NEC

SILICON TRANSISTOR

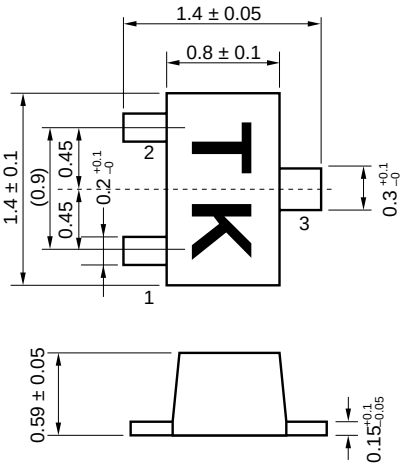
2SC5435

NPN EPITAXIAL SILICON TRANSISTOR FOR HIGH-FREQUENCY LOW-NOISE AMPLIFICATION

FEATURE

- Ultra super mini-mold thin flat package (1.4 mm × 0.8 mm × 0.59 mm: TYP.)
- Contains same chip as 2SC5010

PACKAGE DIMENSIONS (in mm)



PIN CONNECTIONS
1: Emitter
2: Base
3: Collector

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C)

PARAMETER	SYMBOL	RATING	UNIT
Collector to Base Voltage	V_{CBO}	9	V
Collector to Emitter Voltage	V_{CEO}	6	V
Emitter to Base Voltage	V_{EBO}	2	V
Collector Current	I_C	30	mA
Total Power Dissipation	P_T	125	mW
Junction Temperature	T_j	150	°C
Storage Temperature	T_{stg}	–65 to +150	°C

ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Collector Cut-off Current	I_{CBO}	V_{CB} = 5 V, I_E = 0			100	nA
Emitter Cut-off Current	I_{EBO}	V_{EB} = 1 V, I_C = 0			100	nA
DC Current Gain	h_{FE}	V_{CE} = 3 V, I_C = 10 mA **Note 1**	75		140	
Gain Bandwidth Product	f_T	V_{CE} = 3 V, I_C = 10 mA, f = 2 GHz		12.0		GHz
Reverse Transfer Capacitance	C_{re}	V_{CB} = 3 V, I_E = 0, f = 1 MHz **Note 2**		0.4	0.7	pF
Insertion Power Gain	$\|S_{21e}\|^2$	V_{CE} = 3 V, I_C = 10 mA, f = 2 GHz	7.0	8.5		dB
Noise Figure	NF	V_{CE} = 3 V, I_C = 3 mA, f = 2 GHz		1.5	2.5	dB

Notes 1. Pulse measurement $P_W \leq 350\ \mu s$, duty cycle ≤ 2 %

2. Collector to base capacitance measured by capacitance meter (automatic balance bridge method) when emitter pin is connected to the guard pin.

Because this product uses high-frequency process, avoid excessive input of static electricity, etc.

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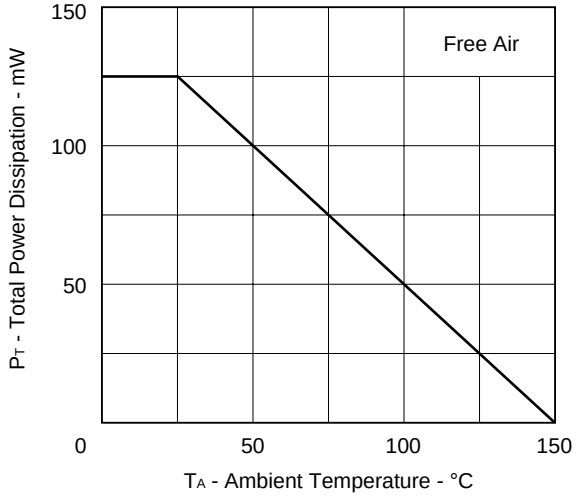
h_{FE} CLASSIFICATION

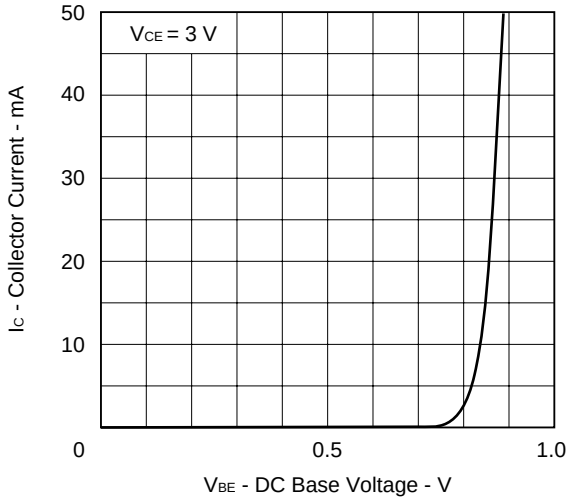
RANK	EB	FB
Marking	TK	TL
h_{FE}	75 to 110	95 to 140

TYPICAL CHARACTERISTICS (T_A = 25 °C)

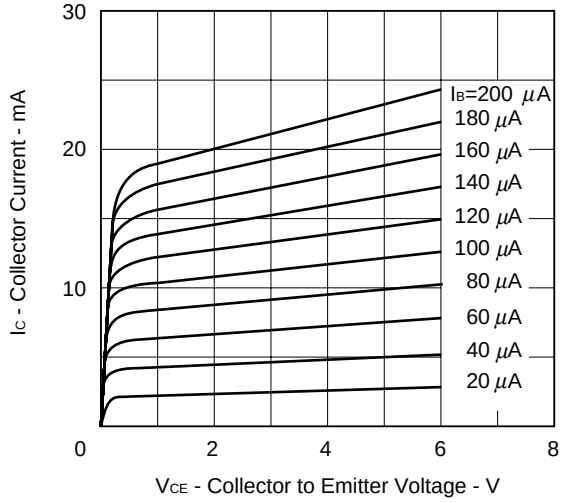
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



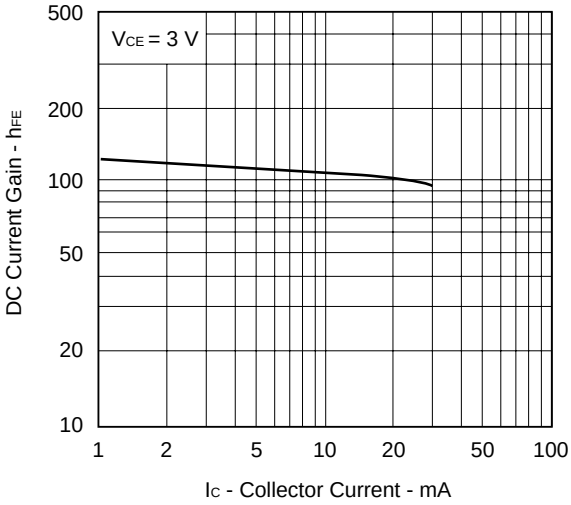
COLLECTOR CURRENT vs. DC BASE VOLTAGE



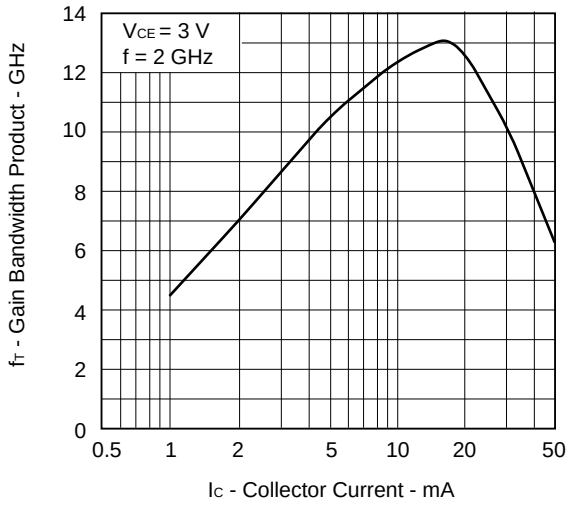
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



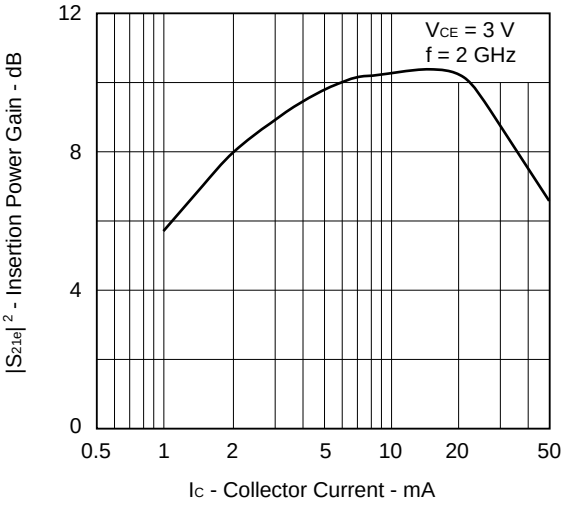
DC CURRENT GAIN vs. COLLECTOR CURRENT



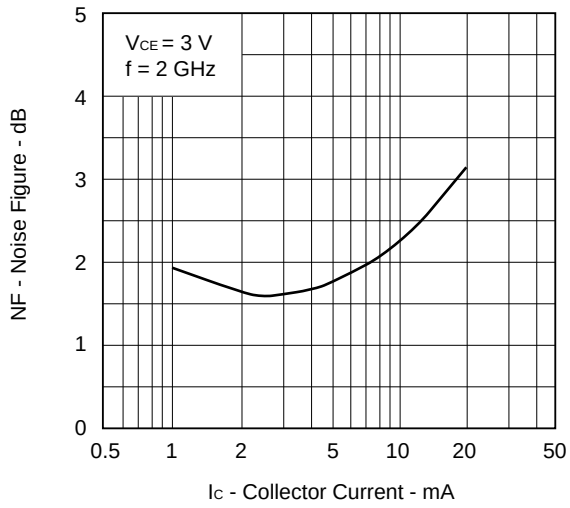
GAIN BANDWIDTH PRODUCT
vs. COLLECTOR CURRENT



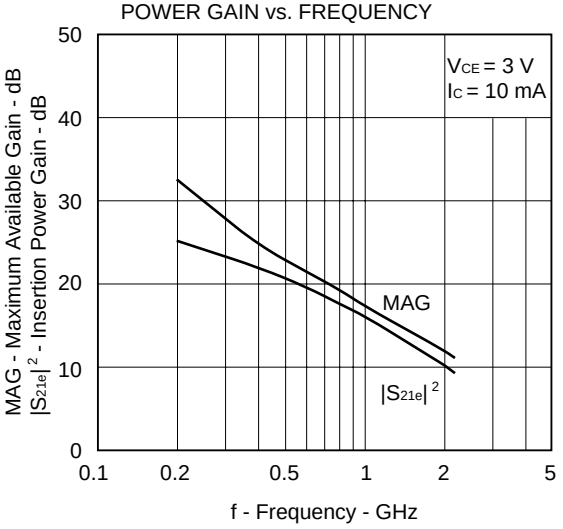
INSERTION POWER GAIN
vs. COLLECTOR CURRENT



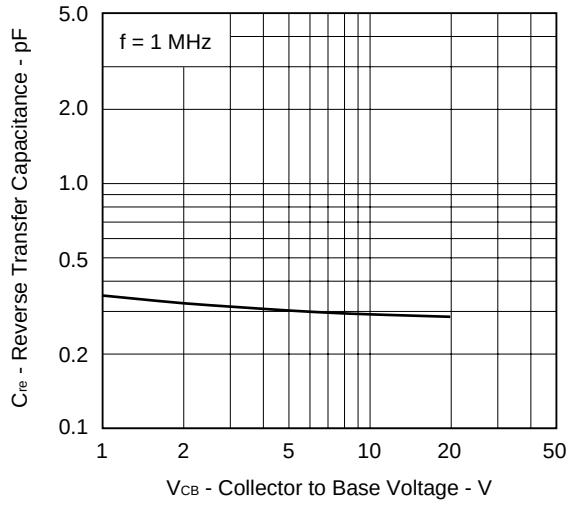
NOISE FIGURE vs. COLLECTOR CURRENT



MAXIMUM AVAILABLE GAIN/INSERTION
POWER GAIN vs. FREQUENCY



REVERSE TRANSFER CAPACITANCE
vs. COLLECTOR TO BASE VOLTAGE



2SC5435 S PARAMETER

V_{CE} = 3.0 V, I_C = 10.0 mA, Z_0 = 50 Ω

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
200.00	0.598	–41.6	18.159	140.3	0.031	70.0	0.812	–26.3
400.00	0.414	–79.4	12.683	117.6	0.048	62.5	0.575	–38.7
600.00	0.330	–103.3	9.464	103.5	0.062	61.7	0.447	–45.3
800.00	0.278	–120.6	7.552	95.5	0.074	62.2	0.385	–48.1
1000.00	0.246	–136.4	6.295	90.1	0.087	61.8	0.345	–48.2
1200.00	0.237	–150.5	5.402	84.8	0.101	62.0	0.310	–47.3
1400.00	0.239	–160.6	4.670	79.1	0.116	62.0	0.277	–48.3
1600.00	0.235	–170.5	4.065	74.9	0.131	62.4	0.247	–50.7
1800.00	0.239	179.4	3.597	71.5	0.143	63.2	0.225	–54.1
2000.00	0.257	170.1	3.246	68.0	0.154	61.8	0.206	–57.7
2200.00	0.280	164.1	2.987	63.2	0.167	60.3	0.184	–62.1
2400.00	0.299	160.0	2.780	59.2	0.181	58.6	0.165	–69.6
2600.00	0.315	155.6	2.609	57.0	0.199	57.9	0.153	–77.7
2800.00	0.334	151.5	2.465	54.8	0.210	58.1	0.146	–85.0
3000.00	0.350	148.7	2.272	51.0	0.217	56.6	0.136	–92.0

V_{CE} = 3.0 V, I_C = 7.0 mA, Z_0 = 50 Ω

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
200.00	0.688	–38.7	15.412	145.5	0.034	70.5	0.863	–22.7
400.00	0.498	–69.0	11.461	123.2	0.053	61.6	0.645	–36.0
600.00	0.400	–92.5	8.826	108.0	0.067	58.4	0.509	–44.4
800.00	0.332	–109.1	7.158	99.1	0.079	58.4	0.439	–48.5
1000.00	0.286	–124.4	6.055	93.0	0.091	58.1	0.391	–49.2
1200.00	0.263	–139.1	5.221	87.3	0.104	57.9	0.349	–48.9
1400.00	0.257	–150.4	4.513	81.1	0.118	58.4	0.311	–50.2
1600.00	0.249	–161.0	3.957	76.6	0.133	59.0	0.277	–52.6
1800.00	0.248	–172.1	3.495	72.8	0.143	60.3	0.253	–55.9
2000.00	0.262	177.1	3.158	69.1	0.153	59.1	0.232	–59.2
2200.00	0.283	169.9	2.903	64.2	0.166	57.6	0.209	–63.3
2400.00	0.302	164.9	2.712	59.9	0.180	56.4	0.189	–70.0
2600.00	0.317	159.9	2.547	57.5	0.197	55.8	0.177	–77.7
2800.00	0.333	155.3	2.408	55.3	0.206	56.2	0.169	–83.9
3000.00	0.350	151.9	2.221	51.5	0.213	55.2	0.158	–89.8

V_{CE} = 3.0 V, I_C = 5.0 mA, Z_0 = 50 Ω

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
200.00	0.773	–31.6	12.320	150.7	0.036	72.7	0.910	–18.8
400.00	0.595	–58.3	9.846	129.7	0.060	62.0	0.725	–31.8
600.00	0.491	–81.2	7.923	114.1	0.075	56.6	0.587	–41.7
800.00	0.412	–97.4	6.600	103.8	0.087	55.2	0.512	–47.3
1000.00	0.350	–111.8	5.638	96.9	0.098	54.0	0.457	–49.1
1200.00	0.310	–126.2	4.908	90.8	0.110	53.7	0.406	–49.4
1400.00	0.293	–138.4	4.286	83.9	0.124	53.8	0.362	–51.0
1600.00	0.278	–149.6	3.766	78.8	0.136	55.2	0.323	–53.6
1800.00	0.267	–161.4	3.388	74.5	0.145	56.1	0.296	–56.8
2000.00	0.274	–173.7	3.018	70.5	0.154	55.1	0.272	–60.1
2200.00	0.293	177.6	2.786	65.3	0.165	54.0	0.247	–63.9
2400.00	0.310	171.5	2.600	60.9	0.179	53.0	0.225	–69.8
2600.00	0.323	165.9	2.492	58.1	0.194	53.1	0.212	–76.5
2800.00	0.337	160.4	2.314	55.6	0.203	53.5	0.204	–82.2
3000.00	0.354	156.2	2.138	51.7	0.208	52.4	0.191	–86.9

2SC5435 S PARAMETER

V_{CE} = 3.0 V, I_C = 3.0 mA, Z_0 = 50 Ω

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
200.00	0.858	–24.0	8.684	157.0	0.038	74.9	0.951	–14.1
400.00	0.716	–45.8	7.442	138.3	0.067	63.9	0.818	–25.7
600.00	0.617	–67.2	6.355	122.7	0.088	56.7	0.693	–36.4
800.00	0.538	–82.8	5.529	111.3	0.101	52.6	0.621	–43.8
1000.00	0.460	–96.4	4.885	103.3	0.112	49.4	0.564	–47.0
1200.00	0.399	–109.7	4.332	96.5	0.124	47.3	0.504	–48.4
1400.00	0.365	–122.4	3.819	88.6	0.136	47.6	0.449	–50.6
1600.00	0.338	–133.9	3.390	82.5	0.145	48.7	0.403	–53.5
1800.00	0.314	–145.6	3.039	77.6	0.151	49.4	0.370	–56.9
2000.00	0.304	–159.0	2.758	73.0	0.157	48.2	0.341	–60.0
2200.00	0.316	–170.1	2.549	67.1	0.167	47.7	0.314	–63.5
2400.00	0.331	–177.4	2.402	62.6	0.178	47.3	0.289	–69.1
2600.00	0.340	175.8	2.289	59.2	0.191	47.6	0.275	–74.9
2800.00	0.349	169.4	2.133	56.4	0.197	48.6	0.268	–79.6
3000.00	0.364	163.8	1.977	52.1	0.201	47.9	0.252	–83.3

V_{CE} = 3.0 V, I_C = 1.0 mA, Z_0 = 50 Ω

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
200.00	0.954	–13.7	3.491	165.5	0.040	79.6	0.989	–7.4
400.00	0.886	–27.2	3.221	152.2	0.078	71.1	0.935	–14.5
600.00	0.817	–43.2	2.976	139.2	0.110	62.2	0.864	–23.4
800.00	0.782	–57.0	2.826	127.6	0.134	55.5	0.828	–31.9
1000.00	0.725	–68.5	2.750	118.6	0.154	48.9	0.803	–36.9
1200.00	0.654	–79.3	2.528	111.1	0.171	43.2	0.751	–40.0
1400.00	0.594	–90.9	2.298	101.8	0.186	39.7	0.690	–43.5
1600.00	0.545	–102.6	2.186	93.2	0.191	38.2	0.632	–47.4
1800.00	0.502	–112.9	2.053	86.4	0.193	36.2	0.592	–51.8
2000.00	0.452	–125.6	1.892	80.3	0.191	32.5	0.558	–55.7
2200.00	0.434	–138.7	1.770	73.0	0.196	30.6	0.523	–59.2
2400.00	0.440	–149.2	1.689	66.6	0.199	29.6	0.491	–64.5
2600.00	0.436	–157.2	1.632	61.9	0.202	29.8	0.477	–69.9
2800.00	0.427	–165.3	1.536	57.9	0.197	30.6	0.472	–74.1
3000.00	0.427	–173.5	1.438	52.9	0.193	30.3	0.453	–77.3

V_{CE} = 1.0 V, I_C = 5.0 mA, Z_0 = 50 Ω

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
200.00	0.750	–36.8	12.139	148.1	0.043	69.6	0.883	–23.4
400.00	0.570	–67.3	9.418	126.2	0.070	58.2	0.669	–39.8
600.00	0.476	–92.0	7.424	110.4	0.087	53.3	0.526	–51.9
800.00	0.404	–109.5	6.104	100.4	0.098	51.4	0.444	–58.7
1000.00	0.354	–125.4	5.191	93.7	0.111	50.3	0.380	–61.7
1200.00	0.330	–140.0	4.491	87.3	0.124	49.8	0.326	–63.7
1400.00	0.323	–151.1	3.905	80.4	0.139	50.3	0.281	–67.3
1600.00	0.312	–161.5	3.422	75.5	0.151	51.5	0.245	–71.8
1800.00	0.308	–172.4	3.031	71.2	0.161	52.3	0.219	–76.5
2000.00	0.320	177.0	2.732	67.1	0.170	51.2	0.194	–82.0
2200.00	0.342	169.8	2.517	61.9	0.183	49.8	0.169	–90.3
2400.00	0.360	164.6	2.361	57.6	0.197	48.9	0.157	–100.8
2600.00	0.373	159.6	2.243	54.8	0.212	48.9	0.154	–110.5
2800.00	0.389	154.8	2.075	52.4	0.220	49.0	0.150	–118.5
3000.00	0.405	151.2	1.914	48.2	0.226	47.8	0.147	–126.7

2SC5435 S PARAMETER

V_{CE} = 1.0 V, I_C = 3.0 mA, Z_0 = 50 Ω

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
200.00	0.845	–27.5	8.623	154.9	0.048	72.9	0.936	–17.5
400.00	0.692	–52.2	7.239	135.2	0.080	60.6	0.777	–31.9
600.00	0.596	–75.4	6.076	119.0	0.103	53.2	0.643	–44.6
800.00	0.516	–92.2	5.213	107.7	0.116	48.5	0.561	–53.0
1000.00	0.447	–107.1	4.559	99.7	0.129	45.3	0.492	–57.2
1200.00	0.398	–121.7	4.018	92.7	0.141	43.5	0.429	–59.9
1400.00	0.375	–134.1	3.526	84.8	0.154	43.6	0.373	–63.5
1600.00	0.355	–145.5	3.117	78.8	0.163	44.7	0.328	–67.9
1800.00	0.336	–157.2	2.779	73.8	0.169	45.0	0.295	–72.2
2000.00	0.336	–169.7	2.520	69.4	0.175	44.1	0.266	–76.7
2200.00	0.354	–179.1	2.330	63.9	0.185	43.1	0.235	–83.0
2400.00	0.370	174.4	2.187	58.8	0.196	42.6	0.217	–91.3
2600.00	0.380	168.5	2.083	55.6	0.209	43.0	0.210	–99.1
2800.00	0.391	162.7	1.931	52.8	0.214	43.5	0.203	–105.2
3000.00	0.406	158.0	1.785	48.3	0.218	42.8	0.194	–111.2

V_{CE} = 1.0 V, I_C = 1.0 mA, Z_0 = 50 Ω

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
200.00	0.950	–15.4	3.449	164.3	0.050	80.0	0.985	–9.0
400.00	0.874	–30.3	3.205	149.9	0.094	68.3	0.921	–17.6
600.00	0.804	–47.6	2.937	136.1	0.132	59.3	0.840	–28.0
800.00	0.764	–62.1	2.773	123.9	0.160	51.8	0.796	–37.4
1000.00	0.700	–74.5	2.666	114.7	0.181	44.6	0.758	–43.0
1200.00	0.628	–86.3	2.427	106.6	0.200	38.8	0.697	–46.8
1400.00	0.574	–98.6	2.200	96.9	0.216	35.6	0.630	–51.1
1600.00	0.529	–110.5	2.080	88.4	0.220	33.5	0.570	–55.7
1800.00	0.487	–121.4	1.938	81.7	0.220	31.1	0.530	–60.5
2000.00	0.447	–134.5	1.779	75.6	0.218	27.3	0.493	–64.9
2200.00	0.438	–147.4	1.660	68.2	0.222	25.2	0.453	–69.4
2400.00	0.446	–157.1	1.581	61.7	0.224	24.4	0.424	–75.7
2600.00	0.445	–164.9	1.523	57.4	0.225	24.1	0.412	–81.8
2800.00	0.440	–172.6	1.425	53.3	0.220	24.1	0.406	–86.3
3000.00	0.444	179.8	1.332	48.0	0.216	23.5	0.387	–90.2

[MEMO]

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