

# M/A-COM Miniature Broadband Gain Stage 200 - 3000 MHz

## Features

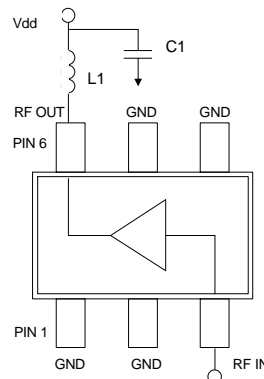
- Low Noise Figure
- High IP3
- Single +3 V or +5 V Supply Voltage
- Very Stable Over Temperature

## Description

M/A-COM's AM50-0015 broadband gain stage is a GaAs MMIC amplifier in a low-cost miniature SOT-363 surface mount plastic package. The AM50-0015 employs a monolithic 1-stage self-biased design featuring a convenient 50 ohm input/output impedance that minimizes the number of external components required. The device typically runs off a single 3.0 volt supply and may also operate at any voltage up to 5.0 volts for improved power performance. Its broadband design provides usable performance from 200 to 3000 MHz.

The AM50-0015 is fabricated using M/A-COM's E/D MESFET process to realize low noise and high dynamic range. The process features full passivation for increased performance and reliability.

## Functional Block Diagram



## External Circuitry

Part	Value	Purpose
C1	470 pF	Decoupling capacitor
L1	12 nH	RF Choke

## Ordering Information

Part Number	Package
AM50-0015TR	1000 Tape and Reel <sup>1</sup>
AM50-0015TR 3000	3000 Tape and Reel <sup>1</sup>
AM50-0015SMB	Sample Test Board

1. Reference Application Note M513 for reel size information.

## Electrical Specifications<sup>1</sup>: T<sub>A</sub> = 25 °C

Parameter	Test Conditions	Units	+3 V			+5 V		
			Min.	Typ.	Max.	Min.	Typ.	Max.
Gain <sup>2</sup>	F = 0.9 GHz	dB	13.0	14.0	15.0	13.2	14.2	15.2
	F = 1.9 GHz	dB	10.9	11.9	12.9	11.0	12.0	13.0
	F = 3.0 GHz	dB		9.4			9.6	
Noise Figure <sup>3</sup>	F = 0.9 GHz	dB		1.4	2.0		1.5	2.0
	F = 1.9 GHz	dB		1.4	2.0		1.5	2.0
	F = 3.0 GHz	dB		1.5			1.6	
Input Return Loss	F = 0.9 GHz	dB		9.3			9.4	
	F = 1.9 GHz	dB		13.2			13.2	
	F = 3.0 GHz	dB		14.9			14.7	
Output Return Loss	F = 0.9 GHz	dB		9.0			9.7	
	F = 1.9 GHz	dB		15.2			15.5	
	F = 3.0 GHz	dB		27.0			33.0	
1dB Compression	200 – 3000 MHz	dBm		18			21	
Output IP3	200 – 3000 MHz	dBm		33			36	
Current		mA	50	79	95	55	87	100

1. All measurements taken in a 50-Ω system unless otherwise specified.

2. Gain varies at -0.0025 dB/°C typical.

3. Noise figure varies at 0.007 dB/°C typical.

Specifications subject to change without notice.

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**Absolute Maximum Ratings<sup>1</sup>**

Parameter	Absolute Maximum
RF Input Power	15 dBm
Voltage	6.0 volts
Operating Temperature	-40°C to +70°C
Storage Temperature	-65°C to +150°C

1. Exceeding any one or combination of these limits may cause permanent damage.
2. Minimum MTTF is 1x10<sup>6</sup> at +70°C, +5V, and 100 mA.

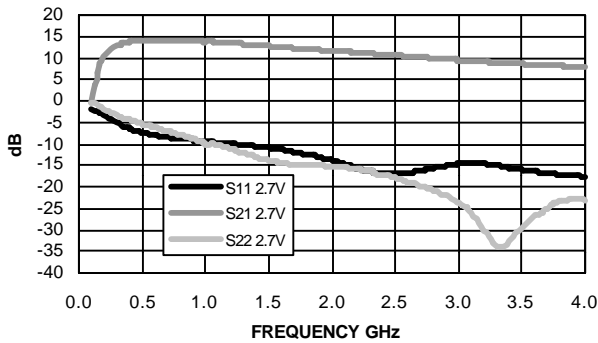
**PIN Configuration**

PIN	Function	Description
1	GND	Ground
2	GND	Ground
3	RF In	RF Input
4	GND	Ground
5	GND	Ground
6 <sup>1</sup>	RF Out/V <sub>DD</sub>	RF Output/Drain Voltage Input

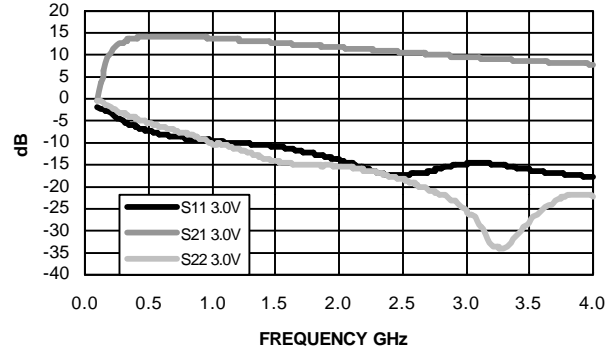
1. Series inductor and decoupling capacitor recommended on pin 6.

**Typical Performance Curves**

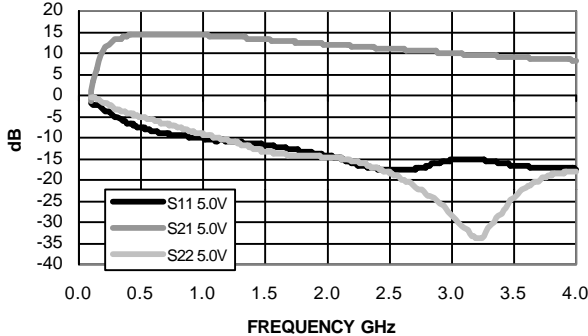
**S-Parameters V<sub>DD</sub> @ 2.7 V, T = 25°C**



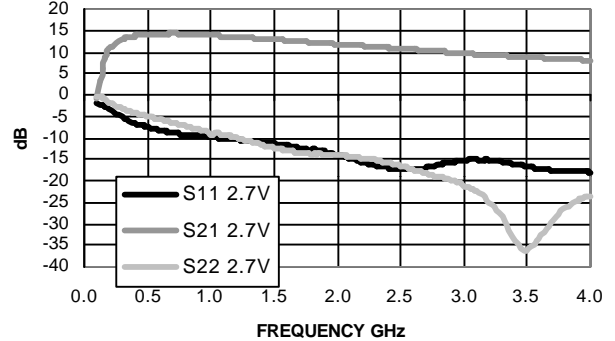
**S-Parameters V<sub>DD</sub> @ 3.0 V, T = 25°C**



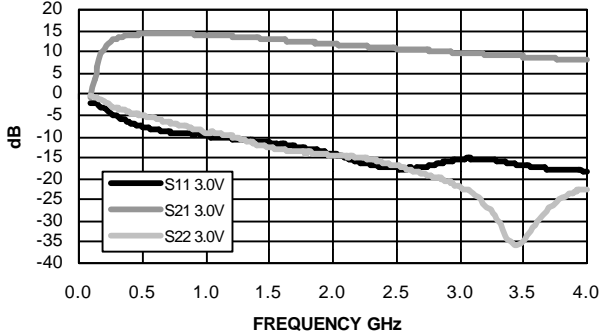
**S-Parameters V<sub>DD</sub> @ 5.0 V, T = 25°C**



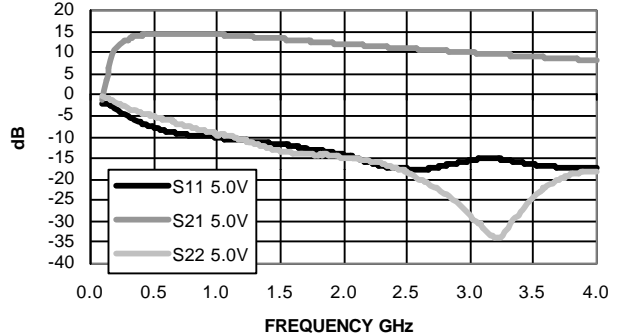
**S-Parameters V<sub>DD</sub> @ 2.7 V, T = -40°C**



**S-Parameters V<sub>DD</sub> @ 3.0 V, T = -40°C**



**S-Parameters V<sub>DD</sub> @ 5.0 V, T = -40°C**



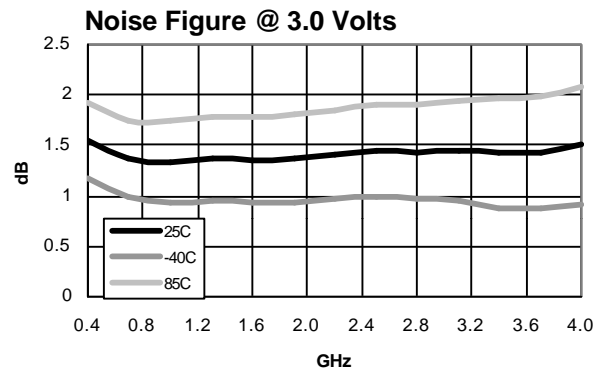
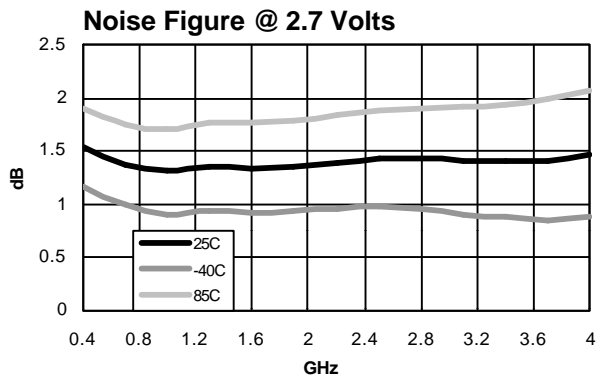
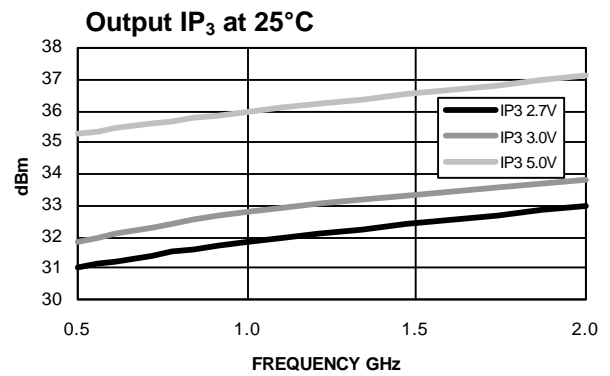
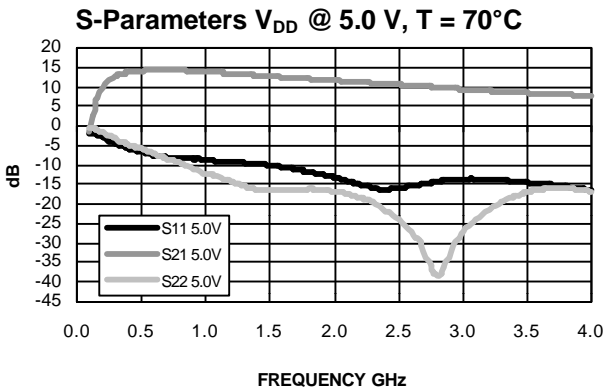
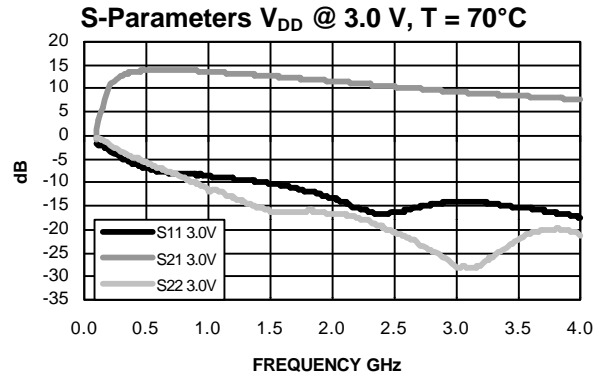
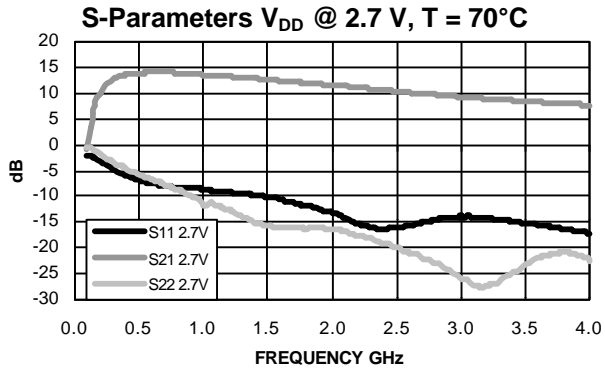
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Typical Performance Curves (Cont'd)



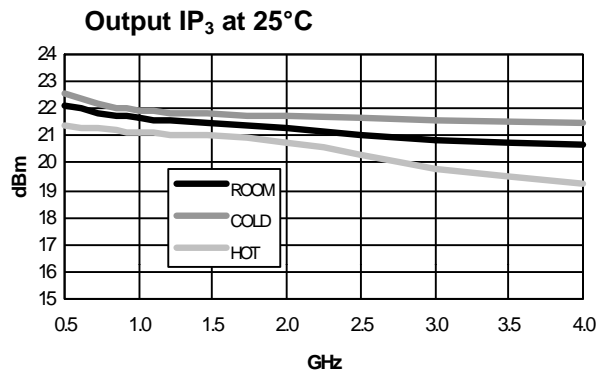
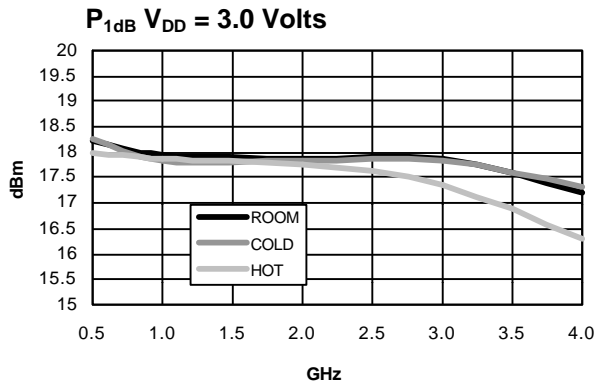
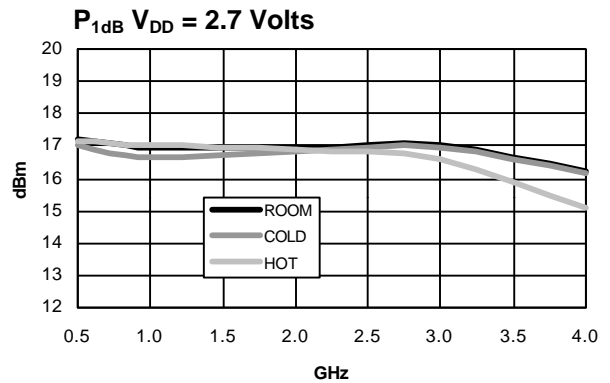
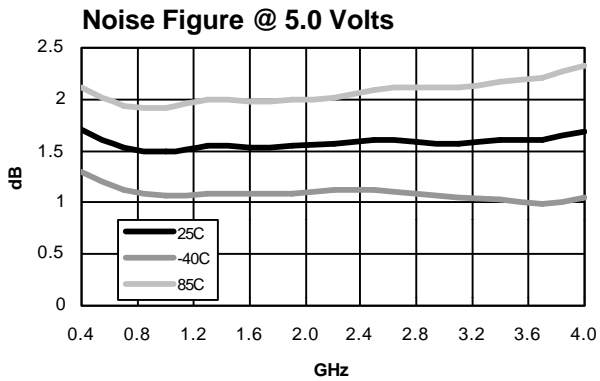
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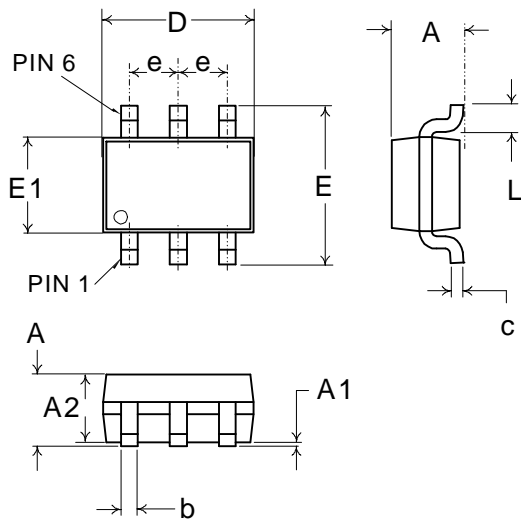
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Typical Performance Curves (Cont'd)



SOT-363 Plastic Package<sup>1</sup>



1. See JEDEC MO-203 VAR AB for additional dimensions and tolerances.

SOT-363 Plastic Package

Dimensions	Measurements (mm)		
	Min.	Nom.	Max.
A	—	—	1.10
A1	0	—	0.10
A2	0.70	0.90	1.00
b	0.15	—	0.30
c	0.08	—	0.22
D	—	2.00 basic	—
e	—	0.65 basic	—
E	—	2.10 basic	—
E1	—	1.25 basic	—
L	—	0.42 ref.	—

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## Typical S-Parameter Data: 2.7 Volts @ 80 mA

Frequency MHz	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	Mag	Ang	Mag	Ang	Mag	Ang	Mag	Ang
400.000	0.2256	-37.03	6.0729	156.17	0.0589	9.34	0.2671	165.08
504.000	0.2219	-42.93	5.9561	151.08	0.0591	10.84	0.2619	160.07
608.000	0.2226	-49.32	5.8267	146.22	0.0591	12.80	0.2526	156.14
660.000	0.2221	-52.48	5.7584	143.68	0.0592	13.54	0.2466	154.05
764.000	0.2214	-58.65	5.6232	138.86	0.0599	15.45	0.2374	149.97
868.000	0.2210	-64.80	5.4826	134.19	0.0600	17.93	0.2267	146.22
972.000	0.2197	-70.49	5.3068	129.42	0.0603	19.95	0.2148	142.03
1076.000	0.2216	-76.33	5.1677	125.01	0.0616	22.51	0.2043	139.02
1180.000	0.2224	-82.01	5.0128	120.76	0.0624	24.49	0.1926	136.09
1284.000	0.2211	-87.07	4.8508	116.57	0.0644	27.03	0.1848	132.86
1388.000	0.2231	-92.07	4.7231	112.63	0.0660	29.49	0.1743	130.63
1492.000	0.2241	-96.75	4.5778	108.93	0.0679	31.65	0.1646	128.19
1596.000	0.2252	-101.10	4.4398	105.21	0.0702	33.37	0.1556	125.64
1700.000	0.2270	-105.62	4.3034	101.69	0.0724	35.52	0.1462	124.69
1804.000	0.2292	-109.34	4.1744	98.20	0.0759	37.62	0.1375	123.32
1908.000	0.2305	-113.34	4.0432	94.87	0.0783	38.40	0.1275	122.77
2012.000	0.2310	-117.21	3.9288	91.64	0.0816	39.90	0.1223	121.44
2116.000	0.2344	-120.73	3.8106	88.45	0.0851	41.32	0.1137	121.94
2220.000	0.2358	-124.00	3.7100	85.29	0.0885	42.07	0.1068	121.71
2324.000	0.2373	-127.52	3.6114	82.27	0.0928	43.01	0.1017	121.75
2428.000	0.2393	-130.65	3.5092	79.46	0.0963	44.00	0.0976	122.79
2532.000	0.2409	-134.18	3.4345	76.78	0.1004	44.58	0.0953	124.23
2636.000	0.2433	-137.24	3.3304	74.03	0.1050	45.43	0.0917	126.82
2740.000	0.2464	-139.90	3.2393	71.51	0.1089	45.57	0.0893	129.07
2844.000	0.2053	-142.69	3.1674	68.72	0.1134	46.28	0.0896	132.63
2948.000	0.2525	-145.50	3.0927	66.24	0.1179	46.25	0.0879	136.79
3000.000	0.2559	-146.99	3.0589	64.75	0.1206	46.24	0.0897	139.73

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## Typical S-Parameter Data: 3.0 Volts @ 80 mA

Frequency MHz	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	Mag	Ang	Mag	Ang	Mag	Ang	Mag	Ang
400.000	0.2217	-37.17	6.1208	156.01	0.0596	9.08	0.2571	164.78
504.000	0.2185	-43.03	6.0097	151.06	0.0597	10.32	0.2524	159.65
608.000	0.2189	-49.53	5.8826	146.15	0.0599	11.96	0.2431	155.35
660.000	0.2183	-52.47	5.8120	143.58	0.0596	12.71	0.2372	153.28
764.000	0.2183	-58.45	5.6770	138.56	0.0599	14.81	0.2268	148.96
868.000	0.2178	-64.74	5.5235	134.02	0.0601	15.52	0.2168	145.11
972.000	0.2161	-70.43	5.3531	129.36	0.0607	19.05	0.2055	140.83
1076.000	0.2177	-76.18	5.2169	124.85	0.0615	21.45	0.1943	137.52
1180.000	0.2191	-81.63	5.0515	120.50	0.0620	23.71	0.1824	134.49
1284.000	0.2185	-86.99	4.8849	116.49	0.0640	25.82	0.1744	131.16
1388.000	0.2204	-91.89	4.7566	112.46	0.0655	28.30	0.1639	128.64
1492.000	0.2210	-96.64	4.6199	108.70	0.0668	30.25	0.1544	126.24
1596.000	0.2220	-100.87	4.4673	105.01	0.0693	32.29	0.1454	123.52
1700.000	0.2245	-105.37	4.3237	101.54	0.0715	34.45	0.1359	122.59
1804.000	0.2256	-109.44	4.2047	97.80	0.0743	36.49	0.1270	120.97
1908.000	0.2278	-112.96	4.0709	94.80	0.0774	37.77	0.1168	120.42
2012.000	0.2290	-116.96	3.9559	91.34	0.0802	39.16	0.1115	119.03
2116.000	0.2326	-120.45	3.8444	88.15	0.0833	40.17	0.1029	119.85
2220.000	0.2335	-123.50	3.7348	85.21	0.0866	41.50	0.0957	119.48
2324.000	0.2361	-127.10	3.6417	81.97	0.0907	42.69	0.0901	119.40
2428.000	0.2367	-130.26	3.5391	79.23	0.0941	43.36	0.0860	121.05
2532.000	0.2393	-133.86	3.4526	76.49	0.0979	44.38	0.0831	123.09
2636.000	0.2413	-136.65	3.3595	73.97	0.1027	44.76	0.0799	125.91
2740.000	0.2447	-139.31	3.2545	71.32	0.1065	45.55	0.0767	129.77
2844.000	0.2492	-142.46	3.1890	68.28	0.1107	46.22	0.0770	133.95
2948.000	0.2503	-144.99	3.1108	66.04	0.1155	46.29	0.0758	138.83
3000.000	0.2544	-146.53	3.0716	64.61	0.1177	46.58	0.0774	142.74

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## Typical S-Parameter Data: 5.0 Volts @ 80 mA

Frequency MHz	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	Mag	Ang	Mag	Ang	Mag	Ang	Mag	Ang
400.000	0.2201	-36.83	6.2856	155.55	0.0630	6.31	0.1920	162.51
504.000	0.2168	-42.60	6.1754	150.33	0.0630	6.80	0.1873	156.15
608.000	0.2168	-49.10	6.0428	145.41	0.0624	8.37	0.1784	151.21
660.000	0.2171	-52.05	5.9696	142.78	0.0625	8.93	0.1726	148.40
764.000	0.2169	-58.23	5.8192	137.69	0.0618	10.35	0.1628	142.85
868.000	0.2171	-64.21	5.6613	133.08	0.0616	11.53	0.1530	137.95
972.000	0.2160	-69.66	5.4627	128.34	0.0613	13.58	0.1427	131.92
1076.000	0.2182	-75.25	5.3271	123.76	0.0612	15.60	0.1316	127.62
1180.000	0.2193	-80.96	5.1602	119.36	0.0614	17.63	0.1202	123.48
1284.000	0.2186	-85.87	4.9814	115.17	0.0619	19.83	0.1124	118.48
1388.000	0.2206	-90.84	4.8421	111.31	0.0627	22.28	0.1026	114.89
1492.000	0.2220	-95.46	4.7014	107.35	0.0630	24.88	0.0931	111.09
1596.000	0.2234	-99.67	4.5447	103.59	0.0644	27.25	0.0844	106.04
1700.000	0.2250	-104.07	4.4061	100.18	0.0652	29.29	0.0744	104.39
1804.000	0.2285	-107.97	4.2764	96.52	0.0676	32.04	0.0654	100.69
1908.000	0.2291	-111.40	4.1327	93.22	0.0692	33.71	0.0543	98.35
2012.000	0.2313	-115.29	4.0120	89.86	0.0712	35.83	0.0483	95.51
2116.000	0.2344	-118.71	3.9018	86.51	0.0742	37.94	0.0381	94.97
2220.000	0.2369	-121.95	3.7920	83.58	0.0767	39.36	0.0295	91.77
2324.000	0.2396	-125.10	3.6950	80.37	0.0798	41.07	0.0229	93.73
2428.000	0.2415	-128.09	3.5850	77.59	0.0833	42.65	0.0166	100.42
2532.000	0.2439	-131.73	3.4994	74.72	0.0867	43.82	0.0130	118.93
2636.000	0.2471	-134.41	3.4058	72.17	0.0901	45.59	0.0117	160.83
2740.000	0.2499	-137.00	3.2991	69.33	0.0942	46.50	0.0148	-170.99
2844.000	0.2546	-140.01	3.2340	66.41	0.0987	47.70	0.0232	-160.77
2948.000	0.2572	-142.28	3.1539	64.07	0.1027	48.04	0.0317	-152.16
3000.000	0.2611	-143.98	3.1213	62.63	0.1050	48.47	0.0386	-151.48

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