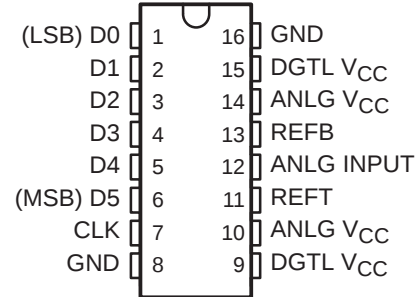


- **6-Bit Resolution**
- **Linearity Error . . . $\pm 0.8\%$**
- **Maximum Conversion Rate . . . 30 MHz Typ**
- **Analog Input Voltage Range**
 V_{CC} to $V_{CC} - 2\text{ V}$
- **Analog Input Dynamic Range . . . 1 V**
- **TTL Digital I/O Level**
- **Low Power Consumption**
200 mW Typ
- **5-V Single-Supply Operation**
- **Interchangeable With Fujitsu MB40576**

N PACKAGE
(TOP VIEW)

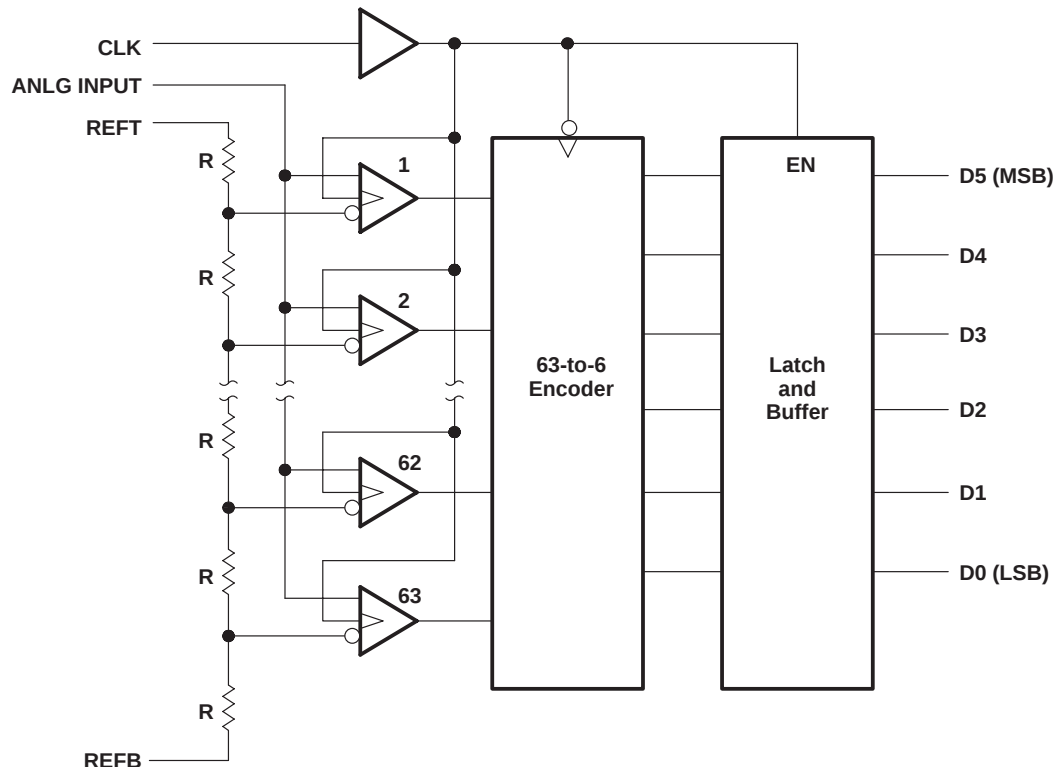


description

The TL5501 is a low-power ultra-high-speed video-band analog-to-digital converter that uses the Advanced Low-Power Schottky (ALS) process. It utilizes the full-parallel comparison (flash method) for high-speed conversion. It converts wide-band analog signals (such as a video signal) to a digital signal at a sampling rate of dc to 30 MHz. Because of this high-speed capability, the TL5501 is suitable for digital video applications such as digital TV, video processing with a computer, or radar signal processing.

The TL5501 is characterized for operation from 0°C to 70°C.

functional block diagram



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TEXAS
INSTRUMENTS

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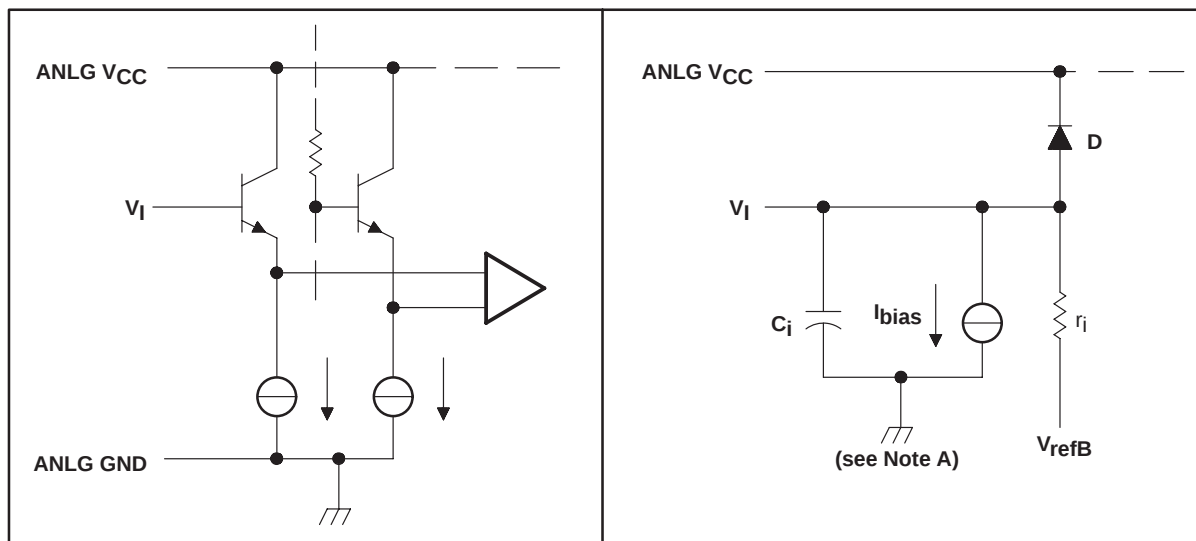
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TL5501

6-BIT ANALOG-TO-DIGITAL CONVERTER

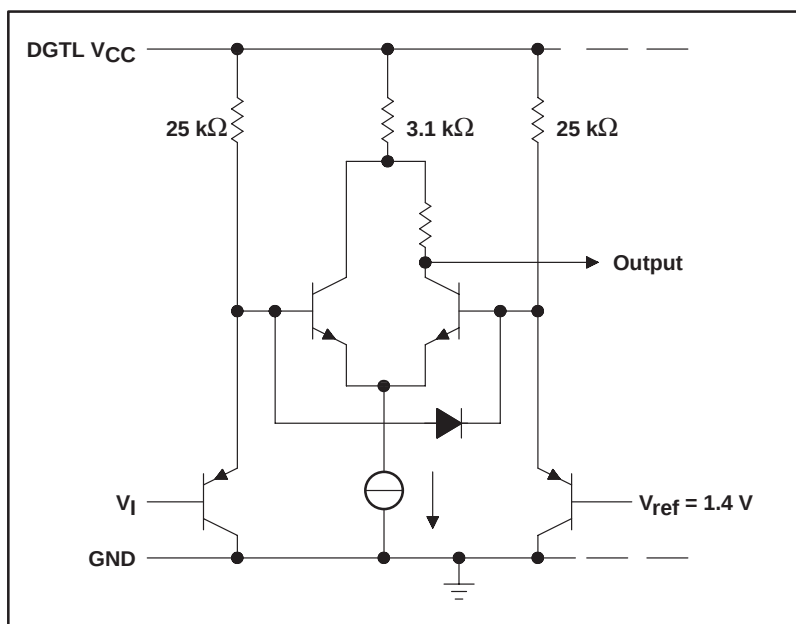
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equivalents of analog input circuit



NOTE A: C_i – nonlinear emitter-follower junction capacitance
 r_i – linear resistance model for input current transition caused by comparator switching.
 $V_I < V_{refB}$: Infinite; CLK high: infinite.
 V_{refB} – voltage at REFB terminal
 I_{bias} – constant input bias current
 D – base-collector junction diode of emitter-follower transistor

equivalent of digital input circuit



FUNCTION TABLE

STEP	ANALOG INPUT VOLTAGE	DIGITAL OUTPUT CODE					
0	3.992 V	L	L	L	L	L	L
1	4.008 V	L	L	L	L	L	H
31	4.488 V	L	H	H	H	H	H
32	4.508 V	H	L	L	L	L	L
33	4.520 V	H	L	L	L	L	H
62	4.984 V	H	H	H	H	H	L
63	5.000 V	H	H	H	H	H	H

† These values are based on the assumption that V_{refB} and V_{refT} have been adjusted so that the voltage at the transition from digital 0 to 1 (V_{ZT}) is 4.000 V and the transition to full scale (V_{FT}) is 4.992 V. 1 LSB = 16 mV.

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

Supply voltage range, ANLG V_{CC} (see Note 1)	– 0.5 V to 7 V
Supply voltage range, DGTL V_{CC}	– 0.5 V to 7 V
Input voltage range at digital input, V_I	– 0.5 V to 7 V
Input voltage range at analog input, V_I	– 0.5 V to ANLG V_{CC} + 0.5 V
Analog reference voltage range, V_{ref}	– 0.5 V to ANLG V_{CC} + 0.5 V
Storage temperature range	–55°C to 150°C
Operating free-air temperature range	0°C to 70°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	260°C

NOTE 1: All voltage values are with respect to the network ground terminal.

recommended operating conditions

	MIN	NOM	MAX	UNIT
Supply voltage, ANLG V_{CC}	4.75	5	5.25	V
Supply voltage, DGTL V_{CC}	4.75	5	5.25	V
High-level input voltage, V_{IH}	2			V
Low-level input voltage, V_{IL}			0.8	V
Input voltage at analog input, V_I (see Note 2)	4		5	V
Analog reference voltage (top side), V_{refT} (see Note 2)	4	5	5.1	V
Analog reference voltage (bottom side), V_{refB} (see Note 2)	3	4	4.1	V
High-level output current, I_{OH}	–400			μA
Low-level output current, I_{OL}			4	mA
Clock pulse duration, high-level or low-level, t_W	25			ns
Operating free-air temperature, T_A	0		70	°C

NOTE 2: $V_{refB} < V_I < V_{refT}$. $V_{refT} - V_{refB} = 1 \text{ V} \pm 0.1 \text{ V}$.

TL5501
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electrical characteristics over operating supply voltage range, T_A = 25°C (unless otherwise noted)

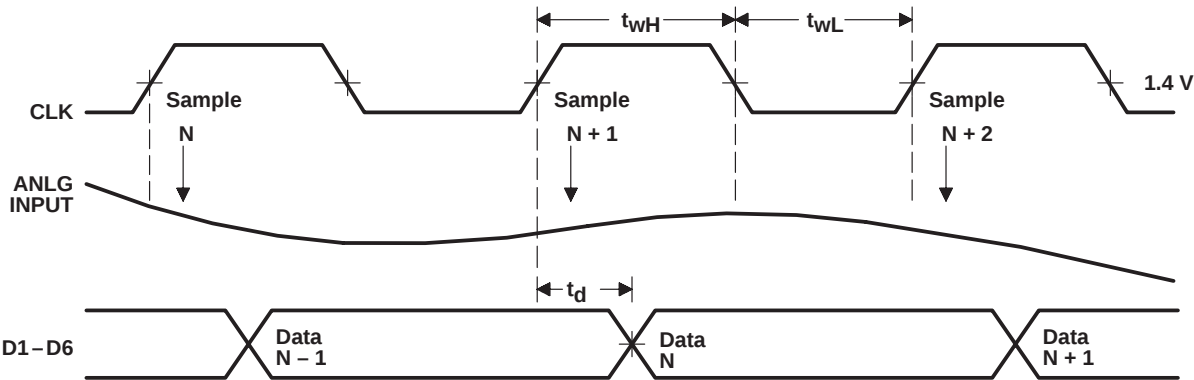
PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
I _I	Analog input current	V _I = 5 V			75	μA
		V _I = 4 V			73	
I _{IH}	Digital high-level input current	V _I = 2.7 V		0	20	μA
I _{IL}	Digital low-level input current	V _I = 0.4 V	– 400	–40		μA
I _I	Digital input current	V _I = 7 V			100	μA
I _{refB}	Reference current	V _{IrefB} = 4 V		–4	–7.2	mA
I _{refT}	Reference current	V _{IrefB} = 5 V		4	7.2	mA
V _{OH}	High-level output voltage	I _{OH} = –400 μA	2.7			V
V _{OL}	Low-level output voltage	I _{OL} = 1.6 mA			0.4	V
r _i	Analog input resistance		100			kΩ
1C _i	Analog input capacitance			35	65	pF
I _{CC}	Supply current			40	60	mA

operating characteristics over operating supply voltage range, T_A = 25°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP [†]	MAX	UNIT
E _L	Linearity error				±0.8	%FSR
f _{max}	Maximum conversion rate		20	30		MHz
t _d	Digital output delay time	See Figure 3		15	30	ns

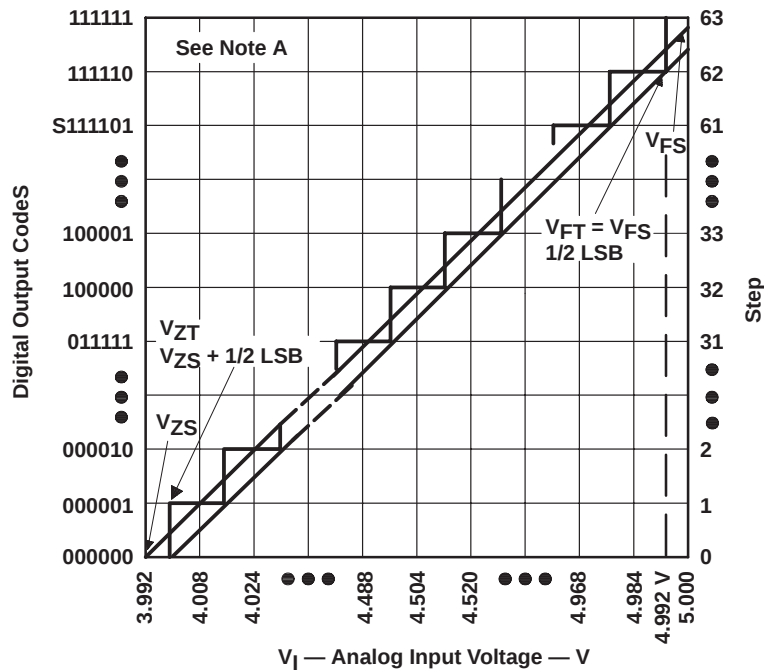
[†] All typical values are at V_{CC} = 5 V, V_{ref} = 4 V, T_A = 25°C.

timing diagram



TYPICAL CHARACTERISTICS

IDEAL CONVERSION CHARACTERISTICS



NOTE A: This curve is based on the assumption that V_{refB} and V_{refT} have been adjusted so that the voltage at the transition from digital 0 to 1 (V_{ZT}) is 4.000 V and the transition to full scale (V_{FT}) is 4.992 V. $1 \text{ LSB} = 16 \text{ mV}$.

Figure 1

END-POINT LINEARITY ERROR

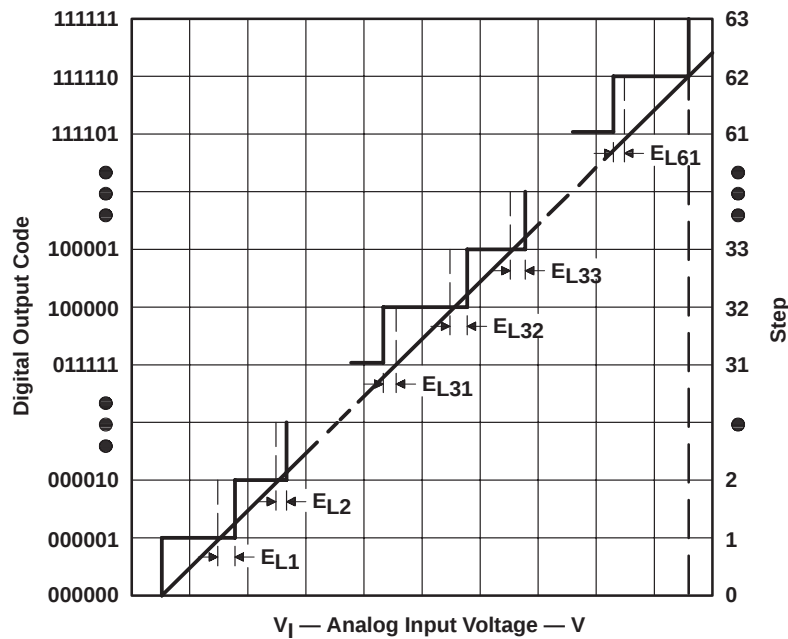


Figure 2

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PARAMETER MEASUREMENT INFORMATION

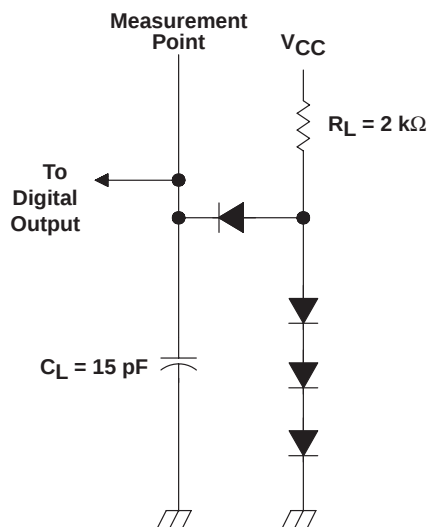


Figure 3. Load Circuit

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
TL5501CDWA	OBSOLETE	SOP	DWA	16		TBD	Call TI	Call TI
TL5501CDWAR	OBSOLETE	SOP	DWA	16		TBD	Call TI	Call TI
TL5501CDWAR	OBSOLETE	SOP	DWA	16		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.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

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

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