

TL1591 SAMPLE-AND-HOLD CIRCUIT FOR CCD IMAGERS

D3327, SEPTEMBER 1989

- 15-MHz Sampling Rate
- 30-ns Acquisition Time
- Diode-Bridge Switch
- 25-MHz Bandwidth
- Low-Voltage Supply

D OR P PACKAGE
(TOP VIEW)

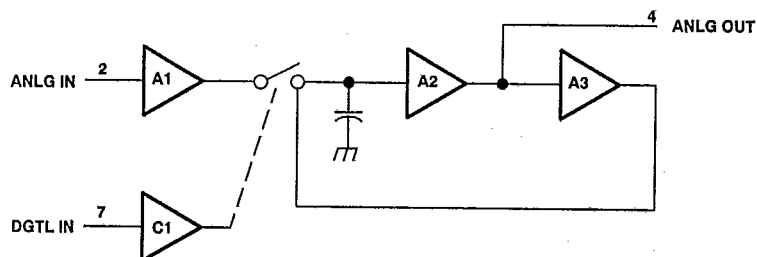
T-77-17

ANLG V _{CC}	1	8	DGTL V _{CC}
ANLG IN	2	7	DGTL IN
ANLG GND	3	6	DGTL GND
ANLG OUT	4	5	SUB GND

description

The TL1591 is a monolithic integrated sample-and-hold circuit with excellent performance features using the BiFET process with Schottky-barrier diodes and designed for use with CCD area imagers. This device consists of an ultra-fast input buffer amplifier, a digital-controlled diode-bridge switch, and a high-impedance output buffer amplifier. The electronic switch is controlled by an LS-TTL-compatible logic input.

functional block diagram



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CCD Image Sensors/Support Functions

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

Supply voltage, V_{CC}	7 V
Digital input voltage	0 to V_{CC}
Continuous total dissipation	See Dissipation Rating Table
Operating free-air temperature range, T_A	-25°C to 80°C
Storage temperature range	-55°C to 150°C

DISSIPATION RATING TABLE

PACKAGE	$T_A \leq 25^\circ\text{C}$	DERATING FACTOR	$T_A = 80^\circ\text{C}$
	POWER RATING	ABOVE $T_A = 25^\circ\text{C}$	POWER RATING
D	725 mW	5.8 mW/°C	406 mW
P	1000 mW	8.0 mW/°C	560 mW

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CCD Image Sensors/Support Functions

recommended operating conditions

	MIN	NOM	MAX	UNIT
V_{CC} Supply voltage	4.75	5	5.5	V
V_{IH} High-level digital input voltage	2			V
V_{IL} Low-level digital input voltage			0.8	V
V_{I-PP} Peak-to-peak analog input voltage			0.8	V

electrical characteristics over operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP†	MAX	UNIT
V_{IK} Input clamp voltage				-1.5	V
$V_{O,PP}$ Analog peak-to-peak output voltage			1.1		V
I_{IH} High-level input current	$V_{CC} = 5.5\text{ V}$, $V_{IH} = 2.7\text{ V}$			20	μA
I_{IL} Low-level input current	$V_{CC} = 5.5\text{ V}$, $V_{IL} = 0.4\text{ V}$	-0.28		-0.4	mA
I_O Analog output current			0.6		mA
I_{CC} Supply current	$V_{CC} = 5.5\text{ V}$		15	20	mA
r_i Input resistance			10		k Ω
r_o Analog output resistance			50		Ω

operating characteristics

PARAMETER	MIN	TYP†	MAX	UNIT
Linearity		0.7%	2%	
A_v Voltage amplification		0.8	0.9	V/V
Sample-to-hold offset error		15		mV
Sample-mode offset error	-50		50	mV
Hold-mode feedthrough			-50	dB
Hold-mode droop			100	$\mu\text{V}/\mu\text{s}$

† All typical values are at $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$.

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dynamic characteristics (see Figure 1)

PARAMETER	MIN	TYP†	MAX	UNIT
Acquisition time 0.6 V to 2% (see Note 1)		18		ns
Acquisition time 0.6 V to 1% (see Note 1)		31		ns
Hold-mode settling time (see Note 2)		35		ns
Sampling-mode bandwidth		25		MHz
Sampling rate			15	MHz

† All typical values are at V_{CC} = 5 V and T_A = 25°C.

PARAMETER MEASUREMENT INFORMATION

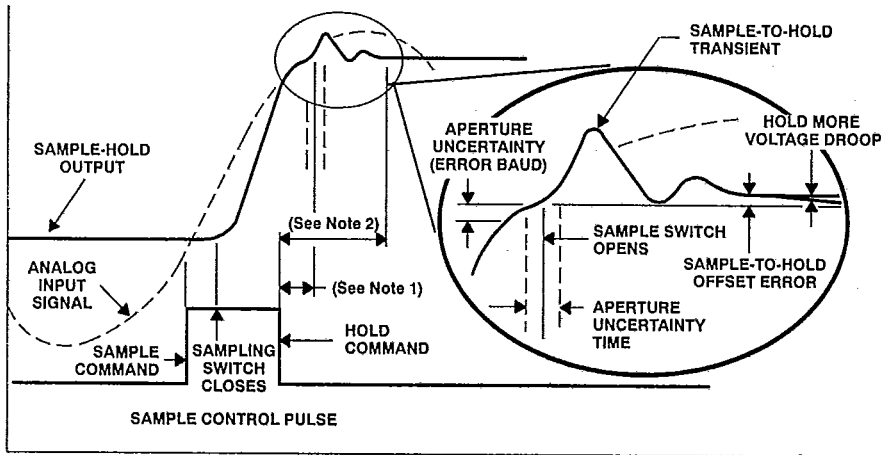


FIGURE 1. SAMPLE-HOLD DEFINITIONS

- NOTES: 1. Acquisition time is the time required, after the closing of the sampling switch, for the hold capacitor to charge to a full-scale voltage change and then remain within a specified error band around the final value.
2. Hold-mode settling time is the time from the hold command transition until the output has settled within a specified error band around the final value.

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PARAMETER MEASUREMENT INFORMATION

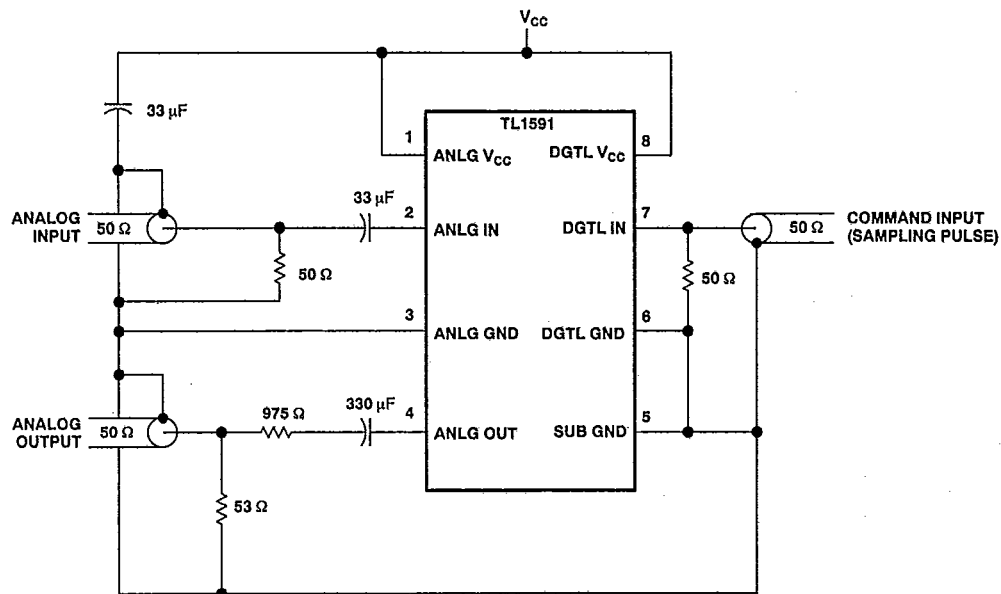


FIGURE 2. TEST CIRCUIT

TYPICAL CHARACTERISTICS

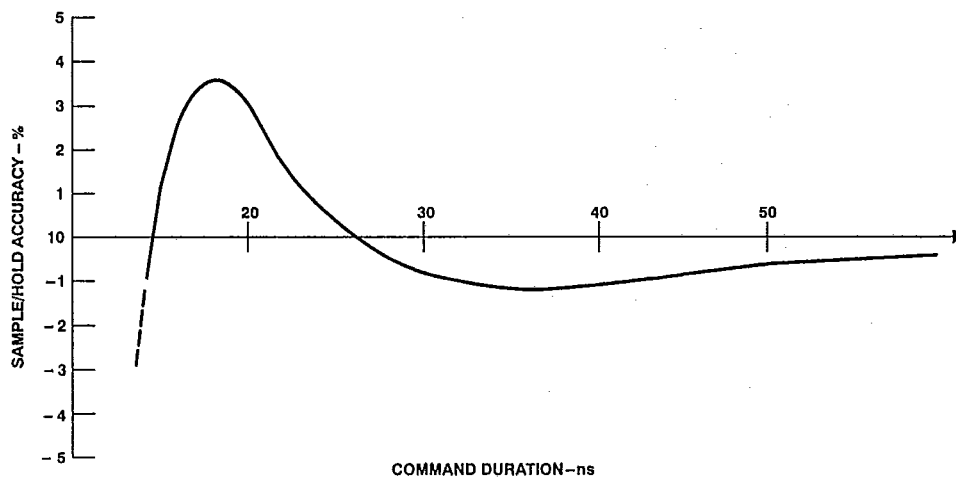


FIGURE 3. SAMPLE/HOLD ACCURACY VS COMMAND DURATION