

# MN88831

## PCM Audio Decoder LSI for Satellite Broadcasting Tuners (Includes Built-In Digital Filter and D/A Converter)

### ■ Overview

The MN88831 greatly streamlines set design by incorporating a satellite broadcasting PCM audio decoder, a switched capacitor D/A converter, and analog post filter to a single chip.

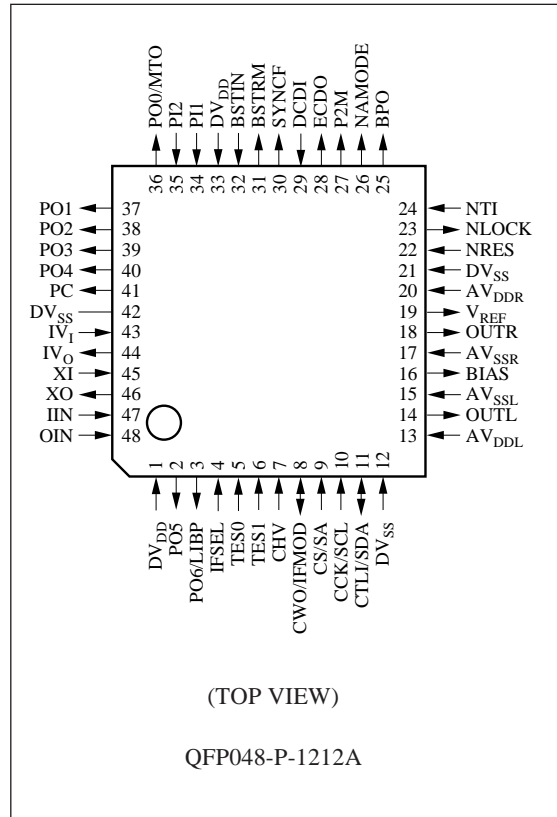
### ■ Features

- Built-in digital filter using 8-fold oversampling
- Built-in tertiary  $\Delta$ - $\Sigma$  noise shaping D/A converter
- Reduced jitter noise through use of switched capacitor configuration
- Built-in analog post filter
- Built-in digital de-emphasis circuit
- Choice of microcomputer interfaces with selector pin:
  - 3-wired serial interface or I<sup>2</sup>C interface
- Muting function supporting following settings
  - Pay-per-view flag detection
  - Error frequency detection
  - Detection of control code bit-7
- Built-in general-purpose microcomputer I/O port
- Bit stream input pin supporting 0.4 V<sub>p-p</sub> input

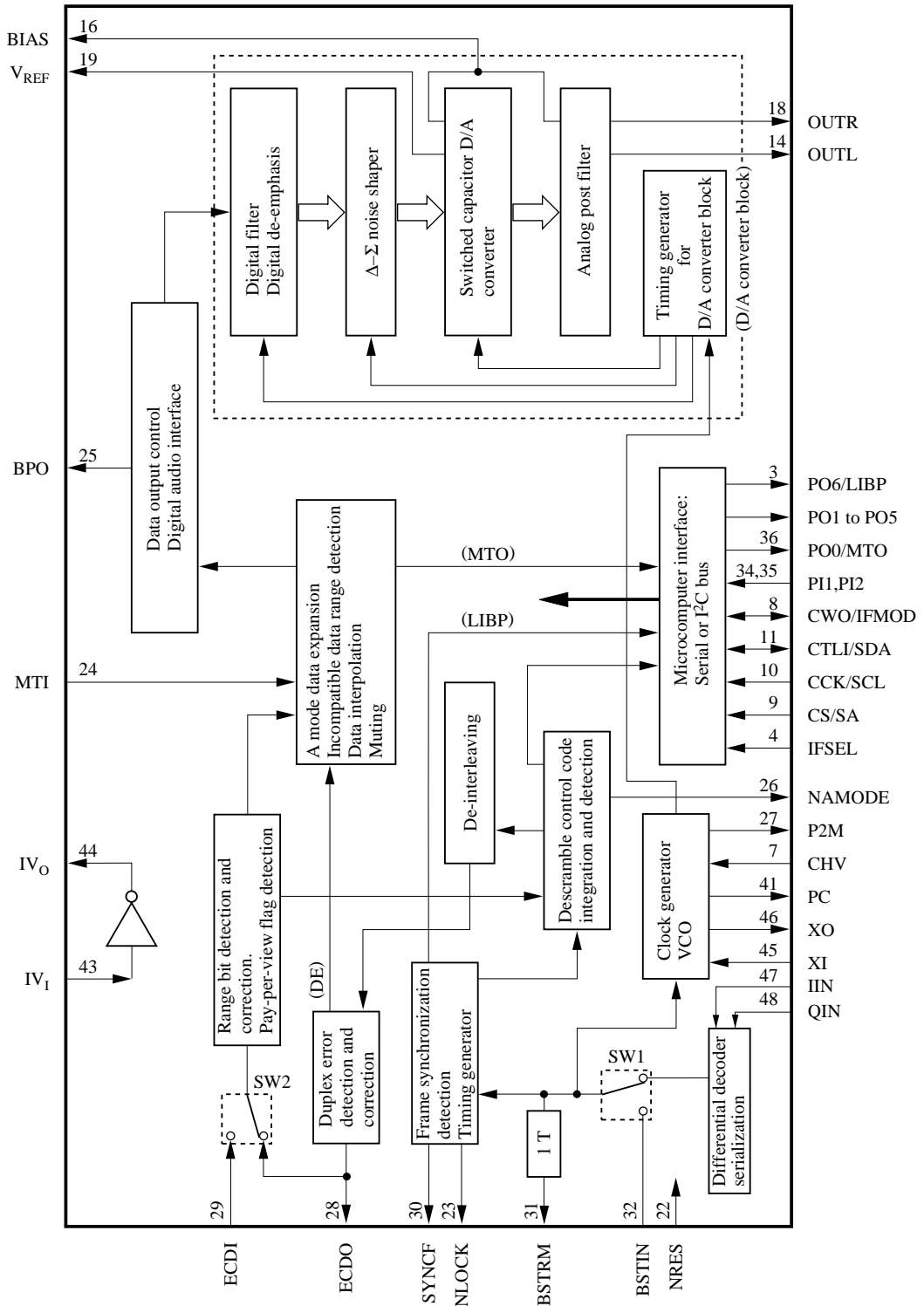
### ■ Applications

- Satellite broadcasting tuners (BS, CS)

### ■ Pin Assignment



■ Block Diagram



### ■ Absolute Maximum Ratings

| Parameter             | Symbol    | Ratings                 | Unit |
|-----------------------|-----------|-------------------------|------|
| Power supply voltage  | $V_{DD}$  | - 0.3 to 7.0            | V    |
| Input voltage         | $V_I$     | - 0.3 to $V_{DD} + 0.3$ | V    |
| Output voltage        | $V_O$     | - 0.3 to $V_{DD} + 0.3$ | V    |
| Output current        | $I_O$     | 25                      | mA   |
| Power dissipation     | $P_D$     | 480                     | mW   |
| Operating temperature | $T_{opr}$ | -20 to +70              | °C   |
| Storage temperature   | $T_{stg}$ | -55 to +125             | °C   |

Notes:

1. The above ratings represent the maximum values that may be applied without damaging the chip, not the limits for guaranteed operation.
2. If the chip is to be used in the presence of strong electric fields—under a CRT tube, for example—apply shielding to the package surface to ensure proper operation.
3. The power dissipation is for an ambient temperature ( $T_a$ ) of 70°C.
4. The voltages applied to the pins CCK/SCL, CTLI/SDA, CWO/IFMOD, PO0/MTO, PO1–PO5, and PO6/LIBP must be within the range between -0.3V and 5.5V when the power is off.

### ■ Operating Conditions

$$DV_{SS}=AV_{SS}=0V$$

| Parameter                                 | Symbol    | Test Conditions      | min  | typ    | max | Unit      |
|---|-----------|----------------------|------|--------|-----|-----------|
| Power supply voltage for digital circuits | $DV_{DD}$ | (*1)                 | 4.5  | 5.0    | 5.5 | V         |
| Power supply voltage for analog circuits  | $AV_{DD}$ | (*2)                 | 4.5  | 5.0    | 5.5 | V         |
| XI clock frequency                        | $f_{XI}$  | CHV="H" (256fs mode) |      | 12.288 |     | MHz       |
| XI clock frequency                        | $f_{XI}$  | CHV="L" (384fs mode) |      | 18.432 |     | MHz       |
| XI clock input amplitude                  | —         | C cut input          | 0.8  |        | 3.0 | $V_{P-P}$ |
| BSTIN input amplitude                     | —         | C cut input          | 0.35 | 0.5    |     | $V_{P-P}$ |
| Ambient temperature during operation      | $T_a$     |                      | -20  |        | +70 | °C        |

Notes:

1. \*1 & \*2:

For the logic portions of the microcomputer interface,  $DV_{DD} \text{ min} = 4.0V$ .

$AV_{DD}$  covers both  $AV_{DDL}$  and  $AV_{DDR}$ .

$AV_{SS}$  covers both  $AV_{SSL}$  and  $AV_{SSR}$ .

Analog characteristics are only guaranteed for  $DV_{DD} = AV_{DD} = 5.0V$ .

2. Always use low-impedance external connections for  $V_{DD}$  and  $V_{SS}$ .  
Always connect the two through a bypass capacitor of at least 0.01  $\mu F$  to ensure proper operation.
3. Keep the NRES pin (pin No. 22) at "L" level to prevent operation error of the CTLI/SDA pin in the I<sup>2</sup>C interface at voltages lower than the guaranteed operating power supply voltage.

## ■ Electrical Characteristics

### (1) DC characteristics

$AV_{DD}=DV_{DD}=4.5$  to  $5.5V$ ,  $AV_{SS}=DV_{SS}=0V$ ,  $T_a = -20$  to  $+70^{\circ}C$

| Parameter                             | Symbol     | Test Conditions  | min                  | typ                           | max                  | Unit    |
|---------------------------------------|------------|--|----------------------|-------------------------------|----------------------|---------|
| Power supply current                  | $I_{DD1}$  | No load, $V_{DD}=5.5V$<br>384fs                                |                      | 56                            | 80                   | mA      |
|                                       | $I_{DD2}$  | No load, $V_{DD}=5.5V$<br>256fs                                |                      | 56                            | 80                   | mA      |
| Digital input pins 1 (*1)             |            |  |                      |                               |                      |         |
| "H" level input voltage               | $V_{IH1}$  |  | $0.7 \times DV_{DD}$ |                               | $DV_{DD}$            | V       |
| "L" level input voltage               | $V_{IL1}$  |  | $DV_{SS}$            |                               | $0.3 \times DV_{DD}$ | V       |
| Digital input pins 2 (*2)             |            |  |                      |                               |                      |         |
| "H" level input voltage               | $V_{IH2}$  |  | $0.8 \times DV_{DD}$ |                               | $DV_{DD}$            | V       |
| "L" level input voltage               | $V_{IL2}$  |  | $DV_{SS}$            |                               | $0.2 \times DV_{DD}$ | V       |
| Digital output pins 1 (*3)            |            |  |                      |                               |                      |         |
| "H" level output voltage              | $V_{OH1}$  | $I_{OH1} = -1mA$   | $DV_{DD} - 0.8$      |                               |                      | V       |
| "L" level output voltage              | $V_{OL1}$  | $I_{OL1} = +1mA$   |                      |                               | 0.5                  | V       |
| Digital output pins 2 (*4)            |            |  |                      |                               |                      |         |
| "L" level output voltage              | $V_{OL2}$  | $I_{OL2} = +1mA$   |                      |                               | 0.5                  | V       |
| High-impedance output leakage current | $I_{LO}$   | $V_O = \text{High-impedance state}$<br>$V_I = 0V$ to $DV_{DD}$ |                      |                               | $\pm 10$             | $\mu A$ |
| Digital output pins 3 (*5)            |            |  |                      |                               |                      |         |
| "L" level output voltage              | $V_{OL3}$  | $I_{OL3} = +1mA$   |                      |                               | 0.5                  | V       |
| High-impedance output leakage current | $I_{LO2}$  | $V_I = 0V$ to $DV_{DD}$<br>$V_{NRES} = 0V$ to $0.5V$           |                      |                               | $\pm 50$             | $\mu A$ |
| Analog output pins                    |            |  |                      |                               |                      |         |
| VREF pin output pin                   | $V_{REF}$  |  |                      | $0.45 \times AV_{DD}$         |                      | V       |
| BIAS pin output pin                   | $V_{BIAS}$ |  |                      | $0.5 \times AV_{DD}$          |                      | V       |
| IVI-IVO inverter                      |            |  |                      |                               |                      |         |
| Inverter input threshold voltage      | $V_{TI}$   |  |                      | $0.5 \times DV_{DD} \pm 0.75$ |                      | V       |

Notes:

\*1: IFSEL, TES0, TES1, CHV, MTI, ECDI, PI1, PI2, IIN, QIN, CWO/IFMOD (C3, C4 only), IVI (C5 only)

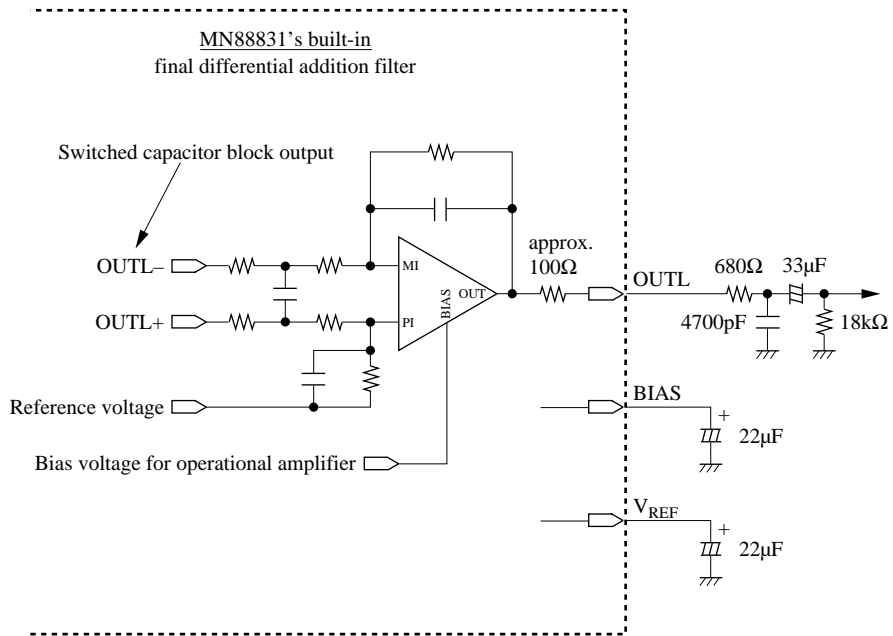
\*2: CS/SA, CCK/SCL, NRES, CTLI/SDA (C6, C7 only)

\*3: NLOCK, BPO, NAMODE, P2M, ECDO, SYNCF, BSTRM, PC

\*4: PO0/MTO, PO1 to PO6, CWO/IFMOD, PC (C12 only)

\*5: CTLI/SDA

■ Application Circuit Example



Structure of Analog Post Filter and Sample Analog Connections

■ Package Dimensions (Unit: mm)

QFP048-P-1212A

