NEC

NPN SILICON RF TWIN TRANSISTOR

μPA831TC

NPN SILICON EPITAXIAL TRANSISTOR (WITH 2 DIFFERENT ELEMENTS) IN A FLAT-LEAD 6-PIN THIN-TYPE ULTRA SUPER MINIMOLD PACKAGE

DESCRIPTION

The μPA831TC has built-in two different transistors (Q1 and Q2) for low noise amplification in the VHF band to UHF band.

FEATURES

- Low noise
  Q1 : NF = 1.2 dB TYP., Q2 : NF = 1.4 dB TYP.
  @f = 1 GHz, V_{CE} = 3 V, I_C = 7 mA
- High gain
  Q1 : $|S_{21e}|^2$ = 9.0 dB TYP., Q2 : $|S_{21e}|^2$ = 12.0 dB TYP.
  @f = 1 GHz, V_{CE} = 3 V, I_C = 7 mA
- Flat-lead 6-pin thin-type ultra super minimold package
- 2 different built-in transistors (2SC5006, 2SC5007)

BUILT-IN TRANSISTORS

	Q1	Q2
3-pin ultra super minimold part No.	2SC5006	2SC5007

ORDERING INFORMATION

Part Number	Package	Quantity	Supplying Form
μPA831TC	Flat-lead 6-pin thin-type ultra super minimold	Loose products (50 pcs)	8 mm wide embossed tape. Pin 6 (Q1 Base), pin 5 (Q2 Emitter), pin 4 (Q2 Base) face to perforation side of the tape.
μPA831TC-T1		Taping products (3 kp/reel)	

Remark To order evaluation samples, please contact your local NEC sales office. (Part number for sample order: μPA831TC.)

Caution Electro-static sensitive devices

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Not all devices/types available in every country. Please check with local NEC representative for availability and additional information.

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ABSOLUTE MAXIMUM RATINGS (T_A = +25°C)

Parameter	Symbol	Ratings		Unit
		Q1	Q2	
Collector to Base Voltage	V_{CBO}	20	20	V
Collector to Emitter Voltage	V_{CEO}	12	10	V
Emitter to Base Voltage	V_{EBO}	3	1.5	V
Collector Current	I_C	100	65	mA
Total Power Dissipation	P_T Note	200 in 1 element	200 in 1 element	mW
		230 in 2 elements		
Junction Temperature	T_j	150	150	°C
Storage Temperature	T_{stg}	–65 to +150		°C

Note Mounted on 1.08 $cm^2 \times 1.0$ mm glass epoxy substrate.

ELECTRICAL CHARACTERISTICS (T_A = +25°C)

(1) Q1

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Collector Cutoff Current	I_{CBO}	V_{CB} = 10 V, I_E = 0	–	–	1.0	μA
Emitter Cutoff Current	I_{EBO}	V_{EB} = 1 V, I_C = 0	–	–	1.0	μA
DC Current Gain	h_{FE}	V_{CE} = 3 V, I_C = 7 mA Note 1	70	–	140	
Gain Bandwidth Product	f_T	V_{CE} = 3 V, I_C = 7 mA, f = 1 GHz	3.0	4.5	–	GHz
Feedback Capacitance	C_{re}	V_{CB} = 3 V, I_E = 0, f = 1 MHz Note 2	–	0.7	1.5	pF
Insertion Power Gain	$\|S_{21e}\|^2$	V_{CE} = 3 V, I_C = 7 mA, f = 1 GHz	7.0	9.0	–	dB
Noise Figure	NF	V_{CE} = 3 V, I_C = 7 mA, f = 1 GHz	–	1.2	2.5	dB

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

2. Collector to base capacitance when measured with capacitance meter (automatic balanced bridge method), with emitter connected to guard pin of capacitance meter.

(2) Q2

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Collector Cutoff Current	I_{CBO}	V_{CB} = 10 V, I_E = 0	–	–	0.8	μA
Emitter Cutoff Current	I_{EBO}	V_{EB} = 1 V, I_C = 0	–	–	0.8	μA
DC Current Gain	h_{FE}	V_{CE} = 3 V, I_C = 7 mA[Note 1]	70	–	150	
Gain Bandwidth Product	f_T	V_{CE} = 3 V, I_C = 7 mA, f = 1 GHz	4.5	7.0	–	GHz
Feedback Capacitance	C_{re}	V_{CB} = 3 V, I_E = 0, f = 1 MHz[Note 2]	–	–	0.9	pF
Insertion Power Gain	$\|S_{21e}\|^2$	V_{CE} = 3 V, I_C = 7 mA, f = 1 GHz	10.0	12.0	–	dB
Noise Figure	NF	V_{CE} = 3 V, I_C = 7 mA, f = 1 GHz	–	1.4	2.7	dB

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

2. Collector to base capacitance when measured with capacitance meter (automatic balanced bridge method), with emitter connected to guard pin of capacitance meter.

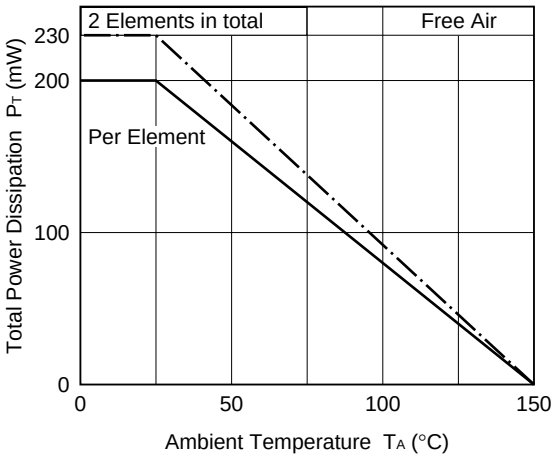
h_{FE} CLASSIFICATION

Rank	FB
Marking	24
h_{FE} Value of Q1	70 to 140
h_{FE} Value of Q2	70 to 150

TYPICAL CHARACTERISTICS (T_A = +25°C)

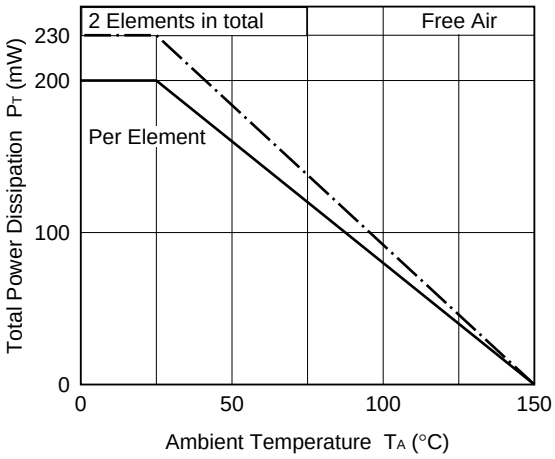
Q1

TOTAL POWER DISSIPATION vs.
AMBIENT TEMPERATURE

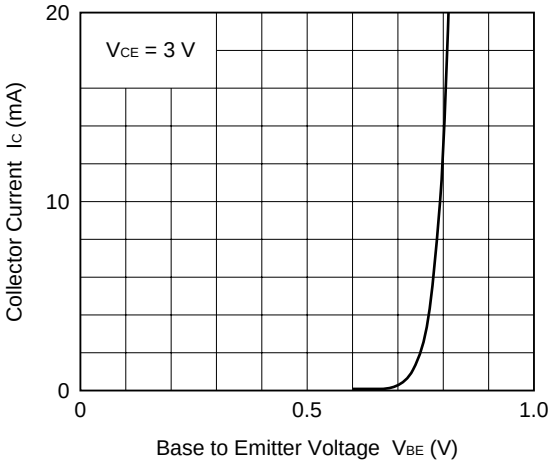


Q2

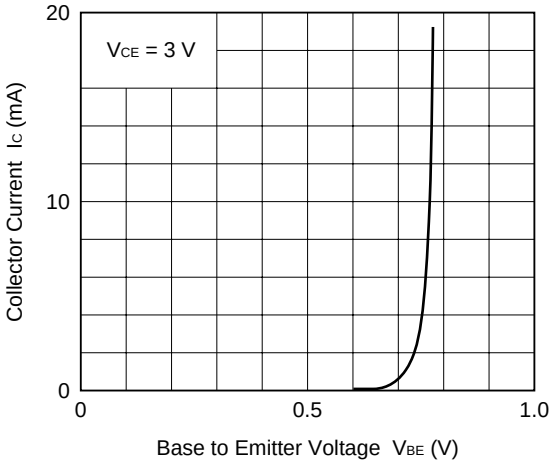
TOTAL POWER DISSIPATION vs.
AMBIENT TEMPERATURE



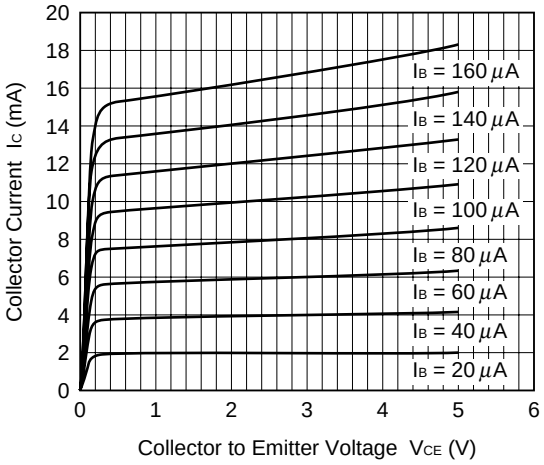
COLLECTOR CURRENT vs.
BASE TO EMITTER VOLTAGE



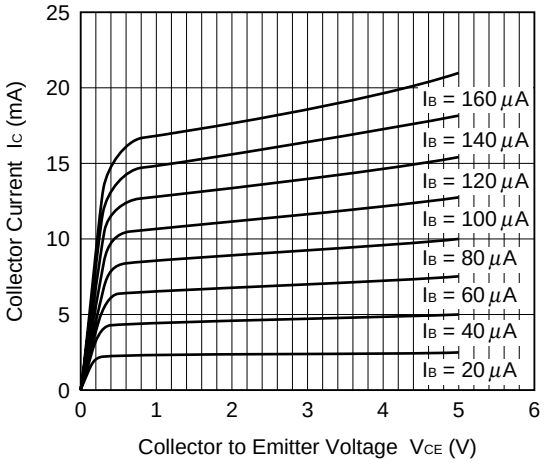
COLLECTOR CURRENT vs.
BASE TO EMITTER VOLTAGE



COLLECTOR CURRENT vs.
COLLECTOR TO EMITTER VOLTAGE

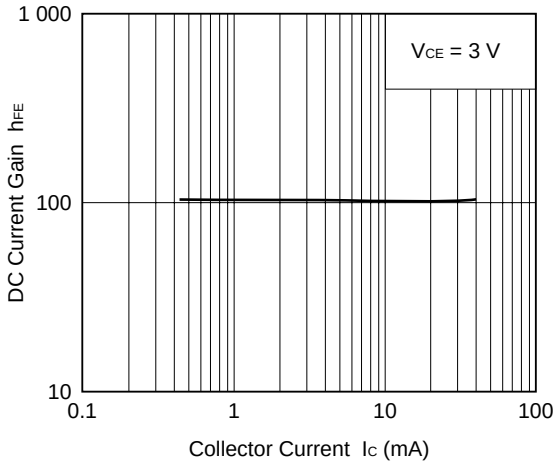


COLLECTOR CURRENT vs.
COLLECTOR TO EMITTER VOLTAGE



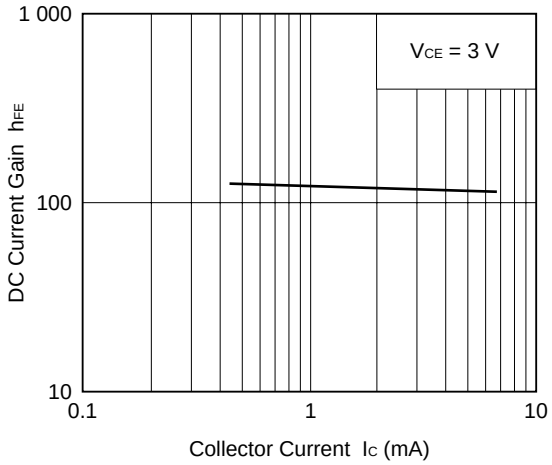
Q1

DC CURRENT GAIN vs.
COLLECTOR CURRENT

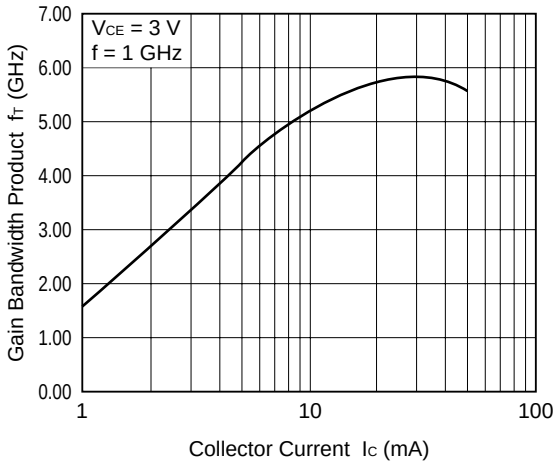


Q2

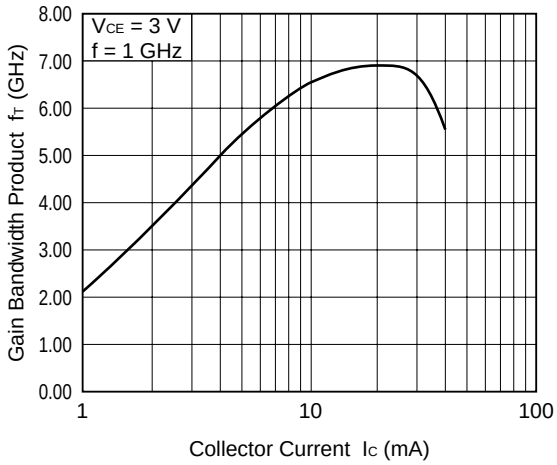
DC CURRENT GAIN vs.
COLLECTOR CURRENT



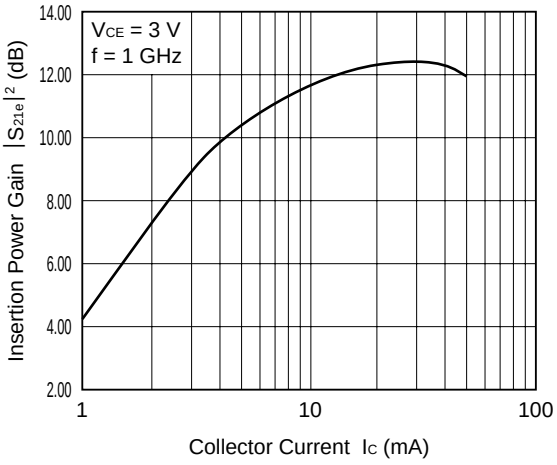
GAIN BANDWIDTH PRODUCT vs.
COLLECTOR CURRENT



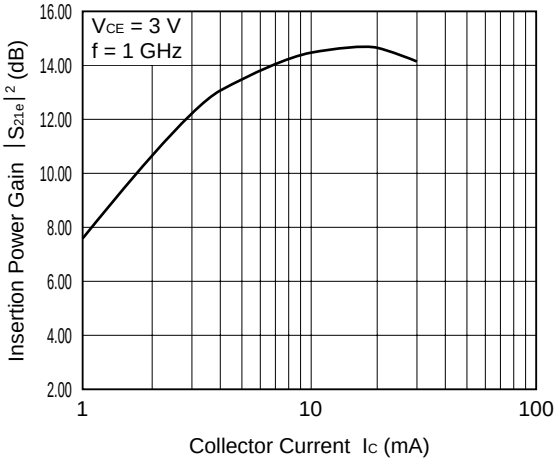
GAIN BANDWIDTH PRODUCT vs.
COLLECTOR CURRENT



INSERTION POWER GAIN vs.
COLLECTOR CURRENT

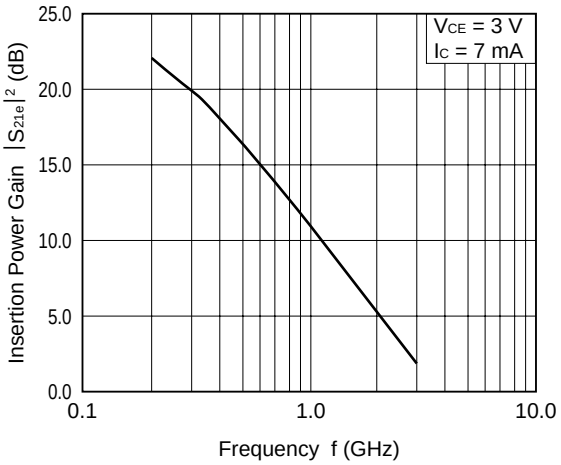


INSERTION POWER GAIN vs.
COLLECTOR CURRENT

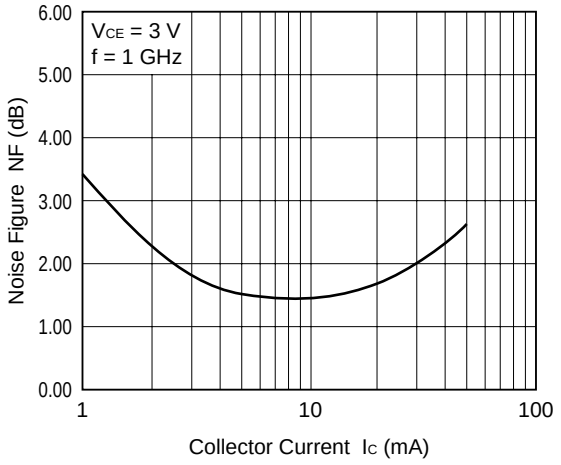


Q1

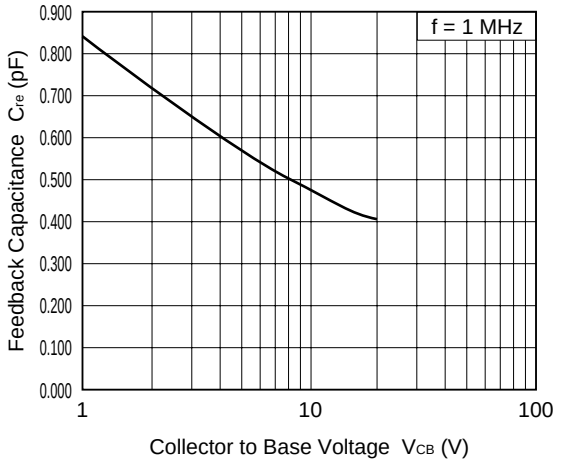
INSERTION POWER GAIN vs. FREQUENCY



NOISE FIGURE vs. COLLECTOR CURRENT

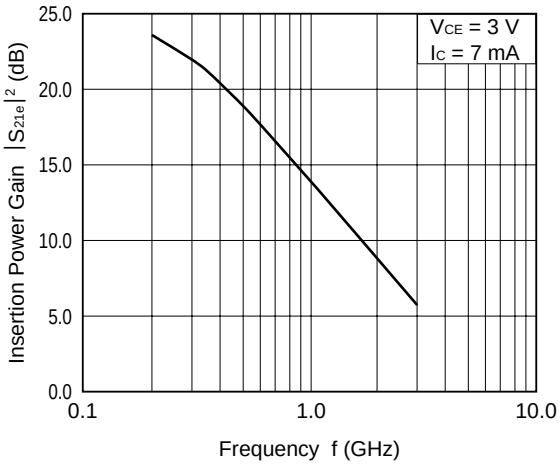


FEEDBACK CAPACITANCE vs.
COLLECTOR TO BASE VOLTAGE

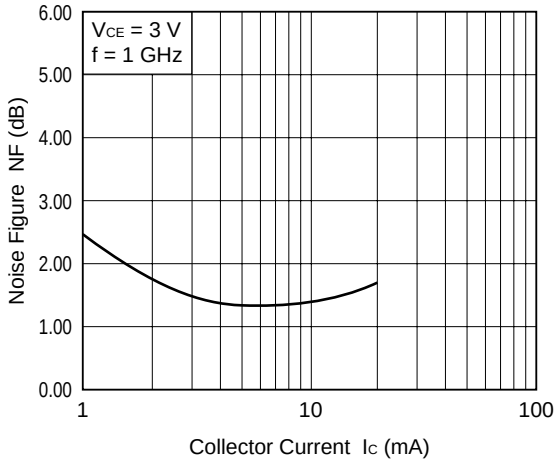


Q2

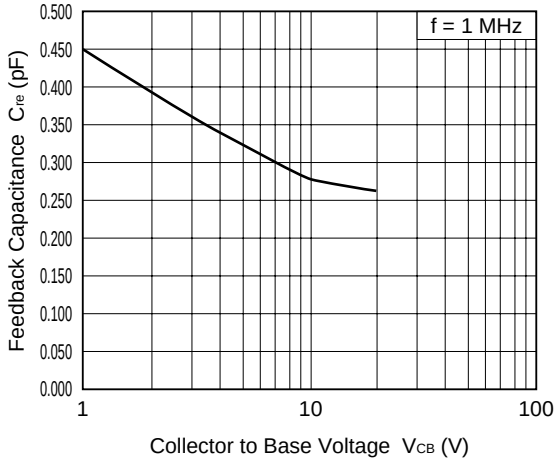
INSERTION POWER GAIN vs. FREQUENCY



NOISE FIGURE vs. COLLECTOR CURRENT



FEEDBACK CAPACITANCE vs.
COLLECTOR TO BASE VOLTAGE



S-PARAMETERS Q1

V_{CE} = 3 V, I_C = 1 mA

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
0.1	0.938	–29.5	3.703	157.3	0.052	50.2	0.981	–13.9
0.2	0.913	–56.4	3.348	137.5	0.082	51.5	0.946	–26.3
0.3	0.881	–81.6	3.052	119.6	0.110	36.2	0.902	–37.6
0.4	0.843	–104.6	2.745	102.4	0.130	20.9	0.844	–48.3
0.5	0.816	–125.7	2.497	86.6	0.141	8.9	0.792	–57.1
0.6	0.782	–145.2	2.241	72.3	0.154	–2.8	0.756	–66.1
0.7	0.759	–162.8	2.023	58.5	0.156	–14.1	0.715	–73.8
0.8	0.748	–178.8	1.852	46.3	0.161	–23.1	0.698	–82.0
0.9	0.739	165.9	1.700	34.1	0.158	–32.0	0.672	–90.0
1.0	0.730	152.1	1.572	22.7	0.158	–40.8	0.655	–97.8
1.1	0.731	138.6	1.461	11.8	0.158	–49.5	0.637	–106.0
1.2	0.726	125.8	1.364	1.0	0.153	–57.1	0.624	–113.7
1.3	0.730	113.7	1.277	–9.2	0.151	–63.5	0.616	–122.2
1.4	0.730	101.7	1.203	–19.4	0.141	–70.4	0.608	–130.2
1.5	0.735	90.6	1.131	–29.3	0.139	–75.7	0.600	–138.6
1.6	0.736	79.6	1.069	–38.9	0.132	–81.0	0.594	–147.4
1.7	0.741	69.1	1.017	–48.2	0.128	–85.1	0.590	–156.3
1.8	0.743	58.7	0.967	–57.6	0.123	–89.6	0.582	–165.0
1.9	0.750	48.8	0.925	–66.6	0.118	–92.7	0.580	–174.2
2.0	0.751	39.0	0.878	–75.7	0.117	–96.3	0.580	177.3
2.1	0.757	29.6	0.840	–84.2	0.111	–99.5	0.571	168.0
2.2	0.761	20.1	0.800	–93.1	0.111	–100.5	0.573	158.1
2.3	0.767	11.3	0.770	–101.1	0.111	–101.6	0.567	148.8
2.4	0.770	1.9556	0.734	–109.5	0.112	–102.9	0.569	138.7
2.5	0.771	–6.6	0.704	–117.2	0.119	–104.3	0.564	128.6
2.6	0.777	–15.2	0.677	–125.3	0.126	–107.2	0.564	118.7
2.7	0.784	–23.9	0.646	–132.6	0.132	–108.9	0.566	108.4
2.8	0.787	–32.0	0.621	–140.4	0.140	–113.5	0.567	98.2
2.9	0.791	–40.2	0.600	–147.9	0.147	–116.1	0.563	87.8
3.0	0.797	–48.2	0.575	–154.7	0.159	–121.2	0.573	77.3

V_{CE} = 3 V, I_C = 3 mA

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
0.1	0.929	–27.6	5.790	157.9	0.050	42.1	0.987	–16.6
0.2	0.881	–53.5	5.401	138.4	0.085	57.3	0.929	–30.8
0.3	0.834	–77.2	4.951	120.9	0.107	41.0	0.865	–45.1
0.4	0.774	–99.8	4.477	103.7	0.130	28.1	0.785	–57.2
0.5	0.730	–120.0	4.065	88.5	0.147	16.9	0.713	–68.1
0.6	0.683	–138.9	3.641	74.6	0.161	6.4	0.660	–77.6
0.7	0.654	–156.1	3.309	61.7	0.168	–3.7	0.602	–86.9
0.8	0.632	–172.9	3.007	49.6	0.174	–12.5	0.560	–95.1
0.9	0.611	172.1	2.747	38.2	0.180	–20.3	0.524	–103.3
1.0	0.600	157.6	2.543	27.1	0.178	–27.6	0.495	–111.3
1.1	0.594	144.2	2.360	16.3	0.186	–35.4	0.467	–119.6
1.2	0.587	130.9	2.202	6.0	0.188	–41.6	0.444	–127.3
1.3	0.587	118.7	2.062	–4.0	0.193	–48.8	0.427	–135.3
1.4	0.588	106.5	1.943	–13.7	0.193	–55.1	0.410	–143.2
1.5	0.590	95.2	1.834	–23.4	0.194	–61.7	0.396	–151.1
1.6	0.595	84.0	1.731	–33.0	0.199	–67.2	0.380	–160.0
1.7	0.596	73.3	1.648	–42.2	0.199	–73.4	0.371	–168.2
1.8	0.600	62.7	1.571	–51.7	0.199	–79.2	0.359	–176.2
1.9	0.606	52.8	1.504	–60.4	0.204	–85.7	0.348	175.1
2.0	0.614	42.6	1.436	–69.5	0.207	–90.8	0.340	166.2
2.1	0.617	33.1	1.367	–78.4	0.208	–97.3	0.329	157.2
2.2	0.623	23.8	1.309	–87.4	0.209	–102.8	0.322	147.9
2.3	0.630	14.3	1.262	–95.6	0.211	–108.6	0.314	138.5
2.4	0.635	5.4	1.210	–104.1	0.214	–113.6	0.310	128.9
2.5	0.641	–3.3	1.162	–112.4	0.217	–119.5	0.303	119.4
2.6	0.648	–11.7	1.121	–120.5	0.222	–124.6	0.300	109.6
2.7	0.653	–20.4	1.080	–128.4	0.223	–130.4	0.295	99.2
2.8	0.660	–28.6	1.044	–136.7	0.229	–136.0	0.297	90.3
2.9	0.668	–36.6	1.014	–144.1	0.232	–141.5	0.295	80.0
3.0	0.673	–44.9	0.977	–152.2	0.235	–147.8	0.301	69.7

V_{CE} = 3 V, I_C = 5 mA

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
0.1	0.787	–50.1	14.281	144.6	0.052	33.3	0.928	–29.0
0.2	0.708	–91.6	11.299	119.6	0.058	48.6	0.722	–48.1
0.3	0.662	–121.9	9.080	100.3	0.075	23.0	0.603	–63.3
0.4	0.619	–146.9	7.356	84.3	0.082	19.3	0.503	–73.0
0.5	0.603	–166.4	6.183	70.9	0.084	10.7	0.433	–81.0
0.6	0.591	176.8	5.269	58.8	0.090	3.6	0.378	–88.5
0.7	0.587	162.0	4.599	48.1	0.091	–1.5	0.346	–96.1
0.8	0.588	148.6	4.073	37.8	0.096	–8.8	0.314	–103.0
0.9	0.586	136.5	3.652	27.6	0.100	–10.5	0.294	–110.4
1.0	0.590	124.6	3.319	18.2	0.101	–16.9	0.274	–116.9
1.1	0.594	114.0	3.043	8.7	0.107	–23.1	0.264	–125.0
1.2	0.596	103.2	2.798	–0.5	0.114	–26.6	0.250	–132.5
1.3	0.603	93.4	2.603	–9.4	0.115	–31.4	0.244	–140.7
1.4	0.607	82.9	2.423	–18.4	0.122	–36.1	0.234	–148.4
1.5	0.614	73.6	2.274	–27.0	0.127	–41.7	0.221	–157.7
1.6	0.623	64.6	2.137	–36.0	0.133	–46.7	0.216	–166.3
1.7	0.628	55.6	2.018	–44.6	0.138	–51.2	0.209	–175.6
1.8	0.632	46.4	1.899	–53.1	0.142	–57.0	0.204	175.9
1.9	0.640	37.7	1.819	–61.3	0.148	–62.2	0.200	166.0
2.0	0.646	28.8	1.724	–69.8	0.155	–67.4	0.197	155.6
2.1	0.656	20.5	1.642	–78.0	0.164	–73.8	0.193	145.4
2.2	0.660	11.9	1.568	–86.6	0.168	–79.3	0.192	134.8
2.3	0.668	4.0	1.506	–94.4	0.173	–84.3	0.189	123.6
2.4	0.674	–4.0	1.442	–102.7	0.181	–90.6	0.190	113.2
2.5	0.677	–12.4	1.383	–110.4	0.187	–96.3	0.191	101.6
2.6	0.685	–20.1	1.330	–118.4	0.195	–101.7	0.195	90.0
2.7	0.693	–27.8	1.286	–126.3	0.201	–108.7	0.197	79.2
2.8	0.697	–35.6	1.235	–133.9	0.204	–114.4	0.205	68.3
2.9	0.706	–43.4	1.194	–141.8	0.213	–120.5	0.208	57.3
3.0	0.713	–50.6	1.151	–149.5	0.221	–125.8	0.217	47.6

V_{CE} = 3 V, I_C = 7 mA

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
0.1	0.738	–60.7	18.140	139.9	0.035	26.0	0.865	–34.7
0.2	0.630	–104.2	13.504	113.5	0.060	38.6	0.653	–55.3
0.3	0.596	–134.1	10.414	95.1	0.067	29.9	0.509	–69.4
0.4	0.574	–158.5	8.249	79.9	0.073	19.5	0.414	–79.9
0.5	0.564	–176.7	6.877	67.4	0.072	14.3	0.348	–87.9
0.6	0.554	168.2	5.807	56.0	0.078	10.2	0.303	–95.0
0.7	0.553	154.2	5.036	45.7	0.083	5.7	0.270	–102.0
0.8	0.559	142.0	4.441	35.9	0.089	1.8	0.244	–109.8
0.9	0.558	130.1	3.988	26.3	0.096	–5.0	0.228	–117.6
1.0	0.562	119.3	3.609	17.0	0.100	–10.4	0.212	–124.3
1.1	0.569	108.6	3.300	7.7	0.107	–14.5	0.200	–132.7
1.2	0.574	98.8	3.039	–1.1	0.113	–19.7	0.188	–140.5
1.3	0.580	89.5	2.819	–9.8	0.119	–25.8	0.177	–149.6
1.4	0.583	79.8	2.622	–18.5	0.127	–29.0	0.172	–157.7
1.5	0.594	70.9	2.463	–27.1	0.133	–35.1	0.164	–168.1
1.6	0.598	61.7	2.307	–35.7	0.138	–40.2	0.157	–177.4
1.7	0.605	53.1	2.180	–44.1	0.148	–46.3	0.154	172.2
1.8	0.611	44.2	2.053	–52.8	0.154	–52.4	0.148	162.6
1.9	0.619	35.8	1.965	–60.8	0.160	–59.2	0.145	151.6
2.0	0.625	27.0	1.862	–69.2	0.168	–64.7	0.143	140.3
2.1	0.634	18.7	1.778	–77.2	0.173	–71.1	0.142	128.1
2.2	0.642	10.7	1.695	–85.5	0.182	–76.6	0.141	116.6
2.3	0.652	2.7	1.626	–93.4	0.186	–82.8	0.144	104.7
2.4	0.652	–5.636	1.557	–101.5	0.196	–88.7	0.146	92.0
2.5	0.662	–13.2	1.496	–109.3	0.200	–95.0	0.149	80.2
2.6	0.669	–21.1	1.440	–117.0	0.209	–101.6	0.155	70.2
2.7	0.677	–28.8	1.387	–124.7	0.214	–107.6	0.164	58.7
2.8	0.682	–36.1	1.337	–132.2	0.221	–114.5	0.169	47.8
2.9	0.688	–44.2	1.294	–140.2	0.228	–121.1	0.177	36.9
3.0	0.696	–51.1	1.242	–147.7	0.234	–127.0	0.186	27.6

S-PARAMETERS Q2

V_{CE} = 3 V, I_C = 1 mA

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
0.1	0.960	–19.1	3.823	163.5	0.020	74.9	0.984	–9.7
0.2	0.943	–37.8	3.597	148.4	0.051	62.2	0.981	–20.2
0.3	0.922	–54.3	3.422	134.7	0.065	48.6	0.961	–30.3
0.4	0.885	–72.3	3.252	120.1	0.084	40.6	0.926	–39.8
0.5	0.862	–89.0	3.105	106.6	0.101	28.1	0.899	–48.5
0.6	0.821	–105.0	2.916	93.3	0.114	17.6	0.860	–56.8
0.7	0.790	–120.6	2.754	80.8	0.124	7.1	0.833	–65.2
0.8	0.759	–135.5	2.595	69.1	0.130	–5.0	0.803	–73.5
0.9	0.728	–150.2	2.445	57.4	0.139	–13.2	0.775	–81.0
1.0	0.706	–164.6	2.316	46.0	0.141	–20.7	0.748	–88.4
1.1	0.685	–178.3	2.194	35.2	0.144	–29.9	0.724	–95.7
1.2	0.671	168.5	2.087	24.7	0.148	–38.6	0.708	–102.9
1.3	0.659	155.7	1.979	14.5	0.147	–46.7	0.688	–110.4
1.4	0.645	143.1	1.891	4.6	0.145	–53.0	0.672	–117.7
1.5	0.641	131.1	1.808	–5.2	0.147	–59.4	0.655	–124.7
1.6	0.635	119.1	1.730	–15.4	0.144	–66.9	0.639	–132.1
1.7	0.629	107.2	1.652	–24.8	0.143	–72.8	0.627	–139.3
1.8	0.623	96.0	1.592	–34.3	0.142	–79.1	0.614	–146.6
1.9	0.626	85.0	1.532	–43.4	0.139	–84.4	0.603	–154.2
2.0	0.621	74.1	1.468	–52.7	0.138	–89.5	0.597	–161.5
2.1	0.620	63.5	1.413	–61.4	0.135	–94.7	0.585	–168.4
2.2	0.620	53.5	1.362	–70.6	0.133	–99.6	0.576	–176.4
2.3	0.623	43.7	1.318	–79.0	0.131	–104.2	0.568	175.4
2.4	0.621	33.6	1.270	–87.8	0.131	–107.7	0.560	167.6
2.5	0.626	24.3	1.230	–96.2	0.133	–112.2	0.551	159.1
2.6	0.626	15.2	1.195	–104.9	0.137	–114.3	0.544	150.8
2.7	0.635	6.4	1.161	–113.3	0.138	–116.8	0.533	142.3
2.8	0.635	–2.2	1.122	–121.7	0.146	–120.9	0.526	133.9
2.9	0.639	–10.6	1.095	–130.0	0.154	–124.0	0.511	125.7
3.0	0.647	–18.5	1.050	–138.3	0.164	–131.3	0.504	117.6

V_{CE} = 3 V, I_C = 3 mA

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
0.1	0.897	–26.0	9.698	157.7	0.025	23.3	0.992	–15.1
0.2	0.844	–49.9	8.841	139.5	0.047	65.0	0.918	–27.5
0.3	0.784	–72.1	8.028	122.8	0.055	47.4	0.858	–39.8
0.4	0.723	–92.8	7.209	106.8	0.072	32.5	0.791	–50.3
0.5	0.670	–111.3	6.534	92.7	0.079	25.9	0.724	–59.4
0.6	0.616	–128.8	5.822	79.6	0.088	14.8	0.669	–67.3
0.7	0.580	–144.9	5.287	67.8	0.093	5.7	0.628	–74.8
0.8	0.547	–160.4	4.812	56.6	0.095	–2.3	0.585	–81.7
0.9	0.528	–175.1	4.391	45.7	0.102	–5.5	0.551	–88.2
1.0	0.510	171.3	4.051	35.6	0.104	–14.3	0.528	–94.4
1.1	0.496	158.6	3.749	25.6	0.107	–20.1	0.501	–101.4
1.2	0.483	145.7	3.501	16.2	0.112	–25.1	0.482	–107.5
1.3	0.480	133.8	3.273	6.9	0.114	–31.7	0.463	–114.4
1.4	0.477	122.6	3.086	–2.2	0.116	–36.0	0.452	–120.8
1.5	0.475	111.1	2.907	–11.1	0.122	–41.3	0.436	–127.5
1.6	0.474	100.0	2.752	–20.2	0.124	–47.3	0.421	–134.4
1.7	0.477	89.8	2.617	–28.8	0.130	–53.2	0.410	–140.9
1.8	0.477	79.4	2.477	–37.4	0.132	–57.9	0.402	–147.9
1.9	0.481	69.6	2.381	–45.7	0.136	–63.7	0.384	–155.0
2.0	0.484	59.9	2.271	–54.4	0.141	–68.1	0.379	–161.4
2.1	0.489	50.1	2.176	–62.8	0.142	–75.1	0.365	–168.6
2.2	0.493	41.2	2.084	–71.4	0.150	–78.8	0.354	–175.9
2.3	0.499	32.1	2.011	–79.4	0.155	–84.0	0.343	176.0
2.4	0.506	23.4	1.933	–87.7	0.162	–90.6	0.337	168.9
2.5	0.508	14.9	1.862	–95.8	0.167	–95.4	0.323	161.0
2.6	0.517	6.4	1.801	–104.1	0.175	–101.4	0.313	153.4
2.7	0.526	–1.2	1.742	–111.9	0.179	–106.8	0.306	145.3
2.8	0.535	–9.4	1.688	–119.8	0.186	–113.6	0.299	137.0
2.9	0.543	–17.1	1.629	–127.5	0.192	–119.9	0.290	129.0
3.0	0.556	–25.0	1.572	–135.3	0.197	–126.4	0.286	120.7

V_{CE} = 3 V, I_C = 5 mA

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
0.1	0.853	–30.1	13.631	154.4	0.030	42.5	0.975	–17.5
0.2	0.761	–58.0	12.026	133.7	0.042	60.6	0.870	–32.4
0.3	0.693	–82.4	10.531	115.9	0.052	41.9	0.781	–45.3
0.4	0.619	–105.0	9.123	99.6	0.062	32.6	0.700	–54.9
0.5	0.568	–124.2	7.999	85.6	0.072	23.5	0.623	–63.4
0.6	0.522	–141.3	7.036	73.1	0.075	16.0	0.571	–70.6
0.7	0.489	–157.8	6.236	61.8	0.079	7.6	0.526	–76.8
0.8	0.467	–172.5	5.612	51.3	0.088	4.3	0.490	–83.3
0.9	0.451	173.6	5.105	41.2	0.091	–2.7	0.464	–89.8
1.0	0.438	160.1	4.661	31.5	0.092	–7.0	0.439	–95.3
1.1	0.428	147.5	4.292	22.1	0.099	–14.7	0.419	–101.9
1.2	0.423	135.7	3.989	12.9	0.106	–18.6	0.401	–107.8
1.3	0.425	124.5	3.720	4.1	0.110	–25.5	0.390	–114.5
1.4	0.422	113.3	3.477	–4.6	0.116	–29.7	0.372	–120.6
1.5	0.425	102.7	3.265	–13.4	0.119	–34.5	0.359	–127.4
1.6	0.430	92.3	3.101	–22.2	0.125	–41.4	0.346	–133.8
1.7	0.434	82.7	2.925	–30.4	0.132	–45.4	0.337	–140.6
1.8	0.436	72.8	2.782	–39.1	0.136	–51.6	0.326	–147.0
1.9	0.443	63.4	2.656	–46.9	0.141	–56.3	0.314	–153.9
2.0	0.444	54.1	2.533	–55.3	0.147	–62.7	0.307	–160.7
2.1	0.453	45.0	2.422	–63.6	0.150	–69.0	0.292	–166.9
2.2	0.457	35.9	2.319	–72.0	0.157	–74.2	0.284	–174.8
2.3	0.464	27.9	2.233	–79.6	0.163	–80.1	0.269	177.4
2.4	0.470	19.6	2.148	–87.8	0.171	–86.5	0.263	170.3
2.5	0.478	11.2	2.066	–95.7	0.179	–92.6	0.251	162.8
2.6	0.487	3.1	1.989	–103.8	0.187	–98.4	0.240	154.5
2.7	0.492	–4.3	1.925	–111.5	0.195	–104.8	0.233	147.6
2.8	0.502	–11.8	1.858	–119.2	0.199	–111.3	0.224	138.8
2.9	0.513	–19.5	1.800	–127.1	0.207	–117.7	0.216	131.2
3.0	0.528	–26.9	1.742	–134.5	0.212	–125.0	0.212	122.8

V_{CE} = 3 V, I_C = 7 mA

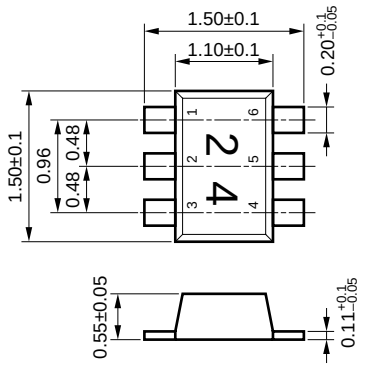
FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
0.1	0.877	–27.1	18.049	149.6	0.034	55.5	0.978	–16.4
0.2	0.801	–51.8	15.160	127.2	0.041	50.5	0.897	–31.8
0.3	0.736	–74.3	12.633	108.8	0.056	40.2	0.823	–44.8
0.4	0.662	–94.3	10.579	92.9	0.070	36.1	0.733	–55.1
0.5	0.600	–112.8	9.065	79.3	0.076	28.3	0.657	–64.4
0.6	0.551	–130.4	7.838	67.4	0.084	18.4	0.601	–72.8
0.7	0.511	–146.4	6.848	56.8	0.089	10.3	0.553	–80.1
0.8	0.483	–161.7	6.110	46.6	0.096	3.1	0.513	–86.7
0.9	0.457	–175.8	5.518	37.0	0.102	–3.0	0.476	–93.6
1.0	0.441	170.6	5.024	27.8	0.108	–8.6	0.445	–100.0
1.1	0.430	157.9	4.604	18.7	0.113	–14.8	0.423	–106.3
1.2	0.418	144.9	4.256	9.9	0.117	–21.3	0.402	–113.1
1.3	0.416	133.5	3.965	1.4	0.120	–26.5	0.381	–119.0
1.4	0.411	121.9	3.709	–7.0	0.128	–30.6	0.363	–125.5
1.5	0.412	110.8	3.481	–15.6	0.131	–37.1	0.348	–131.8
1.6	0.411	99.8	3.273	–23.9	0.139	–43.4	0.332	–138.4
1.7	0.415	89.7	3.108	–31.9	0.146	–48.8	0.321	–145.7
1.8	0.416	79.2	2.952	–40.5	0.149	–54.1	0.306	–151.5
1.9	0.421	69.7	2.819	–48.3	0.156	–60.5	0.292	–158.9
2.0	0.426	60.0	2.676	–56.4	0.161	–65.8	0.283	–165.2
2.1	0.431	50.5	2.560	–64.6	0.164	–72.3	0.268	–171.6
2.2	0.434	41.7	2.452	–72.6	0.175	–78.0	0.259	–178.7
2.3	0.439	32.7	2.360	–80.4	0.178	–84.3	0.244	173.6
2.4	0.446	24.2	2.270	–88.3	0.187	–89.9	0.235	166.6
2.5	0.450	15.6	2.187	–96.0	0.193	–95.8	0.222	159.0
2.6	0.461	7.2	2.117	–104.1	0.204	–102.5	0.213	151.9
2.7	0.467	0.2	2.037	–111.5	0.210	–108.0	0.203	143.8
2.8	0.474	–7.7	1.969	–119.4	0.219	–115.1	0.194	136.2
2.9	0.488	–14.6	1.919	–127.1	0.225	–122.8	0.189	129.6
3.0	0.513	–21.5	1.856	–134.7	0.230	–131.1	0.188	120.8

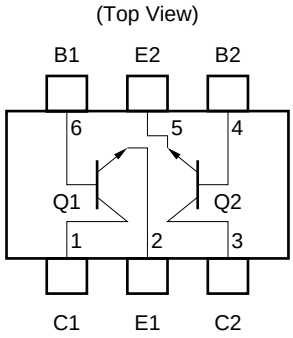
V_{CE} = 3 V, I_C = 10 mA

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
0.1	0.871	–27.4	23.109	145.2	0.023	28.8	0.963	–18.1
0.2	0.797	–50.9	18.315	120.2	0.042	60.1	0.893	–31.7
0.3	0.731	–72.7	14.604	101.8	0.059	43.2	0.824	–45.6
0.4	0.656	–93.2	11.812	86.7	0.069	34.2	0.738	–56.4
0.5	0.597	–111.6	9.921	74.1	0.073	27.5	0.661	–65.9
0.6	0.541	–128.1	8.442	63.1	0.084	18.4	0.593	–73.9
0.7	0.503	–144.8	7.366	52.6	0.090	9.5	0.542	–82.0
0.8	0.472	–159.6	6.535	43.2	0.101	2.9	0.502	–88.7
0.9	0.449	–173.5	5.869	34.1	0.106	–0.5	0.467	–95.6
1.0	0.427	172.7	5.319	25.1	0.110	–6.8	0.435	–101.8
1.1	0.415	159.9	4.860	16.3	0.116	–14.7	0.408	–108.7
1.2	0.405	147.0	4.488	7.8	0.120	–19.4	0.385	–114.6
1.3	0.403	135.3	4.168	–0.6	0.128	–25.5	0.367	–121.7
1.4	0.400	123.6	3.885	–8.7	0.133	–31.0	0.344	–128.3
1.5	0.399	112.4	3.652	–16.8	0.140	–36.3	0.329	–134.9
1.6	0.396	101.8	3.440	–25.3	0.146	–43.6	0.314	–141.4
1.7	0.402	91.4	3.246	–33.4	0.152	–48.1	0.300	–148.6
1.8	0.406	80.7	3.084	–41.7	0.159	–54.6	0.285	–154.9
1.9	0.411	70.3	2.936	–49.1	0.163	–60.4	0.268	–161.9
2.0	0.413	60.6	2.795	–57.3	0.169	–66.3	0.258	–168.3
2.1	0.420	50.8	2.681	–65.2	0.173	–72.5	0.238	–175.3
2.2	0.425	41.5	2.558	–73.3	0.181	–78.7	0.232	177.6
2.3	0.434	32.5	2.460	–80.9	0.185	–84.5	0.216	169.6
2.4	0.438	23.7	2.368	–88.6	0.194	–91.0	0.208	162.4
2.5	0.446	14.8	2.275	–96.3	0.198	–97.5	0.192	154.5
2.6	0.459	6.8	2.204	–104.1	0.206	–102.5	0.180	146.1
2.7	0.467	–1.7	2.122	–111.8	0.213	–109.1	0.170	138.9
2.8	0.476	–10.2	2.050	–119.3	0.217	–115.4	0.162	129.4
2.9	0.480	–18.4	1.999	–126.9	0.221	–121.6	0.147	120.9
3.0	0.489	–26.4	1.931	–134.4	0.228	–128.2	0.141	110.8

PACKAGE DIMENSIONS

FLAT-LEAD 6 PIN THIN-TYPE ULTRA SUPER MINIMOLD (UNIT: mm)





PIN CONNECTIONS

1. Collector (Q1)
2. Emitter (Q1)
3. Collector (Q2)
4. Base (Q2)
5. Emitter (Q2)
6. Base (Q1)

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