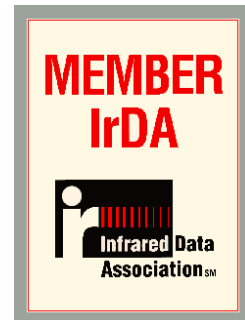


# TFDT4000

## Integrated Transceiver

### Description

The TFDT4000 is an infrared transceiver for data communication systems. The transceiver is compatible to the IRDA standard and allows data rates up to 115 kbit/s. An internal AGC (Automatic Gain Control) ensures proper operation under EMI conditions. The internal IRED driver can be connected by the external current control resistor to an independent unregulated power supply. This will add more freedom in circuit design and efficient serial drive capability for external IREDs for high power applications.

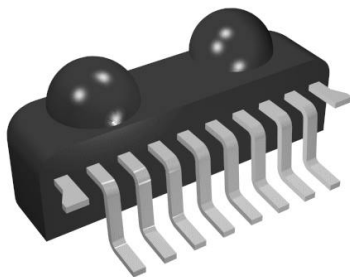


### Features:

Compatible to IRDA standard  
SMD top view and through hole side view  
Wide supply voltage range (2.7V...5.5V)  
Low Profile (height = 5.6 mm max.)

Microcomputer compatible  
Fewest external components  
Low power consumption  
AGC for EMI immunity  
Open collector IRED driver

Package:

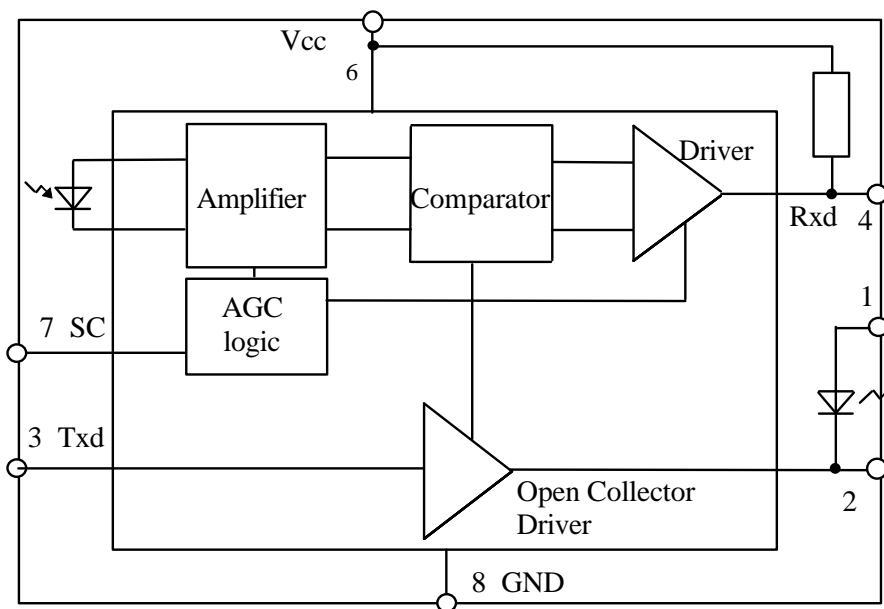


Pins, see pg. 7:

- 1: IRED Anode
- 2: IRED Cathode
- 3: Txd (Input)
- 4: Rxd (Output)
- 5: NC
- 6: V<sub>CC</sub> (Supply Voltage)
- 7: SC (Sensitivity Control)
- 8: Ground

2 stand off pins internally connected to ground.

### Block Diagram



## Absolute maximum ratings

Reference Point Pin 8, unless otherwise noted.

Parameter	Test Conditions	Symbol	MIN	TYP	MAX	Unit	Remark
Supply Voltage Range		$V_{cc}$	- 0.5		6	V	
Voltage Range of IRED Drive Output	pin 1, Txd "LOW"		- 0.5		6	V	
Input Currents	all pins except 1, 8, see IRED current				10	mA	
Output Sinking Current					25	mA	
Power Dissipation		$P_{tot}$			200	mW	s. derating curve, pg. 8
Junction Temperature		$T_J$			125	°C	
Ambient Temperature Range (Operating)		$T_{amb}$	0		70	°C	
Storage temperature range		$T_{stg}$	- 25		85	°C	
Soldering temperature	t= 20 s @215°C			215	230	°C	s. TEMIC IrDA Design Guide
Average IRED current		$I_{IRED(DC)}$			100	mA	
Rep. pulsed IRED current		$I_{IRED(RP)}$			500	mA	<90µs, t <sub>on</sub> <20%
Peak IRED current		$I_{IRED(PK)}$			1	A	<2µs, t <sub>on</sub> <10%
IRED Anode Voltage		$V_{IRED A}$	- 0.5		$V_{cc} + 0.5$	V	
Transmitter Data Input Voltage		$V_{Txd}$	- 0.5		$V_{cc} + 0.5$	V	
Receiver Data Output Voltage		$V_{Rxd}$	- 0.5		$V_{cc} + 0.5$	V	

## Optoelectronic characteristics

Tamb = 25°C, V<sub>cc</sub> = 5V unless otherwise noted.

Parameter	Test condition	Symbol	MIN	TYP	MAX	Unit	Remark
<b>Transceiver</b>							
Supported data rates	Base band		2.4		115.2	kBit/s	IrDA SIR mode
Supply voltage range		V <sub>cc</sub>	2.7	5	5.5	V	reduced function down to 2.5V
Supply current, pin 6	V <sub>cc</sub> =5V	I <sub>S</sub>		1.3	2.5	mA	
Supply current, pin 6	V <sub>cc</sub> =3V	I <sub>S</sub>		1.0	1.5	mA	
Leakage current of IR emitter , pin 1	V <sub>cc</sub> , pin 6: Off, Txd: "LOW" V <sub>cc2</sub> = 6V T=-25°C to 85°C	I <sub>S</sub>		0.005	0.5	μA	s. appl. hint, page 6
Transceiver power on settling time					50	μs	Time from switching on V <sub>cc</sub> to established specified operation
<b>Receiver</b>							
Min. detection threshold irradiance, SC="LOW"	α=±15°	E <sub>emin</sub>		0.020	0.035	Wm <sup>-2</sup>	SIR mode**)
Min. detection threshold irradiance, SC="HIGH"	α=±15°	E <sub>emin</sub>	0.006	0.010	0.015	Wm <sup>-2</sup>	SIR mode **)
Max. detection threshold irradiance	α=±90°, V <sub>cc</sub> =5V	E <sub>emax</sub>	3300	5000		Wm <sup>-2</sup>	SIR mode **)
Max. detection threshold irradiance	α=±90°, V <sub>cc</sub> =3V	E <sub>emax</sub>	8000	15000		Wm <sup>-2</sup>	SIR mode **)
Logic Low Receiver Input Irradiance, SC="HIGH" or SC="LOW"		E <sub>emaxlow</sub>			0.004	Wm <sup>-2</sup>	
Output voltage Rxd	active	V <sub>OL</sub>		0.5	0.8	V	C=15pF, R=2.2k
Output voltage Rxd	non active	V <sub>OH</sub>	V <sub>cc</sub> -0.5			V	C=15pF, R=2.2k
Output current V <sub>OL</sub> <0.8V				4		mA	

\*\* ) BER=10<sup>-8</sup> (IrDA specification)

## Optoelectronic characteristics

Tamb = 25°C, V<sub>cc</sub> = 5V unless otherwise noted.

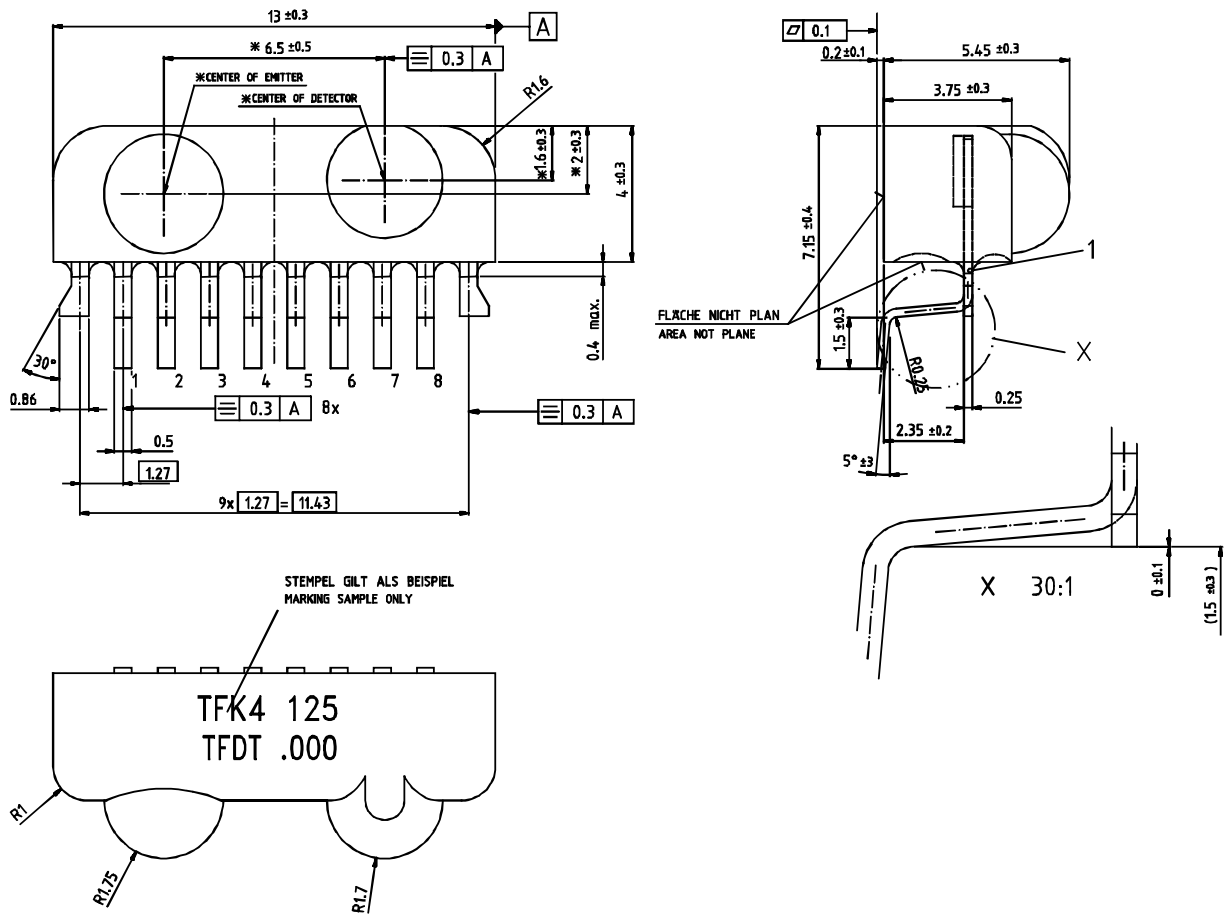
Parameter	Test condition	Symbol	MIN	TYP	MAX	Unit	Remark
<b>Receiver, cont.</b>							
Rise time @load= C=15pF, R=2.2k		t <sub>r</sub>	20		200	ns	
Fall time @load= C=15pF, R=2.2k		t <sub>f</sub>	20		200	ns	
Rxd signal electrical output pulse width	2.4 kBit/s, input pulse length 1.41µs to 3/16 of bit length	t <sub>p</sub>	1.41		20	µs	
Rxd signal electrical output pulse width	115.2 kBit/s, input pulse length 1.41µs to 3/16 of bit length	t <sub>p</sub>	1.41		8	µs	
Rxd signal electrical output pulse width	500 kHz, duty cycle 50%	t <sub>p</sub>	0.8	1	1.2	µs	V <sub>cc</sub> = 5 V only
Output delay time (Rxd)	Output level = 0.5*V <sub>cc</sub> @ E <sub>e</sub> =0.040 W/m <sup>2</sup>	t <sub>dl</sub>		1	2	µs	Delay of leading edge of output signal related to leading edge of optical input signal
Jitter, leading edge of output signal	Over a period of 10bit, 115.2 kBd	t <sub>j</sub>			2	µs	
Output delay time (Rxd)	Output level = 0.5*V <sub>cc</sub>	t <sub>dt</sub>			6.5	µs	Delay of trailing edge of output signal related to trailing edge of optical input signal
Latency	Recovery from last transmitted pulse to 1.1*threshold sensitivity	t <sub>L</sub>		100	800	µs	
<b>Transmitter</b>							
Driver current IRED	Current limiting resistor in series to IRED: R <sub>S</sub> = 8.2 Ω @ 5 V <sub>cc</sub> =5V	I <sub>d</sub>		0.3	0.5	A	I <sub>d</sub> can be adjusted by variation of R <sub>S</sub> , see appl. hint page 6
Logic Low Transmitter Input Voltage		V <sub>IL</sub> (Txd)	0		0.8	V	
Logic High Transmitter Input Voltage		V <sub>IH</sub> (Txd)	2.4		V <sub>cc</sub>	V	

## Optoelectronic characteristics

Tamb = 25°C, V<sub>cc</sub> = 5V unless otherwise noted.

Parameter	Test condition	Symbol	MIN	TYP	MAX	Unit	Remark
<b>Transmitter, cont.</b>							
Output Radiant Intensity, $\alpha = \pm 15^\circ$	Current limiting resistor in series to IRED: R <sub>S</sub> = 8.2 $\Omega$ , V <sub>cc2</sub> = 5V		45	150	200	mW/sr	in agreement with prospective future eye safety limits of IEC825
Angle of half intensity		$\alpha$		$\pm 24$		°	
Peak wavelength of emission		$\lambda_p$	850		900	nm	
Halfwidth of Emission Spectrum				60		nm	
Optical Rise/Falltime	115.2 kHz square wave signal (duty cycle: 1:1)			200	600	ns	
Output Radiant Intensity	logic low level				0.04	$\mu$ W/sr	
Overshoot, optical					25	%	
Rising edge peak to peak jitter	Over a period of 10 bits, independent of information content	t <sub>j</sub>			0.2	$\mu$ s	

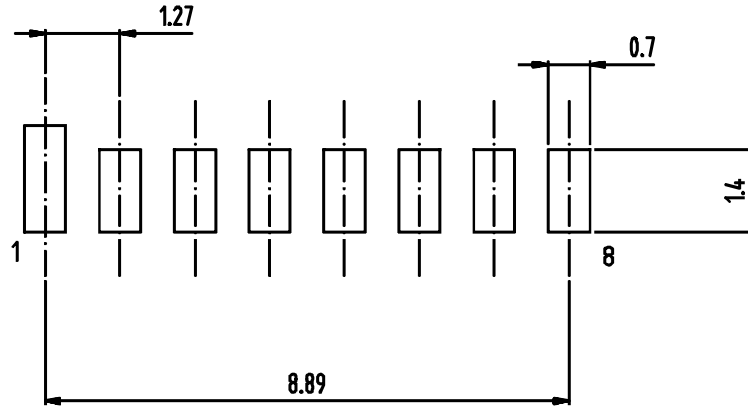
## Mechanical Dimensions



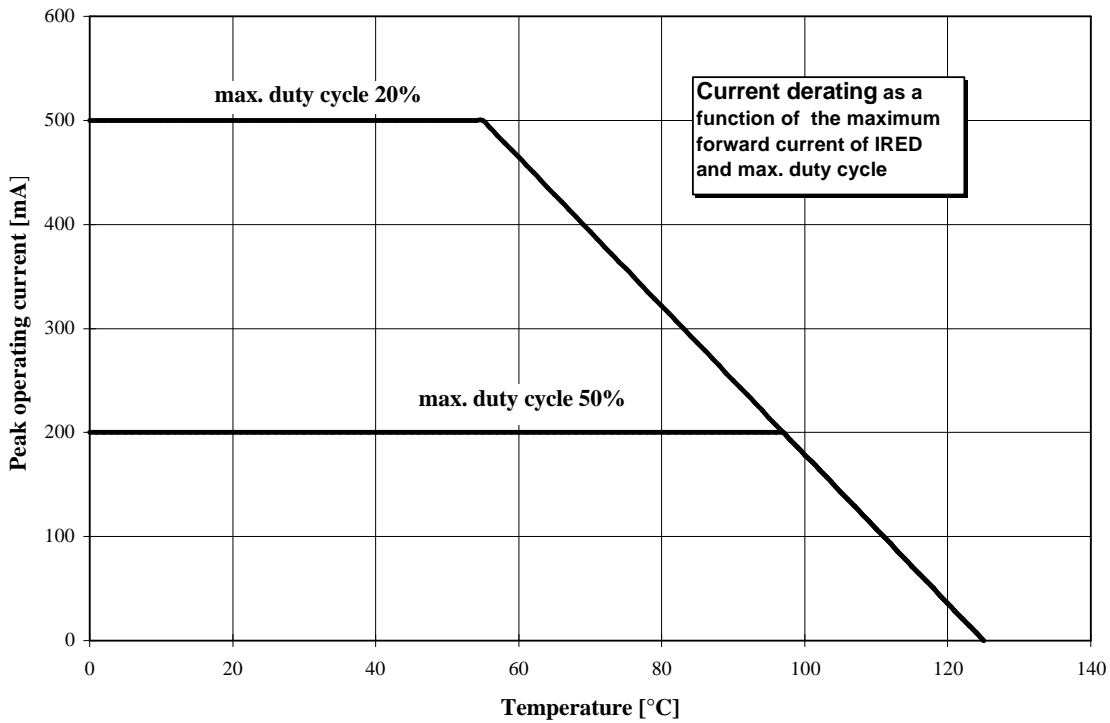
Package Outline Drawing. Dimensions in mm

## Pin Assignment

Pin#	PIN NAME	DESCRIPTION	I/O	ACTIVE
1	IRED Anode	IRED Anode	O	LOW
2	IRED Cathode	IRED Cathode, internally connected to driver transistor	O	LOW
3	Txd	Transmit data	I	HIGH
4	Rxd	Received data	O	LOW
5	NC			
6	V <sub>cc</sub>	Supply voltage		
7	SC	Sensitivity control	I	HIGH
8	GND	Ground		
-	2 stand off pins	Internally connected to ground		

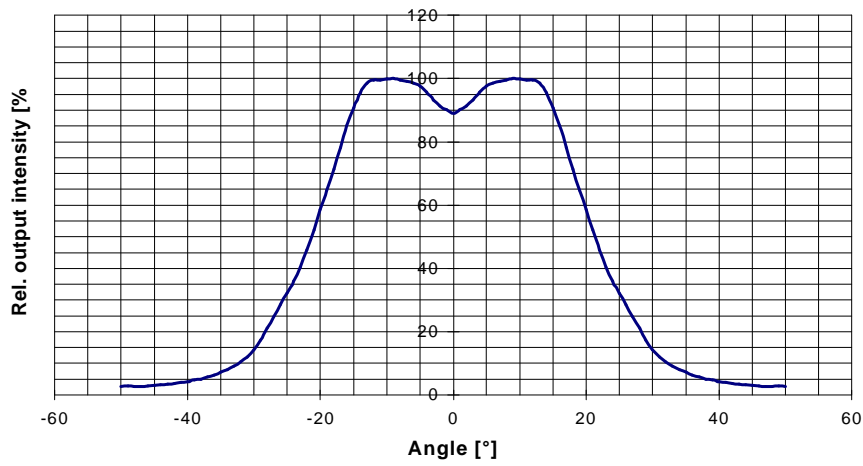
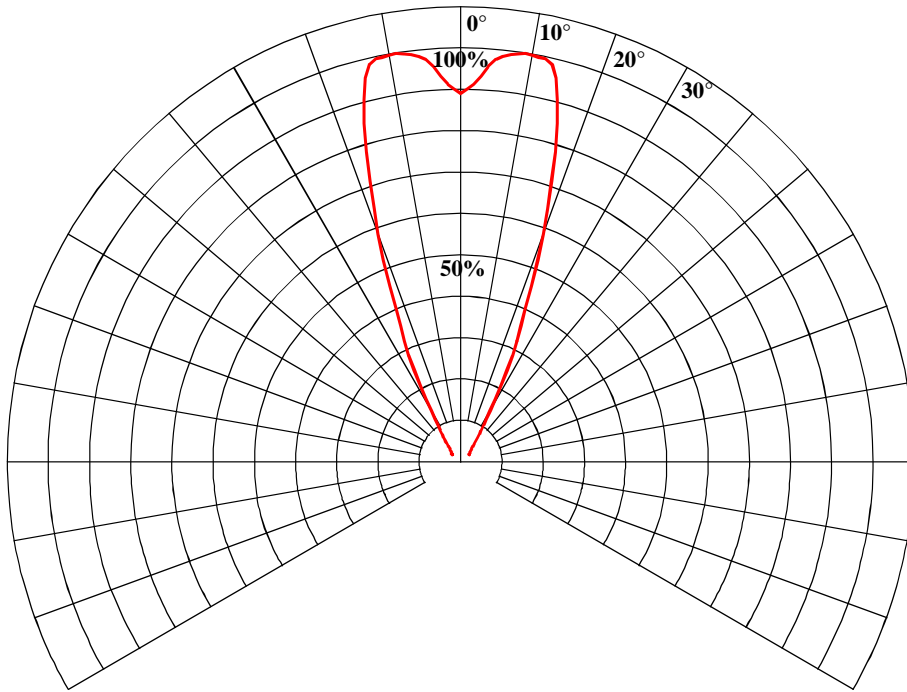


**Recommended SMD pads for the TFDT4000 transceiver**



**Current derating as a function of ambient temperature and max. duty cycle**

## Angular emission characteristic





## Angular receiving characteristic

