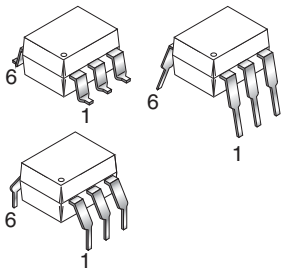
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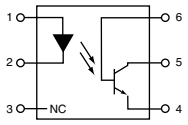
# GENERAL PURPOSE 6-PIN PHOTOTRANSISTOR OPTOCOUPLERS

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

## WHITE PACKAGE (-M SUFFIX)

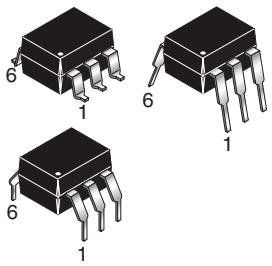



## SCHEMATIC




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

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## ABSOLUTE MAXIMUM RATINGS ($T_A$ = 25°C unless otherwise specified)

| Parameter | Symbol | Value | Units |
|---|---|---|---|
| **TOTAL DEVICE** | | | |
| Storage Temperature | $T_{STG}$ | -55 to +150 | °C |
| Operating Temperature | $T_{OPR}$ | -55 to +100 | °C |
| Wave solder temperature (see page 14 for reflow solder profiles) | $T_{SOL}$ | 260 for 10 sec | °C |
| Total Device Power Dissipation @ $T_A$ = 25°C | $P_D$ | 250 | mW |
| Derate above 25°C | | 3.3 (non-M), 2.94 (-M) | |
| **EMITTER** | | | |
| DC/Average Forward Input Current | $I_F$ | 100 (non-M), 60 (-M) | mA |
| Reverse Input Voltage | $V_R$ | 6 | V |
| Forward Current - Peak (300µs, 2% Duty Cycle) | $I_F$(pk) | 3 | A |
| LED Power Dissipation @ $T_A$ = 25°C | $P_D$ | 150 (non-M), 120 (-M) | mW |
| Derate above 25°C | | 2.0 (non-M), 1.41 (-M) | mW/°C |
| **DETECTOR** | | | |
| 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°C | $P_D$ | 150 | mW |
| Derate above 25°C | | 2.0 (non-M), 1.76 (-M) | mW/°C |

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## ELECTRICAL CHARACTERISTICS ($T_A$ = 25°C unless otherwise specified)

### INDIVIDUAL COMPONENT CHARACTERISTICS

| Parameter | Test Conditions | Symbol | Min | Typ* | Max | Unit |
|---|---|---|---|---|---|---|
| **EMITTER** | | | | | | |
| Input Forward Voltage | ($I_F$ = 10 mA) | $V_F$ | | 1.18 | 1.50 | V |
| Reverse Leakage Current | ($V_R$ = 6.0 V) | $I_R$ | | 0.001 | 10 | µA |
| **DETECTOR** | | | | | | |
| Collector-Emitter Breakdown Voltage | ($I_C$ = 1.0 mA, $I_F$ = 0) | $BV_{CEO}$ | 30 | 100 | | V |
| Collector-Base Breakdown Voltage | ($I_C$ = 100 µA, $I_F$ = 0) | $BV_{CBO}$ | 70 | 120 | | V |
| Emitter-Collector Breakdown Voltage | ($I_E$ = 100 µA, $I_F$ = 0) | $BV_{ECO}$ | 7 | 10 | | V |
| Collector-Emitter Dark Current | ($V_{CE}$ = 10 V, $I_F$ = 0) | $I_{CEO}$ | | 1 | 50 | nA |
| Collector-Base Dark Current | ($V_{CB}$ = 10 V) | $I_{CBO}$ | | | 20 | nA |
| Capacitance | ($V_{CE}$ = 0 V, f = 1 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 Hz, t = 1 min) | $V_{ISO}$ | 5300 | | | Vac(rms) |
| | ('-M', White Package) (f = 60 Hz, t = 1 sec) | | 7500 | | | Vac(pk) |
| Isolation Resistance | ($V_{I-O}$ = 500 VDC) | $R_{ISO}$ | $10^{11}$ | | | Ω |
| Isolation Capacitance | ($V_{I-O}$ = &, f = 1 MHz) | $C_{ISO}$ | | 0.5 | | pF |
| | ('-M' White Package) | | | 0.2 | 2 | pF |

Note
* Typical values at $T_A$ = 25°C

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**TRANSFER CHARACTERISTICS** ($T_A$ = 25°C Unless otherwise specified.)

| DC Characteristic | Test Conditions | Symbol | Device | Min | Typ* | Max | Unit |
|---|---|---|---|---|---|---|---|
| Current Transfer Ratio, Collector to Emitter | ($I_F$ = 10 mA, $V_{CE}$ = 10 V) | CTR | 4N35 4N36 4N37 | 100 | | | % |
| | | | H11A1 | 50 | | | |
| | | | H11A5 | 30 | | | |
| | | | 4N25 4N26 H11A2 H11A3 | 20 | | | |
| | | | 4N27 4N28 H11A4 | 10 | | | |
| | ($I_F$ = 10 mA, $V_{CE}$ = 10 V, $T_A$ = -55°C) | | 4N35 4N36 4N37 | 40 | | | |
| | ($I_F$ = 10 mA, $V_{CE}$ = 10 V, $T_A$ = +100°C) | | 4N35 4N36 4N37 | 40 | | | |
| Collector-Emitter Saturation Voltage | ($I_C$ = 2 mA, $I_F$ = 50 mA) | $V_{CE\ (SAT)}$ | 4N25 4N26 4N27 4N28 | | | 0.5 | V |
| | ($I_C$ = 0.5 mA, $I_F$ = 10 mA) | | 4N35 4N36 4N37 | | | 0.3 | |
| | | | H11A1 H11A2 H11A3 H11A4 H11A5 | | | 0.4 | |
| **AC Characteristic** Non-Saturated Turn-on Time | ($I_F$ = 10 mA, $V_{CC}$ = 10 V, $R_L$ = 100Ω) (Fig.20) | $T_{ON}$ | 4N25 4N26 4N27 4N28 H11A1 H11A2 H11A3 H11A4 H11A5 | | 2 | | µs |
| Non Saturated Turn-on Time | ($I_C$ = 2 mA, $V_{CC}$ = 10 V, $R_L$ = 100Ω) (Fig.20) | $T_{ON}$ | 4N35 4N36 4N37 | | 2 | 10 | µs |

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**TRANSFER CHARACTERISTICS** ($T_A$ = 25°C Unless otherwise specified.) (Continued)

| AC Characteristic | Test Conditions | Symbol | Device | Min | Typ* | Max | Unit |
|---|---|---|---|---|---|---|---|
| Turn-off Time | ($I_F$ = 10 mA, $V_{CC}$ = 10 V, $R_L$ = 100Ω) (Fig.20) | $T_{OFF}$ | 4N25<br>4N26<br>4N27<br>4N28<br>H11A1<br>H11A2<br>H11A3<br>H11A4<br>H11A5 | | 2 | | µs |
| | ($I_C$ = 2 mA, $V_{CC}$ = 10 V, $R_L$ = 100Ω) (Fig.20) | | 4N35<br>4N36<br>4N37 | | 2 | 10 | |

* Typical values at $T_A$ = 25°C

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## TYPICAL PERFORMANCE CURVES

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

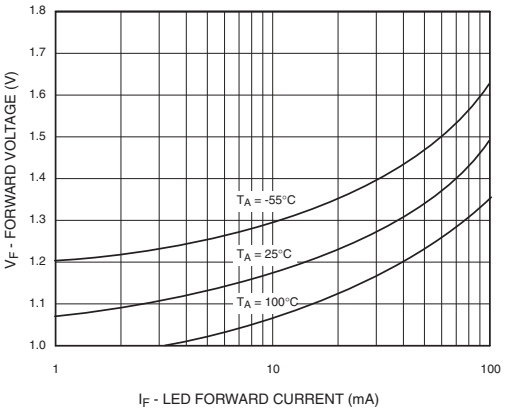



**Fig. 2 LED Forward Voltage vs. Forward Current (White Package)**

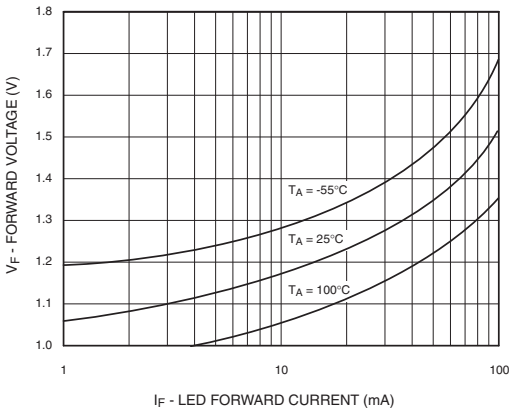



**Fig.3 Normalized CTR vs. Forward Current (Black Package)**

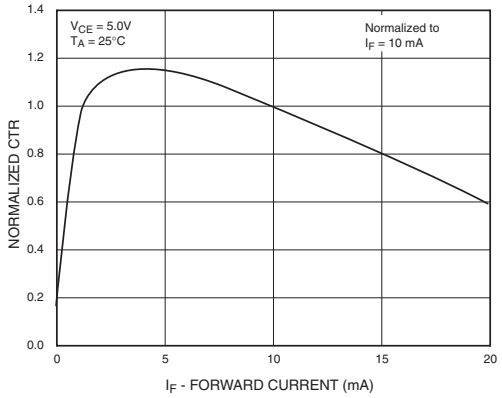



**Fig.4 Normalized CTR vs. Forward Current (White Package)**

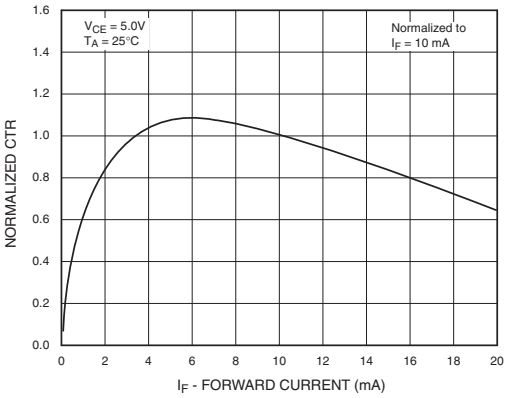



**Fig. 5 Normalized CTR vs. Ambient Temperature (Black Package)**

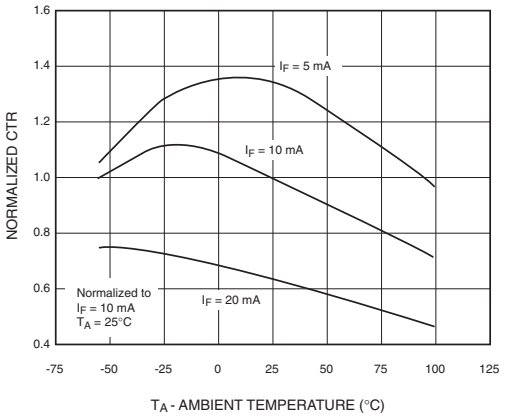
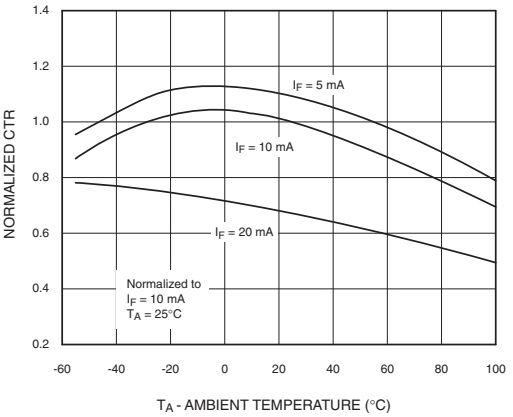



**Fig. 6 Normalized CTR vs. Ambient Temperature (White Package)**




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

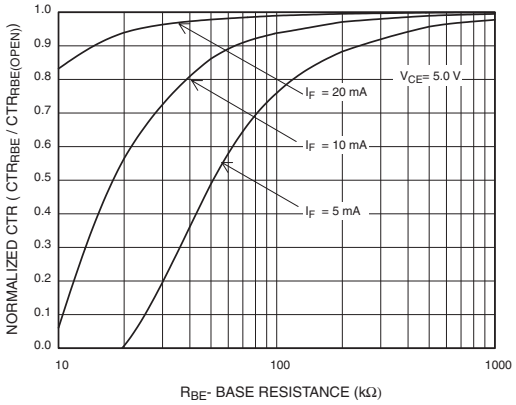



**Fig. 8 CTR vs. RBE (Unsaturated) (White Package)**

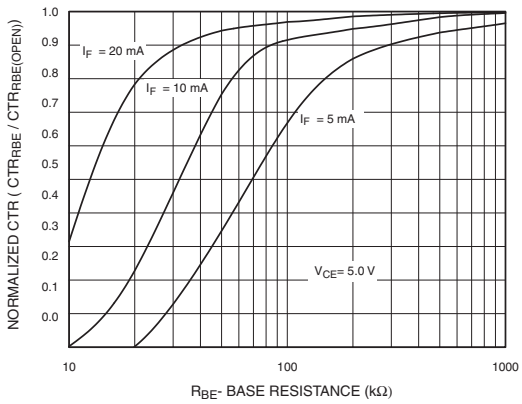



**Fig. 9 CTR vs. RBE (Saturated) (Black Package)**

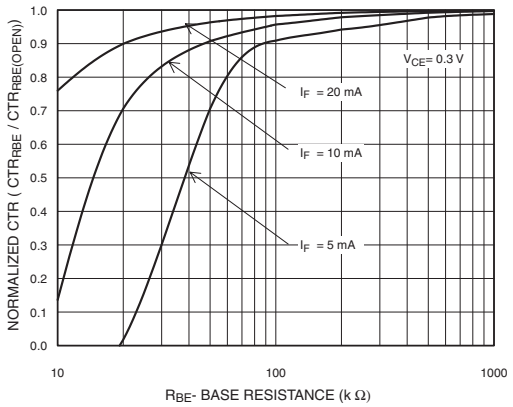



**Fig. 10 CTR vs. RBE (Saturated) (White Package)**

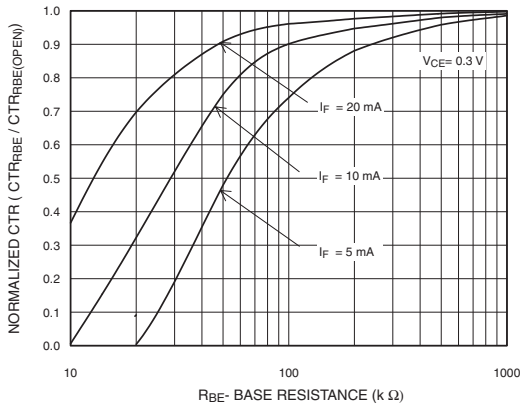



**Fig. 11 Collector-Emitter Saturation Voltage vs Collector Current (Black Package)**

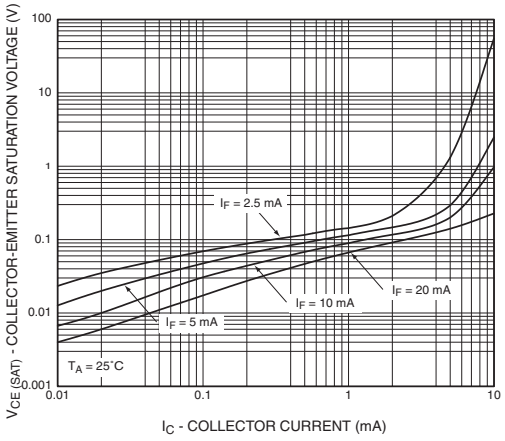
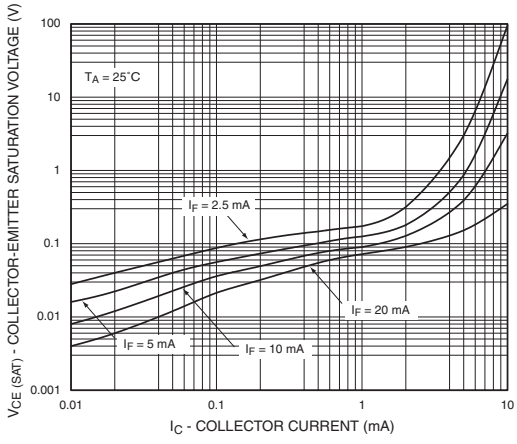



**Fig. 12 Collector-Emitter Saturation Voltage vs Collector Current (White Package)**




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

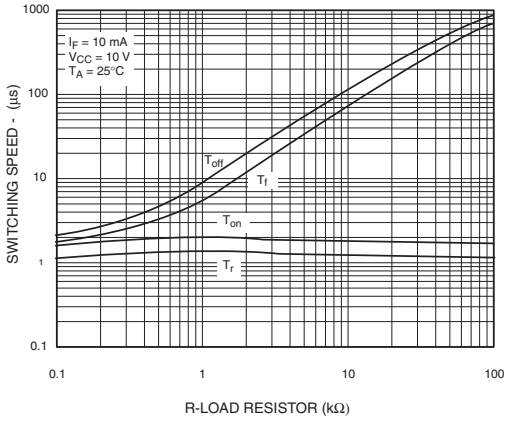



**Fig. 14 Switching Speed vs. Load Resistor (White Package)**

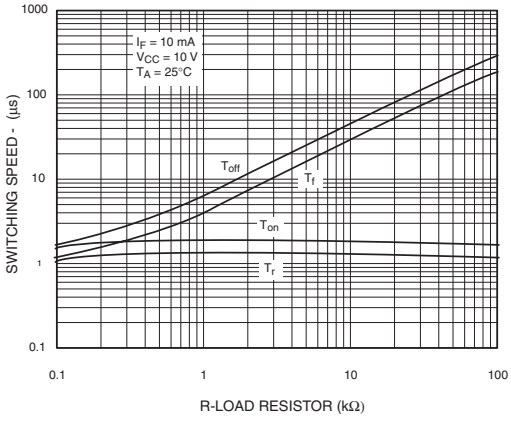



**Fig. 15 Normalized $t_{on}$ vs. $R_{BE}$ (Black Package)**

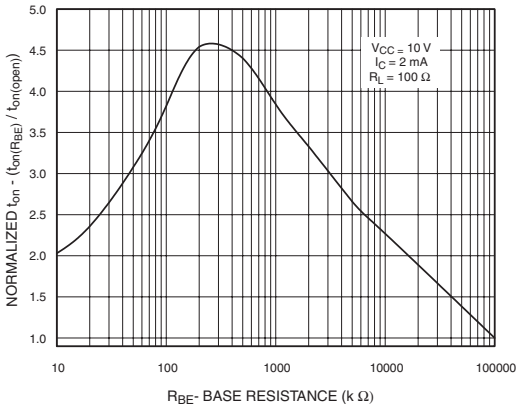



**Fig. 16 Normalized $t_{on}$ vs. $R_{BE}$ (White Package)**

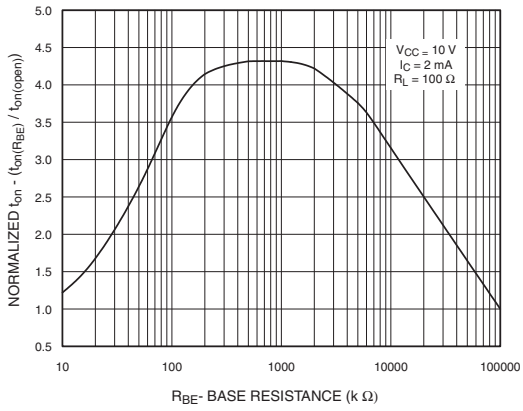



**Fig. 17 Normalized $t_{off}$ vs. $R_{BE}$ (Black Package)**

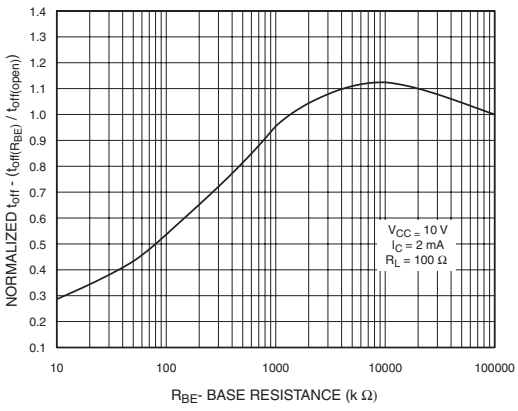
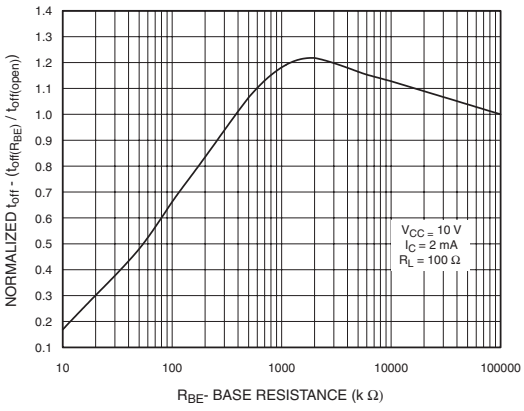
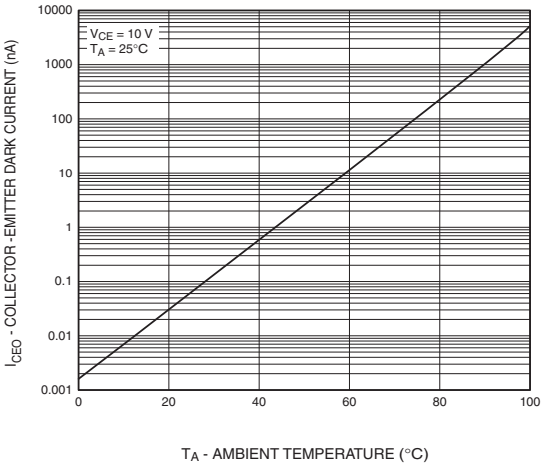



**Fig. 18 Normalized $t_{off}$ vs. $R_{BE}$ (White Package)**




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**Fig. 19 Dark Current vs. Ambient Temperature**



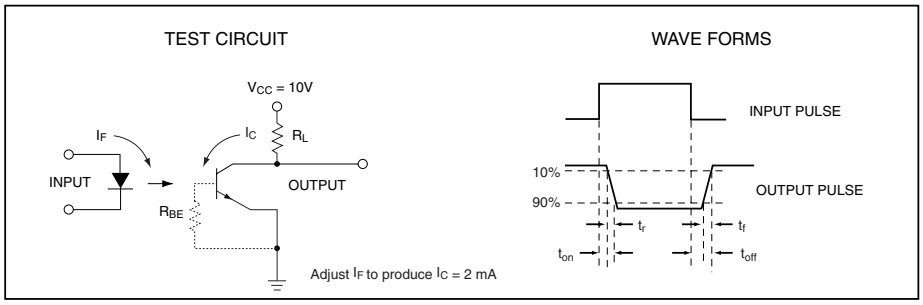
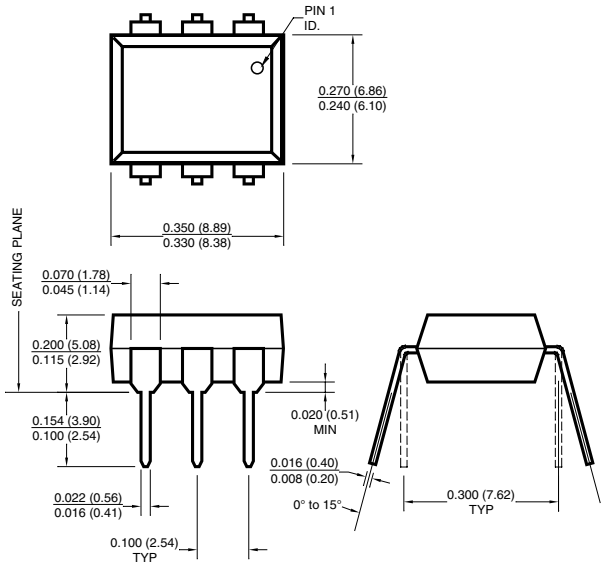



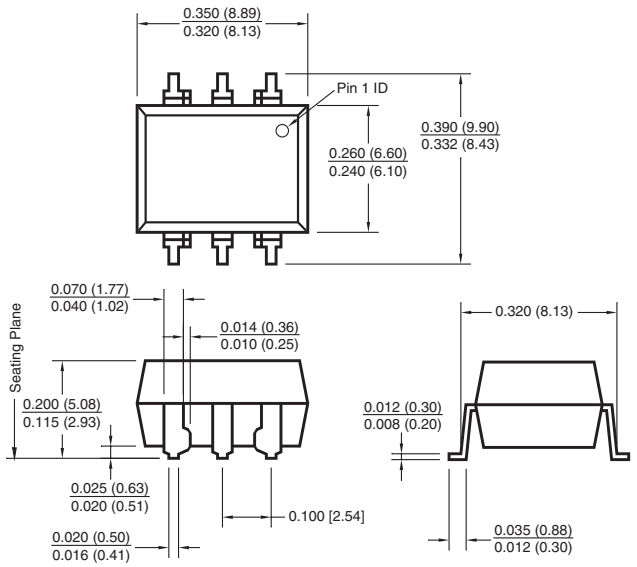

**Figure 20. Switching Time Test Circuit and Waveforms**

## Black Package (No -M Suffix)

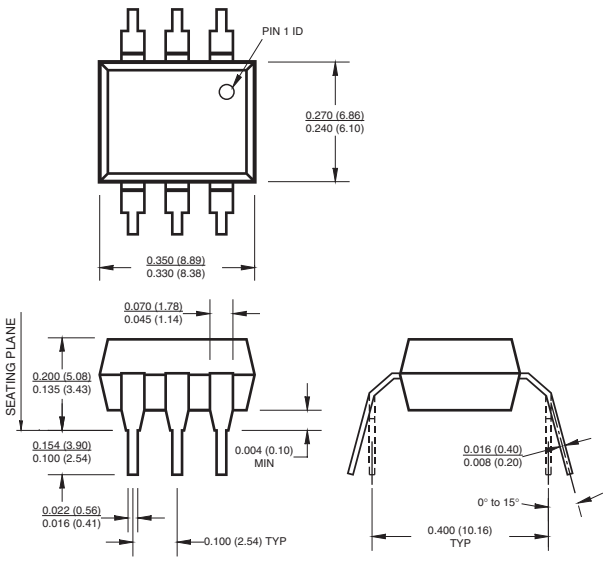
### Package Dimensions (Through Hole)



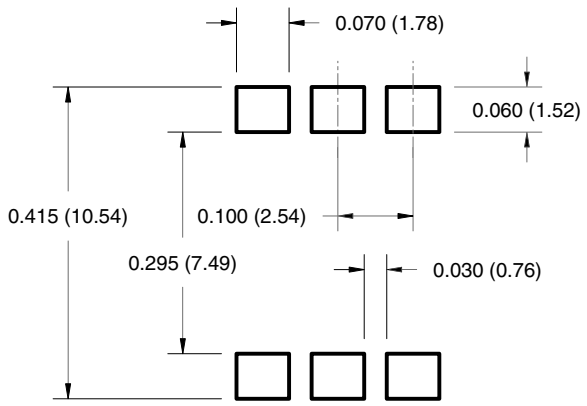

### Package Dimensions (Surface Mount)




### Package Dimensions (0.4” Lead Spacing)




### Recommended Pad Layout for Surface Mount Leadform




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

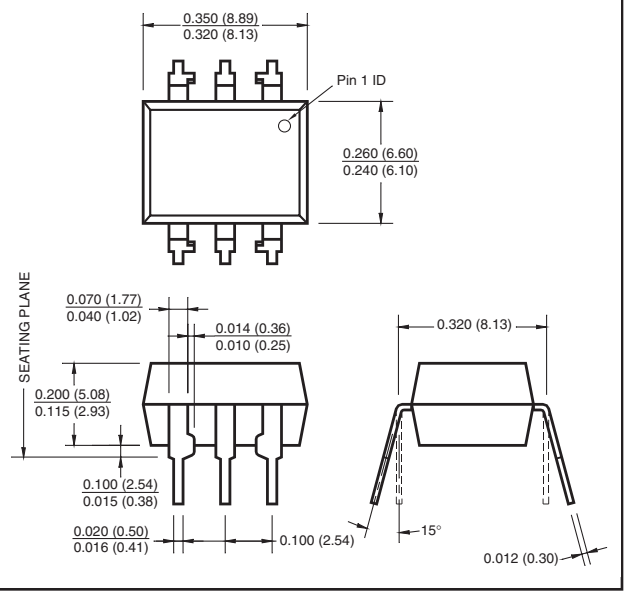
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# GENERAL PURPOSE 6-PIN PHOTOTRANSISTOR OPTOCOUPLERS

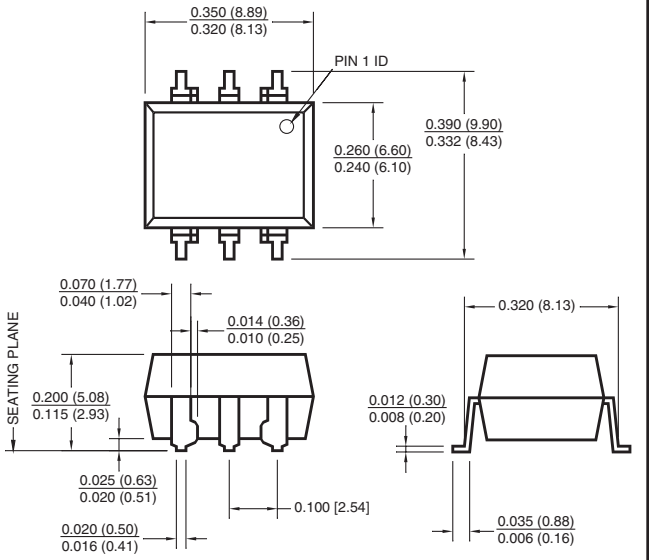
| | | | | | |
|---|---|---|---|---|---|
| 4N25 | 4N26 | 4N27 | 4N28 | 4N35 | 4N36 |
| 4N37 | H11A1 | H11A2 | H11A3 | H11A4 | H11A5 |

## White Package (-M Suffix)

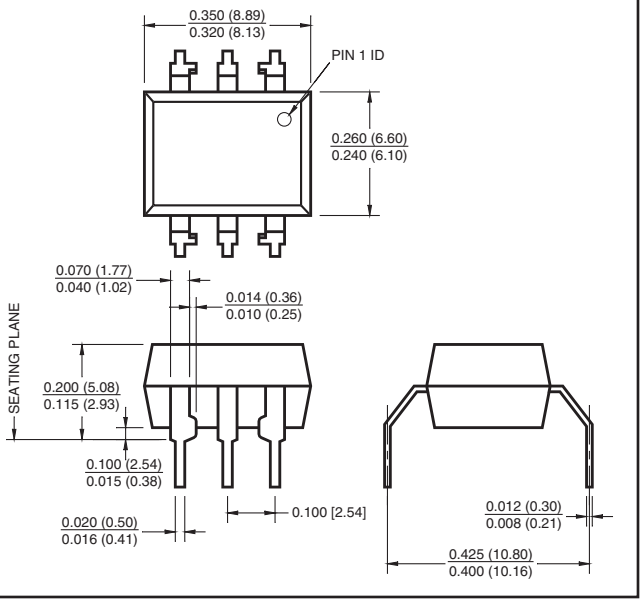
### Package Dimensions (Through Hole)



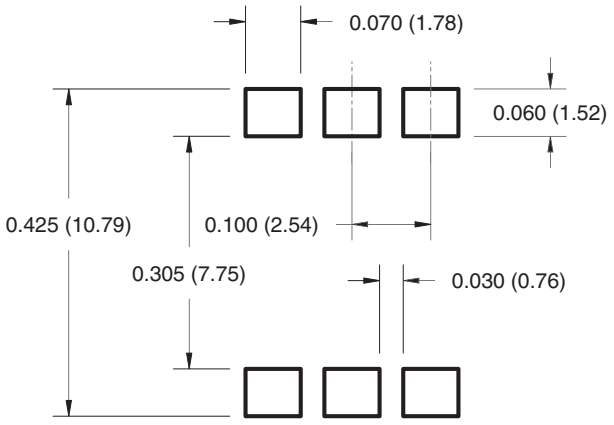

### Package Dimensions (Surface Mount)




### Package Dimensions (0.4" Lead Spacing)




### Recommended Pad Layout for Surface Mount Leadform



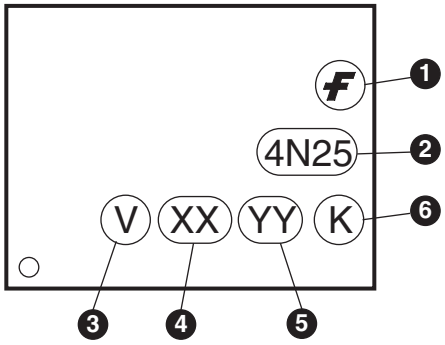

**NOTE**
All dimensions are in inches (millimeters)

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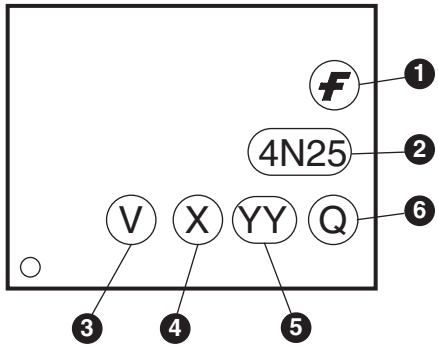
## ORDERING INFORMATION

| 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**



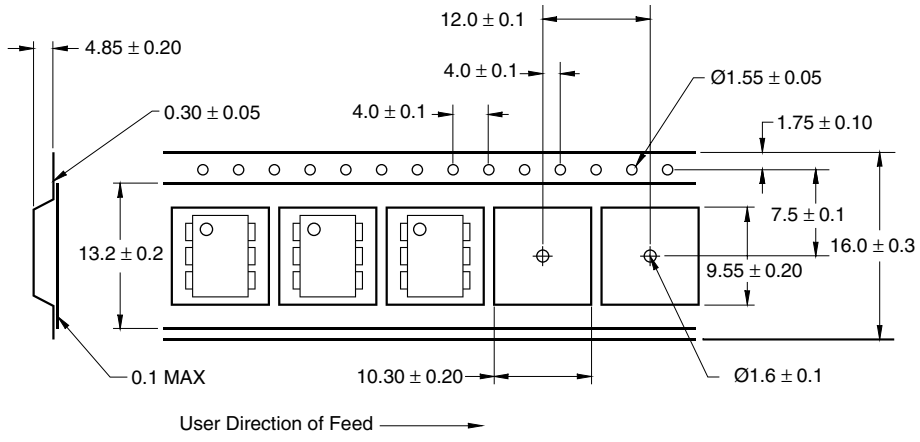

**White Package, -M Suffix**

| 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 |

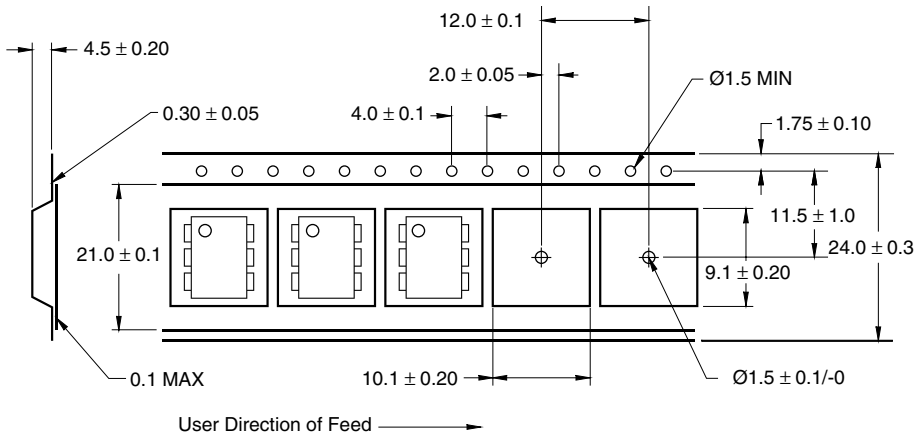
*Note – Parts built in the white package (M suffix) that do not have the 'V' option (see definition 3 above) that are marked with date code '325' or earlier are marked in the portrait format.

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

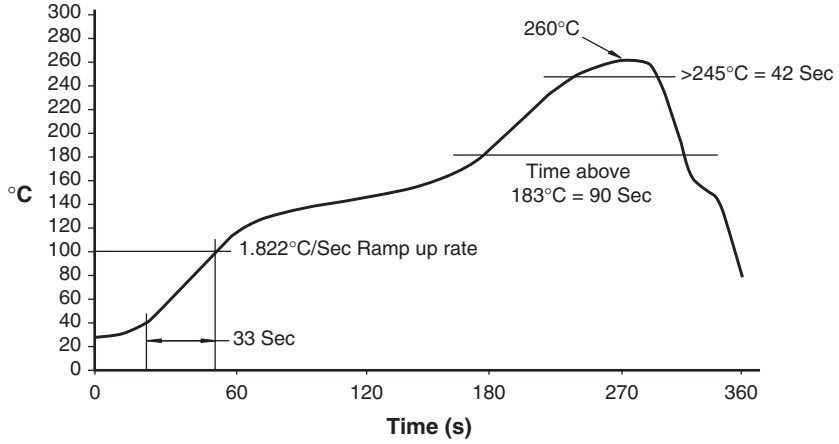



## QT Carrier Tape Specifications (White Package, -M Suffix)

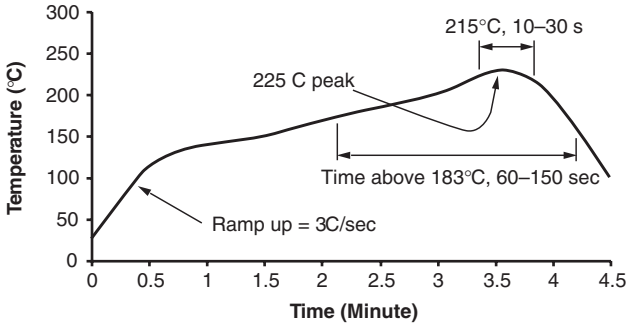



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## Reflow Profile (White Package, -M Suffix)




## 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

# GENERAL PURPOSE 6-PIN PHOTOTRANSISTOR OPTOCOUPLERS

| | | | | | |
|---|---|---|---|---|---|
| **4N25** | **4N26** | **4N27** | **4N28** | **4N35** | **4N36** |
| **4N37** | **H11A1** | **H11A2** | **H11A3** | **H11A4** | **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.

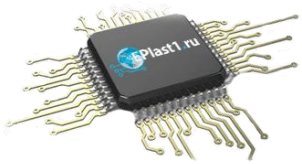
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- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.




**Как с нами связаться**

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