



## DAC0800/DAC0801/DAC0802 8-Bit Digital-to-Analog Converters

### General Description

The DAC0800 series are monolithic 8-bit high-speed current-output digital-to-analog converters (DAC) featuring typical settling times of 100 ns. When used as a multiplying DAC, monotonic performance over a 40 to 1 reference current range is possible. The DAC0800 series also features high compliance complementary current outputs to allow differential output voltages of 20 V<sub>p-p</sub> with simple resistor loads as shown in *Figure 1*. The reference-to-full-scale current matching of better than ±1 LSB eliminates the need for full-scale trims in most applications while the nonlinearities of better than ±0.1% over temperature minimizes system error accumulations.

The noise immune inputs of the DAC0800 series will accept TTL levels with the logic threshold pin, V<sub>LC</sub>, grounded. Changing the V<sub>LC</sub> potential will allow direct interface to other logic families. The performance and characteristics of the device are essentially unchanged over the full ±4.5V to ±18V power supply range; power dissipation is only 33 mW with ±5V supplies and is independent of the logic input states.

The DAC0800, DAC0802, DAC0800C, DAC0801C and DAC0802C are a direct replacement for the DAC-08, DAC-08A, DAC-08C, DAC-08E and DAC-08H, respectively.

### Features

- Fast settling output current 100 ns
- Full scale error ±1 LSB
- Nonlinearity over temperature ±0.1%
- Full scale current drift ±10 ppm/°C
- High output compliance -10V to +18V
- Complementary current outputs
- Interface directly with TTL, CMOS, PMOS and others
- 2 quadrant wide range multiplying capability
- Wide power supply range ±4.5V to ±18V
- Low power consumption 33 mW at ±5V
- Low cost

### Typical Applications

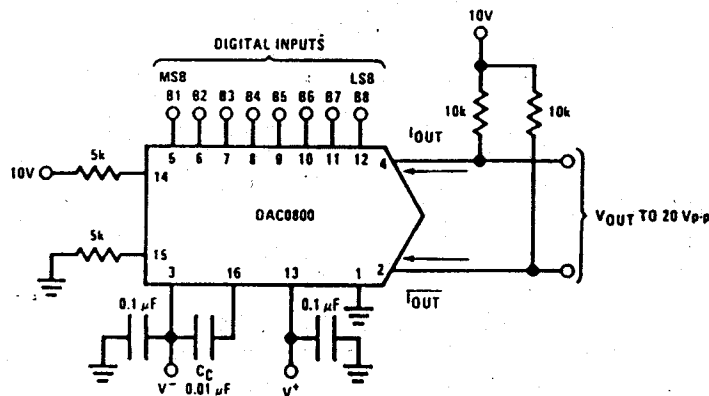


FIGURE 1. ±20 V<sub>p-p</sub> Output Digital-to-Analog Converter (Note 4)

TL/H/5686-1

### Ordering Information

Non-Linearity	Temperature Range	Order Numbers				
		J Package (J16A)*		N Package (N16A)*		SO Package (M16A)
±0.1% FS	-55°C ≤ T <sub>A</sub> ≤ +125°C	DAC0802LJ	DAC-08AQ	DAC0802LCN	DAC-08HP	DAC0802LCM
±0.1% FS	0°C ≤ T <sub>A</sub> ≤ +70°C	DAC0802LCJ	DAC-08HQ			
±0.19% FS	-55°C ≤ T <sub>A</sub> ≤ +125°C	DAC0800LJ	DAC-08Q	DAC0800LCN	DAC-08EP	DAC0800LCM
±0.19% FS	0°C ≤ T <sub>A</sub> ≤ +70°C	DAC0800LCJ	DAC-08EQ			
±0.39% FS	0°C ≤ T <sub>A</sub> ≤ +70°C	DAC0801LCJ	DAC-08CQ	DAC0801LCN	DAC-08CP	DAC0801LCM

\*Devices may be ordered by using either order number.

### Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage (V <sup>+</sup> - V <sup>-</sup> )	± 18V or 36V
Power Dissipation (Note 2)	500 mW
Reference Input Differential Voltage (V14 to V15)	V <sup>-</sup> to V <sup>+</sup>
Reference Input Common-Mode Range (V14, V15)	V <sup>-</sup> to V <sup>+</sup>
Reference Input Current	5 mA
Logic Inputs	V <sup>-</sup> to V <sup>-</sup> plus 36V
Analog Current Outputs (V <sub>S</sub> <sup>-</sup> = -15V)	4.25 mA
ESD Susceptibility (Note 3)	TBD V
Storage Temperature	-65°C to +150°C

Lead Temp. (Soldering, 10 seconds)

Dual-In-Line Package (plastic)	260°C
Dual-In-Line Package (ceramic)	300°C
Surface Mount Package	
Vapor Phase (60 seconds)	215°C
Infrared (15 seconds)	220°C

### Operating Conditions (Note 1)

	Min	Max	Units
Temperature (T <sub>A</sub> )			
DAC0802L	-55	+125	°C
DAC0800L	-55	+125	°C
DAC0800LC	0	+70	°C
DAC0801LC	0	+70	°C
DAC0802LC	0	+70	°C

### Electrical Characteristics

The following specifications apply for V<sub>S</sub> = ±15V, I<sub>REF</sub> = 2 mA and T<sub>MIN</sub> ≤ T<sub>A</sub> ≤ T<sub>MAX</sub> unless otherwise specified. Output characteristics refer to both I<sub>OUT</sub> and I<sub>OUT</sub>.

Symbol	Parameter	Conditions	DAC0802L/ DAC0802LC			DAC0800L/ DAC0800LC			DAC0801LC			Units
			Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
	Resolution		8	8	8	8	8	8	8	8	8	Bits
	Monotonicity		8	8	8	8	8	8	8	8	8	Bits
	Nonlinearity				±0.1			±0.19			±0.39	%FS
t <sub>s</sub>	Settling Time	To ± 1/2 LSB, All Bits Switched "ON" or "OFF", T <sub>A</sub> = 25°C		100	135					100	150	ns
		DAC0800L				100	135					ns
		DAC0800LC				100	150					ns
t <sub>PLH</sub> , t <sub>PHL</sub>	Propagation Delay Each Bit All Bits Switched	T <sub>A</sub> = 25°C		35	60		35	60		35	60	ns
				35	60		35	60		35	60	ns
T <sub>CLFS</sub>	Full Scale Tempo			±10	±50		±10	±50		±10	±80	ppm/°C
V <sub>OC</sub>	Output Voltage Compliance	Full Scale Current Change < 1/2 LSB, R <sub>OUT</sub> > 20 MΩ Typ	-10		18	-10		18	-10		18	V
I <sub>FS4</sub>	Full Scale Current	V <sub>REF</sub> = 10.000V, R14 = 5.000 kΩ, R15 = 5.000 kΩ, T <sub>A</sub> = 25°C	1.984	1.992	2.000	1.94	1.99	2.04	1.94	1.99	2.04	mA
I <sub>FS5</sub>	Full Scale Symmetry	I <sub>FS4</sub> - I <sub>FS2</sub>		±0.5	±4.0		±1	±8.0		±2	±16	μA
I <sub>ZS</sub>	Zero Scale Current			0.1	1.0		0.2	2.0		0.2	4.0	μA
I <sub>FSR</sub>	Output Current Range	V <sup>-</sup> = -5V V <sup>-</sup> = -8V to -18V	0	2.0	2.1	0	2.0	2.1	0	2.0	2.1	mA
			0	2.0	4.2	0	2.0	4.2	0	2.0	4.2	mA
V <sub>IL</sub> V <sub>IH</sub>	Logic Input Levels Logic "0" Logic "1"	V <sub>LC</sub> = 0V			0.8			0.8			0.8	V
			2.0			2.0			2.0			V
I <sub>IL</sub> I <sub>IH</sub>	Logic Input Current Logic "0" Logic "1"	V <sub>LC</sub> = 0V -10V ≤ V <sub>IN</sub> ≤ +0.8V 2V ≤ V <sub>IN</sub> ≤ +18V		-2.0	-10		-2.0	-10		-2.0	-10	μA
				0.002	10		0.002	10		0.002	10	μA
V <sub>IS</sub>	Logic Input Swing	V <sup>-</sup> = -15V	-10		18	-10		18	-10		18	V
V <sub>THR</sub>	Logic Threshold Range	V <sub>S</sub> = ±15V	-10		13.5	-10		13.5	-10		13.5	V
I <sub>15</sub>	Reference Bias Current			-1.0	-3.0		-1.0	-3.0		-1.0	-3.0	μA
di/dt	Reference Input Slew Rate	(Figure 12)	4.0	8.0		4.0	8.0		4.0	8.0		mA/μs
PSSI <sub>FS+</sub>	Power Supply Sensitivity	4.5V ≤ V <sub>S</sub> ≤ 18V		0.0001	0.01		0.0001	0.01		0.0001	0.01	%/%
PSSI <sub>FS-</sub>		-4.5V ≤ V <sub>S</sub> ≤ 18V I <sub>REF</sub> = 1mA		0.0001	0.01		0.0001	0.01		0.0001	0.01	%/%
I <sub>+</sub> I <sub>-</sub>	Power Supply Current	V <sub>S</sub> = ±5V, I <sub>REF</sub> = 1 mA		2.3	3.8		2.3	3.8		2.3	3.8	mA
				-4.3	-5.8		-4.3	-5.8		-4.3	-5.8	mA
I <sub>+</sub> I <sub>-</sub>		V <sub>S</sub> = 5V, -15V, I <sub>REF</sub> = 2 mA		2.4	3.8		2.4	3.8		2.4	3.8	mA
				-6.4	-7.8		-6.4	-7.8		-6.4	-7.8	mA
I <sub>+</sub> I <sub>-</sub>		V <sub>S</sub> = ±15V, I <sub>REF</sub> = 2 mA		2.5	3.8		2.5	3.8		2.5	3.8	mA
				-6.5	-7.8		-6.5	-7.8		-6.5	-7.8	mA