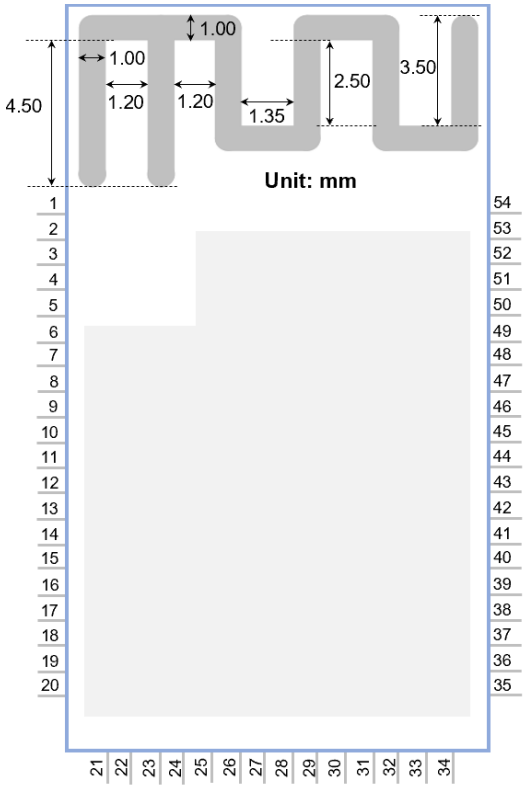
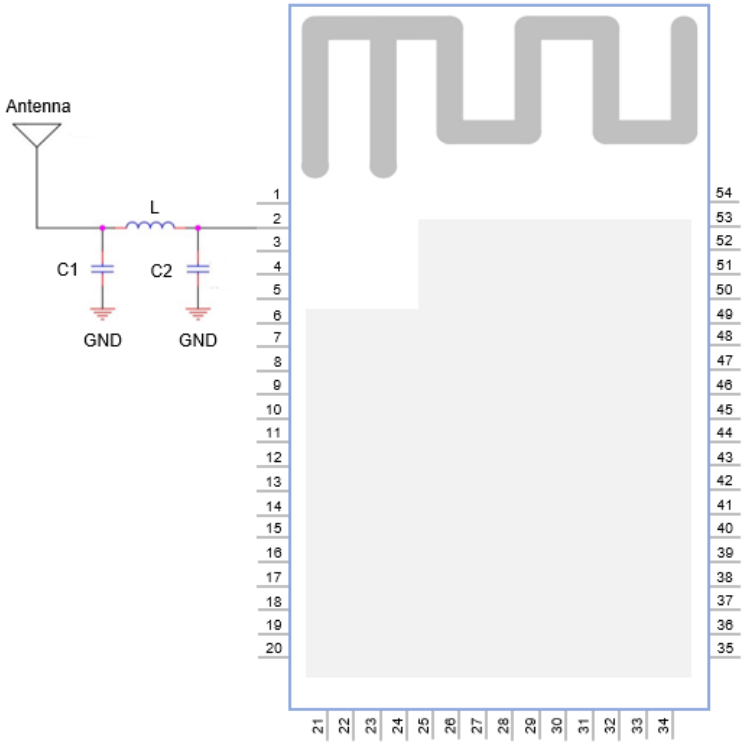
7 Antenna type, performance and application note

BTA65 provides two antenna types of internal antenna and external antenna.

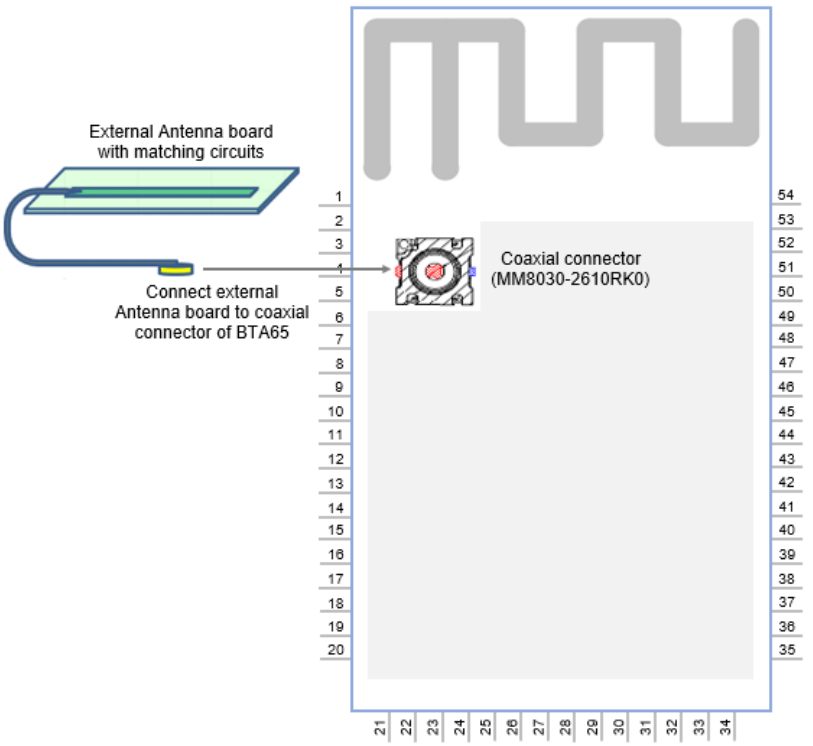
The internal antenna has good RF performance. The manufacturer of internal antenna is BOMIN, and its size information is as follows.



In addition, due to the limitation of some product structure, the performance of internal antenna may not meet the requirements. In order to obtain better RF performance, the pin 2 or the coaxial connector (MM8030-2610RK0) of BTA65 module can be connected to an external antenna as following figures.



Connect to external antenna via Pin 2 of BTA65

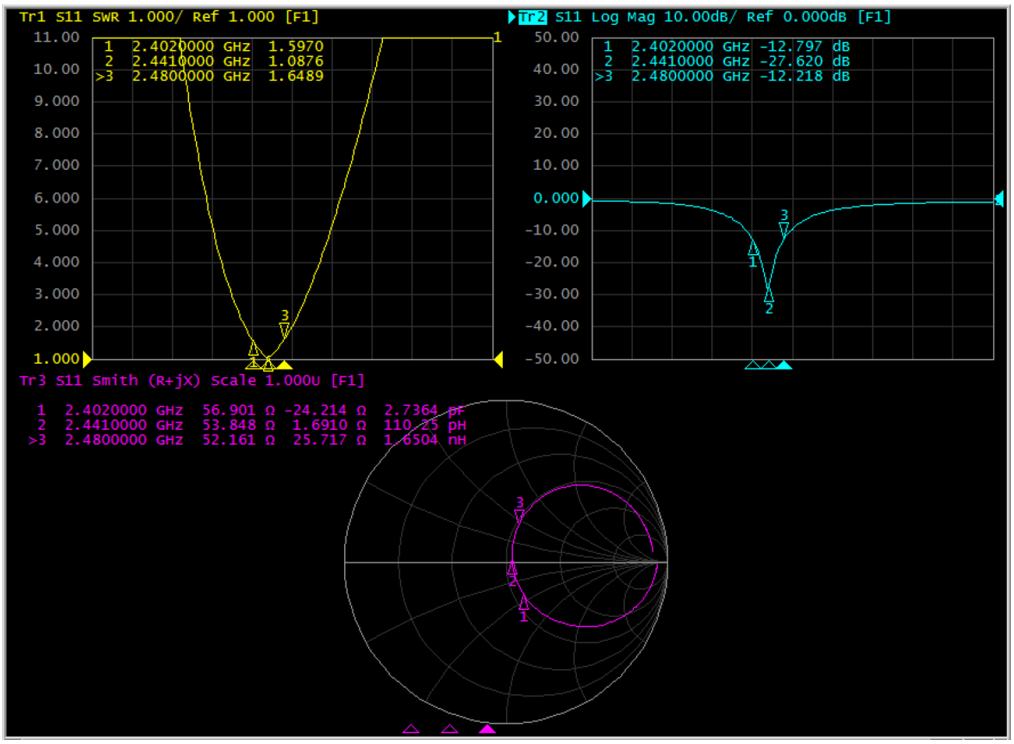


Connect to coaxial connector of BTA65

7.1 Internal antenna performance

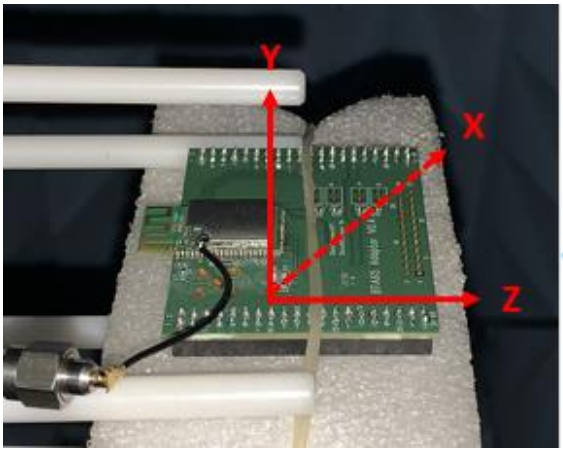
Max Gain	1.54 dBi @ 2443MHz
Max Effieiency	65.69% @2454MHz

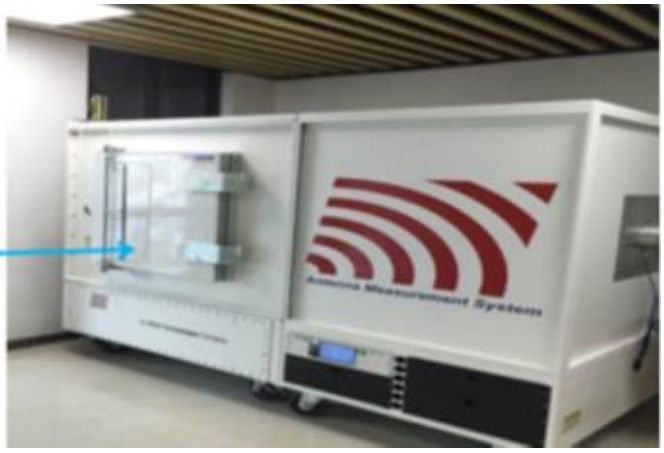
7.1.1 VSWR, Return Loss and Impedance



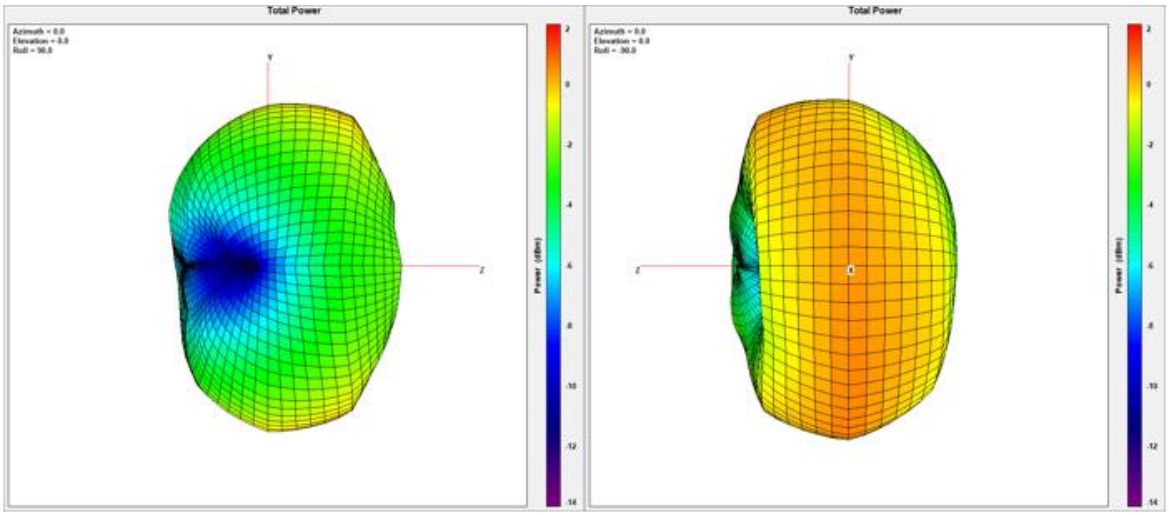
7.1.2 Antenna 3D Radiation, Efficiency and Gain

Test settings:

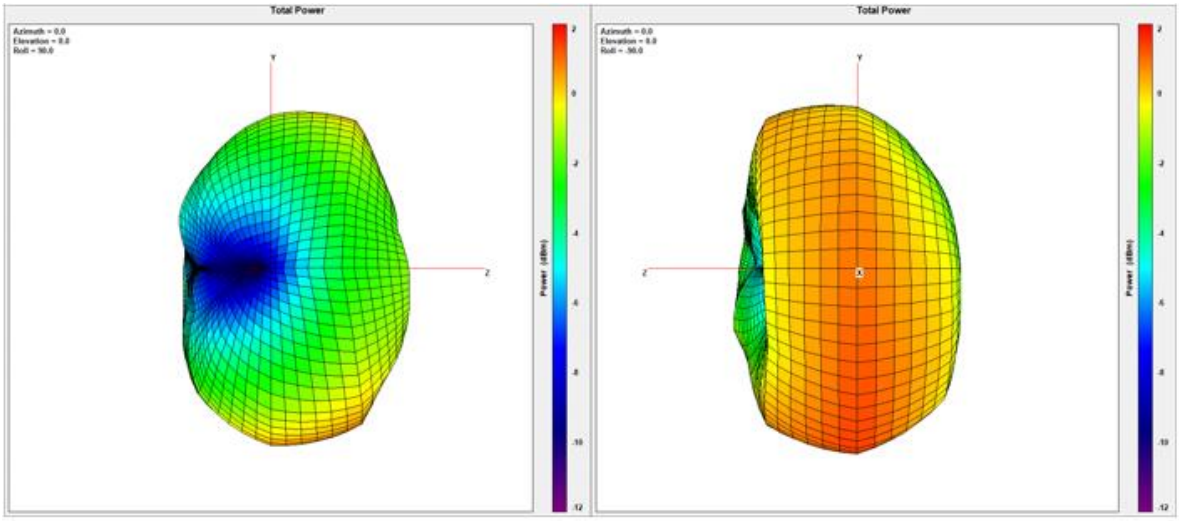




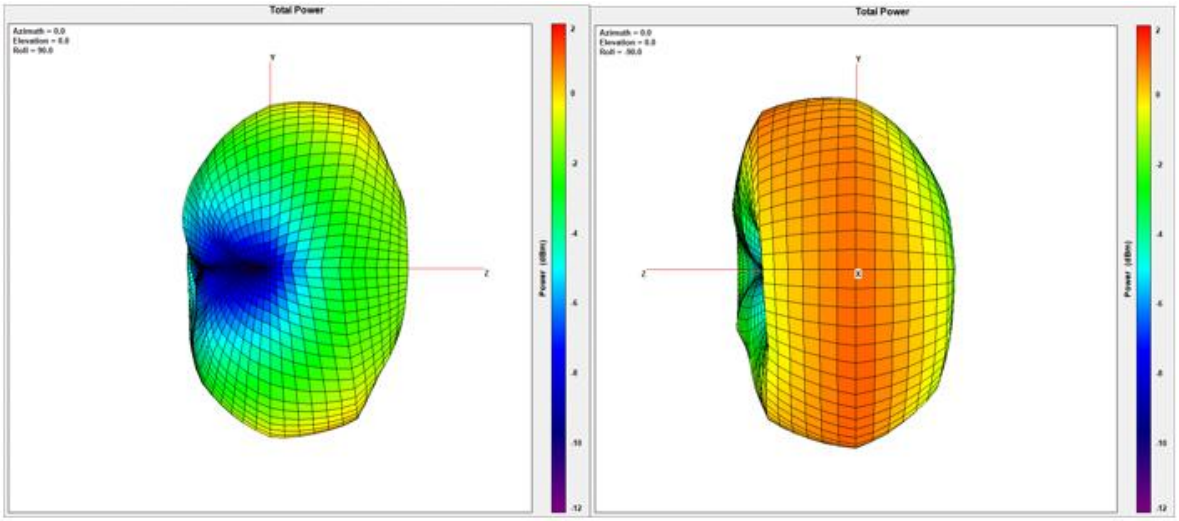
Antenna 3D Radiation Pattern (2402MHz):



Antenna 3D Radiation Pattern (2441MHz):



Antenna 3D Radiation Pattern (2480MHz):



Antenna Efficiency and Gain:

Point Values	Ant. Port Input Pwr. (dBm)	Tot. Rad. Pwr. (dBm)	Peak EIRP (dBm)	Directivity (dBi)	Efficiency (dB)	Efficiency (%)	Gain (dBi)
Frequency (MHz)							
2400	0	-2.39478	0.785812	3.18059	-2.39478	57.6132	0.785812
2401	0	-2.38062	0.771219	3.15184	-2.38062	57.8014	0.771219
2402	0	-2.36777	0.75755	3.12532	-2.36777	57.9726	0.75755
2403	0	-2.35655	0.749425	3.10597	-2.35655	58.1226	0.749425
2404	0	-2.34483	0.738148	3.08298	-2.34483	58.2796	0.738148
2405	0	-2.3289	0.732775	3.06168	-2.3289	58.4938	0.732775
2406	0	-2.3123	0.735283	3.04758	-2.3123	58.7178	0.735283
2407	0	-2.29512	0.743207	3.03833	-2.29512	58.9506	0.743207
2408	0	-2.28042	0.754919	3.03534	-2.28042	59.1504	0.754919
2409	0	-2.26409	0.765269	3.02936	-2.26409	59.3732	0.765269
2410	0	-2.24664	0.782129	3.02877	-2.24664	59.6123	0.782129
2411	0	-2.23182	0.795071	3.02689	-2.23182	59.8161	0.795071
2412	0	-2.21491	0.811126	3.02604	-2.21491	60.0495	0.811126
2413	0	-2.19778	0.825863	3.02364	-2.19778	60.2868	0.825863
2414	0	-2.18695	0.839941	3.02689	-2.18695	60.4372	0.839941
2415	0	-2.17353	0.857325	3.03086	-2.17353	60.6243	0.857325
2416	0	-2.16241	0.872764	3.03517	-2.16241	60.7798	0.872764
2417	0	-2.15052	0.885214	3.03573	-2.15052	60.9464	0.885214
2418	0	-2.13719	0.901648	3.03884	-2.13719	61.1338	0.901648
2419	0	-2.13008	0.918049	3.04813	-2.13008	61.234	0.918049
2420	0	-2.11753	0.932043	3.04958	-2.11753	61.4111	0.932043
2421	0	-2.10805	0.951199	3.05925	-2.10805	61.5454	0.951199
2422	0	-2.09662	0.974484	3.0711	-2.09662	61.7075	0.974484
2423	0	-2.08447	0.993918	3.07839	-2.08447	61.8803	0.993918
2424	0	-2.07214	1.02393	3.09607	-2.07214	62.0563	1.02393
2425	0	-2.06296	1.06305	3.12601	-2.06296	62.1877	1.06305

Point Values	Ant. Port Input Pwr. (dBm)	Tot. Rad. Pwr. (dBm)	Peak EIRP (dBm)	Directivity (dBi)	Efficiency (dB)	Efficiency (%)	Gain (dBi)
Frequency (MHz)							
2426	0	-2.04673	1.10268	3.14941	-2.04673	62.4204	1.10268
2427	0	-2.03027	1.1466	3.17687	-2.03027	62.6574	1.1466
2428	0	-2.01231	1.19047	3.20278	-2.01231	62.9171	1.19047
2429	0	-2.00164	1.22802	3.22966	-2.00164	63.0719	1.22802
2430	0	-1.98904	1.26963	3.25866	-1.98904	63.2552	1.26963
2431	0	-1.97821	1.30754	3.28575	-1.97821	63.4132	1.30754
2432	0	-1.96528	1.34426	3.30954	-1.96528	63.6022	1.34426
2433	0	-1.95338	1.37887	3.33225	-1.95338	63.7767	1.37887
2434	0	-1.9428	1.41248	3.35528	-1.9428	63.9322	1.41248
2435	0	-1.92929	1.44223	3.37152	-1.92929	64.1314	1.44223
2436	0	-1.92158	1.46601	3.3876	-1.92158	64.2453	1.46601
2437	0	-1.91225	1.49052	3.40277	-1.91225	64.3836	1.49052
2438	0	-1.90617	1.50568	3.41185	-1.90617	64.4738	1.50568
2439	0	-1.90008	1.52077	3.42085	-1.90008	64.5643	1.52077
2440	0	-1.89538	1.53222	3.4276	-1.89538	64.6342	1.53222
2441	0	-1.88756	1.53723	3.42479	-1.88756	64.7506	1.53723
2442	0	-1.88694	1.53875	3.42569	-1.88694	64.7599	1.53875
2443	0	-1.8821	1.5396	3.4217	-1.8821	64.8321	1.5396
2444	0	-1.88149	1.53619	3.41768	-1.88149	64.8412	1.53619
2445	0	-1.87549	1.53256	3.40805	-1.87549	64.9308	1.53256
2446	0	-1.86982	1.52873	3.39855	-1.86982	65.0157	1.52873
2447	0	-1.8625	1.52245	3.38494	-1.8625	65.1254	1.52245
2448	0	-1.85476	1.51553	3.37029	-1.85476	65.2415	1.51553
2449	0	-1.84488	1.50472	3.3496	-1.84488	65.3901	1.50472
2450	0	-1.83749	1.49117	3.32866	-1.83749	65.5015	1.49117
2451	0	-1.83335	1.47276	3.30611	-1.83335	65.5639	1.47276

Point Values	Ant. Port Input Pwr. (dBm)	Tot. Rad. Pwr. (dBm)	Peak EIRP (dBm)	Directivity (dBi)	Efficiency (dB)	Efficiency (%)	Gain (dBi)
Frequency (MHz)							
2452	0	-1.82828	1.45414	3.28242	-1.82828	65.6406	1.45414
2453	0	-1.82716	1.43012	3.25728	-1.82716	65.6574	1.43012
2454	0	-1.82492	1.40921	3.23412	-1.82492	65.6914	1.40921
2455	0	-1.82773	1.37954	3.20727	-1.82773	65.6488	1.37954
2456	0	-1.82891	1.36349	3.1924	-1.82891	65.631	1.36349
2457	0	-1.83118	1.35633	3.1875	-1.83118	65.5967	1.35633
2458	0	-1.83146	1.34416	3.17562	-1.83146	65.5925	1.34416
2459	0	-1.83112	1.3376	3.16872	-1.83112	65.5975	1.3376
2460	0	-1.83485	1.328	3.16286	-1.83485	65.5412	1.328
2461	0	-1.83881	1.32318	3.16199	-1.83881	65.4816	1.32318
2462	0	-1.84122	1.31685	3.15807	-1.84122	65.4452	1.31685
2463	0	-1.8468	1.30574	3.15254	-1.8468	65.3612	1.30574
2464	0	-1.85103	1.30246	3.15349	-1.85103	65.2976	1.30246
2465	0	-1.85995	1.30033	3.16028	-1.85995	65.1636	1.30033
2466	0	-1.86424	1.29547	3.15971	-1.86424	65.0993	1.29547
2467	0	-1.86517	1.3008	3.16597	-1.86517	65.0852	1.3008
2468	0	-1.87086	1.2957	3.16657	-1.87086	65	1.2957
2469	0	-1.87635	1.29679	3.17314	-1.87635	64.918	1.29679
2470	0	-1.88173	1.29152	3.17325	-1.88173	64.8377	1.29152
2471	0	-1.88599	1.29049	3.17648	-1.88599	64.7741	1.29049
2472	0	-1.88947	1.29084	3.18031	-1.88947	64.7222	1.29084
2473	0	-1.89019	1.29049	3.18068	-1.89019	64.7114	1.29049
2474	0	-1.88951	1.29716	3.18667	-1.88951	64.7216	1.29716
2475	0	-1.89197	1.30143	3.1934	-1.89197	64.685	1.30143
2476	0	-1.89436	1.30209	3.19645	-1.89436	64.6493	1.30209
2477	0	-1.90168	1.30185	3.20352	-1.90168	64.5405	1.30185
2478	0	-1.90737	1.30324	3.21061	-1.90737	64.456	1.30324
2479	0	-1.91543	1.30546	3.22089	-1.91543	64.3365	1.30546
2480	0	-1.92365	1.30976	3.23341	-1.92365	64.2148	1.30976

7.2 Antenna application note

BTA65 has internal PCB pattern antenna, the antenna placement affects the overall performance of the system. The antenna requires free space to radiate RF signals and it must not be surrounded by the ground plane. Recommend that the areas underneath the antenna on the host PWB must not contain copper on top, inner, or bottom layers.

A low-impedance ground plane will ensure the best radio performance. The ground plane can be extended beyond the minimum recommendation, as required for the main PWB EMC noise reduction. For the best range performance, keep all external metal at least 15mm away from the on-board PWB trace antenna.

Following figure illustrates example of good and poor placement of BTA65 on a board with GND plane.