NEC

NPN SILICON RF TWIN TRANSISTOR

μPA840TC

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

DESCRIPTION

The μPA840TC 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 = 1.5 dB TYP. @ f = 2 GHz, V_{CE} = 3 V, I_C = 3 mA
  Q2 : NF = 1.4 dB TYP. @ f = 1 GHz, V_{CE} = 3 V, I_C = 7 mA
- High gain
  Q1 : $|S_{21e}|^2$ = 8.5 dB TYP. @ f = 2 GHz, V_{CE} = 3 V, I_C = 10 mA
  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
- Built-in 2 different transistors (2SC5010, 2SC5007)

BUILT-IN TRANSISTORS

	Q1	Q2
3-pin ultra super minimold part No.	2SC5010	2SC5007

ORDERING INFORMATION

Part Number	Package	Quantity	Supplying Form
μPA840TC	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.
μPA840TC-T1		Taping products (3 kp/reel)	

Remark To order evaluation samples, please contact your local NEC sales office. (Part number for sample order: μPA840TC.)

Caution Electro-static sensitive devices

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ABSOLUTE MAXIMUM RATINGS (T_A = +25°C)

Parameter	Symbol	Ratings		Unit
		Q1	Q2	
Collector to Base Voltage	V_{CBO}	9	20	V
Collector to Emitter Voltage	V_{CEO}	6	10	V
Emitter to Base Voltage	V_{EBO}	2	1.5	V
Collector Current	I_C	30	65	mA
Total Power Dissipation	P_T[Note]	180 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} = 5 V, I_E = 0	–	–	0.1	μA
Emitter Cutoff Current	I_{EBO}	V_{EB} = 1 V, I_C = 0	–	–	0.1	μA
DC Current Gain	h_{FE}	V_{CE} = 3 V, I_C = 10 mA[Note 1]	75	–	150	
Gain Bandwidth Product	f_T	V_{CE} = 3 V, I_C = 10 mA, f = 2 GHz	10.0	12.0	–	GHz
Feedback 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: 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.

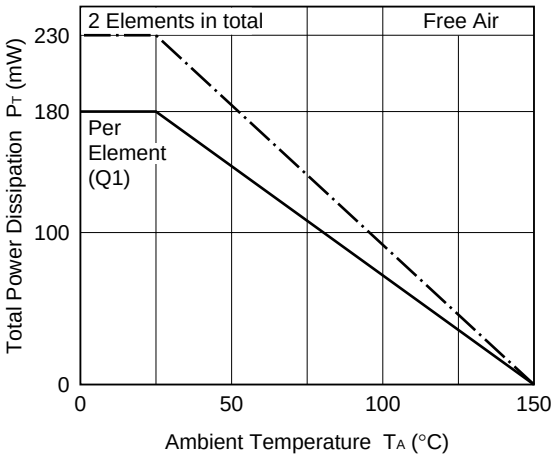
h_{FE} CLASSIFICATION

Rank	FB
Marking	89
h_{FE} Value of Q1	75 to 150
h_{FE} Value of Q2	70 to 150

TYPICAL CHARACTERISTICS (T_A = +25°C)

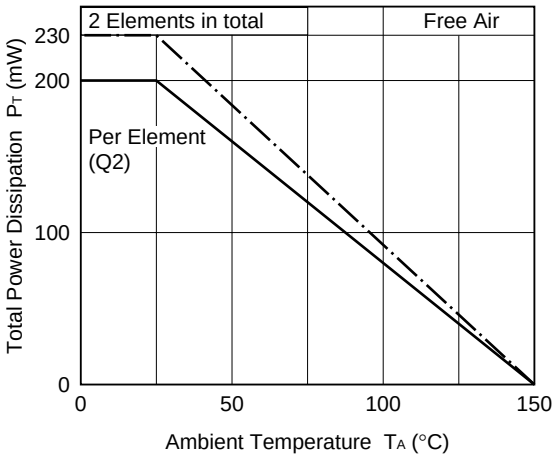
Q1

TOTAL POWER DISSIPATION vs.
AMBIENT TEMPERATURE

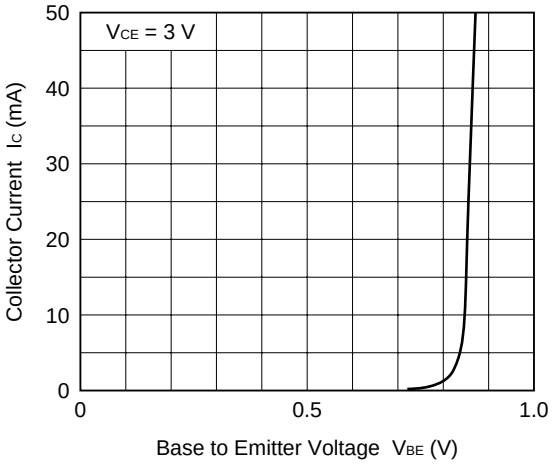


Q2

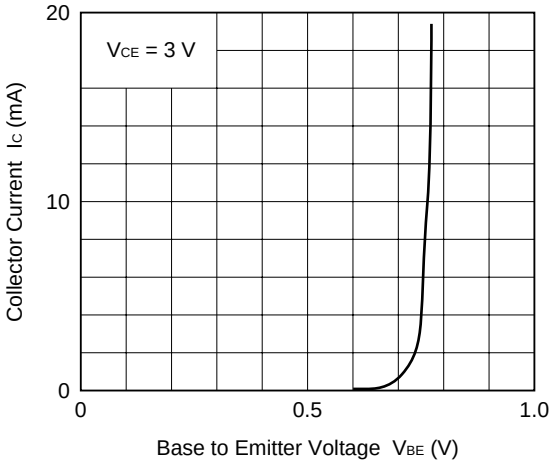
TOTAL POWER DISSIPATION vs.
AMBIENT TEMPERATURE



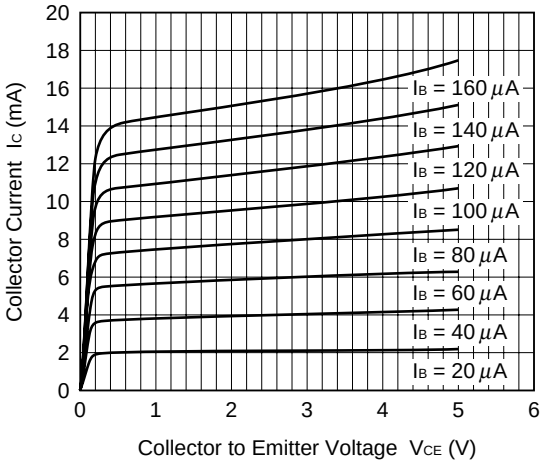
COLLECTOR CURRENT vs.
BASE TO EMITTER VOLTAGE



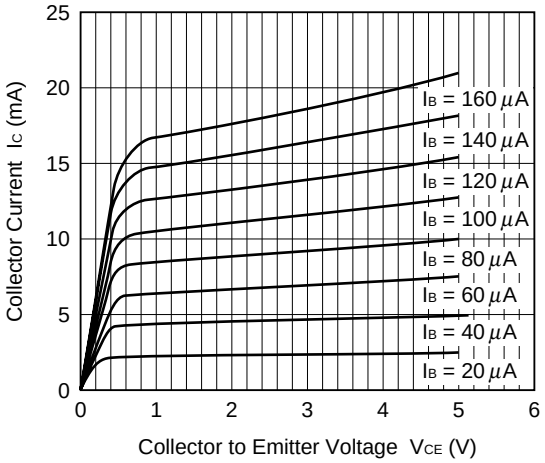
COLLECTOR CURRENT vs.
BASE TO EMITTER VOLTAGE



COLLECTOR CURRENT vs.
COLLECTOR TO EMITTER VOLTAGE

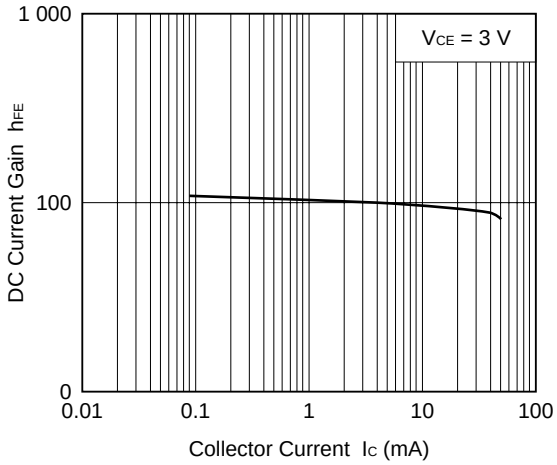


COLLECTOR CURRENT vs.
COLLECTOR TO EMITTER VOLTAGE



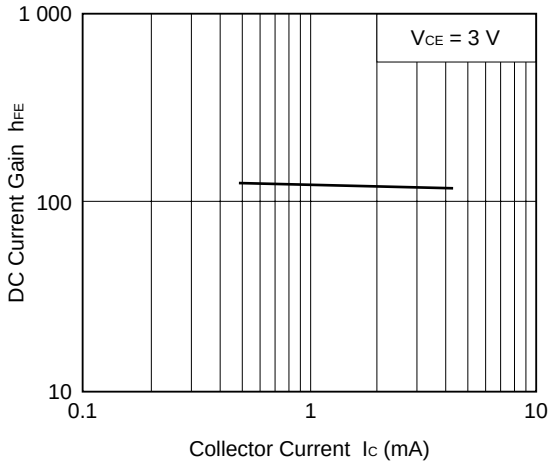
Q1

DC CURRENT GAIN vs.
COLLECTOR CURRENT

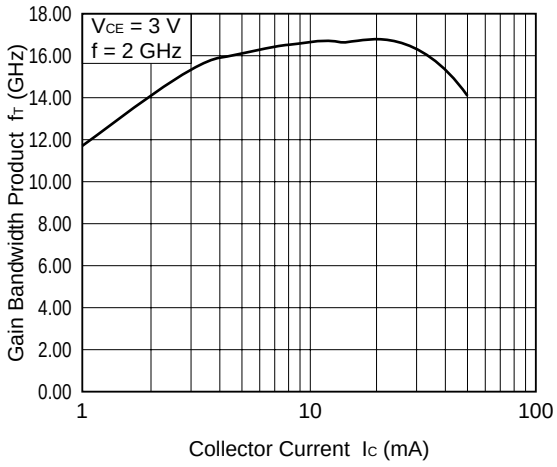


Q2

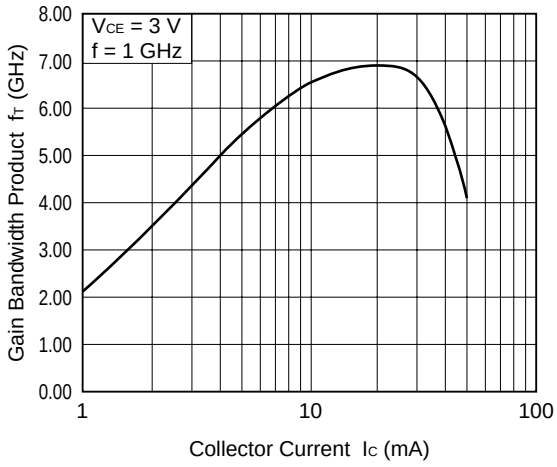
DC CURRENT GAIN vs.
COLLECTOR CURRENT



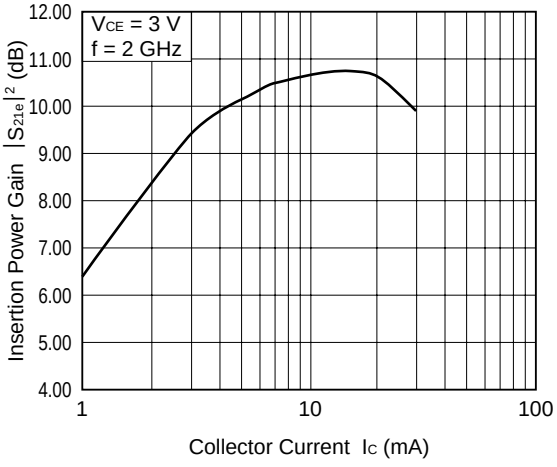
GAIN BANDWIDTH PRODUCT vs.
COLLECTOR CURRENT



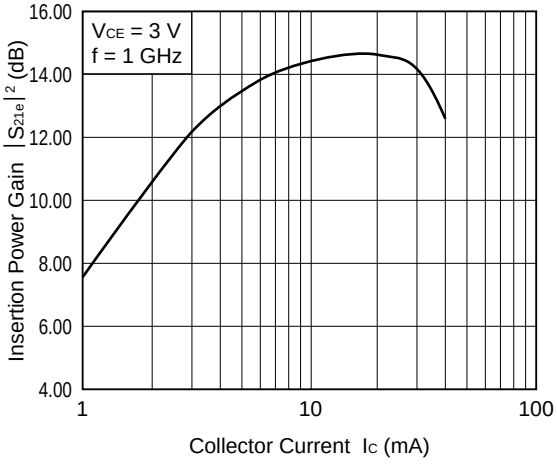
GAIN BANDWIDTH PRODUCT vs.
COLLECTOR CURRENT



INSERTION POWER GAIN vs.
COLLECTOR CURRENT

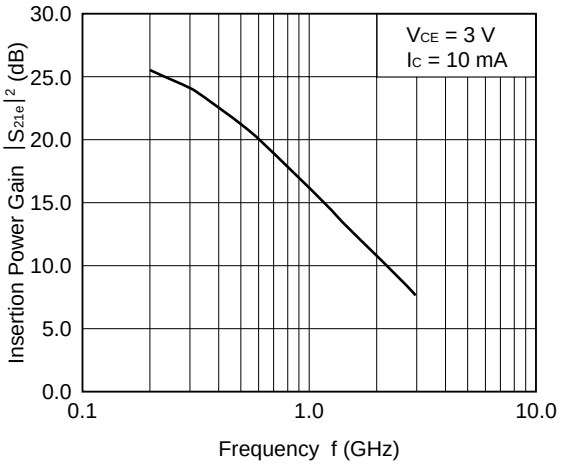


INSERTION POWER GAIN vs.
COLLECTOR CURRENT

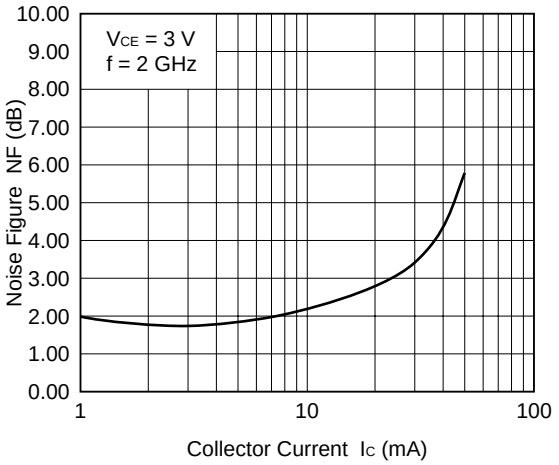


Q1

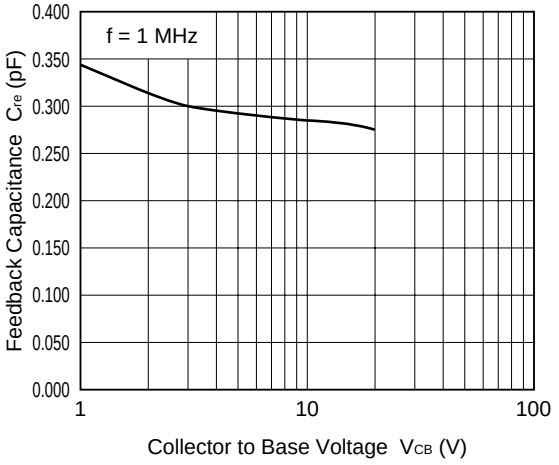
INSERTION POWER GAIN vs. FREQUENCY



NOISE FIGURE vs. COLLECTOR CURRENT

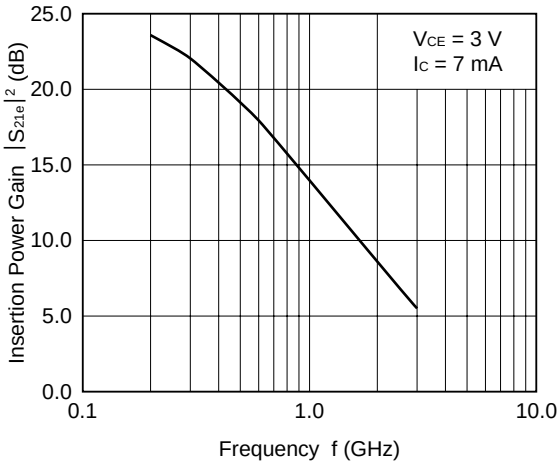


FEEDBACK CAPACITANCE vs.
COLLECTOR TO BASE VOLTAGE

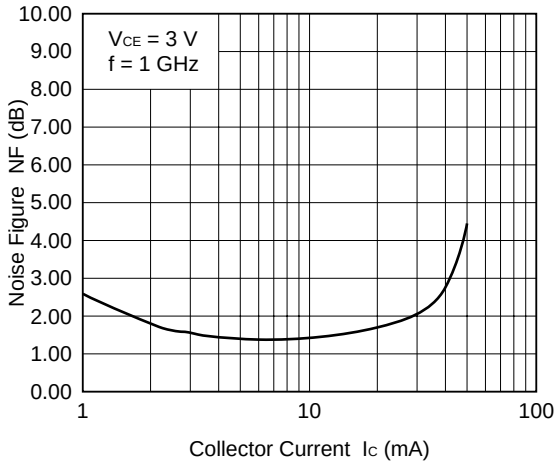


Q2

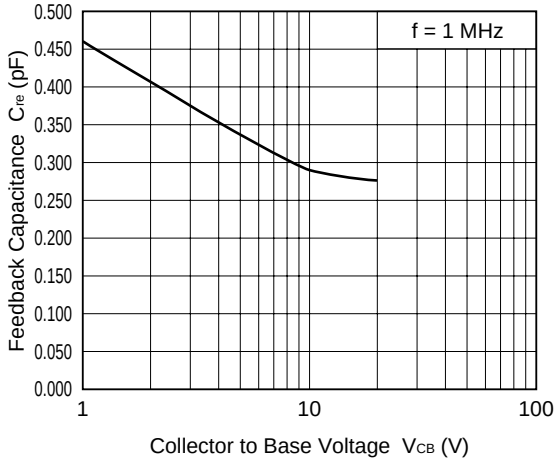
INSERTION POWER GAIN vs. FREQUENCY



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	0.952	–14.6	3.781	166.9	0.012	19.7	0.997	–9.8
0.2	0.948	–25.2	3.629	154.2	0.037	67.2	0.995	–18.9
0.3	0.931	–38.1	3.537	142.6	0.055	60.4	0.976	–28.6
0.4	0.909	–51.0	3.429	130.3	0.068	49.7	0.967	–37.7
0.5	0.884	–63.4	3.380	118.8	0.086	39.5	0.945	–47.0
0.6	0.847	–75.8	3.247	106.6	0.100	31.1	0.918	–55.4
0.7	0.814	–87.5	3.167	95.3	0.113	20.5	0.892	–64.0
0.8	0.782	–99.6	3.055	84.4	0.125	10.4	0.869	–72.3
0.9	0.746	–111.4	2.968	73.3	0.137	3.3	0.844	–81.3
1.0	0.706	–123.7	2.866	62.4	0.147	–5.6	0.816	–89.7
1.1	0.668	–135.6	2.760	52.2	0.157	–15.1	0.789	–97.6
1.2	0.630	–147.0	2.683	41.6	0.162	–22.9	0.762	–105.6
1.3	0.603	–159.3	2.591	31.3	0.171	–31.3	0.740	–113.7
1.4	0.567	–171.2	2.512	21.6	0.171	–38.4	0.715	–121.1
1.5	0.539	176.5	2.424	11.6	0.176	–46.8	0.692	–128.9
1.6	0.513	164.3	2.349	1.6	0.185	–54.2	0.667	–136.4
1.7	0.488	152.2	2.277	–8.2	0.188	–60.9	0.647	–144.2
1.8	0.466	139.4	2.212	–17.7	0.191	–68.6	0.627	–151.5
1.9	0.447	126.7	2.150	–27.1	0.192	–76.1	0.606	–159.5
2.0	0.428	114.6	2.078	–36.7	0.197	–81.6	0.594	–166.1
2.1	0.414	101.1	2.013	–46.0	0.196	–89.0	0.573	–173.8
2.2	0.405	89.4	1.951	–55.2	0.202	–95.2	0.552	178.6
2.3	0.397	76.3	1.893	–64.1	0.204	–103.4	0.537	170.9
2.4	0.392	63.6	1.840	–73.2	0.204	–110.3	0.524	163.2
2.5	0.385	50.6	1.785	–82.0	0.205	–116.7	0.506	155.5
2.6	0.383	38.5	1.732	–91.0	0.206	–122.6	0.493	147.9
2.7	0.388	27.0	1.683	–99.5	0.206	–128.7	0.479	139.9
2.8	0.388	15.5	1.631	–108.0	0.205	–134.8	0.471	132.3
2.9	0.393	4.4	1.586	–116.6	0.203	–141.2	0.455	124.2
3.0	0.400	–6.4	1.551	–125.1	0.206	–147.2	0.447	116.1

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	0.890	–18.5	9.709	161.7	0.021	36.0	0.992	–12.6
0.2	0.848	–35.4	9.062	146.2	0.036	69.5	0.958	–25.4
0.3	0.809	–50.5	8.523	131.7	0.053	51.6	0.924	–37.3
0.4	0.744	–67.1	7.960	117.0	0.065	43.6	0.867	–47.8
0.5	0.688	–82.1	7.476	103.5	0.070	35.4	0.804	–57.8
0.6	0.627	–96.1	6.870	90.8	0.082	24.7	0.756	–67.0
0.7	0.571	–110.0	6.369	78.7	0.090	15.1	0.704	–75.8
0.8	0.518	–123.4	5.908	67.5	0.098	6.9	0.661	–84.2
0.9	0.472	–136.5	5.498	56.5	0.104	1.5	0.623	–92.2
1.0	0.430	–149.6	5.135	46.4	0.107	–6.5	0.588	–99.3
1.1	0.392	–162.2	4.796	36.3	0.115	–14.0	0.556	–107.1
1.2	0.364	–175.2	4.511	26.5	0.121	–17.9	0.527	–114.1
1.3	0.337	171.4	4.240	17.0	0.125	–26.8	0.506	–121.4
1.4	0.313	157.9	4.011	7.8	0.131	–32.3	0.483	–128.1
1.5	0.298	144.6	3.796	–1.0	0.134	–38.4	0.462	–135.5
1.6	0.284	131.2	3.620	–10.5	0.142	–44.0	0.447	–142.5
1.7	0.274	117.6	3.425	–18.9	0.147	–50.3	0.427	–150.0
1.8	0.266	104.3	3.274	–27.9	0.150	–56.5	0.410	–156.8
1.9	0.263	90.9	3.140	–36.1	0.155	–63.4	0.392	–164.1
2.0	0.260	77.4	2.995	–44.9	0.163	–69.3	0.383	–171.3
2.1	0.266	63.7	2.883	–53.2	0.167	–75.3	0.365	–178.6
2.2	0.270	52.3	2.768	–61.7	0.171	–81.3	0.352	174.0
2.3	0.276	40.2	2.660	–69.9	0.175	–87.2	0.334	166.1
2.4	0.281	28.8	2.565	–78.1	0.178	–93.2	0.323	158.6
2.5	0.290	17.0	2.467	–86.2	0.184	–99.9	0.310	150.6
2.6	0.304	7.0	2.386	–94.4	0.190	–105.7	0.297	142.3
2.7	0.312	–3.6	2.303	–102.5	0.196	–112.3	0.285	134.0
2.8	0.321	–13.5	2.227	–110.5	0.199	–119.4	0.277	126.2
2.9	0.335	–22.7	2.153	–118.3	0.203	–124.5	0.261	118.1
3.0	0.347	–32.0	2.083	–125.8	0.208	–131.1	0.252	108.9

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	0.815	–22.5	14.288	158.1	0.013	75.2	0.971	–16.2
0.2	0.767	–42.6	12.989	140.3	0.038	56.3	0.917	–29.7
0.3	0.696	–60.5	11.812	123.8	0.046	49.6	0.845	–42.9
0.4	0.614	–78.3	10.605	108.1	0.054	40.7	0.768	–53.5
0.5	0.545	–94.5	9.627	94.4	0.063	30.1	0.699	–63.4
0.6	0.477	–108.7	8.581	81.4	0.074	26.6	0.645	–71.7
0.7	0.427	–123.2	7.793	70.1	0.077	15.8	0.590	–79.9
0.8	0.375	–137.4	7.051	59.3	0.085	9.4	0.549	–87.2
0.9	0.339	–150.8	6.470	49.0	0.092	2.9	0.511	–94.3
1.0	0.302	–164.6	5.947	39.2	0.093	–0.7	0.482	–101.1
1.1	0.276	–178.0	5.487	29.6	0.100	–8.5	0.454	–108.4
1.2	0.255	168.3	5.121	20.5	0.111	–13.0	0.434	–114.6
1.3	0.241	154.3	4.788	11.5	0.114	–20.5	0.414	–122.1
1.4	0.227	139.2	4.488	2.8	0.121	–26.2	0.393	–128.7
1.5	0.219	126.0	4.223	–5.8	0.126	–31.2	0.381	–135.7
1.6	0.214	111.6	3.993	–14.5	0.133	–37.8	0.362	–142.6
1.7	0.214	98.2	3.797	–22.6	0.140	–43.6	0.351	–149.9
1.8	0.216	84.9	3.597	–31.2	0.144	–49.8	0.334	–157.1
1.9	0.221	71.5	3.455	–39.2	0.150	–56.9	0.321	–164.2
2.0	0.225	59.5	3.283	–47.8	0.156	–61.9	0.311	–171.4
2.1	0.236	47.3	3.148	–55.7	0.164	–69.1	0.295	–178.4
2.2	0.243	36.2	3.009	–64.0	0.169	–74.8	0.282	173.6
2.3	0.253	24.9	2.894	–71.7	0.174	–81.4	0.270	165.2
2.4	0.265	15.2	2.787	–79.9	0.181	–87.9	0.258	158.0
2.5	0.275	4.9	2.676	–87.7	0.186	–94.0	0.246	149.0
2.6	0.291	–4.7	2.585	–95.6	0.195	–100.7	0.233	140.9
2.7	0.302	–14.1	2.501	–103.5	0.199	–106.9	0.224	132.6
2.8	0.315	–23.3	2.402	–111.3	0.204	–113.8	0.215	123.0
2.9	0.325	–32.0	2.328	–118.9	0.209	–119.9	0.199	114.6
3.0	0.340	–40.4	2.246	–126.4	0.213	–126.8	0.195	105.7

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	0.713	–26.5	21.445	152.2	0.032	52.8	0.962	–19.8
0.2	0.603	–53.2	18.474	130.7	0.029	63.2	0.833	–36.4
0.3	0.522	–74.1	15.783	112.6	0.041	43.3	0.734	–49.4
0.4	0.425	–92.8	13.307	96.9	0.049	41.9	0.633	–59.1
0.5	0.369	–110.2	11.614	83.5	0.054	33.2	0.570	–67.3
0.6	0.308	–124.2	10.014	71.9	0.061	32.8	0.512	–74.1
0.7	0.267	–140.0	8.853	60.9	0.065	21.8	0.467	–80.6
0.8	0.232	–154.8	7.913	51.0	0.072	16.8	0.437	–87.3
0.9	0.208	–169.3	7.113	41.4	0.081	13.3	0.411	–92.5
1.0	0.188	175.0	6.506	32.3	0.086	5.7	0.387	–99.4
1.1	0.176	159.2	5.958	23.3	0.096	–0.9	0.369	–105.6
1.2	0.167	143.5	5.524	14.8	0.101	–6.8	0.351	–112.8
1.3	0.164	129.9	5.134	6.3	0.110	–13.7	0.336	–119.0
1.4	0.161	115.5	4.809	–1.7	0.113	–17.7	0.327	–125.3
1.5	0.165	101.5	4.506	–10.1	0.122	–24.0	0.312	–132.8
1.6	0.171	87.4	4.242	–18.4	0.129	–31.4	0.299	–139.6
1.7	0.178	75.5	4.004	–26.4	0.135	–36.9	0.289	–146.6
1.8	0.186	63.3	3.816	–34.5	0.143	–43.4	0.276	–153.7
1.9	0.196	52.0	3.634	–42.1	0.151	–50.0	0.267	–161.6
2.0	0.204	41.5	3.461	–50.2	0.158	–56.6	0.257	–168.5
2.1	0.218	31.0	3.312	–58.1	0.162	–63.0	0.242	–175.3
2.2	0.230	21.5	3.169	–66.1	0.171	–70.2	0.232	176.1
2.3	0.243	12.4	3.046	–73.7	0.178	–76.1	0.221	167.1
2.4	0.254	3.9	2.930	–81.4	0.185	–83.6	0.209	159.0
2.5	0.266	–5.8	2.823	–89.2	0.193	–89.7	0.196	150.5
2.6	0.284	–14.1	2.719	–97.1	0.197	–96.9	0.187	141.2
2.7	0.297	–22.9	2.627	–104.5	0.206	–102.6	0.175	132.1
2.8	0.305	–30.7	2.527	–112.3	0.211	–109.6	0.166	121.2
2.9	0.319	–38.5	2.452	–119.8	0.216	–116.6	0.154	112.8
3.0	0.331	–46.4	2.372	–127.4	0.220	–123.5	0.149	102.6

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	0.966	–19.4	4.009	163.3	0.026	37.6	1.002	–11.1
0.2	0.934	–37.8	3.771	148.1	0.050	63.4	0.978	–20.8
0.3	0.915	–55.2	3.587	134.0	0.070	46.6	0.957	–30.8
0.4	0.881	–73.2	3.401	119.4	0.087	40.4	0.930	–40.5
0.5	0.851	–90.0	3.240	106.0	0.096	27.3	0.895	–49.3
0.6	0.812	–106.1	3.030	92.8	0.110	16.3	0.854	–57.9
0.7	0.780	–122.2	2.861	79.9	0.123	4.5	0.819	–66.2
0.8	0.753	–137.2	2.700	68.3	0.130	–4.3	0.791	–73.7
0.9	0.723	–151.6	2.535	56.9	0.138	–12.5	0.763	–81.9
1.0	0.700	–165.7	2.403	45.8	0.139	–21.4	0.737	–89.2
1.1	0.678	–179.4	2.270	34.8	0.142	–30.9	0.712	–96.5
1.2	0.661	167.1	2.157	24.3	0.147	–39.5	0.691	–103.9
1.3	0.647	154.4	2.046	14.2	0.147	–46.2	0.675	–111.1
1.4	0.640	141.9	1.953	4.2	0.146	–53.1	0.657	–118.2
1.5	0.631	129.4	1.853	–5.6	0.147	–61.0	0.639	–125.4
1.6	0.630	117.7	1.783	–15.6	0.146	–67.0	0.625	–132.6
1.7	0.624	106.2	1.703	–24.8	0.145	–72.8	0.612	–140.3
1.8	0.620	94.8	1.630	–34.4	0.141	–79.5	0.603	–147.2
1.9	0.621	84.0	1.576	–43.5	0.140	–84.7	0.592	–154.7
2.0	0.616	73.0	1.508	–53.0	0.138	–89.6	0.582	–162.3
2.1	0.618	62.6	1.449	–61.7	0.136	–96.3	0.568	–169.5
2.2	0.619	52.2	1.395	–70.6	0.133	–100.1	0.558	–177.1
2.3	0.622	42.5	1.347	–79.1	0.131	–104.9	0.551	175.3
2.4	0.627	32.8	1.305	–87.7	0.132	–109.2	0.549	166.9
2.5	0.631	23.2	1.261	–96.3	0.131	–112.7	0.539	158.7
2.6	0.633	13.5	1.223	–104.8	0.131	–117.0	0.535	150.5
2.7	0.635	4.8	1.181	–113.1	0.133	–120.3	0.524	141.9
2.8	0.638	–4.1	1.146	–121.3	0.134	–123.8	0.520	133.6
2.9	0.646	–12.6	1.118	–129.3	0.134	–127.2	0.510	124.8
3.0	0.650	–21.1	1.081	–137.2	0.141	–130.2	0.505	115.8

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	0.866	–27.8	10.288	157.1	0.017	62.1	0.980	–15.5
0.2	0.831	–52.0	9.222	138.4	0.048	59.3	0.919	–28.3
0.3	0.779	–74.1	8.316	121.7	0.063	40.3	0.852	–40.8
0.4	0.713	–95.3	7.433	105.5	0.070	32.4	0.772	–51.5
0.5	0.666	–114.1	6.706	91.5	0.079	23.2	0.709	–60.3
0.6	0.614	–131.7	5.981	78.5	0.086	13.6	0.653	–68.0
0.7	0.574	–148.5	5.383	66.7	0.084	4.1	0.608	–75.0
0.8	0.551	–163.7	4.885	55.6	0.095	–2.8	0.567	–82.1
0.9	0.527	–177.8	4.460	44.9	0.100	–8.2	0.539	–89.0
1.0	0.510	168.6	4.101	34.7	0.101	–14.2	0.510	–95.3
1.1	0.500	155.3	3.805	25.0	0.106	–21.0	0.487	–101.9
1.2	0.491	143.2	3.550	15.5	0.111	–25.5	0.468	–108.6
1.3	0.487	131.7	3.320	6.4	0.111	–32.5	0.454	–114.9
1.4	0.486	119.7	3.118	–2.7	0.116	–37.2	0.436	–121.6
1.5	0.488	108.9	2.940	–11.5	0.118	–42.6	0.420	–128.1
1.6	0.486	98.0	2.785	–20.7	0.122	–48.6	0.406	–134.9
1.7	0.488	87.9	2.640	–29.4	0.126	–53.3	0.397	–141.5
1.8	0.492	77.6	2.521	–37.9	0.128	–58.3	0.389	–148.3
1.9	0.496	67.9	2.407	–46.2	0.132	–64.2	0.373	–155.5
2.0	0.497	58.0	2.290	–54.7	0.138	–69.8	0.363	–162.7
2.1	0.507	48.6	2.195	–62.9	0.139	–74.9	0.353	–169.7
2.2	0.508	39.4	2.110	–71.6	0.144	–79.7	0.341	–177.2
2.3	0.516	30.8	2.028	–79.6	0.147	–84.1	0.331	175.3
2.4	0.521	22.0	1.954	–87.8	0.154	–89.8	0.323	167.5
2.5	0.525	13.2	1.883	–95.7	0.158	–95.2	0.311	159.5
2.6	0.535	4.7	1.821	–104.0	0.162	–101.1	0.303	151.6
2.7	0.540	–3.4	1.762	–111.7	0.169	–105.5	0.294	143.3
2.8	0.546	–11.6	1.701	–119.8	0.173	–112.1	0.288	134.6
2.9	0.553	–19.6	1.653	–127.6	0.178	–117.0	0.276	126.3
3.0	0.560	–27.4	1.600	–135.3	0.185	–123.2	0.274	117.5

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	0.820	–33.4	14.905	152.8	0.020	47.4	0.956	–18.6
0.2	0.751	–62.2	12.868	131.8	0.047	54.3	0.856	–34.1
0.3	0.675	–87.3	11.094	113.7	0.054	35.5	0.762	–47.0
0.4	0.605	–109.5	9.504	97.5	0.062	31.4	0.673	–56.4
0.5	0.547	–129.0	8.289	83.8	0.063	22.7	0.595	–64.5
0.6	0.513	–146.5	7.248	71.5	0.072	17.2	0.540	–71.6
0.7	0.480	–162.9	6.399	60.2	0.073	9.0	0.499	–77.9
0.8	0.462	–177.7	5.744	49.7	0.079	1.3	0.467	–84.2
0.9	0.448	168.9	5.201	39.6	0.086	–1.1	0.441	–90.2
1.0	0.441	155.7	4.748	30.2	0.092	–7.0	0.419	–96.1
1.1	0.433	143.1	4.364	20.9	0.095	–15.1	0.397	–102.4
1.2	0.429	131.5	4.051	11.9	0.099	–17.8	0.382	–107.6
1.3	0.432	120.5	3.771	3.1	0.106	–24.6	0.368	–114.2
1.4	0.430	109.4	3.528	–5.5	0.107	–28.8	0.353	–121.2
1.5	0.436	99.0	3.322	–14.2	0.116	–34.3	0.342	–127.5
1.6	0.437	89.2	3.132	–22.8	0.120	–40.1	0.328	–133.9
1.7	0.444	79.8	2.960	–31.1	0.126	–44.9	0.318	–141.0
1.8	0.448	70.4	2.826	–39.5	0.129	–50.8	0.308	–147.1
1.9	0.455	61.0	2.687	–47.5	0.136	–57.1	0.298	–154.5
2.0	0.458	51.9	2.563	–55.8	0.140	–61.6	0.288	–161.0
2.1	0.468	42.9	2.453	–64.0	0.146	–68.6	0.274	–167.7
2.2	0.474	33.7	2.351	–72.3	0.152	–74.1	0.266	–175.4
2.3	0.482	25.8	2.262	–80.1	0.157	–78.8	0.255	176.3
2.4	0.483	17.0	2.171	–88.0	0.165	–86.1	0.247	169.8
2.5	0.494	8.8	2.092	–96.0	0.170	–90.9	0.235	161.2
2.6	0.502	0.8	2.025	–104.0	0.176	–96.8	0.225	153.3
2.7	0.509	–7.2	1.956	–111.5	0.182	–103.4	0.216	144.3
2.8	0.516	–15.1	1.883	–119.4	0.189	–109.8	0.209	136.1
2.9	0.525	–22.6	1.831	–127.2	0.194	–115.3	0.196	127.0
3.0	0.533	–30.4	1.772	–134.7	0.202	–121.0	0.192	117.7

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

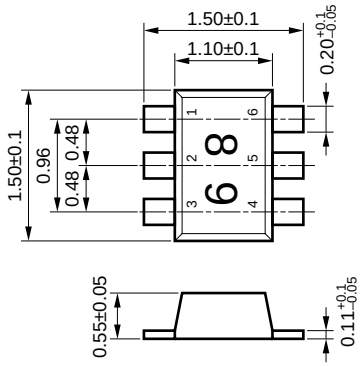
FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
0.1	0.802	–36.6	17.259	151.1	0.030	29.4	0.952	–20.5
0.2	0.708	–66.3	14.639	128.6	0.043	58.3	0.819	–36.6
0.3	0.621	–93.5	12.355	110.2	0.048	35.5	0.715	–49.7
0.4	0.550	–115.4	10.389	94.3	0.056	28.9	0.618	–58.9
0.5	0.508	–135.0	8.980	80.8	0.061	25.6	0.551	–66.0
0.6	0.469	–152.7	7.774	68.8	0.072	19.3	0.500	–72.6
0.7	0.445	–168.1	6.830	57.8	0.074	10.7	0.453	–78.9
0.8	0.428	176.9	6.100	47.6	0.078	7.0	0.424	–84.8
0.9	0.416	163.6	5.492	38.0	0.083	2.1	0.401	–90.5
1.0	0.413	150.8	5.013	28.6	0.091	–3.7	0.380	–96.3
1.1	0.406	138.6	4.594	19.5	0.096	–9.5	0.360	–102.3
1.2	0.405	127.8	4.260	10.6	0.096	–15.2	0.349	–108.0
1.3	0.410	117.2	3.958	2.1	0.106	–21.4	0.332	–114.2
1.4	0.411	106.1	3.699	–6.6	0.112	–26.3	0.319	–120.4
1.5	0.414	96.2	3.479	–14.9	0.116	–31.3	0.308	–126.8
1.6	0.418	86.6	3.275	–23.5	0.122	–37.1	0.298	–133.2
1.7	0.422	77.5	3.095	–31.8	0.129	–42.0	0.287	–140.4
1.8	0.429	68.2	2.948	–39.9	0.134	–48.2	0.277	–146.6
1.9	0.435	58.9	2.815	–47.9	0.142	–54.6	0.268	–154.3
2.0	0.441	50.1	2.675	–55.9	0.148	–60.6	0.258	–160.6
2.1	0.450	41.2	2.559	–64.0	0.153	–66.0	0.243	–167.4
2.2	0.457	32.6	2.454	–72.3	0.159	–72.2	0.233	–174.7
2.3	0.464	24.4	2.362	–80.0	0.164	–77.9	0.223	177.6
2.4	0.471	16.1	2.270	–88.1	0.170	–84.3	0.217	169.8
2.5	0.477	7.7	2.188	–95.8	0.179	–90.1	0.202	161.6
2.6	0.487	0.0	2.113	–103.7	0.183	–96.2	0.194	153.6
2.7	0.494	–7.7	2.044	–111.2	0.190	–102.5	0.184	144.6
2.8	0.501	–15.3	1.975	–119.2	0.196	–109.0	0.175	136.4
2.9	0.511	–23.3	1.920	–127.0	0.203	–114.6	0.165	128.1
3.0	0.517	–30.7	1.854	–134.2	0.209	–121.0	0.157	117.3

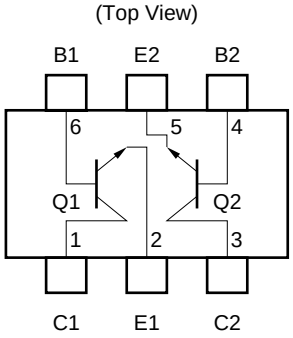
V_{CE} = 3 V, I_C = 10 mA

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
0.1	0.709	–45.9	23.344	145.0	0.036	35.3	0.925	–25.6
0.2	0.582	–81.2	18.347	120.2	0.037	58.3	0.724	–41.5
0.3	0.506	–109.5	14.613	101.7	0.041	39.1	0.603	–53.3
0.4	0.449	–132.8	11.837	86.5	0.048	39.5	0.519	–60.5
0.5	0.418	–151.9	9.941	74.2	0.054	30.6	0.453	–66.3
0.6	0.395	–168.9	8.491	62.9	0.058	26.0	0.412	–71.5
0.7	0.385	176.3	7.391	52.6	0.060	14.6	0.381	–77.0
0.8	0.375	162.0	6.530	43.3	0.072	12.6	0.356	–82.5
0.9	0.371	150.2	5.887	33.9	0.080	9.7	0.340	–88.2
1.0	0.369	138.3	5.324	25.0	0.084	3.3	0.325	–93.0
1.1	0.372	126.8	4.866	16.3	0.092	–3.1	0.310	–99.2
1.2	0.372	116.6	4.502	7.8	0.097	–8.1	0.298	–105.1
1.3	0.380	107.1	4.181	–0.5	0.102	–13.3	0.286	–110.7
1.4	0.384	97.0	3.897	–8.7	0.109	–19.5	0.277	–116.9
1.5	0.390	88.1	3.665	–17.0	0.117	–24.5	0.267	–123.9
1.6	0.394	78.3	3.436	–25.1	0.121	–30.9	0.256	–130.2
1.7	0.402	70.3	3.249	–33.2	0.133	–36.8	0.245	–137.5
1.8	0.407	61.1	3.086	–41.4	0.137	–43.8	0.238	–143.6
1.9	0.416	52.4	2.939	–49.3	0.144	–49.8	0.227	–150.4
2.0	0.421	43.9	2.809	–57.4	0.152	–56.1	0.219	–157.4
2.1	0.433	35.3	2.681	–65.1	0.156	–61.8	0.208	–163.6
2.2	0.440	27.6	2.567	–73.2	0.164	–68.7	0.200	–171.3
2.3	0.448	19.3	2.467	–80.8	0.169	–74.2	0.185	–179.0
2.4	0.455	11.7	2.372	–88.7	0.176	–81.5	0.181	173.5
2.5	0.463	3.8	2.284	–96.3	0.185	–87.7	0.167	165.7
2.6	0.472	–3.8	2.203	–104.2	0.192	–93.8	0.158	156.2
2.7	0.477	–11.4	2.132	–111.5	0.198	–99.2	0.147	147.8
2.8	0.488	–19.2	2.058	–119.5	0.205	–106.5	0.137	138.7
2.9	0.495	–26.5	1.996	–126.8	0.212	–112.9	0.127	130.9
3.0	0.504	–33.9	1.939	–134.6	0.219	–120.0	0.123	121.4

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)

[MEMO]

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