Interface Circuits

Interfacing SIR transceivers to an RS232 port

A quite common method of adding the IrDA capability to a desktop computer is the usage of a so-called dongle connected to the COM - port (RS232 - port). This connectivity is currently available at any desktop or laptop computer but in future will be replaced by the USB port.

For interfacing the SIR frontend transceivers (4000 series) as for other SIR transceivers an Encoder/ Decoder device (TOIM4232) is necessary to provide the NRZ to RZI conversion. This device also provides the clock generator and can be programmed by a set of (8 bit-) commands. Drivers for the RS232 connector with TOIM4232 are provided by Microsoft (R) with the Operating Systems. The block diagram of a dongle connection to RS232 is shown in figure 1.

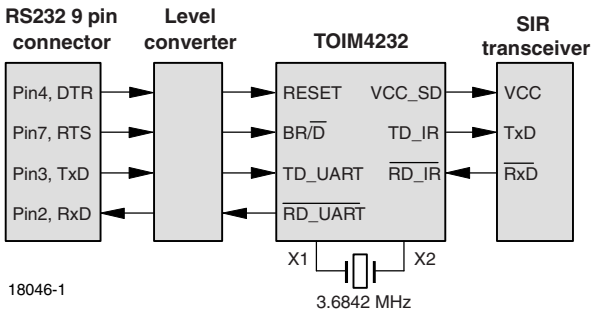

Figure 1. TOIM4232-RS232 Interface (external infrared adapter)

Interfacing SIR Transceivers with Enhanced UART16550A that are provided with internal IR encoder/decoder.

There's a large selections of enhanced UART's and µP's for customized industrial applications as well as portable handheld equipment, that have an embedded IR encoder/decoder supporting speeds from 9.6 kbit/s up to 115.2 kbit/s.

A short list of the UART's in this criteria; PC87334VLJ/PC87334VJG from National Semiconductors as well as FDC37C6651RI/ FDC37C666IR from Standard Microsystems, or W83877TF and W83977TF from Winbond, the SC16C550 and SC16C650 from Philips. Also microprocessors for universal applications such as the Toshiba's TMP91CW12F, TMP3912U and the IT8172G from **ITE** Tech. Inc. just to mention a few.

For this new generation of enhanced UART's and Micros, the SIR transceivers can be directly interconnected. Please consult the application notes and interfacing guidelines by the manufacturer to optimize the efficiency and performance of your design.

Interfacing MIR and FIR Transceivers. Advanced UART Interfaces provides this Port.

Our MIR transceivers support speeds from 9.6 kbit/s to 1.152 Mbit/s while the FIR transceivers are supporting speeds from 9.6 kbit/s to 4 Mbit/s. Only TFDU5307 out of the 5000 series is compatible to the NSC and SMSC controller circuits described in the following. All available devices of the 6000 series are compatible to the described interface circuits.

NSCPC87108

The configuration shown in figure 2 is recommended to interface MIR and FIR transceivers to the National Semiconductor PC87108VHG "Advanced UART and Infrared Controller".

- C1 and C2 should be placed as close as possible to the Infrared Transceiver.
- The area which is grounded should be large enough to cover as much space as possible between the circuit paths leading to the Infrared Transceiver. This will enhance EMI shielding to the internal opto-electronics.

NSCPC87338VLJ

The configuration shown in figure 3 is recommended to interface MIR and FIR transceivers to the National Semiconductor's PC87338VLJ.

- C1 and C2 should be placed as close as possible to the Infrared Transceiver.
- The area which is grounded should be large enough to cover as much space as possible between the circuit paths leading to the Infrared Transceiver. This will enhance EMI shielding to the internal opto-electronics.

A catalog overview by National can be found in at http://www.national.com/catalog/PersonalComputing.html and documentation of the PC87109 controller in http://www.national.com/pf/PC/PC87109.html.

Interfacing MIR and FIR transceivers with SMSC Infrared Controllers

Standard Microsystems Corporation SMC has developed a variety of new Advance and Ultra I/Os. Typical representatives of the new controllers are the FDC37C669FR and the FDC37C93XFR. Application notes describing how to use the Vishay Semiconductor's IrDA compatible transceivers with regard to these circuits are available from SMSC (see appendix for addresses).

For more product information, see:
http://www.smsc.com/main/datasheet.html and **http://www.smsc.com/main/catalog/pcio.html**.
Many application hints can be found in the document "SMSC IrCC (Infrared Communications Controller) Hardware Design Guide" at
http://www.smsc.com/main/appnotes/an76.html

Application Examples

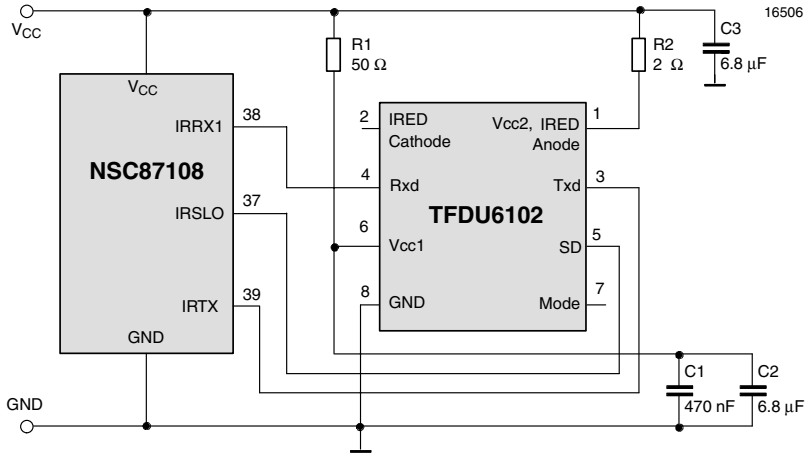

Figure 2. Application Example using NSC87108

Comp.#	Recommended Values	Vishay Part #
R1	50 Ω	CRCW–1206–50R00–F–RT1
R2	2 Ω	CRCW–1206–2R00–F–RT1
C1	470 nF	VJ1206Y474–JXXMT
C2, C3	6.8 µF	293D685X9016B2T

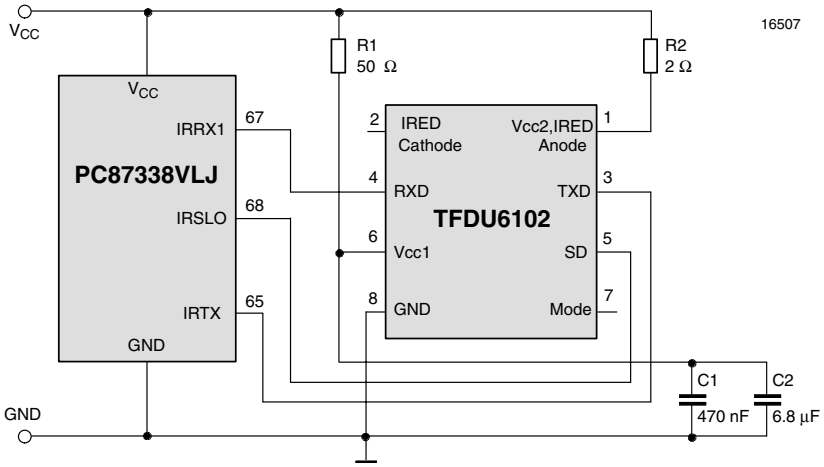

Figure 3. Application Example for TFDU6102 with NSC87338VLJ I/O

Comp.#	Recommended Values	Vishay Part #
R1	50 Ω	CRCW–1206–50R00–F–RT1
R2	2 Ω	CRCW–1206–2R00–F–RT1
C1	470 nF	VJ1206Y474–JXXMT
C2	6.8 µF	293D685X9016B2T

Recommended Application Circuits

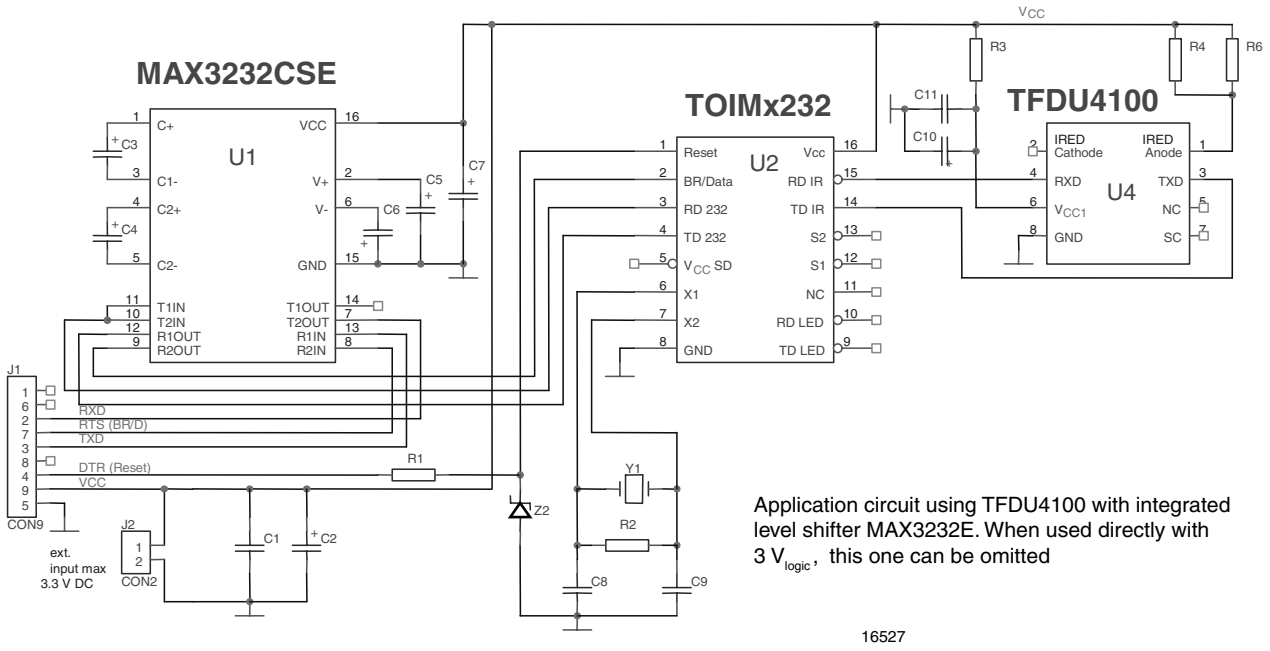

Figure 4. Application circuit using TFDU4300 with an integrated level shifter MAX3232E.
When used directly with 3 V logic, this one can be omitted

For the component list see the TOIM4232 data sheet.

USB to IrDA Interface

The USB connection replaces in computers the well known old peripheral connections as RS232 and LPT and will be the most common connector in future. Therefore it is important to also support the IrDA wireless connectivity at the USB port. In the drawing in figure 5 the circuit block diagram using a SigmaTel solution is shown.

This design operates up to the VFIR speed of 16 Mbit/s using the VISHAY transceiver TFDU8108. The USB to IrDA® interface shown here covers the frequency range up to 16 Mbit/s.

On the following page the Sigmatel reference design is shown for the Sigmatel STIR4230 interface circuit used with the VISHAY transceiver TFDU8108.

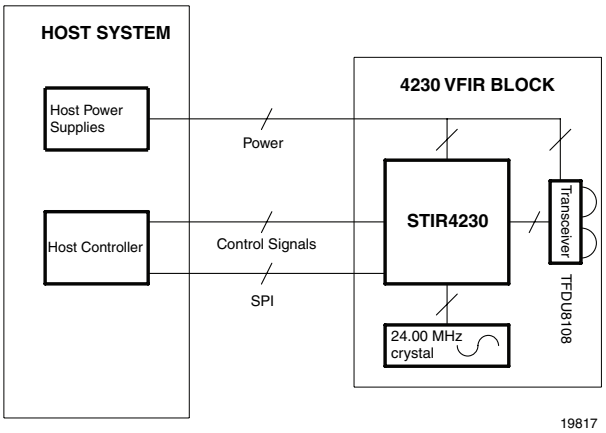

Figure 5. Block diagram of the USB to IrDA interface

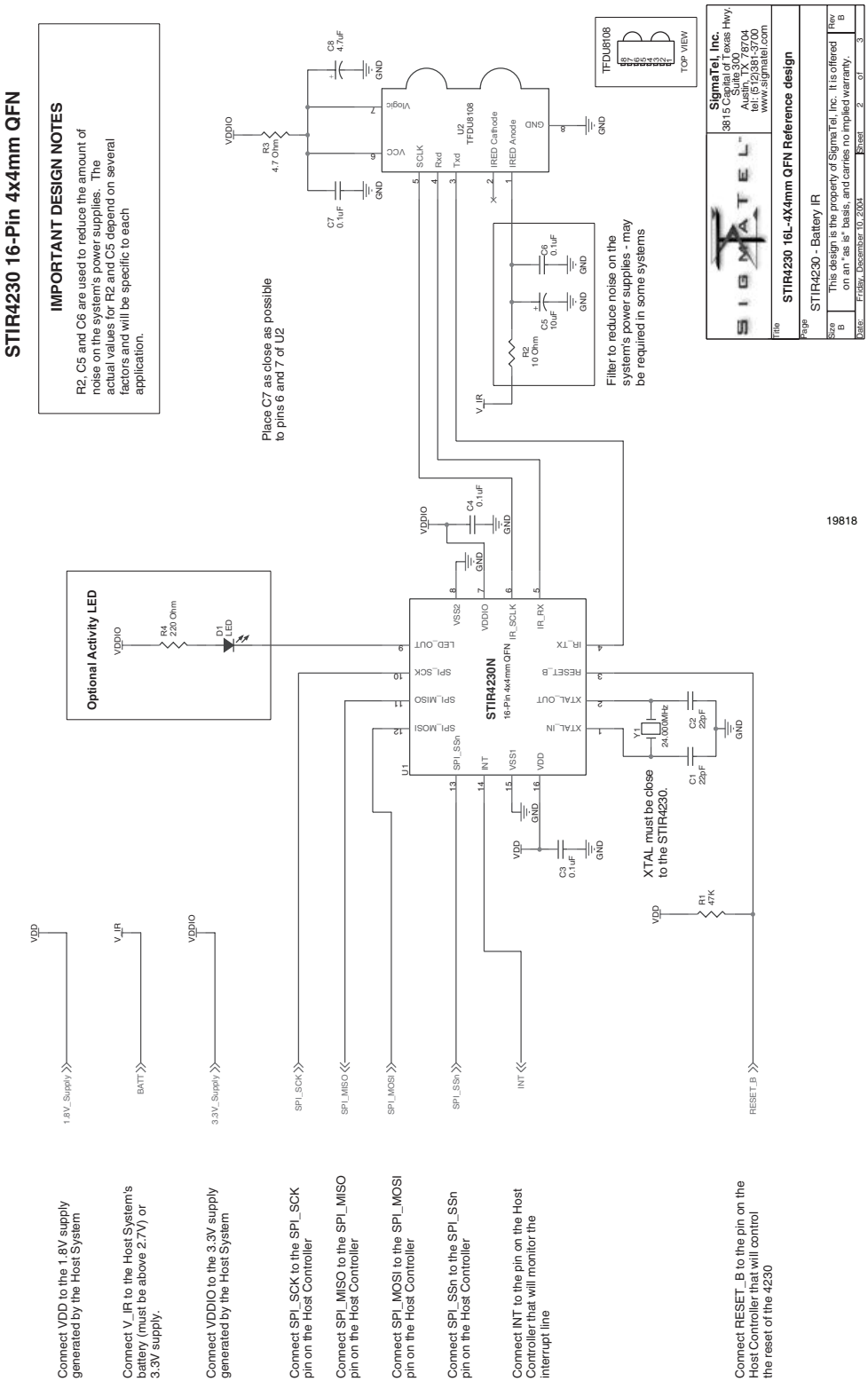

Figure 6. STIR4230 16-Pin 4 x 4 mm QFN Reference design

Remarks to the circuit shown in figure 6, STIR4230 16-Pin 4 x 4 mm QFN Reference design.

1) VDD is the core supply for the 4230. Connect to the host system´s 1.8 V supply.

2) VDDIO is the I/O supply for the 4230 and must be connected to the I/O supply used by the host processor and IR transceiver to ensure proper logic levels.
VDDIO can be either 3.3 V or 1.8 V.

3) The integrity of the SPI_MOSI, SPI_MISO, and SPI_SCK signals are critical to the proper operation of the 4230. Use proper high speed layout techniques for these signals. Use signal paths that are as short and clean as possible. Introducing a delay of even a few nanoseconds can be enough to prevent full speed operation of the SPI bus and must be avoided.

4) While transmitting, the IR transceiver will consume large amounts of power and cause large current spikes on the supply and ground planes. Peak currents of over 500 mA are common for devices that transmit 1 m. Attention must be paid to power and ground layout as well as supply bypassing to prevent issues related to excessive ground bounce or power supply ripple. In some circumstances R2, C5 and C6 can be used to help isolate the transmit diode from the rest of the system. The optimum values for R2 and C5 depend on several factors and will be unique to each design.

5) The supply used for the transmit diode (V_IR) must be above 2.7 V. The transmit diode does not require a regulated supply, and for systems with battery voltages that are between 2.7 V and 5.5 V, can be powered from the battery. If the supply voltage is above 4 V, a series resistor may be needed to limit the amount of power dissipated inside the IR transceiver.

6) Place bypassing caps as close as possible to the IC´s power and ground pins. For U1, place C3 close to pins 15 and 16 and C4 close to pins 7 and 8. For U2, place C7 as close as possible to pins 6 and 7.

7) Place Y1 close to the STIR430.

8) The DAP (die attachpad) is not needed either electrically or thermally and attaching it to the PC board is not required. However, attaching the DAP provides additional mechanical support and may improve self allignment.

List of some I/O Controllers and Interfaces Supporting IR

(Remark: This list is not complete, there are other suppliers such as IBM, ITC, VLSI, or Phoenix)

SC14428 Baseband Processor NSC

ADSP-BF531, 532 & 533 Embedded Processor **ANALOG DEVICES**
ADSP-BF537 & 536 Embedded Processor **ANALOG DEVICES**
ADSP-BF561 Embedded Processor **ANALOG DEVICES**

Elan SC400 Microprocessor **AMD**
Elan SC520 Microprocessor **AMD**
Alchemy AU1000 & 1100 Microprocessor **AMD**
Geode SC Family Microprocessor **AMD**
Geode GX533 & GX500 Microprocessor **AMD**

Vr4100 Processor Family **NEC**

WV8307 VoIP Chipset **Agere Systems**

BCM2121 GPRS/GSM Baseband Processor **BROADCOM**
BCM2132 EDGE/GPRS/GSM Single-Chip Multimedia **BROADCOM**
BCM2140 WCDMA (UTMS) FDD Baseband Coprocessor **BROADCOM**
ML2011 GSM Single-Chip Baseband Processor **BROADCOM**
BCM2702 Mobile Multimedia Processor **BROADCOM**

AT76C713 Microcontroller **ATMEL**

EP9312 Embedded ARM Processor (Industrial Applications) **Cirrus Logic**
EP7309 Embedded ARM Processor (Portable Devices) **Cirrus Logic**
EP7311 Embedded ARM Processor (Industrial, Mediacal) **Cirrus Logic**
EP9302 Embedded ARM Processor (Industrial & Consumer) **Cirrus Logic**
EP7312 Embedded ARM Processor (Portables & Handheld) **Cirrus Logic**
EP9315 Embedded ARM Processor (Industrial & Consumer) **Cirrus Logic**
EP9301 Embedded ARM Processor (Industrial & Consumer) **Cirrus Logic**
EP9307 Embedded ARM Processor (Portables & Handheld) **Cirrus Logic**

CY8C21123, 223 & 323 Mixed-Signal Array PSoC Family product **CYPRESS**

MPC875, 880, 875, 870 Power QUICC Processors **Motorola-Freescale**
i.MX31 & iMX21 Multimedia Applications Processors **Motorola-Freescale**
MCF54xX ColdFire V4e Core Processor Family **Motorola-Freescale**
MC9S12E123/64/32 16-bit Microcontrollers **Motorola-Freescale**

H8 & H8S H8SX Microprocessor Family **HITACHI-Renesas**
M32R Microprocessor Family **HITACHI-Renesas**
HMCS400 Microprocessor Family **HITACHI-Renesas**
M16C Microprocessor Family **HITACHI-Renesas**
H8/300H Microprocessor Family **HITACHI-Renesas**
R8C Microprocessor Family **HITACHI-Renesas**

ComCentrix L1501 I/O Controller **LSI**

MAX3130, MAX3131 IrDA Encoder/Decoder **MAXIM-DALLAS**
DS80C400 Network Microcontroller **MAXIM-DALLAS**
DS89C420 8051 Microcontroller **MAXIM-DALLAS**

MCP2120 EnDec IrDA **MICROCHIP**
MCP2122 EnDec IrDA **MICROCHIP**
MCP2140 EnDec IrDA **MICROCHIP**
MCP2150 EnDec IrDA **MICROCHIP**
MCP2155 EnDec IrDA **MICROCHIP**

Vr41xx Microprocessor Family **NEC**

MSM9405 EnDec IrDA **OKI**

S3C4530A Microcontroller **SAMSUNG**

SC16Cxxx UART Product family **PHILIPS**
SC68Cxxx UART Product family **PHILIPS**
PCD509x2/zuu/v Baseband Controller family **PHILIPS**

uPSD Microcontroller 8032 Product family **STMicroelectronics**

STn88xx Multimedia Processor Product family **STMicroelectronics**

USB2230 & USB2229 USB-IrDA Controller 4 Mbit/s **SMSC**
MPC47N207 Super I/O UART **SMSC**
SIO1036 & SIO 1000 I/O UART **SMSC**
LPC47M10x & 47B272 Super I/O Controller (consumer appl.) **SMSC**
LPC47M112 Enhanced Super I/O UART **SMSC**
LPC47M172 & 182 Advance I/O Controller **SMSC**
LPC47S45x Advance I/O Controller X-Bus **SMSC**
LPC47S42x Enhanced Super I/O Server Appl. **SMSC**
SCH5017 Super I/O **SMSC**
SCH3116, 3114 & 3112 Super I/O **SMSC**
SIO10N268 Advance Notebook I/O (ISA/LPC) **SMSC**
FDC37N3869 Super I/O Controller (Portable Applications) **SMSC**
FDC37M81x Enhanced Super I/O **SMSC**
FDC37M707 Super I/O **SMSC**
FDC37B72x & 78x Super I/O **SMSC**
FDC37C665GT & 66GT Super I/O **SMSC**
KBC1100 & KBC1100L Embedded Controller (Mobile) **SMSC**

UCC5340 IrDA Receiver ???? **Texas Instruments**
UCC5341 IrDA Receiver ???? **Texas Instruments**
MSP430 IrDA SIR EnDec **Texas Instruments**
TL16PIR552 Dual UART **Texas Instruments**
TIR1000 IrDA SIR EnDec **Texas Instruments**
TUSB3410 USB-RS232 **Texas Instruments**
TMS320VC5470 & 5471 Fixed-Point DSP **Texas Instruments**
OMAP5912 Multimedia Processor **Texas Instruments**
OMAP5910 Dual-Core Processor **Texas Instruments**
C5472 Programmable DSP **Texas Instruments**

W83L517D LPC I/O **WINBOND**
W83637HF LPC I/O **WINBOND**
W8369UF LPC I/O **WINBOND**
W83627HF LPC I/O **WINBOND**

TMP91Cxxx Microcontroller Product family **TOSHIBA**
TLCS-900/L1& H1 Microcontroller Product family **TOSHIBA**
TMP86FS64FG Microcontroller Product family **TOSHIBA**

VT1211 Super I/O **VIA**

OXmPCI954 UART Bridge OXFORD Semicon.
OX16PCI952 UART Dual Channel **OXFORD Semicon.**
OXCB950 UART High Performance **OXFORD Semicon.**
OX16C954 UART High Performance **OXFORD Semicon.**

XC95108 Programmable CPLD **Xilinx**

ST16C580 UART **EXAR**
ST16C650A & 654 UART **EXAR**
XR17C152, 154 & 158, UART PCI Bus **EXAR**
XR17D152, 154 & 158 UART PCI Bus **EXAR**
XR17L152, 154 & V258 UART PCI Bus **EXAR**
XR16C285xx UART Family **EXAR**

eCOG1K Mikrocontroller **CYAN Technlg.**

STIR4200 IrDA-USB1 Bridege FIR **SIGMATEL**
STIR4210, 4220 & 4116 IrDA-USB2 Bridege VFIR **SIGMATEL**
STIR4230 & 4231 VFIR Embedded Controller **SIGMATEL**

IT8661F Super I/O **ITE Tech.**
IT8702F Super I/O **ITE Tech.**
IT8705F Super I/O **ITE Tech.**
IT8700F Super I/O **ITE Tech.**
IT8711F Super I/O **ITE Tech.**

L1501 Embedded UART **LSI Logic.**

Note: The list of controllers is based on our research in the public literature. We don't claim that this list covers all available controllers. We cannot guarantee the functionality of these controllers with transceivers. This must be verified for any special case.