

**4N25  
4N37**

**4N26  
H11A1**

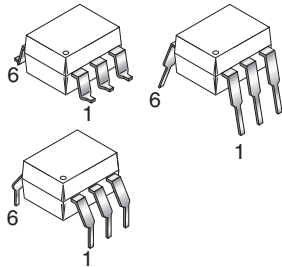
**4N27  
H11A2**

**4N28  
H11A3**

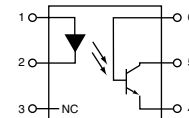
**4N35  
H11A4**

**4N36  
H11A5**

**WHITE PACKAGE (-M SUFFIX)**

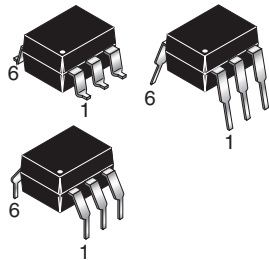


**SCHEMATIC**



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  
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**4N26  
H11A1**

**4N27  
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                                     | $^\circ\text{C}$           |
| Wave solder temperature (see page 14 for reflow solder profiles)                             | $T_{SOL}$   | 260 for 10 sec                                  | $^\circ\text{C}$           |
| Total Device Power Dissipation @ $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$       | 250<br>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 @ $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$          | $P_D$       | 150 (non-M), 120 (-M)<br>2.0 (non-M), 1.41 (-M) | mW<br>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 @ $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$     | $P_D$       | 150<br>2.0 (non-M), 1.76 (-M)                   | mW<br>mW/ $^\circ\text{C}$ |

**4N25  
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**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

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

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

**4N25  
4N37**

**4N26  
H11A1**

**4N27  
H11A2**

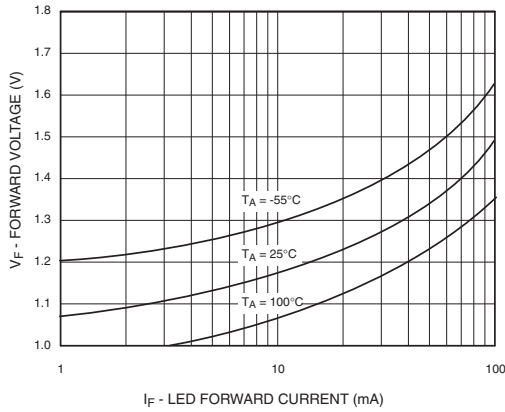
**4N28  
H11A3**

**4N35  
H11A4**

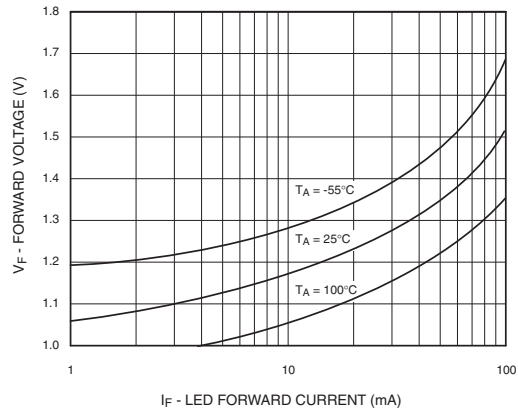
**4N36  
H11A5**

**TYPICAL PERFORMANCE CURVES**

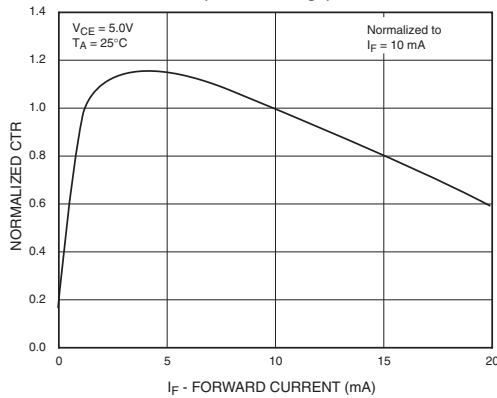
**Fig. 1 LED Forward Voltage vs. Forward Current  
(Black Package)**



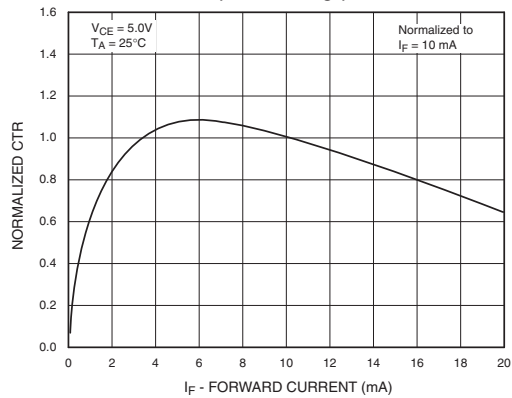
**Fig. 2 LED Forward Voltage vs. Forward Current  
(White Package)**



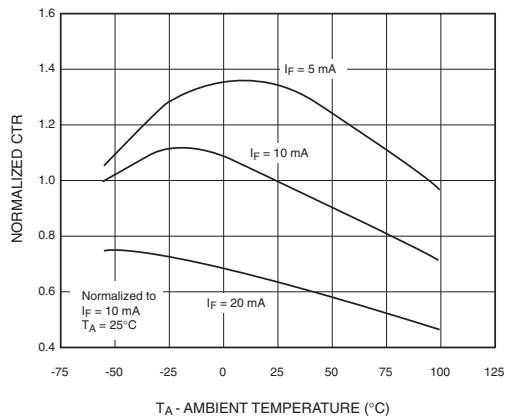
**Fig.3 Normalized CTR vs. Forward Current  
(Black Package)**



**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**

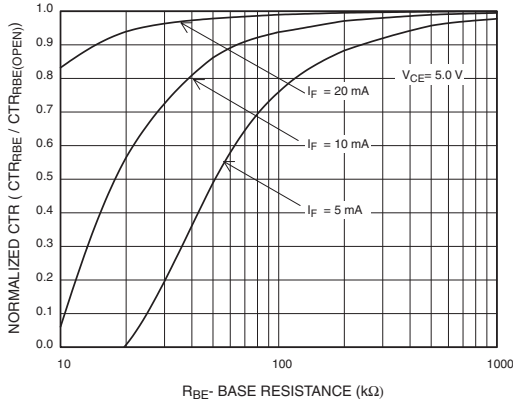
**4N27  
H11A2**

**4N28  
H11A3**

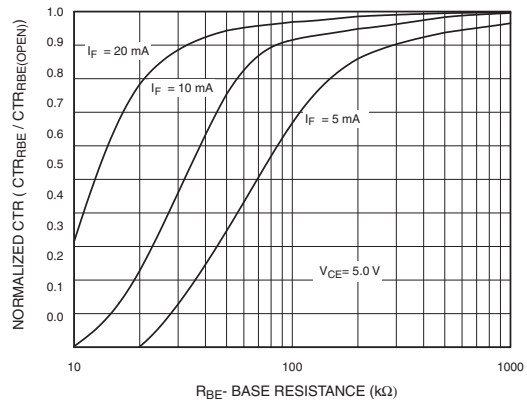
**4N35  
H11A4**

**4N36  
H11A5**

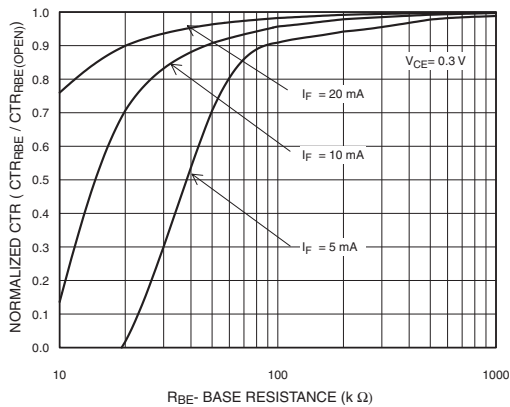
**Fig. 7 CTR vs. RBE (Unsaturated)  
(Black Package)**



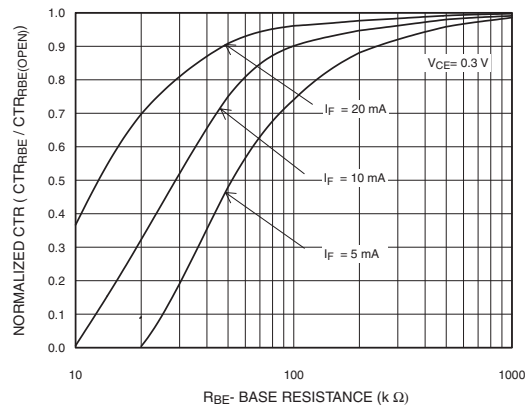
**Fig. 8 CTR vs. RBE (Unsaturated)  
(White Package)**



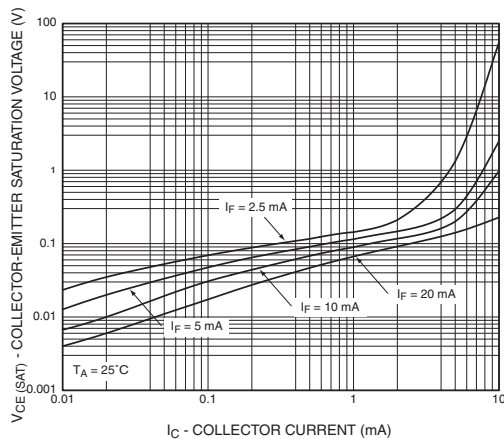
**Fig. 9 CTR vs. RBE (Saturated)  
(Black Package)**



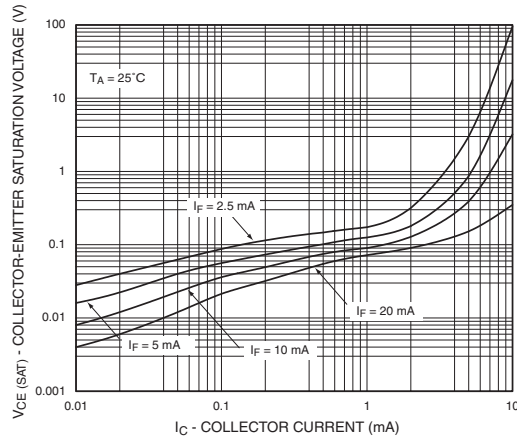
**Fig. 10 CTR vs. RBE (Saturated)  
(White Package)**



**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**

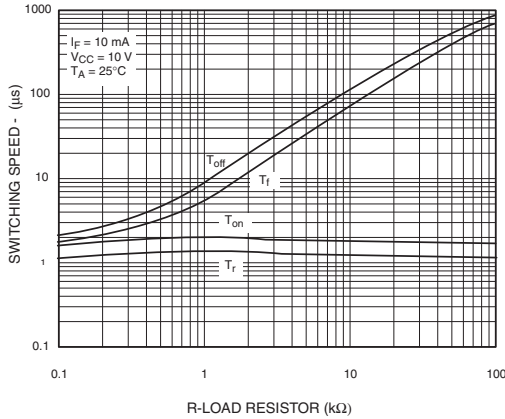
**4N27  
H11A2**

**4N28  
H11A3**

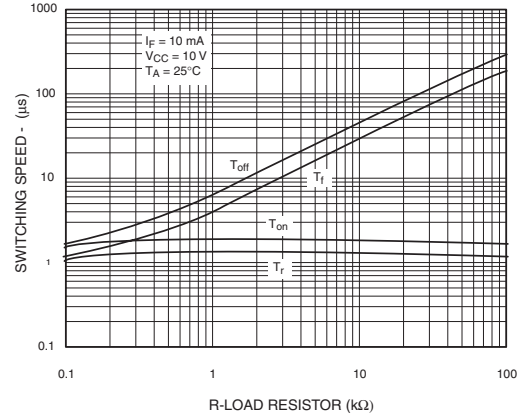
**4N35  
H11A4**

**4N36  
H11A5**

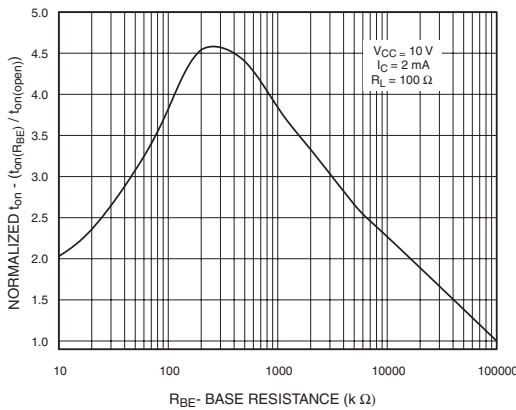
**Fig. 13 Switching Speed vs. Load Resistor  
(Black Package)**



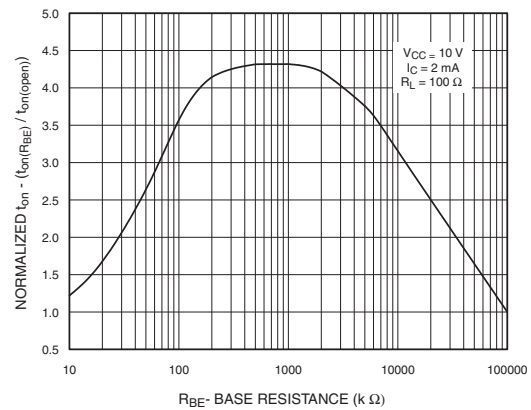
**Fig. 14 Switching Speed vs. Load Resistor  
(White Package)**



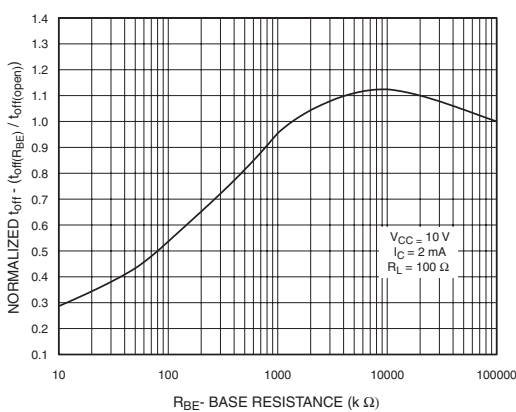
**Fig. 15 Normalized  $t_{on}$  vs.  $R_{BE}$   
(Black Package)**



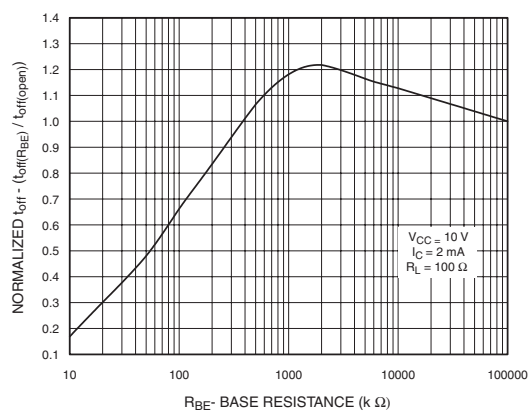
**Fig. 16 Normalized  $t_{on}$  vs.  $R_{BE}$   
(White Package)**



**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

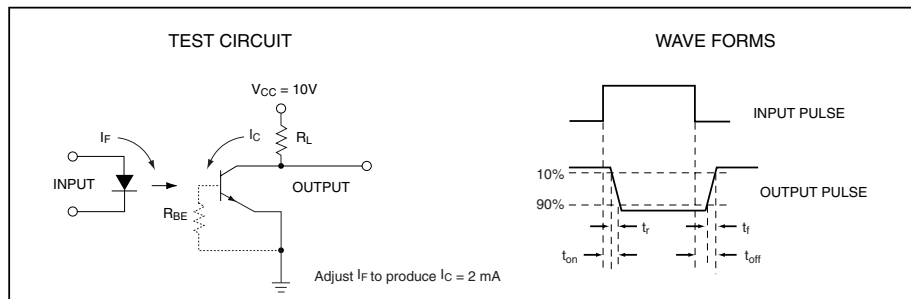
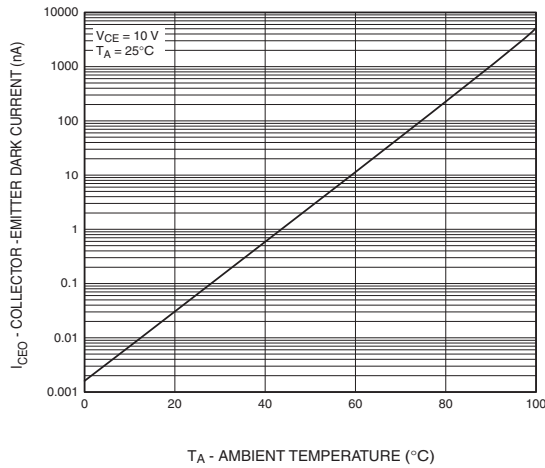


Figure 20. Switching Time Test Circuit and Waveforms

**4N25  
4N37**

**4N26  
H11A1**

**4N27  
H11A2**

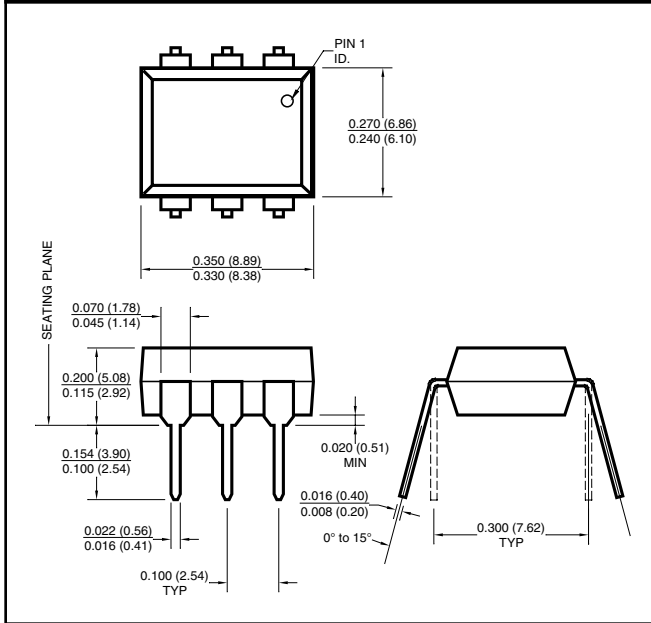
**4N28  
H11A3**

**4N35  
H11A4**

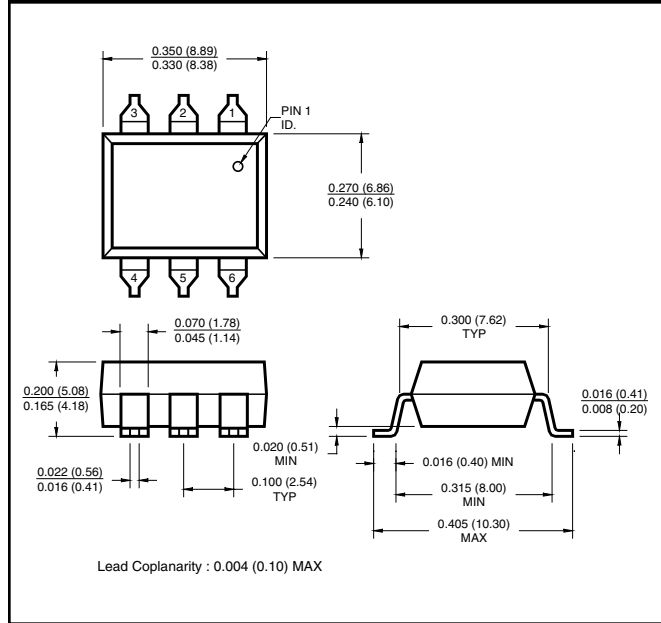
**4N36  
H11A5**

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

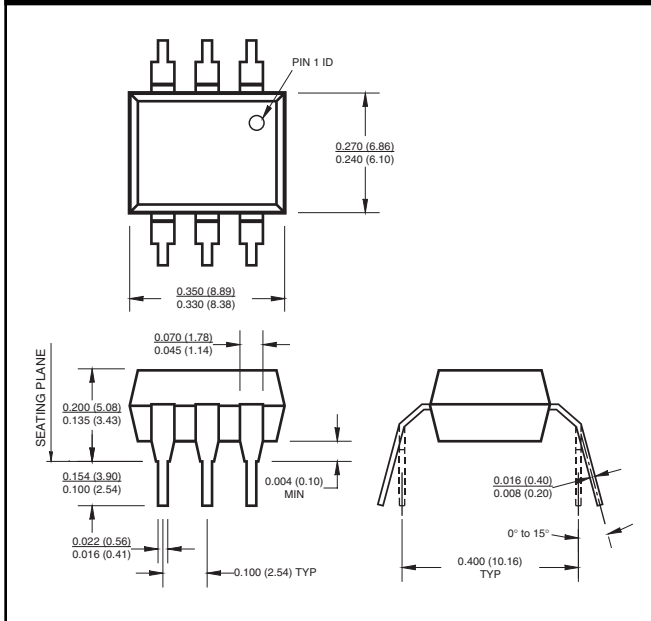
**Package Dimensions (Through Hole)**



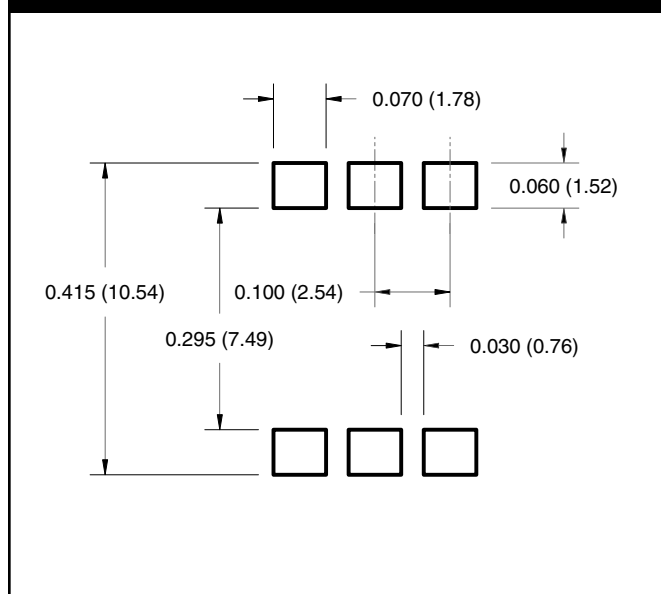
**Package Dimensions (Surface Mount)**



**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**

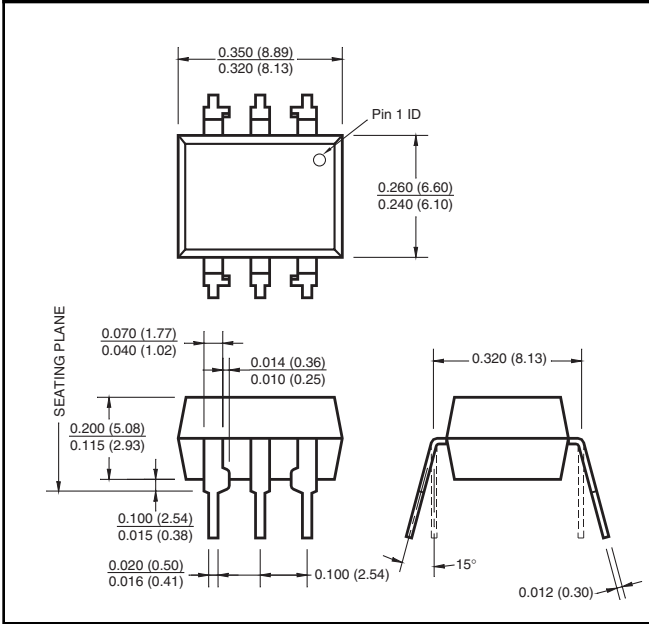
**4N28  
H11A3**

**4N35  
H11A4**

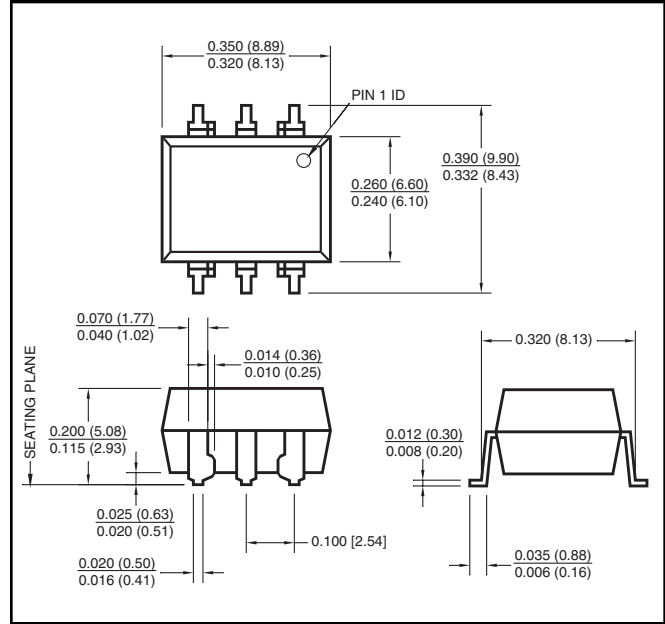
**4N36  
H11A5**

**White Package (-M Suffix)**

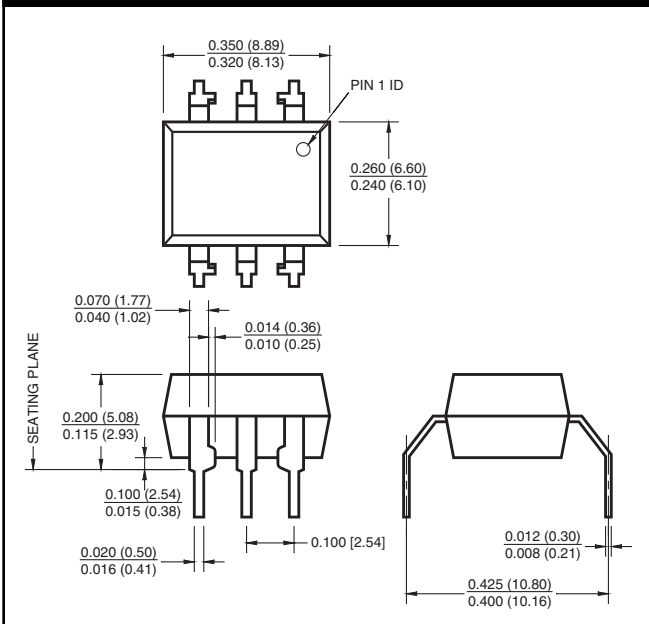
**Package Dimensions (Through Hole)**



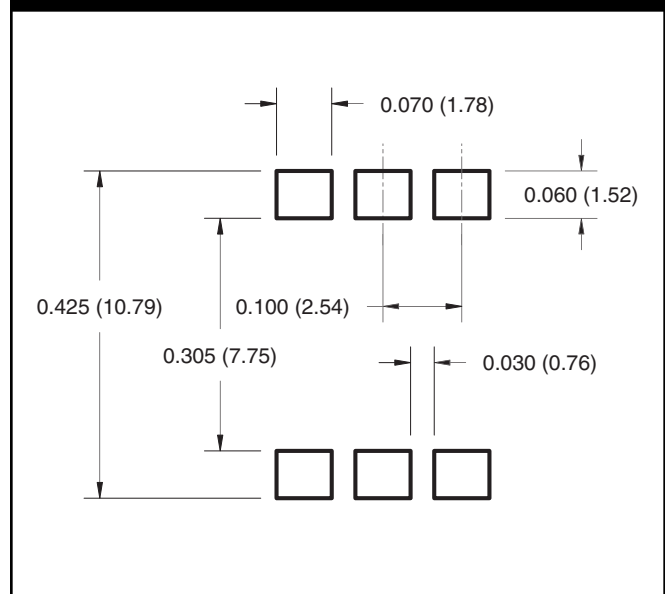
**Package Dimensions (Surface Mount)**



**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**

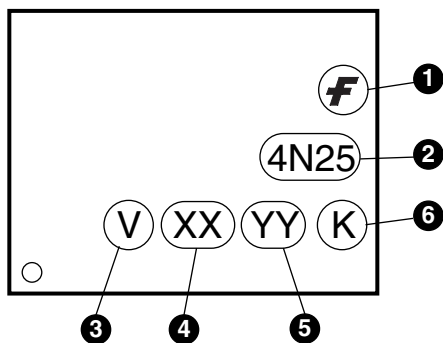
**4N35  
H11A4**

**4N36  
H11A5**

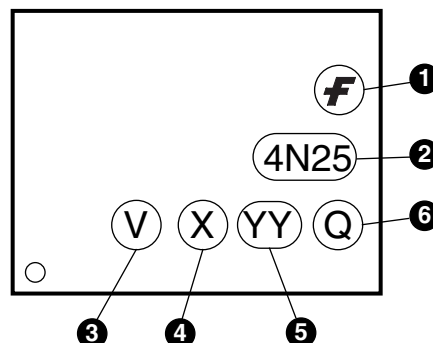
**ORDERING INFORMATION**

| 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 |

**MARKING INFORMATION**



**Black Package, No Suffix**



**White Package, -M Suffix**

| Definitions |  |
|-------------|--|
| 1           | Fairchild logo   |
| 2           | Device number  |
| 3           | VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table)   |
| 4           | One or two digit year code<br>• Two digits for black package parts, e.g., '03'<br>• One digit for white package parts, e.g., '3' |
| 5           | Two digit work week ranging from '01' to '53'  |
| 6           | Assembly package code  |

\*Note – Parts built in the white package (M suffix) that do not have the 'V' option (see definition 3 above) that are marked with date code '325' or earlier are marked in the portrait format.

**4N25  
4N37**

**4N26  
H11A1**

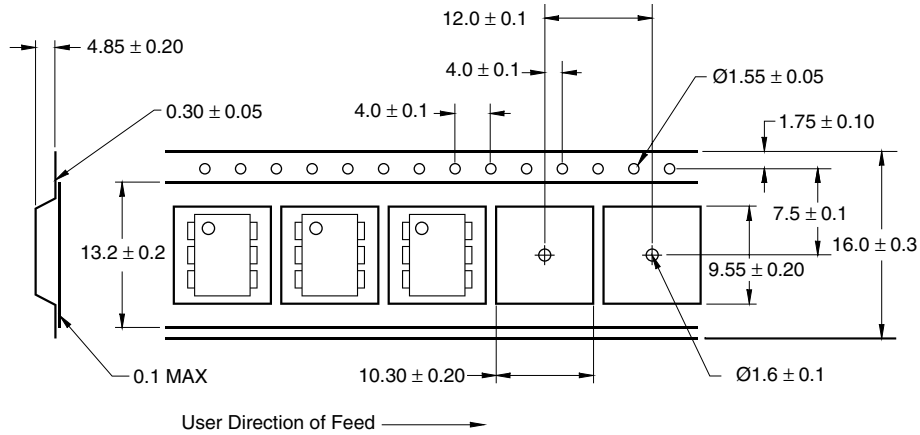
**4N27  
H11A2**

**4N28  
H11A3**

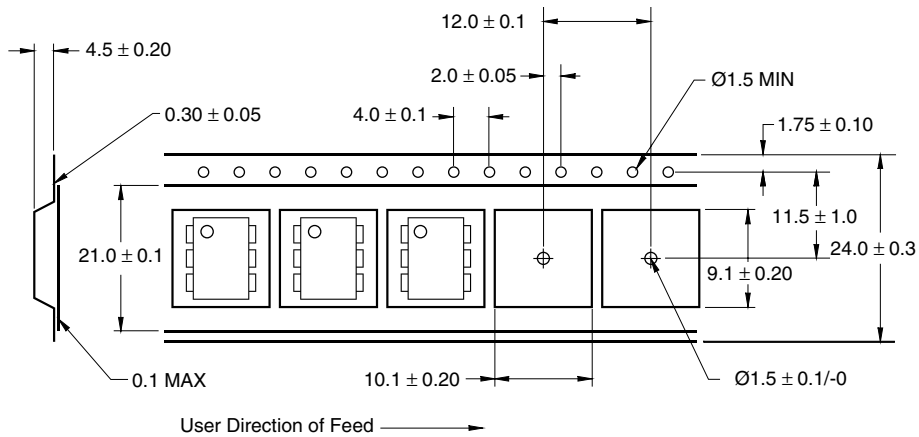
**4N35  
H11A4**

**4N36  
H11A5**

**QT Carrier Tape Specifications (Black Package, No Suffix)**



**QT Carrier Tape Specifications (White Package, -M Suffix)**



**4N25  
4N37**

**4N26  
H11A1**

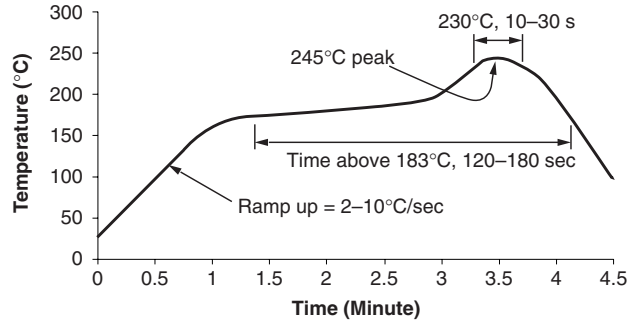
**4N27  
H11A2**

**4N28  
H11A3**

**4N35  
H11A4**

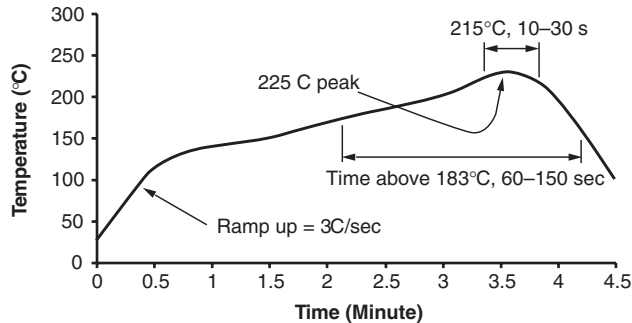
**4N36  
H11A5**

**Reflow Profile (White Package, -M Suffix)**



- Peak reflow temperature: 245°C (package surface temperature)
- Time of temperature higher than 183°C for 120-180 seconds
- One time soldering reflow is recommended

**Reflow Profile (Black Package, No Suffix)**



- Peak reflow temperature: 225°C (package surface temperature)
- Time of temperature higher than 183°C for 60-150 seconds
- One time soldering reflow is recommended

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**4N25  
4N37**

**4N26  
H11A1**

**4N27  
H11A2**

**4N28  
H11A3**

**4N35  
H11A4**

**4N36  
H11A5**

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