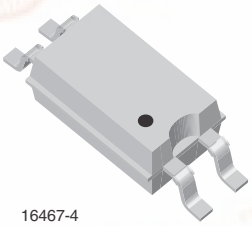
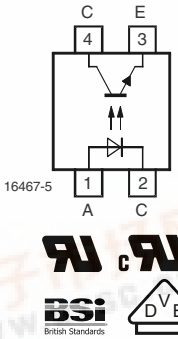
Optocoupler, Phototransistor Output, Single Channel, Half Pitch Mini-Flat Package





FEATURES

- Low profile package (half pitch)
- AC isolation test voltage 3750 V_{RMS}
- Low coupling capacitance of typical 0.3 pF
- Current transfer ratio (CTR) selected into groups
- Low temperature coefficient of CTR
- Wide ambient temperature range
- Compliant to RoHS Directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free

e3

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

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.

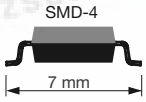
APPLICATIONS

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

ORDERING INFORMATION

T	C	M	T	1	1	1	#

PART NUMBER



AGENCY CERTIFIED/PACKAGE	CTR (%)									
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	TCMT 1110	TCMT 1111	TCMT 1112	TCMT 1113	TCMT 1114	TCMT 1115	TCMT 1116	TCMT 1117	TCMT 1118	TCMT 1119

ABSOLUTE MAXIMUM RATINGS (1) (T_{amb} = 25 °C, unless otherwise specified)

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
INPUT				
Reverse voltage		V_R	6	V
Forward current		I_F	50	mA
Forward surge current	$t_P \leq 10$ µs	I_{FSM}	1.5	A
Power dissipation		P_{diss}	80	mW
Junction temperature		T_j	125	°C

ABSOLUTE MAXIMUM RATINGS [1] (T_{amb} = 25 °C, unless otherwise specified)				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
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}	230	mW
Operating ambient temperature range		T_{amb}	- 40 to + 110	°C
Storage temperature range		T_{stg}	- 40 to + 110	°C
Soldering temperature [2]		T_{sld}	260	°C

Notes

[1] 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 (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT						
Forward voltage	I_F = 5 mA	V_F		1.15	1.4	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}		0.1	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

- 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	TCMT1110	CTR	50		600	%
	V_{CE} = 5 V, I_F = 10 mA	TCMT1112	CTR	63		125	%
		TCMT1113	CTR	100		200	%
		TCMT1114	CTR	160		320	%
	V_{CE} = 5 V, I_F = 5 mA	TCMT1115	CTR	50		150	%
		TCMT1116	CTR	100		300	%
		TCMT1117	CTR	80		160	%
		TCMT1118	CTR	130		260	%
		TCMT1119	CTR	200		400	%

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		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}		5		µs
Turn-off time	V_S = 5 V, I_C = 2 mA, R_L = 100 Ω, (see figure 1)	t_{off}		3		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

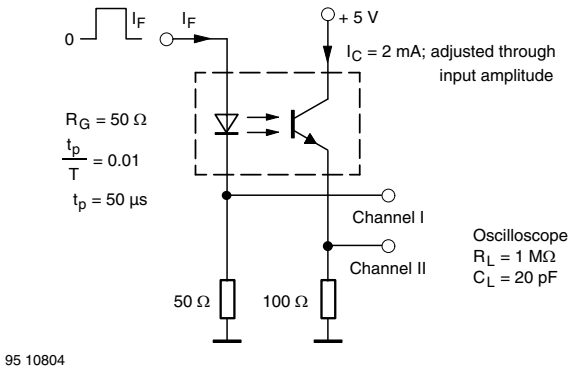


Fig. 1 - Test Circuit, Non-Saturated Operation

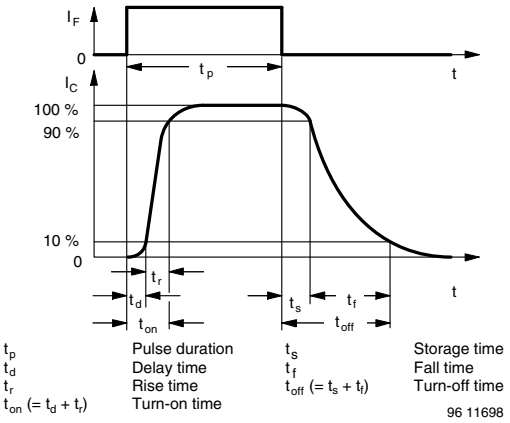


Fig. 3 - Switching Times

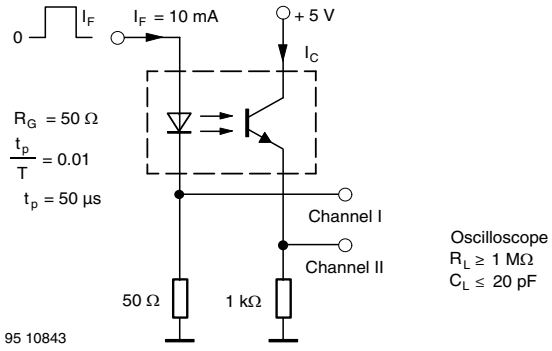


Fig. 2 - Test Circuit, Saturated Operation

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 60747-5-5, §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)

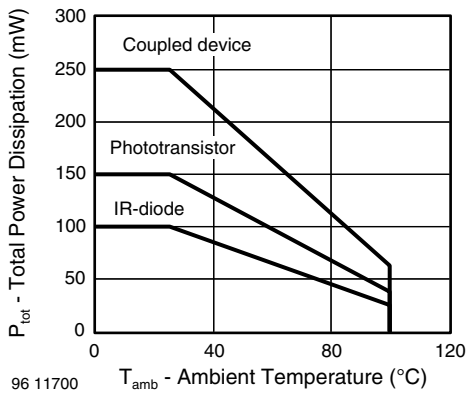


Fig. 4 - Total Power Dissipation vs. Ambient Temperature

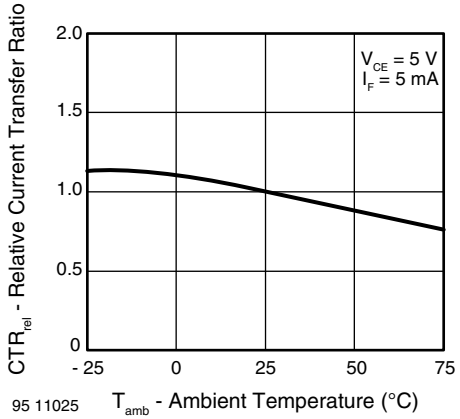


Fig. 6 - Relative Current Transfer Ratio vs. Ambient Temperature

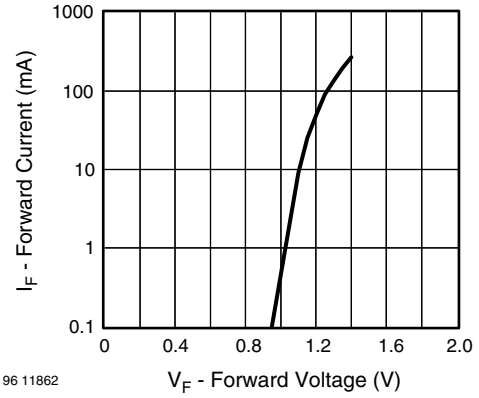


Fig. 5 - Forward Current vs. Forward Voltage

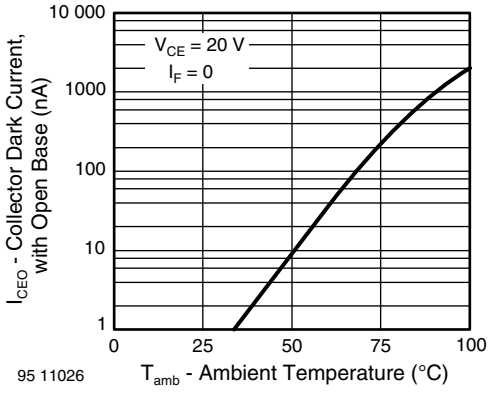


Fig. 7 - Collector Dark Current vs. Ambient Temperature

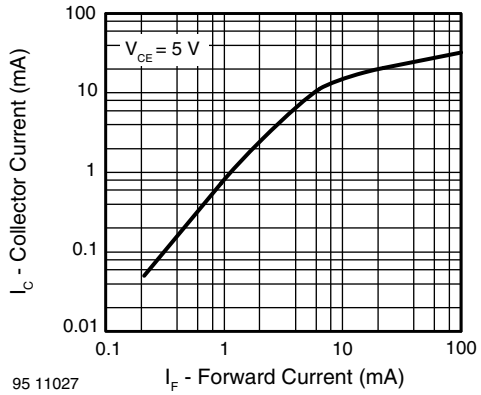


Fig. 8 - Collector Current vs. Forward Current

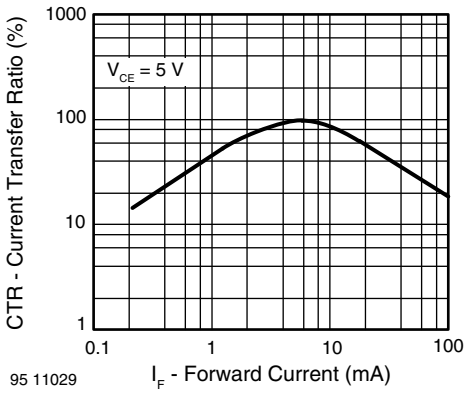


Fig. 11 - Current Transfer Ratio vs. Forward Current

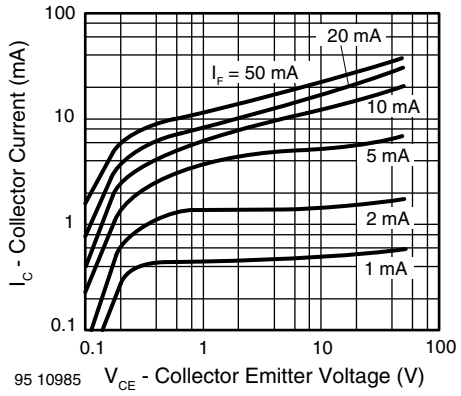


Fig. 9 - Collector Current vs. Collector Emitter Voltage

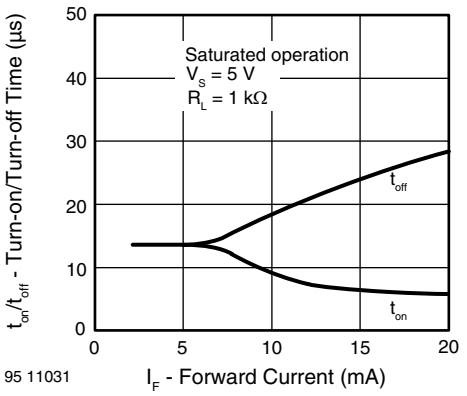


Fig. 12 - Turn-on/off Time vs. Forward Current

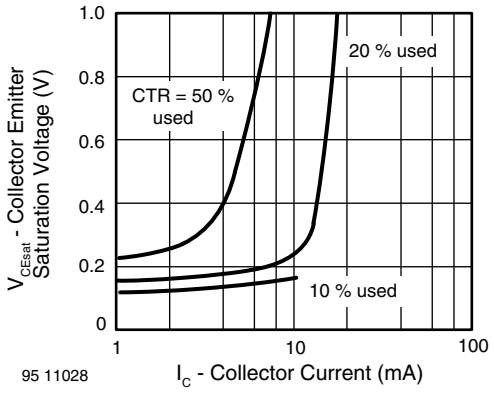


Fig. 10 - Collector Emitter Saturation Voltage vs. Collector Current

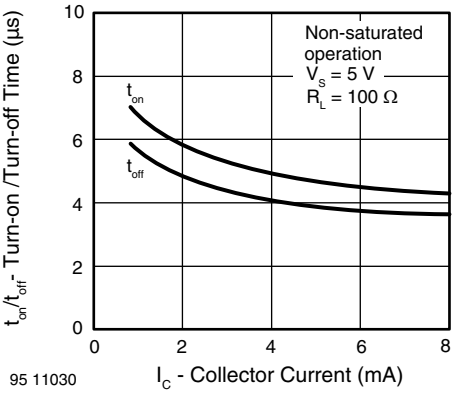
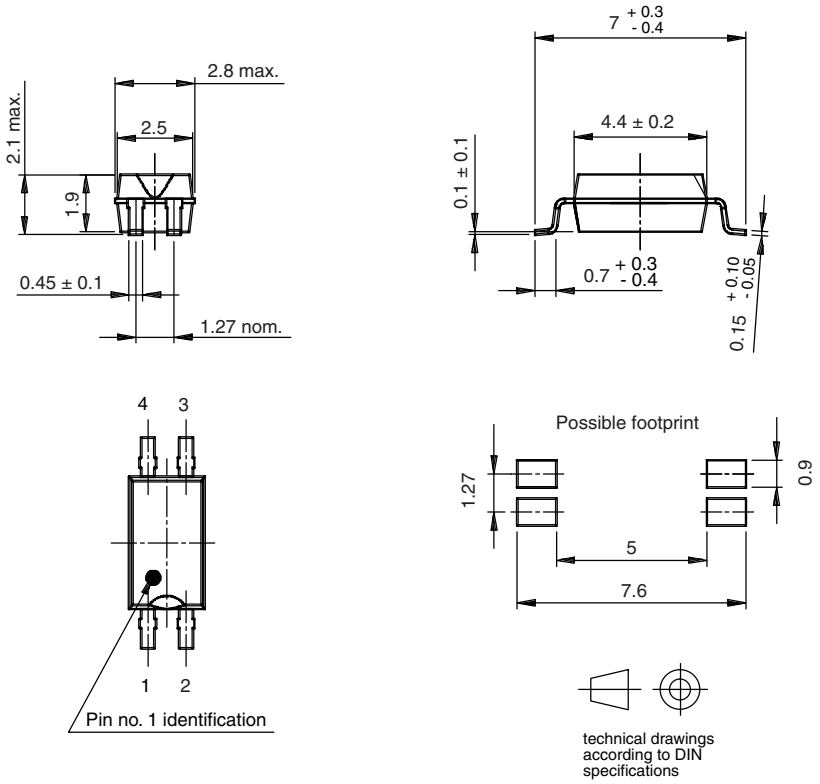


Fig. 13 - Turn-on/off Time vs. Collector Current

PACKAGE DIMENSIONS in millimeters



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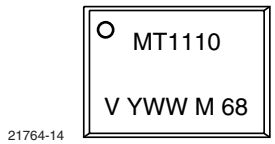
PACKAGE MARKING



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Note

- This is an example of the marking on the TCMT1110

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