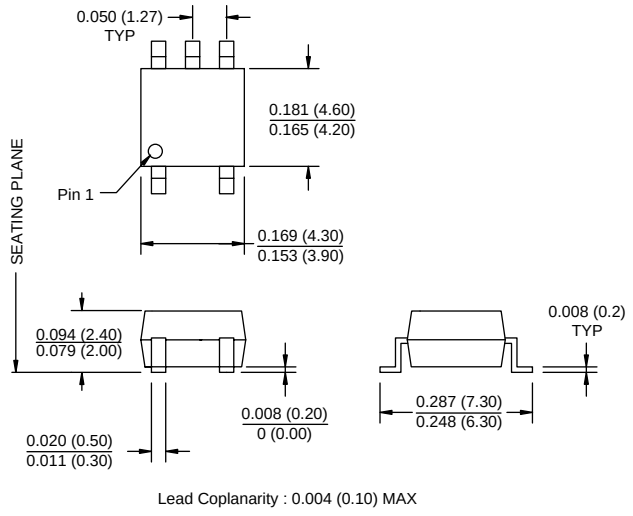
Jameco Part Number 1419938

FAIRCHILD
SEMICONDUCTOR®

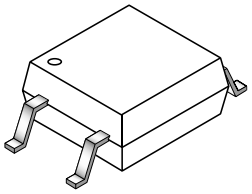
# 5-PIN MINI FLAT PACKAGE HIGH SPEED TRANSISTOR OPTOCOUPLERS

# FODM452 FODM453

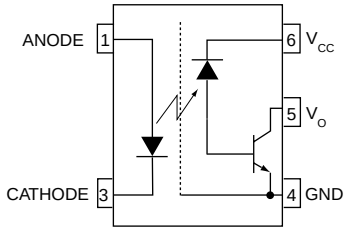
## PACKAGE




Note: All dimensions are in inches (millimeters)



## SCHEMATIC




## DESCRIPTION

The FODM452 and FODM453 optocouplers consist of an AlGaAs LED optically coupled to a high speed photodetector transistor. The devices are housed in a compact 5-pin mini flat package for optimum mounting density. The FODM453 features a high CMR rating for optimum common mode transient immunity.

## FEATURES

- Compact 5-pin mini flat package
- High speed-1 MBit/s
- Superior CMR-15kV/µs at $V_{CM}$ = 1500V (FODM453)
- Performance guaranteed over temperature (0–70°C)
- U.L. recognized (File # E90700)
- VDE0884 recognized (File # 136480)
  – Ordering option V, e.g., FODM452V

## APPLICATIONS

- Line receivers
- Pulse transformer replacement
- Output interface to CMOS-LSTTL-TTL
- Wide bandwidth analog coupling

# 5-PIN MINI FLAT PACKAGE HIGH SPEED TRANSISTOR OPTOCOUPLERS

## FODM452 FODM453

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

| Parameter | Symbol | Value | Units |
|---|---|---|---|
| Storage Temperature | $T_{STG}$ | -40 to +125 | °C |
| Operating Temperature | $T_{OPR}$ | -40 to +85 | °C |
| **EMITTER** | | | |
| DC/Average Forward Input Current | $I_F$ (avg) | 25 | mA |
| Peak Forward Input Current (50% duty cycle, 1 ms P.W.) | $I_F$ (pk) | 50 | mA |
| Peak Transient Input Current - (≤1 µs P.W., 300 pps) | $I_F$ (trans) | 1.0 | A |
| Reverse Input Voltage | $V_R$ | 5 | V |
| Input Power Dissipation (No derating required over specified operating temp range) | $P_D$ | 45 | mW |
| **DETECTOR** | | | |
| Average Output Current | $I_O$ (avg) | 8 | mA |
| Peak Output Current | $I_O$ (pk) | 16 | mA |
| Supply Voltage | $V_{CC}$ | -0.5 to 30 | V |
| Output Voltage | $V_O$ | -0.5 to 20 | V |
| Output power dissipation (No derating required over specified operating temp range) | $P_D$ | 100 | mW |

### ELECTRICAL CHARACTERISTICS ($T_A$ = 0 to 70°C Unless otherwise specified)

### INDIVIDUAL COMPONENT CHARACTERISTICS

| Parameter | Test Conditions | Symbol | Min | Typ** | Max | Unit |
|---|---|---|---|---|---|---|
| **EMITTER** | ($I_F$ = 16 mA, $T_A$ =25°C) | $V_F$ | | 1.60 | 1.7 | V |
| Input Forward Voltage | ($I_F$ = 16 mA) | | | | 1.8 | |
| Input Reverse Breakdown Voltage | ($I_R$ = 10 µA) | $B_{VR}$ | 5.0 | | | V |
| Temperature coefficient of forward voltage | ($I_F$ = 16 mA) | ($\Delta V_F/\Delta T_A$) | | -1.8 | | mV/°C |
| **DETECTOR** | | | | | | |
| Logic high output current | ($I_F$ = 0 mA, $V_O$ = $V_{CC}$ = 5.5 V) ($T_A$ =25°C) | $I_{OH}$ | | .001 | 0.5 | µA |
| | ($I_F$ = 0 mA, $V_O$ = $V_{CC}$ = 15 V) ($T_A$ =25°C) | | | .001 | 1 | |
| | ($I_F$ = 0 mA, $V_O$ = $V_{CC}$ = 15 V) | | | | 50 | |
| Logic low supply current | ($I_F$ = 16 mA, $V_O$ = Open) ($V_{CC}$ = 15 V) | $I_{CCL}$ | | 100 | 200 | µA |
| Logic high supply current | ($I_F$ = 0 mA, $V_O$ = Open, $V_{CC}$ = 15 V) ($T_A$ =25°C) | $I_{CCH}$ | | 0.05 | 1 | µA |
| | ($I_F$ = 0 mA, $V_O$ = Open) ($V_{CC}$ = 15 V) | | | | 2 | |

** All Typicals at $T_A$ = 25°C

# FODM452 FODM453

**TRANSFER CHARACTERISTICS** ($T_A$ = 0 to 70°C Unless otherwise specified)

| Parameter | Test Conditions | Symbol | Min | Typ** | Max | Unit |
|---|---|---|---|---|---|---|
| **COUPLED** Current transfer ratio | (Note 1) ($I_F$ = 16 mA, $V_{CC}$ = 4.5 V) $T_A$ = 25°C $V_{OL}$=0.4V | CTR | 20 | | 50 | % |
| | ($I_F$ = 16 mA, $V_{CC}$ = 4.5 V) $V_{OL}$=0.5V | | 15 | | | |
| Logic low output voltage output voltage | ($I_F$ = 16 mA, $I_O$ = 3 mA) ($V_{CC}$ = 4.5 V, $T_A$ =25°C) | $V_{OL}$ | | | 0.4 | V |
| | ($I_F$ = 16 mA, $I_O$ = 2.4 mA) ($V_{CC}$ = 4.5 V) | | | | 0.5 | |

** All Typicals at $T_A$ = 25°C

**SWITCHING CHARACTERISTICS** ($T_A$ = 0 to 70°C unless otherwise specified., $V_{CC}$ = 5 V)

| Parameter | Test Conditions | Symbol | Device | Min | Typ** | Max | Unit |
|---|---|---|---|---|---|---|---|
| Propagation delay time to logic low | ($R_L$ = 1.9 kΩ, $I_F$ = 16 mA) (Note 2) (Fig. 9) $T_A$ = 25°C | $T_{PHL}$ | | | 0.40 | 0.8 | µs |
| | ($R_L$ = 1.9 kΩ, $I_F$ = 16 mA) (Note 2) (Fig. 9) | | | | | 1.0 | µs |
| Propagation delay time to logic high | ($R_L$ = 1.9 kΩ, $I_F$ = 16 mA) (Note 2) (Fig. 9) $T_A$ = 25°C | $T_{PLH}$ | | | 0.35 | 0.8 | µs |
| | ($R_L$ = 1.9 kΩ, $I_F$ = 16 mA) (Note 2) (Fig. 9) | | | | | 1.0 | µs |
| Common mode transient immunity at logic high | ($I_F$ = 0 mA, $V_{CM}$ = 10 $V_{P-P}$, $R_L$ = 1.9 kΩ) (Note 3) (Fig. 10) $T_A$ = 25°C | $\|CM_H\|$ | FODM452 | 5 | 15 | | KV/µs |
| | ($I_F$ = 0 mA, $V_{CM}$ = 1500 $V_{P-P}$) $T_A$ = 25°C, ($R_L$ = 1.9 kΩ) (Note 3) (Fig. 10) | | FODM453 | 15 | 40 | | KV/µs |
| Common mode transient immunity at logic low | ($I_F$ = 16 mA, $V_{CM}$ = 10 $V_{P-P}$, $R_L$ = 1.9 kΩ) (Note 3) (Fig. 10) $T_A$ = 25°C | $\|CM_L\|$ | FODM452 | 5 | 15 | | KV/µs |
| | ($I_F$ = 16 mA, $V_{CM}$ = 1500 $V_{P-P}$) ($R_L$ = 1.9 kΩ) ($T_A$ = 25°C)(Note 3) (Fig. 10) | | FODM453 | 15 | 40 | | KV/µs |
| Bandwidth | $R_L$ = 100Ω | BW | | | 3 | | MHz |

** All Typicals at $T_A$ = 25°C

| **ISOLATION CHARACTERISTICS** ($T_A$ = 0 to 70°C Unless otherwise specified) | | | | | | |
|---|---|---|---|---|---|---|
| **Characteristics** | **Test Conditions** | **Symbol** | **Min** | **Typ**** | **Max** | **Unit** |
| Withstand insulation test voltage | (RH ≤ 50%, $T_A$ = 25°C) (Note 4) ( t = 1 min.) | $V_{ISO}$ | 3750 | | | $V_{RMS}$ |
| Capacitance (input to output) | (Note 4) (f = 1 MHz) | $C_{I-O}$ | | 0.2 | | pF |

** All Typicals at $T_A$ = 25°C

**Notes**

1. Current Transfer Ratio is defined as a ratio of output collector current, $I_O$, to the forward LED input current, $I_F$, times 100%.
2. The 1.9 kΩ load represents 1 TTL unit load of 1.6 mA and 5.6 kΩ pull-up resistor.
3. Common mode transient immunity in logic high level is the maximum tolerable (positive) $dV_{cm}/dt$ on the leading edge of the common mode pulse signal $V_{CM}$, to assure that the output will remain in a logic high state (i.e., $V_O$>2.0 V). Common mode transient immunity in logic low level is the maximum tolerable (negative) $dV_{cm}/dt$ on the trailing edge of the common mode pulse signal, $V_{CM}$, to assure that the output will remain in a logic low state (i.e., $V_O$<0.8 V).
4. Device is considered a two terminal device: Pins 1, and 3 are shorted together and Pins 4, 5, and 6 are shorted together.

## TYPICAL PERFORMANCE CURVES

**Fig. 1 Input Forward Current vs Forward Voltage**

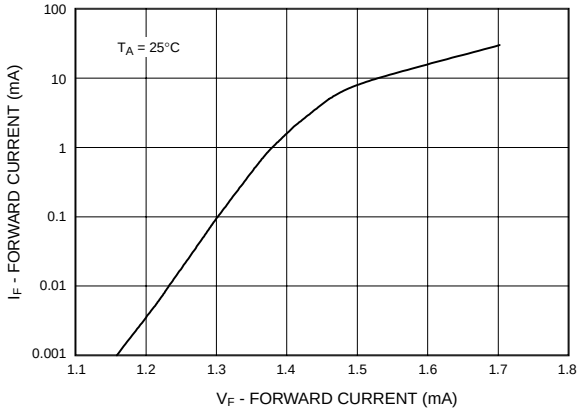



**Fig. 2 Normalized Current Transfer Ratio vs. Input Current**

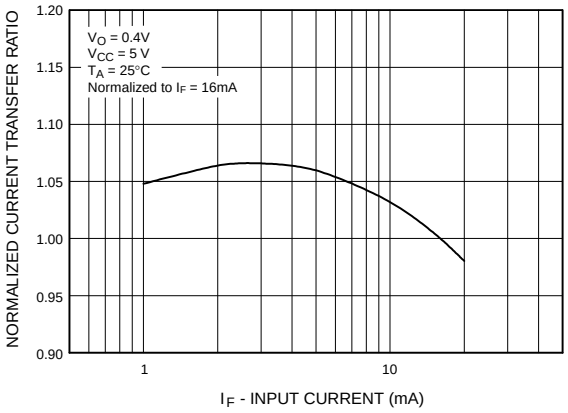



**Fig. 3 Normalized Current Transfer Ratio vs. Ambient Temperature**

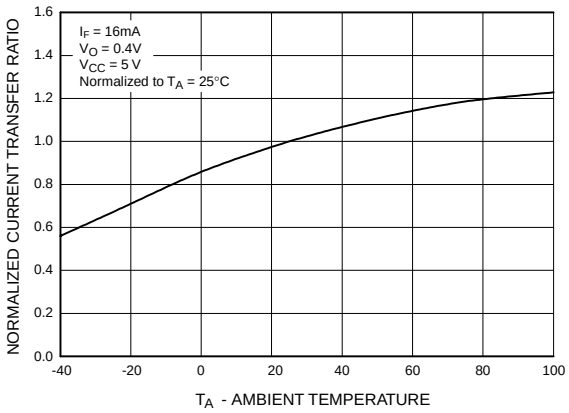



**Fig. 4 Logic High Output Current vs. Ambient Temperature**

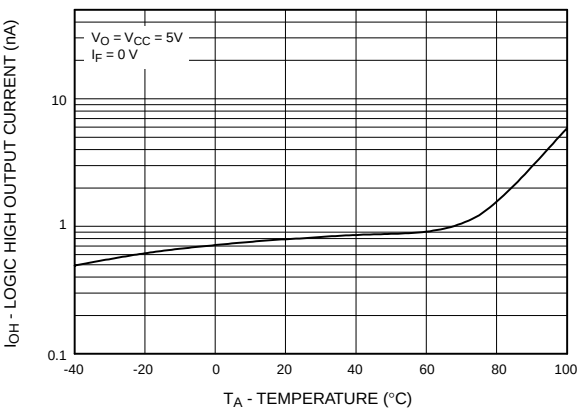



**Fig. 5 DC and Pulsed Transfer Characteristics**

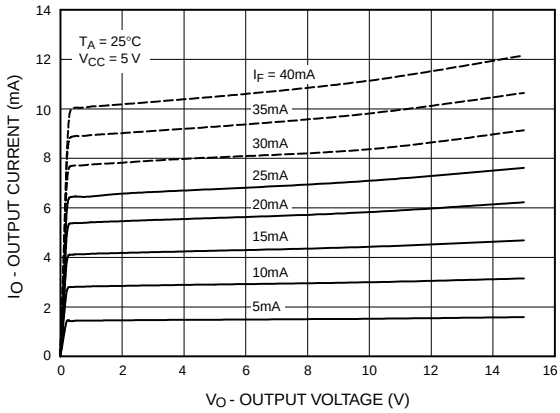
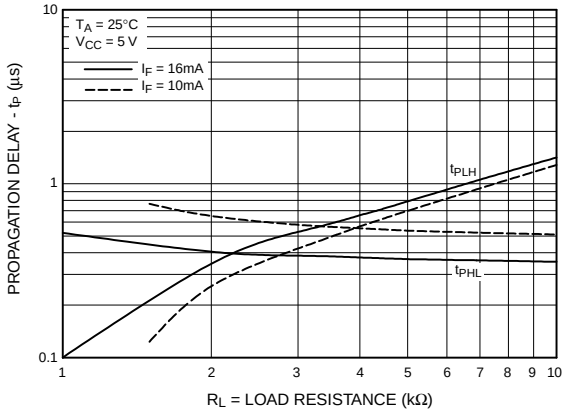



**Fig. 6 Propagation Delay vs. Load Resistance**



## TYPICAL PERFORMANCE CURVES

**Fig. 7 Propagation Delay vs. Ambient Temperature**

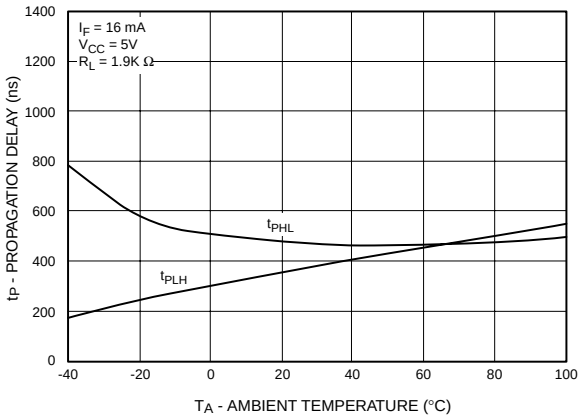
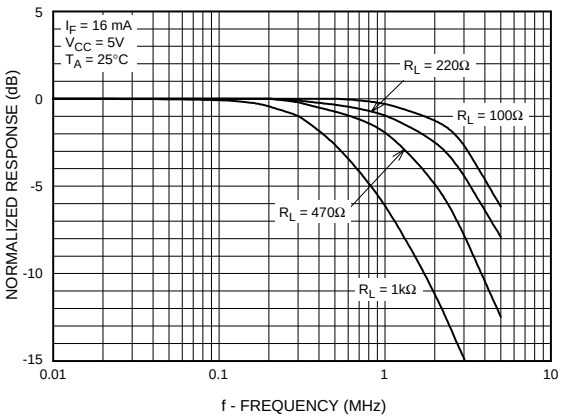



**Fig. 8 Frequency Response**



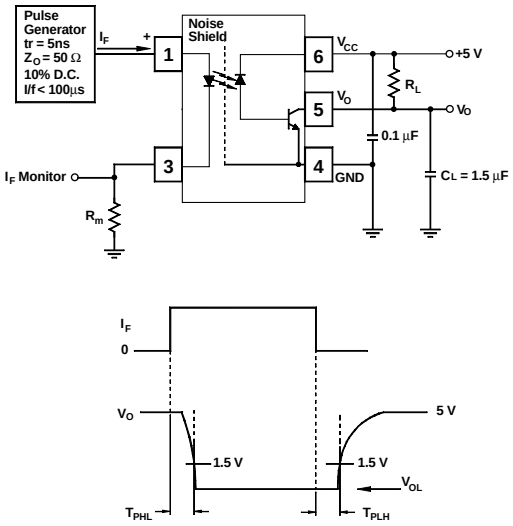



**Fig. 9 Switching Time Test Circuit**

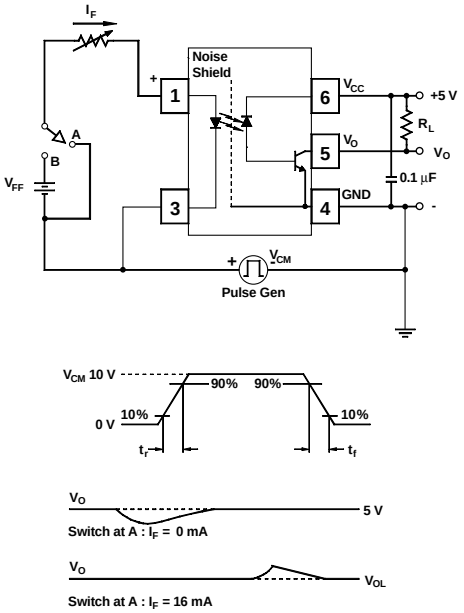
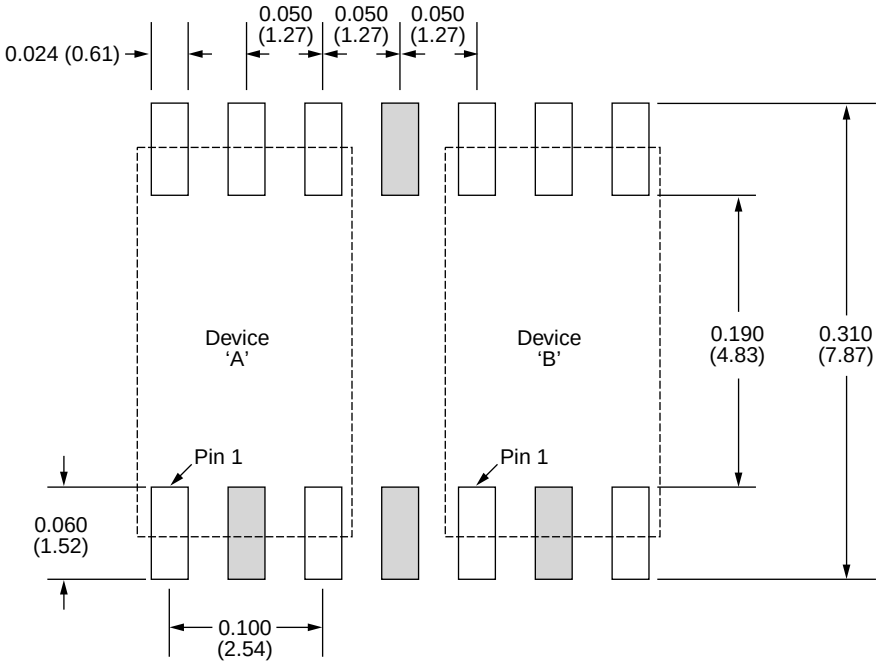



**Fig. 10 Common Mode Immunity Test Circuit**

## FOOTPRINT DRAWING FOR PCB LAYOUT




End Stacking Configuration

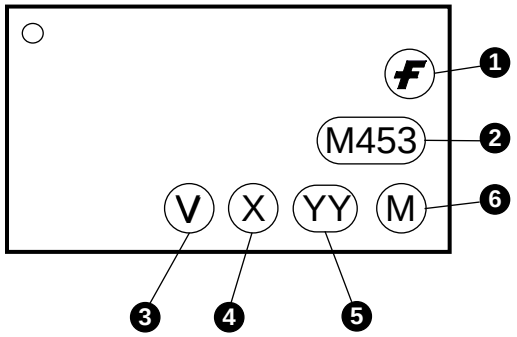
Dimensions in inches (mm)

Unutilized Solder Pad

## ORDERING INFORMATION

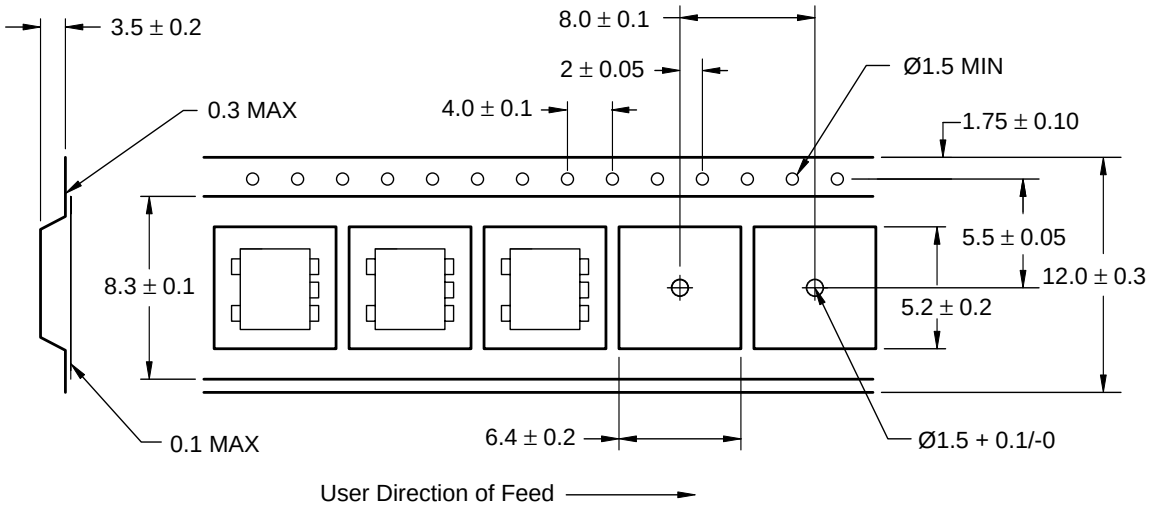
| Option | Description |
|---|---|
| R1 | Tape and Reel (500 per reel) |
| R2 | Tape and Reel (2500 per reel) |
| V | VDE0884 |
| R1V | VDE0884, Tape and Reel (500 per reel) |
| R2V | VDE0884, Tape and Reel (2500 per reel) |

## MARKING INFORMATION

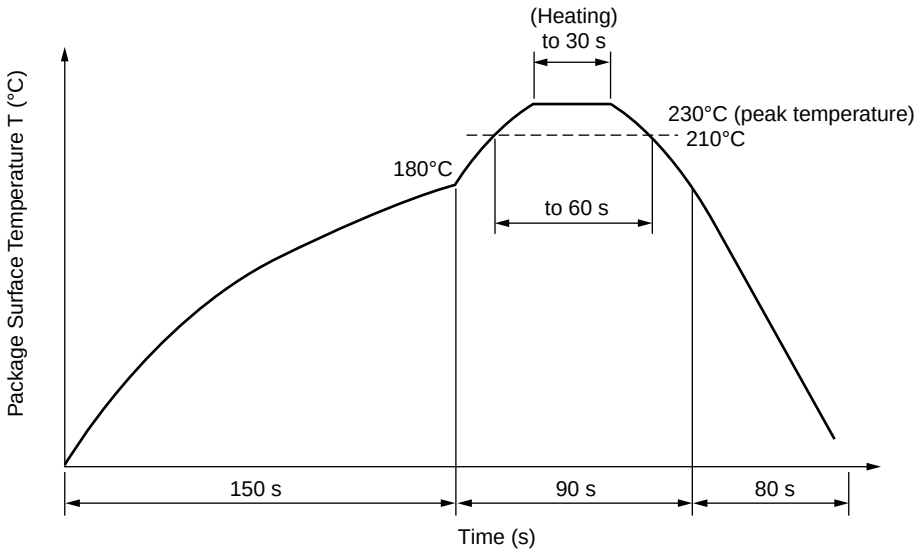



| Definitions | |
|---|---|
| 1 | Fairchild logo |
| 2 | Device number |
| 3 | VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table) |
| 4 | One digit year code, e.g., ‘3’ |
| 5 | Two digit work week ranging from ‘01’ to ‘53’ |
| 6 | Assembly package code |

## Carrier Tape Specifications




## Reflow Profile




- Peak reflow temperature: 230°C (package surface temperature) for 30 seconds
- Time of temperature higher than 210°C: 60 seconds or less
- One time soldering reflow is recommended

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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.