
British Standard

Semiconductor devices

Part 2. Integrated circuits

Section 2.4 Recommendations for interface integrated circuits

National foreword

This Section of BS 6493 has been prepared under the direction of the Electronic Components Standards Committee. It is identical with IEC Publication 748-4 'Semiconductor devices. Integrated circuits Part 4. Interface integrated circuits' published in 1987 by the International Electrotechnical Commission (IEC).

This British Standard constitutes Section 2.4 of the British Standard for semiconductor devices (BS 6493). BS 6493 is identical with IEC Publication 747, 748 and 749 and will be issued in a series of separately published Sections corresponding to the individual parts of the IEC publications.

Terminology and conventions. The text of the international standard has been approved as suitable for publication as a British Standard without deviation. Some terminology and certain conventions are not identical with those used in British Standards; attention is drawn especially to the following.

Wherever page numbers are quoted, they are IEC page numbers.

Cross-references

International standards	Corresponding British Standards
	BS 6493 Semiconductor devices.
IEC 747-1 : 1983	Part 1 Discrete devices Section 1.1 : 1984 General (Identical)
IEC 748-1 : 1984	Part 2 Integrated circuits Section 2.1 : 1985 General (Identical)
IEC 748-2 : 1985	Section 2.2 : 1986 Recommendations for digital integrated circuits (Identical)
IEC 748-3 : 1986	Section 2.3 : 1987 Recommendations for analogue integrated circuits (Identical)

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Amendment No. 1
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to BS 6493 : Section 2.4 : 1989

Semiconductor devices
Part 2. Integrated circuits
Section 2.4 Recommendations for interface
integrated circuits

AMD 7036
Amendment No. 1
to IEC 748-4 : 1987

NOTE. This amendment implements Amendment No. 1 published in October 1991 to IEC Publication 748-4. Consequent amendments to the contents list and national foreword have also been made.

Revised text

AMD 7036
August 1992

National foreword

In line 2, after the title of IEC 748-4, insert ' as amended by Amendment No. 1 published in October 1991, '.

AMD 7036
August 1992

Contents

After the entry for section two of chapter III, insert the following new entries.

` SECTION THREE - CATEGORY III (CONTROL CIRCUITS FOR SWITCH-MODE POWER SUPPLIES)

- 1. General**
- 2. Electrical and functional description of the circuits**
- 3. Ratings (limiting values), electrical and thermal**
- 4. Recommended operating conditions**
- 5. Electrical characteristics**
 - 5.1 Characteristics at an ambient or case temperature of 25 °C**
 - 5.2 Effects of supply voltage or temperature variations on the essential characteristics**
- 6. Mechanical ratings, characteristics and other data**
- 7. Handling precautions**
- 8. Application data, supplementary information**

SECTION FOUR - CATEGORY IV (COMPANDING PCM CODER-DECODERS [CODEC'S])

General

- 1. Circuit identification and description**
- 2. Functional specification**
- 3. Ratings (limiting values)**
- 4. Recommended operating conditions**

5. Electrical characteristics
 - 5.1 Static characteristics
 - 5.2 Dynamic characteristics
 - 5.3 Transmission characteristics (synchronous or asynchronous)
6. Mechanical ratings, characteristics and other data
7. Supplementary information

**SECTION FIVE - CATEGORY IV
(FILTERS FOR COMPANDING PCM CODER-DECODERS [CODEC'S])**

General

1. Circuit identification and description
2. Functional specification
3. Ratings (limiting values)
4. Recommended operating conditions (within the specified operating temperature range)
5. Electrical characteristics
 - 5.1 Static characteristics
 - 5.2 Dynamic characteristics for clock and control inputs
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 - 5.4 Total noise for transmit and receive filters
6. Mechanical ratings, characteristics and other data
7. Supplementary information

Under the heading for section three of chapter IV, delete '(Under consideration)' and substitute the following new entries.

1. Offset error of an adjustable linear digital-to-analogue converter (E_O) 67
2. Gain error of an adjustable linear digital-to-analogue converter (E_G) 68

AMD 7036
August 1992

Clause 2.1.22 of chapter II. Offset point (of an adjustable ADC or DAC)

Delete the existing clause entirely and substitute the following new clause.

2.1.22 Offset characteristics

2.1.22.1 Offset point (of an adjustable ADC or DAC)

A point in the transfer diagram corresponding to the midstep value (for an ADC) or the step value (for a DAC) of the step for which the offset error is specified, and in reference to which the offset adjustment must be performed (see figure 3).

Note.— The offset adjustment causes only a parallel displacement of the transfer diagram without changing its slope.

2.1.22.2 Offset output current (of a DAC)

The output current at the offset point.

After the existing subclause 2.3.3.3, insert the following new subclause.

2.3.3.4 (Digital) average rate of change of output voltage (S_{VOAVD})

For a change of the digital input code, the quotient of a specified large change of the analogue output voltage, by the time interval corresponding to that analogue output voltage change.

After the existing subclause 2.3.5.3, insert the following new subclause 2.3.5.3, and renumber the existing subclauses 2.3.5.4 to 2.3.5.7 as 2.3.5.5 to 2.3.5.8, respectively.

2.3.5.4 (Reference) average rate of change of output voltage (S_{VOAVR})

For a change of reference voltage, the quotient of a specified large change of the analogue output voltage, by the time interval corresponding to that analogue output voltage change.

In subclause 3.3.3, under the row '(Digital) slew rate, maximum rate of (digital) change of output', insert the following new row.

(Digital) average rate of change of output voltage	S_{VOAVD}	
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Under the row 'Reference slew rate', insert the following new row.

(Reference) average rate of change of output voltage	S_{VOAVR}	
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At the end of the chapter, insert the following new sections three, four and five, including figures 18, 19 and 20.

SECTION THREE - CATEGORY III (CONTROL CIRCUITS FOR SWITCH-MODE POWER SUPPLIES)

1. General

This section gives the essential ratings and characteristics that are required to specify the integrated circuits which are generally used with external circuitry to form switch-mode power supplies (SMPS). An integrated circuit generally contains most of the functions which are needed to form the switch-mode power supply. It may or may not include final output driver stage(s) for single-ended and/or push-pull converters. An integrated circuit may also contain additional functions that are required to ensure safe operation of the SMPS (protection circuits). It may even contain unitary functional blocks which are not required for the operation of the SMPS as such, but may be needed in other parts of the equipment where this circuit is intended to be used.

A list (not exhaustive) of possible functional blocks is given below:

- Oscillator
- Synchronization circuit
- Ramp generator
- Phase detector
- Error amplifier
- Symmetry of the output currents
- Pulse width modulator
- Output stage
- Internal regulated supply
- Reference circuit
- Slow-start and fast cut-out circuit
- Inhibiting circuit
- Over-voltage protection
- Over-current protection
- Dynamic current limitation
- Under-voltage protection
- Loop fault protection
- Re-start counting circuit
- Fall safe protection circuit
- Desaturation detection of the power switch
- Thermal protection circuit.

This section should not be applied to unitary functional parts of the circuit that can be specified adequately by other existing publications on essential ratings and characteristics. For example, operational amplifiers which, while within the package, can be assessed separately via available terminals should be specified separately according to the relevant section of Publication 748-3.

2. Electrical and functional description of the circuits

2.1 Block diagram

In the detail specification, a block diagram should be given (see example in figure 18). Subclause 2.1 of the standard format for sectional specifications applies (see Publication 748-1, chapter VI).

2.2 Identification of terminals

Designations and configurations of terminals shall be given.

The following terminals may be distinguished:

- a) supply terminals;
- b) output terminals, i.e. terminals which either deliver the power output of the SMPS, or from which an external output driver stage is fed;
- c) control input terminals, i.e. terminals to which various voltages, currents, or components are applied or connected to ensure proper operation of the SMPS;
- d) protection input terminals, i.e. terminals to which signals are fed to protect the integrated circuit and its associated components against damage and malfunction caused by, for instance, over-voltage, over-current, feedback loop failures, low supply voltage, etc.;
- e) inhibit input terminals, to inhibit in a defined manner the normal operation of the SMPS;
- f) reference voltage terminal(s);
- g) terminals for other external elements.

2.3 Functional description

In detail specifications, the function performed by the circuit should be stated and its functioning should be explained in sufficient detail for proper understanding of specified ratings and characteristics. This may include a description of the particular functional blocks that constitute the circuit.

2.4 Electrical compatibility

If the device has digital inputs or outputs, it should be stated whether these parts of the device are electrically compatible with other devices or families of devices.

3. Ratings (limiting values), electrical and thermal

Unless otherwise stated, the ratings given apply for operating temperatures within the range specified in subclause 3.2. Where such ratings are temperature-dependent, this dependence should be indicated.

If externally connected elements have an influence on the ratings, the ratings should be given for the integrated circuit with the elements connected.

3.1 *Electrical limiting values*

3.1.1 *Power supply voltage(s)*

- a) Maximum value(s) and polarities.**
- b) Maximum ripple on the supply voltage(s) (where appropriate).**
- c) Maximum rate of rise of transient supply voltages (where appropriate).**
- d) Maximum values of transient or spurious signals from the supplies for a specified duration (where appropriate).**
- e) Maximum value of the voltage between any terminal and case or reference terminal.**
- f) The sequence of the application of supply voltages (where appropriate).**

3.1.2 *Power supply current(s)*

- a) Maximum values (where appropriate).**
- b) Maximum values for a specified duration (external fault conditions) (where appropriate).**

3.1.3 *Input voltages*

Maximum values (and polarities, if appropriate) with respect to the reference terminal.

3.1.4 *Output voltages*

- a) Maximum values with respect to the reference terminal.**
- b) Maximum value between output terminals (where appropriate).**

3.1.5 *Input currents* (where appropriate)

Maximum values.

3.1.6 *Output currents*

Maximum values.

3.1.7 *Impedances* (where appropriate)

Minimum value of load impedance.

3.1.8 *Short-circuit duration* (where appropriate)

Maximum value.

3.1.9 *Inter-terminal voltages (where appropriate)*

Maximum values.

3.2 *Temperatures*

3.2.1 *Operating temperatures (see note)*

Minimum and maximum values of ambient or case temperature.

3.2.2 *Storage temperatures (see note)*

Minimum and maximum values.

3.2.3 *Resistance to soldering*

Maximum value of terminal temperature and maximum duration for which it may be applied.

Note.— The values for the operating and storage temperatures should be chosen from the list given in Publication 748-1, chapter VI, clause 5.

3.3 *Power dissipation*

Maximum total power dissipation as a function of temperature over the ambient or case operating temperature range.

4. *Recommended operating conditions*

All recommended operating conditions, for a single value or for a range of values, apply independently of each other, unless otherwise stated.

4.1 *Ambient or case operating temperature range*

4.2 *Power supplies*

4.2.1 *Polarity, nominal values and tolerances for voltage provided by the power supplies*

4.2.2 *Maximum value(s) of the impedance(s) of the power supplies (where appropriate)*

4.3 *Conditions at input terminals*

Range of voltages and/or currents of the input signal and/or, where applicable, bias conditions applied to the input terminals.

4.3.a *Conditions at output terminals*

Range of voltages and/or currents and/or load impedances (where appropriate).

4.4 *Conditions at other terminals*

Load impedance (where appropriate).

Bias conditions (where appropriate).

4.5 External elements

Value(s) and tolerance(s) for the external element(s) that shall be associated with the circuit.

4.6 Switch-mode frequency

Value(s) or range of values with load.

5. Electrical characteristics

Note.– Electrical characteristics should be stated as follows:

- a) If external elements are essential for the operation of the circuit, the electrical characteristics should include the effect of such external elements;
- b) If external elements are optional only, the electrical characteristics should be given for the circuit alone. The effect of adding specified external elements should then be indicated in the application data.

5.1 Characteristics at an ambient or case temperature of 25 °C

5.1.1 Supply current(s)

Maximum value(s) for specified values of:

- supply voltage(s);
- load conditions;
- dynamic conditions (where appropriate), e.g. switch-mode frequency, duty cycle;
- minimum value required to start operation of the SMPS.

5.1.2 Characteristics of various inputs and outputs (where appropriate)

5.1.2.1 Reference input voltage range

5.1.2.2 Synchronization input pulse range and waveform

Peak-to-peak value.

5.1.2.3 Oscillator frequency (with fixed external components)

Nominal value and maximum deviation.

5.1.2.4 Oscillator relative frequency deviation for specified supply voltage range

Maximum value.

5.1.2.5 Oscillator frequency temperature coefficient

Maximum value.

5.1.2.6 Oscillator frequency control sensitivity

Typical value.

5.1.2.7 Loop gain of APC-system (automatic phase control)

Typical value.

5.1.2.8 Capture range of APC

Minimum value.

5.1.2.9 Output pulse range at specified load

Minimum value.

5.1.2.10 Output pulse current at specified load

(Peak-to-peak) minimum value.

5.1.2.11 Saturation voltage(s) of output transistor at specified current(s)

Minimum value(s).

5.1.2.12 Rise time of leading edge of output current pulse

Typical value.

5.1.2.13 Reference terminal: input current

Minimum and maximum values.

5.1.2.14 Input bias current(s) or input impedance(s) of the error amplifier

Minimum and maximum values.

5.1.2.15 Flyback pulse input voltage

Minimum and maximum values and waveform, where appropriate.

5.1.2.16 Duty factor of output pulse at maximum setting

Minimum value.

5.1.2.17 Duty factor of output pulse at minimum setting

Maximum value.

5.1.2.18 Ripple rejection ratio

Minimum value.

5.1.2.19 Input offset voltage of the error amplifier

5.1.3 *Characteristics of various protection circuits (where appropriate)*

5.1.3.1 *Under-voltage shut-off voltage*

Minimum and maximum values.

5.1.3.2 *Quiescent current during shut-off*

Typical value.

5.1.3.4 *Over-reference-voltage protection: threshold voltage*

Minimum and maximum values.

5.1.3.5 *Over-current protection: threshold voltage*

Minimum and maximum values.

5.1.3.6 *Over-voltage protection: threshold voltage*

Minimum and maximum values within the operating temperature range.

5.1.3.7 *Over-voltage protection: input current*

Typical value.

5.2 *Effects of supply voltage or temperature variations on the essential characteristics*

These may be given in this subclause or directly to the characteristic itself.

6. Mechanical ratings, characteristics and other data

Publication 748-1 (Chapter VI, clause 7) applies.

7. Handling precautions, where appropriate

Publication 747-1 (Chapter IX) applies.

8. Application data, supplementary information

Additional information concerning the variations of the characteristics of subclause 5.1 with supply voltage, temperature, source and load impedances, etc., may be given.

The effect of external elements to be associated with the integrated circuit shall be indicated.

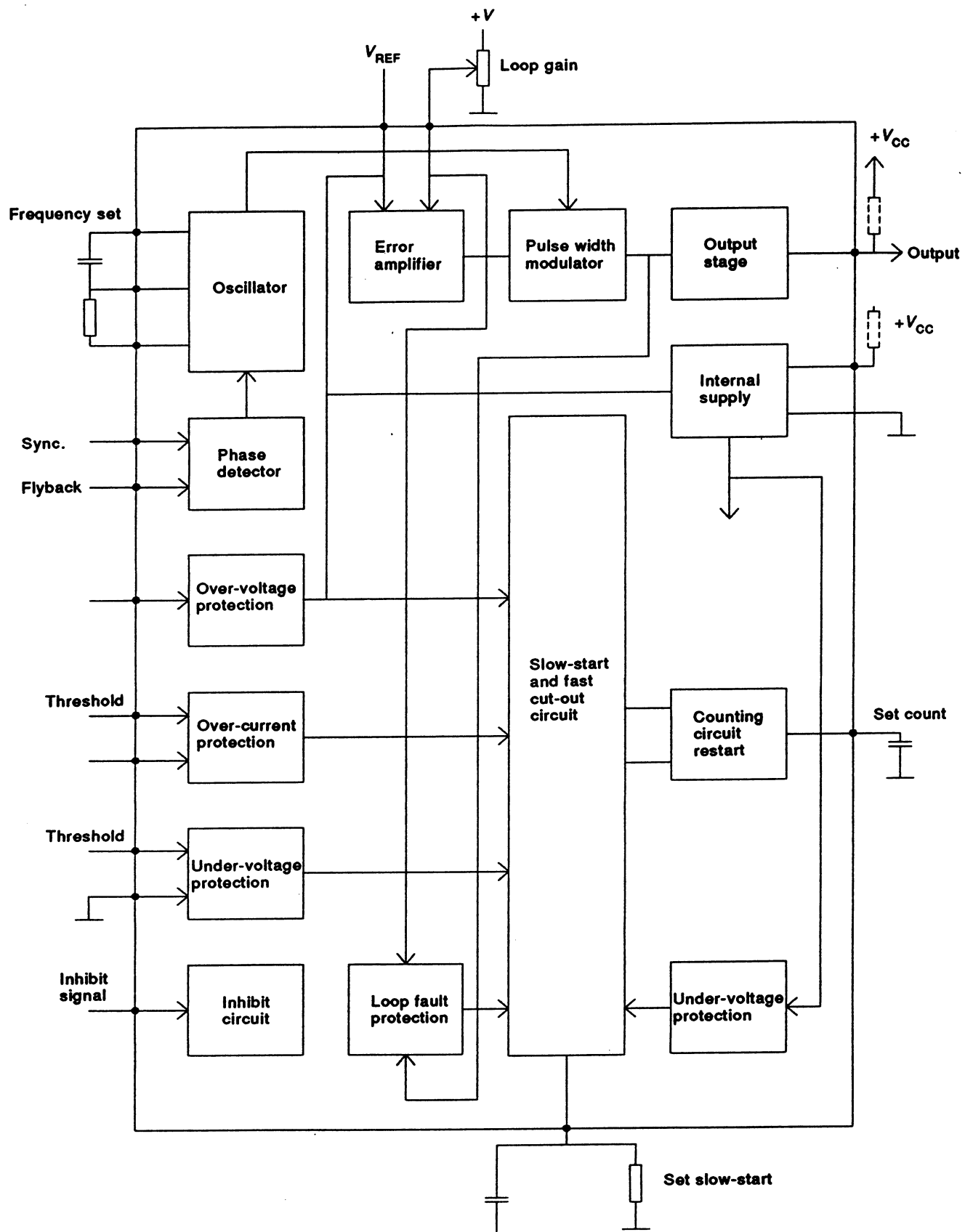


Figure 18 - Block diagram (example)

**SECTION FOUR - CATEGORY IV
(COMPANDING PMC CODER-DECODERS [CODEC'S])**

General

The recommendations given in this standard for data sheets should be applied to PCM codec's having a companding transfer characteristic. Reliability data and handling precautions for these codec's are to be included later.

Note.— The transfer characteristic here describes the functional dependence between analogue electrical quantities and digital codes. For example, they may be conforming to the "A-law" or the "μ-law" (see CCITT G 712, performance characteristics of PCM channels at audio-frequencies).

1. Circuit Identification and description

1.1 Designation and type

Type description, kind of circuit, technology, case.

1.2 Technology

The manufacturing technology, for example, semiconductor monolithic integrated circuit, thin-film integrated circuit, hybrid integrated circuit, micro-assembly, etc. shall be stated. This statement shall also include details of the semiconductor technologies such as NMOS, CMOS, etc.

It shall be stated whether the integrated circuit is electrically compatible with other particular integrated circuits or families of integrated circuits, or whether special interface circuits are required. Details shall be given of the type of output circuit, for example, three-state.

1.3 Package identification

1.3.1 IEC and/or national reference of the outline drawing or drawing of non-standard package including terminal numbering, for example, dual-in-line, chip carrier.

1.3.2 Principal package material, for example, ceramic or plastic.

1.3.3 Terminal identification: terminal numbering and associated functions.

2. Functional specifications

2.1 Block diagram

A block diagram or equivalent circuit information on the integrated circuit shall be given.

It shall be sufficiently detailed to enable the individual functional units to be identified. The main internal connections between the functional units and the identification of their external connections shall also be given. In addition, the block diagram (or an

equivalent circuit giving the function), shall also include important parasitic elements.

The following terminals may be distinguished (see figure 19):

- a) supply voltage terminals;
- b) input and output terminals, that is, terminals into or out of which signals are passed.

The term "signal" includes both pulse and more complex waveforms;

- c) other terminals (for example for reference voltages or those terminals that are wired to the case);
- d) terminals not connected internally:

Example:

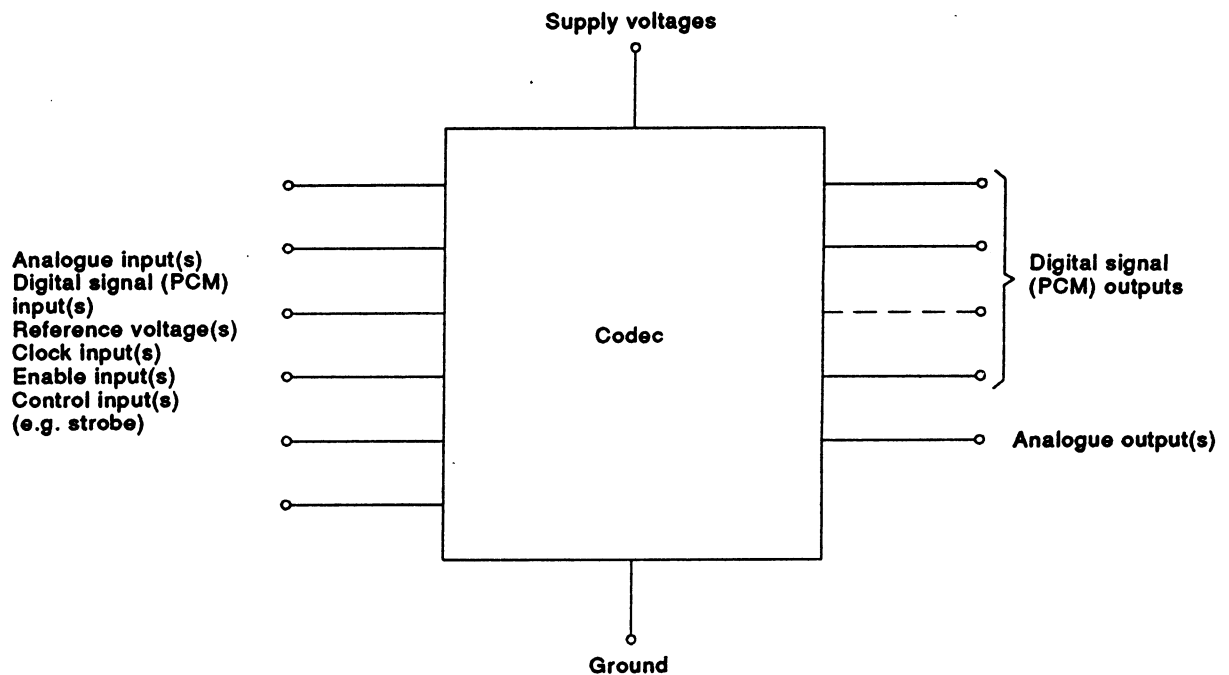


Figure 19 - Terminal connections

2.2 Functional description

The function performed by the circuit shall be specified, for example, conversion principle or technique, number of bits and coding format of the digital signals, companding-law (for instance A-law or μ -law), parallel or serial inputs, outputs, bit-transmission rate, frequency and dynamic range of the analogue signal, sampling rate, availability of internal reference voltage source, functional mode (synchronous or asynchronous).

2.3 Functional timing diagrams

Timing diagrams shall be given.

2.4 Additional information

Any necessary and/or recommended external components and their connections, ratings and effects shall be stated.

3. Ratings (limiting values)

If minimum and/or maximum values are quoted, the manufacturer shall indicate whether these refer to the absolute magnitude or to the algebraic value of the quantity.

The ratings given shall cover the operation of the integrated circuit over the specified range of operating temperatures.

Where such ratings (limiting values) are dependent on the temperature and/or other conditions (for example, supply voltage), the dependence shall be indicated.

3.1 Continuous voltages and currents

3.1.1 Limiting value(s) of the continuous voltage(s) at the supply terminal(s) with respect to a specified electrical reference point (see note).

3.1.2 Where appropriate, limiting value of the voltage between two supply voltage terminals (see note).

3.1.3 Where appropriate, the sequence of application of the supply voltages if more than one supply voltage is required.

3.1.4 Where appropriate, the sequence of application of the supply and input voltages.

3.1.5 Where the current through any terminal is not sufficiently limited by the voltage rating, a limiting current rating for that terminal shall also be given (see note).

3.1.6 Where appropriate, the limiting values of the voltages and the currents at the inputs and/or outputs and other terminals.

Note.— When more than one supply are needed, it may be necessary to state the combinations of ratings for these supply voltages and currents.

3.2 Non-continuous voltages and currents

3.2.1 If the values given in subclauses 3.1.1, 3.1.2 and 3.1.6 may be exceeded under transient or test conditions, then the permissible excess values and their duration shall be stated.

3.2.2 Limiting values of input and/or output voltage and current and, where appropriate, time limitations under specified worst-case conditions.

3.3 Electrostatic sensitivity

Value of the test voltage, test circuit according to Publication 747-1.

3.4 Temperatures

3.4.1 Minimum and maximum ambient or case operating temperatures.

3.4.2 Minimum and maximum storage temperatures.

3.5 Power dissipation where appropriate

Maximum value as a function of the operating temperature.

3.6 Capability of sustaining a short-circuit

Where appropriate, the maximum duration of a short-circuit between each output terminal and any supply terminal (or ground) under specified worst-case conditions of operation shall be given.

4. Recommended operating conditions (within the specified temperature range)

4.1 The range of values of supply voltage(s). The normal voltages and the permitted deviations shall be stated; the plus and minus deviations need not be identical.

The preferred nominal values are given in Publication 747-1, Chapter VI, clause 6.

4.2 The input pulse conditions, voltage and/or current levels and waveforms and, where appropriate, the time relations of the input signals.

4.3 Where appropriate, the continuous voltage and/or current bias conditions at all input terminals, including the magnitude(s), tolerance(s), polarities and maximum source impedance of all external reference voltages.

4.4 Where appropriate, the continuous voltage and/or current bias conditions at all output terminals.

4.5 Where appropriate, the values of external impedances required at the input and output terminals.

4.6 Pulse conditions of the clock(s). Where appropriate, such conditions shall include voltage levels, pulse waveform conditions and time interrelations of the pulses.

5. Electrical characteristics

Each electrical characteristic of this clause shall be stated under specified electrical worst-case conditions, with respect to the recommended range of supply voltage(s), as stated in subclause 4.1 and:

- a) over the specified range of operating temperatures, or**
- b) at a temperature of 25 °C, and at minimum and maximum operating temperatures.**

If external elements are required for the operation of the integrated circuit, the influence of those elements shall be specified.

Note.— Where digital characteristics are called for in this standard, the concepts given in Publication 748-2, chapter II or chapter III, Section one, are to be applied.

5.1 Static characteristics

5.1.1 Supply currents

Typical and maximum values should be stated under specified operating conditions (for example minimum or maximum voltage with the output open-circuited).

5.1.2 Voltage and current characteristics

5.1.2.1 Voltage and current characteristics at terminals for digital signals as required in Publication 748-2, Chapter III, Section one, subclauses 5.1 and 5.3 for bipolar integrated circuits, and subclauses 6.1 and 6.2 for MOS integrated circuits.

5.1.2.2 Output off-state current (for a three-state output in its third or high-impedance state)

Maximum absolute value.

5.1.2.3 Voltage and current characteristics at terminals for analogue signals

- a) Output current, for specified conditions of the output voltage.
Minimum value.
- b) Reference-input current.
Maximum value.
- c) Input current at the offset point.
Maximum value.
- d) Output voltage at the offset point, at specified load conditions.
Maximum value.

5.1.3 Input and output capacitances

5.1.3.1 Input capacitance at terminals for analogue signals

Maximum value.

5.1.3.2 Output capacitance at terminals for digital signals

Maximum value.

5.1.4 Output resistance at terminals for analogue signals

Maximum value.

5.1.5 Input resistance at terminals for analogue signals

- During "sampling" periods, minimum and maximum values.
- Between "sampling" periods, minimum value.

5.2 *Dynamic characteristics (where applicable)*

5.2.1 *Supply currents*

Typical curves of supply currents related to pulse frequency and/or conversion rate at a specified clock duty cycle. They should be given under specified recommended operating conditions.

5.2.2 *Clock frequencies*

5.2.2.1 *Master clock frequency*

Minimum and maximum values.

5.2.2.2 *Receive, transmit clock frequency*

Minimum and maximum values.

5.2.3 *Clock pulse duration*

Minimum value.

- Master clock;
- receive clock;
- transmit clock.

5.2.4 *Rise and fall times*

Maximum values.

- Master clock;
 - receive clock;
 - transmit clock;
 - enable inputs;
 - data inputs;
 - digital outputs
 - analogue outputs
- } at specified load conditions

5.2.5 *Enable pulse duration*

Minimum and maximum values.

- Transmit enable;
- receive enable.

5.2.6 *Delay time*

Minimum value.

- Active edge of transmit clock to enable pulse;
- active edge of transmit clock to negative-/positive-going edge of enable pulse;

- enable pulse to active edge of receive clock;
- active edge of receive clock to negative-/positive-going edge of enable pulse.

Minimum and maximum values.

- Transmit data.

5.2.7 Set-up times

Minimum value.

- Transmit enable pulse;
- receive enable pulse;
- receive data.

5.2.8 Hold time

Minimum value.

- Receive data.

5.2.9 Valid time

Minimum and maximum values.

- Transmit data valid.

5.2.10 Disable time

Maximum value.

- Transmit data disable.

5.2.11 Conversion time, where appropriate

Maximum value.

5.2.12 Maximum rate of change of the output voltage

Minimum value, at specified load conditions.

5.2.13 Time constant of analogue output voltage decay (if appropriate)

Maximum value, at specified load resistance.

5.3 Transmission characteristics (synchronous or asynchronous)

5.3.1 Receive mode

5.3.1.1 Signal to total distortion ratio at specified digital input codes which correspond to specified analogue signal levels

Minimum value.

- Measured with noise source (according to CCITT G 712);
- measured with sine wave signal (according to CCITT G 712).

5.3.1.2 Variation of gain with input levels at specified digital input codes which correspond to specified analogue signal levels.

Minimum and maximum values.

- Measured with noise source (according to CCITT G 712);
- measured with sine wave signal (according to CCITT G 712).

5.3.1.3 Idle channel noise

Maximum value for a digital input code (or codes) which correspond(s) to an analogue input level of zero (digital quiet code).

5.3.1.4 Crosstalk attenuation for transmit to receive.

Minimum value.

5.3.2 *Transmit mode*

5.3.2.1 Signal to total distortion ratio at specified analogue input signal levels.

Minimum value.

- Measured with noise source (according to CCITT G 712);
- measured with sine wave signal (according to CCITT G 712).

5.3.2.2 Variation of gain with input levels at specified analogue input signal levels.

Minimum and maximum values.

- Measured with noise source (according to CCITT G 712);
- measured with sine wave signal (according to CCITT G 712).

5.3.2.3 Idle channel noise.

Maximum value for an analogue input level of zero.

5.3.2.4 Crosstalk attenuation for receive to transmit.

Minimum value.

6. Mechanical ratings, characteristics and other data

See Publication 747-1, Chapter VI, clause 7.

7. Supplementary information

Date of issue of the data sheet.

Additional application data, for example, characteristics, connection of unused terminals, output load, electrical noise margin.

**SECTION FIVE - CATEGORY IV
(FILTERS FOR COMPANDING PMC CODER-DECODERS [CODEC'S])**

General

The recommendations for data sheets given in this standard should be applied to PMC filters containing both transmit and receive filters.

Reliability data and handling precautions for these filters are to be included later.

1. Circuit Identification and description

1.1 *Designation and type*

Type description, kind of circuit, technology, case.

1.2 *Technology*

The manufacturing technology, for example, semiconductor single-chip integrated circuit, hybrid film integrated circuit, etc. shall be stated. This statement shall include details of semiconductor technologies such as NMOS, CMOS, etc.

It shall be stated whether the integrated circuit is electrically compatible with other particular integrated circuits or families of integrated circuits, or whether special interfaces are required. Details shall be given of the type of output circuit.

1.3 *Package identification*

1.3.1 IEC and/or national reference number of the outline drawing or drawing of non-standard package including terminal numbering.

1.3.2 Principal package material, for example ceramic or plastic.

1.3.3 Terminal identification: terminal numbering and associated functions.

2. Functional specifications

2.1 *Block diagram*

A block diagram or equivalent circuit information on the integrated circuit shall be given. It shall be sufficiently detailed to enable the identification of the individual functional units. The main internal connections between the functional units and the identification of their external connections shall also be given. In addition, the circuit diagram (or an equivalent circuit giving the function), which shall also include important parasitic elements, should be given.

The following terminals may be distinguished (see figure 20):

a) supply terminals;

b) input and output signal terminals;

The term "signal" includes both pulse and more complex waveforms;

c) other terminals (for example control inputs);

d) blank terminals.

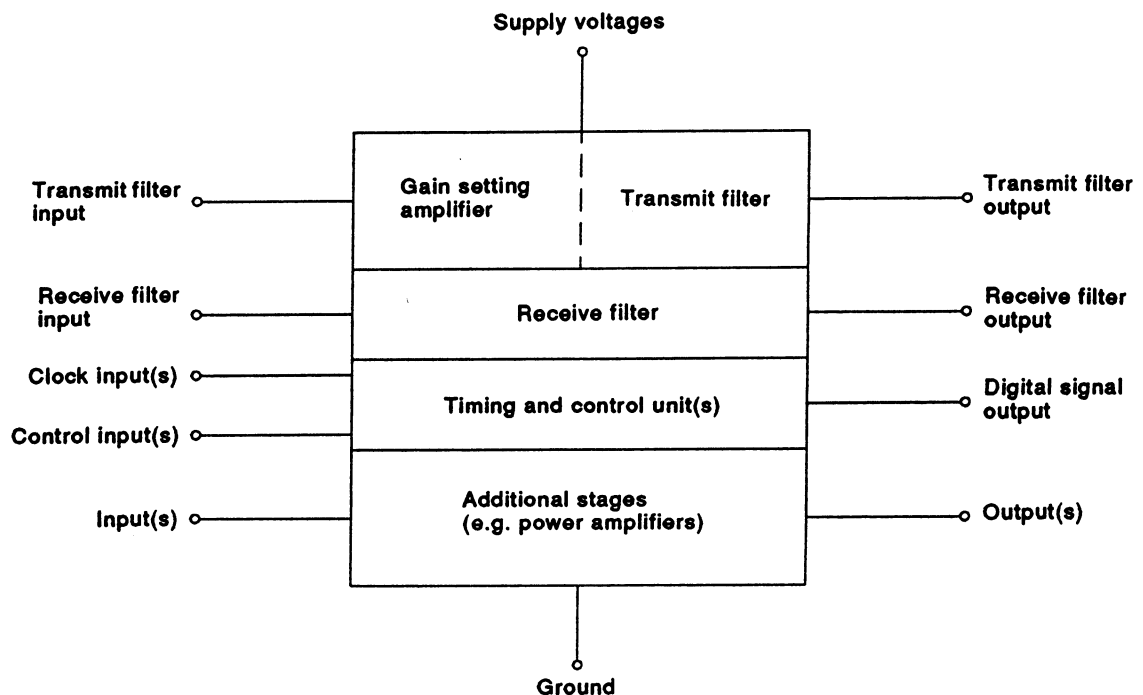


Figure 20 - Example of a block diagram

2.2 Functional description

The function performed by the circuit should be specified:

- type and technique of filters (e.g. switched capacitor band-pass filter);
- transfer characteristics (e.g. $\sin x/x$ - correction in the receive filter);
- inputs and outputs, clock frequency, control signals (e.g. clock select; power down);
- type and function of additional stages (e.g. input and output amplifiers).

2.3 Additional information

Any necessary and/or recommended external components and their connections, ratings and effects should be stated, especially the loads and termination when connecting to a codec.

3. Ratings (limiting values)

If minimum and/or maximum values are quoted, the manufacturer shall indicate whether he refers to the absolute magnitude or to the algebraic value of the quantity.

The ratings given shall cover the operation of the integrated circuit over the specified range of operating temperatures.

Where such ratings (limiting values) are dependent on the temperature and/or other conditions (for example, supply voltage), this dependence shall be indicated.

3.1 *Continuous voltages and currents*

3.1.1 Limiting value(s) of the continuous voltage(s) at the supply terminal(s) with respect to a common specified terminal (see note).

3.1.2 Limiting voltage between two supply voltage terminals (where appropriate) (see note).

3.1.3 The sequence of application of the supply voltages if more than one supply voltage is required (where appropriate).

3.1.4 The sequence of application of the supply and input voltages (where appropriate).

3.1.5 Where the current through any terminal is not limited sufficiently by the voltage rating, a limiting current rating for that terminal shall also be given (see note).

3.1.6 The limiting values of the voltages and the currents at the inputs and/or outputs and other terminals (where appropriate).

Note.— When more than one supply is needed, it may be necessary to state the combinations of ratings for these supply voltages and currents.

3.2 *Non-continuous voltages and currents*

3.2.1 If the values stated in subclauses 3.1.1, 3.1.2 and 3.1.6 may be exceeded under transient conditions, then the permissible excess values and their duration shall be stated.

3.2.2 Limiting values of input and/or output voltage and current and, where appropriate, their duration under specified worst-case conditions.

3.3 *Electrostatic sensitivity*

Value of the test voltage and test circuit according to Publication 747-1.

3.4 *Temperatures*

3.4.1 Minimum and maximum ambient or case operating temperatures.

3.4.2 Minimum and maximum storage temperatures.

3.5 *Power dissipation*

Maximum value as a function of the operating temperature.

3.6 Capability of sustaining a short-circuit, where appropriate

The maximum duration of a short-circuit between any output terminal and any supply terminal (or ground) under specified worst-case conditions of operation should be given.

4. Recommended operating conditions (within the specified operating temperature range)

4.1 The range of values of supply voltage(s) with respect to electrical reference point(s)

The nominal voltages and the permitted deviations should be stated. The positive and negative tolerances need not be identical.

The preferred nominal values are given in Publication 747-1.

4.2 The continuous voltage and/or current bias conditions at the control input terminals

4.3 The continuous voltage and/or current bias conditions at all output terminals (where appropriate)

4.4 The values of external impedances required at the input and output terminals (for example, for connecting to a codec) (where appropriate)

4.5 Pulse conditions of the circuit

Such conditions should include voltage levels, pulse waveform conditions for rise and fall times and time interrelations of the pulses.

5. Electrical characteristics

Each electrical characteristic of this clause shall be stated under specified electrical worst-case conditions, with respect to the recommended range of supply voltage(s) and the electrical reference point(s) as stated in subclause 4.1 and:

- a) over the specified range of operating temperatures, or
- b) at a temperature of 25 °C, and at minimum and maximum operating temperatures.

If external elements are required for the operation of the integrated circuit, the influence of those elements shall be specified.

Note.— Where digital characteristics are called for in this standard, the definitions and concepts given in Publication 748-2, Chapter III, Section one, are to be applied.

5.1 Static characteristics

5.1.1 Supply currents

5.1.1.1 Operating currents

Typical and maximum values should be stated under specified operating conditions (for example minimum or maximum voltage with the output open-circuited).

5.1.1.2 Standby currents

Typical and maximum values should be stated (if appropriate) under specified power-down mode.

5.1.2 Input characteristics

5.1.2.1 For digital signals at the control input and clock terminals

5.1.2.1.1 Input voltages

Minimum and maximum values of low and high level voltages.

5.1.2.1.2 Input currents

Maximum values at low and high level input voltages.

5.1.2.2 For analogue signals

5.1.2.2.1 Input currents

Maximum values for specified input voltage range.

5.1.2.2.2 Input-offset voltage and/or current

Maximum values for specified input voltage range and source impedance if they affect these values.

5.1.2.2.3 Input impedance

Minimum value and, where appropriate, maximum value for specified values of:

- load impedance;
- frequency;
- input signal amplitude.

5.1.2.2.4 Common-mode rejection ratio

Minimum or maximum value for specified values of:

- amplitude or range of input signal in common mode;
- frequency;
- load and source impedances.

5.1.3 Output characteristics for analogue signals

5.1.3.1 Load resistance

Minimum value.

5.1.3.2 Load capacitance

Maximum value.

