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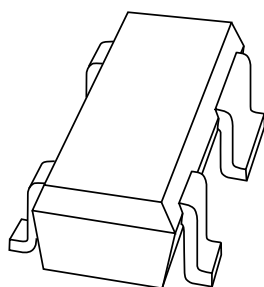
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# DATA SHEET



## **BFG21W** UHF power transistor

Product specification  
Supersedes data of 1997 Nov 21

1998 Jul 06



UHF power transistor

BFG21W

FEATURES

- High power gain
- High efficiency
- 1.9 GHz operating area
- Linear and non-linear operation.

APPLICATIONS

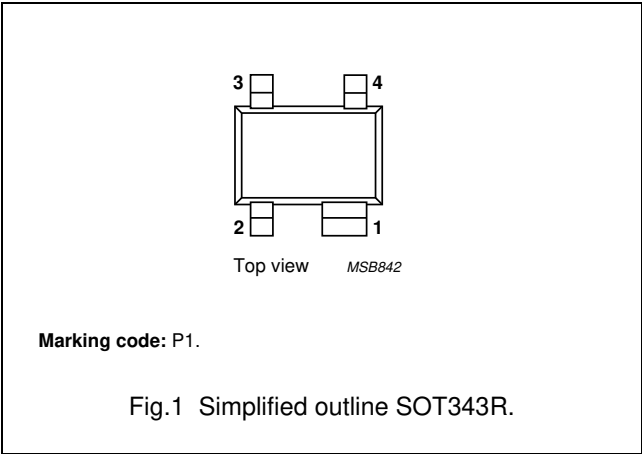
- Common emitter class-AB output stage in hand held radio equipment at 1.9 GHz such as DECT, PHS, etc.
- Driver for DCS1800, 1900.

DESCRIPTION

NPN double polysilicon bipolar power transistor with buried layer for low voltage medium power applications encapsulated in a plastic, 4-pin dual-emitter SOT343R package.

PINNING

PIN	DESCRIPTION
1, 3	emitter
2	base
4	collector



QUICK REFERENCE DATA

RF performance at  $T_s \leq 60\text{ }^{\circ}\text{C}$  in a common emitter test circuit.

MODE OF OPERATION	f (GHz)	V <sub>CE</sub> (V)	P <sub>L</sub> (dBm)	G <sub>p</sub> (dB)	$\eta_c$ (%)
Pulsed class-AB; $\delta < 1 : 2$ ; $t_p = 5\text{ ms}$	1.9	3.6	26	$\geq 10$	typ.55

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LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V <sub>CBO</sub>	collector-base voltage	open emitter	–	15	V
V <sub>CEO</sub>	collector-emitter voltage	open base	–	4.5	V
V <sub>EBO</sub>	emitter-base voltage	open collector	–	1	V
I <sub>C</sub>	collector current (DC)		–	500	mA
P <sub>tot</sub>	total power dissipation	T <sub>s</sub> ≤ 60 °C; note 1	–	600	mW
T <sub>stg</sub>	storage temperature		–65	+150	°C
T <sub>j</sub>	operating junction temperature		–	150	°C

Note

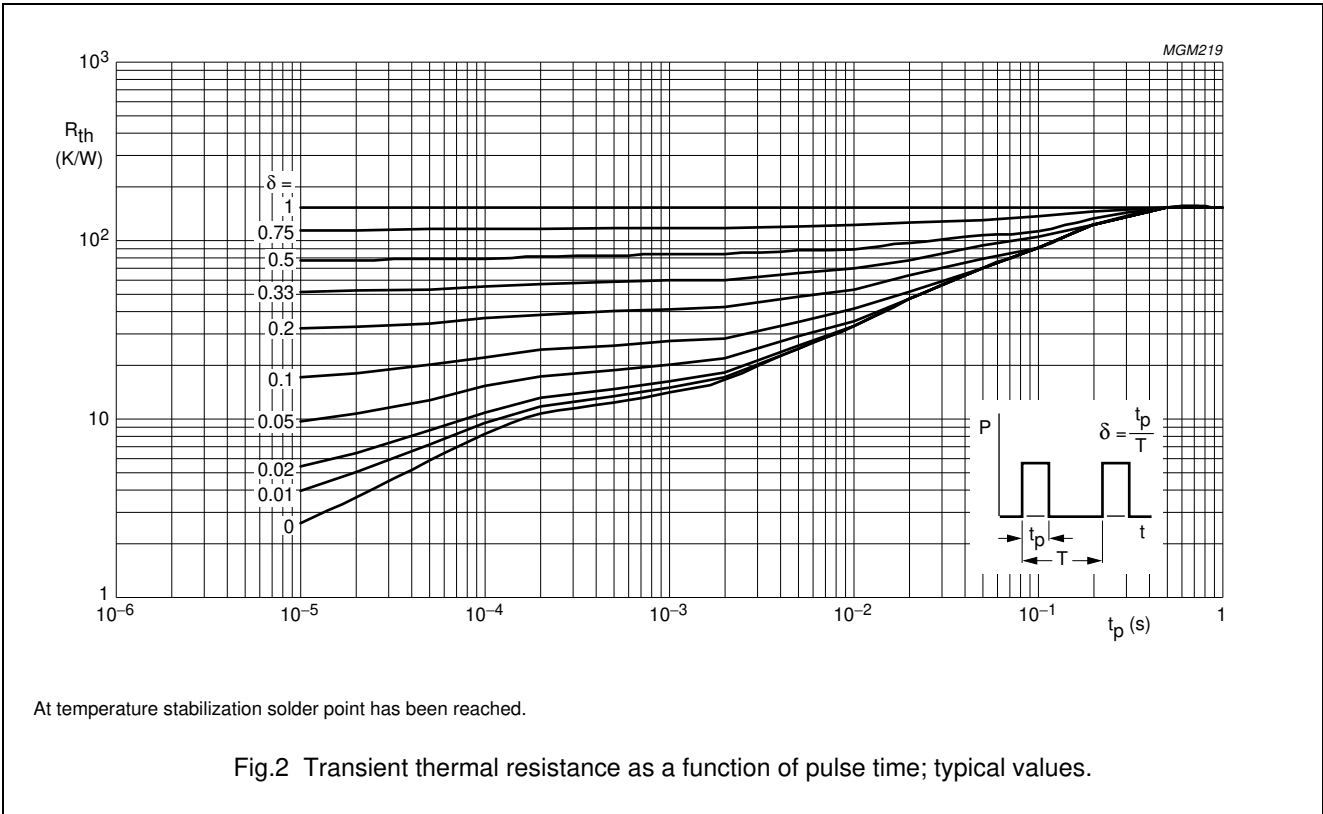
1. T<sub>s</sub> is the temperature at the soldering point of the emitter pins.

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
R <sub>th j-s</sub>	thermal resistance from junction to soldering point	T <sub>s</sub> ≤ 60 °C; P <sub>tot</sub> = 600 mW; note 1	150	K/W

Note

1. T<sub>s</sub> is the temperature at the soldering point of the emitter pins.



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## CHARACTERISTICS

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{(BR)CBO}$	collector-base breakdown voltage	open emitter; $I_C = 0.1\text{ mA}$	15	—	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	open base; $I_C = 10\text{ mA}$	4.5	—	V
$V_{(BR)CER}$	collector-emitter breakdown voltage	$R_{BE} < 1\text{ k}\Omega$ ; $I_C = 10\text{ mA}$	10	—	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	open collector; $I_E = 0.1\text{ mA}$	1	—	V
$I_{CES}$	collector leakage current	$V_{CE} = 5\text{ V}$ ; $V_{BE} = 0$	—	10	$\mu\text{A}$
$h_{FE}$	DC current gain	$I_C = 200\text{ mA}$ ; $V_{CE} = 2\text{ V}$	40	100	
$C_c$	collector capacitance	$I_E = i_e = 0$ ; $V_{CB} = 3\text{ V}$ ; $f = 1\text{ MHz}$	—	3	pF
$C_{re}$	feedback capacitance	$I_C = 0$ ; $V_{CB} = 3.6\text{ V}$ ; $f = 1\text{ MHz}$	—	1.5	pF
$f_T$	transition frequency	$I_C = 200\text{ mA}$ ; $V_{CE} = 3.6\text{ V}$ ; $f = 700\text{ MHz}$	18	—	GHz

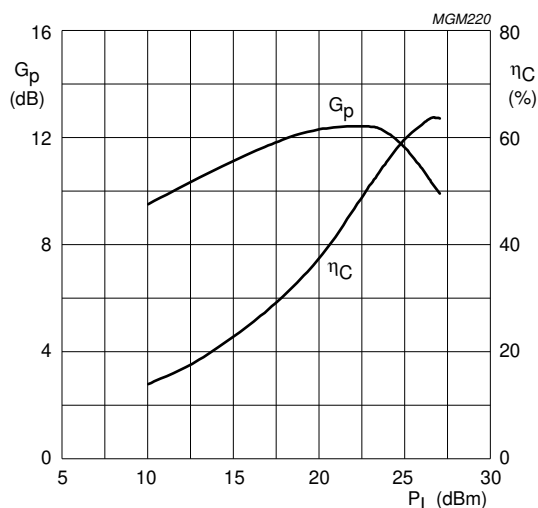
## APPLICATION INFORMATION

RF performance at  $T_s \leq 60\text{ }^{\circ}\text{C}$  in a common emitter test circuit (see Figs 4 and 5).

MODE OF OPERATION	f (GHz)	$V_{CE}$ (V)	$I_{CQ}$ (mA)	$P_L$ (dBm)	$G_p$ (dB)	$\eta_C$ (%)
Pulsed; class-AB; $\delta < 1 : 2$ ; $t_p = 5\text{ ms}$	1.9	3.6	1	26	$\geq 10$	typ. 55

## Ruggedness in class-AB operation

The transistor is capable of withstanding a load mismatch corresponding to  $VSWR = 6 : 1$  through all phases at 26 dBm output power under pulsed conditions:  $\delta = 1 : 2$ ;  $t_p = 5\text{ ms}$ ;  $f = 1.9\text{ GHz}$  at  $V_{CE} = 4.5\text{ V}$ .



Pulsed, class-AB operation;  $\delta < 1 : 2$ ;  $t_p = 5\text{ ms}$ .  
 $f = 1.9\text{ GHz}$ ;  $V_{CE} = 3.6\text{ V}$ ;  $I_{CQ} = 1\text{ mA}$ ; tuned at  $P_L = 26\text{ dBm}$ .

Fig.3 Power gain and collector efficiency as a function of the load power; typical values.

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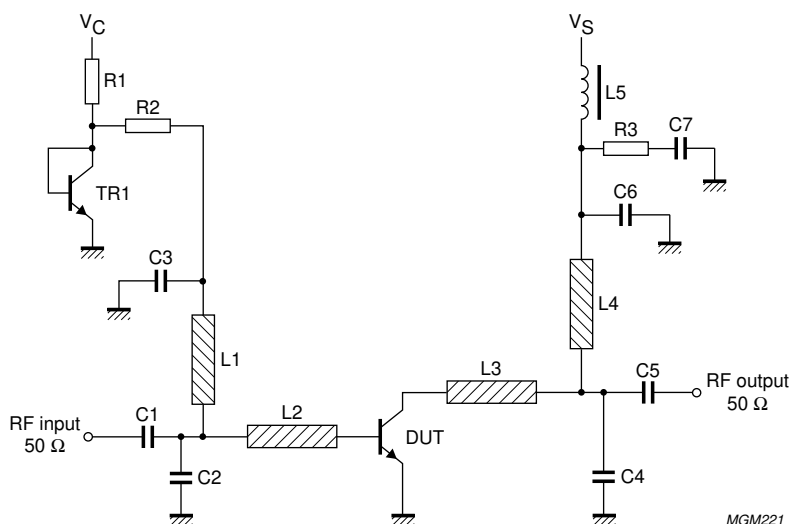


Fig.4 Common emitter test circuit for class-AB operation at 1.9 GHz.

## List of components used in test circuit (see Figs 4 and 5)

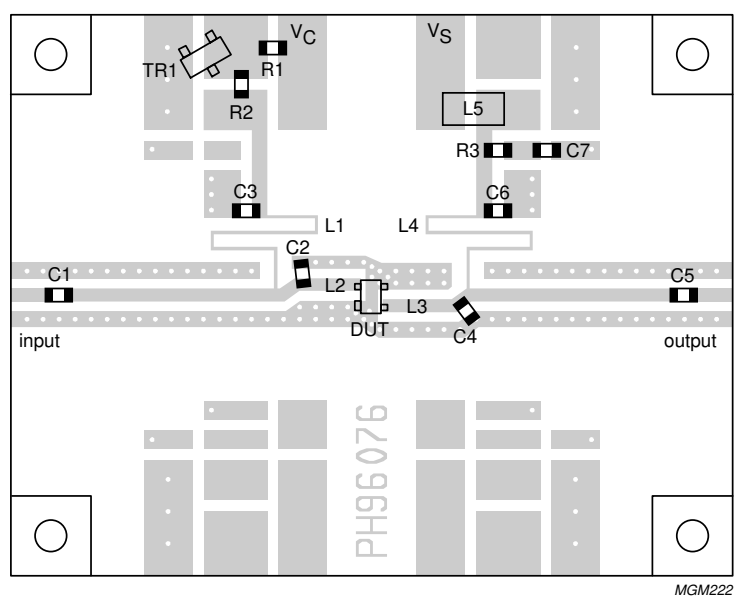
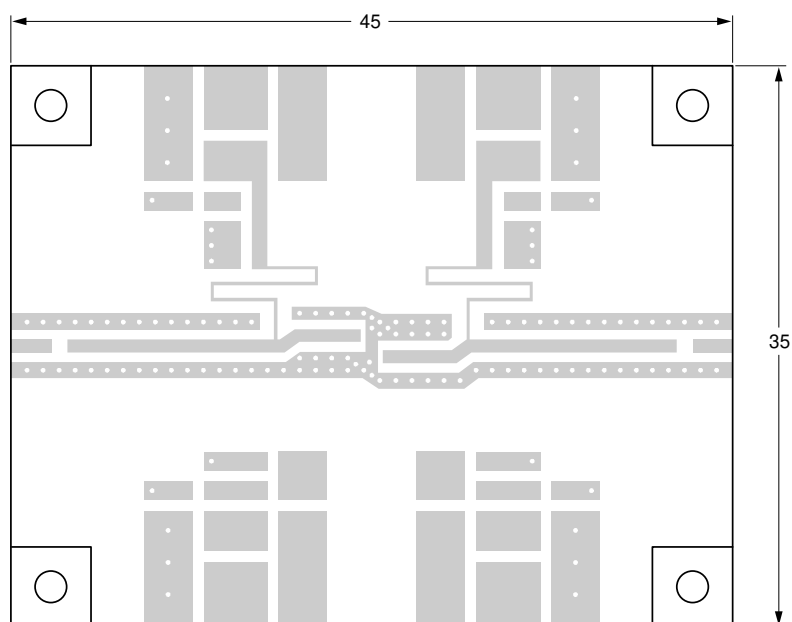
COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE No.
C1, C5	multilayer ceramic chip capacitor; note 1	24 pF		
C2	multilayer ceramic chip capacitor; note 1	3.3 pF		
C3, C6	multilayer ceramic chip capacitor; note 1	15 pF		
C4	multilayer ceramic chip capacitor; note 1	2.4 pF		
C7	multilayer ceramic chip capacitor; note 1	1 nF		
L1, L4	stripline; note 2	100 $\Omega$	18 $\times$ 0.2 mm	
L2	stripline; note 2	50 $\Omega$	3.2 $\times$ 0.8 mm	
L3	stripline; note 2	50 $\Omega$	4.6 $\times$ 0.8 mm	
L5	Grade 4S2 Ferroxcube chip bead			4330 030 36300
R1	metal film resistor	220 $\Omega$ ; 0.4 W		
R2, R3	metal film resistor	10 $\Omega$ ; 0.4 W		
TR1	NPN transistor	BC817		9335 895 20215

## Notes

- American Technical Ceramics type 100A or capacitor of same quality.
- The striplines are on a double copper-clad printed-circuit board with PTFE fibre-glass dielectric ( $\epsilon_r = 6.15$ ,  $\tan \delta = 0.0019$ ); thickness 0.64 mm, copper cladding = 35  $\mu\text{m}$ .

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MGM222

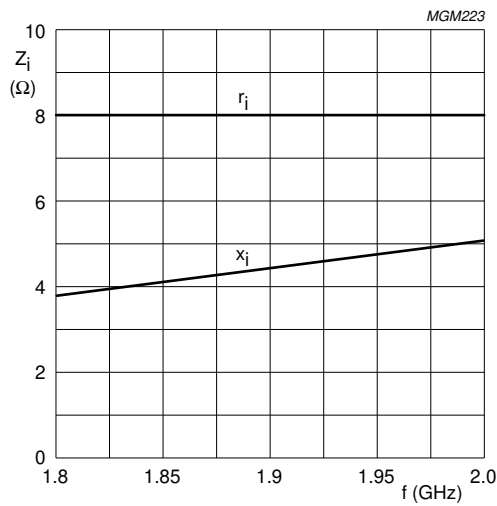
Dimensions in mm.

The components are situated on one side of the copper-clad PTFE fibre-glass board, the other side is unetched and serves as a ground plane. Earth connections from the component side to the ground plane are made by through metallization.

Fig.5 Printed-circuit board and component lay-out for 1.9 GHz class-AB test-circuit in Fig.4.

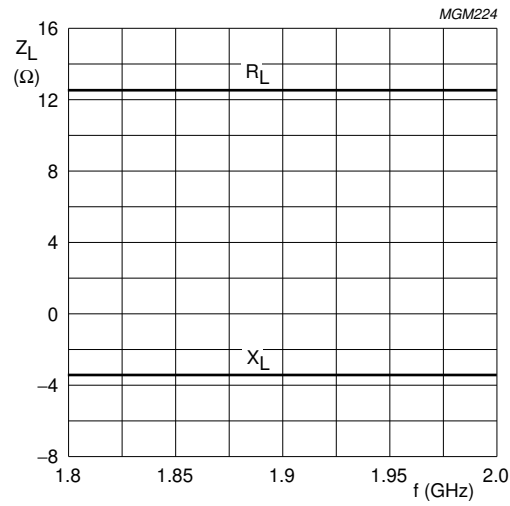
UHF power transistor

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$V_{CE} = 3.6\text{ V}$ ;  $I_{CQ} = 1\text{ mA}$ ;  $P_L = 26\text{ dBm}$ ;  $T_s \leq 60\text{ }^\circ\text{C}$ .

Fig.6 Input impedance as function of frequency (series components); typical values.



$V_{CE} = 3.6\text{ V}$ ;  $I_{CQ} = 1\text{ mA}$ ;  $P_L = 26\text{ dBm}$ ;  $T_s \leq 60\text{ }^\circ\text{C}$ .

Fig.7 Load impedance as a function of frequency (series components); typical values.



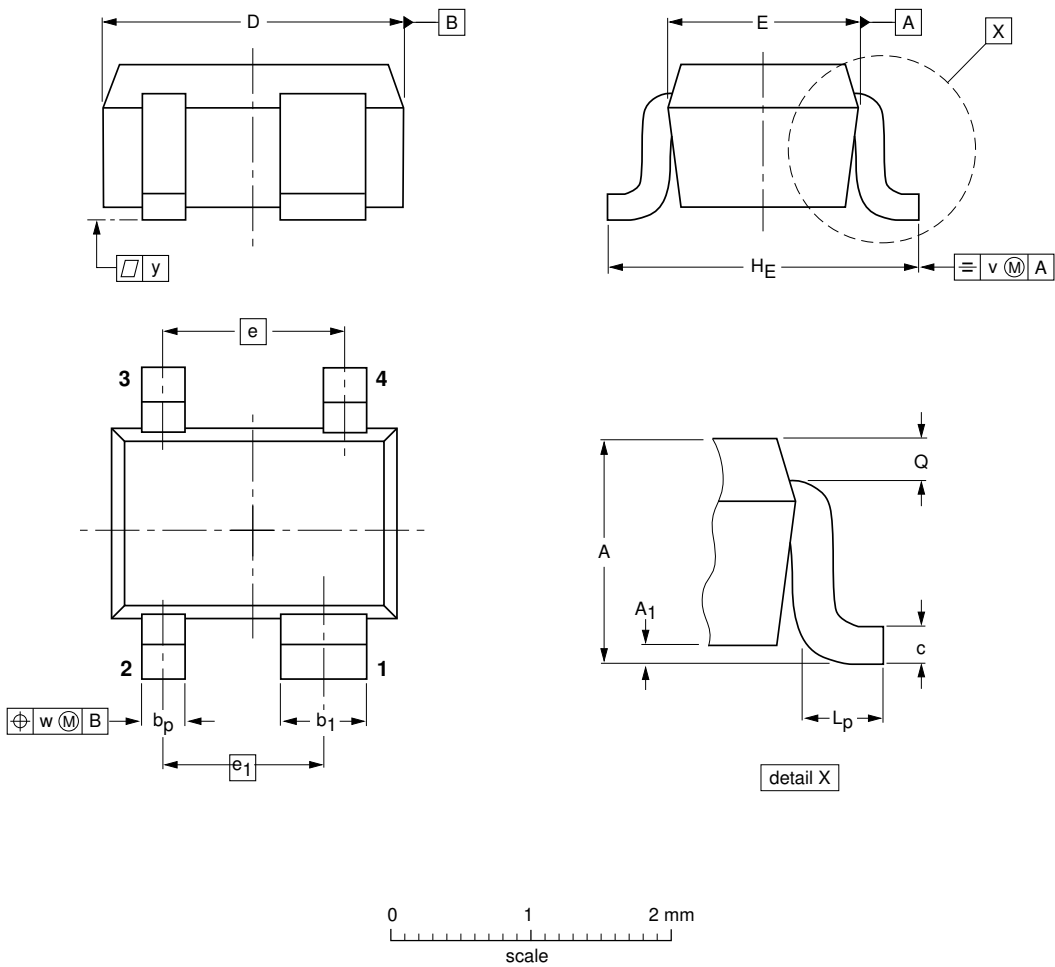
UHF power transistor

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PACKAGE OUTLINE

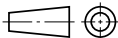
Plastic surface-mounted package; reverse pinning; 4 leads

SOT343R



DIMENSIONS (mm are the original dimensions)

UNIT	A	A <sub>1</sub> max	b <sub>p</sub>	b <sub>1</sub>	c	D	E	e	e <sub>1</sub>	H <sub>E</sub>	L <sub>p</sub>	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 <sup>(1)</sup>	PRODUCT STATUS <sup>(2)</sup>	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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Printed in The Netherlands

R77/03/pp11

Date of release: 1998 Jul 06