

FAN4050

Precision Micropower Shunt Voltage Reference

Features

- Fixed 2.500V, 4.096V, 5.000V, 8.192V, 10.000V
- Tolerances to $\pm 0.1\%$ (25°C)
- Low output noise
- Low temperature coefficient
- Small packages: SSOT-23
- Extended operating current range

Applications

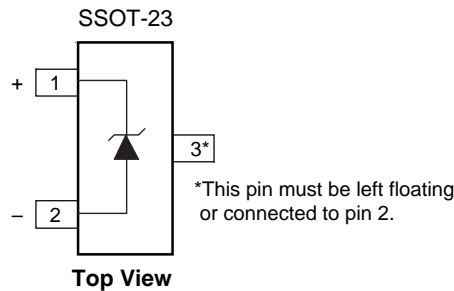
- Portable equipment
- Disk drives
- Instrumentation
- Audio equipment
- Data acquisition systems

Description

The FAN4050 series of precision shunt references are ideal for space- and cost-sensitive applications. They are available in a variety of fixed output voltages (2.500V, 4.096V, 5.000V, 8.192V, and 10.000V) and with a variety of output voltage tolerances (0.1%, 0.2%, and 0.5%). They also have excellent temperature coefficients, 50ppm/°C.

The FAN4050 series is available in the SSOT-23 package.

Connection Diagram



Absolute Maximum Ratings¹

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

Parameter	Min.	Max.	Unit
Continuous cathode current, I_K	-10	20	mA
Power dissipation ²		280	mW
Storage Temperature Range	-65	150	°C
Lead Temperature (Soldering, 10 sec.)		300	°C

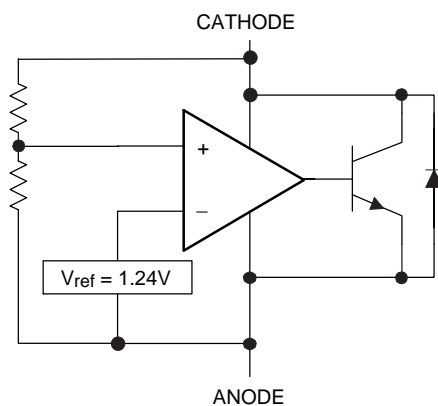
Notes:

- Functional operation under these conditions is not implied. Permanent damage may occur if the device is subjected to conditions outside these ratings.
- It is recommended to connect pin 3 to pin 2 in the SSOT23 package to ensure optimal thermal performance.

Recommended Operating Conditions

Parameter	Min.	Max.	Unit
Continuous cathode current, I_K	0.1	15	mA
Operating temperature range in free air, T_A	-40	85	°C

Equivalent Schematic



Guaranteed Electrical Characteristics, FAN4050-2.5

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

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

Symbol	Parameter	Conditions	Limits			Units
			A	B	C	
V_R	Reverse Breakdown Voltage	$I_K = 100\mu\text{A}$	2.500	2.500	2.500	V*
TCV_R	Reverse Breakdown Voltage Tolerance	$I_K = 100\mu\text{A}$	± 2.5 • ± 11	± 5.0 ± 14	± 13 ± 21	mV mV
$I_{R\text{MIN}}$	Minimum Operating Current		• 65	65	65	μA
$\Delta V_R/\Delta T$	Reverse Breakdown Voltage Temperature Coefficient	$I_K = 100\mu\text{A}$	• ± 50	± 50	± 50	ppm/ $^\circ\text{C}$
$\Delta V_R (\Delta I_K)$	Reverse Breakdown Voltage Change with Operating Current	$I_{R\text{MIN}} \leq I_K \leq 1\text{mA}$ $1\text{mA} \leq I_K \leq 15\text{mA}$	• 1.2 • 8.0	1.2 8.0	1.2 8.0	mV mV
Z_{KA}	Reverse Dynamic Impedance	$I_K=1\text{mA}$, $f=120\text{Hz}$, $I_{AC}=0.1I_K$	0.3	0.3	0.3	Ω^*
e_N	Wideband Noise	$I_K=100\mu\text{A}$, $10\text{Hz} \leq f \leq 10\text{kHz}$	41	41	41	$\mu\text{V}_{\text{RMS}}^*$
ΔV_R	Reverse Breakdown Voltage Long-term Stability	$t=1000\text{hrs}$, $T=25^\circ\text{C}$, $I_K=100\mu\text{A}$	120	120	120	ppm*

*Typical.

Guaranteed Electrical Characteristics, FAN4050-4.1

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

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

Symbol	Parameter	Conditions	Limits			Units
			A	B	C	
V_R	Reverse Breakdown Voltage	$I_K = 100\mu\text{A}$	4.096	4.096	4.096	V*
TCV_R	Reverse Breakdown Voltage Tolerance	$I_K = 100\mu\text{A}$	± 4.1 • ± 18	± 8.2 ± 22	± 21 ± 34	mV mV
$I_{R\text{MIN}}$	Minimum Operating Current		• 73	73	73	μA
$\Delta V_R/\Delta T$	Reverse Breakdown Voltage Temperature Coefficient	$I_K = 100\mu\text{A}$	• ± 50	± 50	± 50	ppm/ $^\circ\text{C}$
$\Delta V_R (\Delta I_K)$	Reverse Breakdown Voltage Change with Operating Current	$I_{R\text{MIN}} \leq I_K \leq 1\text{mA}$ $1\text{mA} \leq I_K \leq 15\text{mA}$	• 1.2 • 10	1.2 10	1.2 10	mV mV
Z_{KA}	Reverse Dynamic Impedance	$I_K=1\text{mA}$, $f=120\text{Hz}$, $I_{AC}=0.1I_K$	0.5	0.5	0.5	Ω^*
e_N	Wideband Noise	$I_K=100\mu\text{A}$, $10\text{Hz} \leq f \leq 10\text{kHz}$	93	93	93	$\mu\text{V}_{\text{RMS}}^*$
ΔV_R	Reverse Breakdown Voltage Long-term Stability	$t=1000\text{hrs}$, $T=25^\circ\text{C}$, $I_K=100\mu\text{A}$	120	120	120	ppm*

*Typical.

Guaranteed Electrical Characteristics, FAN4050-5.0

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

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

Symbol	Parameter	Conditions	Limits			Units
			A	B	C	
V_R	Reverse Breakdown Voltage	$I_K = 100\mu\text{A}$	5.000	5.000	5.000	V*
TCV_R	Reverse Breakdown Voltage Tolerance	$I_K = 100\mu\text{A}$	± 5.0 • ± 22	± 10 ± 27	± 25 ± 42	mV mV
$I_{R\text{MIN}}$	Minimum Operating Current		• 80	80	80	μA
$\Delta V_R/\Delta T$	Reverse Breakdown Voltage Temperature Coefficient	$I_K = 100\mu\text{A}$	• ± 50	± 50	± 50	ppm/ $^\circ\text{C}$
$\Delta V_R (\Delta I_K)$	Reverse Breakdown Voltage Change with Operating Current	$I_{R\text{MIN}} \leq I_K \leq 1\text{mA}$ $1\text{mA} \leq I_K \leq 15\text{mA}$	• 1.4 • 12	1.4 12	1.4 12	mV mV
Z_{KA}	Reverse Dynamic Impedance	$I_K=1\text{mA}$, $f=120\text{Hz}$, $I_{AC}=0.1I_K$	0.5	0.5	0.5	Ω^*
e_N	Wideband Noise	$I_K=100\mu\text{A}$, $10\text{Hz} \leq f \leq 10\text{kHz}$	93	93	93	$\mu\text{V}_{\text{RMS}}^*$
ΔV_R	Reverse Breakdown Voltage Long-term Stability	$t=1000\text{hrs}$, $T=25^\circ\text{C}$, $I_K=100\mu\text{A}$	120	120	120	ppm*

*Typical.

Guaranteed Electrical Characteristics, FAN4050-8.2

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

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

Symbol	Parameter	Conditions	Limits			Units
			A	B	C	
V_R	Reverse Breakdown Voltage	$I_K = 150\mu\text{A}$	8.192	8.192	8.192	V*
TCV_R	Reverse Breakdown Voltage Tolerance	$I_K = 150\mu\text{A}$	± 8.2 • ± 35	± 16 ± 43	± 41 ± 68	mV mV
$I_{R\text{MIN}}$	Minimum Operating Current		• 95	95	95	μA
$\Delta V_R/\Delta T$	Reverse Breakdown Voltage Temperature Coefficient	$I_K = 150\mu\text{A}$	• ± 50	± 50	± 50	ppm/ $^\circ\text{C}$
$\Delta V_R (\Delta I_K)$	Reverse Breakdown Voltage Change with Operating Current	$I_{R\text{MIN}} \leq I_K \leq 1\text{mA}$ $1\text{mA} \leq I_K \leq 15\text{mA}$	• 2.5 • 18	2.5 18	2.5 18	mV mV
Z_{KA}	Reverse Dynamic Impedance	$I_K=1\text{mA}$, $f=120\text{Hz}$, $I_{AC}=0.1I_K$	0.6	0.6	0.6	Ω^*
e_N	Wideband Noise	$I_K=150\mu\text{A}$, $10\text{Hz} \leq f \leq 10\text{kHz}$	150	150	150	$\mu\text{V}_{\text{RMS}}^*$
ΔV_R	Reverse Breakdown Voltage Long-term Stability	$t=1000\text{hrs}$, $T=25^\circ\text{C}$, $I_K=150\mu\text{A}$	120	120	120	ppm*

*Typical.

Guaranteed Electrical Characteristics, FAN4050-10

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

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

Symbol	Parameter	Conditions	Limits			Units
			A	B	C	
V_R	Reverse Breakdown Voltage	$I_K = 150\mu\text{A}$	10.00	10.00	10.00	V*
TCV_R	Reverse Breakdown Voltage Tolerance	$I_K = 150\mu\text{A}$	±10 • ±43	±20 ±53	±50 ±83	mV mV
I_{RMIN}	Minimum Operating Current		• 103	103	103	μA
$\Delta V_R/\Delta T$	Reverse Breakdown Voltage Temperature Coefficient	$I_K = 150\mu\text{A}$	• ±50	±50	±50	ppm/°C
$\Delta V_R (\Delta I_K)$	Reverse Breakdown Voltage Change with Operating Current	$I_{RMIN} \leq I_K \leq 1\text{mA}$ $1\text{mA} \leq I_K \leq 15\text{mA}$	• 3.5 • 23	3.5 23	3.5 23	mV mV
Z_{KA}	Reverse Dynamic Impedance	$I_K=1\text{mA}$, $f=120\text{Hz}$, $I_{AC}=0.1I_K$	0.7	0.7	0.7	Ω*
e_N	Wideband Noise	$I_K=150\mu\text{A}$, $10\text{Hz} \leq f \leq 10\text{kHz}$	150	150	150	μV _{RMS} *
ΔV_R	Reverse Breakdown Voltage Long-term Stability	$t=1000\text{hrs}$, $T=25^\circ\text{C}$, $I_K=150\mu\text{A}$	120	120	120	ppm*

*Typical.

Advance Specification

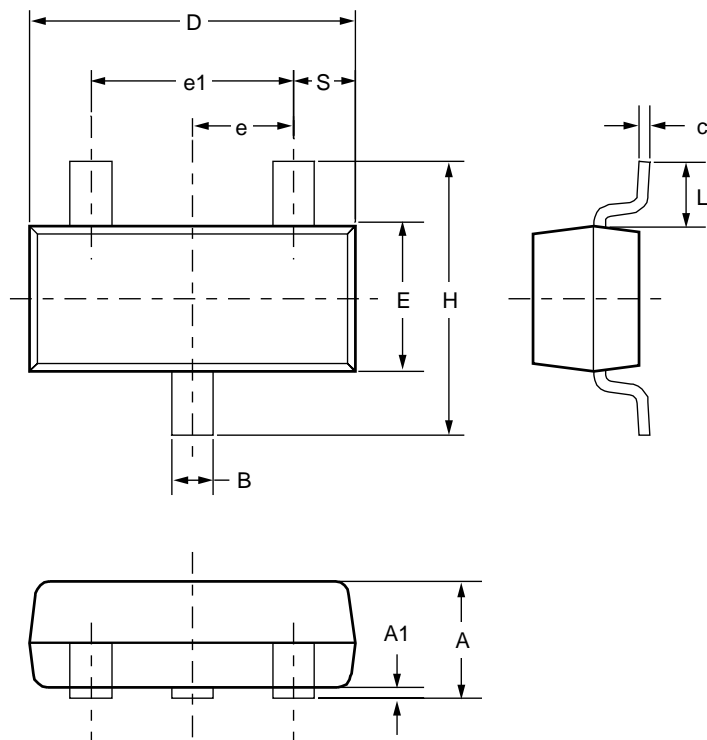
Mechanical Dimensions

SSOT-23 Package

Symbol	Inches		Millimeters		Notes
	Min.	Max.	Min.	Max.	
A	.035	.044	.89	1.02	
A1	.0005	.004	.013	.10	
B	.015	.020	.37	.51	
c	.003	.007	.085	.18	
D	.110	.120	2.80	3.04	
E	.047	.055	1.20	1.40	
e	.035	.041	.89	1.03	
e1	.070	.080	1.78	2.05	
H	.083	.104	2.10	2.64	
L	.027 BSC		.69 BSC		
S	.018	.024	.45	.60	

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.

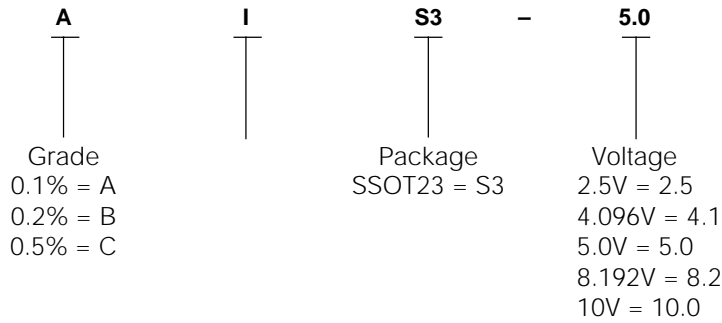


Advance Specification

Ordering Information

Example: FAN4050 A I S3-5.0

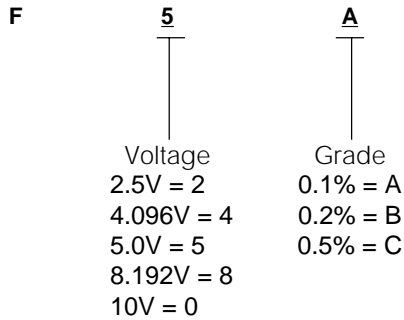
FAN4050



SSOT-23 Package Marking Information

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

Example: F5A



Advance Specification

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FACT™	QFET™	
FACT Quiet Series™	QS™	
FAST®	Quiet Series™	
FASTr™	SuperSOT™-3	
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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.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
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