



**PCM54**  
**PCM55**

DESIGNED FOR AUDIO

ABRIDGED DATA SHEET

## 16-Bit Monolithic DIGITAL-TO-ANALOG CONVERTERS

### FEATURES

- PARALLEL INPUT FORMAT
- 16-BIT RESOLUTION
- 15-BIT MONOTONICITY (typ)
- -92dB TOTAL HARMONIC DISTORTION (K Grade)
- 3 $\mu$ s SETTLE TIME (Voltage Out)
- 96dB DYNAMIC RANGE
- $\pm$ 3V or  $\pm$ 1mA AUDIO OUTPUT
- OPERATES ON  $\pm$ 5V (PCM55) to  $\pm$ 12V (PCM54) SUPPLIES
- 28-PIN DIP (PCM54)
- 24-LEAD SOIC (PCM55)

### DESCRIPTION

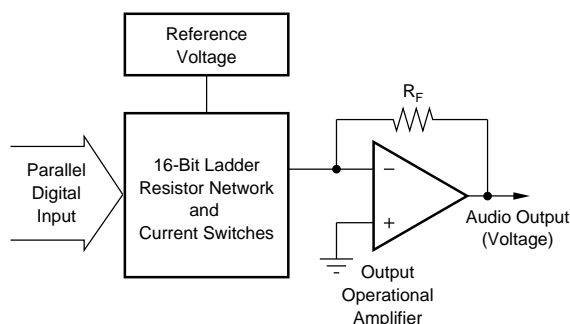
The PCM54 and PCM55 family of converters are parallel input, fully monotonic, 16-bit digital-to-analog converters that are designed and specified for digital audio applications. These devices employ ultra-stable nichrome (NiCr) thin-film resistors to provide monotonicity, low distortion, and low differential linearity error (especially around bipolar zero) over long periods of time and over the full operating temperature.

These converters are completely self-contained with a stable, low noise, internal, zener voltage reference; high speed current switches; a resistor ladder network; and a fast settling, low noise output operational amplifier all on a single monolithic chip. The

converters are operated using two power supplies that can range from  $\pm$ 5V (PCM55) to  $\pm$ 12V (PCM54). Power dissipation with  $\pm$ 5V supplies is typically less than 200mW. Also included is a provision for external adjustment of the MSB error (differential linearity error at bipolar zero, PCM54 only) to further improve THD specifications if desired.

A current output ( $I_{OUT}$ ) wiring option is provided. This output typically settles to within  $\pm$ 0.006% of FSR final value in 350ns (in response to a full-scale change in the digital input code).

The PCM54 is packaged in 28-pin plastic DIP package. The PCM55 is available in a 24-pin plastic mini-flatpak.



International Airport Industrial Park • Mailing Address: PO Box 11400 • Tucson, AZ 85734 • Street Address: 6730 S. Tucson Blvd. • Tucson, AZ 85706  
Tel: (520) 746-1111 • Twx: 910-952-1111 • Cable: BBRCORP • Telex: 066-6491 • FAX: (520) 889-1510 • Immediate Product Info: (800) 548-6132

# SPECIFICATIONS

## ELECTRICAL

At +25°C,  $\pm V_{CC} = 12V$ , unless otherwise noted.

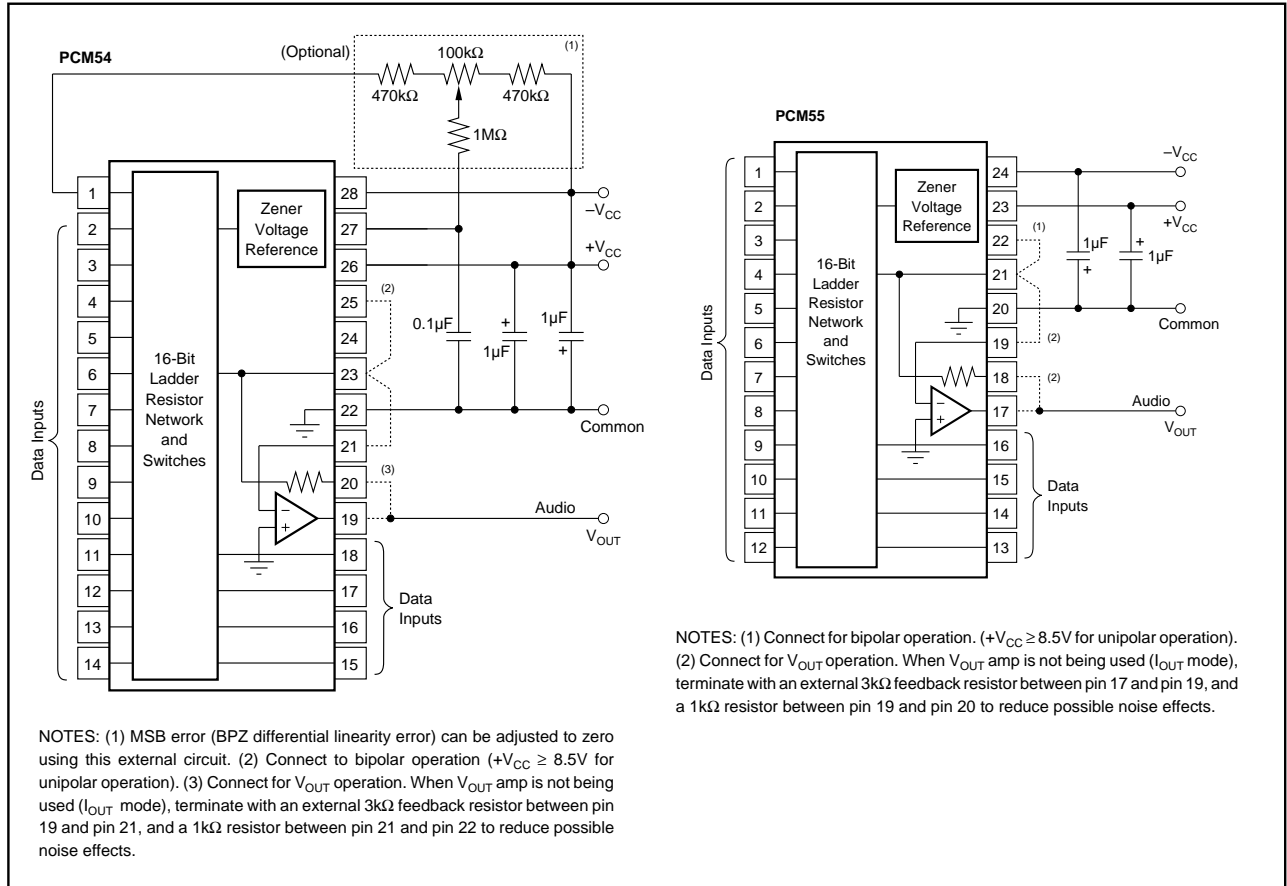
PARAMETER	PCM54HP, PCM55HP			PCM54JP, PCM55JP			PCM54KP			UNITS
	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
<b>DIGITAL INPUTS</b>										
Resolution		16			*			*		Bits
Dynamic Range		96			*			*		dB
Logic Levels (TTL/CMOS Compatible):										
$V_{IH}$	+2.4		+5.25	*		*	*		*	V
$V_{IL}$	0		+0.8	*		*	*		*	V
$I_{IH}, V_{IN} = +2.7V$			+40			*			*	$\mu A$
$I_{IL}, V_{IN} = +0.4V$			-0.5			*			*	mA
<b>TRANSFER CHARACTERISTICS</b>										
<b>ACCURACY</b>										
Gain Error		$\pm 2$			*			*		%
Bipolar Zero Error		$\pm 30$			*			*		mV
Differential Linearity Error at Bipolar Zero <sup>(1)</sup>		$\pm 0.001$			*			*		% FSR <sup>(2)</sup>
Noise (rms) (20Hz to 20kHz) at Bipolar Zero		12			*			*		$\mu V$
<b>TOTAL HARMONIC DISTORTION<sup>(3)</sup></b> (16-Bit Resolution)										
$V_O = \pm FS$ at $f = 991Hz$		-94	-82		*	-88	*	*	-92	dB
$V_O = -20dB$ at $f = 991Hz$		-74	-68		*	*	*	-80	-74	dB
$V_O = -60dB$ at $f = 991Hz$		-34	-28		*	*	*	-40	-34	dB
<b>MONOTONICITY</b>		15			*			*		Bits
<b>SETTLING TIME</b> (to $\pm 0.006\%$ of FSR)										
Voltage Output: 6V Step		3			*			*		$\mu s$
1LSB Step		1			*			*		$\mu s$
Current Output (1mA Step): 10 $\Omega$ to 100 $\Omega$ Load		350			*			*		ns
1k $\Omega$ Load <sup>(4)</sup>		350			*			*		ns
Deglitcher Delay (THD Test) <sup>(5)</sup>		2.5	4		*	*		*	*	$\mu s$
Slew Rate		10			*			*		V/ $\mu s$
<b>WARM-UP TIME</b>	1			*			*			Min
<b>ANALOG OUTPUT</b>										
Voltage Output: Bipolar Range		$\pm 3$			*			*		V
Output Current	$\pm 2$			*			*			mA
Output Impedance		0.1			*			*		$\Omega$
Short-Circuit Duration		Indefinite to Common			*			*		
Current Output: <sup>(6)</sup>										
Bipolar Range ( $\pm 30\%$ )		$\pm 1$			*			*		mA
Bipolar Output Impedance ( $\pm 30\%$ )		1.2			*			*		k $\Omega$
<b>POWER SUPPLY REQUIREMENTS</b>										
Voltage: $+V_{CC}$ (PCM54)	+4.75	+12	+15.75	*	*	*	*	*	*	V
$-V_{CC}$ (PCM54)	-4.75	-12	-15.75	*	*	*	*	*	*	V
$+V_{CC}$ (PCM55)	+4.75	+5	+7.5	*	*	*	*	*	*	V
$-V_{CC}$ (PCM55)	-4.75	-5	-7.5	*	*	*	*	*	*	V
Supply Drain: $+V_{CC}$		+13	+20		*	*		*	*	mA
$-V_{CC}$		-16	-25		*	*		*	*	mA
<b>TEMPERATURE RANGE</b>										
Operating	0		+70	*		*	*		*	$^{\circ}C$
Storage	-55		+100	*		*	*		*	$^{\circ}C$

\* Specifications same as for PCM54HP.

NOTES: (1) Externally adjustable. If external adjustment is not used, connect a 0.01 $\mu F$  capacitor to Common to reduce noise pickup. (2) FSR means Full-Scale Range and is 6V for  $\pm 3V$  output. (3) The measurement of total harmonic distortion is highly dependent on the characteristics of the measurement circuit. Burr-Brown may calculate THD from the measured linearity errors using equation 2 in the section on "Total Harmonic Distortion," but specifies that the maximum THD measured with the circuit shown in Figure 2 will be less than the limits indicated. (4) Measured with an active clamp to provide a low impedance for approximately 200ns. (5) Deglitcher or sample/hold delay used in THD measurement test circuit. See Figures 2 and 3. (6) Output amplifier disconnected.

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## CONNECTION DIAGRAMS



## PIN ASSIGNMENTS

PIN	PCM54-DIP	PIN	PCM54-DIP
1	Trim	15	Bit 13
2	Bit 1 (MSB)	16	Bit 14
3	Bit 2	17	Bit 15
4	NC	18	Bit 16 (LSB)
5	Bit 3	19	$V_{OUT}$
6	Bit 4	20	$R_{FB}$
7	Bit 5	21	SJ
8	Bit 6	22	Common
9	Bit 7	23	$I_{OUT}$
10	Bit 8	24	NC
11	Bit 9	25	$I_{BPO}$
12	Bit 10	26	$+V_{CC}$
13	Bit 11	27	MSB Adjust
14	Bit 12	28	$-V_{CC}$

## PACKAGE INFORMATION

MODEL	PACKAGE	PACKAGE DRAWING NUMBER <sup>(1)</sup>
PCM54HP	28-Pin DIP	215
PCM54JP	28-Pin DIP	215
PCM54KP	28-Pin DIP	215
PCM55HP	24-Pin SOIC	178
PCM55JP	24-Pin SOIC	178

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

## PIN ASSIGNMENTS

PIN	PCM55-SOIC	PIN	PCM55-SOIC
1	Bit 1 (MSB)	13	Bit 13
2	Bit 2	14	Bit 14
3	Bit 3	15	Bit 15
4	Bit 4	16	Bit 16
5	Bit 5	17	$V_{OUT}$
6	Bit 6	18	Feedback Resistor
7	Bit 7	19	Summing Junction
8	Bit 8	20	Common
9	Bit 9	21	Current Output
10	Bit 10	22	Bipolar Offset
11	Bit 11	23	$+V_{CC}$
12	Bit 12	24	$-V_{CC}$

## ABSOLUTE MAXIMUM RATINGS

DC Supply Voltage	$\pm 18VDC$
Input Logic Voltage	-1V to +5.5V
Power Dissipation	PCM54 800mW, PCM55 400mW
Storage Temperature	-55°C to +100°C
Lead Temperature, (soldering, 10s)	+300°C

## ORDERING INFORMATION

MODEL	THD at FS	PACKAGE
PCM54HP	0.008	28-pin DIP
PCM54JP	0.004	28-pin DIP
PCM54KP	0.0025	28-pin DIP
PCM55HP	0.008	24-lead SOIC
PCM55JP	0.004	24-lead SOIC