SGS-THOMSON MICROELECTRONICS

**DEMOBOARD**

# ECONOMY NICAM APPLICATION BOARD

## 1. INTRODUCTION

The SGS-Thomson NICAM stereo decoder kit comprises two integrated circuits, namely the TDA8204 and TDA8205. Together they form a comprehensive architechure including not only the QPSK demodulation and NICAM decoding, but also the DAC circuitry (including audio filters), and an audio switching matrix to interface with the SCART connnector and auxilliary mono FM sound input. The kit is able to automatically synchronise with either system I or B/G NICAM signals, without adjustments of any kind, and requiring the use of only one quartz crystal.

The architechture of the kit is such that, not only does it provide a comprehensive solution for high-end CTV applications, but it is also very economical for low-end applications. This is due to the high level of integration employed, requiring only about 40 external components to obtain a complete basic standalone NICAM application.

The objective therefore of the Economy NICAM Application Board, is to present the TDA8204 and TDA8205 in a very compact application. As a result, certain features of the kit are deliberately not provided for, such as SCART interface and automatic dual-standard operation. The kit is normally controlled via the $I^2C$ bus, but is totally automatic even without any bus control. Thus the board is completely operational from power-up. Even so the Economy NICAM board has been provided with connections to the $I^2C$ bus terminals of the TDA8204 in order to retain access to certain of the inbuilt device features.

A complete parts list and bill of materials has been provided in the appendix at the end of this document.

## 2. SET-UP

Connect a 6.552MHz (or 5.85MHz) QPSK I/P signal of nominal level $100mV_{PP}$ (40dB AGC range) to CN1.

Power supplies are +5V for $V_{DD}$ and +12V for the $V_{CC}$ via the power connector CN2. Switch on both supplies together or +12V first.

Audio outputs are available on CN4 ($500mV_{RMS}$ nom.). In addition, the FM backup input ($500mV_{RMS}$ nom.) is also applied to CN4.

CN3 provides the possibility of access to the $I^2C$ bus, mute and RSW functions of the TDA8204.

## 3. OPERATION

The power on default modes for the decoder are AUT_STD = ON and AUTO_NICAM = ON. In this case, the decoder automatically synchronises with the transmission standard in use (system I or system B/G). FM backup sound is selected if no NICAM signal is present. If a NICAM signal is present and then removed and the Reserve Sound Flag (C4) was set to 1, the decoder will select FM sound. If C4 = 0, the audio outputs are muted. The Economy NICAM Application Board has been fitted with only one QPSK filter, for mono-standard applications. However all that is needed to convert from system I to system B/G, is to change the filter for the appropriate B/G version, no further adjustments being needed.

The transmission mode is indicated by 3 LED's :
- LED4 = Stereo (RED)
- LED3 = Dual-Mono (RED)
- LED2 = Single-Mono (RED)

If no LED lights, either the mode is Data Only or the decoder is out of alignment.

For Stereo and Single Mono modes, FM backup is provided for both audio outputs. For Dual Mono, FM backup is only for M1.

## 4. APPLICATION NOTES

A layout of the application board is shown in Figure 1, enabling the user to identify the positions of all of the components. Figure 2 shows the circuit diagram of the application board.

Several optional modifications can be made to the circuit as described in the following notes. Reference should be made to the data sheets of the TDA8204 and TDA8205 for full details of their implementation.

The common connection to the three LEDs 2,3,4 can include a resistor if desired to reduce the

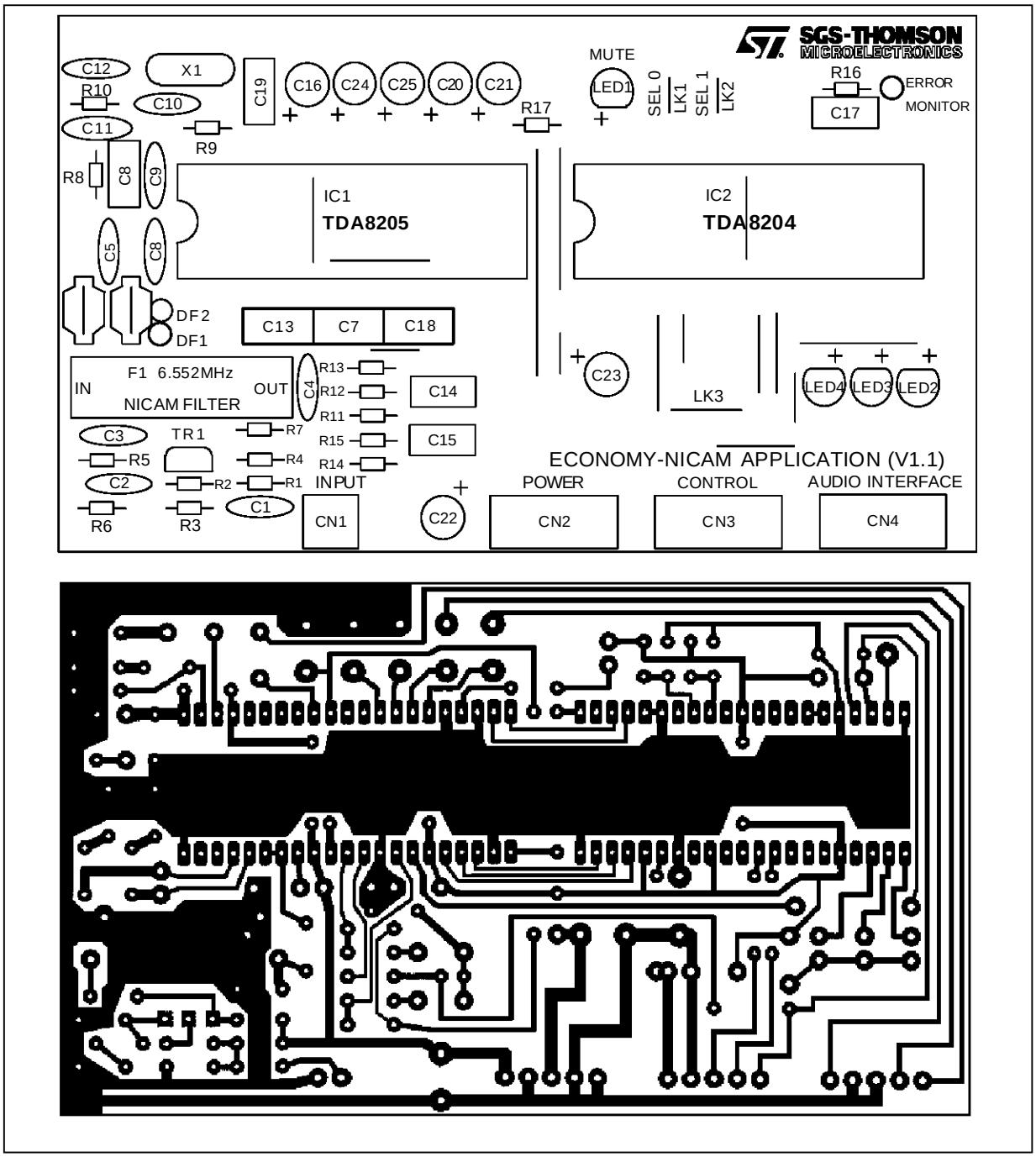
brightness of the LED. The link to place this resistor is located adjacent to LED4.

LK1 and LK2 provide the possibility to force the language select option, in bi-lingual mode, via the SEL0 and SEL1 pins of the TDA8204. The board is supplied with both SEL pins connected to ground (ie normal stereo/mono mode).

LK3 provides the possibility to force the RSW function on-board.

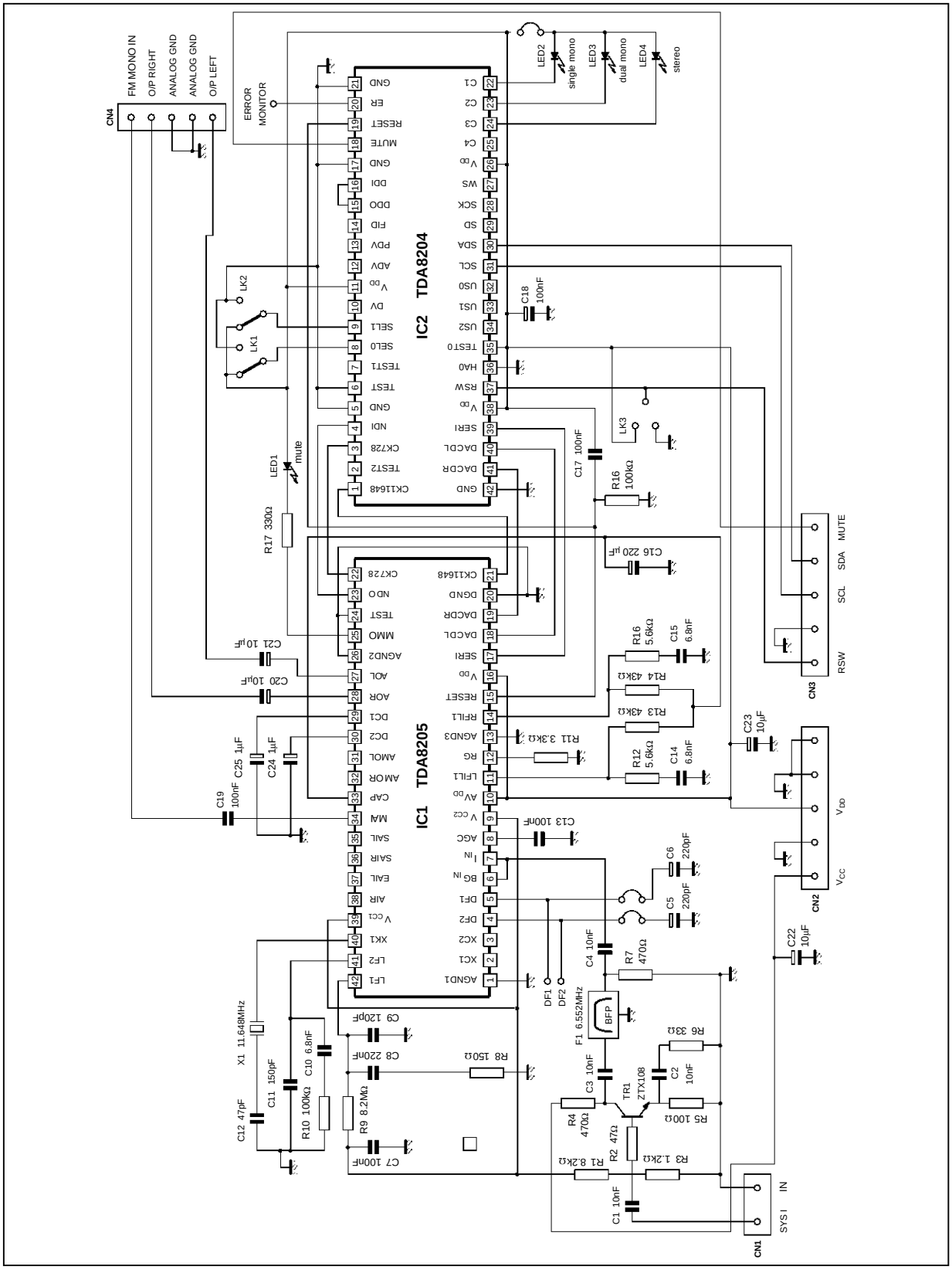
The mute input on CN3 is bi-directional, and indicates or activates the DAC mute status. An indication of this status is shown by the yellow LED1.

**Figure 1 :** Economy NICAM PCB Layout




AN636-01.EPS / AN636-02.TIF

**Figure 2 :** Economy NICAM Application Circuit



## 5. ADDENDUM TO THE NICAM DEMOBOARD NOTES

### Component Choice

The components chosen for this application board have been selected on the basis of their size rather than specific need. There are no critical characteristic requirements for any of the components other than the capacitor C12. The value of this capacitor is simply chosen to match the particular quartz crystal source purchased. Voltage ratings of capacitors will be those appropriate to the total system, 16V types usually being sufficient in most cases.

Two improvements are possible to the application circuit if neccessary and may be needed principally by system B/G with its closer wanted/unwanted carrier spacing. Details are as follows:

1) In system B/G mode, a 5.5MHz ceramic filter can be used to attenuate the FM sound by about 20dB with very little eye-diagram degradation. No provision is made on the application board for this filter.
2) A baseband L-C notch filter tuned to 350KHz can be fitted on DF1/2 pins by replacing the links in series with C5,6 (adjacent to the DF1 and DF2 monitor points), by inductors of 820%H (Toko style 7BS).

## 6. APPENDIX TO THE ECONOMY NICAM APPLICATION BOARD NOTES

### 6.1.Bill Of Materials

6.1.1. CAPACITORS (all rated at 16V)

| Reference | Value | Type |
|---|---|---|
| C1 | 10nF | Monolithic Ceramic |
| C2 | 10nF | Monolithic Ceramic |
| C3 | 10nF | Monolithic Ceramic |
| C4 | 10nF | Monolithic Ceramic |
| C5 | 220pF | Ceramic Plate |
| C6 | 220pF | Ceramic Plate |
| C7 | 100nF | Monolithic Ceramic |
| C8 | 220nF | Polyester |
| C9 | 120pF | Ceramic Plate |
| C10 | 6.8nF | Polyester |
| C11 | 150pF | Ceramic Plate |
| C12 | 47pF | Ceramic Plate |
| C13 | 100nF | Monolithic Ceramic |
| C14 | 6.8nF | Polyester |
| C15 | 6.8nF | Polyester |
| C16 | 220µF | Electrolytic |
| C17 | 100nF | Monolithic Ceramic |
| C18 | 100nF | Monolithic Ceramic |
| C19 | 100nF | Monolithic Ceramic |
| C20 | 10µF | Tantalum Bead |
| C21 | 10µF | Tantalum Bead |
| C22 | 10µF | Tantalum Bead |
| C23 | 10µF | Tantalum Bead |
| C24 | 1µF | Tantalum Bead |
| C25 | 1µF | Tantalum Bead |

6.1.2. LIGHT EMITTING DIODES
(low current type)

| Reference | Colour | Function Indication |
|---|---|---|
| LED1 | Yellow | Audio Muted |
| LED2 | Red | Single Mono Transmission |
| LED3 | Red | Dual Mono Transmission |
| LED4 | Red | Stereo Transmission |

6.1.3. FILTERS

| Reference | Frequency | TYpe |
|---|---|---|
| F1 | 6.552MHz | TOKO 5VFP TH316BQM2110QDAF |

6.1.4. INTEGRATED CIRCUITS

| Reference | Type | Function |
|---|---|---|
| IC1 | TDA8205 | QPSK, DAC and Audio Matrix |
| IC2 | TDA8204 | NICAM Decoder and $I^2S$ Bus Output |

6.1.5. TRANSISTORS

| Reference | Type | Function |
|---|---|---|
| TR1 | ZTX108 | 6.552MHz Filter Input Buffer |

6.1.6 . RESISTORS
(all 1/8W carbon film and values in 2)

| Reference | Value |
|---|---|
| R1 | 8.2kΩ |
| R2 | 47Ω |
| R3 | 1.2kΩ |
| R4 | 470Ω |
| R5 | 100Ω |
| R6 | 33Ω |
| R7 | 470Ω |
| R8 | 150Ω |
| R9 | 8.2MΩ |
| R10 | 180kΩ |
| R11 | 3.3kΩ |
| R12 | 5.6kΩ |
| R13 | 43kΩ |
| R14 | 43kΩ |
| R15 | 5.6kΩ |
| R16 | 100kΩ |
| R17 | 330Ω |

6.1.7. QUARTZ CRYSTALS

| Reference | Frequency |
|---|---|
| X1 | 11.648MHz, Series Resonant with 30pF HC49U Package |

6.1.8. CONNECTORS

| Reference | Type | Function |
|---|---|---|
| CN1 | 2-way | Sound IF Input |
| CN2 | 5-way | Power Input |
| CN3 | 5-way | Control Input/Output |
| CN4 | 5-way | Audio Input/Output |

## 6.2. Component Purchase List

6.2.1.CAPACITORS

| Value | Type | Quantity |
|---|---|---|
| 47pF | Ceramic Plate | 1 |
| 120pF | Ceramic Plate | 1 |
| 150pF | Ceramic Plate | 1 |
| 220pF | Ceramic Plate | 2 |
| 6.8nF | Polyester | 3 |
| 10nF | Monolithic Ceramic | 4 |
| 100nF | Monolithic Ceramic | 5 |
| 220nF | Polyester | 1 |
| 10µF | Tantalum Bead | 4 |
| 220µF | Electrolytic | 1 |

6.2.2. LIGHT EMITTING DIODES

| Colour | Quantity |
|---|---|
| Red | 3 |
| Yellow | 1 |

6.2.3. FILTERS

| Type | Quantity |
|---|---|
| TOKO 5VFP TH3167BQM2110QDAF | 1 |

6.2.4. INTEGRATED CIRCUITS

| Type | Quantity |
|---|---|
| TDA8204 | 1 |
| TDA8205 | 1 |

6.2.5. TRANSISTORS

| Type | Quantity |
|---|---|
| ZTX108 | 1 |

6.2.6. QUARTZ CRYSTALS

| Frequency | Quantity |
|---|---|
| 11.648MHz | 1 |

6.2.7. RESISTORS

| Value | Quantity |
|---|---|
| 33Ω | 1 |
| 47Ω | 1 |
| 100Ω | 1 |
| 150Ω | 1 |
| 330Ω | 1 |
| 470Ω | 2 |
| 1.2kΩ | 1 |
| 3.3kΩ | 1 |
| 5.6kΩ | 2 |
| 8.2kΩ | 1 |
| 43kΩ | 2 |
| 100kΩ | 1 |
| 180kΩ | 1 |
| 8.2MΩ | 1 |

6.2.8 CONNECTORS

| Type | Quantity |
|---|---|
| 2-way Header | 1 |
| 5-way Header | 3 |

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