PLANAR MONOLITHICS INDUSTRIES, INC.
East Coast: 7311F GROVE ROAD, FREDERICK, MD 21704 USA • PHONE: 301-662-5019 • FAX: 301-662-2029
West Coast: 4921 ROBERT J. MATHEWS PARKWAY, SUITE 1, EL DORADO HILLS, CA 95762 USA • PHONE: 916-542-1401
EMAIL: sales@pmi-rf.com WEB: www.pmi-rf.com
ISO 9001 CERTIFIED

APPENDIX A
SWITCH, RF, PIN DIODE, SPST QUALIFICATION & ENVIRONMENTAL TESTING
(Reference PMI Model No. P1T-7G18G-60-T-2W)

Table I – Qualification Test

TEST	REQT	METHOD 2/			
		PARA	INSPECTION	ANALYSIS 3/	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 1/	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 2/	3.4.2	4.4.1, 25 cycles
Mechanical Shock 2/	3.4.4	4.4.3
Burn-In Test 1/	---	4.4.9
Fine and Gross Leak 3/	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 on-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 5/	ACCEPTANCE 4/
Frequency Range	---	7-18	GHz	X	X
RF Power Handling	30% duty cycle and 130 µsec pulse width	2	watts	X	X
Isolation (Off State) 2/	---	60 min	dB	X	X
Insertion Loss	---	3 max	dB	X	X
Insertion Loss (On State) 1/	---	≤ 3	dB	X	X
Insertion Loss Ripple	Any 500 MHz bandwidth within 7-18 GHz	0.3 max	dB	X	X
VSWR Port Selected Port Not Selected	Into termination/source of ≤1.3:1	1.6 to 1 max 2.0 to 1 max 3/	ratio	X	X
Command Logic	TTL (0,5V), see switch Table V	----	---	X	---
DC Power Dissipation	See 3.5.3.2.1	1.25	W	X	X
Grounding	---	The case shall be electrically grounded	N/A	---	---
Phase Noise 6/	Residual noise 100Hz to 1kHz Residual noise 1kHz to 10kHz	Linear -90 to -125 -125	dBc/Hz	X	---
Rise Time	---	20-50	ns	X	---
Fall Time	---	40-80	ns	X	---
Switch Delay	---	<100	ns	X	---

NOTES:

1/ Insertion loss shall be measured with the control signal relative to its return (i.e., ON or low loss state) over the frequency range of 7-18 GHz.

2/ Measure and record S_{21} from 6 GHz to 18 GHz (1201 points), with the DC voltage supply set to > 2.6 V (Pulse modulator in the off state). Isolation will be verified from this data.

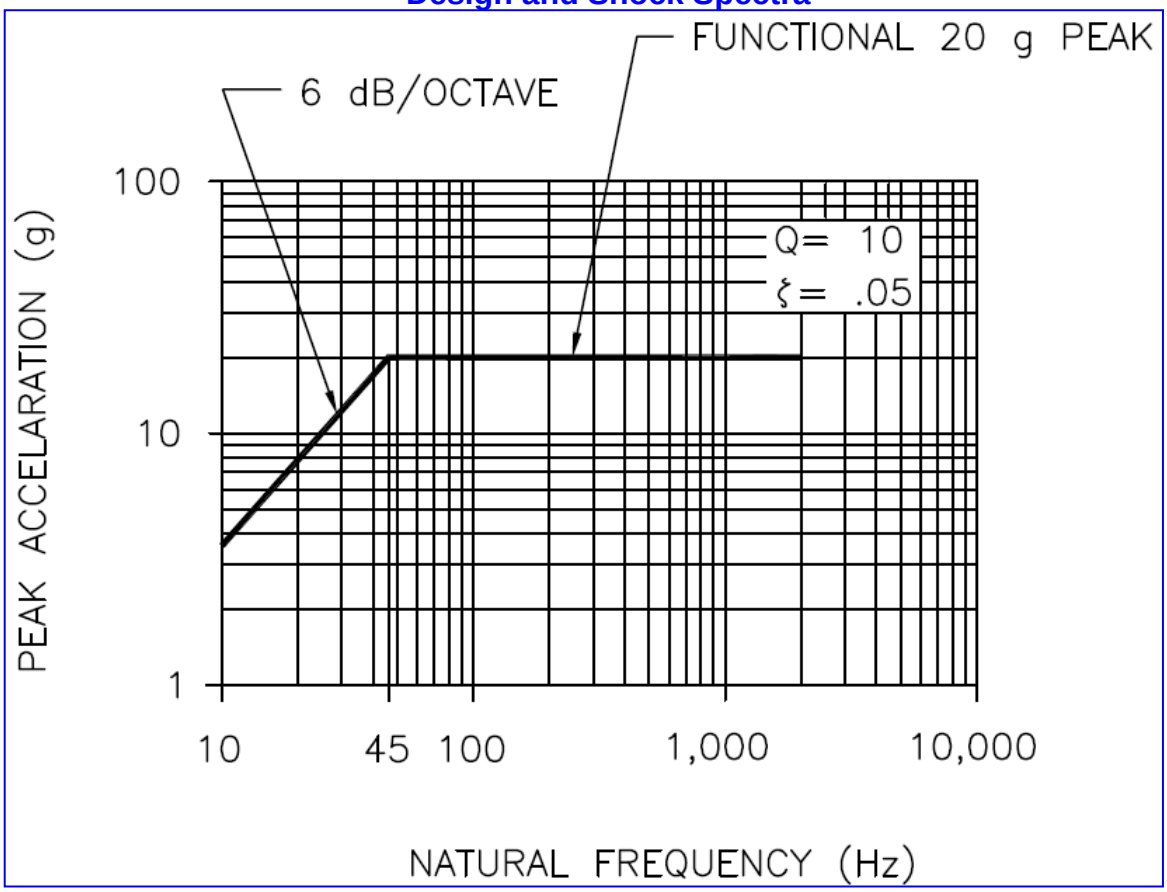
3/ VSWR required only during functional vibration.

4/ The part shall be tested at 25°C ±3°C.

5/ The requirement is performed at -30°C, 25°C and 85°C with a tolerance of ±3°C. The network analyzer shall be set to sweep from 6-18 GHz with an 8% smoothing aperture.

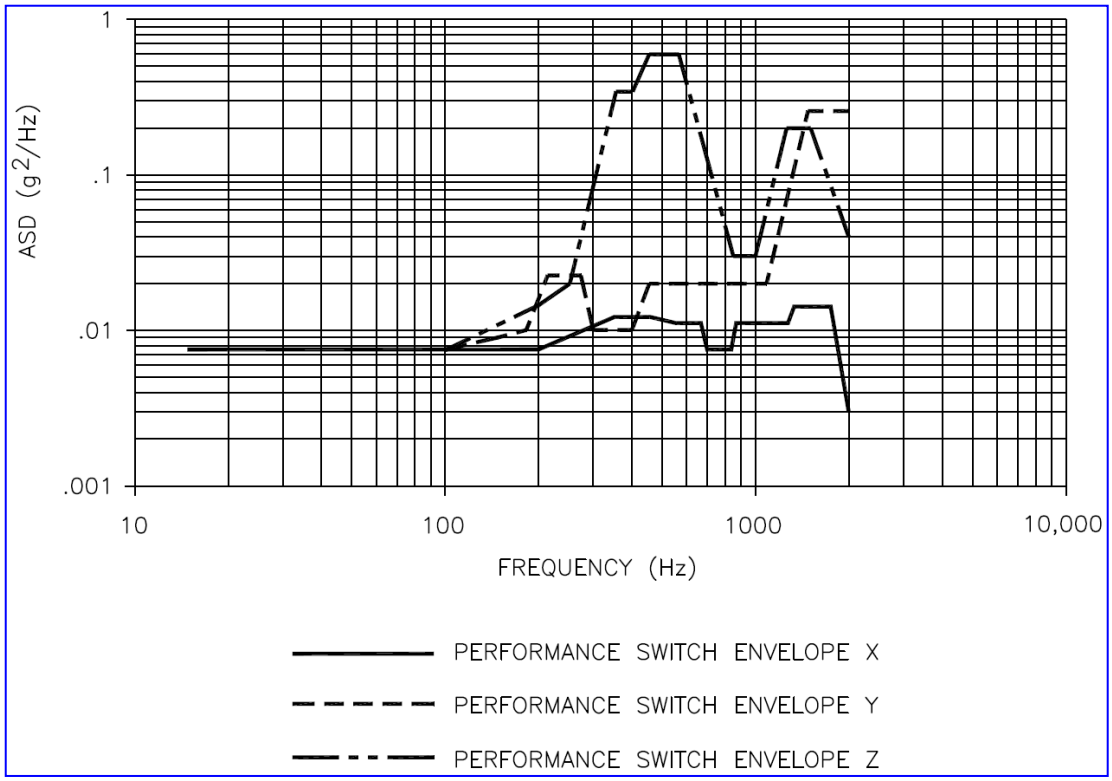
6/ Phase noise required only during functional vibration at ambient temperature.

Design and Shock Spectra



East Coast: 7311F GROVE ROAD, FREDERICK, MD 21704 USA • PHONE: 301-662-5019 • FAX: 301-662-2029
West Coast: 4921 ROBERT J. MATHEWS PARKWAY, SUITE 1, EL DORADO HILLS, CA 95762 USA • PHONE: 916-542-1401
EMAIL: sales@pmi-rf.com WEB: www.pmi-rf.com
ISO 9001 CERTIFIED

Switch Performance Vibration



Switch Performance Vibration (Contd)

SWITCHES' OPERATING PERFORMANCE SWITCH ENVELOPE X

FREQUENCY (Hz)	PSD (g^2/Hz)	SLOPE m
15	0.0076	–
200	0.0076	0.0
350	0.0120	2.4
450	0.0120	0.0
530	0.0110	−1.6
670	0.0110	0.0
700	0.0076	−25.3
830	0.0076	0.0
880	0.0110	19.0
1250	0.0110	0.0
1320	0.0140	13.3
1640	0.0140	0.0
2000	0.0030	−23.3
grms = 4.5		

SWITCHES' OPERATING PERFORMANCE SWITCH ENVELOPE Y

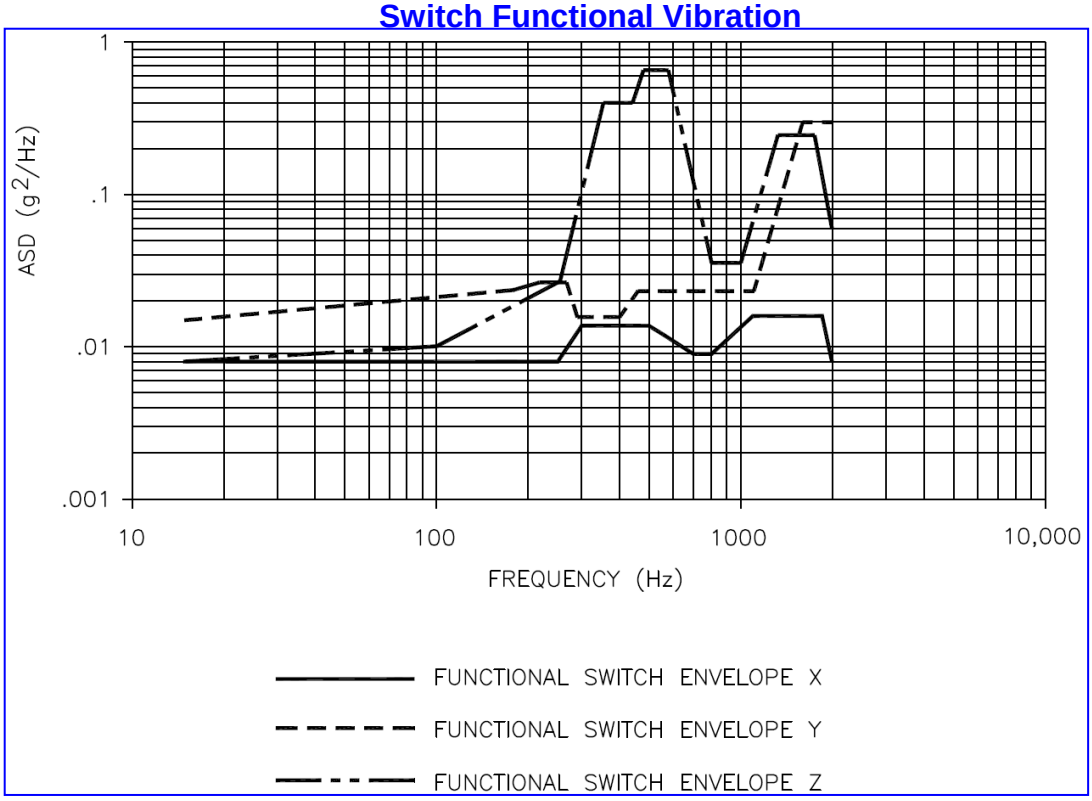
FREQUENCY (Hz)	PSD (g^2/Hz)	SLOPE m
15	0.0076	–
100	0.0076	0.0
150	0.0090	1.3
180	0.0100	1.7
210	0.0220	15.3
270	0.0220	0.0
300	0.0100	−22.5
400	0.0100	0.0
450	0.0200	17.7
1150	0.0200	0.0
1550	0.2600	25.8
2000	0.2600	0.0
grms = 13.3		

SWITCHES' OPERATING PERFORMANCE SWITCH ENVELOPE Z

FREQUENCY (Hz)	PSD (g^2/Hz)	SLOPE m
15	0.0076	–
100	0.0076	0.0
200	0.0150	2.9
250	0.0200	3.9
350	0.3500	25.5
400	0.3500	0.0
450	0.6000	13.7
575	0.6000	0.0
850	0.0300	−23.0
1000	0.0300	0.0
1330	0.2000	20.0
1690	0.2000	0.0
2000	0.0400	−28.7
grms = 17.8		

East Coast: 7311F GROVE ROAD, FREDERICK, MD 21704 USA • PHONE: 301-662-5019 • FAX: 301-662-2029
West Coast: 4921 ROBERT J. MATHEWS PARKWAY, SUITE 1, EL DORADO HILLS, CA 95762 USA • PHONE: 916-542-1401
EMAIL: sales@pmi-rf.com WEB: www.pmi-rf.com
ISO 9001 CERTIFIED

Switch Functional Vibration



Switch Functional Vibration (Contd)

30 MINUTES

SWITCHES' OPERATING FUNCTIONAL SWITCH ENVELOPE X

FREQUENCY (Hz)	PSD (g^2/Hz)	SLOPE m
15	0.008	–
250	0.008	0.0
300	0.014	9.2
500	0.014	0.0
550	0.012	−4.9
700	0.009	−3.9
800	0.009	0.0
1132	0.016	5.2
1850	0.016	0.0
2000	0.008	−26.7
grms = 5.1		

30 MINUTES

SWITCHES' OPERATING FUNCTIONAL SWITCH ENVELOPE Y

FREQUENCY (Hz)	PSD (g^2/Hz)	SLOPE m
15	0.015	–
176	0.023	0.5
227	0.026	1.2
260	0.026	0.0
280	0.015	−21.5
400	0.015	0.0
460	0.022	7.7
1100	0.022	0.0
1600	0.300	20.9
2000	0.300	0.0
grms = 14.1		

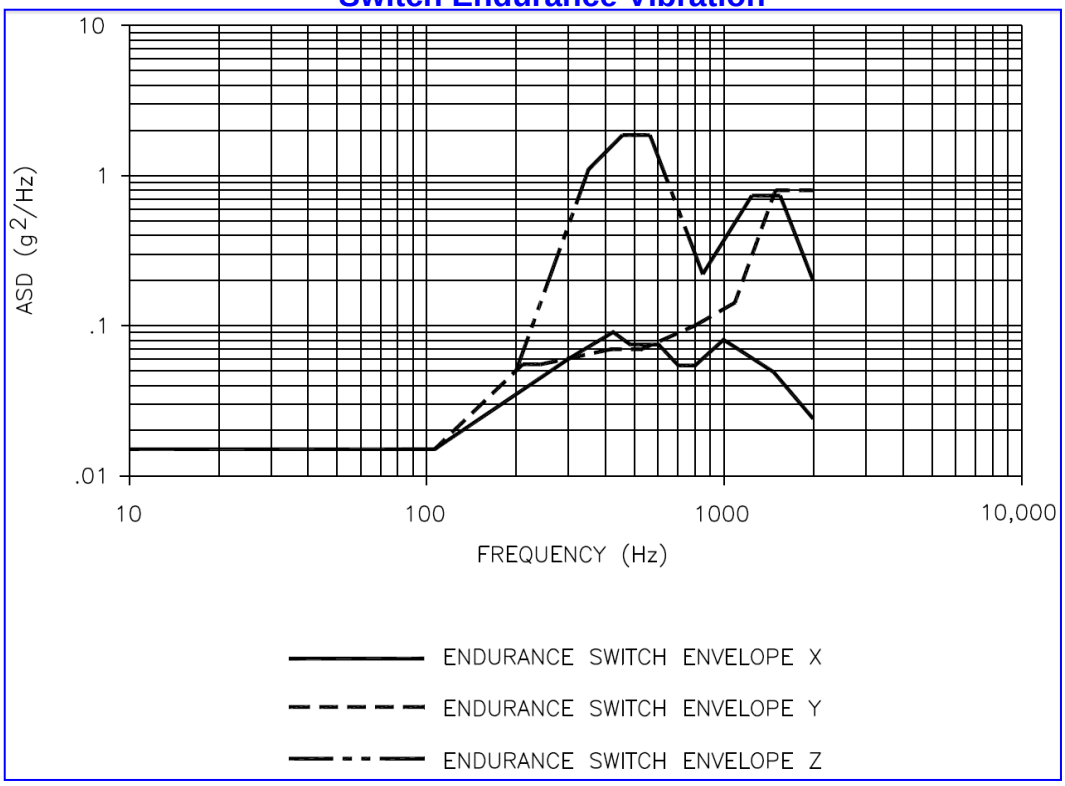
30 MINUTES

SWITCHES' OPERATING FUNCTIONAL SWITCH ENVELOPE Z

FREQUENCY (Hz)	PSD (g^2/Hz)	SLOPE m
15	0.008	–
100	0.010	0.4
250	0.025	3.0
350	0.400	24.7
430	0.400	0.0
460	0.650	21.6
580	0.650	0.0
800	0.035	−27.3
1000	0.035	0.0
1350	0.240	19.2
1720	0.240	0.0
2000	0.060	−27.6
grms = 18.9		

East Coast: 7311F GROVE ROAD, FREDERICK, MD 21704 USA • PHONE: 301-662-5019 • FAX: 301-662-2029
West Coast: 4921 ROBERT J. MATHEWS PARKWAY, SUITE 1, EL DORADO HILLS, CA 95762 USA • PHONE: 916-542-1401
EMAIL: sales@pmi-rf.com WEB: www.pmi-rf.com
ISO 9001 CERTIFIED

Switch Endurance Vibration



Switch Endurance Vibration (Contd)

2 HOURS

SWITCHES' NON-OP ENDURANCE SWITCH ENVELOPE X		
FREQUENCY (Hz)	PSD (g^2/Hz)	SLOPE m
10	0.015	–
113	0.015	0.0
300	0.060	4.3
416	0.090	3.7
480	0.075	−3.8
600	0.075	0.0
700	0.055	−6.1
800	0.055	0.0
1000	0.080	5.1
1510	0.049	−3.6
2000	0.024	−7.6
grms = 10.25		

2 HOURS

SWITCHES' NON-OP ENDURANCE SWITCH ENVELOPE Y		
FREQUENCY (Hz)	PSD (g^2/Hz)	SLOPE m
10	0.015	–
113	0.015	0.0
211	0.055	6.2
240	0.055	0.0
410	0.070	1.4
510	0.070	0.0
800	0.100	2.4
1150	0.140	2.8
1500	0.795	19.6
2000	0.795	0.0
grms = 25.0		

2 HOURS

SWITCHES' NON-OP ENDURANCE SWITCH ENVELOPE Z		
FREQUENCY (Hz)	PSD (g^2/Hz)	SLOPE m
10	0.015	–
113	0.015	0.0
150	0.030	7.3
200	0.050	5.3
352	1.135	16.6
450	1.802	5.6
577	1.802	0.0
865	0.220	−15.6
1310	0.730	8.7
1665	0.730	0.0
2000	0.200	21.2
grms = 35.1		

East Coast: 7311F GROVE ROAD, FREDERICK, MD 21704 USA • PHONE: 301-662-5019 • FAX: 301-662-2029
West Coast: 4921 ROBERT J. MATHEWS PARKWAY, SUITE 1, EL DORADO HILLS, CA 95762 USA • PHONE: 916-542-1401
EMAIL: sales@pmi-rf.com WEB: www.pmi-rf.com

ISO 9001 CERTIFIED