TELEDYNE PHILBRICK

PRELIMINARY SPECIFICATION

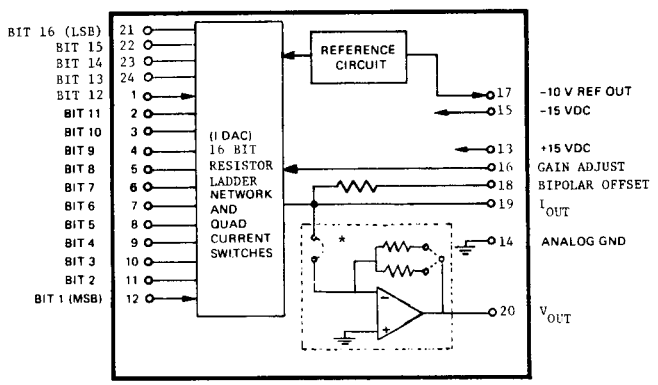
4059 16-Bit, High-Speed, Hybrid D/A Converter

The 4059 series of D/A converters are 16-bit hybrid devices that combine both high speed and high stability. Laser-trimmed thin-film networks, proprietary quad bit switches, precision reference circuitry, and an internal high-speed/ high-precision operational amplifier are all contained in this 24-pin hermetically sealed DIP.

Superb performance, such as ±0.003% non-linearity, low gain and offset errors, guaranteed monotonicity over 0°C to +70°C, and guaranteed settling time to 0.003% are all inherent characteristics in this 16-bit device. Three basic models, having five output ranges, provide both unipolar and bipolar output coding. See Table 1.

FEATURES
- o Guaranteed Monotonicity over the 0°C to +70°C Operating Temperature Range
- o Low Gain and Offset Errors
- o Guaranteed Nonlinearity to 0.003%
- o Five Output Ranges Available
- o Guaranteed Settling to 0.003%
  Voltage: 10 V Step, 10 us
  Current: 5 mA Step, 2 us
- o Hermetically Sealed 24-Pin DIP

APPLICATIONS
- o VLSI Process Control
- o High-Speed/ High-Resolution Instrumentation
- o Medical Instrumentation
- o High-Resolution Industrial Process Control
- o High-Resolution Military Systems



* Optional gain selected by internal programming. For available versions see Table 2.

Figure 1. Function Block Diagram

ANALOG OUTPUT		DIGITAL INPUT	
Voltage	Current	Unipolar Binary	Bipolar Offset Binary
+F.S.	-F.S.		000 . . . 000
+½ F.S.	-½ F.S.		010 . . . 000
+1 LSB	-1 LSB		011 . . . 111
0	0	000 . . . 000	100 . . . 000
-1 LSB	+1 LSB	000 . . . 001	100 . . . 001
-½ F.S.	+½ F.S.	100 . . . 000	110 . . . 000
-F.S. +1 LSB	+F.S. -1 LSB	111 . . . 111	111 . . . 111

Table 1. Data Code Table

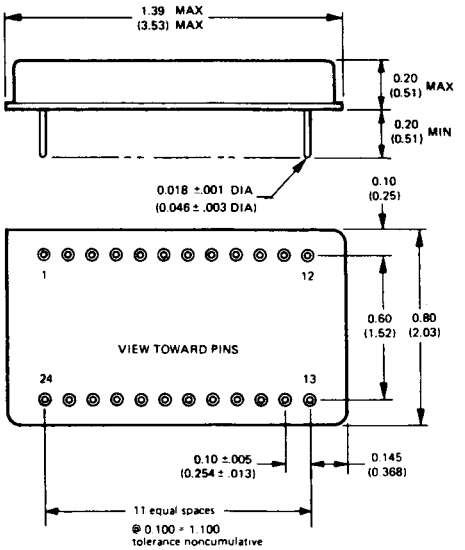
MODEL	OUTPUT RANGE	OPERATING TEMPERATURE RANGE
4059 J	0 to +5 mA, ±2.5 mA	0°C to +70°C
4059 K	0 to -10 V, ±5 V	
4059 M	±10 V	
4059-80 J	0 to +5 mA, ±2.5 mA	-55°C to +125°C
4059-80 K	0 to -10 V, ±5 V	
4059-80 M	±10 V	
4059-83 J	0 to +5 mA, ±2.5 mA	-55°C to +125°C Processed to MIL-STD-883
4059-83 K	0 to -10 V, ±5 V	
4059-83 M	±10 V	

Table 2. 4059 Versions

SPECIFICATIONS

Each specification is tested at +25°C, ±15 V DC, unless otherwise indicated.

	TYPICAL	GUARANTEED
RESOLUTION		16 Bits
INPUTS		
Logic Code		
Unipolar	---	Binary
Bipolar	---	Offset Binary
Switching Levels		
"0" State	---	≥0 V DC, ≤ +0.8 V DC
"1" State	---	≥+2.0 V DC, ≤+5.5 V DC
Logic Current	---	±40 µA
Loading	---	< 1 TTL Load
POWER	+15 V DC @ 35 mA Max.	
	-15 V DC @ 20 mA Max.	
Recommended Philbrick Supply	2204	
TRANSFER CHARACTERISTICS		
Accuracy		
Nonlinearity	±½ LSB/16 Bits	±½ LSB/14 Bits
Differential Nonlinearity	±½ LSB/16 Bits	±½ LSB/14 Bits
Monotonicity and No Missing Output Levels to 14 Bits	---	0°C to +70°C
Monotonicity and No Missing Output Levels to 16 Bits	+15°C to +35°C	---
Zero Offset Error, Adjustable to Zero		
Current		
Unipolar (000...000)	±0.03%	±0.04%
Bipolar (100...000)	±0.05%	---
Voltage		
Unipolar	±0.05%	---
Bipolar	±0.05%	---
Gain Error, Adjustable to Zero	---	±0.1%
Stability		
Zero Offset Error vs. Temperature		
Current		
Unipolar (000...000)	±1.0 ppm/°C	±1.5 ppm/°C
Bipolar (100...000)	±9 ppm/°C	---
Voltage		
Unipolar (000...000)	±5 ppm/°C	---
Bipolar (100...000)	±10 ppm/°C	---
Gain Error vs. Temperature	±10 ppm/°C	±15 ppm of F.S./°C
Reference vs. Temperature	±8 ppm/°C	±15 ppm/°C
Power Supply Rejection Ratio	---	±0.0024%/%ΔV_S
Warm-Up Time to Within ±1 LSB/14 Bit	5 min.	---
OUTPUTS		
Range		
Unipolar	---	0 to +5 mA, 0 to -10 V
Bipolar	---	±2.5 mA, ±5 V, ±10 V
Terminal Limits for Rated Accuracy	---	0.6 V Max.
Output Resistance		
Unipolar	1.5 kΩ	---
Bipolar	1.0 kΩ	---
Output Capacitance	10 pF	---
DYNAMIC CHARACTERISTICS		
Settling Time to 0.003%		
Voltage		
Unipolar, 0 to -10 V @ 5 mA	---	10 µs
Bipolar, +10 V to -10 V @ 5 mA	---	10 µs
Current		
Unipolar, 0 to+5 mA	1.5 µs	2 µs
Bipolar, ±2.5 mA	1.5 µs	2 µs
Major Carry Current	1.2 µs	2 µs
Slew Rate	15.4 V/µs	---
INTERNAL VOLTAGE REFERENCE		
Voltage	---	-10 V DC ±1%
External Load	---	2 mA, 50 pF Max.
TEMPERATURE SPECIFICATIONS		
Operating Temperature Range		
4059 (J, K, M)	---	0°C to +70°C
4059-80/4059-83 (J, K, M)	---	-55°C to +85°C
Storage Temperature Range	---	-65°C to +125°C
ABSOLUTE MAXIMUM RATINGS		
Logic Input Voltage	---	0 V to +6 V
Supply Voltage to Ground, +15 V	---	+16 V
Supply Voltage to Ground, -15 V	---	-16 V
Short Circiut Protection to Ground		
Current Output	---	Continuous
Reference Output	---	2 seconds
Voltage Output	---	Continuous



PIN DESIGNATIONS

1	BIT 12	13	+15 V
2	BIT 11	14	ANALOG GROUND
3	BIT 10	15	-15 V
4	BIT 9	16	GAIN ADJUST
5	BIT 8	17	-10 V REF OUT
6	BIT 7	18	BIPOLAR OFFSET
7	BIT 6	19	I OUT
8	BIT 5	20	V OUT
9	BIT 4	21	BIT 16 (LSB)
10	BIT 3	22	BIT 15
11	BIT 2	23	BIT 14
12	BIT 1 (MSB)	24	BIT 13

RECOMMENDED SOCKET: AUGAT SOCKET NO. 324-AG2D OR EQUIVALENT
DIMENSIONS IN PARENTHESES ARE IN CENTIMETERS

Figure 2. Pinout

REPRESENTED BY
T. LOUIS SNITZER CO.
10320 S. DE ANZA BLVD.
CUPERTINO, CALIF. 95014
TELEPHONE (408) 257-8333

TELEDYNE PHILBRICK
Allied Drive at Route 128, Dedham, Massachusetts 02026
Tel: (617)329-1600 TWX:(710)348-6726 Telex: 92-4439

PRELIMINARY, PRINTED 5/80