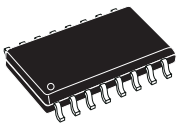
# TDA7479

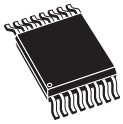
## Single chip RDS demodulator + filter

## Features

- Very high RDS demodulation quality with improved digital signal processing
- High performance, 57 kHz bandpass filter ($8^{th}$ order)
- FIlter adjustment free and without external components
- Purely digitaL RDS Demodulation without external components
- ARI (SK indication) and RDS signal quality output
- 4.332 MHz crystal oscillator (8.664 and 17.328 MHz optional)
- Low noise CMOS technology
- Low radiation



**SO16**



**TSSOP16**

## Description

The TDA7479 recovers the additional inaudible RDS information which is transmitted by FM radio broadcasting stations and operates in accordance with the EBU (European Broadcasting Union) specifications.

The device is made up of two sections: a cascaded antialiasing + switched capacitors $8^{th}$ bandpass filter for precise RDS band selection and a demodulating section that performs the extraction od RDS data stream (RDDA) and clock (RDCL), to be further processed by a suitable RDS decoder.

Outputs for RDS signal quality and ARI indication are also present.

**Table 1. Device summary**

| Order code | Package | Packing |
|---|---|---|
| E-TDA7479D(1) | SO16 | Tube |
| E-TDA7479AD(1) | TSSOP16 | Tube |

1. Device in ECOPACK® package (see *Section 5: Package information on page 9*).

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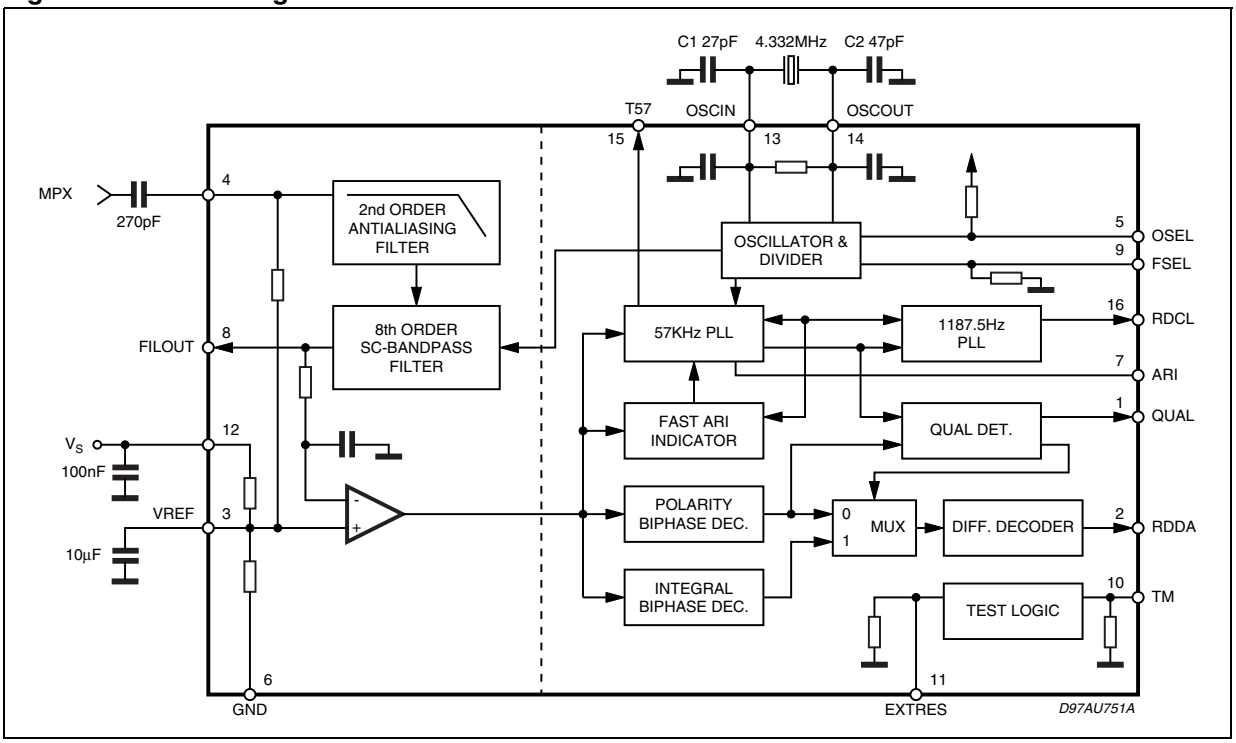
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# 1 Block diagram and pin description

## 1.1 Block diagram

**Figure 1. Block diagram**




## 1.2 Pin description

**Figure 2. Pin connection (top view)**

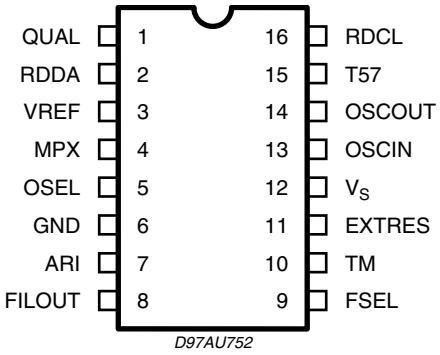


**Table 2. Pin description**

| No pin | Name | Description |
|---|---|---|
| 1 | QUAL | Output for signal quality indication (High = good) |
| 2 | RDDA | RDS data output |
| 3 | VREF | Reference voltage |
| 4 | MPX | RDS input signal |
| 5 | OSEL | Oscillator selector pin:<br>– open, closed to $V_S$ = quartz oscillator<br>– closed to GND = external driven |
| 6 | GND | Ground |
| 7 | ARI | Output for ARI indication:<br>– high when RDS+ARI are present<br>– high when only ARI is present<br>– low when only RDS is present<br>– undefined when nos signal is present |
| 8 | FILOUT | Filter output |
| 9 | FSEL | Frequency selector pin:<br>– 100 kHz to $V_S$ = 17.328 MHz<br>– open = 4.332MHz<br>– closed to VS = 8.664 MHz |
| 10 | TM | Test mode pin:<br>– open = normal operation<br>– closed to VS = test mode |
| 11 | EXTRES | Reset pin:<br>– open = run mode<br>– -closed to VS = reset condition |
| 12 | $V_S$ | Supply voltage |
| 13 | OSCIN | Oscillator input |
| 14 | OSCOUT | Oscillator output |
| 15 | T57 | Testing output pin: 57 kHz clock output |
| 16 | RDCL | RDS clock output 1187.5 Hz |

# 2 Electrical specification

## 2.1 Thermal data

**Table 3. Thermal data**

| Symbol | Parameter | | SO16 | TSSOP16 | Unit |
|---|---|---|---|---|---|
| $R_{th\ j\text{-}case}$ | Thermal resistance junction to case | Max. | 200 | 160 | °C/W |

## 2.2 Absolute maximum ratings

**Table 4. Absolute maximum ratings**

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_S$ | Supply voltage | -0.3 to 7 | V |
| $T_{op}$ | Operating temperature range | -40 to 85 | °C |
| $T_{stg}$ | Storage temperature | -55 to 150 | °C |

## 2.3 Electrical characteristics

**Table 5. Electrical characteristics**
($T_{amb}$ = 25°C, $V_S$ = 5V, unless otherwise specified)

| Symbol | Parameter | Test condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_S$ | Supply voltage | | 4.5 | 5 | 5.5 | V |
| $I_S$ | Supply current | | | 7.5 | 11.0 | mA |
| **Filter** | | | | | | |
| $f_C$ | Center frequency | | 56.5 | 57 | 57.5 | kHz |
| BW | 3dB Bandwidth | | 2.5 | 3 | 3.5 | kHz |
| G | Gain | f = 57 kHz | 18 | 20 | 22 | dB |
| A | Attenuation | Δf ± 4 kHz | 18 | 22 | | dB |
| | | f = 38 kHz | 50 | 60 | | dB |
| | | f = 67 kHz | 35 | 45 | | dB |
| $R_I$ | Input impedance of MPX | | 80 | 120 | 150 | KΩ |
| $R_L$ | Load impedance on FILOUT | | 1 | | | MΩ |
| S/N | Signal to noise ratio | $V_{IN}$ = 3 mVrms | 30 | 40 | | dB |
| $V_{IN}$ | MPX input signal | f = 19 kHz; T3 ≤ 40 dB(1)<br>f = 57 kHz (RDS+ ARI) | | | 1000<br>50 | $mV_{RMS}$<br>$mV_{RMS}$ |
| $S_{RDS}$ | RDS detection sensitivity | | 1 | | | mVrms |
| $S_{ARI}$ | ARI Detection Sensitivity | | 3 | | | mVrms |

**Table 5. Electrical characteristics (continued)**
($T_{amb}$ = 25°C, $V_S$ = 5V, unless otherwise specified)

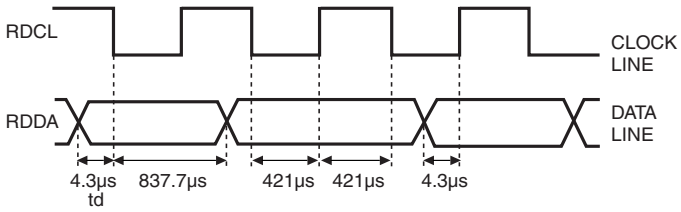
| Symbol | Parameter | Test condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_{REF}$ | Reference | | | $V_S/2$ | | V |
| **Demodulator** | | | | | | |
| *Input pins (EXTRES, FSEL, TM:)* | | *all with internal pull down resistor* | | | | |
| *Input pin (OSEL):* | | *with internal pull up resistor* | | | | |
| $I_{PD}$ | Input current | $V_{IN}$ = 5 V (pull-down input) | 15 | | 30 | µA |
| $I_{PU}$ | Input current | $V_{IN}$ = 0 V (pull-up input) | -25 | | -10 | µA |
| $V_{IH}$ | Input voltage high | | $0.7 \cdot V_S$ | $0.8 \cdot V_S$ | | V |
| $V_{IL}$ | Input voltage low | | | $0.2 \cdot V_S$ | $0.3 \cdot V_S$ | V |
| *Output pins (RDCL, RDDA, ARI, QUAL, T57)* | | | | | | |
| $V_{OH}$ | Output voltage high | $I_L$ = 0.5mA | 4 | 4.6 | | V |
| $V_{OL}$ | Output voltage low | $I_L$ = 0.5mA | | 0.4 | 1 | V |
| **Oscillator** | | | | | | |
| $V_{CLL}$ | Input level OSCIN pin | OSEL = open circuit | | | 1 | V |
| $V_{CLH}$ | Input level OSCIN pin | OSEL = open circuit | 4 | | | V |
| | Amplitude OSCOUT | OSEL = open circuit | | 4.5 | | V |
| $V_{PP}$ | Amplitude OSCIN (for external drive) | OSEL = GND, f = 4.332 MHz<br>OSEL = GND, f = 8.664 MHz | | 100<br>120 | | mVpp<br>mVpp |
| | | OSEL = GND, f = 17.328 MHz | | 150 | | mVpp |

1. The 3rd harmonic (57 kHz) must be less than -40 dB with respect to the input signal plus gain.

# 3 Output timing

The RDS (1187.5Hz) output clock on RDCL line is synchronized to the incoming data. According to the internal PLL lock condition data change can result on the falling or on the rising clock edge (see *Figure 3*). Whichever clock edge is used by the decoder (rising or falling edge) the data will remain valid for 416.7 µs after the clock transition.

**Figure 3. RDS timing diagram**



# 4 Oscillator controls (FSEL, OSEL)

Three different crystal frequencies can be used. The adoption of the internal clock divider to the external crystal is achieved via the input pin FSEL. See the following table for reference:

**Table 6. Crystal frequencies**

| Crystal | FSEL (pin configuration) |
|---|---|
| 4.332MHz<br>8.664MHz<br>17.328MHz | connected to GND or open connected to Vs external resistor of 100K to Vs |

A special mode is introduced to reduce EMI. With pin OSEL connected to GND the internal oscillator is switched off and an external sinusoidal frequency could be applied on OSCIN. The peak to peak voltage of this signal can be reduced down to 60mV.

In this mode the frequency selection via FSEL is still active.

Suggested values of C1 and C2 are shown in the following table:

**Table 7. C1 and C2 value**

| Crystal | C1 | C2 |
|---|---|---|
| 4.332MHz | 27pF | 47pF |
| 8.664MHz | 27pF | - |
| 17.328MHz | 27pF | - |

# 5 Package information

In order to meet environmental requirements, ST (also) offers these devices in ECOPACK® packages. ECOPACK® packages are lead-free. The category of second Level Interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label.

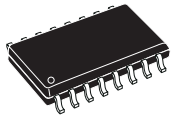
ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com.

**Figure 4. SO16 mechanical data and package dimensions**

| DIM. | mm | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 2.35 | | 2.65 | 0.093 | | 0.104 |
| A1 | 0.10 | | 0.30 | 0.004 | | 0.012 |
| B | 0.33 | | 0.51 | 0.013 | | 0.200 |
| C | 0.23 | | 0.32 | 0.009 | | 0.013 |
| D (1) | 10.10 | | 10.50 | 0.398 | | 0.413 |
| E | 7.40 | | 7.60 | 0.291 | | 0.299 |
| e | | 1.27 | | | 0.050 | |
| H | 10.0 | | 10.65 | 0.394 | | 0.419 |
| h | 0.25 | | 0.75 | 0.010 | | 0.030 |
| L | 0.40 | | 1.27 | 0.016 | | 0.050 |
| k | 0° (min.), 8° (max.) | | | | | |
| ddd | | | 0.10 | | | 0.004 |

(1) "D" dimension does not include mold flash, protusions or gate burrs. Mold flash, protusions or gate burrs shall not exceed 0.15mm per side.

**OUTLINE AND MECHANICAL DATA**



**SO16 (Wide)**

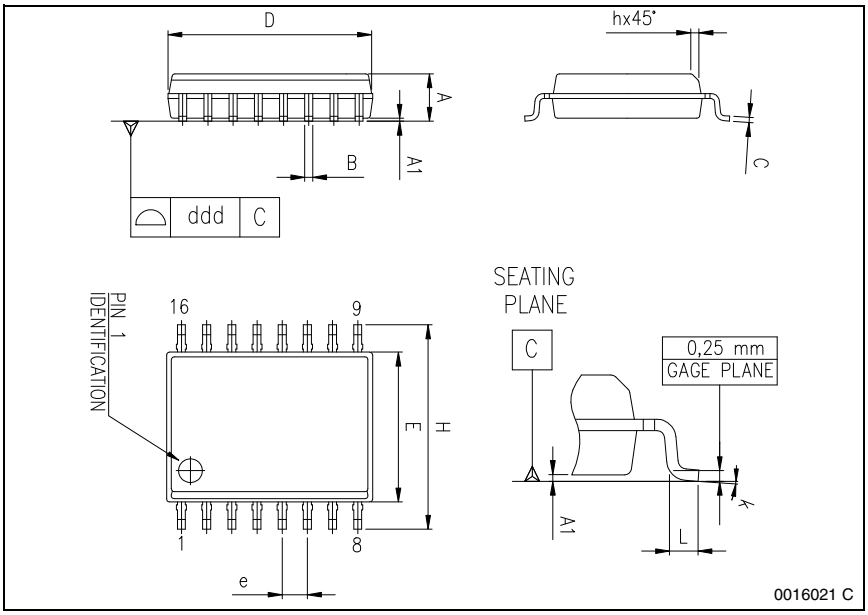
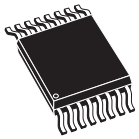


**Figure 5. TSSOP16 mechanical data and package dimensions**

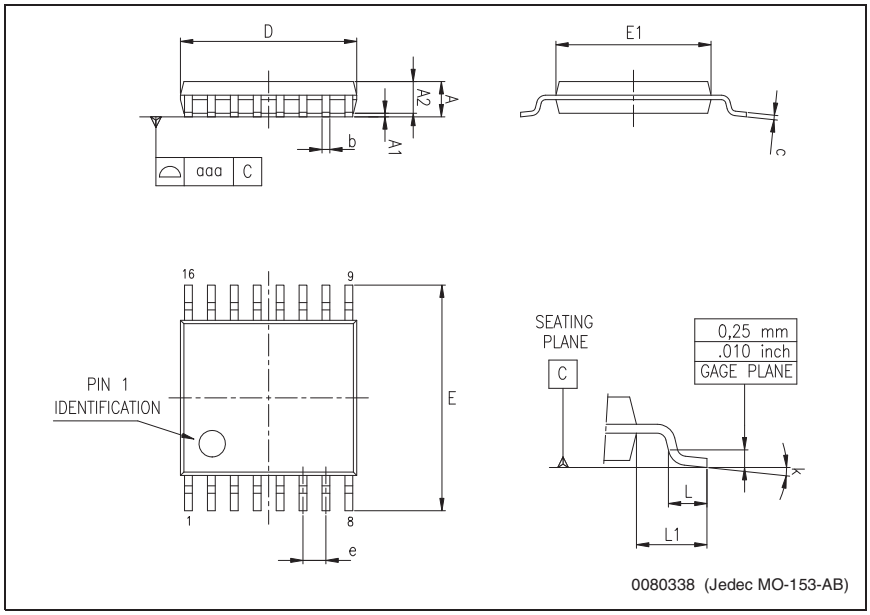
| DIM. | mm | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | | | 1.200 | | | 0.047 |
| A1 | 0.050 | | 0.150 | 0.002 | | 0.006 |
| A2 | 0.800 | 1.000 | 1.050 | 0.031 | 0.039 | 0.041 |
| b | 0.190 | | 0.300 | 0.007 | | 0.012 |
| c | 0.090 | | 0.200 | 0.005 | | 0.009 |
| D (1) | 4.900 | 5.000 | 5.100 | 0.114 | 0.118 | 0.122 |
| E | 6.200 | 6.400 | 6.600 | 0.244 | 0.252 | 0.260 |
| E1 (1) | 4.300 | 4.400 | 4.500 | 0.170 | 0.173 | 0.177 |
| e | | 0.650 | | | 0.026 | |
| L | 0.450 | 0.600 | 0.750 | 0.018 | 0.024 | 0.030 |
| L1 | | 1.000 | | | 0.039 | |
| k | 0° (min.) 8° (max.) | | | | | |
| aaa | | | 0.100 | | | 0.004 |

Note: 1. D and E1 does not include mold flash or protrusions. Mold flash or potrusions shall not exceed 0.15mm (.006inch) per side.

**OUTLINE AND MECHANICAL DATA**



**TSSOP16 (Body 4.4mm)**



# 6 Revision history

**Table 8. Document revision history**

| Date | Revision | Changes |
|---|---|---|
| 10-Sep-2004 | 4 | Initial release. |
| 20-Nov-2004 | 5 | Add in *Table 5: Electrical characteristics on page 5* the “RDS and ARI Detection Sensitivity” parameters. |
| 02-Dec-2004 | 6 | Modified the order codes table. |
| 04-Nov-2008 | 7 | Document reformatted.<br>Updated *Table 1: Device summary on page 1*.<br>Updated *Section 5: Package information on page 9*. |
| 16-Sept-2013 | 8 | Updated Disclaimer |

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