DATA SHEET

TDA8011T
IF amplifier for satellite TV receivers

Product specification
File under Integrated Circuits, IC02

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Philips Semiconductors

PHILIPS

IF amplifier for satellite TV receivers TDA8011T

FEATURES

- High voltage gain, up to 860 MHz
- Low noise
- Large dynamic gain control
- High impedance differential input stage
- Low output impedance.

APPLICATIONS

- Second IF amplifier for satellite TV receivers.

DESCRIPTION

The TDA8011T is a broadband low-noise AGC amplifier which is used for the second IF amplifier in satellite TV receivers. The amplifier is powered from a single 5 V supply. The amplifier gain can be easily controlled over a large dynamic range by using a single ground reference voltage. The two outputs are 180° out of phase and are separately buffered. The two outputs can therefore, be used in either the differential or asymmetrical mode.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{CC}	supply voltage		4.5	5.0	5.5	V
I_{CC}	supply current	V_{CC} = 5 V; T_{amb} = 25 °C; I_{AGC} = 0 mA	27	35	45	mA
V_i	input voltage level		–	–	96	dBμV
V_o	output voltage level		–	–	85	dBμV
$G_{v(max)}$	maximum voltage gain		25	–	–	dB
$G_{v(min)}$	minimum voltagegain		–	–	–21	dB

ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
TDA8011T	SO8	plastic small outline package; 8 leads; body width 3.9 mm	SOT96-1

BLOCK DIAGRAM

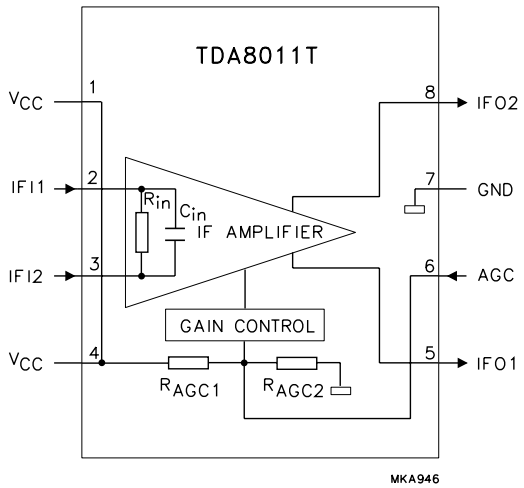


Fig.1 Block diagram.

PINNING

SYMBOL	PIN	DESCRIPTION
V_{CC}	1	supply voltage
IFI1	2	IF input 1
IFI2	3	IF input 2
V_{CC}	4	supply voltage
IFO1	5	IF output 1
AGC	6	AGC input
GND	7	ground
IFO2	8	IF output 2

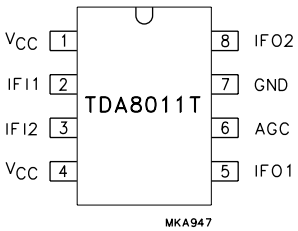


Fig.2 Pin configuration.

LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

SYMBOL	PARAMETER	MIN.	MAX.	UNIT
V_{CC}	supply voltage	–0.3	6.0	V
$V_{(max)}$	maximum voltage on all pins	–0.3	V_{CC}	V
$I_{source(max)}$	maximum output source current	–	10	mA
$t_{sc(max)}$	maximum short-circuit time on outputs	–	10	s
T_{stg}	storage temperature	–55	+150	°C
T_j	junction temperature	–	+150	°C
T_{amb}	operating ambient temperature	–10	+80	°C

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	VALUE	UNIT
$R_{th\ j\text{-}a}$	thermal resistance from junction to ambient in free air	160	K/W

HANDLING

Inputs and outputs are protected against electrostatic discharge in normal handling. However, to be totally safe it is desirable to take normal precautions appropriate to handling MOS devices.

CHARACTERISTICS

V_{CC} = 5 V; f_i = 70, 480 and 610 MHz; T_{amb} = 25 °C; measured in application circuit of Fig.6; unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Supply						
I_{CC}	supply current		27	35	45	mA
IF amplifier						
$G_{v(max)}$	maximum voltage gain	$V_{AGC} = 0.9V_{CC}$; note 1	25	–	–	dB
$G_{v(min)}$	minimum voltage gain	$V_{AGC} = 0.1V_{CC}$; note 1	–	–	–21	dB
ΔG	tilt	Δf_i = 20 MHz; note 2	–	0.4	–	dB
V_i	input voltage level		–	–	96	dBμV
$V_{I(DC)}$	DC input voltage level		–	2.5	–	V
V_o	output voltage level		–	–	85	dBμV
$V_{O(DC)}$	DC output voltage level		–	2.2	–	V
F	noise figure	unmatched configuration; note 3	–	–	15	dB
$F_{(min)}$	minimum noise figure	note 4	–	–	11	dB
IM3	third-order intermodulation distance	note 5	–	40	–	dB
$R_{i(diff)}$	differential input resistance	note 6	–	4	–	kΩ
$C_{i(diff)}$	differential input capacitance	note 6	–	0.75	–	pF
$R_{o(SE)}$	single-ended output resistance		–	50	–	Ω

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Gain control						
V_{AGC}	AGC input voltage	$G \leq G_{v(min)}$	$0.1V_{CC}$	–	–	V
		$G \geq G_{v(max)}$	–	–	$0.9V_{CC}$	V
R_{AGC1}	AGC resistor 1		–	4.3	–	kΩ
R_{AGC2}	AGC resistor 2		–	110	–	kΩ

Notes

1. The voltage gain G_v is defined as the ratio between the single-ended output voltage and the differential input voltage with a 150 Ω output load: $G = 20 \times \log\left(\frac{V_{IFO}}{V_i}\right)$
2. The tilt is defined as the maximum absolute difference between the gain at the frequency f_o = 480 MHz and the gain at the frequency f_o = 480 MHz ±20 MHz. Where $\Delta G_v = \max \left| G(f_o \pm \Delta f) - G(f_o) \right|$
3. The unmatched noise figure (F) is measured at f_i = 480 MHz in the application circuit (see Fig.6). With the hybrid coupler used, the equivalent source impedance is equal to 100 Ω.
4. The minimum noise figure [$F_{(min)}$] is measured at f_i = 480 MHz with the input matching circuit shown in Fig.3; (L1: 4.5 turns on, Φ_{int} = 3 mm, wire = 0.4 mm; L2: 11 turns on, Φ_{int} = 3 mm, wire = 0.4 mm).
5. The third-order intermodulation distance (IM3) is measured with an AGC voltage set to obtain a gain of –17 dB. The input signal applied to the amplifier consists of two sine wave signals at f_i = 479.5 MHz and f_i = 480.5 MHz with an amplitude equal to 90 dBμV for each tone.
6. The differential input impedance is represented by an equivalent parallel resistance and capacitance as shown in Fig.1. The specified values are measured at f_i = 480 MHz.

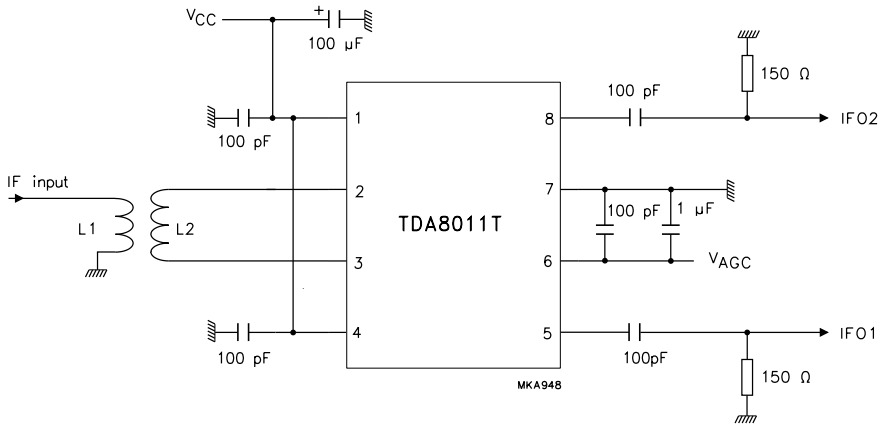


Fig.3 Input matching circuit.

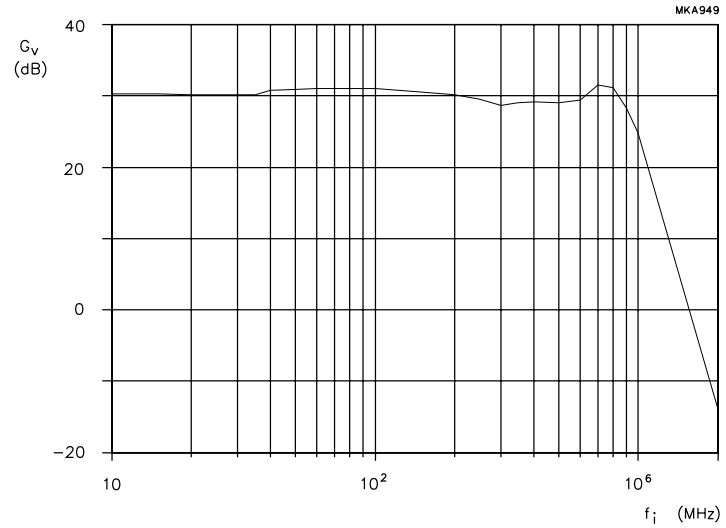


Fig.4 Typical frequency response curve.

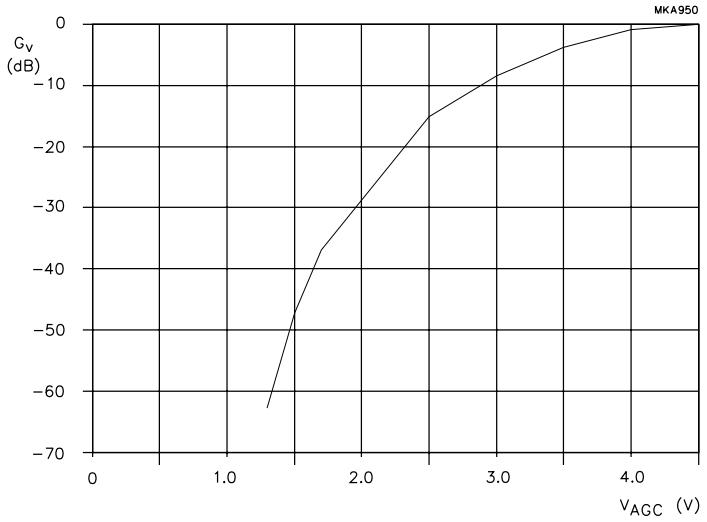


Fig.5 Typical gain control response curve.

APPLICATION INFORMATION

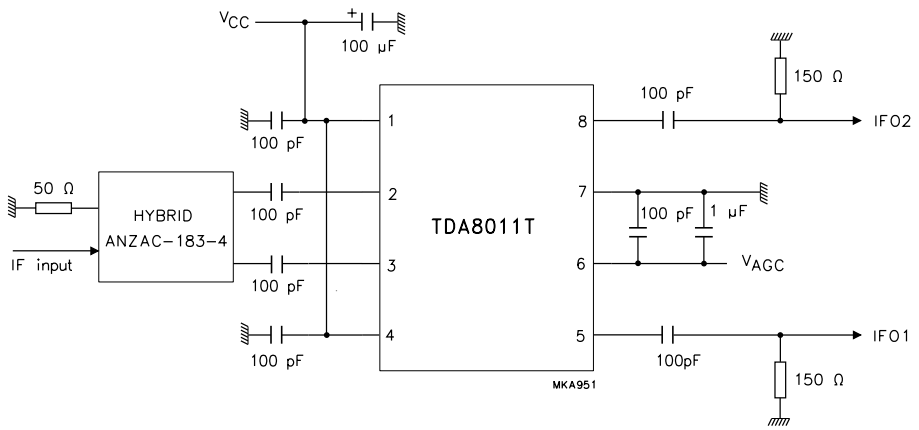
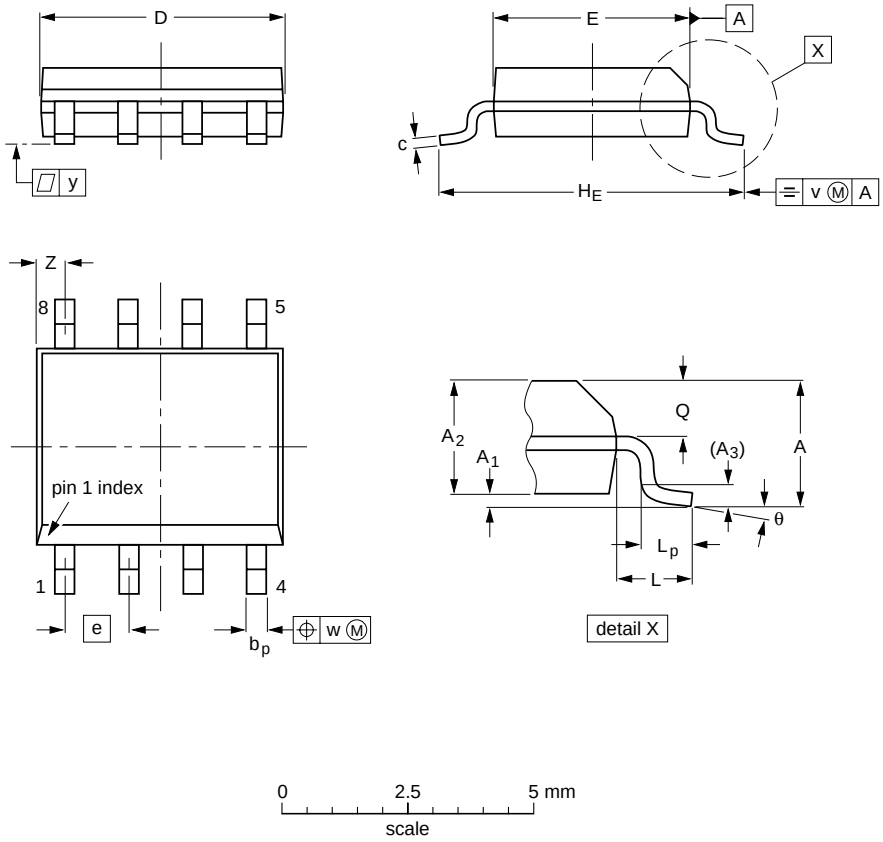


Fig.6 Application circuit.

PACKAGE OUTLINE

SO8: plastic small outline package; 8 leads; body width 3.9 mm **SOT96-1**



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	$D^{(1)}$	$E^{(2)}$	e	H_E	L	L_p	Q	v	w	y	$Z^{(1)}$	θ
mm	1.75	0.25 0.10	1.45 1.25	0.25	0.49 0.36	0.25 0.19	5.0 4.8	4.0 3.8	1.27	6.2 5.8	1.05	1.0 0.4	0.7 0.6	0.25	0.25	0.1	0.7 0.3	8^o 0^o
inches	0.069	0.010 0.004	0.057 0.049	0.01	0.019 0.014	0.0100 0.0075	0.20 0.19	0.16 0.15	0.050	0.244 0.228	0.041	0.039 0.016	0.028 0.024	0.01	0.01	0.004	0.028 0.012	

Notes

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT96-1	076E03S	MS-012AA				~~95-02-04~~ 97-05-22

SOLDERING

Plastic small-outline packages

BY WAVE

During placement and before soldering, the component must be fixed with a droplet of adhesive. After curing the adhesive, the component can be soldered. The adhesive can be applied by screen printing, pin transfer or syringe dispensing.

Maximum permissible solder temperature is 260 °C, and maximum duration of package immersion in solder bath is 10 s, if allowed to cool to less than 150 °C within 6 s. Typical dwell time is 4 s at 250 °C.

A modified wave soldering technique is recommended using two solder waves (dual-wave), in which a turbulent wave with high upward pressure is followed by a smooth laminar wave. Using a mildly-activated flux eliminates the need for removal of corrosive residues in most applications.

BY SOLDER PASTE REFLOW

Reflow soldering requires the solder paste (a suspension of fine solder particles, flux and binding agent) to be applied to the substrate by screen printing, stencilling or pressure-syringe dispensing before device placement.

Several techniques exist for reflowing; for example, thermal conduction by heated belt, infrared, and vapour-phase reflow. Dwell times vary between 50 and 300 s according to method. Typical reflow temperatures range from 215 to 250 °C.

Preheating is necessary to dry the paste and evaporate the binding agent. Preheating duration: 45 min at 45 °C.

REPAIRING SOLDERED JOINTS (BY HAND-HELD SOLDERING IRON OR PULSE-HEATED SOLDER TOOL)

Fix the component by first soldering two, diagonally opposite, end pins. Apply the heating tool to the flat part of the pin only. Contact time must be limited to 10 s at up to 300 °C. When using proper tools, all other pins can be soldered in one operation within 2 to 5 s at between 270 and 320 °C. (Pulse-heated soldering is not recommended for SO packages.)

For pulse-heated solder tool (resistance) soldering of VSO packages, solder is applied to the substrate by dipping or by an extra thick tin/lead plating before package placement.

DEFINITIONS

Data sheet status	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
Limiting values	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

LIFE SUPPORT APPLICATIONS

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NOTES

NOTES

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