

ON5088

NPN wideband silicon germanium RF transistor

Rev. 3 — 12 December 2012

Product data sheet

1. Product profile

1.1 General description

NPN silicon germanium microwave transistor for high speed, low noise applications in a plastic, 4-pin dual-emitter SOT343F package.

CAUTION



This device is sensitive to ElectroStatic Discharge (ESD). Observe precautions for handling electrostatic sensitive devices.

Such precautions are described in the *ANSI/ESD S20.20*, *IEC/ST 61340-5*, *JESD625-A* or equivalent standards.

1.2 Features and benefits

- Low noise high gain microwave transistor
- High maximum stable gain 27 dB at 1.8 GHz
- 110 GHz f_T silicon germanium technology

1.3 Applications

- 2nd and 3rd LNA stage in DBS LNBS
- Satellite radio
- Low noise amplifiers for microwave communications systems
- WLAN and WiMAX applications
- Analog/digital cordless applications

1.4 Quick reference data

Table 1. Quick reference data

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------|----------------------------|--|-------------------|-----|-----|------|
| V_{CB} | collector-base voltage | open emitter | - | - | 10 | V |
| V_{CE} | collector-emitter voltage | open base | - | - | 3.0 | V |
| | | shorted base | - | - | 10 | V |
| V_{EB} | emitter-base voltage | open collector | - | - | 1.0 | V |
| I_C | collector current | | - | 25 | 40 | mA |
| P_{tot} | total power dissipation | $T_{sp} \leq 90\text{ }^\circ\text{C}$ | 1 | - | 136 | mW |
| h_{FE} | DC current gain | $I_C = 10\text{ mA}$; $V_{CE} = 2\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$ | 160 | 280 | 400 | |
| C_{CBS} | collector-base capacitance | $V_{CB} = 2\text{ V}$; $f = 1\text{ MHz}$ | - | 70 | - | fF |



Table 1. Quick reference data ...continued

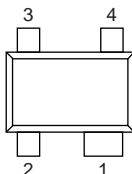
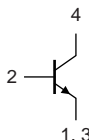
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------|----------------------|--|-----|-----|-----|------|
| f_T | transition frequency | $I_C = 25 \text{ mA}; V_{CE} = 2 \text{ V}; f = 2 \text{ GHz}; T_{amb} = 25 \text{ }^\circ\text{C}$ | - | 55 | - | GHz |
| $G_{p(max)}$ | maximum power gain | $I_C = 25 \text{ mA}; V_{CE} = 2 \text{ V}; f = 12 \text{ GHz}; T_{amb} = 25 \text{ }^\circ\text{C}$ | [2] | 13 | - | dB |
| NF | noise figure | $I_C = 5 \text{ mA}; V_{CE} = 2 \text{ V}; f = 12 \text{ GHz}; \Gamma_S = \Gamma_{opt}; T_{amb} = 25 \text{ }^\circ\text{C}$ | - | 1.1 | - | dB |

[1] T_{sp} is the temperature at the solder point of the emitter lead.

[2] $G_{p(max)}$ is the maximum power gain, if $K > 1$. If $K < 1$ then $G_{p(max)}$ = Maximum Stable Gain (MSG).

2. Pinning information

Table 2. Discrete pinning

| Pin | Description | Simplified outline | Graphic symbol |
|-----|-------------|--|--|
| 1 | emitter |  |  |
| 2 | base | | |
| 3 | emitter | | |
| 4 | collector | | |

3. Ordering information

Table 3. Ordering information

| Type number | Package | | Version |
|-------------|---------|---|---------|
| | Name | Description | |
| ON5088 | - | plastic surface-mounted flat pack package; reverse pinning; 4 leads | SOT343F |

4. Marking

Table 4. Marking

| Type number | Marking | Description |
|-------------|---------|--|
| ON5088 | *6N | * = p : made in Hong Kong * = t : made in Malaysia * = W : made in China |

5. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

| Symbol | Parameter | Conditions | Min | Max | Unit |
|-----------|---------------------------|----------------------------|-----|------|------|
| V_{CB} | collector-base voltage | open emitter | - | 10 | V |
| V_{CE} | collector-emitter voltage | open base | - | 3.0 | V |
| | | shorted base | - | 10 | V |
| V_{EB} | emitter-base voltage | open collector | - | 1.0 | V |
| I_C | collector current | | - | 40 | mA |
| P_{tot} | total power dissipation | $T_{sp} \leq 90\text{ °C}$ | [1] | 136 | mW |
| T_{stg} | storage temperature | | -65 | +150 | °C |
| T_j | junction temperature | | - | 150 | °C |

[1] T_{sp} is the temperature at the solder point of the emitter lead.

6. Thermal characteristics

Table 6. Thermal characteristics

| Symbol | Parameter | Conditions | Typ | Unit |
|----------------|--|------------|-----|------|
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point | | 440 | K/W |

7. Characteristics

Table 7. Characteristics

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

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---------------|-------------------------------------|---|-----|------|-----|------|
| $V_{(BR)CBO}$ | collector-base breakdown voltage | $I_C = 2.5\ \mu\text{A}$; $I_E = 0\ \text{mA}$ | 10 | - | - | V |
| $V_{(BR)CEO}$ | collector-emitter breakdown voltage | $I_C = 1\ \text{mA}$; $I_B = 0\ \text{mA}$ | 3.0 | - | - | V |
| I_C | collector current | | - | 25 | 40 | mA |
| I_{CBO} | collector-base cut-off current | $I_E = 0\ \text{mA}$; $V_{CB} = 4.5\ \text{V}$ | - | - | 100 | nA |
| h_{FE} | DC current gain | $I_C = 10\ \text{mA}$; $V_{CE} = 2\ \text{V}$ | 160 | 280 | 400 | |
| C_{CES} | collector-emitter capacitance | $V_{CB} = 2\ \text{V}$; $f = 1\ \text{MHz}$ | - | 268 | - | fF |
| C_{EBS} | emitter-base capacitance | $V_{EB} = 0.5\ \text{V}$; $f = 1\ \text{MHz}$ | - | 400 | - | fF |
| C_{CBS} | collector-base capacitance | $V_{CB} = 2\ \text{V}$; $f = 1\ \text{MHz}$ | - | 70 | - | fF |
| f_T | transition frequency | $I_C = 25\ \text{mA}$; $V_{CE} = 2\ \text{V}$; $f = 2\ \text{GHz}$; $T_{amb} = 25\text{ °C}$ | - | 55 | - | GHz |
| $G_{p(max)}$ | maximum power gain | $I_C = 25\ \text{mA}$; $V_{CE} = 2\ \text{V}$; $T_{amb} = 25\text{ °C}$ | [1] | | | |
| | | $f = 1.8\ \text{GHz}$ | - | 27 | - | dB |
| | | $f = 12\ \text{GHz}$ | - | 13 | - | dB |
| $ s_{21} ^2$ | insertion power gain | $I_C = 25\ \text{mA}$; $V_{CE} = 2\ \text{V}$; $T_{amb} = 25\text{ °C}$ | | | | |
| | | $f = 1.8\ \text{GHz}$ | - | 25.4 | - | dB |
| | | $f = 12\ \text{GHz}$ | - | 9.3 | - | dB |

Table 7. Characteristics ...continued $T_j = 25\text{ °C}$ unless otherwise specified.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------|---------------------------------------|---|-----|------|-----|------|
| NF | noise figure | $I_C = 5\text{ mA}; V_{CE} = 2\text{ V}; \Gamma_S = \Gamma_{opt}; T_{amb} = 25\text{ °C}$ | | | | |
| | | $f = 1.8\text{ GHz}$ | - | 0.43 | - | dB |
| | | $f = 12\text{ GHz}$ | - | 1.1 | - | dB |
| G_{ass} | associated gain | $I_C = 5\text{ mA}; V_{CE} = 2\text{ V}; \Gamma_S = \Gamma_{opt}; T_{amb} = 25\text{ °C}$ | | | | |
| | | $f = 1.8\text{ GHz}$ | - | 22 | - | dB |
| | | $f = 12\text{ GHz}$ | - | 10 | - | dB |
| $P_{L(1dB)}$ | output power at 1 dB gain compression | $I_C = 25\text{ mA}; V_{CE} = 2\text{ V}; Z_S = Z_L = 50\ \Omega; T_{amb} = 25\text{ °C}; f = 1.8\text{ GHz}$ | - | 9 | - | dBm |
| IP3 | third-order intercept point | $I_C = 25\text{ mA}; V_{CE} = 2\text{ V}; Z_S = Z_L = 50\ \Omega; T_{amb} = 25\text{ °C}; f_2 = f_1 + 1\text{ MHz}; f_1 = 1.8\text{ GHz}$ | - | 17 | - | dBm |

[1] $G_{p(max)}$ is the maximum power gain, if $K > 1$. If $K < 1$ then $G_{p(max)} = MSG$.

8. Package outline

Plastic surface-mounted flat pack package; reverse pinning; 4 leads

SOT343F

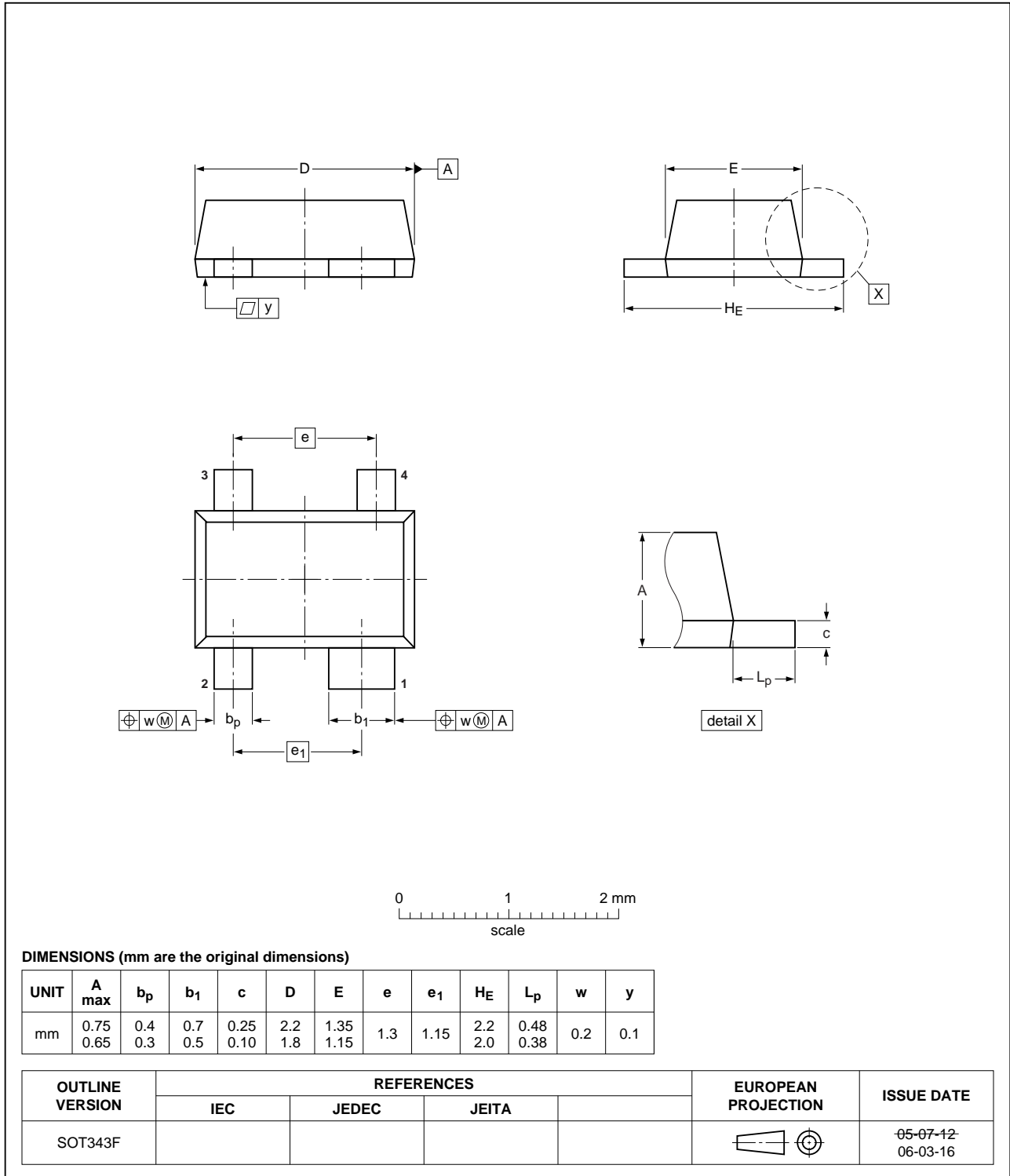


Fig 1. Package outline SOT343F

9. Abbreviations

Table 8. Abbreviations

| Acronym | Description |
|---------|---|
| DBS | Direct Broadcast Satellite |
| DC | Direct Current |
| DRO | Dielectric Resonator Oscillator |
| LNA | Low Noise Amplifier |
| LNB | Low Noise Block |
| NPN | Negative-Positive-Negative |
| RF | Radio Frequency |
| WLAN | Wireless Local Area Network |
| WiMAX | Worldwide Interoperability for Microwave Access |

10. Revision history

Table 9. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|----------------|---|--------------------|---------------|------------|
| ON5088 v.3 | 20121212 | Product data sheet | - | ON5088 v.2 |
| Modifications: | <ul style="list-style-type: none"> • Table 1 on page 1: some changes have been made. • Table 5 on page 3: some changes have been made. • Table 7 on page 3: The minimum value for $V_{(BR)CEO}$ has been changed. | | | |
| ON5088 v.2 | 20111222 | Product data sheet | - | ON5088 v.1 |
| ON5088 v.1 | 20100422 | Product data sheet | - | - |

11. Legal information

11.1 Data sheet status

| Document status ^{[1][2]} | Product status ^[3] | Definition |
|-----------------------------------|-------------------------------|---|
| Objective [short] data sheet | Development | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet | Qualification | This document contains data from the preliminary specification. |
| Product [short] data sheet | Production | This document contains the product specification. |

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

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Date of release: 12 December 2012

Document identifier: ON5088