

From
AE-BE/ENG21-
AU

Our Reference
Guillaume Geoffroy

Tel
+61 3 9541 7307

Fax
+61 3 9541 7700

Clayton
25.09.2009

Technical Description

Recipient

Cc

Topic **Ford B299N Body Computer Module (BCM) RF Receiver Technical Description**

The Ford B299N BCM incorporate a RF receiver circuit that receives ASK/FSK data packets transmitted by a Remote Keyless Entry (RKE) device. The receiver for North America has only one variants based on the RF frequency of the system, that is 314.9MHz. The RF receiver IC for this frequency is the TDA5231.

1. Radio Frequency Parameters

| RF parameter | B299N |
|----------------------------------|---------|
| Carrier frequency (MHz) | 315.000 |
| IF bandwidth at ± 6 dB (kHz) | 230 |

2. Components

The B299N receiver has the following components.

a. Antenna

The system uses a printed antenna on PCB. The antenna is matched to next stage with 50Ω reference impedance.

b. Low Noise Amplifier (LNA)

The TDA 5231 consists of an LNA to boost the received RF signal. An additional discrete LNA between the antennae matching and the SAW filter is used to achieve better receiver sensitivity.

c. Bandpass filter

The system uses a bandpass Surface Accoustic Wave (SAW) filter to limit the RF signal received from the LNA.

d. PLL and local Oscillator (LO)

The TDA 5231 uses a reference oscillator and internal Local Oscillator (LO) divided by internal counter (64) to perform PLL function. There is no external components to perform PLL loop filtering. For 315MHz $LO = 314.9 + 10.7 \text{ MHz} = 325.6 \text{ MHz}$.

Reference oscillator is $3*LO/32$. Therefore, reference oscillator for 314.9MHz is 15.26MHz.

From
AE-BE/ENG21-
AU

Our Reference
Guillaume Geoffroy

Tel
+61 3 9541 7307

Fax
+61 3 9541 7700

Clayton
25.09.2009

Error! Bookmark not defined.

Ford B299N Body Computer Module (BCM) RF Receiver Technical Description

e. Superheterodyne receiver

The TDA 5231 has an internal superheterodyne receiver, which mixes the output from its internal LNA with the internal LO to produce the Intermediate Frequency (IF)

f. IF filter

The IF filter is a 10.7MHz bandpass filter with a bandwidth of 230kHz

g. Limiter and synthesiser

A Direct Digital synthesiser is used to demodulate the IF signal out from the limiter to the baseband using a digital I/Q mixer. Then the data is demodulated based on ASK and/or FSK based modulation scheme.

h. Digital interface

Baseband data validation, framing and processing is done by the microcontroller core which feeds the data in the FIFO to be further received by the main BCM controller via SPI.

i. Power circuit

This is a DC/ DC converter that converts incoming 12V to 5V, which is used by the electronics of the microcontroller and receiver.

From
AE-BE/ENG21-
AU

Our Reference
Guillaume Geoffroy

Tel
+61 3 9541 7307

Fax
+61 3 9541 7700

Clayton
25.09.2009

Error! Bookmark not defined.

Ford B299N Body Computer Module (BCM) RF Receiver Technical Description

3. Description of operation

12V is supplied to the Body Computer Module (BCM). This is then down converted to 5V by a voltage regulator which feeds the main microcontroller and RF receiver IC.

The receiver IC is programmed to self poll the RF channels using Constant On/Off mode: polls the set channel at a predefined timing

The receiver is 3.6ms on in a 39.6ms cycle.

When the BCM is awake, the main microcontroller continuously checks the FIFO of the RF receiver IC every 10ms for received messages.

When the BCM is in sleep mode (after an idle time of 30mins), the RF receiver IC is still polling at a predefined timing. Upon reception of a valid message, the RF receiver IC will issue a wakeup interrupt to the BCM's main microcontroller, which will in turn check the FIFO for a received message.

The RF signal at the antenna with appropriate matching is passed through an external discrete LNA, then to the SAW filter. The filtered signal is then passed to the LNA input of the receiver IC. The output from the internal LNA is then passed to the mixer, which mixes with the LO and down-converts the received RF signal into IF frequency of 10.7MHz. This IF signal is then filtered through IF filter and passed to the synthesiser.

AE-BE/ENG21-AU