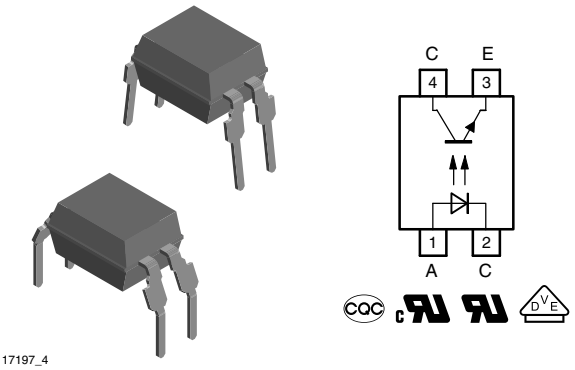
TCET1100, TCET1100G

Vishay Semiconductors

Optocoupler, Phototransistor Output, High Temperature



FEATURES

- High common mode rejection
- Low temperature coefficient of CTR
- Reinforced isolation provides circuit protection against electrical shock (safety class II)
- Isolation materials according to UL 94 V-0
- Pollution degree 2 (DIN / VDE 0110 / resp. IEC 60664)
- Climatic classification 55 / 100 / 21 (IEC 60068 part 1)
- Rated impulse voltage (transient overvoltage) V_{IOTM} = 6 kV_{peak}
- Isolation test voltage (partial discharge test voltage) V_{pd} = 1.6 kV
- Rated recurring peak voltage (repetitive) V_{IORM} = 850 V_{peak}
- Creepage current resistance according to VDE 0303 / IEC 60112 comparative tracking index: CTI ≥ 175
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free

e3

RoHS COMPLIANT

LINKS TO ADDITIONAL RESOURCES

Related Documents

DESCRIPTION

The TCET110. consists of a phototransistor optically coupled to a gallium arsenide infrared-emitting diode in a 4-lead plastic dual inline package.

AGENCY APPROVALS

- UL 1577
- cUL 1577
- DIN EN 60747-5-5 (VDE 0884-5)
- BSI: EN 62368-1:2014
- CQC GB4943.1-2011
- CQC GB8898-2011

APPLICATIONS

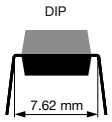
Circuits for safe protective separation against electrical shock according to safety class II (reinforced isolation):

- For application class I to IV at mains voltage ≤ 300 V
- For application class I to III at mains voltage ≤ 600 V according to DIN EN 60747-5-5 (VDE 0884), suitable for:
  - Switch-mode power supplies
  - Line receiver
  - Computer peripheral interface
  - Microprocessor system interface

ORDERING INFORMATION

T	C	E	T	1	1	0	#	#

PART NUMBER — LEAD FORM



AGENCY CERTIFIED / PACKAGE	CTR (%)								
	10 mA								
UL, cUL, VDE, BSI, CQC	50 to 600	40 to 80	63 to 125	100 to 200	160 to 320	100 to 300	80 to 160	130 to 260	200 to 400
DIP-4	TCET1100	-	TCET1102	TCET1103	-	TCET1106	TCET1107	TCET1108	TCET1109
DIP-4, 400 mil	TCET1100G	TCET1101G	TCET1102G	TCET1103G	TCET1104G	TCET1106G	TCET1107G	TCET1108G	TCET1109G

Note

- G = lead form 10.16 mm; G is not marked on the body

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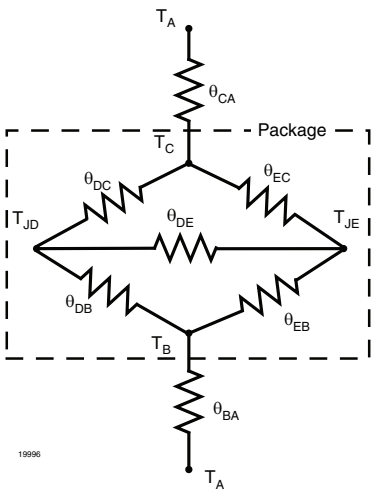
ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
INPUT				
Reverse voltage		V_R	6	V
Forward current		I_F	60	mA
Forward surge current	$t_p \leq 10$ µs	I_{FSM}	1.5	A
OUTPUT				
Collector emitter voltage		V_{CEO}	70	V
Emitter 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
COUPLER				
Operating ambient temperature range		T_{amb}	-40 to +100	°C
Storage temperature range		T_{stg}	-55 to +125	°C
Soldering temperature (1)	2 mm from case, ≤ 10 s	T_{sld}	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

(1) Refer to wave profile for soldering conditions for through hole devices

THERMAL CHARACTERISTICS			
PARAMETER	**SYMBOL**	**VALUE**	**UNIT**
LED power dissipation	P_{diss}	100	mW
Output power dissipation	P_{diss}	150	mW
Maximum LED junction temperature	$T_{jmax.}$	125	°C
Maximum output die junction temperature	$T_{jmax.}$	125	°C
Thermal resistance, junction emitter to board	θ_{EB}	173	°C/W
Thermal resistance, junction emitter to case	θ_{EC}	149	°C/W
Thermal resistance, junction detector to board	θ_{DB}	111	°C/W
Thermal resistance, junction detector to case	θ_{DC}	127	°C/W
Thermal resistance, junction emitter to junction detector	θ_{ED}	173	°C/W
Thermal resistance, board to ambient (1)	θ_{BA}	197	°C/W
Thermal resistance, case to ambient (1)	θ_{CA}	4041	°C/W



Notes

- The thermal model is represented in the thermal network below. Each resistance value given in this model can be used to calculate the temperatures at each node for a given operating condition. The thermal resistance from board to ambient will be dependent on the type of PCB, layout and thickness of copper traces. For a detailed explanation of the thermal model, please reference Vishay's "Thermal Characteristics of Optocouplers" application note

(1) For 2 layer FR4 board (4" x 3" x 0.062")

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ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
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 = 1 mA	V_{CEO}	70	-	-	V
Emitter collector voltage	I_E = 100 µA	V_{ECO}	7	-	-	V
Collector emitter cut-off current	V_{CE} = 20 V, I_F = 0 A, E = 0	I_{CEO}	-	10	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	-	110	-	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 = 1 mA	TCET1101G	CTR	13	30	-	%
		TCET1102, TCET1102G	CTR	22	45	-	%
		TCET1103, TCET1103G	CTR	34	70	-	%
		TCET1104G	CTR	56	90	-	%
	V_{CE} = 5 V, I_F = 5 mA	TCET1100, TCET1100G	CTR	50	-	600	%
		TCET1106, TCET1106G	CTR	100	-	300	%
		TCET1107, TCET1107G	CTR	80	-	160	%
		TCET1108, TCET1108G	CTR	130	-	260	%
		TCET1109, TCET1109G	CTR	200	-	400	%
	V_{CE} = 5 V, I_F = 10 mA	TCET1101, TCET1101G	CTR	40	-	80	%
		TCET1102, TCET1102G	CTR	63	-	125	%
		TCET1103, TCET1103G	CTR	100	-	200	%
		TCET1104, TCET1104G	CTR	160	-	320	%

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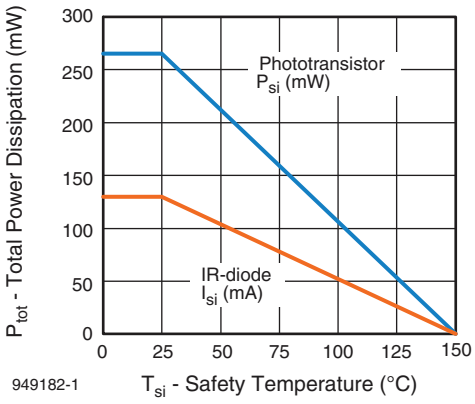


Fig. 1 - Derating Diagram

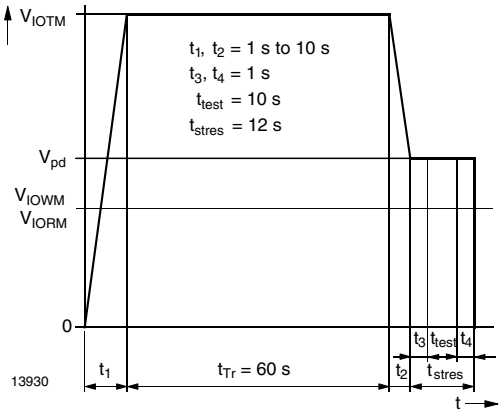


Fig. 2 - Test Pulse Diagram for Sample Test According to DIN EN 60747-5-5 / DIN EN 60747-; IEC 60747

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 Fig. 3)	t_d	-	3	-	µs
Rise time	V_S = 5 V, I_C = 2 mA, R_L = 100 Ω, (see Fig. 3)	t_r	-	3	-	µs
Turn-on time	V_S = 5 V, I_C = 2 mA, R_L = 100 Ω, (see Fig. 3)	t_{on}	-	6	-	µs
Storage time	V_S = 5 V, I_C = 2 mA, R_L = 100 Ω, (see Fig. 3)	t_s	-	0.3	-	µs
Fall time	V_S = 5 V, I_C = 2 mA, R_L = 100 Ω, (see Fig. 3)	t_f	-	4.7	-	µs
Turn-off time	V_S = 5 V, I_C = 2 mA, R_L = 100 Ω, (see Fig. 3)	t_{off}	-	5	-	µs
Turn-on time	V_S = 5 V, I_F = 10 mA, R_L = 1 kΩ, (see Fig. 4)	t_{on}	-	9	-	µs
Turn-off time	V_S = 5 V, I_F = 10 mA, R_L = 1 kΩ, (see Fig. 4)	t_{off}	-	10	-	µs

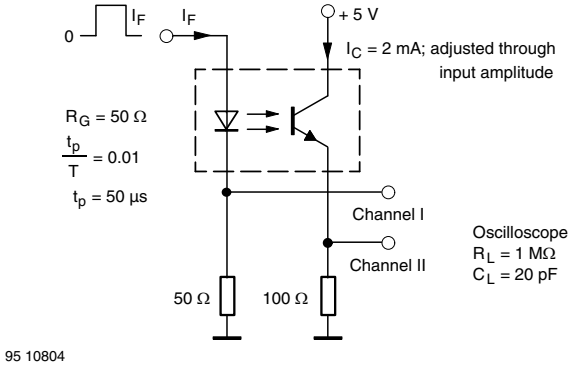


Fig. 3 - Test Circuit, Non-Saturated Operation

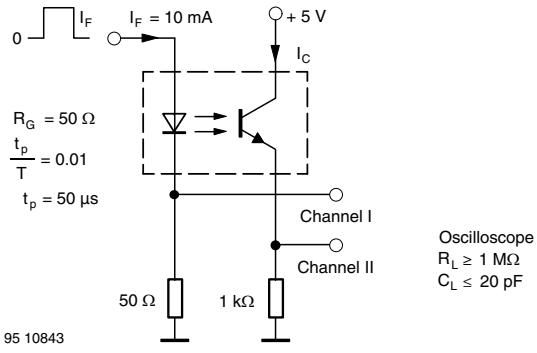


Fig. 4 - Test Circuit, Saturated Operation

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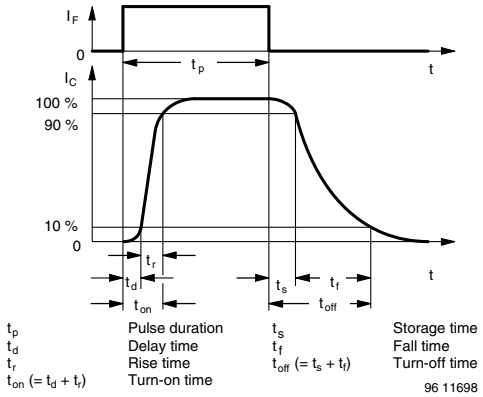


Fig. 5 - Switching Times

SAFETY AND INSULATION RATINGS (T_{amb} = 25 °C, unless otherwise specified)				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**UNIT**
Climatic classification	According to IEC 68 part 1		55 / 100 / 21	
Pollution degree	According to DIN VDE 0109		2	
Comparative tracking index	Insulation group IIIa	CTI	175	
Maximum rated withstanding isolation voltage	According to UL1577, t = 1 min	V_{ISO}	5000	V_{RMS}
Maximum transient isolation voltage	According to DIN EN 60747-5-5	V_{IOTM}	6000	V_{peak}
Maximum repetitive peak isolation voltage	According to DIN EN 60747-5-5	V_{IORM}	850	V_{peak}
Isolation resistance	T_{amb} = 25 °C, V_{IO} = 500 V	R_{IO}	≥ 10^{12}	Ω
	T_{amb} = 100 °C, V_{IO} = 500 V	R_{IO}	≥ 10^{11}	Ω
	T_{amb} = T_S, V_{IO} = 500 V	R_{IO}	≥ 10^{9}	Ω
Output safety power		P_{SO}	265	mW
Input safety current		I_{SI}	130	mA
Input safety temperature		T_S	150	°C
Creepage distance	DIP-4		≥ 7	mm
Clearance distance			≥ 7	mm
Creepage distance	DIP-4, 400 mil		≥ 8	mm
Clearance distance			≥ 8	mm
Insulation thickness		DTI	≥ 0.4	mm
Input to output test voltage, method B	V_{IORM} x 1.875 = V_{PR}, 100 % production test with t_M = 1 s, partial discharge < 5 pC	V_{PR}	1600	V_{peak}
Input to output test voltage, method A	V_{IORM} x 1.6 = V_{PR}, 100 % sample test with t_M = 10 s, partial discharge < 5 pC	V_{PR}	1300	V_{peak}

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TYPICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)

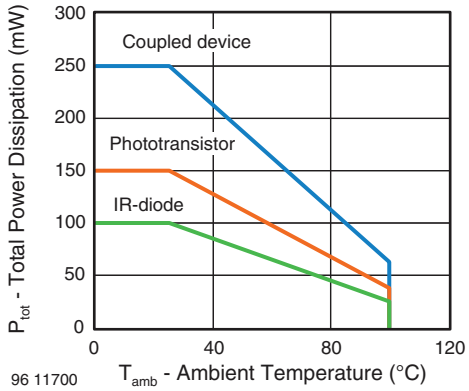


Fig. 6 - Total Power Dissipation vs. Ambient Temperature

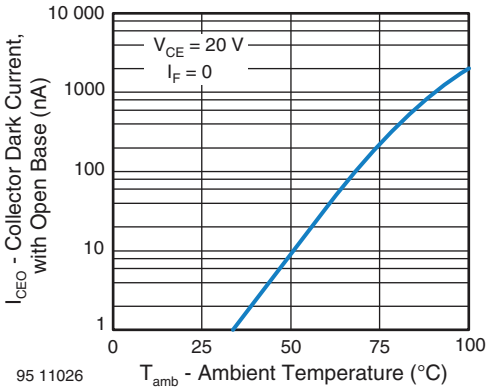


Fig. 9 - Collector Dark Current vs. Ambient Temperature

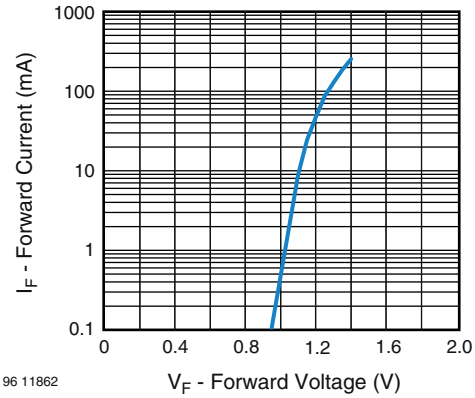


Fig. 7 - Forward Current vs. Forward Voltage

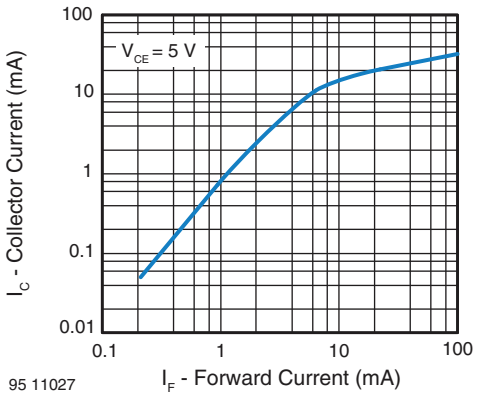


Fig. 10 - Collector Current vs. Forward Current

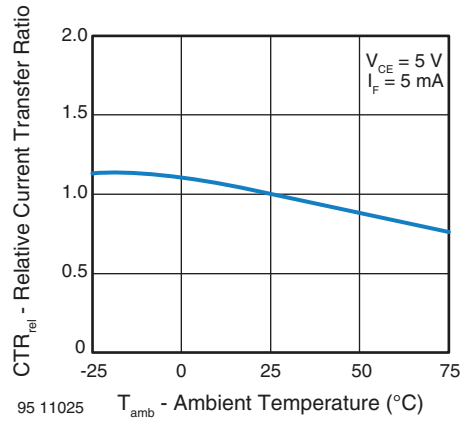


Fig. 8 - Relative Current Transfer Ratio vs. Ambient Temperature

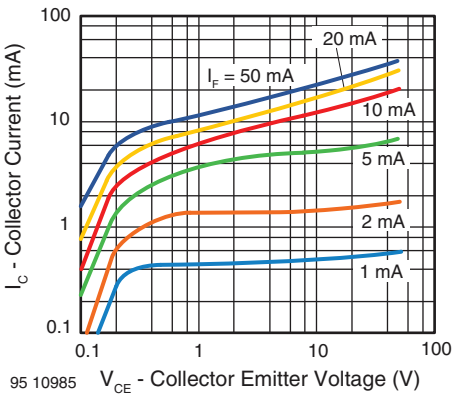


Fig. 11 - Collector Current vs. Collector Emitter Voltage

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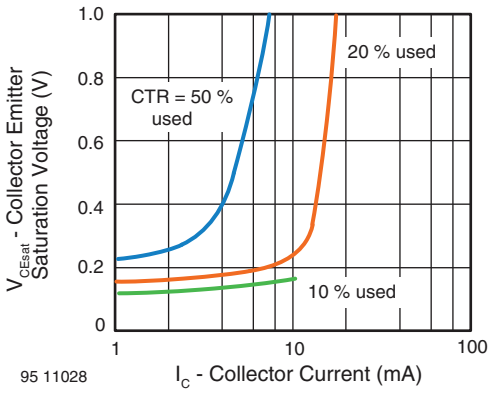


Fig. 12 - Collector Emitter Saturation Voltage vs. Collector Current

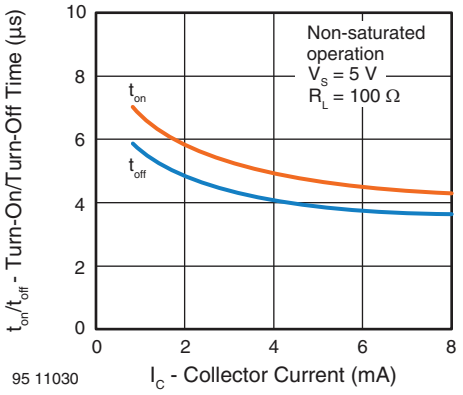


Fig. 14 - Turn-On / Off Time vs. Collector Current

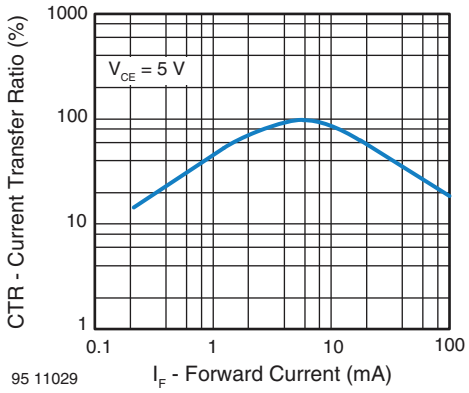


Fig. 13 - Current Transfer Ratio vs. Forward Current

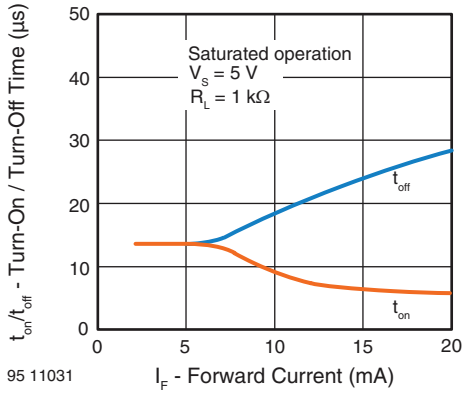


Fig. 15 - Turn-On / Off Time vs. Forward Current

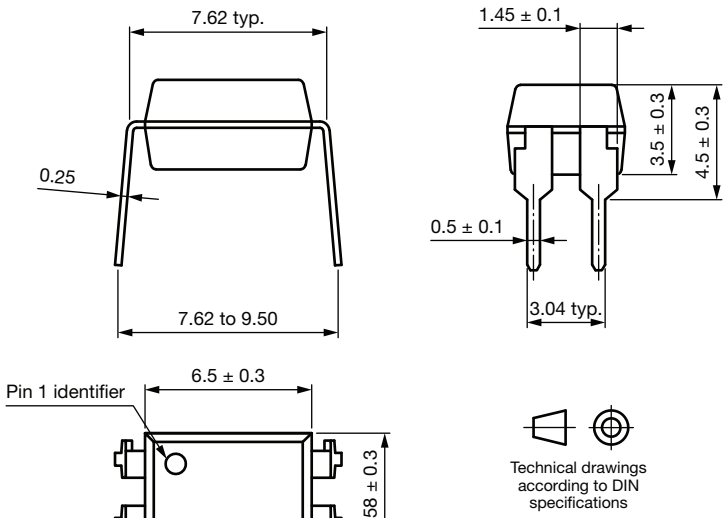
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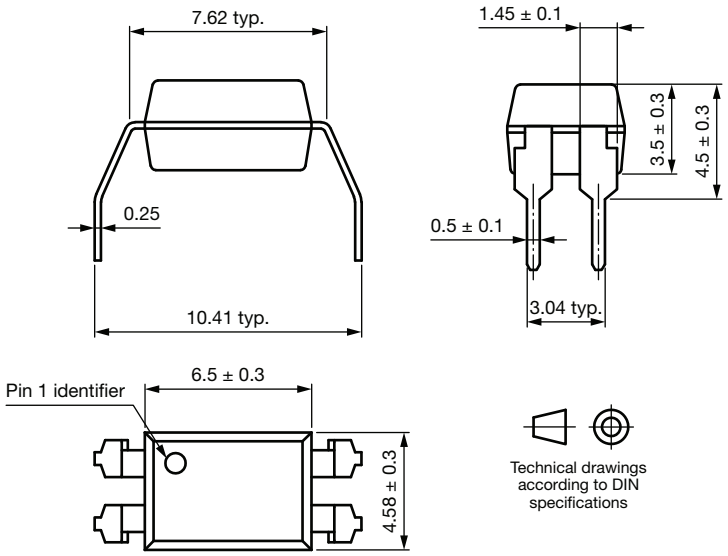
PACKAGE DIMENSIONS in millimeters

DIP-4



Drawing-No.: 6.544-5436.01-4

DIP-4, 400 mil

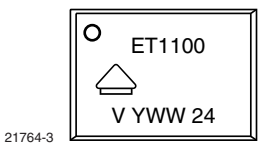


Drawing-No.: 6.544-5437.01-4

PACKING INFORMATION (in millimeters)

TUBE PACKING			
TYPE	**UNITS/TUBE**	**TUBES/BOX**	**UNITS/BOX**
DIP-4, standard and option 6	100	40	4000

PACKAGE MARKING



21764-3

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