Application Report
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Migrating From TMS37122 and TMS37127 to TMS37126D3

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ABSTRACT

The TMS37122, TMS37127, and TMS37126 devices belong to the Passive Entry and Passive Start (PEPS) product family used mainly for automotive applications. These devices are also usable in industrial applications for similar functionality.

Since the TMS37122 and TMS37127 devices are becoming obsolete, this application report describes how to migrate to the TMS37126D3 device as a replacement.

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[(1)]1 Introduction

The IC consists basically of a three dimensional analog frontend with internal Wake Pattern detection; two 16-bit wake patterns can be freely programmed and a sensitivity threshold assigned for each pattern.

In standby mode, all three channels are active and waiting for an RF field containing the specific programmed wake pattern. During this phase, the current consumption of the analog frontend is extremely low and the microcontroller can be put in low-power mode to extend battery life.

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The reception of a correct wake pattern is indicated by the wake signal that wakes up the microcontroller for further communications.

From a functional standpoint, the TMS37126D3 device is a superset of the TMS37122 and TMS37127 devices, but with additional features.

2 Comparison Overview

Table 1. Comparison Table

Parameter and Function	Unit	TMS37122	TMS37127	TMS37126D3	Compatibility
Embedded passive TRP functionality		by Micro	by Micro	yes	
Number of RF inputs (antennas)	No.	3	3	3	√
Antenna inductance (PEPS)	[mH]	2.66 to 10	2.66 to 10	2.66 to 10	√
Antenna inductance (TRP)	[mH]	2.66	2.66	4.6 and 7.2	no
Sensitivity	[mVpp]	5	5	3.7	√√
Wake pattern	No.	A and B	A and B	A and B	√
Wake pattern length	[bit]	16	4, 8, 16	4, 8, 16	no
Adjustable sensitivity steps	No.	16	16	32	√√
Watch dog selectable		-	yes	yes	√
Standby current	[µA]	5	5	3.8	√√
RSSI (current sink)		no	no	yes	no
Programmer		RI-ACC-PBOX-20	RI-ACC-PBOX-20	PTB2	no
Test interface EEPROM programming voltage	[V]	16	16	Internal Charge Pump	no
Package		TSSOP 16 pitch0.65mm	TSSOP 16 pitch0.65mm	TSSOP 30 pitch0.5mm	no
SPI		no	no	yes	-

2.1 Pin Assignment

The gray pins are additional signals that are available on the TMS37126 device.

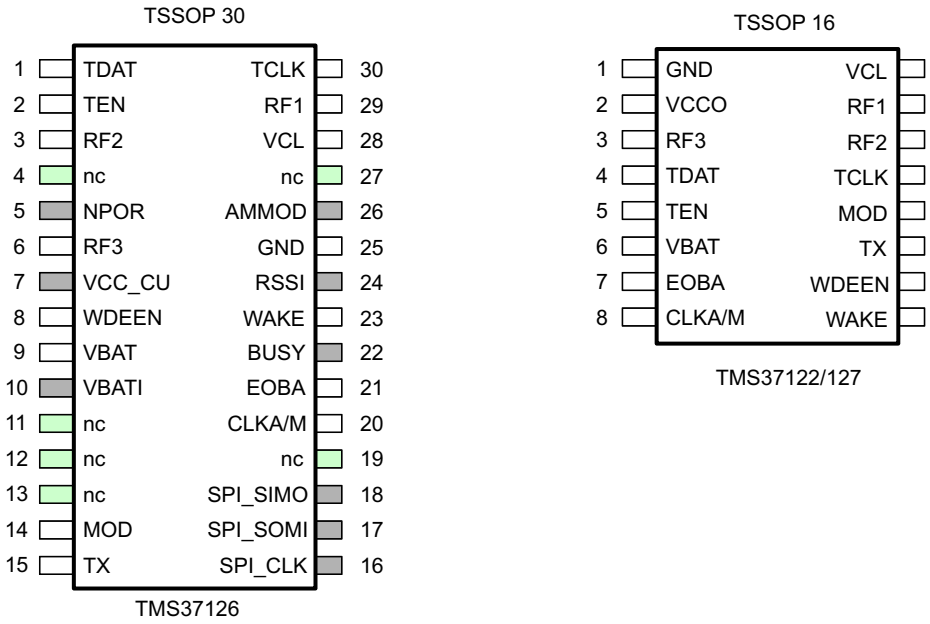


Figure 1. Pin Assignment Comparison

2.2 SPI Interface Signals

The TMS37126x devices have an SPI interface for accessing EEPROM memory as well as for using different functionalities like hardware (HW) encryption or the block check character (BCC) generator.

If the SPI interface is not used, the clock input should be connected to GND in order to avoid spurious clock pulses (for example, electrostatic discharge).

2.3 Programmer Box

The TMS122 and TMS37127 programmer box cannot be used for TMS37126x. Since the TMS37126 is equipped with an internal charge pump to program the EEPROM cells, the test interface needs 5 V signal levels. Probe test box (PTB or PTB2) is used for programming.

2.4 Watchdog

The TMS37127 and TMS37126x both have an integrated watchdog that can be enabled by the configuration registers. The watchdog is not available in the TMS37122 device.

In case the device operates without Wake Pattern detection, the watchdog resets the device if no clock is received by the RF inputs.

2.5 Wake Pattern

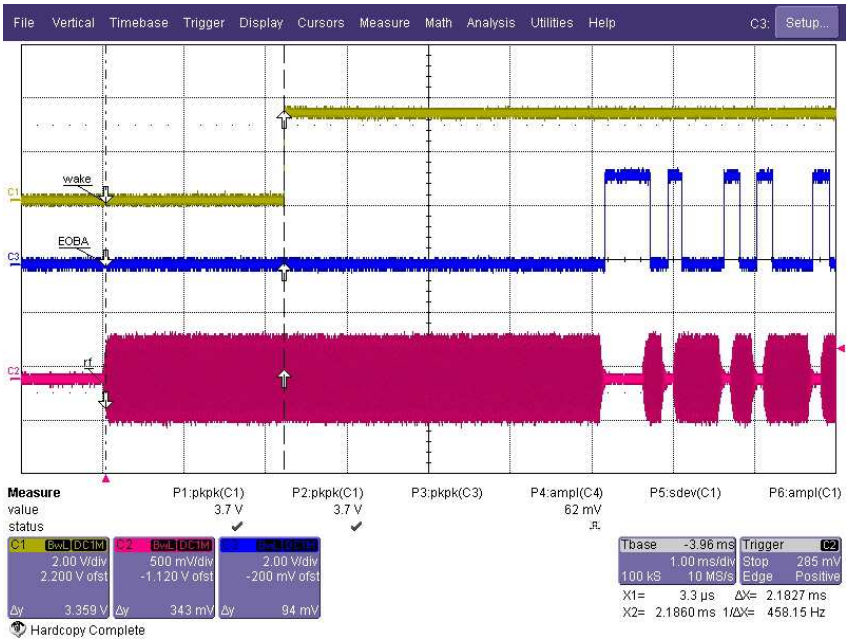
The TMS37126x can be configured for a 4-, 8-, or 16-bit Wake Pattern.

2.6 Wakeup Without Wake Pattern Detection

The front end can be configured to operate with or without Wake Pattern detection.

2.6.1 TMS37122 and TMS37127

If a continuous carrier is present for about 2 ms to 5 ms, the device will wake up and set the Wake output to high (see Figure 2).



A The EOBA signal (blue trace) is the demodulated LF signal.

Figure 2. TMS37122 and 127 Wakeup Without Wake Pattern

2.6.2 TMS37126

In the TMS37126 device, the wake output is only set high if the continuous LF carrier is switched off and on again (see Figure 3).

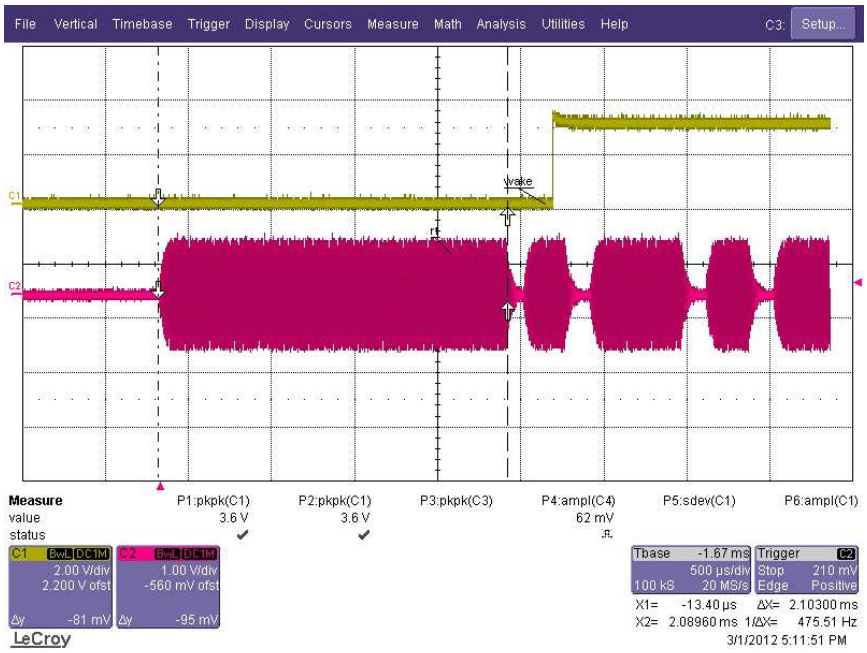


Figure 3. 126 Wakeup Without Wake Pattern

2.7 Wakeup With Wake Pattern Detection

If the Wake pattern detection is enabled, the behavior of the TMS37126 device is identical to the TMS37122 and TMS37127 devices (see Figure 4).

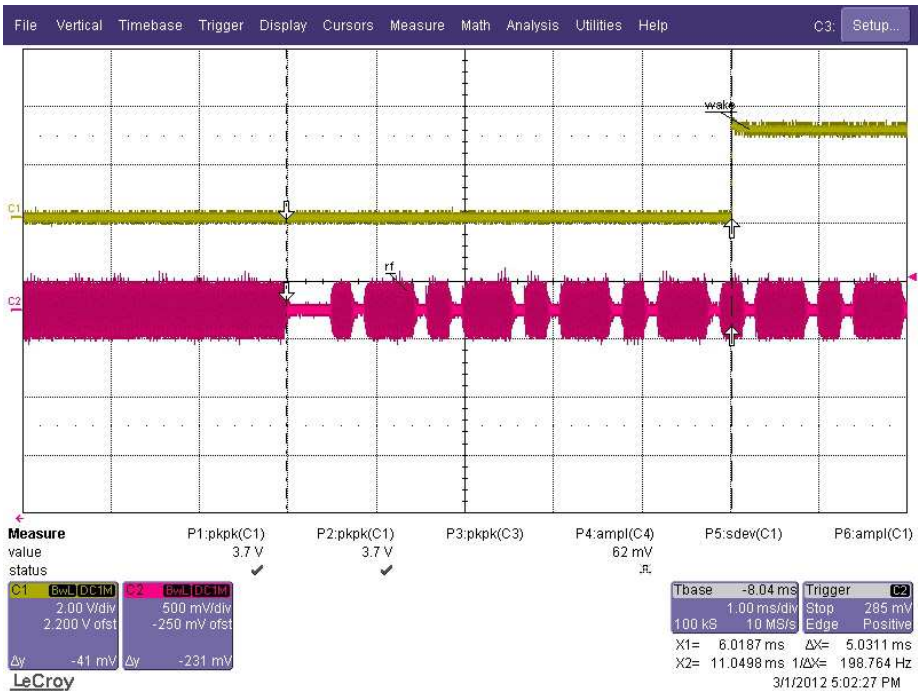


Figure 4. Wakeup With 8-Bit Wake Pattern (1010 1010) LS-bit First

2.8 Configuration Memory

Since the TMS37122 and TMS37127 devices have different configurable features, the configuration memory contains an additional row. One row consists of five Nibbles. The TMS37126 device has 5 bytes per row.

2.8.1 TMS37122 (5 Nibbles, 3 Rows)

Figure 5 shows the memory configuration of the TMS37122 device.

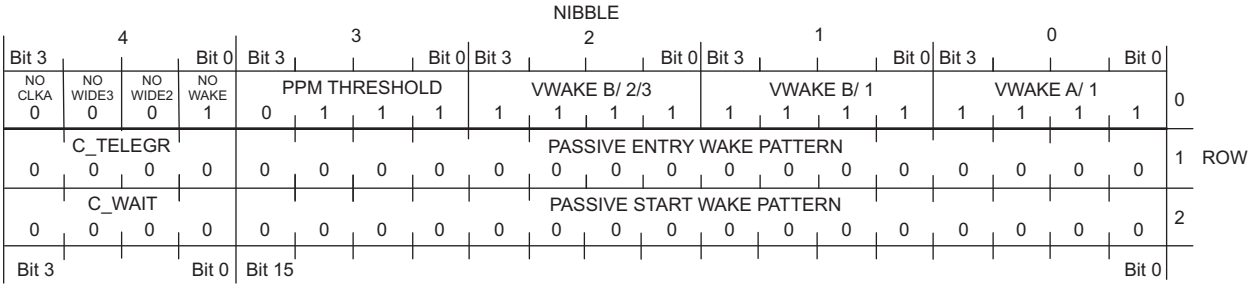


Figure 5. TMS37122 (5 Nibbles, 3 Rows)

2.8.2 TMS37127 (5 Nibbles, 4 Rows)

Figure 6 shows the memory configuration of the TMS37127 device. The TMS37127 has one more row for configuration than the additional features.

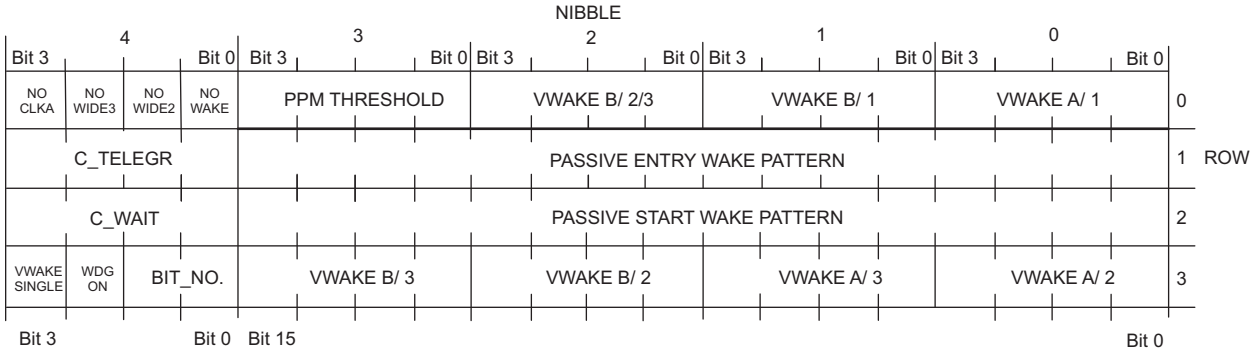


Figure 6. TMS37127 (5 Nibbles, 4 Rows)

2.8.3 TMS37126 (5 Bytes, 3 Rows)

Figure 7 shows the memory configuration of the TMS37126 device. The configuration is byte wise organized in comparison to the TMS37122 and TMS37127. Note that the TMS37122 and TMS37127 programmers cannot be used for the TMS37126 device (also see Section 2.3).

	BYTE 4	BYTE 3	BYTE 2	BYTE 1	BYTE 0
ROW 0	INTERNAL USE		AFE CNTR DEF	AFE FUNCTION DEFINITION B	AFE FUNCTION DEFINITION A
ROW 1	VWAKE A1	VWAKE A2	VWAKE A3	PE WAKE PATTERN	PE WAKE PATTERN
ROW 2	VWAKE B1	VWAKE B2	VWAKE B3	PS WAKE PATTERN	PS WAKE PATTERN

Figure 7. TMS37126 (5 Bytes, 3 Rows)

2.9 Principle Schematic TMS37122 and TMS37127

Figure 8 shows the principle schematic for the wake-up receiver. For details, see the device-specific reference manual: Spec# 11-07-21-002.

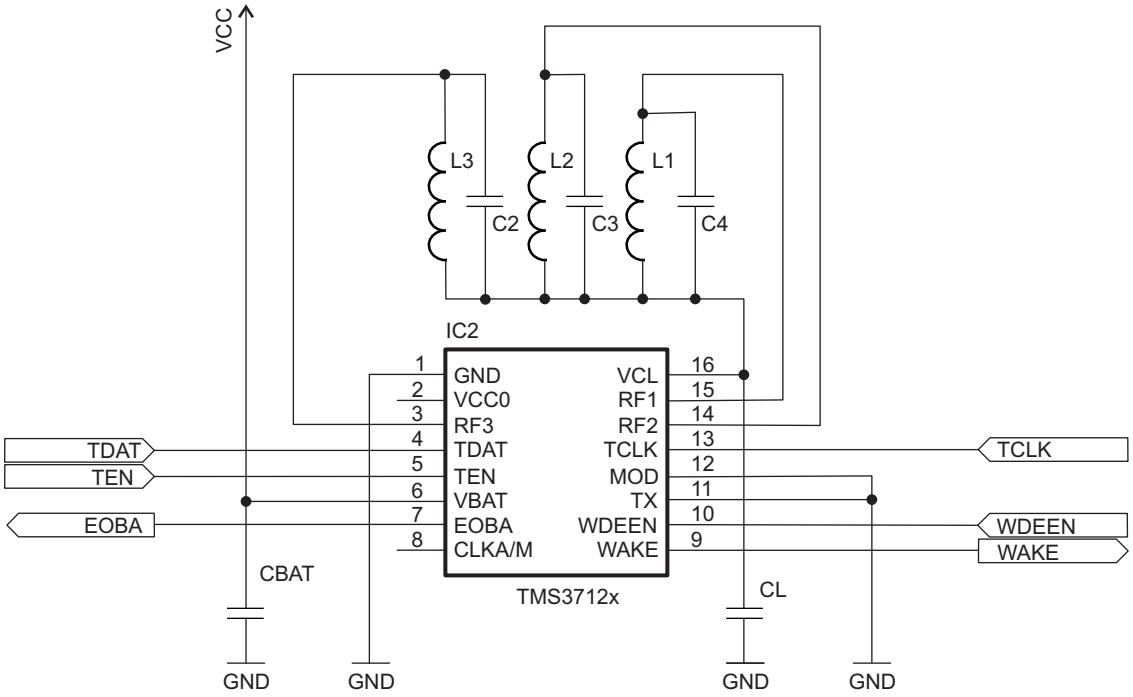


Figure 8. Schematic TMS37122 and TMS37127

2.9.1 Programmer Box Signal Connections (TMS37122 and TMS37127)

For configuration and resonance tuning (tuning capacitor programming) of the TMS37122 and TMS37127, the tool RI-ACC-PBOX-20 is used. The programmer supports all necessary signals with a 4 V level and provides the 16 V EEPROM programming voltage at the TEN input.

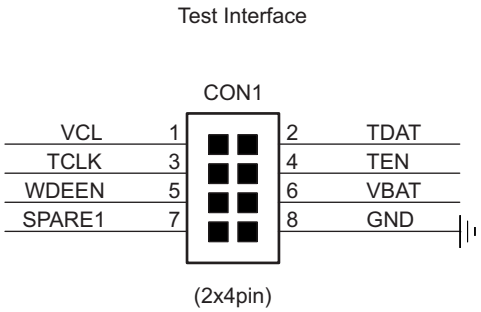


Figure 9. Test Interface Pin Assignment TMS37122 and TMS37127 (4 V Level)

For programming the EEPROM cells at the end of the telegram, the TEN signal is switched to 16 V during programming time.

2.10 Principle Replacement Schematic

Figure 10 shows the principle schematic for the wake-up receiver. For details, see the device-specific reference manual: Spec# 11-09-21-046

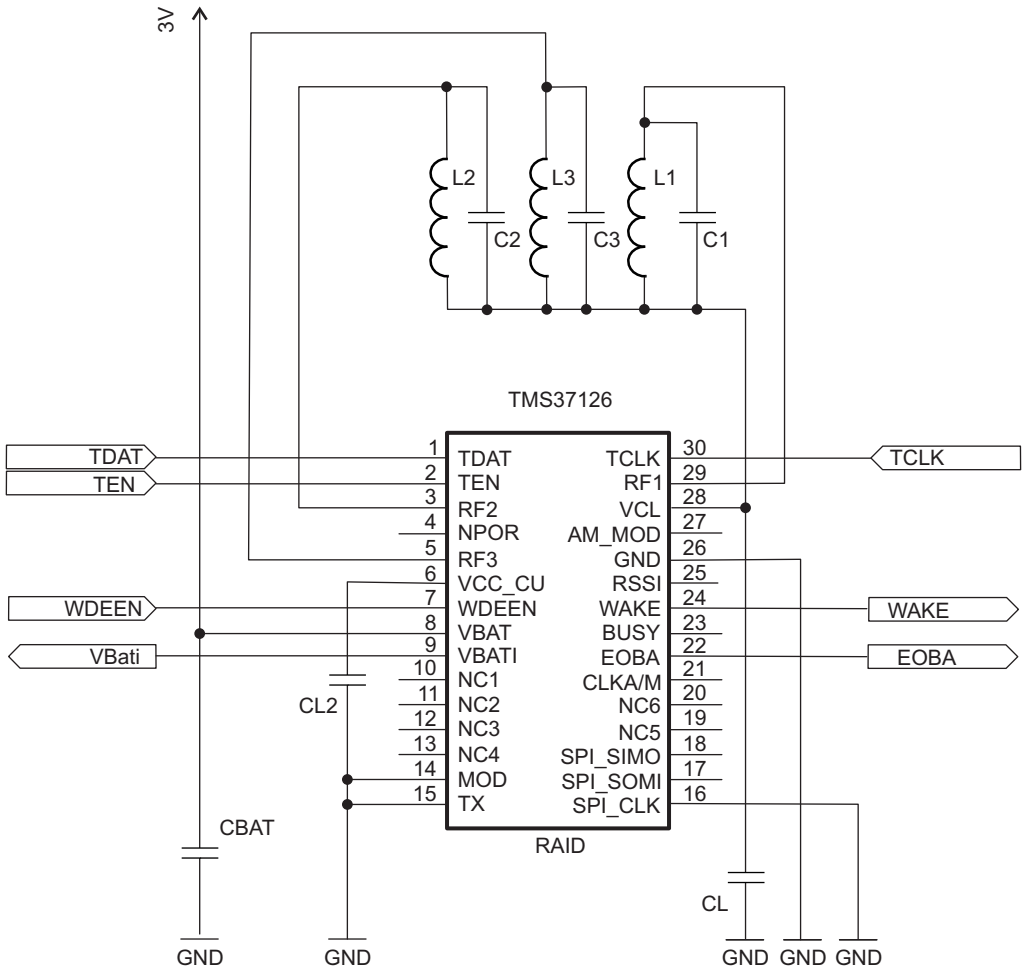


Figure 10. Replacement Schematic for TMS37122 and TMS37127

2.10.1 Programmer Board Signal Connections (TMS37126)

For configuration and resonance tuning (tuning capacitor programming) of the TMS37126, the tool RI-ACC-PTB2-00 is used. The programmer supports all necessary signals with a 5 V level. The EEPROM programming voltage is provided internal to the IC.

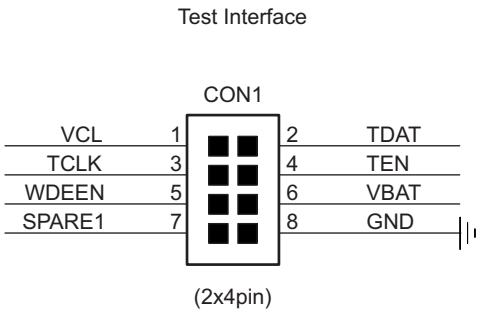


Figure 11. Test Interface Pin Assignment TMS37126 (5 V Level)

2.10.2 Function Definition Byte B

Figure 12 shows the content of the Function Definition Byte B located in the Memory Block 2 Byte 1.

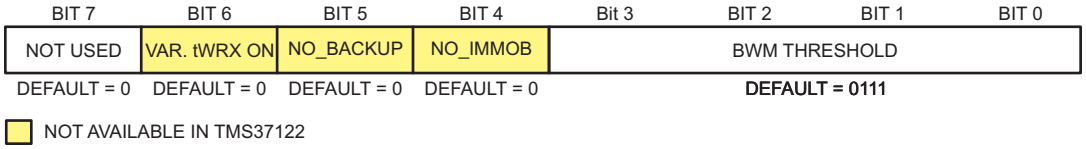


Figure 12. Function Definition Byte B

2.11 3D Antenna

Connect the 3D antenna in such a way as to have the lowest mutual coupling between the three channels. To accomplish that, contact the antenna supplier or test it by interchanging the winding sense. An indication for high coupling is when the resonance of the already tuned channel is changed after tuning one of the other channels.

2.12 ESD

For a higher ESD immunity additional ESD protection diodes must be added.

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