DataSourceCD Q1-2003: Xilinx Packaging and Thermal Characteristics
Thermally Enhanced Packaging

Contents

This section contains the following information:

The Package Offering

Table 1: **Package Offering**

Xilinx Code	Body (mm)	THK (mm)	Mass (gm)	Heatsink Location	JEDEC No.	Xilinx No.
HQ160	28 X 28	3.40	10.8	Down	MO-108-DDI	OPQ0021
HQ208	28 X 28	3.40	10.0	Down	MO_143-FA	OPQ0020
HQ240	32 X 32	3.40	15.0	Down	MO-143-GA	OPQ0019
HQ304	40 X 40	3.80	26.2	Top	MO-143-JA	OPQ0014

Overview

Xilinx offers thermally enhanced quad flat pack packages on certain devices. This section discusses the performance and usage of these packages (designated HQ). In summary:

- The HQ-series and the regular PQ packages conform to the same JEDEC drawings.
- The HQ and PQ packages use the same PCB land patterns.
- The HQ packages have more mass
- Thermal performance is better for the HQ packages

Where and When Offered

- HQ packages are offered as the thermally enhanced equivalents of PQ packages. They are used for high gate count or high I/O count devices in packages, where heat dissipation without the enhancement may be a handicap for device performance. Such devices include XC4013E, XC4020E, XC4025E, and XC5215.
- They are also being used in place of MQUAD (MQ) packages of the same lead count for new devices.
- The HQ series at the 240-pin count level or below are offered with the heatsink at the bottom of the package. This was done to ensure pin to pin compatibility with the existing PQ and MQ packages.

At the 304-pin count level, the HQ is offered with the heatsink up. This arrangement offers a better potential for further thermal enhancement by the designer.

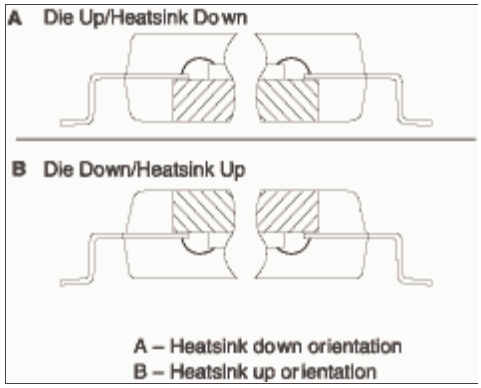

Figure 1: **Heatsink Orientation**

Mass Comparison

Because of the copper heatsink, the HQ series of packages are about twice as heavy as the equivalent PQ. Here is a quick comparison.

	HQ (gm)	PQ (gm)
160-pin	10.8	5.8
208-pin	10.8	5.3
240-pin	15.0	7.1
304-pin	26.2	N/A

Thermal Data for the HQ

The data for individual devices may be obtained from Xilinx.

Table 2: **Still Air Data Comparison**

	HQ Theta$_{JA}$ (°C/Watt)	PQ Theta$_{JA}$ (°C/Watt)
160-pin	13.5 - 14.5	20.5 - 38.5
208-pin	14 - 15	26 - 35
240-pin	12 - 13	19 - 28
304-pin	10 - 11	N/A

Notes:

1. Theta$_{JC}$ is typically between 1 and 2°C/Watt for HQ and MQ Packages. For PQ's, it is between 2 and 7°C/Watt.

Table 3: **Data Comparison at Airflow - 250 LFM**

	HQ ThetaJA (°C/Watt)	PQ ThetaJA (°C/Watt)
160-pin	9 - 10	15 - 28.5
208-pin	9 - 10	14 - 26
240-pin	8 - 9	11 - 21
304-pin	6.5 - 8	N/A

Other Information

- Leadframe: Copper EFTEC-64 or C7025
- Heat Slug: Copper - Nickel plated = Heatsink metal is Grounded
- Lead Finish 85/15 Sn/Pb 300 microinches minimum
- D/A material: Same as PQ; Epoxy 84-1LMISR4
- Mold Cpd: Same as PQ - EME7304LC
- Packed in the same JEDEC trays

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