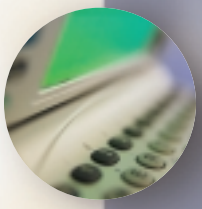
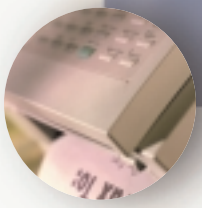
Logic Selection Guide





June 2000

FAIRCHILD
SEMICONDUCTOR™

Product Overview

The availability of logic products is vast and dynamic. New family offerings are introduced almost every year, even as many manufacturers are reducing their product portfolios. There are sometimes only subtle differences between logic families. With so many options available, it can be hard to know which family or families can best support or differentiate your application.

This easy-to-use *Logic Selection Guide* provides an overview of Fairchild Logic offerings. It will help you choose the best solution for your design.

To use the Guide, select the attribute that is of most concern for you—switching speed, power consumption, drive capability, noise immunity—and note the comparative family information. Then use other criteria to fine-tune your selection.

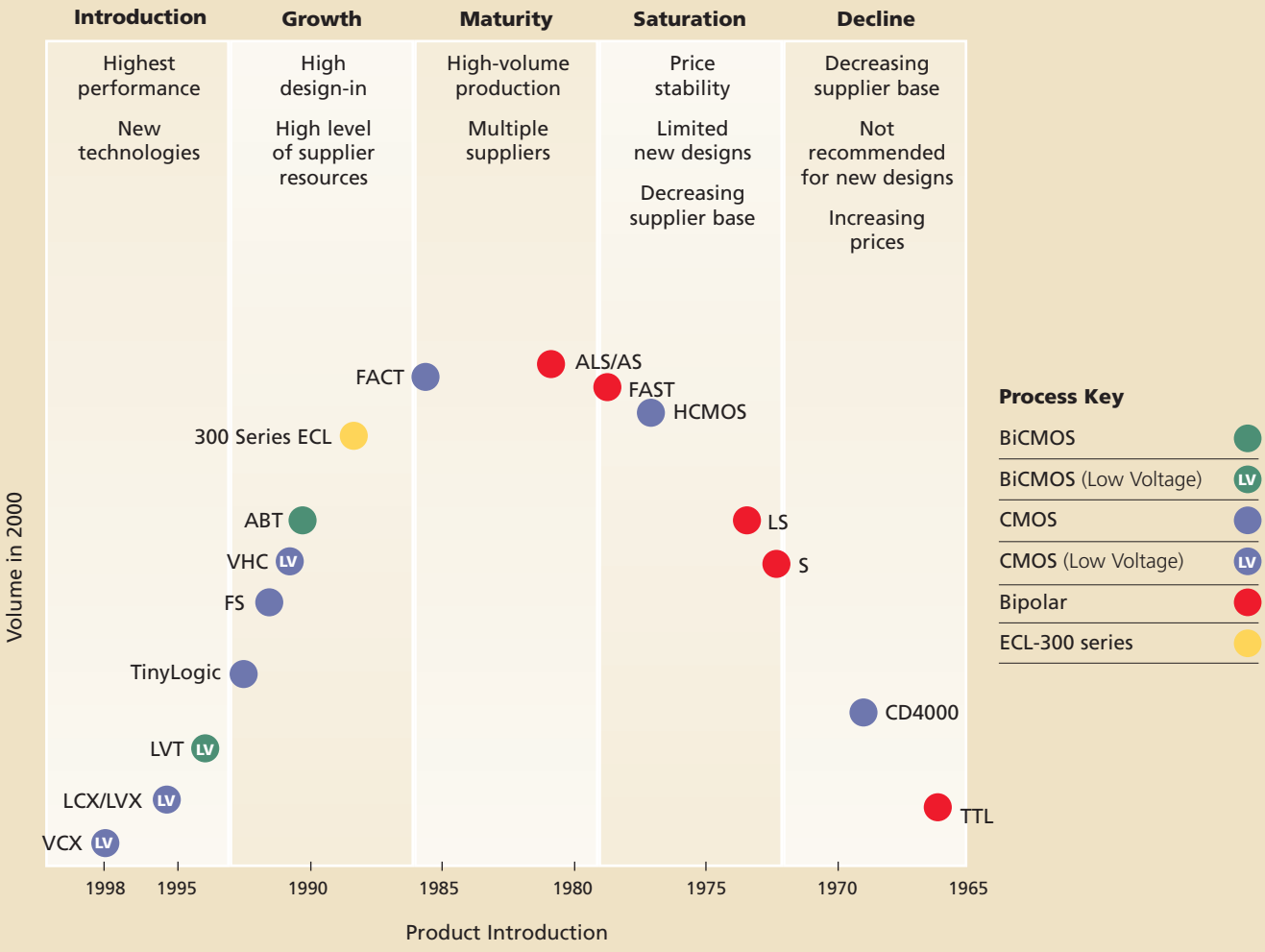
Fairchild Semiconductor has the right logic solution:

- *Broad range of logic*—get the performance you want
- *Long-term family support*—extend the life of your designs
- *Migration paths*—differentiate your high-performance systems with easy upgrades
- *Responsiveness to market needs*—get the function, specification, and packaging that you need. For example, our *CROSSVOLT*™ low-voltage series provides translation capabilities for mixed-voltage applications, while TinyLogic™ delivers the space savings necessary for today's shrinking platforms.
- *Value*—obtain the right performance/availability/reliability/price solution from our broad portfolio of products

For quick response to your technical questions and literature needs visit: **www.fairchildsemi.com**

Fairchild Logic Families

Product Life Cycle



Product Portfolio and Description

	Buffers / Line Drivers	Transceivers	Registers / Flip-Flops	Latches	Counters	Multiplexers	Comparators	Parity Generator / Checker	Decoders / Demultiplexers	FIFOs / Arithmetic Functions	Gates	Video Support	Voltage Translators	25Ω Series Resistor Options	Bus Switches	Boundary Scan (IEEE 1149.1)	16- 18- 32-bit Functions	8- 10- 12-bit Functions	1-bit Functions	
BiCMOS																				
ABT	●	●	●	●				●						●		●	●	●		• High speed, high drive and low noise for superior system performance
LVT	●	●	●	●										●		●	●	●		• High-speed, high-drive logic for 3.3V applications
CMOS																				
CROSSVOLT™ VCX	●	●	●	●							●		●				●	●		• High-speed CMOS enables interoperability between 3.3V and 2.5V systems, with 3.6V-tolerant inputs and outputs
LCX	●	●	●	●		●			●		●		●				●	●		• 5V-tolerant inputs and outputs • Ideal for 3.3V applications requiring balanced drive capability, high speed, and low noise
LVX	●	●	●	●	●	●			●		●		●		●			●		• 5V input tolerance allows 5V CMOS to interface with 3.3V systems. Includes specialized dual voltage translators and bus switch devices.
FACT™ AC/ACT	●	●	●	●	●	●	●	●	●	●	●	●						●		• General-purpose / broad-portfolio ACMOS family
FACT Quiet Series™ ACQ/ACTQ	●	●	●	●				●			●				●		●	●		• Family extension specifically designed for noise-sensitive applications. Proprietary circuitry guarantees low EMI and low device-generated noise.
Fairchild Switch FS						●					●		●	●	●		●	●		• High-speed, high-impedance, low-resistance undershoot protected switches
VHC/VHCT	●	●	●	●	●	●			●		●							●		• The natural migration for HCMOS users who need more speed for their low-power, low-noise, low-drive applications • Offered in fine pitch packages
HC/HCT	●	●	●	●	●	●	●			●	●							●		• The lowest CMOS device-generated noise and EMI available in the moderate speed performance range • Not recommended for new designs
74C	●		●	●	●	●			●		●							●		• Application-specific, high-voltage CMOS products for high-noise environments
CD4K	●		●	●	●	●			●		●							●		• Standard high-voltage CMOS products for high-noise environments
TinyLogic™ HS											●								●	• General-purpose single-gate logic
HST											●								●	• TTL-compatible single-gate logic
UHS	●										●			●					●	• High-performance single- and dual-gate logic with 5V over-voltage tolerance on inputs and outputs
Bipolar																				
FASTr™	●	●	●	●										●		●	●			• Fastest TTL logic available • A speed-improved, design-enhanced version of FAST®
FAST®	●	●	●	●	●	●	●	●	●	●	●			●				●		• The best speed to power portfolio of Advanced Schottky TTL families
AS	●	●	●	●	●	●		●		●	●							●		• A high-speed, high-drive TTL family • Not recommended for new designs
ALS	●	●	●	●	●	●	●		●		●							●		• Low output noise and the lowest power consumption of any advanced TTL logic family
LS / S / TTL	●	●	●	●	●	●		●	●	●	●							●		• Well-known, mature logic families for which Fairchild provides long-term support • Not recommended for new designs
ECL																				
300 Series	●	●	●	●	●	●		●	●		●		●					●		• Easiest to use ECL with the lowest power and best price / performance of any ECL family • Socket replacement of F100K 100 Series

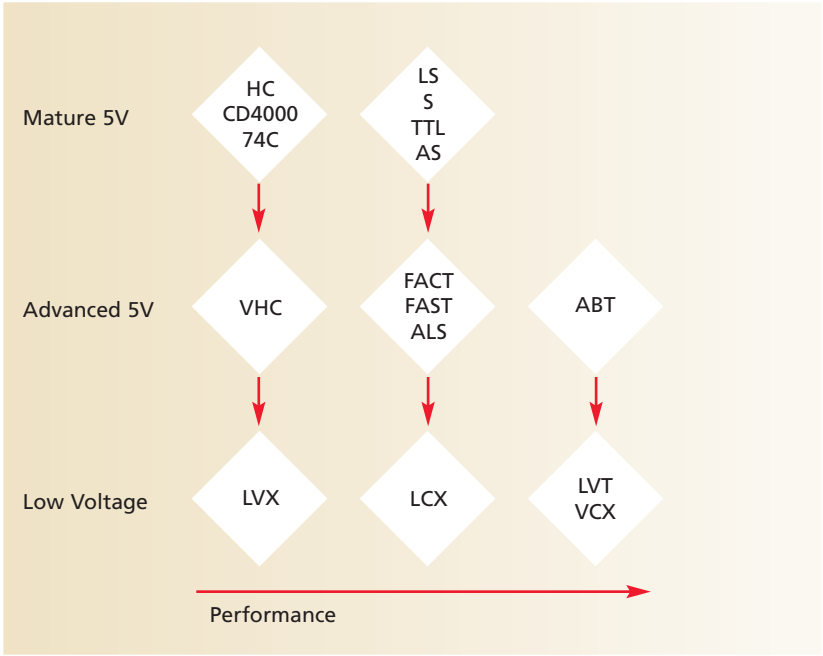
Fairchild Logic Selection Guide

Quick Reference Flowchart

Process Tech.	High Speed	Low Noise	Low Static Power	High Drive	Low Voltage	Board Space
BiCMOS 5V	ABT			ABT		
BiCMOS 3V	LVT			LVT	LVT	
CMOS 5V	TinyLogic UHS	TinyLogic HS/HST	TinyLogic HS/HST/UHS			TinyLogic HS
		FACT QS	FACT			TinyLogic HST
	FACT	HC/HCT	FACT QS			TinyLogic UHS
	FS	VHC/VHCT	HC/HCT			FS*
		FS	VHC/VHCT			
CMOS 3V	VCX	LVX	LCX		LCX	TinyLogic HS
	LCX	TinyLogic HS	LVX		LVX	TinyLogic UHS
	TinyLogic UHS		VCX		VCX	
			TinyLogic HS/UHS			
Bipolar	FASTr	ALS		FASTr		
		FAST				
ECL	300 Series ECL					

*in BGA package

Logic Migration and Low Voltage Transition



FAIRCHILD SEMICONDUCTOR™

Family Specification Comparison*

		Specified Power Supply**	Compatibility Input‡	Compatibility Output‡‡	Input Current †	Drive ††	Supply Current †	Speed †
		V_{CC} ± 10%	V_{IL} / V_{IH}	V_{OL} / V_{OH}	I_{IL} / I_{IH}	I_{OL} / I_{OH}	I_{CC}	t_{PD}
BiCMOS								
	ABT	5V	TTL	TTL	-5µA / 5µA	64mA / -32mA	30mA	3.6ns
	LVT (8)	3.3V	TTL, CMOS	TTL , CMOS	-5µA / 1µA	64mA / -32mA	5mA	3.5ns
	LVT (16)	3.3V	TTL, CMOS	TTL , CMOS	-5µA / 1µA	64mA / -32mA	5mA	3.5ns
CMOS								
CROSSVOLT™	VCX (16)◊◊◊	1.65 / 2.5 / 3.3V	TTL, CMOS	TTL, CMOS	-5µA / 5µA	24mA / -24mA	20µA	2.5 / 3.2ns
CROSSVOLT™	LCX (8)	2.5 / 3.3V	TTL, CMOS	TTL, CMOS	-5µA / 5µA	24mA / -24mA	10µA	6.5ns
CROSSVOLT™	LCX (16)	2.5 / 3.3V	TTL, CMOS	TTL, CMOS	-5µA / 5µA	24mA / -24mA	20µA	4.5ns
CROSSVOLT™	LVX (8)	3.3V	TTL, CMOS	TTL, CMOS	-1µA / 1µA	4mA / -4mA	40µA	12.0ns
	AC	3.3 / 5V	CMOS	TTL, CMOS	-1µA / 1µA	24mA / -24mA	80µA	7.5ns
	ACQ	3.3 / 5V	CMOS	TTL, CMOS	-1µA / 1µA	24mA / -24mA	80µA	6.5ns
	ACT	5V	TTL, CMOS	TTL, CMOS	-1µA / 1µA	24mA / -24mA	80µA	10.0ns
	ACTQ	5V	TTL, CMOS	TTL, CMOS	-1µA / 1µA	24mA / -24mA	80µA	7.0ns
	VHC	3.3 / 5V	CMOS	TTL, CMOS	-1µA / 1µA	8mA / -8mA	40µA	8.5ns
	VHCT	5V	TTL, CMOS	TTL, CMOS	-1µA / 1µA	8mA / -8mA	40µA	9.5ns
	HC	2 / 4.5 / 6V	CMOS	TTL, CMOS	-1µA / 1µA	6mA / -6mA	80µA	25ns
	HCT	5V	TTL, CMOS	TTL, CMOS	-1µA / 1µA	6mA / -6mA	80µA	25ns
	74C	3 - 15V	CMOS	TTL, CMOS	-1µA / 1µA	12mA / -14mA	300µA	70ns
	CD4K°°	3 - 15V	CMOS	TTL, CMOS	10pA	8mA / -1.25mA	3µA	40ns
TinyLogic™	HS◊◊	2.0/3.0/4.5/6V°°°	CMOS	TTL, CMOS	-1µA / 1µA	2.6mA / -2.6mA	10µA	21ns
TinyLogic™	HST◊◊	4.5 / 5 / 5.5V	TTL, CMOS	TTL, CMOS	-1µA / 1µA	2.0mA / -2.0mA	10µA	30ns
TinyLogic™	UHS◊◊	1.65/2.5/3.3/5V	CMOS	TTL, CMOS	-10µA / 10µA	32mA / -32mA	20µA	4.5ns
	FS	4.0 - 5.5V	TTL	TTL	N/A	N/A	3µA	0.25ns
Bipolar								
	FASTr™	5V	TTL	TTL	-150µA / 5µA	64mA / -15mA	75mA	3.9ns
	FAST®	5V	TTL	TTL	-1.6mA / 5µA	64mA / -15mA	90mA	6.5ns
	AS	5V	TTL	TTL	-1.0mA / 20µA	64mA / -15mA	90mA	6.2ns
	ALS	5V	TTL	TTL	-0.1mA / 20µA	24mA / -15mA	27mA	10ns
	LS	5V	TTL	TTL	-200µA / 20µA	24mA / -15mA	54mA	18ns
	S	5V	TTL	TTL	-400µA / 50µA	64mA / -15mA	120mA	9ns
	TTL°	5V	TTL	TTL	-1.6mA / 40µA	40mA / -250µA	41mA	30ns
ECL								
	300 Series	-5.7 to -4.2V	ECL	ECL	0.5µA / 240µA	-1.8V into 50 Ω	-65mA	1.55ns

* '244 function used unless otherwise noted

** except for ECL and HC

‡ input levels recognized by the device

‡‡ input levels the device is capable of driving

† maximum specification at maximum specified V_{CC}

†† at maximum specified V_{CC}

° 7407 used for specifications

°° CD4010 used for specifications

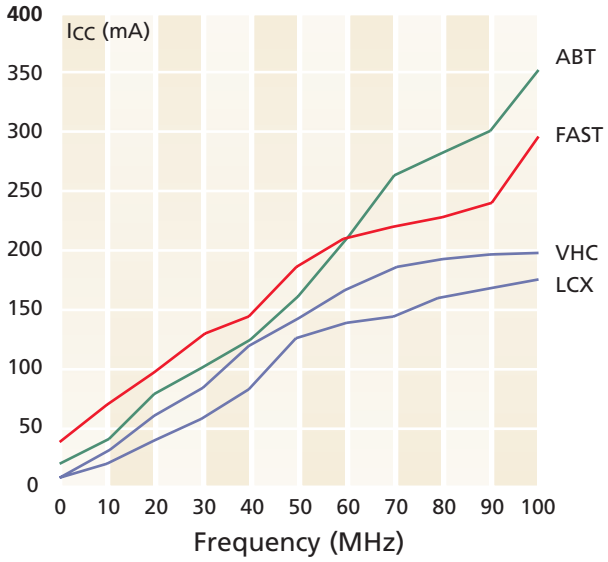
°°° not ±10%

◊◊ NAND Gate

◊◊◊ C_{LOAD} =30pF

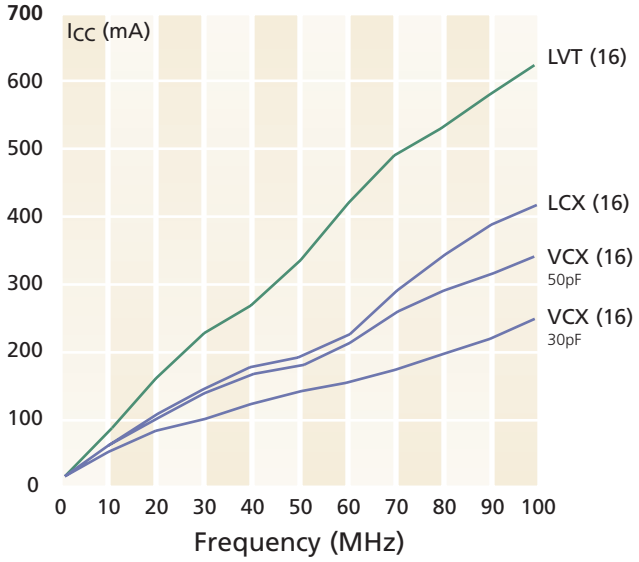
8-bit Dynamic Power

(typical process comparison)

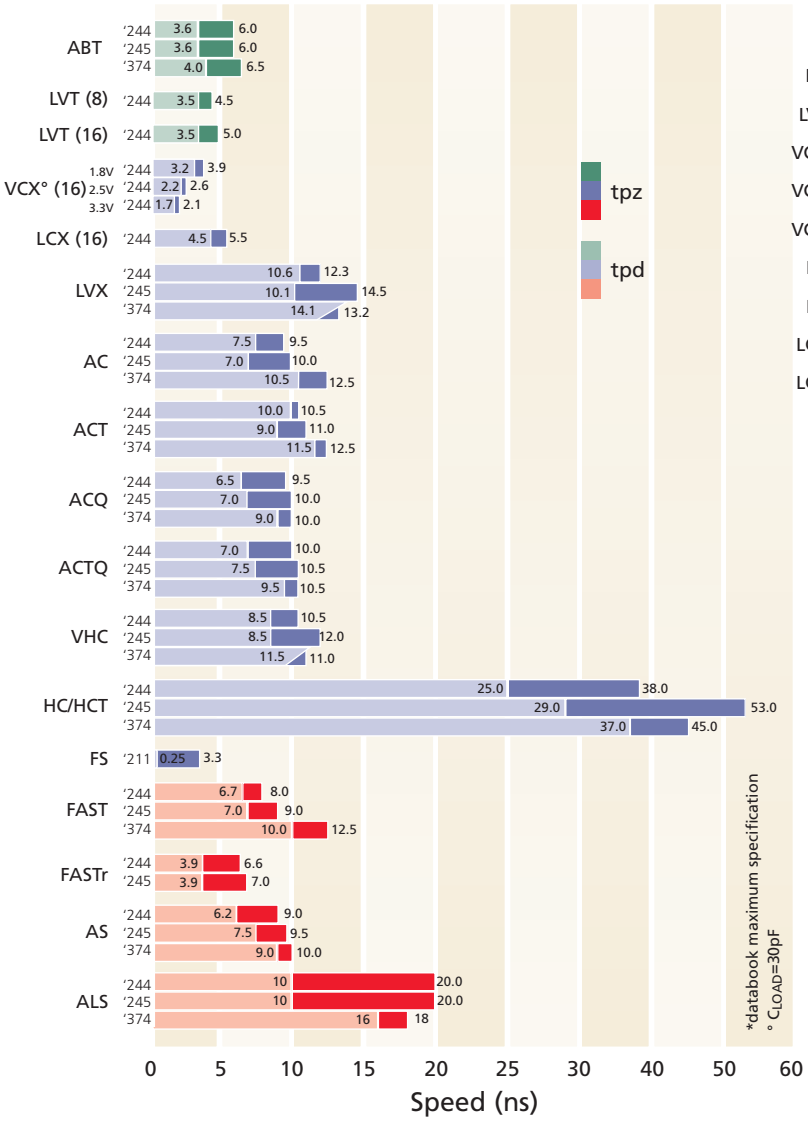


16-bit Dynamic Power

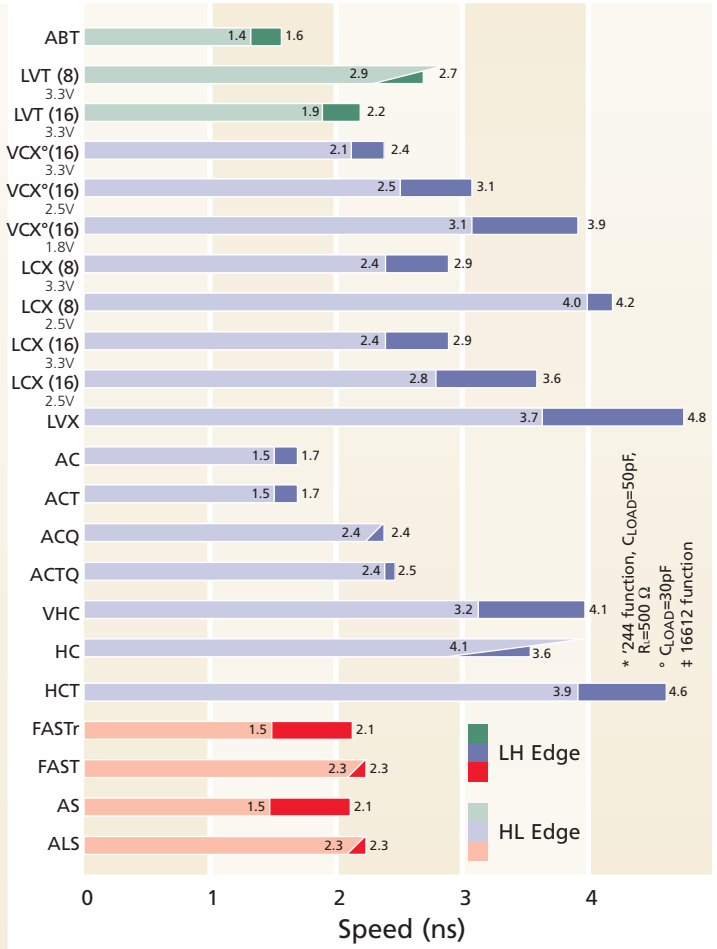
(typical process comparison)



Propagation Delay*



Output Rise and Fall Time*



Dynamic Power* (mA)

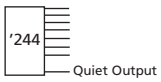
	1MHz	10MHz	35MHz	70MHz	90MHz
BiCMOS					
ABT	19.7	43.8	115.9	266.0	303.3
LVT (8)	11.0	29.3	75.8	133.4	170.2
LVT (16)	12.5	90.1	246.2	494.3	580.1
CMOS					
VCX (16)	9.9	61.9	146.8	253.7	312.7
LCX (8)	2.2	20.9	64.8	146.6	163.1
LCX (16)	6.7	61.9	160.0	294.4	375.1
LVX	2.0	19.4	64.0	100.1	106.3
AC	3.9	38.9	105.5	352.8	404.2
ACQ	5.4	52.3	139.5	206.0	218.5
VHC	3.1	30.8	103.0	180.7	192.1
HC	3.8	37.9	132.0	181.5	—
Bipolar					
FAST	42.9	69.4	136.6	221.1	246.8
FASTr	38.6	58.0	94.5	198.2	232.4
ALS	14.1	41.0	126.7	240.2	393.8

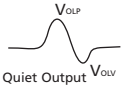
* '244 function, multiple outputs switching @ 50pF, C_{LOAD}
All figures represent typical performance values.

Noise*

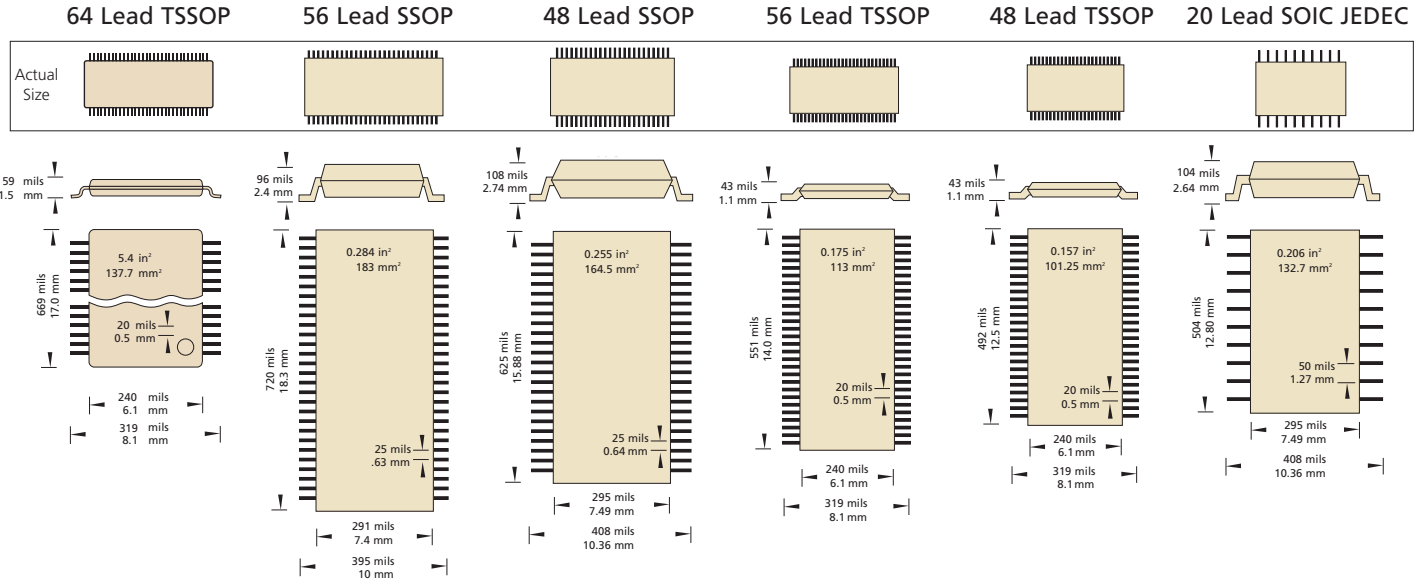
		VOLP (V)	VOLV (V)
BiCMOS			
ABT		0.6	-1.0
LVT/LVTH	3.3V	0.8	-0.8
CMOS			
CROSSVOLT™ VCX°(16)	1.8V	0.2	-0.2
	2.5V	0.6	-0.6
	3.3V	0.8	-0.8
LCX (16)	2.5V	0.3	-0.3
	3.3V	0.4	-0.5
LCX (8)	2.5V	0.5	-0.5
	3.3V	0.7	-0.7
LVX		0.3	-0.2
AC		1.6	-1.5
ACQ		0.9	-0.6
ACT		1.6	-1.6
ACTQ		0.9	-0.5
VHC		0.6	-0.6
VHCT		0.7	-0.7
HC		0.5	-0.3
HCT		0.5	-0.3
Bipolar			
FASTr		0.8	-0.8
FAST		0.6	-0.3
AS		0.8	-1.4
ALS		0.2	-0.5

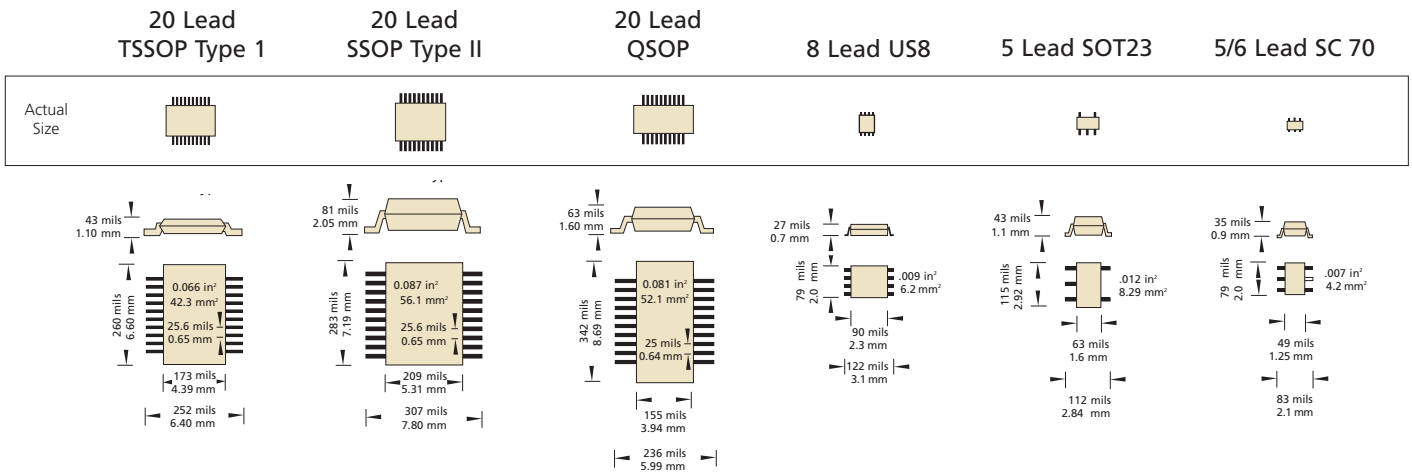
* '244 function, C_{LOAD}= 50pF, R_L = 500 Ω, seven outputs switching, minimum input skew, typical values
° C_{LOAD}=30pF
‡ 16612 function

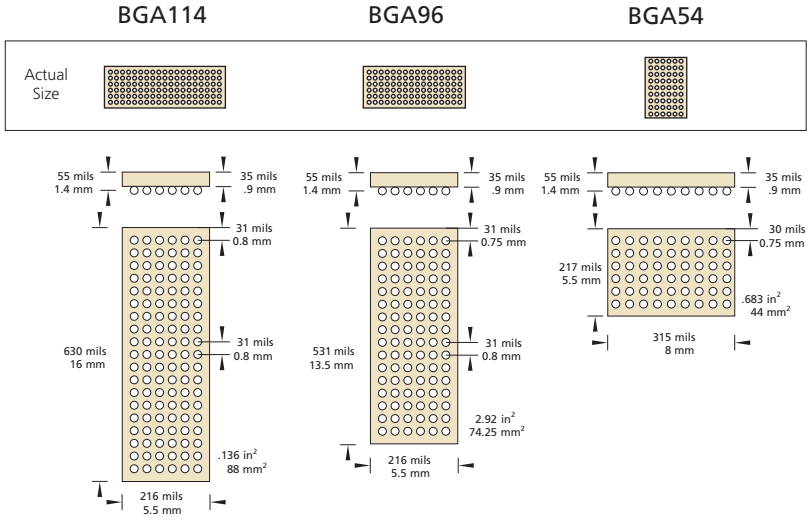




Packaging*







Package Availability

- BiCMOS
- CMOS
- Bipolar
- ECL

	SOT23, SC70 (5/6 pin) and US8	SSOP (48/56 pin)	TSSOP Type I	TSSOP (48/56 pin)	SSOP Type II (20/24 pin)	QSOP (20/24 pin)	SOIC EIAJ	SOIC JEDEC	PDIP	BGA
300 Series							●	●		
LS/S						●	●	●		
TTL							●	●		
ALS					●		●	●	●	
AS						●	●	●		
FAST					●		●	●	●	
FASTr		●			●		●	●	●	
TinyLogic UHS	●									
TinyLogic HS/HST	●									
CD4K/74C			●					●	●	
HC/HCT			●					●	●	
VHC/VHCT			●	●				●	●	
FACT QS		●	●		●	●		●	●	
FACT			●		●			●	●	
FS		●	●	●		●		●		●
LVX			●	●		1*	●	●		
LCX		●	●	●	●			●		●
VCX			●	●				●		●
LVT	●	●	●	●	●		●	●		●
ABT		●	●	●	●		●	●	●	

1*: LVX3245, LVX4245, LVXC3245, LVXC4245, LVX3I383, LVX3L384

* Area calculated using lead-tip to lead-tip width dimension.

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