



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

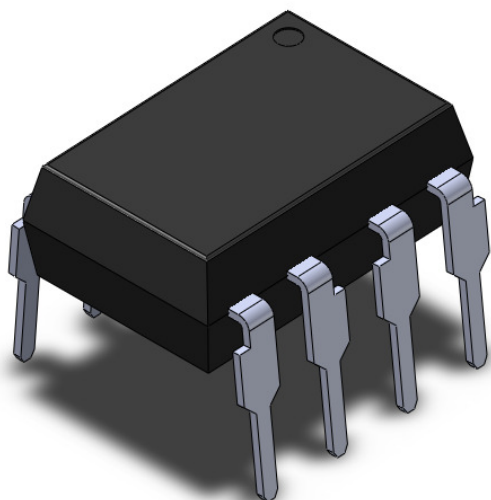
- Line receivers
- Telecommunication equipment
- Feedback loop in switch-mode power supplies
- Home appliances
- High speed logic ground isolation

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.

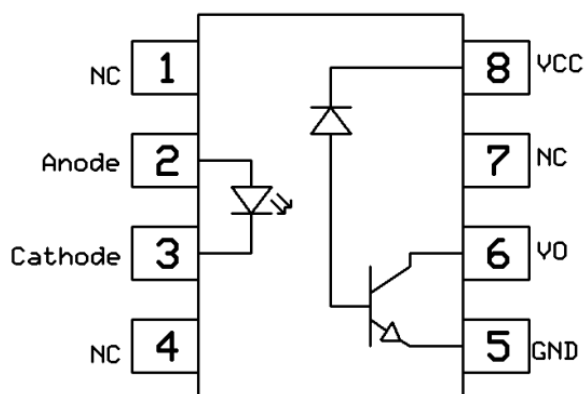
The devices are packaged in an 8-pin DIP package and also available in gullwing (400mil) and surface mount lead forming.

Package Outline



Note: Different bending options available. See package dimension.

Schematic



**CT4504****High CMR, 1Mbit/s High Speed Optocoupler****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	



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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 $V_{CC}=5V$

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	$I_F=0\text{mA}$, $V_O=V_{CC}=5.5V$, $T_A=25^\circ\text{C}$	-	0.001	0.5	μA	
		$I_F=0\text{mA}$, $V_O=V_{CC}=15V$, $T_A=25^\circ\text{C}$	-	0.01	1		
		$I_F=0\text{mA}$, $V_O=V_{CC}=15V$	-	-	50		
I_{CCL}	Logic Low Supply Current	$I_F=16\text{mA}$, $V_O=\text{Open}$, $V_{CC}=15V$	-	140	200	μA	
I_{CCH}	Logic High Supply Current	$I_F=0\text{mA}$, $V_O=\text{Open}$, $V_{CC}=15V$, $T_A=25^\circ\text{C}$	-	0.01	1	μA	
		$I_F=0\text{mA}$, $V_O=\text{Open}$, $V_{CC}=15V$	-	-	2		

Transfer Characteristics

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

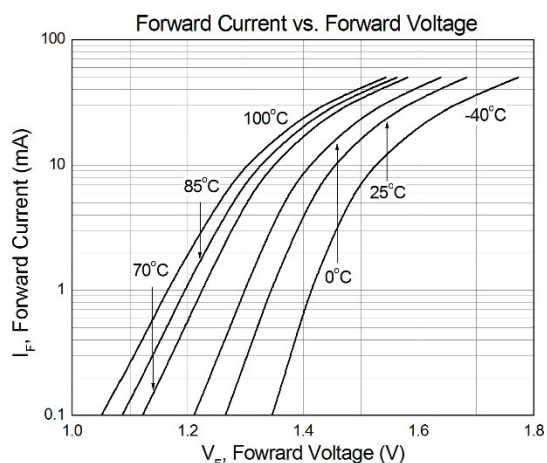


Figure 1

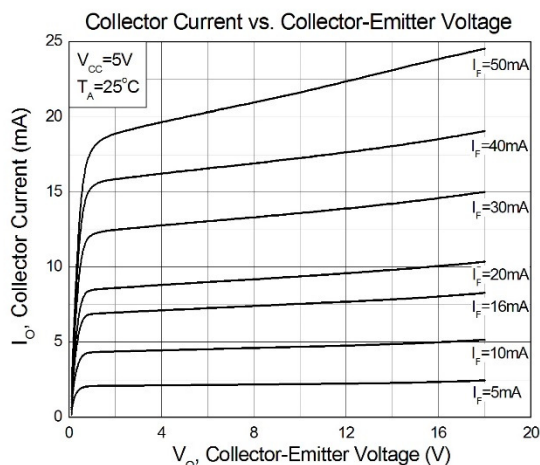


Figure 2

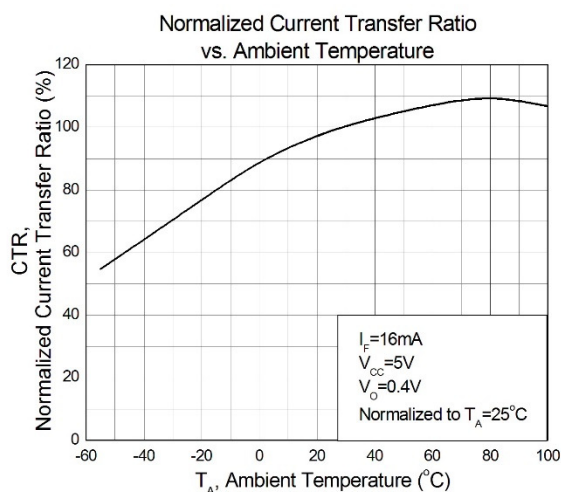


Figure 3

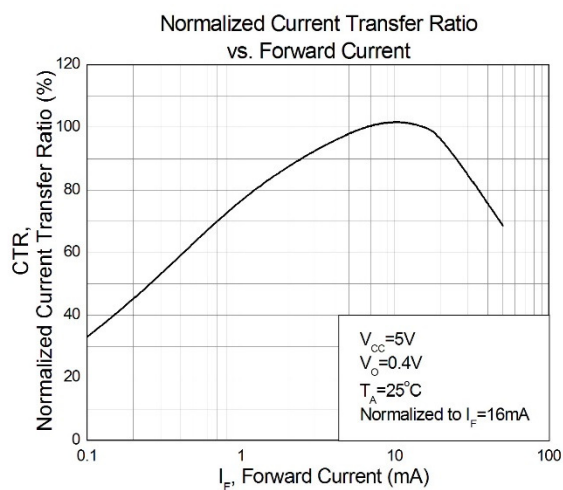


Figure 4

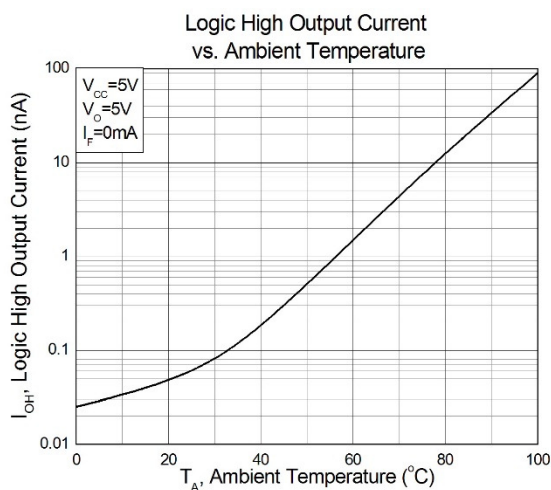


Figure 5

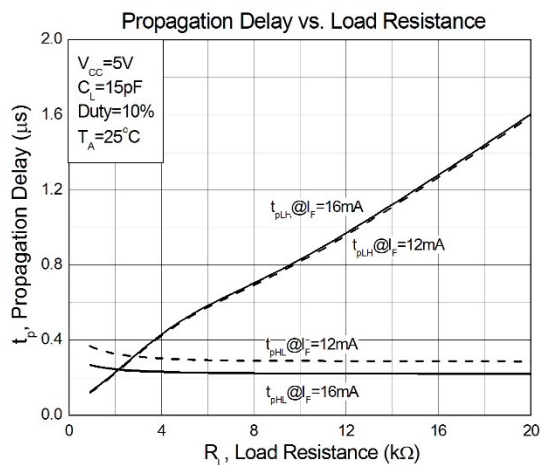


Figure 6



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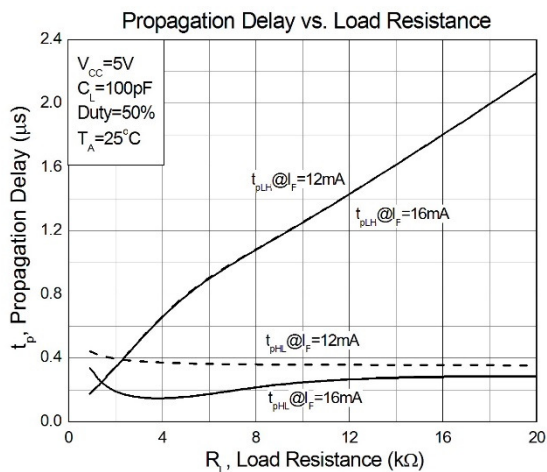


Figure 7

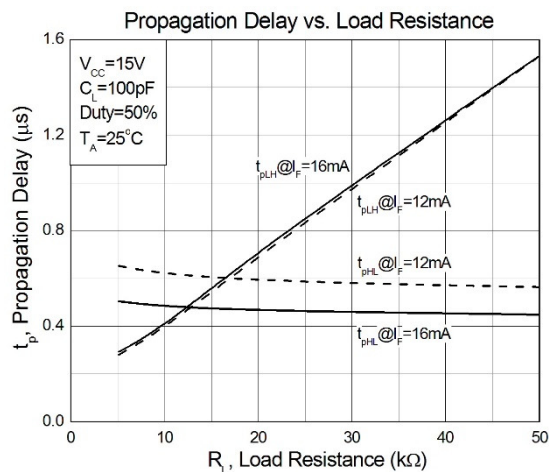


Figure 8

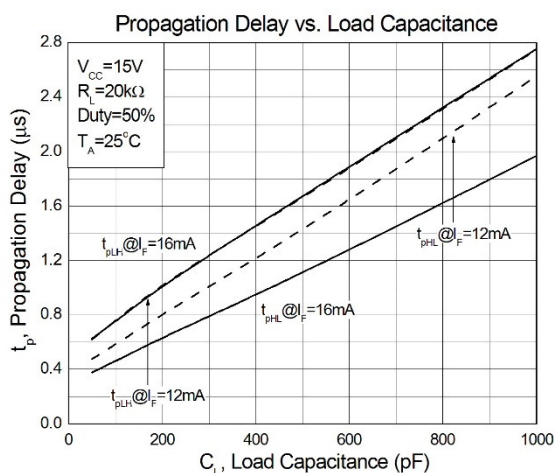


Figure 9

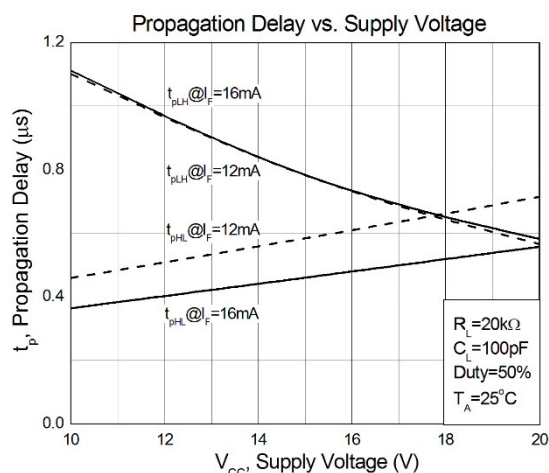


Figure 10

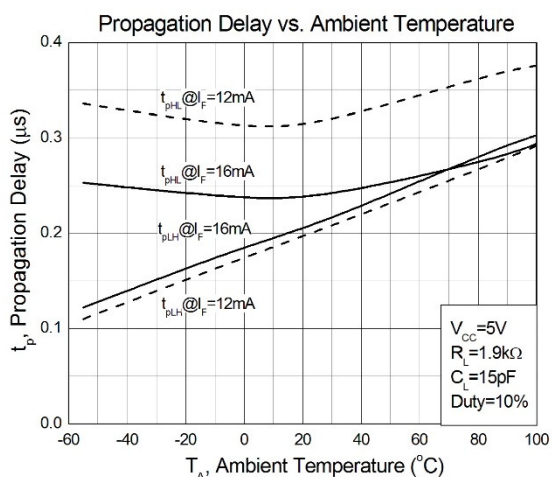


Figure 11

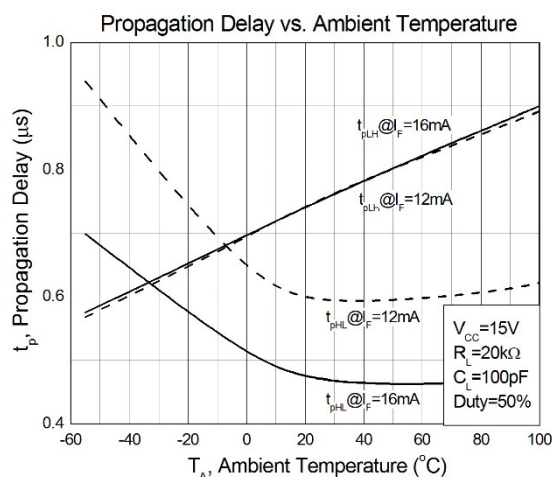
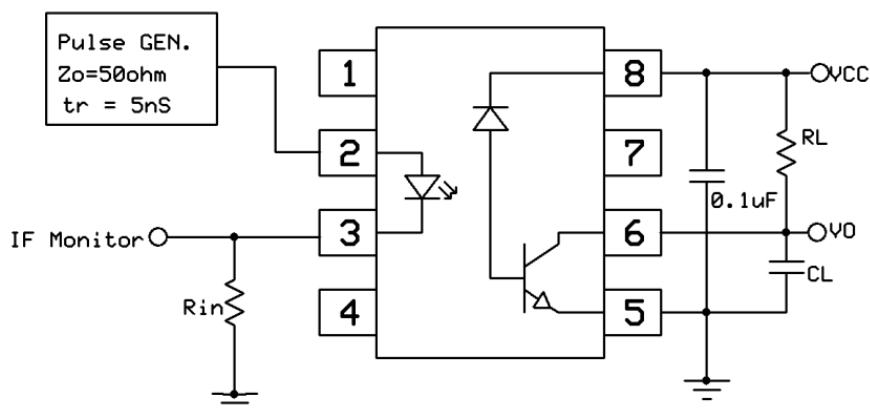


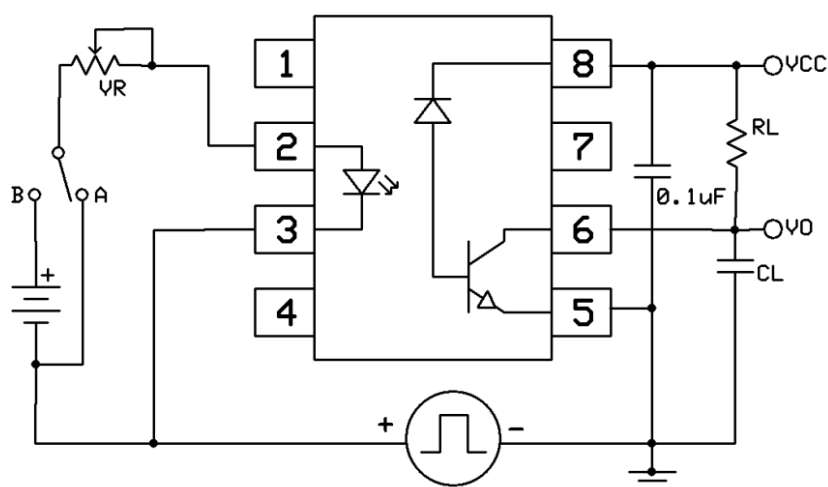
Figure 12



Test Circuits



Switching Time Test Circuit



CMR Test Circuit

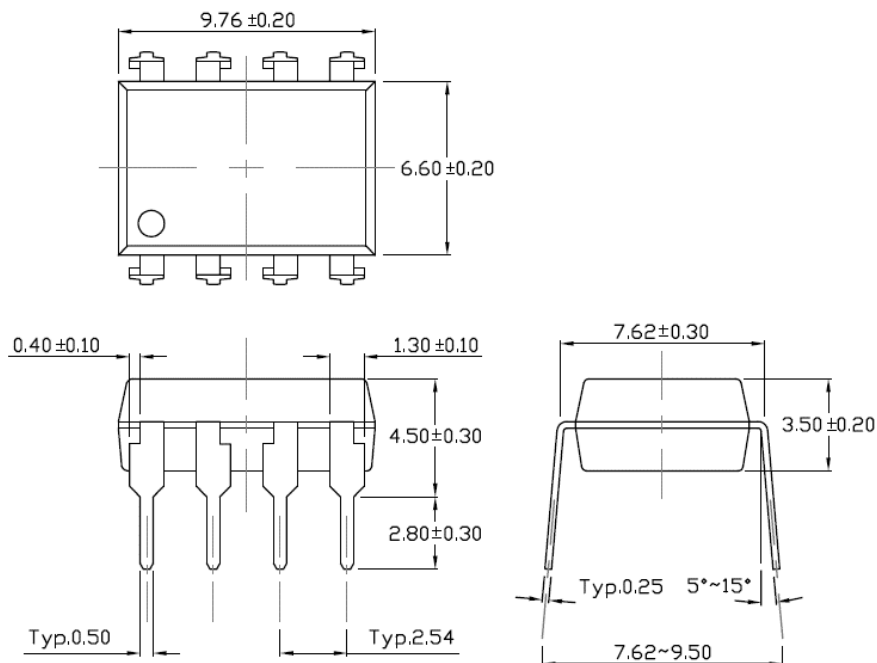


CT4504

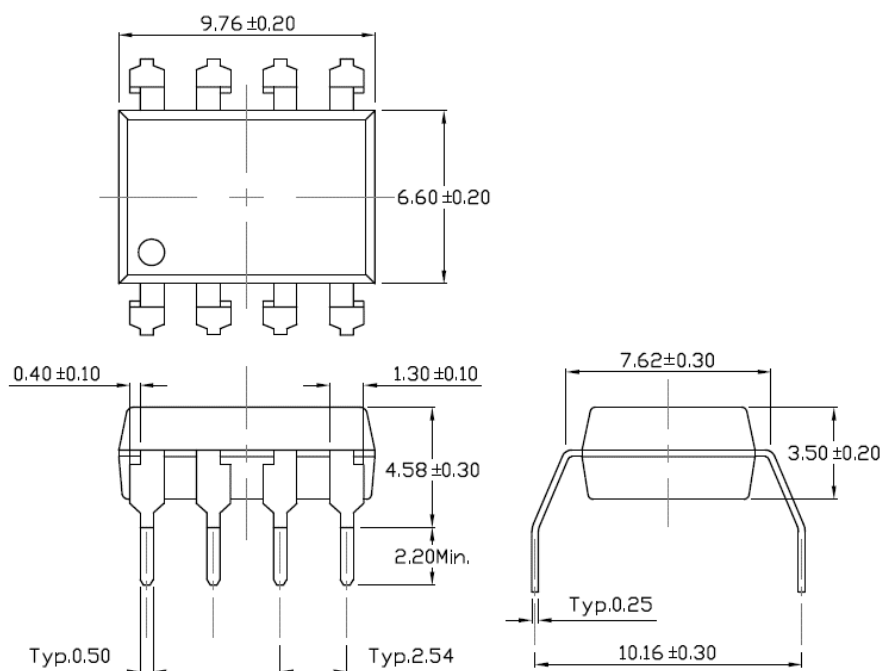
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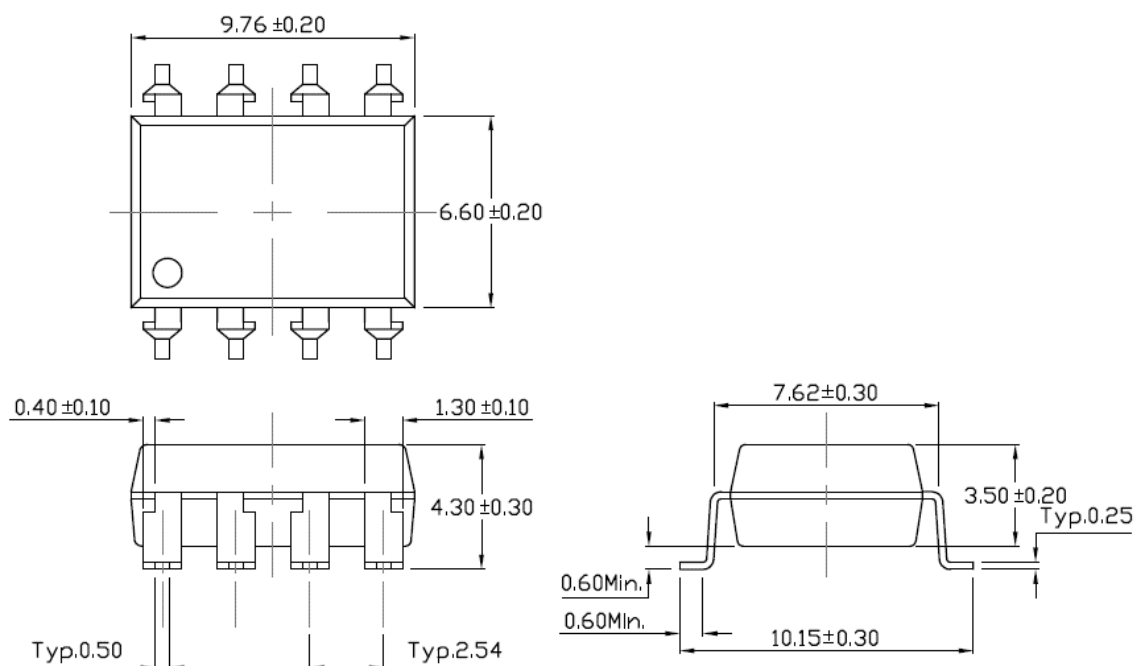
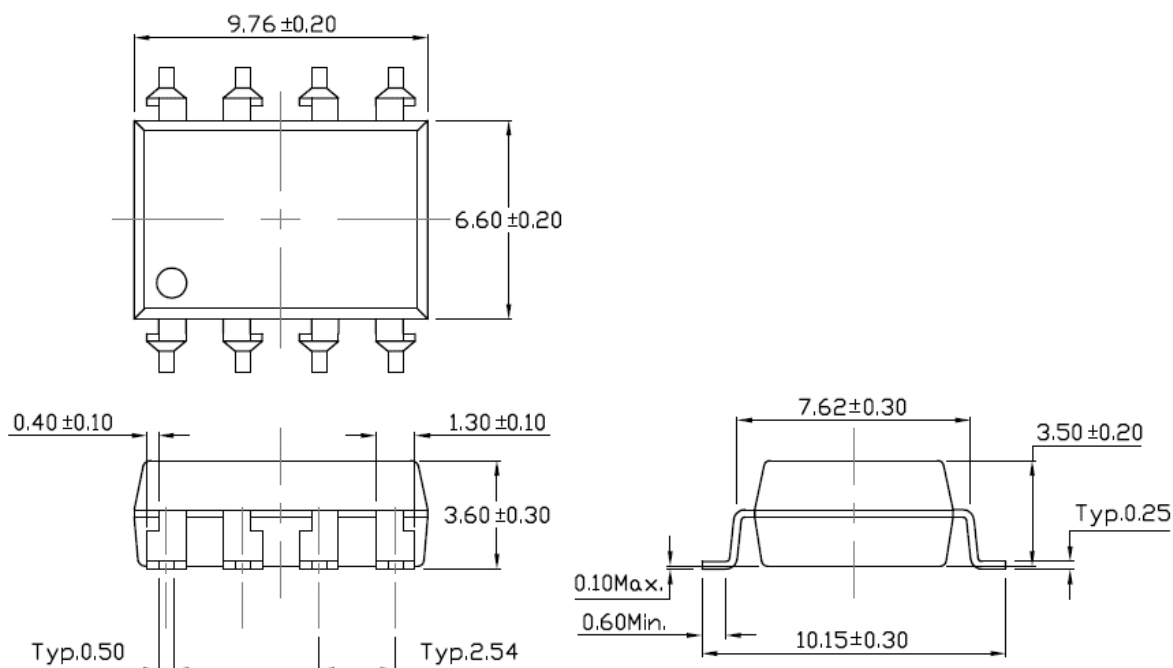
Package Dimension *Dimensions in mm unless otherwise stated*

Standard DIP – Through Hole



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



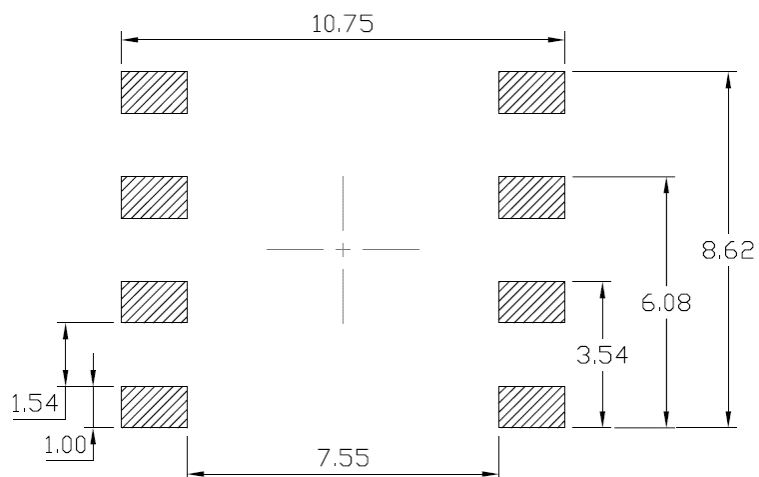
**Surface Mount Lead Forming (S Type)****Surface Mount (Low Profile) Lead Forming (SL Type)**



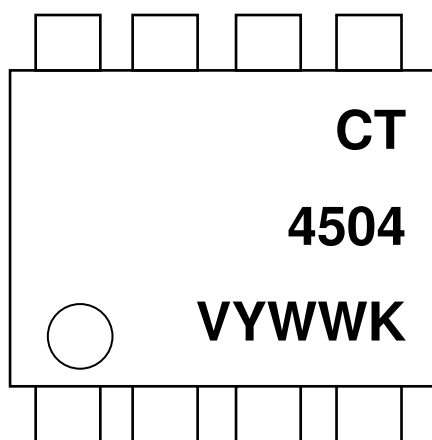
CT4504

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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



CT4504

High CMR, 1Mbit/s High Speed Optocoupler

Ordering Information

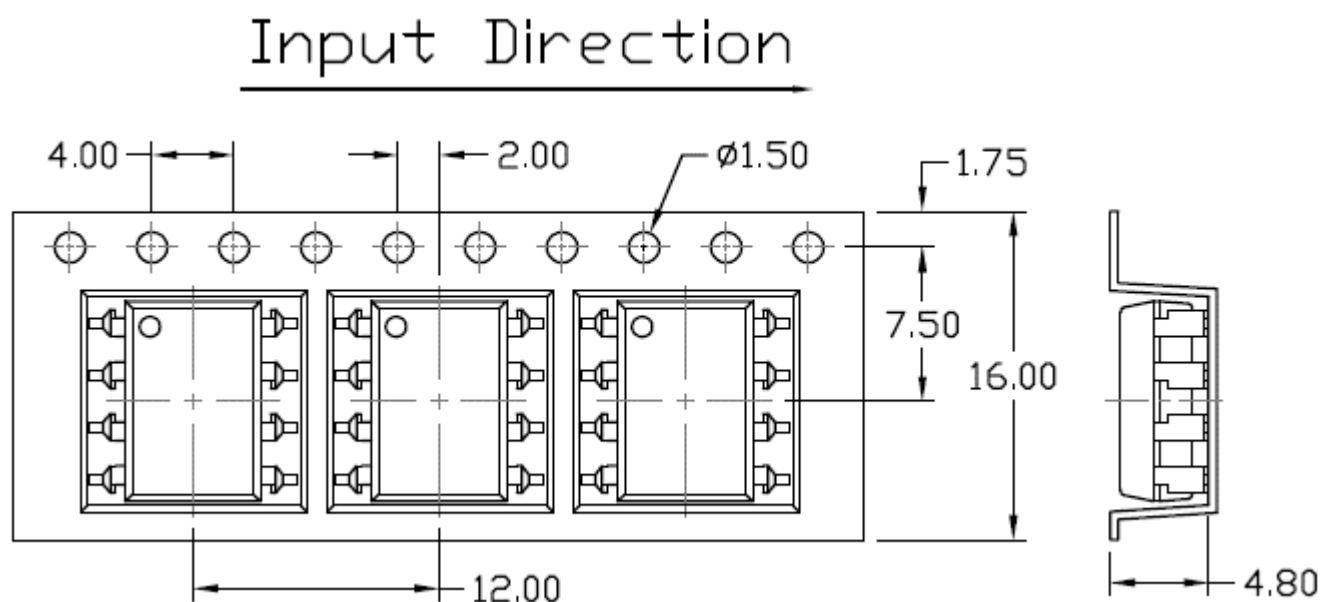
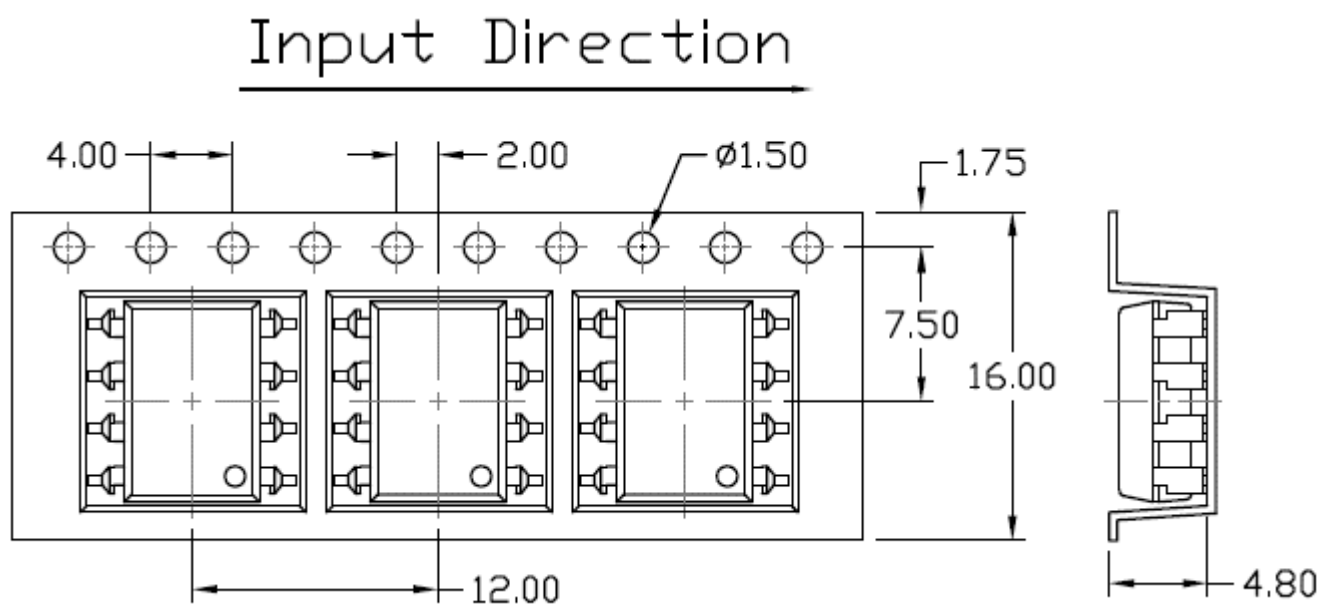
CT4504(V)(Y)(Z)

V = VDE option (V or None)

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

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

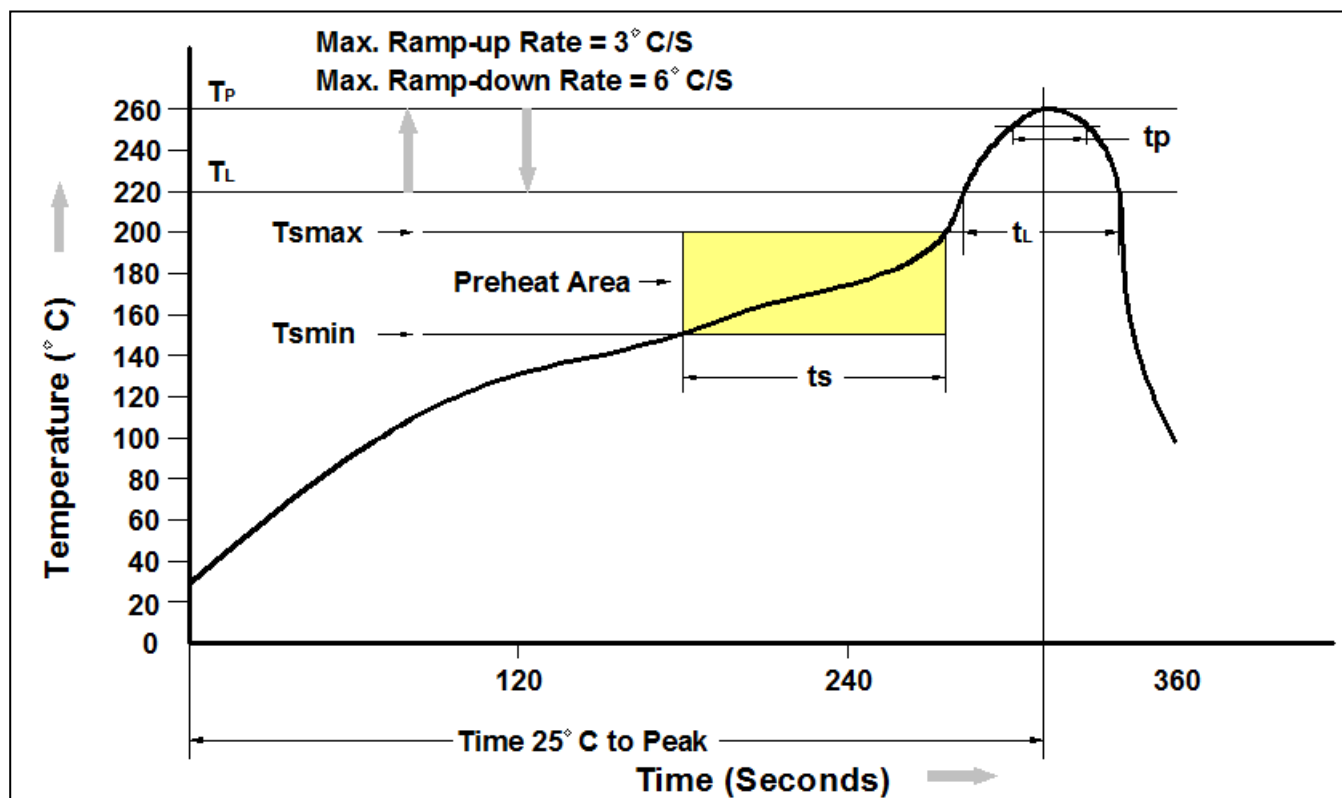
<i>Option</i>	<i>Description</i>	<i>Quantity</i>
None	Standard 8 Pin Dip	40 Units/Tube
M	Gullwing (400mil) Lead Forming	40 Units/Tube
S(T1)	Surface Mount Lead Forming – With Option 1 Taping	1000 Units/Reel
S(T2)	Surface Mount Lead Forming – With Option 2 Taping	1000 Units/Reel
SL(T1)	Surface Mount (Low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

**Carrier Tape Specifications** *Dimensions in mm unless otherwise stated***Option S(T1) & SL(T1)****Option S(T2) & SL(T2)**



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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.



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