Integrated Interface Circuits

ULC Technology:
High-performance gate array package using dual metal layer CMOS technology, featuring sub-micron channel length (0.8 μm)

Description

The TOIM3000 IC provides the proper timing for the front-end infrared transceivers of the 4000-series, as specified by the IrDA standard. In the transmit mode, the TOIM3xxx provides IrDA compatible pulse shaping of the electrical pulses to the infrared transceiver. In the receive mode, the TOIM3000 stretches the received infrared pulses to the proper bit width at the operating bit rate. The IrDA bit rate varies between 2.4 kbit/s to 115.2 kbit/s.

For the UART interface, the TOIM3000 uses the 1.8432 MHz clock input as the fast clock and the baud clock output from the UART to do the pulse stretching and shortening. The baud clock is 16 times the baud rate. The output pulses are fixed at 1.627 μs or 3/16 of bit time.

The typical power consumption of both circuits is very low with about 10 mW in operational state and in the order of microwatts in standby mode.

Features

- Pulse shaping function (shortening and stretching) used in infrared IrDA standard applications
- Directly interfaces the infrared transceivers of the 3000 and 4000 series to a UART or a microcontroller

- 3 V and 5 V operation
- Low operating current
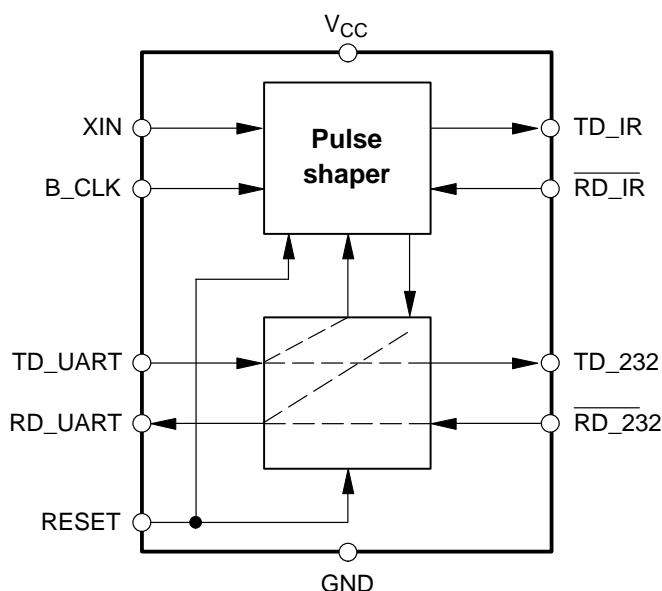- SO16L package

Block Diagram

Figure 1. Block diagram

Pin Assignment and Description

Pin	Symbol	Function	I/O	Active
1	RESET	Resets all internal registers. Initially must be HIGH to reset internal registers. When LOW, the TOIM3000 connects the UART to the IrDA transceiver. Data from the UART are transmitted by the infrared transmitter. Data received from the infrared receiver is routed to the UART. When HIGH, the TOIM3000 connects the UART to the RS232 port. Minimum hold time for reset is 1 μs.	I	
2	RD_UART	Data channel, output to the UART	O	LOW
3	TD_UART	Data out channel, data input from the UART to be transmitted	I	LOW
4	B_CLK	16 times baud rate clock, input from the UART (Baudout)	I	
5	XIN	Oscillator input, 1.8432 MHz clock (to be connected to Xout pin of the UART)	I	
6	NC	Not connected		
7	NC	Not connected		
8	GND	Ground in common with the UART and RS232 port		
9	S0	Must be connected to GND	I	
10	S1	Must be connected to GND for output pulse length of 1.627 μs, Connected to V_{CC} for pulse length of 3/16 of bit [*)	I	
11	TD_232	Transmit data input from the RS232 port, TXD pin	I	LOW
12	RD_232	Receive data output to the RS232 port, RXD pin	O	LOW
13	NC	Not connected		
14	TD_IR	Data output to infrared transmitter (e.g., TFDS4000)	O	HIGH
15	RD_IR	Data receive input from the infrared transmitter (e.g., TFDS4000)	I	LOW
16	V_{CC}	Supply voltage		

[*) The use of a pulse length of 3/16 of bit duration is not recommended when both clocks, Xout and Baudout, of the UART are available.

Operation Description

Features of TOIM3000

The TOIM3000 uses 2 clocks from the UART: the 1.8432 MHz clock and the Baud_out clock for its internal timing processing. Both are connected to XIN and B_CLK, respectively. The B_CLK is used as a reference for pulse stretching while XIN is taken as a time base for pulse shortening to 1.627 μs and noise filtering.

Single clock operation

TOIM3000 can be operated with only a single clock. In this case, the B_CLK and XIN are tied together and connected to the Baudout pin of the UART. The pulse width is then shortened to 3/16 of the bit length and noise filtering is deactivated. S1 is to be connected to V_{CC} and S0 to GND.

We strongly recommend not to use this mode because the 3/16 pulse length at lower bit rates consumes more power than the shorter pulse. At a baud rate of 9600 bit/s, the ratio of power consumption of both modes is a factor of 12 (!).

The TOIM3000 interfaces additionally to an RS232 level converter through two pins, RD_232 and TD_232. These two pins provide the extra IR function that a single TOIM3000 IC can time share with both an infrared IrDA port and an RS232 port. Whenever RESET = 0, the TOIM3000 links to the infrared transceiver of the TFDS4000 series through RD_IR and TD_IR pins. On the other hand, when RESET = 1, the TOIM3000 links to the RS232 port through RD_232 and TD_232 pins (see figure KEIN MERKER).

Absolute Maximum Ratings

Parameter		Symbol	Min.	Typ.	Max.	Unit
Supply voltage		V_{CC}	− 0.5		7	V
Input/ output voltage	all pins		− 0.5		$V_{CC} + 0.5$	V
Output sinking current	all pins	I_{out}	8			mA
Junction temperature		T_j			125	°C
Ambient temperature (operating)		T_{amb}	0		70	°C
Storage temperature		T_{stg}	− 25		85	°C
Soldering temperature	t = 20 s @ 215°C	T_{sld}		215	230	°C

DC Characteristics

V_{CC} = 5 V ± 10% [**]), operating temperature 0 ∼ 70°C

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Input HIGH voltage		V_{IH}	2.2			V
Input LOW voltage		V_{IL}			0.8	V
Schmitt trigger Positive threshold Negative threshold		V_{T+} V_{T-}	1.1		 1.4	V V
Input leakage no pull-up/ down	$V_{IN} = V_{DD}$ or GND	I_L		± 1	± 5	µA
Output HIGH voltage	I_{OH} = −3.2 mA	V_{OH}	2.4			V
Output LOW voltage	I_{OL} = + 3.2 mA	V_{OL}			0.4	V
Current consumption Standby Dynamic	Inputs grounded, no output load [*] V_{CC} = 5 V, T = 25°C	I_{SB} I_{DD}		 2	1	µA mA

[*]   Oscillator inactivated.

[**]   Operation at V_{CC} = 3 V is also specified. For data compare TEMIC Matra MHS ULC technology data sheet.
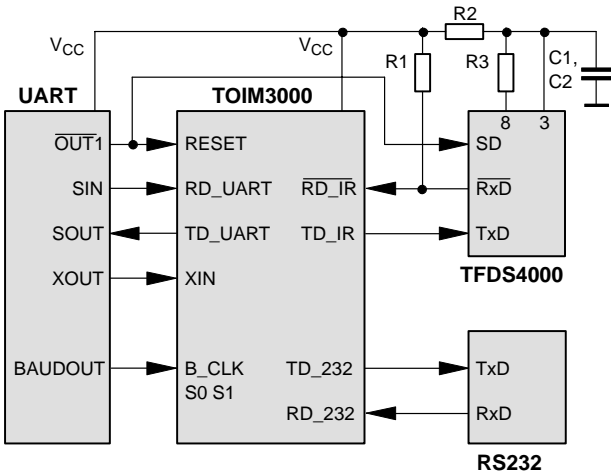
Application

Figure 2. UART interface (built-in infrared port)

Figure KEIN MERKER shows a typical example of a UART interface. As shown, XIN accepts the 1.8432 MHz input clock, and B_CLK accepts the 16 times baud rate clock.

Set S1 = S0 = LOW ("0"). When RESET = 0, the TOIM3000 communicates with the infrared transceiver TFDS4000. On the other hand, if RESET = 1, the TOIM3000 communicates with the RS232 port.

R1 = 2.2 kΩ optional, only necessary when $\overline{RxD}$–$\overline{RD\_IR}$ line is capacitive loaded, R2 = 100 Ω, R3 = 10 Ω, C1 = 6.8 μF and C2 = 0.1 μF. C1 and C2 are in parallel (V_{CC} = 5 V, in case of 3 V supply, value of R3 should be reduced (IrDA Design Guide).
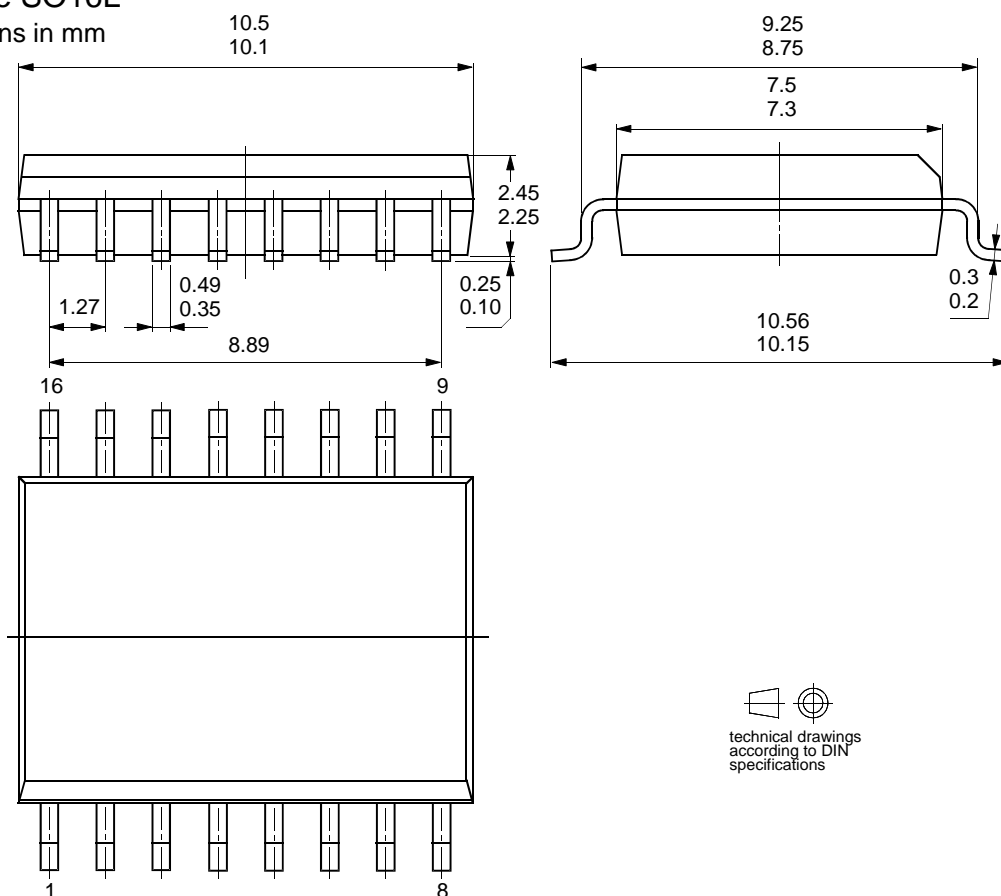
Table 1. Recommended Application Circuit Components

Component	Recommended Value	Vishay Part Number
C1	6.8 μF	293D 685X9 016B 2T
C2	0.1 μF	VJ 1206 Y 104 J XXMT
R1	2.2 kΩ	CRCW–1206–2201–F–RT1
R2	100 Ω	CRCW–1206–1000–F–RT1
R3	10 Ω	CRCW–1206–10R0–F–RT1

Package Information

Package SO16L
Dimensions in mm

10.5
10.1

9.25
8.75

7.5
7.3

2.45
2.25

0.49
0.35

0.25
0.10

1.27

8.89

0.3
0.2

10.56
10.15

16

9

1

8

technical drawings
according to DIN
specifications

13011

Ozone Depleting Substances Policy Statement

It is the policy of **Vishay Semiconductor GmbH** to

1. Meet all present and future national and international statutory requirements.

2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

Vishay Semiconductor GmbH has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively

2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA

3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

Vishay Semiconductor GmbH can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.