FAN4040

Precision Micropower Shunt Voltage Reference

Features

- Fixed 2.500V, 3.300V and 5.00V
- Tolerances to ±0.1% (25°C)
- Low output noise
- Low temperature coefficient to 100ppm/°C
- Small package
- Extended operating current range
- Extended temperature range

Applications

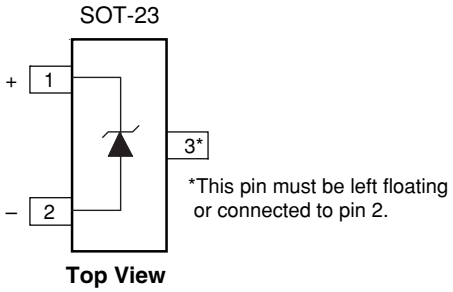
- Portable equipment
- Disk drives
- Instrumentation
- Audio equipment
- Data acquisition systems

Description

The FAN4040 series of precision shunt references are ideal for space- and cost-sensitive applications. They are available in three output voltages (2.500V, 3.300V and 5.00V) and with four output voltage tolerances (0.1%, 0.2%, 0.5% and 1%). They also have excellent temperature coefficients, to 100ppm/°C for the tighter tolerance grades. The FAN4040 series has an extended operating current range, sinking as much as 25mA.

The FAN4040 series is available in SOT-23 package.

Connection Diagrams



Top View

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	-30	30	mA
Power dissipation	See Dissipation Rating Table		
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.

Recommended Operating Conditions

Parameter		Min.	Max.	Unit
Continuous cathode current, I_K		0.025	25	mA
Operating temperature range in free air, T_A	I Grade	-40	85	°C
	E Grade	-40	125	°C

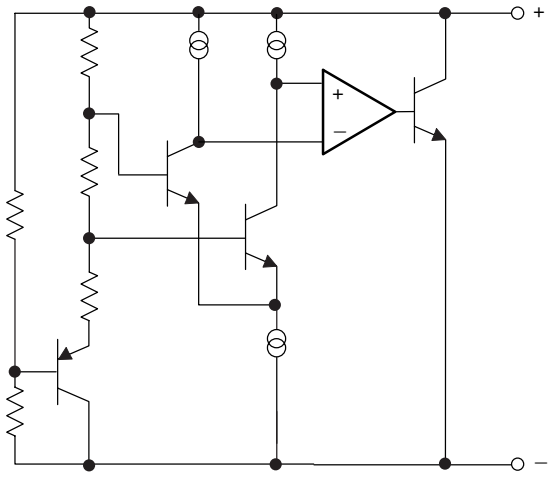
Dissipation Rating Table

Package	Power Rating $T_A \leq 25°C$	Derating Factor $T_A \geq 25°C$	Power Rating $T_A = 70°C$
SOT23[1]	306mW	3.0mW/°C	168mW

Note:

1. It is recommended to connect pin 3 to pin 2 to ensure optimal thermal performance.

Equivalent Schematic



Guaranteed Electrical Characteristics, FAN4040-2.5, Industrial Temperature Range

(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	Limits D	Units
V_R	Reverse Breakdown Voltage	I_K = 100µA		2.500	2.500	2.500	2.500	V*
TCV_R	Reverse Breakdown Voltage Tolerance	I_K = 100µA	 •	±2.5 ±19	±5.0 ±21	±12 ±29	±25 ±49	mV mV
I_{RMIN}	Minimum Operating Current		•	65	65	65	70	µA
$\Delta V_R/\Delta T$	Reverse Breakdown Voltage Temperature Coefficient	I_K = 1mA	•	±100	±100	±100	±150	ppm/°C
ΔV_R (ΔI_K)	Reverse Breakdown Voltage Change with Operating Current	$I_{RMIN} \le I_K \le$1mA 1mA ≤ I_K ≤ 15mA 1mA ≤ I_K ≤ 25mA	• • 	1.2 8.0 10	1.2 8.0 10	1.2 8.0 10	1.5 10.0 12	mV mV mV*
Z_{KA}	Reverse Dynamic Impedance	I_K=1mA, f=120Hz, I_{AC}=0.1I_K		1.0	1.0	1.0	1.3	Ω*
e_N	Wideband Noise	I_K=100µA, 10Hz ≤ f ≤ 10kHz		35	35	35	35	μV_{RMS}*
ΔV_R	Reverse Breakdown Voltage Long-term Stability	t=1000hrs, T=25°C, I_K=100µA		120	120	120	120	ppm*

*Typical.

Guaranteed Electrical Characteristics, FAN4040-3.3, Industrial Temperature Range

(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	Limits D	Units
V_R	Reverse Breakdown Voltage	I_K = 100µA		3.300	3.300	3.300	3.300	V*
TCV_R	Reverse Breakdown Voltage Tolerance	I_K = 100µA	 •	±3.3 ±25	±6.6 ±28	±17 ±38	±33 ±65	mV mV
I_{RMIN}	Minimum Operating Current		•	70	70	70	75	µA
$\Delta V_R/\Delta T$	Reverse Breakdown Voltage Temperature Coefficient	I_K = 1mA	•	±100	±100	±100	±150	ppm/°C
ΔV_R (ΔI_K)	Reverse Breakdown Voltage Change with Operating Current	$I_{RMIN} \le I_K \le$1mA 1mA ≤ I_K ≤ 15mA 1mA ≤ I_K ≤ 25mA	• • 	1.2 10 12	1.2 10 12	1.2 10 12	1.5 13 15	mV mV mV*
Z_{KA}	Reverse Dynamic Impedance	I_K=1mA, f=120Hz, I_{AC}=0.1I_K		1.0	1.0	1.0	1.3	Ω*
e_N	Wideband Noise	I_K=100µA, 10Hz ≤ f ≤ 10kHz		70	70	70	70	μV_{RMS}*
ΔV_R	Reverse Breakdown Voltage Long-term Stability	t=1000hrs, T=25°C, I_K=100µA		120	120	120	120	ppm*

*Typical.

Guaranteed Electrical Characteristics, FAN4040-5.0, Industrial Temperature Range

(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	Limits D	Units
V_R	Reverse Breakdown Voltage	I_K = 100µA		5.00	5.00	5.00	5.00	V*
TCV_R	Reverse Breakdown Voltage Tolerance	I_K = 100µA	 •	±5 ±40	±10 ±45	±24 ±60	±50 ±100	mV mV
I_{RMIN}	Minimum Operating Current		•	65	65	65	70	µA
$\Delta V_R/\Delta T$	Reverse Breakdown Voltage Temperature Coefficient	I_K = 1mA	•	±100	±100	±100	±150	ppm/°C
ΔV_R (ΔI_K)	Reverse Breakdown Voltage Change with Operating Current	$I_{RMIN} \le I_K \le$1mA 1mA ≤ I_K ≤ 15mA 1mA ≤ I_K ≤ 25mA	• • 	1.2 8.0 10	1.2 8.0 10	1.2 8.0 10	1.5 10.0 12	mV mV mV*
Z_{KA}	Reverse Dynamic Impedance	I_K=1mA, f=120Hz, I_{AC}=0.1I_K		1.0	1.0	1.0	1.3	Ω*
e_N	Wideband Noise	I_K=100µA, 10Hz ≤ f ≤ 10kHz		70	70	70	70	μV_{RMS}*
ΔV_R	Reverse Breakdown Voltage Long-term Stability	t=1000hrs, T=25°C, I_K=100µA		120	120	120	120	ppm*

*Typical.

Guaranteed Electrical Characteristics, FAN4040-2.5, Extended Temperature Range

(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	Limits D	Units
V_R	Reverse Breakdown Voltage	I_K = 100µA		2.500	2.500	2.500	2.500	V*
TCV_R	Reverse Breakdown Voltage Tolerance	I_K = 100µA	 •	±2.5 ±25	±5.0 ±30	±12 ±35	±25 ±49	mV mV
I_{RMIN}	Minimum Operating Current		•	65	65	65	70	µA
$\Delta V_R/\Delta T$	Reverse Breakdown Voltage Temperature Coefficient	I_K = 1mA	•	±100	±100	±100	±150	ppm/°C
ΔV_R (ΔI_K)	Reverse Breakdown Voltage Change with Operating Current	$I_{RMIN} \le I_K \le$1mA 1mA ≤ I_K ≤ 15mA 1mA ≤ I_K ≤ 25mA	• • 	1.5 10.0 10	1.5 10.0 10	1.5 10.0 10	1.5 10.0 12	mV mV mV*
Z_{KA}	Reverse Dynamic Impedance	I_K=1mA, f=120Hz, I_{AC}=0.1I_K		1.0	1.0	1.0	1.3	Ω*
e_N	Wideband Noise	I_K=100µA, 10Hz ≤ f ≤ 10kHz		70	70	70	70	μV_{RMS}*
ΔV_R	Reverse Breakdown Voltage Long-term Stability	t=1000hrs, T=25°C, I_K=100µA		120	120	120	120	ppm*

*Typical.

Guaranteed Electrical Characteristics, FAN4040-3.3, Extended Temperature Range

(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	Limits D	Units
V_R	Reverse Breakdown Voltage	I_K = 100µA		3.300	3.300	3.300	3.300	V*
TCV_R	Reverse Breakdown Voltage Tolerance	I_K = 100µA	 •	±3.3 ±30	±6.6 ±35	±17 ±42	±33 ±65	mV mV
I_{RMIN}	Minimum Operating Current		•	70	70	70	75	µA
$\Delta V_R/\Delta T$	Reverse Breakdown Voltage Temperature Coefficient	I_K = 1mA	•	±100	±100	±100	±150	ppm/°C
ΔV_R (ΔI_K)	Reverse Breakdown Voltage Change with Operating Current	$I_{RMIN} \le I_K \le$1mA 1mA ≤ I_K ≤ 15mA 1mA ≤ I_K ≤ 25mA	• • 	1.5 10 12	1.5 10 12	1.5 10 12	1.5 13 15	mV mV mV*
Z_{KA}	Reverse Dynamic Impedance	I_K=1mA, f=120Hz, I_{AC}=0.1I_K		1.0	1.0	1.0	1.3	Ω*
e_N	Wideband Noise	I_K=100µA, 10Hz ≤ f ≤ 10kHz		70	70	70	70	μV_{RMS}*
ΔV_R	Reverse Breakdown Voltage Long-term Stability	t=1000hrs, T=25°C, I_K=100µA		120	120	120	120	ppm*

*Typical.

Guaranteed Electrical Characteristics, FAN4040-5.0, Extended Temperature Range

(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	Limits D	Units
V_R	Reverse Breakdown Voltage	I_K = 100µA		5.00	5.00	5.00	5.00	V*
TCV_R	Reverse Breakdown Voltage Tolerance	I_K = 100µA	 •	±5 ±50	±10 ±60	±24 ±70	±50 ±100	mV mV
I_{RMIN}	Minimum Operating Current		•	100	100	100	100	µA
$\Delta V_R/\Delta T$	Reverse Breakdown Voltage Temperature Coefficient	I_K = 1mA	•	±100	±100	±100	±150	ppm/°C
ΔV_R (ΔI_K)	Reverse Breakdown Voltage Change with Operating Current	$I_{RMIN} \le I_K \le$1mA 1mA ≤ I_K ≤ 15mA 1mA ≤ I_K ≤ 25mA	• • 	1.5 10 10	1.5 10 10	1.5 10 10	1.5 15 12	mV mV mV*
Z_{KA}	Reverse Dynamic Impedance	I_K=1mA, f=120Hz, I_{AC}=0.1I_K		1.0	1.0	1.0	1.3	Ω*
e_N	Wideband Noise	I_K=100µA, 10Hz ≤ f ≤ 10kHz		70	70	70	70	μV_{RMS}*
ΔV_R	Reverse Breakdown Voltage Long-term Stability	t=1000hrs, T=25°C, I_K=100µA		120	120	120	120	ppm*

*Typical.

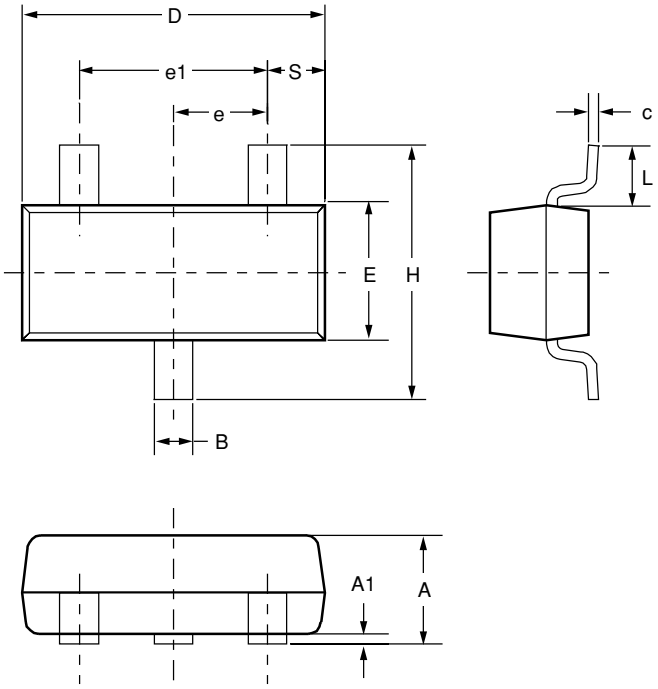
Mechanical Dimensions

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: FAN4040DIS325X ('X' denotes Tape and Reel)

FAN4040	D	I	S3	25
	Grade	**Temperature**	**Package**	**Voltage**
	0.1% = A*	-40°C to 85°C – I	SOT23 = S3	2.5V = 25
	0.2% = B	-40°C to 125°C – E		3.3V = 33
	0.5% = C			5.0V = 5
	1.0% = D			

* 'A' grade is a special order. Please contact factory for availability.

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: F2A

F	2	A
	Voltage	**Grade**
	2.5V = 2	0.1% = A
	3.3V = 3	0.2% = B
	5.0V = 5	0.5% = C
		1.0% = D

1/29/03 0.0m 006
Stock#DS30004040

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