DATA SHEET

BF1108; BF1108R
Silicon RF switches

Product specification
Supersedes data of 1999 Aug 19

1999 Nov 18

Philips
Semiconductors

PHILIPS

Silicon RF switches BF1108; BF1108R

FEATURES

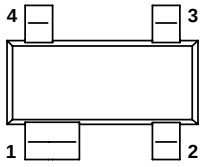
- Specially designed for low loss RF switching up to 1 GHz.

APPLICATIONS

- Various RF switching applications such as:
  - Passive loop through for VCR tuner
  - Transceiver switching.

DESCRIPTION

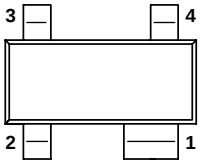
These switches are a combination of a depletion type field-effect transistor and a bandswitching diode in an SOT143B (BF1108) or SOT143R (BF1108R) package. The low loss and high isolation capabilities of these devices provide excellent RF switching functions. The gate of the MOSFET can be isolated from ground with the diode, resulting in low losses. Integrated diodes between gate and source and between gate and drain protect against excessive input voltage surges.



Top view MSB014

Marking code: NGp.

Fig.1 Simplified outline (SOT143B).



Top view MSB035

Marking code: NHp.

Fig.2 Simplified outline (SOT143R).

PINNING

PIN	DESCRIPTION
1	FET gate; diode anode
2	diode cathode
3	source; note 1
4	drain; note 1

Note

1. Drain and source are interchangeable.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$\lvert s_{21(on)} \rvert^2$	losses (on-state)	$R_S = R_L = 50\ \Omega$; $f \leq 1$ GHz	–	–	2	dB
$\lvert s_{21(off)} \rvert^2$	isolation (off-state)		30	–	–	dB
R_{DSon}	drain-source on-resistance	$V_{CS} = 0$; $I_D = 1$ mA	–	12	20	Ω
V_{GSoff}	pinch-off voltage	$I_D = 20\ \mu A$; $V_{DS} = 1$ V	–	–3	–4	V

CAUTION

This product is supplied in anti-static packing to prevent damage caused by electrostatic discharge during transport and handling. For further information, refer to Philips specs.: SNW-EQ-608, SNW-FQ-302A and SNW-FQ-302B.

LIMITING VALUES

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

SYMBOL	PARAMETER	MIN.	MAX.	UNIT
FET				
V_{DS}	drain-source voltage	–	3	V
V_{SD}	source-drain voltage	–	3	V
V_{DG}	drain-gate voltage	–	7	V
V_{SG}	source-gate voltage	–	7	V
I_D	drain current	–	10	mA
Diode				
V_R	continuous reverse voltage	–	35	V
I_F	continuous forward current	–	100	mA
FET and diode				
T_{stg}	storage temperature	–65	+150	°C
T_j	junction temperature	–	150	°C

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j\text{-}s}$	thermal resistance from junction to soldering point	note 1	250	K/W

Note

1. Soldering point of FET gate and diode anode lead.

STATIC CHARACTERISTICS

T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
FET						
$V_{(BR)GSS}$	gate-source breakdown voltage	V_{DS} = 0; I_{GS} = 0.1 mA	7	–	–	V
V_{GSoff}	gate-source pinch-off voltage	V_{DS} = 1 V; I_D = 20 µA	–	–3	–4	V
I_{DSX}	drain-source leakage current	V_{GS} = –5 V; V_{DS} = 2 V	–	–	10	µA
I_{GSS}	gate cut-off current	V_{GS} = –5 V; V_{DS} = 0	–	–	100	nA
R_{DSon}	drain-source on-state resistance	V_{GS} = 0; I_D = 1 mA	–	12	20	Ω
Diode						
V_F	forward voltage	I_F = 10 mA	–	–	1	V
I_R	reverse current	V_R = 25 V	–	–	50	nA
		V_R = 20 V; T_{amb} = 75 °C	–	–	1	µA

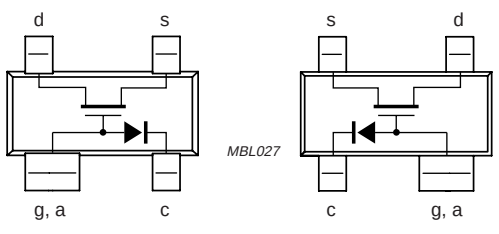
DYNAMIC CHARACTERISTICS

Common cathode; T_{amb} = 25 °C.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
FET and diode						
$\lvert s_{21(on)} \rvert^2$	losses (on-state)	$V_{SC} = V_{DC} = 0$; $R_S = R_L = 50\ \Omega$; $I_F = 0$; note 1; $f \leq 1$ GHz	–	–	2	dB
		$V_{SC} = V_{DC} = 0$; $R_S = R_L = 50\ \Omega$; $I_F = 0$; f = 1 GHz	–	1.3	–	dB
		$V_{SC} = V_{DC} = 0$; $R_S = R_L = 75\ \Omega$; $I_F = 0$; $f \leq 1$ GHz	–	–	3	dB
$\lvert s_{21(off)} \rvert^2$	isolation (off-state)	$V_{SC} = V_{DC} = 5$ V; $R_S = R_L = 50\ \Omega$; $I_F = 1$ mA; $f \leq 1$ GHz	30	–	–	dB
		$V_{SC} = V_{DC} = 5$ V; $R_S = R_L = 50\ \Omega$; $I_F = 1$ mA; f = 1 GHz	–	38	–	dB
		$V_{SC} = V_{DC} = 5$ V; $R_S = R_L = 75\ \Omega$; $I_F = 1$ mA; $f \leq 1$ GHz	30	–	–	dB
R_{DSon}	drain-source on-resistance	$V_{CS} = 0$; $I_D = 1$ mA	–	12	20	Ω
C_{ic}	input capacitance; note 2	$V_{SC} = V_{DC} = 5$ V; $I_F = 1$ mA; f = 1 MHz	–	1	–	pF
		$V_{SC} = V_{DC} = 0$; $I_F = 0$; f = 1 MHz	–	0.65	0.9	pF
C_{oc}	output capacitance; note 2	$V_{SC} = V_{DC} = 5$ V; $I_F = 1$ mA; f = 1 MHz	–	1	–	pF
		$V_{SC} = V_{DC} = 0$; $I_F = 0$; f = 1 MHz	–	0.65	0.9	pF
Diode						
C_d	diode capacitance	f = 1 MHz; $V_R = 0$	–	1.1	–	pF
r_D	diode forward resistance	$I_F = 2$ mA; f = 100 MHz; note 3	–	–	0.7	Ω

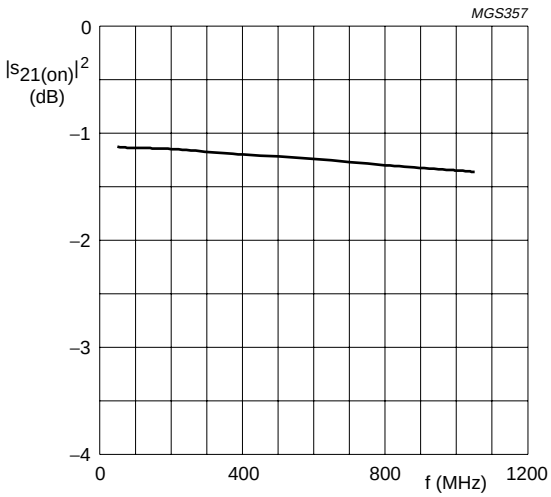
Notes

1. I_F = diode forward current.
2. C_{ic} is the series connection of C_{sg} and C_{gc}; C_{oc} is the series connection of C_{dg} and C_{gc}.
3. Guaranteed on AQL basis; inspection level S4, AQL 1.0.



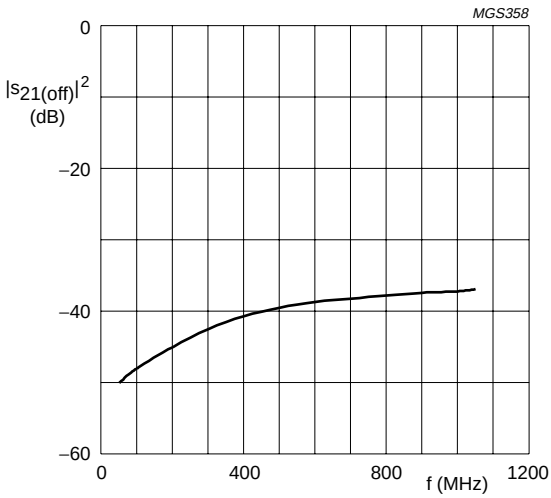
SOT143B **SOT143R**

Fig.3 Simplified diagram.



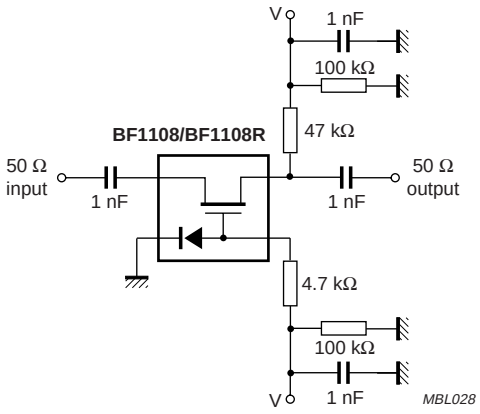
$V_{SC} = V_{DC} = 0$ V; $R_S = R_L = 50\ \Omega$; $I_F = 0$ mA (diode forward current); Measured in test circuit (Fig.6).

Fig.4 Losses (on-state) as a function of frequency; typical values.



$V_{SC} = V_{DC} = 5$ V; $R_S = R_L = 50\ \Omega$; $I_F = 1$ mA (diode forward current); Measured in test circuit (Fig.6).

Fig.5 Isolation (off-state) as a function of frequency; typical values.

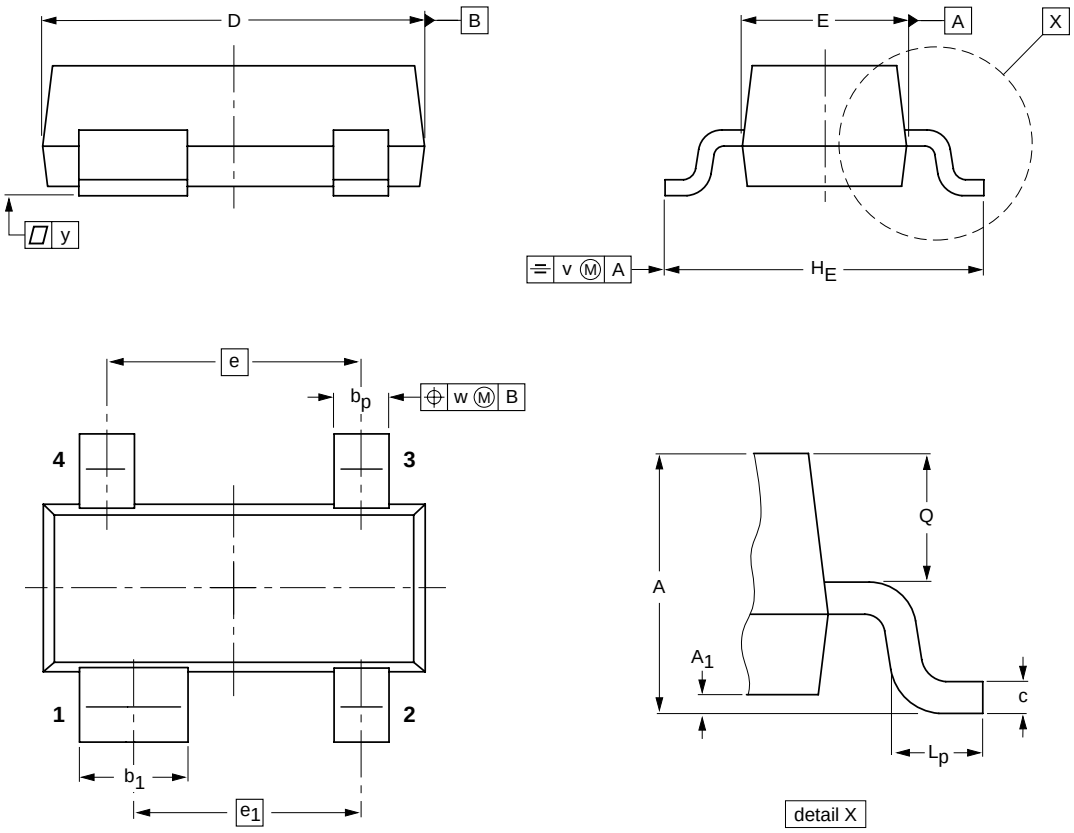


On-state: V = 0 V.
Off-state: V = 5 V.

Fig.6 Test circuit.

PACKAGE OUTLINES

Plastic surface mounted package; 4 leads **SOT143B**

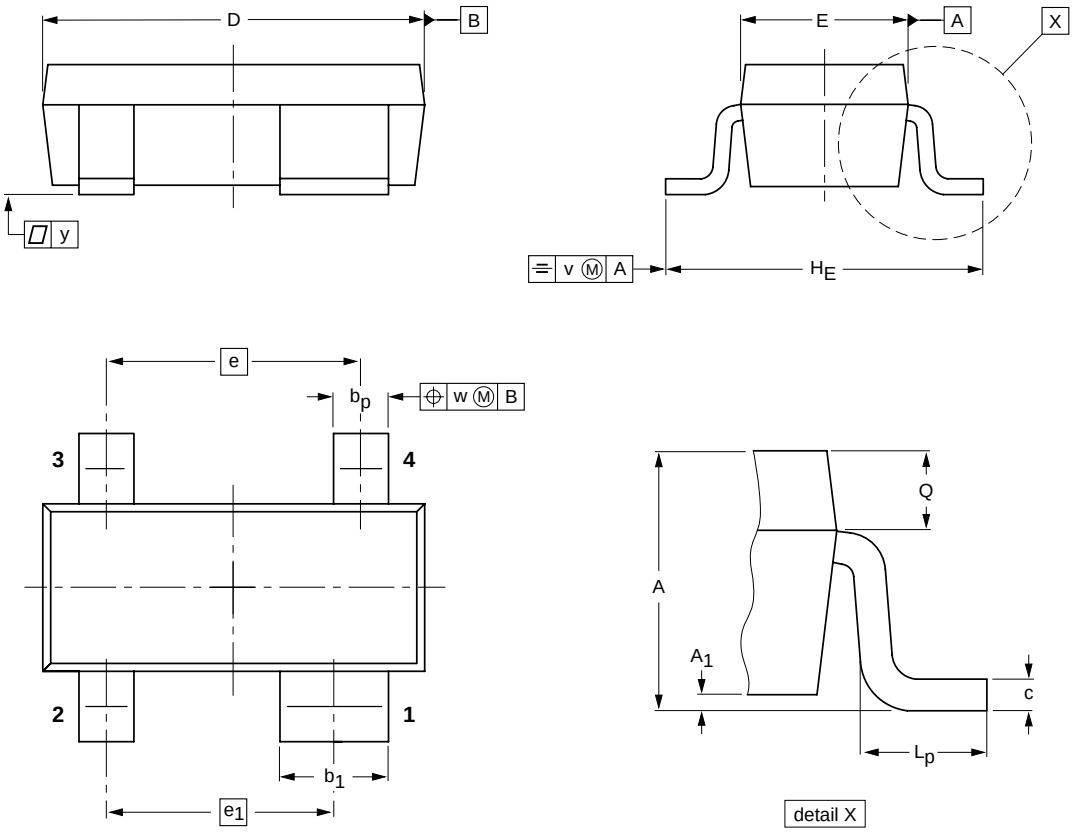


DIMENSIONS (mm are the original dimensions)

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 0.9	0.1	0.48 0.38	0.88 0.78	0.15 0.09	3.0 2.8	1.4 1.2	1.9	1.7	2.5 2.1	0.45 0.15	0.55 0.45	0.2	0.1	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT143B						97-02-28

Plastic surface mounted package; reverse pinning; 4 leads **SOT143R**



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 0.9	0.1	0.48 0.38	0.88 0.78	0.15 0.09	3.0 2.8	1.4 1.2	1.9	1.7	2.5 2.1	0.55 0.25	0.45 0.25	0.2	0.1	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT143R			SC-61B			~~97-03-10~~ 99-09-13

DEFINITIONS

Data sheet status	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
Limiting values	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

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These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.

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