# BIPOLARICS, INC. Part Number BRF480

## MEDIUM POWER SILICON MICROWAVE TRANSISTOR

### PRODUCT DATA SHEET

### FEATURES:

- High Gain Bandwidth Product
  $f_t$ = 8 GHz typ @ $I_C$ = 70 mA
- High Gain
  $|S_{21}|^2$ = 14.2 dB @ 1.0 GHz
  8.2 dB @ 2.0 GHz
- Dice, Plastic, Hermetic and Surface Mount packages available

### PERFORMANCE DATA:

- Electrical Characteristics ($T_A = 25^oC$)

### DESCRIPTION AND APPLICATIONS:

Bipolarics' BRF480 is a high performance silicon bipolar transistor intended for medium power linear and Class C applications at VHF, UHF and microwave frequencies in 7.2 and 12V systems. Depending on package type, the BRF480 can operate at up to 0.5W. These applications include high intermod receivers, CATV and instrumentation amplifiers as well as pre-drivers, drivers and final stages in transmitter applications such as cellular telephone. Package options include Dice, SOT-223 Surface Mount, Ceramic Micro-X, 0.145" Plastic SOT-103 and 0.230" power flange package.

### Absolute Maximum Ratings:

| SYMBOL | PARAMETERS | RATING | UNITS |
|---|---|---|---|
| $V_{CBO}$ | Collector-Base Voltage | 25 | V |
| $V_{CEO}$ | Collector-Emitter Voltage | 15 | V |
| $V_{EBO}$ | Emitter-Base Voltage | 1.5 | V |
| $I_C$ | Collector Current (continuous) | 120 | mA |
| $I_{C\ MAX}$ | Collector Current (instantaneous) | 180 | mA |
| $T_{J\ (1)}$ | Junction Temperature | 200 | $^oC$ |
| $T_{STG}$ | Storage Temperature | -65 to 150 | $^oC$ |
| $\theta_{JC}$ | Thermal Resistance | 50 | C/W |

(1) Depends on package

| SYMBOL | PARAMETERS & CONDITIONS<br>$V_{CE}$ = 8V, $I_C$ =60 mA, Class A, unless stated | | | UNIT | MIN. | TYP. | MAX. |
|---|---|---|---|---|---|---|---|
| $f_t$ | Gain Bandwidth Product | | | GHz | | 8.0 | |
| $\|S_{21}\|^2$ | Insertion Power Gain: | Micro-X<br>SOT-103 | f = 1.0 GHz<br>f = 2.0 GHz | dB<br>dB | | 14.2<br>8.2 | |
| $P_{1dB}$ | Power output at 1dB compression: | | f = 1.0 GHz<br>$I_C$ = 75 mA | dBm | | 27.0 | |
| NF | Noise Figure: $V_{CE}$ = 5V, $I_C$ =20 mA | | f = 1.0 GHz | dB | | 1.6 | |
| $h_{FE}$ | Forward Current Transfer Ratio: $V_{CE}$ = 5V, $I_C$ = 15 mA | | | | 30 | 100 | 300 |
| $I_{CBO}$ | Collector Cutoff Current : $V_{CB}$ = 8V | | | µA | | | 0.4 |
| $C_{CB}$ | Collector Base Capacitance: $V_{CB}$ =8V | | f = 1MHz | pF | | .75 | |

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### TYPICAL S PARAMETERS: (1)

**BIAS CONDITION: $V_{CE}$ = 8 V, $I_C$ = 35 mA**

**S-MATRIX: $Z_S$ = 50.0 + J 0.0 $Z_L$ = 50.0 + J 0.0**

**(1)** Typical for microwave packages. Does not apply specifically to SOT-223.

| FREQ. | S11 | | S21 | | S12 | | S22 | | S21 |
|---|---|---|---|---|---|---|---|---|---|
| GHz | Mag | Ang | Mag | Ang | Mag | Ang | Mag | Ang | dB |
| 0.20000 | 0.5821 | -146 | 16.78 | 126 | 0.0239 | 42 | 0.3801 | - 86 | 24.5 |
| 0.40000 | 0.7585 | -168 | 12.30 | 104 | 0.0263 | 48 | 0.2884 | -122 | 21.8 |
| 0.60000 | 0.7244 | -179 | 8.222 | 92 | 0.0354 | 52 | 0.2600 | -134 | 18.3 |
| 0.80000 | 0.7413 | 179 | 6.456 | 86 | 0.0426 | 56 | 0.2600 | -145 | 16.2 |
| 1.00000 | 0.7943 | 176 | 5.069 | 83 | 0.0467 | 64 | 0.2371 | -147 | 14.1 |
| 1.20000 | 0.7585 | 166 | 4.365 | 76 | 0.0543 | 65 | 0.2630 | -152 | 12.8 |
| 1.40000 | 0.7161 | 159 | 3.715 | 70 | 0.0602 | 67 | 0.2630 | -154 | 11.4 |
| 1.60000 | 0.7585 | 156 | 3.311 | 68 | 0.0691 | 68 | 0.2691 | -158 | 10.4 |
| 1.80000 | 0.7585 | 154 | 3.162 | 65 | 0.0724 | 70 | 0.2884 | -163 | 10.0 |
| 2.00000 | 0.7585 | 150 | 2.630 | 61 | 0.0794 | 71 | 0.2851 | -165 | 8.4 |
| 2.20000 | 0.7852 | 141 | 2.371 | 55 | 0.0841 | 71 | 0.3235 | -177 | 7.5 |
| 2.40000 | 0.7673 | 138 | 2.137 | 55 | 0.0870 | 74 | 0.3054 | -176 | 6.6 |
| 2.60000 | 0.8222 | 134 | 2.018 | 50 | 0.0954 | 73 | 0.3630 | 180 | 6.1 |
| 2.80000 | 0.8222 | 132 | 1.819 | 47 | 0.1000 | 73 | 0.3589 | 175 | 5.2 |
| 3.00000 | 0.8511 | 130 | 1.757 | 45 | 0.1109 | 76 | 0.3935 | 180 | 4.9 |
| 3.20000 | 0.8317 | 126 | 1.566 | 40 | 0.1148 | 73 | 0.4315 | 172 | 3.9 |
| 3.40000 | 0.8413 | 126 | 1.479 | 41 | 0.1216 | 75 | 0.3845 | 171 | 3.4 |
| 3.60000 | 0.9120 | 118 | 1.428 | 33 | 0.1318 | 75 | 0.4677 | 165 | 3.1 |
| 3.80000 | 0.8128 | 115 | 1.273 | 33 | 0.1303 | 74 | 0.4216 | 159 | 2.1 |
| 4.00000 | 0.8709 | 119 | 1.258 | 35 | 0.1462 | 76 | 0.4415 | 170 | 2.0 |
| 4.20000 | 0.8609 | 112 | 1.122 | 26 | 0.1479 | 72 | 0.4518 | 156 | 1.0 |

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### TYPICAL S PARAMETERS:(1)

**BIAS CONDITION: $V_{CE}$ = 8 V, $I_C$ = 75 mA**

**S-MATRIX: $Z_S$ = 50.0 + J 0.0 $Z_L$ = 50.0 + J 0.0**

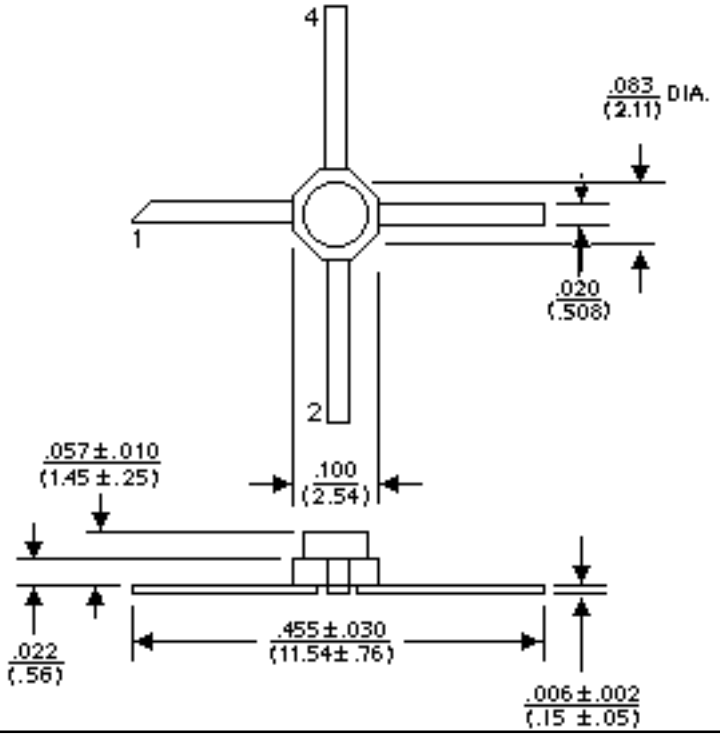
**(1)** Typical for microwave packages. Does not apply specifically to SOT-223.

| FREQ. | S11 | | S21 | | S12 | | S22 | | S21 |
|---|---|---|---|---|---|---|---|---|---|
| GHz | Mag | Ang | Mag | Ang | Mag | Ang | Mag | Ang | dB |
| 0.20000 | 0.6456 | -156 | 17.78 | 124 | 0.0169 | 46 | 0.3090 | -102 | 25.0 |
| 0.40000 | 0.8128 | -136 | 12.02 | 102 | 0.0229 | 54 | 0.2630 | -136 | 21.6 |
| 0.60000 | 0.7843 | 176 | 8.317 | 92 | 0.0288 | 62 | 0.2511 | -145 | 18.4 |
| 0.80000 | 0.7952 | 174 | 6.456 | 87 | 0.0371 | 68 | 0.2600 | -155 | 16.2 |
| 1.00000 | 0.7943 | 172 | 5.128 | 83 | 0.0426 | 72 | 0.2371 | -155 | 14.2 |
| 1.20000 | 0.7943 | 162 | 4.365 | 78 | 0.0506 | 73 | 0.2630 | -159 | 12.8 |
| 1.40000 | 0.7478 | 156 | 3.715 | 72 | 0.0575 | 73 | 0.2630 | -169 | 11.4 |
| 1.60000 | 0.7943 | 154 | 3.198 | 70 | 0.0630 | 74 | 0.2722 | -164 | 10.1 |
| 1.80000 | 0.7762 | 151 | 2.851 | 66 | 0.0707 | 77 | 0.2884 | -168 | 9.1 |
| 2.00000 | 0.7673 | 148 | 2.570 | 63 | 0.0794 | 77 | 0.2851 | -168 | 8.2 |
| 2.20000 | 0.7852 | 139 | 2.213 | 58 | 0.0860 | 75 | 0.3235 | 178 | 6.9 |
| 2.40000 | 0.7762 | 136 | 1.995 | 59 | 0.0891 | 78 | 0.3090 | 180 | 6.0 |
| 2.60000 | 0.8222 | 132 | 1.883 | 54 | 0.1000 | 77 | 0.3845 | 176 | 5.5 |
| 2.80000 | 0.8222 | 131 | 1.698 | 51 | 0.1047 | 77 | 0.4265 | 172 | 4.6 |
| 3.00000 | 0.8413 | 129 | 1.640 | 49 | 0.1109 | 79 | 0.4073 | 177 | 4.3 |
| 3.20000 | 0.8317 | 128 | 1.513 | 45 | 0.1174 | 76 | 0.4073 | 169 | 3.6 |
| 3.40000 | 0.8413 | 125 | 1.412 | 46 | 0.1244 | 78 | 0.3801 | 168 | 3.0 |
| 3.60000 | 0.9120 | 117 | 1.364 | 37 | 0.1348 | 75 | 0.4677 | 162 | 2.7 |
| 3.80000 | 0.8128 | 114 | 1.188 | 17 | 0.1303 | 76 | 0.4168 | 156 | 1.5 |
| 4.00000 | 0.8709 | 118 | 1.230 | 18 | 0.1462 | 79 | 0.4365 | 167 | 1.8 |
| 4.20000 | 0.8609 | 111 | 1.071 | 30 | 0.1479 | 74 | 0.4415 | -154 | 0.6 |

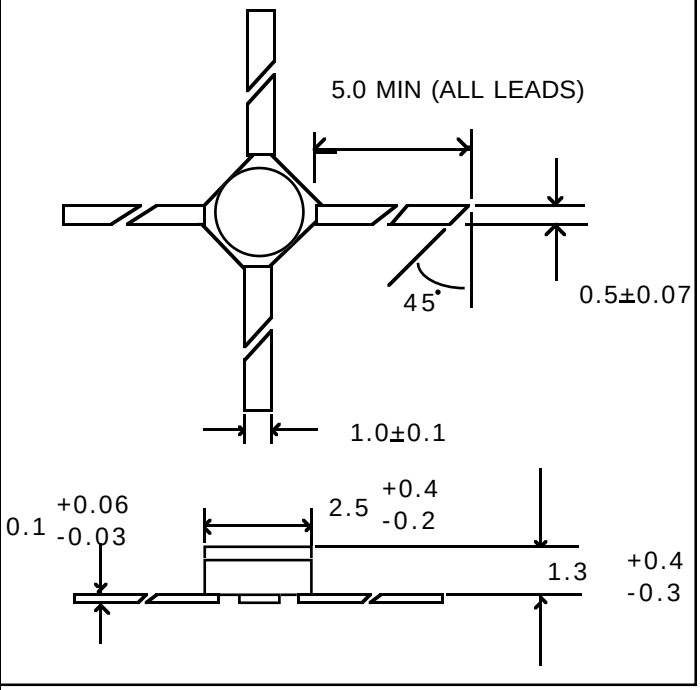
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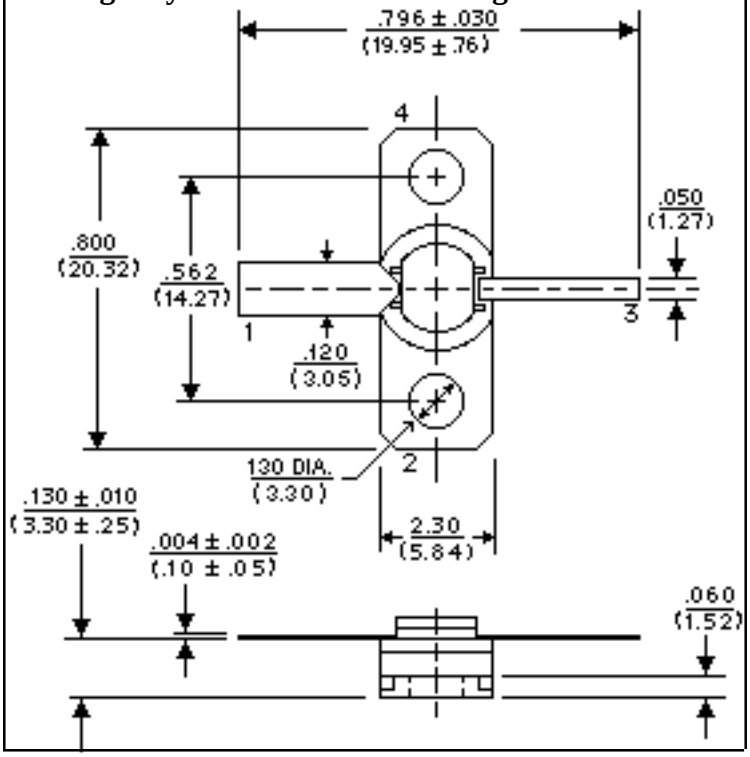
**BRF48035**
**Package Style 35: Micro-X 0.085" Ceramic**




**BRF48070**
**Package Style 70: 0.070" Stripline**




**BRF48023**
**Package Style 23: 0.230" BeO Flange**




| LEAD | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Package 9 | Emitter | Base | Emitter | Collector |
| Package 14,85,35 & 04 | Base | Emitter | Collector | Emitter |

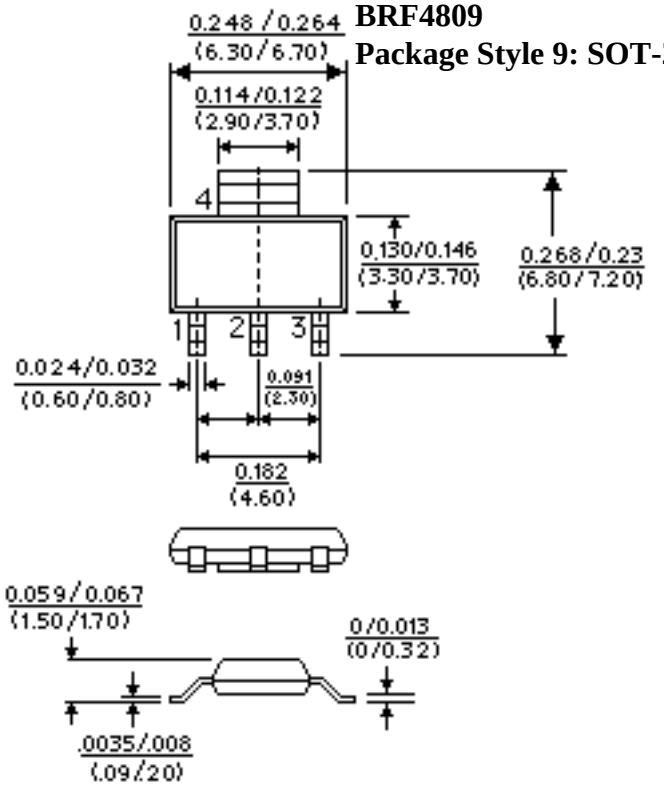
**NOTES:** (unless otherwise specified)

1. Dimensions are $\frac{\text{in}}{(\text{mm})}$
2. Tolerances:
   in .xxx = ± .005
   mm .xx = ± .13
3. All dimensions nominal; subject to change without notice

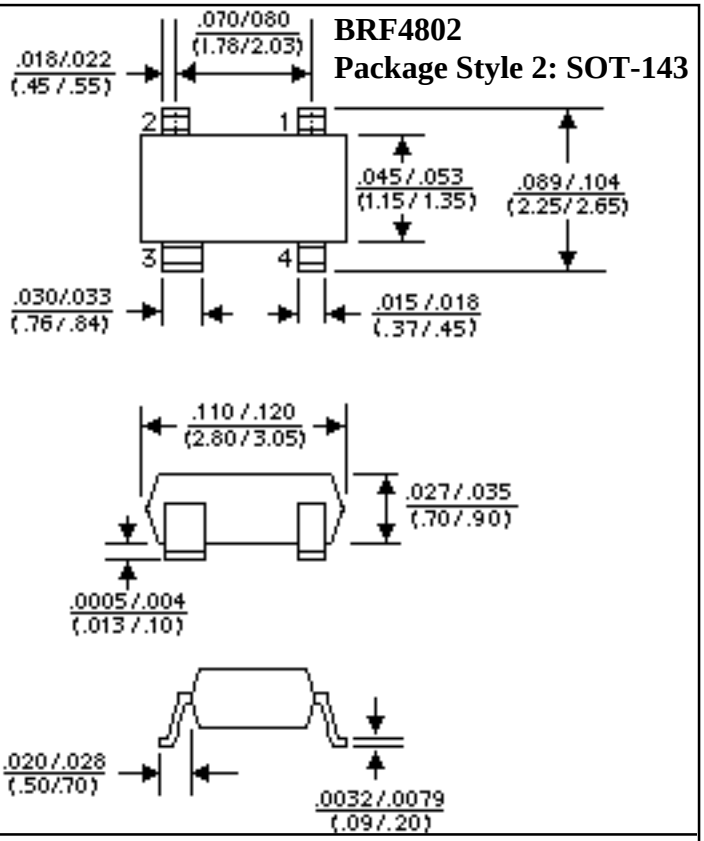
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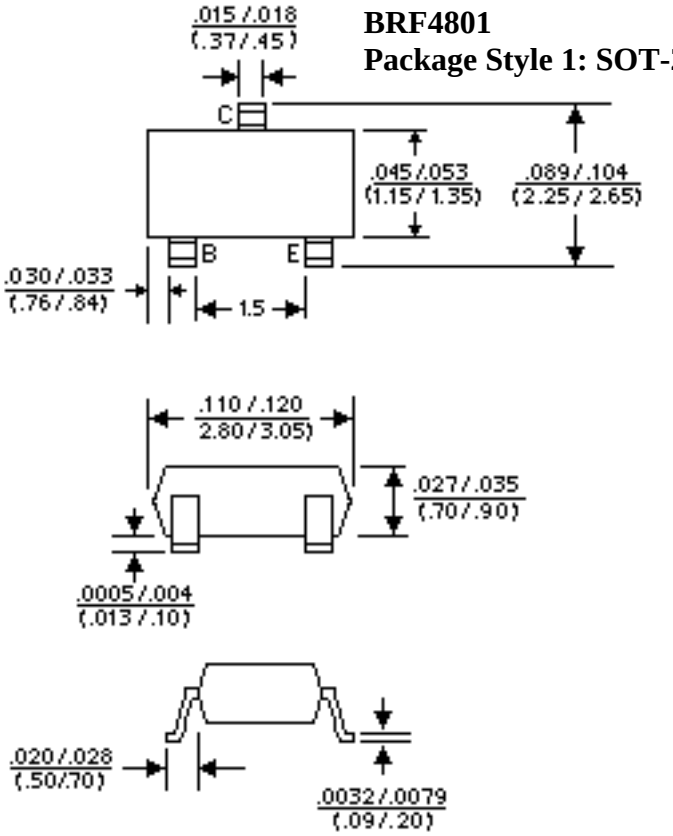
**BRF4809**
**Package Style 9: SOT-223**



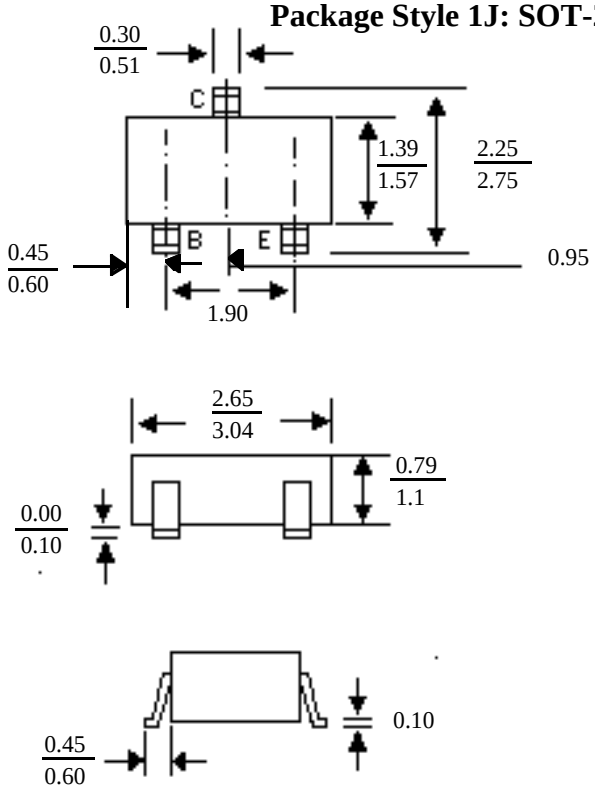

**BRF4802**
**Package Style 2: SOT-143**




**BRF4801**
**Package Style 1: SOT-23**



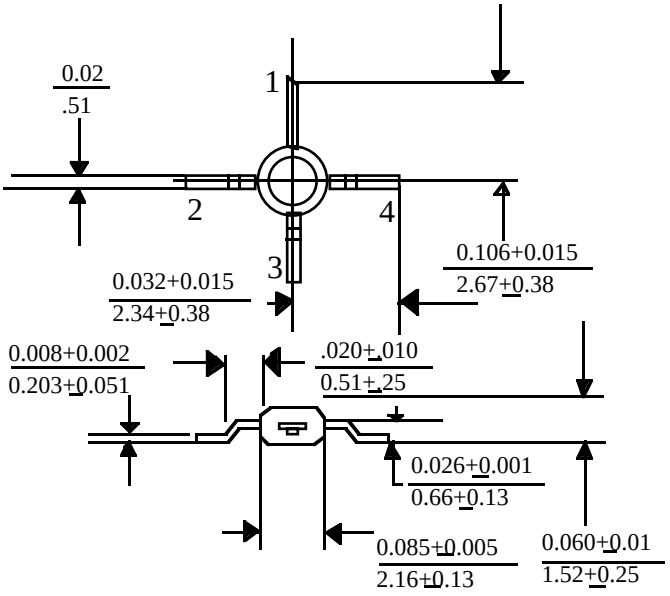

**BRF4801J**
**Package Style 1J: SOT-23J**



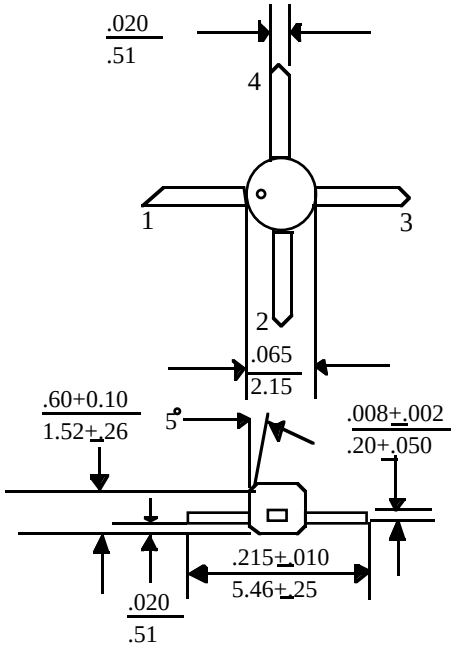
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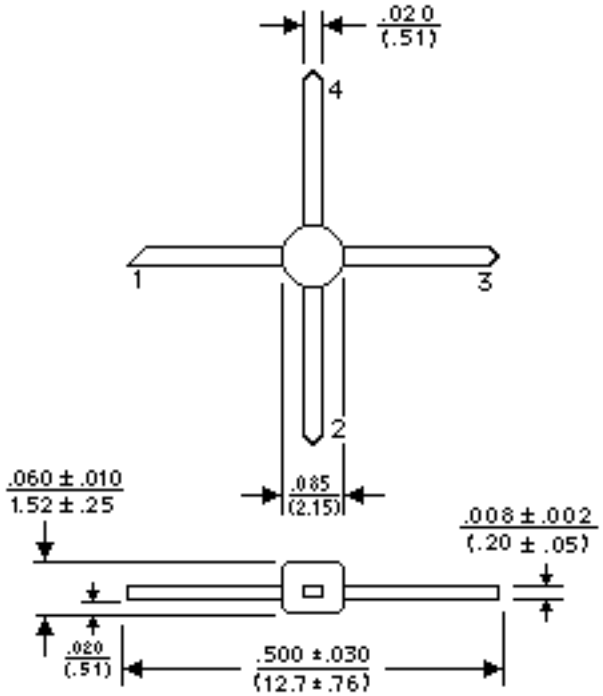
**BRF48086**
**Package Style 86: 85 mil Plastic Micro-X , Surface Mount**




**BRF48084**
**Package Style 84: 85 mil Plastic Micro-X, Short Lead**




**BRF48085**
**Package Style 85: 85 mil Plastic, Micro-X**




**BRF48004**
**Package Style 04: 145 mil Plastic Macro-X**

