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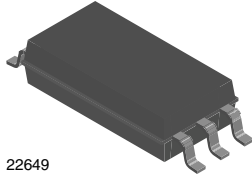


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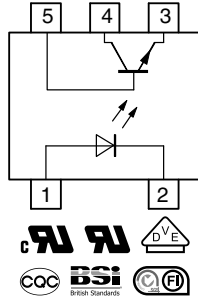
## TCLT111. Series

Vishay Semiconductors

# Optocoupler, Phototransistor Output, SOP-6L5, 110 °C Rated, Half Pitch, Long Mini-Flat Package



22649



### FEATURES

- SMD low profile 5 pin package
- Isolation test voltage 5000 V<sub>RMS</sub>
- CTR flexibility available see order information
- Special construction
- Extra low coupling capacitance
- Connected base
- DC input with transistor output
- Temperature range -55 °C to 110 °C
- Creepage distance > 8 mm
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



### DESCRIPTION

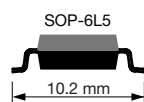
The TCLT111. series consists of a phototransistor optically coupled to a gallium arsenide infrared-emitting diode in a 5-lead SOP-6L package.

### APPLICATIONS

- Switchmode power supplies
- Computer peripheral interface
- Microprocessor system interface

### AGENCY APPROVALS

- UL1577, file no. E76222
- cUL - file no. E76222, equivalent to CSA 22.2 bulletin 5A
- DIN EN 60747-5-5 (VDE 0884-5)
- FIMKO
- BSI
- CQC

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;">L</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, VDE, FIMKO, CQC	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-6L5	TCLT1110	TCLT1111	TCLT1112	TCLT1113	TCLT1114	TCLT1115	TCLT1116	TCLT1117	TCLT1118	TCLT1119

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>	60	mA
Forward surge current	t <sub>p</sub> ≤ 10 μs	I <sub>FSM</sub>	1.5	A
Power dissipation		P <sub>diss</sub>	100	mW
Junction temperature		T <sub>j</sub>	125	°C
<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



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ABSOLUTE MAXIMUM RATINGS (T <sub>amb</sub> = 25 °C, unless otherwise specified)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
<b>COUPLER</b>				
Total power dissipation		P <sub>tot</sub>	250	mW
Operating ambient temperature range		T <sub>amb</sub>	-55 to +110	°C
Storage temperature range		T <sub>stg</sub>	-55 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 Rating for extended periods of the time can adversely affect reliability.

<sup>(1)</sup> Wave soldering three cycles are allowed. Also refer to "Assembly Instruction" ([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> = 50 mA	V <sub>F</sub>	-	1.25	1.6	V
Junction capacitance	V <sub>R</sub> = 0 V, f = 1 MHz	C <sub>j</sub>	-	50	-	pF
<b>output</b>						
Collector emitter voltage	I <sub>C</sub> = 1 mA	V <sub>CEO</sub>	80	-	-	V
Emitter collector voltage	I <sub>E</sub> = 100 μA	V <sub>ECO</sub>	7	-	-	V
Collector emitter leakage current	V <sub>CE</sub> = 20 V, I <sub>F</sub> = 0 A	I <sub>CEO</sub>	-	10	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>	-	-	0.3	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>	-	110	-	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	TCLT1110	CTR	50	-	600	%
		TCLT1111	CTR	40	-	80	%
	V <sub>CE</sub> = 5 V, I <sub>F</sub> = 10 mA	TCLT1112	CTR	63	-	125	%
		TCLT1113	CTR	100	-	200	%
		TCLT1114	CTR	160	-	320	%
		TCLT1111	CTR	13	30	-	%
	V <sub>CE</sub> = 5 V, I <sub>F</sub> = 1 mA	TCLT1112	CTR	22	45	-	%
		TCLT1113	CTR	34	70	-	%
		TCLT1114	CTR	56	100	-	%
		TCLT1115	CTR	50	-	150	%
	V <sub>CE</sub> = 5 V, I <sub>F</sub> = 5 mA	TCLT1116	CTR	100	-	300	%
		TCLT1117	CTR	80	-	160	%
		TCLT1118	CTR	130	-	260	%
TCLT1119		CTR	200	-	400	%	



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SAFETY AND INSULATION RATINGS				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Tested withstanding isolation voltage	According to UL1577, t = 1 s	$V_{ISO}$	5000	$V_{RMS}$
Maximum transient isolation voltage	According to DIN EN 60747-5-5	$V_{IOTM}$	8000	$V_{peak}$
Maximum repetitive peak isolation voltage	According to DIN EN 60747-5-5	$V_{IORM}$	890	$V_{peak}$
Partial discharge test voltage - lot test (sample test)	$t_{Tr} = 60$ s, $t_{test} = 10$ s, (see figure 2)	$V_{pd}$	13 000	V
Isolation resistance	$T_{amb} = 25$ °C, $V_{IO} = 500$ V	$R_{IO}$	$\geq 10^{12}$	$\Omega$
	$T_{amb} = 100$ °C, $V_{IO} = 500$ V	$R_{IO}$	$\geq 10^{11}$	$\Omega$
	$T_{amb} = 150$ °C, $V_{IO} = 500$ V (construction test only)	$R_{IO}$	$\geq 10^9$	$\Omega$
Output safety power		$P_{SO}$	265	mW
Input safety current		$I_{SI}$	130	mA
Input safety temperature		$T_S$	150	°C
Creepage distance	DIP-6, option 6		$\geq 8$	mm
Clearance distance	DIP-6, option 6		$\geq 8$	mm
Insulation distance (internal)			0.75	mm

#### Note

- As per IEC 60747-5-5, § 7.4.3.8.2, 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.

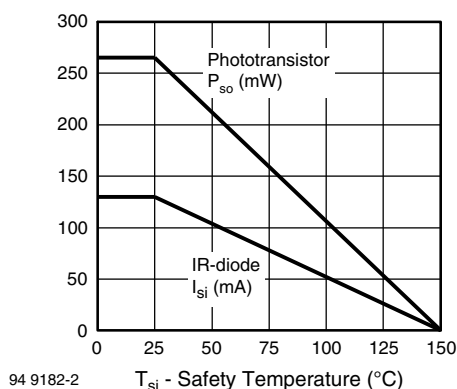


Fig. 1 - Derating Diagram

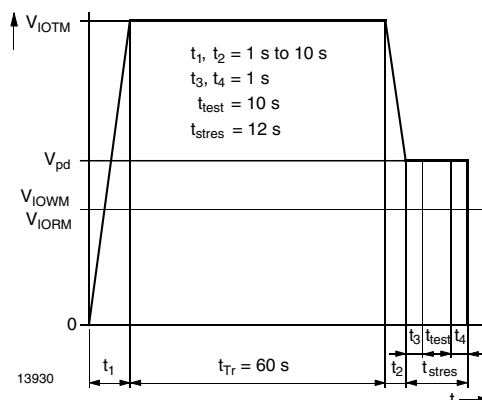


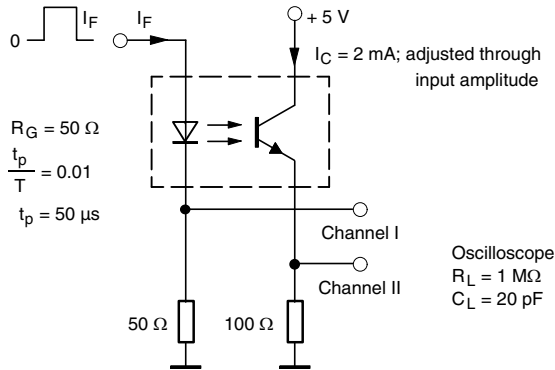
Fig. 2 - Test Pulse Diagram for Sample Test According to DIN EN 60747-5-5 (VDE 0884-5); IEC 60747-5-5

SWITCHING CHARACTERISTICS ( $T_{amb} = 25$ °C, unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Delay time	$V_S = 5$ V, $I_C = 2$ mA, $R_L = 100$ $\Omega$ , (see figure 3)	$t_d$	-	3	-	$\mu$ s
Rise time	$V_S = 5$ V, $I_C = 2$ mA, $R_L = 100$ $\Omega$ , (see figure 3)	$t_r$	-	3	-	$\mu$ s
Fall time	$V_S = 5$ V, $I_C = 2$ mA, $R_L = 100$ $\Omega$ , (see figure 3)	$t_f$	-	4.7	-	$\mu$ s
Storage time	$V_S = 5$ V, $I_C = 2$ mA, $R_L = 100$ $\Omega$ , (see figure 3)	$t_s$	-	0.3	-	$\mu$ s
Turn-on time	$V_S = 5$ V, $I_C = 2$ mA, $R_L = 100$ $\Omega$ , (see figure 3)	$t_{on}$	-	6	-	$\mu$ s
Turn-off time	$V_S = 5$ V, $I_C = 2$ mA, $R_L = 100$ $\Omega$ , (see figure 3)	$t_{off}$	-	5	-	$\mu$ s
Turn-on time	$V_S = 5$ V, $I_F = 10$ mA, $R_L = 1$ k $\Omega$ , (see figure 4)	$t_{on}$	-	9	-	$\mu$ s
Turn-off time	$V_S = 5$ V, $I_F = 10$ mA, $R_L = 1$ k $\Omega$ , (see figure 4)	$t_{off}$	-	10	-	$\mu$ s



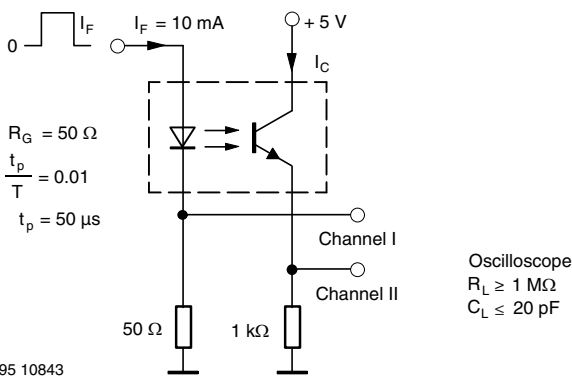
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95 10804

Fig. 3 - Test Circuit, Non-Saturated Operation



95 10843

Fig. 4 - Test Circuit, Saturated Operation

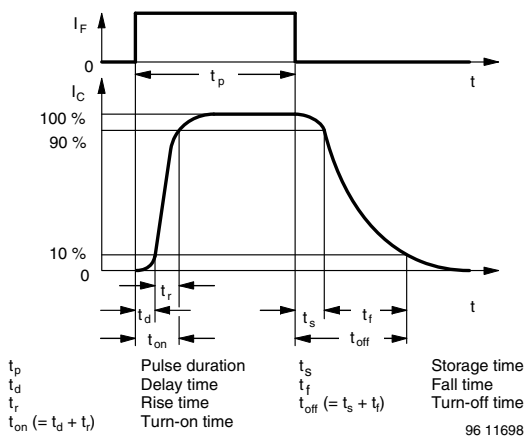


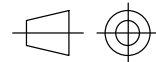
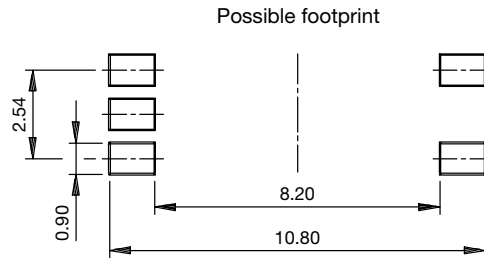
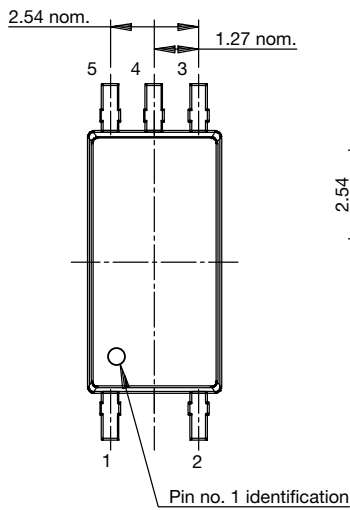
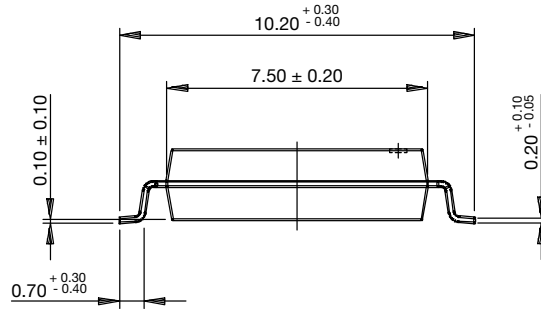
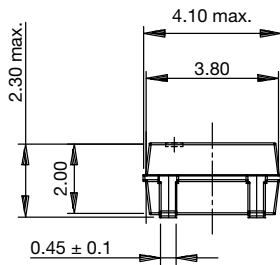
Fig. 5 - Switching Times



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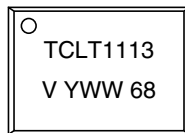
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**PACKAGE DIMENSIONS** in millimeters



technical drawings according to DIN specifications

**PACKAGE MARKING**



**TAPE AND REEL DIMENSIONS** (in millimeters)

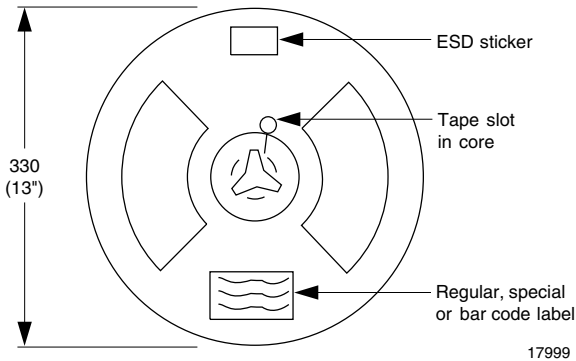


Fig. 6 - Reel Dimensions

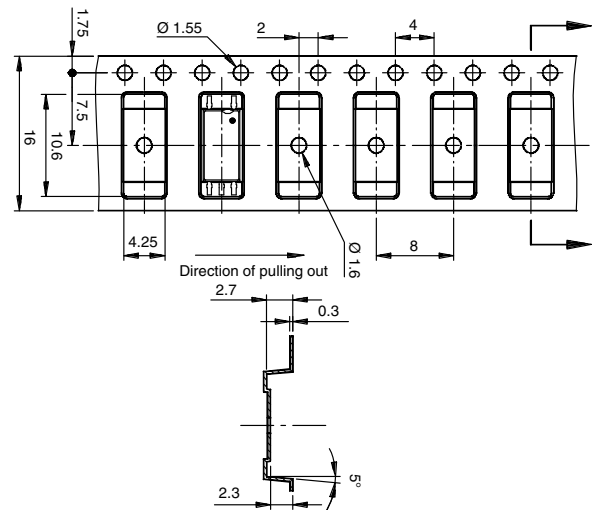


Fig. 7 - Tape Packing

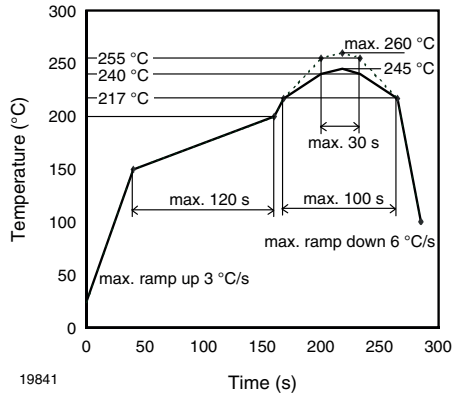


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### SOLDER PROFILE



19841

Fig. 8 - Lead (Pb)-free Reflow Solder Profile according to J-STD-020

### HANDLING AND STORAGE CONDITIONS

ESD level: HBM class 2

Floor life: unlimited

Conditions:  $T_{amb} < 30\text{ °C}$ , RH < 85 %

Moisture sensitivity level 1, according to J-STD-020



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