ASAT

ELECTRICAL CHARACTERIZATION STUDY IN ASAT 2 LAYER 256 PLASTIC BALL GRID ARRAY

Background

To understand the electrical performance of the IC package design, it is important to measure the actual electrical such that the package electrical performance will meet the package specification. The Tektronix Ipa 510 Interconnect Parameter Analyzer will allow the engineer to make a sound decision on the performance of the package to the IC device. In this study, a plastic ball grid array (PBGA) package was analyzed. The design and netlist for this package is a known standard in the industry today.

Introduction

Nowadays, most integrated circuit (IC) chips are assembled in high pin count such as BGA type packages. This is due to the increasing performance of IC chips. The majority of IC chip design companies are interested in BGA package due to the high electrical performance of this package type .

High speed performance devices require accurate measurement for the package. This is to assure that the signal integrity of the die within the package meets the system requirement. Some of the parameters which can be extracted from package electrical measurement are self inductance, mutual inductance, mutual capacitance and total capacitance. This information will allow the system engineer to study the electrical characterization of this package.

Package Parameters for Electrical Measurement of 2 Layer 256 PBGA (27X27mm)

Attribute	256 I/0 PBGA
Size (mm^2)	27 x 27
Ball Pitch (mm)	1.27
Gold bond wire (mils)	1.3
Analysis Frequency	100 MHz
Lead width/space (mils)	4 / 4
Corner Long lead (mm)	9.2
Center Short lead (mm)	3.1

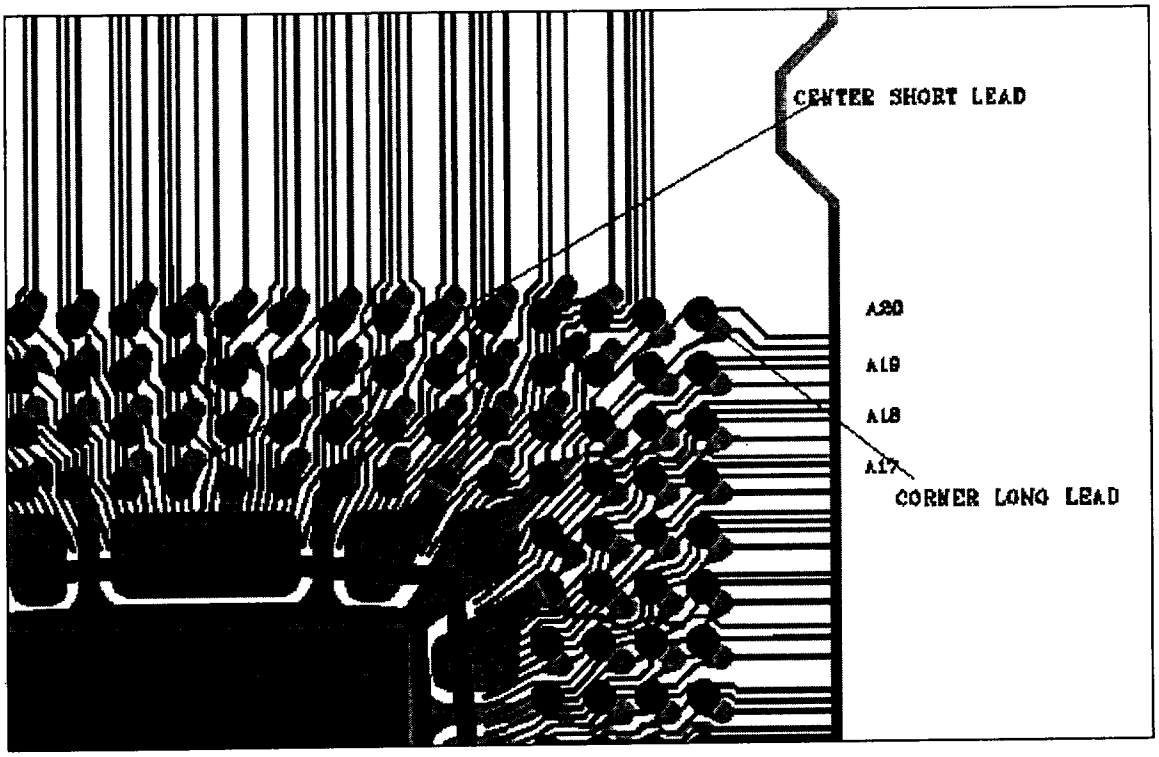

Figure 1. This is the 2 Layer 256 PBGA 1/4 design layout and the indication for the longest and the short lead.

Modeling Details:

The material properties and the geometrical details of the package are listed in the Table 1.

Table 1. Material Properties and Geometrical Details

Layer	Component	Distance from Reference point	Dielectric Constant (mm)	Loss Tangent	Trace Conductivity	Trace Thickness (mm)
4	Air	5	1	0	0	0
3	Mold Compound	2.45	4.3	-0.008	$4.9x10^7$	0.03
2	BT Resin	1.16	4	-0.005	$4.9x10^7$	0.03
1	Air	0.6	1	0	0	0
0	Reference	0	1	0	∞	0

The Electrical Measurement Setup are listed as follows:

A) Tektronix Ipa 510 Interconnect Parameter Analyzer

B) Altair Microwave Model T-1067 BGA Test Fixture

C) Tdr Rise/Fall Time < 150 Ps

D) Procedure Follows The JEDEC Publication Eia/Jep 123