

### Description

GMA103A 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.

### Application

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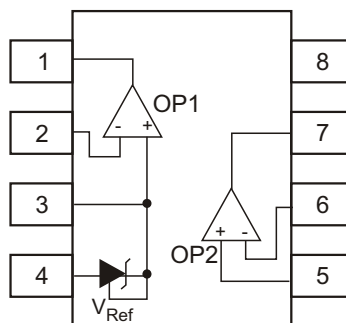
Battery Charger  
 Switch Mode Power Supply  
 Linear Regulator

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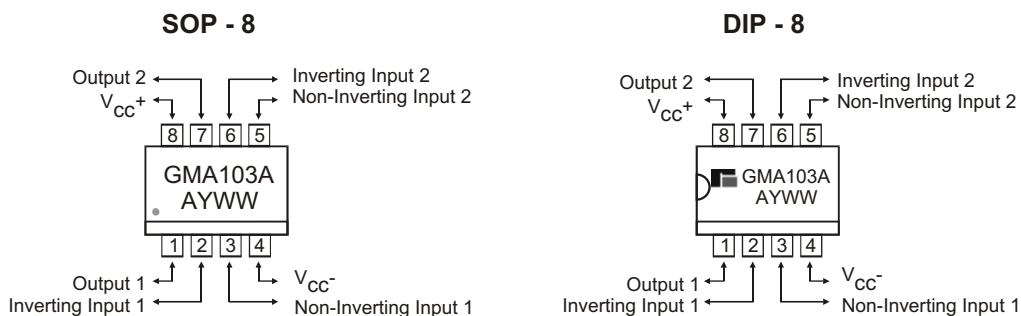
### Features

- ◆ **Low Input Offset Voltage : 0.5mV typ.**
- ◆ **Low Supply Current : 350µA/op.**  
 (@  $V_{CC} = 5V$ )
- ◆ **Medium Bandwidth (unity gain) : 0.9MHz**
- ◆ **Large Output Voltage Swing : 0V to ( $V_{CC} - 1.5V$ )**
- ◆ **Input Common Mode Voltage Range Includes Ground**
- ◆ **Wide Power Supply Range : 3 to 32V  $\pm 1.5$  to  $\pm 16V$**
- ◆ **Fixed Output Voltage Reference 2.5V**
- ◆ **0.4% and 1% Voltage Precision**
- ◆ **Sink Current Capability : 1 to 100mA**
- ◆ **Typical Output Impedance : 0.2**

### TYPICAL APPLICATIONS



◆ MARKING INFORMATION & PIN CONFIGURATIONS (Top View)



A = Assembly Location  
 Y = Year  
 W W = Weekly

◆ ORDERING INFORMATION

Ordering Number	Package	Shipping
GMA103AS8T	SOP-8	100 Units / Tube
GMA103AS8R	SOP-8	2,500 Units / Tape & Reel
GMA103AD8T	DIP-8	60 Units / Tube

\* For detail Ordering Number identification, please see last page.

## ◆ ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Supply Voltage	$V_{CC}$	36	V
Differential Input Voltage	$V_{id}$	36	V
Input Voltage	$V_i$	-0.3 to +36	V
Operating Temperature Range	$T_{oper}$	-40 to +105	°C
Maximum Junction Temperature	$T_J$	150	°C

## ◆ ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Min.	Typ.	Max.	Unit
Total Supply Current, Excluding Current in the Voltage Reference  $V_{CC+}=5V$ , No load $T_{min.} < T_{amb} < T_{max.}$ $V_{CC+}= 30V$ , No load $T_{min.} < T_{amb} < T_{max}$	$I_{CC}$		0.7	1.2 2	mA

### ◆ OPERATOR 1 (Independent op- amp)

$V_{CC+} = +5V$ ,  $V_{CC} = \text{Ground}$ ,  $V_O = 1.4V$ ,  $T_{amb} = 25^\circ C$  (unless otherwise specified)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Input Offset Voltage $T_{amb} = 25^\circ C$ $T_{min.} \leq T_{amb} \leq T_{max.}$	$V_{IO}$		0.5	3 5	mV
Input Offset Current	$DV_{IO}$			7	$\mu V / ^\circ C$
Input Offset Current $T_{min.} \leq T_{amb} \leq T_{max.}$	$I_{IO}$		2	30 50	nA
Input Bias Current $T_{min.} \leq T_{amb} \leq T_{max.}$	$I_{IB}$		20	150 200	nA
Large Signal Voltage Gain $V_{CC} = 15V$ , $R_L = 2K$ , $V_O = 1.4V$ to $11.4V$ $T_{min.} \leq T_{amb} \leq T_{max.}$	$A_{vd}$	50 25	100		V/ mV
Supply Voltage Rejection Ration $V_{CC} = 5V$ to $30V$	SVR	65	100		dB
Input Common Mode Voltage Range $V_{CC} = +30V$ (Note 1) $T_{min.} \leq T_{amb} \leq T_{max.}$	$V_{icm}$	0 0		$(V_{CC+}) - 1.5$ $(V_{CC+}) - 2$	V
Common Mode Rejection Ratio $T_{min.} \leq T_{amb} \leq T_{max.}$	CMR	70 60	85		dB
Output Current Source $V_{CC} = +15V$ , $V_O = 2V$ , $V_{id} = +1V$	$I_{source}$	20	40		mA
Short Circuit Ground $V_{CC} = +15V$	$I_o$		40	60	mA
Output Current Sink $V_{id} = -1V$ $V_{CC} = +15V$ , $V_O = 2V$	$I_{sink}$	10	20		mA
High Level Output Voltage $V_{CC+} = 30V$ $T_{amb} = 25^\circ C$ , $R_L = 10K$ $T_{min.} \leq T_{amb} \leq T_{max.}$	$V_{OH}$	27 27	28		V
Low Level Output Voltage $R_L = 10K$ $T_{min.} \leq T_{amb} \leq T_{max.}$	$V_{OL}$		5	20 20	mV
Slew Rate at Unity Gain $V_i = 0.5$ to $3V$ , $V_{CC} = 15V$ $R_L = 2K$ , $C_L = 100pF$ , unity gain	SR	0.2	0.4		V/ $\mu s$
Gain Bandwidth Product $V_{CC} = 30V$ , $R_L = 2K$ , $C_L = 100pF$ , $f = 100kHz$ , $V_{IN} = 10mV$	GBP	0.5	0.9		Mhz
Total Harmonic Distortion $f = 1kHz$ $A_v = 20dB$ , $R_L = 2K$ , $V_{CC} = 30V$ $C_L = 100pF$ , $V_O = 2V_{pp}$	THD		0.02		%

Note 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  $V_{CC+} - 1.5V$ .  
But either of both inputs can go to +36V without damage.

◆ **OPERATOR 2** (op-amp with non-inverting input connected to the internal Vref)

$V_{CC+} = +5V$ ,  $V_{CC-} = \text{Ground}$ ,  $T_{amb} = 25^{\circ}\text{C}$  (unless otherwise specified)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Input Offset Voltage $T_{amb} = 25^{\circ}\text{C}$ $T_{min.} \leq T_{amb} \leq T_{max.}$	$V_{IO}$		0.5	3 5	mV
Input Offset Current	$DV_{IO}$			7	$\mu\text{V}/^{\circ}\text{C}$
Input Bias Current Negative Input	$I_{IB}$		20		nA
Large Signal Voltage Gain $V_{icm} = 0V$ $V_{CC} = 15V$ , $R_L = 2K$	$A_{vd}$		100		V/mV
Supply Voltage Rejection Ratio $V_{icm} = 0V$ $V_{CC} = 5V$ to $30V$	SVR	65	100		dB
Output Current Source $V_O = 2V$ , $V_{CC} = +15V$ , $V_{id} = +1V$	$I_{source}$	20	40		mA
Short Circuit Ground $V_{CC} = +15V$	$I_o$		40	60	mA
Output Current Sink $V_{id} = -1V$ $V_{CC} = +15V$ , $V_O = 2V$	$I_{sink}$	10	20		mA
High Level Output Voltage $V_{CC+} = 30V$ $T_{amb} = 25^{\circ}\text{C}$ , $R_L = 10K$ $T_{min.} \leq T_{amb} \leq T_{max.}$	$V_{OH}$	27 27	28		V
Low Level Output Voltage $R_L = 10K$ $T_{min.} \leq T_{amb} \leq T_{max.}$	$V_{OL}$		5	20 20	mV
Slew Rate at Unity Gain $V_i = 0.5$ to $2V$ , $V_{CC} = 15V$ $R_L = 2K$ , $C_L = 100\text{pF}$ , unity gain	SR	0.2	0.4		V/ $\mu\text{s}$
Gain Bandwidth Product $V_{CC} = 30V$ , $R_L = 2K$ , $C_L = 100\text{pF}$ , $f = 100\text{kHz}$ , $V_{IN} = 10\text{mV}$	GBP	0.5	0.9		Mhz
Total Harmonic Distortion $f = 1\text{kHz}$ $A_v = 20\text{dB}$ , $R_L = 2K$ , $V_{CC} = 30V$ $C_L = 100\text{pF}$ , $V_O = 2V_{pp}$	THD		0.02		%

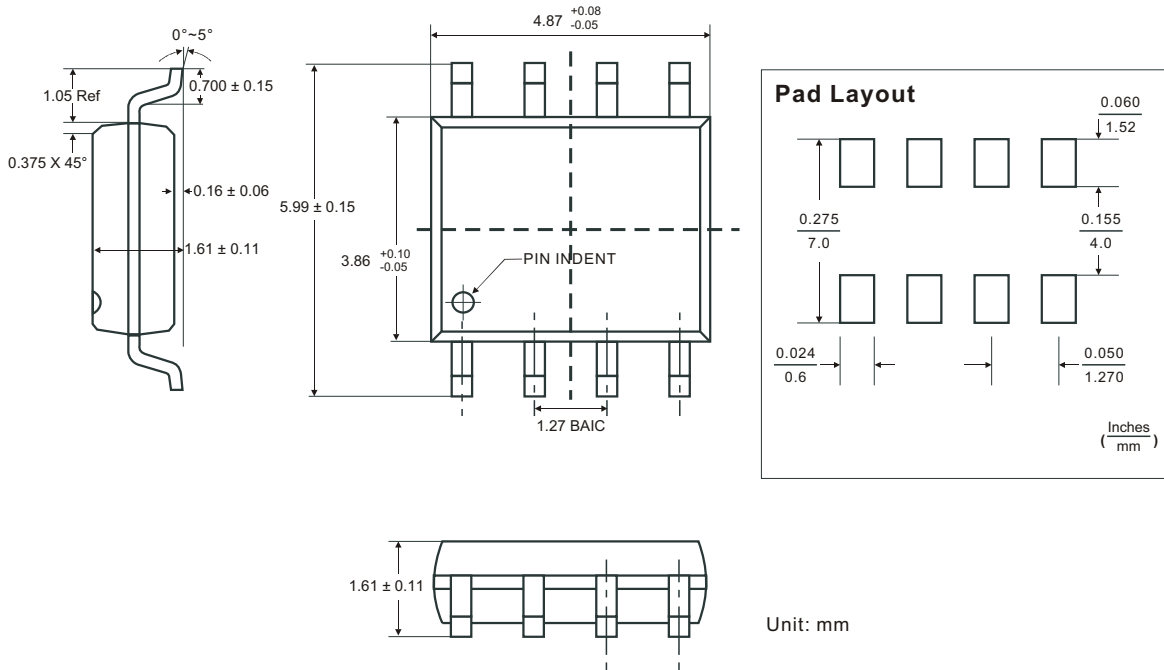
### ◆ VOLTAGE REFERENCE

Parameter	Symbol	Value	Unit
Cathode Current	$I_K$	1 to 100	mA

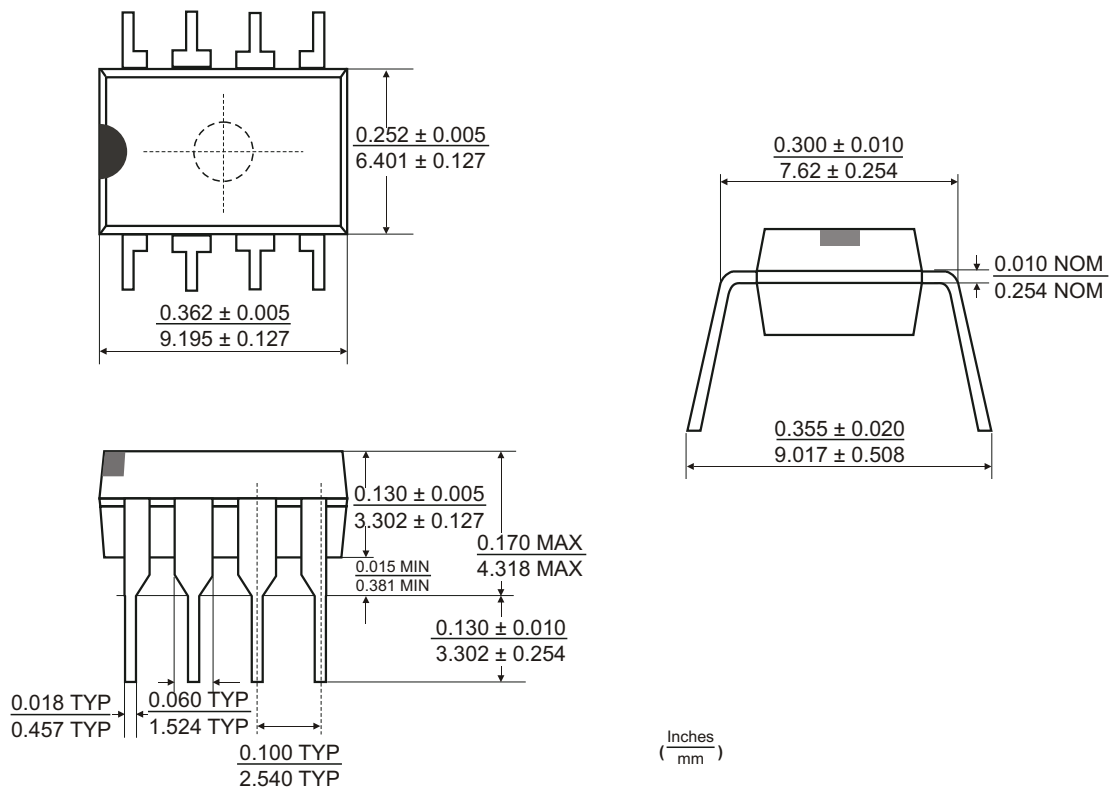
Parameter	Symbol	Min.	Typ.	Max.	Unit
Reference Input Voltage Tamb= 25°C Tmin. ≤ Tamb ≤ Tmax.	$V_{ref}$	2.49 2.48	2.5	2.51 2.52	V
Reference Input Voltage Deviation Over Temperature Range $V_{KA} = V_{ref}$ , $I_K = 10mA$ Tmin. ≤ Tamb ≤ Tmax.	$V_{ref}$		5	24	mV
Minimum Cathode Current for Regulation $V_{KA} = V_{ref}$	$I_{min}$		0.5	1	mA
Dynamic Impedance (Note 1) $V_{KA} = V_{ref}$ , $I_K = 1$ to 100mA, $f < 1kHz$	$ Z_{KA} $		0.2	0.5	

Note 1: The dynamic impedance is defined as  $|Z_{KA}| = V_{KA} / I_K$

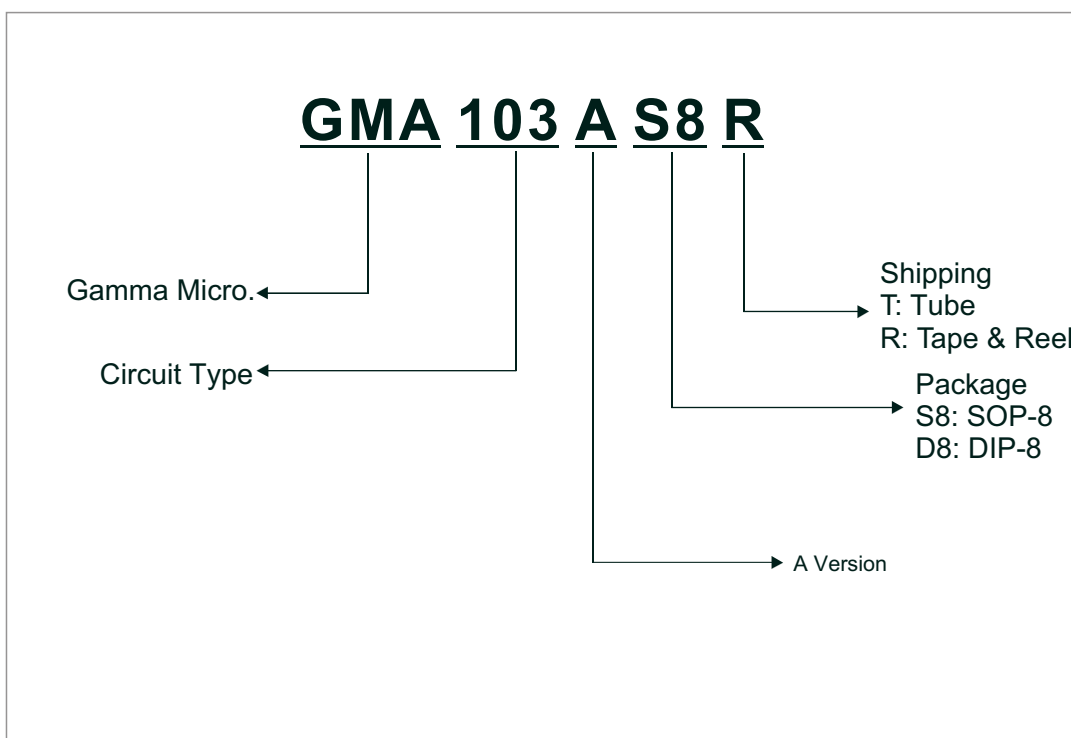
### ◆ SOP-8 PACKAGE OUTLINE DIMENSIONS



### ◆ DIP-8 PACKAGE OUTLINE DIMENSIONS





◆ ORDERING NUMBER





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