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**CTM452, CTM453**

**5 Pin Mini-Flat DMC-Isolator®**

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

## Features

- High speed: 1 Mbit/s
- High isolation voltage between input and output (Viso=3750 Vrms )
- Guaranteed performance from 0°C to 70°C
- Wide operating temperature range of -55°C to 125°C
- RoHS and REACH compliance
- Halogen Free compliance
- MSL class 1
- Regulatory Approvals
  - ✓ UL - UL1577 (E364000)
  - ✓ VDE - EN60747-5-5(VDE0884-5)
  - ✓ CQC – GB4943.1, 2022 (14001105803)
  - ✓ IEC62368 (FI/41119)

## Description

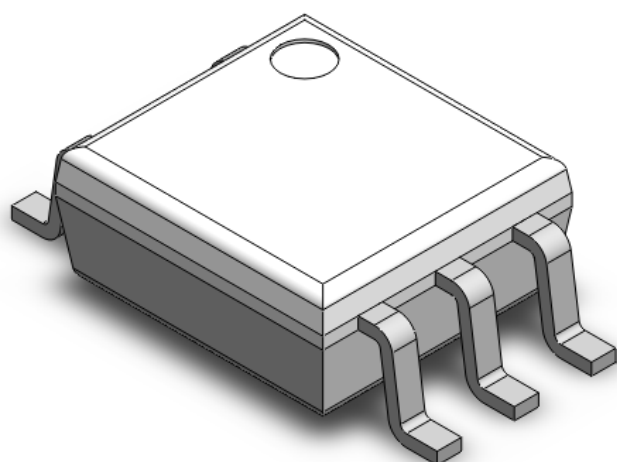
The CTM452 and CTM453 devices each consist of an infrared emitting diode, optically coupled to a high speed photo detector transistor.

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.

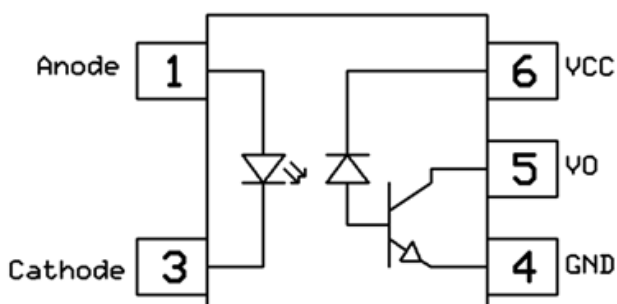
## Applications

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

## Package Outline



## Schematic





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#### Absolute Maximum Ratings $T_A = 25^{\circ}\text{C}$ , unless otherwise specified

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. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameters	Ratings	Units	Notes
$V_{\text{ISO}}$	Isolation voltage (AC, 1 minute, 40 ~ 60% R.H.)	3750	$V_{\text{RMS}}$	
$T_{\text{OPR}}$	Operating temperature	-55 ~ +125	$^{\circ}\text{C}$	
$T_{\text{STG}}$	Storage temperature	-55 ~ +150	$^{\circ}\text{C}$	
$T_{\text{SOL}}$	Soldering temperature (For 10 seconds)	260	$^{\circ}\text{C}$	
<b>Emitter</b>				
$I_{\text{F}}$	Forward current	25	mA	
$I_{\text{FP}}$	Peak forward current (50% duty, 1ms P.W)	50	mA	
$I_{\text{F(TRANS)}}$	Peak transient current ( $\leq 1\mu\text{s}$ P.W, 300pps)	1	A	
$V_{\text{R}}$	Reverse voltage	5	V	
$P_{\text{D}}$	Power dissipation	45	mW	
<b>Detector</b>				
$P_{\text{D}}$	Power dissipation	100	mW	
$I_{\text{O(AVG)}}$	Average Output current	8	mA	
$I_{\text{O (Peak)}}$	Peak Output current	16	mA	
$V_{\text{O}}$	Output voltage	-0.5 to 20	V	
$V_{\text{CC}}$	Supply voltage	-0.5 to 30	V	



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#### 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

Symbol	Parameters	Test Conditions	Min	Typ	Max	Units	Notes
$V_F$	Forward voltage	$I_F = 16\text{mA}$	-	1.6	1.8	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/ $^{\circ}\text{C}$	

##### Detector Characteristics

Symbol	Parameters	Test Conditions	Min	Typ	Max	Units	Notes
$I_{OH}$	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	$\mu\text{A}$	
		$I_F=0\text{mA}$ , $V_O=V_{CC}=3.3\text{V}$ , $T_A=25^{\circ}\text{C}$		0.001	0.4		
		$I_F=0\text{mA}$ , $V_O=V_{CC}=15\text{V}$ , $T_A=25^{\circ}\text{C}$	-	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		



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#### Transfer Characteristics

Symbol	Parameters	Test Conditions	Min	Typ	Max	Units	Notes
CTR	Current Transfer Ratio	$I_F=16\text{mA}$ , $V_O=0.4\text{V}$ , $V_{CC}=4.5\text{V}$ , $T_A=25^\circ\text{C}$	20	-	50	%	
		$I_F=16\text{mA}$ , $V_O=0.5\text{V}$ , $V_{CC}=4.5\text{V}$	15	-	-		
		$I_F=16\text{mA}$ , $V_O=0.4\text{V}$ , $V_{CC}=3.3\text{V}$ , $T_A=25^\circ\text{C}$	18		51		
		$I_F=16\text{mA}$ , $V_O=0.5\text{V}$ , $V_{CC}=3.3\text{V}$	13				
VOL	Logic Low Output Voltage	$I_F=16\text{mA}$ , $I_O=3\text{mA}$ , $V_{CC}=4.5\text{V}$ , $T_A=25^\circ\text{C}$	-	-	0.4	V	
		$I_F=16\text{mA}$ , $I_O=3\text{mA}$ , $V_{CC}=3.3\text{V}$ , $T_A=25^\circ\text{C}$			0.4		
		$I_F=16\text{mA}$ , $I_O=2.4\text{mA}$ , $V_{CC}=4.5\text{V}$	-	-	0.5		
		$I_F=16\text{mA}$ , $I_O=2.4\text{mA}$ , $V_{CC}=3.3\text{V}$			0.5		



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#### Switching Characteristics

Symbol	Parameters		Test Conditions	Min	Typ	Max	Units	Notes
$T_{PHL}$	Propagation Delay Time Logic High to Logic Low		$I_F=16\text{mA}$ , $R_L=1.9\text{K}\Omega$ , $T_A=25^\circ\text{C}$	-	0.35	0.8	$\mu\text{s}$	
			$I_F=16\text{mA}$ , $R_L=1.9\text{K}\Omega$	-	-	1.0		
			$I_F=16\text{mA}$ , $V_{CC}=3.3\text{V}$ , $R_L=1.9\text{K}\Omega$ , $T_A=25^\circ\text{C}$		0.4	1		
			$I_F=16\text{mA}$ , $V_{CC}=3.3\text{V}$ , $R_L=1.9\text{K}\Omega$			1.4		
$T_{PLH}$	Propagation Delay Time Logic Low to Logic High		$I_F=16\text{mA}$ , $R_L=1.9\text{K}\Omega$ , $T_A=25^\circ\text{C}$	-	0.3	0.8	$\mu\text{s}$	
			$I_F=16\text{mA}$ , $R_L=1.9\text{K}\Omega$	-	-	1.0		
			$I_F=16\text{mA}$ , $V_{CC}=3.3\text{V}$ , $R_L=1.9\text{K}\Omega$ , $T_A=25^\circ\text{C}$			1.5		
			$I_F=16\text{mA}$ , $V_{CC}=3.3\text{V}$ , $R_L=1.9\text{K}\Omega$			2.0		
$CM_H$	Common Mode Transient Immunity at Logic High	CTM452	$I_F = 0\text{mA}$ , $V_{CM}=10\text{Vp-p}$ , $R_L=1.9\text{K}\Omega$ , $T_A=25^\circ\text{C}$	5,000	-	-	$\text{V}/\mu\text{s}$	
		CTM453	$I_F = 0\text{mA}$ , $V_{CM}=1500\text{Vp-p}$ , $R_L=1.9\text{K}\Omega$ , $T_A=25^\circ\text{C}$	15,000	-			
$CM_L$	Common Mode Transient Immunity at Logic Low	CTM452	$I_F = 16\text{mA}$ , $V_{CM}=10\text{Vp-p}$ , $R_L=1.9\text{K}\Omega$ , $T_A=25^\circ\text{C}$	5,000	-	-	$\text{V}/\mu\text{s}$	
		CTM453	$I_F = 16\text{mA}$ , $V_{CM}=1500\text{Vp-p}$ , $R_L=1.9\text{K}\Omega$ , $T_A=25^\circ\text{C}$	15,000	-			



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#### Typical Characteristic Curves $T_A = 25^\circ\text{C}$ , unless otherwise specified

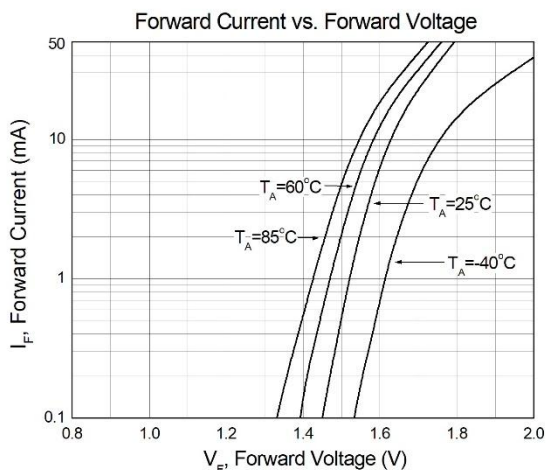


Figure 1

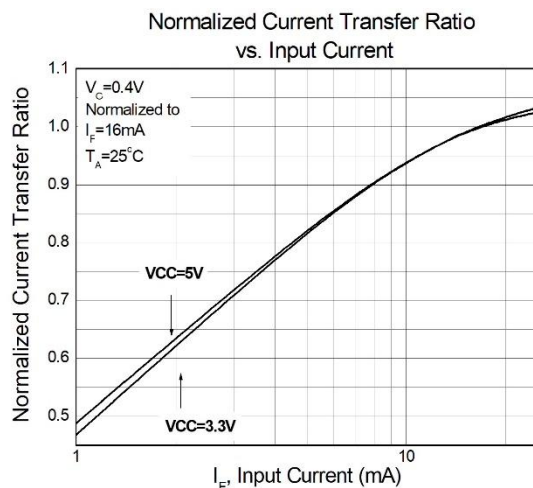


Figure 2

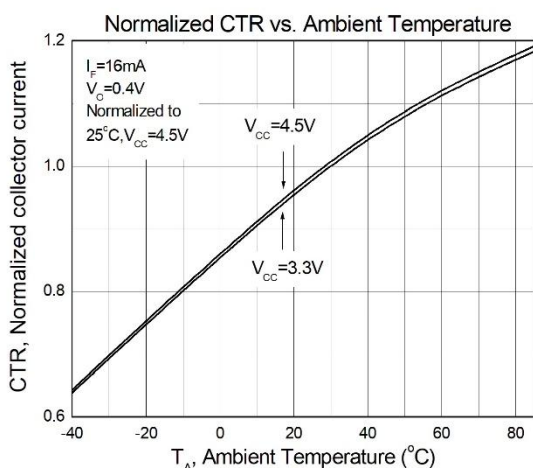


Figure 3

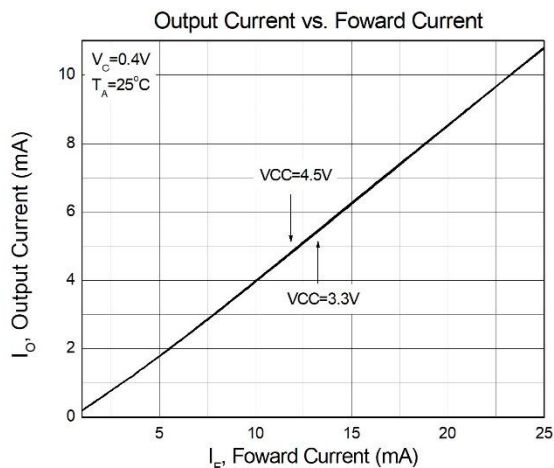


Figure 4

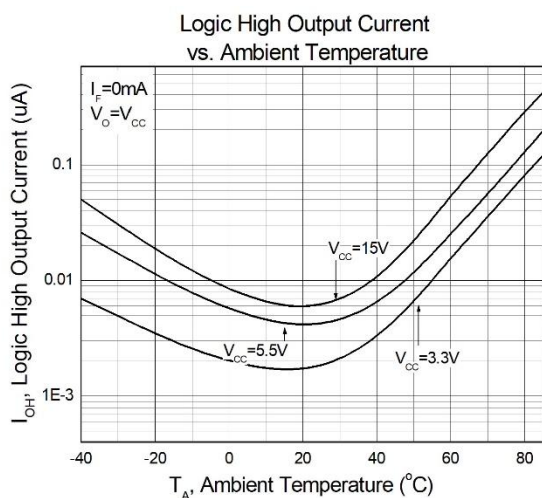


Figure 5

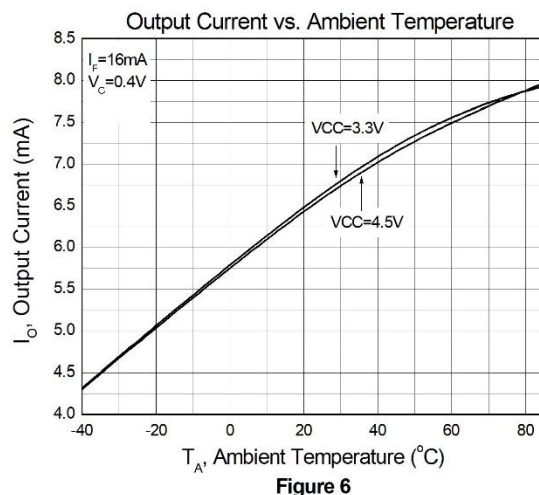


Figure 6



# CTM452, CTM453

## 5 Pin Mini-Flat DMC-Isolator®

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#### Typical Characteristic Curves $T_A = 25^\circ\text{C}$ , unless otherwise specified

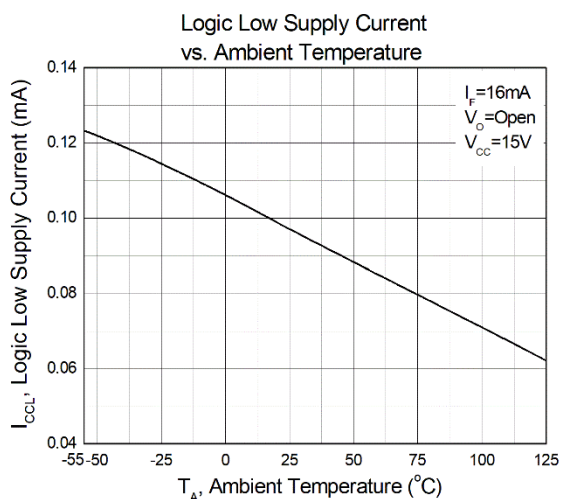


Figure 7

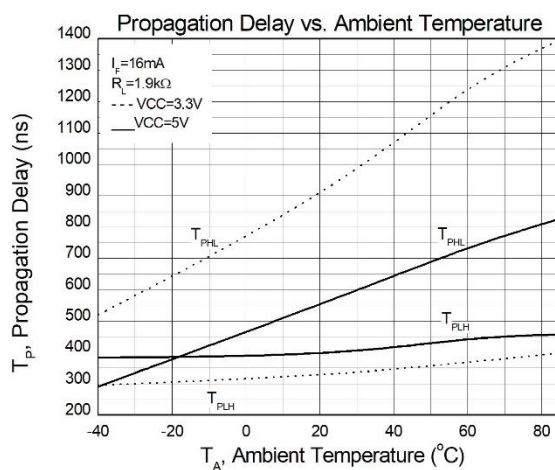


Figure 8

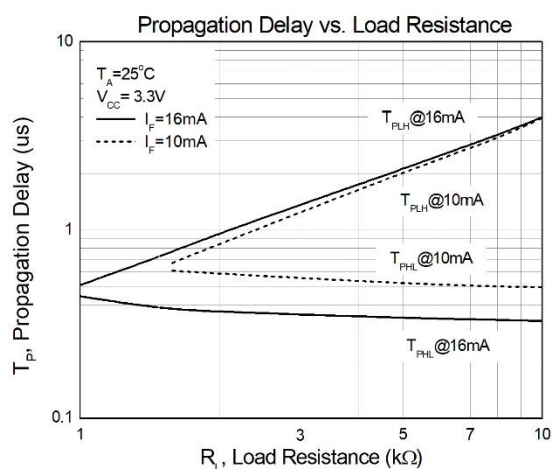


Figure 9

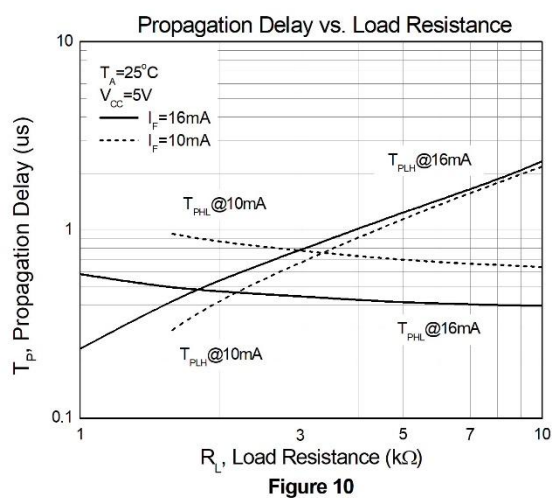


Figure 10



## Test Circuits

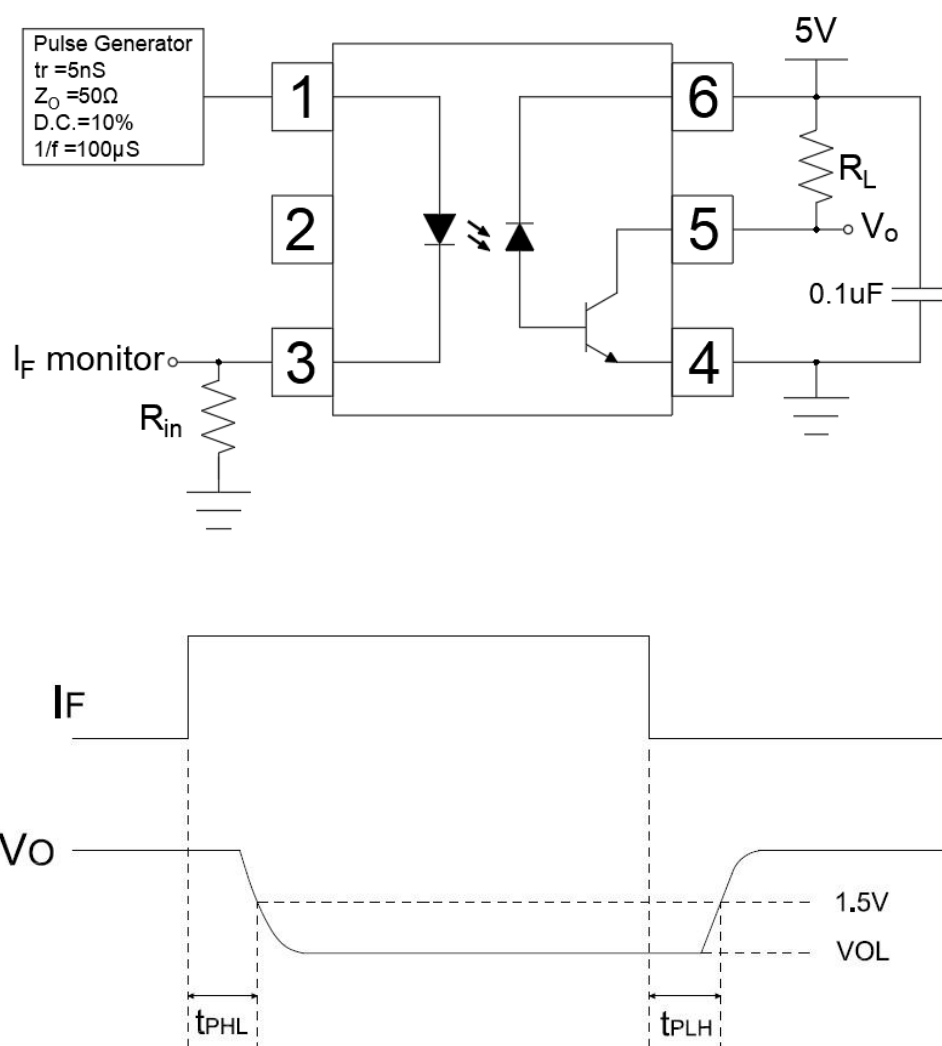


Figure 11: Switching Time Test Circuits





## Test Circuits

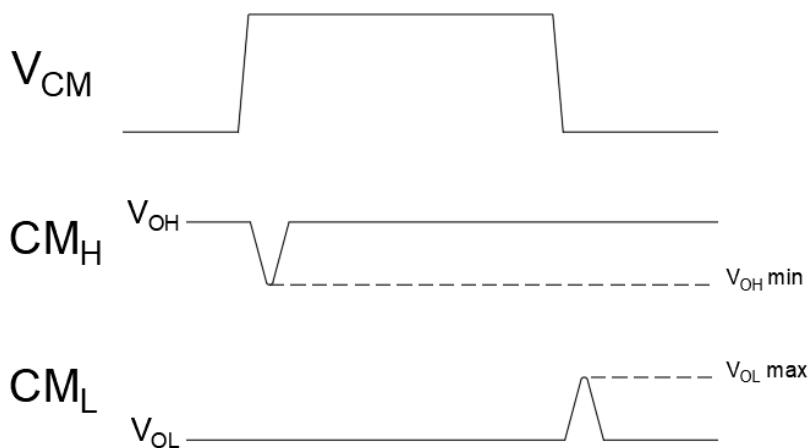
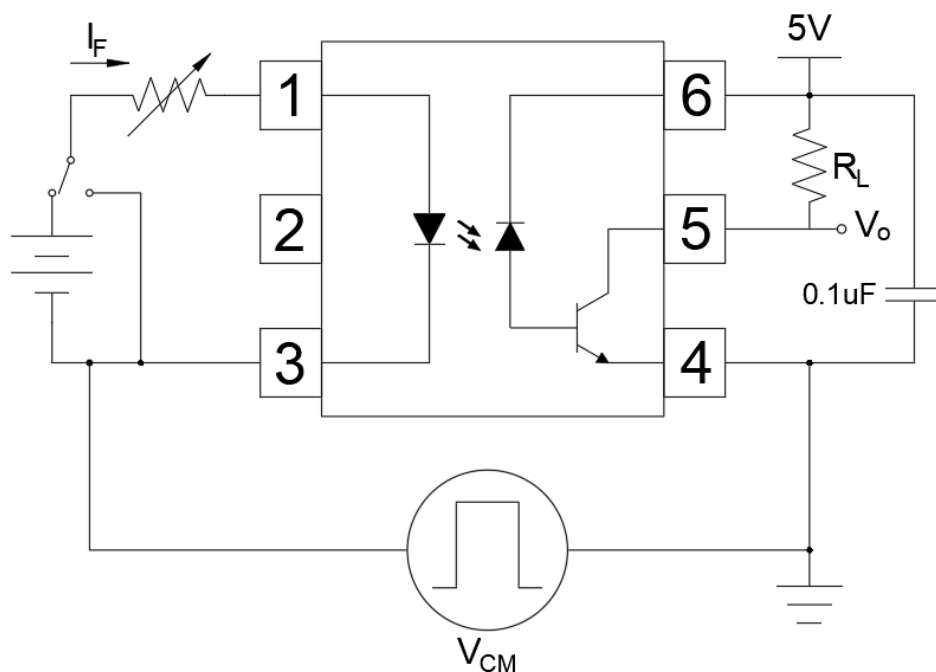


Figure 12: CMR Test Circuits

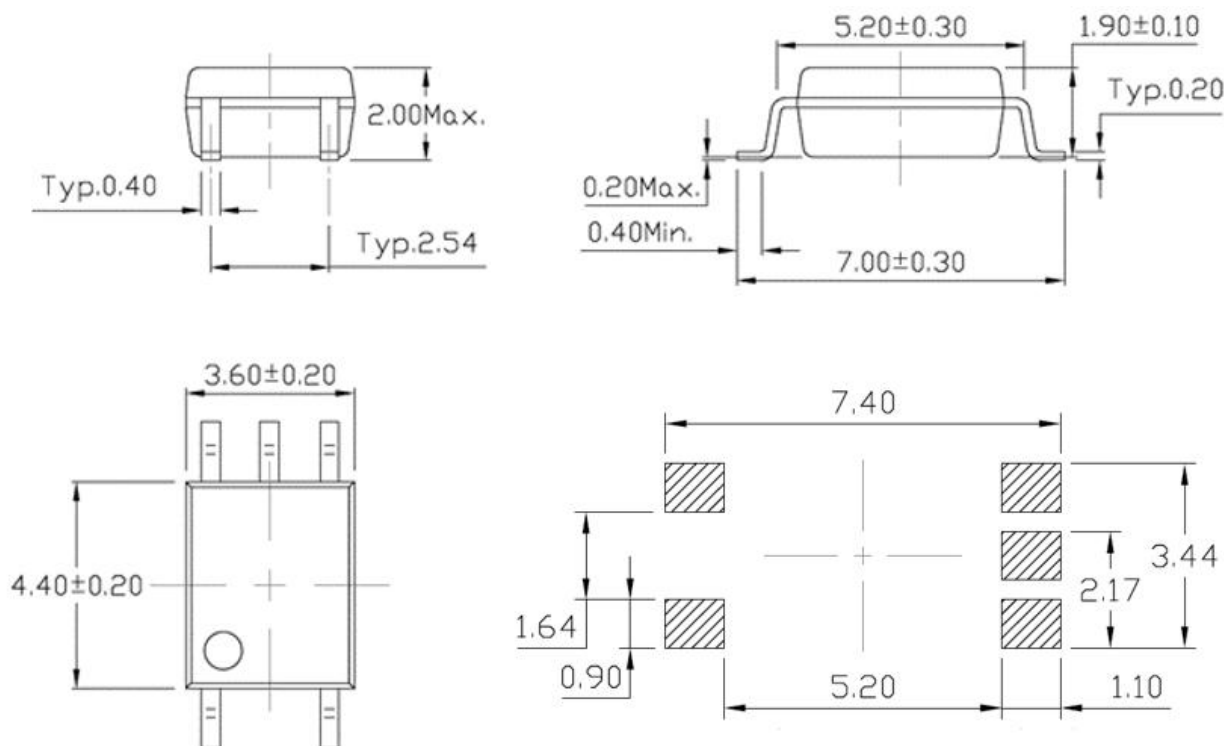


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## 5 Pin Mini-Flat DMC-Isolator®

### 1 Mbit/s High Speed Transistor Coupler

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



#### Marking Information



#### Note:

- CT : Denotes "CT Micro"
- M452 : Product Number
- V : VDE Safety Mark Option
- Y : One Digit Year Code
- WW : Two Digit Work Week
- K : Manufacturing Code



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#### Ordering Information

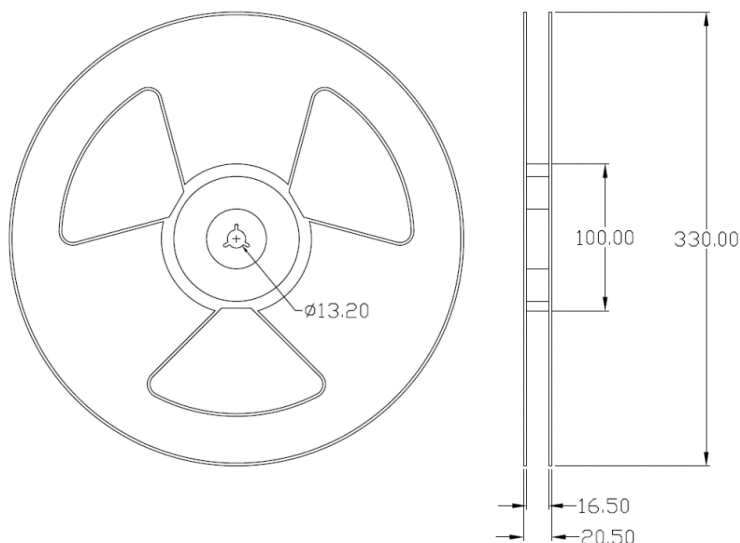
##### CTM45X (V)(Z)

- CT = Denotes "CT Micro"  
M45X = Product Number (X= 2, or 3)  
V = VDE Safety Mark Option (Blank or V)  
Z = Tape and Reel Option (T1 or T2)

Option	Description	Quantity
T1	Surface Mount Lead Forming – With Option 1 Tapping	3000 Units/Reel
T2	Surface Mount Lead Forming – With Option 2 Tapping	3000 Units/Reel

#### Reel Dimension *All dimensions are in mm, unless otherwise stated*

##### Option T1/T2





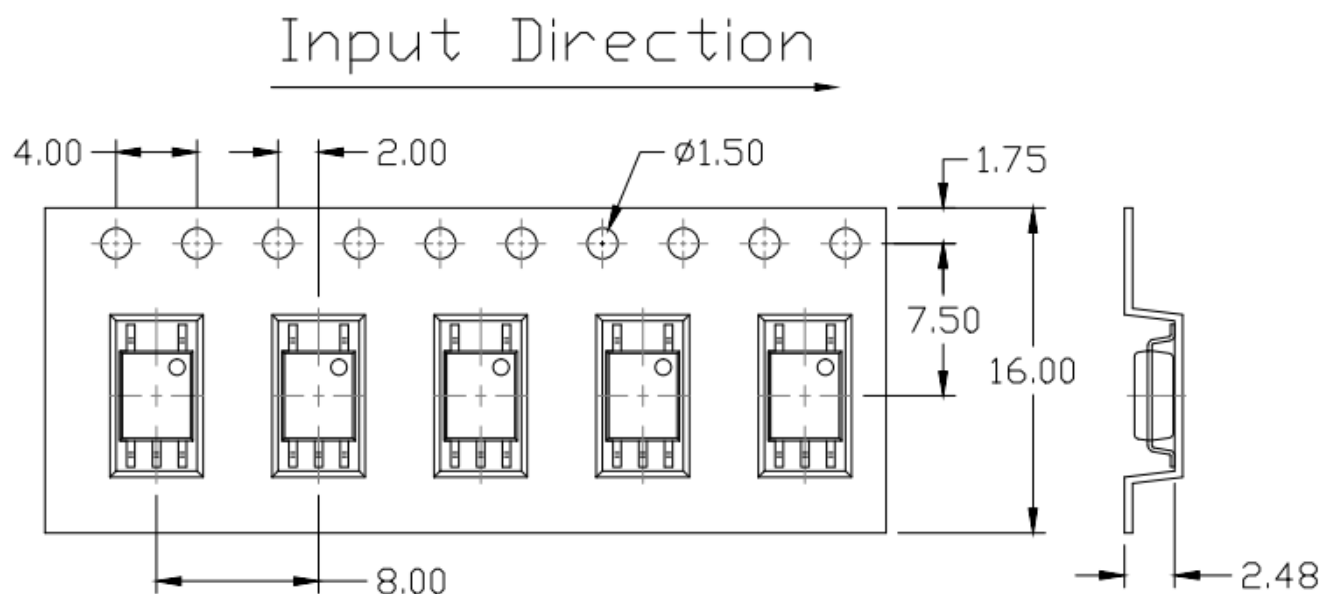
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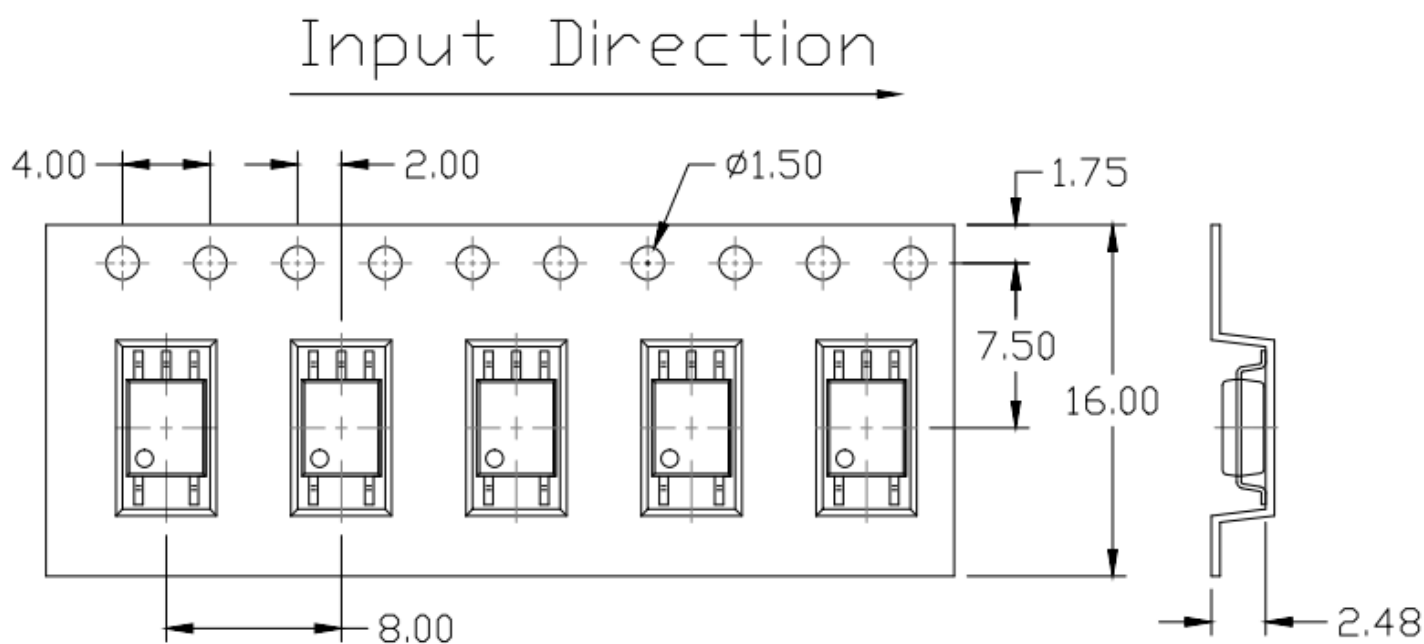
### 1 Mbit/s High Speed Transistor Coupler

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

##### Option T1



##### Option T2





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#### Solderability spec (Follow the JEDEC standard JESD22-B102)

Reflow Soldering: Immersed surface, other than the end of pin as cut-surface, must be covered by solder.

Solder-Bath: More than 95% of the electrode must be covered with solder.

#### Wave soldering (Follow the JEDEC standard JESD22-A111)

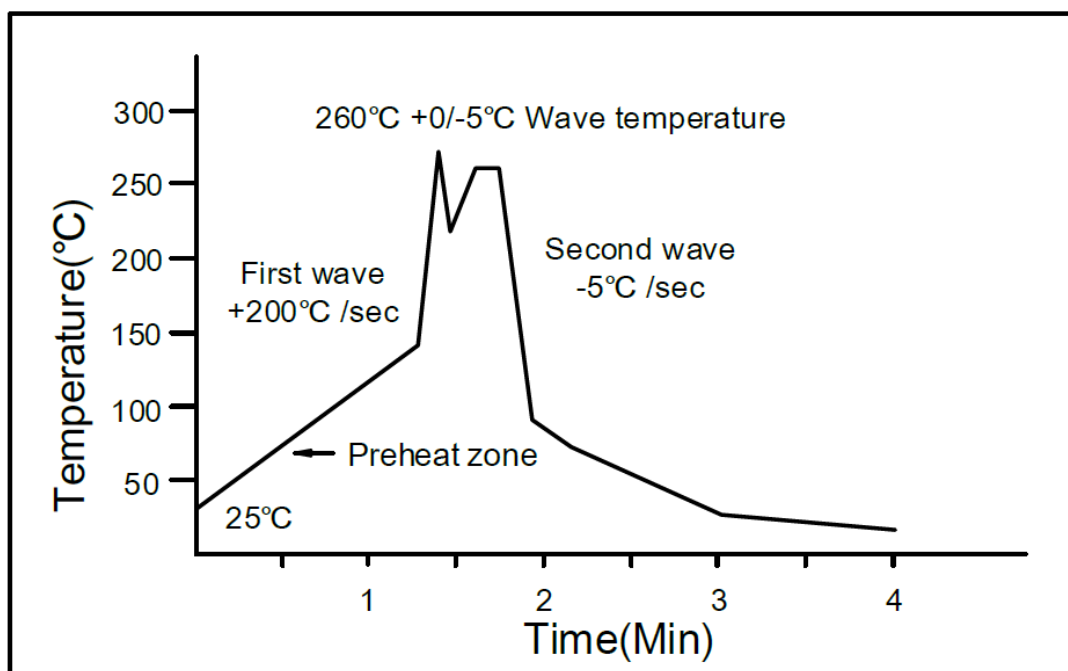
One time soldering is recommended within the condition of temperature.

Temperature:  $260 \pm 0/-5^{\circ}\text{C}$ .

Time: 10 sec.

Preheat temperature: 25 to  $140^{\circ}\text{C}$ .

Preheat time: 30 to 80 sec.



#### Iron soldering (Follow the standard MIL-STD 202G, Method 210F)

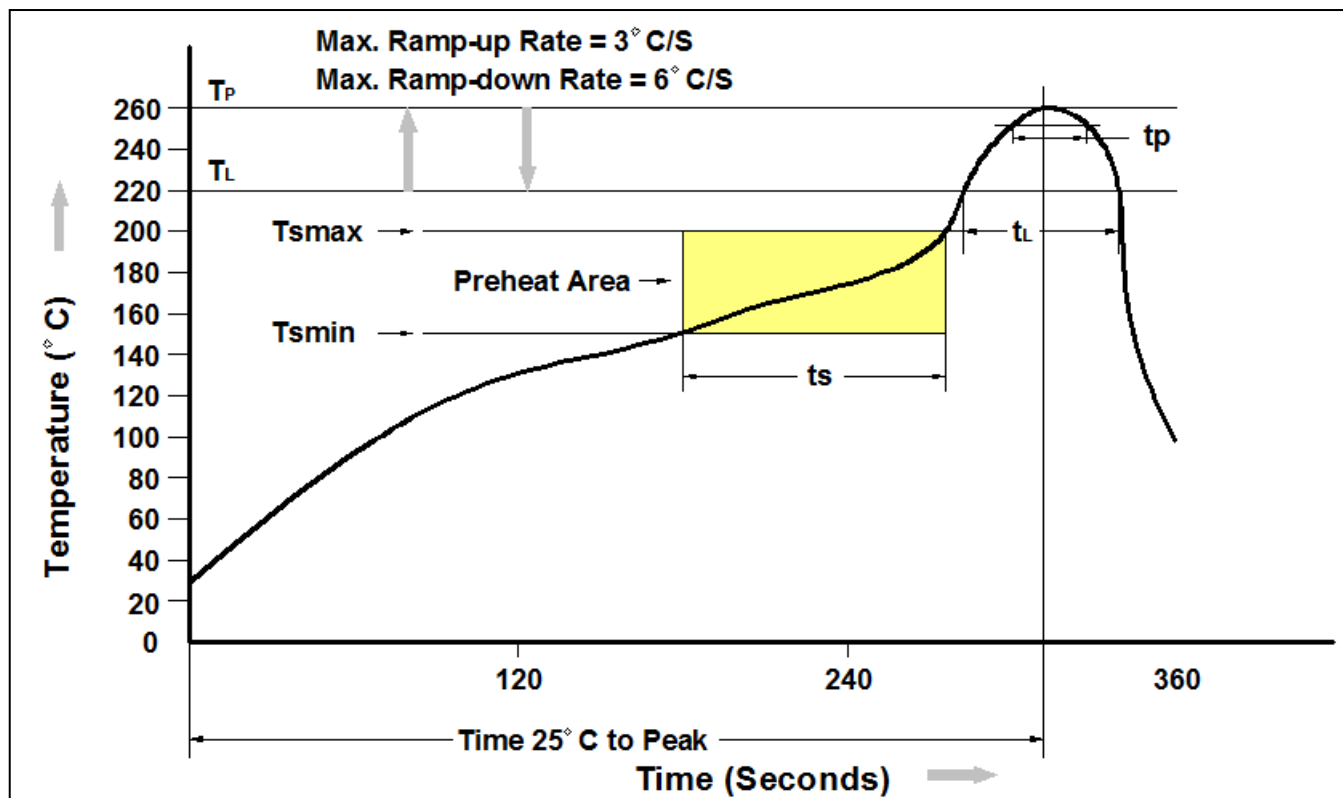
Allow single lead soldering in every single process.

One time soldering is recommended. Temperature:  $350 \pm 10^{\circ}\text{C}$

Time: 5 sec max.



## Reflow Profile (Follow the JEDEC standard J-STD-020)



Profile Feature	Pb-Free Assembly Profile
Temperature Min. (T <sub>smin</sub> )	150°C
Temperature Max. (T <sub>smax</sub> )	200°C
Time (t <sub>s</sub> ) from (T <sub>smin</sub> to T <sub>smax</sub> )	60-120 seconds
Ramp-up Rate (t <sub>L</sub> to t <sub>P</sub> )	3°C/second max.
Liquidous Temperature (T <sub>L</sub> )	217°C
Time (t <sub>L</sub> ) Maintained Above (T <sub>L</sub> )	60 – 150 seconds
Peak Body Package Temperature	260°C +0°C / -5°C
Time (t <sub>P</sub> ) within 5°C of 260°C	30 seconds
Ramp-down Rate (T <sub>P</sub> to T <sub>L</sub> )	6°C/second max
Time 25°C to Peak Temperature	8 minutes max.



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- 2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.*