

DAC-349

10-Bit/3 Channel, 50 MHz RGB D/A Converter

PRODUCT DATA SHEET



DAC-349

GENERAL DESCRIPTION

The DAC-349 is a 10-bit, 50 MHz D/A Converter designed for video applications. The DAC-349's main features include 3 channel RGB I/O, individual channel gain adjustment and very low glitch energy.

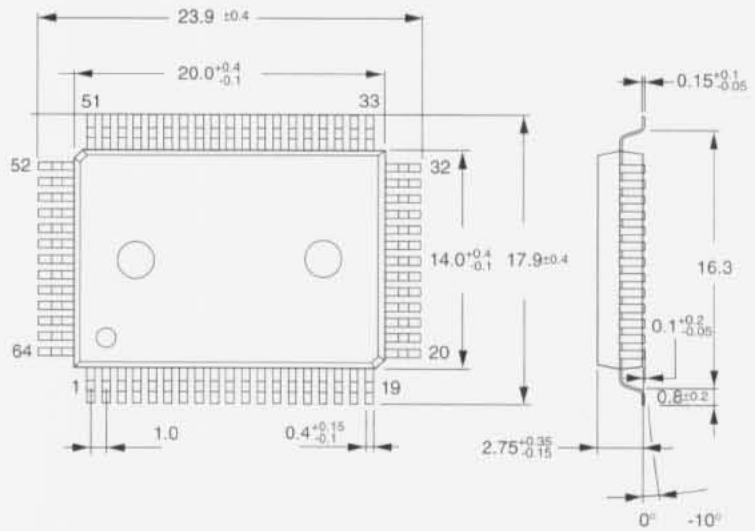
The DAC-349 develops an output voltage of 0 to 2 V and can directly drive a 75 Ω impedance load. Settling time is approximately 14 ns while glitch energy is a low 50 pV/s. The input coding is straight binary.

The DAC-349 is a low power device requiring only a single +5 V supply with a maximum current draw of 110 mA. The DAC-349 is packaged in a 64 pin QFP (plastic) and operates over a -20°C to +75°C temperature range.

FEATURES

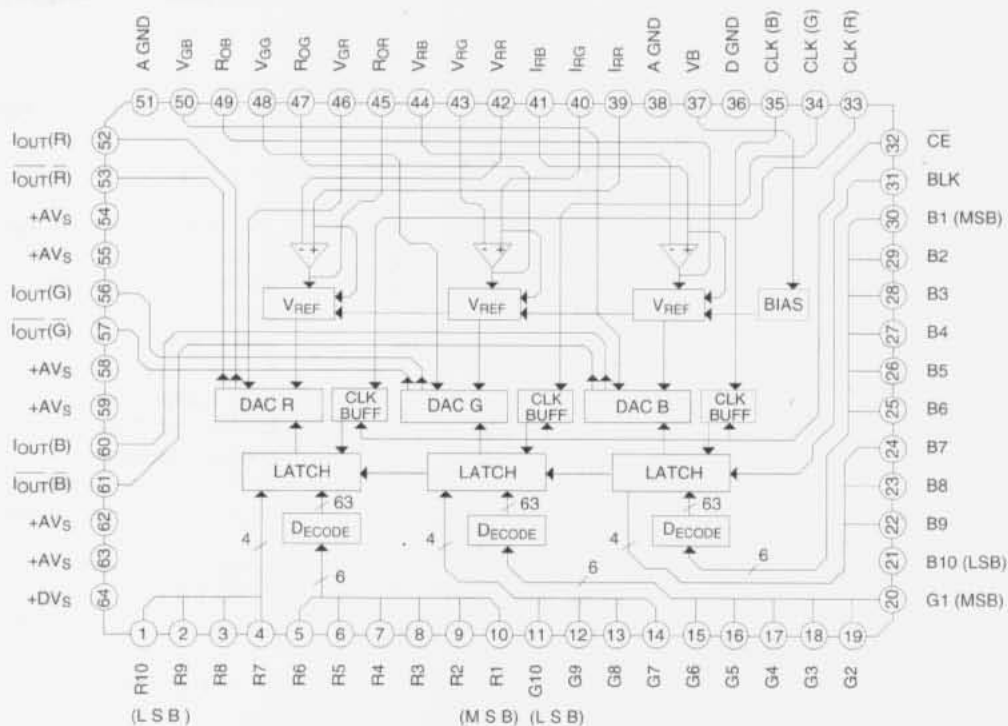
- 10-Bit RGB Resolution
- Single +5V Operation
- TTL CMOS
- $\pm 1/2$ LSB Differential Non-linearity
- 50MHz Conversion Speed
- Low 500mW Power Dissipation
- Low Glitch Energy, 50pV/S

Mechanical Dimensions



Units: mm 64-Pin Plastic QFP

Figure 1: Functional Block Diagram and Input/Output Connections



Absolute Maximum Ratings (Ta = 25°C)

Parameters	Symbols	Limits	Units
Supply voltages			
Analog	(+AV _S)	-0.5 to 7	V
Digital	(+DV _S)	-0.5 to 7	V
Input Voltages	(V _{RR} , V _{RG} , V _{RB})	-0.5 to +AV _S	V
Digital Input Voltages		-0.5 to +DV _S	V
Output Current, per channel		0 to 30	mA

Electrical Specifications

Typical at Ta = +25°C, +AV_S = +DV_S = 5 V, V_{RR} = V_{RG} = V_{RB} = 2V, R_L = 75 Ω, F_S = 50 MHz unless otherwise specified.

Parameters	Symbols	Min	Type	Max	Units
Inputs					
Digital Input Voltage	1 (V _{IH})	2.15	-	-	V
	0 (V _{IL})	-	-	0.85	V
Digital Input Current	1 (I _{IH})	-	-	5	μA
	0 (I _{IL})	-5	-	-	μA
Set-Up Time	(T _S)	-	5	7	ns
Hold Time	(T _H)	-	1	3	ns
Clock Pulse Width	(T _{PWT})	10	-	-	ns
	(T _{PWO})	10	-	-	ns
Reference Voltage Input Range	(V _{RR} , V _{RG} , V _{RB})	1.9	2.0	2.1	V
Reference Input Current		-	5	-	μA

Outputs

Full Scale Output Current	(I _{FS})	-	27	30	mA
Full Scale Output Voltage	(V _{FS})	1.8	1.9	2.0	V
Precision Guaranteed Full Scale Output Voltage	(V _{OC})	1.8	1.9	2.0	V
Output Resistance	(R _O)	-	200	-	kΩ
Load Resistance	(R _L)	-	75	-	Ω

Performance

Resolution		10	-	-	Bits
Output Channels		3	-	-	Channels
Integral Linearity Error		-	-	±2	LSB
Differential Linearity Error		-	-	±1/2	LSB
Conversion Rate		50	-	-	MHz
Output Full Scale Ratio for Equal Gain	*1	-	1.5	3	%
Output Offset Voltage		-	-	1	mV
Output Rise/Fall Time (T _R /T _F)		-	4	-	ns
Propagation Delay Time (T _D)		-	10	-	ns
Glitch Energy		-	50	-	pV/s
Cross Talk (10 MHz Sinewave Output)		-	54	-	dB

Power Supply Requirements

Power Supply Voltage (+AV _S , +DV _S)		4.75	5.0	5.25	V
Power Supply Current		-	100	110	mA
Power Dissipation		-	500	-	mW

Environmental/Physical

Operating Temp. Range (Case)		-20	-	+75	°C
Storage Temperature Range		-55	-	+150	°C
Package				64-Pin Plastic QFP	
Weight				1.5	g

$$*1 \text{ Output F.S. Ratio} = \left| \frac{\text{Full Scale Channel Voltage}}{\text{Average F.S. Channel Voltage, All Channels}} - 1 \right| \times 100\%$$

Technical Notes

1. Proper operation of the DAC-349 is dependent on good board layout and connection practices. Bypass supplies as shown in the connection diagrams. Mount bypass capacitors close to the converter, directly to the supply pins where possible.

2. Use of a ground plane is particularly important in high speed D/A converters as it reduces high frequency noise and aids in decoupling the digital inputs from the analog output. Avoid ground loop problems by connecting all grounds on the board to the ground plane. The remainder of the ground plane should include as much of the circuit board as possible.

3. When the converter is configured for voltage output with an external operational amplifier, keep the leads from the converter to the output amplifier as short as possible.

4. The high speed current switching technique used in the DAC-349 inherently reduces the amplitude and duration of large transient spikes at the output ('glitches'). The most severe glitches occur at half-scale, the major carry transition from 011 ... 1 to 100 ... 0 or vice versa. At this time, a skewing of the input codes can create a transition state code of 111 ... 1. The duration of the 'transition state code' is dependent on the degree of skewing but its effect is dependent on the speed of the DAC (an ultra-fast DAC will respond to these brief spurious inputs to a greater degree than a slow DAC).

Minimize the effects of input skewing by using a high-speed input register to match input switching times. The input register recommended for use with the DAC-349 is easily implemented with two Texas Instruments SN74S174 Hex D-type flip-flops. This register will reduce glitches to a very low level and ensure fast output setting times.

5. The blanking function BLK (Pin 31) allows output when connected to digital low (ground). The output is blanked when connected to digital high.

6. The chip enable function CE (Pin 32) inhibits output when connected to digital high. This minimizes power consumption while output is inhibited.

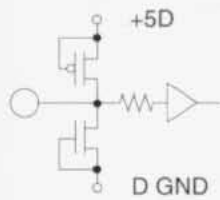
7. The full scale output values on each channel may be adjusted as a group or individually. Refer to Figure 2 Typical Connection Diagrams.

Table 1
Coding Table

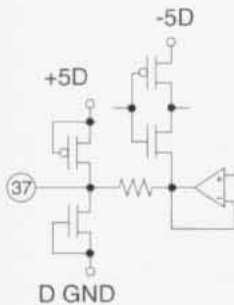
Input Code		Output Voltage (2 V FS)
MSB	LSB	
0	0000000000	0V
0	0000000001	0.002V
	⋮	⋮
1	0000000000	1.000V
1	1000000000	1.500V
	⋮	⋮
1	1111111111	1.998V

Equivalent Circuits

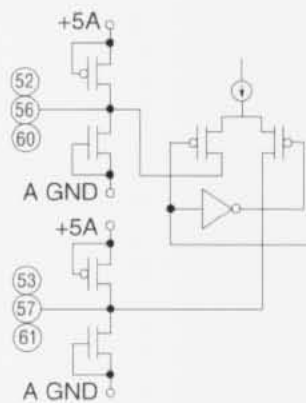
Digital input, BLK, \overline{CE} and CLK inputs



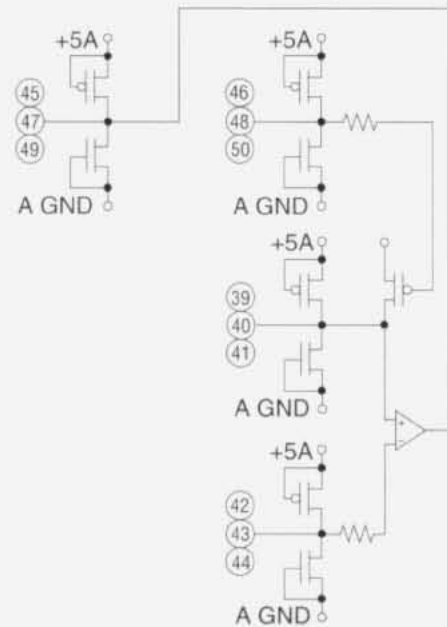
Bias Voltage



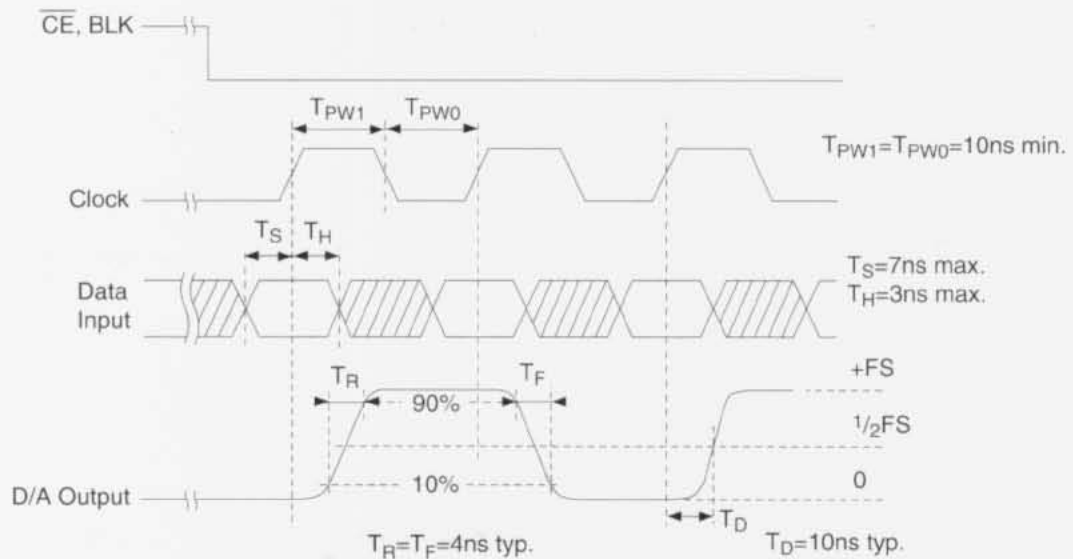
Current output pins



Reference pins



Timing Diagram



Typical Performance Curves

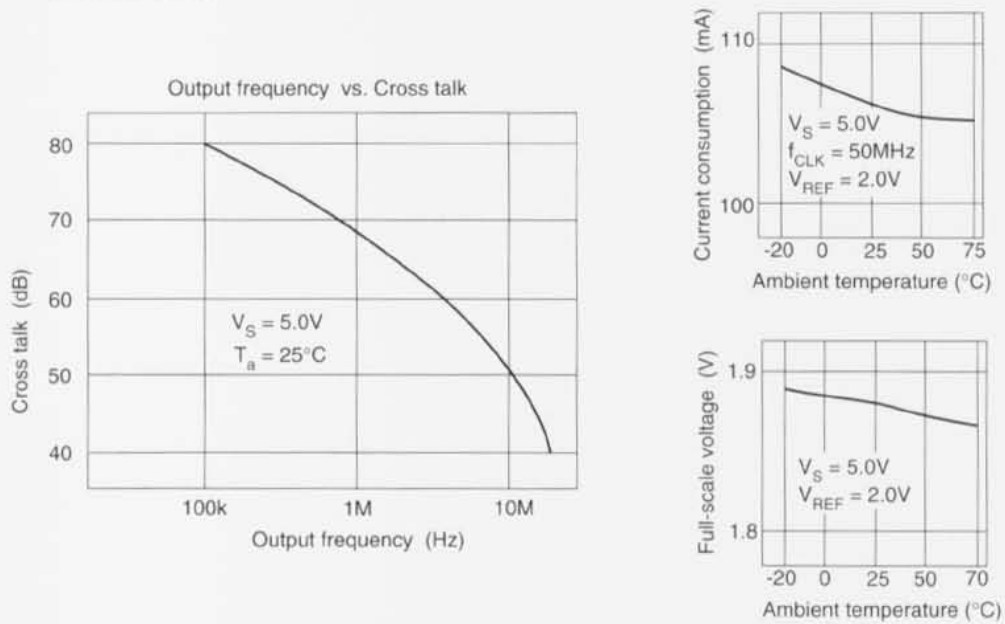
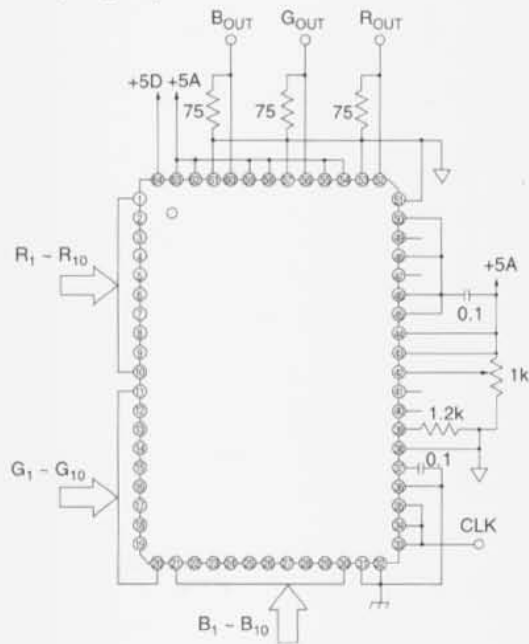


Figure 2
Typical DAC-349 Connections Diagrams

1. Equal gain per channel



2. Independent channel gain

