Intel - EPF10K30ATC144-1N Datasheet

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Understanding Embedded - FPGAs (Field Programmable Gate Array)

Embedded - FPGAs, or Field Programmable Gate Arrays, are advanced integrated circuits that offer unparalleled flexibility and performance for digital systems. Unlike traditional fixed-function logic devices, FPGAs can be programmed and reprogrammed to execute a wide array of logical operations, enabling customized functionality tailored to specific applications. This reprogrammability allows developers to iterate designs quickly and implement complex functions without the need for custom hardware.

Applications of Embedded - FPGAs

The versatility of Embedded - FPGAs makes them indispensable in numerous fields. In telecommunications.

Details	
Product Status	Obsolete
Number of LABs/CLBs	216
Number of Logic Elements/Cells	1728
Total RAM Bits	12288
Number of I/O	102
Number of Gates	69000
Voltage - Supply	3V ~ 3.6V
Mounting Type	Surface Mount
Operating Temperature	0°C ~ 70°C (TA)
Package / Case	144-LQFP
Supplier Device Package	144-TQFP (20x20)
Purchase URL	https://www.e-xfl.com/product-detail/intel/epf10k30atc144-1n

Table 2. FLEX 10K Device Features

Feature	EPF10K70	EPF10K100 EPF10K100A	EPF10K130V	EPF10K250A
Typical gates (logic and RAM) *(1)*	70,000	100,000	130,000	250,000
Maximum system gates	118,000	158,000	211,000	310,000
LEs	3,744	4,992	6,656	12,160
LABs	468	624	832	1,520
EABs	9	12	16	20
Total RAM bits	18,432	24,576	32,768	40,960
Maximum user I/O pins	358	406	470	470

Note to tables:

(1) The embedded IEEE Std. 1149.1 JTAG circuitry adds up to 31,250 gates in addition to the listed typical or maximum system gates.

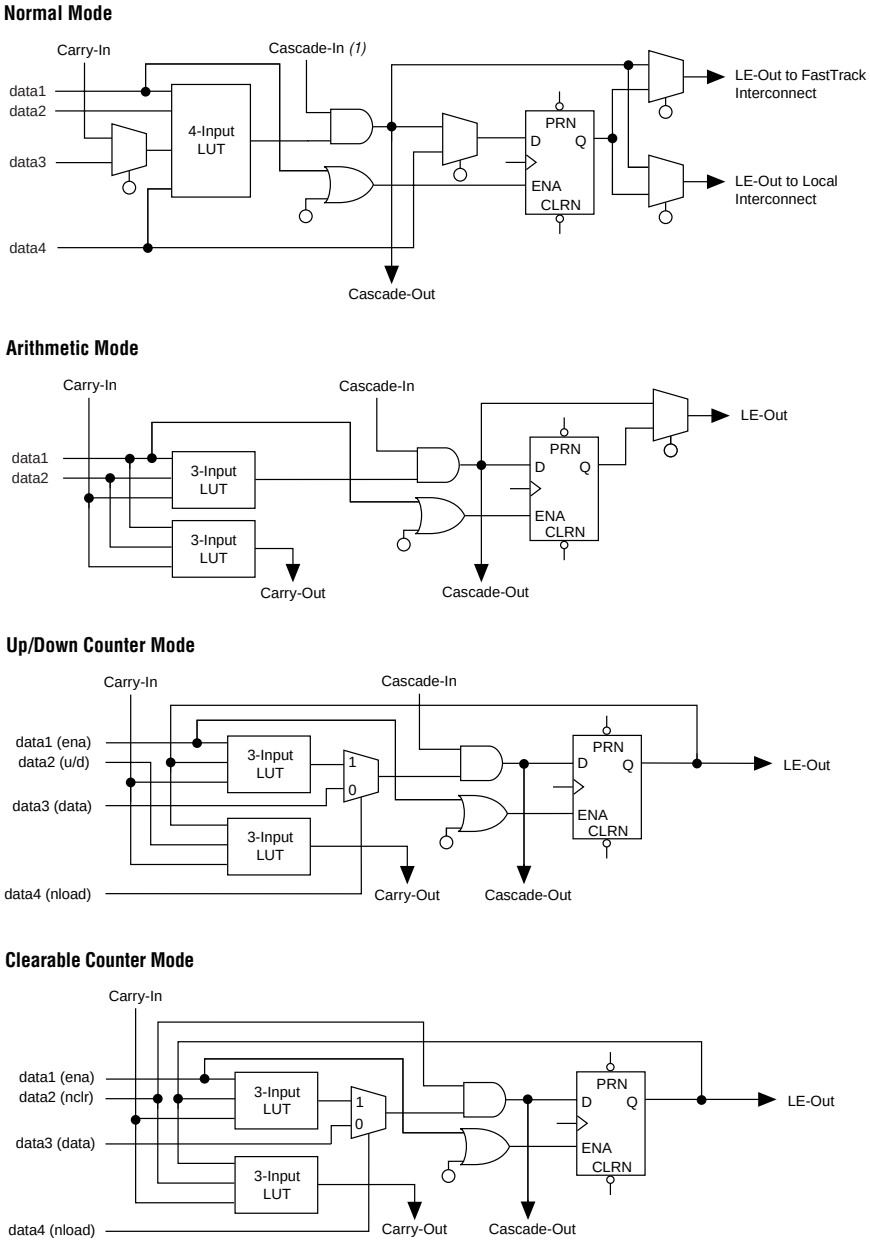
...and More Features

- Devices are fabricated on advanced processes and operate with a 3.3-V or 5.0-V supply voltage (see Table 3
- In-circuit reconfigurability (ICR) via external configuration device, intelligent controller, or JTAG port
- ClockLock™ and ClockBoost™ options for reduced clock delay/skew and clock multiplication
- Built-in low-skew clock distribution trees
- 100% functional testing of all devices; test vectors or scan chains are not required

Table 3. Supply Voltages for FLEX 10K & FLEX 10KA Devices

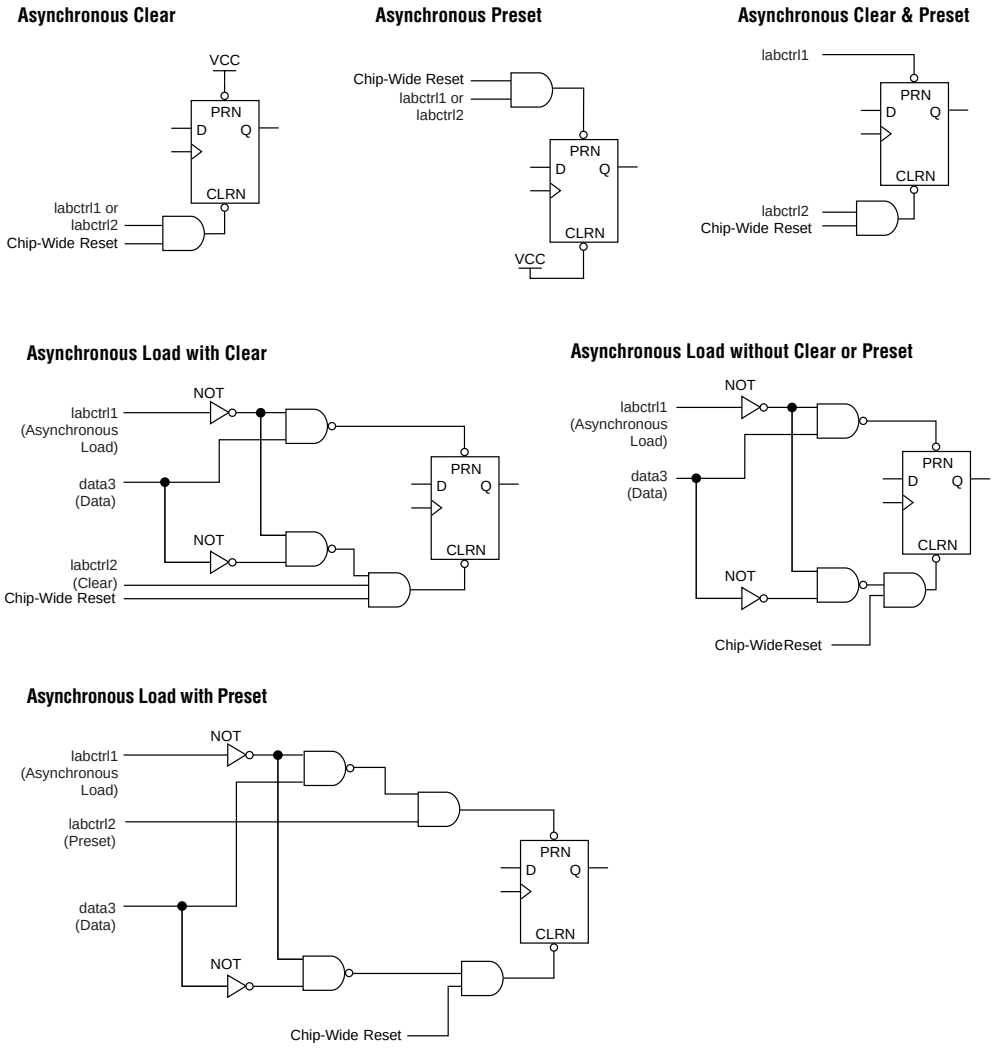
5.0-V Devices	3.3-V Devices
EPF10K10 EPF10K20 EPF10K30 EPF10K40 EPF10K50 EPF10K70 EPF10K100	EPF10K10A EPF10K30A EPF10K50V EPF10K100A EPF10K130V EPF10K250A

Figure 9. FLEX 10K LE Operating Modes



Note:
(1) Packed registers cannot be used with the cascade chain.

Figure 10. LE Clear & Preset Modes



Asynchronous Clear

The flipflop can be cleared by either LABCTRL1 or LABCTRL2. In this mode, the preset signal is tied to V_{CC} to deactivate it.

Figure 11. LAB Connections to Row & Column Interconnect

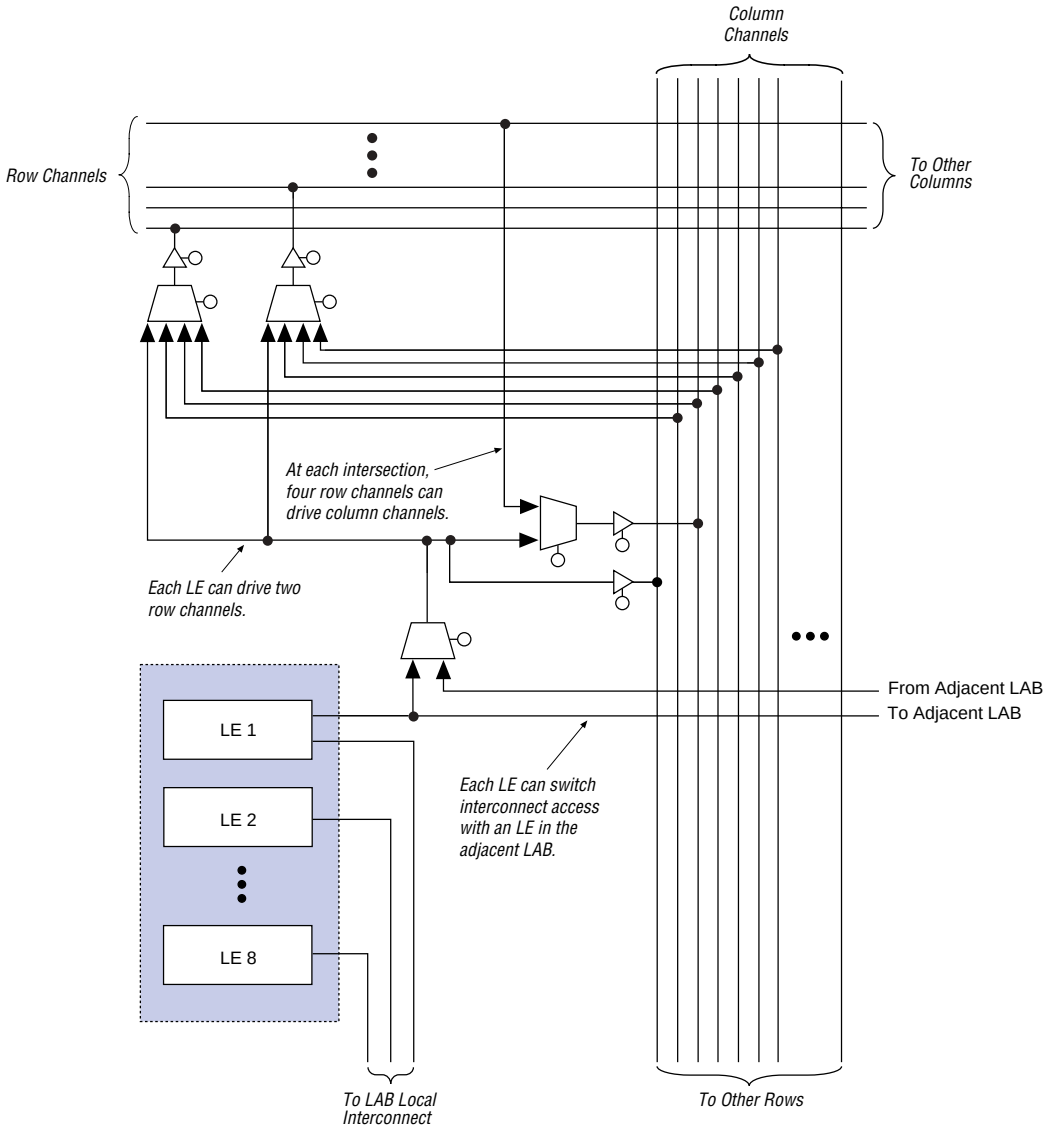


Figure 26. FLEX 10K Device IOE Timing Model

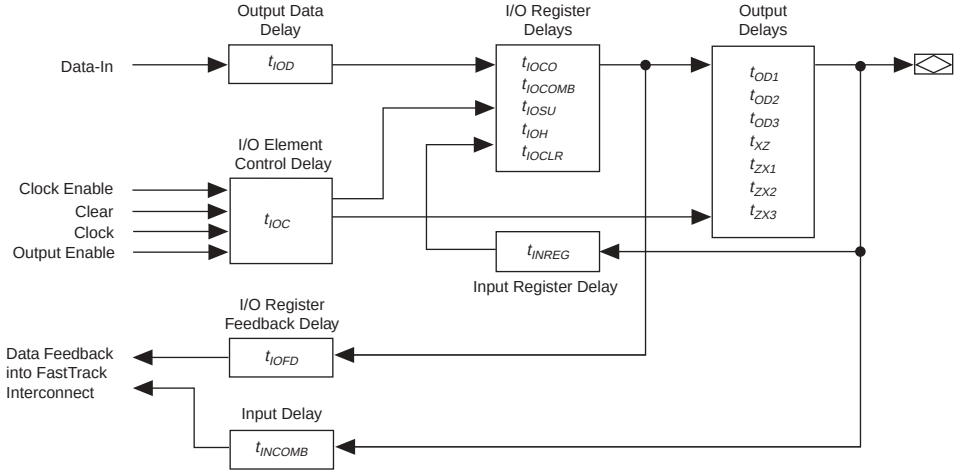
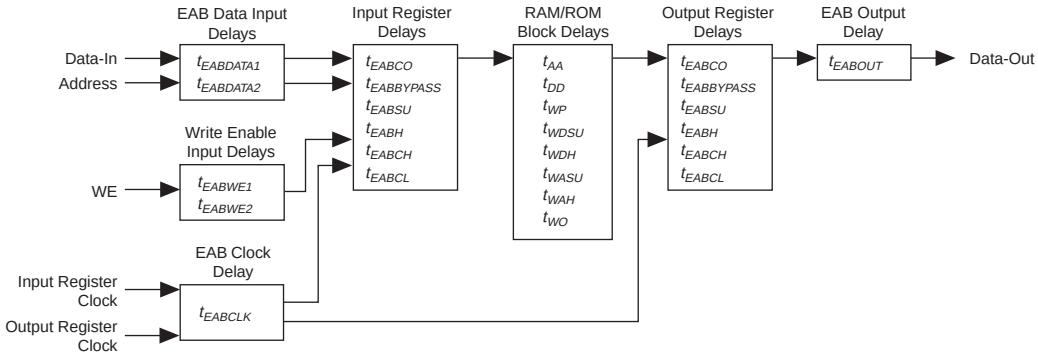


Figure 27. FLEX 10K Device EAB Timing Model



Figures 28 shows the timing model for bidirectional I/O pin timing.

Table 34. EAB Timing Microparameters *Note (1)*

Symbol	Parameter	Conditions
$t_{EABDATA1}$	Data or address delay to EAB for combinatorial input	
$t_{EABDATA2}$	Data or address delay to EAB for registered input	
t_{EABWE1}	Write enable delay to EAB for combinatorial input	
t_{EABWE2}	Write enable delay to EAB for registered input	
t_{EABCLK}	EAB register clock delay	
t_{EABCO}	EAB register clock-to-output delay	
$t_{EABBYPASS}$	Bypass register delay	
t_{EABSU}	EAB register setup time before clock	
t_{EABH}	EAB register hold time after clock	
t_{AA}	Address access delay	
t_{WP}	Write pulse width	
t_{WDSU}	Data setup time before falling edge of write pulse	*(5)*
t_{WDH}	Data hold time after falling edge of write pulse	*(5)*
t_{WASU}	Address setup time before rising edge of write pulse	*(5)*
t_{WAH}	Address hold time after falling edge of write pulse	*(5)*
t_{WO}	Write enable to data output valid delay	
t_{DD}	Data-in to data-out valid delay	
t_{EABOUT}	Data-out delay	
t_{EABCH}	Clock high time	
t_{EABCL}	Clock low time	

Table 43. EPF10K10 Device Interconnect Timing Microparameters *Note (1)*					
Symbol	**-3 Speed Grade**		**-4 Speed Grade**		**Unit**
	Min	**Max**	**Min**	**Max**	
$t_{DIN2IOE}$		4.8		6.2	ns
t_{DIN2LE}		2.6		3.8	ns
$t_{DIN2DATA}$		4.3		5.2	ns
$t_{DCLK2IOE}$		3.4		4.0	ns
$t_{DCLK2LE}$		2.6		3.8	ns
$t_{SAMELAB}$		0.6		0.6	ns
$t_{SAMEROW}$		3.6		3.8	ns
$t_{SAMECOLUMN}$		0.9		1.1	ns
$t_{DIFFROW}$		4.5		4.9	ns
$t_{TWOROWS}$		8.1		8.7	ns
$t_{LEPERIPH}$		3.3		3.9	ns
$t_{LABCARRY}$		0.5		0.8	ns
$t_{LABCASC}$		2.7		3.0	ns

Table 44. EPF10K20 Device Interconnect Timing Microparameters *Note (1)*					
Symbol	**-3 Speed Grade**		**-4 Speed Grade**		**Unit**
	Min	**Max**	**Min**	**Max**	
$t_{DIN2IOE}$		5.2		6.6	ns
t_{DIN2LE}		2.6		3.8	ns
$t_{DIN2DATA}$		4.3		5.2	ns
$t_{DCLK2IOE}$		4.3		4.0	ns
$t_{DCLK2LE}$		2.6		3.8	ns
$t_{SAMELAB}$		0.6		0.6	ns
$t_{SAMEROW}$		3.7		3.9	ns
$t_{SAMECOLUMN}$		1.4		1.6	ns
$t_{DIFFROW}$		5.1		5.5	ns
$t_{TWOROWS}$		8.8		9.4	ns
$t_{LEPERIPH}$		4.7		5.6	ns
$t_{LABCARRY}$		0.5		0.8	ns
$t_{LABCASC}$		2.7		3.0	ns

Table 59. EPF10K70 Device EAB Internal Microparameters *Note (1)*

Symbol	-2 Speed Grade		-3 Speed Grade		-4 Speed Grade		Unit
	Min	Max	Min	Max	Min	Max	
$t_{EABDATA1}$		1.3		1.5		1.9	ns
$t_{EABDATA2}$		4.3		4.8		6.0	ns
t_{EABWE1}		0.9		1.0		1.2	ns
t_{EABWE2}		4.5		5.0		6.2	ns
t_{EABCLK}		0.9		1.0		2.2	ns
t_{EABCO}		0.4		0.5		0.6	ns
$t_{EABBYPASS}$		1.3		1.5		1.9	ns
t_{EABSU}	1.3		1.5		1.8		ns
t_{EABH}	1.8		2.0		2.5		ns
t_{AA}		7.8		8.7		10.7	ns
t_{WP}	5.2		5.8		7.2		ns
t_{WDSU}	1.4		1.6		2.0		ns
t_{WDH}	0.3		0.3		0.4		ns
t_{WASU}	0.4		0.5		0.6		ns
t_{WAH}	0.9		1.0		1.2		ns
t_{WO}		4.5		5.0		6.2	ns
t_{DD}		4.5		5.0		6.2	ns
t_{EABOUT}		0.4		0.5		0.6	ns
t_{EABCH}	4.0		4.0		4.0		ns
t_{EABCL}	5.2		5.8		7.2		ns

Table 66. EPF10K100 Device EAB Internal Microparameters *Note (1)*

Symbol	-3DX Speed Grade		-3 Speed Grade		-4 Speed Grade		Unit
	Min	Max	Min	Max	Min	Max	
$t_{EABDATA1}$		1.5		1.5		1.9	ns
$t_{EABDATA2}$		4.8		4.8		6.0	ns
t_{EABWE1}		1.0		1.0		1.2	ns
t_{EABWE2}		5.0		5.0		6.2	ns
t_{EABCLK}		1.0		1.0		2.2	ns
t_{EABCO}		0.5		0.5		0.6	ns
$t_{EABBYPASS}$		1.5		1.5		1.9	ns
t_{EABSU}	1.5		1.5		1.8		ns
t_{EABH}	2.0		2.0		2.5		ns
t_{AA}		8.7		8.7		10.7	ns
t_{WP}	5.8		5.8		7.2		ns
t_{WDSU}	1.6		1.6		2.0		ns
t_{WDH}	0.3		0.3		0.4		ns
t_{WASU}	0.5		0.5		0.6		ns
t_{WAH}	1.0		1.0		1.2		ns
t_{WO}		5.0		5.0		6.2	ns
t_{DD}		5.0		5.0		6.2	ns
t_{EABOUT}		0.5		0.5		0.6	ns
t_{EABCH}	4.0		4.0		4.0		ns
t_{EABCL}	5.8		5.8		7.2		ns

Tables 71 through 77 show EPF10K50V device internal and external timing parameters.

Table 71. EPF10K50V Device LE Timing Microparameters *Note (1)*

Symbol	-1 Speed Grade		-2 Speed Grade		-3 Speed Grade		-4 Speed Grade		Unit
	Min	Max	Min	Max	Min	Max	Min	Max	
t_{LUT}		0.9		1.0		1.3		1.6	ns
t_{CLUT}		0.1		0.5		0.6		0.6	ns
t_{RLUT}		0.5		0.8		0.9		1.0	ns
t_{PACKED}		0.4		0.4		0.5		0.7	ns
t_{EN}		0.7		0.9		1.1		1.4	ns
t_{CICO}		0.2		0.2		0.2		0.3	ns
t_{CGEN}		0.8		0.7		0.8		1.2	ns
t_{CGENR}		0.4		0.3		0.3		0.4	ns
t_{CASC}		0.7		0.7		0.8		0.9	ns
t_{C}		0.3		1.0		1.3		1.5	ns
t_{CO}		0.5		0.7		0.9		1.0	ns
t_{COMB}		0.4		0.4		0.5		0.6	ns
t_{SU}	0.8		1.6		2.2		2.5		ns
t_{H}	0.5		0.8		1.0		1.4		ns
t_{PRE}		0.8		0.4		0.5		0.5	ns
t_{CLR}		0.8		0.4		0.5		0.5	ns
t_{CH}	2.0		4.0		4.0		4.0		ns
t_{CL}	2.0		4.0		4.0		4.0		ns

Notes to tables:
(1) All timing parameters are described in Tables 32 through 38 in this data sheet.
(2) Using an LE to register the signal may provide a lower setup time.
(3) This parameter is specified by characterization.

Tables 78 through 84 show EPF10K130V device internal and external timing parameters.

Table 78. EPF10K130V Device LE Timing Microparameters *Note (1)*

Symbol	-2 Speed Grade		-3 Speed Grade		-4 Speed Grade		Unit
	Min	Max	Min	Max	Min	Max	
t_{LUT}		1.3		1.8		2.3	ns
t_{CLUT}		0.5		0.7		0.9	ns
t_{RLUT}		1.2		1.7		2.2	ns
t_{PACKED}		0.5		0.6		0.7	ns
t_{EN}		0.6		0.8		1.0	ns
t_{CICO}		0.2		0.3		0.4	ns
t_{CGEN}		0.3		0.4		0.5	ns
t_{CGENR}		0.7		1.0		1.3	ns
t_{CASC}		0.9		1.2		1.5	ns
t_{C}		1.9		2.4		3.0	ns
t_{CO}		0.6		0.9		1.1	ns
t_{COMB}		0.5		0.7		0.9	ns
t_{SU}	0.2		0.2		0.3		ns
t_{H}	0.0		0.0		0.0		ns
t_{PRE}		2.4		3.1		3.9	ns
t_{CLR}		2.4		3.1		3.9	ns
t_{CH}	4.0		4.0		4.0		ns
t_{CL}	4.0		4.0		4.0		ns

Table 81. EPF10K130V Device EAB Internal Timing Macroparameters *Note (1)*							
Symbol	**-2 Speed Grade**		**-3 Speed Grade**		**-4 Speed Grade**		**Unit**
	Min	**Max**	**Min**	**Max**	**Min**	**Max**	
t_{EABAA}		11.2		14.2		14.2	ns
$t_{EABRCCOMB}$	11.1		14.2		14.2		ns
$t_{EABRCREG}$	8.5		10.8		10.8		ns
t_{EABWP}	3.7		4.7		4.7		ns
$t_{EABWCCOMB}$	7.6		9.7		9.7		ns
$t_{EABWCREG}$	14.0		17.8		17.8		ns
t_{EABDD}		11.1		14.2		14.2	ns
$t_{EABDATACO}$		3.6		4.6		4.6	ns
$t_{EABDATASU}$	4.4		5.6		5.6		ns
$t_{EABDATAH}$	0.0		0.0		0.0		ns
$t_{EABWESU}$	4.4		5.6		5.6		ns
t_{EABWEH}	0.0		0.0		0.0		ns
$t_{EABWDSU}$	4.6		5.9		5.9		ns
t_{EABWDH}	0.0		0.0		0.0		ns
$t_{EABWASU}$	3.9		5.0		5.0		ns
t_{EABWAH}	0.0		0.0		0.0		ns
t_{EABWO}		11.1		14.2		14.2	ns

Notes to tables:
(1) All timing parameters are described in Tables 32 through 38 in this data sheet.
(2) Using an LE to register the signal may provide a lower setup time.
(3) This parameter is specified by characterization.

Tables 85 through 91 show EPF10K10A device internal and external timing parameters.

Table 85. EPF10K10A Device LE Timing Microparameters *Note (1)*

Symbol	-1 Speed Grade		-2 Speed Grade		-3 Speed Grade		Unit
	Min	Max	Min	Max	Min	Max	
t_{LUT}		0.9		1.2		1.6	ns
t_{CLUT}		1.2		1.4		1.9	ns
t_{RLUT}		1.9		2.3		3.0	ns
t_{PACKED}		0.6		0.7		0.9	ns
t_{EN}		0.5		0.6		0.8	ns
t_{CICO}		02		0.3		0.4	ns
t_{CGEN}		0.7		0.9		1.1	ns
t_{CGENR}		0.7		0.9		1.1	ns
t_{CASC}		1.0		1.2		1.7	ns
t_{C}		1.2		1.4		1.9	ns
t_{CO}		0.5		0.6		0.8	ns
t_{COMB}		0.5		0.6		0.8	ns
t_{SU}	1.1		1.3		1.7		ns
t_{H}	0.6		0.7		0.9		ns
t_{PRE}		0.5		0.6		0.9	ns
t_{CLR}		0.5		0.6		0.9	ns
t_{CH}	3.0		3.5		4.0		ns
t_{CL}	3.0		3.5		4.0		ns

Table 86. EPF10K10A Device IOE Timing Microparameters *Note (1)* **(Part 1 of 2)**

Symbol	-1 Speed Grade		-2 Speed Grade		-3 Speed Grade		Unit
	Min	Max	Min	Max	Min	Max	
		1.3		1.5		2.0	ns
t_{IOC}		0.2		0.3		0.3	ns
t_{IOCO}		0.2		0.3		0.4	ns
t_{IOCOMB}		0.6		0.7		0.9	ns
t_{IOSU}	0.8		1.0		1.3		ns

Table 86. EPF10K10A Device IOE Timing Microparameters *Note (1)* *(Part 2 of 2)*

Symbol	-1 Speed Grade		-2 Speed Grade		-3 Speed Grade		Unit
	Min	Max	Min	Max	Min	Max	
t_{IOH}	0.8		1.0		1.3		ns
t_{IOCLR}		1.2		1.4		1.9	ns
t_{OD1}		1.2		1.4		1.9	ns
t_{OD2}		2.9		3.5		4.7	ns
t_{OD3}		6.6		7.8		10.5	ns
t_{XZ}		1.2		1.4		1.9	ns
t_{ZX1}		1.2		1.4		1.9	ns
t_{ZX2}		2.9		3.5		4.7	ns
t_{ZX3}		6.6		7.8		10.5	ns
t_{INREG}		5.2		6.3		8.4	ns
t_{IOFD}		3.1		3.8		5.0	ns
t_{INCOMB}		3.1		3.8		5.0	ns

Table 89. EPF10K10A Device Interconnect Timing Microparameters *Note (1)*

Symbol	-1 Speed Grade		-2 Speed Grade		-3 Speed Grade		Unit
	Min	Max	Min	Max	Min	Max	
$t_{DIN2IOE}$		4.2		5.0		6.5	ns
t_{DIN2LE}		2.2		2.6		3.4	ns
$t_{DIN2DATA}$		4.3		5.2		7.1	ns
$t_{DCLK2IOE}$		4.2		4.9		6.6	ns
$t_{DCLK2LE}$		2.2		2.6		3.4	ns
$t_{SAMELAB}$		0.1		0.1		0.2	ns
$t_{SAMEROW}$		2.2		2.4		2.9	ns
$t_{SAMECOLUMN}$		0.8		1.0		1.4	ns
$t_{DIFFROW}$		3.0		3.4		4.3	ns
$t_{TWOROWS}$		5.2		5.8		7.2	ns
$t_{LEPERIPH}$		1.8		2.2		2.8	ns
$t_{LABCARRY}$		0.5		0.5		0.7	ns
$t_{LABCASC}$		0.9		1.0		1.5	ns

Table 90. EPF10K10A External Reference Timing Parameters *Note (1)*

Symbol	-1 Speed Grade		-2 Speed Grade		-3 Speed Grade		Unit
	Min	Max	Min	Max	Min	Max	
t_{DRR}		10.0		12.0		16.0	ns
t_{INSU} *(2)*, *(3)*	1.6		2.1		2.8		ns
t_{INH} *(3)*	0.0		0.0		0.0		ns
t_{OUTCO} *(3)*	2.0	5.8	2.0	6.9	2.0	9.2	ns

Table 91. EPF10K10A Device External Bidirectional Timing Parameters *Note (1)*

Symbol	-2 Speed Grade		-3 Speed Grade		-4 Speed Grade		Unit
	Min	Max	Min	Max	Min	Max	
$t_{INSUBIDIR}$	2.4		3.3		4.5		ns
$t_{INHBIDIR}$	0.0		0.0		0.0		ns
$t_{OUTCOBIDIR}$	2.0	5.8	2.0	6.9	2.0	9.2	ns
$t_{XZBIDIR}$		6.3		7.5		9.9	ns
$t_{ZXBIDIR}$		6.3		7.5		9.9	ns

Table 94. EPF10K30A Device EAB Internal Microparameters *Note (1)*

Symbol	-1 Speed Grade		-2 Speed Grade		-3 Speed Grade		Unit
	Min	Max	Min	Max	Min	Max	
$t_{EABDATA1}$		5.5		6.5		8.5	ns
$t_{EABDATA2}$		1.1		1.3		1.8	ns
t_{EABWE1}		2.4		2.8		3.7	ns
t_{EABWE2}		2.1		2.5		3.2	ns
t_{EABCLK}		0.0		0.0		0.2	ns
t_{EABCO}		1.7		2.0		2.6	ns
$t_{EABBYPASS}$		0.0		0.0		0.3	ns
t_{EABSU}	1.2		1.4		1.9		ns
t_{EABH}	0.1		0.1		0.3		ns
t_{AA}		4.2		5.0		6.5	ns
t_{WP}	3.8		4.5		5.9		ns
t_{WDSU}	0.1		0.1		0.2		ns
t_{WDH}	0.1		0.1		0.2		ns
t_{WASU}	0.1		0.1		0.2		ns
t_{WAH}	0.1		0.1		0.2		ns
t_{WO}		3.7		4.4		6.4	ns
t_{DD}		3.7		4.4		6.4	ns
t_{EABOUT}		0.0		0.1		0.6	ns
t_{EABCH}	3.0		3.5		4.0		ns
t_{EABCL}	3.8		4.5		5.9		ns

Notes to tables:
(1) All timing parameters are described in Tables 32 through 38 in this data sheet.
(2) Using an LE to register the signal may provide a lower setup time.
(3) This parameter is specified by characterization.

Tables 99 through 105 show EPF10K100A device internal and external timing parameters.

Table 99. EPF10K100A Device LE Timing Microparameters *Note (1)*

Symbol	-1 Speed Grade		-2 Speed Grade		-3 Speed Grade		Unit
	Min	Max	Min	Max	Min	Max	
t_{LUT}		1.0		1.2		1.4	ns
t_{CLUT}		0.8		0.9		1.1	ns
t_{RLUT}		1.4		1.6		1.9	ns
t_{PACKED}		0.4		0.5		0.5	ns
t_{EN}		0.6		0.7		0.8	ns
t_{CICO}		0.2		0.2		0.3	ns
t_{CGEN}		0.4		0.4		0.6	ns
t_{CGENR}		0.6		0.7		0.8	ns
t_{CASC}		0.7		0.9		1.0	ns
t_{C}		0.9		1.0		1.2	ns
t_{CO}		0.2		0.3		0.3	ns
t_{COMB}		0.6		0.7		0.8	ns
t_{SU}	0.8		1.0		1.2		ns
t_{H}	0.3		0.5		0.5		ns
t_{PRE}		0.3		0.3		0.4	ns
t_{CLR}		0.3		0.3		0.4	ns
t_{CH}	2.5		3.5		4.0		ns
t_{CL}	2.5		3.5		4.0		ns

Notes to tables:
(1) All timing parameters are described in Tables 32 through 38 in this data sheet.
(2) Using an LE to register the signal may provide a lower setup time.
(3) This parameter is specified by characterization.

Tables 106 through 112 show EPF10K250A device internal and external timing parameters.

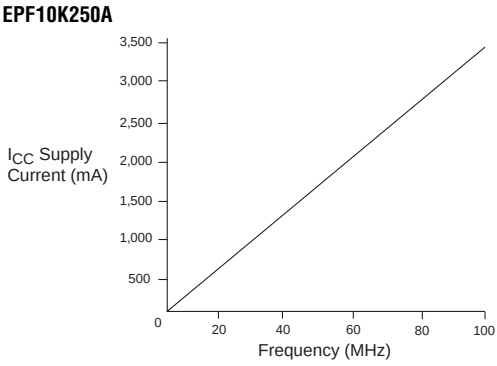
Table 106. EPF10K250A Device LE Timing Microparameters *Note (1)*

Symbol	-1 Speed Grade		-2 Speed Grade		-3 Speed Grade		Unit
	Min	Max	Min	Max	Min	Max	
t_{LUT}		0.9		1.0		1.4	ns
t_{CLUT}		1.2		1.3		1.6	ns
t_{RLUT}		2.0		2.3		2.7	ns
t_{PACKED}		0.4		0.4		0.5	ns
t_{EN}		1.4		1.6		1.9	ns
t_{CICO}		0.2		0.3		0.3	ns
t_{CGEN}		0.4		0.6		0.6	ns
t_{CGENR}		0.8		1.0		1.1	ns
t_{CASC}		0.7		0.8		1.0	ns
t_{C}		1.2		1.3		1.6	ns
t_{CO}		0.6		0.7		0.9	ns
t_{COMB}		0.5		0.6		0.7	ns
t_{SU}	1.2		1.4		1.7		ns
t_{H}	1.2		1.3		1.6		ns
t_{PRE}		0.7		0.8		0.9	ns
t_{CLR}		0.7		0.8		0.9	ns
t_{CH}	2.5		3.0		3.5		ns
t_{CL}	2.5		3.0		3.5		ns

Table 107. EPF10K250A Device IOE Timing Microparameters *Note (1)*

Symbol	-1 Speed Grade		-2 Speed Grade		-3 Speed Grade		Unit
	Min	Max	Min	Max	Min	Max	
t_{IOD}		1.2		1.3		1.6	ns
t_{IOC}		0.4		0.4		0.5	ns
t_{IOCO}		0.8		0.9		1.1	ns
t_{IOCOMB}		0.7		0.7		0.8	ns
t_{IOSU}	2.7		3.1		3.6		ns
t_{IOH}	0.2		0.3		0.3		ns
t_{IOCLR}		1.2		1.3		1.6	ns
t_{OD1}		3.2		3.6		4.2	ns
t_{OD2}		5.9		6.7		7.8	ns
t_{OD3}		8.7		9.8		11.5	ns
t_{XZ}		3.8		4.3		5.0	ns
t_{ZX1}		3.8		4.3		5.0	ns
t_{ZX2}		6.5		7.4		8.6	ns
t_{ZX3}		9.3		10.5		12.3	ns
t_{INREG}		8.2		9.3		10.9	ns
t_{IOFD}		9.0		10.2		12.0	ns
t_{INCOMB}		9.0		10.2		12.0	ns

Figure 32. $I_{CCACTIVE}$ vs. Operating Frequency (Part 3 of 3)



Configuration & Operation

The FLEX 10K architecture supports several configuration schemes. This section summarizes the device operating modes and available device configuration schemes.

See *Application Note 116 (Configuring APEX 20K, FLEX 10K & FLEX 6000 Devices)* for detailed descriptions of device configuration options, device configuration pins, and for information on configuring FLEX 10K devices, including sample schematics, timing diagrams, and configuration parameters.

Operating Modes

The FLEX 10K architecture uses SRAM configuration elements that require configuration data to be loaded every time the circuit powers up. The process of physically loading the SRAM data into the device is called *configuration*. Before configuration, as VCC rises, the device initiates a Power-On Reset (POR). This POR event clears the device and prepares it for configuration. The FLEX 10K POR time does not exceed 50 µs.

During initialization, which occurs immediately after configuration, the device resets registers, enables I/O pins, and begins to operate as a logic device. The I/O pins are tri-stated during power-up, and before and during configuration. Together, the configuration and initialization processes are called *command mode*; normal device operation is called *user mode*.