

# FAN4041

## Precision Micropower Shunt Voltage Reference

### Features

- Adjustable shunt reference
- Tolerances to  $\pm 0.5\%$  ( $25^{\circ}\text{C}$ )
- Low output noise
- Low temperature coefficient to  $100\text{ ppm}/^{\circ}\text{C}$  max
- Small packages
- Extended operating current range

### Applications

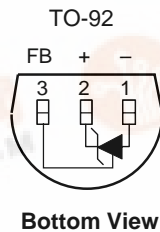
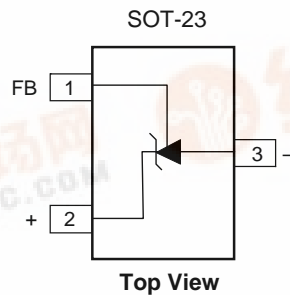
- Portable equipment
- Disk drives
- Instrumentation
- Audio equipment
- Data acquisition systems

### Description

The FAN4041 adjustable precision shunt references are ideal for space- and cost-sensitive applications. They are available with output voltage tolerances of 0.5% and 1%. They also have excellent temperature coefficients, to  $100\text{ ppm}/^{\circ}\text{C}$  for the tighter tolerance grades. The FAN4041 series has an extended operating current range, sinking as much as 25mA.

The FAN4041 series is available in SOT-23 and TO-92 packages.

### Connection Diagrams



## Absolute Maximum Ratings<sup>1</sup>

Ratings are over full operating free-air temperature range unless otherwise noted.

| Parameter                             | Min.                         | Max. | Unit |
|---------------------------------------|------------------------------|------|------|
| Continuous cathode current, $I_K$     | -30                          | 30   | mA   |
| Power dissipation                     | See Dissipation Rating Table |      |      |
| Maximum Output Voltage (FAN4041)      |                              | 12   | V    |
| Storage Temperature Range             | -65                          | 150  | °C   |
| Lead Temperature (Soldering, 10 sec.) |                              | 300  | °C   |

### Notes:

- Functional operation under these conditions is not implied. Permanent damage may occur if the device is subjected to conditions outside these ratings.

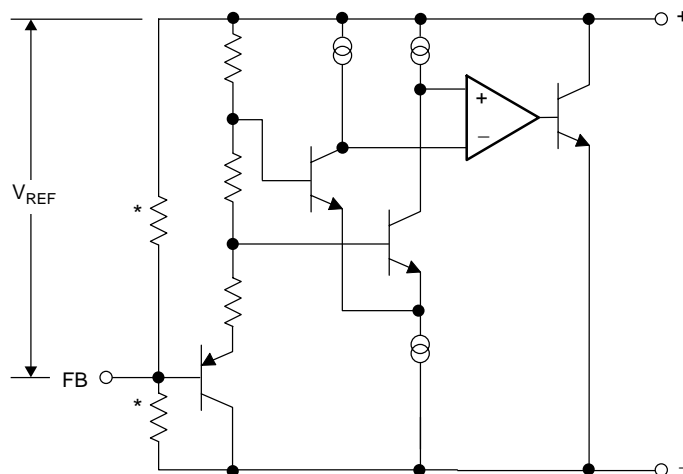
## Recommended Operating Conditions

| Parameter                                      | Min. | Max. | Unit |
|--|------|------|------|
| Continuous cathode current, $I_K$              | 0.07 | 25   | mA   |
| Operating temperature range in free air, $T_A$ | -40  | 85   | °C   |
| Output Voltage Range (FAN4041)                 | 1.24 | 10   | V    |

## Dissipation Rating Table

| Package | Power Rating<br>$T_A \leq 25^\circ\text{C}$ | Derating Factor<br>$T_A \geq 25^\circ\text{C}$ | Power Rating<br>$T_A = 70^\circ\text{C}$ |
|---------|---|--|--|
| TO-92   | 550mW                                       | 5.5mW/°C                                       | 302mW                                    |
| SOT23   | 306mW                                       | 3.0mW/°C                                       | 168mW                                    |

## Equivalent Schematic



\*External adjust components.

## Guaranteed Electrical Characteristics, FAN4041

( $T_A = 25^\circ\text{C}$  unless otherwise specified, in free air)

The • denotes specifications which apply over the full operating temperature range.

| Symbol                        | Parameter                                       | Conditions  | Limits             |                 | Units               |
|-------------------------------|---|---|--------------------|-----------------|---------------------|
|                               |   |   | C                  | D               |                     |
| $V_{REF}$                     | Reference Voltage                               | $I_K = 100\mu\text{A}$ , $V_{OUT} = 5\text{V}$  | 1.220              | 1.220           | V*                  |
| $TCV_{Ref}$                   | Reference Voltage Tolerance                     | $I_K = 100\mu\text{A}$ , $V_{OUT} = 5\text{V}$  | ±6.2<br>• ±14      | ±12<br>±24      | mV<br>mV            |
| $I_{RMIN}$                    | Minimum Operating Current                       |   | • 65               | 70              | μA                  |
| $\Delta V_{REF}/\Delta T$     | Reference Voltage Temperature Coefficient       | $I_K = 1\text{mA}$  | • ±100             | ±150            | ppm/°C              |
| $\Delta V_{REF} (\Delta I_K)$ | Reference Voltage Change with Operating Current | $I_{RMIN} \leq I_K \leq 1\text{mA}$<br>$1\text{mA} \leq I_K \leq 12\text{mA}$<br>$1\text{mA} \leq I_K \leq 25\text{mA}$ | • 2.0<br>• 8<br>12 | 2.5<br>10<br>15 | mV<br>mV<br>mV*     |
| $\Delta V_{REF} (\Delta V_O)$ | Reference Voltage Change with Output Voltage    | $I_\mu = 1\text{mA}$  | • -2.5             | -3.0            | mV/V                |
| $I_{FB}$                      | Feedback Current                                |   | • 120              | 200             | nA                  |
| $Z_{KA}$                      | Reverse Dynamic Impedance                       | $I_K = 1\text{mA}$ , $f = 120\text{Hz}$ ,<br>$I_{AC} = 0.1I_K$<br>$V_{OUT} = V_{REF}$<br>$V_{OUT} = 10\text{V}$         | 0.3<br>2           | 0.3<br>2        | Ω*<br>Ω*            |
| $e_N$                         | Wideband Noise                                  | $I_K = 100\mu\text{A}$ , $V_{OUT} = V_{REF}$<br>$10\text{Hz} \leq f \leq 10\text{kHz}$                                  | 20                 | 20              | μV <sub>RMS</sub> * |
| $\Delta V_{REF}$              | Reference Voltage Long-term Stability           | $t = 1000\text{hrs}$ , $T = 25^\circ\text{C}$ ,<br>$I_K = 100\mu\text{A}$   | 120                | 120             | ppm*                |

\*Typical.

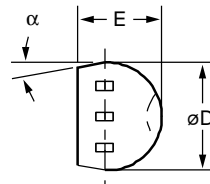
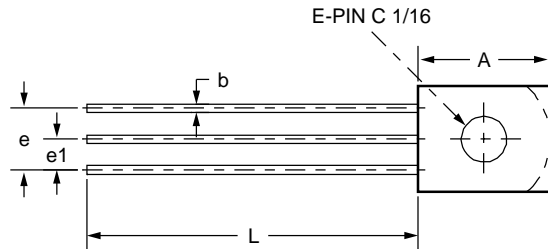
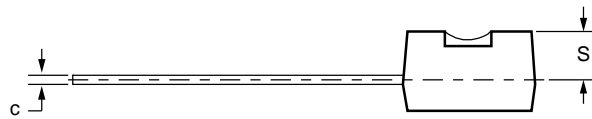
# Mechanical Dimensions

## TO-92 Package

| Symbol | Inches |      | Millimeters |      | Notes |
|--------|--------|------|-------------|------|-------|
|        | Min.   | Max. | Min.        | Max. |       |
| A      | .170   | .210 | 4.32        | 5.33 |       |
| b      | .015   | .021 | .38         | .53  |       |
| c      | .014   | .020 | .36         | .51  |       |
| øD     | .175   | .205 | 4.45        | 5.21 |       |
| E      | .125   | .165 | 3.18        | 4.19 |       |
| e      | .095   | .105 | 2.41        | 2.67 |       |
| e1     | .045   | .055 | 1.14        | 1.40 |       |
| L      | .500   | —    | 12.70       | —    |       |
| S      | .080   | .115 | 2.03        | 2.92 |       |
| α      | 4°     | 6°   | 4°          | 6°   |       |

**Notes:**

1. Package outline exclusive of any mold flashes dimension.
2. Package outline exclusive of burr dimension.



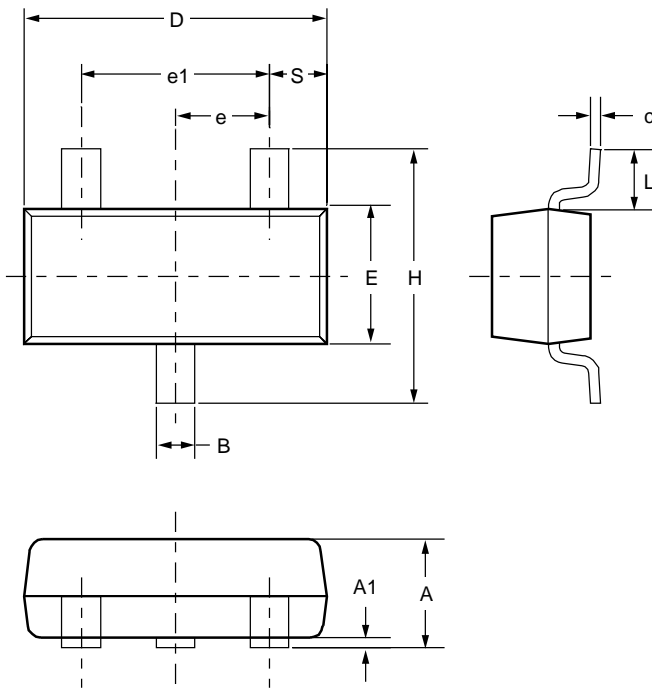
# Mechanical Dimensions (continued)

## SOT-23 Package

| Symbol | Inches   |      | Millimeters |      | Notes |
|--------|----------|------|-------------|------|-------|
|        | Min.     | Max. | Min.        | Max. |       |
| A      | .035     | .044 | .89         | 1.12 |       |
| A1     | .0004    | .004 | .01         | .10  |       |
| B      | .012     | .020 | .30         | .50  |       |
| c      | .003     | .008 | .08         | .20  |       |
| D      | .110     | .120 | 2.80        | 3.04 |       |
| E      | .047     | .055 | 1.20        | 1.40 |       |
| e      | .037 BSC |      | .95 BSC     |      |       |
| e1     | .075 BSC |      | 1.90 BSC    |      |       |
| H      | .083     | .104 | 2.10        | 2.64 |       |
| L      | .021 REF |      | .54 REF     |      |       |
| S      | .016 Nom |      | .395 Nom    |      |       |

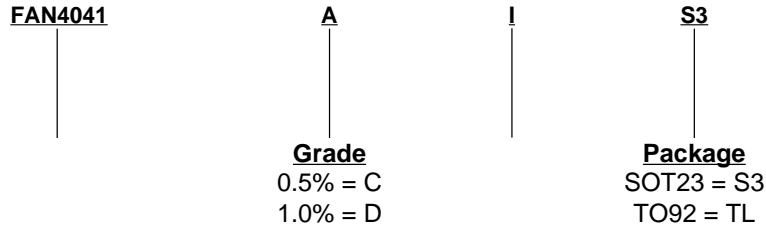
**Notes:**

1. Dimensions are inclusive of plating.
2. Dimensions are exclusive of mold flash & metal burr.
3. Comply to JEDEC TO-236.
4. This drawing is for matrix leadframe only.



## Ordering Information

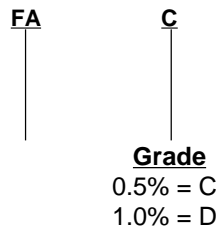
Example: FAN4041CIS3



## SOT-23 Package Marking Information

Only 3 fields of marking are possible on an SOT-23. This table gives the meaning of these fields.

Example: FAC



### 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.

### 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 THE PRESIDENT 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, or (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 significant injury to the user.
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.