

TSM103/A

DUAL OPERATIONAL AMPLIFIER AND VOLTAGE REFERENCE

NOT FOR NEW DESIGN - REPLACED BY TSM103W

OPERATIONAL AMPLIFIER

- LOW INPUT OFFSET VOLTAGE: 0.5mV typ.for TSM103A
- LOW SUPPLY CURRENT : 350μ A/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 ±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

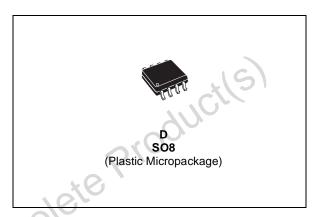
DESCRIPTION

The TSM103 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.

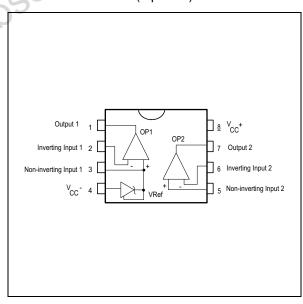
ORDER CODE

Part Number	Temperature Range	Package
Part Number	remperature Nange	D
TSM103I/AI	-40°C, +105°C	•

D = Small Outline Package (SO) - also available in Tape & Reel (DT)



PIN CONNECTIONS (top view)



January 2003 1/9

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{CC}	Supply Voltage	36	V
V_{id}	Differential Input Voltage	36	V
V _i	Input Voltage	-03. to +36	V
T _{oper}	Operating Free-air Temperature Range	-55 to +125	°C
T _j	Maximum Junction Temperature	150	°C
R _{thja}	Thermal Resistance Junction to Ambient (SO package)	175	°C/W

ELECTRICAL CHARACTERISTICS

	Symbol	Parameter	Min.	Тур.	Max.	Unit
	I _{cc}	Total Supply Current, excluding Current in the Voltage Reference VCC+ = 5V, no load Tmin. < Tamb < Tmax. VCC+ = 30V, no load Tmin. < Tamb < Tmax		0.7	1.2	mA
O _k	5018	e Producti(s)	dete			

OPERATOR 2 (independent op-amp)

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

Symbol	Parameter	Min.	Тур.	Max.	Unit
V _{io}	Input Offset Voltage TSM103, T _{amb} = 25°C		1	4	mV
	$\begin{split} & T_{min.} \leq T_{amb} \leq T_{max.} \\ & TSM103A, \ T_{amb} = 25^{\circ}C \\ & T_{min.} \leq T_{amb} \leq T_{max.} \end{split}$		0.5	5 2 3	
DV _{io}	Input Offset Voltage Drift		7		μV/°C
I _{io}	Input Offset Current $T_{min.} \leq T_{amb} \leq T_{max.}$		2	30 50	nA
I _{ib}			20	150 200	nA
Avd	Large Signal Voltage Gain V_{CC} = 15V, R_L = 2k, V_0 = 1.4V to 11.4V $T_{min.} \le T_{amb} \le T_{max.}$	50 25	100	UCIL	V/mV
SVR	Supply Voltage Rejection Ratio V _{CC} = 5V to 30V	65	100)	dB
Vicm	Input Common Mode Voltage Range $V_{CC} = +30V \text{ - see note }^{1)}$ $T_{min.} \le T_{amb} \le T_{max.}$	00		(V _{CC} +) -1.5 (V _{CC} +) -2	V
CMR	Common Mode Rejection Ratio $T_{min.} \le T_{amb} \le T_{max.}$	70 60	85		dB
I _{source}	Output Current Source V _{CC} = +15V, Vo = 2V, V _{id} = +1V	20	40		mA
I _o	Short Circuit to Ground V _{CC} = +15V		40	60	mA
I _{sink}	Output Current Sink $V_{id} = -1V,$ $V_{CC} = +15V, V_{o} = 2V$	10	20		mA
V _{OH}	High Level Output Voltage $V_{CC}^{+} = 30V$ $T_{amb} = 25^{\circ}C, R_{L} = 10k$ $T_{min.} \leq T_{amb} \leq T_{max.}$	27 27	28		V
Vol	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, $V_{CC} = 15V$ $R_L = 2k$, $C_L = 100pF$, unity gain	0.2	0.4		V/μs
GBP	Gain Bandwidth Product $V_{CC} = 30V, R_L = 2k, C_L = 100pF$ $f = 100kHz, V_{in} = 10mV$	0.5	0.9		MHz
THD	Total Harmonic Distortion $f = 1 \text{kHz}$ $A_V = 20 \text{dB}, R_L = 2 \text{k}, \ V_{CC} = 30 \text{V}$ $C_L = 100 \text{pF}, \ V_o = 2 \text{V}_{pp}$		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 V_{CC}⁺ - 1.5V.

But either of both inputs can go to +36V without damage.

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OPERATOR 1 (op-amp with non-inverting input connected to the internal Vref) V_{CC}^+ = +5V, V_{CC}^- = Ground, T_{amb} = 25°C (unless otherwise specified)

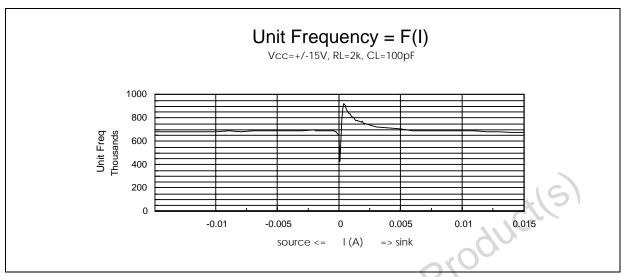
Symbol	Parameter	Min.	Тур.	Max.	Unit
V _{io}	Input Offset Voltage				mV
	V _{icm} = 0V		1	4	
	TSM103, $T_{amb} = 25^{\circ}C$ $T_{min.} \le T_{amb} \le T_{max.}$		'	5	
	TSM103A, T _{amb} = 25°C		0.5	2	
	$T_{min.} \le T_{amb} \le T_{max.}$			3	
DV _{io}	Input Offset Voltage Drift		7		μV/°C
I_{ib}	Input Bias Current			4	nA
	negative input		20	+ 6	
Avd	Large Signal Voltage Gain V _{icm} = 0V			-11-	V/mV
	$V_{CC} = 15V, R_L = 2k$		100	. 1000	
SVR	Supply Voltage Rejection Ratio		.00		dB
SVIC	V _{icm} = 0V		~40	,-	uБ
	$V_{CC}^{+} = 5V \text{ to } 30V$	65	100		
I _{source}	Output Current Source	. 0			mA
Source	$\dot{V}_0 = 2V$	2/10			
	$V_{CC} = +15V, V_{id} = +1V$	20	40		
I _o	Short Circuit to Ground) `			mA
	V _{CC} = +15V		40	60	
I _{sink}	Output Current Sink				mA
	$V_{id} = -1V,$ $V_{CC} = +15V, V_{o} = 2V$	10	20		
V _{OH}	High Level Output Voltage				V
V OH	$V_{CC}^{+} = 30V$				V
	$T_{amb} = 25$ °C, $R_L = 10$ k	27			
	$T_{min.} \le T_{amb} \le T_{max.}$	27	28		
V _{OL}	Low Level Output Voltage				mV
01	$R_1 = 10k$		5	20	
	$T_{min.} \le T_{amb} \le T_{max.}$			20	
SR	Slew Rate at Unity Gain				V/µs
78	$V_i = 0.5 \text{ to } 2V, V_{CC} = 15V$	0.2	0.4		•
~0,	$R_L = 2k$, $C_L = 100pF$, unity gain				
GBP	Gain Bandwidth Product				MHz
,	$V_{CC} = 30V, R_L = 2k, C_L = 100pF$	0.5	0.9		
	f = 100kHz, V _{in} = 10mV				
THD	Total Harmonic Distortion f = 1kHz		0.02		%
	$A_V = 20 \text{dB}, R_L = 2k, V_{CC} = 30 \text{V}$		0.02		
	$C_L = 100 pF, V_o = 2 V_{pp}$				

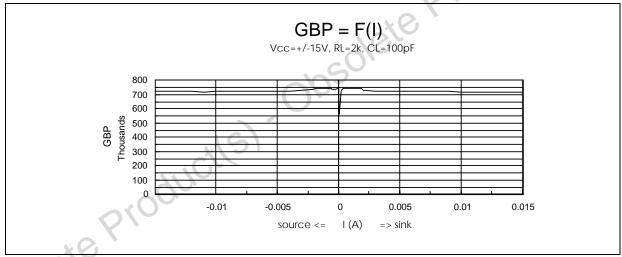
VOLTAGE REFERENCE

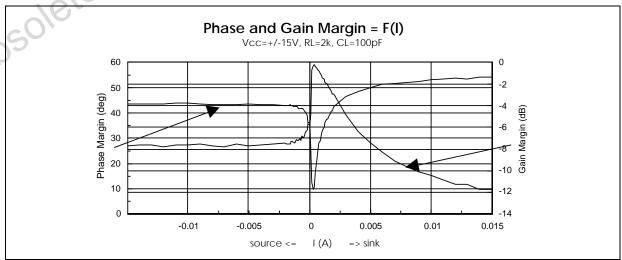
Symbol	Parameter	Value	Unit
l _k	Cathode Current	1 to 100	mA

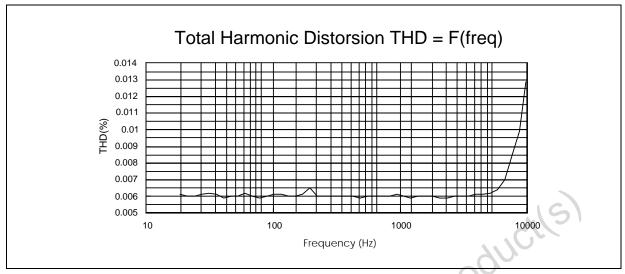
2.475 2.45 2.49 2.48	2.5 2.5 7 0.5 0.2	2.525 2.55 2.51 2.52 30 1 0.5	V mV Ω
net ^e	0.5	UGU	mA
ete		0.5	
nete	0.2	0.5	Ω
lete			

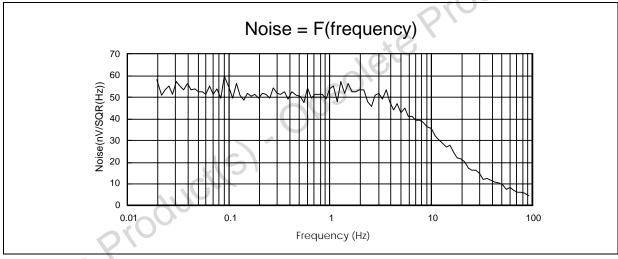
OPERATIONAL AMPLIFIERS

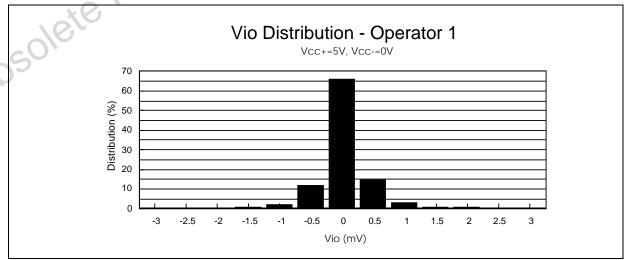


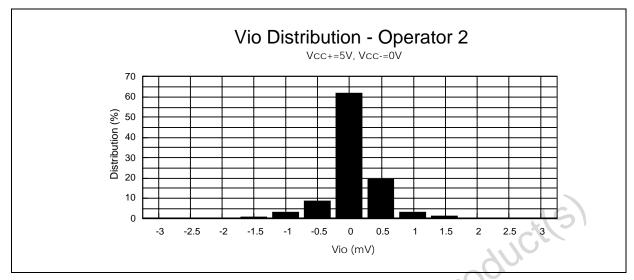


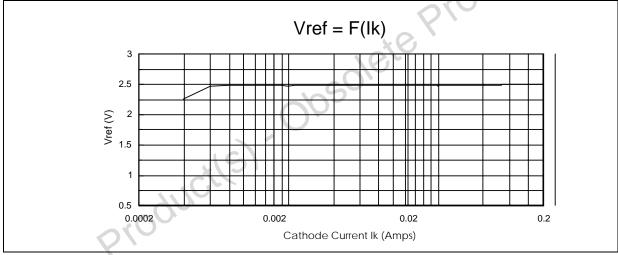


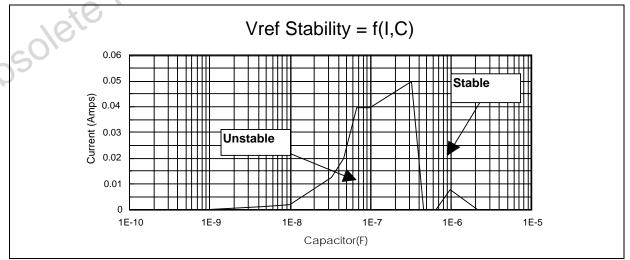






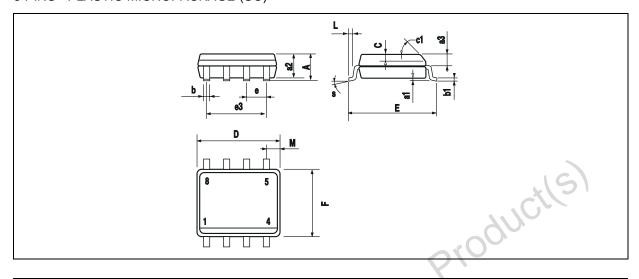






PACKAGE MECHANICAL DATA

8 PINS - PLASTIC MICROPACKAGE (SO)



Dim.		Millimeters		40	Inches	
Dilli.	Min.	Тур.	Max.	Min.	Тур.	Max.
Α			1.75	7		0.069
a1	0.1		0.25	0.004		0.010
a2			1.65			0.065
a3	0.65		0.85	0.026		0.033
b	0.35	16	0.48	0.014		0.019
b1	0.19	*(3)	0.25	0.007		0.010
С	0.25	10,	0.5	0.010		0.020
c1	4/	<i></i>	45° ((typ.)		
D	4.8		5.0	0.189		0.197
E	5.8		6.2	0.228		0.244
е		1.27			0.050	
e3	1	3.81			0.150	
F	3.8		4.0	0.150		0.157
~ () _[0.4		1.27	0.016		0.050
M			0.6			0.024
S			8° (n	nax.)		

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