NEW PRODUCTS 4

IEEE1394 PHYSICAL LAYER / OHCI LINK LAYER REALIZED ON 1 CHIP μPD72870 / μPD72871

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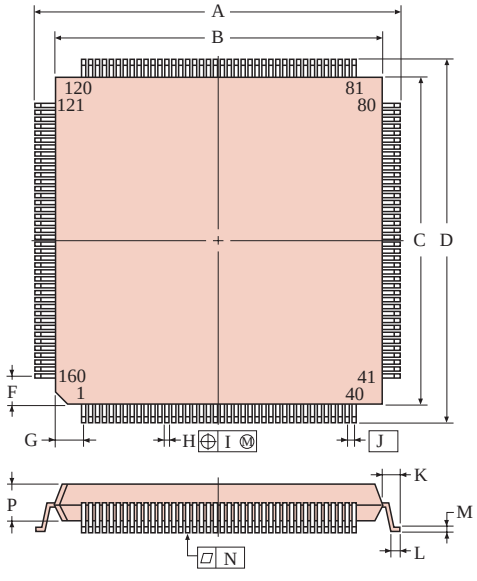
Introduction

This article introduces NEC's newly developed μPD72870 and μPD72871, which integrate an IEEE1394 interface-compliant physical layer LSI and an Open Host Controller Interface (OHCI) link layer LSI on one chip.

Development Background

The IEEE1394 interface (hereafter, 1394-I/F) is drawing attention as a common interface for PCs and information appliances. Recent digital video camcorders come with 4-pin type standard connectors, and the 1394-I/F is becoming one of the most powerful candidates for next-generation interfaces. Aided by the fact that a standard 1394 driver is included in Windows 98, this interface is starting this year to be widely used as a simple yet high-speed interface even in PCs, like the Universal Serial Bus (USB), which has spread explosively since 1998.

The μPD72870 and μPD72871 are products that have been designed for the above mentioned PCs. Older desktop PCs must be newly fitted with a PCI board in order to use the 1394-I/F. Notebook the abive mentioned PCs either support the 1394-I/F from the time they are shipped or require the



NOTE
Each lead centerline is located within 0.10 mm(0.004 inch)of its true position(T.P.)at maximun material condition.

ITEM	MILLIMETERS	INCHES
A	26.0 ± 0.2	1.024 $^{+0.008}_{-0.009}$
B	24.0 ± 0.2	0.945 ± 0.008
C	24.0 ± 0.2	0.945 ± 0.008
D	26.0 ± 0.2	1.024 $^{+0.008}_{-0.009}$
F	2.25	0.089
G	2.25	0.089
H	0.22 $^{+0.05}_{-0.04}$	0.009 ± 0.002
I	0.10	0.004
J	0.5 (T.P.)	0.020 (T.P.)
K	1.0 ± 0.2	0.039 $^{+0.009}_{-0.008}$
L	0.5 ± 0.2	0.020 $^{+0.008}_{-0.009}$
M	0.17 $^{+0.03}_{-0.07}$	0.007 $^{+0.001}_{-0.003}$
N	0.10	0.004
P	2.7	0.106
Q	0.4 ± 0.1	0.016 $^{+0.004}_{-0.005}$
R	3i $^{+7i}_{-3i}$	3i $^{+7i}_{-3i}$
S	3.3MAX.	0.130MAX.

S160GM-50-JMD,KMD

Fig. 1 160-Pin Plastic QFP Package Drawing

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purchase of a PC card as a peripheral. However, the mounting space required for mounting parts is a problem, even if the mounting surface is a PCI board, much less a motherboard or PC card. On the other hand, inquiries about the possibility of combining the physical layer and the link layer on one chip started emanating from users who were aiming for the diffusion of 1394-I/F. Therefore, although NEC had only just started releasing products on the market from 1998, in response to user expectations, the company, as a partner actively promoting the diffusion of IEEE1394, decided to add the μPD72870 and μPD72871 to NEC's IEEE1394 product family.

For a description of NEC's existing lineup of IEEE1394 products, see the article entitled "LINEUP 1: Approach to IEEE1394 High-Speed Serial Interface" in Device Technology International No. 52.

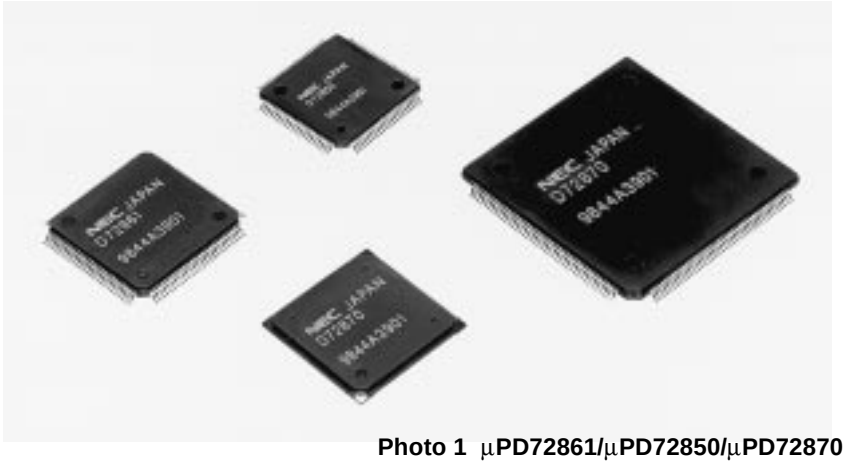

Photo 1 μPD72861/μPD72850/μPD72870

Outline of New Products μPD72870/μPD72871

The μPD72870 and μPD72871 are single-chip 1394-I/F controllers for PCs. They contain the physical layer and OHCI link layer, and can also operate as 1394 repeaters. The μPD72870 supports up to three 1394 cable ports, while the μPD72871 supports only one. Both products comply with P1394a Draft 2.0, the latest 1394-I/F specification, and support transfer speeds of 400M/200M/100Mbps. Because the original functions they support include not only a PCI bus, but a card bus as well, they can also be used for notebook PCs. Two packages are available, a 24 x 24mm 160-pin LQFP (Fig. 1) and a 14 x 14mm 192-pin plastic FBGA (Fig. 2).

Features of μPD72870/μPD72871

The features of the μPD72870 and μPD72871 are described below.

1. A 50% to 70% reduction of mounting surface compared to existing products

The major feature and merit of these new products is that they enable a reduction in mounting surface through single-chip integration.

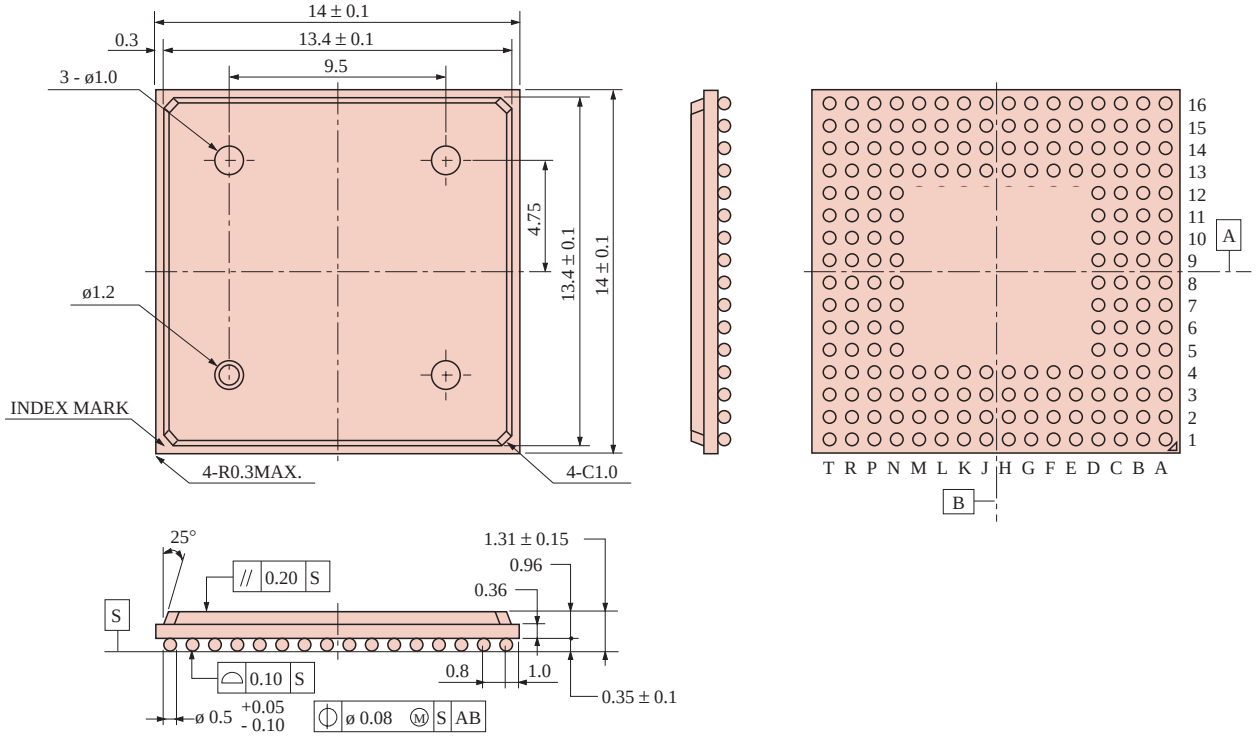

Fig. 2 192-Pin Plastic FBGA Package Drawing

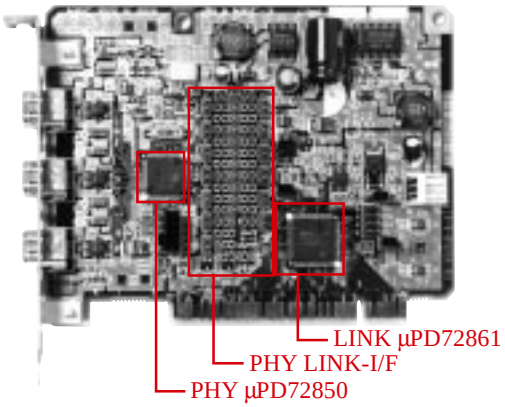

Photo 2 Board with µPD72861 & µPD72850

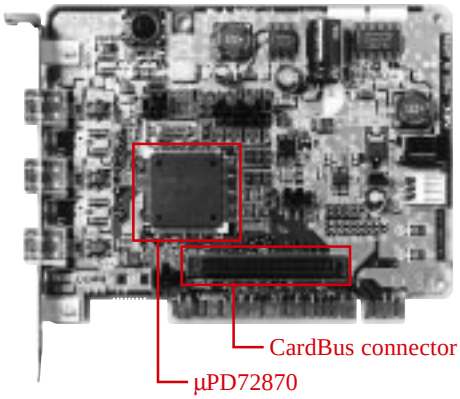

Photo 3 Board with µPD72870 LQFP

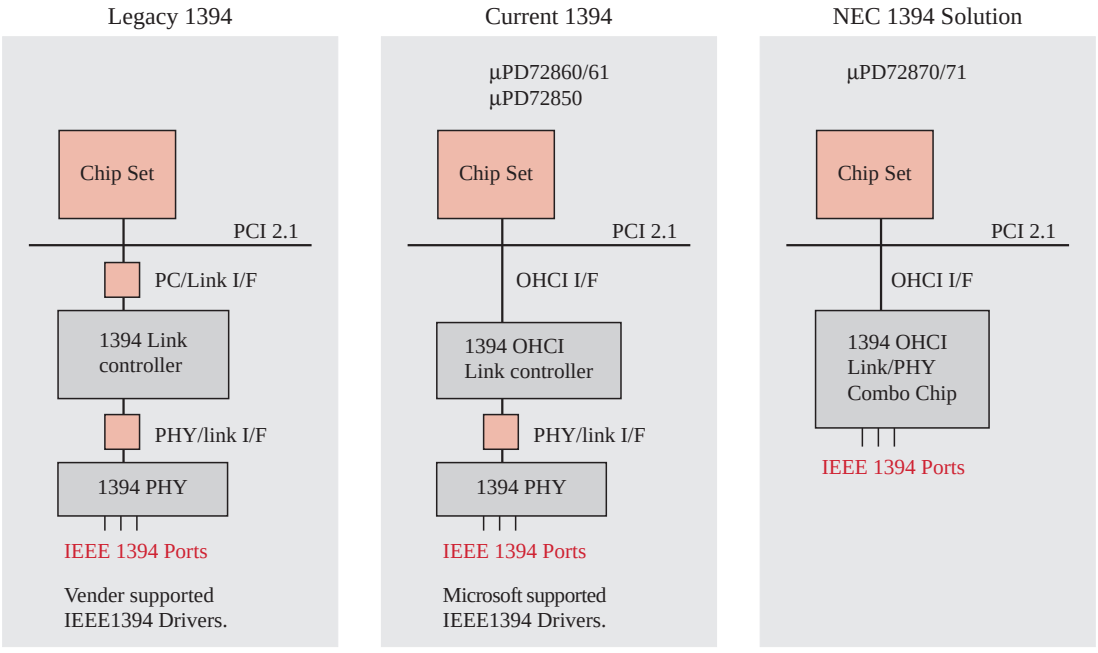

Fig. 3 Block Diagram of 1394-I/F for PCs

Photo 1 shows the µPD72850 physical layer LSI, µPD72861 OHCI link layer LSI, and the µPD72870's QFP and FBGA versions for purposes of comparison. Photo 2 shows a PCI board for evaluation purposes that uses conventional physical layer and OHCI link LSIs, and Photo 3 shows a board carrying the QFP version of the new µPD72870. The single-chip design of the µPD72870 naturally results in a smaller chip size, but it also eliminates the need for the surface used to mount the physical layer and link layer interface, thereby enabling space saving from 50% to over 70%. Figure 3 shows the PC 1394-I/F block.

2. 1394 Repeater operation supported

The connection of a 1394 device is achieved by connecting the two physical layer LSIs. Communication between devices separated by a long distance is made by joining the physical layer part of several devices. In this case, because the relay devices do not use applications, the link layer is not required and operation is performed without problem using only the physical layer. If the products are used only as relay devices, this function can be achieved using a simple physical layer LSI. The function of this physical layer is called repeater function. To use as a repeater, the power supply of the physical layer LSI must be turned on. In order to enable information exchange without having to reconnect the power line even if the main power supply of the relay device is off, it is possible to use the cable's power supply pin to operate the physical layer.

The µPD72870 and µPD72871 also

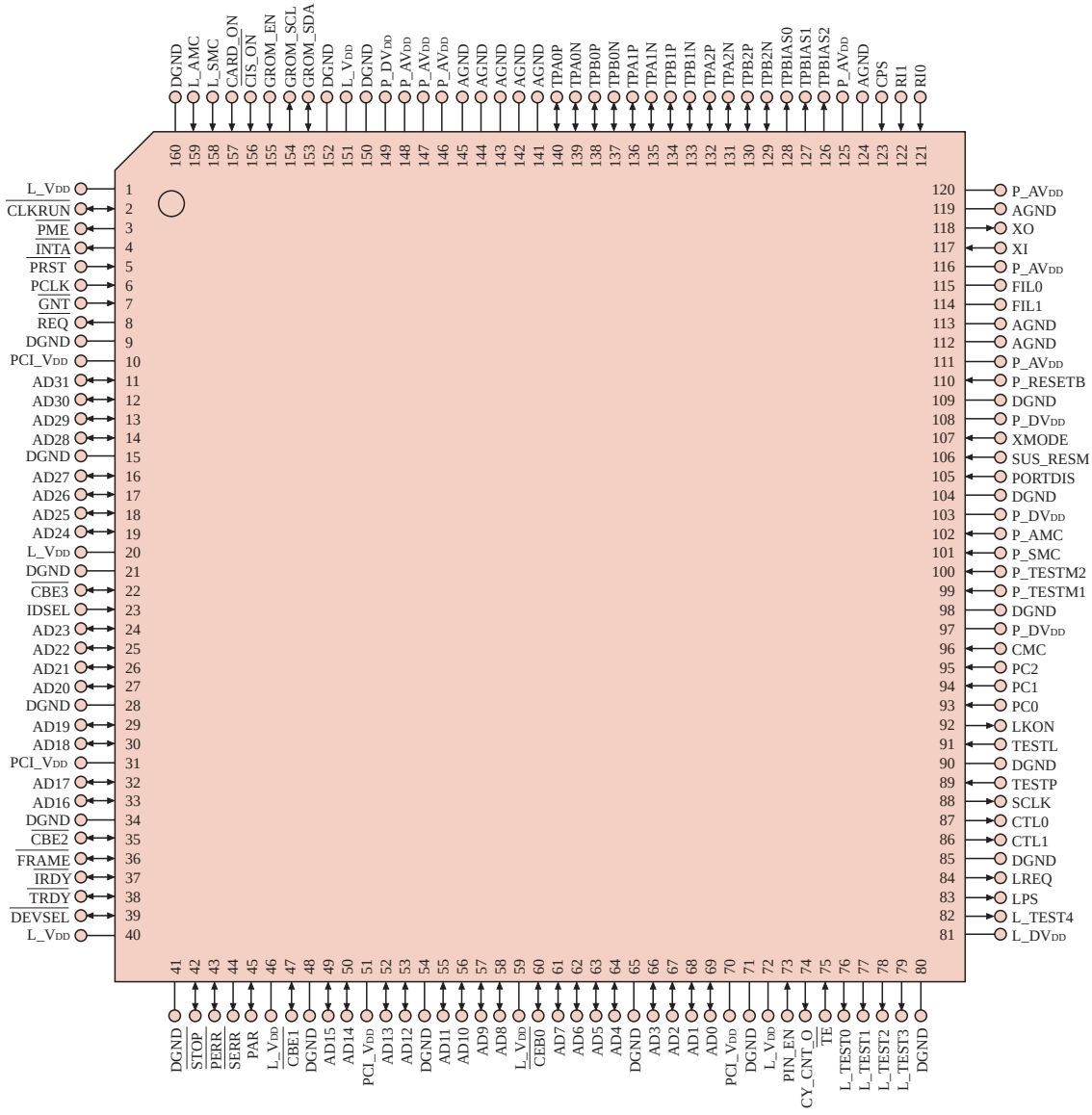

Fig. 4 Pin Configuration of μPD72870 LQFP Version

function as repeaters. The power supply of the physical layer has been separated inside the chip, and a different power supply can be externally provided to each block. By supplying power to the physical layer block from the device or a cable, and supplying power to the link layer block from the device, it is possible to operate the physical layer as a repeater when the device's power is off. In the near future, PCs are likely to be increasingly used as 1394 network relay points. This function is provided for this purpose.

3. Support of standard driver operation and card bus for Windows 98 and beyond

The μPD72870 and μPD72871 support OpenHCI 1.0. OHCI is a PC interface specification that conveniently enables PCI interface card operation with the standard Windows driver. If an LSI that has a link layer that supports 1394-I/F is used, device recognition and operation are enabled with the standard driver, making it unnecessary to provide software drivers as in the case of conventional products. Users can thus concentrate on application development.

Moreover, the I/O buffer drive capacity can be controlled with the pin input level, and it is possible to select either the PCI bus or card bus. The 14 x 14mm 192-pin FBGA package is the optimum package for PC cards.

4. Compliant with latest 1394-I/F specification P1394a draft 2.0, 400Mbps transfer speed enabled

The μPD72870 and μPD72871 support physical layer/link layer interfaces compliant

	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	T
16	RI0	RI1	A_GND	XO	FIL2	P_RESETB	X_MODE	PORTDIS	P_SMC	CMC	PC1	TESTL	CTL0	LREQ	L_VDD	DGND
15	CSP	AGND	P_AVDD	XI	FIL1	P_AVDD	SUS_RESUM	DGND	P_TESTM2	PC2	PC0	DGND	CTL1	LPS	L_TEST2	L_TEST3
14	TPBIAS2	TPBIAS1	TPBIAS0	P_AVDD	A_GND	DGND	P_DVDD	P_DVDD	P_TESTM1	P_DVDD	LKON	TESTP	D_GND	L_TEST4	L_TEST0	L_TEST1
13	TPB2N	TPB2P	AGND	P_AVDD	A_GND	DGND	P_DVDD	P_AMC	DGND	P_DVDD	P_DVDD	SCLK	L-VDD	PIN_EN	CY_CNT_O	TE#
12	TPA2N	TPA2P	AGND	P_AVDD									PCI_VDD	DGND	AD1	AD0
11	TPB1N	TPB1P	AGND	P_AVDD									PCI_VDD	DGND	AD3	AD2
10	TPA1N	TPB1P	AGND	AGND									L-VDD	DGND	AD5	AD4
9	TPB0N	TPB0P	AGND	AGND									L-VDD	CBE0#	AD7	AD6
8	TPA0N	TPA0P	AGND	AGND									DGND	DGND	AD9	AD8
7	AGND	AGND	AGND	AGND									DGND	DGND	AD11	AD10
6	AGND	P_AVDD	P_AVDD	P_AVDD									PCI_VDD	PCI_VDD	AD13	AD12
5	P_AVDD	DGND	L_VDD	DGND									L_VDD	D_GND	AD15	AD14
4	GROM_SDA	GROM_SCL	GROM_EN	L_AMC	DGND	DGND	DGND	DGND	L_VDD	L_VDD	L_VDD	DGND	D_GND	DGND	PAR#	CBE1#
3	CIS_ON#	CARD_ON	L_SMC	DGND	PCI_VDD	PCI_VDD	DGND	DGND	DGND	DGND	DGND	DGND	PCI_VDD	L_VDD	PERR#	SERR#
2	L_VDD	PME#	RST#	GNT#	AD31	AD29	AD27	AD25	CBE#3	AD23	AD21	AD19	AD17	CBE2#	IRDY#	STOP#
1	CHKRUN	INTA#	PCLK	REQ#	AD30	AD28	AD26	AD24	IDSEL	AD22	AD20	AD18	AD16	FRAME#	TRDY#	DEVSEL#

Fig. 5 Pin Configuration of μPD72870 FBGA Version

with P1394a Draft 2.0, the upgraded version of the IEEE1394-1995 specification established in 1995, and include the latest functions in addition to the suspend/resume function. These products also support three transfer speeds, 400M/200M/100Mbps.

5. Advanced analog/digital mixed device

Until now, there have been only a few vendors supplying both the 1394-I/F physical layer and link layer. While users have been served separately by vendors specializing in the analog field and vendors specializing in the digital field, NEC already possessed the technology to realize single-chip solutions and the μPD72870 and μPD72871 are products of this technology. For the design process, NEC has used the 0.35-μm rule, which is the most commonly used rule for System On a Chip, and has successfully achieved single-chip integration utilizing a CMOS cell-based method.

6. Additional features

For additional details on functions and electrical specifications, see the products' data sheets. Figures 4 and 5 show the pin configuration of the μPD72870.

Applications and Support

The μPD72870, which has three cable ports, is designed for desktop PCs, and the μPD72871, which has one cable port, is designed for notebook PCs. Since the physical layer and the link layer interface are linked with a DC type connection, these products are not suitable for applications that require an AC connection. In this case, separate physical layer and link layer LSIs should be combined.

Moreover, similar to when supporting physical layer and link layer LSIs, an evaluation board and reference circuit diagrams are available to users. The evaluation board is a PCI interface card. A card bus slot is also provided, and support of the selection of which side to evaluate using a DIP switch is planned. By the time this article is released, the evaluation board should be available. For details, please contact either your nearest NEC Sales Office or authorized NEC distributor.

Conclusion

In conclusion, these two new products lay the foundation for next-generation products. NEC plans to announce other exciting new products within the next six months.