To our customers,

Old Company Name in Catalogs and Other Documents

On April 1st, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

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

April 1st, 2010
Renesas Electronics Corporation

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

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NPN SILICON RF TRANSISTOR

Phase-out/Discontinued

2SC5437

NPN EPITAXIAL SILICON TRANSISTOR FOR HIGH-FREQUENCY LOW-NOISE AMPLIFICATION FLAT-LEAD 3-PIN THIN-TYPE ULTRA SUPER MINIMOLD

FEATURES

- Contains same chip as 2SC5195
- Flat-lead 3-pin thin-type ultra super minimold package

★ ORDERING INFORMATION

Part Number	Quantity	Supplying Form
2SC5437	50 pcs (Non reel)	• 8 mm wide embossed taping
2SC5437-T1	3 kpcs/reel	• Pin 3 (collector) face the perforation side of the tape

Remark To order evaluation samples, contact your nearby sales office.
The unit sample quantity is 50 pcs.

ABSOLUTE MAXIMUM RATINGS (T_A = +25°C)

Parameter	Symbol	Ratings	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	100	mA
Total Power Dissipation	P_{tot} Note	125	mW
Junction Temperature	T_j	150	°C
Storage Temperature	T_{stg}	−65 to +150	°C

Note Free air

Because this product uses high-frequency technology, avoid excessive static electricity, etc.

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The mark ★ shows major revised points.

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 mA	–	–	100	nA
Emitter Cut-off Current	I_{EBO}	V_{EB} = 1 V, I_C = 0 mA	–	–	100	nA
DC Current Gain	h_{FE} Note 1	V_{CE} = 1 V, I_C = 3 mA	80	–	145	–
Gain Bandwidth Product (1)	f_T	V_{CE} = 1 V, I_C = 3 mA, f = 2 GHz	4.0	5.0	–	GHz
Gain Bandwidth Product (2)	f_T	V_{CE} = 3 V, I_C = 20 mA, f = 2 GHz	–	9.5	–	GHz
Insertion Power Gain (1)	$\|S_{21e}\|^2$	V_{CE} = 1 V, I_C = 3 mA, f = 2 GHz	3.0	4.0	–	dB
Insertion Power Gain (2)	$\|S_{21e}\|^2$	V_{CE} = 3 V, I_C = 20 mA, f = 2 GHz	–	8.0	–	dB
Noise Figure (1)	NF	V_{CE} = 1 V, I_C = 3 mA, f = 2 GHz	–	1.9	2.5	dB
Noise Figure (2)	NF	V_{CE} = 3 V, I_C = 7 mA, f = 2 GHz	–	1.7	–	dB
Reverse Transfer Capacitance	C_{re} Note 2	V_{CB} = 1 V, I_E = 0 mA, f = 1 MHz	–	0.7	0.8	pF

Notes 1. Pulse measurement: PW ≤ 350 μs, Duty Cycle ≤ 2%

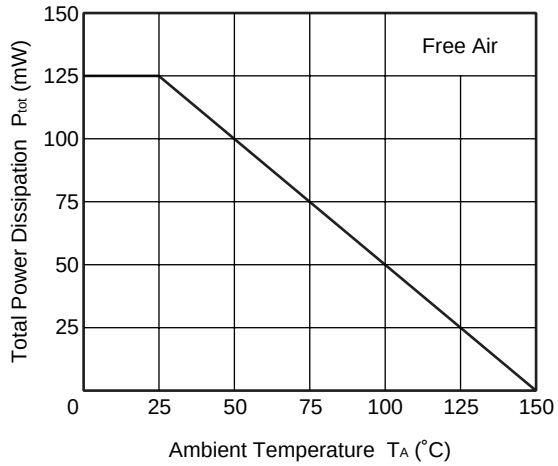
2. Collector to base capacitance when the emitter grounded

h_{FE} CLASSIFICATION

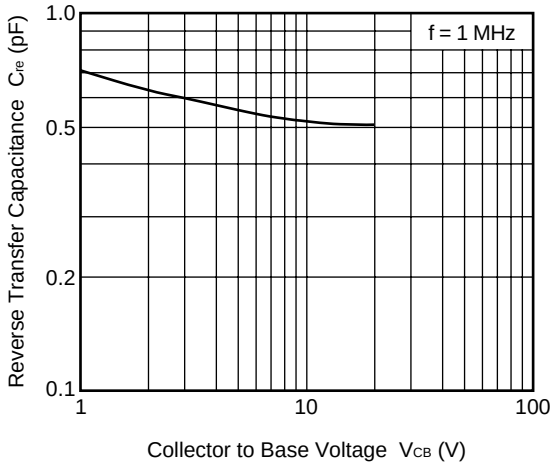
Rank	EB	FB
Marking	TS	TT
h_{FE} Value	80 to 110	100 to 145

TYPICAL CHARACTERISTICS (Unless otherwise specified, T_A = +25°C)

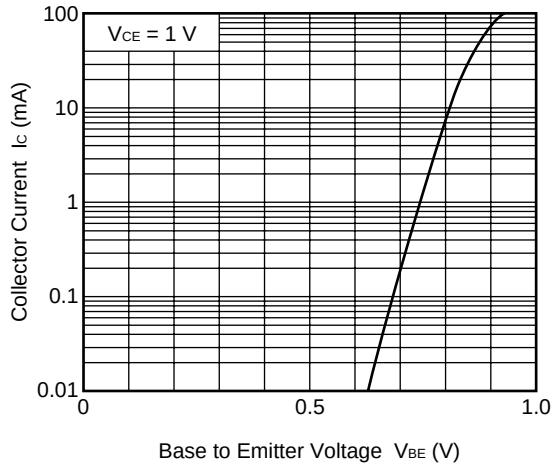
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



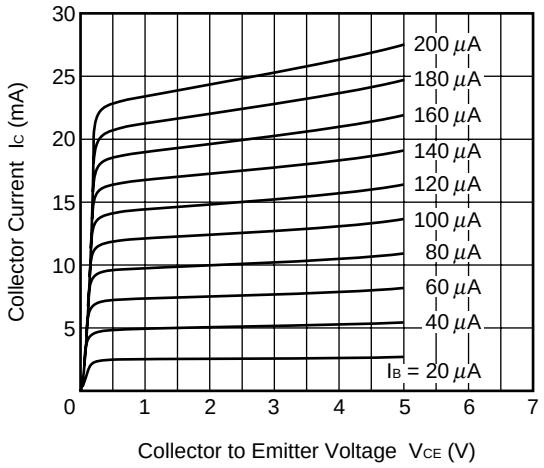
REVERSE TRANSFER CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



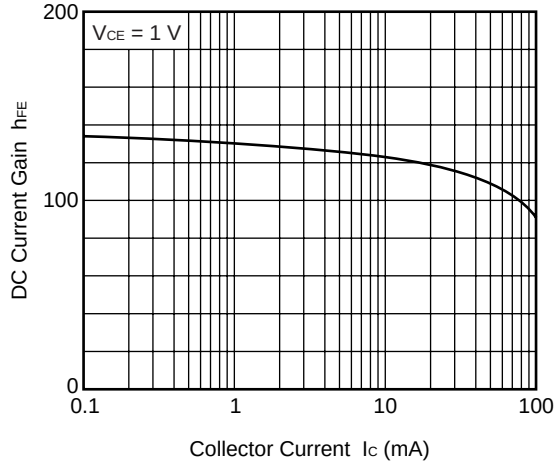
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



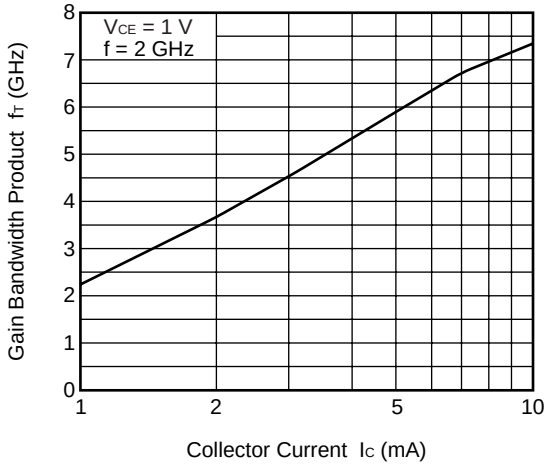
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



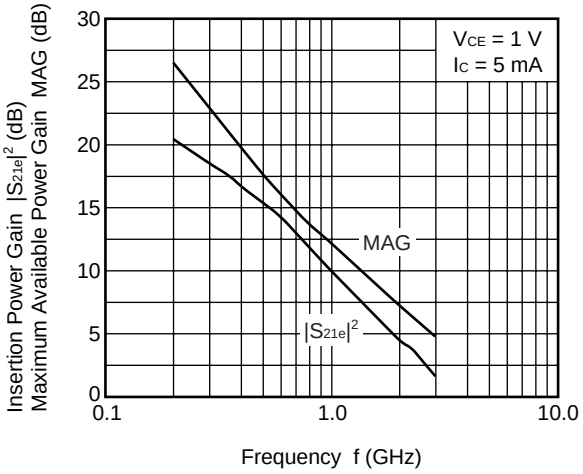
DC CURRENT GAIN vs. COLLECTOR CURRENT



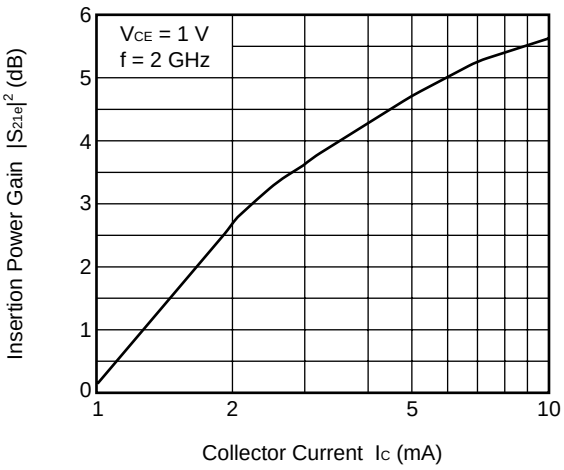
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



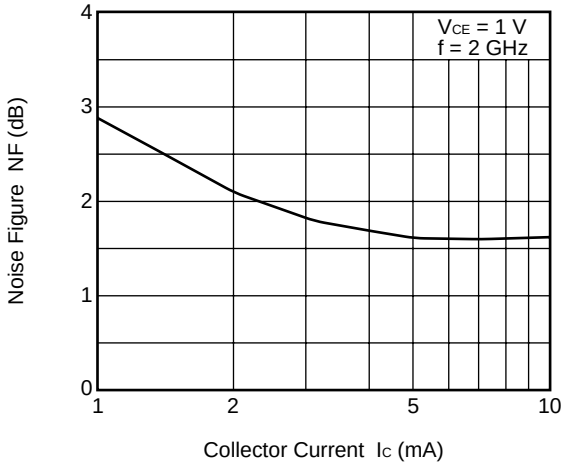
INSERTION POWER GAIN, MAG vs. FREQUENCY



INSERTION POWER GAIN vs. COLLECTOR CURRENT



NOISE FIGURE vs. COLLECTOR CURRENT



Remark The graphs indicate nominal characteristics.

S-PARAMETERS

V_{CE} = 1 V, I_C = 1 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.2	0.903	–35.0	3.343	151.0	0.092	66.0	0.939	–18.2
0.4	0.746	–66.3	2.695	127.5	0.155	46.6	0.781	–32.4
0.6	0.675	–93.2	2.223	108.3	0.189	33.9	0.662	–45.0
0.8	0.608	–112.2	1.934	94.8	0.200	24.4	0.600	–53.4
1.0	0.561	–128.6	1.661	84.9	0.207	17.1	0.553	–58.4
1.2	0.541	–143.1	1.432	75.1	0.209	13.0	0.510	–62.9
1.4	0.539	–153.8	1.283	66.2	0.203	12.1	0.473	–68.7
1.6	0.525	–162.9	1.168	59.9	0.191	11.5	0.451	–75.7
1.8	0.510	–173.3	1.041	53.8	0.175	10.6	0.443	–82.6
2.0	0.523	176.9	0.938	47.9	0.165	9.4	0.431	–89.8
2.2	0.548	170.0	0.869	40.8	0.159	11.7	0.420	–99.0
2.4	0.562	164.7	0.825	35.6	0.154	16.0	0.432	–109.5
2.6	0.573	159.6	0.774	32.7	0.150	21.5	0.457	–117.6
2.8	0.584	154.7	0.702	29.4	0.151	27.9	0.467	–124.6
3.0	0.605	150.7	0.656	24.5	0.153	32.5	0.468	–132.2

V_{CE} = 1 V, I_C = 3 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.2	0.748	–56.1	7.879	139.2	0.080	56.6	0.811	–35.7
0.4	0.584	–97.0	5.518	114.6	0.114	40.2	0.552	–58.2
0.6	0.526	–123.2	4.133	98.1	0.129	33.4	0.420	–73.5
0.8	0.486	–141.4	3.325	88.3	0.135	30.0	0.346	–82.6
1.0	0.469	–156.1	2.790	81.2	0.141	28.6	0.292	–89.6
1.2	0.477	–167.1	2.327	74.1	0.148	28.9	0.255	–97.0
1.4	0.483	–174.4	2.050	67.2	0.155	31.6	0.235	–105.6
1.6	0.473	178.3	1.832	62.4	0.157	34.6	0.223	–114.0
1.8	0.473	169.6	1.617	57.8	0.160	36.3	0.218	–122.0
2.0	0.494	162.6	1.447	52.8	0.164	36.2	0.212	–131.8
2.2	0.516	157.7	1.325	46.8	0.174	36.6	0.221	–142.3
2.4	0.530	153.7	1.255	42.0	0.185	37.6	0.242	–150.4
2.6	0.542	149.7	1.184	39.1	0.197	39.6	0.261	–155.7
2.8	0.556	146.0	1.085	36.5	0.205	41.2	0.277	–161.8
3.0	0.575	143.3	1.005	31.7	0.210	41.6	0.289	–167.8

V_{CE} = 1 V, I_C = 5 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.2	0.598	–68.1	10.072	129.5	0.066	50.2	0.684	–50.7
0.4	0.430	–109.0	6.323	106.6	0.086	39.1	0.419	–77.9
0.6	0.375	–132.9	4.527	93.0	0.097	37.2	0.311	–95.4
0.8	0.347	–150.0	3.563	85.1	0.105	37.2	0.251	–107.0
1.0	0.340	–163.6	2.965	79.6	0.114	38.8	0.214	–118.5
1.2	0.351	–173.4	2.454	73.8	0.126	40.4	0.195	–129.8
1.4	0.358	–179.8	2.157	68.0	0.138	42.9	0.190	–139.5
1.6	0.356	173.5	1.927	64.0	0.146	45.9	0.190	–147.9
1.8	0.362	165.7	1.699	60.1	0.153	47.5	0.190	–156.7
2.0	0.383	159.3	1.524	55.8	0.162	46.9	0.197	–166.0
2.2	0.404	155.2	1.397	50.4	0.174	45.9	0.216	–173.4
2.4	0.421	151.7	1.321	46.0	0.189	45.6	0.236	–178.0
2.6	0.435	148.1	1.256	43.5	0.204	46.7	0.255	178.3
2.8	0.452	144.8	1.159	41.2	0.214	47.4	0.271	173.9
3.0	0.472	142.5	1.072	37.1	0.220	46.9	0.287	169.6

V_{CE} = 1 V, I_C = 7 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.2	0.561	–85.4	12.549	125.2	0.060	50.5	0.627	–59.0
0.4	0.469	–128.0	7.589	103.4	0.079	41.8	0.381	–89.6
0.6	0.444	–149.4	5.337	90.6	0.092	42.3	0.290	–109.0
0.8	0.432	–164.1	4.184	83.5	0.103	43.9	0.242	–123.1
1.0	0.438	–175.2	3.455	78.0	0.115	45.5	0.216	–136.1
1.2	0.456	177.5	2.933	72.0	0.130	46.7	0.209	–147.8
1.4	0.462	172.7	2.503	66.6	0.146	48.4	0.211	–156.1
1.6	0.457	166.8	2.226	62.8	0.158	50.1	0.213	–163.6
1.8	0.463	159.6	1.953	58.9	0.168	50.8	0.217	–171.8
2.0	0.487	154.2	1.744	54.6	0.179	49.6	0.228	–179.9
2.2	0.506	150.6	1.589	49.4	0.193	47.9	0.249	174.3
2.4	0.520	147.3	1.499	45.1	0.209	46.6	0.269	170.6
2.6	0.533	143.8	1.420	42.6	0.226	46.9	0.286	167.5
2.8	0.548	140.8	1.305	40.4	0.237	47.0	0.302	163.4
3.0	0.566	138.8	1.202	36.2	0.242	45.7	0.319	160.1

V_{CE} = 1 V, I_C = 10 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.2	0.496	–99.1	14.099	120.4	0.051	48.8	0.555	–69.8
0.4	0.439	–139.2	8.130	99.5	0.067	44.9	0.340	–103.3
0.6	0.425	–158.0	5.656	88.4	0.083	48.0	0.270	–123.9
0.8	0.420	–171.0	4.400	82.0	0.097	50.1	0.238	–138.8
1.0	0.432	179.3	3.622	77.1	0.112	51.7	0.224	–152.2
1.2	0.451	173.3	3.070	71.6	0.128	52.4	0.227	–162.4
1.4	0.456	169.1	2.622	66.4	0.146	53.3	0.234	–169.0
1.6	0.452	163.6	2.325	62.9	0.161	54.3	0.237	–175.5
1.8	0.460	157.0	2.036	59.2	0.172	54.4	0.243	177.1
2.0	0.484	152.1	1.818	55.2	0.185	52.8	0.257	170.2
2.2	0.503	148.8	1.656	50.1	0.199	50.5	0.279	165.6
2.4	0.517	145.6	1.560	46.1	0.216	49.0	0.297	162.7
2.6	0.530	142.4	1.476	43.6	0.234	48.7	0.312	159.8
2.8	0.545	139.5	1.360	41.5	0.245	48.4	0.329	156.4
3.0	0.563	137.6	1.250	37.5	0.251	47.1	0.346	153.4

V_{CE} = 3 V, I_C = 1 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.2	0.922	–31.0	3.396	154.4	0.072	68.3	0.959	–14.0
0.4	0.781	–59.5	2.823	132.8	0.122	51.1	0.833	–25.2
0.6	0.711	–85.9	2.381	114.4	0.154	39.1	0.724	–35.9
0.8	0.645	–104.8	2.107	100.9	0.166	29.5	0.670	–43.6
1.0	0.594	–121.1	1.841	91.1	0.173	22.3	0.634	–47.9
1.2	0.564	–136.2	1.591	81.8	0.176	18.1	0.593	–51.2
1.4	0.557	–147.7	1.424	72.6	0.171	17.7	0.553	–55.6
1.6	0.541	–157.3	1.299	66.1	0.162	17.5	0.523	–61.3
1.8	0.520	–168.1	1.165	60.1	0.149	17.5	0.511	–67.6
2.0	0.530	–178.5	1.050	54.3	0.140	17.1	0.500	–73.8
2.2	0.553	173.7	0.969	47.2	0.136	20.0	0.482	–81.0
2.4	0.567	168.1	0.922	41.7	0.133	25.2	0.479	–90.7
2.6	0.576	162.8	0.870	38.6	0.134	31.9	0.497	–99.1
2.8	0.586	157.6	0.792	35.1	0.138	38.9	0.505	–105.9
3.0	0.605	153.2	0.738	30.1	0.143	44.2	0.497	–112.8

V_{CE} = 3 V, I_C = 3 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.2	0.782	−47.6	8.239	143.8	0.062	61.0	0.860	−27.1
0.4	0.605	−85.1	6.070	120.0	0.093	45.1	0.625	−44.1
0.6	0.536	−111.7	4.667	103.1	0.109	38.0	0.488	−55.9
0.8	0.481	−130.4	3.796	92.9	0.115	34.5	0.416	−62.2
1.0	0.453	−145.8	3.207	85.7	0.122	33.2	0.360	−65.6
1.2	0.452	−158.4	2.689	78.8	0.128	33.8	0.319	−68.8
1.4	0.456	−166.9	2.366	71.7	0.135	36.2	0.286	−73.8
1.6	0.446	−174.8	2.123	66.8	0.138	39.7	0.262	−80.0
1.8	0.442	176.0	1.879	62.2	0.141	42.0	0.249	−86.3
2.0	0.461	168.0	1.682	57.3	0.146	42.3	0.236	−93.4
2.2	0.484	162.5	1.536	51.3	0.154	43.1	0.226	−102.9
2.4	0.499	158.2	1.451	46.3	0.166	44.3	0.231	−113.6
2.6	0.511	154.0	1.376	43.4	0.180	46.2	0.244	−121.5
2.8	0.526	150.0	1.261	40.4	0.190	48.5	0.251	−128.7
3.0	0.545	146.9	1.167	35.8	0.195	49.0	0.255	−136.2

V_{CE} = 3 V, I_C = 5 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.2	0.677	−59.7	11.364	136.5	0.056	57.6	0.776	−36.3
0.4	0.512	−100.5	7.682	112.9	0.078	44.3	0.508	−56.0
0.6	0.456	−125.9	5.639	98.0	0.091	41.5	0.378	−68.2
0.8	0.420	−143.6	4.496	89.3	0.099	41.0	0.309	−74.9
1.0	0.408	−157.9	3.744	83.3	0.108	42.3	0.257	−79.3
1.2	0.416	−168.5	3.206	77.0	0.118	43.5	0.220	−84.4
1.4	0.424	−175.3	2.769	70.6	0.130	45.9	0.195	−91.6
1.6	0.418	177.7	2.440	66.5	0.138	48.6	0.178	−99.6
1.8	0.419	169.4	2.151	62.5	0.146	50.5	0.169	−107.7
2.0	0.440	162.7	1.921	58.0	0.154	50.0	0.159	−117.8
2.2	0.463	158.1	1.752	52.6	0.166	49.3	0.160	−129.2
2.4	0.479	154.3	1.651	47.9	0.180	49.0	0.173	−139.8
2.6	0.492	150.4	1.566	45.2	0.197	50.0	0.187	−146.4
2.8	0.508	146.9	1.438	42.6	0.208	50.7	0.200	−153.9
3.0	0.527	144.4	1.327	38.2	0.214	50.3	0.209	−160.9

V_{CE} = 3 V, I_C = 7 mA, Z_O = 50 Ω

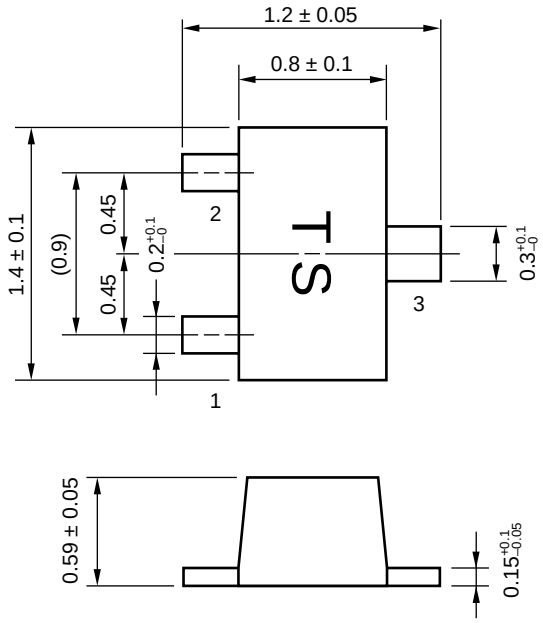
Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.2	0.587	−70.9	13.785	131.0	0.049	54.4	0.696	−44.5
0.4	0.450	−113.1	8.717	107.8	0.067	46.4	0.425	−66.1
0.6	0.408	−136.9	6.260	94.6	0.080	46.4	0.308	−79.3
0.8	0.386	−153.3	4.926	86.9	0.090	47.1	0.245	−87.2
1.0	0.384	−166.2	4.074	81.6	0.102	49.2	0.200	−94.2
1.2	0.397	−175.1	3.474	75.8	0.115	50.6	0.171	−102.2
1.4	0.406	179.1	3.002	70.1	0.129	52.2	0.154	−111.9
1.6	0.401	172.8	2.613	66.0	0.141	54.0	0.144	−121.8
1.8	0.408	165.2	2.320	62.5	0.151	55.3	0.141	−131.5
2.0	0.430	159.1	2.074	58.4	0.162	54.2	0.140	−143.3
2.2	0.451	155.1	1.888	53.2	0.175	52.9	0.149	−154.7
2.4	0.468	151.8	1.775	48.8	0.190	51.7	0.167	−162.7
2.6	0.482	148.1	1.683	46.1	0.207	51.9	0.183	−167.8
2.8	0.498	144.9	1.547	43.9	0.219	52.4	0.197	−173.8
3.0	0.517	142.6	1.422	39.7	0.225	51.4	0.212	−179.4

V_{CE} = 3 V, I_C = 10 mA, Z_O = 50 Ω

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
0.2	0.507	–82.3	15.830	125.7	0.044	54.4	0.619	–52.5
0.4	0.404	–124.5	9.537	103.9	0.059	48.9	0.361	–75.9
0.6	0.377	–146.4	6.711	92.0	0.073	51.3	0.259	–90.6
0.8	0.364	–161.3	5.250	85.2	0.086	53.1	0.204	–100.5
1.0	0.370	–172.7	4.334	80.4	0.100	55.0	0.169	–110.3
1.2	0.386	179.7	3.675	75.0	0.114	55.6	0.148	–121.9
1.4	0.394	174.9	3.173	69.7	0.130	56.7	0.141	–132.5
1.6	0.392	169.0	2.757	65.9	0.144	58.0	0.140	–142.3
1.8	0.400	162.1	2.446	62.6	0.156	58.5	0.140	–152.6
2.0	0.423	156.6	2.183	58.7	0.168	57.1	0.146	–163.7
2.2	0.444	153.0	1.984	53.8	0.181	54.9	0.162	–172.3
2.4	0.461	149.8	1.865	49.6	0.198	53.3	0.181	–177.7
2.6	0.475	146.3	1.769	47.1	0.216	53.3	0.200	178.2
2.8	0.492	143.4	1.630	44.9	0.228	53.3	0.214	173.4
3.0	0.512	141.3	1.499	41.0	0.234	51.9	0.231	168.9

★ **PACKAGE DIMENSIONS**

FLAT-LEAD 3-PIN THIN-TYPE ULTRA SUPER MINIMOLD (UNIT: mm)



PIN CONNECTIONS

1. Emitter
2. Base
3. Collector

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►**Business issue**

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►**Technical issue**

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