



### 1 Mbit/s High Speed Transistor Coupler

#### Features

- High speed 1Mbit/s
- High isolation voltage between input and output (Viso=3750 Vrms )
- Guaranteed CTR performance from 0°C to 70°C
- Wide operating temperature range of -55°C to 100°C
- Green Package
- Regulatory Approvals
  - UL - UL1577 (E364000)
  - VDE - EN60747-5-5(VDE0884-5)
  - CQC – GB4943.1, GB8898
  - IEC60065, IEC60950

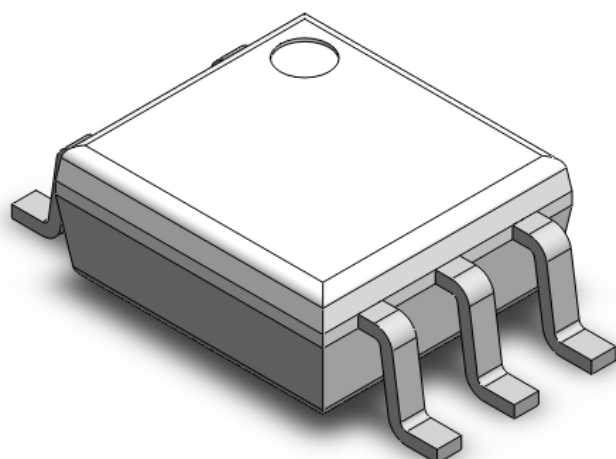
#### Description

The CTM452 and CTM453 devices each consist of an infrared emitting diode, optically coupled to a high speed photo detector transistor. A separate connection for the photodiode bias and output-transistor collector increase the speed by several orders of magnitude over conventional phototransistor couplers by reducing the base-collector capacitance of the input transistor. The devices are packaged in a Mini-Flat package .

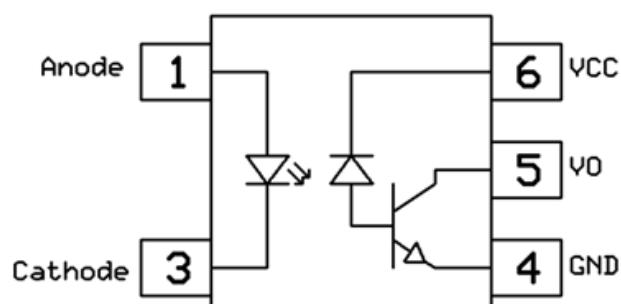
#### Applications

- Line receivers
- Telecommunication equipment
- Feedback loop in switch-mode power supplies
- Home appliances
- High speed logic ground isolation

#### Package Outline



#### Schematic



**Absolute Maximum Rating at 25°C**

<b>Symbol</b>	<b>Parameters</b>	<b>Ratings</b>	<b>Units</b>	<b>Notes</b>
V <sub>ISO</sub>	Isolation voltage *1	3750	V <sub>RMS</sub>	
T <sub>OPR</sub>	Operating temperature	-55 ~ +100	°C	
T <sub>STG</sub>	Storage temperature	-55 ~ +125	°C	
T <sub>SOL</sub>	Soldering temperature *2	260	°C	
<b>Emitter</b>				
I <sub>F</sub>	Forward current	25	mA	
I <sub>FP</sub>	Peak forward current (50% duty, 1ms P.W)	50	mA	
I <sub>F(TRANS)</sub>	Peak transient current (≤1μs P.W,300pps)	1	A	
V <sub>R</sub>	Reverse voltage	5	V	
P <sub>D</sub>	Power dissipation	45	mW	
<b>Detector</b>				
P <sub>D</sub>	Power dissipation	100	mW	
I <sub>O(AVG)</sub>	Average Output current	8	mA	
I <sub>O(Peak)</sub>	Peak Output current	16	mA	
V <sub>O</sub>	Output voltage	-0.5 to 20	V	
V <sub>CC</sub>	Supply voltage	-0.5 to 30	V	

**Electrical Characteristics**

$T_A = 0 - 70^\circ\text{C}$  (unless otherwise specified). Typical values are measured at  $T_A = 25^\circ\text{C}$  and  $V_{CC}=5\text{V}$

**Emitter Characteristics**

<b>Symbol</b>	<b>Parameters</b>	<b>Test Conditions</b>	<b>Min</b>	<b>Typ</b>	<b>Max</b>	<b>Units</b>	<b>Notes</b>
$V_F$	Forward voltage	$I_F = 16\text{mA}$	-	1.45	1.6	V	
$V_R$	Reverse Voltage	$I_R = 10\mu\text{A}$	5.0	-	-	V	
$\Delta V_F/\Delta T_A$	Temperature coefficient of forward voltage	$I_F = 16\text{mA}$	-	-1.6	-	mV/°C	

**Detector Characteristics**

<b>Symbol</b>	<b>Parameters</b>	<b>Test Conditions</b>	<b>Min</b>	<b>Typ</b>	<b>Max</b>	<b>Units</b>	<b>Notes</b>
$I_{OH}$	Logic High Output Current	$I_F=0\text{mA}$ , $V_O=V_{CC}=5.5\text{V}$ , $T_A=25^\circ\text{C}$	-	0.001	0.5	$\mu\text{A}$	
		$I_F=0\text{mA}$ , $V_O=V_{CC}=15\text{V}$ , $T_A=25^\circ\text{C}$	-	0.01	1		
		$I_F=0\text{mA}$ , $V_O=V_{CC}=15\text{V}$	-	-	50		
$I_{CCL}$	Logic Low Supply Current	$I_F=16\text{mA}$ , $V_O=\text{Open}$ , $V_{CC}=15\text{V}$	-	120	200	$\mu\text{A}$	
$I_{CCH}$	Logic High Supply Current	$I_F=0\text{mA}$ , $V_O=\text{Open}$ , $V_{CC}=15\text{V}$ , $T_A=25^\circ\text{C}$	-	0.01	1	$\mu\text{A}$	
		$I_F=0\text{mA}$ , $V_O=\text{Open}$ , $V_{CC}=15\text{V}$	-	-	2		



**Electrical Characteristics**

*T<sub>A</sub> = 0 - 70°C (unless otherwise specified). Typical values are measured at T<sub>A</sub> = 25°C and V<sub>CC</sub>=5V*

**Transfer Characteristics**

<b>Symbol</b>	<b>Parameters</b>	<b>Test Conditions</b>	<b>Min</b>	<b>Typ</b>	<b>Max</b>	<b>Units</b>	<b>Notes</b>
CTR	Current Transfer Ratio	I <sub>F</sub> =16mA, V <sub>O</sub> =0.4V, V <sub>CC</sub> =4.5V, T <sub>A</sub> =25°C	20	-	50	%	
		I <sub>F</sub> =16mA, V <sub>O</sub> =0.5V, V <sub>CC</sub> =4.5V	15	-	-		
V <sub>OL</sub>	Logic Low Output Voltage	I <sub>F</sub> =16mA, I <sub>O</sub> =3mA, V <sub>CC</sub> =4.5V, T <sub>A</sub> =25°C	-	-	0.4	V	
		I <sub>F</sub> =16mA, I <sub>O</sub> =2.4mA, V <sub>CC</sub> =4.5V	-	-	0.5		

**Electrical Characteristics**

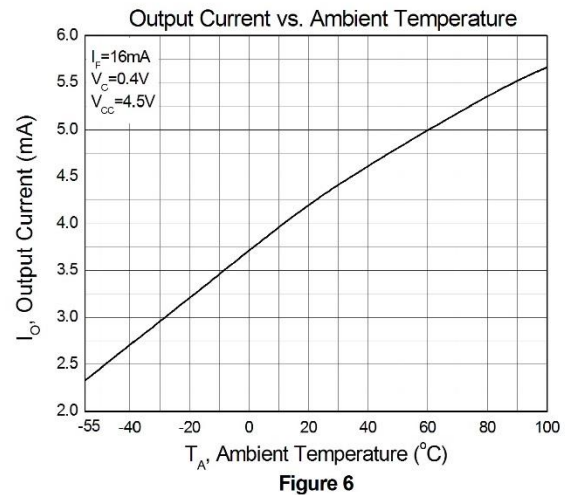
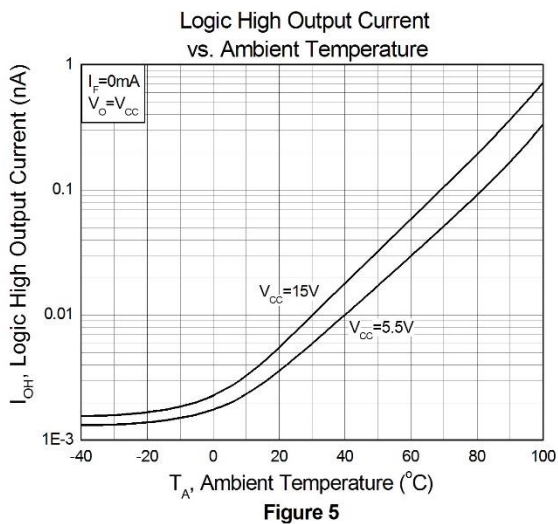
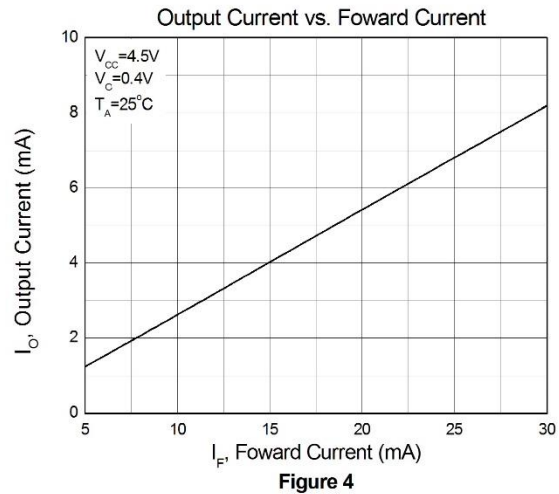
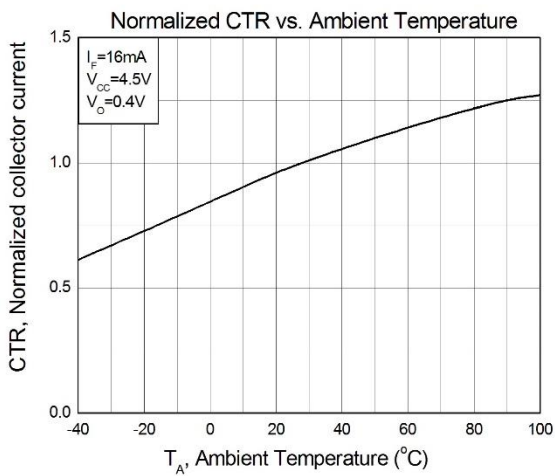
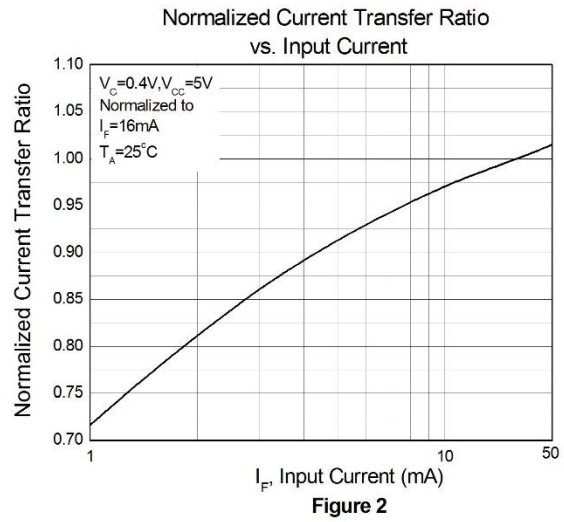
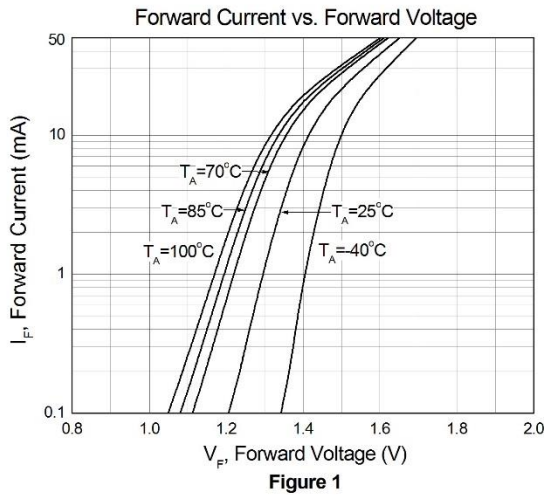
*T<sub>A</sub> = 0 - 70°C (unless otherwise specified). Typical values are measured at T<sub>A</sub> = 25°C and V<sub>CC</sub>=5V*

**Switching Characteristics**

<b>Symbol</b>	<b>Parameters</b>		<b>Test Conditions</b>	<b>Min</b>	<b>Typ</b>	<b>Max</b>	<b>Units</b>	<b>Notes</b>
T <sub>PHL</sub>	Propagation Delay Time Logic High to Logic Low		I <sub>F</sub> =16mA, R <sub>L</sub> =1.9KΩ, T <sub>A</sub> =25°C	-	0.35	0.8	μs	
			I <sub>F</sub> =16mA, R <sub>L</sub> =1.9KΩ	-	-	1.0		
T <sub>PLH</sub>	Propagation Delay Time Logic Low to Logic High		I <sub>F</sub> =16mA, R <sub>L</sub> =1.9KΩ, T <sub>A</sub> =25°C	-	0.3	0.8	μs	
			I <sub>F</sub> =16mA, R <sub>L</sub> =1.9KΩ	-	-	1.0		
CM <sub>H</sub>	Common Mode Transient Immunity at Logic High	CTM452	I <sub>F</sub> = 0mA , V <sub>CM</sub> =10Vp-p, R <sub>L</sub> =1.9KΩ, T <sub>A</sub> =25°C	5,000	-	-	V/μs	
		CTM453	I <sub>F</sub> = 0mA , V <sub>CM</sub> =1500Vp-p, R <sub>L</sub> =1.9KΩ, T <sub>A</sub> =25°C	15,000	-	-		
CM <sub>L</sub>	Common Mode Transient Immunity at Logic Low	CTM452	I <sub>F</sub> = 16mA , V <sub>CM</sub> =10Vp-p, R <sub>L</sub> =1.9KΩ, T <sub>A</sub> =25°C	5,000	-	-	V/μs	
		CTM453	I <sub>F</sub> = 16mA , V <sub>CM</sub> =1500Vp-p, R <sub>L</sub> =1.9KΩ, T <sub>A</sub> =25°C	15,000	-	-		



Typical Characteristic Curves





Typical Characteristic Curves

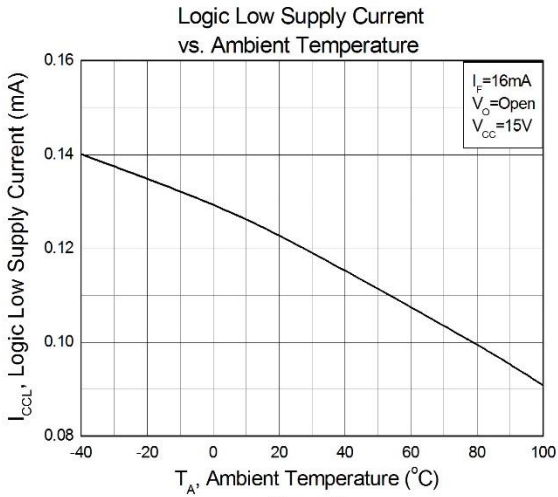


Figure 7

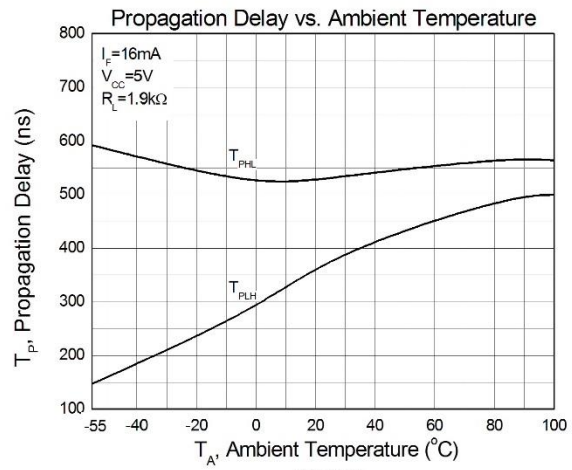


Figure 8

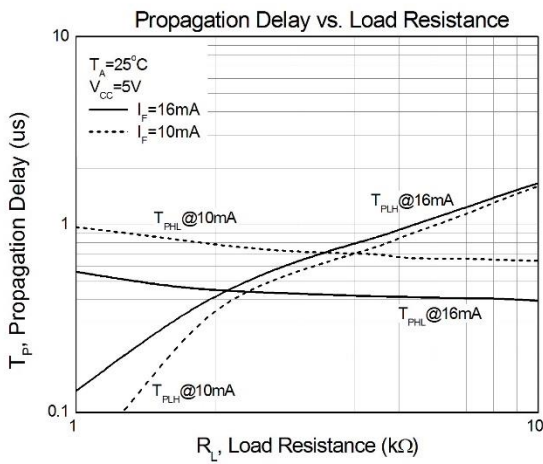


Figure 9

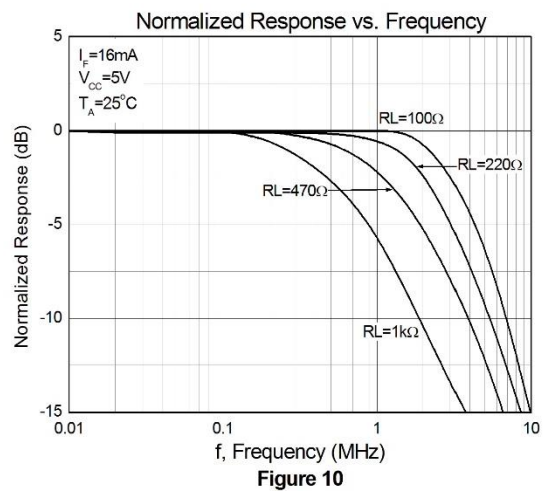
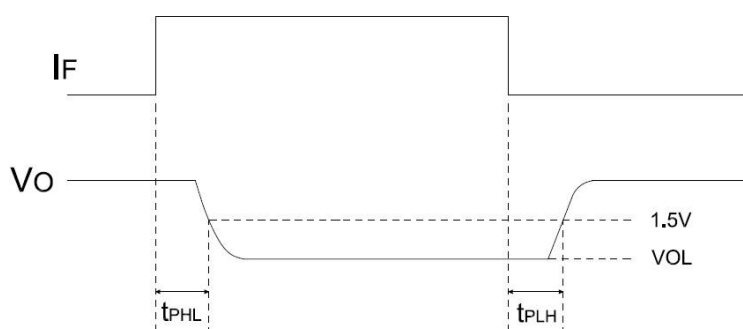
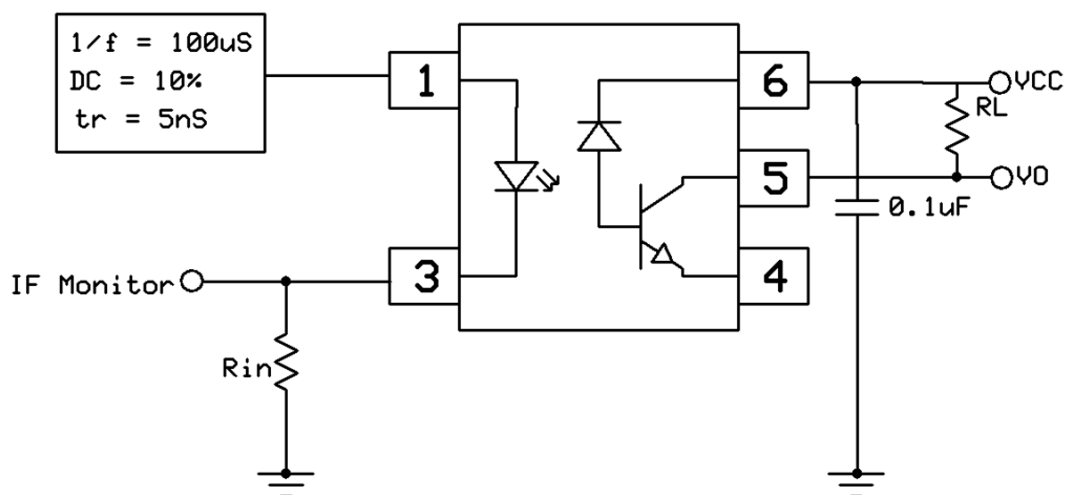


Figure 10



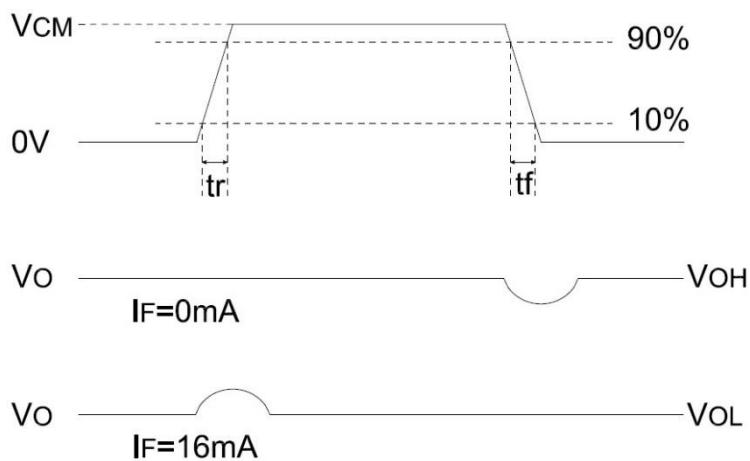
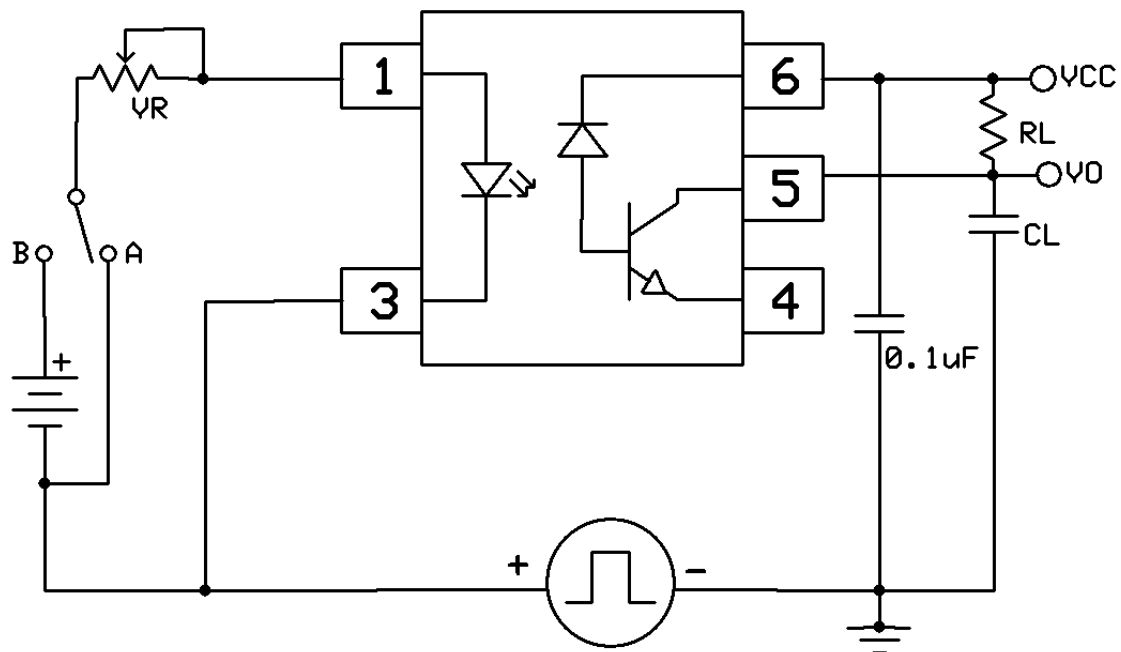
Test Circuits



Switching Time Test Circuit



Test Circuits



CMR Test Circuit



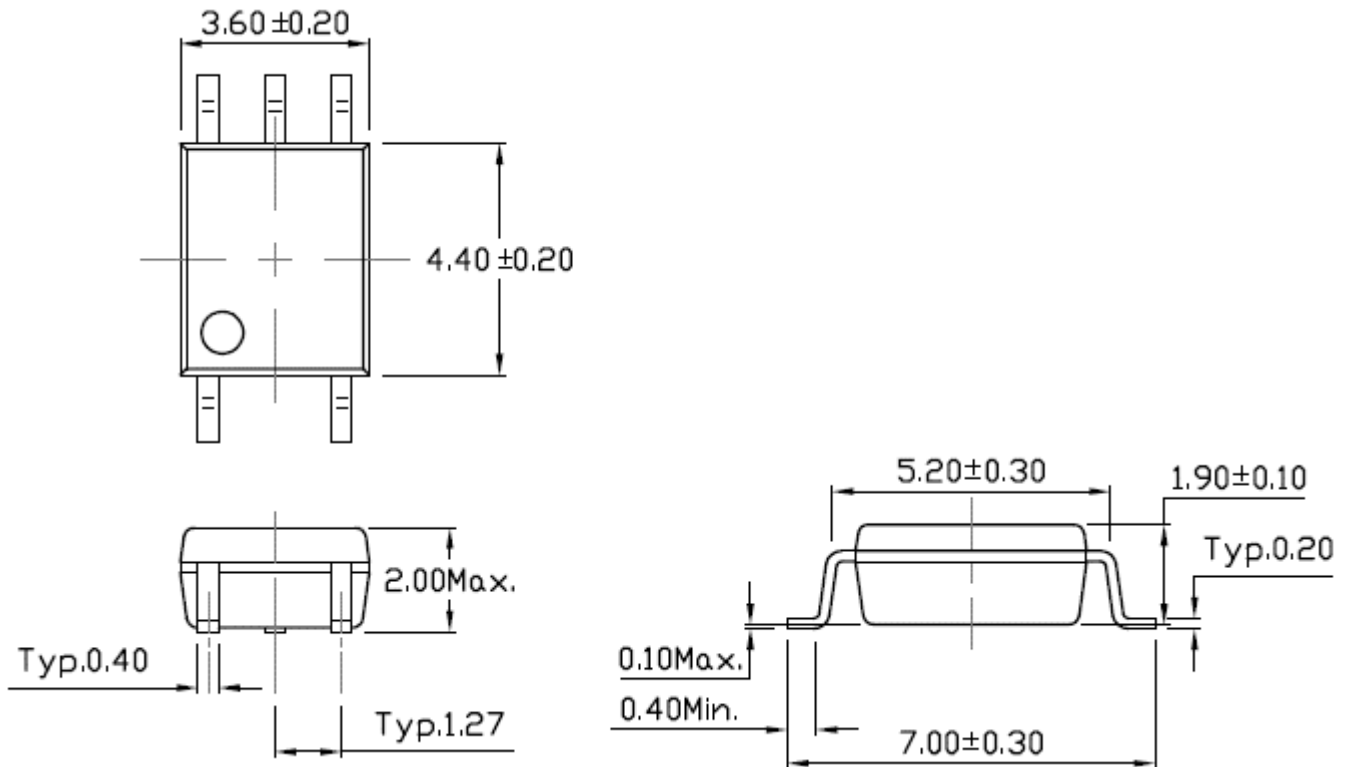


CTM452, CTM453

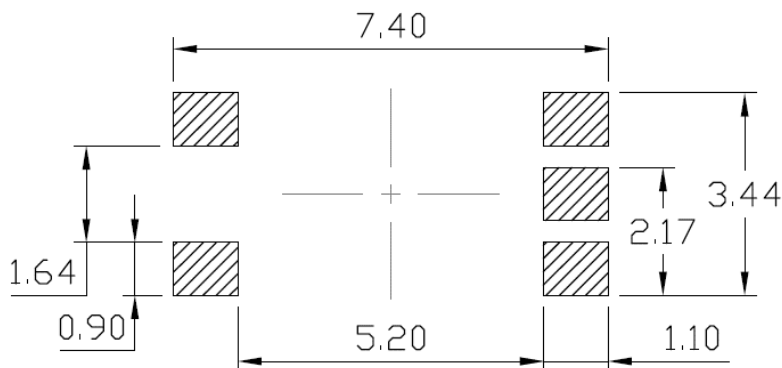
5 Pin Mini-Flat

1 Mbit/s High Speed Transistor Coupler

**Package Dimension** *Dimensions in mm unless otherwise stated*



**Recommended Solder Mask** *Dimensions in mm unless otherwise stated*





### Marking Information



**Note:**

- CT : Denotes “CT Micro”
- M453 : Product Number
- V : VDE Option
- Y : Fiscal Year
- WW : Work Week
- K : Production Code

### Ordering Information

#### CTM45X(V)(Z)

X = Part No. (X=2 or 3)

V = VDE Option (V or none)

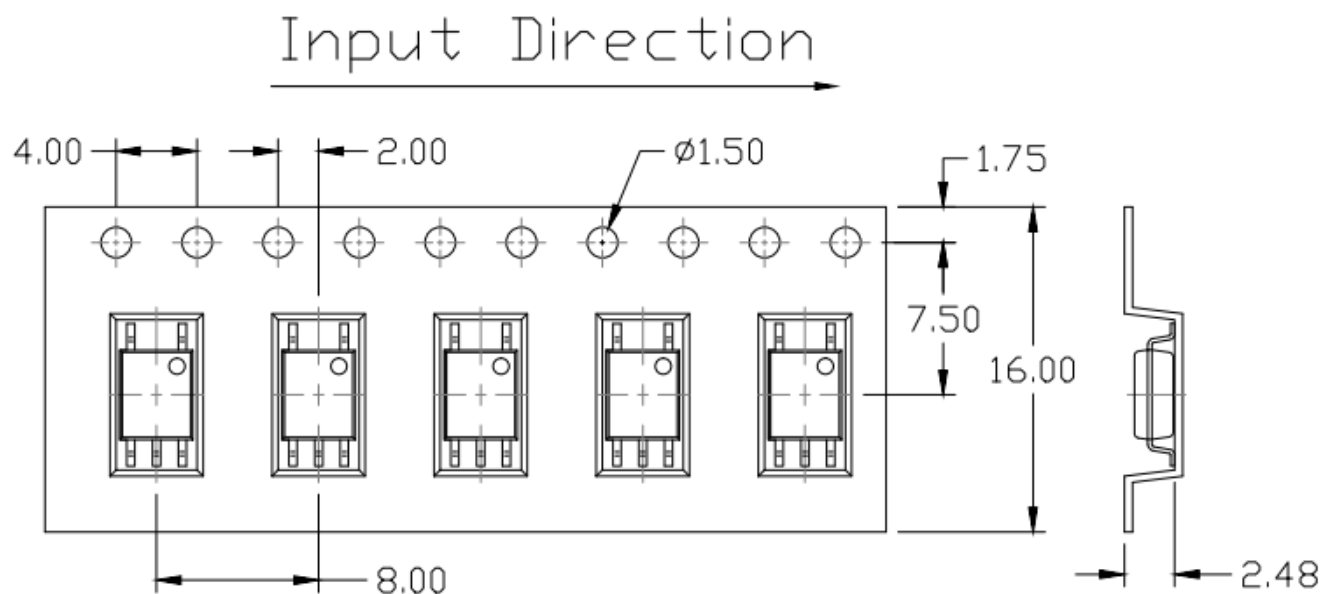
Z = Tape and reel option (T1, T2, T3 or T4)

<b>Option</b>	<b>Description</b>	<b>Quantity</b>
T1	Surface Mount Lead Forming – With Option 1 Tapping	3000 Units/Reel
T2	Surface Mount Lead Forming – With Option 2 Tapping	3000 Units/Reel
T3	Surface Mount Lead Forming – With Option 3 Tapping	3000 Units/Reel
T4	Surface Mount Lead Forming – With Option 4 Tapping	3000 Units/Reel

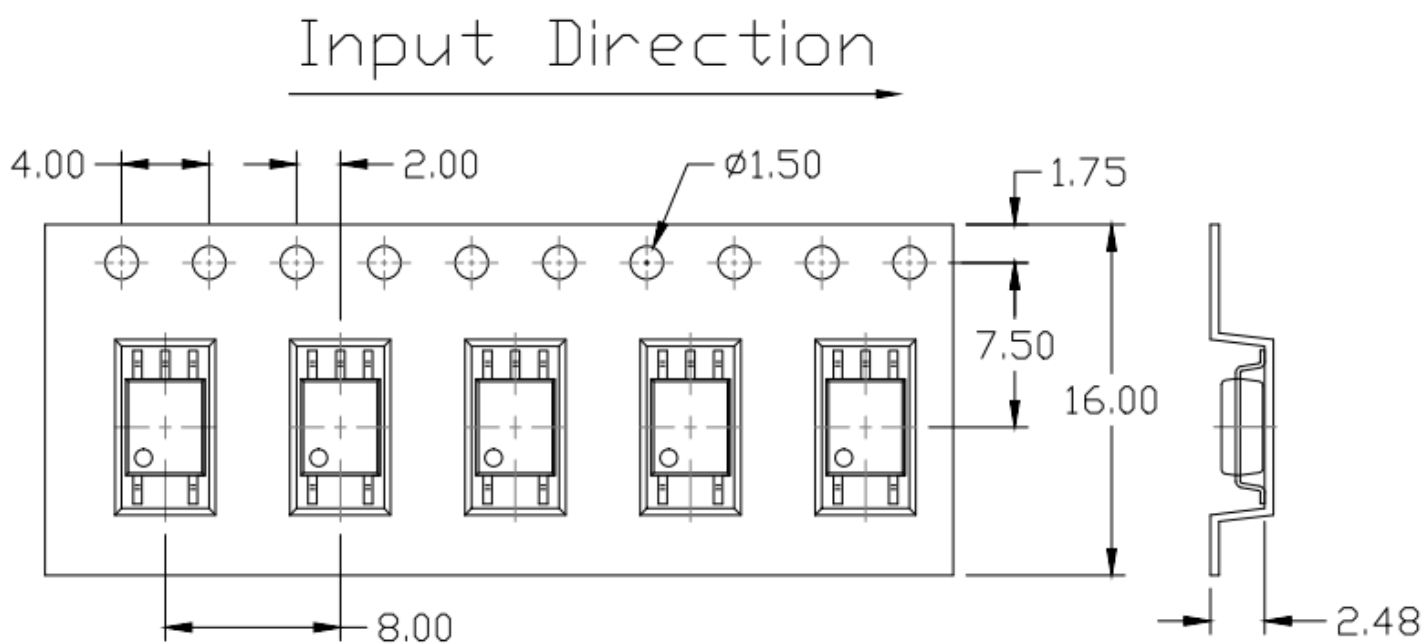


**Carrier Tape Specifications** *Dimensions in mm unless otherwise stated*

**Option T1**



**Option T2**



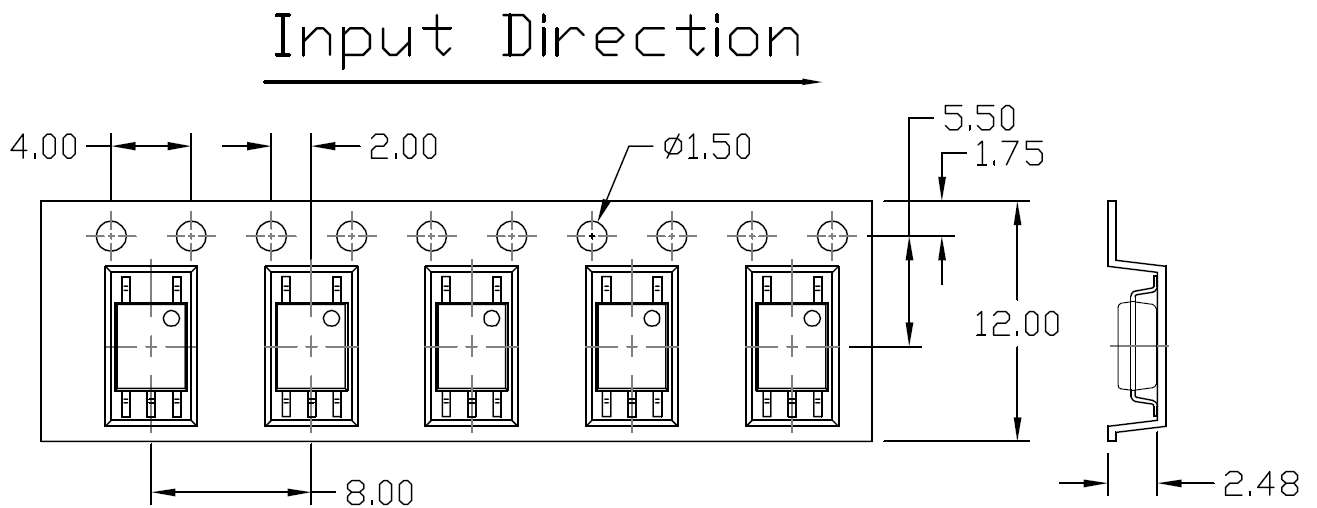


CTM452, CTM453

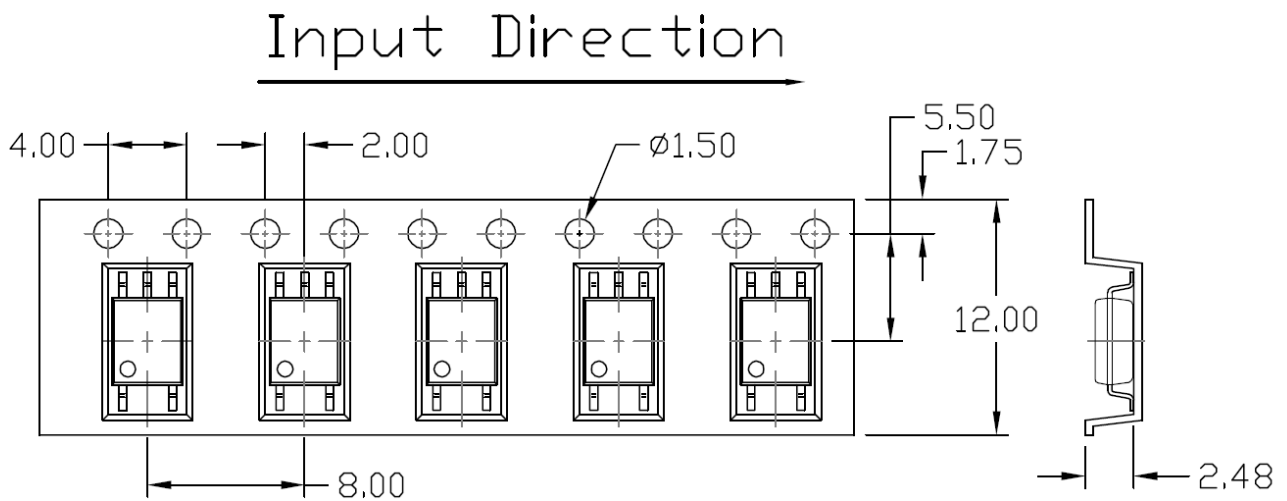
5 Pin Mini-Flat

1 Mbit/s High Speed Transistor Coupler

Option T3

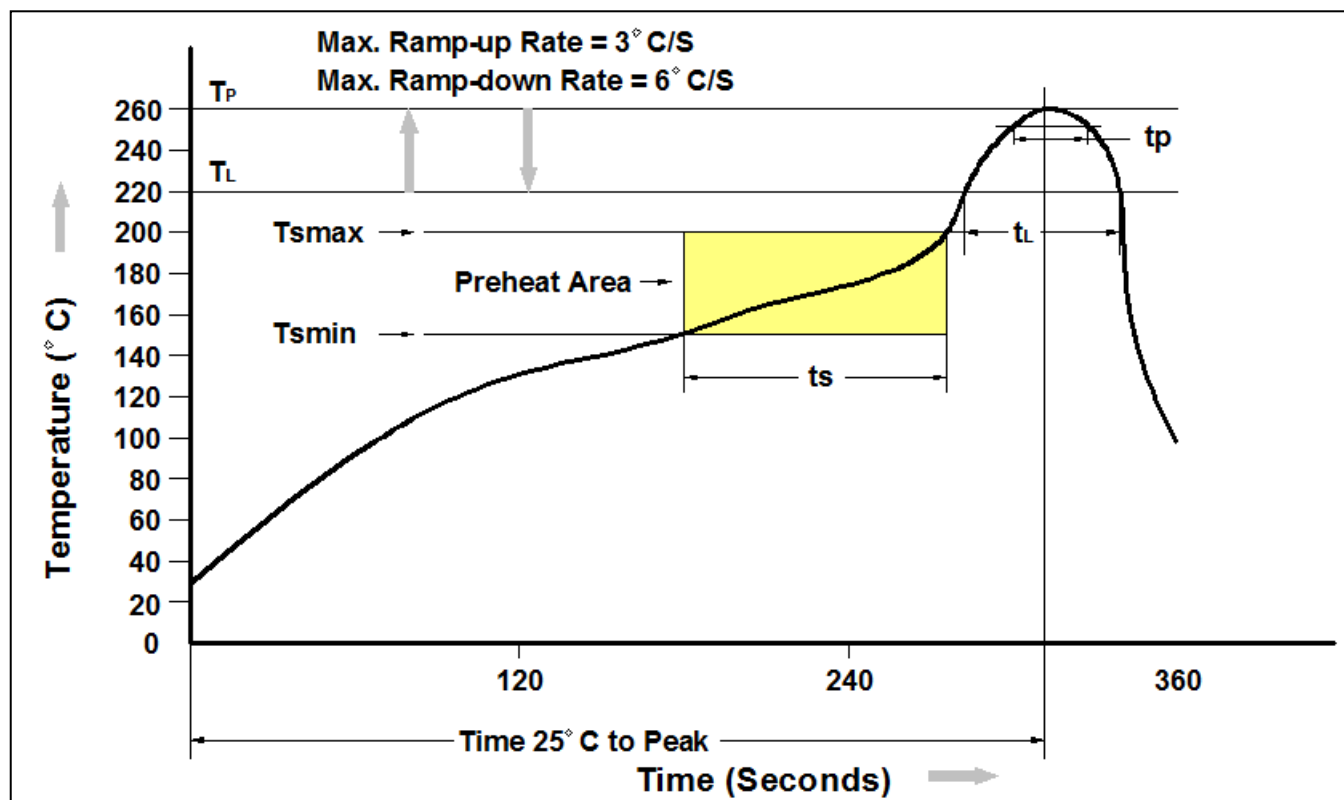


Option T4





**Reflow Profile**



Profile Feature	Pb-Free Assembly Profile
Temperature Min. (Tsmin)	150°C
Temperature Max. (Tsmax)	200°C
Time (ts) from (Tsmin to Tsmax)	60-120 seconds
Ramp-up Rate (tL to tp)	3°C/second max.
Liquidous Temperature (TL)	217°C
Time (tL) Maintained Above (TL)	60 – 150 seconds
Peak Body Package Temperature	260°C +0°C / -5°C
Time (tp) within 5°C of 260°C	30 seconds
Ramp-down Rate (TP to TL)	6°C/second max
Time 25°C to Peak Temperature	8 minutes max.



**CTM452, CTM453**

**5 Pin Mini-Flat**

**1 Mbit/s High Speed Transistor Coupler**

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