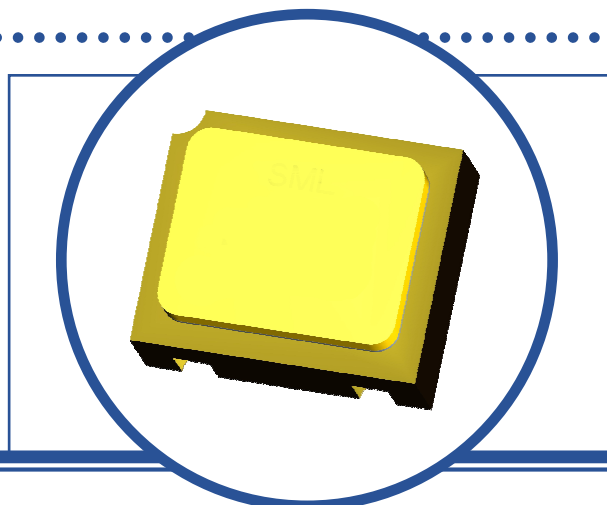


# SMALL SIGNAL NPN RF TRANSISTOR

## BFR92, BFR92A

- Silicon Planar Epitaxial NPN Transistor
- Hermetic Ceramic Surface Mount Package (SOT23 Compatible)
- Suitable For UHF Applications Up To 1.0GHz
- Space Level and High-Reliability Screening Options Available



### ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25°C unless otherwise stated)

|                  |  |                 |
|------------------|--|-----------------|
| V <sub>CBO</sub> | Collector – Base Voltage   | 20V             |
| V <sub>CEO</sub> | Collector – Emitter Voltage  | 15V             |
| V <sub>EBO</sub> | Emitter – Base Voltage   | 2V              |
| I <sub>C</sub>   | Collector Current  | 25mA            |
| I <sub>CM</sub>  | Collector Peak Current   | 35mA            |
| I <sub>B</sub>   | Base Current   | 4mA             |
| P <sub>D</sub>   | Total Power Dissipation at<br>T <sub>A</sub> = 25°C<br>Derate Above 25°C | 250mW<br>2mW/°C |
| T <sub>J</sub>   | Junction Temperature Range   | -65 to +150°C   |
| T <sub>stg</sub> | Storage Temperature Range  | -55 to +150°C   |

### THERMAL PROPERTIES

| Symbols          | Parameters                              | Min. | Typ. | Max. | Units |
|------------------|---|------|------|------|-------|
| R <sub>θJA</sub> | Thermal Resistance, Junction To Ambient |      |      | 500  | °C/W  |

Semelab Limited reserves the right to change test conditions, parameter limits and package dimensions without notice. Information furnished by Semelab is believed to be both accurate and reliable at the time of going to press. However Semelab assumes no responsibility for any errors or omissions discovered in its use. Semelab encourages customers to verify that datasheets are current before placing orders.



# SMALL SIGNAL NPN RF TRANSISTOR BFR92, BFR92A

## ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise stated)

| Symbols             | Parameters                                 | Test Conditions  | Min.     | Typ. | Max. | Units |
|---------------------|--|--|----------|------|------|-------|
| $V_{(BR)CBO}^{(1)}$ | Collector-Base Breakdown Voltage           | $I_C = 10\mu\text{A}$ $I_E = 0$                              | 20       |      |      | V     |
| $V_{(BR)CEO}^{(1)}$ | Collector-Emitter Breakdown Voltage        | $I_C = 1.0\text{mA}$ $I_B = 0$                               | 15       |      |      |       |
| $V_{(BR)EBO}^{(1)}$ | Collector-Emitter Breakdown Voltage        | $I_C = 10\mu\text{A}$ $I_C = 0$                              | 2        |      |      |       |
| $I_{CBO}$           | Collector-Base Cut-Off Current             | $V_{CB} = 10\text{V}$ $I_E = 0$                              |          |      | 50   | nA    |
| $I_{CEO}$           | Collector-Emitter Cut-Off Current (BFR92A) | $V_{CB} = 10\text{V}$ $I_B = 0$                              |          |      | 50   |       |
| $I_{EBO}$           | Emitter-Base Cut-Off Current (BFR92A)      | $V_{EB} = 1.0\text{V}$ $I_C = 0$                             |          |      | 10   |       |
| $h_{FE}^{(1)}$      | Forward-current transfer ratio             | $I_C = 14\text{mA}$ $V_{CE} = 10\text{V}$<br>BFR92<br>BFR92A | 25<br>40 |      |      |       |

## DYNAMIC CHARACTERISTICS

|                 |                               |  |  |            |  |     |
|-----------------|-------------------------------|--|--|------------|--|-----|
| $f_T^{(2)}$     | Transition Frequency          | $I_C = 14\text{mA}$ $V_{CE} = 10\text{V}$<br>$f = 500\text{MHz}$   |  | 5          |  | GHz |
| $C_{EB}^{(2)}$  | Emitter Base Capacitance      | $V_{EB} = 0.5\text{V}$ , $I_C = 0$ , $f = 1.0\text{MHz}$   |  | 0.4        |  | pF  |
| $C_{CB}^{(2)}$  | Collector Base Capacitance    | $V_{CB} = 10\text{V}$ , $I_E = 0$ , $f = 1.0\text{MHz}$<br>BFR92<br>BFR92A   |  | 0.5<br>0.6 |  |     |
| $N_F^{(2)}$     | Noise Figure                  | $I_C = 2\text{mA}$ , $V_{CE} = 10\text{V}$<br>$f = 500\text{MHz}$ for BFR92<br>$f = 800\text{MHz}$ for BFR92A  |  | 2.4<br>1.8 |  | dB  |
| $G_{UM}^{(2)}$  | Maximum Unilateral Power Gain | $I_C = 14\text{mA}$ , $V_{CE} = 10\text{V}$<br>$f = 500\text{MHz}$ for BFR92<br>$f = 800\text{MHz}$ for BFR92A   |  | 18<br>16   |  |     |
| $d_{IM3}^{(2)}$ | Intermodulation Distortion    | $I_C = 14\text{mA}$ , $V_{CE} = 10\text{V}$<br>$R_L = 500\Omega$ , $V_O = 150\text{mV}$<br>$f = 500\text{MHz}$ for BFR92<br>$f = 800\text{MHz}$ for BFR92A |  | -60<br>-60 |  |     |

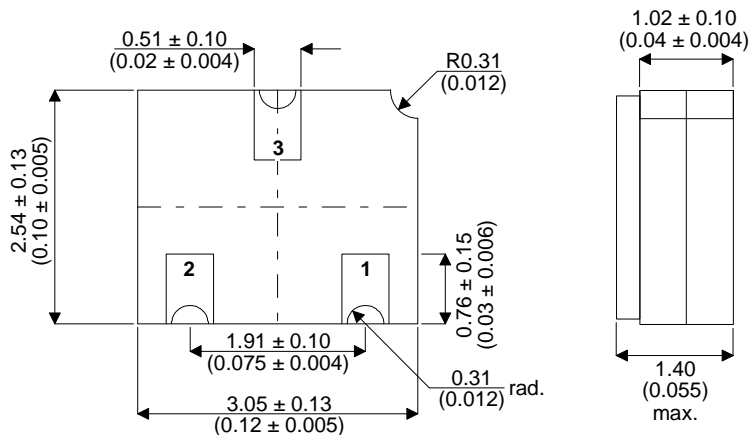
### Notes

- (1) Pulse Width  $\leq 300\mu\text{s}$ ,  $\delta \leq 2\%$   
(2) By Design, not measured as a production test.

# SMALL SIGNAL NPN RF TRANSISTOR BFR92, BFR92A

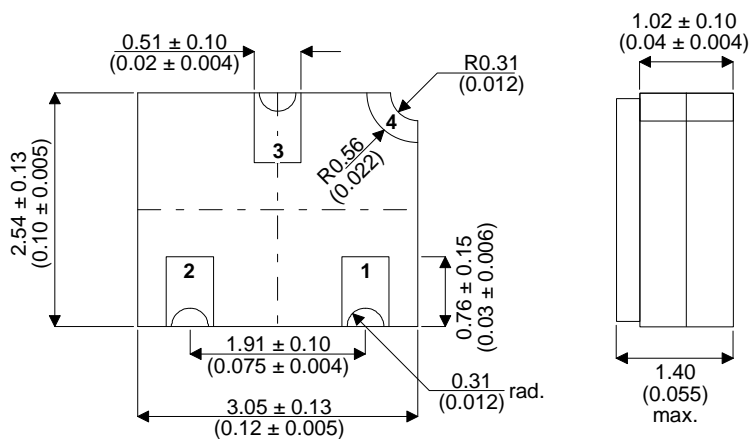
## MECHANICAL DATA

Dimensions in mm (inches)



**C1A**  
(Underside View)

Pad 1 - Base      Pad 2 - Emitter      Pad 3 - Collector



**C1B**  
(Underside View)

Pad 1 - Base      Pad 2 - Emitter      Pad 3 - Collector      Pad 4 -Lid Contact Ground \*

\* The additional contact provides a connection to the lid in the application. Connecting the metal lid to a known electrical potential stops deep dielectric discharge in space applications; see the Space Weather link [www.semelab.co.uk/mil/lcc1\\_4](http://www.semelab.co.uk/mil/lcc1_4) on the Semelab web site. Package variant to be specified at order.

Other Package Outlines may be available – Contact Semelab Sales to Enquire

# SMALL SIGNAL NPN RF TRANSISTOR BFR92, BFR92A

## SCREENING OPTIONS

Space Level (JQRS/ESA) and High Reliability options are available in accordance with the [High Reliability and Screening Options Handbook](#) available for download from the from the TT electronics Semelab web site.

ESA Quality Level Products are based on the testing procedures specified in the generic ESCC 5000 and in the corresponding part detail specifications.

Semelabs QR216 and QR217 processing specifications (JQRS), in conjunction with the companies ISO 9001:2000 approval present a viable alternative to the American MIL-PRF-19500 space level processing.

QR217 (Space Level Quality Conformance) is based on the quality conformance inspection requirements of MIL-PRF-19500 groups A (table V), B (table VIa), C (table VII) and also ESA / ESCC 5000 (chart F4) lot validation tests.

QR216 (Space Level Screening) is based on the screening requirements of MIL-PRF-19500 (table IV) and also ESA /ESCC 5000 (chart F3).

JQRS parts are processed to the device data sheet and screened to QR216 with conformance testing to Q217 groups A and B in accordance with MIL-STD-750 methods and procedures.

Additional conformance options are available, for example Pre-Cap Visual Inspection, Buy-Off Visit or Data Packs. These are chargeable and must be specified at the order stage (See Ordering Information). Minimum order quantities may apply.

Alternative or additional customer specific conformance or screening requirements would be considered. Contact Semelab sales with enquires.

## MARKING DETAILS

Screened parts are typically marked with specification number, serial number (or week of seal) as shown in the example below. All non screened parts are printed with three characters only eg. 92A.

Customer specific marking requirements can be arranged at time of order but is approximately limited to two lines of 7 Characters. This is to ensure text remains readable..

Example Marking:



## ORDERING INFORMATION

Part number is built from part and screening level. The part number can be extended to include the additional options as shown below.

Type – See Electrical Stability Characteristics Table

Package Variant – See Mechanical Data

Screening Level – See Screening Options (ESA / JQRS)

Additional Options:

|  |                   |
|--|-------------------|
| Customer Pre-Cap Visual Inspection         | .CVP              |
| Customer Buy-Off visit                     | .CVB              |
| Data Pack                                  | .DA               |
| Solderability Samples                      | .SS               |
| Scanning Electron Microscopy               | .SEM              |
| Radiography (X-ray)                        | .XRAY             |
| Total Dose Radiation Test                  | .RAD              |
| MIL-PRF-19500 (QR217)                      |                   |
| Group B charge                             | .GRPB             |
| Group B destructive mechanical samples     | .GBDM (12 pieces) |
| Group C charge                             | .GRPC             |
| Group C destructive electrical samples     | .GCDE (12 pieces) |
| Group C destructive mechanical samples     | .GCDM (6 pieces)  |
| ESA/ESCC                                   |                   |
| Lot Validation Testing (subgroup 1) charge | .LVT1             |
| LVT1 destructive samples (environmental)   | .L1DE (15 pieces) |
| LVT1 destructive samples (mechanical)      | .L1DM (15 pieces) |
| Lot Validation Testing (subgroup 2) charge | .LVT2             |
| LVT2 endurance samples (electrical)        | .L2D (15 pieces)  |
| Lot Validation Testing (subgroup 3) charge | .LVT3             |
| LVT3 destructive samples (mechanical)      | .L3D (5 pieces)   |

Additional Option Notes:

- 1) All 'Additional Options' are chargeable and must be specified at order stage.
- 2) When Group B,C or LVT is required, additional electrical and mechanical destructive samples must be ordered
- 3) All destructive samples are marked the same as other production parts unless otherwise requested.

Example ordering information:

The following example is for the 4 pad packaged part option with, JQRS screening, additional Group C conformance testing and a Data pack.

Part Numbers:

BFR92AC1B-JQRS (Include quantity for flight parts)  
BFR92AC1B-JQRS.GRPC (chargeable conformance option)  
BFR92AC1B-JQRS.GCDE (charge for destructive parts)  
BFR92AC1B-JQRS.GCDM (charge for destructive parts)  
BFR92AC1B-JQRS.DA (charge for Data pack)

Customers with any specific requirements (e.g. marking, package or screening) may be supplied with a similar alternative part number (there is maximum 20 character limit to part numbers). Requirements for deep dielectric discharge variant (C1B) must be specified at time of order. Contact Semelab sales with all enquiries

High Reliability and Screening Options Handbook link: [http://www.semelab.co.uk/pdf/misc/documents/hirel\\_and\\_screening\\_options.pdf](http://www.semelab.co.uk/pdf/misc/documents/hirel_and_screening_options.pdf)