



PLANAR MONOLITHICS INDUSTRIES, INC.

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ISO 9001 CERTIFIED

APPENDIX C SWITCH, RF, PIN DIODE, SP4T QUALIFICATION & ENVIRONMENTAL TESTING (Reference PMI Model No. SWN-2181-TRA-T)

Table I – Qualification Test

TEST	REQT	METHOD <u>2/</u>			
		PARA	INSPECTION	ANALYSIS <u>3/</u>	TEST
Pre-environmental					
Electrical, Operating Extremes	3.3 and Table IV	---	---	---	QTP
Environmental Testing					
Non-operating Temperature Cycling	3.4.2	4.4.1	---	---	4.4.1, 500 cycles
Altitude	3.4.3	4.4.2	---	---	X
Mechanical Shock	3.4.4	4.4.3	---	---	X
Vibration	3.4.5	4.4.4	---	---	X
Humidity	3.4.6	4.4.5	---	---	X
Hermetic Seal	3.4.8, 3.5.6	4.4.7	---	---	X
Electrical, Operating Extremes	3.3 and Table IV	---	---	---	QTP
Internal Water Vapor Content <u>1/</u>	3.4.9	4.4.8	---	X	X
Post-environmental					
Mechanical	3.5	---	X	---	---
Marking	3.7	---	X	---	---
Workmanship	3.8	---	X	---	---
Marking Permanency	3.4.7	4.4.6	X	---	---
Steady State Life Test	---	4.4.10	---	---	X
Electrical, Operating Extremes	3.3 and Table IV	---	---	---	QTP

- NOTES:**
- 1/ Controlled vacuum bake-out of manufactured product satisfies the RGA requirement.
 - 2/ The manufacturer shall show compliance to the requirement by the method with an “X” in the box. If there is an “X” in two (2) boxes (i.e., analysis and test) the manufacturer may show compliance by either method.
 - 3/ In the Analysis method, the manufacturer may show compliance to the requirement by Providing evidence that similarly constructed products have survived/passed the requirements.



Table II – Acceptance Test, 100%

TEST	REQUIREMENT	TEST METHOD
Mechanical	3.5	---
Marking	3.7	---
Workmanship	3.9	---
Electrical Test	3.3 and Table IV	ATP

Table III – Screening, 100%

TEST	REQUIREMENT	METHOD
Internal Visual Inspection	3.4.10	4.4.11
Electrical Test	3.3 and Table IV	ATP
Non-operating Temperature Cycling <u>2/</u>	3.4.2	4.4.1, 25 cycles
Mechanical Shock <u>2/</u>	3.4.4	4.4.3
Burn-In Test <u>1/</u>	---	4.4.9
Fine and Gross Leak <u>3/</u>	3.4.8, 3.5.6	4.4.7
External Visual	3.4.11	4.4.12

- NOTES:**
- 1/ Pre-seal burn-in may be performed as follows:
 - a. Maximum pre-seal burn-in time, accumulated for screening compliance, shall not exceed one-half the total burn-in time. Pre-seal burn-in, when utilized, shall be accomplished in an oven providing an inert gas atmosphere.
 - b. A minimum of one-half the burn-in shall be performed after seal.
 - c. The actual process flow shall be clearly documented on the work order travelers.
 - d. Parts shall receive internal visual inspection, as specified, prior to sealing.
 - 2/ Temperature cycling and mechanical shock, as specified, shall be performed after completion of the seal operation.
 - 3/ Seal test shall be performed on parts after completion of temperature cycling and mechanical shock.

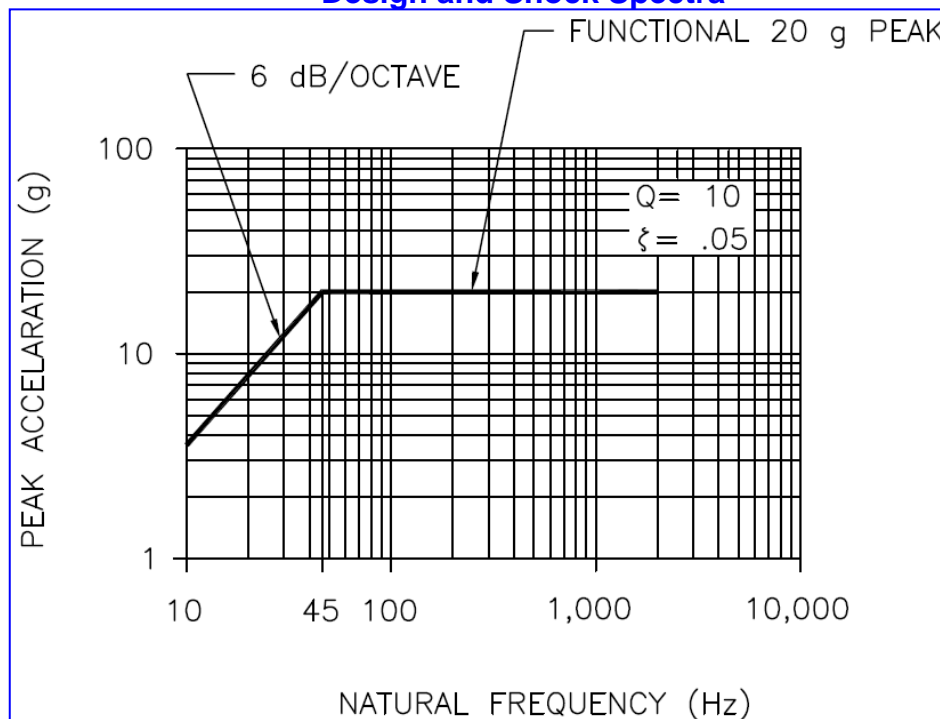


Table IV – Electrical Requirements

PARAMETER	CONDITIONS	LIMITS	UNITS	TEST	
				QUALIFICATION <u>1/</u>	ACCEPTANCE <u>3/</u>
Frequency Range	---	7-18	GHz	X	X
RF Power Handling	30% duty cycle and 130 μ sec pulse width	2	watts	X	X
Isolation	---	60 min	dB	X	X
Insertion Loss	---	5 max	dB	X	X
Insertion Loss Ripple	Any 500 MHz bandwidth within 7-18 GHz	0.3 max	dB	X	X
VSWR	Into termination/source of $\leq 1.3:1$	1.6 to 1 max 2.0 to 1 max <u>2/</u>	ratio	X	X
Port Selected Port Not Selected					
Switching Time	50%TTL-90/10% Detected RF	500 max	nsec	X	---
Command Logic	TTL (0,5V), see switch Table V	----	---	X	---
DC Power Dissipation	See 3.5.3.2.1	2.25 max	W	X	X
Grounding	---	The case shall be electrically grounded	N/A	---	---
Phase Noise ^{4/}	Residual noise 100Hz to 1kHz Residual noise 1kHz to 10kHz	Linear -90 to -125 -125	dBc/Hz	X	---

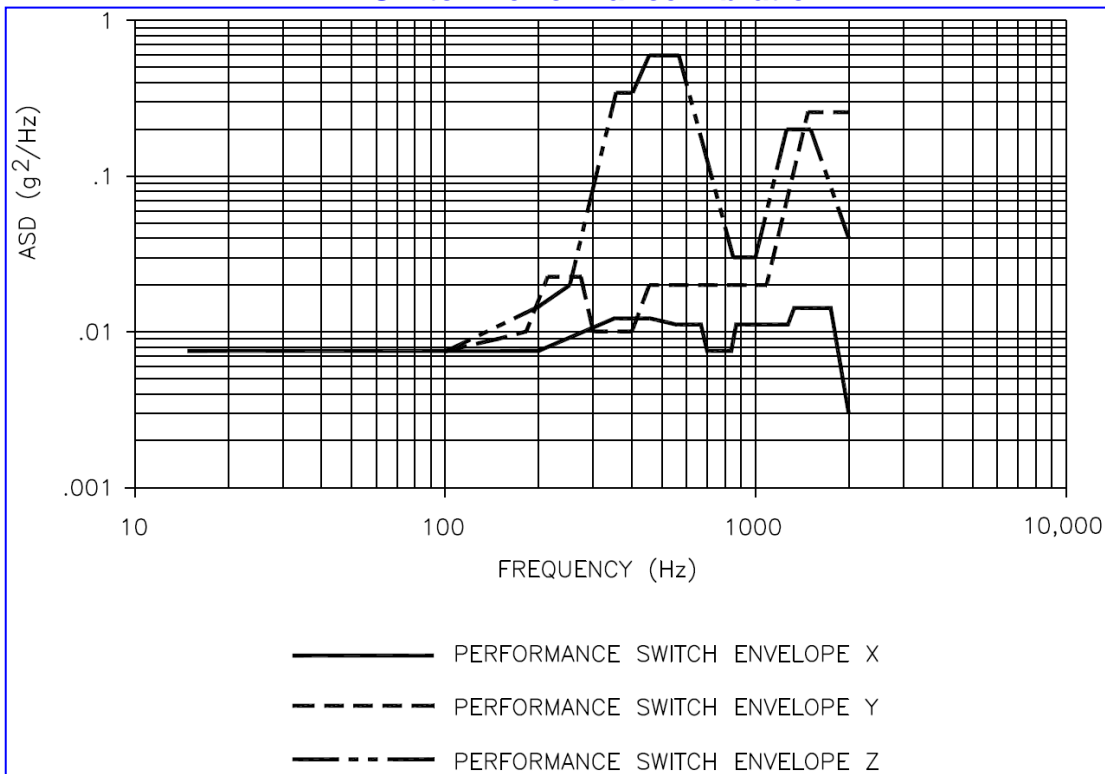
- NOTES:**
- 1/ The requirement is performed at -30°C, 25°C and 85°C with a tolerance of $\pm 3^\circ\text{C}$. The network analyzer shall be set to sweep from 6-18 GHz with an 8% smoothing aperture.
 - 2/ VSWR required only during functional vibration.
 - 3/ The part shall be tested 25°C $\pm 3^\circ\text{C}$.
 - 4/ Phase noise required only during functional vibration at ambient temperature.

Design and Shock Spectra





Switch Performance Vibration



Switch Performance Vibration (Contd)

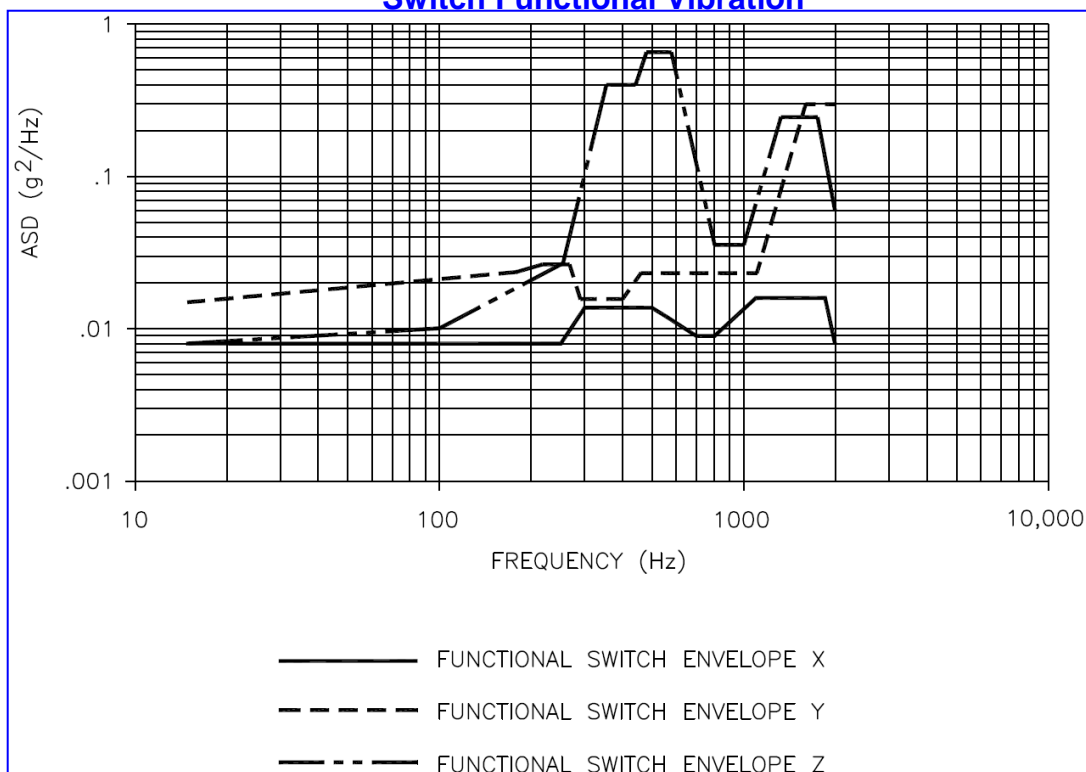
SWITCHES' OPERATING PERFORMANCE SWITCH ENVELOPE X			SWITCHES' OPERATING PERFORMANCE SWITCH ENVELOPE Y			SWITCHES' OPERATING PERFORMANCE SWITCH ENVELOPE Z		
FREQUENCY (Hz)	PSD (g ² /Hz)	SLOPE m	FREQUENCY (Hz)	PSD (g ² /Hz)	SLOPE m	FREQUENCY (Hz)	PSD (g ² /Hz)	SLOPE m
15	0.0076	-	15	0.0076	-	15	0.0076	-
200	0.0076	0.0	100	0.0076	0.0	100	0.0076	0.0
350	0.0120	2.4	150	0.0090	1.3	200	0.0150	2.9
450	0.0120	0.0	180	0.0100	1.7	250	0.0200	3.9
530	0.0110	-1.6	210	0.0220	15.3	350	0.3500	25.5
670	0.0110	0.0	270	0.0220	0.0	400	0.3500	0.0
700	0.0076	-25.3	300	0.0100	-22.5	450	0.6000	13.7
830	0.0076	0.0	400	0.0100	0.0	575	0.6000	0.0
880	0.0110	19.0	450	0.0200	17.7	850	0.0300	-23.0
1250	0.0110	0.0	1150	0.0200	0.0	1000	0.0300	0.0
1320	0.0140	13.3	1550	0.2600	25.8	1330	0.2000	20.0
1640	0.0140	0.0	2000	0.2600	0.0	1690	0.2000	0.0
2000	0.0030	-23.3				2000	0.0400	-28.7
grms = 4.5			grms = 13.3			grms = 17.8		

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Switch Functional Vibration

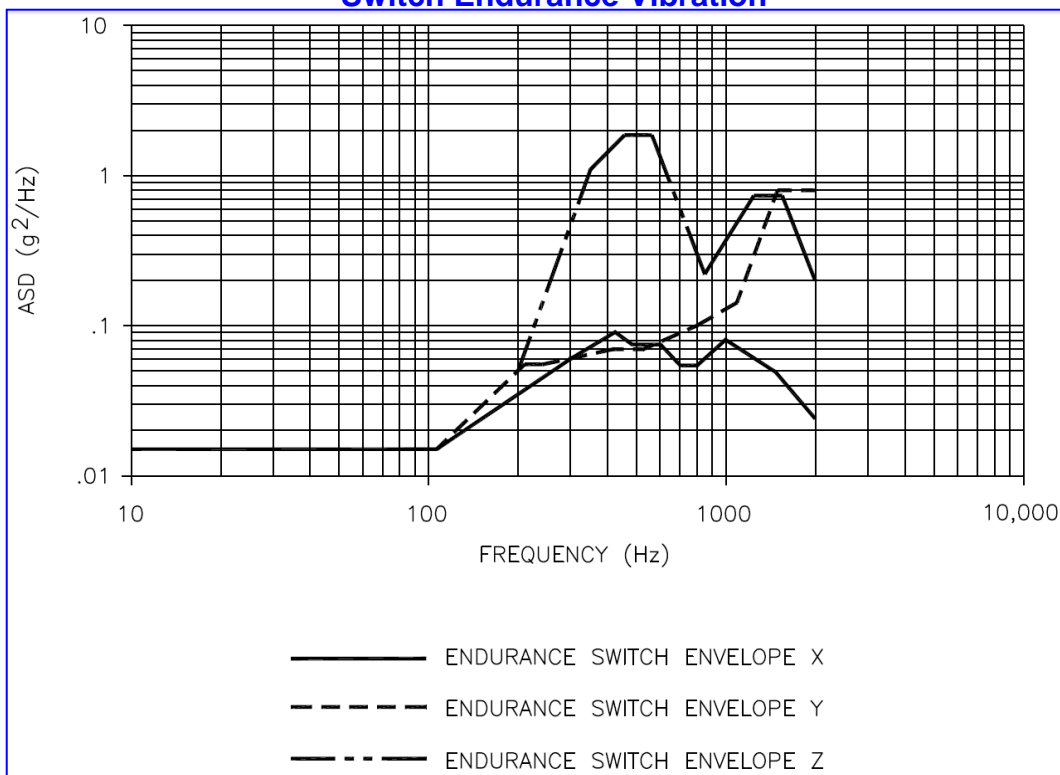


Switch Functional Vibration (Contd)

30 MINUTES			30 MINUTES			30 MINUTES		
SWITCHES' OPERATING FUNCTIONAL SWITCH ENVELOPE X			SWITCHES' OPERATING FUNCTIONAL SWITCH ENVELOPE Y			SWITCHES' OPERATING FUNCTIONAL SWITCH ENVELOPE Z		
FREQUENCY (Hz)	PSD (g ² /Hz)	SLOPE m	FREQUENCY (Hz)	PSD (g ² /Hz)	SLOPE m	FREQUENCY (Hz)	PSD (g ² /Hz)	SLOPE m
15	0.008	-	15	0.015	-	15	0.008	-
250	0.008	0.0	176	0.023	0.5	100	0.010	0.4
300	0.014	9.2	227	0.026	1.2	250	0.025	3.0
500	0.014	0.0	260	0.026	0.0	350	0.400	24.7
550	0.012	-4.9	280	0.015	-21.5	430	0.400	0.0
700	0.009	-3.9	400	0.015	0.0	460	0.650	21.6
800	0.009	0.0	460	0.022	7.7	580	0.650	0.0
1132	0.016	5.2	1100	0.022	0.0	800	0.035	-27.3
1850	0.016	0.0	1600	0.300	20.9	1000	0.035	0.0
2000	0.008	-26.7	2000	0.300	0.0	1350	0.240	19.2
grms = 5.1			grms = 14.1			grms = 18.9		



Switch Endurance Vibration



Switch Endurance Vibration (Contd)

2 HOURS			2 HOURS			2 HOURS		
SWITCHES' NON-OP ENDURANCE SWITCH ENVELOPE X			SWITCHES' NON-OP ENDURANCE SWITCH ENVELOPE Y			SWITCHES' NON-OP ENDURANCE SWITCH ENVELOPE Z		
FREQUENCY (Hz)	PSD (g ² /Hz)	SLOPE m	FREQUENCY (Hz)	PSD (g ² /Hz)	SLOPE m	FREQUENCY (Hz)	PSD (g ² /Hz)	SLOPE m
10	0.015	-	10	0.015	-	10	0.015	-
113	0.015	0.0	113	0.015	0.0	113	0.015	0.0
300	0.060	4.3	211	0.055	6.2	150	0.030	7.3
416	0.090	3.7	240	0.055	0.0	200	0.050	5.3
480	0.075	-3.8	410	0.070	1.4	352	1.135	16.6
600	0.075	0.0	510	0.070	0.0	450	1.802	5.6
700	0.055	-6.1	800	0.100	2.4	577	1.802	0.0
800	0.055	0.0	1150	0.140	2.8	865	0.220	-15.6
1000	0.080	5.1	1500	0.795	19.6	1310	0.730	8.7
1510	0.049	-3.6	2000	0.795	0.0	1665	0.730	0.0
2000	0.024	-7.6				2000	0.200	21.2
grms = 10.25			grms = 25.0			grms = 35.1		