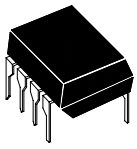
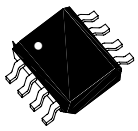
RS103

Dual Operational Amplifier and Voltage Reference



8-Lead Plastic **DIP-8**
Package Code: P



8-Lead Plastic **SOP-8**
Package Code: S

Description

The RS103 is a monolithic IC that includes one independent op-amp and another op-amp for which the non inverting input is wired to a 2.5V fixed Voltage Reference. This device is offering space and cost saving in many applications like power supply management or data acquisition systems.

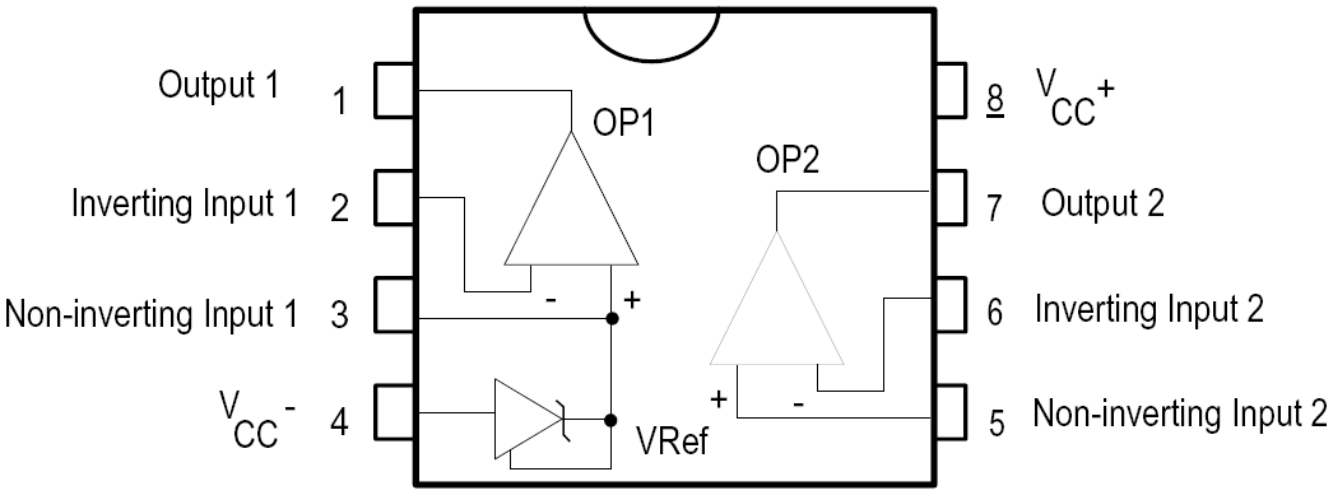
Operational Amplifier

- Low input offset voltage: 0.5mV typ.
- Low supply current: 350mA/op. (@ VCC = 5V)
- Medium bandwidth (unity gain): 0.9MHz
- Large output voltage swing: 0V to (VCC - 1.5V)
- Input common mode voltage range includes ground
- Wide power supply range: 3 to 32V ±1.5 to ±16V

Operational Amplifier

- Fixed output voltage reference 2.5V
- 0.5% and 1% voltage precision
- Sink current capability: 1 to 100mA
- Typical output impedance: 0.2Ω

Pin Configurations



Absolute Maximum Ratings

Symbol	Parameter	Range	Units
V_{CC}	Power Supply Voltage	36	V
V_{ID}	Input Differential Voltage Range	36	V
V_I	Input Voltage Range	-0.3 to +36	V
T_J	Maximum Junction Temperature	150	°C
T_{OPER}	Operating Free-air Temperature Range	-55 to +125	°C
R_{thja}	Thermal Resistance Junction to Ambient (SO package)	175	°C/W

Electrical Characteristics

Symbol	Parameter	Test Conditions	RS103			Unit
			Min	Typ	Max	
I_{CC}	Power Supply Current	V_{CC}=30V, Ta=T_{high} to T_{low}	-	1	2	mA
		V_{CC}=5V, Ta=T_{high} to T_{low}	-	0.6	1.2	mA

Operator 2 (independent op-amp)

V_{CC} = +5V, V_{CC} = Ground, V_o = 1.4V, T_{amb} = 25°C (unless otherwise specified)

Symbol	Parameter	Test Conditions	RS103			Unit
			Min	Typ	Max	
V_{IO}	Input Offset Voltage	Tamb = 25°C Tmin. ≤ Tamb ≤ Tmax.	-	2	7	mV
DV_{IO}	Input Offset Voltage Drift	---	-	7	-	uV/°C
I_{IO}	Input Offset Current	Tmin. ≤ Tamb ≤ Tmax.	-	-	30	nA
I_{IB}	Input Bias Current	Tmin. ≤ Tamb ≤ Tmax	-	35	200	nA
A_{VD}	Large Signal Voltage Gain	VCC = 15V, RL = 2k, Vo = 1.4V to 11.4V. Tmin. ≤ Tamb ≤ Tmax.	25	100	-	V/mV
SVR	Supply Voltage Rejection Ratio	VCC = 5V to 30V	65	100	-	dB
CMR	Common-Mode Rejection Ratio	Tmin. ≤ Tamb ≤ Tmax.	65	85	-	dB
V_{ICR}	Input Common Mode Voltage Range	VCC = +30V - see note 1) Tmin. ≤ Tamb ≤ Tmax.	-	-	V_{CC}-2V	V
V_{OH}	Output Voltage (High Limit)	V_{CC}=30V, R_L=2KΩ	26	27	-	V
		V_{CC}=30V, R_L=10KΩ	27	28	-	
V_{OL}	Output Voltage (Low Limit)	R_L=10KΩ	-	5	20	mV
I_{Source}	Output Source Current	VCC = +15V, Vo = 2V, Vid = +1V	20	40	-	mA
I_{Sink}	Output Sink Current	VCC = +15V, Vo = 2V, Vid = -1V	10	20	-	mA
I_{SC}	Output Short Circuit to Ground	V_{CC}=15V	-	40	60	mA
SR	Slew Rate at Unity Gain	Vi = 0.5 to 3V, VCC = 15V RL = 2k, CL = 100pF, unity gain	0.2	0.4	-	V/us
GBP	Gain Bandwidth Product	VCC = 30V,RL = 2k, CL = 100pF = 100kHz, Vin = 10mV	0.5	0.9	-	MHz
THD	Total Harmonic Distortion	f = 1kHz AV = 20dB,RL = 2k, VCC = 30V CL = 100pF, Vo = 2Vpp	-	0.02	-	%

1. The input common-mode voltage of either input signal voltage should not be allowed to go negative by more than 0.3V. The upper end of the common-mode voltage range is VCC + - 1.5V. But either of both inputs can go to +36V without damage.

Operator 1 (op-amp with non-inverting input connected to the internal Vref)

VCC+ = +5V, VCC- = Ground, Tamb = 25°C (unless otherwise specified)

Symbol	Parameter	Test Conditions	RS103			Unit
			Min	Typ	Max	
V_{IO}	Input Offset Voltage	Tamb = 25°C Tmin. ≤ Tamb ≤ Tmax.	-	2	7	mV
DV_{IO}	Input Offset Voltage Drift	---	-	7	-	uV/°C
I_{IB}	Input Bias Current	Tmin. ≤ Tamb ≤ Tmax	-	20	-	nA
A_{VD}	Large Signal Voltage Gain	Vicm = 0V VCC = 15V, RL = 2k	-	100	-	V/mV
SVR	Supply Voltage Rejection Ratio	Vicm = 0V VCC+ = 5V to 30V	65	100	-	dB
V_{OH}	Output Voltage (High Limit)	V_{CC}=30V, R_L=10KΩ	27	28	-	V
V_{OL}	Output Voltage (Low Limit)	R_L=10KΩ	-	5	20	mV
I_{Source}	Output Source Current	VCC = +15V, Vo = 2V, Vid = +1V	20	40	-	mA
I_{Sink}	Output Sink Current	VCC = +15V, Vo = 2V, Vid = -1V	10	20	-	mA
I_{SC}	Output Short Circuit to Ground	V_{CC}=15V	-	40	60	mA
SR	Slew Rate at Unity Gain	Vi = 0.5 to 2V, VCC = 15V RL = 2k, CL = 100pF, unity gain	0.2	0.4	-	V/us
GBP	Gain Bandwidth Product	VCC = 30V,RL = 2k, CL = 100pF = 100kHz, Vin = 10mV	0.5	0.9	-	MHz
THD	Total Harmonic Distortion	f = 1kHz AV = 20dB,RL = 2k, VCC = 30V CL = 100pF, Vo = 2Vpp	-	0.02	-	%

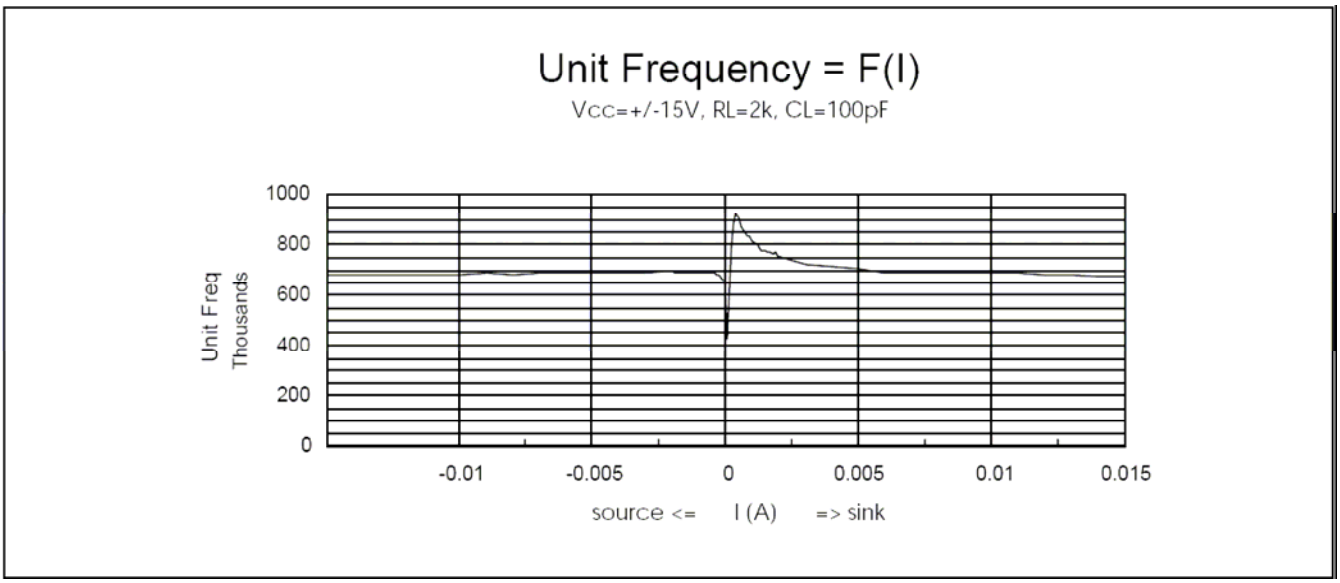
Voltage Reference

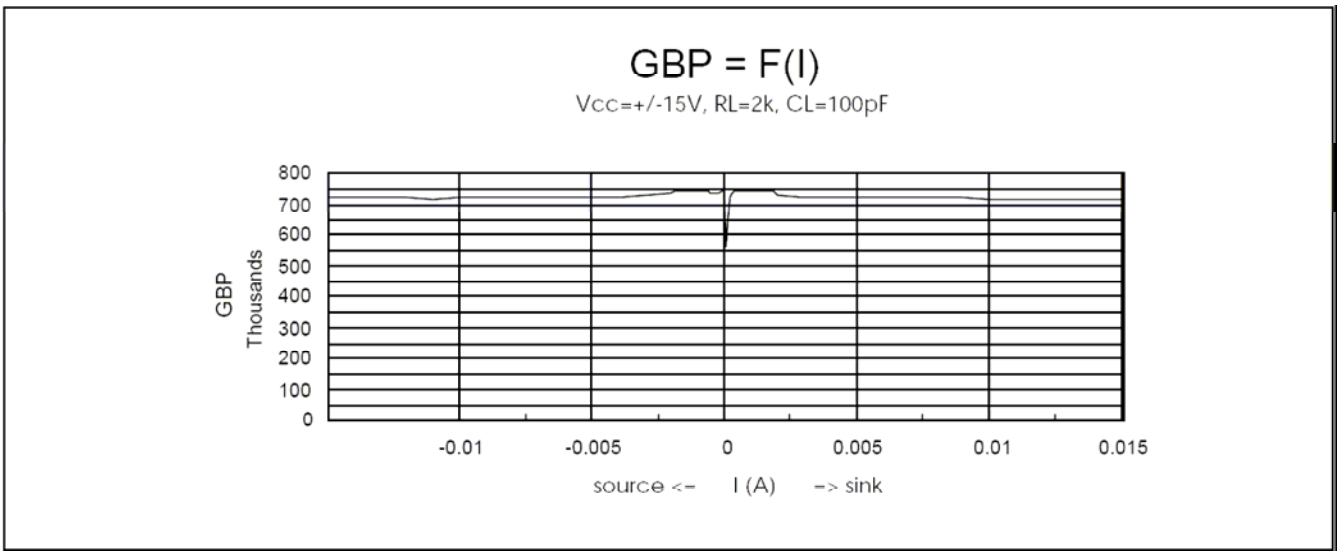
Symbol	Parameter	Value	Units
I_K	Cathode Current	1 to 100	mA

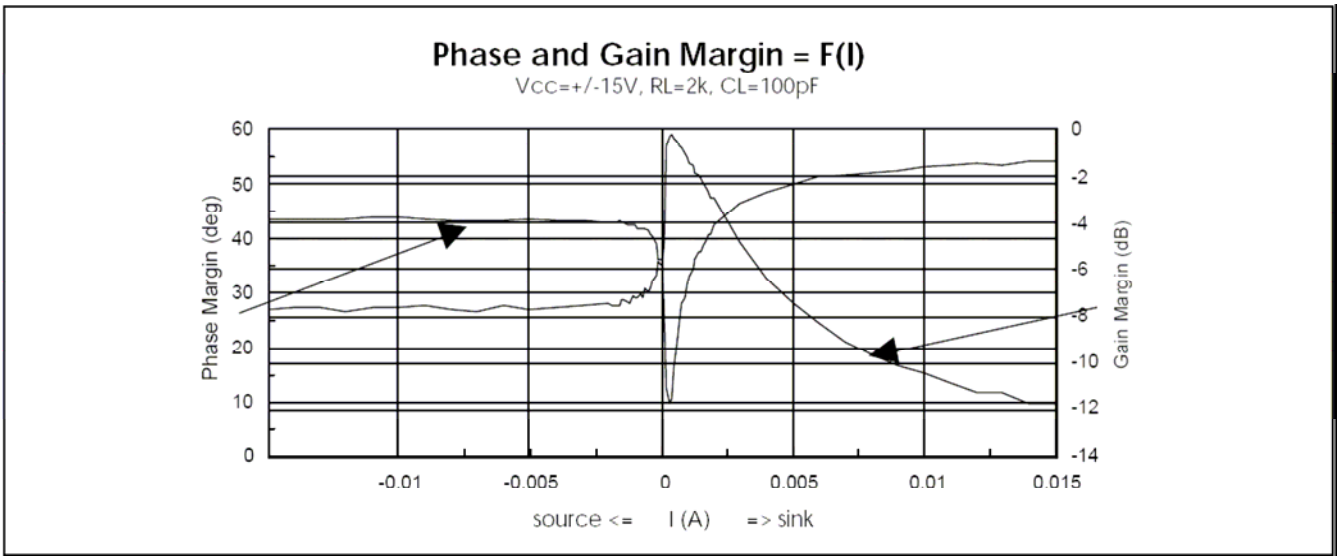
Symbol	Parameter	Test Conditions	RS103			Unit
			Min	Typ	Max	
V_{REF}	Reference Input Voltage	Tamb = 25°C Tmin. ≤ Tamb ≤ Tmax.	2.48	2.5	2.52	V
ΔV_{REF}	Reference Input Voltage Deviation Over Temperature Range	VKA = Vref; Ik = 10mA Tmin. ≤ Tamb ≤ Tmax.	-	7	30	mV
I_{min}	Minimum Cathode Current for Regulation	VKA = VREF	-	0.5	1	mA
|ZKA|	Dynamic Impedance - note 1)	VKA = VREF, ΔIK = 1 to 100mA, f < 1kHz	-	0.2	0.5	Ω

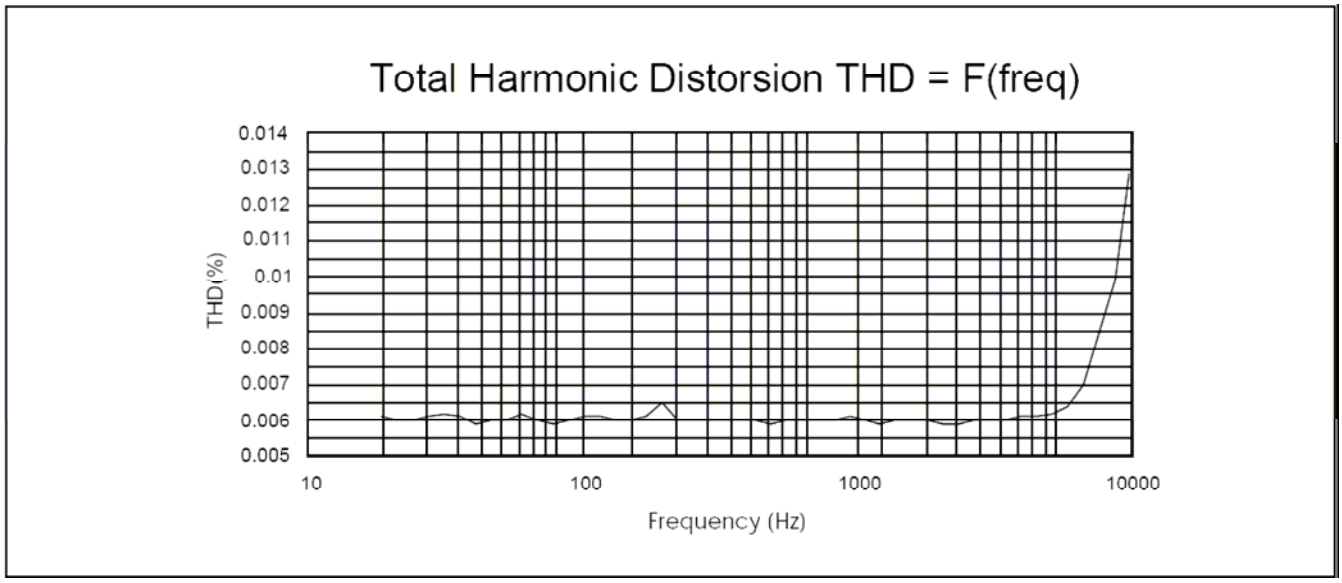
1. The dynamic impedance is defined as [ZKA| = ΔVKA/ΔIK

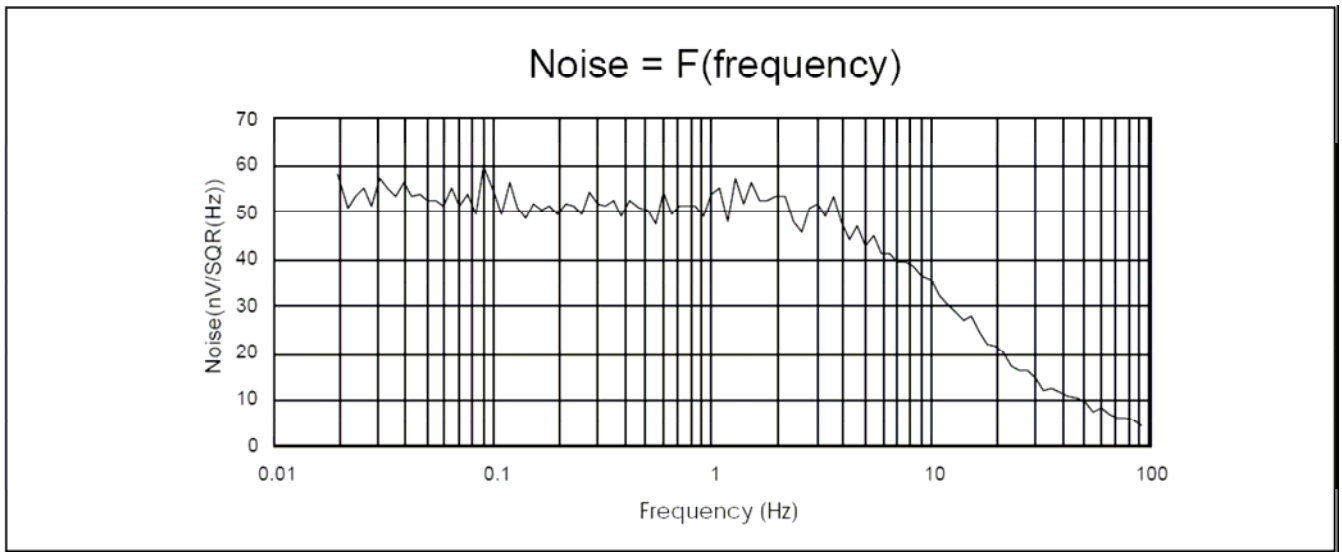
Operational Amplifiers

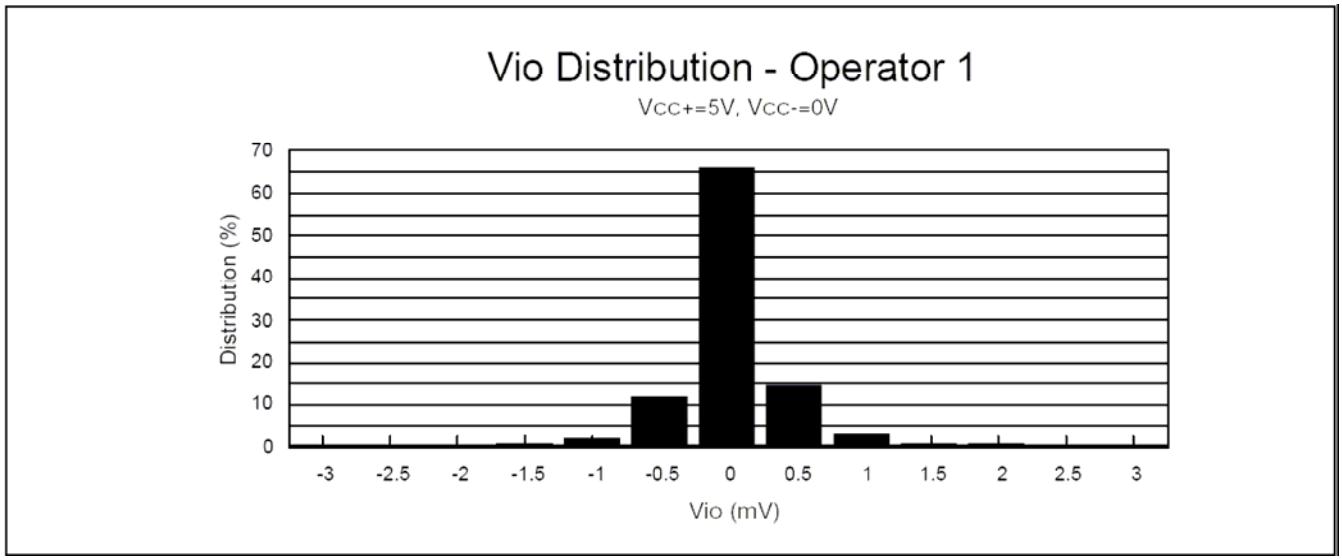


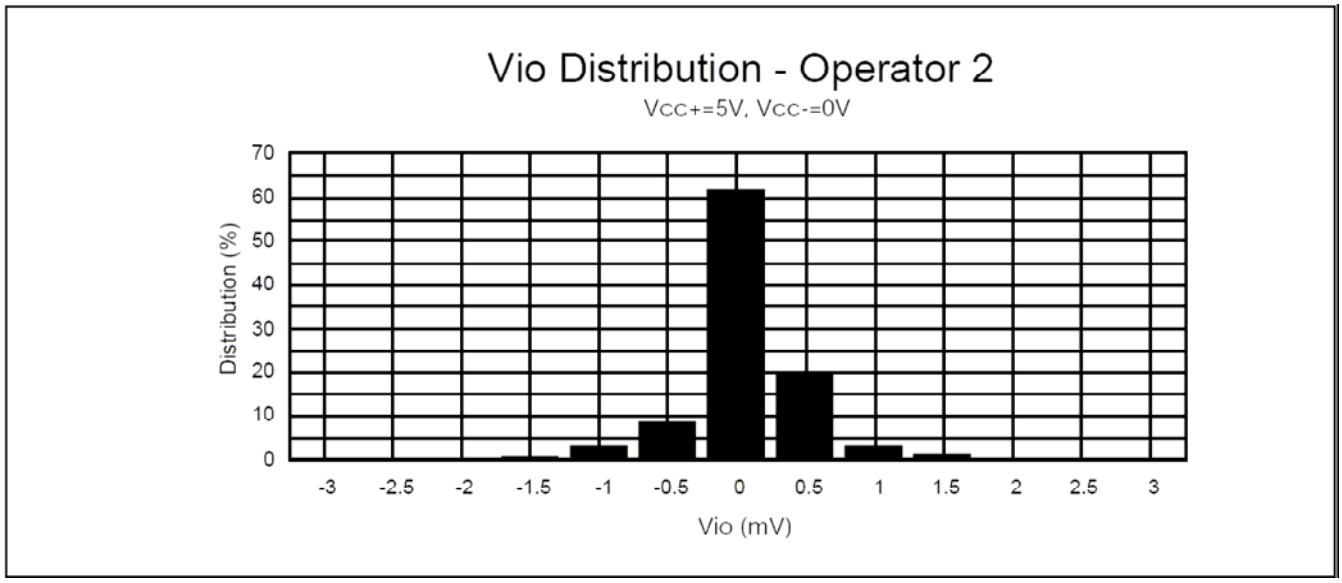


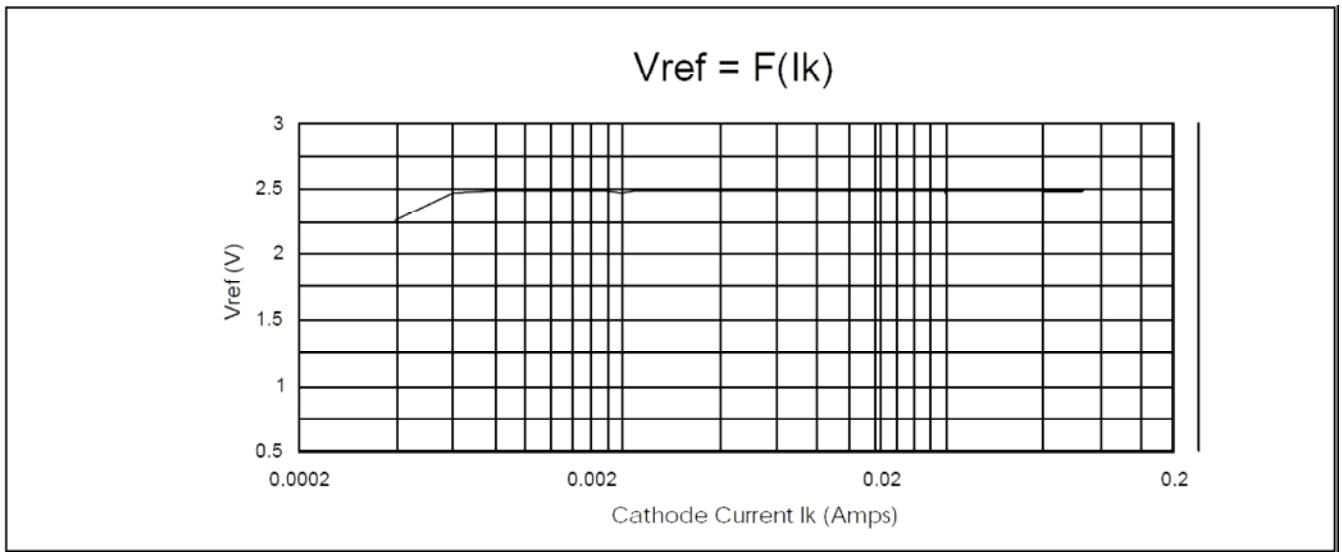


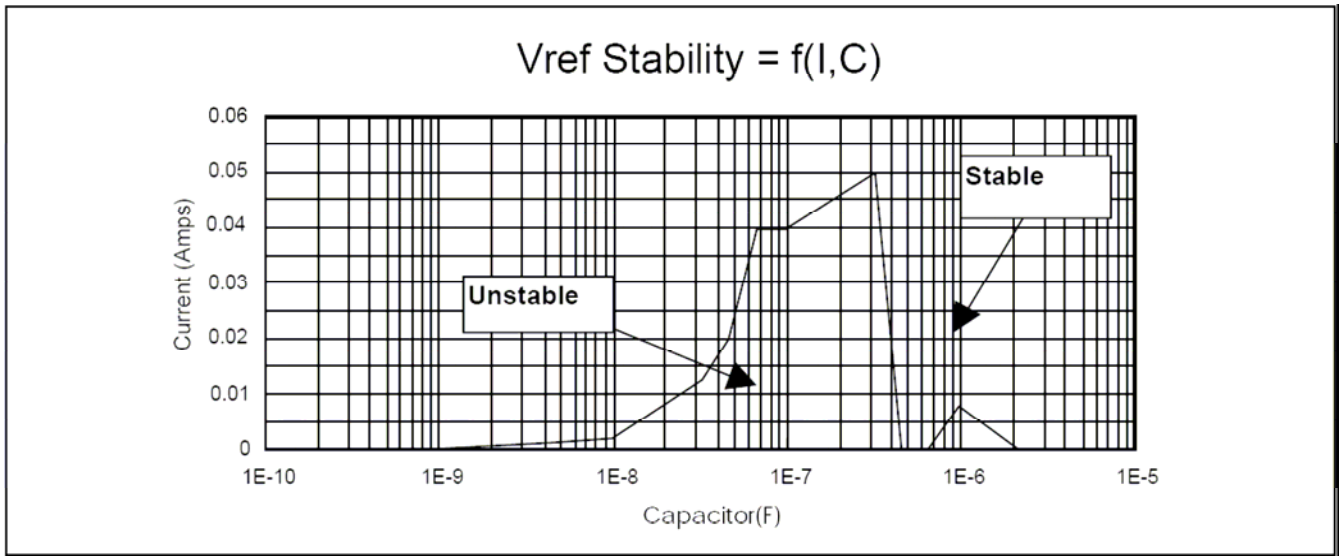

Total Harmonic Distorsion THD = F(freq)
THD(%)
0.014
0.013
0.012
0.011
0.01
0.009
0.008
0.007
0.006
0.005
10
100
1000
10000
Frequency (Hz)


Noise = F(frequency)
Noise(nV/SQR(Hz))
70
60
50
40
30
20
10
0
0.01
0.1
1
10
100
Frequency (Hz)

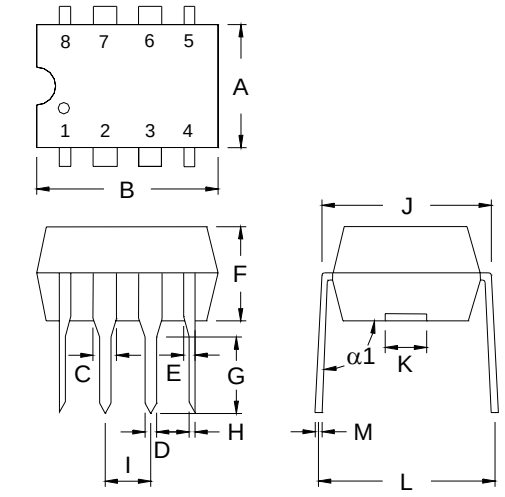

Vio Distribution - Operator 1
Vcc+=5V, Vcc-=0V
Distribution (%)
70
60
50
40
30
20
10
0
-3
-2.5
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2
2.5
3
Vio (mV)


Vio Distribution - Operator 2
Vcc+=5V, Vcc-=0V
Distribution (%)
70
60
50
40
30
20
10
0
-3
-2.5
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2
2.5
3
Vio (mV)

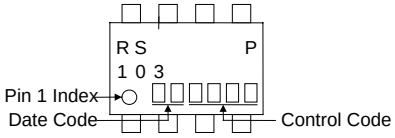

Vref = F(Ik)
Vref (V)
3
2.5
2
1.5
1
0.5
0.0002
0.002
0.02
0.2
Cathode Current Ik (Amps)


Vref Stability = f(I,C)
Current (Amps)
0.06
0.05
0.04
0.03
0.02
0.01
0
Unstable
Stable
1E-10
1E-9
1E-8
1E-7
1E-6
1E-5
Capacitor(F)

DIP-8 Dimension



Marking:



Note: Green label is used for pb-free packing

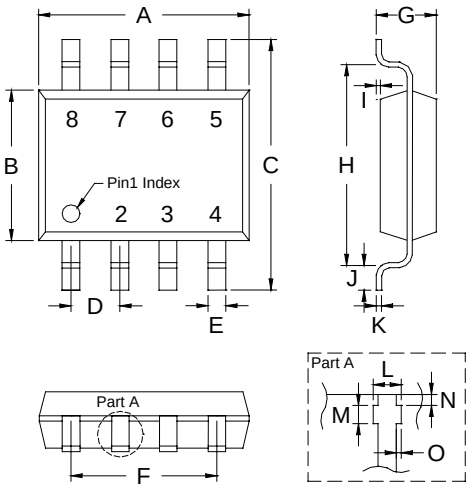
Material:
- Lead solder plating: Sn60/Pb40 (Normal), Sn/3.0Ag/0.5Cu or Pure-Tin (Pb-free)
- Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0

DIM	Min.	Max.
A	6.29	6.40
B	9.22	9.32
C	-	*1.52
D	-	*1.27
E	-	*0.99
F	3.25	3.35
G	3.17	3.55
H	0.38	0.53
I	2.28	2.79
J	7.49	7.74
K	-	*3.00
L	8.56	8.81
M	0.229	0.381
α1	94°	97°

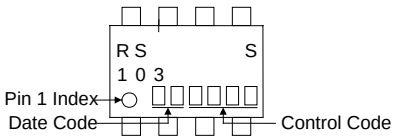
*: Typical, Unit: mm

8-Lead DIP-8
Plastic Package
Package Code: P

SOP-8 Dimension



Marking:



Note: Green label is used for pb-free packing

Material:
- Lead solder plating: Sn60/Pb40 (Normal), Sn/3.0Ag/0.5Cu or Pure-Tin (Pb-free)
- Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0

DIM	Min.	Max.
A	4.85	5.10
B	3.85	3.95
C	5.80	6.20
D	1.22	1.32
E	0.37	0.47
F	3.74	3.88
G	1.45	1.65
H	4.80	5.10
I	0.05	0.20
J	0.30	0.70
K	0.19	0.25
L	0.37	0.52
M	0.23	0.28
N	0.08	0.13
O	0.00	0.15

*: Typical, Unit: mm

8-Lead SOP-8 Plastic
Surface Mounted Package
Package Code: S

Ordering Information

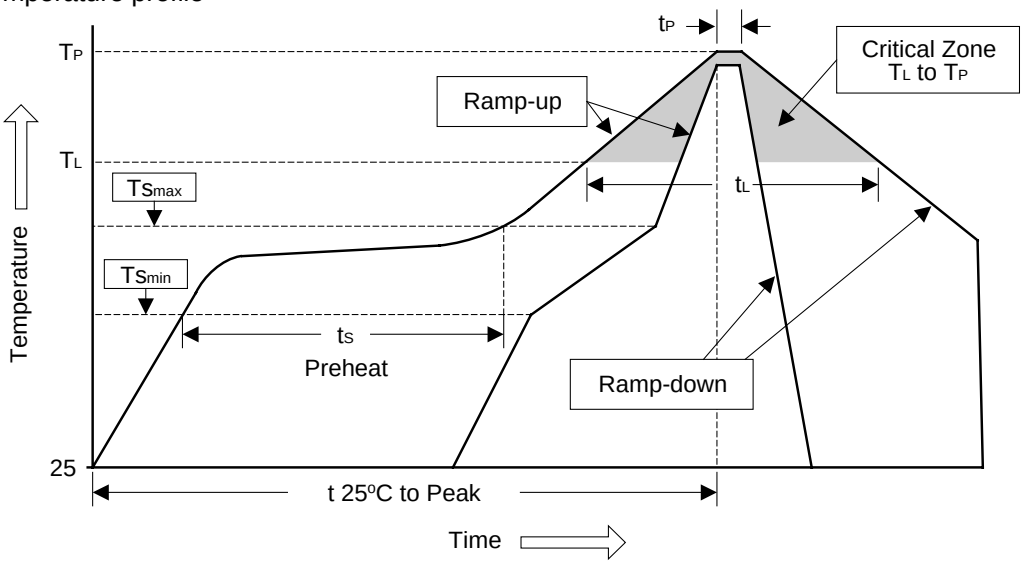
PART NUMBER	PIN-PACKAGE
RS103P	DIP-8
RS103S	SOP-8

Soldering Methods for Orister's Products

1. Storage environment: Temperature=10°C~35°C Humidity=65%±15%

2. Reflow soldering of surface-mount devices

Figure 1: Temperature profile



Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average ramp-up rate (T_L to T_P)	<3°C/sec	<3°C/sec
Preheat - Temperature Min (Ts_{min}) - Temperature Max (Ts_{max}) - Time (min to max) (ts)	 100°C 150°C 60~120 sec	 150°C 200°C 60~180 sec
Tsmax to T_L - Ramp-up Rate	 <3°C/sec	 <3°C/sec
Time maintained above: - Temperature (T_L) - Time (t_L)	 183°C 60~150 sec	 217°C 60~150 sec
Peak Temperature (T_P)	240°C +0/-5°C	260°C +0/-5°C
Time within 5°C of actual Peak Temperature (t_P)	10~30 sec	20~40 sec
Ramp-down Rate	<6°C/sec	<6°C/sec
Time 25°C to Peak Temperature	<6 minutes	<8 minutes

3. Flow (wave) soldering (solder dipping)

Products	Peak temperature	Dipping time
Pb devices.	245°C ±5°C	5sec ±1sec
Pb-Free devices.	260°C +0/-5°C	5sec ±1sec

Important Notice: