



Section VII. Cyclone Device Package Information

This section provides information for board layout designers to successfully layout their boards for Cyclone devices. It contains the required PCB layout guidelines, device pin tables, and package specifications.

This section includes the following chapter:

- [Chapter 15. Package Information for Cyclone Devices](#)

Revision History

Refer to each chapter for its own specific revision history. For information on when each chapter was updated, refer to the Chapter Revision Dates section, which appears in the complete handbook.

Introduction

This data sheet provides package information for Altera® devices. It includes the following sections:

- “Device and Package Cross Reference” on page 15–1
- “Thermal Resistance” on page 15–2
- “Package Outlines” on page 15–2

In this data sheet, packages are listed in the order of ascending pin count.

Device and Package Cross Reference

Table 15–1 shows which Altera Cyclone® devices are available in FineLine BGA packages.

<i>Table 15–1. Cyclone Devices in FineLine BGA Packages</i>		
Device	Package	Pins
EP1C4	Non-Thermally Enhanced FineLine BGA	324
	Non-Thermally Enhanced FineLine BGA	400
EP1C6	Non-Thermally Enhanced FineLine BGA	256
EP1C12	Non-Thermally Enhanced FineLine BGA	256
	Non-Thermally Enhanced FineLine BGA	324
EP1C20	Non-Thermally Enhanced FineLine BGA	324
	Non-Thermally Enhanced FineLine BGA	400

Thermal Resistance

Table 15–2 provides θ_{JA} (junction-to-ambient thermal resistance) and θ_{JC} (junction-to-case thermal resistance) values for Altera Cyclone devices.

Table 15–2. Thermal Resistance of Cyclone Devices Notes (1), (2)

Device	Pin Count	Package	θ_{JC} (° C/W)	θ_{JA} (° C/W) Still Air	θ_{JA} (° C/W) 100 ft./min.	θ_{JA} (° C/W) 200 ft./min.	θ_{JA} (° C/W) 400 ft./min.
EP1C3	100	TQFP	11.0	37.5	35.4	33.4	29.8
	144	TQFP	10.0	31.1	29.4	27.9	25.5
EP1C4	324	FineLine BGA	8.3	28.5	24.4	22.1	20.3
	400	FineLine BGA	7.9	20.7	17.5	15.5	13.9
EP1C6	144	TQFP	9.8	29.4	28.0	26.7	24.7
	240	PQFP	4.3	27.2	24.7	22.1	17.8
	256	FineLine BGA	8.8	28.7	24.5	22.3	20.5
EP1C12	240	PQFP	4.0	26.0	23.4	20.8	17.1
	256	FineLine BGA	6.6	24.3	20.2	18.1	16.4
	324	FineLine BGA	6.1	23.0	19.8	17.7	16.1
EP1C20	324	FineLine BGA	5.0	21.0	17.7	15.6	14.1
	400	FineLine BGA	4.7	20.7	17.5	15.5	13.9

Notes to Table 15–2:

- (1) TQFP: thin quad flat pack
- (2) PQFP: plastic quad flat pack

Package Outlines

The package outlines on the following pages are listed in order of ascending pin count. Altera package outlines meet the requirements of JEDEC Publication No. 95.

Document Revision History

Table 15–3 shows the revision history for this chapter.

Date and Document Version	Changes Made	Summary of Changes
May 2008 v1.3	Minor changes to format.	—
January 2007 v1.2	Added document revision history.	—