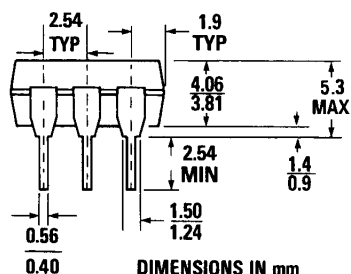
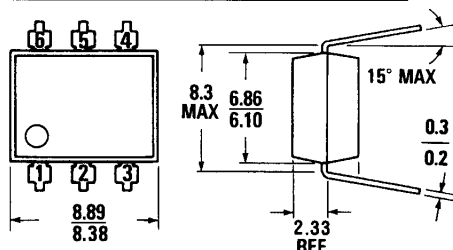
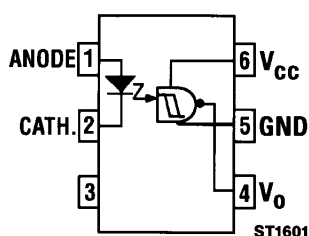


PACKAGE DIMENSIONS



ST1603A



Equivalent Circuit

DESCRIPTION

The H11N series has a medium-to-high speed integrated circuit detector optically coupled to a gallium-aluminum-arsenide infrared emitting diode. 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.

FEATURES & APPLICATIONS

- 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
- Guaranteed on/off threshold hysteresis
- High common mode transient immunity 2000 V/ μ s minimum
- Fast switching: $t_r, t_f = 10$ ns typical
- Wide supply voltage capability, compatible with all popular logic systems
- Underwriters Laboratory (UL) recognized — file #E90700
- 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

ABSOLUTE MAXIMUM RATINGS

TOTAL PACKAGE

Storage temperature -55°C to 125°C
Operating temperature -25°C to 85°C
Lead solder temperature 260°C for 10 sec

INPUT DIODE

Power dissipation (25°C ambient) 50 mW
Derate linearly (above 70°C) $1.67 \text{ mW}/^{\circ}\text{C}$
Continuous forward current 30 mA
Peak forward current
($300 \mu\text{s}$ pulse, 2% duty cycle) 50 mA
Reverse voltage 6 V

DETECTOR

Power dissipation (at 25°C ambient) 150 mW
Derate linearly (above 25°C ambient) $5 \text{ mW}/^{\circ}\text{C}$
 V_{AS} allowed range 0 to 16 V
 V_{ES} allowed range 0 to 16 V
 I_L output current 50 mA



HIGH-SPEED AlGaAs SCHMITT TRIGGER OPTOCOUPLEDERS

ELECTRICAL CHARACTERISTICS ($T_A = 0-70^\circ\text{C}$ Unless Otherwise Specified) Note 1

INDIVIDUAL COMPONENT CHARACTERISTICS						
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
INPUT DIODE						
Forward voltage	V_F		1.6	2.0	V	$I_F = 10\text{ mA}$
	V_F	0.75	1.45		V	$I_F = 0.3\text{ mA}$
Reverse current	I_R			10	μA	$V_R = 5\text{ V}, T_A = 25^\circ\text{C}$
	I_R			100	μA	$V_R = 5\text{ V}, T_A = 100^\circ\text{C}$
Capacitance	C_J			100	pF	$V = 0\text{ V}, f = 1\text{ MHz}$
OUTPUT DETECTOR						
Operating voltage range	V_{CC}	4		15	V	
Supply current	$I_{B(off)}$		5.5	10	mA	$I_F = 0, V_{CC} = 5\text{ V}$
Output current, high	I_{OH}			100	μA	$I_F = 0.3\text{ mA}, V_{CC} = V_O = 15\text{ V}$

TRANSFER CHARACTERISTICS ($T_A = 0-70^\circ\text{C}$) Note 1						
CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
Supply current	$I_{B(on)}$		5	10	mA	$I_F = 10\text{ mA}, V_{CC} = 5\text{ V}$
Output voltage, low	V_{OL}		0.3	0.5	V	$R_L = 270\ \Omega, V_{CC} = 5\text{ V}, I_F = I_{F(on)}\text{ max.}$
Turn-on threshold current	(H11N1) $I_{F(on)}$	0.8		3.2	mA	$R_L = 270\ \Omega, V_{CC} = 5\text{ V}$
	(H11N2) $I_{F(on)}$	2.3		5.0	mA	$R_L = 270\ \Omega, V_{CC} = 5\text{ V}$
	(H11N3) $I_{F(on)}$	4.1		10.0	mA	$R_L = 270\ \Omega, V_{CC} = 5\text{ V}$
Turn-off threshold current	$I_{F(off)}$	0.3	1.5		mA	$R_L = 270\ \Omega, V_{CC} = 5\text{ V}$
Hysteresis ratio	$I_{F(off)}/I_{F(on)}$	0.65	0.8	0.95		$R_L = 270\ \Omega, V_{CC} = 5\text{ V}$



PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
SWITCHING SPEED (Figures 7&8)						
Propagation delay, high to low	t_{PHL}		150	330	ns	$C = 120\text{ pF}$, $t_r = 1\text{ }\mu\text{s}$, R_E : Note 4
Rise time	t_r		10		ns	$C = 120\text{ pF}$, $t_r = 1\text{ }\mu\text{s}$, R_E : Note 4
Propagation delay, low to high	t_{PLH}		150	330	ns	$C = 120\text{ pF}$, $t_r = 1\text{ }\mu\text{s}$, R_E : Note 4
Fall time	t_f		15		ns	$C = 120\text{ pF}$, $t_r = 1\text{ }\mu\text{s}$, R_E : Note 4
Data rate			5		MHz	Note 3
OVERDRIVE SWITCHING (FIGURES 7&8), NOTE 2						
Turn-off time	t_{off}		0.2	0.5	μs	$C = 0$, $R_L = 270\text{ }\Omega$, $I_E(\text{MAX})$ H11N1: 5 mA H11N2: 10 mA H11N3: 20 mA
TRANSIENT IMMUNITY (FIGURE 9)						
Common mode transient immunity	CM_{IH}	± 2000	± 10000		V/ μs	$V_{pk} = 50\text{ V}$, $V_{cc} = 5\text{ V}$, $R_L = 270\text{ }\Omega$, $I_F = 0$
Common mode transient immunity	CM_L	± 2000	± 10000		V/ μs	$V_{pk} = 50\text{ V}$, $V_{cc} = 5\text{ V}$, $R_L = 270\text{ }\Omega$, $I_F = 0$

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
Surge isolation voltage	V_{ISO}	7500			V_{PEAK}	1 Minute
Surge isolation voltage	V_{ISO}	5300			V_{RMS}	1 Minute

1. All measurements are with 100nF bypass capacitor from pin 6 to pin 5.
2. Steady overdrive increases t_{cr} . Use of a large R_E 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_{F000} and V_{CC} is between 5 and 15V. With this optimized bias, most units will operate at over 10 MHz, NRZ.
4. H11N1: $R_E = 910\Omega$, H11N2: $R_E = 560\Omega$, H11N3: $R_E = 240\Omega$.

TYPICAL CHARACTERISTICS

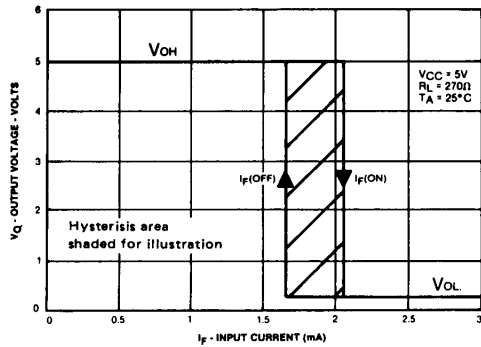


Figure 1. Transfer characteristics ST2022

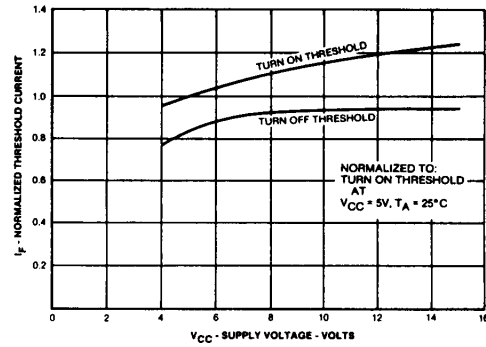


Figure 2. Threshold current vs. supply voltage ST2023

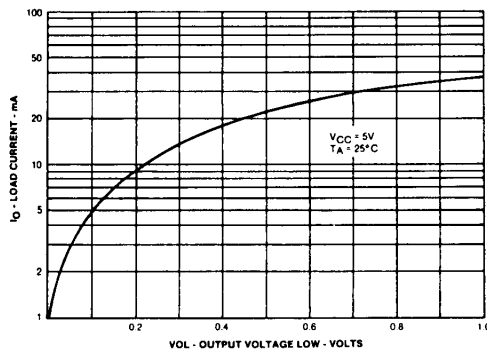


Figure 3. ON voltage vs. current ST2024

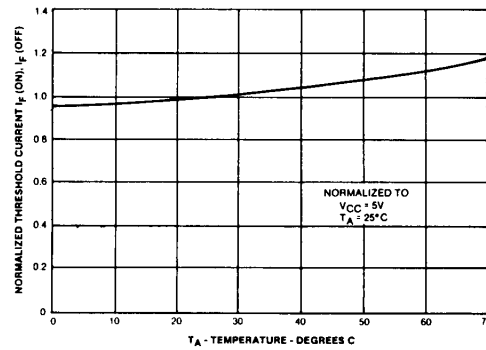


Figure 4. Threshold current vs. temperature ST2025

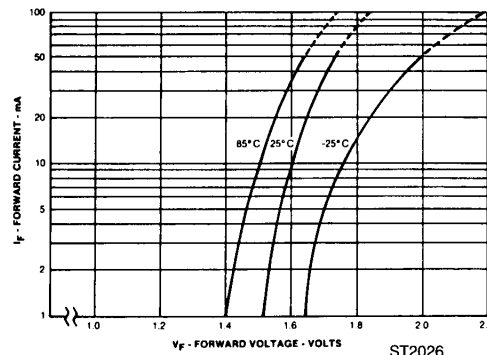


Figure 5. Forward voltage vs. forward current ST2026

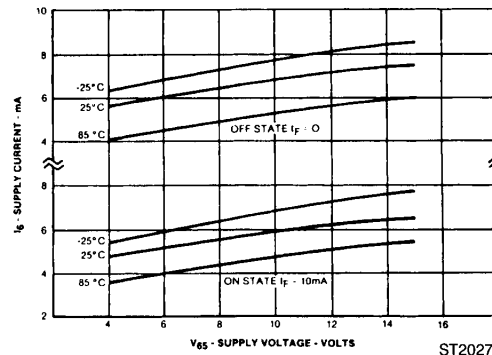
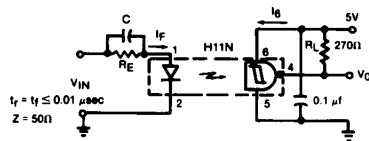


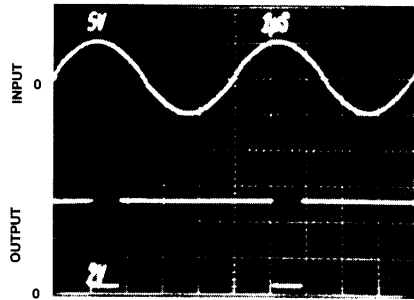
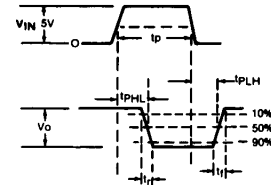
Figure 6. Supply current vs. supply voltage ST2027

TYPICAL CHARACTERISTICS



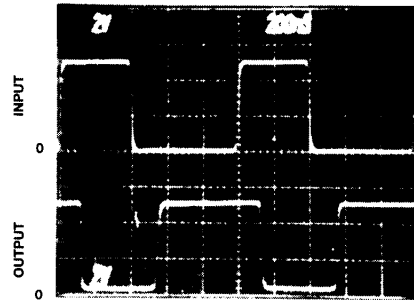
ST2028

Figure 7. Switching test circuit

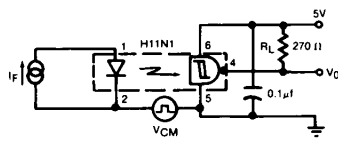


ST2029

Figure 8. Switching test waveforms

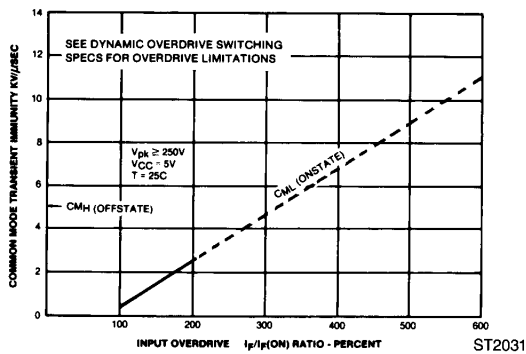
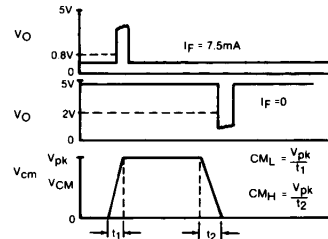


R_E = 910 Ω
C = 120 pF



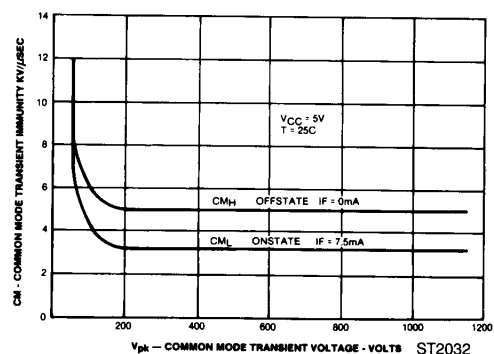
ST2030

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



ST2031

Figure 10. CM_T and CM_H input current



ST2032

Figure 11. CM_T and CM_H vs. common-mode transient voltage



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