Introduction to Generic Array Logic

Overview

Lattice Semiconductor Corporation (LSC), the inventor of the Generic Array Logic™ (GAL®) family of low density, E^{2}CMOS® PLDs is the leading supplier of low density CMOS PLDs in the world. Features such as industry leading performance, full reprogrammability, low power consumption, 100% testability and 100% programming yields make the GAL family the preferred choice among system designers. The GAL family contains 16 product architectures with a variety of performance levels specified across commercial, industrial and military (MIL-STD-883) operating ranges to meet the demands of any system logic design.

A Product for Any System Design Need

Lattice Semiconductor GAL products have the performance, architectural features, low power, and high quality to meet the needs of the most demanding system designs.

Low Voltage Products

This rapidly growing family of 3.3V products support all speed, power and system logic level requirements. Included are the world's fastest PLDs (16LV8D, 20LV8D and 22LV10D) which are ideal for high performance, 3.3V logic applications, the "zero power" (22LV10Z/ZD, 16/20LV8ZD) and the "low power" (16LV8C, 22LV10C) product lines which offer the flexibility of working in mixed 3.3V and 5V systems.

Standard Products

Aimed at providing a superior design alternative to the bipolar PLD, the GAL16V8, GAL20V8, GAL22V10, GAL20RA10 and GAL20XV10 replace over 98% of all bipolar PAL devices. These GAL devices meet, and in most cases, beat bipolar PAL performance specifications while consuming significantly lower power and offering higher quality and reliability via LSC's electrically reprogrammable E^{2}CMOS technology.

Extension Products

These products provide enhanced functionality including innovative architecture (GAL18V10, GAL26CV12, GAL6001/6002), 64mA high output drive (GAL16VP8 and GAL20VP8), "zero power" operation (GAL16V8Z/ZD and GAL20V8Z/ZD), and in-system programmability (ispGAL22V10).

GAL16LV8 and GAL20LV8

Fastest 3.3V PLDs in the World

- Performance ranging from 3.5ns Tpd and 250MHz Fmax to 15ns Tpd and 62.5MHz Fmax
- Ideal for supporting high performance microprocessors
- Supports 5 Volt Interface
- 45 mA typical power consumption
- Available in 20-pin and 28-pin PLCC packages

GAL16LV8ZD and GAL20LV8ZD

3.3 Volt and Zero Stand-by Power

- 50µA Icc typical stand-by power (100µA MAX)
- 15ns Tpd performance
- Dedicated power-down pin
- Available in 20-pin and 28-pin PLCC packages

GAL22LV10

Fastest 3.3V 22V10 in the World

- Performance from 4 ns Tpd and 250 MHz to 15 ns Tpd and 83 MHz Fmax
- Ideal for high performance systems
- Supports 5 Volt Interface
- Available in 28-pin PLCC package

GAL22LV10Z/ZD

3.3 Volt and Zero Stand-by Power

- 50µA Icc typical stand-by power (100µA MAX)
- 15ns Tpd performance
- Two power-down modes
  - Input transition detection (Z)
  - Dedicated power-down pin (ZD)
- Available in 28-pin PLCC package

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GAL16V8 and GAL20V8

Industry Standard Architecture

- Performance ranges from the industry's fastest at 3.5ns Tpd (16V8D-3) to popular 25ns versions
- Low power consumption with low power versions rated at 75mA typical and quarter power versions at 45mA typical
- Eight powerful Output Logic Macrocells (OLMCs) with eight product terms each
- Standard 20-pin (DIP and PLCC) and 24/28-pin (DIP/PLCC) packages

GAL16V8Z/ZD and GAL20V8Z/ZD

Zero Stand-by Power

- 50µA Icc typical stand-by power (100µA MAX)
- 12ns Tpd performance
- Two power-down modes
  - Input transition detection (Z)
  - Dedicated power-down pin (ZD)
- Available in 20-pin DIP/PLCC/SOIC and 24/28-pin DIP/PLCC packages

GAL16VP8 and GAL20VP8

Ideal for Bus Interface or Memory Control Logic

- High output drive versions of the GAL16V8 and GAL20V8
- IOL = 64mA vs standard 24mA
- Combines GAL architecture with high drive of 74XX244 buffer families
- Fast 15ns/80MHz performance
- Available in 20-pin DIP/PLCC and 24/28-pin DIP/PLCC packages

GAL18V10

10 Outputs in a 20-pin Package

- 7.5ns Tpd performance
- 20-pin space-saving subset of the popular GAL22V10
- 8-10 Product Terms per OLMC
- Ideal for space constrained designs
- Only 10 output, 20-pin PLD in the market

GAL20RA10

High Performance Asynchronous Logic

- 10 OLMCs
- 10 independently programmable clocks
- Each macrocell has an independent product term clock
- Fast 7.5ns Tpd performance
- Faster and lower power than bipolar PAL
- Available in 24/28-pin DIP/PLCC packages

GAL20XV10

Perfect for Fast Counters, Decoders or Comparators

- Utilizes powerful XOR function for efficient implementation of arithmetic functions
- Replaces: PAL20L10, 20X10, 20X8 and 20X4, 12L10
- 10ns/100MHz performance significantly outperforms bipolar PALs
- Perfect for video, multimedia and graphics applications
- Available in 24/28-pin DIP/PLCC packages

GAL22V10

Industry Standard Architecture

- Available in industry leading 5ns/200MHz versions through 25ns versions
- Low power consumption with Low Power versions at 90mA and Quarter Power versions at 45mA typical
- 10 OLMCs with variable Product Terms per OLMC ranging from 8 to 16 for increased logic capability
- Standard 24-pin DIP and 28-pin PLCC packages

ispGAL22V10

Offers the Benefits of ISP in a 22V10

- Popular 22V10 architecture
- In-system programmable
- Fast 7.5ns/111MHz performance
- Same 28-pin PLCC footprint as GAL22V10
- Also available in space-saving 28-pin SSOP

GAL26CV12

Expanded Logic Density in a 28-pin DIP/PLCC Package

- 28-pin superset of the popular GAL22V10
- World's fastest 28-pin PLD at 7.5ns
- 26 inputs, 12 outputs
- Flexible 22V10 OLMC
- Fully utilized 28-pin PLCC package gives added functionality over the 22V10 at no space premium!

GAL6001 and GAL6002

The Logic Density of an FPLA Architecture

- Unprecedented logic density in a 24/28-pin DIP/PLCC
- Functional equivalent of two GAL22V10s
- 38 macrocells
  - 10 input macrocells
  - 10 output macrocells
  - 10 I/O macrocells
  - 8 buried logic macrocells
- 15ns/75MHz performance
- Ideal for register-intensive applications

Commercial/Industrial/Military Grades Available

The Lattice Semiconductor GAL family is available in a wide range of commercial, industrial and military grade versions. In the military arena, LSC offers a MIL-STD-883 family as well as a family of Standard Military Drawing (SMD) devices.

Table 1. Lattice Semiconductor Corporation's GAL Product Offering

		Speed Options by Grade (Tpd in ns)		
		Commercial	**Industrial**	**883/Military**
3.3V Products	**GAL16LV8**	3.5, 5, 7.5, 10, 15		
	GAL16LV8ZD Zero Power	15, 25		
	GAL20LV8	3.5, 5, 7.5		
	GAL20LV8ZD Zero Power	15, 25		
	GAL22LV10	4, 5, 7.5, 10, 15		
	GAL22LV10Z/ZD Zero Power	15, 25		
5V Products	**GAL16V8Z/ZD Zero Power**	12, 15		
	GAL16V8 Low Power	5, 7.5, 10, 15, 25	7.5, 10, 15, 25	7.5, 10, 15, 20, 30
	GAL16V8 Quarter Power	10, 15, 25	20, 25	
	GAL16VP8	15, 25		
	GAL18V10	7.5, 10, 15, 20		
	GAL20RA10	7.5, 10, 15, 20, 30	20	
	GAL20V8Z/ZD Zero Power	12, 15		
	GAL20V8 Low Power	5, 7.5, 10, 15, 25	10, 15, 25	10, 15, 20
	GAL20V8 Quarter Power	15, 25	20, 25	
	GAL20VP8	15, 25		
	GAL20XV10	10, 15, 20		
	GAL22V10 Low Power	5, 7.5, 10, 15, 25	7.5, 10, 15, 20, 25	10, 15, 20, 25, 30
	GAL22V10 Quarter Power	15, 25		
	ispGAL22V10	7.5, 10, 15	15	
	GAL26CV12	7.5, 10, 15, 20	10, 15, 20	
	GAL6001	30		
	GAL6002	15, 20		
	Vcc (3.3V Products)	3.3V ±10%		
	Vcc (5V Products)	5V ±5%	5V ±10%	5V ±10%
	Operating Temperature	0 to 75°C	-40 to 85°C	-55 to 125°C
	Packaging	Plastic DIP, PLCC, SOIC* and SSOP**	Plastic DIP and PLCC	CERDIP and LCC

* SOIC available with GAL16V8Z only.
** SSOP available with ispGAL22V10 only.

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