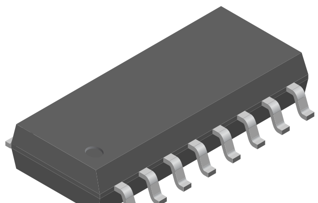
Optocoupler, Phototransistor Output, AC Input, Single / Quad Channel, Half Pitch Mini-Flat Package



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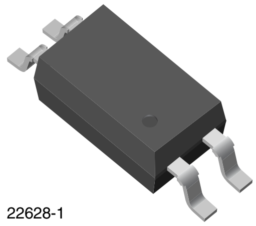

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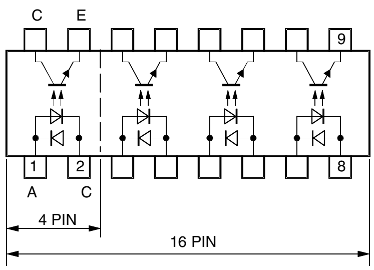


FEATURES

- Low profile package (half pitch)
- AC isolation test voltage 3750 V_{RMS}
- Low coupling capacitance of typical 0.3 pF
- Low temperature coefficient of CTR
- Wide ambient temperature range
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free

e3

RoHS COMPLIANT

APPLICATIONS

- Programmable logic controllers

AGENCY APPROVALS

- UL 1577
- cUL
- DIN EN 60747-5-5 (VDA 0884-5)
- BSI
- CQC
- FIMKO

LINKS TO ADDITIONAL RESOURCES

Related Documents | Design Tools | 3D Models | SPICE Models | Footprints | Schematics | Ultra Librarian EDA / CAD

DESCRIPTION

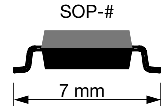
The low profile miniflat package includes an optocoupler with AC Input and transistor output. It is available in single channel (4 pin) TCMT1600 or quad channel (16 pin) TCMT4600.

ORDERING INFORMATION

T C M T # 6 0 #

PART NUMBER

SOP-#



AGENCY CERTIFIED / PACKAGE	CTR (%)		
	SINGLE CHANNEL	QUAD CHANNEL	
UL, cUL, FIMKO, BSI, CQC, VDE	**80 to 300**	**80 to 300**	**100 to 300**
SOP-4	TCMT1600	-	-
SOP-4	TCMT1600T3 (1)	-	-
SOP-16	-	TCMT4600	TCMT4606
SOP-16	-	TCMT4600T0 (1)	-

Notes

- Available only on tape and reel

(1) Product is rotated 180° in tape and reel cavity

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
INPUT				
Forward current		I_F	± 60	mA
Forward surge current	$t_p \leq 10\ \mu s$	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)		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 +125	°C
Soldering temperature (1)		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) Wave soldering three cycles are allowed. Also refer to “Assembly Instructions” (www.vishay.com/doc?80054)

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	-	1.35	1.6	V
Junction capacitance	V_R = 0 V, f = 1 MHz	C_j	-	8	-	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	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
Capacitance (input to output)	f = 1 MHz	C_{IO}	-	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_{amb} = 25 °C, unless otherwise specified)							
PARAMETER	**TEST CONDITION**	**PART**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
I_C/I_F	V_{CE} = 5 V, I_F = ± 5 mA	TCMT1600	CTR	80	-	300	%
		TCMT4600	CTR	80	-	300	%
		TCMT4606	CTR	100	-	300	%

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 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	-	0.3	-	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

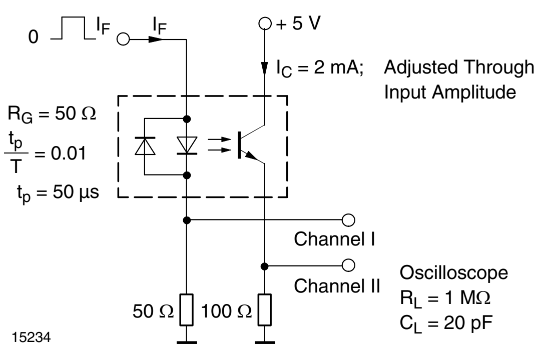


Fig. 1 - Test Circuit, Non-Saturated Operation

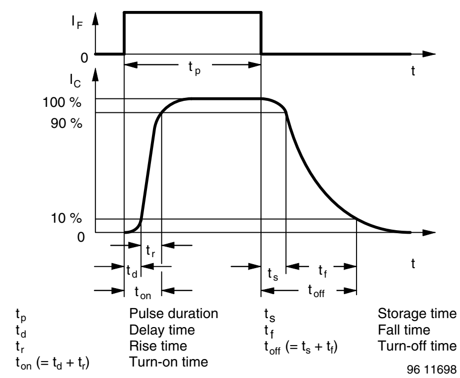


Fig. 3 - Switching Times

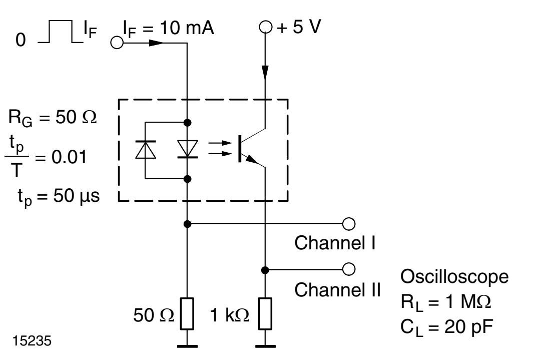


Fig. 2 - Test Circuit, Saturated Operation

SAFETY AND INSULATION RATINGS				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Climatic classification (according to IEC 68 part 1)			55 / 110 / 21	
Comparative tracking index		CTI	175	
Maximum rated withstanding isolation voltage	40 % to 60 % RH, AC test of 1 min	V_{ISO}	3750	V_{RMS}
Maximum transient isolation voltage		V_{IOTM}	6000	V
Maximum repetitive peak isolation voltage		V_{IORM}	707	V
Insulation resistance	V_{IO} = 500 V, T_{amb} = 100 °C	R_{IO}	10^{11}	Ω
Isolation resistance (under fault conditions)	V_{IO} = 500 V, T_{amb} = T_{SI}	R_{IO}	10^9	Ω
Output safety power		P_{SO}	350	mW
Input safety current		I_{SI}	200	mA
Input safety temperature		T_{SI}	175	°C
Apparent charge test voltage (method A)	V_{IORM} x 1.6 = V_{PR}, type and sample test t_m = 60 s, partial discharge < 5 pC	V_{PR}	1132	V_{peak}
Apparent charge 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}	1326	V_{peak}
Creepage distance			≥ 5	mm
Clearance distance			≥ 5	mm
Insulation thickness		DTI	≥ 0.4	mm
Environment (pollution degree in accordance to DIN VDE 0109)			2	

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

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

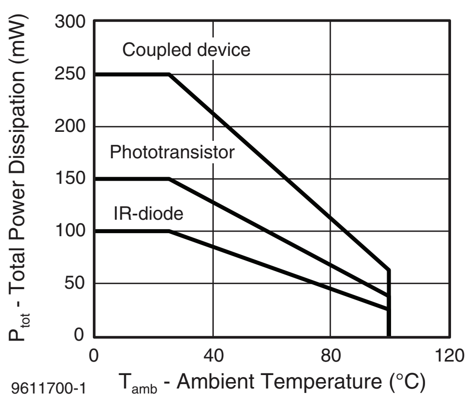


Fig. 4 - Total Power Dissipation vs. Ambient Temperature

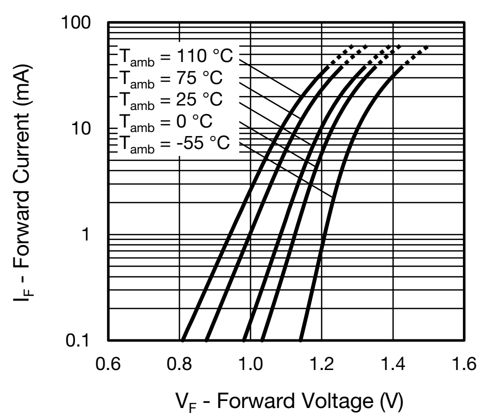


Fig. 5 - Forward Voltage vs. Forward Current

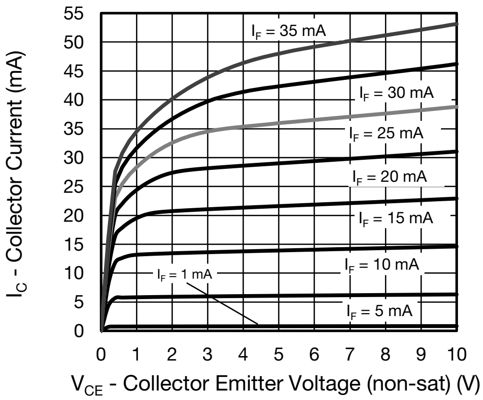


Fig. 6 - Collector Current vs. Collector Emitter Voltage

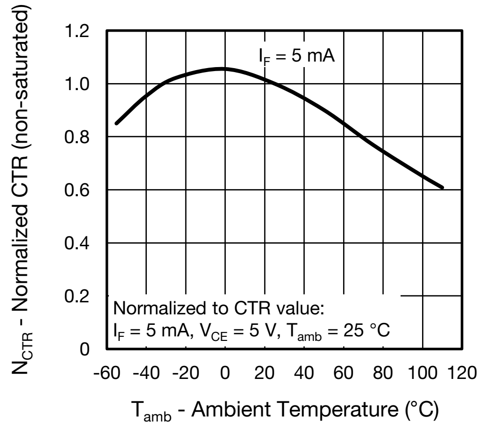


Fig. 9 - Normalized Current Transfer Ratio (non-saturated) vs. Ambient Temperature

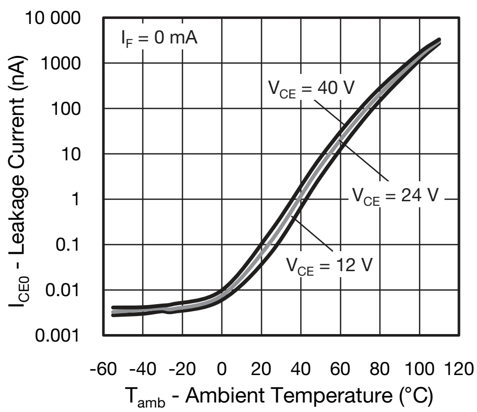


Fig. 7 - Leakage Current vs. Ambient Temperature

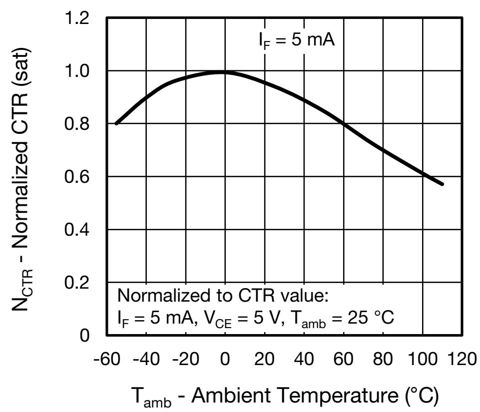


Fig. 10 - Normalized Current Transfer Ratio (saturated) vs. Ambient Temperature

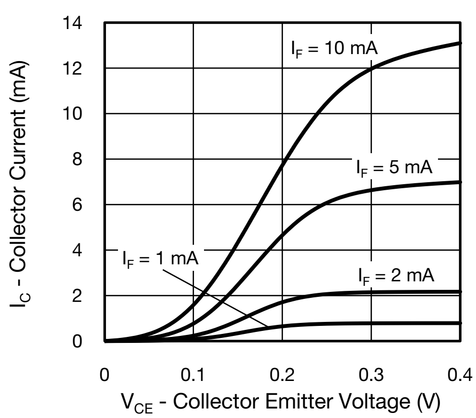


Fig. 8 - Collector Current vs. Collector Emitter Voltage

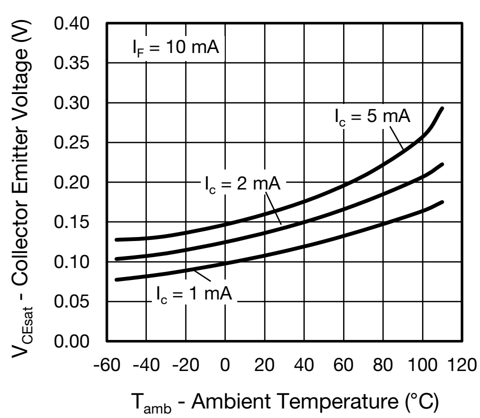


Fig. 11 - Collector Emitter Voltage vs. Ambient Temperature

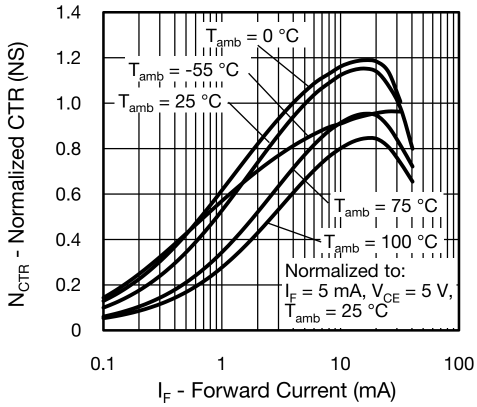


Fig. 12 - Normalized CTR (non-saturated) vs. Forward Current

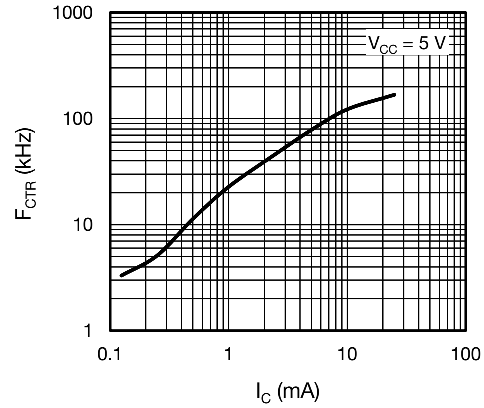


Fig. 15 - F_{CTR} vs. Collector Current

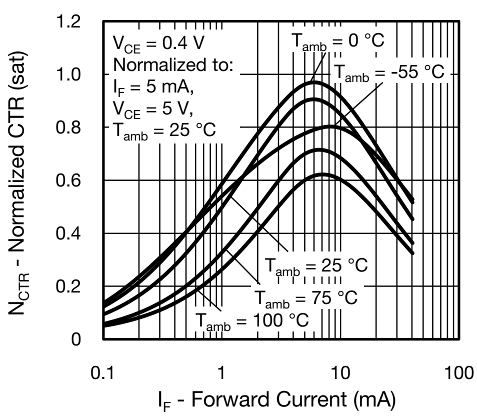


Fig. 13 - Normalized CTR (saturated) vs. Forward Current

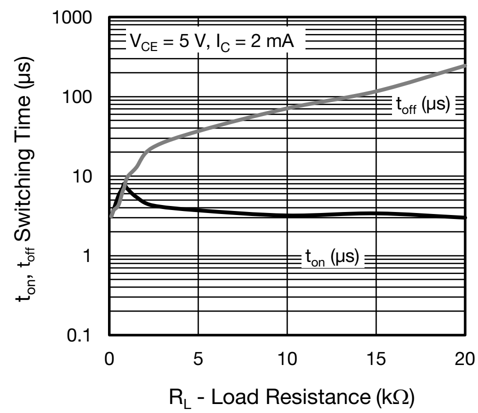


Fig. 16 - Switching Time vs. Load Resistance

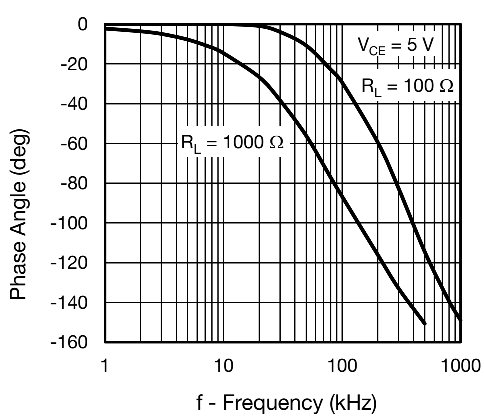
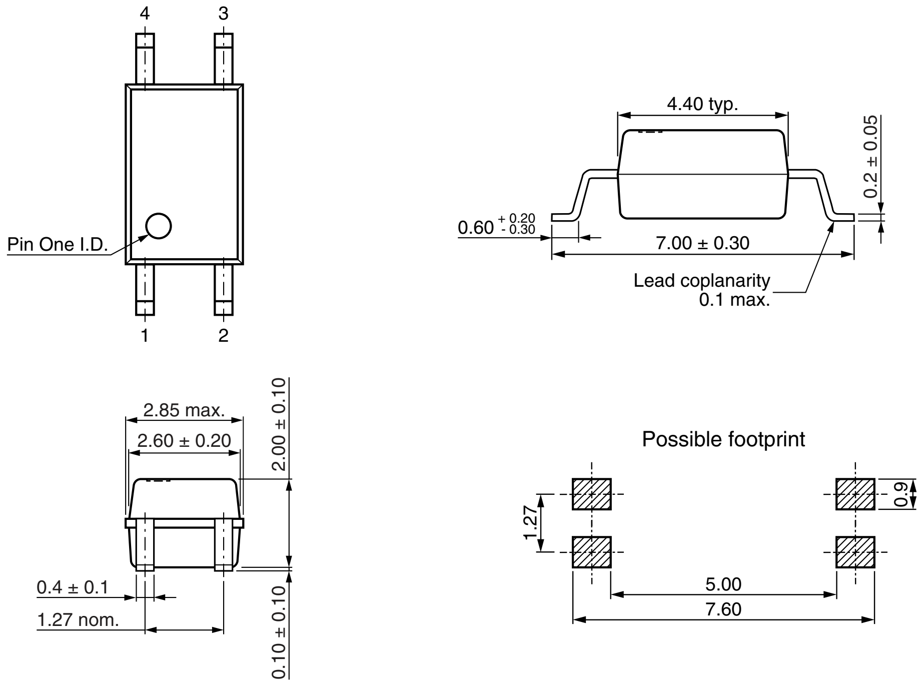
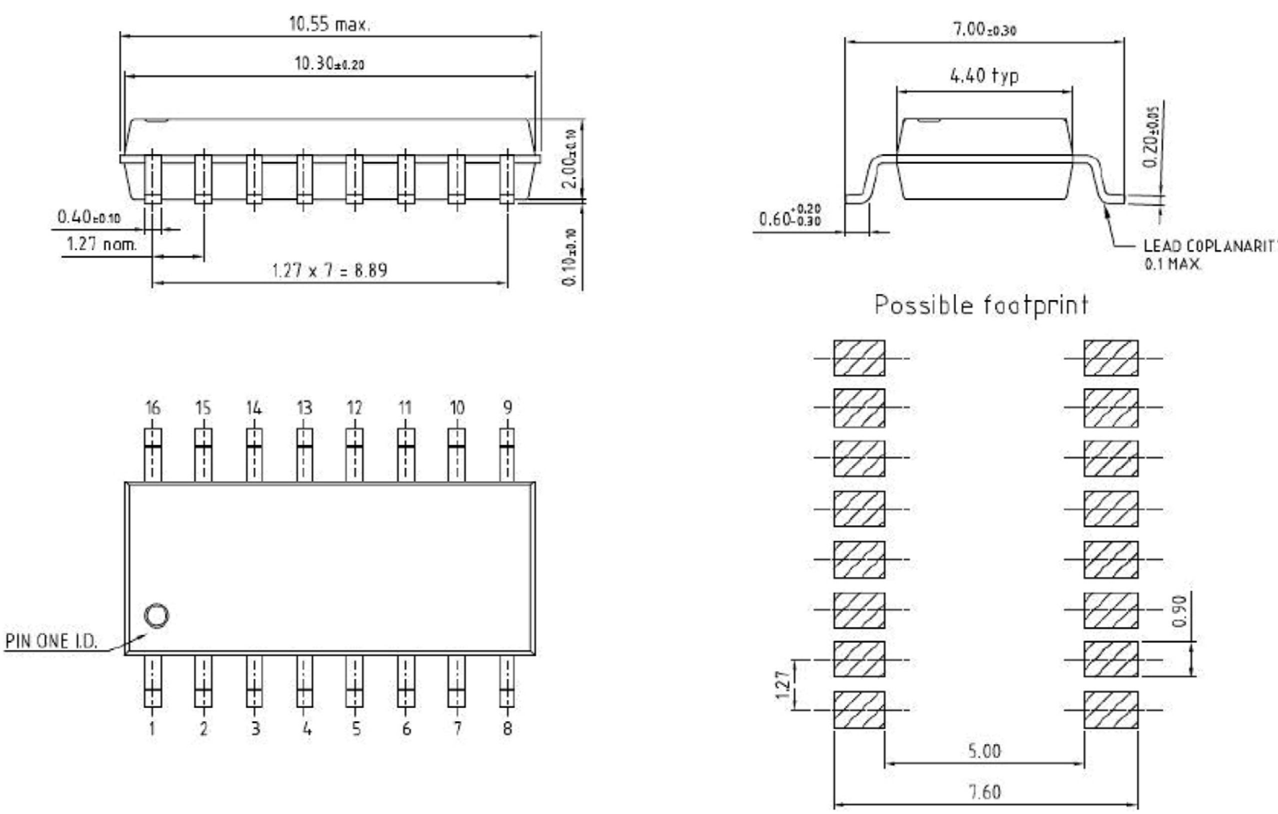


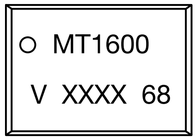
Fig. 14 - F_{CTR} vs. Phase Angle

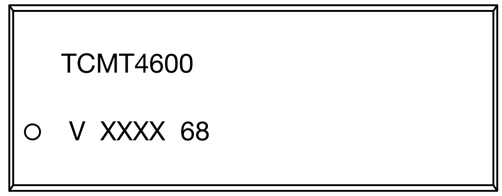
PACKAGE DIMENSIONS in millimeters





PACKAGE MARKING





Note

- XXXX = LMC (lot marking code)

PACKAGING INFORMATION (TAPE AND REEL) in millimeters

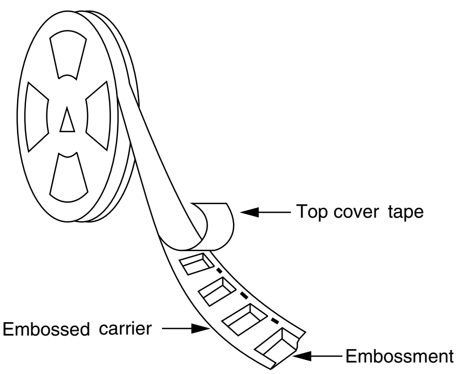


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Fig. 17 - Tape and Reel Shipping Medium

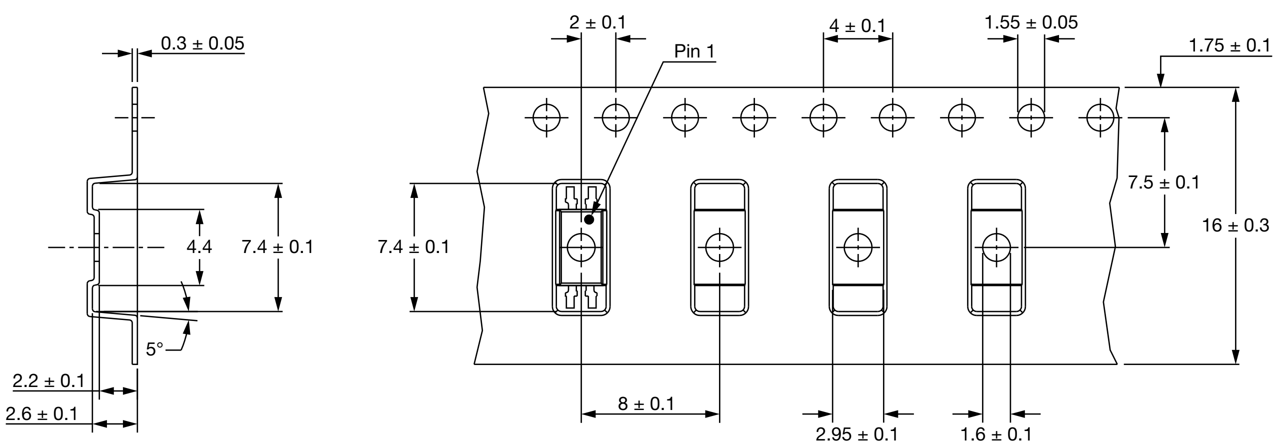

Fig. 18 - Tape and Reel Packing (3000 parts per reel)

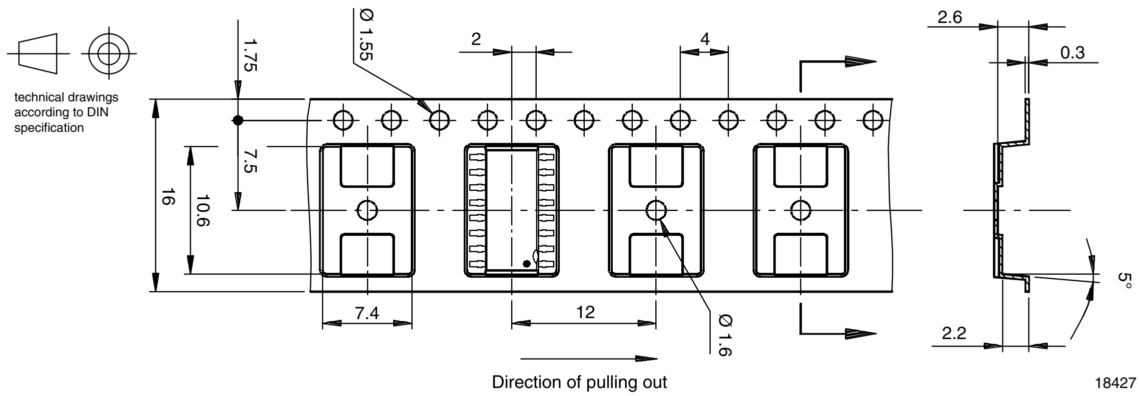

Fig. 19 - TTape and Reel Packing for TCMT460X (2000 parts per reel)

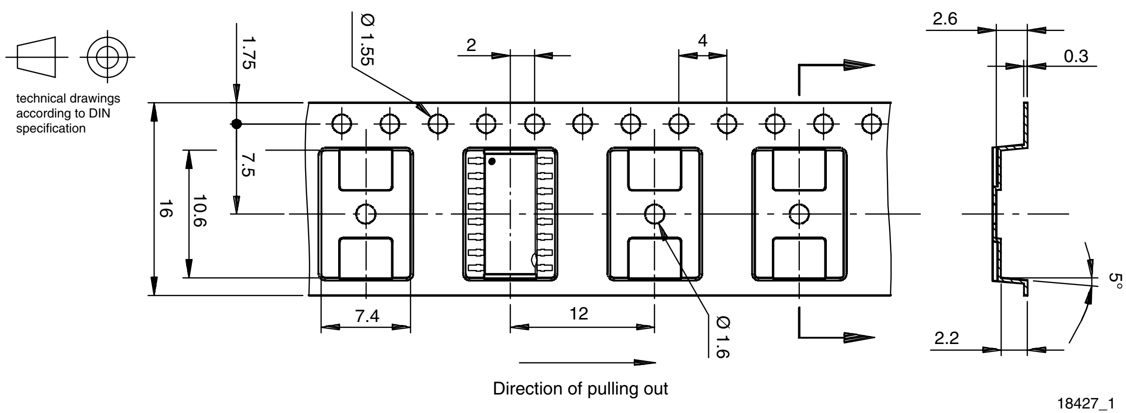

Fig. 20 - TTape and Reel Packing for TCMT460XT0 (2000 parts per reel)

SOLDER PROFILES

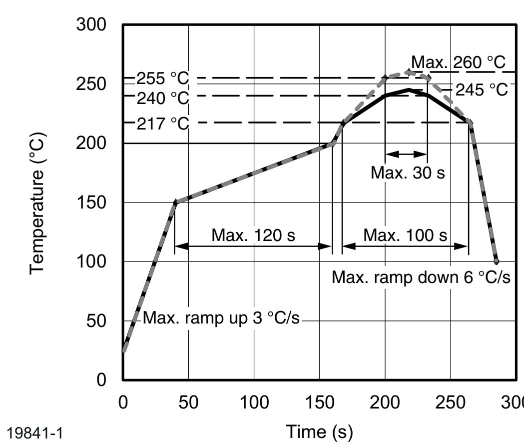

Fig. 21 - Lead (Pb)-free Reflow Solder Profile According to J-STD-020 for SMD Devices

HANDLING AND STORAGE CONDITIONS

ESD level: HBM class 2

Floor life: unlimited

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

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

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