TDA7478

SINGLE CHIP RDS DEMODULATOR

1 FEATURES

- VERY HIGH RDS DEMODULATION QUALITY WITH IMPROVED DIGITAL SIGNAL PROCESSING
- HIGH PERFORMANCE, 57KHz BANDPASS FILTER (8th ORDER)
- FILTER ADJUSTMENT FREE AND WITHOUT EXTERNAL COMPONENTS
- PURELY DIGITAL RDS DEMODULATION WITHOUT EXTERNAL COMPONENTS
- RDS SIGNAL QUALITY OUTPUT
- 4.332MHz CRYSTAL OSCILLATOR(8.664MHz OPTIONAL)
- LOW NOISE CMOS TECHNOLOGY
- LOW RADIATION

2 DESCRIPTION

The TDA7478 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 8th 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.

Output for RDS signal quality is also present.

Figure 1. Packages

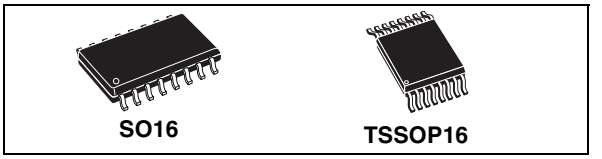


Table 1. Order Codes

Part Number	Package
TDA7478D	SO16
E-TDA7478AD	TSSOP16

Figure 2. Block Diagram

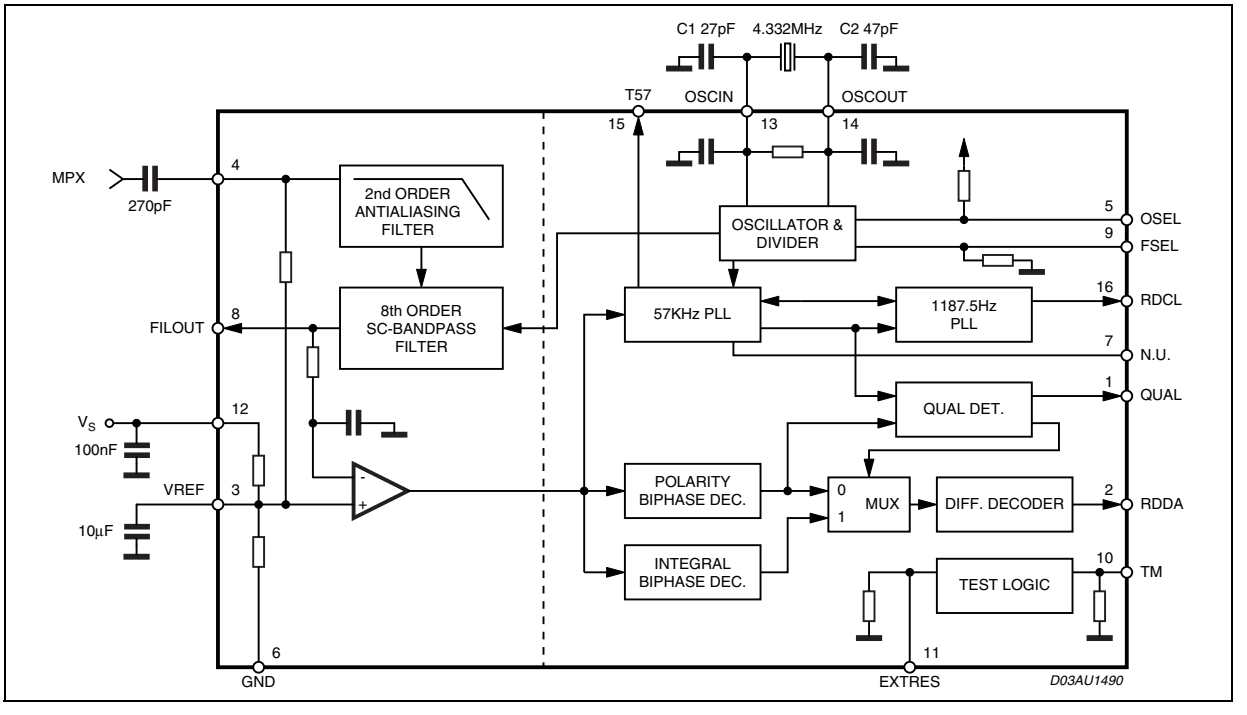


Table 2. Pin Description

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: - open, closed to V_S = quartz oscillator - closed to GND=external driven
6	GND	Ground
7	N.U.	Not Used (to be left open)
8	FILOUT	Filter output
9	FSEL	Frequency selector pin: - open = 4.332MHz - closed to VS = 8.664MHz
10	TM	Test mode pin: - open = normal operation - closed to VS = testmode
11	EXTRES	Reset pin: - open=run mode - closed to VS = reset condition
12	V_S	Supply voltage
13	OSCIN	Oscillator input
14	OSCOUT	Oscillator output
15	T57	Testing output pin: 57kHz clock output
16	RDCL	RDS clock output 1187.5Hz

Figure 3. Pin Connection (Top view)

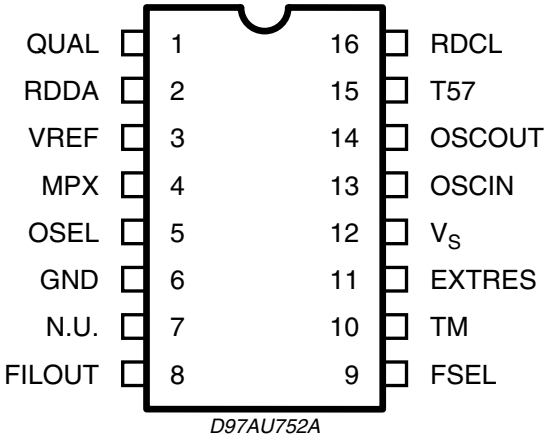


Table 3. Thermal Data

Symbol	Description	Value	Unit
$R_{th\ j\text{-}case}$	Thermal Resistance Junction-case Max.	200	°C/W

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

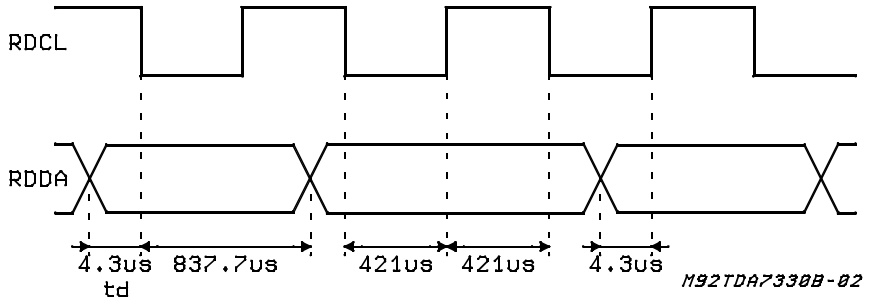
Table 5. Electrical Characteristcs

(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	12.0	mA
FILTER						
f_C	Center frequency		56.6	57	57.4	kHz
BW	3dB Bandwidth		2.5	3	3.5	kHz
G	Gain	f = 57kHz	17	20	23	dB
A	Attenuation	Δf ± 4kHz		22		dB
		f = 38kHz		60		dB
		f = 67kHz		45		dB
R_I	Input impedance of MPX			120		KΩ
R_L	Load impedance on FILOUT		1			MΩ
S/N	Signal to noise ratio	V_{IN} = 3mVRMS	30	40		dB
V_{IN}	MPX input signal	f = 19kHz; T3 ≤ 40dB(1) f = 57kHz (RDS)			1000 50	mV_{RMS} mV_{RMS}
S_{RDS}	RDS Detection Sensitivity		1			mVrms
S_{ARI}	ARI Detection Sensitivity		3			mVrms
V_{REF}	Reference			V_S/2		V
DEMODULATOR						
Input pins (EXTRES, FSEL, TM) **Input pin (OSEL)**			**all with internal pull down resistor** **with internal pull up resistor**			
I_{PD}	Input Current	V_{IN} = 5V (pull-down input)	15		30	µA
I_{PU}	Input Current	V_{IN} = 0V (pull-up input)	-25		-10	µA
V_{IH}	Input voltage high		0.7 · V_S	0.8 · V_S		V
VIL	Input voltage low			0.2 · V_S	0.3 · V_S	V
Output pins (RDCL, RDDA, QUAL, T57)						
V_{OH}	Ouput voltage high	I_L = 0.5mA	4	4.6		V
V_{OL}	Output voltage low	I_L = 0.5mA		0.4	1	V
OSCILLATOR						
VCLL	Input level OSCIN pin	OSEL = open circuit			1	V
VCLH	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 = 4.332MHz OSEL = GND, f = 8.664MHz		100 120		mVpp mVpp

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

Figure 4. RDS timing diagram



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 Fig. 1)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.

4 OSCILLATOR CONTROLS (FSEL, OSEL)

Two different crystal frequencies can be used. The adaption 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	FSEL (pin configuration)
4.332MHz 8.664MHz	connected to GND or open connected 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.

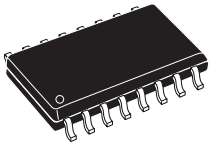
Crystal	C1	C2
4.332MHz 8.664MHz	27pF 27pF	47pF -

Figure 5. SO16 Mechanical Data & 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)

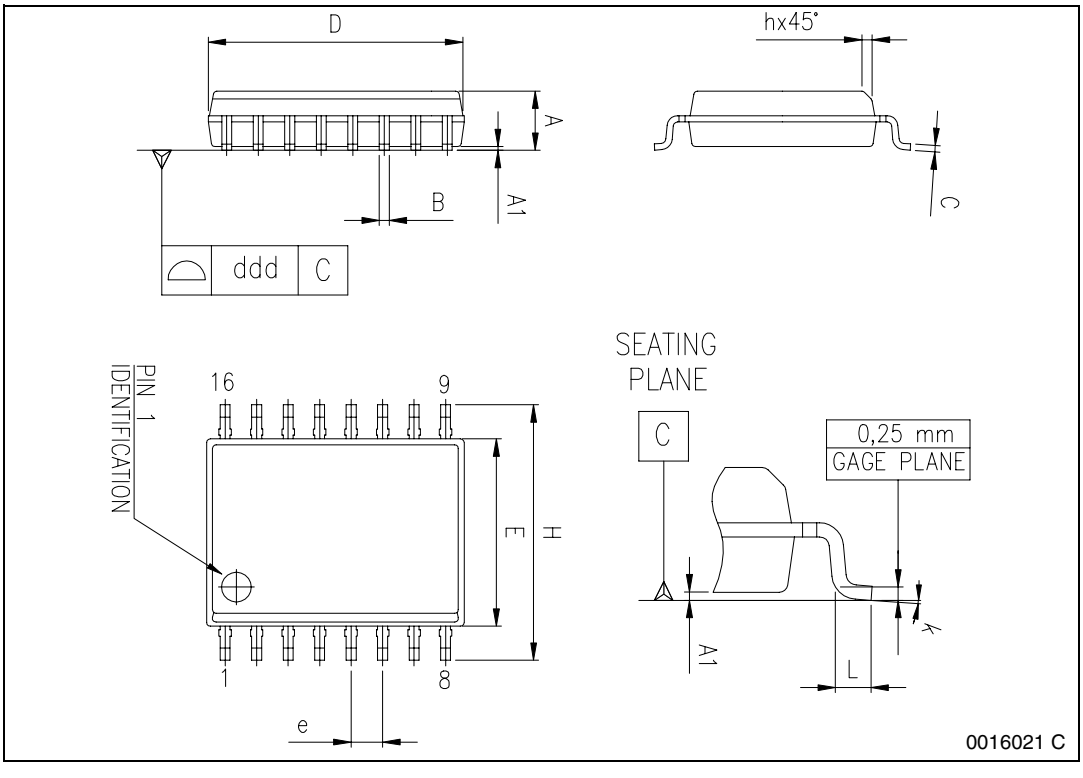
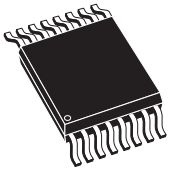


Figure 6. TSSOP16 Mechanical Data & Package Dimensions

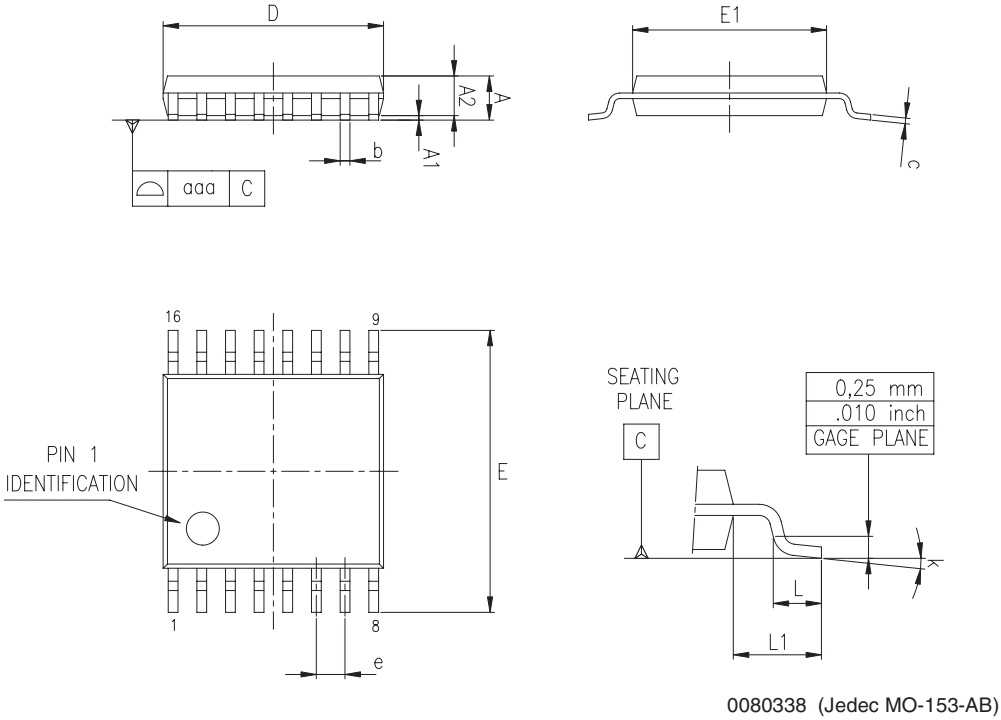
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.200			0.047
A1	0.050		0.150	0.002		0.006
A2	0.800	1.000	1.050	0.031	0.039	0.041
b	0.190		0.300	0.007		0.012
c	0.090		0.200	0.005		0.009
D (1)	4.900	5.000	5.100	0.114	0.118	0.122
E	6.200	6.400	6.600	0.244	0.252	0.260
E1 (1)	4.300	4.400	4.500	0.170	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)



0080338 (Jedec MO-153-AB)

Table 8. Revision History

Date	Revision	Description of Changes
July 2004	1	First Issue
November 2004	2	Add in the table 5 “RDS and ARI Detection Sensitivity” parameters.