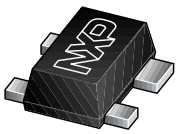


BFU690F

NPN wideband silicon RF transistor

Rev. 2 — 14 March 2014 Product data sheet

1. Product profile

1.1 General description

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

1.2 Features and benefits

- Low noise high linearity microwave transistor
- High output third-order intercept point 34 dBm at 1.8 GHz
- 40 GHz f_T silicon technology

1.3 Applications

- Ka band oscillators DRO's
- C-band high output buffer amplifier
- ZigBee
- LTE, cellular, UMTS

1.4 Quick reference data

Table 1. Quick reference data

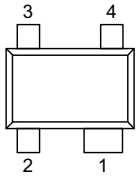
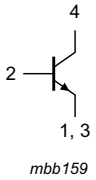
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CBO}	collector-base voltage	open emitter	-	-	16	V
V_{CEO}	collector-emitter voltage	open base	-	-	5.5	V
V_{EBO}	emitter-base voltage	open collector	-	-	2.5	V
I_C	collector current		-	70	100	mA
P_{tot}	total power dissipation	$T_{sp} \leq 85$ °C [1]	-	-	490	mW
h_{FE}	DC current gain	I_C = 20 mA; V_{CE} = 2 V; T_j = 25 °C	90	135	180	
C_{CBS}	collector-base capacitance	V_{CB} = 2 V; f = 1 MHz	-	404	-	fF
f_T	transition frequency	I_C = 60 mA; V_{CE} = 1 V; f = 2 GHz; T_{amb} = 25 °C	-	18	-	GHz
$G_{p(max)}$	maximum power gain	I_C = 60 mA; V_{CE} = 1 V; f = 1.8 GHz; T_{amb} = 25 °C [2]	-	20.5	-	dB
NF	noise figure	I_C = 15 mA; V_{CE} = 2 V; f = 1.8 GHz; $\Gamma_S = \Gamma_{opt}$	-	0.65	-	dB
$P_{L(1dB)}$	output power at 1 dB gain compression	I_C = 70 mA; V_{CE} = 4 V; $Z_S = Z_L$ = 50 Ω; f = 1.8 GHz; T_{amb} = 25 °C	-	22	-	dBm

[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
BFU690F	-	plastic surface-mounted flat pack package; reverse pinning; 4 leads	SOT343F

4. Marking

Table 4. Marking

Type number	Marking	Description
BFU690F	D4*	* = 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_{CBO}	collector-base voltage	open emitter	-	16	V
V_{CEO}	collector-emitter voltage	open base	-	5.5	V
V_{EBO}	emitter-base voltage	open collector	-	2.5	V
I_C	collector current		-	100	mA
P_{tot}	total power dissipation	$T_{sp} \leq 85$ °C [1]	-	490	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.

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6. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j-sp)}$	thermal resistance from junction to solder point	[1]	132	K/W

[1] Determined by simulation.

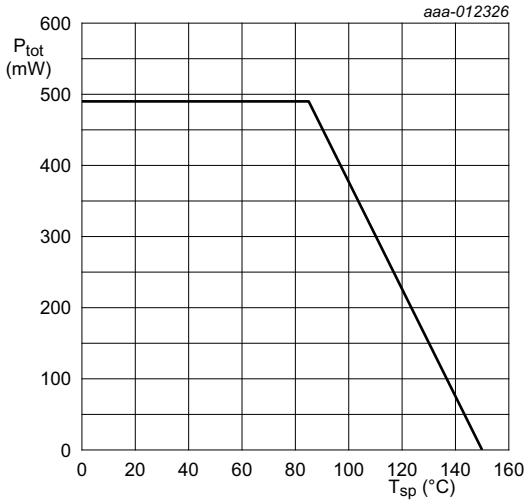

Fig 1. Power derating curve

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7. Characteristics

Table 7. Characteristics

T_j = 25 °C unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)CBO}$	collector-base breakdown voltage	I_C = 2.5 μA; I_E = 0 mA	16	-	-	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	I_C = 1 mA; I_B = 0 mA	5.5	-	-	V
I_C	collector current		-	70	100	mA
I_{CBO}	collector-base cut-off current	I_E = 0 mA; V_{CB} = 8 V	-	-	100	nA
h_{FE}	DC current gain	I_C = 20 mA; V_{CE} = 2 V	90	135	180	
C_{CES}	collector-emitter capacitance	V_{CB} = 2 V; f = 1 MHz	-	527	-	fF
C_{EBS}	emitter-base capacitance	V_{EB} = 0.5 V; f = 1 MHz	-	1699	-	fF
C_{CBS}	collector-base capacitance	V_{CB} = 2 V; f = 1 MHz	-	404	-	fF
f_T	transition frequency	I_C = 60 mA; V_{CE} = 1 V; f = 2 GHz; T_{amb} = 25 °C	-	18	-	GHz
$G_{p(max)}$	maximum power gain	I_C = 60 mA; V_{CE} = 1 V; T_{amb} = 25 °C [1]				
		f = 1.5 GHz	-	22	-	dB
		f = 1.8 GHz	-	20.5	-	dB
		f = 2.4 GHz	-	17	-	dB
$\|s_{21}\|^2$	insertion power gain	I_C = 60 mA; V_{CE} = 1 V; T_{amb} = 25 °C				
		f = 1.5 GHz	-	15	-	dB
		f = 1.8 GHz	-	13.5	-	dB
		f = 2.4 GHz	-	11	-	dB
NF	noise figure	I_C = 15 mA; V_{CE} = 2 V; $\Gamma_S = \Gamma_{opt}$; T_{amb} = 25 °C				
		f = 1.5 GHz	-	0.60	-	dB
		f = 1.8 GHz	-	0.65	-	dB
		f = 2.4 GHz	-	0.70	-	dB
G_{ass}	associated gain	I_C = 15 mA; V_{CE} = 2 V; $\Gamma_S = \Gamma_{opt}$; T_{amb} = 25 °C				
		f = 1.5 GHz	-	18.5	-	dB
		f = 1.8 GHz	-	17.5	-	dB
		f = 2.4 GHz	-	15.5	-	dB
$P_{L(1dB)}$	output power at 1 dB gain compression	I_C = 70 mA; V_{CE} = 4 V; $Z_S = Z_L$ = 50 Ω; T_{amb} = 25 °C				
		f = 1.5 GHz	-	22	-	dBm
		f = 1.8 GHz	-	22	-	dBm
		f = 2.4 GHz	-	20	-	dBm
IP3	third-order intercept point	I_C = 70 mA; V_{CE} = 4 V; $Z_S = Z_L$ = 50 Ω; T_{amb} = 25 °C				
		f = 1.5 GHz	-	34	-	dBm
		f = 1.8 GHz	-	34	-	dBm
		f = 2.4 GHz	-	33	-	dBm

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

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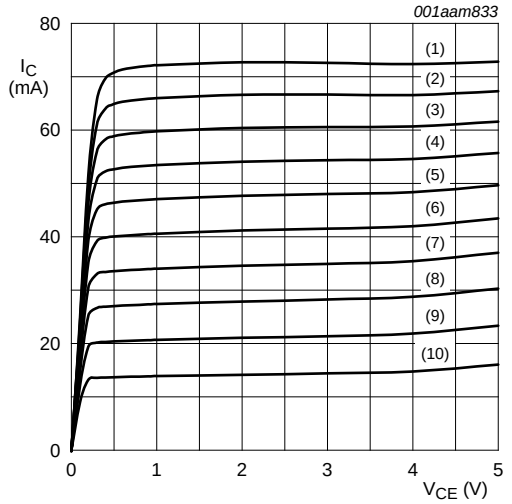
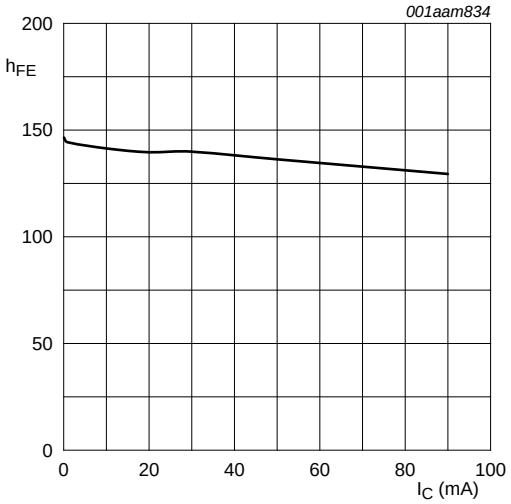


T_{amb} = 25 °C.

(1) I_B = 550 μA
(2) I_B = 500 μA
(3) I_B = 450 μA
(4) I_B = 400 μA
(5) I_B = 350 μA
(6) I_B = 300 μA
(7) I_B = 250 μA
(8) I_B = 200 μA
(9) I_B = 150 μA
(10) I_B = 100 μA

Fig 2. Collector current as a function of collector-emitter voltage; typical values



V_{CE} = 2 V; T_{amb} = 25 °C.

Fig 3. DC current gain as a function of collector current; typical values

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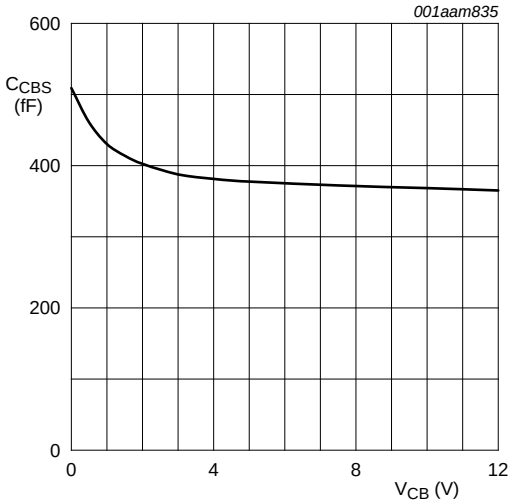
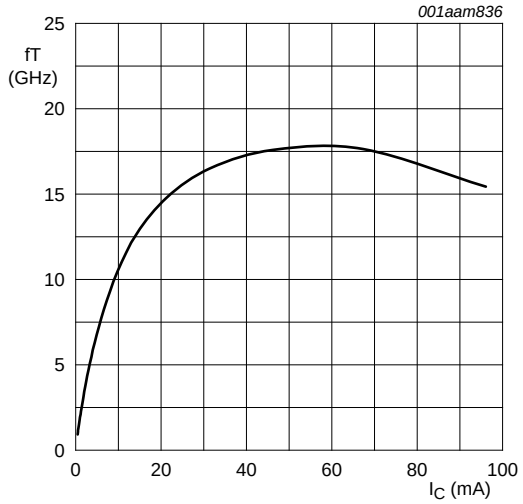


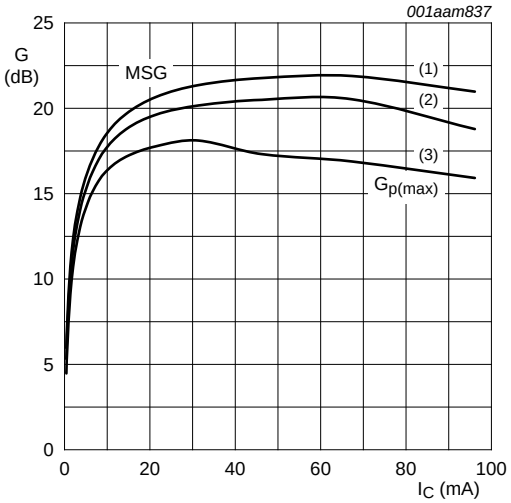
f = 1 MHz, T_{amb} = 25 °C.

Fig 4. Collector-base capacitance as a function of collector-base voltage; typical values



V_{CE} = 1 V; f = 2 GHz; T_{amb} = 25 °C.

Fig 5. Transition frequency as a function of collector current; typical values



V_{CE} = 1 V; T_{amb} = 25 °C.

(1) f = 1.5 GHz

(2) f = 1.8 GHz

(3) f = 2.4 GHz

Fig 6. Gain as a function of collector current; typical value

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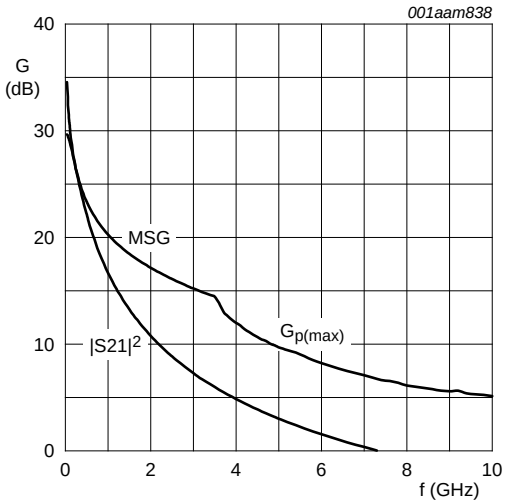
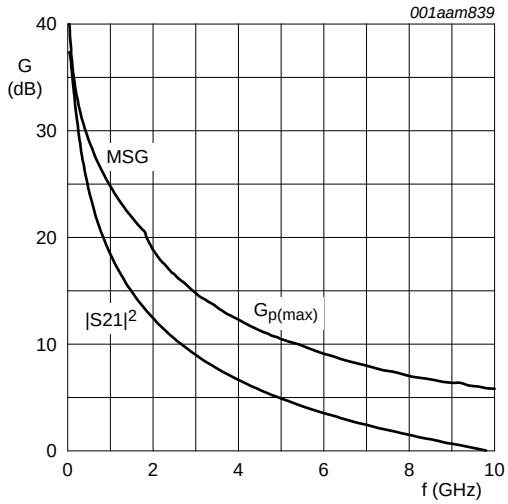


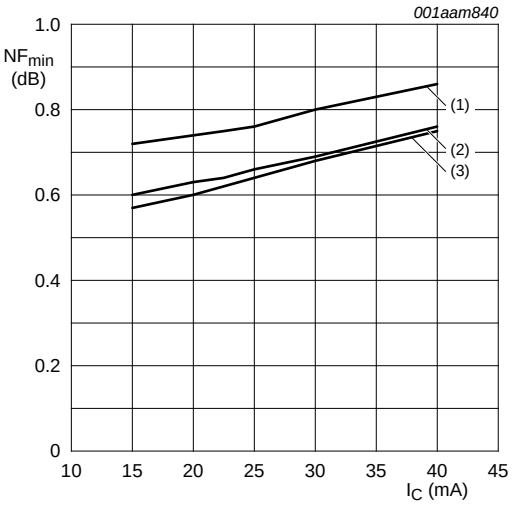
V_{CE} = 1 V; I_C = 10 mA; T_{amb} = 25 °C.

Fig 7. Gain as a function of frequency; typical values



V_{CE} = 1 V; I_C = 60 mA; T_{amb} = 25 °C.

Fig 8. Gain as a function of frequency; typical values



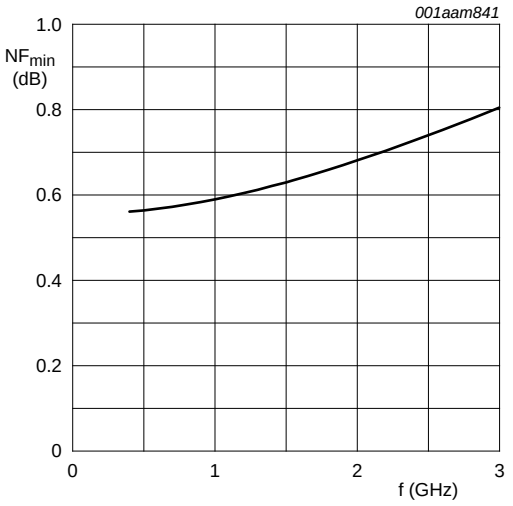
V_{CE} = 2 V; T_{amb} = 25 °C.

(1) f = 2.4 GHz

(2) f = 1.8 GHz

(3) f = 1.5 GHz

Fig 9. Minimum noise figure as a function of collector current; typical values



V_{CE} = 2 V; I_C = 15 mA; T_{amb} = 25 °C.

Fig 10. Minimum noise figure as a function of frequency; typical values

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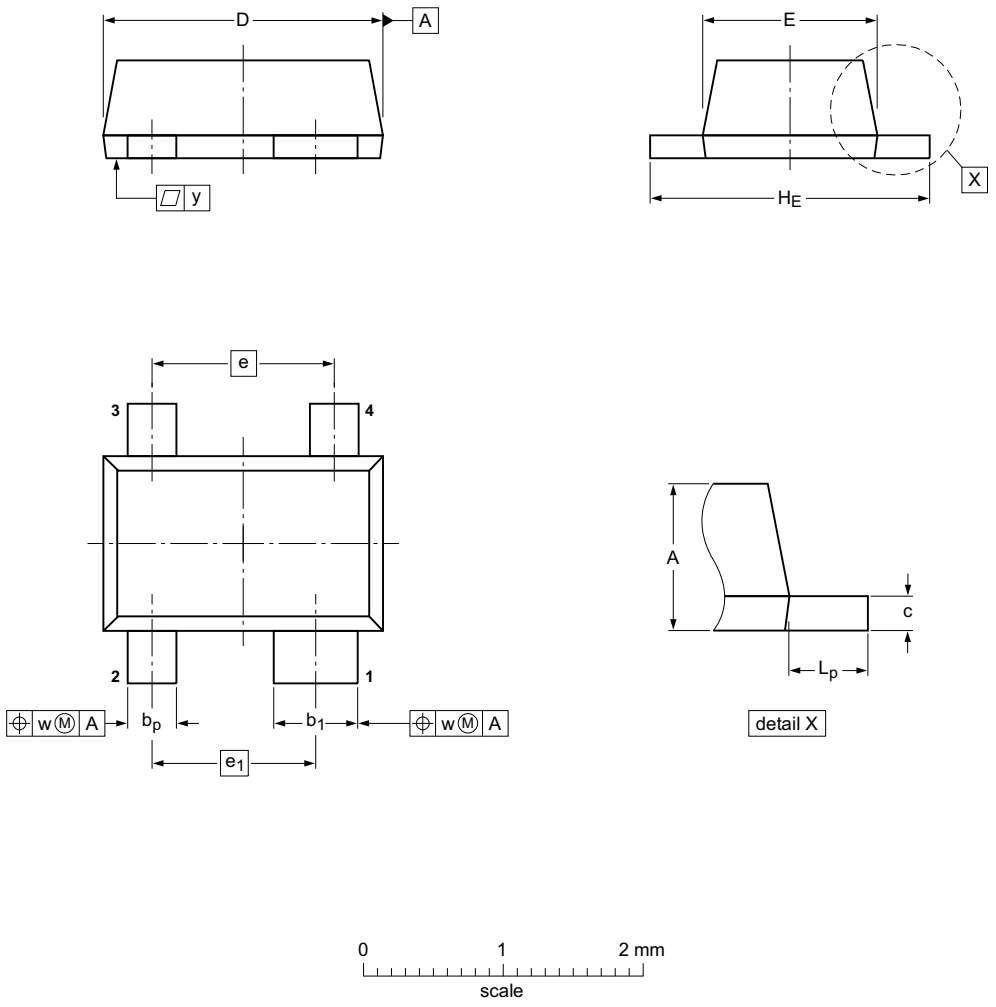
8. Package outline

Plastic surface-mounted flat pack package; reverse pinning; 4 leads **SOT343F**



DIMENSIONS (mm are the original dimensions)

UNIT	A max	b_p	b_1	c	D	E	e	e_1	H_E	L_p	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 11. Package outline SOT343F

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9. Handling information

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.

10. Abbreviations

Table 8. Abbreviations

Acronym	Description
DRO	Dielectric Resonator Oscillator
Ka	Kurtz above
LTE	Long Term Evolution
NPN	Negative-Positive-Negative
UMTS	Universal Mobile Telecommunications System

11. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BFU690F v.2	20140314	Product data sheet	-	BFU690F v.1
Modifications:	• Table 1 on page 1: The value and conditions for P_{tot} have been updated. • Table 5 on page 2: The value and conditions for P_{tot} have been updated. • Table 6 on page 3: The value and conditions for $R_{th(j-sp)}$ have been updated. • Figure 1 on page 3: The graph has been updated. • Section 9 on page 9: The ESD caution has been moved here from Section 1.1 on page 1.			
BFU690F v.1	20101216	Product data sheet	-	-

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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: 14 March 2014
Document identifier: BFU690F

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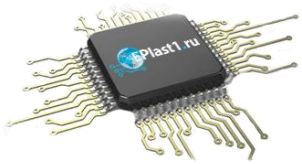
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits,General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

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