Preliminary Product Information

NEC

MOS Integrated Circuit

78K0/KE2

8-BIT SINGLE-CHIP MICROCONTROLLER

The 78K0/KE2 products are 8-bit single-chip microcontrollers of the 78K0 series.

These microcontrollers feature Single-voltage Self-programming Flash memory and many peripherals.

FEATURES

- 78K0 CPU core, 8-bit CISC architecture
- Flash EEPROM and RAM sizes

Item / Product name	Program memory (Flash EEPROM)	Data memory (RAM)
μPD78F0537	128K bytes (Flash)	7K bytes
μPD78F0536	96K bytes (Flash)	5K bytes
μPD78F0535	60K bytes (Flash)	3K bytes
μPD78F0534	48K bytes (Flash)	2K bytes
μPD78F0533	32K bytes (Flash)	1K bytes
μPD78F0532	24K bytes (Flash)	1K bytes
μPD78F0531	16K bytes (Flash)	768 bytes

ZUD-CC-0128-E
Data Published Oct 2004 N CP(K)

Minimum instruction cycle

0.1μs (20MHz@4.0V to 5.5V)

0.2μs (10MHz@2.7V to 5.5V)

0.4μs (5MHz@1.8V to 5.5V)

Clock

- MAIN CLOCK
  - Internal High-speed-oscillator 8MHz (Typ.)
  - Ceramic/Crystal Oscillator/External CLK (1MHz to 20MHz)
    (Instruction execution time = 100ns(min.) @20MHz)
- SUB CLOCK
  - 32.768KHz Crystal oscillator/ External CLK
- WDT CLOCK
  - Internal High-speed-oscillator 240KHz (Typ.)

Peripherals.

- On-Chip Power-On-Clear (POC) Circuit
- Low-Voltage Detector (LVI) Circuit
- Timer
  - 16bit Timer 2ch (1ch: μPD78F0533/0532/0531)
  - 8bit Timer 4ch
  - Watch Timer
  - Watchdog Timer (Operable with 240KHz Internal Low speed -oscillator)
- Serial Interface
  - UART/CSI 1ch
  - UART (with LIN-bus) 1ch
  - CSI 1ch (μPD78F0534/0535/0536/0537 only)
  - IIC 1ch
- Key Interrupt 8ch
- AD CONVERTER
  - 10-bit resolution A/D converter 8ch
- I/O PORT

  Total : 55

  CMOS I/O : 50

  CMOS Output: 1

  N-ch O.D I/O: 4
- MULTUPLIER/DIVIDER
  - 16bit x 16bit, 32bit / 16bit

    (μPD78F0534/0535/0536/0537 only)
- Other
  - Self programming
  - PCL / BUZ OUTPUT
  - On-chip debug function (μPD78F0537D only)

Interrupt

- Internal 19ch (16ch: μPD78F0531/0532/0533)
- External 9ch

Operation Voltage

1.8V to 5.5V

Package

64-pin TQFP(7mm x 7mm, 0.4mm pitch)

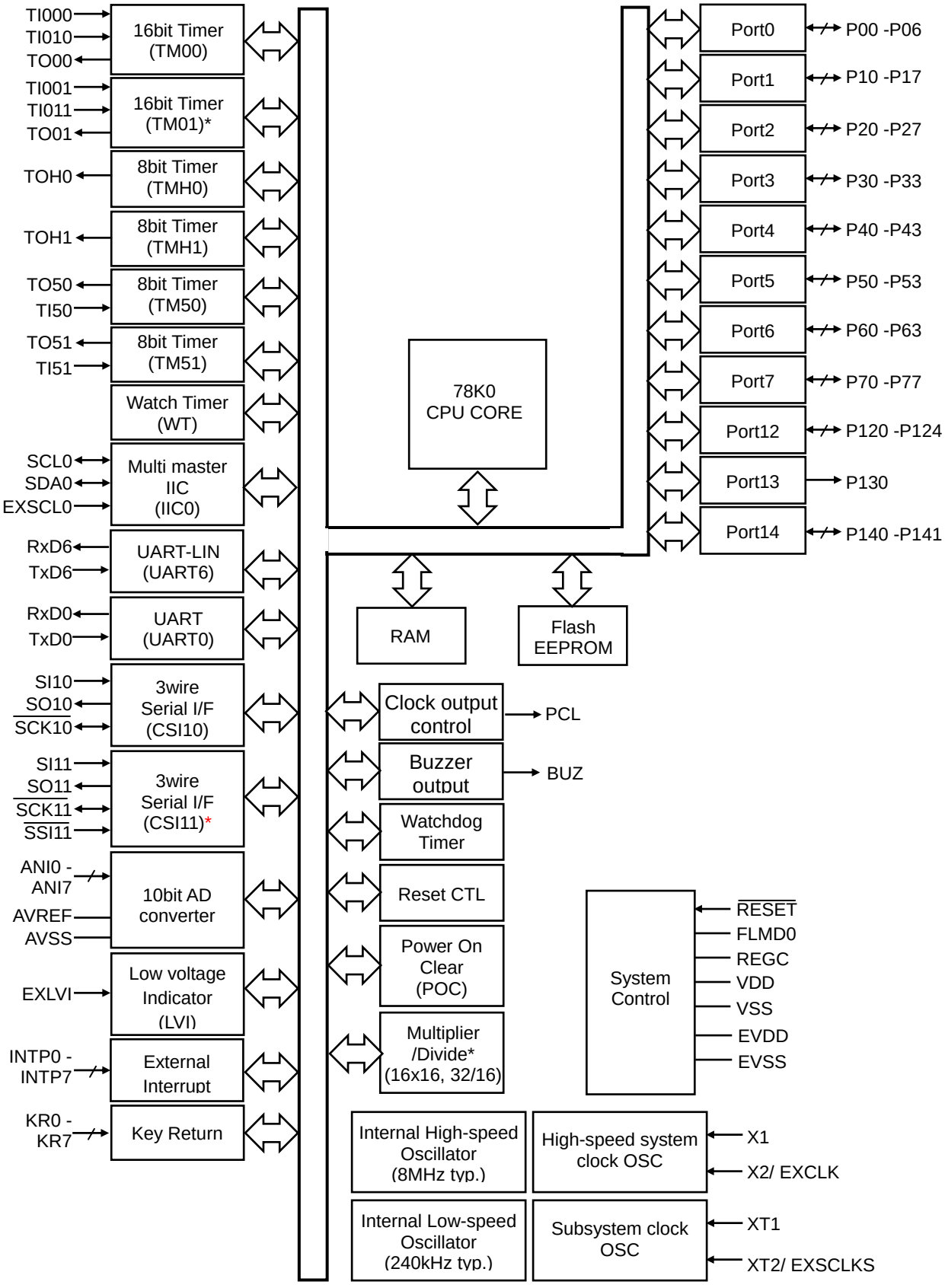
64-pin LQFP(10mm x 10mm, 0.5mm pitch)

64-pin LQFP(12mm x 12mm, 0.65mm pitch)

64-pin QFP(14mm x 14mm, 0.8mm pitch)

1. Block Diagram

Fig. 78K0/KE2



*: μPD78F0537/0536/0535/0534 only

2. Pin Lay Out

78K0/KE2

64-pin plastic QFP (14 x 14mm 0.8mm pitch)

μPD78F0537GC-UBS, μPD78F0536GC-UBS, μPD78F0535GC-UBS
μPD78F0534GC-UBS, μPD78F0533GC-UBS, μPD78F0532GC-UBS
μPD78F0531GC-UBS

64-pin plastic LQFP (12 x 12mm 0.65mm pitch)

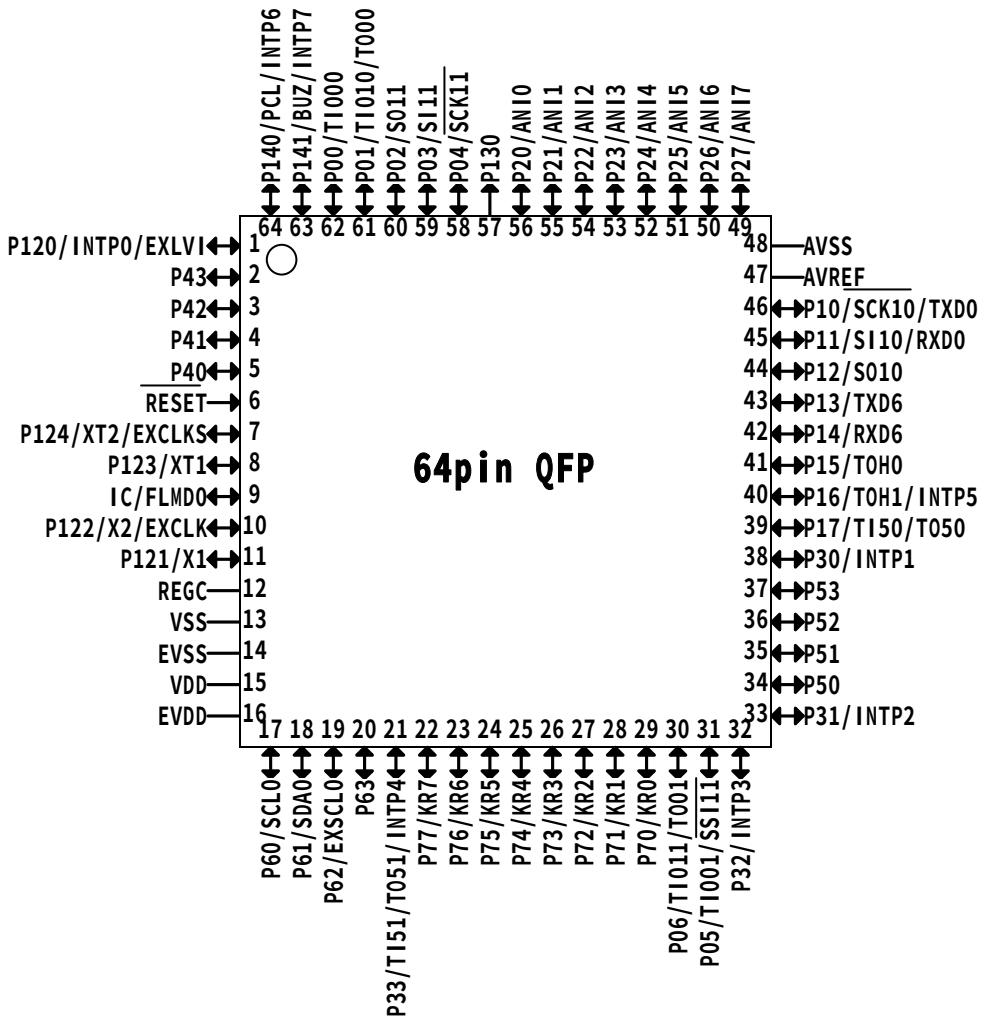
μPD78F0537GK-UET, μPD78F0536GK-UET, μPD78F0535GK-UET
μPD78F0534GK-UET, μPD78F0533GK-UET, μPD78F0532GK-UET
μPD78F0531GK-UET

64-pin plastic LQFP (10 x 10mm 0.5mm pitch)

μPD78F0537GB-UEU, μPD78F0536GB-UEU, μPD78F0535GB-UEU,
μPD78F0534GB-UEU, μPD78F0533GB-UEU, μPD78F0532GB-UEU,
μPD78F0531GB-UEU,

64-pin plastic TQFP (7 x 7mm 0.4mm pitch)

μPD78F0537GA-9EV, μPD78F0536GA-9EV, μPD78F0535GA-9EV,
μPD78F0534GA-9EV, μPD78F0533GA-9EV, μPD78F0532GA-9EV,
μPD78F0531GA-9EV,



*: μPD78F0537/0536/0535/0534 only

3. Pin Function

Table (1/2)

PIN NAME	Function
VDD	Positive power supply except for ports (except P20-P27 and P121-P124) and AD converter
VSS	Ground potential except for ports(except P20-P27 and P121-P124) and AD converter
EVDD	Positive power supply for ports (except P20-P27 and P121-P124)
EVSS	Ground potential for ports (except P20-P27 and P121-P124)
RESET	System reset input
FLMD0	Flash EEPROM programming mode setting
REGC	Connecting regulator stabilization capacitor. Connect to ground via a capacitor (0.47μF)
AVREF	A/D converter analog power supply and power supply for P20-P27
AVSS	Ground potential for A/D converter and P20 - P27.
P00 /TI00	I/O port
	External count clock input to 16-bit timer/event counter 00 Capture trigger input to capture registers (CR000, CR010) of16-bit timer/event counter 00 (TM00)
P01 /TI010 /TO00	I/O port
	Capture trigger input to capture register (CR000) of 16-bit timer/event counter 00 (TM00)
	16-bit timer/event counter 00 output (TM00)
P02 /SO11*	I/O port
	Serial data output from serial interface (CSI11)
P03 /SI11*	I/O port
	Serial data input to serial interface (CSI11)
P04 /SCK11*	I/O port
	Clock input/ output for serial interface (CSI11)
P05 /TI001* /SSI11*	I/O port
	External count clock input to 16-bit timer/event counter 01 Capture trigger input to capture registers (CR001, CR011) of16-bit timer/event counter 01 (TM01)
	Chip select input for serial interface (CSI11)
P06 /TI011* /TO01*	I/O port
	Capture trigger input to capture register (CR001) of 16-bit timer/event counter 01 (TM01)
	16-bit timer/event counter 01 output (TM01)
P10 /SCK10 /TXD0	I/O port
	Clock input/ output for serial interface (CSI10)
	Serial data output from asynchronous serial interface (UART0)
P11 /SI10 /RXD0	I/O port
	Serial data input to serial interface (CSI10)
	Serial data input to asynchronous serial interface (UART0)
P12 /SO10	I/O port
	Serial data output form serial interface (CSI10)
P13 /TXD6	I/O port
	Serial data output from asynchronous serial interface (UART6)
P14 /RXD6	I/O port
	Serial data input from asynchronous serial interface (UART6)
P15 /TOH0	I/O port
	8-bit timer H0 output (TMH0)
P16 /TOH1 /INTP5	I/O port
	8-bit timer H1 output (TMH1)
	External interrupt request input with specifiable valid edges
P17 /TI50 /TO50	I/O port
	External count clock input to 8-bit timer/event counter 50 (TM50)
	8-bit timer/event counter 50 output (TM50)

*: μPD78F0537/0536/0535/0534 only

Table(2/2)

PIN NAME	Function
P20- P27 / ANI0- ANI7	I/O ports A/D converter analog input
P30/INTP1	I/O port External interrupt request input with specifiable valid edges
P31/INTP2	
P32/INTP3	
P33 /TI51 /TO51 /INTP4	I/O port External count clock input to 8-bit timer/event counter 51(TM51) 8-bit timer/event counter 51output (TM51) External interrupt request input with specifiable valid edges
P40 - P43	I/O port
P50 - P53	I/O port
P60 /SCL0	I/O port (N-ch Open drain) Clock input/ output for serial interface (IIC0)
P61 /SDA0	I/O port (N-ch Open drain) Serial data input/ output for serial interface (IIC0)
P62 /EXSCL0	I/O port (N-ch Open drain) External clock input for serial interface (IIC0)
P63	I/O port (N-ch Open drain)
P70 – P77 /KR0 – KR7	I/O ports Key interrupt input
P120 /INTP0 /EXLVI	I/O port External interrupt request input with specifiable valid edges Reference voltage input for Low voltage Indicator
P121 /X1	I/O port (An external oscillation circuit is not used) Connecting resonator for main system clock oscillation
P122 /X2 /EXCLK	I/O port (An external oscillation circuit is not used) Connecting resonator for main system clock oscillation External clock input for main system clock
P123 /XT1	I/O port (An external oscillation circuit is not used) Connecting resonator for subsystem clock oscillation
P124 /XT2 /EXCLKS	I/O port (An external oscillation circuit is not used) Connecting resonator for subsystem clock oscillation External clock input for subsystem clock
P130	Output port
P140 /PCL /INTP6	I/O port Clock output External interrupt request input with specifiable valid edge
P141 /BUZ / INTP7 / BUSY0	I/O port Buzzer output External interrupt request input with specifiable valid edge Busy signal input for serial interface (AUTOCSI)

4. Memory space

78K0/KE2 have 64kB linear address area.

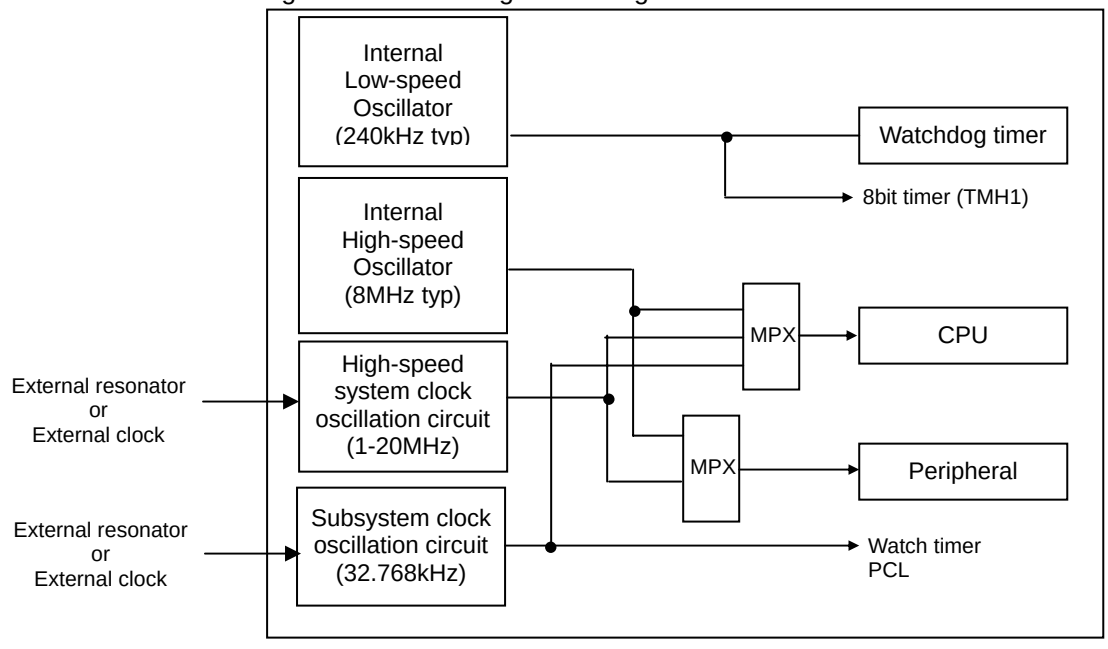
To access more than 64KB ROM area, 96KB and 128KB ROM products have BANK type ROM at address of 8000H to C000H. All BANK ROM size is 16KB.

Products	ROM size	Common ROM	Bank ROM	
		Address	Address	Number of Bank
μPD78F0537	128KB	0000H-7FFFH (32KB)	8000H-BFFFH (16KB)	6
μPD78F0536	96KB	0000H-7FFFH (32KB)	8000H-BFFFH (16KB)	4
μPD78F0535	60KB	0000H-EFFFH (60KB)	-	-
μPD78F0534	48KB	0000H-BFFFH (48KB)	-	-
μPD78F0533	32KB	0000H-7FFFH (32KB)	-	-
μPD78F0532	24KB	0000H-5FFFH (24KB)	-	-
μPD78F0531	16KB	0000H-3FFFH (16KB)	-	-

5. Clock

78K0/KE2 have 2 type internal oscillator and 2 type external resonator oscillation circuit. 78K0/KE2 can be operated Internal High-speed oscillator only. Internal Low-speed oscillator can connect to Watch dog timer and 8bit timer (TMH1) only for high secure.

Fig. Clock connecting block image



6. Outline of Functions of KE2

		μPD78F0531	μPD78F0532	μPD78F0533
Internal Memory (Byte)	Flash Memory	16 K	24 K	32 K
	Bank	-		
	High Speed RAM	768	1K	
	Extend RAM	-		
Main System Clock	Ceramic/Crystal	- 1 to 20 MHz: V_{DD} = 4.0 to 5.5 V - 1 to 10 MHz: V_{DD} = 2.7 to 5.5 V - 1 to 5 MHz: V_{DD} = 1.8 to 5.5 V		
	Internal oscillator	- 8 MHz(TYP.)		
Sub System Clock		- 32.768 kHz(TYP.)		
Internal Low Speed oscillator (For TMH1, WDT)		- 240 kHz(TYP.)		
Minimum Instruction Cycle		- 0.1 μs (Ceramic/ Crystal Operation f_{XH} = 20 MHz V_{DD} = 4.0 to 5.5 V)		
I/O		Total :55 - CMOS I/O :50 - CMOS Out :1 - N-ch O.D. :4		
Timer		- 16 Bit Timer/Event Counter:1ch - 8 Bit Timer/Event Counter:2ch - 8 bit Timer:2ch - Watch Timer:1ch - Watch Dog Timer:1ch		
	Timer Output	-5(PWM:34)		
PCL output		- 156.25kHz, 312.5kHz, 615kHz, 1.25MHz, 2.5MHz, 5MHz, 10MHz (f_{PRS} = 20 MHz)		
Buzzer Output		- 2.44 kHz, 4.88 kHz, 9.77 kHz, 19.54 kHz(f_{PRS} = 20 MHz)		
A/D Converter		- 10bit x 8ch		
Serial Interface		- UART (with LIN-bus):1ch - CSI/ UART:1ch - I^2C:1ch		
Multiplier/Divider		-		
Interrupt	Internal	16		
	External	9		
Key Return		8ch		
On Chip Debug Function		Product name is undecided.		
Voltage Range		V_{DD} = 1.8 to 5.5 V		
Operation temperature		Ta = -40°C to +85°C		
Package		- 64pin LQFP(10x10) 0.5mm pitch - 64pin LQFP(12x12) 0.65mm pitch - 64pin QFP(14x14) 0.8mm pitch		

		μPD78F0534	μPD78F0535	μPD78F0536	μPD78F0537
Internal Memory (Byte)	Flash Memory	48 K	60 K	96 K	128 K
	Bank	-	-	4	6
	High Speed RAM	1K			
	Extend RAM	1 K	2 K	4 K	6 K
Main System Clock	Ceramic/Crystal	- 1 to 20 MHz: V_{DD} = 4.0 to 5.5 V - 1 to 10 MHz: V_{DD} = 2.7 to 5.5 V - 1 to 5 MHz: V_{DD} = 1.8 to 5.5 V			
	Internal oscillator	- 8 MHz(TYP.)			
Sub System Clock		- 32.768 kHz(TYP.)			
Internal Low Speed oscillator (For TMH1, WDT)		- 240 kHz(TYP.)			
Minimum Instruction Cycle		- 0.1 μs (Ceramic/ Crystal Operation f_{XH} = 20 MHz V_{DD} = 4.0 to 5.5 V)			
I/O		Total :55 - CMOS I/O :50 - CMOS Out :1 - N-ch O.D. :4			
Timer		- 16 Bit Timer/Event Counter:2ch - 8 Bit Timer/Event Counter:2ch - 8 bit Timer:2ch - Watch Timer:1ch - Watch Dog Timer:1ch			
	Timer Output	-6(PWM:4)			
PCL output		- 156.25kHz, 312.5kHz, 615kHz, 1.25MHz, 2.5MHz, 5MHz, 10MHz (f_{PRS} = 20 MHz)			
Buzzer Output		- 2.44 kHz, 4.88 kHz, 9.77 kHz, 19.54 kHz(f_{PRS} = 20 MHz)			
A/D Converter		- 10bit x 8ch			
Serial Interface		- UART (with LIN-bus):1ch - CSI/ UART:1ch - CSI:1ch - I^2C:1ch			
Multiplier/Divider		16bitx16bit, 32bit/8bit			
Interrupt	Internal	19			
	External	9			
Key Return		8ch			
On Chip Debug Function		Product name is undecided.			
Voltage Range		V_{DD} = 1.8 to 5.5 V			
Operation temperature		Ta = -40°C to +85°C			
Package		- 64pin TQFP(7 x7) 0.4mm pitch - 64pin LQFP(10x10) 0.5mm pitch - 64pin LQFP(12x12) 0.65mm pitch - 64pin QFP(14x14) 0.8mm pitch			

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