

Features

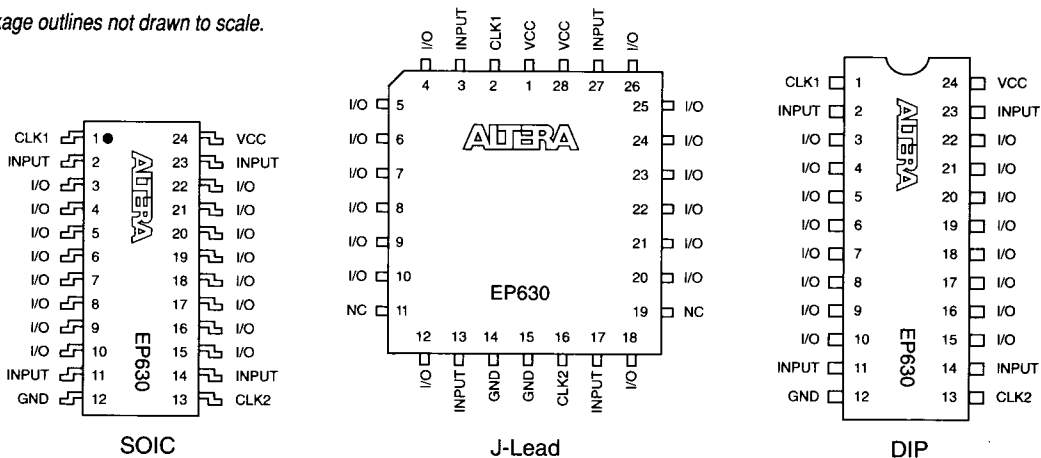
- ❑ High-performance 16-macrocell EPLD
 - Combinatorial speeds with $t_{PD} = 15$ ns
 - Counter frequencies up to 83 MHz
 - Pipelined data rates up to 83 MHz
- ❑ Pin-, function-, and JEDEC-File-compatible with Altera's EP610, EP610A, and EP610T EPLDs
- ❑ 100% generically testable to provide 100% programming yield
- ❑ Available in one-time-programmable (OTP) plastic chip carrier packages
 - 24-pin, 300-mil dual in-line package (PDIP)
 - 24-pin, 300-mil small-outline integrated circuit (SOIC)
 - 28-pin J-lead chip carrier (PLCC)
- ❑ Programmable clock option for independent clocking of all registers
- ❑ Macrocells individually programmable as D, T, JK, or SR flip-flops, or for combinatorial operation
- ❑ Extensive third-party software and programming support
- ❑ MAX+PLUS II and A+PLUS software support includes schematic capture, Boolean equation, state machine, and netlist design entry methods; Altera Hardware Description Language (AHDL), waveform entry, and an EDIF 2.0.0 interface are available with MAX+PLUS II.

General Description

Altera's EP630 Erasable Programmable Logic Device (EPLD) is a fast, low-power version of the EP610 device. The EP630 EPLD can implement a 16-bit counter at up to 83 MHz and typically consumes 5 mA when operating at 1 MHz. The EP630 EPLD is available in OTP plastic 24-pin, 300-mil DIP; 24-pin, 300-mil SOIC; and 28-pin J-lead chip carrier packages. It is available with maximum t_{PD} values of 15 ns and 20 ns. See Figure 12.

Figure 12. EP630 Package Pin-Out Diagrams

Package outlines not drawn to scale.



Absolute Maximum Ratings Note: See *Operating Requirements for EPLDs* 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	See Note (1)	-2.0	14.0	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

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	See Note (2)		40	ns
t_F	Input fall time	See Note (2)		40	ns

DC Operating Conditions See Notes (3), (4)

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_{OH}	High-level CMOS output voltage	$I_{OH} = -2$ mA DC	3.84			V
V_{OL}	Low-level output voltage	$I_{OL} = 4$ 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	-10		10	μA
I_{CC1}	V_{CC} supply current (non-turbo standby)	$V_I = V_{CC}$ or GND, No load, See Note (5)		20	150	μA
I_{CC2}	V_{CC} supply current (non-turbo mode)	$V_I = V_{CC}$ or GND, No load, $f = 1.0$ MHz, See Note (6)		5	10	mA
I_{CC3}	V_{CC} supply current (turbo mode)	$V_I = V_{CC}$ or GND, No load, $f = 1.0$ MHz, See Note (6)		45	90	mA

Capacitance See Note (7)

Symbol	Parameter	Conditions	Min	Max	Unit
C_{IN}	Input capacitance	$V_{IN} = 0\text{ V}, f = 1.0\text{ MHz}$		10	pF
C_{OUT}	Output capacitance	$V_{OUT} = 0\text{ V}, f = 1.0\text{ MHz}$		12	pF
C_{CLK}	Clock pin capacitance	$V_{IN} = 0\text{ V}, f = 1.0\text{ MHz}$		20	pF

AC Operating Conditions See Note (4)

			EP630-15		EP630-20		Non-Turbo Adder	
Symbol	Parameter	Conditions	Min	Max	Min	Max	See Note (8)	Unit
t_{PD1}	Input to non-registered output	$C1 = 35\text{ pF}$		15		20	20	ns
t_{PD2}	I/O input to non-registered output			17		22	20	ns
t_{PZX}	Input to output enable			15		20	20	ns
t_{PXZ}	Input to output disable	$C1 = 5\text{ pF}, \text{Note (9)}$		15		20	20	ns
t_{CLR}	Asynchronous output clear time	$C1 = 35\text{ pF}$		15		20	20	ns
t_{IO}	I/O input pad and buffer delay			2		2	0	ns

Global Clock Mode			EP630-15		EP630-20		Non-Turbo Adder	
Symbol	Parameter	Conditions	Min	Max	Min	Max	See Note (8)	Unit
f_{MAX}	Maximum frequency	See Note (10)	83.3		62.5		0	MHz
t_{SU}	Input setup time		9		11		20	ns
t_H	Input hold time		0		0		0	ns
t_{CH}	Clock high time		6		8		0	ns
t_{CL}	Clock low time		6		8		0	ns
t_{CO1}	Clock to output delay			11		13	0	ns
t_{CNT}	Minimum clock period			12		16	0	ns
f_{CNT}	Internal maximum frequency	See Note (6)	83.3		62.5		0	MHz

Array Clock Mode			EP630-15		EP630-20		Non-Turbo Adder	
Symbol	Parameter	Conditions	Min	Max	Min	Max	See Note (8)	Unit
f_{MAX}	Maximum frequency	See Note (10)	71.4		55.5		0	MHz
t_{ASU}	Input setup time		6		8		20	ns
t_{AH}	Input hold time		6		8		0	ns
t_{ACH}	Clock high time		7		9		0	ns
t_{ACL}	Clock low time		7		9		0	ns
t_{ACO1}	Clock to output delay			15		20	20	ns
t_{ACNT}	Minimum clock period			14		18	0	ns
f_{ACNT}	Internal maximum frequency	See Note (6)	71.4		55.5		0	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) For all clocks: t_R and $t_F = 20$ ns.
- (3) Typical values are for $T_A = 25^\circ\text{C}$ and $V_{CC} = 5$ V.
- (4) Operating conditions: $V_{CC} = 5\text{ V} \pm 5\%$, $T_A = 0^\circ\text{C}$ to 70°C for commercial use.
 $V_{CC} = 5\text{ V} \pm 10\%$, $T_A = -40^\circ\text{C}$ to 85°C for industrial use.
- (5) When in non-turbo mode, an EPLD will automatically enter standby mode if logic transitions do not occur (approximately 100 ns after the last transition).
- (6) Measured with a device programmed as a 16-bit counter.
- (7) Capacitance measured at 25°C . Sample-tested only. Clock-pin capacitance for dedicated clock inputs only.
- (8) See "Turbo Bit" earlier in this data sheet.
- (9) Sample-tested only for an output change of 500 mV.
- (10) The f_{MAX} values represent the highest frequency for pipelined data.

Product Availability

Operating Temperature		Availability
Commercial	$(0^\circ\text{C}$ to $70^\circ\text{C})$	EP630-15, EP630-20
Industrial	$(-40^\circ\text{C}$ to $85^\circ\text{C})$	EP630-20
Military	$(-55^\circ\text{C}$ to $125^\circ\text{C})$	Consult factory

Figure 13 shows the output drive characteristics for EP630 I/O pins and typical supply current versus frequency for the EP630 EPLD.

Figure 13. EP630 Output Drive Characteristics and I_{CC} vs. Frequency

