



# TDA18271HD

## Silicon Tuner IC

Rev. 04 — 19 May 2009

Product data sheet

## 1. General description

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The TDA18271HD is a Silicon Tuner IC designed mainly for terrestrial analog and digital TV reception. The TDA18271HD integrates the overall tuning function, including selectivity.

The TDA18271HD is compatible with all analog and digital TV standards and delivers a low IF signal to a demodulator (for analog TV) and/or channel decoder (for digital TV).

This specification is based on software version 3.4.

## 2. Features

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- Fully integrated RF tracking filters for unwanted signal suppression
- Fully integrated IF selectivity (no need for external SAW filters)
- Worldwide multistandard terrestrial (all analog and digital worldwide terrestrial standards supported)
- Integrated loop-through and slave tuner output for straightforward multi-Silicon Tuner application
- Fully integrated oscillators with no external components
- Alignment free
- Integrated wide-band gain control
- Single 3.3 V power supply
- Low power consumption
- Crystal oscillator output buffer (16 MHz) for single crystal applications
- I<sup>2</sup>C-bus interface compatible with 3.3 V and 5 V microcontrollers
- Three Standby modes
- RoHS packaging

## 3. Applications

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### 3.1 Target applications

- Hybrid (analog and digital TV) for PCTV, DVD-R and TV applications
- Application optimization is described in application notes *AN602*, *AN604* and *AN605*



### 3.2 Key benefits

- The TDA18271HD is a Silicon Tuner targeting digital and analog TV applications. The aim is to match the performance of conventional Can tuners while reducing the size of the tuner function. Additionally, the following benefits are provided:
  - ◆ Easy on-board integration
  - ◆ Easy dual tuner configuration
  - ◆ Drastic size reduction of the tuner function and power consumption

## 4. Quick reference data

**Table 1. Quick reference data**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$f_{RF(STO)}$	RF frequency on pin STO	slave tuner output	45	-	864	MHz
$NF_{tun}$	tuner noise figure	maximum gain	-	5.5	-	dB
$\phi_n$	phase noise	1 kHz and 10 kHz	-	-89	-	dBc/Hz
P	power dissipation		-	780	-	mW
$V_{i(max)}$	maximum input voltage	1 dB gain compression, one analog TV signal at RF input (-5 dBm)	-	103	-	dB $\mu$ V
$\alpha_{image}$	image rejection		-	65	-	dB
$S_{dig}$	digital sensitivity	DVB-T (64 QAM $\frac{2}{3}$ ); BER = $2 \cdot 10^{-4}$	[1]	-82	-	dBm
$S_a$	analog sensitivity	50 dB video SNR weighted 22 dB $\mu$ V (color loss)	[2]	58	-	dB $\mu$ V

[1] Measured with TDA10048HN channel decoder.

[2] Measured with TDA8295 IF modulator.

## 5. Ordering information

**Table 2. Ordering information**

Type number	Package		Version
	Name	Description	
TDA18271HD/C2	HLQFN64R	plastic thermal enhanced low profile quad flat package; no leads; 64 terminals; resin based; body 9 × 9 × 1.6 mm	SOT903-1

6. Block diagram

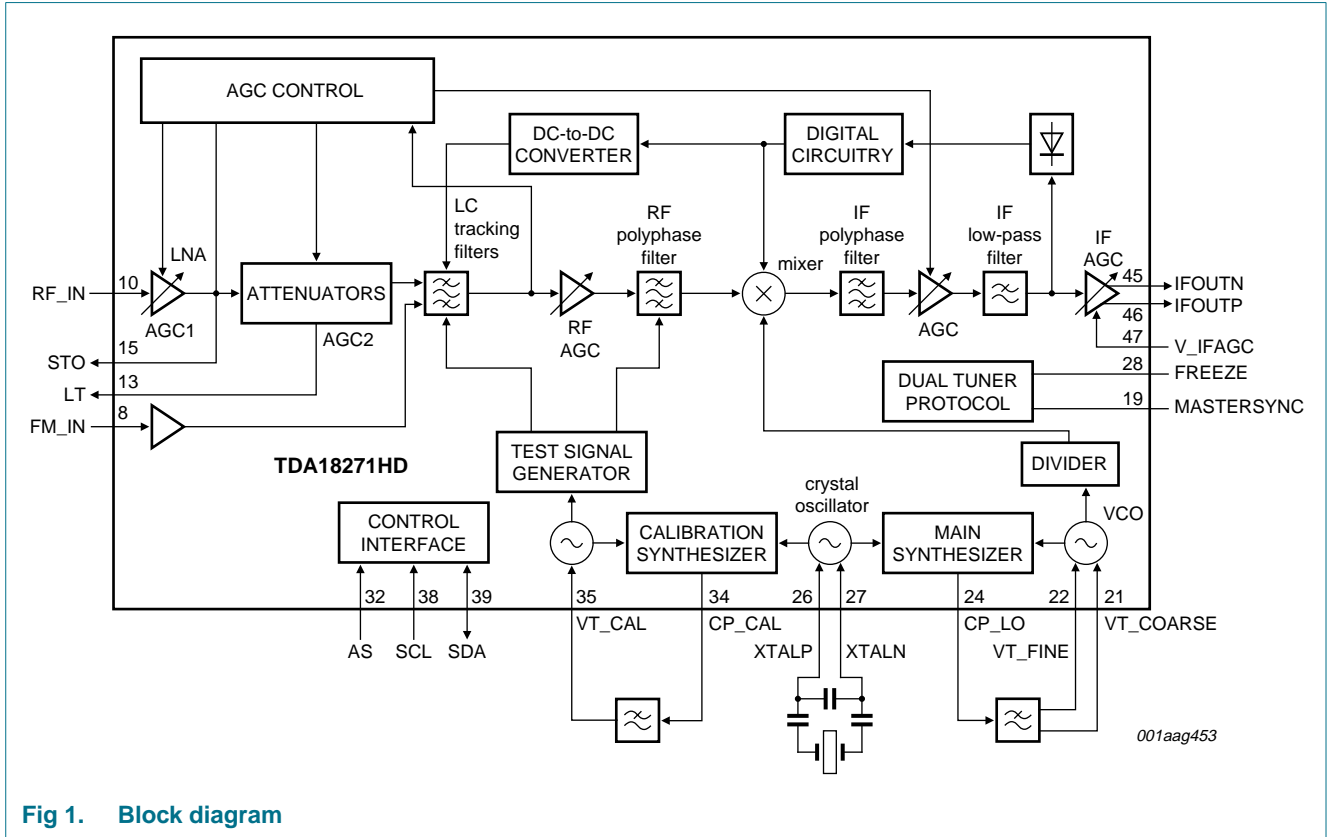
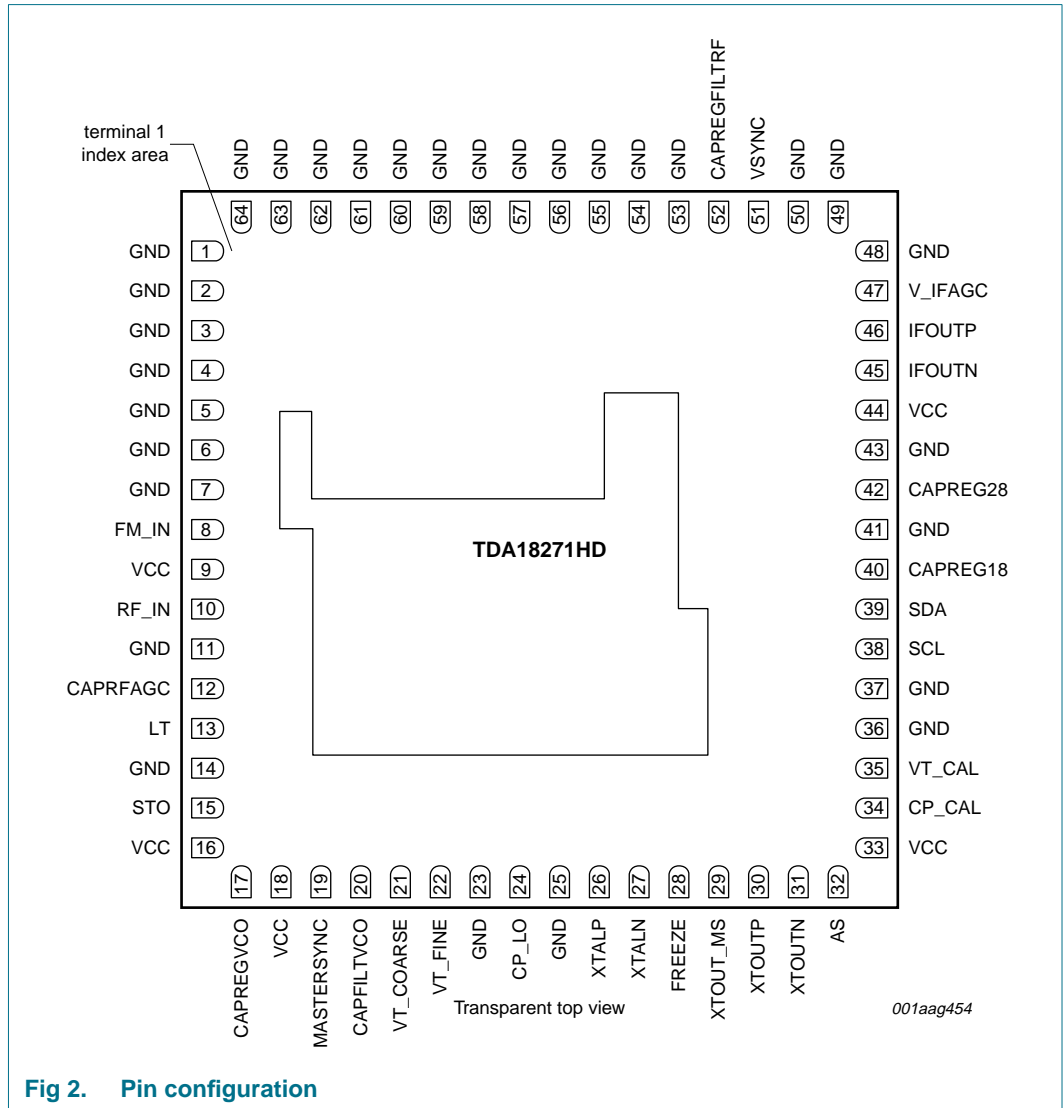


Fig 1. Block diagram

## 7. Pinning information

### 7.1 Pinning



### 7.2 Pin description

Table 3. Pin description

Symbol	Pin	Description
GND	1 to 7	ground
FM_IN	8	unbalanced FM input
VCC	9	3.3 V supply voltage
RF_IN	10	unbalanced RF (TV) input
GND	11	ground
CAPRFAGC	12	RF AGC filtering
LT	13	loop-through output

Table 3. Pin description ...continued

Symbol	Pin	Description
GND	14	ground
STO	15	slave tuner output
VCC	16	3.3 V supply voltage
CAPREGVCO	17	VCO supply decoupling
VCC	18	3.3 V supply voltage
MASTERSYNC	19	synchronization signal for dual tuner applications; leave open for single tuner applications
CAPFILTVCO	20	VCO reference decoupling
VT_COARSE	21	LO tuning voltage input
VT_FINE	22	LO tuning voltage input
GND	23	ground
CP_LO	24	charge pump of the local synthesizer
GND	25	ground
XTALP	26	crystal oscillator input
XTALN	27	crystal oscillator input
FREEZE	28	synchronization signal for multi tuner applications; leave open for single tuner applications
XTOUT_MS	29	XTOUT mode and master/slave selection
XTOUTP	30	crystal oscillator output buffer
XTOUTN	31	crystal oscillator output buffer
AS	32	I <sup>2</sup> C-bus address selection input
VCC	33	3.3 V supply voltage
CP_CAL	34	charge pump of the calibration synthesizer
VT_CAL	35	tuning voltage of the calibration synthesizer
GND	36, 37	ground
SCL	38	I <sup>2</sup> C-bus clock input
SDA	39	I <sup>2</sup> C-bus data input/output
CAPREG18	40	internal regulator decoupling
GND	41	ground
CAPREG28	42	internal regulator decoupling
GND	43	ground
VCC	44	3.3 V supply voltage
IFOUTN	45	IF output
IFOUTP	46	IF output
V_IFAGC	47	IF gain control input
GND	48 to 50	ground
VSYNC	51	vertical synchronization input for analog applications; connect to ground for digital applications
CAPREGFILTRF	52	internal regulator decoupling
GND	53 to 64	ground
GND	exposed die	ground

## 8. Functional description

The RF input signal is driven to a low-noise amplifier. It is then band-pass filtered, amplified and fed to the image rejection mixer. The mixer downconverts the RF signal to a low IF depending on the channel bandwidth.

Standard IF filters are implemented for 1.5 MHz, 6 MHz, 7 MHz and 8 MHz channel bandwidths; see [Table 43](#).

The Silicon Tuner can be used either as TV receiver or FM radio receiver.

The TDA18271HD requires a single 16 MHz crystal for clock generation. When bit XTOUT\_ON = 1, a clock signal is available on pins XTOUTP and XTOUTN to drive a second tuner, a channel decoder or an IF demodulator (TDA8295) for analog TV reception and FM radio.

**Remark:** Most recent video decoders from NXP Semiconductors include a low IF demodulation function.

### 8.1 TV and FM reception

The Silicon Tuner can be used in two modes, selectable via the I<sup>2</sup>C-bus:

- TV reception: the RF signal must be connected to pin RF\_IN
- FM reception: the RF signal must be connected to pin FM\_IN or RF\_IN

The RF\_IN input pin can also be used for FM reception at the cost of software modification. The FM\_IN input pin can only receive signals in the FM frequency range.

### 8.2 Master and slave operation

The TDA18271HD allows easy dual-tuner configuration.

Each individual tuner has to be set either to Master mode or Slave mode by applying a specific DC voltage to the XTOUT\_MS pin; see [Table 4](#). This will decide whether the crystal oscillator part is used as negative impedance connected to the crystal part or as a current buffer.

**Table 4. Master/slave selection**

Voltage on pin XTOUT_MS	Tuner type	Crystal oscillator function
0 V to 0.1V <sub>CC</sub>	master	negative impedance presented to the crystal
0.4V <sub>CC</sub> to 0.6V <sub>CC</sub>	slave	current input buffer

In dual tuner applications:

- The first tuner is set to Master mode
- The second tuner has to be set to Slave mode

In single tuner applications:

- The tuner must be set to Master mode

### 8.3 Tuner outputs

The tuner provides a slave tuner output (pin STO) and a loop-through output (pin LT). These outputs are used to transmit the antenna signal to other tuners. Each output has its own characteristics (see [Table 58](#) and [Table 59](#)).

#### 8.3.1 Loop-through output

The gain between the antenna connector and the loop-through pin (pin LT) equals 0 dB. This pin can be connected to any consumer electronic equipment.

#### 8.3.2 Slave tuner output

In dual tuner applications the slave tuner output (pin STO) must be connected to the RF input of the slave tuner TDA18271HD.

The gain between the antenna connector and the slave tuner output can change according to the input level. The slave tuner will automatically compensate for the gain change, using the MASTERSYNC and FREEZE signals.

### 8.4 Crystal input mode

The TDA18271HD requires a 16 MHz crystal reference. The chosen crystal must withstand at least 100  $\mu$ W drive level and an additional shunt capacitor with a typical value of 5.6 pF as shown in [Figure 1](#) is also needed. The quartz references for which the performances are guaranteed are:

- NDK NX5032
- Siward SX-5032
- TXC 9C series
- Chungho Elcom HC49S profile

Clock reference:

- In Master mode, the clock reference must be provided by a 16 MHz crystal connected between pins XTALP and XTALN of the master tuner
- In Slave mode, the clock reference must be provided by pins XTOUTP and XTOUTN of the tuner in Master mode to pins XTALP and XTALN of the tuner in Slave mode

### 8.5 Crystal output mode

Pins XTOUTP and XTOUTN deliver a symmetrical sine waveform to drive the channel decoder and/or IF demodulator. The load on these outputs should be made similar to ensure optimum performances. If only one crystal output is used, the unused output should be loaded by an equivalent capacitance.

## 9. Control interface

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### 9.1 I<sup>2</sup>C-bus format, Write/Read mode

**Remark:** The I<sup>2</sup>C-bus read in the TDA18271HD must read the entire I<sup>2</sup>C-bus map, with required subaddress 00h. The number of bytes read is 16, or 39 in extended register mode; see [Table 7](#). Reading write-only bits can return values that are different from the programmed values.



Table 5. I<sup>2</sup>C-bus format

Name	Byte name	Sub address	Bit													
			7	6	5	4	3	2	1	0						
Address byte 1	-	-	1	1	0	0	0	0	MA[1:0]							R/W
Address byte 2	-	-	0	0					AD[5:0]							
ID byte	ID	00h	1						ID[6:0]							
Thermo byte	TM	01h	POR	LOCK	TM_RANGE	TM_ON	TM_D[3:0]									
Power level byte	PL	02h					POWER_LEVEL[7:0]									
Easy prog byte 1	EP1	03h	POWER_LEVEL[8]	DIS_POWER_LEVEL	0	RF_CAL_OK	IR_CAL_OK									BP_FILTER[2:0]
Easy prog byte 2	EP2	04h		RF_BAND[2:0]												GAIN_TAPER[4:0]
Easy prog byte 3	EP3	05h	SM	SM_LT	SM_XT		AGCK_MODE[1:0]									STD[2:0]
Easy prog byte 4	EP4	06h	FM_RFN	XTOUT_ON	1		IF_LEVEL[2:0]									CAL_MODE[1:0]
Easy prog byte 5	EP5	07h	EXTENDED_REG				IR_GSTEP[2:0]									IR_MEAS[2:0]
Cal post-divisor byte	CPD	08h					CAL_POST_DIV[7:0]									
Cal divider byte 1	CD1	09h	0				CAL_DIV[22:16]									
Cal divider byte 2	CD2	0Ah					CAL_DIV[15:8]									
Cal divider byte 3	CD3	0Bh					CAL_DIV[7:0]									
Main post-divisor byte	MPD	0Ch	IF_NOTCH				MAIN_POST_DIV[6:0]									
Main divider byte 1	MD1	0Dh	0				MAIN_DIV[22:16]									
Main divider byte 2	MD2	0Eh					MAIN_DIV[15:8]									
Main divider byte 3	MD3	0Fh					MAIN_DIV[7:0]									
Extended byte 1	EB1	10h			EB1[7:3]											AGC1_ALWAYS_MASTERN
																AGC1_FIRSTN
Extended byte 2	EB2	11h					EB2[7:0]									
Extended byte 3	EB3	12h					EB3[7:0]									
Extended byte 4	EB4	13h	EB4[7:6]		LO_FORCE_SRCE											EB4[4:0]
Extended byte 5	EB5	14h					EB5[7:0]									
Extended byte 6	EB6	15h					EB6[7:0]									

TDA18271HD\_4

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Table 5. I<sup>2</sup>C-bus format ... continued

Name	Byte name	Sub address	Bit								
			7	6	5	4	3	2	1	0	
Extended byte 7	EB7	16h	EB7[7:6]		CAL_FORCE SRCE	EB7[4:0]				0	
Extended byte 8	EB8	17h	CID_ALARM	EB8[6:4]			EB8[3]		EB8[2:0]		
Extended byte 9	EB9	18h	EB9[7:0]								
Extended byte 10	EB10	19h	EB10[7:6]								
Extended byte 11	EB11	1Ah	EB11[7:0]								
Extended byte 12	EB12	1Bh	EB12[7:6]	PD_AGC1_DET			PD_AGC2_DET		EB12[3:0]		
Extended byte 13	EB13	1Ch	EB13[7]	RFC_K[2:0]			RFC_M[1:0]		EB13[1:0]		
Extended byte 14	EB14	1Dh	RFC_CPROG[7:0]								
Extended byte 15	EB15	1Eh	EB15[7:4]								
Extended byte 16	EB16	1Fh	EB16[7:0]								
Extended byte 17	EB17	20h	EB17[7:0]								
Extended byte 18	EB18	21h	AGC1_LOOP_OFF	EB18[6:2]				AGC1_GAIN[1:0]			
Extended byte 19	EB19	22h	EB19[7:0]								
Extended byte 20	EB20	23h	EB20[7:6]			FORCE_LOCK		EB20[4:0]			
Extended byte 21	EB21	24h	AGC2_LOOP_OFF	EB21[6:2]				AGC2_GAIN[1:0]			
Extended byte 22	EB22	25h	EB22[7]				RF_TOP[2:0]		IF_TOP[3:0]		
Extended byte 23	EB23	26h	EB23[7:3]				FORCELP_FC2_EN		LP_FC		EB23[0]

9.2 I<sup>2</sup>C-bus at Power-On ResetTable 6. I<sup>2</sup>C-bus at Power-On Reset

Name	Byte	Subaddress	7 <sup>[1]</sup>	6 <sup>[1]</sup>	5 <sup>[1]</sup>	4 <sup>[1]</sup>	3 <sup>[1]</sup>	2 <sup>[1]</sup>	1 <sup>[1]</sup>	0 <sup>[1]</sup>
Address byte 1	-	-	1	1	0	0	0	MA[1]	MA[0]	X
Address byte 2	-	-	X	X	AD[5]	AD[4]	AD[3]	AD[2]	AD[1]	AD[0]
ID byte	ID	00h	1	0	0	0	0	1	0	0
Thermo byte	TM	01h	1	0	0	0	X	X	X	X
Power level byte	PL	02h	X	X	X	X	X	X	X	X
Easy prog byte 1	EP1	03h	X	1	0	0	0	1	1	0
Easy prog byte 2	EP2	04h	1	1	0	1	1	1	1	1
Easy prog byte 3	EP3	05h	1	0	0	1	0	0	1	0
Easy prog byte 4	EP4	06h	0	1	1	0	0	0	0	0
Easy prog byte 5	EP5	07h	0	0	1	1	0	0	0	0
Cal post-divider byte	CPD	08h	0	0	0	0	0	0	0	0
Cal divider byte 1	CD1	09h	0	0	0	0	0	0	0	0
Cal divider byte 2	CD2	0Ah	0	0	0	0	0	0	0	0
Cal divider byte 3	CD3	0Bh	0	0	0	0	0	0	0	0
Main post-divider byte	MPD	0Ch	0	0	0	0	0	0	0	0
Main divider byte 1	MD1	0Dh	0	0	0	0	0	0	0	0
Main divider byte 2	MD2	0Eh	0	0	0	0	0	0	0	0
Main divider byte 3	MD3	0Fh	0	0	0	0	0	0	0	0
Extended byte 1	EB1	10h	1	1	1	1	1	1	1	1
Extended byte 2	EB2	11h	0	0	0	0	0	0	0	1
Extended byte 3	EB3	12h	1	0	0	0	0	1	0	0
Extended byte 4	EB4	13h	0	1	0	0	0	0	0	1
Extended byte 5	EB5	14h	0	0	0	0	0	0	0	1
Extended byte 6	EB6	15h	1	0	0	0	0	1	0	0
Extended byte 7	EB7	16h	0	1	0	0	1	0	0	0
Extended byte 8	EB8	17h	0	1	1	1	X	1	0	1
Extended byte 9	EB9	18h	0	0	0	0	0	0	0	0
Extended byte 10	EB10	19h	X	X	X	X	X	X	X	X
Extended byte 11	EB11	1Ah	1	0	0	0	0	1	1	0
Extended byte 12	EB12	1Bh	0	0	0	0	0	1	1	1
Extended byte 13	EB13	1Ch	1	1	0	0	0	0	1	0
Extended byte 14	EB14	1Dh	0	0	0	0	0	0	0	0
Extended byte 15	EB15	1Eh	1	0	0	0	X	X	X	X
Extended byte 16	EB16	1Fh	0	0	0	X	X	X	0	0
Extended byte 17	EB17	20h	0	0	0	X	X	X	X	X
Extended byte 18	EB18	21h	0	0	0	0	0	0	0	0
Extended byte 19	EB19	22h	0	0	0	X	X	X	0	0
Extended byte 20	EB20	23h	1	0	0	X	X	X	X	X

Table 6. I<sup>2</sup>C-bus at Power-On Reset ...continued

Name	Byte	Subaddress	7 <sup>[1]</sup>	6 <sup>[1]</sup>	5 <sup>[1]</sup>	4 <sup>[1]</sup>	3 <sup>[1]</sup>	2 <sup>[1]</sup>	1 <sup>[1]</sup>	0 <sup>[1]</sup>
Extended byte 21	EB21	24h	0	0	1	1	0	0	1	1
Extended byte 22	EB22	25h	0	1	0	0	1	0	0	0
Extended byte 23	EB23	26h	1	0	1	1	0	0	0	0

[1] X indicates a bit not changed on reset.

### 9.3 Description of symbols used in I<sup>2</sup>C-bus format table

Table 7. I<sup>2</sup>C-bus register bits explanation

Address	Byte	Symbol	Description	Reference
		MA[1:0]	programmable address bits	<a href="#">Table 8</a>
		AD[5:0]	programmable address bits of the first programming byte	<a href="#">Table 9</a>
<b>Data bytes</b>				
00h	ID	ID[6:0]	chip identification number	<a href="#">Table 10</a>
01h	TM	POR	Power-On Reset bit	<a href="#">Table 11</a>
		LOCK	indicates that the main synthesizer is locked to the programmed frequency	
		TM_RANGE	range selection bit for the internal die sensor	
		TM_ON	enables die temperature measurement	
		TM_D[3:0]	data from die temperature measurement (read only)	
		02h	PL	POWER_LEVEL[7:0]
03h	EP1	POWER_LEVEL[8]		
		DIS_POWER_LEVEL	disables the power-on level function	<a href="#">Table 13</a>
		RF_CAL_OK	indicates that the RF tracking filter calibration procedure has been successful	
		IR_CAL_OK	indicates that the complete image rejection calibration procedure has been successful	
		BP_FILTER[2:0]	RF band-pass filter selection	
04h	EP2	RF_BAND[2:0]	RF tracking filter band selection	<a href="#">Table 14</a>
		GAIN_TAPER[4:0]	gain taper value	
05h	EP3	SM	Sleep mode, Standby modes	<a href="#">Table 15</a>
		SM_LT		
		SM_XT		
		AGCK_MODE[1:0]	defines the standard	
		STD[2:0]	defines the standard	
		06h	EP4	FM_RFN
XTOUT_ON	provides the 16 MHz crystal reference on the XTOUTP and XTOUTN pins			
IF_LEVEL[2:0]	IF output level selection			
CAL_MODE[1:0]	calibration mode selection			
07h	EP5	EXTENDED_REG	enables the extended register addressing	<a href="#">Table 19</a>
		IR_GSTEP[2:0]	gain step for image rejection calibration	
		IR_MEAS[2:0]	image rejection measurement frequency range	

Table 7. I<sup>2</sup>C-bus register bits explanation ...continued

Address	Byte	Symbol	Description	Reference
08h	CPD	CAL_POST_DIV[7:0]	calibration synthesizer post-divider	<a href="#">Table 20</a>
09h	CD1	CAL_DIV[22:16]	calibration synthesizer main divider bits	<a href="#">Table 21</a>
0Ah	CD2	CAL_DIV[15:8]		
0Bh	CD3	CAL_DIV[7:0]		
0Ch	MPD	IF_NOTCH	adds a DC notch in IF for a better adjacent channels rejection; depends on standards	<a href="#">Table 22</a>
		MAIN_POST_DIV[6:0]	LO synthesizer post-divider bits	
0Dh	MD1	MAIN_DIV[22:16]	LO synthesizer main divider bits	<a href="#">Table 23</a>
0Eh	MD2	MAIN_DIV[15:8]		
0Fh	MD3	MAIN_DIV[7:0]		

**Extended bytes**

10h	EB1	CALVCO_FORLON	determines which VCO is used during Normal mode operations	<a href="#">Table 24</a>
		AGC1_ALWAYS_MASTERN	enables AGC1 normal operation whatever the tuner type (master or slave)	
		AGC1_FIRSTN	determines which AGC (1 or 2) will be detected when detectors 1 and 2 are up	
13h	EB4	LO_FORCESRCE	forces the main PLL charge pump to source current to the main PLL loop filter	
16h	EB7	CAL_FORCESRCE	forces the calibration PLL charge pump to source current to the calibration PLL loop filter	
17h	EB8	CID_ALARM	indicates that signal sensed by the power detector used during calibrations is out of range	
19h	EB10	CID_GAIN[5:0]	calibration power detector output	
1Bh	EB12	PD_AGC1_DET	power-down of AGC1 detector	
		PD_AGC2_DET	power-down of AGC2 detector	
1Ch	EB13	RFC_K[2:0]	parameter used during the RF tracking filter calibration	
		RFC_M[1:0]	parameter used during the RF tracking filter calibration	
1Dh	EB14	RFC_CPROG[7:0]	tuning word of the RF tracking filters	
21h	EB18	AGC1_LOOP_OFF	turns off the AGC1 loop	
		AGC1_GAIN[1:0]	AGC1 gain	
23h	EB20	FORCE_LOCK	forces the internal PLLs lock indicator to logic 1	
24h	EB21	AGC2_LOOP_OFF	turns off the AGC2 loop	
		AGC2_GAIN[1:0]	AGC2 gain	
25h	EB22	RF_TOP[2:0]	Take-Over Point (TOP) of the RF AGC, detection in RF	
		IF_TOP[3:0]	TOP of the RF AGC, detection in IF	
26h	EB23	FORCELP_FC2_EN	FM filter selection	
		LP_FC		

**9.3.1 I<sup>2</sup>C-bus address selection**

The programmable module address bits MA[1:0] allow up to four tuners to be addressed in one system. Bits MA1 and MA0 are programmed by a specific voltage ( $V_{AS}$ ) applied to pin AS. The relationship between the status of bits MA[1:0] and the voltage applied to pin AS is shown in [Table 8](#).

**Table 8. Address byte 1 bit description**

Legend: \* power-on reset value.

Bit	Symbol	Access	Value	Description
7 to 3	-	R/W	1 1000*	must be set to 1 1000
2 to 1	MA[1:0]	R/W		programmable address bits
			00	$V_{AS} = 0\text{ V to }0.1 \times V_{CC}$
			01	$V_{AS} = 0.2 \times V_{CC} \text{ to } 0.3 \times V_{CC}$
			10	$V_{AS} = 0.4 \times V_{CC} \text{ to } 0.6 \times V_{CC}$
			11	$V_{AS} = 0.9 \times V_{CC} \text{ to } V_{CC}$
0	R/W	R/W	0	write mode
			1	read mode

**Table 9. Address byte 2 bit description**

Legend: \* power-on reset value.

Bit	Symbol	Access	Value	Description
7 to 6	-	R/W	00	must be set to 00
5 to 0	AD[5:0]	R/W	-	programmable address bits of the first programming byte

### 9.3.2 Description of chip ID byte

**Table 10. ID - identification byte (subaddress 00h) bit description**

Legend: \* power-on reset value.

Bit	Symbol	Access	Value	Description
7	-	R	1*	must be 1
6 to 0	ID[6:0]	R	000 0100*	TDA18271HD/C2 identification number

### 9.3.3 Description of temperature sensor byte

The temperature sensor is not available in Device-off mode, as it requires a 16 MHz clock to operate.

**Table 11. TM - Thermo byte (subaddress 01h) bit description**

Legend: \* power-on reset value.

Bit	Symbol	Access	Value	Description
7	POR	R	1*	power supply falls below the power-on reset level and is reset after a read operation ending with a stop condition
			0	power supply is above the power-on reset level
6	LOCK	R	1	main synthesizer is locked to the programmed frequency
			0*	main synthesizer is not locked to the programmed frequency
5	TM_RANGE	R/W		temperature range selection for the internal die sensor (see <a href="#">Table 52</a> )
			1	92 °C to 122 °C
			0*	60 °C to 90 °C
4	TM_ON	R/W	1	enables die temperature measurement (see <a href="#">Table 52</a> )
			0*	disables die temperature measurement (see <a href="#">Table 52</a> )
3 to 0	TM_D[3:0]	R	XXXX	data from die temperature measurement (see <a href="#">Table 52</a> )

9.3.4 Description of power level byte (read mode)

There are 9 power level bits sent in power level bytes 2 and 3. They indicate the composite voltage gain of the LNA, the loaded attenuator voltage gains, and the level at the input of the RF AGC.

Table 12. PL - Power level (address 02h and 03h) bit description

Legend: \* power-on reset value.

Address	Register	Bit	Symbol	Access	Value	Description
03h	EP1	7	POWER_LEVEL[8]	R		AGC2 gain, attenuator voltage gain including load, the attenuator load is 50 Ω (allows the maximum gain of -6 dB)
02h	PL	7	POWER_LEVEL[7]		00	-15 dB
					01	-12 dB
					10	-9 dB
					11	-6 dB
		6 to 5	POWER_LEVEL[6:5]	R		AGC1 gain, LNA voltage gain, the LNA voltage gain assumes a 75 Ω source impedance and a low output impedance
					00	6 dB
					01	9 dB
					10	12 dB
					11	15 dB
		4 to 0	POWER_LEVEL[4:0]	R		sensed level at the input of the RF AGC, detector slope is -1 dB/step
					0 0000	103 dBμV (RMS value)
					0 0001	102 dBμV (RMS value)
					...	...
					1 1110	73 dBμV (RMS value)
					1 1111	72 dBμV (RMS value)

9.3.5 Description of Easy prog byte 1

Table 13. EP1 - Easy prog byte 1 (subaddress 03h) bit description

Legend: \* power-on reset value.

Bit	Symbol	Access	Value	Description
7	POWER_LEVEL[8]	R		see <a href="#">Table 12</a>
6	DIS_POWER_LEVEL	R/W	1*	power level disabled
			0	power level enabled
5	-	R/W	0*	must be set to 0
4	RF_CAL_OK	R/W		RF tracking filter calibration procedure (see <a href="#">Section 9.4.9</a> ); updated each time the procedure is started
			1	successful
			0*	not successful

**Table 13. EP1 - Easy prog byte 1 (subaddress 03h) bit description ...continued**

Legend: \* power-on reset value.

Bit	Symbol	Access	Value	Description
3	IR_CAL_OK	R/W		complete image rejection calibration procedure (see <a href="#">Section 9.4.4</a> ); can only be reset with POR
			1	successful
			0*	not successful
2 to 0	BP_FILTER[2:0]	R/W	110*	RF band-pass filter selection (see <a href="#">Table 44</a> )

### 9.3.6 Description of Easy prog byte 2

**Table 14. EP2 - Easy prog byte 2 (subaddress 04h) bit description**

Legend: \* power-on reset value.

Bit	Symbol	Access	Value	Description
7 to 5	RF_BAND[2:0]	R/W	110*	RF tracking filter band selection (see <a href="#">Table 45</a> )
4 to 0	GAIN_TAPER[4:0]	R/W		gain taper value (see <a href="#">Table 49</a> )
			1 1111*	minimum attenuation
			0 0000	maximum attenuation

### 9.3.7 Description of Easy prog byte 3

The TDA18271HD has three different Standby modes. Two Standby modes are dedicated to special application demands; the third Standby mode is called ‘device-off’. It represents the smallest achievable power consumption.

**Table 15. EP3 - Easy prog byte 3 (subaddress 05h) bit description**

Legend: \* power-on reset value.

Bit	Symbol	Access	Value	Description
7 to 5	SM, SM_LT, SM_XT	R/W	100	Power modes <a href="#">Table 16</a>
4 to 3	AGCK_MODE[1:0]	R/W	10010*	defines the standard
2 to 0	STD[2:0]	R/W		description of standards (see <a href="#">Table 43</a> )

**Table 16. Power modes**

Bit			Circuit			Mode <sup>[1]</sup>
SM	SM_LT	SM_XT	Loop-through	Slave-tuner output	Crystal oscillator	
0	0	0	on	on	on	Normal mode
1	0	0	on	on	on	Standby mode with crystal oscillator, slave-tuner output and loop-through output on
1	1	0	off	off	on	Standby mode with only crystal oscillator and its output buffer on
1	1	1	off	off	off	Device-off mode

[1] In all modes, the I<sup>2</sup>C-bus interface remains active. All other bit settings are invalid.



**Table 17. AGC modes**

Standard	AGC_MODE[1:0] EP3[4:3] <sup>[1]</sup>		Reference signal
FM radio	1	1	internal
Analog TV standards	0	1	VSYNC
Digital TV standards	1	1	internal

[1] Depending on the programmed AGC\_MODE, AGC1 can be synchronous with either VSYNC or an internal 16 MHz signal; for analog reception, when no synchronization signal is available for VSYNC pin, the internal reference may be used.

**9.3.8 Description of Easy prog byte 4**

**Table 18. EP4 - Easy prog byte 4 (subaddress 06h) bit description**

Legend: \* power-on reset value.

Bit	Symbol	Access	Value	Description
7	FM_RFN	R/W		selection which input is fed to RF filter
			1	FM input (RF LNA on; FM LNA on)
			0*	RF input (RF LNA on; FM LNA off)
6	XTOUT_ON	R/W	1*	16 MHz on pins XTOUT
			0	not 16 MHz on pins XTOUT
5	-	R/W	1*	must be set to logic 1
4 to 2	IF_LEVEL[2:0]	R/W		IF output level selection and attenuation with regard to 2 V (p-p)
			000*	2 V (p-p); 0 dB
			001	1.25 V (p-p); 4 dB
			010	1 V (p-p); 6 dB
			011	0.8 V (p-p); 8 dB
			100	not used
			101	not used
			110	0.6 V (p-p); 10.4 dB
			111	0.5 V (p-p); 12 dB
			1 to 0	CAL_MODE[1:0]
00*	no calibration (Normal mode)			
01	Power detection mode			
10	image rejection calibration (IRCAL) mode			
11	RF tracking filter calibration (RFCAL) mode			

All calibrations require a precise set of sequential operations, therefore it is mandatory to follow the flowcharts described in [Section 9.4](#).

The TDA18271HD has two calibration modes: one for the image rejection calibration and one for the RF tracking filter calibration.

The image rejection calibration optimizes tunable parameters inside the mixer using a set of internal measurements to ensure a 65 dB typical value of image rejection. The internal signal used during this phase is generated by the PLL calibration (CAL PLL).

The RF tracking filters central frequency can be adjusted with the tuning word RFC\_CPROG. The RF tracking filter calibration (RFCAL) uses an internal tone at the input of the tracking filters (generated by CAL PLL) and finds the RFC\_CPROG that corresponds to the maximum transmitted power. The RFCAL is just a small part of a more complex algorithm fully described in the flowcharts in [Section 9.4](#).

The Power detection mode is a Normal mode in which the detector used for the calibrations is switched ON. This special mode enables power sensing at the input of the TDA18271HD and makes the power scan algorithm possible (see [Section 9.4.8](#) “Flowchart TDA18271PowerScan”).

### 9.3.9 Description of Easy prog byte 5

**Table 19. EP5 - Easy prog byte 5 (subaddress 07h) bit description**

Legend: \* power-on reset value.

Bit	Symbol	Access	Value	Description
7	EXTENDED_REG	R/W		enables extended register addressing
			1	extended register (10h to 26h)
			0*	limited register (00h to 0Fh); only 1 byte can be programmed after address 0Fh within 1 transmission
6 to 4	IR_GSTEP[2:0]	R/W	011*	gain step for image rejection calibration
3	-	R/W	0*	must be set to logic 0
2 to 0	IR_MEAS[2:0]	R/W	000*	image rejection measurement frequency range (see <a href="#">Table 53</a> )

### 9.3.10 Description of Cal post-divider byte

**Table 20. CPD - Cal post-divider byte (subaddress 08h) bit description**

Legend: \* power-on reset value.

Bit	Symbol	Access	Value	Description
7 to 0	CAL_POST_DIV[7:0]	R/W	00h*	calibration synthesizer post-divider (see <a href="#">Table 48</a> )

### 9.3.11 Description of Cal divider bytes 1, 2 and 3

**Table 21. CD1, CD2 and CD3 - Cal divider bytes 1, 2 and 3 (address 09h, 0Ah and 0Bh) bit description**

Legend: \* power-on reset value.

Address	Register	Bit	Symbol	Access	Value	Description
09h	CD1	7	-	R/W	0*	must be set to 0
		6 to 0	CAL_DIV[22:16]	R/W	00h*	calibration synthesizer main divider bits
0Ah	CD2	7 to 0	CAL_DIV[15:8]	R/W	00h*	
0Bh	CD3	7 to 0	CAL_DIV[7:0]	R/W	00h*	

9.3.12 Description of Main post-divider byte

Table 22. MPD - Main post-divider byte (subaddress 0Ch) bit description

Legend: \* power-on reset value.

Bit	Symbol	Access	Value	Description
7	IF_NOTCH	R/W	0*	adds a DC notch in IF for better adjacent channels rejection; depends on standards; see <a href="#">Table 43</a>
6 to 0	MAIN_POST_DIV[6:0]	R/W	000	LO synthesizer post-divider; see <a href="#">Table 47</a>

9.3.13 Description of Main divider bytes 1, 2 and 3

Table 23. MD1, MD2 and MD3 - Main divider bytes 1, 2 and 3 (address 0Dh, 0Eh and 0Fh) bit description

Legend: \* power-on reset value.

Address	Register	Bit	Symbol	Access	Value	Description
0Dh	MD1	7	-	R/W	0*	must be set to 0
		6 to 0	MAIN_DIV[22:16]	R/W	00h*	LO synthesizer main divider bits
0Eh	MD2	7 to 0	MAIN_DIV[15:8]	R/W	00h*	
0Fh	MD3	7 to 0	MAIN_DIV[7:0]	R/W	00h*	

9.3.14 Description of Extended bytes 1 to 23

Table 24. EB1 to EB23 - Extended bytes 1 to 23 (address 10h to 26h) bit description

Legend: \* power-on reset value.

Address	Register	Bit	Symbol	Access	Value	Description
10h	EB1	7 to 3	EB1[7:3]	R	1 1111*	extended byte 1
		2	CALVCO_FORLON	R		determines VCO used during Normal mode operations
					1*	LO VCO is used
					0	CAL VCO is used
		1	AGC1_ALWAYS_MASTERN	R		enables AGC1 normal operation whatever the tuner type (master or slave)
					1*	normal operation for the master; 6 dB fixed for the slave
					0	normal operation for both the master and the slave
0	AGC1_FIRSTN	R		determines which AGC will be updated when detectors 1 and 2 are active		
			1*	AGC1 and AGC2 both updated		
		0			AGC1 has priority on AGC2	
11h	EB2	7 to 0	EB2[7:0]	R/W	0000 0001*	extended byte 2
12h	EB3	7 to 0	EB3[7:0]	R/W	1000 0100*	extended byte 3

Table 24. EB1 to EB23 - Extended bytes 1 to 23 (address 10h to 26h) bit description ...continued

Legend: \* power-on reset value.

Address	Register	Bit	Symbol	Access	Value	Description
13h	EB4	7 to 6	EB4[7:6]	R/W	01*	extended byte 4
		5	LO_FORCESRCE	R/W	1	forces the main PLL charge pump to source current to the main PLL loop filter
					0*	no force
		4 to 0	EB4[4:0]	R/W	0 0001*	extended byte 4
14h	EB5	7 to 0	EB5[7:0]	R/W	0000 0001*	extended byte 5
15h	EB6	7 to 0	EB6[7:0]	R/W	1000 0100*	extended byte 6
16h	EB7	7 and 6	EB7[7:6]	R/W	01*	extended byte 7
		5	CAL_FORCESRCE	R/W	1	forces the CAL PLL charge pump to source current to the CAL PLL loop filter
					0*	no force
		4 to 0	EB7[4:0]	R/W	0 1000*	extended byte 7
17h	EB8	7	CID_ALARM	R		signal sensed by the power detector used during calibrations
					1	out of range
					0*	in range
		6 to 4	EB8[6:4]	R/W	111 0101*	extended byte 8
		3	EB8[3]	R		
		2 to 0	EB8[2:0]	R/W		
18h	EB9	7 to 0	EB9[7:0]	W	0000 0000*	extended byte 9
19h	EB10	7 and 6	EB10[7:6]	R	00*	extended byte 10
		5 to 0	CID_GAIN[5:0]	R	-	calibration power detector output
1Ah	EB11	7 to 0	EB11[7:0]	R/W	1000 0110*	extended byte 11
1Bh	EB12	7 and 6	EB12[7:6]	R	00*	extended byte 12
		5	PD_AGC1_DET	R/W		AGC1 detector
					1	power-down
					0*	no power-down
		4	PD_AGC2_DET	R/W		AGC2 detector
			1	power-down		
			0*	no power-down		
		3 to 0	EB12[3:0]	R/W	0111*	extended byte 12
1Ch	EB13	7	EB13[7]	R/W	1*	extended byte 13
		6 to 4	RFC_K[2:0]	R/W	100*	parameters used during the RF tracking filter calibration (see <a href="#">Table 46</a> )
		3 and 2	RFC_M[1:0]	R/W	00*	
		1 to 0	EB13[1:0]	R/W	10*	extended byte 13
1Dh	EB14	7 to 0	RFC_CPROG[7:0]	R/W	0000 0000*	tuning word of the RF tracking filters
1Eh	EB15	7 to 4	EB15[7:4]	R/W	1000 XXXX*	extended byte 15
		3 to 0	EB15[3:0]	R		
1Fh	EB16	7 to 0	EB16[7:0]	W	000X XX00*	extended byte 16

**Table 24. EB1 to EB23 - Extended bytes 1 to 23 (address 10h to 26h) bit description ...continued**

Legend: \* power-on reset value.

Address	Register	Bit	Symbol	Access	Value	Description
20h	EB17	7 to 0	EB17[7:0]	W	000X XXXX*	extended byte 17
21h	EB18	7	AGC1_LOOP_OFF	R/W		turns the AGC1 loop
					1	off
					0*	on
		6 to 2	EB18[6:2]	R/W	00000*	extended byte 18
		1 and 0	AGC1_GAIN[1:0]	R/W		AGC1 gain
		00*	6 dB			
		01	9 dB			
		10	12 dB			
11	15 dB					
22h	EB19	7 to 0	EB19[7:0]	W	000X XX00*	extended byte 19
23h	EB20	7 and 6	EB20[7:6]	W	10*	extended byte 20
		5	FORCE_LOCK	W		forces the internal lock indicator
					1	forced to logic 1
					0*	not forced
		4 to 0	EB20[4:0]	W	X XXXX*	extended byte 20
24h	EB21	7	AGC2_LOOP_OFF	R/W		turns the AGC2 loop
					1	off
					0*	on
		6 to 2	EB21[6:2]	R/W	00000*	extended byte 21
		1 and 0	AGC2_GAIN[1:0]	R/W		AGC2 gain
		00*	-15 dB			
		01	-12 dB			
		10	-9 dB			
11	-6 dB					
25h	EB22	7	EB22[7]	R	0*	extended byte 22
		6 to 4	RF_TOP[2:0]	R/W	100*	Take-Over Point of the RF AGC, detection in RF
		3 to 0	IF_TOP[3:0]	R/W	1000*	Take-Over Point of the RF AGC, detection in IF
26h	EB23	7 to 3	EB23[7:3]	R/W	1 0110*	extended byte 23
		2	FORCELP_FC2_EN	R/W	0*	FM filter selection; see <a href="#">Table 25</a> and <a href="#">Table 26</a>
		1	LP_FC	R/W	0*	
		0	EB23[0]	R/W	0*	extended byte 23

Table 25. Low-pass cut-off frequency when using RF\_IN input

RF input	FORCELP_FC2_EN	LP_FC	STD[1:0]	Cut-off frequency (MHz)
RF_IN	1	1	XX	1.5
	0	X	00	6
	0	X	01	7
	0	X	10	8
	0	X	11	9

Table 26. Low-pass cut-off frequency when using FM\_IN input

RF input	FORCELP_FC2_EN	LP_FC	STD[1:0]	Cut-off frequency (MHz)
FM_IN	1	0	00	6
	1	0	01	7
	1	0	10	8
	1	0	11	9
	1	1	XX	1.5

## 9.4 I<sup>2</sup>C-bus programming flowcharts

The following flowcharts describe how to:

- Initialize the TDA18271HD
- Launch the calibrations
- Go to Normal mode

The image rejection calibration and RF tracking filter calibration must be launched exactly as described in the flowchart, otherwise bad calibration or even blocking of the TDA18271HD can result making it impossible to communicate via the I<sup>2</sup>C-bus.

Proper internal initialization requires switching to Normal mode using a single I<sup>2</sup>C-bus sequence from subaddresses 03h to 0Fh.

### 9.4.1 Flowchart explanation

This section provides instructions for reading the flowcharts.

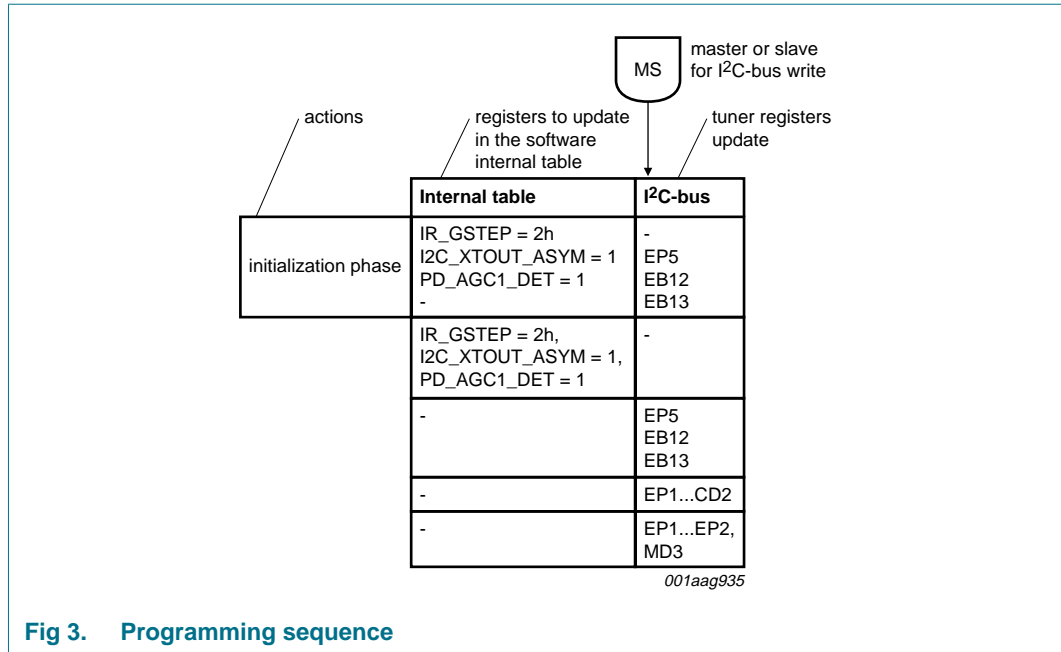


Fig 3. Programming sequence

1. I2C-bus write:

- IR\_GSTEP is updated, no immediate I2C-bus write
- I2C\_XTOUT\_ASYM is updated followed by an I2C-bus write of byte EP5
- PD\_AGC1\_DET is updated followed by an I2C-bus write of byte EB12
- I2C-bus write of byte EB13 with current value of the software internal register of byte EB13

I2C-bus read:

- Subaddressing is not supported in read mode
- The mandatory I2C-bus read access procedures to the TDA18271HD are described in [Section 9.4.16 "Flowchart TDA18271Read"](#) and [Section 9.4.17 "Flowchart TDA18271ReadExtended"](#)

2. Update at the same time is indicated by separation with commas:

IR\_GSTEP, I2C\_XTOUT\_ASYM and PD\_AGC1\_DET are updated, no I2C-bus registers updated

3. I2C-bus registers update bytes EP5, EB12 and EB13

4. Bytes EP1 to CD2 are written in a single I2C-bus sequence

Example:

Start C0 03 EP1 EP2 EP3 EP4 EP5 CPD CD1 CD2 Stop

5. Bytes EP1, EP2 and MD3 are written in as many I2C-bus sequences as needed

Example:

Start C0 03 EP1 EP2 Stop

Start C0 0F MD3 Stop

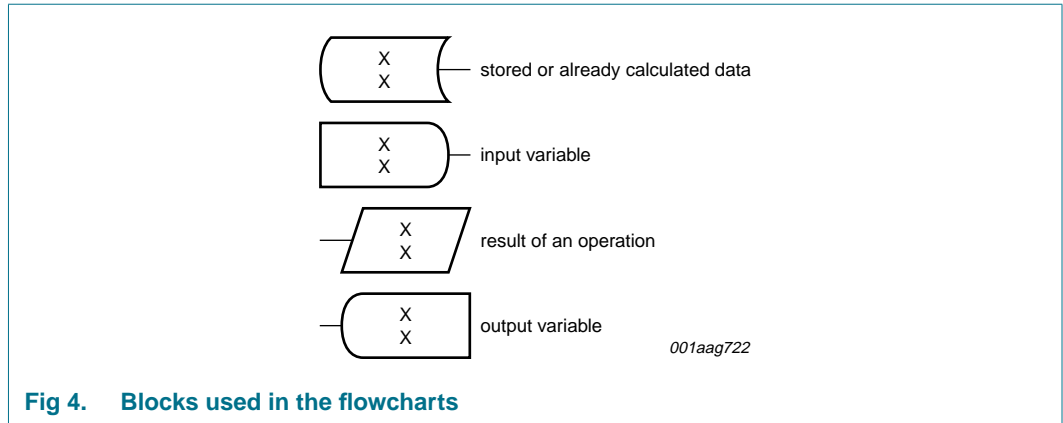


Fig 4. Blocks used in the flowcharts

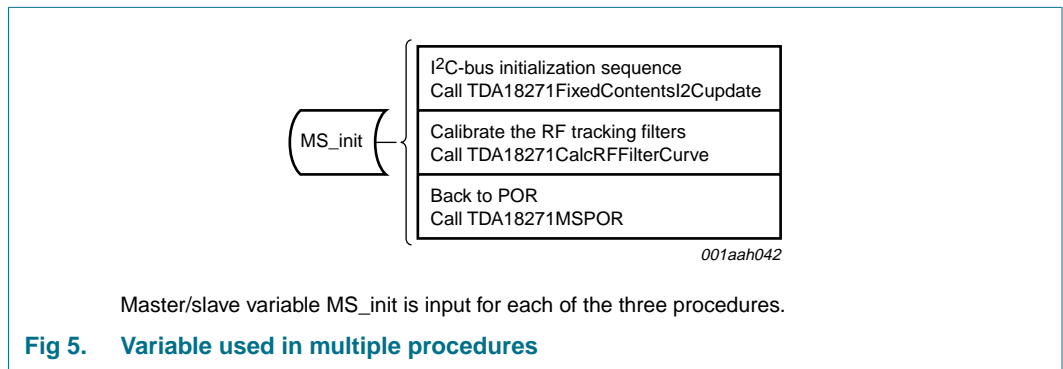


Fig 5. Variable used in multiple procedures

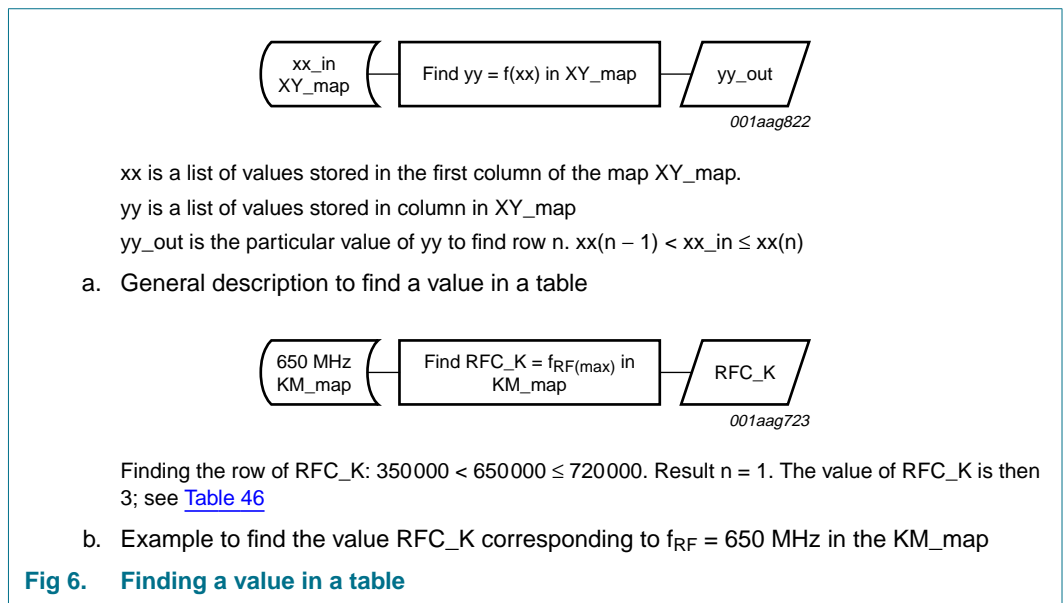


Fig 6. Finding a value in a table

**Units:** In the flowcharts, hexadecimal values end with “h”, decimal values with “d”.



9.4.2 Flowchart TDA18271SetRf\_dual

The initialization phase has to be launched before any SetRf.

Table 27. TDA18271SetRf\_dual

Function	Description	Reference
Description	protocol top view for a dual tuner application	
Input	RF_freq, Standard (from microcontroller), MS (from microcontroller) <sup>[1]</sup>	
Table	-	
Output	-	

[1] MS = 1: master is selected for the channel configuration; MS = 0: slave is selected for the channel configuration.

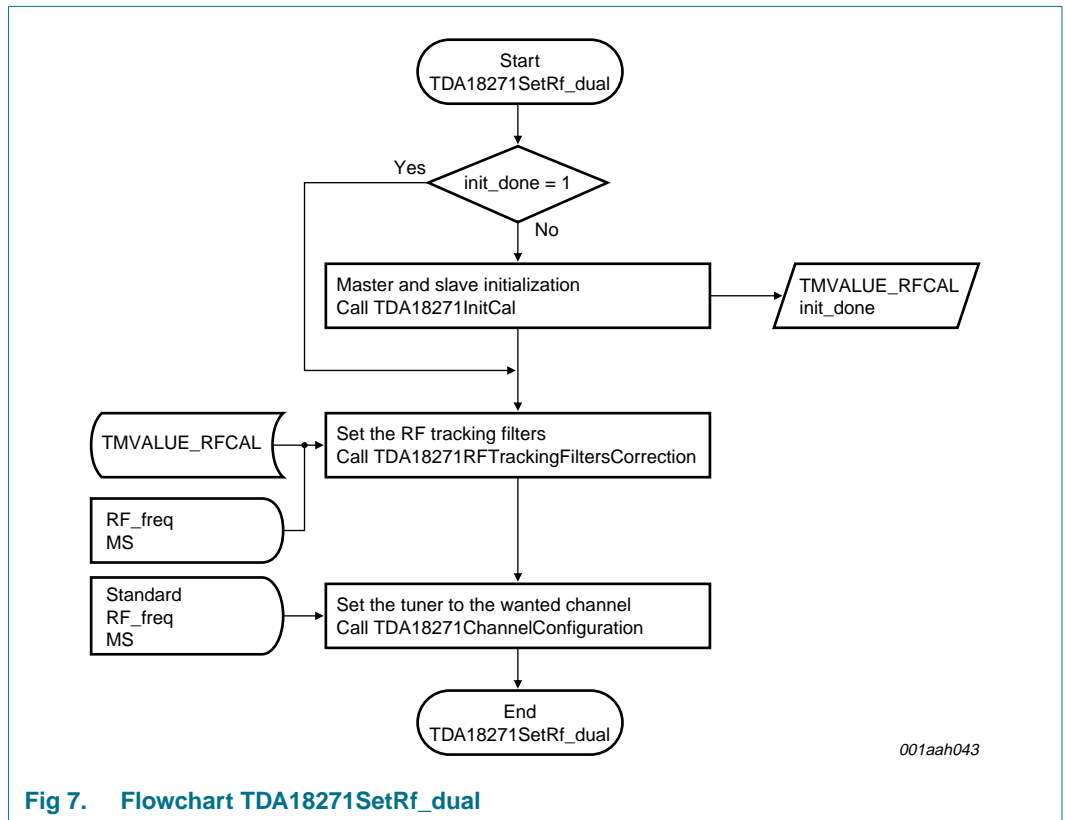


Fig 7. Flowchart TDA18271SetRf\_dual

9.4.3 Flowchart TDA18271InitCal

Table 28. TDA18271InitCal

Function	Description	Reference
Description	systematic initializations for master and slave tuners	
Input	MS_init	
Table	-	
Output	TMVALUE_RFCAL, init_done	

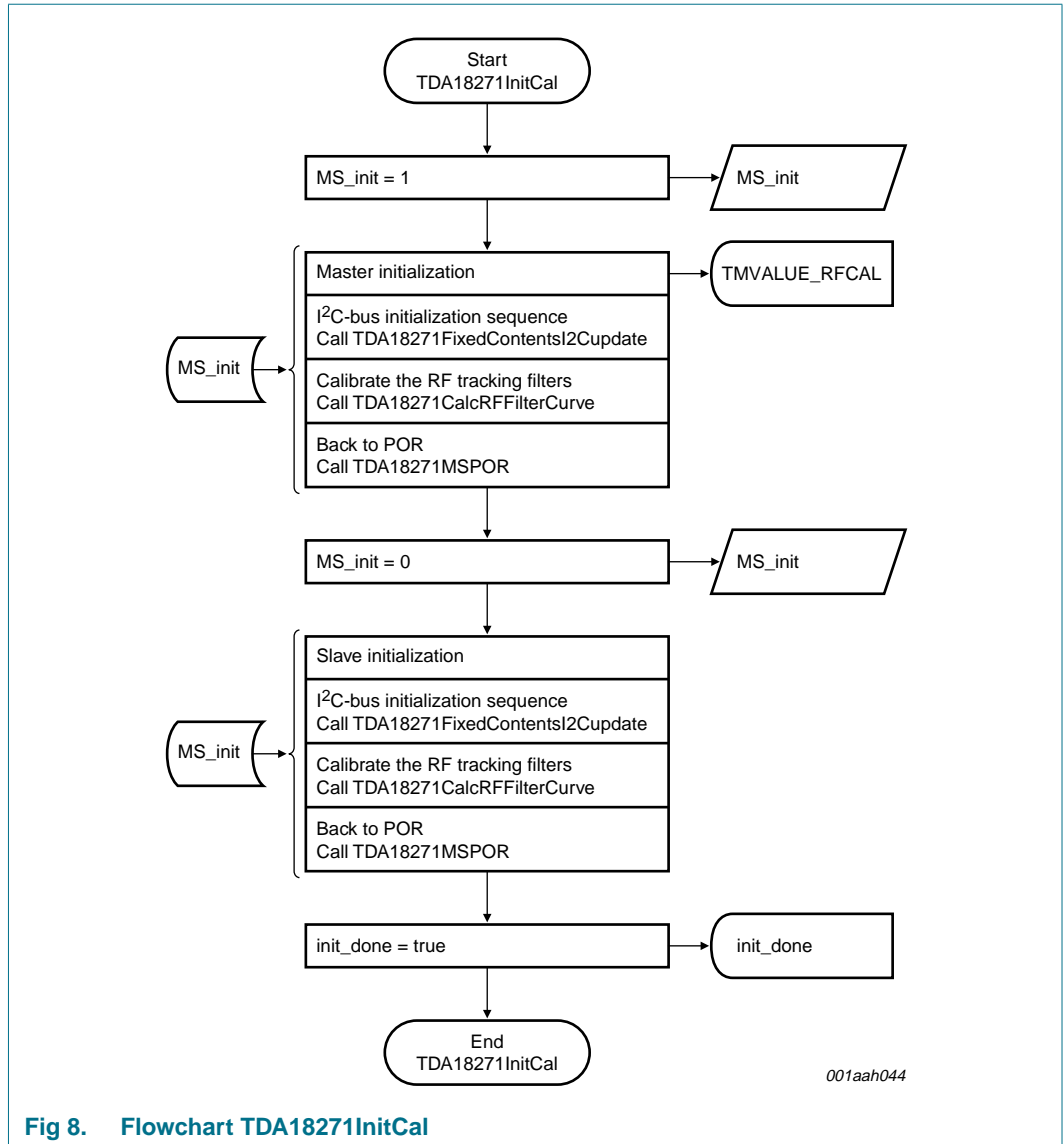


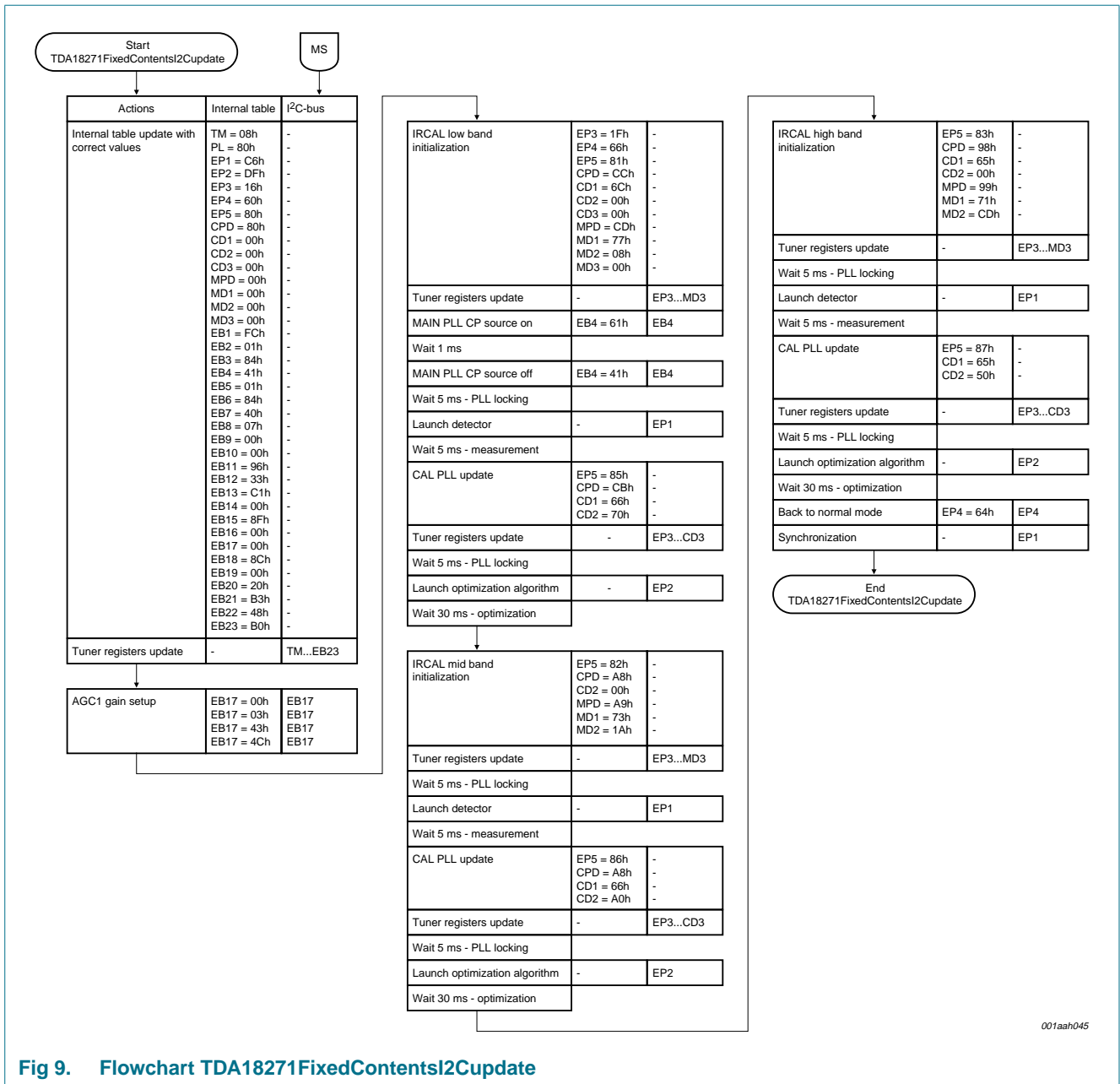
Fig 8. Flowchart TDA18271InitCal

### 9.4.4 Flowchart TDA18271FixedContentsI2Cupdate

Table 29. TDA18271FixedContentsI2Cupdate

Function	Description	Reference
Description	update and write the TDA18271HD registers sequential update of AGC1 and AGC2 image calibration algorithm	
Input	MS	
Table	-	
Output	-	

The register contents are not described in detail as this procedure is not to be modified.



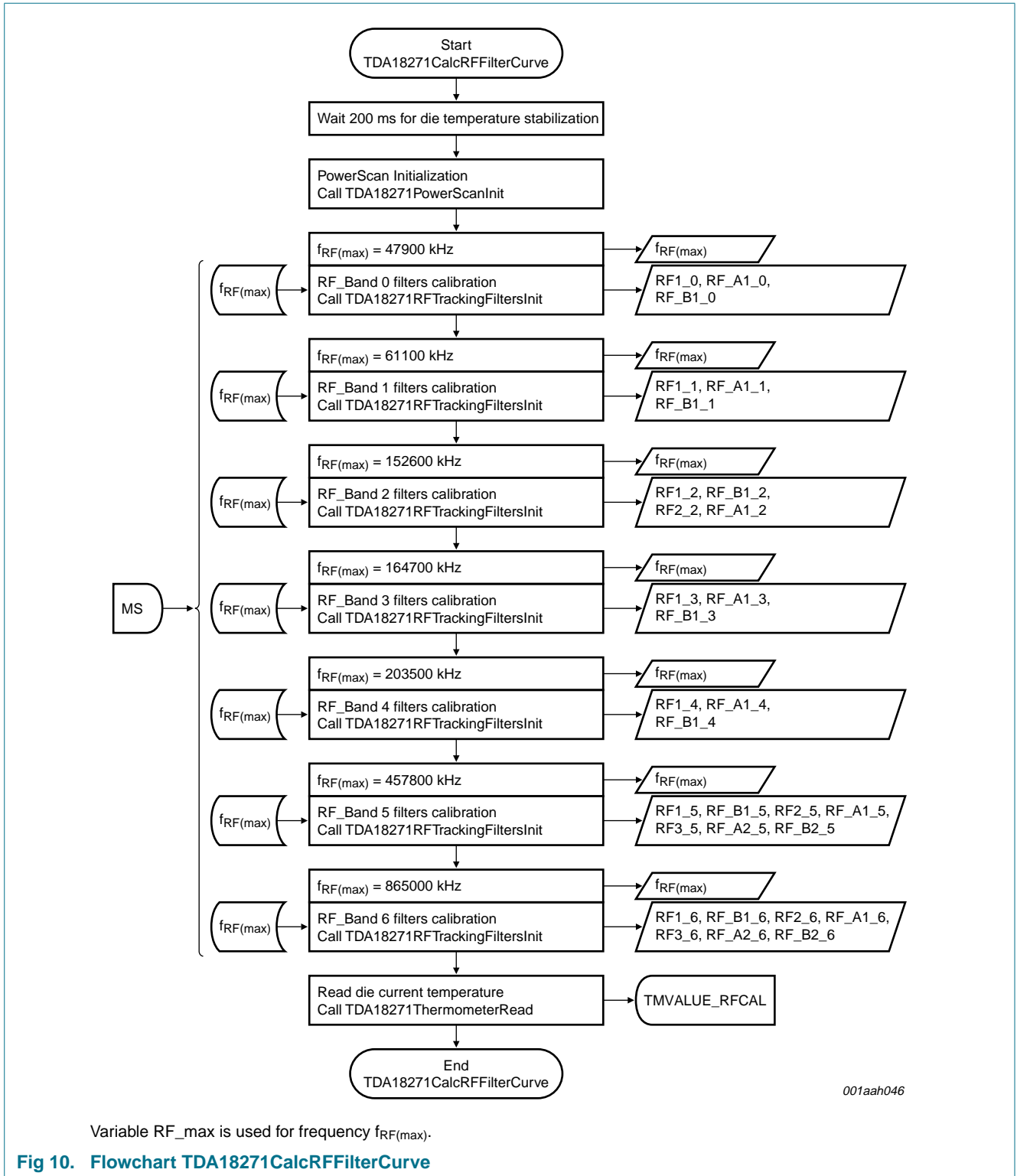
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Fig 9. Flowchart TDA18271FixedContentsI2Cupdate

### 9.4.5 Flowchart TDA18271CalcRFFilterCurve

Table 30. TDA18271CalcRFFilterCurve

Function	Description	Reference
Description	calculate the RF filter curve coefficients	
Input	RF1_default, RF2_default, RF3_default, MS	
Table	RF_BAND_map	<a href="#">Table 45 "RF_BAND_map"</a>
Output	TMVALUE_RFCAL	



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### 9.4.6 Flowchart TDA18271RFTrackingFiltersInit

**Table 31. TDA18271RFTrackingFiltersInit**

Function	Description	Reference
Description	calculate the RF filter curve coefficients used for their approximation	
Input	$f_{RF(max)}$ , MS	
Table	RF_CAL_map (Cprog_table = f (frequency))	<a href="#">Table 51 "RF_CAL_map"</a>
Output	RF1, RF2, RF3, RF_A1, RF_B1, RF_A2, RF_B2	

bcal is a boolean output from TDA18271PowerScan:

bcal = 1 (true): enables the calibration of the RF tracking filters

bcal = 0 (false): no calibration is performed, default values for RFC\_CPROG are used

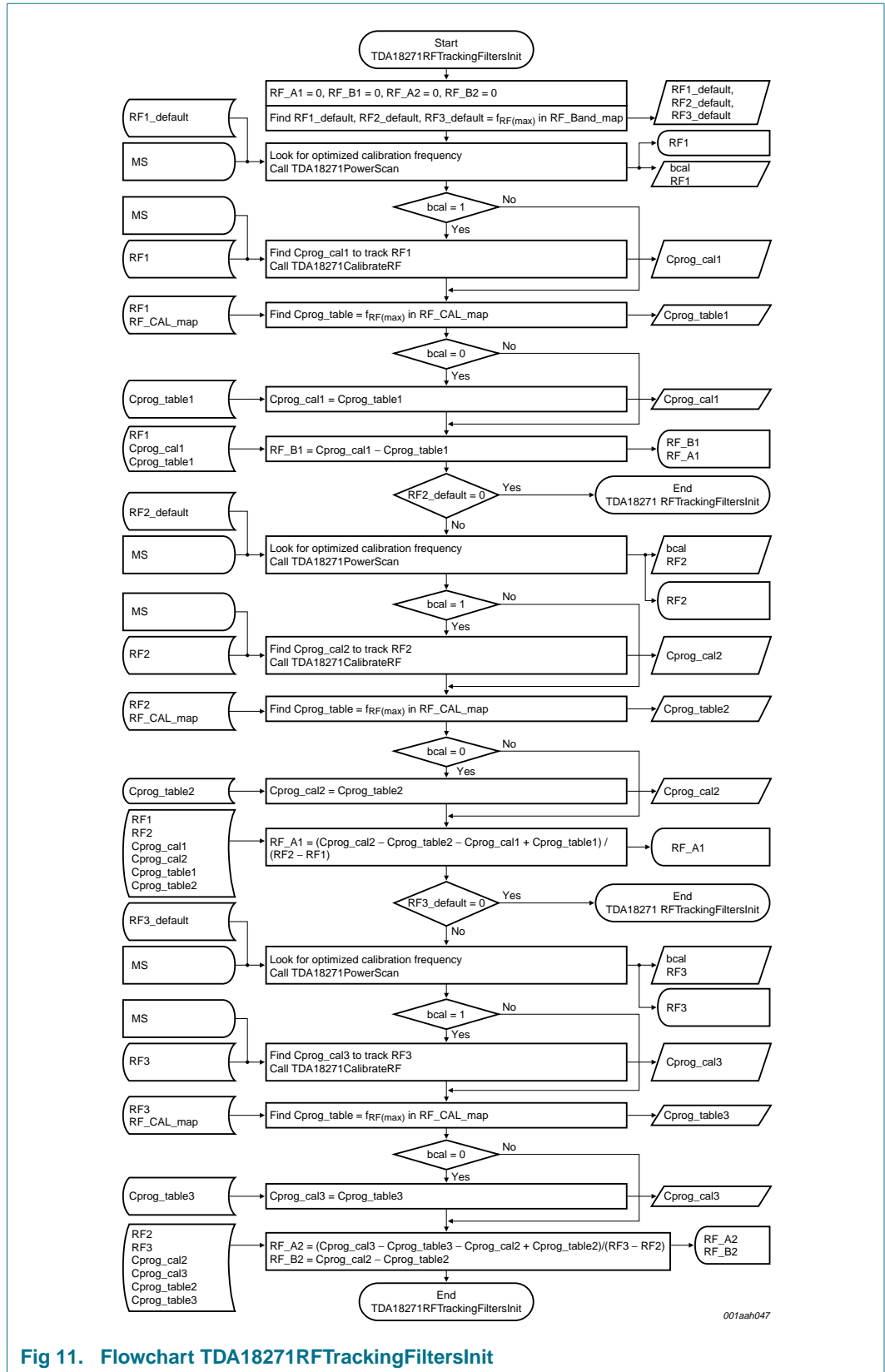


Fig 11. Flowchart TDA18271RFTrackingFiltersInit

9.4.7 Flowchart TDA18271PowerScanInit

Table 32. TDA18271PowerScanInit

Function	Description	Reference
Description	fixed settings of the TDA18271PowerScan	
Input	MS	
Table	-	
Output	-	

Frequency unit during the algorithm in kHz.

Variable count homogeneous to kHz.

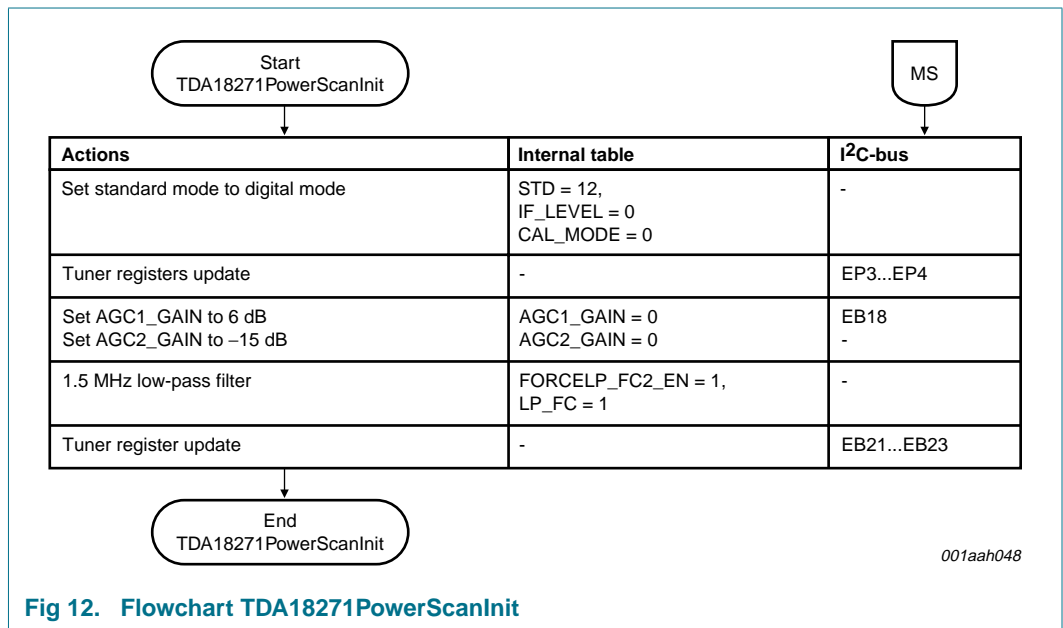


Fig 12. Flowchart TDA18271PowerScanInit

9.4.8 Flowchart TDA18271PowerScan

Table 33. TDA18271PowerScan

Function	Description	Reference
Description	find an interference-free calibration frequency	
Input	freq_input, MS	
Table	RF_BAND_map, RF_CAL_map, CID_Target_map	<a href="#">Table 45 "RF_BAND_map"</a> <a href="#">Table 51 "RF_CAL_map"</a> <a href="#">Table 54 "CID_Target_map"</a>
Output	bcal, freq_output	

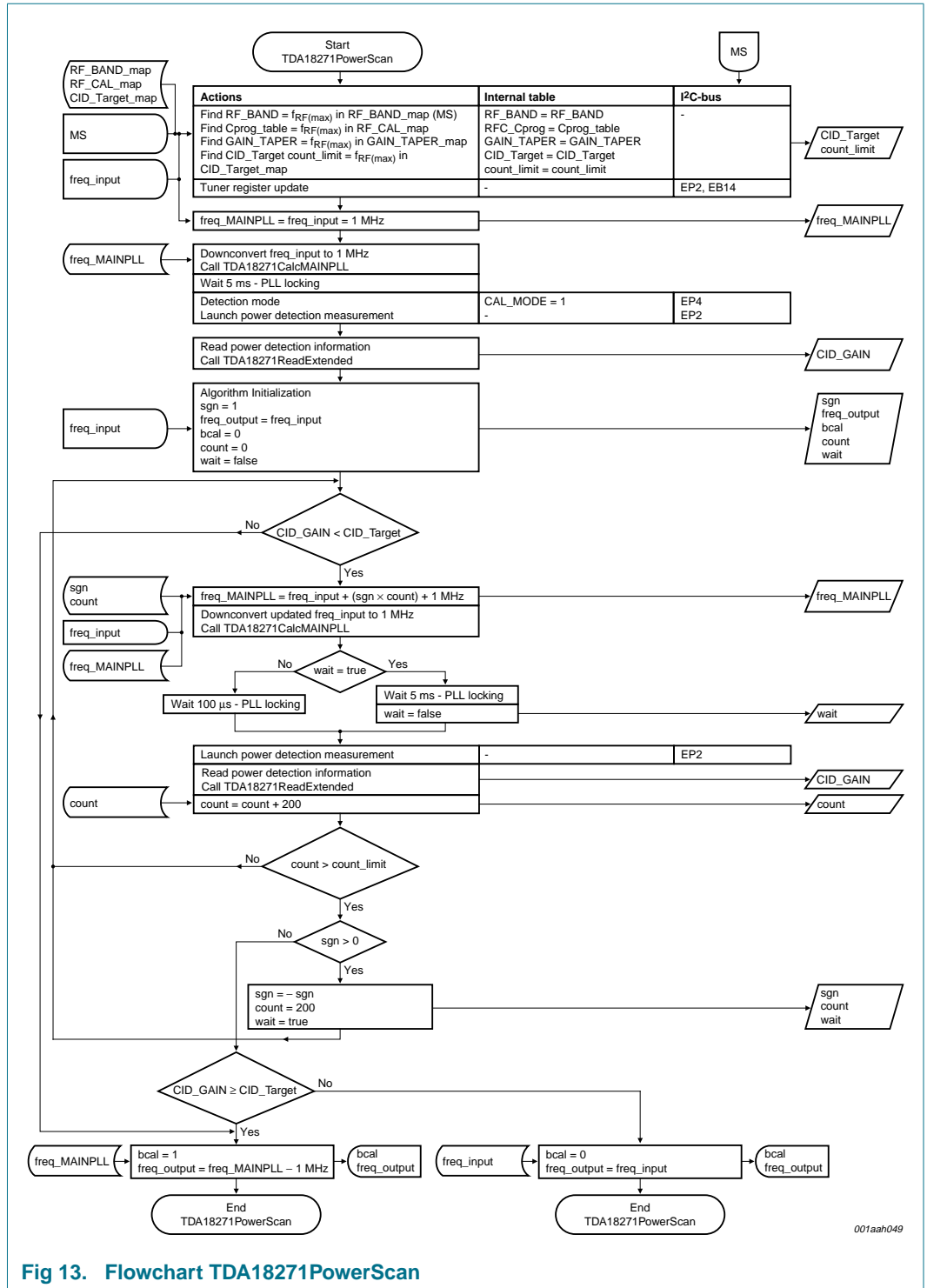


Fig 13. Flowchart TDA18271PowerScan

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9.4.9 Flowchart TDA18271CalibrateRF

Table 34. TDA18271RFCalibrateRF

Function	Description	Reference
Description	finds the Cprog for which freq_input is the central frequency of the RF tracking filters	
Input	freq_input, MS	
Table	BP_FILTER_map, KM_map and GAIN_TAPER_map	<a href="#">Table 44 "BP_FILTER_map"</a> <a href="#">Table 46 "KM_map"</a> <a href="#">Table 49 "GAIN_TAPER_map"</a>
Output	RFC_CPROG	

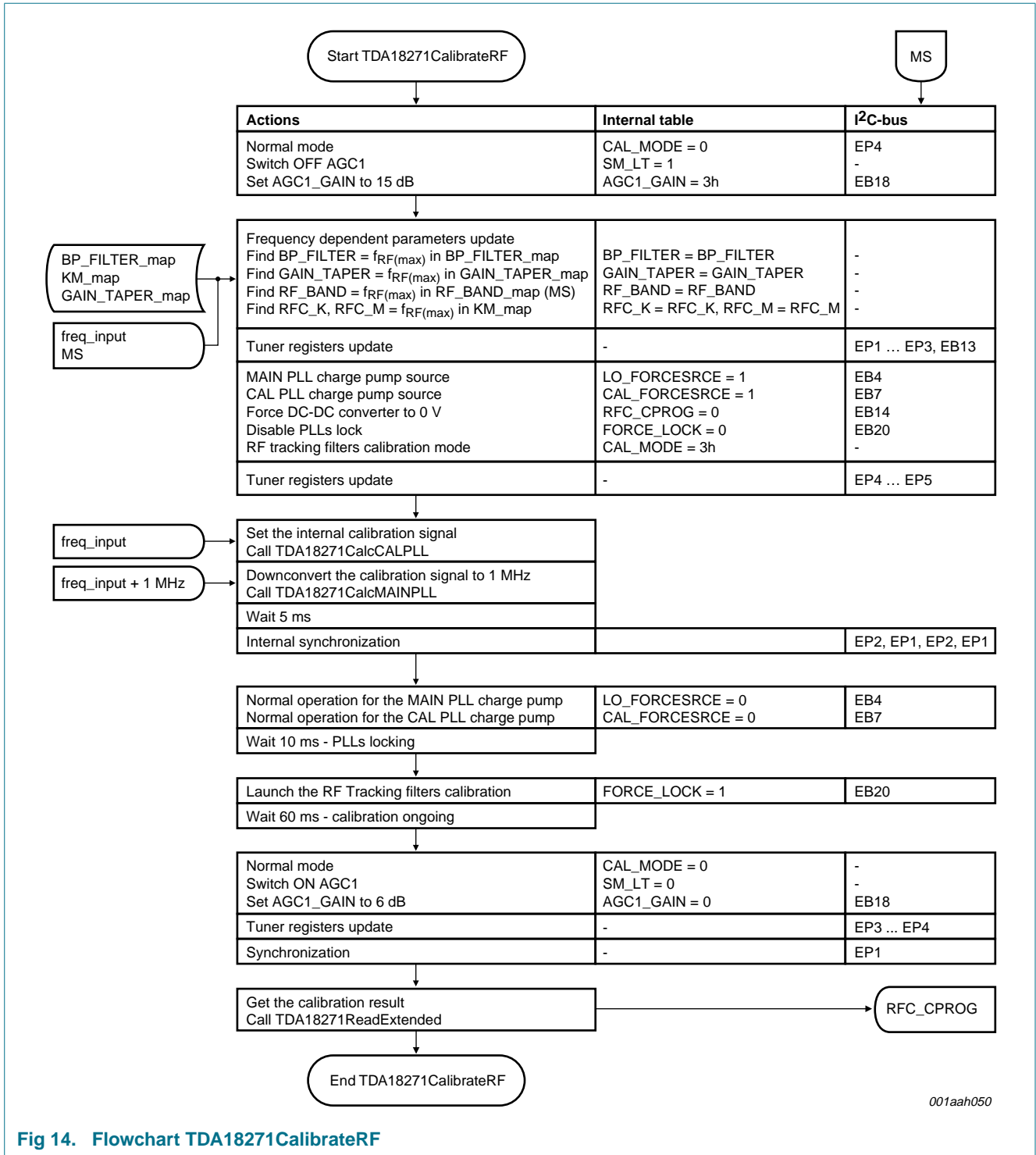


Fig 14. Flowchart TDA18271CalibrateRF

9.4.10 Flowchart TDA18271MSPOR

Table 35. TDA18271MSPOR

Function	Description	Reference
Description	master or slave tuner goes to Power-On Reset (POR) mode	
Input	MS	
Table	-	
Output	-	

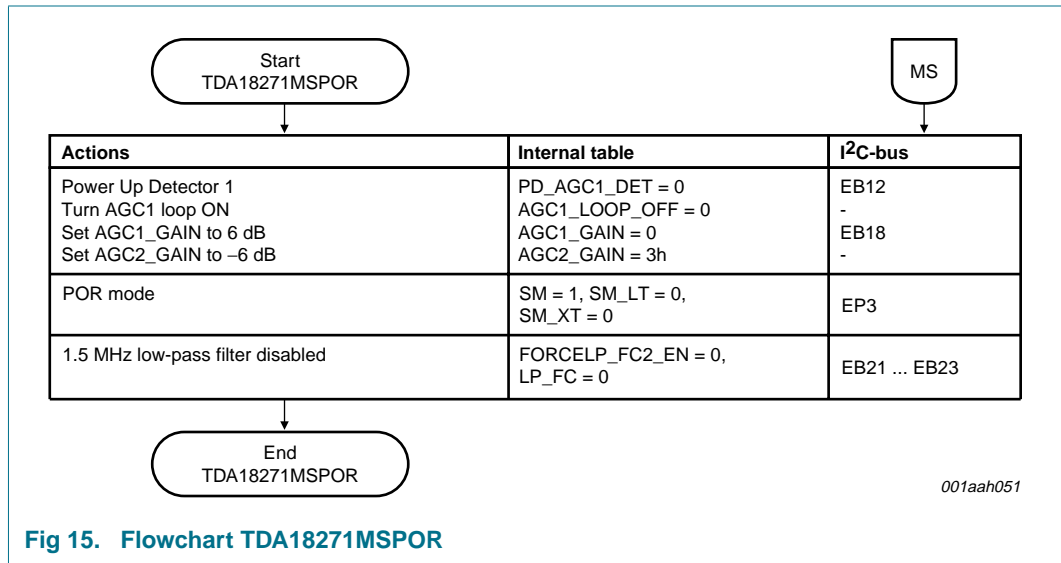
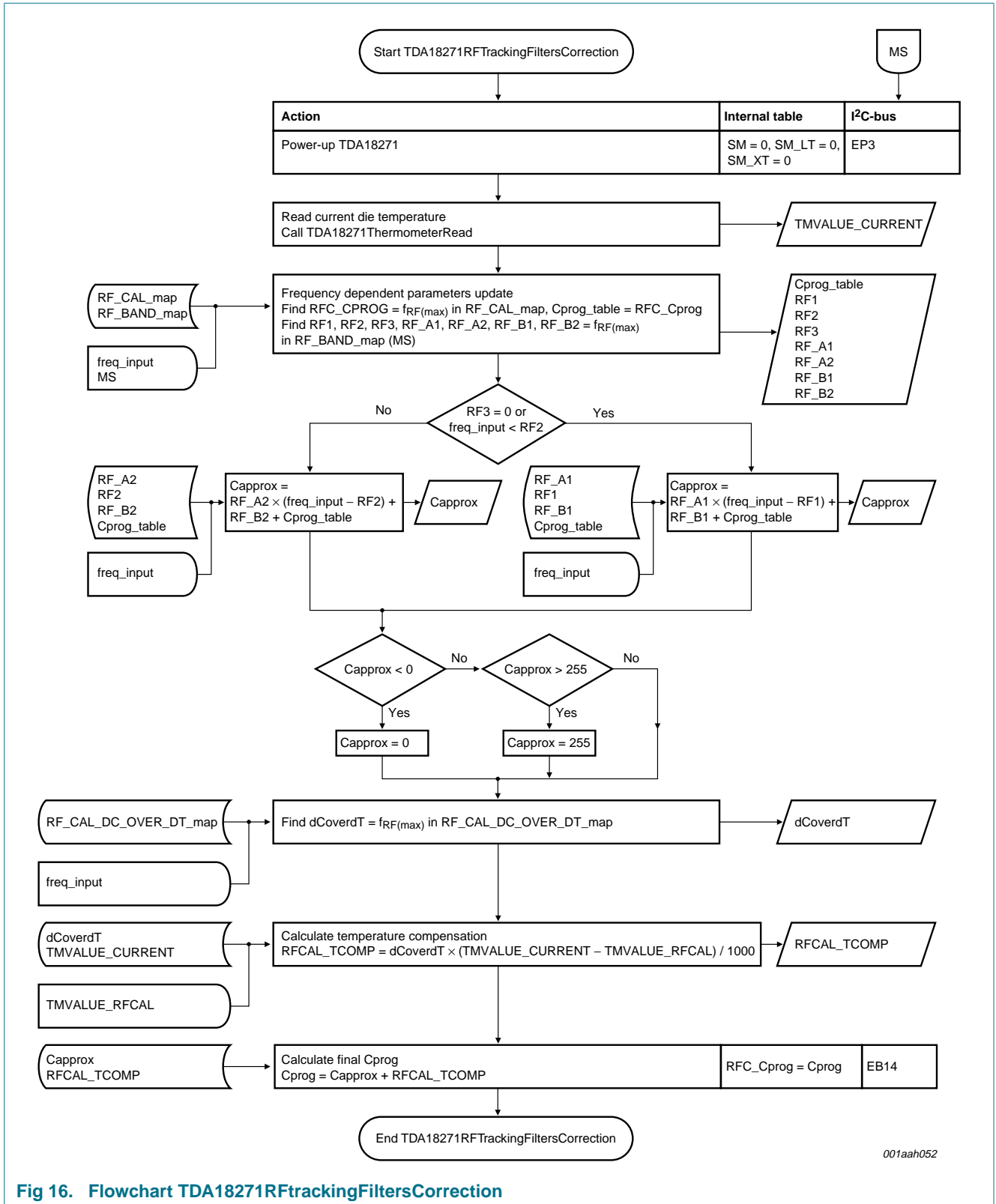


Fig 15. Flowchart TDA18271MSPOR

9.4.11 Flowchart TDA18271RFTrackingFiltersCorrection

Table 36. TDA18271RFTrackingFiltersCorrection

Function	Description	Reference
Description	find the Cprog corresponding to the programmed central frequency freq_input	
Input	freq_input, TMVALUE_RFCAL, MS	
Table	RF_BAND_map, RF_CAL_DC_OVER_DT_map, RF_CAL_map	<a href="#">Table 45 "RF_BAND_map"</a> <a href="#">Table 50 "RF_CAL_DC_OVER_DT_map"</a> <a href="#">Table 51 "RF_CAL_map"</a>
Output	-	



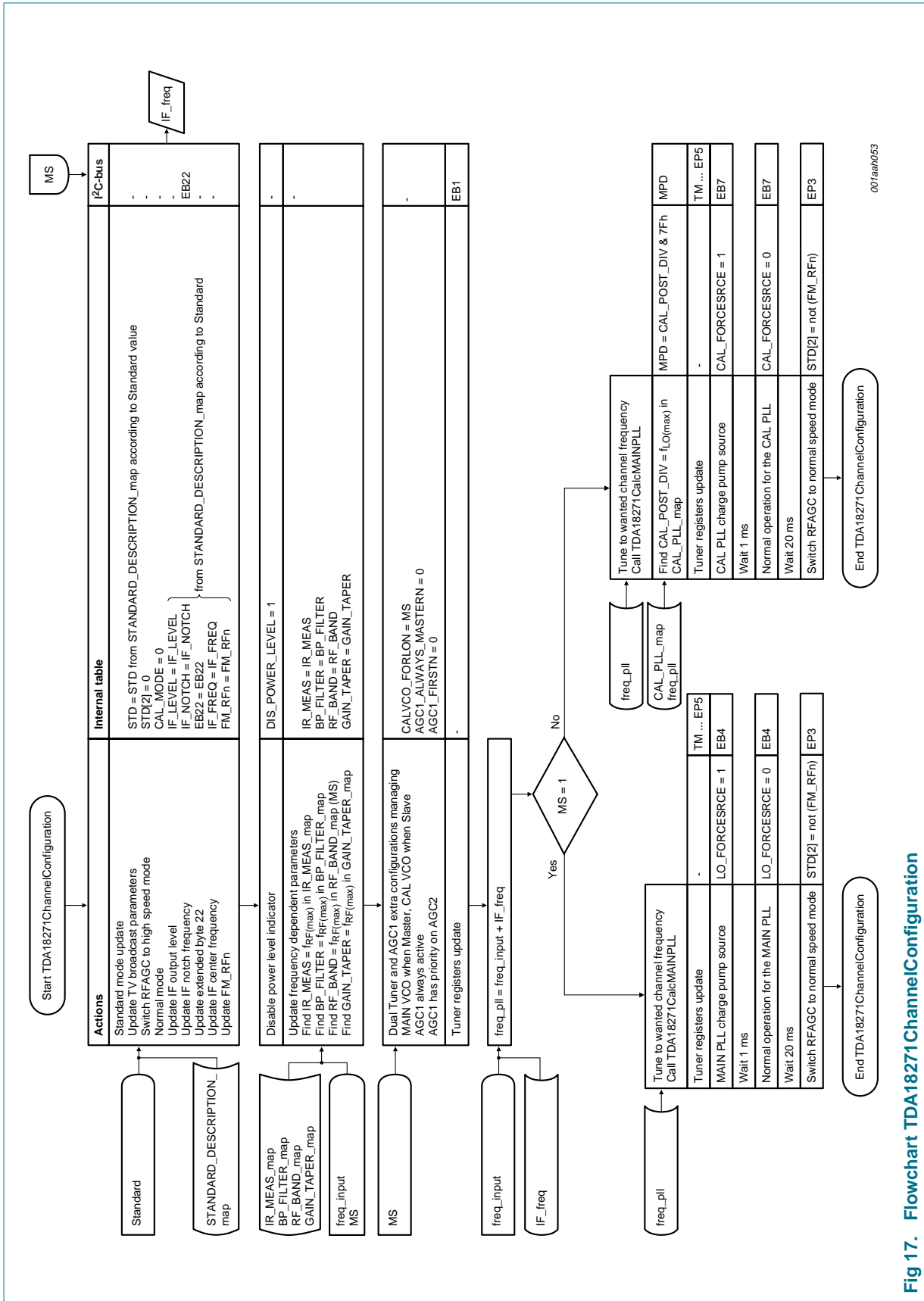
001aah052

Fig 16. Flowchart TDA18271RFtrackingFiltersCorrection

9.4.12 Flowchart TDA18271ChannelConfiguration

Table 37. TDA18271ChannelConfiguration

Function	Description	Reference
Description	tunes the tuner according to the channel and broadcast configuration	
Input	freq_input, MS, Standard	
Table	STANDARD_DESCRIPTION_map, BP_FILTER_map, RF_BAND_map, CAL_PLL_map, GAIN_TAPER_map, IR_MEAS_map	<a href="#">Table 43 "STANDARD_DESCRIPTION_map"</a> <a href="#">Table 44 "BP_FILTER_map"</a> <a href="#">Table 45 "RF_BAND_map"</a> <a href="#">Table 48 "CAL_PLL_map"</a> <a href="#">Table 49 "GAIN_TAPER_map"</a> <a href="#">Table 53 "IR_MEAS_map"</a>
Output	-	



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Fig 17. Flowchart TDA18271 Channel Configuration

9.4.13 Flowchart TDA18271CalcMAINPLL

MPD, MD1, MD2 and MD3 are 8-bit registers. Arithmetical and logical operations performed on these registers are handled as binary operations. Dividing is right shifting and multiplying is left shifting.

Table 38. TDA18271CalcMAINPLL

Function	Description	Reference
Description	finds the correct values for the bytes MPD, MD1, MD2, MD3 and update the tuner registers	
Input	freq_input, MS	
Table	MAIN_PLL_map	<a href="#">Table 47 "MAIN_PLL_map"</a>
Output	-	

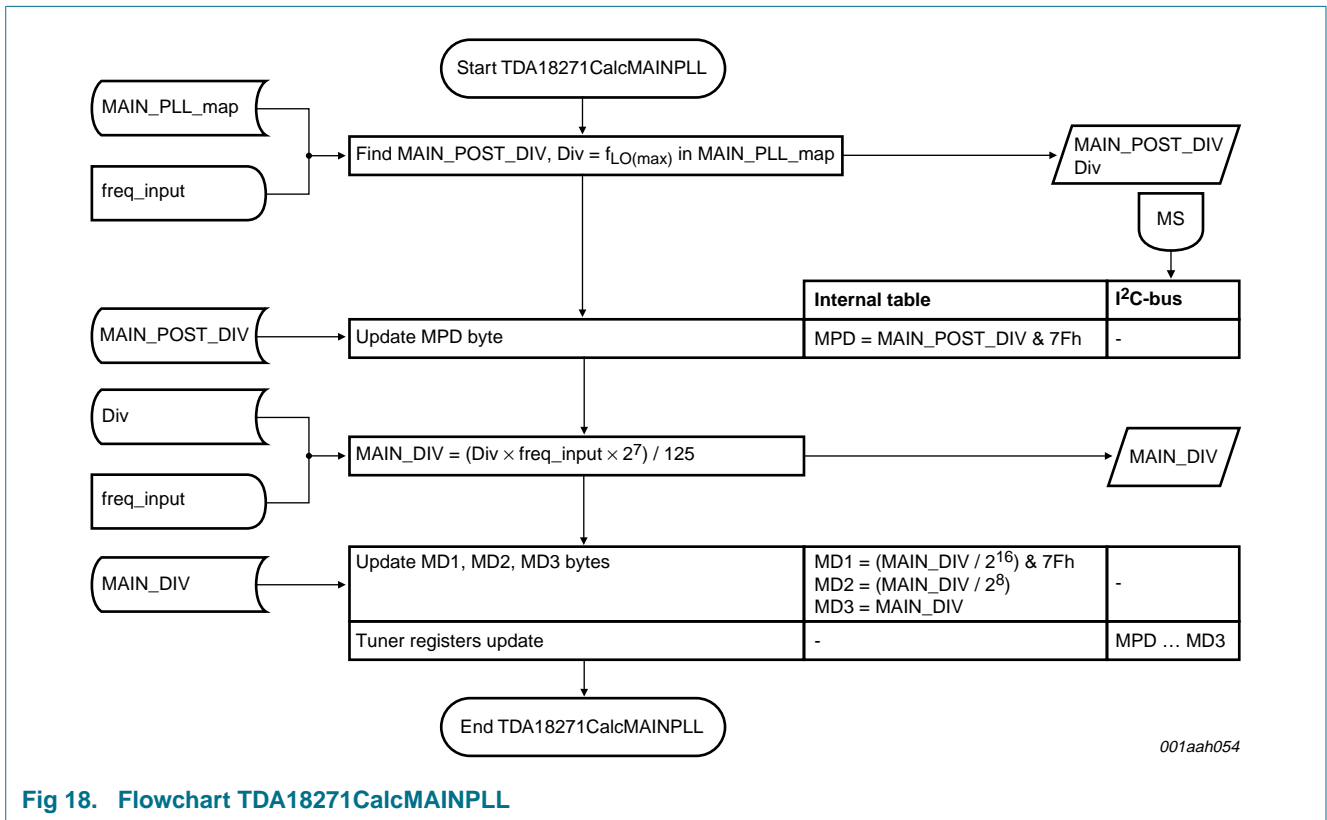


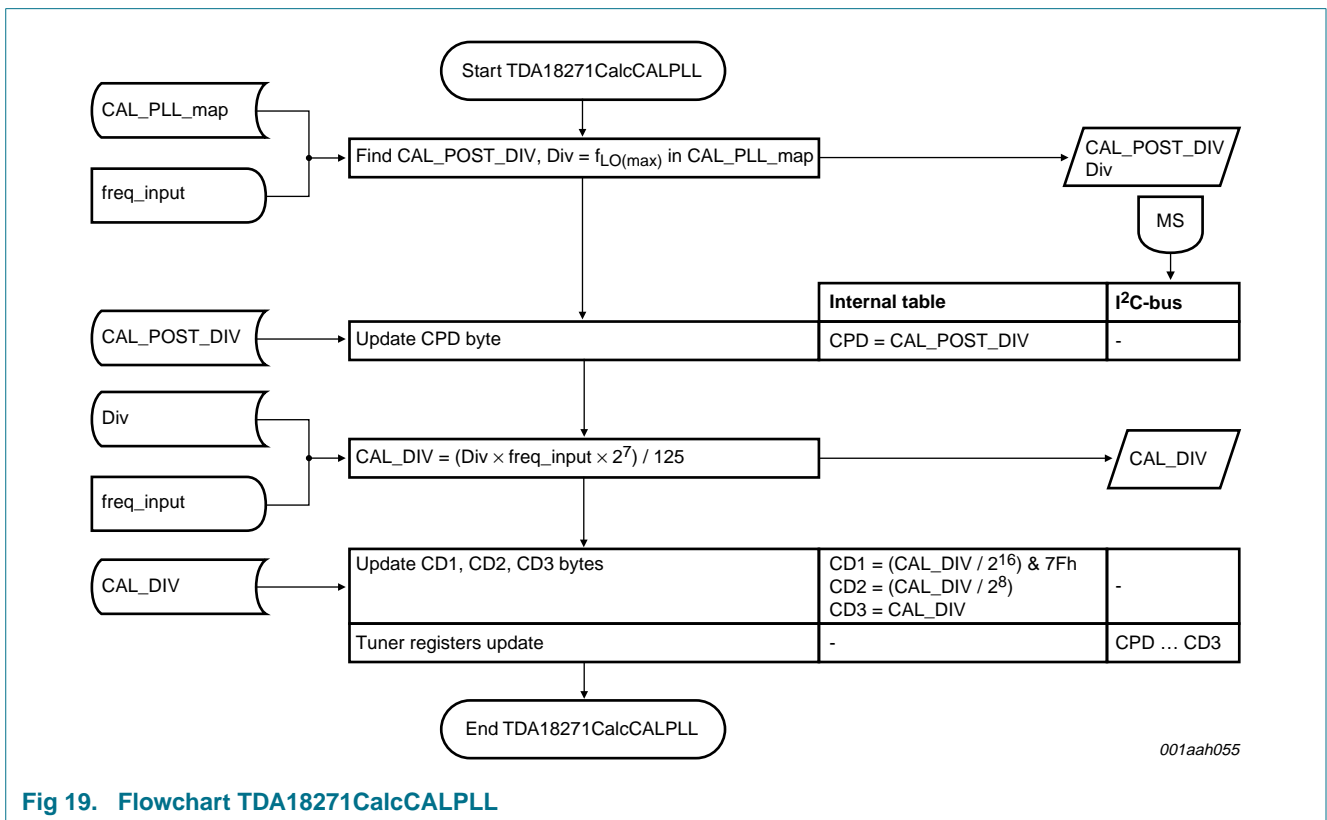
Fig 18. Flowchart TDA18271CalcMAINPLL

9.4.14 Flowchart TDA18271CalcCALPLL

CPD, CD1, CD2 and CD3 are 8-bit registers. Arithmetical and logical operations performed on these registers are handled as binary operations. Dividing is right shifting and multiplying is left shifting.

**Table 39. TDA18271CalcCALPLL**

Function	Description	Reference
Description	finds the correct values for the bytes CPD, CD1, CD2, CD3 and update the tuner registers	
Input	freq_input, MS	
Table	CAL_PLL_map	<a href="#">Table 48 "CAL_PLL_map"</a>
Output	-	



**Fig 19. Flowchart TDA18271CalcCALPLL**

**9.4.15 Flowchart TDA18271ThermometerRead**

**Table 40. TDA18271ThermometerRead**

Function	Description	Reference
Description	turns the on-chip temperature sensor ON, reads the current temperature on the die and then turns the temperature sensor OFF	
Input	MS	
Table	THERMOMETER_map	<a href="#">Table 52 "THERMOMETER_map"</a>
Output	TMVALUE (temperature in °C)	



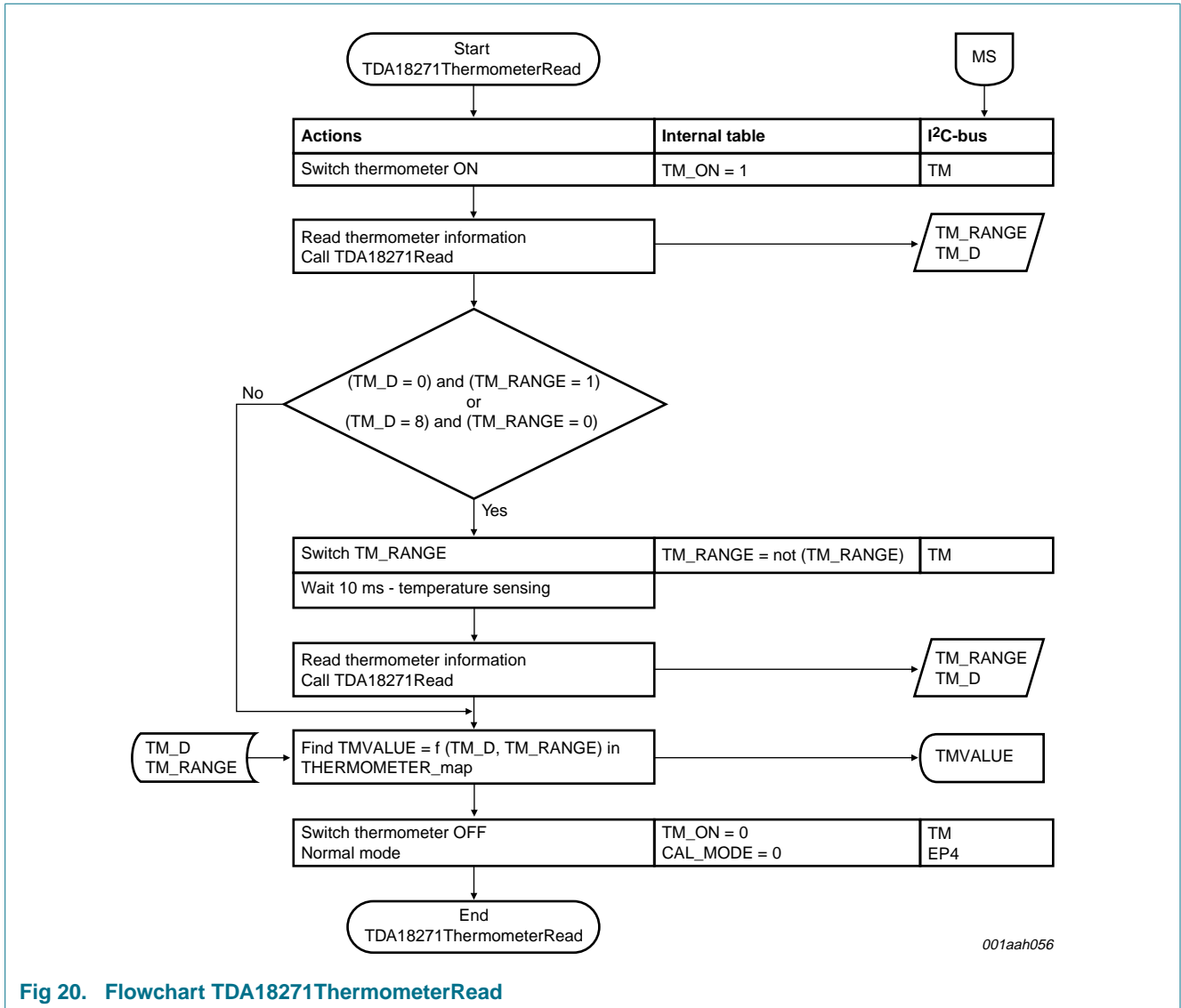


Fig 20. Flowchart TDA18271ThermometerRead

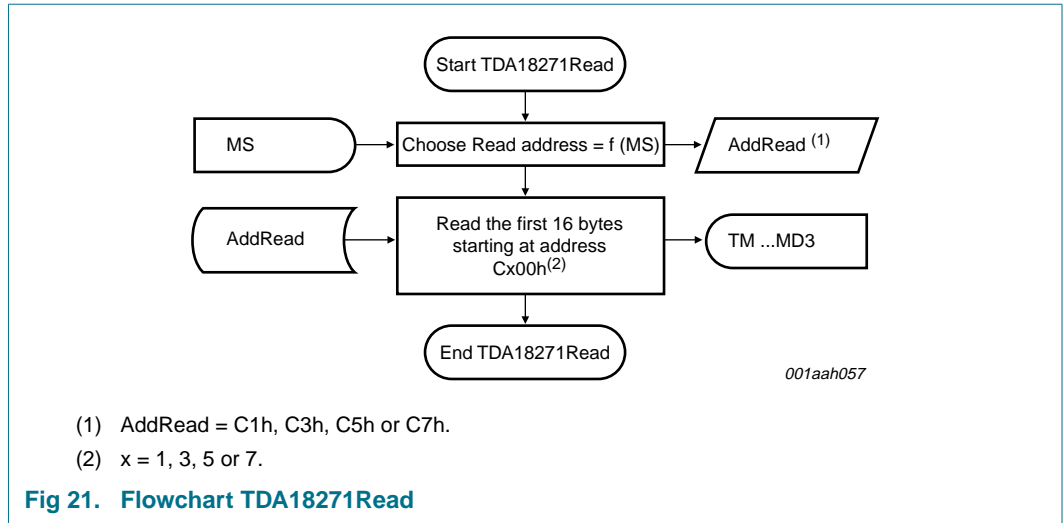
### 9.4.16 Flowchart TDA18271Read

Table 41. TDA18271Read

Function	Description	Reference
Description	reads the first 16 bytes of the TDA18271HD	
Input	MS	
Table	-	
Output	an image of the tuner registers from TM to MD3	

The internal software registers are never updated at any time during the read procedure but are updated when the TDA18271Read is called.

The I<sup>2</sup>C-bus read in the TDA18271HD does not support subaddressing or variable length sequences. The chip can only be read by performing read sequences TDA18271Read (16 bytes) or TDA18271ReadExtended (39 bytes).

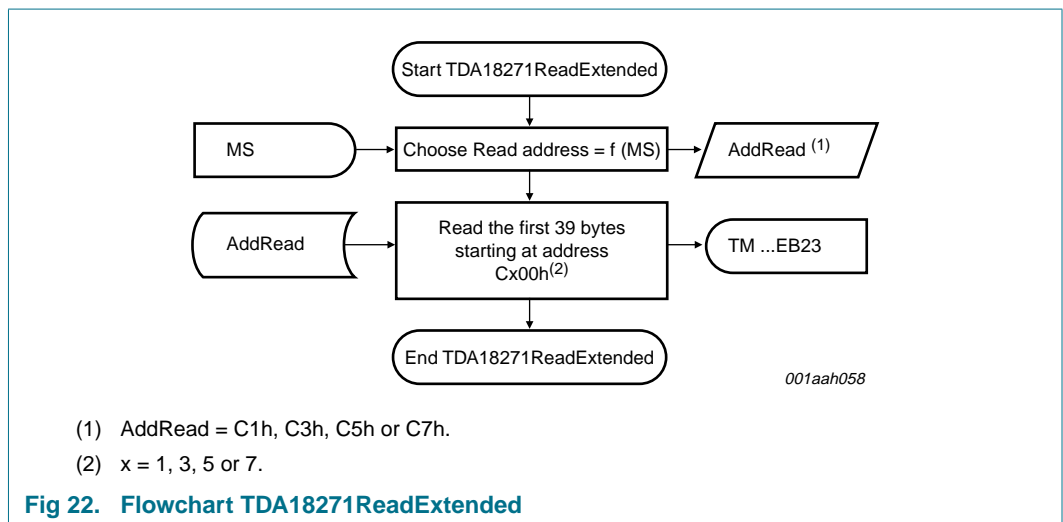


9.4.17 Flowchart TDA18271ReadExtended

Table 42. TDA18271ReadExtended

Function	Description	Reference
Description	read the first 39 bytes of the TDA18271HD	
Input	MS	
Table	-	
Output	an image of the tuner registers from TM to EB23	

The internal software registers are not updated throughout a read procedure. The update is performed at the level of the call TDA18271ReadExtended.



## 9.5 Maps

**Table 43. STANDARD\_DESCRIPTION\_map**

Standard	Selection		Recommended values <sup>[1]</sup>			
	STD[2:0]	FM_RFN	IF_LEVEL[2:0]	IF_NOTCH	EB22[7:0] <sup>[2]</sup>	f <sub>IF</sub> (MHz)
<b>Radio</b>						
FM radio	000	1	000	0	2Ch	1.25
<b>Analog TV</b>						
Analog TV std B	101	0	000	0	2Ch	6
Analog TV std D/K	110					6.9
Analog TV std G/H						7.1
Analog TV std I						7.25
Analog TV std L						6.9
Analog TV std L'						1.25
Analog TV std M/N	100					5.4
<b>Digital TV<sup>[3]</sup></b>						
ATSC 6 MHz	100	0	001	1	37h	3.25
DVB-T 6 MHz						3.30
DVB-T 7 MHz						3.50
DVB-T 8 MHz	101					4
QAM 6 MHz						4
QAM 8 MHz	111					5

[1] Recommended values for analog and digital reception with a TDA8295 IF demodulator and a TDA10048HN channel decoder respectively.

[2] EB22[7:0] is the byte of the Take-Over Points of the RF\_AGC (bits RF\_TOP[2:0] and bits IF\_TOP[3:0]). The RF performances (see [Section 13 "Characteristics"](#)) relate to these standard dependent arrangements. Any other combination of RF\_TOP and IF\_TOP fields is not recommended.

[3] Digital standard settings may vary, depending on channel decoder used.

**Table 44. BP\_FILTER\_map**

f <sub>RF(max)</sub> (kHz)	BP_FILTER[2:0]
62000	000
84000	001
100000	010
140000	011
170000	100
180000	101
865000	110

Table 45. RF\_BAND\_map

f <sub>RF(max)</sub> (kHz)	RF_BAND [2:0]	Used in flowchart							RF1_ default (kHz)	RF2_ default (kHz)	RF3_ default (kHz)
		RF_A1	RF_B1	RF_A2	RF_B2	RF1	RF2	RF3			
47900	000	RF_A1_0	RF_B1_0	RF_A2_0	RF_B2_0	RF1_0	0	0	46000	0	0
61100	001	RF_A1_1	RF_B1_1	RF_A2_1	RF_B2_1	RF1_1	0	0	52200	0	0
152600	010	RF_A1_2	RF_B1_2	RF_A2_2	RF_B2_2	RF1_2	RF2_2	0	70100	136800	0
164700	011	RF_A1_3	RF_B1_3	RF_A2_3	RF_B2_3	RF1_3	0	0	156700	0	0
203500	100	RF_A1_4	RF_B1_4	RF_A2_4	RF_B2_4	RF1_4	0	0	186250	0	0
457800	101	RF_A1_5	RF_B1_5	RF_A2_5	RF_B2_5	RF1_5	RF2_5	RF3_5	230000	345000	426000
865000	110	RF_A1_6	RF_B1_6	RF_A2_6	RF_B2_6	RF1_6	RF2_6	RF3_6	489500	697500	842000

Table 46. KM\_map

f <sub>RF(max)</sub> (kHz)	RFC_K[2:0]	RFC_M[1:0]
47900	011	10
61100	100	01
350000	011	00
720000	010	01
865000	011	11

The KM\_map refers to parameters used during the RF tracking filter calibration. These parameters are frequency dependent.

Table 47. MAIN\_PLL\_map

f <sub>LO(max)</sub> (kHz)	MAIN_POST_DIV[6:0]	Div <sup>[1]</sup>
33125	57h	F0h
35500	56h	E0h
38188	55h	D0h
41375	54h	C0h
45125	53h	B0h
49688	52h	A0h
55188	51h	90h
62125	50h	80h
66250	47h	78h
71000	46h	70h
76375	45h	68h
82750	44h	60h
90250	43h	58h
99375	42h	50h
110375	41h	48h
124250	40h	40h
132500	37h	3Ch
142000	36h	38h
152750	35h	34h
165500	34h	30h

Table 47. MAIN\_PLL\_map ...continued

f <sub>LO(max)</sub> (kHz)	MAIN_POST_DIV[6:0]	Div <sup>[1]</sup>
180500	33h	2Ch
198750	32h	28h
220750	31h	24h
248500	30h	20h
265000	27h	1Eh
284000	26h	1Ch
305500	25h	1Ah
331000	24h	18h
361000	23h	16h
397500	22h	14h
441500	21h	12h
497000	20h	10h
530000	17h	0Fh
568000	16h	0Eh
611000	15h	0Dh
662000	14h	0Ch
722000	13h	0Bh
795000	12h	0Ah
883000	11h	09h
994000	10h	08h

[1] Used in [Section 9.4.13 "Flowchart TDA18271CalcMAINPLL"](#).

Table 48. CAL\_PLL\_map

f <sub>LO(max)</sub> (kHz)	CAL_POST_DIV[7:0]	Div <sup>[1]</sup>
33813	DDh	D0h
36625	DCh	C0h
39938	DBh	B0h
43938	DAh	A0h
48813	D9h	90h
54938	D8h	80h
62813	D3h	70h
67625	CDh	68h
73250	CCh	60h
79875	CBh	58h
87875	CAh	50h
97625	C9h	48h
109875	C8h	40h
125625	C3h	38h
135250	BDh	34h
146500	BCh	30h
159750	BBh	2Ch

Table 48. CAL\_PLL\_map ...continued

f <sub>LO(max)</sub> (kHz)	CAL_POST_DIV[7:0]	Div <sup>[1]</sup>
175750	BAh	28h
195250	B9h	24h
219750	B8h	20h
251250	B3h	1Ch
270500	ADh	1Ah
293000	ACh	18h
319500	ABh	16h
351500	AAh	14h
390500	A9h	12h
439500	A8h	10h
502500	A3h	0Eh
541000	9Dh	0Dh
586000	9Ch	0Ch
639000	9Bh	0Bh
703000	9Ah	0Ah
781000	99h	09h
879000	98h	08h

[1] Used in [Section 9.4.14 "Flowchart TDA18271CalcCALPLL"](#).

Table 49. GAIN\_TAPER\_map

GAIN_TAPER[4:0] <sup>[1]</sup>	f <sub>RF(max)</sub> (kHz)			
	1	2	3	4
1Fh	45400	154300	-	-
1Eh	45800	156100	-	-
1Dh	46200	157800	-	-
1Ch	46700	159500	-	-
1Bh	47100	161200	-	-
1Ah	47500	163000	-	-
19h	47900	164700	-	476300
18h	-	-	-	494800
17h	49600	170200	-	513300
16h	51200	175800	-	531800
15h	52900	181300	-	550300
14h	54500	186900	216200	568900
13h	56200	192400	228900	587400
12h	57800	198000	241600	605900
11h	59500	203500	254400	624400
10h	61100	-	267100	642900
0Fh	-	-	279800	661400
0Eh	-	-	292500	679900
0Dh	67600	-	305200	698400

Table 49. GAIN\_TAPER\_map ...continued

GAIN_TAPER[4:0] <sup>[1]</sup>	f <sub>RF(max)</sub> (kHz)			
	1	2	3	4
0Ch	74200	-	317900	716900
0Bh	80700	-	330700	735400
0Ah	87200	-	343400	753900
09h	93800	-	356100	772500
08h	100300	-	368800	791000
07h	106900	-	381500	809500
06h	113400	-	394200	828000
05h	119900	-	406900	846500
04h	126500	-	419700	865000
03h	133000	-	432400	-
02h	139500	-	445100	-
01h	146100	-	457800	-
00h	152600	-	-	-

[1] The gain taper function compensates for any systematic RF gain ripple, giving a flat RF gain with frequency.

Table 50. RF\_CAL\_DC\_OVER\_DT\_map

f <sub>RF(max)</sub> (kHz)	dCoverdT <sup>[1]</sup>	f <sub>RF(max)</sub> (kHz)	dCoverdT <sup>[1]</sup>	f <sub>RF(max)</sub> (kHz)	dCoverdT <sup>[1]</sup>	f <sub>RF(max)</sub> (kHz)	dCoverdT <sup>[1]</sup>
47900	0h	383000	22h	457800	3Ch	754000	3Ch
55000	0h	386000	23h	465000	0Fh	759000	3Dh
61100	0Ah	389000	24h	477000	12h	764000	3Eh
64000	0Ah	393000	25h	483000	14h	769000	3Fh
82000	14h	396000	26h	502000	19h	774000	40h
84000	19h	399000	27h	508000	1Bh	779000	41h
119000	1Ch	402000	28h	519000	1Ch	784000	43h
124000	20h	404000	29h	522000	1Dh	789000	46h
129000	2Ah	407000	2Ah	524000	1Eh	794000	48h
134000	32h	409000	2Bh	534000	1Fh	799000	4Bh
139000	39h	412000	2Ch	549000	20h	804000	4Fh
144000	3Eh	414000	2Dh	554000	22h	809000	54h
149000	3Fh	417000	2Eh	584000	24h	814000	59h
152600	40h	419000	2Fh	589000	26h	819000	5Dh
154000	40h	422000	30h	658000	27h	824000	61h
164700	41h	424000	31h	664000	2Ch	829000	68h
203500	32h	427000	32h	669000	2Dh	834000	6Eh
353000	19h	429000	33h	699000	2Eh	839000	75h
356000	1Ah	432000	34h	704000	30h	844000	7Eh
359000	1Bh	434000	35h	709000	31h	849000	82h
363000	1Ch	437000	36h	714000	32h	854000	84h
366000	1Dh	439000	37h	724000	33h	859000	8Fh
369000	1Eh	442000	38h	729000	36h	865000	9Ah

Table 50. RF\_CAL\_DC\_OVER\_DT\_map ...continued

f <sub>RF(max)</sub> (kHz)	dCoverdT <sup>[1]</sup>	f <sub>RF(max)</sub> (kHz)	dCoverdT <sup>[1]</sup>	f <sub>RF(max)</sub> (kHz)	dCoverdT <sup>[1]</sup>	f <sub>RF(max)</sub> (kHz)	dCoverdT <sup>[1]</sup>
373000	1Fh	444000	39h	739000	38h	-	-
376000	20h	447000	3Ah	744000	39h	-	-
379000	21h	449000	3Bh	749000	3Bh	-	-

[1] Used in flowcharts.

Table 51. RF\_CAL\_map

f <sub>RF(max)</sub> (kHz)	Cprog_table	f <sub>RF(max)</sub> (kHz)	Cprog_table	f <sub>RF(max)</sub> (kHz)	Cprog_table	f <sub>RF(max)</sub> (kHz)	Cprog_table	f <sub>RF(max)</sub> (kHz)	Cprog_table	f <sub>RF(max)</sub> (kHz)	Cprog_table
41000	0Fh	127000	6Eh	208000	0Fh	370000	58h	521000	20h	740000	69h
43000	1Ch	128000	70h	212000	10h	372000	59h	525000	21h	741000	6Ah
45000	2Fh	129000	71h	216000	11h	375000	5Ah	529000	22h	742000	6Bh
46000	39h	130000	75h	217000	12h	376000	5Bh	533000	23h	743000	6Ch
47000	40h	131000	77h	218000	13h	377000	5Ch	539000	24h	745000	6Dh
47900	50h	132000	78h	220000	14h	379000	5Dh	541000	25h	747000	6Eh
49100	16h	133000	7Bh	222000	15h	382000	5Eh	547000	26h	748000	6Fh
50000	18h	134000	7Eh	225000	16h	384000	5Fh	549000	27h	750000	70h
51000	20h	135000	81h	228000	17h	385000	60h	551000	28h	752000	71h
53000	28h	136000	82h	231000	18h	386000	61h	556000	29h	754000	72h
55000	2Bh	137000	87h	234000	19h	388000	62h	561000	2Ah	757000	73h
56000	32h	138000	88h	235000	1Ah	390000	63h	563000	2Bh	758000	74h
57000	35h	139000	8Dh	236000	1Bh	393000	64h	565000	2Ch	760000	75h
58000	3Eh	140000	8Eh	237000	1Ch	394000	65h	569000	2Dh	763000	76h
59000	43h	141000	91h	240000	1Dh	396000	66h	571000	2Eh	764000	77h
60000	4Eh	142000	95h	242000	1Eh	397000	67h	577000	2Fh	766000	78h
61100	55h	143000	9Ah	244000	1Fh	398000	68h	580000	30h	767000	79h
63000	0Fh	144000	9Dh	247000	20h	400000	69h	582000	31h	768000	7Ah
64000	11h	145000	A1h	249000	21h	402000	6Ah	584000	32h	773000	7Bh
65000	12h	146000	A2h	252000	22h	403000	6Bh	588000	33h	774000	7Ch
66000	15h	147000	A4h	253000	23h	407000	6Ch	591000	34h	776000	7Dh
67000	16h	148000	A9h	254000	24h	408000	6Dh	596000	35h	777000	7Eh
68000	17h	149000	AEh	256000	25h	409000	6Eh	598000	36h	778000	7Fh
70000	19h	150000	B0h	259000	26h	410000	6Fh	603000	37h	779000	80h
71000	1Ch	151000	B1h	262000	27h	411000	70h	604000	38h	781000	81h
72000	1Dh	152000	B7h	264000	28h	412000	71h	606000	39h	783000	82h
73000	1Fh	152600	BDh	267000	29h	413000	72h	612000	3Ah	784000	83h
74000	20h	154000	20h	269000	2Ah	414000	73h	615000	3Bh	785000	84h
75000	21h	155000	22h	271000	2Bh	417000	74h	617000	3Ch	786000	85h
76000	24h	156000	24h	273000	2Ch	418000	75h	621000	3Dh	793000	86h
77000	25h	157000	25h	275000	2Dh	420000	76h	622000	3Eh	794000	87h
78000	27h	158000	27h	277000	2Eh	422000	77h	625000	3Fh	795000	88h
80000	28h	159000	29h	279000	2Fh	423000	78h	632000	40h	797000	89h



Table 51. RF\_CAL\_map ...continued

f <sub>RF(max)</sub> (kHz)	Cprog_ table	f <sub>RF(max)</sub> (kHz)	Cprog_ table	f <sub>RF(max)</sub> (kHz)	Cprog_ table	f <sub>RF(max)</sub> (kHz)	Cprog_ table	f <sub>RF(max)</sub> (kHz)	Cprog_ table	f <sub>RF(max)</sub> (kHz)	Cprog_ table
81 000	29h	160 000	2Ch	282 000	30h	424 000	79h	633 000	41h	799 000	8Ah
82 000	2Dh	161 000	2Dh	284 000	31h	427 000	7Ah	634 000	42h	801 000	8Bh
83 000	2Eh	163 000	2Eh	286 000	32h	428 000	7Bh	642 000	43h	802 000	8Ch
84 000	2Fh	164 000	2Fh	287 000	33h	429 000	7Dh	643 000	44h	803 000	8Dh
85 000	31h	164 700	30h	290 000	34h	432 000	7Fh	647 000	45h	804 000	8Eh
86 000	33h	166 000	11h	293 000	35h	434 000	80h	650 000	46h	810 000	90h
87 000	34h	167 000	12h	295 000	36h	435 000	81h	652 000	47h	811 000	91h
88 000	35h	168 000	13h	297 000	37h	436 000	83h	657 000	48h	812 000	92h
89 000	37h	169 000	14h	300 000	38h	437 000	84h	661 000	49h	814 000	93h
90 000	38h	170 000	15h	303 000	39h	438 000	85h	662 000	4Ah	816 000	94h
91 000	39h	172 000	16h	305 000	3Ah	439 000	86h	665 000	4Bh	817 000	96h
93 000	3Ch	173 000	17h	306 000	3Bh	440 000	87h	667 000	4Ch	818 000	97h
94 000	3Eh	174 000	18h	307 000	3Ch	441 000	88h	670 000	4Dh	820 000	98h
95 000	3Fh	175 000	1Ah	310 000	3Dh	442 000	89h	673 000	4Eh	821 000	99h
96 000	40h	176 000	1Bh	312 000	3Eh	445 000	8Ah	676 000	4Fh	822 000	9Ah
97 000	42h	178 000	1Dh	315 000	3Fh	446 000	8Bh	677 000	50h	828 000	9Bh
99 000	45h	179 000	1Eh	318 000	40h	447 000	8Ch	681 000	51h	829 000	9Dh
100 000	46h	180 000	1Fh	320 000	41h	448 000	8Eh	683 000	52h	830 000	9Fh
102 000	48h	181 000	20h	323 000	42h	449 000	8Fh	686 000	53h	831 000	A0h
103 000	4Ah	182 000	21h	324 000	43h	450 000	90h	688 000	54h	833 000	A1h
105 000	4Dh	183 000	22h	325 000	44h	452 000	91h	689 000	55h	835 000	A2h
106 000	4Eh	184 000	24h	327 000	45h	453 000	93h	691 000	56h	836 000	A3h
107 000	50h	185 000	25h	331 000	46h	454 000	94h	695 000	57h	837 000	A4h
108 000	51h	186 000	26h	334 000	47h	456 000	96h	698 000	58h	838 000	A6h
110 000	54h	187 000	27h	337 000	48h	457 800	98h	703 000	59h	840 000	A8h
111 000	56h	188 000	29h	339 000	49h	461 000	11h	704 000	5Ah	842 000	A9h
112 000	57h	189 000	2Ah	340 000	4Ah	468 000	12h	705 000	5Bh	845 000	AAh
113 000	58h	190 000	2Ch	341 000	4Bh	472 000	13h	707 000	5Ch	846 000	ABh
114 000	59h	191 000	2Dh	343 000	4Ch	473 000	14h	710 000	5Dh	847 000	ADh
115 000	5Ch	192 000	2Eh	345 000	4Dh	474 000	15h	712 000	5Eh	848 000	AEh
116 000	5Dh	193 000	2Fh	349 000	4Eh	481 000	16h	717 000	5Fh	852 000	AFh
117 000	5Fh	194 000	30h	352 000	4Fh	486 000	17h	718 000	60h	853 000	B0h
119 000	60h	195 000	33h	353 000	50h	491 000	18h	721 000	61h	858 000	B1h
120 000	64h	196 000	35h	355 000	51h	498 000	19h	722 000	62h	860 000	B2h
121 000	65h	198 000	36h	357 000	52h	499 000	1Ah	723 000	63h	861 000	B3h
122 000	66h	200 000	38h	359 000	53h	501 000	1Bh	725 000	64h	862 000	B4h
123 000	68h	201 000	3Ch	361 000	54h	506 000	1Ch	727 000	65h	863 000	B6h
124 000	69h	202 000	3Dh	362 000	55h	511 000	1Dh	730 000	66h	864 000	B8h
125 000	6Ch	203 500	3Eh	364 000	56h	516 000	1Eh	732 000	67h	865 000	B9h
126 000	6Dh	206 000	0Eh	368 000	57h	520 000	1Fh	735 000	68h	-	-

**Table 52. THERMOMETER\_map***Bit TM\_ON must be set to logic 1.*

TM_D[3:0]	TMVALUE (die temperature)	
	TM_RANGE = 0	TM_RANGE = 1
0000	60 °C	92 °C
0001	62 °C	94 °C
0010	66 °C	98 °C
0011	64 °C	96 °C
0100	74 °C	106 °C
0101	72 °C	104 °C
0110	68 °C	100 °C
0111	70 °C	102 °C
1000	90 °C	122 °C
1001	88 °C	120 °C
1010	84 °C	116 °C
1011	86 °C	118 °C
1100	76 °C	108 °C
1101	78 °C	110 °C
1110	82 °C	114 °C
1111	80 °C	112 °C

**Table 53. IR\_MEAS\_map**

f <sub>RF(max)</sub> (kHz)	IR_MEAS[2:0]
200	101
600	110
865	111

Table 54. CID\_Target\_map

$f_{RF(max)}$	CID_Target	count_limit
46000	4	1800
52200	A	1500
70100	1	4000
136800	18	
156700	18	
186250	A	
230000	A	
345000	18	
426000	E	
489500	1E	
697500	32	
842000	3A	

## 10. Internal circuitry

Table 55. Internal circuits

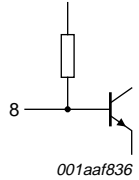
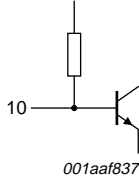
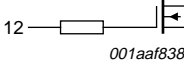
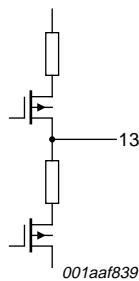
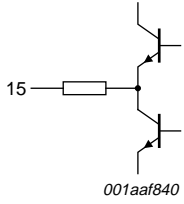
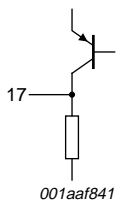
Symbol	Pin	Description <sup>[1]</sup>	Average DC voltage
FM_IN	8	 001aaf836	0.8 V
RF_IN	10	 001aaf837	0.8 V
CAPRFAGC	12	 001aaf838	2.8 V
LT	13	 001aaf839	0.85 V
STO	15	 001aaf840	0.85 V
CAPREGVCO	17	 001aaf841	2.8 V (Normal mode); 0 V (Standby mode)

Table 55. Internal circuits ...continued

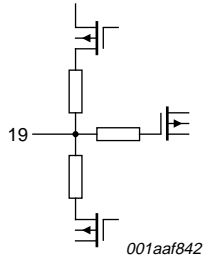
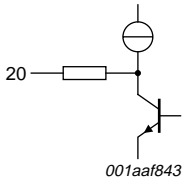
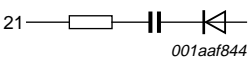
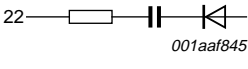
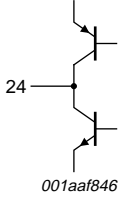
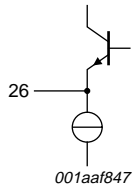
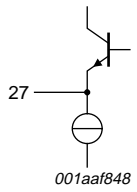
Symbol	Pin	Description <sup>[1]</sup>	Average DC voltage
MASTERSYNC	19		$0.5 \times V_{CC}$
CAPFILTVCO	20		1.6 V (Normal mode); 0 V (Standby mode)
VT_COARSE	21		$0.5 \times V_{CC}$
VT_FINE	22		$0.5 \times V_{CC}$
CP_LO	24		$0.5 \times V_{CC}$
XTALP	26		1.45 V
XTALN	27		1.45 V

Table 55. Internal circuits ...continued

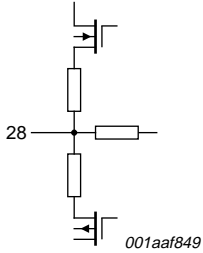
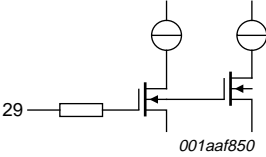
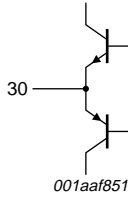
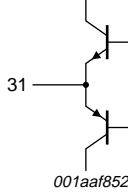
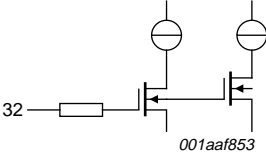
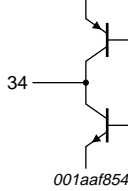
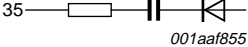
Symbol	Pin	Description <sup>[1]</sup>	Average DC voltage
FREEZE	28		3.3 V
XTOUT_MS	29		high-Z
XTOUTP	30		2.4 V
XTOUTN	31		2.4 V
AS	32		high-Z
CP_CAL	34		3.3 V (Normal mode); 0.5 × V <sub>CC</sub> (Calibration mode)
VT_CAL	35		3.3 V (Normal mode); 0.5 × V <sub>CC</sub> (Calibration mode)

Table 55. Internal circuits ...continued

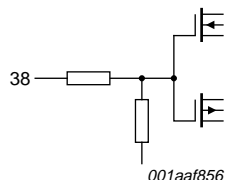
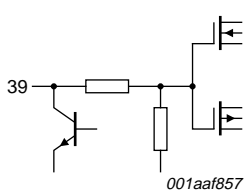
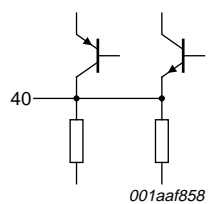
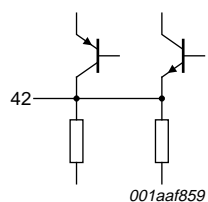
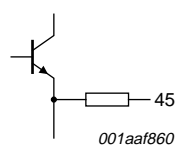
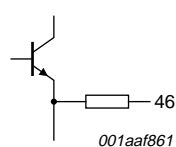
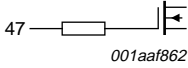
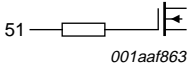
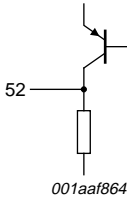
Symbol	Pin	Description <sup>[1]</sup>	Average DC voltage
SCL	38	 001aaf856	high-Z
SDA	39	 001aaf857	high-Z
CAPREG18	40	 001aaf858	1.8 V (Normal mode); 2.0 V (Sleep mode)
CAPREG28	42	 001aaf859	2.8 V (Normal mode); 2.4 V (Sleep mode)
IFOUTN	45	 001aaf860	1.35 V
IFOUTP	46	 001aaf861	1.35 V

Table 55. Internal circuits ...continued

Symbol	Pin	Description <sup>[1]</sup>	Average DC voltage
V_IFAGC	47		high-Z
VSYNC	51		high-Z
CAPREGFILTRF	52		2.8 V (Normal mode); 0 V (Sleep mode)

[1] ESD protection components are not shown.

## 11. Limiting values

Table 56. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).<sup>[1]</sup>

Symbol	Parameter	Conditions	Min	Max	Unit
V <sub>CC</sub>	supply voltage		-0.3	+3.6	V
V <sub>I</sub>	input voltage	pins SDA and SCL	-0.3	+5.5	V
		all other pins			
		V <sub>CC</sub> < 3.3 V	-0.3	V <sub>CC</sub> + 0.3	V
		V <sub>CC</sub> > 3.3 V	-0.3	+3.6	V
T <sub>stg</sub>	storage temperature		-40	+150	°C
T <sub>j</sub>	junction temperature		-	110	°C
V <sub>esd</sub>	electrostatic discharge voltage	HBM: EIA/JESD22-A114	±2000	-	V
		MM: EIA/JESD22-A115	±200	-	V

[1] The TDA18271HD withstands the latch-up specifications of JEDEC JESD78A, with the specific recommendation using coupling capacitors on pins RF\_IN, LT, STO, XTOUTP and XTOUTN.

## 12. Thermal characteristics

Table 57. Thermal characteristics<sup>[1]</sup>

Symbol	Parameter	Conditions	Typ	Unit
R <sub>th(j-c)</sub>	thermal resistance from junction to case	according to JEDEC specification	19.6	K/W

[1] The junction temperature can be obtained with the formula  $T_j = T_{amb} + R_{th(j-a)} \times V_{CC} \times I_{CC}$ , where  $R_{th(j-a)}$  is the thermal resistance of the application.  $R_{th(j-a)}$  must be such that the resulting  $T_j$  does not exceed the maximum value defined in [Table 56](#).



### 13. Characteristics

All data in this section refers to Master mode operation

**Table 58. Loop-through characteristics (RF input to loop-through output)**

$T_{amb} = 25\text{ }^{\circ}\text{C}$ ;  $V_{CC} = 3.3\text{ V}$ ; for test circuit see [Figure 27](#); unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$f_{RF(lt)}$	loop-through RF frequency	center of channel	45	-	864	MHz	
VSWR	voltage standing wave ratio	loop-through output; 75 $\Omega$ nominal impedance	-	-	3		
$G_{v(lt)}$	loop-through voltage gain	75 $\Omega$ load	-	1.5	-	dB	
$\Delta G_{lt}$	loop-through gain variation	in the RF frequency range; 75 $\Omega$ load	-	3	-	dB	
$NF_{lt}$	loop-through noise figure	Standby mode with LT, STO and crystal oscillator on	-	6.5	-	dB	
CSO	composite second-order distortion		[1]	-	-60	-	dBc
CTB	composite triple beat		[1]	-	-63	-	dBc
$\alpha_{isol(bp)}$	bypass isolation	from loop-through output to RF input	-	24	-	dB	
$V_{L(tun-lto)}$	leakage voltage between tuner and loop-through output	in RF TV band	-	5	-	dB $\mu$ V	

[1] Channel loading assumptions: 129 channels (NTSC 129 frequency plan) at 75 dB $\mu$ V.

**Table 59. Slave tuner output characteristics (pin STO)**

$T_{amb} = 25\text{ }^{\circ}\text{C}$ ;  $V_{CC} = 3.3\text{ V}$ ; for test circuit see [Figure 27](#); unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$f_{RF(STO)}$	RF frequency on pin STO	slave tuner output	45	-	864	MHz
$Z_{o(STO)}$	output impedance on pin STO		30	35	40	$\Omega$
$G_{v(STO)}$	voltage gain on pin STO	75 $\Omega$ source resistance on RF input; $Z_i = 35\text{ } \Omega$ (75 $\Omega$ , VSWR = 2)				
		POWER_LEVEL[6:5] = 00	-	6	-	dB
		POWER_LEVEL[6:5] = 01	-	9	-	dB
		POWER_LEVEL[6:5] = 10	-	12	-	dB
		POWER_LEVEL[6:5] = 11	-	15	-	dB

**Table 60. General characteristics for TV reception (RF input to IF output)**

$T_{amb} = 25\text{ }^{\circ}\text{C}$ ;  $V_{CC} = 3.3\text{ V}$ ; IF output level option 2 V (p-p); IF output load = 1 k $\Omega$  on each terminal; for test circuit see [Figure 27](#); unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Supply</b>						
$V_{CC}$	supply voltage		3.13	3.30	3.47	V
$I_{CC}$	supply current	Normal mode	180	235	290	mA
		Standby mode with LT, STO and crystal oscillator on (default at POR)	40	51	65	mA
		Standby mode with only crystal oscillator and its output on	10	15	20	mA
		Device off mode	1	2	5	mA
P	power dissipation		-	780	-	mW
$T_{amb}$	ambient temperature		0	-	70	$^{\circ}\text{C}$
<b>Input</b>						
$f_{RF}$	RF frequency	center of channel	45	-	864	MHz
VSWR	voltage standing wave ratio	RF input; 75 $\Omega$ nominal impedance	-	2	-	-
NF <sub>tun</sub>	tuner noise figure	maximum gain	-	5.5	-	dB
$G_{v(tun)max}$	maximum tuner voltage gain	2 V (p-p) IF output selection	-	83	-	dB
$\Delta G_{AGC(tun)}$	tuner AGC gain range		-	71	-	dB
$V_{i(max)}$	maximum input voltage	1 dB gain compression, one analog TV signal at RF input (-5 dBm)	-	103	-	dB $\mu$ V
$V_{L(tun-RF)}$	leakage voltage between tuner and RF	at RF input; in RF band	-	0	-	dB $\mu$ V
<b>Output</b>						
$V_{o(IF)diff(p-p)}$	peak-to-peak differential IF output voltage	IF_LEVEL[2:0] = 000	-	2	-	V
		IF_LEVEL[2:0] = 001	-	1.25	-	V
		IF_LEVEL[2:0] = 010	-	1	-	V
		IF_LEVEL[2:0] = 110	-	0.6	-	V
		IF_LEVEL[2:0] = 111	-	0.5	-	V
$Z_{o(IF)}$	IF output impedance	differential mode; magnitude value	-	100	-	$\Omega$
$\Delta G_{AGC(IF)}$	IF AGC GAIN range	2 V (p-p) IF output voltage selection	-	30	-	dB
$G_{tit}$	tilt gain	RF frequency range; 6/7/8 MHz channel	-	2	4	dB

**Table 60. General characteristics for TV reception (RF input to IF output) ...continued**  
 $T_{amb} = 25\text{ }^{\circ}\text{C}$ ;  $V_{CC} = 3.3\text{ V}$ ; IF output level option 2 V (p-p); IF output load = 1 k $\Omega$  on each terminal;  
 for test circuit see [Figure 27](#); unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$f_{IF(stpb)lp}$	low-pass stop-band IF frequency	60 dB attenuation				
		6 MHz IF filter	-	14	-	MHz
		7 MHz IF filter	-	16	-	MHz
		8 MHz IF filter	-	18	-	MHz
$\alpha_{image}$	image rejection		-	65	-	dB
$t_{d(grp)}$	group delay time	analog TV; difference between f1 and f2 in IF				
		Std B; f1 = 1.57 MHz; f2 = 6 MHz	-	130	-	ns
		Std G; f1 = 2.67 MHz; f2 = 7.1 MHz	-	36	-	ns
		Std M/N; f1 = 1.82 MHz; f2 = 5.4 MHz	-	92	-	ns
$t_{ripple}$	ripple time	digital TV; difference between f1 and f2 in digital channel				
		ATSC 6 MHz; f1 = 0.75 MHz; f2 = 5.75 MHz	-	395	-	ns
		DVB-T 6 MHz; f1 = 0.8 MHz and f2 = 5.8 MHz	-	365	-	ns
		DVB-T 7 MHz; f1 = 0.5 MHz and f2 = 6.5 MHz	-	478	-	ns
		DVB-T 8 MHz; f1 = 0.5 MHz and f2 = 7.5 MHz	-	515	-	ns
		QAM 6 MHz; f1 = 1.5 MHz and f2 = 6.5 MHz	-	155	-	ns
		QAM 8 MHz; f1 = 1.5 MHz and f2 = 8.5 MHz	-	180	-	ns
$\phi_n$	phase noise	1 kHz and 10 kHz; see <a href="#">Figure 23</a>	-	-89	-	dBc/Hz
<b>Various</b>						
$t_{startup(tun)}$	tuner start-up time	at power-up	-	1.5	-	s
$t_{set}$	setting time	channel change	-	20	-	ms
$S_{dig}$	digital sensitivity	DVB-T (64 QAM $\frac{2}{3}$ ); BER = $2 \cdot 10^{-4}$	[1]	-82	-	dBm
$S_a$	analog sensitivity	50 dB video SNR weighted 22 dB $\mu$ V (color loss)	[2]	58	-	dB $\mu$ V

[1] Measured with TDA10048HN channel decoder.

[2] Measured with TDA8295 IF modulator.

**Table 61. General characteristics for FM radio reception (FM input to IF output)**

$V_{CC} = 3.3\text{ V}$ ;  $T_{amb} = 25\text{ }^{\circ}\text{C}$ ; IF output load of 1 k $\Omega$  on each terminal; for test circuit see [Figure 27](#); unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Supply</b>						
$I_{CC}$	supply current	FM mode with loop-through, slave tuner output and crystal oscillator on (default at POR)	-	265	315	mA
<b>Input</b>						
$f_{RF}$	RF frequency		65	-	108	MHz
VSWR	voltage standing wave ratio	75 $\Omega$ nominal impedance	-	2	-	
<b>Output</b>						
$f_o$	output frequency	IF	-	1	-	MHz
$V_{o(p-p)}$	peak-to-peak output voltage	IF_LEVEL[2:0] = 000	-	2.0	-	V
		IF_LEVEL[2:0] = 001	-	1.25	-	V
		IF_LEVEL[2:0] = 010	-	1.0	-	V
		IF_LEVEL[2:0] = 111	-	0.5	-	V
$\alpha_{isol(bp)}$	bypass isolation	in FM band between pins RF_IN and pin FM_IN	-	32	-	dB

**Table 62. Characteristics of terminals**

$T_{amb} = 25\text{ }^{\circ}\text{C}$ ;  $V_{CC} = 3.3\text{ V}$ ; 2.2 nF on input pin V\_IFAGC; for test circuit see [Figure 27](#); unless otherwise specified.

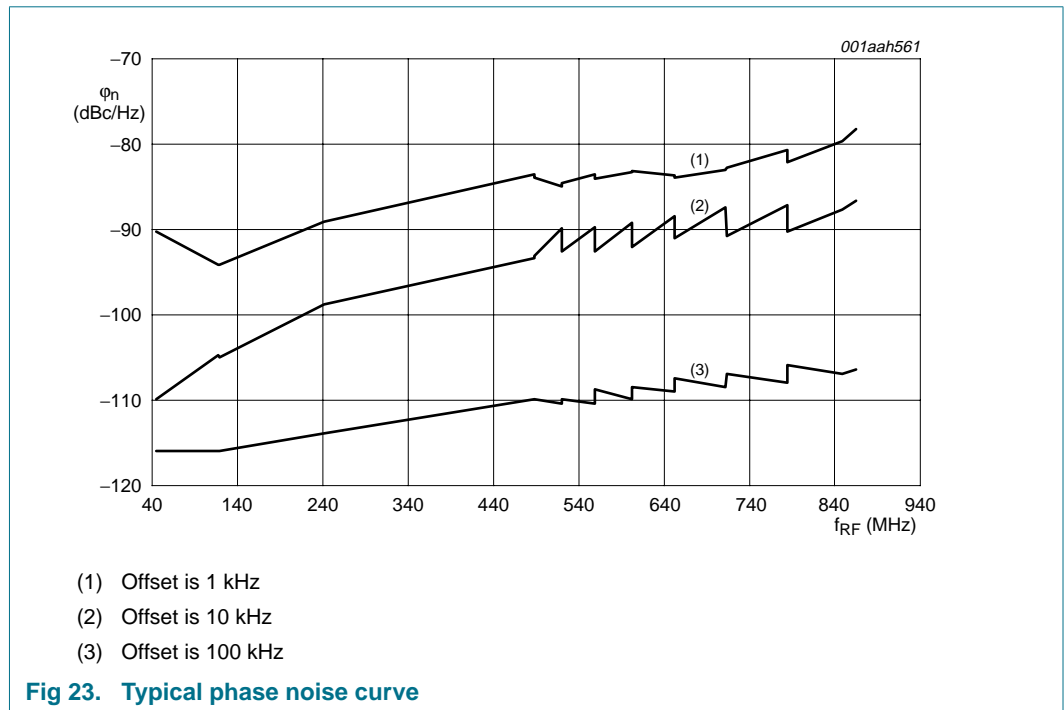
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>IF AGC input: pin V_IFAGC</b>						
$V_{AGC}$	AGC voltage		0	-	$V_{CC}$	V
$Z_i$	input impedance		-	high-Z	-	$\Omega$
$dG_{AGC}/dV$	rate of change of AGC gain with voltage		-	30	55	dB/V
<b>Crystal oscillator</b>						
$f_{xtal}$	crystal frequency		15.99	16	16.01	MHz
$Z_i$	input impedance	magnitude value; master mode	-	500	-	$\Omega$
<b>Crystal oscillator output buffer; pins XTOUTP and XTOUTN</b>						
$R_o$	output resistance	16 MHz output frequency	-	460	-	$\Omega$
$V_{o(p-p)}$	peak-to-peak output voltage	10 k $\Omega$ //10 pF AC load	-	0.4	-	V
$SR_r$	slew rate of rising signal	10 k $\Omega$ //10 pF AC load	-	40	-	V/ $\mu$ s
$SR_f$	slew rate of falling signal	10 k $\Omega$ //10 pF AC load	-	40	-	V/ $\mu$ s

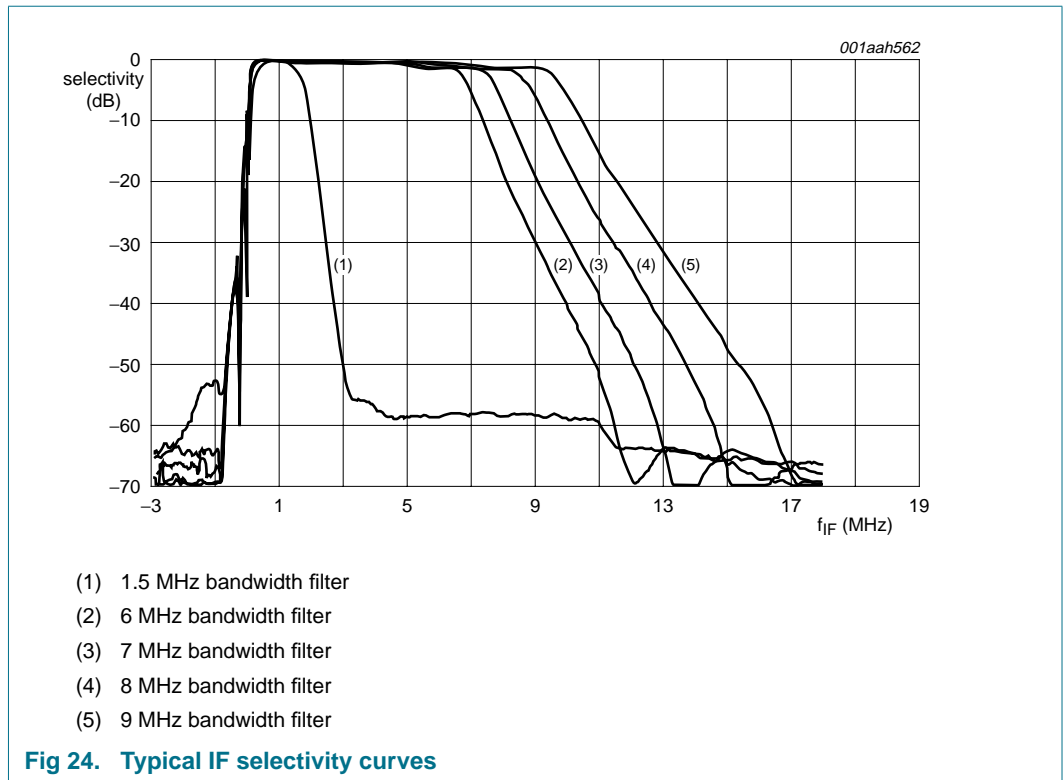
**Table 62. Characteristics of terminals ...continued**

$T_{amb} = 25^{\circ}\text{C}$ ;  $V_{CC} = 3.3\text{ V}$ ;  $2.2\text{ nF}$  on input pin  $V_{IFAGC}$ ; for test circuit see [Figure 27](#); unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>I<sup>2</sup>C-bus<sup>[1]</sup></b>						
<b>Pin SCL</b>						
$V_{IL}$	LOW-level input voltage	fixed input levels	-	-	1.5	V
		$V_{DD}$ related input levels	-	-	$0.3V_{DD}$	V
$V_{IH}$	HIGH-level input voltage	fixed input levels	3	-	-	V
		$V_{DD}$ related input levels	$0.7V_{DD}$	-	-	V
$f_{SCL}$	SCL clock frequency		-	-	400	kHz
<b>pin SDA</b>						
$V_{OH}$	HIGH-level output voltage	$I_{SDA} = 3\text{ mA}$ (sink current)	-	-	0.4	V
$V_{IL}$	LOW-level input voltage	fixed input levels	-	-	1.5	V
		$V_{DD}$ related input levels	-	-	$0.3V_{DD}$	V
$V_{IH}$	HIGH-level input voltage	fixed input levels	3	-	-	V
		$V_{DD}$ related input levels	$0.7V_{DD}$	-	-	V

[1] Devices that use non-standard supply voltages, which do not conform to the intended I<sup>2</sup>C-bus system levels, must relate their input levels to the supply voltage to which the pull-up resistors are connected.





## 14. Application information

### 14.1 Application examples

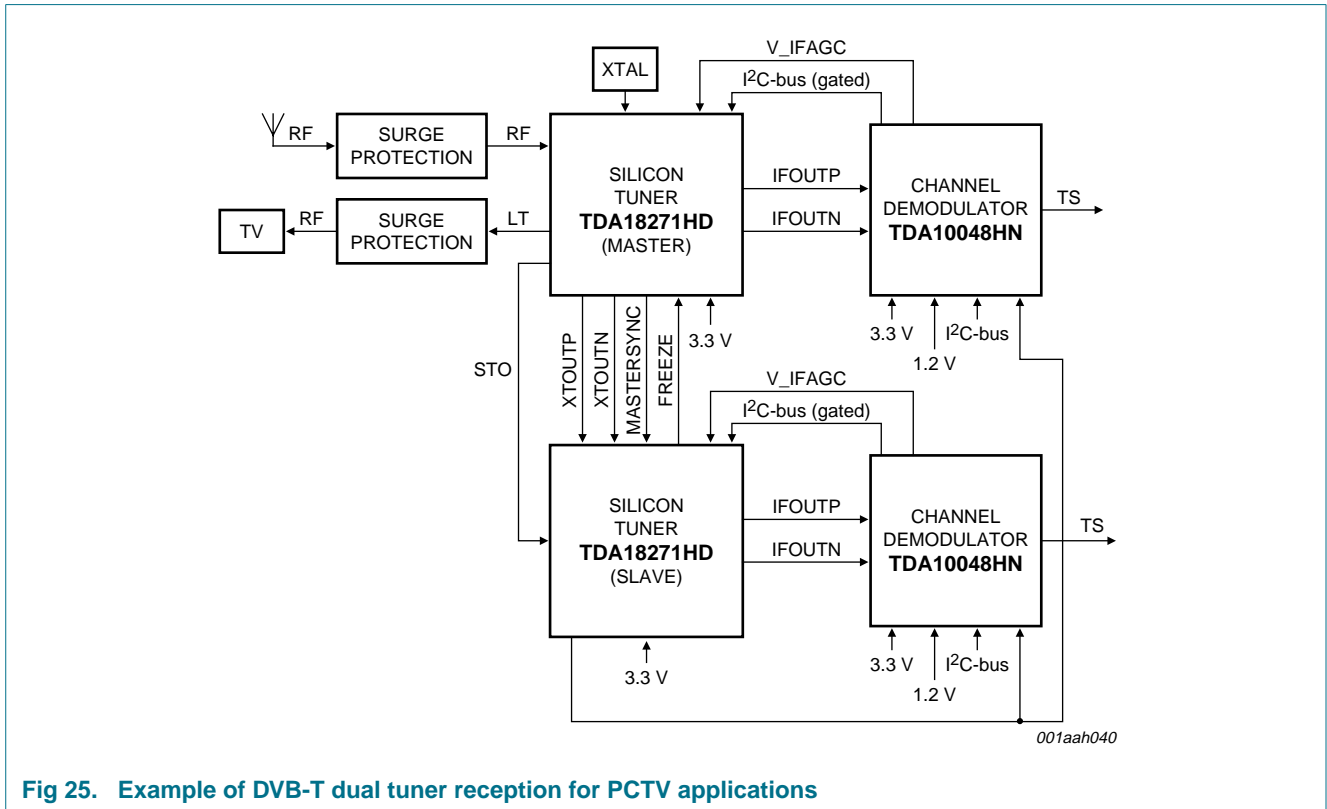


Fig 25. Example of DVB-T dual tuner reception for PCTV applications

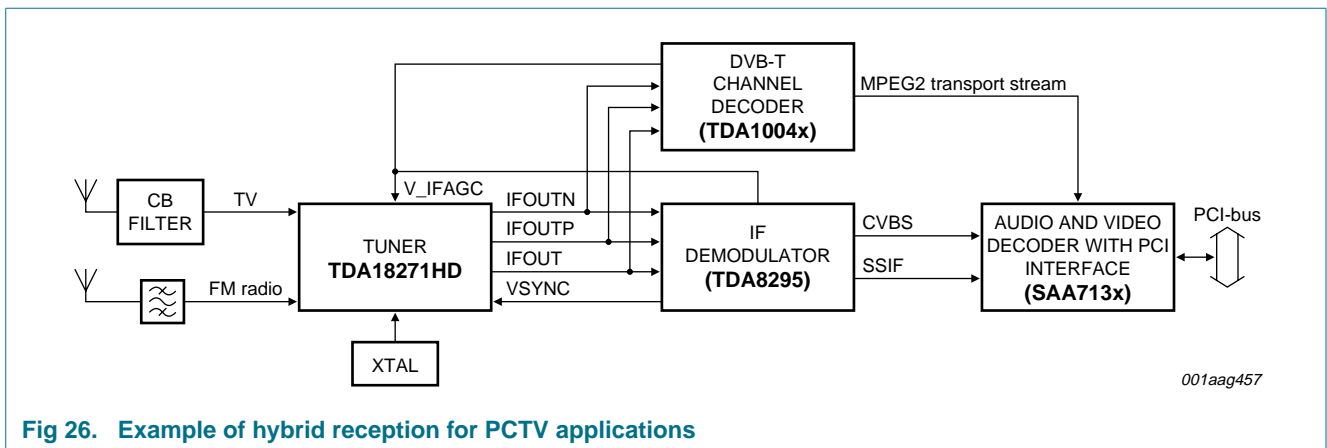


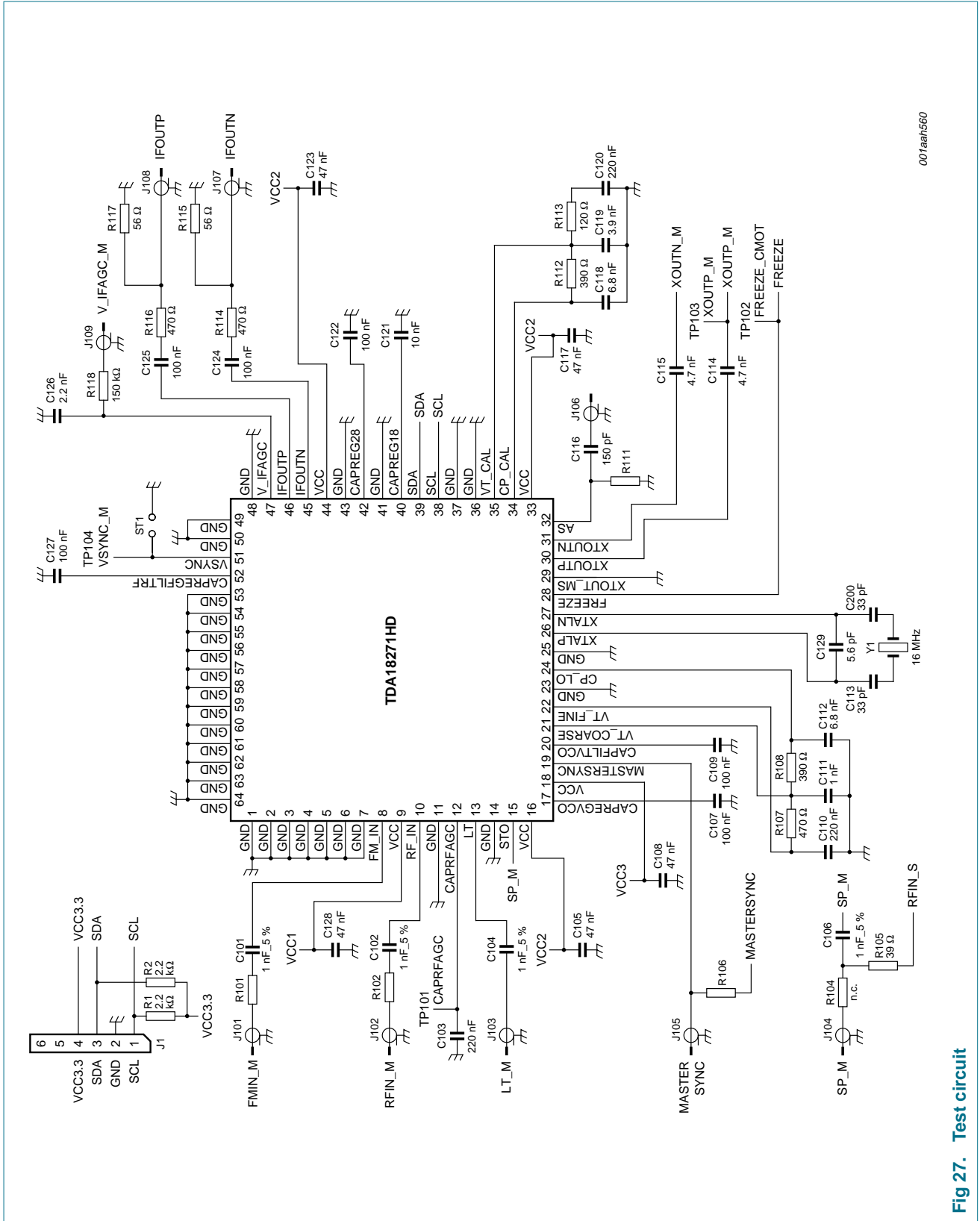
Fig 26. Example of hybrid reception for PCTV applications

### 14.2 Application notes

Application notes are available for the following:

- Analog and digital front end: see application note AN605
- Analog front end: see application note AN602
- Dual tuner application for PCTV: see application note AN604

15. Test information



001aah560

Fig 27. Test circuit



16. Package outline

HLQFN64R; plastic thermal enhanced low profile quad flat package; no leads; 64 terminals; resin based; body 9 × 9 × 1.6 mm

SOT903-1

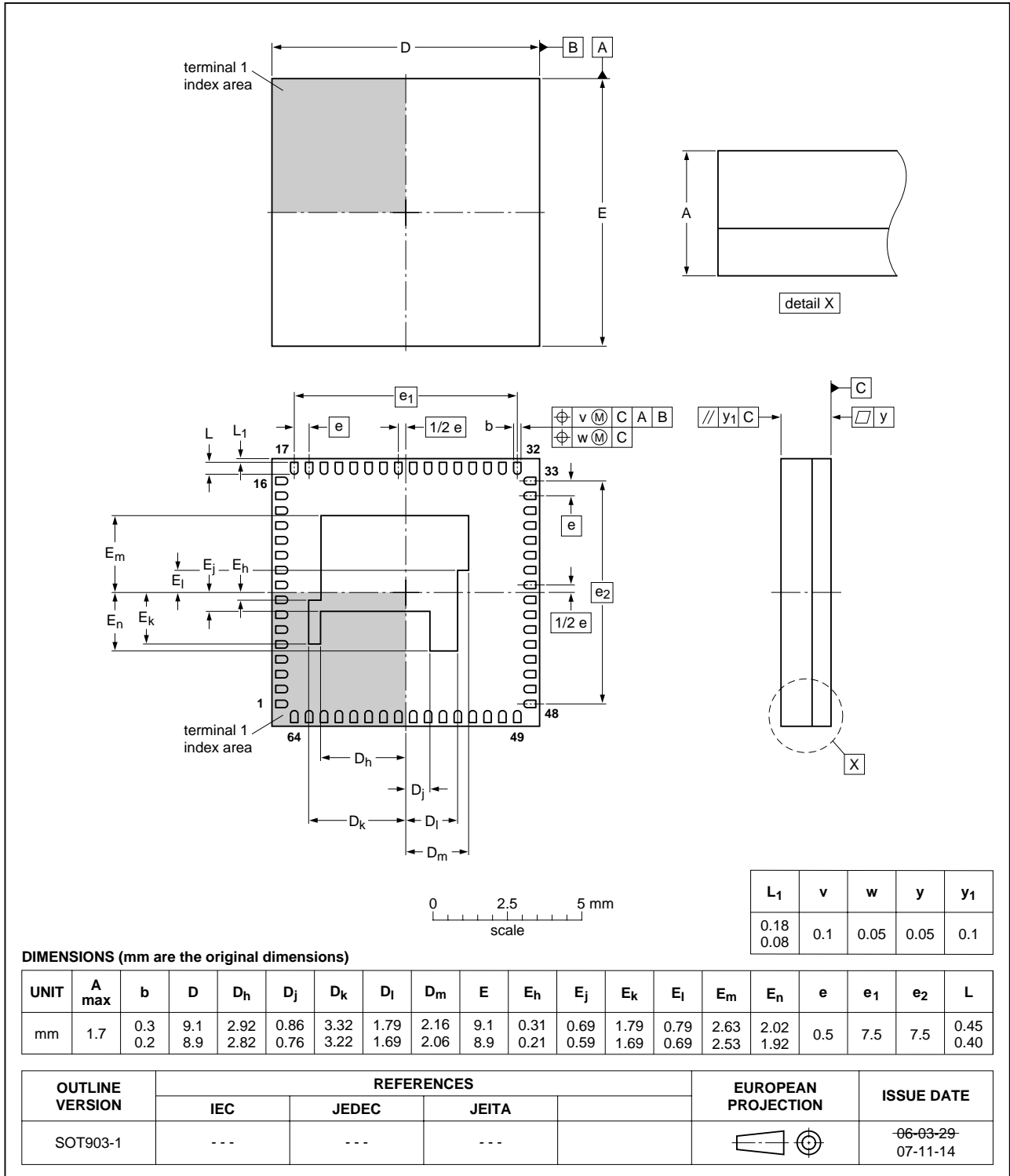


Fig 28. Package outline SOT903-1 (HLQFN64R)

## 17. Printed-circuit board

---

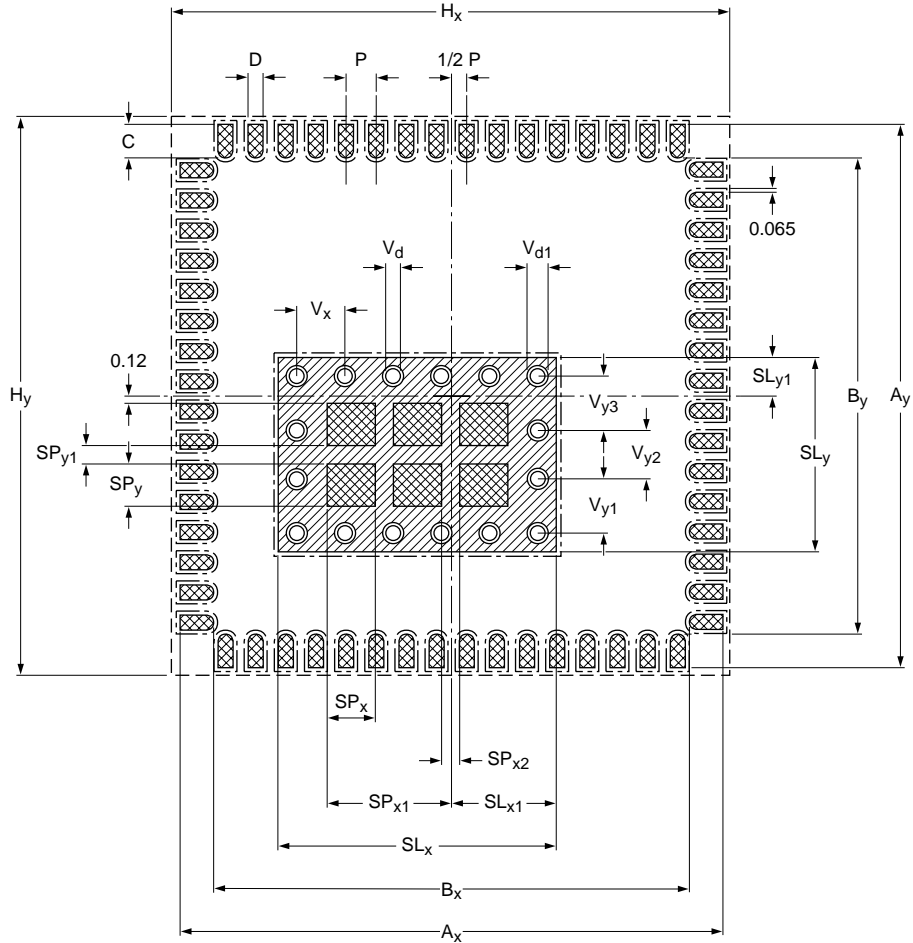
### 17.1 Reflow profile





See application note *AN10366*.

### 17.2 De-soldering recommendation

See application note *AN10366*.

17.3 Footprint layout



-  solder lands
-  solder paste
-  solder resist
-  occupied area

$SP_{y1}$	$V_d$	$V_{d1}$	$V_x$	$V_{y1}$	$V_{y2}$	$V_{y3}$
0.3	0.35	0.5	0.8	0.9	0.8	0.9

DIMENSIONS in mm

P	$A_x$	$A_y$	$B_x$	$B_y$	C	D	$H_x$	$H_y$	$SL_x$	$SL_{x1}$	$SL_y$	$SL_{y1}$	$SP_x$	$SP_{x1}$	$SP_{x2}$	$SP_y$
0.500	9.000	9.000	7.880	7.880	0.555	0.250	9.500	9.500	4.610	1.740	3.220	0.640	0.800	2.065	0.3	0.7

Fig 29. Footprint HLQFN64R (SOT903-1)

## 18. Abbreviations

**Table 63. Abbreviations**

Acronym	Description
AGC	Automatic Gain Control
BER	Bit Error Rate
CB	Citizens Band
CP	Charge Pump
DVB-T	Digital Video Broadcasting - Terrestrial
DVD-R	Digital Versatile Disk-Recordable
ESD	ElectroStatic Discharge
HBM	Human Body Model
IF	Intermediate Frequency
LNA	Low Noise Amplifier
LO	Local Oscillator
LT	Loop-Through
MM	Machine Model
PCTV	Personal Computer TeleVision
PLL	Phase-Locked Loop
QAM	Quadrature Amplitude Modulation
RoHS	Restriction of Hazardous Substances
SAW	Surface Acoustic Wave
SNR	Signal-to-Noise Ratio
TS	Transport Stream
VCO	Voltage Controlled Oscillator

## 19. Revision history

**Table 64. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
TDA18271HD_4	20090519	Product data sheet	-	TDA18271HD_3
Modifications:	<ul style="list-style-type: none"> <li>• <a href="#">Figure 16 "Flowchart TDA18271RFtrackingFiltersCorrection"</a> updated the formula "RFCAL_TCOMP = dCoverdT x (TMVALUE_CURRENT - TMVALUE_RFCAL) / 1000"</li> </ul>			
TDA18271HD_3	20080911	Product data sheet	-	TDA18271HD_2
TDA18271HD_2	20080306	Product data sheet	-	TDA18271HD_1
TDA18271HD_1	20070806	Product data sheet	-	-

## 20. Legal information

### 20.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nxp.com>.

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