TS391

Low Power Single Voltage Comparator

ON Semiconductor®

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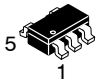


TSOP−5
SN SUFFIX
CASE 483

Description

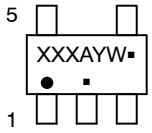
This device consists of a low−power voltage comparator designed specifically to operate from a single supply over a wide range of voltages. Operation from split power supplies is also possible.

This comparator also has a unique characteristic in that the input common−mode voltage range includes ground, even though operated from a single power supply voltage.

Features

- Wide Single Supply Voltage Range or Dual Supplies
- Low Supply Current (0.5 mA) Independent of Supply Voltage (1 mW/Comparator at +5 V)
- Low Input Bias Current: 25 nA TYP
- Low Input Offset Current: ±5 nA TYP
- Low Input Offset Voltage: ±1 mV TYP
- Input Common Mode Voltage Range includes Ground
- Low Output Saturation Voltage: 250 mV TYP at I_O = 4 mA
- Differential Input Voltage Range Equal to the Supply Voltage
- TTL, DTL, ECL, CMOS Compatible Devices
- These are Pb−free Devices

MARKING DIAGRAM

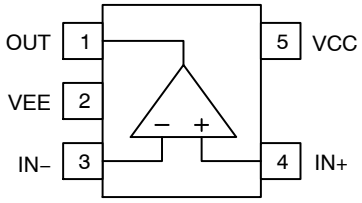


Analog

XXX = Specific Device Code
A = Assembly Location
Y = Year
W = Work Week
▪ = Pb−Free Package

(Note: Microdot may be in either location)

PIN CONNECTIONS



ORDERING INFORMATION

Device	Package	Shipping†
TS391SN2T1G	TSOP−5 (Pb−Free)	3000 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

Table 1. ABSOLUTE MAXIMUM RATINGS (Over operating free−air temperature, unless otherwise stated)

Parameter	Symbol	Limit	Unit
Supply Voltage (V_{CC} − V_{EE})	V_S	36 V	V
INPUT AND OUTPUT PINS			
Input Voltage	V_{IN}	±36	V
Differential Input Voltage	V_{ID}	−0.3 to 36	V
Output Short Circuit Current (Note 1)	I_{OSC}	20	mA
TEMPERATURE			
Storage Temperature	T_{STG}	−65 to +150	°C
Junction Temperature	T_J	+150	°C
ESD RATINGS			
Human Body Model	HBM	1500	V
Charged Device Model	CDM	2000	V
Machine Model	MM	200	V

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Short circuits from the output to V_{CC} can cause excessive heating and potential destruction. The maximum short circuit current is independent of the magnitude of V_{CC}.

Table 2. THERMAL INFORMATION (Note 2)

Thermal Metric	Symbol	Limit	Unit
Junction to Ambient − SOIC8	θ_{JA}	238	°C/W

2. Short circuits can cause excessive heating. These values are typical.

Table 3. OPERATING CONDITIONS

Parameter	Symbol	Limit	Unit
Operating Supply Voltage	V_S	2 to 36	V
Specified Operating Range	T_A	−40 to +125	°C

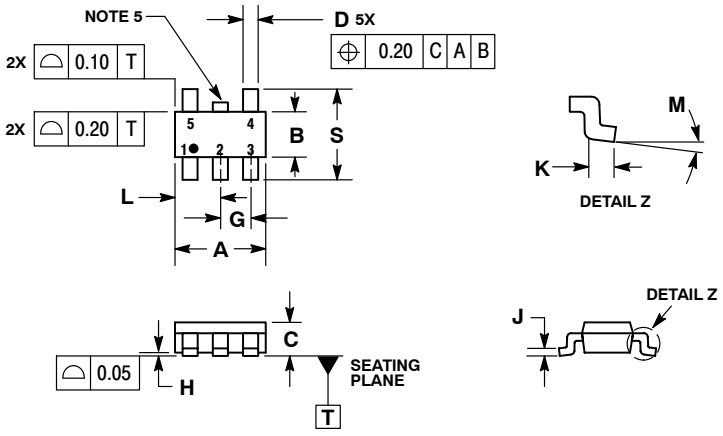
Table 4. ELECTRICAL CHARACTERISTICS (Vs=+5.0 V, At T_A = +25°C**)**
Boldface limits apply over the specified temperature range, T_A = −40°C to +125°C.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
INPUT CHARACTERISTICS						
Offset Voltage	V_{OS}	Vo = 1.4 V, R_S = 0 Ω, V_S = 5 V to 30 V, V_{CM} = 0 to V_{CC} −1.5 V		1	5	mV
					9	**mV**
Input Bias Current	I_{IB}			25	250	nA
					400	**nA**
Input Offset Current	I_{OS}			5	50	nA
					150	**nA**
Input Common Mode Range (Note 3)	V_{ICR}		0		V_{CC} − 1.5	V
			0		**V_{CC} − 2**	**V**
Differential Input Voltage (Note 4)	V_{ID}				V_{CC}	V
OUTPUT CHARACTERISTICS						
Output Voltage Low	V_{OL}	V_{ID} = 1 V, I_O = 4 mA		150	400	mV
					700	**mV**
Output Sink Current	I_O	V_{ID} = −1, V_O = 1.5 V	6	16		mA
Output Leakage Current	I_{OH}	V_{ID} = 1 V, V_{CC} = V_O = 5 V		0.1		nA
		V_{ID} = 1 V, V_{CC} = V_O = 30 V			**1**	**μA**
DYNAMIC PERFORMANCE						
Open Loop Voltage Gain	A_{VOL}	V_{CC} = 15 V, R_{PU} = 15 kΩ	94	106		dB
Propagation Delay L−H	t_{PLH}	5 mV overdrive, R_{PU} = 5.1 kΩ		850		ns
		20 mV overdrive, R_{PU} = 5.1 kΩ		490		ns
		100 mV overdrive, R_{PU} = 5.1 kΩ		300		ns
		TTL Input, Vref = +1.4 V, R_{PU} = 5.1 kΩ		220		ns
Propagation Delay H−L	t_{PHL}	5 mV overdrive, R_{PU} = 5.1 kΩ		620		μs
		20 mV overdrive, R_{PU} = 5.1 kΩ		400		ns
		100 mV overdrive, R_{PU} = 5.1 kΩ		250		ns
		TTL Input, Vref = +1.4 V, R_{PU} = 5.1 kΩ		350		ns
POWER SUPPLY						
Quiescent Current	I_{CC}	V_{CC} = 5 V		0.5	–	mA
		V_{CC} = 30 V		0.5	1.25	mA

3. The input common mode voltage of either input signal should not be allowed to go negative by more than 0.3 V. The upper end of the common mode voltage range is VCC − 1.5 V, but either or both inputs can go to +30 V without damage.
4. Positive excursions of the input voltage may exceed the power supply level. As long as the other voltage remains within the common mode range, the comparator will provide a proper output stage. The low input voltage state must not be less than 0.3 V below the negative supply rail.

PACKAGE DIMENSIONS

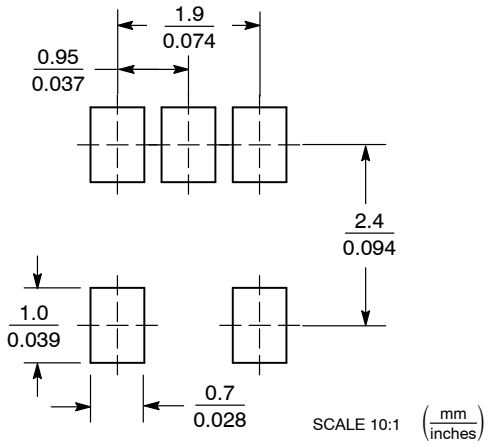
TSOP−5
CASE 483−02
ISSUE H



NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.
5. OPTIONAL CONSTRUCTION: AN ADDITIONAL TRIMMED LEAD IS ALLOWED IN THIS LOCATION. TRIMMED LEAD NOT TO EXTEND MORE THAN 0.2 FROM BODY.

	MILLIMETERS	
DIM	MIN	MAX
A	3.00 BSC	
B	1.50 BSC	
C	0.90	1.10
D	0.25	0.50
G	0.95 BSC	
H	0.01	0.10
J	0.10	0.26
K	0.20	0.60
L	1.25	1.55
M	0 °	10 °
S	2.50	3.00

SOLDERING FOOTPRINT*



*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
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