UMW HCPL-4503-xxxE

1.Description

HCPL4503 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 an 8-pin DIP package and available in wide-lead spacing and SMD option

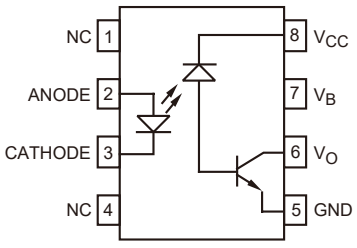
2.Applications

- Line receivers
- Telecommunication equipments
- Power transistor isolation in motor drives
- Replacement for low speed phototransistor photo couplers
- Feedback loop in switch-mode power supplies
- Home appliances
- High speed logic ground isolation

3.Features

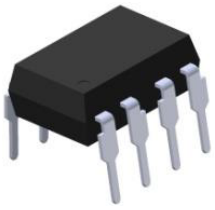
- High speed 1Mbit/s
- High isolation voltage between input
- and output (Viso=5000 Vrms)
- Guaranteed performance from 0°C to 70°C
- Wide operating temperature range of -55°C to 100°C
- Pb free and RoHS compliant

4.Pinning Information

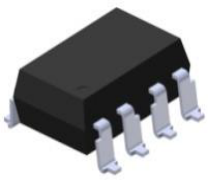


Truth Table

LED	V_O
ON	LOW
OFF	HIGH



DIP-8



SOP- 8

A 0.1 μF bypass capacitor must be connected between pins 5 and 8.

5.Absolute Maximum Ratings T_A= 25°C

Parameter		Symbol	Value	Units
Input	Forward current	I_F	25	mA
	Peak forward current (50% duty, 1ms P.W)	I_{FP}	50	mA
	Peak transient current (≤1μs P.W,300pps)	I_{Ftrans}	1	A
	Reverse voltage	V_R	5	V
	Power dissipation	P_{IN}	45	mW
Output	Power dissipation	P_O	100	mW
	Average Output current	$I_{O(AVG)}$	8	mA
	Peak Output current	$I_{IO(PK)}$	16	mA
	Output voltage	V_O	-0.5 to 20	V
	Supply voltage	V_{CC}	-0.5 to 30	V
Total Power Dissipation		P_{TOT}	145	mW
Isolation Voltage *1		V_{ISO}	5000	V_{rms}
Operating Temperature		T_{OPR}	-55 to 100	°C
Storage Temperature		T_{STG}	-55 to 125	°C
Soldering Temperature *2		T_{SOL}	260	°C

*1 AC for 1 minute, R.H.=40 ~ 60% R.H. In this test, pins 1,2,3 & 4 are shorted together,and pins 5,6,7 & 8 are shorted together.

*2 For 10 seconds.

6.Electrical Characteristics (T_A=0 to 70°C unless specified otherwise)

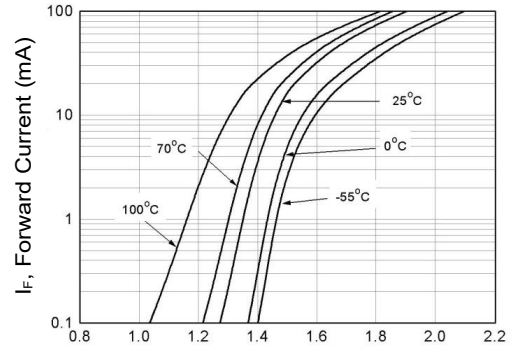
Parameter	Symbol	Conditions	Min	Typ	Max	Units
Input						
Forward Voltage	V_F	I_F=16mA		1.45	1.7	V
Reverse Voltage	B_{VR}	I_R=10μA	5	20		V
Temperature coefficient of forward voltage	$\Delta V_F/\Delta T_A$	I_F=16mA		-1.6		mV/°C
Output						
Logic High Supply Current	I_{CCH}	V_{CC}=15V, I_F=0mA, V_O=Open			2	μA
Logic Low Supply Current	I_{CCL}	V_{CC}=15V, I_F=16mA, V_O=Open		160	200	μA
Transfer						
Logic High Output Current	I_{OH}	I_F=0mA, V_O=V_{CC}=5.5V		0.001	0.5	μA
		I_F=0mA, V_O=V_{CC}=15V		0.005	1	μA
		T_A=0~70°C, V_O=V_{CC}=15V			50	μA
Logic Low Output Voltage	VOL	I_F=16mA, V_{CC}=4.5V,I_O=2.4mA		0.1	0.4	V
Current Transfer Ratio	CTR	I_F=16mA, V_{CC}=4.5V, I_O=0.4V	20	35	50	%
Isolation Voltage	V_{ISO}	RH<50%, T_A=25°C, I_{I-O}≤50μA	5000			V_{RMS}

7.Switching Characteristics

(T_A=0 to 70°C unless specified otherwise, I_F=16mA, V_{CC}=5V)

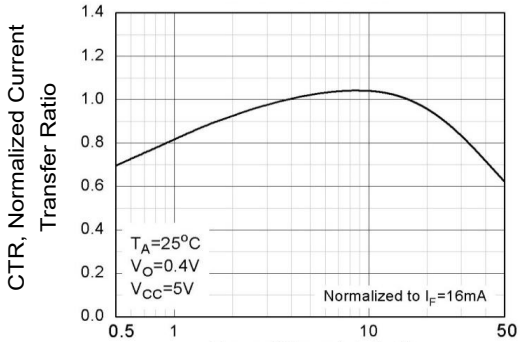
Parameter	Symbol	Conditions		Min	Typ	Max	Units
Propagation Delay Time to Logic Low	T_{PLH}	I_F=16mA, R_L=4.1kΩ			1300	1500	ns
		I_F=16mA, R_L=1.9kΩ			600	800	ns
Propagation Delay Time to Logic	T_{PHL}	I_F=16mA, R_L=4.1kΩ			200	1500	ns
		I_F=16mA, R_L=1.9kΩ			200	800	ns
Common Mode Transient Immunity at Logic High	$\|CM_H\|$	R_L=4.1KΩ	T_A=25°C, I_F=0mA, C_L=15pF		10000		V/μs
		R_L=1.9KΩ	|VCM|=10V(Peak)				
Common Mode Transient Immunity at Logic Low	$\|CM_L\|$	R_L=4.1KΩ	T_A=25°C, I_F=16mA		10000		V/μs
		R_L=1.9KΩ	C_L=15pF				

8.Typical Characteristic



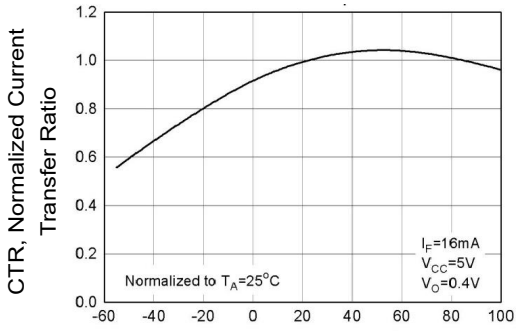
V_F, Forward Voltage (V)

Figure 1: Forward Current vs. Forward Voltage



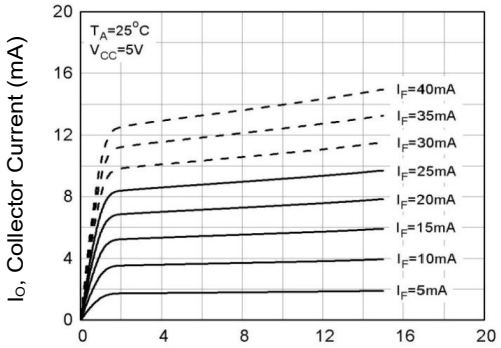
I_F, Forward Current (mA)

Figure 2: Normalized Current Transfer Ratio vs. Forward Current



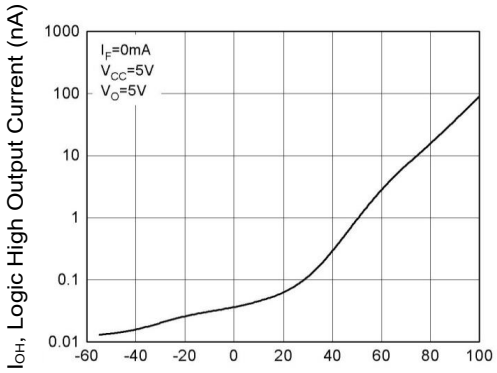
T_A, Ambient Temperature (°C)

Figure 3: Normalized Current Transfer Ratio vs. Ambient Temperature



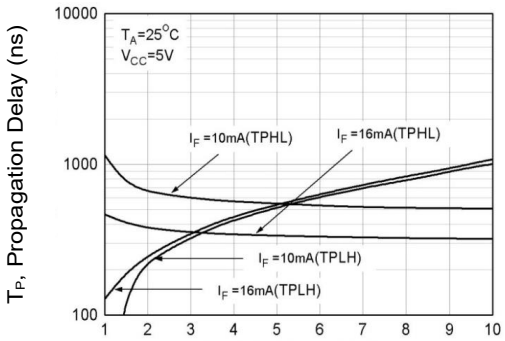
V_O, Collector-Emitter Voltage (V)

Figure 4: Output Current vs Output Voltage



T_A, Temperature (°C)

Figure 5: Logic High Output Current vs. Temperature



R_L, Load Resistance (kΩ)

Figure 6: Propagation Delay vs. Load Resistance

9.Switching Time Test Circuit & Waveform

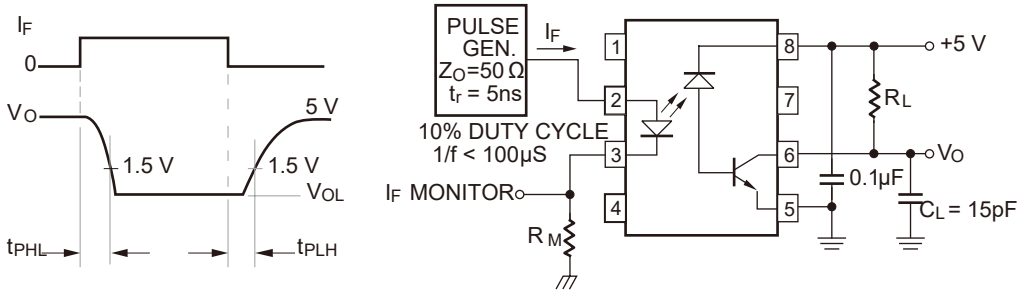


Figure 7. Switching test circuit.

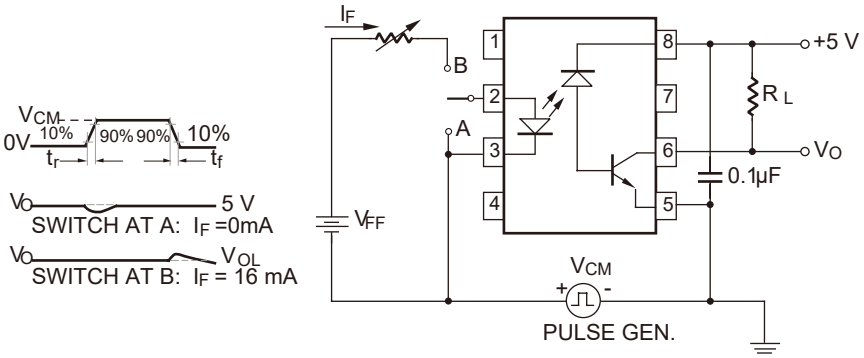
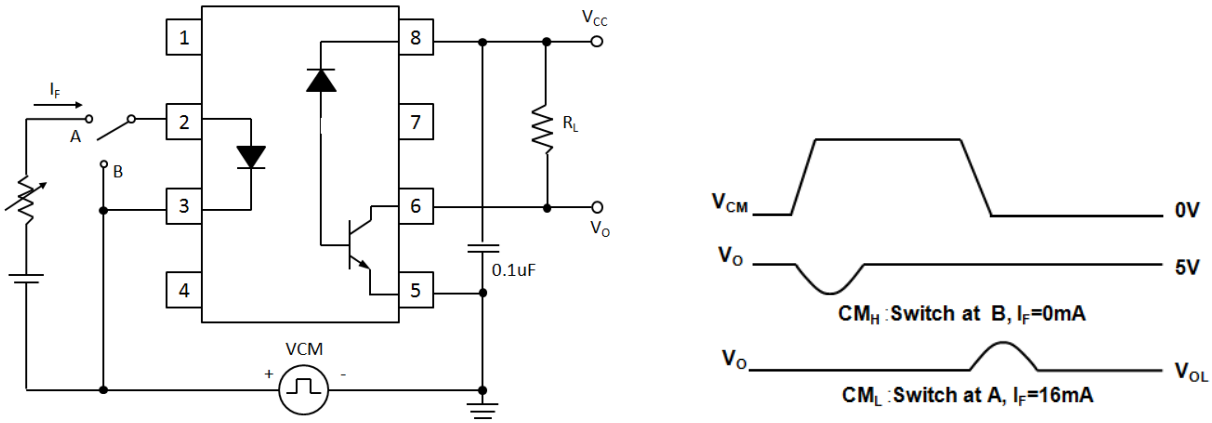
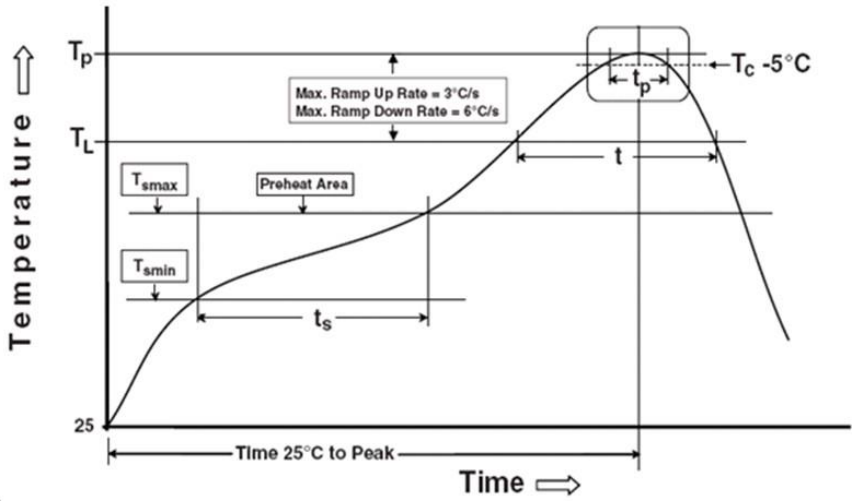


Figure 8. Test circuit for transient immunity and typical waveforms.

10.Transient Immunity Test Circuit & Waveform



11.Precautions for Use

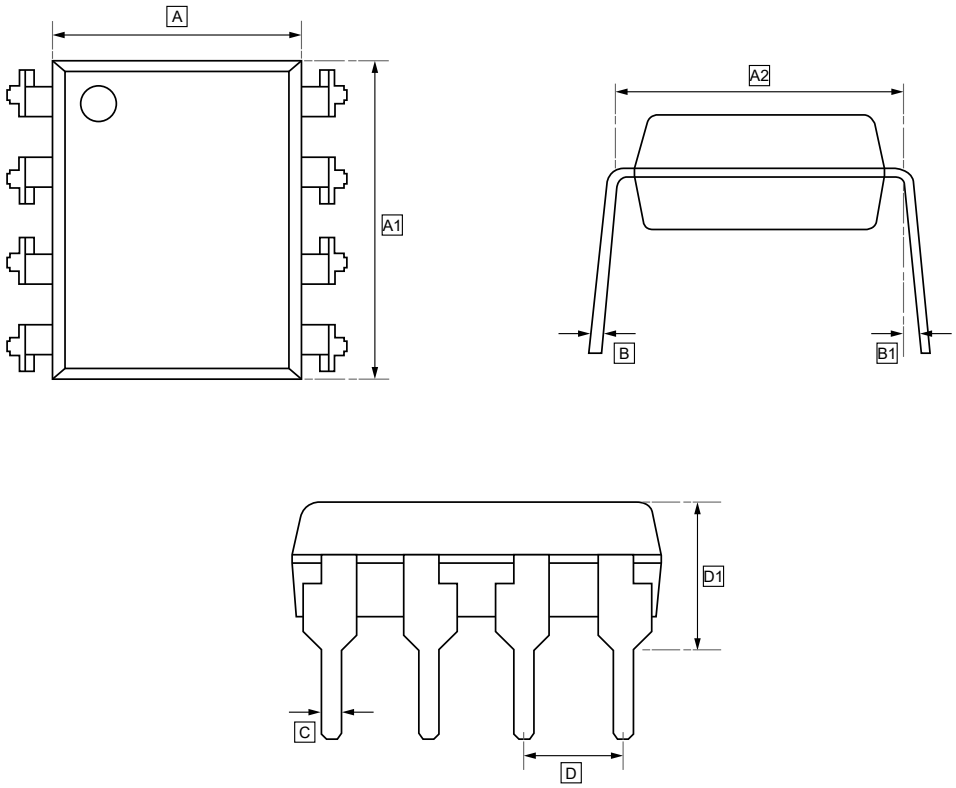


1. Soldering Condition

1.1 (A) Maximum Body Case Temperature Profile for evaluation of Reflow Profile

Preheat	
Temperature min (T_{smin})	150°C
Temperature max (T_{smax})	200°C
Time (T_{smin} to T_{smax}) (t_s)	60-120 seconds
Average ramp-up rate (T_{smax} to T_p)	3°C/second max
Other	
Liquidus Temperature (T_L)	216°C
Time above Liquidus Temperature (t_L)	60-100 sec
Peak Temperature (T_p)	260°C
Time within 5°C of Actual Peak Temperature: T_p - 5°C	30s
Ramp- Down Rate from Peak Temperature	6°C /second max
Time 25°C to peak temperature	8 minutes max
Reflow times	3 times

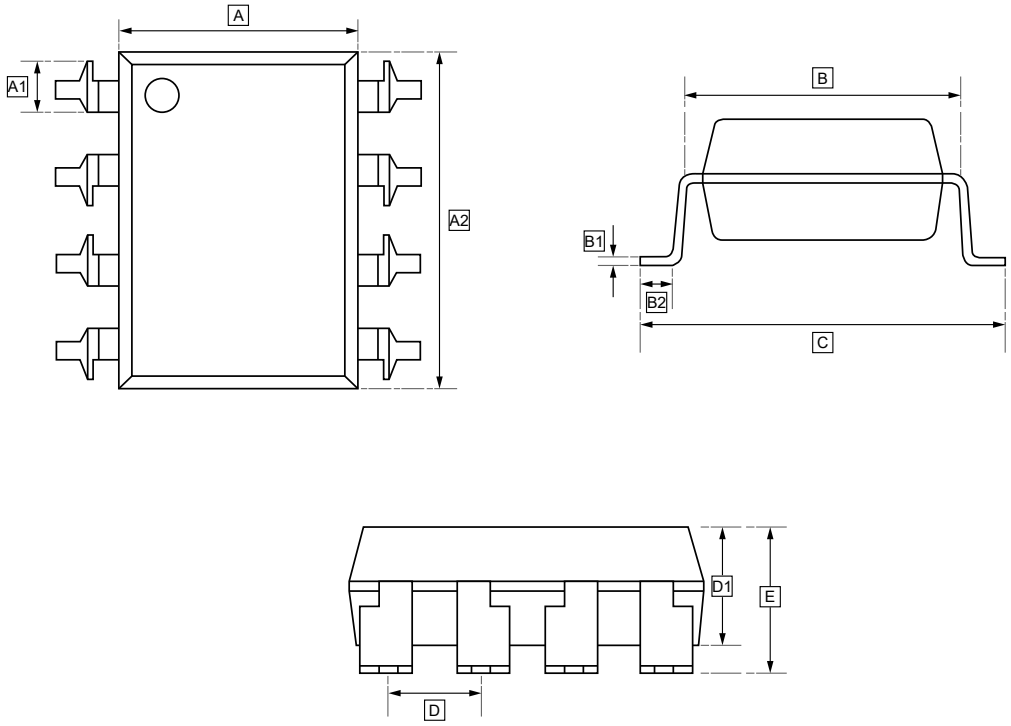
12.1 DIP-8 Package Outline Dimensions



DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	A2	B	B1	C	D	D1
Min	6.30	9.46	7.62	0.25	5°	0.40	2.54	4.20
Max	6.90	10.06	TYP.		15°	0.60	TYP.	4.80

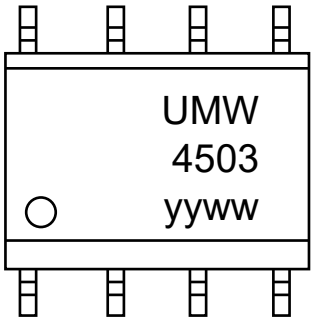
12.2 SOP-8 Package Outline Dimensions



DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	A2	B	B1	B2	C	D	D1	E
Min	6.30	1.45	9.46	7.62	0.25	0.6	-	2.54	3.20	4.00
Max	6.90		10.06	TYP		-	10.3	TYP	3.80	4.60

13.Ordering Information



yy: Year Code
ww: Week Code

Order Code	Marking	Package	Base QTY	Delivery Mode
UMW HCPL-4503-000E	4503	DIP-8	2250	Tube and box
UMW HCPL-4503-500E	4503	SOP-8	1000	Tape and reel

14.Disclaimer

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