1 ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	36	V
V_{id}	Differential Input Voltage	Vcc + 0.6	V
V_i	Input VoltageL	-0.3 to Vcc + 0.3V	V
T_{stg}	Storage temperature range	-65 to + 150	°C
Ik	Continuous cathode current range	-100 to 150	mA
T_j	Maximum Junction Temperature	150	°C
R_{thja}	Thermal Resistance Junction to Ambient (SO package)	175	°C/W
T_l	Maximum Lead Temperature (10 seconds maximum)	260	°C
ESD	Electrostatic Discharge Protection	1.5	kV

OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
Vcc	DC Supply Conditions	3 to 32	V
I_k	Vref Cathode Current	1 to 100	mA
T_{oper}	Operating Free-air Temperature Range	-40°C, +105°C	°C

2 ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Min.	Typ.	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 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	Min.	Typ.	Max.	Unit
V_{io}	Input Offset Voltage V_{icm} = 0V TSM103WA, T_{amb} = 25° $T_{min.} \le T_{amb} \le T_{max.}$ TSM103W, T_{amb} = 25° $T_{min.} \le T_{amb} \le T_{max.}$		0.5 1	2 3 4 5	mV
DV_{io}	Input Offset Voltage Drift		7		µV/°C
I_{io}	Input Offset Current $T_{min.} \le T_{amb} \le T_{max.}$		2	75 150	nA
I_{ib}	Input Bias Current $T_{min.} \le T_{amb} \le T_{max}$		20	150 200	nA
Avd	Large Signal Voltage Gain V_{CC} = 15V, R_L = 2k, Vo = 1.4V to 11.4V $T_{min.} \le T_{amb} \le T_{max.}$	50 25	100		V/mV
SVR	Supply Voltage Rejection Ratio V_{CC} = 5V to 30V	65	100		dB
Vicm	Input Common Mode Voltage Range V_{CC} = +30V - see note [1] $T_{min.} \le T_{amb} \le T_{max.}$	0 0		(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 V_{CC} = +15V, V_o = 0.2V	10 12	20 50		mA µA
V_{OH}	High Level Output Voltage V_{CC}^+ = 30V T_{amb} = 25°C, R_L = 2k $T_{min.} \le T_{amb} \le T_{max}$ T_{amb} = 25°C, R_L = 10k $T_{min.} \le T_{amb} \le T_{max.}$	26 26 27 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, V_{CC} = 15V R_L = 2k, C_L = 100pF, unity gain	0.2	0.4		V/µs

Symbol	Parameter	Min.	Typ.	Max.	Unit
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 = 1kHz A_V = 20dB,R_L = 2k, V_{CC} = 30V C_L = 100pF, V_o = $2V_{pp}$		0.02		%
e_n	Equivalent Input Noise Voltage f = 1kHz, Rs = 100Ω Vcc = 30V		50		nV/√Hz

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. Both inputs can go to Vcc+ 0.3V without damage.

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.	Typ.	Max.	Unit
V_{io}	Input Offset Voltage V_{icm} = 0V TSM103WA, T_{amb} = 25° $T_{min.} \le T_{amb} \le T_{max.}$ TSM103W, T_{amb} = 25° $T_{min.} \le T_{amb} \le T_{max.}$		0.5 1	2 3 4 5	mV
DV_{io}	Input Offset Voltage Drift		7		µV/°C
I_{ib}	Input Bias Current negative input		20		nA
Avd	Large Signal Voltage Gain V_{CC} = 15V, R_L = 2k, Vo = 1.4V to 11.4V $T_{min.} \le T_{amb} \le T_{max}$		100		V/mV
SVR	Supply Voltage Rejection Ratio V_{icm} = 0V V_{CC}^+ = 5V to 30V	65	100		dB
I_{source}	Output Current Source V_o = 2V V_{CC} = +15V, 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 V_{CC} = +15V, V_o = 0.2V	10 12	20 50		mA µA
V_{OH}	High Level Output Voltage V_{CC}^+ = 30V T_{amb} = 25°C, R_L = 2k $T_{min.} \le T_{amb} \le T_{max.}$ T_{amb} = 25°C, R_L = 10k $T_{min.} \le T_{amb} \le T_{max.}$	26 26 27 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, V_{CC} = 15V R_L = 2k, C_L = 100pF, unity gain	0.2	0.4		V/µs

Symbol	Parameter	Min.	Typ.	Max.	Unit
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 = 1kHz A_V = 20dB,R_L = 2k, V_{CC} = 30V C_L = 100pF, V_o = $2V_{pp}$		0.02		%

VOLTAGE REFERENCE

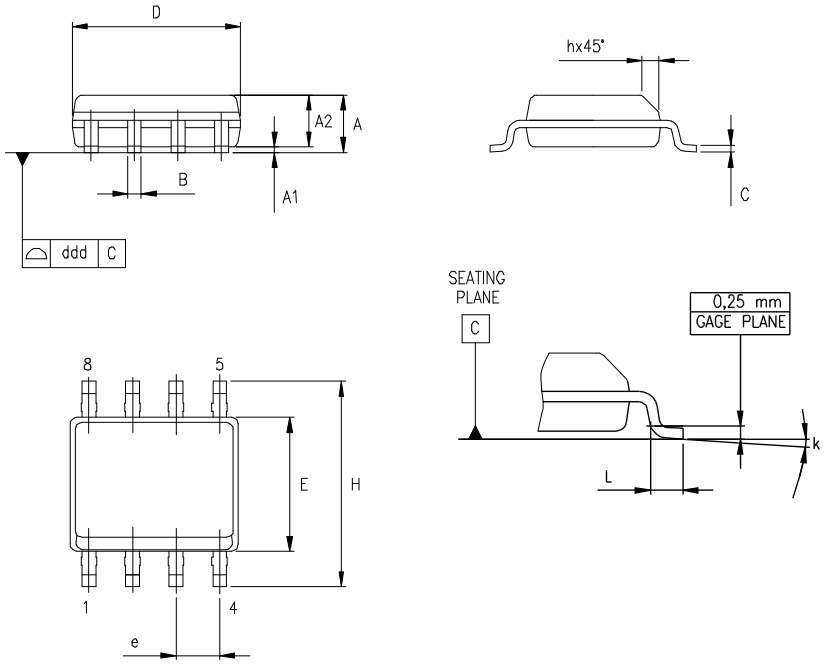
Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{ref}	Reference Input Voltage, Ik=10mA TSM103WA ±0.4% T_{amb} = 25°C $T_{min.} \le T_{amb} \le T_{max.}$ TSM103W ±0.7% T_{amb} = 25°C $T_{min.} \le T_{amb} \le T_{max.}$	 2.49 2.48 2.482 2.465	 2.5 2.500	 2.51 2.52 2.518 2.535	V
ΔV_{ref}	Reference Input Voltage Deviation Over Temperature Range $V_{KA} = V_{ref}$; I_k = 10mA $T_{min.} \le T_{amb} \le T_{max.}$		7	30	mV
I_{min}	Minimum Cathode Current for Regulation $V_{KA} = V_{ref}$		0.5	1	mA
$\|Z_{KA}\|$	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 $[Z_{KA}| = \Delta V_{KA}/\Delta I_K$

PACKAGE MECHANICAL DATA

SO-8 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	1.35		1.75	0.053		0.069
A1	0.10		0.25	0.04		0.010
A2	1.10		1.65	0.043		0.065
B	0.33		0.51	0.013		0.020
C	0.19		0.25	0.007		0.010
D	4.80		5.00	0.189		0.197
E	3.80		4.00	0.150		0.157
e		1.27			0.050	
H	5.80		6.20	0.228		0.244
h	0.25		0.50	0.010		0.020
L	0.40		1.27	0.016		0.050
k	8° (max.)					
ddd			0.1			0.04



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3 SUMMARY OF CHANGES

Date	Revision	Description of Changes
	1-2	First Release
02-April-2004	3	1 - Vid=Vcc+0.6 modified on AMR table - page 2 2 - Add Ik parameter on AMR table - page 2 3 - Avd test condition equal on both tables Operator 1 & Operator 2 - pages 3 & 4