

E-tec Test Results

0591 elastomer interposer (0.50mm thick)
1090 elastomer interposer (1.00mm thick)

12/12/2009



Objective

Gatewave Northern has conducted in-depth analysis of the E-tec elastomer interposer sockets to determine the performance under various conditions and test settings and the results can be summarized as follows :

1. RF tests

	1.00mm thick elastomer		0.50mm thick elastomer			
	1.00mm pitch	0.80mm pitch	1.00mm pitch	0.80mm pitch	0.50mm pitch	
	0.60mm ball	0.45mm ball	0.60mm ball	0.45mm ball	0.30mm ball	
	EBW081-1090	EBW144-0890	EBW081-1091	EBW144-0891	EBW361-0591	
	Field	Field	Field	Field	Field	
Delay	12.8	9.9	6.9	6.2	8.2	ps
Risetime open	31.5	33.0	31.5	39.0	31.5	ps
Risetime short	34.5	33.0	28.5	30.0	30.0	ps
Risetime thru, 50 Ω	31.5	31.5	30.0	33.0	33.0	ps
Sinusoidal signals						
Insertion loss (1dB)	20.5	23.5	38.3	24.3	17.7	GHz
Insertion loss (3dB)	23.3	29.7	40.0	40.0	40.0	GHz
VSWR (2:1)	22.7	28.9	40.0	40.0	27.5	GHz
Digital signals (est.)	6.5 GHz max.	6.5 GHz max.	10 GHz min.	10 GHz min.	10 GHz min.	GHz
Inductance	0.52	0.43	0.35	0.26	0.23	nH
Mutual inductance	0.11	0.1	0.05	0.06	0.04	nH
Capacitance	0.254	0.202	0.117	0.158	0.139	pF
Mutual capacitance	0.017	0.018	0.007	0.016	0.037	pF
Impedance	44.8	43.2	44.4	44.4	41.3	Ohm

Note :

Tests with smaller solderball diameters of 0.20mm on the 0.50mm thick interposer have been performed and no major differences have been observed when moving to smaller solderball diameters. Detailed information is available upon request.

Different chip configurations may result in different performance, but the above data can reliably be considered as the « typical » RF performance of the E-tec elastomer interposers.

2. DC measurement results

Resistance measurements were performed before and after 1000 cycles on 0.50mm and 1.00mm thick interposers, showing very stable resistance values :

	1.00mm	0.50mm	
	0.60mm ball	0.30mm ball	
Average Cres	22.4	26.0	mOhms
Max.	26.0	30.0	mOhms
Min.	18.0	22.0	mOhms
STDEV	2.8	2.4	mOhms

These measurements include the resistance of the solder ball itself. Nominal compression was used.

Current carrying capability has been determined with different test methods

- voltage and resistance as a function of drive current
- power dissipation as a function of drive current
- temperature rise as a function of drive current
- derivative power as a function of drive current

Based on the above tests, the following « typical » current carrying performance can be determined :

1.00mm interposer: with 0.30mm solderball diameter at around 0.10mm compression: 1.5A max.
with 0.60mm solderball diameter at around 0.10mm compression : 4.0A max.
0.50mm interposer: with 0.30mm solderball diameter at around 0.10mm compression : 2.5A max

Note :

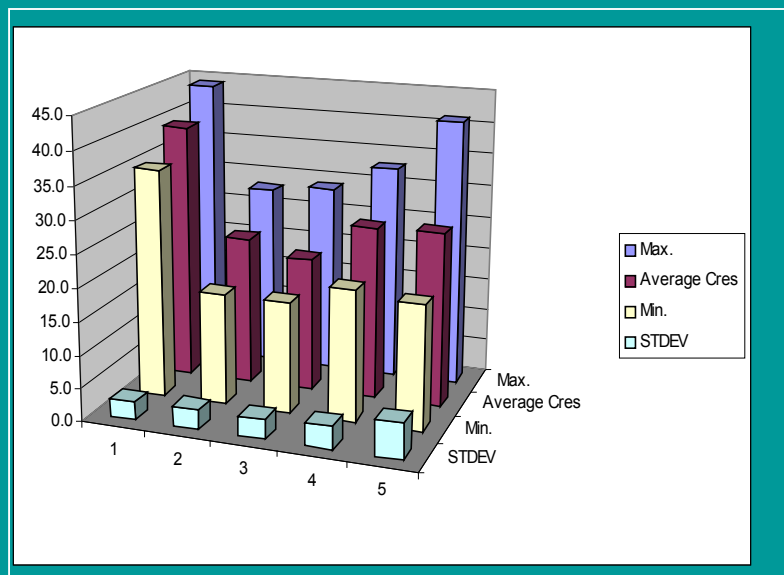
Performance changes after 1000 cycles remained remarkably low.

Tests were made with solderballs being pressed by around 0.10mm into elastomer interposer. Increased compression will reduce the contact resistance values and increase the current carrying performance.

3. Temperature cycling

Temperature cycling was performed on 5 different test sites with the 1.00mm thick elastomer interposer to determine contact resistance as a function of temperature. Temperature cycling commenced at 30°C and was then lowered to -45° and afterwards increased to +150°C and then lowered again to 30°C. Dwell time at each step was around 2 minutes for an overall test period of around 2.5 hours.

	1	2	3	4	5	
Max.	44.0	28.0	29.0	33.0	41.0	mOhms
Average Cres	39.3	22.7	20.5	26.4	26.6	mOhms
Min.	35.0	17.0	17.0	20.0	19.0	mOhms
STDEV	2.7	3.0	3.0	3.5	5.4	mOhms



Note :

Higher values for site 1 are likely caused by reduced contact pressure. Resistance variation for the site compares favorably with the others however. Based on the above results, it can be confirmed that E-tec's typical temperature range of -35°C to +125°C will be supported without problems.

4. Elastomer life

Based on the tests performed the life of the E-tec elastomer interposer can be determined as follows:

BGA testing: min. 1000 cycles (chips were changed regularly during the test)

LGA/QFN testing: min. 10'000 cycles (chips were changed regularly during the test)

5. Humidity test

Test condition: Precondition the interposer at 50°C for 24 hours, followed by 96 hours at 40°C and 90% to 95% RH.

Result: The elastomer interposer shows no deterioration. The contact resistance, leakage and leakage resistance values remain stable throughout the test

5. Additional test data

Full line test reports of the various tests performed as well as SPICE models can be obtained from E-tec.