

Model Name: BRFM  
 Type of product: Battery Radiofrequency Module  
 Brand Name: Visteon  
 Manufacturer: Visteon Corporation  
 Manufacturer Address: One Village center drive, Van Buren Township  
 48111-5711 Michigan  
 United States of America

**BRFM features:**

The BRFM is an electronic module intended to aggregate data from up to 24 CMU units and module temperatures from the High Voltage battery bus in addition to pack voltage and current data collected from the Battery Disconnect Signal Board (BDSB) and from multiple Cell Monitoring Units (CMUs) to communicate them to the Vehicle Integration Control Module (VICM3).

All cell voltages, module temperatures, pack voltage and current are reported directly to the VICM3 on a regular periodic basis.

There are two variants of the BRFM:

- Application 1 has a single wireless RFIC (Pinnacle) and one antenna.
- Application 2 has two wireless RFICs (Pinnacle) and two antennas.

The BRFM implements a Pinnacle IC (ADRF8850), this is an IC that provides wireless communication between the Battery Cell Monitoring chip and the Battery Management System Controller.

The BRFM includes a voltage supervisor/windowed watchdog (TPS3850) counter which generates a wake up signal to the VICM3 when any of the battery cells reports a critical condition when the VICM3 is sleeping.

The BRFM has two redundant sets of sensors that monitor the battery pack for excessive temperature, pressure, or hydrogen concentration that indicate a battery cell thermal runaway or thermal propagation.

**System interaction:**

<b>Module-to-Vehicle Electrical Interface</b>	
<b>Analog Input</b>	<i>VICM3 provides power to BRFM module. Power nominal value is 5.4V Minimum voltage expected is 5.2V and maximum is 5.6V.</i>
<b>Analog Output</b>	<i>BDSB Power Output is provided or enabled by BRFM module depending on variant. BDSB Power is provided by Single BRFM variant. BDSB Power nominal value is 5V. Minimum voltage expected is 4.2V and maximum is 5.5V</i>
<b>Digital (discrete state) Output</b>	<i>BDSB Power Output is provided or enabled by BRFM module depending on variant. BDSB Power is enabled by sending commands through the Dual BRFM variant. BDSB Power nominal value is 5V. Minimum voltage expected is 4.2V and maximum is 5.5V</i>
<b>Communication Bus</b>	<i>isoSPI communication serves as interface between BRFM and VICM3, as well as BRFM and BDSB. isoSPI lines shall be monitored to ensure proper performance. Amplitude and timing measurements should be captured. 1Mbps nominal is expected.</i>
<b>RF Link(s)</b>	<i>ISM Band (2.405 GHz to 2.480 GHz) used to communicate with CMU modules. Rx sensitivity shall be around 50% of PER, where each measurement shall vary by no more than +/- 2.0dB from the golden sample. Tx output power shall vary by no more than +/-2.5dB from the golden sample. Radio frequency reference shall be within ±20PPM from desired frequency (2.44GHz, channel 7).</i>
<b>Module-to-Vehicle Non-Electrical Interface</b>	
<i>Pressure Sensors -&gt; Values shall be between 50kPa and 150kPa ±1% (0 – 150C) and ±2% (-40C – 0C)</i>	
<i>Hydrogen Sensors -&gt; Values shall be between 0PPM and 65,000PPM ± 100PPM (5% of accuracy)</i>	
<i>Temperature Sensors -&gt; Detection range shall be between -40C and 150C ± 1% of measured value</i>	
<b>Internal Interface</b>	

**Note:** For these internal I/O, monitoring shall only occur via communication bus data or via indirect methods. Direct monitoring using attachments leads to external monitoring devices shall not be included.

<b>Switching &amp; Clock Frequency Content</b>	SPI communication shall be 1Mbps nominal. Used to communicate between RF manager to Sensors ASIC and RF Manager to isoSPI Transceiver. RF Manager IC XTAL frequency shall be 40MHz nominal. Pressure sensor frequency shall be 20kHz. Hydrogen sensor frequency shall be 24.5kHz. UART communication between RF Manager 1 and RF Manager 2 for Dual BRFM variant. These shall be 1Mbps nominal.
<b>Analog Output</b>	
<b>Digital (discrete state) Output</b>	3.3V voltage output from U7/U9 shall be within the following range: $+3.25V < VOUT < +3.35V$ Main power supply (U30001) shall have an output voltage of 3.3V with $\pm 5mV$ peak-to-peak ripple voltage
<b>Communication Bus</b>	

**Note:** This section assumes that production software is not mandatory; the use of specialized software is acceptable.  
**Note:** Software diagnostic timers should be reset to minimum detection values, to facilitate assertion of potential diagnostic flags during the RF exposure time (maximum 2 seconds).  
**Note:** States/faults/issues shall be reported directly over the communication bus (i.e., Class 2, Controller Area Network (CAN), etc.) or indirectly if the communication bus is not available via the cycling of output(s) (e.g., PWM duty cycle change, telltale flash rate change, etc.)  
**Note:** Unless otherwise specified in the EMC Test Plan, in order to ensure a refreshed value, all information related to data monitoring (such as analog input voltages, operating states, etc.) shall be via parameter requests (e.g., Parameter ID (PID)) and not via scheduled, or periodic, broadcast messages. This ensures bi-directional communications during immunity testing.  
**Note:** The BRFM is powered by a poser supply that meets the requirements of ES1 and PS1 (P<15W) in accordance with the IEC 62368-1 standard.

## Harness Pinout, Capacities, and Use

Connector ID / Cavity #	Name	Description	Termination (R-L-C) etc.	Wire Gauge (AWG) Used in Vehicle	Twist w/ Cavity #	Shield ed w/ Cavity #	Applicable Bands		
							Required for Module Operation	External Antenna Band WiFi	External Antenna Band YYYY
X1-1	BUF5V I	5V Input Power from VICM		16	n/a	n/a	Yes	n/a	n/a
X1-2	NC	NC		n/a	n/a	n/a	n/a	n/a	n/a
X1-3	NC	NC		n/a	n/a	n/a	n/a	n/a	n/a
X1-4	VICM_WU_SIG	Vehicle Integration Control Module Wake Up Signal	Connect to 5V	16	n/a	n/a	Yes	n/a	n/a
X1-5	BUF5V O	5V Output Power to BDSB	BDSB or simulator	16	n/a	n/a	Yes	n/a	n/a
X1-6	NC	NC		n/a	n/a	n/a	n/a	n/a	n/a
X1-7	RTN_5 VO	Ground to BDSB		16	n/a	n/a	Yes	n/a	n/a
X1-8	RTN_5 VI	Ground to VICM		16	n/a	n/a	Yes	n/a	n/a
X1-9	BRFM_SPLY_V_2	Battery Radio Frequency Module Supply Voltage 2		16	n/a	n/a	Yes	n/a	n/a
X1-10	NC	NC		n/a	n/a	n/a	n/a	n/a	n/a
X1-11	ISOSPI_PV2	isoSPI Positive 2 to VICM	100 ohm cross positive and negative	20	n/a	n/a	Yes	n/a	n/a

X1-12	ISOSPI _NV2	isoSPI Negative 2 to VICM							
X1-13	ISOSPI _PV1	isoSPI Positive 1 to VICM	100 ohm cross positive and negative	20	n/a	n/a	Yes	n/a	n/a
X1-14	ISOSPI _NV1	isoSPI Negative 1 to VICM							
X1-15	ISOSPI _PB1	isoSPI Positive 1 to BDSB 1	100 ohm cross positive and negative	20	n/a	n/a	Yes	n/a	n/a
X1-16	ISOSPI _NB1	isoSPI Negative 1 to BDSB 1							
X1-17	ISOSPI _PB2	isoSPI Positive 2 to BDSB 2	100 ohm cross positive and negative	20	n/a	n/a	Yes	n/a	n/a
X1-18	ISOSPI _NB2	IsoSPI Negative 2 to BDSB 2							
X1-19	NC	NC		n/a	n/a	n/a	n/a	n/a	n/a
X1-20	BRFM_ RTN_2	Battery Radio Frequency Module Return 2	BDSB or simulation	16	n/a	n/a	Yes	n/a	n/a

The following information shall also be included in the case of radio equipment intentionally emitting radio waves:

- a. Frequency band : 2.405 – 2.480 GHz
- b. Maximum radio-frequency power transmitted in the frequency band(s) in which the radio equipment operates. Max output power = 10dBm

**(U.S.A. and Canada)**

**FCC**

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) The device must accept any interference received, including interference that may cause undesired operation.

*Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.*

***RF exposure safety***

*This device complies with the FCC RF exposure limits and has been evaluated in compliance with **portable** exposure conditions.*

*The equipment must be installed and operated and was evaluated with minimum distance of **11 cm** of the human body. This distance or greater is maintained by vehicle design and ensures compliance by normal use of the vehicle.*

**ISED CANADA**

This device complies with Industry Canada License-exempt RSS standard(s). Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) The device must accept any interference received, including interference that may cause undesired operation.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

- (1) l'appareil ne doit pas produire de brouillage, et,
- (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

*Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.*

#### ***RF exposure safety***

*This device complies with ISED RF exposure limits and has been evaluated in compliance with **portable** exposure conditions.*

*The equipment must be installed and operated and was evaluated with minimum distance of **11 cm** of the human body. This distance or greater is maintained by vehicle design and ensures compliance by normal use of the vehicle.*

#### ***CAN ICES-003***

*Les changements ou modifications non expressément approuvés par la partie responsable de la conformité peuvent annuler le droit de l'utilisateur à utiliser l'équipement.*

#### ***Sécurité d'exposition aux RF***

*Cet appareil est conforme aux limites d'exposition RF d'ISDE et a été évalué conformément aux conditions d'exposition **portable**.*

*L'équipement doit être installé et utilisé à une distance minimale de **11 cm** du corps humain.*

#### ***CAN NMB-003***

*Cet appareil numérique de classe B est conforme à la norme canadienne NMB-003.*

**Part 15 – Interference Statement (On Part and in Owners Manual, or in Owners Manual)**

NOTE: When the device is so small or for such use that it is not practicable to place the Interference Statement on it (e.g. TPMS), the below statement shall be placed in the Owners Manual:

"This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation."

**Interference Statement (On Part and in Owners Manual, or in Owners Manual)**

Licence-exempt radio apparatus shall contain the following or equivalent notice in a conspicuous location in the user manual or alternatively on the device or both.

This device complies with Innovation, Science, and Economic Development Canada (ISED) licence-exempt RSS standard(s).

Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device

Customer Information

## Declaration of Conformity

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CE MARK:



Simplified EU DoC:

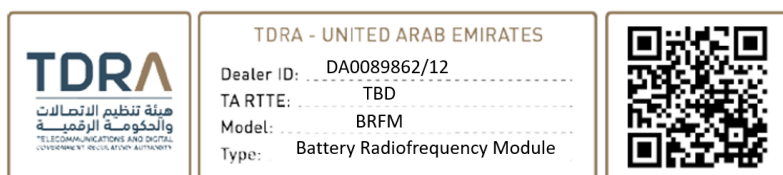
Hereby, Visteon Corporation declares that the radio equipment type **BRFM** is in compliance with Directive 2014/53/EU. The full text of the EU declaration of conformity is available at the following internet address: <http://www.visteondocs.com/>

български [Bulgarian]	С това фирмата <b>Visteon Corporation</b> декларира, че частта <b>BRFM</b> е в съответствие със съществените изисквания и други приложими разпоредби на директивата 2014/53/ЕС.
Česky [Czech]	<b>Visteon Corporation</b> tímto prohlašuje, že tento <b>BRFM</b> je ve shodě se základními požadavky a dalšími příslušnými ustanoveními směrnice 2014/53/EU.

Dansk [Danish]	Undertegnede <b>Visteon Corporation</b> erklærer herved, at følgende udstyr <b>BRFM</b> overholder de væsentlige krav og øvrige relevante krav i direktiv 2014/53/EU.
Deutsch [German]	Hiermit erklärt <b>Visteon Corporation</b> , dass sich das Gerät <b>BRFM</b> in Übereinstimmung mit den grundlegenden Anforderungen und den übrigen einschlägigen Bestimmungen der Richtlinie 2014/53/EU befindet.
Eesti [Estonian]	Käesolevaga kinnitab <b>Visteon Corporation</b> seadme <b>BRFM</b> vastavust direktiivi 2014/53/EL põhinõuetele ja nimetatud direktiivist tulenevatele teistele asjakohastele sätetele.
English	Hereby, <b>Visteon Corporation</b> , declares that this <b>BRFM</b> is in compliance with the essential requirements and other relevant provisions of Directive 2014/53/EU.
Español [Spanish]	Por medio de la presente <b>Visteon Corporation</b> declara que el <b>BRFM</b> cumple con los requisitos esenciales y cualesquiera otras disposiciones aplicables o exigibles de la Directiva 2014/53/UE.
Ελληνική [Greek]	ΜΕ ΤΗΝ ΠΑΡΟΥΣΑ <b>Visteon Corporation</b> ΔΗΛΩΝΕΙ ΟΤΙ <b>BRFM</b> ΣΥΜΜΟΡΦΩΝΕΤΑΙ ΠΡΟΣ ΤΙΣ ΟΥΣΙΩΔΕΙΣ ΑΠΑΙΤΗΣΕΙΣ ΚΑΙ ΤΙΣ ΛΟΙΠΕΣ ΣΧΕΤΙΚΕΣ ΔΙΑΤΑΞΕΙΣ ΤΗΣ ΟΔΗΓΙΑΣ 2014/53/ΕΚ.
Français [French]	Par la présente <b>Visteon Corporation</b> déclare que l'appareil <b>BRFM</b> est conforme aux exigences essentielles et aux autres dispositions pertinentes de la directive 2014/53/UE.
Italiano [Italian]	Con la presente <b>Visteon Corporation</b> dichiara che questo <b>BRFM</b> è conforme ai requisiti essenziali ed alle altre disposizioni pertinenti stabilite dalla direttiva 2014/53/UE.
Latviski [Latvian]	Ar šo <b>Visteon Corporation</b> deklarē, ka <b>BRFM</b> atbilst Direktīvas 2014/53/EK būtiskajām prasībām un citiem ar to saistītajiem noteikumiem.
Lietuvių [Lithuanian]	Šiuo <b>Visteon Corporation</b> deklaruoja, kad šis <b>BRFM</b> atitinka esminius reikalavimus ir kitas 2014/53/EB Direktyvos nuostatas.
Nederlands [Dutch]	Hierbij verklaart <b>Visteon Corporation</b> dat het toestel <b>BRFM</b> in overeenstemming is met de essentiële eisen en de andere relevante bepalingen van richtlijn 2014/53/EG.
Malti [Maltese]	Hawnhekk, <b>Visteon Corporation</b> , jiddikjara li dan <b>BRFM</b> jikkonforma mal-ħtiġijiet essenzjali u ma provvedimenti oħrajn rilevanti li hemm fid-Dirrettiva 2014/53/UE.
Magyar [Hungarian]	Alulírott, <b>Visteon Corporation</b> nyilatkozom, hogy a <b>BRFM</b> megfelel a vonatkozó alapvető követelményeknek és az 2014/53/EU irányelv egyéb előírásainak.
Polski [Polish]	Niniejszym <b>Visteon Corporation</b> oświadcza, że <b>BRFM</b> jest zgodny z zasadniczymi wymogami oraz pozostałymi stosownymi postanowieniami Dyrektywy 2014/53/UE.
Português [Portuguese]	<b>Visteon Corporation</b> declara que este <b>BRFM</b> está conforme com os requisitos essenciais e outras disposições da Directiva 2014/53/UE.
Slovensko	<b>Visteon Corporation</b> izjavlja, da je ta <b>BRFM</b> v skladu z bistvenimi zahtevami in ostalimi relevantnimi določili direktive 2014/53/ES.

[Slovenian]	
Slovensky [Slovak]	<b>Visteon Corporation</b> týmto vyhlasuje, že <b>BRFM</b> spĺňa základné požiadavky a všetky príslušné ustanovenia Smernice 2014/53/EÚ.
Suomi [Finnish]	<b>Visteon Corporation</b> vakuuttaa täten että <b>BRFM</b> tyyppinen laite on direktiivin 2014/53/EU oleellisten vaatimusten ja sitä koskevien direktiivin muiden ehtojen mukainen.
Svenska [Swedish]	Härmed intygar <b>Visteon Corporation</b> att denna <b>BRFM</b> står i överensstämmelse med de väsentliga egenskapskrav och övriga relevanta bestämmelser som framgår av direktiv 2014/53/EU.
Íslenska [Icelandic]	Hér með lýsir <b>Visteon Corporation</b> yfir því að <b>BRFM</b> er í samræmi við grunnkröfur og aðrar kröfur, sem gerðar eru í tilskipun 2014/53/EU.
Norsk [Norwegian]	<b>Visteon Corporation</b> erklærer herved at utstyret <b>BRFM</b> er i samsvar med de grunnleggende krav og øvrige relevante krav i direktiv 2014/53/EF.
Crnogorski jezik, Црногорски језик [Montenegrin]	Ovim, <b>Visteon Corporation</b> , izjavljuje da ovaj <b>BRFM</b> je usklađen sa bitnim zahtjevima i drugim relevantnim odredbama Direktive 2014/53/UE.
Română [Romanian]	Prin prezenta, <b>Visteon Corporation</b> , declară că acest <b>BRFM</b> respectă cerințele esențiale și alte dispoziții relevante din Directiva 2014/53 / UE.
Türkiye [Turkey]	<b>Visteon Corporation</b> , işbu <b>BRFM</b> 'ın 2014/53 / EU Direktifinin esas şartları ve diğer ilgili hükümlerine uygun olduğunu beyan eder.
Hrvatska [Croatian]	Ovime <b>Visteon Corporation</b> izjavljuje da je ovaj <b>BRFM</b> u skladu s osnovnim zahtjevima i ostalim relevantnim odredbama Direktive 2014/53 / EU.

## United Arab Emirates



## Kingdom of Saudi Arabia



Oman

OMAN - TRA
X/NNNN/YY
Dynnnn

Mexico

Homologation by IFTXXXXXXXX-XXXX

Certification By: NYCE



'La operación de este equipo está sujeta a las siguientes dos condiciones:

(1) es posible que este equipo o dispositivo no cause interferencia perjudicial y (2) este equipo o dispositivo debe aceptar cualquier interferencia, incluyendo la que pueda causar su operación no deseada'.

a) Lea el Manual antes de operar o usar el Equipo.

b) Información de importador:

Nombre: General Motors de México, S. de R. L. de C. V.

Dirección/Address: Av. Ejército Nacional 843-B. Colonia Granada, Miguel Hidalgo. CP 11520

Contacto: Fernando Camacho Jiménez

Correo: [fernando.camacho@gm.com](mailto:fernando.camacho@gm.com)

Teléfono: (52-722) 235 8487

c) Marca: Visteon Corporation / Nombre del Modelo: BRFM

d) El BRFM es instalado dentro del Battery Pack, por lo tanto, el usuario final no tiene interacción directa con el módulo BRFM.

e) Especificaciones Eléctricas:

Tensión de alimentación: 5,4V (Vcc)

Corriente de alimentación: 450 mA

Frecuencia: 2.4 GHz

Potencia: 2.5 W

China

This device contains SRRC type approval radio transmitter module with code as: CMIIT ID: XXXXYZNNNN'.

本设备包含型号核准代码(分别)为: CMIIT ID:XXXXYYZZZ,...的无线电发射模块。

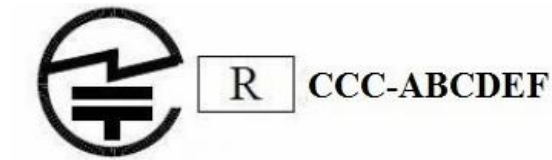


Israel

מספר XX-XXXXX הוא התקשורת משרד של אלוטו אישור מספר

"Wireless approval signed by the Ministry of Communication no. #ID Certificate"

Japan



Kazakhstan

- Safety using requirements. (GM will need to provide or place this information on final User Manual in Russian and Kazakhstan language).
- Installing, storing, shipping, sailing and utilization requirements. (GM will need to provide or place this information on final User Manual in Kazakhstan language).

**EAC**

South Korea



인증번호: TBD

인증 받은 자의 상호: Visteon Corporation

기자재의 명칭/ 모델명: BRFM

제조연월일: 별도표기

제조자/제조국가: Visteon Corporation /USA

United Kingdom

**UK  
CA**

- a. Frequency band : 2.405 – 2.480 GHz
- b. Maximum radio-frequency power transmitted in the frequency band(s) in which the radio equipment operates. Max output power = 10dBm