

# DATA SHEET

## **BFQ270**

## **NPN 6 GHz wideband transistor**

勝特力材料 886-3-5753170  
勝特力电子(上海) 86-21-34970699  
勝特力电子(深圳) 86-755-83298787  
[Http://www.100y.com.tw](http://www.100y.com.tw)

Product specification  
File under Discrete Semiconductors, SC14

September 1995

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### FEATURES

- High power gain
- Emitter-ballasting resistors for good thermal stability
- Gold metallization ensures excellent reliability.

### PINNING

| PIN | DESCRIPTION |
|-----|-------------|
| 1   | collector   |
| 2   | emitter     |
| 3   | base        |
| 4   | emitter     |

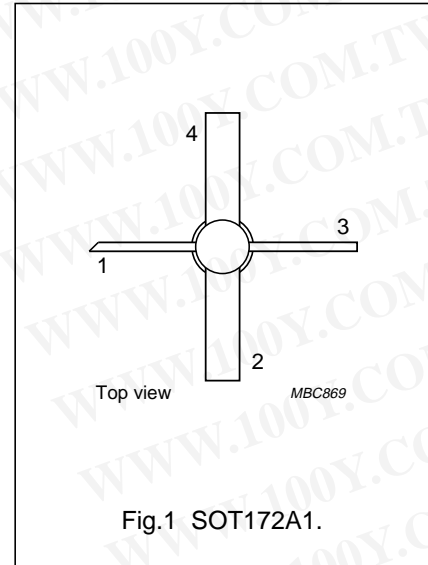


Fig.1 SOT172A1.

### DESCRIPTION

Silicon NPN transistor mounted in a 4-lead dual-emitter SOT172A1 envelope with a ceramic cap. All leads are isolated from the mounting base.

It is primarily intended for use in MATV and CATV amplifiers.

### QUICK REFERENCE DATA

| SYMBOL    | PARAMETER                     | CONDITIONS   | MIN. | TYP. | MAX. | UNIT |
|-----------|-------------------------------|--|------|------|------|------|
| $V_{CBO}$ | collector-base voltage        | open emitter   | –    | –    | 25   | V    |
| $V_{CEO}$ | collector-emitter voltage     | open base  | –    | –    | 19   | V    |
| $I_C$     | DC collector current          |  | –    | –    | 500  | mA   |
| $P_{tot}$ | total power dissipation       | up to $T_c = 100\text{ }^\circ\text{C}$  | –    | –    | 10   | W    |
| $h_{FE}$  | DC current gain               | $I_C = 240\text{ mA}; V_{CE} = 18\text{ V}; T_j = 25\text{ }^\circ\text{C}$  | 60   | –    | –    |      |
| $f_T$     | transition frequency          | $I_C = 240\text{ mA}; V_{CE} = 18\text{ V}; f = 1\text{ GHz}; T_{amb} = 25\text{ }^\circ\text{C}$                            | –    | 6    | –    | GHz  |
| $G_{UM}$  | maximum unilateral power gain | $I_C = 240\text{ mA}; V_{CE} = 18\text{ V}; f = 800\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$                          | –    | 10   | –    | dB   |
| $V_O$     | output voltage                | $d_{im} = -60\text{ dB}; I_C = 240\text{ mA}; V_{CE} = 18\text{ V}; R_L = 75\text{ }\Omega; f_{(p+q-r)} = 793.25\text{ MHz}$ | –    | 1.6  | –    | V    |

### WARNING

#### Product and environmental safety - toxic materials

This product contains beryllium oxide. The product is entirely safe provided that the BeO discs are not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

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## LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134).

| SYMBOL           | PARAMETER                 | CONDITIONS                    | MIN. | MAX. | UNIT |
|------------------|---------------------------|-------------------------------|------|------|------|
| V <sub>CBO</sub> | collector-base voltage    | open emitter                  | –    | 25   | V    |
| V <sub>CEO</sub> | collector-emitter voltage | open base                     | –    | 19   | V    |
| V <sub>EBO</sub> | emitter-base voltage      | open collector                | –    | 2    | V    |
| I <sub>C</sub>   | DC collector current      |                               | –    | 500  | mA   |
| P <sub>tot</sub> | total power dissipation   | up to T <sub>C</sub> = 100 °C | –    | 10   | W    |
| T <sub>stg</sub> | storage temperature       |                               | –65  | 150  | °C   |
| T <sub>j</sub>   | junction temperature      |                               | –    | 200  | °C   |

## THERMAL RESISTANCE

| SYMBOL              | PARAMETER                                | THERMAL RESISTANCE |
|---------------------|--|--------------------|
| R <sub>th j-c</sub> | thermal resistance from junction to case | 10 K/W             |

## CHARACTERISTICS

T<sub>j</sub> = 25 °C unless otherwise specified.

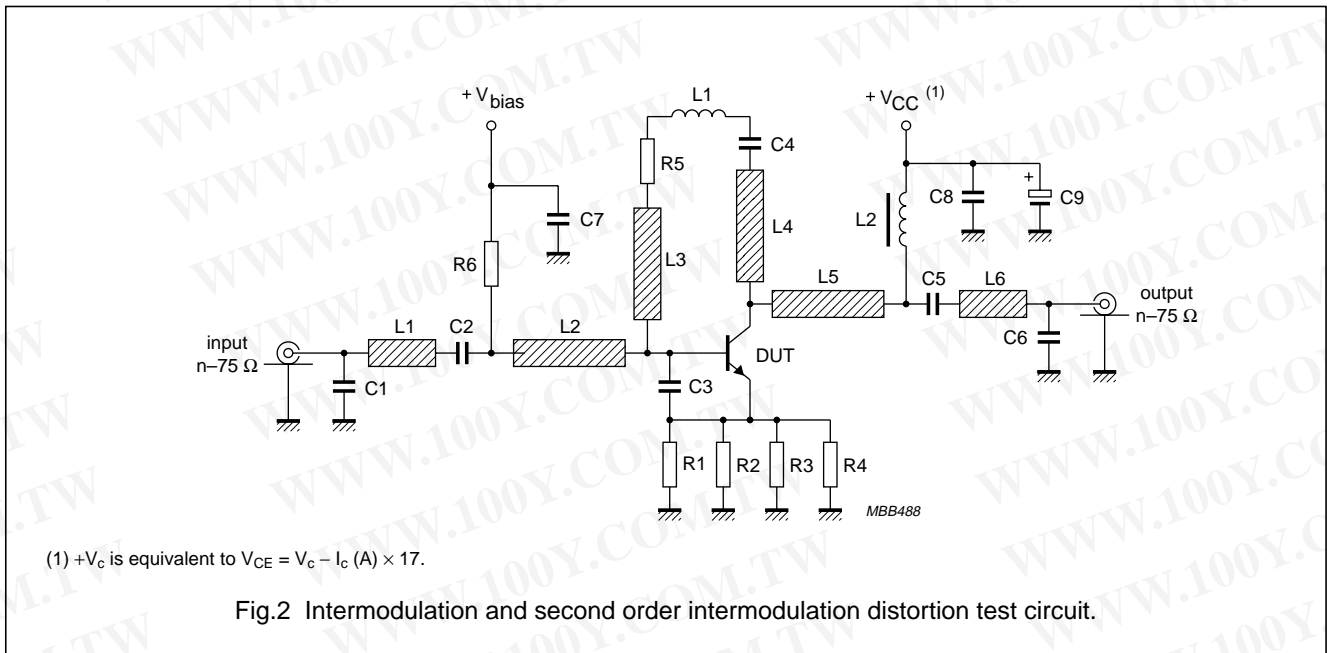
| SYMBOL           | PARAMETER                                  | CONDITIONS  | MIN. | TYP. | MAX. | UNIT |
|------------------|--|---|------|------|------|------|
| I <sub>CBO</sub> | collector cut-off current                  | I <sub>E</sub> = 0; V <sub>CB</sub> = 18 V  | –    | –    | 100  | μA   |
| h <sub>FE</sub>  | DC current gain                            | I <sub>C</sub> = 240 mA; V <sub>CE</sub> = 18 V   | 60   | 110  | –    |      |
| C <sub>c</sub>   | collector capacitance                      | I <sub>E</sub> = i <sub>e</sub> = 0; V <sub>CB</sub> = 18 V; f = 1 MHz                    | –    | 3.6  | –    | pF   |
| C <sub>e</sub>   | emitter capacitance                        | I <sub>C</sub> = i <sub>c</sub> = 0; V <sub>EB</sub> = 0.5 V; f = 1 MHz                   | –    | 11   | –    | pF   |
| C <sub>re</sub>  | feedback capacitance                       | I <sub>C</sub> = 0; V <sub>CB</sub> = 18 V; f = 1 MHz                                     | 2    | 2.6  | –    | pF   |
| C <sub>cs</sub>  | collector-stud capacitance                 |   | –    | 1.2  | –    | pF   |
| f <sub>T</sub>   | transition frequency                       | I <sub>C</sub> = 240 mA; V <sub>CE</sub> = 18 V; f = 1 GHz;<br>T <sub>amb</sub> = 25 °C   | 4.5  | 6    | –    | GHz  |
| G <sub>UM</sub>  | maximum unilateral power gain<br>(note 1)  | I <sub>C</sub> = 240 mA; V <sub>CE</sub> = 18 V;<br>f = 500 MHz; T <sub>amb</sub> = 25 °C | –    | 16   | –    | dB   |
|                  |  | I <sub>C</sub> = 240 mA; V <sub>CE</sub> = 18 V; f = 1 GHz;<br>T <sub>amb</sub> = 25 °C   | –    | 10   | –    | dB   |
| V <sub>O</sub>   | output voltage                             | note 2  | –    | 1.6  | –    | V    |
| d <sub>2</sub>   | second order intermodulation<br>distortion | note 3  | –    | –50  | –    | dB   |

## Notes

- G<sub>UM</sub> is the maximum unilateral power gain, assuming S<sub>12</sub> is zero and  $G_{UM} = 10 \log \left( \frac{|S_{21}|^2}{(1 - |S_{11}|^2)(1 - |S_{22}|^2)} \right)$  dB
- d<sub>im</sub> = –60 dB (DIN 45004); I<sub>C</sub> = 240 mA; V<sub>CE</sub> = 18 V; R<sub>L</sub> = 75 Ω;  
 V<sub>p</sub> = V<sub>O</sub>; f<sub>p</sub> = 795.25 MHz;  
 V<sub>q</sub> = V<sub>O</sub> –6 dB; f<sub>q</sub> = 803.25 MHz;  
 V<sub>r</sub> = V<sub>O</sub> –6 dB; f<sub>r</sub> = 805.25 MHz;  
 measured at f<sub>(p+q-r)</sub> = 793.25 MHz.
- I<sub>C</sub> = 240 mA; V<sub>CE</sub> = 18 V; R<sub>L</sub> = 75 Ω;  
 V<sub>p</sub> = V<sub>q</sub> = V<sub>O</sub> = 50.5 dBmV = 335 mV;  
 f<sub>(p+q)</sub> = 810 MHz; f<sub>p</sub> = 250 MHz; f<sub>q</sub> = 560 MHz.

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## List of components (see test circuit)

| DESIGNATION    | DESCRIPTION  | VALUE           | DIMENSIONS                     | CATALOGUE NO.  |
|----------------|--|-----------------|--------------------------------|----------------|
| C1             | miniature ceramic plate capacitor                    | 0.82 pF         |                                | 2222 680 03827 |
| C2, C5, C7, C8 | multilayer ceramic capacitor                         | 10 nF           |                                | 2222 852 47103 |
| C3             | multilayer ceramic chip capacitor                    | 2.2 pF          |                                | 2222 855 12228 |
| C4 (note 1)    | miniature ceramic plate capacitor                    | 1 nF            |                                | 2222 630 08102 |
| C6             | miniature ceramic plate capacitor                    | 1.2 pF          |                                | 2222 680 03128 |
| C9             | electrolytic capacitor                               | 4.7 $\mu$ F     |                                | 2222 014 28478 |
| L1 (note 1)    | 4.5 turns loosely wound 0.4 mm enamelled copper wire | $\approx$ 35 nH | internal coil diameter<br>2 mm |                |
| L2             | Ferroxcube choke                                     | 5 $\mu$ H       |                                | 3122 108 20153 |
| ML1, ML6       | microstripline                                       | 75 $\Omega$     | width 2.46 mm;<br>length 9 mm  |                |
| ML2, ML5       | microstripline                                       | 75 $\Omega$     | width 2.46 mm;<br>length 22 mm |                |
| ML3, ML4       | microstripline                                       | 145 $\Omega$    | width 0.5 mm;<br>length 12 mm  |                |
| R1, R2, R3, R4 | metal film resistor                                  | 68 $\Omega$     | type MR25                      | 2322 151 76819 |
| R5 (note 1)    | metal film resistor                                  | 240 $\Omega$    | type SFR16T                    | 2322 180 73241 |
| R6             | metal film resistor                                  | 10 k $\Omega$   | type SFR16T                    | 2322 180 73103 |

## Note

- Components C4, L1, and R5 are mounted in a cavity in the brass ground plate.

The circuit is constructed on a printed circuit board and 10 mm thick brass ground plate, with a relative dielectric constant of ( $\epsilon_r = 2.2$ ), thickness 1.57 mm; thickness of copper 0.017 mm (E.G. Rogers' RT/Duroid 5880).



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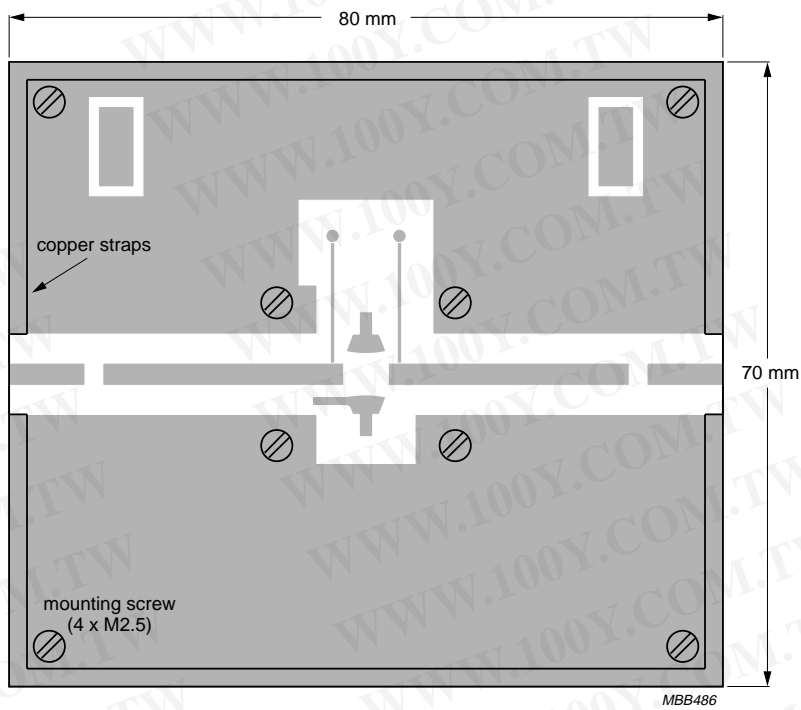
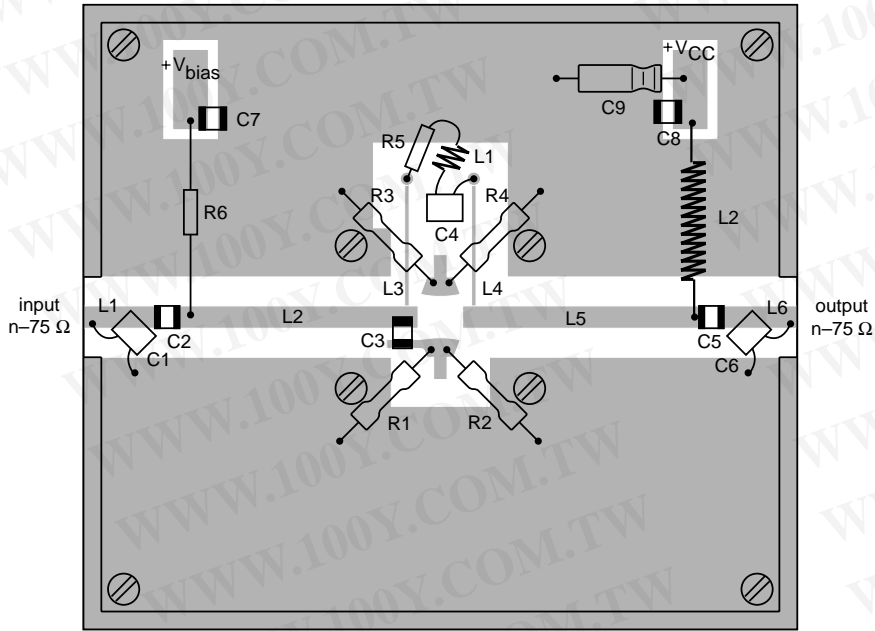
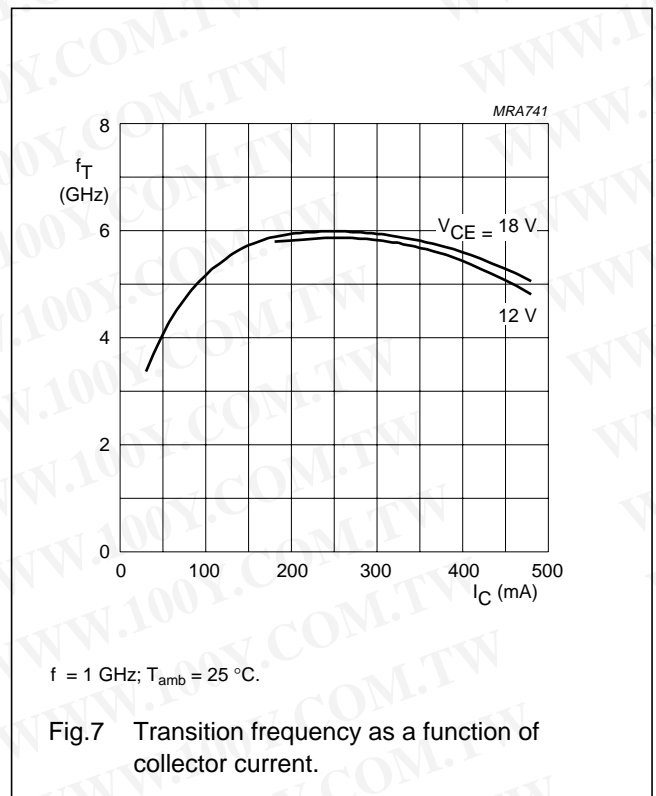
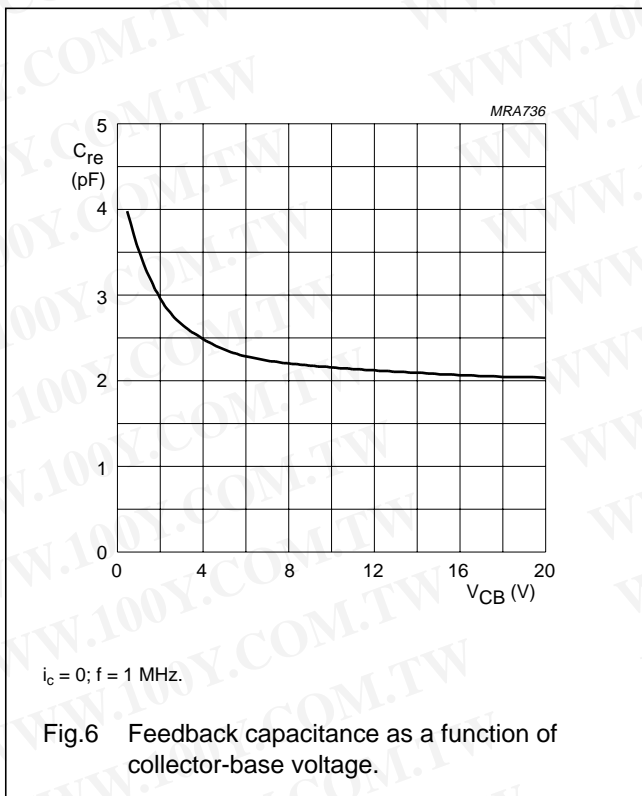
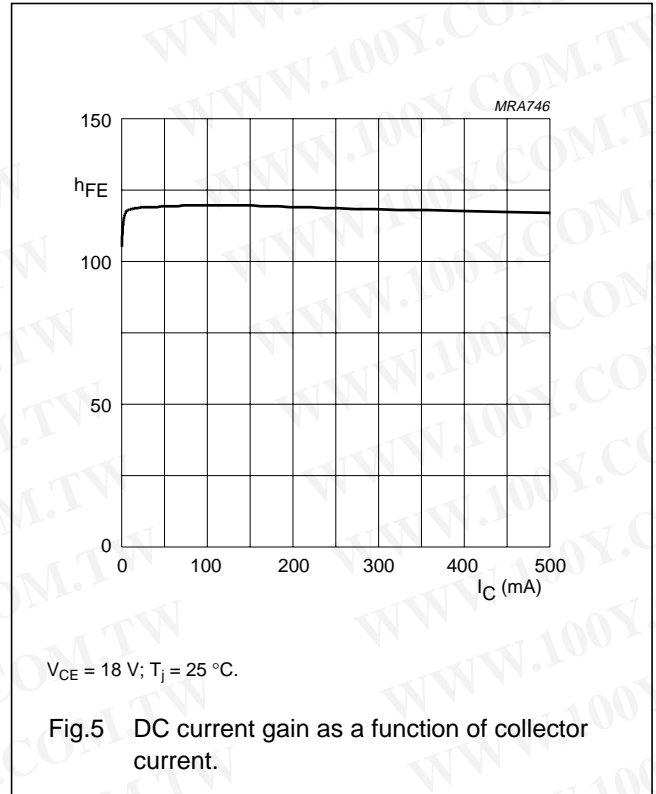
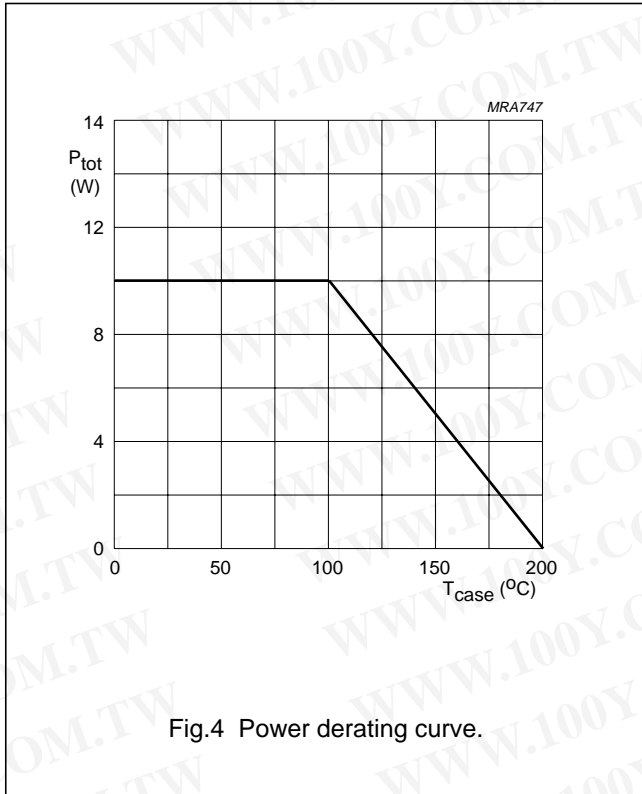


Fig.3 Intermodulation test circuit printed circuit board.

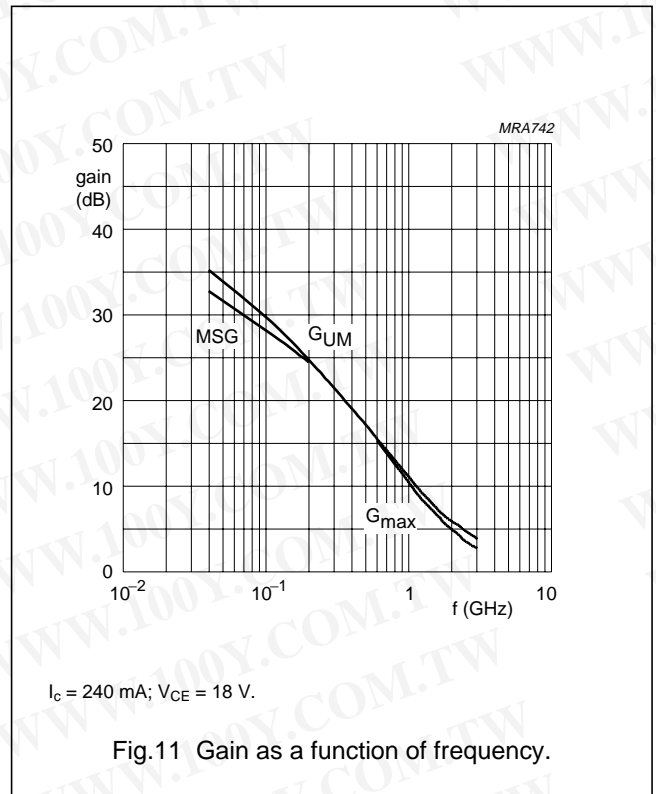
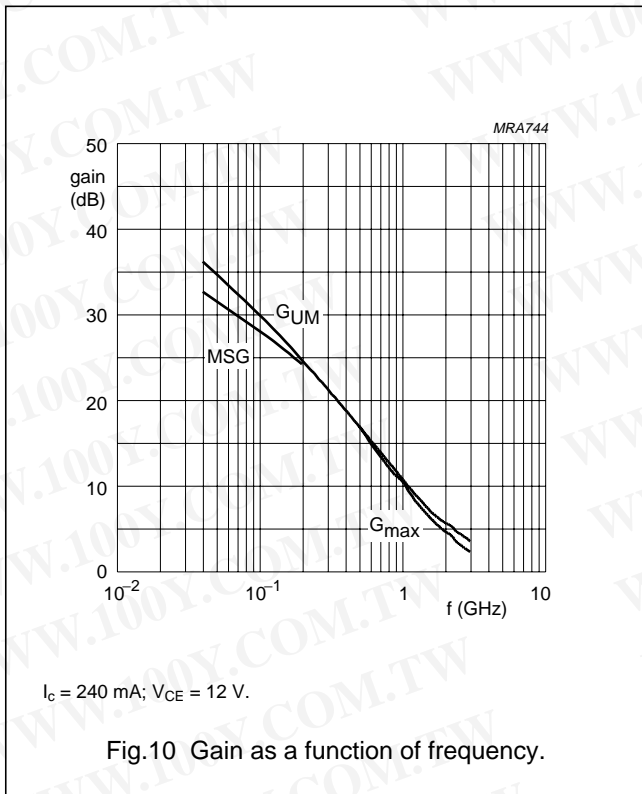
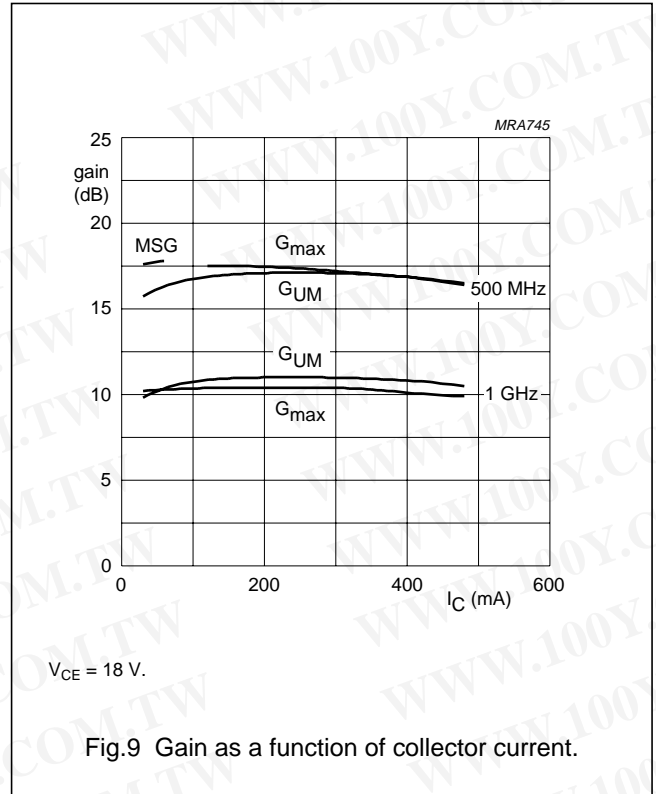
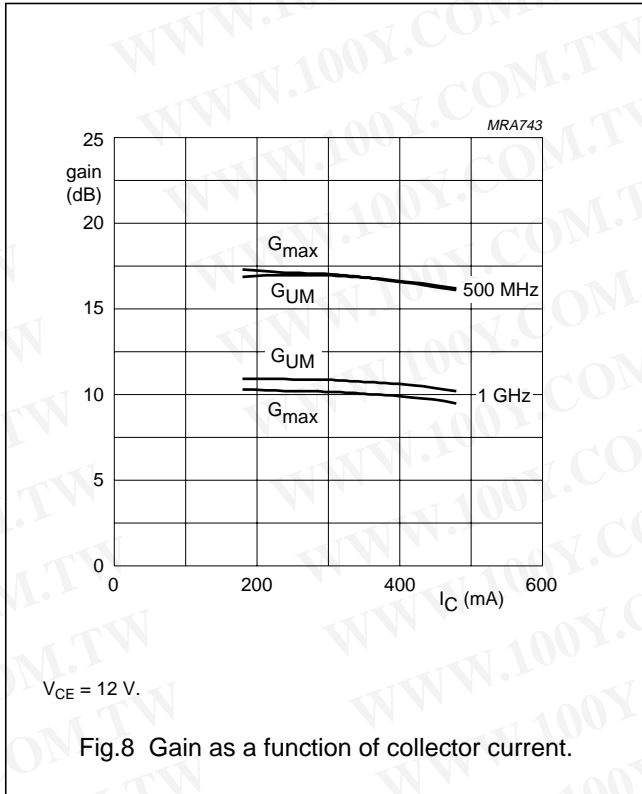
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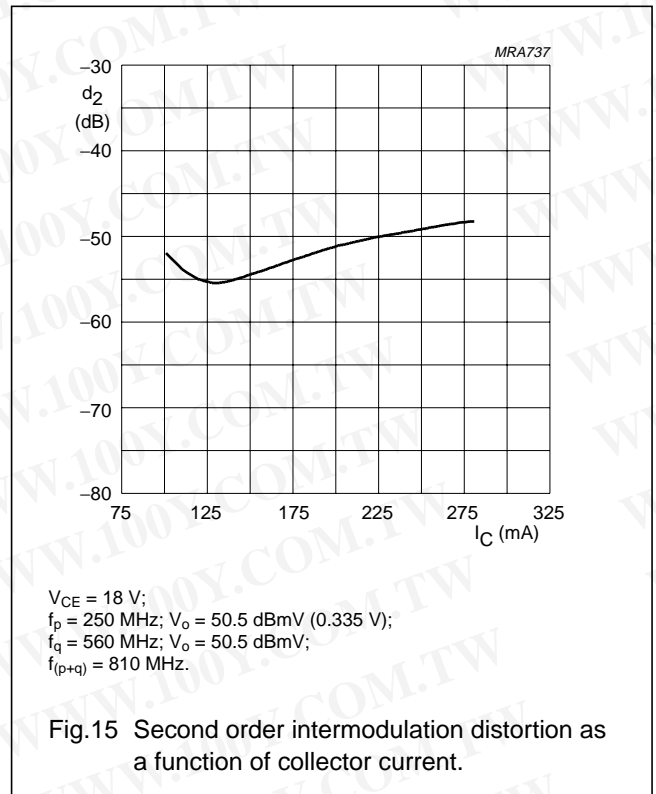
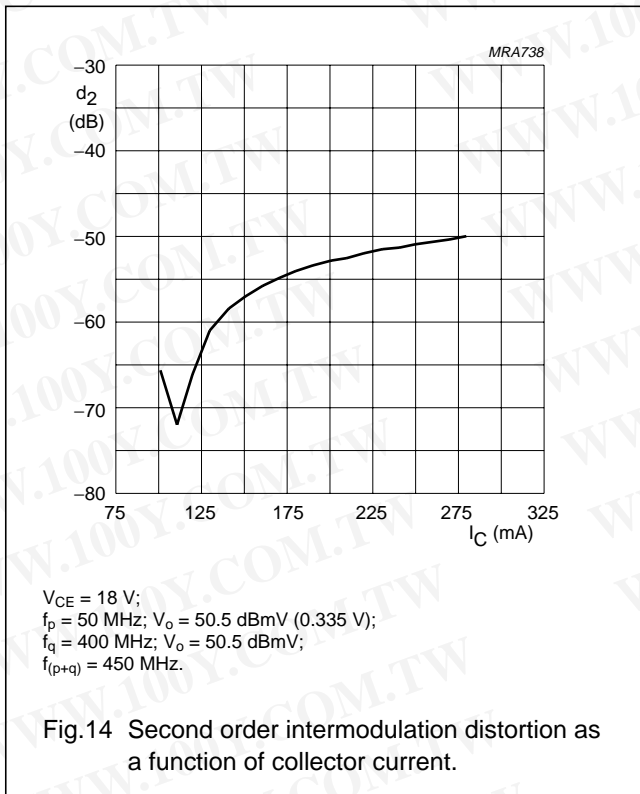
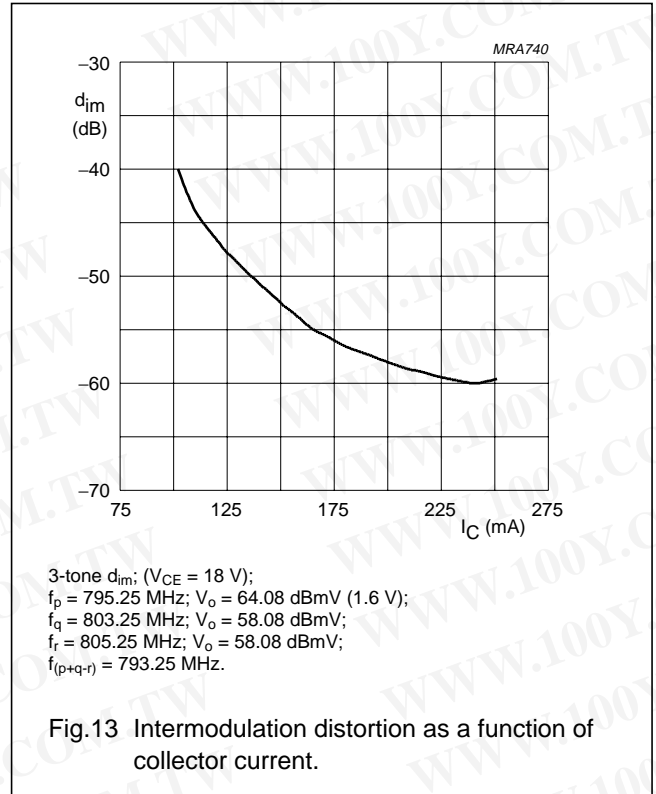
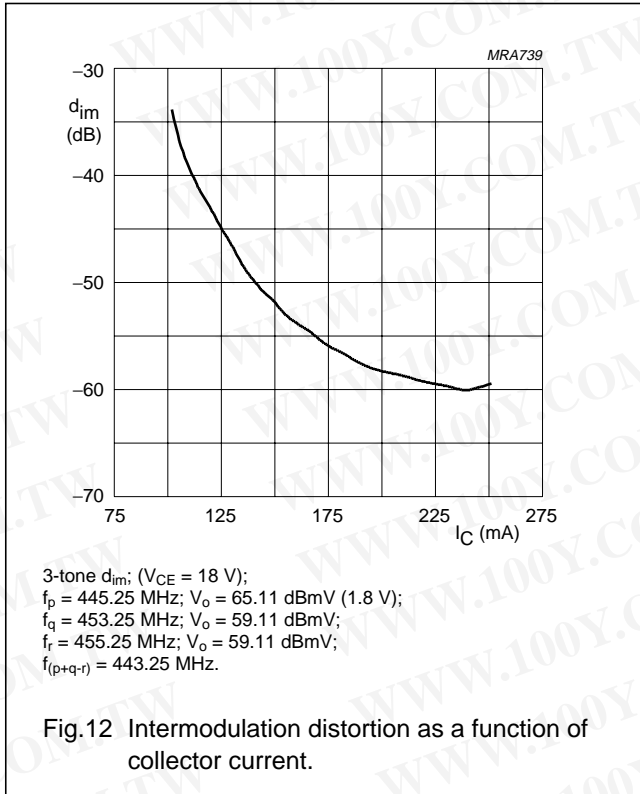
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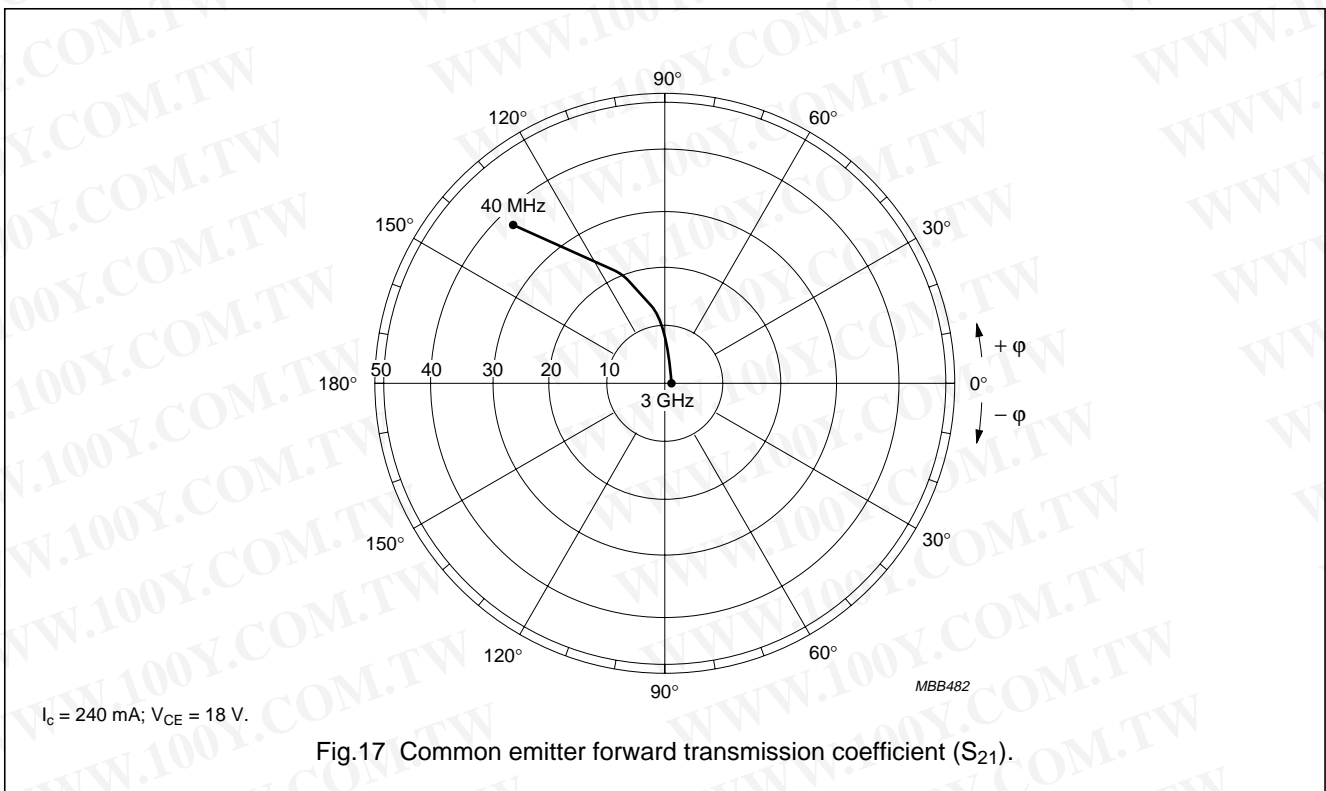
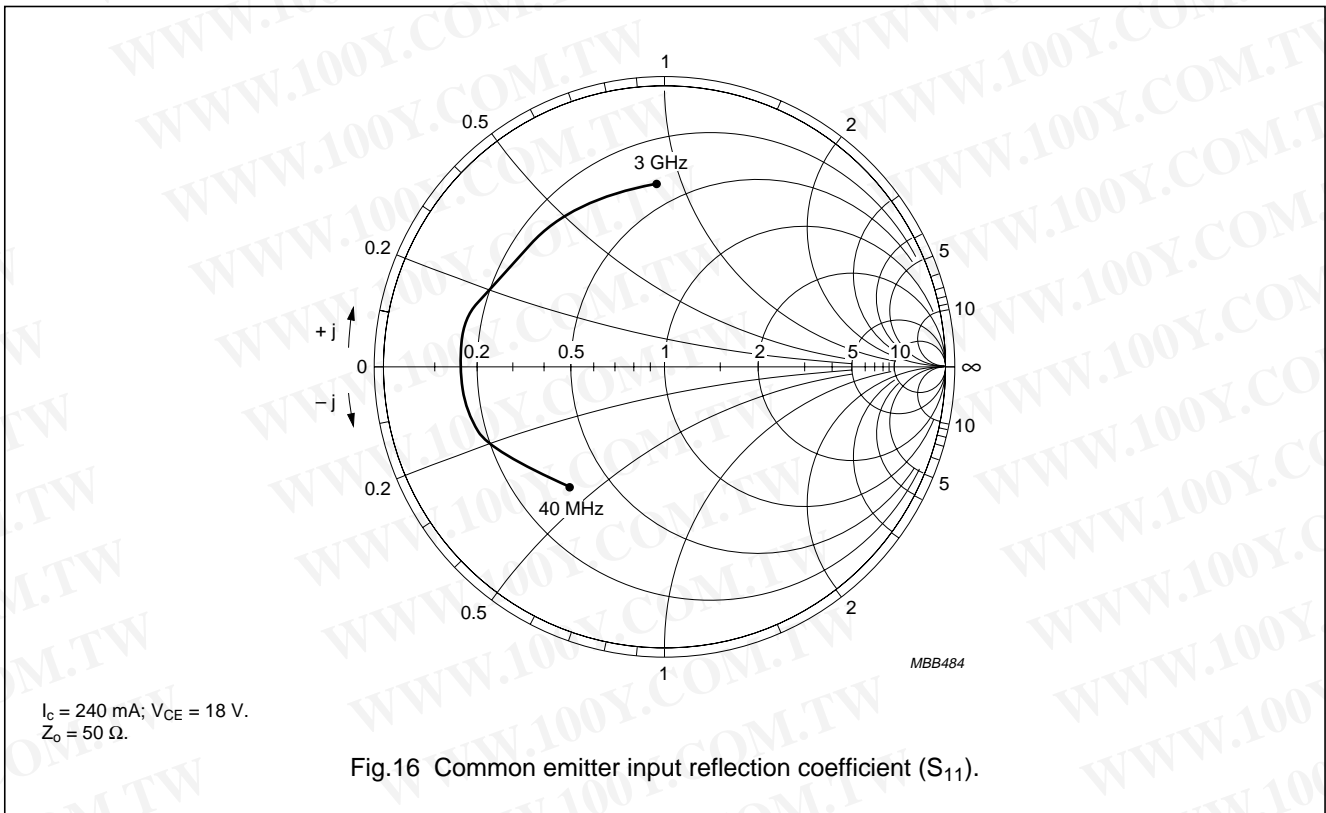
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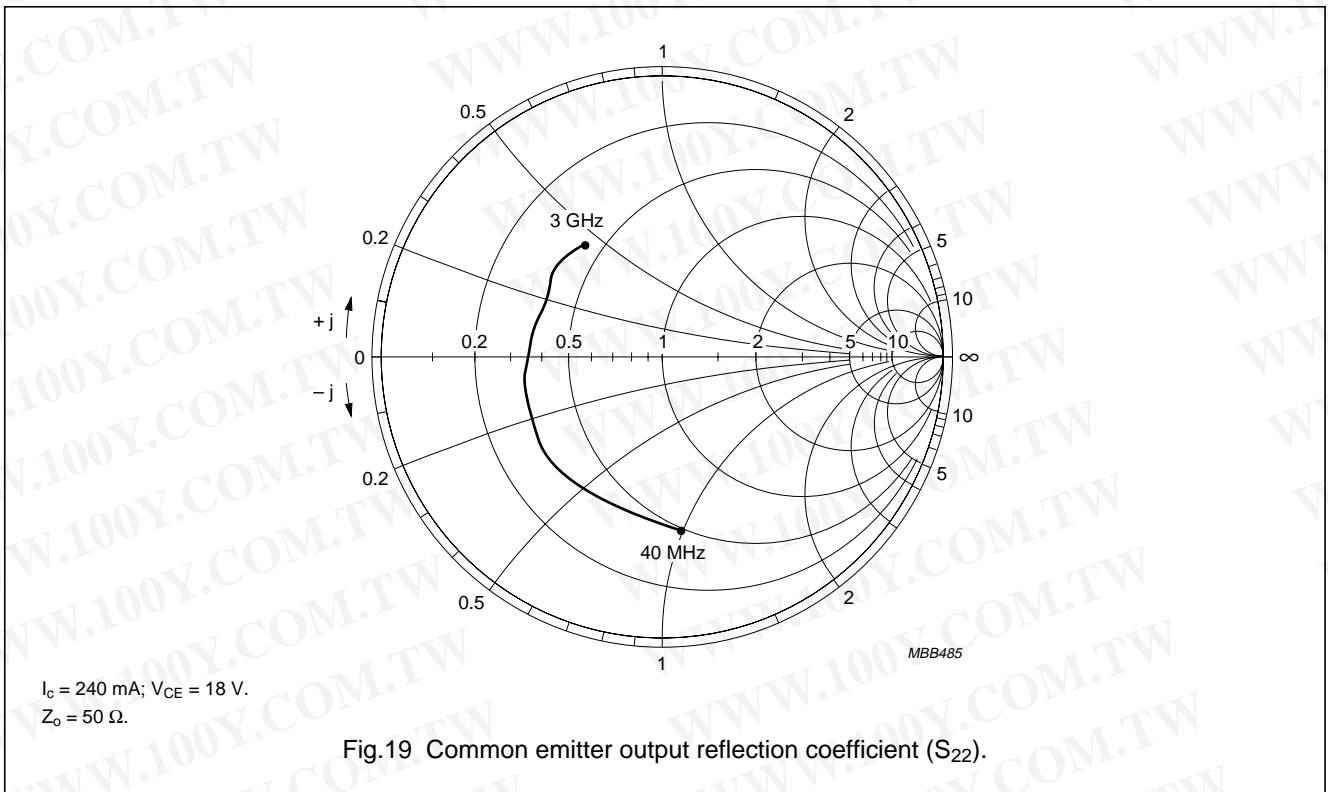
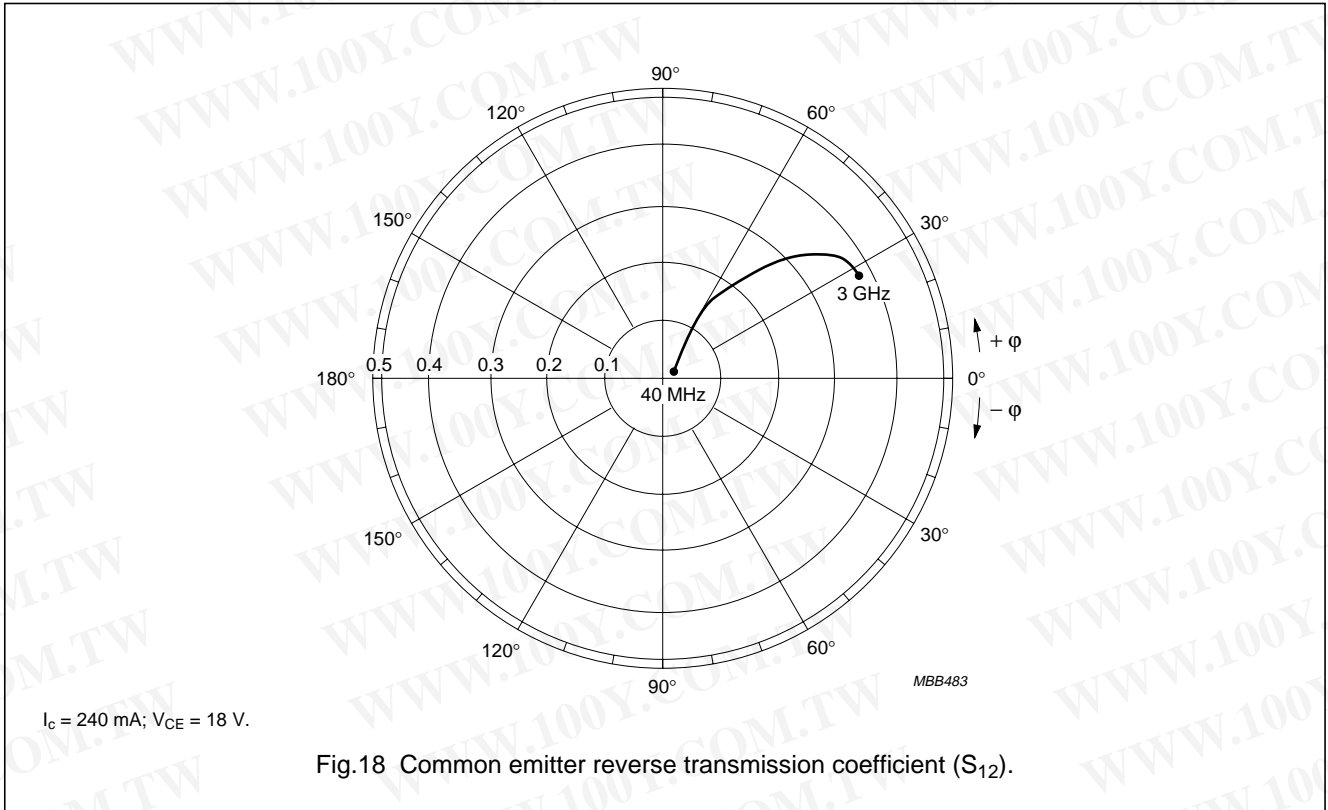
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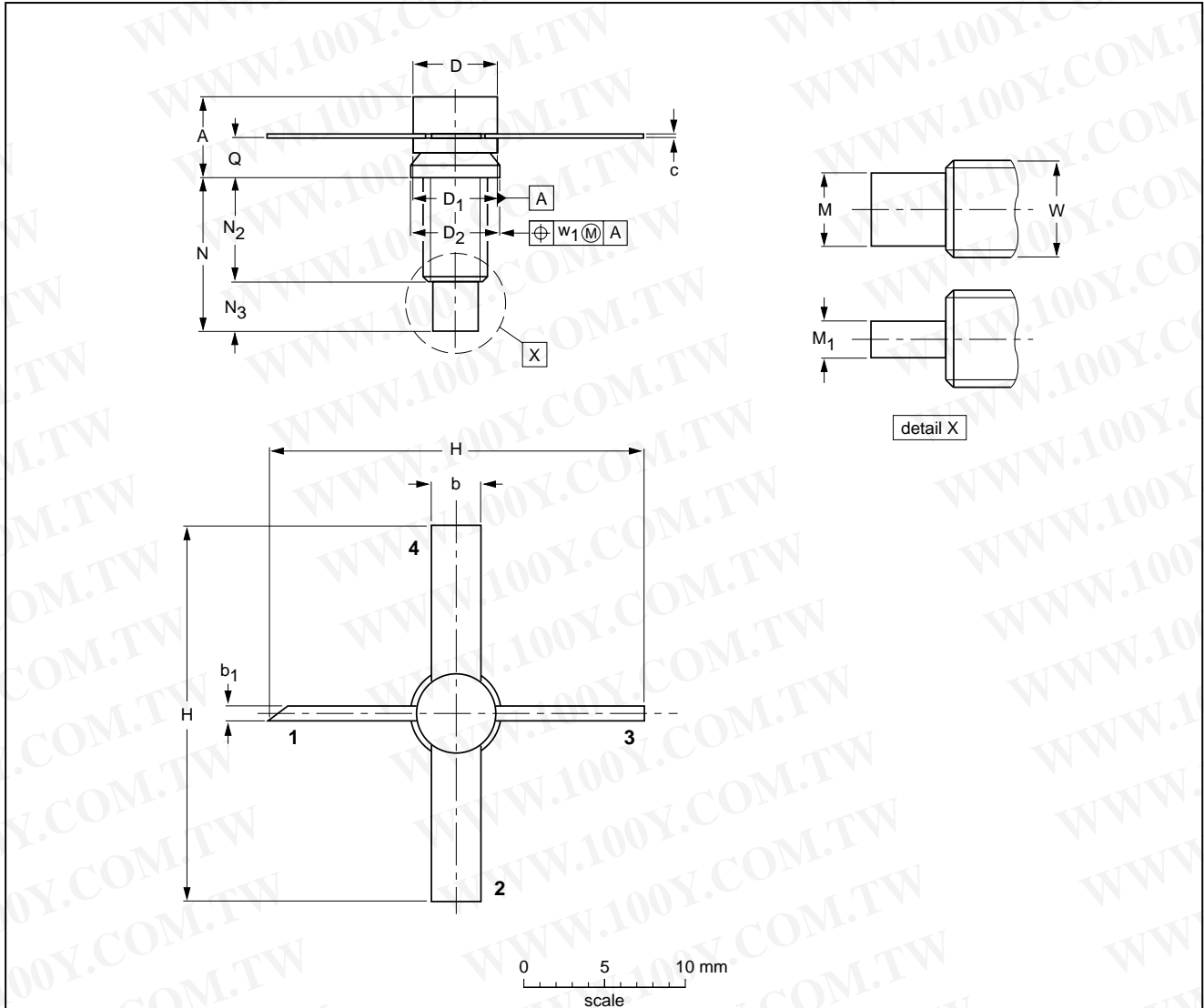
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PACKAGE OUTLINE

Studded ceramic package; 4 leads

SOT172A1



DIMENSIONS (millimetre dimensions are derived from the original inch dimensions)

| UNIT   | A              | b              | b <sub>1</sub> | c              | D              | D <sub>1</sub> | D <sub>2</sub> | H              | M            | M <sub>1</sub> | N              | N <sub>2</sub> | N <sub>3</sub> | Q              | W           | w <sub>1</sub> |
|--------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|--------------|----------------|----------------|----------------|----------------|----------------|-------------|----------------|
| mm     | 5.31<br>4.34   | 3.31<br>3.04   | 0.89<br>0.63   | 0.16<br>0.10   | 5.20<br>4.95   | 5.33<br>5.08   | 5.33<br>5.08   | 26.17<br>24.63 | 3.05<br>2.79 | 1.66<br>1.39   | 11.82<br>10.89 | 8.89<br>6.90   | 3.69<br>2.92   | 2.90<br>2.31   | 8-32<br>UNC | 0.38           |
| inches | 0.209<br>0.171 | 0.130<br>0.120 | 0.035<br>0.025 | 0.006<br>0.004 | 0.205<br>0.195 | 0.210<br>0.200 | 0.210<br>0.200 | 1.03<br>0.97   | 0.12<br>0.11 | 0.065<br>0.055 | 0.465<br>0.429 | 0.350<br>0.272 | 0.145<br>0.115 | 0.114<br>0.091 |             | 0.015          |

| OUTLINE VERSION | REFERENCES |       |      | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|-------|------|---------------------|------------|
|                 | IEC        | JEDEC | EIAJ |                     |            |
| SOT172A1        |            |       |      |                     | 97-06-28   |

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## DEFINITIONS

| Data Sheet Status   |   |
|---|---|
| Objective specification   | This data sheet contains target or goal specifications for product development.       |
| Preliminary specification   | This data sheet contains preliminary data; supplementary data may be published later. |
| Product specification   | This data sheet contains final product specifications.                                |
| Limiting values   |   |
| Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability. |   |
| Application information   |   |
| Where application information is given, it is advisory and does not form part of the specification.   |   |

## LIFE SUPPORT APPLICATIONS

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