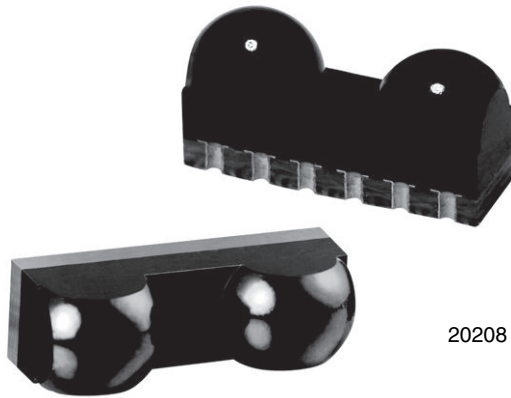


# Serial Infrared Transceiver (SIR), 115.2 kbit/s, 2.4 V to 5.5 V Operation



## DESCRIPTION

TFBS4711 is an infrared transceiver that supports data rates up to 115 kbit/s per the IrDA standard. The link distance is up to 1 meter. The transceiver includes a PIN photodiode, an infrared emitter, and a low-power control IC. These components have not been qualified according to automotive specifications.

## FEATURES

- Compliant to the IrDA physical layer specification
- Standard IrDA link distance of 1 m
- Low power consumption, typically less than 70  $\mu$ A
- Less than 1  $\mu$ A in shutdown mode
- Material categorization:  
for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



## APPLICATIONS

- Short-distance wireless communication and data transfer
- Use in environments where RF is problematic

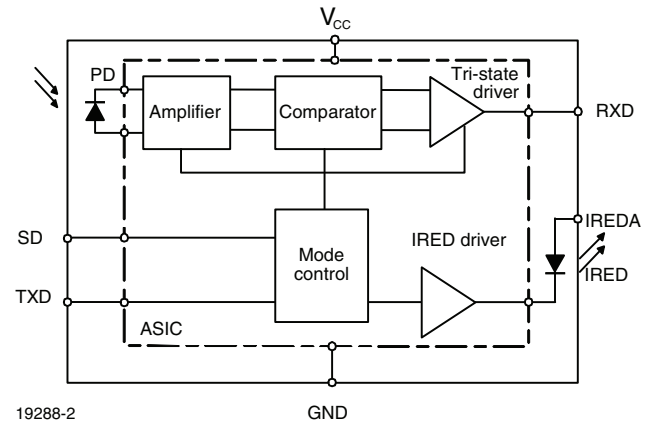
## LINKS TO ADDITIONAL RESOURCES



## DESIGN SUPPORT TOOLS

- [3D model](#)
- [Window size calculator](#)
- [Symbols and terminology](#)
- [IRDC protocol](#)
- [Reference layouts and circuit diagrams](#)

## FUNCTIONAL BLOCK DIAGRAM

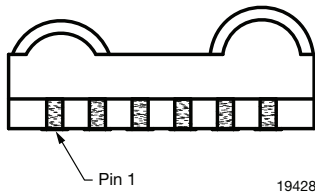


PARTS TABLE		
PART NUMBER	DESCRIPTION	QTY/REEL
TFBS4711-TR1	Oriented in carrier tape for side view surface mounting	1000 pcs
TFBS4711-TR3	Oriented in carrier tape for side view surface mounting	2500 pcs
TFBS4711-TT1	Oriented in carrier tape for top view surface mounting	1000 pcs

PRODUCT SUMMARY					
PART NUMBER	DATA RATE (kbit/s)	DIMENSIONS H x L x W (mm)	LINK DISTANCE (m)	OPERATING VOLTAGE (V)	IDLE SUPPLY CURRENT (mA)
TFBS4711	115.2	1.9 x 6 x 3	0 to $\geq 0.7$	2.4 to 5.5	0.07

**PINOUT**

TFBS4711  
weight 50 mg


**Definitions:**

In the Vishay transceiver datasheets the following nomenclature is used for defining the IrDA operating modes:  
SIR: 2.4 kbit/s to 115.2 kbit/s, equivalent to the basic serial infrared standard with the physical layer version IrPhy 1.0

MIR: 576 kbit/s to 1152 kbit/s

FIR: 4 Mbit/s

VFIR: 16 Mbit/s

MIR and FIR were implemented with IrPhy 1.1, followed by IrPhy 1.2, adding the SIR low power standard.

PIN DESCRIPTION				
PIN NUMBER	SYMBOL	DESCRIPTION	I/O	ACTIVE
1	V <sub>CC2</sub> IRED anode	Connect IRED anode directly to the power supply (V <sub>CC2</sub> ). IRED current can be decreased by adding a resistor in series between the power supply and IRED anode. A separate unregulated power supply can be used at this pin		
2	TXD	This Schmitt-Trigger input is used to transmit serial data when SD is low. An on-chip protection circuit disables the LED driver if the TXD pin is asserted for longer than 100 $\mu$ s. The input threshold voltage adapts to and follows the logic voltage swing defined by the applied supply voltage	I	High
3	RXD	Received data output, push-pull CMOS driver output capable of driving standard CMOS or TTL loads. During transmission the RXD output is active and mirrors the transmit signal. No external pull-up or pull-down resistor is required. Floating with a weak pull-up of 500 k $\Omega$ (typ.) in shutdown mode. The voltage swing is defined by the applied supply voltage	O	Low
4	SD	Shutdown. The input threshold voltage adapts to and follows the logic voltage swing defined by the applied supply voltage	I	High
5	V <sub>CC1</sub>	Supply voltage		
6	GND	Ground		



ABSOLUTE MAXIMUM RATINGS						
PARAMETER	TEST CONDITIONS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply voltage range, transceiver	$-0.3\text{ V} < V_{CC2} < 6\text{ V}$	$V_{CC1}$	-0.5	-	+6	V
Supply voltage range, transmitter	$-0.5\text{ V} < V_{CC1} < 6\text{ V}$	$V_{CC2}$	-0.5	-	+6	V
RXD output voltage	$-0.5\text{ V} < V_{CC1} < 6\text{ V}$	$V_{RXD}$	-0.5	-	$V_{CC1} + 0.5$	V
Voltage at all inputs	Note: $V_{in} \geq V_{CC1}$ is allowed	$V_{in}$	-0.5	-	+6	V
Input current	For all pins except IRED anode pin	$I_{CC}$	-	-	10	mA
Output sink current			-	-	25	mA
Power dissipation		$P_D$	-	-	250	mW
Junction temperature		$T_j$	-	-	125	°C
Ambient temperature range (operating)		$T_{amb}$	-25	-	+85	°C
Storage temperature range		$T_{stg}$	-40	-	+100	°C
Soldering temperature	See recommended solder profile		-	-	260	°C
Average output current, pin 1		$I_{IRED} (DC)$	-	-	85	mA
Repetitive pulsed output current pin 1 to pin 2	$t < 90\ \mu\text{s}$ , $t_{on} < 20\%$	$I_{IRED} (RP)$	-	-	430	mA
ESD protection		$V_{ESD}$	1	-	-	kV
Latchup			$ \pm 100 $	-	-	mA
Thermal resistance junction-to-ambient	JESD51	$R_{thJA}$	-	300	-	K/W

**Note**

- Reference point ground, pin 6 unless otherwise noted.  
Typical values are for design aid only, not guaranteed nor subject to production testing.  
We apologize to use sometimes in our documentation the abbreviation LED and the word light emitting diode instead of infrared emitting diode (IRED) for IR-emitters. That is by definition wrong; we are here following just a bad trend

EYE SAFETY INFORMATION	
STANDARD	CLASSIFICATION
IEC/EN 60825-1 (2007-03), DIN EN 60825-1 (2008-05) "SAFETY OF LASER PRODUCTS - Part 1: equipment classification and requirements", simplified method	Class 1
IEC 62471 (2006), CIE S009 (2002) "Photobiological Safety of Lamps and Lamp Systems"	Exempt
DIRECTIVE 2006/25/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 5 <sup>th</sup> April 2006 on the minimum health and safety requirements regarding the exposure of workers to risks arising from physical agents (artificial optical radiation) (19 <sup>th</sup> individual directive within the meaning of article 16(1) of directive 89/391/EEC)	Exempt

**Note**

- Vishay transceivers operating inside the absolute maximum ratings are classified as eye safe according the above table



<b>ELECTRICAL CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , $V_{CC1} = V_{CC2} = 2.4\text{ V}$ to $5.5\text{ V}$ unless otherwise noted)						
PARAMETER	TEST CONDITIONS	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>TRANSCEIVER</b>						
Supply voltage		$V_{CC1}$	2.4	-	5.5	V
Operating temperature range		$T_A$	-25	-	+85	$^{\circ}\text{C}$
Data rates			9.6	-	115.2	kbit/s
Idle supply current at $V_{CC1}$ (receive mode, no signal)	SD = low, $T_{amb} = -25\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$ independent of ambient light, $V_{CC1} = V_{CC2} = 2.4\text{ V}$ to $5.5\text{ V}$	$I_{CC1}$	40	70	150	$\mu\text{A}$
	SD = low, $T_{amb} = 25\text{ }^{\circ}\text{C}$ , $V_{CC1} = V_{CC2} = 2.4\text{ V}$ to $5.5\text{ V}$	$I_{CC1}$	40	70	100	$\mu\text{A}$
Average dynamic supply current, transmitting	$I_{RED} = 300\text{ mA}$ , 20 % duty cycle	$I_{CC1}$	-	0.6	2	mA
Standby (SD) <sup>(1)</sup> supply current	SD = high, $T_{amb} = -25\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$ , independent of ambient light	$I_{SD}$	-	0.01	1	$\mu\text{A}$
RXD to $V_{CC1}$ impedance	SD = high	$R_{RXD}$	400	500	600	$\text{k}\Omega$
Input voltage low (TXD, SD)		$V_{ILo}$	-0.3	-	0.4	V
Input voltage high (SD)	For compliance with $I_{SD}$ spec.	$V_{IHHi}$	$V_{CC1} - 0.3$	-	6	V
Input voltage high (TXD)		$V_{IHHi}$	$V_{CC1} - 0.5$	-	6	V
Input leakage current low	$V_{ILo} \leq 0.3\text{ V}$	$I_{ILo}$	-	0.01	10	$\mu\text{A}$
Input leakage current high	$V_{IHHi} \geq V_{CC1} - 0.3\text{ V}$	$I_{IHHi}$	-	0.01	10	$\mu\text{A}$
Input capacitance (TXD, SD)		$C_{IN}$	-	-	5	pF
Output voltage low, RXD	$C_{load} = 8\text{ pF}$ , $I_{OLo} \leq   +500\text{ }\mu\text{A} $	$V_{OLo}$	-	-	0.4	V
Output voltage high, RXD	$I_{OH} = -200\text{ }\mu\text{A}$	$V_{OHHi}$	$0.8 \times V_{CC1}$	-	$V_{CC1}$	V

**Notes**

- Typical values are for design aid only, not guaranteed nor subject to production testing
- (1) SD mode becomes active when SD is set high for more than 0.2  $\mu\text{s}$ . In SD mode the detector is disabled and the output disconnected



<b>OPTOELECTRONIC CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , $V_{CC1} = V_{CC2} = 2.4\text{ V to }5.5\text{ V}$ unless otherwise noted)						
PARAMETER	TEST CONDITIONS	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>RECEIVER</b>						
Minimum irradiance $E_e$ in angular range <sup>(2)</sup>	9.6 kbit/s to 115.2 kbit/s $\lambda = 850\text{ nm to }900\text{ nm}$ , $\alpha = 0^{\circ}, 15^{\circ}$	$E_e$	-	35 (3.5)	80 (8)	$\text{mW}/\text{m}^2$ ( $\mu\text{W}/\text{cm}^2$ )
Maximum irradiance $E_e$ in angular range <sup>(3)</sup>	$\lambda = 850\text{ nm to }900\text{ nm}$	$E_e$	-	5 (500)	-	$\text{kW}/\text{m}^2$ ( $\text{mW}/\text{cm}^2$ )
Maximum no detection irradiance <sup>(1)</sup>	$\lambda = 850\text{ nm to }900\text{ nm}$ , $t_r, t_f < 40\text{ ns}$ , $t_{po} = 1.6\text{ }\mu\text{s}$ at $f = 115\text{ kHz}$ , no output signal allowed	$E_e$	4 (0.4)	-	-	$\text{mW}/\text{m}^2$ ( $\mu\text{W}/\text{cm}^2$ )
Rise time of output signal	10 % to 90 %, $C_L = 8\text{ pF}$	$t_{r(RXD)}$	10	30	80	ns
Fall time of output signal	90 % to 10 %, $C_L = 8\text{ pF}$	$t_{f(RXD)}$	10	30	80	ns
RXD pulse width of output signal	Input pulse length $> 1.2\text{ }\mu\text{s}$	$t_{PW}$	1.7	2.2	3	$\mu\text{s}$
Stochastic jitter, leading edge	Input irradiance = $100\text{ mW}/\text{m}^2$ , $\leq 115.2\text{ kbit/s}$		-	-	350	ns
Standby/shutdown delay, receiver startup time	After shutdown active or power-on		-	100	500	$\mu\text{s}$
Latency		$t_L$	-	50	150	$\mu\text{s}$
<b>TRANSMITTER</b> (new surface emitter values introduced via PCN)						
IREC operating current limitation	No external resistor for current limitation <sup>(5)</sup>	$I_D$	200	300	430	mA
Forward voltage of built-in IRED	$I_F = 300\text{ mA}$	$V_f$	1.4	1.8	1.9	V
Output leakage IRED current	$\text{TXD} = 0\text{ V}$ , $0 < V_{CC1} < 5.5\text{ V}$	$I_{\text{IRED}}$	-1	0.01	1	$\mu\text{A}$
Output radiant intensity	$\alpha = 0^{\circ}, 15^{\circ}$ $\text{TXD} = \text{high}$ , $\text{SD} = \text{low}$	$I_e$	40	140	300	$\text{mW}/\text{sr}$
	$V_{CC1} = 5\text{ V}$ , $\alpha = 0^{\circ}, 15^{\circ}$ , $\text{TXD} = \text{low}$ or $\text{SD} = \text{high}$ (receiver is inactive as long as $\text{SD} = \text{high}$ )	$I_e$	-	-	0.04	$\text{mW}/\text{sr}$
Output radiant intensity, angle of half intensity		$\alpha$	-	$\pm 24$	-	deg
Peak-emission wavelength <sup>(5)</sup>		$\lambda_p$	870	-	910	nm
Spectral bandwidth		$\Delta\lambda$	-	45	-	nm
Optical rise time		$t_{\text{ropt}}$	10	50	300	ns
Optical fall time		$t_{\text{fopt}}$	10	50	300	ns
Optical output pulse duration	Input pulse width $1.6 < t_{\text{TXD}} < 23\text{ }\mu\text{s}$	$t_{\text{opt}}$	$t_{\text{TXD}} - 0.15$	-	$t_{\text{TXD}} + 0.15$	$\mu\text{s}$
	Input pulse width $t_{\text{TXD}} \geq 23\text{ }\mu\text{s}$	$t_{\text{opt}}$	23	50	100	$\mu\text{s}$
Optical overshoot			-	-	25	%

**Notes**

- Typical values are for design aid only, not guaranteed nor subject to production testing
- <sup>(2)</sup> Equivalent to IrDA background light and electromagnetic field test: fluorescent lighting immunity
- <sup>(3)</sup> IrDA sensitivity definition: minimum irradiance  $E_e$  in angular range, power per unit area. The receiver must meet the BER specification while the source is operating at the minimum intensity in angular range into the minimum half-angular range at the maximum link length
- <sup>(4)</sup> Maximum irradiance  $E_e$  in angular range, power per unit area. The optical delivered to the detector by a source operating at the maximum intensity in angular range at minimum link length must not cause receiver overdrive distortion and possible related link errors. If placed at the active output interface reference plane of the transmitter, the receiver must meet its bit error ratio (BER). For more definitions see the document "Symbols and Terminology" on the Vishay website
- <sup>(5)</sup> Using an external current limiting resistor is allowed and recommended to reduce IRED intensity and operating current when current reduction is intended to operate at the IrDA low power conditions. E.g. for  $V_{CC2} = 3.3\text{ V}$  a current limiting resistor of  $R_S = 56\text{ }\Omega$  will allow a power minimized operation at IrDA low power conditions
- <sup>(6)</sup> Due to this wavelength restriction compared to the IrDA spec of 850 nm to 900 nm the transmitter is able to operate as source for the standard remote control applications with codes as e.g. Phillips RC5/RC6<sup>®</sup> or RECS 80



I/O AND SOFTWARE

In the description, already different I/Os are mentioned. Different combinations are tested and the function verified with the special drivers available from the I/O suppliers. In special cases refer to the I/O manual, the Vishay application notes, or contact directly Vishay Sales, Marketing or Application.

For operating at RS232 ports the ENDECS TIR1000 or MCP2122 is recommended.

Note

- TFBS4711 echoes the TXD signal at the RXD output during transmission. For communication this signal is to be correctly ignored by the controller or the software. The echo signal is implemented for test purposes in mass production

TABLE 2 - TRUTH TABLE					
INPUTS			OUTPUTS		REMARK
SD	TXD	OPTICAL INPUT IRRADIANCE mW/m <sup>2</sup>	RXD	TRANSMITTER	OPERATION
High > 1 ms	x	x	Weakly pulled (500 kΩ) to V <sub>CC1</sub>	0	Shutdown
Low	High	x	Low (active)	I <sub>e</sub>	Transmitting
Low	High > 100 μs	x	High inactive	0	Protection is active
Low	Low	< 4	High inactive	0	Ignoring low signals below the IrDA defined threshold for noise immunity
Low	Low	> min. detection threshold irradiance < max. detection threshold irradiance	Low (active)	0	Response to an IrDA compliant optical input signal
Low	Low	> min. detection threshold irradiance	Undefined	0	Overload conditions can cause unexpected outputs

**PACKAGE DIMENSIONS** in millimeters

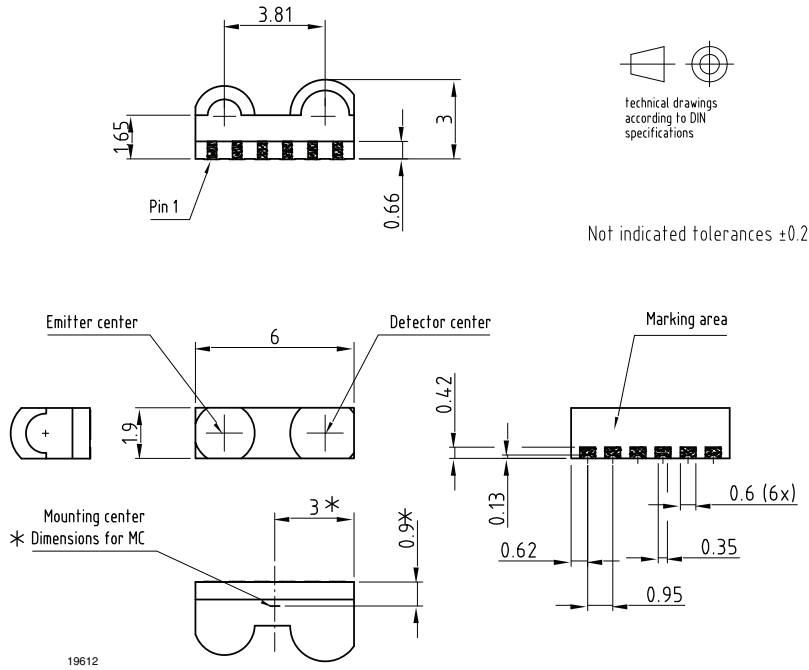


Fig. 1 - Package Drawing of TFBS4711, Tolerance of Height is +0.1 mm, -0.2 mm, other Tolerances  $\pm 0.2$  mm

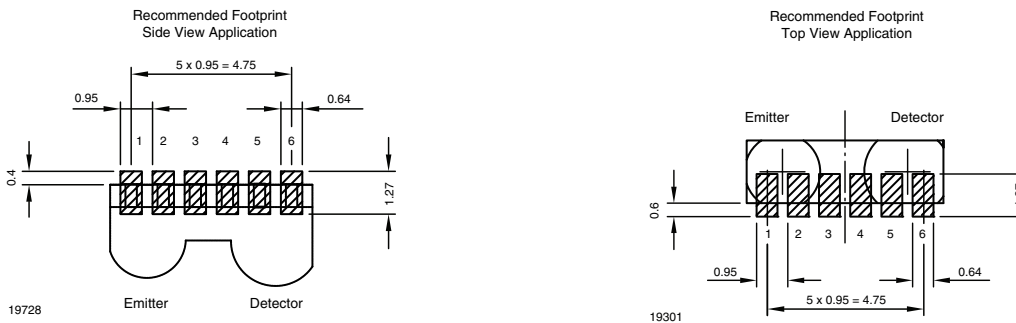
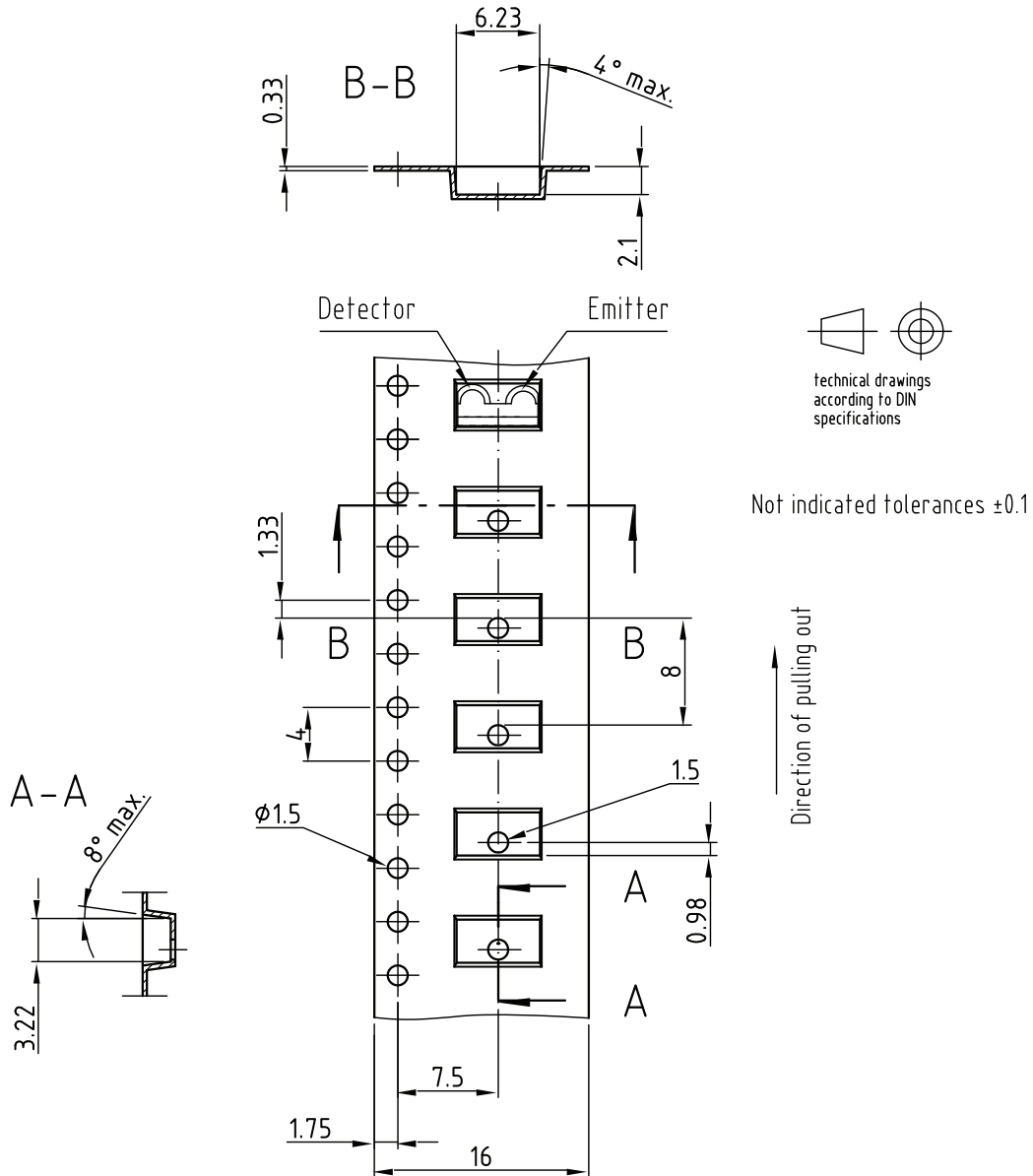


Fig. 2 - Soldering Footprints

TAPE DIMENSIONS FOR TR1 AND TR3 in millimeters

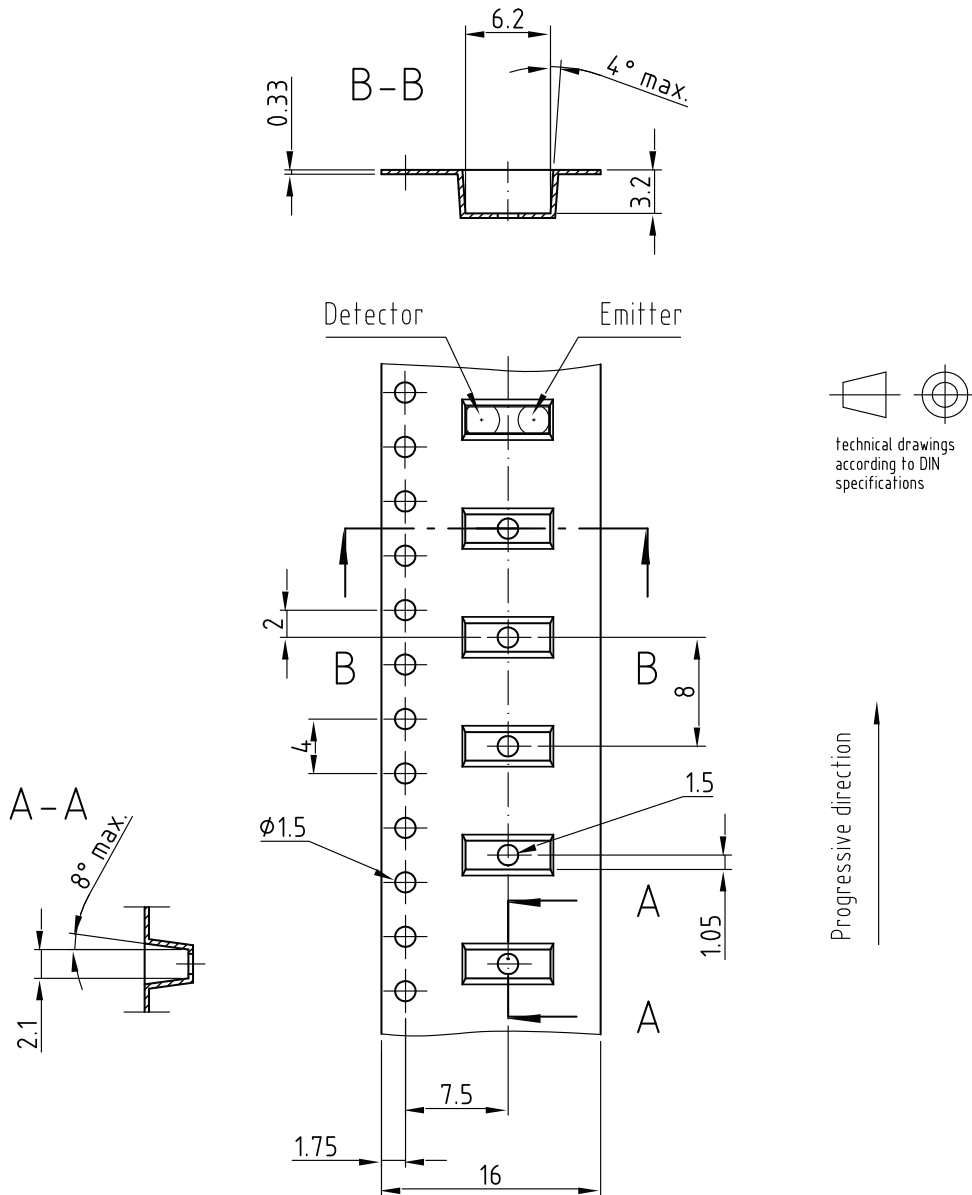


Drawing-No.: 9.700-5294.01-4

Issue: 1; 08.12.04

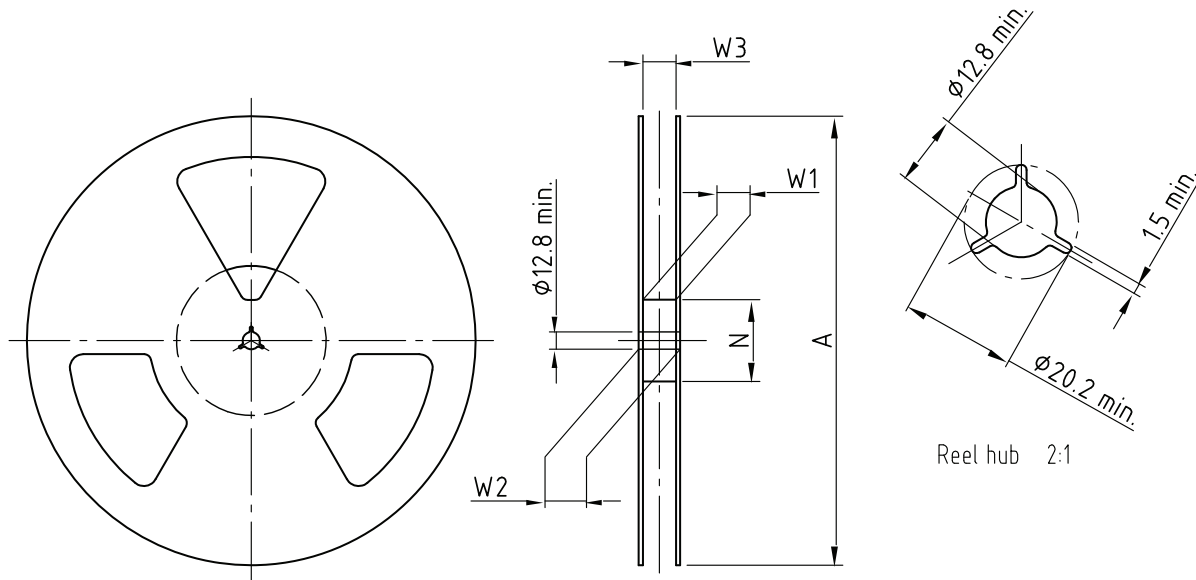
19613

TAPE DIMENSIONS FOR TT1 in millimeters



Drawing-No.: 9.700-5295.01-4  
 Issue: 1; 08.12.04  
 20416

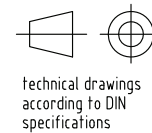
**REEL DIMENSIONS** in millimeters



Drawing-No.: 9.800-5090.01-4  
Issue: 1; 29.11.05  
14017

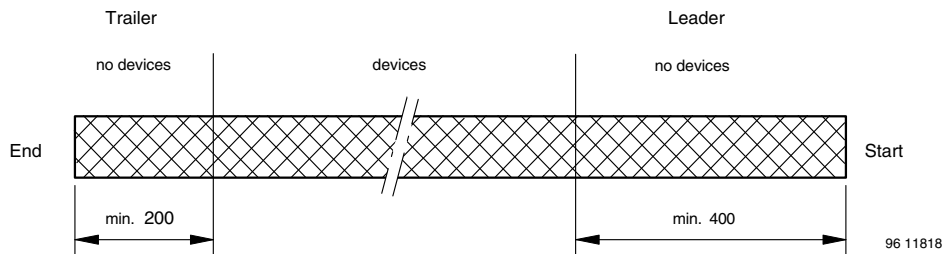
Form of the leave open of the wheel is supplier specific.

Dimension acc. to IEC EN 60 286-3



TAPING VARIANT	TAPE WIDTH (mm)	A MAX. (mm)	N (mm)	W <sub>1</sub> MIN. (mm)	W <sub>2</sub> MAX. (mm)	W <sub>3</sub> MIN. (mm)	W <sub>3</sub> MAX. (mm)
TT1 / TR1	16	180	60	16.4	22.4	15.9	19.4
TT3 / TR3	16	330	50	16.4	22.4	15.9	19.4

**LEADER AND TRAILER DIMENSIONS** in millimeters



**COVER TAPE PEEL STRENGTH**

According to DIN EN 60286-3  
0.1 N to 1.3 N  
300 ± 10 mm/min.  
165° to 180° peel angle

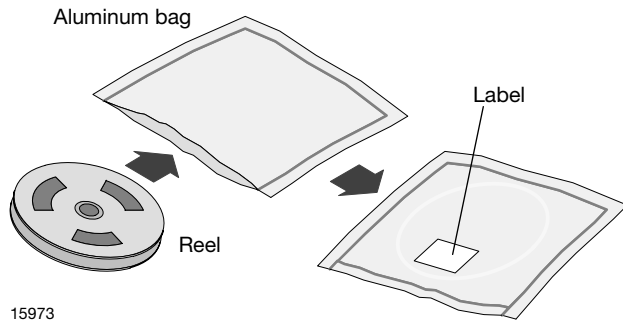
**LABEL**

**Standard bar code labels for finished goods**

The standard bar code labels are product labels and used for identification of goods. The finished goods are packed in final packing area. The standard packing units are labeled with standard bar code labels before transported as finished goods to warehouses. The labels are on each packing unit and contain Vishay Semiconductor GmbH specific data.

**DRY PACKING**

The reel is packed in an anti-humidity bag to protect the devices from absorbing moisture during transportation and storage.



**FINAL PACKING**

The sealed reel is packed into a cardboard box.

**RECOMMENDED METHOD OF STORAGE**

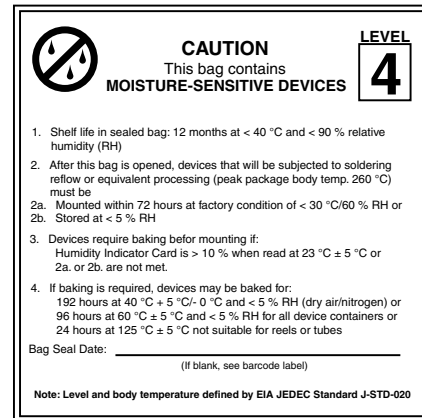
Dry box storage is recommended as soon as the aluminum bag has been opened to prevent moisture absorption. The following conditions should be observed, if dry boxes are not available:

- Storage temperature 10 °C to 30 °C
- Storage humidity ≤ 60 % RH max.

After more than 72 h under these conditions moisture content will be too high for reflow soldering.

In case of moisture absorption, the devices will recover to the former condition by drying under the following condition:  
 192 h at 40 °C + 5 °C / - 0 °C and < 5 % RH (dry air / nitrogen) or  
 96 h at 60 °C + 5 °C and < 5 % RH for all device containers or  
 24 h at 125 °C + 5 °C not suitable for reel or tubes.

An EIA JEDEC® standard J-STD-020 level 4 label is included on all dry bags.



EIA JEDEC standard J-STD-020 level 4 label is included on all dry bags

**OUTER PACKAGING**

The sealed reel is packed into a pizza box.

<b>CARTON BOX DIMENSIONS</b> in millimeters				
<p>Thickness</p> <p>Width</p> <p>Length</p> <p>22127</p>				
ORDER CODE	BOXING	THICKNESS	WIDTH	LENGTH
TT3 / TR3	Pizza box (taping in reels)	50	340	340
TT1 / TR1	Pizza box (taping in reels)	32	190	190



VISHAY SEMICONDUCTOR GmbH STANDARD BAR CODE PRODUCT LABEL (finished goods)		
PLAIN WRITING	ABBREVIATION	LENGTH
Item-description	-	18
Item-number	INO	8
Selection-code	SEL	3
LOT-/serial-number	BATCH	10
Data-code	COD	3 (YWW)
Plant-code	PTC	2
Quantity	QTY	8
Accepted by	ACC	-
Packed by	PCK	-
Mixed code indicator	MIXED CODE	-
Origin	xxxxxxx+	Company logo
Long bar code top	Type	Length
Item-number	N	8
Plant-code	N	2
Sequence-number	X	3
Quantity	N	8
Total length	-	21
Short bar code bottom	Type	Length
Selection-code	X	3
Data-code	N	3
Batch-number	X	10
Filter	-	1
Total length	-	17

**ESD PRECAUTION**

Proper storage and handling procedures should be followed to prevent ESD damage to the devices especially when they are removed from the antistatic shielding bag. Electrostatic sensitive devices warning labels are on the packaging.

**VISHAY SEMICONDUCTORS STANDARD BAR CODE LABELS**

The Vishay Semiconductors standard bar code labels are printed at final packing areas. The labels are on each packing unit and contain Vishay Semiconductors specific data.



PartNo: TFBS4711-TR1      LotNo: 1A03469.R  
 QTY: 1000      Batch: 202005MY68  
 SelCode/LotNo2:  
 PTC: 68      Origin MALAYSIA      Region: 2310      SL: 0010  
 Catalog:      Serial#: K03202579411



23199



## Disclaimer

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