AN3692

Difference for Migration: From KSZ8995MA/FQ to KSZ8895MQ/FMQ

INTRODUCTION

Microchip's 5-port management switch KSZ8895 family has many new features and benefits with on-chip termination, lowest power consumption, power management, quality of service (QoS) four queues prioritization, programmable rate limit and priority ratio, RSTP, multiple packets filtering and so on. This application note describes the migration requirements from the KSZ8995 to KSZ8895.

There are two parts that can be migrated directly:

1. KSZ8995MA can be migrated to the KSZ8895MQ with all copper ports.
2. KSZ8995FQ can be migrated to the KSZ8895FMQ with fiber port to be used on port 3 and port 4, other are copper ports.

PIN-TO-PIN COMPATIBILITY

The KSZ8995 device can be replaced by KSZ8895 on the PCB board directly because they are compatible. Please see their pin diagrams below:

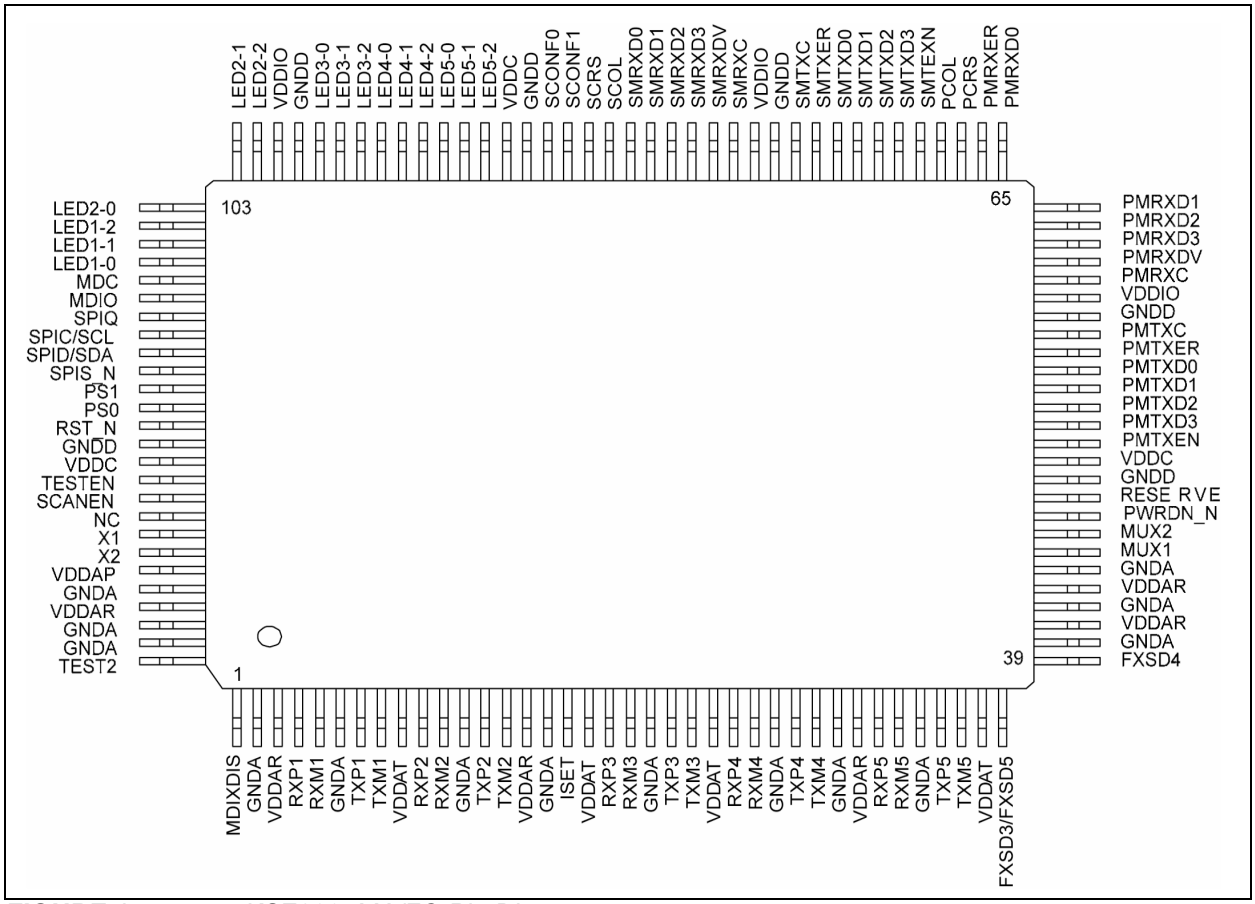

FIGURE 1: *KSZ8995MA/FQ Pin Diagram.*

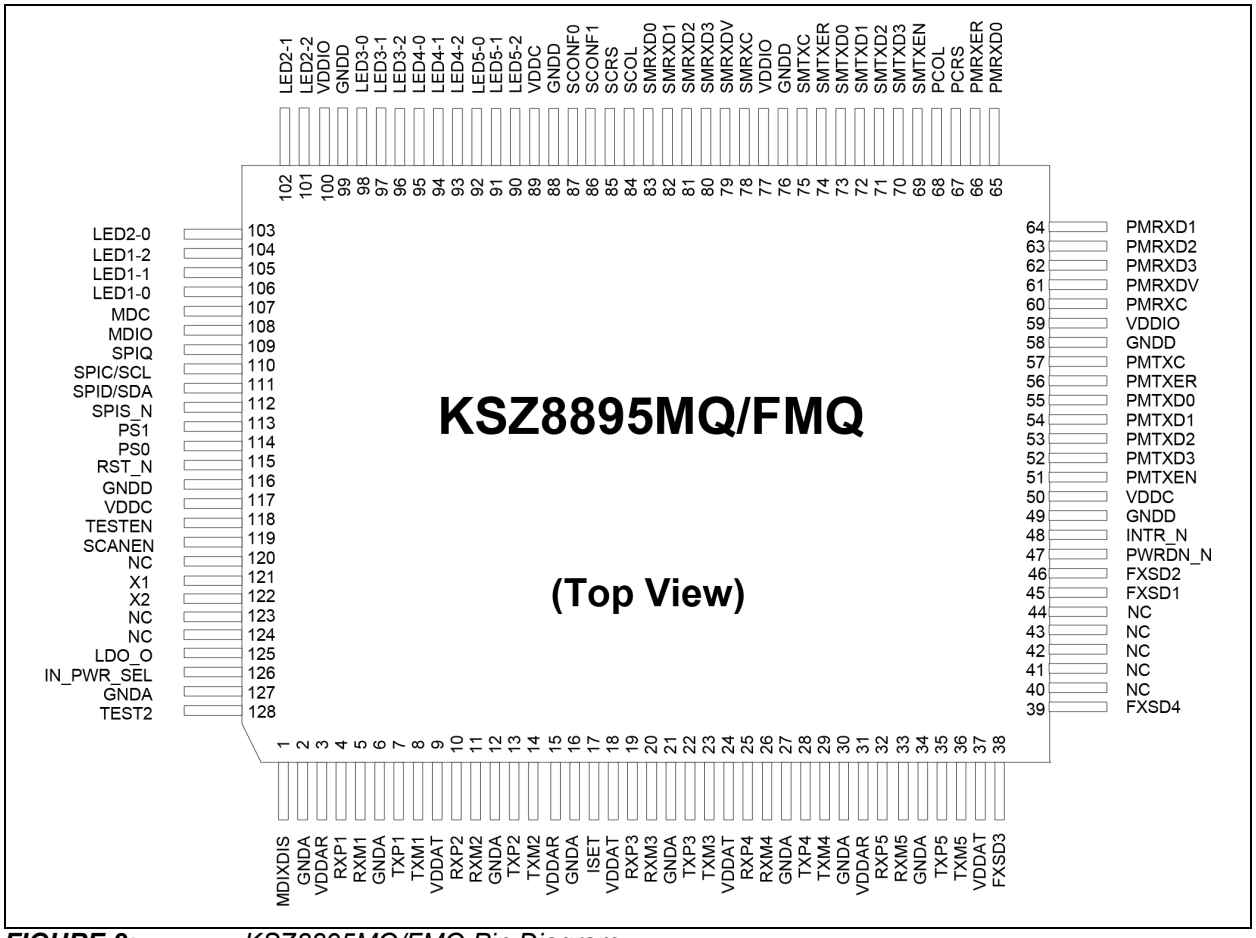

FIGURE 2: *KSZ8895MQ/FMQ Pin Diagram.*

What follows is a description of the pin-to-pin compatibility if you are replacing KSZ8995 with KSZ8895 on an existing board:

1. Pin 1 to Pin 37 are the same between KSZ8995 and KSZ8895.
2. Pin 38 is NC (No Connection) in KS8895MQ/TMQ, pin 38 is FXSD3 in KSZ8895FMQ which is the same as KSZ8995FQ. Pin 39 is NC (No Connection) on the KSZ8895MQ/TMQ, pin 39 is FXSD4 on KSZ8895FMQ which is the same as KSZ8995FQ. Pin 38 and Pin 39 have internal pull-down for copper mode of the KSZ8895MQ/TMQ. Pin 38 and Pin 39 are signal detect pins for fiber mode of port 3 and port 4 on the KSZ8895FMQ.
3. Pins 40 through 46 are NC (No Connection) in the KSZ8895, which is different than in the KSZ8995. Therefore, when migrating from the KSZ8995 to the KSZ8895, pins 40 through 46 can either be left with their original KSZ8995 connections or be left unconnected. The MUX pins (pins 45 and 46) on the KSZ8995 are used for factory test and should be left unconnected for normal operation on KSZ8895MQ. For KSZ8895FMQ, pins 45 and 46 are FXSD.
4. Pin 47 PWRDN_N is the same as the hardware power-down pin between KSZ8995 and KSZ8895.
5. Pin 48 is NC on the KSZ8995, Pin 48 is INTR_N interrupt pin for the link change in the KSZ8895. It is okay to leave this pin floating if the interrupt pin is unused.
6. Pin 49 to Pin 122 are the same between the KSZ8995 and KSZ8895.
7. Pin 123 and Pin 124 are NC with internal no connection in KSZ8895. Pin 123 and Pin 124 are the power VDDAP and ground on the KSZ8995. So it doesn't matter when KSZ8895 is used instead of KSZ8995 with respect to these pins.
8. Pin 125 and Pin 126 are power and ground pins in the KSZ8995. Pin 125 and Pin 126 are LDO_O (1.2V LDO controller output) and IN_PWR_SEL (internal 1.2V LDO controller select) pins on the KSZ8895. When Pin 126 IN_PWR_SEL pin is ground '0', the internal 1.2V LDO controller is disabled and Pin 125 LDO_O is tri-stated. So the two pins will not be affected when the KSZ8895 is used instead of the KSZ8995 because Pin 126 is ground '0' with internal 1.2V LDO controller disabled and Pin 125 is tri-stated with a power.

9. Pin 127 and Pin 128 are same between KSZ8995 and KSZ8895.

TABLE 1: PIN-TO-PIN COMPARISON

Pin Number	Pin Name	Type	KSZ8995MA/FQ Function	KSZ8895MQ/FMQ Function (Note 1)
1-37	—	—	MDI-XDIS, RX/TX pairs, and ground/power	Same as KSZ8995
38	FXSD3/5	IPD	FQ: Fiber signal detect pin for port 3 MA/XA: Fiber signal detect pin for port 5 No connection for copper	FMQ: Fiber signal detect pin for port 3 MQ/TMQ/RQ: No connection for copper
39	FXSD4	IPD	FQ/MA/XA: Fiber signal detect pin for port 4 No connection for copper	FMQ: Fiber signal detect pin for port 4 MQ/TMQ/RQ: no connection for copper
40	—	—	GNDA	NC (Internal no connection) Note: Due to using 0.13 µm technology, KSZ8895 can reduce some ground and power pins.
41	—	—	VDDAR	NC (Internal no connection)
42	—	—	GNDA	NC (Internal no connection)
43	—	—	VDDAR	NC (Internal no connection)
44	—	—	GNDA	NC (Internal no connection)
45	—	NC	MUX1	NC
46	—	NC	MUX2	NC
47	PWRDN_N	IPU	Full-chip power down. Active-low.	Full-chip power down. Active-low.
48	—	—	RESERVED with NC	Interrupt pin. If not using this pin, NC is okay.
49	GNDD	GND	Digital ground	Digital ground
50	VDDC	P	1.8V digital core V_{DD}	1.2V digital core V_{DD}
51-57	—	—	Port 5 PHY5 P5-MII TX signals	Port 5 PHY5 P5-MII TX signals
58	GNDD	GND	Digital ground	Digital ground
59	VDDIO	P	3.3V digital V_{DD} for digital I/O circuitry	3.3V, 2.5V, or 1.8V digital V_{DD} for digital I/O circuitry
60-68	—	—	Port 5 PHY5 P5-MII RX signals	Port 5 PHY5 P5-MII RX signals Strap pin same as KSZ8995
69-75	—	—	Port 5 MAC5 SW5-MII TX signals	Port 5 MAC5 SW5-MII TX signals
76	GNDD	GND	Digital ground	Digital ground
77	VDDIO	P	3.3V digital V_{DD} for digital I/O circuitry	3.3V, 2.5V, or 1.8V digital V_{DD} for digital I/O circuitry
78-85	—	—	Port 5 PHY5 P5-MII RX signals	Port 5 PHY5 P5-MII RX signals
86-87	SCONF[1:0]	IPD	Configuration pins for MII	Same as KSZ8995
88	GNDD	GND	Digital ground	Digital ground
89	VDDC	P	1.8V digital core V_{DD}	1.2V digital core V_{DD}
90-92	LED5[2:0]	IPU/O	Port 5 LED indicators	Same as KSZ8995
93-95	LED4[2:0]	IPU/O	Port 4 LED indicators	Same as KSZ8995
96-98	LED3[2:0]	IPU/O	Port 3 LED indicators	Same as KSZ8995
99	GNDD	GND	Digital ground	Digital ground
100	VDDIO	P	3.3V digital V_{DD} for digital I/O circuitry	3.3V, 2.5V, or 1.8V digital V_{DD} for digital I/O circuitry

TABLE 1: PIN-TO-PIN COMPARISON (CONTINUED)

Pin Number	Pin Name	Type	KSZ8995MA/FQ Function	KSZ8895MQ/FMQ Function (Note 1)
101-103	LED2[2:0]	IPU/O	Port 2 LED indicators	Same as KSZ8995 except LED2-1 strap option: It is for port 3 only. PU (default) = Enable auto-negotiation. PD = Disable auto-negotiation. Strap to register60 bit [7].
104	LED1-2	IPU/O	Port 1 LED indicator 2	Port 1 LED indicator 2
105	LED1-1	IPU/O	Port 1 LED indicator 1	Port 1 LED indicator 1 Strap option: For port 3 only. PU (default) = No force flow control, normal operation. PD = Force flow control.
106	LED1-0	IPU/O	Port 1 LED indicator 0	Port 1 LED indicator 0 Strap option for port 3 only. PU (default) = Force half-duplex if auto-negotiation is disabled or fails. PD = Force full-duplex if auto-negotiation is disabled or fails.
107-112	—	—	MDC/MDIO and SPI interfaces	Same as KSZ8995
113-114	PS[1:0]	IPD	Serial bus configuration pin	Same as KSZ8995
115-122	RST_N	IPU	Reset pin	Same as KSZ8995
116	GNDD	GND	Digital ground	Digital ground
117	VDDC	P	1.8V digital core V_{DD}	1.2V digital core V_{DD}
118-122	—	—	TEST/SCANEN, NC and X1/X2 pins	Same as KSZ8995
123	—	—	VDDAP	NC (Internal no connection)
124	—	—	GNDA	NC (Internal no connection)
125	—	—	VDDAR	LDO_O When Pin126 is pulled up, the internal 1.2V LDO controller is enabled and creates 1.2V output with using an external FET. When Pin126 is pulled down (default), Pin 125 is tri-stated.
126	—	—	GNDA	IN_PWR_SEL (internal pull-down) Pull up to enable LDO_O of Pin 125. Pull down to GNDA to disable LDO_0.
127	GNDA	GND	Analog ground	Analog ground
128	TEST2	NC	NC for normal operation	Same as KSZ8995

Note 1: For other changes, see the following sections.

CORE POWER FROM 1.8V TO 1.2V

The KSZ8895 can use 1.2V for core power, resulting in lower power consumption. The internal 1.2V LDO controller is disabled after the KSZ8995 is replaced by the KSZ8895 due to the ground at Pin 126, but an external 1.2V LDO is still needed. Just change the external 1.8V LDO to a 1.2V LDO. The 1.2V power rail will meet the core power request of the KSZ8895 device.

For new designs, there is one more option to use the internal 1.2V LDO controller with a cheap MOSFET to support 1.2V core power by pulling up Pin 126 IN_PWR_SEL. Please see the reference schematics in the hardware design package of the design kit.

TRANSCEIVER POWER 3.3V ONLY

For the VDDAT power, KSZ8995 supports 2.5V or 3.3V while KSZ8895 only supports 3.3V. If the old product uses 2.5V as VDDAT power, then the migration should use 3.3V as VDDAT for the KSZ8895 device.

ON-CHIP TERMINATION AND INTERNAL BIASING

KSZ8895 supports on-chip termination and internal biasing, so all external 49.9Ω termination resistors on the RX pair and TX pair can be removed. There is no need to pull up to VDDAT for the center tap of the transformer, Just leave the center taps open or go through two capacitors to ground separately for the RX and TX paths. The transformer will not consume power and reduce the system power consumption. Please see the figures below.

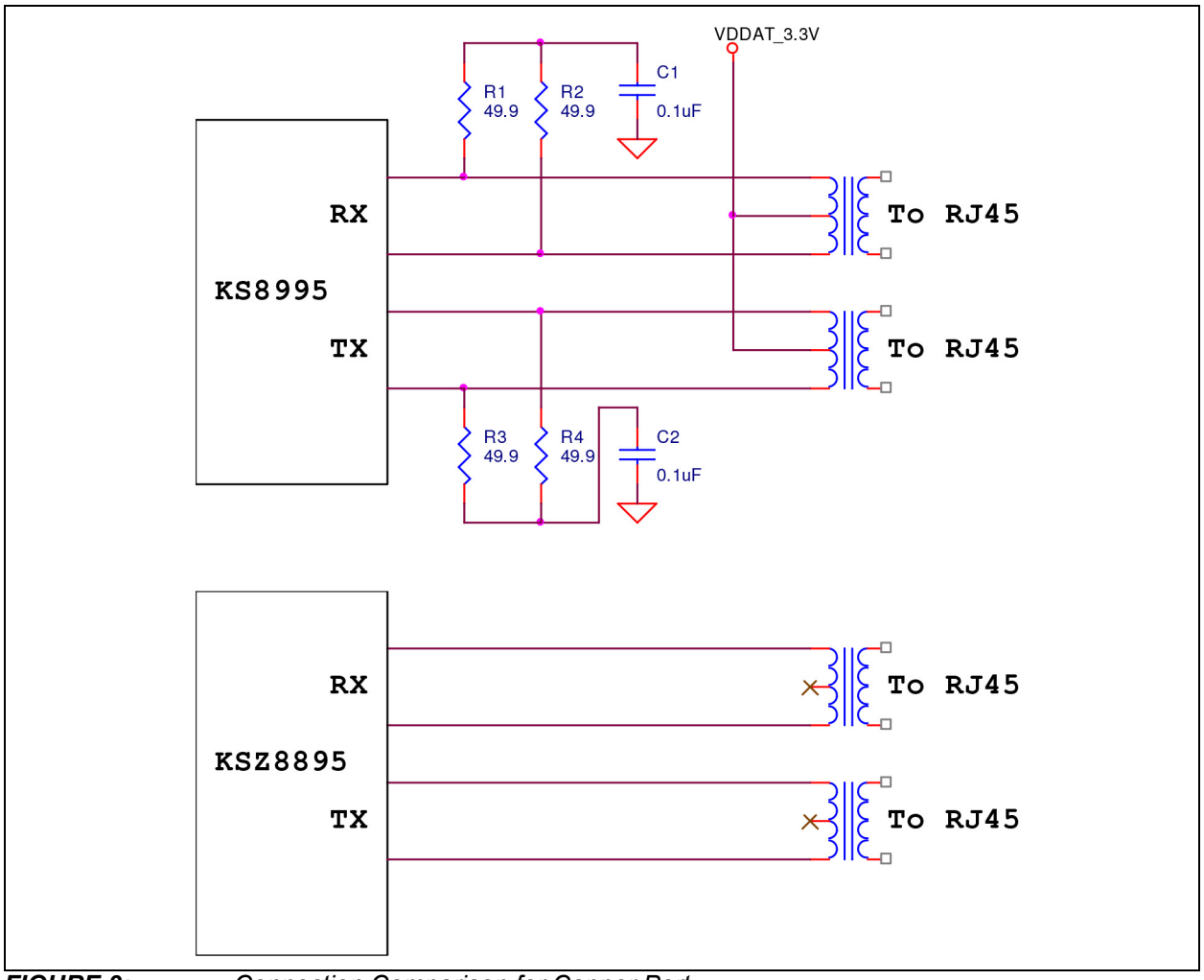

FIGURE 3: *Connection Comparison for Copper Port.*

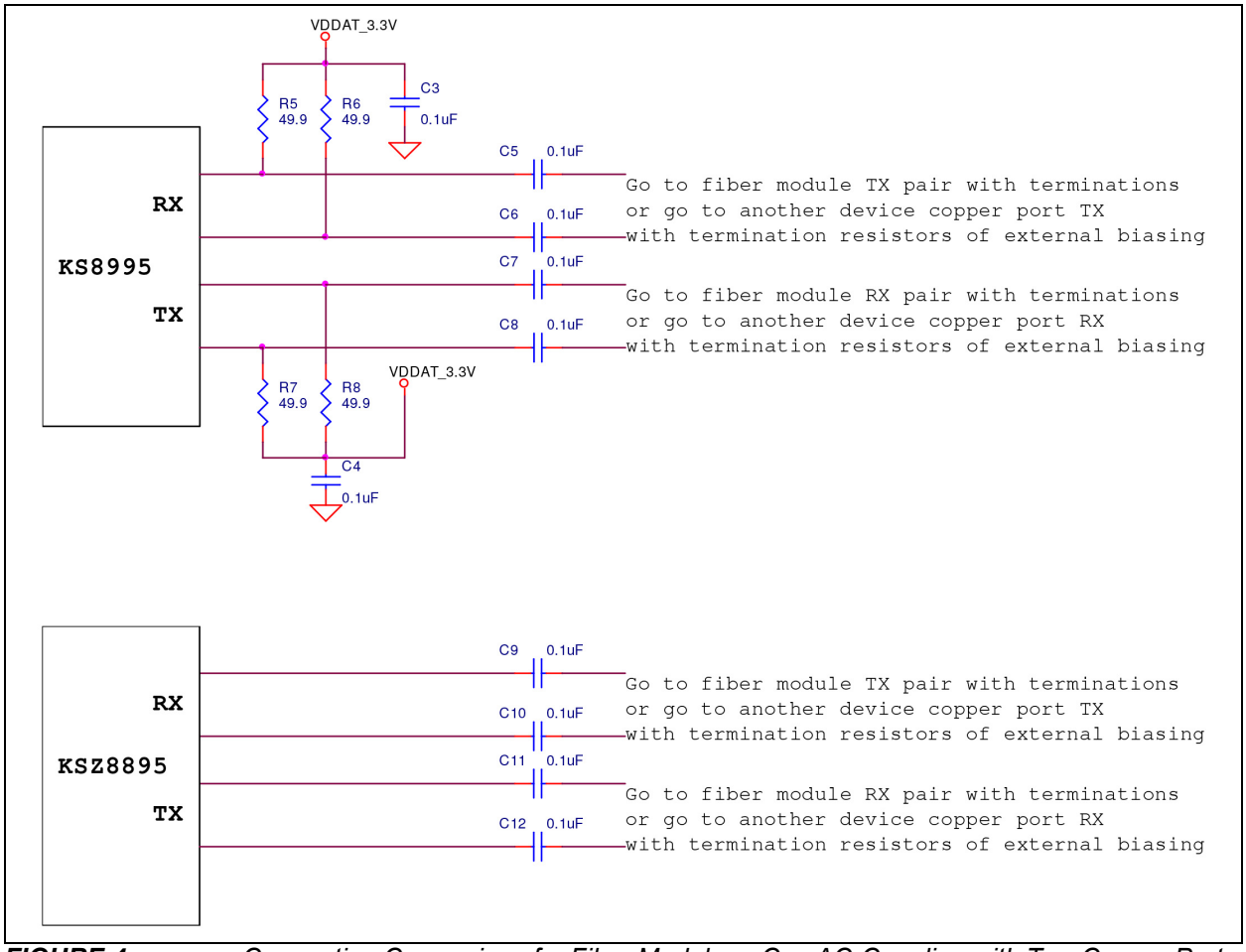

FIGURE 4: *Connection Comparison for Fiber Module or Cap AC-Coupling with Two Copper Ports.*

If the old product with the KSZ8995 device being replaced by the KSZ8895 uses a quad transformer, the quad transformer should be changed to part number of the H1664NL, in which the internal center taps of the RX and TX is disconnected with no connection. Use Pulse H1664NL or other similar quad transformer.

ISET RESISTOR VALUE

Due to using enhanced mixed signal design with DSP technology for the transceiver in the KSZ8895, the ISET resistor value will need to be changed from 3.01 kΩ on the KSZ8995 to 12.4 kΩ on the KSZ8895.

CONCLUSION

This application note has described the difference between and the migration path from the KSZ8995 to the KSZ8895. The migration is simple and easy. They are pin-to-pin compatible, the core power voltage changes to 1.2V, change the ISET resistor value to 12.4 kΩ, and refer to the connection diagram for new features like on-chip termination and internal biasing. As shown in this paper, Microchip's KSZ8895 family of switches provides an easy way to migrate from the KSZ8995 to the KSZ8895, creating a simple path to upgrade and support your Ethernet applications.

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