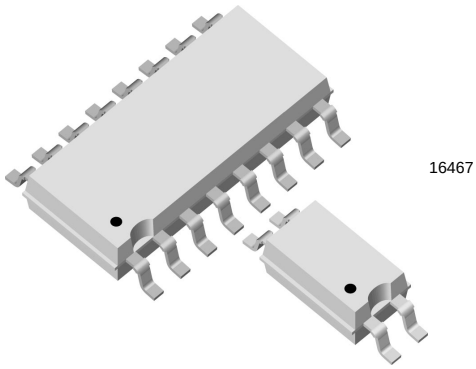
Optocoupler with Phototransistor Output

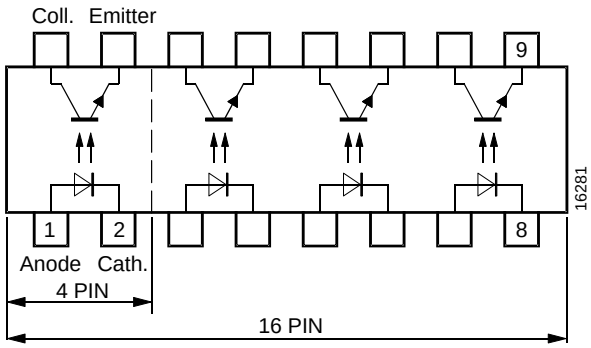
Description

The TCMT11.. Series consist of a phototransistor optically coupled to a gallium arsenide infrared-emitting diode in an 4- lead up to 16- lead plastic Miniflat package.
The elements are mounted on one leadframe using a **coplanar technique,** providing a fixed distance between input and output for highest safety requirements.



Applications

Programmable logic controllers, modems, answering machines, general applications



Features

- Low profile package (half pitch)
- AC Isolation test voltage V_{io} = 3.75 kV_{RMS}
- Low coupling capacitance of typical 0.3 pF
- **C**urrent **T**ransfer **R**atio (CTR) selected into groups
- Low temperature coefficient of CTR
- Wide ambient temperature range
- **U**nderwriters **L**aboratory (UL) 1577 recognized, file number E-76222
- **CSA** (C-UL) 1577 recognized
  file number E- 76222 - Double Protection
- Coupling System M

Order Instruction

Ordering Code	CTR Ranking	Remarks
TCMT1100	50 to 600%	4 Pin = Single channel
TCMT1101	40 to 80%	4 Pin = Single channel
TCMT1102	63 to 125%	4 Pin = Single channel
TCMT1103	100 to 200%	4 Pin = Single channel
TCMT1104	160 to 320%	4 Pin = Single channel
TCMT1105	50 to 150%	4 Pin = Single channel
TCMT1106	100 to 300%	4 Pin = Single channel
TCMT1107	80 to 160%	4 Pin = Single channel
TCMT1108	130 to 260%	4 Pin = Single channel
TCMT1109	200 to 400%	4 Pin = Single channel
TCMT4100	50 to 600%	16 Pin = Quad channel

Absolute Maximum Ratings

Input (Emitter)

Parameter	Test Conditions	Symbol	Value	Unit
Reverse voltage		V_R	6	V
Forward current		I_F	60	mA
Forward surge current	$t_p \leq 10$ µs	I_{FSM}	1.5	A
Power dissipation	$T_{amb} \leq 25$°C	P_V	100	mW
Junction temperature		T_j	125	°C

Output (Detector)

Parameter	Test Conditions	Symbol	Value	Unit
Collector emitter voltage		V_{CEO}	70	V
Emitter collector voltage		V_{ECO}	7	V
Collector current		I_C	50	mA
Peak collector current	$t_p/T = 0.5$, $t_p \leq 10$ ms	I_{CM}	100	mA
Power dissipation	$T_{amb} \leq 25$°C	P_V	150	mW
Junction temperature		T_j	125	°C

Coupler

Parameter	Test Conditions	Symbol	Value	Unit
AC isolation test voltage (RMS)		V_{IO} [1)]	3.75	kV
Total power dissipation	$T_{amb} \leq 25$°C	P_{tot}	250	mW
Operating ambient temperature range		T_{amb}	–40 to +100	°C
Storage temperature range		T_{stg}	–40 to +100	°C
Soldering temperature		T_{sd}	235	°C

1) Related to standard climate 23/50 DIN 50014

Electrical Characteristics (T_{amb} = 25°C)

Input (Emitter)

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Forward voltage	I_F = 50 mA	V_F		1.25	1.6	V
Junction capacitance	V_R = 0 V, f = 1 MHz	C_j		50		pF

Output (Detector)

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Collector emitter voltage	I_C = 100 µA	V_{CEO}	70			V
Emitter collector voltage	I_E = 100 µA	V_{ECO}	7			V
Collector dark current	V_{CE} = 20 V, I_F = 0, E = 0	I_{CEO}			100	nA

Coupler

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Collector emitter saturation voltage	I_F = 10 mA, I_C = 1 mA	V_{CEsat}			0.3	V
Cut-off frequency	I_F = 10 mA, V_{CE} = 5 V, R_L = 100 Ω	f_c		100		kHz
Coupling capacitance	f = 1 MHz	C_k		0.3		pF

Current Transfer Ratio (CTR)

Parameter	Test Conditions	Type	Symbol	Min.	Typ.	Max.	Unit
I_C/I_F	V_{CE} = 5 V, I_F = 5 mA	TCMT1100	CTR	0.5		6.0	
	V_{CE} = 5 V, I_F = 10 mA	TCMT1101	CTR	0.4		0.8	
	V_{CE} = 5 V, I_F = 10 mA	TCMT1102	CTR	0.63		1.25	
	V_{CE} = 5 V, I_F = 10 mA	TCMT1103	CTR	1.0		2.0	
	V_{CE} = 5 V, I_F = 10 mA	TCMT1104	CTR	1.6		3.2	
	V_{CE} = 5 V, I_F = 5 mA	TCMT1105	CTR	0.5		1.5	
	V_{CE} = 5 V, I_F = 5 mA	TCMT1106	CTR	1.0		3.0	
	V_{CE} = 5 V, I_F = 5 mA	TCMT1107	CTR	0.8		1.6	
	V_{CE} = 5 V, I_F = 5 mA	TCMT1108	CTR	1.3		2.6	
	V_{CE} = 5 V, I_F = 5 mA	TCMT1109	CTR	2.0		4.0	
	V_{CE} = 5 V, I_F = 5 mA	TCMT4100	CTR	0.5		6.0	

Switching Characteristics

Parameter	Test Conditions	Symbol	Typ.	Unit
Delay time	V_S = 5 V, I_C = 2 mA, R_L = 100 Ω (see figure 1)	t_d	3.0	µs
Rise time		t_r	3.0	µs
Fall time		t_f	4.7	µs
Storage time		t_s	0.3	µs
Turn-on time		t_{on}	6.0	µs
Turn-off time		t_{off}	5.0	µs
Turn-on time	V_S = 5 V, I_F = 10 mA, R_L = 1 kΩ (see figure 2)	t_{on}	9.0	µs
Turn-off time		t_{off}	18.0	µs

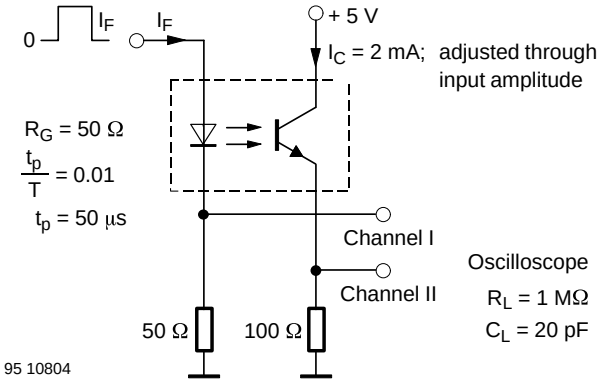


Figure 1. Test circuit, non-saturated operation

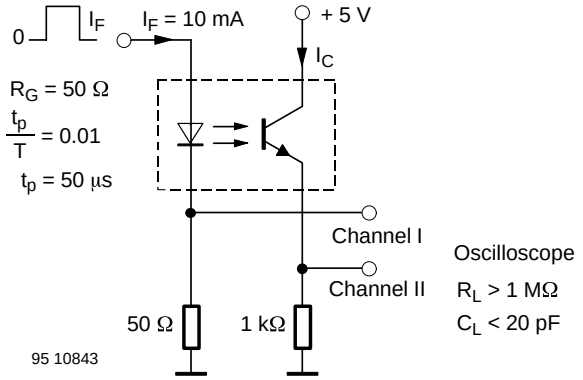
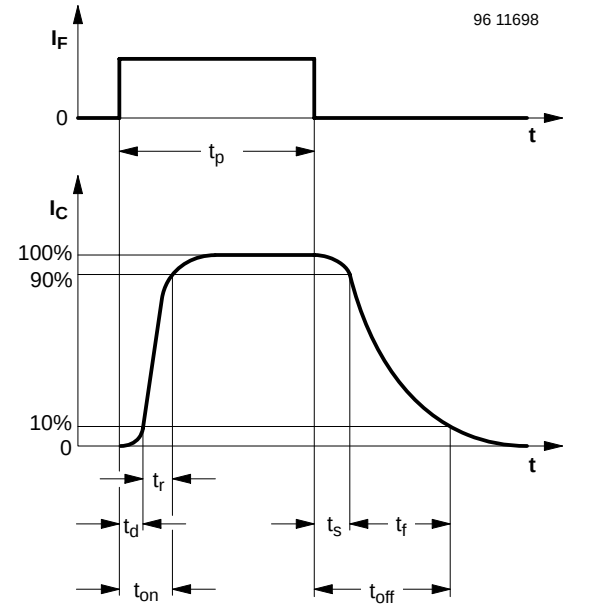


Figure 2. Test circuit, saturated operation



t_p	pulse duration	t_s	storage time
t_d	delay time	t_f	fall time
t_r	rise time	t_{off} (= t_s + t_f)	turn-off time
t_{on} (= t_d + t_r)	turn-on time		

Figure 3. Switching times

Typical Characteristics (T_{amb} = 25°C, unless otherwise specified)

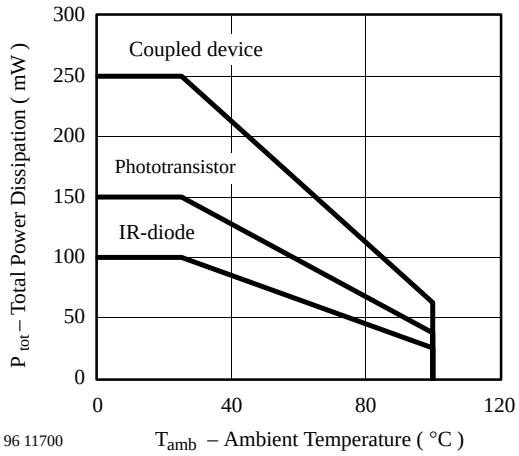


Figure 4. Total Power Dissipation vs. Ambient Temperature

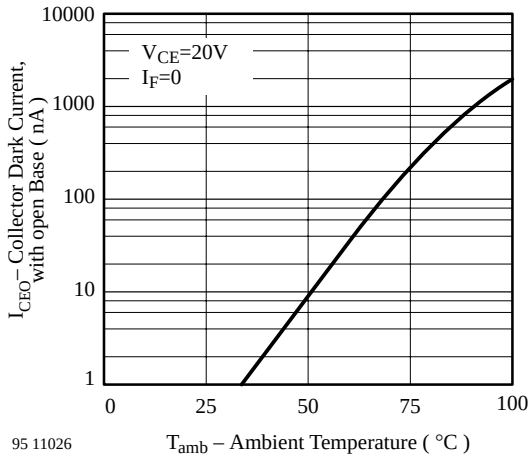


Figure 7. Collector Dark Current vs. Ambient Temperature

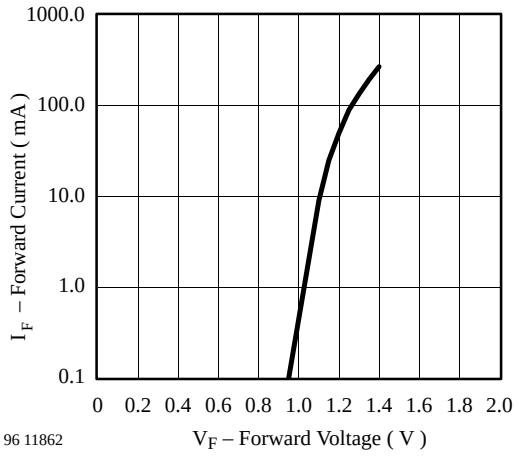


Figure 5. Forward Current vs. Forward Voltage

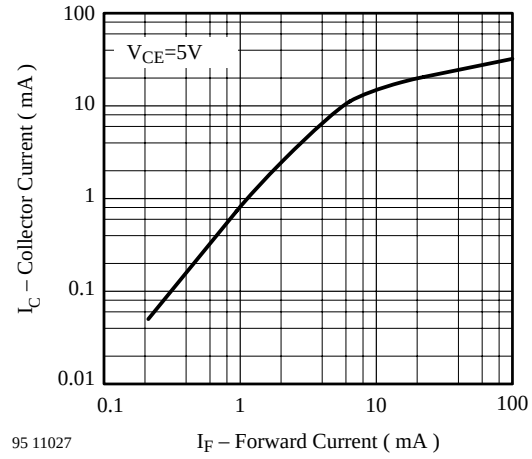


Figure 8. Collector Current vs. Forward Current

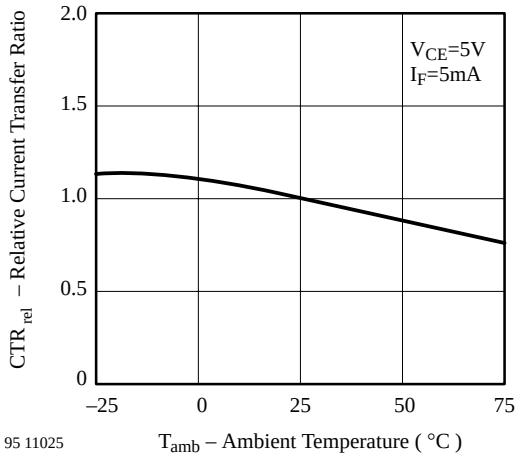


Figure 6. Relative Current Transfer Ratio vs. Ambient Temperature

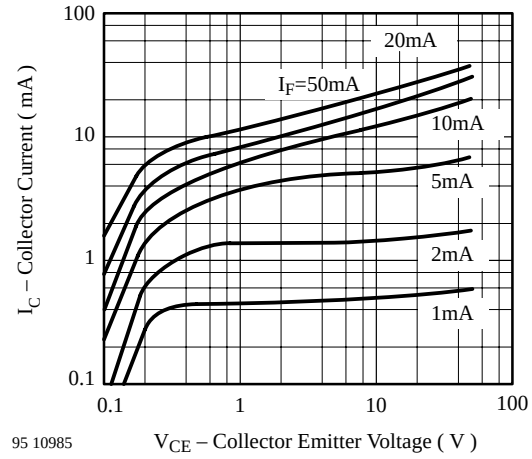


Figure 9. Collector Current vs. Collector Emitter Voltage

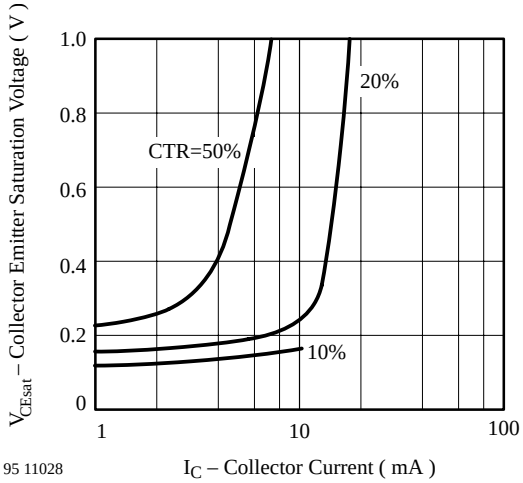


Figure 10. Collector Emitter Saturation Voltage vs. Collector Current

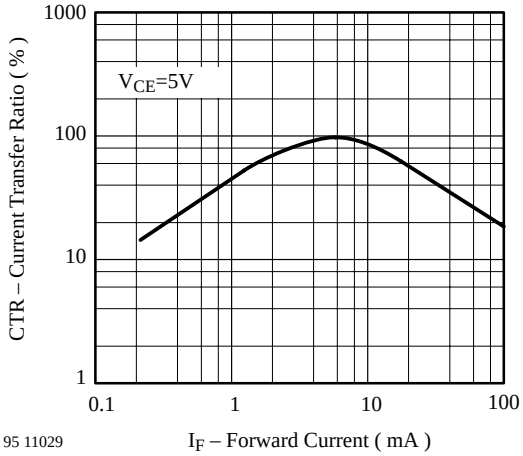


Figure 11. Current Transfer Ratio vs. Forward Current

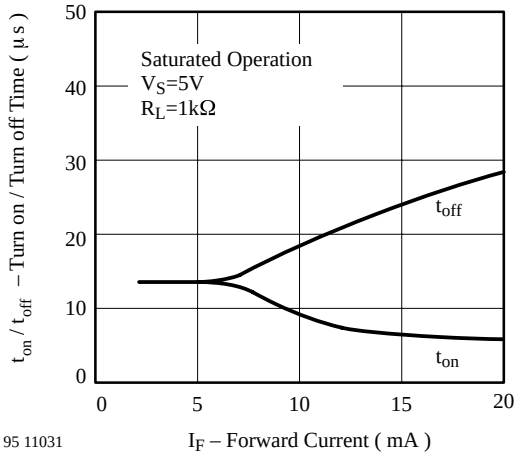


Figure 12. Turn on / off Time vs. Forward Current

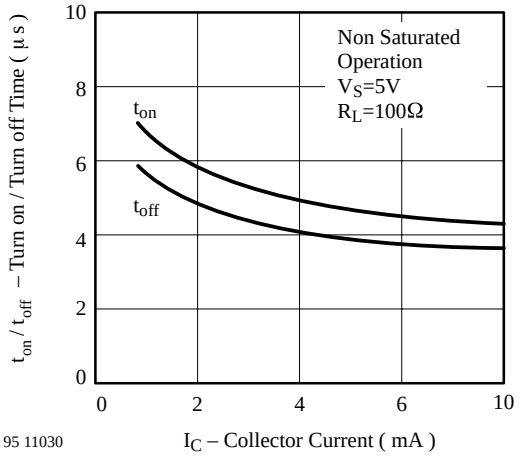


Figure 13. Turn on / off Time vs. Collector Current

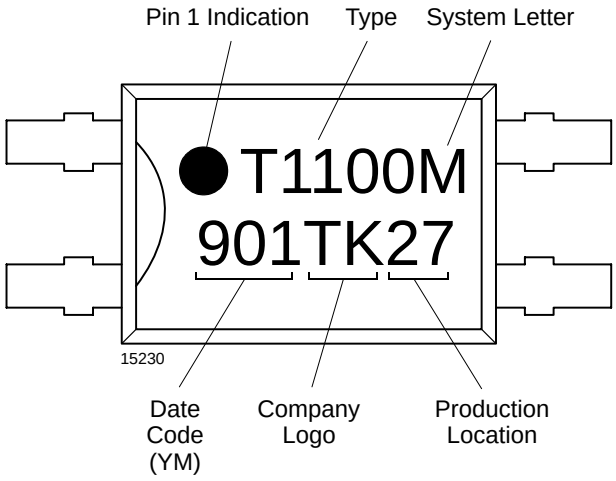
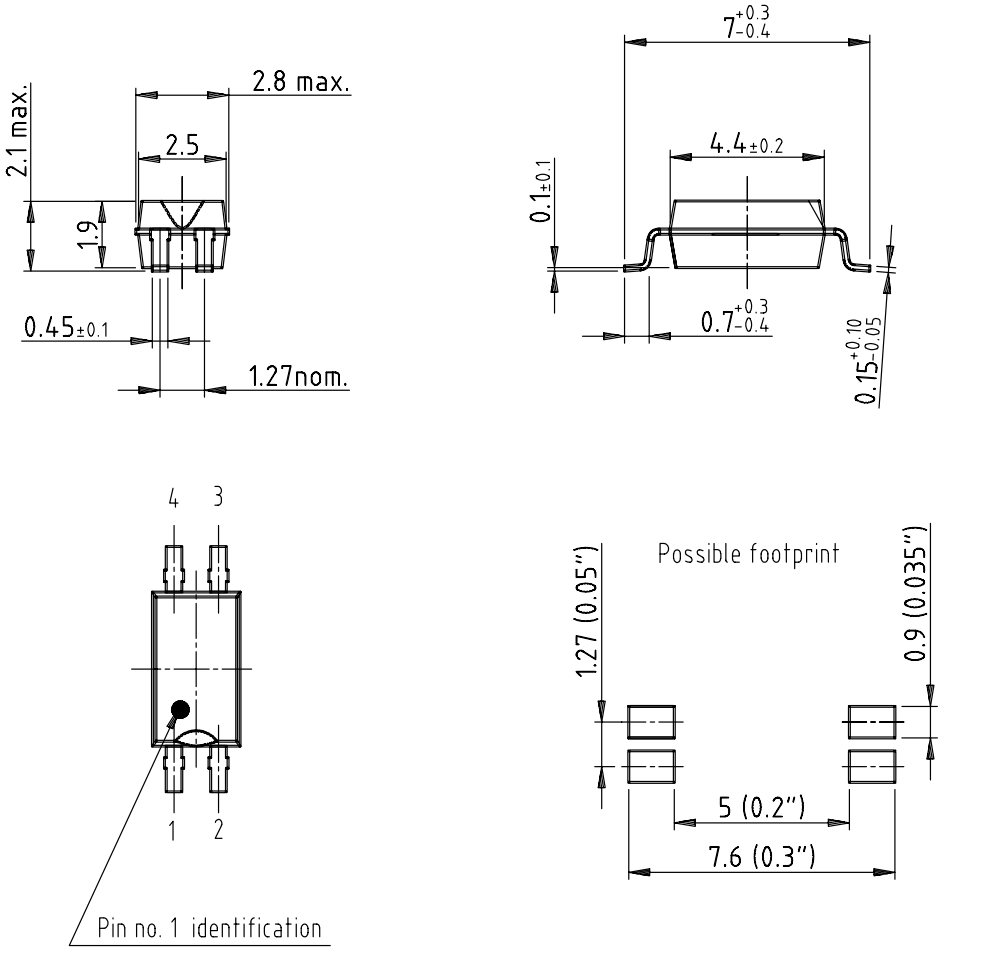
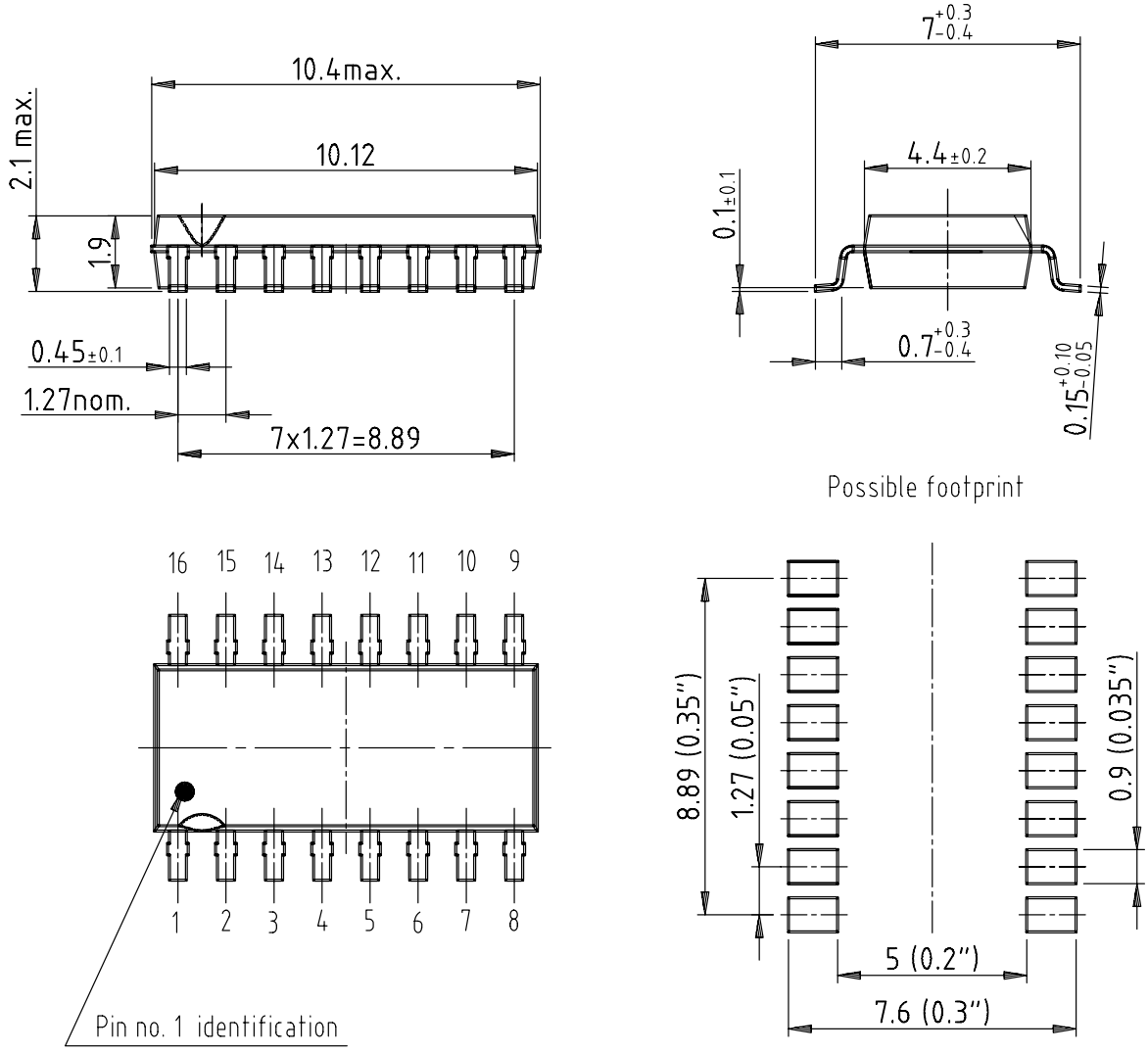


Figure 14. Marking example

Dimensions of TCMT1... in mm



Dimensions of TCMT4... in mm

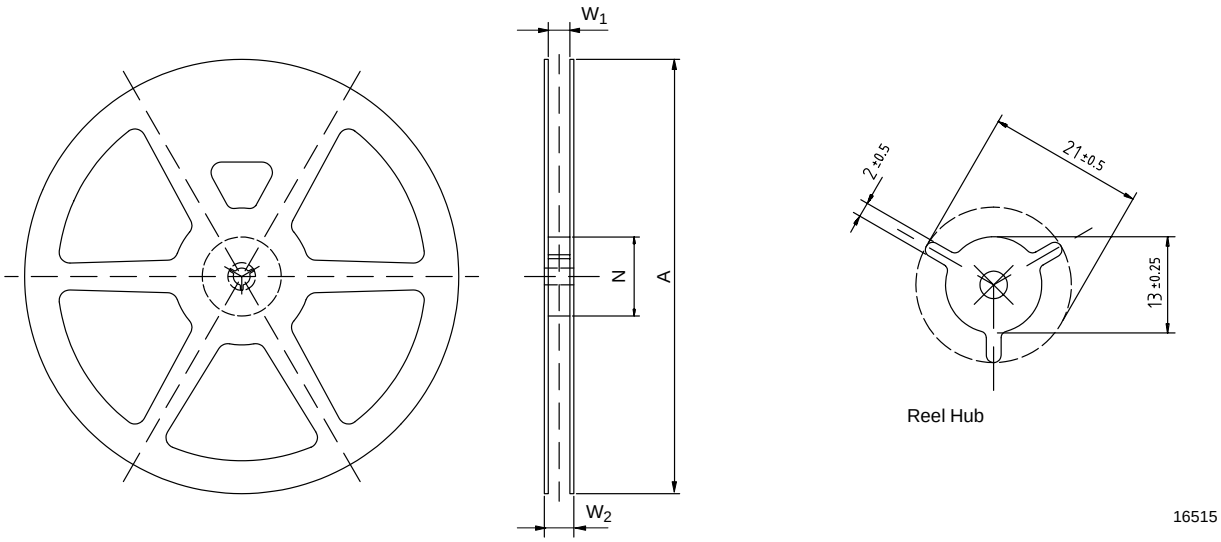


Drawing-No.: 6.544-5330.03-4
Issue: 1; 04.04.00

technical drawings
according to DIN
specifications

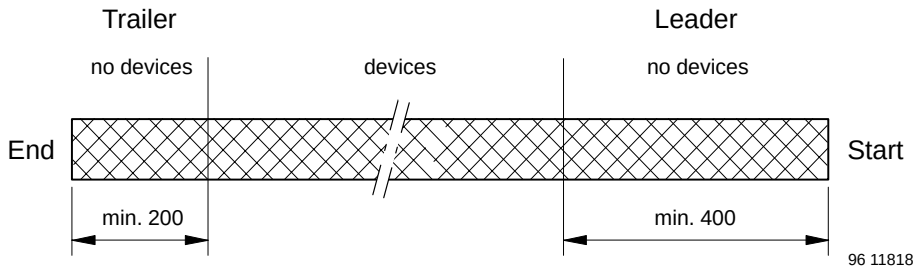
15226

Dimensions of Reel in mm

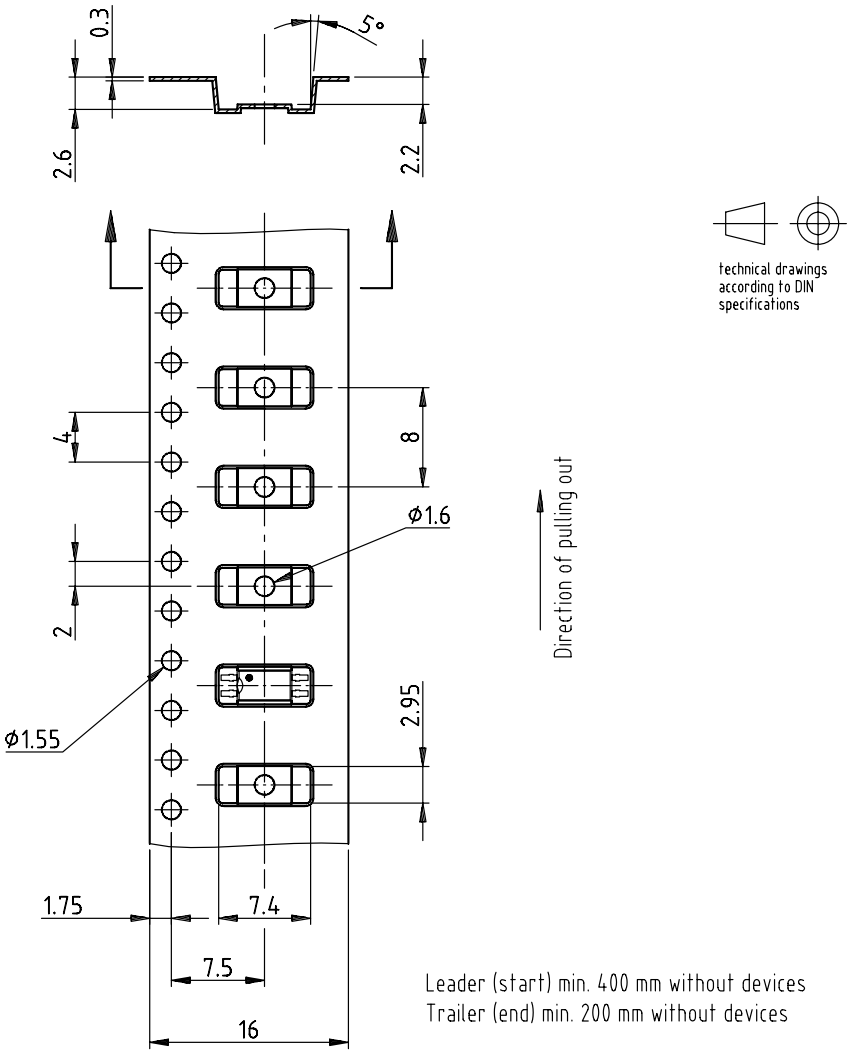


Version	Tape Width	A	N	W_1	$W_{2\ max}$
G	16	330 ± 1	100 ± 1.5	16.4 + 2	22.4

Dimensions of Leader and Trailer in mm



Dimensions of Tape in mm



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Issue: 1; 22.11.00

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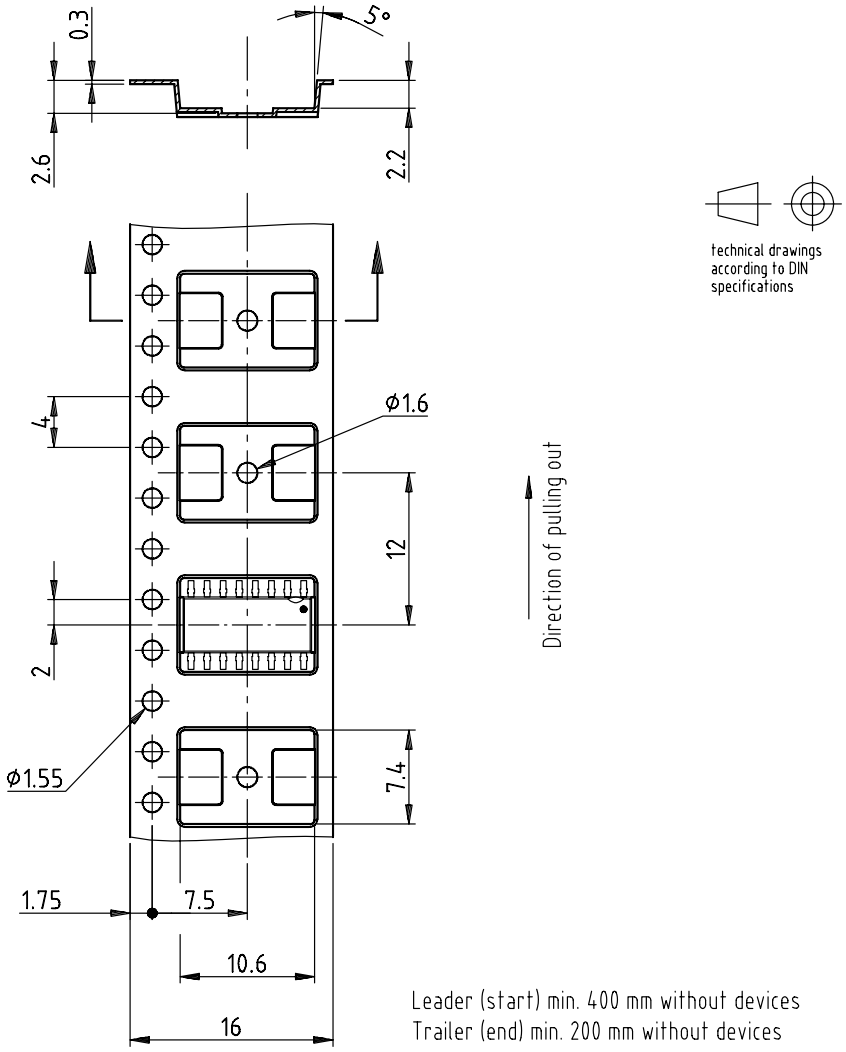
Dimensions of Tape in mm



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Issue: 1; 22.11.00

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Ozone Depleting Substances Policy Statement

It is the policy of **Vishay Semiconductor GmbH** to

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.

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