

TEST REPORT

ON

2.0 TO 18.0 GHz

TSS OF -63dBm

DYNAMIC RANGE OF -60 TO +5dB

DIRECTION FINDING RECEIVER FRONTEND

PMI MODEL No: RFE-218-70-BB

With Option JT

Serial Numbers: PM604086

Designed
By
Brent Baker

Tested
By
Brent Baker

Reported
By
Peter Wood

June 25, 2006



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2.0 TO 18.0 GHz, -63 dBm TSS, -60 TO +5 dB DYNAMIC RANGE DIRECTION FINDING RECEIVER FRONTEND

KEY FEATURES:

- 2.0 TO 18.0 GHz
- 65 dB MINIMUM DYNAMIC RANGE
- -63 dBm TSS



ELECTRICAL SPECIFICATIONS:

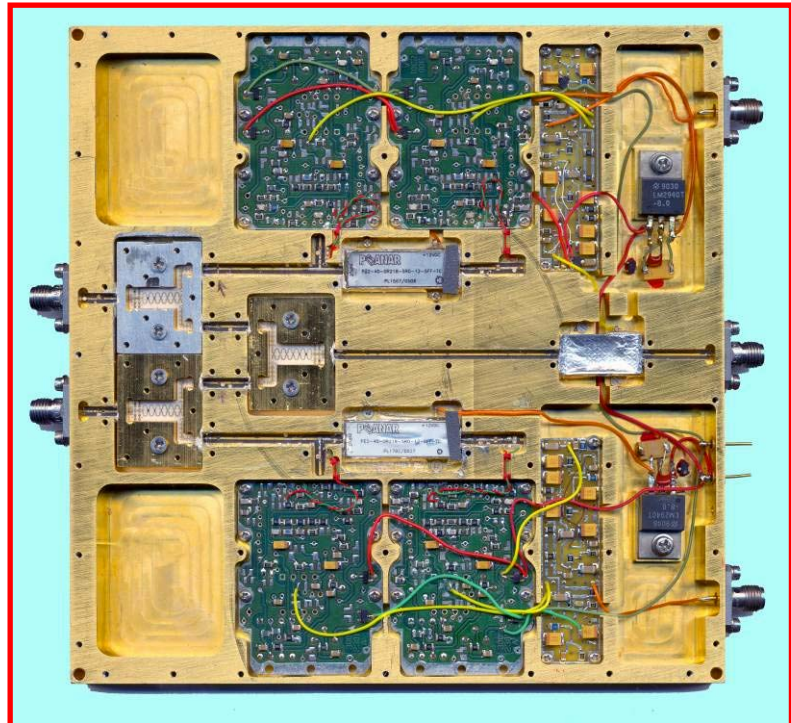
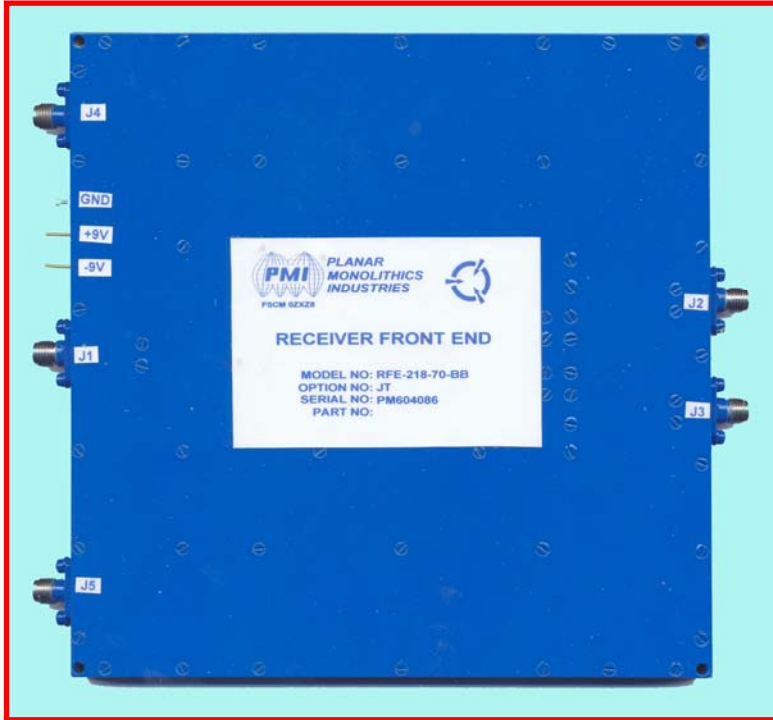
- | | |
|--|---------------------------------|
| ● FREQUENCY | : 2.0 TO 18.0 GHz |
| ● INPUT VSWR IN FREQUENCY RANGE | : 3.0:1 (MAXIMUM) |
| ● FREQUENCY FLATNESS OF DLVA OUTPUTS | : ± 3.0 dB (MAXIMUM) |
| ● DYNAMIC RANGE | : -60 TO +5 dBm (MINIMUM) |
| ● RISE TIME | : 30 nSec (MAXIMUM) |
| ● RECOVERY TIME | : 350 nSec (MAXIMUM) |
| ● LOG SLOPE | : 50 mV/dB ($\pm 10\%$) |
| ● LOG LINEARITY | : ± 2.25 dB (MAXIMUM) |
| ● TSS | : -63 dBm (MINIMUM) |
| ● TEMPERATURE STABILITY (-10° C TO +85° C) | : ± 2.0 dB (MAXIMUM) |
| ● GAIN | : +3.0 dB (TYPICAL) |
| ● ISOLATION J2 TO J3 | : 24 dB (MINIMUM) |
| ● D.C. POWER +9 VDC | : 850 mA (MAXIMUM, NO RF INPUT) |
| ● D.C. POWER -9 VDC | : 300 mA (MAXIMUM) |

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RECEIVER FRONTEND SUBSYSTEM – RFE-218-70-BB



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PT69-RFE-PW-0600

PRODUCT FEATURE

ZONE	REV.	DESCRIPTION	DATE	APPROVED
—	—	ORIGINAL RELEASE JOB# P511046E	9/28/06	

DESCRIPTION

PMI MODEL RFE-218-70-BB OPTION: JT IS A 2 TO 18 GHz HIGH SENSITIVITY AND HIGH DYNAMIC RANGE DIRECTION FINDING (DF) RECEIVER FRONT END CONSISTING OF THREE POWER DIVIDERS, SIX LIMITERS, ONE LOW NOISE 15 dB GAIN PBT AMPLIFIER, AND TWO AMC 70 dB EXTENDED DYNAMIC RANGE DETECTOR LOG VIDEO AMPLIFIERS (ERDLVA) INTEGRATED IN A MINIATURE ASSEMBLY.

SPECIFICATIONS

- FREQUENCY RANGE (J1, J2, J3): 2 TO 18 GHz
- FREQUENCY FLATNESS (J4, J5): ±3.0 dB MAXIMUM
- TSS (J4, J5): -63 dBm MINIMUM
- VSWR (J2, J3): 3.0:1 MAXIMUM
- DYNAMIC RANGE (J4, J5): -60 TO +5 dBm MINIMUM
- LOG LINEARITY (J4, J5): ±2.25 dB MAXIMUM
- LOG SLOPE (J4, J5): 50 mV/dB (±10%)
- TEMPERATURE STABILITY (J4, J5): ±2 dB MAXIMUM (-10°C TO +85°C)
- RISE TIME (J4, J5): 30 nSec MAXIMUM
- RECOVERY TIME (J4, J5): 350 nSec MAXIMUM
- VIDEO LOAD (J4, J5): 93 OHMS (RECOMMENDED)
- ISOLATION (J2 TO J3): 24 dB MINIMUM
- GAIN:
 - J2 TO J1 AND J3 TO J1
 - +3 dB TYPICAL
- DC POWER:
 - +V: 9V TO 12V @ 850 mA MAXIMUM (WITH NO RF INPUT)
 - -V: 9V TO 12V @ 300 mA MAXIMUM

OPTIONS:

- JT: CUSTOMER SPECIFICATIONS

RECEIVER FRONT END

MODEL NO: RFE-218-70-BB
 OPTION NO: JT
 SERIAL NO:
 PART NO:

ENVIRONMENTAL RATINGS:

- TEMPERATURE: -55°C TO +85°C (OPERATING)
- HUMIDITY: -65°C TO +125°C (STORAGE)
- SHOCK: MIL-STD-202F, METHOD 103B COND. B
- VIBRATION: MIL-STD-202F, METHOD 213B COND. B
- ALTITUDE: MIL-STD-202F, METHOD 204D COND. B
- TEMPERATURE CYCLE: MIL-STD-202F, METHOD 105C COND. B
- TEMPERATURE CYCLE: MIL-STD-202F, METHOD 107D COND. A

ALL DIMENSIONS ARE IN INCHES
 TOLERANCES:
 X.XX ±0.020
 X.XXX ±0.010

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 ISO 9001:2000 CERTIFIED

PRODUCT FEATURE
 RFE-218-70-BB
 OPTION: JT
 2-18 GHz, RECEIVER FRONT END

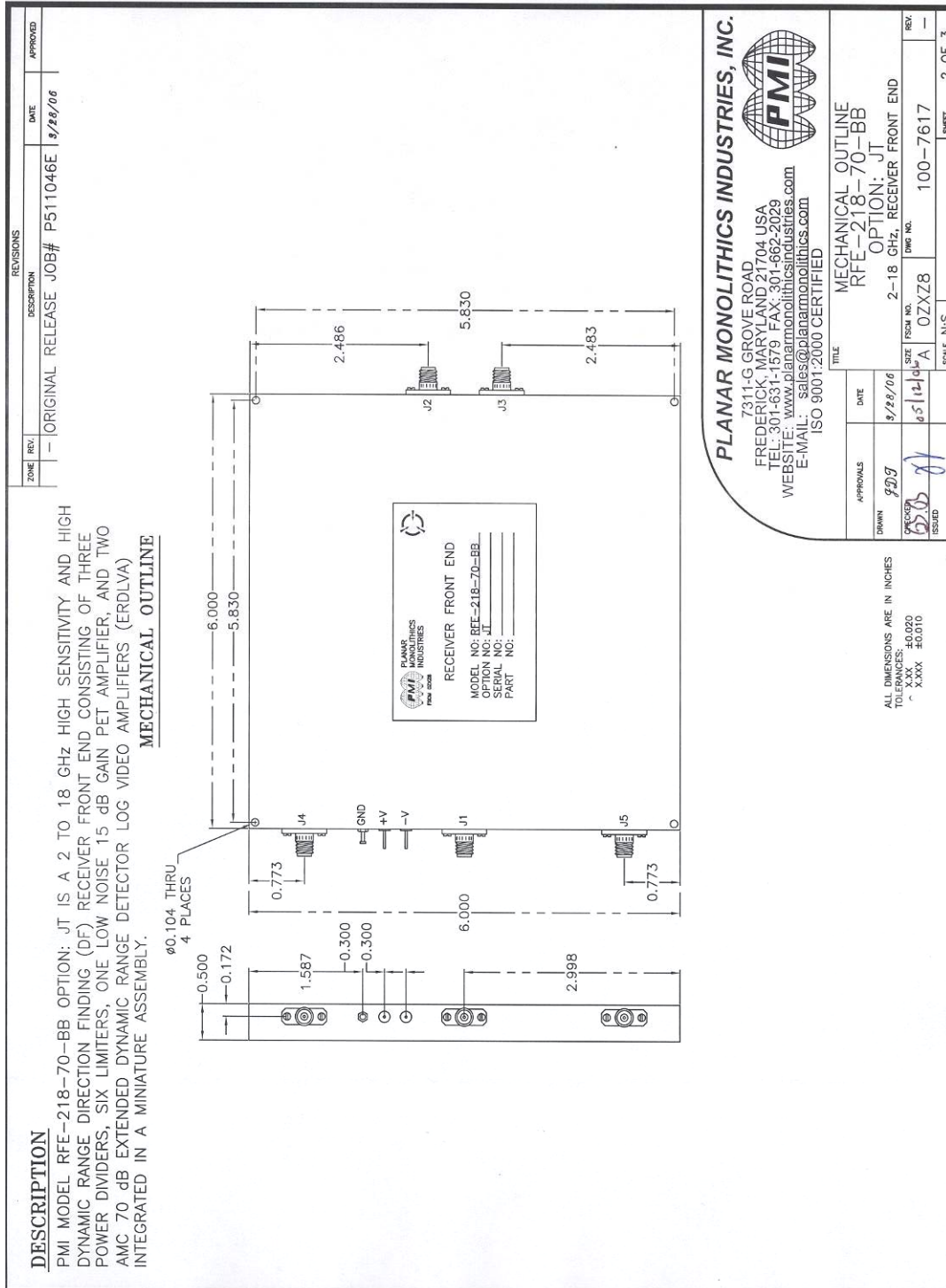
APPROVALS	DATE	TITLE	SIZE	FORM NO.	REV.
APPROVED: [Signature]	9/28/06	PRODUCT FEATURE RFE-218-70-BB OPTION: JT	1/4	02XZ8	—
CHECKED: [Signature]					
ISSUED: [Signature]					

NOTE: SPECIFICATIONS WILL VARY OVER OPERATING TEMPERATURE
 NOTE: THE ABOVE SPECIFICATIONS ARE SUBJECT TO CHANGE OR REVISION



PT69-RFE-PW-0600

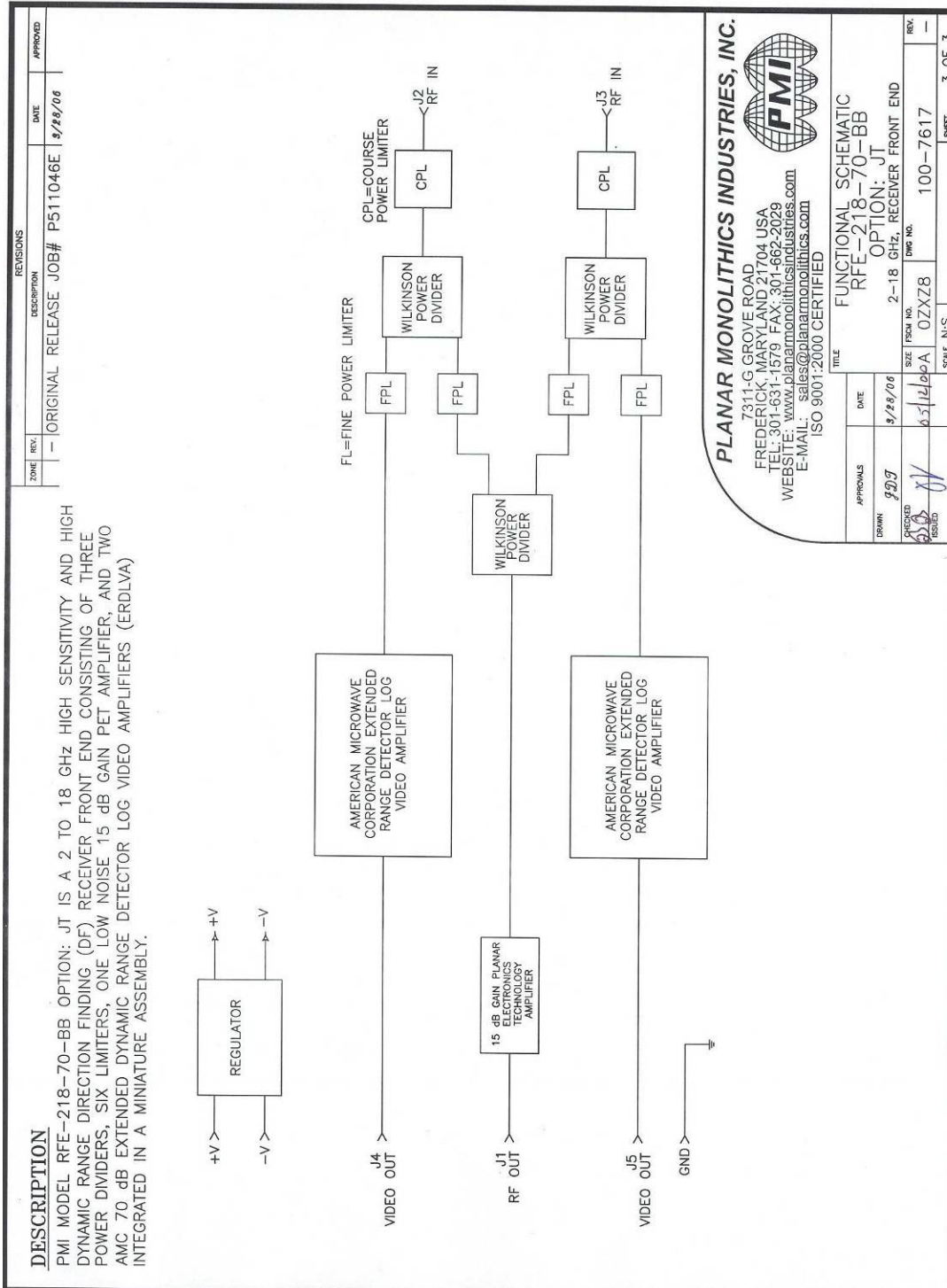
MECHANICAL OUTLINE





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FUNCTIONAL BLOCK DIAGRAM



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TEST DATA

ON

DIRECTION FINDING RECEIVER FRONTEND

PMI MODEL No: RFE-218-70-BB with option JT

AS MEASURED FROM 2.0 TO 18.0 GHz

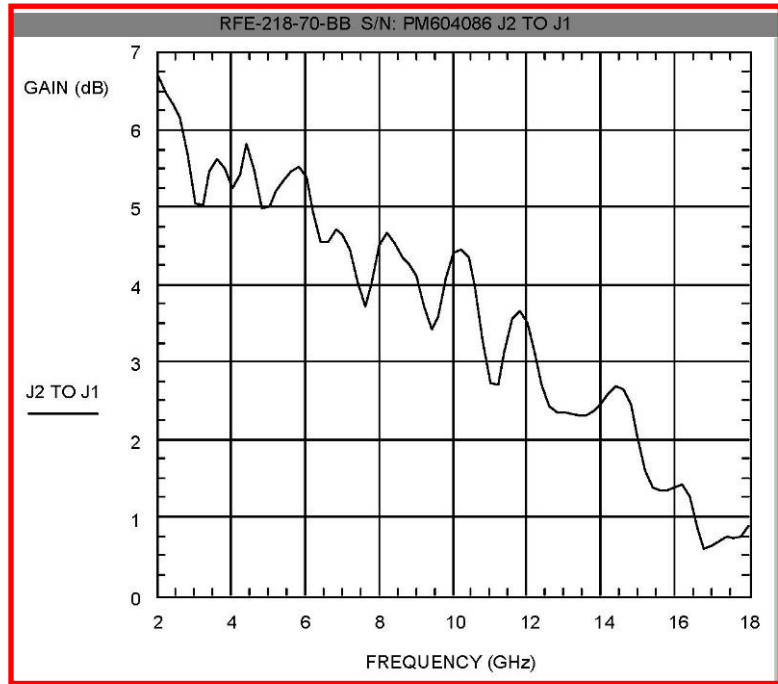
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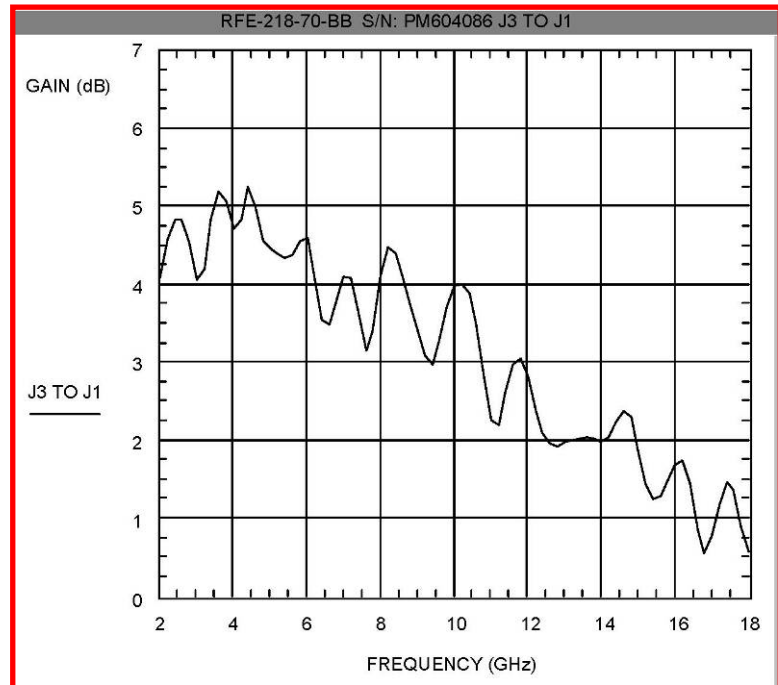


GAIN

GAIN J2 TO J1
S/N: PM604086



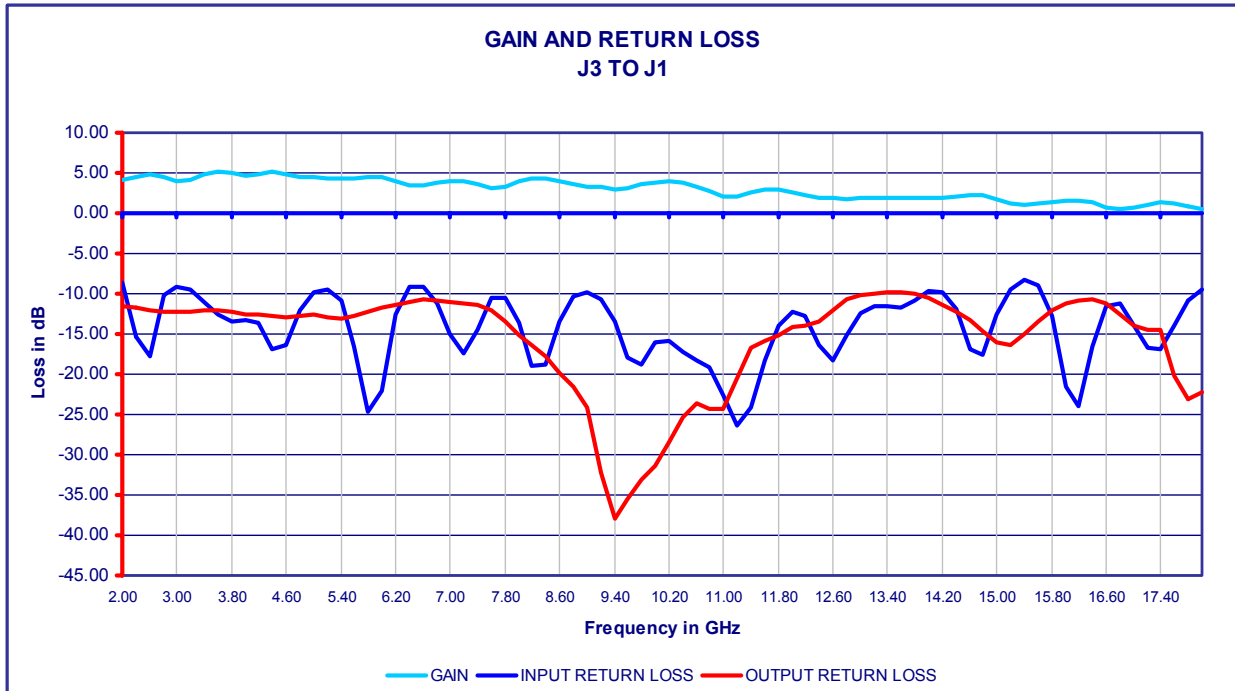
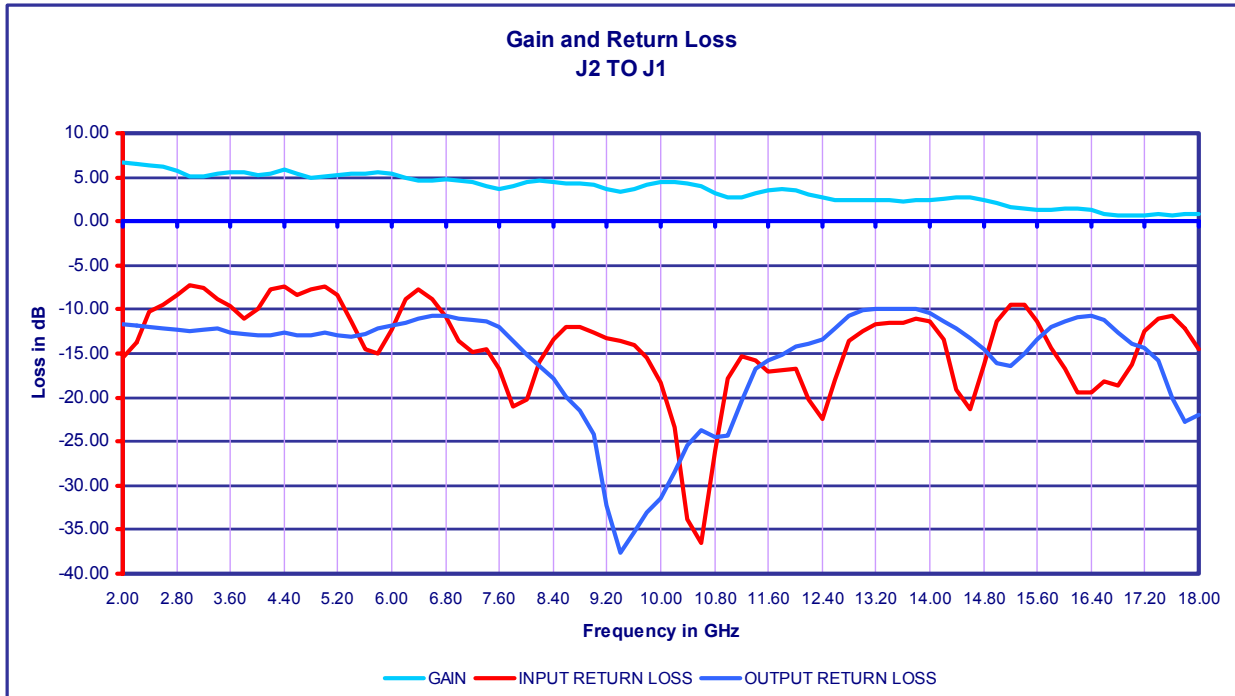
GAIN J3 TO J1
S/N: PM604086



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GAIN AND RETURN LOSS

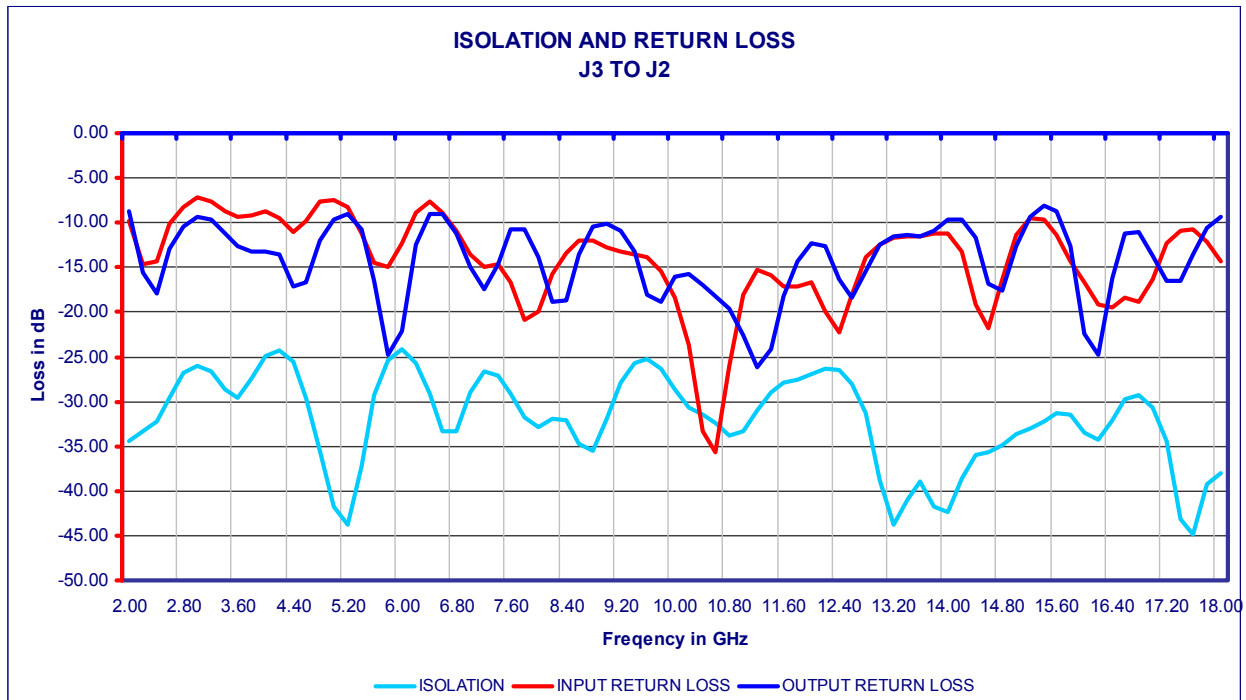
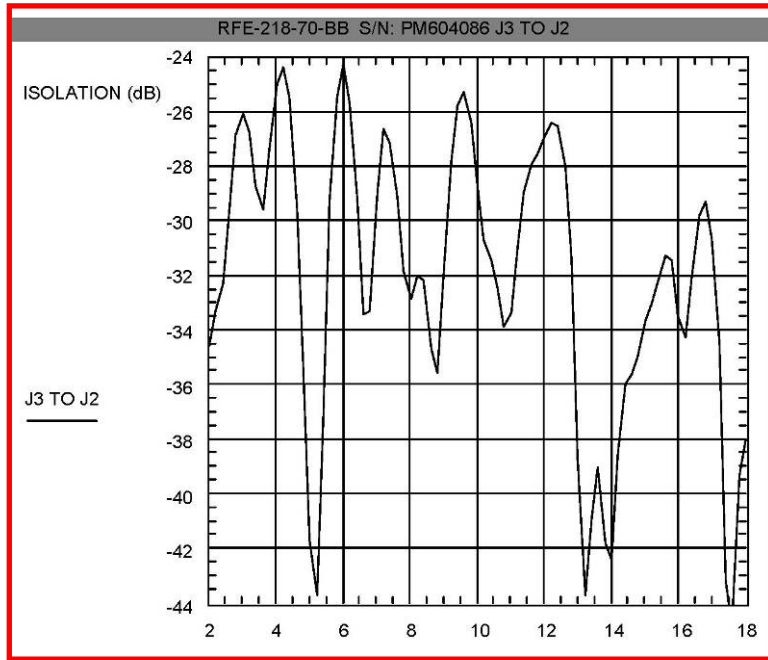


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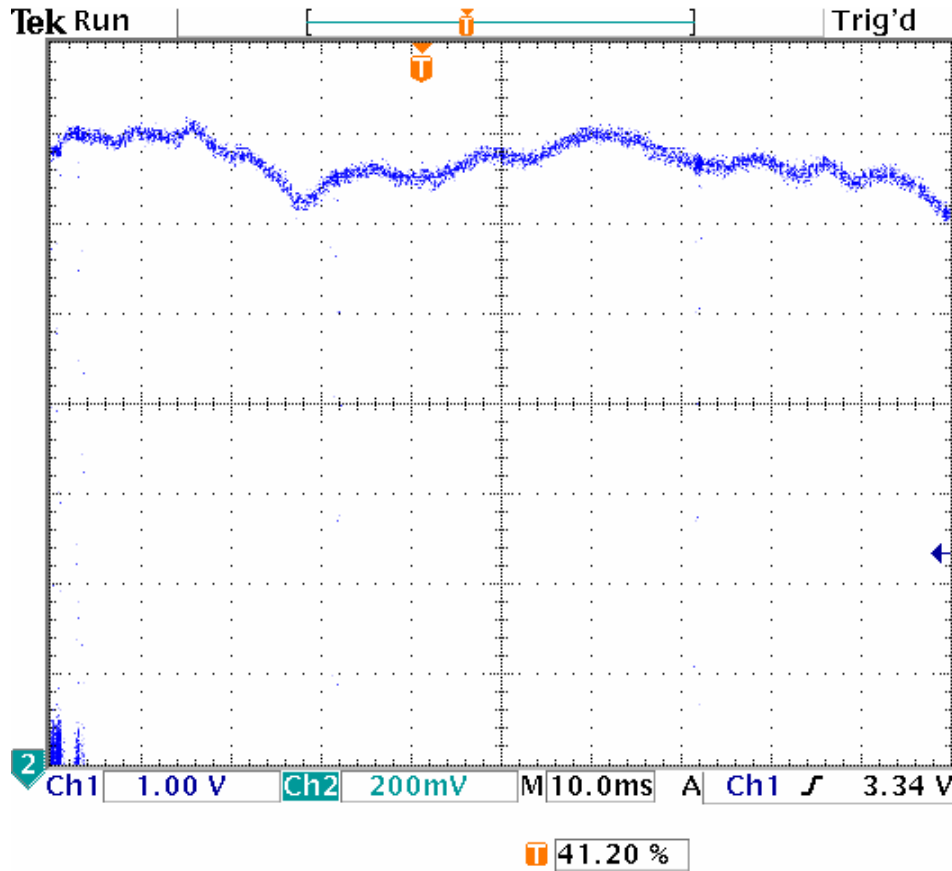
ISOLATION J3 TO J2



FREQUENCY FLATNESS AT OUTPUT J4

RFE-218-70-BB S/N: 604086

J4 FREQUENCY FLATNESS @ - 20 dBm, + 25 C, 2 TO 18 GHz



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PT69-RFE-PW-0606

LOG LINEARITY OUTPUT J4 vs INPUT J2 @ -10°C

RFE-218-70-BB S/N: PM604086
 LOG TRANSFER AT J4 OUTPUT VERSUS J2 INPUT 05/10/06 -10 C



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J2 INPUT POWER (dBm)

-65	-60	-55	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
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FREQUENCY	2 GHz
SLOPE	51.0 mV/db
INTERCEPT	3445.7 millivolts

190	430	660	880	1130	1370	1610	1840	2100	2440	2670	2970	3240	3490	3720
61	46	21	-14	-19	-34	-50	-75	-70	15	-10	35	49	44	19

J4 OUTPUT (millivolts)
LOG TRANSFER ERROR (millivolts)

FREQUENCY	6 GHz
SLOPE	50.5 mV/db
INTERCEPT	3390.3 millivolts

150	380	620	840	1090	1330	1590	1850	2140	2400	2640	2890	3160	3390	3670
45	22	9	-23	-26	-39	-32	-24	13	20	8	5	22	0	27

J4 OUTPUT (millivolts)
LOG TRANSFER ERROR (millivolts)

FREQUENCY	10 GHz
SLOPE	51.0 mV/db
INTERCEPT	3430.3 millivolts

170	400	640	860	1110	1350	1610	1880	2140	2420	2690	2930	3200	3440	3720
52	27	12	-23	-27	-42	-37	-22	-16	9	24	9	24	10	35

J4 OUTPUT (millivolts)
LOG TRANSFER ERROR (millivolts)

FREQUENCY	14 GHz
SLOPE	49.4 mV/db
INTERCEPT	3352.6 millivolts

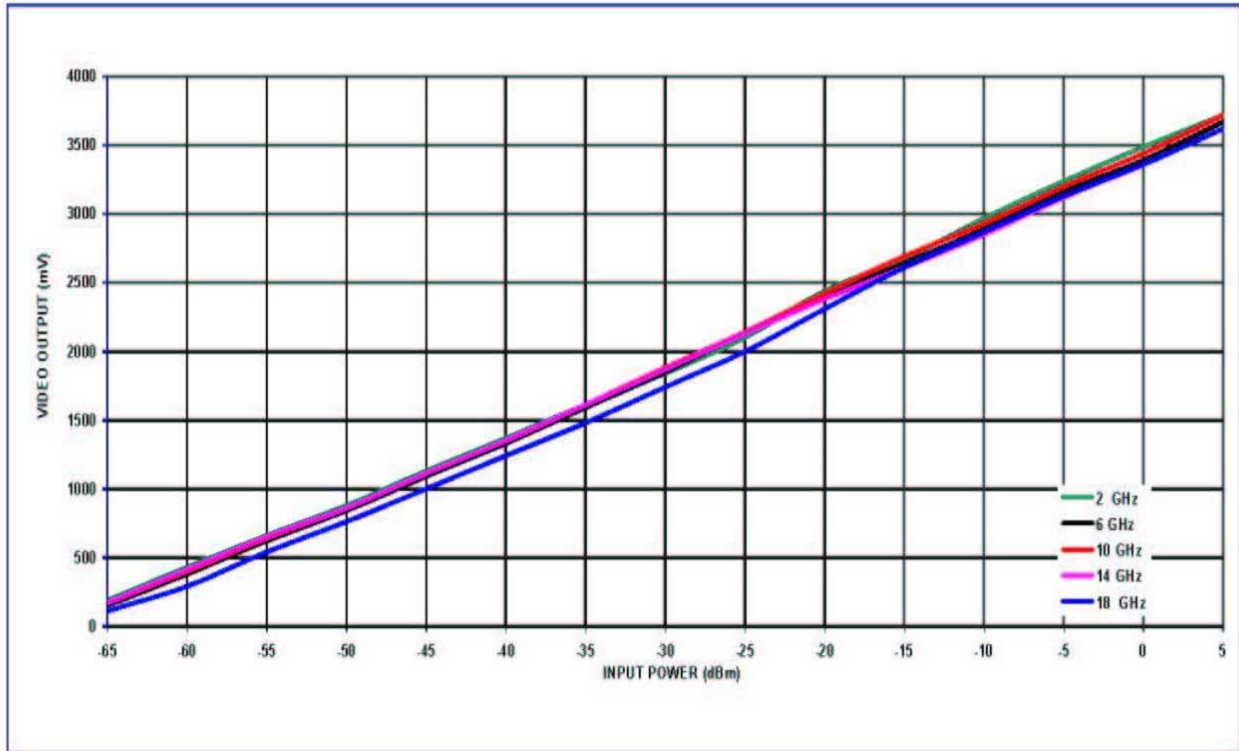
170	410	650	860	1110	1350	1610	1870	2130	2380	2610	2850	3120	3360	3620
25	19	12	-25	-22	-28	-15	-2	11	15	-2	-9	14	7	21

J4 OUTPUT (millivolts)
LOG TRANSFER ERROR (millivolts)

FREQUENCY	18 GHz
SLOPE	51.3 mV/db
INTERCEPT	3338.6 millivolts

110	290	540	760	1000	1240	1480	1740	2000	2310	2610	2870	3130	3360	3620
108	32	25	-12	-28	-45	-62	-58	-55	-2	41	45	48	21	25

J4 OUTPUT (millivolts)
LOG TRANSFER ERROR (millivolts)





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LOG LINEARITY OUTPUT J4 vs INPUT J2 @ +25°C

RFE-218-70-BB S/N: PM604086
 LOG TRANSFER AT J4 OUTPUT VERSUS J2 INPUT 05/10/06 + 25 C



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J2 INPUT POWER (dBm)

-65	-60	-55	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
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FREQUENCY	2 GHz
SLOPE	50.3 mV/dB
INTERCEPT	3422.6 millivolts

170	420	680	910	1160	1390	1640	1890	2110	2410	2660	2950	3200	3450	3680
20	18	26	5	3	-19	-21	-62	-54	-6	-7	31	29	27	6

J4 OUTPUT (millivolts)
LOG TRANSFER ERROR (millivolts)

FREQUENCY	6 GHz
SLOPE	49.7 mV/dB
INTERCEPT	3368.9 millivolts

150	380	640	870	1130	1370	1630	1890	2150	2370	2610	2860	3130	3370	3640
12	-7	5	-14	-2	-11	1	12	24	-5	-13	-12	10	1	23

J4 OUTPUT (millivolts)
LOG TRANSFER ERROR (millivolts)

FREQUENCY	10 GHz
SLOPE	50.3 mV/dB
INTERCEPT	3418.3 millivolts

160	410	670	890	1150	1390	1650	1910	2160	2400	2670	2920	3180	3420	3700
10	8	17	-14	-6	-17	-9	0	-1	-13	6	4	13	2	30

J4 OUTPUT (millivolts)
LOG TRANSFER ERROR (millivolts)

FREQUENCY	14 GHz
SLOPE	48.8 mV/dB
INTERCEPT	3362.9 millivolts

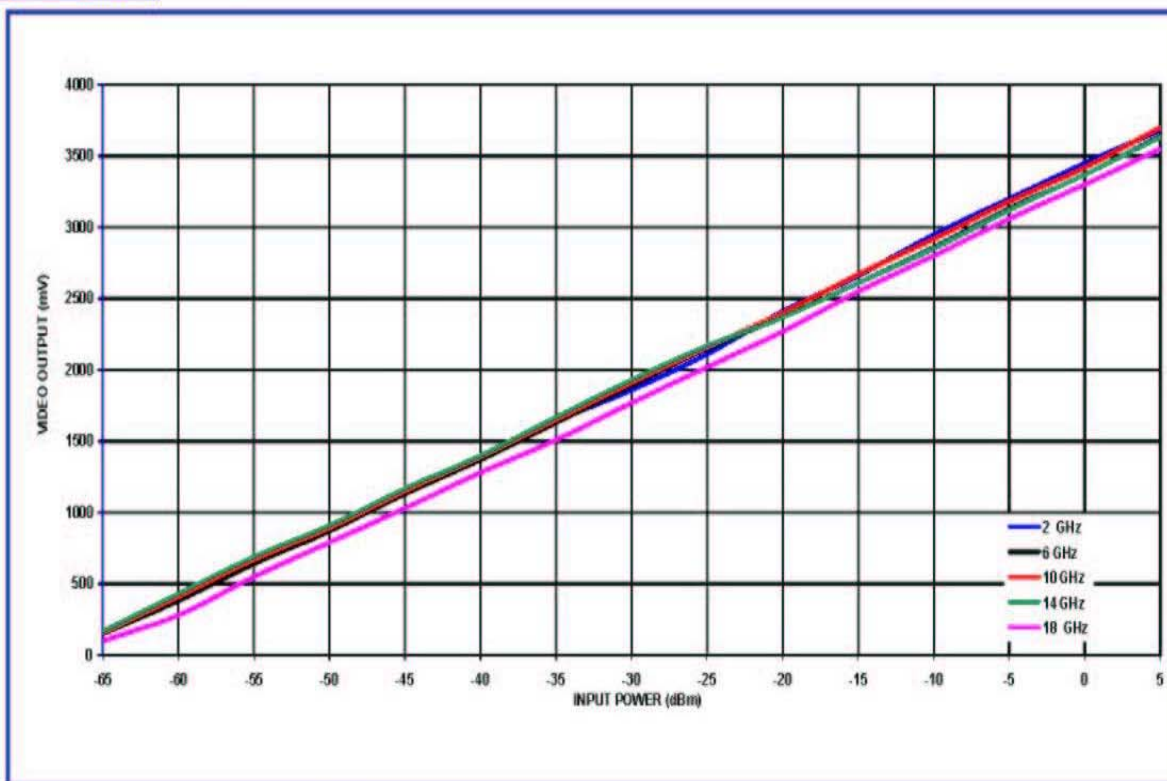
170	430	690	910	1170	1400	1670	1930	2170	2370	2610	2850	3120	3370	3630
-19	-3	13	-11	5	-9	16	32	28	-16	-20	-25	1	7	23

J4 OUTPUT (millivolts)
LOG TRANSFER ERROR (millivolts)

FREQUENCY	18 GHz
SLOPE	49.9 mV/dB
INTERCEPT	3285.4 millivolts

100	280	550	790	1030	1280	1510	1770	2020	2270	2550	2800	3060	3300	3550
60	-9	11	1	-8	-8	-28	-17	-17	-17	14	14	24	15	15

J4 OUTPUT (millivolts)
LOG TRANSFER ERROR (millivolts)





PT69-RFE-PW-0606

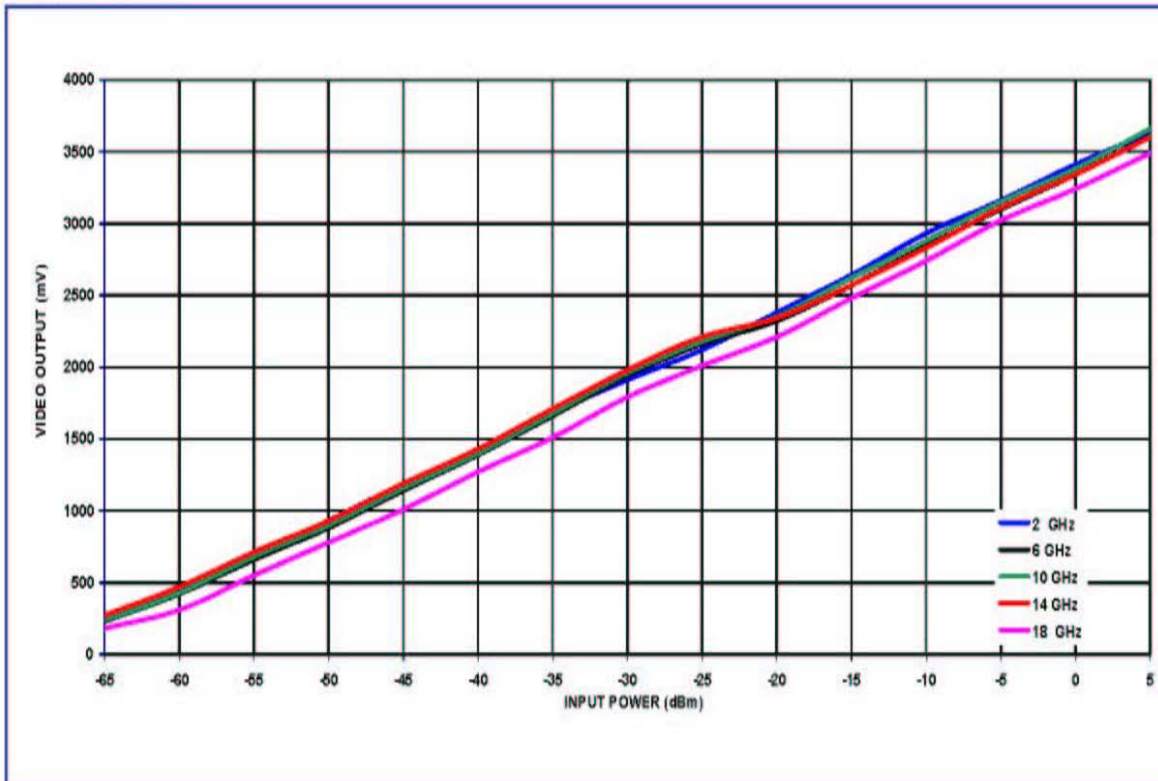
LOG LINEARITY OUTPUT J4 vs INPUT J2 @ +85°C

RFE-218-70-BB S/N: PM604086
 LOG TRANSFER AT J4 OUTPUT VERSUS J2 INPUT 05/10/06 + 85 C



J2 INPUT POWER (dBm)	-65	-60	-55	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
FREQUENCY 2 GHz	260	460	700	930	1190	1420	1680	1910	2120	2380	2640	2930	3160	3410	3630
SLOPE 48.8 mV/dB	46	2	-2	-16	0	-13	3	-11	-45	-29	-13	33	19	25	2
INTERCEPT 3384.6 millivolts															
FREQUENCY 6 GHz	230	420	660	880	1140	1390	1660	1940	2160	2320	2570	2840	3100	3340	3610
SLOPE 48.3 mV/dB	39	-13	-14	-36	-17	-9	20	59	37	-44	-36	-7	11	10	39
INTERCEPT 3330.0 millivolts															
FREQUENCY 10 GHz	240	430	680	900	1160	1400	1680	1960	2180	2350	2620	2880	3150	3380	3660
SLOPE 48.9 mV/dB	41	-13	-7	-31	-16	-20	16	51	27	-47	-21	-6	20	6	41
INTERCEPT 3374.3 millivolts															
FREQUENCY 14 GHz	270	470	710	930	1190	1430	1710	1980	2210	2340	2570	2830	3110	3340	3600
SLOPE 47.4 mV/dB	19	-18	-15	-32	-9	-7	36	69	62	-45	-52	-29	14	7	30
INTERCEPT 3333.1 millivolts															
FREQUENCY 18 GHz	180	310	550	780	1010	1270	1510	1790	2010	2210	2480	2740	3020	3240	3490
SLOPE 48.4 mV/dB	107	-4	-6	-18	-30	-12	-14	24	2	-40	-11	7	45	23	31
INTERCEPT 3217.1 millivolts															

J4 OUTPUT (millivolts)
LOG TRANSFER ERROR (millivolts)
J4 OUTPUT (millivolts)
LOG TRANSFER ERROR (millivolts)
J4 OUTPUT (millivolts)
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J4 OUTPUT (millivolts)
LOG TRANSFER ERROR (millivolts)



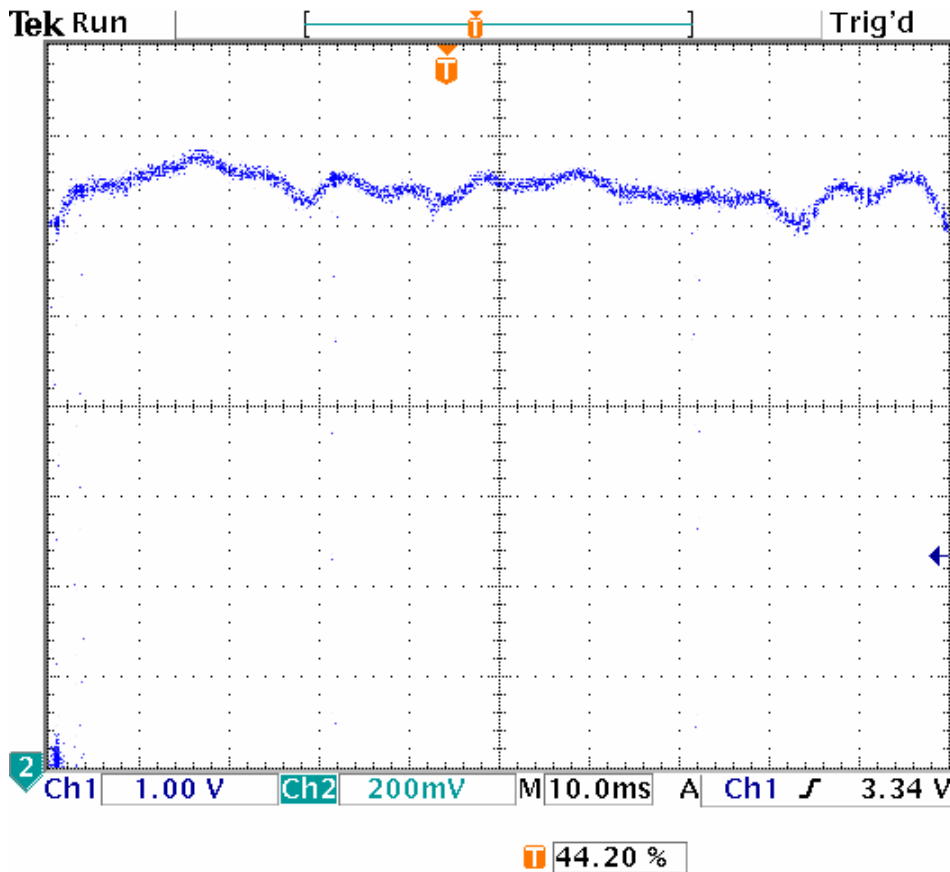


PT69-RFE-PW-0606

FREQUENCY FLATNESS @ OUTPUT J5

RFE-218-70-BB S/N: 604086

J5 FREQUENCY FLATNESS @ - 20 dBm, + 25 C, 2 TO 18 GHz



9 May 2006
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LOG LINEARITY OUTPUT J5 vs INPUT J3 @ -10°C

RFE-218-70-BB S/N: PM604086
 LOG TRANSFER AT J5 OUTPUT VERSUS J3 INPUT 05/10/06 -10 C



J2 INPUT POWER (dBm)

FREQUENCY	2 GHz
SLOPE	50.4 mV/db
INTERCEPT	3385.7 millivolts

-65	-60	-55	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
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100	370	640	870	1120	1360	1620	1860	2090	2390	2600	2860	3170	3410	3650
-9	9	27	5	3	-9	-1	-13	-35	13	-29	-22	36	24	12

J4 OUTPUT (millivolts)
LOG TRANSFER ERROR (millivolts)

FREQUENCY	6 GHz
SLOPE	51.0 mV/db
INTERCEPT	3532.6 millivolts

200	500	750	980	1230	1460	1730	1990	2280	2500	2750	3020	3290	3550	3810
-15	30	25	0	-5	-31	-16	-11	24	-12	-17	-2	13	17	22

J4 OUTPUT (millivolts)
LOG TRANSFER ERROR (millivolts)

FREQUENCY	10 GHz
SLOPE	51.2 mV/db
INTERCEPT	3529.7 millivolts

190	490	740	970	1220	1460	1730	1990	2230	2500	2750	3020	3290	3550	3810
-13	31	25	-1	-7	-23	-8	-4	-20	-6	-12	2	16	20	24

J4 OUTPUT (millivolts)
LOG TRANSFER ERROR (millivolts)

FREQUENCY	14 GHz
SLOPE	48.9 mV/db
INTERCEPT	3456.9 millivolts

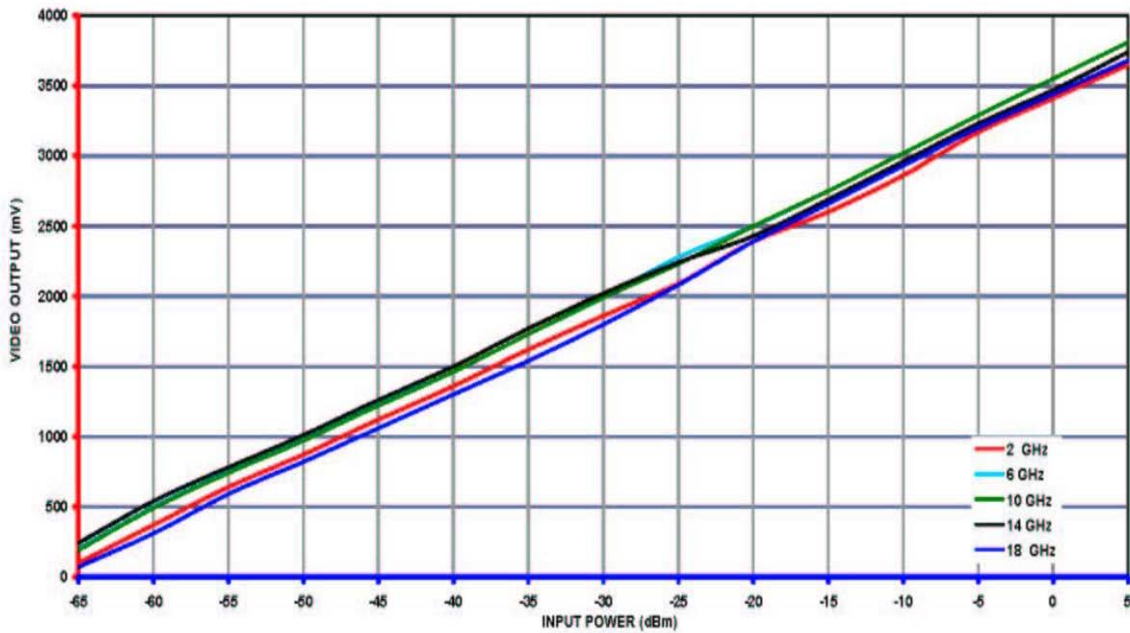
240	540	780	1010	1260	1500	1770	2020	2240	2430	2690	2960	3230	3470	3740
-37	18	13	-1	4	0	25	31	6	-49	-33	-8	18	13	39

J4 OUTPUT (millivolts)
LOG TRANSFER ERROR (millivolts)

FREQUENCY	18 GHz
SLOPE	52.2 mV/db
INTERCEPT	3424.9 millivolts

70	310	590	820	1060	1300	1540	1800	2080	2390	2660	2930	3200	3440	3680
37	16	35	4	-17	-37	-58	-59	-40	9	18	27	36	15	-6

J4 OUTPUT (millivolts)
LOG TRANSFER ERROR (millivolts)





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LOG LINEARITY OUTPUT J5 vs INPUT J3 @ +25°C

RFE-218-70-BB S/N: PM604086
 LOG TRANSFER AT J5 OUTPUT VERSUS J3 INPUT 05/10/06 + 25 C



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J2 INPUT POWER (dBm)

-65 -60 -55 -50 -45 -40 -35 -30 -25 -20 -15 -10 -5 0 5

FREQUENCY	2 GHz
SLOPE	48.5 mV/dB
INTERCEPT	3376.0 millivolts

260	480	720	940	1190	1420	1670	1900	2140	2390	2600	2890	3180	3420	3670
36	14	11	-11	-4	-16	-9	-21	-24	-16	-49	-1	46	44	52

J4 OUTPUT (millivolts)
LOG TRANSFER ERROR (millivolts)

FREQUENCY	6 GHz
SLOPE	48.3 mV/dB
INTERCEPT	3507.4 millivolts

330	570	800	1020	1270	1510	1770	2030	2280	2490	2740	3010	3280	3550	3800
30	24	7	-20	-17	-23	-10	3	6	-30	-27	-4	19	43	46

J4 OUTPUT (millivolts)
LOG TRANSFER ERROR (millivolts)

FREQUENCY	10 GHz
SLOPE	49.4 mV/dB
INTERCEPT	3478.9 millivolts

300	540	770	990	1240	1470	1740	1990	2220	2460	2720	2990	3260	3520	3790
35	27	10	-17	-14	-31	-9	-6	-23	-30	-17	6	28	41	64

J4 OUTPUT (millivolts)
LOG TRANSFER ERROR (millivolts)

FREQUENCY	14 GHz
SLOPE	47.2 mV/dB
INTERCEPT	3429.1 millivolts

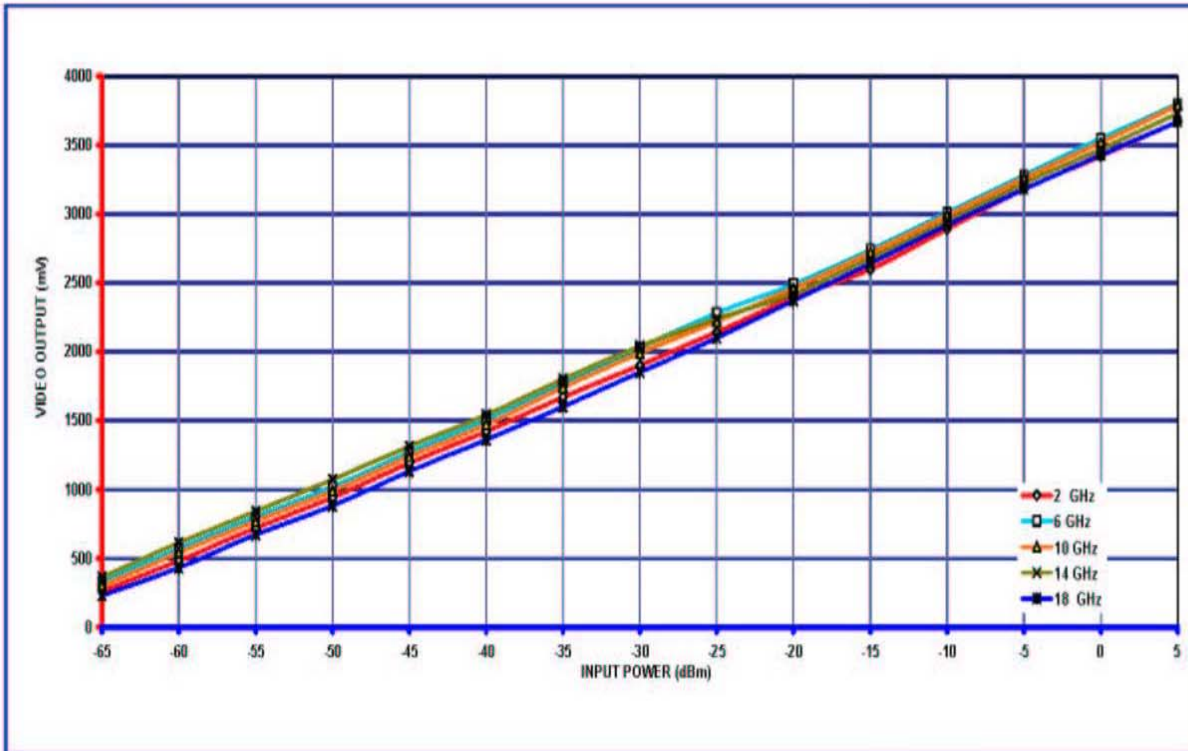
360	610	840	1070	1310	1540	1800	2040	2240	2420	2680	2950	3220	3470	3730
-4	10	5	-1	3	-3	21	26	-10	-66	-42	-8	27	41	66

J4 OUTPUT (millivolts)
LOG TRANSFER ERROR (millivolts)

FREQUENCY	18 GHz
SLOPE	49.9 mV/dB
INTERCEPT	3386.3 millivolts

230	430	670	880	1130	1360	1600	1850	2100	2370	2640	2920	3180	3430	3670
86	37	27	-12	-11	-31	-40	-40	-39	-19	2	33	43	44	34

J4 OUTPUT (millivolts)
LOG TRANSFER ERROR (millivolts)



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PT69-RFE-PW-0606

LOG LINEARITY OUTPUT J5 vs INPUT J3 @ +85°C

RFE-218-70-BB S/N: PM604066
 LOG TRANSFER AT J5 OUTPUT VERSUS J3 INPUT 05/10/06 + 85 C



J2 INPUT POWER (dBm)

-65 -60 -55 -50 -45 -40 -35 -30 -25 -20 -15 -10 -5 0 5

FREQUENCY	2 GHz
SLOPE	49.2 mV/db
INTERCEPT	3396.9 millivolts

190	410	720	960	1210	1440	1680	1920	2160	2380	2610	2900	3180	3420	3660
-10	-36	28	22	26	10	4	-2	-7	-33	-49	-5	29	23	17

J4 OUTPUT (millivolts)
LOG TRANSFER ERROR (millivolts)

FREQUENCY	6 GHz
SLOPE	49.6 mV/db
INTERCEPT	3514.3 millivolts

250	540	820	1060	1300	1530	1790	2040	2270	2480	2740	3020	3270	3540	3800
-41	1	33	15	17	-1	11	13	-5	-43	-31	2	4	26	38

J4 OUTPUT (millivolts)
LOG TRANSFER ERROR (millivolts)

FREQUENCY	10 GHz
SLOPE	49.6 mV/db
INTERCEPT	3467.1 millivolts

220	470	770	1000	1260	1480	1740	1980	2200	2430	2700	2970	3230	3500	3760
-20	-18	34	15	27	-1	11	2	-26	-44	-22	-1	11	33	45

J4 OUTPUT (millivolts)
LOG TRANSFER ERROR (millivolts)

FREQUENCY	14 GHz
SLOPE	47.3 mV/db
INTERCEPT	3418.9 millivolts

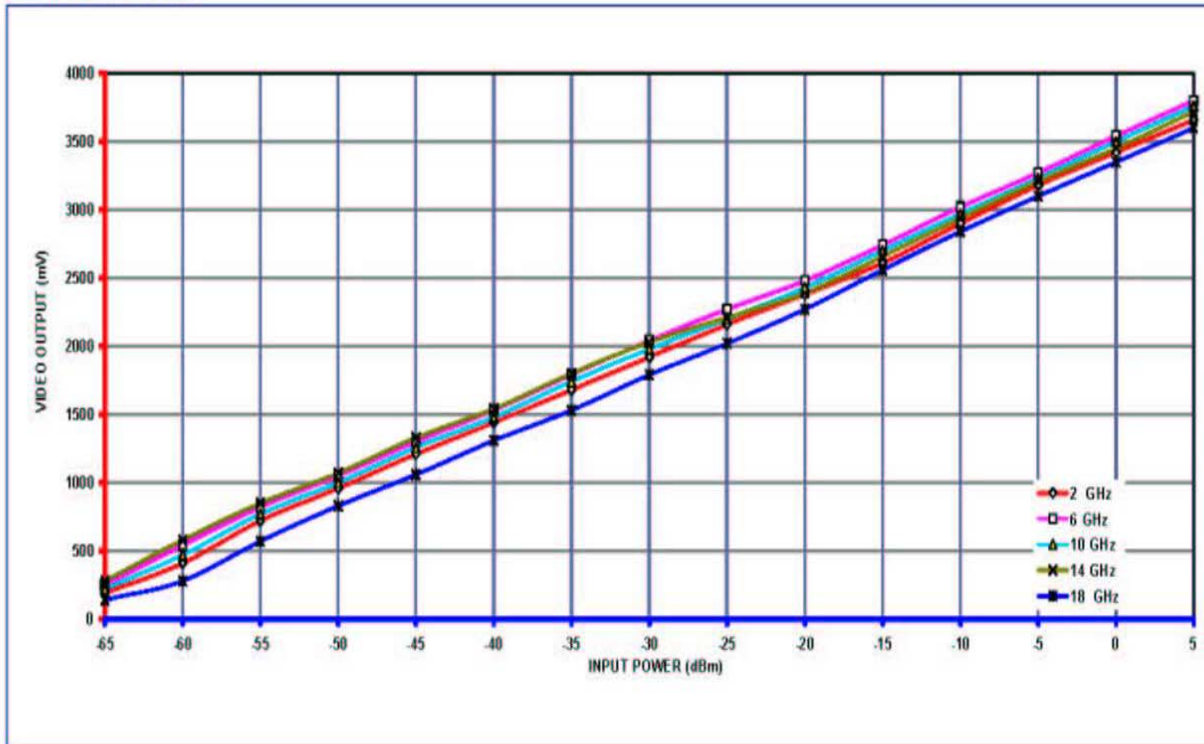
280	580	850	1070	1330	1540	1800	2030	2210	2390	2660	2940	3210	3450	3720
-64	-1	33	16	40	13	37	30	-26	-83	-49	-6	28	31	65

J4 OUTPUT (millivolts)
LOG TRANSFER ERROR (millivolts)

FREQUENCY	18 GHz
SLOPE	50.2 mV/db
INTERCEPT	3314.0 millivolts

140	280	570	830	1060	1310	1530	1790	2020	2270	2560	2840	3100	3350	3600
87	-24	15	25	4	3	-28	-19	-40	-41	-1	28	37	36	35

J4 OUTPUT (millivolts)
LOG TRANSFER ERROR (millivolts)





PT69-RFE-PW-0606

ACTUAL MEASURED TEST DATA AS PREPARED FOR THE CUSTOMER

FORM: 010-SUB-DTA



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 EMAIL: SALES@PLANARMONOLITHICS.COM
 ISO 9001:2000 CERTIFIED

**SUMMARY TEST DATA ON
 RECEIVER SUBSYSTEM**

CUSTOMER: _____	TESTED BY: <u>B. Baker</u>
MODEL NO: <u>RFE-218-70-BB</u>	TEMPERATURE: <u>-10 TO +85 C</u>
OPTION NO: <u>JT</u>	DATE: <u>05/11/06</u>
SERIAL NO: <u>PM604086</u>	JOB NO: <u>P511046E</u>

TEST ITEM NO:	PARAMETERS	SPECIFIED VALUE	MEASURED VALUE	Q/A
1	FREQUENCY	2 TO 18 GHz	2 to 18 GHz	
2	INPUT VSWR IN FREQUENCY RANGE	3.0:1 (MAXIMUM)	J2: 2.7:1 J3: 2.6:1	
3	FREQUENCY FLATNESS OF DLVA OUTPUTS	±3 dB (MAXIMUM)	J4: ±2.6 dB J5: ±3 dB	
4	DYNAMIC RANGE	-60 TO +5 dBm (MINIMUM)	J4: -65to+5dBm J5: -65to+5dBm	
5	RISE TIME	30 nSec (MAXIMUM)	J4: 23 nSec J5: 23 nSec	
6	RECOVERY TIME	350 nSec MAXIMUM	J4: 250 nSec J5: 100 nSec	
7	LOG SLOPE	50 mV/dB (±10%)	J4: 47 to 52 Mv J5: 47 to 53 mV	
8	LOG LINEARITY	±2.25 dB (MAXIMUM)	J4: + 2.2 dB J5: + 1.8 dB	
9	TSS	-63 dBm (MINIMUM)	J4: - 65 dBm J5: -66 dBm	
10	TEMPERATURE STABILITY (-10 TO + 85 C)	± 2 dB (MAXIMUM)	J4: ±1.3 dB J5: ±1.6 dB	
11	GAIN	+3 dB (TYPICAL)	J2-J1: + 3.5 dB J3-J1: + 3 dB	
12	ISOLATION J2 TO J3	24 dB (MINIMUM)	> 24 dB	
13	D.C. POWER +9 V	850 mA (MAXIMUM WITH NO RF INPUT)	750 mA	
14	D.C. POWER -9 V	300 mA (MAXIMUM)	250 mA	

QA/QC APPROVAL: _____

DATED: _____

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