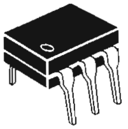
H11N1, H11N2, H11N3

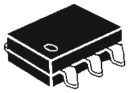
Optoisolator GaAlAs Infrared Emitting Diode and Microprocessor-Compatible High-Speed Schmitt Trigger

The H11N series has a gallium-aluminum-arsenide, infrared emitting diode optically coupled across a glass isolating medium-to-high speed integrated circuit detector. The output incorporates a Schmitt trigger, which provides hysteresis for noise immunity and pulse shaping. The detector circuit is optimized for simplicity of operation and utilizes an open collector output for maximum application flexibility. These deivces are mounted in dual in-line packages. These devices are also available in surface-mount packaging.

Features:
- *High data rate, 5 MHz typical (NRZ)*
- *Free from latch up and oscillation throughout voltage and temperature ranges*
- *Microprocessor compatible drive*
- *Logic compatible output sinks 16 mA at 0.5 V maximum*
- *High isolation between input and output*
- *Guaranteed on/off threshold hysteresis*
- *High common mode transient immunity 2000V/µs minimum*
- *Fast switching: t_r, t_f = 10 ns typical*
- *Wide supply voltage capability, compatible with all popular logic systems*

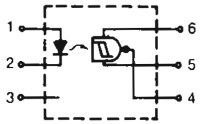


Standard Type



Surface Mount Version

MECHANICAL SPECIFICATIONS
- Plastic 6 PIN dual-in-line package
- Lead orientation as shown:



Schematic diagram for H11N1, H11N2, and H11N3.

APPLICATIONS
- Logic to logic isolator
- Programmable current level sensor
- Line receiver — eliminates noise and transient problems
- Logic level shifter — couples TTL to CMOS
- A.C. to TTL conversion — square wave shaping
- Isolated power MOS driver for power supplies
- Interfaces computers with peripherals

MAXIMUM RATINGS, *Absolute-Maximum Values (T_A=25° C):*

INFRARED EMITTING DIODE		
Power Dissipation	*50	milliwatts
Forward Current (Continuous)	30	milliampere
Forward Current (Peak) (Pulse width 300 µsec 2% Duty Cycle)	50	milliampere
Reverse Voltage	6	volts

*Derate 1.67 mW°C above 70°C ambient.

PHOTO DETECTOR		
Power Dissipation	**150	milliwatts
V_{45} Allowed Range	0 to 16	volts
V_{65} Allowed Range	0 to 16	volts
I_4 Output Current	50	milliampere

**Derate 5.0 mW/°C above 25°C ambient.

TOTAL DEVICE		
Storage Temperature -55°C to +125°C		
Operating Temperature -25 to +85°C		
Lead Soldering Time (at 260°C) 10 seconds		
Surge Isolation Voltage (Input to Output)		
H11N1, H11N2	5656 $V_{(peak)}$	4000 $V_{(RMS)}$
H11N3	3535 $V_{(peak)}$	2500 $V_{(RMS)}$
Steady-State Isolation Voltage (Input to Output).		
H11N1, H11N2	5300 $V_{(peak)}$	3750 $V_{(RMS)}$
H11N3	3180 $V_{(peak)}$	2250 $V_{(RMS)}$

Covered under U.L. component recognition program, reference file E51868

VDE approved to 0883/6.80 0110b

H11N1, H11N2, H11N3

ELECTRICAL CHARACTERISTICS: (TA = 0-70°C) See Note 1

INFRARED EMITTING DIODE	MIN.	TYP.	MAX.	UNITS
Forward Voltage V_F I_F = 10 mA I_F = 0.3 mA	— 0.75	1.6 1.45	2.0 —	volts volts
Reverse Current T_A=25°C I_R (V_R = 5V) T_A=100°C	— —	— —	10 100	micro-ampere
Capacitance C_J (V = 0, f = 1 MHz)	—	—	100	picofarads

PHOTO DETECTOR	MIN.	TYP.	MAX.	UNITS
Operating Voltage Range V_{CC}	4	—	15	volts
Supply Current $I_{6(off)}$ (I_F = 0, V_{CC} = 5V)	—	5.5	10	milli-ampere
Output Current, High I_{OH} (I_F = 0.3 mA, V_{CC} = V_O = 15V)	—	—	100	micro-ampere

COUPLED ELECTRICAL CHARACTERISTICS (TA = 0-70°C) See Note 1

		MIN.	TYP.	MAX.	UNITS
Supply Current (I_F = 10 mA, V_{CC} = 5V	$I_{6(on)}$	—	5	10	milliampere
Output Voltage, Low (R_L = 270 Ω, V_{CC} = 5V, I_F = $I_{F(on)}$ max.	V_{OL}	—	0.3	0.5	volts
Turn-On Threshold Current (R_L = 270 Ω, V_{CC} = 5V)	$I_{F(on)}$ H11N1 H11N2 H11N3	0.8 2.3 4.1	— — —	3.2 5.0 10.0	milliampere milliampere milliampere
Turn-Off Threshold Current (R_L = 270 Ω, V_{CC} = 5V)	$I_{F(off)}$	0.3	1.5	—	milliampere
Hysteresis Ratio R_L = 270 Ω, V_{CC} = 5V)	$I_{F(off)}/I_{F(on)}$	0.65	0.8	0.95	—

DYNAMIC CHARACTERISTICS: (0-70° C) See Note 1

SWITCHING SPEED (See Figures 7 & 8)		MIN.	TYP.	MAX.	UNITS
C = 120pF, tp = 1μsec, R_E: See Note 4					
Propagation delay, high to low	t_{PHL}	-	150	330	nsec.
Rise Time	t_r	—	10	—	nsec.
Propagation delay, low to high	t_{PLH}	—	150	330	nsec.
Fall Time	t_f	--	15	—	nsec.
Date Rate (NRZ) See Note 3			5	—	MHz
OVERDRIVE SWITCHING (See Figures 7 & 8) See Note 2					
C = 0, R_L = 270 Ω I_F(Max.) H11N1: 5mA H11N2: 10mA H11N3: 20mA					
Turn-Off Time	t_{off}	—	0.2	0.5	μsec.
TRANSIENT IMMUNITY (See Figure 9)					
Common Mode Transient Immunity (TA = 25°C) V_{pk} = 50V, V_{CC} = 5V, R_L = 270 Ω					
I_F = 0	CM_H	±2000	±10000	—	V/μsec
I_F = I_F = $I_{F(on)}$ max. x 2.35	Cm_l	±2000	±10000	—	V/μsec

NOTES:

1. All measurements are with 100nF bypass capacitor from pin 6 to pin 5.
2. Steady overdrive increases t_{off}. Use of a large RE and a small C as in Figure 7 is preferred over overdrive current.
3. Maximum data rate will vary depending on the bias conditions and is usually highest when R_E and C are matched to $I_{F(ON)}$ and V_{CC} is between 5 and 15V. With this optimized bias, most units will operate at over 10MHz, NRZ.
4. H11N1: R_E = 910Ω; H11N2: R_E = 560Ω; H11N3: R_E = 240Ω

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TYPICAL CHARACTERISTICS

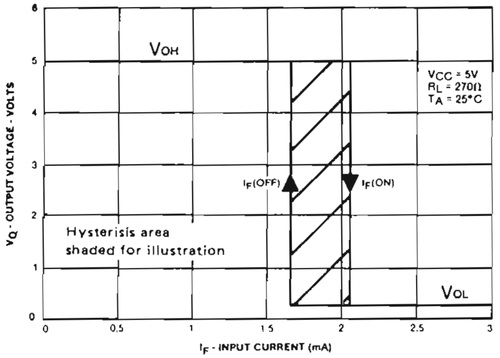


Fig. 1 - Transfer characteristics.

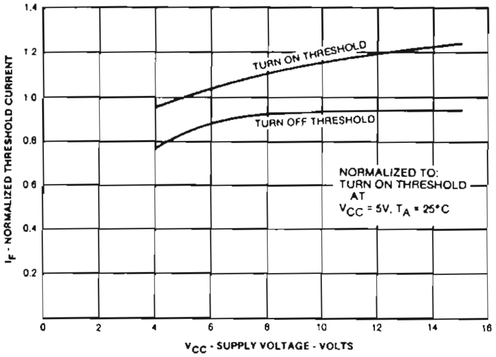


Fig. 2 - Threshold current vs. supply voltage.

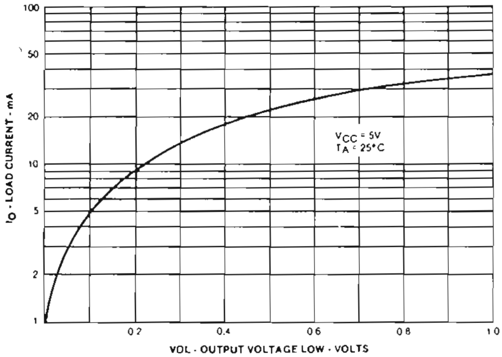


Fig. 3 - ON voltage vs. current.

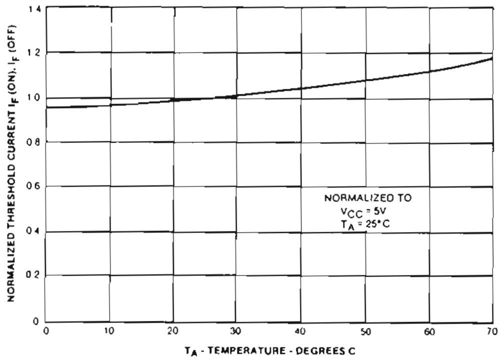


Fig. 4 - Threshold current vs. temperature.

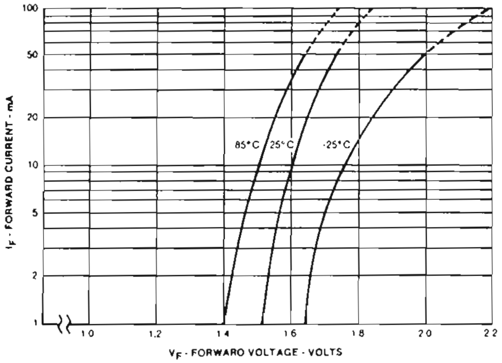


Fig. 5 - Forward voltage vs. forward current.

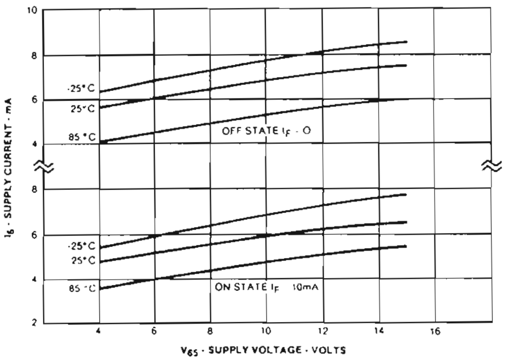


Fig. 6 - Supply current vs. supply voltage.

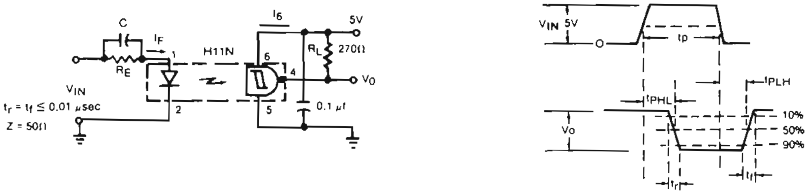
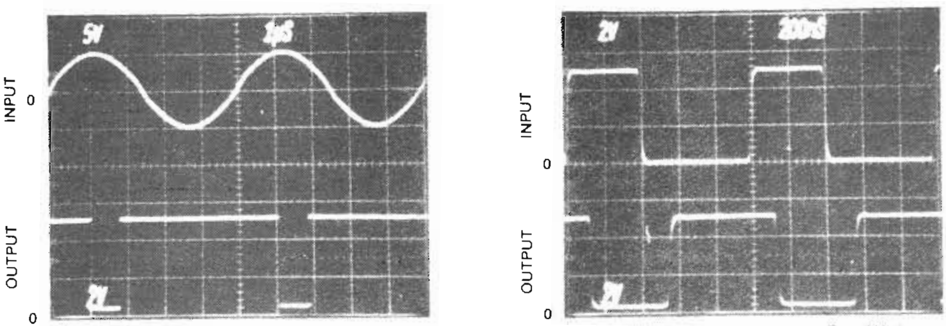


Fig. 7 - Switching test circuit.



R_E = 910 Ω
C = 120 pF

R_E = 910 Ω
C = 120 pF

Fig. 8 - Switching test waveforms.

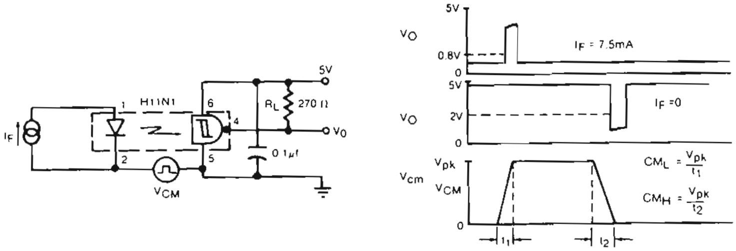


Fig. 9 - Common-mode transient immunity, test circuit and voltage waveforms.

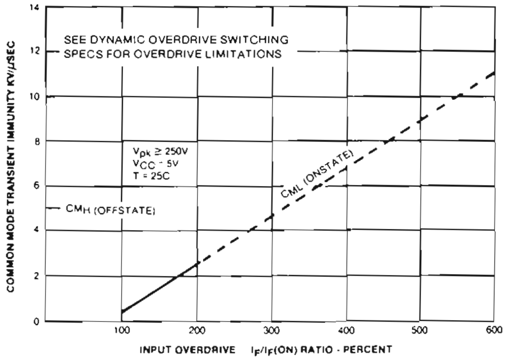


Fig. 10 - CM_L and CM_H vs. input current.

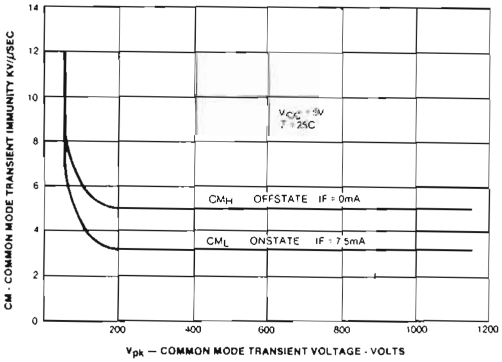


Fig. 11 - CM_L and CM_H vs. common-mode transient voltage.