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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	4300
Number of Logic Elements/Cells	107500
Total RAM Bits	4992000
Number of I/O	744
Number of Gates	-
Voltage - Supply	0.86V ~ 1.15V
Mounting Type	Surface Mount
Operating Temperature	0°C ~ 85°C (TJ)
Package / Case	1152-BBGA, FCBGA
Supplier Device Package	1152-FBGA (35x35)
Purchase URL	https://www.e-xfl.com/product-detail/intel/ep3sl110f1152c4n

OCT Calibration Block Specifications

Table 1–34 lists the on-chip termination calibration block specifications for Stratix III devices.

Table 1–34. On-Chip Termination Calibration Block Specification

Symbol	Description	Min	Typical	Max	Unit
OCTUSRCLK	Clock required by OCT calibration blocks	—	—	20	MHz
t_{OCTCAL}	Number of OCTUSRCLK clock cycles required for OCT Rs and Rt calibration	—	1000	—	cycles
$t_{OCTSHIFT}$	Number of OCTUSRCLK clock cycles required for OCT code to shift out per OCT calibration block	—	28	—	cycles
t_{RS_RT}	Time required to dynamically switch from Rs to Rt	—	2.5	—	ns

DCD Specifications

Table 1–35 lists the worst case duty cycle distortion for Stratix III devices.

Table 1–35. Duty Cycle Distortion on Stratix III I/O Pins *(Note 1)*

Symbol	C2		C3		C4		Unit
	Min	Max	Min	Max	Min	Max	
Output Duty Cycle	45	55	45	55	45	55	%

Note to Table 1–35:

(1) The DCD specification applies to clock outputs from the PLLs, global clock tree, and IOE driving dedicated and general-purpose I/O pins.

I/O Timing

The following sections describe the timing models, preliminary and final timings, I/O timing measurement methodology, I/O default capacitive loading, programmable IOE delay, programmable output buffer delay, user I/O timing, and dedicated clock pin timing.

Timing Model

The DirectDrive technology and MultiTrack interconnect ensure predictable performance, accurate simulation, and accurate timing analysis across all Stratix III device densities and speed grades. This section describes the performance of the Stratix III device I/Os.

All specifications except the fast model are representative of worst-case supply voltage and junction temperature conditions. Fast model specifications are representative of best case process, supply voltage, and junction temperature conditions.

The timing numbers listed in this section are extracted from the Quartus II software version 8.1.

Table 1–43. EP3SL50 Column Pins output Timing Parameters (Part 3 of 7)

I/O Standard	Current Strength	Clock	Parameter	Fast Model		C2	C3	C4	C4L		I3	I4	I4L		Units
				Industrial	Commercial	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 0.9 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 0.9 V	
1.8 V	2mA	GCLK	t_{co}	3.359	3.347	4.782	5.197	5.726	5.608	5.810	5.197	5.726	5.608	5.810	ns
		GCLK PLL	t_{co}	3.715	3.715	5.304	5.759	6.336	6.193	6.460	5.759	6.336	6.193	6.460	ns
	4mA	GCLK	t_{co}	3.178	3.166	4.503	4.888	5.379	5.262	5.461	4.888	5.379	5.262	5.461	ns
		GCLK PLL	t_{co}	3.534	3.534	5.025	5.450	5.989	5.847	6.112	5.450	5.989	5.847	6.112	ns
	6mA	GCLK	t_{co}	3.096	3.084	4.396	4.773	5.268	5.150	5.352	4.773	5.268	5.150	5.352	ns
		GCLK PLL	t_{co}	3.452	3.452	4.918	5.335	5.878	5.735	6.002	5.335	5.878	5.735	6.002	ns
	8mA	GCLK	t_{co}	3.076	3.064	4.337	4.719	5.202	5.084	5.286	4.719	5.202	5.084	5.286	ns
		GCLK PLL	t_{co}	3.432	3.432	4.860	5.281	5.812	5.669	5.936	5.281	5.812	5.669	5.936	ns
	10mA	GCLK	t_{co}	3.013	3.001	4.276	4.644	5.121	5.003	5.205	4.644	5.121	5.003	5.205	ns
		GCLK PLL	t_{co}	3.369	3.369	4.799	5.206	5.731	5.588	5.855	5.206	5.731	5.588	5.855	ns
	12mA	GCLK	t_{co}	2.995	2.983	4.256	4.623	5.098	4.980	5.182	4.623	5.098	4.980	5.182	ns
		GCLK PLL	t_{co}	3.351	3.351	4.778	5.185	5.708	5.565	5.832	5.185	5.708	5.565	5.832	ns
1.5 V	2mA	GCLK	t_{co}	3.305	3.293	4.710	5.129	5.664	5.546	5.748	5.129	5.664	5.546	5.748	ns
		GCLK PLL	t_{co}	3.661	3.661	5.233	5.691	6.274	6.131	6.398	5.691	6.274	6.131	6.398	ns
	4mA	GCLK	t_{co}	3.093	3.081	4.391	4.773	5.272	5.154	5.356	4.773	5.272	5.154	5.356	ns
		GCLK PLL	t_{co}	3.449	3.449	4.914	5.335	5.882	5.739	6.006	5.335	5.882	5.739	6.006	ns
	6mA	GCLK	t_{co}	3.068	3.056	4.324	4.713	5.205	5.087	5.289	4.713	5.205	5.087	5.289	ns
		GCLK PLL	t_{co}	3.424	3.424	4.847	5.275	5.815	5.672	5.939	5.275	5.815	5.672	5.939	ns
	8mA	GCLK	t_{co}	3.057	3.045	4.307	4.688	5.185	5.067	5.269	4.688	5.185	5.067	5.269	ns
		GCLK PLL	t_{co}	3.413	3.413	4.830	5.250	5.795	5.652	5.919	5.250	5.795	5.652	5.919	ns
	10mA	GCLK	t_{co}	3.002	2.990	4.269	4.637	5.115	4.997	5.199	4.637	5.115	4.997	5.199	ns
		GCLK PLL	t_{co}	3.358	3.358	4.792	5.199	5.725	5.582	5.849	5.199	5.725	5.582	5.849	ns
	12mA	GCLK	t_{co}	2.997	2.985	4.253	4.626	5.104	4.986	5.188	4.626	5.104	4.986	5.188	ns
		GCLK PLL	t_{co}	3.353	3.353	4.775	5.188	5.714	5.571	5.838	5.188	5.714	5.571	5.838	ns

Table 1–47. EP3SL50 Column Pins Output Timing Parameters (Part 3 of 4)

I/O Standard	Current Strength	Clock	Parameter	Fast Model		C2	C3	C4	C4L		I3	I4	I4L		Units
				Industrial	Commercial	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 0.9 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 0.9 V	
DIFFERENTIAL 1.5-V SSTL CLASS I	4mA	GCLK	t_{co}	3.056	3.279	4.646	5.054	5.571	5.431	5.649	5.181	5.698	5.560	5.717	ns
		GCLK PLL	t_{co}	3.046	3.269	4.636	5.043	5.561	5.421	5.639	5.170	5.688	5.550	5.707	ns
	6mA	GCLK	t_{co}	3.046	3.269	4.639	5.047	5.565	5.425	5.643	5.175	5.693	5.555	5.712	ns
		GCLK PLL	t_{co}	3.039	3.263	4.632	5.041	5.559	5.419	5.637	5.168	5.687	5.549	5.706	ns
	8mA	GCLK	t_{co}	3.038	3.261	4.629	5.038	5.556	5.416	5.634	5.165	5.683	5.545	5.702	ns
		GCLK PLL	t_{co}	3.060	3.283	4.650	5.058	5.575	5.435	5.653	5.185	5.703	5.565	5.722	ns
	10mA	GCLK	t_{co}	3.050	3.272	4.629	5.035	5.550	5.410	5.628	5.161	5.676	5.538	5.695	ns
		GCLK PLL	t_{co}	3.045	3.268	4.629	5.035	5.551	5.411	5.629	5.162	5.678	5.540	5.697	ns
	12mA	GCLK	t_{co}	3.043	3.266	4.628	5.034	5.549	5.409	5.627	5.161	5.677	5.539	5.696	ns
		GCLK PLL	t_{co}	3.035	3.257	4.618	5.024	5.540	5.400	5.618	5.151	5.667	5.529	5.686	ns
DIFFERENTIAL 1.5-V SSTL CLASS II	8mA	GCLK	t_{co}	3.036	3.259	4.624	5.031	5.548	5.408	5.626	5.159	5.676	5.538	5.695	ns
		GCLK PLL	t_{co}	3.035	3.256	4.607	5.012	5.526	5.386	5.604	5.138	5.652	5.514	5.671	ns
	16mA	GCLK	t_{co}	3.047	3.269	4.625	5.030	5.544	5.404	5.622	5.157	5.671	5.533	5.690	ns
		GCLK PLL	t_{co}	3.043	3.266	4.626	5.032	5.548	5.408	5.626	5.159	5.675	5.537	5.694	ns
DIFFERENTIAL 1.8-V SSTL CLASS I	4mA	GCLK	t_{co}	3.033	3.255	4.615	5.021	5.536	5.396	5.614	5.148	5.663	5.525	5.682	ns
		GCLK PLL	t_{co}	3.031	3.253	4.613	5.018	5.534	5.394	5.612	5.146	5.661	5.523	5.680	ns
	6mA	GCLK	t_{co}	3.031	3.254	4.616	5.023	5.539	5.399	5.617	5.150	5.667	5.529	5.686	ns
		GCLK PLL	t_{co}	3.035	3.257	4.613	5.018	5.533	5.393	5.611	5.145	5.660	5.522	5.679	ns
	8mA	GCLK	t_{co}	3.061	3.286	4.658	5.066	5.583	5.443	5.661	5.193	5.710	5.572	5.729	ns
		GCLK PLL	t_{co}	3.047	3.272	4.646	5.055	5.573	5.433	5.651	5.183	5.701	5.563	5.720	ns
	10mA	GCLK	t_{co}	3.035	3.259	4.629	5.037	5.555	5.415	5.633	5.165	5.683	5.545	5.702	ns
		GCLK PLL	t_{co}	3.035	3.259	4.632	5.041	5.559	5.419	5.637	5.169	5.688	5.550	5.707	ns
	12mA	GCLK	t_{co}	3.031	3.255	4.625	5.033	5.552	5.412	5.630	5.162	5.680	5.542	5.699	ns
		GCLK PLL	t_{co}	3.035	3.257	4.618	5.024	5.540	5.400	5.618	5.151	5.667	5.529	5.686	ns
DIFFERENTIAL 1.8-V SSTL CLASS II	8mA	GCLK	t_{co}	3.036	3.259	4.626	5.034	5.551	5.411	5.629	5.161	5.679	5.541	5.698	ns
		GCLK PLL	t_{co}	3.064	3.289	4.657	5.064	5.581	5.441	5.659	5.192	5.708	5.570	5.727	ns
	16mA	GCLK	t_{co}	3.053	3.277	4.645	5.052	5.569	5.429	5.647	5.180	5.696	5.558	5.715	ns
		GCLK PLL	t_{co}	3.048	3.273	4.645	5.053	5.570	5.430	5.648	5.181	5.698	5.560	5.717	ns

Table 1–67. EP3SL110 Column Pins Output Timing Parameters (Part 3 of 4)

I/O Standard	Current Strength	Clock	Parameter	Fast Model		C2	C3	C4	C4L		I3	I4	I4L		Units
				Industrial	Commercial	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 0.9 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 0.9 V	
DIFFERENTIAL 1.8-V HSTL CLASS I	4mA	GCLK	t_{co}	3.118	3.353	4.737	5.133	5.643	5.504	5.788	5.256	5.765	5.629	5.862	ns
		GCLK PLL	t_{co}	1.326	1.503	1.935	2.032	2.245	2.256	2.283	2.137	2.352	2.362	2.270	ns
	6mA	GCLK	t_{co}	3.114	3.350	4.738	5.135	5.647	5.508	5.792	5.258	5.769	5.633	5.866	ns
		GCLK PLL	t_{co}	1.322	1.500	1.936	2.034	2.249	2.260	2.287	2.139	2.356	2.366	2.274	ns
	8mA	GCLK	t_{co}	3.104	3.339	4.727	5.124	5.635	5.496	5.780	5.247	5.757	5.621	5.854	ns
		GCLK PLL	t_{co}	1.312	1.489	1.925	2.023	2.237	2.248	2.275	2.128	2.344	2.354	2.262	ns
	10mA	GCLK	t_{co}	3.102	3.337	4.725	5.121	5.633	5.494	5.778	5.245	5.755	5.619	5.852	ns
		GCLK PLL	t_{co}	1.310	1.487	1.923	2.020	2.235	2.246	2.273	2.126	2.342	2.352	2.260	ns
	12mA	GCLK	t_{co}	3.102	3.338	4.728	5.126	5.638	5.499	5.783	5.249	5.761	5.625	5.858	ns
		GCLK PLL	t_{co}	1.310	1.488	1.926	2.025	2.240	2.251	2.278	2.130	2.348	2.358	2.266	ns
DIFFERENTIAL 1.8-V HSTL CLASS II	16mA	GCLK	t_{co}	3.106	3.341	4.725	5.121	5.632	5.493	5.777	5.244	5.754	5.618	5.851	ns
		GCLK PLL	t_{co}	1.314	1.491	1.923	2.020	2.234	2.245	2.272	2.125	2.341	2.351	2.259	ns
DIFFERENTIAL 1.5-V SSTL CLASS I	4mA	GCLK	t_{co}	3.132	3.370	4.770	5.169	5.682	5.543	5.827	5.292	5.804	5.668	5.901	ns
		GCLK PLL	t_{co}	1.340	1.520	1.968	2.068	2.284	2.295	2.322	2.173	2.391	2.401	2.309	ns
	6mA	GCLK	t_{co}	3.118	3.356	4.758	5.158	5.672	5.533	5.817	5.282	5.795	5.659	5.892	ns
		GCLK PLL	t_{co}	1.326	1.506	1.956	2.057	2.274	2.285	2.312	2.163	2.382	2.392	2.300	ns
	8mA	GCLK	t_{co}	3.106	3.343	4.741	5.140	5.654	5.515	5.799	5.264	5.777	5.641	5.874	ns
		GCLK PLL	t_{co}	1.314	1.493	1.939	2.039	2.256	2.267	2.294	2.145	2.364	2.374	2.282	ns
	10mA	GCLK	t_{co}	3.106	3.343	4.744	5.144	5.658	5.519	5.803	5.268	5.782	5.646	5.879	ns
		GCLK PLL	t_{co}	1.314	1.493	1.942	2.043	2.260	2.271	2.298	2.149	2.369	2.379	2.287	ns
	12mA	GCLK	t_{co}	3.102	3.339	4.737	5.136	5.651	5.512	5.796	5.261	5.774	5.638	5.871	ns
		GCLK PLL	t_{co}	1.310	1.489	1.935	2.035	2.253	2.264	2.291	2.142	2.361	2.371	2.279	ns
DIFFERENTIAL 1.5-V SSTL CLASS II	8mA	GCLK	t_{co}	3.106	3.341	4.730	5.127	5.639	5.500	5.784	5.250	5.761	5.625	5.858	ns
		GCLK PLL	t_{co}	1.314	1.491	1.928	2.026	2.241	2.252	2.279	2.131	2.348	2.358	2.266	ns
	16mA	GCLK	t_{co}	3.107	3.343	4.738	5.137	5.650	5.511	5.795	5.260	5.773	5.637	5.870	ns
		GCLK PLL	t_{co}	1.315	1.493	1.936	2.036	2.252	2.263	2.290	2.141	2.360	2.370	2.278	ns

Table 1–70 lists the EP3SL110 row pin delay adders when using the regional clock.

Table 1–70. EP3SL110 Row Pin Delay Adders for Regional Clock

Parameter	Fast Model		C2	C3	C4	C4L		I3	I4	I4L		Units
	Industrial	Commercial	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 0.9 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 0.9 V	
RCLK input adder	0.086	0.109	0.158	0.16	0.161	0.159	0.281	0.137	0.153	0.153	0.285	ns
RCLK PLL input adder	0.075	0.075	0.117	0.123	0.129	0.125	0.222	0.113	0.118	0.114	0.226	ns
RCLK output adder	-0.072	-0.097	-0.137	-0.135	-0.116	-0.134	-0.24	-0.11	-0.104	-0.124	-0.244	ns
RCLK PLL output adder	-0.063	-0.065	-0.097	-0.1	-0.104	-0.101	-0.198	-0.088	-0.09	-0.088	-0.201	ns

EP3SL150 I/O Timing Parameters

Table 1–71 through Table 1–74 list the maximum I/O timing parameters for EP3SL150 devices for single-ended I/O standards.

Table 1–71 lists the EP3SL150 column pins input timing parameters for single-ended I/O standards.

Table 1–71. EP3SL150 Column Pins Input Timing Parameters (Part 1 of 3)

I/O Standard	Clock	Parameter	Fast Model		C2	C3	C4	C4L		I3	I4	I4L		Units
			Industrial	Commercial	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 0.9 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 0.9 V	
3.3-V LVTTL	GCLK	t_{su}	-0.986	-0.964	-1.402	-1.558	-1.797	-1.778	-2.106	-1.558	-1.797	-1.778	-2.106	ns
		t_h	1.119	1.093	1.584	1.767	2.027	1.996	2.327	1.767	2.027	1.996	2.327	ns
	GCLK PLL	t_{su}	-1.278	-1.221	-1.771	-1.984	-2.197	-2.123	-2.542	-1.984	-2.197	-2.123	-2.542	ns
		t_h	1.556	1.499	2.175	2.439	2.697	2.598	3.034	2.439	2.697	2.598	3.034	ns
3.3-V LVCMOS	GCLK	t_{su}	-0.986	-0.964	-1.402	-1.558	-1.797	-1.778	-2.106	-1.558	-1.797	-1.778	-2.106	ns
		t_h	1.119	1.093	1.584	1.767	2.027	1.996	2.327	1.767	2.027	1.996	2.327	ns
	GCLK PLL	t_{su}	-1.278	-1.221	-1.771	-1.984	-2.197	-2.123	-2.542	-1.984	-2.197	-2.123	-2.542	ns
		t_h	1.556	1.499	2.175	2.439	2.697	2.598	3.034	2.439	2.697	2.598	3.034	ns
3.0-V LVTTL	GCLK	t_{su}	-0.997	-0.975	-1.401	-1.560	-1.796	-1.777	-2.105	-1.560	-1.796	-1.777	-2.105	ns
		t_h	1.130	1.104	1.583	1.769	2.026	1.995	2.326	1.769	2.026	1.995	2.326	ns
	GCLK PLL	t_{su}	-1.289	-1.232	-1.770	-1.986	-2.196	-2.122	-2.541	-1.986	-2.196	-2.122	-2.541	ns
		t_h	1.567	1.510	2.174	2.441	2.696	2.597	3.033	2.441	2.696	2.597	3.033	ns
3.0-V LVCMOS	GCLK	t_{su}	-0.997	-0.975	-1.401	-1.560	-1.796	-1.777	-2.105	-1.560	-1.796	-1.777	-2.105	ns
		t_h	1.130	1.104	1.583	1.769	2.026	1.995	2.326	1.769	2.026	1.995	2.326	ns
	GCLK PLL	t_{su}	-1.289	-1.232	-1.770	-1.986	-2.196	-2.122	-2.541	-1.986	-2.196	-2.122	-2.541	ns
		t_h	1.567	1.510	2.174	2.441	2.696	2.597	3.033	2.441	2.696	2.597	3.033	ns
2.5 V	GCLK	t_{su}	-0.992	-0.970	-1.410	-1.572	-1.815	-1.796	-2.124	-1.572	-1.815	-1.796	-2.124	ns
		t_h	1.125	1.099	1.592	1.781	2.045	2.014	2.345	1.781	2.045	2.014	2.345	ns
	GCLK PLL	t_{su}	-1.284	-1.227	-1.779	-1.998	-2.215	-2.141	-2.560	-1.998	-2.215	-2.141	-2.560	ns
		t_h	1.562	1.505	2.183	2.453	2.715	2.616	3.052	2.453	2.715	2.616	3.052	ns

Table 1–72 lists the EP3SL150 row pins input timing parameters for single-ended I/O standards.

Table 1–72. EP3SL150 Row Pins Input Timing Parameters (Part 1 of 3)

I/O Standard	Clock	Parameter	Fast Model		C2	C3	C4	C4L		I3	I4	I4L		Units
			Industrial	Commercial	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 0.9 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 0.9 V	
3.3-V LVTTL	GCLK	t_{su}	-0.925	-0.964	-1.360	-1.470	-1.682	-1.633	-1.954	-1.480	-1.679	-1.634	-1.993	ns
		t_h	1.040	1.094	1.544	1.677	1.910	1.851	2.173	1.698	1.917	1.860	2.212	ns
	GCLK PLL	t_{su}	0.988	1.009	1.642	1.858	1.971	1.855	1.796	1.865	1.993	1.875	1.848	ns
		t_h	-0.737	-0.741	-1.241	-1.407	-1.471	-1.383	-1.314	-1.407	-1.482	-1.393	-1.363	ns
3.3-V LVCMOS	GCLK	t_{su}	-0.925	-0.964	-1.360	-1.470	-1.682	-1.633	-1.954	-1.480	-1.679	-1.634	-1.993	ns
		t_h	1.040	1.094	1.544	1.677	1.910	1.851	2.173	1.698	1.917	1.860	2.212	ns
	GCLK PLL	t_{su}	0.988	1.009	1.642	1.858	1.971	1.855	1.796	1.865	1.993	1.875	1.848	ns
		t_h	-0.737	-0.741	-1.241	-1.407	-1.471	-1.383	-1.314	-1.407	-1.482	-1.393	-1.363	ns
3.0-V LVTTL	GCLK	t_{su}	-0.931	-0.975	-1.357	-1.471	-1.685	-1.636	-1.957	-1.479	-1.684	-1.639	-1.998	ns
		t_h	1.046	1.105	1.541	1.678	1.913	1.854	2.176	1.697	1.922	1.865	2.217	ns
	GCLK PLL	t_{su}	0.982	0.998	1.645	1.857	1.968	1.852	1.793	1.866	1.988	1.870	1.843	ns
		t_h	-0.731	-0.730	-1.244	-1.406	-1.468	-1.380	-1.311	-1.408	-1.477	-1.388	-1.358	ns
3.0-V LVCMOS	GCLK	t_{su}	-0.931	-0.975	-1.357	-1.471	-1.685	-1.636	-1.957	-1.479	-1.684	-1.639	-1.998	ns
		t_h	1.046	1.105	1.541	1.678	1.913	1.854	2.176	1.697	1.922	1.865	2.217	ns
	GCLK PLL	t_{su}	0.982	0.998	1.645	1.857	1.968	1.852	1.793	1.866	1.988	1.870	1.843	ns
		t_h	-0.731	-0.730	-1.244	-1.406	-1.468	-1.380	-1.311	-1.408	-1.477	-1.388	-1.358	ns
2.5 V	GCLK	t_{su}	-0.919	-0.968	-1.366	-1.484	-1.700	-1.651	-1.972	-1.488	-1.694	-1.649	-2.008	ns
		t_h	1.034	1.098	1.550	1.691	1.928	1.869	2.191	1.706	1.932	1.875	2.227	ns
	GCLK PLL	t_{su}	0.994	1.005	1.636	1.844	1.953	1.837	1.778	1.857	1.978	1.860	1.833	ns
		t_h	-0.743	-0.737	-1.235	-1.393	-1.453	-1.365	-1.296	-1.399	-1.467	-1.378	-1.348	ns
1.8 V	GCLK	t_{su}	-0.949	-1.000	-1.406	-1.530	-1.590	-1.662	-1.875	-1.521	-1.582	-1.663	-1.913	ns
		t_h	1.065	1.131	1.590	1.738	1.824	1.880	2.098	1.739	1.826	1.889	2.137	ns
	GCLK PLL	t_{su}	0.964	0.966	1.589	1.806	1.955	1.835	1.780	1.824	1.977	1.854	1.832	ns
		t_h	-0.712	-0.698	-1.190	-1.356	-1.455	-1.362	-1.298	-1.366	-1.466	-1.372	-1.347	ns
1.5 V	GCLK	t_{su}	-0.939	-0.989	-1.382	-1.498	-1.522	-1.594	-1.807	-1.490	-1.517	-1.598	-1.848	ns
		t_h	1.055	1.120	1.566	1.706	1.756	1.812	2.030	1.708	1.761	1.824	2.072	ns
	GCLK PLL	t_{su}	0.974	0.977	1.613	1.838	2.023	1.903	1.848	1.855	2.042	1.919	1.897	ns
		t_h	-0.722	-0.709	-1.214	-1.388	-1.523	-1.430	-1.366	-1.397	-1.531	-1.437	-1.412	ns
1.2 V	GCLK	t_{su}	-0.879	-0.936	-1.303	-1.397	-1.363	-1.435	-1.648	-1.394	-1.362	-1.443	-1.693	ns
		t_h	0.995	1.067	1.487	1.605	1.597	1.653	1.871	1.612	1.606	1.669	1.917	ns
	GCLK PLL	t_{su}	1.034	1.030	1.692	1.939	2.182	2.062	2.007	1.951	2.197	2.074	2.052	ns
		t_h	-0.782	-0.762	-1.293	-1.489	-1.682	-1.589	-1.525	-1.493	-1.686	-1.592	-1.567	ns

Table 1–76. EP3SL150 Row Pins Input Timing Parameters (Part 2 of 2)

I/O Standard	Clock	Parameter	Fast Model		C2	C3	C4	C4L		I3	I4	I4L		Units
			Industrial	Commercial	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 0.9 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 0.9 V	
DIFFERENTIAL 1.8-V HSTL CLASS II	GCLK	t_{su}	-0.747	-0.789	-1.131	-1.230	-1.338	-1.288	-1.617	-1.231	-1.336	-1.288	-1.659	ns
		t_h	0.864	0.922	1.321	1.440	1.569	1.508	1.836	1.449	1.576	1.516	1.879	ns
	GCLK PLL	t_{su}	1.131	1.148	1.840	2.080	2.304	2.185	2.121	2.097	2.327	2.205	2.170	ns
		t_h	-0.877	-0.878	-1.437	-1.629	-1.803	-1.712	-1.640	-1.637	-1.814	-1.720	-1.685	ns
DIFFERENTIAL 1.5-V SSTL CLASS I	GCLK	t_{su}	-0.733	-0.777	-1.122	-1.220	-1.320	-1.270	-1.599	-1.220	-1.319	-1.271	-1.642	ns
		t_h	0.850	0.910	1.311	1.430	1.551	1.490	1.818	1.438	1.559	1.499	1.862	ns
	GCLK PLL	t_{su}	1.145	1.160	1.853	2.090	2.322	2.203	2.139	2.108	2.344	2.222	2.187	ns
		t_h	-0.891	-0.890	-1.449	-1.639	-1.821	-1.730	-1.658	-1.648	-1.831	-1.737	-1.702	ns
DIFFERENTIAL 1.5-V SSTL CLASS II	GCLK	t_{su}	-0.733	-0.777	-1.122	-1.220	-1.320	-1.270	-1.599	-1.220	-1.319	-1.271	-1.642	ns
		t_h	0.850	0.910	1.311	1.430	1.551	1.490	1.818	1.438	1.559	1.499	1.862	ns
	GCLK PLL	t_{su}	1.145	1.160	1.853	2.090	2.322	2.203	2.139	2.108	2.344	2.222	2.187	ns
		t_h	-0.891	-0.890	-1.449	-1.639	-1.821	-1.730	-1.658	-1.648	-1.831	-1.737	-1.702	ns
DIFFERENTIAL 1.8-V SSTL CLASS I	GCLK	t_{su}	-0.747	-0.789	-1.131	-1.230	-1.338	-1.288	-1.617	-1.231	-1.336	-1.288	-1.659	ns
		t_h	0.864	0.922	1.321	1.440	1.569	1.508	1.836	1.449	1.576	1.516	1.879	ns
	GCLK PLL	t_{su}	1.131	1.148	1.840	2.080	2.304	2.185	2.121	2.097	2.327	2.205	2.170	ns
		t_h	-0.877	-0.878	-1.437	-1.629	-1.803	-1.712	-1.640	-1.637	-1.814	-1.720	-1.685	ns
DIFFERENTIAL 1.8-V SSTL CLASS II	GCLK	t_{su}	-0.747	-0.789	-1.131	-1.230	-1.338	-1.288	-1.617	-1.231	-1.336	-1.288	-1.659	ns
		t_h	0.864	0.922	1.321	1.440	1.569	1.508	1.836	1.449	1.576	1.516	1.879	ns
	GCLK PLL	t_{su}	1.131	1.148	1.840	2.080	2.304	2.185	2.121	2.097	2.327	2.205	2.170	ns
		t_h	-0.877	-0.878	-1.437	-1.629	-1.803	-1.712	-1.640	-1.637	-1.814	-1.720	-1.685	ns
DIFFERENTIAL 2.5-V SSTL CLASS I	GCLK	t_{su}	-0.756	-0.798	-1.145	-1.241	-1.345	-1.296	-1.623	-1.238	-1.337	-1.291	-1.661	ns
		t_h	0.873	0.931	1.336	1.454	1.579	1.518	1.847	1.459	1.582	1.521	1.886	ns
	GCLK PLL	t_{su}	1.122	1.139	1.825	2.064	2.293	2.173	2.110	2.086	2.321	2.197	2.163	ns
		t_h	-0.868	-0.869	-1.422	-1.611	-1.789	-1.698	-1.625	-1.623	-1.805	-1.711	-1.674	ns
DIFFERENTIAL 2.5-V SSTL CLASS II	GCLK	t_{su}	-0.756	-0.798	-1.145	-1.241	-1.345	-1.296	-1.623	-1.238	-1.337	-1.291	-1.661	ns
		t_h	0.873	0.931	1.336	1.454	1.579	1.518	1.847	1.459	1.582	1.521	1.886	ns
	GCLK PLL	t_{su}	1.122	1.139	1.825	2.064	2.293	2.173	2.110	2.086	2.321	2.197	2.163	ns
		t_h	-0.868	-0.869	-1.422	-1.611	-1.789	-1.698	-1.625	-1.623	-1.805	-1.711	-1.674	ns

Table 1–81. EP3SL200 Column Pins Input Timing Parameters (Part 4 of 4)

I/O Standard	Clock	Parameter	Fast Model		C2	C3	C4	C4L		I3	I4	I4L		Units
			Industrial	Commercial	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 0.9 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 0.9 V	
3.0-V PCI-X	GCLK	t_{su}	-1.148	-1.184	-1.809	-1.777	-2.001	-1.933	-2.481	-1.777	-2.001	-1.933	-2.481	ns
		t_h	1.296	1.330	2.031	2.010	2.258	2.176	2.723	2.010	2.258	2.176	2.723	ns
	GCLK PLL	t_{su}	-1.476	-1.476	-2.237	-2.273	-2.557	-2.476	-2.996	-2.273	-2.557	-2.476	-2.996	ns
		t_h	1.789	1.789	2.726	2.778	3.112	2.999	3.542	2.778	3.112	2.999	3.542	ns

Table 1–82 lists the EP3SL200 row pins input timing parameters for single-ended I/O standards.

Table 1–82. EP3SL200 Row Pins Input Timing Parameters (Part 1 of 3)

I/O Standard	Clock	Parameter	Fast Model		C2	C3	C4	C4L		I3	I4	I4L		Units
			Industrial	Commercial	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 0.9 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 0.9 V	
3.3-V LVTTL	GCLK	t_{su}	-1.298	-1.321	-1.972	-1.978	-2.368	-2.291	-2.712	-2.132	-2.388	-2.291	-2.712	ns
		t_h	1.432	1.473	1.671	1.862	1.969	1.850	1.775	1.751	1.869	1.850	1.775	ns
	GCLK PLL	t_{su}	0.915	0.938	2.210	2.223	2.633	2.541	2.966	2.384	2.665	2.541	2.966	ns
		t_h	-0.638	-0.643	-1.972	-1.978	-2.368	-2.291	-2.712	-2.132	-2.388	-2.291	-2.712	ns
3.3-V LVCMOS	GCLK	t_{su}	-1.298	-1.321	-1.972	-1.978	-2.368	-2.291	-2.712	-2.132	-2.388	-2.291	-2.712	ns
		t_h	1.432	1.473	1.671	1.862	1.969	1.850	1.775	1.751	1.869	1.850	1.775	ns
	GCLK PLL	t_{su}	0.915	0.938	2.210	2.223	2.633	2.541	2.966	2.384	2.665	2.541	2.966	ns
		t_h	-0.638	-0.643	-1.969	-1.979	-2.371	-2.294	-2.715	-2.131	-2.393	-2.294	-2.715	ns
3.0-V LVTTL	GCLK	t_{su}	-1.304	-1.332	2.207	2.224	2.636	2.544	2.969	2.383	2.670	2.544	2.969	ns
		t_h	1.438	1.484	-1.969	-1.979	-2.371	-2.294	-2.715	-2.131	-2.393	-2.294	-2.715	ns
	GCLK PLL	t_{su}	0.909	0.927	1.674	1.861	1.966	1.847	1.772	1.752	1.864	1.847	1.772	ns
		t_h	-0.632	-0.632	2.207	2.224	2.636	2.544	2.969	2.383	2.670	2.544	2.969	ns
3.0-V LVCMOS	GCLK	t_{su}	-1.304	-1.332	2.216	2.237	2.651	2.559	2.984	2.392	2.680	2.559	2.984	ns
		t_h	1.438	1.484	-1.978	-1.992	-2.386	-2.309	-2.730	-2.140	-2.403	-2.309	-2.730	ns
	GCLK PLL	t_{su}	0.909	0.927	1.665	1.848	1.951	1.832	1.757	1.743	1.854	1.832	1.757	ns
		t_h	-0.632	-0.632	2.216	2.237	2.651	2.559	2.984	2.392	2.680	2.559	2.984	ns
2.5 V	GCLK	t_{su}	-1.292	-1.325	1.625	1.722	1.945	1.834	1.742	1.710	1.853	1.834	1.742	ns
		t_h	1.426	1.477	2.254	2.297	2.649	2.557	2.982	2.425	2.681	2.557	2.982	ns
	GCLK PLL	t_{su}	0.921	0.934	-2.017	-2.051	-2.384	-2.307	-2.728	-2.173	-2.404	-2.307	-2.728	ns
		t_h	-0.644	-0.639	1.625	1.722	1.945	1.834	1.742	1.710	1.853	1.834	1.742	ns
1.8 V	GCLK	t_{su}	-1.322	-1.354	1.649	1.754	2.013	1.902	1.810	1.741	1.918	1.902	1.810	ns
		t_h	0.891	0.902	2.230	2.265	2.581	2.489	2.914	2.394	2.616	2.489	2.914	ns
	GCLK PLL	t_{su}	1.457	1.507	-1.993	-2.019	-2.316	-2.239	-2.660	-2.142	-2.339	-2.239	-2.660	ns
		t_h	-1.312	-1.343	1.728	1.855	2.172	2.061	1.969	1.837	2.073	2.061	1.969	ns

Table 1–83. EP3SL200 Column Pins Output Timing Parameters (Part 7 of 7)

I/O Standard	Current Strength	Clock	Parameter	Fast Model		C2	C3	C4	C4L		I3	I4	I4L		Units
				Industrial	Commercial	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 0.9 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 0.9 V	
1.2-V HSTL CLASS I	4mA	GCLK	t_{co}	3.524	3.524	5.175	5.375	5.888	5.745	6.150	5.375	5.888	5.745	6.150	ns
		GCLK PLL	t_{co}	3.923	3.923	5.810	6.015	6.592	6.420	6.907	6.015	6.592	6.420	6.907	ns
	6mA	GCLK	t_{co}	3.516	3.516	5.166	5.366	5.879	5.736	6.141	5.366	5.879	5.736	6.141	ns
		GCLK PLL	t_{co}	3.915	3.915	5.801	6.006	6.583	6.411	6.898	6.006	6.583	6.411	6.898	ns
	8mA	GCLK	t_{co}	3.517	3.517	5.174	5.374	5.888	5.745	6.150	5.374	5.888	5.745	6.150	ns
		GCLK PLL	t_{co}	3.916	3.916	5.809	6.014	6.592	6.420	6.907	6.014	6.592	6.420	6.907	ns
	10mA	GCLK	t_{co}	3.506	3.506	5.161	5.361	5.874	5.731	6.136	5.361	5.874	5.731	6.136	ns
		GCLK PLL	t_{co}	3.905	3.905	5.796	6.001	6.578	6.406	6.893	6.001	6.578	6.406	6.893	ns
	12mA	GCLK	t_{co}	3.506	3.506	5.161	5.361	5.875	5.732	6.137	5.361	5.875	5.732	6.137	ns
		GCLK PLL	t_{co}	3.905	3.905	5.796	6.001	6.579	6.407	6.894	6.001	6.579	6.407	6.894	ns
1.2-V HSTL CLASS II	16mA	GCLK	t_{co}	3.527	3.527	5.177	5.376	5.888	5.745	6.150	5.376	5.888	5.745	6.150	ns
		GCLK PLL	t_{co}	3.926	3.926	5.812	6.016	6.592	6.420	6.907	6.016	6.592	6.420	6.907	ns
3.0-V PCI	—	GCLK	t_{co}	3.630	3.630	5.222	5.410	5.913	5.770	6.175	5.410	5.913	5.770	6.175	ns
		GCLK PLL	t_{co}	4.029	4.029	5.857	6.050	6.617	6.445	6.932	6.050	6.617	6.445	6.932	ns
3.0-V PCI-X	—	GCLK	t_{co}	3.630	3.630	5.222	5.410	5.913	5.770	6.175	5.410	5.913	5.770	6.175	ns
		GCLK PLL	t_{co}	4.029	4.029	5.857	6.050	6.617	6.445	6.932	6.050	6.617	6.445	6.932	ns

Table 1–87. EP3SL200 Column Pins output Timing Parameters (Part 2 of 4)

I/O Standard	Current Strength	Clock	Parameter	Fast Model		C2	C3	C4	C4L		I3	I4	I4L		Units
				Industrial	Commercial	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 0.9 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 0.9 V	
DIFFERENTIAL 1.5-V HSTL CLASS I	4mA	GCLK	t_{co}	3.511	3.790	5.589	5.802	6.366	6.202	6.609	5.946	6.509	6.202	6.609	ns
		GCLK PLL	t_{co}	3.497	3.776	5.577	5.791	6.356	6.192	6.599	5.936	6.500	6.192	6.599	ns
	6mA	GCLK	t_{co}	3.485	3.763	5.560	5.773	6.338	6.174	6.581	5.918	6.482	6.174	6.581	ns
		GCLK PLL	t_{co}	3.485	3.763	5.563	5.777	6.342	6.178	6.585	5.922	6.487	6.178	6.585	ns
	8mA	GCLK	t_{co}	3.481	3.759	5.556	5.769	6.335	6.171	6.578	5.915	6.479	6.171	6.578	ns
		GCLK PLL	t_{co}	3.485	3.761	5.549	5.760	6.323	6.159	6.566	5.904	6.466	6.159	6.566	ns
	10mA	GCLK	t_{co}	3.486	3.763	5.557	5.770	6.334	6.170	6.577	5.914	6.478	6.170	6.577	ns
		GCLK PLL	t_{co}	3.514	3.793	5.588	5.800	6.364	6.200	6.607	5.945	6.507	6.200	6.607	ns
	12mA	GCLK	t_{co}	3.503	3.781	5.576	5.788	6.352	6.188	6.595	5.933	6.495	6.188	6.595	ns
		GCLK PLL	t_{co}	3.498	3.777	5.576	5.789	6.353	6.189	6.596	5.934	6.497	6.189	6.596	ns
DIFFERENTIAL 1.5-V HSTL CLASS II	16mA	GCLK	t_{co}	3.484	3.762	5.558	5.770	6.334	6.170	6.577	5.915	6.479	6.170	6.577	ns
		GCLK PLL	t_{co}	3.482	3.760	5.556	5.768	6.332	6.168	6.575	5.913	6.476	6.168	6.575	ns
DIFFERENTIAL 1.8-V HSTL CLASS I	4mA	GCLK	t_{co}	3.486	3.762	5.548	5.758	6.320	6.156	6.563	5.902	6.463	6.156	6.563	ns
		GCLK PLL	t_{co}	3.486	3.763	5.556	5.768	6.332	6.168	6.575	5.913	6.476	6.168	6.575	ns
	6mA	GCLK	t_{co}	3.502	3.780	5.572	5.783	6.346	6.182	6.589	5.928	6.489	6.182	6.589	ns
		GCLK PLL	t_{co}	3.502	3.780	5.572	5.783	6.346	6.182	6.589	5.928	6.489	6.182	6.589	ns
	8mA	GCLK	t_{co}	3.492	3.770	5.562	5.773	6.336	6.172	6.579	5.918	6.480	6.172	6.579	ns
		GCLK PLL	t_{co}	3.485	3.762	5.548	5.758	6.320	6.156	6.563	5.902	6.463	6.156	6.563	ns
	10mA	GCLK	t_{co}	3.479	3.750	5.506	5.712	6.270	6.106	6.513	5.854	6.411	6.106	6.513	ns
		GCLK PLL	t_{co}	3.475	3.753	5.553	5.767	6.332	6.168	6.575	5.913	6.477	6.168	6.575	ns
	12mA	GCLK	t_{co}	3.479	3.750	5.506	5.712	6.270	6.106	6.513	5.854	6.411	6.106	6.513	ns
		GCLK PLL	t_{co}	3.475	3.753	5.553	5.767	6.332	6.168	6.575	5.913	6.477	6.168	6.575	ns
DIFFERENTIAL 1.8-V HSTL CLASS II	16mA	GCLK	t_{co}	3.479	3.750	5.506	5.712	6.270	6.106	6.513	5.854	6.411	6.106	6.513	ns
		GCLK PLL	t_{co}	3.475	3.753	5.553	5.767	6.332	6.168	6.575	5.913	6.477	6.168	6.575	ns

Table 1–88. EP3SL200 Row Pins Output Timing Parameters (Part 2 of 3)

I/O Standard	Current Strength	Clock	Parameter	Fast Model		C2	C3	C4	C4L		I3	I4	I4L		Units
				Industrial	Commercial	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 0.9 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 0.9 V	
DIFFERENTIAL 1.5-V HSTL CLASS I	4mA	GCLK	t_{co}	3.581	3.866	5.700	5.916	6.490	6.323	6.702	6.068	6.644	6.323	6.702	ns
		GCLK PLL	t_{co}	3.566	3.851	5.686	5.901	6.475	6.308	6.687	6.053	6.629	6.308	6.687	ns
	6mA	GCLK	t_{co}	3.555	3.840	5.681	5.898	6.472	6.305	6.684	6.050	6.627	6.305	6.684	ns
		GCLK PLL	t_{co}	3.535	3.820	5.658	5.874	6.449	6.282	6.661	6.027	6.603	6.282	6.661	ns
	8mA	GCLK	t_{co}	3.532	3.816	5.654	5.871	6.445	6.278	6.657	6.023	6.600	6.278	6.657	ns
		GCLK PLL	t_{co}	3.537	3.820	5.645	5.859	6.431	6.264	6.643	6.010	6.584	6.264	6.643	ns
DIFFERENTIAL 1.8-V HSTL CLASS I	4mA	GCLK	t_{co}	3.530	3.813	5.644	5.860	6.434	6.267	6.646	6.013	6.589	6.267	6.646	ns
		GCLK PLL	t_{co}	3.568	3.852	5.682	5.897	6.470	6.303	6.682	6.049	6.624	6.303	6.682	ns
	6mA	GCLK	t_{co}	3.550	3.835	5.667	5.882	6.455	6.288	6.667	6.034	6.609	6.288	6.667	ns
		GCLK PLL	t_{co}	3.536	3.819	5.644	5.858	6.430	6.263	6.642	6.010	6.584	6.263	6.642	ns
	8mA	GCLK	t_{co}	3.152	3.376	4.936	5.115	5.637	5.478	5.865	5.239	5.762	5.478	5.865	ns
		GCLK PLL	t_{co}	3.536	3.812	5.604	5.814	6.381	6.214	6.593	5.962	6.531	6.214	6.593	ns
	10mA	GCLK	t_{co}	3.518	3.802	5.642	5.860	6.435	6.268	6.647	6.013	6.592	6.268	6.647	ns
		GCLK PLL	t_{co}	3.152	3.376	4.936	5.115	5.637	5.478	5.865	5.239	5.762	5.478	5.865	ns
	12mA	GCLK	t_{co}	3.536	3.812	5.604	5.814	6.381	6.214	6.593	5.962	6.531	6.214	6.593	ns
		GCLK PLL	t_{co}	3.518	3.802	5.642	5.860	6.435	6.268	6.647	6.013	6.592	6.268	6.647	ns
	16mA	GCLK	t_{co}	3.152	3.376	4.936	5.115	5.637	5.478	5.865	5.239	5.762	5.478	5.865	ns
		GCLK PLL	t_{co}	3.536	3.812	5.604	5.814	6.381	6.214	6.593	5.962	6.531	6.214	6.593	ns
DIFFERENTIAL 1.5-V SSTL CLASS I	4mA	GCLK	t_{co}	3.518	3.802	5.642	5.860	6.435	6.268	6.647	6.013	6.592	6.268	6.647	ns
		GCLK PLL	t_{co}	3.562	3.845	5.678	5.894	6.468	6.301	6.680	6.046	6.621	6.301	6.680	ns
	6mA	GCLK	t_{co}	3.548	3.831	5.665	5.881	6.455	6.288	6.667	6.032	6.608	6.288	6.667	ns
		GCLK PLL	t_{co}	3.544	3.827	5.663	5.881	6.456	6.289	6.668	6.032	6.610	6.289	6.668	ns
	8mA	GCLK	t_{co}	3.560	3.842	5.664	5.878	6.450	6.283	6.662	6.029	6.603	6.283	6.662	ns
		GCLK PLL	t_{co}	3.549	3.832	5.660	5.874	6.447	6.280	6.659	6.026	6.600	6.280	6.659	ns

Table 1–97. EP3SL340 Column Pins Output Timing Parameters (Part 2 of 4)

I/O Standard	Current Strength	Clock	Parameter	Fast Model		C2	C3	C4	C4L		I3	I4	I4L		Units
				Industrial	Commercial	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 0.9 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 0.9 V	
DIFFERENTIAL 1.5-V HSTL CLASS I	4mA	GCLK	t_{co}	3.459	3.726	5.469	5.666	6.206	6.054	6.462	5.799	6.338	6.186	6.539	ns
		GCLK PLL	t_{co}	1.448	1.632	2.143	2.240	2.469	2.470	2.538	2.347	2.575	2.578	2.523	ns
	6mA	GCLK	t_{co}	3.454	3.722	5.469	5.666	6.207	6.055	6.463	5.800	6.340	6.188	6.541	ns
		GCLK PLL	t_{co}	1.443	1.628	2.143	2.240	2.470	2.471	2.539	2.348	2.577	2.580	2.525	ns
	8mA	GCLK	t_{co}	3.452	3.720	5.468	5.665	6.205	6.053	6.461	5.799	6.339	6.187	6.540	ns
		GCLK PLL	t_{co}	1.441	1.626	2.142	2.239	2.468	2.469	2.537	2.347	2.576	2.579	2.524	ns
	10mA	GCLK	t_{co}	3.444	3.711	5.458	5.655	6.196	6.044	6.452	5.789	6.329	6.177	6.530	ns
		GCLK PLL	t_{co}	1.433	1.617	2.132	2.229	2.459	2.460	2.528	2.337	2.566	2.569	2.514	ns
	12mA	GCLK	t_{co}	3.445	3.713	5.464	5.662	6.204	6.052	6.460	5.797	6.338	6.186	6.539	ns
		GCLK PLL	t_{co}	1.434	1.619	2.138	2.236	2.467	2.468	2.536	2.345	2.575	2.578	2.523	ns
DIFFERENTIAL 1.5-V HSTL CLASS II	16mA	GCLK	t_{co}	3.444	3.710	5.447	5.643	6.182	6.030	6.438	5.776	6.314	6.162	6.515	ns
		GCLK PLL	t_{co}	1.433	1.616	2.121	2.217	2.445	2.446	2.514	2.324	2.551	2.554	2.499	ns
DIFFERENTIAL 1.8-V HSTL CLASS I	4mA	GCLK	t_{co}	3.456	3.723	5.465	5.661	6.200	6.048	6.456	5.795	6.333	6.181	6.534	ns
		GCLK PLL	t_{co}	1.445	1.629	2.139	2.235	2.463	2.464	2.532	2.343	2.570	2.573	2.518	ns
	6mA	GCLK	t_{co}	3.452	3.720	5.466	5.663	6.204	6.052	6.460	5.797	6.337	6.185	6.538	ns
		GCLK PLL	t_{co}	1.441	1.626	2.140	2.237	2.467	2.468	2.536	2.345	2.574	2.577	2.522	ns
	8mA	GCLK	t_{co}	3.442	3.709	5.455	5.652	6.192	6.040	6.448	5.786	6.325	6.173	6.526	ns
		GCLK PLL	t_{co}	1.431	1.615	2.129	2.226	2.455	2.456	2.524	2.334	2.562	2.565	2.510	ns
	10mA	GCLK	t_{co}	3.440	3.707	5.453	5.649	6.190	6.038	6.446	5.784	6.323	6.171	6.524	ns
		GCLK PLL	t_{co}	1.429	1.613	2.127	2.223	2.453	2.454	2.522	2.332	2.560	2.563	2.508	ns
	12mA	GCLK	t_{co}	3.440	3.708	5.456	5.654	6.195	6.043	6.451	5.788	6.329	6.177	6.530	ns
		GCLK PLL	t_{co}	1.429	1.614	2.130	2.228	2.458	2.459	2.527	2.336	2.566	2.569	2.514	ns
DIFFERENTIAL 1.8-V HSTL CLASS II	16mA	GCLK	t_{co}	3.444	3.711	5.453	5.649	6.189	6.037	6.445	5.783	6.322	6.170	6.523	ns
		GCLK PLL	t_{co}	1.433	1.617	2.127	2.223	2.452	2.453	2.521	2.331	2.559	2.562	2.507	ns

Table 1–103. EP3SE50 Column Pins Output Timing Parameters (Part 6 of 6)

I/O Standard	Current Strength	Clock	Parameter	Fast Model		C2	C3	C4	C4L		I3	I4	I4L		Units
				Industrial	Commercial	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 0.9 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 0.9 V	
1.2-V HSTL CLASS I	4mA	GCLK	t_{co}	3.048	3.058	4.317	4.683	5.208	5.088	5.302	4.683	5.208	5.088	5.302	ns
		GCLK PLL	t_{co}	3.397	3.371	4.777	5.212	5.710	5.565	5.864	5.212	5.710	5.565	5.864	ns
	6mA	GCLK	t_{co}	3.040	3.050	4.308	4.668	5.191	5.071	5.290	4.668	5.191	5.071	5.290	ns
		GCLK PLL	t_{co}	3.389	3.363	4.768	5.203	5.701	5.556	5.855	5.203	5.701	5.556	5.855	ns
	8mA	GCLK	t_{co}	3.041	3.051	4.315	4.674	5.187	5.067	5.293	4.674	5.187	5.067	5.293	ns
		GCLK PLL	t_{co}	3.390	3.364	4.775	5.212	5.710	5.565	5.864	5.212	5.710	5.565	5.864	ns
	10mA	GCLK	t_{co}	3.030	3.040	4.302	4.661	5.164	5.044	5.287	4.661	5.164	5.044	5.287	ns
		GCLK PLL	t_{co}	3.379	3.353	4.762	5.198	5.696	5.551	5.850	5.198	5.696	5.551	5.850	ns
	12mA	GCLK	t_{co}	3.030	3.040	4.302	4.661	5.165	5.045	5.279	4.661	5.165	5.045	5.279	ns
		GCLK PLL	t_{co}	3.379	3.353	4.762	5.198	5.697	5.552	5.851	5.198	5.697	5.552	5.851	ns
1.2-V HSTL CLASS II	16mA	GCLK	t_{co}	3.061	3.061	4.318	4.685	5.243	5.123	5.316	4.685	5.243	5.123	5.316	ns
		GCLK PLL	t_{co}	3.400	3.374	4.778	5.213	5.710	5.565	5.864	5.213	5.710	5.565	5.864	ns
3.0-V PCI	—	GCLK	t_{co}	3.154	3.164	4.363	4.710	5.218	5.098	5.347	4.710	5.218	5.098	5.347	ns
		GCLK PLL	t_{co}	3.503	3.477	4.823	5.247	5.735	5.590	5.889	5.247	5.735	5.590	5.889	ns
3.0-V PCI-X	—	GCLK	t_{co}	3.154	3.164	4.363	4.710	5.218	5.098	5.347	4.710	5.218	5.098	5.347	ns
		GCLK PLL	t_{co}	3.503	3.477	4.823	5.247	5.735	5.590	5.889	5.247	5.735	5.590	5.889	ns

Table 1–104 lists the EP3SE50 row pins output timing parameters for single-ended I/O standards.

Table 1–104. EP3SE50 Row Pins Output Timing Parameters (Part 1 of 5)

I/O Standard	Current Strength	Clock	Parameter	Fast Model		C2	C3	C4	C4L		I3	I4	I4L		Units
				Industrial	Commercial	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 0.9 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 0.9 V	
3.3-V LVTTL	4mA	GCLK	t_{co}	3.161	3.395	4.722	5.117	5.622	5.486	5.755	5.247	5.754	5.618	5.832	ns
		GCLK PLL	t_{co}	1.488	1.692	2.101	2.185	2.381	2.400	2.349	2.304	2.505	2.523	2.344	ns
	8mA	GCLK	t_{co}	3.095	3.324	4.612	5.005	5.508	5.372	5.611	5.134	5.638	5.502	5.683	ns
		GCLK PLL	t_{co}	1.395	1.587	1.971	2.047	2.237	2.256	2.205	2.163	2.356	2.374	2.195	ns
	12mA	GCLK	t_{co}	3.016	3.235	4.506	4.905	5.412	5.276	5.483	5.035	5.539	5.403	5.551	ns
		GCLK PLL	t_{co}	1.314	1.493	1.852	1.924	2.109	2.128	2.077	2.036	2.224	2.242	2.063	ns

Table 1–107. EP3SE50 Column Pins Output Timing Parameters (Part 2 of 4)

I/O Standard	Current Strength	Clock	Parameter	Fast Model		C2	C3	C4	C4L		I3	I4	I4L		Units
				Industrial	Commercial	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 0.9 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 0.9 V	
DIFFERENTIAL 1.2-V HSTL CLASS I	4mA	GCLK	t_{co}	3.079	3.303	4.664	5.073	5.590	5.448	5.677	5.200	5.718	5.578	5.744	ns
		GCLK PLL	t_{co}	3.074	3.299	4.664	5.073	5.591	5.449	5.678	5.201	5.720	5.580	5.746	ns
	6mA	GCLK	t_{co}	3.072	3.297	4.663	5.072	5.589	5.447	5.676	5.200	5.719	5.579	5.745	ns
		GCLK PLL	t_{co}	3.064	3.288	4.653	5.062	5.580	5.438	5.667	5.190	5.709	5.569	5.735	ns
	8mA	GCLK	t_{co}	3.065	3.290	4.659	5.069	5.588	5.446	5.675	5.198	5.718	5.578	5.744	ns
		GCLK PLL	t_{co}	3.064	3.287	4.642	5.050	5.566	5.424	5.653	5.177	5.694	5.554	5.720	ns
	10mA	GCLK	t_{co}	3.076	3.300	4.660	5.068	5.584	5.442	5.671	5.196	5.713	5.573	5.739	ns
		GCLK PLL	t_{co}	3.072	3.297	4.661	5.070	5.588	5.446	5.675	5.198	5.717	5.577	5.743	ns
	12mA	GCLK	t_{co}	3.062	3.286	4.650	5.059	5.576	5.434	5.663	5.187	5.705	5.565	5.731	ns
		GCLK PLL	t_{co}	3.060	3.284	4.648	5.056	5.574	5.432	5.661	5.185	5.703	5.563	5.729	ns
DIFFERENTIAL 1.2-V HSTL CLASS II	16mA	GCLK	t_{co}	3.060	3.285	4.651	5.061	5.579	5.437	5.666	5.189	5.709	5.569	5.735	ns
		GCLK PLL	t_{co}	3.064	3.288	4.648	5.056	5.573	5.431	5.660	5.184	5.702	5.562	5.728	ns
DIFFERENTIAL 1.5-V HSTL CLASS I	4mA	GCLK	t_{co}	3.090	3.317	4.693	5.104	5.623	5.481	5.710	5.232	5.752	5.612	5.778	ns
		GCLK PLL	t_{co}	3.076	3.303	4.681	5.093	5.613	5.471	5.700	5.222	5.743	5.603	5.769	ns
	6mA	GCLK	t_{co}	3.064	3.290	4.664	5.075	5.595	5.453	5.682	5.204	5.725	5.585	5.751	ns
		GCLK PLL	t_{co}	3.064	3.290	4.667	5.079	5.599	5.457	5.686	5.208	5.730	5.590	5.756	ns
	8mA	GCLK	t_{co}	3.060	3.286	4.660	5.071	5.592	5.450	5.679	5.201	5.722	5.582	5.748	ns
		GCLK PLL	t_{co}	3.064	3.288	4.653	5.062	5.580	5.438	5.667	5.190	5.709	5.569	5.735	ns
	10mA	GCLK	t_{co}	3.065	3.290	4.661	5.072	5.591	5.449	5.678	5.200	5.721	5.581	5.747	ns
		GCLK PLL	t_{co}	3.093	3.320	4.692	5.102	5.621	5.479	5.708	5.231	5.750	5.610	5.776	ns
	12mA	GCLK	t_{co}	3.082	3.308	4.680	5.090	5.609	5.467	5.696	5.219	5.738	5.598	5.764	ns
		GCLK PLL	t_{co}	3.077	3.304	4.680	5.091	5.610	5.468	5.697	5.220	5.740	5.600	5.766	ns
DIFFERENTIAL 1.5-V HSTL CLASS II	16mA	GCLK	t_{co}	3.063	3.289	4.662	5.072	5.591	5.449	5.678	5.201	5.722	5.582	5.748	ns
		GCLK PLL	t_{co}	3.061	3.287	4.660	5.070	5.589	5.447	5.676	5.199	5.719	5.579	5.745	ns

Table 1–108. EP3SE50 Row Pins Output Timing Parameters (Part 3 of 3)

I/O Standard	Current Strength	Clock	Parameter	Fast Model		C2	C3	C4	C4L		I3	I4	I4L		Units
				Industrial	Commercial	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 0.9 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 0.9 V	
DIFFERENTIAL 1.8-V SSTL CLASS I	4mA	GCLK	t_{co}	3.088	3.322	4.721	5.136	5.662	5.519	5.722	5.272	5.802	5.657	5.793	ns
		GCLK PLL	t_{co}	3.099	3.332	4.722	5.137	5.661	5.518	5.721	5.271	5.800	5.655	5.791	ns
	6mA	GCLK	t_{co}	3.089	3.323	4.720	5.135	5.660	5.517	5.720	5.271	5.800	5.655	5.791	ns
		GCLK PLL	t_{co}	3.075	3.309	4.705	5.120	5.646	5.503	5.706	5.256	5.785	5.640	5.776	ns
	8mA	GCLK	t_{co}	3.072	3.305	4.701	5.116	5.642	5.499	5.702	5.252	5.781	5.636	5.772	ns
		GCLK PLL	t_{co}	3.069	3.303	4.702	5.119	5.645	5.502	5.705	5.255	5.785	5.640	5.776	ns
	10mA	GCLK	t_{co}	3.070	3.303	4.692	5.107	5.632	5.489	5.692	5.242	5.771	5.626	5.762	ns
		GCLK PLL	t_{co}	3.119	3.356	4.763	5.180	5.708	5.565	5.768	5.316	5.847	5.702	5.838	ns
	12mA	GCLK	t_{co}	3.095	3.332	4.745	5.163	5.691	5.548	5.751	5.299	5.832	5.687	5.823	ns
		GCLK PLL	t_{co}	3.077	3.313	4.723	5.141	5.669	5.526	5.729	5.277	5.810	5.665	5.801	ns
DIFFERENTIAL 1.8-V SSTL CLASS II	8mA	GCLK	t_{co}	3.123	3.359	4.763	5.180	5.707	5.564	5.767	5.316	5.847	5.702	5.838	ns
		GCLK PLL	t_{co}	3.108	3.344	4.749	5.165	5.692	5.549	5.752	5.301	5.832	5.687	5.823	ns
	16mA	GCLK	t_{co}	3.097	3.333	4.744	5.162	5.689	5.546	5.749	5.298	5.830	5.685	5.821	ns
		GCLK PLL	t_{co}	3.077	3.313	4.721	5.138	5.666	5.523	5.726	5.275	5.806	5.661	5.797	ns
DIFFERENTIAL 2.5-V SSTL CLASS I	8mA	GCLK	t_{co}	3.074	3.309	4.717	5.135	5.662	5.519	5.722	5.271	5.803	5.658	5.794	ns
		GCLK PLL	t_{co}	3.079	3.313	4.708	5.123	5.648	5.505	5.708	5.258	5.787	5.642	5.778	ns
	12mA	GCLK	t_{co}	3.072	3.306	4.707	5.124	5.651	5.508	5.711	5.261	5.792	5.647	5.783	ns
		GCLK PLL	t_{co}	3.100	3.335	4.735	5.151	5.677	5.534	5.737	5.287	5.817	5.672	5.808	ns
DIFFERENTIAL 2.5-V SSTL CLASS II	16mA	GCLK	t_{co}	3.082	3.318	4.720	5.136	5.662	5.519	5.722	5.272	5.802	5.657	5.793	ns
		GCLK PLL	t_{co}	3.068	3.302	4.697	5.112	5.637	5.494	5.697	5.248	5.777	5.632	5.768	ns

Table 1–113. EP3SE80 Column Pins Output Timing Parameters (Part 4 of 7)

I/O Standard	Current Strength	Clock	Parameter	Fast Model		C2	C3	C4	C4L		I3	I4	I4L		Units
				Industrial	Commercial	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 0.9 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 0.9 V	
1.2 V	2mA	GCLK	t_{co}	3.620	3.620	5.244	5.726	6.036	6.206	6.263	5.726	6.036	6.206	6.263	ns
		GCLK PLL	t_{co}	3.912	3.918	5.648	6.149	6.794	6.608	7.029	6.149	6.794	6.608	7.029	ns
	4mA	GCLK	t_{co}	3.447	3.447	4.922	5.345	5.750	5.777	5.977	5.345	5.750	5.777	5.977	ns
		GCLK PLL	t_{co}	3.789	3.795	5.422	5.887	6.508	6.322	6.743	5.887	6.508	6.322	6.743	ns
	6mA	GCLK	t_{co}	3.360	3.360	4.795	5.204	5.637	5.622	5.864	5.204	5.637	5.622	5.864	ns
		GCLK PLL	t_{co}	3.751	3.757	5.330	5.798	6.395	6.209	6.630	5.798	6.395	6.209	6.630	ns
	8mA	GCLK	t_{co}	3.336	3.336	4.726	5.144	5.581	5.531	5.808	5.144	5.581	5.531	5.808	ns
		GCLK PLL	t_{co}	3.704	3.710	5.302	5.749	6.339	6.153	6.574	5.749	6.339	6.153	6.574	ns
SSTL-2 CLASS I	8mA	GCLK	t_{co}	3.324	3.324	4.688	5.075	5.512	5.479	5.739	5.075	5.512	5.479	5.739	ns
		GCLK PLL	t_{co}	3.704	3.710	5.259	5.696	6.270	6.084	6.505	5.696	6.270	6.084	6.505	ns
	10mA	GCLK	t_{co}	3.321	3.321	4.681	5.068	5.508	5.485	5.735	5.068	5.508	5.485	5.735	ns
		GCLK PLL	t_{co}	3.701	3.707	5.256	5.693	6.266	6.080	6.501	5.693	6.266	6.080	6.501	ns
	12mA	GCLK	t_{co}	3.309	3.309	4.677	5.064	5.509	5.465	5.736	5.064	5.509	5.465	5.736	ns
		GCLK PLL	t_{co}	3.699	3.705	5.256	5.694	6.267	6.081	6.502	5.694	6.267	6.081	6.502	ns
SSTL-2 CLASS II	16mA	GCLK	t_{co}	3.286	3.286	4.647	5.033	5.494	5.431	5.721	5.033	5.494	5.431	5.721	ns
		GCLK PLL	t_{co}	3.690	3.696	5.241	5.678	6.252	6.066	6.487	5.678	6.252	6.066	6.487	ns
SSTL-18 CLASS I	4mA	GCLK	t_{co}	3.340	3.340	4.700	5.090	5.528	5.507	5.755	5.090	5.528	5.507	5.755	ns
		GCLK PLL	t_{co}	3.711	3.717	5.271	5.710	6.286	6.100	6.521	5.710	6.286	6.100	6.521	ns
	6mA	GCLK	t_{co}	3.323	3.323	4.697	5.087	5.526	5.496	5.753	5.087	5.526	5.496	5.753	ns
		GCLK PLL	t_{co}	3.707	3.713	5.269	5.708	6.284	6.098	6.519	5.708	6.284	6.098	6.519	ns
	8mA	GCLK	t_{co}	3.311	3.311	4.677	5.067	5.517	5.489	5.744	5.067	5.517	5.489	5.744	ns
		GCLK PLL	t_{co}	3.696	3.702	5.259	5.699	6.275	6.089	6.510	5.699	6.275	6.089	6.510	ns
	10mA	GCLK	t_{co}	3.282	3.282	4.659	5.049	5.504	5.450	5.731	5.049	5.504	5.450	5.731	ns
		GCLK PLL	t_{co}	3.685	3.691	5.246	5.686	6.262	6.076	6.497	5.686	6.262	6.076	6.497	ns
	12mA	GCLK	t_{co}	3.281	3.281	4.659	5.049	5.504	5.450	5.731	5.049	5.504	5.450	5.731	ns
		GCLK PLL	t_{co}	3.685	3.691	5.246	5.686	6.262	6.076	6.497	5.686	6.262	6.076	6.497	ns

Table 1–121. EP3SE110 Column Pins Input Timing Parameters (Part 3 of 4)

I/O Standard	Clock	Parameter	Fast Model		C2	C3	C4	C4L		I3	I4	I4L		Units
			Industrial	Commercial	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 0.9 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 0.9 V	
SSTL-18 CLASS II	GCLK	t_{su}	-0.961	-0.937	-1.361	-1.508	-1.636	-1.573	-1.938	-1.508	-1.636	-1.573	-1.938	ns
		t_h	1.105	1.077	1.555	1.730	1.879	1.803	2.170	1.730	1.879	1.803	2.170	ns
	GCLK PLL	t_{su}	-1.228	-1.198	-1.738	-1.918	-2.050	-1.974	-2.445	-1.918	-2.050	-1.974	-2.445	ns
		t_h	1.533	1.498	2.169	2.406	2.579	2.475	2.965	2.406	2.579	2.475	2.965	ns
SSTL-15 CLASS I	GCLK	t_{su}	-0.950	-0.926	-1.350	-1.497	-1.617	-1.554	-1.919	-1.497	-1.617	-1.554	-1.919	ns
		t_h	1.094	1.066	1.543	1.719	1.860	1.784	2.151	1.719	1.860	1.784	2.151	ns
	GCLK PLL	t_{su}	-1.217	-1.187	-1.727	-1.907	-2.031	-1.955	-2.426	-1.907	-2.031	-1.955	-2.426	ns
		t_h	1.522	1.487	2.157	2.395	2.560	2.456	2.946	2.395	2.560	2.456	2.946	ns
1.8-V HSTL CLASS I	GCLK	t_{su}	-0.950	-0.926	-1.350	-1.497	-1.617	-1.554	-1.919	-1.497	-1.617	-1.554	-1.919	ns
		t_h	1.094	1.066	1.543	1.719	1.860	1.784	2.151	1.719	1.860	1.784	2.151	ns
	GCLK PLL	t_{su}	-1.217	-1.187	-1.727	-1.907	-2.031	-1.955	-2.426	-1.907	-2.031	-1.955	-2.426	ns
		t_h	1.522	1.487	2.157	2.395	2.560	2.456	2.946	2.395	2.560	2.456	2.946	ns
1.8-V HSTL CLASS II	GCLK	t_{su}	-0.961	-0.937	-1.361	-1.508	-1.636	-1.573	-1.938	-1.508	-1.636	-1.573	-1.938	ns
		t_h	1.105	1.077	1.555	1.730	1.879	1.803	2.170	1.730	1.879	1.803	2.170	ns
	GCLK PLL	t_{su}	-1.228	-1.198	-1.738	-1.918	-2.050	-1.974	-2.445	-1.918	-2.050	-1.974	-2.445	ns
		t_h	1.533	1.498	2.169	2.406	2.579	2.475	2.965	2.406	2.579	2.475	2.965	ns
1.5-V HSTL CLASS I	GCLK	t_{su}	-0.961	-0.937	-1.361	-1.508	-1.636	-1.573	-1.938	-1.508	-1.636	-1.573	-1.938	ns
		t_h	1.105	1.077	1.555	1.730	1.879	1.803	2.170	1.730	1.879	1.803	2.170	ns
	GCLK PLL	t_{su}	-1.228	-1.198	-1.738	-1.918	-2.050	-1.974	-2.445	-1.918	-2.050	-1.974	-2.445	ns
		t_h	1.533	1.498	2.169	2.406	2.579	2.475	2.965	2.406	2.579	2.475	2.965	ns
1.5-V HSTL CLASS II	GCLK	t_{su}	-0.950	-0.926	-1.350	-1.497	-1.617	-1.554	-1.919	-1.497	-1.617	-1.554	-1.919	ns
		t_h	1.094	1.066	1.543	1.719	1.860	1.784	2.151	1.719	1.860	1.784	2.151	ns
	GCLK PLL	t_{su}	-1.217	-1.187	-1.727	-1.907	-2.031	-1.955	-2.426	-1.907	-2.031	-1.955	-2.426	ns
		t_h	1.522	1.487	2.157	2.395	2.560	2.456	2.946	2.395	2.560	2.456	2.946	ns
1.2-V HSTL CLASS I	GCLK	t_{su}	-0.950	-0.926	-1.350	-1.497	-1.617	-1.554	-1.919	-1.497	-1.617	-1.554	-1.919	ns
		t_h	1.094	1.066	1.543	1.719	1.860	1.784	2.151	1.719	1.860	1.784	2.151	ns
	GCLK PLL	t_{su}	-1.217	-1.187	-1.727	-1.907	-2.031	-1.955	-2.426	-1.907	-2.031	-1.955	-2.426	ns
		t_h	1.522	1.487	2.157	2.395	2.560	2.456	2.946	2.395	2.560	2.456	2.946	ns
1.2-V HSTL CLASS II	GCLK	t_{su}	-0.938	-0.914	-1.340	-1.486	-1.601	-1.538	-1.903	-1.486	-1.601	-1.538	-1.903	ns
		t_h	1.082	1.054	1.533	1.708	1.844	1.768	2.135	1.708	1.844	1.768	2.135	ns
	GCLK PLL	t_{su}	-1.205	-1.175	-1.717	-1.896	-2.015	-1.939	-2.410	-1.896	-2.015	-1.939	-2.410	ns
		t_h	1.510	1.475	2.147	2.384	2.544	2.440	2.930	2.384	2.544	2.440	2.930	ns
3.0-V PCI	GCLK	t_{su}	-0.938	-0.914	-1.340	-1.486	-1.601	-1.538	-1.903	-1.486	-1.601	-1.538	-1.903	ns
		t_h	1.082	1.054	1.533	1.708	1.844	1.768	2.135	1.708	1.844	1.768	2.135	ns
	GCLK PLL	t_{su}	-1.205	-1.175	-1.717	-1.896	-2.015	-1.939	-2.410	-1.896	-2.015	-1.939	-2.410	ns
		t_h	1.510	1.475	2.147	2.384	2.544	2.440	2.930	2.384	2.544	2.440	2.930	ns

Table 1–126. EP3SE110 Row Pins Input Timing Parameters (Part 2 of 3)

I/O Standard	Clock	Parameter	Fast Model		C2	C3	C4	C4L		I3	I4	I4L		Units
			Industrial	Commercial	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 0.9 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 0.9 V	
DIFFERENTIAL 1.5-V HSTL CLASS I	GCLK	t_{su}	-0.758	-0.806	-1.154	-1.254	-1.359	-1.307	-1.649	-1.255	-1.360	-1.309	-1.693	ns
		t_h	0.884	0.948	1.354	1.478	1.603	1.540	1.883	1.488	1.613	1.551	1.928	ns
	GCLK PLL	t_{su}	1.147	1.162	1.855	2.094	2.328	2.208	2.147	2.111	2.346	2.224	2.194	ns
		t_h	-0.884	-0.882	-1.438	-1.629	-1.812	-1.720	-1.650	-1.635	-1.818	-1.725	-1.693	ns
DIFFERENTIAL 1.5-V HSTL CLASS II	GCLK	t_{su}	-0.758	-0.806	-1.154	-1.254	-1.359	-1.307	-1.649	-1.255	-1.360	-1.309	-1.693	ns
		t_h	0.884	0.948	1.354	1.478	1.603	1.540	1.883	1.488	1.613	1.551	1.928	ns
	GCLK PLL	t_{su}	1.147	1.162	1.855	2.094	2.328	2.208	2.147	2.111	2.346	2.224	2.194	ns
		t_h	-0.884	-0.882	-1.438	-1.629	-1.812	-1.720	-1.650	-1.635	-1.818	-1.725	-1.693	ns
DIFFERENTIAL 1.8-V HSTL CLASS I	GCLK	t_{su}	-0.772	-0.818	-1.163	-1.264	-1.377	-1.325	-1.667	-1.266	-1.377	-1.326	-1.710	ns
		t_h	0.898	0.960	1.364	1.488	1.621	1.558	1.901	1.499	1.630	1.568	1.945	ns
	GCLK PLL	t_{su}	1.133	1.150	1.842	2.084	2.310	2.190	2.129	2.100	2.329	2.207	2.177	ns
		t_h	-0.870	-0.870	-1.426	-1.619	-1.794	-1.702	-1.632	-1.624	-1.801	-1.708	-1.676	ns
DIFFERENTIAL 1.8-V HSTL CLASS II	GCLK	t_{su}	-0.772	-0.818	-1.163	-1.264	-1.377	-1.325	-1.667	-1.266	-1.377	-1.326	-1.710	ns
		t_h	0.898	0.960	1.364	1.488	1.621	1.558	1.901	1.499	1.630	1.568	1.945	ns
	GCLK PLL	t_{su}	1.133	1.150	1.842	2.084	2.310	2.190	2.129	2.100	2.329	2.207	2.177	ns
		t_h	-0.870	-0.870	-1.426	-1.619	-1.794	-1.702	-1.632	-1.624	-1.801	-1.708	-1.676	ns
DIFFERENTIAL 1.5-V SSTL CLASS I	GCLK	t_{su}	-0.758	-0.806	-1.154	-1.254	-1.359	-1.307	-1.649	-1.255	-1.360	-1.309	-1.693	ns
		t_h	0.884	0.948	1.354	1.478	1.603	1.540	1.883	1.488	1.613	1.551	1.928	ns
	GCLK PLL	t_{su}	1.147	1.162	1.855	2.094	2.328	2.208	2.147	2.111	2.346	2.224	2.194	ns
		t_h	-0.884	-0.882	-1.438	-1.629	-1.812	-1.720	-1.650	-1.635	-1.818	-1.725	-1.693	ns
DIFFERENTIAL 1.5-V SSTL CLASS II	GCLK	t_{su}	-0.758	-0.806	-1.154	-1.254	-1.359	-1.307	-1.649	-1.255	-1.360	-1.309	-1.693	ns
		t_h	0.884	0.948	1.354	1.478	1.603	1.540	1.883	1.488	1.613	1.551	1.928	ns
	GCLK PLL	t_{su}	1.147	1.162	1.855	2.094	2.328	2.208	2.147	2.111	2.346	2.224	2.194	ns
		t_h	-0.884	-0.882	-1.438	-1.629	-1.812	-1.720	-1.650	-1.635	-1.818	-1.725	-1.693	ns
DIFFERENTIAL 1.8-V SSTL CLASS I	GCLK	t_{su}	-0.772	-0.818	-1.163	-1.264	-1.377	-1.325	-1.667	-1.266	-1.377	-1.326	-1.710	ns
		t_h	0.898	0.960	1.364	1.488	1.621	1.558	1.901	1.499	1.630	1.568	1.945	ns
	GCLK PLL	t_{su}	1.133	1.150	1.842	2.084	2.310	2.190	2.129	2.100	2.329	2.207	2.177	ns
		t_h	-0.870	-0.870	-1.426	-1.619	-1.794	-1.702	-1.632	-1.624	-1.801	-1.708	-1.676	ns
DIFFERENTIAL 1.8-V SSTL CLASS II	GCLK	t_{su}	-0.772	-0.818	-1.163	-1.264	-1.377	-1.325	-1.667	-1.266	-1.377	-1.326	-1.710	ns
		t_h	0.898	0.960	1.364	1.488	1.621	1.558	1.901	1.499	1.630	1.568	1.945	ns
	GCLK PLL	t_{su}	1.133	1.150	1.842	2.084	2.310	2.190	2.129	2.100	2.329	2.207	2.177	ns
		t_h	-0.870	-0.870	-1.426	-1.619	-1.794	-1.702	-1.632	-1.624	-1.801	-1.708	-1.676	ns
DIFFERENTIAL 2.5-V SSTL CLASS I	GCLK	t_{su}	-0.781	-0.827	-1.178	-1.275	-1.384	-1.333	-1.673	-1.273	-1.378	-1.329	-1.712	ns
		t_h	0.907	0.969	1.379	1.502	1.631	1.568	1.912	1.509	1.636	1.573	1.952	ns
	GCLK PLL	t_{su}	1.124	1.141	1.827	2.068	2.299	2.178	2.118	2.089	2.323	2.199	2.170	ns
		t_h	-0.861	-0.861	-1.411	-1.601	-1.780	-1.688	-1.617	-1.610	-1.792	-1.699	-1.665	ns

Table 1–134. EP3SE260 Row Pins Output Timing Parameters (Part 3 of 5)

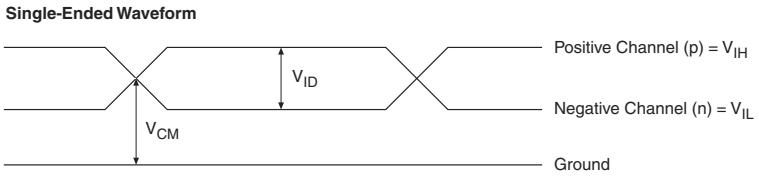
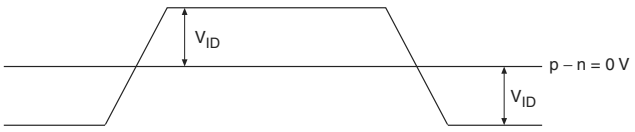
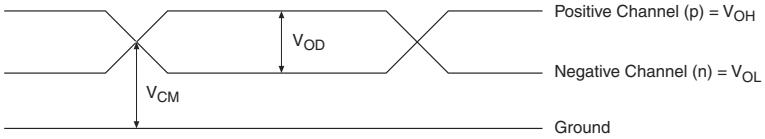
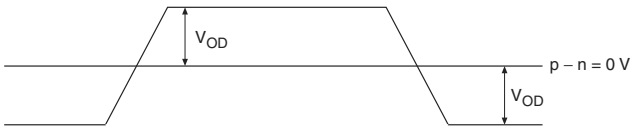
I/O Standard	Current Strength	Clock	Parameter	Fast Model		C2	C3	C4	C4L		I3	I4	I4L		Units
				Industrial	Commercial	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 0.9 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 1.1 V	V_{CCL}= 0.9 V	
1.5 V	2mA	GCLK	t_{co}	3.797	4.088	6.084	6.364	7.016	6.687	7.188	6.547	7.005	6.687	7.188	ns
		GCLK PLL	t_{co}	1.698	1.932	2.608	2.736	3.037	3.028	2.986	2.895	3.177	3.028	2.986	ns
	4mA	GCLK	t_{co}	3.555	3.831	5.679	5.927	6.525	6.293	6.713	6.101	6.604	6.293	6.713	ns
		GCLK PLL	t_{co}	1.456	1.675	2.203	2.299	2.546	2.537	2.495	2.449	2.673	2.537	2.495	ns
	6mA	GCLK	t_{co}	3.528	3.783	5.606	5.831	6.419	6.224	6.644	6.003	6.531	6.224	6.644	ns
		GCLK PLL	t_{co}	1.429	1.640	2.130	2.219	2.440	2.431	2.389	2.351	2.568	2.431	2.389	ns
	8mA	GCLK	t_{co}	3.519	3.774	5.584	5.813	6.400	6.205	6.625	5.985	6.512	6.205	6.625	ns
		GCLK PLL	t_{co}	1.420	1.629	2.108	2.195	2.421	2.412	2.370	2.333	2.549	2.412	2.370	ns
1.2 V	2mA	GCLK	t_{co}	3.740	4.013	5.994	6.278	6.941	6.626	7.113	6.459	6.936	6.626	7.113	ns
		GCLK PLL	t_{co}	1.641	1.857	2.518	2.650	2.962	2.953	2.911	2.807	3.093	2.953	2.911	ns
	4mA	GCLK	t_{co}	3.560	3.824	5.701	5.955	6.566	6.341	6.761	6.126	6.648	6.341	6.761	ns
		GCLK PLL	t_{co}	1.461	1.670	2.225	2.327	2.587	2.578	2.536	2.474	2.715	2.578	2.536	ns
SSTL-2 CLASS I	8mA	GCLK	t_{co}	3.457	3.706	5.468	5.677	6.285	6.073	6.524	5.857	6.395	6.073	6.524	ns
		GCLK PLL	t_{co}	1.391	1.578	2.024	2.119	2.306	2.328	2.255	2.235	2.434	2.328	2.255	ns
	12mA	GCLK	t_{co}	3.445	3.702	5.465	5.675	6.277	6.071	6.522	5.849	6.394	6.071	6.522	ns
		GCLK PLL	t_{co}	1.379	1.566	2.016	2.111	2.301	2.326	2.247	2.227	2.433	2.326	2.247	ns
SSTL-2 CLASS II	16mA	GCLK	t_{co}	3.429	3.691	5.450	5.659	6.250	6.054	6.505	5.823	6.376	6.054	6.505	ns
		GCLK PLL	t_{co}	1.363	1.548	1.991	2.086	2.284	2.309	2.220	2.201	2.415	2.309	2.220	ns
SSTL-18 CLASS I	4mA	GCLK	t_{co}	3.497	3.748	5.512	5.726	6.301	6.119	6.539	5.893	6.422	6.119	6.539	ns
		GCLK PLL	t_{co}	1.398	1.593	2.041	2.131	2.324	2.313	2.271	2.241	2.459	2.313	2.271	ns
	6mA	GCLK	t_{co}	3.482	3.734	5.509	5.724	6.299	6.118	6.538	5.891	6.420	6.118	6.538	ns
		GCLK PLL	t_{co}	1.383	1.588	2.039	2.130	2.323	2.311	2.269	2.239	2.457	2.311	2.269	ns
	8mA	GCLK	t_{co}	3.471	3.722	5.492	5.707	6.282	6.108	6.528	5.874	6.411	6.108	6.528	ns
		GCLK PLL	t_{co}	1.372	1.577	2.029	2.120	2.313	2.294	2.252	2.222	2.448	2.294	2.252	ns
	10mA	GCLK	t_{co}	3.447	3.699	5.476	5.691	6.267	6.095	6.515	5.859	6.399	6.095	6.515	ns
		GCLK PLL	t_{co}	1.348	1.566	2.016	2.107	2.300	2.279	2.237	2.207	2.436	2.279	2.237	ns
	12mA	GCLK	t_{co}	3.447	3.698	5.475	5.690	6.266	6.095	6.515	5.858	6.399	6.095	6.515	ns
		GCLK PLL	t_{co}	1.348	1.565	2.016	2.107	2.300	2.278	2.236	2.206	2.436	2.278	2.236	ns

Glossary

The following table lists the glossary for this chapter.

Table 1.

Glossary Table (Part 1 of 4)

Letter	Subject	Definitions
A	—	—
B	—	—
C	—	—
D	Differential I/O Standards	Receiver Input Waveforms **Single-Ended Waveform**  **Differential Waveform**  Transmitter Output Waveforms **Single-Ended Waveform**  **Differential Waveform** 
E	—	—
F	f_{HSCLK}	High-Speed I/O Block: High-speed receiver/transmitter input and output clock frequency.
	f_{HSDR}	High-Speed I/O Block: Maximum/minimum LVDS data transfer rate (f_{HSDR} = 1/TUI), non-DPA.
	$f_{HSDRDPA}$	High-Speed I/O Block: Maximum/minimum LVDS data transfer rate ($f_{HSDRDPA}$ = 1/TUI), DPA.
G	—	—
H	—	—
I	—	—