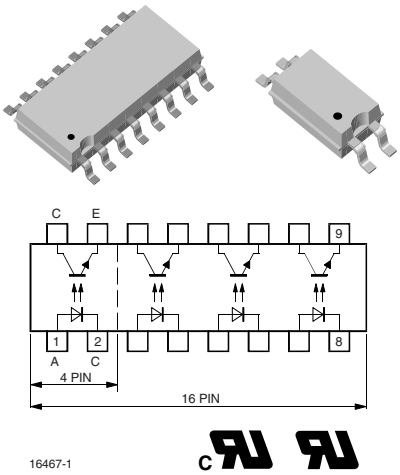
Optocoupler, Phototransistor Output, Single/Quad Channel, Half Pitch Mini-Flat Package



FEATURES

- Low profile package (half pitch)
- AC isolation test voltage 3750 V_{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
- Lead (Pb)-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC

Pb-free

e3

RoHS COMPLIANT

AGENCY APPROVALS

- UL1577, file no. E76222 system code M, double protection
- C-UL CSA 22.2 bulletin 5A, double protection
- DIN EN 60747-5-2 (VDE 0884)
  DIN EN 60747-5-5 pending

APPLICATIONS

- Programmable logic controllers
- Modems
- Answering machines
- General applications

DESCRIPTION

The TCMT1100 series consist of a phototransistor optically coupled to a gallium arsenide infrared-emitting diode in an 4-pin (single channel) up to 16-pin (quad channel) package.

The elements are mounted on one leadframe providing a fixed distance between input and output for highest safety requirements.

ORDER INFORMATION	
PART	**REMARKS**
TCMT1100	CTR 50 to 600 %, SOP-4
TCMT1102	CTR 63 to 125 %, SOP-4
TCMT1103	CTR 100 to 200 %, SOP-4
TCMT1104	CTR 160 to 320 %, SOP-4
TCMT1105	CTR 50 to 150 %, SOP-4
TCMT1106	CTR 100 to 300 %, SOP-4
TCMT1107	CTR 80 to 160 %, SOP-4
TCMT1108	CTR 130 to 260 %, SOP-4
TCMT1109	CTR 200 to 400 %, SOP-4
TCMT4100	CTR 50 to 600 %, quad channel, SOP-16
TCMT4106	CTR 100 to 300 %, quad channel, SOP-16

ABSOLUTE MAXIMUM RATINGS (1)

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
INPUT				
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		P_{diss}	100	mW
Junction temperature		T_j	125	°C
OUTPUT				
Collector emitter voltage		V_{CEO}	70	V
Emitter collector voltage		V_{ECO}	7	V
Collector current		I_C	50	mA
Collector peak current	$t_P/T = 0.5$, $t_P \leq 10$ ms	I_{CM}	100	mA
Power dissipation		P_{diss}	150	mW
Junction temperature		T_j	125	°C
COUPLER				
AC isolation test voltage (RMS)	Related to standard climate 23/50 DIN 50014	V_{ISO}	3750	V_{RMS}
Total power dissipation		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 (2)		T_{sld}	260	°C

Notes

(1) T_{amb} = 25 °C, unless otherwise specified.
Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of this document. Exposure to absolute maximum ratings for extended periods of the time can adversely affect reliability.

(2) Refer to reflow profile soldering conditions for surface mounted devices.

ELECTRICAL CHARACTERISTICS

PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
INPUT						
Forward voltage	I_F = 50 mA	V_F		1.25	1.6	V
Junction capacitance	V_R = 0, f = 1 MHz	C_j		50		pF
OUTPUT						
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						
Collector emitter saturation voltage	I_F = 10 mA, I_C = 1 mA	V_{CEsat}			0.3	V
Cut-off frequency	V_{CE} = 5 V, I_F = 10 mA, R_L = 100 Ω	f_c		100		kHz
Coupling capacitance	f = 1 MHz	C_k		0.3		pF

Note

T_{amb} = 25 °C, unless otherwise specified.
Minimum and maximum values are testing requirements. Typical values are characteristics of the device and are the result of engineering evaluation. Typical values are for information only and are not part of the testing requirements.

CURRENT TRANSFER RATIO							
PARAMETER	**TEST CONDITION**	**PART**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
I_C/I_F	V_{CE} = 5 V, I_F = 5 mA	TCMT1100	CTR	50		600	%
	V_{CE} = 5 V, I_F = 10 mA	TCMT1102	CTR	63		125	%
		TCMT1103	CTR	100		200	%
		TCMT1104	CTR	160		320	%
	V_{CE} = 5 V, I_F = 5 mA	TCMT1105	CTR	50		150	%
		TCMT1106	CTR	100		300	%
		TCMT1107	CTR	80		160	%
		TCMT1108	CTR	130		260	%
		TCMT1109	CTR	200		400	%
		TCMT4100	CTR	50		600	%
		TCMT4106	CTR	100		300	%

SWITCHING CHARACTERISTICS						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Delay time	V_S = 5 V, I_C = 2 mA, R_L = 100 Ω, (see figure 1)	t_d		3		µs
Rise time	V_S = 5 V, I_C = 2 mA, R_L = 100 Ω, (see figure 1)	t_r		3		µs
Fall time	V_S = 5 V, I_C = 2 mA, R_L = 100 Ω, (see figure 1)	t_f		4.7		µs
Storage time	V_S = 5 V, I_C = 2 mA, R_L = 100 Ω, (see figure 1)	t_s		0		µs
Turn-on time	V_S = 5 V, I_C = 2 mA, R_L = 100 Ω, (see figure 1)	t_{on}		6		µs
Turn-off time	V_S = 5 V, I_C = 2 mA, R_L = 100 Ω, (see figure 1)	t_{off}		5		µs
Turn-on time	V_S = 5 V, I_F = 10 mA, R_L = 1 kΩ, (see figure 2)	t_{on}		9		µs
Turn-off time	V_S = 5 V, I_F = 10 mA, R_L = 1 kΩ, (see figure 2)	t_{off}		18		µs

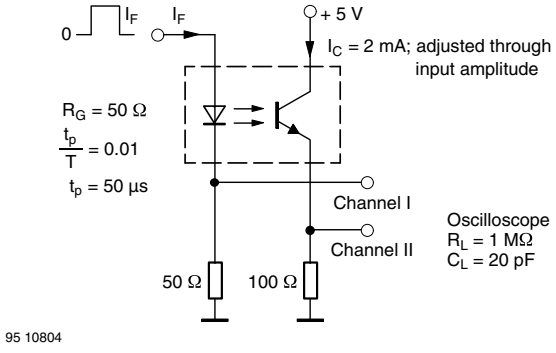


Fig. 1 - Test Circuit, Non-Saturated Operation

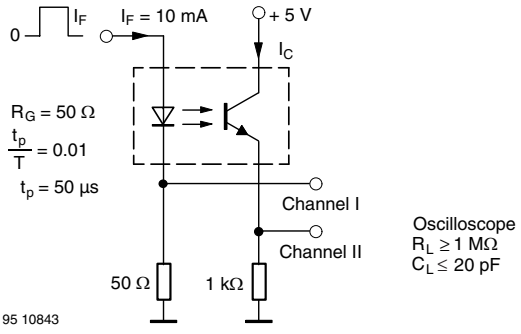


Fig. 2 - Test Circuit, Saturated Operation

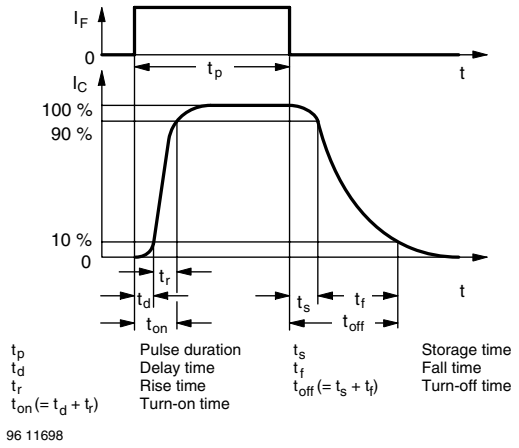


Fig. 3 - Switching Times

SAFETY AND INSULATION RATINGS						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Climatic classification	IEC 68 part 1			40/110/21		
Comparative tracking index		CTI	175		399	
V_{IOTM}			6000			V
V_{IORM}			707			V
P_{SO}					265	mW
I_{SI}					130	mA
T_{SI}					150	°C
Creepage distance			5			mm
Clearance distance			5			mm
Insulation thickness, reinforced rated	per IEC60950 2.10.5.1		0.4			mm

Note

As per IEC 60747-5-2, § 7.4.3.8.1, this optocoupler is suitable for "safe electrical insulation" only within the safety ratings. Compliance with the safety ratings shall be ensured by means of protective circuits.

TYPICAL CHARACTERISTICS

T_{amb} = 25 °C, unless otherwise specified

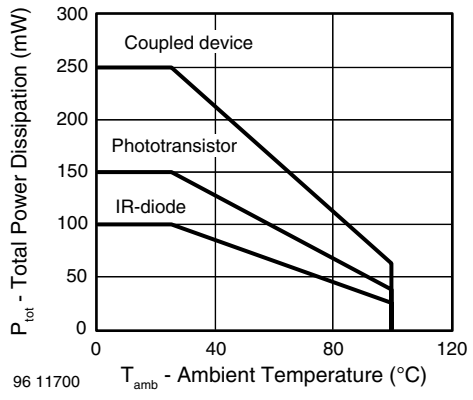


Fig. 4 - Total Power Dissipation vs. Ambient Temperature

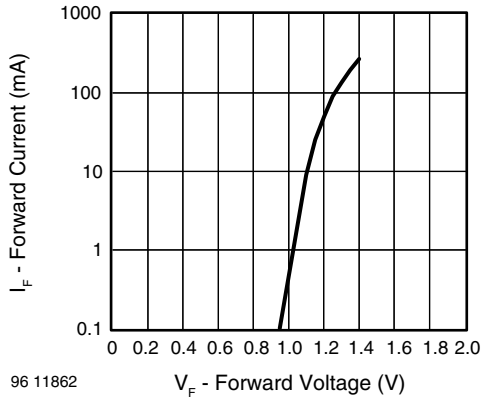


Fig. 5 - Forward Current vs. Forward Voltage

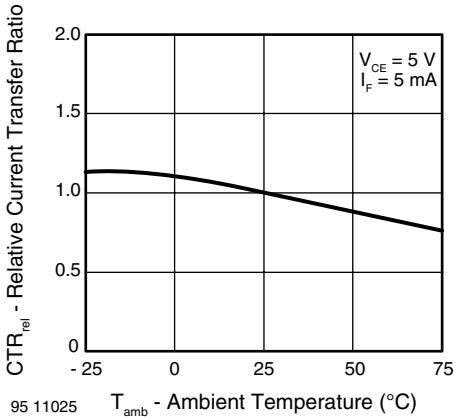


Fig. 6 - Relative Current Transfer Ratio vs. Ambient Temperature

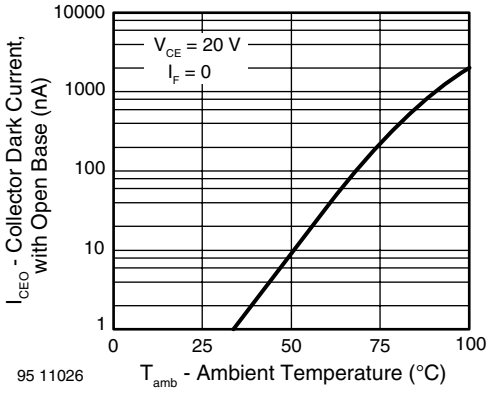


Fig. 7 - Collector Dark Current vs. Ambient Temperature

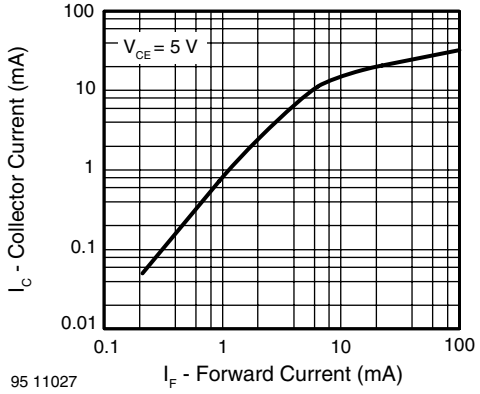


Fig. 8 - Collector Current vs. Forward Current

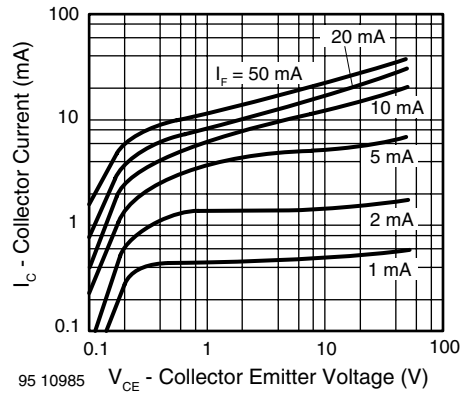


Fig. 9 - Collector Current vs. Collector Emitter Voltage

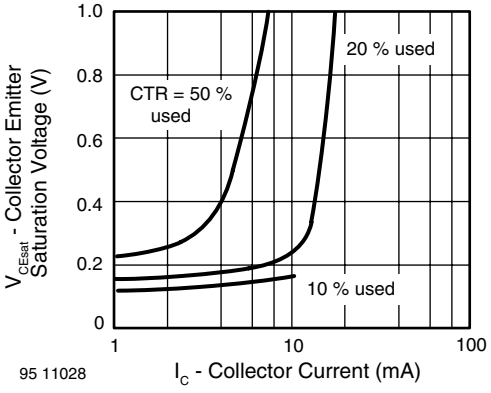


Fig. 10 - Collector Emitter Saturation Voltage vs. Collector Current

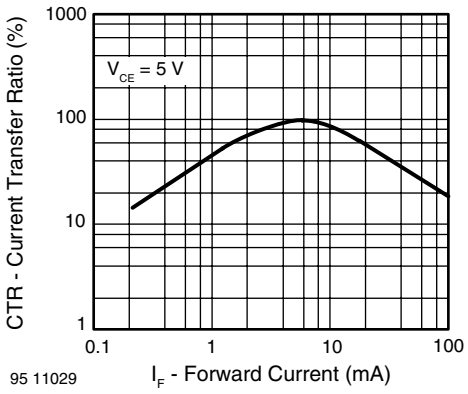


Fig. 11 - Current Transfer Ratio vs. Forward Current

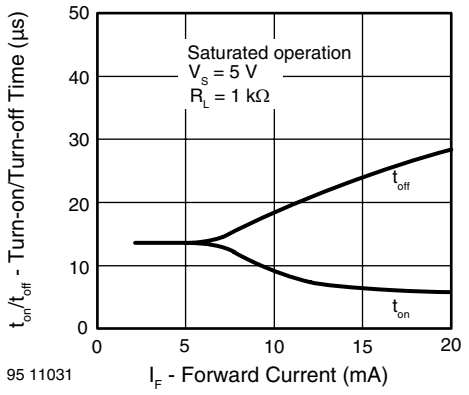


Fig. 12 - Turm-on/off Time vs. Forward Current

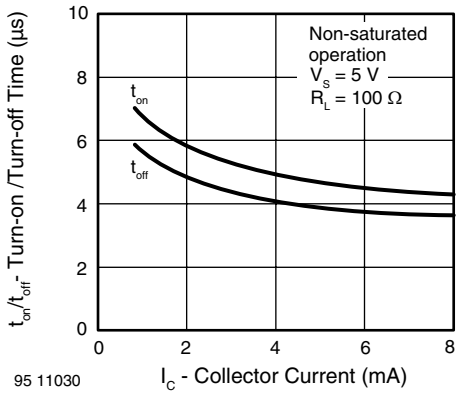
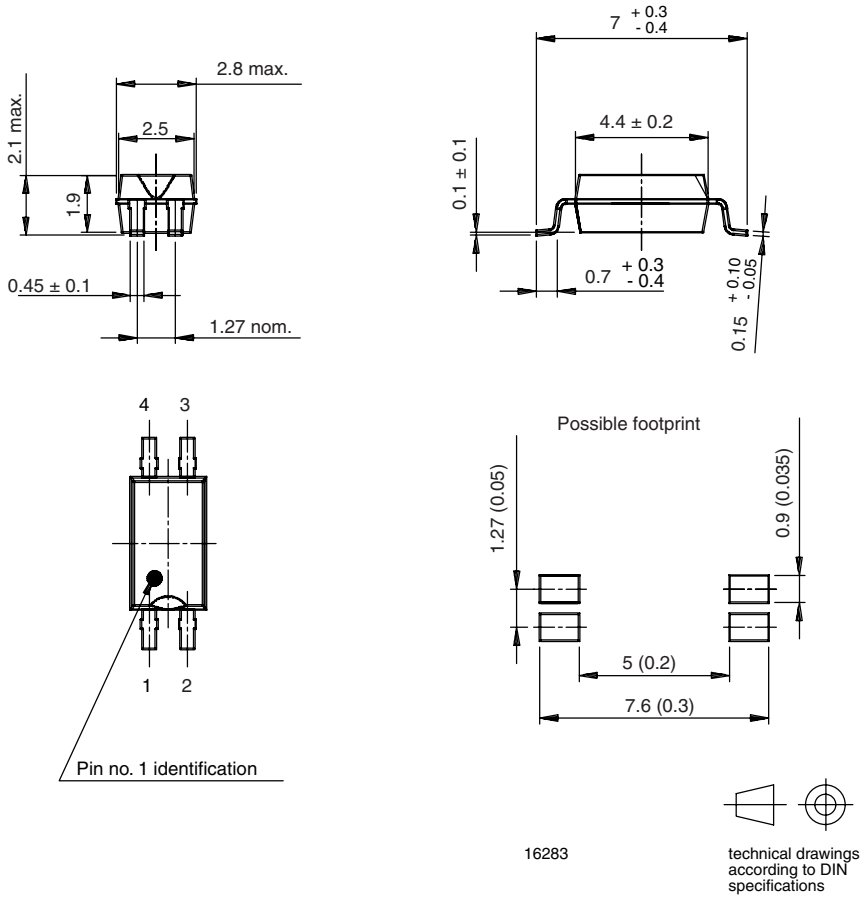
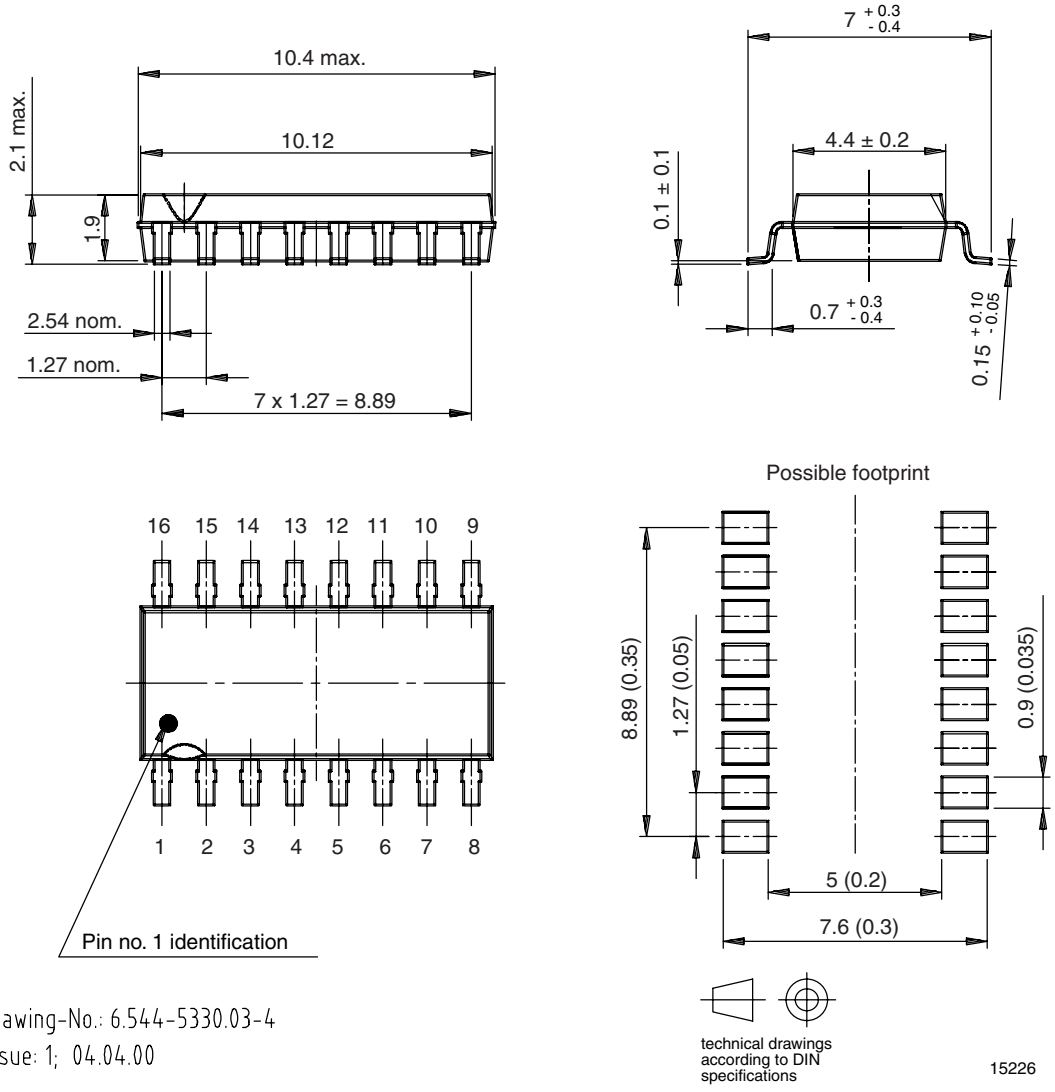


Fig. 13 - Turn-on/off Time vs. Collector Current

PACKAGE DIMENSIONS in inches (millimeters)





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

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.

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

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