

# EP610A EPLD

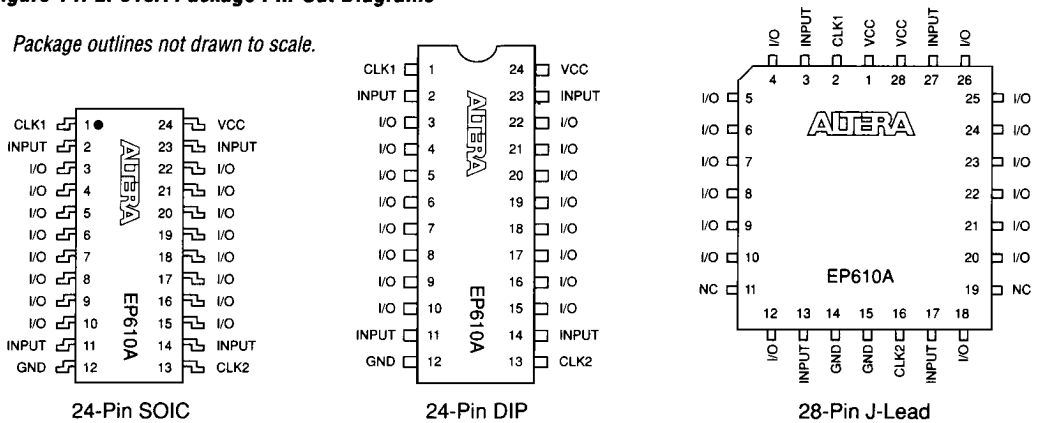
## Features

- ❑ Highest-performance, 16-macrocell Classic EPLD
  - Combinatorial speeds with  $t_{PD} = 7.5$  ns
  - Counter frequencies up to 125 MHz
  - Pipelined data rates up to 142.9 MHz
- ❑ Fabricated on advanced 0.8-micron CMOS EEPROM technology
- ❑ Programmable I/O architecture with up to 20 inputs or 16 outputs
- ❑ Pin-, function-, and programming file-compatible with Altera's EP610, EP610T, EP610 MIL-STD-883-compliant, and EP630 devices
- ❑ Programmable Clock option for independent clocking of all registers
- ❑ Macrocells individually programmable as D, T, JK, or SR flipflops, or for combinatorial operation
- ❑ Available in reprogrammable plastic packages (see Figure 14):
  - 24-pin small-outline integrated circuit (SOIC)
  - 24-pin dual in-line package (PDIP)
  - 28-pin J-lead chip carrier (PLCC)

## Preliminary Information

**Figure 14. EP610A Package Pin-Out Diagrams**

Package outlines not drawn to scale.



## General Description

The Altera EP610A EPLD is a high-speed, EEPROM-based version of the EP610 device. Fully compatible with EP610 devices, the EP610A offers enhanced performance for existing EP610 designs with no additional design modifications. For information on EP610A architecture, refer to Figure 11 earlier in this data sheet.

**Absolute Maximum Ratings** See *Operating Requirements for Altera Devices* in this data book.

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CC}$	Supply voltage	With respect to GND	-2.0	7.0	V
$V_{PP}$	Programming supply voltage	Note (1)	-2.0	13.5	V
$V_I$	DC input voltage		-2.0	7.0	V
$I_{MAX}$	DC $V_{CC}$ or GND current		-175	175	mA
$I_{OUT}$	DC output current, per pin		-25	25	mA
$P_D$	Power dissipation			1000	mW
$T_{STG}$	Storage temperature	No bias	-65	150	°C
$T_{AMB}$	Ambient temperature	Under bias	-65	135	°C
$T_J$	Junction temperature	Under bias		150	°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			25	ns
$t_F$	Input fall time			25	ns

### DC Operating Conditions Notes (2), (3)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{IH}$	High-level input voltage		2.0		$V_{CC} + 0.3$	V
$V_{IL}$	Low-level input voltage		-0.3		0.8	V
$V_{OH}$	High-level TTL output voltage	$I_{OH} = -4$ mA DC	2.4			V
$V_{OL}$	Low-level output voltage	$I_{OL} = 8$ mA DC			0.45	V
$I_I$	Input leakage current	$V_I = V_{CC}$ or GND	-10		10	μA
$I_{OZ}$	Tri-state output off-state current	$V_O = V_{CC}$ or GND	-40		40	μA
$I_{CC3}$	$V_{CC}$ supply current (active)	$V_I = V_{CC}$ or GND, No load, $f = 1.0$ MHz, Notes (4), (5)		105	130 (180)	mA

### Capacitance Note (6)

Symbol	Parameter	Conditions	Min	Max	Unit
$C_{IN}$	Input capacitance	$V_{IN} = 0$ V, $f = 1.0$ MHz		12	pF
$C_{OUT}$	Output capacitance	$V_{OUT} = 0$ V, $f = 1.0$ MHz		12	pF

**AC Operating Conditions** Note (3)

Symbol	Parameter	Conditions	EP610A-7		EP610A-10		EP610A-12		EP610A-15		Unit
			Min	Max	Min	Max	Min	Max	Min	Max	
$t_{PD1}$	Input to non-registered output	C1 = 35 pF		7.5		10		12		15	ns
$t_{PD2}$	I/O input to non-registered output			7.5		10		12		15	ns
$t_{PZX}$	Input to output enable			7.5		10		12		16	ns
$t_{PXZ}$	Input to output disable	C1 = 5 pF, Note (7)		7.5		10		12		16	ns
$t_{CLR}$	Asynchronous output clear time	C1 = 35 pF		7.5		10		12		16	ns

<b>Global Clock Mode</b>			EP610A-7		EP610A-10		EP610A-12		EP610A-15		Unit
Symbol	Parameter	Conditions	Min	Max	Min	Max	Min	Max	Min	Max	
$f_{MAX}$	Maximum frequency	Note (8)	142.9		125		100		83.3		MHz
$t_{SU}$	Input setup time		6		7		8		10		ns
$t_H$	Input hold time		0		0		0		0		ns
$t_{CH}$	Clock high time		3.5		4		5		6		ns
$t_{CL}$	Clock low time		3.5		4		5		6		ns
$t_{CO1}$	Clock to output delay			5		6		7		8	ns
$t_{CNT}$	Minimum clock period			8		10		12		14	ns
$f_{CNT}$	Internal maximum frequency	Note (4)	125.0		100		83.3		71.4		MHz

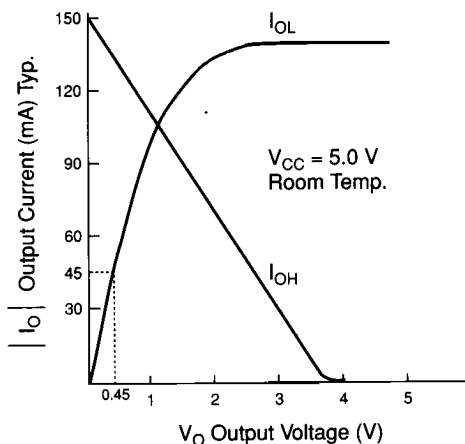
<b>Array Clock Mode</b>			EP610A-7		EP610A-10		EP610A-12		EP610A-15		Unit
Symbol	Parameter	Conditions	Min	Max	Min	Max	Min	Max	Min	Max	
$f_{MAX}$	Maximum frequency	Note (8)	142.9		125		100		83.3		MHz
$t_{ASU}$	Input setup time		3		3		4		5		ns
$t_{AH}$	Input hold time		3		3		4		5		ns
$t_{ACH}$	Clock high time		3.5		4		5		6		ns
$t_{ACL}$	Clock low time		3.5		4		5		6		ns
$t_{ACO1}$	Clock to output delay			8		10		12		14	ns
$t_{ACNT}$	Minimum clock period			8		10		12		14	ns
$f_{ACNT}$	Internal maximum frequency	Note (4)	125.0		100		83.3		71.4		MHz

**Notes to tables:**

- (1) The minimum DC input is  $-0.3$  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.
- (2) Typical values are for  $T_A = 25^\circ$  C and  $V_{CC} = 5$  V.
- (3) Operating conditions:  $V_{CC} = 5$  V  $\pm$  5%,  $T_A = 0^\circ$  C to  $70^\circ$  C for commercial use;  $V_{CC} = 5$  V  $\pm$  10%,  $T_A = -40^\circ$  C to  $85^\circ$  C for industrial use;  $V_{CC} = 5$  V  $\pm$  10%,  $T_C = -55^\circ$  C to  $125^\circ$  C for military use.
- (4) Measured with a device programmed as a 16-bit counter.  $I_{CC}$  measured at  $0^\circ$  C. Actual  $I_{CC}$  should be verified during operation because this measurement is sensitive to the operating conditions and the actual pattern in the device.
- (5) Numbers in parentheses are for military and industrial temperature versions.
- (6) Capacitance measured at  $25^\circ$  C. Sample-tested only. Clock-pin capacitance for dedicated Clock inputs only. CLK2 (high-voltage pin during programming) has a maximum capacitance of 20 pF.
- (7) Sample-tested only for an output change of 500 mV.
- (8) The  $f_{MAX}$  values represent the highest frequency for pipelined data.

Figure 15 shows the output drive characteristics of EP610A I/O pins.

**Figure 15. EP610A Maximum Output Drive Characteristics**



## Product Availability

Product Grade		Availability
Commercial Temp.	( $0^\circ$ C to $70^\circ$ C)	EP610A-7, EP610A-10, EP610A-12, EP610A-15
Industrial Temp.	( $-40^\circ$ C to $85^\circ$ C)	EP610A-15
Military Temp.	( $-55^\circ$ C to $125^\circ$ C)	Consult factory