



SDIP-61 Mbit/s High Speed Transistor Coupler

Features

- High speed 1MBit/s
- High isolation voltage between input and output (V_{ISO}=5000 V_{RMS})
- Guaranteed CTR performance from 0°C to 70°C
- Operating Temperature range - 55 °C to 110 °C
- RoHS and REACH Compliance
- MSL class 1
- Regulatory Approvals
 - ✓ UL - UL1577 (E364000)
 - ✓ VDE - EN60747-5-5(VDE0884-5)
 - ✓ CQC – GB4943.1, GB8898(14001104999)
 - ✓ IEC62368 (FI/41119)

Description

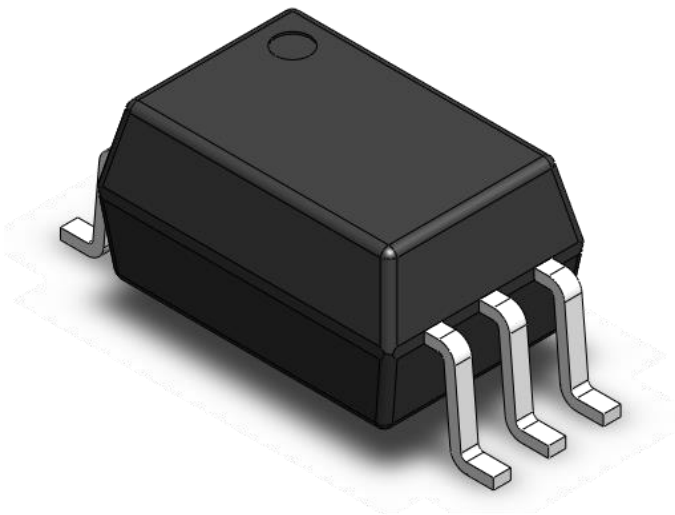
The CTS452 and CTS453 devices each consist of an infrared emitting diode, optically coupled to a high speed photo detector transistor.

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.

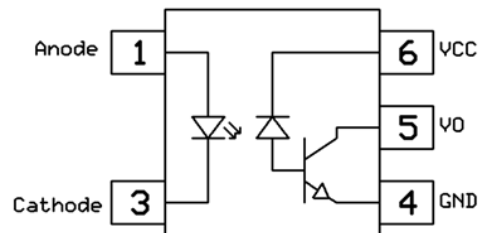
Applications

- Isolated IGBT/Power MOSFET gate drive
- Industrial Inverter
- AC brushless and DC motor drives
- Induction Heating

Package Outline



Schematic



Truth Table

Input	Output
Off	High
On	Low

Note: Different bending options available. See package dimension.



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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 _{ISO}	Isolation voltage (AC, 1 minute, 40 ~ 60% R.H.)	5000	V _{RMS}	
T _{OPR}	Operating temperature	-55 ~ +100	°C	
T _{STG}	Storage temperature	-55 ~ +125	°C	
T _{SOL}	Soldering temperature (For 10 seconds)	260	°C	
Emitter				
I _F	Forward current	25	mA	
I _{FP}	Peak forward current (50% duty, 1ms P.W)	50	mA	
I _{F(TRANS)}	Peak transient current (≤1μs P.W,300pps)	1	A	
V _R	Reverse voltage	5	V	
P _D	Power dissipation	40	mW	
Detector				
P _D	Power dissipation	100	mW	
V _{EBR}	Emitter-Base reverse voltage	5	V	
I _B	Base current	5	mA	
I _{O(AVG)}	Average Output current	8	mA	
I _{O(Peak)}	Peak Output current	16	mA	
V _O	Output voltage	-0.5 to 20	V	
V _{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	$I_F = 16\text{mA}$	-	1.45	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	$I_F = 16\text{mA}$	-	-1.8	-	mV/°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	μA	
		$I_F = 0\text{mA}$, $V_O = V_{CC} = 15\text{V}$, $T_A = 25^\circ\text{C}$	-	0.01	1		
		$I_F = 0\text{mA}$, $V_O = V_{CC} = 15\text{V}$	-	-	50		
I_{CCL}	Logic Low Supply Current	$I_F = 16\text{mA}$, $V_O = \text{Open}$, $V_{CC} = 15\text{V}$	-	140	200	μA	
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	μA	
		$I_F = 0\text{mA}$, $V_O = \text{Open}$, $V_{CC} = 15\text{V}$	-	-	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	-	-		
V _{OL}	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 =16mA, R _L =1.9KΩ, T _A =25°C	-	0.35	0.8	μs	
			I _F =16mA, R _L =1.9KΩ	-	-	1.0		
			I _F =16mA, V _{CC} =3.3V, R _L =1.9KΩ, T _A =25°C	-	0.4	1		
			I _F =16mA, V _{CC} =3.3V, R _L =1.9KΩ	-	-	1.4		
T _{PLH}	Propagation Delay Time Logic Low to Logic High		I _F =16mA, R _L =1.9KΩ, T _A =25°C	-	0.3	0.8	μs	
			I _F =16mA, R _L =1.9KΩ	-	-	1.0		
			I _F =16mA, V _{CC} =3.3V, R _L =1.9KΩ, T _A =25°C	-	-	1.5		
			I _F =16mA, V _{CC} =3.3V, R _L =1.9KΩ	-	-	2.0		
CM _H	Common Mode Transient Immunity at Logic High	CTS452	I _F = 0mA, V _{CM} =10Vp-p, R _L =1.9KΩ, T _A =25°C	5,000	-	-	V/μs	
		CTS453	I _F = 0mA, V _{CM} =1500Vp-p, R _L =1.9KΩ, T _A =25°C	15,000	-	-		
CM _L	Common Mode Transient Immunity at Logic Low	CTS452	I _F = 16mA, V _{CM} =10Vp-p, R _L =1.9KΩ, T _A =25°C	5,000	-	-	V/μs	
		CTS453	I _F = 16mA, V _{CM} =1500Vp-p, R _L =1.9KΩ, T _A =25°C	15,000	-	-		



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

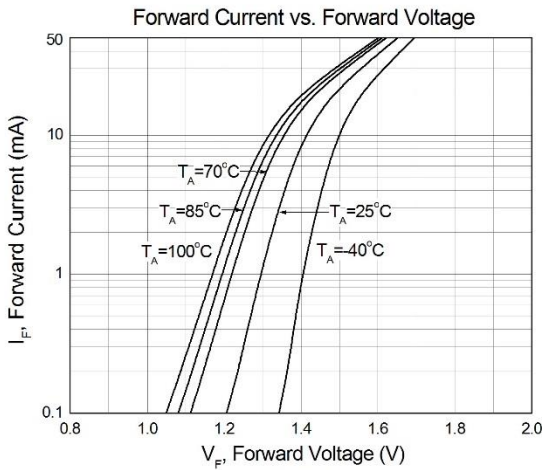


Figure 1

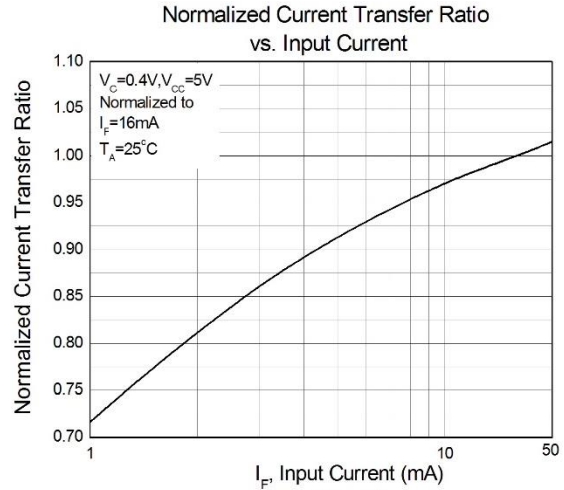


Figure 2

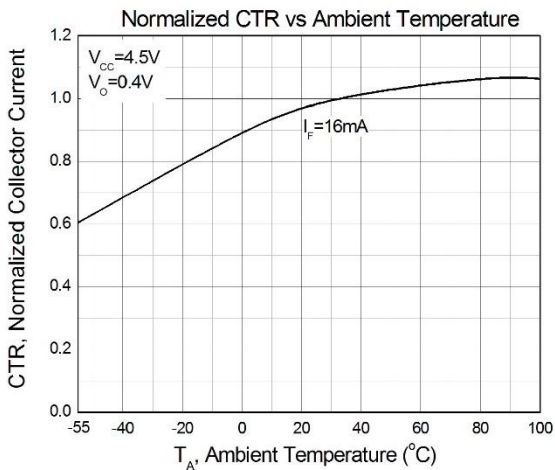


Figure 3

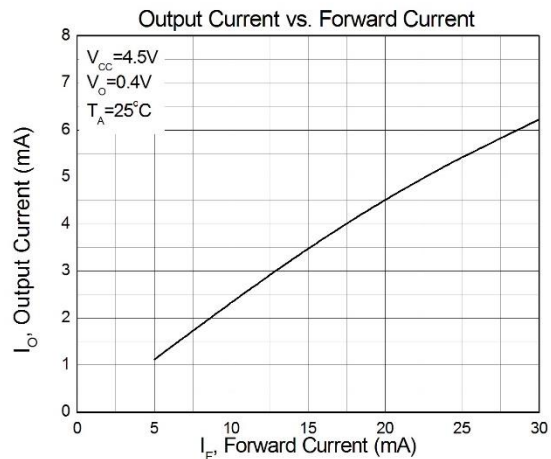


Figure 4

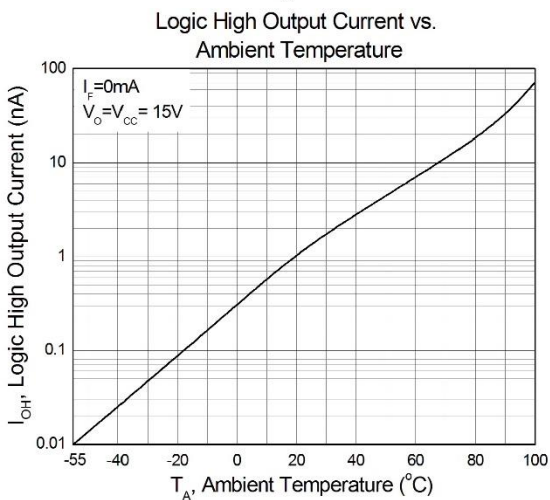


Figure 5

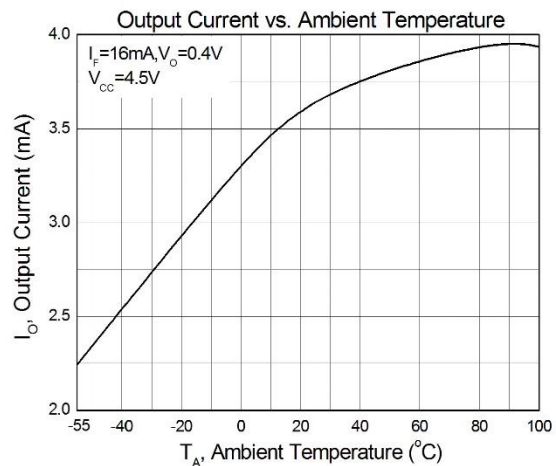


Figure 6



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

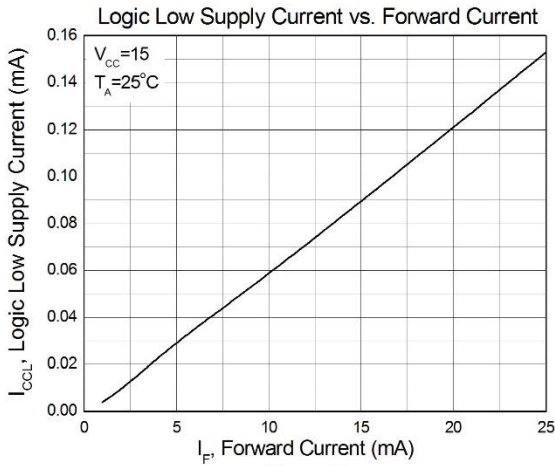


Figure 7

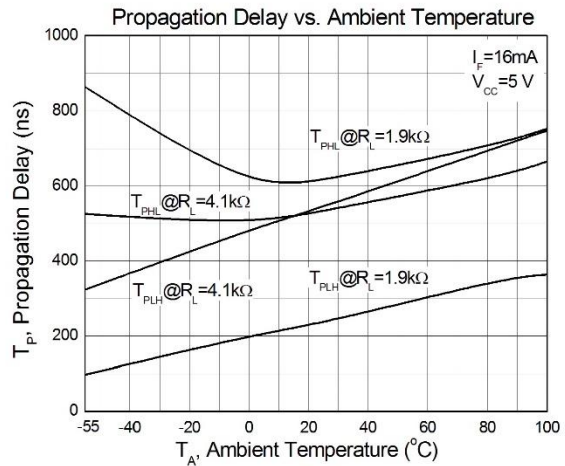


Figure 8

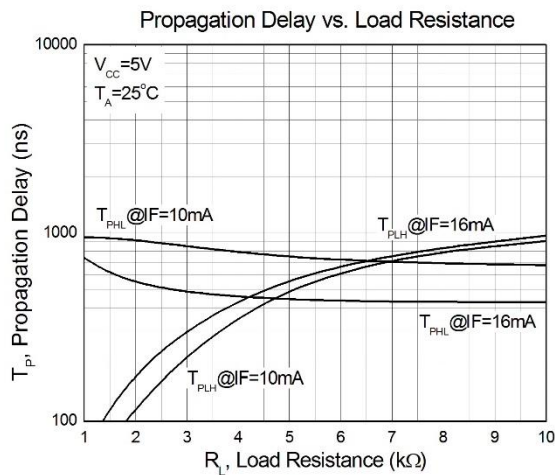


Figure 9



SDIP-61 Mbit/s High Speed Transistor Coupler

Test Circuits

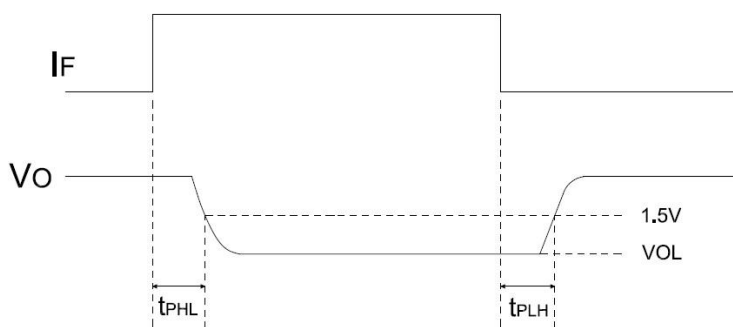
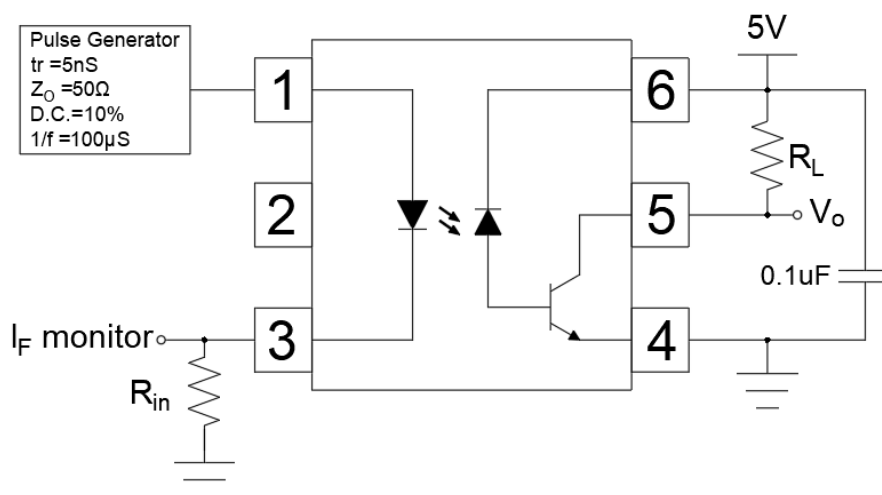


Figure 10: Switching Time Test Circuit



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Test Circuits

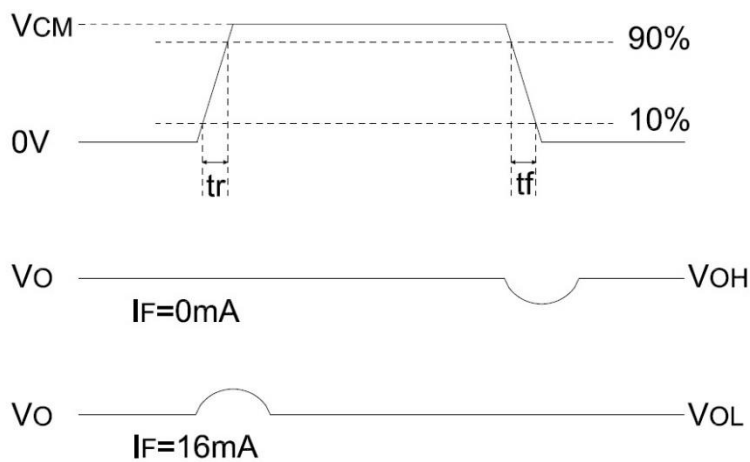
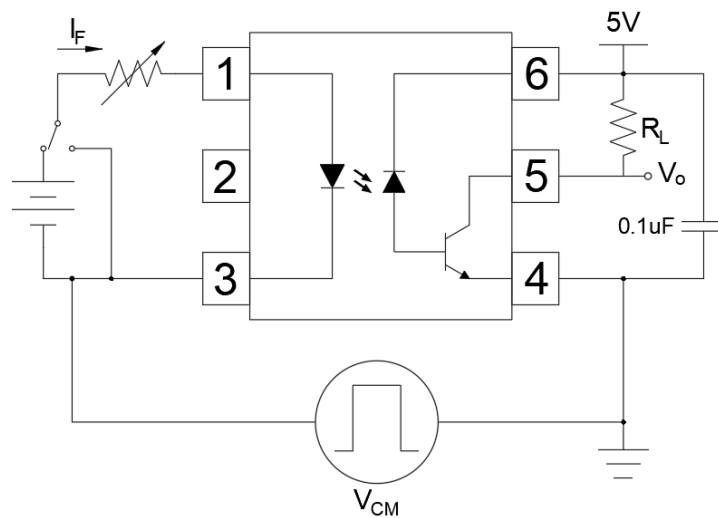


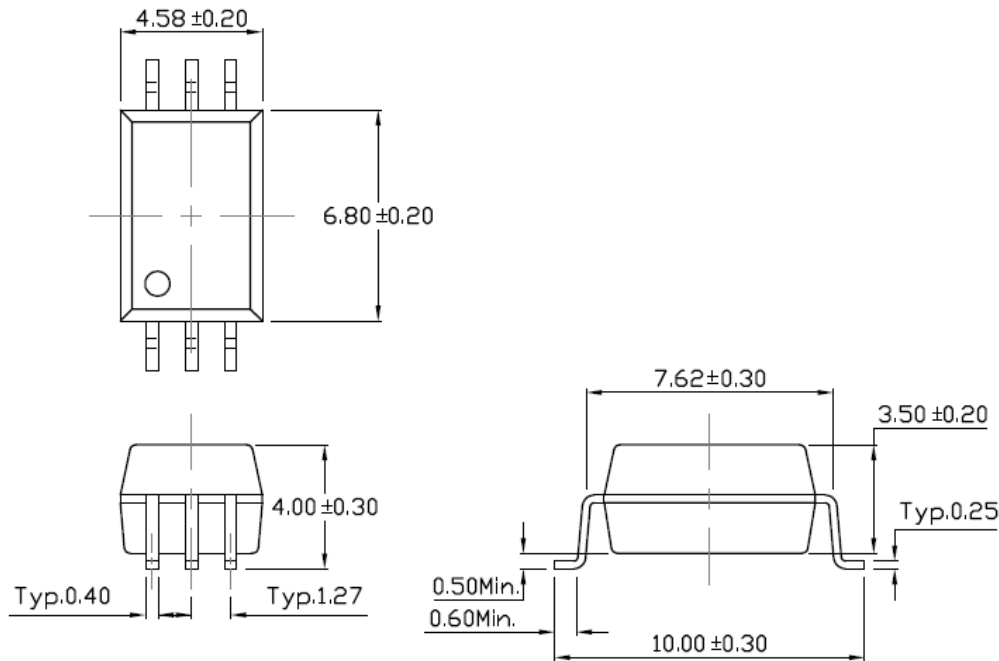
Figure 11: CMR Test Circuit



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Package Dimension *Dimensions in mm unless otherwise stated*

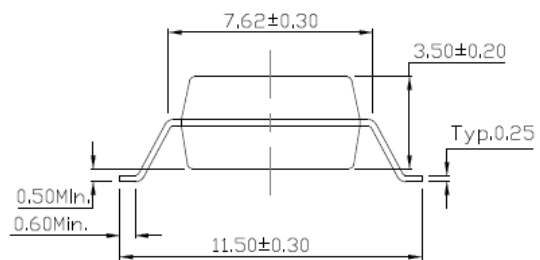
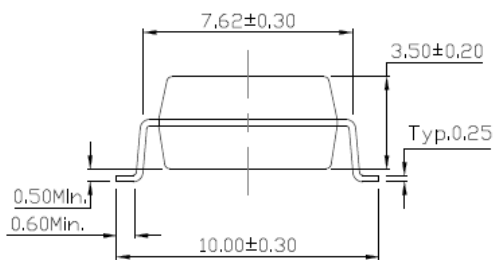
Surface Mount Lead Forming



Forming Option *Dimensions in mm unless otherwise stated*

S Type

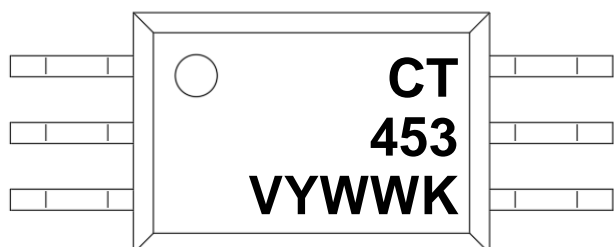
SM Type





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Marking Information



Note:

- CT : Denotes "CT Micro"
- 453 : Part Number
- V : VDE Safety Mark Option (Blank or V)
- Y : One Digit Year Code
- WW : Two Digit Work Week
- K : Manufacturing Code

Ordering Information

CTS45X(V)(Y)(Z)

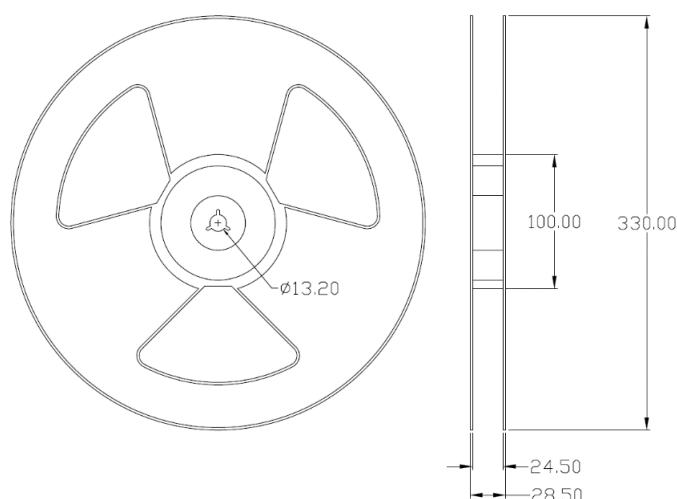
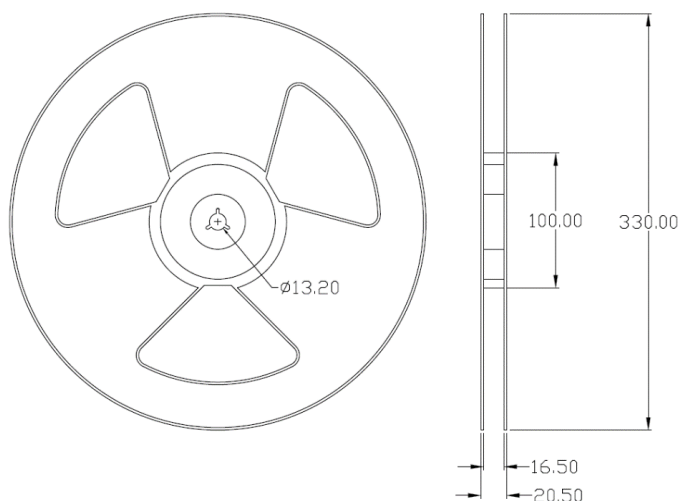
- CT = Denotes "CT Micro"
- X = Part Number(2, 3)
- V = VDE Safety Mark Option (Blank or V)
- Y = Lead Form Option (Blank, M)
- Z = Tape and Reel Option (T1, T2)

Option	Description	Quantity
S(T1)	Surface Mount Lead Forming with Option 1 Taping	1500 Units/Reel
S(T2)	Surface Mount Lead Forming with Option 2 Taping	1500 Units/Reel
SM(T1)	Surface Mount (Gullwing) Lead Forming with Option 1 Taping	1500 Units/Reel
SM(T2)	Surface Mount (Gullwing) Lead Forming with Option 2 Taping	1500 Units/Reel

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

Option S(T1/T2)

Option SM(T1/T2)



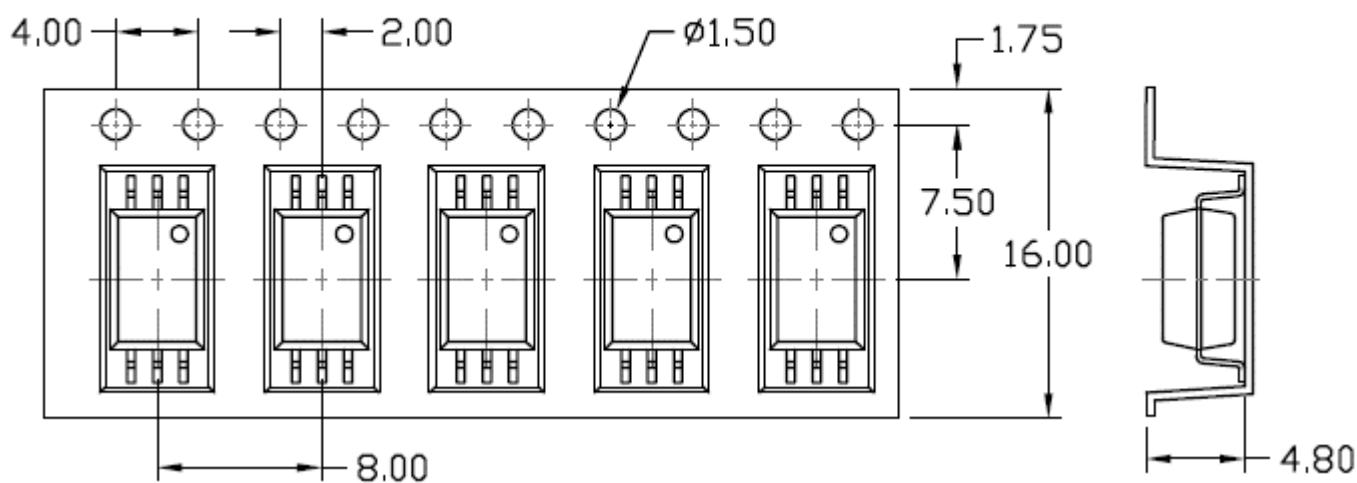


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Carrier Tape Specifications *Dimensions in mm unless otherwise stated*

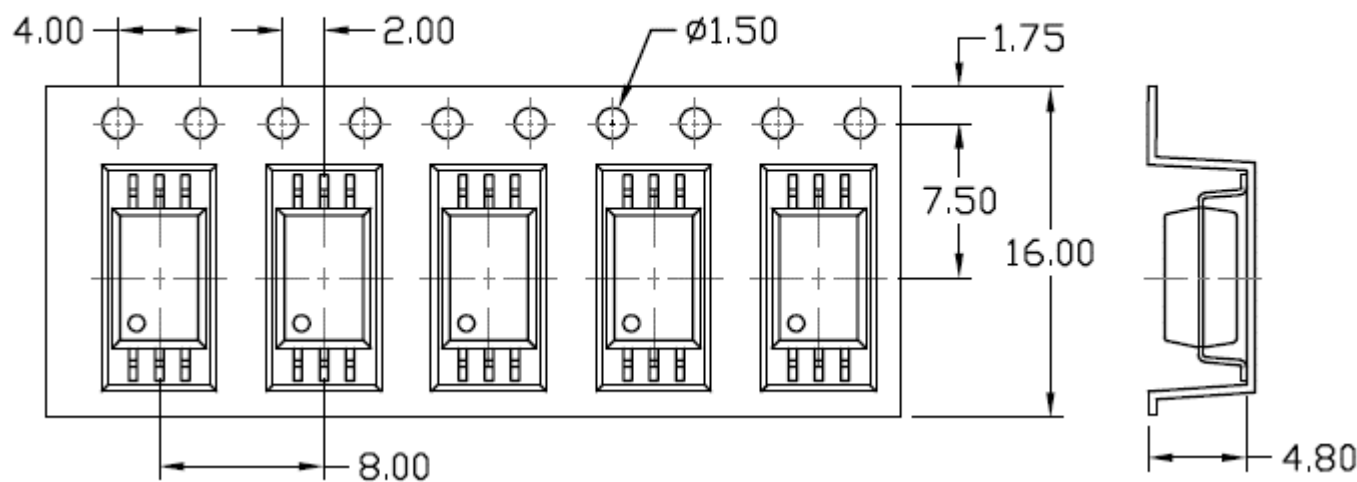
Option S(T1)

Input Direction →



Option S(T2)

Input Direction →

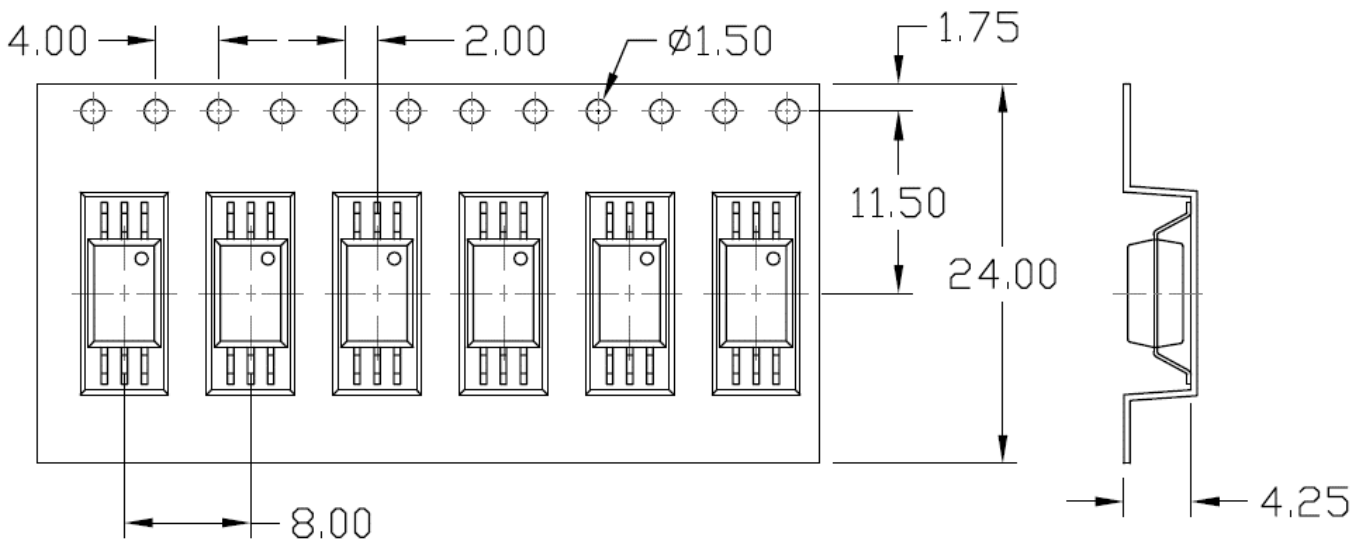




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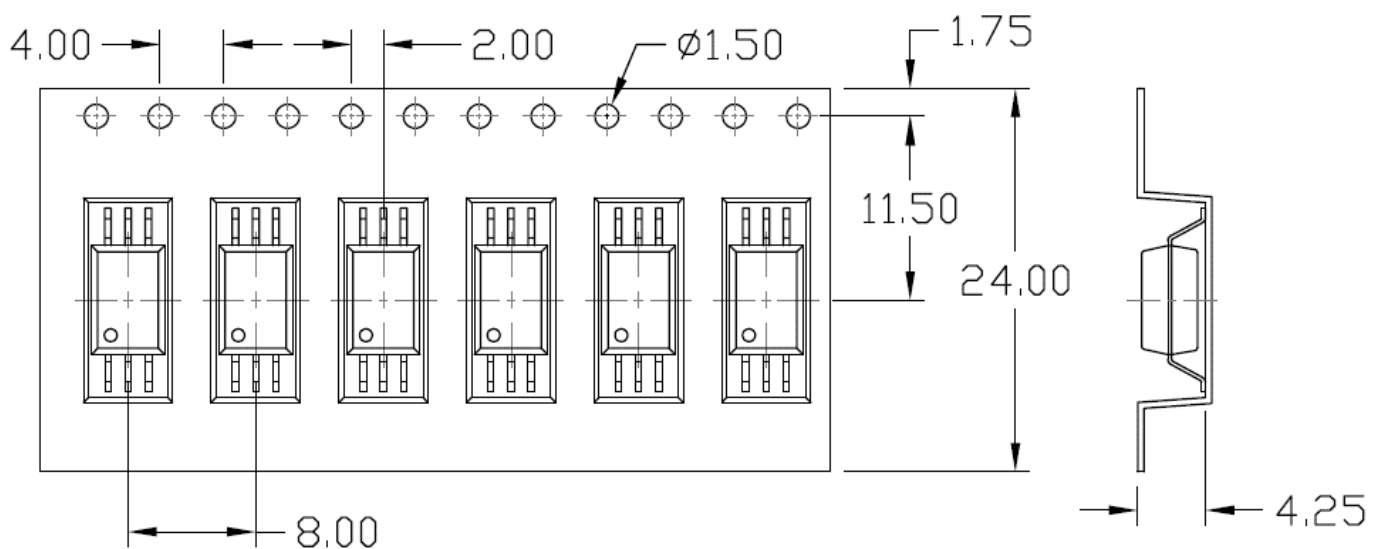
Option SM (T1)

Input Direction



Option SM (T2)

Input Direction





SDIP-61 Mbit/s High Speed Transistor Coupler

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)

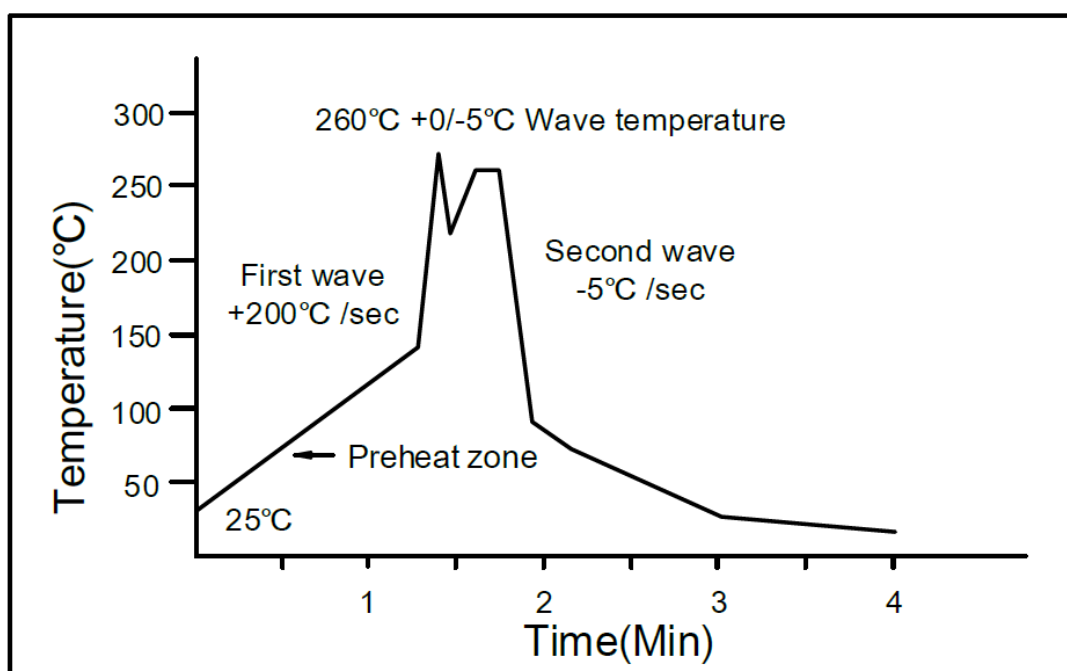
One time soldering is recommended within the condition of temperature.

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

Time: 10 sec.

Preheat temperature: 25 to 140°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.

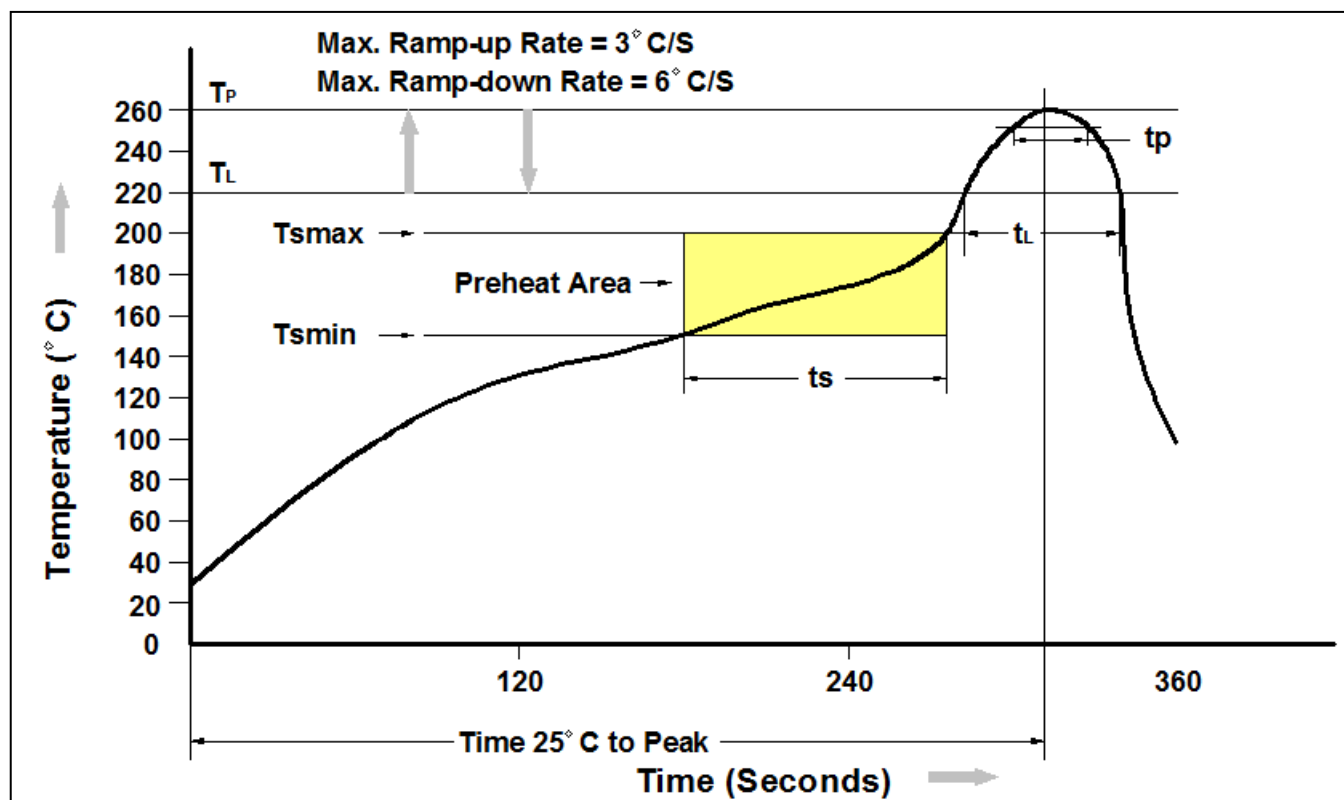
One time soldering is recommended. Temperature: $350 \pm 10^\circ\text{C}$

Time: 5 sec max.



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



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



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