查询TL507CP供应商

捷多邦,专业PCB打样工厂,24小时加**急出验**7C,TL507I ANALOG-TO-DIGITAL CONVERTER

SLAS041 - OCTOBER 1979 - REVISED OCTOBER 1988

- Low Cost
- 7-Bit Resolution
- Montonicity Over Entire A/D Conversion Range
- Ratiometric Conversion
- Conversion Speed ... Approximately 1 ms
- Single-Supply Operation . . . Either Unregulated 8-V to 18-V (V_{CC2} Input) or Regulated 3.5-V to 6-V (V_{CC1} Input)
- I²L Technology
- Power Consumption at 5 V . . . 25 mW Typ
- Regulated 5.5-V Output (≤1 mA)

description

The TL507 is a low-cost single-slope analog-todigital converter designed to convert analog inputvoltages between 0.25 V_{CC1} and 0.75 V_{CC1} into a pulse-width-modulated output code. The device contains a 7-bit synchronous counter, a binary weighted resistor ladder network, an operational amplifier, two comparators, a buffer amplifier, an internal regulator, and necessary logic circuitry. Integrated-injection logic (I²L) technology makes it possible to offer this complex circuit at low cost in a small dual-in-line 8-pin package.



I ONCTION TABLE							
ANALOG INPUT CONDITION	ENABLE	OUTPUT					
Х	Lţ	Н					
V _I < 200 mV	Н	L					
$V_{ramp} > V_{I} > 200 \text{ mV}$	Н	Н					
V _I > V _{ramp}	Н	L					

ELINCTION TABLE

⁺ Low level on enable also inhibits the reset function. H = high level, L = low level, X = irrelevant

A high level on RESET clears the counter to zero, which sets the internal ramp to $0.75 V_{CC}$. Internal pulldown resistors keep RESET and ENABLE low when not connected.



In continuous operation, conversion speeds of up to 1000 conversions per second are possible. The TL507 requires external signals for CLK, RESET, and ENABLE. Versatility and simplicity of operation, coupled with low cost, makes this converter especially useful for a wide variety of applications.

The TL507C is characterized for operation from 0°C to 70°C, and the TL507I is characterized for operation from -40° C to 85° C.





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functional block diagram (positive logic)

 \bigcirc indicates an n-p-n open-collector output.

schematics of inputs and outputs





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absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, V _{CC1} (see Note 1)	6.5 V
Supply voltage, V _{CC2}	20 V
Input voltage at analog input	6.5 V
Input voltage at ENABLE, CLK, and RESET	20 V
On-state output voltage	6 V
Off-state output voltage	20 V
Continuous total dissipation at (or below) 25°C free-air temperature (see Note 2)	1000 mW
Operating free-air temperature range: TL507C	$\ldots \ldots \ldots 0$ to $70^\circ C$
TL507I	$\dots \dots -40^{\circ}C$ to $85^{\circ}C$
Storage temperature range	$\dots \dots -65^{\circ}C$ to $150^{\circ}C$
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	260°C

NOTES: 1. Voltage values are with respect to network ground terminal unless otherwise noted.
2. For operation above 25°C free-air temperature, derate linearly to 520 mW at 85°C at the rate of 8.0 mW/°C.

recommended operating conditions

	MIN	NOM	MAX	UNIT
Supply voltage, V _{CC1}	3.5	5	6	V
Supply voltage, V _{CC2}	8	15	18	V
Input voltage at ANALOG INPUT	0		5.5	V
Input voltage at ENABLE, CLK, and RESET			±18	V
High-level input voltage, VIH, RESET and ENABLE	2			V
Low-level input voltage, VIL, RESET and ENABLE			0.8	V
On-state output voltage			5.5	V
Off-state output voltage			1.8	V
Clock frequency, f _{clock}	0	125	150	kHz

electrical characteristics over recommended operating free-air temperature range, $V_{CC1} = V_{CC2} = 5 V$ (unless otherwise noted)

regular section

	PARAMETER	TEST CONDITIONS	MIN	TYP†	MAX	UNIT
VCC1	Supply voltage (output)	$V_{CC2} = 10 V \text{ to } 18 V$, $I_{CC1} = 0 \text{ to } -1 \text{ mA}$	5	5.5	6	V
ICC1	Supply current	$V_{CC1} = 5 V$, $V_{CC2} open$		5	8	mA
ICC2	Supply current	$V_{CC2} = 15 V$, $V_{CC1} open$		7	10	mA

inputs

	PARAMETER		TEST CONDITIONS	MIN	TYP†	MAX	UNIT
V _{T+}	Positive-going threshold voltage [‡]					4.5	V
V _T -	Negative-going threshold voltage [‡]	CLK		0.4			V
V _{hys}	Hysteresis (V _{T+} – V _{T–})			2	2.6	4	V
			V _I = 2.4 V		17	35	
ЧН	High-level liput current	RESET, ENABLE, and CLK	V _I = 18 V	130	220	320	μΑ
١L	Low-level input current		$V_{I} = 0$			±10	μΑ
Ц	Analog input current		V _I = 4 V		10	300	nA

[†] All typical values are at $T_A = 25^{\circ}C$.

[‡] These parameters are linear functions of V_{CC1}.



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output section

	PARAMETER	TEST CONDITIONS	MIN	TYP†	MAX	UNIT
ЮН	High-level output current	V _{OH} = 18 V		0.1	100	μΑ
IOL	Low-level output current	V _{OL} = 5.5 V	5	10	15	mA
VOL	Low-level output voltage	I _{OL} = 1.6 mA		80	400	mV

operating characteristics over recommended operating free-air temperature range, $V_{CC1} = V_{CC2} = 5.12 \text{ V}$

PARAMETER	TEST CONDITIONS	MIN	TYP†	MAX	UNIT
Overall error				±80	mV
Differential nonlinearity	See Figure 1			±20	mV
Zero erro ^{r‡}	Binary count = 0			±80	mV
Scale error	Binary count =127			±80	mV
Full scale input voltage [‡]	Binary count = 127	3.74	3.82	3.9	V
Propagation delay time from RESET or ENABLE			2		μs

[†] All typical values are at $T_A = 25^{\circ}C$.

[‡] These parameters are linear functions of V_{CC1} .

definitions

zero error

The absolute value of the difference between the actual analog voltage at the 01H-to-00H transition and the ideal analog voltage at that transition.

overall error

The magnitude of the deviation from a straight line between the endpoints of the transfer function.

differential nonlinearity

The maximum deviation of an analog-value change associated with a 1-bit code change (1 clock pulse) from its theoretical value of 1 LSB.



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Figure 1. Monotonicity and Nonlinearity Test Circuit



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PRINCIPLES OF OPERATION

The TL507 is a single-slope analog-to-digital converter. All single-slope converters are basically voltage-to-time or current-to-time converters. A study of the functional block diagram shows the versatility of the TL507.

An external clock signal is applied through a buffer to a negative-edge-triggered synchronous counter. Binary-weighted resistors from the counter are connected to an operational amplifier used as an adder. The operational amplifier generates a signal that ramps from $0.75 \cdot V_{CC1}$ down to $0.25 \cdot V_{CC1}$. Comparator 1 compares the ramp signal to the analog input signal. Comparator 2 functions as a fault defector. With the analog input voltage in the range $0.25 \cdot V_{CC1}$ to $0.75 \cdot V_{CC1}$, the duty cycle of the output signal is determined by the unknown analog input, as shown in Figure 2 and the Function Table.

For illustration, assume $V_{CC1} = 5.12$ V,

$$0.25 \bullet V_{CC1} = 1.28 V$$
1 binary count = $\frac{(0.75 - 0.25) V_{CC1}}{128} = 20 \text{ mV}$

$$0.75 \bullet V_{CC1} - 1 \text{ count} = 3.82 V$$

The output is an open-collector n-p-n transistor capable of withstanding up to 18 V in the off state. The output is current limited to the 8- to 12-mA range; however, care must be taken to ensure that the output does not exceed 5.5 V in the on state.

The voltage regulator section allows operation f rom either an unregulated 8- to 18-V V_{CC2} source or a regulated 3.5- to 6-V V_{CC1} source. Regardless of which external power source is used, the internal circuitry operates at V_{CC1}. When operating from a V_{CC1} source, V_{CC2} may be connected to V_{CC1} or left open. When operating from a V_{CC2} source, V_{CC1} can be used as a reference voltage output.



Figure 2



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PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
TL507CP	OBSOLETE	PDIP	Р	8	TBD	Call TI	Call TI

⁽¹⁾ The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS) or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details. TBD: The Pb-Free/Green conversion plan has not been defined.

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⁽³⁾ MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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Mailing Address: Texas Instruments

Post Office Box 655303 Dallas, Texas 75265

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