

# 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	$T_{sp} \leq 90\text{ °C}$	<a href="#">[1]</a> -	-	136	mW
$h_{FE}$	DC current gain	$I_C = 10\text{ mA}$ ; $V_{CE} = 2\text{ V}$ ; $T_j = 25\text{ °C}$	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

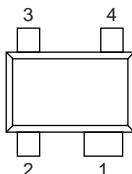
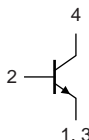
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$f_T$	transition frequency	$I_C = 25\text{ mA}$ ; $V_{CE} = 2\text{ V}$ ; $f = 2\text{ GHz}$ ; $T_{amb} = 25\text{ °C}$	-	55	-	GHz
$G_{p(max)}$	maximum power gain	$I_C = 25\text{ mA}$ ; $V_{CE} = 2\text{ V}$ ; $f = 12\text{ GHz}$ ; $T_{amb} = 25\text{ °C}$	[2] -	13	-	dB
NF	noise figure	$I_C = 5\text{ mA}$ ; $V_{CE} = 2\text{ V}$ ; $f = 12\text{ GHz}$ ; $\Gamma_S = \Gamma_{opt}$ ; $T_{amb} = 25\text{ °C}$	-	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		
	Name	Description	Version
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	$I_C = 2.5\text{ }\mu\text{A}$ ; $I_E = 0\text{ mA}$	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

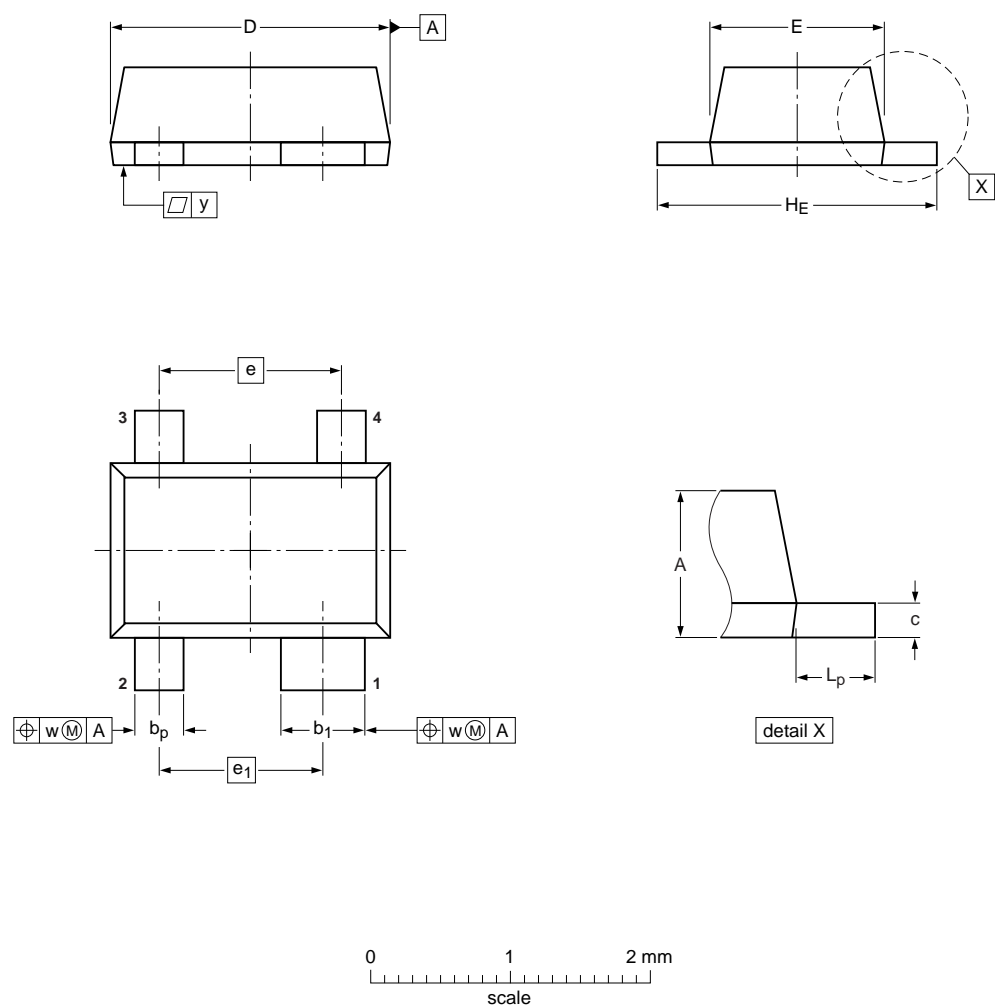
**Table 7. Characteristics ...continued** $T_j = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
NF	noise figure	$I_C = 5\text{ mA}; V_{CE} = 2\text{ V}; \Gamma_S = \Gamma_{opt}; T_{amb} = 25\text{ }^{\circ}\text{C}$				
		$f = 1.8\text{ GHz}$	-	0.43	-	dB
		$f = 12\text{ GHz}$	-	1.1	-	dB
$G_{ass}$	associated gain	$I_C = 5\text{ mA}; V_{CE} = 2\text{ V}; \Gamma_S = \Gamma_{opt}; T_{amb} = 25\text{ }^{\circ}\text{C}$				
		$f = 1.8\text{ GHz}$	-	22	-	dB
		$f = 12\text{ GHz}$	-	10	-	dB
$P_{L(1dB)}$	output power at 1 dB gain compression	$I_C = 25\text{ mA}; V_{CE} = 2\text{ V}; Z_S = Z_L = 50\text{ }\Omega; T_{amb} = 25\text{ }^{\circ}\text{C}; f = 1.8\text{ GHz}$	-	9	-	dBm
IP3	third-order intercept point	$I_C = 25\text{ mA}; V_{CE} = 2\text{ V}; Z_S = Z_L = 50\text{ }\Omega; T_{amb} = 25\text{ }^{\circ}\text{C}; f_2 = f_1 + 1\text{ MHz}; f_1 = 1.8\text{ GHz}$	-	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 leadsSOT343F



DIMENSIONS (mm are the original dimensions)

UNIT	A <sub>max</sub>	b <sub>p</sub>	b <sub>1</sub>	c	D	E	e	e <sub>1</sub>	H <sub>E</sub>	L <sub>p</sub>	w	y
mm	0.75 0.65	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	0.48 0.38	0.2	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT343F						05-07-12 06-03-16

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"><li>• <a href="#">Table 1 on page 1</a>: some changes have been made.</li><li>• <a href="#">Table 5 on page 3</a>: some changes have been made.</li><li>• <a href="#">Table 7 on page 3</a>: The minimum value for <math>V_{(BR)CEO}</math> has been changed.</li></ul>			
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 <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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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