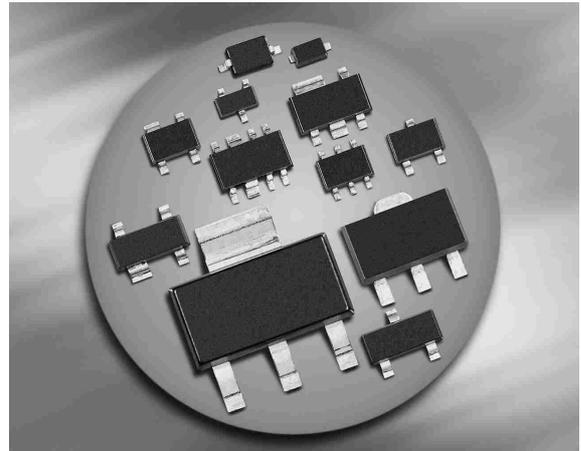## RF ESD Protection Diodes

- ESD / transient protection of RF antenna / interfaces or ultra high speed data lines acc. to:
  IEC61000-4-2 (ESD): ± 20 kV (contact)
  IEC61000-4-4 (EFT): 40 A (5/50 ns)
  IEC61000-4-5 (surge): 10 A (8/20 µs)

- Ultra low capacitance of 1 pF typ.
  (0.5 pF per diode)

- Low clamping voltage

- Pb-free (ROHS compliant) package

Applications in anti-parallel configuration

- For low RF signal levels without superimposed DC voltage: e.g. GPS, WLAN, Bluetooth

Applications in rail-to-rail configuration

- For high RF signal levels or low RF signal levels with superimposed DC voltage: e.g. HDMI, S-ATA, Gbit Ethernet

RoHS ✓
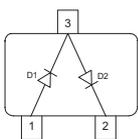
ESD1P0RFW   **ESD1P0RFS**
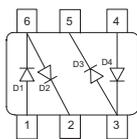
Type	Package	Configuration	Marking
ESD1P0RFS	SOT363	2 channels	E6s
ESD1P0RFW	SOT323	1 channel	E6s

20NM-NO-CM

Maximum Ratings at T_A = 25°C, unless otherwise specified

Parameter	Symbol	Value	Unit
ESD contact discharge[1]	V_{ESD}	20	kV
Peak pulse current (t_p = 8 / 20 µs)[2]	I_{pp}	10	A
Operating temperature range	T_{op}	-55...150	°C
Storage temperature	T_{stg}	-65...150	

Electrical Characteristics at T_A = 25°C, unless otherwise specified

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Characteristics					
Reverse working voltage[3]	V_{RWM}	-	-	70	V
Reverse current V_R = 70 V	I_R	-	-	100	nA
Forward clamping voltage[2]	V_{FC}				V
I_{PP} = 3 A, t_p = 8/20 µs		-	4	7	
I_{PP} = 10 A, t_p = 8/20 µs		-	12	15	
Line capacitance[4]	C_T				pF
V_R = 0 V, f = 1 MHz		-	1	1.5	
V_R = 0 V, f = 1 MHz, for Application example 4		-	0.5	0.75	
Series inductance (per diode)	L_S				nH
SOT323		-	1.4	-	
SOT363		-	1.6	-	

[1]V_{ESD} according to IEC61000-4-2, only valid in anti-parallel or rail-to-rail connection.
Please refer to the application examples.
[2]I_{pp} according to IEC61000-4-5, only valid in anti-parallel or rail-to-rail connection.
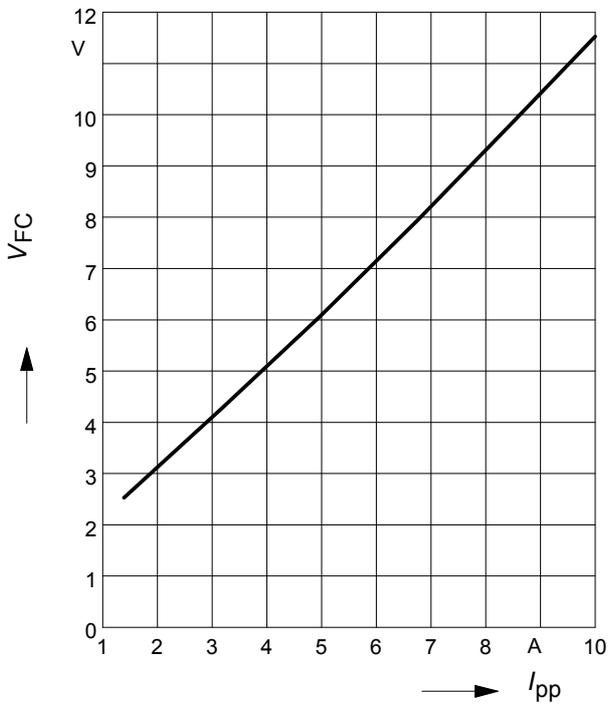Please refer to the application examples.
[3]Only valid in rail-to-rail configuration $V_{CC} \geq V_{RWM}$
[4]Total capacitance line to ground (2 diodes in parallel)

=

Forward clamping voltage $V_{FC} = f(I_{PP})$

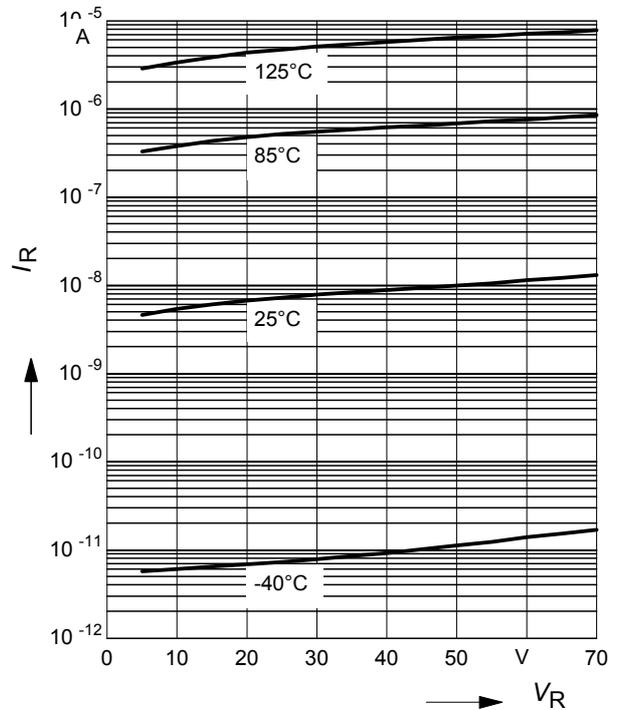t_p = 8 / 20 µs

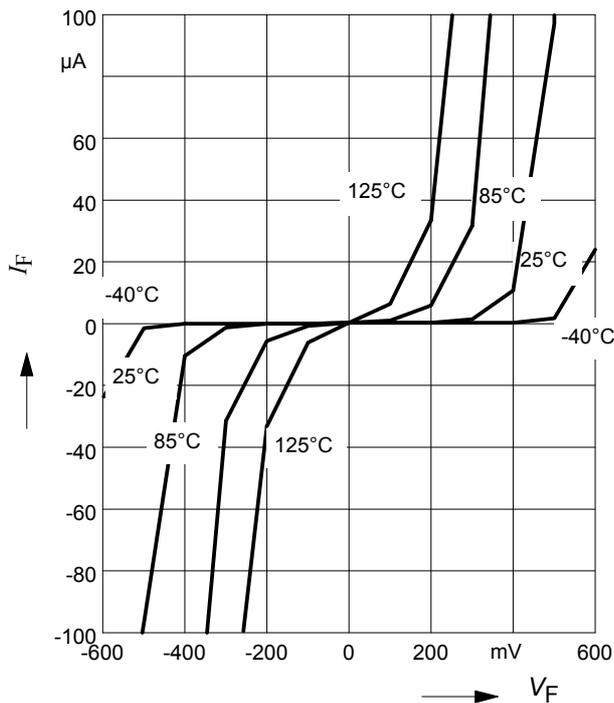## Reverse current $I_R = f(V_R)$

T_A = Parameter

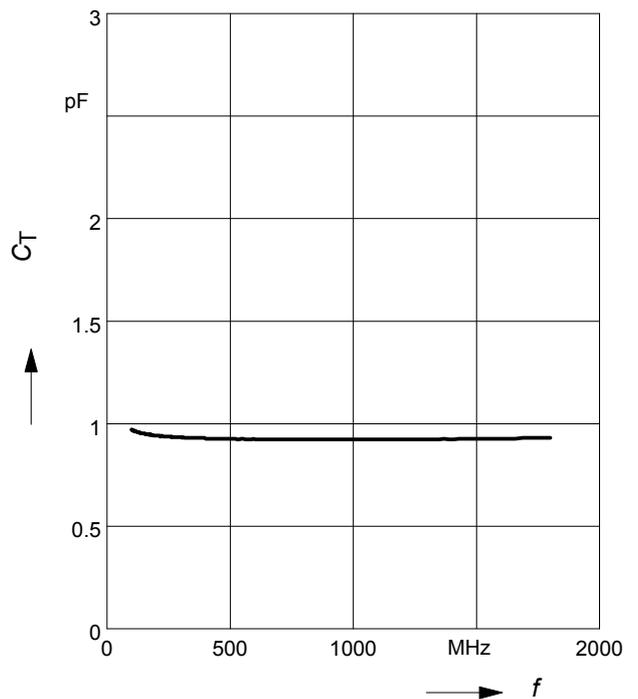in rail-to-rail configuration

Forward current $I_F = f(V_F)$
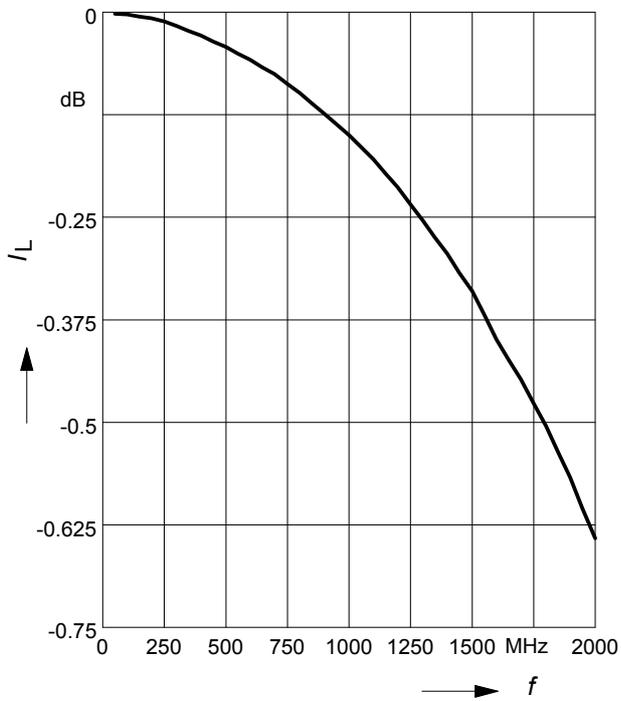
T_A = Parameter

in anti-parallel configuration
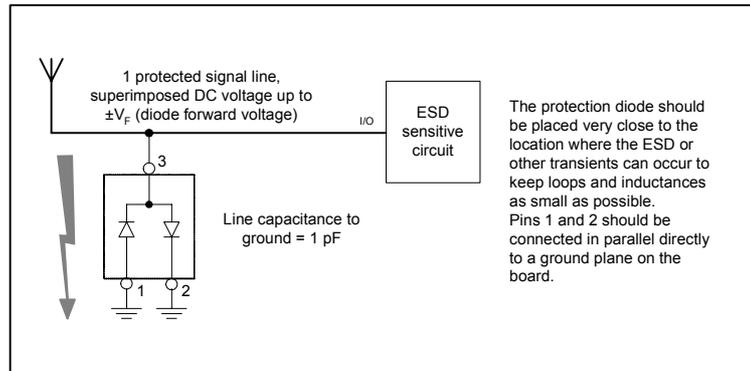

Line capacitance $C_T = f(f)$

V_R = 0 V

=

Insertion loss $|S_{21}|^2 = f(f)$
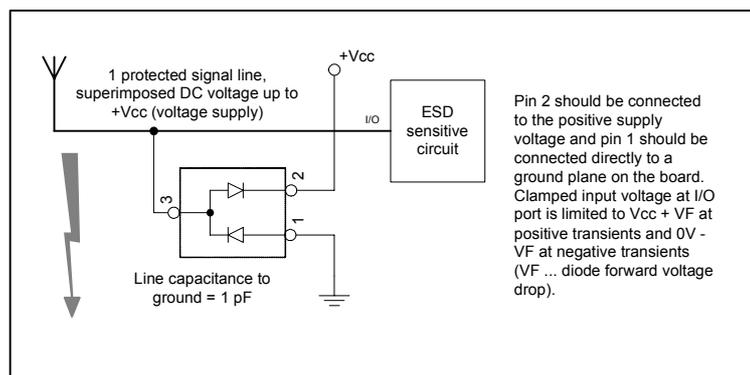
V_R = 0 V, line to ground, Z = 50 Ω

4

1. Application example ESD1P0RFW
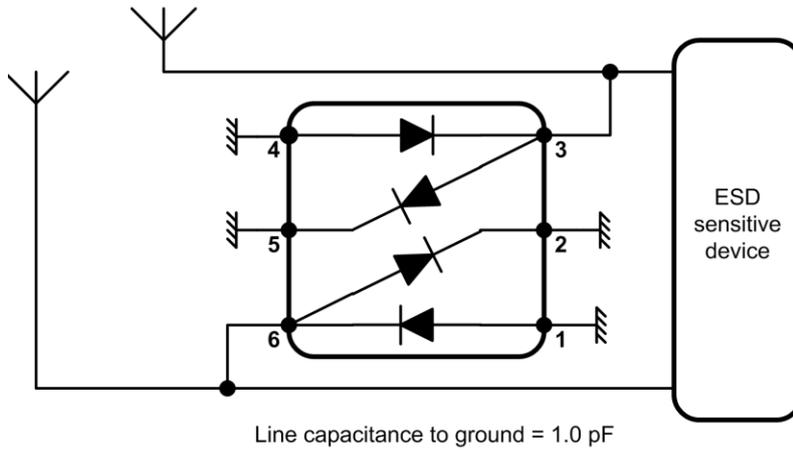1 channel, anti-parallel configuration

1 protected signal line, superimposed DC voltage up to $\pm V_F$ (diode forward voltage)

I/O

ESD sensitive circuit

3

Line capacitance to ground = 1 pF

1   2

The protection diode should be placed very close to the location where the ESD or other transients can occur to keep loops and inductances as small as possible. Pins 1 and 2 should be connected in parallel directly to a ground plane on the board.

2. Application example ESD1P0RFW
1 channel, rail-to-rail configuration

1 protected signal line, superimposed DC voltage up to +Vcc (voltage supply)

+Vcc

I/O

ESD sensitive circuit

3

2

1

Line capacitance to ground = 1 pF

Pin 2 should be connected to the positive supply voltage and pin 1 should be connected directly to a ground plane on the board. Clamped input voltage at I/O port is limited to Vcc + VF at positive transients and 0V - VF at negative transients (VF ... diode forward voltage drop).

5

3. Application example ESD1P0RFS
2 channel, anti-parallel configuration

2 protected signal lines,
superimposed DC voltage up to
+-VF (diode forward voltage)

Line capacitance to ground = 1.0 pF

Pins 1, 2 and 4, 5 should be
connected in parallel directly
to a ground plane on the
board. Clamped input
voltage at I/O port is limited
to ± VCL (clamping voltage)
at positive resp. negative
transients.

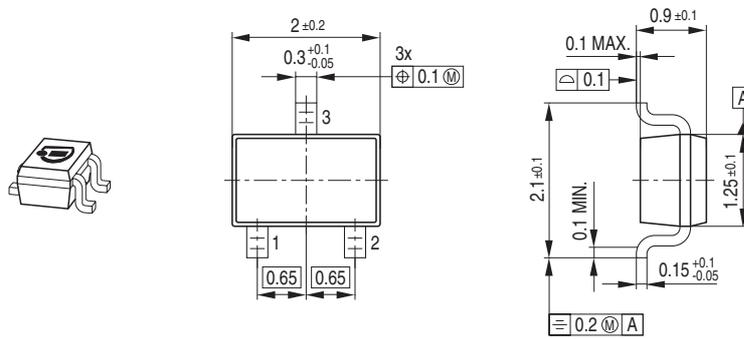### 4. Application example ESD1P0RFS
1 channel, low capacitance anti-parallel configuration

1 protected signal line,
superimposed DC voltage up to
+-2 x VF (diode forward voltage)

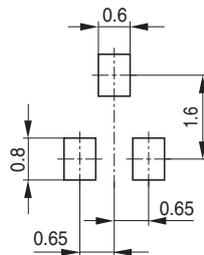Line capacitance to ground = 0.5 pF
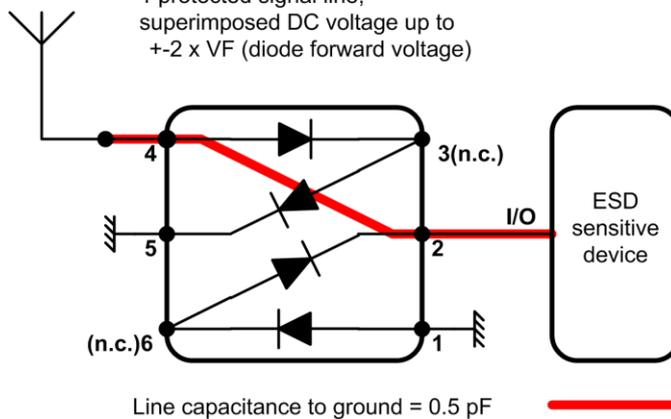
Pins 1 and 5 should be
connected directly to a
ground plane on the board.
Pins 3, 6 are not connected.
Clamped input voltage at I/O
port is limited to +- 2 x VCL
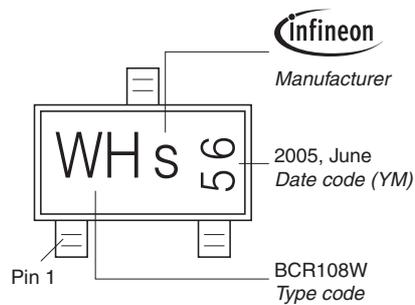(clamping voltage) at
positive resp. negative
transients.

━━━━━━ RF line on PCB

=
S=

Package Outline

Foot Print

Marking Layout (Example)

Manufacturer

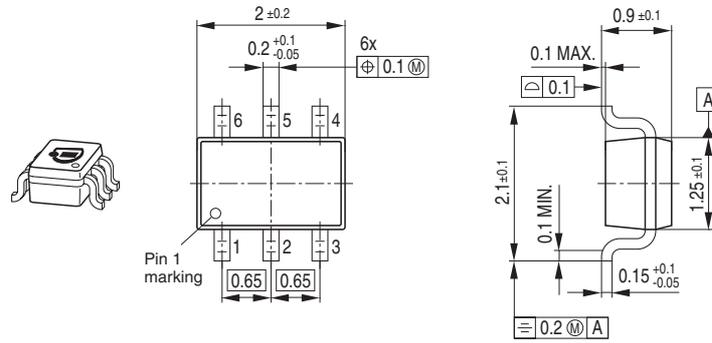2005, June
Date code (YM)

BCR108W
Type code

Pin 1

WH s 5 6

Standard Packing
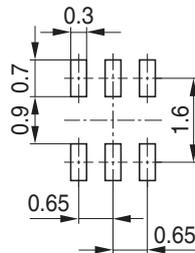
Reel ø180 mm = 3.000 Pieces/Reel
Reel ø330 mm = 10.000 Pieces/Reel
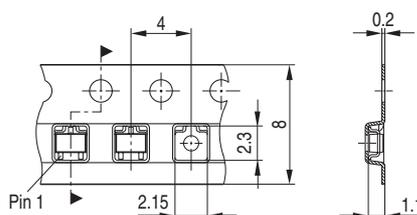
Package Outline

Foot Print

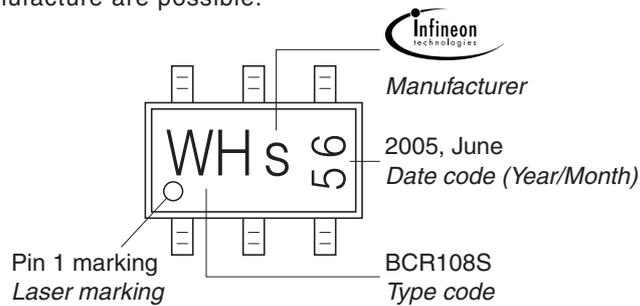## Marking Layout (Example)

Small variations in positioning of
Date code, Type code and Manufacture are possible.

Manufacturer

2005, June
Date code (Year/Month)

BCR108S
Type code

Pin 1 marking
Laser marking

WH s 5 6

Standard Packing

Reel ø180 mm = 3.000 Pieces/Reel
Reel ø330 mm = 10.000 Pieces/Reel

For symmetric types no defined Pin 1 orientation in reel.
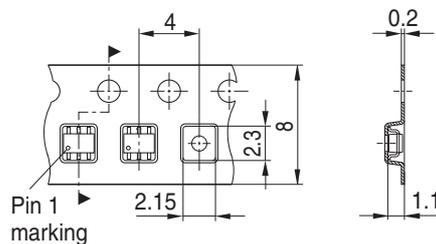
Pin 1
marking

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Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:
moschip.ru   moschip.ru_6
moschip.ru_4   moschip.ru_9