# TSM100

## SINGLE OPERATIONAL AMPLIFIER AND SINGLE COMPARATOR

**NOT FOR NEW DESIGN**

### 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 ±2.5 TO ±15V
- ESD PROTECTION : 2kV

### COMPARATOR (OPEN COLLECTOR)

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

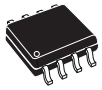
### DESCRIPTION

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

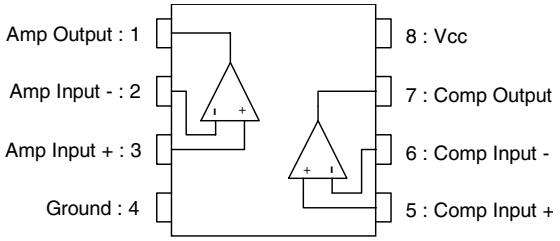
| Part Number | Temperature Range | Package |
|---|---|---|
| | | D |
| TSM100I | -40°C, +105°C | • |

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



**D**
**SO8**
(Plastic Micropackage)

**PIN CONNECTIONS** (top view)

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## 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<br>Vcc+ = 5V, no load<br>Vcc+ = 30V, no load | | <br>0.9 | <br>1.4<br>1.8 | mA |

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## OPERATIONAL AMPLIFIER

$V_{CC}^+$ = +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<br>$T_{amb}$ = 25°C<br>$T_{min.} \le T_{amb} \le T_{max.}$ | | 0.5 | 3<br>4 | mV |
| $DV_{io}$ | Input Offset Voltage Drift | | 7 | | µV/°C |
| $I_{io}$ | Input Offset Current | | 2 | 30 | nA |
| $I_{ib}$ | Input Bias Current | | 20 | 150 | nA |
| Avd | Large Signal Voltage Gain<br>$V_{CC}$ = 15V, $R_L$ = 2k, Vo = 1.4V to 11.4V | 50 | 100 | | V/mV |
| SVR | Supply Voltage Rejection Ratio<br>$V_{CC}$ = 5V to 30V | 65 | 100 | | dB |
| Vicm | Input Common Mode Voltage Range<br>$V_{CC}$ = +30V - see note 1) | 0 | | ($V_{CC}$+) -1.5 | V |
| CMR | Common Mode Rejection Ratio | 65 | 85 | | dB |
| $I_{source}$ | Output Current Source<br>$V_{CC}$ = +15V, Vo = 2V, $V_{id}$ = +1V | 20 | 40 | | mA |
| $I_o$ | Short Circuit to Ground<br>$V_{CC}$ = +15V | | 40 | 60 | mA |
| $I_{sink}$ | Output Current Sink<br>$V_{id}$ = -1V,<br>$V_{CC}$ = +15V, $V_o$ = 2V<br>$V_{CC}$ = +15V, $V_o$ = 0.2V | <br><br>10<br>12 | <br><br>20<br>50 | | <br><br>mA<br>µA |
| $V_{OH}$ | High Level Output Voltage<br>$V_{CC}^+$ = 30V<br>$T_{amb}$ = 25°C, $R_L$ = 2k<br>$T_{amb}$ = 25°C, $R_L$ = 10k | <br><br>26<br>27 | <br><br>27<br>28 | | V |
| $V_{OL}$ | Low Level Output Voltage<br>$R_L$ = 10k | | 5 | 15 | mV |
| SR | Slew Rate at Unity Gain<br>$V_i$ = 0.5 to 3V, $V_{CC}$ = 15V<br>$R_L$ = 2k, $C_L$ = 100pF, unity gain | 0.2 | 0.4 | | V/µs |
| GBP | Gain Bandwidth Product<br>$V_{CC}$ = 30V,$R_L$ = 2k, $C_L$ = 100pF<br>f = 100kHz, $V_{in}$ = 10mV | 0.5 | 0.9 | | MHz |
| THD | Total Harmonic Distortion<br>f = 1kHz<br>$A_V$ = 20dB,$R_L$ = 2k, $V_{CC}$ = 30V<br>$C_L$ = 100pF, $V_o$ = $2V_{pp}$ | | 0.015 | | % |
| $e_n$ | Equivalent Input Noise Voltage<br>f = 1kHz, Rs = 100Ω<br>Vcc = 30V | | 40 | | 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.
But both inputs can go to Vcc+ +0.3V without damage.

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## COMPARATOR

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

| Symbol | Parameter | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| $V_{io}$ | Input Offset Voltage<br>$T_{amb}$ = 25°C | | 1 | 5 | mV |
| $I_{io}$ | Input Offset Current | | 5 | 50 | nA |
| $I_{ib}$ | Input Bias Current | | 25 | 250 | nA |
| Avd | Large Signal Voltage Gain<br>$V_{CC}$ = 15V, $R_L$ = 15k, Vo = 1V to 11V | | 200 | | V/mV |
| Vicm | Input Common Mode Voltage Range [1] | 0 | | ($V_{CC}$+) -1.5 | V |
| $I_{sink}$ | Output Sink Current<br>$V_{id}$ = -1V, $V_o$ = 1.5V | 6 | 16 | | mA |
| $V_{OL}$ | Low Level Output Voltage<br>$V_{id}$ = -1V, $I_{sink}$ = 4mA | | 250 | 400 | mV |
| $I_{OH}$ | High Level Output Current<br>$V_{id}$ = 1V, $V_{cc}$ = $V_o$ = 30V | | 0.1 | | nA |
| $t_{re}$ | Response Time<br>$R_L$ = 5.1k to $V_{CC}$+ [2] | | 1.3 | | µs |
| $t_{rel}$ | Large Signal Response Time<br>$V_i$ = 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

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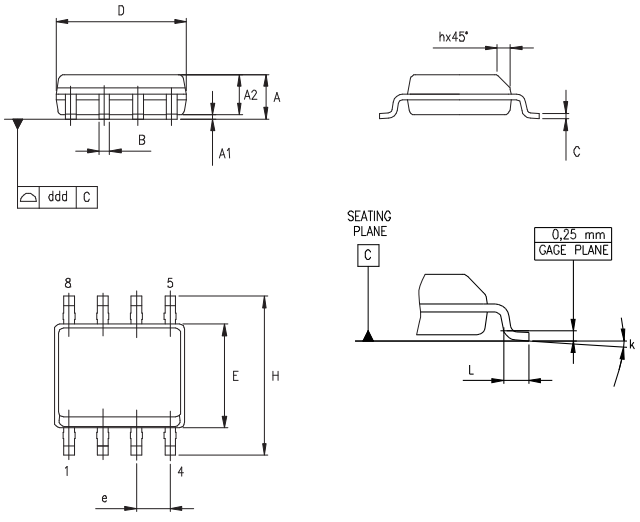
## PACKAGE MECHANICAL DATA

8 PINS - PLASTIC MICROPACKAGE (SO)

**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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