CTW135, CTW136, CTW4502, CTW4503

9mm, 1Mbit/s High Speed Phototransistor Optocoupl

Features

- High speed 1MBit/s
- High isolation voltage between input and output (Viso=5000 Vrms)
- Guaranteed CTR performance from 0℃ to 70℃
- Wide operating temperature range of -55℃ to 100℃
- Regulatory Approvals
  - UL - UL1577 (E364000)
  - VDE - EN60747-5-5(VDE0884-5)
  - CQC – GB4943.1, GB8898
  - IEC60065, IEC60950

Applications

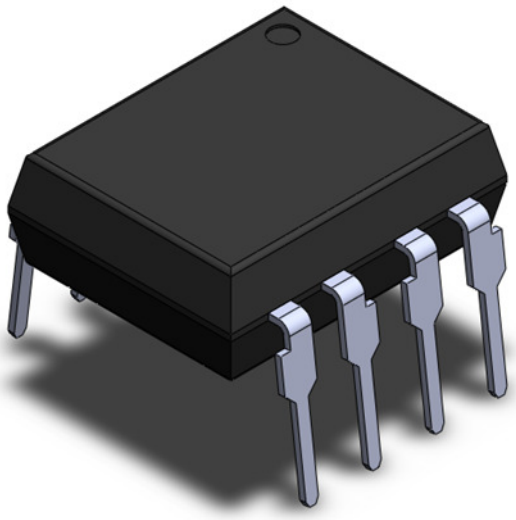
- Line receivers
- Telecommunication equipment
- High speed logic ground isolation
- Feedback loop in switch-mode power supplies
- Home appliances

Description

The CTW135, CTW136, CTW4502, and CTW4503 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.

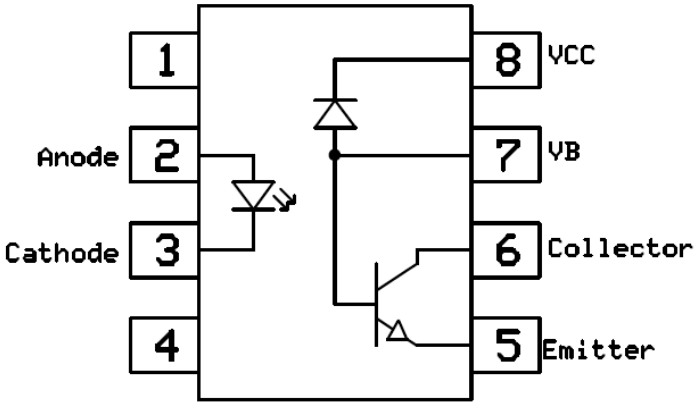
The device is packaged in an 8-pin wide body DIP and also available in surface mount option.

Package Outline



Note: Different bending options available. See package dimension.

Schematic



CTW135 / CTW136

Pin 7 not connected for CTW4502/CTW4503

Absolute Maximum Rating at 25°C

Symbol	*Parameters*	*Ratings*	*Units*	*Notes*
V_{ISO}	Isolation voltage *1	5000	V_{RMS}	
T_{OPR}	Operating temperature	-55 ~ +100	°C	
T_{STG}	Storage temperature	-55 ~ +125	°C	
T_{SOL}	Soldering temperature *2	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	

Electrical Characteristics

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

Emitter Characteristics

Symbol	*Parameters*	*Test Conditions*	*Min*	*Typ*	*Max*	*Units*	*Notes*
V_F	Forward voltage	IF = 16mA	-	1.45	1.6	V	
V_R	Reverse Voltage	IR = 10μA	5.0	-	-	V	
$\Delta V_F/\Delta T_A$	Temperature coefficient of forward voltage	IF =16mA	-	-1.8	-	mV/℃	

Detector Characteristics

Symbol	*Parameters*	*Test Conditions*	*Min*	*Typ*	*Max*	*Units*	*Notes*
I_{OH}	Logic High Output Current	I_F=0mA, V_O=V_{CC}=5.5V, T_A=25℃	-	0.001	0.5	μA	
		I_F=0mA, V_O=V_{CC}=15V, T_A=25℃	-	0.01	1		
		I_F=0mA, V_O=V_{CC}=15V	-	-	50		
I_{CCL}	Logic Low Supply Current	I_F=16mA, V_O=Open, V_{CC}=15V	-	140	200	μA	
I_{CCH}	Logic High Supply Current	I_F=0mA, V_O=Open, V_{CC}=15V, T_A=25℃	-	0.01	1	μA	
		IF=0mA, VO=Open, VCC=15V	-	-	2		

Electrical Characteristics

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

Transfer Characteristics

Symbol	*Parameters*		*Test Conditions*	*Min*	*Typ*	*Max*	*Units*	*Notes*
CTR	Current Transfer Ratio	CTW135 CTW4502	I_F=16mA, V_O=0.4V,V_{CC}=4.5V, T_A=25℃	7	-	50	%	
		CTW136 CTW4503		19	-	50		
		CTW135 CTW4502	I_F=16mA, V_O=0.5V, V_{CC}=4.5V	5	-	-		
		CTW136 CTW4503		15	-	-		
V_{OL}	Logic Low Output Voltage	CTW135 CTW4502	I_F=16mA,I_O=1.1mA,V_{CC}=4.5V, T_A=25℃	-	0.18	0.4	V	
		CTW136 CTW4503	I_F=16mA, I_O=3mA, V_{CC}=4.5V, T_A=25℃	-	0.18	0.4		
		CTW135 CTW4502	I_F=16mA, I_O=0.8mA, V_{CC}=4.5V	-	-	0.5		
		CTW136 CTW4503	I_F=16mA, I_O=2.4mA, V_{CC}=4.5V	-	-	0.5		

Electrical Characteristics

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

Switching Characteristics

Symbol	*Parameters*		*Test Conditions*	*Min*	*Typ*	*Max*	*Units*	*Notes*
T_{PHL}	Propagation Delay Time Logic High to Logic Low	CTW135	R_L=4.1KΩ, T_A=25℃	-	0.35	1.5	µs	
		CTW4502	R_L=4.1KΩ	-	-	2.0		
		CTW136	R_L=1.9KΩ, T_A=25℃	-	0.35	0.8		
		CTW4503	R_L=1.9KΩ	-	-	1.0		
T_{PLH}	Propagation Delay Time Logic Low to Logic High	CTW135	R_L=4.1KΩ, T_A=25℃	-	0.5	1.5	µs	
		CTW4502	R_L=4.1KΩ	-	-	2.0		
		CTW136	R_L=1.9KΩ, T_A=25℃	-	0.3	0.8		
		CTW4503	R_L=1.9KΩ	-	-	1.0		
CM_H	Common Mode Transient Immunity at Logic High	CTW135	I_F = 0mA , V_{CM}=10Vp-p, R_L=4.1KΩ, T_A =25℃	1,000	-	-	V/µs	
		CTW136	I_F = 0mA , V_{CM}=10Vp-p, R_L=1.9KΩ, T_A =25℃	1,000	-	-		
		CTW4502 CTW4503	I_F = 0mA , V_{CM}=1500Vp-p, R_L=1.9KΩ, T_A =25℃	15,000	20,000			
CM_L	Common Mode Transient Immunity at Logic Low	CTW135	I_F = 16mA , V_{CM}=10Vp-p, R_L=4.1KΩ, T_A =25℃	1,000	-	-	V/µs	
		CTW136	I_F = 16mA , V_{CM}=1500Vp-p, R_L=1.9KΩ, T_A=25℃	1,000	-	-		
		CTW4502 CTW4503	I_F = 16mA , V_{CM}=1500Vp-p, R_L=1.9KΩ, T_A=25℃	15,000	20,000			

Typical Characteristic Curves

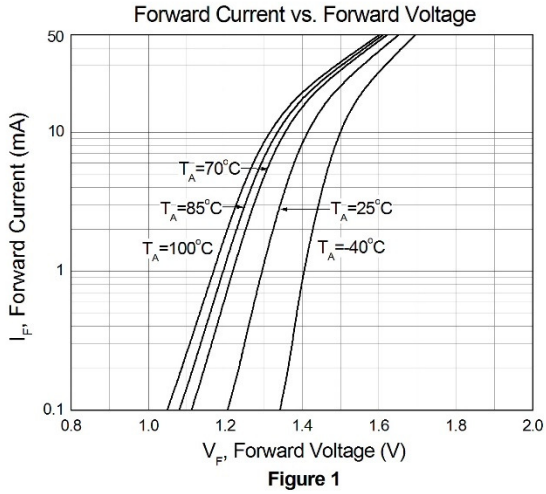


Figure 1

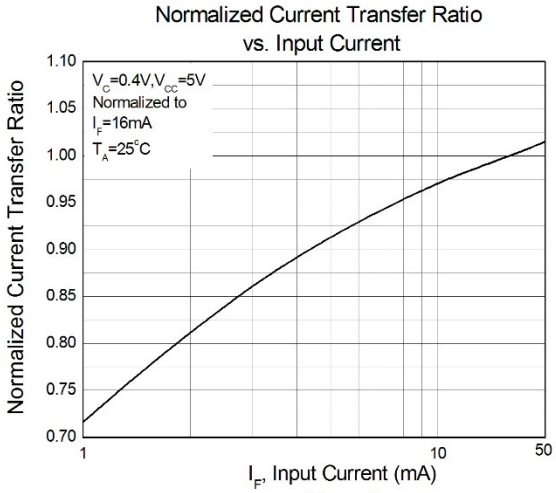


Figure 2

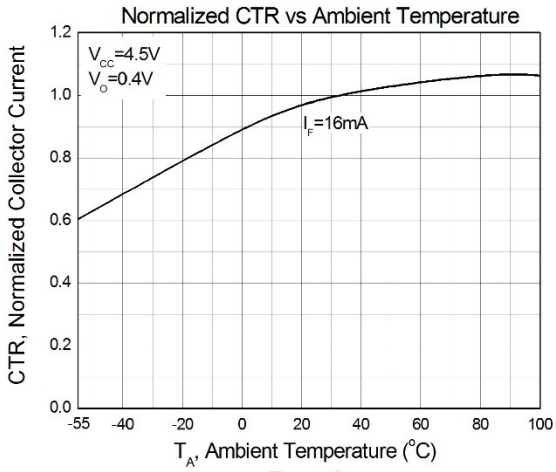


Figure 3

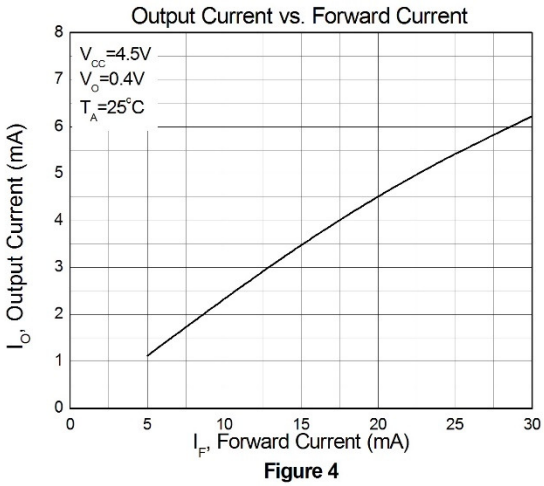


Figure 4

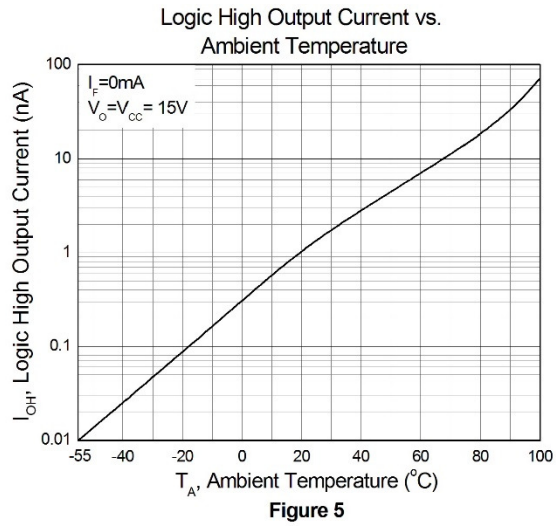


Figure 5

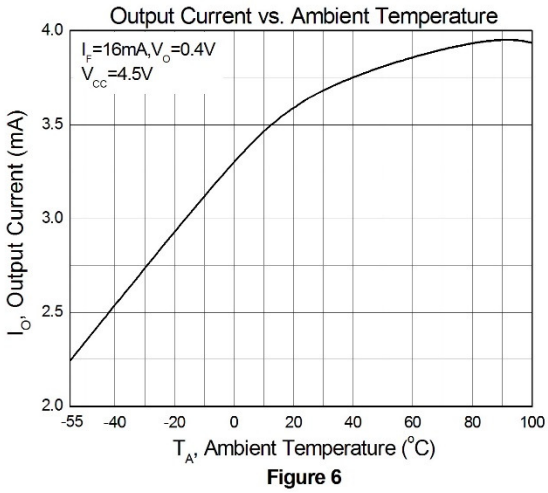


Figure 6

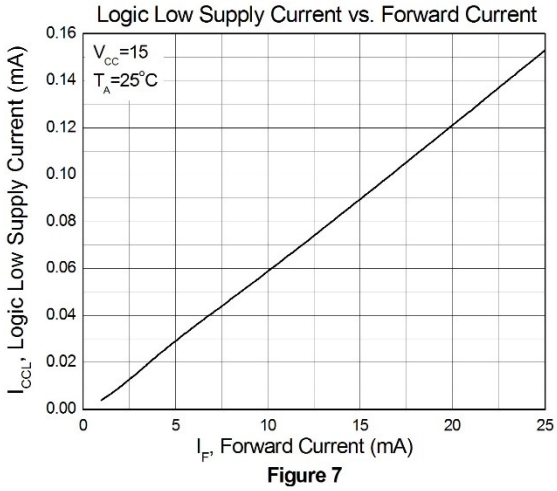
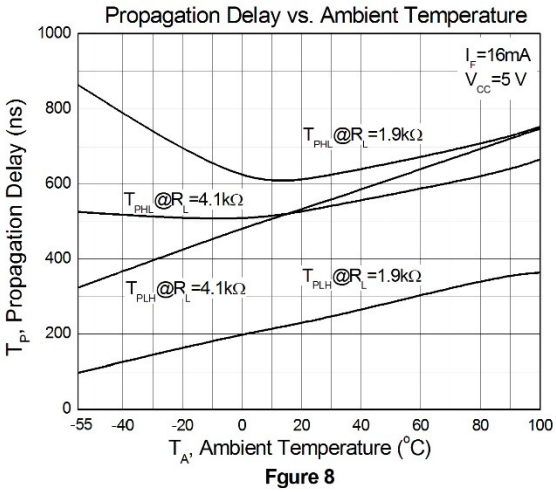


Figure 7



Fgure 8

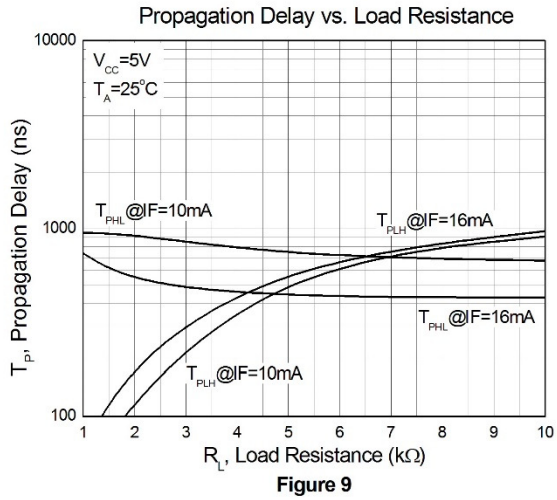
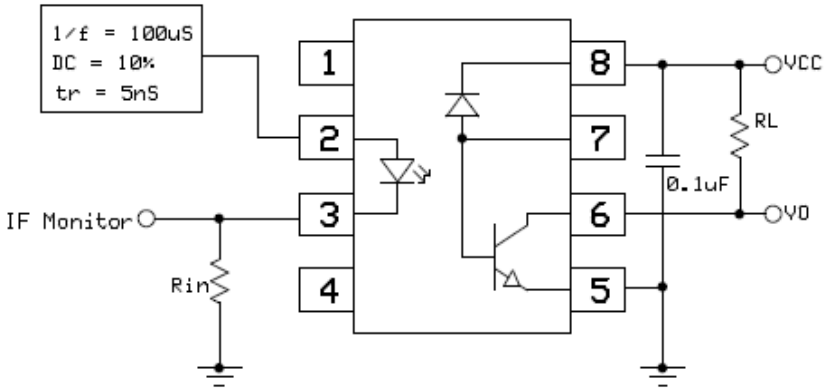
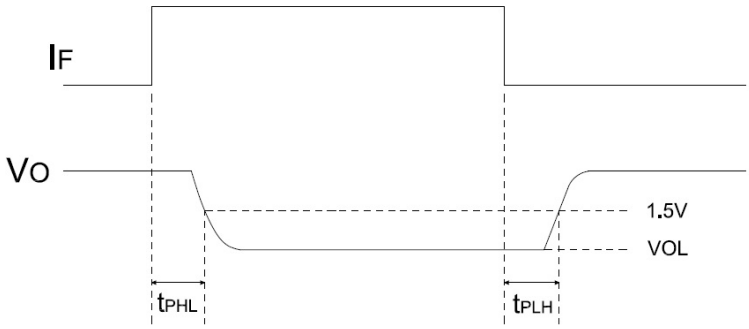


Figure 9

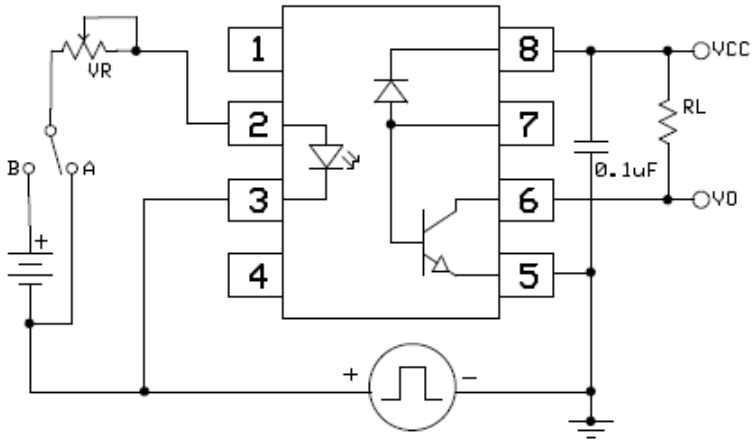
Test Circuits

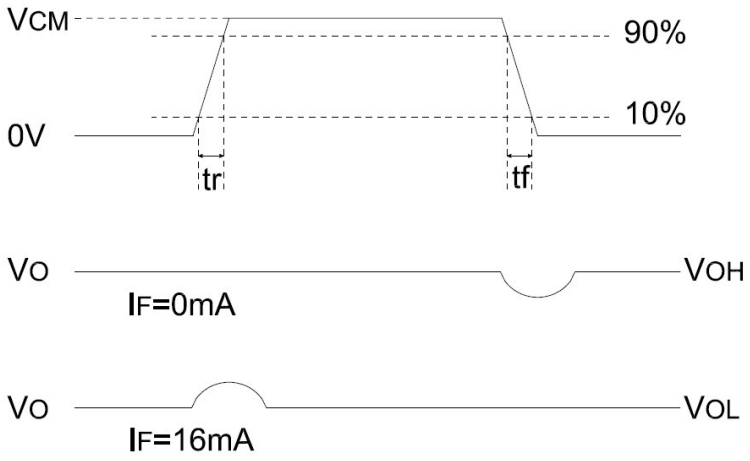




Switching Time Test Circuit

Test Circuits

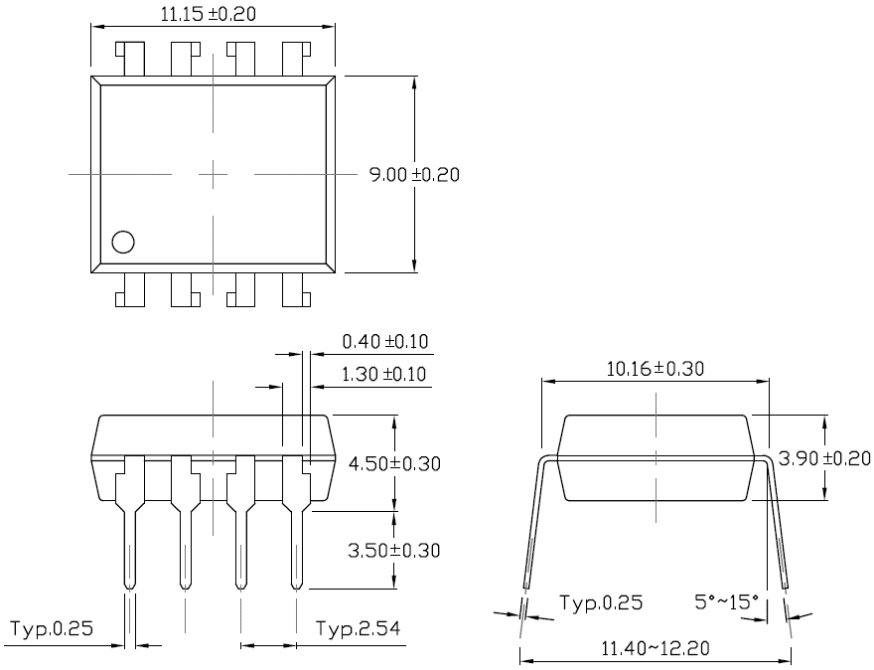




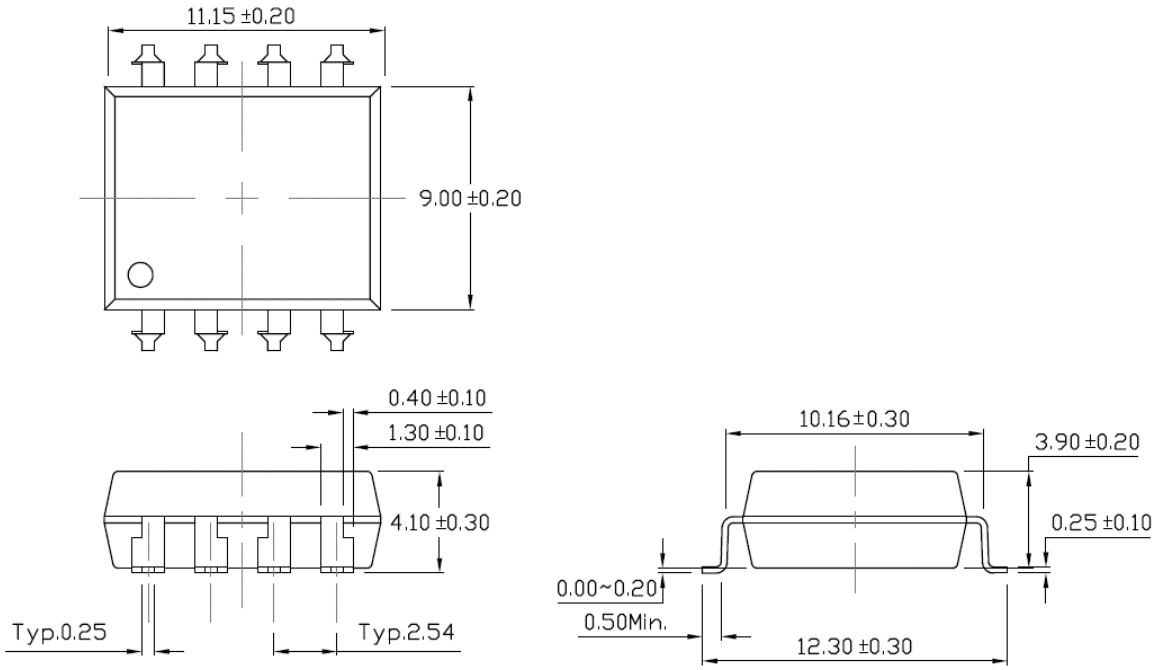
CMR Test Circuit

Package Dimension *Dimensions in mm unless otherwise stated*

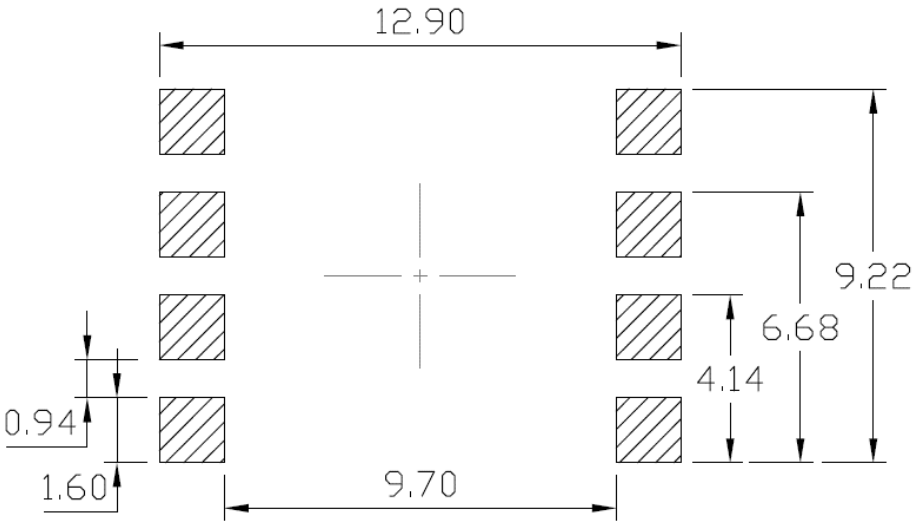
Standard DIP – Through Hole



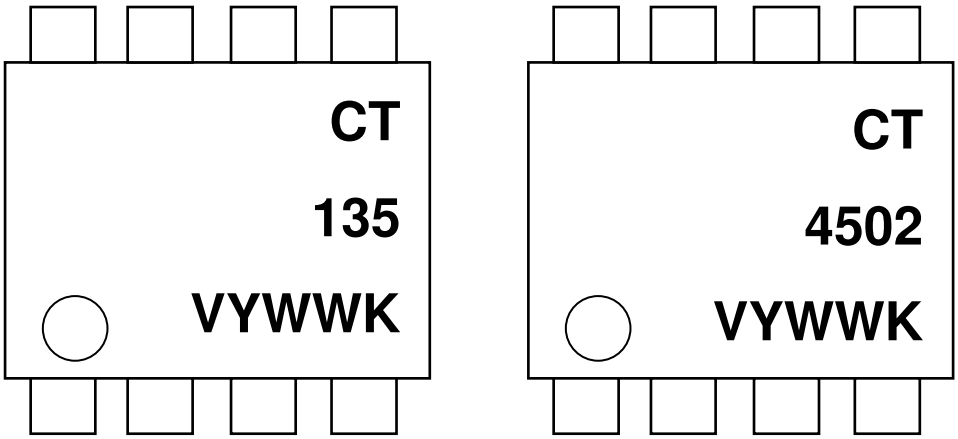
Surface Mount Lead Forming (SL Type)



Recommended Solder Mask *Dimensions in mm unless otherwise stated*



Device Marking



CT	: Denotes “CT Micro”
135	: Product Number (135, 136, 4502, 4503)
V	: VDE Option
Y	: Fiscal Year
WW	: Work Week
K	: Production Code

Ordering Information

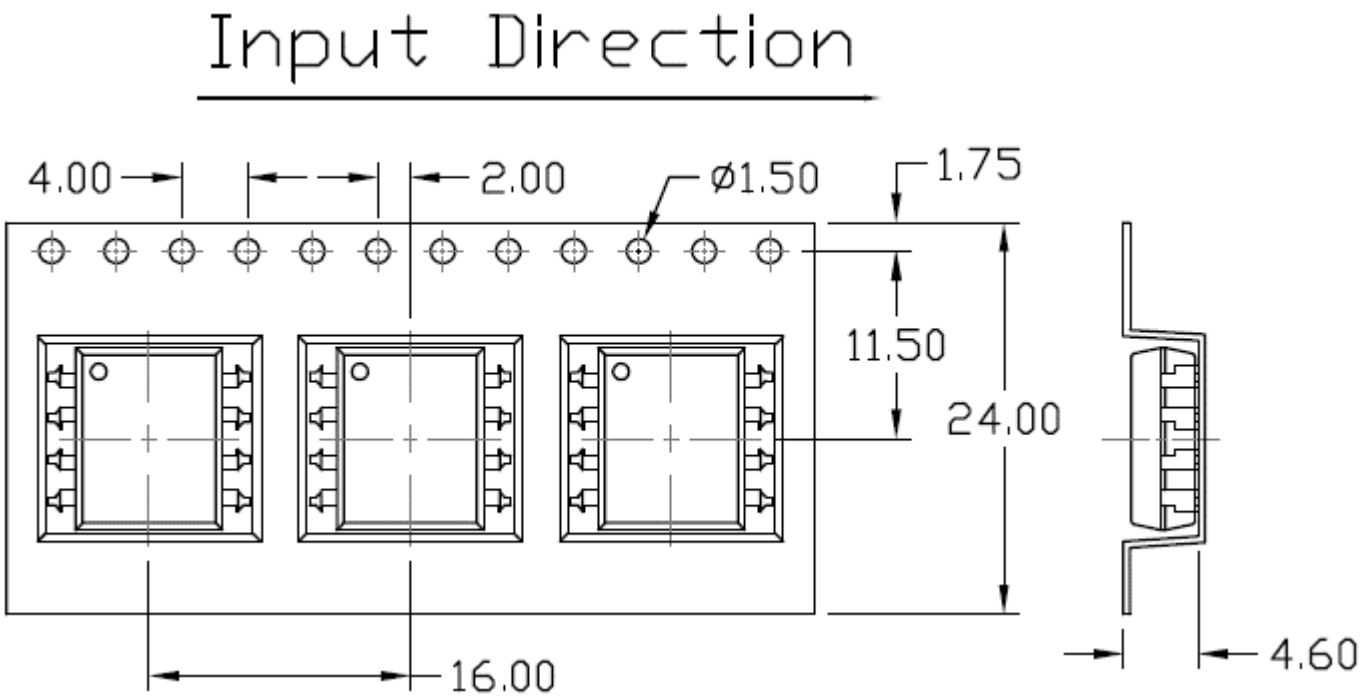
CTW13X(V)(Y)(Z) or CTW450X(V)(Y)(Z)

X = Part No. (5,6 for CTW13X series), (2,3 for CTW450X series)
V = VDE Option (V or None)
Y = Lead form option (SL, or none)
Z = Tape and reel option (T1, T2 or none)

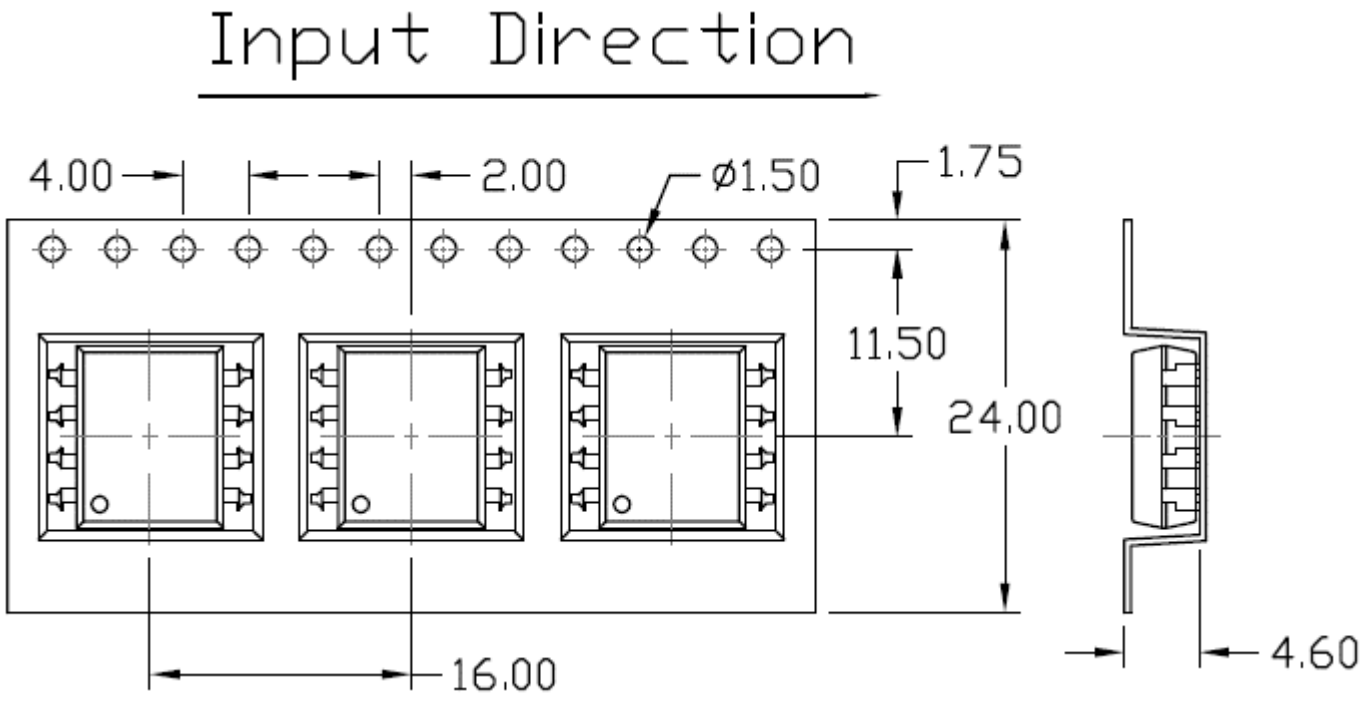
Option	***Description***	***Quantity***
None	Standard 8 Pin Dip	40 Units/Tube
SL(T1)	Surface Mount (Low Profile) Lead Forming– With Option 1 Taping	750 Units/Reel
SL(T2)	Surface Mount (Low Profile) Lead Forming– With Option 2 Taping	750 Units/Reel

Carrier Tape Specifications *Dimensions in mm unless otherwise stated*

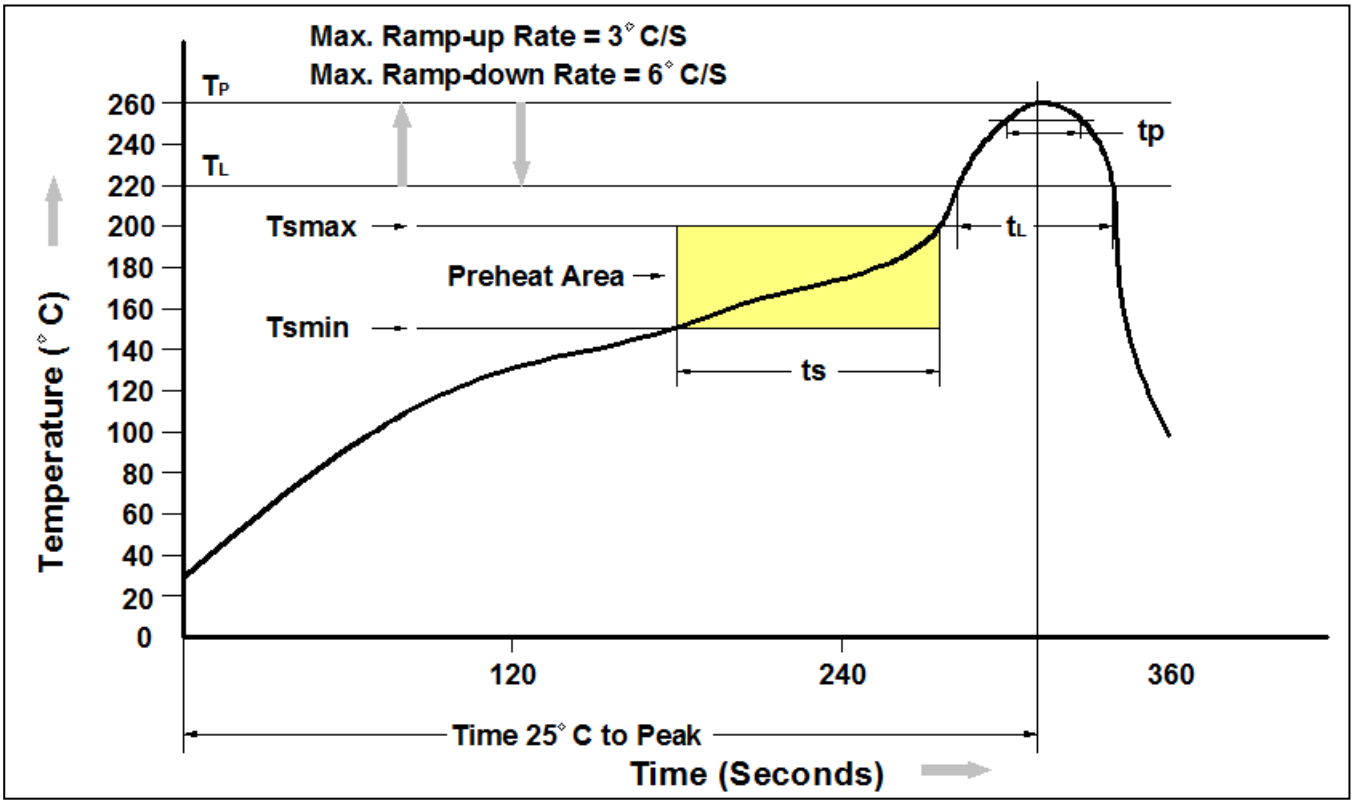
Option SL(T1)



Option SL(T2)



Reflow Profile



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

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