

**4N25  
4N37**

**4N26  
H11A1**

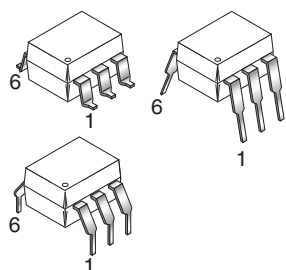
**4N27  
H11A2**

**4N28  
H11A3**

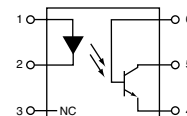
**4N35  
H11A4**

**4N36  
H11A5**

## WHITE PACKAGE (-M SUFFIX)

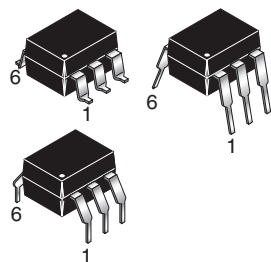


## SCHEMATIC



PIN 1. ANODE  
2. CATHODE  
3. NO CONNECTION  
4. EMITTER  
5. COLLECTOR  
6. BASE

## BLACK PACKAGE (NO -M SUFFIX)



## DESCRIPTION

The general purpose optocouplers consist of a gallium arsenide infrared emitting diode driving a silicon phototransistor in a 6-pin dual in-line package.

## FEATURES

- Also available in white package by specifying -M suffix, eg. 4N25-M
- UL recognized (File # E90700)
- VDE recognized (File # 94766)
  - Add option V for white package (e.g., 4N25V-M)
  - Add option 300 for black package (e.g., 4N25.300)

## APPLICATIONS

- Power supply regulators
- Digital logic inputs
- Microprocessor inputs

**4N25  
4N37**

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H11A1**

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H11A2**

**4N28  
H11A3**

**4N35  
H11A4**

**4N36  
H11A5**

**ABSOLUTE MAXIMUM RATINGS** ( $T_A = 25^\circ\text{C}$  unless otherwise specified)

Parameter	Symbol	Value	Units
<b>TOTAL DEVICE</b>			
Storage Temperature	$T_{\text{STG}}$	-55 to +150	$^\circ\text{C}$
Operating Temperature	$T_{\text{OPR}}$	-55 to +100	$^\circ\text{C}$
Lead Solder Temperature	$T_{\text{SOL}}$	260 for 10 sec	$^\circ\text{C}$
Total Device Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	250 3.3 (non-M), 2.94 (-M)	mW
<b>EMITTER</b>			
DC/Average Forward Input Current	$I_F$	100 (non-M), 60 (-M)	mA
Reverse Input Voltage	$V_R$	6	V
Forward Current - Peak (300 $\mu\text{s}$ , 2% Duty Cycle)	$I_{F(\text{pk})}$	3	A
LED Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	150 (non-M), 120 (-M) 2.0 (non-M), 1.41 (-M)	mW mW/ $^\circ\text{C}$
<b>DETECTOR</b>			
Collector-Emitter Voltage	$V_{\text{CEO}}$	30	V
Collector-Base Voltage	$V_{\text{CBO}}$	70	V
Emitter-Collector Voltage	$V_{\text{ECO}}$	7	V
Detector Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	150 2.0 (non-M), 1.76 (-M)	mW mW/ $^\circ\text{C}$

**4N25**  
**4N37**

**4N26**  
**H11A1**

**4N27**  
**H11A2**

**4N28**  
**H11A3**

**4N35**  
**H11A4**

**4N36**  
**H11A5**

## ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise specified)

### INDIVIDUAL COMPONENT CHARACTERISTICS

Parameter	Test Conditions	Symbol	Min	Typ*	Max	Unit
<b>EMITTER</b>						
Input Forward Voltage	( $I_F = 10\text{ mA}$ )	$V_F$		1.18	1.50	V
Reverse Leakage Current	( $V_R = 6.0\text{ V}$ )	$I_R$		0.001	10	$\mu\text{A}$
<b>DETECTOR</b>						
Collector-Emitter Breakdown Voltage	( $I_C = 1.0\text{ mA}$ , $I_F = 0$ )	$BV_{CEO}$	30	100		V
Collector-Base Breakdown Voltage	( $I_C = 100\text{ }\mu\text{A}$ , $I_F = 0$ )	$BV_{CBO}$	70	120		V
Emitter-Collector Breakdown Voltage	( $I_E = 100\text{ }\mu\text{A}$ , $I_F = 0$ )	$BV_{ECO}$	7	10		V
Collector-Emitter Dark Current	( $V_{CE} = 10\text{ V}$ , $I_F = 0$ )	$I_{CEO}$		1	50	nA
Collector-Base Dark Current	( $V_{CB} = 10\text{ V}$ )	$I_{CBO}$			20	nA
Capacitance	( $V_{CE} = 0\text{ V}$ , $f = 1\text{ MHz}$ )	$C_{CE}$		8		pF

### ISOLATION CHARACTERISTICS

Characteristic	Test Conditions	Symbol	Min	Typ*	Max	Units
Input-Output Isolation Voltage	(Non '-M', Black Package) ( $f = 60\text{ Hz}$ , $t = 1\text{ min}$ )	$V_{ISO}$	5300			Vac(rms)
	('M', White Package) ( $f = 60\text{ Hz}$ , $t = 1\text{ sec}$ )		7500			Vac(pk)
Isolation Resistance	( $V_{I-O} = 500\text{ VDC}$ )	$R_{ISO}$	$10^{11}$			$\Omega$
Isolation Capacitance	( $V_{I-O} = \&$ , $f = 1\text{ MHz}$ )	$C_{ISO}$		0.5		pF
	('M' White Package)			0.2	2	pF

Note

\* Typical values at  $T_A = 25^\circ\text{C}$

**4N25  
4N37**

**4N26  
H11A1**

**4N27  
H11A2**

**4N28  
H11A3**

**4N35  
H11A4**

**4N36  
H11A5**

**TRANSFER CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  Unless otherwise specified.)

DC Characteristic	Test Conditions	Symbol	Device	Min	Typ*	Max	Unit
Current Transfer Ratio, Collector to Emitter	(I <sub>F</sub> = 10 mA, V <sub>CE</sub> = 10 V)	CTR	4N35 4N36 4N37	100			%
			H11A1	50			
			H11A5	30			
			4N25 4N26 H11A2 H11A3	20			
	4N27 4N28 H11A4		10				
	4N35 4N36 4N37		40				
	4N35 4N36 4N37		40				
	(I <sub>F</sub> = 10 mA, V <sub>CE</sub> = 10 V, T <sub>A</sub> = -55°C)						
	(I <sub>F</sub> = 10 mA, V <sub>CE</sub> = 10 V, T <sub>A</sub> = +100°C)						
Collector-Emitter Saturation Voltage	(I <sub>C</sub> = 2 mA, I <sub>F</sub> = 50 mA)	V <sub>CE (SAT)</sub>	4N25 4N26 4N27 4N28			0.5	V
	(I <sub>C</sub> = 0.5 mA, I <sub>F</sub> = 10 mA)		4N35 4N36 4N37			0.3	
			H11A1 H11A2 H11A3 H11A4 H11A5			0.4	
AC Characteristic							
Non-Saturated Turn-on Time	(I <sub>F</sub> = 10 mA, V <sub>CC</sub> = 10 V, R <sub>L</sub> = 100Ω) (Fig.20)	T <sub>ON</sub>	4N25 4N26 4N27 4N28 H11A1 H11A2 H11A3 H11A4 H11A5		2		μs
Non Saturated Turn-on Time	(I <sub>C</sub> = 2 mA, V <sub>CC</sub> = 10 V, R <sub>L</sub> = 100Ω) (Fig.20)	T <sub>ON</sub>	4N35 4N36 4N37		2	10	μs

**4N25  
4N37**

**4N26  
H11A1**

**4N27  
H11A2**

**4N28  
H11A3**

**4N35  
H11A4**

**4N36  
H11A5**

TRANSFER CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ Unless otherwise specified.) (Continued)							
AC Characteristic	Test Conditions	Symbol	Device	Min	Typ*	Max	Unit
Turn-off Time	( $I_F = 10\text{ mA}$ , $V_{CC} = 10\text{ V}$ , $R_L = 100\Omega$ ) (Fig.20)	$T_{OFF}$	4N25 4N26 4N27 4N28 H11A1 H11A2 H11A3 H11A4 H11A5		2		$\mu\text{s}$
	( $I_C = 2\text{ mA}$ , $V_{CC} = 10\text{ V}$ , $R_L = 100\Omega$ ) (Fig.20)		4N35 4N36 4N37		2	10	

\* Typical values at  $T_A = 25^\circ\text{C}$

**4N25  
4N37**

**4N26  
H11A1**

**4N27  
H11A2**

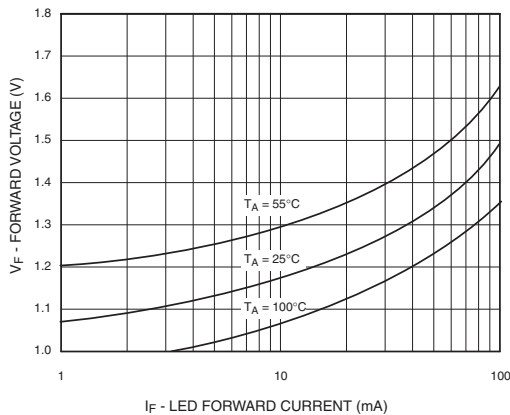
**4N28  
H11A3**

**4N35  
H11A4**

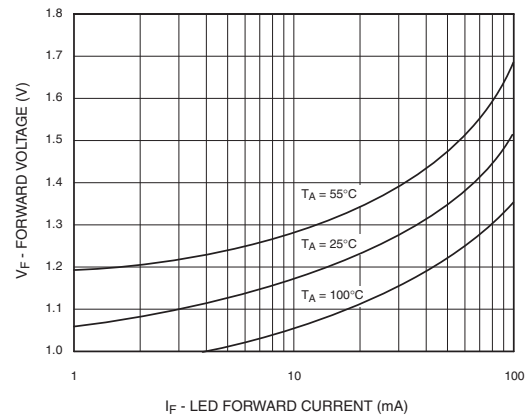
**4N36  
H11A5**

## TYPICAL PERFORMANCE CURVES

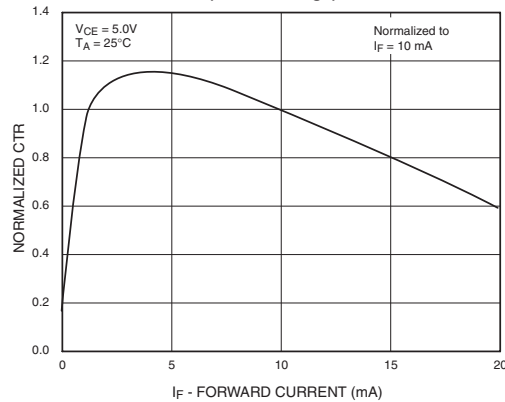
**Fig. 1 LED Forward Voltage vs. Forward Current  
(Black Package)**



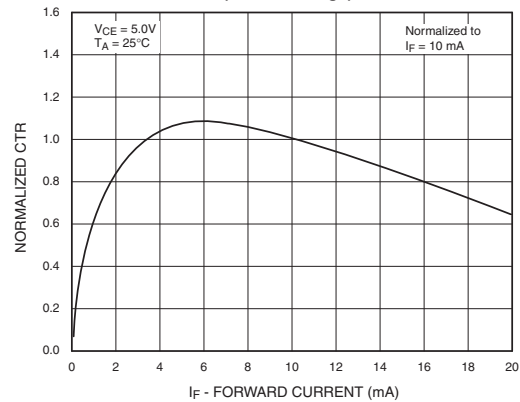
**Fig. 2 LED Forward Voltage vs. Forward Current  
(White Package)**



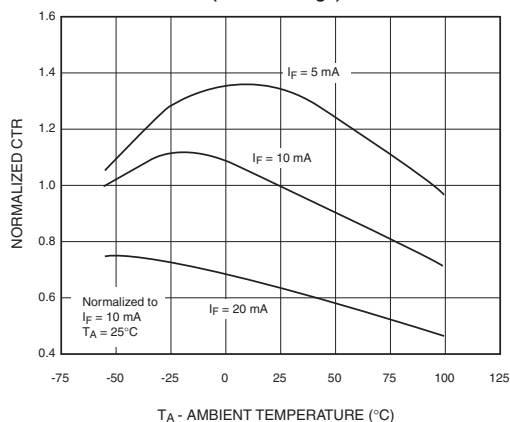
**Fig.3 Normalized CTR vs. Forward Current  
(Black Package)**



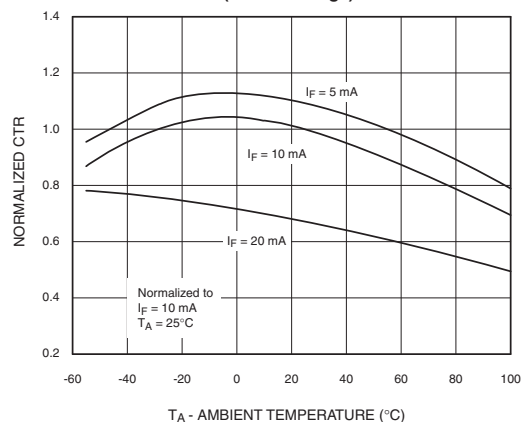
**Fig.4 Normalized CTR vs. Forward Current  
(White Package)**



**Fig. 5 Normalized CTR vs. Ambient Temperature  
(Black Package)**



**Fig. 6 Normalized CTR vs. Ambient Temperature  
(White Package)**



**4N25**  
**4N37**

**4N26**  
**H11A1**

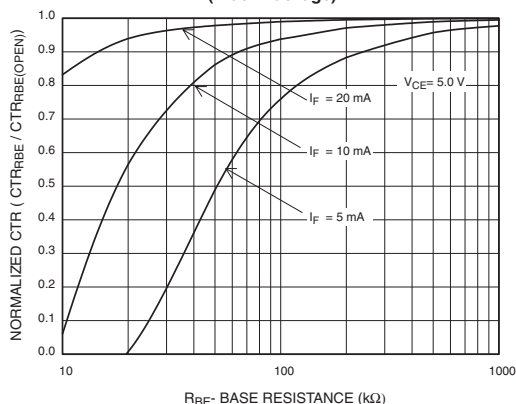
**4N27**  
**H11A2**

**4N28**  
**H11A3**

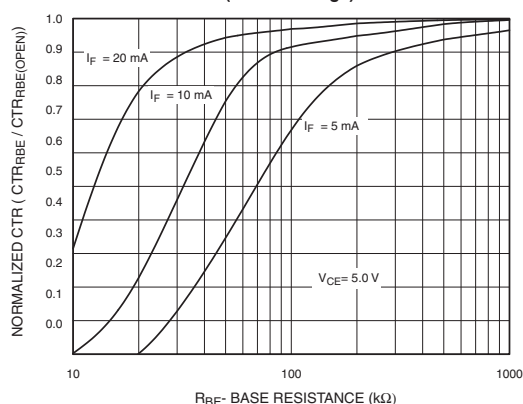
**4N35**  
**H11A4**

**4N36**  
**H11A5**

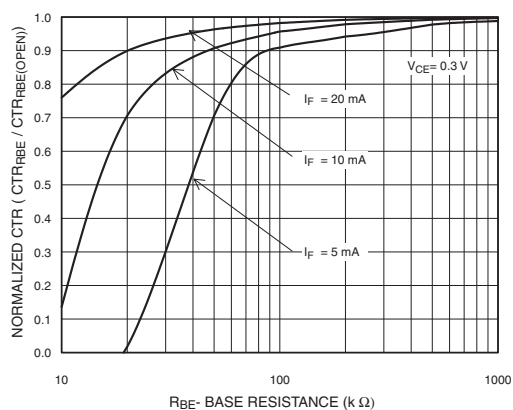
**Fig. 7 CTR vs. RBE (Unsaturated)**  
**(Black Package)**



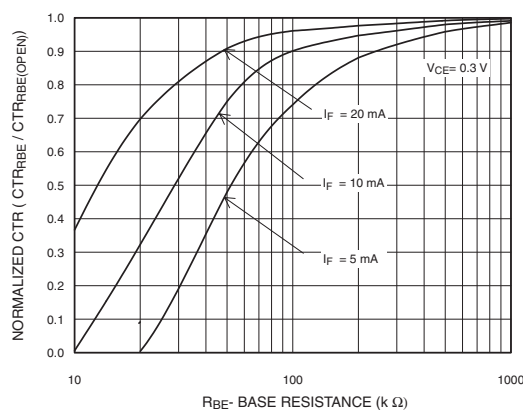
**Fig. 8 CTR vs. RBE (Unsaturated)**  
**(White Package)**



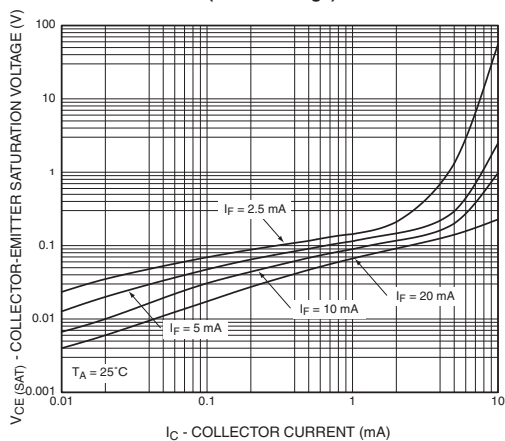
**Fig. 9 CTR vs. RBE (Saturated)**  
**(Black Package)**



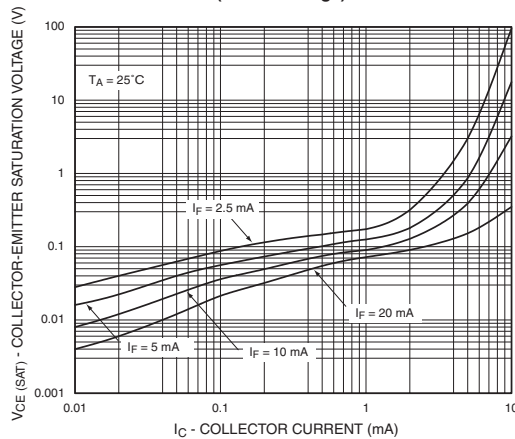
**Fig. 10 CTR vs. RBE (Saturated)**  
**(White Package)**



**Fig. 11 Collector-Emitter Saturation Voltage vs. Collector Current**  
**(Black Package)**



**Fig. 12 Collector-Emitter Saturation Voltage vs. Collector Current**  
**(White Package)**



**4N25**  
**4N37**

**4N26**  
**H11A1**

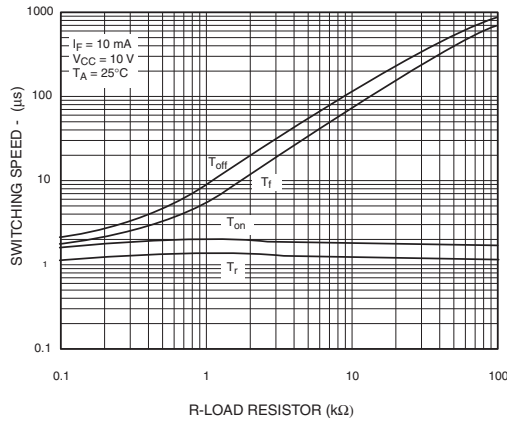
**4N27**  
**H11A2**

**4N28**  
**H11A3**

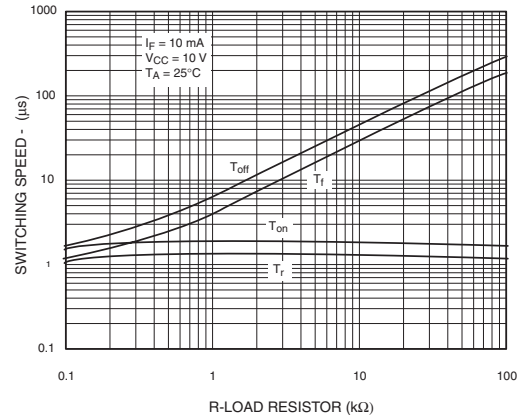
**4N35**  
**H11A4**

**4N36**  
**H11A5**

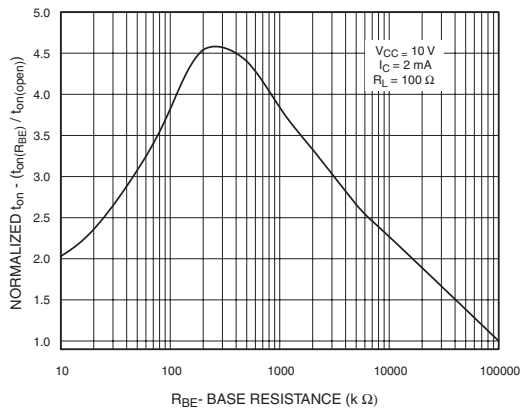
**Fig. 13 Switching Speed vs. Load Resistor  
(Black Package)**



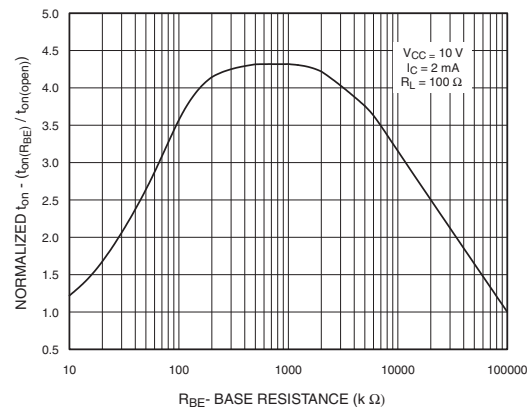
**Fig. 14 Switching Speed vs. Load Resistor  
(White Package)**



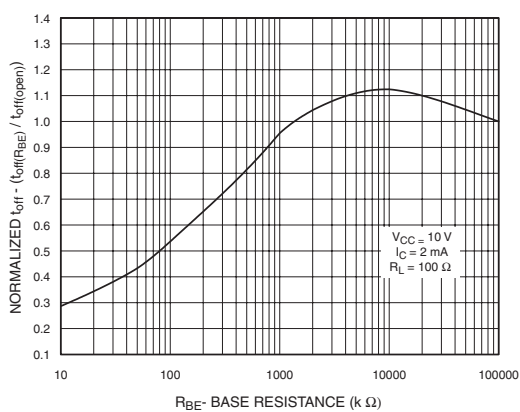
**Fig. 15 Normalized  $t_{on}$  vs.  $R_{BE}$   
(Black Package)**



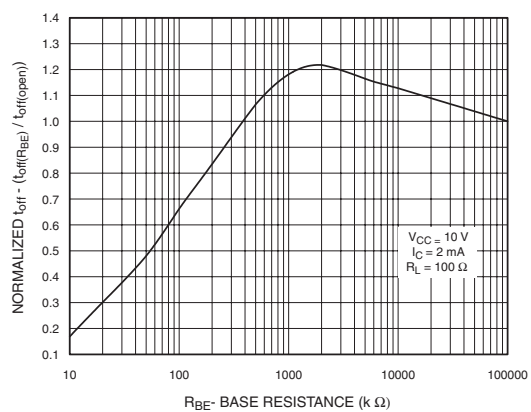
**Fig. 16 Normalized  $t_{on}$  vs.  $R_{BE}$   
(White Package)**



**Fig. 17 Normalized  $t_{off}$  vs.  $R_{BE}$   
(Black Package)**



**Fig. 18 Normalized  $t_{off}$  vs.  $R_{BE}$   
(White Package)**





4N25  
4N37

4N26  
H11A1

4N27  
H11A2

4N28  
H11A3

4N35  
H11A4

4N36  
H11A5

Fig. 19 Dark Current vs. Ambient Temperature

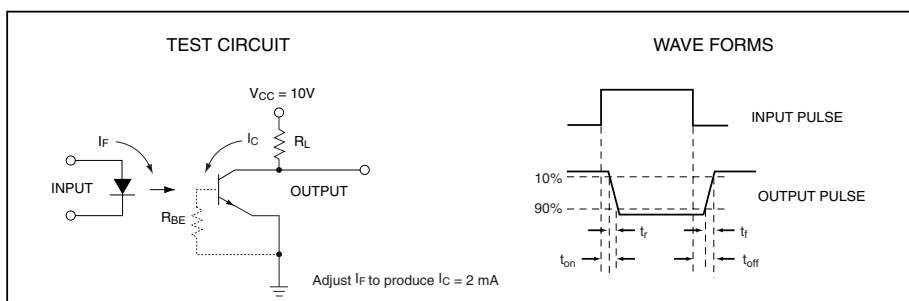
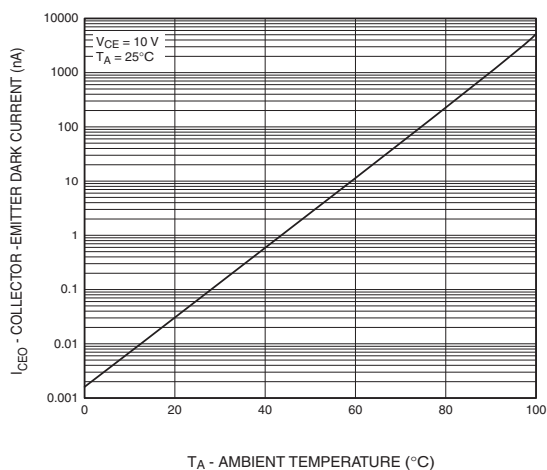


Figure 20. Switching Time Test Circuit and Waveforms

**4N36**  
**H11A5**

6/6/02

**4N25  
4N37**

**4N26  
H11A1**

**4N27  
H11A2**

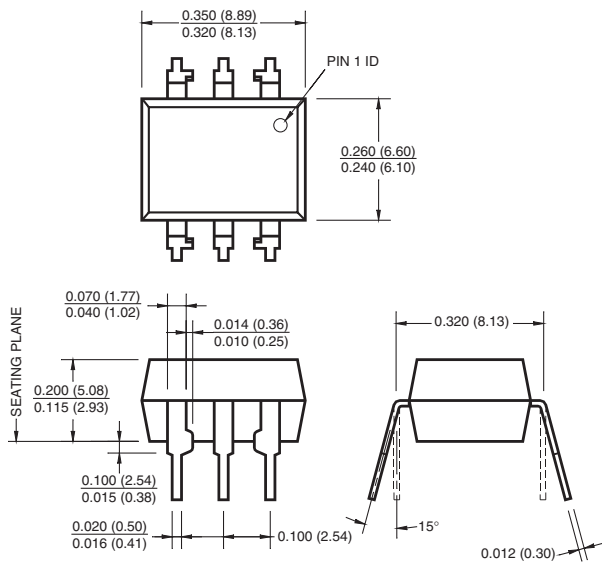
**4N28  
H11A3**

**4N35  
H11A4**

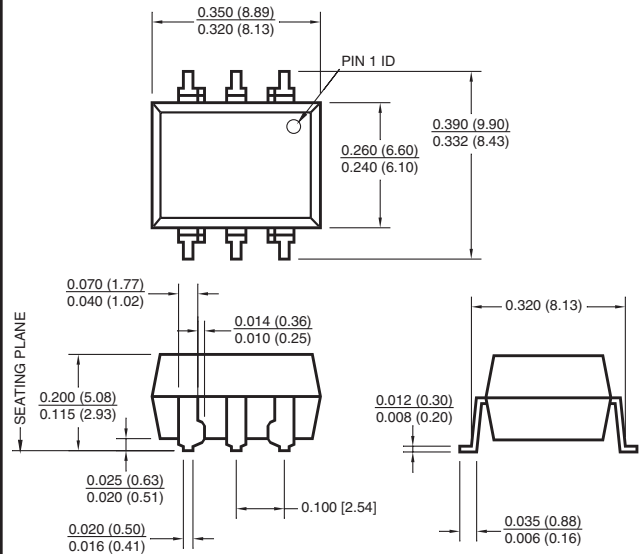
**4N36  
H11A5**

## White Package (-M Suffix)

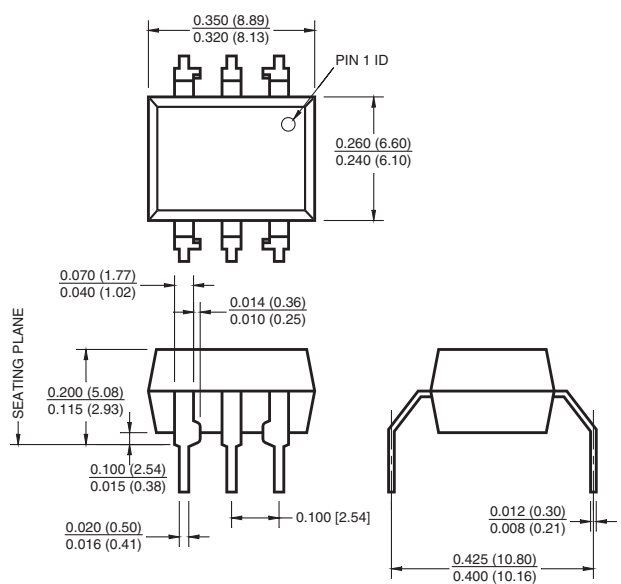
### Package Dimensions (Through Hole)



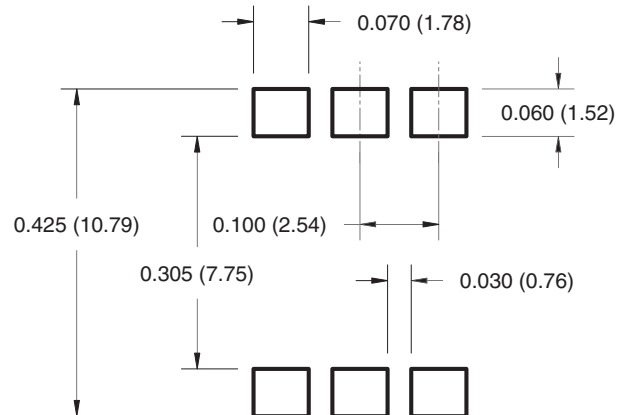
### Package Dimensions (Surface Mount)



### Package Dimensions (0.4" Lead Spacing)



### Recommended Pad Layout for Surface Mount Leadform



## NOTE

All dimensions are in inches (millimeters)

4N25	4N26	4N27	4N28	4N35	4N36
4N37	H11A1	H11A2	H11A3	H11A4	H11A5

**Order Entry Identifier**

Black Package (No Suffix)	White Package (-M Suffix)	Option
.S	S	Surface Mount Lead Bend
.SD	SR2	Surface Mount; Tape and reel
.W	T	0.4" Lead Spacing
.300	V	VDE 0884
.300W	TV	VDE 0884, 0.4" Lead Spacing
.3S	SV	VDE 0884, Surface Mount
.3SD	SR2V	VDE 0884, Surface Mount, Tape & Reel

Technical drawing of a 5-axis lathe tool holder. The drawing shows a side view of the tool holder with various dimensions and tolerances. The dimensions are as follows:

- Overall length:  $12.0 \pm 0.1$
- Distance from left face to first hole:  $4.85 \pm 0.20$
- Distance between holes:  $4.0 \pm 0.1$
- Distance from last hole to right face:  $4.0 \pm 0.1$
- Overall width:  $16.0 \pm 0.3$
- Distance from top face to hole center:  $7.5 \pm 0.1$
- Distance from bottom face to hole center:  $9.55 \pm 0.20$
- Distance from left face to hole center:  $10.30 \pm 0.20$
- Distance from left face to tool holder body:  $0.30 \pm 0.05$
- Distance from left face to tool holder body:  $13.2 \pm 0.2$
- Distance from left face to tool holder body:  $0.1 \text{ MAX}$
- Hole diameter:  $\varnothing 1.55 \pm 0.05$
- Hole diameter:  $\varnothing 1.6 \pm 0.1$

The drawing also includes a "User Direction of Feed" arrow pointing to the right.

Technical drawing of a 5-axis lathe tool holder. The drawing shows a side view of the tool holder with various dimensions and features. The dimensions are in millimeters (mm) and include tolerances.

Key dimensions and features:

- Overall length:  $12.0 \pm 0.1$
- Distance from front face to first hole:  $4.5 \pm 0.20$
- Distance between holes:  $2.0 \pm 0.05$
- Distance from last hole to back face:  $4.0 \pm 0.1$
- Overall width:  $21.0 \pm 0.1$
- Distance from front face to first hole (width):  $0.30 \pm 0.05$
- Distance from last hole to back face (width):  $0.1 \text{ MAX}$
- Distance from front face to first hole (depth):  $1.75 \pm 0.10$
- Distance from last hole to back face (depth):  $11.5 \pm 1.0$
- Distance from front face to first hole (depth):  $9.1 \pm 0.20$
- Distance from last hole to back face (depth):  $24.0 \pm 0.3$
- Hole diameter:  $\varnothing 1.5 \text{ MIN}$
- Distance from front face to first hole (depth):  $\varnothing 1.5 \pm 0.1/-0$
- Distance from last hole to back face (depth):  $10.1 \pm 0.20$
- User Direction of Feed: Indicated by an arrow pointing to the right.

**4N25  
4N37**

**4N26  
H11A1**

**4N27  
H11A2**

**4N28  
H11A3**

**4N35  
H11A4**

**4N36  
H11A5**

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2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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