Actel IGLOO®
Low-Power Flash FPGAs

THE INDUSTRY'S LOWEST POWER FPGAs

The Actel IGLOO families, which include IGLOO/e, IGLOO nano, and IGLOO PLUS devices, are reprogrammable, full-featured flash FPGAs designed to meet the demanding power and area requirements of today's portable and power-conscious electronics. Based on Actel nonvolatile flash technology and single-chip ProASIC®3 FPGA architecture, the 1.2 V to 1.5 V operating voltage family offers the industry's lowest power consumption at competitive prices with many devices under $0.99.
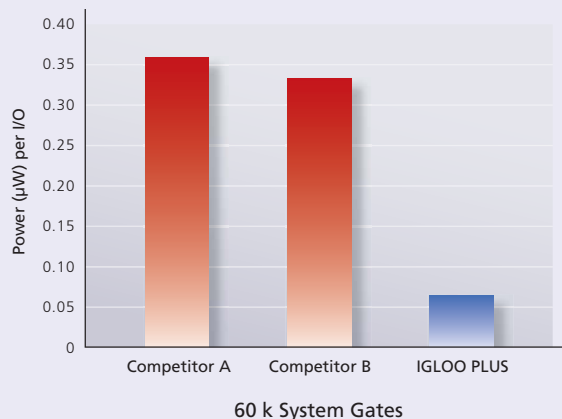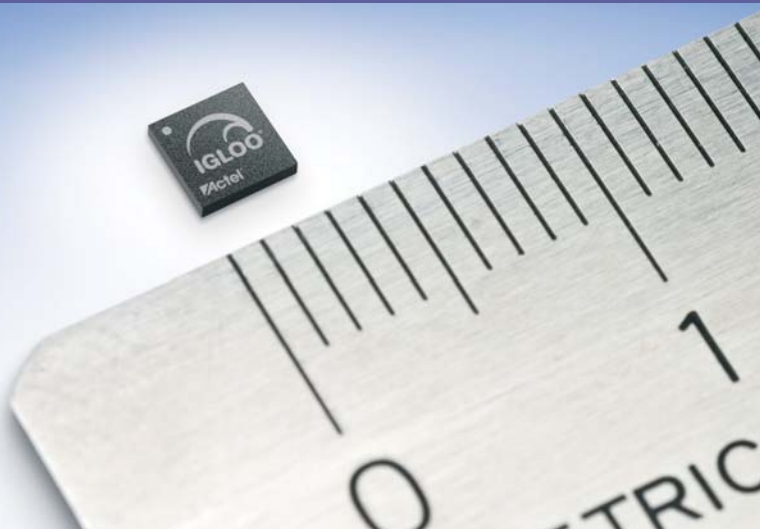
Flash*Freeze technology used in IGLOO devices enables easy entry to and exit from ultra-low-power mode, which consumes as little as 2 µW, while retaining SRAM and register data. Flash*Freeze technology simplifies power management through I/O and clock management without the need to turn off voltages, I/Os, or clocks at the system level. The Actel IGLOO families supports secure in-system reprogrammability, which allows quick and easy upgrades or design updates in the final stages of manufacturing or in the field.

The IGLOO families support up to 3 million system gates with up to 504 kbits of true dual-port SRAM, up to 6 embedded PLLs, and up to 620 user I/Os. Low-power applications that require 32-bit processing can use the ARM Cortex-M1 processor without license fee or royalties in M1 IGLOO devices. Developed specifically for implementation in FPGAs, Cortex-M1 offers an optimal balance between performance and size to minimize power consumption.

Key Benefits

— **Flash*Freeze Ultra-Low Power (from 2 µW) while Maintaining FPGA Content**

— **1.2 V to 1.5 V Core and I/O Voltage Minimizes Static and Active Power Consumption**

— **Supports ARM® Cortex™-M1**

— **True Single Chip and Small Form Factor for Space-Constrained Applications**

— **Full-Featured FPGA with On-Chip Nonvolatile Memory, SRAM, and PLLs**

— **Comprehensive I/O Offering with High I/O per Area and Logic Ratios**

— **Secure In-System Programmability**

IGLOO®

Power (µW) per I/O chart — 60 k System Gates

	Power (µW) per I/O
Competitor A	~0.36
Competitor B	~0.33
IGLOO PLUS	~0.065

IGLOO nano—Industry's Lowest Power and Smallest Size FPGAs

Worlds Smallest FPGA Package

Actel's IGLOO nano products offer the largest selection of small-footprint packages with six distinctive packages at 8x8 mm or less, including the industry's smallest 3x3 mm micro chip scale package. Small size combined with the lowest-power FPGA available, starting at just 2 µW, opens new opportunities for designers of battery-powered and handheld applications.

Available in logic densities from 10 k to 250 k gates, the 1.2 V to 1.5 V IGLOO nano devices have been designed for consumer, industrial, medical, and other high-volume, cost-sensitive applications where power and size are key decision criteria and market differentiators. IGLOO nano devices are ideal for independent level shifting to enable support for varying voltage levels, for I/O expansion or multiplexing, for adapting to changing standards, and when embedded security is required to ensure fidelity of valuable Intellectual Property. Priced competitively in the market, IGLOO nano devices are perfect ASIC or ASSP replacements yet retain the historical FPGA advantages of flexibility and quick time-to- market in low-power and small-footprint profiles.

IGLOO PLUS and IGLOO nano devices support Flash*Freeze bus hold, which allows users to hold the I/O states while in Flash*Freeze mode—a capability that is necessary in applications such as smartphones, wireless audio, and video equipment. Additionally, both IGLOO PLUS and IGLOO nano devices support Schmitt trigger inputs and are hot-swappable. The Schmitt trigger input delivers greater noise immunity in the circuit, enabling designers to safely identify an input signal that rises slowly, such as a keyboard or touchpad. The hot-swap capability offers designers the flexibility to maintain direct system connection while powering up.

IGLOO PLUS—Ultra-Low-Power FPGAs with Enhanced I/O Capabilities

Today's highly competitive market demands devices that consume minimum power and offer differentiating features at a competitive price. Responding to the challenge, Actel's IGLOO PLUS family delivers unrivaled low-power options and I/O features in a feature-rich programmable device. Starting at 5 µW, IGLOO PLUS devices are the best low-power solution for I/O-intensive applications employing memory bus manipulation, general-purpose I/O expansion, sequencing, interface translation, storage, and human interface touch screens and keypads.

Ranging from 30 k to 125 k gates, the 1.2 V to 1.5 V IGLOO PLUS devices have been optimized to meet the needs of I/O-intensive power-conscious applications that require exceptional features. These area- and cost-effective devices offer four I/O banks for independent level shifting to enable support for varying voltage levels, a feature that bridges the gap between application processors and application-specific standard products (ASSPs) in which differing I/O standards and voltages may be utilized.

Extending Battery Life with

Actel IGLOO ultra-low-power

FPGAs are ideal for

next-generation handheld

systems, such as smartphones

and portable media players.

With high I/O counts, lowest

power, and a rich feature set,

Actel IGLOO devices enable

design of handheld products

to meet the toughest market

demands with ease.

Additionally, available

targeted reference designs

speed product development

for many portable and

battery-operated applications.

Three Low-Power Capabilities

The Actel IGLOO families are designed to maximize usable power in many different ways. In Flash*Freeze mode, power drops to as low as 2 µW, and no additional components are required to turn off I/Os or clocks while preserving the design information, SRAM content, and registers. I/Os can maintain their state during Flash*Freeze mode. Entering and exiting Flash*Freeze mode takes less than 1 µs.

Flash*Freeze Pin
Flash*Freeze
Mode Control

Additionally, the Low-Power Active capability (static idle) allows for ultra-low power consumption while the IGLOO device is completely functional in the system, maintaining I/Os, SRAM, registers, and logic functions. This allows the IGLOO device to control the system power management based on external inputs (e.g., scanning for keyboard stimulus) while consuming minimal power.

In Sleep mode, larger IGLOO FPGAs experience maximum power savings when the FPGA core voltage is powered down. The unique Level 0 live-at-power-up (LAPU) capability of Actel flash devices allows for rapid system wake-up from Sleep mode.

Actel IGLOO FPGAs are 1.2 V low-power programmable logic devices (PLDs) and consume 90 percent less static power and over 50 percent less dynamic power than 1.8 V "low-power" PLD alternatives. Actel IGLOO 1.2 V operation often eliminates an additional DC/DC power converter for the 1.8 V power rail, saving power, area, and cost. Unlike other PLD technologies, flash-based Actel IGLOO devices do not suffer from high inrush current or battery-sapping configuration current each time the system is powered up. Having a true ASIC-like power profile enables Actel IGLOO FPGAs to dramatically extend battery life relative to SRAM and Hybrid PLD alternatives.

Actel IGLOO FPGAs

Flash-based Actel IGLOO FPGAs are full-featured and include clock conditioning analog PLLs for clock generation, on-chip SRAM, and nonvolatile user memory storage, all of which help eliminate parts and reduce total system power consumption and cost.

Battery Life Experiment

Using Actel IGLOO families can extend your product's battery life dramatically. Actel IGLOO devices can provide ten times the battery life of their nearest low-power competitor.

Low-Power Devices Are Just the Beginning

Actel's IGLOO FPGAs are true single-chip devices, do not require configuration or other support components, and offer a variety of small-footprint packages with high I/O pin count to match design needs.

8x8 mm   3x3 mm

The Actel IGLOO families are is offered in a small-form-factor (3x3, 4x4, 5x5, 6x6, and 8x8 mm), high-density, chip-scale package and quad flat no-lead package.

Packages shown approximately to scale.

Like a digital ASIC, nonvolatile flash-based IGLOO devices have the advantage of being a secure, low-power, single-chip solution that is Level 0 LAPU. Unlike ASIC devices, Actel IGLOO devices are reprogrammable and offer time-to-market benefits, allowing users to quickly and easily upgrade and update the design in the final stages of manufacturing or in the field without non-recurring engineering (NRE) charges and at an ASIC-level unit cost.

Actel Comprehensive Power Analysis Tools

Actel provides accurate, comprehensive power analysis tools for IGLOO devices. These range from the Power Calculator (pre-netlist) tool for device comparison to post-layout, in-depth analysis and reporting tools. These tools provide an easy-to-use Power-Driven Layout (PDL) that can minimize design power by as much as 30 percent.
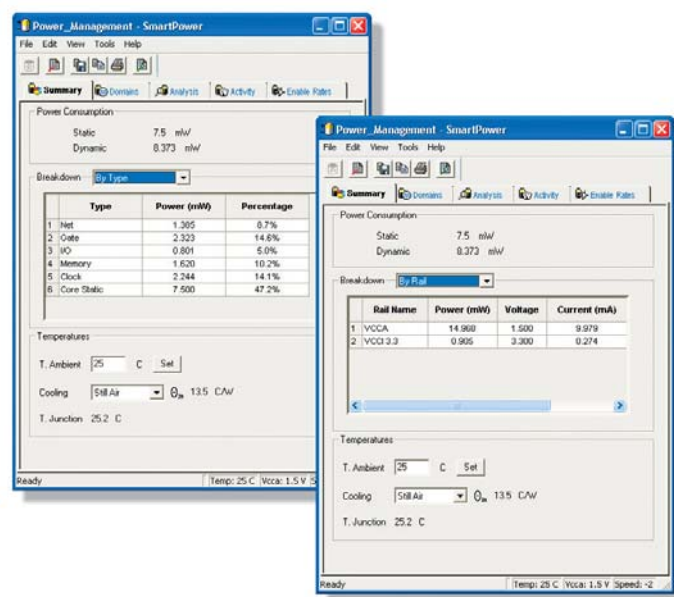
Prior to compiling a design, the enhanced spreadsheet-based Power Calculator helps in analyzing design implementation options for rapid "what if…" power analysis and design partitioning. Enhanced power reporting for low-power Flash*Freeze mode, and all other operating modes, enables the designer to calculate and predict total system power consumption, summing up power consumed in each mode.

The Actel Libero® Integrated Design Environment (IDE) SmartPower tool provides market-leading netlist-based analysis capabilities. Power reports are broken down by net, gate, I/O, memory, clock, core static, instance, and power rail. A design-level power summary includes average switching activity, ambient temperature, and junction temperature readings.

Actel power tools provide an accurate prediction that gives straightforward analysis of design options to help meet your system power budget.

Low-Power Solutions for Portable Devices
Actel provides a variety of low-power solutions, such as storage and display interfaces, to help customers get to market fast. Embedded processors need to work with one or more of the popular storage interfaces such as IDE, CE-ATA, SDIO, or CF.

There is a pressing need to efficiently manage the interface for the storage devices by offloading the task from the processor to an FPGA. With its ultra-low power capabilities, ease of use, and reprogrammability, an IGLOO FPGA is the ideal choice. Actel IGLOO devices can manage interfaces between the VLIO or AMBA bus and the different types of storage devices.
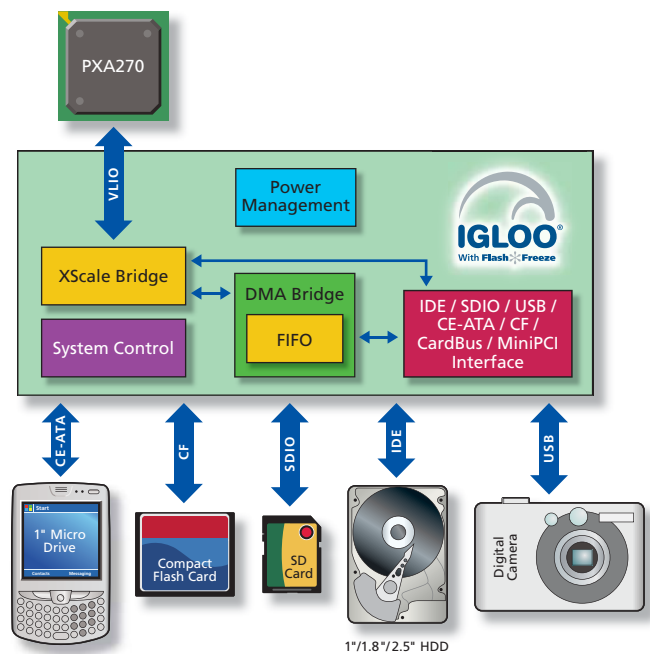
Extensive Application Support

Actel provides extensive application support for IGLOO FPGAs, including board-level schematics, IP cores, and development platforms for low-power applications. Reference designs and documentation are available for cost-sensitive portable electronics, such as handheld and mobile storage, GPS, PDA, and smartphones, as well as portable medical and industrial applications.

IGLOO Devices	AGLN010	AGLN015	AGL015	AGLN020	AGLN030	AGL030	AGLP030	AGLN060	AGLP060	AGL060	AGLN125	AGLP125	AGL125
System Gates	10 k	15 k	15 k	20 k	30 k	30 k	30 k	60 k	60 k	60 k	125 k	125 k	125 k
Typ. Equivalent Macrocells	86	128	128	172	256	256	256	512	512	512	1,024	1,024	1,024
VersaTiles (D-flip-flops)	260	384	384	520	768	768	768	1,536	1,536	1,536	3,072	3,072	3,072
Quiescent Current (typ) in Flash*Freeze Mode (µW)	2	4	5	4	5	5	5	10	10	10	16	16	16
RAM kbits (1,024 bits)	–	–	–	–	–	–	–	18	18	18	36	36	36
4,608-Bit Blocks	–	–	–	–	–	–	–	4	4	4	8	8	8
FlashROM (bits)	1 k	1 k	1 k	1 k	1 k	1 k	1 k	1 k	1 k	1 k	1 k	1 k	1 k
Secure (AES) ISP[3]	–	–	–	–	–	–	–	Yes	Yes	Yes	Yes	Yes	Yes
Integrated PLL in CCCs	–	–	–	–	–	–	–	1	1	1	1	1	1
VersaNet Globals[1]	4	4	6	4	6	6	6	18	18	18	18	18	18
I/O Standards	Std, Hot-Swap	Std, Hot-Swap	Std, Hot-Swap	Std, Hot-Swap	Std, Hot-Swap	Std, Hot-Swap	Std, Hot-Swap	Std, Hot-Swap	Std, Hot-Swap	Std+	Std, Hot-Swap	Std, Hot-Swap	Std+
I/O Banks (+ JTAG)	2	3	2	3	2	2	4	2	4	2	2	4	2
Temperature Grades	C, I	C, I	C, I	C, I	C, I	C, I	C, I	C, I	C, I	C, I	C, I	C, I	C, I
Package Pins	UC36 QN48	QN68	QN68	QN68 UC81 CS81	QN48 QN68 UC81 CS81 VQ100	QN48 QN68 UC81 CS81 VQ100 QN132	VQ128 CS201 CS289	CS81 VQ100	VQ176 CS201 CS289	VQ100 CS121 QN132 FG144[2]	CS81 VQ100	CS281 CS289	VQ100 QN132 FG144 CS196

IGLOO Devices	AGLN250	AGL250	AGL400	AGL600	AGL1000	AGLE600	AGLE3000
ARM-Enabled Cortex-M1 IGLOO Devices		M1AGL250		M1AGL600	M1AGL1000		M1AGLE3000
System Gates	250	250 k	400 k	600 k	1 M	600 k	3 M
Typ. Equivalent Macrocells	2,048	2,048	–	–	–	–	–
VersaTiles (D-flip-flops)	6,144	6,144	9,216	13,824	24,576	13,824	75,264
Quiescent Current (typ) in Flash*Freeze Mode (µW)	24	24	32	36	53	49	137
RAM kbits (1,024 bits)	36	36	54	108	144	108	504
4,608-Bit Blocks	8	8	12	24	32	24	112
FlashROM (bits)	1 k	1 k	1 k	1 k	1 k	1 k	1 k
Secure (AES) ISP[3]	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Integrated PLL in CCCs	1	1	1	1	1	6	6
VersaNet Globals[1]	18	18	18	18	18	18	18
I/O Standards	Std, Hot-Swap	Std+/LVDS	Std+/LVDS	Std+/LVDS	Std+/LVDS	Pro	Pro
I/O Banks (+ JTAG)	4	4	4	4	4	8	8
Temperature Grades	C, I	C, I	C, I	C, I	C, I	C, I	C, I
Package Pins	CS81 VQ100	VQ100 QN132[2,4] FG144 CS196[4]	FG144 CS196 FG256 FG484	FG144 FG256 CS281 FG484	FG144 FG256 CS281 FG484	FG256 FG484	FG484 FG896

Notes: [1] Six chip (main) and twelve quadrant global networks are available for AGL060 and above.
[2] Device/package support TBD.
[3] AES not available for ARM-enabled IGLOO devices.
[4] The M1AGL250 device does not support this package.

For more information regarding **Actel IGLOO FPGA Families**, please contact your local **Actel** sales representative.

55700025-11/4.09