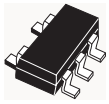
TS391

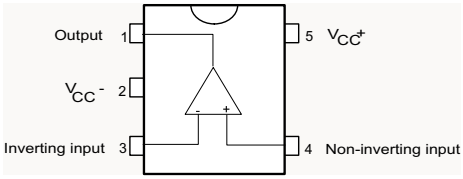
Low Power Single Voltage Comparator

- Wide single supply voltage range or dual supplies +2V to +34V or ±1V to ±17V
- Very low supply current (0.2mA) independent of supply voltage (1mW/comparator at +5V)
- Low input bias current: 25nA typ.
- Low input offset current: ±5nA typ.
- Low input offset voltage: ±1mV typ.
- Input common-mode voltage range includes ground
- Low output saturation voltage: 250mV typ. (Io=4mA)
- Differential input voltage range equal to the supply voltage
- TTL, DTL, ECL, CMOS compatible outputs



L
SOT23-5
(Plastic Package)

Pin connections (top view)



Description

These devices consist 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.

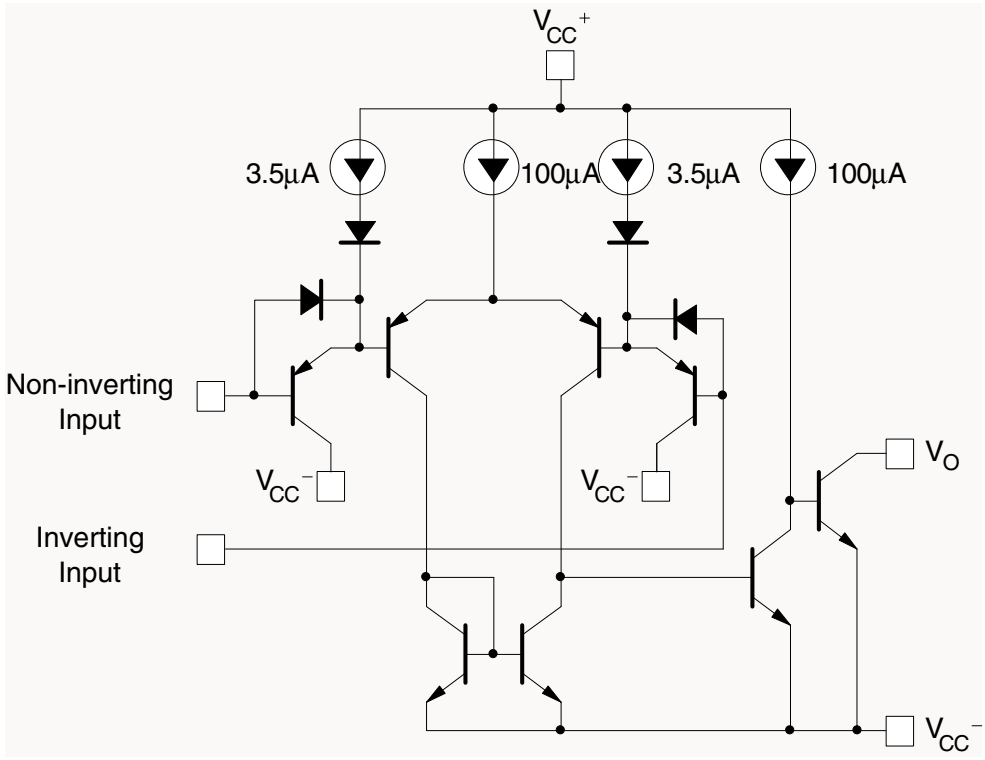
This comparator also has a unique characteristic in that the input common-mode voltage range includes ground even though operated from a single power supply voltage.

Order Codes

Part Number	Temperature Range	Package	Packaging	Marking
TS391ILT	-40°C, +125°C	SOT23-5L	Tape & Reel	K511
TS391IYLT				K510

1 Typical Application Schematic

Figure 1. Typical application schematic



2 Absolute Maximum Ratings

Table 1. Key parameters and their absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	±18 or 34	V
V_{id}	Differential Input Voltage	-±34	V
V_i	Input Voltage	-0.3 to +34	V
	Output Short-circuit to Ground(1)	Infinite	
Pd	Power Dissipation (2)	500	mW
T_{stg}	Storage Temperature Range	-65 to +150	°C

1. Short-circuits from the output to V_{CC}^+ can cause excessive heating and eventual destruction. The maximum output current is approximately 20mA independent of the magnitude of V_{CC}^+.
2. T_j = 150°C, T_{amb} = 25°C with R_{thja} = 250°C/W for SOT23-5 package.

Table 2. Operation conditions

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	2 to 34 ±1 to ±17	V
V_{icm}	Input Common Mode Voltage Range	0 to V_{CC}^+ -1.5	V
T_{oper}	Operating Free Air Temperature Range	-40 to +125	°C

3 Electrical Characteristics

Table 3. V_{CC}^+ = +5V, V_{CC}^- = 0V, T_{amb} = 25°C (unless otherwise specified)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{io}	Input Offset Voltage (1)	$T_{min.} \le T_{amb} \le T_{max.}$		1	5 9	mV
I_{io}	Input Offset Current	$T_{min.} \le T_{amb} \le T_{max.}$		5	50 150	nA
I_{ib}	Input Bias Current (2)	$T_{min.} \le T_{amb} \le T_{max.}$		25	250 400	nA
A_{vd}	Large Signal Voltage Gain	V_{CC} = 15V, R_L = 15kΩ, V_o = 1 to 11V	50	200		V/mV
I_{CC}	Supply Current	V_{CC} = 5V, no load V_{CC} = 30V, no load		0.2 0.5	0.5 1.25	mA
V_{icm}	Input Common Mode Voltage Range (3)	$T_{min.} \le T_{amb} \le T_{max.}$	0 0		V_{CC}^+ -1.5 V_{CC}^+ -2	V
V_{id}	Differential Input Voltage (4)				V_{CC}^+	V
I_{sink}	Output Sink Current	V_{id} = -1V, V_O = 1.5V	6	16		mA
V_{OL}	Low Level Output Voltage	V_{id} = 1V, V_{CC} = V_O = 30V $T_{min.} \le T_{amb} \le T_{max.}$		250	400 700	mV
I_{OH}	High Level Output Current	V_{id} = 1V, V_{CC} = V_O = 30V $T_{min.} \le T_{amb} \le T_{max.}$		0.1	 1	nA µA
tre	Small Signal Response Time	R_L = 5.1kΩ to V_{CC}^+ (5)		1.3		µs
t_{rel}	Large Signal Response Time	V_i = TTL, V_{ref} = +1.4V, R_L = 5.1kΩ to V_{CC}^+		300		ns

1. At output switch point, $V_O \approx$ 1.4V, R_S = 0Ω with V_{CC}^+ from 5V to 30V and over the full input common-mode range (0V to V_{CC} -1.5V).
2. The direction of the input current is out of the IC due to the PNP input stage. This current is essentially constant, independent of the state of the output, so no loading charge exists on the reference or input lines.
3. 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 or both inputs can go to +30V without damage.
4. Positive excursions of 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 state. The low input voltage state must not be less than –0.3V (or 0.3V below the negative power supply, if used).
5. The response time specified is for a 100mV input step with 5mV overdrive. For larger overdrive signals 300ns can be obtained.

Figure 2. Supply current vs. supply voltage

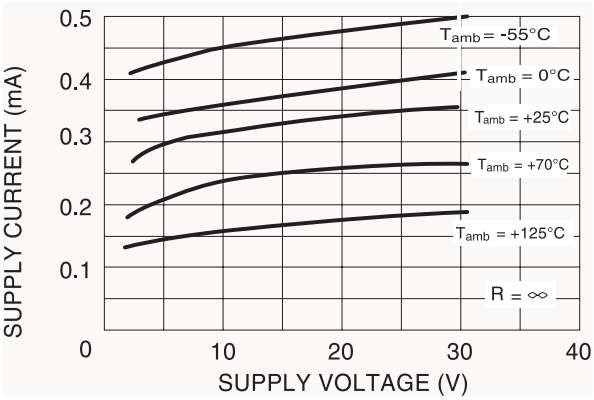


Figure 3. Response time for various input overdrives - negative transition

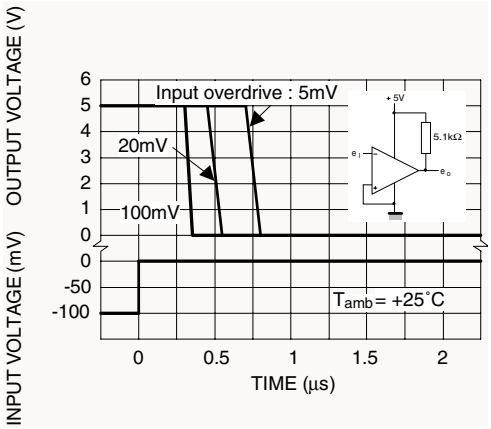


Figure 4. Input current vs. supply voltage

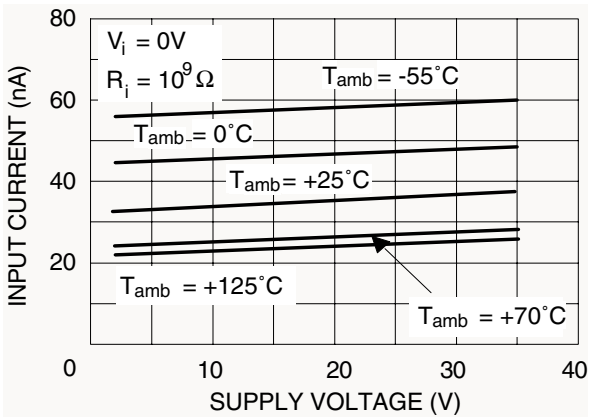


Figure 5. Response time for various input overdrives - positive transition

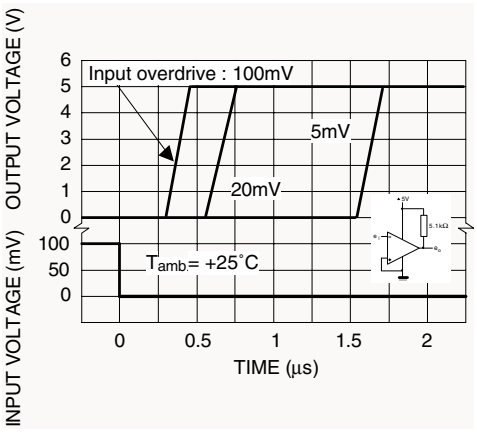
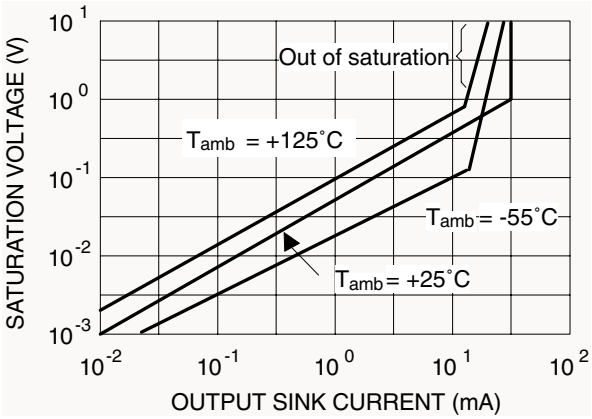


Figure 6. Output saturation voltage vs. output current



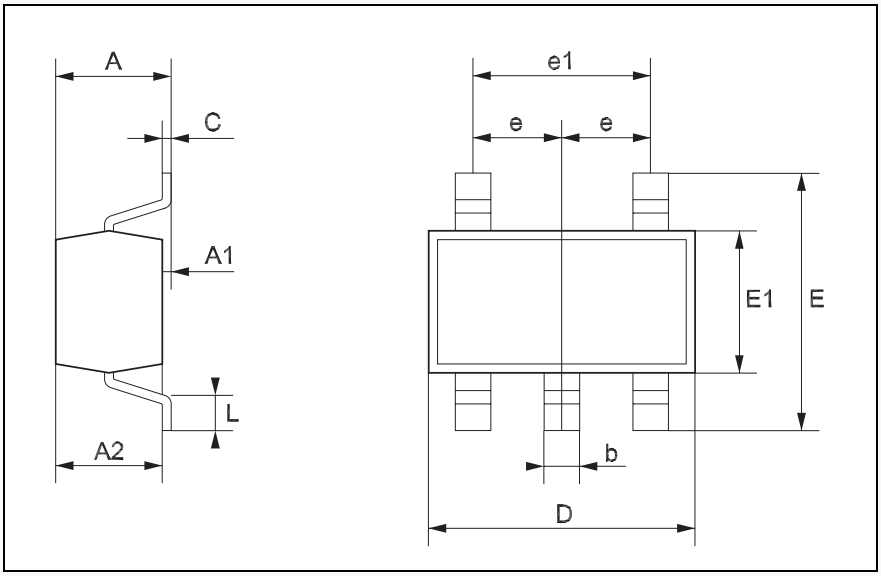
4 Package Mechanical Data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com.

SOT23-5L Package

SOT23-5L MECHANICAL DATA

DIM.	mm.			mils		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	0.90		1.45	35.4		57.1
A1	0.00		0.15	0.0		5.9
A2	0.90		1.30	35.4		51.2
b	0.35		0.50	13.7		19.7
C	0.09		0.20	3.5		7.8
D	2.80		3.00	110.2		118.1
E	2.60		3.00	102.3		118.1
E1	1.50		1.75	59.0		68.8
e		0.95			37.4	
e1		1.9			74.8	
L	0.35		0.55	13.7		21.6



5 Revision history

Table 4. Document revision history

Date	Revision	Changes
Sept. 2004	1	Initial release.
Jan. 2006	2	PPAP reference inserted in the document.

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