

PCM1700U
PCM1700P

Dual 18-Bit Monolithic Audio DIGITAL-TO-ANALOG CONVERTER

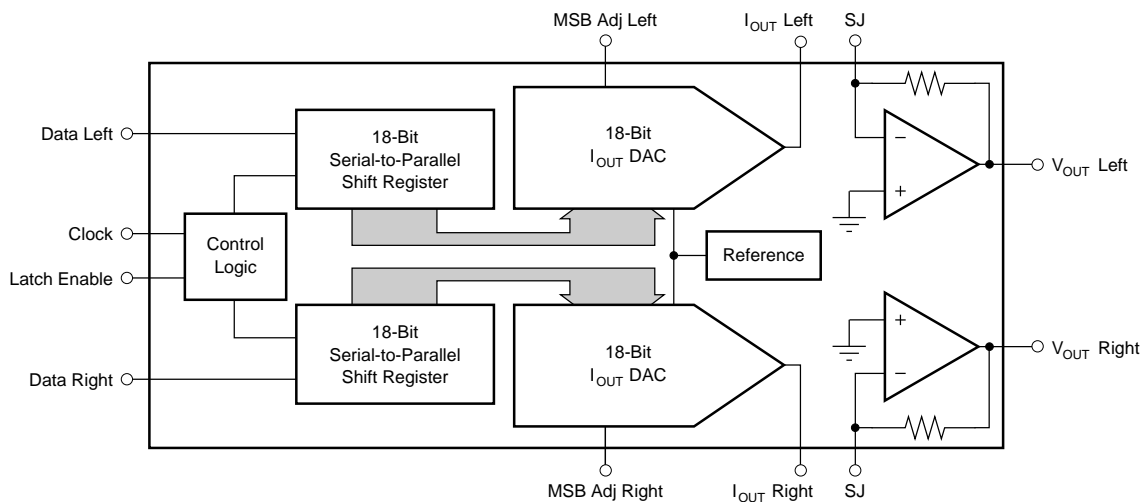
FEATURES

- **DUAL 18-BIT LOW-POWER MONOLITHIC AUDIO D/A CONVERTER**
- **VERY LOW MAX THD+N: -92dB Without External Adjust**
- **CO-PHASE, LOW-GLITCH $\pm 3V$ OR $\pm 670\mu A$ AUDIO OUTPUTS**
- **CAPABLE OF 16X PER CHANNEL OVERSAMPLING RATE**
- **COMPLETE WITH INTERNAL REFERENCE**
- **SERIAL INPUT FORMAT 100% COMPATIBLE WITH INDUSTRY STD PCM56P**
- **RUNS ON $\pm 5V$ SUPPLIES AND DISSIPATES 300mW MAX**
- **COMPACT 28-PIN PLASTIC DIP OR SOIC**

DESCRIPTION

The PCM1700 is a low cost, high-performance, dual 18-bit digital-to-analog converter. The PCM1700 features low glitch, co-phase current and voltage outputs and only requires $\pm 5V$ supplies. The PCM1700 comes complete with an internal reference and optional MSB adjustability for even greater THD performance. Total power dissipation is less than 400mW max. Low maximum Total Harmonic Distortion + Noise (-92dB max; PCM1700P-K) is 100% tested. The very fast PCM1700 is also capable of 16X oversampling rates on both channels simultaneously, providing freedom in output filter selection.

The PCM1700 comes in space-saving 28-pin plastic DIP and SOIC packages. PCM1700 accepts a serial data input format that is compatible with other Burr-Brown PCM products such as the industry standard PCM56P.



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SPECIFICATIONS

ELECTRICAL

At 25°C, and $\pm V_{CC} = \pm 5.00V$ unless otherwise noted. Where relevant, specifications apply to both left and right input/output channels.

| PARAMETER | CONDITIONS | PCM1700U/J-U-K, PCM1700P/P-J/P-K | | | UNITS |
|---|--|----------------------------------|---|---|--|
| | | MIN | TYP | MAX | |
| RESOLUTION | | 18 | | | Bits |
| DYNAMIC RANGE | | | +108 | | dB |
| INPUT | | | | | |
| DIGITAL INPUT Logic Family Logic Level: V_{IH} V_{IL} I_{IH} I_{IL} Data Format Input Clock Frequency | $V_{IH} = +2.7V$ $V_{IL} = +0.4V$ | +2 0 | TTL Compatible Serial BTC ⁽¹⁾ 20 | $+V_{DD}$ +0.8 +1 -50 | V V μA μA MHz |
| DYNAMIC CHARACTERISTICS | | | | | |
| TOTAL HARMONIC DISTORTION + N⁽⁶⁾ PCM1700_: f = 991kHz (0dB) f = 991kHz (-20dB) f _{IN} = 991kHz (-60dB) PCM1700_-J: f = 991kHz (0dB) f = 991kHz (-20dB) f = 991kHz (-60dB) PCM1700_-K: f = 991kHz (0dB) f = 991kHz (-20dB) f = 991kHz (-60dB) | f _S = 352.8kHz ⁽⁴⁾ f _S = 352.8kHz f _S = 352.8kHz f _S = 352.8kHz f _S = 352.8kHz f _S = 352.8kHz f _S = 352.8kHz | | -88 -74 -34 -94 -76 -36 -98 -80 -40 | -82 -68 -28 -88 -74 -34 -92 -74 -34 | dB dB dB dB dB dB dB dB dB |
| CHANNEL SEPARATION | | +96 | +108 | | dB |
| SIGNAL-TO-NOISE RATIO⁽⁵⁾ | 20Hz to 20kHz at BPZ ⁽⁶⁾ | | +108 | | dB |
| TRANSFER CHARACTERISTICS | | | | | |
| ACCURACY Gain Error Gain Mismatch Bipolar Zero Error BPZ Error Mismatch BPZ Differential Linearity Error ⁽⁷⁾ Gain Drift Bipolar Zero Drift Warm-up Time | Channel to Channel Channel to Channel | | ± 1 ± 1 10 5 ± 1 100 20 | ± 3 ± 3 | % % mV mV LSB ppm/°C ppm of FSR/°C minute |
| POWER SUPPLY REJECTION | $\pm V_{CC}$ to V_{OUT} | | +86 | | dB |
| ANALOG OUTPUT Voltage: Output Range Output Impedance Current Output Capacitive Load Drive Short Circuit Duration Settling Time Glitch Energy Current: Output Range Output Impedance | R _{LOAD} = 1.5k Ω ($\pm 2\%$) ($\pm 2\%$) | | ± 3 0.1 ± 2 TBD Indefinite Meets All THD+N Specs Without External Output Deglitching 1.67 | | V Ω mA pF μA k Ω |
| POWER SUPPLY REQUIREMENTS | | | | | |
| $\pm V_{CC}$ Supply Voltage Supply Current: $+I_{CC}$ $-I_{CC}$ Power Dissipation | $+V_{CC} = +5.0V$ $-V_{CC} = -5.0V$ $\pm V_{CC} = \pm 5.0V$ | +4.75 | +5.00 +18 -42 280 | +5.25 +30 -65 475 | V mA mA mW |
| TEMPERATURE RANGE | | | | | |
| Specification Operating Storage | | 0 -30 -60 | | +70 +70 +100 | °C °C °C |

NOTES: (1) Binary Two's Complement coding. (6) Ratio of (Distortion_{RMS} + Noise_{eRMS}) / Signal_{RMS}. (3) D/A converter input frequency/signal level on both left and right channels. (4) D/A converter sample frequency (8 X 44.1kHz; 8X oversampling per channel). (5) Ratio of Noise_{RMS} / Signal_{RMS}. Measured using an A-weighted filter. (6) Bipolar zero. (7) Differential non-linearity at bipolar major carry input code. Measured in 16-bit LSBs. Adjustable to zero error.

PIN ASSIGNMENTS (Plastic PKG)

| PIN | DESCRIPTION | MNEMONIC |
|-----|---|----------------------|
| 1 | -5V Analog Supply | -V _{CC} |
| 2 | Left Channel Servo-Amp Decoupling Point | CAP |
| 3 | Left Channel MSB Adjustment | MSB ADJ (L) |
| 4 | No Connect | NC |
| 5 | Left Channel Bipolar Offset Decoupling Point | CAP |
| 6 | Left Channel Current Output | I _{OUT} (L) |
| 7 | Left Channel Analog Common | ACOM |
| 8 | Left Channel Summing Junction | SJ (L) |
| 9 | Left Channel Voltage Output | VO _{UT} (L) |
| 10 | No Connect | NC |
| 11 | +5V Digital Supply | +V _{DD} |
| 12 | Left Channel Data Input | DATA |
| 13 | Clock Input | CLOCK |
| 14 | -5V Logic Supply | -V _{DD} |
| 15 | Latch Enable Input | LE |
| 16 | Right Channel Data Input | DATA (R) |
| 17 | Digital Common | DCOM |
| 18 | No Connect | NC |
| 19 | Right Channel Voltage Output | VO _{UT} (R) |
| 20 | Right Channel Summing Junction | SJ (R) |
| 21 | Right Channel Analog Common | ACOM |
| 22 | Right Channel Current Output | I _{OUT} (R) |
| 23 | Right Channel Bipolar Offset Decoupling Point | CAP |
| 24 | Right Channel MSB Adjustment | MSB ADJ (R) |
| 25 | Right Channel Servo-Amp Decoupling Point | CAP |
| 26 | MSB Adjustment Potentiometer Voltage Output | VPOT |
| 27 | +5V Analog Supply | +V _{CC} |
| 28 | Digital Common | DCOM |

PIN ASSIGNMENTS (SOIC PKG)

| PIN | DESCRIPTION | MNEMONIC |
|-----|---|----------------------|
| 9 | -5V Analog Supply | -V _{CC} |
| 10 | Left Channel Servo-Amp Decoupling Point | CAP |
| 11 | Left Channel MSB Adjustment | MSB ADJ (L) |
| 19 | No Connect | NC |
| 12 | Left Channel Bipolar Offset Decoupling Point | CAP |
| 13 | Left Channel Current Output | I _{OUT} (L) |
| 14 | Left Channel Analog Common | ACOM |
| 15 | Left Channel Summing Junction | SJ (L) |
| 16 | Left Channel Voltage Output | VO _{UT} (L) |
| 17 | No Connect | NC |
| 18 | +5V Digital Supply | +V _{DD} |
| 20 | Left Channel Data Input | DATA |
| 21 | Clock Input | CLOCK |
| 22 | -5V Logic Supply | -V _{DD} |
| 23 | Latch Enable Input | LE |
| 24 | Right Channel Data Input | DATA (R) |
| 25 | Digital Common | DCOM |
| 26 | No Connect | NC |
| 27 | Right Channel Voltage Output | VO _{UT} (R) |
| 28 | Right Channel Summing Junction | SJ (R) |
| 1 | Right Channel Analog Common | ACOM |
| 2 | Right Channel Current Output | I _{OUT} (R) |
| 3 | Right Channel Bipolar Offset Decoupling Point | CAP |
| 4 | Right Channel MSB Adjustment | MSB ADJ (R) |
| 5 | Right Channel Servo-Amp Decoupling Point | CAP |
| 6 | MSB Adjustment Potentiometer Voltage Output | V _{POT} |
| 7 | +5V Analog Supply | +V _{DD} |
| 8 | Digital Common | DCOM |

NOTE: In the SOIC (PCM1700U) package, the die is rotated 90°. Therefore, the pin assignments are different from the DIP. See pin assignments on page 4 for details.

ORDERING INFORMATION

| | | | |
|------------------------------|---------|-----|-----|
| Basic Model Number _____ | PCM1700 | () | () |
| P: Plastic U: SOIC _____ | | | |
| Performance Grade Code _____ | | | |

ABSOLUTE MAXIMUM RATINGS

| | |
|---|-------------------------|
| DC Supply Voltages | ±7.5VDC |
| Input Logic Voltage | -1V to +V _{CC} |
| Power Dissipation | 500mW |
| Operating Temperature | -25°C to +70°C |
| Storage Temperature | -60°C to +100°C |
| Lead Temperature (soldering, 10s) | +300°C |

PACKAGE INFORMATION

| MODEL | PACKAGE | PACKAGE DRAWING NUMBER ⁽¹⁾ |
|------------|--------------------|---------------------------------------|
| PCM1700U | 28-Pin SOIC | 217 |
| PCM1700U-J | 28-Pin SOIC | 217 |
| PCM1700U-K | 28-Pin SOIC | 217 |
| PCM1700P | 28-Pin Plastic DIP | 126 |
| PCM1700P-J | 28-Pin Plastic DIP | 126 |
| PCM1700P-K | 28-Pin Plastic DIP | 126 |

NOTE: (1) For detailed drawing and dimension table, please see end of data sheet, or Appendix D of Burr-Brown IC Data Book.

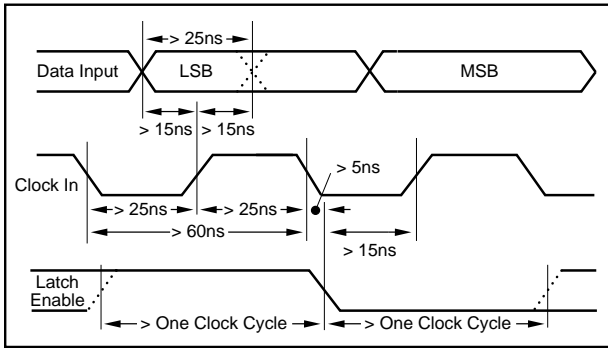


FIGURE 1. PCM1700P Setup and Hold Timing Diagram.

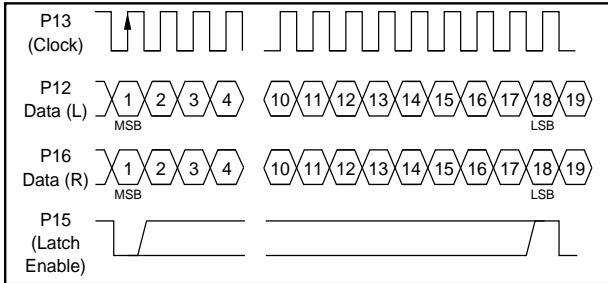


FIGURE 2. Timing Diagram.

| DIGITAL INPUT | ANALOG OUTPUT | | |
|-------------------------------|---------------|--------------------------------------|---------------------------------------|
| Binary Two's Complement (BTC) | DAC Output | Voltage (V) V _{OUT} Mode | Current (mA) I _{OUT} Mode |
| 1FFFF Hex | + FS | +2.99997711 | -0.66999489 |
| 00000 Hex | BPZ | 0.00000000 | 0.00000000 |
| 3FFFF Hex | BPZ - 1LSB | -0.00002289 | +0.00000511 |
| 20000 Hex | - FS | -3.00000000 | +0.67000000 |

TABLE I. PCM1700 Input/Output Relationships.

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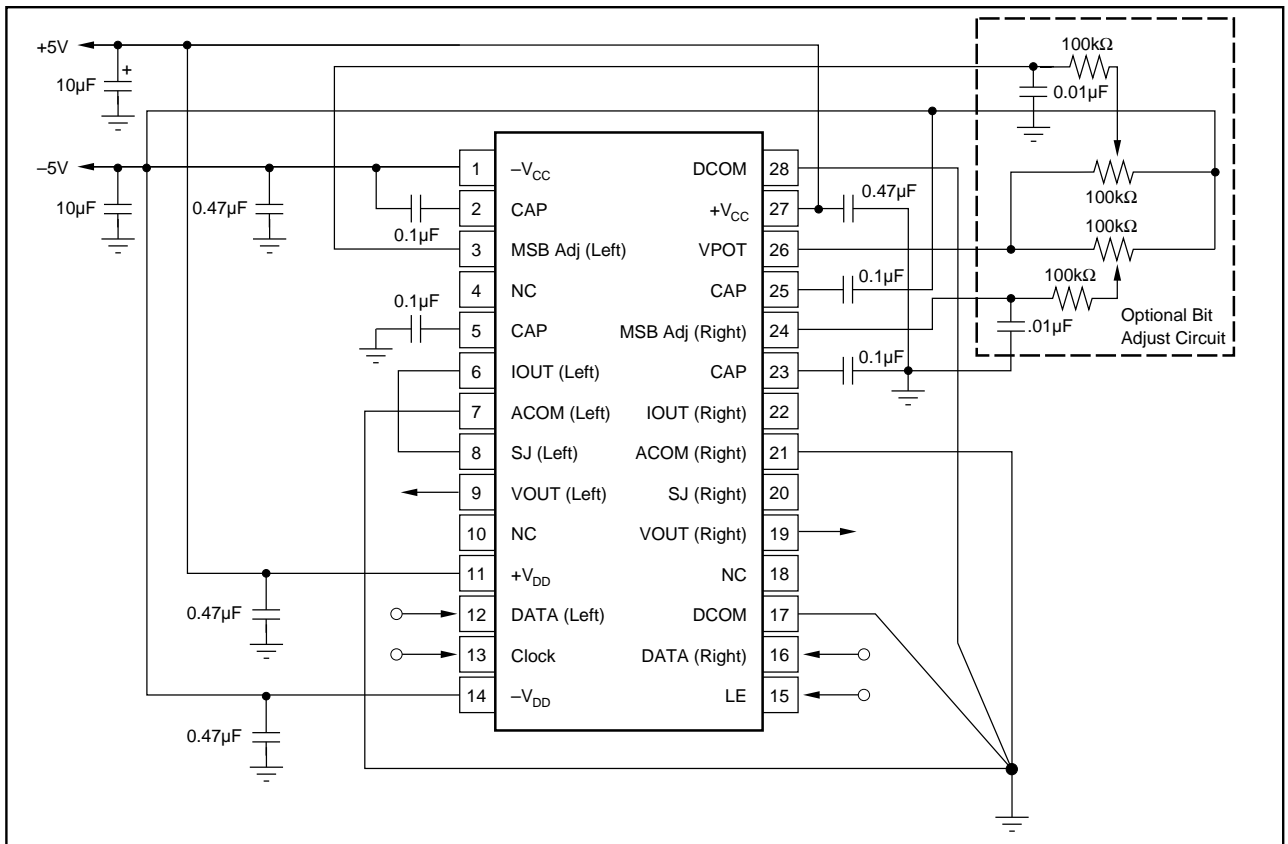


FIGURE 3. Voltage Output Connection Diagram (DIP Package Diagram.)

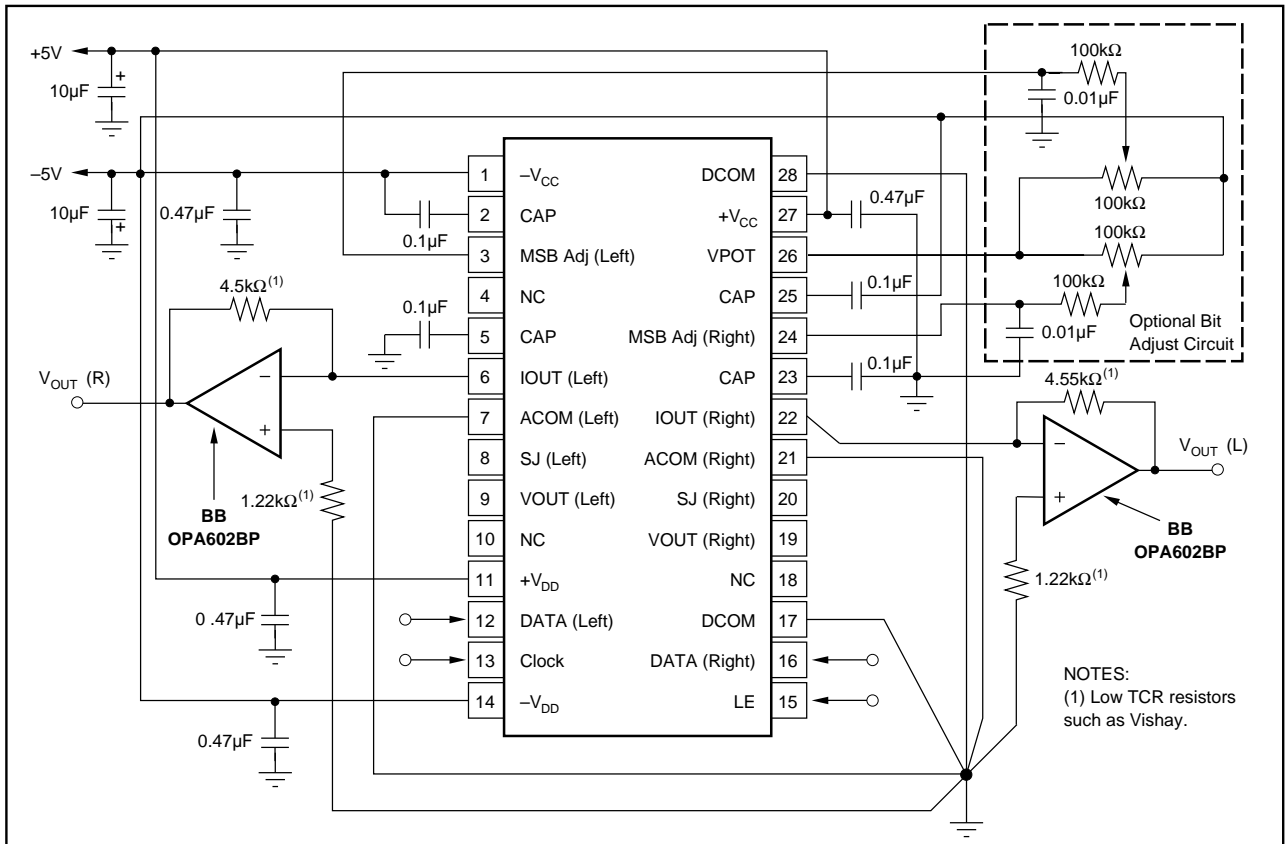


FIGURE 4. Current Output Connection Diagram (DIP Package Diagram.)