

To our customers,

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## Old Company Name in Catalogs and Other Documents

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Renesas Electronics website: <http://www.renesas.com>

April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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# NE850R5 SERIES

## 0.5 W C-BAND POWER GaAs FET N-CHANNEL GaAs MES FET

### DESCRIPTION

The NE850R599 power GaAs FET covers 2 GHz to 10 GHz frequency range for commercial amplifier, oscillator applications and so on.

The device incorporates Ti-Al gate and silicon dioxide glassivation. To reduce the thermal resistance, the device has a PHS. (Plated Heat Sink)

NEC's stringent quality assurance and test procedures assure the highest reliability and performance.

### FEATURES

- Class A operation
- High power output
- High reliability

### SELECTION CHART

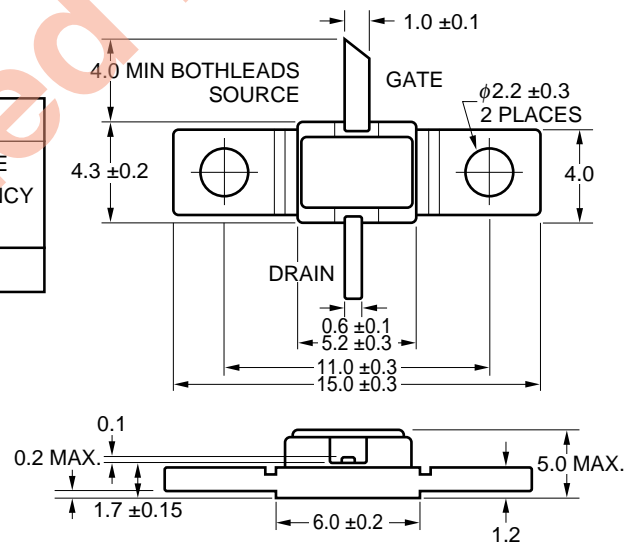
PART NUMBER	PERFORMANCE SPECIFIED		
	Pout (*) (dBm)	GL (*) (dB)	USABLE FREQUENCY (GHz)
NE850R599	25.5 min	9.5 typ	2 to 10

\* specified at the condition at the last page

### PHYSICAL DIMENSIONS

PACKAGE CODE-99

(unit: mm)



Discontinued Product

**ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25 °C)**

Drain to Source Voltage	V <sub>DSX</sub>	15	V
Gate to Drain Voltage	V <sub>GDX</sub>	-18	V
Gate to Source Voltage	V <sub>G SX</sub>	-12	V
Total Power Disipation(*)	P <sub>T</sub>	3.0	W
Drain Current	I <sub>D</sub>	560	mA
Gate Current	I <sub>G</sub>	3.0	mA
Channel Temperature	T <sub>ch</sub>	175	°C
Storage Temperature	T <sub>stg</sub>	-65 to 175	°C

\*T<sub>C</sub> = 25 °C

**RECOMMENDING OPERATION RANDGE**

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Drain to Source Voltage	V <sub>DS</sub>	9	-	10	V
Channel Temperature	T <sub>ch</sub>	-	-	130	°C
Input Power	G <sub>comp</sub>	-	-	3	dB <sub>comp</sub>
Gate Resistance	R <sub>g</sub>	-	-	1	kΩ

**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C)**

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Saturated Drain Current	I <sub>DSS</sub>	220	-	430	mA	V <sub>ds</sub> = 2.5 V, V <sub>gs</sub> = 0 V
Pinch-off Voltage	V <sub>P</sub>	-3.0	-	-1.0	V	V <sub>ds</sub> = 2.5 V, I <sub>ds</sub> = 2 mA
Transconductance	g <sub>m</sub>	-	150	-	mS	V <sub>ds</sub> = 2.5 V, I <sub>ds</sub> = I <sub>DSS</sub>
Thermal Resistance	R <sub>th</sub>	-	-	60	°C/W	

**PERFORMANCE SPECIFICATION (T<sub>A</sub> = 25 °C)**

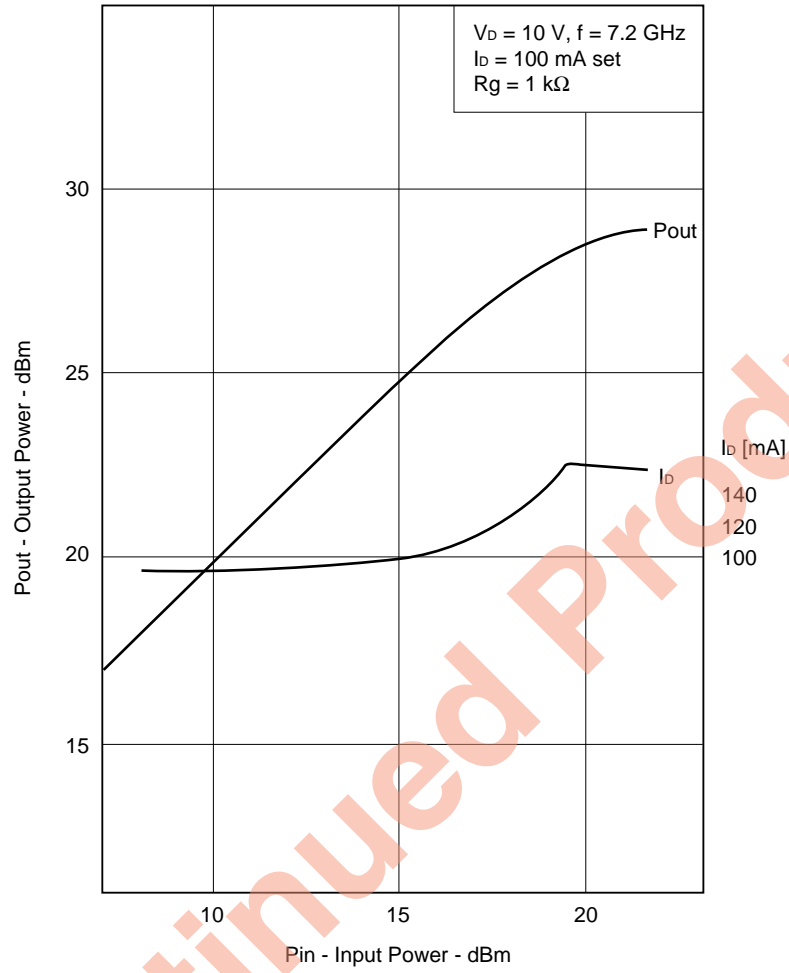
PART NUMBER		NE850R599			UNIT	TEST CONDITIONS
PACKAGE CODE		99				
CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.		
Output Power	P <sub>o</sub>	25.5	-	-	dBm	V <sub>ds</sub> = 10 V I <sub>ds</sub> = 100 mA set f = 7.2 GHz, R <sub>g</sub> = 1 KΩ Pin = 18.5 dBm (*)
Gate to Source Current	I <sub>gs</sub>	-1.6	-	1.6	mA	
Linear Gain	G <sub>L</sub>	-	9.5	-	dB	Pin ≤ 7 dBm (**)

\* : Pin for Pout specification.

\*\* : The same as the above except this.

TYPICAL CHARACTERISTICS (TA = 25 °C)

OUTPUT POWER vs. INPUT POWER



Discontinued Product

S-PARAMETERS

V<sub>DS</sub> = 10 V, I<sub>D</sub> = 100 mA set

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
1000.0000	.991	-95.7	6.681	131.1	.032	57.1	.326	-57.6
1050.0000	.993	-98.7	6.564	129.2	.034	56.7	.322	-59.1
1100.0000	.993	-101.8	6.422	127.4	.035	50.6	.320	-60.3
1150.0000	.990	-104.7	6.242	125.6	.035	54.2	.313	-61.6
1200.0000	.970	-107.5	6.106	123.4	.036	53.4	.303	-63.2
1250.0000	.945	-110.4	5.908	121.9	.037	53.4	.295	-66.1
1300.0000	.929	-113.4	5.730	121.0	.036	52.9	.291	-69.0
1350.0000	.913	-116.3	5.567	120.0	.037	53.6	.288	-71.2
1400.0000	.895	-118.8	5.408	118.6	.038	51.9	.284	-73.9
1450.0000	.879	-121.2	5.230	118.0	.037	50.5	.286	-77.2
1500.0000	.883	-123.5	5.147	118.1	.037	53.1	.292	-79.6
1550.0000	.892	-125.9	5.082	117.1	.038	52.6	.301	-81.1
1600.0000	.891	-127.7	4.919	116.0	.040	51.0	.302	-82.8
1650.0000	.891	-129.5	4.825	115.7	.038	51.1	.306	-83.9
1700.0000	.898	-131.3	4.803	115.2	.039	51.6	.310	-85.1
1750.0000	.905	-133.2	4.746	114.3	.040	52.2	.311	-86.2
1800.0000	.905	-134.5	4.609	113.0	.039	50.3	.310	-86.5
1850.0000	.897	-135.9	4.513	112.9	.040	52.0	.305	-87.1
1900.0000	.888	-137.4	4.429	112.4	.040	52.1	.304	-88.9
1950.0000	.884	-139.3	4.403	111.4	.042	51.9	.303	-90.0
2000.0000	.906	-141.8	4.308	109.1	.040	52.8	.300	-87.4
2050.0000	.895	-143.4	4.157	109.1	.041	53.0	.293	-88.8
2100.0000	.884	-145.1	4.121	108.1	.040	53.7	.291	-90.6
2150.0000	.882	-146.6	4.082	107.3	.040	56.0	.292	-91.4
2200.0000	.879	-147.6	3.991	106.9	.041	56.1	.290	-92.1
2250.0000	.878	-148.8	3.938	107.0	.041	57.0	.289	-93.2
2300.0000	.874	-150.4	3.894	106.6	.039	55.1	.290	-94.6
2350.0000	.875	-151.9	3.858	105.2	.040	55.3	.293	-95.3
2400.0000	.876	-153.4	3.851	104.9	.042	57.9	.295	-96.3
2450.0000	.878	-154.0	3.761	104.5	.041	55.8	.294	-97.1
2500.0000	.878	-155.0	3.717	104.5	.039	56.4	.293	-98.4
2550.0000	.878	-156.4	3.705	103.9	.040	58.0	.298	-99.3
2600.0000	.883	-157.5	3.670	103.8	.042	58.0	.298	-100.6
2650.0000	.886	-158.5	3.621	103.9	.041	55.1	.297	-101.9
2700.0000	.890	-159.2	3.575	104.0	.037	58.3	.295	-103.6
2750.0000	.892	-160.3	3.605	103.7	.038	59.7	.294	-105.6
2800.0000	.897	-161.5	3.567	102.8	.042	59.3	.296	-106.9
2850.0000	.897	-162.5	3.536	103.0	.040	56.4	.295	-109.4
2900.0000	.892	-163.4	3.513	103.1	.040	61.5	.295	-111.3
2950.0000	.891	-164.8	3.494	102.0	.040	61.4	.296	-113.4
3000.0000	.887	-166.0	3.463	101.1	.040	60.5	.301	-115.6
3050.0000	.881	-167.3	3.416	101.5	.041	58.6	.302	-117.7
3100.0000	.868	-168.9	3.436	100.9	.042	62.6	.304	-119.5
3150.0000	.871	-169.6	3.376	99.9	.041	62.7	.308	-120.9
3200.0000	.861	-171.1	3.282	99.3	.041	62.4	.313	-122.4
3250.0000	.862	-173.5	3.326	98.5	.040	63.8	.316	-124.2
3300.0000	.848	-174.2	3.300	98.3	.041	66.5	.319	-125.2
3350.0000	.839	-175.5	3.181	98.0	.044	65.0	.320	-127.1
3400.0000	.832	-177.1	3.141	97.3	.040	66.7	.321	-128.7
3450.0000	.831	-178.6	3.122	96.5	.043	68.5	.323	-130.5

S-PARAMETERS

V<sub>DS</sub> = 10 V, I<sub>D</sub> = 100 mA set

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
3500.0000	.828	-180.0	3.115	95.9	.043	69.0	.324	-132.1
3550.0000	.828	178.6	3.042	95.7	.044	69.3	.326	-133.8
3600.0000	.835	177.3	2.993	95.5	.044	70.4	.329	-136.0
3650.0000	.841	175.9	2.984	94.3	.043	74.7	.330	-137.8
3700.0000	.849	174.2	3.007	93.2	.045	70.9	.332	-140.4
3750.0000	.852	172.8	2.969	93.2	.042	68.3	.335	-142.9
3800.0000	.858	171.4	2.932	93.1	.043	72.5	.339	-144.7
3850.0000	.862	169.8	2.891	91.7	.046	75.7	.344	-147.2
3900.0000	.865	168.0	2.912	90.7	.045	74.8	.347	-148.7
3950.0000	.866	166.4	2.878	89.4	.043	73.7	.355	-150.1
4000.0000	.868	165.1	2.869	90.0	.045	74.6	.361	-151.4
4050.0000	.863	163.6	2.848	88.8	.048	74.1	.366	-152.1
4100.0000	.857	162.2	2.767	87.6	.048	73.3	.372	-153.2
4150.0000	.852	160.9	2.801	87.0	.047	77.8	.381	-153.8
4200.0000	.849	159.8	2.770	87.3	.048	79.4	.387	-154.5
4250.0000	.844	158.6	2.726	87.0	.048	74.2	.390	-154.8
4300.0000	.839	157.3	2.703	85.9	.047	76.2	.396	-155.5
4350.0000	.838	156.1	2.679	85.1	.050	79.3	.400	-156.4
4400.0000	.837	155.0	2.671	85.1	.050	78.8	.401	-156.9
4450.0000	.835	153.7	2.699	85.7	.048	75.9	.407	-157.8
4500.0000	.834	152.2	2.632	84.2	.049	78.0	.409	-158.6
4550.0000	.838	151.2	2.592	83.8	.053	77.3	.414	-159.6
4600.0000	.840	150.1	2.622	83.7	.052	75.1	.420	-160.4
4650.0000	.838	148.7	2.652	83.6	.050	77.0	.426	-161.0
4700.0000	.841	147.7	2.588	82.0	.051	78.4	.436	-161.9
4750.0000	.843	146.6	2.513	82.8	.055	75.0	.440	-161.8
4800.0000	.844	145.7	2.576	81.0	.051	74.2	.453	-163.2
4850.0000	.842	144.5	2.528	80.7	.052	79.6	.461	-163.7
4900.0000	.841	143.9	2.508	81.0	.051	77.0	.470	-164.6
4950.0000	.839	142.8	2.411	80.7	.052	75.5	.479	-165.7
5000.0000	.840	142.1	2.434	80.6	.051	74.2	.485	-166.8
5050.0000	.833	141.5	2.444	79.1	.050	78.5	.492	-168.0
5100.0000	.829	140.6	2.410	79.7	.053	78.6	.495	-168.0
5150.0000	.827	139.5	2.334	80.1	.051	78.9	.498	-169.7
5200.0000	.822	139.2	2.371	80.4	.050	77.0	.499	-170.1
5250.0000	.816	138.6	2.372	78.1	.051	80.0	.504	-170.6
5300.0000	.810	137.9	2.361	78.6	.052	79.3	.508	-172.0
5350.0000	.809	136.7	2.331	79.6	.053	81.3	.508	-172.2
5400.0000	.805	136.1	2.332	80.2	.052	81.0	.514	-173.7
5450.0000	.803	135.3	2.375	76.6	.051	81.0	.522	-174.6
5500.0000	.801	134.4	2.289	76.8	.053	81.9	.529	-175.5
5550.0000	.799	133.3	2.337	78.7	.055	83.1	.533	-176.5
5600.0000	.800	132.3	2.357	77.7	.054	84.9	.537	-178.2
5650.0000	.796	131.3	2.319	75.9	.054	82.4	.541	-178.8
5700.0000	.793	130.4	2.311	74.8	.052	82.6	.540	179.7
5750.0000	.789	129.0	2.333	75.6	.057	85.5	.540	179.9
5800.0000	.783	127.6	2.333	75.6	.057	84.5	.537	178.8
5850.0000	.778	126.7	2.311	73.3	.056	84.0	.534	178.9
5900.0000	.773	125.4	2.255	72.5	.053	86.0	.527	178.3
5950.0000	.762	124.3	2.291	73.1	.058	86.4	.519	177.8

S-PARAMETERS

V<sub>DS</sub> = 10 V, I<sub>D</sub> = 100 mA set

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
6000.0000	.754	123.1	2.301	72.4	.059	84.6	.516	176.7
6050.0000	.747	121.9	2.291	71.5	.058	85.4	.509	176.0
6100.0000	.740	121.1	2.182	69.7	.058	88.1	.504	175.2
6150.0000	.736	119.9	2.216	71.9	.063	88.7	.501	174.0
6200.0000	.726	118.4	2.306	70.7	.063	83.2	.497	173.3
6250.0000	.726	117.4	2.232	69.7	.060	83.1	.497	172.3
6300.0000	.728	116.0	2.198	69.9	.064	88.4	.494	171.4
6350.0000	.722	114.2	2.246	70.1	.063	86.6	.496	170.6
6400.0000	.721	112.6	2.293	68.0	.064	85.2	.496	169.7
6450.0000	.720	111.2	2.221	68.1	.064	84.8	.495	169.1
6500.0000	.723	109.0	2.234	68.4	.067	85.8	.496	168.3
6550.0000	.715	107.7	2.272	68.7	.069	83.4	.490	167.6
6600.0000	.712	106.3	2.342	66.5	.068	84.4	.487	166.8
6650.0000	.706	105.1	2.290	65.3	.068	85.9	.485	166.6
6700.0000	.696	103.4	2.300	65.9	.071	83.7	.480	165.9
6750.0000	.688	101.7	2.283	64.5	.069	83.7	.476	165.2
6800.0000	.679	100.3	2.320	64.4	.072	85.1	.472	164.3
6850.0000	.668	98.6	2.339	61.9	.073	83.2	.469	163.6
6900.0000	.657	96.6	2.265	62.1	.070	82.3	.467	162.9
6950.0000	.648	94.7	2.289	63.3	.071	83.3	.463	161.9
7000.0000	.643	92.7	2.331	61.5	.075	83.1	.465	160.9
7050.0000	.640	90.7	2.317	59.4	.073	80.3	.462	160.3
7100.0000	.635	87.9	2.263	60.5	.072	81.2	.460	159.4
7150.0000	.627	85.3	2.314	61.0	.072	83.1	.460	158.8
7200.0000	.627	82.6	2.373	59.3	.077	80.8	.460	157.3
7250.0000	.625	79.8	2.343	57.0	.073	78.3	.456	156.8
7300.0000	.620	77.1	2.316	57.6	.074	82.7	.461	155.6
7350.0000	.615	73.9	2.383	57.8	.077	80.3	.460	154.5
7400.0000	.612	71.2	2.390	55.2	.079	79.3	.461	153.8
7450.0000	.607	68.3	2.336	54.4	.076	76.6	.463	152.9
7500.0000	.598	66.2	2.355	54.8	.078	80.5	.466	151.5
7550.0000	.593	63.1	2.422	54.2	.083	80.2	.471	150.0
7600.0000	.590	60.5	2.431	52.5	.081	78.4	.475	148.8
7650.0000	.582	57.9	2.372	51.9	.082	78.6	.484	147.7
7700.0000	.574	55.2	2.411	51.8	.086	78.4	.486	146.1
7750.0000	.570	51.8	2.493	51.0	.089	79.1	.494	144.7
7800.0000	.570	48.5	2.511	48.8	.088	76.5	.503	143.2
7850.0000	.565	45.1	2.504	47.9	.088	77.8	.513	142.0
7900.0000	.564	41.5	2.516	47.1	.091	76.3	.518	140.7
7950.0000	.560	37.6	2.607	45.3	.095	74.4	.523	139.1
8000.0000	.559	33.7	2.636	42.3	.092	73.3	.532	137.6
8050.0000	.555	30.5	2.567	41.0	.093	75.0	.541	136.6
8100.0000	.555	27.0	2.597	40.3	.097	72.2	.545	135.6
8150.0000	.549	23.7	2.597	37.6	.094	71.1	.549	134.1
8200.0000	.548	20.4	2.601	35.5	.098	71.7	.558	132.6
8250.0000	.539	17.3	2.539	33.7	.100	69.9	.562	131.4
8300.0000	.530	14.3	2.508	33.6	.098	69.0	.569	130.1
8350.0000	.521	10.9	2.527	31.4	.099	69.1	.574	128.1
8400.0000	.513	7.0	2.494	29.1	.102	67.2	.580	126.8
8450.0000	.506	3.7	2.472	27.7	.102	66.7	.589	124.6



S-PARAMETERS

V<sub>DS</sub> = 10 V, I<sub>D</sub> = 100 mA set

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
8500.0000	.499	.4	2.427	27.5	.103	67.0	.584	123.0
8550.0000	.492	-3.4	2.443	25.9	.105	64.8	.596	120.7
8600.0000	.485	-7.2	2.426	23.4	.107	63.9	.594	119.4
8650.0000	.481	-10.8	2.370	22.9	.104	62.3	.598	117.6
8700.0000	.479	-15.0	2.384	22.1	.105	62.3	.598	115.5
8750.0000	.476	-19.2	2.395	20.2	.107	61.8	.599	114.5
8800.0000	.475	-23.0	2.316	18.0	.108	59.9	.602	112.3
8850.0000	.470	-27.1	2.282	17.2	.110	59.2	.600	110.9
8900.0000	.472	-30.8	2.303	16.5	.111	57.2	.604	109.2
8950.0000	.467	-34.1	2.274	14.5	.111	57.7	.600	107.3
9000.0000	.467	-37.9	2.228	13.0	.110	54.6	.603	105.7
9050.0000	.464	-41.4	2.192	12.3	.112	53.2	.597	103.2
9100.0000	.462	-45.4	2.201	10.9	.114	51.3	.595	101.5
9150.0000	.459	-49.3	2.157	9.5	.114	51.1	.595	99.4
9200.0000	.459	-52.3	2.122	8.7	.113	49.4	.588	97.2
9250.0000	.457	-56.0	2.101	7.8	.114	47.0	.587	95.6
9300.0000	.455	-59.9	2.088	6.8	.113	46.5	.579	93.8
9350.0000	.458	-63.4	2.061	5.7	.112	44.8	.574	91.8
9400.0000	.460	-66.7	2.036	5.2	.111	45.6	.568	90.0
9450.0000	.465	-70.6	2.024	4.3	.109	44.3	.561	88.5
9500.0000	.470	-73.7	2.008	3.6	.109	42.6	.557	86.8
9550.0000	.475	-77.2	2.002	2.8	.109	42.6	.551	85.0
9600.0000	.483	-80.3	1.994	2.0	.108	41.8	.546	83.5
9650.0000	.491	-83.6	2.012	.6	.105	39.8	.546	81.8
9700.0000	.499	-87.1	1.992	-4	.105	40.2	.543	80.3
9750.0000	.506	-90.2	1.983	-1.5	.106	39.6	.537	79.2
9800.0000	.514	-93.4	1.984	-2.9	.105	38.1	.536	77.7
9850.0000	.523	-97.2	1.985	-5.1	.104	38.5	.527	76.7
9900.0000	.532	-99.9	1.957	-6.7	.106	36.4	.527	75.0
9950.0000	.542	-102.9	1.955	-7.2	.104	36.9	.518	74.2
10000.0000	.551	-106.0	1.933	-8.6	.103	34.8	.513	73.9
10050.0000	.560	-109.0	1.923	-11.1	.102	35.8	.508	72.7
10100.0000	.569	-111.8	1.884	-12.1	.104	34.7	.496	72.9
10150.0000	.584	-114.3	1.871	-12.9	.104	33.6	.502	70.7
10200.0000	.591	-116.7	1.886	-14.6	.105	34.8	.490	70.6
10250.0000	.604	-118.9	1.856	-16.6	.104	32.6	.485	70.3
10300.0000	.613	-121.7	1.816	-17.6	.103	32.6	.486	68.7
10350.0000	.628	-126.4	1.792	-19.3	.104	30.6	.482	68.5
10400.0000	.638	-128.5	1.793	-20.6	.103	31.9	.479	66.5
10450.0000	.653	-131.1	1.766	-22.7	.104	28.9	.474	65.1
10500.0000	.662	-132.8	1.730	-23.9	.103	28.3	.474	63.8
10550.0000	.678	-135.8	1.734	-24.9	.104	28.2	.460	62.6
10600.0000	.690	-138.3	1.719	-27.1	.106	26.4	.453	61.7
10650.0000	.702	-141.1	1.666	-29.1	.104	23.8	.443	60.4
10700.0000	.715	-144.1	1.629	-30.2	.104	24.5	.427	59.7
10750.0000	.726	-146.6	1.603	-31.2	.102	22.5	.412	59.3
10800.0000	.742	-148.8	1.589	-33.5	.102	20.8	.398	58.4
10850.0000	.753	-150.9	1.555	-35.2	.101	19.5	.382	57.2
10900.0000	.766	-153.3	1.510	-36.6	.098	21.2	.365	56.2
10950.0000	.773	-155.9	1.481	-37.6	.101	19.7	.355	55.8
11000.0000	.780	-158.0	1.458	-39.1	.097	17.9	.339	54.9

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