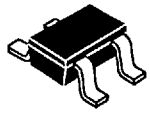
NEC SURFACE MOUNT NPN SILICON HIGH FREQUENCY TRANSISTOR | NE686 SERIES

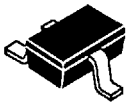
FEATURES

- **HIGH GAIN BANDWIDTH PRODUCT:** f_T of 15 GHz
- **LOW VOLTAGE/LOW CURRENT OPERATION**
- **HIGH INSERTION POWER GAIN:**
  $|S21E|^2$ = 12 dB @ 2 V, 7 mA, 2 GHz
  $|S21E|^2$ = 11 dB @ 1 V, 5 mA, 2 GHz
- **LOW NOISE:** 1.5 dB AT 2.0 GHz
- **AVAILABLE IN SIX LOW COST PLASTIC SURFACE MOUNT PACKAGE STYLES**

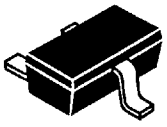


18 (SOT 343 STYLE)

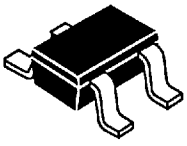
19 (3 PIN ULTRA SUPER MINI MOLD)



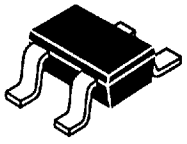
30 (SOT 323 STYLE)



33 (SOT 23 STYLE)



39 (SOT 143 STYLE)



39R (SOT 143R STYLE)

DESCRIPTION

The NE686 series of NPN epitaxial silicon transistors are designed for low voltage/low current, amplifier and oscillator applications. NE686's high f_T make it an excellent choice for portable wireless applications up to 5 GHz. The NE686 die is available in six different low cost plastic surface mount package styles.

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

PART NUMBER[1] / EIAJ[2] REGISTERED NUMBER / PACKAGE OUTLINE			NE68618 2SC5180 18			NE68619 2SC5181 19			NE68630 2SC5179 30			NE68633 2SC5177 33			NE68639/39R 2SC5178/78R 39/39R		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX
f_T	Gain Bandwidth Product at V_{CE} = 2 V, I_C = 7 mA, f = 2.0 GHz	GHz	12	15.5		10	13		7.5	9		10	13		10.5	13.5	
f_T	Gain Bandwidth Product at V_{CE} = 1 V, I_C = 5 mA, f = 2.0 GHz	GHz	10	13		8.5	12		7	8.5		8.5	12		8.5	12	
NF_{MIN}	Minimum Noise Figure at V_{CE} = 2 V, I_C = 3 mA, f = 2.0 GHz	dB		1.5	2.0		1.5	2.0		1.5	2.0		1.5	2.0		1.5	2.0
NF_{MIN}	Minimum Noise Figure at V_{CE} = 1 V, I_C = 3 mA, f = 2.0 GHz	dB		1.5	2.0		1.5	2.0		1.5	2.0		1.5	2.0		1.5	2.0
$\|S_{21e}\|^2$	Insertion Power Gain at V_{CE} = 2V, I_C =7 mA, f = 2.0 GHz	dB	10	12		8	10.5		7.5	9		7.5	9		9.5	11.5	
$\|S_{21e}\|^2$	Insertion Power Gain at V_{CE} = 1V, I_C =5 mA, f = 2.0 GHz	dB	8.5	11		7	9		7	8.5		7	8.5		7.5	10.5	
h_{FE}	Forward Current Gain[3] at V_{CE} = 2 V, I_C = 7 mA		70		140	70		140	70		140	70		140	70		140
I_{CBO}	Collector Cutoff Current at V_{CB} = 5 V, I_E = 0 mA	nA			100			100			100			100			100
I_{EBO}	Emitter Cutoff Current at V_{EB} = 1 V, I_C = 0 mA	nA			100			100			100			100			100
C_{RE}[4]	Feedback Capacitance at V_{CB} = 2 V, I_E = 0 mA, f = 1 MHz	pF		0.3	0.5		0.4	0.6		0.4	0.6		0.5	0.6		0.3	0.5
P_T	Total Power Dissipation	mW			30			30			30			30			30
$R_{TH(J-A)}$	Thermal Resistance (Junction to Ambient)	°C/W			833			1250			833			625			625
$R_{TH(J-C)}$	Thermal Resistance(Junction to Case)	°C/W															

Notes:
1. Precaution: Devices are ESD sensitive. Use proper handling procedures.
2. Electronic Industrial Association of Japan.
3. Pulsed measurement, PW ≤ 350 μs, duty cycle ≤ 2%.
4. The emitter terminal should be connected to the ground terminal of the 3 terminal capacitance bridge.

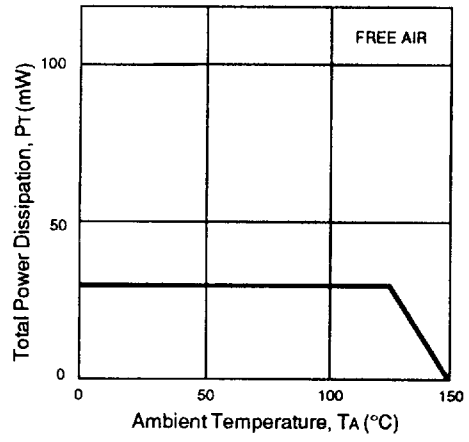
ABSOLUTE MAXIMUM RATINGS[1] (T_A = 25°C)

SYMBOLS	PARAMETERS	UNITS	RATINGS
V_{CBO}	Collector to Base Voltage	V	5
V_{CEO}	Collector to Emitter Voltage	V	3
V_{EBO}	Emitter to Base Voltage	V	2
I_C	Collector Current	mA	10
T_J	Operating Junction Temperature	°C	150
T_{STG}	Storage Temperature	°C	-65 to +150

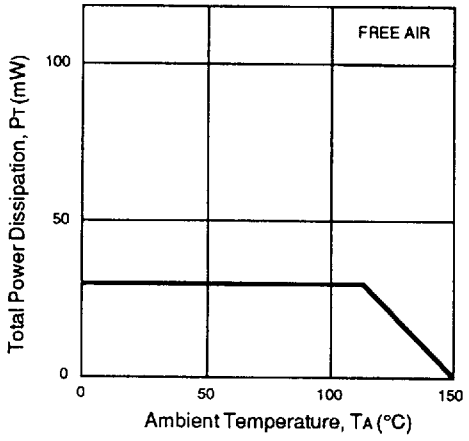
Notes:
1. Operation in excess of any one of these parameters may result in permanent damage.

TYPICAL PERFORMANCE CURVES (T_A = 25°)

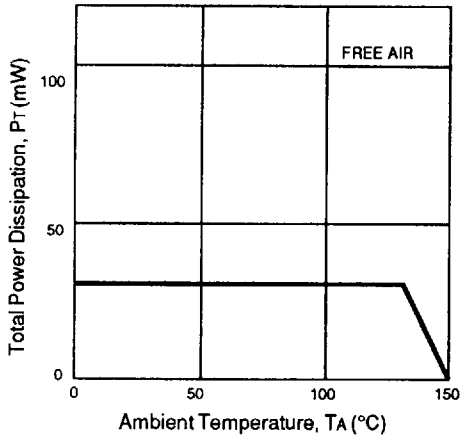
NE68618, NE68630
D.C. POWER DERATING CURVE



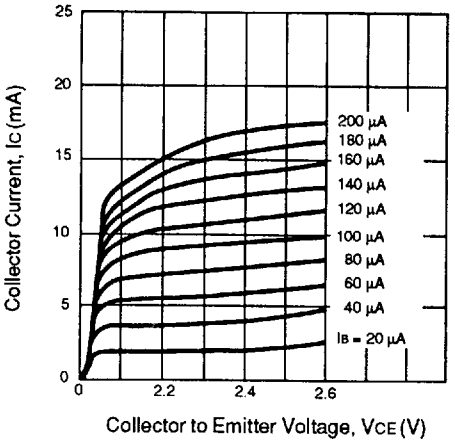
NE68619
D.C. POWER DERATING CURVE



NE68633, NE68639
D.C. POWER DERATING CURVE

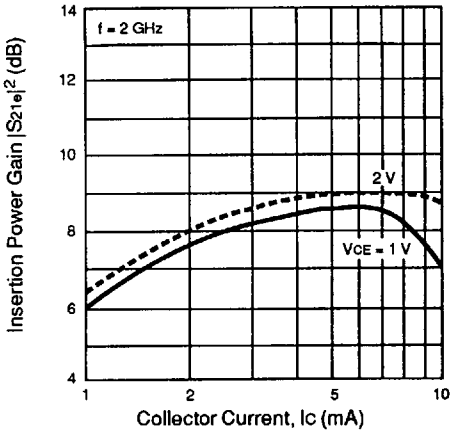


COLLECTOR CURRENT vs.
COLLECTOR TO EMITTER VOLTAGE

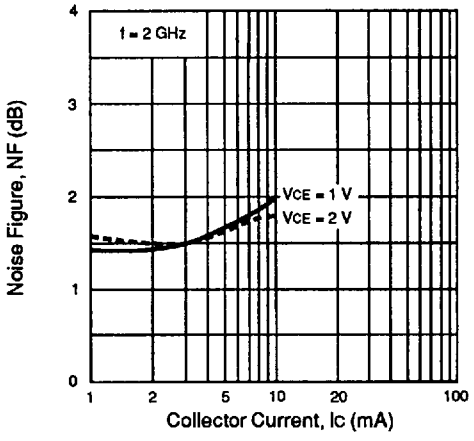


TYPICAL PERFORMANCE CURVES (TA = 25°C)

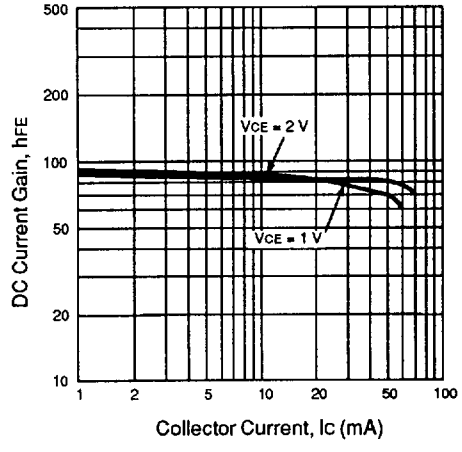
NE68618
INSERTION GAIN vs.
COLLECTOR CURRENT



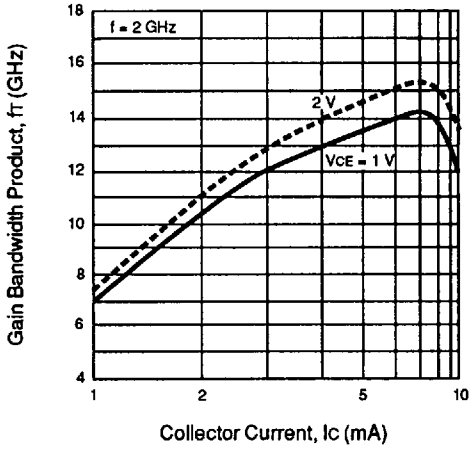
NE68633
NOISE FIGURE vs.
COLLECTOR CURRENT



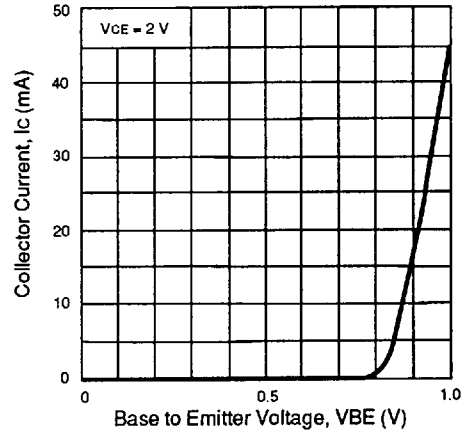
D.C. CURRENT GAIN vs.
COLLECTOR CURRENT



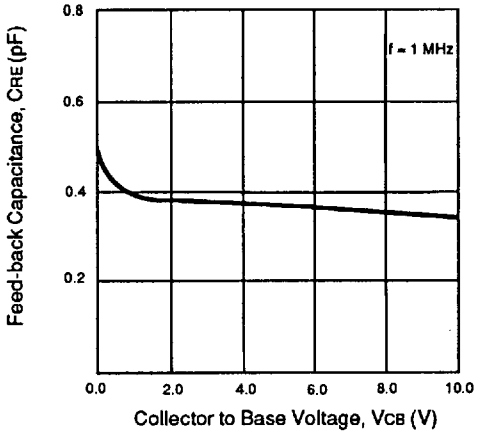
NE68618
GAIN BANDWIDTH PRODUCT
vs. COLLECTOR CURRENT



COLLECTOR CURRENT vs.
BASE TO EMITTER VOLTAGE



NE68630
FEED-BACK CAPACITANCE vs.
COLLECTOR TO BASE VOLTAGE



TYPICAL SCATTERING PARAMETERS (T_A = 25°C)

NE68618

V_{CE} = 0.5 V, I_C = 0.5 mA

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG[1]
GHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG		(dB)
0.1	0.981	-5.400	1.742	170.900	0.018	85.100	0.998	-4.500	0.088	19.858
0.4	0.965	-19.400	1.717	156.600	0.069	72.900	0.988	-17.400	0.128	13.959
0.8	0.910	-38.900	1.667	134.100	0.130	56.400	0.953	-33.800	0.247	11.080
1.0	0.873	-47.700	1.620	123.700	0.156	48.600	0.930	-41.500	0.310	10.164
1.5	0.775	-70.200	1.506	98.600	0.208	30.500	0.863	-59.000	0.455	8.598
2.0	0.675	-90.800	1.385	76.400	0.241	15.000	0.795	-74.000	0.595	7.594
2.5	0.584	-111.200	1.289	56.200	0.261	1.800	0.741	-86.800	0.714	6.936
3.0	0.505	-130.500	1.215	38.700	0.273	-9.500	0.694	-98.500	0.820	6.484
4.0	0.363	-175.500	1.118	6.100	0.289	-29.700	0.599	-120.800	1.013	5.181
5.0	0.298	122.200	1.049	-26.800	0.289	-47.800	0.492	-151.700	1.187	2.982
V_{CE} = 1.0 V, I_C = 1.0 mA										
0.1	0.951	-6.200	3.324	171.000	0.015	82.800	0.995	-4.900	0.119	23.456
0.4	0.941	-21.900	3.232	154.800	0.057	71.800	0.976	-19.000	0.147	17.536
0.8	0.854	-43.300	3.027	131.200	0.105	55.200	0.919	-36.500	0.277	14.598
1.0	0.799	-53.000	2.879	120.700	0.125	47.700	0.884	-44.400	0.341	13.623
1.5	0.669	-75.800	2.529	95.900	0.161	31.200	0.793	-61.500	0.507	11.961
2.0	0.554	-95.800	2.211	74.800	0.184	18.500	0.715	-75.600	0.656	10.798
2.5	0.456	-114.500	1.969	55.800	0.199	8.000	0.657	-87.300	0.793	9.954
3.0	0.378	-132.100	1.781	39.300	0.211	-0.500	0.611	-97.900	0.907	9.264
4.0	0.247	-176.200	1.543	8.700	0.238	-15.500	0.520	-119.200	1.075	6.442
5.0	0.207	114.600	1.397	-22.400	0.269	-31.300	0.411	-151.100	1.165	4.693
V_{CE} = 1.0 V, I_C = 3.0 mA										
0.1	0.888	-9.000	8.309	169.500	0.015	86.700	0.981	-7.200	0.058	27.435
0.4	0.806	-34.400	7.521	143.100	0.053	66.400	0.905	-27.100	0.266	21.520
0.8	0.619	-61.800	6.033	114.400	0.088	50.300	0.758	-46.800	0.486	18.361
1.0	0.537	-72.800	5.360	103.200	0.101	44.600	0.695	-54.100	0.580	17.248
1.5	0.377	-95.200	4.085	79.700	0.126	34.100	0.582	-67.900	0.782	15.108
2.0	0.272	-113.800	3.257	61.200	0.148	26.500	0.516	-78.500	0.921	13.426
2.5	0.201	-131.800	2.729	44.700	0.168	19.300	0.478	-87.400	1.015	11.363
3.0	0.149	-147.600	2.359	30.200	0.190	12.500	0.453	-96.200	1.072	9.303
4.0	0.092	146.900	1.921	3.400	0.240	-2.500	0.387	-116.200	1.114	6.980
5.0	0.175	74.000	1.669	-24.300	0.292	-20.500	0.284	-150.600	1.116	5.501
V_{CE} = 1.0 V, I_C = 5.0 mA										
0.1	0.841	-11.500	11.845	167.400	0.014	82.300	0.968	-8.900	0.137	29.274
0.4	0.702	-42.900	9.947	135.300	0.049	64.100	0.840	-31.600	0.357	23.075
0.8	0.479	-72.200	7.185	105.600	0.079	50.400	0.658	-49.900	0.624	19.588
1.0	0.397	-83.000	6.172	94.900	0.090	46.100	0.596	-56.000	0.726	18.362
1.5	0.259	-104.900	4.478	73.100	0.114	38.200	0.501	-67.100	0.910	15.942
2.0	0.174	-124.400	3.490	56.000	0.140	31.500	0.453	-76.400	1.008	13.409
2.5	0.120	-144.600	2.882	40.500	0.164	24.400	0.429	-84.700	1.066	10.880
3.0	0.083	-163.500	2.469	26.700	0.190	17.000	0.413	-93.300	1.095	9.258
4.0	0.075	112.200	1.987	1.000	0.244	1.000	0.356	-113.400	1.111	7.078
5.0	0.190	62.000	1.712	-25.700	0.300	-18.000	0.253	-148.900	1.100	5.637
V_{CE} = 2.0 V, I_C = 3.0 mA										
0.1	0.888	-8.100	8.454	169.600	0.013	81.500	0.986	-6.600	0.146	28.131
0.4	0.819	-31.700	7.701	144.300	0.047	68.200	0.918	-25.000	0.263	22.144
0.8	0.638	-57.400	6.259	116.100	0.080	52.500	0.785	-43.400	0.483	18.934
1.0	0.555	-67.400	5.586	105.000	0.092	46.900	0.727	-50.500	0.576	17.833
1.5	0.389	-87.700	4.289	81.500	0.116	36.500	0.621	-63.800	0.775	15.679
2.0	0.282	-103.500	3.425	63.000	0.138	28.700	0.558	-74.100	0.909	13.948
2.5	0.203	-118.000	2.868	46.600	0.157	21.600	0.524	-82.800	0.999	12.617
3.0	0.145	-127.900	2.472	32.300	0.178	14.700	0.503	-91.300	1.056	9.982
4.0	0.056	-178.900	2.004	5.900	0.225	-0.200	0.446	-109.700	1.101	7.565
5.0	0.126	66.600	1.747	-21.100	0.278	-17.500	0.346	-138.700	1.098	6.072

TYPICAL SCATTERING PARAMETERS (T_A = 25°C)

NE68618

V_{CE} = 2.0 V, I_C = 7.0 mA

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG[1]
GHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG		(dB)
0.1	0.799	-12.200	14.596	166.100	0.012	80.800	0.968	-8.900	0.180	30.851
0.4	0.642	-44.000	11.751	131.900	0.041	65.000	0.822	-30.600	0.425	24.573
0.8	0.418	-70.900	8.108	102.600	0.066	53.500	0.646	-46.000	0.703	20.894
1.0	0.343	-79.900	6.877	92.300	0.076	50.000	0.592	-50.900	0.799	19.566
1.5	0.213	-97.100	4.913	71.400	0.100	43.000	0.517	-60.600	0.953	16.913
2.0	0.139	-111.500	3.795	55.000	0.125	36.200	0.481	-69.500	1.029	13.777
2.5	0.089	-124.100	3.120	40.100	0.150	28.800	0.465	-77.900	1.064	11.634
3.0	0.053	-129.000	2.656	26.800	0.175	21.200	0.456	-86.600	1.085	10.036
4.0	0.029	90.100	2.124	1.900	0.227	5.000	0.409	-106.000	1.093	7.853
5.0	0.154	53.900	1.837	-24.100	0.285	-13.900	0.307	-137.200	1.073	6.443

NE68619

V_{CE} = 0.5 V, I_C = 0.5 mA

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG[1]
GHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG		(dB)
0.1	0.978	-5.400	1.736	170.700	0.020	84.800	0.997	-4.700	0.096	19.385
0.4	0.959	-21.100	1.711	154.500	0.080	71.800	0.984	-18.400	0.147	13.302
0.8	0.897	-41.100	1.617	131.200	0.148	54.700	0.936	-34.900	0.289	10.384
1.0	0.861	-50.000	1.562	120.500	0.176	47.000	0.907	-42.000	0.363	9.482
1.5	0.758	-72.300	1.414	96.300	0.227	30.200	0.827	-56.800	0.526	7.944
2.0	0.670	-92.200	1.302	75.400	0.259	16.800	0.749	-68.400	0.676	7.013
2.5	0.591	-110.700	1.211	56.800	0.281	5.400	0.685	-78.100	0.809	6.344
3.0	0.517	-129.300	1.163	40.000	0.298	-4.600	0.619	-88.300	0.919	5.914
4.0	0.372	-167.900	1.088	7.900	0.321	-23.200	0.488	-113.800	1.126	3.145
5.0	0.251	140.900	1.015	-22.800	0.320	-39.200	0.398	-152.600	1.313	1.663

V_{CE} = 1.0 V, I_C = 1.0 mA

0.1	0.961	-6.300	3.302	171.100	0.018	82.900	0.994	-5.400	0.109	22.635
0.4	0.930	-24.200	3.199	152.900	0.068	71.000	0.970	-20.700	0.146	16.725
0.8	0.836	-46.000	2.916	129.000	0.123	53.900	0.899	-38.500	0.294	13.749
1.0	0.784	-55.600	2.756	118.400	0.144	46.900	0.860	-45.900	0.362	12.819
1.5	0.660	-78.000	2.370	94.800	0.182	31.900	0.761	-60.600	0.532	11.147
2.0	0.562	-97.200	2.065	75.200	0.207	21.100	0.677	-71.400	0.681	9.989
2.5	0.480	-115.000	1.847	57.500	0.226	12.500	0.609	-80.100	0.814	9.124
3.0	0.408	-131.900	1.699	41.600	0.244	5.100	0.547	-89.400	0.920	8.428
4.0	0.280	-169.700	1.504	11.500	0.284	-9.200	0.431	-114.200	1.058	5.763
5.0	0.180	131.100	1.356	-18.200	0.320	-24.300	0.360	-153.900	1.126	4.110

V_{CE} = 1.0 V, I_C = 3.0 mA

0.1	0.892	-9.200	8.262	169.100	0.016	82.600	0.977	-8.000	0.118	27.130
0.4	0.787	-37.400	7.340	140.500	0.061	65.500	0.886	-29.400	0.281	20.804
0.8	0.588	-64.400	5.668	111.800	0.100	50.400	0.721	-48.500	0.523	17.534
1.0	0.508	-74.400	4.989	100.900	0.114	45.500	0.658	-54.700	0.622	16.411
1.5	0.364	-94.500	3.743	78.900	0.142	37.000	0.548	-64.600	0.819	14.209
2.0	0.282	-110.800	2.989	61.800	0.168	30.900	0.483	-70.900	0.943	12.502
2.5	0.223	-124.100	2.515	46.400	0.197	24.800	0.439	-75.600	1.020	10.186
3.0	0.179	-140.000	2.202	32.500	0.226	18.500	0.400	-82.000	1.062	8.366
4.0	0.104	168.400	1.825	6.200	0.293	3.400	0.309	-103.900	1.086	6.160
5.0	0.127	70.800	1.587	-20.100	0.355	-14.700	0.242	-147.500	1.081	4.769

V_{CE} = 1.0 V, I_C = 5.0 mA

0.1	0.840	-12.900	11.730	166.900	0.016	82.800	0.961	-10.000	0.117	28.652
0.4	0.673	-46.800	9.623	132.800	0.056	63.100	0.812	-34.800	0.371	22.351
0.8	0.455	-75.500	6.718	103.800	0.089	50.500	0.617	-52.600	0.649	18.778
1.0	0.379	-85.400	5.736	93.500	0.101	47.100	0.555	-57.600	0.752	17.543
1.5	0.262	-105.600	4.127	73.200	0.130	40.800	0.463	-64.900	0.920	15.017
2.0	0.201	-121.400	3.232	57.400	0.159	35.100	0.414	-69.700	1.011	12.437
2.5	0.163	-134.500	2.683	42.900	0.191	28.700	0.383	-73.600	1.056	10.027
3.0	0.132	-150.800	2.327	29.700	0.224	21.900	0.352	-79.600	1.077	8.475
4.0	0.095	149.700	1.904	4.300	0.293	5.700	0.267	-102.400	1.084	6.364
5.0	0.151	66.900	1.644	-21.200	0.358	-13.100	0.206	-151.000	1.069	5.014

TYPICAL SCATTERING PARAMETERS (T_A = 25°C)

NE68619

V_{CE} = 2.0 V, I_C = 3.0 mA

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG[1]
GHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG		(dB)
0.1	0.904	-9.100	8.282	169.400	0.015	80.300	0.982	-7.500	0.146	27.420
0.4	0.802	-34.800	7.456	142.400	0.056	66.800	0.902	-27.800	0.266	21.243
0.8	0.619	-60.300	5.880	114.400	0.094	51.800	0.748	-46.500	0.498	17.962
1.0	0.542	-70.200	5.215	103.600	0.107	46.700	0.686	-52.800	0.593	16.879
1.5	0.403	-89.400	3.951	81.500	0.134	37.900	0.576	-63.000	0.786	14.696
2.0	0.315	-105.000	3.172	64.500	0.159	31.700	0.509	-69.600	0.912	12.999
2.5	0.260	-117.100	2.670	49.100	0.185	25.800	0.464	-74.500	0.995	11.593
3.0	0.216	-130.900	2.337	35.400	0.213	19.500	0.424	-80.800	1.040	9.182
4.0	0.134	-168.900	1.938	9.200	0.276	4.900	0.334	-102.000	1.071	6.832
5.0	0.094	96.000	1.691	-17.000	0.337	-12.900	0.265	-143.300	1.070	5.392

V_{CE} = 2.0 V, I_C = 7.0 mA

0.1	0.798	-13.600	14.350	165.400	0.014	79.200	0.961	-10.300	0.190	30.107
0.4	0.615	-48.500	11.222	129.400	0.049	63.600	0.789	-34.400	0.438	23.599
0.8	0.397	-75.100	7.496	100.900	0.077	53.500	0.597	-49.400	0.722	19.883
1.0	0.326	-83.900	6.329	91.000	0.089	50.900	0.543	-53.300	0.813	18.519
1.5	0.221	-99.200	4.482	71.700	0.118	45.000	0.470	-59.200	0.956	15.796
2.0	0.169	-112.400	3.478	56.600	0.148	39.200	0.434	-63.600	1.021	12.823
2.5	0.138	-122.600	2.869	42.800	0.179	32.600	0.413	-67.500	1.053	10.636
3.0	0.112	-134.500	2.477	30.100	0.211	25.600	0.389	-73.500	1.068	9.106
4.0	0.069	168.400	2.022	5.700	0.281	9.500	0.311	-94.400	1.064	7.024
5.0	0.120	63.400	1.750	-19.400	0.348	-9.500	0.239	-136.900	1.047	5.687

NE68630

V_{CE} = 0.5 V, I_C = 0.5 mA

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG[1]
GHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG		(dB)
0.1	0.972	-4.900	1.758	172.400	0.028	84.900	0.996	-4.100	0.092	17.979
0.4	0.951	-18.300	1.726	156.700	0.105	75.500	0.974	-15.600	0.167	12.159
0.8	0.874	-35.300	1.644	135.800	0.192	62.700	0.909	-29.400	0.317	9.326
1.0	0.821	-42.600	1.585	126.300	0.228	57.300	0.872	-35.400	0.393	8.421
1.5	0.699	-59.800	1.449	105.600	0.291	45.900	0.775	-47.700	0.556	6.972
2.0	0.584	-74.400	1.327	89.100	0.327	37.800	0.693	-57.200	0.692	6.083
2.5	0.487	-86.700	1.237	75.200	0.346	32.500	0.628	-64.600	0.812	5.533
3.0	0.405	-98.600	1.172	64.100	0.356	28.800	0.583	-71.200	0.900	5.175
4.0	0.257	-125.800	1.073	46.200	0.367	27.400	0.488	-82.400	1.075	2.991
5.0	0.178	175.900	1.036	31.100	0.397	28.700	0.388	-97.500	1.140	1.893

V_{CE} = 1.0 V, I_C = 1.0 mA

0.1	0.958	-5.400	3.367	172.000	0.025	84.700	0.991	-5.000	0.099	21.293
0.4	0.910	-22.800	3.220	153.400	0.092	73.800	0.949	-18.900	0.194	15.441
0.8	0.785	-42.300	2.873	131.200	0.162	61.200	0.843	-34.100	0.366	12.488
1.0	0.712	-50.100	2.675	121.800	0.189	56.600	0.788	-40.100	0.451	11.509
1.5	0.557	-67.000	2.254	102.100	0.234	48.200	0.665	-51.500	0.636	9.837
2.0	0.438	-80.000	1.929	87.000	0.264	43.800	0.577	-58.900	0.785	8.637
2.5	0.340	-90.100	1.708	74.600	0.288	41.800	0.516	-64.200	0.903	7.731
3.0	0.262	-98.500	1.552	64.300	0.310	40.900	0.475	-68.800	0.985	6.995
4.0	0.137	-117.500	1.336	47.900	0.364	40.300	0.407	-76.700	1.073	3.998
5.0	0.081	159.300	1.247	33.800	0.432	37.900	0.318	-89.800	1.072	2.961

V_{CE} = 1.0 V, I_C = 3.0 mA

0.1	0.887	-10.600	8.217	167.700	0.024	81.700	0.969	-8.500	0.154	25.345
0.4	0.718	-40.600	6.754	137.100	0.078	66.700	0.815	-28.700	0.386	19.375
0.8	0.480	-64.500	4.780	111.800	0.121	58.200	0.612	-41.300	0.676	15.966
1.0	0.391	-72.000	4.086	103.500	0.138	56.800	0.546	-44.200	0.785	14.714
1.5	0.251	-85.900	2.992	87.800	0.176	55.700	0.447	-47.600	0.962	12.304
2.0	0.165	-94.200	2.373	76.600	0.214	55.000	0.399	-49.000	1.054	9.032
2.5	0.098	-96.600	1.993	67.300	0.252	54.100	0.375	-50.200	1.100	7.058
3.0	0.051	-88.500	1.745	59.200	0.288	52.600	0.363	-52.200	1.118	5.731
4.0	0.042	17.300	1.428	46.400	0.362	48.400	0.337	-56.900	1.124	3.817
5.0	0.099	60.800	1.280	35.400	0.433	43.400	0.264	-63.300	1.104	2.741

TYPICAL SCATTERING PARAMETERS (T_A = 25°C)

NE68630

V_{CE} = 1.0 V, I_C = 5.0 mA

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG[1]
GHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG		(dB)
0.1	0.826	-13.600	11.659	165.100	0.023	80.000	0.949	-11.200	0.194	27.049
0.4	0.613	-46.800	8.787	130.400	0.073	66.900	0.736	-35.200	0.471	20.805
0.8	0.379	-69.300	5.730	105.800	0.116	62.200	0.520	-47.300	0.753	16.937
1.0	0.303	-75.700	4.805	98.200	0.134	61.600	0.459	-49.900	0.842	15.546
1.5	0.190	-86.800	3.434	83.800	0.181	60.900	0.375	-52.900	0.959	12.781
2.0	0.123	-93.300	2.693	73.300	0.227	59.400	0.338	-54.600	1.012	10.084
2.5	0.074	-93.100	2.251	64.500	0.273	57.300	0.321	-56.500	1.032	8.058
3.0	0.043	-80.100	1.958	56.800	0.316	54.700	0.315	-59.400	1.040	6.692
4.0	0.029	17.700	1.595	44.000	0.401	48.600	0.294	-67.500	1.040	4.770
5.0	0.088	80.400	1.427	32.300	0.480	41.700	0.218	-82.000	1.028	3.714

V_{CE} = 2.0 V, I_C = 3.0 mA

0.1	0.898	-9.500	8.250	168.600	0.022	83.000	0.975	-7.900	0.132	25.740
0.4	0.749	-35.900	6.999	139.900	0.075	69.200	0.841	-27.500	0.357	19.700
0.8	0.525	-57.500	5.127	114.800	0.121	60.800	0.645	-41.300	0.625	16.271
1.0	0.438	-64.300	4.423	106.300	0.138	59.000	0.577	-44.900	0.727	15.058
1.5	0.297	-75.100	3.271	90.100	0.178	57.400	0.470	-49.400	0.896	12.643
2.0	0.209	-80.300	2.599	78.700	0.217	56.200	0.416	-51.600	0.988	10.783
2.5	0.148	-81.000	2.187	69.000	0.256	55.000	0.389	-53.100	1.033	8.201
3.0	0.107	-73.500	1.909	60.900	0.294	53.300	0.375	-55.300	1.056	6.682
4.0	0.064	-42.400	1.558	47.800	0.370	49.000	0.349	-60.600	1.068	4.653
5.0	0.049	43.000	1.397	36.400	0.444	43.600	0.276	-69.000	1.057	3.522

V_{CE} = 2.0 V, I_C = 7.0 mA

0.1	0.792	-14.500	14.186	163.100	0.021	82.400	0.945	-11.900	0.191	28.296
0.4	0.546	-48.600	9.984	126.400	0.065	68.000	0.700	-35.000	0.547	21.864
0.8	0.324	-67.600	6.224	103.200	0.105	65.400	0.496	-43.600	0.816	17.729
1.0	0.257	-71.700	5.173	96.000	0.124	65.200	0.445	-44.900	0.889	16.203
1.5	0.160	-78.500	3.652	82.800	0.171	64.400	0.379	-46.500	0.978	13.295
2.0	0.106	-77.700	2.844	73.000	0.218	62.600	0.352	-48.000	1.014	10.423
2.5	0.071	-67.400	2.368	64.700	0.264	60.200	0.342	-50.000	1.027	8.529
3.0	0.058	-43.600	2.049	57.300	0.307	57.300	0.340	-53.100	1.032	7.149
4.0	0.060	-2.800	1.655	45.200	0.391	51.200	0.326	-61.200	1.030	5.204
5.0	0.075	59.900	1.478	34.200	0.471	44.400	0.255	-73.500	1.017	4.177

NE68633

V_{CE} = 0.5 V, I_C = 0.5 mA

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG[1]
GHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG		(dB)
0.1	0.984	-4.100	1.714	170.200	0.026	86.600	0.996	-3.800	0.116	18.190
0.4	0.960	-16.900	1.716	158.200	0.091	76.200	0.979	-14.300	0.161	12.755
0.8	0.884	-33.600	1.665	136.800	0.169	63.500	0.923	-27.400	0.322	9.935
1.0	0.837	-40.900	1.617	127.200	0.202	57.800	0.888	-33.300	0.400	9.034
1.5	0.704	-59.100	1.512	105.700	0.264	45.500	0.789	-46.400	0.566	7.579
2.0	0.571	-75.600	1.406	86.800	0.300	36.000	0.695	-57.500	0.721	6.709
2.5	0.453	-92.300	1.315	70.800	0.319	29.100	0.620	-67.500	0.843	6.151
3.0	0.356	-109.000	1.236	57.600	0.327	24.400	0.562	-77.300	0.947	5.775
4.0	0.218	-151.200	1.123	35.900	0.337	22.500	0.473	-95.300	1.107	3.235
5.0	0.184	144.400	1.050	17.700	0.384	24.000	0.411	-117.600	1.124	2.226

V_{CE} = 1.0 V, I_C = 1.0 mA

0.1	0.951	-4.800	3.286	170.200	0.022	85.000	0.992	-4.400	0.139	21.742
0.4	0.916	-20.800	3.203	154.600	0.079	74.800	0.958	-17.000	0.196	16.079
0.8	0.793	-39.700	2.914	131.500	0.142	62.200	0.862	-31.200	0.386	13.122
1.0	0.723	-47.500	2.730	121.800	0.167	57.400	0.811	-37.000	0.471	12.134
1.5	0.560	-65.000	2.338	100.900	0.212	48.200	0.685	-48.700	0.663	10.425
2.0	0.415	-78.500	2.017	83.600	0.242	42.800	0.588	-57.400	0.832	9.209
2.5	0.304	-92.200	1.786	69.500	0.266	39.500	0.518	-65.000	0.947	8.270
3.0	0.222	-104.600	1.607	57.600	0.290	37.600	0.468	-72.500	1.025	6.458
4.0	0.100	-144.900	1.389	38.200	0.347	34.900	0.402	-87.600	1.079	4.313
5.0	0.095	123.200	1.260	21.000	0.422	30.400	0.349	-107.900	1.057	3.286

TYPICAL SCATTERING PARAMETERS (T_A = 25°C)

NE68633

V_{CE} = 1.0 V, I_C = 3.0 mA

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG[1]
GHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG		(dB)
0.1	0.889	-8.500	8.189	167.000	0.021	85.000	0.973	-7.600	0.147	25.910
0.4	0.750	-33.500	7.038	139.600	0.070	70.100	0.847	-26.100	0.380	20.024
0.8	0.519	-53.800	5.176	112.800	0.114	61.600	0.658	-39.300	0.661	16.571
1.0	0.432	-59.900	4.470	103.500	0.133	59.500	0.592	-42.900	0.760	15.265
1.5	0.285	-69.900	3.309	86.100	0.175	56.700	0.481	-48.700	0.920	12.767
2.0	0.186	-74.600	2.641	72.600	0.217	54.200	0.419	-53.200	1.002	10.604
2.5	0.113	-78.500	2.218	61.600	0.259	51.400	0.379	-58.600	1.038	8.139
3.0	0.065	-74.200	1.934	51.900	0.301	48.100	0.353	-65.200	1.051	6.692
4.0	0.019	36.600	1.606	35.700	0.384	40.600	0.311	-81.600	1.044	4.938
5.0	0.099	72.600	1.426	20.500	0.467	31.800	0.262	-104.700	1.023	3.921

V_{CE} = 1.0 V, I_C = 5.0 mA

0.1	0.826	-11.900	11.534	163.800	0.021	84.800	0.955	-9.700	0.176	27.398
0.4	0.623	-40.600	8.878	130.600	0.064	69.300	0.761	-30.000	0.507	21.421
0.8	0.385	-57.600	5.834	104.700	0.105	64.100	0.563	-39.700	0.796	17.448
1.0	0.311	-61.900	4.901	96.300	0.123	63.100	0.507	-41.700	0.877	16.004
1.5	0.193	-66.600	3.501	81.000	0.169	60.900	0.424	-45.400	0.986	13.163
2.0	0.121	-64.700	2.751	69.000	0.216	58.000	0.379	-49.200	1.029	9.999
2.5	0.069	-57.300	2.294	58.900	0.263	54.300	0.349	-54.800	1.043	8.138
3.0	0.043	-32.000	1.986	49.900	0.307	50.300	0.329	-61.900	1.049	6.761
4.0	0.047	46.100	1.640	34.400	0.394	41.600	0.292	-79.400	1.034	5.066
5.0	0.120	65.700	1.452	19.800	0.477	32.000	0.243	-103.700	1.016	4.066

V_{CE} = 2.0 V, I_C = 3.0 mA

0.1	0.894	-7.900	8.161	167.300	0.018	84.000	0.978	-7.000	0.161	26.565
0.4	0.766	-31.100	7.109	141.000	0.066	71.500	0.862	-24.300	0.372	20.323
0.8	0.544	-50.100	5.308	114.600	0.109	62.900	0.682	-37.000	0.650	16.875
1.0	0.460	-55.400	4.601	105.300	0.127	60.800	0.618	-40.500	0.749	15.590
1.5	0.311	-63.800	3.423	88.000	0.168	57.800	0.509	-46.200	0.908	13.091
2.0	0.217	-66.800	2.731	74.700	0.209	55.500	0.448	-50.500	0.990	11.162
2.5	0.147	-67.800	2.297	63.800	0.249	52.600	0.409	-55.600	1.028	8.616
3.0	0.102	-63.900	2.002	54.100	0.290	49.400	0.384	-61.800	1.042	7.129
4.0	0.042	-34.200	1.655	38.200	0.370	42.400	0.345	-76.800	1.038	5.306
5.0	0.068	52.700	1.475	23.200	0.453	34.000	0.296	-97.100	1.018	4.311

V_{CE} = 2.0 V, I_C = 7.0 mA

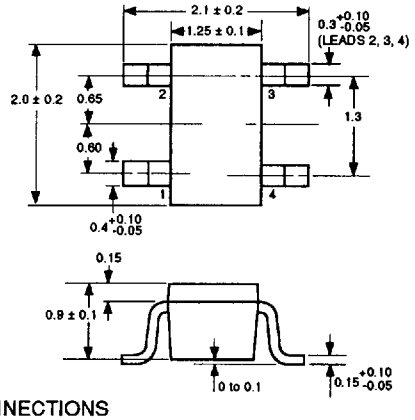
0.1	0.785	-13.000	14.030	161.800	0.018	83.800	0.951	-10.100	0.216	28.918
0.4	0.563	-40.500	10.089	126.700	0.056	70.600	0.733	-29.000	0.585	22.557
0.8	0.342	-53.000	6.330	102.000	0.094	67.400	0.552	-35.400	0.853	18.283
1.0	0.279	-54.200	5.264	94.300	0.113	66.700	0.507	-36.600	0.917	16.682
1.5	0.187	-53.800	3.715	80.200	0.158	64.400	0.441	-39.400	1.000	13.713
2.0	0.132	-46.500	2.903	69.000	0.205	61.200	0.406	-43.100	1.028	10.482
2.5	0.093	-37.700	2.412	59.500	0.251	57.300	0.382	-48.600	1.035	8.687
3.0	0.079	-23.100	2.083	50.900	0.295	53.200	0.365	-55.400	1.037	7.312
4.0	0.065	8.300	1.709	36.200	0.381	44.600	0.332	-71.800	1.023	5.579
5.0	0.100	47.600	1.513	22.100	0.465	35.200	0.282	-93.100	1.006	4.662

V_{CE} = 2.0 V, I_C = 10 mA

0.1	0.727	-15.600	16.497	159.100	0.017	82.200	0.933	-11.300	0.270	29.870
0.4	0.472	-43.500	10.762	121.200	0.052	71.300	0.685	-28.900	0.677	23.159
0.8	0.274	-53.000	6.412	98.100	0.089	69.600	0.527	-32.600	0.912	18.576
1.0	0.224	-52.500	5.286	90.900	0.108	69.000	0.492	-33.300	0.961	16.897
1.5	0.149	-47.800	3.691	77.700	0.155	66.700	0.443	-36.100	1.017	12.973
2.0	0.109	-36.600	2.873	67.000	0.202	63.100	0.416	-40.200	1.035	10.391
2.5	0.084	-21.600	2.381	57.900	0.248	59.100	0.397	-46.100	1.037	8.649
3.0	0.079	-8.000	2.055	49.400	0.293	54.900	0.383	-53.100	1.035	7.322
4.0	0.077	20.500	1.685	35.100	0.379	46.100	0.354	-69.600	1.018	5.664
5.0	0.114	46.500	1.489	21.300	0.465	36.800	0.308	-90.100	0.998	5.054

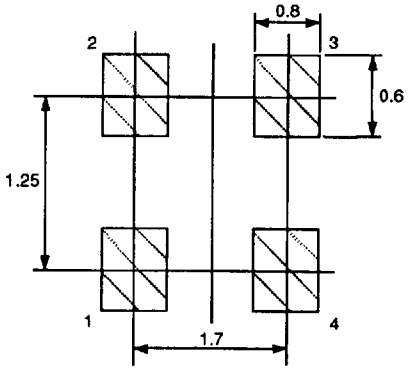
OUTLINE DIMENSIONS[1] (Units in mm)

PACKAGE OUTLINE 18
(SOT-343)

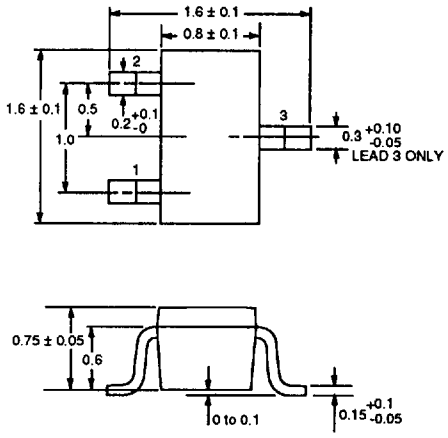


LEAD CONNECTIONS
1. Collector
2. Emitter
3. Base
4. Emitter

OUTLINE 18
RECOMMENDED P.C.B. LAYOUT

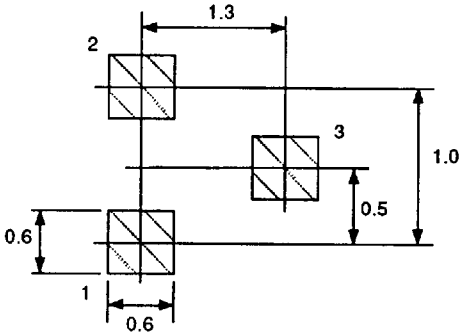


PACKAGE OUTLINE 19

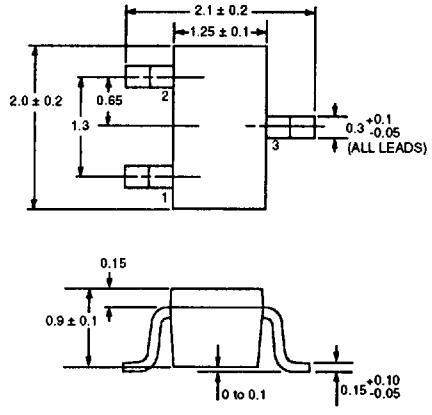


LEAD CONNECTIONS
1. Emitter
2. Base
3. Collector

OUTLINE 19
RECOMMENDED P.C.B. LAYOUT

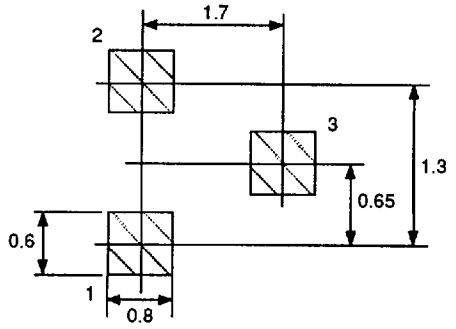


PACKAGE OUTLINE 30
(SOT-323)



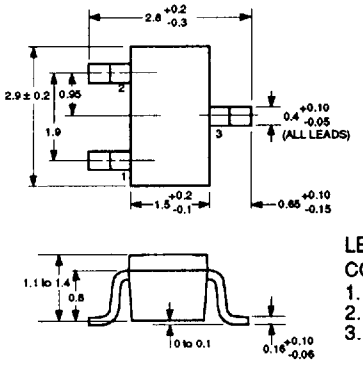
LEAD CONNECTIONS
1. Emitter
2. Base
3. Collector

OUTLINE 30
RECOMMENDED P.C.B. LAYOUT



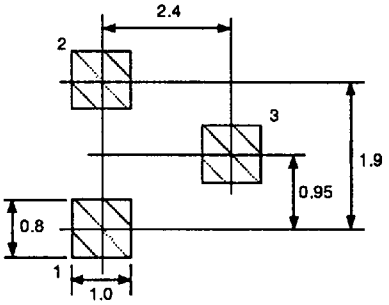
OUTLINE DIMENSIONS[1] (Units in mm)

PACKAGE OUTLINE 33
(SOT-23)

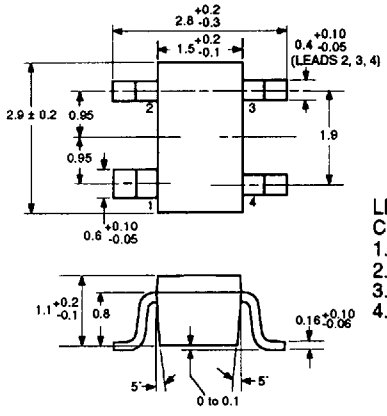


LEAD CONNECTIONS
1. Emitter
2. Base
3. Collector

OUTLINE 33
RECOMMENDED P.C.B. LAYOUT

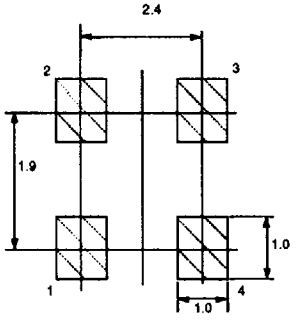


PACKAGE OUTLINE 39
(SOT-143)

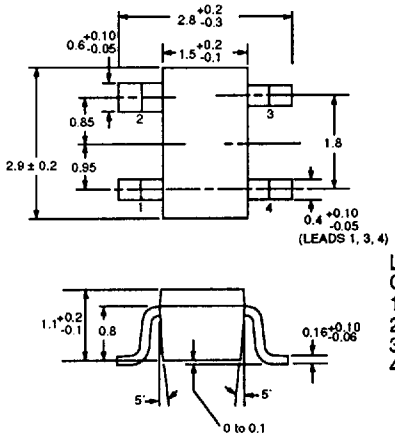


LEAD CONNECTIONS
1. Collector
2. Emitter
3. Base
4. Emitter

OUTLINE 39
RECOMMENDED P.C.B. LAYOUT

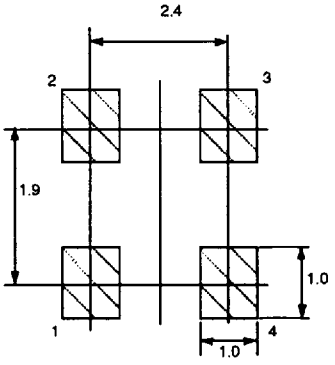


PACKAGE OUTLINE 39R
(SOT-143)



LEAD CONNECTIONS
1. Emitter
2. Collector
3. Emitter
4. Base

OUTLINE 39R
RECOMMENDED P.C.B. LAYOUT



ORDERING INFORMATION

PART NUMBER	QTY
NE68618-T1	3K/REEL
NE68619-T1	3K/REEL
NE68630-T1	3K/REEL
NE68633-T1	3K/REEL
NE68639-T1	3K/REEL
NE68639R-T1	3K/REEL

Note:
1. Lead material: Cu
   Lead plating: PbSn