

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

**4N26**  
**H11A1**

**4N27**  
**H11A2**

**4N28**  
**H11A3**

**4N35**  
**H11A4**

**4N36**  
**H11A5**

**DESCRIPTION**

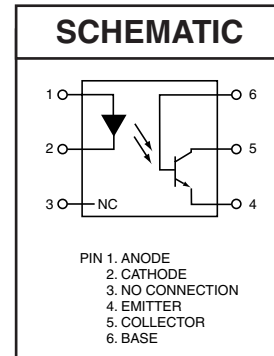
The general purpose optocouplers consist of a gallium arsenide infrared emitting diode driving a silicon phototransistor in a 6-pin dual in-line package.

**FEATURES**

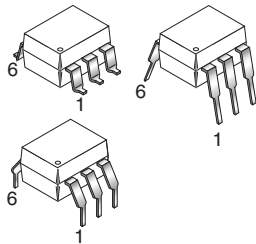
- UL recognized (File # E90700)
- VDE recognized (File # 94766)
  - Add option V for white package (e.g., 4N25V-M)
  - Add option 300 for black package (e.g., 4N25.300)
- Also available in white package by specifying -M suffix, eg. 4N25-M except H11A2, H11A4 and H11A5

**APPLICATIONS**

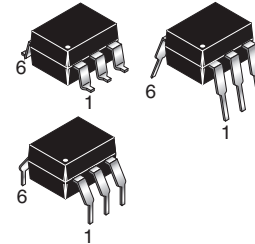
- Power supply regulators
- Digital logic inputs
- Microprocessor inputs



**WHITE PACKAGE (-M SUFFIX)**



**BLACK PACKAGE (NO -M SUFFIX)**



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

Parameter	Symbol	Value	Units
<b>TOTAL DEVICE</b>			
Storage Temperature	$T_{STG}$	-55 to +150	$^\circ\text{C}$
Operating Temperature	$T_{OPR}$	-55 to +100	$^\circ\text{C}$
Lead Solder Temperature	$T_{SOL}$	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)	$I_{F(pk)}$	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	$V_{CEO}$	30	V
Collector-Base Voltage	$V_{CBO}$	70	V
Emitter-Collector Voltage	$V_{ECO}$	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	( $V_{I-O} = 500\text{ VDC}$ )	$R_{ISO}$	$10^{11}$			B
Isolation Capacitance	( $V_{I-O} = .$ , $f = 1\text{ MHz}$ )	$C_{ISO}$		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  $T_A = 25^\circ\text{C}$

**4N25  
4N37**

**4N26  
H11A1**

**4N27  
H11A2**

**4N28  
H11A3**

**4N35  
H11A4**

**4N36  
H11A5**

TRANSFER CHARACTERISTICS (T <sub>A</sub> = 25°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	100			%	
			4N36					
			4N37					
			H11A1	50				
			H11A5	30				
			4N25	20				
	4N26							
	H11A2							
	H11A3		10					
4N27								
4N28								
H11A4	40							
4N35								
4N36								
4N37	40							
4N35								
4N36								
4N37								
Collector-Emitter Saturation Voltage	(I <sub>C</sub> = 2 mA, I <sub>F</sub> = 50 mA)	V <sub>CE (SAT)</sub>	4N25			0.5	V	
	(I <sub>C</sub> = 0.5 mA, I <sub>F</sub> = 10 mA)		4N26					
			4N27					
			4N28					
	(I <sub>C</sub> = 0.5 mA, I <sub>F</sub> = 10 mA)		4N35			0.3		
			4N36					
4N37								
(I <sub>C</sub> = 0.5 mA, I <sub>F</sub> = 10 mA)	H11A1			0.4				
	H11A2							
	H11A3							
	H11A4							
	H11A5							
AC Characteristic	(I <sub>F</sub> = 10 mA, V <sub>CC</sub> = 10 V, R <sub>L</sub> = 100Ω) (Fig.20)	T <sub>ON</sub>	4N25				μs	
			4N26					
			4N27					
			4N28					
			H11A1					2
			H11A2					
			H11A3					
			H11A4					
			H11A5					

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

**4N25  
4N37**

**4N26  
H11A1**

**4N27  
H11A2**

**4N28  
H11A3**

**4N35  
H11A4**

**4N36  
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> = 100B) (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> = 100B) (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**

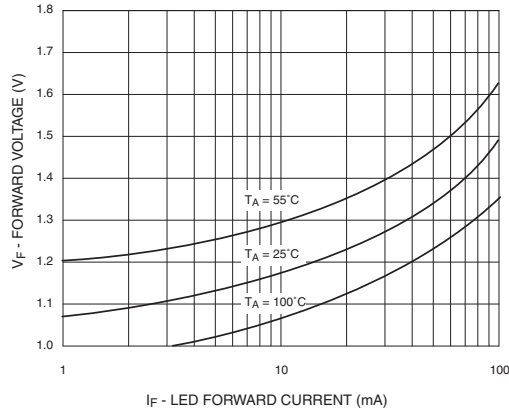
**4N28  
H11A3**

**4N35  
H11A4**

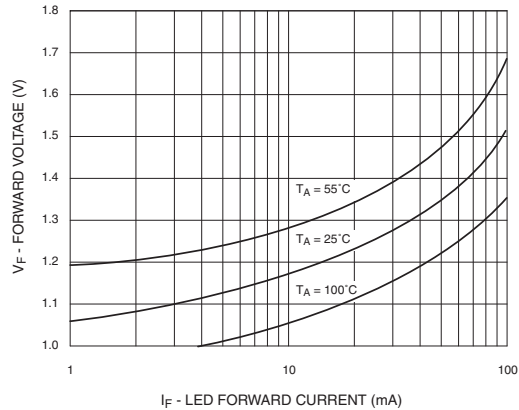
**4N36  
H11A5**

**TYPICAL PERFORMANCE CURVES**

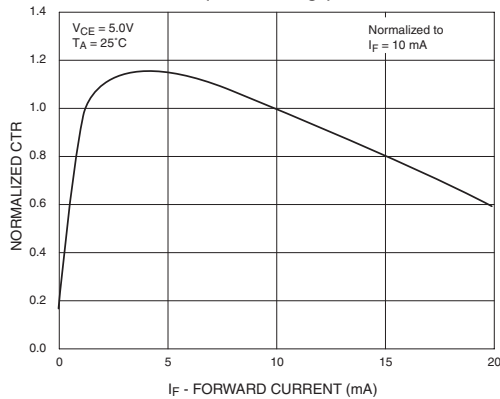
**Fig. 1 LED Forward Voltage vs. Forward Current (Black Package)**



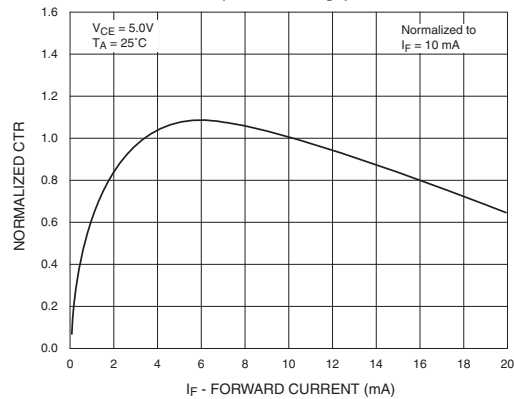
**Fig. 2 LED Forward Voltage vs. Forward Current (White Package)**



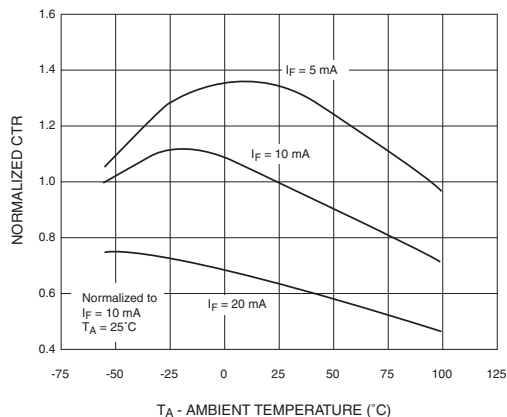
**Fig.3 Normalized CTR vs. Forward Current (Black Package)**



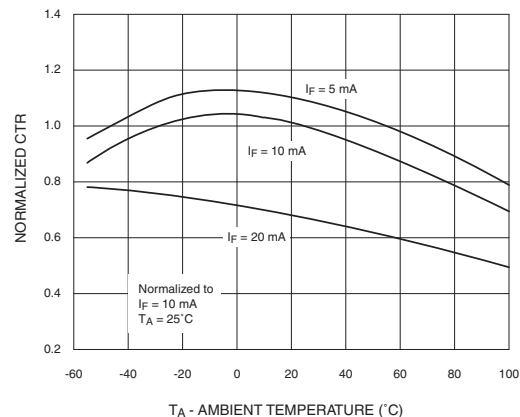
**Fig.4 Normalized CTR vs. Forward Current (White Package)**



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



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



**4N25  
4N37**

**4N26  
H11A1**

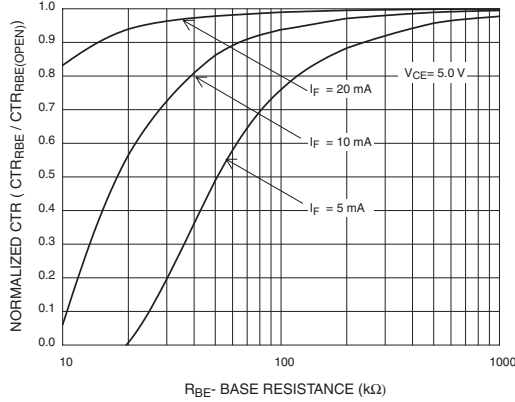
**4N27  
H11A2**

**4N28  
H11A3**

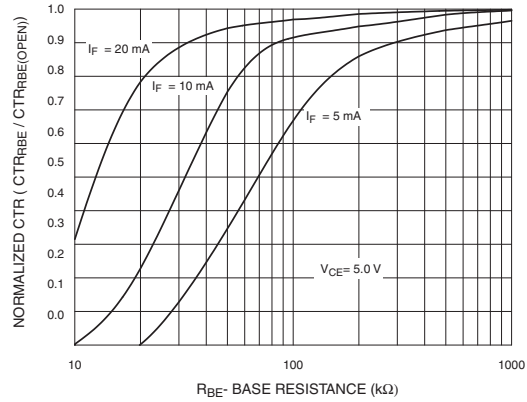
**4N35  
H11A4**

**4N36  
H11A5**

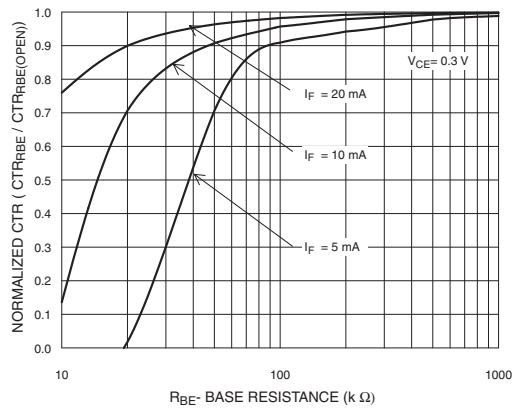
**Fig. 7 CTR vs. RBE (Unsaturated)  
(Black Package)**



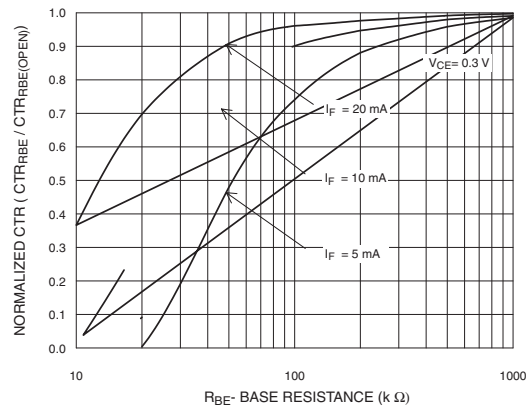
**Fig. 8 CTR vs. RBE (Unsaturated)  
(White Package)**



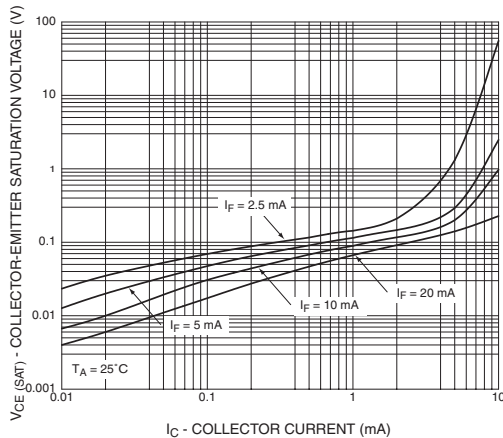
**Fig. 9 CTR vs. RBE (Saturated)  
(Black Package)**



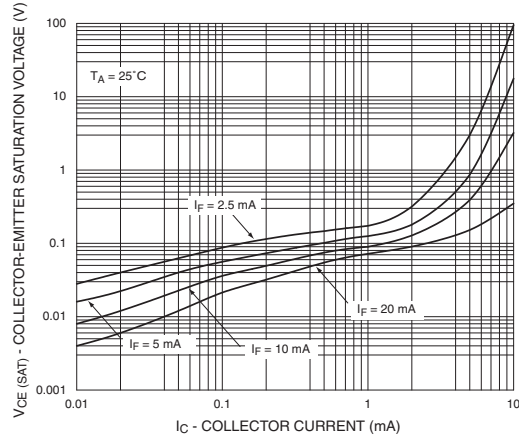
**Fig. 10 CTR vs. RBE (Saturated)  
(White Package)**



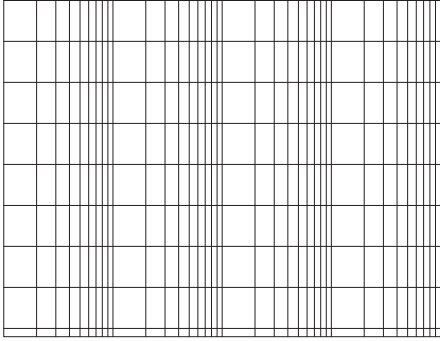
**Fig. 11 Collector-Emitter Saturation Voltage vs Collector Current  
(Black Package)**



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



NORMALIZED  $t_{on} - (t_{on(R_{ig})} / t_{on(open)}) - t$



4N25  
4N37

4N26  
H11A1

4N27  
H11A2

4N28  
H11A3

4N35  
H11A4

4N36  
H11A5

Fig. 19 Dark Current vs. Ambient Temperature

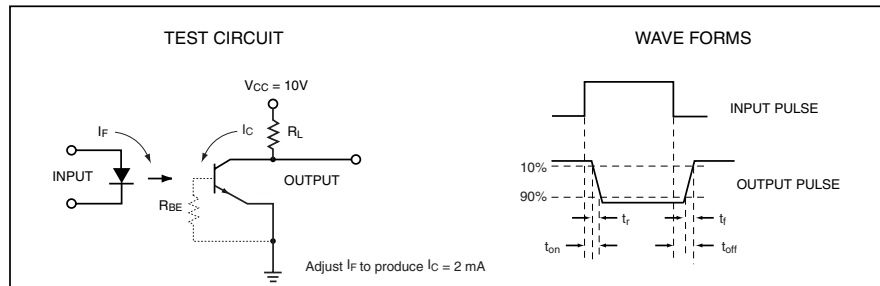
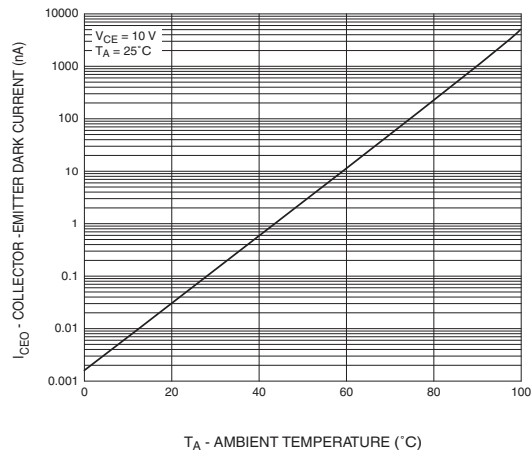


Figure 20. Switching Time Test Circuit and Waveforms



4N25  
4N37

4N26  
H11A1

4N27  
H11A2

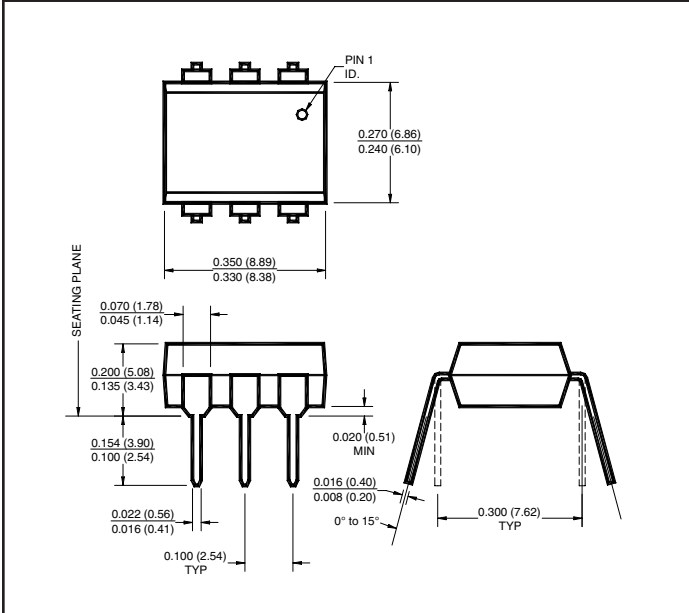
4N28  
H11A3

4N35  
H11A4

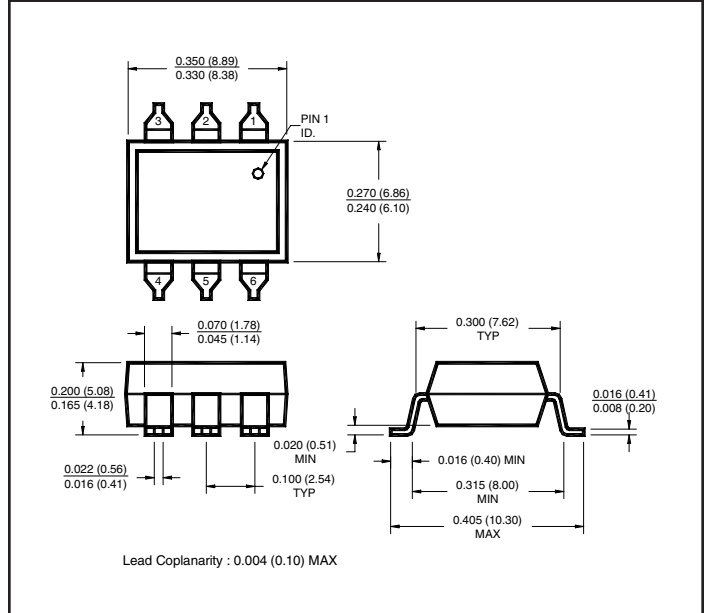
4N36  
H11A5

**Black Package (No -M Suffix)**

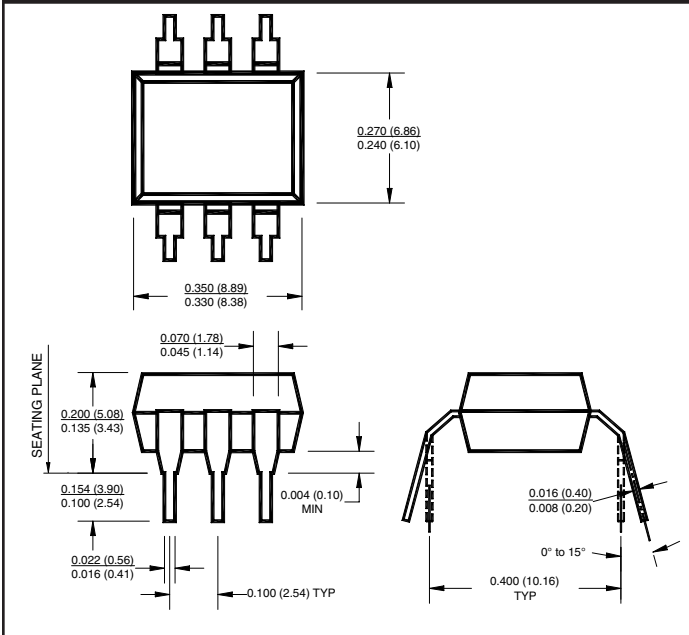
**Package Dimensions (Through Hole)**



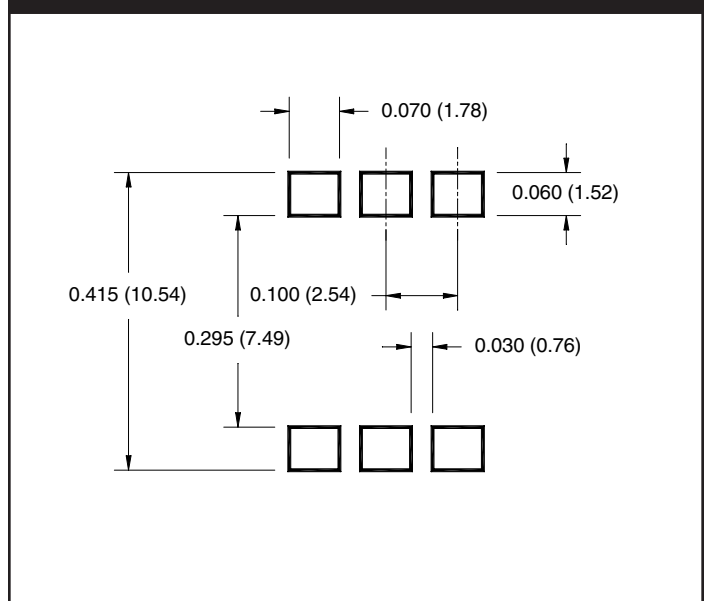
**Package Dimensions (Surface Mount)**



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



**Recommended Pad Layout for  
Surface Mount Leadform**

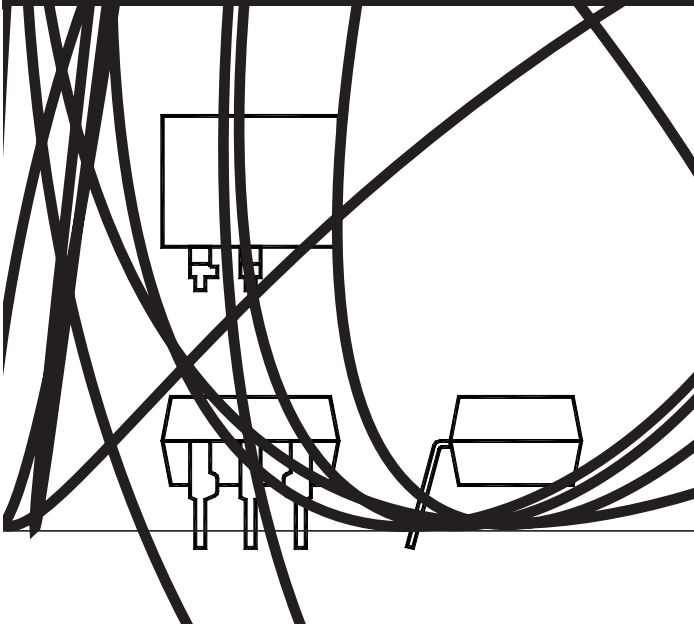


**NOTE**

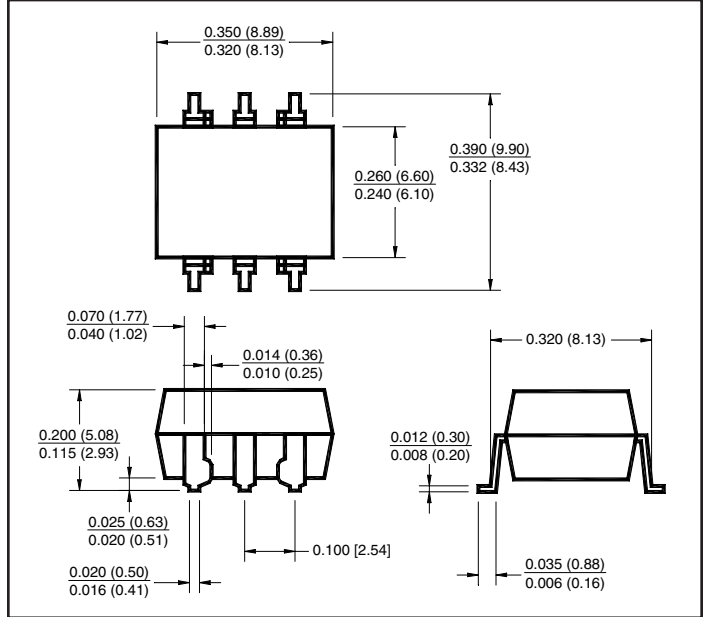
All dimensions are in inches (millimeters)

# White Package (-M Suffix)

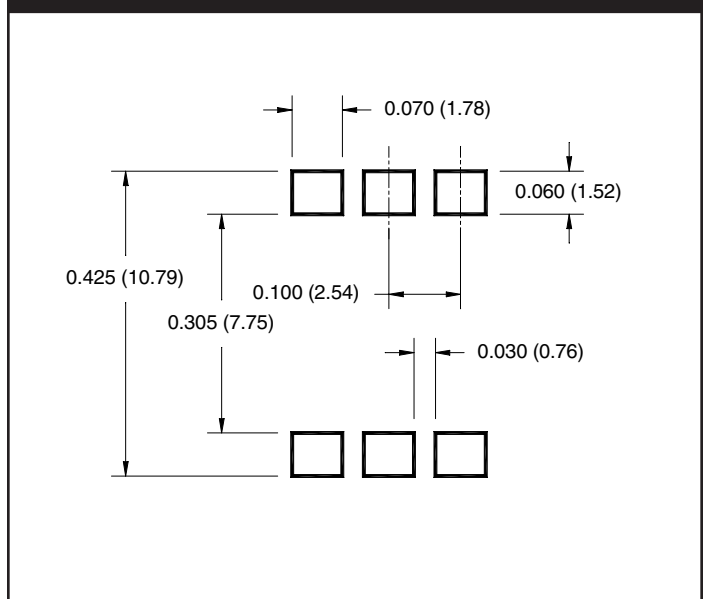
## Package Dimensions (Through Hole)



## Package Dimensions (Surface Mount)



## Recommended Pad Layout for Surface Mount Leadform



4N25  
4N37

4N26  
H11A1

4N27  
H11A2

4N28  
H11A3

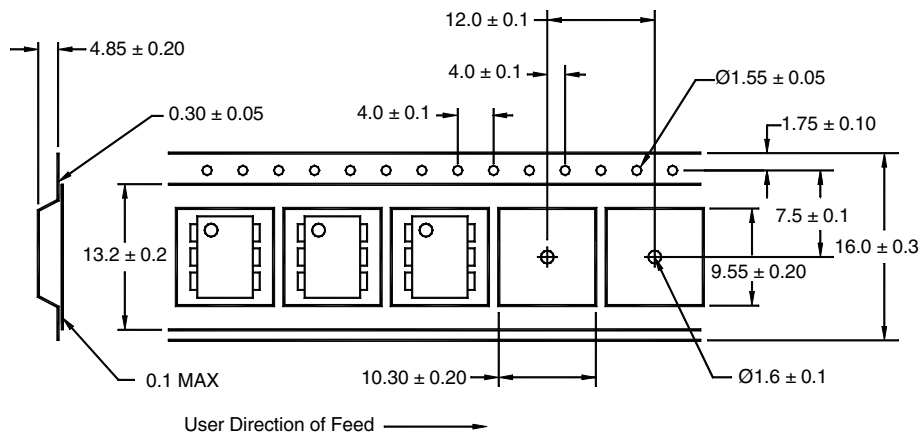
4N35  
H11A4

4N36  
H11A5

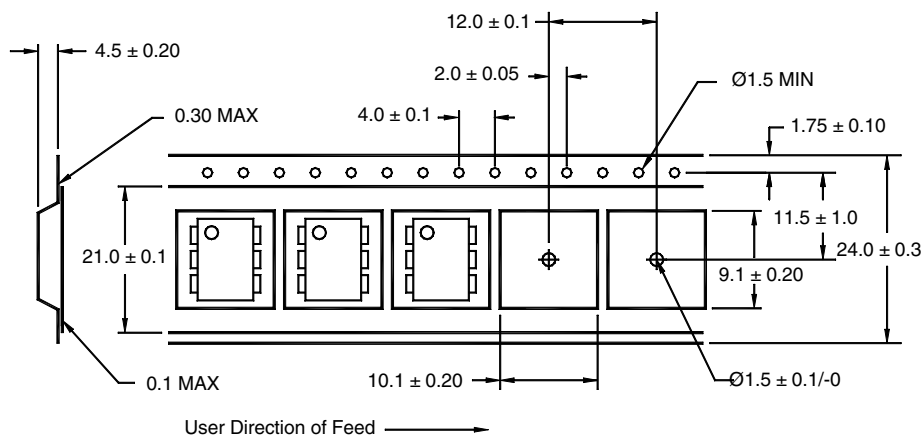
## ORDERING INFORMATION

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)



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

**4N26**  
**H11A1**

**4N27**  
**H11A2**

**4N28**  
**H11A3**

**4N35**  
**H11A4**

**4N36**  
**H11A5**

**DISCLAIMER**

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

**LIFE SUPPORT POLICY**

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF FAIRCHILD SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in labeling, can be reasonably expected to result in a significant injury of the user.
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.