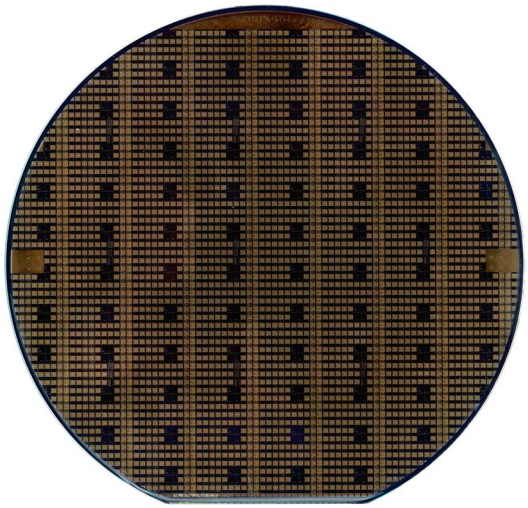
JTS393

Micropower dual CMOS voltage comparator: unsawn wafer

Datasheet - production data



Unsawn wafer

Description

The JTS393 is a micro power CMOS dual voltage comparator with extremely low consumption of 9 µA typical per comparator (20 times less than the dual bipolar LM393 device). Similar performance is offered by the dual micropower TS3702 (or JTS3702 in wafer version) with a push-pull CMOS output. Thus, response times remain similar to the LM393.

Features

- Extremely low supply current: typically 9 µA per comparator
- Wide single supply range: 2.7 V to 16 V or dual supplies (±1.35 V to ±8 V)
- Extremely low input bias current: 1 pA typical
- Extremely low input offset currents: 1 pA typical
- Input common-mode voltage range includes ground
- High input impedance: $10^{12}\ \Omega$ typical
- Fast response time: 2.5 µs typical for 5 mV overdrive
- Functionally compatible with bipolar LM393

Related products

- See TS393 for plastic packaged version

Contents

1 Schematic diagram and pad configuration

Figure 1. Schematic diagram (for one channel of JTS393)

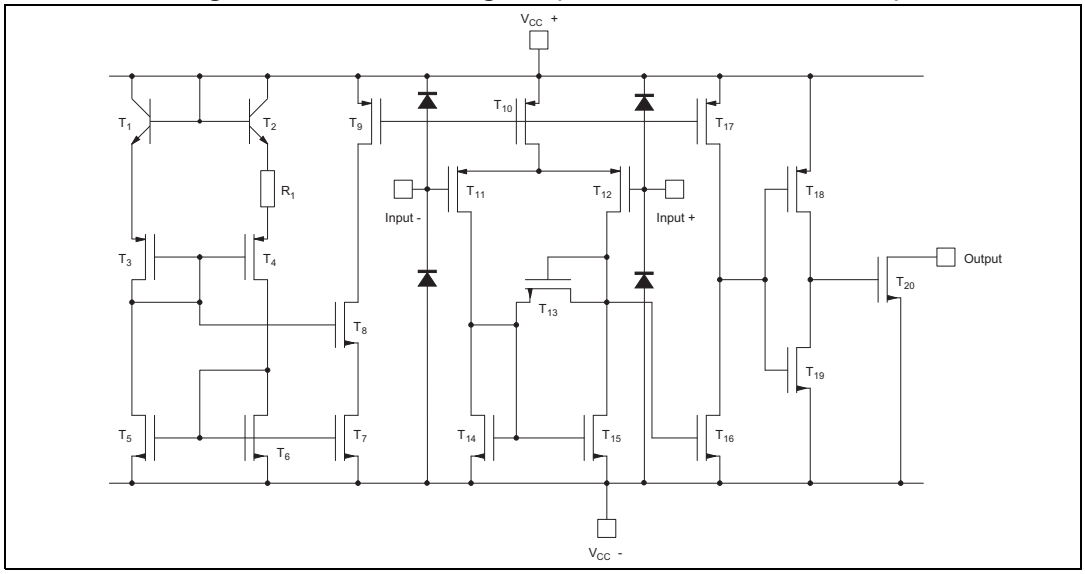


Figure 2. Pad configuration (top view)

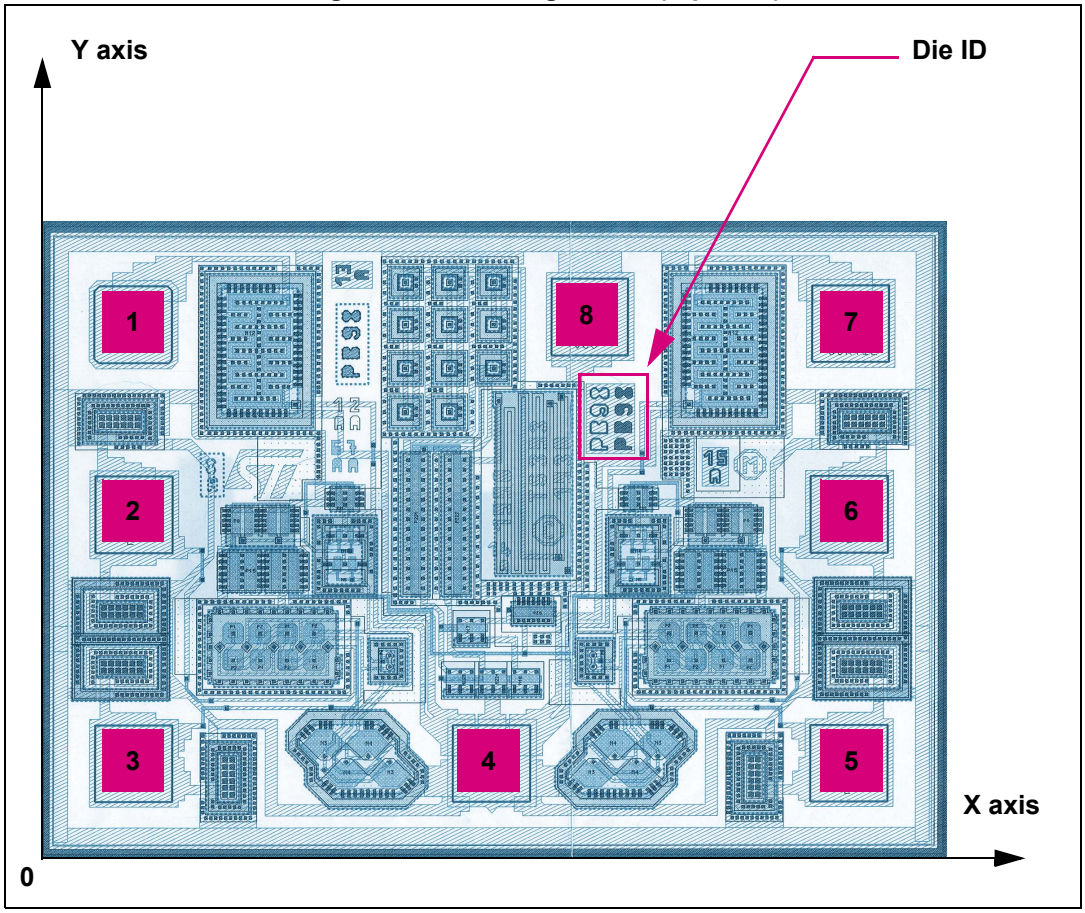


Table 1. Pad coordinates (pad placement origin is the lower left corner of the die)

Pad number	Pad description	Center pad coordinates	
		X (µm)	Y (µm)
1	Output 1	165	870.3
2	Inverting input 1	165	575.3
3	Non-inverting input 1	165	140.3
4	Vcc-	695	140.3
5	Non-inverting input 2	1225	140.3
6	Inverting input 2	1225	575.3
7	Output 2	1225	870.3
8	Vcc+	835	870.3

Wafer dimension: 6 inches.

Die size without scribe line:

- X = 1326.0 µm
- Y = 926.0 µm

Scribe line: 60 µm

Bond pad opening 109 x 109 µm

2 Absolute maximum ratings and operating conditions

Table 2. Absolute maximum ratings (AMR)

Symbol	Parameter	Value	Unit
V_{CC}^+	Supply voltage(1)	18	V
V_{id}	Differential input voltage(2)	±18	
V_i	Input voltage(3)	18	
V_o	Output voltage	18	
I_o	Output current	20	mA
I_F	Forward current in ESD protection diodes on input(4)	50	
T_J	Maximum junction temperature	150	°C
T_{stg}	Storage temperature range	-65 to +150	
ESD	HBM: human body model(5)	500	V
	MM: machine model(6)	200	

1. All voltage values, except differential voltage, are with respect to network ground terminal.
2. Differential voltages are the non-inverting input terminal with respect to the inverting input terminal.
3. Excursions of input voltages may exceed the power supply level. As long as the common-mode voltage [Vicm = (Vin+ + Vin-)/2] remains within the specified range, the comparator provides a stable output state. However, the maximum current through the ESD diodes (IF) of the input stage must strictly be observed.
4. Guaranteed by design.
5. Human body model: 100 pF discharged through a 1.5 kΩ resistor between two pins of the device, done for all couples of pin combinations with other pins floating.
6. Machine model: a 200 pF cap is charged to the specified voltage, then discharged directly between two pins of the device with no external series resistor (internal resistor < 5 Ω), done for all couples of pin combinations with other pins floating.

Table 3. Operating conditions

Symbol	Parameter	Value	Unit
V_{CC}^+	Supply voltage	2.7 to 16	V
V_{icm}	Common mode input voltage range $T_{min.} \leq T_{amb} \leq T_{max}$	0 to V_{CC}^+ -1.2 0 to V_{CC}^+ -1.5	
T_{oper}	Operating free-air temperature range - JTS393C	0 to +70	°C

3 Electrical characteristics

Table 4. Electrical characteristics at V_{CC+} = 3 V, V_{CC-} = 0 V, T = 25 °C (unless otherwise specified)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{io}	Input offset voltage(1)	V_{ic} = 1.5 V $T_{min.} \leq T_{amb} \leq T_{max}$			5 6.5	mV
I_{io}	Input offset current(2)	V_{ic} = 1.5 V $T_{min.} \leq T_{amb} \leq T_{max.}$		1	300	pA
I_{ib}	Input bias current(2)	V_{ic} = 1.5 V $T_{min.} \leq T_{amb} \leq T_{max.}$		1	600	
CMR	Common-mode rejection ratio	$V_{ic} = V_{icm\ min.}$		70		dB
SVR	Supply voltage rejection ratio	V_{CC}^{+} = 3 V to 5 V		70		
I_{OH}	High level output current	V_{id} = 1 V, V_{OH} = 3 V $T_{min.} \leq T_{amb} \leq T_{max.}$		2	40 1000	nA
V_{OL}	Low level output voltage	V_{id} = -1 V, I_{OL} = 6 mA $T_{min.} \leq T_{amb} \leq T_{max.}$		400	550 800	mV
I_{CC}	Supply current (each comparator)	No load - outputs low $T_{min.} \leq T_{amb} \leq T_{max.}$		9	20 25	µA
t_{PLH}	Response time low to high	V_{ic} = 0 V, f = 10 kHz, R_L = 5.1 kΩ, C_L = 50 pF, Overdrive = 5 mV TTL input		1.5 0.7		µs
t_{PHL}	Response time high to low	V_{ic} = 0 V, f = 10 kHz, R_L = 5.1 kΩ, C_L = 50 pF, Overdrive = 5 mV TTL input		2.5 0.08		

1. The specified offset voltage is the maximum value required to drive the output up to 2.5 V or down to 0.3 V.
2. Maximum values including unavoidable inaccuracies of the industrial test.

Table 5. Electrical characteristics at V_{CC+} = 5 V, V_{CC-} = 0 V, T = 25 °C (unless otherwise specified)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{io}	Input offset voltage(1)	V_{ic} = 2.5 V, V_{cc}^+ = 5 V to 10 V $T_{min.} \leq T_{amb} \leq T_{max.}$		1.4	5 6.5	mV
I_{io}	Input offset current(2)	V_{ic} = 2.5 V $T_{min.} \leq T_{amb} \leq T_{max.}$		1	 300	pA
I_{ib}	Input bias current(2)	V_{ic} = 2.5 V $T_{min.} \leq T_{amb} \leq T_{max.}$		1	 600	
CMR	Common-mode rejection ratio	V_{ic} = 0 V		71		dB
SVR	Supply voltage rejection ratio	V_{CC}^+ = +5 V to +10 V		80		
I_{OH}	High level output current	V_{id} = 1 V, V_{OH} = 5 V $T_{min.} \leq T_{amb} \leq T_{max.}$		2	40 1000	nA
V_{OL}	Low level output voltage	V_{id} = -1 V, I_{OL} = 6 mA $T_{min.} \leq T_{amb} \leq T_{max.}$		260	400 650	mV
I_{CC}	Supply current (each comparator)	No load - outputs low $T_{min.} \leq T_{amb} \leq T_{max.}$		10	20 25	µA
t_{PLH}	Response time low to high	V_{ic} = 0 V, f = 1 0kHz, R_L = 5.1 kΩ, C_L = 50 pF, Overdrive = 5 mV Overdrive = 10 mV Overdrive = 20 mV Overdrive = 40 mV TTL input		 1.5 1.2 1.0 0.8 0.7		µs
t_{PHL}	Response time high to low	V_{ic} = 0 V, f = 10 kHz, R_L = 5.1 kΩ, C_L = 50 pF, Overdrive = 5 mV Overdrive = 10 mV Overdrive = 20 mV Overdrive = 40 mV TTL input		 2.5 1.9 1.2 0.8 0.08		
t_f	Fall time	f = 10 kHz, C_L = 50 pF, R_L = 5.1 kΩ, overdrive 50 mV		25		ns

1. The specified offset voltage is the maximum value required to drive the output up to 4.5 V or down to 0.3 V.
2. Maximum values including unavoidable inaccuracies of the industrial test.

4 Packing description

Collective packing is used as STMicroelectronics qualified system for shipment of finished wafers.

The following parts of the collective packing are used in the clean room (see *Figure 3* for detailed view):

- Canister (composed of a base and a cover, maximum content is 25 wafers)
- Pink foam discs (lodged below and over the stack, minimum content is 2 discs)
- White interleaves (separators between wafers, maximum content is 26 or more for best fit).
- CMB bag (to protect canister under moderate vacuum)

Figure 3. Canister composition overview

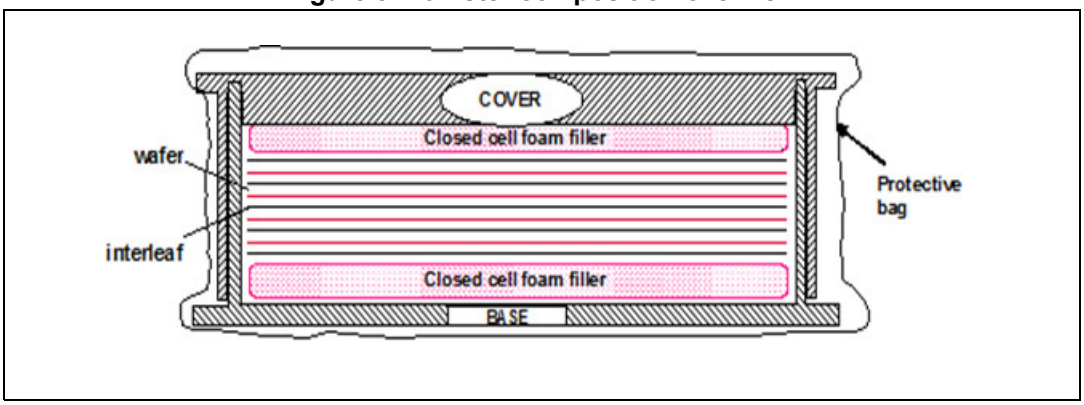


Figure 4. Packed canister picture

5 Ordering information

Table 6. Order codes

Order code	Temperature range	Package	Packaging
JTS393C-1AA5	0 to +70 °C	Unsawn wafer	Collective packing

6 Revision history

Table 7. Document revision history

Date	Revision	Changes
18-Dec-2013	1	Initial release

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