FAIRCHILD SEMICONDUCTOR®

September 2009

# H11L1M, H11L2M, H11L3M
# 6-Pin DIP Optocoupler

## Features

- High data rate, 1MHz typical (NRZ)
- Free from latch up and oscilliation throughout voltage and temperature ranges.
- Microprocessor compatible drive
- Logic compatible output sinks 16mA at 0.4V maximum
- Guaranteed on/off threshold hysteresis
- Wide supply voltage capability, compatible with all popular logic systems
- Underwriters Laboratory (UL) recognized—file #E90700, Volume 2
- VDE recognized – File#102497 – Add option V (e.g., H11LIVM)

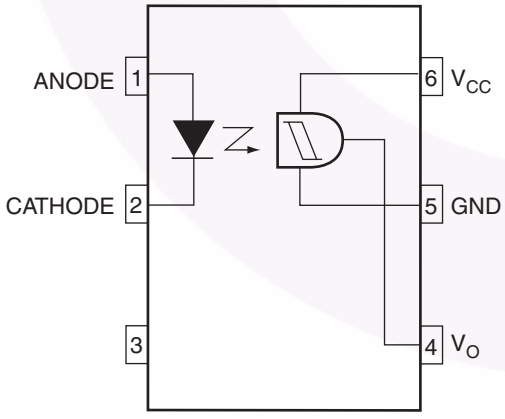
## Applications

- Logic to logic isolator
- Programmable current level sensor
- Line receiver—eliminate noise and transient problems
- A.C. to TTL conversion—square wave shaping
- Digital programming of power supplies
- Interfaces computers with peripherals

## Description

The H11LXM series has a high speed integrated circuit detector optically coupled to a gallium-arsenide infrared emitting diode. The output incorporates a Schmitt trigger, which provides hysteresis for noise immunity and pulse shaping. The detector circuit is optimized for simplicity of operation and utilizes an open collector output for maximum application flexibility.

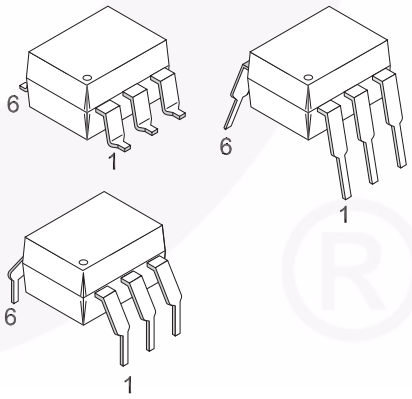
## Schematic




**Truth Table**

| Input | Output |
|---|---|
| H | L |
| L | H |

## Package Outlines




©2005 Fairchild Semiconductor Corporation

## Absolute Maximum Ratings ($T_A$ = 25°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 | Parameters | Value | Units |
|---|---|---|---|
| **TOTAL DEVICE** | | | |
| $T_{STG}$ | Storage Temperature | -40 to +150 | °C |
| $T_{OPR}$ | Operating Temperature | -40 to +85 | °C |
| $T_{SOL}$ | Lead Solder Temperature | 260 for 10 sec | °C |
| $P_D$ | Total Device Power Dissipation @ 25°C | 250 | mW |
| | Derate Above 25°C | 2.94 | mW/°C |
| **EMITTER** | | | |
| $I_F$ | Continuous Forward Current | 60 | mA |
| $V_R$ | Reverse Voltage | 6 | V |
| $I_F$(pk) | Forward Current – Peak (1µs pulse, 300pps) | 3.0 | A |
| $P_D$ | LED Power Dissipation 25°C Ambient | 120 | mW |
| | Derate Linearly From 25°C | 1.41 | mW/°C |
| **DETECTOR** | | | |
| $P_D$ | Detector Power Dissipation @ 25°C | 150 | mW |
| | Derate Linearly from 25°C | 2.0 | mW/°C |
| $V_O$ | $V_{45}$ Allowed Range | 0 to 16 | V |
| $V_{CC}$ | $V_{65}$ Allowed Range | 3 to 16 | V |
| $I_O$ | $I_4$ Output Current | 50 | mA |

©2005 Fairchild Semiconductor Corporation

## Electrical Characteristics ($T_A$ = 25°C Unless otherwise specified.)

### Individual Component Characteristics

| Symbol | Parameters | Test Conditions | Device | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|---|
| **EMITTER** | | | | | | | |
| $V_F$ | Input Forward Voltage | $I_F$ = 10mA | All | | 1.2 | 1.5 | V |
| | | $I_F$ = 0.3mA | | 0.75 | 1.0 | | |
| $I_R$ | Reverse Current | $V_R$ = 3V | All | | | 10 | µA |
| $C_J$ | Capacitance | V = 0, f = 1.0MHz | All | | | 100 | pF |
| **DETECTOR** | | | | | | | |
| $V_{CC}$ | Operating Voltage Range | | All | 3 | | 15 | V |
| $I_{CC(off)}$ | Supply Current | $I_F$ = 0, $V_{CC}$ = 5V | All | | 1.6 | 5.0 | mA |
| $I_{OH}$ | Output Current, High | $I_F$ = 0, $V_{CC}$ = $V_O$ = 15V | All | | | 100 | µA |

### Transfer Characteristics

| Symbol | Parameter | Test Conditions | Device | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|---|
| **DC CHARACTERISTICS** | | | | | | | |
| $I_{CC(on)}$ | Supply Current | $I_F$ = 10mA, $V_{CC}$ = 5V | All | | 1.6 | 5.0 | mA |
| $V_{OL}$ | Output Voltage, low | $R_L$= 270Ω,$V_{CC}$ = 5V, $I_F$ = $I_{F(on)}$ max. | All | | 0.2 | 0.4 | V |
| $I_{F(on)}$ | Turn-On Threshold Current(1) | $R_L$ = 270Ω, $V_{CC}$ = 5V | H11L1M | | | 1.6 | mA |
| | | | H11L2M | | | 10.0 | |
| | | | H11L3M | | | 5.0 | |
| $I_{F(off)}$ | Turn-Off Threshold Current | $R_L$ = 270Ω, $V_{CC}$ = 5V | All | 0.3 | 1.0 | | mA |
| $I_{F(off)}/I_{F(on)}$ | Hysteresis Ratio | $R_L$ = 270Ω, $V_{CC}$ = 5V | All | 0.50 | 0.75 | 0.90 | |
| **AC CHARACTERISTICS, Switching Speed** | | | | | | | |
| $t_{on}$ | Turn-On time | $R_L$ = 270Ω, $V_{CC}$ = 5V, $I_F$ = $I_{F(on)}$, $T_A$ = 25°C | All | | 1.0 | 4 | µs |
| $t_f$ | Fall Time | $R_L$ = 270Ω, $V_{CC}$ = 5V, $I_F$ = $I_{F(on)}$, $T_A$= 25°C | All | | 0.1 | | µs |
| $t_{off}$ | Turn-Off Time | $R_L$= 270Ω, $V_{CC}$ = 5V, $I_F$ = $I_{F(on)}$, $T_A$= 25°C | All | | 1.2 | 4 | µs |
| $t_r$ | Rise time | $R_L$ = 270Ω, $V_{CC}$ = 5V, $I_F$ = $I_{F(on)}$, $T_A$ = 25°C | All | | 0.1 | | µs |
| | Data Rate | | All | | 1.0 | | MHz |

### Isolation Characteristics

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| $V_{ISO}$ | Input-Output Isolation Voltage | t =1 sec. | 7500 | | | $V_{PEAK}$ |
| $C_{ISO}$ | Isolation Capacitance | $V_{I-O}$ = 0V, f = 1MHz | | 0.4 | 0.6 | pF |
| $R_{ISO}$ | Isolation Resistance | $V_{I-O}$ = ±500 VDC | $10^{11}$ | | | Ω |

**Note:**

1. Maximum $I_{F(ON)}$ is the maximum current required to trigger the output. For example, a 1.6mA maximum trigger current would require the LED to be driven at a current greater than 1.6mA to guarantee the device will turn on. A 10% guard band is recommended to account for degradation of the LED over its lifetime. The maximum allowable LED drive current is 60mA.

©2005 Fairchild Semiconductor Corporation

## Safety and Insulation Ratings

As per IEC 60747-5-2, this optocoupler is suitable for “safe electrical insulation” only within the safety limit data. Compliance with the safety ratings shall be ensured by means of protective circuits.

| Symbol | Parameter | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| | Installation Classifications per DIN VDE 0110/1.89 Table 1 | | | | |
| | For Rated Main Voltage < 150Vrms | | I-IV | | |
| | For Rated Main voltage < 300Vrms | | I-IV | | |
| | Climatic Classification | | 55/100/21 | | |
| | Pollution Degree (DIN VDE 0110/1.89) | | 2 | | |
| CTI | Comparative Tracking Index | 175 | | | |
| $V_{PR}$ | Input to Output Test Voltage, Method b, $V_{IORM}$ x 1.875 = $V_{PR}$, 100% Production Test with tm = 1 sec, Partial Discharge < 5pC | 1594 | | | $V_{peak}$ |
| | Input to Output Test Voltage, Method a, $V_{IORM}$ x 1.5 = $V_{PR}$, Type and Sample Test with tm = 60 sec, Partial Discharge < 5pC | 1275 | | | $V_{peak}$ |
| $V_{IORM}$ | Max. Working Insulation Voltage | 850 | | | $V_{peak}$ |
| $V_{IOTM}$ | Highest Allowable Over Voltage | 6000 | | | $V_{peak}$ |
| | External Creepage | 7 | | | mm |
| | External Clearance | 7 | | | mm |
| | Insulation Thickness | 0.5 | | | mm |
| RIO | Insulation Resistance at Ts, $V_{IO}$ = 500V | $10^9$ | | | Ω |

## Typical Performance Curves

**Figure 1. Transfer Characteristics**

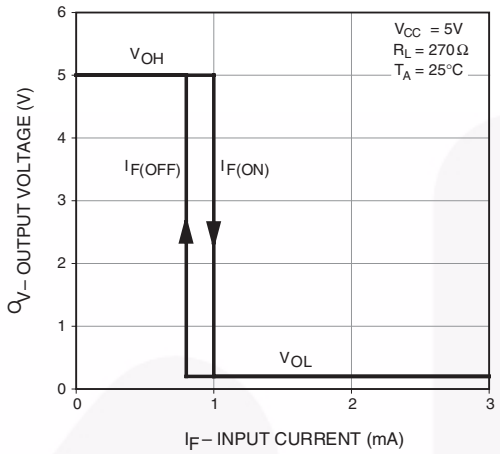



**Figure 2. Threshold Current vs. Supply Voltage**

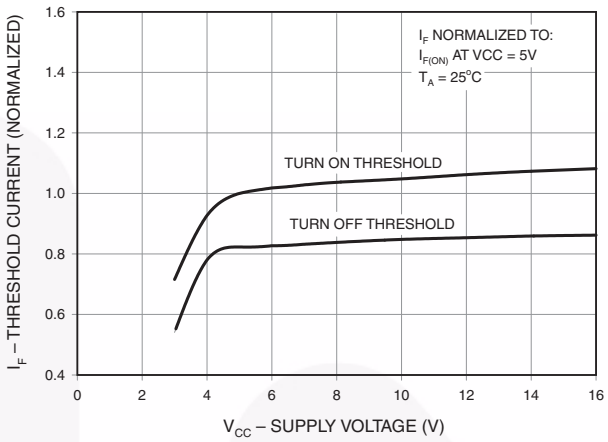



**Figure 3. Threshold Current vs. Supply Temperature**

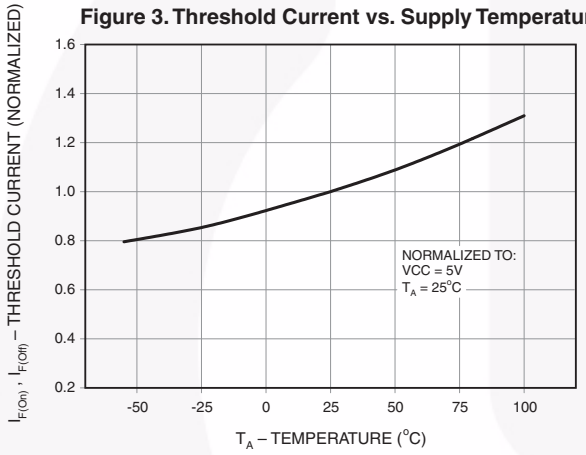



**Figure 4. Output Voltage, Low vs. Load Current**

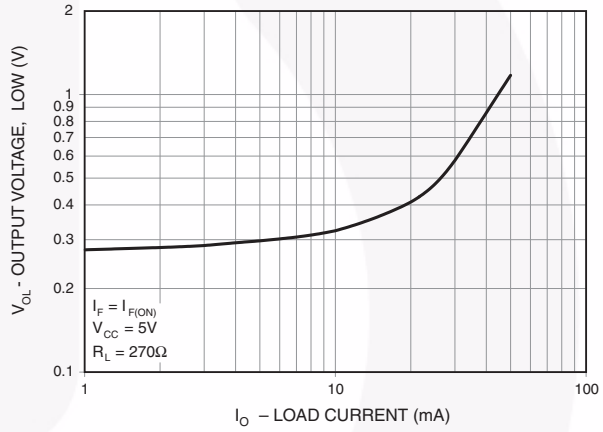



**Figure 5. Supply Current vs. Supply Voltage**

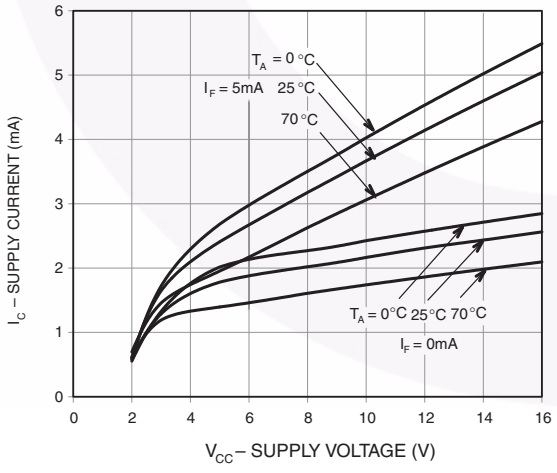
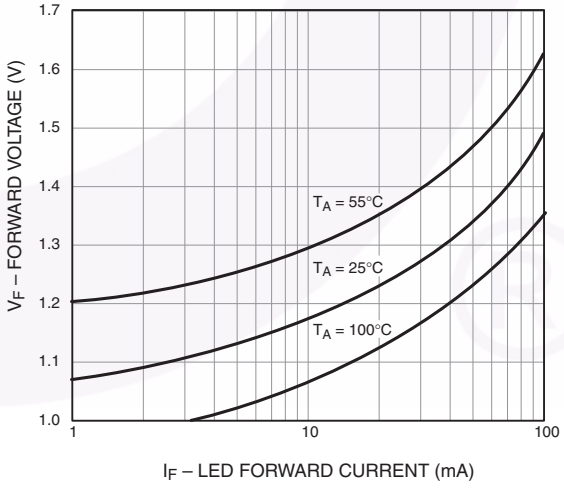



**Figure 6. LED Forward Voltage vs. Forward Current**



## Typical Performance Curves (Continued)

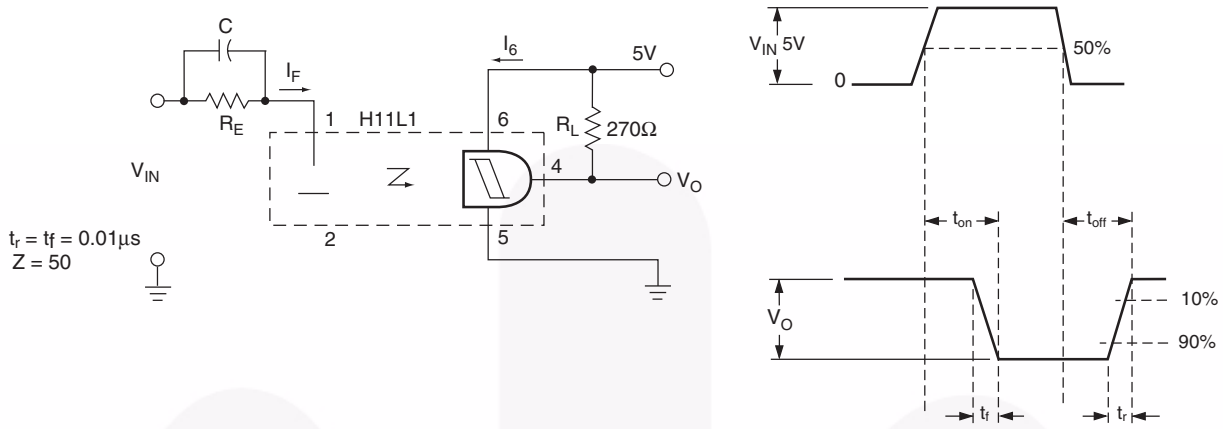
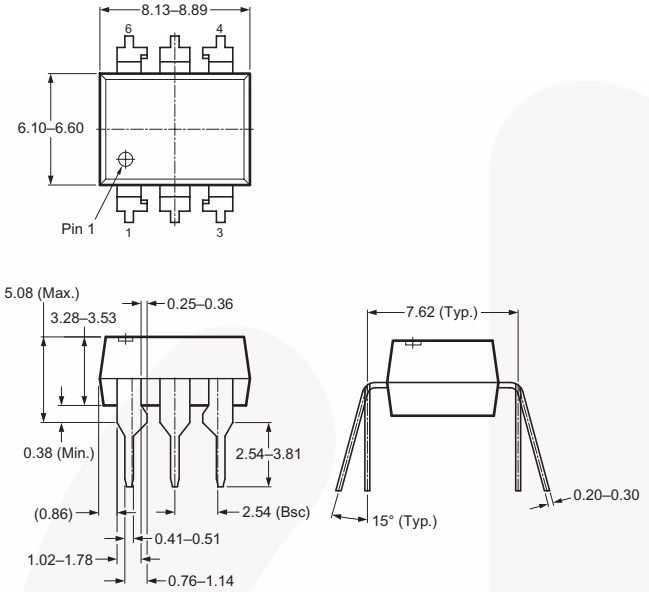


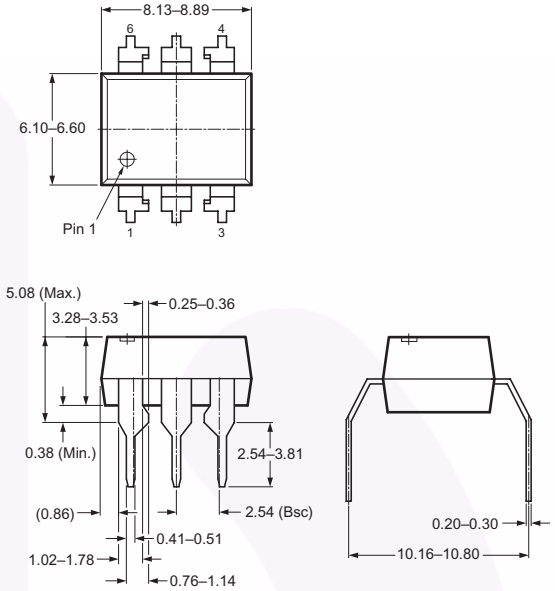

**Figure 7. Switching Test Circuit and Waveforms**

## Package Dimensions

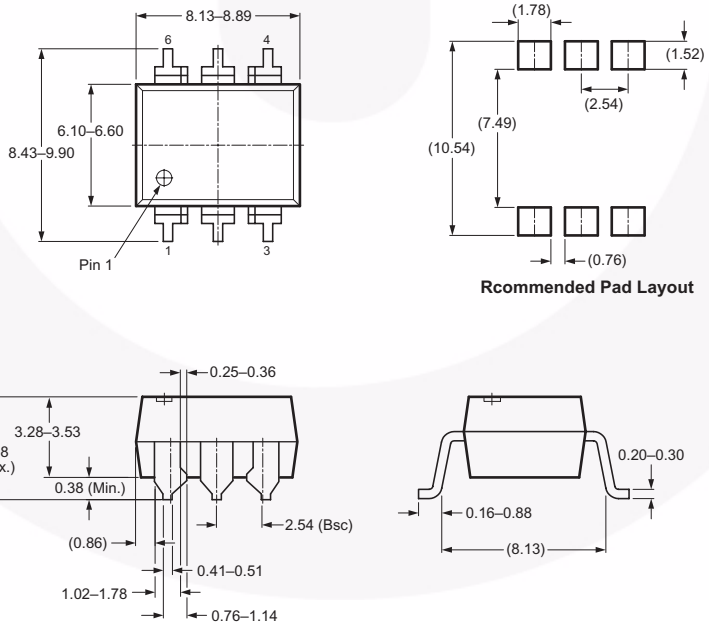
### Through Hole




### 0.4" Lead Spacing




### Surface Mount

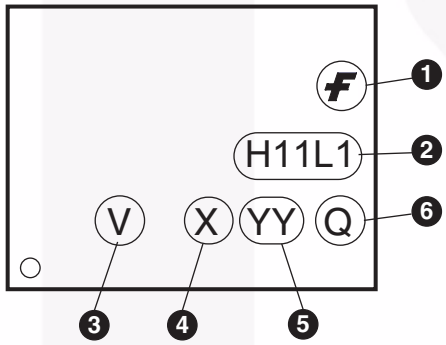



**Note:**
All dimensions in mm.

## Ordering Information

| Option | Order Entry Identifier (Example) | Description |
|---|---|---|
| No option | H11L1M | Standard Through Hole Device |
| S | H11L1SM | Surface Mount Lead Bend |
| SR2 | H11L1SR2M | Surface Mount; Tape and Reel |
| T | H11L1TM | 0.4" Lead Spacing |
| V | H11L1VM | VDE 0884 |
| TV | H11L1TVM | VDE 0884, 0.4" Lead Spacing |
| SV | H11L1SVM | VDE 0884, Surface Mount |
| SR2V | H11L1SR2VM | VDE 0884, Surface Mount, Tape and Reel |

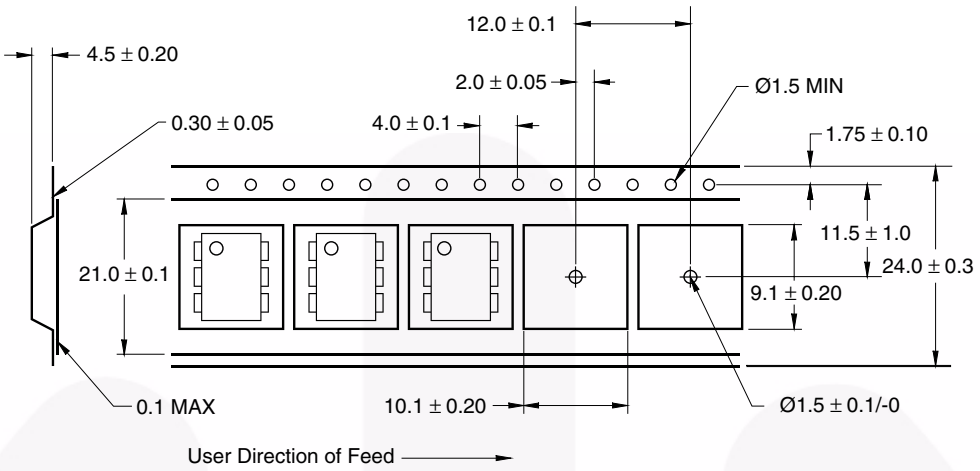
## Marking Information




| 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 |

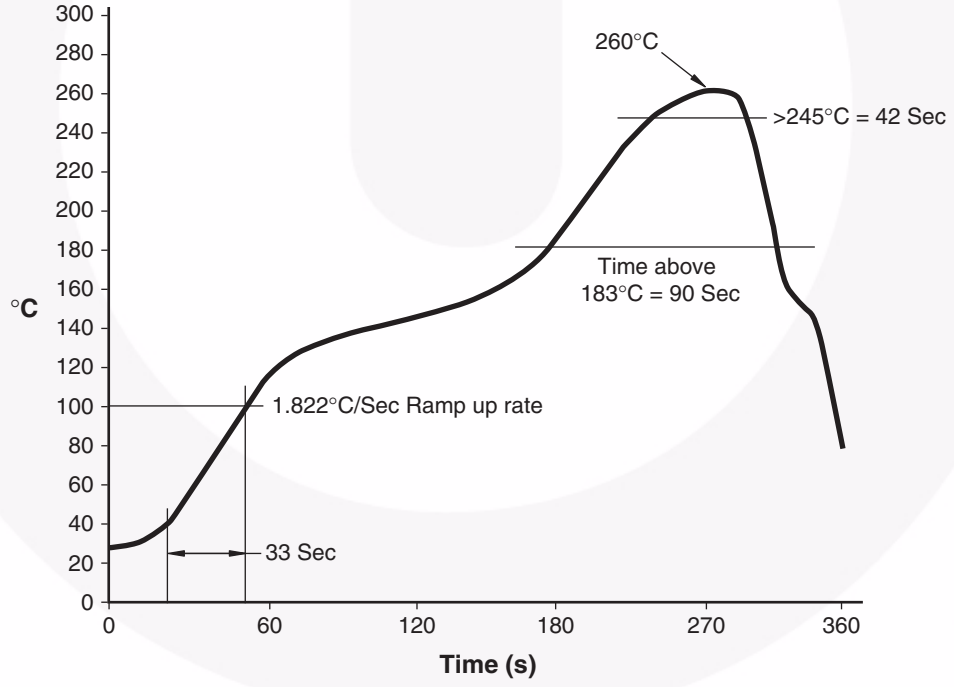
*Note – Parts that do not have the 'V' option (see definition 3 above) that are marked with date code '325' or earlier are marked in portrait format.

## Tape Dimensions




**Note:**
All dimensions are in millimeters.

## Reflow Profile



FAIRCHILD SEMICONDUCTOR®

## TRADEMARKS

The following includes registered and unregistered trademarks and service marks, owned by Fairchild Semiconductor and/or its global subsidiaries, and is not intended to be an exhaustive list of all such trademarks.

Auto-SPM™
Build it Now™
CorePLUS™
CorePOWER™
*CROSSVOLT*™
CTL™
Current Transfer Logic™
EcoSPARK®
EfficentMax™
EZSWITCH™*
™*
®
Fairchild®
Fairchild Semiconductor®
FACT Quiet Series™
FACT®
FAST®
FastvCore™
FETBench™
FlashWriter®*
FPS™
F-PFS™
FRFET®
Global Power Resource SM
Green FPS™
Green FPS™ e-Series™
G*max*™
GTO™
IntelliMAX™
ISOPLANAR™
MegaBuck™
MICROCOUPLER™
MicroFET™
MicroPak™
MillerDrive™
MotionMax™
Motion-SPM™
OPTOLOGIC®
OPTOPLANAR®
®
PDP SPM™
Power-SPM™
PowerTrench®
PowerXS™
Programmable Active Droop™
QFET®
QS™
Quiet Series™
RapidConfigure™
™
Saving our world, 1mW/W/kW at a time™
SmartMax™
SMART START™
SPM®
STEALTH™
SuperFET™
SuperSOT™-3
SuperSOT™-6
SuperSOT™-8
SupreMOS™
SyncFET™
Sync-Lock™
SYSTEM GENERAL ®*
The Power Franchise®
the power franchise
TinyBoost™
TinyBuck™
TinyLogic®
TINYOPTO™
TinyPower™
TinyPWM™
TinyWire™
TriFault Detect™
TRUECURRENT™*
µSerDes™
SerDes
UHC®
Ultra FRFET™
UniFET™
VCX™
VisualMax™
XS™

* Trademarks of System General Corporation, used under license by Fairchild Semiconductor.

## DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION, OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

## LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.

As used herein:

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.

## ANTI-COUNTERFEITING POLICY

Fairchild Semiconductor Corporation's Anti-Counterfeiting Policy. Fairchild's Anti-Counterfeiting Policy is also stated on our external website, www.fairchildsemi.com, under Sales Support.

Counterfeiting of semiconductor parts is a growing problem in the industry. All manufacturers of semiconductor products are experiencing counterfeiting of their parts. Customers who inadvertently purchase counterfeit parts experience many problems such as loss of brand reputation, substandard performance, failed applications, and increased cost of production and manufacturing delays. Fairchild is taking strong measures to protect ourselves and our customers from the proliferation of counterfeit parts. Fairchild strongly encourages customers to purchase Fairchild parts either directly from Fairchild or from Authorized Fairchild Distributors who are listed by country on our web page cited above. Products customers buy either from Fairchild directly or from Authorized Fairchild Distributors are genuine parts, have full traceability, meet Fairchild's quality standards for handling and storage and provide access to Fairchild's full range of up-to-date technical and product information. Fairchild and our Authorized Distributors will stand behind all warranties and will appropriately address any warranty issues that may arise. Fairchild will not provide any warranty coverage or other assistance for parts bought from Unauthorized Sources. Fairchild is committed to combat this global problem and encourage our customers to do their part in stopping this practice by buying direct or from authorized distributors.

## PRODUCT STATUS DEFINITIONS

**Definition of Terms**

| Datasheet Identification | Product Status | Definition |
|---|---|---|
| Advance Information | Formative / In Design | Datasheet contains the design specifications for product development. Specifications may change in any manner without notice. |
| Preliminary | First Production | Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design. |
| No Identification Needed | Full Production | Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design. |
| Obsolete | Not In Production | Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only. |

Rev. I40

**ООО «НИОКРсистемс» -** это оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов. Реализуемая нашей компанией продукция насчитывает более полумиллиона наименований.

Благодаря этому наша компания предлагает к поставке практически не ограниченный ассортимент компонентов как оптовыми, мелкооптовыми партиями, так и в розницу.

Благодаря развитой сети поставщиков, помогаем в поиске и приобретении экзотичных или снятых с производства компонентов.

## Наша компания это:

- Гарантия качества поставляемой продукции
- Широкий ассортимент
- Минимальные сроки поставок
- Техническая поддержка
- Подбор комплектации
- Индивидуальный подход
- Гибкое ценообразование
- Работаем по 275 ФЗ

ООО «НИОКР СИТЕМС»
Москва, 125362, Россия, ул. Вишневая, д. 9, к. 1, Блок 104 а и 104 в

Телефон: 8 (495) 268-14-82
Email: n@nsistems.ru

ИНН: 7735154786
ОГРН: 1167746717709