

# **DCT 704x**

## **DIGITAL CABLE TUNER**

### **SPECIFICATION**

#### **FEATURES**

- ⇨ Full frequency range from 47 to 862 MHz
- ⇨ Antenna loop through function
- ⇨ Suitable for low and high data rates
- ⇨ Low phase noise
- ⇨ Channel filter and IF AGC amplifier inside
- ⇨ I2C bus control
- ⇨ Compatible to all major software drivers

MODEL	DESCRIPTION	PRODUCT REF. NO.
DCT7042A	Digital Cable Tuner with Channel filter and IF AGC amplifier inside, horizontal mounting, RH	21415800
DCT7043A	Digital Cable Tuner with Channel filter and IF AGC amplifier inside, horizontal mounting, LH	21421950
DCT7046	Digital Cable Tuner with Channel filter and IF AGC amplifier inside, horizontal mounting, RH With F-connector	21467480
DCT7047	Digital Cable Tuner with Channel filter and IF AGC amplifier inside, horizontal mounting, LH With F-connector	21477930

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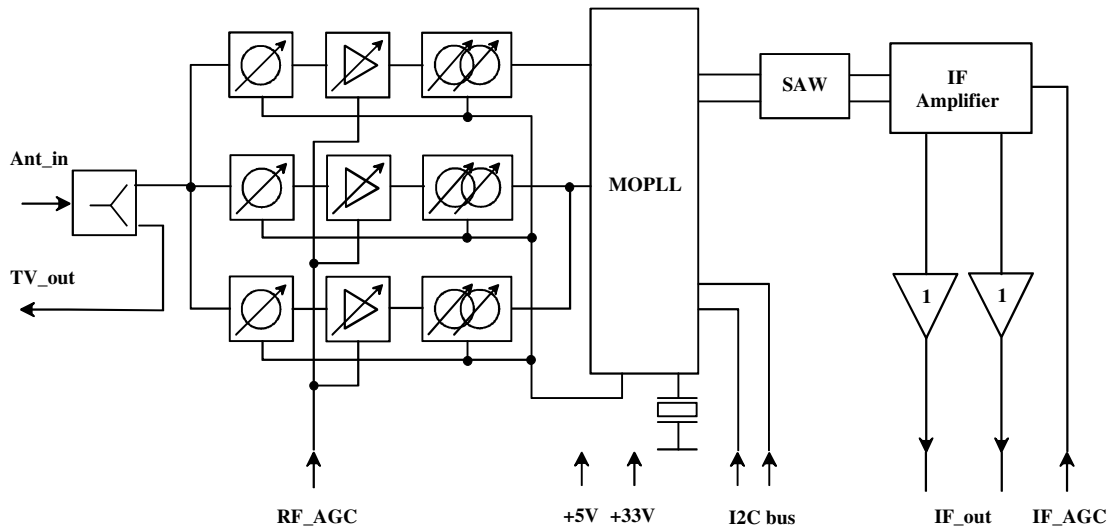
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## 1 Brief description

The tuner DCT 704x is designed for digital cable set top box application in compliance with the European digital cable standard ETS 300 429. The tuner consists of a VHF/ UHF tuner, a SAW filter for channel filtering, an IF amplifier with AGC and an antenna loop through function. The full frequency range from 47 to 862 MHz is automatically splitted into 3 bands and after gain setting and filtering converted to the standard IF frequency of 36 MHz by means of a mixer/oscillator IC. The tuner incorporates the Thomson Universal Tuning System, which doesn't require any band switching information. The unit is built on a low-loss printed circuit board carrying all the components in a metal housing frame with top and rear covers. The aerial connectors (IEC-male/female type) are mounted on one frame side; all other connections are made via pins at the bottom.

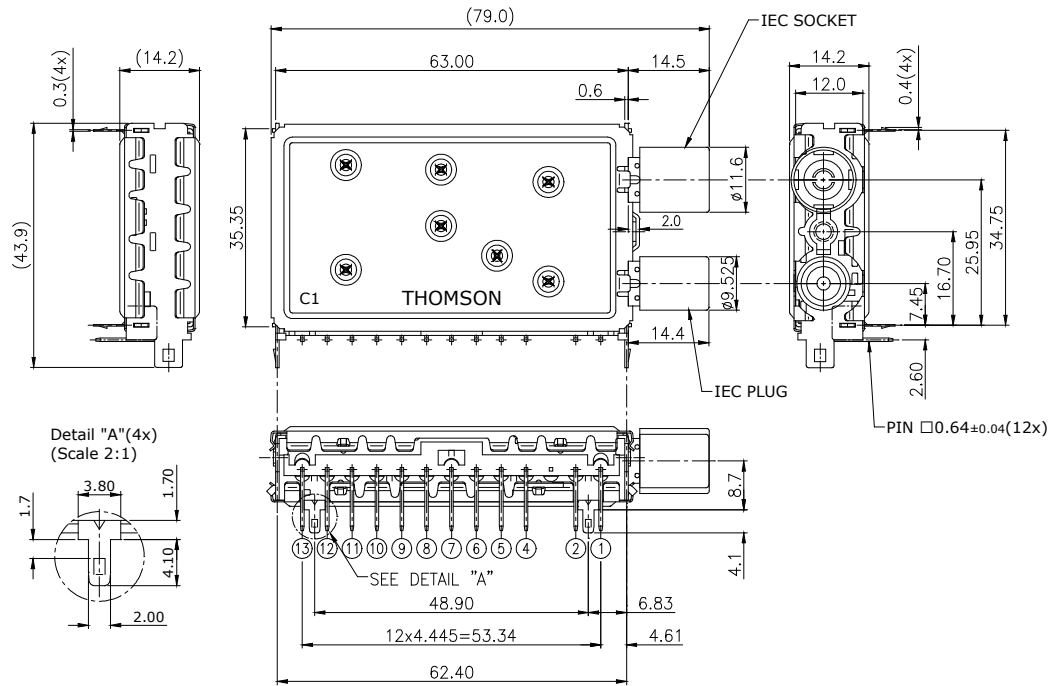
The tuner complies with the requirements of radiation, signal handling capability and immunity interference of CENELEC European standards EN55013 and EN55020.

## 2 Block diagram

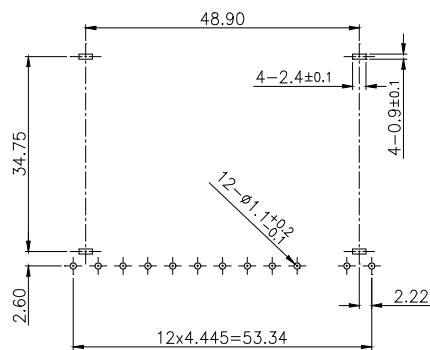




**3.2 DCT 7042A and DCT7046 Horizontal mounting (Right hand pinning)**



**PCB PINNING LAYOUT  
(TOP VIEW)**



NOTE:  
- GENERAL TOLERANCE  $\pm 0.2$ mm UNLESS OTHERWISE STATED.  
- ALL DIMENSIONS ARE IN MILLIMETER.

\* DCT7046 is with F-connector (L=17.6) instead of IEC socket



**4 Pin Definitions**

Pin	Symbol	Description
1	RF_AGC	Tuner AGC input
2	Vcc1	Supply voltage +5V (Antenna Loop Through)
3	nc	
4	Vcc2	Supply voltage +5V (Tuner)
5	nc	
6	SCL	I2C bus clock
7	SDA	I2C bus data
8	AS	Address select
9	Vt	Tuning voltage +33V
10	Vcc3	Supply voltage +5V (IF amplifier)
11	IF_AGC	IF AGC input
12	IF_out +	IF output
13	IF_out -	IF output

**5 Operational Conditions**

No	Parameter	Unit	Min	Typ	Max	Remarks
1.	Supply voltage Vcc 1/2/3	V	4,75	5	5,25	ripple $\leq$ 20mVpp
2.	Supply current Icc1	mA		50	65	
3.	Supply current Icc2	mA		86	110	
4.	Supply current Icc3	mA		125	150	
5.	Tuning voltage Vt	V	31,5	33	34,5	ripple $\leq$ 10mVpp
6.	Input signal at Ant_IN	dBuV		60		
7.	RF AGC voltage	V	0,1		4,0	$\leq$ 0.2mA
8.	IF AGC voltage	V	0,1		2,0	$\leq$ 0.2mA
9.	IF output	$\Omega$		1000		balanced
10.	Ambient temperature	$^{\circ}$ C	-10		60	
11.	Relative humidity	%			90	

Remark: The ripple voltage must be guaranteed in the final application. The ripple frequency  $\leq$  100 Hz



**6 Standard Test Conditions**

No	Parameter	Unit	Min	Typ	Max	Remarks
1.	Ambient temperature	°C	23	25	27	
2.	Relative humidity	%	45	60	75	
3.	Vcc	V	4,9	5	5,1	
4.	RF AGC voltage	V	3,9	4,0	4,1	
5.	IF AGC voltage	V	0		1,7	
5.	Vt	V	31,5	33	34,5	
6.	Input impedance	Ω	70	75	80	unbalanced
7.	Output impedance	Ω		1000		balanced

Note: A proper function is guaranteed within the specified supply voltage and environmental conditions but a certain deterioration of performance parameters may occur at the limits of operational conditions.

## 7 Electrical Characteristics

### 7.1 Tuner

No	Parameters	Unit	Min	Typ	Max	Remarks
1.	Frequency range	MHz	51		858	related to the center frequency of the channel
2.	Frequency margin Low end High end	MHz	2 2			
3.	Input return loss	dB	8			Over full tuning range
4.	Intermediate frequency	MHz		36		center frequency, oscillator operates above the input signal
5.	Amplitude response curve of tuner part	dB			3	Difference in amplitude inside the channel bandwidth $\pm 4$ MHz. See note 1
6.	Voltage gain At IF output	dB		95		Max. voltage gain measured with Ant_In at 30dBuV wrt 1k ohm load
7.	Gain taper	dB			8	
8.	RF AGC range	dB	40			Maximum value between AGC voltage 0,1...4,0 V Note 1
9.	AGC range RF+IF	dB	80			RF AGC =4V (max.) IF AGC =1.7V (max.)
10.	Noise figure	dB			8,5	AGC voltage = 4,0V
11.	IF rejection All channels except CH 02	dB	60 50	80 60		
12.	Image rejection	dB	50			across 20dB AGC range
13.	Oscillator stability	ppm			$\pm 50$	0°C -60°C ambient temperature
14.	Oscillator phase noise At 1 KHz At 10 KHz At 100 KHz	dBc/Hz	-57 -82 -100			without transmission on SDA/SCL
15.	Acquisition time Low charge pump current High charge pump current	ms			120 60	
16.	Intermodulation CSO CTB	dBc dBc	50 50			full spectrum of carriers at +75dB $\mu$ V each, AGC set for 15dB gain reduction
17.	IF output level	dB $\mu$ V		111		balanced
18.	IF bandwidth	MHz		8		
19.	IF accuracy	kHz			$\pm 74$	

Note1: Amplitude response may increase by 1dB, if voltage gain is reduced by 20dB.

**7.2 Antenna Loop Through**

No	Parameters	Unit	Min	Typ	Max	Remarks
1.	Frequency range	MHz	47		858	
2.	Power Gain at TV out	dB	-1		3	
3.	Noise Figure at TV out	dB		6	8,5	
4.	Return loss at TV out	dB	6			
5.	Oscillator leakage at TV out <300MHz >300MHz	dB $\mu$ V			15 26	Antenna Input terminated with 75 $\Omega$
6.	Isolation at TV out/IF out 90 to 860MHz	dB		25		Test signals with same levels at ANT in and TV out
7.	Isolation TV out / ANT in	dB	20			
8.	Linearity at TV out CSO CTB	dB dB	57 61			In accordance to CENELEC 50083-7

## 8 Application Information

### 8.1 Tuner

#### Write Data

	MSB					LSB			
Address Byte	1	1	0	0	0	MA1	MA0	0	A
Prog. Divider Byte 1	0	n14	n13	n12	n11	n10	n9	n8	A
Prog. Divider Byte 2	n7	n6	n5	n4	n3	n2	n1	n0	A
Control Byte 1	1	CP	0	0	x	RSA	RSB	0	A
Control Byte 2	x	x	x	x	x	x	P1	P0	A

CP Charge pump current

CP=0 : I = 50uA (recommended for best phase noise performance)

CP=1 : I = 250uA

#### Programmable Divider (Byte1 and Byte2)

Divider ratio:

$$N = \frac{F_{OSC}(MHz)}{F_{REF}(KHz)}$$

with:

$$N = 16384 \times N14 + 8192 \times N13 + 4096 \times N12 + \dots + 4 \times N2 + 2 \times N1 + N0$$

Address	MA1	MA0	Voltage at Pin 8
C0	0	0	(0...0,1) * Vcc1
C2	0	1	open circuit
C4	1	0	(0,4...0,6) * Vcc1
C6	1	1	(0,9...1) * Vcc13

#### Control Info Byte1

RSA	RSB	fref/min tuning step
1	1	62,5 KHz
X	0	50,00 KHz
0	1	31,25 KHz

#### Control Info Byte2

Fosc	P1	P0
[ 87 ~ 185 ] MHz	1	0
[ 185 ~ 465 ] MHz	0	1
[ 465 ~ 894 ] MHz	0	0
na	1	1

**Note:**

For information regarding general specification of I2C bus see datasheet of the IC CP3550 from INFINEON.

## **9 Electrostatic discharge**

### **9.1 Test**

Each DUT must be capable of normal performance following its subjection to the following tests:

#### MIL STD 883C HBM

Test is performed with a voltage discharge from a 100 PF capacitor over a 1500  $\Omega$  series resistance in the discharge path. There is a direct contact between the test probe head and the unit under test, using the test points and conditions detailed below:

- o Test to pins 1 through 13 :  
3 successive ESD discharges of  $\pm 2$  KVDC between each pin and the DUT frame.

#### IEC 1000-4-2

Test is performed with a voltage discharge from a 150 PF capacitor over a 330  $\Omega$  series resistance in the discharge path. There is a direct contact between the test probe head and the unit under test, using the test points and conditions detailed below:

- o Test for antenna input socket  $\pm 8$  KVDC
- o Test for antenna output socket  $\pm 5$  KVDC

### **9.2 Handling**

Anyone handling a Unit must wear a properly grounded anti - static discharge bracelet to minimize ESD damage.

After each Unit is aligned and tested, it will be packed with anti - static poly foam or material prior to transportation and storage. This protective foam is to remain in place until the front-end is assembled and soldered onto the receiver main board.

## **10 Reliability test procedure & conditions**

Note: Room temperature =  $25\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$

### **10.1 Heat load test**

- o Measure the DUTs at room temperature
- o Load the DUTs into chamber of the following conditions:

Temperature	= $60\text{ }^{\circ}\text{C}$
Period	= 500 hrs
Cycle	= 1,5 hrs on; 0,5 hrs off
Quantity	= 10 pcs

- o Cool-down 0,5 hr at room temperature, then measured the DUTs within 1 hr
- o The test shall be continued to 1000 cycles for information only

### **10.2 Humidity load test**

- o Measure the DUTs at room temperature
- o Load the DUTs into chamber of the following conditions:

Temperature	= $40 \pm 5\text{ }^{\circ}\text{C}$
Period	= 24 hrs
Cycle	= constantly on
Quantity	= 20 pcs

- o Cool-down 0.5 hr at room temperature, then measured the DUTs within 1 hr
- o Load the DUTs again into chamber of the following conditions:

Temperature	= $40 \pm 5\text{ }^{\circ}\text{C}$
Humidity	= 90 to 95 %
Period	= 500 hrs
Cycle	= 1,5 hrs on; 0,5 hrs off
Quantity	= 20 pcs

- o Cool down 0.5 hr at room temperature, then measured the DUTs within 1 hr



## 10.6 Vibration test

(per FR-M-202 of Thomson Green Book, Vibration test)

- o Frequency: 3,5 Hz
- o Vertical amplitude: 15 to 25 mm
- o Duration: 1 hr
- o Quantity : 1 carton

## 10.7 Drop test

(per FP-M-204 of Thomson Green Book, Drop test)

- o Packaged apparatus: < or = 50 kg
- o Height: depend on weight per FP-M-204
- o 1 corner + 3 edges + 6 faces

- o
  - Drop on the weakest corner (point G)
  - Drop on the shortest edge in contact with point G
  - Drop on average edge in contact with point G
  - Drop on the longest edge in contact with point G
  - Drop flat wise on the side of minimum surface
  - Drop flat wise on the side of opposite minimum surface
  - Drop flat wise on the side of average surface
  - Drop flat wise on the side of opposite average surface
  - Drop flat wise on the side of maximum surface
  - Drop flat wise on the side of opposite maximum surface

- o Quantity: 1 carton

## 10.8 Life test

- o Measure the DUTs at room temperature
- o Load the DUTs into chamber of the following conditions:

- o
  - Temperature = 60 °C
  - Period = 500 hrs
  - Cycle = constantly on
  - Quantity = 20 pcs

- o Cool down 0.5 hr at room temperature, then measured the DUTs within 1 hr



**11 Appendix**

**11.1 Packaging**

	<b>Tuner</b>	<b>Carton Box</b>	<b>PALLET (BIG)</b>
<b>1. TYPE</b>		Corrugated Paper Box	wood
<b>2. QUANTITY</b>			
<b>TUNERS</b>	1	65	5200
<b>CARTONS</b>		1	80
<b>3. WEIGHT (Approximate)</b>	50g	4Kg	340Kg
<b>4. DIMENSIONS L x H x D (in mm)</b>	63 x 35.25 x 14.2	469 x 396 x 64	1200 x 1450 x 800

## 11.2 Identification / Trace ability

### Packaging Label

<b>DCT 7042A</b> <b>TOCOM NO. : 21415800</b> <b>QTY. : 65 PCS</b> <b>CTN. NO. :</b>
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### Tuner Label

<b>DCT 7042A</b> <b>21415800      21140100043</b>
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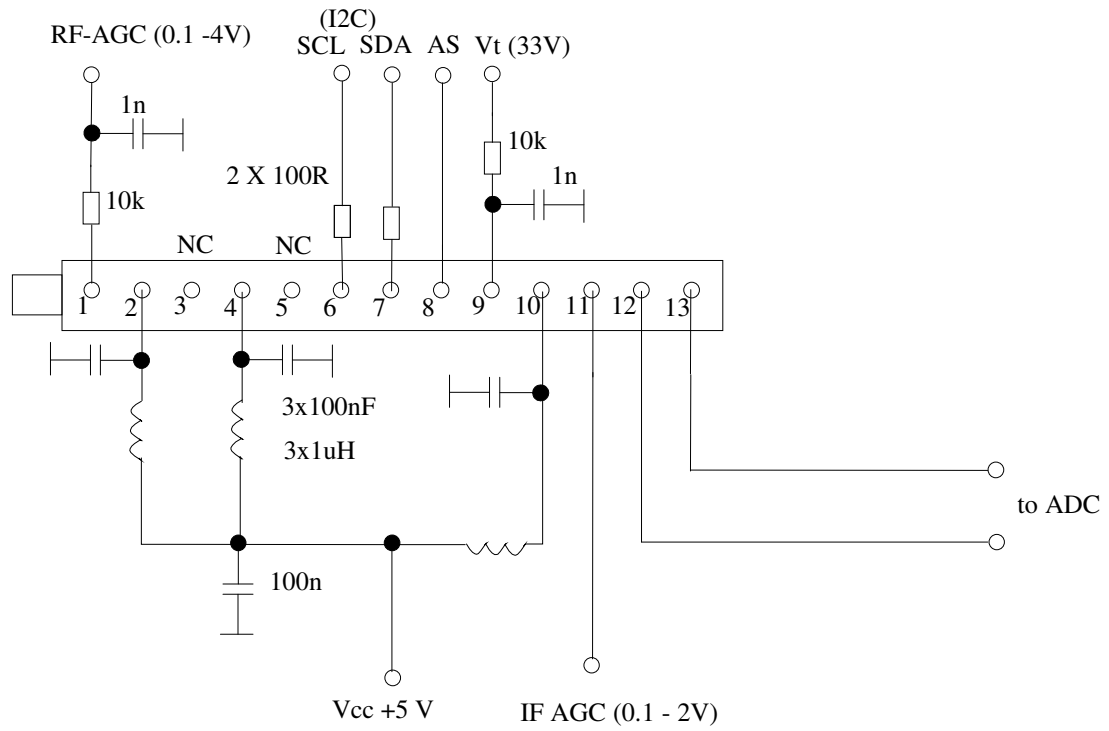
### Format

Y-WW-D-II-NNNNN

e.g **2-11-4-01-00043**

Note: Y : Year Produced  
WW : Week Produced  
D : Day of the week Produced  
II : Current Index  
NNNNN : Running number of the tuner

**11.3 Application Circuit**



**12 Revision**

<b>Date of Changes</b>	<b>Index</b>	<b>Modification</b>	<b>Pages</b>
07-10-04	00	Preliminary Specification. (MOPLL -CP3550)	all
27-05-05	A	Include new model DCT7046 and DCT7047	5,6