FAN4050

Precision Micropower Shunt Voltage Reference

Features

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

Applications

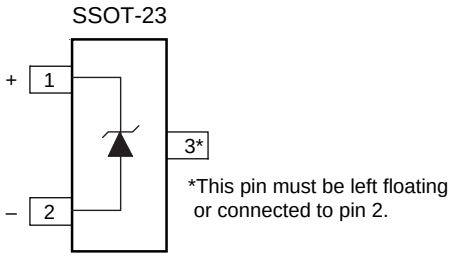
- Portable equipment
- Disk drives
- Instrumentation
- Audio equipment
- Data acquisition systems

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



Top View

Advance Specification

Absolute Maximum Ratings[1]

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

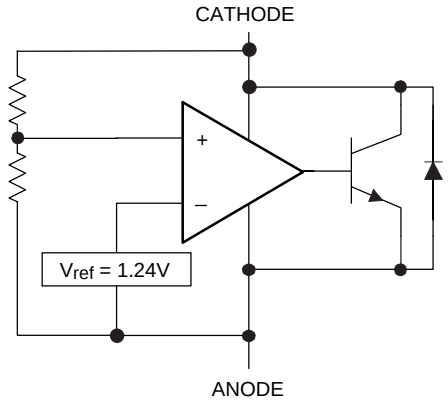
Notes:

1. Functional operation under these conditions is not implied. Permanent damage may occur if the device is subjected to conditions outside these ratings.
2. 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



Advance Specification

Advance Specification

Guaranteed Electrical Characteristics, FAN4050-2.5

(T_A = 25°C unless otherwise specified, in free air)

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

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

*Typical.

Guaranteed Electrical Characteristics, FAN4050-4.1

(T_A = 25°C unless otherwise specified, in free air)

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

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

*Typical.

Guaranteed Electrical Characteristics, FAN4050-5.0

(T_A = 25°C unless otherwise specified, in free air)
The • denotes specifications which apply over the full operating temperature range.

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

*Typical.

Guaranteed Electrical Characteristics, FAN4050-8.2

(T_A = 25°C unless otherwise specified, in free air)
The • denotes specifications which apply over the full operating temperature range.

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

*Typical.

Advance Specification

Guaranteed Electrical Characteristics, FAN4050-10

(T_A = 25°C unless otherwise specified, in free air)

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

Symbol	Parameter	Conditions		Limits A	Limits B	Limits C	Units
V_R	Reverse Breakdown Voltage	I_K = 150µA		10.00	10.00	10.00	V*
TCV_R	Reverse Breakdown Voltage Tolerance	I_K = 150µA	 •	±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 = 150µA	•	±50	±50	±50	ppm/°C
ΔV_R (ΔI_K)	Reverse Breakdown Voltage Change with Operating Current	$I_{RMIN} \le I_K \le$1mA 1mA ≤ I_K ≤ 15mA	• •	3.5 23	3.5 23	3.5 23	mV mV
Z_{KA}	Reverse Dynamic Impedance	I_K=1mA, f=120Hz, I_{AC}=0.1I_K		0.7	0.7	0.7	Ω*
e_N	Wideband Noise	I_K=150µA, 10Hz ≤ f ≤ 10kHz		150	150	150	μV_{RMS}*
ΔV_R	Reverse Breakdown Voltage Long-term Stability	t=1000hrs, T=25°C, I_K=150µA		120	120	120	ppm*

*Typical.

Advance Specification

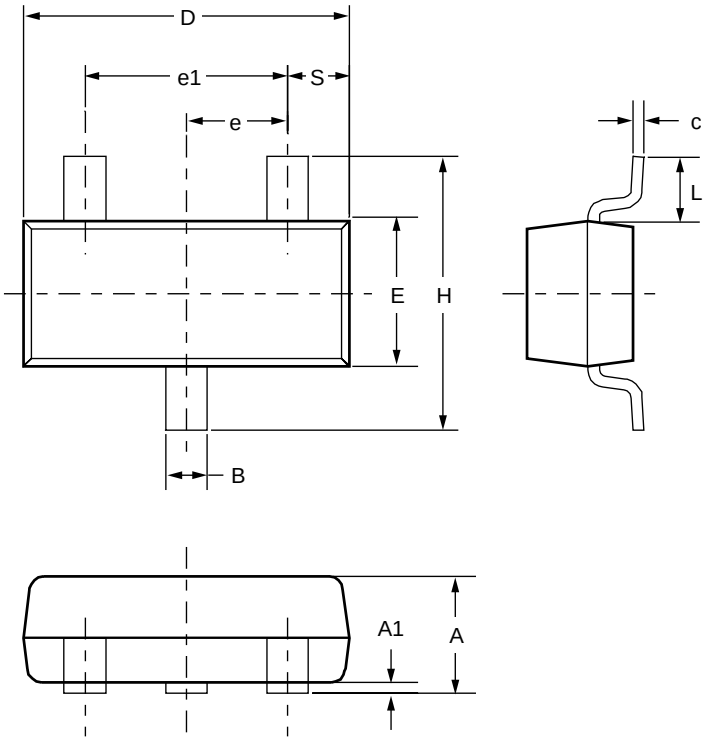
Mechanical Dimensions

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 **A** **I** **S3** **–** **5.0**

Grade	Package	Voltage
0.1% = A	SSOT23 = S3	2.5V = 2.5
0.2% = B		4.096V = 4.1
0.5% = C		5.0V = 5.0
		8.192V = 8.2
		10V = 10.0

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

F **5** **A**

Voltage	Grade
2.5V = 2	0.1% = A
4.096V = 4	0.2% = B
5.0V = 5	0.5% = C
8.192V = 8	
10V = 0	

Advance Specification

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Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
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