Precision 2.5-Volt Reference

Description

The SG1503 is a monolithic integrated circuit implementing a self-contained precision voltage reference generator. It is internally trimmed for ±1% accuracy and requires less than 2mA quiescent current. SG1503 can deliver greater than 10mA output current while achieving total load and line induced tolerances of less than 0.5%.

In addition to voltage accuracy, internal trimming achieves a temperature coefficient of output voltage of typically 10 ppm/°C. As a result, these references are excellent choices for applications in critical instrumentation and D-to-A converter systems. The SG1503 is specified for operation over the full military ambient temperature range of -55°C to 125°C, while the SG2503 is designed for -25°C to 85°C and the SG3503 for commercial applications of 0°C to 70°C.

Features

- Output Voltage Trimmed to ±1%
- Input Voltage Range of 4.5V to 40V
- Temperature Coefficient of 10ppm/°C
- Quiescent Current Typically 1.5mA
- Output Current in excess of 10mA
- Interchangeable with MC1503 and AD580

Application

- Available to MIL-STD-883, ¶ 1.2.1
- Available to DSCC
  - Standard Microcircuit Drawing (SMD)
- Microsemi® Level “S” Processing Available

Functional Diagram

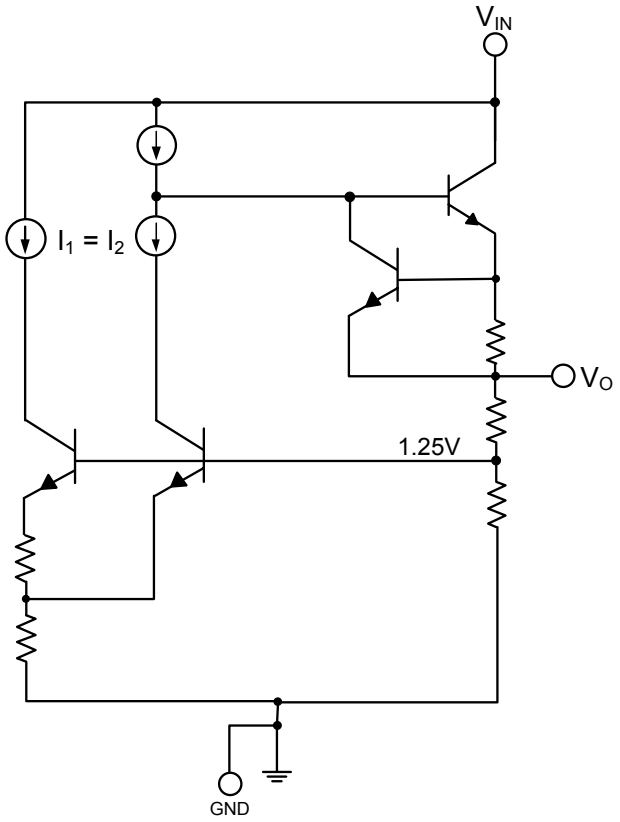
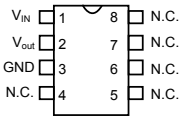
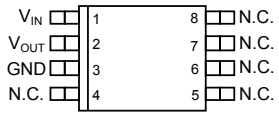
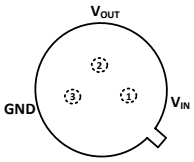


Figure 1 · Functional Block Diagram

Connection Diagrams and Ordering Information

Ambient Temperature	Type	Package	Part Number	Packaging Type	Connection Diagram
-55°C to 125°C	Y	8-PIN ceramic DIP	SG1503Y-883B	CERDIP	 Y Package: PbSn Lead Finish M Package: Pb-free / RoHS 100% Matte Tin Lead Finish
			SG1503Y-DESC		
			SG1503Y		
-25°C to 85°C			SG2503Y		
0°C to 70°C			SG3503Y		
-25°C to 85°C	M	8-PIN plastic DIP Pb-free / RoHS Transition DC: 0503*	SG2503M	PDIP	
0°C to 70°C			SG3503M		
-25°C to 85°C	DM	8-PIN plastic SOIC Pb-free / RoHS Transition DC: 0440*	SG2503DM	SOIC	 DM Package: Pb-free / RoHS 100% Matte Tin Lead Finish
0°C to 70°C			SG3503DM		
-55°C to 125°C	T	3-PIN METAL CAN	SG1503T-883B	TO-39	 T Package: PbSn Lead Finish
			SG1503T-DESC		
			SG1503T		
-25°C to 85°C			SG2503T		
0°C to 70°C			SG3503T		

Notes:
1. *Contact factory for JAN and DESC product availability.*
2. *All packages are viewed from the top.*

**RoHS compliant*

Absolute Maximum Ratings

Parameter	Value	Units
Input Voltage	40	V
Storage Temperature Range	-65 to 150	°C
Operating Junction Temperature		
Hermetic (T, Y Packages)	150	°C
Plastic (M, DM Packages)	150	°C
Lead Temperature (Soldering, 10 seconds)	300	°C
Pb-free / RoHS Peak Solder Reflow Temp (40s max. exp.)	260 (+0, -5)	°C
Note: Exceeding these ratings could cause damage to the device.		

Thermal Data

Parameter	Value	Units
T Package		
Thermal Resistance-Junction to Case, θ_{JC}	15	°C/W
Thermal Resistance-Junction to Ambient, θ_{JA}	120	°C/W
Y Package		
Thermal Resistance-Junction to Case, θ_{JC}	50	°C/W
Thermal Resistance-Junction to Ambient, θ_{JA}	130	°C/W
M Package		
Thermal Resistance-Junction to Case, θ_{JC}	60	°C/W
Thermal Resistance-Junction to Ambient, θ_{JA}	95	°C/W
DM Package		
Thermal Resistance-Junction to Case, θ_{JC}	55	°C/W
Thermal Resistance-Junction to Ambient, θ_{JA}	165	°C/W

Notes:

1. *Junction Temperature Calculation: $T_J = T_A + (P_D \times \theta_{JA})$.*
2. *The above numbers for θ_{JC} are maximums for the limiting thermal resistance of the package in a standard mounting configuration. The θ_{JA} numbers are meant to be guidelines for the thermal performance of the device/pc-board system. All of the above assume no ambient airflow.*

Recommended Operating Conditions

Parameter	Value	Units
Input Voltage	4.5 to 40	V
Operating Ambient Temperature Range		
SG1503	-55 to 125	°C
SG2503	-25 to 85	°C
SG3503	0 to 70	°C
Note: Range over which the device is functional.		

Electrical Characteristics

(Unless otherwise specified, these specifications apply over the operating ambient temperatures for SG1503 with -55°C ≤ T_A ≤ 125°C, SG2503/SG3503 with 0°C ≤ T_A ≤ 70°C, V_{IN} = 15V, and I_L = 0mA. Low duty cycle pulse testing techniques are used that maintains junction and case temperatures equal to the ambient temperature.)

Parameter	Test Conditions	SG1503/2503			SG3503			Units
		Min	Typ	Max	Min	Typ	Max	
Output Voltage	T_A = 25°C	2.485	2.500	2.515	2.475	2.500	2.525	V
Input Voltage		4.7		40	4.7		40	V
	T_A = 25°C	4.5		40	4.5		40	V
Line Regulation	V_{IN}= 5V TO 15V		1	3		1	3	mV
	V_{IN} = 15V TO 40V		3	5		3	10	mV
Load Regulation	Δ I_L = 10mA		3	5		3	10	mV
	Δ I_L = 10mA, V_{IN} = 30V		4	8		4	15	mV
Temperature Regulation	(SG1503 only)		15	20				mV
	(SG2503/SG3503 only)		2.5	5		5	10	mV
Quiescent Current	V_{IN} = 40V		1.5	2.0		1.5	2.0	mA
Short Circuit Current	T_A = 25°C	15	20	30	15	20	30	mA
Ripple Rejection	f = 120Hz, T_A = 25°C		76			76		dB
Output Noise	BW = 10kHz, T_A = 25°C		100			100		μV rms
Voltage Stability			250			250		μV/khr

Characteristics Curves

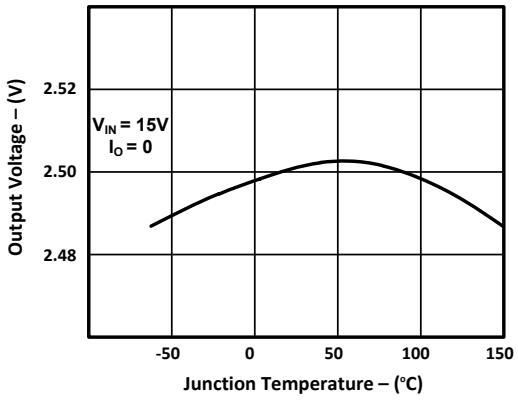


Figure 2 · Output Voltage versus Temperature

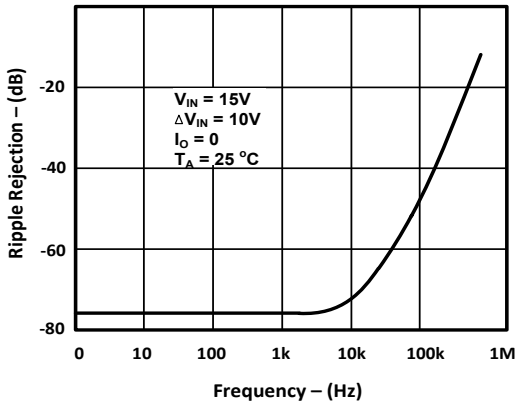
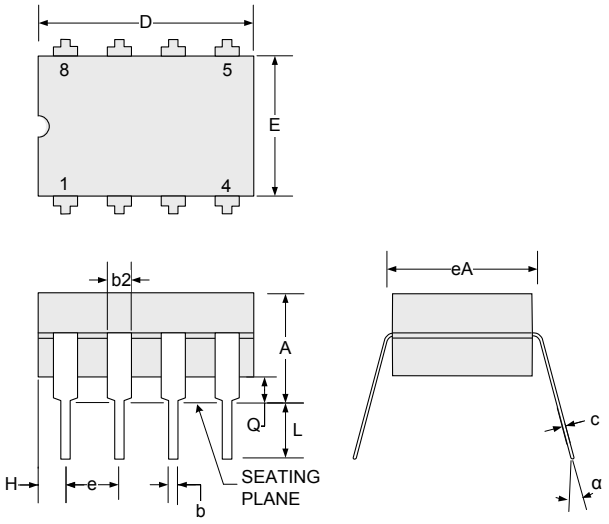


Figure 3. Ripple Rejection

Package Outline Dimensions

Controlling dimensions are in inches; metric equivalents are shown for general information.

Y 8-Pin CERDIP Package Dimensions



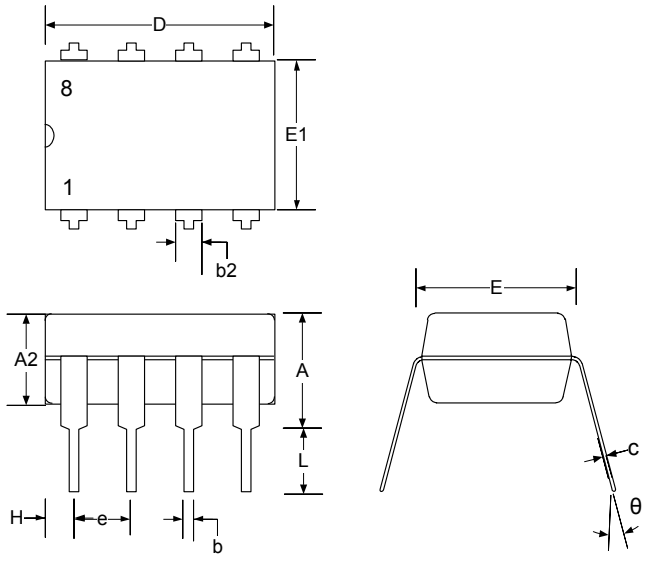
Dim	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.32	5.08	0.170	0.200
b	0.38	0.51	0.015	0.020
b2	1.04	1.65	0.045	0.065
c	0.20	0.38	0.008	0.015
D	9.52	10.29	0.375	0.405
E	5.59	7.11	0.220	0.280
e	2.54 BSC		0.100 BSC	
eA	7.37	7.87	0.290	0.310
H	0.63	1.78	0.025	0.070
L	3.18	4.06	0.125	0.160
α	-	15°	-	15°
Q	0.51	1.02	0.020	0.040

Note:

Dimensions do not include protrusions; these shall not exceed 0.155mm (.006”) on any side. Lead dimension shall not include solder coverage.

Figure 4 · Y 8-Pin CERDIP Package Dimensions

M 8-Pin PDIP Package Dimensions



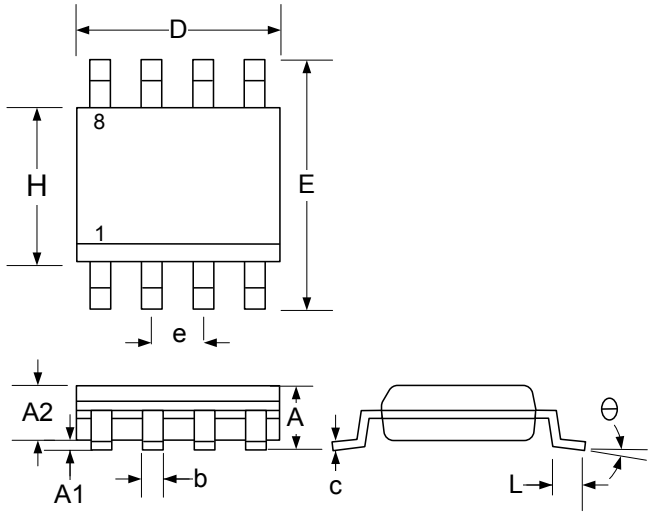
Dim	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	-	5.08	-	0.200
A2	3.30 Typ.		1.30 Typ.	
b	0.38	0.51	0.145	0.020
b2	0.76	1.65	0.030	0.065
c	0.20	0.38	0.008	0.015
D	-	10.16	-	0.400
E	7.62 BSC		0.300 BSC	
e	2.54 BSC		0.100 BSC	
E1	6.10	6.86	0.240	0.270
L	3.05	-	0.120	-
θ	0°	15°	0°	15°

Note:

Dimensions do not include mold flash or protrusions; these shall not exceed 0.155mm (.006”) on any side. Lead dimension shall not include solder coverage.

Figure 5 · M 8-Pin PDIP Package Dimensions

DM 8-Pin SOIC Package Dimensions



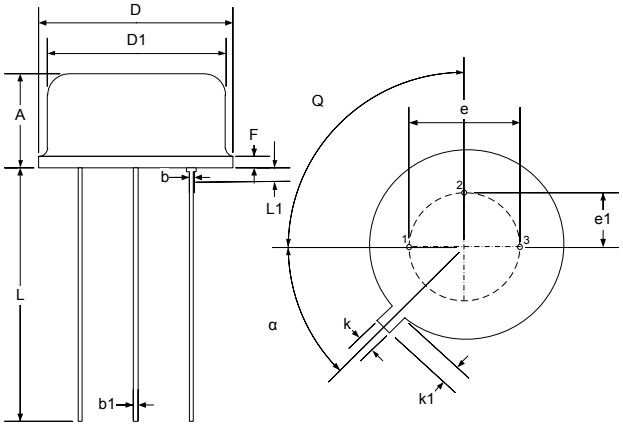
Dim	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.35	1.75	0.053	0.069
A1	0.10	0.25	0.004	0.010
A2	1.25	1.52	0.049	0.060
b	0.33	0.51	0.013	0.020
c	0.19	0.25	0.007	0.010
D	4.83	5.21	0.189	0.205
E	5.79	6.20	0.228	0.244
e	1.27 BSC		0.050 BSC	
H	3.81	4.01	0.150	0.158
L	0.40	1.27	0.016	0.050
θ	0°	8°	0°	8°
*LC	-	.010	-	0.004

*Lead Co-planarity

Note:
Dimensions do not include mold flash or protrusions; these shall not exceed 0.155mm (.006”) on any side. Lead dimension shall not include solder coverage.

Figure 6 · DM 8-Pin SOIC Package Dimensions

T 3-Pin Metal Can TO-39



Dim	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.19	4.70	0.165	0.185
b	0.41	0.48	0.016	0.019
b1	0.41	0.53	0.016	0.021
D	8.89	9.40	0.350	0.370
D1	8.13	8.51	0.320	0.335
e	5.08 BSC		0.200 BSC	
e1	2.54 TYP		0.100 TYP	
F	-	1.02	-	0.040
k	0.71	0.86	0.028	0.034
k1	0.74	1.14	0.029	0.045
L	12.70	14.48	0.500	0.570
L1	-	1.27	-	0.050
Q	90° TYP		90° TYP	
α	45° TYP		45° TYP	

Note:

Dimensions do not include mold flash or protrusions; these shall not exceed 0.155mm (.006”) on any side. Lead dimension shall not include solder coverage.

Figure 7 · T 3-Pin Metal Can TO-39

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