

NPN LOW NOISE SILICON MICROWAVE TRANSISTOR

PRODUCT DATA SHEET

FEATURES:

- High Gain Bandwidth Product
 $f_t = 10 \text{ GHz typ @ } I_C = 10 \text{ mA}$
- Low Noise Figure
 1.6 dB typ at 1 GHz
 2.0 dB typ at 2 GHz
- High Gain
 $|S_{21}|^2 = 18.1 \text{ dB @ } 1 \text{ GHz}$
 $12.8 \text{ dB @ } 2 \text{ GHz}$
- Dice, Plastic, Hermetic and Surface Mount packages available

PERFORMANCE DATA:

- Electrical Characteristics ($T_A = 25^\circ\text{C}$)

DESCRIPTION AND APPLICATIONS:

Bipolarics' B12V105 is a high performance silicon bipolar transistor intended for use in low noise application at VHF, UHF and microwave frequencies. High performance low noise performance can be realized at 2 mA or less making the B12V105 an excellent choice for battery applications. From 10 mA to greater than 25 mA, f_t is nominally 10 GHz. Maximum recommended continuous current is 40 mA. A broad range of packages are offered including SOT-23, SOT-143, plastic and ceramic 0.085" Micro-X, 0.070" Stripline and unencapsulated dice.

Absolute Maximum Ratings:

SYMBOL	PARAMETERS	RATING	UNITS
V_{CBO}	Collector-Base Voltage	20	V
V_{CEO}	Collector-Emitter Voltage	12	V
V_{EBO}	Emitter-Base Voltage	1.5	V
$I_{C \text{ CONT}}$	Collector Current	40	mA
T_J	Junction Temperature	200	$^\circ\text{C}$
T_{STG}	Storage Temperature	-65 to 150	$^\circ\text{C}$

SYMBOL	PARAMETERS & CONDITIONS $V_{CE} = 8V, I_C = 10 \text{ mA}$ unless stated	UNIT	MIN.	TYP.	MAX.
f_t	Gain Bandwidth Product	GHz		10	
$ S_{21} ^2$	Insertion Power Gain: $f = 1.0 \text{ GHz}, I_C = 10 \text{ mA}$ $I_C = 25 \text{ mA}$ $f = 2.0 \text{ GHz}, I_C = 10 \text{ mA}$ $I_C = 25 \text{ mA}$			17.5 18.1 12.8 12.6	
P_{1dB}	Power output at 1dB compression: $f = 1.0 \text{ GHz}$	dBm		12	
G_{1dB}	Gain at 1dB compression: $f = 1.0 \text{ GHz}$	dBm		15	
NF	Noise Figure: $V_{CE} = 8V, I_C = 2mA$ $f = 1.0 \text{ GHz}$ $Z_S = 50\Omega$	dB		1.6	
h_{FE}	Forward Current Transfer Ratio: $V_{CE} = 8V, I_C = 10 \text{ mA}$ $f = 1MHz$		50	100	250
I_{CBO}	Collector Cutoff Current : $V_{CB} = 8V$	μA			0.2
I_{EBO}	Emitter Cutoff Current : $V_{EB} = 1V$	μA			1.0
C_{CB}	Collector Base Capacitance: $V_{CB} = 8V$ $f = 1MHz$	pF		0.11	

BIPOLARICS, INC.**Part Number B12V105****NPN LOW NOISE SILICON MICROWAVE TRANSISTOR****PRODUCT DATA SHEET****TYPICAL S PARAMETERS:**BIAS CONDITION: $V_{CE} = 5 \text{ V}$, $I_C = 2 \text{ mA}$ S-MATRIX: $Z_S = 50.0 + j 0.0$ $Z_L = 50.0 + j 0.0$

(NOTE: S-Parameters were taken in a ceramic Micro-X package; See package outline 35)

FREQ.	S11		S21		S12		S22		
S21									
GHZ	Mag		Ang	Mag	Ang	Mag	Ang	Mag	Ang
dB									
0.20000	0.8709	-19	5.888	172	0.0316	80	0.9549	-10	15.4
0.40000	0.8511	-32	4.623	157	0.0478	76	0.9120	-17	13.3
0.60000	0.8128	-45	4.027	142	0.0660	61	0.8511	-25	12.1
0.80000	0.7762	-55	3.388	137	0.0776	59	0.8511	-32	10.6
1.00000	0.7244	-68	3.273	126	0.0876	53	0.7161	-34	10.3
1.20000	0.6760	-80	3.162	122	0.0933	51	0.6998	-37	10.0
1.40000	0.6309	-100	3.235	116	0.1035	48	0.6531	-47	10.2
1.60000	0.5888	-114	3.019	106	0.1071	47	0.6165	-49	9.6
1.80000	0.5754	-124	2.786	102	0.1096	46	0.6456	-51	8.9
2.00000	0.5623	-137	2.722	88	0.1148	46	0.6025	-54	8.7
2.20000	0.5370	-144	2.691	82	0.1174	45	0.5888	-57	8.6
2.40000	0.5248	-165	2.317	86	0.1188	46	0.5370	-63	7.3
2.60000	0.5370	-174	2.264	84	0.1216	48	0.5308	-64	7.1
2.80000	0.5128	178	2.187	78	0.1244	49	0.5188	-70	6.8
3.00000	0.5069	173	1.949	78	0.1258	50	0.4897	-72	5.8
3.20000	0.4954	166	1.883	73	0.1303	51	0.5011	-78	5.5
3.40000	0.5011	162	1.737	70	0.1333	53	0.4677	-81	4.8
3.60000	0.5128	153	1.717	69	0.1348	55	0.4773	-87	4.7
3.80000	0.5432	152	1.566	63	0.1333	57	0.4773	-96	3.9
4.00000	0.5308	152	1.479	64	0.1348	60	0.4677	-93	3.4
4.20000	0.5188	144	1.445	58	0.1380	61	0.5069	-102	3.2

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TYPICAL S PARAMETERS:

BIAS CONDITION: $V_{CE} = 5 \text{ V}$, $I_C = 5 \text{ mA}$

S-MATRIX: $Z_S = 50.0 + j 0.0$ $Z_L = 50.0 + j 0.0$

(NOTE: S-Parameters were taken in a ceramic Micro-X package; See package outline 35, 36)

FREQ.	S11		S21		S12		S22		
GHz	Mag	Ang	Mag	Ang	Mag	Ang	Mag	Ang	Mag
0.20000	0.7762	-24	12.02	151	0.0223	74	0.9225	-14	21.6
0.40000	0.7885	-44	10.47	134	0.0398	72	0.8709	-25	20.4
0.60000	0.6382	-60	8.810	106	0.0512	60	0.7413	-31	18.9
0.80000	0.6165	-72	7.244	80	0.0568	59	0.7079	-36	17.2
1.00000	0.5248	-88	6.456	72	0.0616	57	0.6095	-38	16.2
1.20000	0.4677	-102	6.025	57	0.0691	57	0.5559	-40	15.6
1.40000	0.4168	-124	5.188	44	0.0776	57	0.5495	-48	14.3
1.60000	0.3672	-138	4.677	30	0.0822	57	0.5128	-46	13.4
1.80000	0.3548	-146	4.168	20	0.0860	58	0.5069	-50	12.4
2.00000	0.3467	-158	3.901	9	0.0954	59	0.4677	-52	12.0
2.20000	0.3548	-176	3.801	-4	0.1047	60	0.4570	-58	11.6
2.40000	0.3235	171	3.388	-17	0.1071	62	0.4216	-60	10.6
2.60000	0.3672	163	3.273	-27	0.1122	63	0.4315	-62	10.3
2.80000	0.3801	157	3.019	-39	0.1174	63	0.4265	-67	9.6
3.00000	0.3935	153	2.818	-49	0.1230	64	0.4168	-70	9.0
3.20000	0.4120	146	2.722	-60	0.1318	65	0.4073	-75	8.7
3.40000	0.4216	142	2.570	-70	0.1348	65	0.3890	-79	8.2
3.60000	0.4786	135	2.511	-82	0.1380	67	0.3890	-83	8.0
3.80000	0.4731	132	2.290	-92	0.1412	69	0.3981	-86	7.2
4.00000	0.4841	131	2.187	-101	0.1445	70	0.3870	-88	6.8
4.20000	0.5495	128	2.162	-112	0.1548	68	0.3801	-99	6.7

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TYPICAL S PARAMETERS:

BIAS CONDITION: $V_{CE} = 8 \text{ V}$, $I_C = 10 \text{ mA}$ S-MATRIX: $Z_S = 50.0 + j 0.0$ $Z_L = 50.0 + j 0.0$

(NOTE: S-Parameters were taken in a ceramic Micro-X package; See package outline 35, 36)

FREQ.	S11		S21		S12		S22		
S21									
GHz	Mag	Ang	Mag	Ang	Mag	Ang	Mag	Ang	dB
0.20000	0.6025	-46	15.84	160	0.0177	70	0.8912	-17	24.0
0.40000	0.5888	-78	14.12	144	0.0301	65	0.7762	-30	23.0
0.60000	0.4954	-109	11.09	124	0.0407	56	0.6309	-36	20.9
0.80000	0.4786	-122	9.332	118	0.0457	58	0.6095	-40	19.4
1.00000	0.4265	-136	7.498	109	0.0506	58	0.5128	-39	17.5
1.20000	0.4027	-151	6.456	102	0.0537	60	0.5248	-42	16.2
1.40000	0.4027	-168	6.025	99	0.0616	62	0.4677	-49	15.6
1.60000	0.3935	-180	5.308	94	0.0676	62	0.4315	-50	14.5
1.80000	0.3890	176	4.897	90	0.0707	64	0.4415	-52	13.8
2.00000	0.3890	170	4.518	85	0.0741	66	0.4027	-53	13.1
2.20000	0.4216	158	4.365	82	0.0803	65	0.4120	-58	12.8
2.40000	0.4168	149	3.890	79	0.0812	67	0.3758	-62	11.8
2.60000	0.4623	145	3.715	77	0.0912	69	0.3845	-64	11.4
2.80000	0.4786	140	3.388	74	0.0933	68	0.3672	-70	10.6
3.00000	0.4897	138	3.198	74	0.1000	71	0.3758	-71	10.1
3.20000	0.4841	133	3.019	71	0.1059	70	0.3880	-76	9.6
3.40000	0.4954	128	2.818	67	0.1011	72	0.3630	-75	9.0
3.60000	0.5495	123	2.660	66	0.1188	72	0.3935	-84	8.5
3.80000	0.5754	121	2.371	62	0.1188	72	0.3548	-90	7.5
4.00000	0.5821	120	2.137	62	0.1230	76	0.3890	-86	6.6
4.20000	0.5888	117	2.018	58	0.1318	74	0.3548	-94	6.1

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TYPICAL S PARAMETERS:

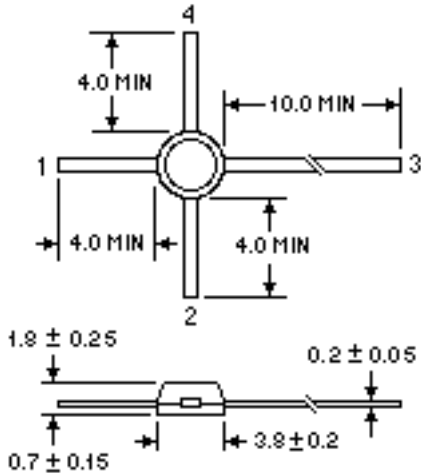
BIAS CONDITION: $V_{CE} = 8 \text{ V}$, $I_C = 25 \text{ mA}$ S-MATRIX: $Z_S = 50.0 + j 0.0$ $Z_L = 50.0 + j 0.0$

(NOTE: S-Parameters were taken in a ceramic Micro-X package; See package outline 35, 36)

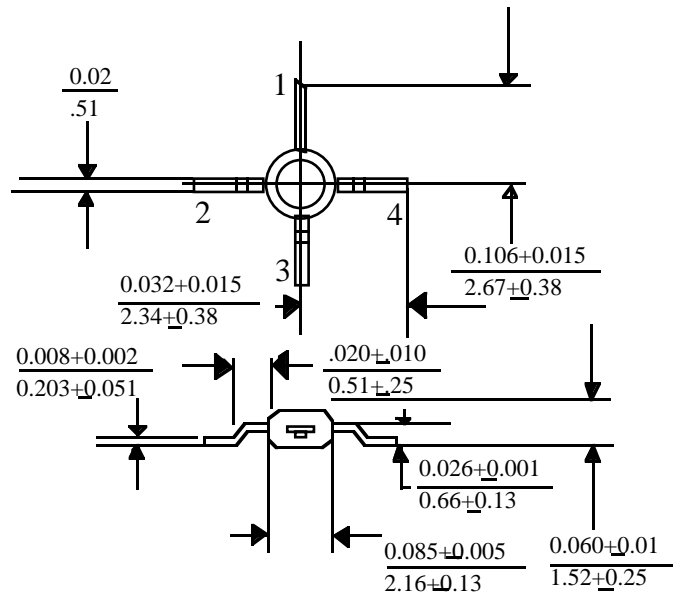
FREQ.	S11		S21		S12		S22		
GHz	Mag	Ang	Mag	Ang	Mag	Ang	Mag	Ang	Ang
0.20000	0.4466	-55	17.78	154	0.0149	56	0.7585	-22	25.0
0.40000	0.4265	-98	14.62	136	0.0234	62	0.6456	-34	23.3
0.60000	0.3715	-127	12.44	116	0.0301	64	0.5069	-33	21.9
0.80000	0.3672	-140	9.855	105	0.0342	68	0.5011	-36	19.9
1.00000	0.3467	-145	8.035	102	0.0407	69	0.4466	-33	18.1
1.20000	0.3019	-158	7.244	96	0.0467	71	0.4786	-34	17.2
1.40000	0.3311	-165	6.025	93	0.0543	72	0.4027	-43	15.6
1.60000	0.3801	-172	5.308	88	0.0638	72	0.3715	-41	14.5
1.80000	0.4027	-176	4.677	86	0.0645	74	0.3630	-46	13.4
2.00000	0.4120	168	4.265	84	0.0699	76	0.3630	-47	12.6
2.20000	0.4365	157	4.027	80	0.0785	77	0.3548	-53	12.1
2.40000	0.4315	149	3.672	77	0.0915	77	0.3273	-57	11.3
2.60000	0.4731	146	3.467	76	0.0891	78	0.3235	-61	10.8
2.80000	0.4897	141	3.235	73	0.0933	78	0.3162	-67	10.2
3.00000	0.4786	141	3.019	73	0.1000	80	0.3198	-69	9.6
3.20000	0.4954	137	2.804	70	0.1071	80	0.3198	-74	9.2
3.40000	0.5308	134	2.732	68	0.1109	79	0.2951	-76	8.7
3.60000	0.5559	128	2.630	65	0.1202	80	0.3162	-82	8.4
3.80000	0.5432	128	2.398	64	0.1206	79	0.2851	-94	7.6
4.00000	0.5370	129	2.364	64	0.1258	81	0.3162	-91	7.1
4.20000	0.5623	125	2.137	61	0.1348	80	0.3162	-90	6.6

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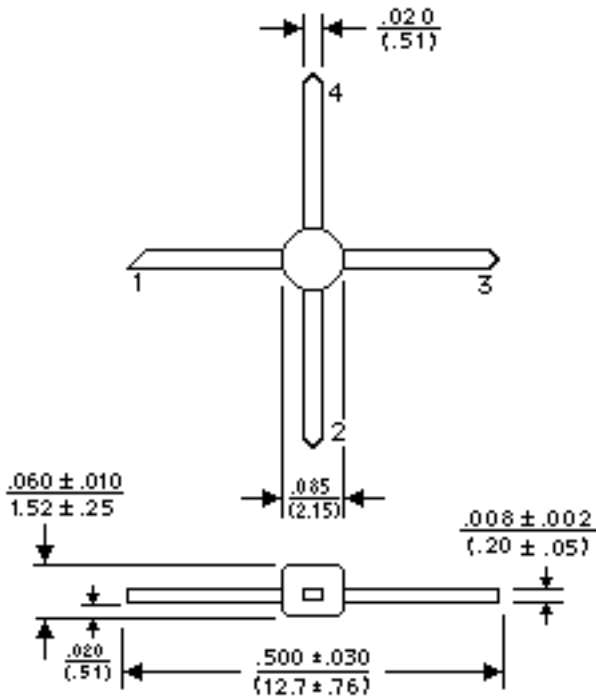
04 Package: 0.145" Plastic Macro-X



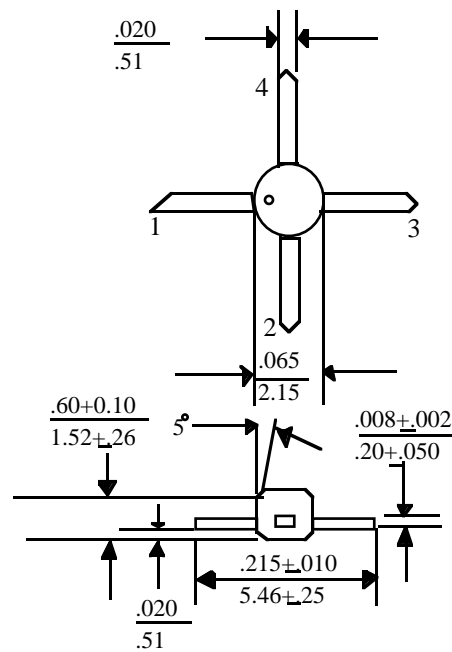
86 Package: 0.085" Plastic Micro-X, Surface Mount



85 Package: 0.085" Plastic Micro-X

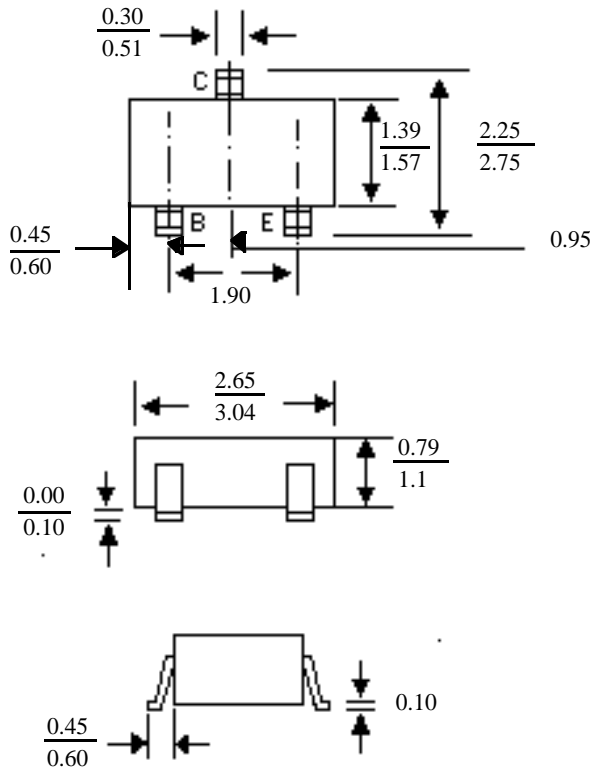


87 Package: 0.085" Plastic Micro-X, Short Lead

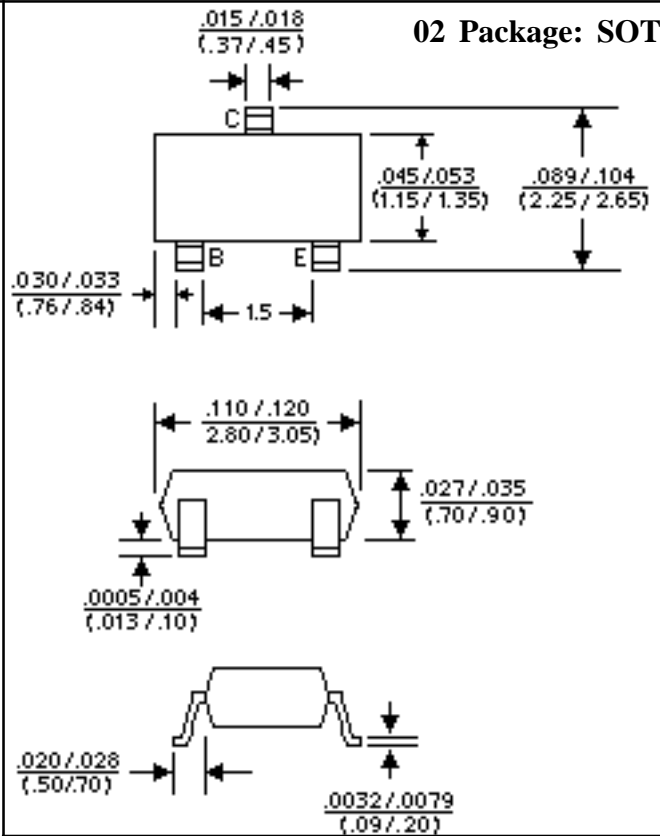


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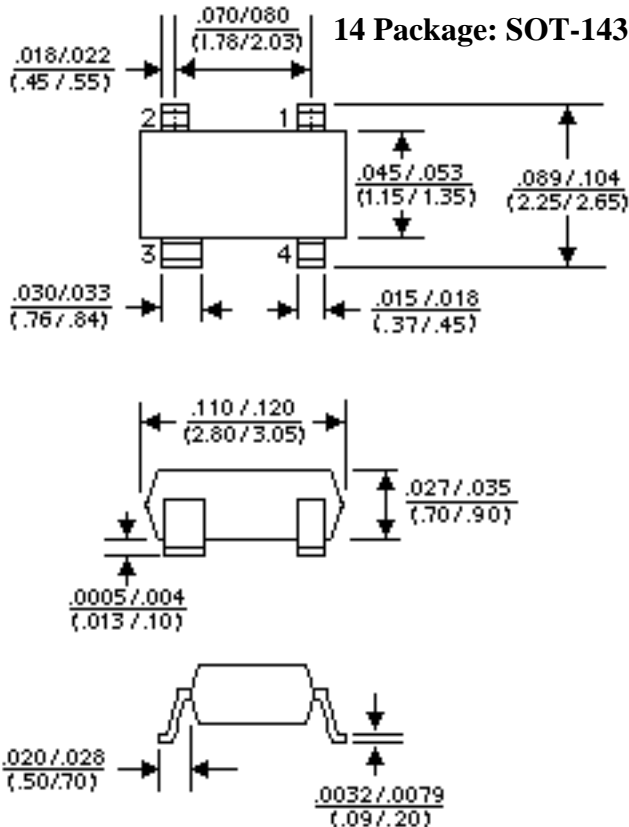
02J Package: SOT-23J



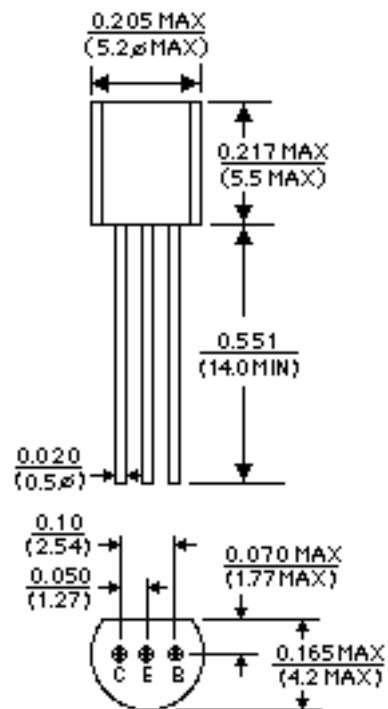
02 Package: SOT-23



14 Package: SOT-143



92 Package: TO-92



BIPOLARICS, INC.

Part Number B12V105

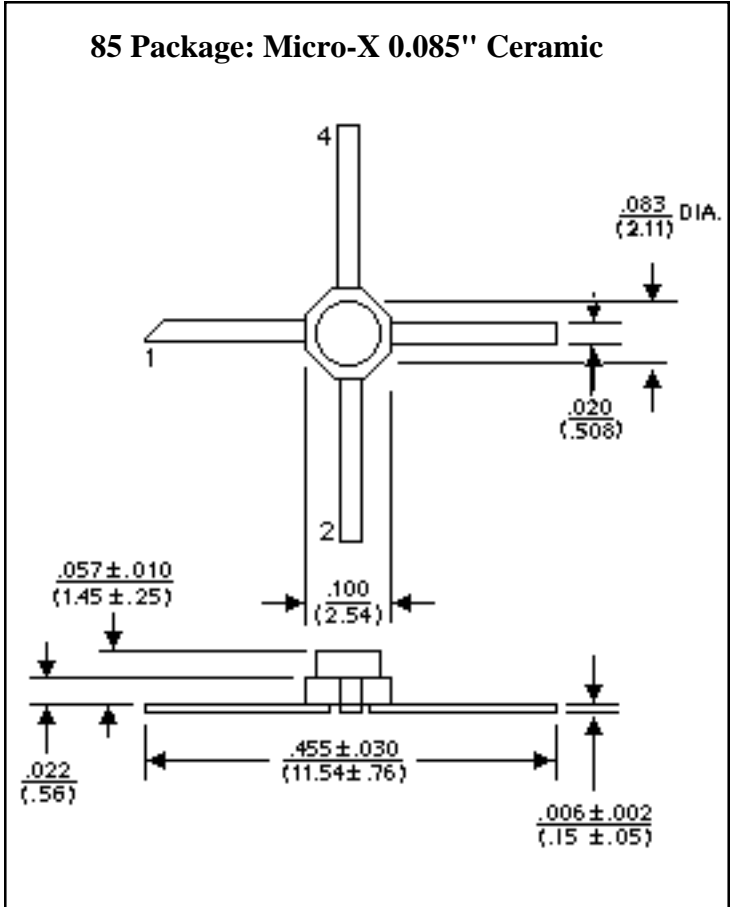
NPN LOW NOISE SILICON MICROWAVE TRANSISTOR

ORDERING INFORMATION:

P/N Including Pkg	Temp Range/App
B12V105 00	-55 to +125°C
B12V105 02	-40 to +85°C
B12V105 14	-40 to +85°C
B12V105 35	-55 to +125°C
B12V105 92	-40 to +85°C

NOTES: (unless otherwise specified)

- Dimensions are $\frac{\text{in}}{\text{mm}}$
- Tolerances:
 in .xxx = $\pm .005$
 mm .xx = $\pm .13$
- All dimensions nominal; subject to change without notice



LEAD	1	2	3	4
14, 85, 86, 87, 35 & 04 Packages	Base	Emitter	Collector	Emitter

BIPOLARICS, INC.
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 Fremont, CA 94538
 Phone: (510) 226-6565 FAX: (510) 226-6765