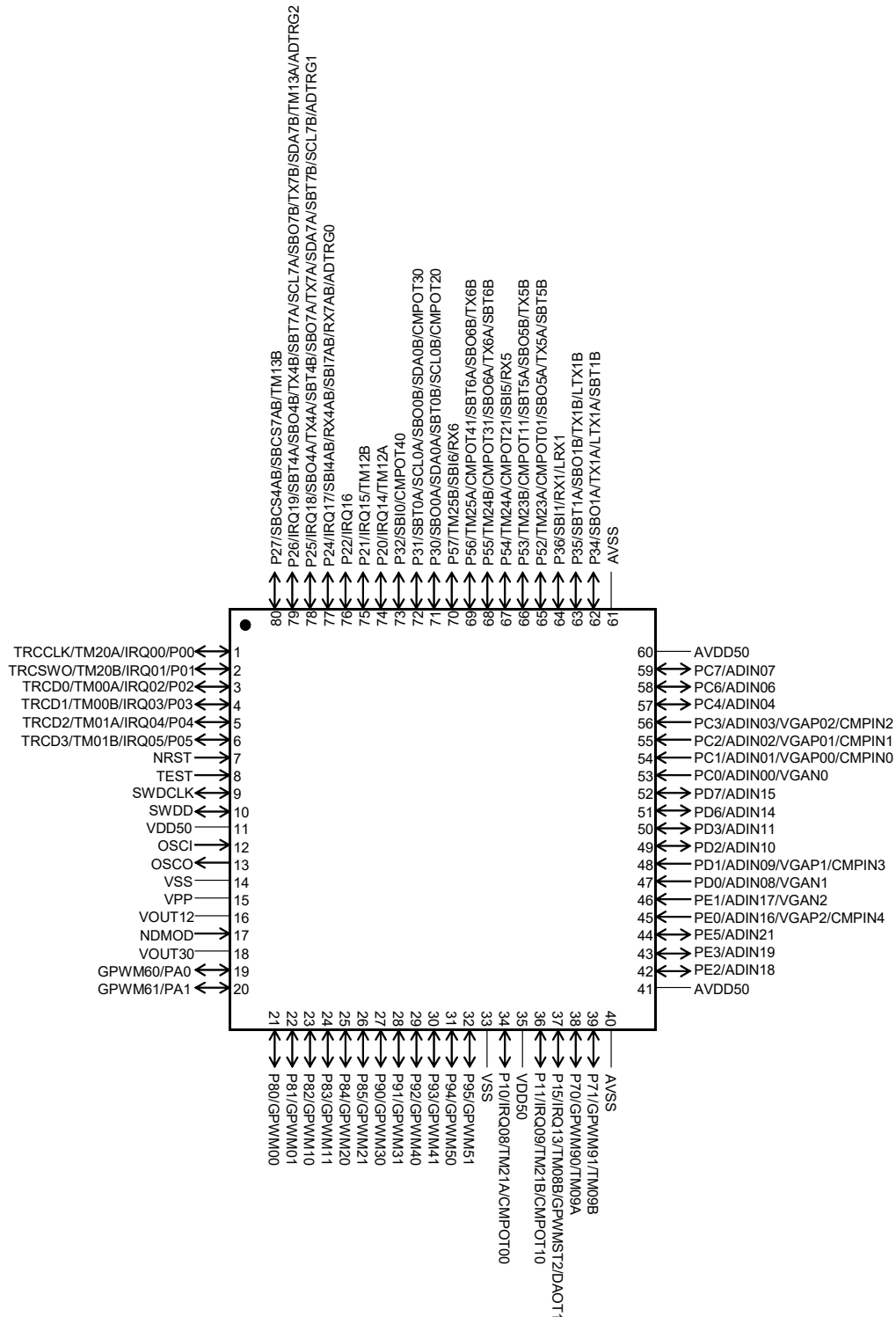


Figure 1.4-4 Pin Configuration Figure of MN1M7BFx3z(80 pins)



1.4.2 Pin Functions

The pin functions are listed in Table 1.4-1 .

Table 1.4-1 Pin Functions

Functions	Pin name	MN1M7BFx0z (144 pins) Pin No.	MN1M7BFx1z (128 pins) Pin No.	MN1M7BFx2z (100 pins) Pin No.	MN1M7BFx3z (80 pins) Pin No.	I/O	Other Pins
External power pin	VDD50	3 23 57	21 51	14 42	11 35	Input	-
Power pin for analog	AVDD50	73 108	65 96	51 75	41 60	Input	-
Power pin for internal circuit	VOUT30	30	28	21	18	Output	-
	VOUT12	28	26	19	16	Output	-
GND	VSS	1 26 55	24 49	17 40	14 33	Input	-
GND for analog	AVSS	72 109	64 97	50 76	40 61	Input	-
Debugger	NDMOD	29	27	20	17	Input	-
	SWDCLK	21	19	12	9	Input	-
	SWDD	22	20	13	10	I/O	-
	TRCCLK	5	3	1	1	Output	P00/IRQ00/TM20A
	TRCSWO	6	4	2	2	Output	P01/IRQ01/TM20B
	TRCD0	7	5	3	3	Output	P02/IRQ02/TM00A
	TRCD1	8	6	4	4	Output	P03/IRQ03/TM00B
	TRCD2	9	7	5	5	Output	P04/IRQ04/TM01A
	TRCD3	10	8	6	6	Output	P05/IRQ05/TM01B
External oscillation Input pin	OSCI	24	22	15	12	Input	-
External oscillation Output pin	OSCO	25	23	16	13	Output	-
Reset	NRST	13	11	7	7	Input	-
Mode pin	TEST	18	16	11	8	Input	-
Input pin for flash memory	VPP	27	25	18	15	Input	-
External interrupt	IRQ00	5	3	1	1	Input	P00/TM20A/TRCCLK
	IRQ01	6	4	2	2	Input	P01/TM20B/TRCSWO
	IRQ02	7	5	3	3	Input	P02/TM00A/TRCD0
	IRQ03	8	6	4	4	Input	P03/TM00B/TRCD1
	IRQ04	9	7	5	5	Input	P04/TM01A/TRCD2
	IRQ05	10	8	6	6	Input	P05/TM01B/TRCD3
	IRQ06	11	9	-	-	Input	P06/TM02A/SMCL1
	IRQ07	12	10	-	-	Input	P07/TM02B/SMDA1
	IRQ08	56	50	41	34	Input	P10/TM21A/COMPOT00
	IRQ09	58	52	43	36	Input	P11/TM21B/COMPOT10
	IRQ10	59	53	44	-	Input	P12/TM07A
IRQ11	60	54	45	-	Input	P13/TM07B/GPWMST0/GPWMST9	



Functions	Pin name	MN1M7BFx0z (144 pins) Pin No.	MN1M7BFx1z (128 pins) Pin No.	MN1M7BFx2z (100 pins) Pin No.	MN1M7BFx3z (80 pins) Pin No.	I/O	Other Pins
External interrupt	IRQ12	61	55	46	-	Input	P14/TM08A/GPWMST1/GPWMSTA/DAOT0
	IRQ13	62	56	47	37	Input	P15/TM08B/GPWMST2/GPWMSTB/DAOT1
	IRQ14	132	116	89	74	Input	P20/TM12A
	IRQ15	133	117	90	75	Input	P21/TM12B
	IRQ16	134	118	91	76	Input	P22
	IRQ17	137	121	94	77	Input	P24/SB14AB/RX4AB/SB17AB/RX7AB/ADTRG0
	IRQ18	138	122	95	78	Input	P25/SBO4A/TX4A/SBT4B/SBO7A/TX7A/SDA7A/SBT7B/SCL7B/ADTRG1
IRQ19	139	123	96	79	Input	P26/SBT4A/SBO4B/TX4B/SBT7A/SCL7A/SBO7B/TX7B/SDA7B/TM13A/ADTRG2	
16-bit timer	TM00A	7	5	3	3	I/O	P02/IRQ02/TRCD0
	TM00B	8	6	4	4	I/O	P03/IRQ03/TRCD1
	TM01A	9	7	5	5	I/O	P04/IRQ04/TRCD2
	TM01B	10	8	6	6	I/O	P05/IRQ05/TRCD3
	TM02A	11	9	-	-	I/O	P06/IRQ06/SMCL1
	TM02B	12	10	-	-	I/O	P07/IRQ07/SMDA1
	TM03A	14	12	8	-	I/O	P60/GPWMST5/RX4CD/SB14CD/RX7CD/SB17CD
	TM03B	15	13	9	-	I/O	P61/GPWMST6/TX4C/SBO4C/SBT4D/SBO7C/TX7C/SDA7C/SBT7D/SCL7D
	TM04A	16	14	10	-	I/O	P62/GPWMST7/SBT4C/TX4D/SBO4D/SBT7C/SCL7C/SBO7D/TX7D/SDA7D
	TM04B	17	15	-	-	I/O	P63/GPWMST8/SBCS4CD/SBCS7CD
	TM05A	19	17	-	-	I/O	P64
	TM05B	20	18	-	-	I/O	P65
	TM06A	47	41	-	-	I/O	P86
	TM06B	48	42	-	-	I/O	P87
	TM07A	59	53	44	-	I/O	P12/IRQ10
	TM07B	60	54	45	-	I/O	P13/IRQ11/GPWMST0/GPWMST9
	TM08A	61	55	46	-	I/O	P14/IRQ12/GPWMST1/GPWMSTA/DAOT0
	TM08B	62	56	47	37	I/O	P15/IRQ13/GPWMST2/GPWMSTB/DAOT1
	TM09A	65	58	48	38	I/O	P70/GPWM90
	TM09B	66	59	49	39	I/O	P71/GPWM91
	TM10A	67	60	-	-	I/O	P72/GPWMA0
	TM10B	68	61	-	-	I/O	P73/GPWMA1
	TM11A	125	110	-	-	I/O	P74/GPWMST3
	TM11B	126	111	-	-	I/O	P75/GPWMST4
TM12A	132	116	89	74	I/O	P20/IRQ14	
TM12B	133	117	90	75	I/O	P21/IRQ15	



Functions	Pin name	MN1M7BFx0z (144 pins) Pin No.	MN1M7BFx1z (128 pins) Pin No.	MN1M7BFx2z (100 pins) Pin No.	MN1M7BFx3z (80 pins) Pin No.	I/O	Other Pins
16-bit timer	TM13A	139	123	96	79	I/O	P26/IRQ19/SBT4A/SBO4B /TX4B/SBT7A/SCL7A/SBO7B /TX7B/SDA7B/ADTRG2
	TM13B	140	124	97	80	I/O	P27/SBCS4AB/SBCS7AB
	TM20A	5	3	1	1	I/O	P00/IRQ00/TRCCLK
	TM20B	6	4	2	2	I/O	P01/IRQ01/TRCSWO
	TM21A	56	50	41	34	I/O	P10/IRQ08/CMPOT00
	TM21B	58	52	43	36	I/O	P11/IRQ09/CMPOT10
	TM22A	135	119	92	-	I/O	P50
	TM22B	136	120	93	-	I/O	P51
	TM23A	119	104	80	65	I/O	P52/CMPOT01/SBO5A/TX5A /SBT5B
	TM23B	120	105	81	66	I/O	P53/CMPOT11/SBT5A/SBO5B /TX5B
	TM24A	121	106	82	67	I/O	P54/CMPOT21/SBI5/RX5
	TM24B	122	107	83	68	I/O	P55/CMPOT31/SBO6A/TX6A /SBT6B
	TM25A	123	108	84	69	I/O	P56/CMPOT41/SBT6A/SBO6B /TX6B
	TM25B	124	109	85	70	I/O	P57/SBI6/RX6
Power control PWM pin	GPWM00	41	35	28	21	Output	P80
	GPWM01	42	36	29	22	Output	P81
	GPWM10	43	37	30	23	Output	P82
	GPWM11	44	38	31	24	Output	P83
	GPWM20	45	39	32	25	Output	P84
	GPWM21	46	40	33	26	Output	P85
	GPWM30	49	43	34	27	Output	P90
	GPWM31	50	44	35	28	Output	P91
	GPWM40	51	45	36	29	Output	P92
	GPWM41	52	46	38	30	Output	P93
	GPWM50	53	47	38	31	Output	P94
	GPWM51	54	48	39	32	Output	P95
	GPWM60	31	29	22	19	Output	PA0
	GPWM61	32	30	23	20	Output	PA1
	GPWM70	33	31	24	-	Output	PA2
	GPWM71	34	32	25	-	Output	PA3
	GPWM80	37	33	26	-	Output	PA4
	GPWM81	38	34	27	-	Output	PA5
	GPWM90	65	58	48	38	Output	P70/TM09A
	GPWM91	66	59	49	39	Output	P71/TM09B
	GPWMA0	67	60	-	-	Output	P72/TM10A
GPWMA1	68	61	-	-	Output	P73/GPWMA1/TM10B	
GPWMB0	69	62	-	-	Output	PB0	
GPWMB1	70	63	-	-	Output	PB1	
Power control PWM monitor	GPWMST0	60	54	45	-	Output	P13/IRQ11/TM07B/GPWMST9



Functions	Pin name	MN1M7BFx0z (144 pins) Pin No.	MN1M7BFx1z (128 pins) Pin No.	MN1M7BFx2z (100 pins) Pin No.	MN1M7BFx3z (80 pins) Pin No.	I/O	Other Pins
Power control PWM monitor	GPWMST1	61	55	46	-	Output	P14/IRQ12/TM08A/GPWMSTA /DAOT0
	GPWMST2	62	56	47	37	Output	P15/IRQ13/TM08B/GPWMSTB /DAOT1
	GPWMST3	125	110	-	-	Output	P74/TM11A
	GPWMST4	126	111	-	-	Output	P75/TM11B
	GPWMST5	14	12	8	-	Output	P60/TM03A/RX4CD/SBI4CD /RX7CD/SBI7CD
	GPWMST6	15	13	9	-	Output	P61/TM03B/TX4C/SBO4C /SBT4D/SBO7C/TX7C/SDA7C /SBT7D/SCL7D
	GPWMST7	16	14	10	-	Output	P62/TM04A/SBT4C/TX4D /SBO4D/SBT7C/SCL7C/SBO7D /TX7D/SDA7D
	GPWMST8	17	15	-	-	Output	P63/TM04B/SBCS4CD/SBCS7CD
	GPWMST9	60	54	45	-	Output	P13/IRQ11/TM07B/GPWMST0
	GPWMSTA	61	55	-	-	Output	P14/IRQ12/TM08A/GPWMST1 /DAOT0
GPWMSTB	62	56	-	-	Output	P15/IRQ13/TM08B/GPWMST2 /DAOT1	
Clock Synchron- ous SIF/SPI	SBO0A	129	113	86	71	I/O	P30/SDA0A/SBT0B/SCL0B /CMPOT20
	SBT0A	130	114	87	72	I/O	P31/SCL0A/SBO0B/SDA0B /CMPOT30
	SBO0B	130	114	87	72	I/O	P31/SBT0A/SCL0A/SDA0B /CMPOT30
	SBT0B	129	113	86	71	I/O	P30/SBO0A/SDA0A/SCL0B /CMPOT20
	SBI0	131	115	88	73	Input	P32/CMPOT40
	SBO1A	113	98	77	62	I/O	P34/TX1A/LTX1A/SBT1B
	SBT1A	114	99	78	63	I/O	P35/SBO1B/TX1B/LTX1B
	SBO1B	114	99	78	63	I/O	P35/SBT1A/TX1B/LTX1B
	SBT1B	113	98	77	62	I/O	P34/SBO1A/TX1A/LTX1A
	SBI1	115	100	79	64	Input	P36/RX1/LRX1
	SBO2A	116	101	-	-	I/O	P40/TX2A/SBT2B
	SBT2A	117	102	-	-	I/O	P41/SBO2B/TX2B
	SBO2B	117	102	-	-	I/O	P41/SBT2A/TX2B
	SBT2B	116	101	-	-	I/O	P40/SBO2A/TX2A
	SBI2	118	103	-	-	Input	P42/RX2
	SBCS3	144	128	-	-	Output	P47
	SBO3A	141	125	98	-	I/O	P44/TX3A/SBT3B
	SBT3A	142	126	99	-	I/O	P45/SBO3B/TX3B
	SBO3B	142	126	99	-	I/O	P45/SBT3A/TX3B
	SBT3B	141	125	98	-	I/O	P44/SBO3A/TX3A
	SBI3	143	127	100	-	I/O	P46/RX3
	SBCS4AB	140	124	97	80	Input	P27/SBCS7AB/TM13B
	SBO4A	138	122	95	78	I/O	P25/IRQ18/TX4A/SBT4B /SBO7A/TX7A/SDA7A/SBT7B SCL7B/ADTRG1



Functions	Pin name	MN1M7BFx0z (144 pins) Pin No.	MN1M7BFx1z (128 pins) Pin No.	MN1M7BFx2z (100 pins) Pin No.	MN1M7BFx3z (80 pins) Pin No.	I/O	Other Pins
Clock Synchronous SIF/SP1	SBT4A	139	123	96	79	I/O	P26/IRQ19/SBO4B/TX4B /SBT7A/SCL7A/SBO7B/TX7B /SDA7B/TM13A/ADTRG2
	SBO4B	139	123	96	79	I/O	P26/IRQ19/SBT4A/TX4B /SBT7A/SCL7A/SBO7B/TX7B /SDA7B/TM13A/ADTRG2
	SBT4B	138	122	95	78	I/O	P25/IRQ18/SBO4A/TX4A /SBO7A/TX7A/SDA7A/SBT7B /SCL7B/ADTRG1
	SBI4AB	137	121	94	77	Input	P24/IRQ17/RX4AB/SBI7AB /RX7AB/ADTRG0
	SBCS4CD	17	15	-	-	Input	P63/TM04B/GPWMST8/SBCS7CD
	SBO4C	15	13	9	-	I/O	P61/TM03B/GPWMST6/TX4C /SBT4D/SBO7C/TX7C/SDA7C /SBT7D/SCL7D
	SBT4C	16	14	10	-	I/O	P62/TM04A/GPWMST7/TX4D /SBO4D/SBT7C/SCL7C/SBO7D /TX7D/SDA7D
	SBO4D	16	14	10	-	I/O	P62/TM04A/GPWMST7/SBT4C /TX4D/SBT7C/SCL7C/SBO7D /TX7D/SDA7D
	SBT4D	15	13	9	-	I/O	P61/TM03B/PWMST6/TX4C /SBO4C/SBO7C/TX7C/SDA7C /SBT7D/SCL7D
	SBI4CD	14	12	8	-	Input	P60/TM03A/GPWMST5/RX4CD /RX7CD/SBI7CD
	SBO5A	119	104	80	65	I/O	P52/TM23A/CMPOT01/TX5A /SBT5B
	SBT5A	120	105	81	66	I/O	P53/TM23B/CMPOT11/SBO5B /TX5B
	SBO5B	120	105	81	66	I/O	P53/TM23B/CMPOT11/SBT5A /TX5B
	SBT5B	119	104	80	65	I/O	P52/TM23A/CMPOT01/SBO5A /TX5A
	SBI5	121	106	82	67	Input	P54/TM24A/CMPOT21/RX5
	SBO6A	122	107	83	68	I/O	P55/TM24B/CMPOT31/TX6A /SBT6B
	SBT6A	123	108	84	69	I/O	P56/TM25A/CMPOT41/SBO6B /TX6B
	SBO6B	123	108	84	69	I/O	P56/TM25A/CMPOT41/SBT6A /TX6B
	SBT6B	122	107	83	68	I/O	P55/TM24B/CMPOT31/SBO6A /TX6A
	SBI6	124	109	85	70	Input	P57/TM25B/RX6
	SBCS7AB	140	124	97	80	Input	P27/SBCS4AB/TM13B
	SBO7A	138	122	95	78	I/O	P25/IRQ18/SBO4A/TX4A /SBT4B/TX7A/SCL7A/SBT7B SCL7B/ADTRG1
	SBT7A	139	123	96	79	I/O	P26/IRQ19/SBT4A/SBO4B /TX4B/SCL7A/SBO7B/TX7B /SDA7B/TM13A/ADTRG2
SBO7B	139	123	96	79	I/O	P26/IRQ19/SBT4A/SBO4B /TX4B/SBT7A/SCL7A/TX7B /SDA7B/TM13A/ADTRG2	



Functions	Pin name	MN1M7BFx0z (144 pins) Pin No.	MN1M7BFx1z (128 pins) Pin No.	MN1M7BFx2z (100 pins) Pin No.	MN1M7BFx3z (80 pins) Pin No.	I/O	Other Pins
Clock Synchronous SIF/SPI	SBT7B	138	122	95	78	I/O	P25/IRQ18/SBO4A/TX4A /SBT4B/SBO7A/TX7A/SDA7A /SCL7B/ADTRG1
	SBI7AB	137	121	94	77	Input	P24/IRQ17/SBI4AB/RX4AB /RX7AB/ADTRG0
	SBCS7CD	17	15	-	-	Input	P63/TM04B/GPWMST8/SBCS4CD
	SBO7C	15	13	9	-	I/O	P61/TM03B/GPWMST6/TX4C /SBO4C/SBT4D/TX7C/SDA7C /SBT7D/SCL7D
	SBT7C	16	14	10	-	I/O	P62/TM04A/GPWMST7/SBT4C /TX4D/SBO4D/SCL7C/SBO7D /TX7D/SDA7D
	SBO7D	16	14	10	-	I/O	P62/TM04A/GPWMST7/SBT4C /TX4D/SBO4D/SBT7C/SCL7C /TX7D/SDA7D
	SBT7D	15	13	9	-	I/O	P61/TM03B/GPWMST6/TX4C /SBO4C/SBT4D/SBO7C/TX7C /SCL7D
	SBI7CD	14	12	8	-	Input	P60/TM03A/GPWMST5/RX4CD /SBI4CD/RX7CD
UART	TX1A	113	98	77	62	I/O	P34/SBO1A/LTX1A/SBT1B
	TX1B	114	99	78	63	I/O	P35/SBT1A/SBO1B/LTX1B
	RX1	115	100	79	64	Input	P36/SBI1/LRX1
	TX2A	116	101	-	-	I/O	P40/SBO2A/SBT2B
	TX2B	117	102	-	-	I/O	P41/SBT2A/SBO2B
	RX2	118	103	-	-	Input	P42/SBI2
	TX3A	141	125	98	-	I/O	P44/SBO3A/SBT3B
	TX3B	142	126	99	-	I/O	P45/SBT3A/SBO3B
	RX3	143	127	100	-	Input	P46/SBI3
	TX4A	138	122	95	78	I/O	P25/IRQ18/SBO4A/SBT4B /SBO7A/TX7A/SDA7A/SBT7B /SCL7B/ADTRG1
	TX4B	139	123	96	79	I/O	P26/IRQ19/SBT4A/SBO4B /SBT7A/SCL7A/SBO7B/TX7B /SDA7B/TM13A/ADTRG2
	RX4AB	137	121	94	77	Input	P24/IRQ17/SBI4AB/SBI7AB /RX7AB/ADTRG0
	TX4C	15	13	9	-	I/O	P61/TM03B/GPWMST6/SBO4C /SBT4D/SBO7C/TX7C/SDA7C /SBT7D/SCL7D
	TX4D	16	14	10	-	I/O	P62/TM04A/GPWMST7/SBT4C /SBO4D/SBT7C/SCL7C/SBO7D /TX7D/SDA7D
	RX4CD	14	12	8	-	Input	P60/TM03A/GPWMST5/SBI4CD /RX7CD/SBI7CD
	TX5A	119	104	80	65	I/O	P52/TM23A/CMPOT01/SBO5A /SBT5B
	TX5B	120	105	81	66	I/O	P53/TM23B/CMPOT11/SBT5A /SBO5B
	RX5	121	106	82	67	Input	P54/TM24A/CMPOT21/SBI5
TX6A	122	107	83	68	I/O	P55/TM24B/CMPOT31/SBO6A /SBT6B	
TX6B	123	108	84	69	I/O	P56/TM25A/CMPOT41/SBT6A /SBO6B	
RX6	124	109	85	70	Input	P57/TM25B/SBI6	



Functions	Pin name	MN1M7BFx0z (144 pins) Pin No.	MN1M7BFx1z (128 pins) Pin No.	MN1M7BFx2z (100 pins) Pin No.	MN1M7BFx3z (80 pins) Pin No.	I/O	Other Pins
UART	TX7A	138	122	95	78	I/O	P25/IRQ18/SBO4A/TX4A /SBT4B/SBO7A/SDA7A/SBT7B /SCL7B/ADTRG1
	TX7B	139	123	96	79	I/O	P26/IRQ19/SBT4A/SBO4B /TX4B/SBT7A/SCL7A/SBO7B /SDA7B/TM13A/ADTRG2
	RX7AB	137	121	94	77	Input	P24/IRQ17/SBI4B/RX4AB /SBI7AB/ADTRG0
	TX7C	15	13	9	-	I/O	P61/TM03B/GPWMST6/TX4C /SBO4C/SBT4D/SBO7C/SDA7C /SBT7D/SCL7D
	TX7D	16	14	10	-	I/O	P62/TM04A/GPWMST7/SBT4C /TX4D/SBO4D/SBT7C/SCL7C /SBO7D/SCL7D
	RX7CD	14	12	8	-	Input	P60/TM03A/GPWMST5/RX4CD /SBI4CD/SBI7CD
LIN	LTX1A	113	98	77	62	Output	P34/SBO1A/TX1A/SBT1B
	LTX1B	114	99	78	63	Output	P35/SBT1A/SBO1B/TX1B
	LRX1	115	100	79	64	Input	P36/SBI1/RX1
IIC	SDA0A	129	113	86	71	I/O	P30/SBO0A/SBT0B/SCL0B /CMPOT20
	SCL0A	130	114	87	72	I/O	P31/SBT0A/SBO0B/SDA0B /CMPOT30
	SDA0B	130	114	87	72	I/O	P31/SBT0A/SCL0A/SBO0B /CMPOT30
	SCL0B	129	113	86	71	I/O	P30/SBO0A/SDA0A/SBT0B /CMPOT20
	SDA7A	138	122	95	78	I/O	P25/IRQ18/SBO4A/TX4A /SBT4B/SBO7A/TX7A/SBT7B /SCL7B/ADTRG1
	SCL7A	139	123	96	79	I/O	P26/IRQ19/SBT4A/SBO4B /TX4B/SBT7A/SBO7B/TX7B /SDA7B/TM13A/ADTRG2
	SDA7B	139	123	96	79	I/O	P26/IRQ19/SBT4A/SBO4B /TX4B/SBT7A/SCL7A/SBO7B /TX7B/TM13A/ADTRG2
	SCL7B	138	122	95	78	I/O	P25/IRQ18/SBO4A/TX4A /SBT4B/SBO7A/TX7A/SDA7A /SBT7B/ADTRG1
	SDA7C	15	13	9	-	I/O	P61/TM03B/GPWMST6/SBO4C /TX4C/SBT4D/SBO7C/TX7C /SBT7D/SCL7D
	SCL7C	16	14	10	-	I/O	P62/TM04A/GPWMST7/SBT4C /SBO4D/TX4D/SBT7C/SBO7D /TX7D/SDA7D
	SDA7D	16	14	10	-	I/O	P62/TM04A/GPWMST7/SBT4C /SBO4D/TX4D/SBT7C/SCL7C /SBO7D/TX7D
	SCL7D	15	13	9	-	I/O	P61/TM03B/GPWMST6/SBO4C /TX4C/SBT4D/SBO7C/TX7C /SDA7C/SBT7D
SM Bus	SMDA1	12	10	-	-	I/O	P07/IRQ07/TM02B
	SMCL1	11	9	-	-	I/O	P06/IRQ06/TM02A



Functions	Pin name	MN1M7BFx0z (144 pins) Pin No.	MN1M7BFx1z (128 pins) Pin No.	MN1M7BFx2z (100 pins) Pin No.	MN1M7BFx3z (80 pins) Pin No.	I/O	Other Pins
A/D Input	ADIN00	97	87	67	53	Input	PC0/VGAN0
	ADIN01	98	88	68	54	Input	PC1/VGAP00/CMPIN0
	ADIN02	99	89	69	55	Input	PC2/VGAP01/CMPIN1
	ADIN03	100	90	70	56	Input	PC3/VGAP02/CMPIN2
	ADIN04	101	91	71	57	Input	PC4
	ADIN05	102	92	72	-	Input	PC5
	ADIN06	103	93	73	58	Input	PC6
	ADIN07	104	94	74	59	Input	PC7
	ADIN08	87	77	61	47	Input	PD0/VGAN1
	ADIN09	88	78	62	48	Input	PD1/VGAP1/CMPIN3
	ADIN10	89	79	63	49	Input	PD2
	ADIN11	90	80	64	50	Input	PD3
	ADIN12	91	81	-	-	Input	PD4
	ADIN13	92	82	-	-	Input	PD5
	ADIN14	93	83	65	51	Input	PD6
	ADIN15	94	84	66	52	Input	PD7
	ADIN16	85	75	59	45	Input	PE0/VGAP2/CMPIN4
	ADIN17	86	76	60	46	Input	PE1/VGAN2
	ADIN18	79	69	54	42	Input	PE2
	ADIN19	80	70	55	43	Input	PE3
	ADIN20	81	71	56	-	Input	PE4
	ADIN21	82	72	57	44	Input	PE5
	ADIN22	83	73	58	-	Input	PE6
	ADIN23	84	74	-	-	Input	PE7
	ADIN24	76	66	52	-	Input	PF0
	ADIN25	77	67	53	-	Input	PF1
	ADIN26	78	68	-	-	Input	PF2
	ADIN27	95	85	-	-	Input	PF3
	ADIN28	96	86	-	-	Input	PF4
	ADIN29	105	95	-	-	Input	PF5
	ADIN30	106	-	-	-	Input	PF6
ADIN31	107	-	-	-	Input	PF7	
A/D monitor	ADTRG0	137	121	94	77	Output	P24/IRQ17/SB14AB/RX4AB /SB17AB/RX7AB
	ADTRG1	138	122	95	78	Output	P25/IRQ18/SBO4A/TX4A /SBT4B/SBO7A/TX7A/SDA7A /SBT7B/SCL7B
	ADTRG2	139	123	96	79	Output	P26/IRQ19/SBT4A/SBO4B /TX4B/SBT7A/SCL7A/SBO7B /SDA7B/TX7B/TM13A
VGA Input	VGAP00	98	88	68	54	Input	PC1/ADIN01/CMPIN0
	VGAP01	99	89	69	55	Input	PC2/ADIN02/CMPIN1
	VGAP02	100	90	70	56	Input	PC3/ADIN03/CMPIN2
	VGAN0	97	87	67	53	Input	PC0/ADIN00
	VGAP1	88	78	62	48	Input	PD1/ADIN09/CMPIN3
	VGAN1	87	77	61	47	Input	PD0/ADIN08
	VGAP2	85	75	59	45	Input	PE0/ADIN16/CMPIN4
	VGAN2	86	76	60	46	Input	PE1/ADIN17
Comparator Input	CMPIN0	98	88	68	54	Input	PC1/ADIN01/VGAP00
	CMPIN1	99	89	69	55	Input	PC2/ADIN02/VGAP01
	CMPIN2	100	90	70	56	Input	PC3/ADIN03/VGAP02
	CMPIN3	88	78	62	48	Input	PD1/ADIN09/VGAP1
	CMPIN4	85	75	59	45	Input	PE0/ADIN16/VGAP2



Functions	Pin name	MN1M7BFx0z (144 pins) Pin No.	MN1M7BFx1z (128 pins) Pin No.	MN1M7BFx2z (100 pins) Pin No.	MN1M7BFx3z (80 pins) Pin No.	I/O	Other Pins
Comparator Output	CMPOT00	56	50	41	34	Output	P10/IRQ08/TM21A
	CMPOT01	119	104	80	65	Output	P52/TM23A/SBO5A/TX5A /SBT5B
	CMPOT10	58	52	43	36	Output	P11/IRQ09/TM21B
	CMPOT11	120	105	81	66	Output	P53/TM23B/SBT5A/SBO5B /TX5B
	CMPOT20	129	113	86	71	Output	P30/SBO0A/SDA0A/SBT0B /SCL0B
	CMPOT21	121	106	82	67	Output	P54/TM24A/SB15/RX5
	CMPOT30	130	114	87	72	Output	P31/SBT0A/SCL0A/SBO0B /SDA0B
	CMPOT31	122	107	83	68	Output	P55/TM24B/SBO6A/TX6A /SBT6B
	CMPOT40	131	115	88	73	Output	P32/SB10
	CMPOT41	123	108	84	69	Output	P56/TM25A/SBT6A/SBO6B /TX6B
D/A Output	DAOT0	61	55	46	-	Output	P14/IRQ12/TM08A/GPWMST1 /GPWMSTA
	DAOT1	62	56	47	37	Output	P15/IRQ13/TM08B/GPWMST2 /GPWMSTB
I/O port	P00	5	3	1	1	I/O	IRQ00/TM20A/TRCCLK
	P01	6	4	2	2	I/O	IRQ01/TM20B/TRCSWO
	P02	7	5	3	3	I/O	IRQ02/TM00A/TRCD0
	P03	8	6	4	4	I/O	IRQ03/TM00B/TRCD1
	P04	9	7	5	5	I/O	IRQ04/TM01A/TRCD2
	P05	10	8	6	6	I/O	IRQ05/TM01B/TRCD3
	P06	11	9	-	-	I/O	IRQ06/TM02A/SMCL1
	P07	12	10	-	-	I/O	IRQ07/TM02B/SMDA1
	P10	56	50	41	34	I/O	IRQ08/TM21A/CMPOT00
	P11	58	52	43	36	I/O	IRQ09/TM21B/CMPOT10
	P12	59	53	44	-	I/O	IRQ10/TM07A
	P13	60	54	45	-	I/O	IRQ11/TM07B/GPWMST0/GPWMST9
	P14	61	55	46	-	I/O	IRQ12/TM08A/GPWMST1/GPWMSTA /DAOT0
	P15	62	56	47	37	I/O	IRQ13/TM08B/GPWMST2/GPWMSTB /DAOT1
	P16	63	57	-	-	I/O	-
	P17	64	-	-	-	I/O	-



Functions	Pin name	MN1M7BFx0z (144 pins) Pin No.	MN1M7BFx1z (128 pins) Pin No.	MN1M7BFx2z (100 pins) Pin No.	MN1M7BFx3z (80 pins) Pin No.	I/O	Other Pins
I/O port	P20	132	116	89	74	I/O	IRQ14/TM12A
	P21	133	117	90	75	I/O	IRQ15/TM12B
	P22	134	118	91	76	I/O	IRQ16
	P24	137	121	94	77	I/O	IRQ17/SBI4AB/RX4AB/SBI7AB /RX7AB/ADTRG0
	P25	138	122	95	78	I/O	IRQ18/SBO4A/TX4A/SBT4B /SBO7A/TX7A/SDA7A/SBT7B /SCL7B/ADTRG1
	P26	139	123	96	79	I/O	IRQ19/SBT4A/SBO4B/TX4B /SBT7A/SCL7A/SBO7B/TX7B /SDA7B/TM13A/ADTRG2
	P27	140	124	97	80	I/O	SBCS4AB/SBCS7AB/TM13B
	P30	129	113	86	71	I/O	SBO0A/SDA0A/SBT0B/SCL0B /CMPOT20
	P31	130	114	87	72	I/O	SBT0A/SCL0A/SBO0B/SDA0B /CMPOT30
	P32	131	115	88	73	I/O	SBI0/CMPOT40
	P34	113	98	77	62	I/O	SBO1A/TX1A/LTX1A/SBT1B
	P35	114	99	78	63	I/O	SBT1A/SBO1B/TX1B/LTX1B
	P36	115	100	79	64	I/O	SBI1/RX1/LRX1
	P40	116	101	-	-	I/O	SBO2A/TX2A/SBT2B
	P41	117	102	-	-	I/O	SBT2A/SBO2B/TX2B
	P42	118	103	-	-	I/O	SBI2/RX2
	P44	141	125	98	-	I/O	SBO3A/TX3A/SBT3B
	P45	142	126	99	-	I/O	SBT3A/SBO3B/TX3B
	P46	143	127	100	-	I/O	SBI3/RX3
	P47	144	128	-	-	I/O	SBCS3
	P50	135	119	92	-	I/O	TM22A
	P51	136	120	93	-	I/O	TM22B
	P52	119	104	80	65	I/O	TM23A/CMPOT01/SBO5A/TX5A /SBT5B
	P53	120	105	81	66	I/O	TM23B/CMPOT11/SBT5A/SBO5B /TX5B
	P54	121	106	82	67	I/O	TM24A/CMPOT21/SBI5/RX5
	P55	122	107	83	68	I/O	TM24B/CMPOT31/SBO6A/TX6A /SBT6B
	P56	123	108	84	69	I/O	TM25A/CMPOT41/SBT6A/SBO6B /TX6B
	P57	124	109	85	70	I/O	TM25B/SBI6/RX6
	P60	14	12	8	-	I/O	TM03A/GPWMST5/RX4CD/SBI4CD /RX7CD/SBI7CD
	P61	15	13	9	-	I/O	TM03B/GPWMST6/TX4C/SBO4C /SBT4D/SBO7C/TX7C/SDA7C /SBT7D/SCL7D
	P62	16	14	10	-	I/O	TM04A/GPWMST7/SBT4C/TX4D /SBO4D/SBT7C/SCL7C/SBO7D /TX7D/SDA7D
	P63	17	15	-	-	I/O	TM04B/GPWMST8/SBCS4CD/SBCS7CD
P64	19	17	-	-	I/O	TM05A	



Functions	Pin name	MN1M7BFx0z (144 pins) Pin No.	MN1M7BFx1z (128 pins) Pin No.	MN1M7BFx2z (100 pins) Pin No.	MN1M7BFx3z (80 pins) Pin No.	I/O	Other Pins
I/O port	P65	20	18	-	-	I/O	TM05B
	P66	35	-	-	-	I/O	-
	P67	36	-	-	-	I/O	-
	P70	65	58	48	38	I/O	GPWM90/TM09A
	P71	66	59	49	39	I/O	GPWM91/TM09B
	P72	67	60	-	-	I/O	GPWMA0/TM10A
	P73	68	61	-	-	I/O	GPWMA1/TM10B
	P74	125	110	-	-	I/O	TM11A/GPWMST3
	P75	126	111	-	-	I/O	TM11B/GPWMST4
	P76	127	112	-	-	I/O	-
	P77	128	-	-	-	I/O	-
	P80	41	35	28	21	I/O	GPWM00
	P81	42	36	29	22	I/O	GPWM01
	P82	43	37	30	23	I/O	GPWM10
	P83	44	38	31	24	I/O	GPWM11
	P84	45	39	32	25	I/O	GPWM20
	P85	46	40	33	26	I/O	GPWM21
	P86	47	41	-	-	I/O	TM06A
	P87	48	42	-	-	I/O	TM06B
	P90	49	43	34	27	I/O	GPWM30
	P91	50	44	35	28	I/O	GPWM31
	P92	51	45	36	29	I/O	GPWM40
	P93	52	46	37	30	I/O	GPWM41
	P94	53	47	38	31	I/O	GPWM50
	P95	54	48	39	32	I/O	GPWM51
	P96	2	1	-	-	I/O	-
	P97	4	2	-	-	I/O	-
	PA0	31	29	22	19	I/O	GPWM60
	PA1	32	30	23	20	I/O	GPWM61
	PA2	33	31	24	-	I/O	GPWM70
	PA3	34	32	25	-	I/O	GPWM71
	PA4	37	33	26	-	I/O	GPWM80
	PA5	38	34	27	-	I/O	GPWM81
	PA6	39	-	-	-	I/O	-
	PA7	40	-	-	-	I/O	-
	PB0	69	62	-	-	I/O	GPWMB0
	PB1	70	63	-	-	I/O	GPWMB1
	PB2	71	-	-	-	I/O	-
	PB3	74	-	-	-	I/O	-
	PB4	75	-	-	-	I/O	-
	PB6	111	-	-	-	I/O	-
	PB7	112	-	-	-	I/O	-
	PC0	97	87	67	53	Input	ADIN00/VGAN0



Functions	Pin name	MN1M7BFx0z (144 pins) Pin No.	MN1M7BFx1z (128 pins) Pin No.	MN1M7BFx2z (100 pins) Pin No.	MN1M7BFx3z (80 pins) Pin No.	I/O	Other Pins
I/O port	PC1	98	88	68	54	Input	ADIN01/VGAP00/CMPIN0
	PC2	99	89	69	55	Input	ADIN02/VGAP01/CMPIN1
	PC3	100	90	70	56	Input	ADIN03/VGAP02/CMPIN2
	PC4	101	91	71	57	I/O	ADIN04
	PC5	102	92	72	-	I/O	ADIN05
	PC6	103	93	73	58	I/O	ADIN06
	PC7	104	94	74	59	I/O	ADIN07
	PD0	87	77	61	47	Input	ADIN08/VGAN1
	PD1	88	78	62	48	Input	ADIN09/VGAP1/CMPIN3
	PD2	89	79	63	49	I/O	ADIN10
	PD3	90	80	64	50	I/O	ADIN11
	PD4	91	81	-	-	I/O	ADIN12
	PD5	92	82	-	-	I/O	ADIN13
	PD6	93	83	65	51	I/O	ADIN14
	PD7	94	84	66	52	I/O	ADIN15
	PE0	85	75	59	45	Input	ADIN16/VGAP2/CMPIN4
	PE1	86	76	60	46	Input	ADIN17/VGAN2
	PE2	79	69	54	42	I/O	ADIN18
	PE3	80	70	55	43	I/O	ADIN19
	PE4	81	71	56	-	I/O	ADIN20
	PE5	82	72	57	44	I/O	ADIN21
	PE6	83	73	58	-	I/O	ADIN22
	PE7	84	74	-	-	I/O	ADIN23
	PF0	76	66	52	-	I/O	ADIN24
	PF1	77	67	53	-	I/O	ADIN25
	PF2	78	68	-	-	I/O	ADIN26
	PF3	95	85	-	-	I/O	ADIN27
	PF4	96	86	-	-	I/O	ADIN28
	PF5	105	95	-	-	I/O	ADIN29
	PF6	106	-	-	-	I/O	ADIN30
	PF7	107	-	-	-	I/O	ADIN31



1.5 Electrical Characteristics

About electrical specifications, standard specifications are described in the manual of this LSI. When using this LSI, consult the staff in our sales offices for the product specifications.

1.5.1 Absolute Maximum Ratings

Parameter		Symbol	Rating	Unit	
A1	Power supply voltage 1	V_{DD5A}	-0.3 to 7.0	V	
A2	Power supply voltage 2	AV_{DD5A}	-0.3 to 7.0	V	
A3	Internal power supply voltage 1	V_{OUT3A}	-0.3 to 4.6	V	
A4	Internal power supply voltage 2	V_{OUT12A}	-0.3 to 1.6	V	
A5	Input pin voltage	V_{I1}	-0.3 to $V_{DD5} + 0.3$ (Upper limit: 7.0)	V	
A6	VGA input pin voltage	V_{I2}	-2.5 to $V_{DD5} + 0.3$ (Upper limit: 7.0)	V	
A7	I/O pin voltage	V_{I3}	-0.3 to $V_{DD5} + 0.3$ (Upper limit: 7.0)	V	
A8	Average Output current	I/O pin 1 *1	$I_{O1}(avg)$	± 12	mA
A9		I/O pin 2 *2	$I_{O2}(avg)$	± 24	mA
A10		Total of all pins	I_{O3}	± 70	mA
A11	Power dissipation	P_D	1.04	W	
A12	Operating case temperature	T_{copr}	-40 to 110	°C	
A13	Storage temperature	T_{stg}	-40 to +125	°C	

Note:

Although this LSI has internal ESD protection circuit, it may still sustain permanent damage if not handled properly. Therefore, proper ESD precautions are recommended to avoid electrostatic damage to the MOS gate.

This product may sustain permanent damage if it gets stress which is higher than the above stated absolute maximum rating even only for a second. This rating is the maximum rating and device operating at this range is not guaranteed as it is higher than our stated recommended operating range.

Note:

*1 I/O pin 1 is I/O pin 1 and I/O pin 3 of [1.5.3 DC Characteristics](#).

Note:

*2 I/O pin 2 is I/O pin 2 and I/O pin 4 to 6 of [1.5.3 DC Characteristics](#).



1.5.2 Operation Conditions

Power supply voltage during operation			$V_{SS} = AV_{SS} = 0.0 \text{ V}$ $T_c = -40 \text{ }^\circ\text{C to } 110 \text{ }^\circ\text{C}$			
Parameter		Symbol	Rating			Unit
			MIN	TYP	MAX	
B1	External power supply voltage 1	V_{DD5}	V_{RST5N}	5.0	5.5	V
B2	External power supply voltage 2	AV_{DD5}	-	V_{DD5}	-	
B3	Internal power supply voltage 1	V_{OUT3}	-	2.9	-	
B4	Internal power supply voltage 2	V_{OUT12}	-	1.25	-	

Note:

Supply the external power supply pin V_{DD50} and the analog power supply pin AV_{DD50} from the same external power supply.

Oscillation pin			$V_{DD5} = AV_{DD5} = V_{RST5N} \text{ to } 5.5 \text{ V}$, $V_{SS} = AV_{SS} = 0.0 \text{ V}$ $T_c = -40 \text{ }^\circ\text{C to } 110 \text{ }^\circ\text{C}$			
Parameter		Symbol	Rating			Unit
			MIN	TYP	MAX	
B5	External oscillation frequency (Ceramic/Crystal)	F_{OSC}	4.0	-	20.0	MHz
B6	External oscillation Feedback resistor	R_{FB}	-	1.0	-	$M\Omega$

Note:

Oscillation circuit characteristics and peripheral parts (load capacity, damping resistor, and feedback resistor) are different by each oscillator and substrate. To decide appropriate capacity value for circuit constant, please consult the oscillator manufacturer.

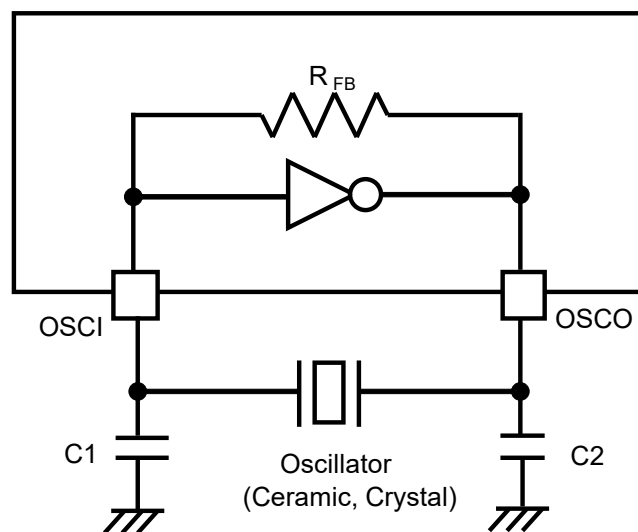


Figure 1.5-1 Oscillation Circuit



External clock input OSCI (OSCO left open)			$V_{DD5} = AV_{DD5} = V_{RST5N}$ to 5.5 V, $V_{SS} = AV_{SS} = 0.0$ V $T_c = -40$ °C to 110 °C			
Parameter		Symbol	Rating			Unit
			MIN	TYP	MAX	
B7	Clock frequency	F_{CP}	4.0	-	20.0	MHz
B8	High level pulse width	t_{wh1}	20	-	-	ns
B9	Low level pulse width	t_{wl1}	20	-	-	
B10	Rising time	t_{wr1}	-	-	5	
B11	Falling time	t_{wf1}	-	-	5	

Note:

It is necessary to set clock duty ratio from 45 % to 55 %.

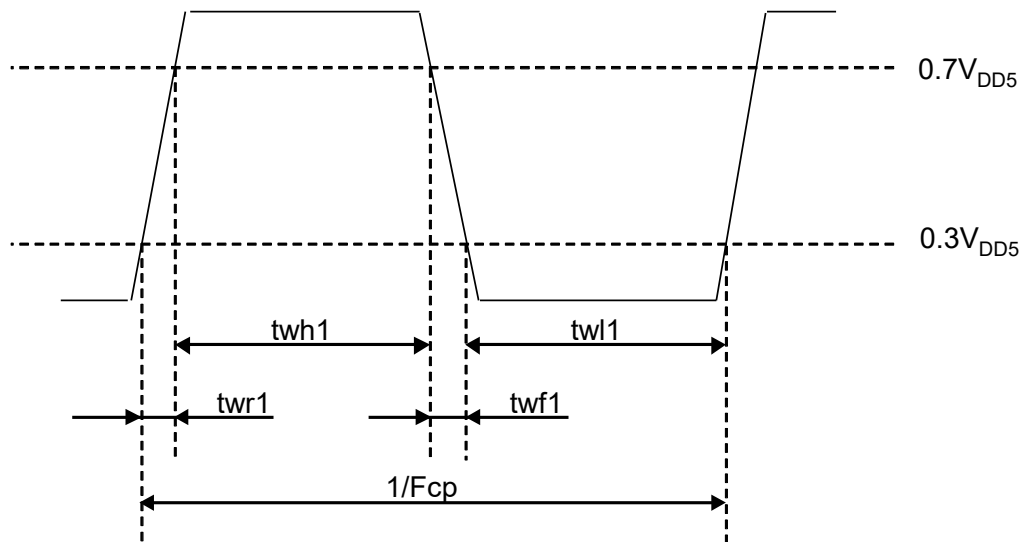


Figure 1.5-2 OSCI Timing Chart



1.5.3 DC Characteristics

Power supply current during operation		$V_{DD5} = AV_{DD5} = 5.0\text{ V}$, $V_{SS} = AV_{SS} = 0.0\text{ V}$ $T_c = -40\text{ }^\circ\text{C}$ to $110\text{ }^\circ\text{C}$ Output pins left open				
Parameter	Symbol	Conditions	Rating		Unit	
			TYP	MAX		
C1	NORMAL mode	I_{DD1}	$F_{OSC} = 10\text{ MHz}$, PLL is used $CPUCLK = 160\text{ MHz}$, $IOCLK = 80\text{ MHz}$ CPU and Peripheral circuits are operating. Analog circuits are stopped.	90	190	mA
C2	SLEEP mode	I_{DD2}	$F_{OSC} = 10\text{ MHz}$, PLL is used $CPUCLK = 160\text{ MHz}$, $IOCLK = 80\text{ MHz}$ CPU is stopped, Peripheral circuits are operating. Analog circuits are stopped.	60	160	
C3	DEEP SLEEP mode	I_{DD3}	$F_{OSC} = 10\text{ MHz}$, PLL is stopped, $CPUCLK = IOCLK = \text{Stop}$, CPU and Peripheral circuits are stopped. Analog circuits are stopped.	12	120	
C4		I_{DD4}	F_{OSC} is stopped, PLL is stopped.	10	120	

Note:

- *1 The measurement conditions are as follows.
- All I/O pins are output state. (No load)

Input pin 1 TEST		$V_{DD5} = AV_{DD5} = 5.0\text{ V}$, $V_{SS} = AV_{SS} = 0.0\text{ V}$ $T_c = -40\text{ }^\circ\text{C}$ to $110\text{ }^\circ\text{C}$					
Parameter	Symbol	Conditions	Rating			Unit	
			MIN	TYP	MAX		
C5	Input voltage "High level"	V_{IH1}	$V_{DD5} = AV_{DD5} = V_{RST5N}$ to 5.5 V	$V_{DD5} \times 0.7$	-	V_{DD5}	V
C6	Input voltage "Low level"	V_{IL1}	$V_{DD5} = AV_{DD5} = V_{RST5N}$ to 5.5 V	V_{SS}	-	$V_{DD5} \times 0.3$	
C7	Input leakage current	I_{LK1}	$V_{IN} = 0\text{ V}$ to V_{DD5}	-	-	± 10	μA

Input pin 2 NDMOD, SWDCLK		$V_{DD5} = AV_{DD5} = 5.0\text{ V}$, $V_{SS} = AV_{SS} = 0.0\text{ V}$ $T_c = -40\text{ }^\circ\text{C}$ to $110\text{ }^\circ\text{C}$					
Parameter	Symbol	Conditions	Rating			Unit	
			MIN	TYP	MAX		
C8	Input voltage "High level"	V_{IH2}	$V_{DD5} = AV_{DD5} = V_{RST5N}$ to 5.5 V	$V_{DD5} \times 0.7$	-	V_{DD5}	V
C9	Input voltage "Low level"	V_{IL2}	$V_{DD5} = AV_{DD5} = V_{RST5N}$ to 5.5 V	V_{SS}	-	$V_{DD5} \times 0.3$	
C10	Internal pull-up resistor	R_{IO2}	$V_{IN} = 0\text{ V}$	15	30	60	$\text{k}\Omega$



Input pin 3 PC0 to PC3, PD0, PD1, PE0, PE1		$V_{DD5} = AV_{DD5} = 5.0\text{ V}$, $V_{SS} = AV_{SS} = 0.0\text{ V}$ $T_c = -40\text{ }^\circ\text{C}$ to $110\text{ }^\circ\text{C}$					
Parameter	Symbol	Conditions	Rating			Unit	
			MIN	TYP	MAX		
C11	Input voltage "High level"	V_{IH3}	$V_{DD5} = AV_{DD5} = V_{RST5N}$ to 5.5 V	$V_{DD5} \times 0.7$	-	V_{DD5}	V
C12	Input voltage "Low level"	V_{IL3}	$V_{DD5} = AV_{DD5} = V_{RST5N}$ to 5.5 V	V_{SS}	-	$V_{DD5} \times 0.3$	
C13	Input leakage current	I_{LK3}	$V_{IN} = 0\text{ V}$ to V_{DD5}	-	-	± 15	μA
C14	Input voltage range	V_{IN3}	VGA is used	-2.0	-	V_{DD5}	V

I/O pin 1 NRST		$V_{DD5} = AV_{DD5} = 5.0\text{ V}$, $V_{SS} = AV_{SS} = 0.0\text{ V}$ $T_c = -40\text{ }^\circ\text{C}$ to $110\text{ }^\circ\text{C}$					
Parameter	Symbol	Conditions	Rating			Unit	
			MIN	TYP	MAX		
C15	Input voltage "High level"	V_{IH4}	$V_{DD5} = AV_{DD5} = V_{RST5N}$ to 5.5 V	$V_{DD5} \times 0.7$	-	V_{DD5}	V
C16	Input voltage "Low level"	V_{IL4}	$V_{DD5} = AV_{DD5} = V_{RST5N}$ to 5.5 V	V_{SS}	-	$V_{DD5} \times 0.3$	
C17	Internal pull-up resistor	R_{IO4}	$V_{IN} = 0\text{ V}$	15	30	60	$\text{k}\Omega$
C18	Output voltage "Low level"	V_{OL4}	$V_{DD5} = V_{RST5P}$ $I_{OL} = 3.0\text{ mA}$	-	-	0.5	V

I/O pin 2 SWDD		$V_{DD5} = AV_{DD5} = 5.0\text{ V}$, $V_{SS} = AV_{SS} = 0.0\text{ V}$ $T_c = -40\text{ }^\circ\text{C}$ to $110\text{ }^\circ\text{C}$					
Parameter	Symbol	Conditions	Rating			Unit	
			MIN	TYP	MAX		
C19	Input voltage "High level"	V_{IH5}	$V_{DD5} = AV_{DD5} = V_{RST5N}$ to 5.5 V	$V_{DD5} \times 0.7$	-	V_{DD5}	V
C20	Input voltage "Low level"	V_{IL5}	$V_{DD5} = AV_{DD5} = V_{RST5N}$ to 5.5 V	V_{SS}	-	$V_{DD5} \times 0.3$	
C21	Internal pull-up resistor	R_{IO5}	$V_{IN} = 0\text{ V}$	15	30	60	$\text{k}\Omega$
C22	Output voltage "High level"	V_{OH5}	$I_{OH} = -6.0\text{ mA}$	4.5	-	-	V
C23	Output voltage "Low level"	V_{OL5}	$I_{OL} = 6.0\text{ mA}$	-	-	0.5	



Parameter		Symbol	Conditions	Rating			Unit
				MIN	TYP	MAX	
I/O pin 3 P16, P17, P22, P24, P36, P42, P47, P60, P64 to P67, P70 to P77, P86, P87, P96, P97, PA6, PA7, PB0 to PB4, PB6, PB7, PC4 to PC7, PD2 to PD7, PE2 to PE7, PF0 to PF7			$V_{DD5} = AV_{DD5} = 5.0\text{ V}$, $V_{SS} = AV_{SS} = 0.0\text{ V}$ $T_c = -40\text{ }^\circ\text{C to }110\text{ }^\circ\text{C}$				
C24	Input voltage "High level"	V_{IH6}	$V_{DD5} = AV_{DD5} = V_{RST5N}$ to 5.5 V	$V_{DD5} \times 0.7$	-	V_{DD5}	V
C25	Input voltage "Low level"	V_{IL6}	$V_{DD5} = AV_{DD5} = V_{RST5N}$ to 5.5 V	V_{SS}	-	$V_{DD5} \times 0.3$	
C26	Input leakage current	I_{LK6}	$V_{IN} = 0\text{ V to }V_{DD5}$	-	-	± 10	μA
C27	Internal pull-up resistor	R_{IO6}	$V_{IN} = 0\text{ V}$	15	30	60	$\text{k}\Omega$
C28	Output voltage "High level"	V_{OH6}	$I_{OH} = -3.0\text{ mA}$	4.5	-	-	V
C29	Output voltage "Low level"	V_{OL6}	$I_{OL} = 3.0\text{ mA}$	-	-	0.5	

Parameter		Symbol	Conditions	Rating			Unit
				MIN	TYP	MAX	
I/O pin 4 P00 to P05, P10, P11, P25 to P27, P30 to P32, P34, P35, P40, P41, P44 to P46, P50, P51, P54 to P57, P61 to P63, P80 to P85, P90 to P95, PA0 to PA5			$V_{DD5} = AV_{DD5} = 5.0\text{ V}$, $V_{SS} = AV_{SS} = 0.0\text{ V}$ $T_c = -40\text{ }^\circ\text{C to }110\text{ }^\circ\text{C}$				
C30	Input voltage "High level"	V_{IH7}	$V_{DD5} = AV_{DD5} = V_{RST5N}$ to 5.5 V	$V_{DD5} \times 0.7$	-	V_{DD5}	V
C31	Input voltage "Low level"	V_{IL7}	$V_{DD5} = AV_{DD5} = V_{RST5N}$ to 5.5 V	V_{SS}	-	$V_{DD5} \times 0.3$	
C32	Input leakage current	I_{LK7}	$V_{IN} = 0\text{ V to }V_{DD5}$	-	-	± 10	μA
C33	Internal pull-up resistor	R_{IO7}	$V_{IN} = 0\text{ V}$	15	30	60	$\text{k}\Omega$
C34	Output voltage "High level"	V_{OH7}	$I_{OH} = -6.0\text{ mA}$	4.5	-	-	V
C35	Output voltage "Low level"	V_{OL7}	$I_{OL} = 6.0\text{ mA}$	-	-	0.5	



I/O pin 5 P06, P07, P52, P53		$V_{DD5} = AV_{DD5} = 5.0\text{ V}$, $V_{SS} = AV_{SS} = 0.0\text{ V}$ $T_c = -40\text{ }^\circ\text{C to }110\text{ }^\circ\text{C}$					
Parameter		Symbol	Conditions	Rating			Unit
				MIN	TYP	MAX	
C36	Input voltage "High level" 1	V_{IH81}	$V_{DD5} = AV_{DD5} = V_{RST5N}$ to 5.5 V Register PnILV=0	$V_{DD5} \times 0.7$	-	V_{DD5}	V
C37	Input voltage "High level" 2	V_{IH82}	$V_{DD5} = AV_{DD5} = V_{RST5N}$ to 5.5 V Register PnILV=1	1.35	-	V_{DD5}	
C38	Input voltage "Low level" 1	V_{IL81}	$V_{DD5} = AV_{DD5} = V_{RST5N}$ to 5.5 V Register PnILV=0	V_{SS}	-	$V_{DD5} \times 0.3$	
C39	Input voltage "Low level" 2	V_{IL82}	$V_{DD5} = AV_{DD5} = V_{RST5N}$ to 5.5 V Register PnILV=1	V_{SS}	-	0.8	
C40	Input leakage current	I_{LK8}	$V_{IN} = 0\text{ V to }V_{DD5}$	-	-	± 10	μA
C41	Internal pull-up resistor	R_{IO8}	$V_{IN} = 0\text{ V}$	15	30	60	k Ω
C42	Output voltage "High level"	V_{OH8}	$I_{OH} = -6.0\text{ mA}$	4.5	-	-	V
C43	Output voltage "Low level"	V_{OL8}	$I_{OL} = 6.0\text{ mA}$	-	-	0.5	

I/O pin 6 P12 to P15, P20, P21		$V_{DD5} = AV_{DD5} = 5.0\text{ V}$, $V_{SS} = AV_{SS} = 0.0\text{ V}$ $T_c = -40\text{ }^\circ\text{C to }110\text{ }^\circ\text{C}$					
Parameter		Symbol	Conditions	Rating			Unit
				MIN	TYP	MAX	
C44	Input voltage "High level" 1	V_{IH91}	$V_{DD5} = AV_{DD5} = V_{RST5N}$ to 5.5 V Register PnILV=0	$V_{DD5} \times 0.7$	-	V_{DD5}	V
C45	Input voltage "High level" 2	V_{IH92}	$V_{DD5} = AV_{DD5} = V_{RST5N}$ to 5.5 V Register PnILV=1	$V_{DD5} \times 0.8$	-	V_{DD5}	
C46	Input voltage "Low level" 1	V_{IL91}	$V_{DD5} = AV_{DD5} = V_{RST5N}$ to 5.5 V Register PnILV=0	V_{SS}	-	$V_{DD5} \times 0.3$	
C47	Input voltage "Low level" 2	V_{IL92}	$V_{DD5} = AV_{DD5} = V_{RST5N}$ to 5.5 V Register PnILV=1	V_{SS}	-	$V_{DD5} \times 0.2$	
C48	Input leakage current	I_{LK9}	$V_{IN} = 0\text{ V to }V_{DD5}$	-	-	± 10	μA
C49	Internal pull-up resistor	R_{IO9}	$V_{IN} = 0\text{ V}$	15	30	60	k Ω
C50	Output voltage "High level"	V_{OH9}	$I_{OH} = -6.0\text{ mA}$	4.5	-	-	V
C51	Output voltage "Low level"	V_{OL9}	$I_{OL} = 6.0\text{ mA}$	-	-	0.5	



1.5.4 Analog Characteristics

This LSI Manual shows the electrical characteristics of analog.

1.5.4.1 12bit A/D Converter

ADC0, ADC1, ADC2			V _{DD5} = AV _{DD5} = 5.0 V, V _{SS} = AV _{SS} = 0.0 V T _c = -40 °C to 110 °C				
Parameter	Symbol	Conditions	Rating			Unit	
			MIN	TYP	MAX		
D1	Resolution	-	-	-	12	Bits	
D2	Conversion clock	-	10	-	40	MHz	
D3	Integral non-linearity error	INLE _{AD}	-	-	±3	LSB	
D4	Differential non-linearity error	DNLE _A D	Sampling time ≥ 150 ns Conversion clock = 40 MHz	-	-	±3	LSB
D5	Zero transition voltage	-		-20	-	20	mV
D6	Full-scale transition voltage	-		4980	-	5020	mV
D7	A/D conversion time	-		0.5	-	-	μs
D8	Input dynamic range	V _{IA}	AV _{SS}	-	AV _{DD5}	V	
D9	Power supply current during operation	I _{AD}	Conversion clock = 40 MHz	-	2.5	-	mA/unit



1.5.4.2 Programmable Gain Amplifier (VGA)

VGA00 to 02, VGA1, VGA2			V _{DD5} = AV _{DD5} = 5.0 V, V _{SS} = AV _{SS} = 0.0 V T _c = -40 °C to 110 °C				
Parameter		Symbol	Conditions	Rating			Unit
				MIN	TYP	MAX	
D10	Gain	G _{VGA}		1	-	20	times
D11	Gain error	G _{ERR1}	G _{VGA} = 1 to 10 times	-	±0.7	±1.5	%
		G _{ERR2}	G _{VGA} = 20 times	-	±1.2	±2.0	
D12	Output offset voltage	V _{OFFG1}	G _{VGA} = 1 to 10 times	-	±80	±120	mV
		V _{OFFG2}	G _{VGA} = 20 times	-	±130	±180	
D13	Output reference voltage range	V _{REFG}		1.0	-	4.0	V
D14	Output dynamic range	V _{OG}		1.0	-	4.0	
D15	Input dynamic range	V _{IG1}	G _{VGA} =1 time	-2.0	-	3.0	
		V _{IG2}	G _{VGA} =2 times	-1.5	-	1.5	
		V _{IG3}	G _{VGA} =3 times	-1.0	-	1.0	
		V _{IG4}	G _{VGA} =4 times	-0.75	-	0.75	
		V _{IG5}	G _{VGA} =5 times	-0.6	-	0.6	
		V _{IG6}	G _{VGA} =6 times	-0.5	-	0.5	
		V _{IG7}	G _{VGA} =8 times	-0.375	-	0.375	
		V _{IG8}	G _{VGA} =10 times	-0.3	-	0.3	
		V _{IG9}	G _{VGA} =20 times	-0.15	-	0.15	
D16	Power supply current during operation	I _G	G _{VGA} =10 times, V _{INP} =V _{INN} =0.0 V	-	2.6	-	mA/ Unit



1.5.4.3 Comparator

CMP00 to CMP41		$V_{DD5} = AV_{DD5} = 5.0 \text{ V}$, $V_{SS} = AV_{SS} = 0.0 \text{ V}$ $T_c = -40 \text{ }^\circ\text{C to } 110 \text{ }^\circ\text{C}$					
Parameter		Symbol	Conditions	Rating			Unit
				MIN	TYP	MAX	
D17	Input offset voltage	V_{OFFC}		-	-	± 20	mV
D18	Input dynamic range	V_{IC}		50	-	4950	
D19	Input hysteresis width	V_{HYSC}	CMPNn = 2.5 V	-	30	50	
D20	Minimum comparison voltage	V_{MINC}		20	-	-	
D21	Power supply current during operation	I_C		-	0.3	-	mA/ Unit

1.5.4.4 D/A Converter

8bit D/A Converter DAC00 to DAC41, DACV00 to 02, DACV1, DACV2		$V_{DD5} = AV_{DD5} = 5.0 \text{ V}$, $V_{SS} = AV_{SS} = 0.0 \text{ V}$ $T_c = -40 \text{ }^\circ\text{C to } 110 \text{ }^\circ\text{C}$					
Parameter		Symbol	Conditions	Rating			Unit
				MIN	TYP	MAX	
D22	Resolution			-	-	8	Bits
D23	Integral non-linearity error	$INLE_D$ A1		-	-	± 1	LSB
D24	Differential linearity error	$DNLE_D$ A1		-	-	± 1	
D25	Zero scale voltage	-		-20	-	80	mV
D26	Full scale voltage	-		4900	-	5020	
D27	Power supply current during operation	I_{DA1}		-	0.5	-	mA/ Unit

10bit D/A Converter DACA0, DACA1		$V_{DD5} = AV_{DD5} = 5.0 \text{ V}$, $V_{SS} = AV_{SS} = 0.0 \text{ V}$ $T_c = -40 \text{ }^\circ\text{C to } 110 \text{ }^\circ\text{C}$					
Parameter		Symbol	Conditions	Rating			Unit
				MIN	TYP	MAX	
D28	Resolution			-	-	10	Bits
D29	Integral non-linearity error	$INLE_D$ A2		-	-	± 3	LSB
D30	Differential linearity error	$DNLE_D$ A2		-	-	± 3	
D31	Zero scale voltage	-		-20	-	80	mV
D32	Full scale voltage	-		4950	-	5035	
D33	Power supply current during operation	I_{DA2}		-	0.5	-	mA/ Unit



1.5.4.5 Power Supply Voltage Detection(LVD)

				$V_{SS} = AV_{SS} = 0.0\text{ V}$ $T_c = -40\text{ }^\circ\text{C to } 110\text{ }^\circ\text{C}$			
Parameter		Symbol	Conditions	Rating			Unit
				MIN	TYP	MAX	
D34	Power supply voltage de- tection level	V_{LVDP}	At rising	4.0	4.2	4.4	V
D35		V_{LVDN}	At falling	3.9	4.1	4.3	
D36	Change rate of power supply voltage(V_{DD5})	ΔV_{DD5P}	At rising			5	V/ms
D37		ΔV_{DD5N}	At falling			1	

1.5.4.6 Power-on Reset

				$V_{SS} = AV_{SS} = 0.0\text{ V}$ $T_c = -40\text{ }^\circ\text{C to } 110\text{ }^\circ\text{C}$			
Parameter		Symbol	Conditions	Rating			Unit
				MIN	TYP	MAX	
D38	Power supply voltage de- tection level	V_{RST5P}	At rising	3.6	3.8	4.1	V
D39		V_{RST5N}	At falling	3.5	3.7	4.0	
D40		V_{RST3P}	At rising	2.40	2.55	2.70	
D41		V_{RST3N}	At falling	2.35	2.50	2.65	
D42	Change rate of power supply voltage(V_{DD5})	ΔV_{DD5P}	At rising	-	-	5	V/ms
D43		ΔV_{DD5N}	At falling	-	-	1	

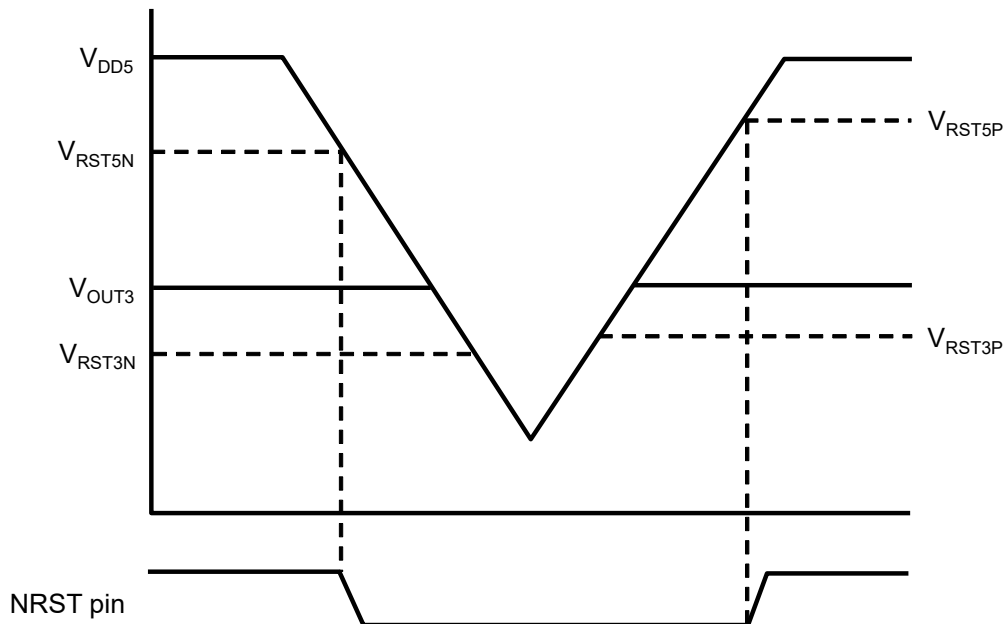


Figure 1.5-3 Characteristics of Power-on Reset Circuit



1.5.4.7 Internal Oscillation

Parameter		Sym- bol	Conditions	Rating			Unit
				MIN	TYP	MAX	
$V_{DD5} = AV_{DD5} = V_{RST5N}$ to 5.5 V, $V_{SS} = AV_{SS} = 0.0$ V $T_c = -40$ °C to 110 °C							
D44	Oscillation frequency	F_{RC}		9	10	11	MHz

1.5.5 AC Characteristics

Parameter		Sym- bol	Conditions	Rating			Unit
				MIN	TYP	MAX	
$V_{DD5} = AV_{DD5} = V_{RST5N}$ to 5.5 V, $V_{SS} = AV_{SS} = 0.0$ V $T_c = -40$ °C to 110 °C							
E1	Reset signal pulse width	t_{NRSTW}		1	-	-	µs

1.5.6 Flash EEPROM Characteristics

Parameter		Sym- bol	Conditions	Rating			Unit
				MIN	TYP	MAX	
$V_{DD5} = AV_{DD5} = V_{RST5N}$ to 5.5 V, $V_{SS} = AV_{SS} = 0.0$ V $T_c = -40$ °C to 110 °C							
F1	Allowable time of re-writing:1	E_{MAX1}	I-Flash, ECC function enabled	10,000	-	-	times
F2	Allowable times of re-writing:2	E_{MAX2}	D-Flash, ECC function enabled	30,000	100,000	-	
F3	Data retention period 1 (*1)	T_{HLD1}	I-Flash After rewriting E_{MAX1} (MIN) times	20	-	-	years
F4	Data retention period 2 (*1)	T_{HLD2}	D-Flash After rewriting E_{MAX2} (MIN) times	5	-	-	
F5	Data retention period 3 (*1)	T_{HLD3}	D-Flash After rewriting 1,000 times	10	-	-	

Note:

*1 Including time when power is turned off.

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1.6 Package Dimension

External dimensions of package are shown as follows.

- HQFP144-20□ Figure 1.6-1

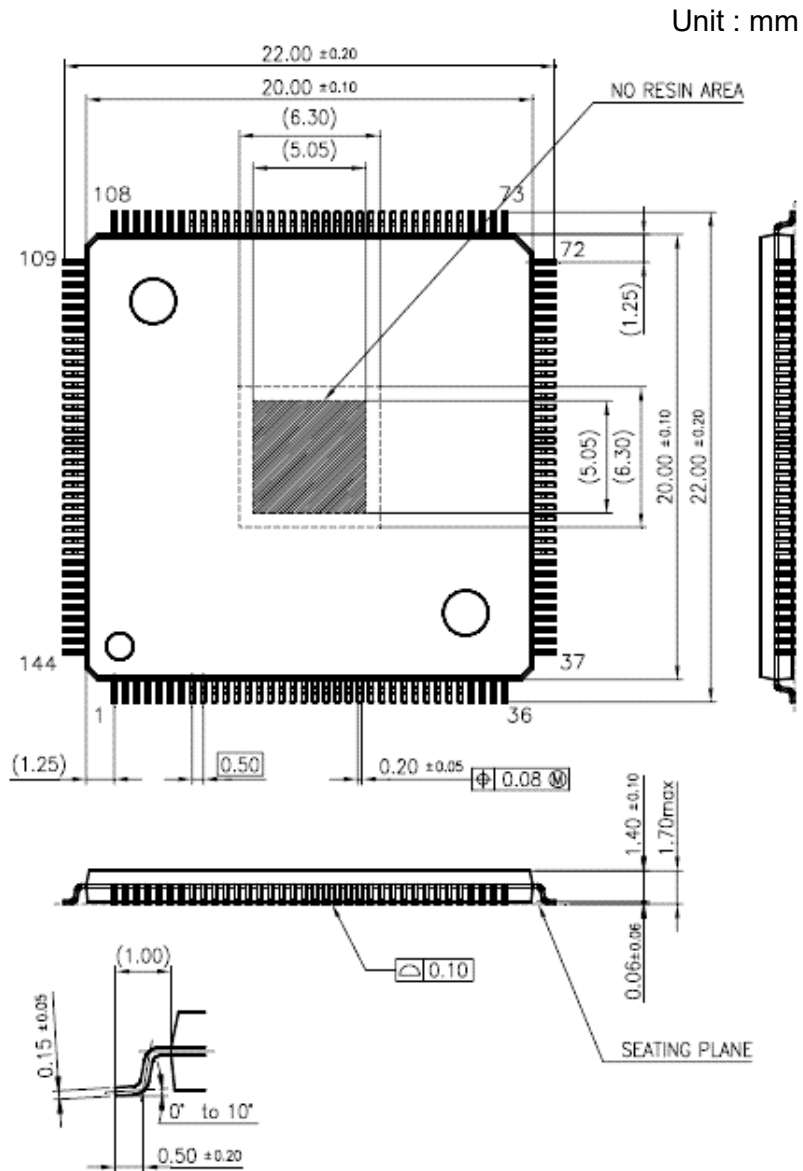


Figure 1.6-1 Package Dimension of HQFP144-20□ (unit: mm)

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