Product Unit

Infrared Data Communication

Recommended Circuits

TFDx4x00
TFDx5x00
TFDx6x00x

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TFDS4x00 - Recommended Circuit Diagram

AC or DC Coupling of Input

A typical circuit to operate TFDS4x00 from split power supplies is shown in figure 1. The resistors R4 and R5 loading the input lines are only necessary when operating this board with long (typically > 60 cm ribbon) cables. The RxD-output is connected internally to V_{cc} by a 20 kΩ load. Therefore the additional load resistor is only necessary when driving capacitive wiring and loads. The Txd input should be DC coupled. AC coupling is only necessary when an input signal can be active for longer periods. This can happen under certain conditions connected to the NSC or SMC Super I/Os. See e.g., National Semiconductors application note. Operating with split power supplies is a speciality of the Vishay Telefunken 4000 series. The advantage is, that a regulated power supply is used only for the little current the receiver part is consuming. The optical output channel driven by quite high currents is operated from the unregulated power source and therefore needs no expensive control circuitry. C1 is optional if the unregulated power supply needs to be supported. C2 and C3 are dependent on the quality of the supply voltage Vcc. In most applications instead of C2 and C3 only a 470 nF ceramics is sufficient. With noisy power lines a 4.7 µF to 6.8 µF electrolytic or Tantalum capacitor would avoid noise influences. To optimize costs, the values of the capacitors should be adapted to the special design before going to mass production. The supply voltage Vcc has to source less than 1 mA typically in 3-V applications in receive mode plus an additive base current of the drive transistor of the IRED depending on the driver transistor current.

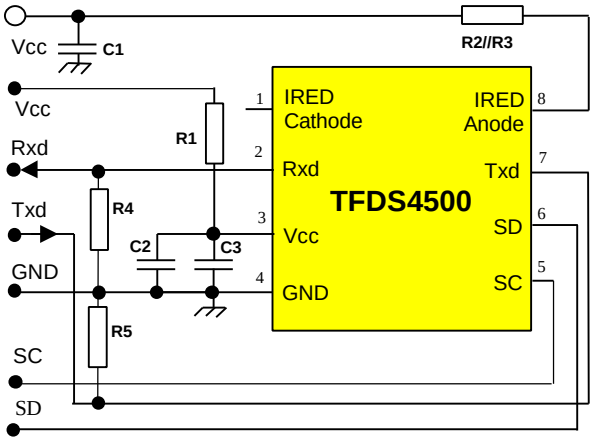

Figure 1. Application circuit for TFDS4x00

The R2/R3 combination is used for controlling the current through the IR emitter. For increasing the output power, reduce the values. For reducing the output power, increase the value. The upper drive current limitation depends on the duty cycle and is given by the absolute maximum ratings. For an IrDA-compatible application with a 5-V operating voltage, a current control resistor of 14 Ohm is recommended. For 3-V operation, 5 Ohm is recommended respectively. Examples for the intensity variation are given in the separate document „Reference Design Boards“

Shut Down

The TFDS4x00 can be very efficiently shut down keeping the IRED connected to the power supply V_{cc2} but switching off V_{cc}. Therefore, a special shut down is not needed. The V_{cc2}-source can be maintained as an unregulated power

supply. The voltage at pin 8 is limited to max. 6.0 V. The settling time after switching V_{cc} on is less than 50 µs.
The TOIM3232 interface circuit is designed for this shutdown feature because the V_{cc}_SD, S0 or S1 outputs can be used to power the TFDS4x00 with the necessary supply current.

Sensitivity control

The receiver sensitivity can be increased by about a factor of two by activating the SC input. This would increase the transmission range by the factor 1.4. However, in noisy ambient light conditions one should switch back to the normal position because the sensitivity to in-band noise signals will be increased, too.

Latency

The receiver is in specified conditions after the defined latency. In a UART-related application the receiver buffer of the UART must be cleared after a certain amount of time (typically 100 µs). Therefore the transceiver has to wait at least for the specified latency after receiving the last bit before starting the transmission to ensure that the corresponding receiver is in a defined state.

TFDx6x00x / TFDx5x00 Recommended Circuit Diagram

Remarks

TFDx6x00 and TFDx6x00E transceivers are working up to 4 Mbit/s. A sensitive receiver, and an IRED and an IRED driver are built-in.
This combination requires carefully planned circuit-board layout. For layouts and a reference layout see the document „Reference design boards“. Thin and long-resistive and inductive wiring should be prevented. A circuit identical, or similar to the proposal in figure2 is recommended.
The inputs (Tx, SD) and the output (Rx) should be directly (DC) coupled to the I/O circuit. **Capacitive coupling is not necessary** and should be avoided.
TFDx6x00D will automatically switch off the output if the input is accidentally kept active longer than approximately 60 µs (see data sheet).

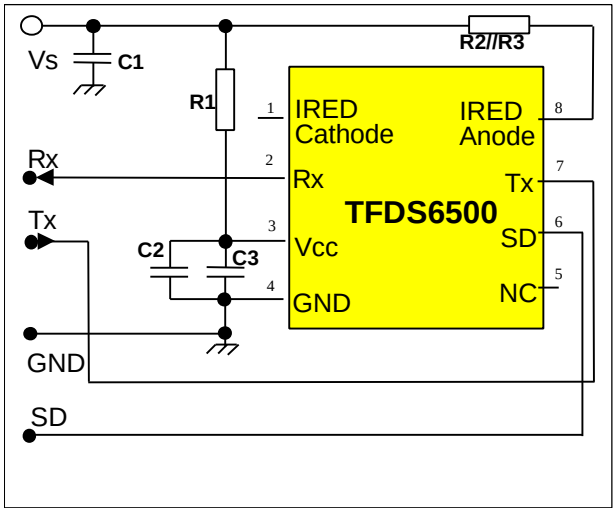

Figure 2. Application circuit proposal using the TFDS6500. Identical circuits are used with the whole 5000 and 6000 series.

In case of **TFDx6x00,** care should be taken that the voltage at the Tx and SD inputs do not exceed the specified values.
R2 and R3 are used for controlling the current through the IR emitter. For power

dissipation, two parallel resistors are used instead of a single one for the emitter current control. For increasing the output power, reduce the value. For reducing the output power, increase the value. A diagram of the typical dependence of the intensity I_e as a function of the current control resistor is shown in the document „Reference Design Boards“.
TFDx6x00x and TFDx5x00 need no external load at the push-pull output.

Power Supply

C1, C2, and C3 are dependent on the quality of the supply voltage. A combination of C2 = 10 µF with C3 = 470 nF and C1 = 470 nF will work in most cases. The placement of these parts is critical. (Remark: On the reference design boards we are using different, optimized values, see there.) We strongly recommend positioning the ceramic capacitor of C2 and C3 as near as possible to the TFDS6x00x power supply pins as in the proposed layouts (see there).
The capacitance depends on the power supply and injected noise. For a 5 V (± 5 %) application a resistor R1 = 47 Ohm is recommended.
When connecting the described circuit to the power supply unit, low impedance wiring is absolutely necessary. Use an oscilloscope to check for stable power supply at Vcc (pin 3). Unstable power supply with dropping voltage during transmission may reduce the sensitivity (and transmission range) of the receiver unit.
For IrDA-compliant operation (at Vcc = 5 V), a current control resistor of 7 Ohm to 8 Ohm is recommended.

The 5000 series and the 6000E series can be operated at 3 V – power supplies, too.