

H11AA1M, H11AA2M, H11AA3M, H11AA4M AC Input/Phototransistor Optocouplers

Features

- Bi-polar emitter input
- Built-in reverse polarity input protection
- Underwriters Laboratory (UL) recognized File #E90700, Volume 2
- VDE approved File #102497 (ordering option 'V')

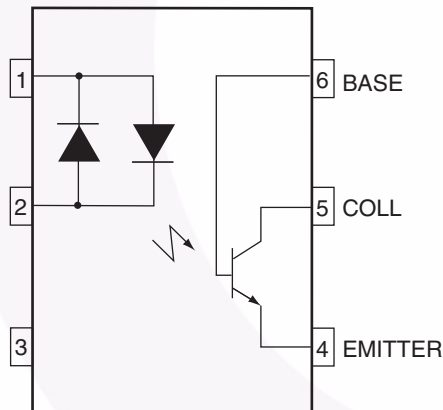
Applications

- AC line monitor
- Unknown polarity DC sensor
- Telephone line interface

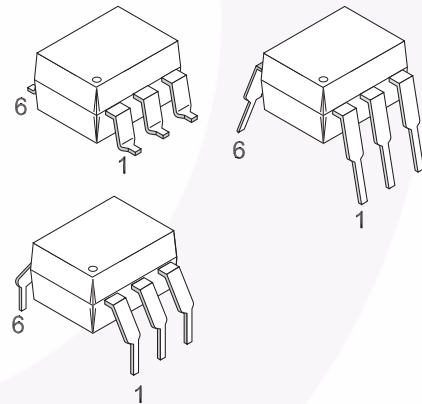
Description

The H11AAXM series consists of two gallium-arsenide infrared emitting diodes connected in inverse parallel driving a single silicon phototransistor output.

Schematic



Package Outlines



Absolute Maximum Ratings ($T_A = 25^\circ\text{C}$ Unless otherwise specified)

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

| Symbol | Parameter | Device | Value | Units |
|--------------------|---|--------|----------------|-------|
| TOTAL DEVICE | | | | |
| T _{STG} | Storage Temperature | All | -40 to +150 | °C |
| T _{OPR} | Operating Temperature | All | -40 to +100 | °C |
| T _{SOL} | Lead Solder Temperature | All | 260 for 10 sec | °C |
| P _D | Total Device Power Dissipation Derate Linearly From 25°C | All | 250 | mW |
| | | | 2.94 | mW/°C |
| EMITTER | | | | |
| I _F | Continuous Forward Current | All | 60 | mA |
| I _{F(pk)} | Forward Current – Peak (1μs pulse, 300 pps) | All | ±1.0 | A |
| P _D | LED Power Dissipation Derate Linearly From 25°C | All | 120 | mW |
| | | | 1.41 | mW/°C |
| DETECTOR | | | | |
| I _C | Continuous Collector Current | All | 50 | mA |
| P _D | Detector Power Dissipation Derate linearity from 25°C | All | 150 | mW |
| | | | 1.76 | mW/°C |

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

| Symbol | Parameter | Test Conditions | Device | Min. | Typ.* | Max. | Unit |
|-----------------|---|---|-------------------------------|------|-------|------|------|
| EMITTER | | | | | | | |
| V_F | Input Forward Voltage | $I_F = \pm 10\text{mA}$ | All | | 1.17 | 1.5 | V |
| C_J | Capacitance | $V_F = 0\text{V}$, $f = 1.0\text{MHz}$ | All | | 80 | | pF |
| DETECTOR | | | | | | | |
| BV_{CEO} | Breakdown Voltage Collector to Emitter | $I_C = 1.0\text{mA}$, $I_F = 0$ | All | 30 | 100 | | V |
| BV_{CBO} | Collector to Base | $I_C = 100\mu\text{A}$, $I_F = 0$ | All | 70 | 120 | | V |
| BV_{EBO} | Emitter to Base | $I_E = 100\mu\text{A}$, $I_F = 0$ | All | 5 | 10 | | V |
| BV_{ECO} | Emitter to Collector | $I_E = 100\mu\text{A}$, $I_F = 0$ | All | 7 | 10 | | V |
| I_{CEO} | Leakage Current Collector to Emitter | $V_{CE} = 10\text{V}$, $I_F = 0$ | H11AA1M H11AA3M H11AA4M | | 1 | 50 | nA |
| | | | H11AA2M | | 1 | 200 | |
| C_{CE} | Capacitance Collector to Emitter | $V_{CE} = 0$, $f = 1\text{MHz}$ | All | | 10 | | pF |
| C_{CB} | Collector to Base | $V_{CB} = 0$, $f = 1\text{MHz}$ | All | | 80 | | pF |
| C_{EB} | Emitter to Base | $V_{EB} = 0$, $f = 1\text{MHz}$ | All | | 15 | | pF |

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

| Symbol | Characteristics | Test Conditions | Device | Min. | Typ.* | Max. | Units |
|---------------|---|--|---------|------|-------|------|-------|
| CTR_{CE} | Current Transfer Ratio, Collector to Emitter | $I_F = \pm 10\text{mA}$, $V_{CE} = 10\text{V}$ | H11AA4M | 100 | | | % |
| | | | H11AA3M | 50 | | | |
| | | | H11AA1M | 20 | | | |
| | | | H11AA2M | 10 | | | |
| | Current Transfer Ratio, Symmetry | $I_F = \pm 10\text{mA}$, $V_{CE} = 10\text{V}$ (Figure 11) | All | .33 | | 3.0 | |
| $V_{CE(SAT)}$ | Saturation Voltage, Collector to Emitter | $I_F = \pm 10\text{mA}$, $I_{CE} = 0.5\text{mA}$ | All | | | .40 | V |

Isolation Characteristics

| Symbol | Characteristic | Test Conditions | Min. | Typ.* | Max. | Units |
|-----------|-------------------------------------|---|-----------|-------|------|----------|
| C_{I-O} | Package Capacitance Input/Output | $V_{I-O} = 0$, $f = 1\text{MHz}$ | | 0.7 | | pF |
| V_{ISO} | Isolation Voltage | $f = 60\text{Hz}$, $t = 1\text{ sec.}$ | 7500 | | | Vac(pk) |
| R_{ISO} | Isolation Resistance | $V_{I-O} = 500\text{VDC}$ | 10^{11} | | | Ω |

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

Typical Performance Characteristics

Fig. 1 Input Voltage vs. Input Current

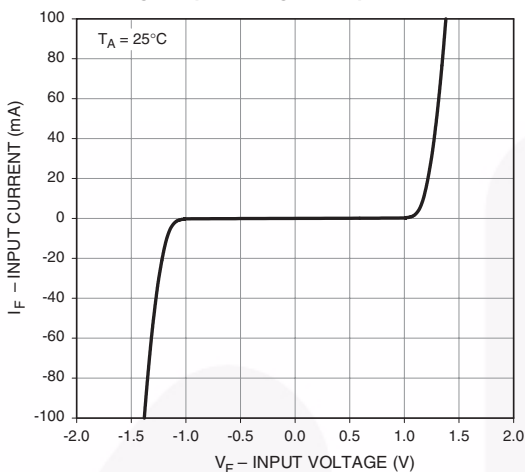


Fig. 2 Normalized CTR vs. Forward Current

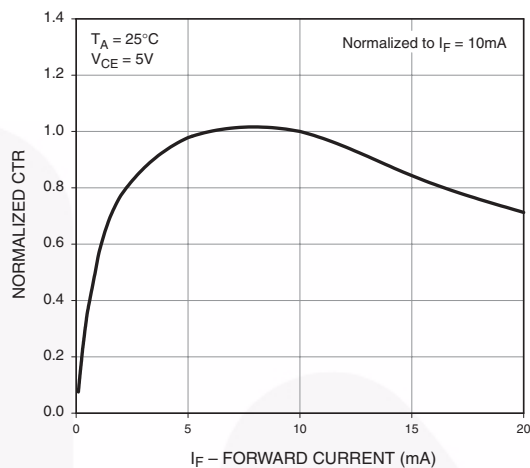


Fig. 3 Normalized CTR vs. Ambient Temperature

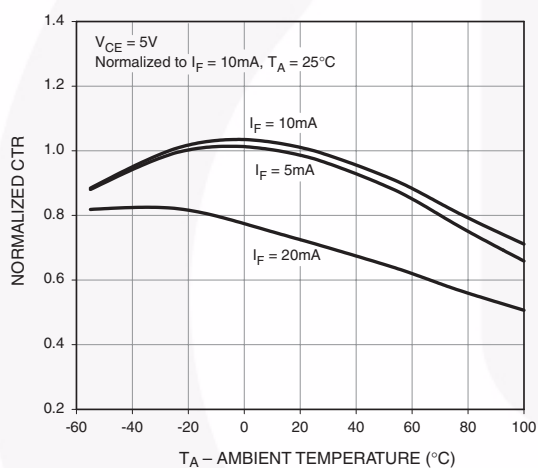


Fig. 4 CTR vs. R_{BE} (Unsaturated)

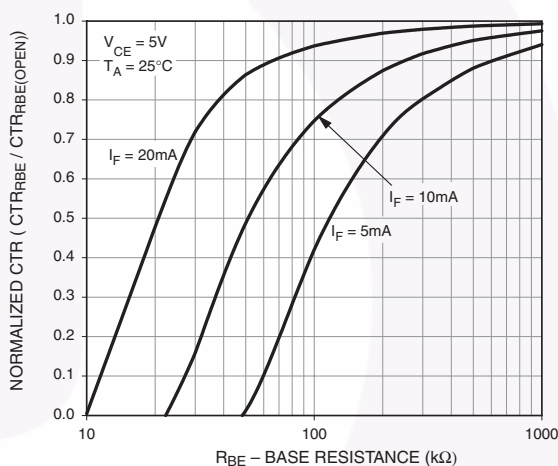


Fig. 5 CTR vs. R_{BE} (Saturated)

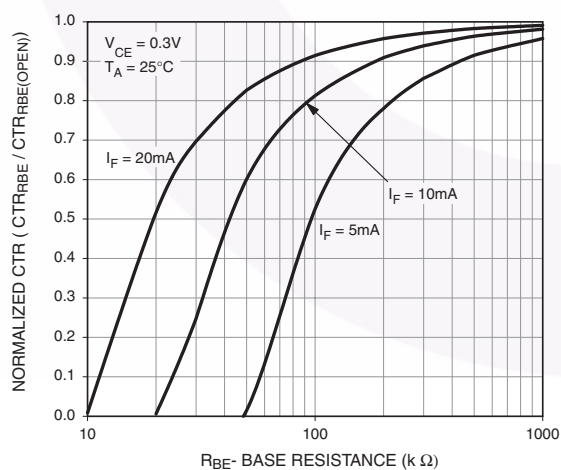
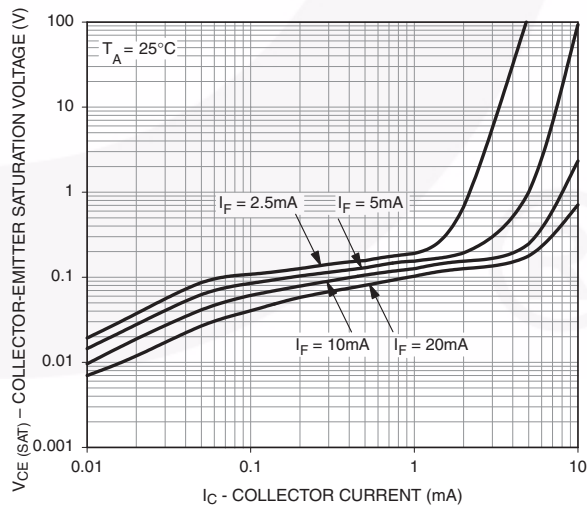


Fig. 6 Collector-Emitter Saturation Voltage vs. Collector Current



Typical Performance Characteristics (Continued)

Fig. 7 Switching Speed vs. Load Resistor

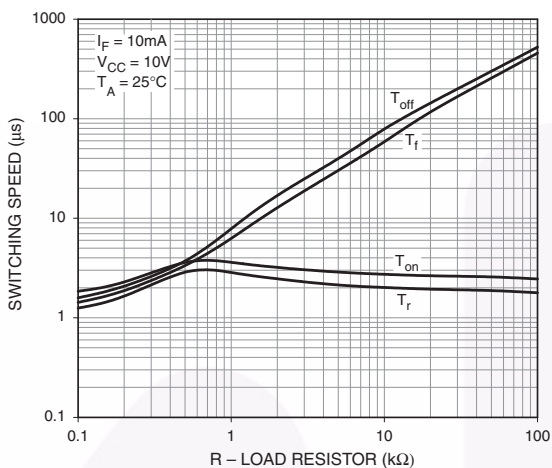


Fig. 8 Normalized t_{on} vs. R_{BE}

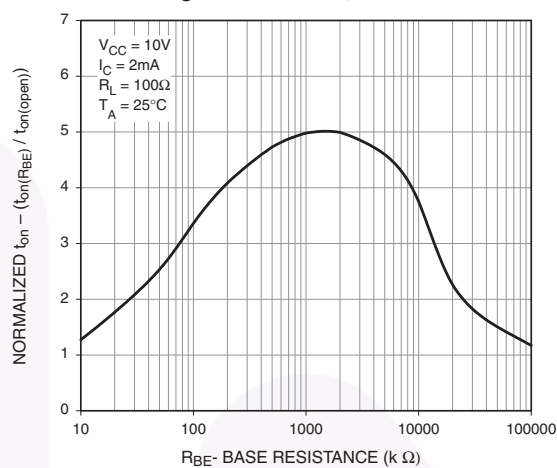


Fig. 9 Normalized t_{off} vs. R_{BE}

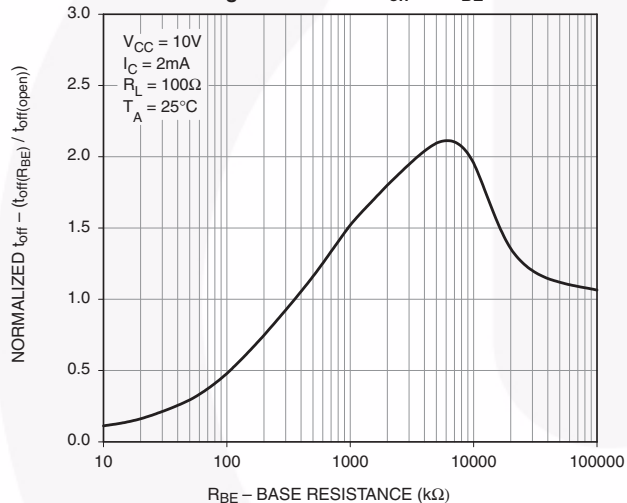


Fig. 10 Dark Current vs. Ambient Temperature

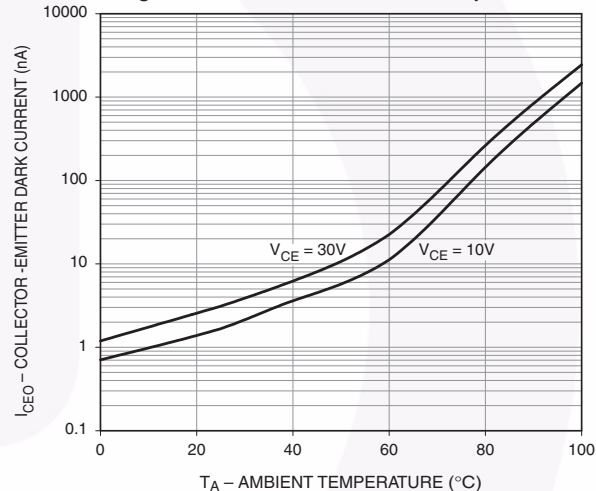
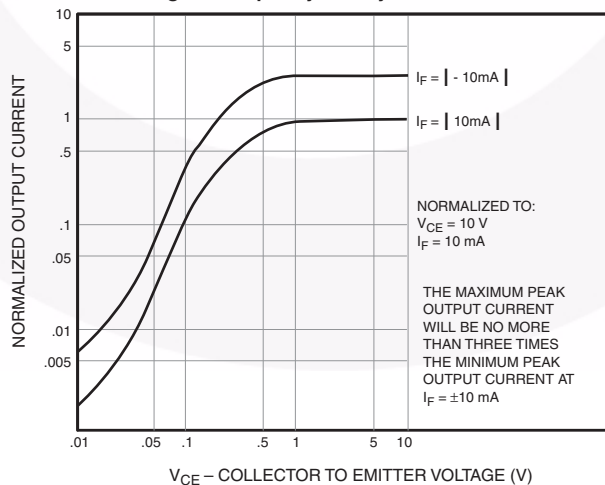
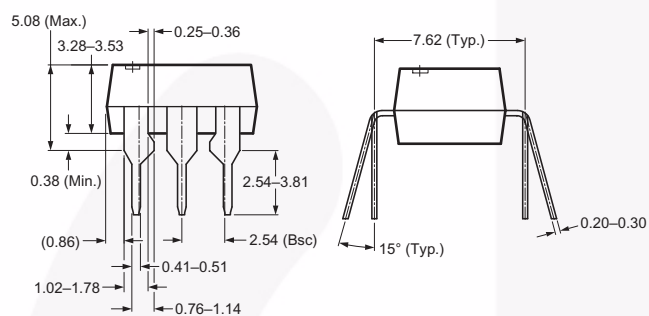
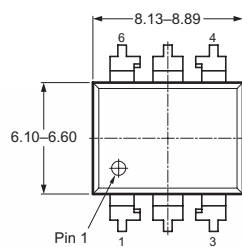


Fig. 11 Output Symmetry Characteristics

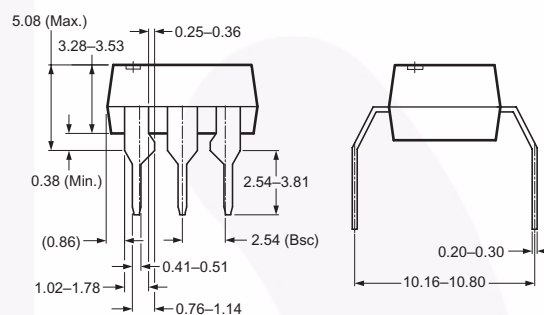
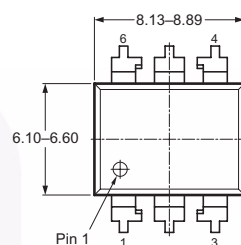


Package Dimensions

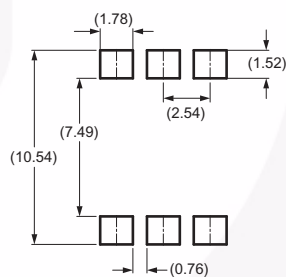
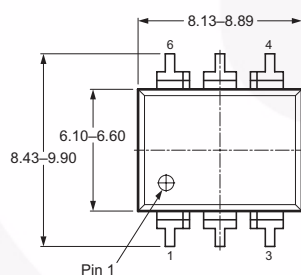
Through Hole



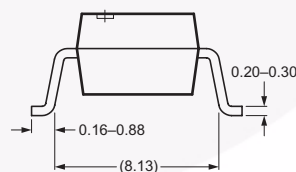
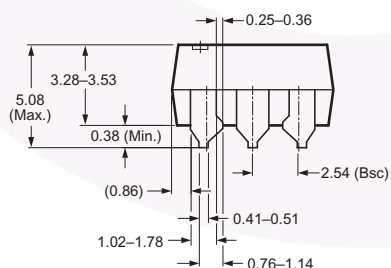
0.4" Lead Spacing



Surface Mount



Recommended Pad Layout

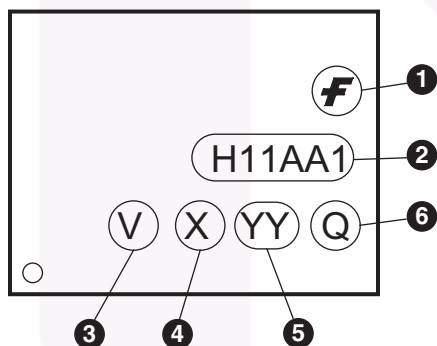


Note:
All dimensions in mm.

Ordering Information

| Option | Order Entry Identifier (Example) | Description |
|-----------|-------------------------------------|--|
| No option | H11AA1M | Standard Through Hole Device |
| S | H11AA1SM | Surface Mount Lead Bend |
| SR2 | H11AA1SR2M | Surface Mount; Tape and Reel |
| T | H11AA1TM | 0.4" Lead Spacing |
| V | H11AA1VM | VDE 0884 |
| TV | H11AA1TVM | VDE 0884, 0.4" Lead Spacing |
| SV | H11AA1SVM | VDE 0884, Surface Mount |
| SR2V | H11AA1SR2VM | VDE 0884, Surface Mount, Tape and Reel |

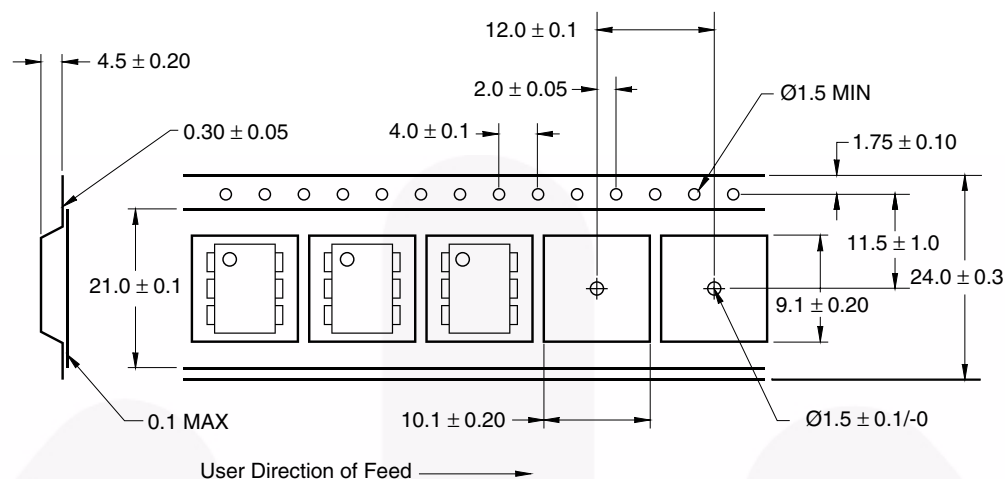
Marking Information



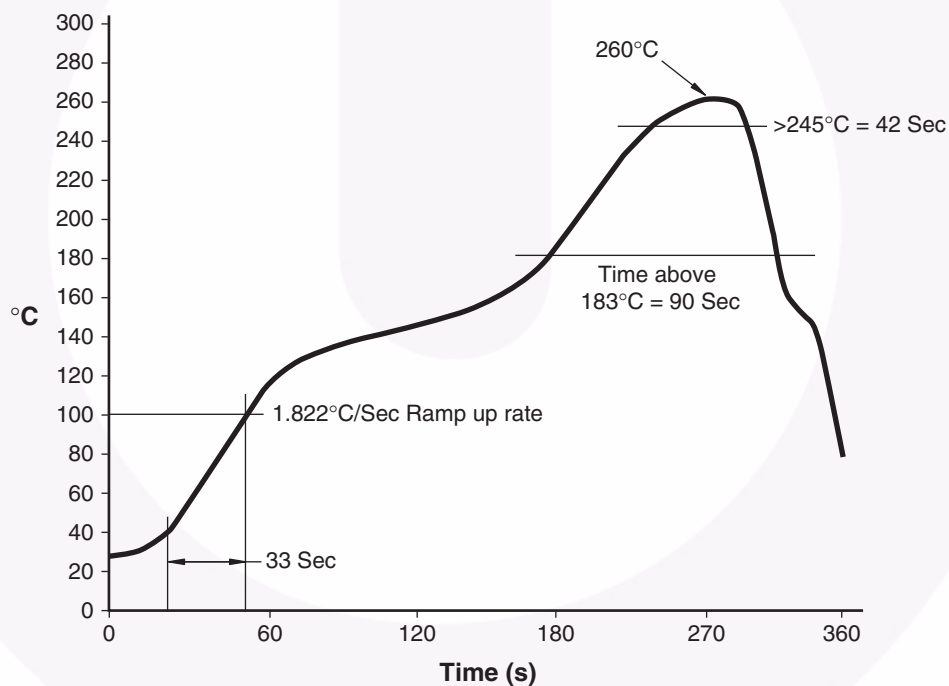
| Definitions | |
|-------------|--|
| 1 | Fairchild logo |
| 2 | Device number |
| 3 | VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table) |
| 4 | One digit year code, e.g., '3' |
| 5 | Two digit work week ranging from '01' to '53' |
| 6 | Assembly package code |

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

Carrier Tape Specification







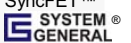
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