

DATA SHEET

BF909WR

N-channel dual-gate MOS-FET

Product specification
Supersedes data of 1997 Sep 05

2010 Sep 15



N-channel dual-gate MOS-FET

BF909WR

FEATURES

- Specially designed for use at 5 V supply voltage
- Short channel transistor with high forward transfer admittance to input capacitance ratio
- Low noise gain controlled amplifier up to 1 GHz
- Superior cross-modulation performance during AGC.

APPLICATIONS

- VHF and UHF applications with 3 to 7 V supply voltage such as television tuners and professional communications equipment.

DESCRIPTION

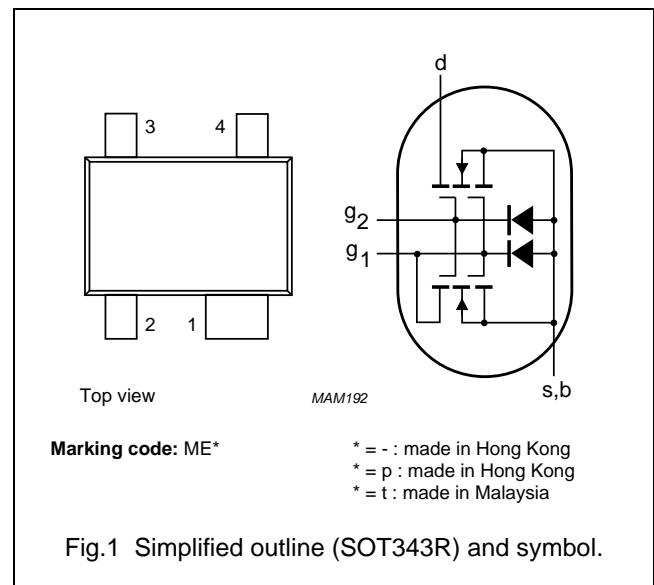
Enhancement type field-effect transistor in a plastic microminiature SOT343R package. The transistor consists of an amplifier MOS-FET with source and substrate interconnected and an internal bias circuit to ensure good cross-modulation performance during AGC.

CAUTION

The device is supplied in an antistatic package. The gate-source input must be protected against static discharge during transport or handling.

PINNING

| PIN | SYMBOL | DESCRIPTION |
|-----|----------------|-------------|
| 1 | s, b | source |
| 2 | d | drain |
| 3 | g ₂ | gate 2 |
| 4 | g ₁ | gate 1 |



QUICK REFERENCE DATA

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|--------------------|--------------------------------|-------------|------|------|------|------|
| V _{DS} | drain-source voltage | | – | – | 7 | V |
| I _D | drain current | | – | – | 40 | mA |
| P _{tot} | total power dissipation | | – | – | 280 | mW |
| T _j | operating junction temperature | | – | – | 150 | °C |
| y _{fs} | forward transfer admittance | | 36 | 43 | 50 | mS |
| C _{ig1-s} | input capacitance at gate 1 | | – | 3.6 | 4.3 | pF |
| C _{rs} | reverse transfer capacitance | f = 1 MHz | – | 30 | 50 | fF |
| F | noise figure | f = 800 MHz | – | 2 | 2.8 | dB |

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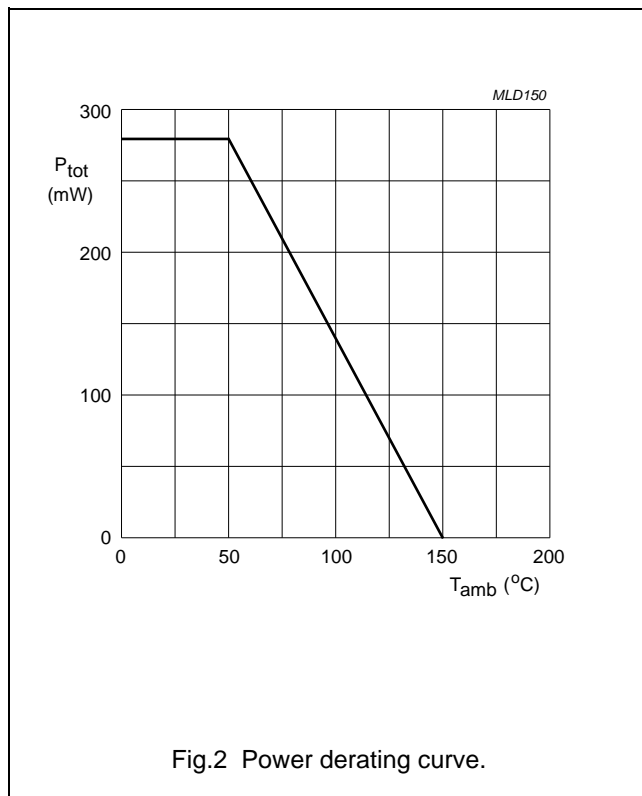
LIMITING VALUES

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

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|-----------|--------------------------------|--|------|----------|------------------|
| V_{DS} | drain-source voltage | | – | 7 | V |
| I_D | drain current | | – | 40 | mA |
| I_{G1} | gate 1 current | | – | ± 10 | mA |
| I_{G2} | gate 2 current | | – | ± 10 | mA |
| P_{tot} | total power dissipation | up to $T_{amb} = 50\text{ }^\circ\text{C}$; see Fig.2; note 1 | – | 280 | mW |
| T_{stg} | storage temperature range | | –65 | +150 | $^\circ\text{C}$ |
| T_j | operating junction temperature | | – | +150 | $^\circ\text{C}$ |

Note

1. Device mounted on a printed-circuit board.



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THERMAL CHARACTERISTICS

| SYMBOL | PARAMETER | CONDITIONS | VALUE | UNIT |
|---------------|---|-------------------------------|-------|------|
| $R_{th\ j-a}$ | thermal resistance from junction to ambient | note 1 | 350 | K/W |
| $R_{th\ j-s}$ | thermal resistance from junction to soldering point | $T_s = 91\text{ °C}$; note 2 | 210 | K/W |

Notes

1. Device mounted on a printed-circuit board.
2. T_s is the temperature at the soldering point of the source lead.

STATIC CHARACTERISTICS

$T_j = 25\text{ °C}$; unless otherwise specified.

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|-----------------|---------------------------------|--|------|------|------|
| $V_{(BR)G1-SS}$ | gate 1-source breakdown voltage | $V_{G2-S} = V_{DS} = 0$; $I_{G1-S} = 10\text{ mA}$ | 6 | 15 | V |
| $V_{(BR)G2-SS}$ | gate 2-source breakdown voltage | $V_{G1-S} = V_{DS} = 0$; $I_{G2-S} = 10\text{ mA}$ | 6 | 15 | V |
| $V_{(F)S-G1}$ | forward source-gate 1 voltage | $V_{G2-S} = V_{DS} = 0$; $I_{S-G1} = 10\text{ mA}$ | 0.5 | 1.5 | V |
| $V_{(F)S-G2}$ | forward source-gate 2 voltage | $V_{G1-S} = V_{DS} = 0$; $I_{S-G2} = 10\text{ mA}$ | 0.5 | 1.5 | V |
| $V_{G1-S(th)}$ | gate 1-source threshold voltage | $V_{G2-S} = 4\text{ V}$; $V_{DS} = 5\text{ V}$; $I_D = 20\text{ }\mu\text{A}$ | 0.3 | 1 | V |
| $V_{G2-S(th)}$ | gate 2-source threshold voltage | $V_{G1-S} = V_{DS} = 5\text{ V}$; $I_D = 20\text{ }\mu\text{A}$ | 0.3 | 1.2 | V |
| I_{DSX} | drain-source current | $V_{G2-S} = 4\text{ V}$; $V_{DS} = 5\text{ V}$; $R_{G1} = 120\text{ k}\Omega$; note 1 | 12 | 20 | mA |
| I_{G1-SS} | gate 1 cut-off current | $V_{G2-S} = V_{DS} = 0$; $V_{G1-S} = 5\text{ V}$ | – | 50 | nA |
| I_{G2-SS} | gate 2 cut-off current | $V_{G1-S} = V_{DS} = 0$; $V_{G2-S} = 5\text{ V}$ | – | 50 | nA |

Note

1. R_{G1} connects gate 1 to $V_{GG} = 5\text{ V}$.

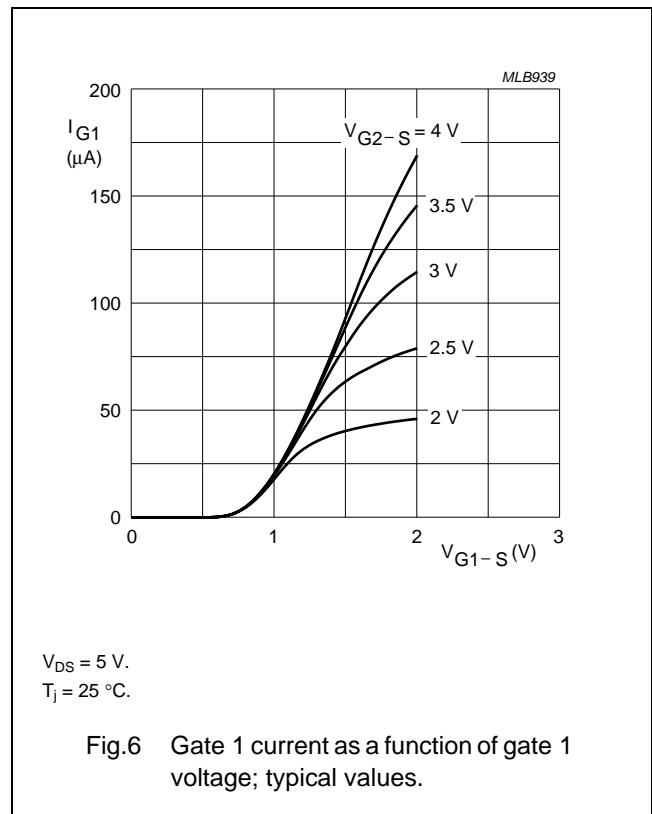
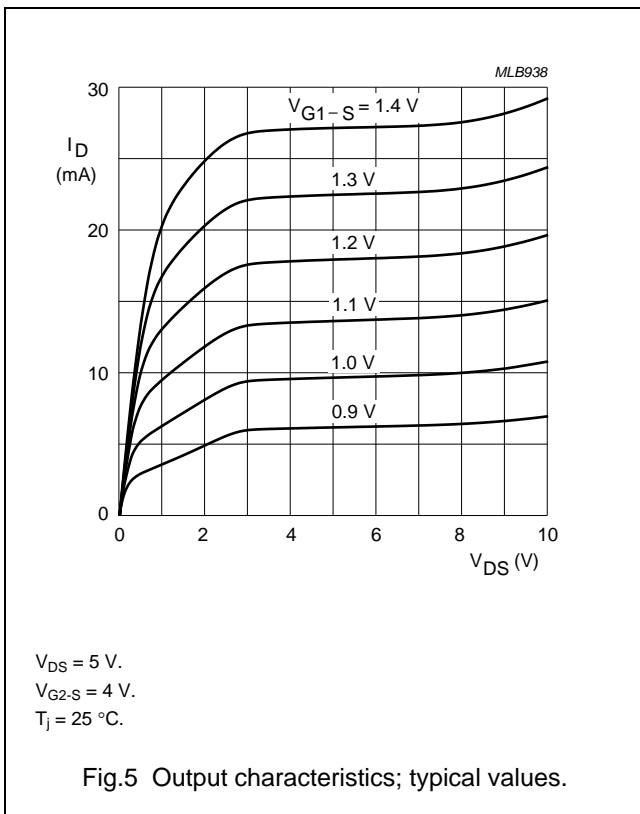
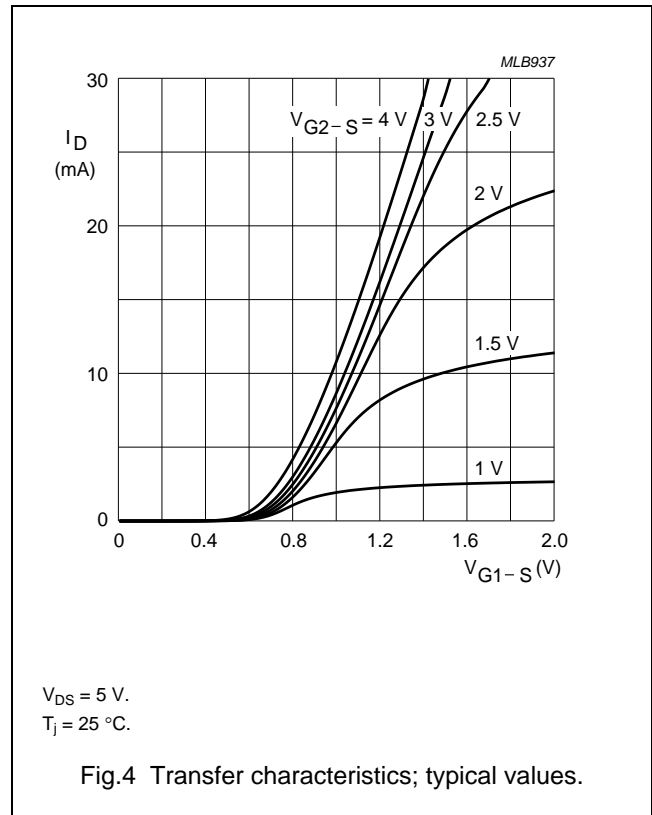
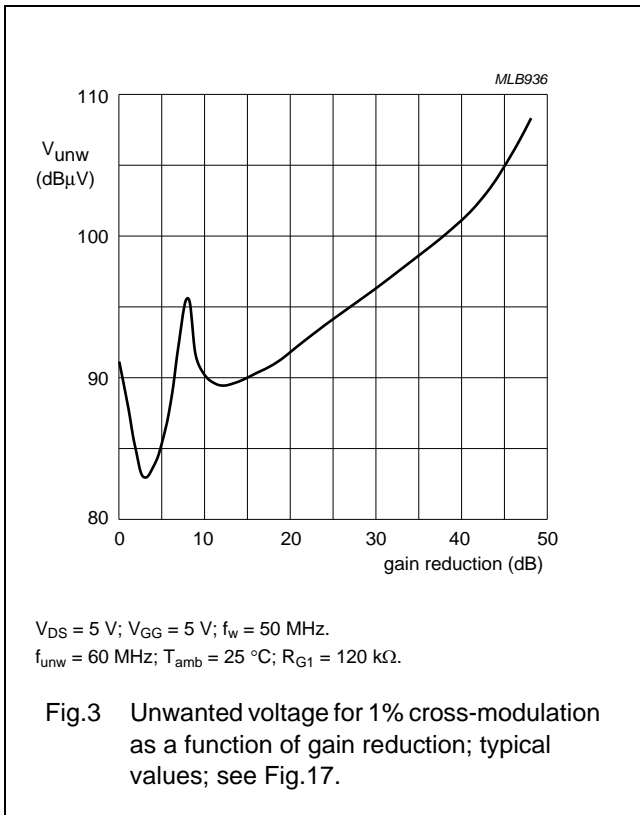
DYNAMIC CHARACTERISTICS

Common source; $T_{amb} = 25\text{ °C}$; $V_{DS} = 5\text{ V}$; $V_{G2-S} = 4\text{ V}$; $I_D = 15\text{ mA}$; unless otherwise specified.

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|-------------|------------------------------|--|------|------|------|------|
| $ y_{fs} $ | forward transfer admittance | pulsed; $T_j = 25\text{ °C}$ | 36 | 43 | 50 | mS |
| C_{ig1-s} | input capacitance at gate 1 | $f = 1\text{ MHz}$ | – | 3.6 | 4.3 | pF |
| C_{ig2-s} | input capacitance at gate 2 | $f = 1\text{ MHz}$ | – | 2.3 | 3 | pF |
| C_{os} | drain-source capacitance | $f = 1\text{ MHz}$ | – | 2.3 | 3 | pF |
| C_{rs} | reverse transfer capacitance | $f = 1\text{ MHz}$ | – | 30 | 50 | fF |
| F | noise figure | $f = 800\text{ MHz}$; $G_S = G_{Sopt}$; $B_S = B_{Sopt}$ | – | 2 | 2.8 | dB |

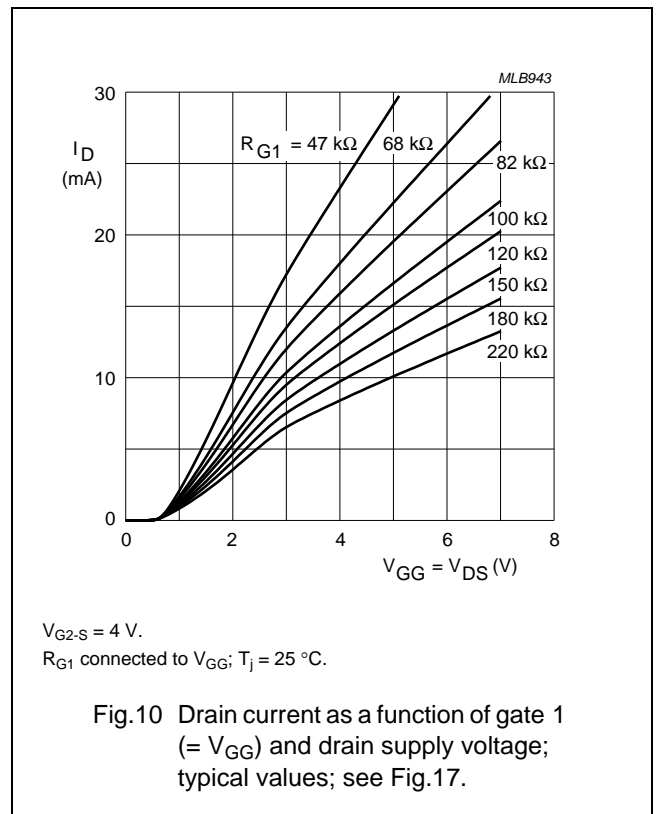
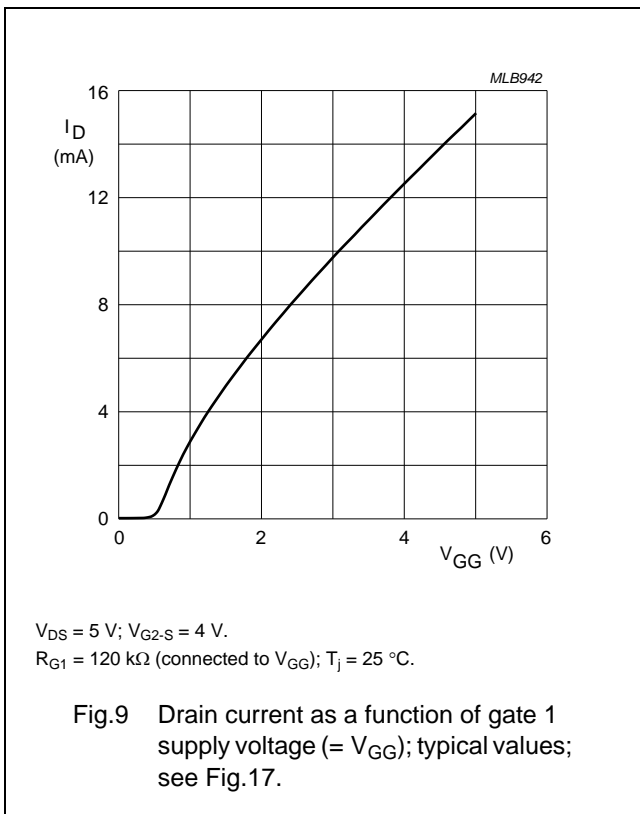
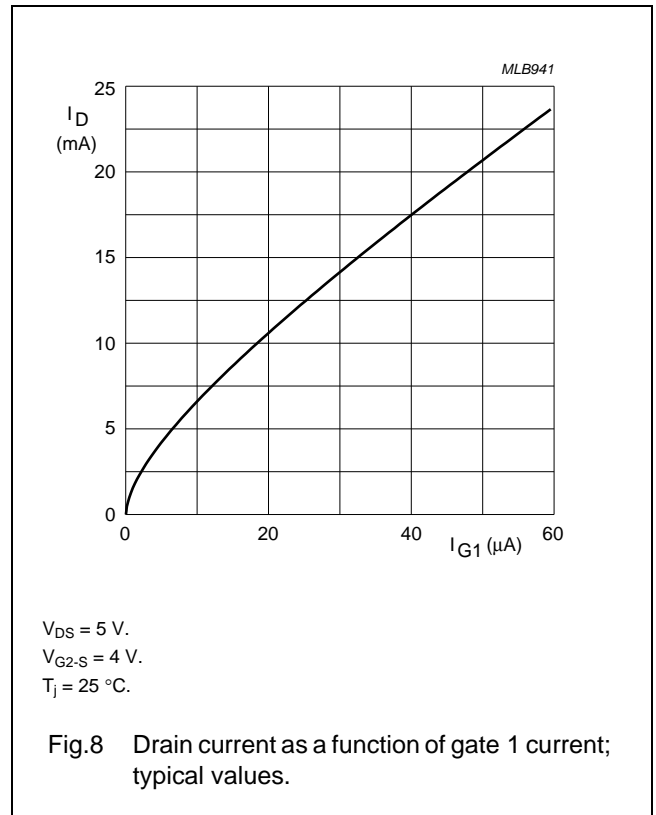
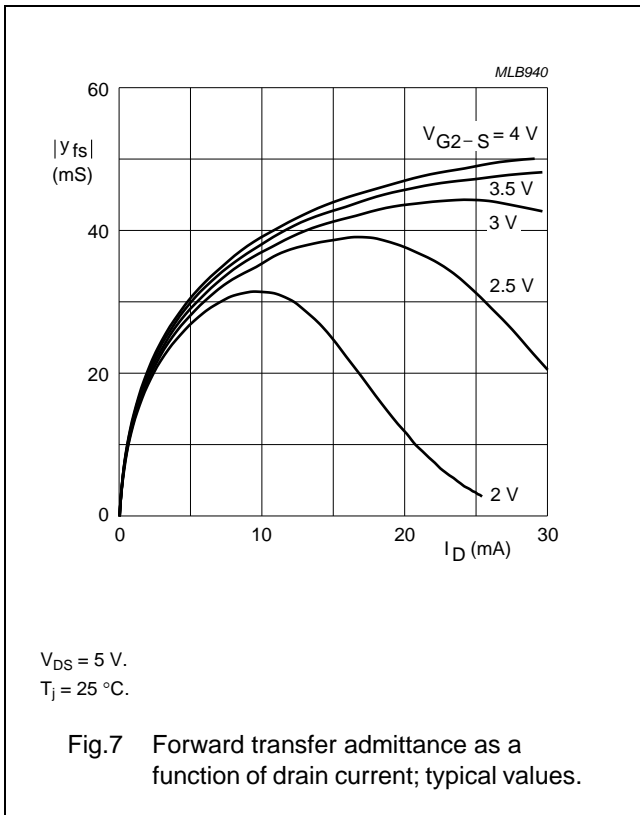
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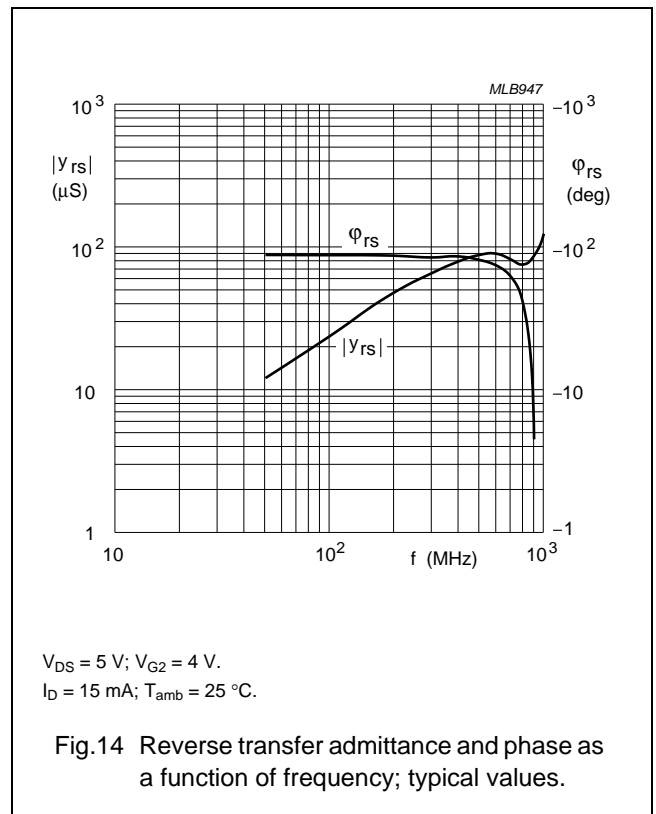
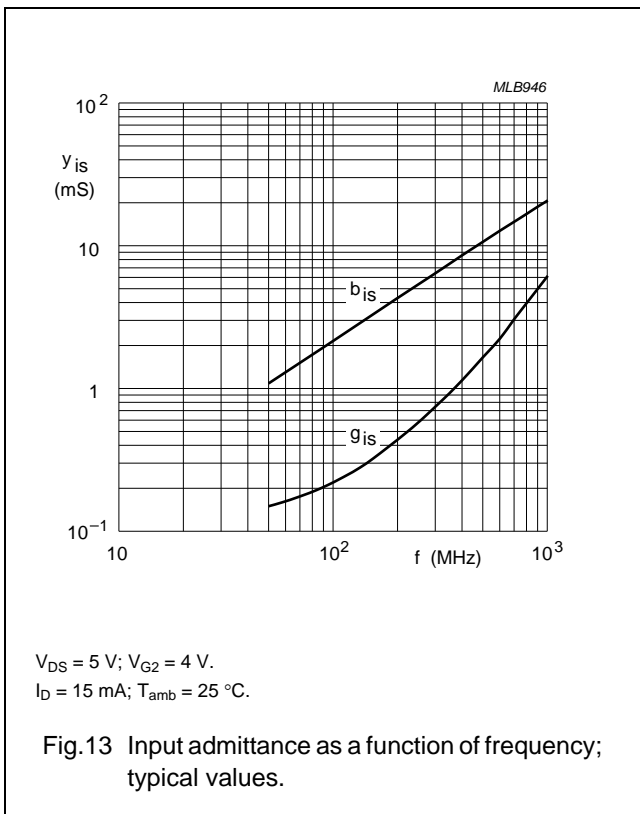
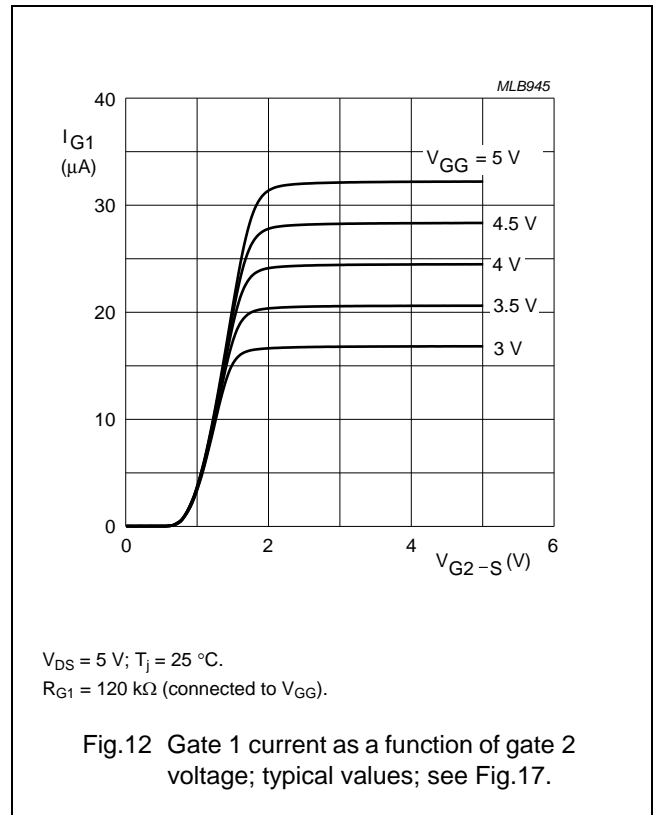
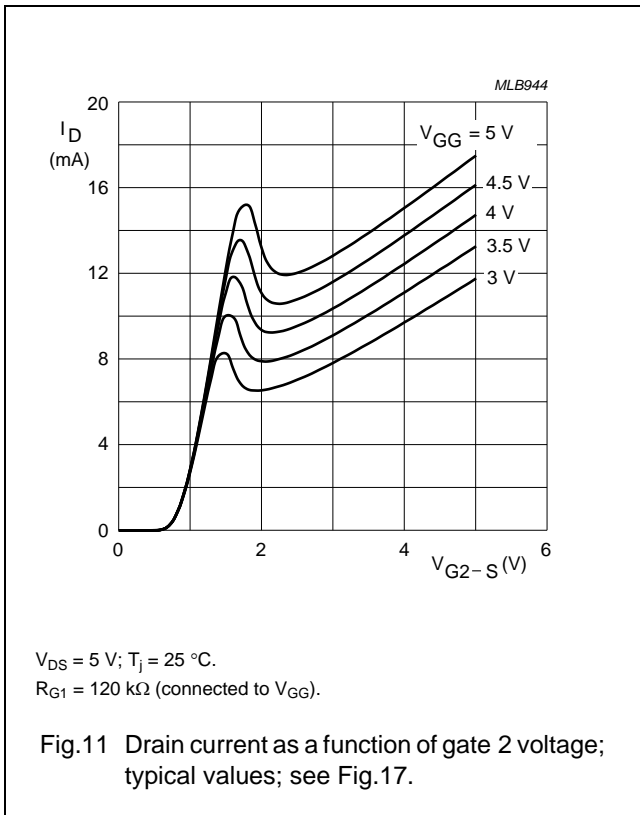
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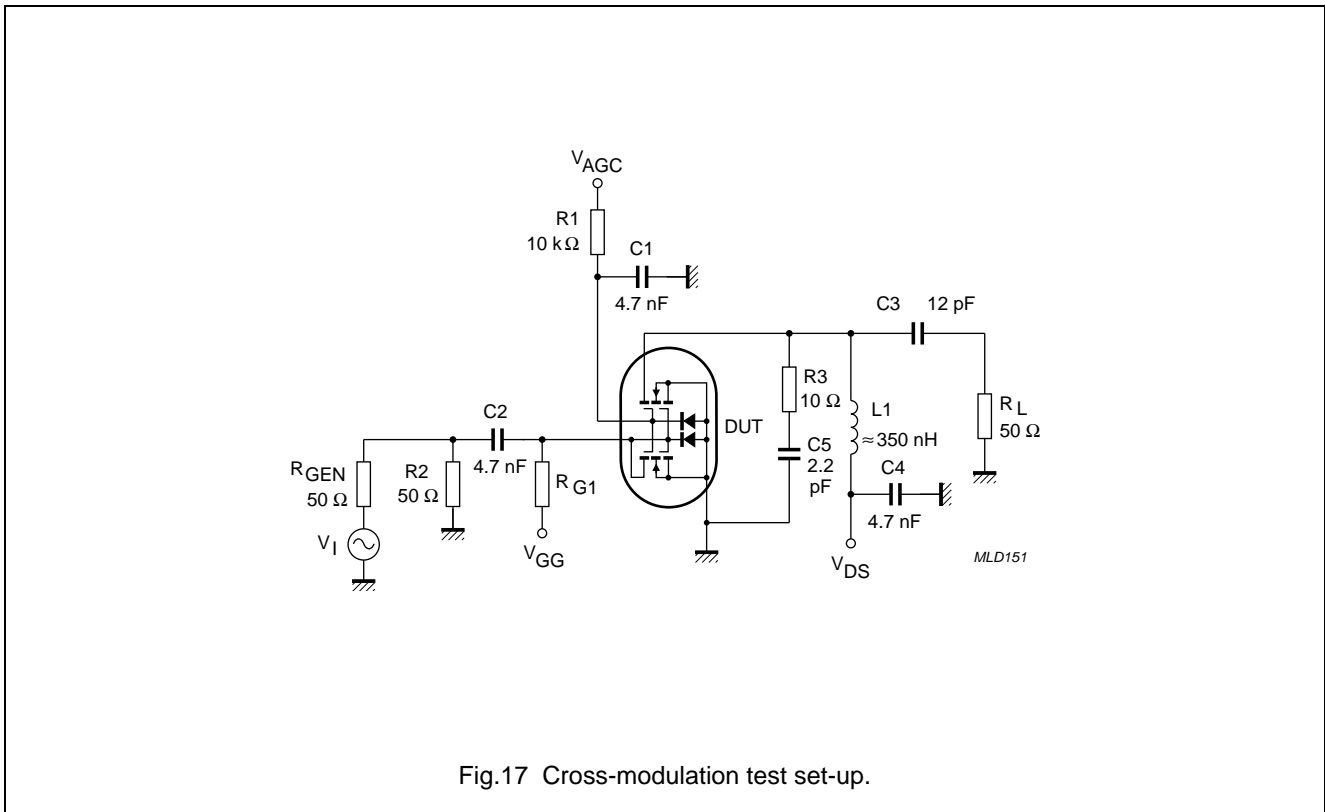
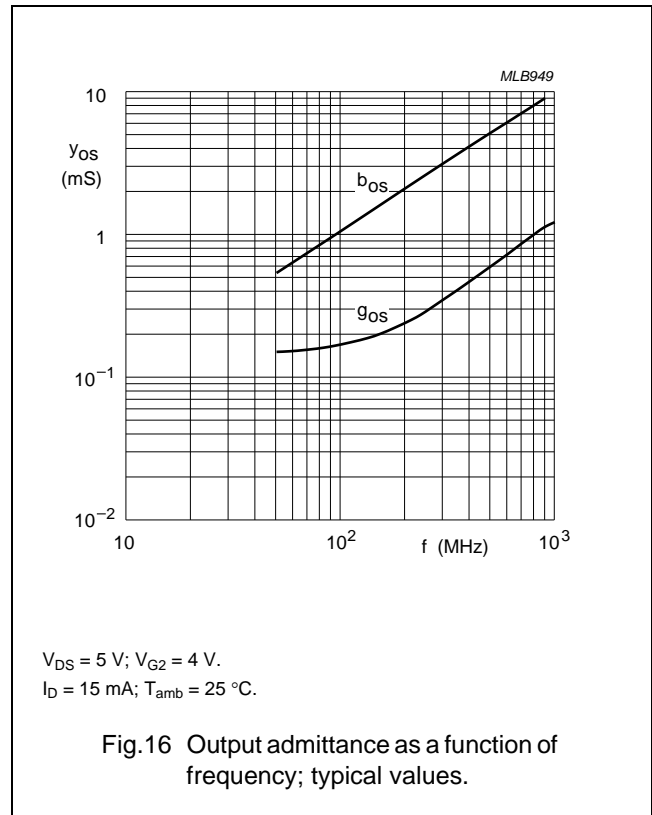
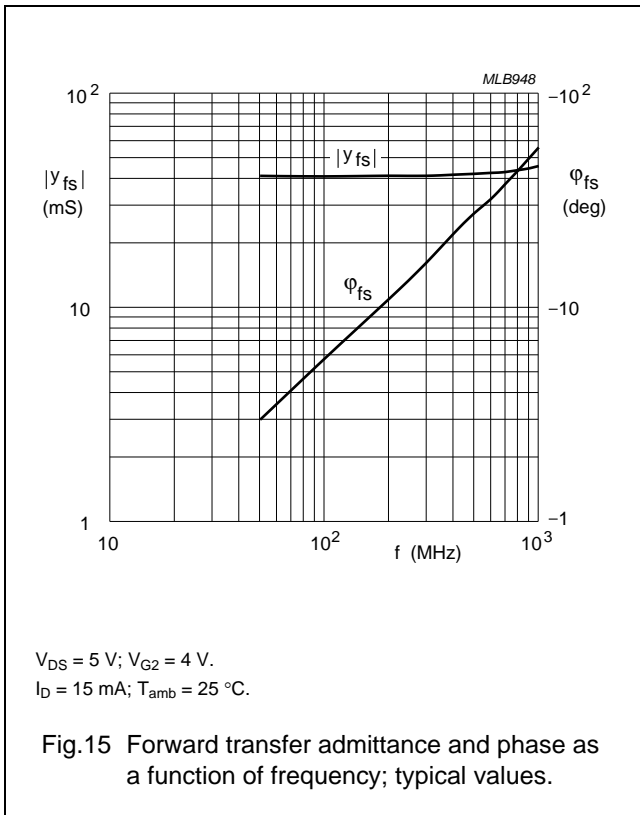
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Table 1 Scattering parameters: $V_{DS} = 5\text{ V}$; $V_{G2-S} = 4\text{ V}$; $I_D = 15\text{ mA}$; $T_{amb} = 25\text{ °C}$

| f (MHz) | S ₁₁ | | S ₂₁ | | S ₁₂ | | S ₂₂ | |
|------------|----------------------|----------------|----------------------|----------------|----------------------|----------------|----------------------|----------------|
| | MAGNITUDE (ratio) | ANGLE (deg) | MAGNITUDE (ratio) | ANGLE (deg) | MAGNITUDE (ratio) | ANGLE (deg) | MAGNITUDE (ratio) | ANGLE (deg) |
| 50 | 0.985 | -6.4 | 4.064 | 172.3 | 0.001 | 86.9 | 0.985 | -3.2 |
| 100 | 0.978 | -12.6 | 3.997 | 164.9 | 0.002 | 82.7 | 0.982 | -6.4 |
| 200 | 0.957 | -25.0 | 3.886 | 150.8 | 0.005 | 74.3 | 0.973 | -12.6 |
| 300 | 0.931 | -36.5 | 3.682 | 137.3 | 0.006 | 68.9 | 0.960 | -18.6 |
| 400 | 0.899 | -47.6 | 3.484 | 123.8 | 0.007 | 59.6 | 0.947 | -24.2 |
| 500 | 0.868 | -57.4 | 3.260 | 111.7 | 0.007 | 57.9 | 0.936 | -29.6 |
| 600 | 0.848 | -66.6 | 3.053 | 101.0 | 0.006 | 58.5 | 0.927 | -34.8 |
| 700 | 0.816 | -74.6 | 2.829 | 90.3 | 0.005 | 65.5 | 0.919 | -39.8 |
| 800 | 0.792 | -82.2 | 2.652 | 79.9 | 0.005 | 83.3 | 0.913 | -44.6 |
| 900 | 0.772 | -89.3 | 2.470 | 69.5 | 0.005 | 114.9 | 0.910 | -49.5 |
| 1000 | 0.754 | -95.6 | 2.328 | 59.5 | 0.006 | 138.7 | 0.909 | -54.6 |

Table 2 Noise data: $V_{DS} = 5\text{ V}$; $V_{G2-S} = 4\text{ V}$; $I_D = 15\text{ mA}$; $T_{amb} = 25\text{ °C}$

| f (MHz) | F _{min} (dB) | Γ _{opt} | | r _n |
|------------|--------------------------|------------------|-------|----------------|
| | | (ratio) | (deg) | |
| 800 | 2.00 | 0.603 | 67.71 | 0.581 |

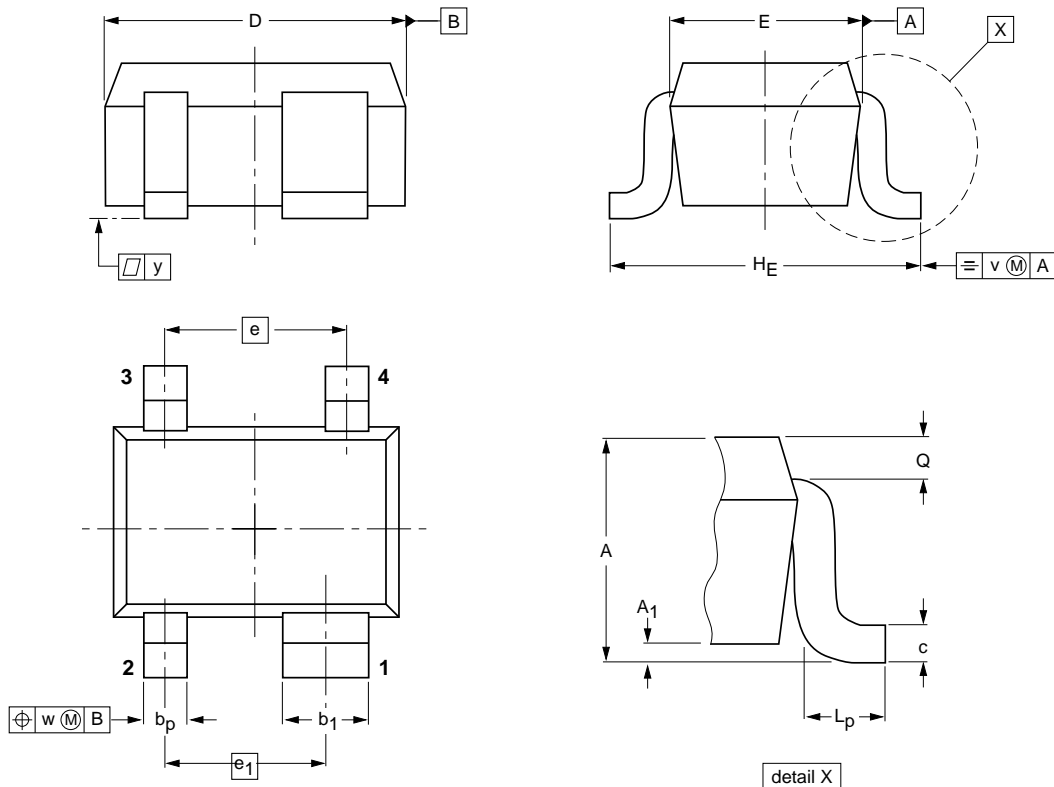
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PACKAGE OUTLINE

Plastic surface-mounted package; reverse pinning; 4 leads

SOT343R



DIMENSIONS (mm are the original dimensions)

| UNIT | A | A ₁ max | b _p | b ₁ | c | D | E | e | e ₁ | H _E | L _p | Q | v | w | y |
|------|------------|-----------------------|----------------|----------------|--------------|------------|--------------|-----|----------------|----------------|----------------|--------------|-----|-----|-----|
| mm | 1.1 0.8 | 0.1 | 0.4 0.3 | 0.7 0.5 | 0.25 0.10 | 2.2 1.8 | 1.35 1.15 | 1.3 | 1.15 | 2.2 2.0 | 0.45 0.15 | 0.23 0.13 | 0.2 | 0.2 | 0.1 |

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|--------------------|------------|-------|------|--|------------------------|----------------------|
| | IEC | JEDEC | EIAJ | | | |
| SOT343R | | | | | | 97-05-21 06-03-16 |

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DATA SHEET STATUS

| DOCUMENT STATUS ⁽¹⁾ | PRODUCT STATUS ⁽²⁾ | DEFINITION |
|--------------------------------|-------------------------------|---|
| Objective data sheet | Development | This document contains data from the objective specification for product development. |
| Preliminary data sheet | Qualification | This document contains data from the preliminary specification. |
| Product data sheet | Production | This document contains the product specification. |

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Contact information

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