

# KS8695P

Integrated Multi-Port PCI Gateway Solution

Rev. 1.5

# **General Description**

The CENTAUR KS8695P, Multi-Port PCI Gateway Solution, delivers a new level of networking integration, performance, and overall BOM cost savings, enabling original equipment manufacturers (OEMs) to provide customers with feature-rich, low-cost solutions for the residential gateway and small office environment.

- Integration of a PCI arbiter supporting three external masters.
  - Allows incorporation of a variety of productivity enhancing system interfaces, including the expanding 802.11 a/g/b wireless LAN.
- High-performance ARM<sup>™</sup> CPU (ARM9) with 8KB I-cache, 8KB D-cache, and a memory management unit (MMU) for Linux and WinCE<sup>®</sup> support.

- XceleRouter™ technology to accelerate packet processing.
- Proven wire-speed switching technology that includes 802.1Q tag-based VLAN and quality of service (QoS) support.
- Five patented mixed-signal, low-powered Fast Ethernet transceivers with corresponding media access control (MAC) units.
- Advanced memory interface with programmable 8/16/32bit data and 22-bit address bus with up to 64MB of total memory space for Flash, ROM, SRAM, SDRAM, and external peripherals.





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# Features

The CENTAUR KS8695P featuring XceleRouter technology is a single-chip, multi-port PCI "gateway-ona-chip" with all the key components integrated for a highperformance and low-cost broadband gateway.

## • ARM9 High-Performance CPU Core

- ARM9 core at 166MHz
- 8KB I-cache and 8KB D-cache
- Memory management unit (MMU) for Linux and WinCE
- 32-bit ARM and 16-bit thumb instruction sets for smaller memory footprints

## • 33MHz 32-Bit PCI Interface

- Version PCI 2.1
- Supports bus mastership or guest-mode
- Supports normal and memory-mapped I/O
- Support for miniPCI and cardbus peripherals
- Integrated Ethernet Transceivers and Switch Engine
  - Five 10/100 Ethernet transceivers and five MACs (1P for WAN interface, 4P for LAN switching)
  - 100BASE-FX mode option on the WAN port and one LAN port
  - Automatic MDI/MDI-X crossover on all ports
  - Wire-speed, non-blocking switch
  - 802.1Q tag-based VLAN (16 VLANs, full range VID)
  - Port-based VLAN
  - QoS/CoS packet prioritization support: per port, 802.1p, and DiffServ-based
  - 64KB on-chip frame buffer SRAM
  - VLAN ID and 802.1P tag/untag option per port
  - 802.1D Spanning Tree Protocol support
  - Programmable rate-limiting per port: 0Mbps to 100Mbps, ingress and egress, rate options for high and low priority
  - Extensive MIB counter management support
  - IGMP snooping for multicast packet filtering
  - Dedicated 1K entry look-up engine
  - Port mirroring/monitoring/sniffing
  - Broadcast and multicast storm protection with % control global and per port basis
  - Full- and half-duplex flow control

## XceleRouter Technology

- TCP/UDP/IP packet header checksum generation to offload CPU tasks
- IPv4 packet fi Itering on checksum errors
- Automatic error packet discard
- DMA engine with burst-mode support for efficient WAN/LAN data transfers
- FIFOs for back-to-back packet transfers

- Memory and External I/O Interfaces
  - 8/16/32-bit wide shared data path for Flash, ROM, SRAM, SDRAM, and external I/O
  - Total memory space up to 64MB
  - Intel<sup>®</sup>/AMD<sup>®</sup>-type Flash support
- Peripheral Support
  - 8/16/32-bit external I/O interface supporting PCMCIA or generic CPU/DSP host I/F
  - Sixteen general purpose input/output (GPIO)
  - Two 32-bit timer counters (one watchdog)
  - Interrupt controller

## System Design

- Up to 166MHz CPU and 125MHz bus speed
- 289 PBGA package (19mm x 19mm) saving board real estate
- Two power supplies: 1.8V core and Ethernet RX supply, 3.3V I/O and Ethernet TX supply
- Built-in LED controls

## Debugging

- ARM9 JTAG debug interface
- UART for console port or modem back-up

## Power Management

- CPU and system clock speed step-down options
- Low-power Ethernet transceivers
- Per port power-down and Ethernet transmit disable
- Reference Hardware and Software Evaluation Kit
  - Hardware evaluation board (passes class B EMI)
  - Board support package including firmware source codes, Linux kernel, and software stacks
  - Complete hardware and software reference designs available

# Applications

- Multi-port wireless VoIP gateway
- Wireless mesh network node
- RG + combo 802.11 a/b/g/n access point
- Multimedia gateway
- Digital audio access point
- Network storage element
- Multi-port broadband gateway
- Multi-port firewall and VPN appliances
- Combination wireless and wireline gateway
- Fiber-to-the-home managed CPE

# **Ordering Information**

Commerc	ial Part Number	Temperature	Package
Standard	Pb (lead)-Free	Range	Fackage
KS8695P	KSZ8695P	0° to +70°C	289-Pin PBGA

Industria	I Part Number	Temperature	Package
Standard	Pb (lead)-Free	Range	Fackage
KS8695PI	KSZ8695PI	–40° to +85°C	289-Pin PBGA

# **Revision History**

Revision	Date	Summary of Changes
0.9	05/13/03	Created.
0.91	06/04/03	Corrected WRSTPLS sets WRSTO to active low when '1', and active high when '0'.
0.92	06/10/03	Changed pin A1 to GND. Changed pin E3, H7, J7, K7, L7 to AGND. Changed Figure 5 WRSTPLS to pull up.
0.93	07/11/03	Removed PCI 2.2 compliance. Removed TM from Centaur. Added LANFXSD1 signal description.
0.94	07/17/03	Updated DC Electrical Characteristics.
0.95	08/11/03	Added addressing description to memory controller and address pin description Table 11. Changed PRSTN to input in Table 10.
1.0	09/02/03	Changed Figure 1. Removed old register address tables and replaced with Figure 11. Added Memory Interface examples, Figures 7,8, and 9. Added memory interface description, section 2.5.
1.1	09/29/03	Changed Figure 2.
1.2	08/04/04	Transferred to Micrel format and updated System Clock.
1.3	01/27/05	Added recommended reset circuit.
1.4	08/18/05	Added wireless applications. Added Pb-Free and industrial specification. Edits to Pin Description Table.
1.5	05/18/06	Added Pb-Free option for industrial specification.

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# **System Level Applications**



Figure 1. KS8695P PCI Gateway System Options

# **Pin Description**

## Signal List Alphabetized by Name

Pin Number	Pin Name	Type <sup>(1)</sup>	Pin Function
U4	ADDR0	0	Address Bit.
T4	ADDR1	0	Address Bit.
R3	ADDR10	0	Address Bit.
P1	ADDR11	0	Address Bit.
P2	ADDR12	0	Address Bit.
N1	ADDR13	0	Address Bit.
N2	ADDR14	0	Address Bit.
N3	ADDR15	0	Address Bit.
N4	ADDR16	0	Address Bit.
M1	ADDR17	0	Address Bit.
M2	ADDR18	0	Address Bit.
M3	ADDR19	0	Address Bit.
U3	ADDR2	0	Address Bit.
P3	ADDR20/BA0	0	Address Bit/Bank Address Bit 0 for SDRAM Interface.
P4	ADDR2/BA1	0	Address Bit/Bank Address Bit 1 for SDRAM Interface.
Т3	ADDR3	0	Address Bit.
U2	ADDR4	0	Address Bit.
U1	ADDR5	0	Address Bit.
T1	ADDR6	0	Address Bit.
T2	ADDR7	0	Address Bit.
R1	ADDR8	0	Address Bit.
R2	ADDR9	0	Address Bit.
E3	AGND	Gnd	Analog Signal Ground.
H7	AGND	Gnd	Analog Signal Ground.
J7	AGND	Gnd	Analog Signal Ground.
K7	AGND	Gnd	Analog Signal Ground.
L7	AGND	Gnd	Analog Signal Ground.
D14	CBEN0	I/O	PCI Commands and Byte Enable 0. Active Low.
A11	CBEN1	I/O	PCI Commands and Byte Enable 1. Active Low.
B9	CBEN2	I/O	PCI Commands and Byte Enable 2. Active Low.
A6	CBEN3	I/O	PCI Commands and Byte Enable 3. Active Low.
B10	CLKRUNN	I/O	Cardbus Clock Run Request Signal. Active Low.
U15	DATA0	I/O	External Data Bit.
T15	DATA1	I/O	External Data Bit.
U12	DATA10	I/O	External Data Bit.
T12	DATA11	I/O	External Data Bit.

Note:

1. Gnd = Ground.

O = Output.

Pin Number	Pin Name	Type <sup>(1)</sup>	Pin Function
R12	DATA12	I/O	External Data Bit.
P12	DATA13	I/O	External Data Bit.
U11	DATA14	I/O	External Data Bit.
T11	DATA15	I/O	External Data Bit.
R11	DATA16	I/O	External Data Bit.
P11	DATA17	I/O	External Data Bit.
U10	DATA18	I/O	External Data Bit.
T10	DATA19	I/O	External Data Bit.
U14	DATA2	I/O	External Data Bit.
R10	DATA20	I/O	External Data Bit.
P10	DATA21	I/O	External Data Bit.
U9	DATA22	I/O	External Data Bit.
Т9	DATA23	I/O	External Data Bit.
R9	DATA24	I/O	External Data Bit.
P9	DATA25	I/O	External Data Bit.
U8	DATA26	I/O	External Data Bit.
Т8	DATA27	I/O	External Data Bit.
R8	DATA28	I/O	External Data Bit.
P8	DATA29	I/O	External Data Bit.
T14	DATA3	I/O	External Data Bit.
R7	DATA30	I/O	External Data Bit.
P7	DATA31	I/O	External Data Bit.
R14	DATA4	I/O	External Data Bit.
P14	DATA5	I/O	External Data Bit.
U13	DATA6	I/O	External Data Bit.
T13	DATA7	I/O	External Data Bit.
R13	DATA8	I/O	External Data Bit.
P13	DATA9	I/O	External Data Bit.
C11	DEVSELN	I/O	PCI Device Select Signal. Active Low.
R16	ECSN0	0	External I/O Device Chip Select. Active Low.
T16	ECSN1	0	External I/O Device Chip Select. Active Low.
U16	ECSN2	0	External I/O Device Chip Select. Active Low.
T17	EROEN/ WRSTPLS	O/I	ROM/SRAM/FLASH and External I/O Output Enable. Active Low. WRSTO Polarity Select. WRSTPLS = 0, WRSTO = Active High; WRSTPLS = 1, Active Low.
M17	ERWEN0/ TESTACK	0	External I/O and ROM/SRAM/FLASH Write Byte Enable. Active Low.
N17	ERWEN1/ TESTREQB	0	External I/O and ROM/SRAM/FLASH Write Byte Enable. Active Low.
P17	ERWEN2/ TESTREQA	0	External I/O and ROM/SRAM/FLASH Write Byte Enable. Active Low.

1. O = Output.

I/O = BidirectionaL.

Pin Number	Pin Name	Type <sup>(1)</sup>	Pin Function
R17	ERWEN3/ TICTESTENN	0	External I/O and ROM/SRAM/FLASH Write Byte Enable. Active Low.
P16	EWAITN	I	External Wait. Active Low.
D10	FRAMEN	I/O	PCI Bus Frame Signal. Active Low.
A1	GND	Gnd	Signal Ground.
G7	GND	Gnd	Signal Ground.
G8	GND	Gnd	Signal Ground.
G9	GND	Gnd	Signal Ground.
G10	GND	Gnd	Signal Ground.
G11	GND	Gnd	Signal Ground.
H8	GND	Gnd	Signal Ground.
H9	GND	Gnd	Signal Ground.
H10	GND	Gnd	Signal Ground.
H11	GND	Gnd	Signal Ground.
J8	GND	Gnd	Signal Ground.
J9	GND	Gnd	Signal Ground.
J10	GND	Gnd	Signal Ground.
J11	GND	Gnd	Signal Ground.
K8	GND	Gnd	Signal Ground.
K9	GND	Gnd	Signal Ground.
K10	GND	Gnd	Signal Ground.
K11	GND	Gnd	Signal Ground.
L8	GND	Gnd	Signal Ground.
L9	GND	Gnd	Signal Ground.
L10	GND	Gnd	Signal Ground.
L11	GND	Gnd	Signal Ground.
C4	GNT1N	0	PCI Bus Grant 2. Active Low. Output for Host Bridge Mode and Guest Bridge Mode.
C3	GNT2N	0	PCI Bus Grant 2. Active Low. Output for Host Bridge Mode. Not Used in Guest Bridge Mode.
C2	GNT3N	0	PCI Bus Grant 3. Active Low. Output for Host Bridge Mode. Not Used in Guest Bridge Mode.
G17	GPIO0/EINT0	I/O	General Purpose I/O Pin. External Interrupt Request Pin.
G16	GPIO1/EINT1	I/O	General Purpose I/O Pin. External Interrupt Request Pin.
K17	GPIO10	I/O	General Purpose I/O Pin.
K16	GPIO11	I/O	General Purpose I/O Pin.
K15	GPIO12	I/O	General Purpose I/O Pin.
K14	GPIO13	I/O	General Purpose I/O Pin.
L17	GPIO14	I/O	General Purpose I/O Pin.

1. Gnd = Ground.

I = Input.

O = Output.

Pin Number	Pin Name	Type <sup>(1)</sup>	Pin Function
L16	GPIO15	I/O	General Purpose I/O Pin.
H17	GPIO2/EINT2	I/O	General Purpose I/O Pin. External Interrupt Request Pin.
H16	GPIO3/EINT3	I/O	General Purpose I/O Pin. External Interrupt Request Pin.
H15	GPIO4/TOUT0	I/O	General Purpose I/O Pin. Timer 0 Output Pin.
H14	GPIO5/TOUT1	I/O	General Purpose I/O Pin. Timer 1 Output Pin.
J17	GPIO6	I/O	General Purpose I/O Pin.
J16	GPIO7	I/O	General Purpose I/O Pin.
J15	GPIO8	I/O	General Purpose I/O Pin.
J14	GPIO9	I/O	General Purpose I/O Pin.
D7	IDSEL	l	Initialization Device Select. Active High.
A9	IRDYN	I/O	PCI Initiator Ready Signal. Active Low.
F1	ISET	Ι	Set PHY Transmit Output Current. Connect to Ground with $3.01k\Omega \ 1\%$ Resistor.
B17	L1LED0	0	LAN Port 1 LED Programmable Indicator 0. Active Low.
B16	L1LED1	0	LAN Port 1 LED Programmable Indicator 1. Active Low.
C17	L2LED0	0	LAN Port 2 LED Programmable Indicator 0. Active Low.
C16	L2LED1	0	LAN Port 2 LED Programmable Indicator 1. Active Low.
D17	L3LED0	0	LAN Port 3 LED Programmable Indicator 0. Active Low.
D16	L3LED1	0	LAN Port 3 LED Programmable Indicator 1. Active Low.
E17	L4LED0	0	LAN Port 4 LED Programmable Indicator 0. Active Low.
E16	L4LED1	0	LAN Port 4 LED Programmable Indicator 1. Active Low.
H4	LANRXM1	l	LAN Port 1 PHY Receive Signal – (differential).
J4	LANRXM2	I	LAN Port 2 PHY Receive Signal – (differential).
K4	LANRXM3	l	LAN Port 3 PHY Receive Signal – (differential).
L4	LANRXM4	I	LAN Port 4 PHY Receive Signal – (differential).
H3	LANRXP1	l	LAN Port 1 PHY Receive Signal + (differential).
J3	LANRXP2		LAN Port 2 PHY Receive Signal + (differential).
K3	LANRXP3	l	LAN Port 3 PHY Receive Signal + (differential).
L3	LANRXP4	I	LAN Port 4 PHY Receive Signal + (differential).
H2	LANTXM1	0	LAN Port 1 PHY Transmit Signal – (differential).
J2	LANTXM2	0	LAN Port 2 PHY Transmit Signal – (differential).
K2	LANTXM3	0	LAN Port 3 PHY Transmit Signal – (differential).
L2	LANTXM4	0	LAN Port 4 PHY Transmit Signal – (differential).
H1	LANTXP1	0	LAN Port 1 PHY Transmit Signal + (differential).
J1	LANTXP2	0	LAN Port 2 PHY Transmit Signal + (differential).
K1	LANTXP3	0	LAN Port 3 PHY Transmit Signal + (differential).
L1	LANTXP4	0	LAN Port 4 PHY Transmit Signal + (differential).
E4	M66EN	I	PCI 66 MHz Enable.
D2	MPCIACTN	0	MiniPCI Active Signal. Active Low.
A16	PAD0	I/O	PCI Address and Data 0.

1. I = Input.

O = Output.

Pin Number	Pin Name	Type <sup>(1)</sup>	Pin Function
A15	PAD1	I/O	PCI Address and Data 1.
B13	PAD10	I/O	PCI Address and Data 10.
D13	PAD11	I/O	PCI Address and Data 11.
A12	PAD12	I/O	PCI Address and Data 12.
C12	PAD13	I/O	PCI Address and Data 13.
B12	PAD14	I/O	PCI Address and Data 14.
D12	PAD15	I/O	PCI Address and Data 15.
C9	PAD16	I/O	PCI Address and Data 16.
A8	PAD17	I/O	PCI Address and Data 17.
D9	PAD18	I/O	PCI Address and Data 18.
B8	PAD19	I/O	PCI Address and Data 19.
C15	PAD2	I/O	PCI Address and Data 2.
D8	PAD20	I/O	PCI Address and Data 20.
A7	PAD21	I/O	PCI Address and Data 21.
C7	PAD22	I/O	PCI Address and Data 22.
B7	PAD23	I/O	PCI Address and Data 23.
C6	PAD24	I/O	PCI Address and Data 24.
B6	PAD25	I/O	PCI Address and Data 25.
D6	PAD26	I/O	PCI Address and Data 26.
A5	PAD27	I/O	PCI Address and Data 27.
C5	PAD28	I/O	PCI Address and Data 28.
B5	PAD29	I/O	PCI Address and Data 29.
B15	PAD3	I/O	PCI Address and Data 3.
D5	PAD30	I/O	PCI Address and Data 30.
A4	PAD31	I/O	PCI Address and Data 31.
D15	PAD4	I/O	PCI Address and Data 4.
A14	PAD5	I/O	PCI Address and Data 5.
C14	PAD6	I/O	PCI Address and Data 6.
B14	PAD7	I/O	PCI Address and Data 7.
A13	PAD8	I/O	PCI Address and Data 8.
C13	PAD9	I/O	PCI Address and Data 9.
C8	PAR	I/O	PCI Parity.
D3	PBMS	I	PCI Bridge Mode Select. '1' = Host Bridge Mode. '0' = Guest Bridge Mode.
D4	PCLK	I	PCI Bus Clock.
A2	PCLKOUT0	0	PCI Clock Output 0.
B1	PCLKOUT1	0	PCI Clock Output 1.
C1	PCLKOUT2	0	PCI Clock Output 2.
D1	PCLKOUT3	0	PCI Clock Output 3.
B11	PERRN	I/O	PCI Parity Error Signal. Active Low.
A3	PRSTN	I	PCI Reset. Active Low.

1. I = Input.

O = Output.

Pin Number	Pin Name	Type <sup>(1)</sup>	Pin Function
P15	RCSN0	0	ROM/SRAM/FLASH Chip Select. Active Low.
R15	RCSN1	0	ROM/SRAM/FLASH Chip Select. Active Low.
B4	REQ1N	I	PCI Bus Request 1. Active Low. Input for Host Bridge Mode and Guest Bridge Mode.
B3	REQ2N	I	PCI Bus Request 2. Active Low. Input for Host Bridge Mode, Not Used in Guest Bridge Mode.
B2	REQ3N	I	PCI Bus Request 3. Active Low. Input for Host Bridge Mode, Not Used in Guest Mode
A17	RESETN	I	KS8695P Chip Reset. Active Low.
T5	SDCASN	0	SDRAM Column Address Strobe. Active Low.
P5	SDCSN0	0	SDRAM Chip Select. Active Low Chip Select Pins for SDRAM.
R4	SDCSN1	0	SDRAM Chip Select. Active Low Chip Select Pins for SDRAM.
T7	SDICLK		SDRAM Clock In.
U7	SDOCLK	0	System/SDRAM Clock Out.
U6	SDQM0	0	SDRAM Data Input/Output Mask.
T6	SDQM1	0	SDRAM Data Input/Output Mask.
R6	SDQM2	0	SDRAM Data Input/Output Mask.
P6	SDQM3	0	SDRAM Data Input/Output Mask.
R5	SDRASN	0	SDRAM Row Address Strobe. Active Low.
U5	SDWEN	0	SDRAM Write Enable. Active Low.
A10	SERRN	0	PCI System Error Signal. Active Low.
D11	STOPN	I/O	PCI Stop Signal. Active Low.
G14	TCK		JTAG Test Clock.
F14	TDI		JTAG Test Data In.
F15	TDO	0	JTAG Test Data Out.
M4	TEST1		PHY Test Pin (factory reserved test signal).
F4	TEST2		PHY Test Pin (factory reserved test signal).
F17	TESTEN	I	Chip Test Enable (factory reserved test signal). Must be connected to GND for normal operation.
G15	TMS	l	JTAG Test Mode Select.
C10	TRDYN	I/O	PCI Target Ready Signal. Active Low.
F16	TRSTN	I	JTAG Test Reset. Active Low.
M14	UCTSN/ BISTEN	I	UART Data Set Ready. Active Low. BIST Enable (factory reserved test signal).
L15	UDCDN/ SCANEN	Ι	UART Data Carrier Detect. Scan Enable (factory reserved test signal).
M16	UDSRN	I	UART Data Set Ready. Active Low.
N15	UDTRN/ DBGENN	O/I	UART Data Terminal Ready. Active Low. Debug Enable (factory reserved test signal).
L14	URIN/TSTRST	I	UART Ring Indicator/Chip Test Reset (factory reserved test signal).
M15	URTSN/ CPUCLKSEL	O/I	UART Request to Send/CPU Clock Select.

1. I = Input. O = Output.

I/O = Bidirectional.

Pin Number	Pin Name	Type <sup>(1)</sup>	Pin Function
N16	URXD	I	UART Receive Data.
N14	UTXD	0	UART Transmit Data.
E7	VDD1.8	Р	1.8V Digital Core V <sub>DD</sub> .
E8	VDD1.8	Р	1.8V Digital Core V <sub>DD</sub> .
E9	VDD1.8	Р	1.8V Digital Core V <sub>DD</sub> .
E10	VDD1.8	Р	1.8V Digital Core V <sub>DD</sub> .
F7	VDD1.8	Р	1.8V Digital Core V <sub>DD</sub> .
F8	VDD1.8	Р	1.8V Digital Core V <sub>DD</sub> .
F9	VDD1.8	Р	1.8V Digital Core V <sub>DD</sub> .
F10	VDD1.8	Р	1.8V Digital Core V <sub>DD</sub> .
M7	VDD1.8	Р	1.8V Digital Core V <sub>DD</sub> .
M8	VDD1.8	Р	1.8V Digital Core V <sub>DD</sub> .
M9	VDD1.8	Р	1.8V Digital Core V <sub>DD</sub> .
H12	VDD1.8	Р	1.8V Digital Core V <sub>DD</sub> .
H13	VDD1.8	Р	1.8V Digital Core V <sub>DD</sub> .
J12	VDD1.8	Р	1.8V Digital Core V <sub>DD</sub> .
J13	VDD1.8	Р	1.8V Digital Core V <sub>DD</sub> .
K12	VDD1.8	Р	1.8V Digital Core V <sub>DD</sub> .
K13	VDD1.8	Р	1.8V Digital Core V <sub>DD</sub> .
N7	VDD1.8	Р	1.8V Digital Core V <sub>DD</sub> .
N8	VDD1.8	Р	1.8V Digital Core V <sub>DD</sub> .
N9	VDD1.8	Р	1.8V Digital Core V <sub>DD</sub> .
E11	VDD3.3	Р	3.3V Digital I/O Circuitry V <sub>DD</sub> .
E12	VDD3.3	Р	3.3V Digital I/O Circuitry V <sub>DD</sub> .
E13	VDD3.3	Р	3.3V Digital I/O Circuitry V <sub>DD</sub> .
F11	VDD3.3	Р	3.3V Digital I/O Circuitry V <sub>DD</sub> .
F12	VDD3.3	Р	3.3V Digital I/O Circuitry V <sub>DD</sub> .
F13	VDD3.3	Р	3.3V Digital I/O Circuitry V <sub>DD</sub> .
G12	VDD3.3	Р	3.3V Digital I/O Circuitry V <sub>DD</sub> .
G13	VDD3.3	Р	3.3V Digital I/O Circuitry V <sub>DD</sub> .
L12	VDD3.3	Р	3.3V Digital I/O Circuitry V <sub>DD</sub> .
L13	VDD3.3	Р	3.3V Digital I/O Circuitry V <sub>DD</sub> .
M10	VDD3.3	Р	3.3V Digital I/O Circuitry V <sub>DD</sub> .
M11	VDD3.3	Р	3.3V Digital I/O Circuitry V <sub>DD</sub> .
M12	VDD3.3	Р	3.3V Digital I/O Circuitry V <sub>DD</sub> .
M13	VDD3.3	Р	3.3V Digital I/O Circuitry V <sub>DD</sub> .
N10	VDD3.3	Р	3.3V Digital I/O Circuitry V <sub>DD</sub> .
N11	VDD3.3	Р	3.3V Digital I/O Circuitry V <sub>DD</sub> .
N12	VDD3.3	Р	3.3V Digital I/O Circuitry V <sub>DD</sub> .
N13	VDD3.3	Р	3.3V Digital I/O Circuitry V <sub>DD</sub> .

1. P = Power supply.

I = Input.

O = Output.

Pin Number	Pin Name	Type <sup>(1)</sup>	Pin Function
E5	VDDA1.8	Р	1.8V Analog V <sub>DD</sub> .
E6	VDDA1.8	Р	1.8V Analog V <sub>DD</sub> .
F5	VDDA1.8	Р	1.8V Analog V <sub>DD</sub> .
F6	VDDA1.8	Р	1.8V Analog V <sub>DD</sub> .
G5	VDDA1.8	Р	1.8V Analog V <sub>DD</sub> .
G6	VDDA1.8	Р	1.8V Analog V <sub>DD</sub> .
H5	VDDA1.8	Р	1.8V Analog V <sub>DD</sub> .
H6	VDDA1.8	Р	1.8V Analog V <sub>DD</sub> .
J5	VDDA1.8	Р	1.8V Analog V <sub>DD</sub> .
J6	VDDA1.8	Р	1.8V Analog V <sub>DD</sub> .
K5	VDDA3.3	Р	3.3V Analog V <sub>DD</sub> .
K6	VDDA3.3	Р	3.3V Analog V <sub>DD</sub> .
L5	VDDA3.3	Р	3.3V Analog V <sub>DD</sub> .
L6	VDDA3.3	Р	3.3V Analog V <sub>DD</sub> .
M5	VDDA3.3	Р	3.3V Analog V <sub>DD</sub> .
M6	VDDA3.3	Р	3.3V Analog V <sub>DD</sub> .
N5	VDDA3.3	Р	3.3V Analog V <sub>DD</sub> .
N6	VDDA3.3	Р	3.3V Analog V <sub>DD</sub> .
F2	WANFXSD	I	WAN Fiber Signal Detect.
G4	WANRXM	I	WAN PHY Receive Signal – (differential).
G3	WANRXP	I	WAN PHY Receive Signal + (differential).
G2	WANTXM	0	WAN PHY Transmit Signal – (differential).
G1	WANTXP	0	WAN PHY Transmit Signal + (differential).
E15	WLED0/ B0SIZE0	O/I	WAN LED Programmable Indicator 0. Bank 0 Size Bit 0.
E14	WLED1/ B0SIZE1	O/I	WAN LED Programmable Indicator 1. Bank 0 Size Bit 1.
U17	WRSTO	0	Watchdog Timer Reset Output. When EROEN/WRSTPLS = 0, Active High. When EROEN/WRSTPLS = 1, Active Low.
E1	XCLK1	I	External Clock In.
E2	XCLK2	I	External Clock In (negative polarity).

1. P = Power supply.

I = Input.

O = Output.

# **Pin Configuration**

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
GND	PCLKOUTO	PRSTN	PAD31	PAD27	CBEN3	PAD21	PAD17	IRDYN	SERRN	CBEN1	PAD12	PAD8	PAD5	PAD1	PADO	RESETN
PCLKOUT1	REQ3N	REQ2N	REQ1N	PAD29	PAD25	PAD23	PAD19	CBEN2	CLKRUNN	PERRN	PAD14	PAD10	PAD7	PAD3	L1LED1	L1LED0
PCLKOUT2	GNT3N	GNT2N	GNT1N	PAD28	PAD24	PAD22	PAR	PAD16	TRDYN	DEVSELN	PAD13	PAD9	PAD6	PAD2	L2LED1	L2LED0
PCLKOUT3	MPCIACTN	PMBS	PCLK	PAD30	PAD26	IDSEL	PAD20	PAD18	FRAMEN	STOPN	PAD15	PAD11	CBEN0	PAD4	L3LED1	L3LED0
XCLK1	XCLK2	AGND	M66EN	VPLL1.8	VDDA1.8	VDD1.8	VDD1.8	VDD1.8	VDD1.8	VDD3.3	VDD3.3	VDD3.3	WLED1	WLED0/ BOSIZE	L4LED1	L4LED0
ISET	WANFXSD	LAN FXSD1	TEST2	VDDA1.8	VDDA1.8	VDD1.8	VDD1.8	VDD1.8	VDD1.8	VDD3.3	VDD3.3	VDD3.3	TDI	TDO	TRSTN	TESTEN
WANTXP	WANTXM	WANRXP	WANRXM	VDDA1.8	VDDA1.8	GND	GND	GND	GND	GND	VDD3.3	VDD3.3	тск	TMS	GPIO1/ EINT1	GPIO0/ EINTO
LANTXP1	LANTXM1	LANRXP1	LANRXM1	VDDA1.8	VDDA1.8	AGND	GND	GND	GND	GND	VDD1.8	VDD1.8	GPIO5/ TOUT1	GPIO4/ TOUT0	GPIO3/ EINT3	GPIO2/ EINT2
LANTXP2	LANTXM2	LANRXP2	LANRXM2	VDDA1.8	VDDA1.8	AGND	GND	GND	GND	GND	VDD1.8	VDD1.8	GPI09	GPI08	GPIO7	GPI06
LANTXP3	LANTXM3	LANRXP3	LANRXM3	VDDA3.3	VDDA3.3	AGND	GND	GND	GND	GND	VDD1.8	VDD1.8	GPIO13	GPIO12	GPIO11	GPIO10
LANTXP4	LANTXM4	LANRXP4	LANRXM4	VDDA3.3	VDDA3.3	AGND	GND	GND	GND	GND	VDD3.3	VDD3.3	URIN/ TSTRST	UDCDN/ SCANEN	GPIO15	GPIO14
ADDR17	ADDR18	ADDR19	TEST1	VDDA3.3	VDDA3.3	VDD1.8	VDD1.8	VDD1.8	VDD3.3	VDD3.3	VDD3.3	VDD3.3	UCTSN/ BISTEN	URTSN/ CPUCLKSEL	UDSRN	ERWENO
ADDR13	ADDR14	ADDR15	ADDR16	VDDA3.3	VDDA3.3	VDD1.8	VDD1.8	VDD1.8	VDD3.3	VDD3.3	VDD3.3	VDD3.3	UTXD	UDTRN	URXD	ERWEN1
ADDR11	ADDR12	ADDR20/ BA0	ADDR21/ BA1	SDCSNO	SDQM3	DATA31	DATA29	DATA25	DATA21	DATA 17	DATA13	DATA9	DATA5	RCSNO	EWAITN	ERWEN2
ADDR8	ADDR9	ADDR10	SDCSN1	SDRASN	SDQM2	DATA30	DATA28	DATA24	DATA20	DATA16	DATA12	DATA8	DATA4	RSCN1	ECSNO	ERWEN3
ADDR6	ADDR7	ADDR3	ADDR1	SDCASN	SDQM1	SDICLK	DATA27	DATA23	DATA19	DATA15	DATA11	DATA7	DATA3	DATA1	ECSN1	EROEN/ WRSTPLS
ADDR5	ADDR4	ADDR2	ADDRO	SDWEN	SDQM0	SDOCLK	DATA26	DATA22	DATA18	DATA14	DATA10	DATA6	DATA2	DATAO	ECSN2	WRSTO
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	PCI Sig	nals			LED D	rivers				VDD	3.3				VDDA	.3.3
	UART Signals				Memory Interface				VDDA1.8				AGND			
	JTAG S	ignals			GPIO				VDD1.8							
	Miscella	ineous			Analog					GN	C					
	GND GND CLKOUT2 PCLKOUT3 PCLKOUT3 CLK1 GLANTXP1 LANTXP2 LANTXP4 LANTXP4 ADDR17 ADDR17 ADDR11 ADDR5 ADDR5 CLANTS	GNDPCLKOUT0PCLKOUT2GNT3NPCLKOUT3GNT3NPCLKOUT3GNT3NPCLKOUT3MPCIACTNICLKOUT3MPCIACTNICLKOUT4XCLK2ISETVANFXSDVANTXPVANFXSDLANTXP1LANTXM1LANTXP2LANTXM2LANTXP3LANTXM3LANTXP4LANTXM4ADDR17ADDR140ADDR11ADDR120ADDR3ADDR3ADDR5ADDR4ADR5ADDR4LANTXP3LANTXM3ADR5ADDR5ADR5ADDR5JADR5JADR4	GNDPCLKOUT0PRSTNPCLKOUT1REQ3NREQ2NPCLKOUT2GNT3NGNT2NPCLKOUT3MPCIACTNPMBSPCLKOUT3MPCIACTNPMBSXCLK1XCLK2AGNDISETWANFXSDFXSD1LANTXPUANTXMWANRXP1LANTXP1LANTXM1LANRXP2LANTXP2LANTXM3LANRXP3LANTXP3LANRXP4ADDR10ADDR10ADDR14ADDR19ADDR30ADDR12ADDR30ADDR5ADDR4ADDR30ADDR5ADDR4ADDR30ADDR5ADDR4ADDR30ADDR5ADDR4ADDR30ADDR5ADDR4ADDR30ADDR5ADDR4ADDR30ADDR5PCI SIGNAL	GNDPCLKOUT0PRSTNPAD31PCLKOUT1REQ3NREQ2NREQ1NPCLKOUT2QNT3NGNT2NGNT1NPCLKOUT3MPCIACTNPMBSPCLKXCLK1XCLK2AGNDM66ENISETWANFXSDFXSD1TEST2WANTXPWANFXMWANRXPWANRXMLANTXP1LANTXM1LANRXP1LANRXM1LANTXP2LANTXM2LANRXM2LANRXM2LANTXP3LANTXM3LANRXP4LANRXM3LANTXP4LANTXM4ADDR19TEST1ADDR10ADDR14ADDR19ADDR16ADDR11ADDR12ADDR10ADDR17ADDR3ADDR3ADDR3ADDR10ADDR3ADDR4ADDR3ADDR1ADDR3ADDR4ADDR3ADDR3ADDR3ADDR4ADDR3ADDR3ADDR3ADDR4ADDR3ADDR3ADDR3ADDR4JADR3ADR3ADDR3ADDR4JADR3ADR3ADDR3ADDR4JADR3ADR3ADDR3ADR4ADDR3ADR3ADR4SCISITALSJTAGS Signals	GNDPCL KOUTIPRSTNPAD31PAD27PCLKOUT1REQ3NREQ2NREQ1NPAD28PCLKOUT2GNT3NGNT2NGNT1NPAD28PCLKOUT3MPCIACTNPMBSPCLKPAD30XCLK1XCLK2AGNDM66ENVPLL1.8ISETWANFXDLANRTEST2VDDA1.8LANTXPILANTXMILANRXPILANRXMIVDDA1.8LANTXPILANTXMILANRXPILANRXMIVDDA1.8LANTXPILANTXMILANRXPILANRXMIVDDA1.8LANTXPILANTXMILANRXPILANRXMIVDDA1.8LANTXPILANTXMILANRXPILANRXMIVDDA1.8LANTXPILANTXMILANRXPILANRXMIVDDA3.3LANTXPILANTXMILANRXPILANRXMIVDDA3.3ADDR10ADDR11ADDR19TEST1VDDA3.3ADDR11ADDR12ADDR19ADDR19SDCSNIADDR3ADDR1ADDR19ADDR19SDCSNIADDR3ADDR1ADDR1ADDR1SDCSNIADDR3ADDR1ADDR2ADDR2SDCSNIADDR3ADDR1ADDR3ADDR3SDCSNIADDR3ADDR1ADDR3ADDR3SDCSNIADDR3ADDR1ADDR3ADDR3SDCSNIADDR3ADDR1ADDR3ADDR3SDCSNIADDR3ADDR3ADDR3ADDR3ADDR3ADDR3ADDR4ADDR3ADDR3SDCSNIADDR5ADDR4AD	GNDPCLKOUT0PRSTNPAD31PAD27CBEN3PCLKOUT1REQ3NREQ2NREQ1NPAD29PAD25PCLKOUT2GNT3NGNT2NGNT1NPAD28PAD24PCLKOUT3MPCIACTNPMBSPCLKPAD30PAD26XCLK1XCLK2AGNDM66ENVPLL1.8VDDA1.8ISETWANFXSDFXSD1TEST2VDDA1.8VDDA1.8WANTXPWANFXXDWANRXPWANRXMVDDA1.4VDDA1.8LANTXP1LANTXM1LANRXP1LANRXM1VDDA1.3VDDA1.3LANTXP2LANTXM2LANRXP2LANRXM3VDDA3.3VDDA3.3LANTXP4LANTXM3LANRXP2LANRXM4VDDA3.3VDDA3.3ADDR17ADDR18ADDR19TEST1VDDA3.3VDDA3.3ADDR11ADDR14ADDR19TEST1VDDA3.3VDDA3.3ADDR13ADDR14ADDR19ADDR19SDCSN0SDCM3ADDR3ADDR12ADDR10SDCASNSDCM1ADM3ADDR3ADDR4ADDR3ADDR10SDCASNSDCM1ADDR3ADDR4ADDR3ADDR10SDCM20SDCM0SDCM0123456ADDR3ADDR4ADDR3ADDR4ADDR5ADDR5ADM6ADDR3ADDR4ADDR3ADDR4ADDR5ADM4SDCM0ADDR3ADR4ADR3ADR6SOWENSDCM0ADM6ADDR3ADR4ADR3ADR6AD	GNDPCLKOUT0PRSTNPAD31PAD27CBEN3PAD21PCLKOUT1REQ3NREQ2NREQ1NPAD29PAD25PAD23PCLKOUT2GNT3NGNT2NGNT1NPAD28PAD24PAD22PCLKOUT3MPCIACTNPMBSPCLKPAD30PAD26IDSELXCLK1XCLK2AGNDM66ENVPLL1.8VDDA1.8VDD1.8ISETWANFXSDLANTEST2VDDA1.8VDD1.8WANTXPWANTXMUANRXPWANRXMVDDA1.8VDD1.8LANTXP1LANTXM1LANRXP1LANRXM1VDDA1.8VDD1.8LANTXP2LANTXM2LANRXP2LANRXM1VDDA1.8VDD1.8LANTXP3LANTXM2LANRXP1LANRXM1VDDA1.8VDD1.8LANTXP4LANTXM2LANRXP2LANRXM3VDDA1.8VDD1.8LANTXP5LANTXM2LANRXP2LANRXM3VDDA1.8AGNDLANTXP4LANTXM4LANRXP5LANRXM3VDDA1.8VDDA1.8LANTXP5LANTXM4LANRXP6LANRXM3VDDA1.8AGNDLANTXP4LANTXM4LANRXP5LANRXM3VDDA1.8VDDA1.8AGNDLANTXP5LANTXM4LANRXP6LANRXM4VDDA1.8VDDA1.8AGNDLANTXP4LANTXM4LANRXP5LANRXM4VDDA1.8VDDA1.8AGNDADDR11ADDR15ADDR15ADDR15SDC5N6SDCM3JDT1.8ADDR14ADDR1ADDR10SDC5N1SDC4N5SDCM0SDCCK	GNDPCLKOUTDPRSTNPAD31PAD27CBEN3PAD21PAD17PCLKOUT1REG3NREG2NREG1NPAD29PAD25PAD23PAD19PCLKOUT2GNT3NGNT2NGHT1NPAD28PAD24PAD22PARPCLKOUT3MPCIACTNPMBSPCLKPAD30PAD26IDSELPAD20XCLK1XCLK2AGNDM66ENVPL1.8VDDA1.8VDD1.8VDD1.8ISETWANFXDFXSD1TEST2VDDA1.8VDD1.8VDD1.8GNDIANTXP1WANFXMWANRXMWANRXMVDDA1.8VDD41.8GNDGNDLANTXP1LANTXM1LANRXP1LANRXM1VDDA1.8VDD41.8GNDGNDLANTXP2LANTXM2LANRXP2LANRXM2VDDA1.8VDD41.8AGNDGNDLANTXP3LANRXP2LANRXM3VDDA1.8VDDA1.8AGNDGNDLANTXP4LANTXM4LANRXP5LANRXM4VDDA1.8VDDA1.8AGNDGNDLANTXP4LANRXP5LANRXM4VDDA1.8VDDA1.8AGNDGNDLANTXP4LANRXP5LANRXM4VDDA1.8VDDA1.8AGNDGNDLANTXP4LANTXM4LANRXM4VDDA1.8VDDA1.8AGNDGNDLANTXP4LANTXM4LANRXM4VDDA1.8VDDA1.8AGNDGNDLANTXP4LANTXM4LANRXM4VDDA3.3VDDA3.3AGNDGNDADDR10ADDR10ADDR10ADDR1ADDR1ADDR3AGN	GNDPCLKOUT0PRSTNPAD31PAD27CBEN3PAD21PAD17IRDYNPCLKOUT1REG3NREG2NREG1NPAD29PAD25PAD23PAD16CBEN2PCLKOUT2GNT3NGNT2NGNT1NPAD20PAD24PAD22PARPAD16PCLKOUT3MPCIACTNPMBSPCLKPAD30PAD24PAD22PARPAD16PCLKOUT3MPCIACTNPMBSPCLKPAD30PAD24IDSELPAD20PAD16YCLK1XCLK2AGNDM66ENYPLL18VDDA18VDD18VDD18VDD18VDD18XCLK1XCLK2AGNDFRST1YDDA18VDDA18VDD18VDD18VDD18VDD18XANTXPWANFXNDWANRXPWANRXMVDDA18VDDA18AGNDGNDGNDLANTXP1LANRXP2LANRXP2VDDA18VDDA18AGNDGNDGNDLANTXP2LANRXP2LANRXP2VDDA33VDDA33AGNDGNDGNDLANTXP4LANRXP4LANRXP4VDDA33VDDA33AGNDGNDGNDLANTXP4LANRXP4LANRXP4VDDA33VDDA33VDD18VDD18VDD18LANTXP4LANRXP4LANRXP4VDDA33VDDA33AGNDGNDGNDLANTXP4LANRXP4LANRXP4VDDA33VDDA33VDD18VD18VD18LANTXP4LANRXP4LANRXP4VDDA33VDDA33VD18VD18VD18LANTXP4ADR15 <td< th=""><th>AND     PCLKOUT0     PRSTN     PAD31     PAD27     CBEN3     PAD21     PAD17     IRDYN     SERN       PCLKOUT1     REG3N     REG2N     REG1N     PAD29     PAD24     PAD23     PAD19     CBEN2     CLKUNN       PCLKOUT2     GNT3N     GNT2N     GNT1N     PAD29     PAD24     PAD22     PAR     PAD18     CLKUNN       PCLKOUT2     GNT3N     GNT2N     GNT1N     PAD29     PAD24     PAD22     PAR     PAD18     CLKUNN       PCLKOUT2     MPCIACTN     PMB50     PCLK     PAD30     PAD26     IDSEL     PAD20     PAD18     FRAMEN       XCLK1     XCLK2     AGND     M66EN     VPL18     VDDA18     VDD18     VD18     VD18</th><th>OND     PELKOUTO     PRETN     PAD31     PAD27     GBEN3     PAD22     PAD17     IRBYN     SERRN     CBEN1       PCLKOUT1     REG3N     REG2N     REG1N     PAD25     PAD22     PAD22     PAD19     GBEN2     CLKUNN     PERRN       PCLKOUT2     ONT3N     GNT2N     GNT1N     PAD26     PAD24     PAD22     PAR     PAD16     TRDYN     DEVERN       PCLKOUT3     MPGIACTN     PMB2     PCLK     PAD26     PAD24     PAD22     PAR     PAD16     FRAMEN     STOPH       XCLK1     XCLK2     AGND     M6EN     VPL1.8     VDDA14     VDD18     VD18     <td< th=""><th>OND     PELKOUTO     PRSTN     PAD31     PAD32     CBEH3     PAD22     PAD17     HEDYN     SEREN     CBEH1     PAD12       PELKOUT1     REG3N     REG2N     REG1N     PAD24     PAD25     PAD23     PAD19     CBEH2     CLKRUNN     PERN     PAD14       PELKOUT3     GNT3N     GNT2N     GNT1N     PAD28     PAD24     PAD22     PAR     PAD16     TRDYN     DEVSELN     PAD14       PELKOUT3     MPCACTN     PMB5     PCLK     PAD24     PAD24     PAD20     PAD14     VDD18     &lt;</th><th>OND       PELKOUT       PRSTN       PAD31       PAD37       CBEN3       PAD21       PAD17       IEDYN       BERN       CBEN1       PAD12       PAD14         PELKOUT1       REG3N       REG2N       REG1N       PAD22       PAD23       PAD23       PAD12       CBEN2       CLKUUN       PAD14       PAD14       PAD14         PELKOUT2       ONT3N       ONT3N       ONT3N       PAT2N       PAD24       PAD22       PAD2       PAD24       PAD24       PAD24       PAD24       PAD24       PAD14       TENTN       PAD14       PAD14         PELKOUT2       ONT3N       ONT3N       ONT3N       PAT2N       PAD24       &lt;</th><th>OND       PELKOUTO       PRETN       PAD31       PAD32       CREH3       PAD32       PAD17       RED7N       GERN       CREH1       PAD32       PAD33         PCLKOUTO       REG3N       REG2N       REG1N       PAD32       PAD32       PAD32       PAD13       CREN1       PAD14       PAD34       PAD33         PCLKOUTO       ONT3N       ONT2N       ONT1N       PAD32       PAD34       PAD32       PAD12       PAD16       CRENN       PERNE       PAD13       PAD3       PAD34       PAD34       PAD34       CRENN       PERNE       PAD14       PAD34       <t< th=""><th>OND     PELKOUT     PRETN     PAD31     PAD31     PAD32     CBENA     PAD32     PAD32     PAD32     PAD32     PAD32     PAD33     PAD33     PAD34     PAD34    &lt;</th><th>OND     PCLKOUT     PREST     PAD21     PAD27     CBENA     PAD22     PAD23     PAD23     PAD23     PAD24     PAD14     CBENA     PAD24     PAD14     PAD24     PAD24     PAD14     PAD24     PAD24     PAD14     PAD24     PAD14     PAD24     PAD24     PAD14     PEREN     PAD24     PAD24     PAD14     PEREN     PAD14     PAD24     PAD14     PAD14     PAD24     PAD14     PAD14</th></t<></th></td<></th></td<>	AND     PCLKOUT0     PRSTN     PAD31     PAD27     CBEN3     PAD21     PAD17     IRDYN     SERN       PCLKOUT1     REG3N     REG2N     REG1N     PAD29     PAD24     PAD23     PAD19     CBEN2     CLKUNN       PCLKOUT2     GNT3N     GNT2N     GNT1N     PAD29     PAD24     PAD22     PAR     PAD18     CLKUNN       PCLKOUT2     GNT3N     GNT2N     GNT1N     PAD29     PAD24     PAD22     PAR     PAD18     CLKUNN       PCLKOUT2     MPCIACTN     PMB50     PCLK     PAD30     PAD26     IDSEL     PAD20     PAD18     FRAMEN       XCLK1     XCLK2     AGND     M66EN     VPL18     VDDA18     VDD18     VD18     VD18	OND     PELKOUTO     PRETN     PAD31     PAD27     GBEN3     PAD22     PAD17     IRBYN     SERRN     CBEN1       PCLKOUT1     REG3N     REG2N     REG1N     PAD25     PAD22     PAD22     PAD19     GBEN2     CLKUNN     PERRN       PCLKOUT2     ONT3N     GNT2N     GNT1N     PAD26     PAD24     PAD22     PAR     PAD16     TRDYN     DEVERN       PCLKOUT3     MPGIACTN     PMB2     PCLK     PAD26     PAD24     PAD22     PAR     PAD16     FRAMEN     STOPH       XCLK1     XCLK2     AGND     M6EN     VPL1.8     VDDA14     VDD18     VD18     VD18 <td< th=""><th>OND     PELKOUTO     PRSTN     PAD31     PAD32     CBEH3     PAD22     PAD17     HEDYN     SEREN     CBEH1     PAD12       PELKOUT1     REG3N     REG2N     REG1N     PAD24     PAD25     PAD23     PAD19     CBEH2     CLKRUNN     PERN     PAD14       PELKOUT3     GNT3N     GNT2N     GNT1N     PAD28     PAD24     PAD22     PAR     PAD16     TRDYN     DEVSELN     PAD14       PELKOUT3     MPCACTN     PMB5     PCLK     PAD24     PAD24     PAD20     PAD14     VDD18     &lt;</th><th>OND       PELKOUT       PRSTN       PAD31       PAD37       CBEN3       PAD21       PAD17       IEDYN       BERN       CBEN1       PAD12       PAD14         PELKOUT1       REG3N       REG2N       REG1N       PAD22       PAD23       PAD23       PAD12       CBEN2       CLKUUN       PAD14       PAD14       PAD14         PELKOUT2       ONT3N       ONT3N       ONT3N       PAT2N       PAD24       PAD22       PAD2       PAD24       PAD24       PAD24       PAD24       PAD24       PAD14       TENTN       PAD14       PAD14         PELKOUT2       ONT3N       ONT3N       ONT3N       PAT2N       PAD24       &lt;</th><th>OND       PELKOUTO       PRETN       PAD31       PAD32       CREH3       PAD32       PAD17       RED7N       GERN       CREH1       PAD32       PAD33         PCLKOUTO       REG3N       REG2N       REG1N       PAD32       PAD32       PAD32       PAD13       CREN1       PAD14       PAD34       PAD33         PCLKOUTO       ONT3N       ONT2N       ONT1N       PAD32       PAD34       PAD32       PAD12       PAD16       CRENN       PERNE       PAD13       PAD3       PAD34       PAD34       PAD34       CRENN       PERNE       PAD14       PAD34       <t< th=""><th>OND     PELKOUT     PRETN     PAD31     PAD31     PAD32     CBENA     PAD32     PAD32     PAD32     PAD32     PAD32     PAD33     PAD33     PAD34     PAD34    &lt;</th><th>OND     PCLKOUT     PREST     PAD21     PAD27     CBENA     PAD22     PAD23     PAD23     PAD23     PAD24     PAD14     CBENA     PAD24     PAD14     PAD24     PAD24     PAD14     PAD24     PAD24     PAD14     PAD24     PAD14     PAD24     PAD24     PAD14     PEREN     PAD24     PAD24     PAD14     PEREN     PAD14     PAD24     PAD14     PAD14     PAD24     PAD14     PAD14</th></t<></th></td<>	OND     PELKOUTO     PRSTN     PAD31     PAD32     CBEH3     PAD22     PAD17     HEDYN     SEREN     CBEH1     PAD12       PELKOUT1     REG3N     REG2N     REG1N     PAD24     PAD25     PAD23     PAD19     CBEH2     CLKRUNN     PERN     PAD14       PELKOUT3     GNT3N     GNT2N     GNT1N     PAD28     PAD24     PAD22     PAR     PAD16     TRDYN     DEVSELN     PAD14       PELKOUT3     MPCACTN     PMB5     PCLK     PAD24     PAD24     PAD20     PAD14     VDD18     <	OND       PELKOUT       PRSTN       PAD31       PAD37       CBEN3       PAD21       PAD17       IEDYN       BERN       CBEN1       PAD12       PAD14         PELKOUT1       REG3N       REG2N       REG1N       PAD22       PAD23       PAD23       PAD12       CBEN2       CLKUUN       PAD14       PAD14       PAD14         PELKOUT2       ONT3N       ONT3N       ONT3N       PAT2N       PAD24       PAD22       PAD2       PAD24       PAD24       PAD24       PAD24       PAD24       PAD14       TENTN       PAD14       PAD14         PELKOUT2       ONT3N       ONT3N       ONT3N       PAT2N       PAD24       <	OND       PELKOUTO       PRETN       PAD31       PAD32       CREH3       PAD32       PAD17       RED7N       GERN       CREH1       PAD32       PAD33         PCLKOUTO       REG3N       REG2N       REG1N       PAD32       PAD32       PAD32       PAD13       CREN1       PAD14       PAD34       PAD33         PCLKOUTO       ONT3N       ONT2N       ONT1N       PAD32       PAD34       PAD32       PAD12       PAD16       CRENN       PERNE       PAD13       PAD3       PAD34       PAD34       PAD34       CRENN       PERNE       PAD14       PAD34       PAD34 <t< th=""><th>OND     PELKOUT     PRETN     PAD31     PAD31     PAD32     CBENA     PAD32     PAD32     PAD32     PAD32     PAD32     PAD33     PAD33     PAD34     PAD34    &lt;</th><th>OND     PCLKOUT     PREST     PAD21     PAD27     CBENA     PAD22     PAD23     PAD23     PAD23     PAD24     PAD14     CBENA     PAD24     PAD14     PAD24     PAD24     PAD14     PAD24     PAD24     PAD14     PAD24     PAD14     PAD24     PAD24     PAD14     PEREN     PAD24     PAD24     PAD14     PEREN     PAD14     PAD24     PAD14     PAD14     PAD24     PAD14     PAD14</th></t<>	OND     PELKOUT     PRETN     PAD31     PAD31     PAD32     CBENA     PAD32     PAD32     PAD32     PAD32     PAD32     PAD33     PAD33     PAD34     PAD34    <	OND     PCLKOUT     PREST     PAD21     PAD27     CBENA     PAD22     PAD23     PAD23     PAD23     PAD24     PAD14     CBENA     PAD24     PAD14     PAD24     PAD24     PAD14     PAD24     PAD24     PAD14     PAD24     PAD14     PAD24     PAD24     PAD14     PEREN     PAD24     PAD24     PAD14     PEREN     PAD14     PAD24     PAD14     PAD14     PAD24     PAD14     PAD14

Figure 2. KS8695P Pin Mapping (Top View)

# **Functional Description**

#### Introduction

Micrel's KS8695P, a member of the CENTAUR line of integrated processors, is a high-performance router-on-a-chip solution for Ethernet and 802.11 a/g/b based embedded systems. Designed for use in communication's routers, it integrates a PCI to AHB bridge solution for interfacing with 32-bit PCI, miniPCI, and cardbus devices. The KS8695P combines a proven third generation 5-port managed switch, an ARM9 RISC processor with MMU, and five physical layer transceivers (PHYs) including their corresponding MAC units with Micrel's XceleRouter technology.

The KS8695P is built around the 16/32-bit ARM9 RISC processor, which is a scalable, high-performance, microprocessor developed for highly integrated system-on-a-chip applications. It also offers a configurable 8KB I-cache and 8KB D-cache that reduces memory access latency for high-performance applications. The simple, elegant, and fully static design of the KS8695P is especially suitable for cost-effective, power-sensitive applications.

The KS8695P contains five 10/100 PHYs: four are for the local area network (LAN) and one is for the wide area network (WAN). Connected to the PHYs are five corresponding MAC units with an integrated Layer 2 managed switch. The combining of the switch and the analog PHYs make the KS8695P an extremely prudent solution for SOHO router applications, saving both board space and BOM costs. The Layer 2 switch contains a 16Kx32 SRAM on-chip memory for frame buffering. The embedded frame buffer memory is designed with a 1.4Gbps on-chip memory bus. This allows the KS8695P to perform full non-blocking frame switching and/or routing on the fly for many applications.

For the media interface, the KS8695P supports 10BASE-T and 100BASE-TX, as specified by the IEEE 802.3 standard, and 100 BASE-FX on the WAN port and on one LAN port.

The KS8695P supports two modes of operation in the PCI bus environment: host bridge mode and guest bridge mode. In the host bridge mode, the ARM9 processor acts as the host of the entire system. It configures other PCI devices and coordinates their transactions, including initiating transactions between the PCI devices and AHB bus subsystem. An onchip PCI arbiter is included to determine the PCI bus ownership among PCI master devices. In host bridge mode, all I/O registers, including those for the embedded switch, are configured by the ARM9 processor through the on-chip AMBA bus interface.

In guest bridge mode, all of the I/O registers are programmed by either the external host CPU on the PCI bus or the local ARM9 host processor through the AMBA bus. The KS8695P functions as a slave on the PCI bus with the on-chip PCI arbiter disabled. The KS8695PX can be configured by either the ARM9 CPU or the PCI host CPU. In both cases, the KS8695P memory subsystem is accessible from either the PCI host or the ARM9 CPU. Communications between the external host CPU and the ARM9 is accomplished through message passing or through shared memory.

#### **CPU Features**

- 166MHz ARM9 RISC processor core
- On-chip AMBA bus 2.0 interfaces
- 16-bit thumb programming to relax memory requirement
- 8KB I-cache and 8KB D-cache
- Little-endian mode supported
- Configurable memory management unit
- Supports reduced CPU and system clock speed for power savings

#### PCI to AHB Bridge Features

- Support 33MHz, 32-bit data PCI bus
- Integrated PCI bridge support for interfacing with 32-bit miniPCI or cardbus devices
- Independent AHB and PCI clock speed
- Supports 125MHz AHB speed
- Supports PCI revision 2.1 protocols
- Supports AHB bus 2.0 interfaces
- Supports both regular and memory-mapped I/O on the PCI interface
- Integrated PCI arbiter with power-on option to enable or disable
- Support Round Robin arbitration with three external PCI devices and one internal device
- Supports AHB burst transfers up to 16 data words
- Configurable PCI registers by host CPU ARM9
- Supports bus mastership from PCI to AHB or AHB to PCI bus

#### Switch Engine

- 5-Port 10/100 integrated switch with one WAN and four LAN physical layer transceivers
- 16Kx32 on-chip SRAM for frame buffering
- 1.4Gbps on-chip memory bandwidth for wire-speed frame switching
- 10Mbps and 100Mbps modes of operation for both full and half duplex
- Supports 802.1Q tag-based VLAN and port-based VLAN
- Supports 8.2,1p-based priority, DiffServ priority, and post-based priority
- Integrated address look-up engine, supports 1K absolute MAC addresses
- Automatic address learning, address aging, and address migration
- Broadcast storm protection
- Full-duplex IEEE 802.3x flow control
- Half-duplex back pressure flow control
- Supports IGMP snooping
- Spanning Tree Protocol support

#### **Advanced Memory Controller Features**

- Supports glueless connection to two banks of ROM/SRAM/FLASH memory with programmable 8/16/32 bit data bus and
  programmable access timing
- Supports glueless connection to two SDRAM banks with programmable 8/16/32-bit data bus and programmable RAS/CAS latency
- Supports three external I/O banks with programmable 8/16/32-bit data bus and programmable access timing
- Programmable system clock speed for power management
- Automatic address line mapping for 8/16/32-bit accesses on Flash, ROM, SRAM, and SDRAM interfaces

#### Direct Memory Access (DMA) Engines

- · Independent MAC DMA engine with programmable burst mode for WAN port
- Independent MAC DMA engine with programmable burst mode for LAN ports
- Supports little-endian byte ordering for memory buffers and descriptors
- Contains large independent receive and transmit FIFOs (3KB receive/3KB transmit) for back-to-back packet receive, and guaranteed no under-run packet transmit
- Data alignment logic and scatter gather capability

#### Protocol Engine and XceleRouter™ Technology

- Supports IPv4 IP header/TCP/UDP packet checksum generation for host CPU offloading
- Supports IPv4 packet filtering based on checksum errors

#### **Network Interface**

- Features five MAC units and five PHY units
- Supports 10BASE-T and 100BASE-TX on all LAN ports and one WAN port. Also supports 100BASE-FX on the WAN
  port and on one LAN port
- Supports automatic CRC generation and checking
- Supports automatic error packet discard
- Supports IEEE 802.3 auto-negotiation algorithm of full-duplex and half-duplex operation for 10Mbps and 100Mbps
- Supports full-/half-duplex operation on PHY interfaces
- Fully compliant with IEEE 802.3 Ethernet standards
- IEEE 802.3 full-duplex flow control and half-duplex backpressure collision flow control
- Supports MDI/MDI-X auto-crossover

## Peripherals

- Twenty-eight interrupt sources, including four external interrupt sources
- Normal or fast interrupt mode (IRQ, FIQ) supported
- Prioritized interrupt handling
- Sixteen programmable general purpose I/O. Pins individually configurable to input, output, or I/O mode for dedicated signals
- Two programmable 32-bit timers with watchdog timer capability
- High-speed UART interface up to 115kbps

#### **Other Features**

- Integrated PLL to generate CPU and system clocks
- JTAG development interface for ICE connection
- 19mm x 19mm 289-pin PBGA
- 1.8V CMOS for core and 3.3V for I/O

# Signal Description

## System Level Hardware Interfaces



#### Figure 3. System Level Interfaces

At the system level the KS8695P features the following interfaces:

- · Clock interface for crystal or external oscillator
- JTAG development interface
- One WAN Ethernet physical interface
- Four LAN Ethernet physical interfaces
- PHY LED drivers
- One high-speed UART interface
- Sixteen GPIO pins
- 33MHz, 32-bit PCI interface supporting three external masters
- Advanced memory interface
  - Programmable synchronous bus rate
  - Programmable asynchronous interface timing
  - Independently programmable data bus width for static and synchronous memory
  - Glueless connection to SDRAM
  - Glueless connection to flash memory or ROM
- Factory test
- Power and ground

#### **Configuration Pins**

The following pins are sampled as input during reset.

Configuration	Pin Name	Pin #	Setting
Bank0 Flash Data Width	B0SIZE[1:0]	E14, E15	'00'= reserved '01' = byte wide '10' = half word wide (16 bits) '11' = word wide (32 bits)
WRSTO Polarity	EROEN/WRSTPLS	U17	'0' = active high '1' = active low
CPU Clock Select	URTSN/CPUCLKSEL	M15	<ul><li>'0' = normal mode (PLL)</li><li>'1' = bypass internal PLL</li></ul>
PCI Bridge Mode	PBMS	D3	<ul><li>'0' = guest bridge mode</li><li>'1' = host bridge mode</li></ul>
CPUCLKSEL	URTSN/CPUCLKSEL	M15	<ul><li>'0' = normal operation</li><li>'1' = factory reserved</li></ul>
Debug Enable	UDTRN/DBGENN	N15	'0' = factory reserved

#### Table 1. Configuration Pins

Following pins have second function as factory test of chip.

Configuration	Pin Name	Pin #	Setting
Chip Test Enable	TESTEN	F17	<ul> <li>'0' = normal operation</li> <li>'1' = factory reserved. Used for factory test of chip and affects all signals listed in this table.</li> </ul>
	ERWEN0/TESTACK	M17	
	ERWEN1/TESTREQB	N17	
	ERWEN2/TESTREQA	P17	
	ERWEN3/TICTESTTENN	R17	
	UCTSN/BISTEN	M14	
	UDCDN/SCANEN	L15	
	URIN/TSTRST	L14	
	TEST1	M4	
	TEST2	F4	

#### Table 2. Configuration Pins

#### Reset

The KS8695P has a single reset input that can be driven by a system reset circuit or a simple power on reset circuit. The KS8695P also features a reset output (WRSTO) that can be used to reset other devices in the system. WRSTO can be configured as either an active high reset or an active low reset through a strap-in option on pin U17, as shown in Table 1. The KS8695P also has a built in watchdog timer. When the watchdog timer is programmed and the timer setting expires, the KS8695P resets itself and also asserts WRSTO to reset the other devices in the system. Figure 4 shows a typical system using the KS8695P WRSTO as the system reset.

#### **Reset Circuit Diagram**







Figure 5. Recommended Circuit for Interfacing with CPU/FPGA Reset

At power-on-reset, R, C,and D1 provide the necessary ramp rise time to reset the Micrel device. The reset out from CPU/FPGA provides warm reset after power up.

## System Clock

The clock to the KS8695P is supplied by either a 25MHz ±50ppm crystal or by an oscillator. If an oscillator is used, it must be connected to the XCLK1 input (pin E1) on the KS8695P. If a crystal is used, it must be connected with a circuit similar to the one shown below. The 25MHz input clock is used by an internal PLL to generate the programmable SDOCLK. SDOCLK is the system clock and can be programmed from 25MHz to 125MHz using the system clock and bus control register at offset 0x0004. The CPUCLKSEL strap-in option on pin M15 needs to be pulled low for normal operation. SDICLK is used to register the data read from the SDRAM back into the KS8695P. The system designer must ensure that SDRAM timing is met when routing SDOCLK back to SDICLK.



Figure 6. Typical Clock Circuit

#### Memory Interface

The KS8695P has a glueless interface for SDRAM and static memory, i.e. ROM, SRAM, and Flash. It supports up to two banks of static memory (Figure 7), up to two banks of SDRAM (Figure 8), and three banks of external I/O (Figure 9). The total address space for the KS8695P is 64MB. This includes SDRAM, static memory, external I/O, and the KS8695P's own 64KB of register space.

The memory interface for the SDRAM and static memory has a special automatic address mapping feature. This allows the designer to connect address bit 0 on the memory to ADDR[0] on the KS8695P and address bit 1 on the memory to ADDR[1] on the memory, regardless of whether the designer is trying to achieve word, half word, or byte addressing.

The KS8695P memory controller performs the address mapping internally. This permits the designer to use the maximum amount of address bits, instead of losing one or two bits because of address mapping. For external I/O, however, the designer still needs to take care of the address mapping (see Figure 9).



Figure 7. Static Memory Interface Examples



Figure 8. SDRAM Interface Examples







Figure 9. External I/O Interface Examples

KS8695P outputs ERWEN[3:0] as write strobes to byte wide, half-word wide, and word-wide memory port. The following figures show the most commonly implemented examples.











# Signal Descriptions by Group Clock and Reset Pins

Pin	Name	I/O Type <sup>(1)</sup>	Description
E1	XCLK1/ CPUCLK	Ι	External Clock In. This signal is used as the source clock for the transmit clock of the internal MAC and PHY. The clock frequency is 25MHz ±50ppm. The XCLK1 signal is also used as the reference clock signal for the internal PLL to generate the 125MHz internal system clock.
E2	XCLK2	Ι	External Clock In. Used with XCLK1 pin when another polarity of crystal is needed. This is unused for a normal clock input.
M15	URTSN/ CPUCLKSEL	O/I	Normal Mode: UART request to send. Active low output. During reset: CPU clock select. Select CPU clock source. CPUCLKSEL=0 (normal mode), the internal PLL clock output is used as the CPU clock source. CPUCLKSEL=1 (factory reserved test signal).
A17	RESETN	I	KS8695P chip reset. Active low input asserted for at least 256 system clock (40ns) cycles to reset the KS8695P. When in the reset state, all the output pins are tristated and all open drain signals are floating.
U17	WRSTO	0	Watchdog timer reset output. This signal is asserted for at least 200ms if RESETN is asserted or when the internal watchdog timer expires.
T17	EROEN/ WRSTPLS	O/I	Normal Mode: ROM/SRAM/FLASH and External I/O output enable. Active low. When asserted, this signal controls the output enable port of the specified device. During reset: Watchdog timer reset polarity setting. WRSTPLS=0, Active high; WRSTPLS=1, Active low. No default.

## **JTAG Interface Pins**

Pin	Name	I/O Type <sup>(1)</sup>	Description
G14	TCK	I	JTAG test clock.
G15	TMS	I	JTAG test mode select.
F14	TDI	I	JTAG test data in.
F15	TDO	0	JTAG test data out.
F16	TRSTN	I	JTAG test reset. Active low.

#### **WAN Ethernet Physical Interface Pins**

Pin	Name	I/O Type <sup>(1)</sup>	Description
G1	WANTXP	0	WAN PHY transmit signal + (differential).
G2	WANTXM	0	WAN PHY transmit signal – (differential).
G3	WANRXP	I	WAN PHY receive signal + (differential).
G4	WANRXM	I	WAN PHY receive signal – (differential).
G5	WANFXSD	I	WAN fiber signal detect. Signal detect input when the WAN port is operated in 100BASE-FX 100Mb fiber mode. See Application Note 10.

#### Note:

1. I = Input.

O = Output.

## LAN Ethernet Physical Interface Pins

Pin	Name	I/O Type <sup>(1)</sup>	Description
H1	LANTXP1	I	LAN Port[4:1] PHY transmit signal + (differential).
J1	LANTXP2		
K1	LANTXP3		
L1	LANTXP4		
H2	LANTXM1	I	LAN Port[4:1] PHY transmit signal – (differential).
J2	LANTXM2		
K2	LANTXM3		
L2	LANTXM4		
H3	LANRXP1	0	LAN Port[4:1] PHY receive signal + (differential).
J3	LANRXP2		
K3	LANRXP3		
L3	LANRXP4		
H4	LANRXM1	0	LAN Port[4:1] PHY receive signal – (differential).
J4	LANRXM2		
K4	LANRXM3		
L4	LANRXM4		
F1	ISET	I	Set PHY transmit output current. Connect to ground through a 3.01k $\Omega$ 1% resistor.
F3	LANFXSD1	I	LAN fiber signal detect. Signal detect input when the LAN1 port is operated in 100BASE-FX 100Mb fiber mode. See Application Note 107.

#### **PHY LED Drivers**

Pin	Name	I/O Type <sup>(1)</sup>	Description
E15	WLED0/ B0SIZE0	O/I	Normal Mode: WAN LED indicator 0. Programmable via WAN misc. Control register bits [2:0]. '000' = Speed; '001' = Link; '010' = Full/half duplex; '011' = Collision; '100' = TX/RX activity; '101' = Full-duplex collision; '110' = Link/Activity.
			During reset: Bank 0 Data Access Size. Bank 0 is used for the boot program. B0SIZE[1:0] are used to specify the size of the bank 0 data bus width as follows: '01' = one byte, '10' = half-word, '11' = one word, and '00' = reserved.
E14	WLED1/ B0SIZE1	O/I	Normal Mode: WAN LED indicator 1. Programmable via WAN Misc. Control register bits [6:4]. '000' = Speed; '001'= Link; '010' = Full/half duplex; '011' = Collision; '100' = TX/RX activity; '101' = Full-duplex collision; '110' = Link/Activity.
			During reset: Bank 0 data access size. Bank 0 is used for the boot program. B0SIZE[1:0] are used to specify the size of the bank 0 data bus width as follows: '01' = one byte, '10' = half-word, '11' = one word, and '00' = reserved.
B17 C17	L1LED0 L2LED0	0	LAN Port[4:1] LED indicator 0. Programmable via switch control 0 register bits [27:25].
D17 E17	L3LED0 L4LED0		'000' = Speed; '001' = Link; '010' = Full/half duplex; '011' = Collision; '100' = TX/RX activity; '101' = Full-duplex collision; '110' = Link/Activity.
B16	L1LED1	0	LAN Port[4:1] LED indicator 1. Programmable via switch control 0 register bits
C16 D16 E16	L2LED1 L3LED1 L4LED1		[24:22]. '000' = Speed; '001' = Link; '010' = Full/half duplex; '011' = Collision; '100' = TX/RX activity; '101' = Full-duplex collision; '110' = Link/Activity.

Note:

1. I = Input.

O = Output.

## **UART Pins**

Pin	Name	I/O Type <sup>(1)</sup>	Description
N16	URXD	I	UART receive data.
N14	UTXD	0	UART transmit data.
N15	UDTRN/ DBGENN	O/I	UART data terminal ready. Active low. DBGENN = 0 (factory reserved test signal)
M16	UDSRN	I	UART data set ready. Active low.
M15	URTSN/	O/I	Normal mode: UART request to send. Active low output.
	CPUCLKSEL		During reset: CPU clock select. Select CPU clock source. CPUCLKSEL=0 (normal mode), the internal PLL clock output is used as the CPU clock source. CPUCLKSEL=1 (factory reserved test signal).
M14	UCTSN/ BISTEN	I	UART clear to send. BIST enable (factory reserved test signal).
L15	UDCDN/ SCANEN	I	UART data carrier detect. Scan enable (factory reserved test signal).
L14	URIN/ TSTRST	Ι	UART ring indicator. Chip test reset (factory reserved test signal).

## General Purpose I/O Pins

Pin	Name	I/O Type <sup>(1)</sup>	Description
G17	GPIO0/ EINT0	I/O	General purpose I/O pin. External interrupt request pin.
G16	GPIO1/ EINT1	I/O	General purpose I/O pin. External interrupt request pin.
H17	GPIO2/ EINT2	I/O	General purpose I/O pin. External interrupt request pin.
H16	GPIO3/ EINT3	I/O	General purpose I/O pin. External interrupt request pin.
H15	GPIO4/ TOUT0	I/O	General purpose I/O pin. Timer 0 output pin.
H14	GPIO5/ TOUT1	I/O	General purpose I/O pin. Timer 1 output pin.
J17	GPIO6	I/O	General purpose I/O pin.
J16	GPIO7	I/O	General purpose I/O pin.
J15	GPIO8	I/O	General purpose I/O pin.
J14	GPIO9	I/O	General purpose I/O pin.
K17	GPIO10	I/O	General purpose I/O pin.
K16	GPIO11	I/O	General purpose I/O pin.
K15	GPIO12	I/O	General purpose I/O pin.
K14	GPIO13	I/O	General purpose I/O pin.
L17	GPIO14	I/O	General purpose I/O pin.
L16	GPIO15	I/O	General purpose I/O pin.
A3	PRSTN	Ι	PCI Reset. Active low. This signal is an input used to reset the KS8695P PCI logic. If the KS8695P is the host, use the RESETN signal to drive this input. If the KS8695P is a guest, use the system reset to drive this signal.

Note:

1. I = Input.

O = Output.

I/O = Bidirectional.

## General Purpose I/O Pins (continued)

Pin	Name	I/O Type <sup>(1)</sup>	Description
D4	PCLK	I	PCI bus clock. This signal provides the timing for the PCI bus transactions. This signal is used to drive the PCI bus interface and the internal PCI logic. All PCI bus signals are sampled on the rising edges of the PCLK. PCLK can operate from 20MHz to 33MHz. For host mode, use PCLKOUT0 signal to drive this input. In guest mode, use the system PCI clock to drive this input.
C2	GNT3N	0	PCI bus grant 3. Active low. In host bridge mode, this is an output signal from the internal PCI arbiter to grant PCI bus access to the device connected to REQ3N. In guest bridge mode, this signal is reserved.
C3	GNT2N	0	PCI bus grant 2. Active low. In host bridge mode, this is an output signal from the internal PCI arbiter to grant PCI bus access to the device connected to REQ2N. In guest bridge mode, this signal is reserved.
C4	GNT1N	0	PCI bus grant 1. Active low. In host bridge mode, this is an output signal from the internal PCI arbiter to grant PCI bus access to the device connected to REQ1N. In guest bridge mode, this signal is an output to indicate that the KS8695P is requesting to access the PCI bus as a PCI master. In guest bridge mode, this is basically the KS8695P's request output.
B2	REQ3N	I	PCI bus request 3. Active low. In host bridge mode, this is an input signal from the external PCI device to request PCI bus access. In guest bridge mode, this signal is reserved.
B3	REQ2N	I	PCI bus request 2. Active low. In host bridge mode, this is an input signal from the external PCI device to request PCI bus access. In guest bridge mode, this signal is reserved.
B4	REQ1N	I	PCI bus request 1. Active low. In host bridge mode, this is an input signal from the external PCI device to request PCI bus access. In guest bridge mode, this is an input signal from an external PCI bus arbiter granting access to the bus. In guest bridge, this is basically the KS8695P's grant input.
A4 D5 B5 C5 A5 D6 B6 C6 B7 C7 A7 D8 B8 D9 A8 C9 D12 B12 C12 A12 D13 B13 C13 B13 C13 A13 B14 C14 A14 D15 B15	PAD31 PAD30 PAD29 PAD28 PAD27 PAD26 PAD25 PAD24 PAD23 PAD22 PAD21 PAD20 PAD20 PAD20 PAD20 PAD19 PAD18 PAD19 PAD18 PAD17 PAD16 PAD15 PAD14 PAD13 PAD12 PAD11 PAD10 PAD10 PAD9 PAD8 PAD7 PAD6 PAD5 PAD4 PAD3	I/O	32-Bit PCI address and data. PCI bus transactions consist of an address phase followed by one or more data phases. Address and data signals are multiplexed on the same pins. For a PCI write transaction, the source of the data is the KS8695P. For a PCI read transaction, the data source is the target. The KS8695P supports both read and write burst transactions. In the case of a read transaction, a special data turn around cycle is needed between the address phase and the data phase(s).

General Purpose I/O Pins (continued)

Pin	Name	I/O Type <sup>(1)</sup>	Description
C15	PAD2	I/O	32-Bit PCI address and data (continued from previous page).
A15	PAD1	_	· · · · · · · · · · · · · · · · · · ·
A16	PAD0		
A6	CBEN3	I/O	PCI commands and byte enable. Active low.
B9	CBEN2	1/0	The PCI command and byte enable signals are multiplexed on the same pins.
A11	CBEN1		During the first clock cycle of a PCI transaction, the CBEN bus contains the
D14	CBEN0		command for the transaction. The PCI transaction consists of the address phases
511	OBEIN		and one or more data phases. During the data phases of the transaction, the bus
			carries the byte enable for the current data phases.
<u></u>	PAR	I/O	
C8	PAR	1/0	Parity. PCI bus parity is even across PAD[31:0] and CBEN[3:0]. The KS8695P generates PAR during the address phase and write data phases as a bus master and during read data phases as a target. It checks for correct PAR during the read data phase as a bus master, during every address phase as a bus slave, and during write data phases as a target.
D10	FRAMEN	I/O	PCI bus frame signal. Active low. FRAMEN is an indication of an active PCI bus cycle. It is asserted at the beginning of a PCI transaction, i.e. the address phase, and deasserted before the final transfer of the data phase of the transaction.
A9	IRDYN	I/O	PCI initiator ready signal. Active low. This signal is asserted by a PCI master to indicate a valid data phase on the PAD bus during data phases of a write transaction. During a read transaction, it indicates that the master is ready to accept data from the target. A target monitors the IRDYN signal when a data phase is completed on any rising edge of the PCI clock when both IRDYN and TRDYN are asserted. Wait cycles are inserted until both IRDYN and TRDYN are asserted together.
C10	TRDYN	I/O	PCI target ready signal. Active low. This signal is asserted by a PCI slave to indicate a valid data phase on the PAD bus during a read transaction. During a write transaction, it indicates that the slave is ready to accept data from the target. A PCI initiator monitors the TRDYN signal when a data phase is completed on any rising edge of the PCI clock when both IRDYN and TRDYN are asserted. Wait cycles are inserted until both IRDYN and TRDYN are asserted together.
C11	DEVSELN	I/O	PCI device select signal. Active low. This signal is asserted when the KS8695P is selected as a target during a bus transaction. When the KS8695P is the initiator of the current bus access, it expects the target to assert DEVSELN within fi ve PCI bus cycles, confirming the access. If the target does not assert DEVSELN within the required bus cycles, the KS8695P aborts the bus cycle. To meet the timing requirement, the KS8695P asserts this signal in a medium speed decode timing. (two bus cycles).
D7	IDSEL	I	Initialization device select. Active high. It is used as a chip select during configuration read and write transactions.
D11	STOPN	I/O	PCI stop signal. Active low. This signal is asserted by the PCI target to indicate to the bus master that it is terminating the current transaction. The KS8695P responds to the assertion of STOPN when it is the bus master, either to disconnect, retry, or abort the transaction.
B11	PERRN	I/O	PCI parity error signal. Active low. The KS8695P asserts PERRN when it checks and detects a bus parity error. When it generates the PAR output, the KS8695P monitors for any reported parity error on PERRN. When the KS8695P is the bus master and a parity error is detected, the KS8695P sets error bits in the control status registers. It completes the current data burst transaction, and then stops the operation. After the host clears the system error, the KS8695P continues its operation.
A10	SERRN	0	PCI system error signal. Active low. If an address parity error is detected, the KS8695P asserts the SERRN signal two clocks after the failing address.
E4	M66EN	I	PCI 66MHz enable. When asserted, this signal indicates the PCI bus segment is operating at 66MHz. This pin is mainly used in guest bridge mode when the PCLK is driven by an external host bridge.

## General Purpose I/O Pins (continued)

Pin	Name	I/O Type <sup>(1)</sup>	Description
D1	PCLKOUT3	0	PCI clock output 3. In host bridge mode driven as 33MHz In guest bridge mode, this signal is reserved
C1	PCLKOUT2	0	PCI clock output 2. In host bridge mode driven as 33MHz In guest bridge mode, this signal is reserved
B1	PCLKOUT1	0	PCI clock output 1. In host bridge mode driven as 33MHz In guest bridge mode, this signal is reserved
A2	PCLKOUT0	0	PCI clock output 0. In host bridge mode driven as 33MHz In guest bridge mode, this signal is reserved
B10	CLKRUNN	I/O	This is a cardbus only signal. The CLKRUNN signal is used by portable cardbus devices to request that the system turn on the bus clock. Output is always active in cardbus and miniPCI modes.
D2	MPCIACTN	0	MiniPCI active. This signal is asserted by the PCI device to indicate that its current function requires full system performance. MPCIACTN is an open drain output signal. In miniPCI mode, this signal is always low.
D3	PBMS	Ι	PCI bridge mode select. This selects the operating mode for the PCI bridge. When PBMS is high, the host bridge mode is selected and the on-chip PCI bus arbiter is enabled. When PBMS is low, the guest bridge mode is selected and the on-chip arbiter is disabled.

#### Advanced Memory Interface (SDRAM/ROM/FLASH/SRAM/EXTERNAL I/O)

Pin	Name	I/O Type <sup>(1)</sup>	Description
T7	SDICLK	I	SDRAM Clock In: SDRAM clock input for the SDRAM memory controller interface.
U7	SDOCLK	0	System/SDRAM Clock Out: Output of the internal system clock, it is also used as the clock signal for SDRAM interface.
P4	ADDR21/BA1	0	Address Bit 21/Bank Address Input 1: Address bit 21 for asynchronous accesses. Bank Address Input bit 1 for SDRAM accesses.
P3	ADDR20/BA0	0	Address Bit 20/Bank Address Input 0: Address bit 20 for asynchronous accesses. Bank Address Input bit 0 for SDRAM accesses.
M3	ADDR[19]	0	Address Bus: The 22-bit address bus (including ADDR[21:20] above) covers 4M
M2	ADDR[18]		word memory space shared by ROM/SRAM/FLASH, SDRAM, and external I/O
M1	ADDR[17]		banks. During the SDRAM cycles, the internal address bus is used to generate RAS
N4	ADDR[16]		and CAS addresses for the SDRAM. The number of column address bits in the
N3	ADDR[15]		SDRAM banks can be programmed from 8 to 11 bits via the SDRAM control
N2	ADDR[14]		registers. ADDR[12:0] are the SDRAM address and ADDR[21:20] are the SDRAM
N1	ADDR[13]		bank address. During other cycles, the ADDR[21:0] is the byte address of the data
P2	ADDR[12]		transfer. For SDRAM and FLASH/ROM/SRAM, connect all address lines, i.e. A0 to
P1	ADDR[11]		A0, A1 to A1, etc. The memory controller automatically handles address line
R3	ADDR[10]		adjustments for the 8/16/32 bit accesses. For external I/O devices, the user needs
R2	ADDR[9]		to connect address lines for 8/16/32 bit accesses.
R1 T2	ADDR[8]		
T1	ADDR[7] ADDR[6]		
U1	ADDR[5]		
U2	ADDR[4]		
T3	ADDR[3]		
U3	ADDR[2]		
T4	ADDR[1]		
U4	ADDR[0]		

Note:

1. I = Input.

O = Output.

## Advanced Memory Interface (SDRAM/ROM/FLASH/SRAM/EXTERNAL I/O) (continued)

P7     DATA[31]     I/O     External Data Bus. 32-Bit bi-directional data bus for data transfer. The KS8695P also supports 8-bit and 16-bit data bus widths.       P8     DATA[22]     DATA[23]       P8     DATA[23]     DATA[24]       P8     DATA[25]     DATA[25]       P9     DATA[25]     DATA[26]       P9     DATA[25]     DATA[26]       P9     DATA[25]     DATA[26]       P10     DATA[26]     DATA[27]       P10     DATA[27]     DATA[28]       P10     DATA[26]     DATA[27]       P11     DATA[17]     DATA[17]       P11     DATA[17]     DATA[18]       P11     DATA[18]     DATA[11]       P12     DATA[11]     DATA[12]       P13     DATA[12]     DATA[11]       P14     DATA[21]     DATA[21]       P14     DATA[21]     DATA[21]       P14     DATA[21]     DATA[21]       P15     DATA[21]     DATA[21]       P14     DATA[21]     DATA[21]       P15     DATA[21]     DATA[21]       P14     DATA[21]     DATA[21]       P15     DATA[21]     DATA[21]       P15     DATA[31]     DATA[31]       P14     DATA[31]     DATA[31] <td< th=""><th>Pin</th><th>Name</th><th>I/O Type<sup>(1)</sup></th><th>Description</th></td<>	Pin	Name	I/O Type <sup>(1)</sup>	Description
R7         DATA[30]         also supports 8-bit and 16-bit data bus widths.           P8         DATA[28]         also supports 8-bit and 16-bit data bus widths.           P8         DATA[27]         also supports 8-bit and 16-bit data bus widths.           P8         DATA[27]         also supports 8-bit and 16-bit data bus widths.           P9         DATA[23]         also supports 8-bit and 16-bit data bus widths.           P9         DATA[24]         also supports 8-bit and 16-bit data bus widths.           P10         DATA[23]         also supports 8-bit and 16-bit data bus widths.           P10         DATA[23]         also supports 8-bit and 16-bit data bus widths.           P10         DATA[21]         also supports 8-bit and 16-bit data bus widths.           P10         DATA[21]         also supports 8-bit and 16-bit data bus widths.           P10         DATA[21]         also supports 8-bit and 16-bit data bus widths.           P11         DATA[21]         also supports 8-bit and 16-bit data bus widths.           P11         DATA[21]         also supports 8-bit and 16-bit data bus widths.           P11         DATA[21]         also supports 8-bit and 16-bit data bus widths.           P11         DATA[21]         also supports 8-bit and 16-bit data bus widths.           P11         DATA[21]         also supports 8-b	P7			
P8     DATA[29]       R8     DATA[29]       R8     DATA[29]       R9     DATA[25]       P9     DATA[25]       P9     DATA[24]       P10     DATA[21]       R11     DATA[21]       R12     DATA[21]       R10     DATA[21]       R11     DATA[21]       R11     DATA[11]       U10     DATA[11]       U11     DATA[11]       U11     DATA[13]       R11     DATA[13]       R12     DATA[13]       R11     DATA[13]       R12     DATA[13]       R13     DATA[13]       R14     DATA[13]       R13     DATA[2]       R14     DATA[2]       R4     SDCSN[1]     O       SDRAM     SDRAM Colum Address Strobe: Active low. The row address strobe pin for SDRAM.       R5     SDCASN     O       SDRAM     SDRAM Colum Address Strobe: Active low. The column address strobe pin for SDRAM.			1/0	
R8         DATA[22]           R9         DATA[22]           P9         DATA[22]           R9         DATA[23]           P0         DATA[24]           R9         DATA[23]           P10         DATA[23]           P10         DATA[21]           P10         DATA[21]           P11         DATA[21]           P11         DATA[21]           P11         DATA[21]           P11         DATA[16]           P11         DATA[16]           P11         DATA[16]           P11         DATA[16]           P11         DATA[16]           P11         DATA[16]           P12         DATA[16]           P13         DATA[17]           P14         DATA[16]           P12         DATA[17]           P13         DATA[6]           P14         DATA[6]				
TB         DATA[27]           UB         DATA[25]           P9         DATA[25]           P9         DATA[24]           T9         DATA[25]           P10         DATA[21]           P10         DATA[22]           P10         DATA[22]           P10         DATA[22]           P10         DATA[21]           P11         DATA[18]           P11         DATA[17]           R11         DATA[18]           P12         DATA[18]           P12         DATA[18]           P12         DATA[11]           P12         DATA[13]           R12         DATA[14]           P12         DATA[13]           R12         DATA[14]           P12         DATA[11]           U13         DATA[6]           P14         DATA[2]           P14         DATA[2]           P14         DATA[2]           P14         DATA[2]           P15         SDCSN[1]           P16         SDCSN[1]           P17         SDCSNN           P18         SDCSNN           P2         SDCASN				
U8     DATA[25]       P9     DATA[25]       R9     DATA[22]       U9     DATA[22]       P10     DATA[22]       P10     DATA[22]       P10     DATA[22]       P10     DATA[22]       P10     DATA[22]       P10     DATA[23]       U10     DATA[21]       P11     DATA[11]       P11     DATA[11]       P12     DATA[11]       P13     DATA[2]       P14     DATA[2]       P13     DATA[2]       P14     DATA[2]       P14     DATA[2]       P14     DATA[2]       P15     SDCSN[1]       O     SDRAM Chip Select: Active low chip select pins for SDRAM. The KS8695P       supports up to two SDRAM banks. One SDCSN output is provided for each bank.       R5     SDRASN       O     SDRAM Column Address Strobe: Active low. The ora address strobe pin for SDRAM.       P6     SDCSN[1]     O       SDRAM     SDRAM Column Address Strobe: Active low. The ora address strobe pin for SDRAM.       P6     SDOM[3]     SDRAM Column Address Strobe: Active low. The coultim address strobe pin for SDRAM.       P6     SDOM[2]     SDRAM Write Enable: Active low. The wite acable signal for SDRAM.       P16     SDOM[1]     O <td></td> <td></td> <td></td> <td></td>				
P9         DATA[25]           R9         DATA[23]           U9         DATA[22]           P10         DATA[21]           R10         DATA[21]           R10         DATA[21]           R10         DATA[21]           R10         DATA[21]           R10         DATA[21]           R11         DATA[11]           R11         DATA[11]           R11         DATA[12]           R11         DATA[13]           R12         DATA[13]           R12         DATA[13]           R12         DATA[13]           R13         DATA[13]           R14         DATA[3]           R13         DATA[3]           R14         DATA[3]           R14         DATA[3]           R14         DATA[3]           R14         DATA[3]           R14         DATA[3]           R14         DATA[3]           R15         SDCSN[0]           SDRAM         O           SDRAM         SDRAM Chip Select: Active low. The ouddress strobe pin for SDRAM.           R5         SDCSN[0]         SDRAM Chip Mathese Strobe: Active low. The column address strobe pin for SDRAM.				
R9         DATA[23]           19         DATA[23]           19         DATA[21]           P10         DATA[21]           P10         DATA[21]           P10         DATA[21]           P10         DATA[21]           P11         DATA[21]           P110         DATA[18]           P111         DATA[17]           P111         DATA[14]           P12         DATA[13]           P11         DATA[14]           P12         DATA[14]           P12         DATA[13]           P13         DATA[9]           P13         DATA[6]           P14         DATA[7]           U13         DATA[7]           U14         DATA[7]           U15         DATA[7]           U14         DATA[7]           U15         DATA[7]           U14         DATA[7]           U15         DATA[7]           U16         SDCSN[1]           U17         DATA[7]           U18         DATA[7]           U19         SDCSN[1]           O         SDRAM Chip Select: Active low chip select pins for SDRAM. The K88695P				
T9         DATA[22]           P10         DATA[21]           P10         DATA[21]           P10         DATA[20]           P10         DATA[20]           P10         DATA[20]           P11         DATA[19]           U10         DATA[17]           R11         DATA[18]           P11         DATA[16]           P11         DATA[17]           R12         DATA[12]           P12         DATA[13]           P12         DATA[14]           P12         DATA[12]           P13         DATA[13]           P14         DATA[13]           P13         DATA[14]           P14         DATA[17]           U14         DATA[2]           P14         DATA[3]           U14         DATA[2]           P15         DATA[1]           U14         DATA[2]           P15         DATA[1]           U14         DATA[2]           P15         SDCSN[0]         SDRAM Chip Select: Active low chip select pins for SDRAM. The KS8695P           SDCASN         O         SDRAM Row Address Strobe: Active low. The row address strobe pin for SDRAM.           T5				
U9       DATA[22]         P10       DATA[21]         P10       DATA[21]         P10       DATA[20]         T10       DATA[21]         P11       DATA[18]         P11       DATA[17]         P11       DATA[17]         P11       DATA[18]         P11       DATA[13]         P12       DATA[13]         P12       DATA[13]         P12       DATA[13]         P12       DATA[13]         P13       DATA[3]         P14       DATA[13]         P13       DATA[6]         P14       DATA[6]         P15       SDCSN[0]       O         SDRAM       O       SDRAM Column Address Strobe: Active low. The row address strobe pin for SDRAM.         P15       SDCM3N       O       SDRAM Column Address Strobe: Active low. The column address strobe				
P10DATA[21]R10DATA[20]R10DATA[21]R11DATA[13]P11DATA[17]R11DATA[17]R11DATA[16]P11DATA[17]R11DATA[13]P12DATA[13]P12DATA[13]P13DATA[13]P14DATA[14]P12DATA[13]P13DATA[10]P13DATA[10]P13DATA[11]U12DATA[13]P14DATA[14]P14DATA[13]U15DATA[1]U15DATA[1]U15DATA[1]U15DATA[1]U15DATA[1]U15SDCSN[0]SUPANN up to two SDRAM banks. One SDCSN output is provided for each bank.R4SDCSN[1]OSDRAMSDRAM Column Address Strobe: Active low. The row address strobe pin for SDRAM.T5SDCASNOSDRAM.SDRAM Write Enable: Active low. The column address strobe pin for SDRAM.P6SDOM[3]OSDCANI1OSDCANI1OSDCANI1OU16ECSN[2]OSDRAM Data Input/Output Mask signal for SDRAM.P6SDOM[3]OSDCANI1OSDCANI1ODATA[2], respectively.U16ECSN[1]P7RECSN[1]OSDRAM Data Input/Output Mask signal for SDRAM.P6SDOM[3]OSDRAM Data Input/Output Mask signal f				
R10       DATA[20]         T10       DATA[12]         U10       DATA[13]         P11       DATA[14]         P11       DATA[15]         T11       DATA[15]         T11       DATA[16]         T12       DATA[13]         P12       DATA[14]         P12       DATA[13]         R12       DATA[14]         P13       DATA[16]         T14       DATA[16]         P13       DATA[16]         P14       DATA[2]         R13       DATA[1]         U14       DATA[2]         T15       DATA[1]         U14       DATA[2]         T15       DATA[1]         U15       DATA[1]         U16       DATA[2]         T15       SDCSN[0]         SDRASN       O         SDRASN       O         SDRAM       SDRAM Chip Select: Active low chip select pins for SDRAM. The KS8695P         SubcSN[0]       SDRAM More Address Strobe: Active low. The row address strobe pin for SDRAM.         T5       SDCASN       O       SDRAM Write Enable: Active low. The row address strobe pin for SDRAM.         T6       SDOM[3]       O       S				
T10DATA[19]U10DATA[17]P11DATA[17]R11DATA[17]R11DATA[16]U11DATA[15]U11DATA[15]U11DATA[14]P12DATA[12]R12DATA[12]R12DATA[10]P13DATA[10]P13DATA[8]T13DATA[8]T13DATA[6]P14DATA[5]R14DATA[6]P14DATA[1]U15DATA[0]P3SDCSN[0]SDCSN[0]SDRAM Chip Select: Active low chip select pins for SDRAM. The KS8695Psupports up to two SDRAM banks. One SDCSN output is provided for each bank.R5SDCSN[0]SDCSN[0]SDRAM Column Address Strobe: Active low. The row address strobe pin for SDRAM.U5SDCANOSDRAM Column Address Strobe: Active low. The column address strobe pin for SDRAM.U5SDCMI3OSDRAM Column Address Strobe: Active low. The column address strobe pin for SDRAM.U5SDWENOSDRAM Data Input/Output Mask: Data input/output mask signals for SDRAM. The SDGM[1]U6SDQM[3]OSDRAM Data Input/Output Mask signals for SDRAM. The SDCM0[1]U6SDQM[1]U76ECSN[2]U6SDQM[1]U76ECSN[2]U76ECSN[2]U76ECSN[2]U76ECSN[2]U76ECSN[2]U76ECSN[2]U76ECSN[3]U76 <td></td> <td></td> <td></td> <td></td>				
U10DATA[17] P11DATA[17] DATA[17] P11DATA[16] P11P11DATA[17] P11DATA[14] P12P11DATA[14] P12DATA[13] P12P12DATA[12] P13DATA[10] P13P13DATA[10] P13DATA[10] P13P13DATA[7] P13DATA[6] P14P14DATA[6] P14DATA[1] P14U13DATA[6] P14DATA[1] P14U14DATA[2] P15DATA[1] P15P5SDCSN[0]SDRAM Chip Select: Active low chip select pins for SDRAM. The KS8695P supports up to two SDRAM banks. One SDCSN output is provided for each bank.R5SDRASNOSDRAM Row Address Strobe: Active low. The row address strobe pin for SDRAM.V5SDWENOSDRAM Write Enable: Active low. The row address strobe pin for SDRAM.V6SDQM[3]OSDRAM Write Enable: Active low. The write enable signal for SDRAM.V6SDQM[1]OSDRAM Data Input/Output Mask: signal for SDRAM. The SDQM[1]V6SDQM[1]OSDRAM Data Input/Output Mask: isgnal for SDRAM.V6SDQM[2] SDQM[1]OSDRAM Data Input/Output Mask signal for SDRAM. The Output enable signal for read accesses. Input data are masked during a write cycle. The SDQM[1]V16ECSN[2] ECSN[2]OExternal I/O Device Chip Select: Active low. Three external I/O bank stores up to 16KB. The ECSNX signals indicate which of the three I/O bank stores up to 16KB. The ECSNX signals indicate which of the three I/O bank stores up to 16KB. The ECSNX signals indicate which of the three I/O bank	R10	DATA[20]		
P11       DATA[17]         R11       DATA[16]         P11       DATA[16]         U11       DATA[13]         P12       DATA[13]         R12       DATA[13]         R12       DATA[13]         R12       DATA[13]         R12       DATA[13]         R12       DATA[14]         U12       DATA[16]         P13       DATA[8]         T13       DATA[6]         P14       DATA[6]         P14       DATA[6]         P14       DATA[6]         P14       DATA[7]         U15       DATA[1]         U15       SDCSN[0]       SDRAM Column Address Strobe: Active low. The row address strobe pin for SDRAM.         U16 <td< td=""><td>T10</td><td>DATA[19]</td><td></td><td></td></td<>	T10	DATA[19]		
P11       DATA[17]         R11       DATA[16]         P11       DATA[16]         U11       DATA[13]         P12       DATA[13]         R12       DATA[13]         R12       DATA[13]         R12       DATA[13]         R12       DATA[13]         R12       DATA[14]         U12       DATA[16]         P13       DATA[8]         T13       DATA[6]         P14       DATA[6]         P14       DATA[6]         P14       DATA[6]         P14       DATA[7]         U15       DATA[1]         U15       SDCSN[0]       SDRAM Column Address Strobe: Active low. The row address strobe pin for SDRAM.         U16 <td< td=""><td>U10</td><td>DATA[18]</td><td></td><td></td></td<>	U10	DATA[18]		
R11       DATA[16]         T11       DATA[14]         P12       DATA[14]         P12       DATA[13]         R12       DATA[14]         P12       DATA[13]         T12       DATA[14]         U12       DATA[13]         T12       DATA[14]         U12       DATA[16]         P13       DATA[9]         R13       DATA[6]         P14       DATA[16]         P14       DATA[17]         U13       DATA[13]         U14       DATA[14]         T14       DATA[16]         P14       DATA[17]         U13       DATA[10]         U14       DATA[1]         U15       DATA[1]         U14       DATA[1]         U15       DATA[1]         U14       DATA[1]         U15       DATA[1]         U14       DATA[2]         T15       DATA[1]         U14       DATA[2]         T15       SDCSN[0]         SDRAM Row Address Strobe: Active low. The row address strobe pin for SDRAM.         T5       SDCASN       O       SDRAM Column Address Strobe: Active low. The column address s	P11			
T11       DATA[15]         U11       DATA[13]         P12       DATA[13]         R12       DATA[13]         R12       DATA[14]         U12       DATA[13]         R12       DATA[14]         U12       DATA[10]         P13       DATA[8]         R13       DATA[8]         T13       DATA[6]         P14       DATA[5]         R14       DATA[2]         T15       DATA[1]         U14       DATA[2]         T15       DATA[1]         U14       DATA[2]         T15       DATA[1]         U14       DATA[2]         T15       DATA[1]         U14       DATA[2]         T15       DATA[1]         U15       DATA[0]         R4       SDCSN[1]       O         SDRAM Row Address Strobe: Active low. The row address strobe pin for SDRAM.         T5       SDCASN       O         SDRAM Column Address Strobe: Active low. The column address strobe pin for SDRAM.         T6       SDQM[2]       O         SDRAM Data Input/Output Mask: Data input/output mask signals for SDRAM.         T6       SDQM[1]				
U11       DATA[13]         P12       DATA[12]         T12       DATA[12]         T12       DATA[11]         U12       DATA[10]         P13       DATA[9]         R13       DATA[1]         U12       DATA[1]         U13       DATA[1]         U13       DATA[1]         U13       DATA[1]         U14       DATA[2]         T14       DATA[1]         U14       DATA[2]         T14       DATA[1]         U15       DATA[1]         U14       DATA[2]         T15       DATA[1]         U15       DATA[1]         U15       DATA[1]         U15       DATA[1]         U15       DATA[1]         U15       DATA[0]         SDCSN[0]       SUPPOrts up to two SDRAM banks. One SDCSN output is provided for each bank.         R5       SDCASN       O       SDRAM Column Address Strobe: Active low. The row address strobe pin for SDRAM.         T5       SDCASN       O       SDRAM Vrite Enable: Active low. The write enable signal for SDRAM.         P6       SDQM[3]       O       SDRAM Data Input/Output Mask: Data input/output mask signals for SDRAM. The SDQM is sam				
P12       DATA[13]         R12       DATA[12]         T12       DATA[11]         U12       DATA[10]         P13       DATA[9]         R13       DATA[9]         R13       DATA[6]         P14       DATA[1]         U13       DATA[6]         P14       DATA[1]         U14       DATA[1]         U14       DATA[2]         T14       DATA[1]         U15       DATA[1]         U14       DATA[2]         T15       SDCSN[0]         R4       SDCSN[1]       O         SDRAM Row Address Strobe: Active low. The row address strobe pin for SDRAM.         T5       SDCASN       O         SDRAM       O       SDRAM Column Address Strobe: Active low. The row address strobe pin for SDRAM.         T5       SDCASN       O       SDRAM Column Address Strobe: Active low. The column address strobe pin for SDRAM.         T6       SDQM[2]       O       SDRAM Data Input/Output Mask: Data input/output mask signal for SDRAM.         T6       SDQM[1]       O       SDRAM Data Input/Output mask signal for write accesses and an output enable signal for read accesses. Input data are masked during a write cycle. The SDQM0/1/2/3 correspond to DATA[7:0], DATA[13:4], espectively. <td></td> <td></td> <td></td> <td></td>				
R12       DATA[12]         T12       DATA[10]         P13       DATA[10]         P13       DATA[2]         R13       DATA[2]         R13       DATA[2]         P14       DATA[5]         P14       DATA[2]         T15       DATA[2]         T14       DATA[2]         T15       DATA[1]         U14       DATA[2]         T15       DATA[1]         U15       DATA[1]         O       SDRAM Chip Select: Active low chip select pins for SDRAM. The KS8695P         Supports up to two SDRAM banks. One SDCSN output is provided for each bank.         R5       SDRASN       O         SDRAM Column Address Strobe: Active low. The row address strobe pin for SDRAM.         T5       SDCAN[3]       O         SDRAM Write Enable: Active low. The write enable signal for SDRAM.         P6       SDQM[2]       SDQAM Strang a mite cycle. <td></td> <td></td> <td></td> <td></td>				
T12       DATA[11]         U12       DATA[10]         P13       DATA[9]         R13       DATA[9]         R13       DATA[6]         P14       DATA[6]         P14       DATA[6]         P14       DATA[6]         P14       DATA[7]         U13       DATA[6]         P14       DATA[2]         R14       DATA[1]         U14       DATA[2]         T15       DATA[0]         R4       SDCSN[1]       O         SDRAM Row Address Strobe: Active low chip select pins for SDRAM. The KS8695P         SDSSN[0]       SDRAM Row Address Strobe: Active low. The row address strobe pin for SDRAM.         R5       SDCASN       O       SDRAM Column Address Strobe: Active low. The column address strobe pin for SDRAM.         T5       SDCKSN       O       SDRAM Column Address Strobe: Active low. The column address strobe pin for SDRAM.         U5       SDWEN       O       SDRAM Column Address Strobe: Active low. The column address strobe pin for SDRAM.         R6       SDQM[3]       O       SDRAM Data Input/Output Mask: signal for SDRAM.         U6       SDQM[3]       O       SDRAM Data Input/Output Mask: signal for surite accesses and an output enable signal for read accesses. Input data are m				
U12       DATA[10]         P13       DATA[9]         P13       DATA[9]         P13       DATA[9]         P13       DATA[7]         U13       DATA[6]         P14       DATA[5]         R14       DATA[1]         U13       DATA[2]         R14       DATA[2]         R14       DATA[2]         T15       DATA[1]         U14       DATA[2]         T15       DATA[1]         U15       DATA[0]         R4       SDCSN[0]         SDRAM Row Address Strobe: Active low. The row address strobe pin for SDRAM.         SDRASN       O         SDRAM Column Address Strobe: Active low. The row address strobe pin for SDRAM.         T5       SDCASN         U5       SDWEN         O       SDRAM Write Enable: Active low. The write enable signal for SDRAM. The SDQMI/1         U16       SDQM[2]         U16       SDQM[2]         U16       ECSN[1]         U16       ECSN[0]         U16       ECSN[0]         U16       ECSN[0]         U16       ECSN[0]         U16       ECSN[0]         U16       ECS				
P13       DATA[9]         R13       DATA[4]         T13       DATA[7]         U13       DATA[6]         P14       DATA[5]         P14       DATA[4]         T14       DATA[2]         T14       DATA[2]         U14       DATA[2]         U15       DATA[1]         U15       DATA[1]         U15       DATA[1]         U15       DATA[2]         R4       SDCSN[0]         SDRAM       SDRAM Chip Select: Active low chip select pins for SDRAM. The KS8695P         supports up to two SDRAM banks. One SDCSN output is provided for each bank.         R5       SDRASN       O         SDRAM Row Address Strobe: Active low. The row address strobe pin for SDRAM.         T5       SDCASN       O         SDRAM       O       SDRAM Write Enable: Active low. The column address strobe pin for SDRAM.         T6       SDQM[3]       O       SDRAM Data Input/Output Mask: Data input/output mask signal for SDRAM. The SDQMI is an output enable signal for write accesses and an output enable signal for read accesses. Input data are masked during a write cycle.         U16       ECSN[1]       O       External I/O Device Chip Select: Active low. Three external I/O banks are provided for external memory mapped I/O operations. Each I/O banks are provi				
R13       DATA[6]         T13       DATA[7]         U13       DATA[6]         P14       DATA[6]         P14       DATA[6]         R14       DATA[2]         T15       DATA[1]         U14       DATA[2]         T15       DATA[0]         R4       SDCSN[1]       O         SDCSN[0]       SDRAM Chip Select: Active low chip select pins for SDRAM. The KS8695P         supports up to two SDRAM banks. One SDCSN output is provided for each bank.         R5       SDCSN[0]         SDCASN       O         SDRAM Column Address Strobe: Active low. The row address strobe pin for SDRAM.         T5       SDCASN         U5       SDWEN         O       SDRAM Mrite Enable: Active low. The write enable signal for SDRAM.         V5       SDQM[2]         O       SDRAM Data Input/Output Mask: Data input/output mask signals for SDRAM.         R6       SDQM[2]         O       SDRAM Data Input/Output Mask: Data input/output mask signal for write accesses and an output enable signal for read accesses. Input data are masked during a write cycle. The SDQM/12/2 correspond to DATA[7:0], DATA[15:8], DATA[23:16] and DATA[31:24], respectively.         U16       ECSN[2]       O         External I/O Device Chip Select: Active low. Th				
T13       DATA[7]         U13       DATA[6]         P14       DATA[6]         P14       DATA[6]         R14       DATA[2]         T14       DATA[2]         T15       DATA[0]         U14       DATA[2]         U15       DATA[1]         U15       DATA[0]         R4       SDCSN[0]         SDRAM       SDRAM Chip Select: Active low chip select pins for SDRAM. The KS8695P supports up to two SDRAM banks. One SDCSN output is provided for each bank.         R5       SDRASN       O       SDRAM Row Address Strobe: Active low. The row address strobe pin for SDRAM.         T5       SDCASN       O       SDRAM Column Address Strobe: Active low. The column address strobe pin for SDRAM.         U5       SDWEN       O       SDRAM Data Input/Output Mask: Data input/output mask signals for SDRAM.         V6       SDQM[3]       O       SDRAM Data Input/Output Mask: Data input/output mask signal for write accesses and an output enable signal for read accesses. Input data are masked during a write cycle. The SDQM0/12/3 correspond to DATA[7:0], DATA[15:8], DATA[23:16] and DATA[31:24], respectively.         U16       ECSN[2]       O       External I/O Device Chip Select: Active low. Three external I/O banks are provided for external memory mapped I/O operations. Each I/O banks stores up to 16KB. The ECSNx signals indicate which of the three I/O banks is select				
U13       DATA[6]         P14       DATA[5]         R14       DATA[4]         T14       DATA[3]         U14       DATA[2]         T15       DATA[0]         R4       SDCSN[1]       O         SDRAM Chip Select: Active low chip select pins for SDRAM. The KS8695P         P5       SDCSN[0]         R4       SDCSN[1]       O         SDRAM Row Address Strobe: Active low. The row address strobe pin for SDRAM.         T5       SDCASN       O         SDRAM Column Address Strobe: Active low. The column address strobe pin for SDRAM.         U5       SDWEN       O         SDRAM Write Enable: Active low. The write enable signal for SDRAM.         P6       SDQM[2]       SDRAM Data Input/Output Mask: Data input/output mask signals for SDRAM.         V16       SDQM[2]       O         SDRAM Data Input/Output Mask: Data input/output mask signal for write accesses and an output enable signal for read accesses. Input data are masked during a write cycle. The SDQM(0)/12/3 correspond to DATA[7:0], DATA[15:8], DATA[23:16] and DATA[31:24], respectively.         U16       ECSN[2]       O       External I/O Device Chip Select: Active low. Three external I/O banks are provided for external memory mapped I/O operations. Each I/O banks is selected.         P16       EWAITN       I       External Wait: Acti				
P14       DATA[5]         R14       DATA[4]         T14       DATA[3]         U14       DATA[2]         T15       DATA[1]         U15       DATA[0]         R4       SDCSN[0]         SDRASN       O         SDRAM Row Address Strobe: Active low. The row address strobe pin for SDRAM.         R5       SDRASN         O       SDRAM Row Address Strobe: Active low. The column address strobe pin for SDRAM.         T5       SDCASN         0       SDRAM Column Address Strobe: Active low. The column address strobe pin for SDRAM.         U5       SDWEN         0       SDRAM Data Input/Output Mask: Data input/output mask signal for SDRAM.         P6       SDQM[2]         0       SDRAM Data Input/Output Mask: Data input/output mask signal for write accesses and an output enable signal for read accesses. Input data are masked during a write cycle. The SDQM0/1/2/3 correspond to DATA[7:0], DATA[15:8], DATA[23:16] and DATA[31:24], respectively.         U16       ECSN[1]       O         External I/O Device Chip Select: Active low. Three external I/O banks are provided for external memory mapped I/O operations. Each I/O banks tores up to 16KB. The ECSN[0]         P16       EWAITN       I       External Wait: Active low. This signal is asserted when an external I/O device or a ROM/SRAM/FLASH bank needs more access cycles than those d				
R14       DATA[4]         T14       DATA[3]         U14       DATA[2]         T15       DATA[1]         U15       DATA[0]         R4       SDCSN[0]         SDRAM       O         SDRAM Row Address Strobe: Active low. The row address strobe pin for SDRAM.         R5       SDRASN         O       SDRAM Row Address Strobe: Active low. The row address strobe pin for SDRAM.         T5       SDCASN         O       SDRAM Column Address Strobe: Active low. The column address strobe pin for SDRAM.         U5       SDWEN         O       SDRAM Row Address Strobe: Active low. The column address strobe pin for SDRAM.         U5       SDWEN         O       SDRAM Data Input/Output Mask: Data input/output mask signals for SDRAM. The SDQM[3]         V6       SDQM[2]         U16       SDQM[1]         U16       ECSN[2]         U16       ECSN[1]         P16       EWAITN         P16       EVAITN         R16       ECSN[1]         P16       EVAITN         P16       EVAITN         P16       EVAITN         P16       EVAITN         P16       RCSN[0] <t< td=""><td></td><td></td><td></td><td></td></t<>				
T14       DATA[3]         U14       DATA[2]         T15       DATA[1]         U15       DATA[0]         R4       SDCSN[0]       O         SDRAM Chip Select: Active low chip select pins for SDRAM. The KS8695P         P5       SDCSN[0]       O         SDRAM       O       SDRAM Row Address Strobe: Active low. The row address strobe pin for SDRAM.         T5       SDCASN       O       SDRAM Column Address Strobe: Active low. The column address strobe pin for SDRAM.         U5       SDWEN       O       SDRAM Write Enable: Active low. The write enable signal for SDRAM.         P6       SDQM[2]       O       SDRAM Data Input/Output Mask: Data input/output mask signals for SDRAM. The SDQM[1]         U6       SDQM[2]       SDQMI is sampled high and is an output mask signal for write accesses and an output enable signal for read accesses. Input data are masked during a write cycle. The SDQM0/11/2/3 correspond to DATA[7:0], DATA[23:16] and DATA[31:24], respectively.         U16       ECSN[2]       O       External McDevice Chip Select: Active low. Thre external I/O banks are provided for external memory mapped I/O operations. Each I/O banks is selected.         P16       EWAITN       I       External Wait: Active low. This signal is asserted when an external I/O device or a ROM/SRAM/FLASH bank needs more access cycles than those defined in the corresponding control register.         R15				
U14 T15 DATA[1]DATA[2] DATA[0]R4 SDCSN[0]SDCAN[0]OSDRAM Chip Select: Active low chip select pins for SDRAM. The KS8695P supports up to two SDRAM banks. One SDCSN output is provided for each bank.R5SDRASNOSDRAM Row Address Strobe: Active low. The row address strobe pin for SDRAM.T5SDCASNOSDRAM Column Address Strobe: Active low. The column address strobe pin for SDRAM.U5SDWENOSDRAM Column Address Strobe: Active low. The column address strobe pin for SDRAM.P6SDQM[3]OSDRAM Data Input/Output Mask: Data input/output mask signal for SDRAM. The SDQM is sampled high and is an output mask signal for write accesses and an output enable signal for read accesses. Input data are masked during a write cycle. The SDQM0/1/2/3 correspond to DATA[7:0], DATA[15:8], DATA[23:16] and DATA[31:24], respectively.U16ECSN[2] ECSN[0]OExternal I/O Device Chip Select: Active low. Three external I/O banks are provided for external memory mapped I/O operations. Each I/O bank stores up to 16KB. The ECSNx signals indicate which of the three I/O banks is selected.P16EWAITNIExternal Wait: Active low. This signal is asserted when an external I/O device or a ROM/SRAM/FLASH Chip Select: Active low. The KS8695P can access up to two external ROM/SRAM/FLASH chip Select: Active low. The KS8695P can access up to two external ROM/SRAM/FLASH memory banks. The RCSN pins can be controlled to		DATA[4]		
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U15DATA[0]R4SDCSN[1]OSDRAM Chip Select: Active low chip select pins for SDRAM. The KS8695P supports up to two SDRAM banks. One SDCSN output is provided for each bank.R5SDRASNOSDRAM Row Address Strobe: Active low. The row address strobe pin for SDRAM.T5SDCASNOSDRAM Column Address Strobe: Active low. The column address strobe pin for SDRAM.U5SDWENOSDRAM Write Enable: Active low. The write enable signal for SDRAM.P6SDQM[3]OSDRAM Data Input/Output Mask: Data input/output mask signals for SDRAM. The SDQM is sampled high and is an output mask signal for write accesses and an output enable signal for read accesses. Input data are masked during a write cycle. The SDQM[1]U16ECSN[2]OExternal I/O Device Chip Select: Active low. Three external I/O banks are provided for external memory mapped I/O operations. Each I/O bank stores up to 16KB. The ECSNs signals indicate which of the three I/O banks is selected.P16EWAITNIExternal Wait: Active low. This signal is asserted when an external I/O device or a ROM/SRAM/FLASH bank needs more access cycles than those defined in the corresponding control register.R15RCSN[0]OROM/SRAM/FLASH Chip Select: Active low. The KS8695P can access up to two external ROM/SRAM/FLASH memory banks. The RCSN pins can be controlled to	U14	DATA[2]		
U15DATA[0]R4SDCSN[1]OSDRAM Chip Select: Active low chip select pins for SDRAM. The KS8695P supports up to two SDRAM banks. One SDCSN output is provided for each bank.R5SDRASNOSDRAM Row Address Strobe: Active low. The row address strobe pin for SDRAM.T5SDCASNOSDRAM Column Address Strobe: Active low. The column address strobe pin for SDRAM.U5SDWENOSDRAM Write Enable: Active low. The write enable signal for SDRAM.P6SDQM[3]OSDRAM Data Input/Output Mask: Data input/output mask signals for SDRAM. The SDQM is sampled high and is an output mask signal for write accesses and an output enable signal for read accesses. Input data are masked during a write cycle. The SDQM[1]U16ECSN[2]OExternal I/O Device Chip Select: Active low. Three external I/O banks are provided for external memory mapped I/O operations. Each I/O bank stores up to 16KB. The ECSNs signals indicate which of the three I/O banks is selected.P16EWAITNIExternal Wait: Active low. This signal is asserted when an external I/O device or a ROM/SRAM/FLASH bank needs more access cycles than those defined in the corresponding control register.R15RCSN[1]OROM/SRAM/FLASH Chip Select: Active low. The KS8695P can access up to two external ROM/SRAM/FLASH memory banks. The RCSN pins can be controlled to	T15	DATA[1]		
R4       SDCSN[1]       O       SDRAM Chip Select: Active low chip select pins for SDRAM. The KS8695P supports up to two SDRAM banks. One SDCSN output is provided for each bank.         R5       SDRASN       O       SDRAM Row Address Strobe: Active low. The row address strobe pin for SDRAM.         T5       SDCASN       O       SDRAM Column Address Strobe: Active low. The column address strobe pin for SDRAM.         U5       SDWEN       O       SDRAM Write Enable: Active low. The write enable signal for SDRAM.         P6       SDQM[3]       O       SDRAM Data Input/Output Mask: Data input/output mask signals for SDRAM. The SDQM[2]         R6       SDQM[1]       O       SDRAM Data Input/Output Mask: Data input/output mask signal for write accesses and an output enable signal for read accesses. Input data are masked during a write cycle. The SDQM0[1]         U6       SDQM[1]       O       External I/O Device Chip Select: Active low. Three external I/O banks are provided for external memory mapped I/O operations. Each I/O bank stores up to 16KB. The ECSN[0]         T16       ECSN[0]       C       External Wait: Active low. This signal is asserted when an external I/O device or a ROM/SRAM/FLASH bank needs more access cycles than those defined in the corresponding control register.         R15       RCSN[0]       O       ROM/SRAM/FLASH bank needs more access cycles than those defined in the corresponding control register.         P15       RCSN[0]       O       ROM/SRAM/FLASH bank meeds more	U15			
P5SDCSN[0]supports up to two SDRAM banks. One SDCSN output is provided for each bank.R5SDRASNOSDRAM Row Address Strobe: Active low. The row address strobe pin for SDRAM.T5SDCASNOSDRAM Column Address Strobe: Active low. The column address strobe pin for SDRAM.U5SDWENOSDRAM Write Enable: Active low. The write enable signal for SDRAM.P6SDQM[3]OSDRAM Data Input/Output Mask: Data input/output mask signals for SDRAM. The SDQM is sampled high and is an output mask signal for write accesses and an output enable signal for read accesses. Input data are masked during a write cycle. The SDQM0[0]U16ECSN[2]OExternal I/O Device Chip Select: Active low. Three external I/O banks are provided for external memory mapped I/O operations. Each I/O banks is selected.P16EWAITNIExternal Wait: Active low. This signal is asserted when an external I/O device or a ROM/SRAM/FLASH bank needs more access cycles than those defined in the corresponding control register.R15RCSN[1]OROM/SRAM/FLASH Chip Select: Active low. The KS8695P can access up to two external ROM/SRAM/FLASH memory banks. The RCSN pins can be controlled to	R4		0	SDRAM Chip Select: Active low chip select pins for SDRAM. The KS8695P
T5SDCASNOSDRAM Column Address Strobe: Active low. The column address strobe pin for SDRAM.U5SDWENOSDRAM Write Enable: Active low. The write enable signal for SDRAM.P6SDQM[3]OSDRAM Data Input/Output Mask: Data input/output mask signals for SDRAM. The SDQM[2]R6SDQM[2]SDRAM Data Input/Output Mask: Data input/output mask signal for write accesses and an output enable signal for read accesses. Input data are masked during a write cycle. The SDQM0/1/2/3 correspond to DATA[7:0], DATA[15:8], DATA[23:16] and DATA[31:24], respectively.U16ECSN[2]OExternal I/O Device Chip Select: Active Iow. Three external I/O banks are provided for external memory mapped I/O operations. Each I/O bank stores up to 16KB. The ECSNx signals indicate which of the three I/O banks is selected.P16EWAITNIExternal Wait: Active Iow. This signal is asserted when an external I/O device or a ROM/SRAM/FLASH bank needs more access cycles than those defined in the corresponding control register.R15RCSN[1]OROM/SRAM/FLASH Chip Select: Active Iow. The KS8695P can access up to two external ROM/SRAM/FLASH memory banks. The RCSN pins can be controlled to			C C	
T5SDCASNOSDRAM Column Address Strobe: Active low. The column address strobe pin for SDRAM.U5SDWENOSDRAM Write Enable: Active low. The write enable signal for SDRAM.P6SDQM[3]OSDRAM Data Input/Output Mask: Data input/output mask signals for SDRAM. The SDQM[2]R6SDQM[2]SDRAM Data Input/Output Mask: Data input/output mask signals for SDRAM. The SDQM is sampled high and is an output mask signal for write accesses and an output enable signal for read accesses. Input data are masked during a write cycle. The SDQM0/1/2/3 correspond to DATA[7:0], DATA[15:8], DATA[23:16] and DATA[31:24], respectively.U16ECSN[2]OExternal I/O Device Chip Select: Active Iow. Three external I/O banks are provided for external memory mapped I/O operations. Each I/O bank stores up to 16KB. The ECSNx signals indicate which of the three I/O banks is selected.P16EWAITNIExternal Wait: Active Iow. This signal is asserted when an external I/O device or a ROM/SRAM/FLASH bank needs more access cycles than those defined in the corresponding control register.R15RCSN[1]OROM/SRAM/FLASH Chip Select: Active Iow. The KS8695P can access up to two external ROM/SRAM/FLASH memory banks. The RCSN pins can be controlled to	R5		0	SDRAM Row Address Strobe: Active low. The row address strobe pin for SDRAM.
U5SDWENOSDRAM.U5SDWENOSDRAM Write Enable: Active low. The write enable signal for SDRAM.P6SDQM[3]OSDRAM Data Input/Output Mask: Data input/output mask signals for SDRAM. The SDQM[2]R6SDQM[2]OSDRAM Data Input/Output Mask: Data input/output mask signal for write accesses and an output enable signal for read accesses. Input data are masked during a write cycle. The SDQM0/1/2/3 correspond to DATA[7:0], DATA[15:8], DATA[23:16] and DATA[31:24], respectively.U16ECSN[2]OExternal I/O Device Chip Select: Active low. Three external I/O banks are provided for external memory mapped I/O operations. Each I/O banks is selected.P16EWAITNIExternal Wait: Active low. This signal is asserted when an external I/O device or a ROM/SRAM/FLASH bank needs more access cycles than those defined in the corresponding control register.R15RCSN[1]OROM/SRAM/FLASH Chip Select: Active low. The KS8695P can access up to two external ROM/SRAM/FLASH memory banks. The RCSN pins can be controlled to	T5	SDCASN		SDRAM Column Address Strobe: Active low. The column address strobe nin for
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P6 R6 SDQM[2]SDQAM[3] SDQM[2]O SDQM[2]SDRAM Data Input/Output Mask: Data input/output mask signals for SDRAM. The SDQM[1] U6T6 U6SDQM[1] SDQM[0]O SDQM[0]SDRAM Data Input/Output Mask: Data input/output mask signal for write accesses and an output enable signal for read accesses. Input data are masked during a write cycle. The SDQM0/1/2/3 correspond to DATA[7:0], DATA[15:8], DATA[23:16] and DATA[31:24], respectively.U16 T16 ECSN[2] R16ECSN[2] ECSN[0]O External I/O Device Chip Select: Active Iow. Three external I/O banks are provided for external memory mapped I/O operations. Each I/O bank stores up to 16KB. The ECSNx signals indicate which of the three I/O banks is selected.P16EWAITNI External Wait: Active Iow. This signal is asserted when an external I/O device or a ROM/SRAM/FLASH bank needs more access cycles than those defined in the corresponding control register.R15 P15RCSN[0]O ROM/SRAM/FLASH Chip Select: Active Iow. The KS8695P can access up to two external ROM/SRAM/FLASH memory banks. The RCSN pins can be controlled to	115	SDW/EN	0	
R6 T6 SDQM[1] U6SDQM[2] SDQM[0]SDQM is sampled high and is an output mask signal for write accesses and an output enable signal for read accesses. Input data are masked during a write cycle. The SDQM0/1/2/3 correspond to DATA[7:0], DATA[15:8], DATA[23:16] and DATA[31:24], respectively.U16 T16 ECSN[1] R16ECSN[2] ECSN[0]O External I/O Device Chip Select: Active low. Three external I/O banks are provided for external memory mapped I/O operations. Each I/O bank stores up to 16KB. The ECSNx signals indicate which of the three I/O banks is selected.P16EWAITNI External Wait: Active low. This signal is asserted when an external I/O device or a ROM/SRAM/FLASH bank needs more access cycles than those defined in the corresponding control register.R15 P15RCSN[0]O ROSN[0]R15 P15RCSN[0]O ROM/SRAM/FLASH Chip Select: Active low. The KS8695P can access up to two external ROM/SRAM/FLASH memory banks. The RCSN pins can be controlled to				<u> </u>
T6 U6SDQM[1] SDQM[0]output enable signal for read accesses. Input data are masked during a write cycle. The SDQM0/1/2/3 correspond to DATA[7:0], DATA[15:8], DATA[23:16] and DATA[31:24], respectively.U16ECSN[2] ECSN[1] ECSN[0]OExternal I/O Device Chip Select: Active low. Three external I/O banks are provided for external memory mapped I/O operations. Each I/O bank stores up to 16KB. The ECSNx signals indicate which of the three I/O banks is selected.P16EWAITNIExternal Wait: Active low. This signal is asserted when an external I/O device or a ROM/SRAM/FLASH bank needs more access cycles than those defined in the corresponding control register.R15RCSN[1] RCSN[0]OROM/SRAM/FLASH Chip Select: Active low. The KS8695P can access up to two external ROM/SRAM/FLASH memory banks. The RCSN pins can be controlled to				
U6SDQM[0]The SDQM0/1/2/3 correspond to DATA[7:0], DATA[15:8], DATA[23:16] and DATA[31:24], respectively.U16ECSN[2]OExternal I/O Device Chip Select: Active low. Three external I/O banks are provided for external memory mapped I/O operations. Each I/O bank stores up to 16KB. The ECSN[0]P16EWAITNIExternal Wait: Active low. This signal is asserted when an external I/O device or a ROM/SRAM/FLASH bank needs more access cycles than those defined in the corresponding control register.R15RCSN[1]OROM/SRAM/FLASH Chip Select: Active low. The KS8695P can access up to two external ROM/SRAM/FLASH memory banks. The RCSN pins can be controlled to				
D16       DCSN[2]       O       External I/O Device Chip Select: Active low. Three external I/O banks are provided for external memory mapped I/O operations. Each I/O bank stores up to 16KB. The ECSN[0]         R16       ECSN[0]       I       External Wait: Active low. This signal is asserted when an external I/O device or a ROM/SRAM/FLASH bank needs more access cycles than those defined in the corresponding control register.         R15       RCSN[1]       O       ROM/SRAM/FLASH Chip Select: Active low. The KS8695P can access up to two external ROM/SRAM/FLASH memory banks. The RCSN pins can be controlled to				
U16       ECSN[2]       O       External I/O Device Chip Select: Active low. Three external I/O banks are provided for external memory mapped I/O operations. Each I/O bank stores up to 16KB. The ECSN[0]         R16       ECSN[0]       I       External memory mapped I/O operations. Each I/O banks is selected.         P16       EWAITN       I       External Wait: Active low. This signal is asserted when an external I/O device or a ROM/SRAM/FLASH bank needs more access cycles than those defined in the corresponding control register.         R15       RCSN[1]       O       ROM/SRAM/FLASH Chip Select: Active low. The KS8695P can access up to two external ROM/SRAM/FLASH memory banks. The RCSN pins can be controlled to	U6	SDQM[0]		
T16       ECSN[1]       for external memory mapped I/O operations. Each I/O bank stores up to 16KB.         R16       ECSN[0]       The ECSNx signals indicate which of the three I/O banks is selected.         P16       EWAITN       I       External Wait: Active low. This signal is asserted when an external I/O device or a ROM/SRAM/FLASH bank needs more access cycles than those defined in the corresponding control register.         R15       RCSN[1]       O       ROM/SRAM/FLASH Chip Select: Active low. The KS8695P can access up to two external ROM/SRAM/FLASH memory banks. The RCSN pins can be controlled to				DATA[31:24], respectively.
T16       ECSN[1]       for external memory mapped I/O operations. Each I/O bank stores up to 16KB.         R16       ECSN[0]       The ECSNx signals indicate which of the three I/O banks is selected.         P16       EWAITN       I       External Wait: Active low. This signal is asserted when an external I/O device or a ROM/SRAM/FLASH bank needs more access cycles than those defined in the corresponding control register.         R15       RCSN[1]       O       ROM/SRAM/FLASH Chip Select: Active low. The KS8695P can access up to two external ROM/SRAM/FLASH memory banks. The RCSN pins can be controlled to	U16	ECSN[2]	0	External I/O Device Chip Select: Active low. Three external I/O banks are provided
R16       ECSN[0]       The ECSNx signals indicate which of the three I/O banks is selected.         P16       EWAITN       I       External Wait: Active low. This signal is asserted when an external I/O device or a ROM/SRAM/FLASH bank needs more access cycles than those defined in the corresponding control register.         R15       RCSN[1]       O       ROM/SRAM/FLASH Chip Select: Active low. The KS8695P can access up to two external ROM/SRAM/FLASH memory banks. The RCSN pins can be controlled to				
P16       EWAITN       I       External Wait: Active low. This signal is asserted when an external I/O device or a ROM/SRAM/FLASH bank needs more access cycles than those defined in the corresponding control register.         R15       RCSN[1]       O       ROM/SRAM/FLASH Chip Select: Active low. The KS8695P can access up to two external ROM/SRAM/FLASH memory banks. The RCSN pins can be controlled to				
R15         RCSN[1]         O         ROM/SRAM/FLASH bank needs more access cycles than those defined in the corresponding control register.           R15         RCSN[1]         O         ROM/SRAM/FLASH Chip Select: Active low. The KS8695P can access up to two external ROM/SRAM/FLASH memory banks. The RCSN pins can be controlled to			1	T
R15         RCSN[1]         O         ROM/SRAM/FLASH Chip Select: Active low. The KS8695P can access up to two external ROM/SRAM/FLASH memory banks. The RCSN pins can be controlled to				
R15         RCSN[1]         O         ROM/SRAM/FLASH Chip Select: Active low. The KS8695P can access up to two external ROM/SRAM/FLASH memory banks. The RCSN pins can be controlled to				
P15 RCSN[0] external ROM/SRAM/FLASH memory banks. The RCSN pins can be controlled to		DOONIA		
			0	
I man the CPU addresses into physical memory banks	P15	RCSN[0]		
				map the CPU addresses into physical memory banks.

Note:

1. I = Input.

O = Output. I/O = Bidirectional.

## Advanced Memory Interface (SDRAM/ROM/FLASH/SRAM/EXTERNAL I/O) (continued)

Pin	Name	I/O Type <sup>(1)</sup>	Description
T17	EROEN/ WRSTPLS	O/I	Normal mode: External I/O and ROM/SRAM/FLASH output enable: Active low. When asserted, this signal controls the output enable port of the specified memory device. During reset: Watchdog timer reset polarity setting. WRSTPLS=0, active low; WRSTPLS = 1, active high. No default.
M17	ERWEN0/ TESTACK	0	External I/O and ROM/SRAM/FLASH write byte enable: Active low. When asserted, the ERWENx controls the byte write enable of the memory device (except SDRAM). ARM CPU test signal (factory reserved test signal).
N17	ERWEN1/ TESTREQB	0	External I/O and ROM/SRAM/FLASH write byte enable: Active low. When asserted, the ERWENx controls the byte write enable of the memory device (except SDRAM). ARM CPU test signal (factory reserved test signal).
P17	ERWEN2/ TESTREQA	0	External I/O and ROM/SRAM/FLASH write byte enable: Active low. When asserted, the ERWENx controls the byte write enable of the memory device except SDRAM). ARM CPU test signal (factory reserved test signal).
R17	ERWEN3/ TICTESTENN	0	External I/O and ROM/SRAM/FLASH write byte enable. Active low. When asserted, the ERWENx controls the byte write enable of the memory device (except SDRAM). ARM CPU test signal (factory reserved test signal).
E15	WLED0/ BOSIZE0	O/I	Normal mode: WAN LED indicator 0: Programmable via WAN misc. Control register bits [2:0]. 000 = Speed; 001 = Link; 010 = Full/half duplex; 011 = Collision; 100 = TX/RX activity; 101 = Full-duplex collision; 110 = Link/Activity. During reset: Bank 0 data access size. Bank 0 is used for the boot program. B0SiZE[1:0] are used to specify the size of the bank 0 data bus width as follows: '01' = one byte, '10' = half-word, '11' = one word, and '00' = reserved.
E14	WLED1/ B0SIZE1	O/I	Normal mode: WAN LED indicator 1: Programmable via WAN Misc. Control register bits [6:4]. 000 = Speed; 001 = Link; 010 = Full/half duplex; 011 = Collision; 100 = TX/RX activity; 101 = Full-duplex collision; 110 = Link/Activity. During reset: Bank 0 data access size. Bank 0 is used for the boot program. B0SIZE[1:0] are used to specify the size of the bank 0 data bus width as follows: '01' = one byte, '10' = half-word, '11' = one word, and '00' = reserved.

#### **Factory Test Pins**

Pin	Name	I/O Type <sup>(1)</sup>	Description
F7	TESTEN	I	Factory test signal. Pull-down or direct connect to GND required.
M4	TEST1	I	Factory test signal. No connect for normal operation.
F4	TEST2	Ι	Factory test signal. No connect for normal operation.

Note:

1. I = Input.

O = Output.

#### **Power and Ground Pins**

Pin	Name	I/O Type <sup>(1)</sup>	Description
E5	VDDA1.8	P	1.8V analog V <sub>DD</sub> .
E6			
F5			
F6 G5			
G5			
G6 H5			
H5 H6			
J5			
J6			
E7	VDD1.8	Р	1.8V digital core V <sub>DD</sub> .
E8			
E9			
E10			
F7 F8			
F9			
F10			
M7			
M8			
M9 H12			
H12			
H13			
J12 J13			
K12			
K12 K13			
N7			
N8			
N9			
K5	VDDA3.3	Р	3.3V analog V <sub>DD</sub> .
K6			
L5 L6			
M5			
M6			
N5			
N6			
E11	VDD3.3	Р	3.3V digital I/O V <sub>DD</sub> .
E12			
E13			
F11 F12			
F12 F13			
G12			
G13			
L12			
L13			
M10			
M11			
M12 M13			
N10			
N11			
N12			
N13			

Note:

1. P = Power supply.

## Power and Ground Pins (continued)

TOWER	and Ground Pins		
Pin	Name	I/O Type <sup>(1)</sup>	Description
E3	AGND	Gnd	Analog Ground.
H7			
J7			
K7			
L7		Quad	Orecord
A1 G7	GND	Gnd	Ground.
G7 G8			
G8 G9			
G10			
G11			
H8			
H9			
H10			
H11			
J8			
J9			
J10			
J11 K8			
K9			
K10			
K11			
L8			
L9			
L10			
L11			

#### Note:

1. Gnd = Ground.

# Address Map and Register Description

#### **Memory Map**

Upon power up, the KS8695P memory map is confi gured as shown below.

Address Range	Region	Description
0x03FF0000-0x03FFFFFF	64KB	KS8695P System Configuration Register Space
0x0200000-0x03FEFFFF	32MB	Not Configured
0x0000000-0x01FFFFF	32MB	Flash Bank 0

#### Memory Map Example

The default base address for the KS8695P system configuration registers is 0x03ff0000. After power up, the user is free to remap the memory for their specific application. The following is an example of the memory space remapped for operation.

Address Range	Region	Description
0x03FF0000-0x03FFFFFF	64KB	KS8695P System Configuration Register Space
0x03E00000-0x03FEFFFF	2MB	Disabled, Not Used
0x03200000-0x036FFFFF	5MB	Space (External I/O)
0x02C00000-0x031FFFFF	6MB	Reserved FLASH Space, Not Used
0x02800000-0x02BFFFFF	4MB	FLASH
0x02000000-0x027FFFFF	8MB	Disabled, Not Used
0x0000000-0x01FFFFF	32MB	SDRAM

#### **Register Description**

The KS8695P system configuration registers (SCRs) are located in a block of 64KB in the host memory address space. After power up and initialization, the user can remap the SCRs to a desired offset. The SCRs are 32 bits wide. They are 32 bit word-aligned and must be accessed using word instructions.

The AHB-PCI bridge configuration registers are also included in the SCRs. A subset of the AHB-PCI bridge configuration registers is also accessible to an external PCI host when the KS8695P is configured in PCI guest mode. Refer to the detailed Register Description document for additional information, including bit definitions. If you don't have this document, contact your local Micrel Field Application Engineer or salesperson.

Address Range	Register Type
0x0000 – 0x0004	System Registers
0x2000 – 0x2224	PCI-AHB Bridge Configuration
0x4000 – 0x4040	Memory Controller Interface
0x6000 – 0x60FC	WAN DMA
x8000 – 0x80FC	LAN DMA
xA000 – 0xA0FC	Reserved
xE000 – 0xA0FC	UART Registers
xE200 – 0xE234	Interrupt Controller
)xE400 – 0xE410	Timer Registers
)xE600 – 0xE608	General Purpose I/O
)xE800 – 0xE850	Switch Engine Configuration
xEA00 – 0xEA18	Miscellaneous Registers

Register Type	Address Range
<ul> <li>System Configuration</li> </ul>	0x03FFFFFF – 0x03FEFFFF
External I/O Bank 2	0x03FEFFFF – 0x039FFFFF
External I/O Bank 1	0x039FFFFF – 0x035FFFFF
External I/O Bank 0	0x035FFFFF – 0x031FFFFF
Not Used	0x031FFFFF – 0x02FFFFFF
Flash Bank 0 – 4MB	0x02FFFFFF – 0x027FFFFF
Not Used	0x027FFFFF – 0x00FFFFFF
SDRAM 16MB	0x00FFFFFF – 0x00000000

# Absolute Maximum Ratings<sup>(1)</sup>

#### Supply Voltage

(V <sub>DDA1.8</sub> , V <sub>DD1.8</sub> )	–0.5V to +2.4V
(V <sub>DDA3.3</sub> , V <sub>DD3.3</sub> )	–0.5V to +4.0V
Input Voltage (all inputs)	–0.5V to +4.0V
Output Voltage (all outputs)	–0.5V to +4.0V
Lead Temperature (soldering, 10sec.)	270°C
Pb (Lead) Free Temperature (soldering,	10sec.) 260°C
Storage Temperature (T <sub>s</sub> )	–55°C to +150°C

# **Operating Ratings**<sup>(2)</sup>

#### Supply voltage

(V <sub>DDA1.8</sub> , V <sub>DD1.8</sub> )	+1.7V to +1.9V
(V <sub>DDA3.3</sub> ,V <sub>DD3.3</sub> ) <sup>(3)</sup>	+3.0V to +3.6V
Ambient Temperature (T <sub>A</sub> )	
Junction Temperature (T <sub>J</sub> )	150°C
Package Thermal Resistance <sup>(4)</sup>	
PBGA (θ <sub>JA</sub> ) No Air Flow	29.86°C/W
1m/s	21.86°C/W
2m/s	21.54°C/W
$(\theta_{JC})$ No Air Flow	8.34°C/W

#### Symbol Parameter Condition Min Units Тур Max Total Supply Current (including TX output driver current) 100BASE-TX Operation: All ports 100% Utilization, SDOCLK = 125MHz $\mathbf{I}_{\mathsf{T}\mathsf{X}}$ 100BASE-TX (Analog TX) $V_{DDA3.3} = +3.3V$ 0.032 A $I_{RX}$ 100BASE-TX (Analog RX) V<sub>DDA1.8</sub> = +1.8V 0.072 A 0.033 A IDDIO 100BASE-T (Digital I/O) $V_{DD3.3} = +3.3V$ $V_{DD1.8} = +1.8V$ IDDC 100BASE-T (Digital Core) 0.235 А 10BASE-TX Operation: All ports 100% Utilization, SDOCLK = 125MHz V<sub>DDA3.3</sub> = +3.3V A 10BASE-TX (Analog TX) 0.030 $I_{TX}$ $V_{DDA1.8} = +1.8V$ 10BASE-TX (Analog RX) 0.072 А $I_{RX}$ 10BASE-T (Digital I/O) $V_{DD3.3} = +3.3V$ 0.025 А IDDIO 10BASE-T (Digital Core) $V_{DD1.8} = +1.8V$ 0.234 А IDDC Auto-Negotiation Mode: SDOCLK = 125MHz 10BASE-TX (Analog TX) $V_{DDA3.3} = +3.3V$ 0.032 А ITX 10BASE-TX (Analog RX) V<sub>DDA1.8</sub> = +1.8V 0.07 А $I_{RX}$ 10BASE-T (Digital I/O) $V_{DD3.3} = +3.3V$ 0.021 A IDDIO 0.233 A 10BASE-T (Digital Core) $V_{DD1.8} = +1.8V$ IDDC TTL Inputs (PCI, LED, Memory Interface, UART) V VIH Input High Voltage 2.0 V VIL Input Low Voltage 0.8 Input Current $I_{IN}$ (Excluding pull-up/pull-down) $V_{IN} = GND \sim V_{DD3.3}$ -10 10 μA TTL Outputs (PCI, LED, Memory Interface, UART) V<sub>OH</sub> **Output High Voltage** I<sub>OH</sub> = -8mA; V<sub>DD3.3</sub> 2.4 V Output Low Voltage Vol $I_{OL} = 8mA$ 0.7 V 10 μA $I_{OZ}$ Output Tri-state Leakage

# Electrical Characteristics<sup>(5)</sup>

Symbol	Parameter	Condition	Min	Тур	Max	Units
100BASE	TX Transmit (measured different	ally after 1:1 transformer)	ł			
Vo	Peak Differential Output Voltage	100 $\Omega$ termination on the differential output	0.95		1.05	V
V <sub>IMB</sub>	Output Voltage Imbalance	100 $\Omega$ termination on the differential output			2	%
t <sub>r</sub> , t <sub>t</sub>	Rise/Fall Time Rise/Fall Time Imbalance		3 0		5 0.5	ns ns
	Duty Cycle Distortion				±0.5	ns
	Overshoot				5	%
V <sub>SET</sub>	Reference Voltage of ISET			0.5		V
	Output Jitters	Peak-to-peak		0.7	1.4	ns
10BASE-1	Receive					
V <sub>SQ</sub>	Squelch Threshold	5MHz square wave		400		mV
10BASE-1	Transmit (measured differential	ly after 1:1 transformer)				
VP	Peak Differential Output Voltage	100 $\Omega$ termination on the differential output		2.3		V
	Jitters Added	100 $\Omega$ termination on the differential output			±3.5	ns
	Rise/Fall Time			28	30	ns

1. Exceeding the absolute maximum rating may damage the device.

The device is not guaranteed to function outside its operating rating. Unused inputs must always be tied to an appropriate logic voltage level (Ground to V<sub>DD</sub>).

3.  $V_{\text{DDA}} \text{ or } V_{\text{DD}} \text{ can operate from either a 2.5V or 3.3V supply.}$ 

4. No heat spreader in package.

5. Specification for packaged product only.

# **Timing Diagrams**

For PCI timing, please refer to the PCI specification, version 2.1.





Symbol	Parameter	Min	Тур	Max	Units
t <sub>SR</sub>	Stable supply voltages to reset high	10			ms
t <sub>cs</sub>	Configuration set-up time	50			ns
t <sub>CH</sub>	Configuration hold time	50			ns
t <sub>RC</sub>	Reset to strap-in pin output	50			ns

Table 2.	Reset	Timing	Parameters
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Figure 12. Static Memory Read Cycle



Figure 13. Static Memory Write Cycle

Symbol	Parameter <sup>(1)</sup>	Registers
RBITACC	Programmable bank i access time	0x4010
RBiTPA	Programmable bank i page access time	0x4014

#### Table 3. Programmable Static Memory Timing Parameters

#### Note:

1. "i" Refers to chip select parameters 0 and 1.



Figure 14. External I/O Read and Write Cycles

Symbol	Parameter	Min <sup>(1)</sup>	Typ <sup>(1)</sup>	Max <sup>(1)</sup>	Units
T <sub>cta</sub>	Valid address to CS setup time	EBiTACS +0.8	EBiTACS +1.1	EBiTACS +1.3	ns
T <sub>cos</sub>	OE valid to CS setup time	EBiTCOS +0.6	EBiTCOS +0.6	EBiTCOS +1.0	ns
T <sub>dsu</sub>	Valid read data to OE setup time	2.0			ns
T <sub>cws</sub>	WE valid to CS setup time	EBiTCOS +0.6	EBiTCOS +0.6	EBiTCOS +1.0	ns
T <sub>dh</sub>	Write data to CS hold time	0			ns
T <sub>cah</sub>	Address to CS hold time	EBiTCOH +1.0	EBiTCOH +1.0	EBiTCOH +1.4	ns
T <sub>oew</sub>	OE/WE pulsewidth	EBITACT		EBiTACT	ns
$T_{ocs},T_{csw}$	Rising edge CS to OE/WE hold time	0			ns

#### Table 4. External I/O Memory Timing Parameters

#### Note:

1. Measurements for minimum were taken at 0°C, typical at 25°C, and maximum at 100°C.

Symbol	Parameter <sup>(1)</sup>	Registers
EBITACS	Programmable bank i address setup time before chip select	0x4000, 0x4004, 0x4008
EBITACT	Programmable bank i write enable/output enable access time	0x4000, 0x4004, 0x4008
EBITCOS	Programmable bank i chip select setup time before OEN	0x4000, 0x4004, 0x4008
EBITCOH	Programmable bank i chip select hold time	0x4000, 0x4004, 0x4008

#### Table 5. Programmable External I/O Timing Parameters

Note:

1. "i" Refers to chip select parameters 0, 1, or 2.



Figure 15. DRAM Read Timing





Symbol	Parameter <sup>(1)</sup>	Registers
SDTRC	Programmable SDRAM RAS to CAS latency	0x4038
SDCAS	Programmable SDRAM CAS latency	0x4038

#### Table 6. SDRAM Timing Parameters

#### Note:

1. "i" Refers to chip select parameters 0 and 1.

# **Package Information**



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