



TEF701X

Scalable advanced background receiver

Rev. 1 — 30 July 2013

Product short data sheet



1. General description

The TEF7016 and TEF7018 are analog single-chip radio background ICs specifically designed for background reception. Both devices support all major global background receiver standards such as Radio Data System (RDS), Radio Broadcast Data System (RBDS), Traffic Message Channel (TMC), DARC (VICS and RTIC) and optional support of digital radio via a co-processor (HD Radio and DRM).

The devices are following the industry-proven background receiver TEF7006 and TEF7007 with improved performance and feature set optimizing the total system costs. They are completing NXP Semiconductors Car Radio portfolio to provide an efficient, high performing application. The TEF701X are housed in a HVQFN32 package designed for two- and multi-layer PCB applications.

The radio receiver includes the AM/FM front-ends, tuning synthesizer, channel filtering, demodulation, weak signal processing, noise blanking in FM mode, RDS and DARC reception and optional FM multipath improvements.

The TEF7018 supports AM and FM, HD Radio and Digital Radio Mondiale (DRM30 and DRM+). The TEF7016 is an FM-only version and supports optionally the digital radio standards FM-HD Radio and DRM+. For both TEF7016 and TEF7018, these digital radio standards are supported when used with NXP Semiconductors' digital radio coprocessors such as SAF356X and SAF360X.

Furthermore the TEF7018 provides the complete feature set including AM IF noise blanking, AM SoftMute on Modulation and the TEF701X provides digital audio output (mono) via I²S.

2. Features and benefits

- Alignment free digital receiver including tuner and software-defined radio processing
- Read information with device and tuning status, reception quality and RDS data
- FM background receiver with a tuning range of 65 MHz to 108 MHz covering Eastern Europe (OIRT), Japan, Europe and US bands
- AM background receiver (TEF7018) receiver covering LW, MW and full SW
- Fully integrated tuning system with low phase noise and fast tuning
- Variable IF bandwidth filtering (FM PACS) and demodulation
- Baseband I²S output supporting digital radio standards
- FM-HD Radio and DRM+ (TEF7016) with external digital radio coprocessor



- HD Radio and DRM¹ (TEF7018) with external digital radio coprocessor
- AM and FM noise blanking, Signal quality detection and weak signal processing
- Advanced RDS and RBDS demodulation and decoding
- Excellent RDS sensitivity performance
- MPX output supporting an external DARC demodulator and RTIC
- Two mono audio DACs: one analog output for FM MPX and mono analog audio output.
- Single 3.3 V supply voltage
- Fast mode I²C-bus (400 kHz)
- Configurable GPIO pins for RDS, Quality Status, RDS data available interrupt and generic I²C-bus controlled I/O
- Qualified in accordance with AEC-Q100
- I²S audio output

3. Applications

The TEF701X is a background receiver that can be used for Radio Data System (RDS), Radio Broadcast Data System (RBDS), Traffic Message Channel (TMC) and background reception for automotive applications. DARC reception is also supported via the MPX output to VICS/RTIC decoders.

When used together with the digital radio coprocessors SAF356X and SAF360X, digital radio standards background reception can be supported.

Additionally, due to a common technology platform, the TEF701X can be combined with the TEF665X, TEF668X, SAF775X and SAF360X for optimal system application through common crystal oscillator sharing.

4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Supply voltage						
V _{DDA(RF)(3V3)}	RF analog supply voltage (3.3 V)	on pin VDDA_RF	3.0	3.3	3.5	V
V _{DDA(IF)(3V3)}	IF analog supply voltage (3.3 V)	on pin VDDA_IFADC	3.0	3.3	3.5	V
V _{DDD(3V3)}	digital supply voltage (3.3 V)	on pin VDD_DIGITAL	3.0	3.3	3.5	V
Current in FM mode						
I _{DDA(RF)}	RF analog supply current	on pin VDDA_RF	33	37	42	mA
I _{DDA(IFADC)}	IF ADC analog supply current	on pin VDDA_IFADC	81	94	110	mA
I _{DDD}	digital supply current	on pin VDDD	37	38	48	mA
Current in AM - MW/LW mode^[1]						
I _{DDA(RF)}	RF analog supply current	on pin VDDA_RF	34	40	48	mA
I _{DDA(IFADC)}	IF ADC analog supply current	on pin VDDA_IFADC	63	74	86	mA

1. DRM includes DRM30 and DRM+ (band I and II).

Table 1. Quick reference data ...continued

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I _{DDD}	digital supply current	on pin VDDD	33	34	46	mA
Current in Standby mode						
I _{DDA(RF)}	RF analog supply current	on pin VDDA_RF	0	0.3	2	mA
I _{DDA(IFADC)}	IF ADC analog supply current	on pin VDDA_IFADC	25	37	45	mA
I _{DDD}	digital supply current	on pin VDDD	15	24	35	mA

[1] TEF7018 only.

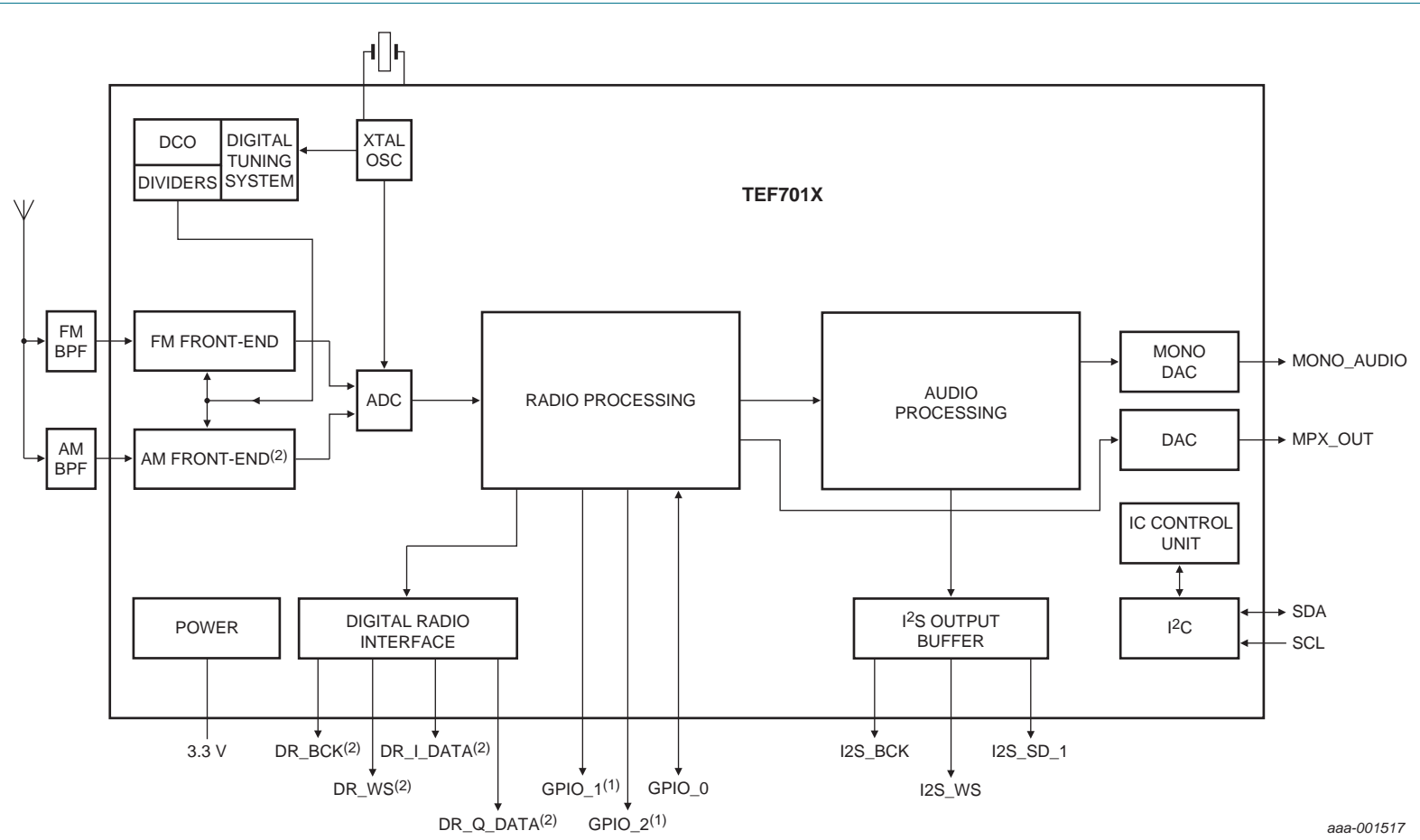
5. Ordering information

Table 2. Ordering information

Type number	Package		Version
	Name	Description	
TEF7016HN/V101	HVQFN32	plastic thermal enhanced very thin quad flat package; no leads; 32 terminals; body 5 × 5 × 0.85 mm ^[1]	SOT617-3
TEF7018HN/V101			

[1] Wettable sides to allow for optical inspection.

6. Block diagram



- (1) GPIO_1 and GPIO_2 are output only.
- (2) TEF7016 optionally and TEF7018.

Fig 1. Block diagram

7. Limiting values

Table 3. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{DDA(RF)(3V3)}$	RF analog supply voltage (3.3 V)	on pin VDDA_RF	-0.5	+3.9	V
$V_{DDA(IF)(3V3)}$	IF analog supply voltage (3.3 V)	on pin VDDA_IFADC	-0.5	+3.9	V
$V_{DDD(3V3)}$	digital supply voltage (3.3 V)	on pin VDDD	-0.5	+3.9	V
$\Delta V_{DD(3V3-3V3)}$	supply voltage difference between two 3.3 V supplies	between pins VDDA_IFADC and VDDA_RF	-0.3	+0.3	V
V_n	voltage on any other pin		-0.5	$+V_{DDD(3V3)} + 0.3$	V
I_{lu}	latch-up current	all supply voltages below the maximum value	[1] -100	+100	mA
V_{lu}	latch-up voltage		-	$1.5 \times V_{DDD(3V3)}$	V
T_{stg}	storage temperature		-55	+150	°C
T_{amb}	ambient temperature		-40	+85	°C
T_j	junction temperature		-40	+125	°C

[1] In accordance with AEC-Q100-004.

8. Revision history

Table 4. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
TEF701X_SDS v.1	20130730	Product short data sheet	-	-

9. Legal information

9.1 Data sheet status

Document status ^{[1][2]}	Product status ^[3]	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".

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