

Introduction

ispLSI[®] and pLSI[®] Families

Lattice's high-density ispLSI and pLSI programmable logic families provide a superior solution for integrating high speed logic into a single chip. The ispLSI and pLSI families combine the high performance and ease of use of PLDs with the density and flexibility of FPGAs. Product features include:

- 180 MHz system performance — World's fastest
- 5.0 ns pin-to-pin delay (maximum)
- 1000 to 25000 PLD gates
- 3.3V or 5V operation
- E²CMOS[®] — PLD technology of choice
- Lattice non-volatile In-System Programmability

GAL[®] Device Family

As the inventor of the GAL architecture and E²CMOS PLDs, Lattice is committed to supplying the best solutions for your 3.3V and 5V programmable logic needs. Lattice GAL architectures are able to replace 99% of all PAL architectures, offering higher or equivalent speed performance at lower power. The Lattice GAL family is the low-density PLD standard.

E²CMOS[®] Technology

All ispLSI, pLSI and GAL devices are manufactured using E²CMOS technology on Lattice's proprietary UltraMOS[®] process. E²CMOS, the PLD technology of choice, provides:

- Electrically erasable, programmable, and reprogrammable devices
- Highest quality: 100% tested during manufacture
- 100% programming yield

ISP[™] Products

Lattice's revolutionary ISP products give customers the ability to program and reprogram logic devices right on the printed circuit board. Lattice ISP devices dramatically reduce time-to-market and production costs. ISP products include ispLSI, ispGAL[®] and ispGDS[™] families.



ISP devices offer users:

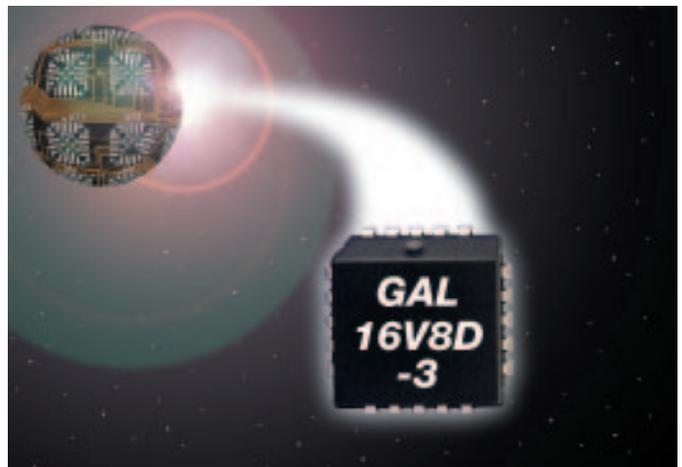
- Faster Time-to-Market
- Integration of PLD Programming into ATE Board Test
- Elimination of Handling-Induced Bent Leads
- Reduction of PLD Inventories and Costs

Break Through the CPLD Speed Barrier



The new ispLSI 2032-180, at 180MHz Fmax, is the world's fastest CPLD. In addition to record breaking speed, the ispLSI 2032 offers 32 macrocells, 32 I/O and Lattice In-System Programmability[™]. With logic delays of only 5ns (tpd), the ispLSI 2032 combines the speed of simple PLDs with the logic density of CPLDs. In full production and available off-the-shelf, the ispLSI 2032-180 is the perfect logic solution for state-of-the-art system designs.

Take Your Designs to Warp Speed



At 3.5ns tpd and 250MHz Fmax, the new GAL16V8D offers a level of performance unmatched by competitive solutions. With 3ns clock to output and 2.5ns setup time, the GAL16V8D will unleash the true power of your logic designs. Able to support the most advanced microprocessors, the GAL16V8D is the ultimate logic device for high-end system designs. The GAL16V8D is available off-the-shelf from Lattice and its franchised distributors.

ispLSI and pLSI 1000 Family

Family	Part #	Tpd (ns)	Fmax (MHz)	Typ Icc (mA)	Density (PLD Gates)	Registers	I/O	Dedicated Inputs	Product Terms per Output	Package**
ispLSI and pLSI	1016E-125L	7.5	125	90	2000	96	32	4	up to 20	44-Pin PLCC & 44-Pin TQFP
	1016E-100L	10	100							
	1016E-80L	15	80							
	1016-110L	10	111	100						
	1016-90L	12	91							
	1016-80L	15	80							
	1016-60L *	20	60							
	1024-90L	12	90.9	130	4000	144	48	6	up to 20	68-Pin PLCC & 100-Pin TQFP
	1024-80L	15	80							
	1024-60L *	20	60							
	1032E-125L	7.5	125	190	6000	192	64	8	up to 20	84-Pin PLCC & 100-Pin TQFP
	1032E-90L	10	90							
	1032E-80L	12	80							
	1032E-70L	15	70	130						
	1032-90L	12	90.9							
	1032-80L	15	80							
	1032-60L *	20	60							
	1048E-90L	10	90.9	175	8000	288	96	12	up to 20	128-Pin PQFP
	1048E-70L	15	70							
1048E-50L	20	50								
1048C-70L	16	70.4	165							
1048C-50L *	22	50.3								

ispLSI and pLSI 2000 Family

Family	Part #	Tpd (ns)	Fmax (MHz)	Typ Icc (mA)	Density (PLD Gates)	Registers	I/O	Dedicated Inputs	Product Terms per Output	Package**
ispLSI and pLSI	2032-180L	5.0	180	60	1000	32	32	2	up to 20	44-Pin PLCC, 44-Pin TQFP & 48-Pin TQFP
	2032-150L	5.5	154							
	2032-135L	7.5	137	40						
	2032-110L	10	111							
	2032-80L*	15	84							
	2064-125L	7.5	125	80	2000	64	64	4	up to 20	84-Pin PLCC & 100-Pin TQFP
	2064-100L	10	100							
	2064-80L*	15	81							
	2096-125L	7.5	125	150	4000	96	96	6	up to 20	128-Pin PQFP & 128-Pin TQFP
	2096-100L	10	100							
	2096-80L*	15	81							
	2128-100L	10	100	165	6000	128	128	8	up to 20	160-Pin MQFP & 176-Pin TQFP
	2128-80L*	15	81							

* Available in Industrial Grade (see datasheet for detailed specifications)

** See product datasheet for specific device package options.

ispLSI and pLSI 2000V Family

Family	Part #	Tpd (ns)	Fmax (MHz)	Typ Icc (mA)	Features	Density (PLD Gates)	Registers	I/O	Dedicated Inputs	Product Terms per Output	Package**
ispLSI and pLSI	2032V-100L	7.5	100	60	3.3V Power Supply; Supports 5V and 3.3V Logic Signals	1000	32	32	2	up to 20	44-Pin PLCC & 44-Pin TQFP
	2032LV-80L	10	80								
	2032LV-60L*	15	60								

ispLSI and pLSI 3000 Family

Family	Part #	Tpd (ns)	Fmax (MHz)	Typ Icc (mA)	Density (PLD Gates)	Registers	I/O	Global Clocks	Product Terms per Output	Package
ispLSI and pLSI	3192-100L	10	100	320	9000	384	192	5	up to 20	240-Pin MQUAD
	3192-70L*	15	70							
	3256-70L	15	77	150	11000	384	128	5	up to 20	160-Pin MQUAD
	3256-50L	20	57							
	3256A-90	12	90							
	3256A-70	15	77	200						
	3256A-50	20	57							
	3256E-100L	10	100	310	12000	512	256	5	up to 20	304-Pin MQUAD
	3256E-70L	15	70							

ispLSI and pLSI 6000 Family

Family	Part #	Tpd (ns)	Fmax (MHz)	Typ Icc (mA)	Density (PLD Gates)	Memory Module	Programmable Register / Counter Module	Programmable Logic Module	Package
ispLSI and pLSI	6192FF-70L	15	77	150	25000	FIFO	Cascadeable 8 x 16-Bit Words, 125MHz Fcnt	192 Registers, 96 I/O, 5 Clocks, 2 Global Output Enables	208-Pin MQUAD
	6192FF-50L	20	57						
	6192SM-70L	15	77	150	25000	Single-Port SRAM			
	6192SM-50L	20	57						
	6192DM-70L	15	77	150	25000	Dual-Port SRAM			
	6192DM-50L	20	57						

ispLSI and pLSI Design Tools

For a complete description of Lattice's high-density logic development tools, please refer to the ispLSI and pLSI Design Tool Guide.

Lattice Design Tools	Third-Party CAE Tools Supported	Simulation Tools Supported
pDS	N/A (Stand-alone PC-based Design Tool)	Viewlogic, Cadence, Verilog-XL, OrCAD 386+, Mentor Quicksim II, Synario and Synopsys (Logic Modeling), VITAL Compliant VHDL Simulators and OVI Compliant Verilog Simulators
pDS+ Fitters	ABEL, Cadence, Exemplar, ISDATA, Logical Devices, Mentor Graphics, OrCAD, Synario, Synopsys and Viewlogic	

ispGDS™ Devices (In-System Programmable Generic Digital Switch)

Family	Part #	Tpd (ns)	Fmax (MHz)	Icc (mA)	Isb (mA)	Features	Matrix Size	I/O	Package
ispGDS14	ispGDS14-7	7.5	50	40	25	In-System Programmable Switch Matrix	7 x 7	14	20-Pin PDIP & 20-Pin PLCC
ispGDS18	ispGDS18-7	7.5	50	40	25		9 x 9	18	24-Pin PDIP
ispGDS22	ispGDS22-7	7.5	50	40	25		11 x 11	22	28-Pin PDIP & 28-Pin PLCC

ispGAL® Devices (In-System Programmable GAL)

Family	Part #	Tpd (ns)	Fmax (MHz)	Icc		Features	Dedicated Inputs	I/O	Product Terms Per Output	Package
				Typ (mA)	Max (mA)					
ispGAL22V10	ispGAL22V10C-7L	7.5	111	90	140	In-System Programmable 22V10	12	10	8 - 16	28-Pin PLCC & 28-Pin SSOP
	ispGAL22V10C-10L	10	105	90	140					
	ispGAL22V10C-15L	15	83.3	90	140					

Universal GAL Devices

Family	Part #	Tpd (ns)	Fmax (MHz)	Icc		Features	Dedicated Inputs	I/O	Product Terms Per Output	Package
				Typ (mA)	Max (mA)					
GAL16V8	GAL16V8D-3L **	3.5	250	75	115	PAL/PALCE Replacement	8	8	8	20-Pin PDIP & 20-Pin PLCC
	GAL16V8C-5L	5	166	75	115					
	GAL16V8C-7L *	7.5	100	75	115					
	GAL16V8D-10Q	10	62.5	45	55					
	GAL16V8B-10L *	10	62.5	75	115					
	GAL16V8B-15Q	15	62.5	45	55					
	GAL16V8B-15L *	15	62.5	75	90					
	GAL16V8B-25Q *	25	41.6	45	55					
GAL16V8B-25L *	25	41.6	75	90						
GAL18V10	GAL18V10B-7L	7.5	111	75	115	22V10 Subset	8	10	8 - 10	
	GAL18V10B-10L	10	105	75	115					
	GAL18V10B-15L	15	66.7	75	115					
	GAL18V10B-20L	20	62.5	75	115					
GAL20V8	GAL20V8C-5L **	5	166	75	115	PAL/PALCE Replacement	12	8	8	24-Pin PDIP & 28-Pin PLCC
	GAL20V8B/C-7L	7.5	100	75	115					
	GAL20V8B/C-10L *	10	62.5	75	115					
	GAL20V8B-15Q	15	62.5	45	55					
	GAL20V8B-15L *	15	62.5	75	115					
	GAL20V8B-25Q *	25	41.6	45	55					
	GAL20V8B-25L *	25	41.6	75	90					
GAL20XV10	GAL20XV10B-10L	10	100	75	90	PAL Replacement (XOR Architecture)	10	10	4	
	GAL20XV10B-15L	15	83.3	75	90					
	GAL20XV10B-20L	20	71.4	75	90					
GAL22V10	GAL22V10C-5L **	5	200	90	150	PAL/PALCE Replacement	12	10	8 - 16	
	GAL22V10B/C-7L *	7.5	111	90	140					
	GAL22V10B/C-10L *	10	105	90	130					
	GAL22V10B-15Q	15	83.3	45	55					
	GAL22V10B-15L *	15	83.3	90	130					
	GAL22V10B-25Q	25	38.5	45	55					
	GAL22V10B-25L *	25	38.5	75	90					
GAL26CV12	GAL26CV12C-7L	7.5	142.8	90	130	22V10 Superset	14	12	8 - 12	28-Pin PDIP & 28-Pin PLCC
	GAL26CV12B-10L *	10	105	90	130					
	GAL26CV12B-15L *	15	83.3	90	130					
	GAL26CV12B-20L *	20	62.5	90	130					

* Available in Industrial Grade (see datasheet for detailed specifications)

** Available in PLCC package only

Asynchronous GAL Devices

Family	Part #	Tpd (ns)	Fmax (MHz)	Icc		Features	Dedicated Inputs	I/O	Product Terms Per Output	Package
				Typ (mA)	Max (mA)					
GAL20RA10	GAL20RA10B-7L **	7.5	83.3	75	100	10 Individually Configurable Clocks	10	10	8	24-Pin PDIP & 28-Pin PLCC
	GAL20RA10B-10L	10	71.4	75	100					
	GAL20RA10B-15L	15	50	75	100					
	GAL20RA10B-20L *	20	41.7	75	100					
	GAL20RA10B-30L	30	25	75	100					

FPLA GAL Devices

Family	Part #	Tpd (ns)	Fmax (MHz)	Icc		Macrocells				Product Terms	Sum Terms	Package
				Typ (mA)	Max (mA)	I/O	Buried	Input	Output			
GAL6002	GAL6002B-15L	15	75	90	135	10	8	10	10	64	36	24-Pin PDIP & 28-Pin PLCC
	GAL6002B-20L	20	60	90	135							
GAL6001	GAL6001B-30L	30	27	90	150							

High Drive GAL Devices (IOL = 64mA)

Family	Part #	Tpd (ns)	Fmax (MHz)	Icc		Features	Dedicated Inputs	I/O	Product Terms Per Output	Package
				Typ (mA)	Max (mA)					
GAL16VP8	GAL16VP8B-15L	15	80	90	115	TTL Compatible 64mA High Output Drive	8	8	8	20-Pin PDIP & 20-Pin PLCC
	GAL16VP8B-25L	25	50	90	115					
GAL20VP8	GAL20VP8B-15L	15	80	90	115		12	8	8	24-Pin PDIP & 28-Pin PLCC
	GAL20VP8B-25L	25	50	90	115					

Low-Voltage (3.3V) GAL Devices

Family	Part #	Tpd (ns)	Fmax (MHz)	Icc		Features	Dedicated Inputs	I/O	Product Terms Per Output	Package
				Typ (mA)	Max (mA)					
GAL16LV8D	GAL16LV8D-3L	3.5	250	45	65	—	8	8	8	20-Pin PLCC
	GAL16LV8D-5L	5	166	45	65					
GAL16LV8C	GAL16LV8C-7L	7.5	100	45	65	Supports 5V and 3.3V Logic Signals	8	8	8	
	GAL16LV8C-10L	10	83.3	45	65					
	GAL16LV8C-15L	15	62.5	45	65					
GAL20LV8D	GAL20LV8D-3L	3.5	250	45	70	—	12	8	8	28-Pin PLCC
	GAL20LV8D-5L	5	166	45	70					
	GAL20LV8D-7L	7.5	125	45	70					
GAL22LV10D	GAL22LV10D-4L	4	250	90	130	—	12	10	8 - 16	
	GAL22LV10D-5L	5	200	90	130					
GAL22LV10C	GAL22LV10C-7L	7.5	125	45	75	Supports 5V and 3.3V Logic Signals	12	10	8 - 16	
	GAL22LV10C-10L	10	111	45	75					
	GAL22LV10C-15L	15	83	45	75					

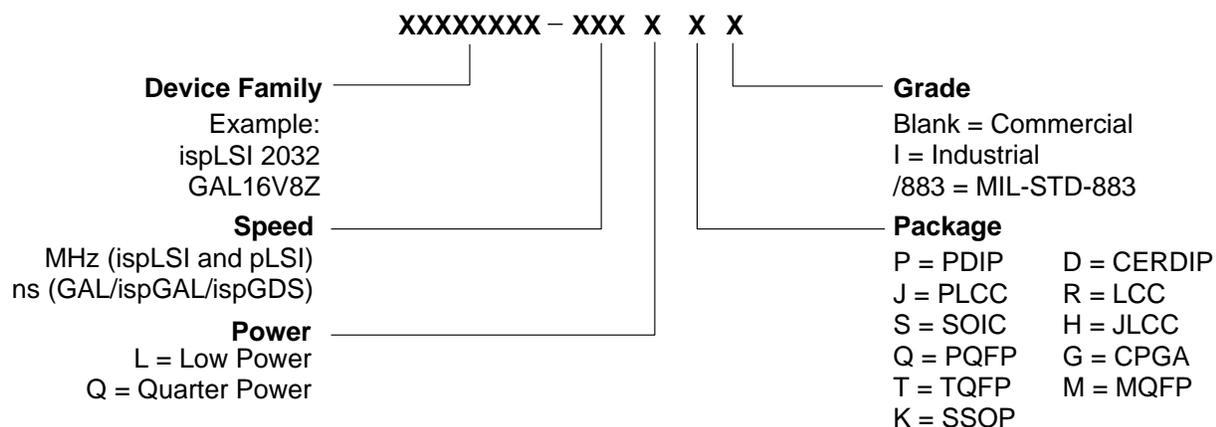
Low-Voltage (3.3V) Zero-Power GAL Devices

Family	Part #	Tpd (ns)	Fmax (MHz)	Icc (mA)	Isb (μ A)	Features	Dedicated Inputs	I/O	Product Terms per Output	Package
GAL16LV8ZD	GAL16LV8ZD-15Q	15	62.5	55	100	Dedicated Power-Down Pin for Zero-Power Standby Mode	7	8	8	20-Pin PLCC
	GAL16LV8ZD-25Q	25	41.6	55	100					
GAL20LV8ZD	GAL20LV8ZD-15Q	15	62.5	55	100		11	8	8	28-Pin PLCC
	GAL20LV8ZD-25Q	25	41.6	55	100					
GAL22LV10ZD	GAL22LV10ZD-15Q	15	71.4	55	100		11	10	8 - 16	28-Pin PLCC
	GAL22LV10ZD-25Q	25	50	55	100					
GAL22LV10Z	GAL22LV10Z-15Q	15	71.4	55	100	Input Transition Detection for Standby Mode	12	10	8 - 16	28-Pin PLCC
	GAL22LV10ZD-25Q	25	50	55	100					

Zero-Power GAL Devices

Family	Part #	Tpd (ns)	Fmax (MHz)	Icc (mA)	Isb (μ A)	Features	Dedicated Inputs	I/O	Product Terms per Output	Package
GAL16V8Z	GAL16V8Z-12Q	12	83.3	55	100	Input Transition Detection for Standby Mode	8	8	8	20-Pin PDIP, PLCC & SOIC
	GAL16V8Z-15Q	15	62.5	55	100					
GAL16V8ZD	GAL16V8ZD-12Q	12	83.3	55	100	Dedicated Power-Down Pin for Standby Mode	7	8	8	20-Pin PDIP & 20-Pin PLCC
	GAL16V8ZD-15Q	15	62.5	55	100					
GAL20V8Z	GAL20V8Z-12Q	12	83.3	55	100	Input Transition Detection for Standby Mode	12	8	8	24-Pin PDIP & 28-Pin PLCC
	GAL20V8Z-15Q	15	62.5	55	100					
GAL20V8ZD	GAL20V8ZD-12Q	12	83.3	55	100	Dedicated Power-Down Pin for Standby Mode	11	8	8	
	GAL20V8ZD-15Q	15	62.5	55	100					

Part Number Description



Military Devices (883 Qualified)

Family	Part #	SMD #	Tpd (ns)	Fmax (MHz)	Icc		Package
					Typ (mA)	Max (mA)	
ispLSI	ispLSI 1016-60LH/883	5962-9476201MXC	20	60	100	170	44-Pin JLCC
	ispLSI 1024-60LH/883	5962-9476101MXC	20	60	135	220	68-Pin JLCC
	ispLSI 1032-60LG/883	5962-9308501MXC	20	60	135	220	84-Pin CPGA
	ispLSI 1048C-50LG/883	5962-9558701MXC	22	50	165	235	133-Pin CPGA
pLSI	pLSI 1016-60LH/883	5962-9476301MXC	20	60	100	170	44-Pin JLCC
	pLSI 1024-60LH/883	5962-9476001MXC	20	60	135	220	68-Pin JLCC
	pLSI 1032-60LG/883	5962-9466801MXC	20	60	135	220	84-Pin CPGA
	pLSI 1048C-50LG/883	5962-9558801MXC	22	50	165	235	133-Pin CPGA
GAL16V8	GAL16V8C-7LD/883	5962-8983907RA	7.5	100	75	130	20-Pin Cerdip
	GAL16V8C-7LR/883	5962-89839072A	7.5	100	75	130	20-Pin LCC
	GAL16V8B-10LD/883	5962-8983904RA	10	62.5	75	130	20-Pin Cerdip
	GAL16V8B-10LR/883	5962-89839042A	10	62.5	75	130	20-Pin LCC
	GAL16V8B-15LD/883	5962-8983903RA	15	50	75	130	20-Pin Cerdip
	GAL16V8B-15LR/883	5962-89839032A	15	50	75	130	20-Pin LCC
	GAL16V8B-20LD/883	5962-8983902RA	20	41.6	75	130	20-Pin Cerdip
	GAL16V8B-20LR/883	5962-89839022A	20	41.6	75	130	20-Pin LCC
GAL20V8	GAL16V8B-30LD/883	5962-8983901RA	30	33.3	75	130	20-Pin Cerdip
	GAL20V8B-10LD/883	5962-8984004LA	10	62.5	75	130	24-Pin Cerdip
	GAL20V8B-10LR/883	5962-89840043A	10	62.5	75	130	28-Pin LCC
	GAL20V8B-15LD/883	5962-8984003LA	15	50	75	130	24-Pin Cerdip
	GAL20V8B-15LR/883	5962-89840033A	15	50	75	130	28-Pin LCC
	GAL20V8B-20LD/883	5962-8984002LA	20	41.6	75	130	24-Pin Cerdip
GAL22V10	GAL20V8B-20LR/883	5962-89840023A	20	41.6	75	130	28-Pin LCC
	GAL22V10C-10LD/883	5962-8984106LA	10	166	90	150	24-Pin Cerdip
	GAL22V10C-10LR/883	5962-89841063A	10	166	90	150	28-Pin LCC
	GAL22V10B-15LD/883	5962-8984103LA	15	62.5	90	150	24-Pin Cerdip
	GAL22V10B-15LR/883	5962-89841033A	15	62.5	90	150	28-Pin LCC
	GAL22V10B-20LD/883	5962-8984102LA	20	33	90	150	24-Pin Cerdip
	GAL22V10B-20LR/883	5962-89841023A	20	33	90	150	28-Pin LCC
	GAL22V10B-25LD/883	5962-8984104LA	25	33	90	150	24-Pin Cerdip
GAL22V10B-30LD/883	5962-8984101LA	30	25	90	150	24-Pin Cerdip	

Sales Offices

FRANCE

Lattice Semicondeurs SARL
Les Algorithmes
Bâtiment Homère
91 190 - Saint Aubin
Gif sur Yvette
TEL: (33) 1 69 33 22 77
FAX: (33) 1 60 19 05 21

GERMANY

Lattice GmbH
PO Box 1104
85369 Neufahrn bei
München
TEL: (49) 8165-9516-0
FAX: (49) 8165-9516-33

HONG KONG

Lattice Semiconductor Asia Ltd.
Rm. 201
HK Industrial Tech. Centre
72 Tat Chee Ave.
Kowloon
TEL: (852) 2319-2929
FAX: (852) 2319-2750

JAPAN

Lattice Semiconductor KK
I•K Building 9F
1-23-3, Yanagibashi
Taito-Ku, Tokyo 111
TEL: (81) 3-5820-3533
FAX: (81) 3-5820-3531

KOREA

Lattice Korea
#107, Pangbae Bldg.
1006-2 Pangbae-dong
Seochu-Ku
Seoul, 137-060
TEL: (822) 583-6783
FAX: (822) 583-6788

TAIWAN

Lattice Semiconductor Taiwan
Taipei Intl. Business Ctr.
4F, 25, Sec. 1, Tunhua S. Rd.
Taipei, Taiwan 105
TEL: (8862) 577-4352
FAX: (8862) 577-0260

UNITED KINGDOM

Lattice UK Limited
Locke King House
2 Balfour Road
Weybridge
Surrey KT13 8HD
TEL: (44) 1932 831180
FAX: (44) 1932 831181

NORTH AMERICA

CALIFORNIA

Lattice Semiconductor
1820 McCarthy Blvd.
Milpitas, CA 95035
TEL: (408) 428-6400
FAX: (408) 944-8411

Lattice Semiconductor
15707 Rockfield Plaza
Suite 110
Irvine, CA 92718
TEL: (714) 580-3880
FAX: (714) 580-3888

Lattice Semiconductor
7585 Ronson Rd., #201
San Diego, CA 92111
TEL: (619) 565-7307
FAX: (619) 565-7336

COLORADO

Lattice Semiconductor
400 S. Colorado Blvd.
Suite 600
Denver, CO 80222
TEL: (303) 377-9055
FAX: (303) 377-9014

FLORIDA

Lattice Semiconductor
1315 Tuskawilla Rd.
Suite 104
Winter Springs, FL 32708
TEL: (407) 695-2043
FAX: (407) 695-3826

GEORGIA

Lattice Semiconductor
3091 Governors Lake Dr.
Building 100, Suite 500
Norcross, GA 30071
TEL: (770) 446-2930
FAX: (770) 416-7404

ILLINOIS

Lattice Semiconductor
1 Pierce Place
Suite 500-E
Itasca, IL 60143
TEL: (630) 250-3118
FAX: (630) 250-3119

MINNESOTA

Lattice Semiconductor
3445 Washington Dr.
Suite 105
Eagan, MN 55122
TEL: (612) 686-8747
FAX: (612) 686-8746

MASSACHUSETTS

Lattice Semiconductor
67 S. Bedford St.
Suite 400 West
Burlington, MA 01803
TEL: (617) 229-5819
FAX: (617) 272-3213

NORTH CAROLINA

Lattice Semiconductor
3200 Beechleaf Ct.
Suite 100
Raleigh, NC 27604
TEL: (919) 871-0037
FAX: (919) 871-0699

OHIO

Lattice Semiconductor
Cincinnati, OH
TEL: (513) 984-8921
FAX: (513) 984-8927

TEXAS

Lattice Semiconductor
4201 Spring Valley Rd.
Suite 1400
Dallas, TX 75244
TEL: (972) 776-3490
FAX: (972) 776-3491

Lattice Semiconductor
9600 Great Hills Trail
Ste. 150W, Office #48
Austin, TX 78759
TEL: (512) 502-3057
FAX: (512) 343-6428



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