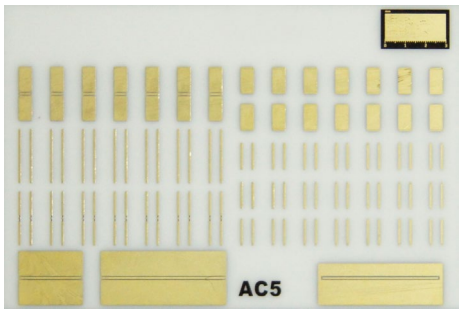
AC-5 Calibration Substrate

AC-5 calibration substrate is designed to provide accurate probe tip calibration of MPI TITAN™ RF probe family with ground-signal-ground (GSG), ground-signal (GS) and signal-ground (SG) probe tips configuration and accommodates 250 to 1250 µm probe pitch variation.

It supports industry standard the short-open-load-thru (SOLT) calibration method, as well as advanced line-reflect-match (LRM), and thru-reflect-line (TRL). AC-5 contains 7 groups of the lumped standard elements for each probe type, as well as a set of coplanar transmission lines for multiline TRL calibration and calibration accuracy verification.



AC-5 substrate

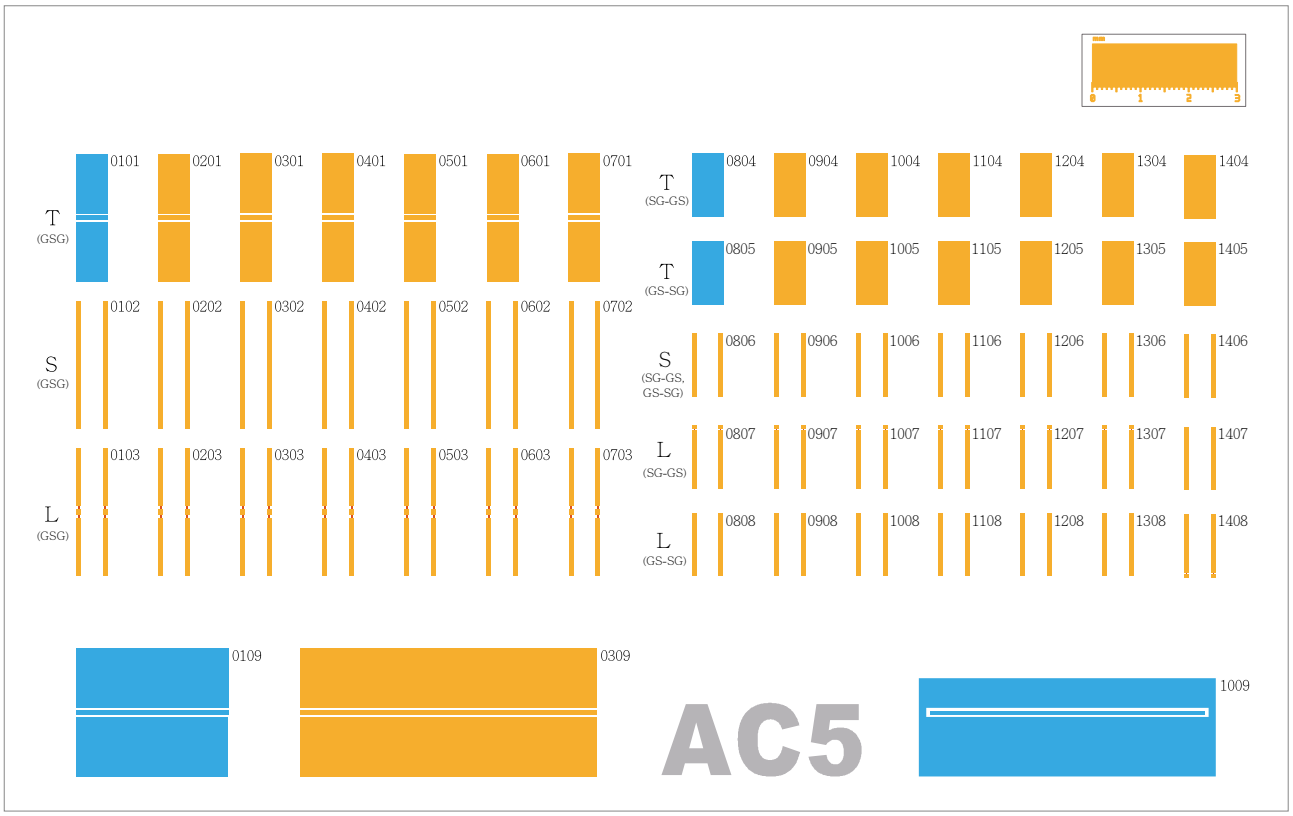
SUBSTRATE CHARACTERISTICS

Material	Alumina
Size	22.5 mm x 15 mm
Thickness	635 µm
Design or standards	Coplanar
Probe configuration	GSG, GS and SG
Supported probe pitch	250 to 1250 µm
Number of lumped standard groups	GSG:7 GS:7 SG:7
Number of calibration and verification lines	GSG:2 SG-GS:1
Calibration verification elements	yes
Supported calibration methods	SOLT, LRM, TRL and multiline TRL
Typical resistance of the load	50 Ω
Typical load trimming accuracy error	± 0.3 %
Open standard	Probes: ~300 µm above the substrate
Ruler scale	0 to 3 mm
Ruler step size	100 µm
Recommended overtravel for TITAN™ probes	10 µm

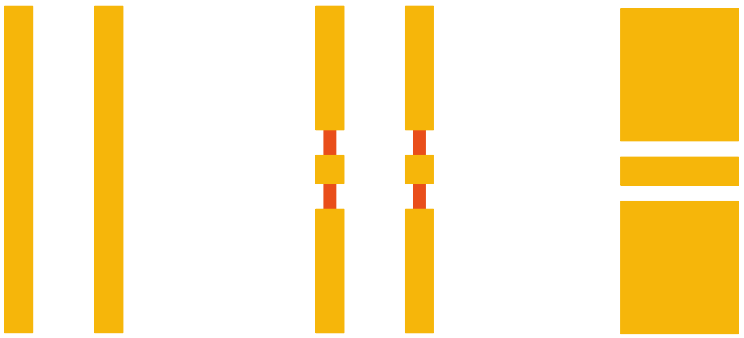
ELECTRICAL CHARACTERISTICS OF CPW LINE STANDARDS

Effective dielectric constant @10 GHz, real part	5.30
Effective velocity factor @10 GHz	0.43
Parameters of the simplified model of line losses	
Reference loss, dB	0.27
Reference delay, ps	47
Reference frequency, GHz	10
Electrical length of line, ps	
Thru	4.60
Line 1 (0109)	24
Line 2 (0309)	47

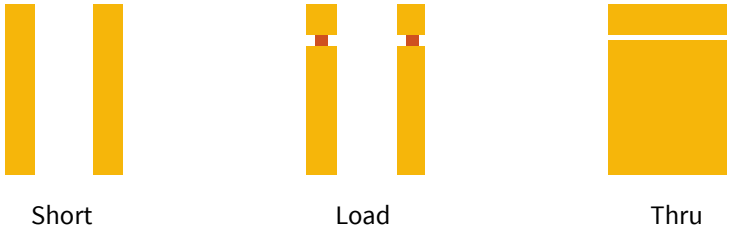
SUBSTRATE LAYOUT



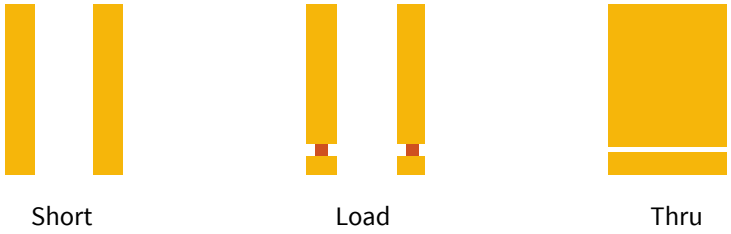
GSG Elements

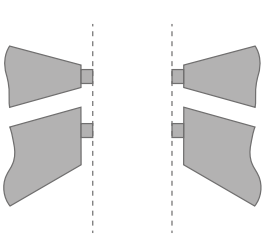


GS-SG Elements

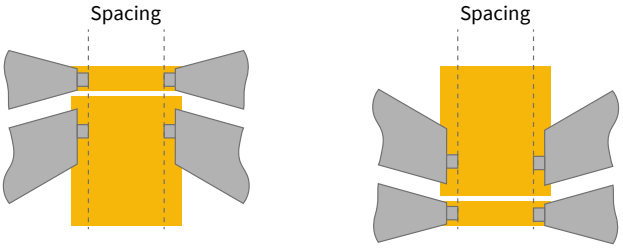


GS-SG Elements





Open standard:
Probes: ~300 µm above the substrate



Probes contacting thru standard:
SG-GS (left) and GS-SG (right) configurations

REFERENCE ELEMENTS

Name	X μm	Y μm	Location Reference	Spacing μm	Note
0101	0	0	0101	600	Reference for SOLT/LRM GSG elements
0804	10850	0	0101	600	Reference for SOLT/LRM SG-GS elements
0805	0	-1810	0101	600	
0109	0	-9050	0101	3100	Reference for TRL line elements
1009	14650	0	0110	5650	Verification element

GSG STANDARD GROUPS

Line Standard

Name	Type	X μm	Y μm	Location Reference	Spacing μm	Length μm
0101	THRU(GSG)	0	0	0102	600	650
0201	THRU(GSG)	1550	0	0102	600	650
0301	THRU(GSG)	3100	0	0102	600	650
0401	THRU(GSG)	4650	0	0102	600	650
0501	THRU(GSG)	6200	0	0102	600	650
0601	THRU(GSG)	7750	0	0102	600	650
0701	THRU(GSG)	9300	0	0102	600	650

Load Standard

Name	Port 1	Port 2	X μm	Y μm	Location Reference	Spacing μm
0104	LOAD(GSG)	LOAD(GSG)	0	-6100	0102	600
0204	LOAD(GSG)	LOAD(GSG)	1550	-6100	0102	600
0304	LOAD(GSG)	LOAD(GSG)	3100	-6100	0102	600
0404	LOAD(GSG)	LOAD(GSG)	4650	-6100	0102	600
0504	LOAD(GSG)	LOAD(GSG)	6200	-6100	0102	600
0604	LOAD(GSG)	LOAD(GSG)	7750	-6100	0102	600
0704	LOAD(GSG)	LOAD(GSG)	9300	-6100	0102	600

GS-SG STANDARD GROUPS

Line Standard

Name	Port 1	Port 2	X µm	Y µm	Location Reference	Spacing µm	Length µm
0804	THRU SG	THRU GS	10850	0	0102	600	650
0904	THRU SG	THRU GS	1550	0	0804	600	650
1004	THRU SG	THRU GS	3100	0	0804	600	650
1104	THRU SG	THRU GS	4650	0	0804	600	650
1204	THRU SG	THRU GS	6200	0	0804	600	650
1304	THRU SG	THRU GS	7750	0	0804	600	650
1404	THRU SG	THRU GS	9300	0	0804	600	650
0805	THRU GS	THRU SG	10850	-1810	0102	600	650
0905	THRU GS	THRU SG	1550	-1810	0805	600	650
1005	THRU GS	THRU SG	3100	-1810	0805	600	650
1105	THRU GS	THRU SG	4650	-1810	0805	600	650
1205	THRU GS	THRU SG	6200	-1810	0805	600	650
1305	THRU GS	THRU SG	7750	-1810	0805	600	650
1405	THRU GS	THRU SG	9300	-1810	0805	600	650

Load Standard

Name	Port 1	Port 2	X µm	Y µm	Location Reference	Spacing µm
0807	LOAD SG	LOAD GS	0	-5635	0804	600
0907	LOAD SG	LOAD GS	1550	-5635	0804	600
1007	LOAD SG	LOAD GS	3100	-5635	0804	600
1107	LOAD SG	LOAD GS	4650	-5635	0804	600
1207	LOAD SG	LOAD GS	6200	-5635	0804	600
1307	LOAD SG	LOAD GS	7750	-5635	0804	600
1407	LOAD SG	LOAD GS	9300	-5635	0804	600
0808	LOAD GS	LOAD SG	0	-5635	0804	600
0908	LOAD GS	LOAD SG	1550	-5635	0804	600
1008	LOAD GS	LOAD SG	3100	-5635	0804	600
1108	LOAD GS	LOAD SG	4650	-5635	0804	600
1208	LOAD GS	LOAD SG	6200	-5635	0804	600
1308	LOAD GS	LOAD SG	7750	-5635	0804	600
1408	LOAD GS	LOAD SG	9300	-5635	0804	600

GSG / GS-SG / SG-GS STANDARD GROUPS

Line Standard

Name	Type	X µm	Y µm	Location Reference	Spacing µm	Length µm
0109	LINE (GSG)	0	-9050	0101	3100	3150
0309	LINE (GSG)	4000	0	0109	6100	6150
1009	LINE (GSG)	14650	0	0110	5650	5700

Short Standards (GSG)

Name	Port 1	Port 2	X µm	Y µm	Location Reference	Spacing µm
0102	SHORT	SHORT	0	-1250	0102	600
0202	SHORT	SHORT	1550	-1250	0102	600
0302	SHORT	SHORT	3100	-1250	0102	600
0402	SHORT	SHORT	4650	-1250	0102	600
0502	SHORT	SHORT	6200	-1250	0102	600
0602	SHORT	SHORT	7750	-1250	0102	600
0702	SHORT	SHORT	9300	-1250	0102	600

Short Standards (SG-GS / GS-SG)

Name	Port 1	Port 2	X µm	Y µm	Location Reference	Spacing µm
0806	SHORT	SHORT	0	-3720	0804	600
0906	SHORT	SHORT	1550	-3720	0804	600
1006	SHORT	SHORT	3100	-3720	0804	600
1106	SHORT	SHORT	4650	-3720	0804	600
1206	SHORT	SHORT	6200	-3720	0804	600
1306	SHORT	SHORT	7750	-3720	0804	600
1406	SHORT	SHORT	9300	-3720	0804	600

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