AN 15.5

Migrating from the LAN9117 to the LAN9217

1 Objective

This purpose of this application note is to assist SMSC customers with existing LAN9117 designs when upgrading to the new LAN9217 device. This upgrade is straightforward. The LAN9217 does require a simple PCB change, which is required to support the HP Auto-MDIX PHY (even if this mode is not used). This application note addresses all the differences between the LAN9117 and the LAN9217 devices, making this transition as easy as possible.

1.1 References

- LAN9217 Datasheet
- One-Page Reference Design for the LAN9217
- One-Page Reference Design for the LAN9117

1.2 Overview of Changes Required

Table 1.1 summarizes the changes needed to migrate from the LAN9117 to the LAN9217.

Table 1.1 Summary of Changes Required

CHANGE REQUIRED	COMMENTS	REFERENCES
New PCB	Needed to support magnetics and minor changes in passive components	This application note and or 1-Page Reference Design available at www.smsc.com
New Magnetics	Needed to Support HP Auto-MDIX, and any industrial temperature range requirements.	See Application Note 8-13 for list of recommended magnetics
Re-design passive component network on PHY side of magnetics	Needed to Support Auto-MDIX PHY	This application note or refer to 1-page reference design for details.
New crystal (optional)	May be needed to support industrial temperature range	Refer to LAN9217 Datasheet
Upgrade drivers	Recognize new device ID	Refer to Table 3.1

2 Hardware Changes

2.1 Component Changes

2.1.1 Magnetics

Migrating to the LAN9217 requires different magnetics than were used on the LAN9117. These magnetics have symmetrical channel configurations to allow for the switching receive and transmit channels. Correct magnetic choices for the LAN9217 can be found in Application Note 8-13, entitled "Suggested Magnetics".

2.2 Circuit Changes

2.2.1 Transmit Circuit

The transmit circuit used by the LAN9217 is almost the same as the one used by the LAN9117. This circuit is shown in Figure 2.1 below.

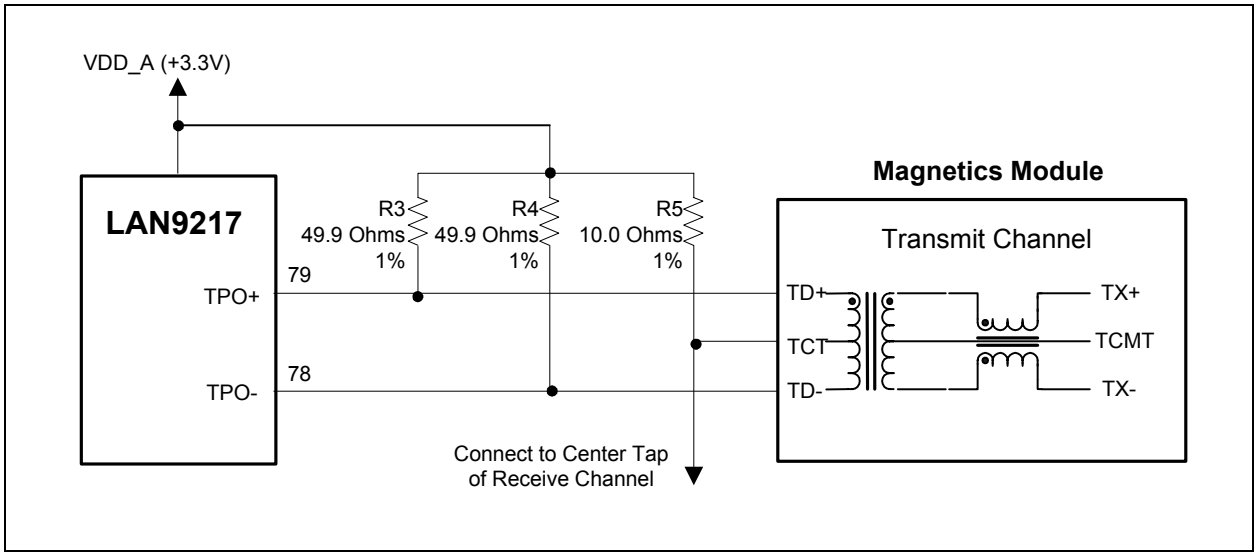

Figure 2.1 Transmit Circuit

There are only two differences between the transmit circuit for the LAN9217 and the one previously used for the LAN9117:

- The LAN9217 uses magnetics that support HP Auto-MDIX.
- The device-side center tap of the transmit core (TCT) is attached to the device-side center-tap of the receive (RCT)

Like the LAN9117, the LAN9217 transmit circuit has the following features:

- A 49.9 ohm, 1% resistor from each side of the twisted pair to VDD_A (+3.3V)
- A 10 ohm, 1% resistor from the transmit center tap to VDD_A (+3.3V).

2.2.2 Receive Circuit

The receive circuit used by the LAN9217 is slightly different from the one used by the LAN9117. This circuit is shown in Figure 2.2 below:

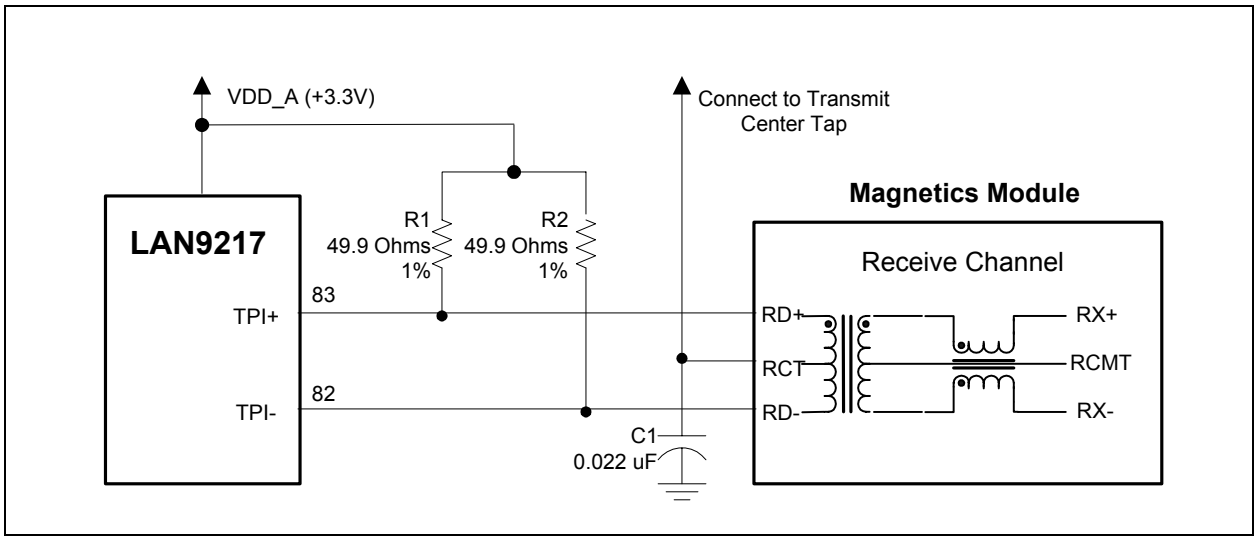

Figure 2.2 Receive Circuit

The similarities between the LAN9217 and the LAN9117 are as follows:

- Both designs have two 49.9 ohm, 1% resistors between the two signals in the twisted pair.

The differences between the LAN9217 and the LAN9117 are as follows:

- The LAN9117 had two 6.8nf capacitors, one in series with each side of the twisted pair, in the LAN9217 these are eliminated (shorted).
- In the LAN9117, the mid-point between the two 49.9 ohm resistors is tied to the center tap of the magnetics (RCT) and to a .01uF bypass capacitor to ground. In the LAN9217, both resistors are tied to VDD_A (+3.3V). The .01uF bypass capacitor is eliminated. The center-tap of the receive channel of the magnetics is tied to the transmit center tap (TCT) and to a common 0.022uF bypass capacitor to ground.

2.3 Pin Changes

2.3.1 AMDIX_EN Pin (Pin 73)

This configuration pin allows hardware to enable or disable the HP AMDIX feature. When pulled high, the feature is enabled. If pulled low or left floating, the feature is disabled. This pin can be overridden by the driver via the internal configuration registers. In the LAN9117 this pin was a No Connect.

2.3.2 Twisted Pair Input and Output Pins (TPI+, TPI-, TPO+, TPO-)

The inputs and outputs will reverse under either of the following conditions:

- HP AMDIX is enabled and the device detects a reversed connection
- A reversed (MDIX) connection is manually enabled by the driver.

2.4 Register Changes

2.4.1 AMDIX_EN Strap State (Read Only)

Located at bit 24 of the HW_CFG Register, previously reserved, this read-only bit provides the status of the AMDIX_EN Strap Pin - Pin 73.

2.4.2 Controlling HP Auto MDIX via Software

The HP Auto-MDIX can be software-controlled using bits 15-13 in PHY Register 0x27, as shown in Table 2.1 below.

Table 2.1 Controlling HP Auto-MDIX from the Driver

BIT 15	BIT 14	BIT 13	RESULT
0	X	X	Pin 73 Enables or Disables the HP Auto MDIX function.
1	1	0	Override Pin 73, Enable Auto-MDIX
1	0	0	Disable Auto-MDIX. Force normal (MDI) connection. TPO = transmit, TPI = receive
1	0	1	Disable Auto-MDIX. Force reverse (MDIX) connection TPO = receive, TPI = transmit
1	1	1	Illegal combination, do not use.

3 Driver Support

Table 3.1 below shows the version of drivers needed to support the LAN9217.

Table 3.1 Driver Support

DRIVER	REVISION	STATUS
WinCE 5.0 - XScale (PXA270)	1.06	In Development/Test
Linux - XScale (PXA270)	1.25	In Development/Test
Linux - SH3	1.25	In Development/Test

4 Answers to Commonly Asked Questions

1Q: I'm not using Auto-MDIX and I notice that the LAN9217 and the LAN9117 have basically the same pin-out. Can I just put a LAN9217 in a LAN9117 socket without having to modify the PCB?
1A: No, even if Auto-MDIX function is disabled, the LAN9217 uses a different biasing scheme in the analog front end. This requires a change in the design of the passive components (resistors and capacitors) between the LAN9217 and the magnetics.

2Q: How extensive are the changes to the driver?
2A: The changes are fairly minor. The only section of the driver that changes is the section that recognizes the Chip ID/revision register.

3Q: Will an old driver work with a new device?
3A: No, the old driver will not recognize the new Chip ID.

4Q: What new features were added to the LAN9217?
4A: Support for HP Auto-MDIX.

5Q: How is HP Auto-MDIX controlled in the LAN9217?

5A: A new configuration pin (pin 73) has been defined to control HP Auto-MDIX. If this pin is pulled high, the feature is enabled; if pulled low or left floating, this feature is disabled. Four new bits are defined in the register set. Bit 24 in the HW Configuration Register can be used to detect the state of pin 73. Three bits in PHY Register 0x27 - bits 15, 14 and 13 can also be used by the driver to control the HP Auto-MDIX feature directly. Bit 15, if high, overrides pin 73, and gives control of HP Auto MDIX to bits 14 and 13. If bit 15 is high, bit 14 enables or disables Auto-MDIX. If bit 15 is high and bit 14 is low (automatic MDIX disabled), the driver can still manually choose a normal (MDI) or cross-over (MDIX) setting via bit 13.

6Q: What exactly is HP Auto-MDIX and what are its benefits
6A: The Ethernet standard allows the physical connector (known as an RJ-45) to have one of two possible pin-outs; the difference between them being the location of the receive and transmit pairs; the locations are exactly reversed. This in turn impacts the type of cabling required to connect two Ethernet nodes. Two types of cable are available: straight and cross-over. The choice of cable depends on the configuration of the RJ-45's. If both RJ-45's have the same configuration, a cross-over cable is required; if the RJ-45's have opposite configurations, a straight cable is required. The situation gets even more complicated if a structured wiring system is used which typically adds at least two patch cables to each end of the system. If a user attempts to connect two nodes and uses the wrong type of cable, the nodes will not be able to communicate. Since end-customers typically do not know the configuration of the devices or the structured wiring systems, mistakes are likely, which in turn can lead to avoidable and expensive service calls.

HP Auto-MDIX eliminates this problem. The PHY detects if the incoming signal is being received on the "wrong pair", it internally switches the transmitter and receiver. This guarantees that every Ethernet connection will work, no matter what cables are used. This improves overall end-customer experience and eliminates potential service calls.

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