

# CNY17-1, CNY17-3, CNY17-2, CNY17-4 Phototransistor Optocouplers

## Features

- CNY17-1/2/3 are also available in white package by specifying -M suffix (eg. CNY17-2-M)
- UL recognized (File # E90700)
- VDE recognized
  - 102497 for white package
  - Add option V for white package (e.g., CNY17-2V-M)
  - File #102497
  - Add option '300' for black package (e.g., CNY17-2.300)
  - File #94766
- Current transfer ratio in select groups
- High  $BV_{CEO}$ —70V minimum

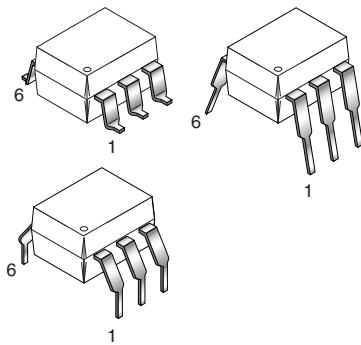
## Applications

- Power supply regulators
- Digital logic inputs
- Microprocessor inputs
- Appliance sensor systems
- Industrial controls

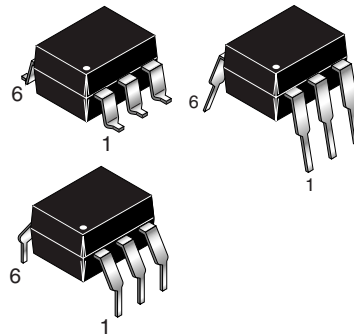
## Description

The CNY17 series consists of a Gallium Arsenide IRED coupled with an NPN phototransistor.

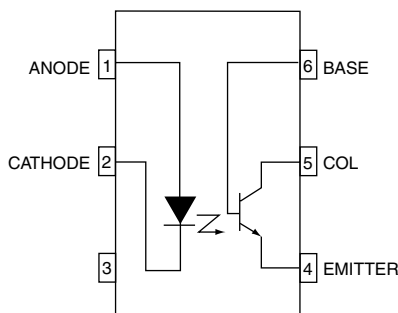
### White Package (-M Suffix)



### Black Package (No -M Suffix)



## Schematic



| Parameters  | Symbol     | Device | Value          | Units |
|---|------------|--------|----------------|-------|
| <b>TOTAL DEVICE</b>                                       |            |        |                |       |
| Storage Temperature                                       | $T_{STG}$  | All    | -55 to +150    | °C    |
| Operating Temperature                                     | $T_{OPR}$  | All    | -55 to +100    | °C    |
| Lead Solder Temperature                                   | $T_{SOL}$  | All    | 260 for 10 sec | °C    |
| Total Device Power Dissipation @ 25°C (LED plus detector) | $P_D$      | -M     | 250            | mW    |
| Derate Linearly From 25°C                                 |            | non -M | 260            |       |
|   |            | -M     | 2.94           | mW/°C |
|   |            | non -M | 3.50           |       |
| <b>EMITTER</b>  |            |        |                |       |
| Continuous Forward Current                                | $I_F$      | -M     | 60             | mA    |
|   |            | non -M | 90             |       |
| Reverse Voltage   | $V_R$      | All    | 6              | V     |
| Forward Current - Peak (1 $\mu$ s pulse, 300 pps)         | $I_F$ (pk) | -M     | 1.5            | A     |
|   |            | non -M | 3.0            |       |
| LED Power Dissipation 25°C Ambient                        | $P_D$      | -M     | 120            | mW    |
| Derate Linearly From 25°C                                 |            | non -M | 135            |       |
|   |            | -M     | 1.41           | mW/°C |
|   |            | non -M | 1.8            |       |
| <b>DETECTOR</b>   |            |        |                |       |
| Detector Power Dissipation @ 25°C                         | $P_D$      | -M     | 150            | mW    |
| Derate Linearly from 25°C                                 |            | non -M | 200            |       |
|   |            | -M     | 1.76           | mW/°C |
|   |            | non -M | 2.67           |       |

### Electrical Characteristics ( $T_A = 25^\circ\text{C}$ Unless otherwise specified.)

#### Individual Component Characteristics

| Parameters              | Test Conditions                        | Symbol     | Device | Min | Typ   | Max  | Units         |
|-------------------------|--|------------|--------|-----|-------|------|---------------|
| <b>EMITTER</b>          |  |            |        |     |       |      |               |
| Input Forward Voltage   | $I_F = 60\text{ mA}$                   | $V_F$      | -M     |     | 1.35  | 1.65 | V             |
|                         | $I_F = 10\text{ mA}$                   |            | non -M |     | 1.15  | 1.50 |               |
| Capacitance             | $V_F = 0\text{ V}, f = 1.0\text{ MHz}$ | $C_J$      | non -M |     | 50    |      | pF            |
|                         |  |            | -M     |     | 18    |      |               |
| Reverse Leakage Current | $V_R = 6\text{ V}$                     | $I_R$      | All    |     | 0.001 | 10   | $\mu\text{A}$ |
| <b>DETECTOR</b>         |  |            |        |     |       |      |               |
| Breakdown Voltage       | Collector to Emitter                   | $BV_{CEO}$ | All    | 70  | 100   |      | V             |
|                         | Collector to Base                      | $BV_{CBO}$ | All    | 70  | 120   |      | V             |
|                         | Emitter to Collector                   | $BV_{ECO}$ | All    | 7   | 10    |      | V             |
| Leakage Current         | Collector to Emitter                   | $I_{CEO}$  | All    |     | 1     | 50   | nA            |
|                         | Collector to Base                      | $I_{CBO}$  | All    |     |       | 20   | nA            |
| Capacitance             | Collector to Emitter                   | $C_{CE}$   | All    |     | 8     |      | pF            |
|                         | Collector to Base                      | $C_{CB}$   | All    |     | 20    |      | pF            |
|                         | Emitter to Base                        | $C_{EB}$   | All    |     | 10    |      | pF            |

## Isolation Characteristics

| Characteristic                 | Test Conditions                 | Symbol           | Device             | Min  | Typ** | Max | Units     |
|--------------------------------|---------------------------------|------------------|--------------------|------|-------|-----|-----------|
| Input-Output Isolation Voltage | f = 60 Hz, t = 1 min.           | V <sub>ISO</sub> | Black Package      | 5300 |       |     | Vac(rms)* |
|                                |                                 |                  | '-M' White Package | 7500 |       |     | Vac(pk)   |
| Isolation Resistance           | V <sub>I-O</sub> = 500 VDC      | R <sub>ISO</sub> | All                | 1011 |       |     | Ω         |
| Isolation Capacitance          | V <sub>I-O</sub> = Ø, f = 1 MHz | C <sub>ISO</sub> | Black Package      |      | 0.5   |     | pF        |
|                                |                                 |                  | '-M' White Package |      | 0.2   |     |           |

Note

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

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

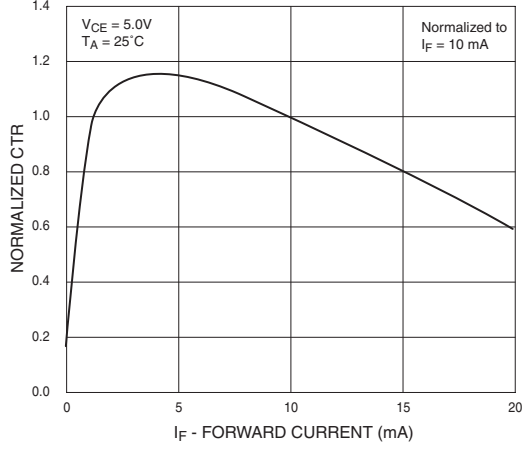
## Transfer Characteristics (T<sub>A</sub> = 25°C Unless otherwise specified.)

| DC Characteristics                           | Test Conditions   | Symbol               | Device                    | Min | Typ | Max  | Units |
|--|---|----------------------|---------------------------|-----|-----|------|-------|
| Current Transfer Ratio, Collector to Emitter | I <sub>F</sub> = 10 mA, V <sub>CE</sub> = 5 V                         | CTR                  | CNY17-1/-1-M              | 40  |     | 80   | %     |
|  |   |                      | CNY17-2/-2-M              | 63  |     | 125  |       |
|  |   |                      | CNY17-3/-3-M              | 100 |     | 200  |       |
|  |   |                      | CNY17-4                   | 160 |     | 320  |       |
| Saturation Voltage                           | I <sub>F</sub> = 10 mA, I <sub>C</sub> = 2.5 mA                       | V <sub>CE(SAT)</sub> | All                       |     |     | .40  | V     |
| AC Characteristics                           | Test Conditions   | Symbol               | Device                    | Min | Typ | Max  | Units |
| <b>Non-Saturated Switching Times</b>         |   |                      |                           |     |     |      |       |
| Turn-On Time (Fig.19 and Fig.20)             | R <sub>L</sub> = 100 Ω, I <sub>C</sub> = 2 mA, V <sub>CC</sub> = 10 V | t <sub>on</sub>      | non -M                    |     |     | 10   | μs    |
| Turn-Off Time (Fig.19 and Fig.20)            | R <sub>L</sub> = 100 Ω, I <sub>C</sub> = 2 mA, V <sub>CC</sub> = 10 V | t <sub>off</sub>     | non -M                    |     |     | 10   | μs    |
| Delay Time (Fig.19 and Fig.20)               | I <sub>F</sub> = 10 mA, V <sub>CC</sub> = 5 V, R <sub>L</sub> = 75 Ω  | t <sub>d</sub>       | -M                        |     |     | 5.6  | μs    |
| Rise Time (Fig.19 and Fig.20)                | I <sub>F</sub> = 10 mA, V <sub>CC</sub> = 5 V, R <sub>L</sub> = 75 Ω  | t <sub>r</sub>       | -M                        |     |     | 4.0  | μs    |
| Storage Time (Fig.19 and Fig.20)             | I <sub>F</sub> = 10 mA, V <sub>CC</sub> = 5 V, R <sub>L</sub> = 75 Ω  | t <sub>s</sub>       | -M                        |     |     | 4.1  | μs    |
| Fall Time (Fig.19 and Fig.20)                | I <sub>F</sub> = 10 mA, V <sub>CC</sub> = 5 V, R <sub>L</sub> = 75 Ω  | t <sub>f</sub>       | -M                        |     |     | 3.5  | μs    |
| <b>Saturated Switching Times</b>             |   |                      |                           |     |     |      |       |
| Turn-On Time (Fig.19 and Fig.20)             | I <sub>F</sub> = 20 mA, V <sub>CE</sub> = 0.4 V                       | t <sub>on</sub>      | CNY17-1                   |     |     | 5.5  | μs    |
|  | I <sub>F</sub> = 10 mA, V <sub>CE</sub> = 0.4 V                       |                      | CNY17-2, CNY17-3, CNY17-4 |     |     | 8.0  |       |
| Rise-Time (Fig.19 and Fig.20)                | I <sub>F</sub> = 20 mA, V <sub>CE</sub> = 0.4 V                       | t <sub>r</sub>       | CNY17-1                   |     |     | 4.0  | μs    |
|  | I <sub>F</sub> = 10 mA, V <sub>CE</sub> = 0.4 V                       |                      | CNY17-2, CNY17-3, CNY17-4 |     |     | 6.0  |       |
|  | I <sub>F</sub> = 20 mA, V <sub>CC</sub> = 5 V, R <sub>L</sub> = 1 KΩ  |                      | CNY17-1-M                 |     |     | 4.0  |       |
|  | I <sub>F</sub> = 10 mA, V <sub>CC</sub> = 5 V, R <sub>L</sub> = 1 KΩ  |                      | CNY17-2-M, CNY17-3-M      |     |     | 6.0  |       |
| Delay Time (Fig.19 and Fig.20)               | I <sub>F</sub> = 20 mA, V <sub>CC</sub> = 5 V, R <sub>L</sub> = 1 KΩ  | t <sub>d</sub>       | CNY17-1-M                 |     |     | 5.5  | μs    |
|  | I <sub>F</sub> = 10 mA, V <sub>CC</sub> = 5 V, R <sub>L</sub> = 1 KΩ  |                      | CNY17-2, CNY17-3          |     |     | 8.0  |       |
| Turn-Off Time (Fig.19 and Fig.20)            | I <sub>F</sub> = 20 mA, V <sub>CE</sub> = 0.4 V                       | t <sub>off</sub>     | CNY17-1                   |     |     | 34.0 | ms    |
|  | I <sub>F</sub> = 10 mA, V <sub>CE</sub> = 0.4 V                       |                      | CNY17-2, CNY17-3, CNY17-4 |     |     | 39.0 |       |

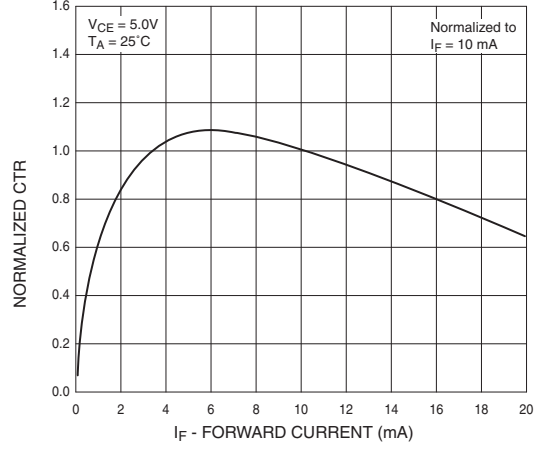
**Transfer Characteristics** ( $T_A = 25^\circ\text{C}$  Unless otherwise specified.) (Continued)

| DC Characteristics                 | Test Conditions   | Symbol | Device                          | Min | Typ | Max  | Units         |
|------------------------------------|---|--------|---------------------------------|-----|-----|------|---------------|
| Fall-Time (Fig. 19 and Fig. 20)    | $I_F = 20\text{ mA}, V_{CE} = 0.4\text{V}$                      | $t_f$  | CNY17-1                         |     |     | 20.0 | $\mu\text{s}$ |
|                                    | $I_F = 10\text{ mA}, V_{CE} = 0.4\text{V}$                      |        | CNY17-2,<br>CNY17-3,<br>CNY17-4 |     |     | 24.0 |               |
|                                    | $I_F = 20\text{ mA}, V_{CC} = 5\text{V}, R_L = 1\text{K}\Omega$ |        | CNY17-1-M                       |     |     | 20.0 |               |
|                                    | $I_F = 10\text{ mA}, V_{CC} = 5\text{V}, R_L = 1\text{K}\Omega$ |        | CNY17-2-M,<br>CNY17-3-M,        |     |     | 24.0 |               |
| Storage Time (Fig. 19 and Fig. 20) | $I_F = 20\text{ mA}, V_{CC} = 5\text{V}, R_L = 1\text{K}\Omega$ | $t_s$  | CNY17-1-M                       |     |     | 34.0 | $\mu\text{s}$ |
|                                    | $I_F = 10\text{ mA}, V_{CC} = 5\text{V}, R_L = 1\text{K}\Omega$ |        | CNY17-2-M,<br>CNY17-3-M,        |     |     | 39.0 |               |

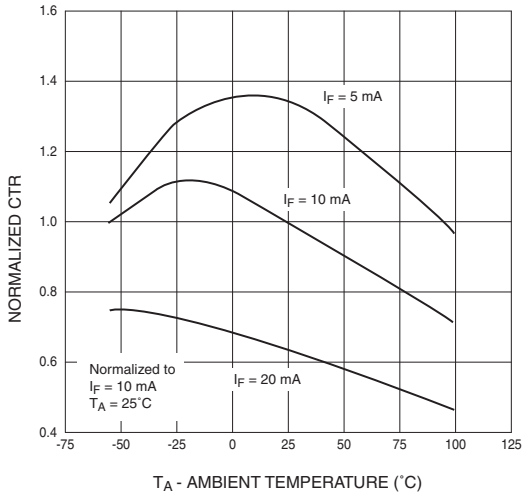
**Fig.1 Normalized CTR vs. Forward Current (Black Package)**



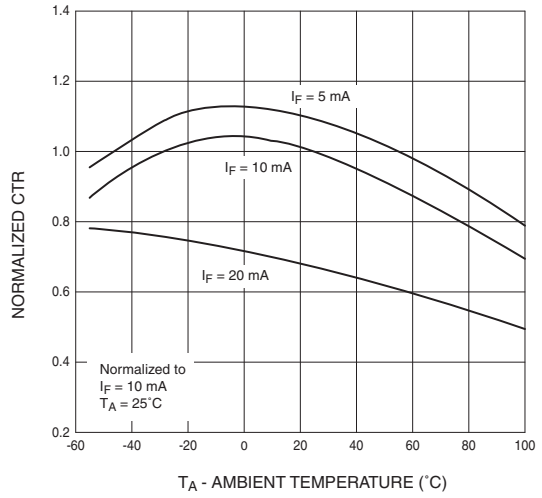
**Fig.2 Normalized CTR vs. Forward Current (White Package)**



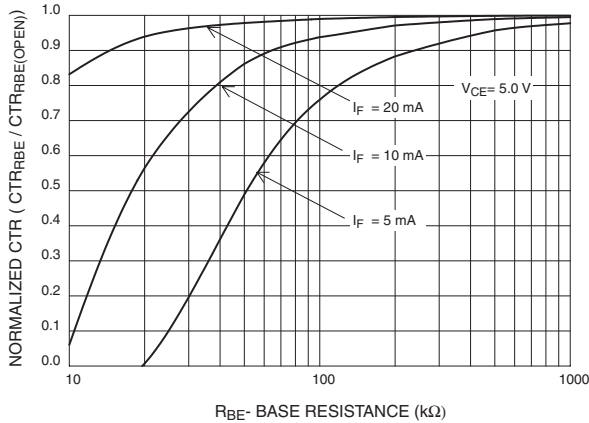
**Fig.3 Normalized CTR vs. Ambient Temperature (Black Package)**



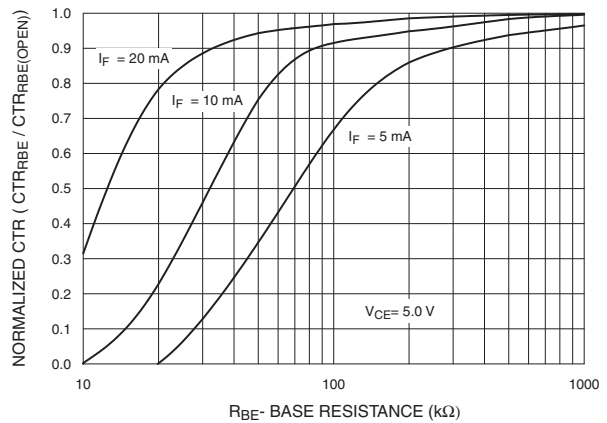
**Fig.4 Normalized CTR vs. Ambient Temperature (White Package)**



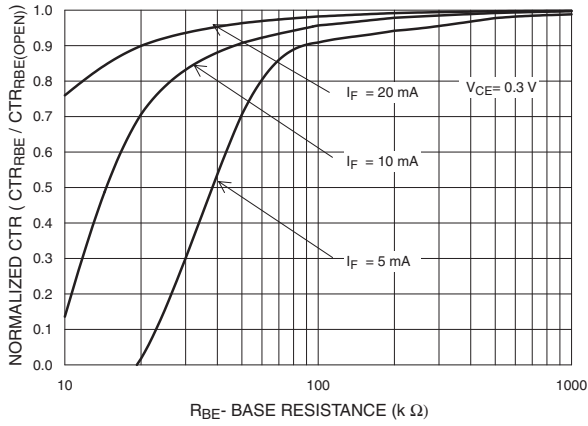
**Fig.5 CTR vs. R\_BE (Unsaturated) (Black Package)**



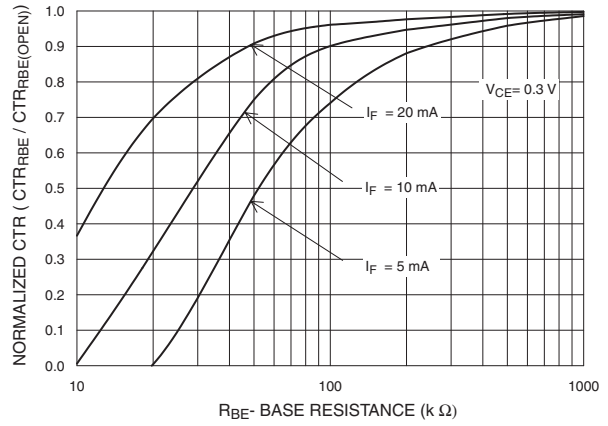
**Fig.6 CTR vs. R\_BE (Unsaturated) (White Package)**



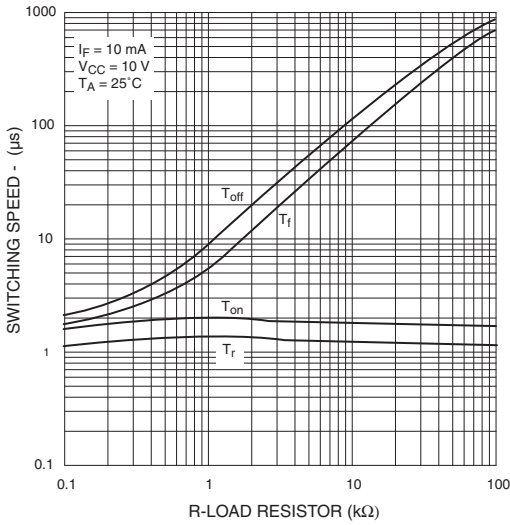
**Fig. 7 CTR vs. RBE (Saturated)  
(Black Package)**



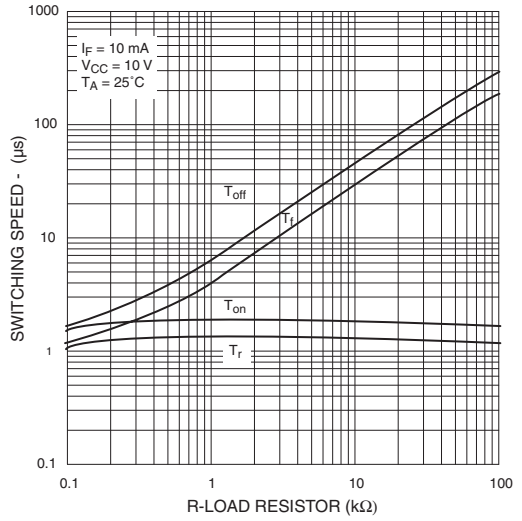
**Fig. 8 CTR vs. RBE (Saturated)  
(White Package)**



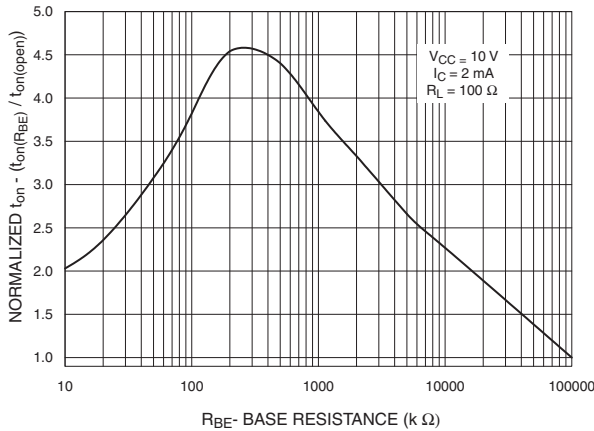
**Fig. 9 Switching Speed vs. Load Resistor  
(Black Package)**



**Fig. 10 Switching Speed vs. Load Resistor  
(White Package)**



**Fig. 11 Normalized t\_on vs. RBE  
(Black Package)**



**Fig. 12 Normalized t\_on vs. RBE  
(White Package)**

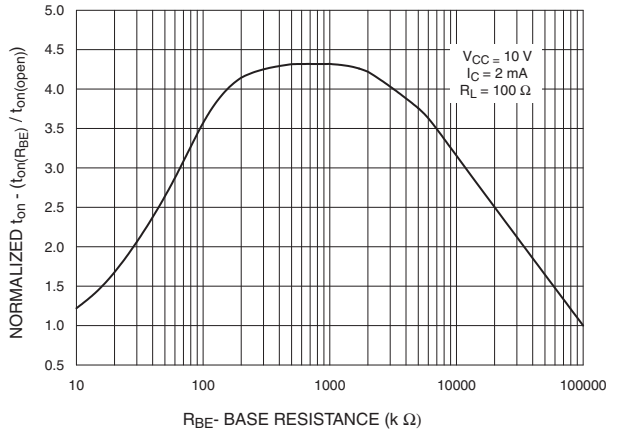


Fig. 13 Normalized  $t_{off}$  vs.  $R_{BE}$  (Black Package)

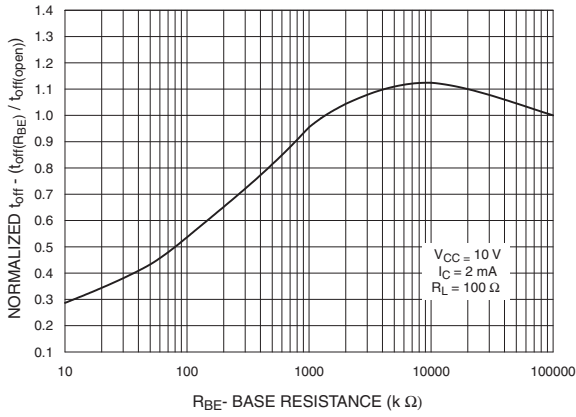


Fig. 14 Normalized  $t_{off}$  vs.  $R_{BE}$  (White Package)

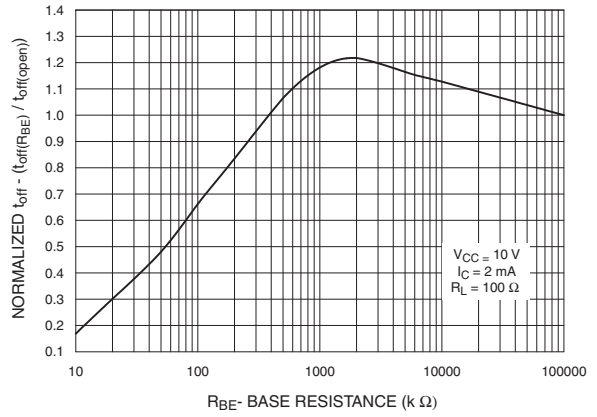


Fig. 15 LED Forward Voltage vs. Forward Current (Black Package)

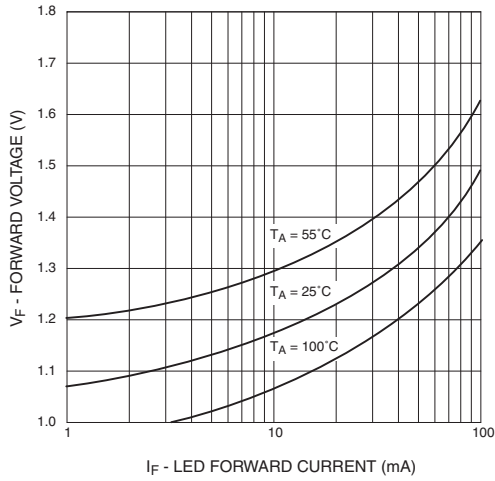


Fig. 16 LED Forward Voltage vs. Forward Current (White Package)

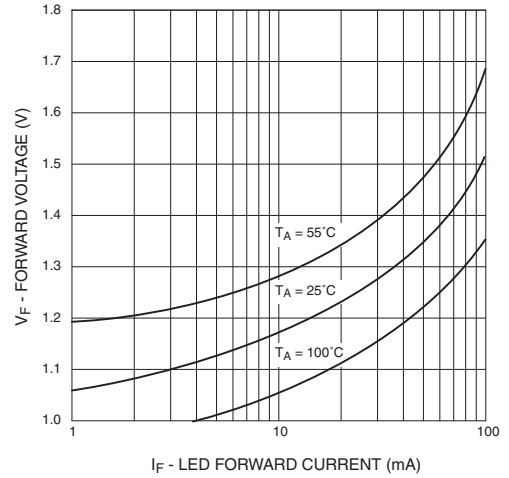


Fig. 17 Collector Current vs. Collector-Emitter Saturation Voltage

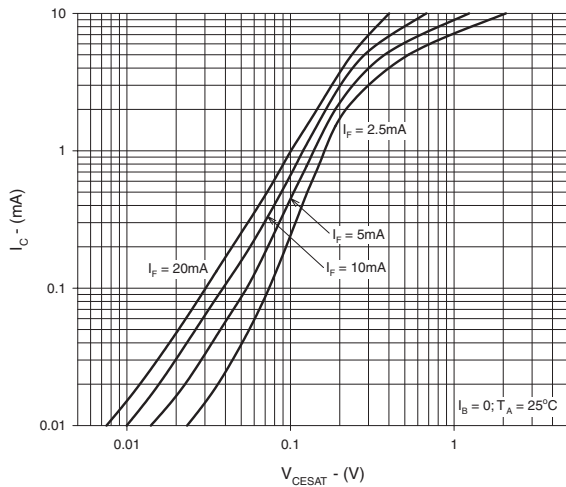
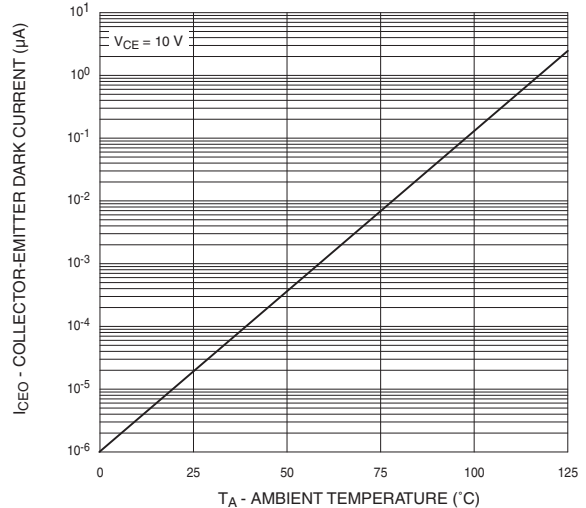


Fig. 18 Dark Current vs. Ambient Temperature (Black Package)



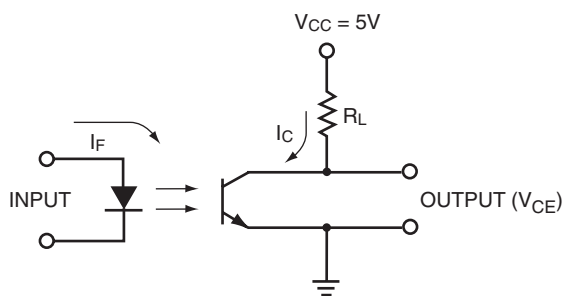


Figure 19. Switching Time Test Circuit

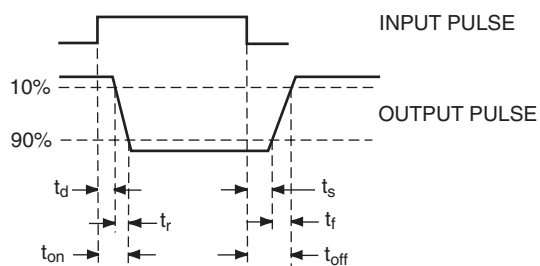
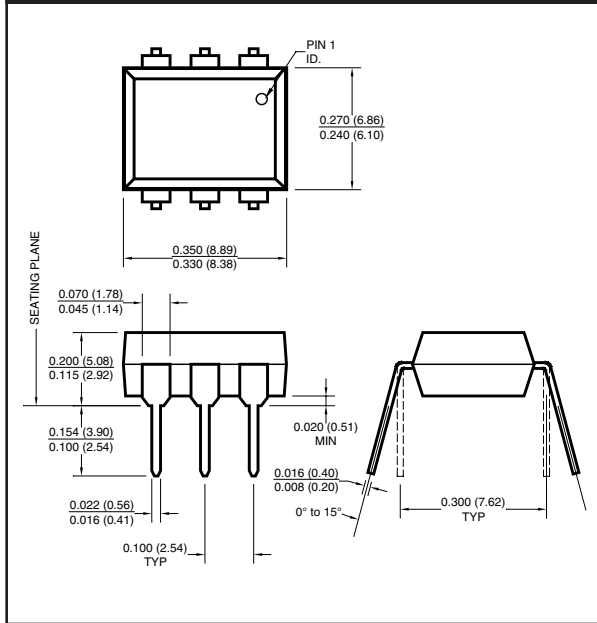


Figure 20. Switching Time Test Circuit

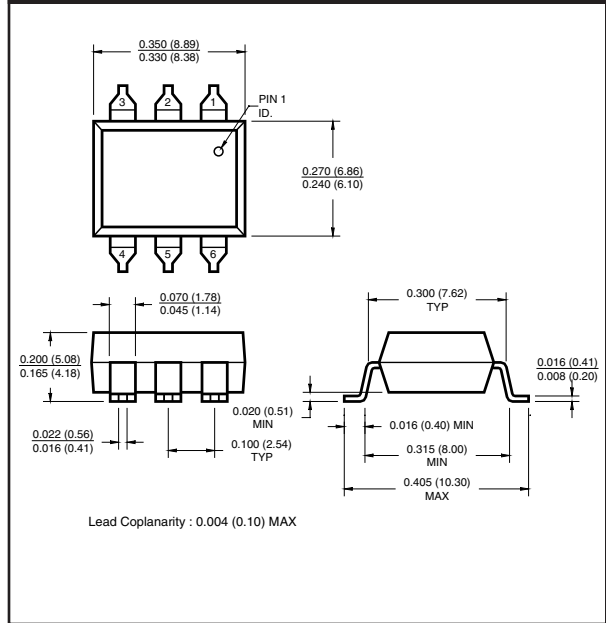


### Black Package (No -M Suffix)

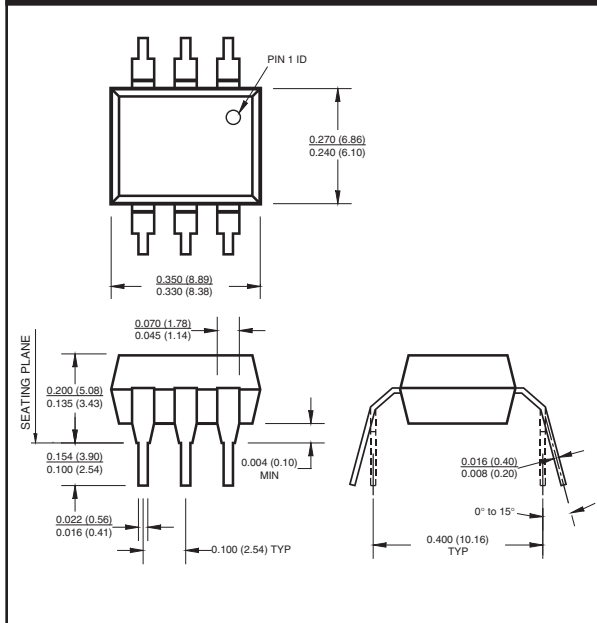
#### Package Dimensions (Through Hole)



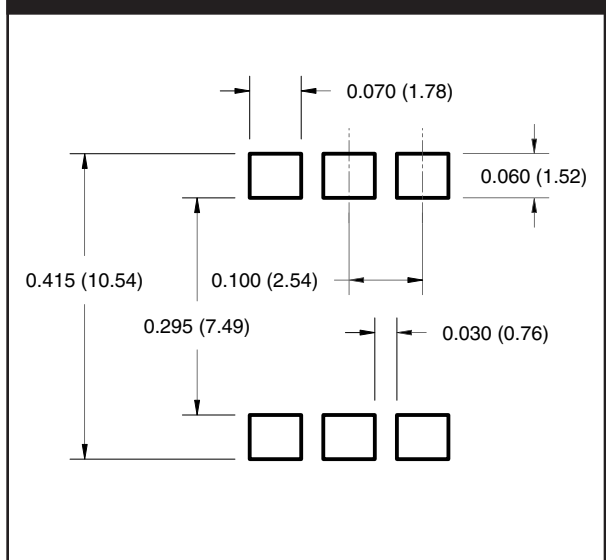
#### Package Dimensions (Surface Mount)



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



#### Recommended Pad Layout for Surface Mount Leadform (Black Package Only)

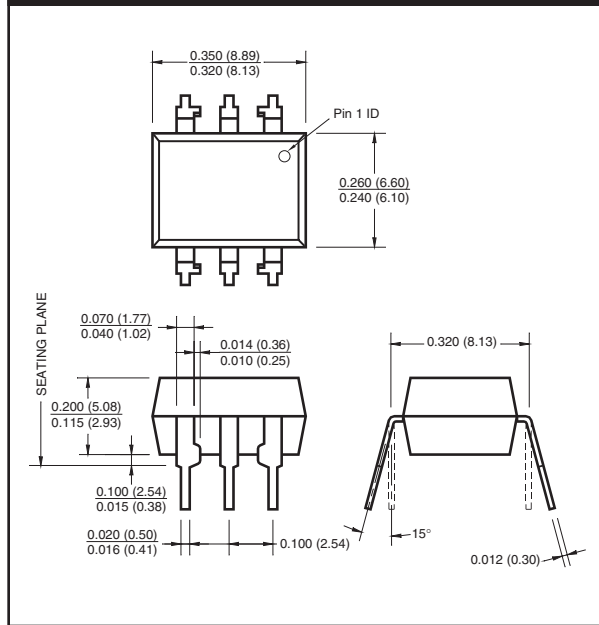


**NOTE**

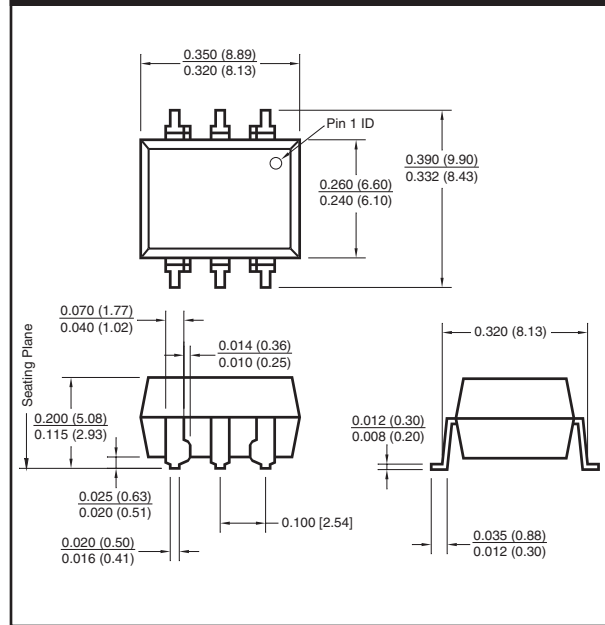
All dimensions are in inches (millimeters)

## White Package (-M Suffix)

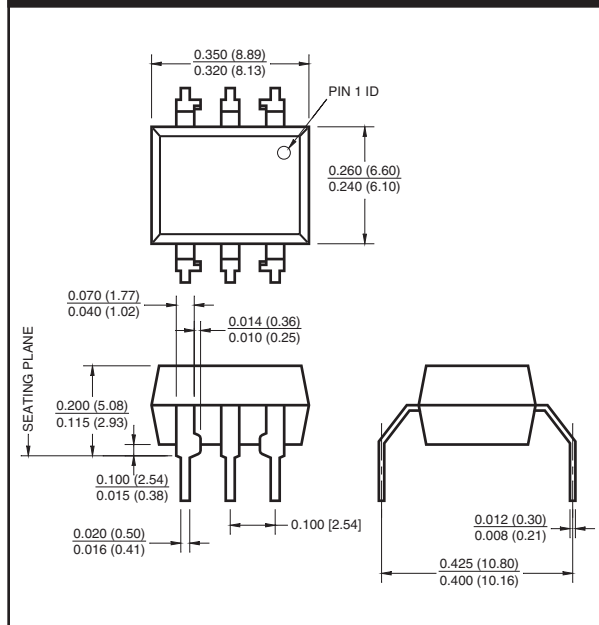
### Package Dimensions (Through Hole)



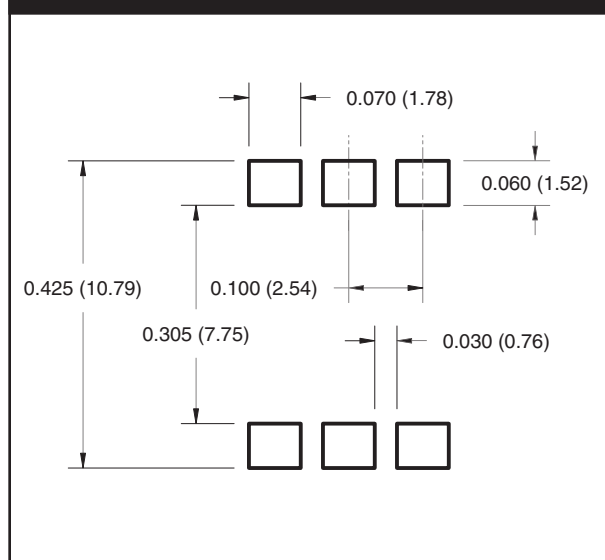
### Package Dimensions (Surface Mount)



### Package Dimensions (0.4" Lead Spacing)



### Recommended Pad Layout for Surface Mount Leadform (White Package Only)



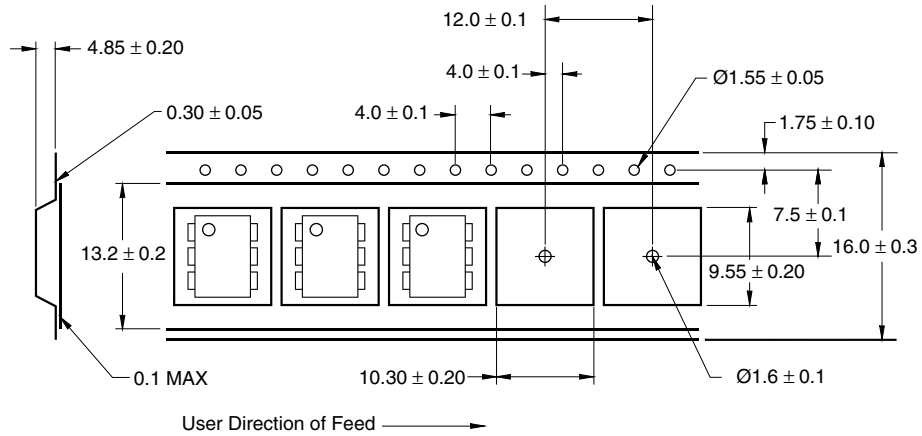
#### NOTE

All dimensions are in inches (millimeters)

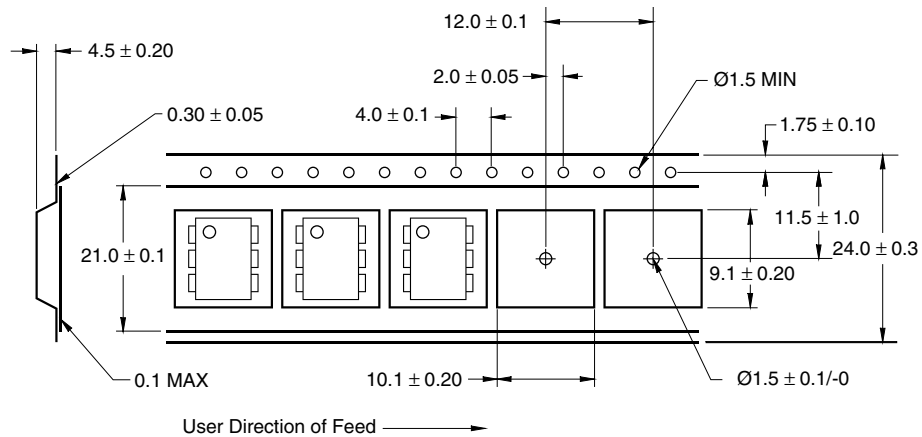
### Ordering Information

| Option                        | Black Package<br>(No Suffix) | White Package<br>(-M Suffix) | Description                          |
|-------------------------------|------------------------------|------------------------------|--------------------------------------|
| <b>Order Entry Identifier</b> |                              |                              |                                      |
| S                             | .S                           | S                            | Surface Mount Lead Bend              |
| SD                            | .SD                          | SR2                          | Surface Mount; Tape and reel         |
| W                             | .W                           | T                            | 0.4" Lead Spacing                    |
| 300                           | .300                         | V                            | VDE 0884                             |
| 300W                          | .300W                        | TV                           | VDE 0884, 0.4" Lead Spacing          |
| 3S                            | .3S                          | SV                           | VDE 0884, Surface Mount              |
| 3SD                           | .3SD                         | SR2V                         | VDE 0884, Surface Mount, Tape & Reel |

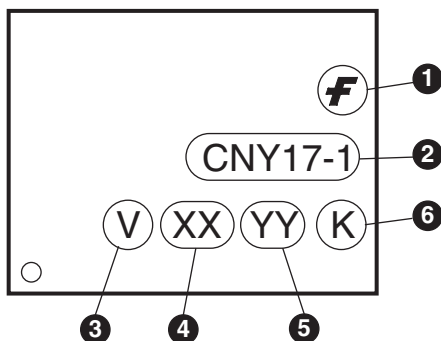
### Carrier Tape Specifications (Black Package, No Suffix)



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

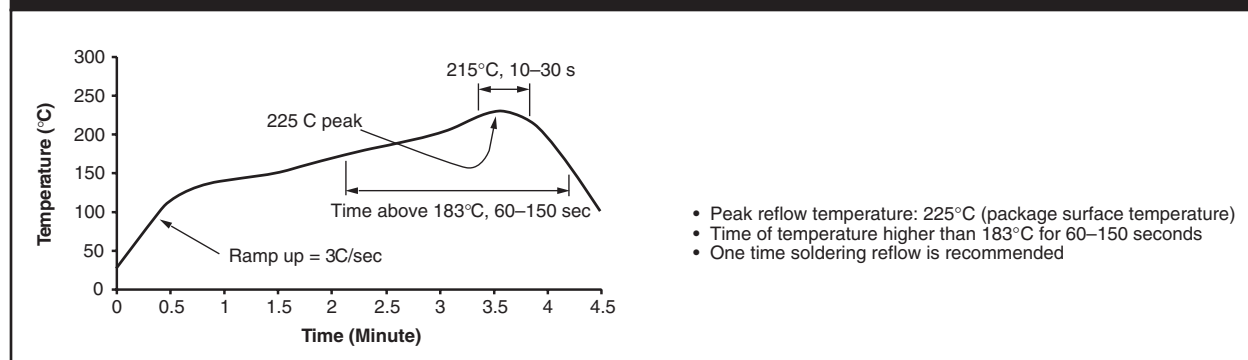


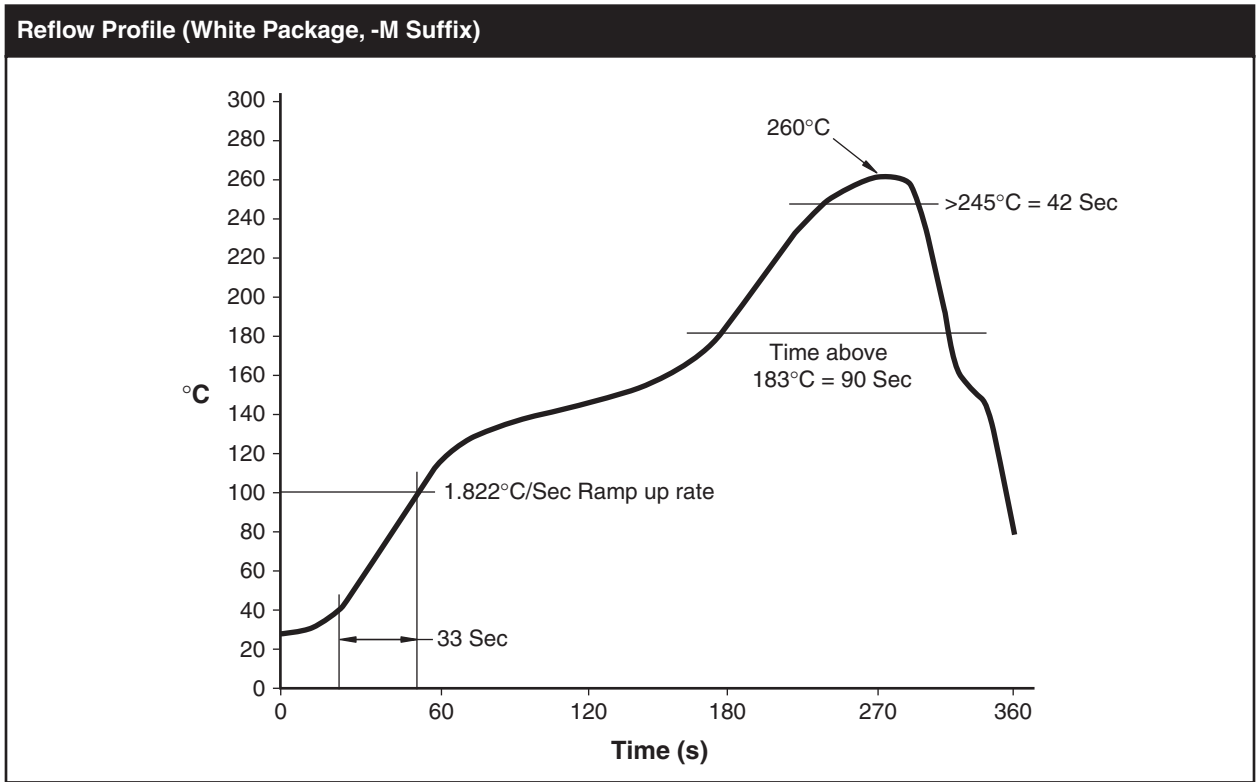
## Marking Information



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

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





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|                                      |                     |               |                     |                 |
|--------------------------------------|---------------------|---------------|---------------------|-----------------|
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| ActiveArray™                         | FASTr™              | LittleFET™    | PowerTrench®        | SyncFET™        |
| Bottomless™                          | FPS™                | MICROCOUPLER™ | QFET®               | TinyLogic®      |
| Build it Now™                        | FRFET™              | MicroFET™     | QS™                 | TINYOPTO™       |
| CoolFET™                             | GlobalOptoisolator™ | MicroPak™     | QT Optoelectronics™ | TruTranslation™ |
| CROSSVOLT™                           | GTO™                | MICROWIRE™    | Quiet Series™       | UHC™            |
| DOMET™                               | HiSeC™              | MSX™          | RapidConfigure™     | UltraFET®       |
| EcoSPARK™                            | I <sup>2</sup> C™   | MSXPro™       | RapidConnect™       | UniFET™         |
| E <sup>2</sup> CMOS™                 | i-Lo™               | OCX™          | μSerDes™            | VCX™            |
| EnSigna™                             | ImpliedDisconnect™  | OCXPro™       | SILENT SWITCHER®    | Wire™           |
| FACT™                                | IntelliMAX™         | OPTOLOGIC®    | SMART START™        |                 |
| FACT Quiet Series™                   |                     | OPTOPLANAR™   | SPM™                |                 |
| Across the board. Around the world.™ |                     | PACMAN™       | Stealth™            |                 |
| The Power Franchise®                 |                     | POP™          | SuperFET™           |                 |
| Programmable Active Droop™           |                     | Power247™     | SuperSOT™-3         |                 |
|                                      |                     | PowerEdge™    | SuperSOT™-6         |                 |

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2. A critical component is 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.

## PRODUCT STATUS DEFINITIONS

### Definition of Terms

| Datasheet Identification | Product Status         | Definition  |
|--------------------------|------------------------|---|
| Advance Information      | Formative or In Design | This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.  |
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