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Application Note AN-2040

Finisar Implementation of Rate Select for FTRJ8524P2BNV and FTLF8524P2BNV 4.25 Gb/s SFP Transceivers

One of the key benefits of the Finisar 4.25 Gb/s transceivers (FTRJ8524P2BNV and FTLF8524P2BNV) is the ability to have exceptional performance at 1x, 2x, and 4x Fibre Channel, and in the same part also have exceptional performance at Gigabit Ethernet. This capability is due in part to the device's rate select feature.

In defining rate select in this part, Finisar has followed all industry standards including the SFP MSA and the current SFF-8079 draft proposed by the T11 committee. In addition, the rate select definition used by Finisar allows backwards compatibility with legacy 2 Gb/s transceivers. The following document outlines Finisar's rate select scheme and the advantages it offers.

Rate Select Definition

In the FTRJ8524P2BNV and FTLF8524P2BNV products, rate select is defined as follows:

Input from Host System into Rate Select Setting:	**Mode of Operation:**
Open or **Low**	1x or 2x Fibre Channel, Gigabit Ethernet (Low Bandwidth)
High	2x or 4x Fibre Channel (High Bandwidth)

Table A. FTRJ8524P2BNV and FTLF8524P2BNV Rate Select Definition

*Note that the same rate select definition has been adopted for Finisar 2x7 pin SFF transceivers (FTLF8524E2xNV).

Rate select can also be set through 2-wire bus in accordance with SFF-8472 at Bit 3, Byte 110, Address A2h (note: writing '1' selects full bandwidth operation). More details of this implementation can be found on the FTRJ8524P2BNV and FTLF8524P2BNV datasheets.

Backwards Compatibility to Legacy Devices

The Finisar rate select definition enables backwards compatibility to legacy transceivers. For example, Finisar's 2 Gb/s "P1" product (FTRJ8519P1BNL) is rated for Gigabit Ethernet and 1x and 2x Fibre Channel and operates at these rates independent of rate select setting.

Because rate select has not been implemented by the industry until the advent of 4G, the vast majority of legacy systems have the rate select pin connected to an open circuit on the host system. This means that if a Finisar 4G transceiver is connected to one of these legacy circuits, it would operate with the "open" settings in Table A above, which is exactly the same as the ratings of the "P1" device (1x, 2x FC and GigE.).

This backwards compatibility enables the FTRJ8524P2BNV and FTLF8524P2BNV to be retroactively qualified into legacy 2G platforms where the FTRJ8519P1BNL is qualified and thus enables suppliers to simplify operations and inventory concerns by standardizing on only one part number.

MSA Compliance

In INF-8074 "Small Form-Factor Pluggable (SFP) Transceiver Multisource Agreement (MSA)" the Rate Select Pin is defined on page 21 as;

Table 1. Pin Function Definitions

Pin Num.	Name	Function	Plug Seq.	Notes
1	VeeT	Transmitter Ground	1	
2	TX Fault	Transmitter Fault Indication	3	Note 1
3	TX Disable	Transmitter Disable	3	Note 2 Module disables on high or open
4	MOD-DEF2	Module Definition 2	3	Note 3, 2 wire serial ID interface
5	MOD-DEF1	Module Definition 1	3	Note 3, 2 wire serial ID interface
6	MOD-DEF0	Module Definition 0	3	Note 3, Grounded in Module
7	Rate Select	Select between full or reduced receiver bandwidth	3	Note 4 Low or Open – reduced bandwidth, High– full bandwidth
8	LOS	Loss of Signal	3	Note 5
9	VeeR	Receiver Ground	1	Note 6
10	VeeR	Receiver Ground	1	Note 6
11	VeeR	Receiver Ground	1	Note 6
12	RD-	Inv. Received Data Out	3	Note 7
13	RD+	Received Data Out	3	Note 7
14	VeeR	Receiver Ground	1	Note 6
15	VccR	Receiver Power	2	3.3 ± 5%, Note 8
16	VccT	Transmitter Power	2	3.3 ± 5%, Note 8
17	VeeT	Transmitter Ground	1	Note 6

Note 4 is defined on page 22;

4) This is an optional input used to control the receiver bandwidth for compatibility with multiple data rates (most likely Fibre Channel 1x and 2x Rates). If implemented, the input will be internally pulled down with > 30kΩ resistor. The input states are:

Low (0 – 0.8V):	Reduced Bandwidth
(>0.8 , < 2.0V):	Undefined
High (2.0 – 3.465V):	Full Bandwidth
Open:	Reduced Bandwidth

The key point here is that rate select low and high defines reduced receiver bandwidth and full bandwidth respectively, which matches with the FTRJ8524P2BNV rate select definition.

SFF-8079 Compliance

Similarly, on page 12 of SFF-8079 "Small Form Factor (SFP) Rate and Application Selection" the following is specified for Hardware pin #7 (the Rate Select pin).

Table 3. Fibre Channel Extended RateSelect Groupings

Extended RateSelect State	Required Compliance	Description
Low	1.0625 Gb/s	Represents legacy performance of non-RateSelect enabled transceivers used in 1G applications. Must comply with the requirements in Clause 6 of FC-PI (until/unless modified by FC-PI-2) for 1.0625 Gb/s data rate. At the module supplier's discretion, modules may be developed to also be compliant at the 2.125 Gb/s data rate at this setting. This position will also commonly result in compliance to 1000Base performance per IEEE 802.3z.
High	2.125 Gb/s, 4.25 Gb/s	Insures that legacy system applications which have used RateSelect in 1G/2G applications will continue to have the "high" state as 2.125 compliant. Must comply with the performance requirements in Clause 6 of FC-PI (until/unless modified by FC-PI-2) for 2.125 and/or 4.25 Gb/s data rates.

Finisar's implementation of Rate Select is compliant with this definition.

Enables Compatibility with Legacy Lasers

A side benefit of Finisar's FTRJ8524P2BNV and FTLF8524P2BNV rate select definition is it meets the electrical receiver 3 dB cutoff frequency specs in both Fibre Channel and Gigabit Ethernet, which are required to ensure compatibility with legacy CD lasers and early VCSELs. This compliance will help minimize the number of potential problems (RMAs, etc.) that systems suppliers might face in dealing with specific customer installations.

Conclusion

Finisar's FTRJ8524P2BNV and FTLF8524P2BNV have a rate select definition that:

a) meets industry standards
b) enables backwards compatibility with legacy 2G transceivers
c) offers compatibility with legacy lasers

This definition will result in the lowest operational cost to system manufacturers while ensuring that all industry standards are met.