

# UTC TS391/A LINEAR INTEGRATED CIRCUIT

## LOW POWER SINGLE VOLTAGE COMPARATOR

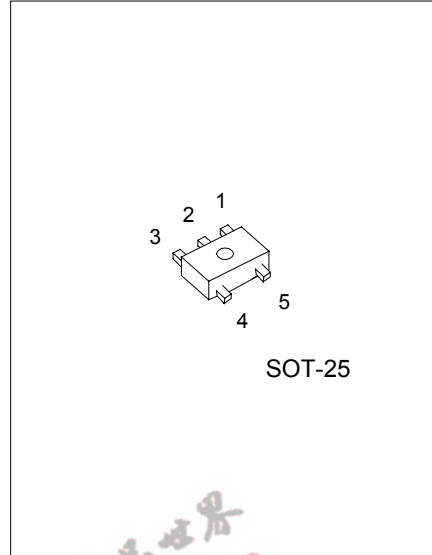
### DESCRIPTION

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

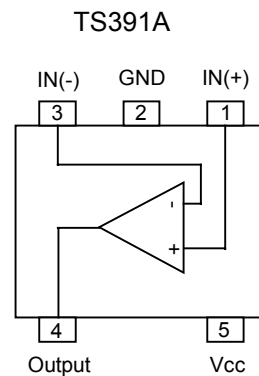
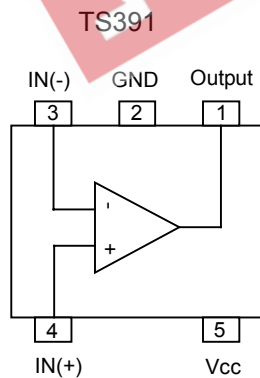
- \*Wide single supply voltage range or dual supplies +2V to +34V or  $\pm 1V$  to  $\pm 18V$
- \*Very low supply current (0.2mA) independent of supply voltage (1 mW /comparator at +5V)
- \*Low input bias current: 25nA typ.
- \*Low input offset current:  $\pm 5nA$  typ.
- \*Low input offset voltage:  $\pm 1mV$  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.



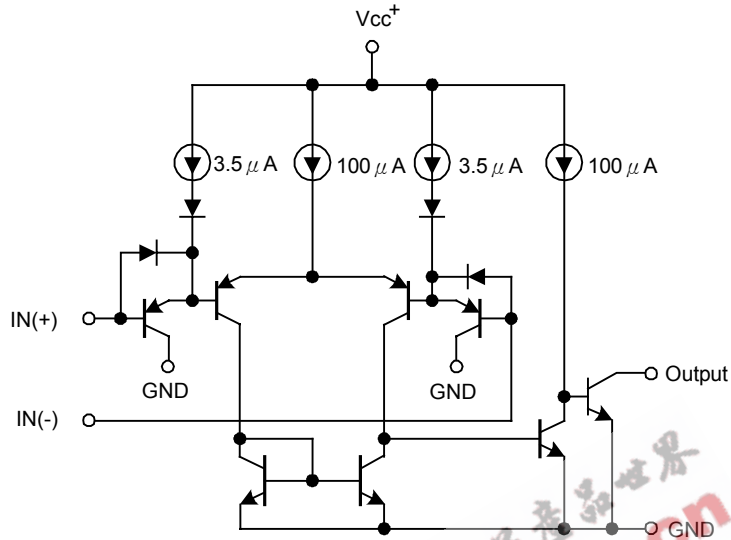
### MARKING

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	Vid	± 36	V
Input Voltage	Vi	-0.3 ~ +36	V
Output Short-circuit to Ground <sup>1)</sup>		Infinite	
Power Dissipation <sup>2)</sup>	Pd	500	mW
Operating Free Air Temperature Range	Topr	-40 ~ +125	°C
Storage Temperature Range	Tstg	-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. Tj=150°C, Tamb=25°C with Rthja=250°C/W for SOT25 Package.

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## ELECTRICAL CHARACTERISTICS

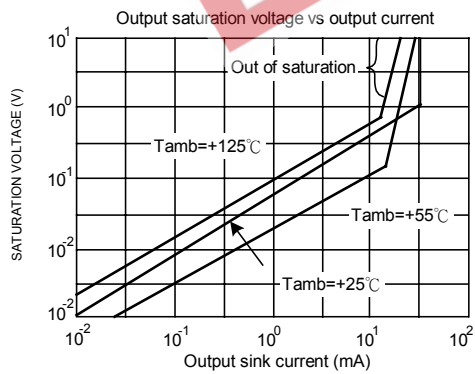
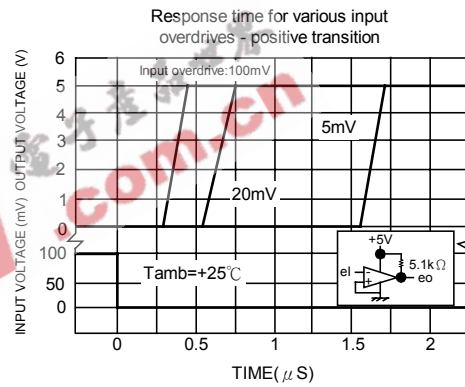
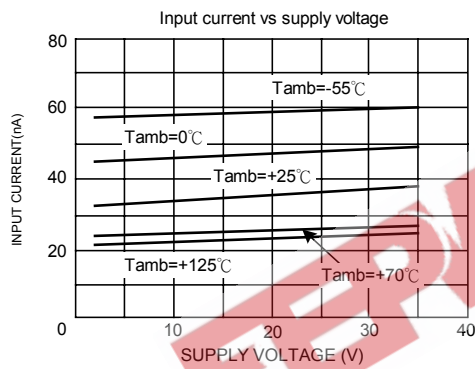
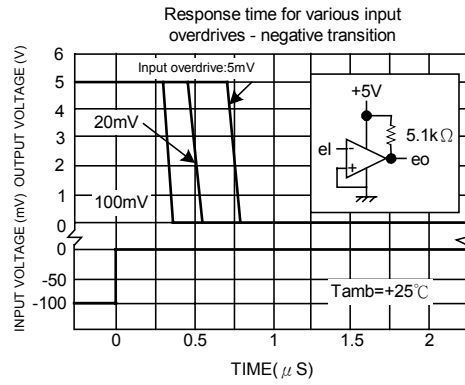
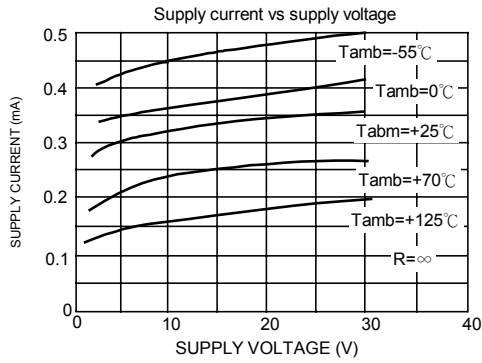
V<sub>cc</sub>=5.0V, All voltage referenced to GND, T<sub>amb</sub>=25°C(unless otherwise specified)

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 PN P 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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