



**CARSEM ELECTRICAL DATA**

UPDATED: 2005 MARCH

**TSSOP**

Package Type TSSOP 8L 4.4mmx3.0mmx0.9mm	Lead	Self Inductance (nH) $L_{11}$			Bulk Capacitance (pF) $C_{11}$			Resistance (mOhm) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
	Center	0.7416	0.7520	1.494	0.2031	0.04333	0.2464	8.773	48.04	56.81	0.7774	1.0	
	Corner	1.425	0.6512	2.076	0.2705	0.04118	0.3117	16.21	43.65	59.86	0.6676	1.0	
Paddle Size (milxmil) 79x118 Die size (milxmil) 53x75		Mutual Inductance $L_{12}$			Mutual Inductance $L_{13}$			Mutual Capacitance $C_{12}$			Mutual Capacitance $C_{13}$		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire
	Center	0.2024	0.02355	0.2260	0.1748	0.09186	0.2667	0.05019	0.002623	0.05281	0.05357	0.002941	0.05651
	Corner	0.01939	0.02801	0.04740	0.2024	0.02355	0.2260	0.005745	0.0009239	0.006669	0.05019	0.002623	0.05281

Package Type TSSOP 14L 4.4mmx5.0mmx0.9mm	Lead	Self Inductance (nH) $L_{11}$			Bulk Capacitance (pF) $C_{11}$			Resistance (mOhm) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
	Center	0.7378	1.122	1.860	0.1844	0.05059	0.2350	9.411	63.10	72.51	1.209	1.0	
	Corner	1.337	1.328	2.665	0.2999	0.06116	0.3611	15.25	72.18	87.43	1.398	1.0	
Paddle Size (milxmil) 118x122 Die size (milxmil) 50x60		Mutual Inductance $L_{12}$			Mutual Inductance $L_{13}$			Mutual Capacitance $C_{12}$			Mutual Capacitance $C_{13}$		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire
	Center	0.1716	0.2311	0.4027	0.1671	0.2925	0.4596	0.05104	0.004395	0.05544	0.04973	0.006229	0.05596
	Corner	0.2209	0.3074	0.5283	0.02317	0.04338	0.06655	0.06041	0.005838	0.06625	0.008935	0.0005085	0.009444

Package Type TSSOP 16L 4.4mmx5.0mmx0.9mm	Lead	Self Inductance (nH) $L_{11}$			Bulk Capacitance (pF) $C_{11}$			Resistance (mOhm) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
	Center	0.7218	1.160	1.882	0.2088	0.05128	0.2601	9.012	56.55	65.56	1.068	1.0	
	Corner	1.369	0.9747	2.344	0.2666	0.04738	0.3140	15.49	64.92	80.41	1.242	1.0	
Paddle Size (milxmil) 118x154 Die size (milxmil) 50x100		Mutual Inductance $L_{12}$			Mutual Inductance $L_{13}$			Mutual Capacitance $C_{12}$			Mutual Capacitance $C_{13}$		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire
	Center	0.1703	0.2532	0.4235	0.1697	0.2349	0.4046	0.05177	0.004338	0.05611	0.04966	0.004343	0.05400
	Corner	0.02246	0.06403	0.08649	0.2235	0.1508	0.3743	0.006585	0.004019	0.01060	0.05197	0.0009715	0.05294



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Package Type	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
TSSOP 20L 14.4mmx6.5mmx0.9mm Paddle Size (milxmil) 118x165 Die size (milxmil) 106x106	Center	0.6579	0.6729	1.331	0.1592	0.04206	0.2013	8.082	44.63	52.71	0.6876	1.0	
	Corner	1.379	1.196	2.575	0.3512	0.05850	0.4097	15.76	67.60	83.36	1.226	1.0	
		Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire
	Center	0.1391	0.08243	0.2215	0.1462	0.07128	0.2175	0.03514	0.002887	0.03803	0.03711	0.002559	0.03967
	Corner	0.3282	0.2522	0.5804	0.009624	0.1288	0.1384	0.1056	0.006210	0.1118	0.01302	0.002454	0.01547
TSSOP 24L 7.8mmx6.4mmx0.9mm Paddle Size (milxmil) 118x217 Die size (milxmil) 106x139x8 *Assumptions: ref (3a)	Center	0.6961	0.6328	1.3289	0.1740	0.0438	0.2178	10.770	44.84	55.61	0.6090	1.0	
	Corner	0.6952	0.8748	1.5700	0.1733	0.0596	0.2329	10.6500	55.9100	66.5600	0.860	1.0	
		Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire
	Center	0.1659	0.0645	0.2304	0.1674	0.0709	0.2383	0.0473	0.0044	0.0517	0.0467	0.0052	0.0519
	Corner	0.1977	0.1658	0.3635	0.1668	0.1165	0.2833	0.0522	0.0081	0.0603	0.0467	0.0078	0.0545
TSSOP 38L 4.4mmx9.7mmx0.9mm Paddle Size (milxmil) 118x217 Die size (milxmil) 108x207 *Assumptions: ref(3)	Center	0.7479	0.4407	1.189	0.1713	0.04130	0.2126	7.126	24.33	31.46	0.5466	1.3	
	Corner	1.992	0.5348	2.527	0.4388	0.04509	0.4839	16.31	27.34	43.65	0.6582	1.3	
		Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire
	Center	0.2411	0.05425	0.2954	0.2401	0.06292	0.3030	0.04949	0.003690	0.05320	0.04934	0.004735	0.05410
	Corner	0.6846	0.09943	0.7840	0.05674	0.04707	0.1038	0.1838	0.006795	0.1906	0.03130	0.003362	0.03470



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Package Type	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
TSSOP 38L 4.4mmx9.7mmx0.9mm Paddle Size (milxmil) 118x217 Die size (milxmil) 108x207 *Assumptions: ref (3a)	Center	0.7538	0.4407	1.195	0.1713	0.04130	0.2126	11.58	24.33	35.91	0.5466	1.3	
	Corner	2.006	0.5348	2.541	0.4388	0.04509	0.4839	25.79	27.34	53.13	0.6582	1.3	
		Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>		
	Center	0.2411	0.05425	0.2954	0.2401	0.06292	0.3030	0.04949	0.003690	0.05320	0.04934	0.004735	0.05410
	Corner	0.6846	0.09943	0.7840	0.05674	0.04707	0.1038	0.1838	0.006795	0.1906	0.03130	0.003362	0.03470
TSSOP 48L 2.50mmx6.10mmx0.9mm Paddle Size (milxmil) 118x197 Die size (milxmil) 108x185	Center	1.186	0.6385	1.825	0.3085	0.03420	0.3427	12.69	43.08	55.77	0.6007	1.0	
	Corner	2.831	0.8678	3.699	0.6909	0.04679	0.7377	26.91	53.37	80.28	0.8956	1.0	
		Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>		
	Center	0.4654	0.1480	0.6134	0.4525	0.1405	0.5930	0.1117	0.005198	0.1169	0.09680	0.004604	0.1014
	Corner	0.1038	0.1164	0.2202	1.067	0.2001	1.267	0.03354	0.002736	0.03628	0.2898	0.005558	0.2954



**CARSEM ELECTRICAL DATA**

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Assumptions

Leadframe Material : Copper with resistivity= $1.73 \times 10^{-8}$  ohm.m; relative permeability,  $\mu_r = 1$

Gold Wire: Resistivity= $2.25 \times 10^{-8}$  ohm.m; relative permeability,  $\mu_r = 1$

Mold compound material : Plastic Novolac with  $\epsilon_r = 4.8$  loss tan d =0.001

Die thickness= 8 mil Wire loop height=6mil

Ref (3)

Leadframe Material : Copper with resistivity= $1.73 \times 10^{-8}$  ohm.m; relative permeability,  $\mu_r = 1$

Gold Wire: Resistivity= $2.35 \times 10^{-8}$  ohm.m; relative permeability,  $\mu_r = 1$

Mold compound material : 7351LS with  $\epsilon_r = 4.161$  loss tan d =0.001

Die thickness= 8 mil Wire loop height=6mil

REF (3a)

Leadframe Material : C7025TR02 with resistivity= $4.35 \times 10^{-8}$  ohm.m; relative permeability,  $\mu_r = 1$

Gold Wire: Resistivity= $2.35 \times 10^{-8}$  ohm.m; relative permeability,  $\mu_r = 1$

Mold compound material : 7351LS with  $\epsilon_r = 4.161$  loss tan d =0.001

Die thickness= 8 mil Wire loop height=6mil

Modeling Tool : Parasitic Parameters 3D Modeler

Data Extracted at 100MHz

Ground Plane positioned at 15mil below the package seating plane.



**Definition**

**Self Resistance**

Resistance of the lead which is under study

**Self Inductance**

Inductance of a lead with a PWB ground plane at 15mil below the package seating place. It is a particle self inductance.

**Mutual Inductance**

Inductance between the lead under study to its left or right adjacent lead

**Mutual Capacitance**

Capacitance between the lead under study to its left or right adjacent lead

**Bulk Capacitance**

Capacitance from the lead under study to all other leads and ground plane. All the other leads and metal are grounded.

**Wire length**

Wire length stated at the above table is the direct distance from point on the bond pad to the bond point on the lead.



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**TQFP**

Package Type TQFP 32L	Lead	Self Inductance (nH) $L_{11}$			Bulk Capacitance (pF) $C_{11}$			Resistance (mOhm) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
5mmx5mmx1.0mm Paddle Size (milxmil) 133x133	Center	0.758	0.7829	1.541	0.1967	0.04386	0.2406	9.513	34.41	43.92	0.919	1.3	
	Corner	0.8174	0.9898	1.807	0.1896	0.04727	0.2369	10.24	40.98	51.22	1.132	1.3	
Die size (milxmil) 110x110		Mutual Inductance (nH), $L_{12}$			Mutual Inductance (nH), $L_{13}$			Mutual Capacitance (pF), $C_{12}$			Mutual Capacitance (pF), $C_{13}$		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire
	Center	0.269	0.2614	0.5304	0.2597	0.2394	0.4991	0.065	0.0061	0.07096	0.0615	0.0060	0.06745
	Corner	0.248	0.2171	0.4653	0.06765	0.1509	0.2186	0.054	0.0062	0.06008	0.0183	0.0032	0.02148
Package Type TQFP 32L	Lead	Self Inductance (nH) $L_{11}$			Bulk Capacitance (pF) $C_{11}$			Resistance (mOhm) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
7mmx7mmx1.0 Paddle Size (milxmil) 195milx195mil	Center	0.754	0.5860	1.340	0.2031	0.04052	0.2436	10.75	40.37	51.12	0.6551	1.0	
	Corner	0.8186	0.6900	1.509	0.1989	0.04612	0.2450	12.19	45.28	57.47	0.7630	1.0	
Die size (milxmil) 185milx185mil *new entry		Mutual Inductance (nH), $L_{12}$			Mutual Inductance (nH), $L_{13}$			Mutual Capacitance (pF), $C_{12}$			Mutual Capacitance (pF), $C_{13}$		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire
	Center	0.1956	0.06432	0.2599	0.1716	0.0585	0.2301	0.050	0.0032	0.05269	0.0440	0.0027	0.04672
	Corner	0.202	0.0910	0.2930	0.05962	0.0723	0.1319	0.057	0.0044	0.06110	0.0198	0.0035	0.02327



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### Assumption

**Leadframe Material : Copper with resistivity= $1.73 \times 10^{-8}$  ohm.m; relative permeability,  $\mu_r = 1$**

**Gold Wire: Resistivity= $2.25 \times 10^{-8}$  ohm.m; relative permeability,  $\mu_r = 1$**

**Mold compound material : Plastic Novolac with  $\epsilon_r = 4.8$  loss tan d = 0.001**

**\*new entry**

**Leadframe Material : C7025TR02 with resistivity= $4.35 \times 10^{-8}$  ohm.m; relative permeability,  $\mu_r = 1$**

**Gold Wire: Resistivity= $2.25 \times 10^{-8}$  ohm.m; relative permeability,  $\mu_r = 1$**

**Mold compound material : with  $\epsilon_r = 4.281$  loss tan d = 0.004**

**Die thickness= 8 mil Wire loop height=6mil**

**Modeling Tool : Parasitic Parameters 3D Modeler**

**Data Extracted at 100MHz**

**Ground Plane positioned at 15mil below the package seating plane.**



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## CARSEM ELECTRICAL DATA

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### Definition

#### **Self Resistance**

Resistance of the lead which is under study

#### **Self Inductance**

Inductance of a lead with a PWB ground plane at 15mil below the package seating place. It is a particle self inductance

#### **Mutual Inductance**

Inductance between the lead under study to its left or right adjacent lead

#### **Mutual Capacitance**

Capacitance between the lead under study to its left or right adjacent lead

#### **Bulk Capacitance**

Capacitance from the lead under study to all other leads and ground plane. All the other leads and metal are grounded.

#### **Wire length**

Wire length stated at the above table is the direct distance from point on the bond pad to the bond point on the lead



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TBGA													
Package Type TBGA 132Balls 2Layer Ball Pitch=0.8mm Body Size (mmxmm) 12.0x12.0 Die Size (mmxmm) 6.0x4.5	Trace	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm ) R			Gold Wire		
		Trace	Wire	Trace+Wire	Trace	Wire	Trace+Wire	Trace	Wire	Trace+Wire	Length (mm)	Diameter(mils)	
	Longest (D3)	1.084	2.134	3.218	0.1651	0.1185	0.2836	25.09	127.0	152.1	2.590	1.0	
	Shortest (A5)	0.2774	2.721	2.998	0.08630	0.1436	0.2299	4.958	141.2	146.2	2.910	1.0	
		Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire
Longest (D3)	0.1110(E2)	1.175	1.286	0.02650(D1)	1.097	1.124	0.04030(E2)	0.05420	0.09450	0.03180(D1)	0.04720	0.07900	
Shortest (A5)	0.02430(B5)	1.385	1.409	0.01640(C6)	1.056	1.073	0.03470(B5)	0.06512	0.09982	0.01610(C6)	0.04230	0.05840	
TBGA													
Package Type Array TBGA 56Balls Ball Pitch=0.5mm Body Size (mmxmm) 6.0x6.0 Die Size (mmxmm) 3.6x3.6	Trace	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm ) R			Gold Wire		
		Trace	Wire	Trace+Wire	Trace	Wire	Trace+Wire	Trace	Wire	Trace+Wire	Length (mm)	Diameter(mils)	
	Longest (F4)	2.934	1.179	4.113	0.3032	0.06597	0.3692	60.87	69.27	130.1	1.151	1.0	
	Shortest (A2)	0.9878	1.170	2.158	0.1928	0.06964	0.2624	19.45	68.91	88.36	1.142	1.0	
		Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire
Longest (F4)	0.5249(G1)	0.4011	0.9260	0.1982(G2)	0.01160	0.2098	0.09976(G1)	0.01860	0.1184	0.08852(G2)	0.003979	0.09250	
Shortest (A2)	0.4829(B2)	0.3942	0.8771	0.5009(B3)	0.3969	0.8978	0.09068(B2)	0.01657	0.1073	0.07127(B3)	0.01663	0.08790	
Peripheral													
Package Type Peripheral TBGA 56Balls Ball Pitch=0.5mm Body Size (mmxmm) 6.0x6.0 Die Size (mmxmm) 3.6x3.6	Trace	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm ) R			Gold Wire		
		Trace	Wire	Trace+Wire	Trace	Wire	Trace+Wire	Trace	Wire	Trace+Wire	Length (mm)	Diameter(mils)	
	Longest (B8)	1.389	1.182	2.571	0.2015	0.06993	0.2714	29.56	69.39	98.95	1.154	1.0	
	Shortest (A4)	0.7337	1.188	1.922	0.1718	0.07006	0.2419	15.47	69.66	85.13	1.155	1.0	
		Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire
Longest (B8)	0.4203(B9)	0.4009	0.8212	0.3663(C9)	0.4013	0.7676	0.07329(B9)	0.01666	0.08995	0.06724(C9)	0.01667	0.08391	
Shortest (A4)	0.3612(B3)	0.4041	0.7653	0.3752(B4)	0.4041	0.7793	0.06433(B3)	0.01668	0.08101	0.08071(B4)	0.01672	0.09743	
FLIP CHIP													
Package Type Peripheral FLIP CHIP TBGA 56Balls Ball Pitch=0.5mm Body Size (mmxmm) 6.0x6.0 Die Size (mmxmm) 3.6x3.6	Trace	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm ) R					
		Trace	Bump	Trace+Bump	Trace	Bump	Trace+Bump	Trace	Bump	Trace+Bump			
	Longest (J1)	0.9809	0.04214	1.023	0.1819	0.05859	0.2405	28.39	2.909	31.30			
	Shortest (H4)	0.2546	0.04214	0.2967	0.09438	0.06821	0.1626	8.640	2.909	11.55			
		Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>		
		Trace	Bump	Trace+Bump	Trace	Bump	Trace+Bump	Trace	Bump	Trace+Bump	Trace	Bump	Trace+Bump
Longest (J1)	0.3031(I1)	0.01700	0.3201	0.1959(J2)	0.008365	0.2043	0.06881(I1)	0.02206	0.09087	0.04571(J2)	0.007823	0.05353	
Shortest (H4)	0.02601(J4)	0.01709	0.04310	0.02662(J5)	0.01710	0.04372	0.02808(J4)	0.02317	0.05125	0.02563(J5)	0.02320	0.04883	



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**Assumption**

For SSBGA : BT-RESIN with  $\epsilon_r = 4.3$  loss tan  $\delta = 0.007$

For TBGA : POLYIMIDE with  $\epsilon_r = 4.5$  loss tan  $\delta = 0.01$

Gold Wire: Resistivity= $2.25 \times 10^{-8}$  ohm.m; relative permeability,  $\mu_r = 1$

Copper with resistivity= $1.73 \times 10^{-8}$  ohm.m; relative permeability,  $\mu_r = 1$

Mold compound material : Plastic Novolac with  $\epsilon_r = 4.8$  loss tan  $\delta = 0.001$

Wire loop height=6mil

Data Extracted at 100MHz

Modeling Tool : Parasitic Parameters 3D Modeler

Ground Plane positioned at 15mil below the package seating plane.

**Definition**

**Self Resistance**

Resistance of the trace which is under study

**Self Inductance**

Inductance of a trace with a PWB ground plane at 15mil below the package seating place. It is a particle self inductance.

**Mutual Inductance**

Inductance between the trace under study to its left or right adjacent trace

**Mutual Capacitance**

Capacitance between the trace under study to its left or right adjacent trace

**Bulk Capacitance**

Capacitance from the trace under study to all other traces and ground plane. All the other traces and metal are grounded.

**Wire length**

Wire length stated at the above table is the direct distance from point on the bond pad to the bond point on the trace.



**CARSEM**

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**CARSEM ELECTRICAL DATA**

UPDATED: 2005 MARCH

**SOT223 - 100 MHz**

Package Type SOT223 3L 6.5mmx3.5mmx0.75mm Paddle Size (milxmil) 100milx110mil	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm ) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
Die size (milxmil) 53.5milx48.6mil	Center	2.0090	1.88	3.8890	1.6200	6.3000	7.9200	6.0470	80.9800	87.0270	0.6770	1.3	
	Corner	1.5680	W8) 2.51	0.4415	1.5680	0.1430	2.2660	8.2450	80.7700	14.2878	2.4760	1.3	
			W9) 1.86			0.1290			60.8600		1.9040	1.3	
			W10) 2.51			0.1580			80.7700		2.4760	1.3	
			W11) 1.88			0.1270			60.9100		1.9060	1.3	
			W12) 2.51			0.1410			80.7800		2.4800	1.3	
		Mutual Inductance (nH) L <sub>12</sub>			Mutual Inductance (nH) L <sub>13</sub>			Mutual Capacitance (pF) C <sub>12</sub>			Mutual Capacitance (pF) C <sub>13</sub>		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire
	Center	0.3792	2.140	2.5192	0.3793	0.0773	0.4566	0.1860	9.780	9.9660	0.18800	9.230	9.4180
	Corner	0.3793	W7,8) 0.0773		0.0000	W7,8) 0.0773	0.1880	0.1880	W7,8) 0.00171	0.0059	W7,8) 0.00171	0.0059	W7,8) 0.00171
	W8,9) 8.880		W8,9) 8.880			W8,9) 0.0342			W8,9) 0.0342				
	W9,10) 9.390		W9,10) 9.390			W9,10) 0.0328			W9,10) 0.0328				
	W10,11) 8.570		W10,11) 8.570			W10,11) 0.0286			W10,11) 0.0286				
	W11,12) 8.730		W11,12) 8.730			W11,12) 0.0326			W11,12) 0.0326				

  

Package Type SOT223 3L Paddle Size (milxmil) 100milx110mil Die size (milxmil) (82.9 x 48.2 mils) 100Mhz	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm ) R			Gold Wire	
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)
Center	2.1230	-0.4160	1.7070	1.3140	1.0870	2.4010	9.48300	10.8170	20.3000	NIL	NIL	
Corner	1.7350	0.0430	1.7780	0.5890	0.6850	1.2740	22.0800	-2.7000	19.3800	NIL	NIL	
	Mutual Inductance (nH) L <sub>12</sub>			Mutual Inductance (nH) L <sub>13</sub>			Mutual Capacitance (pF) C <sub>12</sub>			Mutual Capacitance (pF) C <sub>13</sub>		
	Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire
Center	0.3873	-0.1409	0.2464	0.3865	-0.1643	0.2222	0.1950	0.4649	0.6599	0.1933	0.5030	0.6963
Corner	0.3865	-0.1643	0.2222	0.1021	-0.0254	0.0767	0.1933	0.5030	0.6963	0.0055	0.0615	0.0670



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**CARSEM ELECTRICAL DATA**

UPDATED: 2005 MARCH

Package Type SOT223 3L	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm ) R			Gold Wire	
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)
Paddle Size (milxmil) 100milx110mil	Center	1.8520	-0.4720	1.3800	1.3250	0.7440	2.0690	9.7726	10.1274	19.9000	0.5253	1.3
	Corner	1.6311	0.1989	1.8300	0.5933	0.4417	1.0350	24.3990	-2.7490	21.6500	(1) 1.9633	1.3
Remarks :Simulation between (mold)KMC175& CEL9220HF13,and (Leadframe CuOMCL & HCL-12S).											(2) 2.5592	1.3
(Result : KMC175&Cu OMCL)											(3) 1.9653	1.3
											(4) 2.5609	1.3
											(5) 1.9664	1.3
											(6) 1.9664	1.3
Die size (milxmil) (57.5 x 48.2 mils) 100Mhz	Mutual Inductance (nH) L <sub>12</sub>			Mutual Capacitance (pF) C <sub>12</sub>			Mutual Capacitance (pF) C <sub>13</sub>					
	Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire
Center	0.2747	-0.1226	0.1521	0.2734	-0.1830	0.0904	0.2230	0.3639	0.5869	0.2187	0.3671	0.5858
Corner	0.2734	-0.1830	0.0904	0.0553	0.0749	0.1302	0.2187	0.3671	0.5858	0.0062	0.0391	0.0453



**CARSEM**

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## CARSEM ELECTRICAL DATA

UPDATED: 2005 MARCH

### Assumption

Leadframe Material : C194= $2.87 \times 10^{-8}$  ohm.m; relative permeability,  $\mu_r = 1$

Gold Wire: Resistivity= $2.35 \times 10^{-8}$  ohm.m; relative permeability,  $\mu_r = 1$

Mold compound material : Plastic Novolac with  $\epsilon_r = 4.8$  loss tan  $d = 0.001$

\* New entries : Mold compound material : with  $\epsilon_r = 4.1$  loss tan  $d = 0.001$

Die thickness= 8 mil Wire loop height=6mil

Modeling Tool : Parasitic Parameters 3D Modeler

Ground Plane positioned at 15mil below the package seating plane.

### Definition

#### Self Resistance

Resistance of the lead which is under study

#### Self Inductance

Inductance of a lead with a PWB ground plane at 15mil below the package seating place. It is a particle self inductance.

#### Mutual Inductance

Inductance between the lead under study to its left or right adjacent lead

#### Mutual Capacitance

Capacitance between the lead under study to its left or right adjacent lead

#### Bulk Capacitance

Capacitance from the lead under study to all other leads and ground plane. All the other leads and metal are grounded.

#### Wire length

Wire length stated at the above table is the direct distance from point on the bond pad to the bond point on the lead.



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**CARSEM ELECTRICAL DATA**

UPDATED :2005 MARCH

**Spak 5L**

Data extracted at 1MHz

Package Type Spak 5L Package Size 9.398mm x 10.287mm  Pad size 256mils x 231mils Die size 48.4mils x 44.96mils	Lead	Self Inductance (nH) L <sub>11</sub>		Bulk Capacitance (pF) C <sub>11</sub>		Resistance (mOhm ) R		Gold Wire	
		Lead only	Lead +Wire	Lead only	Lead +Wire	Lead only	Lead +Wire	Length(mm)	Diameter(mils)
	Pin 1	0.7850	3.1900	0.2610	0.6140	0.8000	27.8000	4.226,3.953,3.669,3.311	1.3
Pin 2	0.8310	3.1600	0.3030	0.4050	0.7000	65.8000	2.042	1.3	
Pin 3	1.6800	0.1770	6.8200	6.9300	0.9000	2.3000	0.749,0.749,0.749	1.3	
Pin 4	0.8330	2.5600	0.3000	0.4270	0.7000	34.6000	2.089,2.256	1.3	
Pin 5	0.8760	3.3900	0.2710	0.6030	0.8000	28.1000	3.427,4.167,4.091,4.258	1.3	
		Mutual Inductance L <sub>12</sub>				Mutual Capacitance C <sub>12</sub>			
		Lead only		Lead + wire		Lead only		Lead + wire	
Pin 1 to Pin 2		0.1220		0.7890		0.0520		0.1430	
Pin 2 to Pin 3		0.1250		0.1170		0.1390		0.1570	
Pin 3 to Pin 4		0.1260		0.1140		0.1320		0.1780	
Pin 4 to Pin 5		0.1340		0.8280		0.0540		0.1400	

Data extracted at 1MHz

Package Type Spak 5L Package Size 9.398mm x 10.287mm  Pad size 256mils x 231mils Die size 48.4mils x 44.96mils	Lead	Self Inductance (nH) L <sub>11</sub>		Bulk Capacitance (pF) C <sub>11</sub>		Resistance (mOhm ) R		Gold Wire	
		Lead only	Lead +Wire	Lead only	Lead +Wire	Lead only	Lead +Wire	Length(mm)	Diameter(mils)
	Pin 1	0.7850	3.1500	0.2610	0.6310	0.8000	21.2000	4.226,3.953,3.669,3.311	1.5
Pin 2	0.8310	3.0900	0.3030	0.4130	0.7000	49.6000	2.042	1.5	
Pin 3	1.6800	0.1390	6.8200	6.9400	0.9000	1.7800	0.749,0.749,0.749	1.5	
Pin 4	0.8330	2.5200	0.3000	0.4340	0.7000	26.2000	2.089,2.256	1.5	
Pin 5	0.8760	3.3500	0.2710	0.6170	0.8000	21.5000	3.427,4.167,4.091,4.258	1.5	
		Mutual Inductance L <sub>12</sub>				Mutual Capacitance C <sub>12</sub>			
		Lead only		Lead + wire		Lead only		Lead + wire	
Pin 1 to Pin 2		0.1220		0.7820		0.0520		0.1500	
Pin 2 to Pin 3		0.1250		0.1030		0.1390		0.1590	
Pin 3 to Pin 4		0.1260		0.1000		0.1320		0.1800	
Pin 4 to Pin 5		0.1340		0.8200		0.0540		0.1450	



**CARSEM**

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## CARSEM ELECTRICAL DATA

UPDATED :2005 MARCH

### Assumption

Leadframe Material : C194 with resistivity= $2.87 \times 10^{-8}$  ohm.m; relative permeability,  $\mu_r = 1$

Gold Wire: Resistivity= $2.35 \times 10^{-8}$  ohm.m; relative permeability,  $\mu_r = 1$

Mold compound material : with  $\epsilon_r = 4.3$  loss  $\tan d = 0.001$

Die thickness= 19mil Wire loop height=8mil

Modeling Tool : Parasitic Parameters 3D Modeler

Ground Plane positioned at 15mil below the package seating plane.

\* Mold compound material : KMC289 with  $\epsilon_r = 4.0$  loss  $\tan d = 0.004$

### Definition

#### Self Resistance

Resistance of the lead which is under study

#### Self Inductance

Inductance of a lead with a PWB ground plane at 15mil below the package seating place. It is a particle self inductance.

#### Mutual Inductance

Inductance between the lead under study to its left or right adjacent lead

#### Mutual Capacitance

Capacitance between the lead under study to its left or right adjacent lead

#### Bulk Capacitance

Capacitance from the lead under study to all other leads and ground plane. All the other leads and metal are grounded.

#### Wire length

Wire length stated at the above table is the direct distance from point on the bond pad to the bond point on the lead.



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**CARSEM ELECTRICAL DATA**

UPDATED: 2005 MARCH

**SOICW**

Package Type SOICW 16L 10.11mmx7.4mmx2.24mm	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
	Center	1.364	1.268	2.632	0.4554	0.05952	0.5149	13.15	71.40	84.55	1.246	1.0	
	Corner	2.625	1.978	4.603	0.7472	0.07682	0.8240	41.01	101.1	142.1	1.891	1.0	
Paddle Size (milxmil) 130x157 Die size (milxmil) 84x84		Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire
	Center	0.3471	0.1900	0.5371	0.3404	0.1421	0.4825	0.1137	0.004742	0.1184	0.1130	0.002886	0.1159
	Corner	0.5766	0.4118	0.9884	0.03352	0.2324	0.2659	0.2250	0.007533	0.2325	0.04367	0.004110	0.04778

**Assumption**

Leadframe Material : Copper with resistivity=1.73x10<sup>-8</sup> ohm.m; relative permeability,  $\mu_r = 1$

Gold Wire: Resistivity=2.25x10<sup>-8</sup> ohm.m; relative permeability,  $\mu_r = 1$

Mold compound material : Plastic Novolac with  $\epsilon_r = 4.8$  loss tan  $\delta = 0.001$

Die thickness= 8 mil Wire loop height=6mil

Modeling Tool : Parasitic Parameters 3D Modeler

Data Extracted at 100MHz

Ground Plane positioned at 15mil below the package seating plane.

**Definition**

**Self Resistance**

Resistance of the lead which is under study

**Self Inductance**

Inductance of a lead with a PWB ground plane at 15mil below the package seating place. It is a particle self inductance.

**Mutual Inductance**

Inductance between the lead under study to its left or right adjacent lead



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**CARSEM ELECTRICAL DATA**

UPDATED: 2005 MARCH

**Mutual Capacitance**

Capacitance between the lead under study to its left or right adjacent lead

**Bulk Capacitance**

Capacitance from the lead under study to all other leads and ground plane. All the other leads and metal are grounded.

**Wire length**

Wire length stated at the above table is the direct distance from point on the bond pad to the bond point on the lead.



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**CARSEM ELECTRICAL DATA**

UPDATED: 2005 MARCH

**QSOP - 100MHz**

Package Type QSOP 16L 4.89x3.9 Paddle Size (milxmil) 96x130 Die size (milxmil) 86x120	Lead	Self Inductance (nH) $L_{11}$			Bulk Capacitance (pF) $C_{11}$			Resistance (mOhm) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wir	Length(mm)	Diameter(mils)	
	Center	0.6952	0.4161	1.1110	0.2154	0.03455	0.2500	6.454	30.01	36.46	0.4884	1.0	
	Corner	1.0560	0.4387	1.4950	0.2785	0.0351	0.3136	9.5020	31.5600	41.0600	0.5091	1.0	
		Mutual Inductance $L_{12}$			Mutual Inductance $L_{13}$			Mutual Capacitance $C_{12}$			Mutual Capacitance $C_{13}$		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+W	Lead	Wire	Lead+Wire
	Center	0.2104	0.0424	0.2528	0.2051	0.0381	0.2432	0.0529	0.0027	0.0557	0.050	0.0022	0.0518
	Corner	0.2593	0.0326	0.2919	0.0106	0.0175	0.0281	0.0660	0.0028	0.0688	0.008	0.0008	0.0085

Package Type QSOP 20L 6.0mmx3.9mm Paddle Size (milxmil) 96x140 Die size (milxmil) 86x106 *Ref [2]	Lead	Self Inductance (nH) $L_{11}$			Bulk Capacitance (pF) $C_{11}$			Resistance (mOhm) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wir	Length(mm)	Diameter(mils)	
	Center	0.4861	0.5197	1.0060	0.2204	0.03523	0.2556	7.281	31.67	38.95	0.5142	1.0	
	Corner	0.8754	1.0000	1.8750	0.2328	0.0482	0.2810	10.0400	59.0900	69.1300	1.0370	1.0	
		Mutual Inductance $L_{12}$			Mutual Inductance $L_{13}$			Mutual Capacitance $C_{12}$			Mutual Capacitance $C_{13}$		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+W	Lead	Wire	Lead+Wire
	Center	0.1390	0.0514	0.1940	0.1185	0.0491	0.1676	0.0387	0.0019	0.0407	0.032	0.0018	0.0338
	Corner	0.1972	0.2160	0.4132	0.0107	0.0506	0.0613	0.0708	0.0057	0.0764	0.007	0.0012	0.0084

Package Type QSOP 24L 8.65mmx6.00mm Paddle Size (milxmil) 96x140 Die size (milxmil) 86x130	Lead	Self Inductance (nH) $L_{11}$			Bulk Capacitance (pF) $C_{11}$			Resistance (mOhm) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wir	Length(mm)	Diameter(mils)	
	Center	0.7730	0.5398	1.3128	0.2275	0.0420	0.2695	7.6841	39.6130	47.2971	0.5676	1.0	
	Corner	1.6159	1.0077	2.6236	0.4421	0.0610	0.5031	14.6380	61.3820	76.0200	1.0488	1.0	
		Mutual Inductance $L_{12}$			Mutual Inductance $L_{13}$			Mutual Capacitance $C_{12}$			Mutual Capacitance $C_{13}$		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+W	Lead	Wire	Lead+Wire
	Center	0.2343	0.0539	0.2882	0.2327	0.0623	0.2950	0.0588	0.0048	0.0636	0.056	0.0049	0.0613
	Corner	0.4955	0.1852	0.6807	0.0385	0.1287	0.1672	0.1428	0.0087	0.1515	0.004	0.0066	0.0110



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**CARSEM ELECTRICAL DATA**

UPDATED: 2005 MARCH

Package Type QSOP 44L 17.83mmx7.5mm Paddle Size (milxmil) 190x260 Die size (milxmil) 180x250 *Ref [2]	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm ) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
	Center	1.2650	0.7426	2.0080	0.3753	0.04311	0.4184	8.682	47.66	56.43	0.7646	1.0	
Corner	4.3040	0.7651	5.0690	1.1930	0.0437	1.2370	27.4400	48.6300	76.0700	0.7921	1.0		
		Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+W	Lead	Wire	Lead+Wire
Center	0.4515	0.1051	0.5566	0.4300	0.1052	0.5352	0.1097	0.0037	0.1134	0.106	0.0036	0.1096	
Corner	0.3771	0.0730	0.4501	1.9380	0.1468	2.0850	0.0905	0.0023	0.0928	0.554	0.0049	0.5593	

Package Type QSOP 20L 8.65mmx3.9mm Paddle Size (milxmil) 96x140 Die size (milxmil) 86x106	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm ) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
	Center	0.7437	0.4381	1.1820	0.2204	0.03523	0.2556	7.281	31.67	38.95	0.5091	1.0	
Corner	1.1450	0.9713	2.1160	0.3170	0.0602	0.3772	10.7900	58.3800	69.1700	1.0400	1.0		
		Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+W	Lead	Wire	Lead+Wire
Center	0.2340	0.0435	0.2775	0.1993	0.0392	0.2385	0.0568	0.0022	0.0590	0.047	0.0020	0.0490	
Corner	0.2913	0.2099	0.5012	0.0019	0.0502	0.0521	0.0931	0.0104	0.1035	0.007	0.0018	0.0089	

**QSOP - 300kHz**

Package Type QSOP 16L 4.89mmx3.9mm Paddle Size (milxmil) 96x130 Die size (milxmil) 86x120	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm ) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
	Center	0.7608	0.5682	1.3290	0.2154	0.00980	0.2252	1.106	27.19	28.30	0.4884	1.0	
Corner	1.1510	0.5350	1.6860	0.2785	0.0107	0.2892	1.6150	28.6050	30.2200	0.5091	1.0		
		Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+W	Lead	Wire	Lead+Wire
Center	0.2104	0.1503	0.3607	0.2051	0.1439	0.3490	0.0529	0.0047	0.0576	0.050	0.0035	0.0531	
Corner	0.2593	0.1399	0.3992	0.0106	0.0428	0.0534	0.0660	0.0054	0.0713	0.008	0.0090	0.0087	



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## CARSEM ELECTRICAL DATA

UPDATED: 2005 MARCH

### Assumption

Leadframe Material : C194 with resistivity= $2.87 \times 10^{-8}$  ohm.m; relative permeability,  $\mu_r = 1$

Gold Wire: Resistivity= $2.25 \times 10^{-8}$  ohm.m; relative permeability,  $\mu_r = 1$

Mold compound material :  $\mu_r = 4.281$  loss tan  $\delta = 0.004$

Die thickness= 10 mil Wire loop height=6mil

Modeling Tool : Parasitic Parameters 3D Modeler

Data Extracted at 100MHz

Ground Plane positioned at 15mil below the package seating plane.

\*\*Ref [2]

Leadframe Material : Copper with resistivity= $1.73 \times 10^{-8}$  ohm.m; relative permeability,  $\mu_r = 1$

Gold Wire: Resistivity= $2.25 \times 10^{-8}$  ohm.m; relative permeability,  $\mu_r = 1$

Mold compound material :  $\mu_r = 4.8$  loss tan  $\delta = 0.001$

Die thickness= 8 mil Wire loop height=6mil

### Definition

#### Self Resistance

Resistance of the lead which is under study

#### Self Inductance

Inductance of a lead with a PWB ground plane at 15mil below the package seating place. It is a particle self inductance.

#### Mutual Inductance

Inductance between the lead under study to its left or right adjacent lead

#### Mutual Capacitance

Capacitance between the lead under study to its left or right adjacent lead

#### Bulk Capacitance

Capacitance from the lead under study to all other leads and ground plane. All the other leads and metal are grounded.

#### Wire length

Wire length stated at the above table is the direct distance from point on the bond pad to the bond point on the lead.



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**CARSEM ELECTRICAL DATA**

UPDATED: 2005 MARCH

**Ddpak**  
**Ddpak 3L**

**Data extracted at DC**

Package Type Ddpak 3L	Lead	Self Inductance (nH) $L_{11}$		Bulk Capacitance (pF) $C_{11}$		Resistance (mOhm) R		Gold Wire		
		Lead only	Lead +Wire	Lead only	Lead +Wire	Lead only	Lead +Wire	Length(mm)	Diameter(mils)	
	<b>Pin 1</b>	3.144	4.795	0.9071	1.037	0.4626	10.63	1.40	3.0	
	<b>Pin 2</b>	4.048	4.168	10.54	10.68	0.5555	3.647	1.41,1.47,1.37	3.0	
	<b>Pin 3</b>	3.144	4.806	0.9034	1.044	0.4653	10.64	1.40	3.0	
Pad size 240milx180mil Die size (milxmil) 200milx160mil		Mutual Inductance $L_{12}$			Mutual Capacitance $C_{12}$					
		Lead only		Lead + wire		Lead only		Lead + wire		
		<b>Pin 1 to Pin 2</b>		0.7204		0.9279		0.2857		0.3213
		<b>Pin 2 to Pin 3</b>		0.7128		0.9209		0.2838		0.3259
	<b>Pin 3 to Pin 1</b>		0.2839		0.4282		0.01383		0.01401	

**Data extracted at 100KHz**

Package Type Ddpak 3L	Lead	Self Inductance (nH) $L_{11}$		Bulk Capacitance (pF) $C_{11}$		Resistance (mOhm) R		Gold Wire		
		Lead only	Lead +Wire	Lead only	Lead +Wire	Lead only	Lead +Wire	Length(mm)	Diameter(mils)	
	<b>Pin 1</b>	3.116	4.759	0.9071	1.037	0.5034	10.67	1.40	3.0	
	<b>Pin 2</b>	3.991	4.110	10.54	10.68	0.6131	3.701	1.41,1.47,1.37	3.0	
	<b>Pin 3</b>	3.117	4.770	0.9034	1.044	0.5059	10.68	1.40	3.0	
Pad size 240milx180mil Die size (milxmil) 200milx160mil		Mutual Inductance $L_{12}$			Mutual Capacitance $C_{12}$					
		Lead only		Lead + wire		Lead only		Lead + wire		
		<b>Pin 1 to Pin 2</b>		0.7204		0.9279		0.2857		0.3213
		<b>Pin 2 to Pin 3</b>		0.7128		0.9209		0.2838		0.3259
	<b>Pin 3 to Pin 1</b>		0.2839		0.4282		0.01383		0.01401	



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**CARSEM ELECTRICAL DATA**

UPDATED: 2005 MARCH

**Data extracted at 25MHz**

Package Type Ddpak 3L	Lead	Self Inductance (nH) L <sub>11</sub>		Bulk Capacitance (pF) C <sub>11</sub>		Resistance (mOhm) R		Gold Wire	
		Lead only	Lead +Wire	Lead only	Lead +Wire	Lead only	Lead +Wire	Length(mm)	Diameter(mils)
	Pin 1	2.824	4.465	0.9071	1.037	5.494	18.78	1.40	3.0
	Pin 2	3.642	3.761	10.54	10.68	6.388	9.772	1.41,1.47,1.37	3.0
	Pin 3	2.824	4.474	0.9034	1.044	5.512	18.85	1.40	3.0
Pad size 240milx180mil Die size (milxmil) 200milx160mil		Mutual Inductance L <sub>12</sub>				Mutual Capacitance C <sub>12</sub>			
		Lead only		Lead + wire		Lead only		Lead + wire	
		Pin 1 to Pin 2	0.7204		0.9279		0.2857		0.3213
		Pin 2 to Pin 3	0.7128		0.9209		0.2838		0.3259
		Pin 3 to Pin 1	0.2839		0.4282		0.01383		0.01401

**Data extracted at 50MHz**

Package Type Ddpak 3L	Lead	Self Inductance (nH) L <sub>11</sub>		Bulk Capacitance (pF) C <sub>11</sub>		Resistance (mOhm) R		Gold Wire	
		Lead only	Lead +Wire	Lead only	Lead +Wire	Lead only	Lead +Wire	Length(mm)	Diameter(mils)
	Pin 1	2.821	4.442	0.9071	1.037	9.849	26.93	1.40	3.0
	Pin 2	3.636	3.755	10.54	10.68	11.58	15.04	1.41,1.47,1.37	3.0
	Pin 3	2.820	4.452	0.9034	1.044	9.857	27.11	1.40	3.0
Pad size 240milx180mil Die size (milxmil) 200milx160mil		Mutual Inductance L <sub>12</sub>				Mutual Capacitance C <sub>12</sub>			
		Lead only		Lead + wire		Lead only		Lead + wire	
		Pin 1 to Pin 2	0.7204		0.9279		0.2857		0.3213
		Pin 2 to Pin 3	0.7128		0.9209		0.2838		0.3259
		Pin 3 to Pin 1	0.2839		0.4282		0.01383		0.01401



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**CARSEM ELECTRICAL DATA**

UPDATED: 2005 MARCH

**Data extracted at 100MHz**

Package Type	Lead	Self Inductance (nH) $L_{11}$		Bulk Capacitance (pF) $C_{11}$		Resistance (mOhm) R		Gold Wire	
		Lead only	Lead +Wire	Lead only	Lead +Wire	Lead only	Lead +Wire	Length(mm)	Diameter(mils)
Ddpak 3L	Pin 1	2.840	4.446	0.9071	1.037	15.34	39.48	1.40	3.0
	Pin 2	3.654	3.769	10.54	10.68	17.99	25.17	1.41,1.47,1.37	3.0
	Pin 3	2.840	4.455	0.9034	1.044	15.38	39.83	1.40	3.0
		Mutual Inductance $L_{12}$				Mutual Capacitance $C_{12}$			
Pad size 240milx180mil Die size (milxmil) 200milx160mil		Lead only		Lead + wire		Lead only		Lead + wire	
	Pin 1 to Pin 2	0.7204		0.9279		0.2857		0.3213	
	Pin 2 to Pin 3	0.7128		0.9208		0.2838		0.3259	
	Pin 3 to Pin 1	0.2839		0.4282		0.01383		0.01401	

**Ddpak 5L**

**Data extracted at 1Hz**

Package Type	Lead	Self Inductance (nH) $L_{11}$		Bulk Capacitance (pF) $C_{11}$		Resistance (mOhm) R		Gold Wire	
		Lead only	Lead +Wire	Lead only	Lead +Wire	Lead only	Lead +Wire	Length(mm)	Diameter(mils)
Ddpak 5L	Pin 1	3.179	5.652	0.8324	0.9161	0.5070	28.64	1.97	2.0
	Pin 2	3.161	5.352	0.9343	0.9995	0.5029	25.62	1.63	2.0
	Pin 3	4.036	4.569	10.88	11.00	0.5851	11.43	1.57,1.39	2.0
	Pin 4	3.161	5.303	0.9384	1.001	0.5029	25.36	1.50	2.0
	Pin 5	3.178	5.545	0.8296	0.9098	0.5070	27.45	1.80	2.0
		Mutual Inductance $L_{12}$				Mutual Capacitance $C_{12}$			
Pad size 240milx180mil Die size (milxmil) 200milx160mil		Lead only		Lead + wire		Lead only		Lead + wire	
	Pin 1 to Pin 2	1.065		1.688		0.2412		0.2583	
	Pin 2 to Pin 3	0.9597		1.399		0.3034		0.3375	
	Pin 3 to Pin 4	0.9895		1.415		0.3101		0.3398	
	Pin 4 to Pin 5	1.059		1.662		0.2400		0.2584	
	Pin 5 to Pin1	0.1709		0.3779		0.007550		0.005869	



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**CARSEM ELECTRICAL DATA**

UPDATED: 2005 MARCH

**Data extracted at 100KHz**

Package Type	Lead	Self Inductance (nH) $L_{11}$		Bulk Capacitance (pF) $C_{11}$		Resistance (mOhm) R		Gold Wire		
		Lead only	Lead +Wire	Lead only	Lead +Wire	Lead only	Lead +Wire	Length(mm)	Diameter(mils)	
Ddpak 5L	Pin 1	3.158	5.623	0.8324	0.9161	0.5441	28.68	1.97	2.0	
	Pin 2	3.140	5.319	0.9343	0.9995	0.5400	25.66	1.63	2.0	
	Pin 3	3.975	4.516	10.88	11.00	0.6327	11.48	1.57,1.39	2.0	
	Pin 4	3.140	5.270	0.9384	1.001	0.5400	25.40	1.50	2.0	
	Pin 5	3.157	5.517	0.8296	0.9098	0.5441	27.49	1.80	2.0	
Pad size 240milx180mil Die size (milxmil) 200milx160mil	Mutual Inductance $L_{12}$				Mutual Capacitance $C_{12}$					
		Lead only		Lead + wire		Lead only		Lead + wire		
	Pin 1 to Pin 2	1.063		1.678		0.2412		0.2583		
	Pin 2 to Pin 3	0.9565		1.391		0.3034		0.3375		
	Pin 3 to Pin 4	0.9867		1.410		0.3101		0.3398		
	Pin 4 to Pin 5	1.049		1.653		0.2400		0.2584		
	Pin 5 to Pin1	0.1726		0.3796		0.007550		0.005869		

**Data extracted at 25MHz**

Package Type	Lead	Self Inductance (nH) $L_{11}$		Bulk Capacitance (pF) $C_{11}$		Resistance (mOhm) R		Gold Wire		
		Lead only	Lead +Wire	Lead only	Lead +Wire	Lead only	Lead +Wire	Length(mm)	Diameter(mils)	
Ddpak 5L	Pin 1	2.874	5.346	0.8324	0.9161	5.033	34.99	1.97	2.0	
	Pin 2	2.858	5.050	0.9343	0.9995	4.942	31.45	1.63	2.0	
	Pin 3	3.663	4.209	10.88	11.00	6.683	16.83	1.57,1.39	2.0	
	Pin 4	2.858	5.000	0.9384	1.001	4.942	31.15	1.50	2.0	
	Pin 5	2.874	5.237	0.8296	0.9098	5.022	33.75	1.80	2.0	
Pad size 240milx180mil Die size (milxmil) 200milx160mil	Mutual Inductance $L_{12}$				Mutual Capacitance $C_{12}$					
		Lead only		Lead + wire		Lead only		Lead + wire		
	Pin 1 to Pin 2	1.063		1.677		0.2412		0.2583		
	Pin 2 to Pin 3	0.9564		1.391		0.3034		0.3375		
	Pin 3 to Pin 4	0.9866		1.410		0.3101		0.3398		
	Pin 4 to Pin 5	1.049		1.652		0.2400		0.2584		
	Pin 5 to Pin1	0.1726		0.3858		0.007550		0.005869		



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**CARSEM ELECTRICAL DATA**

UPDATED: 2005 MARCH

Data extracted at 50MHz

Package Type	Lead	Self Inductance (nH) $L_{11}$		Bulk Capacitance (pF) $C_{11}$		Resistance (mOhm) R		Gold Wire	
		Lead only	Lead +Wire	Lead only	Lead +Wire	Lead only	Lead +Wire	Length(mm)	Diameter(mils)
Ddpak 5L	Pin 1	2.873	5.343	0.8324	0.9161	8.467	44.26	1.97	2.0
	Pin 2	2.858	5.048	0.9343	0.9995	8.231	39.85	1.63	2.0
	Pin 3	3.669	4.207	10.88	11.00	11.81	23.10	1.57,1.39	2.0
	Pin 4	2.858	4.998	0.9384	1.001	8.231	39.49	1.50	2.0
	Pin 5	2.873	5.234	0.8296	0.9098	8.432	42.76	1.80	2.0
	Pad size 240milx180mil Die size (milxmil) 200milx160mil		Mutual Inductance $L_{12}$			Mutual Capacitance $C_{12}$			
		Lead only		Lead + wire		Lead only		Lead + wire	
	Pin 1 to Pin 2	1.063		1.677		0.2412		0.2583	
	Pin 2 to Pin 3	0.9564		1.391		0.3034		0.3375	
	Pin 3 to Pin 4	0.9866		1.410		0.3101		0.3398	
	Pin 4 to Pin 5	1.049		1.652		0.2400		0.2584	
	Pin 5 to Pin1	0.1726		0.3860		0.007550		0.005869	



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## CARSEM ELECTRICAL DATA

UPDATED: 2005 MARCH

### Assumption

Leadframe Material : C194 with resistivity= $2.87 \times 10^{-8}$  ohm.m; relative permeability,  $\mu_r = 1$

Gold Wire: Resistivity= $2.35 \times 10^{-8}$  ohm.m; relative permeability,  $\mu_r = 1$

Mold compound material : with  $\epsilon_r = 4.3$  loss  $\tan \delta = 0.001$

Die thickness= 17 mil Wire loop height=8mil

Modeling Tool : Parasitic Parameters 3D Modeler

Ground Plane positioned at 15mil below the package seating plane.

### Definition

**Self Resistance**

Resistance of the lead which is under study

**Self Inductance**

Inductance of a lead with a PWB ground plane at 15mil below the package seating place. It is a particle self inductance.

**Mutual Inductance**

Inductance between the lead under study to its left or right adjacent lead

**Mutual Capacitance**

Capacitance between the lead under study to its left or right adjacent lead

**Bulk Capacitance**

Capacitance from the lead under study to all other leads and ground plane. All the other leads and metal are grounded.

**Wire length**

Wire length stated at the above table is the direct distance from point on the bond pad to the bond point on the lead.



**CARSEM**

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**CARSEM ELECTRICAL DATA**

UPDATEE : 2006 JAN

**MSOP**

**Data Extracted at 1MHz**

Package Type MSOP 10L 3.0mmx3.0mmx0.91mm	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
Center		0.7730	0.3185	1.0915	0.1780	0.1068	0.2848	1.4900	19.73	21.2150	0.7346	1.0	
	Corner	0.7730	0.7120	1.4850	0.1560	0.0474	0.2034	1.5000	42.70	44.2000	0.7471	1.0	
Paddle Size (milxmil) 68x98 Die size (milxmil) 52x81.9		Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>		
	Center	Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire
Corner		0.2610	0.1120	0.3730	0.2610	0.1150	0.3760	0.0483	0.0060	0.0543	0.0490	0.0075	0.0565
Corner		0.2600	0.1150	0.3750	0.2600	0.1020	0.3620	0.0512	0.0073	0.0585	0.0487	0.0065	0.0552

**Data Extracted at 100MHz**

Package Type MSOP 10L 3.0mmx3.0mmx0.91mm	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
Center		0.7180	0.3175	1.0355	0.1780	0.1068	0.2848	7.2200	21.93	29.1500	0.7346	1.0	
	Corner	0.7190	0.7100	1.4290	0.1560	0.0474	0.2034	7.2500	47.50	54.7500	0.6733	1.0	
Paddle Size (milxmil) 68x98 Die size (milxmil) 52x81.9		Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>		
	Center	Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire
Corner		0.2610	0.1120	0.3730	0.2610	0.1440	0.4050	0.0483	0.0060	0.0543	0.0490	0.0075	0.0565
Corner		0.2600	0.1150	0.3750	0.2600	0.1020	0.3620	0.0512	0.0073	0.0585	0.0487	0.0065	0.0552

**Data Extracted at 2GHz**

Package Type MSOP 10L 3.0mmx3.0mmx0.91mm	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm) R			Gold Wire	
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)
Center		0.7130	0.3035	1.0165	0.1780	0.1068	0.2848	22.6000	76.50	99.1000	0.7346	1.0



**CARSEM**

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**CARSEM ELECTRICAL DATA**

UPDATEE : 2006 JAN

<b>Paddle Size (milxmil)</b> <b>68x98</b> <b>Die size (milxmil)</b> <b>52x81.9</b>	<b>Corner</b>	0.7130	0.6800	1.3930	0.1560	0.0474	0.2034	22.7000	167.00	189.7000	0.6733	1.0	
		<b>Mutual Inductance L<sub>12</sub></b>			<b>Mutual Inductance L<sub>13</sub></b>			<b>Mutual Capacitance C<sub>12</sub></b>			<b>Mutual Capacitance C<sub>13</sub></b>		
		<b>Lead</b>	<b>Wire</b>	<b>Lead +Wire</b>	<b>Lead</b>	<b>Wire</b>	<b>Lead +Wire</b>	<b>Lead</b>	<b>Wire</b>	<b>Lead+Wire</b>	<b>Lead</b>	<b>Wire</b>	<b>Lead+Wire</b>
	<b>Center</b>	0.2610	0.11200	0.3730	0.2610	0.1440	0.4050	0.0483	0.0060	0.0543	0.0490	0.0075	0.0565
	<b>Corner</b>	0.2600	0.11500	0.3750	0.2600	0.1020	0.3620	0.0512	0.0073	0.0585	0.0487	0.0065	0.0552

**Modeling Tool : Parasitic Parameters 3D Modeler**

**Data Extracted at 1MHz, 100MHz & 2GHz**

**Ground Plane positioned at 15mil below the package seating plane.**

**Definition**

**Self Resistance**

**Resistance of the lead which is under study**

**Self Inductance**

**Inductance of a lead with a PWB ground plane at 15mil below the package seating place. It is a particle self inductance.**

**Mutual Inductance**

**Inductance between the lead under study to its left or right adjacent lead**

**Mutual Capacitance**

**Capacitance between the lead under study to its left or right adjacent lead**

**Bulk Capacitance**

**Capacitance from the lead under study to all other leads and ground plane. All the other leads and metal are grounded.**

**Wire length**

**Wire length stated at the above table is the direct distance from point on the bond pad to the bond point on the lead.**



**CARSEM**

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**CARSEM ELECTRICAL DATA**

UPDATED: 2005 MARCH

**MQFP**

Package Type MQFP 208L 28mmx28mmx3.4mm	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
Paddle Size (milxmil) 394x394 Die size (milxmil) 374x374	Center	7.073	2.125	9.198	1.606	0.1781	1.784	53.67	84.58	138.3	2.416	1.3	
	Corner	9.369	2.790	12.16	2.007	0.2101	2.217	70.68	102.8	173.5	2.966	1.3	
		Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>		
	Center	Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire
	Center	4.269	0.8775	5.147	4.045	0.8616	4.907	0.6443	0.04789	0.6922	0.6313	0.04408	0.6754
	Corner	5.672	1.281	6.953	2.547	0.4918	3.039	0.8725	0.06630	0.9388	0.1731	0.01618	0.1893

Package Type MQFP 208L 28mmx28mmx3.4mm	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
Paddle Size (milxmil) 394x394 Die size (milxmil) 374x374	Center	7.073	2.266	9.339	1.606	0.1503	1.756	53.67	125.0	178.7	2.416	1.0	
	Corner	9.369	2.961	12.33	2.007	0.1785	2.186	70.68	151.9	222.6	2.966	1.0	
		Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>		
	Center	Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire
	Center	4.269	0.8781	5.147	4.045	0.8622	4.907	0.6443	0.03505	0.6794	0.6313	0.03328	0.6646
	Corner	5.672	1.282	6.594	2.547	0.4926	3.040	0.8725	0.05140	0.9239	0.1731	0.01314	0.1862

Data extracted at 1Hz

Package Type MQFP 100L 14.0mmx20.0mmx2.71mm	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
Paddle Size (milxmil) 358milx358mil Die size (milxmil) 218milx332mil *Ref(2)	Center	2.671	1.227	3.898	0.4559	0.08714	0.5430	5.499	41.54	47.04	1.336	1.3	
	Corner	5.625	2.514	8.139	0.9531	0.1414	1.095	10.12	72.33	82.45	2.492	1.3	
		Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>		
	Center	Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire
	Center	1.140	0.3700	1.510	1.146	0.3668	1.513	0.1594	0.01500	0.1744	0.1613	0.01428	0.1756
	Corner	1.471	0.7057	2.177	2.759	0.9106	3.670	0.1713	0.01997	0.1913	0.4641	0.03048	0.4946



**CARSEM**

(A MEMBER OF THE HONG LEONG GROUP MALAYSIA)

**CARSEM ELECTRICAL DATA**

UPDATED: 2005 MARCH

**Data extracted at 100MHz**

Package Type MQFP 100L 14.0mmx20.0mmx2.71mm	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
	Center	2.495	1.218	3.713	0.4559	0.08714	0.5430	25.53	52.29	77.82	1.336	1.0	
	Corner	5.271	2.498	7.769	0.9531	0.1414	1.095	49.76	91.52	141.3	2.492	1.0	
Paddle Size (milxmil) 358milx358mil Die size (milxmil) 218milx332mil *Ref(2)		Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire
	Center	1.140	0.3700	1.510	1.146	0.3668	1.513	0.1594	0.01500	0.1744	0.1613	0.01428	0.1756
	Corner	1.471	0.7057	2.177	2.759	0.9106	3.670	0.1713	0.01997	0.1913	0.4641	0.03048	0.4946

**Data extracted at 500MHz**

Package Type MQFP 100L 14.0mmx20.0mmx2.71mm	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
	Center	2.483	1.187	3.670	0.4559	0.08714	0.5430	59.58	102.6	162.2	1.336	1.0	
	Corner	5.247	2.443	7.690	0.9531	0.1414	1.095	117.9	180.4	298.3	2.492	1.0	
Paddle Size (milxmil) 358milx358mil Die size (milxmil) 218milx332mil *Ref(2)		Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire
	Center	1.140	0.3700	1.510	1.146	0.3668	1.513	0.1594	0.01500	0.1744	0.1613	0.01428	0.1756
	Corner	1.471	0.7057	2.177	2.759	0.9106	3.670	0.1713	0.01997	0.1913	0.4641	0.03048	0.4946



**CARSEM**

(A MEMBER OF THE HONG LEONG GROUP MALAYSIA)

**CARSEM ELECTRICAL DATA**

UPDATED: 2005 MARCH

Data extracted at 1GHz

Package Type MQFP 100L 14.0mmx20.0mmx2.71mm	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
	Center	2.482	1.177	3.659	0.4559	0.08714	0.5430	89.99	146.5	236.5	1.336	1.0	
	Corner	5.244	2.426	7.670	0.9531	0.1414	1.095	179.3	257.4	436.7	2.492	1.0	
Paddle Size (milxmil) 358milx358mil Die size (milxmil) 218milx332mil *Ref(2)		Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire
	Center	1.140	0.3700	1.510	1.146	0.3668	1.513	0.1594	0.01500	0.1744	0.1613	0.01428	0.1756
	Corner	1.471	0.7057	2.177	2.759	0.9106	3.670	0.1713	0.01997	0.1913	0.4641	0.03048	0.4946

**Assumption**

Leadframe Material : Copper with resistivity=1.73x10<sup>-8</sup>ohm.m; relative permeability,μ<sub>r</sub> =1

Gold Wire: Resistivity=2.25x10<sup>-8</sup>ohm.m; relative permeability, μ<sub>r</sub> =1

Mold compound material : Plastic Novolac with er =4.8 loss tan d =0.001

Die thickness= 8 mil Wire loop height=6mil

Data Extracted at 100MHz

\*Ref (2)

Leadframe Material : C7025 TR02 with resistivity=4.35x10<sup>-8</sup>ohm.m; relative permeability,μ<sub>r</sub> =1

Gold Wire: Resistivity=2.35x10<sup>-8</sup>ohm.m; relative permeability, μ<sub>r</sub> =1

Mold compound material : with er =4.281 loss tan d =0.004

Die thickness= 10 mil Wire loop height=6mil

Modeling Tool : Parasitic Parameters 3D Modeler

Ground Plane positioned at 15mil below the package seating plane.



**CARSEM**

(A MEMBER OF THE HONG LEONG GROUP MALAYSIA)

**CARSEM ELECTRICAL DATA**

UPDATED: 2005 MARCH

**Definition**

**Self Resistance**

Resistance of the lead which is under study

**Self Inductance**

Inductance of a lead with a PWB ground plane at 15mil below the package seating place. It is a particle self inductance.

**Mutual Inductance**

Inductance between the lead under study to its left or right adjacent lead

**Mutual Capacitance**

Capacitance between the lead under study to its left or right adjacent lead

**Bulk Capacitance**

Capacitance from the lead under study to all other leads and ground plane. All the other leads and metal are grounded.

**Wire length**

Wire length stated at the above table is the direct distance from point on the bond pad to the bond point on the lead.



**CARSEM**  
(A MEMBER OF THE HONG LEONG GROUP MALAYSIA)

**CARSEM ELECTRICAL DATA**

UPDATED :2005 MARCH

**MLP Micro**

**Data Extracted at 100MHz**

Package Type	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
MLP Micro 8L 3.0mmx3.0mmx0.75mm	Center	0.1226	0.4974	0.6200	0.1418	0.0135	0.1553	1.1834	25.4026	26.5860	0.6164 / 0.6479	1.0	
	Corner	0.1228	0.6568	0.7796	0.1363	0.0396	0.1759	1.1820	31.6298	32.8118	0.9800 / 0.8857	1.0	
		Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>		
Pad size 67milx99mil Die size (milxmil) 59x81	Center	0.0208	0.0865	0.1073	0.0210	0.1044	0.1254	0.0229	-0.0079	0.0150	0.0233	-0.0022	0.0211
	Corner	0.0210	0.1226	0.1436	0.0006	0.0288	0.0294	0.0233	0.0001	0.0234	0.0002	0.0006	0.0008
		Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>		

**Data Extracted at 2GHz**

Package Type	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
MLP Micro 8L 3.0mmx3.0mmx0.75mm	Center	0.1216	0.4817	0.6033	0.1418	0.0135	0.1553	6.4389	89.7687	96.2076	0.6164 / 0.6479	1.0	
	Corner	0.1218	0.6369	0.7587	0.1363	0.0396	0.1759	6.4376	112.3024	118.7400	0.9800 / 0.8857	1.0	
		Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>		
Pad size 67milx99mil Die size (milxmil) 59x81	Center	0.0208	0.0864	0.1072	0.0210	0.1043	0.1253	0.0229	-0.0079	0.0150	0.0233	-0.0022	0.0211
	Corner	0.0210	0.1225	0.1435	0.0006	0.0288	0.0294	0.0233	0.0001	0.0234	0.0002	0.0006	0.0008
		Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>		



**CARSEM**

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## CARSEM ELECTRICAL DATA

UPDATED :2005 MARCH

### Assumption

**Leadframe Material : Copper with resistivity= $1.73 \times 10^{-8}$  ohm.m; relative permeability,  $\mu_r = 1$**

**Gold Wire: Resistivity= $2.35 \times 10^{-8}$  ohm.m; relative permeability,  $\mu_r = 1$**

**Mold compound material : Plastic Novolac with  $\epsilon_r = 4.8$  loss  $\tan \delta = 0.001$**

**\* New entries : Mold compound material : with  $\epsilon_r = 4.1$  loss  $\tan \delta = 0.001$**

**Die thickness= 8 mil Wire loop height=6mil**

**Modeling Tool : Parasitic Parameters 3D Modeler**

**Data Extracted at 100MHz ( except those with frequency stated above)**

**Ground Plane positioned at 15mil below the package seating plane.**

### Definition

**Self Resistance**

**Resistance of the lead which is under study**

**Self Inductance**

**Inductance of a lead with a PWB ground plane at 15mil below the package seating place. It is a particle self inductance.**

**Mutual Inductance**

**Inductance between the lead under study to its left or right adjacent lead**

**Mutual Capacitance**

**Capacitance between the lead under study to its left or right adjacent lead**

**Bulk Capacitance**

**Capacitance from the lead under study to all other leads and ground plane. All the other leads and metal are grounded.**

**Wire length**

**Wire length stated at the above table is the direct distance from point on the bond pad to the bond point on the lead.**



**CARSEM**

(A MEMBER OF THE HONG LEONG GROUP MALAYSIA)

**CARSEM ELECTRICAL DATA**

UPDATED :2005 MARCH

**MLPD**

Data Extracted at 1MHz

Package Type	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm ) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
MLPD 8L 3.0mmx3.0mmx0.75mm	Center	0.0848	0.5222	0.6070	0.1272	0.0439	0.1711	0.2048	21.4800	21.6848	0.6037	1.3000	
	Corner	0.0848	0.5359	0.6207	0.1173	0.0460	0.1633	0.2048	21.8100	22.0148	0.6037	1.3000	
	Pad size 104milx75mil Die size (milxmil) 65 x 65		Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>	
	Center	0.0171	0.0734	0.0905	0.0171	0.0738	0.0909	0.0279	0.0049	0.0328	0.0294	0.0049	0.0343
	Corner	0.0171	0.0747	0.0918	0.0004	0.0186	0.0190	0.0294	0.0055	0.0349	0.0002	0.0006	0.0008

Data Extracted at 2MHz

Package Type	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm ) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
MLPD 8L 3.0mmx3.0mmx0.75mm	Center	0.0844	0.5222	0.6066	0.1272	0.0439	0.1711	0.2157	21.4900	21.7057	0.6037	1.3000	
	Corner	0.0844	0.5359	0.6203	0.1173	0.0460	0.1633	0.2157	21.8100	22.0257	0.6037	1.3000	
	Pad size 104milx75mil Die size (milxmil) 65 x 65		Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>	
	Center	0.0171	0.0734	0.0905	0.0171	0.0738	0.0909	0.0279	0.0049	0.0328	0.0294	0.0049	0.0343
	Corner	0.0171	0.0747	0.0918	0.0004	0.0186	0.0190	0.0294	0.0055	0.0349	0.0002	0.0006	0.0008

Data Extracted at 100MHz

Package Type	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm ) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
MLPD 8L 3.0mmx3.0mmx0.75mm	Center	0.0803	0.5178	0.5981	0.1272	0.0439	0.1711	0.6728	26.6900	27.3628	0.6037	1.3000	
	Corner	0.0803	0.5315	0.6118	0.1173	0.0460	0.1633	0.6728	27.0800	27.7528	0.6037	1.3000	
	Pad size 104milx75mil Die size (milxmil) 65 x 65		Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>	
	Center	0.0171	0.0734	0.0905	0.0171	0.0738	0.0909	0.0279	0.0049	0.0328	0.0294	0.0049	0.0343
	Corner	0.0171	0.0747	0.0918	0.0004	0.0186	0.0190	0.0294	0.0055	0.0349	0.0002	0.0006	0.0008

Package Type	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm ) R			Gold Wire	
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)
MLPD 10L 3.0mmx3.0mmx0.75mm	Center	0.0803	0.4780	0.5583	0.1268	0.0590	0.1858	0.6723	37.2842	37.9565	0.6153	1.0
	Corner	0.0803	0.5237	0.6040	0.1173	0.0599	0.1772	0.6723	39.4352	40.1075	0.5250	1.0
	Pad size		Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>



**CARSEM**

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**CARSEM ELECTRICAL DATA**

UPDATED :2005 MARCH

104milx75mil Die size (milxmil) 67.5 x 86.4		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire
	Center	0.0172	0.0775	0.0947	0.0170	0.0384	0.0554	0.0288	0.0011	0.0299	0.0282	0.0000	0.0282
	Corner	0.0170	0.0899	0.1069	0.0004	0.0096	0.0100	0.0288	0.0028	0.0316	0.0003	0.0000	0.0003

**Data Extracted at 2GHz**

Package Type	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm ) R			Gold Wire		
MLPD 10L 3.0mmx3.0mmx0.75mm		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
		Center	0.0799	0.5771	0.6570	0.1269	0.0617	0.1886	3.3274	151.7100	155.0374	0.6037	1.3000
		Corner	0.0799	0.4989	0.5788	0.1173	0.0599	0.1772	3.3274	136.8900	140.2174	0.6037	1.3000
Pad size 104milx75mil Die size (milxmil) 67.5 x 86.4		Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire
		Center	0.0172	0.0775	0.0947	0.0170	0.0384	0.0554	0.0288	0.0011	0.0299	0.0282	0.0000
	Corner	0.0170	0.0899	0.1069	0.0004	0.0096	0.0100	0.0288	0.0028	0.0316	0.0003	0.0000	0.0003

**MLPD FCOL Data Extracted at 1MHz**

Package Type	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm ) R			Gold Wire		
MLPD 8L 3.0mmx3.0mmx0.75mm		Lead	Bump	Lead +Bump	Lead	Bump	Lead +Bump	Lead	Bump	Lead +Bump	Length(mm)	Diameter(mils)	
		Center	0.3286	0.0049	0.3335	0.2887	0.0279	0.3166	0.5523	20.1100	20.6623	NIL	NIL
		Corner	0.3259	0.0049	0.3308	0.2425	0.0276	0.2701	0.5680	20.1100	20.6780	NIL	NIL
Die size (milxmil) 67.5 x 86.4		Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>		
		Lead	Bump	Lead +Bump	Lead	Bump	Lead +Bump	Lead	Bump	Lead +Bump	Lead	Bump	Lead +Bump
		Center	0.1045	0.0006	0.1051	0.1042	0.0007	0.1049	0.0935	0.0027	0.0962	0.0933	0.0027
	Corner	0.1042	0.0007	0.1049	0.0076	0.0002	0.0078	0.0933	0.0027	0.0960	0.0034	0.0004	0.0038

**Data Extracted at 2MHz**

Package Type	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm ) R			Gold Wire		
MLPD 8L 3.0mmx3.0mmx0.75mm		Lead	Bump	Lead +Bump	Lead	Bump	Lead +Bump	Lead	Bump	Lead +Bump	Length(mm)	Diameter(mils)	
		Center	0.3262	0.0049	0.3311	0.2887	0.0279	0.3166	0.6088	20.1100	20.7188	NIL	NIL
		Corner	0.3335	0.0049	0.3384	0.2425	0.0276	0.2701	0.6257	20.1100	20.7357	NIL	NIL
Die size (milxmil) 67.5 x 86.4		Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>		
		Lead	Bump	Lead +Bump	Lead	Bump	Lead +Bump	Lead	Bump	Lead +Bump	Lead	Bump	Lead +Bump
		Center	0.1045	0.0006	0.1051	0.1042	0.0007	0.1049	0.0935	0.0027	0.0962	0.0933	0.0027
	Corner	0.1042	0.0007	0.1049	0.0076	0.0002	0.0078	0.0933	0.0027	0.0960	0.0034	0.0004	0.0038



**CARSEM**

(A MEMBER OF THE HONG LEONG GROUP MALAYSIA)

**CARSEM ELECTRICAL DATA**

UPDATED :2005 MARCH

Data Extracted at 100MHz

Package Type	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm ) R			Gold Wire		
		Lead	Bump	Lead +Bump	Lead	Bump	Lead +Bump	Lead	Bump	Lead +Bump	Length(mm)	Diameter(mils)	
MLPD 8L 3.0mmx3.0mmx0.75mm	Center	0.3084	0.0049	0.3133	0.2887	0.0279	0.3166	2.2920	20.1100	22.4020	NIL	NIL	
	Corner	0.3152	0.0049	0.3201	0.2425	0.0276	0.2701	2.3630	20.1100	22.4730	NIL	NIL	
Die size (milxmil) 67.5 x 86.4		Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>		
		Lead	Bump	Lead +Bump	Lead	Bump	Lead +Bump	Lead	Bump	Lead +Bump	Lead	Bump	Lead +Bump
	Center	0.1045	0.0006	0.1051	0.1042	0.0007	0.1049	0.0935	0.0027	0.0962	0.0933	0.0027	0.0960
	Corner	0.1042	0.0007	0.1049	0.0076	0.0002	0.0078	0.0933	0.0027	0.0960	0.0034	0.0004	0.0038

**Assumption**

Leadframe Material : C194=2.87x10<sup>-8</sup>ohm.m; relative permeability, ?<sub>r</sub> =1  
 Gold Wire: Resistivity=2.35x10<sup>-8</sup>ohm.m; relative permeability, ?<sub>r</sub> =1  
 Mold compound material : Plastic Novolac with ?<sub>r</sub> =4.8 loss tan ? =0.001  
 \* New entries : Mold compound material : with ?<sub>r</sub> =4.1 loss tan ? =0.001  
 Die thickness= 8 mil Wire loop height=6mil  
 Modeling Tool : Parasitic Parameters 3D Modeler  
 Ground Plane positioned at 15mil below the package seating plane.

**Definition**

Self Resistance

Resistance of the lead which is under study

Self Inductance

Inductance of a lead with a PWB ground plane at 15mil below the package seating place. It is a particle self inductance.

Mutual Inductance

Inductance between the lead under study to its left or right adjacent lead

Mutual Capacitance

Capacitance between the lead under study to its left or right adjacent lead

Bulk Capacitance

Capacitance from the lead under study to all other leads and ground plane. All the other leads and metal are grounded.

Wire length

Wire length stated at the above table is the direct distance from point on the bond pad to the bond point on the lead.



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**CARSEM ELECTRICAL DATA**

UPDATED :2005 MARCH

<b>SC70-100MHz</b>	<b>SOIC-100MHz</b>												
Package Type <b>SOIC (N) 8LEAD</b> Pad Size <b>90 mil x90 mil</b>  Die size (milxmil) <b>34.8 x 47.6</b>	<b>Lead</b>	<b>Self Inductance (nH) L<sub>11</sub></b>			<b>Bulk Capacitance (pF) C<sub>11</sub></b>			<b>Resistance (mOhm ) R</b>			<b>Gold Wire</b>		
		<b>Lead</b>	<b>Wire</b>	<b>Lead +Wire</b>	<b>Lead</b>	<b>Wire</b>	<b>Lead +Wire</b>	<b>Lead</b>	<b>Wire</b>	<b>Lead+Wire</b>	<b>Length(mm)</b>	<b>Diameter(mils)</b>	
	<b>Center</b>	1.0600	1.2600	2.3200	0.2820	0.0723	0.3543	8.510	73.10	81.610	1.2572	1.0	
	<b>Corner</b>	1.3500	1.2700	1.9640	0.3030	0.0867	0.4733	10.90	73.40	46.756	1.2745	1.0	
			1.1900			0.0836			70.10		1.1999		
		<b>Mutual Inductance L<sub>12</sub></b>			<b>Mutual Inductance L<sub>13</sub></b>			<b>Mutual Capacitance C<sub>12</sub></b>			<b>Mutual Capacitance C<sub>13</sub></b>		
		<b>Lead</b>		<b>Lead +Wire</b>	<b>Lead</b>	<b>Wire</b>	<b>Lead +Wire</b>	<b>Lead</b>	<b>Wire</b>	<b>Lead+Wire</b>	<b>Lead</b>	<b>Wire</b>	<b>Lead+Wire</b>
	<b>Center</b>	0.2550	0.1900	0.4450	0.2330	0.1550	0.3880	0.0621	0.0076	0.0697	0.0448	0.0123	0.0571
	<b>Corner</b>	0.2550	0.1900	0.4450	0.0395	0.0895	0.1290	0.0621	0.0069	0.0690	0.0189	0.0026	0.0215



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## CARSEM ELECTRICAL DATA

UPDATED :2005 MARCH

### Assumption

Gold Wire: Resistivity= $2.25 \times 10^{-8}$  ohm.m; relative permeability,  $\mu_r = 1$   
Mold compound material : Plastic Novolac with  $\epsilon_r = 4.8$  loss  $\tan \delta = 0.001$   
Die thickness= 8 mil Wire loop height=

Modeling Tool : Parasitic Parameters 3D Modeler

Data Extracted at 100MHz

Ground Plane positioned at 15mil below the package seating plane.

### Definition

#### Self Resistance

Resistance of the lead which is under stu

#### Self Inductance

Inductance of a lead with a PWB ground plane at 15mil below the package seating place. It is a particle self inductance.

#### Mutual Inductance

Inductance between the lead under study to its left or right adjacent lead

#### Mutual Capacitance

Capacitance between the lead under study to its left or right adjacent lead

#### Bulk Capacitance

Capacitance from the lead under study to all other leads and ground plane. All the other leads and metal are grounded.

#### Wire length

Wire length stated at the above table is the direct distance from point on the bond pad to the bond point on the lead.



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**CARSEM ELECTRICAL DATA**

UPDATED :2005 MARCH

**SC70-100MHz**

Package Type SSOP 28LEAD 1.95mm x1.22mm  Die size (mm) 0.8200 x1.010	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm ) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
	Center	0.4210	0.4970	0.9180	0.1460	0.0305	0.1765	38.800	53.200	92.000	0.4706	0.8	
Corner	0.4200	0.4740	0.8940	0.1480	0.0299	0.1779	38.700	51.800	90.500	0.4552	0.8		
		Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire
Center	0.1070	0.0170	0.1240	0.0214	0.0286	0.0500	0.0285	0.0007	0.0292	0.0050	0.0016	0.0066	
Corner	0.1100	0.0677	0.1777	0.0214	0.0238	0.0452	0.0750	0.0050	0.0800	0.0504	0.0016	0.0520	

**SC70-100MHz**

Package Type SSOP 28LEAD 1.95mm x1.22mm  Die size (mm) 0.8200 x1.010	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm ) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
	Center	0.4210	0.4640	0.8850	0.1460	0.0345	0.1805	38.800	36.100	74.900	0.4706	1.0	
Corner	0.4200	0.4430	0.8630	0.1480	0.0339	0.1819	38.700	35.100	73.800	0.4552	1.0		
		Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire
Center	0.1070	0.0170	0.1240	0.0214	0.0286	0.0500	0.0285	0.0007	0.0292	0.0050	0.0016	0.0066	
Corner	0.1100	0.0677	0.1777	0.0214	0.0238	0.0452	0.0750	0.0050	0.0800	0.0504	0.0016	0.0520	

**SC70-100MHz**

Package Type SSOP 28LEAD 1.95mm x1.22mm  Die size (mm) 0.8200 x1.010	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm ) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
	Center	0.4210	0.4250	0.8460	0.1460	0.0395	0.1855	38.800	24.300	63.100	0.4706	1.3	
Corner	0.4200	0.4040	0.8240	0.1480	0.0389	0.1869	38.700	23.600	62.300	0.4552	1.3		
		Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire
Center	0.1070	0.0170	0.1240	0.0214	0.0286	0.0500	0.0285	0.0007	0.0292	0.0050	0.0016	0.0066	
Corner	0.1100	0.0677	0.1777	0.0214	0.0238	0.0452	0.0750	0.0050	0.0800	0.0504	0.0016	0.0520	



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**CARSEM ELECTRICAL DATA**

UPDATED :2005 MARCH

**SC70-100MHz**

Package Type SSOP 28LEAD 1.95mm x1.22mm	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm ) R			Gold Wire	
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)
Center	0.4210	0.4610	0.6413	0.1460	0.0400	0.2246	38.800	35.900	56.288	0.4706	1.0	
		0.4220			0.0386			34.100				0.4210
Corner	0.4200	0.3990	0.6324	0.1480	0.0381	0.2264	38.700	33.000	55.825	0.4575	1.0	
		0.4540			0.0403			35.600				0.3660
Die size (mm) 0.8200 x1.010	Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>		
	Lead		Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire
Center	0.1070	0.0155	0.1225	0.0214	0.0338	0.0552	0.0285	0.0008	0.0293	0.0050	0.0012	0.0062
Corner	0.1100	0.0441	0.1541	0.0214	0.0243	0.0457	0.0750	0.0029	0.0779	0.0504	0.0013	0.0517



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## CARSEM ELECTRICAL DATA

UPDATED :2005 MARCH

### Assumption

Gold Wire: Resistivity= $2.25 \times 10^{-8}$  ohm.m; relative permeability,  $\mu_r = 1$   
Mold compound material : Plastic Novolac with  $\epsilon_r = 4.8$  loss  $\tan \delta = 0.001$   
Die thickness= 8 mil Wire loop height=

Modeling Tool : Parasitic Parameters 3D Modeler

Data Extracted at 100MHz

Ground Plane positioned at 15mil below the package seating plane.

### Definition

**Self Resistance**

Resistance of the lead which is under stu

**Self Inductance**

Inductance of a lead with a PWB ground plane at 15mil below the package seating place. It is a particle self inductance.

**Mutual Inductance**

Inductance between the lead under study to its left or right adjacent lead

**Mutual Capacitance**

Capacitance between the lead under study to its left or right adjacent lead

**Bulk Capacitance**

Capacitance from the lead under study to all other leads and ground plane. All the other leads and metal are grounded.

**Wire length**

Wire length stated at the above table is the direct distance from point on the bond pad to the bond point on the lead.



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**CARSEM ELECTRICAL DATA**

UPDATED :2005 MARCH

**SSOP 125MHz**

Package Type SSOP 28LEAD 5.3mmx7.8mm	Lead	Self Inductance (nH) $L_{11}$			Bulk Capacitance (pF) $C_{11}$			Resistance (mOhm ) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
Die size (milxmil) 91x172	Center	1.0200	1.2600	2.2800	0.2670	0.0688	0.3358	10.6000	76.90	87.5000	1.2438	1.0	
	Corner	2.3600	1.1200	3.4800	0.5430	0.0644	0.6074	70.1000	23.50	93.6000	1.1356	1.0	
		Mutual Inductance $L_{12}$			Mutual Inductance $L_{13}$			Mutual Capacitance $C_{12}$			Mutual Capacitance $C_{13}$		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire
	Center	0.3300	0.2540	0.5840	0.3270	0.2490	0.5760	0.0676	0.0094	0.0770	0.0672	0.0093	0.0765
	Corner	0.7150	0.2320	0.9470	0.0326	0.1260	0.1586	0.1800	0.0103	0.1903	0.0112	0.0050	0.0162



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## CARSEM ELECTRICAL DATA

UPDATED :2005 MARCH

### Assumption

Gold Wire: Resistivity= $2.25 \times 10^{-8}$  ohm.m; relative permeability,  $\mu_r = 1$

Mold compound material : Plastic Novolac with  $\epsilon_r = 4.8$  loss  $\tan \delta = 0.001$

Die thickness= 8 mil Wire loop height=6mil

Modeling Tool : Parasitic Parameters 3D Modeler

Data Extracted at 100MHz

Ground Plane positioned at 15mil below the package seating plane.

### Definition

Self Resistance

Resistance of the lead which is under stu

Self Inductance

Inductance of a lead with a PWB ground plane at 15mil below the package seating place. It is a partice self inductance.

Mutual Inductance

Inductance between the lead under study to its left or right adjacent lead

Mutual Capacitance

Capacitance between the lead under study to its left or right adjacent lead

Bulk Capacitance

Capacitance from the lead under study to all other leads and ground plane. All the other leads and metal are grounded.

Wire length

Wire length stated at the above table is the direct distance from point on the bond pad to the bond point on the lead.



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**CARSEM ELECTRICAL DATA**

UPDATED :2005 MARCH

**SSBGA-100MHz**

Package Type SSBGA 145L 7.0mmx7.0mmx1.2mm	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm ) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
Die size (milxmil) 175.5x175	Center	N/A	0.9810	0.9810	N/A	0.0864	0.0864	N/A	43.10	43.10	1.0643	1.3	
	Corner	N/A	1.0300	1.0300	N/A	0.0746	0.0746	N/A	44.60	44.60	1.1115	1.3	
Wire only		Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>		
	Center	Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire
	Corner	N/A	0.4350	0.4350	N/A	0.4130	0.4130	N/A	0.0214	0.0214	N/A	0.0197	0.0197
		N/A	0.3770	0.3770	N/A	0.0613	0.0613	N/A	0.0151	0.0151	N/A	0.0058	0.0058



**CARSEM**

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## CARSEM ELECTRICAL DATA

UPDATED :2005 MARCH

### Assumption

Gold Wire: Resistivity= $2.25 \times 10^{-8}$  ohm.m; relative permeability,  $\mu_r = 1$   
Mold compound material : Plastic Novolac with  $\epsilon_r = 4.8$  loss  $\tan \delta = 0.001$   
Die thickness= 8 mil Wire loop height=6mil

Modeling Tool : Parasitic Parameters 3D Modeler

Data Extracted at 100MHz

Ground Plane positioned at 15mil below the package seating plane.

### Definition

**Self Resistance**

Resistance of the lead which is under study

**Self Inductance**

Inductance of a lead with a PWB ground plane at 15mil below the package seating place. It is a particle self inductance.

**Mutual Inductance**

Inductance between the lead under study to its left or right adjacent lead

**Mutual Capacitance**

Capacitance between the lead under study to its left or right adjacent lead

**Bulk Capacitance**

Capacitance from the lead under study to all other leads and ground plane. All the other leads and metal are grounded.

**Wire length**

Wire length stated at the above table is the direct distance from point on the bond pad to the bond point on the lead.



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**CARSEM ELECTRICAL DATA**

UPDATED :2005 MARCH

**LQFP 100MHz**

Package Type LQFP 80L 14.0mmx14.0mm	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm ) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
Paddle Size (milxmil)	Center	1.8000	1.7100	3.5100	0.4740	0.0994	0.5734	15.500	72.500	88.000	1.7328	1.2	
	Corner	2.6400	1.7000	4.3400	1.2300	0.0930	1.3230	20.000	72.000	92.000	1.7128	1.2	
315x315 Die size (milxmil) 264x264		Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire
	Center	0.8050	0.5340	1.3390	0.8030	0.5400	1.3430	0.1760	0.0172	0.1932	0.1840	0.0174	0.2014
	Corner	1.2000	0.4960	1.6960	0.4920	0.2840	0.7760	0.1640	0.0148	0.1788	0.0127	0.0064	0.0191

**LQFP 1GHz**

Package Type LQFP 80L 14.0mmx14.0mm	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm ) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
Paddle Size (milxmil)	Center	1.7800	1.6600	3.4400	0.4740	0.0994	0.5734	64.700	198.000	262.700	1.7328	1.2	
	Corner	2.6200	1.6500	4.2700	1.2300	0.0930	1.3230	110.000	196.000	306.000	1.7128	1.2	
315x315 Die size (milxmil) 264x264		Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire
	Center	0.8050	0.5340	1.3390	0.8030	0.5400	1.3430	0.1760	0.0172	0.1932	0.1840	0.0174	0.2014
	Corner	1.2000	0.4960	1.6960	0.4920	0.2840	0.7760	0.1640	0.0148	0.1788	0.0127	0.0064	0.0191

**LQFP 10GHz**

Package Type LQFP 80L 14.0mmx14.0mm	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm ) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
Paddle Size (milxmil)	Center	1.7800	1.6400	3.4200	0.4740	0.0994	0.5734	166.000	750.000	916.000	1.7328	1.2	
	Corner	2.6000	1.6200	4.2200	1.2300	0.0930	1.3230	1960.000	747.000	2707.000	1.7128	1.2	
315x315 Die size (milxmil) 264x264		Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire
	Center	0.8050	0.5340	1.3390	0.8030	0.5400	1.3430	0.1760	0.0172	0.1932	0.1840	0.0174	0.2014
	Corner	1.2000	0.4960	1.6960	0.4920	0.2840	0.7760	0.1640	0.0148	0.1788	0.0127	0.0064	0.0191



**CARSEM**

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## CARSEM ELECTRICAL DATA

UPDATED :2005 MARCH

### Assumption

Gold Wire: Resistivity= $2.25 \times 10^{-8}$  ohm.m; relative permeability,  $\mu_r = 1$   
Mold compound material : Plastic Novolac with  $\epsilon_r = 4.8$  loss  $\tan \delta = 0.001$   
Die thickness= 8 mil Wire loop height=6mil

Modeling Tool : Parasitic Parameters 3D Modeler

Data Extracted at 100MHz

Ground Plane positioned at 15mil below the package seating plane.

### Definition

#### Self Resistance

Resistance of the lead which is under study

#### Self Inductance

Inductance of a lead with a PWB ground plane at 15mil below the package seating place. It is a particle self inductance.

#### Mutual Inductance

Inductance between the lead under study to its left or right adjacent lead

#### Mutual Capacitance

Capacitance between the lead under study to its left or right adjacent lead

#### Bulk Capacitance

Capacitance from the lead under study to all other leads and ground plane. All the other leads and metal are grounded.

#### Wire length

Wire length stated at the above table is the direct distance from point on the bond pad to the bond point on the lead.



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**CARSEM ELECTRICAL DATA**

UPDATED :2005 MARCH

**MLPQ- 500MHz**

Package Type MLPQ 44LD 7.00mm x 7.00mm	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
Paddle Size (milxmil) 213x213	Center	0.1230	0.8400	0.9630	0.1600	0.0518	0.2118	6.610	95.700	102.310	0.9022	1.0	
	Corner	0.1240	0.0940	0.2180	0.1500	0.0545	0.2045	6.420	104.000	110.420	1.0218	1.0	
Die size (milxmil) 203x203	Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>			
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire
	Center	0.0307	0.1520	0.1827	0.0307	0.1510	0.1817	0.0409	0.0055	0.0464	0.0409	0.0056	0.0465
	Corner	0.0306	0.1870	0.2176	0.00018	0.1410	0.1412	0.0388	0.0060	0.0448	0.0082	0.0055	0.0136

**MLPQ- 1GHz & 2GHz**

Package Type MLPQ 44LD 7.00mm x 7.00mm	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
Paddle Size (milxmil) 213x213	Center	0.078	1.010	1.088	0.129	0.062	0.191	7.600	154.000	161.600	1.0764	1.0	
	Corner	0.779	1.550	2.329	0.119	0.084	0.203	7.300	217.000	224.300	1.5850	1.0	
Die size (milxmil) 203x203	Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>			
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire
	Center	0.0170	N/A	0.0170	0.0171	N/A	0.0171	0.0297	N/A	0.0297	0.0299	N/A	0.0299
	Corner	0.0171	0.4980	0.5151	0.00007	N/A	0.00007	0.0303	0.0167	0.0470	0.0112	N/A	0.0112
Full Package													

**MLPQ1GHz & 2.1GHz**

Package Type MLPQ 56LD 8.00mm x 8.00mm	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
Paddle Size (milxmil) 251x251	Center	0.0781	1.6700	1.7481	0.1330	0.0924	0.2254	7.090	230.000	237.090	1.7030	1.0	
	Corner	0.0779	2.0100	2.0879	0.1240	0.0971	0.2211	7.520	267.000	274.520	2.0000	1.0	
Die size (milxmil) 212x212	Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>			
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire
	Center	0.0171	0.5360	0.5531	0.0172	0.6100	0.6272	0.0291	0.0190	0.0481	0.0298	0.0193	0.0491
	Corner	0.0172	0.6100	0.6272	0.01720	0.6470	0.6642	0.0298	0.0193	0.0491	0.0307	0.0193	0.0500
Only 4 wires													



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**CARSEM ELECTRICAL DATA**

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**MLPQ1GHz & 2.1GHz**

Package Type MLPQ 56LD 8.00mm x 8.00mm	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
Paddle Size (milxmil)	Center	0.0781	1.5700	1.6481	0.1330	0.1070	0.2400	7.090	178.000	185.090	1.7030	1.3	
	Corner	0.0779	1.8900	1.9679	0.1240	0.1110	0.2350	7.520	207.000	214.520	2.0000	1.3	
Die size (milxmil)	Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>			
	Center	Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire
212x212	Center	0.0171	0.5360	0.5531	0.0172	0.6100	0.6272	0.0291	0.0244	0.0535	0.0298	0.0253	0.0551
	Corner	0.0172	0.6100	0.6272	0.01720	0.6470	0.6642	0.0298	0.0253	0.0551	0.0307	0.0251	0.0558
Only 4 wires													

**MLPQ 2GHz**

Package Type MLPQ 56LD 8.00mm x 8.00mm	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
Paddle Size (milxmil)	Center	0.0849	1.4500	1.5349	0.1110	0.1020	0.2130	3.5800	244.000	247.580	1.6002	1.0	
	Corner	0.0848	2.0500	2.1348	0.1080	0.1280	0.2360	3.6200	323.000	326.620	2.1538	1.0	
Die size (milxmil)	Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>			
	Center	Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire
212x212	Center	0.0165	0.5060	0.5225	0.0164	N/A	0.0164	0.0228	0.0152	0.0380	0.0223	N/A	0.0223
	Corner	0.0164	N/A	0.0164	0.00004	N/A	0.00004	0.0238	N/A	0.0238	0.0095	N/A	0.0095
Full Package													

**MLPQ 1GHz**

Package Type MLPQ 56LD 8.00mm x 8.00mm	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
Paddle Size (milxmil)	Center	0.0862	1.4600	1.5462	0.1110	0.1020	0.2130	6.6600	168.000	174.660	1.6002	1.3	
	Corner	0.0862	2.0600	2.1462	0.1080	0.1280	0.2360	6.720	222.000	228.720	2.1538	1.3	
Die size (milxmil)	Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>			
	Center	Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire
212x212	Center	0.0165	0.5060	0.5225	0.0164	N/A	0.0164	0.0228	0.0189	0.0417	0.0223	N/A	0.0223
	Corner	0.0164	N/A	0.0164	0.00004	N/A	0.00004	0.0238	N/A	0.0238	0.0095	N/A	0.0095
Full Package													



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**MLPQ 2GHz**

Package Type MLPQ 56LD 8.00mm x 8.00mm	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm ) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
Paddle Size (milxmil) 251x251	Center	0.0849	1.5500	1.6349	0.1110	0.0887	0.1997	3.5800	313.000	316.580	1.6002	1.0	
	Corner	0.0848	2.1800	2.2648	0.1080	0.1090	0.2170	3.6200	413.000	416.620	2.1538	1.0	
Die size (milxmil) 212x212	Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>			
	Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire	
Full Package	Center	0.0165	0.5060	0.5225	0.0164	N/A	0.0164	0.0228	0.0152	0.0380	0.0223	N/A	0.0223
	Corner	0.0164	N/A	0.0164	0.00004	N/A	0.00004	0.0238	N/A	0.0238	0.0095	N/A	0.0095

**MLPQ 1GHz**

Package Type MLPQ 56LD 8.00mm x 8.00mm	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm ) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
Paddle Size (milxmil) 251x251	Center	0.0849	1.5500	1.6349	0.1110	0.0887	0.1997	3.5800	313.000	316.580	1.6002	1.3	
	Corner	0.0848	2.1800	2.2648	0.1080	0.1090	0.2170	3.6200	413.000	416.620	2.1538	1.3	
Die size (milxmil) 212x212	Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>			
	Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire	
Full Package	Center	0.0165	0.5060	0.5225	0.0164	N/A	0.0164	0.0228	0.0152	0.0380	0.0223	N/A	0.0223
	Corner	0.0164	N/A	0.0164	0.00004	N/A	0.00004	0.0238	N/A	0.0238	0.0095	N/A	0.0095

**MLPQ 1GHz**

Package Type MLPQ 56LD 8.00mm x 8.00mm	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm ) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
Paddle Size (milxmil) 251x251	Center	0.0775	1.0100	1.0875	0.1290	0.0615	0.1905	7.6000	154.000	161.600	1.0764	1.0	
	Corner	0.0779	1.5500	1.6279	0.1190	0.0835	0.2025	7.3000	217.000	224.300	1.5850	1.0	
Die size (milxmil) 212x212	Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>			
	Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire	
Full Package	Center	0.0170	N/A	0.0170	0.0171	N/A	0.0171	0.0297	N/A	0.0297	0.0299	N/A	0.0299
	Corner	0.0171	0.4980	0.5151	0.00007	N/A	0.00007	0.0303	0.0167	0.0470	0.0112	N/A	0.0112



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**MLPQ 1GHz**

Package Type MLPQ 56LD 8.00mm x 8.00mm	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
Paddle Size (milxmil) 251x251	Center	0.0775	0.9380	1.0155	0.1290	0.0705	0.1995	7.6000	120.000	127.600	1.0764	1.3	
	Corner	0.0779	1.4500	1.5279	0.1190	0.0961	0.2151	7.3000	168.000	175.300	1.5850	1.3	
Die size (milxmil) 212x212	Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>			
	Center	Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire
Full Package	Center	0.0170	N/A	0.0170	0.0171	N/A	0.0171	0.0297	N/A	0.0297	0.0299	N/A	0.0299
	Corner	0.0171	0.4980	0.5151	0.00007	N/A	0.00007	0.0303	0.0167	0.0470	0.0112	N/A	0.0112

**MLPQ 2.1GHz**

Package Type MLPQ 56LD 8.00mm x 8.00mm	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
Paddle Size (milxmil) 251x251	Center	0.0774	1.0000	1.0774	0.1290	0.0615	0.1905	2.8800	227.000	229.880	1.0764	1.0	
	Corner	0.0777	1.5400	1.6177	0.1190	0.0835	0.2025	2.8700	320.000	322.870	1.5850	1.0	
Die size (milxmil) 212x212	Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>			
	Center	Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire
Full Package	Center	0.0170	N/A	0.0170	0.0171	N/A	0.0171	0.0297	N/A	0.0297	0.0299	N/A	0.0299
	Corner	0.0171	0.4980	0.5151	0.00007	N/A	0.00007	0.0303	0.0167	0.0470	0.0112	N/A	0.0112

**MLPQ 1GHz**

Package Type MLPQ 56LD 8.00mm x 8.00mm	Lead	Self Inductance (nH) L <sub>11</sub>			Bulk Capacitance (pF) C <sub>11</sub>			Resistance (mOhm) R			Gold Wire		
		Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Length(mm)	Diameter(mils)	
Paddle Size (milxmil) 251x251	Center	0.0774	0.9320	1.0094	0.1290	0.0705	0.1995	2.8800	179.000	181.880	1.0764	1.3	
	Corner	0.0777	1.4400	1.5177	0.1190	0.0961	0.2151	2.8700	250.000	252.870	1.5850	1.3	
Die size (milxmil) 212x212	Mutual Inductance L <sub>12</sub>			Mutual Inductance L <sub>13</sub>			Mutual Capacitance C <sub>12</sub>			Mutual Capacitance C <sub>13</sub>			
	Center	Lead	Wire	Lead +Wire	Lead	Wire	Lead +Wire	Lead	Wire	Lead+Wire	Lead	Wire	Lead+Wire
Full Package	Center	0.0170	N/A	0.0170	0.0171	N/A	0.0171	0.0297	N/A	0.0297	0.0299	N/A	0.0299
	Corner	0.0171	0.4980	0.5151	0.00007	N/A	0.00007	0.0303	0.0167	0.0470	0.0112	N/A	0.0112



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## CARSEM ELECTRICAL DATA

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### Assumption

Gold Wire: Resistivity= $2.25 \times 10^{-8}$  ohm.m; relative permeability,  $\mu_r = 1$   
Mold compound material : Plastic Novolac with  $\epsilon_r = 4.8$  loss  $\tan \delta = 0.001$   
Die thickness= 8 mil Wire loop height=6mil

Modeling Tool : Parasitic Parameters 3D Modeler

Data Extracted at 100MHz

Ground Plane positioned at 15mil below the package seating plane.

### Definition

#### Self Resistance

Resistance of the lead which is under study

#### Self Inductance

Inductance of a lead with a PWB ground plane at 15mil below the package seating place. It is a particle self inductance.

#### Mutual Inductance

Inductance between the lead under study to its left or right adjacent lead

#### Mutual Capacitance

Capacitance between the lead under study to its left or right adjacent lead

#### Bulk Capacitance

Capacitance from the lead under study to all other leads and ground plane. All the other leads and metal are grounded.

#### Wire length

Wire length stated at the above table is the direct distance from point on the bond pad to the bond point on the lead.