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16/32-Bit

Architecture

XC2288H, XC2289H

16/32-Bit Single-Chip Microcontroller
with 32-Bit Performance

XC2000 Family / High Line

Data Sheet

V1.3 2011-07

Microcontrollers

Edition 2011-07

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Previous Versions:

V1.2, 2010-09

V1.1, 2010-02 Preliminary

Page	Subjects (major changes since last revision)
11	Clarified available Flash and SRAM memory allocation.
77	USIC "QSPI" protocol shortcut removed due to ambiguity (interpreted as Queued SPI or Quad SPI).
108	Relaxed the conditions for short-term deviation of internal clock source frequency Δf_{INT} .
108	Added startup time from power-on t_{SPO}
112	Removed the 128MHz conditions for N_{WSFLE}
119	Added the minimum PLL free running frequency. Reduced the min/max bandwidth.
139	Added notes on required pad settings for FlexRay operation. Added note on FlexRay operation frequency.
139	Corrected parameter name $f(oscdd)$ to $f(osc)$ in FleyRay timing table.
147	Thermal resistance values updated.

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**16/32-Bit Single-Chip Microcontroller
with 32-Bit Performance
XC228xH (XC2000 Family)**

1 Summary of Features

For a quick overview and easy reference, the features of the XC228xH are summarized here.

- High-performance CPU with five-stage pipeline and MPU
 - 10 ns instruction cycle @ 100 MHz CPU clock (single-cycle execution)
 - One-cycle 32-bit addition and subtraction with 40-bit result
 - One-cycle multiplication (16 × 16 bit)
 - Background division (32 / 16 bit) in 21 cycles
 - One-cycle multiply-and-accumulate (MAC) instructions
 - Enhanced Boolean bit manipulation facilities
 - Zero-cycle jump execution
 - Additional instructions to support HLL and operating systems
 - Register-based design with multiple variable register banks
 - Fast context switching support with two additional local register banks
 - 16 Mbytes total linear address space for code and data
 - 1,024 Bytes on-chip special function register area (C166 Family compatible)
 - Integrated Memory Protection Unit (MPU)
- Interrupt system with 16 priority levels providing 112 interrupt nodes
 - Selectable external inputs for interrupt generation and wake-up
 - Fastest sample-rate 10 ns
- Eight-channel interrupt-driven single-cycle data transfer with Peripheral Event Controller (PEC), 24-bit pointers cover total address space
- Clock generation from internal or external clock sources, using on-chip PLL or prescaler
- Hardware CRC-Checker with Programmable Polynomial to Supervise On-Chip Memory Areas
- On-chip memory modules
 - 8 Kbytes on-chip stand-by RAM (SBRAM)
 - 2 Kbytes on-chip dual-port RAM (DPRAM)
 - 24 Kbytes on-chip data SRAM (DSRAM)
 - Up to 112 Kbytes on-chip program/data SRAM (PSRAM)
 - Up to 1,600 Kbytes on-chip program memory (Flash memory)
 - Memory content protection through Error Correction Code (ECC)

Summary of Features

- On-Chip Peripheral Modules
 - Two synchronizable A/D Converters with up to 24 channels, 10-bit resolution, conversion time below 1 μ s, optional data preprocessing (data reduction, range check), broken wire detection
 - Up to two 16-channel general purpose capture/compare units (CCx)
 - Up to four capture/compare units for flexible PWM signal generation (CCU6x)
 - Multi-functional general purpose timer unit with 5 timers
 - Up to 10 serial interface channels to be used as UART, LIN, high-speed synchronous channel (SPI/QSPI), IIC bus interface (10-bit addressing, 400 kbit/s), IIS interface
 - On-chip MultiCAN interface (Rev. 2.0B active) with up to 256 message objects (Full CAN/Basic CAN) on up to 6 CAN nodes and gateway functionality
 - FlexRay™ module (E-Ray) according to protocol specification V2.1, with 2 nodes
 - On-chip system timer and on-chip real time clock
- Up to 12 Mbytes external address space for code and data
 - Programmable external bus characteristics for different address ranges
 - Multiplexed or demultiplexed external address/data buses
 - Selectable address bus width
 - 16-bit or 8-bit data bus width
 - Five programmable chip-select signals
- Single power supply from 3.0 V to 5.5 V
- Power reduction and wake-up modes with flexible power management
- Programmable watchdog timer and oscillator watchdog
- Up to 118 general purpose I/O lines
- On-chip bootstrap loaders
- Supported by a full range of development tools including C compilers, macro-assembler packages, emulators, evaluation boards, HLL debuggers, simulators, logic analyzer disassemblers, programming boards
- On-chip debug support via Device Access Port (DAP) or JTAG interface
- 144-pin Green LQFP package, 0.5 mm (19.7 mil) pitch

Ordering Information

The ordering code for an Infineon microcontroller provides an exact reference to a specific product. This ordering code identifies:

- the derivative itself, i.e. its function set, the temperature range, and the supply voltage
- the temperature range:
 - SAF-...: -40°C to 85°C
 - SAH-...: -40°C to 110°C
 - SAK-...: -40°C to 125°C
- the package and the type of delivery.

For ordering codes for the XC228xH please contact your sales representative or local distributor.

This document describes several derivatives of the XC228xH group:

Basic Device Types are readily available and

Special Device Types are only available on request.

As this document refers to all of these derivatives, some descriptions may not apply to a specific product, in particular to the special device types.

For simplicity the term **XC228xH** is used for all derivatives throughout this document.

1.1 Basic Device Types

Basic device types are available and can be ordered through Infineon's direct and/or distribution channels.

Table 1 Synopsis of XC228xH Basic Device Types

Derivative ¹⁾	Flash Memory ²⁾	PSRAM ³⁾	Capt./Comp. Modules	ADC ⁴⁾ Chan.	Interfaces ⁴⁾
XC2288H-200F _x L	1,600 Kbytes	112 Kbytes	CC1/2 CCU60/1/2/3	16 + 8	4 CAN Nodes, 10 Serial Chan.

1) x is a placeholder for available speed grade in MHz. Can be 100 only.

2) Specific information about the on-chip Flash memory in [Table 3](#) and [Table 4](#).

3) All derivatives additionally provide 8 Kbytes SBRAM, 2 Kbytes DPRAM, and 24 Kbytes DSRAM.

4) Specific information about the available channels in [Table 5](#).

Analog input channels are listed for each Analog/Digital Converter module separately (ADC0 + ADC1).

1.2 Special Device Types

Special device types are only available for high-volume applications on request.

Table 2 Synopsis of XC228xH Special Device Types

Derivative ¹⁾	Flash Memory ²⁾	PSRAM ³⁾	Capt./Comp. Modules	ADC ⁴⁾ Chan.	Interfaces ⁴⁾
XC2288H-136F _x L	1,088 Kbytes	80 Kbytes	CC1/2 CCU60/1/2/3	16 + 8	4 CAN Nodes 10 Serial Chan.
XC2289H-136F _x L	1,088 Kbytes	80 Kbytes	CC1/2 CCU60/1/2/3	16 + 8	2 FlexRay Nodes 6 CAN Nodes 10 Serial Chan.
XC2289H-200F _x L	1,600 Kbytes	112 Kbytes	CC1/2 CCU60/1/2/3	16 + 8	2 FlexRay Nodes 6 CAN Nodes 10 Serial Chan.

1) x is a placeholder for available speed grade in MHz. Can be 80 or 100.

2) Specific information about the on-chip Flash memory in [Table 3](#) and [Table 4](#).

3) All derivatives additionally provide 8 Kbytes SBRAM, 2 Kbytes DPRAM, and 24 Kbytes DSRAM.

4) Specific information about the available channels in [Table 5](#).

Analog input channels are listed for each Analog/Digital Converter module separately (ADC0 + ADC1).

1.3 Definition of Feature Variants

The XC228xH types are offered with several Flash memory sizes. [Table 3](#) and [Table 4](#) describe the location of the available Flash memory.

Table 3 Continuous Flash Memory Ranges

Total Flash Size	1st Range ¹⁾	2nd Range	3rd Range
1,600 Kbytes	C0'0000 _H ... C0'FFFF _H	C1'0000 _H ... D8'FFFF _H	n.a.
1,088 Kbytes	C0'0000 _H ... C0'FFFF _H	C1'0000 _H ... CF'FFFF _H	D8'0000 _H ... D8'FFFF _H

1) The uppermost 4-Kbyte sector of the first Flash segment is reserved for internal use (C0'F000_H to C0'FFFF_H).

Table 4 Flash Memory Module Allocation (in Kbytes)

Total Flash Size	Flash 0 ¹⁾	Flash 1	Flash 2	Flash 3	Flash 4	Flash 5	Flash 6
1,600	256	255	256	256	256	256	64
1,088	256	255	256	256	-	-	64

1) The uppermost 4-Kbyte sector of the first Flash segment is reserved for internal use (C0'F000_H to C0'FFFF_H).

The XC228xH types are offered with different interface options. [Table 5](#) lists the available channels for each option.

Table 5 Interface Channel Association

Total Number	Available Channels / Message Objects
16 ADC0 channels	CH0 ... CH15
8 ADC1 channels	CH0 ... CH7
6 CAN nodes	CAN0, CAN1, CAN2, CAN3, CAN4, CAN5 256 message objects
4 CAN nodes	CAN0, CAN1, CAN2, CAN3 128 Message Objects
10 serial channels	U0C0, U0C1, U1C0, U1C1, U2C0, U2C1, U3C0, U3C1, U4C0, U4C1

Summary of Features

The XC228xH types are offered with several PSRAM memory sizes. **Figure 1** shows the allocation rules. For example 80 Kbytes of PSRAM will be allocated at E0'0000h-E1'3FFFh.

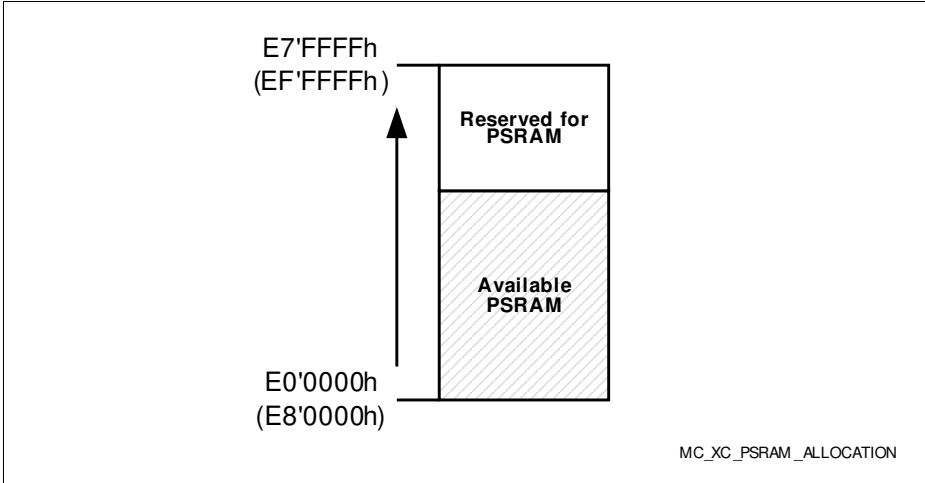


Figure 1 PSRAM Allocation

2 General Device Information

The XC228xH series (16/32-Bit Single-Chip Microcontroller with 32-Bit Performance) is a part of the Infineon XC2000 Family of full-feature single-chip CMOS microcontrollers. These devices extend the functionality and performance of the C166 Family in terms of instructions (MAC unit), peripherals, and speed. They combine high CPU performance (up to 100 million instructions per second) with extended peripheral functionality and enhanced IO capabilities. Optimized peripherals can be adapted flexibly to meet the application requirements. These derivatives utilize clock generation via PLL and internal or external clock sources. On-chip memory modules include program Flash, program RAM, and data RAM.

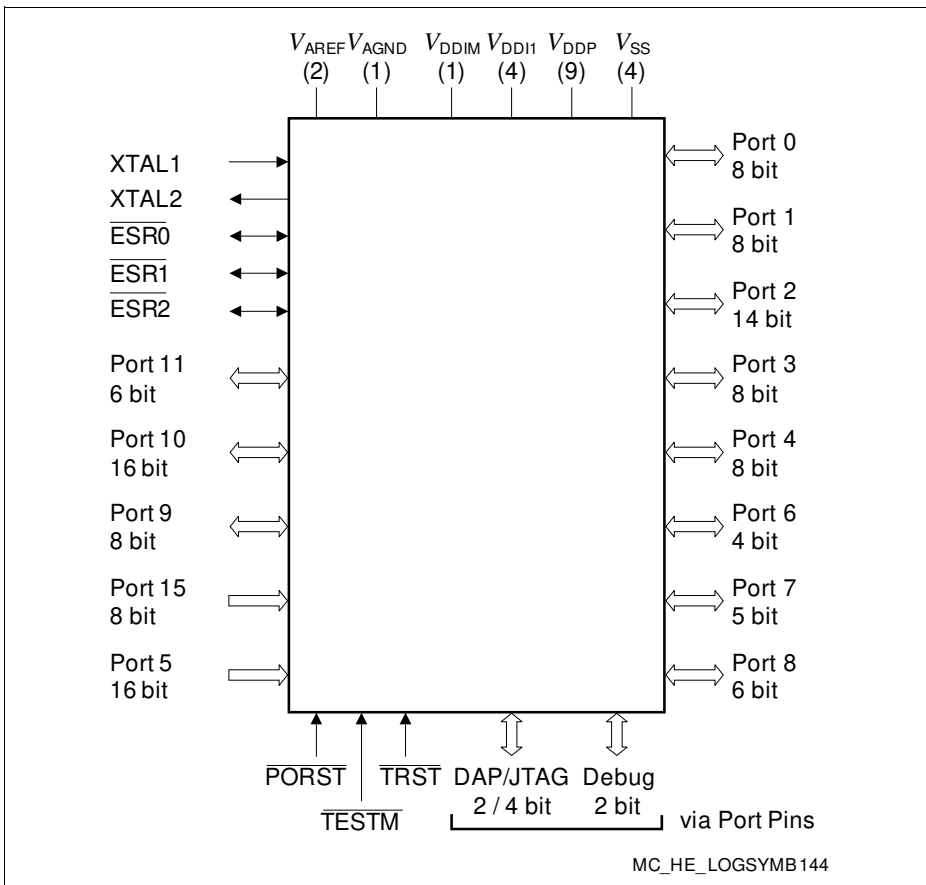


Figure 2 Logic Symbol

2.1 Pin Configuration and Definition

The pins of the XC228xH are described in detail in [Table 6](#), which includes all alternate functions. For further explanations please refer to the footnotes at the end of the table. The following figure summarizes all pins, showing their locations on the four sides of the package.

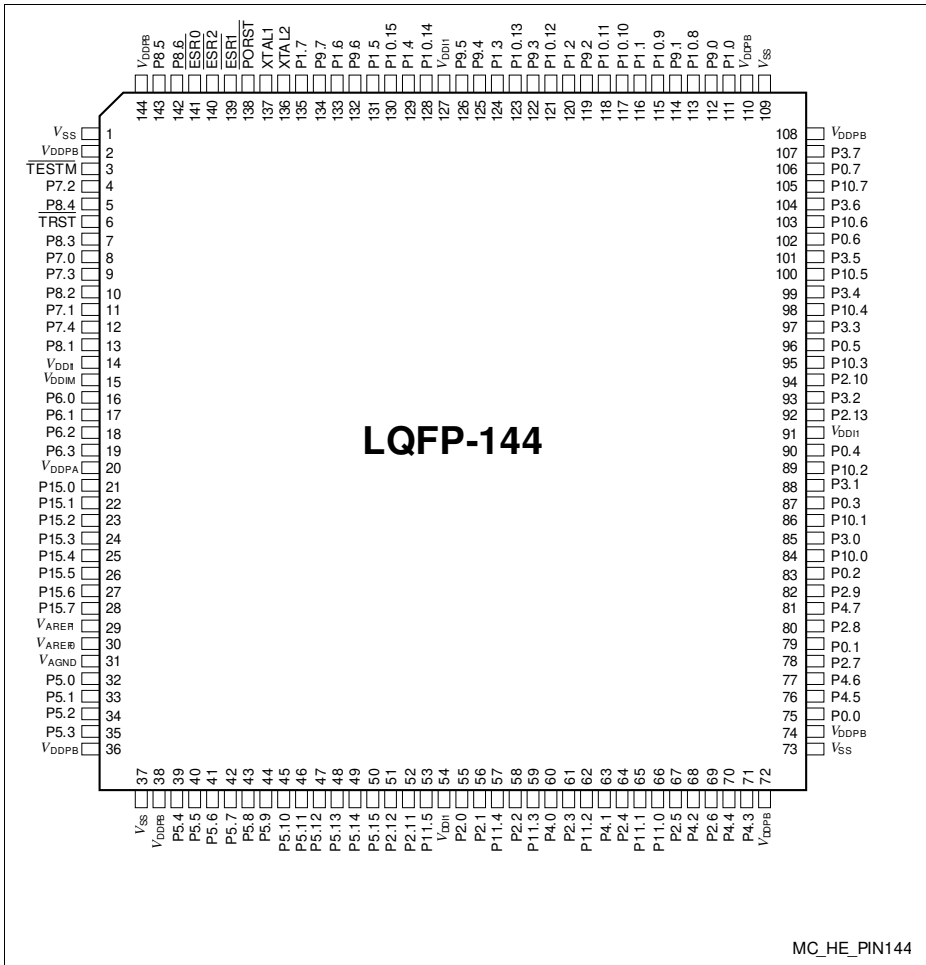


Figure 3 XC228xH Pin Configuration (top view)

Key to Pin Definitions

- **Ctrl.:** The output signal for a port pin is selected by bit field PC in the associated register Px_IOCry. Output O0 is selected by setting the respective bit field PC to 1x00_B, output O1 is selected by 1x01_B, etc. Output signal OH is controlled by hardware.
- **Type:** Indicates the pad type and its power supply domain (A, B, M, 1).
 - St: Standard pad
 - Sp: Special pad e.g. XTALx
 - DP: Double pad - can be used as standard or high speed pad
 - In: Input only pad
 - PS: Power supply pad

Table 6 Pin Definitions and Functions

Pin	Symbol	Ctrl.	Type	Function
3	TESTM	I	In/B	Testmode Enable Enables factory test modes, must be held HIGH for normal operation (connect to V _{DDPB}). An internal pull-up device will hold this pin high when nothing is driving it.
4	P7.2	O0 / I	St/B	Bit 2 of Port 7, General Purpose Input/Output
	EMUX0	O1	St/B	External Analog MUX Control Output 0 (ADC1)
	TxDC4	O2	St/B	CAN Node 4 Transmit Data Output
	TxDC5	O3	St/B	CAN Node 5 Transmit Data Output
	CCU62_CCP OS0A	I	St/B	CCU62 Position Input 0
	TDI_C	IH	St/B	JTAG Test Data Input If JTAG pos. C is selected during start-up, an internal pull-up device will hold this pin high when nothing is driving it.

Table 6 Pin Definitions and Functions (cont'd)

Pin	Symbol	Ctrl.	Type	Function
5	P8.4	O0 / I	St/B	Bit 4 of Port 8, General Purpose Input/Output
	CCU60_COU T61	O1	St/B	CCU60 Channel 1 Output
	CCU62_CC6 1	O2	St/B	CCU62 Channel 1 Output
	CC1_CC2	O3	St/B	CC1 Channel 2 Output
	TMS_D	IH	St/B	JTAG Test Mode Selection Input If JTAG pos. D is selected during start-up, an internal pull-up device will hold this pin high when nothing is driving it.
	CCU62_CC6 1INB	I	St/B	CCU62 Channel 1 Input
	U4C1_DX1A	I	St/B	USIC4 Channel 1 Shift Clock Input
6	$\overline{\text{TRST}}$	I	In/B	Test-System Reset Input For normal system operation, pin $\overline{\text{TRST}}$ should be held low. A high level at this pin at the rising edge of $\overline{\text{PORST}}$ activates the XC228xH's debug system. In this case, pin $\overline{\text{TRST}}$ must be driven low once to reset the debug system. An internal pull-down device will hold this pin low when nothing is driving it.
7	P8.3	O0 / I	St/B	Bit 3 of Port 8, General Purpose Input/Output
	CCU60_COU T60	O1	St/B	CCU60 Channel 0 Output
	CCU62_CC6 0	O2	St/B	CCU62 Channel 0 Output
	U4C1_SELO 0	O3	St/B	USIC4 Channel 1 Select/Control 0 Output
	TDI_D	IH	St/B	JTAG Test Data Input If JTAG pos. D is selected during start-up, an internal pull-up device will hold this pin low when nothing is driving it.
	CCU62_CC6 0INB	I	St/B	CCU62 Channel 0 Input

Table 6 Pin Definitions and Functions (cont'd)

Pin	Symbol	Ctrl.	Type	Function
8	P7.0	O0 / I	St/B	Bit 0 of Port 7, General Purpose Input/Output
	T3OUT	O1	St/B	GPT12E Timer T3 Toggle Latch Output
	T6OUT	O2	St/B	GPT12E Timer T6 Toggle Latch Output
	TDO_A	OH / IH	St/B	JTAG Test Data Output / DAP1 Input/Output If DAP pos. 0 or 2 is selected during start-up, an internal pull-down device will hold this pin low when nothing is driving it.
	ESR2_1	I	St/B	ESR2 Trigger Input 1
	RxDC4B	I	St/B	CAN Node 4 Receive Data Input
	U4C1_DX0C	I	St/B	USIC4 Channel 0 Receive Data Input
9	P7.3	O0 / I	St/B	Bit 3 of Port 7, General Purpose Input/Output
	EMUX1	O1	St/B	External Analog MUX Control Output 1 (ADC1)
	U0C1_DOUT	O2	St/B	USIC0 Channel 1 Shift Data Output
	U0C0_DOUT	O3	St/B	USIC0 Channel 0 Shift Data Output
	CCU62_CCP OS1A	I	St/B	CCU62 Position Input 1
	TMS_C	IH	St/B	JTAG Test Mode Selection Input If JTAG pos. C is selected during start-up, an internal pull-up device will hold this pin low when nothing is driving it.
	U0C1_DX0F	I	St/B	USIC0 Channel 1 Shift Data Input
10	P8.2	O0 / I	St/B	Bit 2 of Port 8, General Purpose Input/Output
	CCU60_CC6 2	O1	St/B	CCU60 Channel 2 Output
	TxDC1	O2	St/B	CAN Node 1 Transmit Data Output
	U1C1_DOUT	O3	St/B	USIC1 Channel 1 Shift Data output
	CCU60_CC6 2INB	I	St/B	CCU60 Channel 2 Input

Table 6 Pin Definitions and Functions (cont'd)

Pin	Symbol	Ctrl.	Type	Function
11	P7.1	O0 / I	St/B	Bit 1 of Port 7, General Purpose Input/Output
	EXTCLK	O1	St/B	Programmable Clock Signal Output
	TXDC4	O2	St/B	CAN Node 4 Transmit Data Output
	U4C1_DOUT	O3	St/B	USIC4 Channel 1 Shift Data Output
	U4C1_DX0D	I	St/B	USIC4 Channel 1 Shift Data Input
	CCU62_CTR APA	I	St/B	CCU62 Emergency Trap Input
	BRKIN_C	I	St/B	OCDS Break Signal Input
12	P7.4	O0 / I	St/B	Bit 4 of Port 7, General Purpose Input/Output
	EMUX2	O1	St/B	External Analog MUX Control Output 2 (ADC1)
	U0C1_DOUT	O2	St/B	USIC0 Channel 1 Shift Data Output
	U0C1_SCLK OUT	O3	St/B	USIC0 Channel 1 Shift Clock Output
	CCU62_CCP OS2A	I	St/B	CCU62 Position Input 2
	TCK_C	IH	St/B	DAP0/JTAG Clock Input If JTAG pos. C is selected during start-up, an internal pull-up device will hold this pin high when nothing is driving it. If DAP pos. 2 is selected during start-up, an internal pull-down device will hold this pin low when nothing is driving it.
	U0C0_DX0D	I	St/B	USIC0 Channel 0 Shift Data Input
U0C1_DX1E	I	St/B	USIC0 Channel 1 Shift Clock Input	
13	P8.1	O0 / I	St/B	Bit 1 of Port 8, General Purpose Input/Output
	CCU60_CC6 1	O1	St/B	CCU60 Channel 1 Output
	CC1_CC1	O2	St/B	CC1 Channel 1 Output
	U4C1_MCLK OUT	O3	St/B	USIC4 Channel 1 Master Clock Output
	CCU60_CC6 1INB	I	St/B	CCU60 Channel 1 Input
	RxDC1F	I	St/B	CAN Node 1 Receive Data Input

Table 6 Pin Definitions and Functions (cont'd)

Pin	Symbol	Ctrl.	Type	Function
16	P6.0	O0 / I	DA/A	Bit 0 of Port 6, General Purpose Input/Output
	EMUX0	O1	DA/A	External Analog MUX Control Output 0 (ADC0)
	TxDC2	O2	DA/A	CAN Node 2 Transmit Data Output
	BRKOUT	O3	DA/A	OCDS Break Signal Output
	ADCx_REQG TyG	I	DA/A	External Request Gate Input for ADC0/1
	U1C1_DX0E	I	DA/A	USIC1 Channel 1 Shift Data Input
17	P6.1	O0 / I	DA/A	Bit 1 of Port 6, General Purpose Input/Output
	EMUX1	O1	DA/A	External Analog MUX Control Output 1 (ADC0)
	T3OUT	O2	DA/A	GPT12E Timer T3 Toggle Latch Output
	U1C1_DOUT	O3	DA/A	USIC1 Channel 1 Shift Data Output
	ADCx_REQT RyE	I	DA/A	External Request Trigger Input for ADC0/1
	RxDC2E	I	DA/A	CAN Node 2 Receive Data Input
18	ESR1_6	I	DA/A	ESR1 Trigger Input 6
	P6.2	O0 / I	DA/A	Bit 2 of Port 6, General Purpose Input/Output
	EMUX2	O1	DA/A	External Analog MUX Control Output 2 (ADC0)
	T6OUT	O2	DA/A	GPT12E Timer T6 Toggle Latch Output
	U1C1_SCLK OUT	O3	DA/A	USIC1 Channel 1 Shift Clock Output
	U1C1_DX1C	I	DA/A	USIC1 Channel 1 Shift Clock Input
19	P6.3	O0 / I	DA/A	Bit 3 of Port 6, General Purpose Input/Output
	T3OUT	O2	DA/A	GPT12E Timer T3 Toggle Latch Output
	U1C1_SELO 0	O3	DA/A	USIC1 Channel 1 Select/Control 0 Output
	U1C1_DX2D	I	DA/A	USIC1 Channel 1 Shift Control Input
	ADCx_REQT RyF	I	DA/A	External Request Trigger Input for ADC0/1
21	P15.0	I	In/A	Bit 0 of Port 15, General Purpose Input
	ADC1_CH0	I	In/A	Analog Input Channel 0 for ADC1
22	P15.1	I	In/A	Bit 1 of Port 15, General Purpose Input
	ADC1_CH1	I	In/A	Analog Input Channel 1 for ADC1

Table 6 Pin Definitions and Functions (cont'd)

Pin	Symbol	Ctrl.	Type	Function
23	P15.2	I	In/A	Bit 2 of Port 15, General Purpose Input
	ADC1_CH2	I	In/A	Analog Input Channel 2 for ADC1
	T5INA	I	In/A	GPT12E Timer T5 Count/Gate Input
24	P15.3	I	In/A	Bit 3 of Port 15, General Purpose Input
	ADC1_CH3	I	In/A	Analog Input Channel 3 for ADC1
	T5EUDA	I	In/A	GPT12E Timer T5 External Up/Down Control Input
25	P15.4	I	In/A	Bit 4 of Port 15, General Purpose Input
	ADC1_CH4	I	In/A	Analog Input Channel 4 for ADC1
	T6INA	I	In/A	GPT12E Timer T6 Count/Gate Input
26	P15.5	I	In/A	Bit 5 of Port 15, General Purpose Input
	ADC1_CH5	I	In/A	Analog Input Channel 5 for ADC1
	T6EUDA	I	In/A	GPT12E Timer T6 External Up/Down Control Input
27	P15.6	I	In/A	Bit 6 of Port 15, General Purpose Input
	ADC1_CH6	I	In/A	Analog Input Channel 6 for ADC1
28	P15.7	I	In/A	Bit 7 of Port 15, General Purpose Input
	ADC1_CH7	I	In/A	Analog Input Channel 7 for ADC1
29	V _{AREF1}	-	PS/A	Reference Voltage for A/D Converter ADC1
30	V _{AREF0}	-	PS/A	Reference Voltage for A/D Converter ADC0
31	V _{AGND}	-	PS/A	Reference Ground for A/D Converters ADC0/1
32	P5.0	I	In/A	Bit 0 of Port 5, General Purpose Input
	ADC0_CH0	I	In/A	Analog Input Channel 0 for ADC0
33	P5.1	I	In/A	Bit 1 of Port 5, General Purpose Input
	ADC0_CH1	I	In/A	Analog Input Channel 1 for ADC0
34	P5.2	I	In/A	Bit 2 of Port 5, General Purpose Input
	ADC0_CH2	I	In/A	Analog Input Channel 2 for ADC0
	TDI_A	I	In/A	JTAG Test Data Input

Table 6 Pin Definitions and Functions (cont'd)

Pin	Symbol	Ctrl.	Type	Function
35	P5.3	I	In/A	Bit 3 of Port 5, General Purpose Input
	ADC0_CH3	I	In/A	Analog Input Channel 3 for ADC0
	T3INA	I	In/A	GPT12E Timer T3 Count/Gate Input
39	P5.4	I	In/A	Bit 4 of Port 5, General Purpose Input
	ADC0_CH4	I	In/A	Analog Input Channel 4 for ADC0
	CCU63_T12 HRB	I	In/A	External Run Control Input for T12 of CCU63
	T3EUDA	I	In/A	GPT12E Timer T3 External Up/Down Control Input
	TMS_A	I	In/A	JTAG Test Mode Selection Input
40	P5.5	I	In/A	Bit 5 of Port 5, General Purpose Input
	ADC0_CH5	I	In/A	Analog Input Channel 5 for ADC0
	CCU60_T12 HRB	I	In/A	External Run Control Input for T12 of CCU60
41	P5.6	I	In/A	Bit 6 of Port 5, General Purpose Input
	ADC0_CH6	I	In/A	Analog Input Channel 6 for ADC0
42	P5.7	I	In/A	Bit 7 of Port 5, General Purpose Input
	ADC0_CH7	I	In/A	Analog Input Channel 7 for ADC0
43	P5.8	I	In/A	Bit 8 of Port 5, General Purpose Input
	ADC0_CH8	I	In/A	Analog Input Channel 8 for ADC0
	ADC1_CH8	I	In/A	Analog Input Channel 8 for ADC1
	CCU6x_T12H RC	I	In/A	External Run Control Input for T12 of CCU60/1/2/3
	CCU6x_T13H RC	I	In/A	External Run Control Input for T13 of CCU60/1/2/3
	U2C0_DX0F	I	In/A	USIC2 Channel 0 Shift Data Input
44	P5.9	I	In/A	Bit 9 of Port 5, General Purpose Input
	ADC0_CH9	I	In/A	Analog Input Channel 9 for ADC0
	ADC1_CH9	I	In/A	Analog Input Channel 9 for ADC1
	CG2_T7IN	I	In/A	CAPCOM2 Timer T7 Count Input

Table 6 Pin Definitions and Functions (cont'd)

Pin	Symbol	Ctrl.	Type	Function
45	P5.10	I	In/A	Bit 10 of Port 5, General Purpose Input
	ADC0_CH10	I	In/A	Analog Input Channel 10 for ADC0
	ADC1_CH10	I	In/A	Analog Input Channel 10 for ADC1
	BRKIN_A	I	In/A	OCDS Break Signal Input
	U2C1_DX0F	I	In/A	USIC2 Channel 1 Shift Data Input
	CCU61_T13 HRA	I	In/A	External Run Control Input for T13 of CCU61
46	P5.11	I	In/A	Bit 11 of Port 5, General Purpose Input
	ADC0_CH11	I	In/A	Analog Input Channel 11 for ADC0
	ADC1_CH11	I	In/A	Analog Input Channel 11 for ADC1
47	P5.12	I	In/A	Bit 12 of Port 5, General Purpose Input
	ADC0_CH12	I	In/A	Analog Input Channel 12 for ADC0
48	P5.13	I	In/A	Bit 13 of Port 5, General Purpose Input
	ADC0_CH13	I	In/A	Analog Input Channel 13 for ADC0
	CCU63_T13 HRF	I	In/A	External Run Control Input for T13 of CCU63
49	P5.14	I	In/A	Bit 14 of Port 5, General Purpose Input
	ADC0_CH14	I	In/A	Analog Input Channel 14 for ADC0
	CC1_T0IN	I	St/B	CAPCOM1 Timer T7 Count Input
50	P5.15	I	In/A	Bit 15 of Port 5, General Purpose Input
	ADC0_CH15	I	In/A	Analog Input Channel 15 for ADC0
	RxDC2F	I	In/A	CAN Node 2 Receive Data Input
51	P2.12	O0 / I	St/B	Bit 12 of Port 2, General Purpose Input/Output
	U0C0_SELO 4	O1	St/B	USIC0 Channel 0 Select/Control 4 Output
	U0C1_SELO 3	O2	St/B	USIC0 Channel 1 Select/Control 3 Output
	TXDC2	O3	St/B	CAN Node 2 Transmit Data Output
	READY	IH	St/B	External Bus Interface READY Input
	U4C0_DX0A	I	St/B	USIC4 Channel 0 Shift Data Input

Table 6 Pin Definitions and Functions (cont'd)

Pin	Symbol	Ctrl.	Type	Function
52	P2.11	O0 / I	St/B	Bit 11 of Port 2, General Purpose Input/Output
	U0C0_SELO 2	O1	St/B	USIC0 Channel 0 Select/Control 2 Output
	U0C1_SELO 2	O2	St/B	USIC0 Channel 1 Select/Control 2 Output
	U3C1_DOUT	O3	St/B	USIC3 Channel 1 Shift Data Output
	BHE/WRH	OH	St/B	External Bus Interf. High-Byte Control Output Can operate either as Byte High Enable (BHE) or as Write strobe for High Byte (WRH).
53	P11.5	O0 / I	St/B	Bit 5 of Port 11, General Purpose Input/Output
	CCU61_CC6 0	O1	St/B	CCU61 Channel 0 Output
	CCU61_COU T63	O2	St/B	CCU61 Channel 3 Output
	U3C1_SELO 1	O3	St/B	USIC3 Channel 1 Select/Control 1 Output
	CCU61_CC6 0INB	I	St/B	CCU61 Channel 0 Input
	U3C1_DX2B	I	St/B	USIC3 Channel 1 Shift Control Input
	U4C0_DX2A	I	St/B	USIC4 Channel 0 Shift Control Input
55	P2.0	O0 / I	St/B	Bit 0 of Port 2, General Purpose Input/Output
	TxDC5	O1	St/B	CAN Node 5 Transmit Data Output
	CCU63_CC6 0	O2	St/B	CCU63 Channel 0 Output
	AD13	OH / IH	St/B	External Bus Interface Address/Data Line 13
	RxDC0C	I	St/B	CAN Node 0 Receive Data Input
	CCU63_CC6 0INB	I	St/B	CCU63 Channel 0 Input
	T5INB	I	St/B	GPT12E Timer T5 Count/Gate Input

Table 6 Pin Definitions and Functions (cont'd)

Pin	Symbol	Ctrl.	Type	Function
56	P2.1	O0 / I	St/B	Bit 1 of Port 2, General Purpose Input/Output
	TxDC0	O1	St/B	CAN Node 0 Transmit Data Output
	CCU63_CC6 1	O2	St/B	CCU63 Channel 1 Output
	AD14	OH / IH	St/B	External Bus Interface Address/Data Line 14
	RxDC5C	I	St/B	CAN Node 5 Receive Data Input
	CCU63_CC6 1INB	I	St/B	CCU63 Channel 1 Input
	T5EUDB	I	St/B	GPT12E Timer T5 External Up/Down Control Input
	ESR1_5	I	St/B	ESR1 Trigger Input 5
57	P11.4	O0 / I	St/B	Bit 4 of Port 11, General Purpose Input/Output
	CCU61_CC6 2	O1	St/B	CCU61 Channel 2 Output
	U3C1_DOUT	O2	St/B	USIC3 Channel 1 Shift Data Output
	RxDC5B	I	St/B	CAN Node 5 Receive Data Input
	CCU61_CC6 2INB	I	St/B	CCU61 Channel 2 Input
	U3C1_DX0B	I	St/B	USIC3 Channel 1 Shift Data Input
58	P2.2	O0 / I	St/B	Bit 2 of Port 2, General Purpose Input/Output
	TxDC1	O1	St/B	CAN Node 1 Transmit Data Output
	CCU63_CC6 2	O2	St/B	CCU63 Channel 2 Output
	AD15	OH / IH	St/B	External Bus Interface Address/Data Line 15
	CCU63_CC6 2INB	I	St/B	CCU63 Channel 2 Input
	ESR2_5	I	St/B	ESR2 Trigger Input 5

Table 6 Pin Definitions and Functions (cont'd)

Pin	Symbol	Ctrl.	Type	Function
59	P11.3	O0 / I	St/B	Bit 3 of Port 11, General Purpose Input/Output
	CCU61_COU T63	O1	St/B	CCU61 Channel 3 Output
	CCU61_COU T62	O2	St/B	CCU61 Channel 2 Output
	TxDC5	O3	St/B	CAN Node 5 Transmit Data Input
	CCU61_T13 HRF	I	St/B	External Run Control Input for T13 of CCU61
	U4C0_DX1A	I	St/B	USIC4 Channel 0 Shift Clock Input
60	P4.0	O0 / I	St/B	Bit 0 of Port 4, General Purpose Input/Output
	CC2_CC24	O3 / I	St/B	CAPCOM2 CC24IO Capture Inp./ Compare Out.
	CS0	OH	St/B	External Bus Interface Chip Select 0 Output
61	P2.3	O0 / I	St/B	Bit 3 of Port 2, General Purpose Input/Output
	U0C0_DOUT	O1	St/B	USIC0 Channel 0 Shift Data Output
	CCU63_COU T63	O2	St/B	CCU63 Channel 3 Output
	CC2_CC16	O3 / I	St/B	CAPCOM2 CC16IO Capture Inp./ Compare Out.
	A16	OH	St/B	External Bus Interface Address Line 16
	ESR2_0	I	St/B	ESR2 Trigger Input 0
	U0C0_DX0E	I	St/B	USIC0 Channel 0 Shift Data Input
	U0C1_DX0D	I	St/B	USIC0 Channel 1 Shift Data Input
RxDC0A	I	St/B	CAN Node 0 Receive Data Input	
62	P11.2	O0 / I	St/B	Bit 2 of Port 11, General Purpose Input/Output
	CCU61_CC6 1	O1	St/B	CCU61 Channel 1 Output
	U3C1_DOUT	O2	St/B	USIC3 Channel 1 Shift Data Output
	U4C0_SELO 1	O3	St/B	USIC4 Channel 0 Select/Control 1 Output
	CCU63_CCP OS2A	I	St/B	CCU63 Position Input 2
	CCU61_CC6 1INB	I	St/B	CCU61 Channel 1 Input