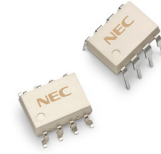


AN 3006

**Optocoupler Performance Comparison:
NEC PS9505 vs. Avago HCPL-3120**



Introduction

Both the PS9505 and HCPL-3120 are optically-coupled isolators that employ a GaAlAs LED on the input side and a photo diode, a signal processing circuit, and a power output transistor on the output side. They feature large peak output current, fast switching speeds, undervoltage lockout protection with hysteresis, and high common mode transient immunity. Applications for these devices include IGBT and power MOSFET gate drivers.

As seen in the tables below, the performance of the two devices is virtually identical and in some parameters, the PS9505 is better as highlighted in **YELLOW**.

Absolute Maximum Ratings		Symbol	PS9505	HCPL-3120	Unit
LED	Reverse Voltage	V_R	5	5	V
	Forward Current	V_F	25	25	mA
	Peak Transient Forward Current (Pulse Width < 1 μ s)	I_F (TRAN)	1	1	A
DETECTOR	High Peak Output Current	I_{OH} (Peak)	2.5	2.5	A
	Low Peak Output Current	I_{OL} (Peak)	2.5	2.5	A
	Supply Voltage	$V_{CC}-V_{EE}$	0 – 35	0 – 35	V
	Output Voltage	V_O	0 to V_{CC}	0 to V_{CC}	V
	Output Power Dissipation	P_O	250	250	mW
	Isolation Voltage	BV	5k	3.75k	$V_{r.m.s.}$
	Total Power Dissipation	P_T	300	295	mW
	Operating Ambient Temperature	T_a	-40°C to 110°C	-40°C to 100°C	

Electrical Characteristics		Symbol	Condition	PS9505	HCPL-3120	Unit
LED Forward Voltage		V_F	$I_F = 10$ mA	1.56 (typ)	1.5 (typ)	V
DETECTOR	High Level Output Current	I_{OH}	$V_O = V_{CC} - 4V$	2.0 (typ)	1.5 (typ)	A
			$V_O = V_{CC} - 15V$	2.0 (min)	2.0 (min)	A
	Low Level Output Current	I_{OL}	$V_O = V_{EE} + 2.5V$	2.0 (typ)	2.0 (typ)	A
			$V_O = V_{EE} + 15V$	2.0 (min)	2.0 (min)	A
	High Level Output Voltage	V_{OH}	$V_O = -100$ mA	$V_{CC} - 1.5V$ (typ)	$V_{CC} - 3.0V$ (typ)	A
	Low Level Output Voltage	V_{OL}	$I_O = 100$ mA	0.5 (max)	0.5 (max)	V
	High Level Supply Current	I_{CCH}	Output Open, $I_F = 7$ to 16 mA	3.0 (max)	5.0 (max)	mA
	Low Level Supply Current	I_{CCL}	Output Open, $V_F = 0.0$ to 0.8 V	3.0 (max)	5.0 (max)	mA
UNLO Threshold	V_{UNLO+}	$V_O > 5V, I_F = 7$ mA (Avago: $I_F = 10$ mA)	10.5 - 12.5	11.0 - 13.5	V	
	V_{UNLO-}		9.2 - 11.1	9.5 - 12.0	V	
UNLO Hysteresis	$UVOLHYS$		1.3 (typ)	1.6 (typ)	V	
COUPLED	Threshold Input Current (L \rightarrow H)	I_{FLH}	$I_O = 0$ mA, $V_O > 5V$	5 (max)	5 (max)	mA
	Threshold Input Voltage (L \rightarrow H)	V_{FHL}		0.8 (min)	0.8 (min)	V

Switching Characteristics	Symbol	Condition	PS9505 ¹	HCPL-3120 ²	Unit
Propagation Delay Time (L → H)	t _{PLH}	R _g = 10Ω C _g = 10 nF f = 10kHz Duty Cycle = 50%	0.1 – 0.25	0.1 – 0.5	μs
Propagation Delay Time (H → L)	t _{PHL}		0.1 – 0.25	0.1 – 0.5	μs
Pulse Width Distortion (PWD)	t _{PHL} – t _{PLH}		0.1 (max)	0.3 (max)	μs
Propagation Delay differences between two parts	t _{PHL} – t _{PLH}		-0.35 to 0.35	-0.35 to 0.35	μs
Rise Time	T _r		0.05 (typ)	0.1 (typ)	μs
Fall Time	T _f		0.05 (typ)	0.1 (typ)	μs
UNLO (Turn On Delay)	t _{UVLO ON}	V _O > 5V, I _F = 7 mA	0.8 (typ)	0.8 (typ)	μs
UNLO (Turn Off Delay)	t _{UNLO OFF}	(Avago: I _F = 10 mA)	0.6 (typ)	0.6 (typ)	μs
Output High Level Common Mode Transient Immunity	C _{MH}	T _A = 25°C, V _{CM} = 1500V, I _F = 10 – 16mA, V _{CC} = 30V	25 (min)	25 (min)	kV/μs
Output Low Level Common Mode Transient Immunity	C _{ML}	T _A = 25°C, V _{CM} = 1500V, V _F = 0V, V _{CC} = 30V	25 (min)	25 (min)	kV/μs

NOTE: 1. (T_A = -40°C to +110°C, V_{CC} = 15V to 30V, I_F (ON) = 7 to 16mA, V_F (OFF) = -2V to 0.8V, V_{EE} = GND)

2. (T_A = -40°C to +100°C, V_{CC} = 15V to 30V, I_F (ON) = 7 to 16mA, V_F (OFF) = -2V to 0.8V, V_{EE} = GND)

Package Options	NEC/CEL P/N	Avago P/N	Note
DIP8	PS9505	HCPL-3120-000E	
Gullwing for Surface Mount	PS9505L3	HCPL-3120-300E#300	50 per tube
Gullwing for Surface Mount	PS9505L3-E3	HCPL-3120-500E#500	1000 per reel
DIP8	PS9505-V	HCPL-3120-060E	VDE Part 2
Gullwing for Surface Mount	PS9505L3-V	HCPL-3120-360E#300	50 per tube / VDE part 2
Gullwing for Surface Mount	PS9505L3-V-E3	HCPL-3120-560E#500	1000 per reel / VDE part 2
DIP8 with 8 mm creepage	PS9505L1		
Gullwing for surface mount with 8 mm creepage	PS9505L2		

Conclusion

In summary, the PS9505 provides all the features and offers performance equivalent to or better than the HCPL-3120. As a result, the PS9505 would be an easy drop-in replacement for the HCPL-3120. For large creepage distances, the PS9505L1 and PS9505L2 provide 8 mm creepage.

Data assembled by Van N. Tran

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