# CS-7204

# 5V, 4 Channel, 2 Terminal Thin Film Read/Write Preamplifier

## Description

The CS-7204 is a 4 channel, Read/Write preamplifier used in two terminal thin film or monofilar ferrite heads. The IC operates from a single 5V supply and has low power standby state that consumes 7.5mW (typ). Optional 400Ω head damping resistors are included on chip.

The magnitude of the write current is set by an external resistor (RWC), connected between the WC pin and ground. When the IC switches to write mode, current flows into the X side of the heads.

The read function uses a low noise differential amplifier with a gain of 200. During READ, the current generator and the WRITE UNSAFE functions are disabled.

The CS-7204 includes two protection features. The POWER FLT detector disables the write current generator whenever the supply voltage falls below 4V as well as during power up and power down. The WRITE UNSAFE function sets a flag when there is an open or shorted head condition, the WDI frequency is too low, no write current exists, or the IC is in read or standby mode.

## Features

**Works with 2 Terminal Thin Film Heads**

**Operates from 5V Supply**

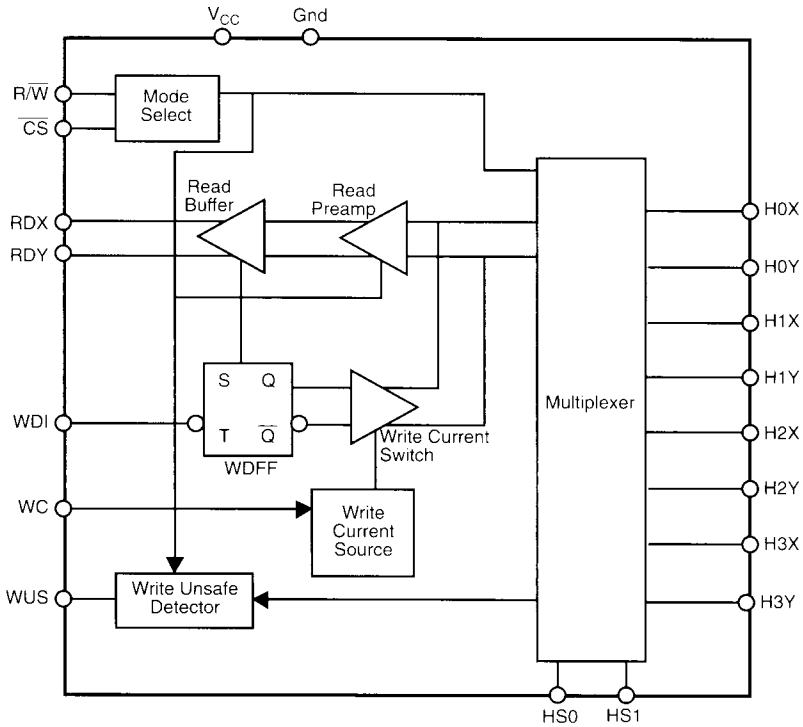
**Externally programmable Write Current**

**Low Noise, High Gain (200) Read Preamplifiers**

**Write Unsafe Detection**

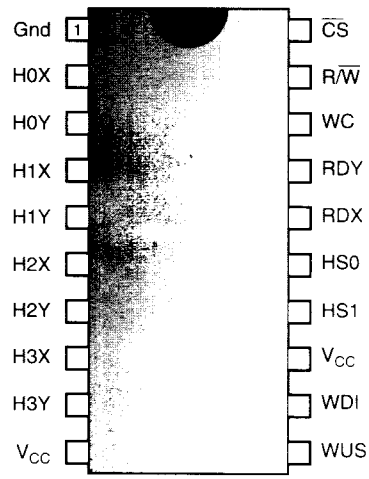
**Power Fault Detection**

## Block Diagram




## Package Options

**16 & 20 Lead SO Wide Body**

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## Absolute Maximum Ratings

| | |
|---|---|
| Power Supply | -0.3 to 7V |
| Logic Input Voltage | -0.3 to $V_{CC}$+0.3V |
| Logic Output Voltage | -0.3 to V to 7V |
| Write Current | 60mA |
| Output Current (RDX, RDY) | -10mA |
| Output Current (WUS) | 12mA |
| Operating Temperature Range | 0°C to 70°C |
| Junction Temperature | 150°C |
| Storage Temperature Range | -65°C to 150°C |

## Electrical Characteristics: $V_{CC}$ =4.25V to 5.5V; TA = 0°C to 70°C unless otherwise noted

| PARAMETER | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|
| **■ DC Characteristics** | | | | | |
| $V_{CC}$ Supply Current | Read Mode | | 33 | 42 | mA |
| | Write Mode | | 42+IW | 50+IW | mA |
| | Idle Mode | | 1.5 | 2.5 | mA |
| Power Dissipation | Read Mode | | 165 | 230 | mW |
| | Write Mode; IW=20mA | | 310 | 385 | mW |
| | Idle Mode | | 7.5 | 14 | mW |
| **■ Logic Functions** | | | | | |
| Input Low Voltage | | | | 0.8 | V |
| Input High Voltage | | 2.0 | | | V |
| Input Low Current | VINLOW=0.4V | -160 | | | uA |
| Input High Current | VINHIGH=2.4V | | | 80 | uA |
| WUS Output Low Voltage | | | | 0.5 | V |
| WUS Output High Current | VOUTHIGH=5.0V | | | 100 | uA |
| $V_{CC}$ Fault Voltage | | 3.7 | 4.0 | 4.2 | V |
| **■ Read Function** | | | | | |
| Diff Voltage Gain | VIN=1mVPP;f=1MHz | 167 | 200 | 233 | V/V |
| Bandwidth | -1dB | 25 | 40 | | MHz |
| | -3dB | 35 | 60 | | MHz |
| Input Noise Voltage | BW=15MHz | | 0.60 | 0.85 | nV/Hz |
| Diff Input Capacitance | VIN=1mVPP;f=5MHz | | 19 | 23 | pF |
| Diff Input Resistance | VIN=1mVPP;f=5MHz | 380 | 1000 | | Ω |
| Dynamic Range | f=5MHz; gain falls to 90% | 4 | | | mVpp |
| CMMR | VIN=0VDC+100mVpp;f=5MHz | 50 | 75 | | dB |
| Channel Separation | VIN=0VDC+20mVpp | 45 | 60 | | dB |
| Output Offset Voltage | | -300 | | 300 | mV |
| Single Ended Output Resistance | f=5MHz | | | 50 | Ω |
| Output Current | AC Coupled Load | 1.5 | | | mA |
| RDX,RDY CM Output Voltage | | | $V_{CC}$-2.3 | | V |
| Read to Write CM Output Change | | -350 | | 350 | mV |
| Power Supply Rejection Ratio | 100mVPP; f=5mHZ | 45 | 70 | | dB |

## Electrical Characteristics: continued

| PARAMETER | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|
| **■ Write Function** | | | | | |
| Diff Head Voltage Swing | | 4 | | | Vpp |
| Unselected Peak Head Current | | | 1 | | mApk |
| Head Diff Load Capacitance | | | | 25 | pF |
| Head Diff Load Resistance | | 3200 | | | Ω |
| WDI Transition Frequency | WUS=low | 1.0 | | | MHz |
| Write Current Range | | 10 | | 40 | mA |
| Write Current Gain | | | 20 | | mA/mA |
| Write Current Voltage | | | 2.50 | | V |
| Write Current Constant | | 46 | 50 | 54 | V |
| Write Current Tolerance | 10mA<=IW<=40mA | -8 | | 8 | % |
| RDX, RDY CM Output Voltage | | | $V_{CC}$-2.3 | | V |
| **■ Switching Characteristics** | | | | | |
| Read to Write | R/W to 90% IW | | 0.1 | 1.0 | us |
| Write to Read | R/W to 90% Read Envelope | | 0.5 | 1.0 | us |
| Unselect to Select | CS to 90% of IW | | | 0.6 | us |
| Select to Unselect | CS to 10% of IW | | | 0.6 | us |
| Head Select | HSX to 90% of Read Envelope | | | 0.6 | us |
| Safe to Unsafe | | 0.6 | 3.1 | 4.5 | us |
| Unsafe to Safe | | | | 1.0 | us |
| WDI to Ix-Iy | from 50% points | | | 30 | ns |
| Asymmetry | WDI 1ns Rise/Fall | | | 1.0 | ns |
| Rise/Fall Time | Lh=0; Rh=0 | | | 8 | ns |
| | Lh=1uH;Rh=30Ω | | | 24 | ns |

## Package Pin Description

| PACKAGE PIN # | | PIN SYMBOL | FUNCTION |
|---|---|---|---|
| 16L SO | 20L SO | | |
| 1 | 1 | Gnd | Ground connection |
| 2 | 2 | H0X | Read/Write head 0 connection |
| 3 | 3 | H0Y | Read/Write head 0 connection |
| 4 | 4 | H1X | Read/Write head 1 connection |
| 5 | 5 | H1Y | Read/Write head 1 connection |
| | 6 | H2X | Read/Write head 2 connection |
| | 7 | H2Y | Read/Write head 2 connection |
| | 8 | H3X | Read/Write head 3 connection |
| | 9 | H3Y | Read/Write head 3 connection |
| 6, 10 | 10, 13 | $V_{CC}$ | Positive power supply; 4.25V to 5.50V. |
| 8 | 11 | WUS | Write unsafe output; a high indicates an unsafe write condition |
| 9 | 12 | WDI | Write data input |

## Package Pin Description: continued

| PACKAGE PIN # | | PIN SYMBOL | FUNCTION |
|---|---|---|---|
| 16L SO | 20L SO | | |
| | 14 | HS1 | Head Select 1 |
| 11 | 15 | HS0 | Head Select 0 |
| 12 | 16 | RDX | Read amplifier output |
| 13 | 17 | RDY | Read amplifier output |
| 14 | 18 | WC | Write current programming pin |
| 15 | 19 | R/W | Read/Write mode select, a low selects write mode |
| 16 | 20 | CS | Chip select; a low enables the chip |
| 7 | | NC | No connection |

## Circuit Description

### Circuit Operation

The CS-7204 addresses a 2-terminal, thin-film recording head, providing switched write current in the write mode, or data amplification in the read mode. Head selection and mode control is determined by the head selection lines, HS1, HS2 and mode control lines, CS, R/W as shown in tables 1 and 2. Internal resistor pullups, provided on the CS and R/W lines, will force the device into a non-write condition if either control line opens up.

### Write Mode

In the write mode, CS-7204 acts as a write current switch with the write unsafe (WUS) detection circuitry activated. Write current is toggled between the X and Y side of the selected head on each high to low transition on the Write Data Flip-Flop (WDFF) so that upon switching to the write mode, the write current flows into the "X" side of the head.

The write current magnitude is determined by an external resistor (RWC) connected between the WC pin and Ground. An internally generated reference voltage is present at the WC pin. The magnitude of the Write Current (0-PK, +/-8%) is:

$$I_W = K_W/R_{WC} = 50/R_{WC}$$

Power supply fault protection ensures data security on the disk by disabling the write current source during a power supply voltage fault or by supply power up/down conditions. Additionally, the write unsafe (WUS) detection circuitry will flag any of the conditions listed below, as a high level on the WUS line.

### Read Mode

In the read mode, the CS-7204 acts as a low noise differential amplifier for signals coming off the disk. The write current generator and write unsafe circuitry is deactivated. The RDX, RDY pins are emitter follower outputs and are in phase with "X" and "Y" head ports. These outputs should be AC coupled to the load. The RDX, RDY common mode output voltage is constant , minimizing the transient between read and write mode, thereby, substantially reducing the recovery time in the Pulse Detector circuit connected to these outputs.

**Table 1: Mode Select**

| CS | R/W | Mode |
|---|---|---|
| 0 | 0 | Write/Awake |
| 0 | 1 | Read/Awake |
| 1 | X | Sleep |

**Table 2: Head Select**

| HS0 | HS1 | Head |
|---|---|---|
| 0 | 0 | 0 |
| 1 | 0 | 1 |
| 0 | 1 | 2 |
| 1 | 1 | 3 |

## Package Specification

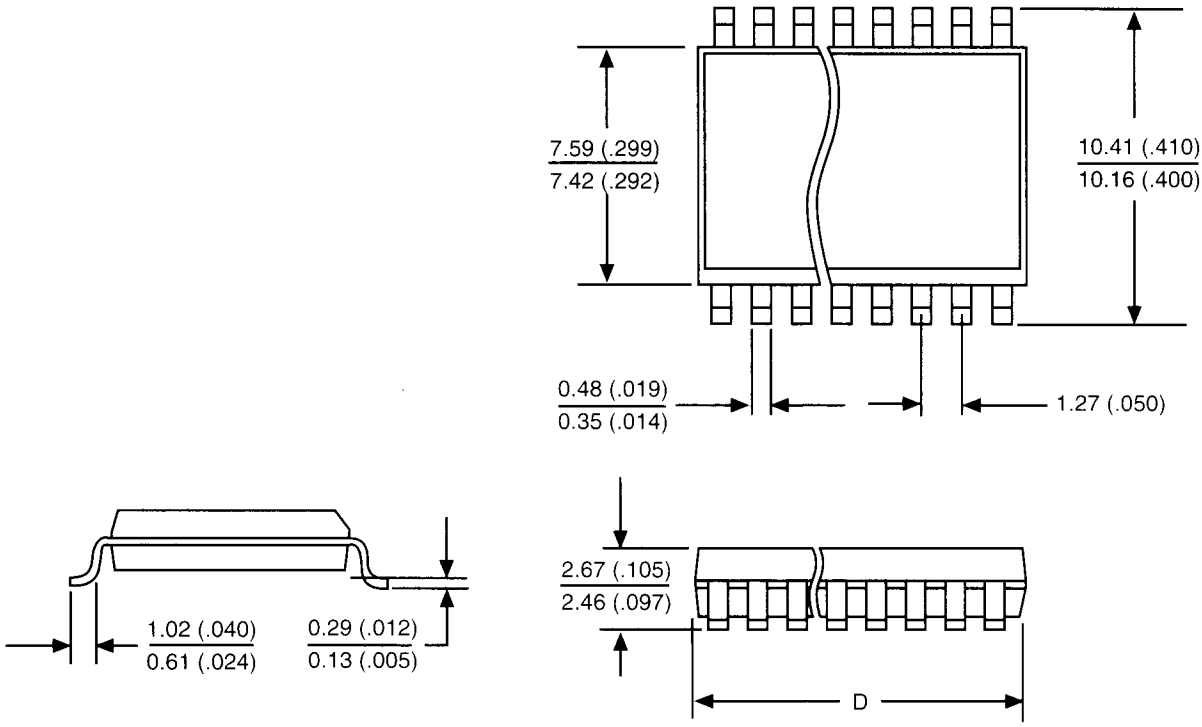
### PACKAGE DIMENSIONS IN mm (INCHES)

| | D | | | |
|---|---|---|---|---|
| Lead Count | Metric | | English | |
| | Max | Min | Max | Min |
| 16L SO | 10.46 | 10.21 | .412 | .402 |
| 20L SO | 12.95 | 12.70 | .510 | .500 |

### PACKAGE THERMAL DATA

| Thermal Data | | 16L SO | 20L SO | |
|---|---|---|---|---|
| $R\Theta_{JC}$ | typ | 23 | 17 | °C/W |
| $R\Theta_{JA}$ | typ | 105 | 90 | °C/W |

16L and 20L SO




### Ordering Information

| Part Number | Description |
|---|---|
| CS-7204DW20 | 20L SO Wide Body |
| CS-7204DW16 | 16L SO Wide Body |

### Preliminary

This product is in the preproduction stages of the design process. The data sheet contains preliminary data. CSC reserves the right to make changes to the specifications without notice. Please contact CSC for the latest available information.