

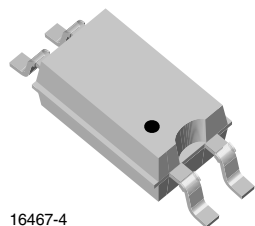


# THE DATASHEET OF TCMT1112

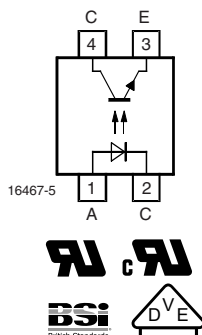




# Optocoupler, Phototransistor Output, Single Channel, Half Pitch Mini-Flat Package



16467-4



## FEATURES

- Low profile package (half pitch)
- AC isolation test voltage 3750 V<sub>RMS</sub>
- Low coupling capacitance of typical 0.3 pF
- Current transfer ratio (CTR) selected into groups
- Low temperature coefficient of CTR
- Wide ambient temperature range
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



RoHS COMPLIANT

## AGENCY APPROVALS

- UL1577, file no. E76222 system code M
- cUL CSA22.2 bulletin 5A
- DIN EN 60747-5-2 (VDE 0884)
- BSI EN 60065:2002, EN 60950:2000 certificate 8986/8987

## APPLICATIONS

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

## DESCRIPTION

The TCMT111X series consist of a phototransistor optically coupled to a gallium arsenide infrared-emitting diode in a 4 pin package.

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

ORDERING INFORMATION										
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px 5px;">T</div> <div style="border: 1px solid black; padding: 2px 5px;">C</div> <div style="border: 1px solid black; padding: 2px 5px;">M</div> <div style="border: 1px solid black; padding: 2px 5px;">T</div> <div style="border: 1px solid black; padding: 2px 5px;">1</div> <div style="border: 1px solid black; padding: 2px 5px;">1</div> <div style="border: 1px solid black; padding: 2px 5px;">1</div> <div style="border: 1px solid black; padding: 2px 5px;">#</div> </div> <p style="text-align: center; margin-top: 5px;">PART NUMBER</p>										
AGENCY CERTIFIED/ PACKAGE	CTR (%)									
	5 mA		10 mA				5 mA			
UL, cUL, BSI, VDE	50 to 600	40 to 80	63 to 125	100 to 200	160 to 320	50 to 150	100 to 300	80 to 160	130 to 260	200 to 400
SOP-4	TCMT1110	TCMT1111	TCMT1112	TCMT1113	TCMT1114	TCMT1115	TCMT1116	TCMT1117	TCMT1118	TCMT1119

ABSOLUTE MAXIMUM RATINGS (T <sub>amb</sub> = 25 °C, unless otherwise specified)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
<b>INPUT</b>				
Reverse voltage		V <sub>R</sub>	6	V
Forward current		I <sub>F</sub>	50	mA
Forward surge current	t <sub>p</sub> ≤ 10 μs	I <sub>FSM</sub>	1.5	A
Power dissipation		P <sub>diss</sub>	80	mW
Junction temperature		T <sub>j</sub>	125	°C



ABSOLUTE MAXIMUM RATINGS (T <sub>amb</sub> = 25 °C, unless otherwise specified)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
<b>OUTPUT</b>				
Collector emitter voltage		V <sub>CEO</sub>	70	V
Emitter collector voltage		V <sub>ECO</sub>	7	V
Collector current		I <sub>C</sub>	50	mA
Collector peak current	t <sub>p</sub> /T = 0.5, t <sub>p</sub> ≤ 10 ms	I <sub>CM</sub>	100	mA
Power dissipation		P <sub>diss</sub>	150	mW
Junction temperature		T <sub>j</sub>	125	°C
<b>COUPLER</b>				
AC isolation test voltage (RMS)	Related to standard climate 23/50 DIN 50014	V <sub>ISO</sub>	3750	V <sub>RMS</sub>
Total power dissipation		P <sub>tot</sub>	230	mW
Operating ambient temperature range		T <sub>amb</sub>	- 40 to + 110	°C
Storage temperature range		T <sub>stg</sub>	- 40 to + 125	°C
Soldering temperature <sup>(1)</sup>		T <sub>slid</sub>	260	°C

**Notes**

- 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.
- <sup>(1)</sup> Wave soldering three cycles are allowed. Also refer to “Assembly Instructions” ([www.vishay.com/doc?80054](http://www.vishay.com/doc?80054)).

ELECTRICAL CHARACTERISTICS (T <sub>amb</sub> = 25 °C, unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>INPUT</b>						
Forward voltage	I <sub>F</sub> = 5 mA	V <sub>F</sub>		1.15	1.4	V
Junction capacitance	V <sub>R</sub> = 0, f = 1 MHz	C <sub>j</sub>		50		pF
<b>OUTPUT</b>						
Collector emitter voltage	I <sub>C</sub> = 100 μA	V <sub>CEO</sub>	70			V
Emitter collector voltage	I <sub>E</sub> = 100 μA	V <sub>ECO</sub>	7			V
Collector dark current	V <sub>CE</sub> = 20 V, I <sub>F</sub> = 0	I <sub>CEO</sub>			100	nA
<b>COUPLER</b>						
Collector emitter saturation voltage	I <sub>F</sub> = 10 mA, I <sub>C</sub> = 1 mA	V <sub>CEsat</sub>		0.1	0.3	V
Cut-off frequency	V <sub>CE</sub> = 5 V, I <sub>F</sub> = 10 mA, R <sub>L</sub> = 100 Ω	f <sub>c</sub>		100		kHz
Coupling capacitance	f = 1 MHz	C <sub>k</sub>		0.3		pF

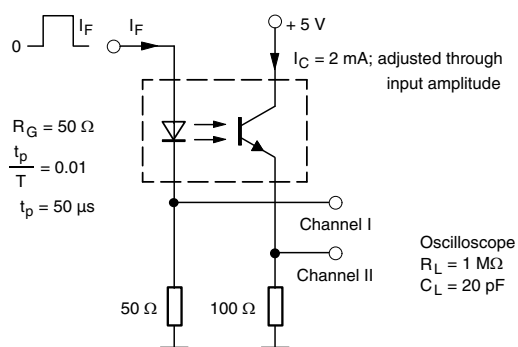
**Note**

- 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.

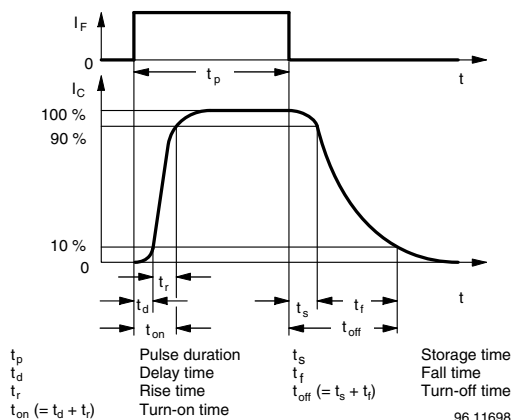
CURRENT TRANSFER RATIO (T <sub>amb</sub> = 25 °C, unless otherwise specified)							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
I <sub>C</sub> /I <sub>F</sub>	V <sub>CE</sub> = 5 V, I <sub>F</sub> = 5 mA	TCMT1110	CTR	50		600	%
		TCMT1111	CTR	40		80	%
	V <sub>CE</sub> = 5 V, I <sub>F</sub> = 10 mA	TCMT1112	CTR	63		125	%
		TCMT1113	CTR	100		200	%
		TCMT1114	CTR	160		320	%
		TCMT1115	CTR	50		150	%
	V <sub>CE</sub> = 5 V, I <sub>F</sub> = 5 mA	TCMT1116	CTR	100		300	%
		TCMT1117	CTR	80		160	%
		TCMT1118	CTR	130		260	%
		TCMT1119	CTR	200		400	%



SWITCHING CHARACTERISTICS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Delay time	$V_S = 5\text{ V}$ , $I_C = 2\text{ mA}$ , $R_L = 100\text{ }\Omega$ , (see figure 1)	$t_d$		3		$\mu\text{s}$
Rise time	$V_S = 5\text{ V}$ , $I_C = 2\text{ mA}$ , $R_L = 100\text{ }\Omega$ , (see figure 1)	$t_r$		3		$\mu\text{s}$
Fall time	$V_S = 5\text{ V}$ , $I_C = 2\text{ mA}$ , $R_L = 100\text{ }\Omega$ , (see figure 1)	$t_f$		4		$\mu\text{s}$
Storage time	$V_S = 5\text{ V}$ , $I_C = 2\text{ mA}$ , $R_L = 100\text{ }\Omega$ , (see figure 1)	$t_s$		0		$\mu\text{s}$
Turn-on time	$V_S = 5\text{ V}$ , $I_C = 2\text{ mA}$ , $R_L = 100\text{ }\Omega$ , (see figure 1)	$t_{on}$		5		$\mu\text{s}$
Turn-off time	$V_S = 5\text{ V}$ , $I_C = 2\text{ mA}$ , $R_L = 100\text{ }\Omega$ , (see figure 1)	$t_{off}$		3		$\mu\text{s}$
Turn-on time	$V_S = 5\text{ V}$ , $I_F = 10\text{ mA}$ , $R_L = 1\text{ k}\Omega$ , (see figure 2)	$t_{on}$		9		$\mu\text{s}$
Turn-off time	$V_S = 5\text{ V}$ , $I_F = 10\text{ mA}$ , $R_L = 1\text{ k}\Omega$ , (see figure 2)	$t_{off}$		18		$\mu\text{s}$



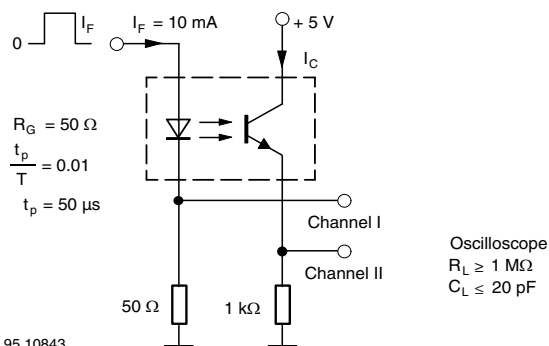
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Fig. 1 - Test Circuit, Non-Saturated Operation

Fig. 3 - Switching Times



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Fig. 2 - Test Circuit, Saturated Operation



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	
Peak transient overvoltage		$V_{IOTM}$	6000			V
Peak insulation voltage		$V_{IORM}$	707			V
Safety rating - power output		$P_{SO}$			265	mW
Safety rating - input current		$I_{SI}$			130	mA
Safety rating - temperature		$T_{SI}$			150	°C
Creepage distance			5			mm
Clearance distance			5			mm
Insulation thickness, reinforced rated	per IEC 60950 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** ( $T_{amb} = 25\text{ °C}$ , unless otherwise specified)

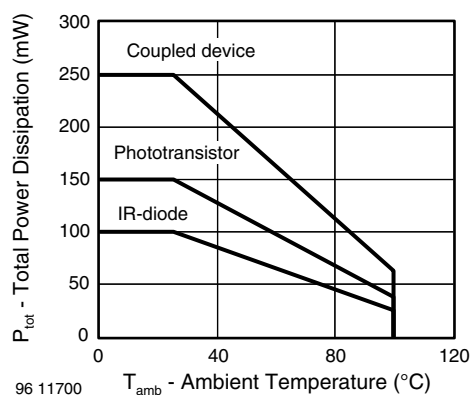


Fig. 4 - Total Power Dissipation vs. Ambient Temperature

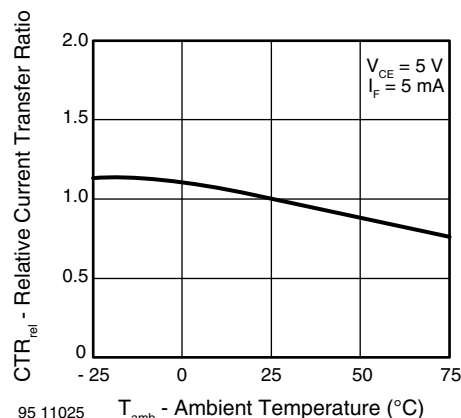


Fig. 6 - Relative Current Transfer Ratio vs. Ambient Temperature

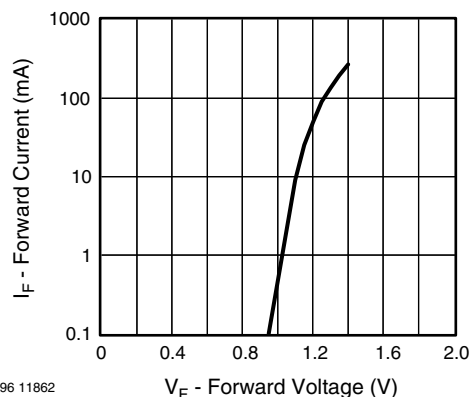


Fig. 5 - Forward Current vs. Forward Voltage

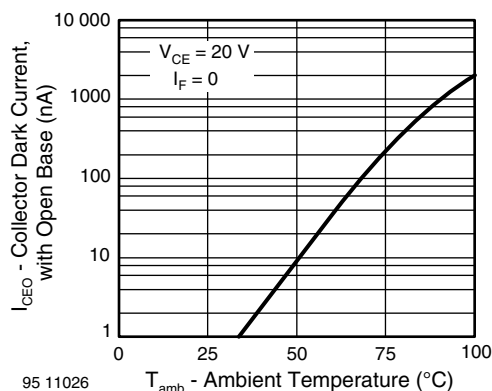
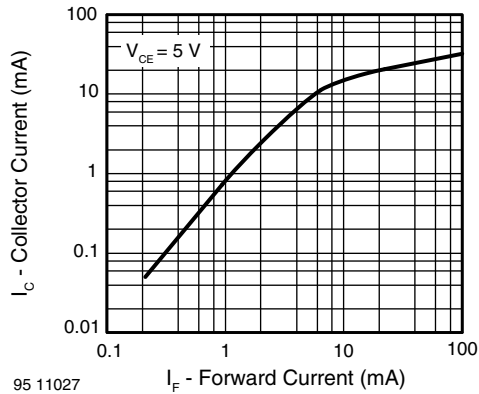
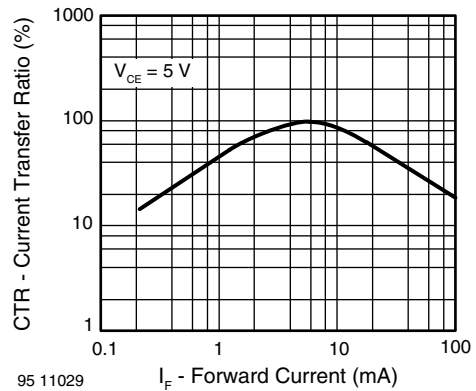


Fig. 7 - Collector Dark Current vs. Ambient Temperature



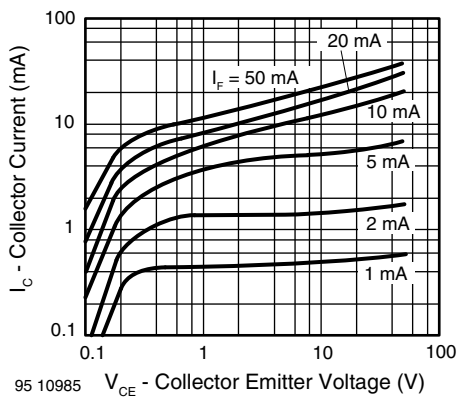
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Fig. 8 - Collector Current vs. Forward Current



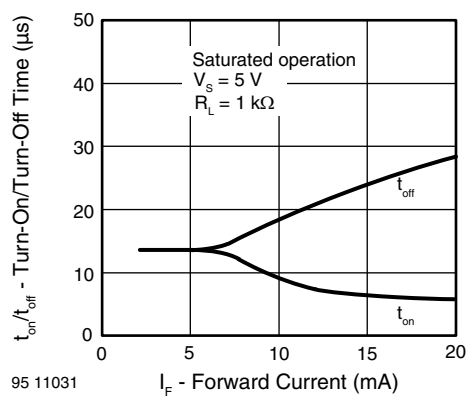
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Fig. 11 - Current Transfer Ratio vs. Forward Current



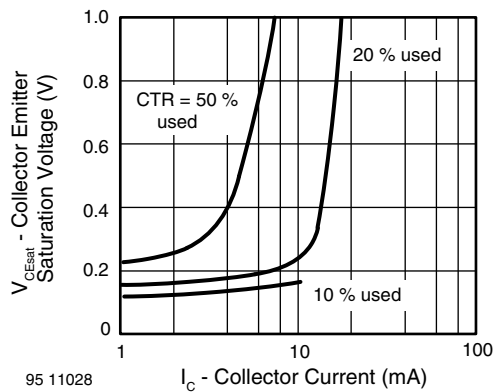
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Fig. 9 - Collector Current vs. Collector Emitter Voltage



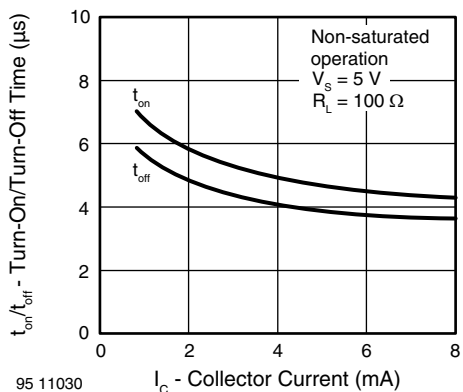
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Fig. 12 - Turn-on/off Time vs. Forward Current



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

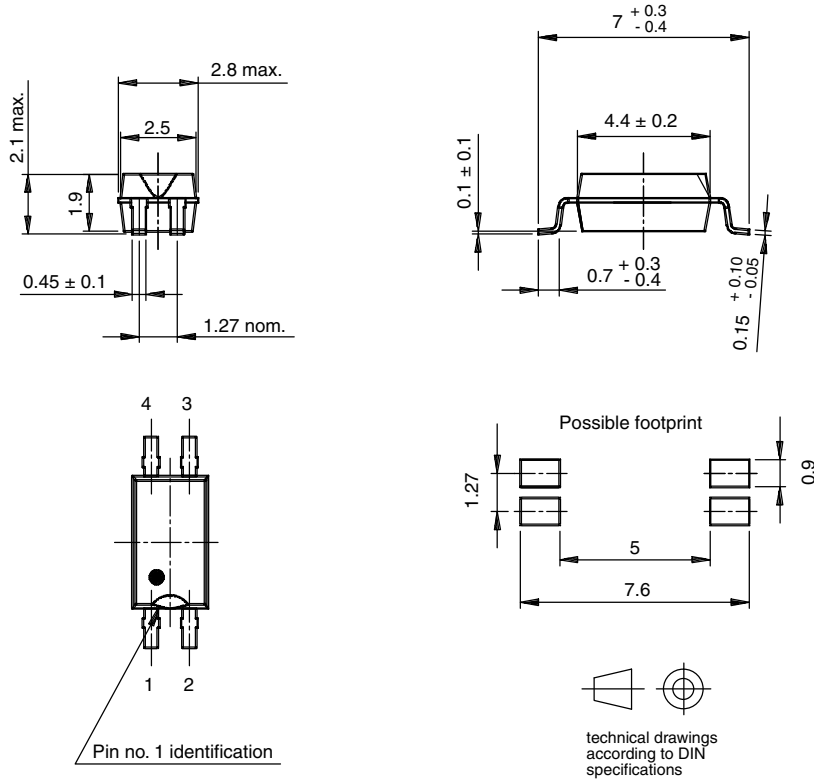


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Fig. 13 - Turn-on/off Time vs. Collector Current

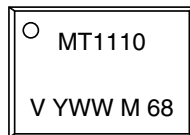


PACKAGE DIMENSIONS in millimeters



16283

PACKAGE MARKING (example of TCMT1110)





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