EP600I

Classic EPLD

March 1995, ver. 2 | Data Sheet Supplement

This data sheet supplement should be used together with the *Classic Family Data Sheet* and the *Altera Device Package Outlines Data Sheet* in the current data book.

Features

- Formerly Intel's 5C060 device
- High-performance, 16-macrocell Classic EPLD
  - Combinatorial speeds with t_{PD} = 45 ns
  - Counter frequencies up to 22.2 MHz
  - Pipelined data rates up to 26.3 MHz
- Pin-, function-, and programming file-compatible with Altera's EP610 EPLDs
- Programmable I/O architecture with up to 20 inputs or 16 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:
  - 24-pin dual in-line packages (CerDIP and PDIP)
  - 28-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_C	Case temperature	For military use	–55	125	° 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	100	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)*		10	15	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		50	pF

AC Operating Conditions *Note (5)*

External Timing Parameters			EP600I-45		EP600I-55		Non-Turbo Adder	
Symbol	**Parameter**	**Conditions**	**Min**	**Max**	**Min**	**Max**	*Note (9)*	**Unit**
t_{PD1}	Input to non-registered output			43		53	25	ns
t_{PD2}	I/O input to non-registered output			45		55	25	ns
t_{PZX}	Input to output enable	*Note (10)*		45		55	25	ns
t_{PXZ}	Input to output disable	*Note (10)*		45		55	25	ns
t_{CLR}	Asynchronous output clear time			45		55	25	ns

Global Clock Mode			EP600I-45		EP600I-55		Non-Turbo Adder	
Symbol	**Parameter**	**Conditions**	**Min**	**Max**	**Min**	**Max**	*Note (9)*	**Unit**
f_{MAX}	Maximum frequency		26.3		23.3		0	MHz
t_{SU1}	Input setup time		36		41		25	ns
t_{SU2}	I/O setup time		38		43		25	ns
t_{H}	Input hold time		0		0		0	ns
t_{CH}	Clock high time		17.5		21.5		0	ns
t_{CL}	Clock low time		17.5		21.5		0	ns
t_{CO}	Clock to output delay			22		25	0	ns
t_{CNT}	Minimum clock period			45		55	25	ns
f_{CNT}	Internal maximum frequency		22.2		18.2		0	MHz

Array Clock Mode			EP600I-45		EP600I-55		Non-Turbo Adder	
Symbol	**Parameter**	**Conditions**	**Min**	**Max**	**Min**	**Max**	*Note (9)*	**Unit**
f_{MAX}	Maximum frequency		28.6		23.3		0	MHz
t_{ASU1}	Input setup time		10		10		25	ns
t_{ASU2}	I/O setup time		12		12		25	ns
t_{AH}	Input hold time		15		15		0	ns
t_{ACH}	Clock high time		17.5		21.5		25	ns
t_{ACL}	Clock low time		17.5		21.5		25	ns
t_{ACO}	Clock to output delay			50		58	25	ns
t_{ACNT}	Minimum clock period			45		55	25	ns
f_{ACNT}	Internal maximum frequency		22.2		18.2		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.
T_C = –55° C to 125° C, V_{CC} = 5.0 V ± 10% for military 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), device enters standby mode approximately 100 ns after the last input transition.
(8) Measured with a device programmed as a 16-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
24-pin CerDIP	-45	Commercial	EP600IDC-45
24-pin CerDIP	-55	Commercial	EP600IDC-55
24-pin PDIP	-45	Commercial	EP600IPC-45
24-pin PDIP	-55	Commercial	EP600IPC-55
28-pin PLCC	-45	Commercial	EP600ILC-45
28-pin PLCC	-45	Industrial	EP600ILI-45
24-pin CerDIP	-55	MIL-STD-883B-Compliant, *(2)*	EP600IDM883B-55 5962-8686401LA

Notes:

(1) Operating temperature: 0° C to 70° C for commercial use.
–40° C to 85° C for industrial use.
–55° C to 125° C for military use.
(2) MIL-STD-883B-compliant product specifications are provided in this data sheet and in Military Product Drawings (MPDs). However, MPDs should be used to prepare Source Control Drawings (SCDs) and are available from Altera Marketing at (408) 894-7000. For more information on MPDs and SCDs, see the *Military Products Data Sheet* in the current Altera ***Data Book***.

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