



High CMR, 1Mbit/s High Speed Optocoupler

Features

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

Applications

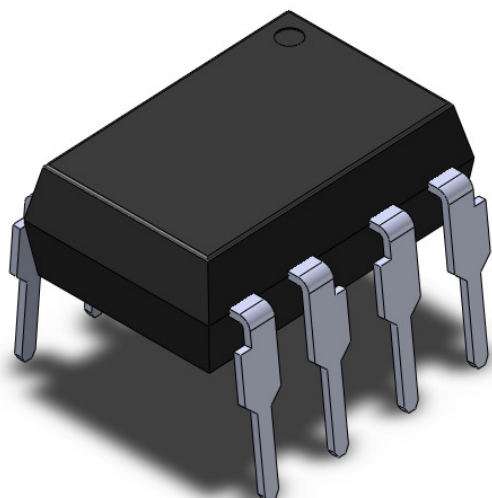
- Line receivers
- Telecommunication equipment
- Feedback loop in switch-mode power supplies
- Home appliances
- High speed logic ground isolation

Description

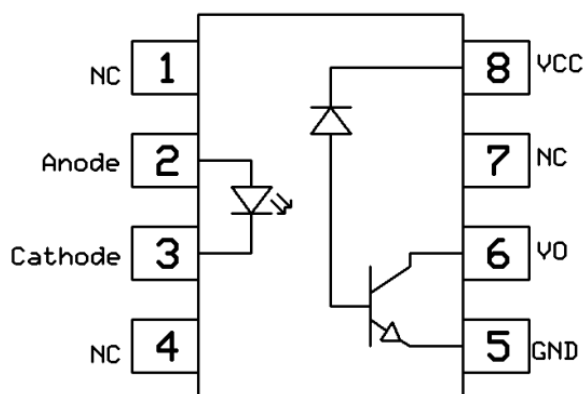
The CT4504 series devices consist of an infrared emitting diode, optically coupled to a high speed photo detector transistor. A separate connection for the photodiode bias and output-transistor collector increase the speed by several orders of magnitude over conventional phototransistor couplers by reducing the base-collector capacitance of the input transistor.

The devices are packaged in an 8-pin DIP package and also available in gullwing (400mil) and surface mount lead forming.

Package Outline



Schematic



Note: Different bending options available. See package dimension.

**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	45	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	



High CMR, 1Mbit/s High Speed Optocoupler

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/ $^\circ\text{C}$	

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	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		

Transfer Characteristics

Symbol	Parameters	Test Conditions	Min	Typ	Max	Units	Notes
CTR	Current Transfer Ratio	$I_F=16\text{mA}, V_O=0.4\text{V}, V_{CC}=4.5\text{V}, T_A=25^\circ\text{C}$	25	35	60	%	
		$I_F=16\text{mA}, V_O=0.5\text{V}, V_{CC}=4.5\text{V}$	21	40	-		
		$I_F=12\text{mA}, V_O=0.4\text{V}, V_{CC}=4.5\text{V}, T_A=25^\circ\text{C}$	26	38	65		
		$I_F=12\text{mA}, V_O=0.5\text{V}, V_{CC}=4.5\text{V}$	22	43	-		
V_{OL}	Logic Low Output Voltage	$I_F=16\text{mA}, I_O=4.0\text{mA}, V_{CC}=4.5\text{V}, T_A=25^\circ\text{C}$	-	0.2	0.4	V	
		$I_F=16\text{mA}, I_O=3.3\text{mA}, V_{CC}=4.5\text{V}$	-	-	0.5		



High CMR, 1Mbit/s High Speed Optocoupler

Switching Characteristics

Symbol	Parameters	Test Conditions	Min	Typ	Max	Units	Notes
T _{PHL}	Propagation Delay Time Logic High to Logic Low	I _F =16mA, V _{CC} =5.0V, R _L =1.9kΩ, C _L =15pF, V _{THHL} =1.5V, T _A =25 °C	-	0.24	0.3	μs	
		I _F =16mA, V _{CC} =5.0V, R _L =1.9kΩ, C _L =15pF, V _{THHL} =1.5V	-	0.24	0.5		
		I _F =12mA, V _{CC} =15.0V, R _L =20kΩ, C _L =100pF, V _{THHL} =1.5V, T _A =25 °C	-	0.58	0.7		
		I _F =12mA, V _{CC} =15.0V, R _L =20kΩ, C _L =100pF, V _{THHL} =1.5V	-	-	1.0		
T _{PLH}	Propagation Delay Time Logic Low to Logic High	I _F =16mA, V _{CC} =5.0V, R _L =1.9kΩ, C _L =15pF, V _{THLH} =1.5V, T _A =25 °C	-	0.21	0.5	μs	
		I _F =16mA, V _{CC} =5.0V, R _L =1.9kΩ, C _L =15pF, V _{THLH} =1.5V	-	0.21	0.7		
		I _F =12mA, V _{CC} =15.0V, R _L =20kΩ, C _L =100pF, V _{THLH} =2.0V, T _A =25 °C	-	0.76	1.1		
		I _F =12mA, V _{CC} =15.0V, R _L =20kΩ, C _L =100pF, V _{THLH} =2.0V	-	0.76	1.4		
T _{PLH} -T _{PHL}	Propagation Delay Difference	I _F =12mA, V _{CC} =15.0V, R _L =20kΩ, C _L =100pF, V _{THHL} =1.5V, V _{THLH} =2.0V , T _A =25 °C	-0.4	0.3	0.9	μs	
		I _F =12mA, V _{CC} =15.0V, R _L =20kΩ, C _L =100pF	-0.7	0.3	1.3		
CM _H	Common Mode Transient Immunity at Logic High	I _F = 0mA , V _{CM} =1.5kVp-p, V _{CC} =5V, R _L =1.9kΩ, C _L =15pF, T _A =25 °C	15000	30000	-	V/μs	
		I _F = 0mA , V _{CM} =1.5kVp-p, V _{CC} =15V, R _L =20kΩ, C _L =100pF, T _A =25 °C	15000	30000	-		
CM _L	Common Mode Transient Immunity at Logic Low	I _F = 12mA , V _{CM} =1.5kVp-p, V _{CC} =5V, R _L =1.9kΩ, C _L =15pF, T _A =25 °C	15000	30000	-	V/μs	
		I _F = 16mA , V _{CM} =1.5kVp-p, V _{CC} =15V, R _L =20kΩ, C _L =100pF, T _A =25 °C	15000	30000	-		



Typical Characteristic Curves

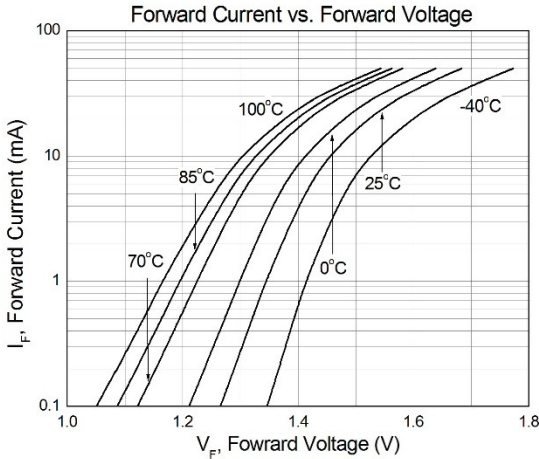


Figure 1

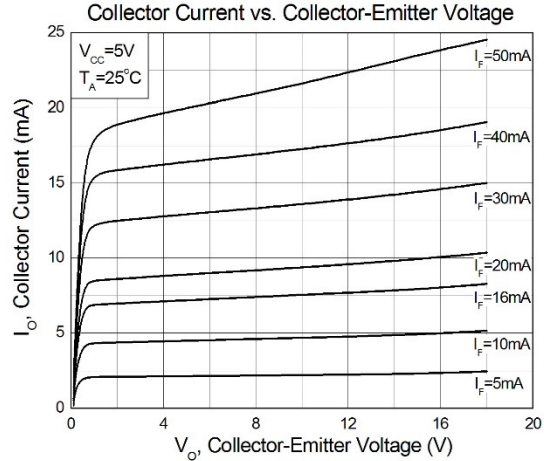


Figure 2

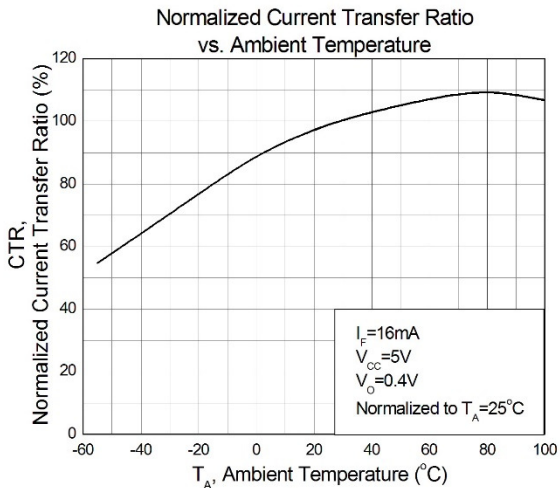


Figure 3

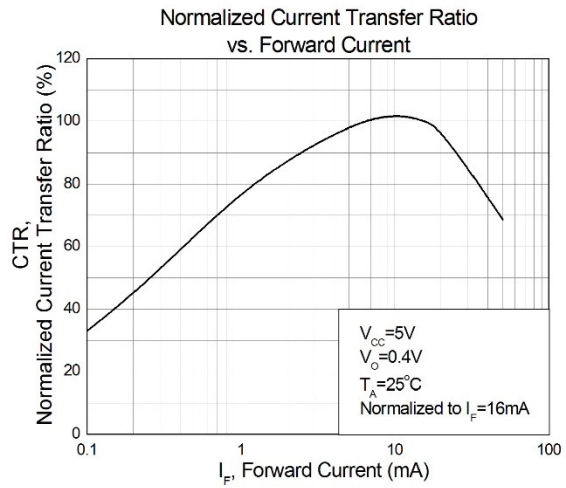


Figure 4

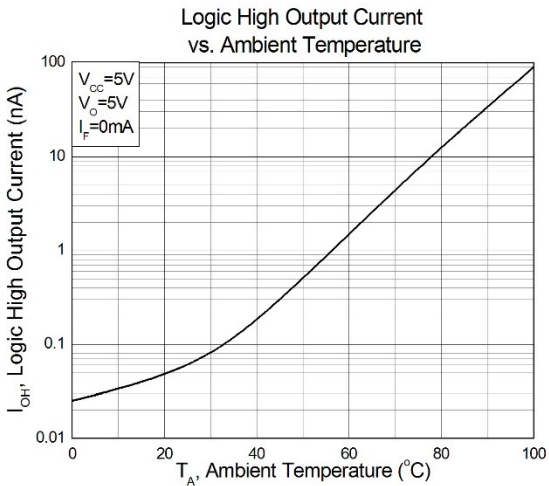


Figure 5

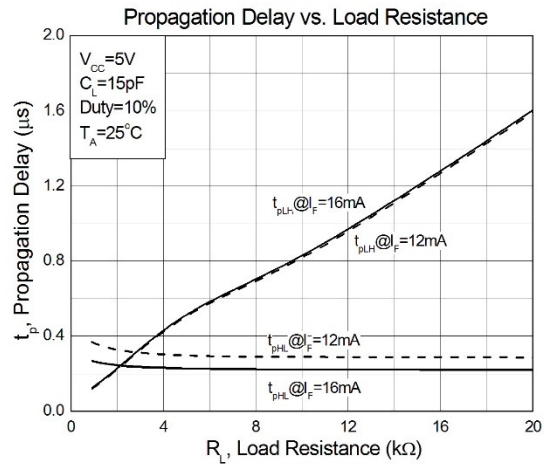


Figure 6

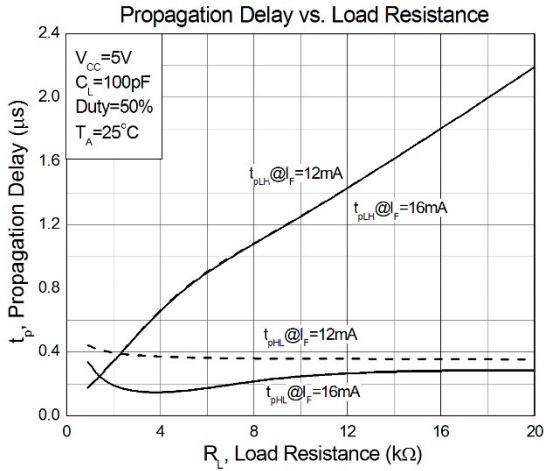


Figure 7

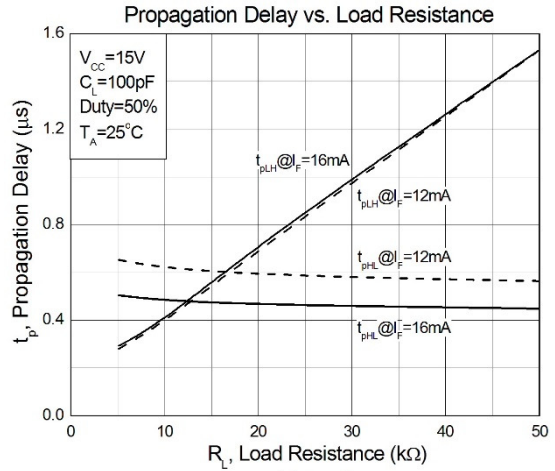


Figure 8

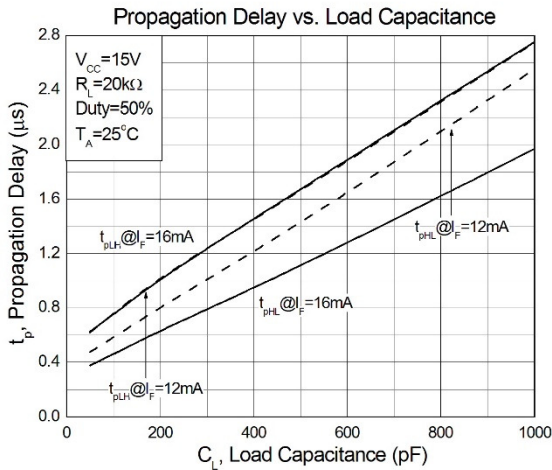


Figure 9

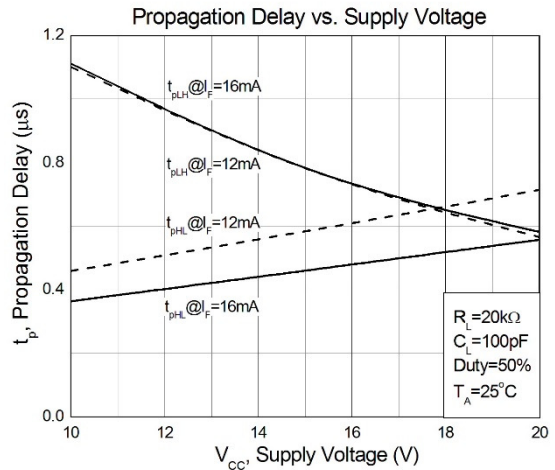


Figure 10

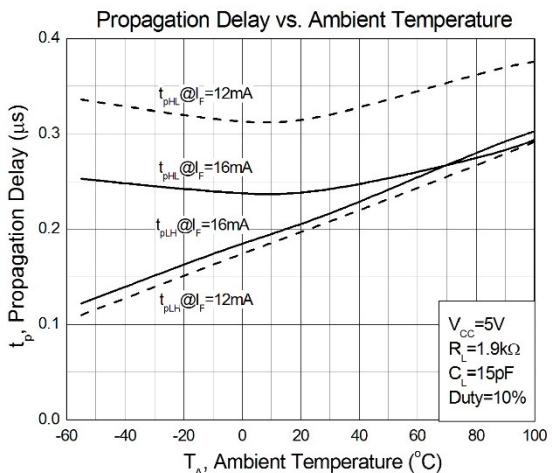


Figure 11

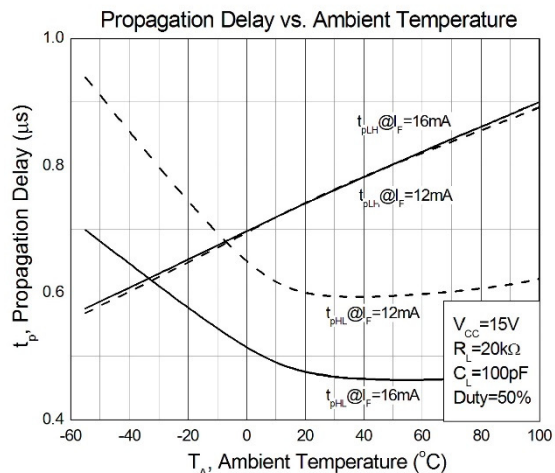
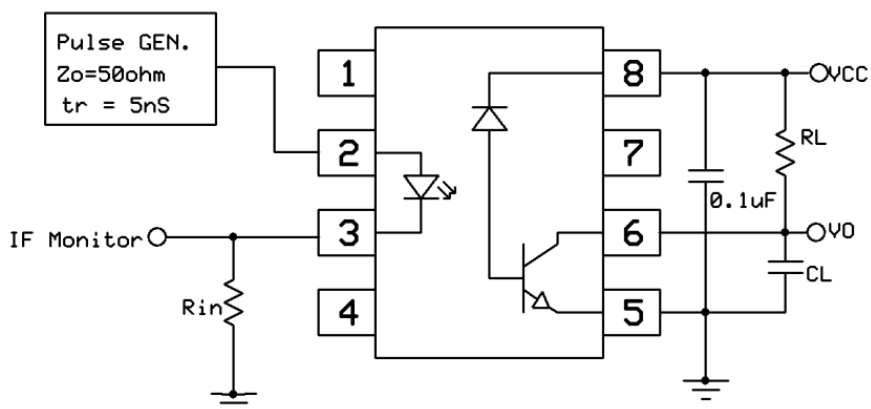


Figure 12

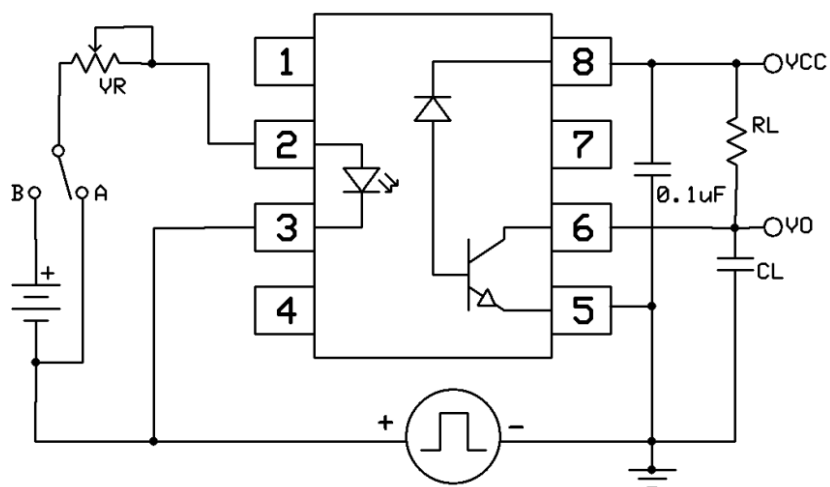


High CMR, 1Mbit/s High Speed Optocoupler

Test Circuits



Switching Time Test Circuit

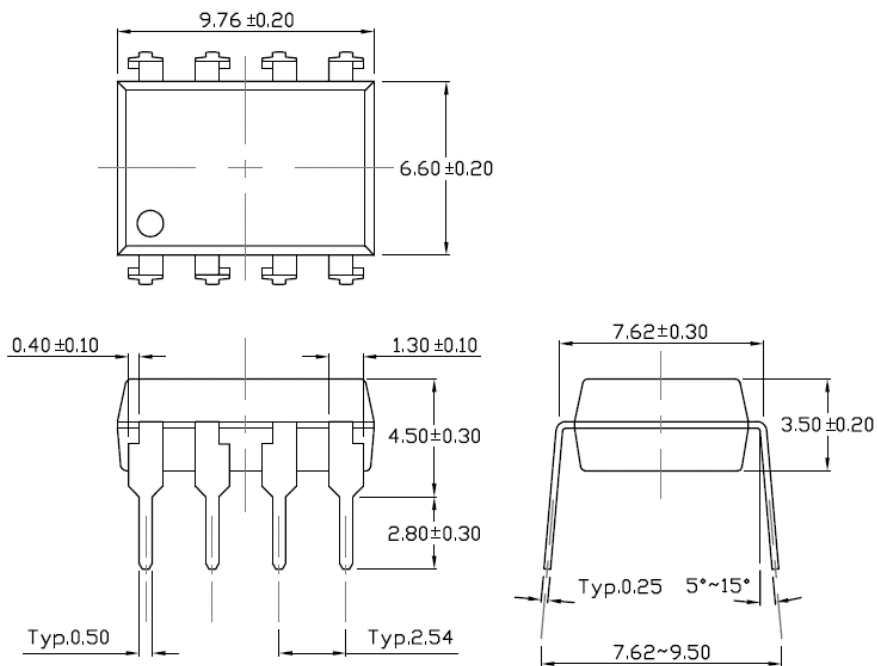


CMR Test Circuit

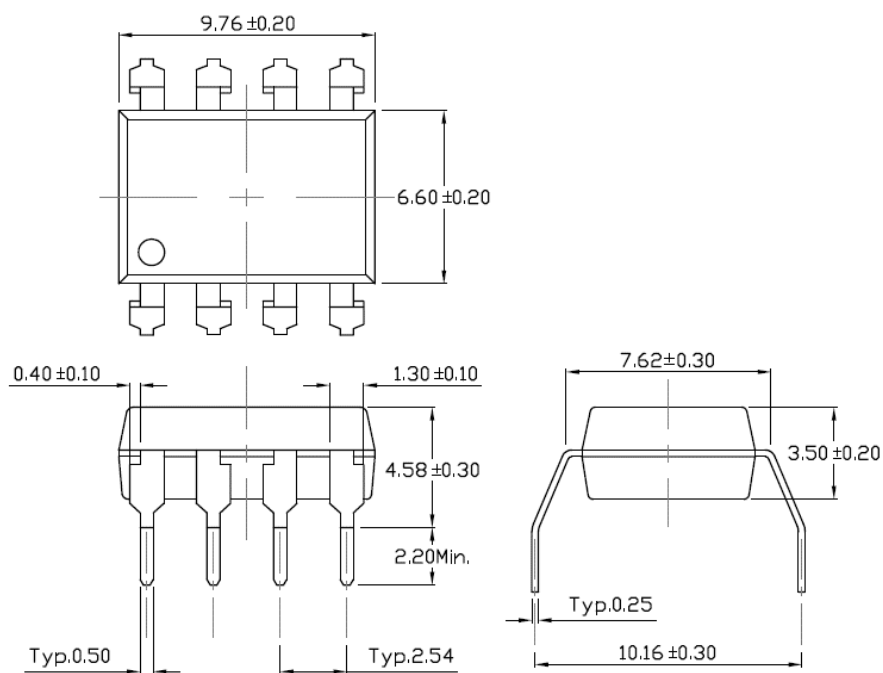


Package Dimension *Dimensions in mm unless otherwise stated*

Standard DIP – Through Hole



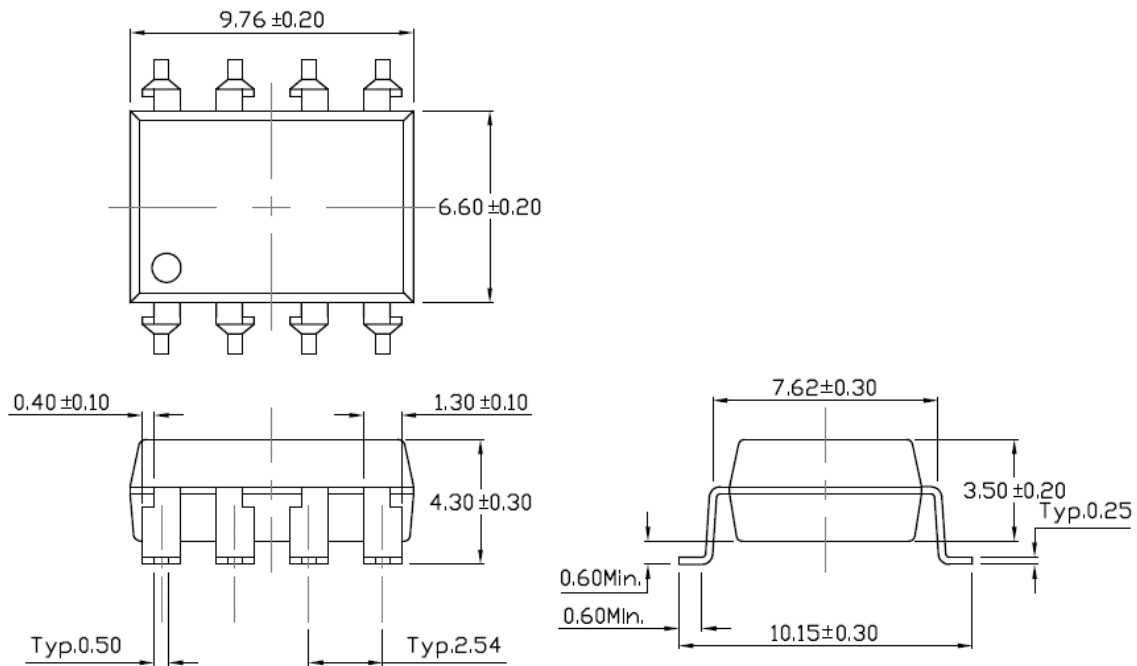
Gullwing (400mil) Lead Forming – Through Hole (M Type)



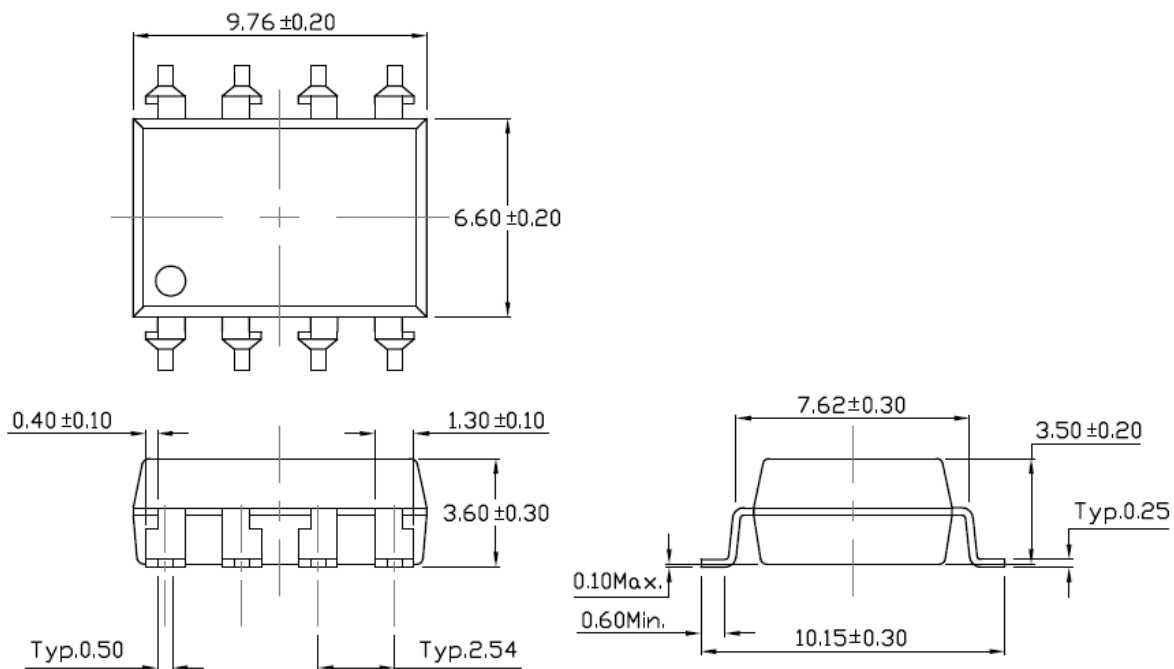


High CMR, 1Mbit/s High Speed Optocoupler

Surface Mount Lead Forming (S Type)



Surface Mount (Low Profile) Lead Forming (SL Type)

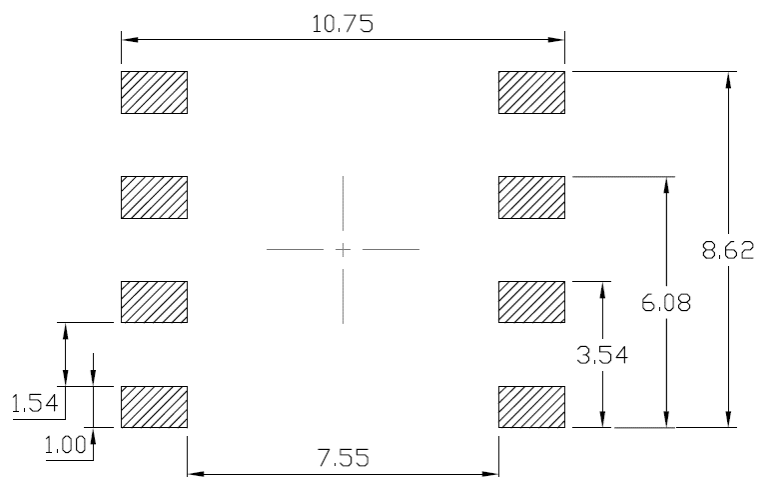




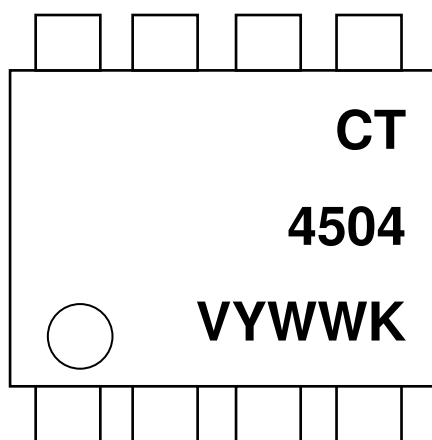
CT4504

High CMR, 1Mbit/s High Speed Optocoupler

Recommended Solder Mask *Dimensions in mm unless otherwise stated*



Device Marking



- CT : Denotes "CT Micro"
- 4504 : Product Number
- V : VDE Option
- Y : Fiscal Year
- WW : Work Week
- K : Production Code



Ordering Information

CT4504(V)(Y)(Z)

V = VDE option (V or None)

Y = Lead form option (S, SL, M or none)

Z = Tape and reel option (T1, T2 or none)

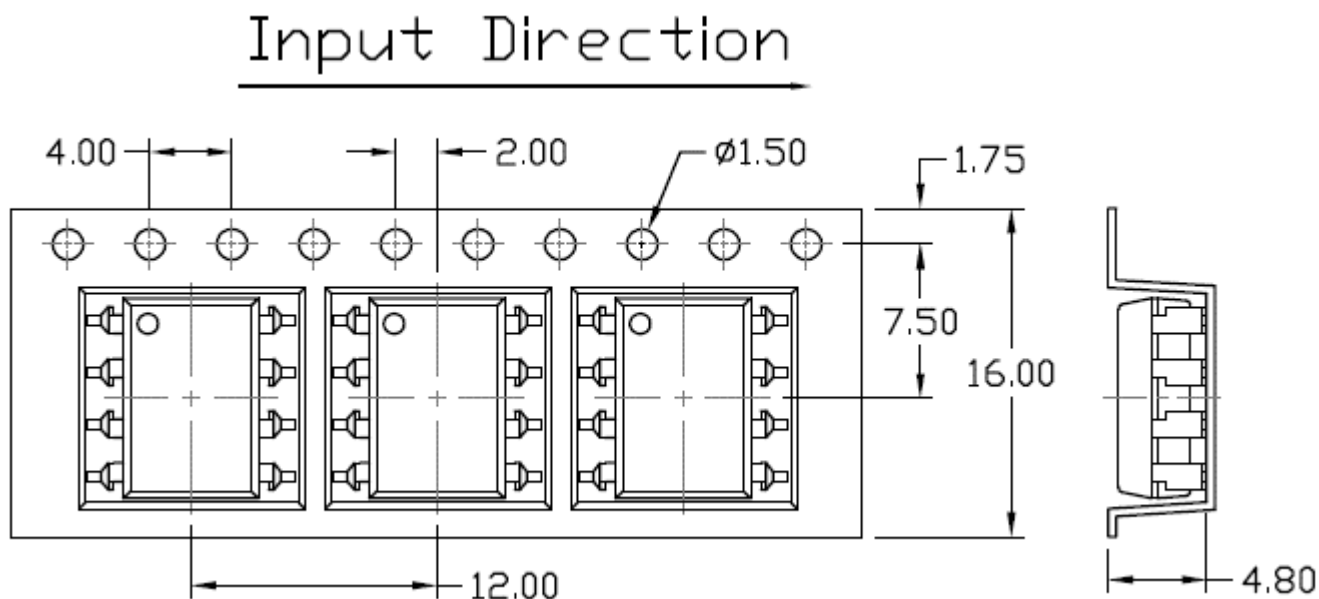
Option	Description	Quantity
None	Standard 8 Pin Dip	40 Units/Tube
M	Gullwing (400mil) Lead Forming	40 Units/Tube
S(T1)	Surface Mount Lead Forming – With Option 1 Taping	1000 Units/Reel
S(T2)	Surface Mount Lead Forming – With Option 2 Taping	1000 Units/Reel
SL(T1)	Surface Mount (Low Profile) Lead Forming– With Option 1 Taping	1000 Units/Reel
SL(T2)	Surface Mount (Low Profile) Lead Forming– With Option 2 Taping	1000 Units/Reel



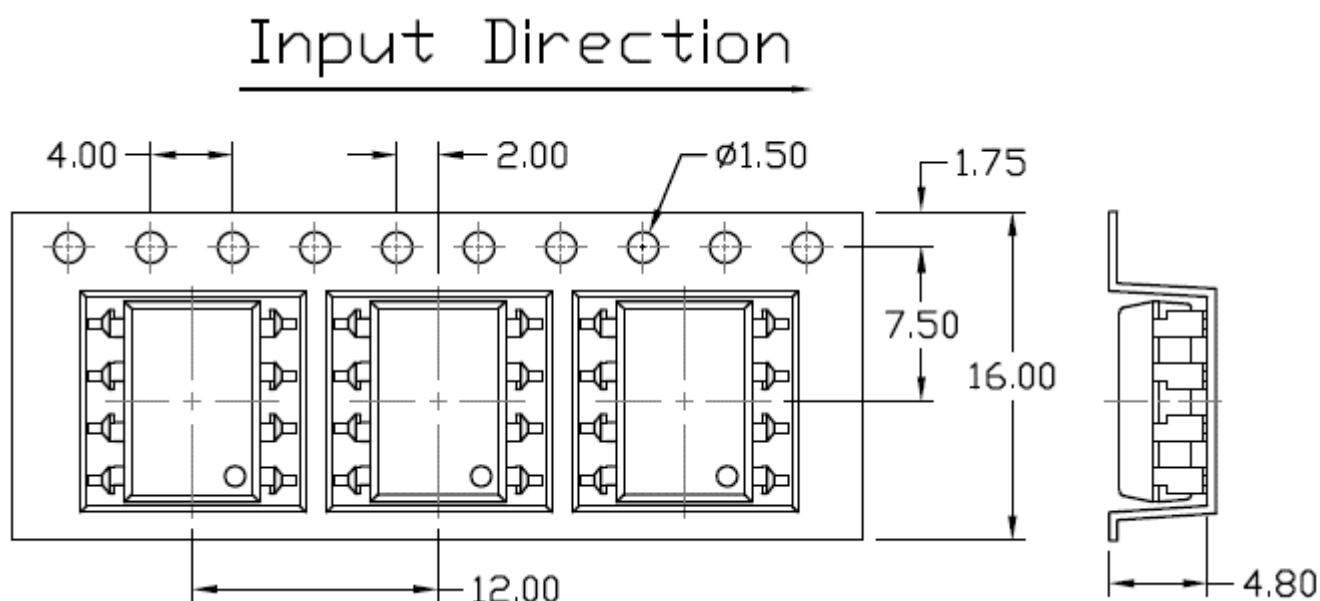
High CMR, 1Mbit/s High Speed Optocoupler

Carrier Tape Specifications *Dimensions in mm unless otherwise stated*

Option S(T1) & SL(T1)



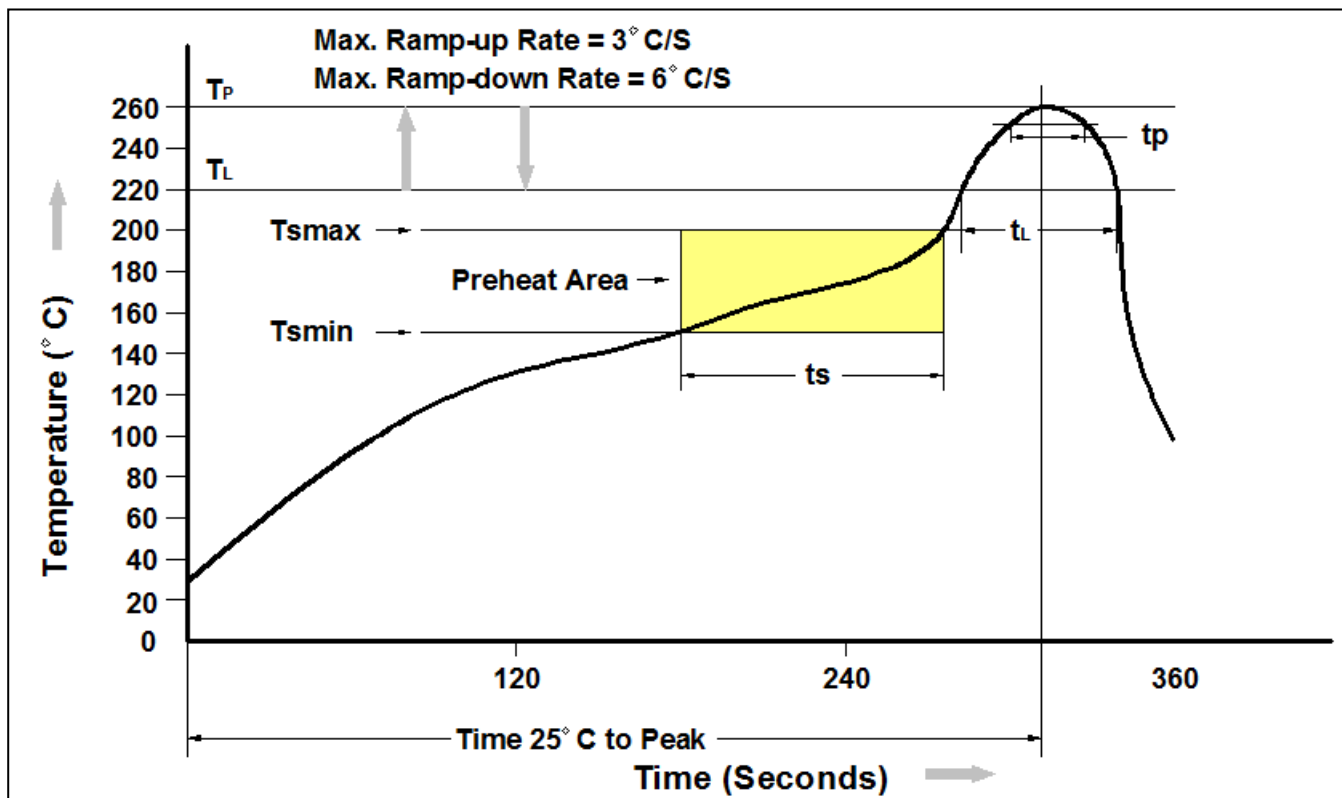
Option S(T2) & SL(T2)





High CMR, 1Mbit/s High Speed Optocoupler

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 (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.



High CMR, 1Mbit/s High Speed Optocoupler

DISCLAIMER

CT MICRO RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. CT MICRO DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

CT MICRO ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT EXPRESS WRITTEN APPROVAL OF CT MICRO INTERNATIONAL CORPORATION.

- 1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instruction for use provided in the labelling, can be reasonably expected to result in significant injury to the user.*
- 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.*