EP900I

Classic EPLD

March 1995, ver. 2 Data Sheet Supplement

This data sheet supplement should be used together with the *Classic Family Data Sheet*.

Features

- Formerly Intel's 5C090 device
- High-performance, 24-macrocell Classic EPLD
  - Combinatorial speeds with t_{PD} = 50 ns
  - Counter frequencies up to 20 MHz
  - Pipelined data rates up to 26.3 MHz
- Pin-, function-, and programming file-compatible with Altera's EP910 EPLDs
- Programmable I/O architecture with up to 36 inputs or 24 outputs
- Macrocells individually programmable as D, T, JK, or SR flipflops, or for combinatorial operation
- Available in windowed ceramic and one-time-programmable plastic packages:
  - 40-pin dual in-line packages (CerDIP and PDIP)
  - 44-pin plastic J-lead chip carrier (PLCC)

Absolute Maximum Ratings

See *Operating Requirements for Altera Devices* in the current Altera ***Data Book***.

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CC}	Supply voltage	*Note (1)*	–2.0	7.0	V
V_I	DC input voltage	*Notes (1), (2)*	–0.5	V_{CC} + 0.5	V
T_{STG}	Storage temperature		–65	150	° C
T_{AMB}	Ambient temperature	*Note (3)*	–10	85	° C

Recommended Operating Conditions

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CC}	Supply voltage		4.75	5.25	V
V_I	Input voltage		0	V_{CC}	V
V_O	Output voltage		0	V_{CC}	V
T_A	Operating temperature	For commercial use	0	70	° C
T_A	Operating temperature	For industrial use	–40	85	° C
t_R	Input rise time	*Note (4)*		500	ns
t_F	Input fall time	*Note (4)*		500	ns

DC Operating Conditions *Note (5)*

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{IH}	High-level input voltage	*Note (6)*	2.0		V_{CC} + 0.3	V
V_{IL}	Low-level input voltage	*Note (6)*	–0.3		0.8	V
V_{OH}	High-level output voltage	I_{OH} = –4 mA DC, V_{CC} = min	2.4			V
V_{OL}	Low-level output voltage	I_{OL} = 4 mA DC, V_{CC} = min			0.45	V
I_I	Input leakage current	V_{CC} = max, GND < V_{IN} < V_{CC}	–10		10	µA
I_{OZ}	Tri-state output off-state current	V_{CC} = max, GND < V_{OUT} < V_{CC}	–10		10	µA
I_{CC1}	V_{CC} supply current (non-turbo, standby)	V_{CC} = max, V_{IN} = V_{CC} or GND, *Note (7)*		50	150	µA
I_{CC2}	V_{CC} supply current (non-turbo, active)	V_{CC} = max, V_{IN} = V_{CC} or GND, no load, f_{IN} = 1 MHz, *Note (8)*		15	25	mA

Capacitance *Note (5)*

Symbol	Parameter	Conditions	Min	Max	Unit
C_{IN}	Input capacitance	V_{IN} = 0 V, f = 1.0 MHz		20	pF
C_{OUT}	Output capacitance	V_{OUT} = 0 V, f = 1.0 MHz		20	pF
C_{CLK1}	CLK1 pin capacitance	V_{IN} = 0 V, f = 1.0 MHz		20	pF
C_{CLK2}	CLK2 pin capacitance	V_{IN} = 0 V, f = 1.0 MHz		80	pF

AC Operating Conditions *Note (5)*

External Timing Parameters			EP900I-50		EP900I-60		Non-Turbo Adder	
Symbol	**Parameter**	**Conditions**	**Min**	**Max**	**Min**	**Max**	*Note (9)*	**Unit**
t_{PD1}	Input to non-registered output			45		55	25	ns
t_{PD2}	I/O input to non-registered output			50		60	25	ns
t_{PZX}	Input to output enable	*Note (10)*		50		60	25	ns
t_{PXZ}	Input to output disable	*Note (10)*		50		60	25	ns
t_{CLR}	Asynchronous output clear time			50		60	25	ns

Global Clock Mode			EP900I-50		EP900I-60		Non-Turbo Adder	
Symbol	**Parameter**	**Conditions**	**Min**	**Max**	**Min**	**Max**	*Note (9)*	**Unit**
f_{MAX}	Maximum frequency		26.3		21.7		0	MHz
t_{SU1}	Input setup time		36		43		25	ns
t_{SU2}	I/O setup time		38		46		25	ns
t_{H}	Input hold time		0		0		0	ns
t_{CH}	Clock high time		17.5		23		0	ns
t_{CL}	Clock low time		17.5		23		0	ns
t_{CO}	Clock to output delay			23		25	0	ns
t_{CNT}	Minimum clock period			50		60	25	ns
f_{CNT}	Internal maximum frequency		20		16.7		0	MHz

Array Clock Mode			EP900I-50		EP900I-60		Non-Turbo Adder	
Symbol	**Parameter**	**Conditions**	**Min**	**Max**	**Min**	**Max**	*Note (9)*	**Unit**
f_{MAX}	Maximum frequency		28.6		21.7		0	MHz
t_{ASU1}	Input setup time		10		10		25	ns
t_{ASU2}	I/O setup time		13		15		25	ns
t_{AH}	Input hold time		15		15		0	ns
t_{ACH}	Clock high time		17.5		23		25	ns
t_{ACL}	Clock low time		17.5		23		25	ns
t_{ACO}	Clock to output delay			48		59	25	ns
t_{ACNT}	Minimum clock period			50		60	25	ns
f_{ACNT}	Internal maximum frequency		20		16.7		0	MHz

Notes to tables:

(1) Voltage is with respect to GND.

(2) The minimum DC input is –0.5 V. During transitions, the inputs may undershoot to –2.0 V or overshoot to +7.0 V for periods less than 20 ns under no-load conditions.

(3) This parameter is under bias. Extended temperature versions are also available.

(4) For all Clocks: t_R and t_F = 250 ns (maximum).

(5) Operating conditions: T_A = 0° C to 70° C, V_{CC} = 5.0 V ± 5% for commercial use.
T_A = –40° C to 85° C, V_{CC} = 5.0 V ± 10% for industrial use.

(6) Absolute values with respect to device GND; all over- and undershoots due to system or tester noise are included.

(7) When the Turbo Bit is not set (non-turbo mode), the device enters standby mode approximately 100 ns after the last input transition.

(8) Measured with a device programmed as a 24-bit counter.

(9) When the Turbo Bit is not set (non-turbo mode), the non-turbo adder values must be added to the appropriate AC parameter to determine worst-case timing.

(10) The t_{PZX} and t_{PXZ} parameters are measured at ±0.5 V from steady state voltage as driven by the output load specification; t_{PZX} is measured with C_L = 5 pF.

Ordering Information

Package	Speed Grade	Product Grade *(1)*	Ordering Code
40-pin CerDIP	-50	Commercial	EP900IDC-50
40-pin PDIP	-50	Commercial	EP900IPC-50
40-pin PDIP	-60	Commercial	EP900IPC-60
44-pin PLCC	-50	Commercial	EP900ILC-50
44-pin PLCC	-60	Commercial	EP900ILC-60
44-pin PLCC	-60	Industrial	EP900ILI-60

Note:

(1) Operating temperature: 0° C to 70° C for commercial use.
–40° C to 85° C for industrial use.