

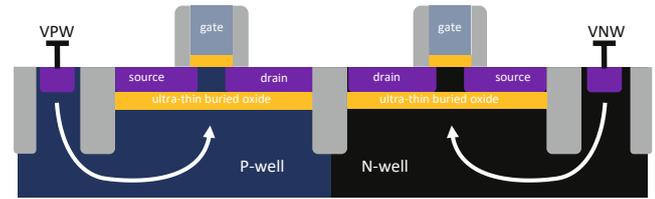
Racyics® ABX® Adaptive Body Bias Generator

GlobalFoundries® 22FDX®

Racyics

CHALLENGE

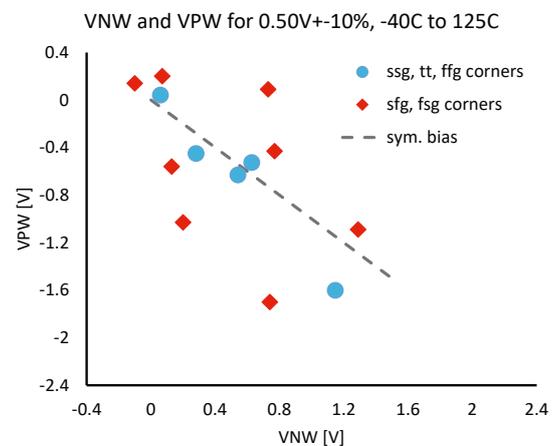
RI_ABB_GF22FDX is a body bias voltage generator for the Racyics® ABX® adaptive body biasing (ABB) foundation IP platform for GlobalFoundries 22FDX® technology. It contains a closed loop body bias regulation loop to generate N-well and P-well bias voltages for adaptive compensation of process, voltage and temperature (PVT) variations during device operation.



KEY FACTS

- ▶ Integrated adaptive body bias (ABB) control loop
- ▶ Charge pumps for N-Well and P-Well voltages, operated from IO supply voltage level
- ▶ Integrated PVT monitors for true independent adaption of NMOS and PMOS performance
- ▶ Operation from typically 10MHz, up to 50MHz reference clock
- ▶ Available in forward (FBB) and reverse body bias (RBB) versions
- ▶ Available in multiple charge pump drive strengths supporting a wide range of active chip areas
- ▶ Delivered as hardmacro for easy and seamless integration
- ▶ Supports dynamic bias corners down to 0.40V nominal.
- ▶ Interoperable with foundation IP standard cells and SRAM

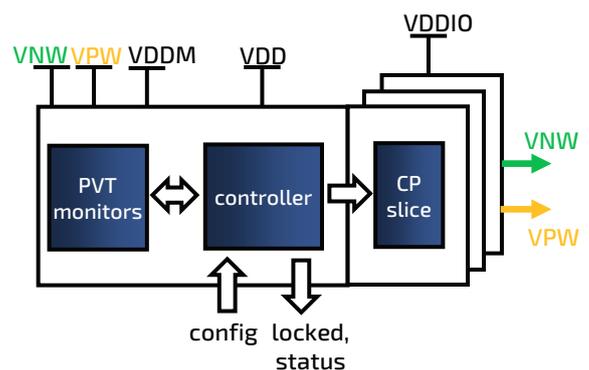
ABX® TRUE INDEPENDENT VPW, VNW



DESIGN VIEWS

- ▶ Verilog simulation models
- ▶ .lib/.db timing and power models
- ▶ .lef layout abstract views
- ▶ NDM and Milkyway libraries
- ▶ GDSII layout
- ▶ LVS netlist
- ▶ EMIR models
- ▶ DFT models

ABX® GENERATOR IP SCHEMATIC



IP SPECIFICATION

IP Type	Supplier	Specification	Nominal Supply Voltages
ABB controller IP hardmacro	Racyics	$f_{ref} = <10\text{MHz to }50\text{MHz}>$ $P_{active} < 60\mu\text{W (typical)}>$ area < 0.006mm ² (smallest pump strength) $-0.2\text{V} < \text{VNW} < 2.4\text{V}$ $-2.4\text{V} < \text{VPW} < 0.2\text{V}$	Body bias generation: 1.80V Control logic: 0.80V PVT monitors: 0.40V/ 0.45V/ 0.50V/ 0.60V/ 0.65V/ 0.80V/ 0.90V

Racyics® ABX® Automotive Adaptive Body Bias Generator

GlobalFoundries® 22FDX®

Racyics

CHALLENGE

RI_ABB_GF22FDX_AM is an adaptive body bias voltage generator for automotive applications in Globalfoundries 22FDX® technology. It contains a closed loop body bias regulation loop to generate N-well and P-well bias voltages for compensation of process, voltage and temperature (PVT) variations during operation. This results in up to 76% leakage power improvement for automotive grade-1 applications up to 150°C junction temperature.

KEY FACTS

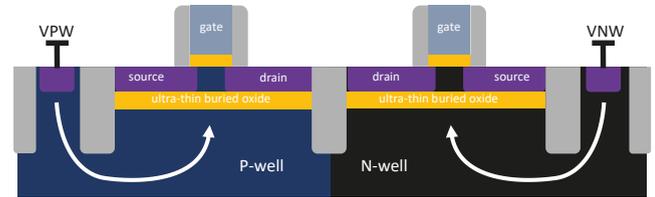
- ▶ Integrated adaptive body bias (ABB) control loop
- ▶ Charge pumps for N-Well and P-Well voltages, operated from IO supply voltage level
- ▶ Integrated PVT monitors for true independent adaption of NMOS and PMOS performance
- ▶ Operation from typically 10MHz, up to 50MHz reference clock
- ▶ Available for forward (FBB) and reverse body bias (RBB)
- ▶ Available with multiple charge pump drive strengths supporting a wide range of active chip areas
- ▶ Delivered as hardmacro for easy and seamless integration
- ▶ ISO26262 Safety Element out of Context (SEooC) with ASIL D capability
- ▶ Interoperable with foundation IP standard cells and SRAM
- ▶ Compliant to automotive grade-1 and grade-2

DESIGN VIEWS

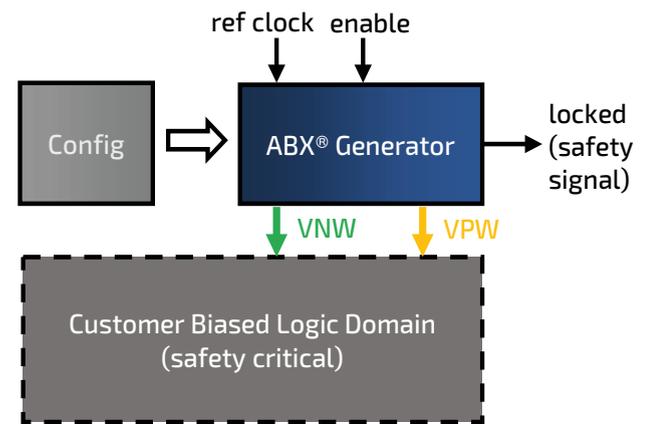
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IP SPECIFICATION

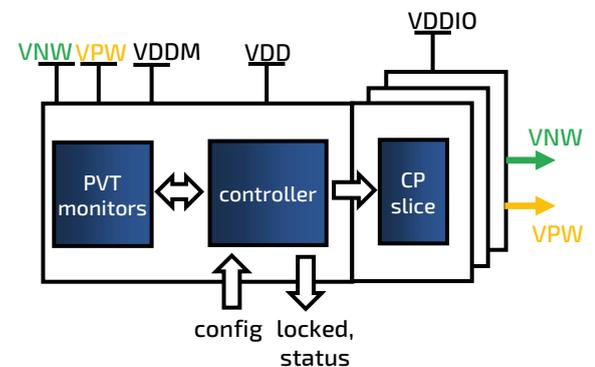
IP Type	Supplier	Specification	Nominal Supply Voltages
Automotive ABB controller IP hardmacro	Racyics	$f_{ref} = <10\text{MHz to }50\text{MHz}>$ $P_{active} < 200\mu\text{W (typical)}$ area < 0.0066mm ² (smallest pump strength) -0.2V < VNW < 2.4V -2.4V < VPW < 0.2V Automotive grade-1 and grade-2 compliant ISO26262 SEooC with ASIL D capability	Body bias generation: 1.80V Control logic: 0.80V PVT monitors: 0.80V



ABX® GENERATOR INTEGRATION SCHEME



ABX® GENERATOR IP SCHEMATIC





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