ATMX150RHA

BG1V2RHA 1.215V Bandgap Voltage Reference

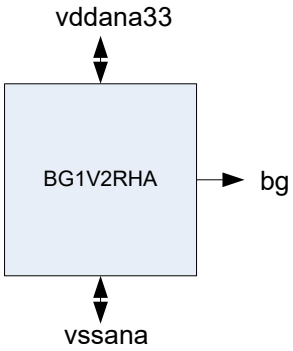
Introduction

BG1V2RHA is a radiation hardened bandgap that delivers a 1.215V voltage reference. It is a trimless voltage reference, achieving a 90 ppm/°C maximum temperature variation over –55°C to 145°C range.

Table 1. General Characteristics

Parameter	Value
Supply voltage	3.3V
Placement	Core
Height	319.2 µm
Width	487.2 µm
Area	0.156 mm²

Figure 1. Pin Diagram



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1. Pin Description

The pinout details for the BG1V2RHA bandgap voltage reference are listed in the following table.

Table 1-1. Pinout

Pin Name	I/O	Related Supply	Description
bg	O	vddana33	Analog bandgap voltage
vddana33	power	—	Analog power supply
vssana	ground	—	Analog ground supply

2. Specifications

The following table lists the electrical characteristics of BG1V2RHA over operating temperature range (T_J = –55°C to 145°C), V_{IN} = 3.3V, and C_L = 470 nF, unless otherwise noted.

The typical values are at T_J = 25°C.

Table 2-1. Electrical Characteristics

Parameter		Test Conditions	Min	Typ	Max	Unit
VDDA33	Supply voltage		2.25	3.3	3.6	V
C_{load}	Load capacitance				10	pF
V_{bg}	Output voltage		1.206	1.216	1.226	V
I_{gnda}	Current consumption	After startup, no load		50	80	µA
t_{start}	Startup time	After VDDA33 is in specs			200	µS
T_{co}	Temperature coefficient	–55°C < T_J< 145°C			90	ppm/°C
∆Vbg	Line regulation	2.25V < VDDA33 < 3.6V			3	mV/V
PSRR	Power supply rejection ratio	DC to 100 Hz	35			dB
		10 kHz to 100 kHz	20			dB
		DC to 100 Hz, Cload = 10 pF	35			dB
		10 kHz to 100 kHz, Cload = 10pF	20			dB

3. Radiation Hardness

The following table lists the radition performance characteristics of BG1V2RHA.

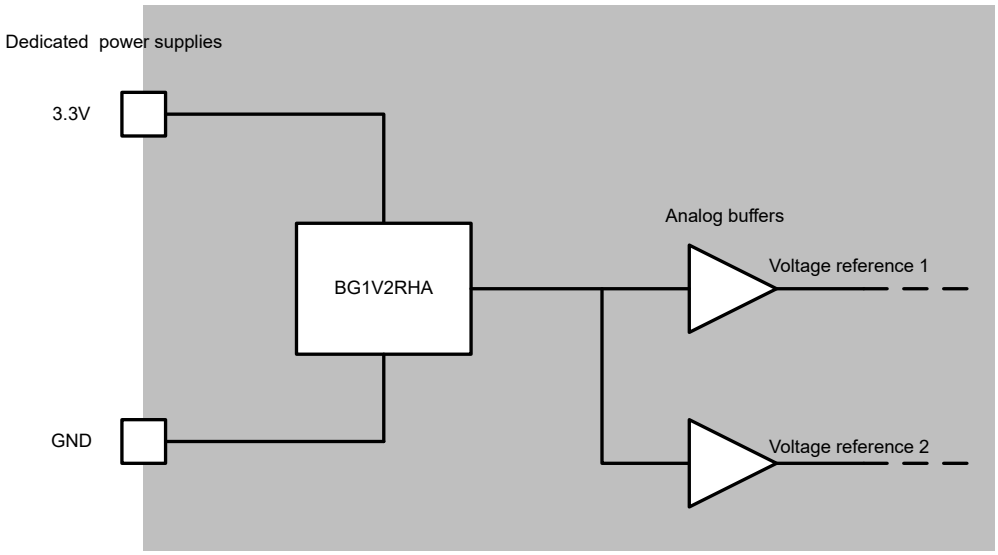
Table 3-1. Radiation Performances

Parameter	Conditions	
TID	ESCC22900 and Mil-Std 883 TM 1019 Input supply voltage Vdd max, Tj = 25°C and total dose rate of 300 rad/h	100 kRads (Si) RHA-R (tested 150 kRads (Si))
SEL	ESCC25100 and JESD57A Input supply voltage Vdd max and Tj = 125°C	> 60 MeV.cm²/mg
SEU/SET	Input supply voltage Vdd min and Tj = 25°C	> 60 MeV.cm²/mg

4. Typical Application

In a typical application, the BG1V2RHA voltage reference has its own supply pads. Analog buffers are usually inserted, when reference is provided to different cells to avoid noise propagation between blocks.

Figure 4-1. BG1V2RHA Typical Application



5. Testability Requirements

Unless otherwise specified at the DSR, V_{bg}, output voltage parameter, is to be measured.

For this test, the bg pin must be accessible through a primary I/O and a minimal resistive load must be applied during measurement to ensure the accurate value measurement.

6. Integration Guidelines

The following sections provide guidelines for the system integration.

6.1 Placement and General Rules

The sensitive cell must be placed in a quiet place, far from the pads area. The width of the wires used to connect the cell must be equal to the pin width.

6.2 Supplies Routing and Decoupling

The wires used to connect the cell must have a width equal to the pin width. Power supplies and ground must be star routed. The power supplies must be externally decoupled with large capacitors (1 µF/100 nF).

6.3 Analog Signals Routing

Unless there is a minimum of 1 µm space between the output bg and other signals, this analog connection must be made through short and shielded lines. The shielding must be made with analog ground line.

6.4 Routing Constraints

The following table lists the rounting constraints of the pins.

Table 6-1. Routing Constraints

Pin Name	Signal Type	Related Power Supply	Max DC Current Flowing (mA)	Max allowed Routing Resistance (Ω)	Max allowed Capacitance to Ground (pF)	Other Constraints
vddana33	Supply	1	1	20	—	Star routed to power supply input
vssana	Supply	1	1	20	—	Star routed to power supply input
bg	Analog	—	—	—	3	No crossing with other signal, shielding to vssana must be inserted in that case. 1 µm minimum spacing to other signal trace

7. Revision History

Revision	Date	Description
A	September 2020	The following is a summary of changes in revision A of this document. • Updated the document as per Microchip standards. • Modified the radiation tolerance specification.

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