



# TSM100

## SINGLE OPERATIONAL AMPLIFIER AND SINGLE COMPARATOR

### OPERATIONAL AMPLIFIER

- LOW INPUT OFFSET VOLTAGE : 0.5mV typ.
- 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 : 5 to 30V  $\pm 2.5$  TO  $\pm 15V$
- ESD PROTECTION : 2kV

### COMPARATOR (OPEN COLLECTOR)

- INPUT COMMON MODE VOLTAGE RANGE INCLUDES GROUND
- LOW OUTPUT SATURATION VOLTAGE : 250mV @  $I_o = 4mA$

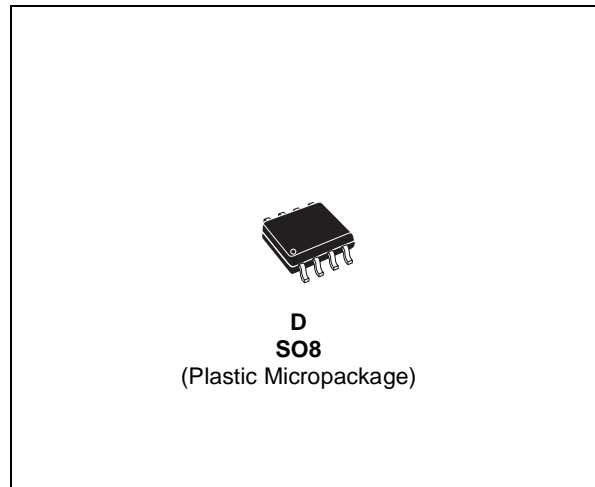
### DESCRIPTION

The TSM100 is a monolithic IC that includes one independent op-amp and one independent comparator. This device is offering space and cost saving in many applications like power supply management or data acquisition systems.

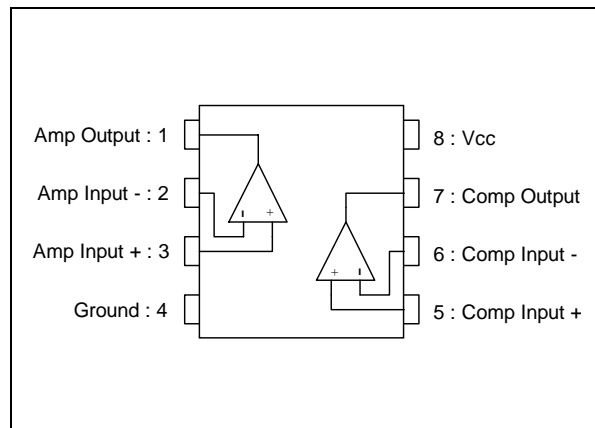
### ORDER CODE

Part Number	Temperature Range	Package
		D
TSM100I	-40°C, +105°C	•

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



### PIN CONNECTIONS (top view)



**ABSOLUTE MAXIMUM RATINGS**

Symbol	Parameter	Value	Unit
$V_{CC}$	Supply Voltage	32	V
$V_{id}$	Differential Input Voltage	32	V
$V_i$	Input Voltage	-03. to +32	V
$T_{oper}$	Operating Free-air Temperature Range	-40 to +105	°C
$T_j$	Maximum Junction Temperature	150	°C
$T_l$	Maximum Lead Temperature (10 seconds maximum)	260	°C
$R_{thja}$	Thermal Resistance Junction to Ambient	175	°C/W

**ELECTRICAL CHARACTERISTICS**

Symbol	Parameter	Min.	Typ.	Max.	Unit
$I_{CC}$	Total Supply Current Vcc+ = 5V, no load Vcc+ = 30V, no load		0.9	1.4 1.8	mA

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

Symbol	Parameter	Min.	Typ.	Max.	Unit
$V_{io}$	Input Offset Voltage $T_{amb} = 25^\circ\text{C}$ $T_{min.} \leq T_{amb} \leq T_{max.}$		0.5	3 4	mV
$DV_{io}$	Input Offset Voltage Drift		7		$\mu\text{V}/^\circ\text{C}$
$I_{io}$	Input Offset Current		2	30	nA
$I_{ib}$	Input Bias Current		20	150	nA
$A_{vd}$	Large Signal Voltage Gain $V_{CC} = 15V$ , $R_L = 2k$ , $V_o = 1.4V$ to $11.4V$	50	100		V/mV
SVR	Supply Voltage Rejection Ratio $V_{CC} = 5V$ to $30V$	65	100		dB
$V_{icm}$	Input Common Mode Voltage Range $V_{CC} = +30V$ - see note <sup>1)</sup>	0		$(V_{CC}^+) - 1.5$	V
CMR	Common Mode Rejection Ratio	65	85		dB
$I_{source}$	Output Current Source $V_{CC} = +15V$ , $V_o = 2V$ , $V_{id} = +1V$	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 $\mu\text{A}$
$V_{OH}$	High Level Output Voltage $V_{CC}^+ = 30V$ $T_{amb} = 25^\circ\text{C}$ , $R_L = 2k$ $T_{amb} = 25^\circ\text{C}$ , $R_L = 10k$	26 27	27 28		V
$V_{OL}$	Low Level Output Voltage $R_L = 10k$		5	15	mV
SR	Slew Rate at Unity Gain $V_i = 0.5$ to $3V$ , $V_{CC} = 15V$ $R_L = 2k$ , $C_L = 100\text{pF}$ , unity gain	0.2	0.4		V/ $\mu\text{s}$
GBP	Gain Bandwidth Product $V_{CC} = 30V$ , $R_L = 2k$ , $C_L = 100\text{pF}$ $f = 100\text{kHz}$ , $V_{in} = 10\text{mV}$	0.5	0.9		MHz
THD	Total Harmonic Distortion $f = 1\text{kHz}$ $A_V = 20\text{dB}$ , $R_L = 2k$ , $V_{CC} = 30V$ $C_L = 100\text{pF}$ , $V_o = 2V_{pp}$		0.015		%
$e_n$	Equivalent Input Noise Voltage $f = 1\text{kHz}$ , $R_s = 100\Omega$ $V_{CC} = 30V$		40		nV/ $\sqrt{\text{Hz}}$

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  $V_{CC}^+ - 1.5V$ .  
But both inputs can go to  $V_{CC}^+ + 0.3V$  without damage.

**COMPARATOR**

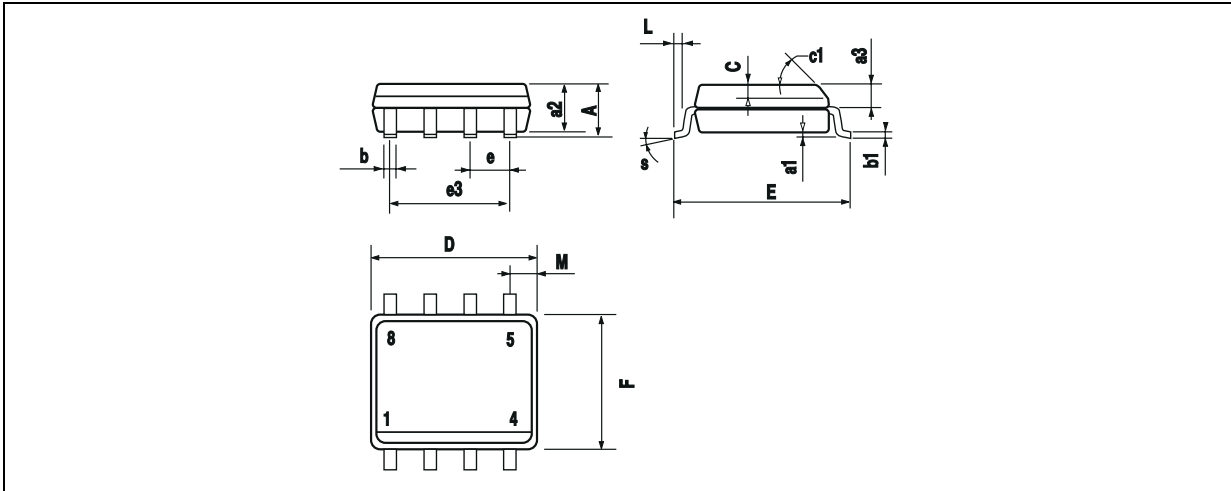
$V_{CC+} = +5V$ ,  $V_{CC} = \text{Ground}$ ,  $T_{\text{amb}} = 25^{\circ}\text{C}$  (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit
$V_{io}$	Input Offset Voltage $T_{\text{amb}} = 25^{\circ}\text{C}$		1	5	mV
$I_{io}$	Input Offset Current		5	50	nA
$I_{ib}$	Input Bias Current		25	250	nA
$A_{vd}$	Large Signal Voltage Gain $V_{CC} = 15V$ , $R_L = 15k$ , $V_o = 1V$ to $11V$		200		V/mV
$V_{icm}$	Input Common Mode Voltage Range <sup>1)</sup>	0		$(V_{CC+}) - 1.5$	V
$I_{\text{sink}}$	Output Sink Current $V_{id} = -1V$ , $V_o = 1.5V$	6	16		mA
$V_{OL}$	Low Level Output Voltage $V_{id} = -1V$ , $I_{\text{sink}} = 4\text{mA}$		250	400	mV
$I_{OH}$	High Level Output Current $V_{id} = 1V$ , $V_{CC} = V_o = 30V$		0.1		nA
$t_{re}$	Response Time $R_L = 5.1k$ to $V_{CC+}$ <sup>2)</sup>		1.3		$\mu\text{s}$
$t_{rel}$	Large Signal Response Time $V_i = \text{TTL}$ , $V_{ref} = +1.4V$ , $R_L = 5.1k$ to $V_{CC+}$		300		ns

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.

2. The response time is specified for a 100mV input step with 5mV overdrive. For larger overdrive signals, 300ns can be obtained

**PACKAGE MECHANICAL DATA**  
8 PINS - PLASTIC MICROPACKAGE (SO)



Dim.	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.75			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		0.48	0.014		0.019
b1	0.19		0.25	0.007		0.010
C	0.25		0.5	0.010		0.020
c1	45° (typ.)					
D	4.8		5.0	0.189		0.197
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		3.81			0.150	
F	3.8		4.0	0.150		0.157
L	0.4		1.27	0.016		0.050
M			0.6			0.024
S	8° (max.)					

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