

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

**4N26**  
**H11A1**

**4N27**  
**H11A2**

**4N28**  
**H11A3**

**4N35**  
**H11A4**

**4N36**  
**H11A5**

## DESCRIPTION

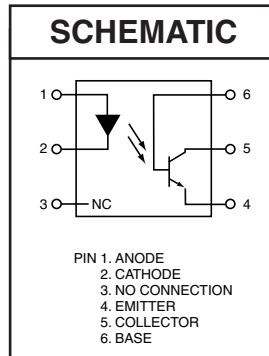
The general purpose optocouplers consist of a gallium arsenide infrared emitting diode driving a silicon phototransistor in a 6-pin dual in-line package.

## FEATURES

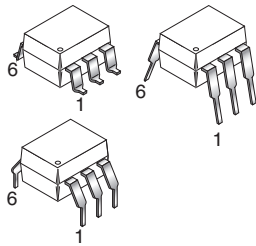
- UL recognized (File # E90700)
- VDE recognized (File # 94766)
  - Add option V for white package (e.g., 4N25V-M)
  - Add option 300 for black package (e.g., 4N25.300)
- Also available in white package by specifying -M suffix, eg. 4N25-M except H11A2, H11A4 and H11A5

## APPLICATIONS

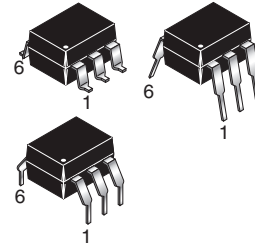
- Power supply regulators
- Digital logic inputs
- Microprocessor inputs



### WHITE PACKAGE (-M SUFFIX)



### BLACK PACKAGE (NO -M SUFFIX)



## ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25°C unless otherwise specified)

Parameter	Symbol	Value	Units
<b>TOTAL DEVICE</b>			
Storage Temperature	T <sub>STG</sub>	-55 to +150	°C
Operating Temperature	T <sub>OPR</sub>	-55 to +100	°C
Lead Solder Temperature	T <sub>SOL</sub>	260 for 10 sec	°C
Total Device Power Dissipation @ T <sub>A</sub> = 25°C Derate above 25°C	P <sub>D</sub>	250 3.3 (non-M), 2.94 (-M)	mW
<b>EMITTER</b>			
DC/Average Forward Input Current	I <sub>F</sub>	100 (non-M), 60 (-M)	mA
Reverse Input Voltage	V <sub>R</sub>	6	V
Forward Current - Peak (300µs, 2% Duty Cycle)	I <sub>F(pk)</sub>	3	A
LED Power Dissipation @ T <sub>A</sub> = 25°C Derate above 25°C	P <sub>D</sub>	150 (non-M), 120 (-M) 2.0 (non-M), 1.41 (-M)	mW mW/°C
<b>DETECTOR</b>			
Collector-Emitter Voltage	V <sub>CEO</sub>	30	V
Collector-Base Voltage	V <sub>CBO</sub>	70	V
Emitter-Collector Voltage	V <sub>ECO</sub>	7	V
Detector Power Dissipation @ T <sub>A</sub> = 25°C Derate above 25°C	P <sub>D</sub>	150 2.0 (non-M), 1.76 (-M)	mW mW/°C

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**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	( $V_{I-O} = \emptyset$ , $f = 1\text{ MHz}$ )	$C_{ISO}$		0.5		pF
	('M' White Package)			0.2	2	pF

Note

\* 5300 Vac(rms) for 1 minute equates to approximately 9000 Vac (pk) for 1 second

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

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**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	$(I_F = 10 \text{ mA}, V_{CE} = 10 \text{ V})$	CTR	4N35	100			%
			4N36				
			4N37				
			H11A1	50			
			H11A5	30			
			4N25	20			
	4N26						
	H11A2						
	H11A3		10				
4N27							
4N28							
H11A4	40						
4N35							
4N36							
$(I_F = 10 \text{ mA}, V_{CE} = 10 \text{ V}, T_A = -55^\circ\text{C})$	4N37	40					
$(I_F = 10 \text{ mA}, V_{CE} = 10 \text{ V}, T_A = +100^\circ\text{C})$	4N35	40					
4N36	40						
4N37	40						
Collector-Emitter Saturation Voltage	$(I_C = 2 \text{ mA}, I_F = 50 \text{ mA})$	$V_{CE(SAT)}$	4N25			0.5	V
			4N26				
			4N27				
	4N28		0.3				
	4N35						
	4N36						
$(I_C = 0.5 \text{ mA}, I_F = 10 \text{ mA})$	4N37	0.4					
	H11A1						
	H11A2						
H11A3							
H11A4							
H11A5							
AC Characteristic  Non-Saturated Turn-on Time	$(I_F = 10 \text{ mA}, V_{CC} = 10 \text{ V}, R_L = 100\Omega)$ (Fig.20)	$T_{ON}$	4N25		2		$\mu\text{s}$
			4N26				
			4N27				
			4N28				
			H11A1				
			H11A2				
			H11A3				
			H11A4				
			H11A5				

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

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H11A5**

**TRANSFER CHARACTERISTICS (Cont.)**

AC Characteristic	Test Conditions	Symbol	Device	Min	Typ**	Max	Unit
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		2	10	μs
			4N36 4N37				
Turn-off Time	(I <sub>F</sub> = 10 mA, V <sub>CC</sub> = 10 V, R <sub>L</sub> = 100Ω) (Fig.20)	T <sub>OFF</sub>	4N25 4N26 4N27 4N28 H11A1 H11A2 H11A3 H11A4 H11A5		2		μs
			4N35 4N36 4N37		2	10	

\*\* Typical values at T<sub>A</sub> = 25°C

4N25  
4N37

4N26  
H11A1

4N27  
H11A2

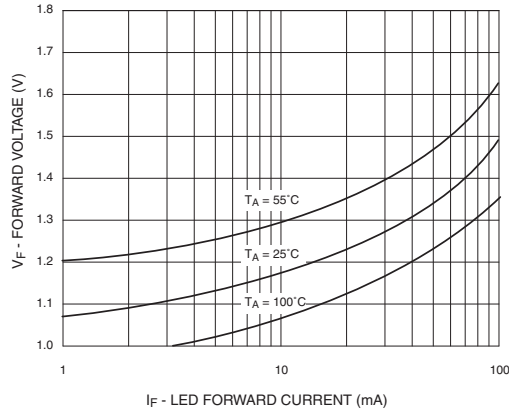
4N28  
H11A3

4N35  
H11A4

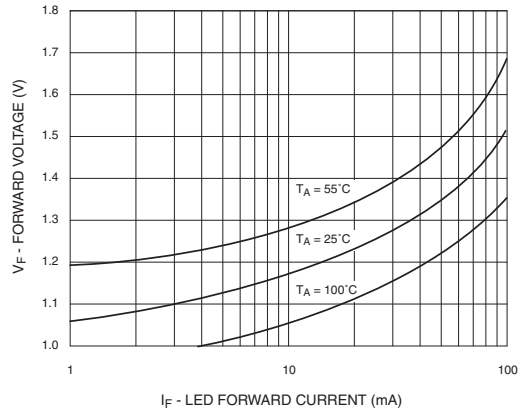
4N36  
H11A5

**TYPICAL PERFORMANCE CURVES**

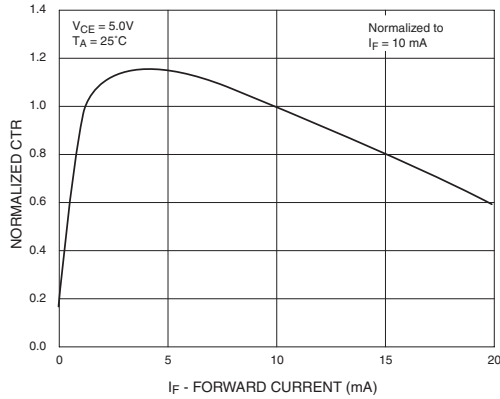
**Fig. 1 LED Forward Voltage vs. Forward Current (Black Package)**



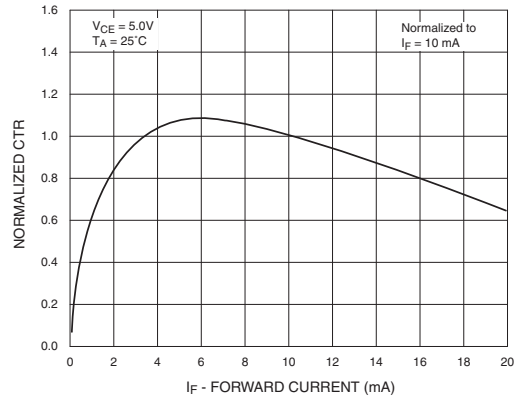
**Fig. 2 LED Forward Voltage vs. Forward Current (White Package)**



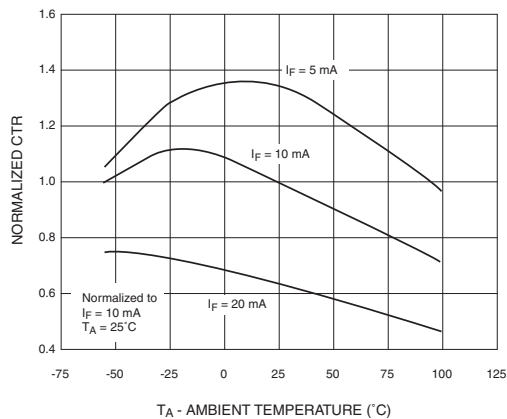
**Fig.3 Normalized CTR vs. Forward Current (Black Package)**



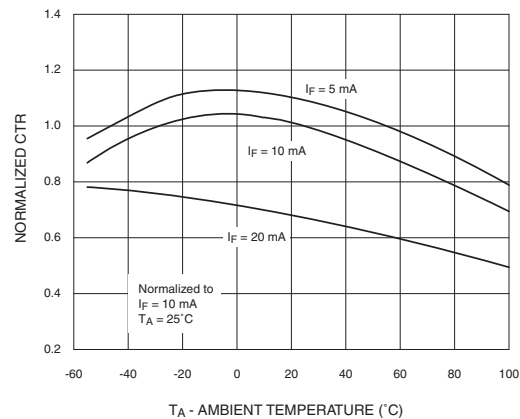
**Fig.4 Normalized CTR vs. Forward Current (White Package)**



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



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



**4N25  
4N37**

**4N26  
H11A1**

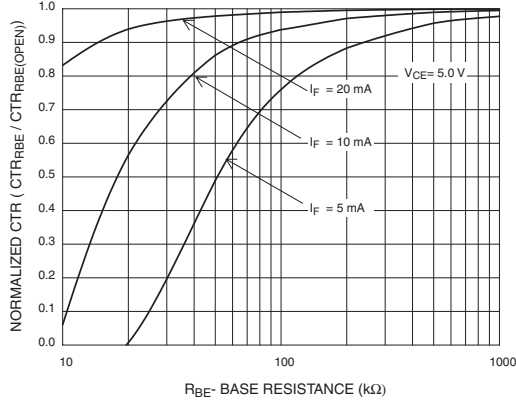
**4N27  
H11A2**

**4N28  
H11A3**

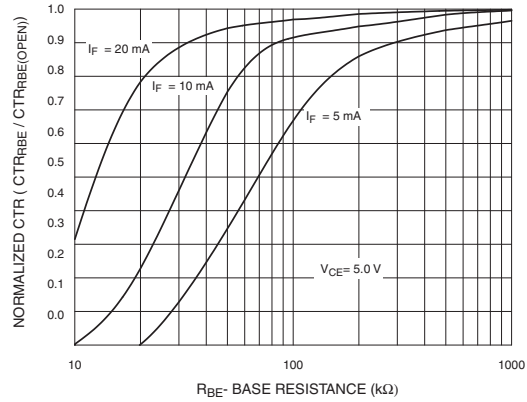
**4N35  
H11A4**

**4N36  
H11A5**

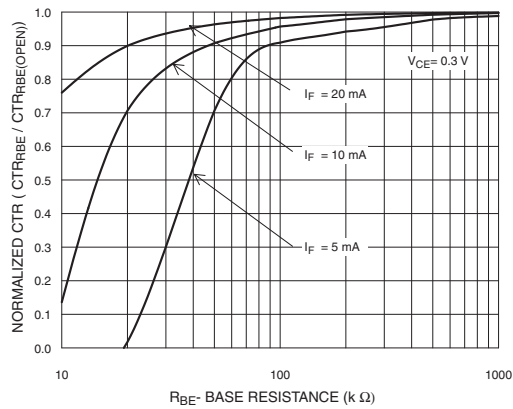
**Fig. 7 CTR vs. RBE (Unsaturated)  
(Black Package)**



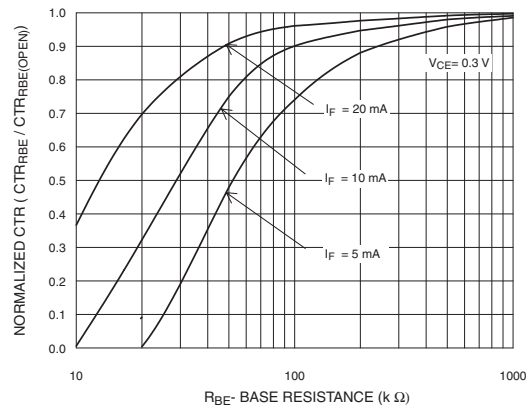
**Fig. 8 CTR vs. RBE (Unsaturated)  
(White Package)**



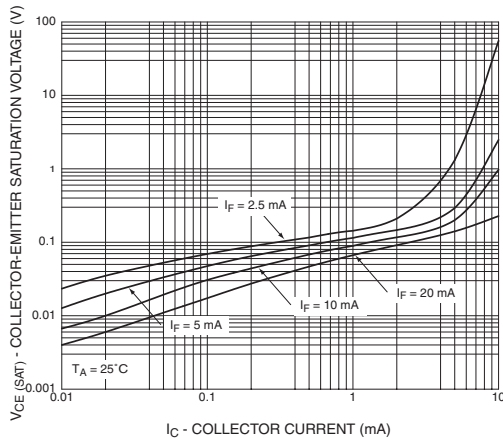
**Fig. 9 CTR vs. RBE (Saturated)  
(Black Package)**



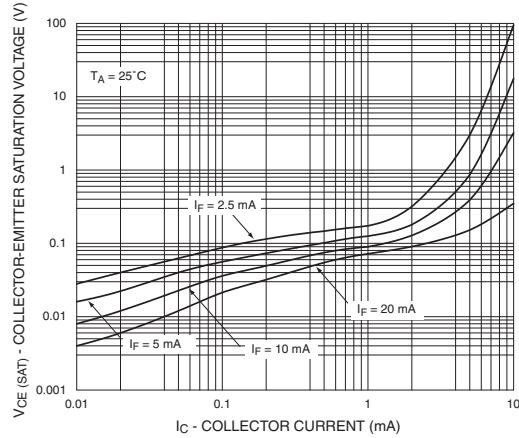
**Fig. 10 CTR vs. RBE (Saturated)  
(White Package)**



**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**

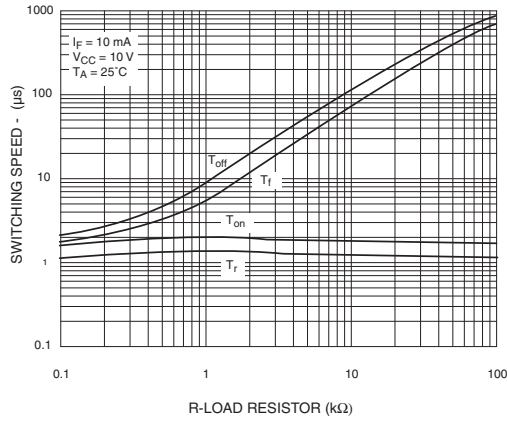
**4N27  
H11A2**

**4N28  
H11A3**

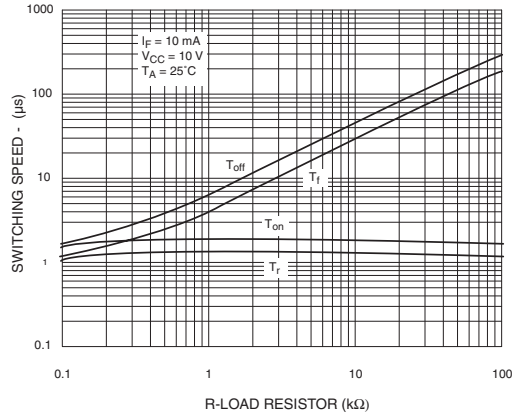
**4N35  
H11A4**

**4N36  
H11A5**

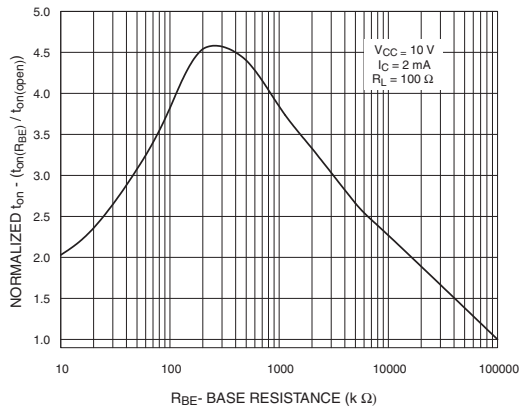
**Fig. 13 Switching Speed vs. Load Resistor  
(Black Package)**



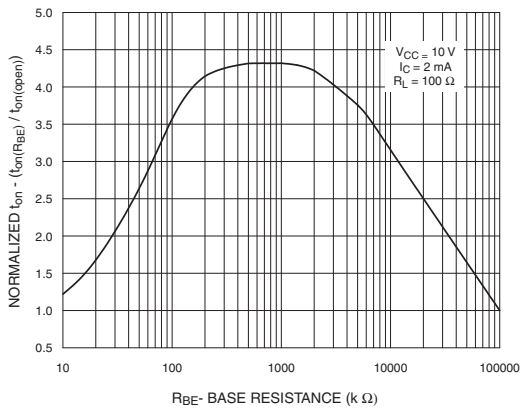
**Fig. 14 Switching Speed vs. Load Resistor  
(White Package)**



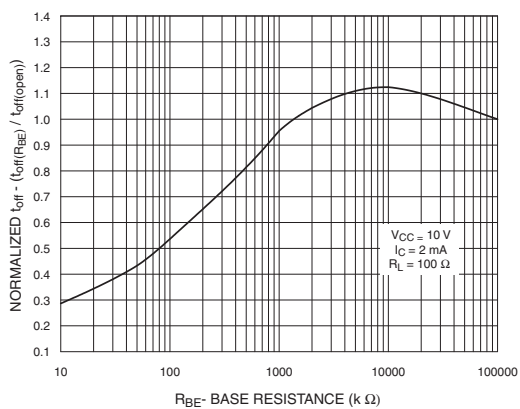
**Fig. 15 Normalized  $t_{on}$  vs.  $R_{BE}$   
(Black Package)**



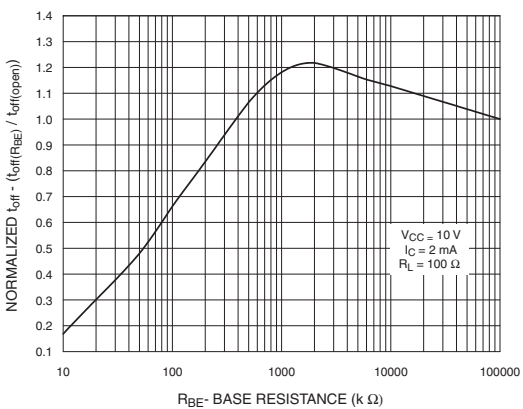
**Fig. 16 Normalized  $t_{on}$  vs.  $R_{BE}$   
(White Package)**



**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

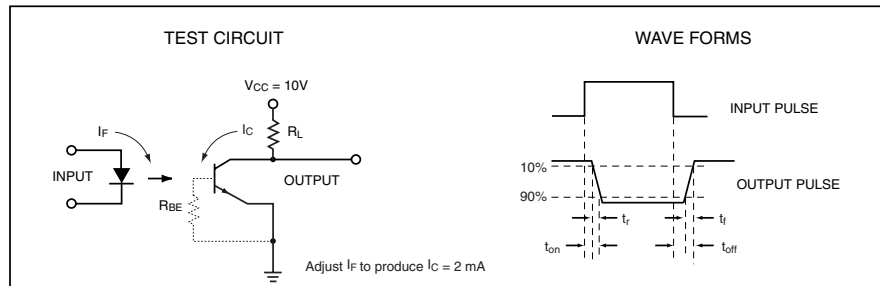
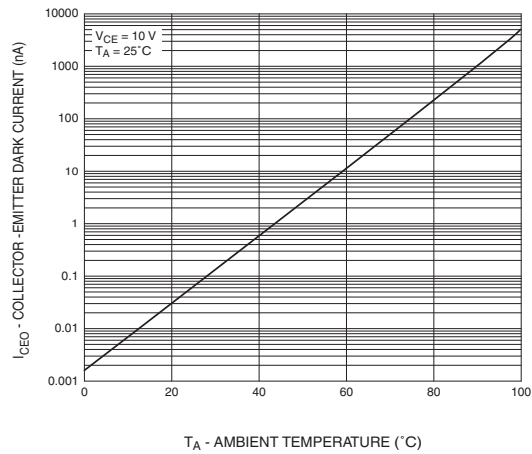


Figure 20. Switching Time Test Circuit and Waveforms





**4N25  
4N37**

**4N26  
H11A1**

**4N27  
H11A2**

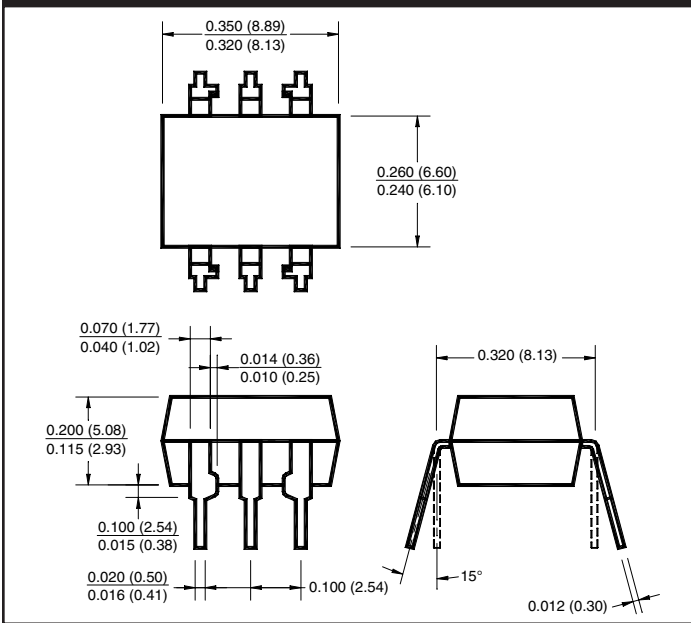
**4N28  
H11A3**

**4N35  
H11A4**

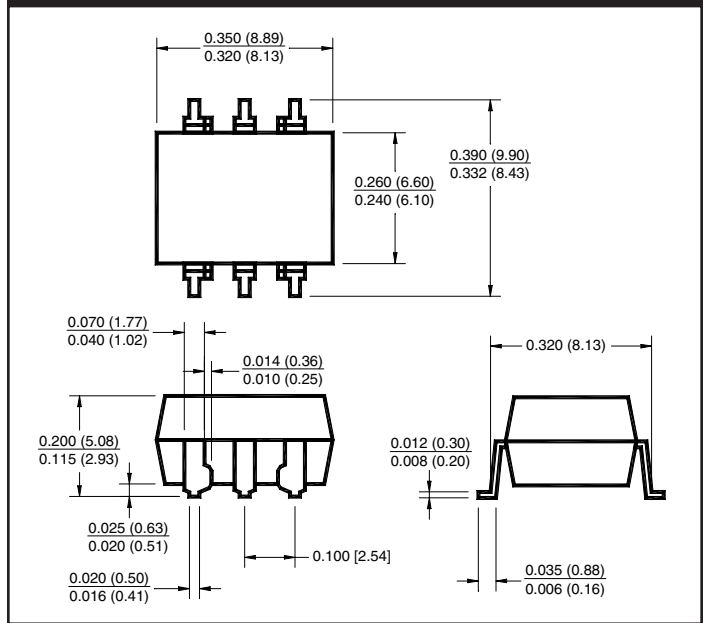
**4N36  
H11A5**

**White Package (-M Suffix)**

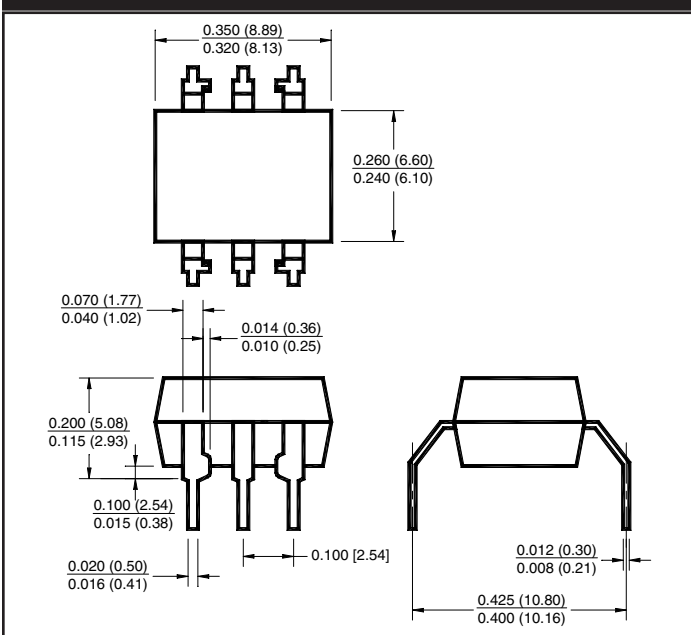
**Package Dimensions (Through Hole)**



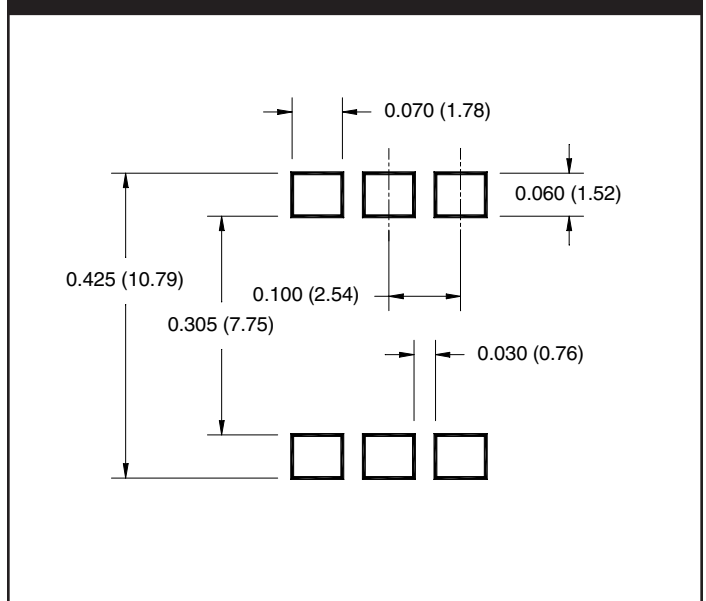
**Package Dimensions (Surface Mount)**



**Package Dimensions (0.4" Lead Spacing)**



**Recommended Pad Layout for  
Surface Mount Leadform**



**NOTE**

All dimensions are in inches (millimeters)

4N25  
4N37

4N26  
H11A1

4N27  
H11A2

4N28  
H11A3

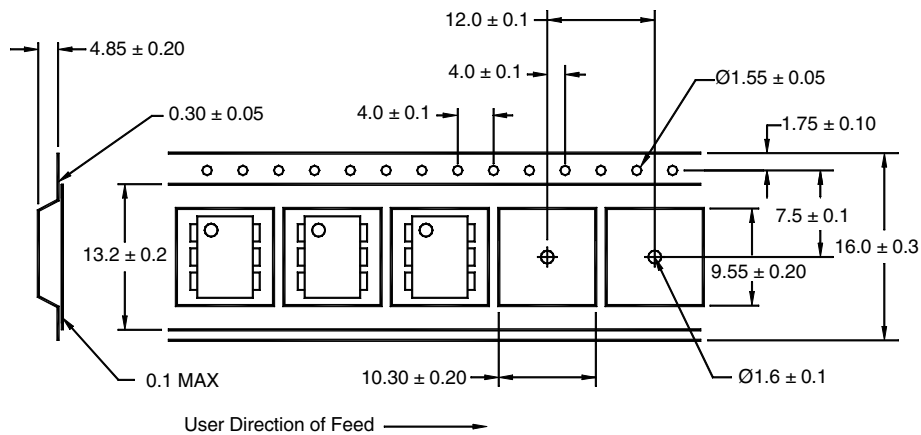
4N35  
H11A4

4N36  
H11A5

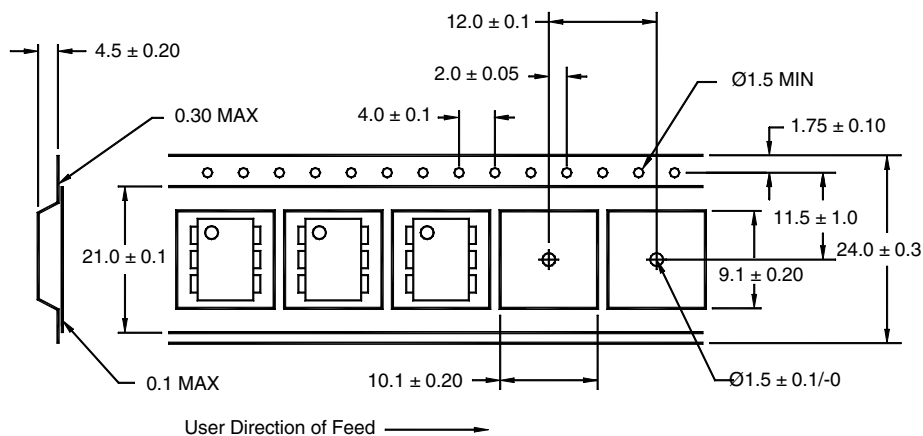
## ORDERING INFORMATION

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

### QT Carrier Tape Specifications ("D" Taping Orientation) (Black Package, No Suffix)



### QT Carrier Tape Specifications ("D" Taping Orientation) (White Package, -M Suffix)



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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.