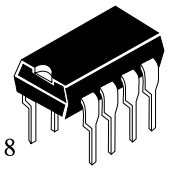
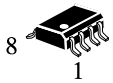
OPERATIONAL AMPLIFIER & VOLTAGE REFERENCE

KL103/A



N SUFFIX
PLASTIC



D SUFFIX
SOIC

ORDERING INFORMATION
KL103N/AN Plastic
KL103D/AD SOIC
T_A = -40° to 105° C for all packages.

OPERATIONAL AMPLIFIER

- LOW INPUT OFFSET VOLTAGE : 0.5 mV typ.
- LOW SUPPLY CURRENT : 350μA/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

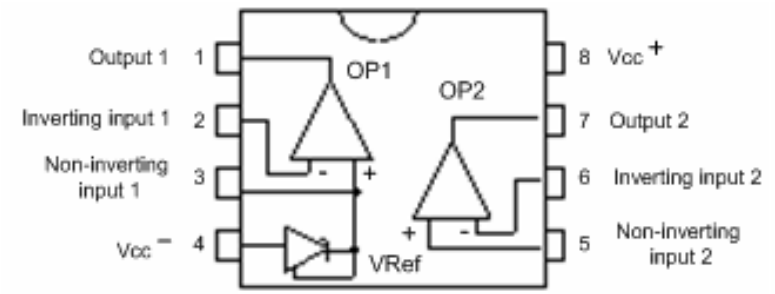
VOLTAGE REFERENCE

- FIXED OUTPUT VOLTAGE REFERENCE 2.5V
- 0.4% AND 1% VOLTAGE PRECISION
- SINK CURRENT CAPABILITY : 1 to 100mA
- TYPICAL OUTPUT IMPEDANCE : 0.2Ω

DESCRIPTION

The KL103/A 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.

PIN CONNECTIONS (top view)



Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
Vcc	Supply Voltage	36	V
V_{id}	Differential Input Voltage	36	V
V_i	Input Voltage	-0.3 to +36	V
Tj	Maximum Junction Temperature	150	^oC

* Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied.
Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

Electrical Characteristics

Symbol	Parameter	Min	Typ	Max	Unit
Icc	Total Supply Current, excluding Current in the Voltage Reference Vcc+ = 5 V, no load Tmin < Tamb < Tmax Vcc+ = 30 V, no load Tmin < Tamb < Tmax		0.7	1.2 2	mA

OPERATOR 2 (independent op-amp)
Vcc^+ = +5 V, Vcc = Ground, V_o = 1.4 V, Tamb = 25 ºC (unless otherwise specified)

Symbol	Parameter	Min	Typ	Max	Unit
V_{io}	Input Offset Voltage KL103 T_{amb} = 25 ºC $T_{min} \le T_{amb} \le T_{max}$ KL103A T_{amb} = 25 ºC $T_{min} \le T_{amb} \le T_{max}$		1 0.5	4 5 2 3	mV
DV_{io}	Input Offset Voltage Drift			7	µV/ ºC
I_{io}	Input Offset Current $T_{min.} \le T_{amb} \le T_{max}$		2	30 50	nA
I_{ib}	Input Bias Current $T_{min.} \le T_{amb} \le T_{max}$		20	150 200	nA
Avd	Large Signal Voltage Gain Vcc = 15V, R_L = 2k, V_o = 1.4V to 11.4V $T_{min.} \le T_{amb} \le T_{max}$	50 25	100		V/mV
SVR	Supply Voltage Rejection Ratio Vcc = 5V to 30V	65	100		dB
Vicm	Input Common Mode Voltage Range Vcc = +30V – see note [1)] $T_{min.} \le T_{amb} \le T_{max}$	0 0		(Vcc^+) -1.5 (Vcc^+) -2	V
CMR	Common Mode Rejection Ratio $T_{min.} \le T_{amb} \le T_{max}$	70 60	85		dB
I_{source}	Output Current Source Vcc = +15V, Vo = 2V, V_{id} = +1V	20	40		mA
I_o	Short Circuit to Ground Vcc = +15V		40	60	mA
I_{sink}	Output Current Sink V_{id} = -1V, Vcc = +15V, Vo = 2V	10	20		mA
V_{OH}	High Level Output Voltage Vcc^+ = 30V, Tamb = 25 ºC, R_L = 10k $T_{min.} \le T_{amb} \le T_{max}$	27 27	28		V
V_{OL}	Low Level Output Voltage R_L = 10k $T_{min.} \le T_{amb} \le T_{max}$		5	20 20	mV
SR	Slew Rate at Unity Gain V_i = 0.5 to 3V, Vcc = 15V R_L = 2k, C_L = 100pF, unity gain	0.2	0.4		V/ µs
GBP	Gain Bandwidth Product Vcc = 30V, R_L = 2k, C_L = 100pF f = 100kHz, V_{in} = 10mV	0.5	0.9		MHz
THD	Total Harmonic Distortion f = 1kHz A_V = 20dB, R_L = 2k, Vcc = 30V C_L = 100pF, Vo = $2V_{pp}$		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^+ = +5 V, Vcc = Ground, Tamb = 25 ºC (unless otherwise specified)

Symbol	Parameter	Min	Typ	Max	Unit
V_{io}	Input Offset Voltage V_{icm} = 0V T_{amb} = 25 ºC $T_{min} \le T_{amb} \le T_{max}$		0.5	3 5	mV
DV_{io}	Input Offset Voltage Drift			7	µV/ ºC
I_{ib}	Input Bias Current Negative input		20		nA
Avd	Large Signal Voltage Gain V_{icm} = 0V Vcc = 15V, R_L = 2k		100		V/mV
SVR	Supply Voltage Rejection Ratio V_{icm} = 0V Vcc^+ = 5V to 30V	65	100		dB
I_{source}	Output Current Source Vo = 2V Vcc = +15V, V_{id} = +1V	20	40		mA
I_o	Short Circuit to Ground Vcc = +15V		40	60	mA
I_{sink}	Output Current Sink V_{id} = -1V, Vcc = +15V, Vo = 2V	10	20		mA
V_{OH}	High Level Output Voltage Vcc^+ = 30V, Tamb = 25 ºC, R_L = 10k $T_{min.} \le T_{amb} \le T_{max}$	27 27	28		V
V_{OL}	Low Level Output Voltage R_L = 10k $T_{min.} \le T_{amb} \le T_{max}$		5	20 20	mV
SR	Slew Rate at Unity Gain V_i = 0.5 to 2V, Vcc = 15V R_L = 2k, C_L = 100pF, unity gain	0.2	0.4		V/ µs
GBP	Gain Bandwidth Product Vcc = 30V, R_L = 2k, C_L = 100pF f = 100kHz, V_{in} = 10mV	0.5	0.9		MHz
THD	Total Harmonic Distortion f = 1kHz A_V = 20dB, R_L = 2k, Vcc = 30V C_L = 100pF, Vo = $2V_{pp}$		0.02		%

VOLTAGE REFERENCE

Symbol	Parameter	Value	Unit
I_k	**Cathode Current**	**1 to 100**	**mA**

Symbol	Parameter	Min	Typ	Max	Unit
V_{ref}	Reference Input Voltage T_{amb} = 25 ºC $T_{min} \le T_{amb} \le T_{max}$	 2.49 2.48	 2.5	 2.51 2.52	V
ΔV_{ref}	Reference Input Voltage Deviation Over Temperatu Range $V_{KA} = V_{ref}$, I_k = 10mA $T_{min} \le T_{amb} \le T_{max}$		 5	 24	mV
I_{min}	Minimum Cathode Current for Regulation $V_{KA} = V_{ref}$		 0.5	 1	mA
$\lvert Z_{KA} \rvert$	Dynamic Impedance-note [1)] $V_{KA} = V_{ref}$, ΔI_K = 1 to 100mA, f < 1kHz		 0.2	 0.5	Ω

1 The Dynamic impedance is defined as $\lvert Z_{KA} \rvert = \Delta V_{KA} / \Delta I_K$

Typical Performance Characteristics

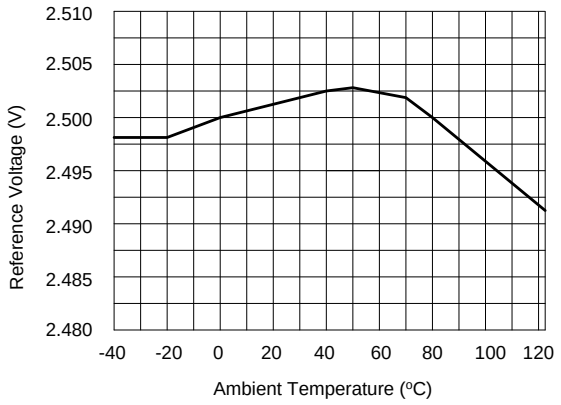


Figure 1. Reference Voltage vs. Ambient Temperature

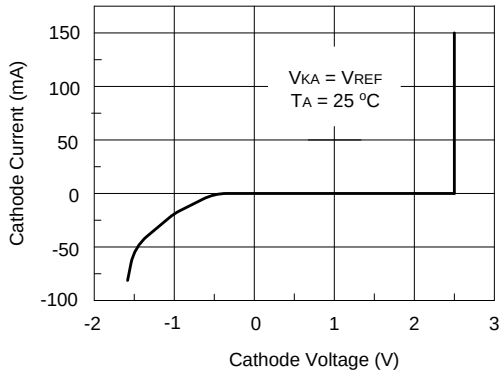


Figure 2. Cathode Current vs. Cathode Voltage

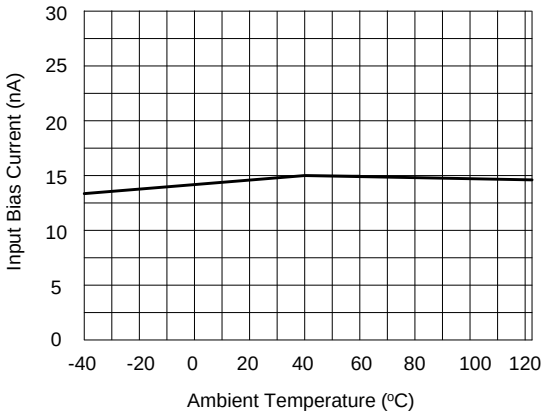


Figure 3. Input Bias Current vs. Ambient Temperature

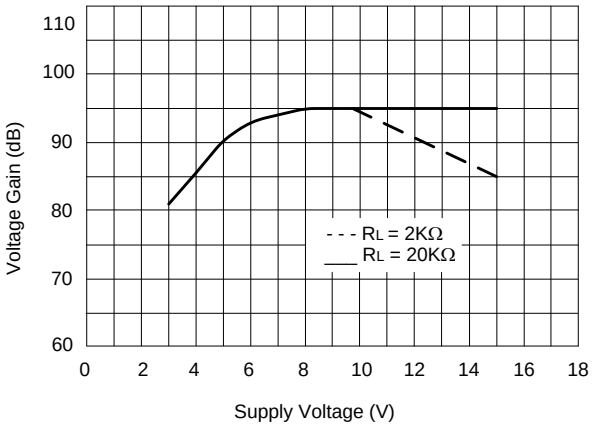
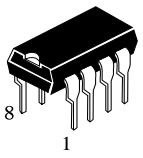
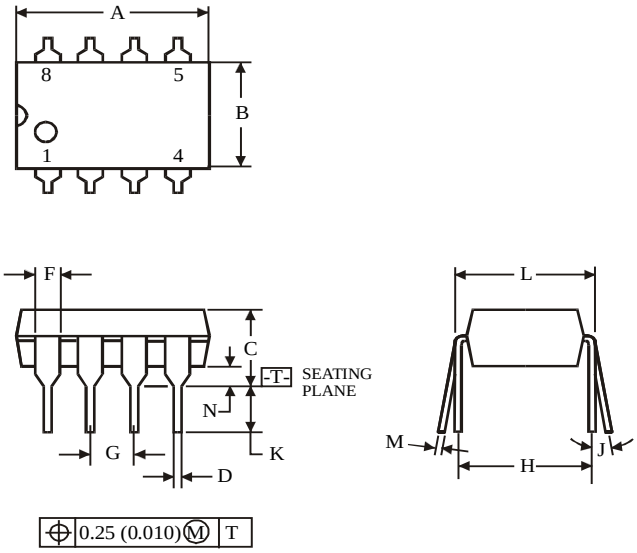


Figure 4. Operational Amplifier Voltage Gain

N SUFFIX PLASTIC DIP
(MS – 001BA)



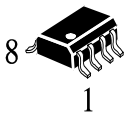


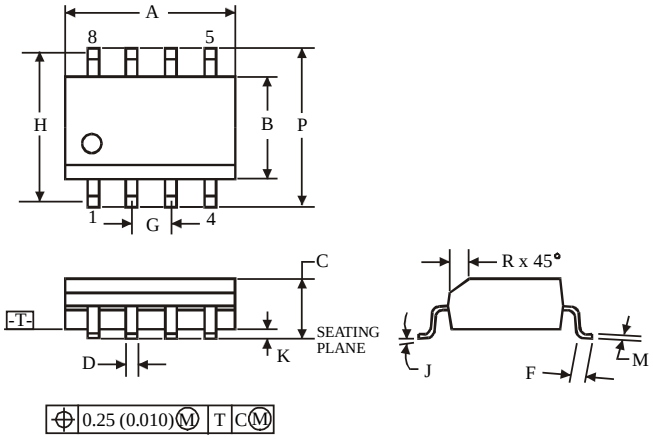
	Dimension, mm	
Symbol	**MIN**	**MAX**
A	8.51	10.16
B	6.1	7.11
C		5.33
D	0.36	0.56
F	1.14	1.78
G	2.54	
H	7.62	
J	0°	10°
K	2.92	3.81
L	7.62	8.26
M	0.2	0.36
N	0.38	

NOTES:

1. Dimensions “A”, “B” do not include mold flash or protrusions.
   Maximum mold flash or protrusions 0.25 mm (0.010) per side.

D SUFFIX SOIC
(MS - 012AA)





	Dimension, mm	
Symbol	**MIN**	**MAX**
A	4.8	5
B	3.8	4
C	1.35	1.75
D	0.33	0.51
F	0.4	1.27
G	1.27	
H	5.72	
J	0°	8°
K	0.1	0.25
M	0.19	0.25
P	5.8	6.2
R	0.25	0.5

NOTES:

1. Dimensions A and B do not include mold flash or protrusion.
2. Maximum mold flash or protrusion 0.15 mm (0.006) per side for A; for B – 0.25 mm (0.010) per side.