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KS8995MA/FQ

Integrated 5-Port 10/100 Managed Switch

Rev. 3.0

General Description

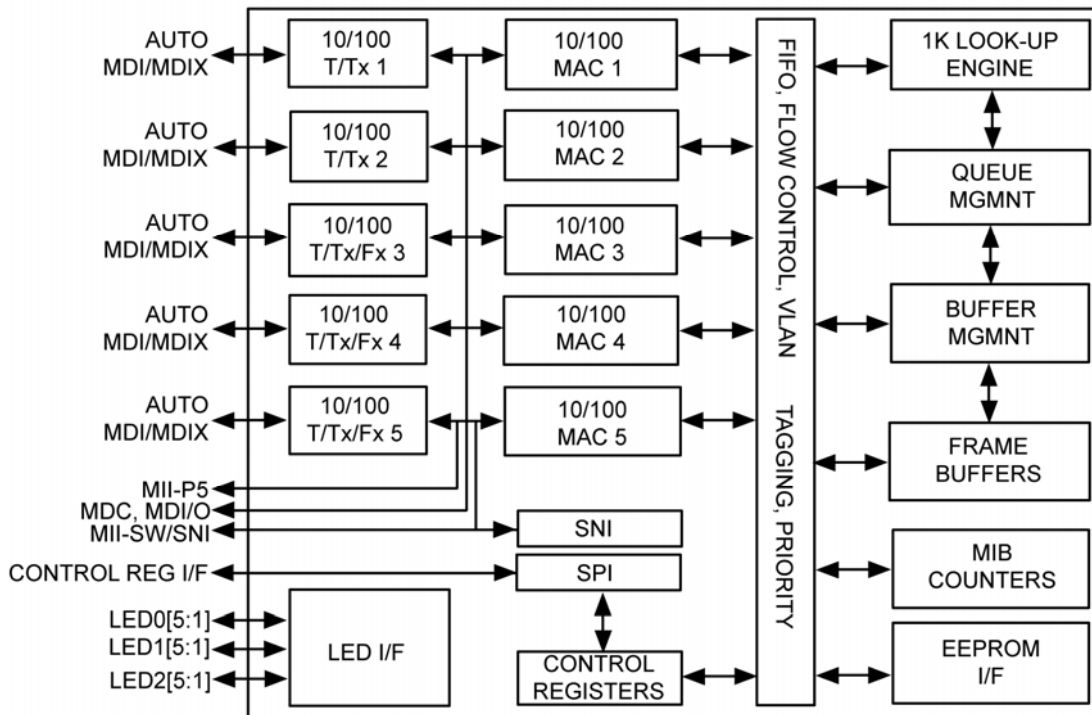
The KS8995MA/FQ is a highly-integrated Layer 2 managed switch with optimized bill of materials (BOM) cost for low port count, cost-sensitive 10/100Mbps switch systems with both copper and optic fiber media. It also provides an extensive feature set such as tag/port-based VLAN, quality of service (QoS) priority, management, MIB counters, dual MII interfaces and CPU control/data interfaces to effectively address both current and emerging fast Ethernet applications.

The KS8995MA/FQ contains five 10/100 transceivers with patented mixed-signal low-power technology, five media access control (MAC) units, a high-speed non-blocking switch fabric, a dedicated address lookup engine, and an on-chip frame buffer memory.

All PHY units support 10BASE-T and 100BASE-TX. In addition, two of the PHY units support 100BASE-FX on ports 4 and 5 for KS8995MA, two of the PHY units support 100BASE-FX on ports 3 and 4 for KS8995FQ.

Datasheets and support documentation can be found on Micrel's web site at: www.micrel.com.

Functional Diagram



Features

- Integrated switch with five MACs and five fast Ethernet transceivers fully-compliant to IEEE 802.3u standard
- Shared memory based switch fabric with fully non-blocking configuration
- 1.4Gbps high-performance memory bandwidth
- 10BASE-T, 100BASE-TX, and 100BASE-FX modes
- Dual MII configuration: MII-Switch (MAC or PHY mode MII) and MII-P5 (PHY mode MII).
- IEEE 802.1q tag-based VLAN (16 VLANs, full-range VID) for DMZ port, WAN/LAN separation or inter-VLAN switch links
- VLAN ID tag/untag options, per-port basis
- Programmable rate limiting 0Mbps to 100Mbps, ingress and egress port, rate options for high and low priority, per-port basis in 32Kbps increments
- Flow control or drop packet rate limiting (ingress port)
- Integrated MIB counters for fully-compliant statistics gathering, 34 MIB counters per port
- Enable/Disable option for huge frame size up to 1916 bytes per frame
- IGMP v1/v2 snooping for multicast packet filtering
- Special tagging mode to send CPU info on ingress packet's port value
- SPI slave (complete) and MDIO (MII PHY only) serial management interface for control of register configuration
- MAC-id based security lock option
- Control registers configurable on-the-fly (port-priority, 802.1p/d/q, AN...)
- CPU read access to MAC forwarding table entries
- 802.1d spanning tree protocol
- Port mirroring/monitoring/sniffing: ingress and/or egress traffic to any port or MII
- Broadcast storm protection with % control – global and per-port basis
- Optimization for fiber-to-copper media conversion
- Full-chip hardware power-down support (register configuration not saved)
- Per-port based software power-save on PHY (idle link detection, register configuration preserved)
- QoS/CoS packets prioritization supports:
 - Per port, 802.1p and DiffServ based
- 802.1p/q tag insertion or removal on a per-port basis (egress)
 - MDC and MDI/O interface support to access the MII PHY control registers (not all control registers)
 - MII local loopback support
 - On-chip 64Kbyte memory for frame buffering (not shared with 1K unicast address table)
 - Wire-speed reception and transmission
 - Integrated look-up engine with dedicated 1K MAC addresses
 - Full duplex IEEE 802.3x and half-duplex back pressure flow control
 - Comprehensive LED support
 - 7-wire SNI support for legacy MAC interface
 - Automatic MDI/MDI-X crossover for plug-and-play
 - Disable automatic MDI/MDI-X option
 - Low power:
 - Core: 1.8V
 - Digital I/O: 3.3V
 - Analog I/O: 3.3V
 - 0.18µm CMOS technology
 - Temperature ranges:
 - Commercial: 0°C to +70°C
 - Industrial: –40°C to +85°C
 - Available in 128-pin PQFP package

Applications

- Broadband gateway/firewall/VPN
- Integrated DSL or cable modem multi-port router
- Wireless LAN access point plus gateway
- Home networking expansion
- Standalone 10/100 switch
- Hotel/campus/MxU gateway
- Enterprise VoIP gateway/phone
- FTTx customer premise equipment
- Managed media converter

Ordering Information

Part Number		Temperature Range	Package
Standard	Pb (lead)-Free		
KS8995MA	KSZ8995MA	0°C to +70°C	128-Pin PQFP
KS8995FQ	KSZ8995FQ	0°C to +70°C	128-Pin PQFP
KS8995MAI	KSZ8995MAI	-40°C to +85°C	128-Pin PQFP
KS8995FQI	KSZ8995FQI	-40°C to +85°C	128-Pin PQFP

Revision History

Revision	Date	Summary of Changes
2.0	10/10/03	Created.
2.1	10/30/03	Editorial changes on electrical characteristics.
2.2	04/01/04	Editorial changes on the TTL input and output electrical characteristics.
2.3	01/19/05	Insert recommended reset circuit, pg. 70. Editorial, Pg. 36.
2.4	04/13/05	Changed VDDIO to 3.3V. Changed Jitter to 16 ns Max.
2.5	02/06/06	Added Pb-Free option for Industrial version.
2.6	07/12/06	Add a note for VLAN table write, improve the timing diagram for MII interface, update pin description for PCRS, PCOL, etc. And update the description of the register bits for the loopback, etc.
2.7	06/01/07	Add the package thermal information in the operating rating and the transformer power consumption information in the electrical characteristics note.
2.8	03/20/08	Add KSZ8995FQ information and pin description.
2.9	09/15/08	Add KSZ8995FQ block diagram and descriptions for revision ID and LED mode.
3.0	10/26/11	Update some descriptions for VDDAT voltage, MDI/MDIX bits of the registers. Update the equation of the broadcast storm protection, correct typo.
	12/09/11	Update the description of MDI/MDIX in the MIIM register 0. Correct the typo error for MDI/MDIX bits of the registers.
	01/27/12	Update the description for the VDDAT analog voltage.
	11/08/12	Correct typo error for the commercial temperature and Thermal Resistance θ_{JC} .
	12/12/12	Correct typo and add notes for pins 109, 111.

Contents

System Level Applications	11
Pin Configuration	13
Pin Description – By Number	14
Pin Description – By Name	20
Introduction	26
Functional Overview: Physical Layer Transceiver	26
<i>100BASE-TX Transmit</i>	26
<i>100BASE-TX Receive</i>	26
<i>PLL Clock Synthesizer</i>	26
<i>Scrambler/De-Scrambler (100BASE-TX Only)</i>	27
<i>100BASE-FX Operation</i>	27
<i>100BASE-FX Signal Detection</i>	27
<i>100BASE-FX Far End fault</i>	27
<i>10BASE-T Transmit</i>	27
<i>10BASE-T Receive</i>	27
<i>Power Management</i>	27
<i>MDI/MDI-X Auto Crossover</i>	27
<i>Auto-Negotiation</i>	28
Functional Overview: Switch Core	29
<i>Address Look-Up</i>	29
<i>Learning</i>	29
<i>Migration</i>	29
<i>Aging</i>	29
<i>Forwarding</i>	29
<i>Switching Engine</i>	29
<i>Media Access Controller (MAC) Operation</i>	30
<i>MII Interface Operation</i>	33
<i>SNI Interface Operation</i>	36
Advanced Functionality	36
<i>Spanning Tree Support</i>	36
<i>Special Tagging Mode</i>	37
<i>IGMP Support</i>	39
<i>Port Mirroring Support</i>	39
<i>VLAN Support</i>	40
<i>Rate Limit Support</i>	40

Configuration Interface	40
MII Management Interface (MIIM)	45
Register Description	46
Global Registers.....	47
Register 0 (0x00): Chip ID0	47
Register 2 (0x02): Global Control 0	47
Register 4 (0x04): Global Control 2	49
Register 5 (0x05): Global Control 3	50
Register 6 (0x07): Global Control 4	51
Register 7 (0x07): Global Control 5	51
Register 8 (0x08): Global Control 6	51
Register 9 (0x09): Global Control 7	51
Register 10 (0x0A): Global Control 8	52
Register 11 (0x0B): Global Control 9	52
Port Registers.....	53
Register 16 (0x10): Port 1 Control 0	53
Register 32 (0x20): Port 2 Control 0	53
Register 48 (0x30): Port 3 Control 0	53
Register 64 (0x40): Port 4 Control 0	53
Register 80 (0x50): Port 5 Control 0	53
Register 17 (0x11): Port 1 Control 1	54
Register 33 (0x21): Port 2 Control 1	54
Register 49 (0x31): Port 3 Control 1	54
Register 65 (0x41): Port 4 Control 1	54
Register 81 (0x51): Port 5 Control 1	54
Register 18 (0x12): Port 1 Control 2	54
Register 34 (0x22): Port 2 Control 2	54
Register 50 (0x32): Port 3 Control 2	54
Register 66 (0x42): Port 4 Control 2	54
Register 82 (0x52): Port 5 Control 2	54
Register 19 (0x13): Port 1 Control 3	55
Register 35 (0x23): Port 2 Control 3	55
Register 51 (0x33): Port 3 Control 3	55
Register 67 (0x43): Port 4 Control 3	55
Register 83 (0x53): Port 5 Control 3	55
Register 20 (0x14): Port 1 Control 4	55
Register 36 (0x24): Port 2 Control 4	55

<i>Register 52 (0x34): Port 3 Control 4</i>	55
<i>Register 68 (0x44): Port 4 Control 4</i>	55
<i>Register 84 (0x54): Port 5 Control 4</i>	55
<i>Register 21 (0x15): Port 1 Control 5</i>	56
<i>Register 37 (0x25): Port 2 Control 5</i>	56
<i>Register 53 (0x35): Port 3 Control 5</i>	56
<i>Register 69 (0x45): Port 4 Control 5</i>	56
<i>Register 85 (0x55): Port 5 Control 5</i>	56
<i>Register 22 (0x16): Port 1 Control 6</i>	56
<i>Register 38 (0x26): Port 2 Control 6</i>	56
<i>Register 54 (0x36): Port 3 Control 6</i>	56
<i>Register 70 (0x46): Port 4 Control 6</i>	56
<i>Register 86 (0x56): Port 5 Control 6</i>	56
<i>Register 23 (0x17): Port 1 Control 7</i>	56
<i>Register 39 (0x27): Port 2 Control 7</i>	56
<i>Register 55 (0x37): Port 3 Control 7</i>	56
<i>Register 71 (0x47): Port 4 Control 7</i>	56
<i>Register 87 (0x57): Port 5 Control 7</i>	56
<i>Register 25 (0x19): Port 1 Control 9</i>	57
<i>Register 41 (0x29): Port 2 Control 9</i>	57
<i>Register 57 (0x39): Port 3 Control 9</i>	57
<i>Register 73 (0x49): Port 4 Control 9</i>	57
<i>Register 89 (0x59): Port 5 Control 9</i>	57
<i>Register 26 (0x1A): Port 1 Control 10</i>	57
<i>Register 42 (0x2A): Port 2 Control 10</i>	57
<i>Register 58 (0x3A): Port 3 Control 10</i>	57
<i>Register 74 (0x4A): Port 4 Control 10</i>	57
<i>Register 90 (0x5A): Port 5 Control 10</i>	57
<i>Register 28 (0x1C): Port 1 Control 12</i>	58
<i>Register 44 (0x2C): Port 2 Control 12</i>	58
<i>Register 60 (0x3C): Port 3 Control 12</i>	58
<i>Register 76 (0x4C): Port 4 Control 12</i>	58
<i>Register 92 (0x5C): Port 5 Control 12</i>	58
<i>Register 29 (0x1D): Port 1 Control 13</i>	59
<i>Register 45 (0x2D): Port 2 Control 13</i>	59
<i>Register 61 (0x3D): Port 3 Control 13</i>	59
<i>Register 77 (0x4D): Port 4 Control 13</i>	59

<i>Register 93 (0x5D): Port 5 Control 13</i>	59
<i>Register 30 (0x1E): Port 1 Status 0</i>	60
<i>Register 46 (0x2E): Port 2 Status 0</i>	60
<i>Register 62 (0x3E): Port 3 Status 0</i>	60
<i>Register 78 (0x4E): Port 4 Status 0</i>	60
<i>Register 94 (0x5E): Port 5 Status 0</i>	60
<i>Register 31 (0x1F): Port 1 Control 14</i>	60
<i>Register 47 (0x2F): Port 2 Control 14</i>	60
<i>Register 63 (0x3F): Port 3 Control 14</i>	60
<i>Register 79 (0x4F): Port 4 Control 14</i>	60
<i>Register 95 (0x5F): Port 5 Control 14</i>	60
Advanced Control Registers	61
<i>Register 96 (0x60): TOS Priority Control Register 0</i>	61
<i>Register 97 (0x61): TOS Priority Control Register 1</i>	61
<i>Register 98 (0x62): TOS Priority Control Register 2</i>	61
<i>Register 99 (0x63): TOS Priority Control Register 3</i>	61
<i>Register 100 (0x64): TOS Priority Control Register 4</i>	61
<i>Register 101 (0x65): TOS Priority Control Register 5</i>	61
<i>Register 102 (0x66): TOS Priority Control Register 6</i>	62
<i>Register 103 (0x67): TOS Priority Control Register 7</i>	62
<i>Register 104 (0x68): MAC Address Register 0</i>	62
<i>Register 105 (0x69): MAC Address Register 1</i>	62
<i>Register 106 (0x6A): MAC Address Register 2</i>	62
<i>Register 107 (0x6B): MAC Address Register 3</i>	62
<i>Register 108 (0x6C): MAC Address Register 4</i>	62
<i>Register 109 (0x6D): MAC Address Register 5</i>	63
<i>Register 110 (0x6E): Indirect Access Control 0</i>	63
<i>Register 111 (0x6F): Indirect Access Control 1</i>	63
<i>Register 112 (0x70): Indirect Data Register 8</i>	64
<i>Register 113 (0x71): Indirect Data Register 7</i>	64
<i>Register 114 (0x72): Indirect Data Register 6</i>	64
<i>Register 115 (0x73): Indirect Data Register 5</i>	64
<i>Register 116 (0x74): Indirect Data Register 4</i>	64
<i>Register 117 (0x75): Indirect Data Register 3</i>	64
<i>Register 118 (0x76): Indirect Data Register 2</i>	64
<i>Register 119 (0x77): Indirect Data Register 1</i>	64
<i>Register 120 (0x78): Indirect Data Register 0</i>	65

Register 121 (0x79): Digital Testing Status 0	65
Register 122 (0x7A): Digital Testing Status 1	65
Register 123 (0x7B): Digital Testing Control 0	65
Register 124 (0x7C): Digital Testing Control 1	65
Register 125 (0x7D): Analog Testing Control 0	65
Register 126 (0x7E): Analog Testing Control 1	65
Register 127 (0x7F): Analog Testing Status	65
Static MAC Address	66
Static Address Table Examples	67
Static Address Table Write Examples	67
VLAN Address	68
VLAN Table Read Example	68
VLAN Table Write Example	68
Dynamic MAC Address	69
Dynamic MAC Address Table Read Example	69
Dynamic MAC Address Table Write Example	70
MIB Counters	71
For port 2, the base is 0x20, same offset definition (0x20-0x3f)	72
For port 3, the base is 0x40, same offset definition (0x40-0x5f)	72
For port 4, the base is 0x60, same offset definition (0x60-0x7f)	72
MIB Counter Read Examples	73
MIIM Registers	74
Absolute Maximum Ratings⁽¹⁾	77
Operating Ratings⁽²⁾	77
Electrical Characteristics^(4, 5)	77
Timing Diagrams	79
Reset Circuit Diagram	86
Selection of Isolation Transformer	87
Package Information	88

List of Figures

Figure 1. Broadband Gateway	11
Figure 2. Integrated Broadband Router	11
Figure 3. Standalone Switch	12
Figure 4. Using KS8995FQ for Dual Media Converter or Fiber Daisy Chain Connection	12
Figure 5. Auto Negotiation	28
Figure 6. DA Look-Up Flowchart – 1.....	31
Figure 7. DA Resolution Flowchart – Stage 2.....	32
Figure 8. KS8995MA/FQ EEPROM Configuration Timing Diagram.....	43
Figure 9. SPI Write Data Cycle	44
Figure 10. SPI Read Data Cycle.....	44
Figure 11. SPI Multiple Write	45
Figure 12. SPI Multiple Read	45
Figure 13. EEPROM Interface Input Receive Timing Diagram.....	79
Figure 14. EEPROM Interface Output Transmit Timing Diagram.....	79
Figure 15. SNI Input Timing	80
Figure 16. SNI Output Timing	80
Figure 17. MAC Mode MII Timing – Data Received from MII	81
Figure 18. MAC Mode MII Timing – Data Transmitted from MII.....	81
Figure 19. PHY Mode MII Timing – Data Received from MII.....	82
Figure 20. PHY Mode MII Timing – Data Transmitted from MII.....	82
Figure 21. SPI Input Timing	83
Figure 22. SPI Output Timing.....	84
Figure 23. Reset Timing.....	85
Figure 24. Recommended Reset Circuit.....	86
Figure 25. Recommended Circuit for Interfacing with CPU/FPGA Reset.....	86

List of Tables

Table 1. MII – P5 Signals (PHY Mode)	34
Table 2. MII – SW Signals.....	35
Table 3. SNI Signals	36
Table 5. STPID Egress Rules (Processor to Switch Port 5)	38
Table 6. STPID Egress Rules (Switch to Processor).....	38
Table 7. FID+DA Look-Up in the VLAN Mode	40
Table 8. FID+SA Look-Up in the VLAN Mode	40
Table 9. SPI Connections	44
Table 10. EEPROM Timing Parameters	79
Table 11. SNI Timing Parameters.....	80
Table 12. MAC Mode MII Timing Parameters.....	81
Table 13. PHY Mode MII Timing Parameters	82
Table 14. SPI Input Timing Parameters.....	83
Table 15. SPI Output Timing Parameters	84
Table 16. Reset Timing Parameters	85
Table 17. Qualified Magnetic Vendors.....	87

System Level Applications

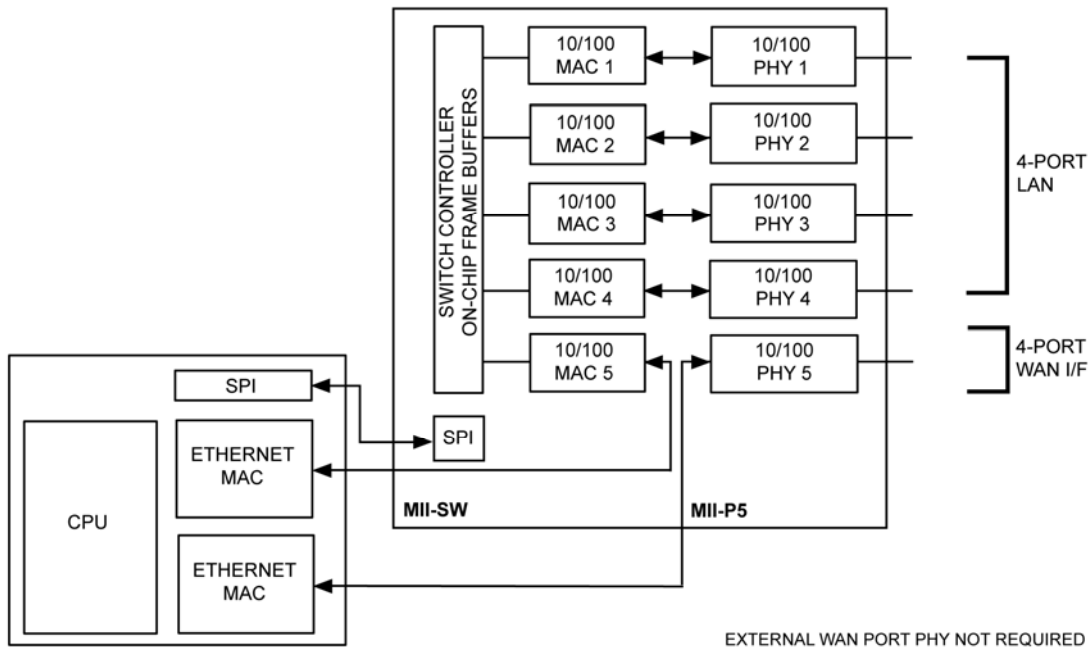


Figure 1. Broadband Gateway

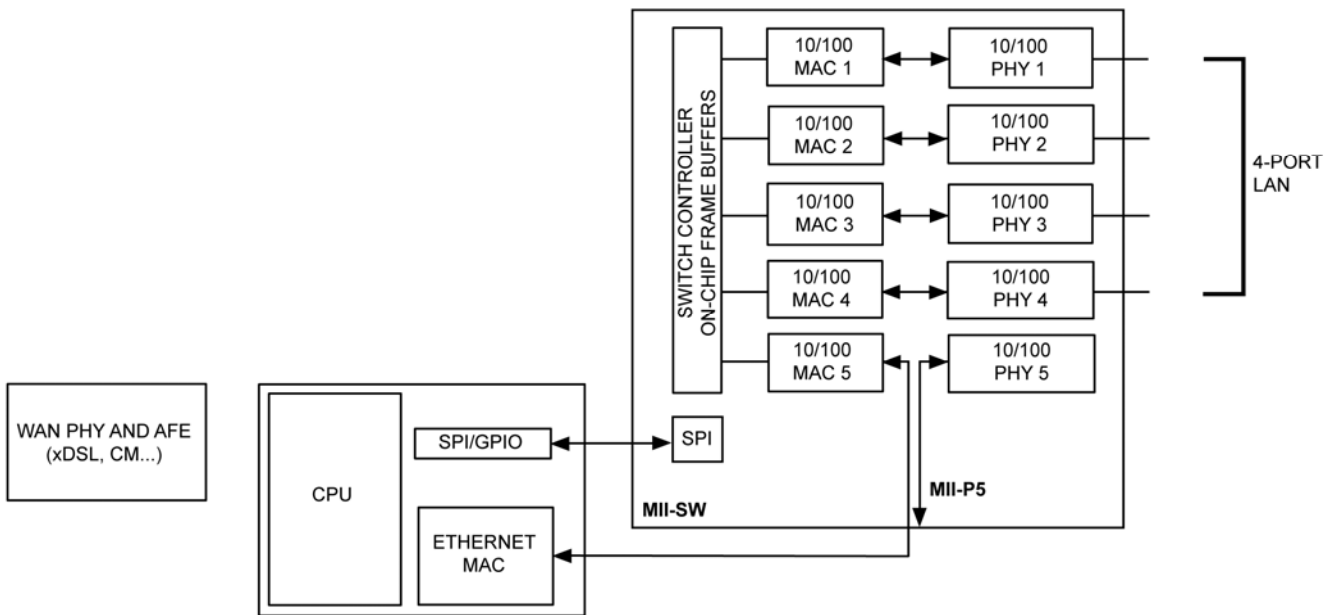


Figure 2. Integrated Broadband Router

System Level Applications (Continued)

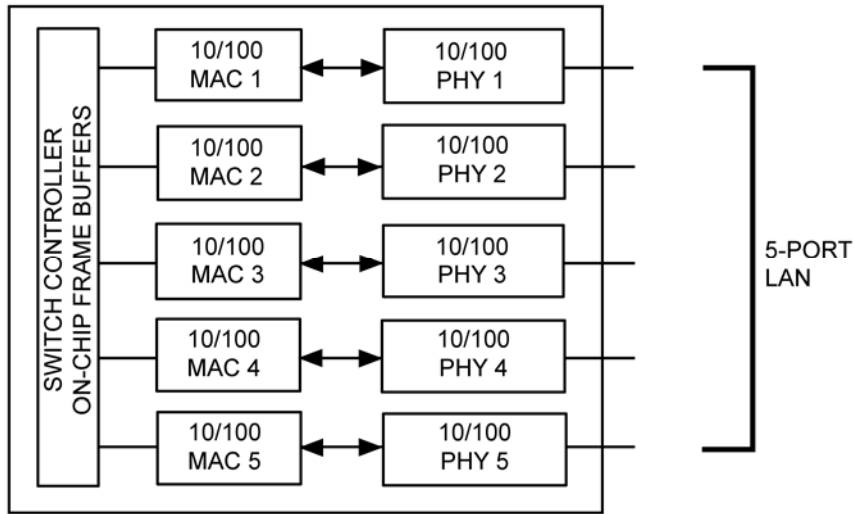


Figure 3. Standalone Switch

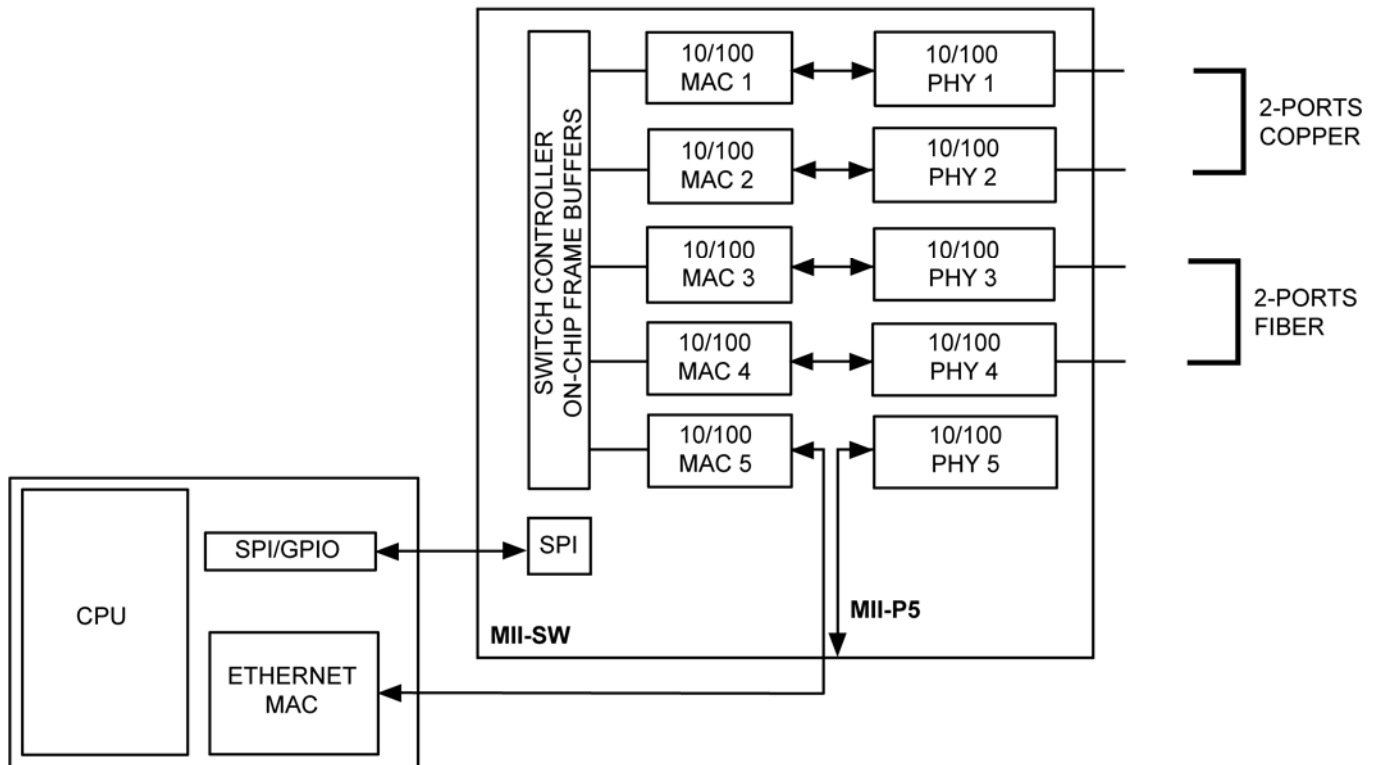
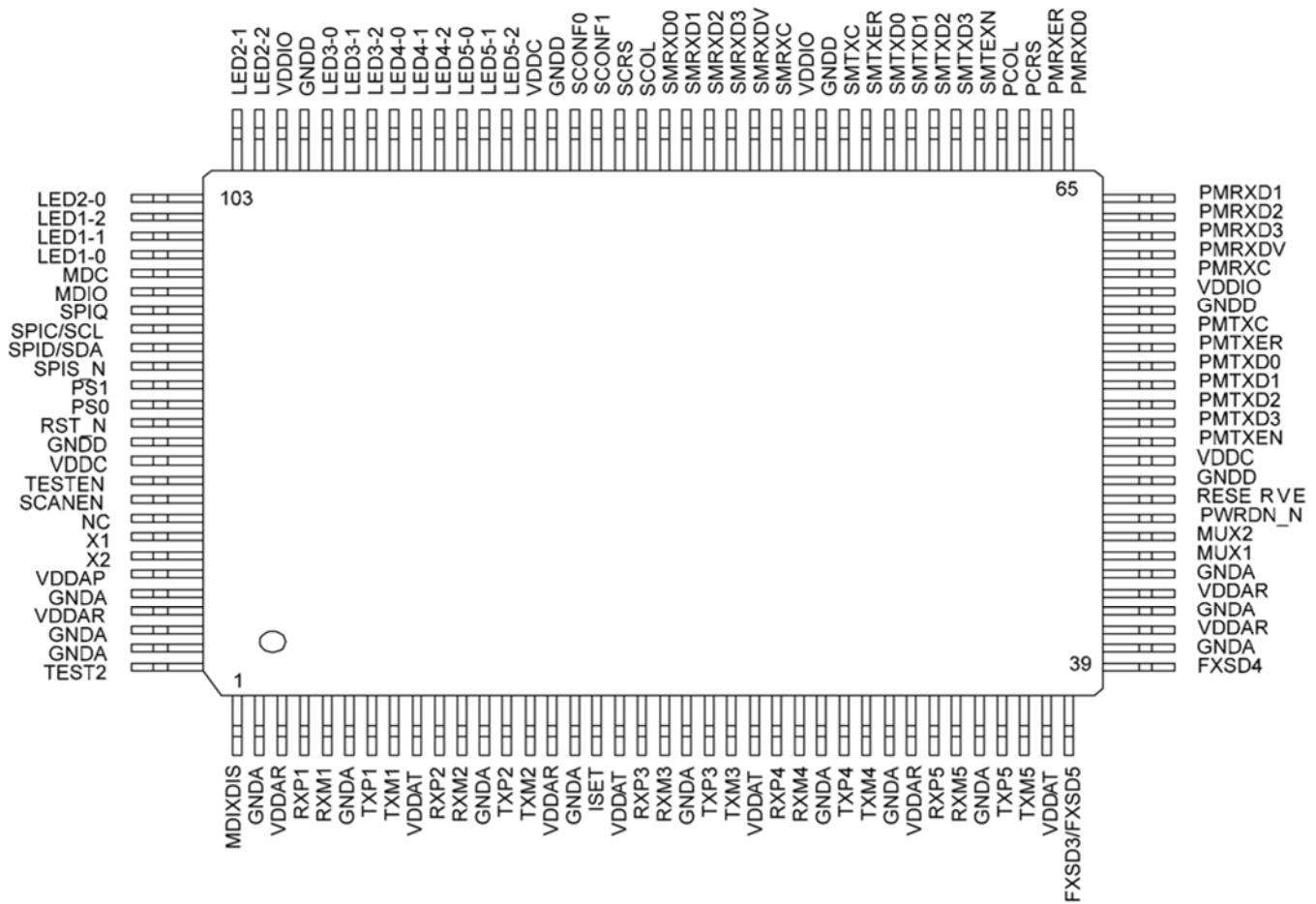


Figure 4. Using KS8995FQ for Dual Media Converter or Fiber Daisy Chain Connection

Pin Configuration



128-Pin PQFP

Pin Description – By Number

Pin Number	Pin Name	Type ⁽¹⁾	Port	Pin Function ⁽²⁾
1	MDI-XDIS	lpd	1 – 5	Disable auto MDI/MDI-X. PD (default) = normal operation. PU = disable auto MDI/MDI-X on all ports.
2	GND A	GND		Analog ground.
3	VDDAR	P		1.8V analog V _{DD} .
4	RXP1	I	1	Physical receive signal + (differential).
5	RXM1	I	1	Physical receive signal – (differential).
6	GND A	GND		Analog ground.
7	TXP1	O	1	Physical transmit signal + (differential).
8	TXM1	O	1	Physical transmit signal – (differential).
9	VDDAT	P		3.3V analog V _{DD} . (2.5V or 3.3V is for B3 and previous chip revision). 3.3V is recommended for new design.
10	RXP2	I	2	Physical receive signal + (differential).
11	RXM2	I	2	Physical receive signal – (differential).
12	GND A	GND		Analog ground.
13	TXP2	O	2	Physical transmit signal + (differential).
14	TXM2	O	2	Physical transmit signal – (differential).
15	VDDAR	P		1.8V analog V _{DD} .
16	GND A	GND		Analog ground.
17	ISET			Set physical transmit output current. Pull-down with a 3.01kΩ1% resistor.
18	VDDAT	P		3.3V analog V _{DD} . (2.5V or 3.3V is for B3 and previous chip revision). 3.3V is recommended for new design.
19	RXP3	I	3	Physical receive signal + (differential).
20	RXM3	I	3	Physical receive signal - (differential).
21	GND A	GND		Analog ground.
22	TXP3	O	3	Physical transmit signal + (differential).
23	TXM3	O	3	Physical transmit signal – (differential).
24	VDDAT	P		3.3V analog V _{DD} . (2.5V or 3.3V is for B3 and previous chip revision). 3.3V is recommended for new design.
25	RXP4	I	4	Physical receive signal + (differential).
26	RXM4	I	4	Physical receive signal - (differential).
27	GND A	GND		Analog ground.
28	TXP4	O	4	Physical transmit signal + (differential).
29	TXM4	O	4	Physical transmit signal – (differential).
30	GND A	GND		Analog ground.

Notes:

- P = Power supply.
 - I = Input.
 - O = Output.
 - I/O = Bidirectional.
 - GND = Ground.
 - lpu = Input w/internal pull-up.
 - lpd = Input w/internal pull-down.
 - lpd/O = Input w/internal pull-down during reset, output pin otherwise.
 - lpu/O = Input w/internal pull-up during reset, output pin otherwise.
 - NC = No connect.
- PU = Strap pin pull-up.
 - PD = Strap pull-down.

Pin Description – By Numbers (Continued)

Pin Number	Pin Name	Type ⁽¹⁾	Port	Pin Function							
31	VDDAR	P		1.8V analog V_{DD} .							
32	RXP5	I	5	Physical receive signal + (differential).							
33	RXM5	I	5	Physical receive signal – (differential).							
34	GND A	GND		Analog ground.							
35	TXP5	O	5	Physical transmit signal + (differential).							
36	TXM5	O	5	Physical transmit signal – (differential).							
37	VDDAT	P		3.3V analog V_{DD} . (2.5V or 3.3V is for B3 and previous chip revision). 3.3V is recommended for new design.							
38	FXSD5/FXSD3	l _{pd}	5/3	Fiber signal detect pin. FXSD5 is for port 5 of the KS8995MA. FXSD3 is for port 3 of the KS8995FQ							
39	FXSD4	l _{pd}	4	Fiber signal detect pin for port 4.							
40	GND A	GND		Analog ground.							
41	VDDAR	P		1.8V analog V_{DD} .							
42	GND A	GND		Analog ground.							
43	VDDAR	P		1.8V analog V_{DD} .							
44	GND A	GND		Analog ground.							
45	MUX1	NC		Factory test pins. MUX1 and MUX2 should be left unconnected for normal operation.							
46	MUX2	NC			<table border="1"> <thead> <tr> <th>Mode</th> <th>MUX1</th> <th>MUX2</th> </tr> </thead> <tbody> <tr> <td>Normal Operation</td> <td>NC</td> <td>NC</td> </tr> </tbody> </table>	Mode	MUX1	MUX2	Normal Operation	NC	NC
			Mode		MUX1	MUX2					
Normal Operation	NC	NC									
47	PWRDN_N	l _{pu}		Full-chip power down. Active low.							
48	RESERVE	NC		Reserved pin. No connect.							
49	GNDD	GND		Digital ground.							
50	VDDC	P		1.8V digital core V_{DD} .							
51	PMTXEN	l _{pd}	5	PHY[5] MII transmit enable.							
52	PMTXD3	l _{pd}	5	PHY[5] MII transmit bit 3.							
53	PMTXD2	l _{pd}	5	PHY[5] MII transmit bit 2.							
54	PMTXD1	l _{pd}	5	PHY[5] MII transmit bit 1.							
55	PMTXD0	l _{pd}	5	PHY[5] MII transmit bit 0.							
56	PMTXER	l _{pd}	5	PHY[5] MII transmit error.							
57	PMTXC	O	5	PHY[5] MII transmit clock. PHY mode MII.							
58	GNDD	GND		Digital ground.							
59	VDDIO	P		3.3V digital V_{DD} for digital I/O circuitry.							
60	PMRXC	O	5	PHY[5] MII receive clock. PHY mode MII.							

Note:

- P = Power supply.
 - I = Input.
 - O = Output.
 - I/O = Bidirectional.
 - GND = Ground.
 - l_{pu} = Input w/internal pull-up.
 - l_{pd} = Input w/internal pull-down.
 - l_{pd}/O = Input w/internal pull-down during reset, output pin otherwise.
 - l_{pu}/O = Input w/internal pull-up during reset, output pin otherwise.
 - NC = No connect.

Pin Description – By Numbers (Continued)

Pin Number	Pin Name	Type ⁽¹⁾	Port	Pin Function ⁽²⁾
61	PMRXDV	lpd/O	5	PHY[5] MII receive data valid.
62	PMRXD3	lpd/O	5	PHY[5] MII receive bit 3. Strap option: PD (default) = enable flow control; PU = disable flow control.
63	PMRXD2	lpd/O	5	PHY[5] MII receive bit 2. Strap option: PD (default) = disable back pressure; PU = enable back pressure.
64	PMRXD1	lpd/O	5	PHY[5] MII receive bit 1. Strap option: PD (default) = drop excessive collision packets; PU = does not drop excessive collision packets.
65	PMRXD0	lpd/O	5	PHY[5] MII receive bit 0. Strap option: PD (default) = disable aggressive back-off algorithm in half-duplex mode; PU = enable for performance enhancement.
66	PMRXER	lpd/O	5	PHY[5] MII receive error. Strap option: PD (default) = packet size 1518/1522 bytes; PU = 1536 bytes.
67	PCRS	lpd/O	5	PHY[5] MII carrier sense/strap option for port 4 only. PD (default) = force half-duplex if auto-negotiation is disabled or fails. PU = force full-duplex if auto negotiation is disabled or fails. Refer to Register 76.
68	PCOL	lpd/O	5	PHY[5] MII collision detect/ strap option for port 4 only. PD (default) = no force flow control, normal operation. PU = force flow control. Refer to Register 66
69	SMTXEN	lpd		Switch MII transmit enable.
70	SMTXD3	lpd		Switch MII transmit bit 3.
71	SMTXD2	lpd		Switch MII transmit bit 2.
72	SMTXD1	lpd		Switch MII transmit bit 1.
73	SMTXD0	lpd		Switch MII transmit bit 0.
74	SMTXER	lpd		Switch MII transmit error.
75	SMTXC	I/O		Switch MII transmit clock. Input in MAC mode, output in PHY mode MII.
76	GNDD	GND		Digital ground.
77	VDDIO	P		3.3V digital V _{DD} for digital I/O circuitry.
78	SMRXC	I/O		Switch MII receive clock. Input in MAC mode, output in PHY mode MII.
79	SMRXDV	lpd/O		Switch MII receive data valid.
80	SMRXD3	lpd/O		Switch MII receive bit 3. Strap option: PD (default) = Disable Switch MII full-duplex flow control; PU = Enable Switch MII full-duplex flow control.
81	SMRXD2	lpd/O		Switch MII receive bit 2. Strap option: PD (default) = Switch MII in full-duplex mode; PU = Switch MII in half-duplex mode.

Notes:

- P = Power supply.
 - I = Input.
 - O = Output.
 - I/O = Bidirectional.
 - GND = Ground.
 - lpu = Input w/internal pull-up.
 - lpd = Input w/internal pull-down.
 - lpd/O = Input w/internal pull-down during reset, output pin otherwise.
 - lpu/O = Input w/internal pull-up during reset, output pin otherwise.
 - NC = No connect.
- PU = Strap pin pull-up.
 - PD = Strap pull-down.

Pin Description – By Numbers (Continued)

Pin Number	Pin Name	Type ⁽¹⁾	Port	Pin Function ⁽²⁾		
82	SMRXD1	lpd/O		Switch MII receive bit 1. Strap option: PD (default) = Switch MII in 100Mbps mode; PU = Switch MII in 10Mbps mode.		
83	SMRXD0	lpd/O		Switch MII receive bit 0; Strap option: LED mode; PD (default) = mode 0; PU = mode 1. See "Register 11". Mode 0, link at: 100/Full LEDx[2,1,0]=0,0,0 100/Half LEDx[2,1,0]=0,1,0 10/Full LEDx[2,1,0]=0,0,1 10/Half LEDx[2,1,0]=0,1,1 Mode 1, link at 100/Full LEDx[2,1,0]=0,1,0 100/Half LEDx[2,1,0]=0,1,1 10/Full LEDx[2,1,0]=1,0,0 10/Half LEDx[2,1,0]=1,0,1		
				Mode 0	Mode 1	
				LEDX_2	Lnk/Act	100Lnk/Act
				LEDX_1	FullD/Col	10Lnk/Act
			LEDX_0	Speed	Full duplex	
84	SCOL	lpd/O		Switch MII collision detect.		
85	SCRS	lpd/O		Switch mode carrier sense.		
86	SCONF1	lpd		Dual MII configuration pin. For the Switch MII, KSZ8995MA supports both MAC mode and PHY mode, KSZ8995FQ supports PHY mode only.		
				Pin# (91, 86, 87):	Switch MII	PHY [5] MII
				000	Disable, Otri	Disable, Otri
				001	PHY Mode MII	Disable, Otri
				010	MAC Mode MII	Disable, Otri
				011	PHY Mode SNI	Disable, Otri
				100	Disable	Disable
				101	PHY Mode MII	PHY Mode MII
				110	MAC Mode MII	PHY Mode MII
				111	PHY Mode SNI	PHY Mode MII
87	SCONF0	lpd		Dual MII configuration pin.		
88	GNDD	GND		Digital ground.		
89	VDDC	P		1.8V digital core V _{DD} .		
90	LED5-2	lpu/O	5	LED indicator 2. Strap option: aging setup. See "Aging" section. PU (default) = aging enable; PD = aging disable.		
91	LED5-1	lpu/O	5	LED indicator 1. Strap option: PU (default): enable PHY[5] MII I/F. PD: tristate all PHY[5] MII output. See "Pin 86 SCONF1."		

Notes:

1. P = Power supply.
 I = Input.
 O = Output.
 I/O = Bidirectional.
 GND = Ground.
 lpu = Input w/internal pull-up.
 lpd = Input w/internal pull-down.
 lpd/O = Input w/internal pull-down during reset, output pin otherwise.
 lpu/O = Input w/internal pull-up during reset, output pin otherwise.
 NC = No connect.
2. PU = Strap pin pull-up.
 PD = Strap pull-down.
 Otri = Output tristated.
 FullD = Full duplex

Pin Description – By Numbers (Continued)

Pin Number	Pin Name	Type ⁽¹⁾	Port	Pin Function	
92	LED5-0	Ipu/O	5	LED indicator 0.	
93	LED4-2	Ipu/O	4	LED indicator 2.	
94	LED4-1	Ipu/O	4	LED indicator 1.	
95	LED4-0	Ipu/O	4	LED indicator 0.	
96	LED3-2	Ipu/O	3	LED indicator 2.	
97	LED3-1	Ipu/O	3	LED indicator 1.	
98	LED3-0	Ipu/O	3	LED indicator 0.	
99	GNDD	GND		Digital ground.	
100	VDDIO	P		3.3V digital V _{DD} for digital I/O.	
101	LED2-2	Ipu/O	2	LED indicator 2.	
102	LED2-1	Ipu/O	2	LED indicator 1.	
103	LED2-0	Ipu/O	2	LED indicator 0.	
104	LED1-2	Ipu/O	1	LED indicator 2.	
105	LED1-1	Ipu/O	1	LED indicator 1.	
106	LED1-0	Ipu/O	1	LED indicator 0.	
107	MDC	Ipu	All	Switch or PHY[5] MII management data clock.	
108	MDIO	I/O	All	Switch or PHY[5] MII management data I/O. Features internal pull down to define pin state when not driven.	
109	SPIQ	Otri	All	SPI serial data output in SPI slave mode. Note: an external pull-up is needed on this pin when it is in use.	
110	SPIC/SCL	I/O	All	(1) Input clock up to 5MHz in SPI slave mode; (2) output clock at 61kHz in I ² C master mode. See "Pin 113."	
111	SSPID/SDA	I/O	All	(1) Serial data input in SPI slave mode; (2) serial data input/output in I ² C master mode. See "Pin 113." Note: an external pull-up is needed on this pin when it is in use.	
112	SPIS_N	Ipu	All	Active low. (1) SPI data transfer start in SPI slave mode. When SPIS_N is high, the KS8995MA/FQ is deselected and SPIQ is held in high impedance state, a high-to-low transition to initiate the SPI data transfer; (2) not used in I ² C master mode.	
113	PS1	Ipd		Serial bus configuration pin. For this case, if the EEPROM is not present, the KS8995MA/FQ will start itself with the PS[1.0] = 00 default register values.	
				Pin Configuration	Serial Bus Configuration
				PS[1.0]=00	I ² C Master Mode for EEPROM
				PS[1.0]=01	Reserved
				PS[1.0]=10	SPI Slave Mode for CPU Interface
				PS[1.0]=11	Factory Test Mode (BIST)

Note:

- P = Power supply.
 I = Input.
 O = Output.
 I/O = Bidirectional.
 GND = Ground.
 Ipu = Input w/internal pull-up.
 Ipd = Input w/internal pull-down.
 Ipd/O = Input w/internal pull-down during reset, output pin otherwise.
 Ipu/O = Input w/internal pull-up during reset, output pin otherwise.
 NC = No connect.

Pin Description – By Numbers (Continued)

Pin Number	Pin Name	Type ⁽¹⁾	Port	Pin Function
114	PS0	lpd		Serial bus configuration pin. See "Pin 113."
115	RST_N	lpu		Reset the KS8995MA/FQ. Active low.
116	GNDD	GND		Digital ground.
117	VDDC	P		1.8V digital core V _{DD} .
118	TESTEN	lpd		NC for normal operation. Factory test pin.
119	SCANEN	lpd		NC for normal operation. Factory test pin.
120	NC	NC		No connect.
121	X1	I		25MHz crystal clock connection/or 3.3V tolerant oscillator input. Oscillator should be ±50ppm.
122	X2	O		25MHz crystal clock connection.
123	VDDAP	P		1.8V analog V _{DD} for PLL.
124	GNDA	GND		Analog ground.
125	VDDAR	P		1.8V analog V _{DD} .
126	GNDA	GND		Analog ground.
127	GNDA	GND		Analog ground.
128	TEST2	NC		NC for normal operation. Factory test pin.

Note:

- P = Power supply.
 - I = Input.
 - O = Output.
 - I/O = Bidirectional.
 - GND = Ground.
 - lpu = Input w/internal pull-up
 - lpd = Input w/internal pull-down.
 - lpd/O = Input w/internal pull-down during reset, output pin otherwise.
 - lpu/O = Input w/internal pull-up during reset, output pin otherwise.
 - NC = No connect.

Pin Description – By Name

Pin Number	Pin Name	Type ⁽¹⁾	Port	Pin Function
39	FXSD4	I	4	Fiber signal detect/Factory test pin.
38	FXSD3/FXSD5	I	3/5	Fiber signal detect/Factory test pin for FQ port 3 or MA port 5
124	GNDA	GND		Analog ground.
42	GNDA	GND		Analog ground.
44	GNDA	GND		Analog ground.
2	GNDA	GND		Analog ground.
16	GNDA	GND		Analog ground.
30	GNDA	GND		Analog ground.
6	GNDA	GND		Analog ground.
12	GNDA	GND		Analog ground.
21	GNDA	GND		Analog ground.
27	GNDA	GND		Analog ground.
34	GNDA	GND		Analog ground.
40	GNDA	GND		Analog ground.
120	NC	NC		No connect.
127	GNDA	GND		Analog ground.
126	GNDA	GND		Analog ground.
49	GNDD	GND		Digital ground.
88	GNDD	GND		Digital ground.
116	GNDD	GND		Digital ground.
58	GNDD	GND		Digital ground.
76	GNDD	GND		Digital ground.
99	GNDD	GND		Digital ground.
17	ISET			Set physical transmit output current. Pull-down with a 3.01kΩ1% resistor.
106	LED1-0	Ipu/O	1	LED indicator 0.
105	LED1-1	Ipu/O	1	LED indicator 1.
104	LED1-2	Ipu/O	1	LED indicator 2.
103	LED2-0	Ipu/O	2	LED indicator 0.
102	LED2-1	Ipu/O	2	LED indicator 1.
101	LED2-2	Ipu/O	2	LED indicator 2.
98	LED3-0	Ipu/O	3	LED indicator 0.

Note:

- P = Power supply.
 I = Input.
 O = Output.
 I/O = Bidirectional.
 GND = Ground.
 Ipu = Input w/internal pull-up.
 Ipd = Input w/internal pull-down.
 Ipd/O = Input w/internal pull-down during reset, output pin otherwise.
 Ipu/O = Input w/internal pull-up during reset, output pin otherwise.
 NC = No connect.

Pin Description – By Name (Continued)

Pin Number	Pin Name	Type ⁽¹⁾	Port	Pin Function ⁽²⁾
97	LED3-1	Ipu/O	3	LED indicator 1.
96	LED3-2	Ipu/O	3	LED indicator 2.
95	LED4-0	Ipu/O	4	LED indicator 0.
94	LED4-1	Ipu/O	4	LED indicator 1.
93	LED4-2	Ipu/O	4	LED indicator 2.
92	LED5-0	Ipu/O	5	LED indicator 0.
91	LED5-1	Ipu/O	5	LED indicator 1. Strap option: PU (default) = enable PHY MII I/F PD: tristate all PHY MII output. See “Pin 86 SCONF1.”
90	LED5-2	Ipu/O	5	LED indicator 2. Strap option: aging setup. See “Aging” section. (default) = aging enable; PD = aging disable.
107	MDC	Ipu	All	Switch or PHY[5] MII management data clock.
108	MDIO	I/O	All	Switch or PHY[5] MII management data I/O.
1	MDI-XDIS	Ipd	1-5	Disable auto MDI/MDI-X.
45	MUX1	NC		Factory test pins. MUX1 and MUX2 should be left unconnected for normal operation.
46	MUX2	NC		
				Mode
				MUX1
				MUX2
				Normal Operation
				NC
				NC
68	PCOL	Ipd/O	5	PHY[5] MII collision detect/force flow control. See “Register 18.” For port 4 only. PD (default) = no force flow control. PU = force flow control.
67	PCRS	Ipd/O	5	PHY[5] MII carrier sense/force duplex mode. See “Register 28.” For port 4 only. PD (default) = force half-duplex if auto-negotiation is disabled or fails. PU = force full-duplex if auto-negotiation is disabled or fails.
60	PMRXC	O	5	PHY[5] MII receive clock. PHY mode MII.
65	PMRXD0	Ipd/O	5	PHY[5] MII receive bit 0. Strap option: PD (default) = disable aggressive back-off algorithm in half-duplex mode; PU = enable for performance enhancement.
64	PMRXD1	Ipd/O	5	PHY[5] MII receive bit 1. Strap option: PD (default) = drop excessive collision packets; PU = does not drop excessive collision packets.
63	PMRXD2	Ipd/O	5	PHY[5] MII receive bit 2. Strap option: PD (default) = disable back pressure; PU = enable back pressure.
62	PMRXD3	Ipd/O	5	PHY[5] MII receive bit 3. Strap option: PD (default) = enable flow control; PU = disable flow control.
61	PMRXDV	Ipd/O	5	PHY[5] MII receive data valid.

Notes:

- P = Power supply.
I = Input.
O = Output.
I/O = Bidirectional.
GND = Ground.
Ipu = Input w/internal pull-up.
Ipd = Input w/internal pull-down.
Ipd/O = Input w/internal pull-down during reset, output pin otherwise.
Ipu/O = Input w/internal pull-up during reset, output pin otherwise.
NC = No connect.
- PU = Strap pin pull-up.
PD = Strap pull-down.

Pin Description – By Name

Pin Number	Pin Name	Type ⁽¹⁾	Port	Pin Function
57	PMTXC	O	5	PHY[5] MII transmit clock. PHY mode MII.
55	PMTXD0	lpd	5	PHY[5] MII transmit bit 0.
54	PMTXD1	lpd	5	PHY[5] MII transmit bit 1.
53	PMTXD2	lpd	5	PHY[5] MII transmit bit 2.
52	PMTXD3	lpd	5	PHY[5] MII transmit bit 3.
51	PMTXEN	lpd	5	PHY[5] MII transmit enable.
56	PMTXER	lpd	5	PHY[5] MII transmit error.
114	PS0	lpd		Serial bus configuration pin. See "Pin 113."
113	PS1	lpd		Serial bus configuration pin. If EEPROM is not present, the KS8995MA/FQ will start itself with chip default (00)...
				Pin Configuration
				PS[1:0]=00
				PS[1:0]=01
				PS[1:0]=10
				PS[1:0]=11
				Serial Bus Configuration
				I ² C Master Mode for EEPROM
				Reserved
				SPI Slave Mode for CPU Interface
				Factory Test Mode (BIST)
47	PWRDN_N	lpu		Full-chip power down. Active low.
48	RESERVE	NC		Reserved pin. No connect.
115	RST_N	lpu		Reset the KS8995MA/FQ. Active low.
5	RXM1	I	1	Physical receive signal – (differential).
11	RXM2	I	2	Physical receive signal – (differential).
20	RXM3	I	3	Physical receive signal – (differential).
26	RXM4	I	4	Physical receive signal – (differential).
33	RXM5	I	5	Physical receive signal – (differential).
4	RXP1	I	1	Physical receive signal + (differential).
10	RXP2	I	2	Physical receive signal + (differential).
19	RXP3	I	3	Physical receive signal + (differential).
25	RXP4	I	4	Physical receive signal + (differential).
32	RXP5	I	5	Physical receive signal + (differential).
119	SCANEN	lpd		NC for normal operation. Factory test pin.
84	SCOL	lpd/O		Switch MII collision detect.
87	SCONF0	lpd		Dual MII configuration pin.

Note:

- P = Power supply.
 I = Input.
 O = Output.
 I/O = Bidirectional.
 GND = Ground.
 lpu = Input w/internal pull-up.
 lpd = Input w/internal pull-down.
 lpd/O = Input w/internal pull-down during reset, output pin otherwise.
 lpu/O = Input w/internal pull-up during reset, output pin otherwise.
 NC = No connect.

Pin Description – By Name

Pin Number	Pin Name	Type ⁽¹⁾	Port	Pin Function ⁽²⁾																											
86	SCONF1	lpd		Dual MII configuration pin. For the Switch MII, KSZ8995MA supports both MAC mode and PHY mode, KSZ8995FQ supports PHY mode only.																											
				<table border="1"> <thead> <tr> <th>Pin# (91, 86, 87):</th> <th>Switch MII</th> <th>PHY [5] MII</th> </tr> </thead> <tbody> <tr> <td>000</td> <td>Disable, Otri</td> <td>Disable, Otri</td> </tr> <tr> <td>001</td> <td>PHY Mode MII</td> <td>Disable, Otri</td> </tr> <tr> <td>010</td> <td>MAC Mode MII</td> <td>Disable, Otri</td> </tr> <tr> <td>011</td> <td>PHY Mode SNI</td> <td>Disable, Otri</td> </tr> <tr> <td>100</td> <td>Disable</td> <td>Disable</td> </tr> <tr> <td>101</td> <td>PHY Mode MII</td> <td>PHY Mode MII</td> </tr> <tr> <td>110</td> <td>MAC Mode MII</td> <td>PHY Mode MII</td> </tr> <tr> <td>111</td> <td>PHY Mode SNI</td> <td>PHY Mode MII</td> </tr> </tbody> </table>	Pin# (91, 86, 87):	Switch MII	PHY [5] MII	000	Disable, Otri	Disable, Otri	001	PHY Mode MII	Disable, Otri	010	MAC Mode MII	Disable, Otri	011	PHY Mode SNI	Disable, Otri	100	Disable	Disable	101	PHY Mode MII	PHY Mode MII	110	MAC Mode MII	PHY Mode MII	111	PHY Mode SNI	PHY Mode MII
Pin# (91, 86, 87):	Switch MII	PHY [5] MII																													
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83	SMRXD0	lpd/O		<p>Switch MII receive bit 0; Strap option: LED mode PD (default) = mode 0; PU = mode 1. See "Register 11."</p> <table border="1"> <thead> <tr> <th></th> <th>Mode 0</th> <th>Mode 1</th> </tr> </thead> <tbody> <tr> <td>LEDX_2</td> <td>Lnk/Act</td> <td>100Lnk/Act</td> </tr> <tr> <td>LEDX_1</td> <td>FullD/Col</td> <td>10Lnk/Act</td> </tr> <tr> <td>LEDX_0</td> <td>Speed</td> <td>Full duplex</td> </tr> </tbody> </table>		Mode 0	Mode 1	LEDX_2	Lnk/Act	100Lnk/Act	LEDX_1	FullD/Col	10Lnk/Act	LEDX_0	Speed	Full duplex															
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82	SMRXD1	lpd/O		Switch MII receive bit 1. Strap option: PD (default) = Switch MII in 100Mbps mode; PU = Switch MII in 10Mbps mode.																											
81	SMRXD2	lpd/O		Switch MII receive bit 2. Strap option: PD (default) = Switch MII in full-duplex mode; PU = Switch MII in half-duplex mode.																											
80	SMRXD3	lpd/O		Switch MII receive bit 3. Strap option: PD (default) = Disable Switch MII full-duplex flow control; PU = Enable Switch MII full-duplex flow control.																											
79	SMRXDV	lpd/O		Switch MII receive data valid.																											
75	SMTXC	I/O		Switch MII transmit clock. Input in MAC mode, output in PHY mode MII.																											
73	SMTXD0	lpd		Switch MII transmit bit 0.																											
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71	SMTXD2	lpd		Switch MII transmit bit 2.																											
70	SMTXD3	lpd		Switch MII transmit bit 3.																											
69	SMTXEN	lpd		Switch MII transmit enable.																											
74	SMTXER	lpd		Switch MII transmit error.																											

Notes:

- P = Power supply.
 I = Input.
 O = Output.
 I/O = Bidirectional.
 GND = Ground.
 lpu = Input w/internal pull-up.
 lpd = Input w/internal pull-down.
 lpd/O = Input w/internal pull-down during reset, output pin otherwise.
 lpu/O = Input w/internal pull-up during reset, output pin otherwise.
 Otri = Output tristated.
 NC = No connect.
- PU = Strap pin pull-up.
 PD = Strap pull-down.
 FullD = Full duplex

Pin Description – By Name

Pin Number	Pin Name	Type ⁽¹⁾	Port	Pin Function
110	SPIC/SCL	I/O	All	(1) Input clock up to 5MHz in SPI slave mode; (2) output clock at 61kHz in I ² C master mode. See "Pin 113."
111	SSPID/SDA	I/O	All	(1) Serial data input in SPI slave mode; (2) serial data input/output in I ² C master mode. See "Pin 113." Note: an external pull-up is needed on this pin when it is in use.
109	SPIQ	Otri	All	SPI serial data output in SPI slave mode. Note: an external pull-up is needed on this pin when it is in use.
112	SPIS_N	lpu	All	Active low. (1) SPI data transfer start in SPI slave mode. When SPIS_N is high, the KS8995MA/FQ is deselected and SPIQ is held in high impedance state, a high-to-low transition to initiate the SPI data transfer; (2) not used in I ² C master mode.
128	TEST2	NC		NC for normal operation. Factory test pin.
118	TESTEN	lpd		NC for normal operation. Factory test pin.
8	TXM1	O	1	Physical transmit signal – (differential).
14	TXM2	O	2	Physical transmit signal – (differential).
23	TXM3	O	3	Physical transmit signal – (differential).
29	TXM4	O	4	Physical transmit signal – (differential).
36	TXM5	O	5	Physical transmit signal – (differential).
7	TXP1	O	1	Physical transmit signal + (differential).
13	TXP2	O	2	Physical transmit signal + (differential).
22	TXP3	O	3	Physical transmit signal + (differential).
28	TXP4	O	4	Physical transmit signal + (differential).
35	TXP5	O	5	Physical transmit signal + (differential).
123	VDDAP	P		1.8V analog V _{DD} for PLL.
41	VDDAR	P		1.8V analog V _{DD} .
43	VDDAR	P		1.8V analog V _{DD} .
3	VDDAR	P		1.8V analog V _{DD} .
15	VDDAR	P		1.8V analog V _{DD} .
31	VDDAR	P		1.8V analog V _{DD} .
125	VDDAR	P		1.8V analog V _{DD} .
18	VDDAT	P		3.3V analog V _{DD} .
9	VDDAT	P		3.3V analog V _{DD} .
24	VDDAT	P		3.3V analog V _{DD} .
37	VDDAT	P		3.3V analog V _{DD} .
50	VDDC	P		1.8V digital core V _{DD} .

Note:

- P = Power supply.
 I = Input.
 O = Output.
 I/O = Bidirectional.
 GND = Ground.
 lpu = Input w/internal pull-up.
 lpd = Input w/internal pull-down.
 lpd/O = Input w/internal pull-down during reset, output pin otherwise.
 lpu/O = Input w/internal pull-up during reset, output pin otherwise.
 Otri = Output tristated.
 NC = No connect.

Pin Description – By Name

Pin Number	Pin Name	Type ⁽¹⁾	Port	Pin Function
89	VDDC	P		1.8V digital core V _{DD} .
117	VDDC	P		1.8V digital core V _{DD} .
59	VDDIO	P		3.3V digital V _{DD} for digital I/O circuitry.
77	VDDIO	P		3.3V digital V _{DD} for digital I/O circuitry.
100	VDDIO	P		3.3V digital V _{DD} for digital I/O circuitry.
121	X1	I		25MHz crystal clock connection/or 3.3V tolerant oscillator input. Oscillator should be ±50ppm.
122	X2	O		25MHz crystal clock connection.

Note:

1. P = Power supply.
I = Input.
O = Output.