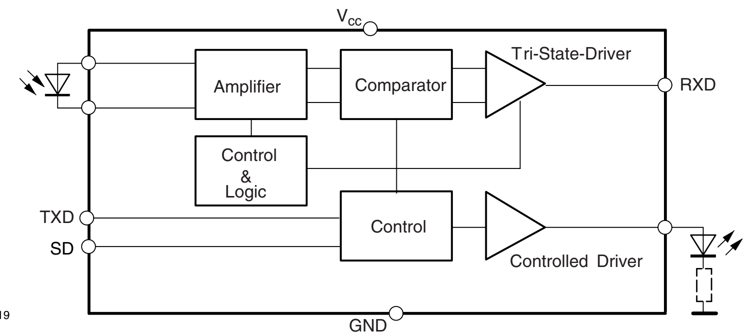
Functional Block Diagram

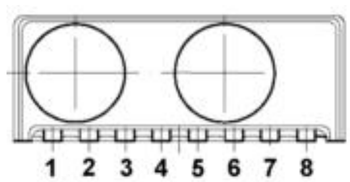


Pin Description

Pin number	Function	Description	I/O	Active
1	IRED GND	IRED cathode, ground		
2	IRED GND	IRED cathode, ground		
3	RXD	Output, received data, tri-state, floating in shutdown mode	O	Low
4	V_{CC}	Supply voltage		
5	GND	Ground		
6	GND	Ground		
7	TXD	Input, transmit data	I	High
8	SD	Shutdown	I	High

Pinout

TFDU4203
weight 100 mg



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Absolute Maximum Ratings

Reference Point pin 8, unless otherwise noted.

Parameter	Test conditions	Symbol	Min.	Typ.	Max.	Unit
Supply voltage range		V_{CC}	- 0.5		+ 6	V
Input current	all pins				10	mA
Output sink current					25	mA
Power dissipation		P_{tot}			200	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 the chapter "Soldering conditions" for lead-bearing and Pb-free processing				260	°C
Average IRED current		$I_{IRED(DC)}$			125	mA
Repetitive pulsed IRED current	< 90 µs, t_{on} < 20 %	$I_{IRED(RP)}$			500	mA
Transmitter data input voltage		V_{TXD}	- 0.5		6	V
Receiver data output voltage		V_{RXD}	- 0.5		6	V

Eye safety information

Parameter	Test conditions	Symbol	Min.	Typ.	Max.	Unit
Virtual source size (TFDU4203 only)	Method: (1 - 1/e) encircled energy	d		2		mm

Note:
Compatible to Class 1 operation of IEC 60825 or EN60825 with worst case IrDA SIR pulse pattern, 115.2 kbit/s

Electrical Characteristics

Transceiver

Parameter	Test conditions	Symbol	Min.	Typ.	Max.	Unit
Supported data rates	base band		9.6		115.2	kbit/s
Supply voltage range	operational down to 2.0 V	V_{CC}	2.4		5.5	V
Supply current	V_{CC} = 2.4 V to 5.5 V, E_e = 0, receive mode, full temperature range	I_S		65	100	µA
	V_{CC} = 2.4 V to 5.5 V, 10 klx sunlight, receive mode or transmit mode, full temperature range, no signal	I_S		70	100	µA
	V_{CC} = 2.7 V 115.2 kbit/s transmission, receive mode, nose to nose operation	I_S		1		mA
Supply current, at V_{CCP}	shutdown mode, entire temperature range	$I_{Sshdown}$		0.02	1	µA
	V_{CC} = 5.5 V, 20 °C	$I_{Sshdown}$			10	nA
IRED peak current transmitting	I_e = 40 mW/sr, no external resistor V_{CCP} = 2.7 V, equivalent to SIR standard	I_{Str}			360	mA
Transceiver ‘power on‘ settling time	time from switching on V_{CC} to established specified operation				1	ms

Optoelectronic Characteristics

Receiver

Tested for the following parameters (V_{CC} = 2.4 V to 5.5 V, - 25 °C to + 85 °C, unless otherwise stated).

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Minimum detection threshold irradiance (logic high receiver input irradiance)	$\|\alpha\| \leq \pm 15°$, V_{CC} = 2.0 V to 5.5 V	$E_{e,\ min.}$		25 (2.5)	50 (5)	mW/m^2 ($\mu W/cm^2$)
	2.0 V, 25 °C tested	$E_{e,\ min.}$		50	100	mW/m^2
Maximum detection threshold irradiance	$\|\alpha\| \leq \pm 90$ °, V_{CC} = 5 V	$E_{e,\ max.}$	3300 (330)	5000 (500)		W/m^2 (mW/cm^2)
	$\|\alpha\| \leq \pm 90$ °, V_{CC} = 3 V	$E_{e,\ max.}$	8000 (800)	15000 (1500)		W/m^2 (mW/cm^2)
Logic low receiver input irradiance		$E_{e,\ max.,low}$			4 (0.4)	mW/m^2 ($\mu W/cm^2$)
Output voltage RXD	active, C = 15 pF	V_{OL}	0		0.5	V
	non active, C = 15 pF	V_{OH}	V_{CC} - 0.5			V
Output current RXD	V_{OL} < 0.5 V				4	mA
Rise time at load	C = 15 pF, R = 2.2 kΩ	t_r	20		70	ns
Fall time at load	C = 15 pF, R = 2.2 kΩ	t_f	20		70	ns
RXD signal electrical output pulse width	2.4 kbit/s, input pulse width 1.41 µs to 3/16 of bit duration	t_p	1.41		20	µs
	115.2 kbit/s, input pulse width 1.41 µs to 3/16 of bit duration	t_p	1.41		4.5	µs
Output delay time (RXD), leading edge optical input to electrical output	output level = 0.5 x V_{CC} at 40 mW/m^2	t_{dl}		1	2	µs
Jitter, leading edge of output signal	over a period of 10 bit, 115.2 kbit/s	t_j			400	ns
Output delay time (RXD), trailing edge optical input to electrical output	output level = 0.5 x V_{CC} at 40 mW/m^2	t_{dt}			6.5	µs
Power on time, SD recovery time				0.1	1	ms
Latency		t_L		100	200	µs

Transmitter

Parameter	Test conditions	Symbol	Min.	Typ.	Max.	Unit
Logic low shutdown input voltage*)		$V_{IL(TXD)}$	- 0.5		0.15 x V_{CC}	V
Logic high shutdown input voltage*)		$V_{IH(TXD)}$	0.8 x V_{CC}		6	V
Logic low transmitter input voltage*)		$V_{IL(TXD)}$	0.5		0.81 x V_{CC}	V
Logic high transmitter input voltage*)		$V_{IH(TXD)}$	0.8 x V_{CC}		6	V
Optical output radiant intensity	$\|\alpha\| \leq \pm$ 15 °, I_{F1} = 320 mA, Internally current controlled**), voltage range 2.7 V to 5.5 V*)	I_e	45			mW/sr
Peak emission wavelength		λ_p	880		900	nm
Spectral emission bandwidth				40		nm
Optical rise/fall time	115.2 kHz square wave signal (duty cycle 1 : 1)				200	ns
Optical output pulse duration	input pulse duration 1.6 µs		1.5	1.6	1.7	µs
Output radiant intensity	logic low level				0.04	µW/sr
Overshoot, optical					25	%
Rising edge peak to peak jitter	over a period of 10 bits, independent of information content	t_j			0.2	µs

Notes:

*) Recommended logic levels for minimum shutdown current. The CMOS decision level is 0.5 x V_{CC}.

**) Add external resistor for V_{CC} > 4 V to prevent thermal overload, see Fig. 3.

Truth table

Inputs			Outputs	
SD	TXD	Optical input Irradiance mW/m^2	RXD	Transmitter
high	x	x	floating	0
low	high	x	high	I_e
low	high ≥ 25 µs	x	high	0
low	low	< 4	high	0
low	low	> Min. Detection Threshold Irradiance	x	0
low	low	> Max. Detection Threshold Irradiance	x	0

Application Hints

The TFDU4203 does not need any external components when operated with a "clean" power supply. In a more noisy ambient it is recommended to add a capacitor C1 (4.7 µF Tantalum) and a resistor R1 (≤ 3 Ω) for noise suppression. In addition the capacitor is needed to prevent a pulse distortion when the power supply is not able to generate the peak currents or inductive wiring is used. A combination of a tantalum with a ceramics capacitor will be efficient to attenuate both, RF and LF if RF noise is present. The value is dependent on the power supply quality. A good choice is between 4.7 µF and 10 µF.

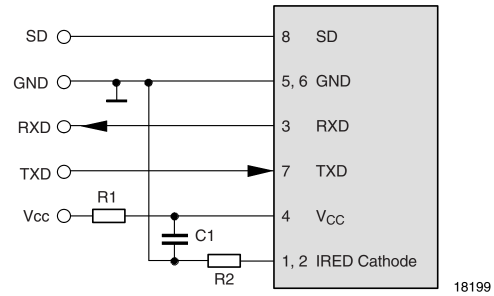
Shut down

To shut down the TFDU4203 into a standby mode the SD pin has to be set active.

Latency

The receiver is in specified conditions after the defined latency.
In a UART related application after that time after the last transmitted signal (IrDA specifies 500 µs maximum for low power applications and 10 ms maximum for standard) the receiver buffer of the UART must be cleared. Therefore the transceiver has to wait at least the specified latency after receiving the last bit before starting the transmission to be sure that the corresponding receiver is in a defined state.
For more application circuits, see IrDC design guide and TOIM4232 data sheet.

Recommended Circuit Diagram



Recommended Application Circuit Components

Component	Recommended value	Vishay part number
C1	4.7 µF, 16 V	293D 475X9 016B 2T
R1	5 Ω maximum	

Note:
This is a recommendation for a combination to start with to exclude power supply effects.
Optimum, from a costs point of view, to work without both.

Temperature Derating Diagram

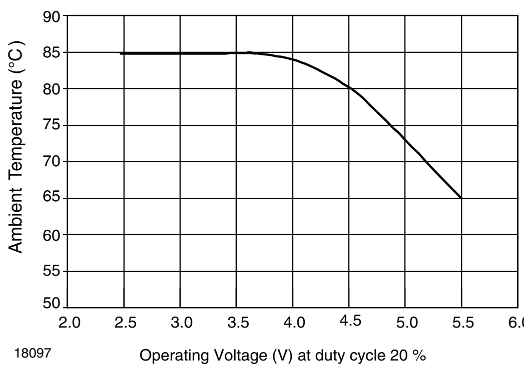


Figure 1. Temperature Derating Diagram

The temperature derating diagram shows the maximum operating temperature when the device is operated without external current limiting resistor. A power dissipating resistor of 2 Ω is recommended from the cathode of the IRED to Ground for supply voltages above 4 V. In that case the device can be operated up to 85 °C, too.

Recommended Solder Profiles

Solder Profile for Sn/Pb Soldering

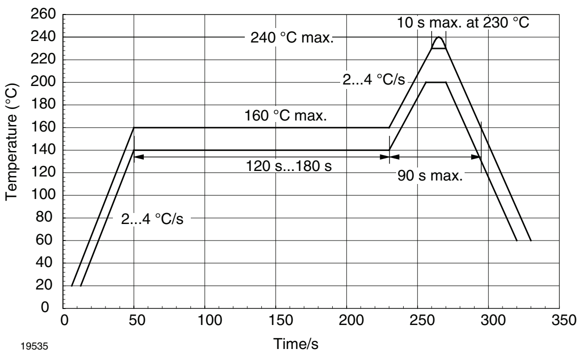


Figure 2. Recommended Solder Profile for Sn/Pb Soldering

Lead (Pb)-Free, Recommended Solder Profile

The TFDU4203 is a lead (Pb)-free transceiver and qualified for lead (Pb)-free processing. For lead (Pb)-free solder paste like Sn (3.0 - 4.0) Ag (0.5 - 0.9) Cu, there are two standard reflow profiles: Ramp-Soak-Spike (RSS) and Ramp-To-Spike (RTS). The Ramp-Soak-Spike profile was developed primarily for reflow ovens heated by infrared radiation. With widespread use of forced convection reflow ovens the Ramp-To-Spike profile is used increasingly. Shown below in figure 3 and 4 are VISHAY's recommended profiles for use with the TFDU4203 transceivers. For more details please refer to the application note "SMD Assembly Instructions" (http://www.vishay.com/docs/82602/82602.pdf).

A ramp-up rate less than 0.9 °C/s is not recommended. Ramp-up rates faster than 1.3 °C/s could damage an optical part because the thermal conductivity is less than compared to a standard IC.

Wave Soldering

For TFDUxxxx and TFBSxxxx transceiver devices wave soldering is not recommended.

Manual Soldering

Manual soldering is the standard method for lab use. However, for a production process it cannot be recommended because the risk of damage is highly dependent on the experience of the operator. Nevertheless, we added a chapter to the above mentioned application note, describing manual soldering and desoldering.

Storage

The storage and drying processes for all VISHAY transceivers (TFDUxxxx and TFBSxxx) are equivalent to MSL4.

The data for the drying procedure is given on labels on the packing and also in the application note "Taping, Labeling, Storage and Packing" (http://www.vishay.com/docs/82601/82601.pdf).

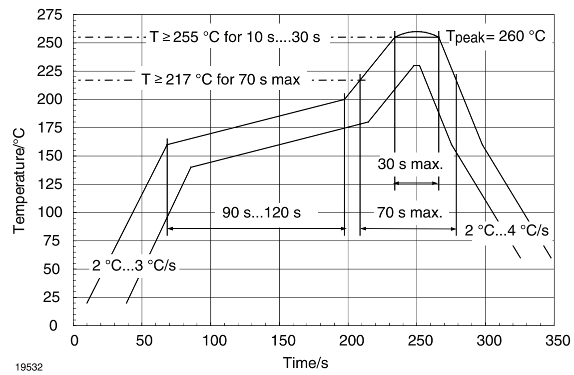


Figure 3. Solder Profile, RSS Recommendation

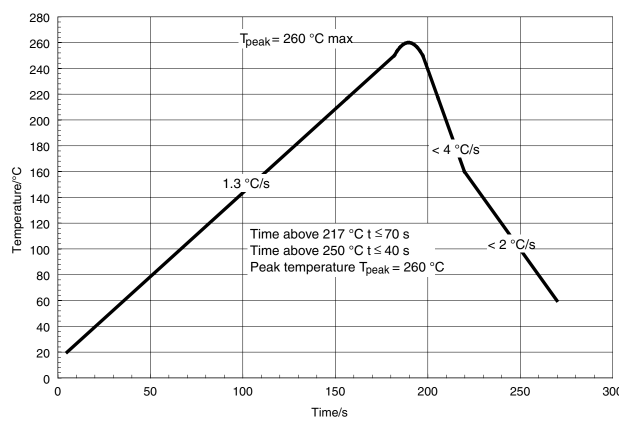
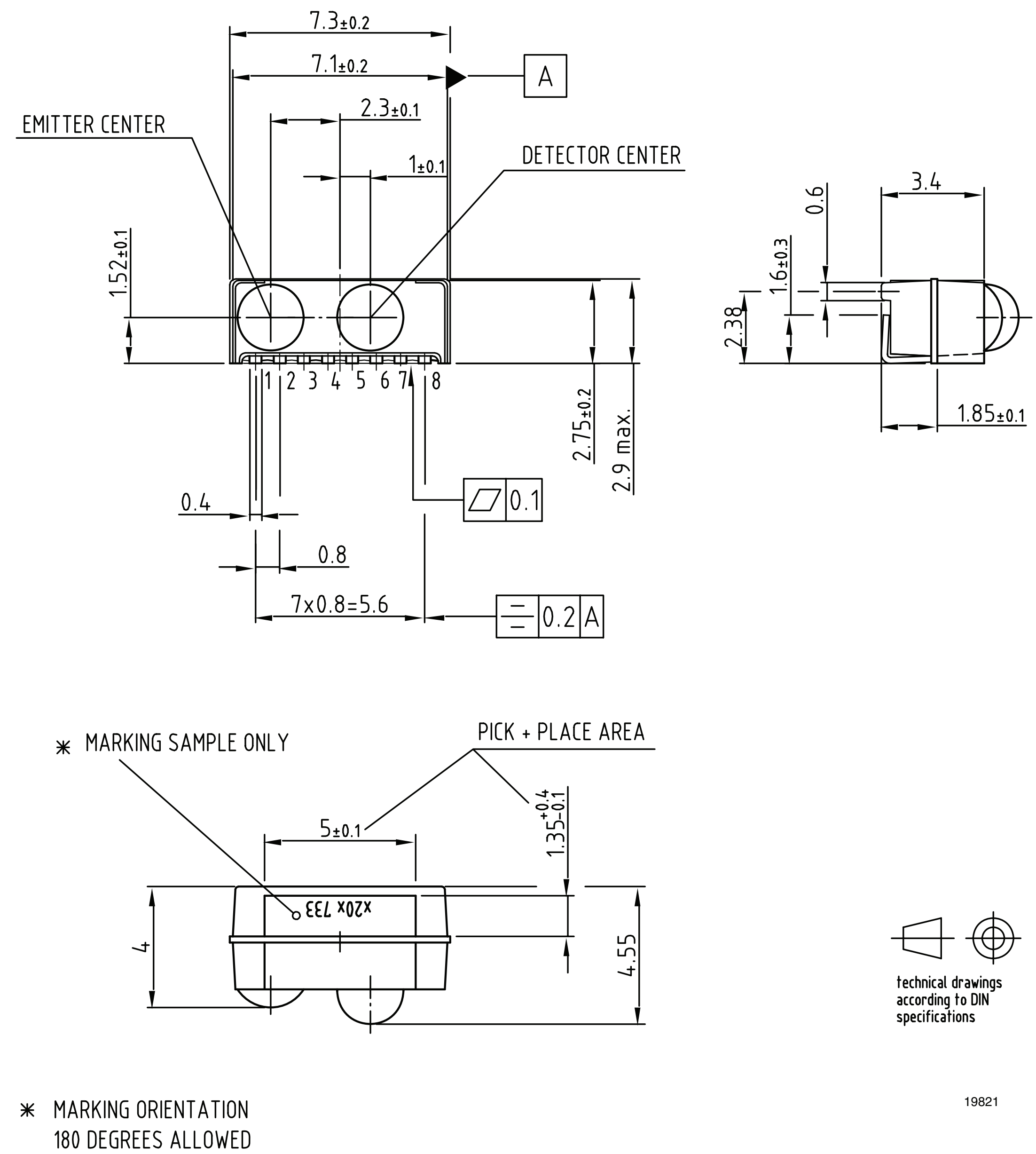


Figure 4. RTS Recommendation

Package Dimensions in mm



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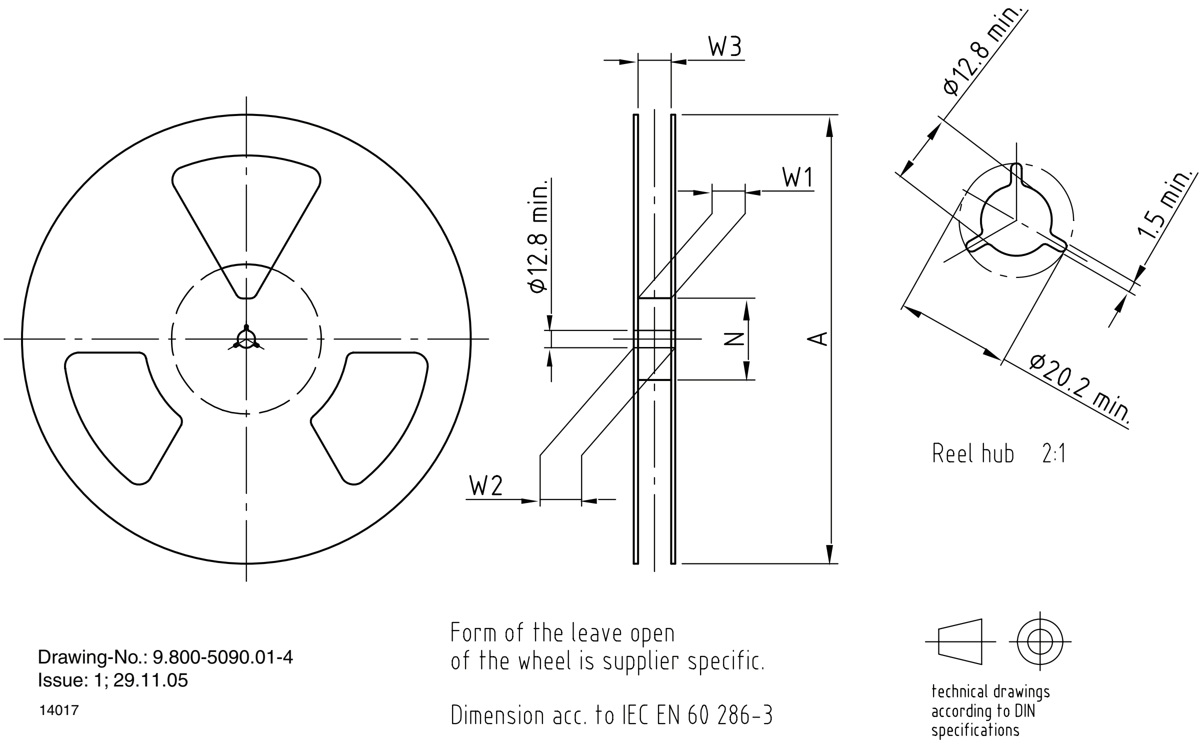
Issue: 5; 02.09.05

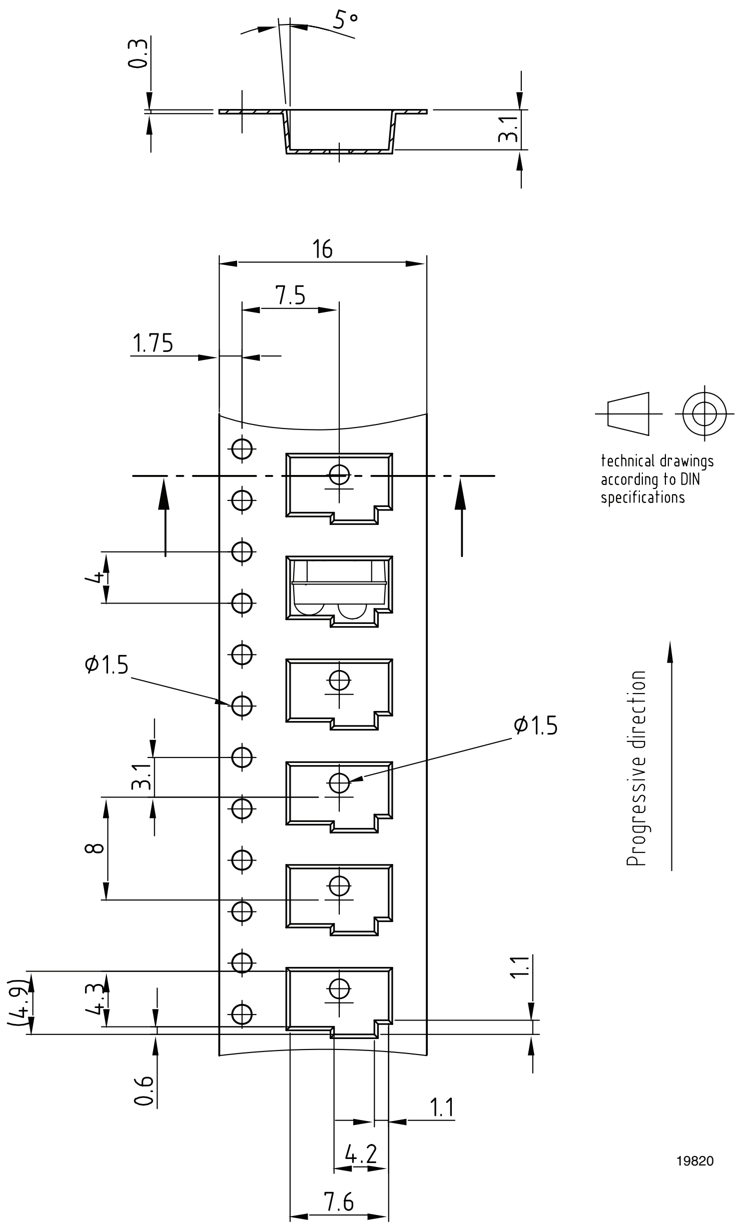
Figure 5. Package Drawing, TFDU4203

Reel Dimensions in mm



mm	mm	mm	mm	mm	mm	mm
Tape width	A max.	N	W_1 min.	W_2 max.	W_3 min.	W_3 max.
16	180	60	16.4	22.4	15.9	19.4
16	330	50	16.4	22.4	15.9	19.4

Tape Dimensions in mm



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Issue: 3; 03.09.99

Figure 6. Tape Drawing, TFDU4203 for Side View Mounting

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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.

Vishay Semiconductor GmbH, P.O.B. 3535, D-74025 Heilbronn, Germany

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