

**4N25  
4N37**

**4N26  
H11A1**

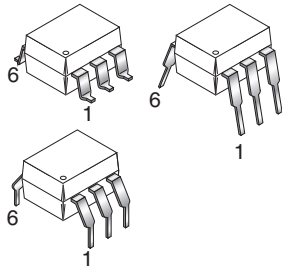
**4N27  
H11A2**

**4N28  
H11A3**

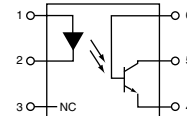
**4N35  
H11A4**

**4N36  
H11A5**

**WHITE PACKAGE (-M SUFFIX)**

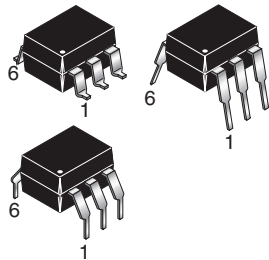


**SCHEMATIC**



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**

- 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

**APPLICATIONS**

- Power supply regulators
- Digital logic inputs
- Microprocessor inputs

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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	$T_{STG}$	-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	( $I_C = 100 \mu\text{A}, I_F = 0$ )	$BV_{CBO}$	70	120		V
Emitter-Collector Breakdown Voltage	( $I_E = 100 \mu\text{A}, I_F = 0$ )	$BV_{ECO}$	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

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

**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**

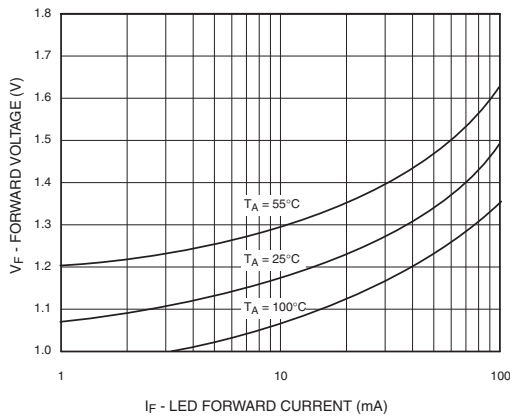
**4N28  
H11A3**

**4N35  
H11A4**

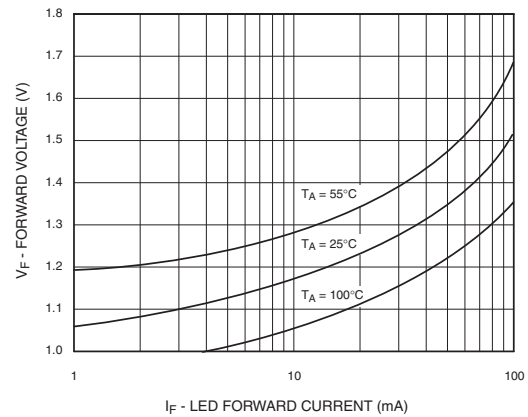
**4N36  
H11A5**

**TYPICAL PERFORMANCE CURVES**

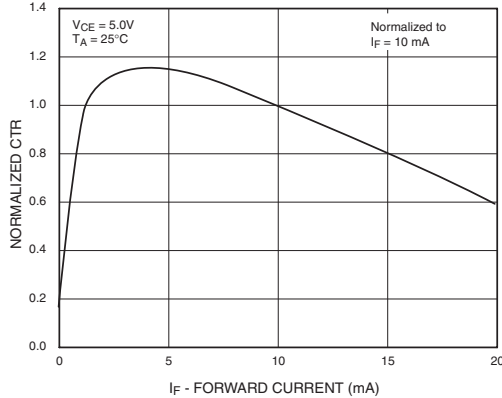
**Fig. 1 LED Forward Voltage vs. Forward Current  
(Black Package)**



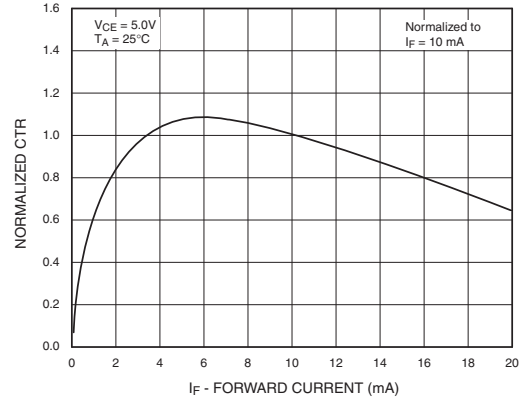
**Fig. 2 LED Forward Voltage vs. Forward Current  
(White Package)**



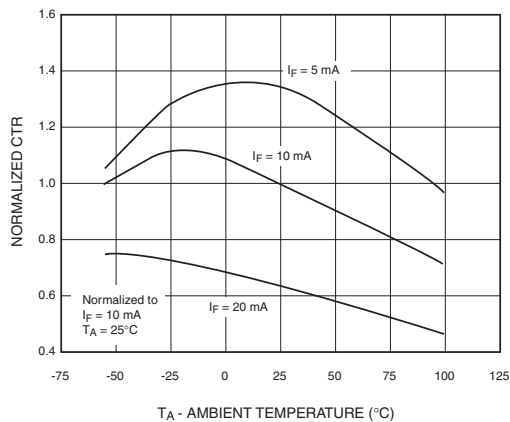
**Fig.3 Normalized CTR vs. Forward Current  
(Black Package)**



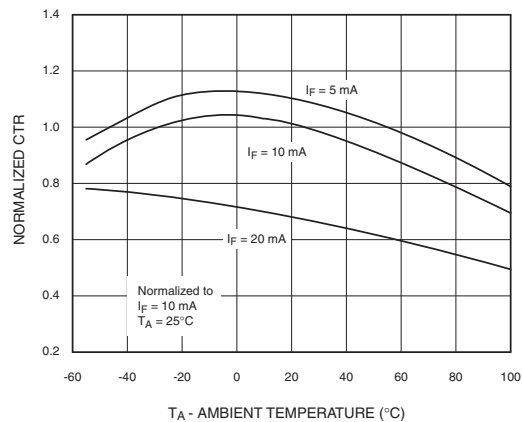
**Fig.4 Normalized CTR vs. Forward Current  
(White Package)**



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



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



**4N25  
4N37**

**4N26  
H11A1**

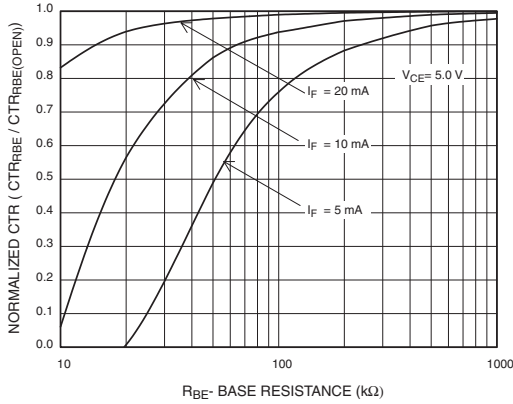
**4N27  
H11A2**

**4N28  
H11A3**

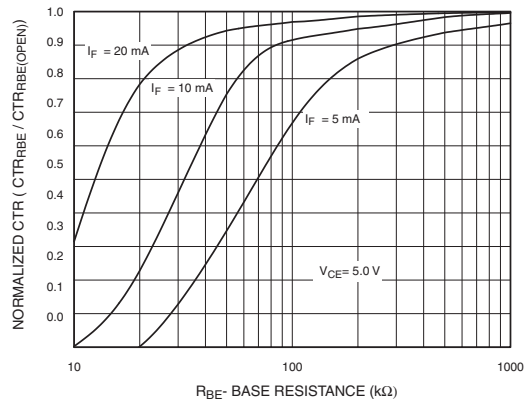
**4N35  
H11A4**

**4N36  
H11A5**

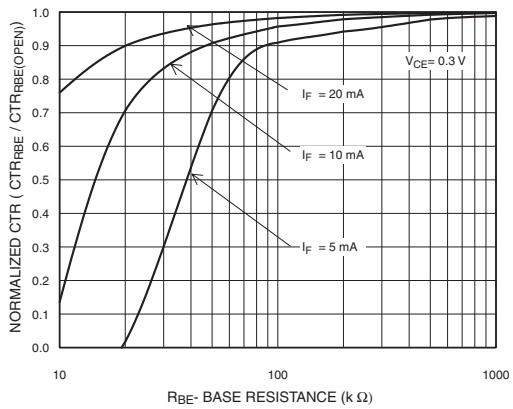
**Fig. 7 CTR vs. RBE (Unsaturated)  
(Black Package)**



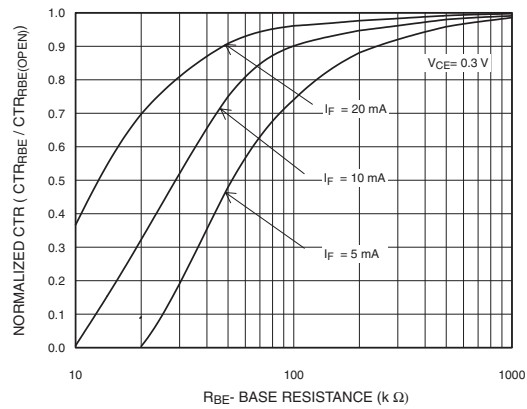
**Fig. 8 CTR vs. RBE (Unsaturated)  
(White Package)**



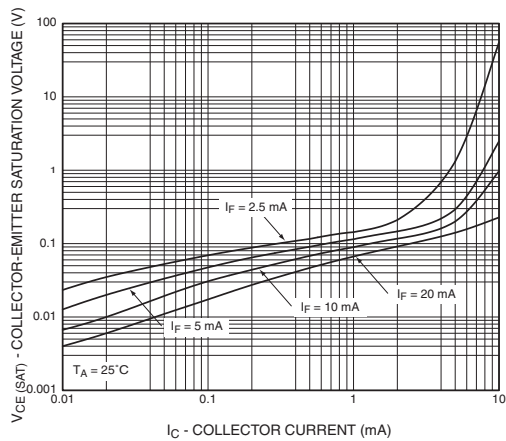
**Fig. 9 CTR vs. RBE (Saturated)  
(Black Package)**



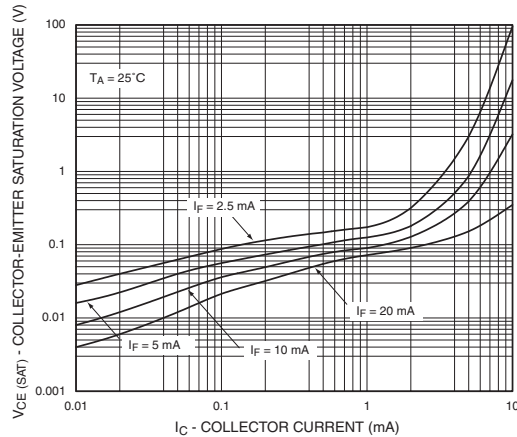
**Fig. 10 CTR vs. RBE (Saturated)  
(White Package)**



**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**

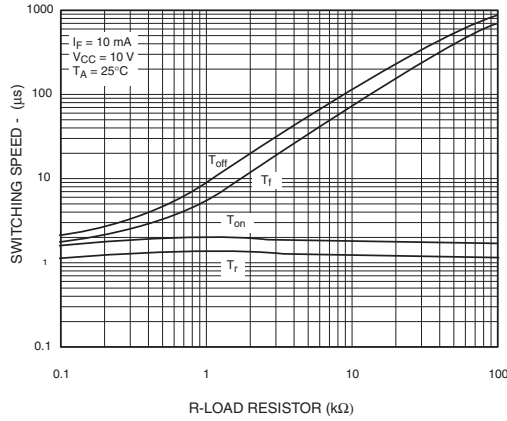
**4N27  
H11A2**

**4N28  
H11A3**

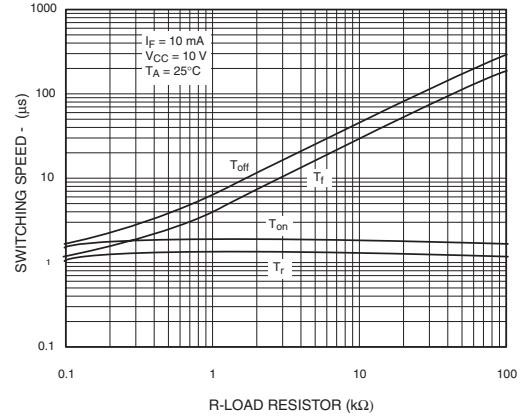
**4N35  
H11A4**

**4N36  
H11A5**

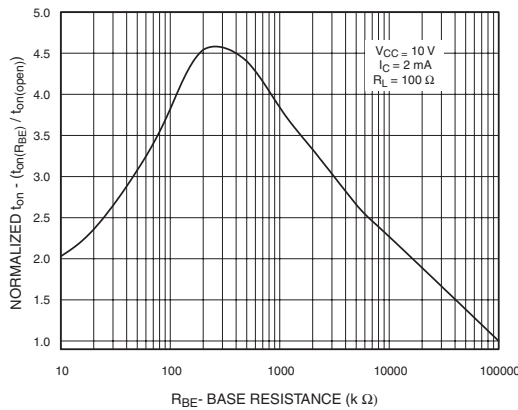
**Fig. 13 Switching Speed vs. Load Resistor  
(Black Package)**



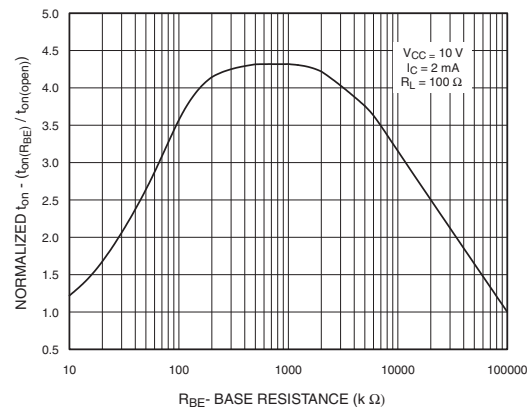
**Fig. 14 Switching Speed vs. Load Resistor  
(White Package)**



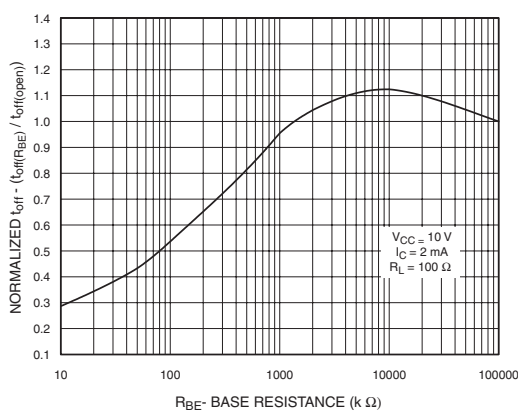
**Fig. 15 Normalized  $t_{on}$  vs.  $R_{BE}$   
(Black Package)**



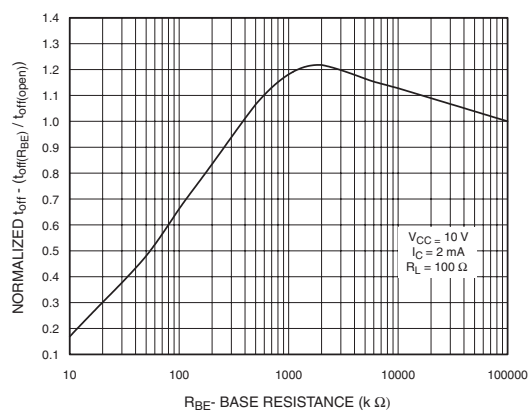
**Fig. 16 Normalized  $t_{on}$  vs.  $R_{BE}$   
(White Package)**



**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

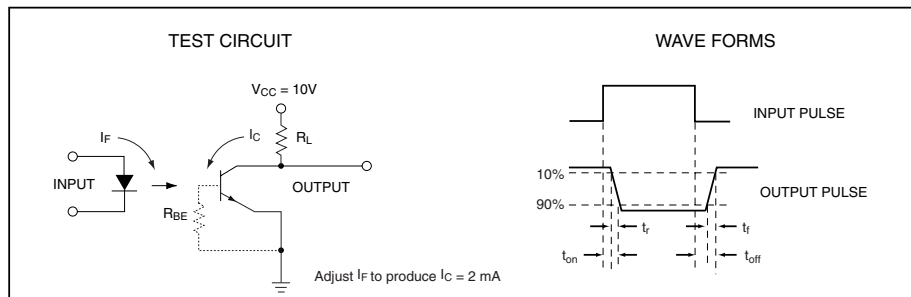
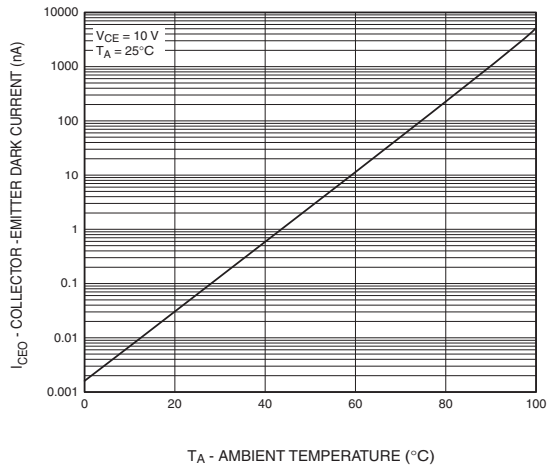


Figure 20. Switching Time Test Circuit and Waveforms

**4N25  
4N37**

**4N26  
H11A1**

**4N27  
H11A2**

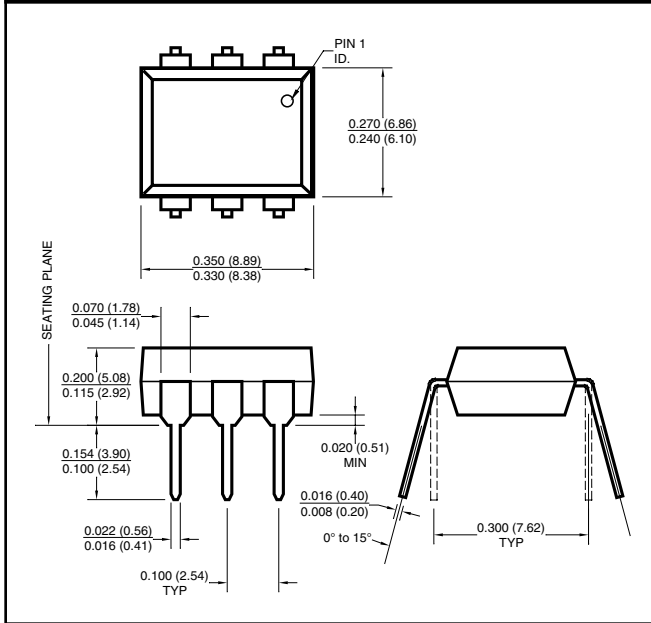
**4N28  
H11A3**

**4N35  
H11A4**

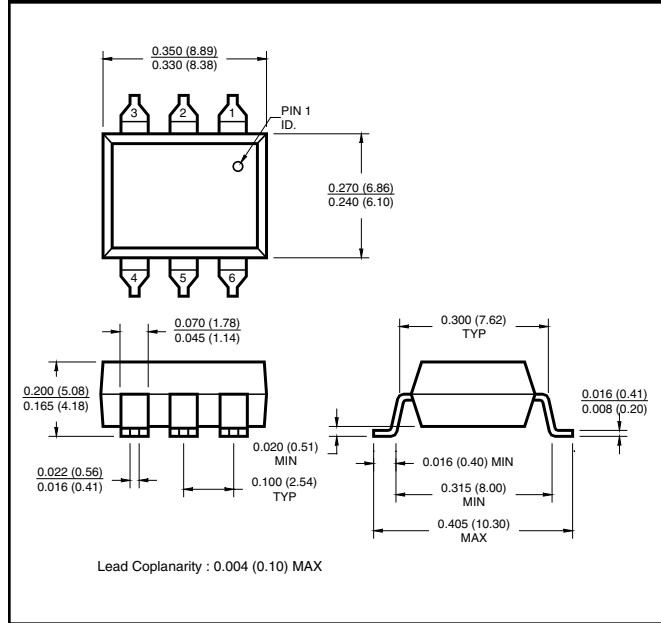
**4N36  
H11A5**

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

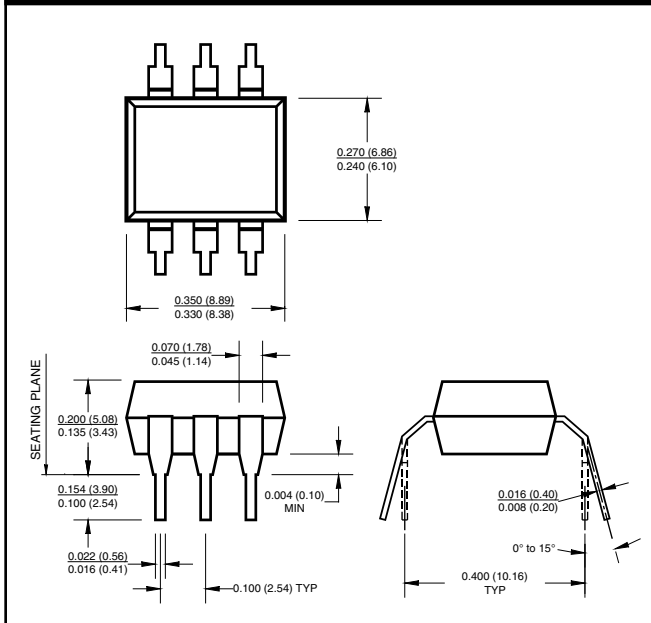
**Package Dimensions (Through Hole)**



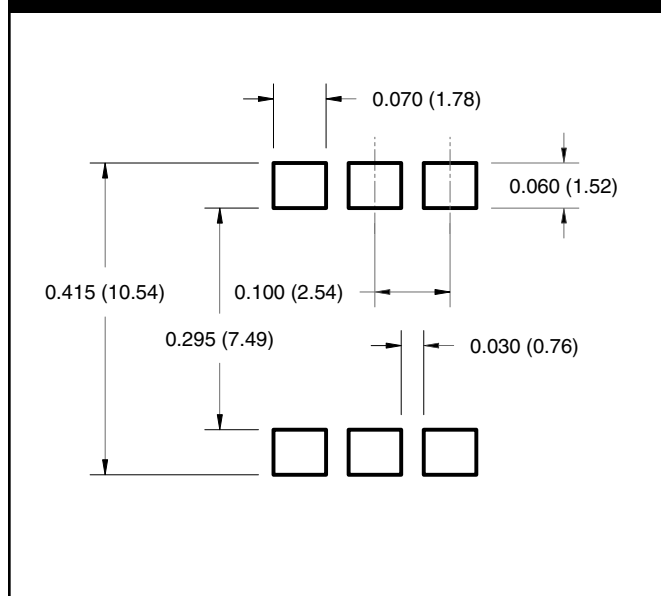
**Package Dimensions (Surface Mount)**



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



**Recommended Pad Layout for Surface Mount Leadform**



**NOTE**  
All dimensions are in inches (millimeters)

**4N25  
4N37**

**4N26  
H11A1**

**4N27  
H11A2**

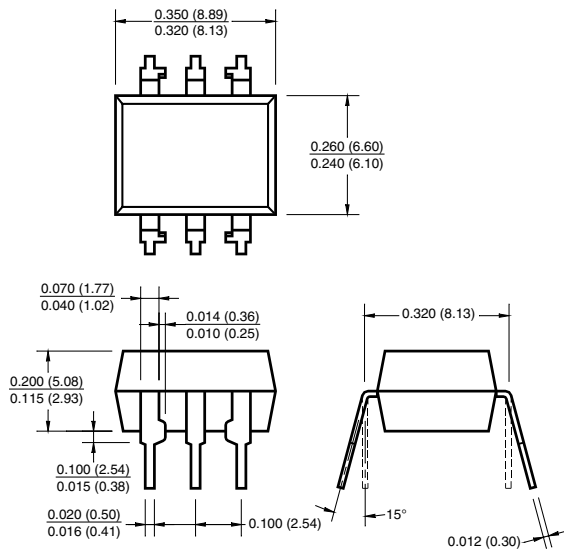
**4N28  
H11A3**

**4N35  
H11A4**

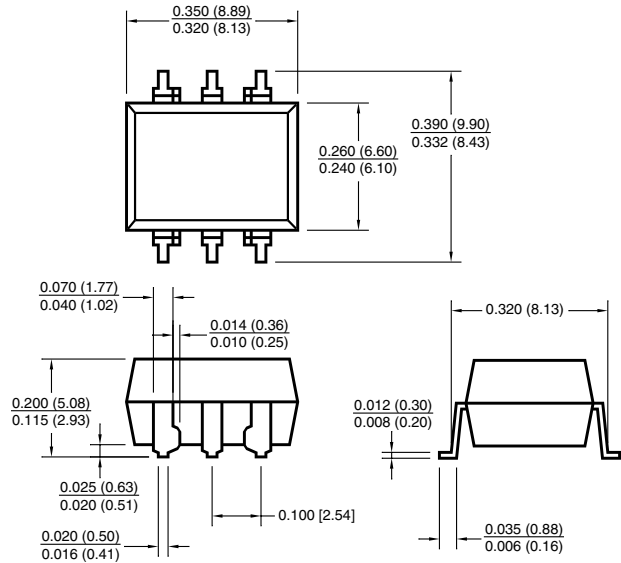
**4N36  
H11A5**

**White Package (-M Suffix)**

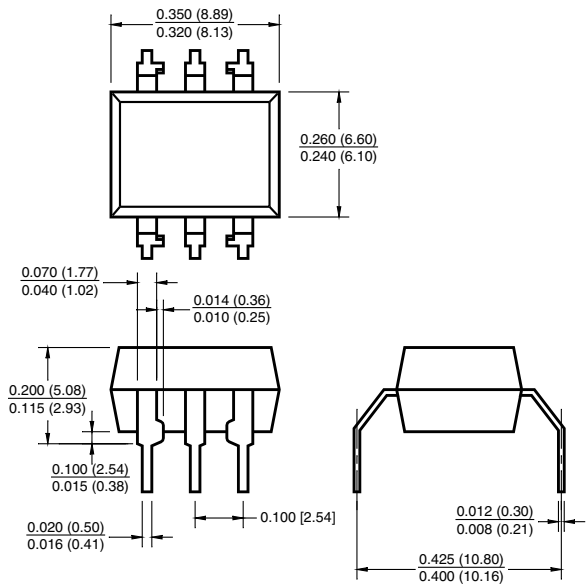
**Package Dimensions (Through Hole)**



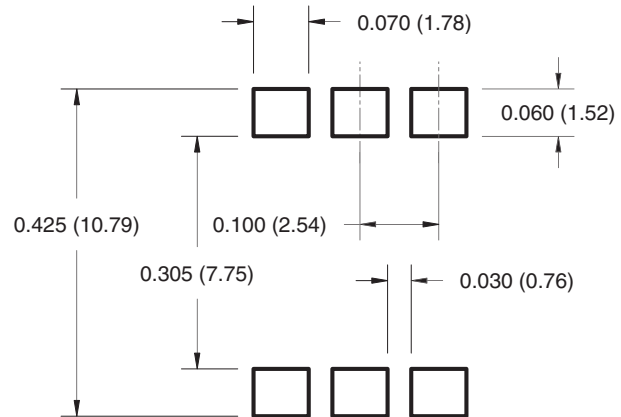
**Package Dimensions (Surface Mount)**



**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**

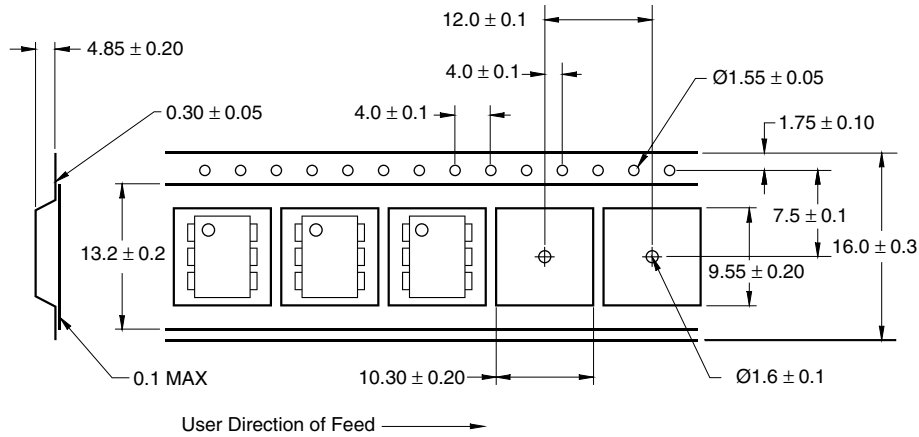
**4N36  
H11A5**

**ORDERING INFORMATION**

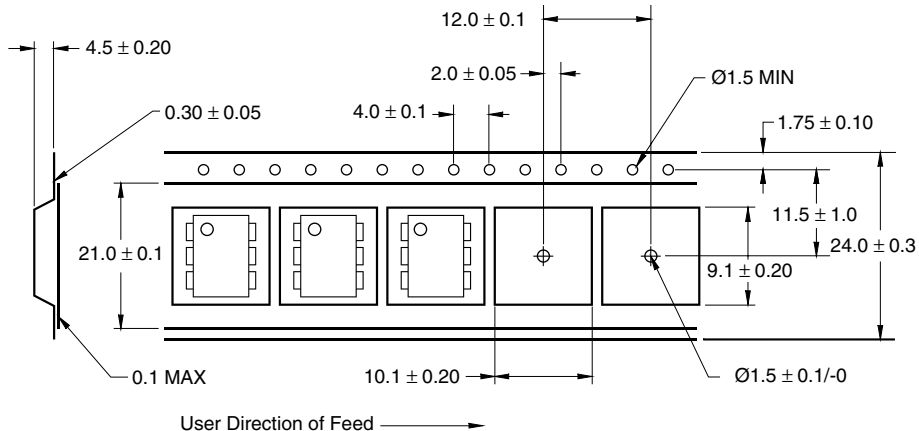
**Order Entry Identifier**

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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**4N25  
4N37**

**4N26  
H11A1**

**4N27  
H11A2**

**4N28  
H11A3**

**4N35  
H11A4**

**4N36  
H11A5**

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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 the 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.