

Integrated Infrared Transceiver Module IrDA (SIR)



Features

- Compliant to IrDA 1.0 Standard
- Two Package Options
 - S Option – Side View
 - T Option – Top View
- Wide Supply Voltage Range (2.7 V – 5.5 V)
- IrDA Data Rates Up to 115.2 kbps Baud Rate
- 0- to 3.0-m Range
- Low Profile
- Few External Components Required
- Low Power Consumption
- AGC for EMI Immunity
- Open Collector IRED Driver

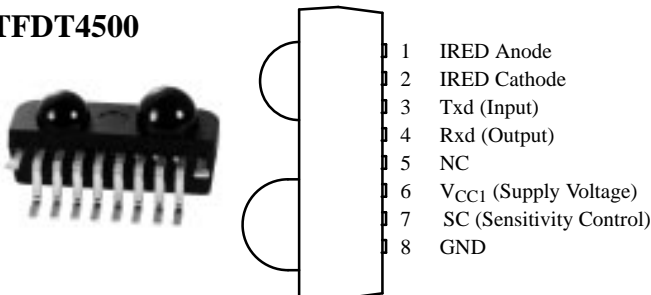
Description

The TFDS4500 and TFDT4500 are infrared transceivers for data communication systems. The transceivers are compliant to the IrDA standard and allow data rates up to 115 kbit/s. An internal AGC (Automatic Gain Control) ensures proper operation under adverse EMI conditions.

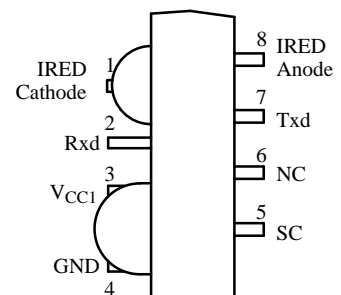
The internal IRED driver can be connected by an external current control resistor to an independent unregulated power supply, V_{CC2} . This adds circuit design flexibility and efficient serial drive capability for external IREDS for high power applications.

Pin Configurations

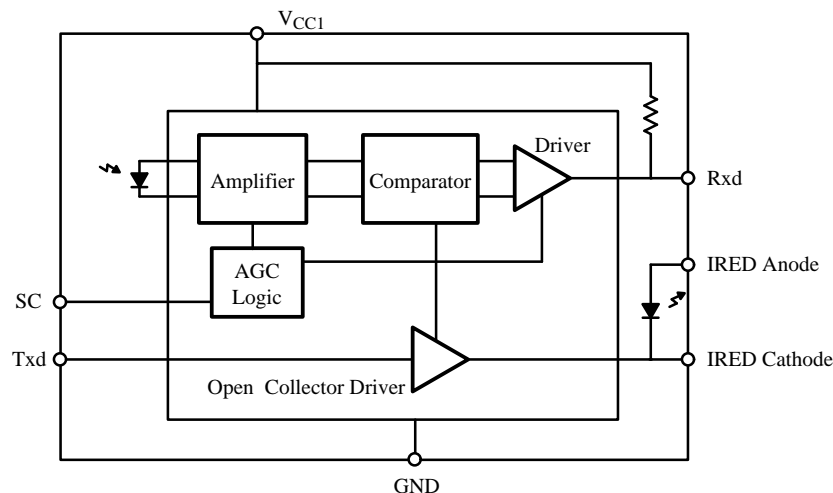
TFDT4500



TFDS4500



Functional Block Diagram



Updates to this data sheet may be obtained via facsimile by calling Siliconix FaxBack, 1-408-970-5600. Please request FaxBack document #70737.

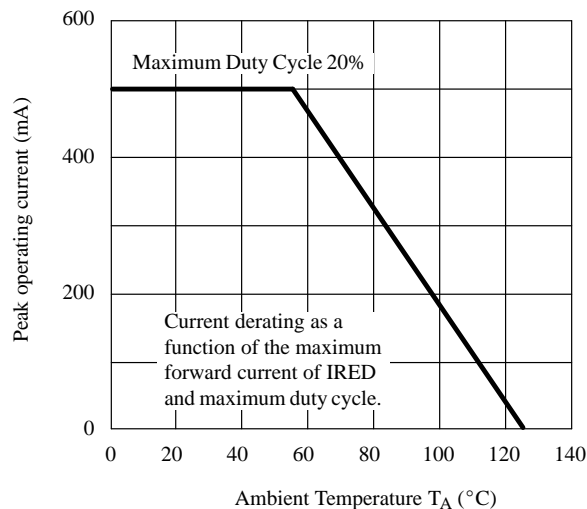
Absolute Maximum Ratings

Parameter	Symbol	Test Conditions ^a	Min ^b	Typ ^c	Max ^b	Unit
Supply Voltage Range	V _{CC1}		-0.5		6	V
Voltage Range of IRED Drive Output		IRED anode pin, Txd LOW	-0.5		6	
Input Currents		All pins except IRED cathode pin and IRED anode pin (See IRED Current)			10	mA
Output Sinking Current					25	
Power Dissipation	P _{tot}	(See Derating Curve)			200	mW
Junction Temperature	T _J				125	°C
Ambient Temperature Range (Operating)	T _A		0		70	
Storage Temperature Range	T _{stg}		-25		85	
Soldering Temperature		t = 20 s		215	240	
Average IRED Current	I _{IRED(DC)}				100	mA
Repetitive Pulsed IRED Current	I _{IRED(RP)}	t < 90 μs, Duty Cycle < 20%			500	
Peak IRED Current	I _{IRED(PK)}	t < 2 μs, Duty Cycle < 10%			1	A
IRED Anode Voltage	V _{IRED A}		-0.5		6	V
Transmitter Data Input Voltage	V _{Txd}		-0.5		V _{CC} + 0.5	
Receiver Data Output Voltage	V _{Rxd}		-0.5		V _{CC} + 0.5	
Virtual source size	d	Method: (1-1/e)	2.5	2.8		mm
Maximum Intensity for Class I Operation of IEC 825 or EN60825		EN60825, 1.1.1.997			400	mW/sr

Notes

- Reference point GND pin unless otherwise noted.
- The algebraic convention whereby the most negative value is a minimum and the most positive a maximum.
- Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.

Current Derating



Specifications

Parameter	Symbol	Test Conditions ^a	Min ^b	Typ ^c	Max ^b	Unit
Transceiver						
Supported Data Rates			2.4		115.2	kBit/s
Supply Voltage Range	V _{CC1}	Reduced Function Down to 2.5 V	2.7	5	5.5	V
Supply Current, V _{CC1} Pin	I _S	V _{CC1} = 5.5 V		1.3	2.5	mA
		V _{CC1} = 2.7 V		1.0	1.5	
Leakage Current of IR Emitter, IRED Anode Pin	I _S	V _{CC1} OFF, Txd LOW, V _{CC2} = 6 V T = -25 to 85°C		0.005	0.5	μA
Transceiver Power On Settling Time					50	μs
Receiver						
Minimum Detection Threshold Irradiance ^d	E _{emin}	α = ±15°, SIR Mode, SC = LOW		0.020	0.035	Wm ⁻²
		α = ±15°, SIR Mode, SC = HIGH	0.006	0.010	0.015	
Maximum Detection Threshold Irradiance ^d	E _{emax}	α = ±90°, V _{CC} = 5 V, SIR Mode	3300	5000		
		α = ±90°, V _{CC} = 3 V, SIR Mode	8000	15000		
Logic Low Receiver Input Irradiance	E _{emax(low)}	SC = HIGH or LOW			0.004	
Output Voltage Rxd	V _{OL}	Active, C = 15 pF, R = 2.2 kΩ		0.5	0.8	
	V _{OH}	Non-Active, C = 15 pF, R = 2.2 kΩ	V _{CC} - 0.5			
Output Current		V _{OL} < 0.8 V		4		mA
Rise and Fall Time	t _r , t _f	C = 15 pF, R = 2.2 kΩ	20		200	ns
Rxd Signal Electrical Output Pulse Width	t _p	2.4 kBits/s, Input Pulse Length 1.41 μs to ³ / ₁₆ of Bit Length	1.41		20	μs
		115.2 kBits/s, Input Pulse Length 1.41 μs to ³ / ₁₆ of Bit Length	1.41		8	
Output Delay Time (Rxd) e, f	t _{dl}	Output Level = 0.5 x V _{CC1} @ E _e = 0.040 W/m ²		1	2	
	t _{dt}	Output Level = 0.5 x V _{CC1}			6.5	
Jitter ^g	t _j	Over a period of 10 bit, 115.2 kBIT/s			2	
Latency	t _L	Recovery from last transmitted pulse to 1.1 x threshold sensitivity		100	800	
Transmitter						
Driver Current IRED	I _D	Current limiting resistor in series to IRED: R _S = 8.2 Ω, V _{CC2} = 5 V		0.3	0.5	A
Logic Low Transmitter Input Voltage	V _{IL} (Txd)		0		0.8	V
Logic High Transmitter Input Voltage	V _{IH} (Txd)		2.4		V _{CC}	
Output Radiant Intensity	I _{eH}	Current limiting resistor in series to IRED: R _S = 8.2 Ω @ 5 V _{CC2} = 5 V, α = ±15°	45	140	200	mW/sr
	I _{eL}	Logic Low Level			0.04	μW/sr
Angle of Half Intensity	α			±24		°
Peak Wavelength of Emission	λ _p		850		900	nm
Halfwidth of Emission Spectrum				60		
Optical Rise/Fall Time	t _R , t _F	115.2-kHz Square Wave Signal Duty Cycle: 1.1		200	600	ns
Overshoot, Optical					25	%
Rising Edge Peak-to-Peak Jitter	t _j	Over a period of 10 bits, independent of information content.			0.2	μs

Notes

- Unless otherwise specified T_A = 25°C, V_{CC} = 5 V.
- The algebraic convention whereby the most negative value is a minimum and the most positive a maximum.
- Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.
- BER = 10⁻⁸ (IrDA Specification)
- t_{dl} = delay of leading edge of output signal related to leading edge of optical input signal.
- t_{dt} = delay of trailing edge of output signal related to trailing edge of optical input signal.
- Leading edge of output signal.

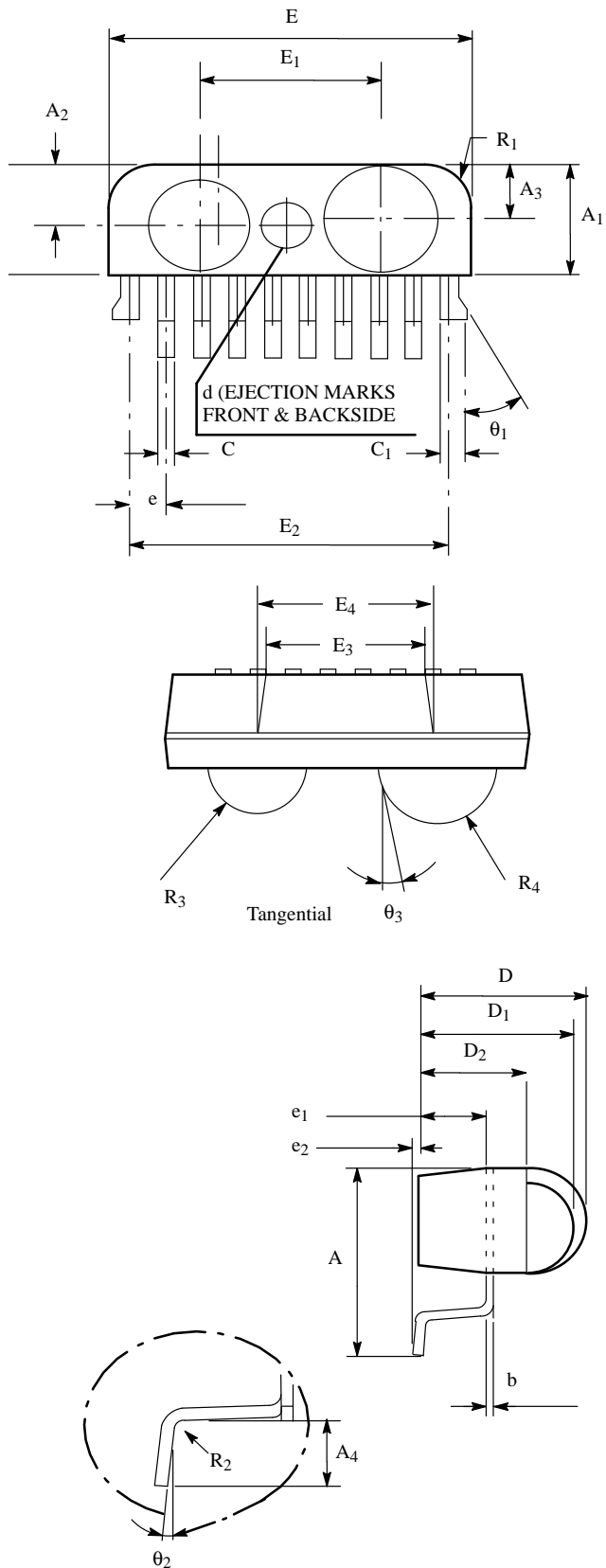
Pin Assignment and Description

Pin		Pin Name	Description	I/O	Active
“S” Option	“T” Option				
8	1	IREDA Anode	IREDA Anode	O	LOW
1	2	IREDC Cathode	IREDC Cathode, internally connected to driver transistor	O	LOW
7	3	Txd	Transmitter Data Input	I	HIGH
2	4	Rxd	Receiver Data Output, push-pull CMOS driver output capable of driving a standard CMOS or TTL load. No external pull-up or pull-down resistor is required.	O	LOW
6	5	NC	No connection		
3	6	V _{CC1}	Supply voltage, 2.7 V to 5.5 V (Refer to 4000 Series Application Note for using V _{CC1} as shutdown pin)		
5	7	SC	Sensitivity control	I	HIGH
4	8	GND	Ground		
-	-	Guide Pins ^a	“S” Option—Guide Pins (two), for surface mounting		
-	-	Stand-off Pins ^b	“T” Option—Guide Pins (two), used only for through-hole mounting		

Note

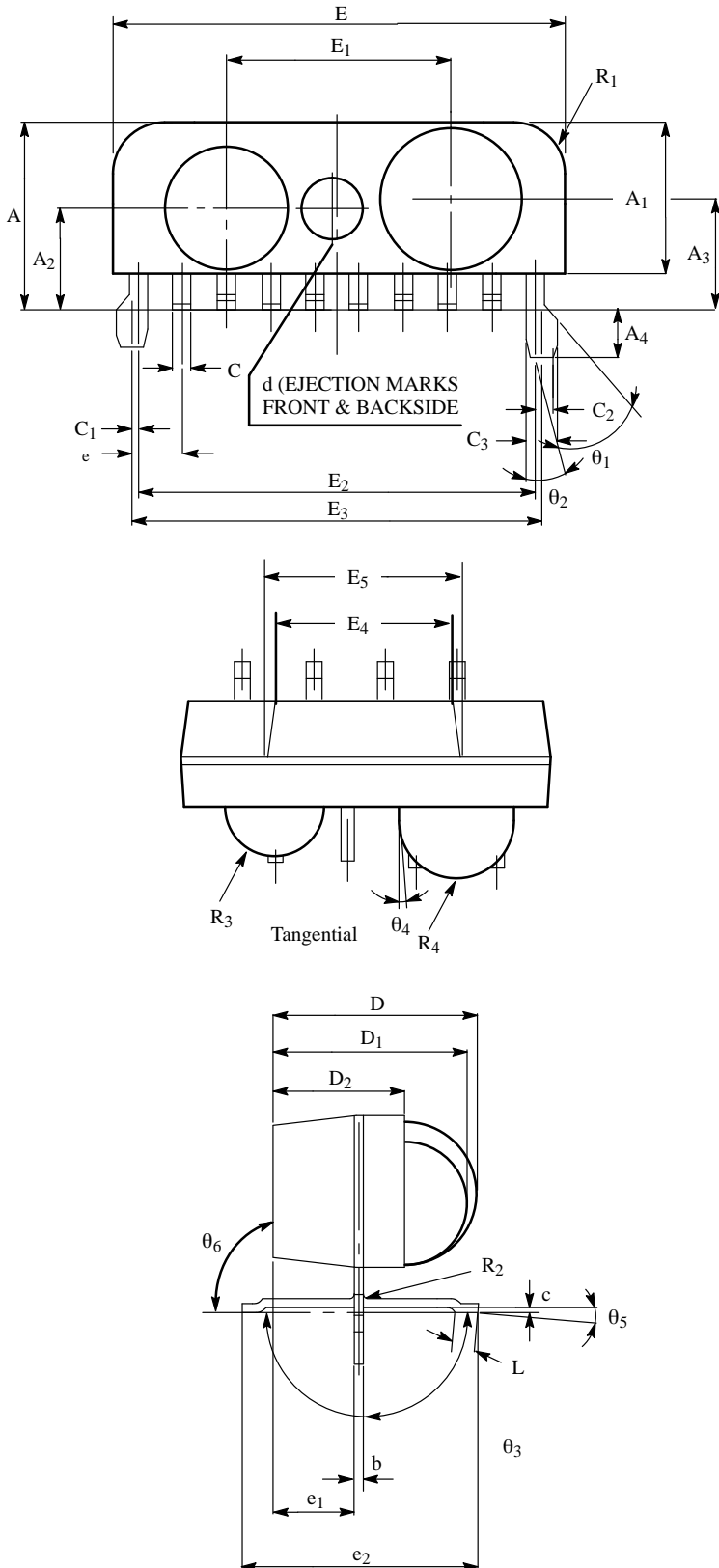
- a. Refer to application notes for connecting “S” option guide pins on PCB.
- b. Refer to application notes for connecting “T” option as a side view, through-hole device for wave soldering application.

TFDT, Top View Option



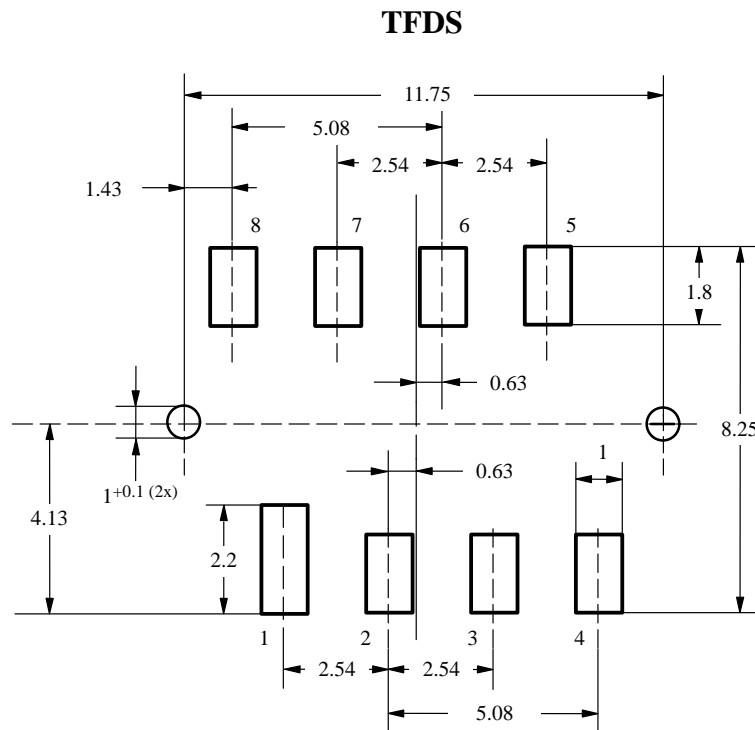
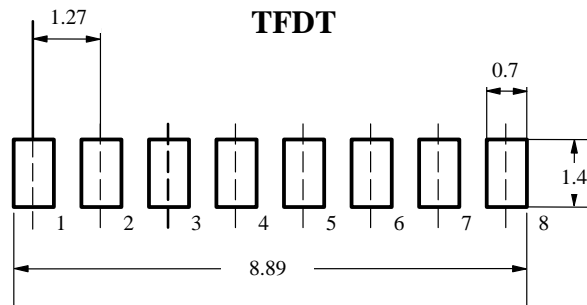
Dim	Millimeters		Inches	
	Typical	Tolerance (±)	Typical	Tolerance (±)
A	7.6	0.5	0.299	0.020
A ₁	4.3	0.3	0.169	0.012
A ₂	2.45	0.3	0.096	0.012
A ₃	2.15	0.3	0.085	0.012
A ₄	1.5	0.3	0.059	0.012
b	0.25	+0.1/ -0.05	0.010	+0.004/ -0.002
C	0.5	0.1	0.020	0.004
C ₁	0.86	+0.14/ -0.16	0.034	+0.0055/ -0.0063
D	5.95	0.25	0.234	0.010
D ₁	5.45	0.25	0.215	0.010
D ₂	3.75	0.25	0.148	0.010
d	1.8	0.25	0.074	0.010
E	13.0	0.5	0.512	0.020
E ₁	6.5	0.5	0.256	0.020
E ₂	11.43	-	0.450	-
E ₃	6	0.5	0.236	0.02
E ₄	6.5	0.5	0.256	0.02
e	1.27	-	0.050	-
e ₁	2.35	0.15	0.093	0.006
e ₂	0.2	0.2	0.008	0.008
R ₁	1.6	-	0.063	-
R ₂	0.25	-	0.010	-
R ₃	1.75	-	0.069	-
R ₄	2	-	0.079	-
θ ₁	30°	-	30°	-
θ ₂	5°	3°	5°	3°
θ ₃	5°	5	5°	5

TFDS, Side View Option



Dim	Millimeters		Inches	
	Typical	Tolerance (±)	Typical	Tolerance (±)
A	5.3	0.3	0.209	0.012
A ₁	4.3	0.3	0.169	0.012
A ₂	2.85	0.3	0.112	0.012
A ₃	3.15	0.3	0.124	0.012
A ₄	1.5	–	0.059	–
b	0.25	+0.1/-0.05	0.010	+0.004/-0.002
c	0.15	0.1	.0059	0.004
C	0.5	0.1	0.020	0.004
C ₁	0.16	–	0.006	–
C ₂	0.58	+0.3/-0.2	0.023	+0.012/-0.008
C ₃	0.86	+0.14/-0.16	0.034	+0.0055/-0.0063
D	5.95	0.25	2.34	0.110
D ₁	5.45	0.25	0.215	0.010
D ₂	3.75	0.25	0.148	0.010
d	1.8	–	0.074	0.010
E	13.0	0.5	0.512	0.020
E ₁	6.5	0.5	0.256	0.020
E ₂	11.43	–	0.450	–
E ₃	11.75	–	0.463	–
E ₄	6	0.5	0.236	0.02
E ₅	6.5	0.5	0.256	0.02
e	1.27	–	0.050	–
e ₁	2.35	0.15	0.093	0.006
e ₂	6.7	0.4	0.264	0.016
R ₁	1.6	–	0.063	–
R ₂	0.2	–	0.008	–
R ₃	1.75	–	0.069	–
R ₄	2.0	–	0.0787	–
θ ₁	30°	–	30°	–
θ ₂	15°	–	30°	–
θ ₃	180°	-6°	180°	-6°
θ ₄	5°	5	5°	5
θ ₅	5°	3°	5°	3°
θ ₆	90°	2°	90°	2°
L	0.6	0.2	0.024	-0.008

Recommended SMD Pads for Transceiver



Dimensions in mm

Ordering Information

Order Part Number	Qty/Reel
TFDS4500-TR3	750 Pieces
TFDT4500-TR3	750 Pieces

All TEMIC transceivers are classified as IEC 825-1 Accessible Emission Limit (AEL) Class 1 based upon the current proposed draft scheduled to go into effect on January 1, 1997. AEC Class 1 LED devices are considered eye safe.