

# UTC TS391/A LINEAR INTEGRATED CIRCUIT

## LOW POWER SINGLE VOLTAGE COMPARATOR

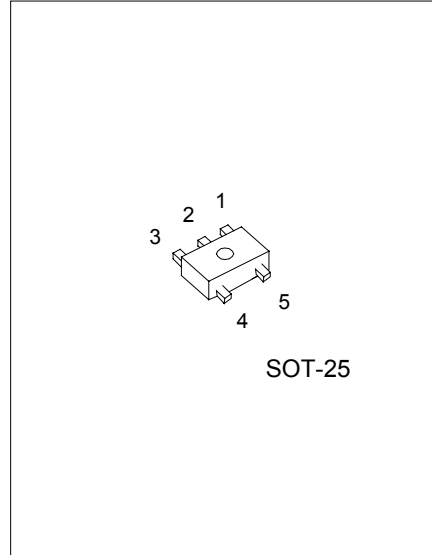
### DESCRIPTION

The UTC TS391/A 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 a unique characteristic in that the input common-mode voltage range includes ground even though operated from a single power supply voltage.

### FEATURES

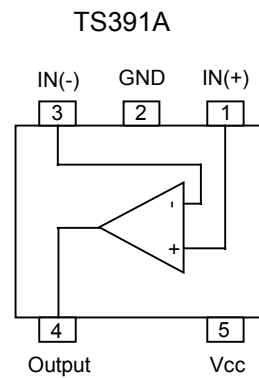
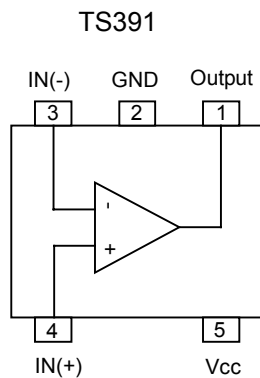
- \*Wide single supply voltage range or dual supplies +2V to +34V or  $\pm 1V$  to  $\pm 18V$
- \*Very low supply current (0.2mA) independent of supply voltage (1 mW /comparator at +5V)
- \*Low input bias current: 25nA typ.
- \*Low input offset current:  $\pm 5nA$  typ.
- \*Low input offset voltage:  $\pm 1mV$  typ
- \*Input common-mode voltage range includes ground.
- \*Low output saturation voltage: 250mV typ.( $I_o=4mA$ ).
- \*Differential input voltage range equal to the supply voltage.



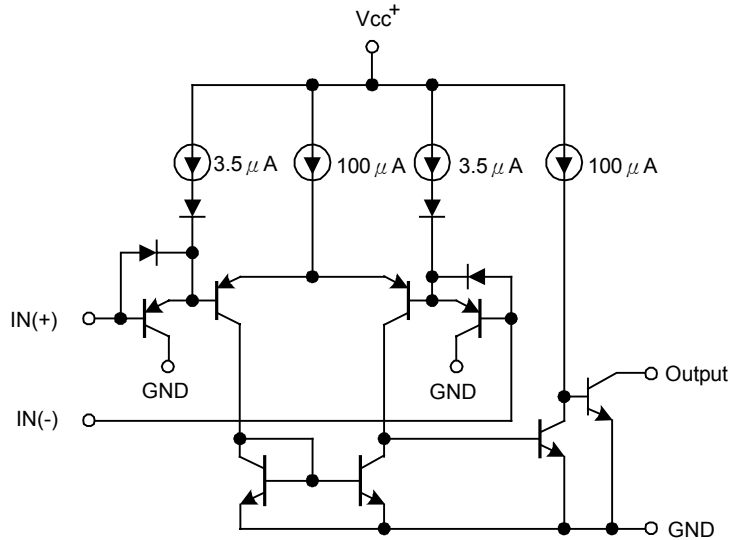
### MARKING

Part Number	Marking
TS391	S1
TS391A	SA

### PIN CONNECTIONS (top view)



BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	Vcc	± 18 or 36	V
Differential Input Voltage	V <sub>id</sub>	± 36	V
Input Voltage	V <sub>i</sub>	-0.3 ~ +36	V
Output Short-circuit to Ground <sup>1)</sup>		Infinite	
Power Dissipation <sup>2)</sup>	P <sub>d</sub>	500	mW
Operating Free Air Temperature Range	T <sub>opr</sub>	-40 ~ +125	°C
Storage Temperature Range	T <sub>stg</sub>	-65 ~ +150	°C

1. Short-circuit from the output to Vcc can cause excessive heating and eventual destruction. The maximum output current is approximately 20mA, independent of the magnitude of Vcc.
2. T<sub>j</sub>=150°C, T<sub>amb</sub>=25°C with R<sub>thja</sub>=250°C/W for SOT25 Package.

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## ELECTRICAL CHARACTERISTICS

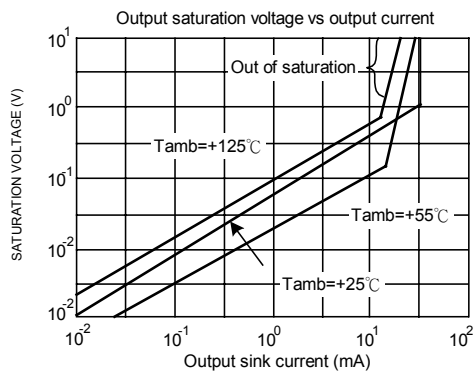
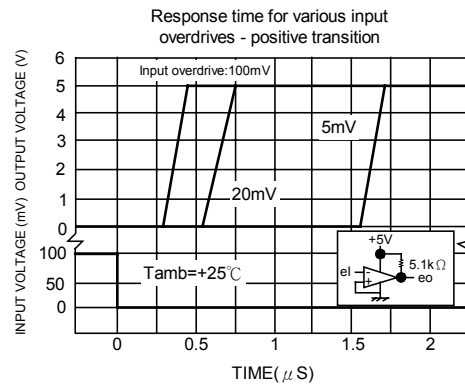
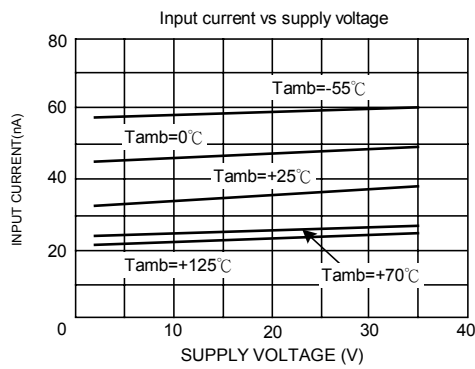
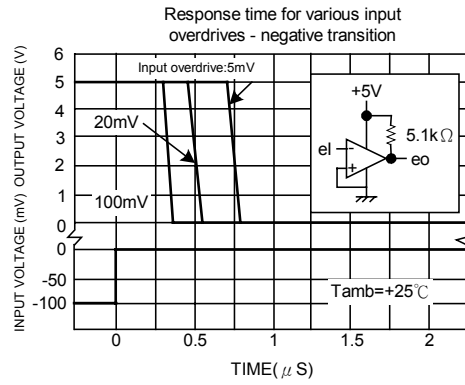
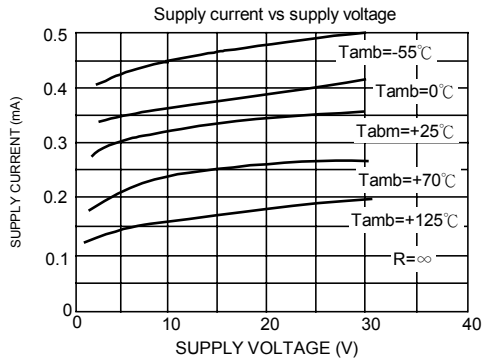
V<sub>cc</sub>=5.0V, All voltage referenced to GND, T<sub>amb</sub>=25°C(unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Input Offset Voltage <sup>1)</sup>	V <sub>io</sub>	T <sub>amb</sub> =+25°C T <sub>min.</sub> ≤ T <sub>amb</sub> ≤ T <sub>max.</sub>		1	5 9	mV
Input Bias Current <sup>2)</sup>	I <sub>ib</sub>	T <sub>amb</sub> =+25°C T <sub>min.</sub> ≤ T <sub>amb</sub> ≤ T <sub>max.</sub>		25	250 400	nA
Input Offset Current	I <sub>io</sub>	T <sub>amb</sub> =+25°C T <sub>min.</sub> ≤ T <sub>amb</sub> ≤ T <sub>max.</sub>		5	50 150	nA
Large Signal Voltage Gain	G <sub>v</sub>	V <sub>cc</sub> =15V, R <sub>L</sub> =15k, V <sub>o</sub> =1 to 11V	50	200		V/mV
Supply Current	I <sub>cc</sub>	V <sub>cc</sub> =5V, no load V <sub>cc</sub> =30V, no load		0.2 0.5	0.5 1.25	mA
Input Common Mode Voltage Range <sup>3)</sup>	V <sub>icm</sub>	T <sub>amb</sub> =+25°C T <sub>min.</sub> ≤ T <sub>amb</sub> ≤ T <sub>max.</sub>	0 0		V <sub>cc</sub> -1.5 V <sub>cc</sub> -2	mV
Differential Input Voltage <sup>4)</sup>	V <sub>id</sub>				V <sub>cc</sub>	mV
Output sink current	I <sub>sink</sub>	V <sub>id</sub> =-1V, V <sub>o</sub> =1.5V	6	16		mA
Low Level Output Voltage	V <sub>OL</sub>	V <sub>id</sub> =1V, V <sub>cc</sub> =V <sub>o</sub> =30V T <sub>amb</sub> =+25°C T <sub>min.</sub> ≤ T <sub>amb</sub> ≤ T <sub>max.</sub>		250	400 700	mV
High Level Output Current	I <sub>OH</sub>	V <sub>id</sub> =1V, V <sub>cc</sub> =V <sub>o</sub> =30V T <sub>amb</sub> =+25°C T <sub>min.</sub> ≤ T <sub>amb</sub> ≤ T <sub>max.</sub>		0.1	1	nA μA
Response Time	t <sub>re</sub>	R <sub>L</sub> =5.1kΩ to V <sub>cc</sub> <sup>5)</sup>		1.3		μs
Large Signal Response Time	t <sub>rel</sub>	V <sub>i</sub> =TTL, V <sub>ref</sub> =+1.4V, R <sub>L</sub> =5.1kΩ to V <sub>cc</sub>		300		ns

1. At output switch point, V<sub>o</sub>=1.4V, R<sub>s</sub>=0Ω with V<sub>cc</sub> from 5V to 30V and over the full input common-mode range(0V to V<sub>cc</sub> -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<sub>cc</sub>+ -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.

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## TYPICAL PERFORMANCE CHARACTERISTICS



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