



**THE DATASHEET OF
BGH182ME6327**



Product & Application Guide 2007

Small Signal Discretes



www.infineon.com/smallsignaldiscretes

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Schottky Diodes

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■ Mobile Communication

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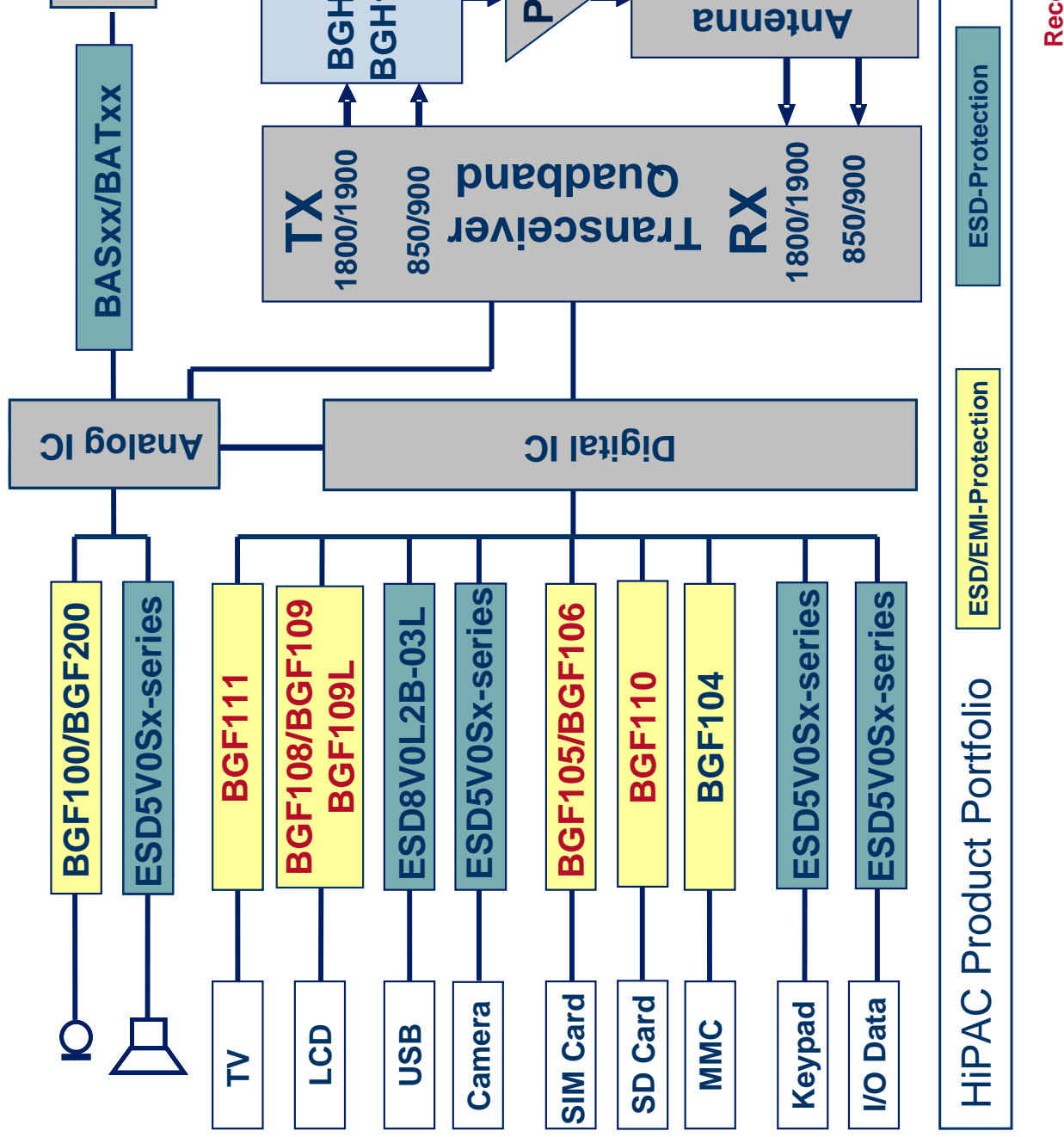
■ Automotive & Industrial

■ ESD/EMI Protection

■ Lighting

Cellular Phone ESD/EMI-Protection and RF Passive Integration

> Applications > Mobile Communication



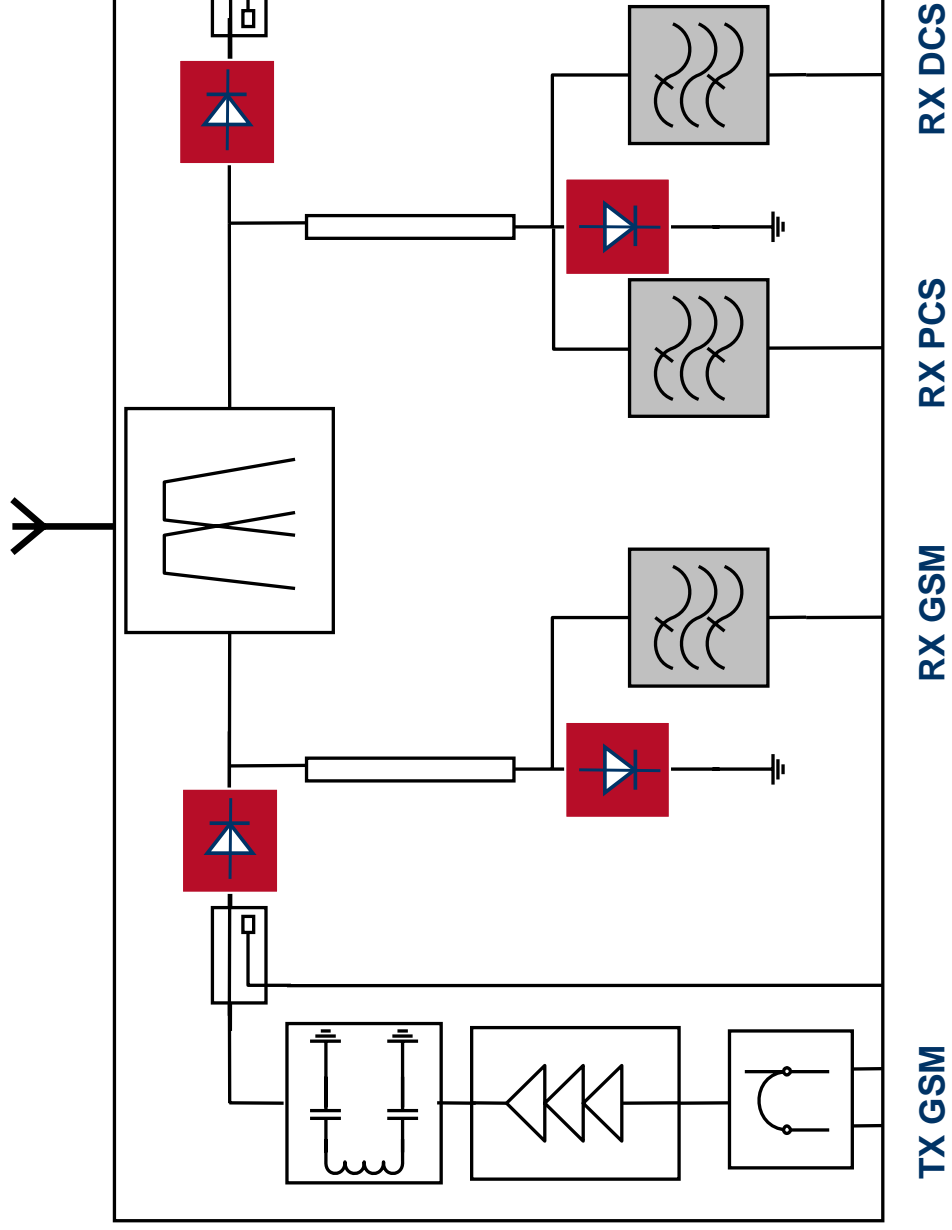
Rec

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Antenna Switch Module (ASM)

Example: Triple Band Front End

> Applications > Mobile Communication



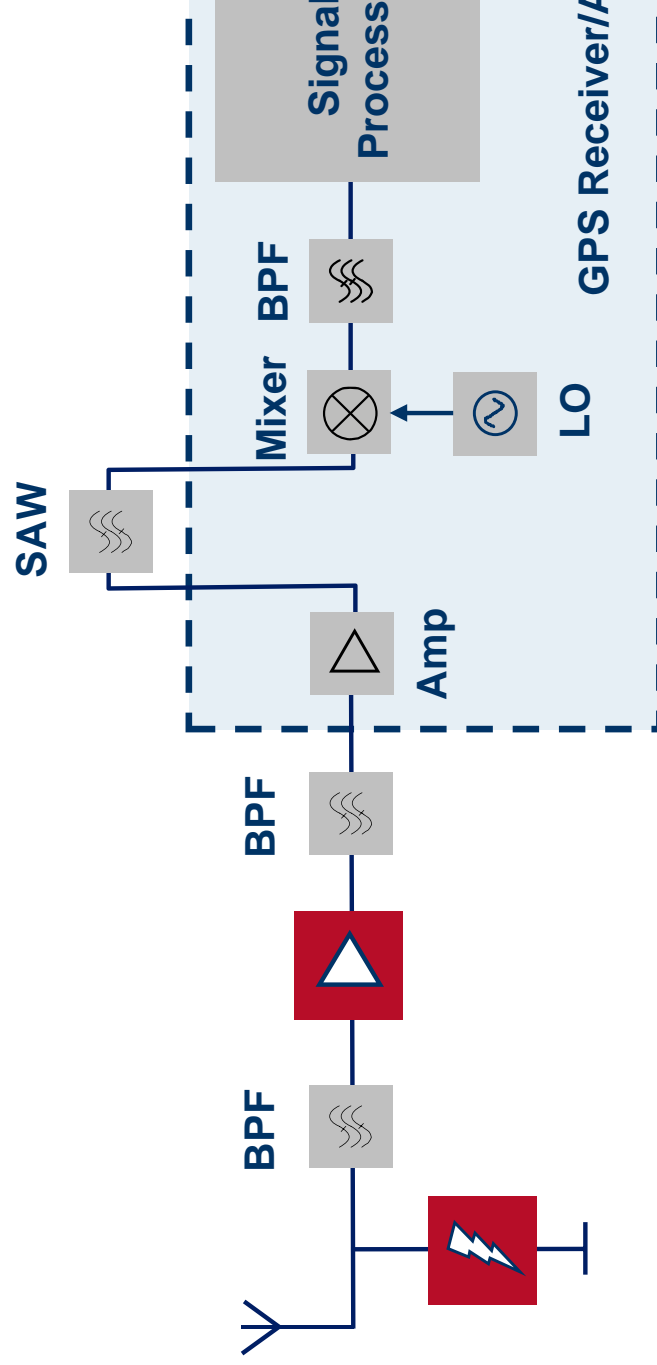
PIN Diode BAR63xx, BAR64xx, BAR65xx, BAR88xx, BAR89xx, BAR90xx

R

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Global Positioning System (GPS) for Mobile P GPS Receiver

> Applications > Mobile Communication



LNA

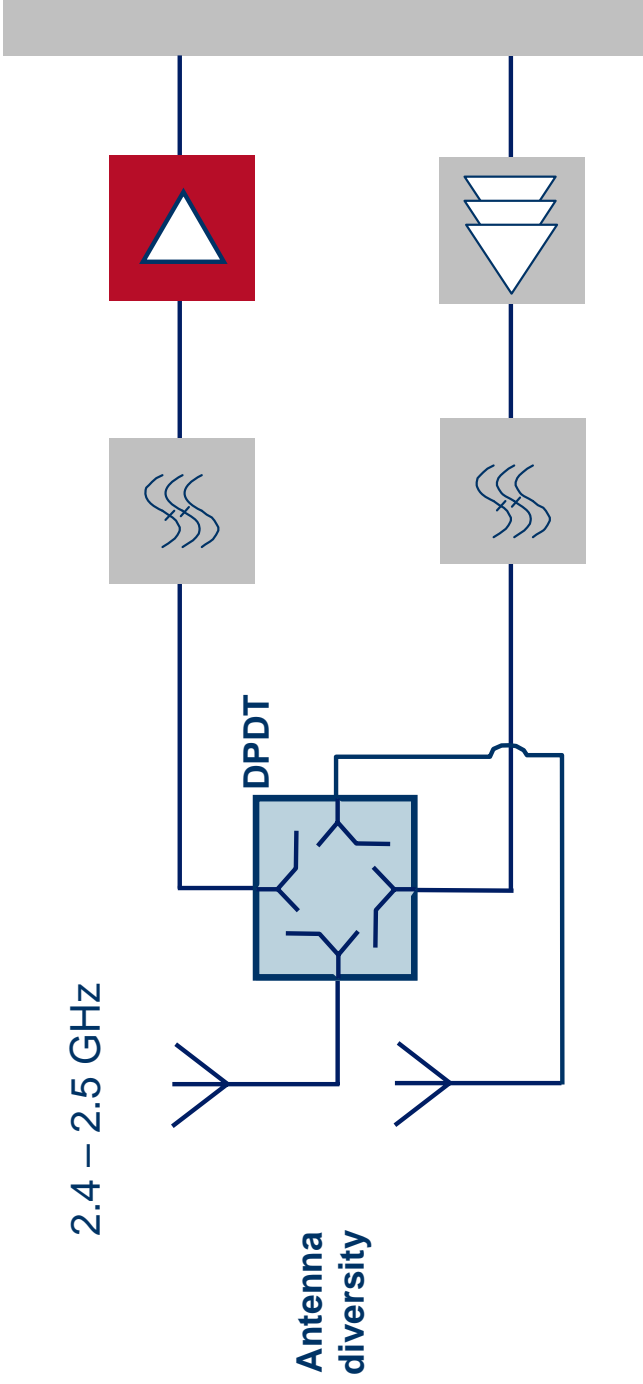
BGA615L7, BGA622(L7), BGA428,
BFP700series, BFP460, BFP540ESD



ESD Protection ESDxPyRF-series

Wireless LAN (802.11b/g) 2.4 GHz WLAN Front-End

> Applications > Mobile Communication



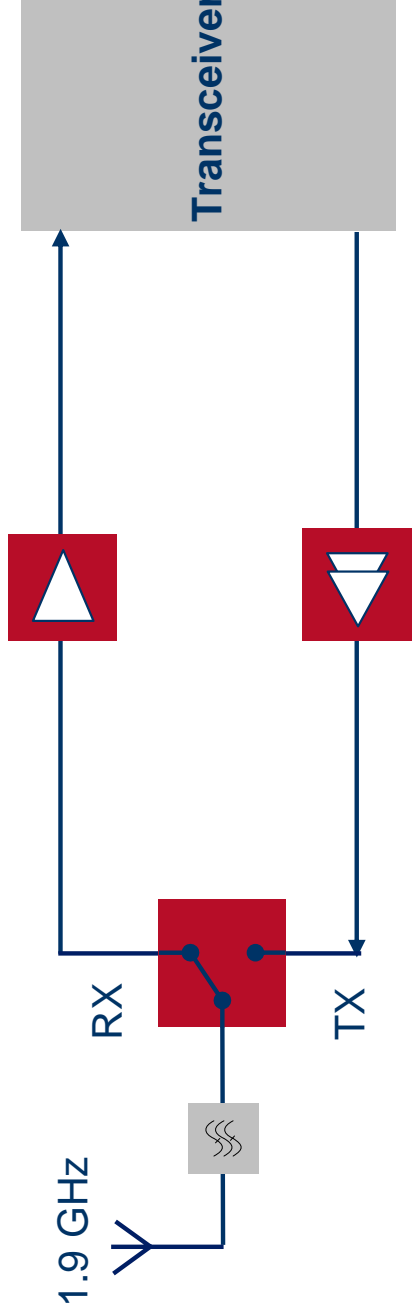
MMIC: BGA622L7

LNA

RF Transistor: BFP640 / 640F / 620 / 620F, **BFP700series**

Cordless Phone (DECT, WDCT, ...) 1.9 GHz Cordless Phone - Block Diagram

> Applications > Mobile Communication

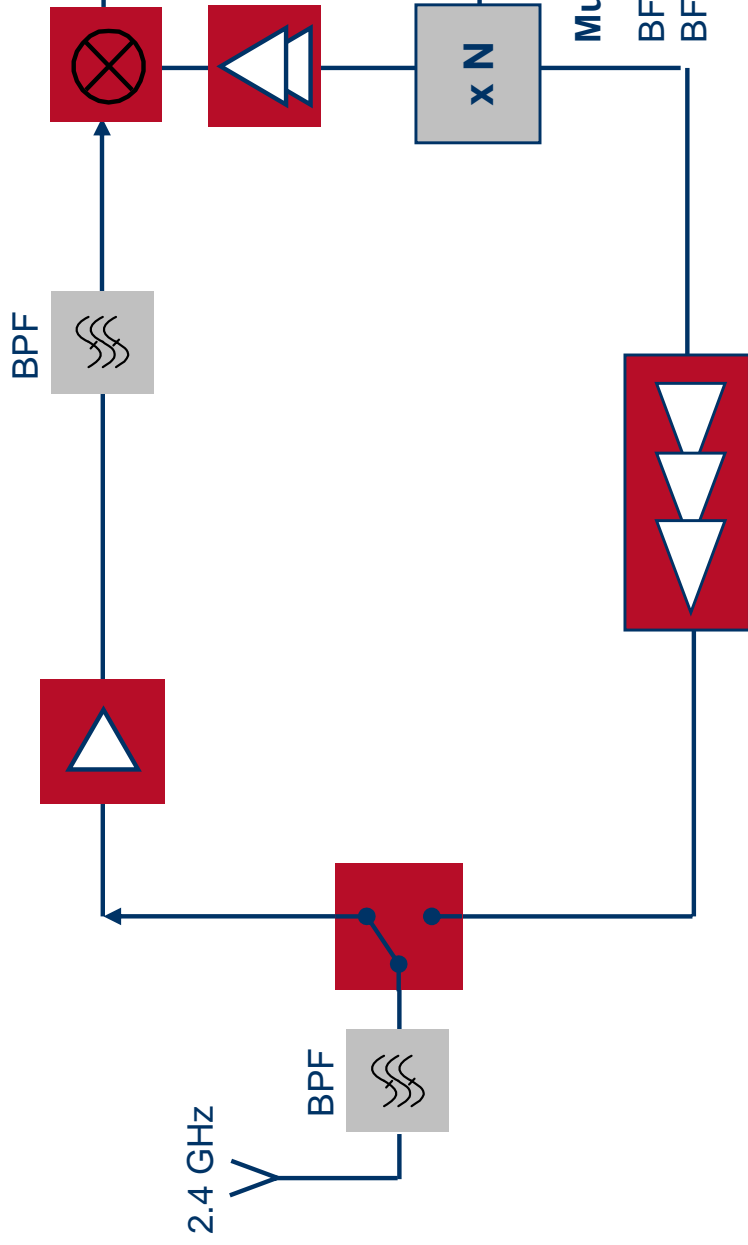






| | | |
|--|---------------|---|
| | LNA | BGA622(L7) |
| | ANT SW | BAR63x, BAR64x, BAR88x, BAR89x, BAR90x, BAR91x, BAR92x, BAR93x, BAR94x, BAR95x, BAR96x, BAR97x, BAR98x, BAR99x, BAR100x |
| | PA | BF776 + BFP650, BFP450 |

R

RF Discretes for Cordless Phone 2.4GHz Cordless Phone

> Applications > Mobile Communication

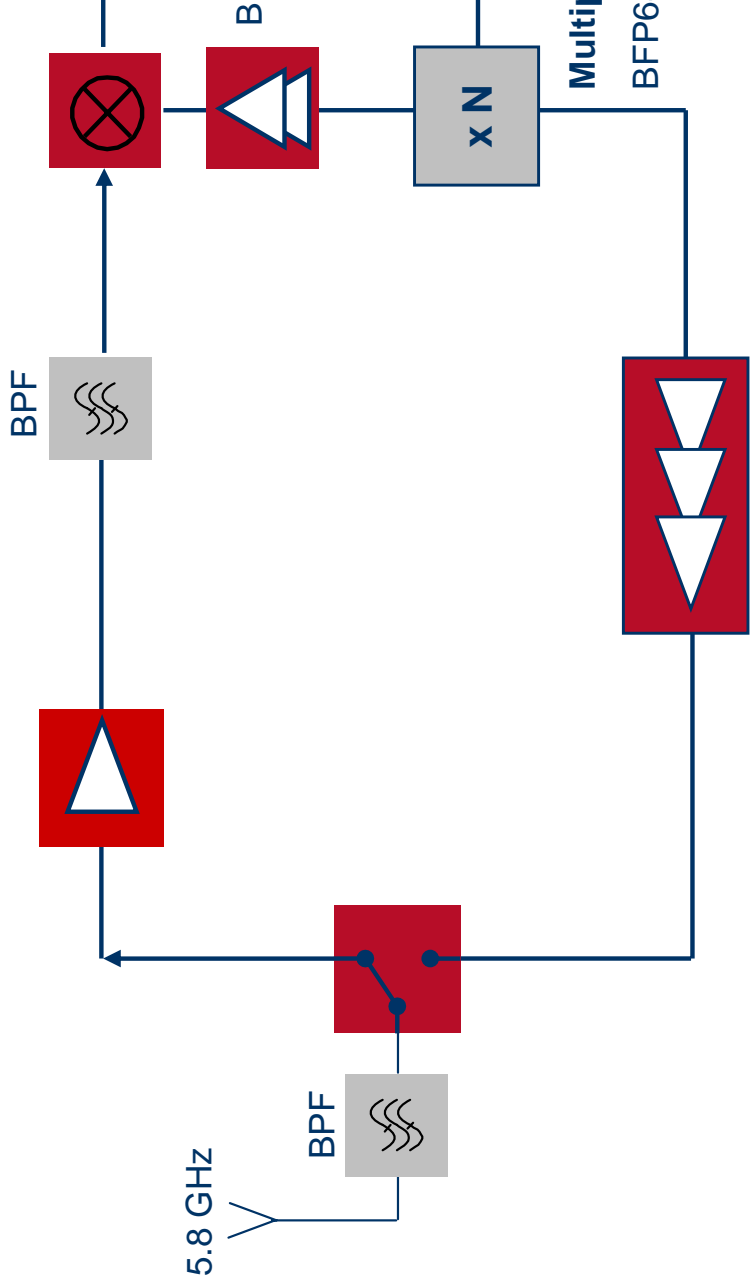








| | | | | | |
|---|------------|--|---|---------------|----------------------------|
|  | LNA | BGA622(L7) |  | ANT SW | BAR88x BAR89x BAR90x |
|  | PA | 1. stage BF776 2. stage BFP650 3. stage BFP650 |  | MIX | BFR300series BFP540 |

RF Discretes for Cordless Phone

5.8GHz Cordless Phone

> Applications > Mobile Communication



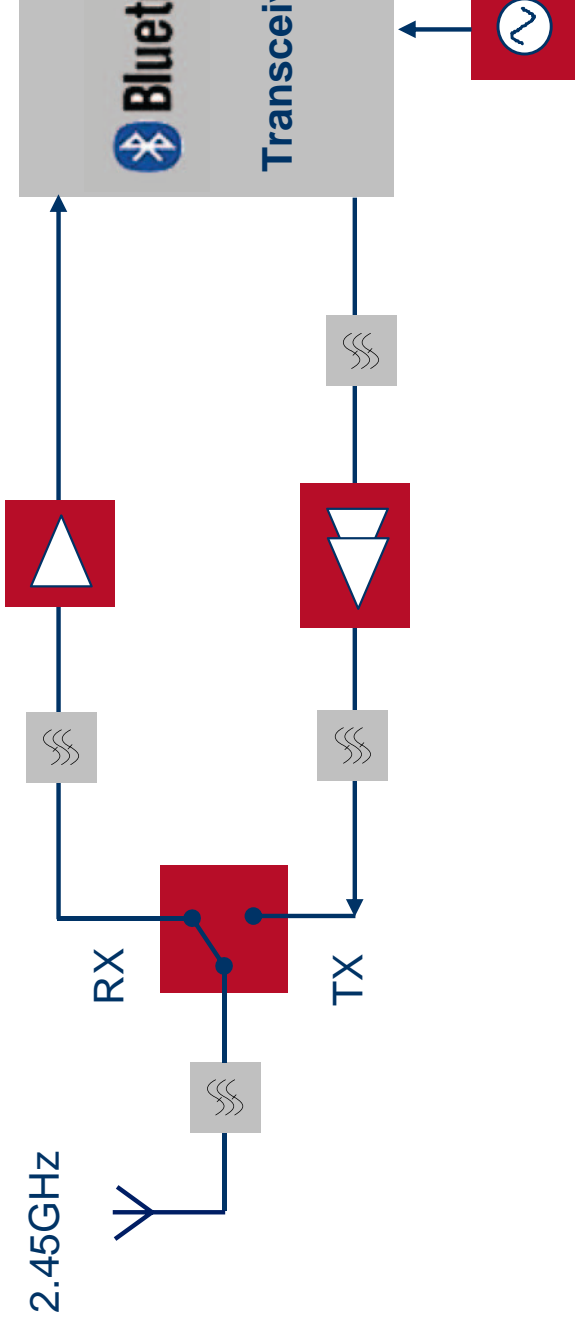
| | | | | | | | | |
|---|---------------|----------------------------|---|---------------|-------|---|------------|-------------|
|  | LNA | BFP700series, BF776 |  | Buffer | BF776 |  | PA | 1 2 3 |
|  | ANT SW | BAR50x BAR89x BAR90x |  | MIX | BF776 |  | VCO | E E |

Re

Bluetooth (BT)

Front End for Bluetooth Class 1

> Applications > Mobile Communication



| | | | | | | |
|---|---------------|-----------------------|---|---|-----------|-------------|
|  | LNA | MMIC: | BGA622L7, BGA428 BGA427 |  | PA | R |
|  | ANT SW | RF Transistor: | BFP640 / 640F / 620 620F / 540F / 640 BFP700series |  | LO | B B B |
| | | | BAR88x, BAR90x BAR63x, BAR64x BAR65x | | | |

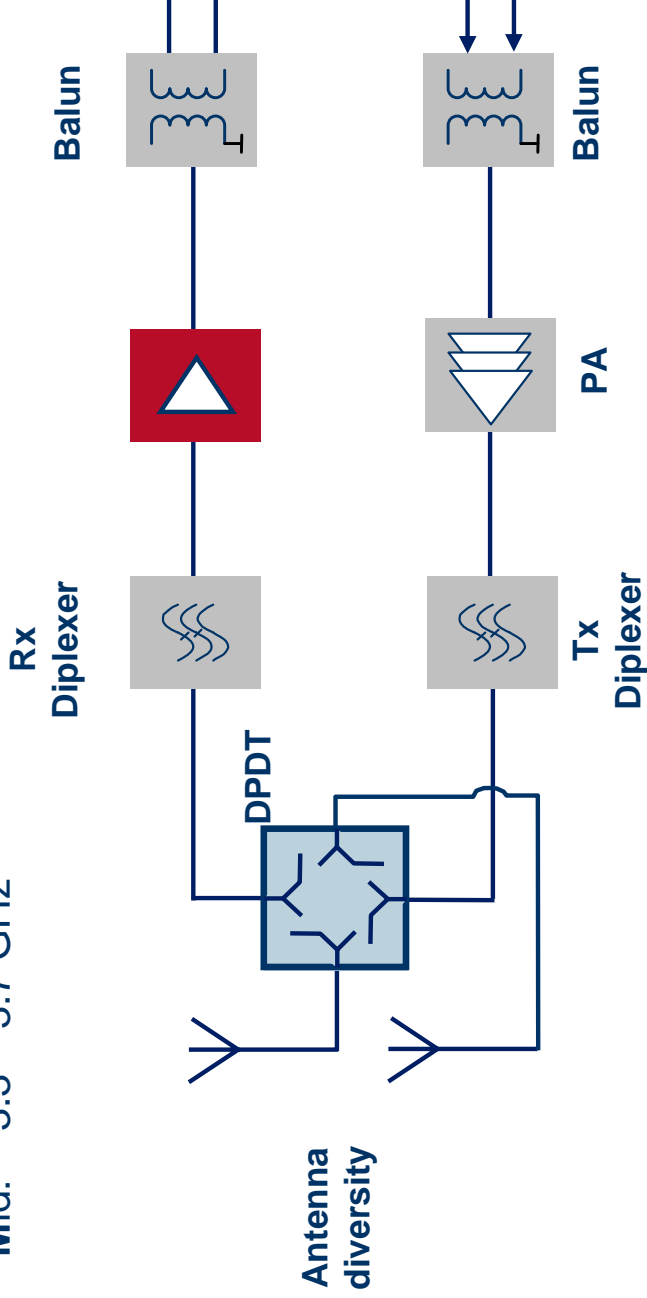
WiMAX Transceiver System

> Applications > Mobile Communication

WiMAX frequencies

Low: 2.3 – 2.7 GHz

Mid: 3.3 – 3.7 GHz



LNA

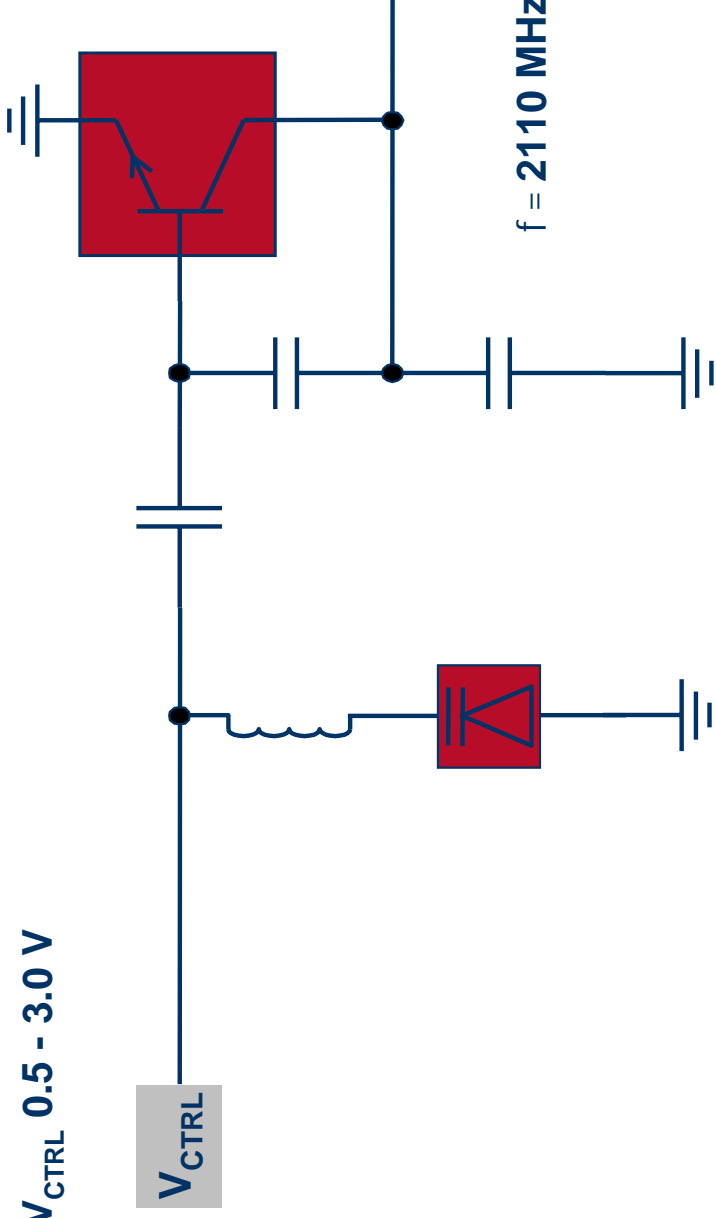
MMIC: BGA622L7 (Low Band)

RF Transistor: BFP640 / 640F / 620 / 620F (Low & Mid Bands)
BFP700series (Low & Mid Bands)

VCO Module for W-CDMA 2.1 GHz

> Applications > Mobile Communication

V_{CTRL} 0.5 - 3.0 V



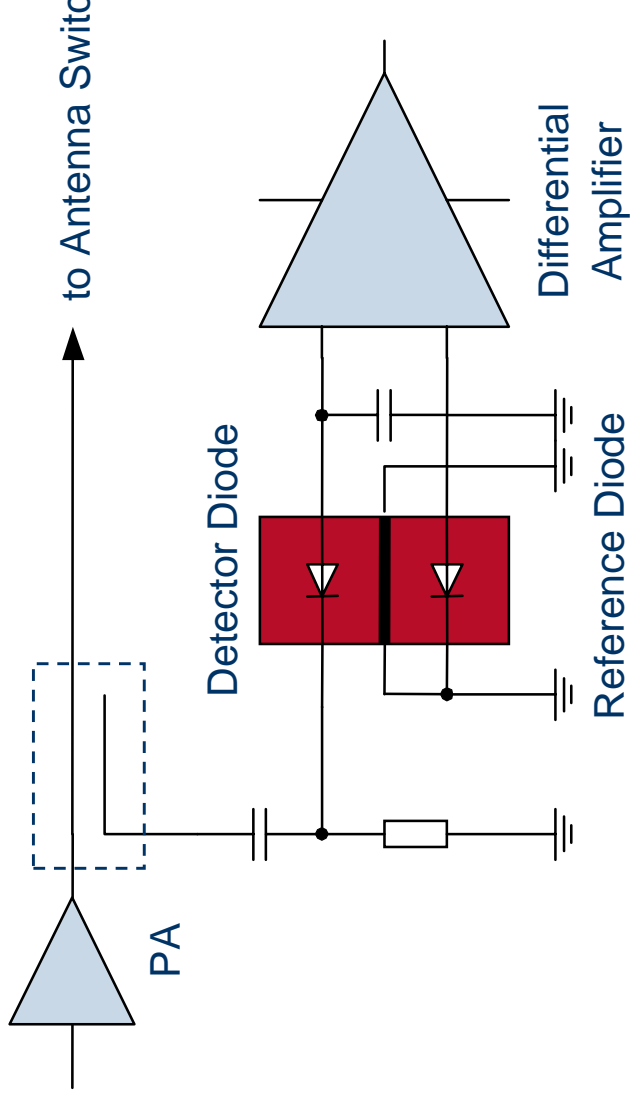
Varactor Diode: BBY58-02L



RF-Transistor: BFR360L3

High Isolation Schottky Diode Pair for Power Detection

> Applications > Mobile Communication



Schottky Diode Pair

BAT62-09S, BAT63-07W

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■ Mobile Communication

■ Consumer

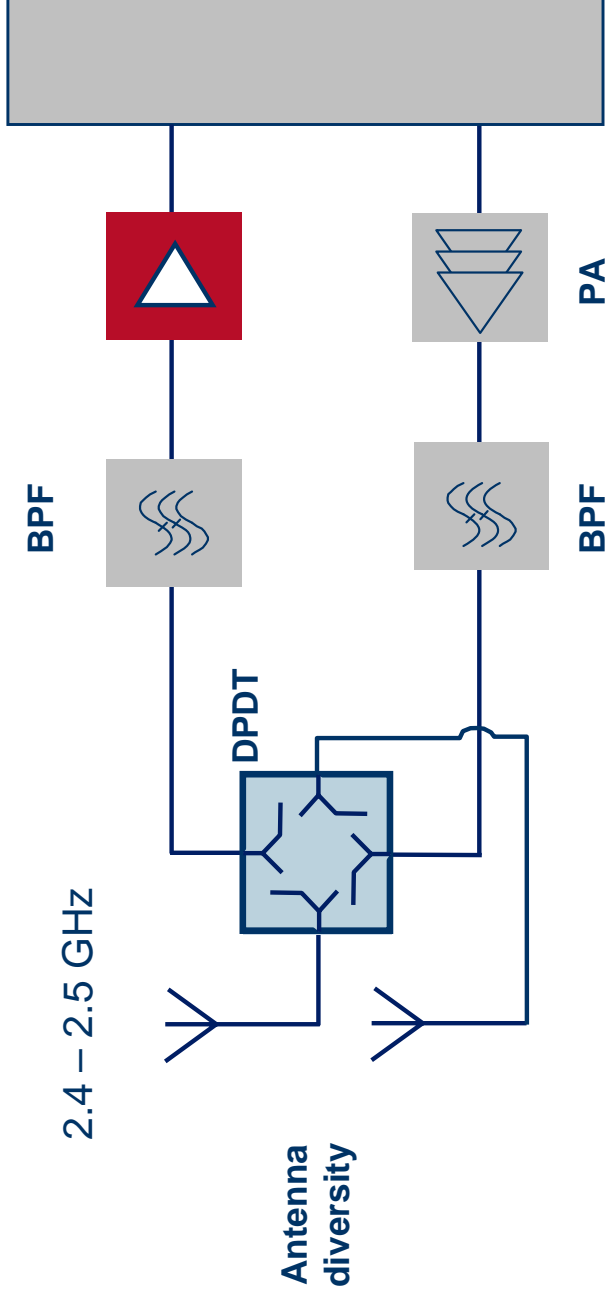
■ Automotive & Industrial

■ ESD/EMI Protection

■ Lighting

Wireless LAN (802.11b/g) 2.4 GHz WLAN Front-End

> Applications > Consumer



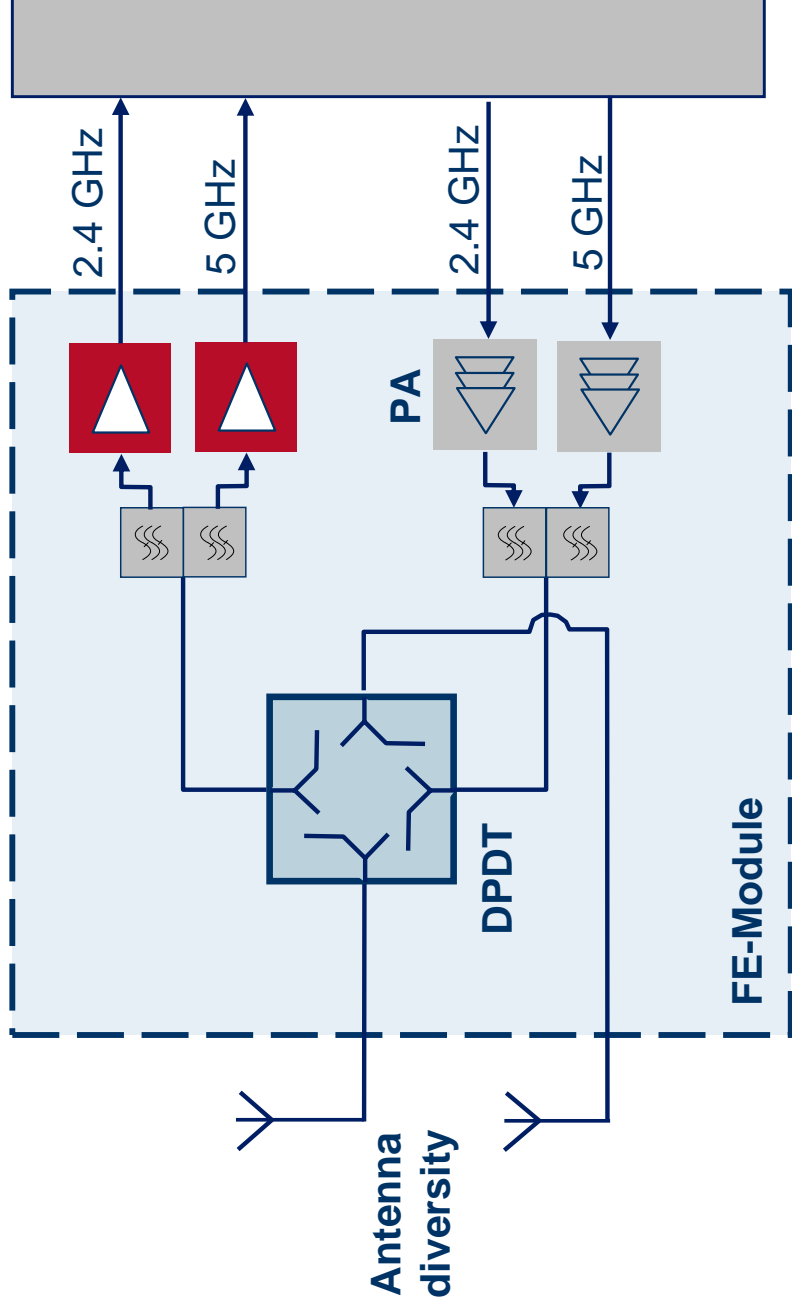
LNA

MMIC: BGA622L7 (2.4GHz - 802.11 b/g)

RF Transistor: BFP640 / 640F / 620 / 620F, **BFP700series**

Wireless LAN (802.11b/g, a/b/g/n) 2.4 and 5 GHz WLAN Front-End

> Applications > Consumer



LNA

2.4GHz:

MMIC: BGA622L7 RF Transistors: BFP640 / 640F / 640G

5GHz:

RF Transistor: BFP640 / 640F / 620 / 620F, BFP700se

2.4&5GHz:

MMIC: T1515, BGA700L16

R

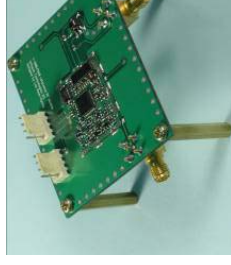
Reference Design Tuners with Infineon IC & Discretes

> Applications > Consumer

Reference designs available at Infineon Tuner Devision:

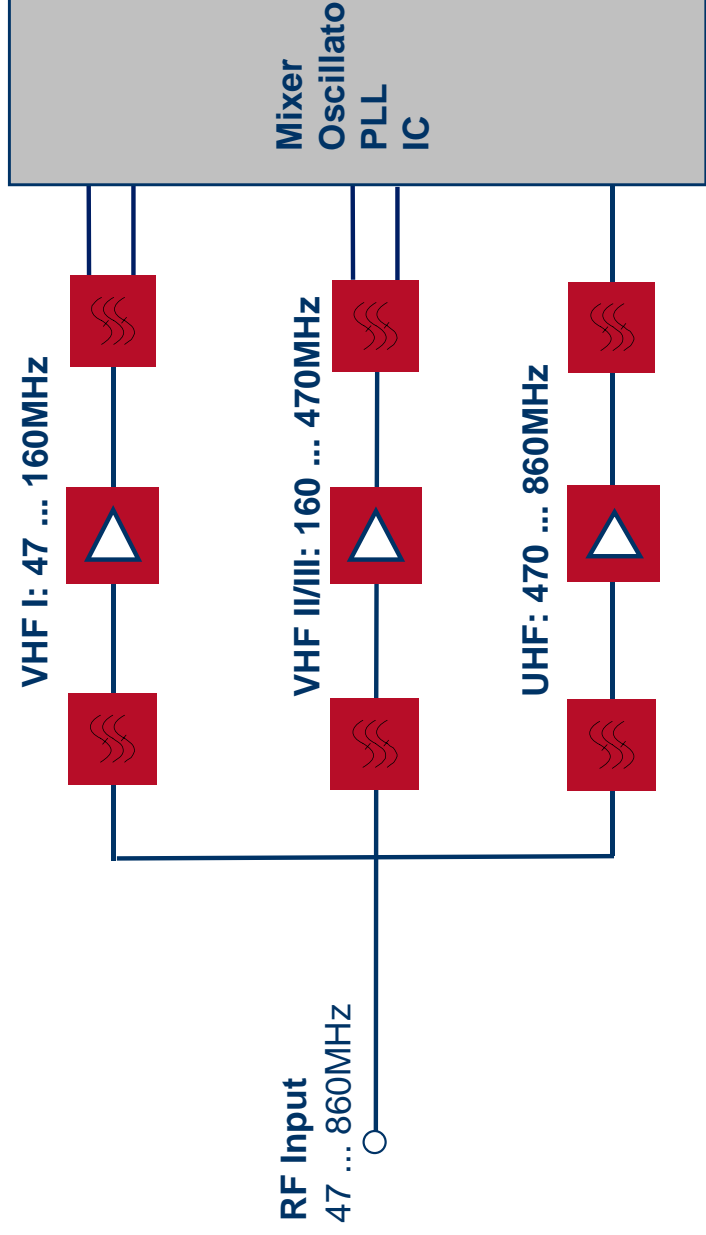
| Target application | Module | IC from COM TU |
|---------------------------------------|----------|----------------------------|
| Analog Terrestrial / Cable (PAL/NTSC) | Tuner | KTS6027-2 |
| Digital Cable | Tuner | TUA6030 |
| Digital Terrestrial | Tuner | TUA6034 |
| | NIM | TUA6034 + TDA6192 + Demod* |
| ATSC | Tuner | TUA6034, TUA6030 |
| | NIM | TUA6034 + TDA6192 + Demod* |
| ISDB-T | Tuner | TUA6034 |
| Digital Portable | Half-NIM | TUA6034 + TDA6192 |
| | Half-NIM | TUA6045 |
| 3V T-DMB | Half-NIM | TUA6041 |
| 3V DVB-H/T UHF | Half-NIM | TUA6041 |
| 3V 3-band | Half-NIM | TUA6041 |

*Demodulator IC from Co-operation partner



Module Tuner for Analog / Cable / Terrestrial

> Applications > Consumer



MOSFET VHF III/UHF

BG3130/R (Dual)
 BG3123/R (Dual)
 BG5130R (Dual)



Tank Circuit

Varactor Diode VHF III/UHF

MOSFET VHF I/II

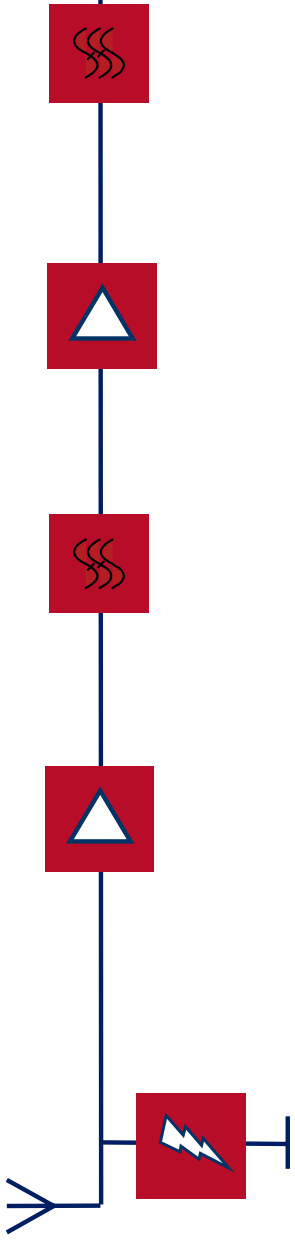
BF2030W
 BF2040W
 BF5030W

Varactor Diode VHF I/II

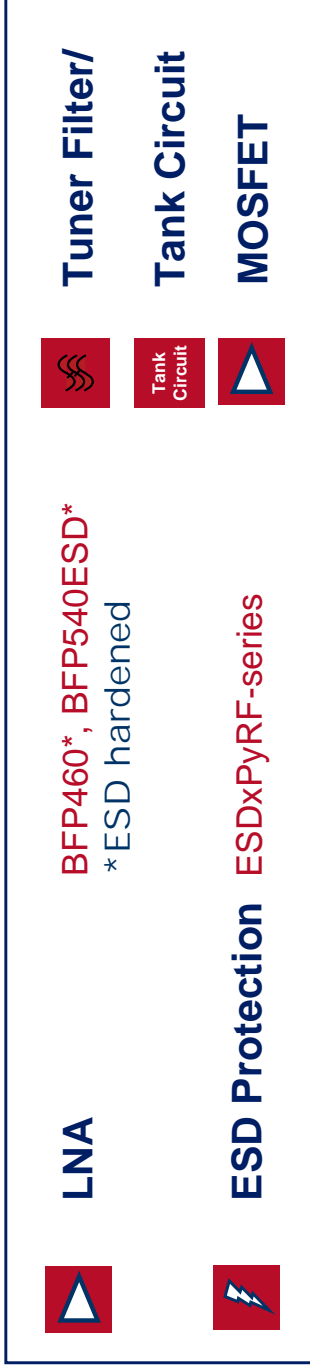
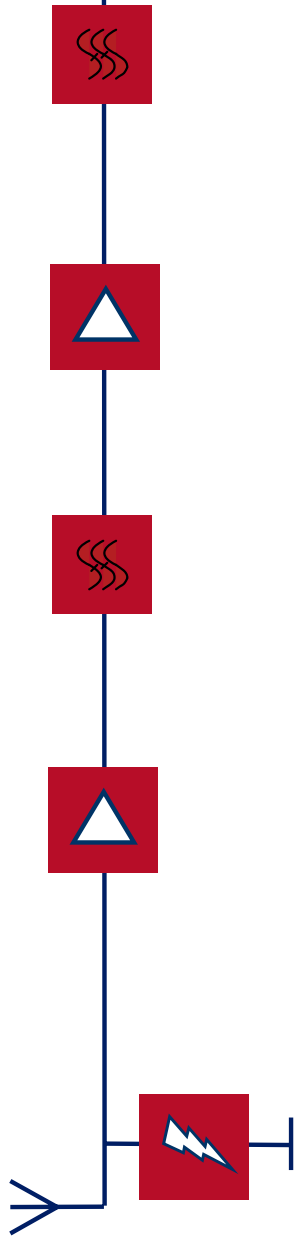
T-DMB/DAB in VHF Band III and L-Band

> Applications > Consumer

VHF III 170MHz-240MHz

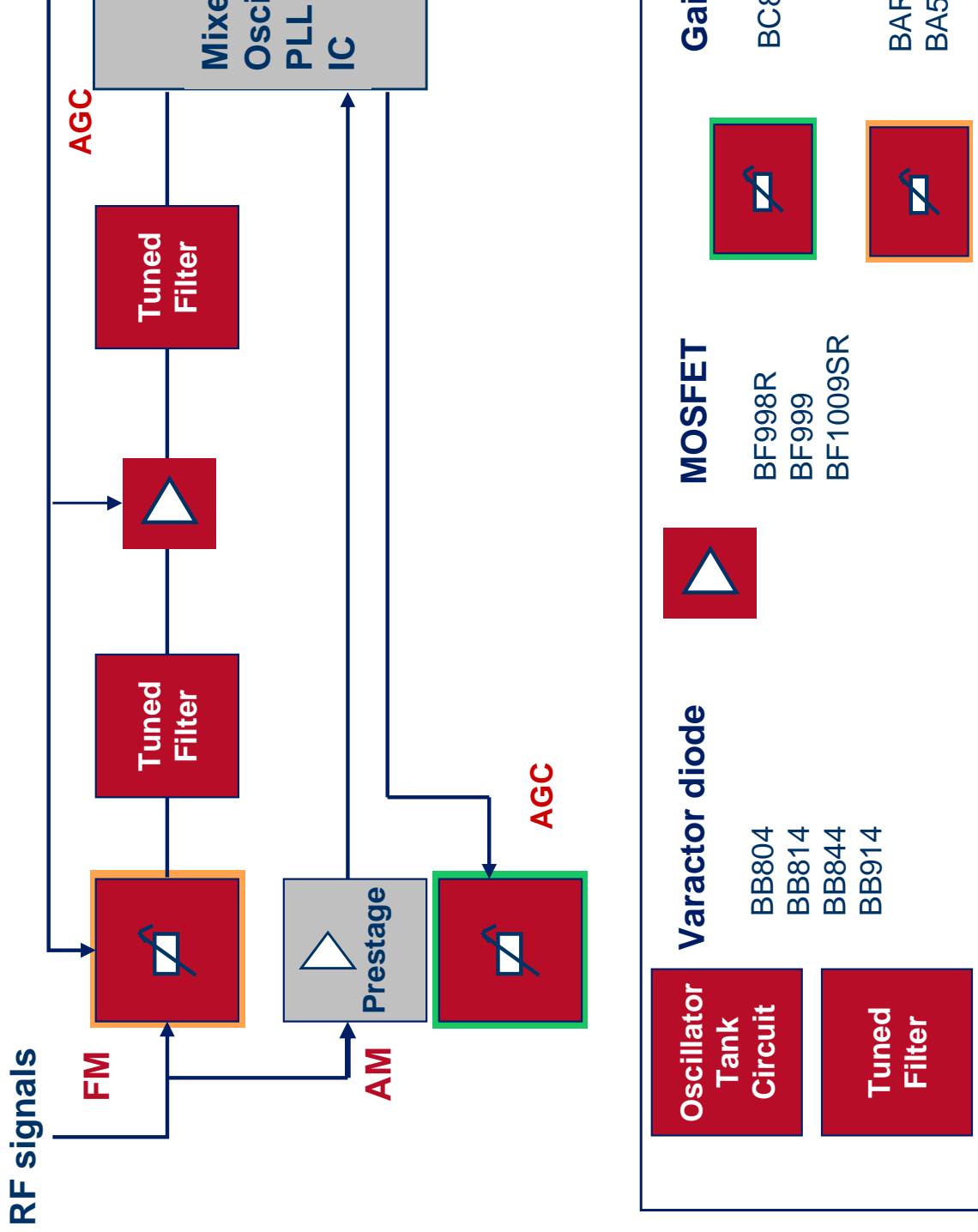


L-Band



FM Tuner

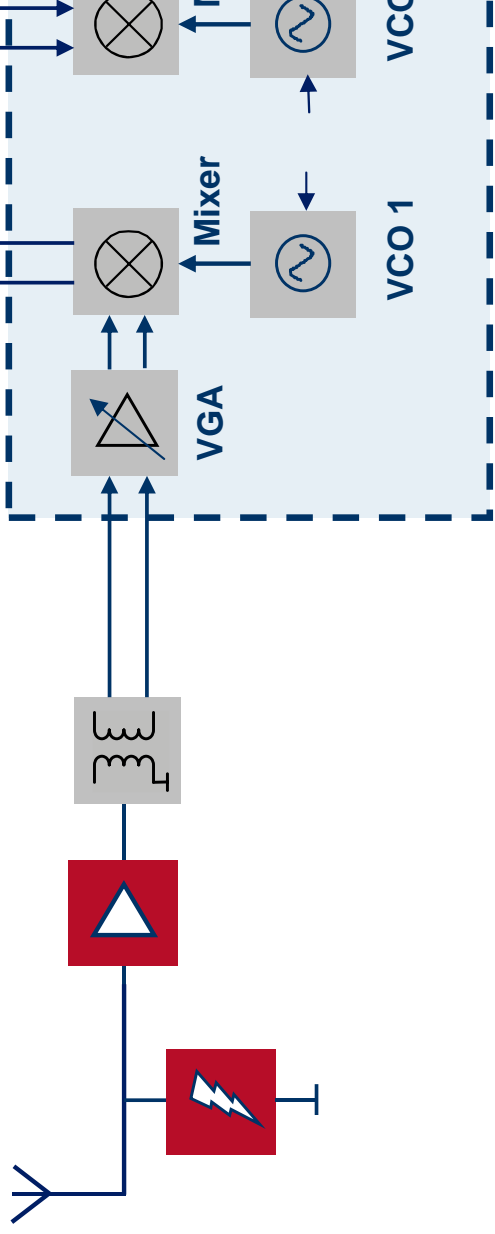
> Applications > Consumer



Si-Tuner System for CATV/DVB-T

> Applications > Consumer

CATV / DVB-T: 40 ...860 MHz



LNA

BFP460*, **BFP540ESD***, **BFP700series**
BGA622(L7), **BGA612**, **BGA614**, **BGA616**



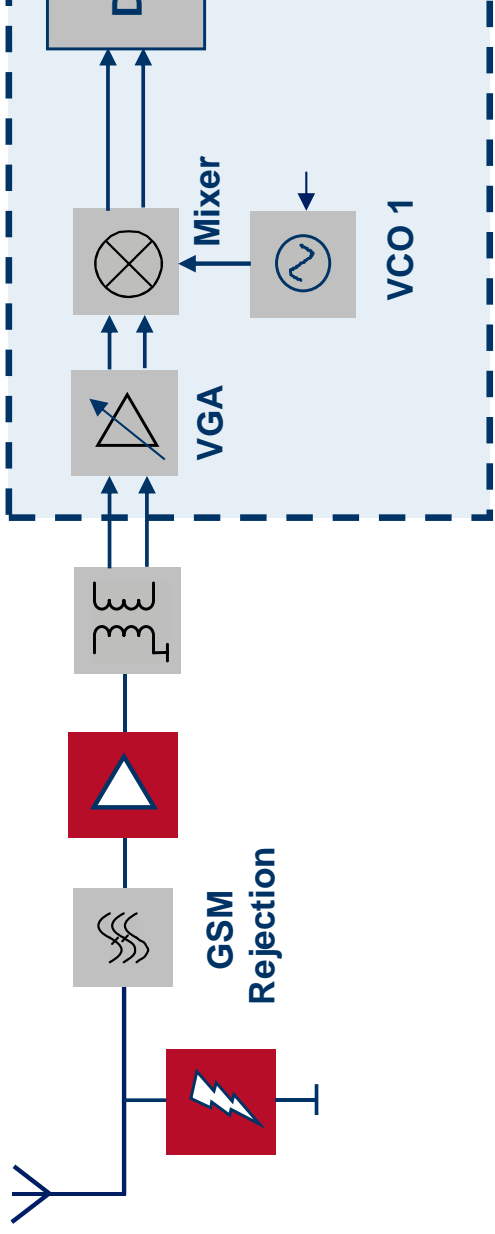
ESD
Protection

ESDxPyRF-series

Si-Tuner System for Mobile TV

> Applications > Consumer

DVB-H: VHF III/UHF/L-Band
DVB-S: 950...2150MHz



LNA

BGA622(L7), BGA612, BGA614, BGA616
BFP460*, BFP540ESD*, BFP700series

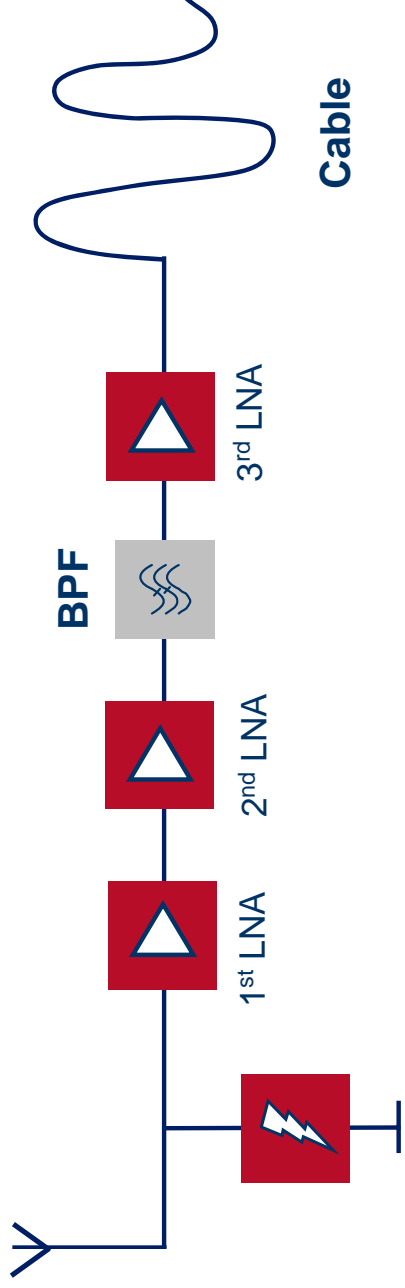


**ESD
Protection**

ESDxPyRF-series

Active Antenna (Tuner, Cellular, GPS) for Portable Applications

> Applications > Consumer



1st/ 2nd LNA

BFP700series, BFP640, BFP640F



3rd LNA

BFP650



ESD Protection

ESDxPyRF-series

Re

WiMAX Transceiver System

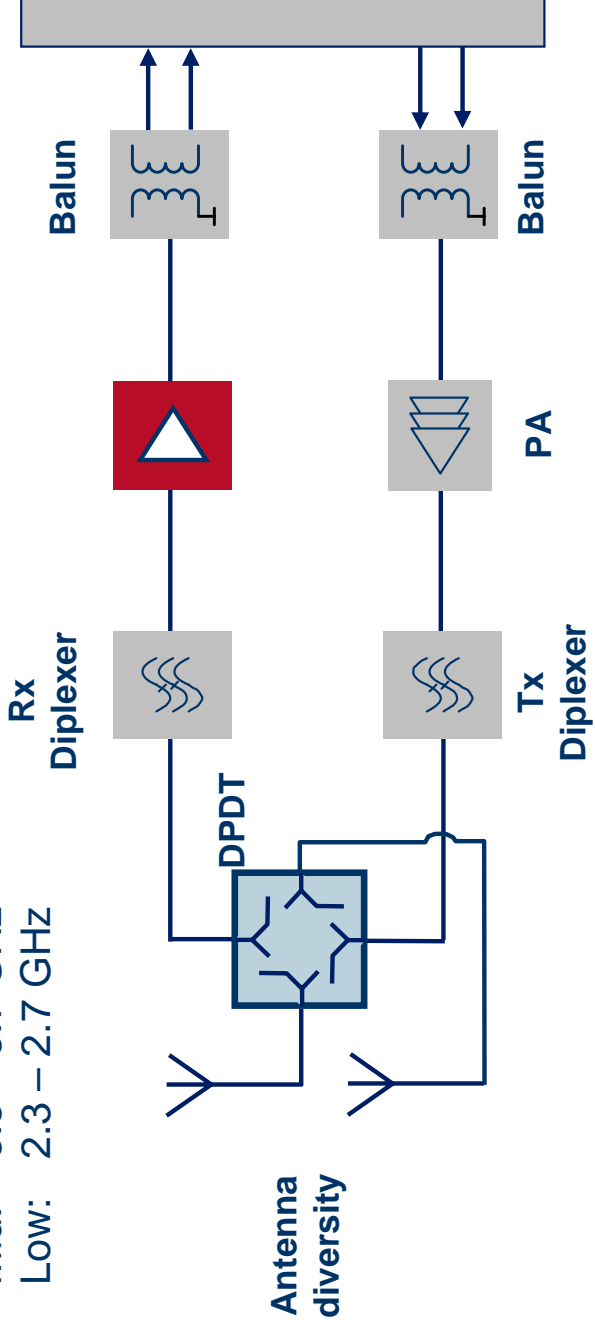
> Applications > Consumer

WiMAX frequencies

High: 5.7 – 5.9 GHz

Mid: 3.3 – 3.7 GHz

Low: 2.3 – 2.7 GHz



 **LNA**

MMIC:

BGA622L7 (Low Band),

T1515 & BGA700L16 (Low / High Band)

BFP640 / 640F / 620 / 620F (Low / Mid

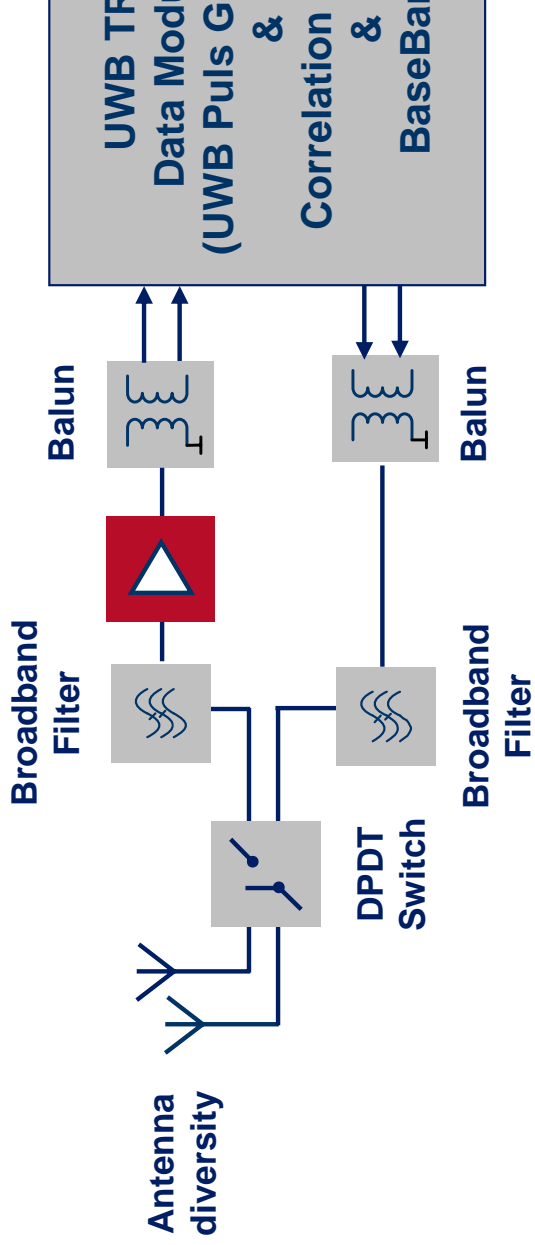
BFP700series (Low / Mid / High Band

RF Transistor:

R

UWB Transceiver System

> Applications > Consumer

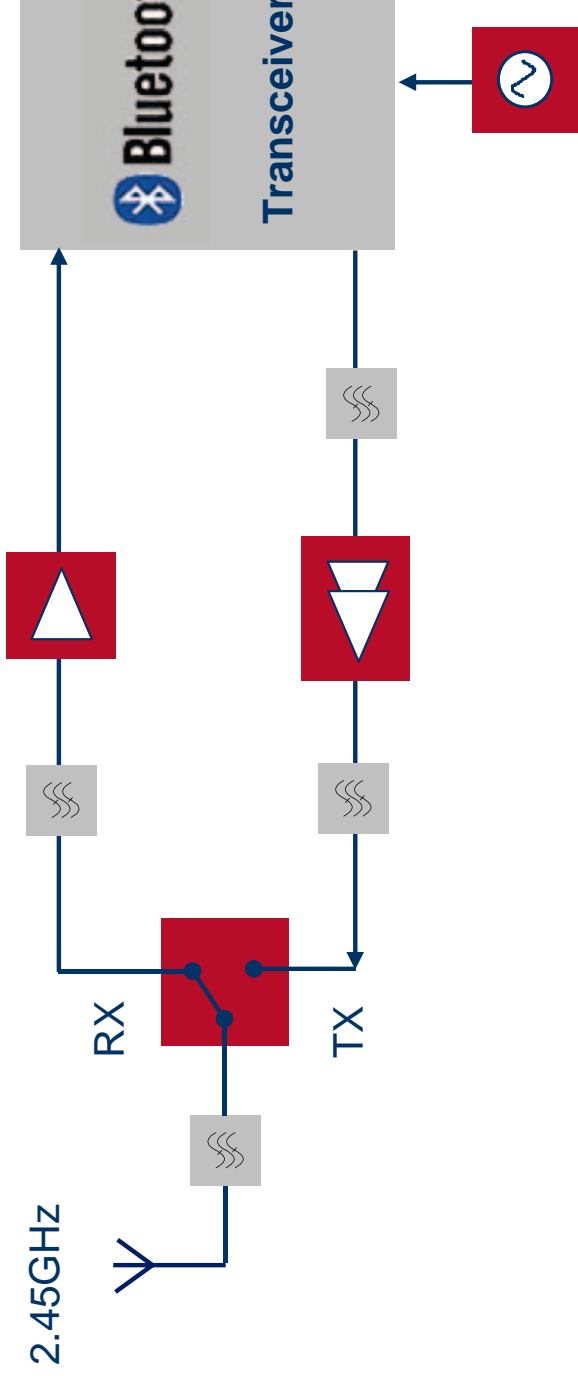


LNA

BFP700series

Bluetooth (BT) Front End for Bluetooth Class 1

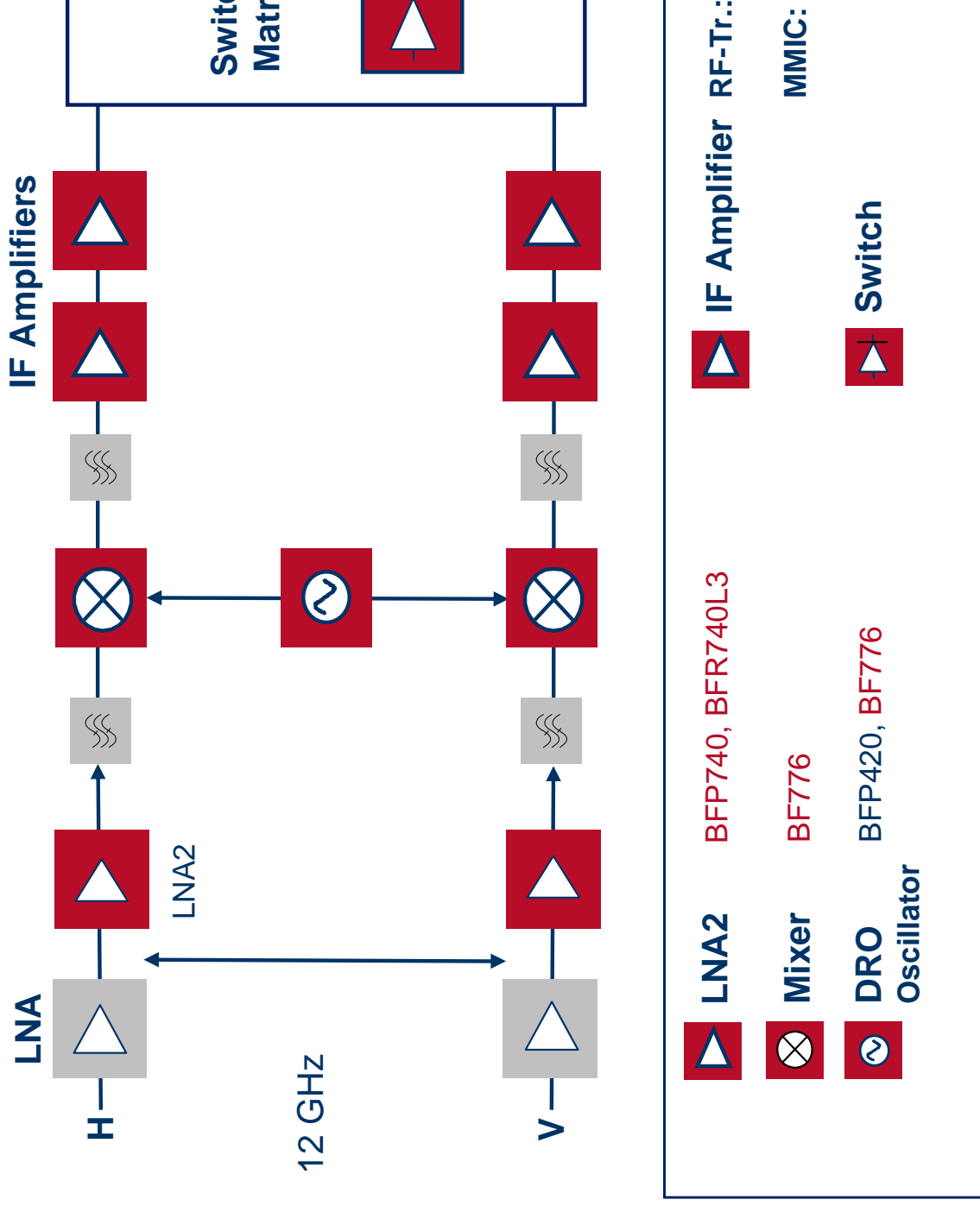
> Applications > Consumer



| | | | | | | |
|---|---------------|-----------------------|---|---|-----------|-----------|
|  | LNA | MMIC: | BGA622L7, BGA428 BGA427 |  | PA | BF |
| | | RF Transistor: | BFP640 / 640F / 620 620F / 540F / 640 | | | BF |
|  | ANT SW | | BFP700series BAR88x, BAR90x BAR63x, BAR64x BAR65x |  | LO | BF |
| | | | | | | BE |

Low Noise Block (LNB) Twin LNB - Block Diagram

> Applications > Consumer

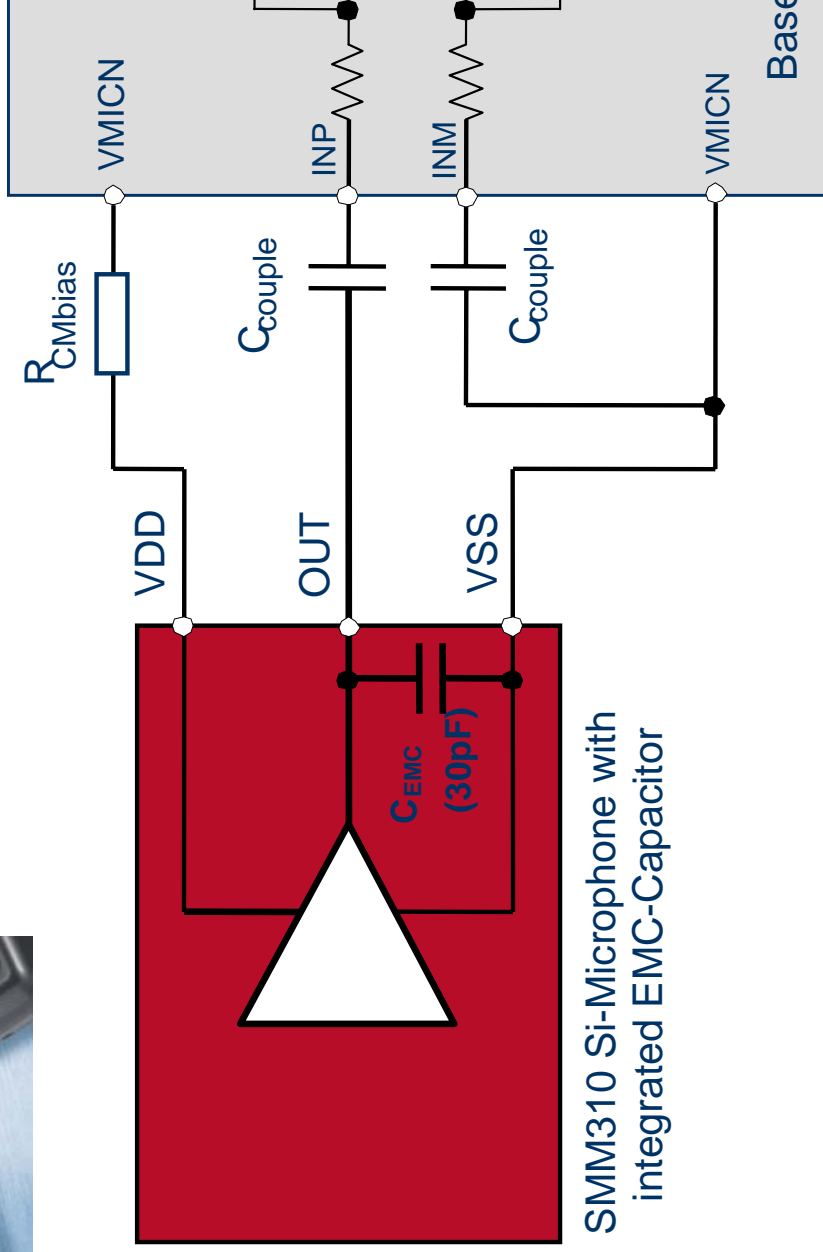


SMM310 Si-MIC for Portable Applications

> Applications > Consumer

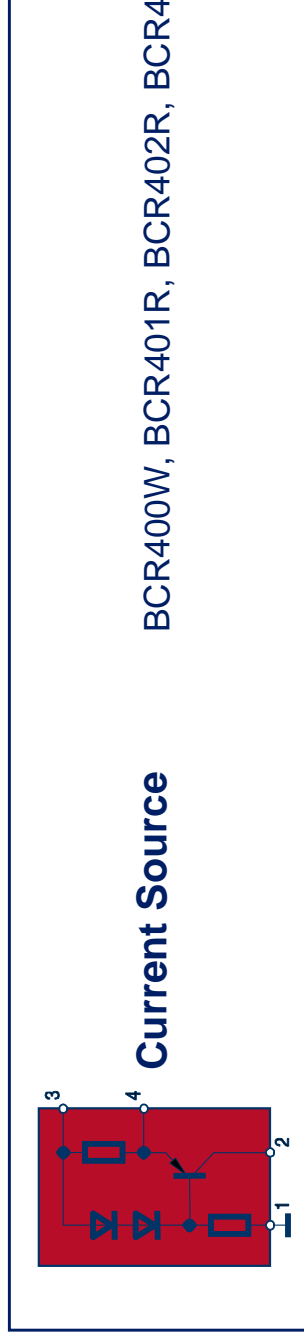
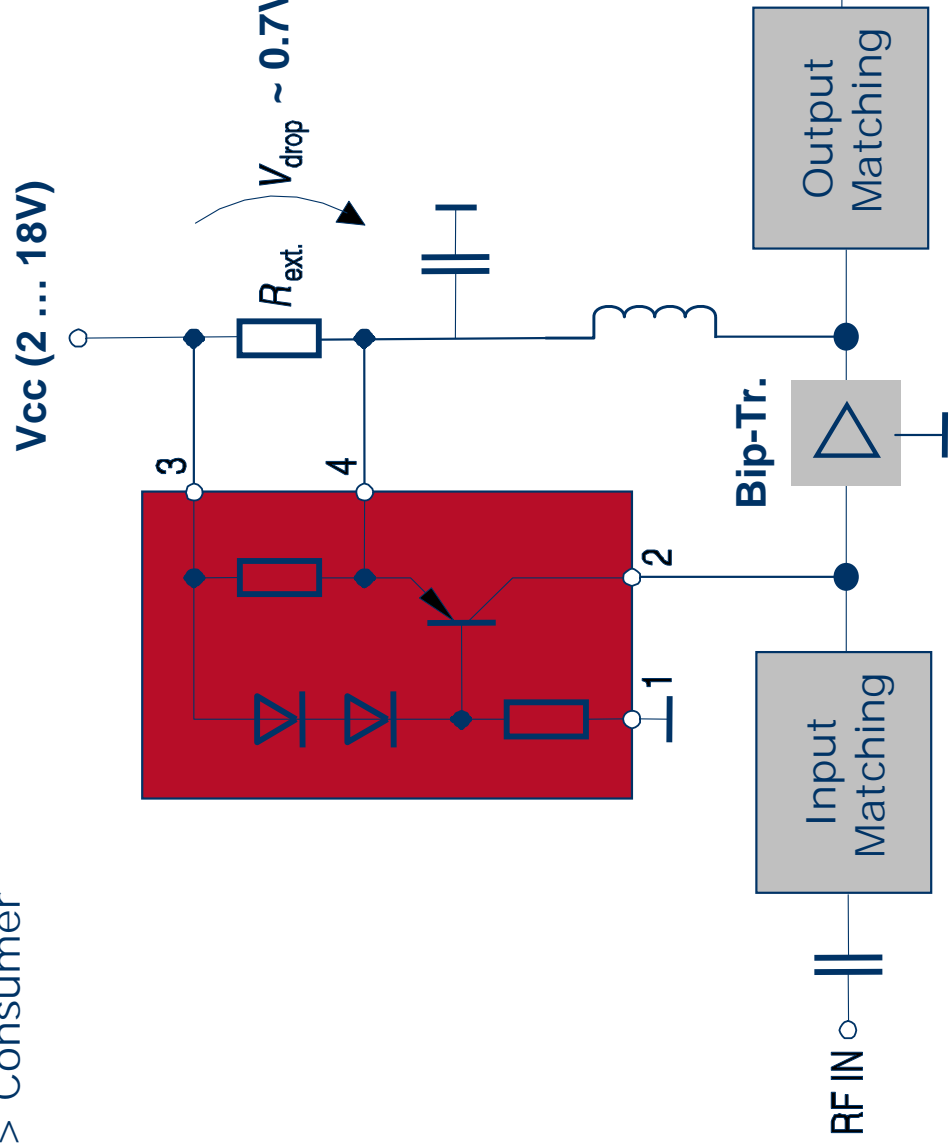


Silicon Microphone



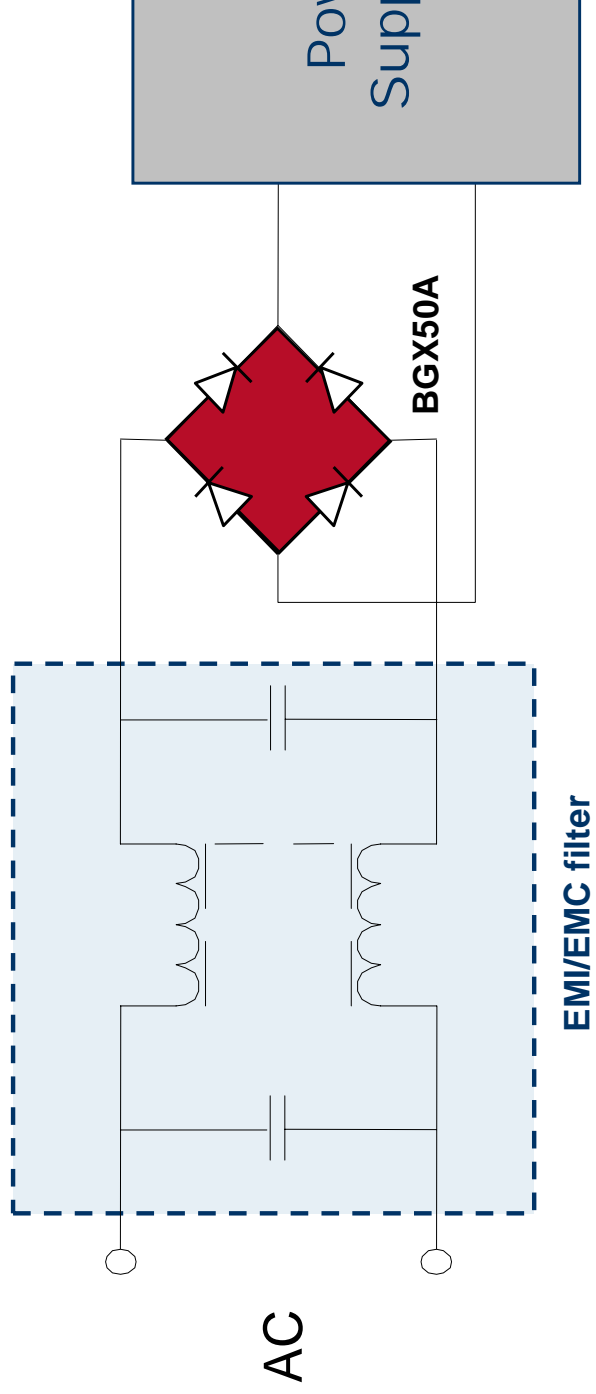
Active Bias Controller/Universal Current Source for GaAs and BJT Transistors/MMICs

> Applications > Consumer



Bridge Rectifier Diode for Power Supplies

> Applications > Consumer



Bridge Rectifier

BGX50A

PC Motherboard

Protection devices and discrete components

> Applications > Consumer

ESD/EMI

Interface protection

USB 

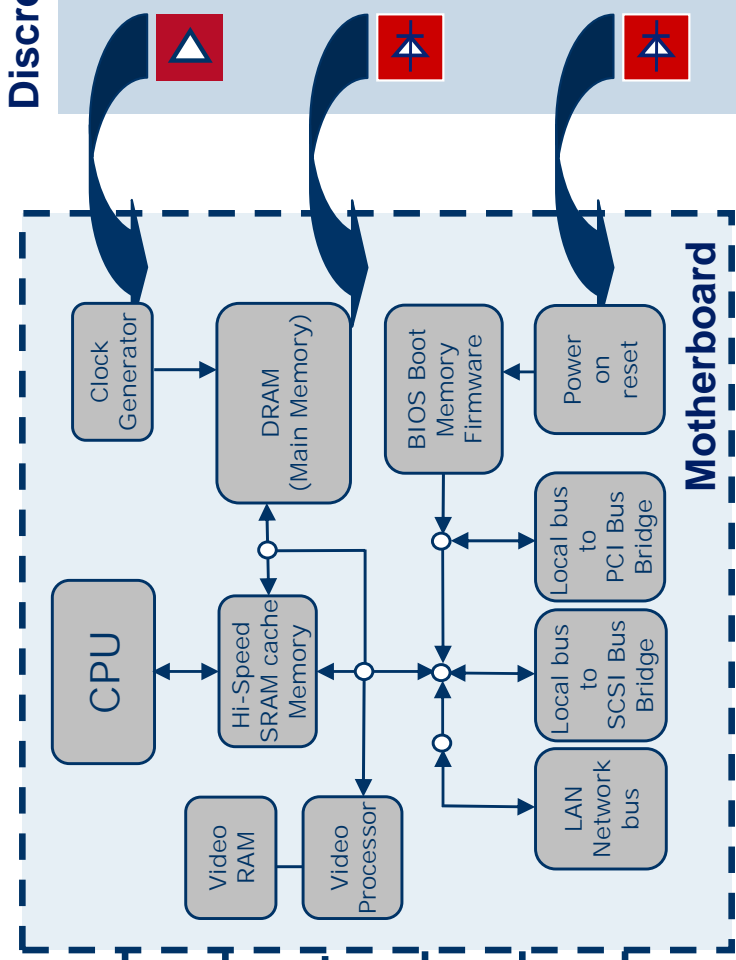
Firewire 

TV Out 

VGA Out 

CardReader 

External Storage 



Protection diode

ESDOP8RFL, ESD5V0Sx, **ESD8VOLxx**



AF transistors

BCRxx, BCxx, SMBTxx



AF Diodes

BATxx, BASxx, BAVxx

ESD/EMI HiPAC & TVS diodes



HiPAC

BGF110, BGF104, BGF109, BGF100, BGF200

Discrete Solution*)

ESDOP8RFL, ESD5V0Sx, **ESD8VOLxx**

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■ Mobile Communication

■ Consumer

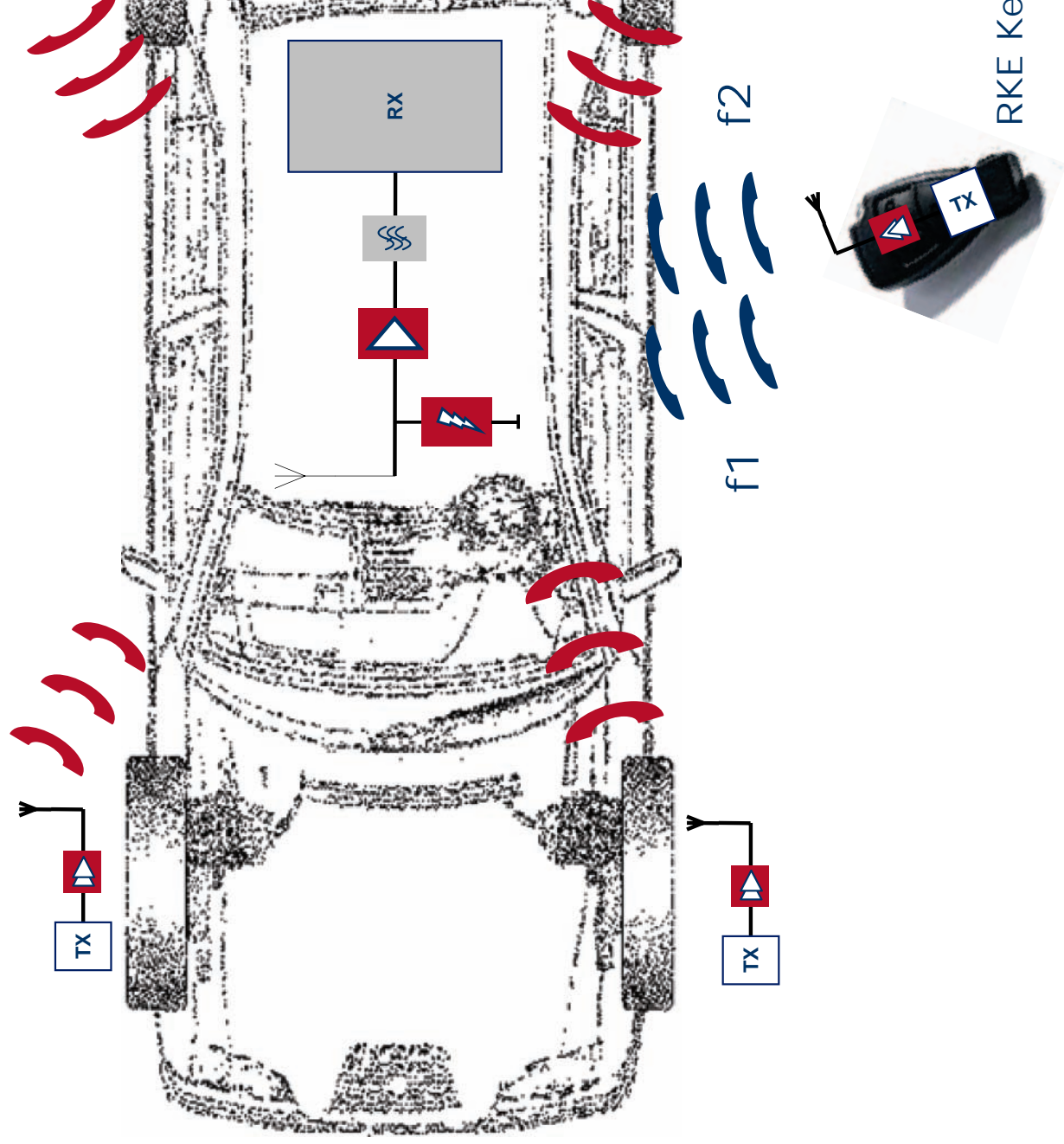
■ Automotive & Industrial

■ ESD/EMI Protection

■ Lighting

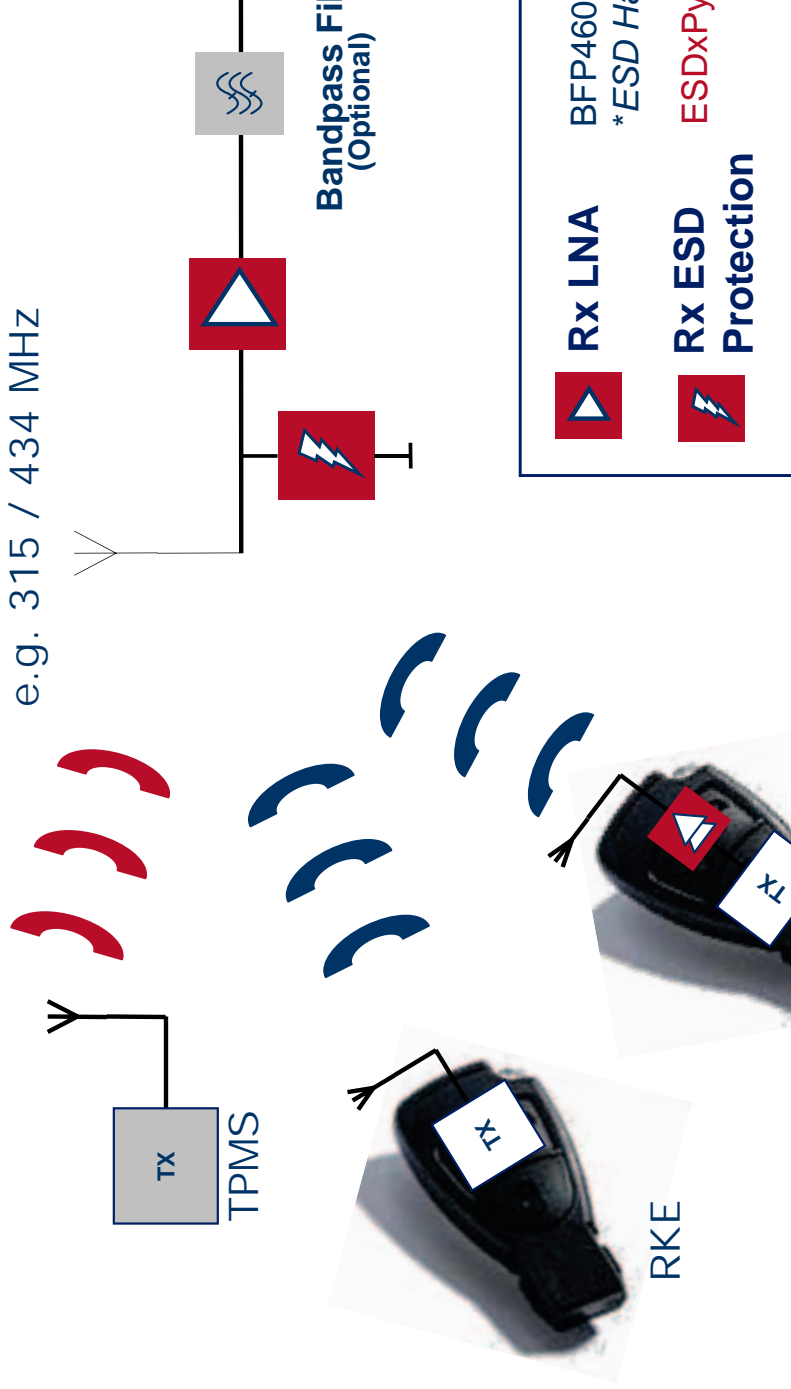
Tire Pressure Monitoring System (TPMS), Remote Keyless Entry (RKE) and Remote Start Applications

> Applications > Automotive

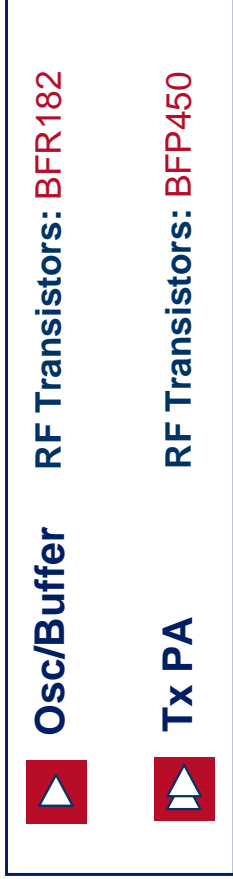


TPMS, RKE & Remote Start KeyFob, Receiver Solution for long Antenna Range

> Applications > Automotive

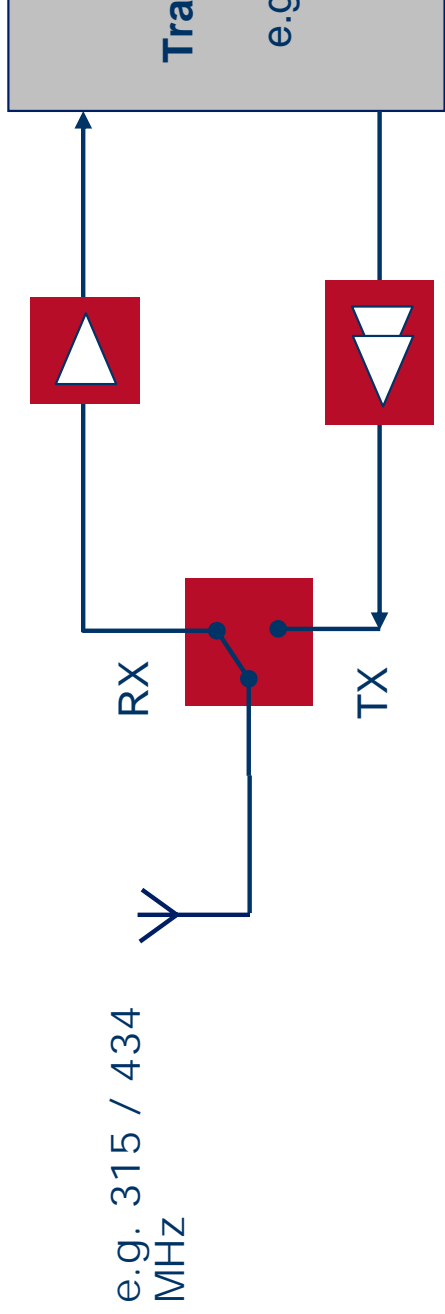


RKE KeyFob for Remote Start e.g. Aircon etc.



Car Alarm Transceiver Solution (KeyFob and Car Unit)

> Applications > Automotive



LNA

ESD Hardened RF Transistors:

BFP460*, BFP540ESD*

* ESD Hardened



PA

MMIC: BGA616

RF Transistors: BFP450, BFP650

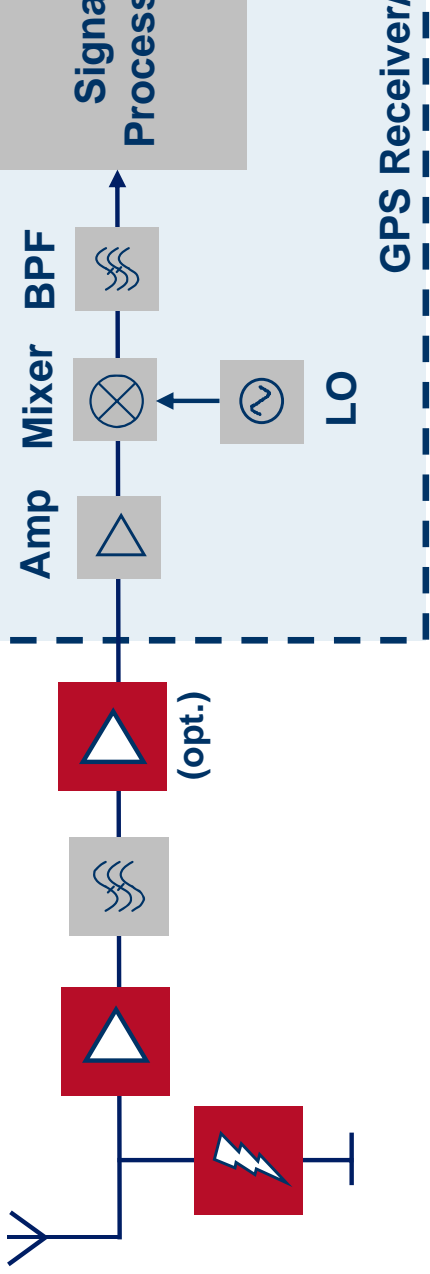


ANT SW

Global Positioning System (GPS) GPS Receiver

> Applications > Automotive

1575.42 MHz



LNA

BGA615L7, BGA622(L7), BGA428

BFP640, BFP460*, BFP540ESD* – * ESD Hardened



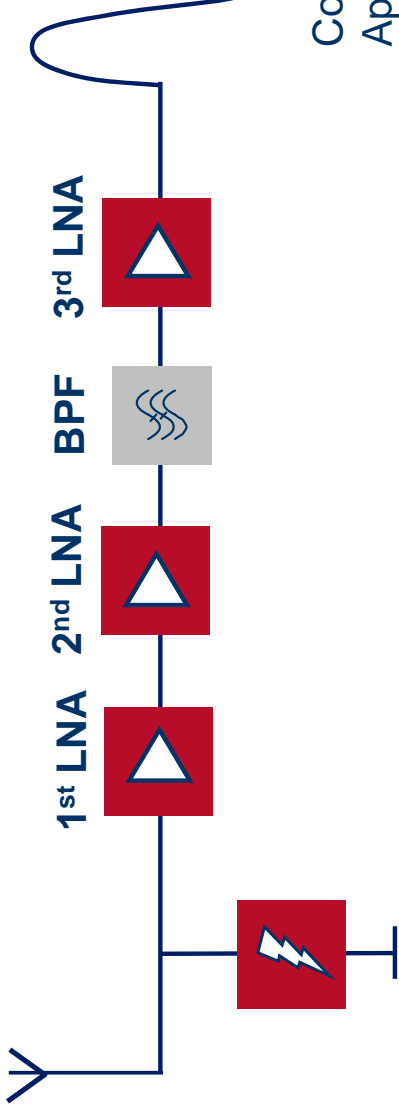
ESD Protection

ESDxPyRF-series

Active Antenna (Tuner, Cellular, GPS, SDARS)

Example: Solution for SDARS Radio 2332.5 - 2345 MHz

> Applications > Automotive



 **1st/ 2nd LNA**

BFP740, BFP640, BFP640F

 **3rd LNA**

BFP650



ESD Protection

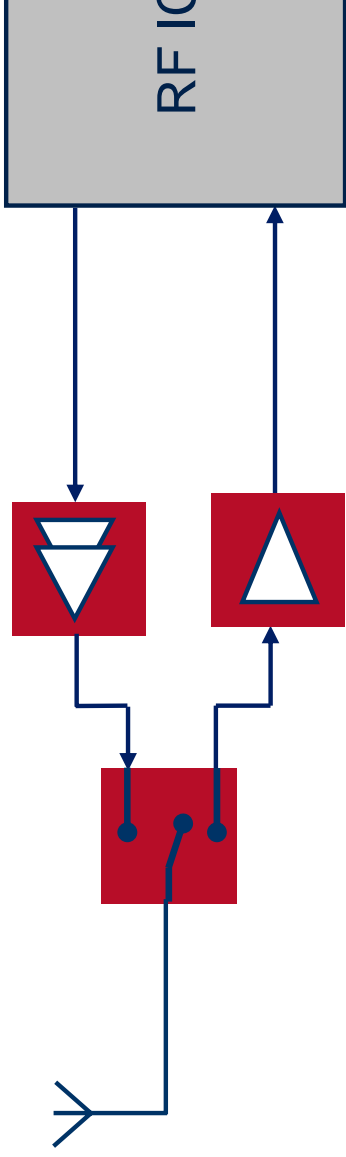
ESDxPyRF-series

Re

ZigBee

low power digital radio system up to 2.5 GHz

> Applications > Automotive



 **LNA**

RF Transistors:
MMIC:

BFR705L3RH, BFP540
BGA622, BGA428

 **Driver**

RF Transistors:
MMIC:

BFP450, BFP650
BGA612, BGA614, BG

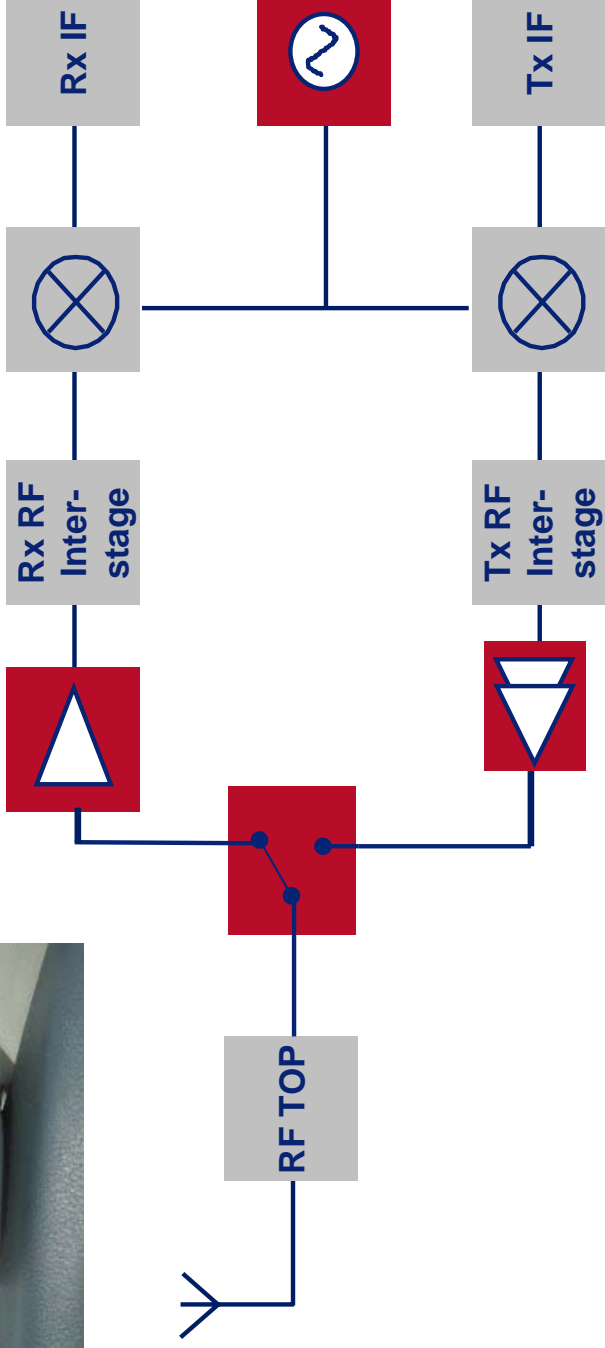
 **PIN Diode**
Switch

BAR88x, BAR90x, BAR63x, BAR64x, BAR65x

Electronic Toll Collect (ETC)

ETC – 5.8GHz Electronic Toll Collect

> Applications > Automotive



LNA

RF Transistors: BFP640F, BFP700series



LO



PA

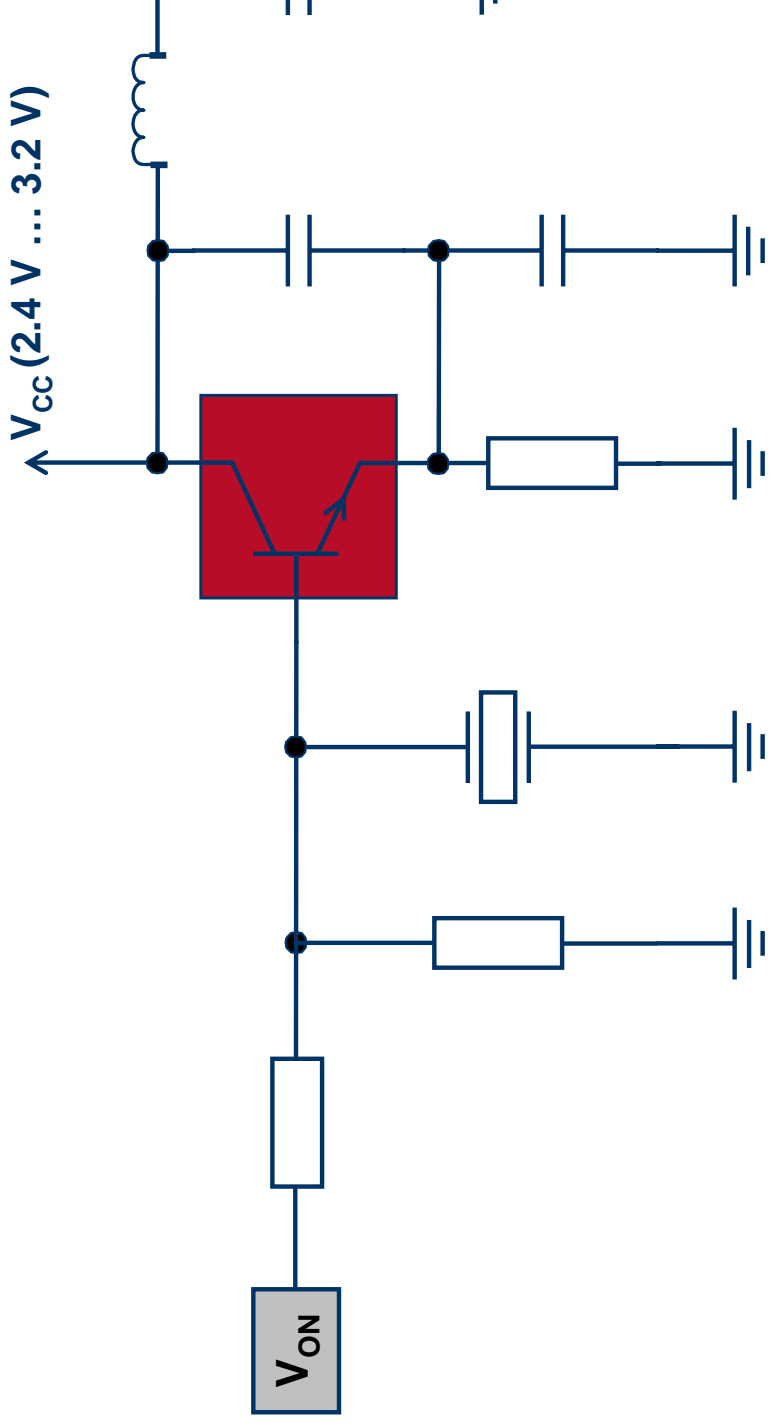
RF Transistors: 2xBFP520+BFP650



ANT SW

Discrete Based Oscillator for RKE (Remote Keyless Entry) KeyFob

> Applications > Automotive

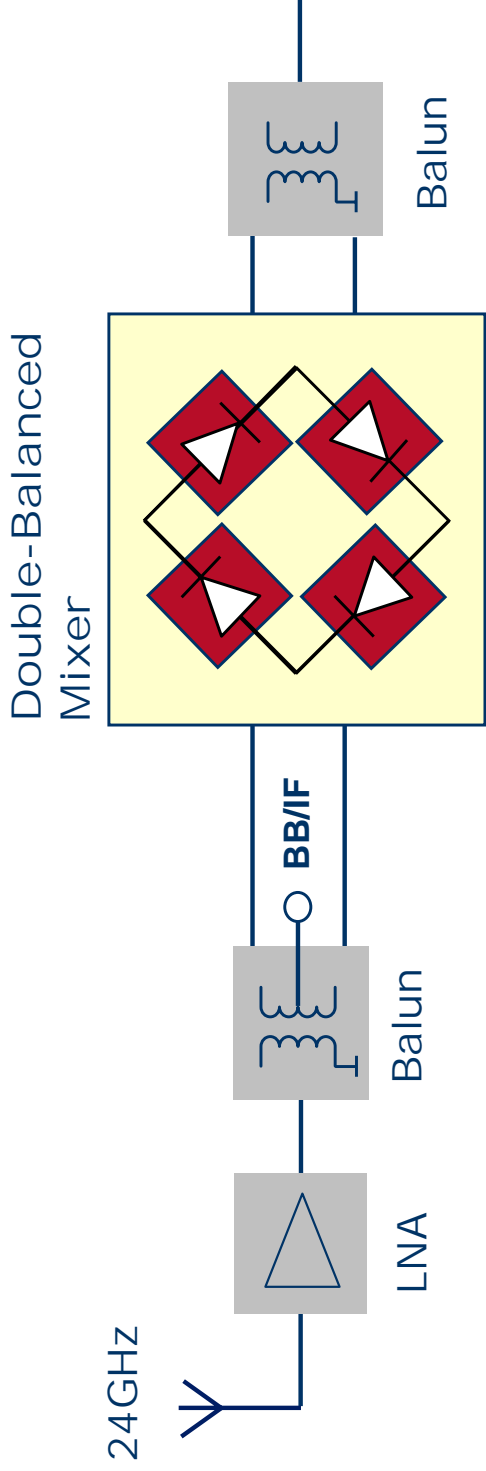


RF-Transistor: BFR182

Re

Schottky Diodes for 24GHz Radar System

> Applications > Automotive

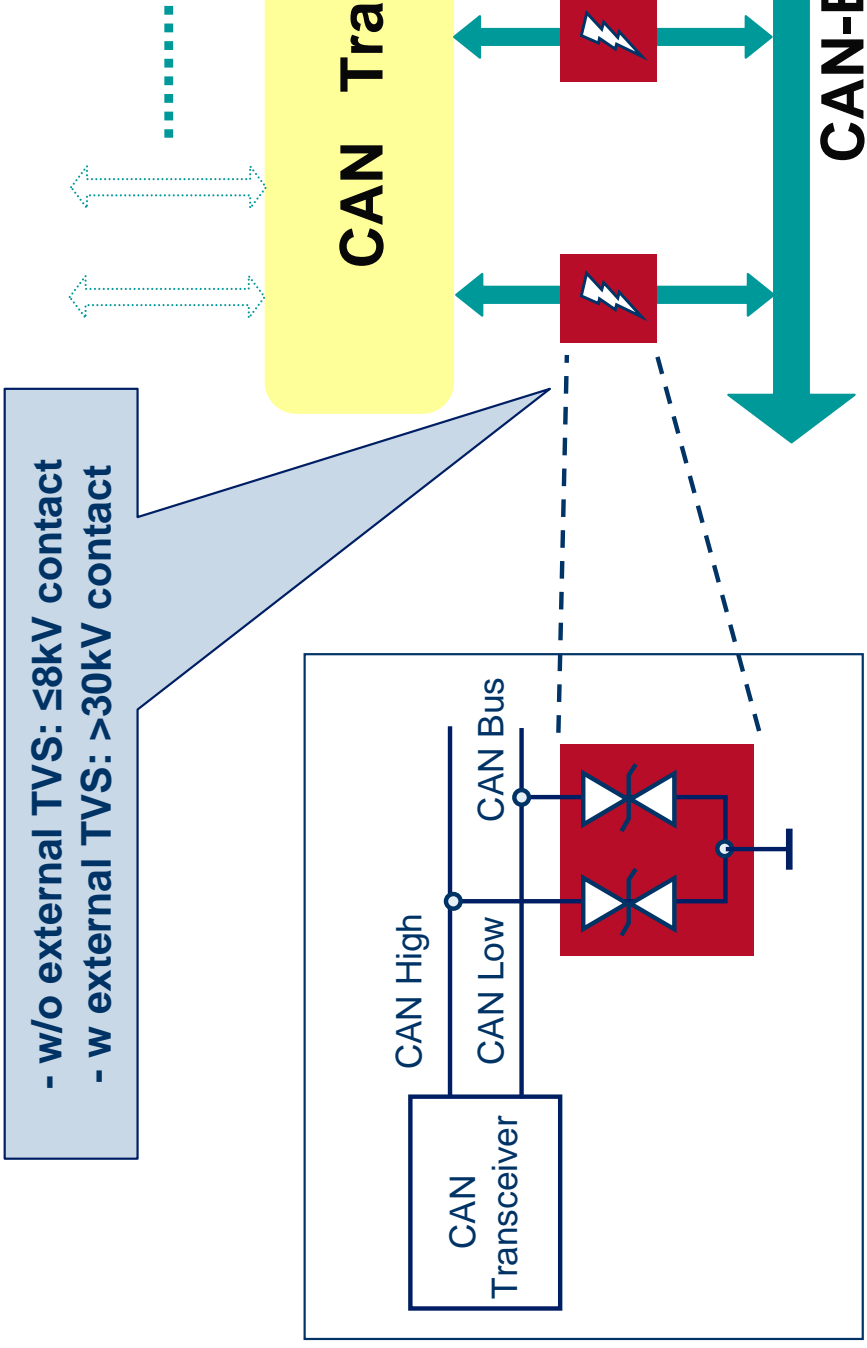


RF Schottky Diode

BAT24-02LS

Automotive CAN Network ESD-protection of CAN Bus Transceiver

> Applications > Automotive & Industrial



ESD Protection

ESD24VS2B

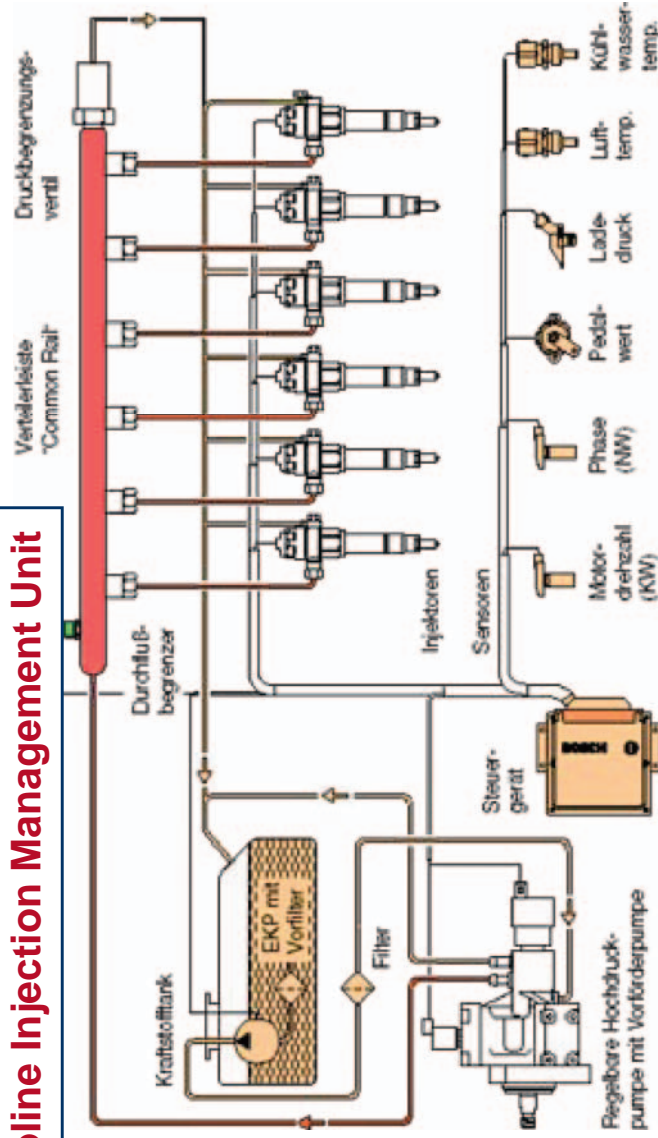
Engine/ Injection Management

> Applications > Automotive

Engine Management Unit



Gasoline Injection Management Unit



Convenience and Safety

> Applications > Automotive



**Door Module:
Side Mirror**

Window Lifter

E.g. door module :

AF Transistors

Digital Transistors

AF Diodes

LED driver

CAN ESD Protection

3x BC847S, 5x BC857S, 1x BC817-

2x BCR135, 2x BCR185

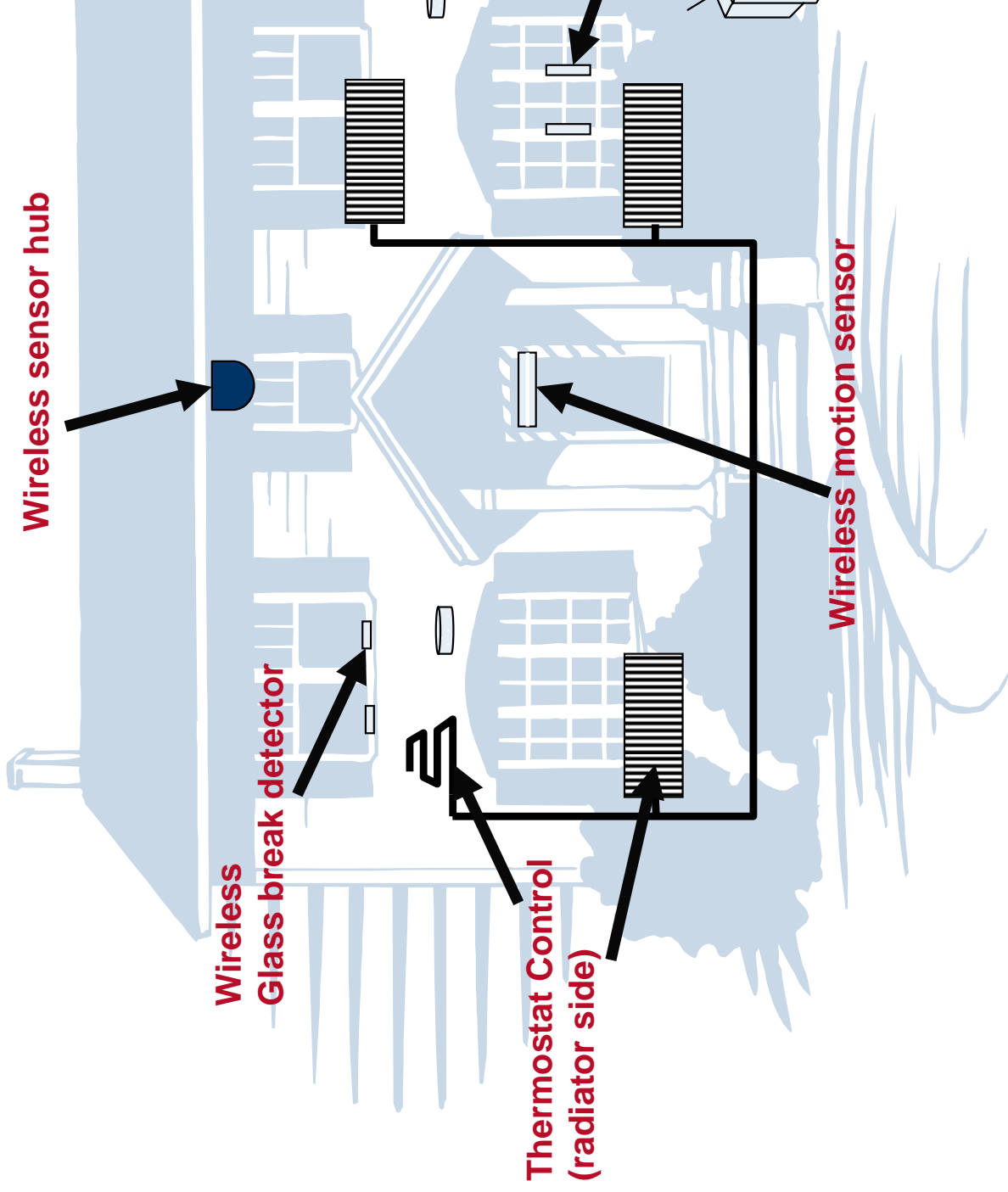
1x BAT64, 2x BAV70

BCR40xU

ESD24VS2B

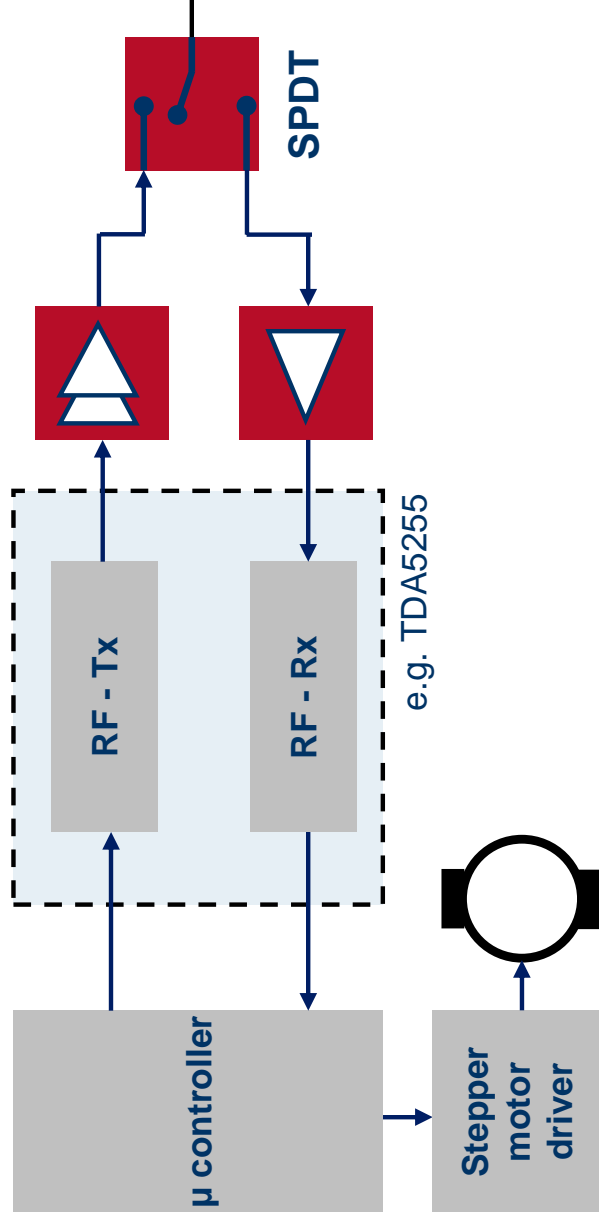
Home: Comfort, Control and Security

> Applications > Industrial



Home Comfort, Control and Security Thermostat Control – radiator side (EU: 868

> Applications > Industrial



 **LNA**

BFP460*, **BFP540ESD*** – * integrated ESD protection



ESDxPyRF-series

System ESD Protection

Discrete: **BFP450 + BFP405**



Driver

MIMIC: **BGA622L7, BGA612, BGA614, BGA615**



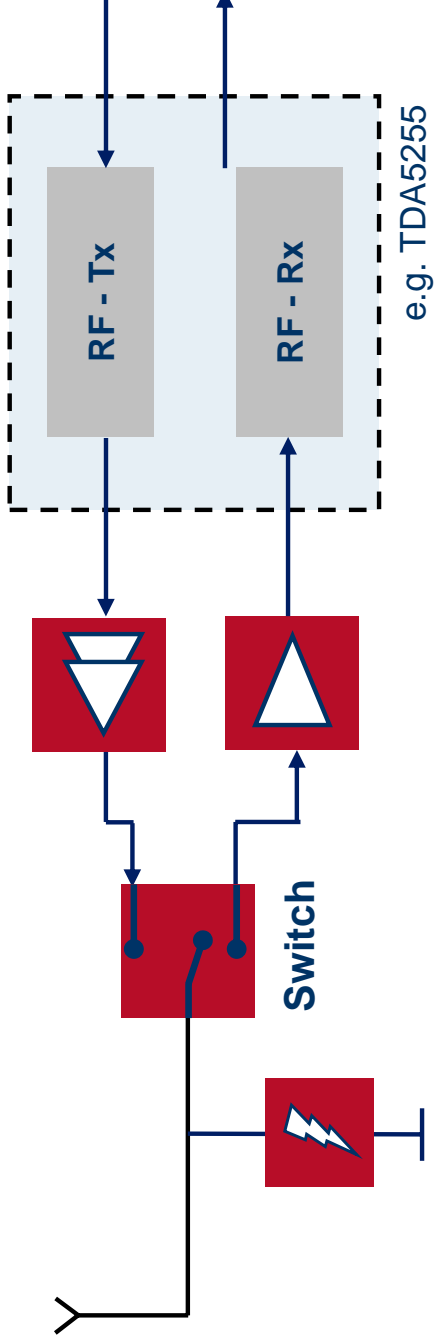
PIN Diode Switch

BAR88x, BAR90x, BAR63x, BAR64x, BAR65

Home Comfort, Control and Security

Thermostat Control – operator side

> Applications > Industrial

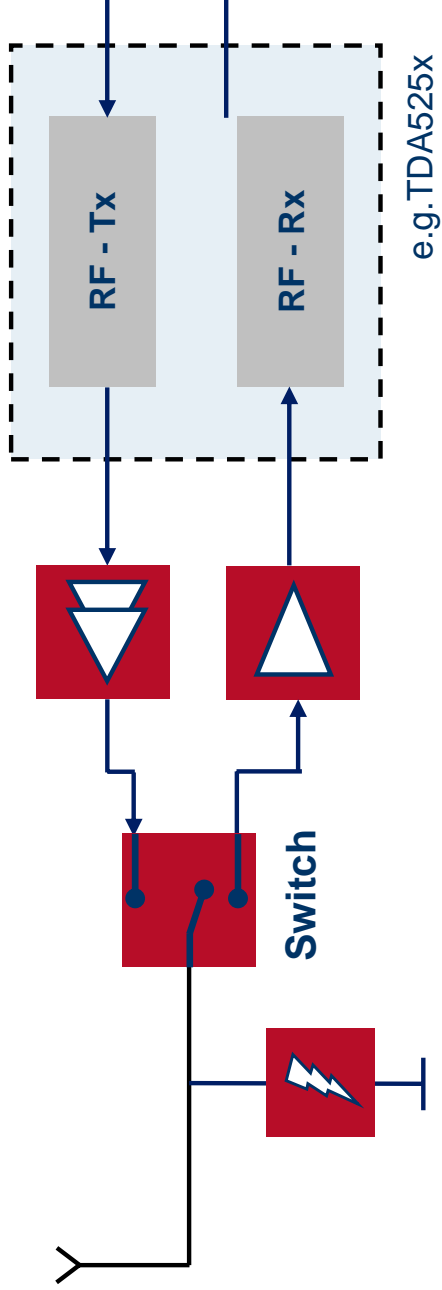


| | | |
|--|------------------------------|--|
| | LNA | BFP460* , BFP540ESD* – * integrated ESD protection |
| | System ESD Protection | ESDxPyRF-series |
| | Driver | Discrete: BFP450 + BFP405 MIMIC: BGA622L7, BGA612, BGA614, BGA615 |
| | PIN Diode Switch | BAR88x, BAR90x, BAR63x, BAR64x, BAR65x |

Home Comfort, Control and Security

Wireless smoke sensor hub (EU: 868MHz / NAFTA: 434

> Applications > Industrial



 **LNA**

BFP460*, **BFP540ESD*** – * integrated ES

 **ESD Protection**

ESDxPyRF-series

 **Driver**

Discrete: **BFP450 + BFP405**
MIMIC: **BGA622L7, BGA612, BGA6**

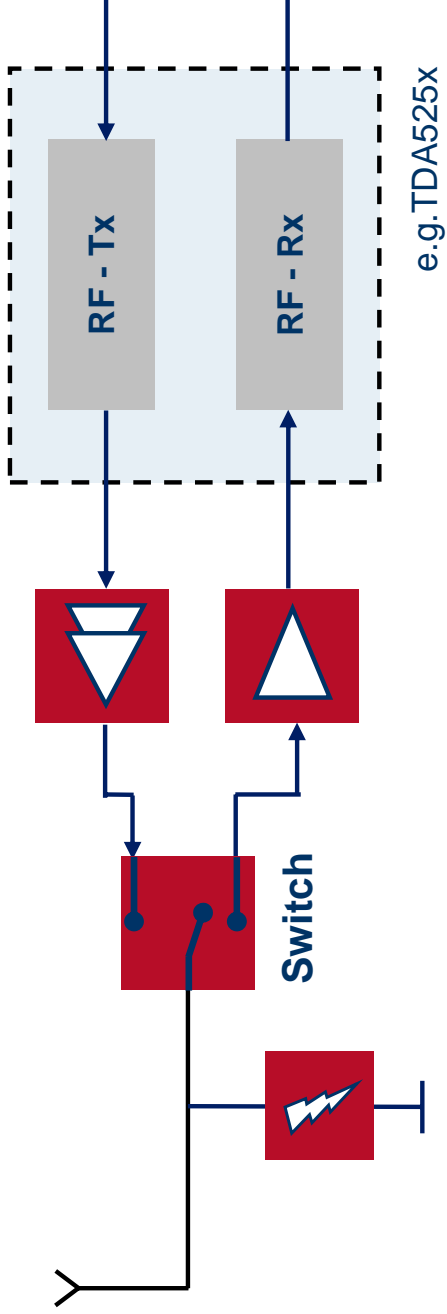
 **PIN Diode Switch**





BAR88x, BAR90x, BAR63x, BAR64x, BAR

Home Comfort, Control and Security

Wireless smoke sensor

> Applications > Industrial

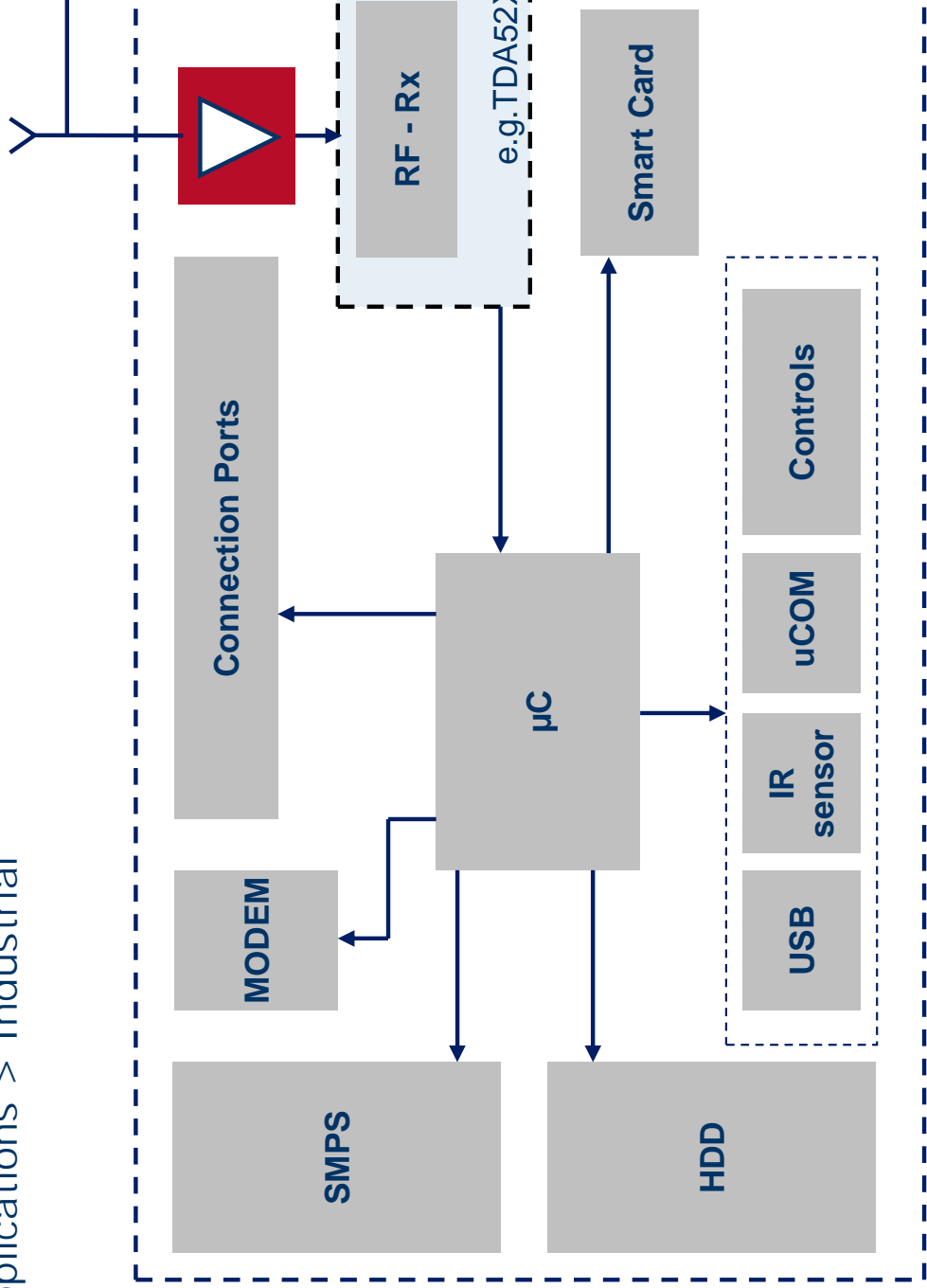


| | | |
|---|-------------------------|---|
|  | LNA | *BFP460, *BFP540ESD – *integrated ESD protection |
|  | ESD Protection | ESDxPyRF-series |
|  | Driver | Discrete: BFP450 + BFP405 MIMIC: BGA622L7, BGA612, BGA614, BGA616 |
|  | PIN Diode Switch | BAR88x, BAR90x, BAR63x, BAR66x, BAR69x, BAR70x, BAR73x, BAR76x, BAR79x, BAR80x, BAR83x, BAR86x, BAR89x, BAR90x, BAR93x, BAR96x, BAR99x, BAR633x, BAR636x, BAR639x, BAR642x, BAR645x, BAR648x, BAR651x, BAR654x, BAR657x, BAR660x, BAR663x, BAR666x, BAR669x, BAR672x, BAR675x, BAR678x, BAR681x, BAR684x, BAR687x, BAR690x, BAR693x, BAR696x, BAR699x |

Home Comfort, Control and Security

RF controlled set top box

> Applications > Industrial



LNA

BFP460*, **BFP540ESD*** – * integrated ESD protection

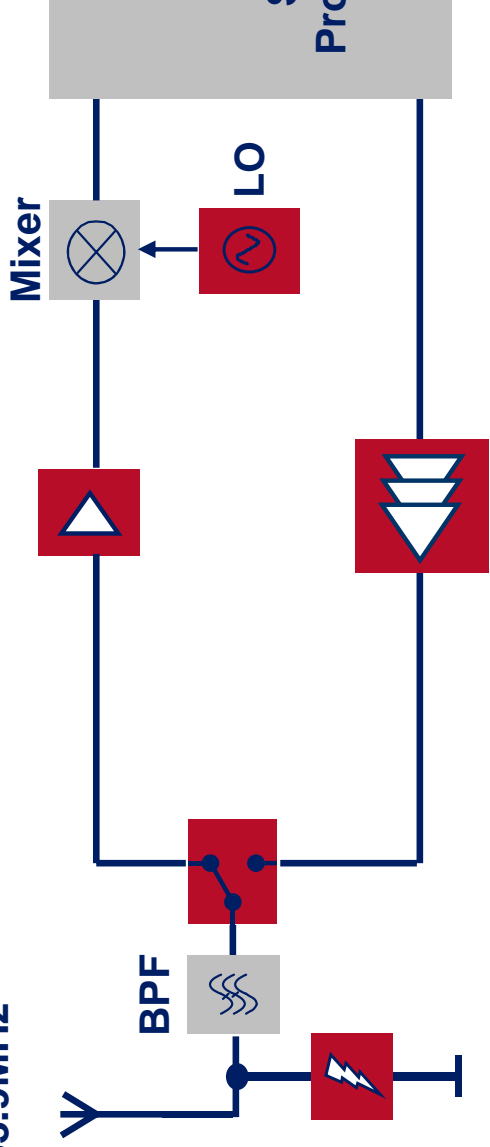


ESD Protection

ESDxPyRF-series

RF Metering, AMR (Automatic meter reading) RKE Based

433.9MHz



Driver Amplifier

3x BFP460*
* integrated ESD



LNA

BFP405



ESD Protection

ESDxPyRF-series



**PIN Diode
Switch**

BAR600
BAR601



**Varactor
Diode**

BBYX

Table of Contents

■ Applications

■ Mobile Communication

■ Consumer

■ Automotive & Industrial

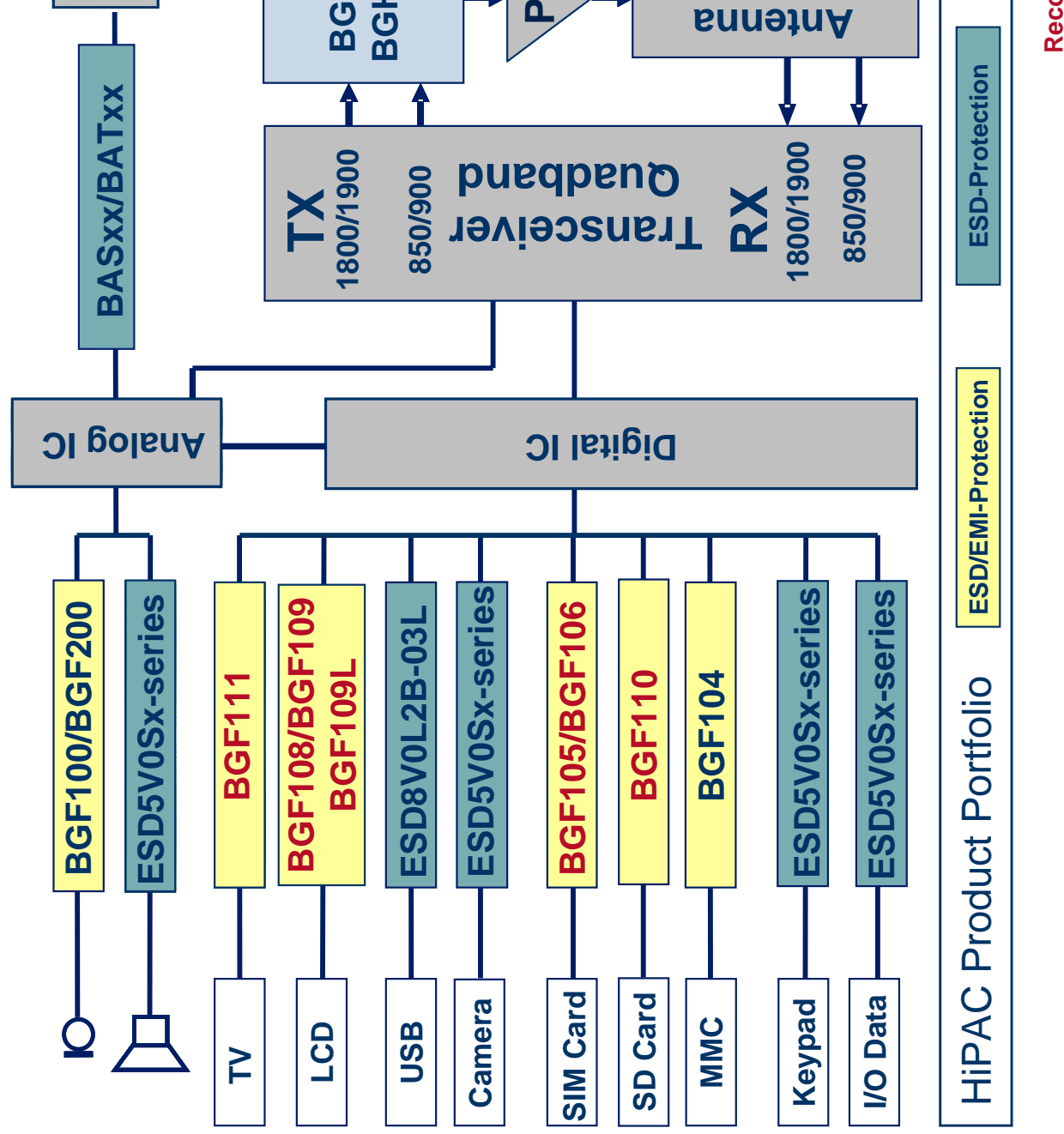
■ ESD/EMI Protection

■ Lighting

Cellular Phone

ESD/EMI-Protection and RF Passive Integration

> Applications > ESD/EMI Protection



Rec

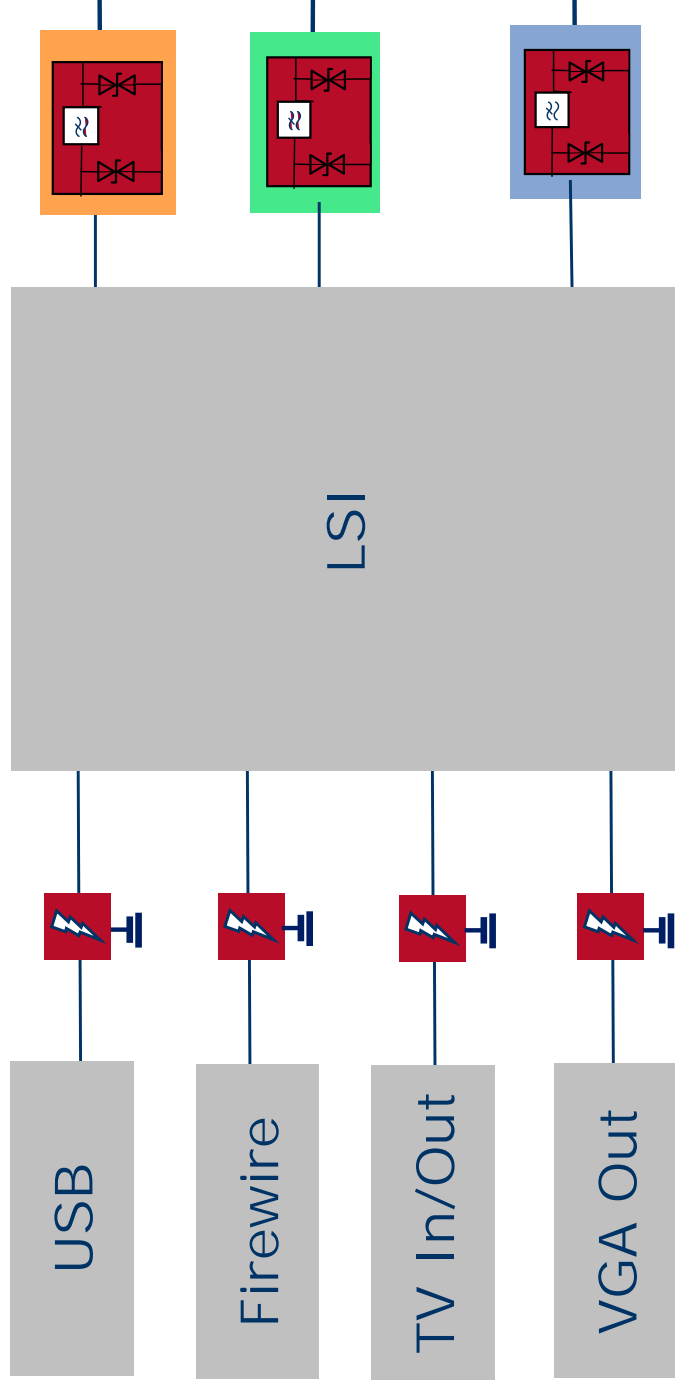
Rec

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Portable System

MP3 player, digital camera, camcorder...

> Applications > ESD/EMI Protection



Protection diode

ESDOP8RFL, ESD8VOLxx

ESD/EMI HiPACs

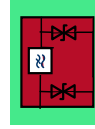


HiPAC for **LCD**

Discrete Solution *)

BGF108, BGF109, BGF109L

ESDOP8RFL, ESD5V0Sx, ESD8V0Sx

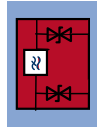


HiPAC for **MMC/SD MemCard**

Discrete Solution *)

BGF104, BGF110

ESDOP8RFL, ESD5V0Sx, ESD8V0Sx



HiPAC for **Microphone**

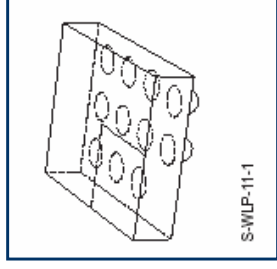
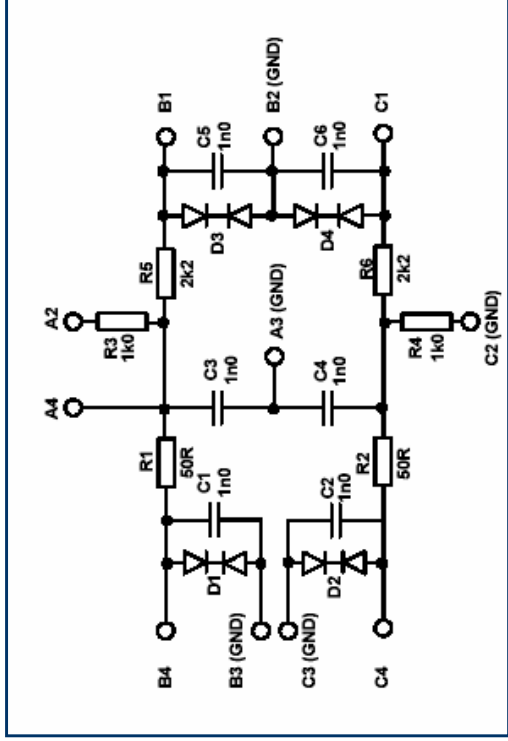
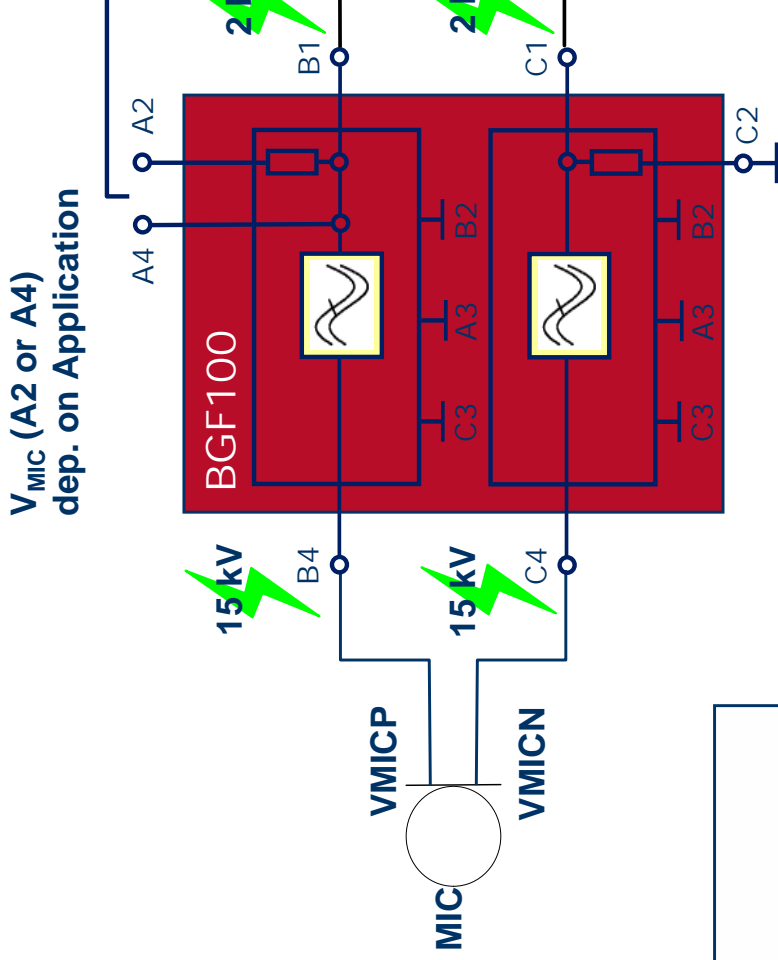
Discrete Solution *)

BGF100, BGF200

ESDOP8RFL, ESD5V0Sx, ESD8V0Sx

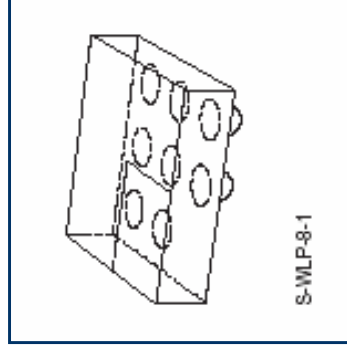
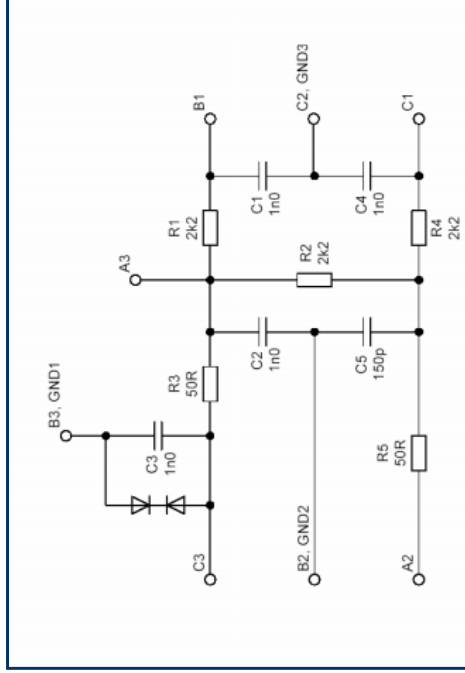
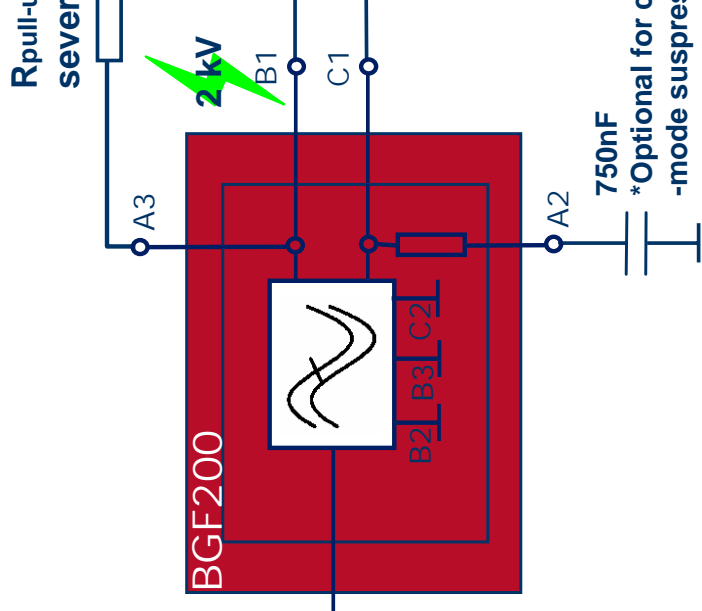
ESD/EMI Protection for Microphone Interface (Differential Mode/Stereo) with BGF100

> Applications > ESD/EMI Protection



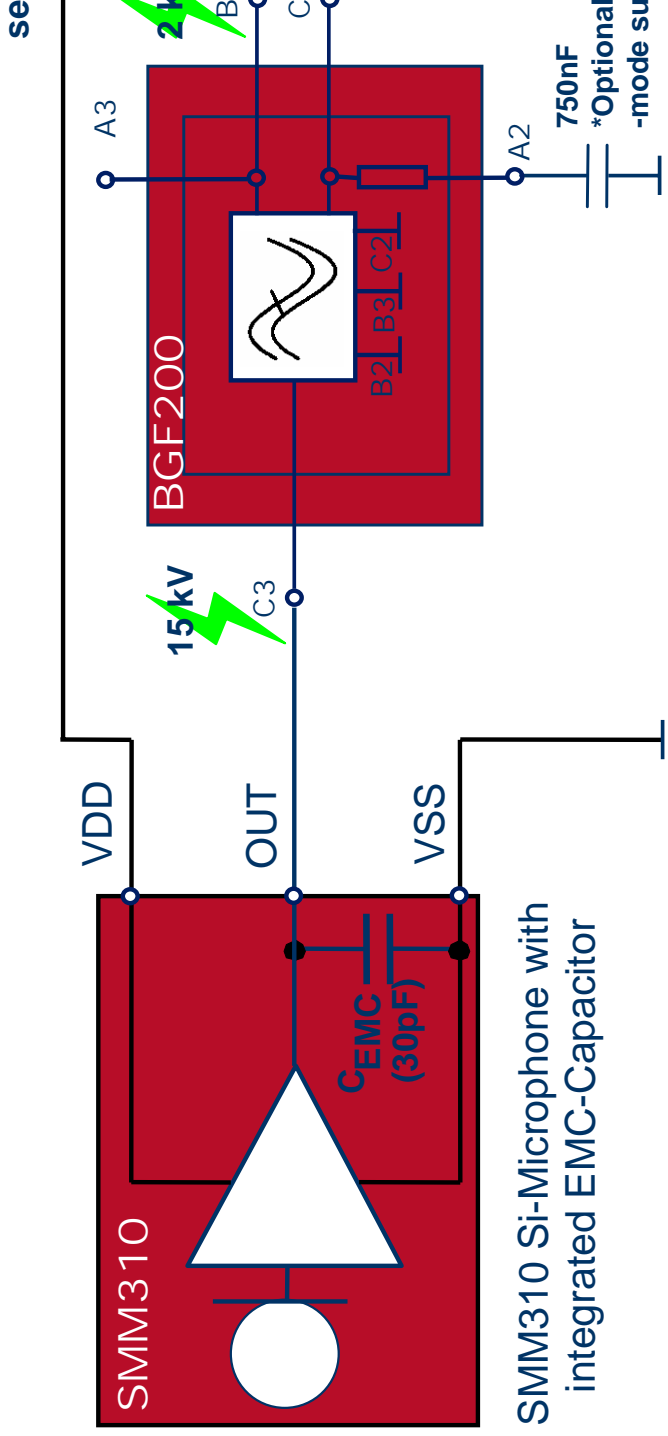
ESD/EMI Protection for Microphone Interface (pseudo differential and/or Single-Ended Mode/Mono) with BGF200

> Applications > ESD/EMI Protection



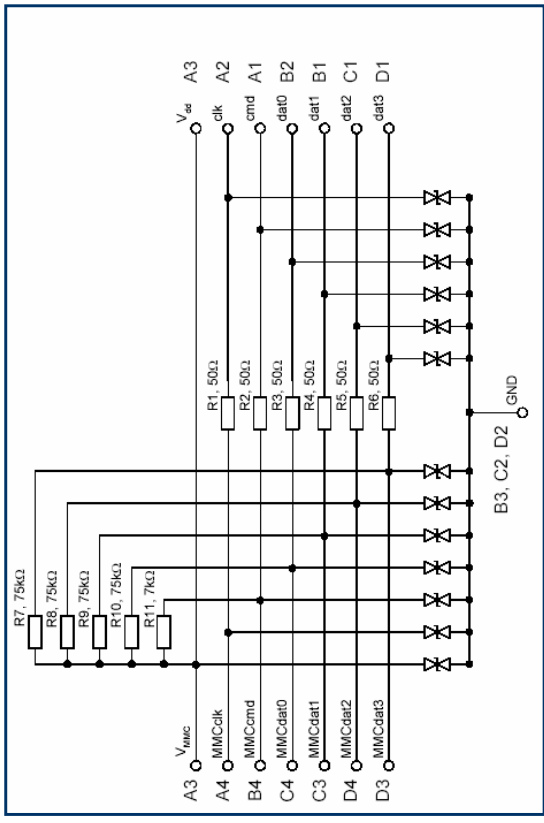
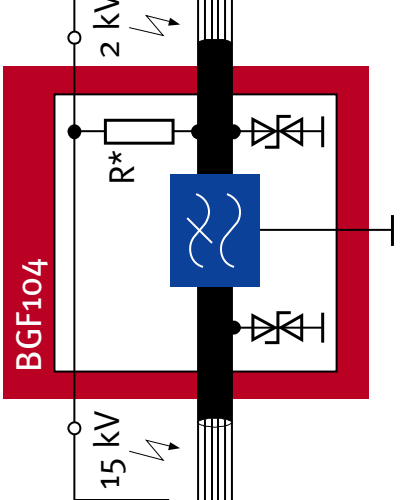
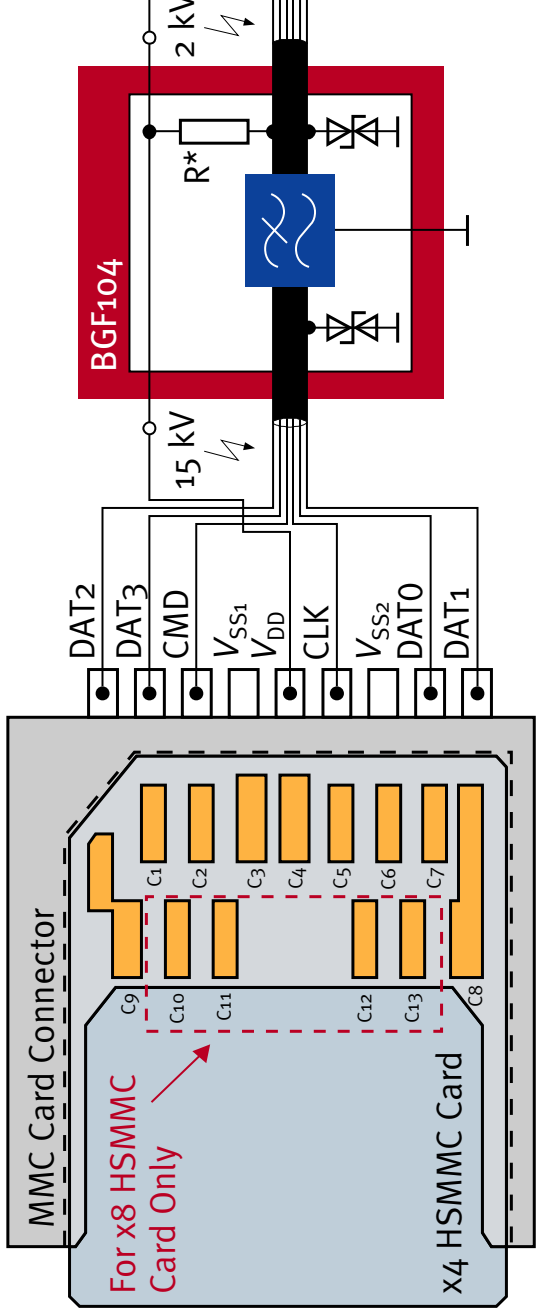
ESD/EMI Protection for Microphone Interface (pseudo Single-Ended Mode) with BGF200

> Applications > ESD/EMI Protection



High Speed MMC Card ESD/EMI Protection with BGF104

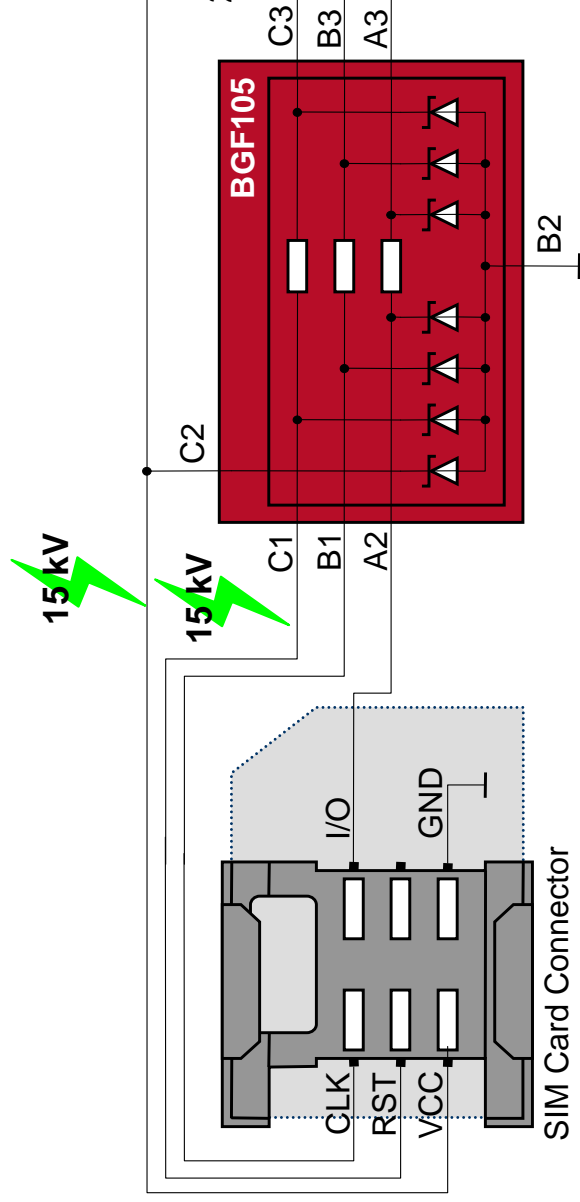
> Applications > ESD/EMI Protection



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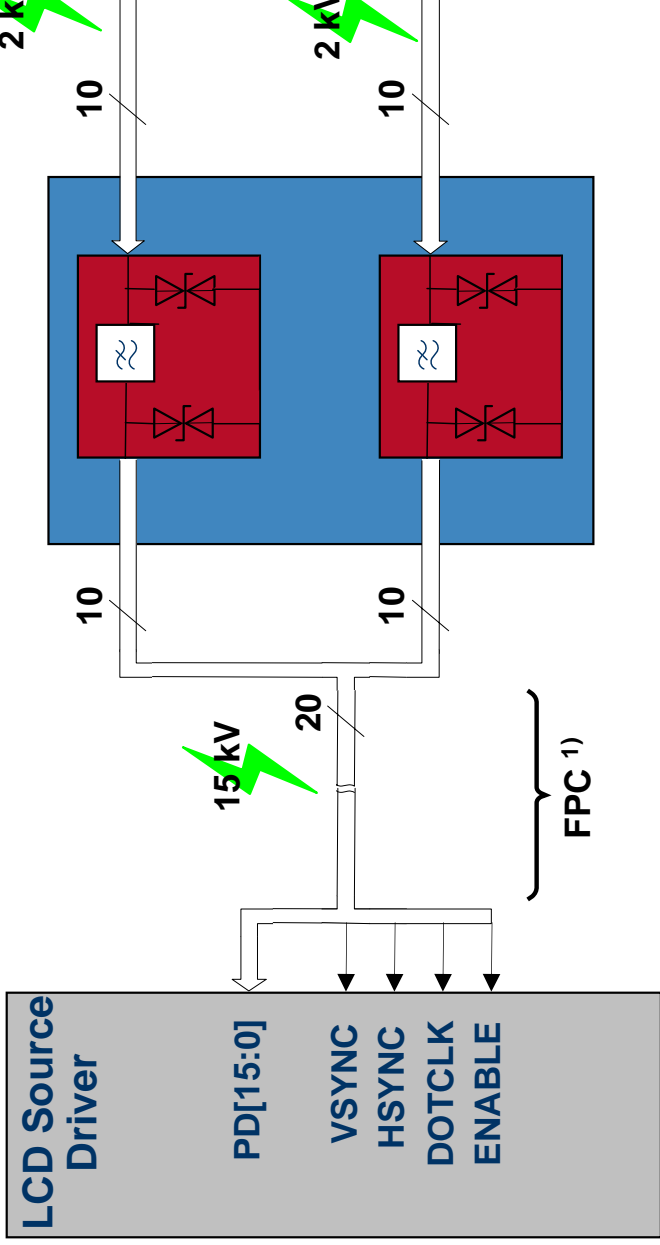
SIM Card Interface Protection with BGF105

> Applications > ESD/EMI Protection



ESD/EMI protection for digital displays with BGF109 for LCD, TFT applications

> Applications > ESD/EMI Protection



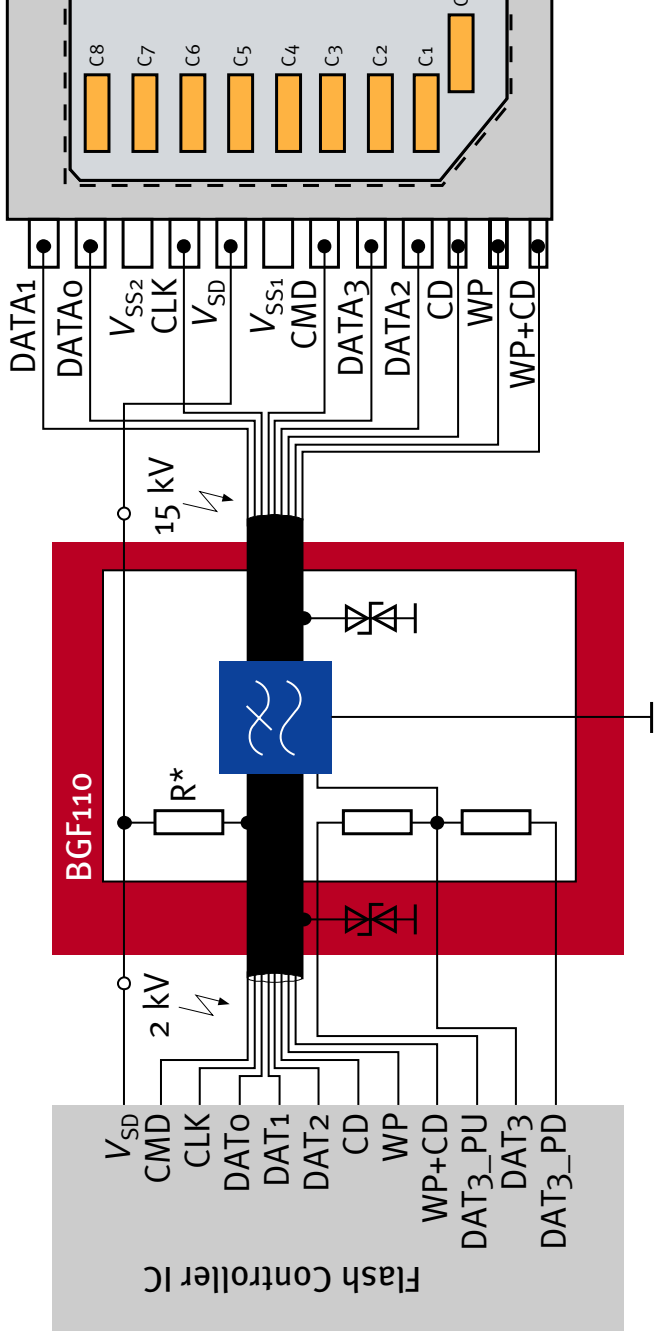
¹⁾ Flexible Printed Circuitry



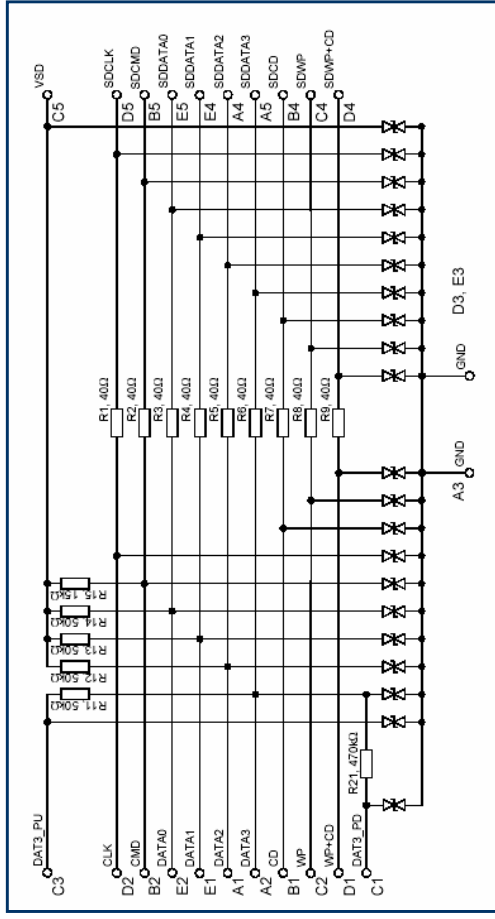
HiPAC BGF109

Secure Digital Card ESD/EMI Protection BGF110

> Applications > ESD/EMI Protection



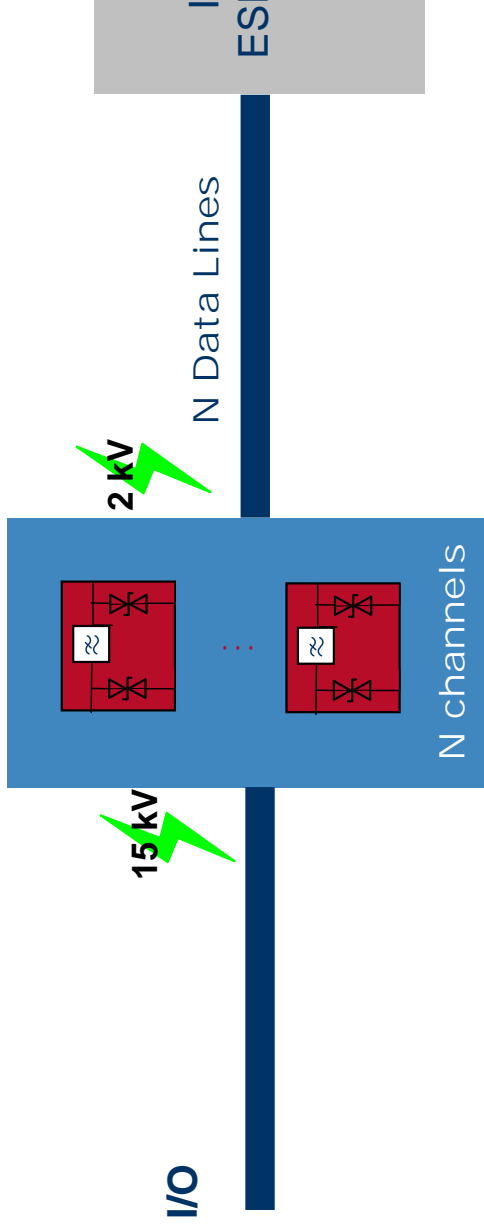
Note:
 WP: Write Protection
 CD: Card Detection
 PU: Pull-Up
 PD: Pull Down



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ESD/EMI Protection for Digital Data Interface with 4/7/10-Channel Diode & Low-Pass Filter

> Applications > ESD/EMI Protection

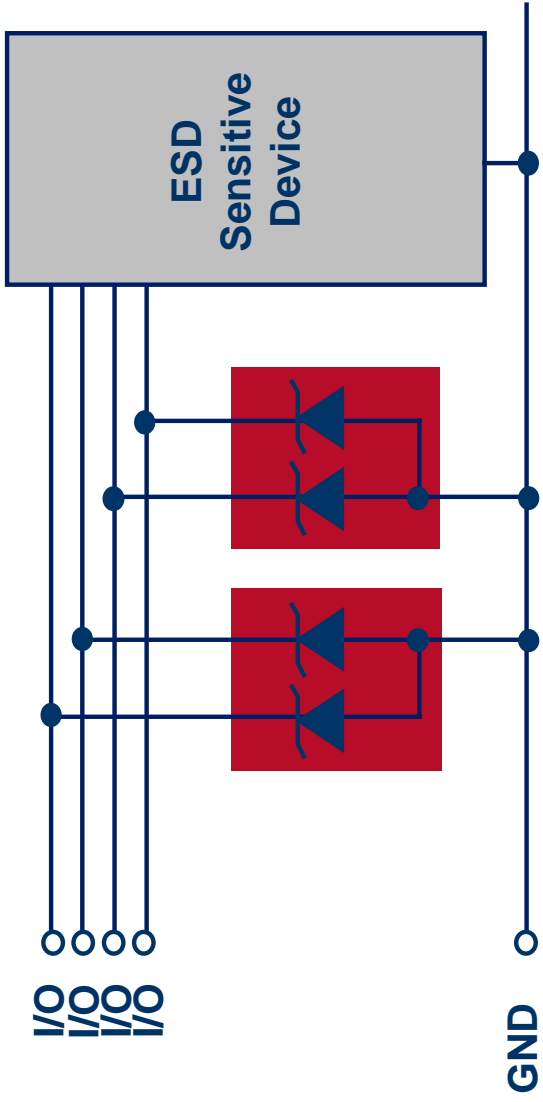


HiPAC

- BGF111 (1 Channel)
- BGF105 (4 Channel)
- BGF108 (7 Channel)
- BGF109 (10 Channel)

General Purpose ESD & Surge Protection with 1-5-Channel TVS Diode Arrays (upto 5V Supply Voltage)

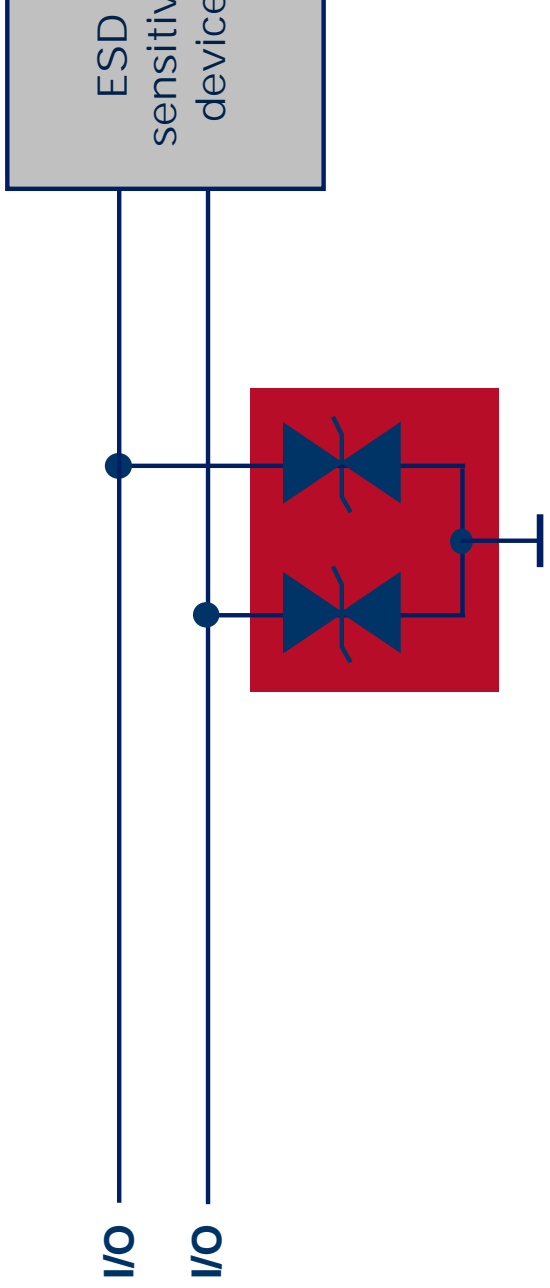
> Applications > ESD/EMI Protection



- Uni-Directional :** ESD5V0S1U-03W (1-channel)
ESD5V0S2U (2-channel)
ESD5V0S5US (5-channel)
- Bi-Directional:** ESD8V0L1B-02LRH (1-channel)
ESD8V0L1B-03L (2-channel)

General Purpose ESD & Surge Protection with 2-Channel TVS Diode Array (upto 24V Supply Voltage)

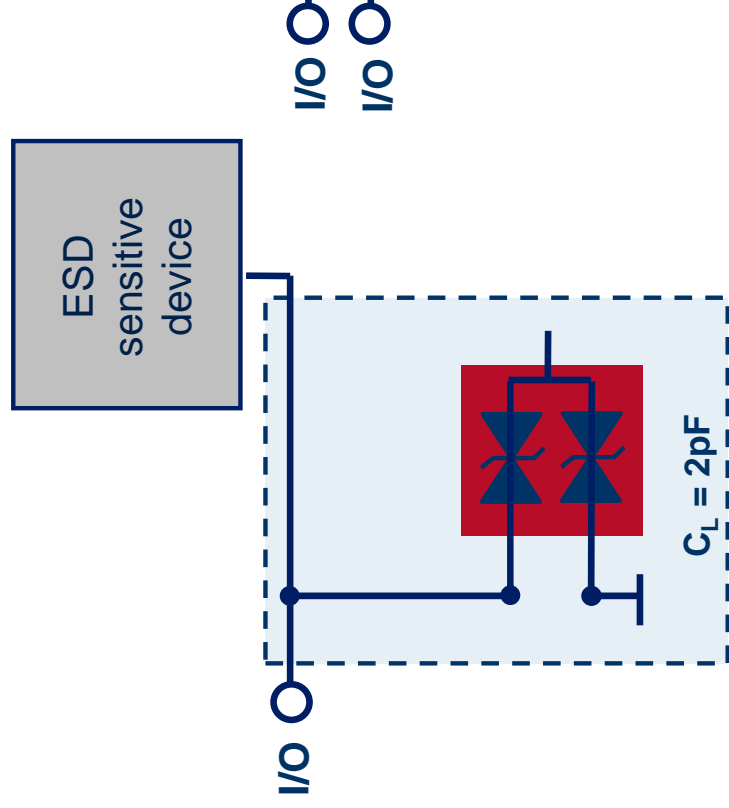
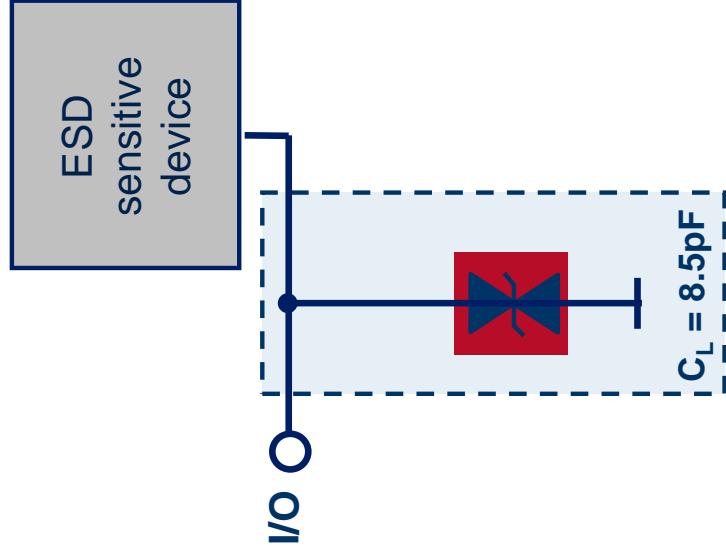
> Applications > ESD/EMI Protection



ESD Diode: ESD24VS2B (2-Channel)

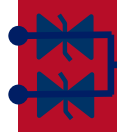
High-Speed ESD & Surge Protection Designed for USB2.0, 10/100 Ethernet, Firewire, ...

> Applications > ESD/EMI Protection



ESD Diode:

ESD8V0L1B-02LRH



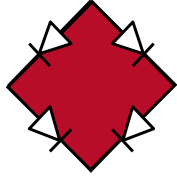
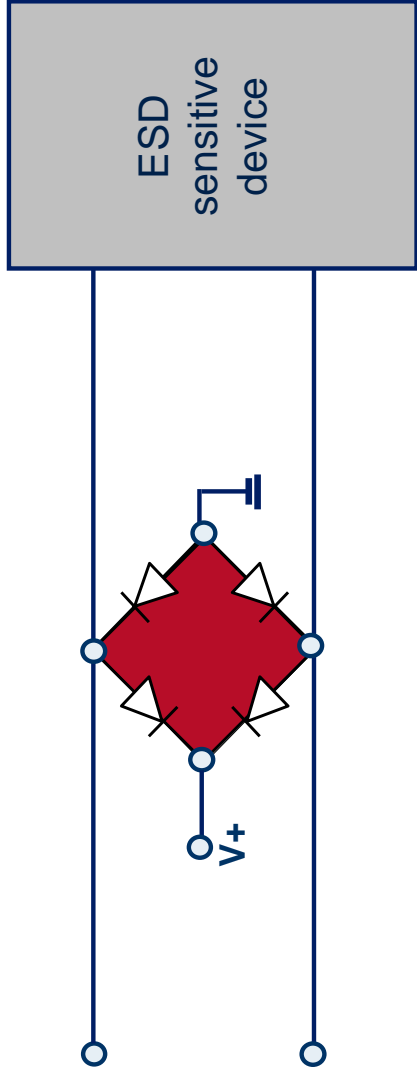
ESD Array:

ESD8V0L2B-03L

ESD, EFT & lightning protection

ADSL, ISDN, WAN or other telecom application (rail-to-

> Applications > ESD/EMI Protection

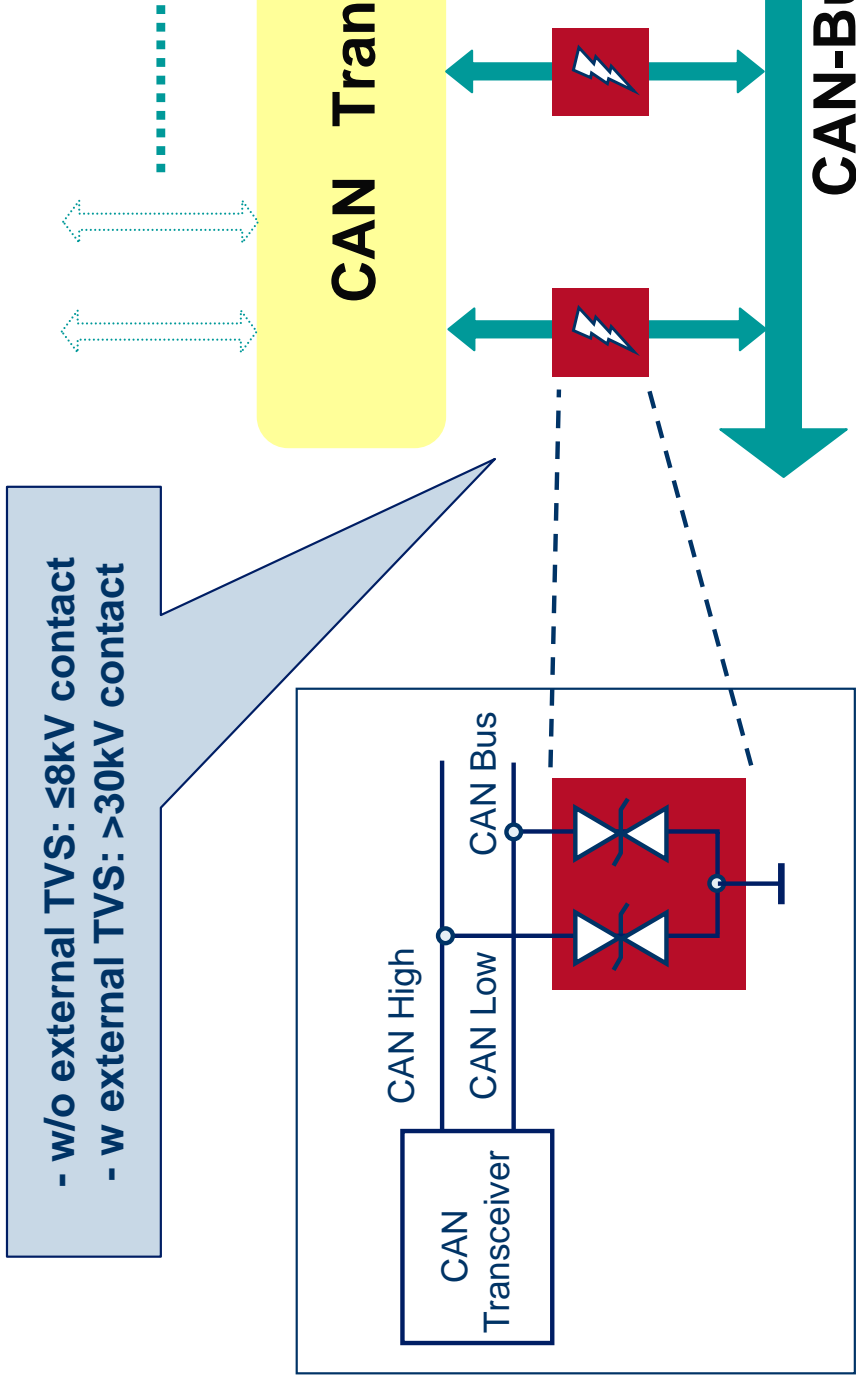


TVS Diode Array: ESD70VU2RR-07

Automotive CAN Network

ESD-protection of CAN Bus Transceiver

> Applications > ESD/EMI Protection



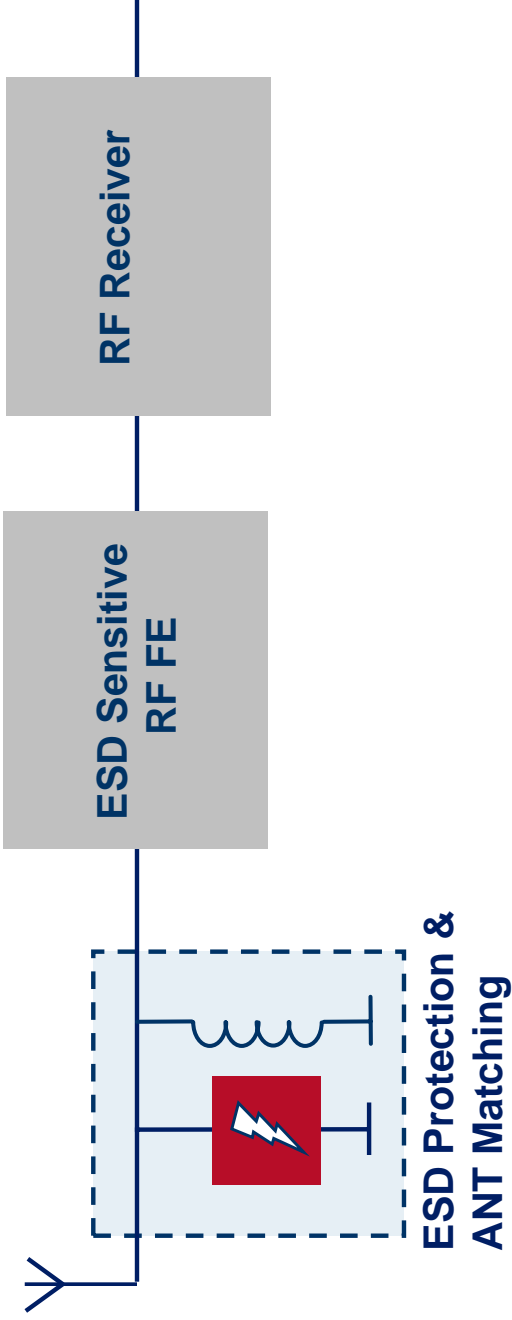
ESD Protection

ESD24VS2B

RF Antenna Port

ESD Protection of with Low-Capacitance ESD Diodes

> Applications > ESD/EMI Protection



ESD Protection

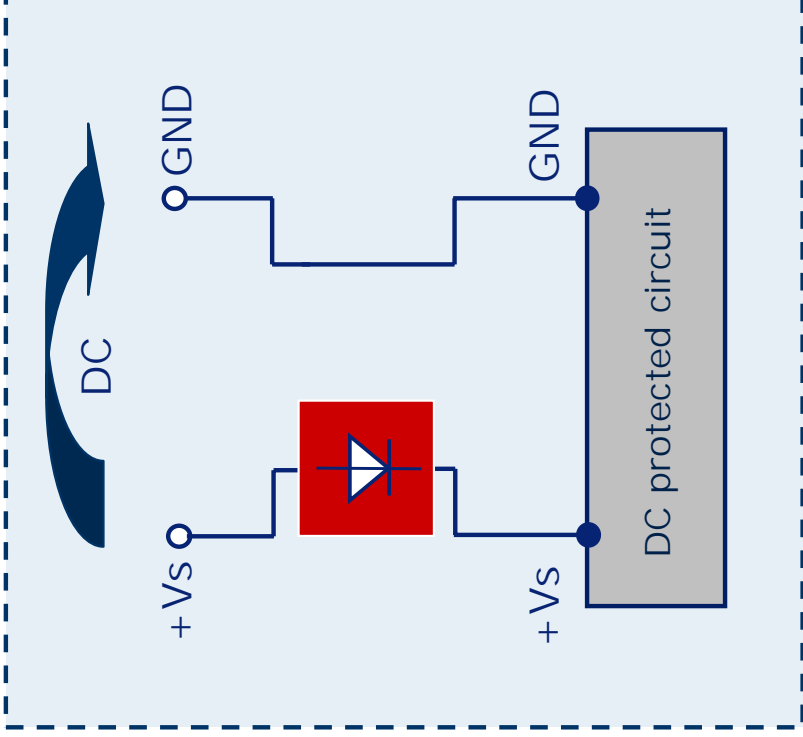
ESD0P8RFL ($C_L = 0.8 \text{ pF}$)

ESD1P0RFW (1-Channel) ($C_L = 1.0 \text{ nF}$)

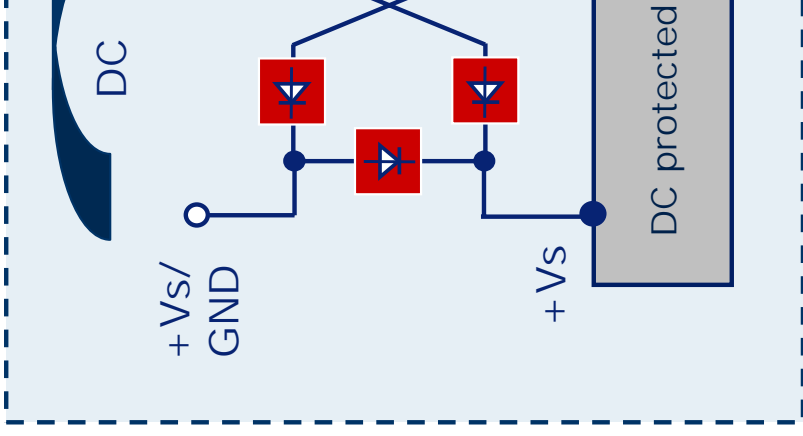
ESD1P0RFS (2-Channel) ($C_L = 1.0 \text{ pF}$)

Reverse Polarity Protection Protection against reverse polarity

> Applications > ESD/EMI Protection



Prevents damage to the circuit



System works with r



Schottky Diode:

BAS3005A-02V,

BAS3010S-03LRH*, BAS3010A-03W

BAS3020B*

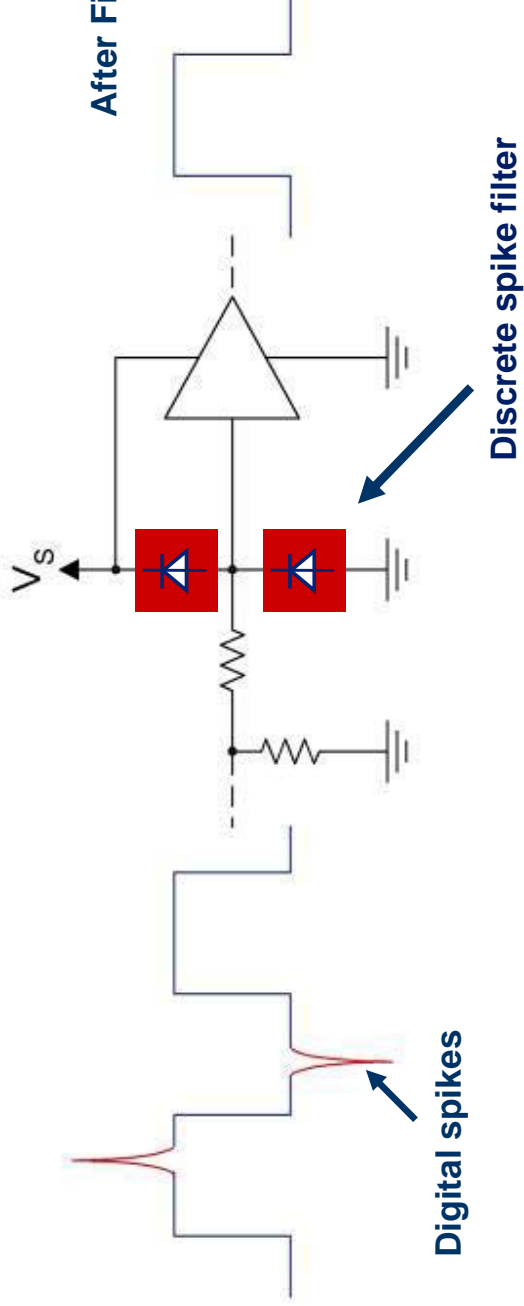
BAS3007A-RPP*

Schottky Diode Array:

***N**

Clipping and Clamping Transient Voltage Suppression

> Applications > ESD/EMI Protection



Protection Diode:

BAT17xx, BAT62xx, BAT54xx, BAT64xx,
BAT68xx, BAS40xx, BAS70xx, BAS125xx

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■ Applications

- Mobile Communication

- Consumer

- Automotive & Industrial

- ESD/EMI Protection

■ Lighting

Why are LED-Drivers needed?

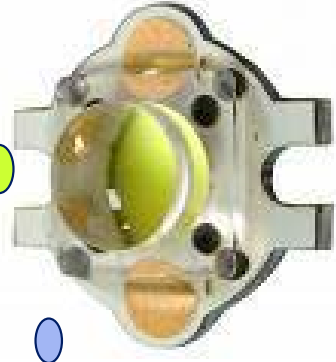
> Applications > Lighting

Protection

- Overvoltage
- Overcurrent
- Excessive Temperature

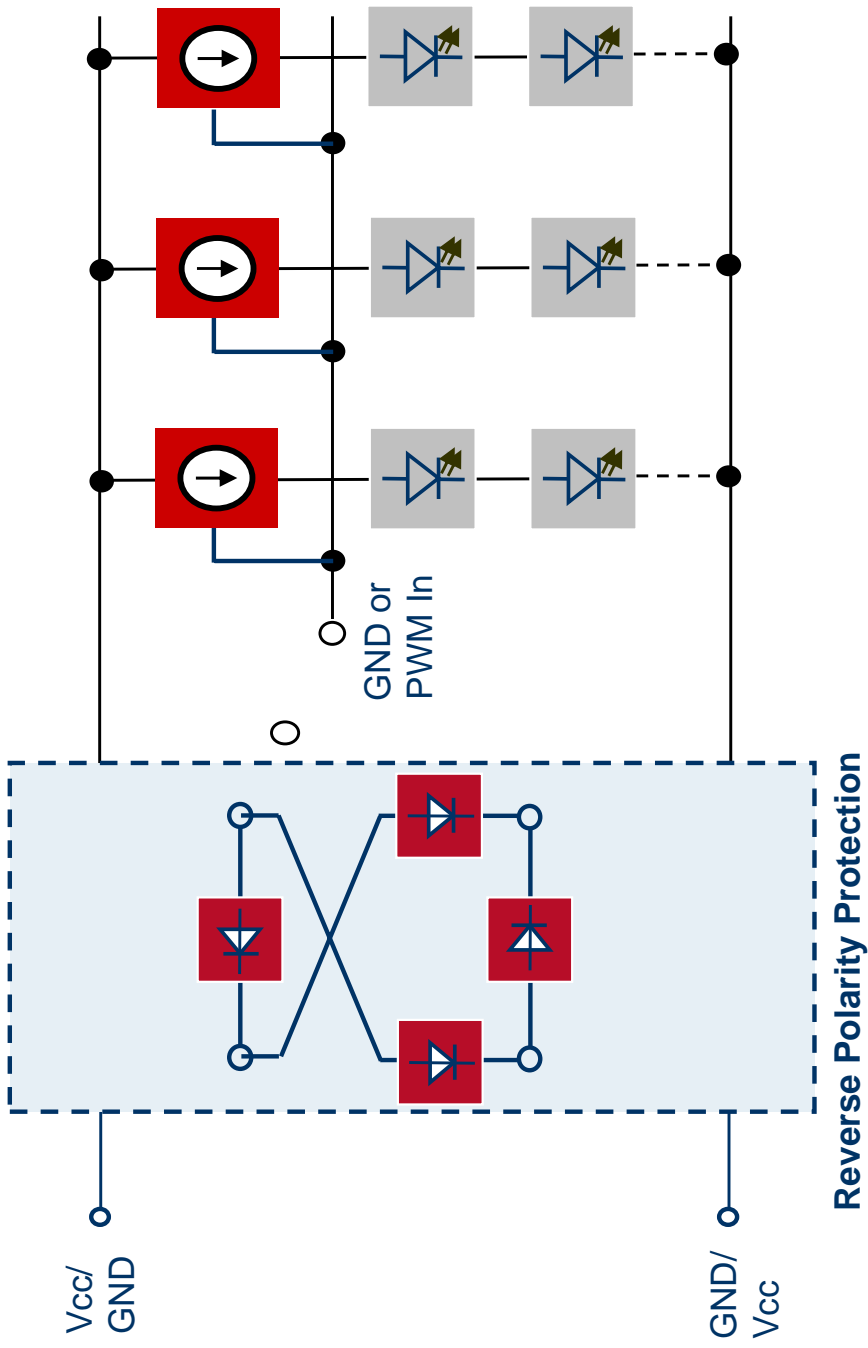
Control

- Brightness Control
- LED Cluster
- Binning Compensation
- RGB Color Mixing
- Realisation of Parallel Diodes



Driving LED-Chains directly (up to 65 mA)

> Applications > Lighting



Reverse Polarity Protection

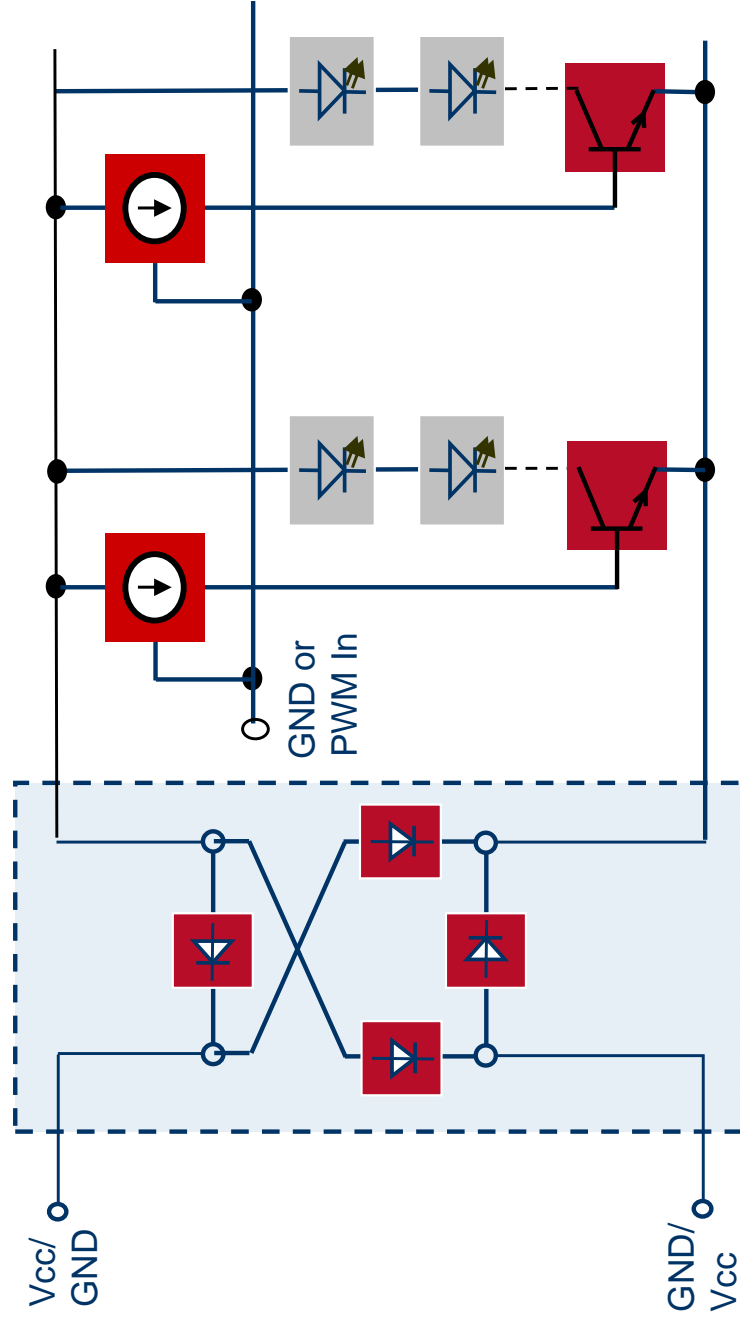
* New product on request

| | |
|---|---|
|  | LED-Driver: BCR401R/W/U, BCR402R/W/U, BCR405U |
|  | Schottky Diode Array: BAS3010S-03LRH*, BAS3010A-03W BAS3020B* |

Driving LED-Chains using a Booster Transistor

(up to 500 mA)

> Applications > Lighting



Reverse Polarity Protection

| | |
|---|--|
|  | LED-Driver: BCR401R/W/U, BCR402R/W/U, BCR405U |
|  | Booster Transistor: BCX55-16, BCX68-25, BC817SU |
|  | Schottky Diode Array: BAS3010S-03LRH*, BAS3010A-03W BAS3020B* |

* New product on request

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- Applications
- **RF Discretes**
- Schottky Diodes
- HiPAC, TVS Diodes, Silicon Microphone
- LED Drivers
- AF Discretes
- General Information

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■ RF Discretes

■ Introduction

■ RF Transistors

■ RF MMICs

■ RF Diodes

■ RF PIN Diodes

■ RF Varactor Diodes

■ RF Mosfet

RF Product Range and Target Applications

> RF Discretes > Introduction

RF Products

RF Building Blocks

- Low Noise Amps
- 50W Driver stages
- Single chip VCOs
- gain blocks

RF MMIC

RF Transistors

RF MOSFETs

RF PIN Diodes

RF Varactor Diodes

RF Schottky Diodes

Applications

Cellular Transceivers

Cordless Telephones

Base Station

LNB Downconverters

CATV Amplifiers

FM/VHF/UHF Transmitters

Set Top Boxes

WLAN

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■ RF Discretes

■ Introduction

■ RF Transistors

■ RF MMICs

■ RF Diodes

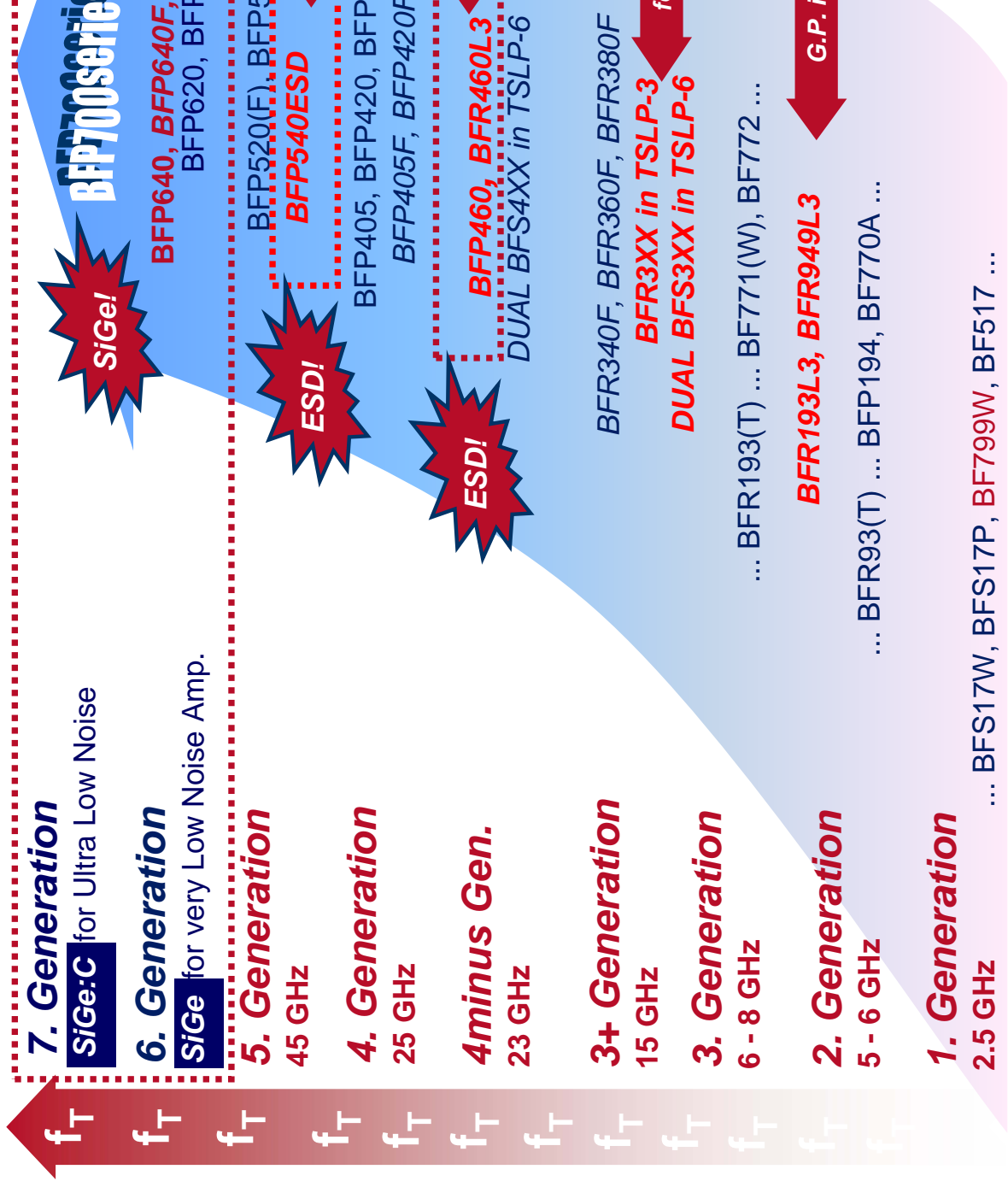
■ RF PIN Diodes

■ RF Varactor Diodes

■ RF Mosfet

RF Transistors Portfolio at a glance

> RF Discretes > RF Transistors



BFP740series

... Keeping the Leadership in RF Performance

> RF Discretes > RF Transistors

Ultra Low Noise SiGe:C Heterojunction Bipolar Transistor (HBT)

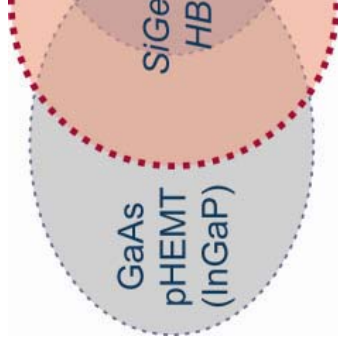


Performance

- f_T of 42 GHz
- **NF = 0.5 dB at 2 GHz**
- NF = 0.8 dB at 6 GHz
- G_{ms} = 28 dB at 1.8 GHz

Present solutions
0.5 dB 1.0

NFmin at 6GHz



Benefits & Arguments

- Lowest noise figure level currently available in the SiGe:C market
- Comparable to GaAs MESFET and pHEMT
- No negative supply voltage required (unlike GaAs FETs)
- High Gain & Low Current Operation

Applications (

- 1.2 – 1.3GHz, 1.5
- 2.1 – 2.4GHz: UWB
- 2.33 GHz, 2.6 GHz DMB
- 5 – 6 GHz: WLAN
- 3 – 10 GHz: UWB
- 12 GHz Satellite

| | | |
|--|---|---|
| BFP740 SOT343 2.0 x 1.25 x 0.9mm Standard | BFP740F TSFP-4 1.2 x 0.8 x 0.55mm Flatlead | BFR740L3RH TSLP-3 1.0 x 0.6 x 0.32mm Leadless |
|--|---|---|

Infineons Ultra Low Noise SiGe: C HBTs BFR700L3RH (reduced height) Series

> RF Discretes > RF Transistors



1.0x0.6mm height 0.32mm max.



1.0x0.6mm height 0.32mm max.

- Outstanding Performance
- Wide Range of Wireless Applications up to 10GHz
- High Gain
- Ultra Low Noise

BFR740L3RH

*Key Data:
V_{ceo} = 4V, I_{cmax} = 30mA
NF = 0.5dB at 1.8GHz, 3V, 8mA
G_{ms} = 24 dB at 1.8GHz, 3V, 25mA

- Low Power Consumption
- Low Current Operation
- High Gain
- Ultra Low Noise
- portable GPS, WLAN, UWB

BFR705L3RH

*Key Data:
V_{ceo} = 4V, I_{cmax} = 10mA
NF = 0.5dB at 1.8GHz, 3V, 3mA
G_{ms} = 24 dB at 1.8GHz, 3V, 7mA

- M
- H
- V
- C
- 5

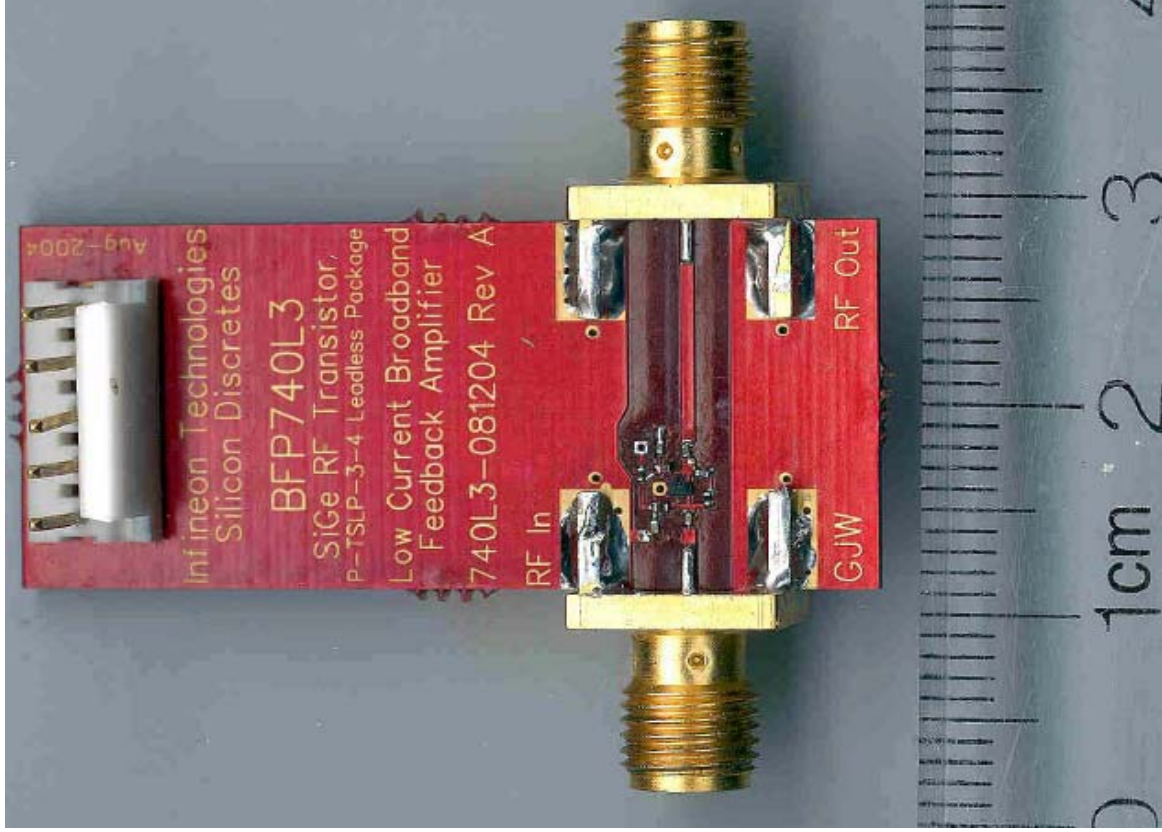
BFR

*Key
V_{ceo}
NF = 0
G_{ms} =
P1dB
IP3 =

* for more details pls. check datasheet

Wideband Feedback LNA for <200 MHz up to Using SiGe RF Transistor BFR740L3RH

> RF Discretes > RF Transistors

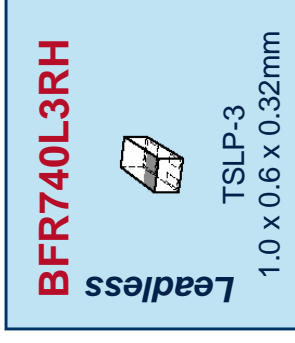


Applications

- 315, 433 MHz: Remote Keyless Entry
- 900 MHz: Cellular, 900 MHz ISM
- 1575 MHz: GPS
- 2400 MHz: 2.4 GHz ISM, Bluetooth
- 5150 MHz: IEEE802.11a WLAN

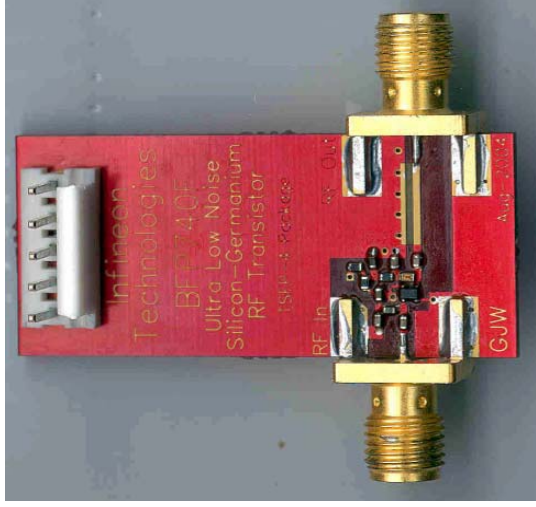
Features

- The complete amplifier on a single chip
- A simple, low-cost general purpose application
- Gain of 19.8-10.0 dB @ 300 MHz
- Noise Figure of 1.1 – 1.5 dB



LNA for 1575 MHz GPS (Global Positioning System) Using the SiGe Transistor BFP740F in TSP-4 Package

> RF Discretes > RF Transistors

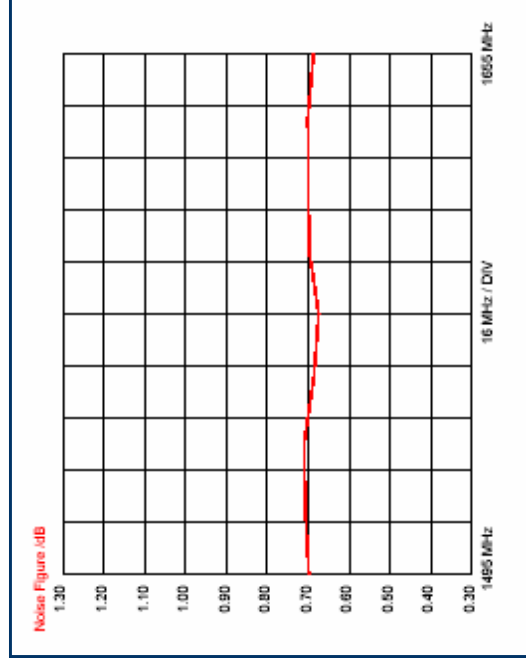


Applications

- 1575.42 MHz GPS LNA

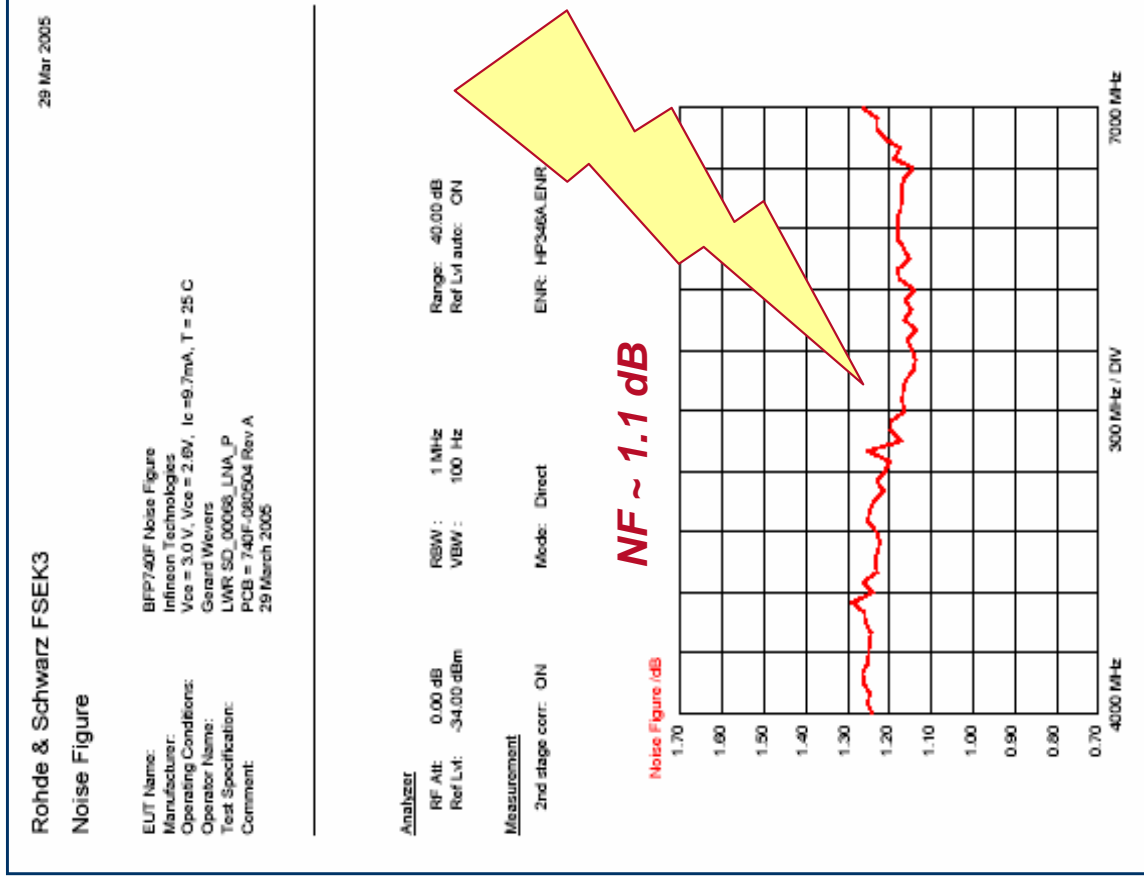
Overview

- Gain of 19.8 dB @ 1575 MHz
- Noise Figure of 0.67 dB @ 1575 MHz
- Input P1dB of -18.0 dBm @ 1575 MHz
- Output P1dB of +0.8 dBm @ 1575 MHz
- Input 3rd Order Intercept of -1.7 dBm @ 1575 MHz
- Current < 8.2 mA from a 3.0 Volt supply
- Input / Output Return Loss 10 dB



Narrowband 5 to 6 GHz (IEEE802.11a WLAN) Using SiGe RF Transistor BFP740F

> RF Discretes > RF Transistors

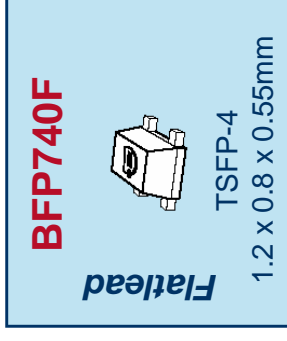


Applications

- 5 to 6 GHz (IEEE802.11a WLAN)

Excellent Results

- NF ~ 1.1 dB on PCB @ substantial improvement ... and better than GaAs
- Application Board on rf



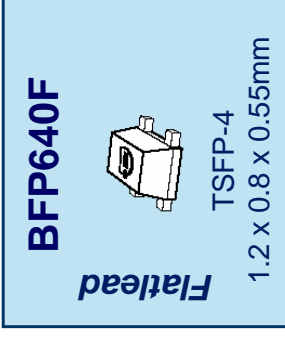
SiGe RF Transistors BFP600 Family

> RF Discretes > RF Transistors

- 70 GHz f_T - Silicon Germanium technology
- Gold metallization for extra high reliability



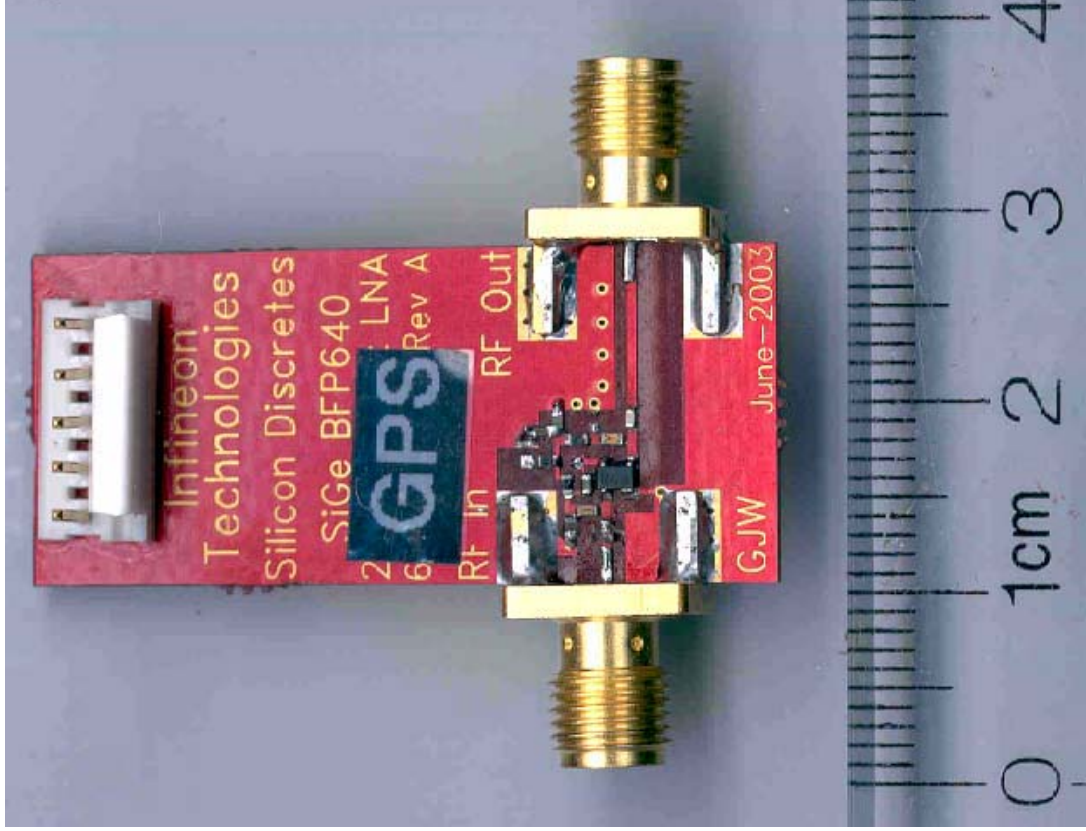
- For a wide range of wireless applications
- Ideal for LNB, CDMA and WLAN applications
- High gain, low noise RF transistor
- Provides outstanding performance
- High maximum stable gain
Gms = 24 dB at 1.8 GHz
- Outstanding noise figure
NF = 0.65 dB at 1.8 GHz
NF = 1.4 dB at 6 GHz



- For m
amplif
- Ideal f
oscilla
- Output
P-1dB
- Max. a
- Gma =
- Noise
- NF = (

Low-Current LNA for 1575 MHz GPS Application Using the SiGe BFP640 Transistor

> RF Discretes > RF Transistors



Applications

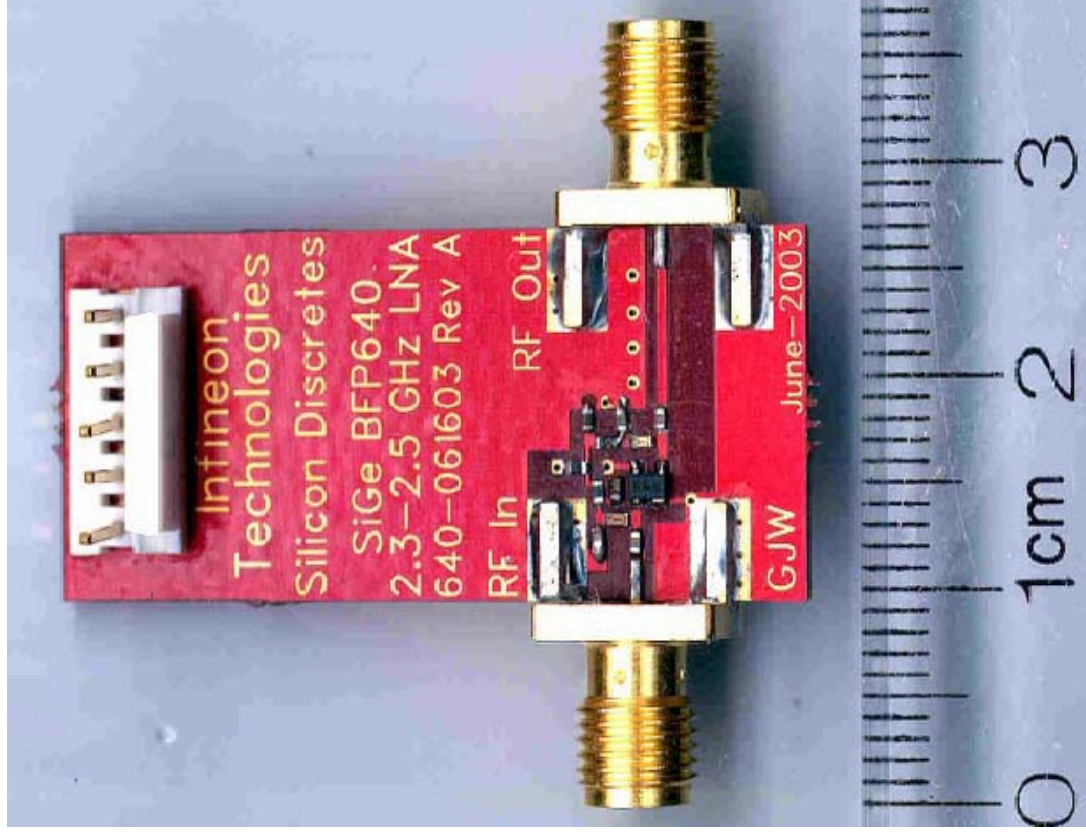
- 1575.42 MHz GPS LNA

Overview

- Gain of 15.2 dB@ 1575 MHz
- Noise Figure of 0.95 dB @
- Input P1dB of -18.7 dBm @
- Output P1dB of -4.5 dBm @
- Input 3rd Order Intercept of
- Current of 4.9 mA from a 3
- Input/Output Return Loss b

LNA for 2.3 – 2.5 GHz ISM Band Applications Using the SiGe Transistor BFP640

> RF Discretes > RF Transistors



Applications

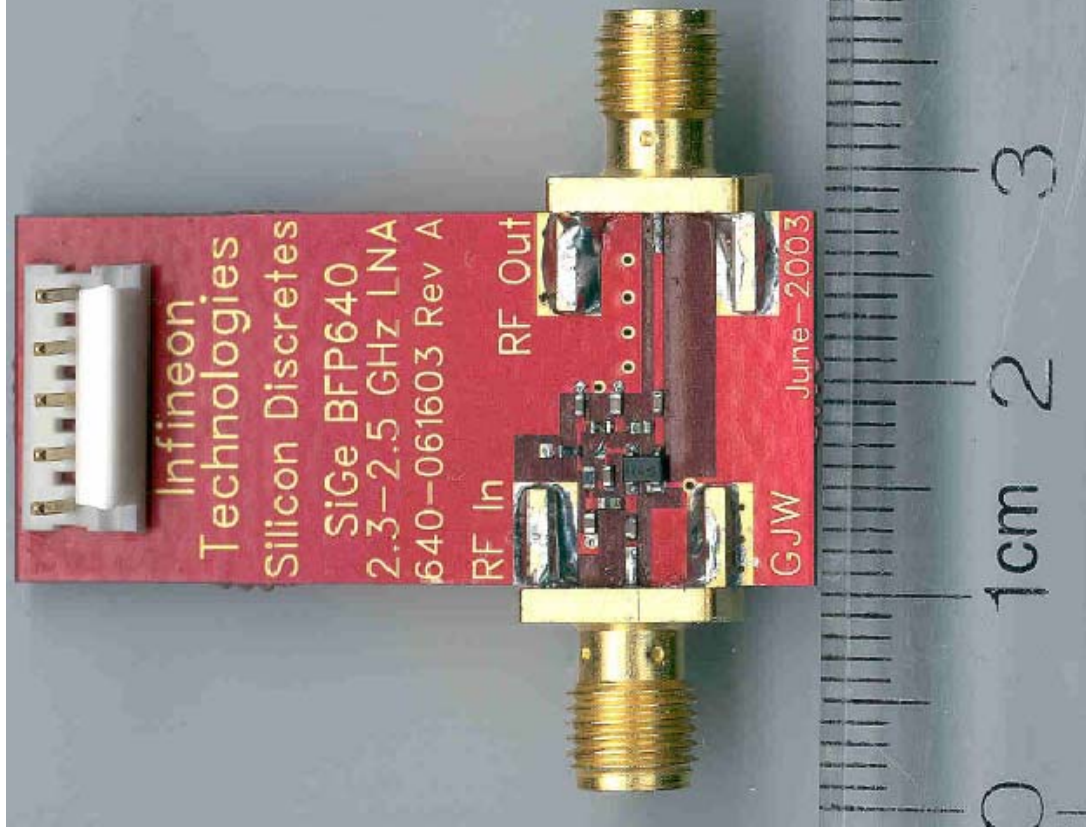
- 2.3 GHz SDARS, 2.4 GHz (2.4 GHz ISM applications)

Overview

- Gain = 15.5 dB @ 2400 MHz
- Noise Figure ~ 0.96 dB @ 2400 MHz
- Input P1dB of -11.3 dBm @ 2400 MHz
- Output P1dB +3.2 dBm @ 2400 MHz
- Input 3rd Order Intercept ~ 10.5 dBm @ 2400 MHz
- Current of 6.7 mA from a 3.0V supply

LNA for Satellite DMB (Digital Multimedia Broadcast) Using the BFP640 Transistor

> RF Discretes > RF Transistors



Applications

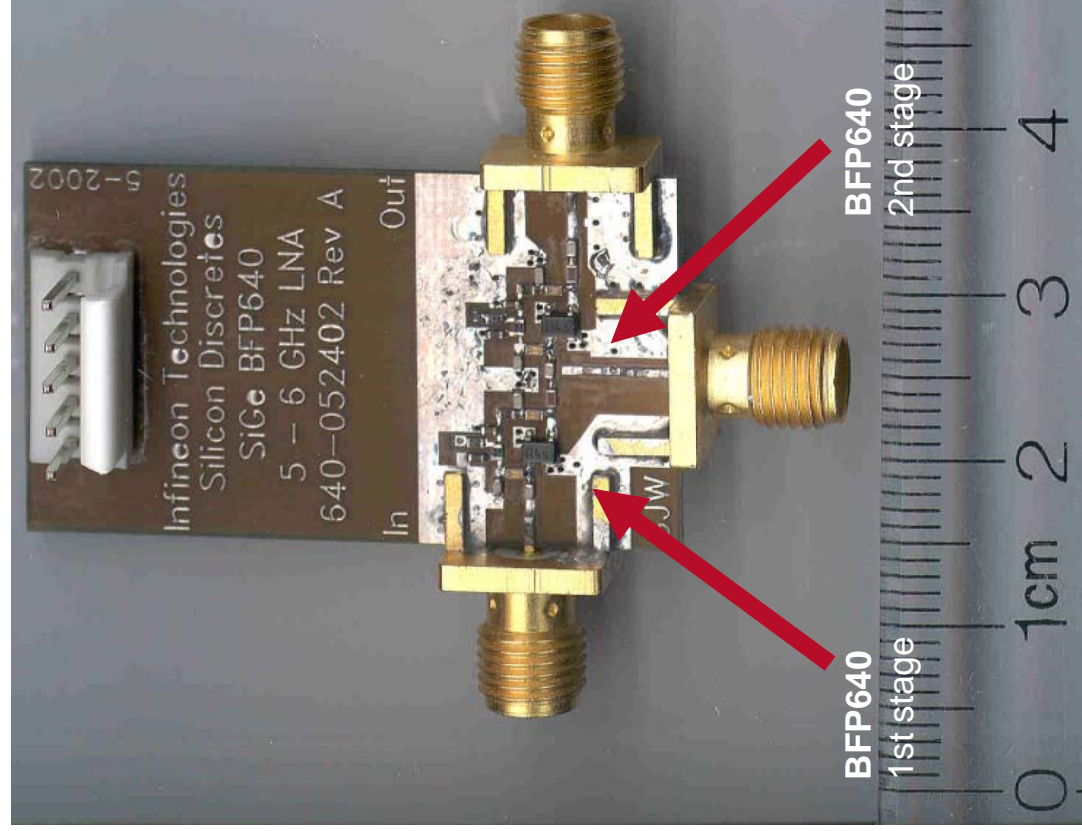
- 2630 – 2655 MHz Digital M

Overview

- Gain = 14.8 dB@ 2642.5 MHz
- Noise Figure of 1.0 dB @ 2642.5 MHz
- Input P1dB of -11.6 dBm @ 2642.5 MHz
- Output P1dB of + 2.2 dBm @ 2642.5 MHz
- Input 3rd Order Intercept of -11.6 dBm @ 2642.5 MHz
- Current of 5.8mA from a 3.0V supply

Two-Stage LNA for 5 to 6 GHz (IEEE802.11a Using SiGe Transistor BFP640

> RF Discretes > RF Transistors



Applications

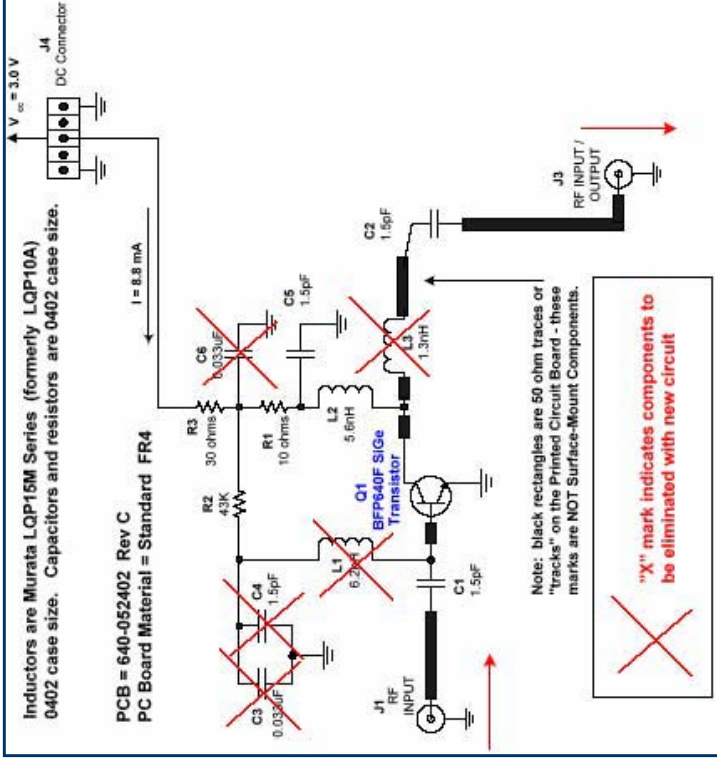
- Frequency Range 5 to 6 GHz

Overview

- Low Cost Solution
- Results achieved on FR4
- Supply Voltage 3.3V
- DC Current 16,2 mA
- Gain 22.3 dB @5350 MHz
20.4 dB @5825 MHz
- Noise Figure 1.54 dB @5350 MHz
1.62 dB @5825 MHz
- Input P_{1dB} -14.8 dBm

Two-Stage LNA for 5 to 6 GHz (IEEE802.11a) Using SiGe Transistor BFP640 – reduced ext. compone

> RF Discretes > RF Transistors



Applications

- Frequency Range 5 to 6 GHz

Overview

- Low Cost Solution
- only 7 passive (3xC, 3xL)**
- Results achieved on FR4
 - Total PCB area 40mm²
 - Supply Voltage 3V
 - DC Current 9 mA
 - Gain (can be increased by Ic)
 - 10.1 dB @5500 MHz
 - Noise Figure 1.4 dB @5500



8 – 9 GHz f_T G.P. RF Transistors in TSLP-3-1

> RF Discretes > RF Transistors

- Bipolar 8 and 9 GHz Silicon technology in Leadless Packages
- Ideal for General Purpose RF Applications e.g. LNAs, Oscillators



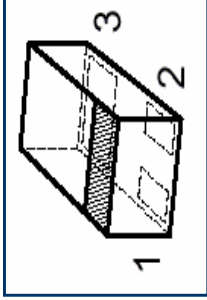
- Ideal for Low Noise and High Gain Broadband Amplifiers at Collector Currents from 1mA to 20mA
- Transition Frequency of 9GHz
- NF of 1.0dB at 1GHz

- **VCE0=10V, IC=35mA**



- For low noise, high-gain
- For linear broadband applications
- Transition Frequency of 9GHz
- NF of 1.2 dB at 900 MHz

- **VCE0=12V, IC=80mA**



Footprint 1.0 x 0.6 x 0.4mm only!

14GHz RF Transistors

> RF Discretes > RF Transistors

- Bipolar 14 GHz Silicon technology in Flatlead and Leadless Packages
- Ideal for Low Phase Noise Oscillators and VCOs



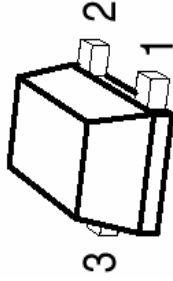
BFR340F/L3

- Ideal for Low Current and Amplifiers and Oscillators
- High Transition Frequency of 14GHz
- High Insertion Gain
- Low Voltage/ Low Current Operation
- **VCE0=6V, IC=10mA**

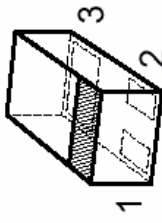


BFR360F/L3

- For Low Voltage / Low Current Applications
- For Oscillators up to 3.5GHz and Pout > 10dBm
- For Low Noise Amplifiers
- Low Noise Figure: 1.0 dB at 1.8 GHz
- **VCE0=6V, IC=35mA**



**TSFP-3
Package
BFRxxxF**

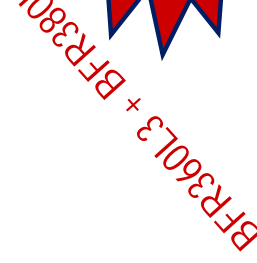


Foot

14GHz f_T Twin RF Transistors in TSLP-6 VCO and RF Modules

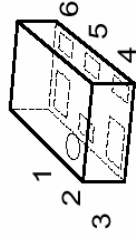
> RF Discretes > RF Transistors

- TWIN Type 14GHz Low Phase Noise RF-Transistors in Ideal for Oscillators
- Two built in Transistors in 6pin Thin Small Leadless Package TSLP-6



- For Low Voltage / Low Current Applications
- For Oscillators up to 3.5GHz and Pout > 10dBm
- For Low Noise Amplifiers
- Low Noise Figure TR1 and TR2 of 1.0 dB at 1.8GHz

- High Current Capability and Low Noise Figure for Wide Dynamic Range Applications
- Ideal for Low Phase Noise Oscillators up to 3.5GHz
- Low Voltage Operation
- Low Noise Figure TR1 and TR2 of 1.1dB at 1.8GHz



**TSLP-6-1
Package**

Footprint 1.2 x 0.8 x 0.4mm only!

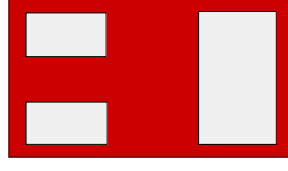
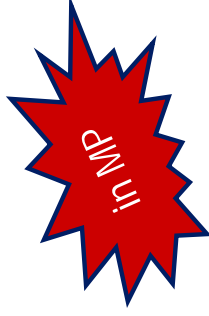
23GHz f_T Single & Twin RF Transistors in TSLP VCO and RF Modules

> RF Discretes > RF Transistors

- SINGLE and TWIN Type 23GHz Low Phase Noise RF-Transistors in Ideal for
- High gain ($\sim 17\text{dB}@1.8\text{GHz}$), low noise ($\sim 1.1\text{dB}$ @1.8GHz)
- 6-Pin Thin Small Leadless Package TSLP-6

| SINGLE | Transistor | Package | f_T [GHz] | VCE0 [V] | ICmax [mA] | Gms [dB] |
|--------------------|------------------|------------------------|-------------|------------|------------|-----------------------------|
| *BFR460L3 | | TSLP-3-1 | 23 | 4,5 | 35 | 17 at 1.8GHz, 2V,20m |
| TWIN | | | | | | |
| BFS460L6 T1 | (*BFR460) | TSLP-6-1 (1208) | 23 | 4,5 | 35 | 17 at 1.8GHz, 2V,20m |
| T2 | (*BFR460) | | 23 | 4,5 | 35 | 17 at 1.8GHz, 2V,20m |
| BFS466L6 T1 | (*BFR460) | TSLP-6-1 (1208) | 23 | 4,5 | 35 | 17 at 1.8GHz, 2V,20m |
| T2 | (BFR360) | | 14 | 6 | 35 | 15,5 at 1.8GHz, 3V,20m |
| BFS469L6 T1 | (*BFR460) | TSLP-6-1 (1208) | 23 | 4,5 | 35 | 17 at 1.8GHz, 2V,20m |
| T2 | (BFR949) | | 9 | 10 | 35 | 14 at 1.8GHz, 8V,10m |

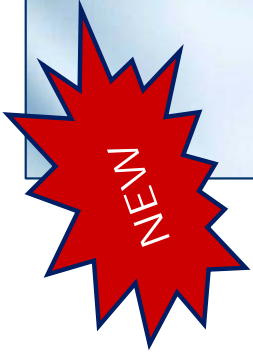
***ESD Performance Typ. 1500V HBM**



TSLP-3-1 (1006)

BFP460, BFP540ESD „EHRT“ ESD-Hardened RF Transistor

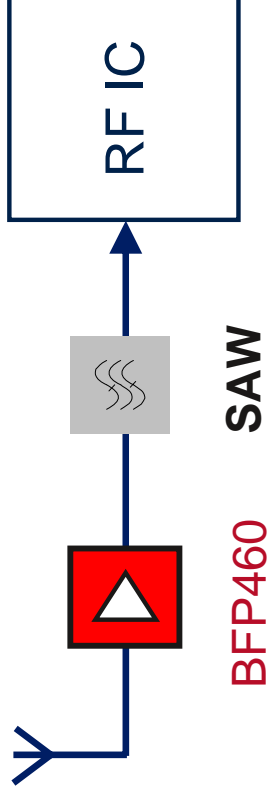
> RF Discretes > RF Transistors



- Excellent general-purpose RF transistor from VHF to 2.5 GHz
- **Survive 1500V, *1000V Electro-Static Discharge Pulses (Human Body Model)**
- Unmatched combination of ESD-Robustness and RF performance
- Industry-standard SOT343 package

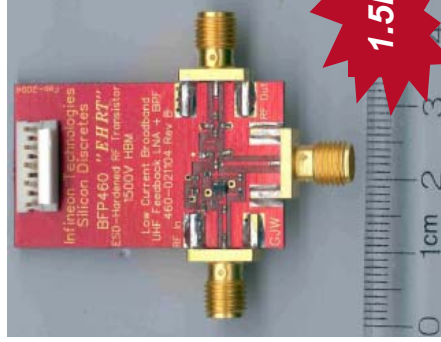
RF Remote Systems (ISM Based) ESD Hardened RF-Transistors BFP460, BFP540ESD

> RF Discretes > RF Transistors

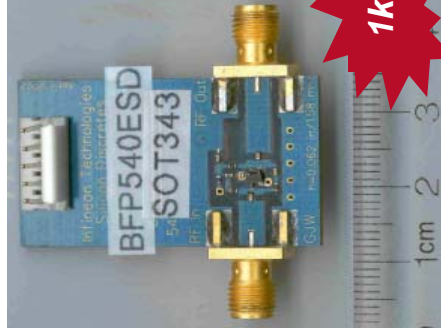


BFP460, BFP540ESD

- LNA Boost significantly the **sensitivity** of RKE ICs
- Easy Set-Up – No SMD Coils Required
- Low Current Operation – Extend Battery Life
- Application Kit/Note No.084 available



1.5kV



Low current, only 3mA

1kV

- Target Applications: Industrial Security Systems (315/433MHz)
- RF Remote On/Off Power
- RF Remote Garage Door Opener
- RF Security
- Product features:
 - Unmatched compatibility with integrated HBM (HBM)
 - Market Driven Convenience and Reliability
 - Customer expected ESD protection high Quality
- IFF products: Extended Antenna Range IFF RKE ICs (T

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■ RF MMICs

■ RF Diodes

■ RF PIN Diodes

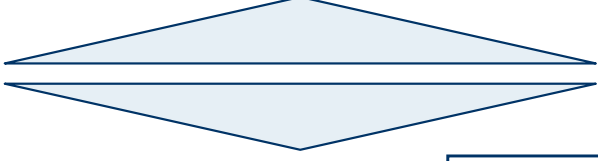
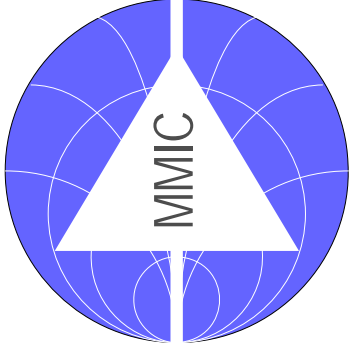
■ RF Varactor Diodes

■ RF Mosfet

Si MMICs and RF Transistors

Difference in Applications

> RF Discretes > RF MMICs



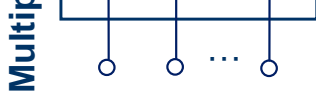
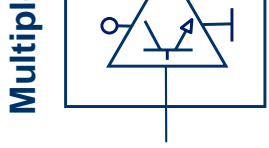
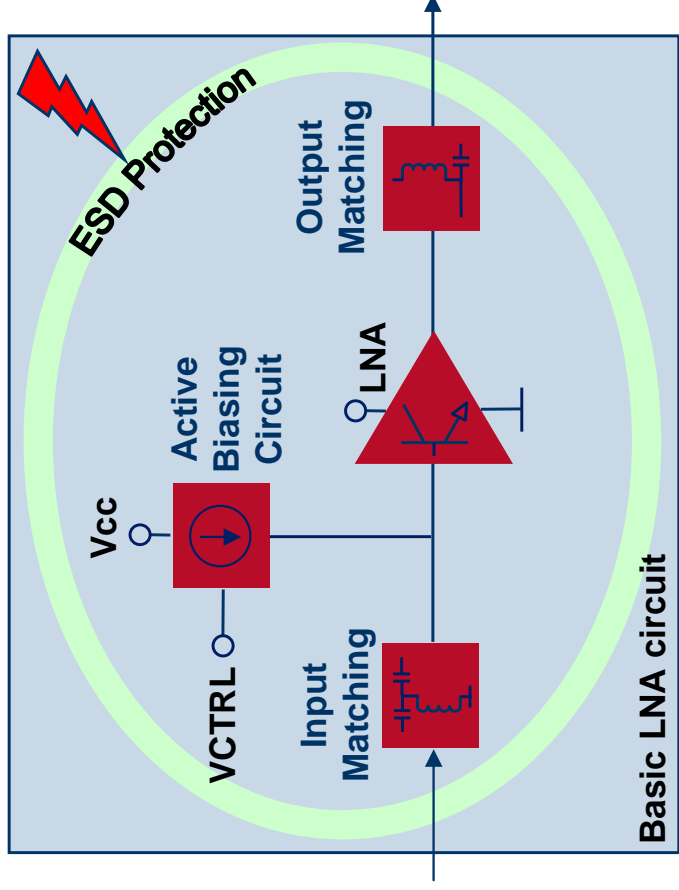
- **Application Specific**
- **Often: bias point fixed**
- **Narrow Band $f = 1.8 \dots 6 \text{ GHz}$**
- **Easiest Circuit & Board Design**
- **Low Parts Count**

- **Universal Application**
- **Broadband $f = \text{D}$**
- **Best Gain & NF**
- **Higher Parts Co**

Si MMICs – Why ?

Integrated Functions in one Package

> RF Discretes > RF MMICs



The function blocks include:

- active biasing circuit with bandgap
- input-/output matching
- multiple stage/band/gain stage LNA
- ESD protection circuit
- Bipolar Logic
- balun for mode conversion
- Linearity improvement circuit
- booster circuit

→ **Customer Benefit: shorter R&D time & cost down**

BGA615L7 GPS (1.575GHz) and L-Band SiGe LNA

> RF Discretes > RF MMICs

Features

- High Gain 18 dB
- Low Noise Figure 0.9 dB
- Off-mode
- 1KV ESD Protection
- Output 50 Ω matched
- Low Parts Count



| V_{cc} = 2.8V, frequency = 1.575GHz | | | |
|--|------------------------------------|-------------|--------------|
| Symbol | Parameter | Unit | Value |
| IS21 ^f | Insertion Power Gain | dB | 18 |
| NF | Noise Figure | dB | 0.9 |
| OP1dB | Output Compression Point | dBm | 6 |
| OIP3 | Output Third Order Intercept Point | dBm | 17 |
| I _d | Total Device Current | mA | 6 |

BGA622L7

Universal SiGe LNA

> RF Discretes > RF MMICs

Applications

- UMTS / CDMA
- GSM / TDMA / EDGE
- GPS / ISM
- Bluetooth
- DVB-T/DVB-H

Features

- 1.1dB Noise Figure @1.575 GHz
- On-Off Switch
- 50 matched @ > 2 GHz
- Low Parts Count



Now ESD-Proof.
2KV acc. to HBM

Vcc = 2.7V, frequency = 1.575GHz

| Symbol | Parameter | Unit | Value |
|--------------------|------------------------------------|------|-------|
| IS21f ² | Insertion Power Gain | dB | 17.5 |
| NF | Noise Figure | dB | 1.1 |
| OP1dB | Output Compression Point | dBm | -1 |
| IP3 out | Output Third Order Intercept Point | dBm | 17 |
| Id | Total Device Current | mA | 5.8 |

BGA622

Universal SiGe LNA

> RF Discretes > RF MMICs

Applications

- UMTS / CDMA
- GSM / TDMA / EDGE
- GPS / ISM
- Bluetooth
- DVB-T/DVB-H

Features

- 1.1 dB Noise Figure @2.1 GHz
- On-Off Switch
- 50 matched @ > 2 GHz
- Low Parts Count



V_{cc} = 2.7V, frequency = 2.14GHz

| Symbol | Parameter | Unit | Value |
|-------------------|-----------------------------|------|-------|
| IS21 ² | Insertion Power Gain | dB | 13.3 |
| NF | Noise Figure | dB | 1.1 |
| P1dB | Output Compression Point | dBm | 0 |
| IP3 out | Third Order Intercept Point | dBm | 18 |
| I _d | Total Device Current | mA | 5.8 |

BGA428 GSM and GPS LNA

> RF Discretes > RF MMICs

Features and Benefits

- For GSM 900/1800/1900 & GPS
- Low NF and high gain
- 50 matched input & output
- Reduced component count
- SOT363 package



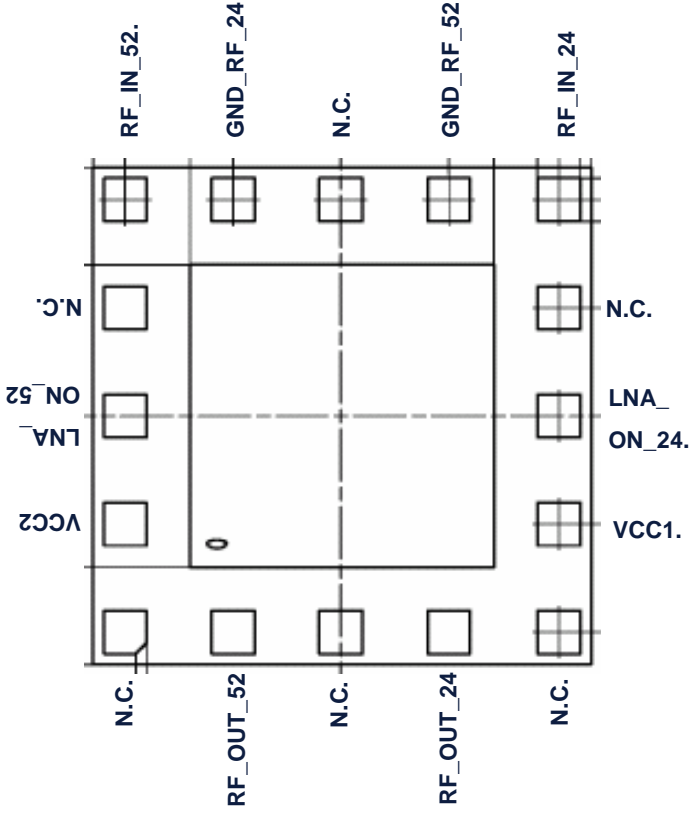
V_{cc} = 2.7V, frequency = 1.8GHz

| Symbol | Parameter | Unit | Value |
|-----------------|-----------------------------------|------|-------|
| G _{ma} | Power Gain | dB | 20 |
| NF | Noise Figure | dB | 1.4 |
| P1dB | Input Compression Point | dBm | -19 |
| IIP3 | Input Third Order Intercept Point | dBm | -9 |
| I _d | Total Device Current | mA | 8,2 |

BGA700L16, Dual Band WLAN LNA

> RF Discretes > RF MMICs

Bare Die Sales Code: T1515
Package Sales Code: BGA700L16



P. Size: 2.3 x 2.3 x 0.39 mm³

| 2.4 GHz, V _{CC} =3.2V | |
|--------------------------------|---|
| Gain | 1 |
| Noise Figure | 0 |
| IP-1dB | - |

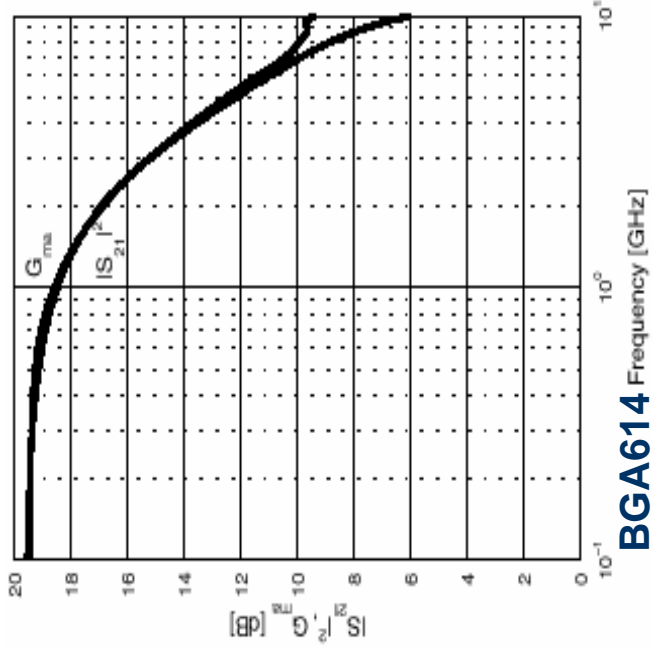
| 5.5 GHz, V _{CC} =3.2V | |
|--------------------------------|---|
| Gain | 2 |
| Noise Figure | 1 |
| IP-1dB | - |

BGA612, BGA614, BGA616 SiGe Broadband Amplifier / DC ... 5GHz, 50 matched

> RF Discretes > RF MMICs



Application support see application note 067 !

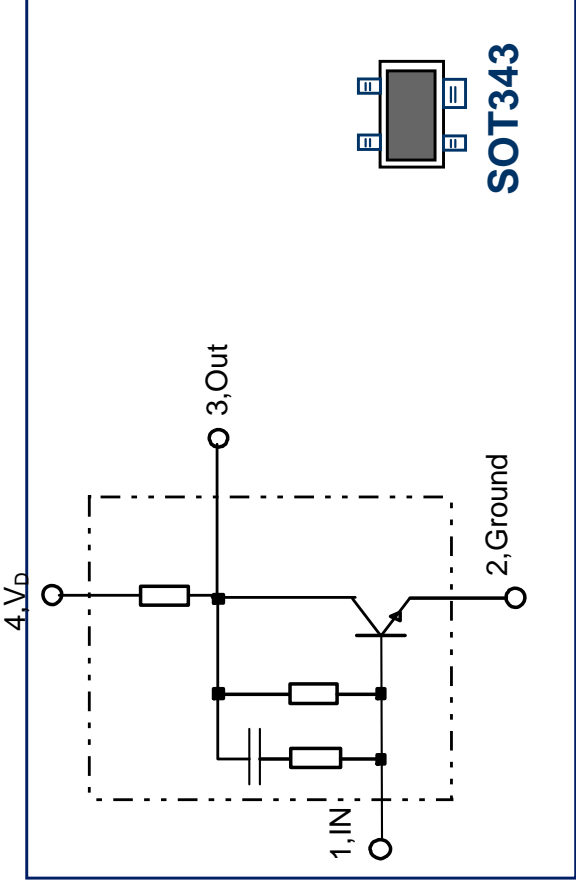


| Type | Maximum Ratings | | Characteristics | | | | |
|---------|--------------------|---------------------|---------------------|------------------------------|-------------------|---|--|
| | Device Voltage [V] | Device Current [mA] | 3dB bandwidth [GHz] | Gain S21 ² [dB] | Noise Figure [dB] | Output Power for 1 dB compression [dBm] | 3rd Order Output Intercept point [dBm] |
| BGA 612 | 2.8 | 80 | 2.8 | 15.8 | 2.35 | 7 | 17 |
| BGA 614 | 3.0 | 80 | 2.4 | 17 | 2.3 | 12 | 25 |
| BGA 616 | 4.5 | 80 | 2.7 | 17.5 | 2.9 | 18 | 29 |

BGA420

Broadband LNA-MMIC in SIEGET[®]25 Technology

> RF Discretes > RF MMICs

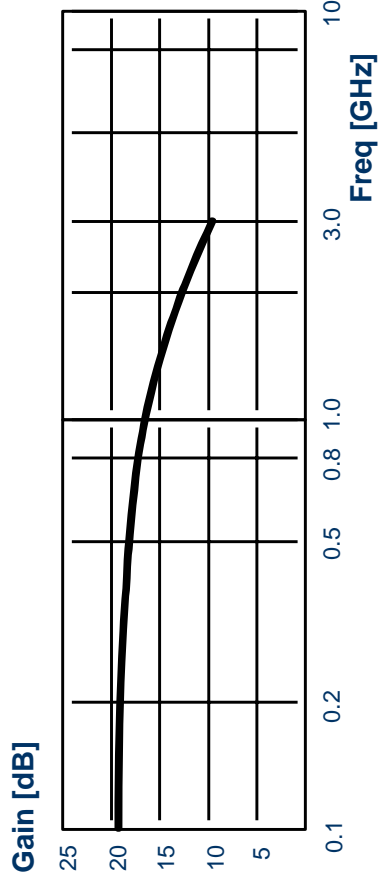


Features

- High Performance
- Gain = 13 dB *
- NF = 2.2 dB *
- Reverse isolation
- OIP3 = +10 dBm
- Input/output match
- * data @ 3 V, 6.4

Benefits

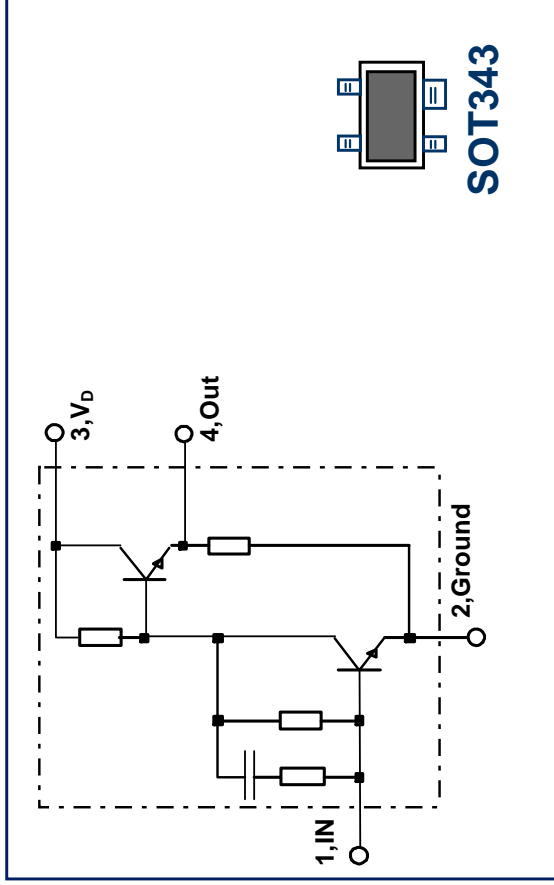
- SOT343
- Easy to design in



BGA427

Broadband LNA-MMIC in SIEGET® 25 Technology

> RF Discretes > RF MMICs



Features

- High Performance
- Gain = 22 dB *
- NF = 2.2 dB *
- Reverse isolation
- IP3 output = +10 dBm
- Input/output matching
- * data @ 3 V, 100 MHz

Benefits

- SOT343
- Easy to design

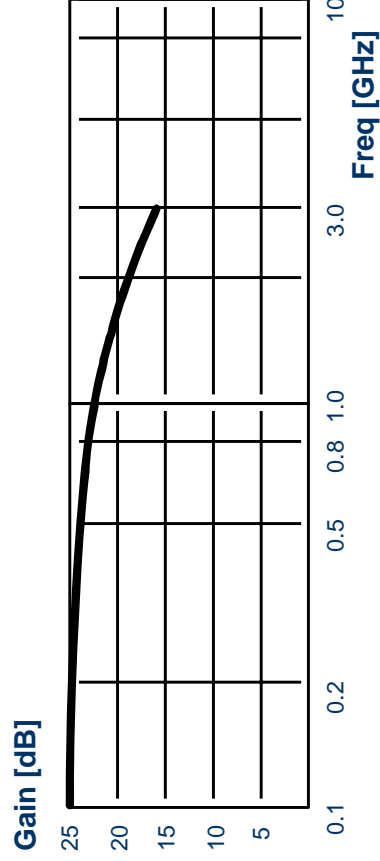


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■ RF PIN Diodes

■ RF Varactor Diodes

■ RF Mosfet

RF Diodes Packages and Configurations

> RF Discretes > RF Diodes

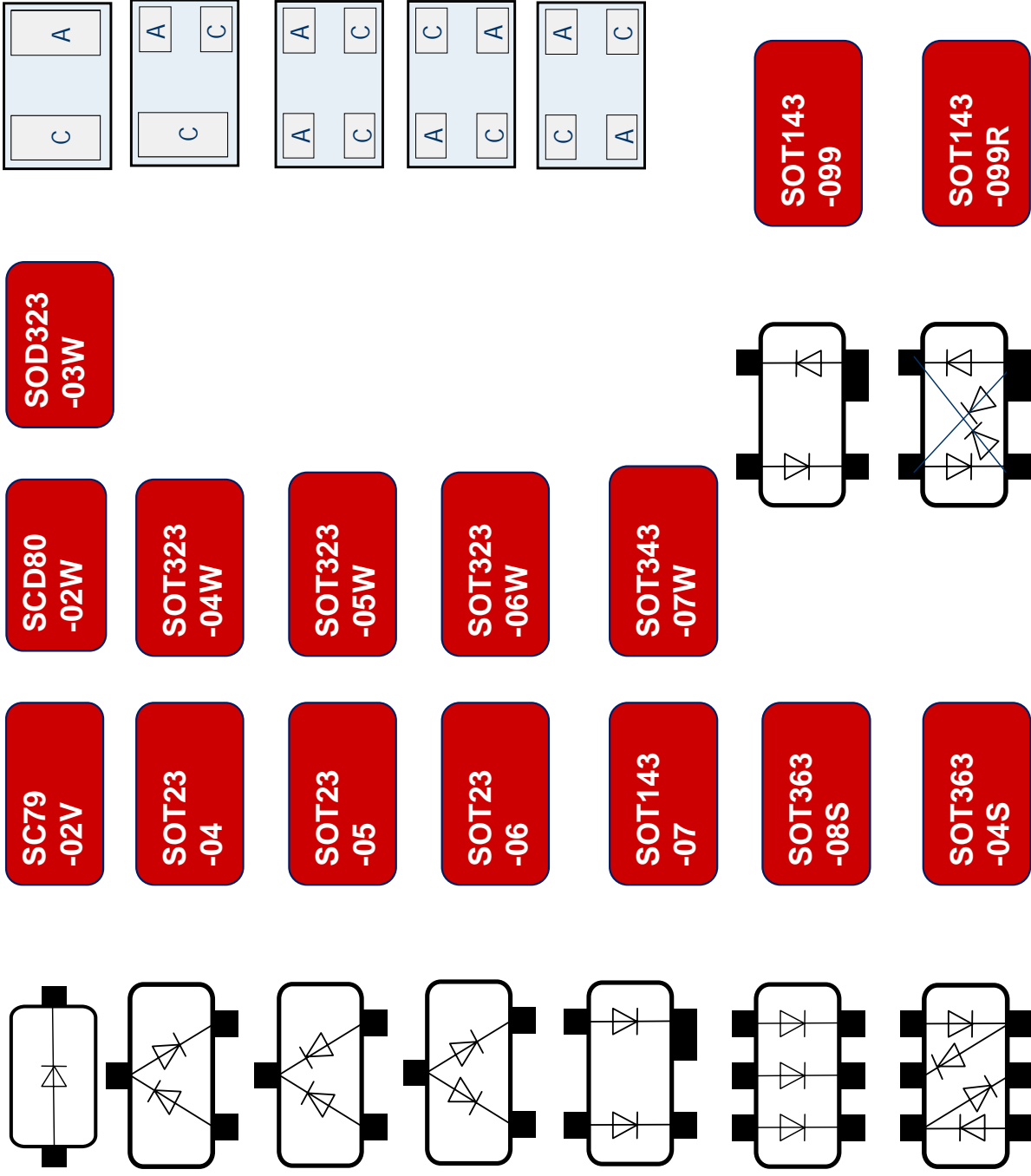


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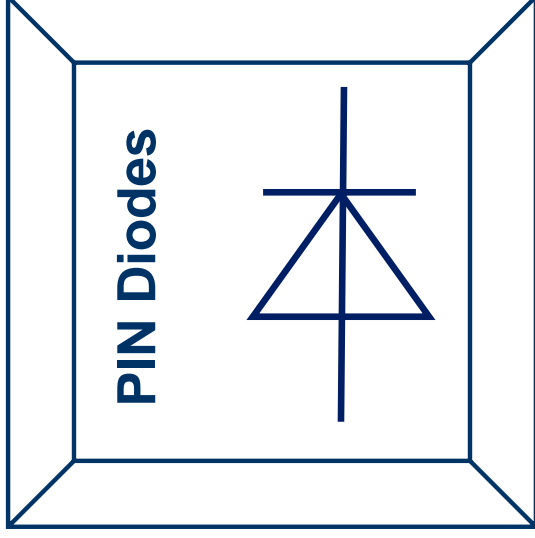
■ RF PIN Diodes

■ RF Varactor Diodes

■ RF Mosfet

PIN Diodes Applications & Key Parameters

> RF Discretes > RF PIN Diodes



Band switching

in TV / SAT tuners

RF attenuator

PIN Diodes

Antennas
in RF

Surge
protection

t_{rr}

r_f

C_T

Charge carrier lifetime

Forward resistance

Diode capacitance

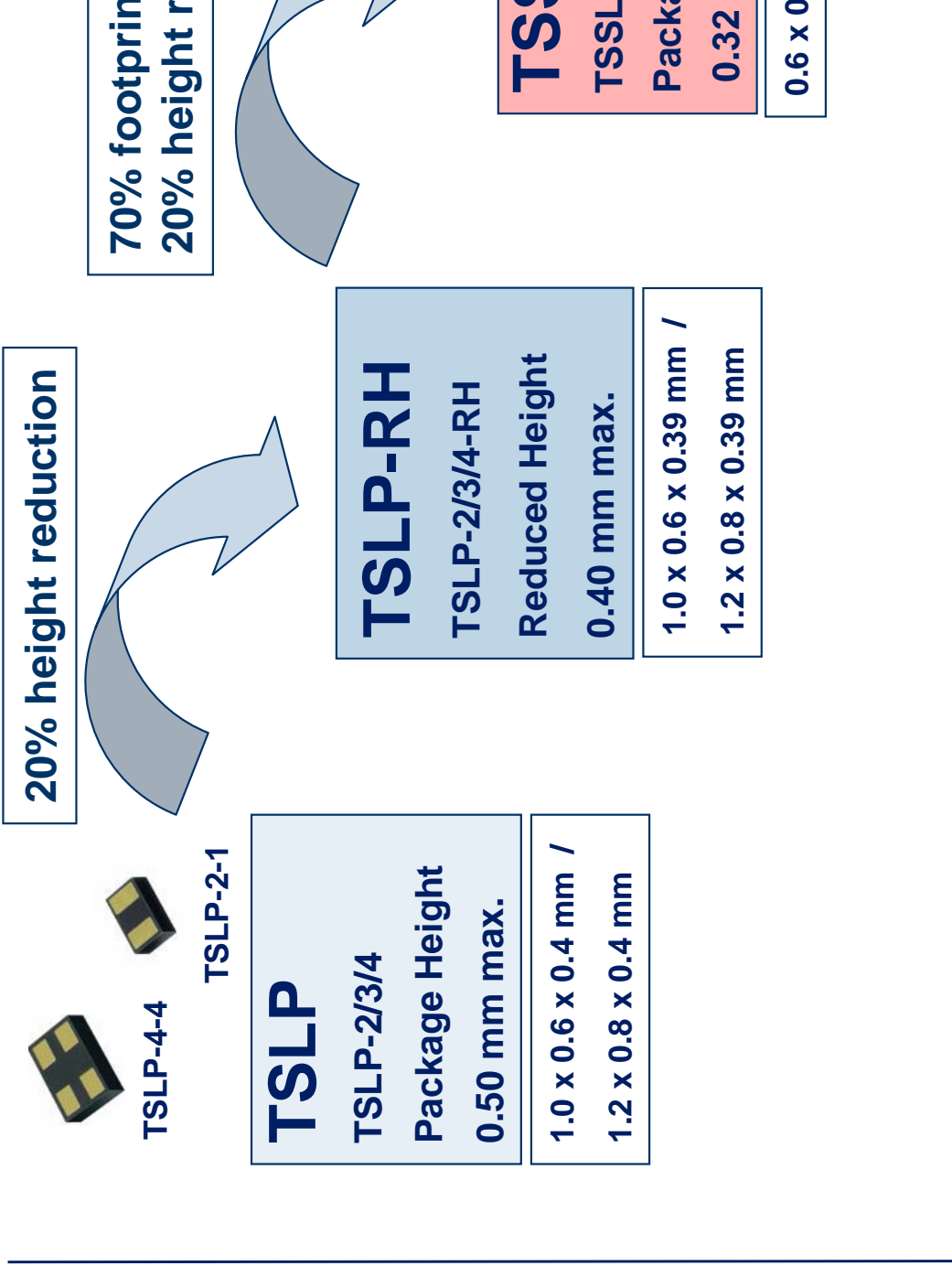
Switching time

Low for low

Small for high

Diode packages for smallest size

> RF Discretes > RF PIN Diodes

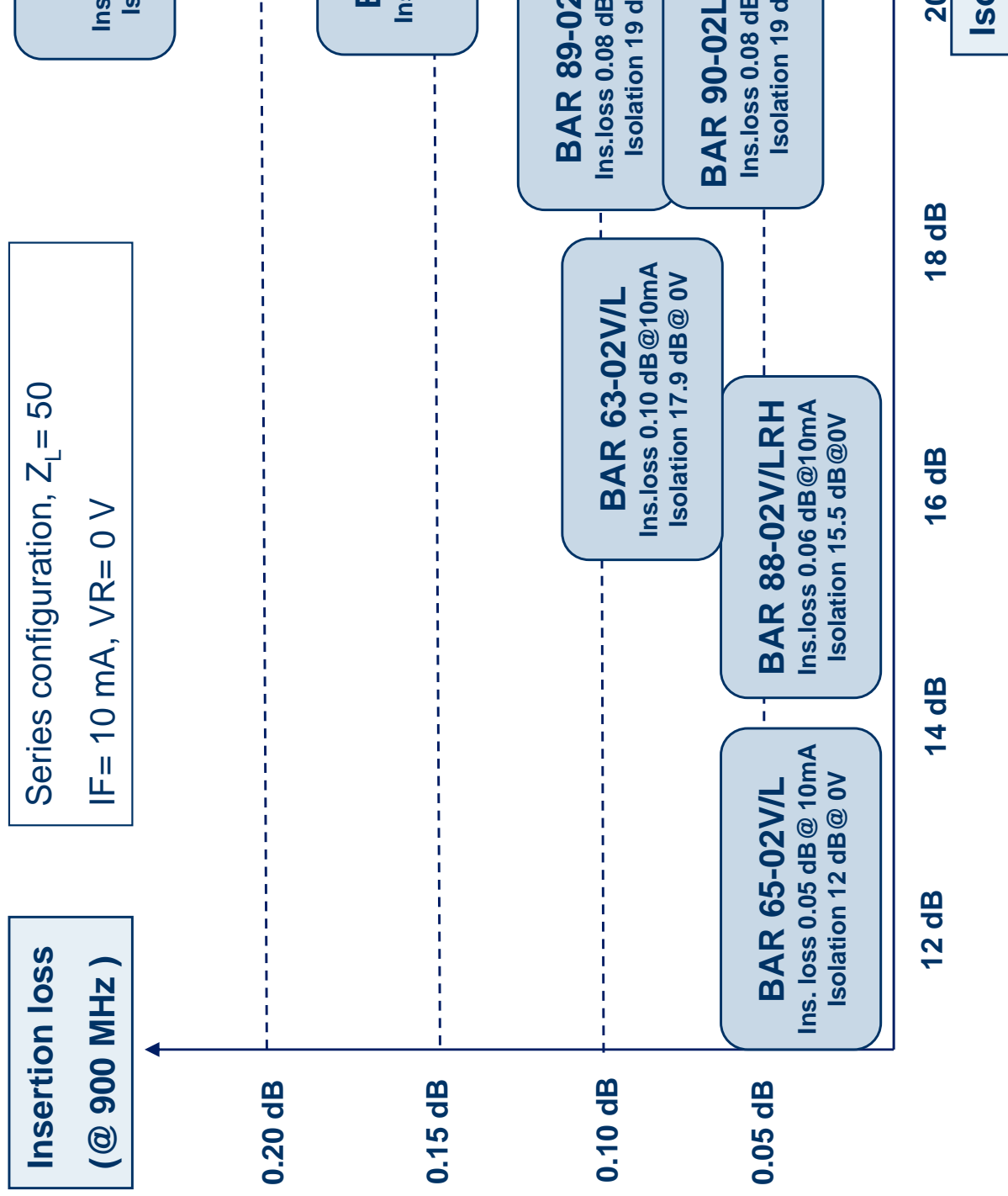


2003

2004

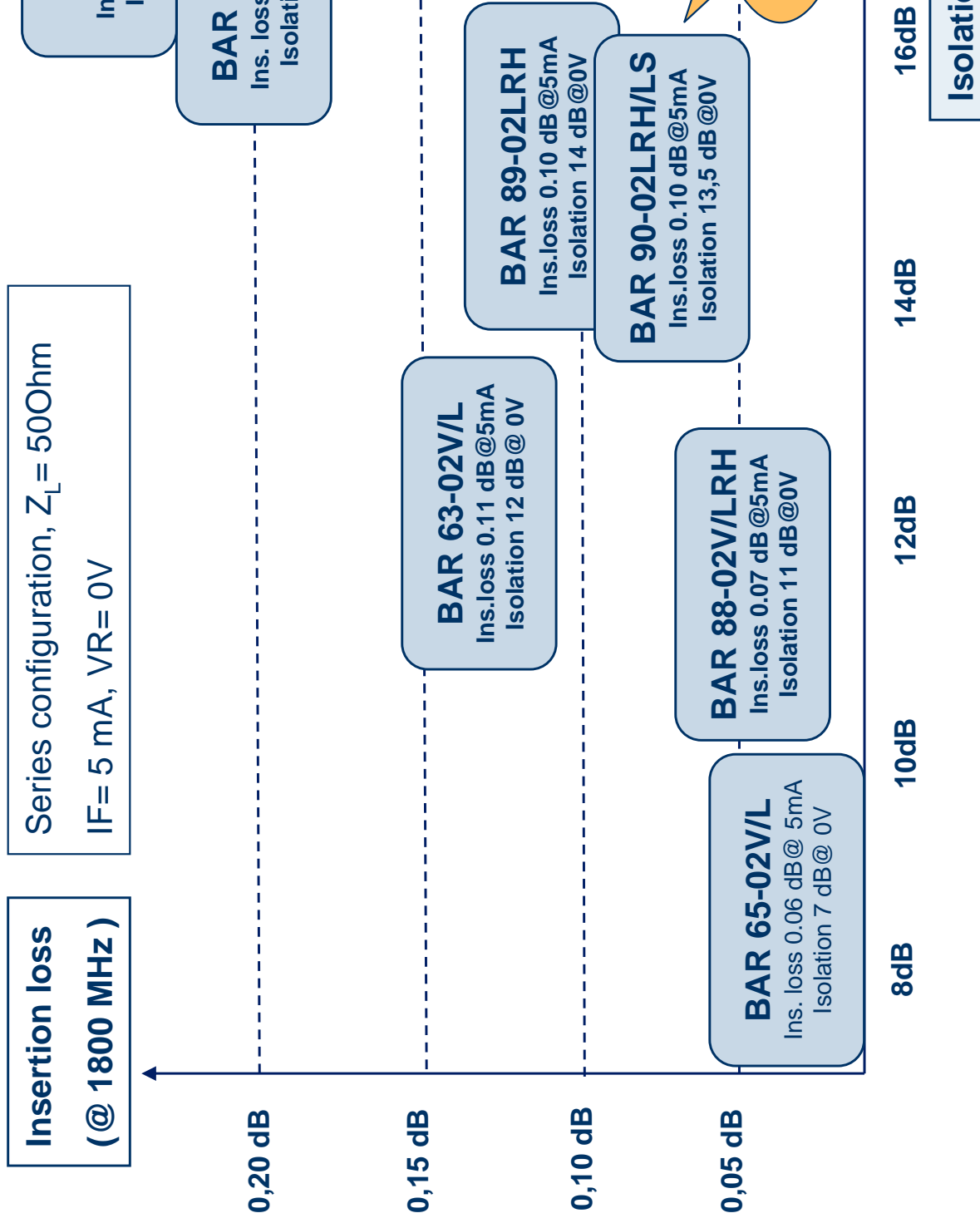
PIN Diodes for Antenna Switches @ 900MHz

> RF Discretes > RF PIN Diodes



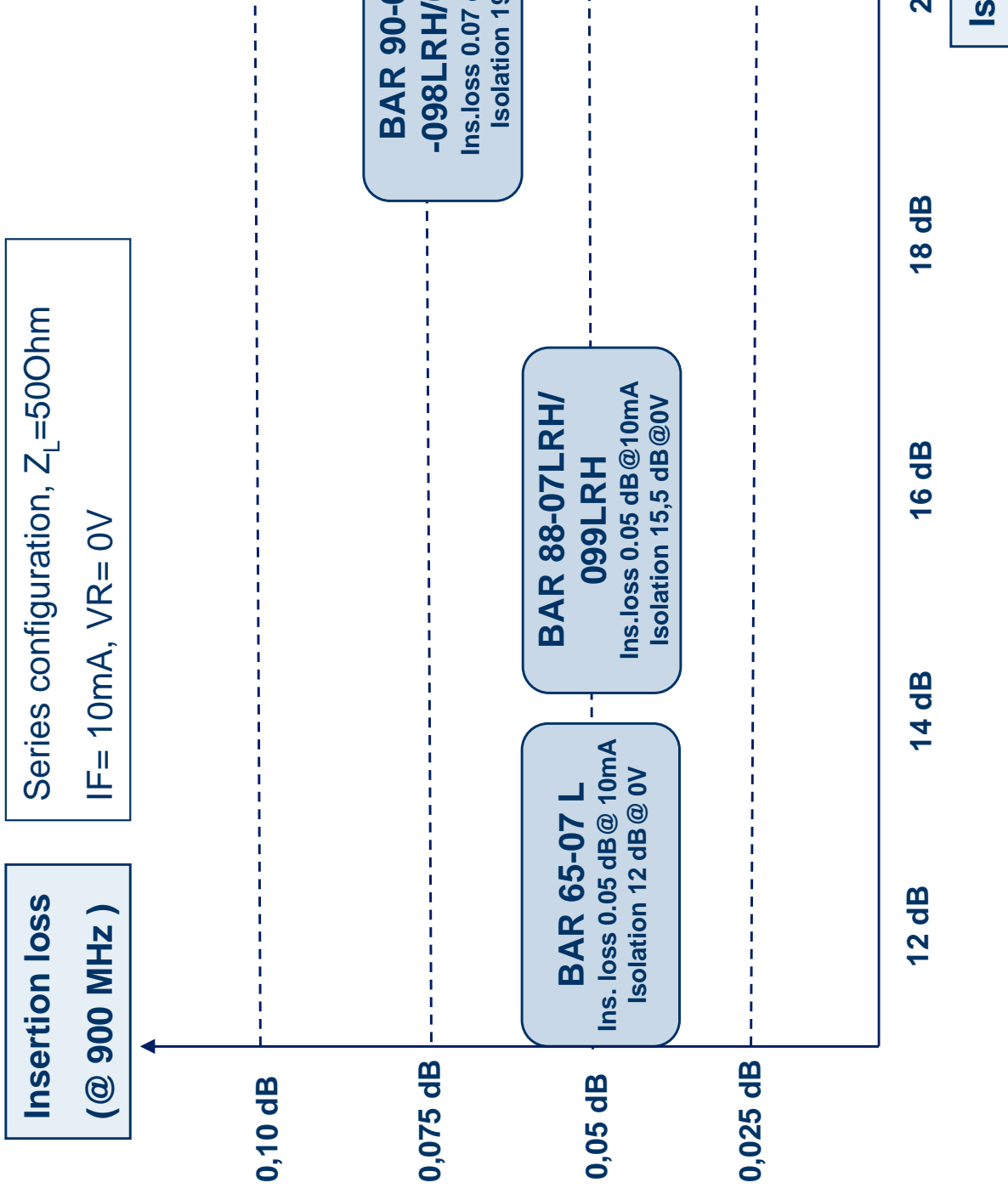
PIN Diodes for Antenna Switches @1800MHZ

> RF Discretes > RF PIN Diodes



Dual PIN Diodes for Antenna Switches in TSLP-4 @ 900MHz

> RF Discretes > RF PIN Diodes



Diodes in TSLP-4 Package

> RF Discretes > RF PIN Diodes

Dual Diodes in **parallel** and **anti-parallel** configurations

Advantage for customer:
40% footprint reduction compared to 2 single diodes

PIN Diodes
BAR88-07LRH
BAR90-07LRH

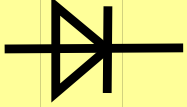
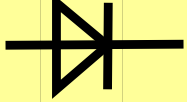
Schottky Diodes
BAT15-07LRH
BAT62-07L4

PIN Diodes
BAR88-098LRH
BAR88-099LRH
BAR90-098LRH
BAR90-099LRH



TSLP-4/TSLP-4-RH
1,2x0,8x0,5/0,4mm

-07L



-099L



PIN Diodes Harmonic Distortion Values

> RF Discretes > RF PIN Diodes

| Type | 2nd / 3rd Harmonics (dBc), typical values 35 dBm, 900 MHz, 50 Ohm, single diode in series co | | |
|------------|---|----------|----------|
| | IF= 1 mA | IF= 3 mA | IF= 6 mA |
| BA 892-... | 60 / 60 | - | 80 / >95 |
| BAR 50-... | na *) | - | 70 / 75 |
| BAR 63-... | na *) | - | 70 / 75 |
| BAR 64-... | na *) | - | 75 / 90 |
| BAR 65-... | 40 / 40 | - | 75 / 90 |
| BAR 67-... | 30 / 30 | - | 75 / 90 |
| BAR 88-... | 70 / 75 | 80 / 85 | 80 / >95 |
| BAR 89-... | 40 / 40 | 65 / 70 | 80 / 90 |
| BAR 90-... | 65 / 65 | 75 / 85 | 85 / >95 |

* Not applicable, restricted by max. power dissipation of diode
Noise floor of used test setup: 95 dBc

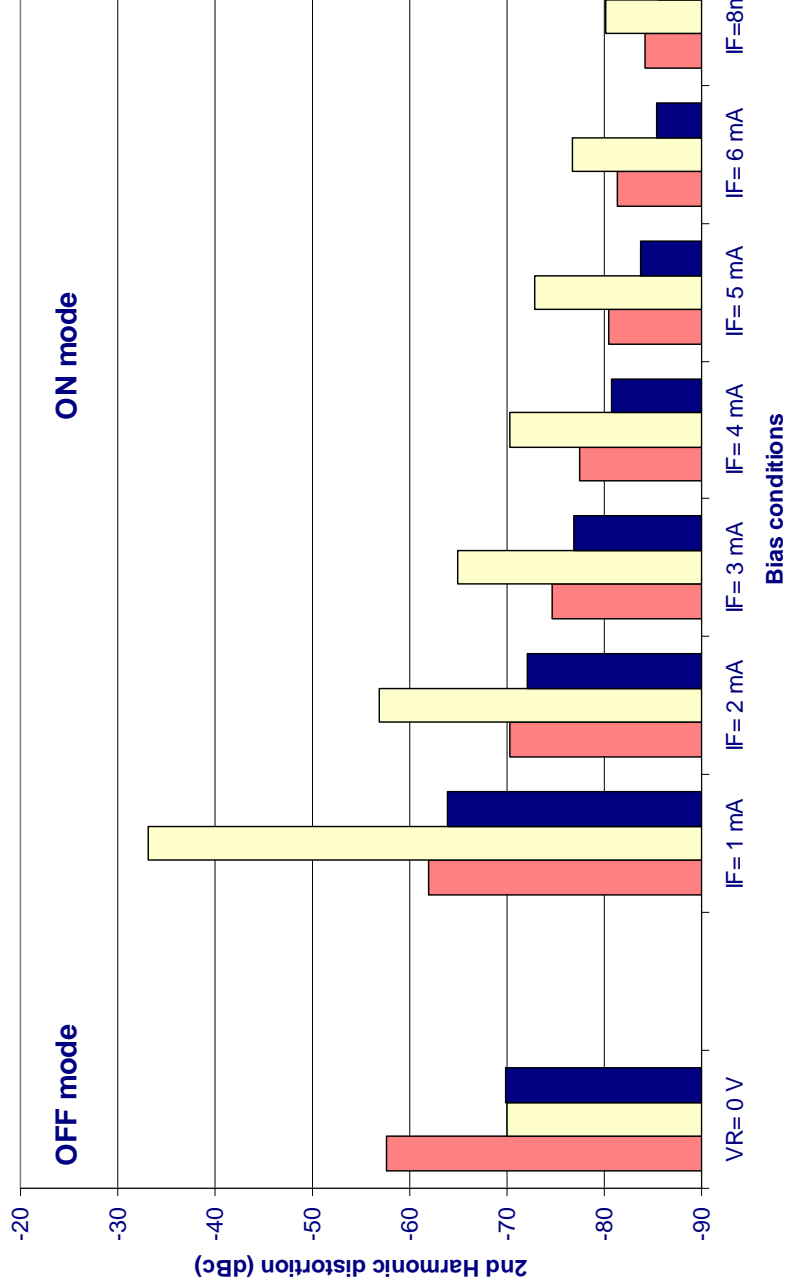
Harmonic Distortion BAR88 / 89 / 90 series

> RF Discretes > RF PIN Diodes

Switching PIN diode BAR88 / BAR89 / BAR90 series

2nd Harmonic distortion performance

Test conditions: Pin= 35 dBm (ON mode) / 0 dBm (OFF mode), fo= 900 MHz



BAR90 with balanced harmonic performance in ,On' and ,Off' m

PIN Diodes Line Up for FM and TV Tuners

> RF Discretes > RF PIN Diodes

Key Features

- Very low capacitance and forward resistance values to guarantee:
 - Low harmonic for band-switching and antenna-switching applications
 - Low distortion factor for RF attenuation applications
 - Long-term stability of electrical characteristics

| Type | package | Ct@1V | rf@10mA | Trr |
|----------------------------------|---------|---------|----------|--------|
| BA592 | SOD323 | | | |
| BA892 | SCD80 | | | |
| BA892-02V | SC79 | 0.92 pF | 0.36 Ohm | 120 ns |
| BA892-02L | TSLP2 | | | |
| BA595 | SOD323 | | | |
| BA885 | SOT23 | 0.35 pF | 4.5 Ohm | 1.6 us |
| BA895 | SCD80 | | | |
| BAR14-1, BAR15-1, BAR16-1 (Dual) | SOT23 | 0.50 pF | 7.0 Ohm | 1.0 us |
| BAR50-02V | SC79 | 0.24 pF | 3.0 Ohm | 1.1 us |
| BAR61 (Triple) | SOT143 | 0.25 pF | 7.0 Ohm | 1.0 us |

PIN Diodes Line up

> RF Discretes > RF PIN Diodes

| Type | package | Ct @ 1V | rF @ 10mA |
|-----------------------------------|--------------------|---------|-----------|
| BA592 | SOD323 | 0.92 pF | 0.36 Ohm |
| BA892 | SCD80 | 0.92 pF | 0.36 Ohm |
| BA892-02V | SC79 | 0.92 pF | 0.36 Ohm |
| BA892-02L | TSLP2 | 0.92 pF | 0.36 Ohm |
| BA595 | SOD323 | 0.35pF | 4.5 Ohm |
| BA885 | SOT23 | 0.35pF | 4.5 Ohm |
| BA895 | SCD80 | 0.35pF | 4.5 Ohm |
| BAR14-1,15-1,16-1 (D) | SOT23 | 0.50 pF | 7.0 Ohm |
| BAR50-02V | SC79 | 0.24 pF | 3.0 Ohm |
| BAR50-02L | TSLP2 | 0.24 pF | 3.0 Ohm |
| BAR63-03W | SOD323 | 0.23 pF | 1.0 Ohm |
| BAR63-02W | SCD80 | 0.23 pF | 1.0 Ohm |
| BAR63-02V | SC79 | 0.23 pF | 1.0 Ohm |
| BAR63-02L | TSLP2 | 0.23 pF | 1.0 Ohm |
| BAR63-04/05/06 (D) | SOT23 | 0.23 pF | 1.0 Ohm |
| BAR63-04W/05W/06W (D) | SOT323 | 0.23 pF | 1.0 Ohm |
| BAR64-03W | SOD323 | 0.45 pF | 2.1 Ohm |
| BAR64-02V | SC79 | 0.45 pF | 2.1 Ohm |
| BAR64-02LRH | TSLP2-RH | 0.45 pF | 2.1 Ohm |
| BAR64-04/05/06/07 (D) | SOT323 | 0.45 pF | 2.1 Ohm |
| BAR64-04W/05W/06W (D) | SOT323 | 0.45 pF | 2.1 Ohm |
| BAR65-03W | SOD323 | 0.45 pF | 0.6 Ohm |
| BAR65-02L | TSLP2 | 0.45 pF | 0.6 Ohm |
| BAR65-02V | SC79 | 0.45 pF | 0.6 Ohm |
| BAR66 | SOT23 | 0.45 pF | 1.0 Ohm |
| BAR67-02V | SC79 | 0.40 pF | 1.0 Ohm |
| BAR61 | SOT143 | 0.50 pF | 7.0 Ohm |
| BAR88-02V | SC79 | 0.3 pF | 0.6 Ohm |
| BAR88-02LRH,-07LRH,-098LRH,099LRH | TSLP2-RH, TSLP4-RH | 0.3 pF | 0.6 Ohm |
| BAR89-02LRH | TSLP2-RH | 0.25 pF | 0.8 Ohm |
| BAR90-02LS | TSSLP2 | 0.25 pF | 0.8 Ohm |
| BAR90-02LRH,-07LRH,-099LRH | TSLP2-RH, TSLP4-RH | 0.25 pF | 0.8 Ohm |

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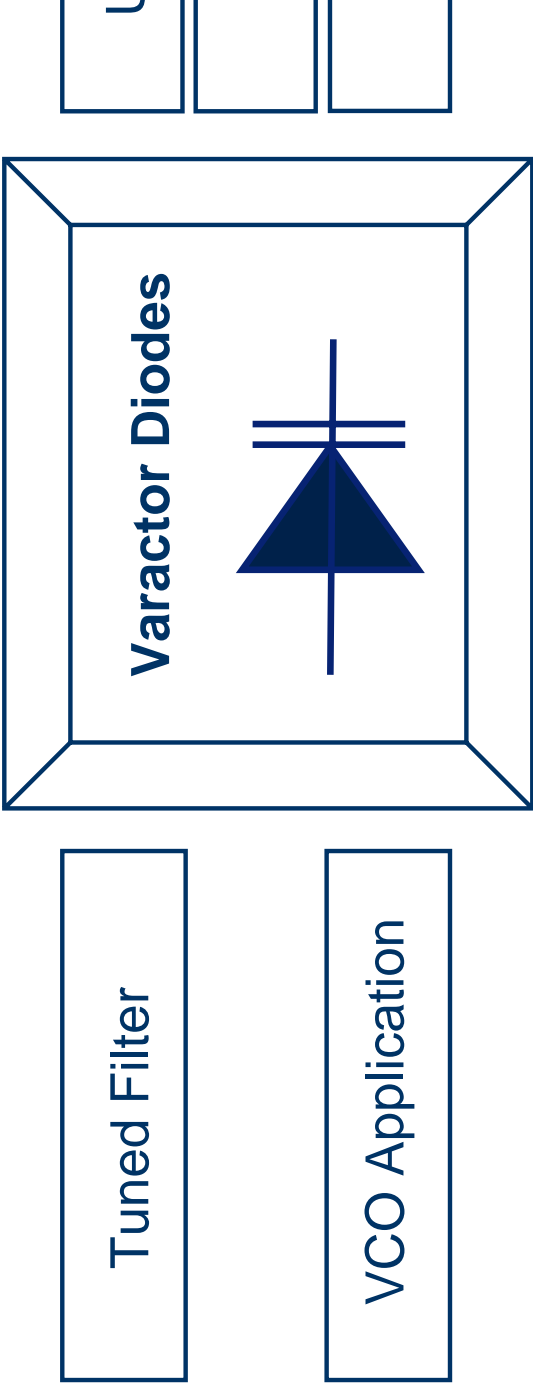
■ RF PIN Diodes

■ RF Varactor Diodes

■ RF Mosfet

Varactor Diodes Applications & Key Parameters

> RF Discretes > RF Varactor Diodes



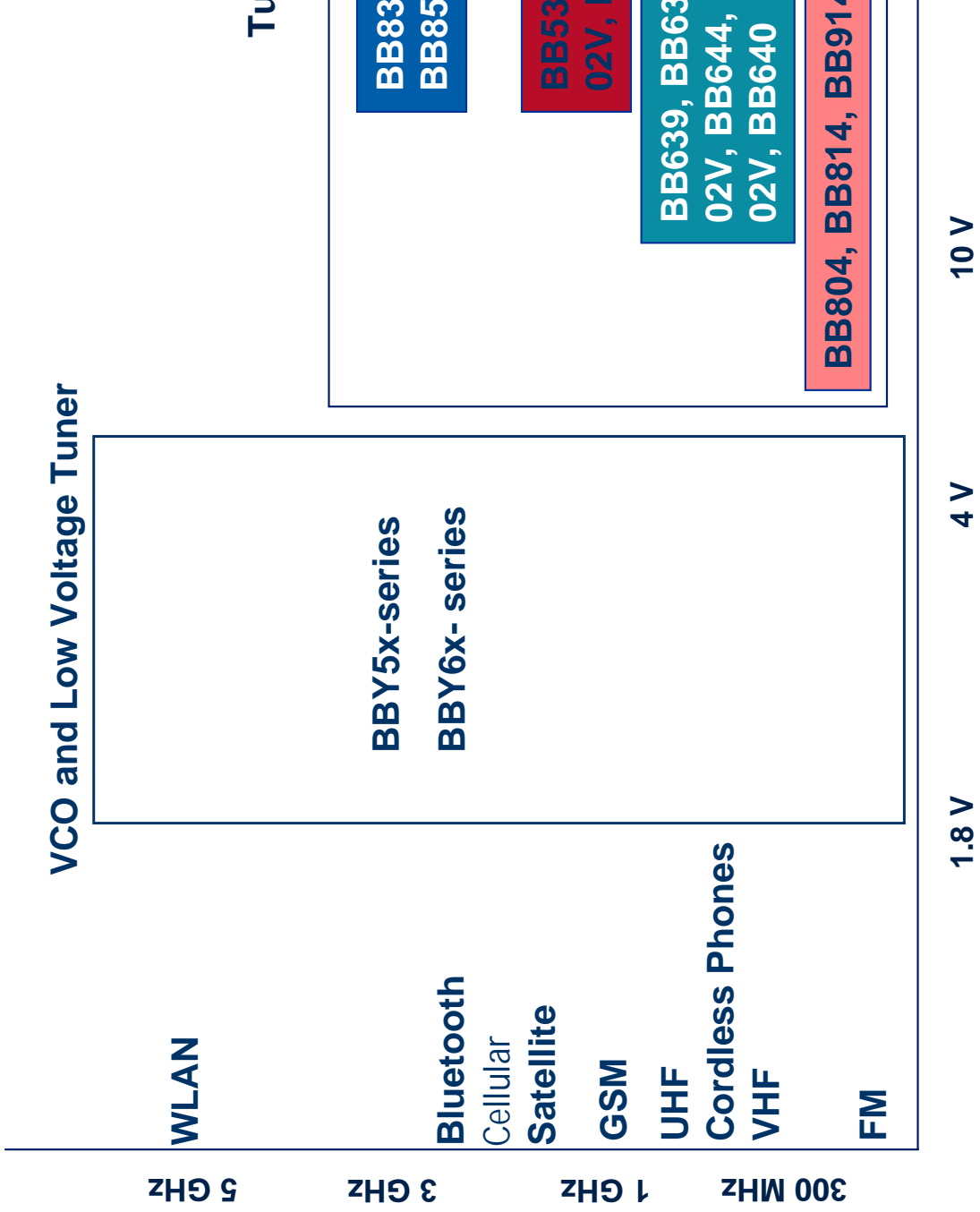
$$\frac{C_{V\min}}{C_{V\max}}$$
$$r_s$$

Capacitance ratio
Series resistance
Indicates Q factor

Indicates tuning range
Influence on phase noise

Varactor Diodes Product Portfolio

> RF Discretes > RF Varactor Diodes



Varactor Diodes Line Up for VCOs

> RF Discretes > RF Varactor Diodes

| Type | Package | C@1V | Cap-ratio |
|---------------------|----------------------|--------|---------------|
| BBY51-03W, 02W, 02L | SOD323, SCD80, TSLP2 | 5.4pF | 1.75 (1V/3V) |
| BBY51 | SOT23 | 5.4pF | 1.75 (1V/3V) |
| BBY52-02W, 02L | SCD80, TSLP2 | 1.9pF | 1.6 (1V/4V) |
| BBY53-03W, 02W, 02V | SOD323, SCD80, SC79 | 5.3pF | 2.2 (1V/3V) |
| BBY53, -05W | SOT23, SOT323 | 5.3pF | 2.2 (1V/3V) |
| BBY53-02L, 03LRH | TSLP2, TSLP3-RH | 5.3pF | 2.2 (1V/3V) |
| BBY55-02W, 02V | SCD80, SC79 | 18.6pF | 2.5 (2V/10V) |
| BBY55-03W | SOD323 | 18.6pF | 2.5 (2V/10V) |
| BBY56-02W | SCD80 | 40pF | 2.6 (1V/3V) |
| BBY56-03W | SOD323 | 40pF | 2.6 (1V/3V) |
| BBY57-02W, 02V | SCD80, SC79 | 17.5pF | 2.45 (1V/3V) |
| BBY57-02L | TSLP2 | 17.5pF | 2.45 (1V/3V) |
| BBY57-05W | SOT323 | 17.5pF | 2.45 (1V/3V) |
| BBY58-03W, 02W, 02V | SOD323, SCD80, SC79 | 18.3pF | 3.05 (1V/4V) |
| BBY58-02L | TSLP2 | 18.3pF | 3.05 (1V/4V) |
| BBY58-05W, 06W | SOT323 | 18.3pF | 3.05 (1V/4V) |
| BBY59-02V | SC79 | 28pF | 4 (1V/4V) |
| BBY65-02V | SC79 | 20pF | 4.55 (1V/3V) |
| BBY66-02V | SC79 | 70pF | 5.5 (1V/4,5V) |
| BBY66-05, 05W | SOT23, SOT323 | 70pF | 5.5 (1V/4,5V) |

Varactor Diodes Product Overview for FM/TV/SAT Tuner

> RF Discretes > RF Varactor Diodes

| Type | package | C@2V | C_{β}/C_2 |
|--------------------|-------------|-------|------------------|
| BB804 (Dual) | SOT23 | 45pF | 1.7 |
| BB814 (Dual) | SOT23 | 46pF | 2.15 |
| BB844 | SOT23 | 45pF | 3.5 |
| BB914 (Dual) | SOT23 | 45 pF | 2.35 |
| Type | package | C@1V | $C_{2\beta}/C_1$ |
| BB639 | SOD323 | 38pF | 14.7 |
| BB659 | SCD80 | 38pF | 14.7 |
| BB639C | SOD323 | 39pF | 15.3 |
| BB659C, BB659C-02V | SCD80, SC79 | 39pF | 15.3 |
| BB644 | SOD323 | 42pF | 16.4 |
| BB664, BB664-02V | SCD80, SC79 | 42pF | 16.4 |
| BB669 | SOD323 | 57pF | 20.9 |
| BB689, BB689-02V | SCD80, SC79 | 57pF | 20.9 |
| BB640 | SOD323 | 69pF | 22.9 |
| BB535 | SOD323 | 19pF | 8.9 |
| BB555, BB555-02V | SCD80, SC79 | 19pF | 8.9 |
| BB545 | SOD323 | 20pF | 10.0 |
| BB565, BB565-02V | SCD80, SC79 | 20pF | 10.0 |
| BB831 | SOD323 | 8.8pF | 8.6 |
| BB833 | SOD323 | 9.3pF | 12.4 |
| BB837 | SOD323 | 6.6pF | 12.0 |
| BB857 | SCD80 | 6.6pF | 12.0 |

Low voltage Varactor Diodes for T-DMB and DVB-H Tuners

> RF Discretes > RF Varactor Diodes

Capacitance value @ 1V

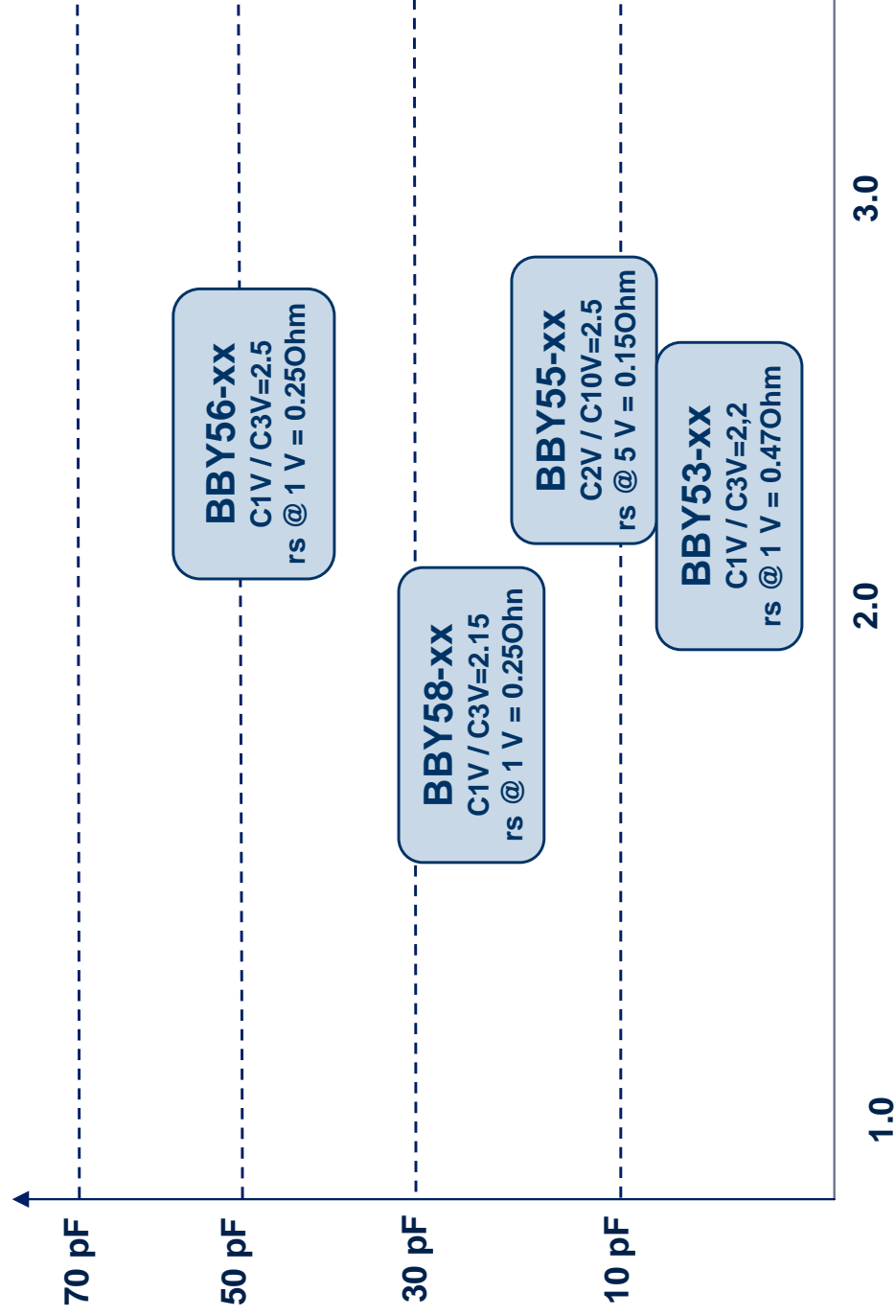


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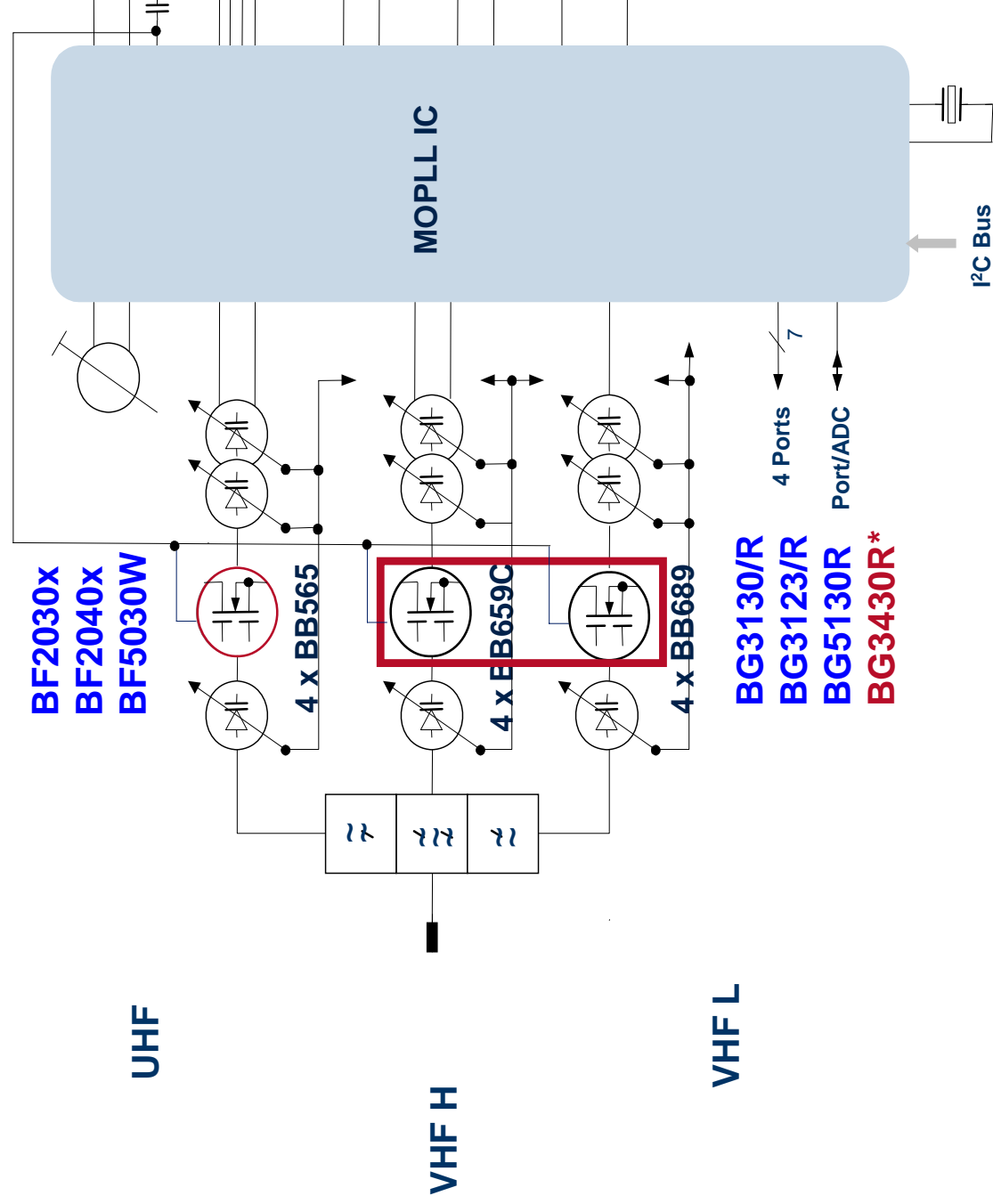
■ RF Varactor Diodes

■ RF Mosfet

RF MOSFET: Single and Dual

Gain controlled prestage amplifier for analog & digital TV DVD/ STB Tuner

> RF Discretes > RF Mosfet



* BG3430R: for two band tuners

DualMOS : Two MOSFETs in One package

> RF Discretes > RF Mosfet

Applications

- Analog and digital tuner modules
- More than 50% of footprint saving compared to 2 single MOSFETs
- Less pick and place effort
- Easier Logistics
- Price advantage than 2 x single MOSFET



SOT343 Outline:
(L x W x H) 2*1.25*0.9 mm³



SOT363 Outline:
(L x W x H) 2*1.25*0.9 mm³

DualMOS Product Portfolio

> RF Discretes > RF Mosfet

| | PNP Switched Semi Biased | NPN Switched Full Biased |
|-------|---|--|
| 25 mS | BG3123 / R $G_{psA}/G_{psB} = 25/24$ dB $F_A / F_B = 1.8/1.8$ dB $C_{g1ssA}/C_{dssA} = 1.9/1.3$ pF $C_{g1ssB}/C_{dssB} = 1.5/1.1$ pF | |
| 30 mS | BG3130 / R $G_{ps} = 24$ dB $F = 1.3$ dB $C_{g1ss}/C_{dss} = 1.9/1.1$ pF | BG3230 / R $G_{ps} = 25.5$ dB $F = 1.3$ dB $C_{g1ss}/C_{dss} = 1.9/1.1$ pF |
| 40 mS | BG5130R $G_{ps} = 24$ dB $F = 1.3$ dB $C_{g1ss}/C_{dss} = 2.7/1.6$ pF | |

Package

BG3430R

First intelligent-switching dualMOS

> RF Discretes > RF Mosfet

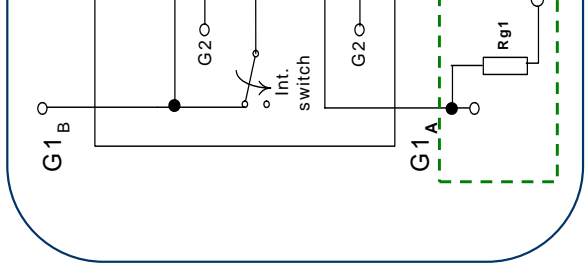
New

Target applications:

- 2 or 2.5 band tuners e.g. for DVB-T

Supporting Tools:

- Datasheet and Simulation Data



Key Features

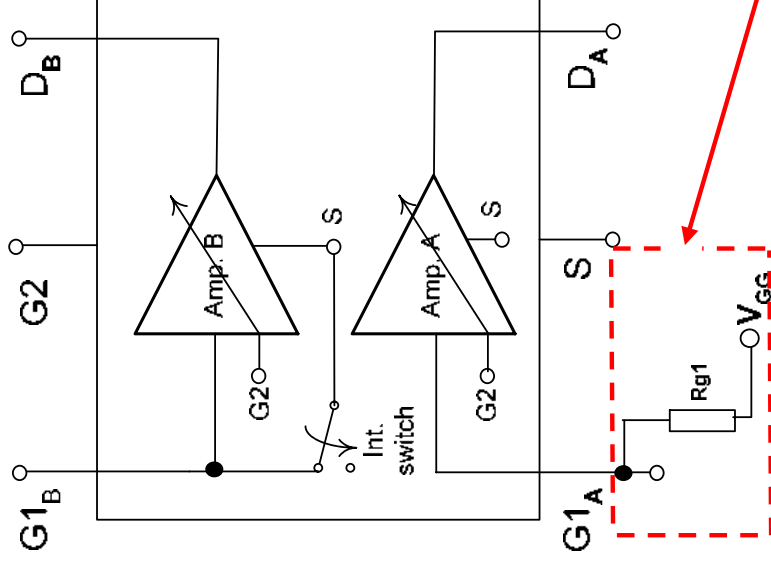
- FET A with partly integrated biasing resistor network
- FET B with fully integrated biasing resistor network
- Only **one** switching pin (G1A) to control **two** MOSFETs simultaneously, at anytime there is always one FET switched on
 - VGG = **5V**, FET A **ON**, FET B **OFF**
 - VGG = **0V**, FET A **OFF**, FET B **ON**
- in SOT363 package

Perf

- GfsA = GfsB
- Cg1ss = 1.8pF
- Cds = 1.3pF
- NF @ 3V, 1dB
- NF @ 3V, 1dB
- System ES

BG3430R – RF DualMOS with Intelligent Switch Layout advantage

> RF Discretes > RF Mosfet



- Application: 2 or 2.5 band tuners
- FET A semi-integrated biasing network
- FET B fully-integrated biasing network
- Only ONE switching line to switch on/off
- Switching @ Pin 1, FET A Gate 1

Switching matrix

| V _{GG} | FET A | FET B |
|-----------------|-------|-------|
| 5V | On | Off |
| 0V | Off | On |

Tuner layout is very high packed

Switching line from PNP port must be lead from tuner IC to MOSFET

If only one line has to be designed

→ Saves PCB area and 1 control port tune

→ Saves 1 resistor and 1 capacitor

→ Lower risk of crosstalk, feedback

→ Easier to design RF ground for MOSFET

SingleMOS Product Portfolio

> RF Discretes > RF Mosfet

| V_{DS} | External Biasing | Semi Biased | Fu |
|----------|---|--|----|
| 12 V | BF999 Triode $G_{ps} = 25 \text{ dB}$ $F = 1.0 \text{ dB}$ $C_{g_{ss}}/C_{d_{ss}} = 2.5/0.9 \text{ pF}$ | | |
| 9 V | BF998 / R $G_{ps} = 20 \text{ dB}$ $F = 1.0 \text{ dB}$ $C_{g_{1ss}}/C_{d_{ss}} = 2.1/1.2 \text{ pF}$ | | |
| 5 V | | BF2040 / R / W $G_{ps} = 23 \text{ dB}$ $F = 1.6 \text{ dB}$ $C_{g_{1ss}}/C_{d_{ss}} = 2.7/1.6 \text{ pF}$ | |
| | | BF2030 / R / W $G_{ps} = 23 \text{ dB}$ $F = 1.6 \text{ dB}$ $C_{g_{1ss}}/C_{d_{ss}} = 2.1/1.3 \text{ pF}$ | |
| 3 V | | BF5030W $G_{ps} = 24 \text{ dB}$ $F = 1.3 \text{ dB}$ $C_{g_{1ss}}/C_{d_{ss}} = 2.7/1.6 \text{ pF}$ | |

Package: SOT23 / SOT143 / SOT143 Reverse /

BF5030W / BG5130R

Ultra Low Noise, Low Power MOSFETs

> RF Discretes > RF Mosfet

Target applications:

5V or 3V tuners requiring superior NF performance

Available types:

Single semi-biased MOSFET in SOT343 [**BF5030W**](#)

Dual semi-biased MOSFET in SOT363 [**BG5130R**](#)

Evaluation board of BF5030W available

- For 50MHz/800MHz
- Application Notes on Internet site



Key features:

- Ultra low NF under 5V or 3V supply voltages
- NF more independent from mismatch of tuner module
- Power saving of **40%** under 3V supply voltage
- Verified with System ESD Class 2 (2kV – 4kV)
- **System solution** with Infineon new tuner IC TUA6045/TUA6041/TUA6039

Performance:

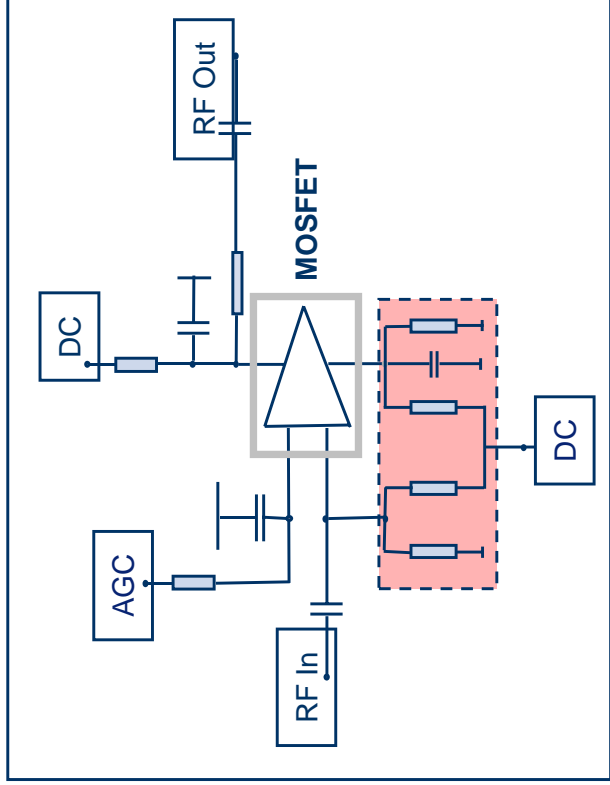
- Gfs = 41mS
- Cg1ss = 2.7fF
- Cdss = 1.6pF
- NF @ 3V, 10
- NF @ 3V, 10
- Xmod @ AG
- Xmod @ AG
- Xmod @ AG

RF MOSFET Biasing Explanation

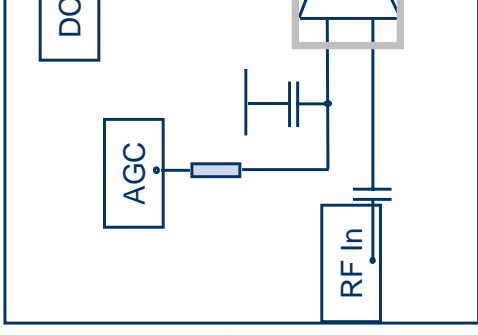
> RF Discretes > RF Mosfet

fully integrated
biasing
network

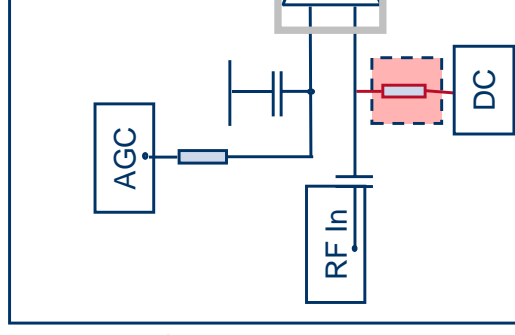
External Biasing



Full Biased



Semi Biased



integrated biasing
network but
external resistor
at G1

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- **Schottky Diodes**
- HiPAC, TVS Diodes, Silicon Microphone
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- AF Discretes
- General Information

Schottky Diodes

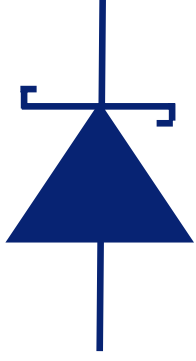
> Schottky Diodes

Signal Detection

High Speed Switching

Mixer Application

Schottky Diodes



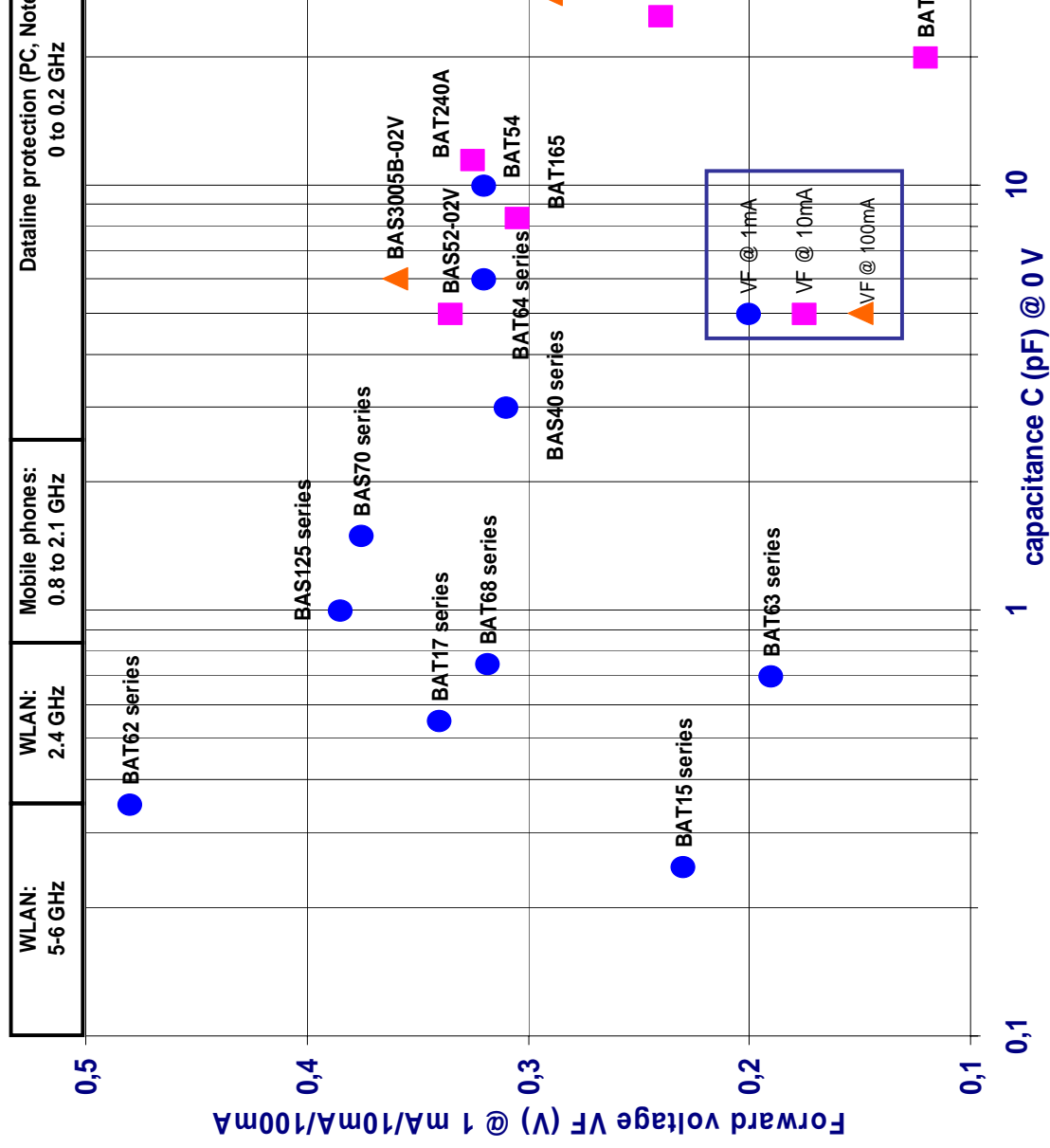
Requirements

- High efficiency / low loss
- Low Forward voltages V_F
- Low leakage current
- Low power consumption
- Low level of signal distortion
- Small packages and more elements /package

Schottky Diode Portfolio

Diode Capacitance vs. Forward Voltage

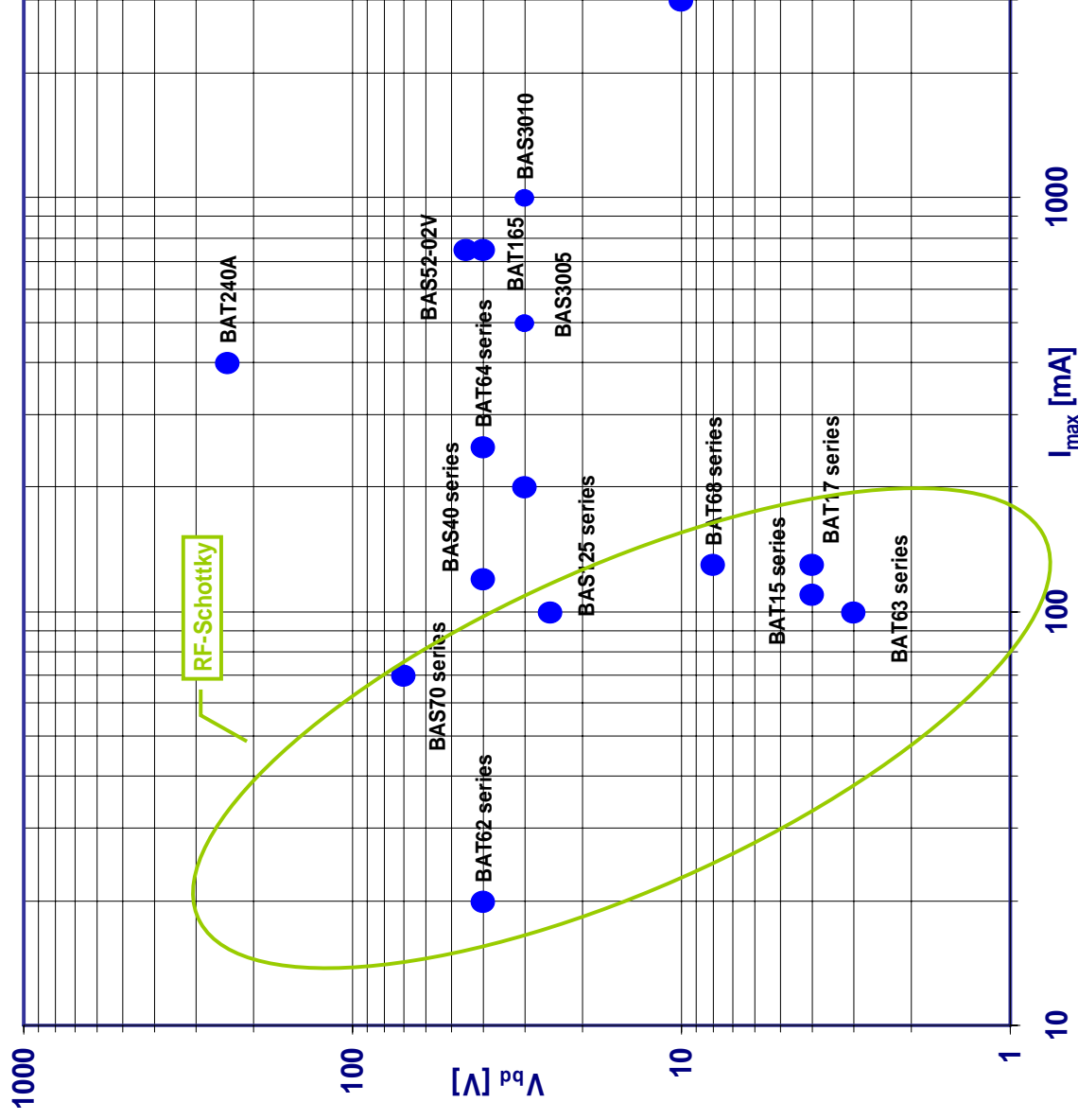
> Schottky Diodes



Schottky Diode Portfolio

Max. Current vs. Breakdown Voltage

> Schottky Diodes



Medium Power AF-Schottky Family

For DC/DC Converter, Battery Charger,

> Schottky Diodes

Smallest package => Ideal for Mobile Phone, PDA, Portable Computer,

- **Max. current IF:** 0.2 A to 2.0 A; max. reverse voltage VR: 10 V
- **Low VF-type and low IR-types available**
- **High ESD ruggedness**



| Type | IF appl. [A] | VF @ IF appl. [V] | Vr max [V] | IR @ 10V [µA] |
|--------------|--------------|-------------------|------------|---------------|
| BAT165 | 0.2 | 0.4 | 40 | 0.2 |
| BAS52-02V | 0.2 | 0.49 | 45 | 0.2 |
| BAS3005A-02V | 0.5 | 0.45 | 30 | 2,5 |
| BAS3005B-02V | 0.5 | 0.55 | 30 | 1.5 |
| BAS3010A-03W | 1.0 | 0.41 | 30 | 10 |
| BAS3010B-03W | 1.0 | 0.48 | 30 | 1 |
| BAT60A | 2.0 | 0.4 | 10 | 2000 |
| BAT60B | 2.0 | 0.55 | 10 | 10 |

Package size: SC79: 1.6 x 0.8 mm; SOD323: 2.5 x 1.25 mm
Color code: Low VF-type; Low IR-type

Schottky Diodes vs. Silicon Diodes for Reverse Polarity Protection

> Schottky Diodes

Why use Schottky diodes for Reverse Polarity Protection

- Schottky diodes have lower forward voltage (V_F), typically ~ to ~ 0.7 volts for Silicon diodes.

This can be a significant advantage in some applications, e.g. for where the goal is to put as many LEDs into one “stack” as possible. A lower voltage drop might mean being able to add one more LED to the stack.

The lower V_F of Schottky diodes also means reduced power dissipation and improved efficiency in the overall circuit.

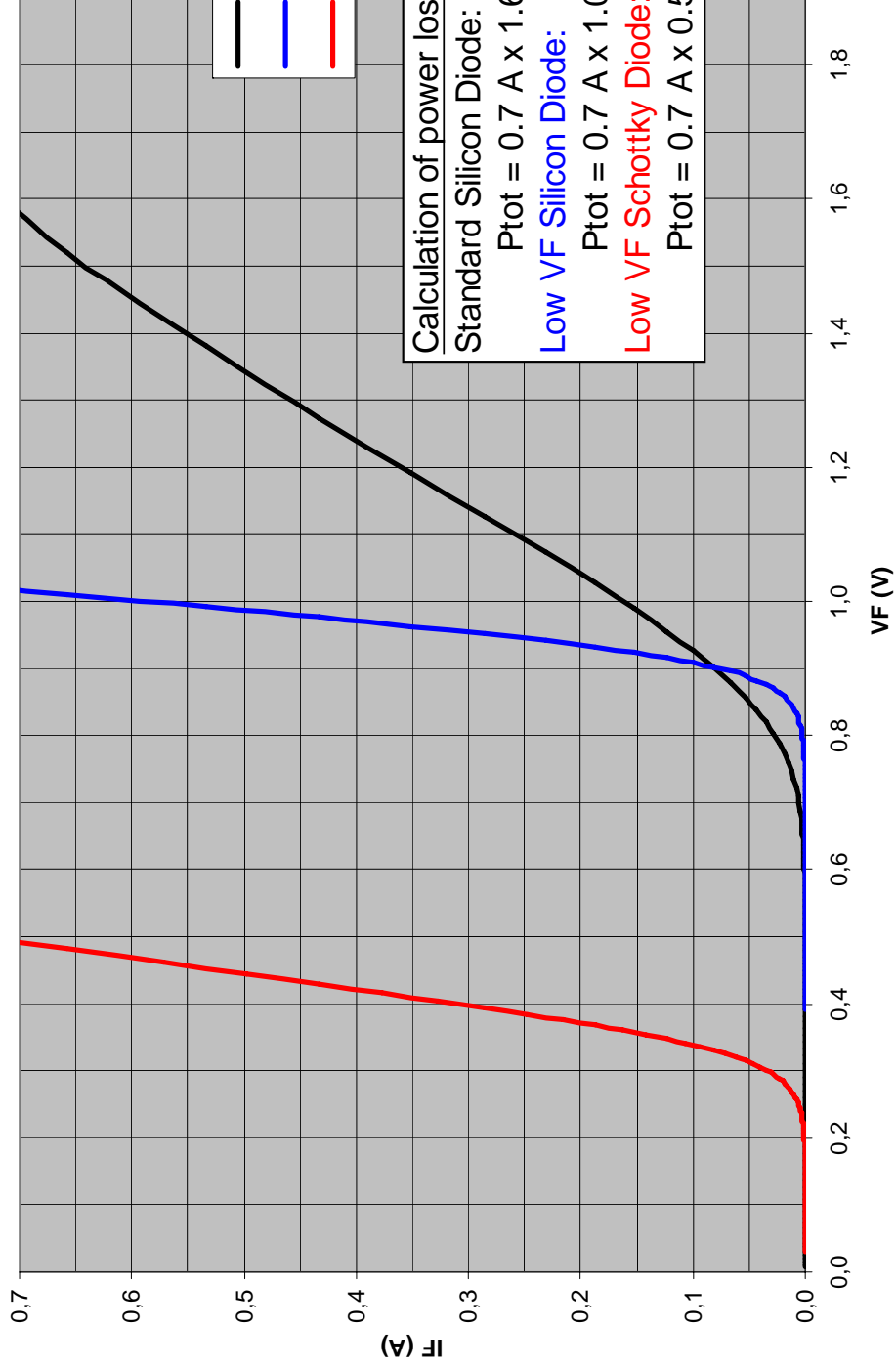
- **2. Speed.** Schottky diodes generally “switch” faster than Silicon diodes.

Schottky Diodes vs. Silicon Diodes

Performance comparison

> Schottky Diodes

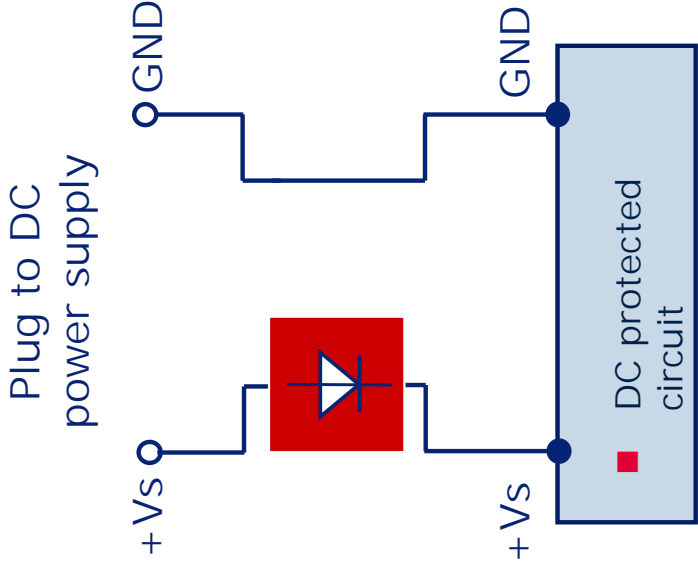
Diode forward current vs. forward voltage drop



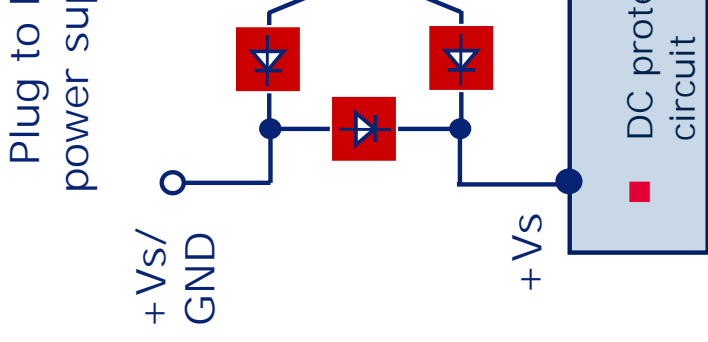
Reverse Polarity Protection („RPP“)

with BAS30xx families e.g. for LED drivers, battery charger

> Schottky Diodes



Prevents damage to circuit when DC plug is inserted backwards.
BUT in this case the circuit will not function.



Protects circuit from damage.
AND circuit will function.
DC power plug is inserted



Schottky Diode:

BAS3010S-03LRH*, **BAS3010S**
BAS3020B*

Schottky Diode Array:

BAS3007A-RPP*

Schottky Diodes for Mixer Applications

> Schottky Diodes

Low capacitance value for high frequency range

- Low & medium Schottky Barrier for low LO mixers
- Available as single and dual diodes
- Latest type **BAT24-02LS** with **ultra-low capacitance** for Modules, etc.

for WLAN applications:
also available in TSLP-RH

In

| | BAT15xx | BAT17xx |
|---------|---------|---------|
| CT@0V | 0.26 pF | 0.55 pF |
| VF @1mA | 230 mV | 340 mV |
| IF max | 110 mA | 130 mA |

Ultra Low Parasitic Inductance & Capacitance Schottky Diode BAT24-02LS

> Schottky Diodes

RF mixer and detector Schottky diodes with integrated guard

- AEC Q101 (automotive) qualified
- Wide operating temperature range: -55 ~ 150°C
- Package size: 0.6mm*0.3mm*0.31mm
- Target applications: 24GHz radar modules
Electrical Toll Collection, etc.
- Competitor types: MACOM MA4E2502L series



| BAT24-02 | |
|-----------------|-------------|
| Ls | 0.2 nH |
| CT@0V | 0.21 pF |
| VF @1mA | 230 mV |
| IF max | 110 mA |
| Frequency range | DC to 24GHz |

Schottky Diodes for Signal Detection (Power Leveling)

> Schottky Diodes

- Low capacitance value for high frequency range
- Low & medium Schottky Barrier for high sensitivity in detector applications
- Available as single and dual diodes

New: BAT62-02LS
In super-mini TSSLP

New: BAT63-02V
in SC79 package!

| | BAT62xx | BAT63xx | BAT68xx |
|---------|---------|---------|---------|
| CT@0V | 0.35 pF | 0.75 pF | 0.75 pF |
| VF @1mA | 440 mV | 318 mV | 318 mV |
| IF max | 20 mA | 130 mA | 130 mA |

BAT63-series

Zero Bias for Tire Pressure Monitoring Systems (TPMS)

> Schottky Diodes

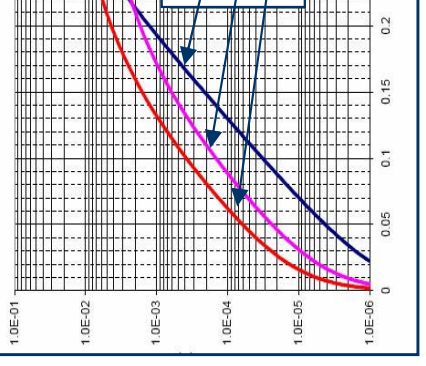
Product description

Zero bias Schottky Diode for RF signal detection, especially **optimized for high temperature application**

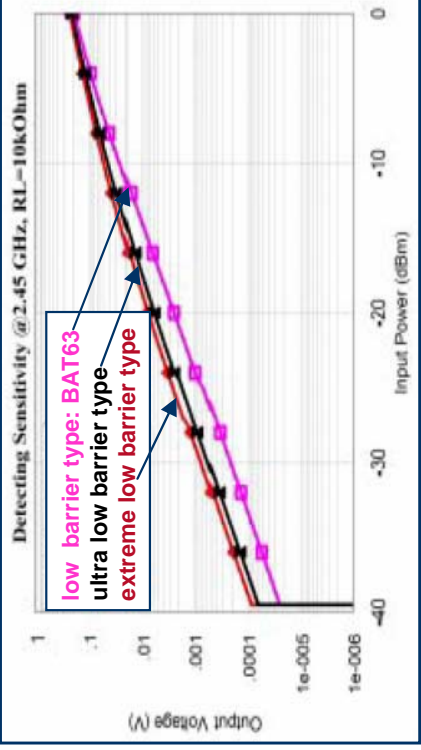
Applications: Tire pressure monitoring system (TPMS), Electronic Toll Collect (ETC), etc

Key advantage: **NO degradation of detection sensitivity** at higher temperatures

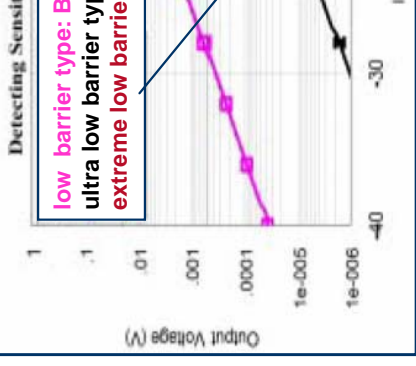
Forward character for different



Detection sensitivity at 25°C



Detection sen



BAT62-09S

High Isolation Schottky Diode Pair in SOT363

> Schottky Diodes

BAT62-09S

Application / Features

- Large signal detect
- Improved cross-talk

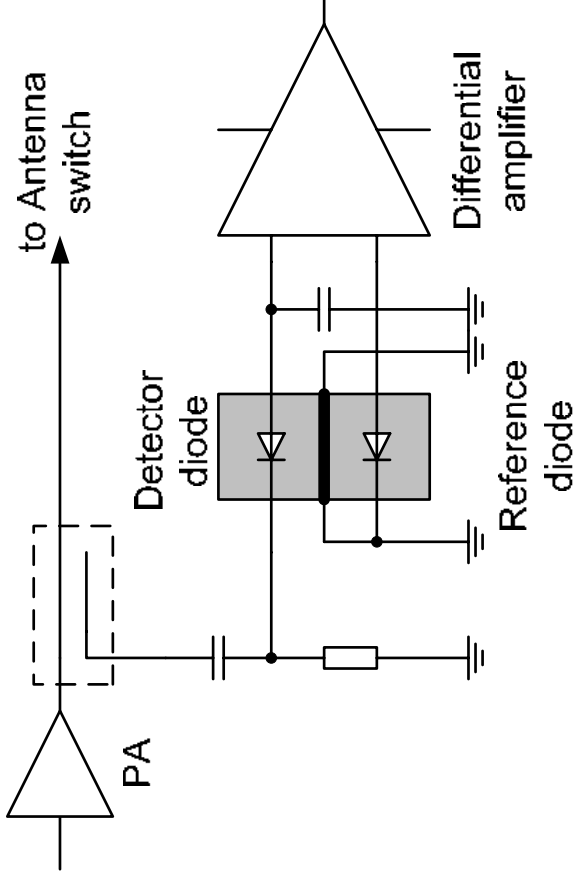
Competition

- Agilent HSMS series

Status: mass production

Other available configurations

- Single:
- Dual:



Schottky Diodes for Clamping / Circuit Protection / High Speed Switching

> Schottky Diodes

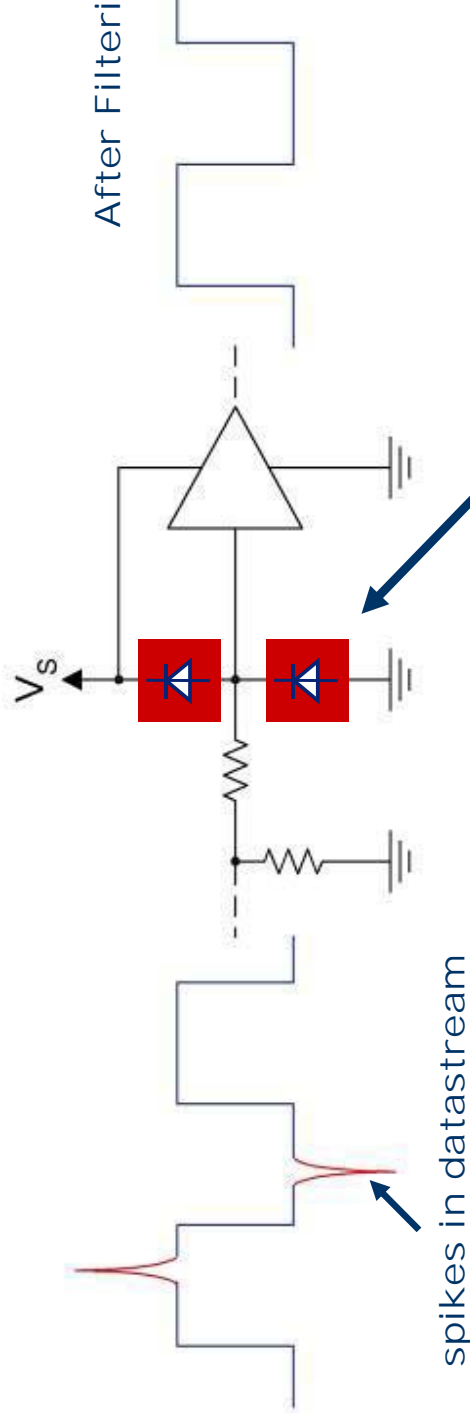
- Schottky Diodes for clipping & clamping applications
- Schottky Diodes for circuit protection
- Schottky Diodes for high speed switching
- Low capacitance value for high frequency range
- Available as single and dual diodes

BAS125xx BAS40xx BAT54

| | | | |
|---------|--------|--------|--------|
| CT@0V | 1.0 pF | 3.0 pF | 7.0 pF |
| VF @1mA | 385 mV | 310 mV | 240 mV |
| IF max | 100 mA | 120 mA | 200 mA |

Clipping, Clamping and Transient Voltage Suppression

Problem: Noisy data-spikes can damage digital circuits!



Two Schottky diodes are used protecting sensitive circuit elements against spikes.



Protection Diode:

BAT17xx, BAT62xx, BAT54xx, BAT64xx,
BAT68xx, BAS40xx, BAS70xx, BAS125xx

Available Packages: SC79, SCD80, SOD323, SOT23, SOT323, SOT143, SOT343, T...

Latest AF-Schottky Diodes with Wide Packages

BAT54-series, BAT64-series

> Schottky Diodes

- For clipping & clamping applications
- For circuit protection
- For high speed switching
- Available as single and dual diodes

| | BAT |
|-------------|--------|
| $C_T @ 0V$ | 4.0 pF |
| $U_F @ 1mA$ | 320 |
| $I_{F max}$ | 250 |

SOT23

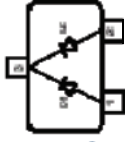
BAT54*
(single)



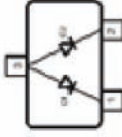
BAT54-04*
(series)



BAT54-05*
(com. cathode)

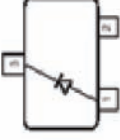


BAT54-06*
(com. anode)

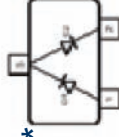


SOT323

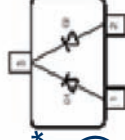
BAT54W*
(single)



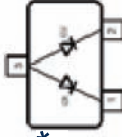
BAT54-04W*
(series)



BAT54-05W*
(com. cathode)



BAT54-06W*
(com. anode)



SC79

BAT54-02V
(single)



TSLP2-RH

BAT54-02LRH
(single)



* Configurations available

Schottky Diodes for Modems & Battery Powered Applications

> Schottky Diodes



**Modem
Protection**

BAT240A

high V_R breakdown

C_T 11.5 pF

V_R 240 V

I_{fmax} 400 mA

High break

**Battery Powered
Applications**

BAT60A

very low voltage drop V_F

C_T 20.0 pF

$V_F@10mA$ 0.12 mV

I_{fmax} 3.0 A

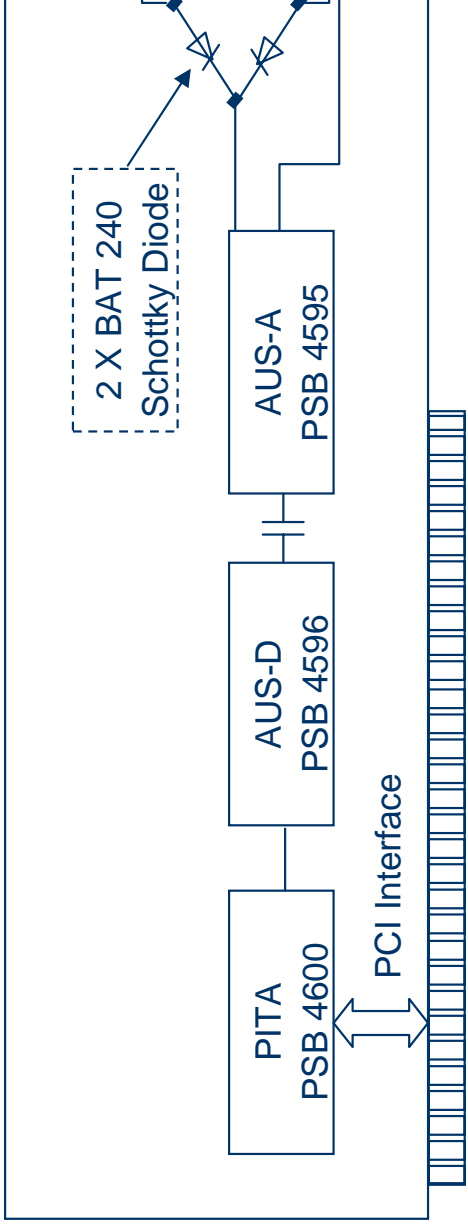
Low voltage drop

**BAT
low C_T
 $V_F@$
 I_{fmax}**

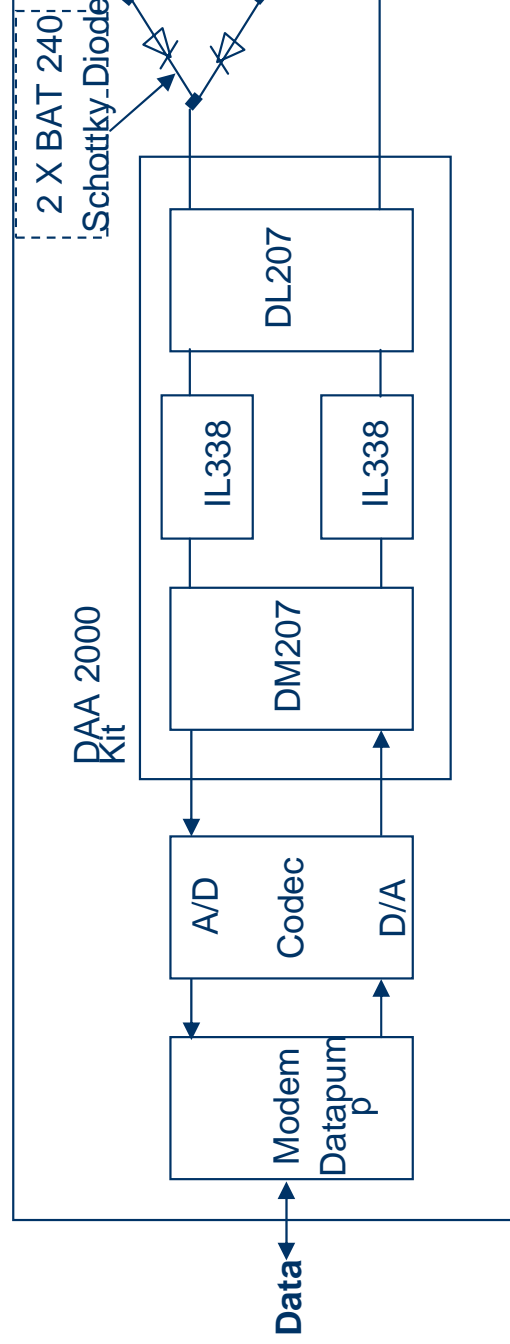
BAT240A for Modems Applications

> Schottky Diodes

Worldwide programmable SW Modem (PCI 2.1 interface)



Modem with optical DAA



Available Schottky Diodes in TS(S)LP

> Schottky Diodes

BAS40-02L

BAS70-02L

BAT54-02LRH

TSLP2

TSLP2

TSLP2-RH



High
switch
and

BAT15-02LRH

BAT15-07LRH(D)

BAT15-098LRH(D)

BAT15-099LRH(D)

BAT24-02LS

BAT62-02LS

BAT62-02L

BAT62-07L4(D)

TSLP2-RH

TSLP4-RH

TSLP4-RH

TSLP4-RH

TSSLP2

TSSLP2

TSLP2

TSLP4-RH



R
de
le

Schottky Diode Lineup

RF Mixer / Detection / Power Leveling

> Schottky Diodes

| Type | V _{Rmax} [V] | I _{Fmax} [mA] | C _T [pF] | V _F [mV] | Pack |
|--------------------------|-----------------------|------------------------|---------------------|---------------------|--------|
| BAT15-02LRH | 4 | 110 | 0,26 | 230 | TSLP22 |
| BAT15-03W | 4 | 110 | 0,26 | 230 | SOD322 |
| BAT15-04W | 4 | 110 | 0,26 | 230 | SOT322 |
| BAT15-05W | 4 | 110 | 0,26 | 230 | SOT322 |
| BAT15-07LRH | 4 | 110 | 0,26 | 230 | TSLP4 |
| BAT15-098LRH | 4 | 110 | 0,26 | 230 | TSLP4 |
| BAT15-099 / LRH | 4 | 110 | 0,26 | 230 | SOT14 |
| BAT15-099R | 4 | 110 | 0,38 | 230 | SOT14 |
| BAT17 | 4 | 130 | 0,55 | 340 | SOT23 |
| BAT17-04 / W | 4 | 130 | 0,55 | 340 | SOT23 |
| BAT17-05 / W | 4 | 130 | 0,55 | 340 | SOT23 |
| BAT17-06W | 4 | 130 | 0,55 | 340 | SOT23 |
| BAT17-07 | 4 | 130 | 0,75 | 340 | SOT14 |
| BAT24-02LS | 4 | 110 | 0,21 | 230 | TSSLP |
| BAT62 | 40 | 20 | 0,35 | 580 | SOT14 |
| BAT62-02L / -02LS / -02W | 40 | 120 | 0,35 | 580 | TSLP2 |
| BAT62-03W | 40 | 20 | 0,35 | 580 | SOD322 |
| BAT62-07L4 / W | 40 | 20 | 0,35 | 580 | TSLP4 |
| BAT62-09S | 40 | 20 | 0,35 | 580 | SOT36 |
| BAT63-02V | 3 | 100 | 0,65 | 190 | SC79 |
| BAT63-07W | 3 | 100 | 0,65 | 190 | SOT34 |
| BAT68 | 8 | 130 | 0,75 | 318 | SOT23 |
| BAT68-04 / W | 8 | 130 | 0,75 | 318 | SOT23 |
| BAT68-06 / W | 8 | 130 | 0,75 | 318 | SOT23 |
| BAT68-07W | 8 | 130 | 0,75 | 318 | SOT34 |
| BAT68-08S | 8 | 130 | 0,75 | 318 | SOT36 |

Schottky Diode Lineup

High speed switching / clipping / clamping

> Schottky Diodes

| Type | V _{Rmax} [V] | I _{Fmax} [mA] | C _T [pF] | V _F [mV] | Package |
|---------------------|-----------------------|------------------------|---------------------|---------------------|-----------------------|
| BAS125-04W | 25 | 100 | 0,95 | 385 | SOT323 |
| BAS125-05W | 25 | 100 | 0,95 | 385 | SOT323 |
| BAS125-06W | 25 | 100 | 0,95 | 385 | SOT323 |
| BAS125-07W | 25 | 100 | 0,95 | 385 | SOT343 |
| BAS140W | 40 | 120 | 3 | 310 | SOD323 |
| BAS170W | 70 | 70 | 1,5 | 375 | SOD323 |
| BAS40 / -02L | 40 | 120 | 3 | 310 | SOT23 / TSLP2 |
| BAS40-04 | 40 | 120 | 3 | 310 | SOT23 |
| BAS40-05 / W | 40 | 120 | 3 | 310 | SOT23 / SOT323 |
| BAS40-06 / W | 40 | 120 | 3 | 310 | SOT23 / SOT323 |
| BAS40-07 / W | 40 | 120 | 3 | 310 | SOT143 / SOT323 |
| BAS70 | 70 | 70 | 1,6 | 375 | SOT23 |
| BAS70-02L / -02W | 70 | 70 | 1,5 | 375 | TSLP2 / SCD80 |
| BAS70-04 / W | 70 | 70 | 1,6 / 1,5 | 375 | SOT23 / SOT323 |
| BAS70-04S | 70 | 70 | 1,6 | 375 | SOT363 |
| BAS70-05 / W | 70 | 70 | 1,6 / 1,5 | 375 | SOT23 / SOT323 |
| BAS70-06 / W | 70 | 70 | 1,6 / 1,5 | 375 | SOT23 / SOT323 |
| BAS70-07 / W | 70 | 70 | 1,5 | 375 | SOT143 / SOT323 |
| BAT240A | 240 | 400 | 11,5 | 325 | SOT23 |
| BAT54 / W | 30 | 200 | < 10 | <320 | SOT23 / SOT323 |
| BAT54-02LRH / -02V | 30 | 200 | <10 | <320 | TSLP2 / SC79 |
| BAT54-04 / W | 30 | 200 | <10 | <320 | SOT23 / SOT323 |
| BAT54-05 / W | 30 | 200 | <10 | <320 | SOT23 / SOT323 |
| BAT54-06 / W | 30 | 200 | <10 | <320 | SOT23 / SOT323 |
| BAT64 / -02V / -02W | 40 | 250 | 4 | 320 | SOT23 / SC79 / SOT323 |
| BAT64-04 / W | 40 | 250 | 4 | 320 | SOT23 / SOT323 |
| BAT64-05 / W | 40 | 250 | 4 | 320 | SOT23 / SOT323 |
| BAT64-06 / W | 40 | 250 | 4 | 320 | SOT23 / SOT323 |

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Schottky Diode Lineup

Medium power $I_{Fmax} > 500$ mA

> Schottky Diodes

| Type | V_{Rmax} [V] | I_{Fmax} [mA] | $I_{app.}$ [mA] | $V_F@I_{app.}$ [V] |
|--------------|----------------|-----------------|-----------------|--------------------|
| BAS3005A-02V | 30 | 500 | 500 | 450 |
| BAS3005B-02V | 30 | 500 | 500 | 550 |
| BAS3010A-03W | 30 | 1000 | 1000 | 410 |
| BAS3010B-03W | 30 | 1000 | 1000 | 480 |
| BAS52-02V | 45 | 750 | 200 | 490 |
| BAT165 | 40 | 750 | 250 | 440 |
| BAT60A | 10 | 3000 | 2000 | 400 |
| BAT60B | 10 | 3000 | 2000 | 450 |

Table of Contents

- Applications
- RF Discretes
- Schottky Diodes
- **HiPAC, TVS Diodes, Silicon Microphone**
- LED Drivers
- AF Discretes
- General Information

HiPAC, TVS Diodes, Silicon Microphone

> HiPAC, TVS Diodes, Silicon Microphone

- TVS Diodes are very flexible and robust ESD protection devices
- HiPAC offers both ESD/EMI and high integration for advanced applications

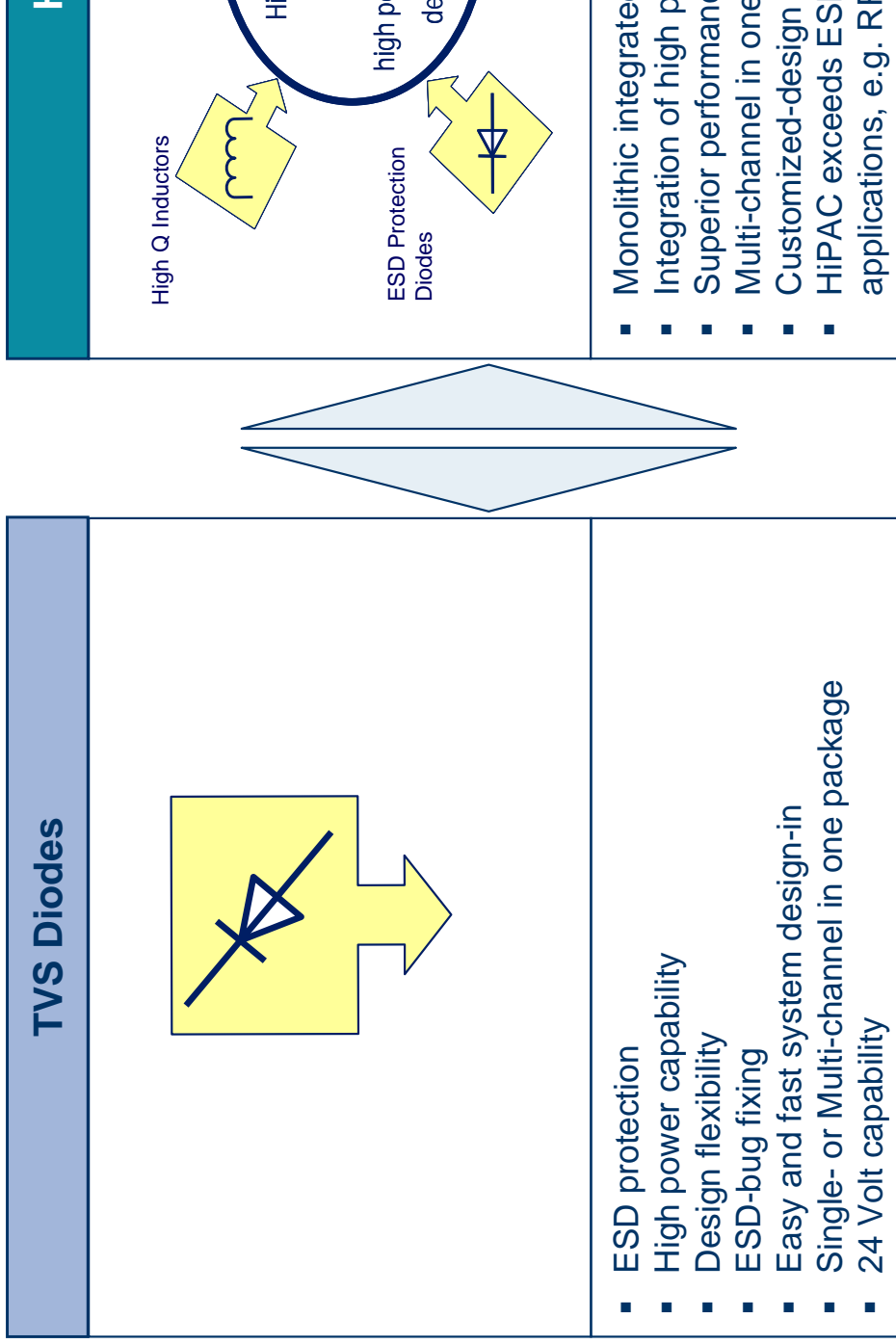


Table of Contents

■ HiPAC, TVS Diodes, Silicon Microphone

■ HiPAC

■ TVS Diodes

■ Silicon Microphone

HiPAC :

Smart Solution with a Maximum of Space Saving

> HiPAC, TVS Diodes, Silicon Microphone > HiPAC

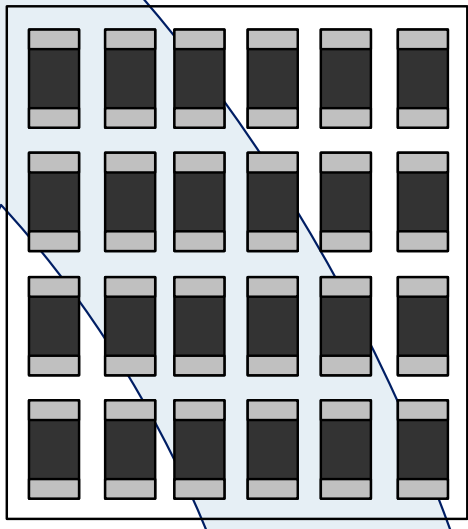
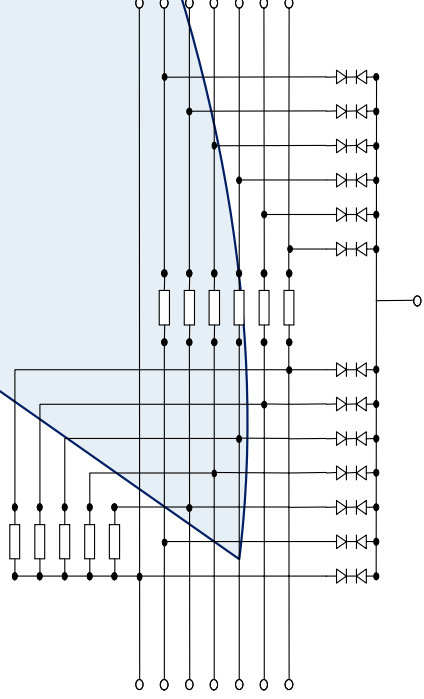
THE SMART SOLUTION

Integrated Discretes

- Reduced Costs
- Enhanced Reliability
- Better Performance

THE CLUMSY SOLUTION: Discrete Components

THE TASK with DISCRETES



Customer Benefit using HiPAC Solutions

> HiPAC, TVS Diodes, Silicon Microphone > HiPAC

Providing new possibilities and adding value to your business

- Improvement of functional performance
- Reduction of board space
- Reduced No. of devices / suppliers
- Lower assembly, pick-and-place and inventory costs
- Improved overall quality and reliability level results in higher production
- Provides ESD / EMI protection at reasonable costs to reduce warranty
- Exceeding IEC61000-4-2 requirements: 15 kV contact discharge for a
- Driver towards miniaturization and adding new functionality

BGF100 / BGF200

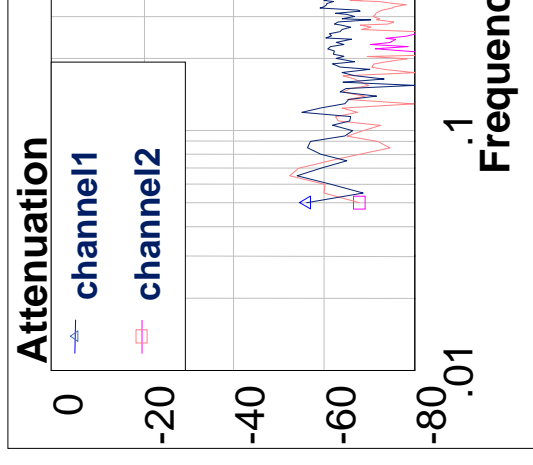
Audio Filter for Differential / Single Ended Microphones

> HiPAC, TVS Diodes, Silicon Microphone > HiPAC



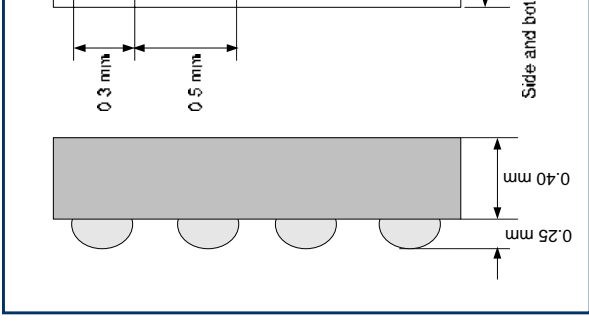
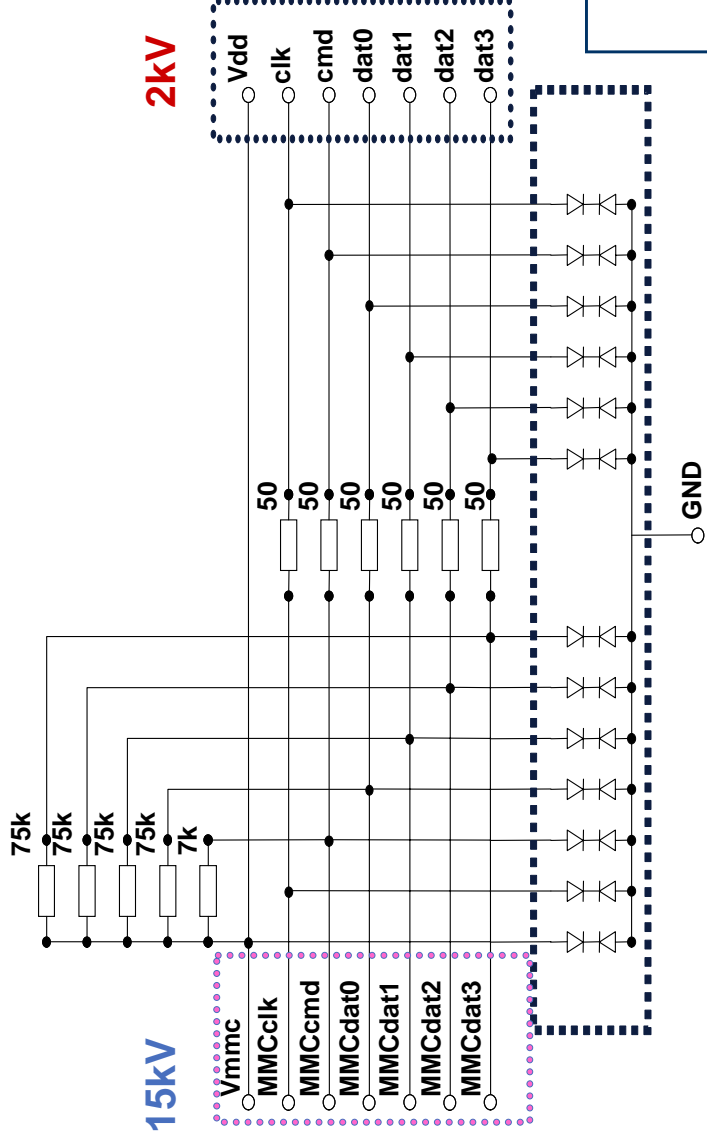
- Improves audio performance
- Eliminates system distortion of headset “antenna”
- 15 kV ESD-protection
- Low pass filter circuit with diodes, R’s and C’s
- WLP11 Package (BGF100)
- WLP8 (BGF200)

e.g. BGF100



BGF104 Flash Memory ESD Protection High Speed Multi Media Card (HSMMMC)

> HiPAC, TVS Diodes, Silicon Microphone > HiPAC

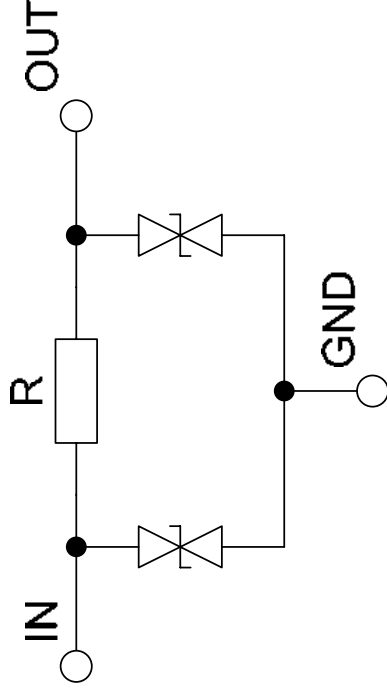


- ESD protection according IEC61000-4-2
 - 15 kV ESD protection for all pins to the outside
 - 2 kV ESD protection for all internal pins
- Integrated filter function for EMI reduction
- Capacity per Line C_T : 16 pF
- Package: WLP-16
- Solder Ball Pitch: 500 μm

BGF108 & BGF109

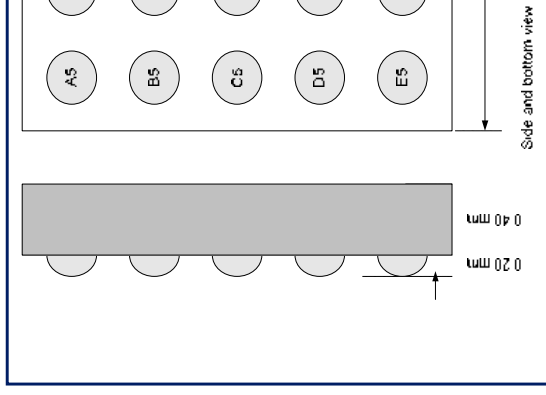
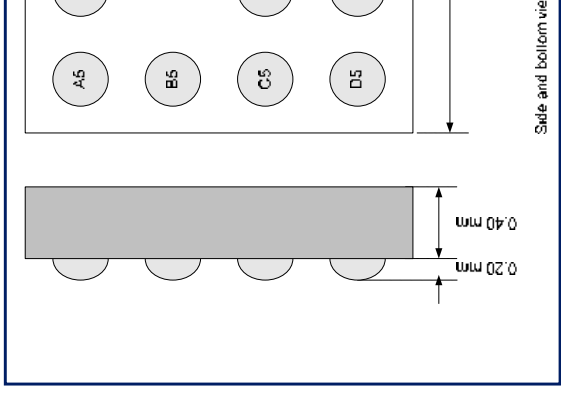
7 Channel & 10 Channel LCD Protection

> HiPAC, TVS Diodes, Silicon Microphone > HiPAC



■ *7x / 10x on chip*

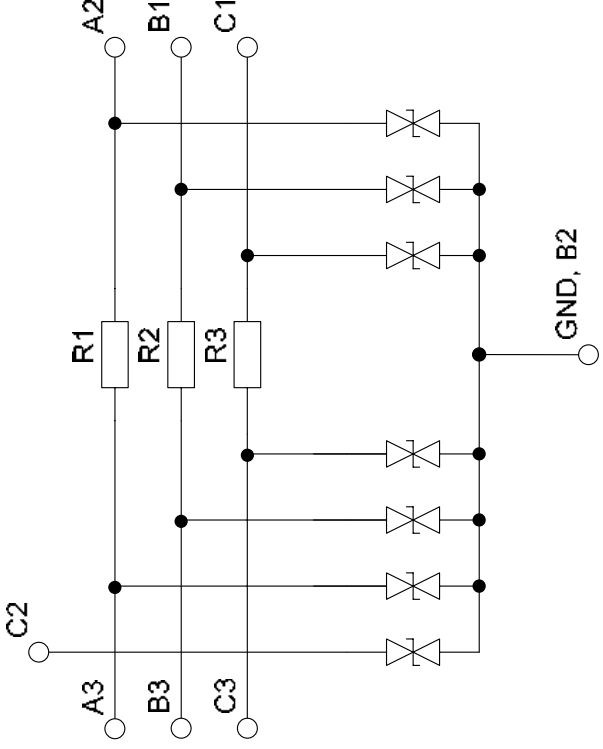
- ESD protection acc. IEC61000-4-2
 - 15 kV ESD protection at LCD interface of mobile phone
- Integrated filter function for EMI reduction
- Capacity per Line CT: 14 pF
- Package: WLP-18 (BGF108), WLP-24 (BGF109)
- Solder Ball Pitch: 400 μm



BGF105 & BGF106 SIM Card Interface Protection



> HiPAC, TVS Diodes, Silicon Microphone > HiPAC



- ESD protection acc. IEC61000-4-2
 - 2 kV @ Pin A3, B3, C3
 - 15 kV @ A2, B1, C1, C2
- Integrated filter function for EMI reduction
- Capacity per Line C_{Tmax} : 20 pF
- Package: WLP-8
- Solder Ball Pitch: 500 μ m (BGF105) / 400 μ m (BGF106)
- SOP – Q3CY2007

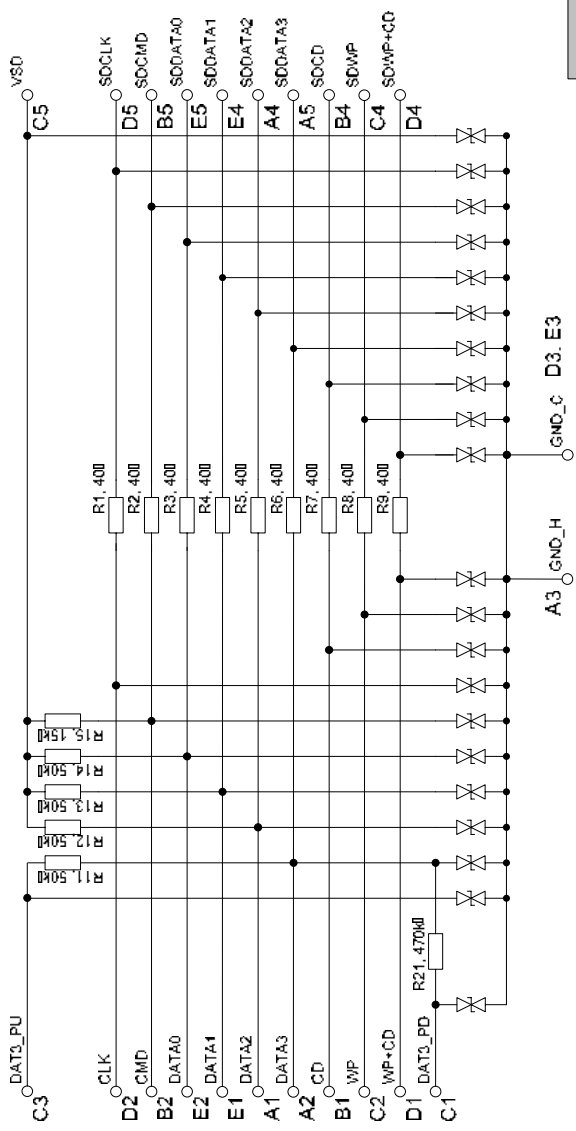


BGF110

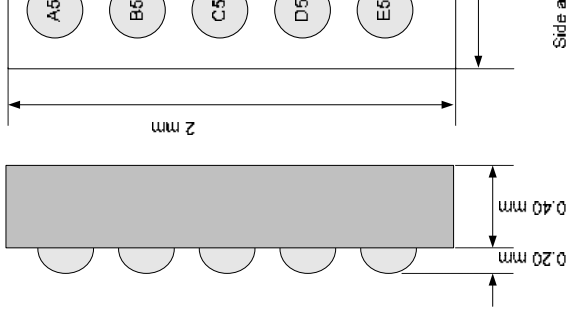
SD Card ESD Protection

> HiPAC, TVS Diodes, Silicon Microphone > HiPAC

NEW



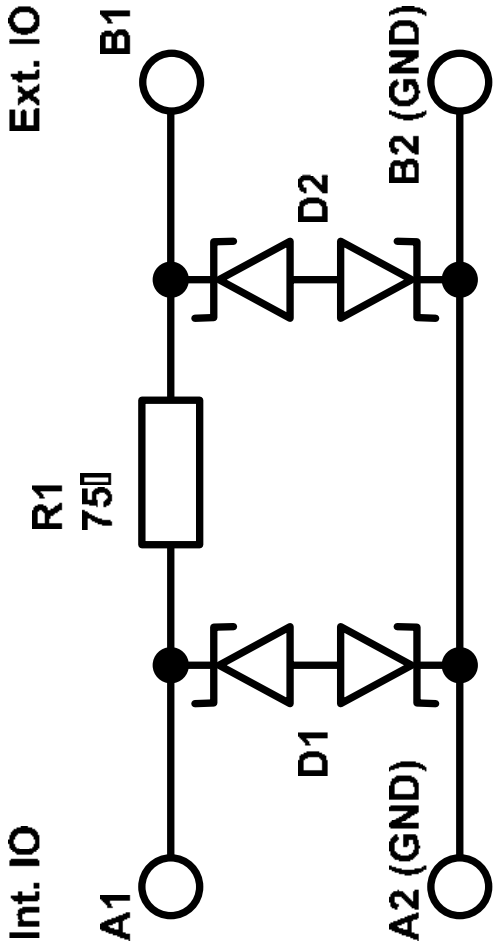
- ESD protection acc. IEC61000-4-2
 - 15 kV for SD Card Interface
 - 2 kV ESD protection at internal I/O
- Integrated filter function for EMI reduction
- Capacity per Line CT: 16 pF
- Package: WLP-24
- Solder Ball Pitch: 400 μm
- SOP – Q3CY2007



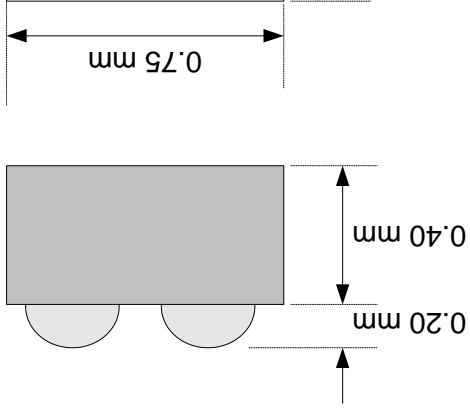
BGF111

TV out filter & ESD protection

> HiPAC, TVS Diodes, Silicon Microphone > HiPAC

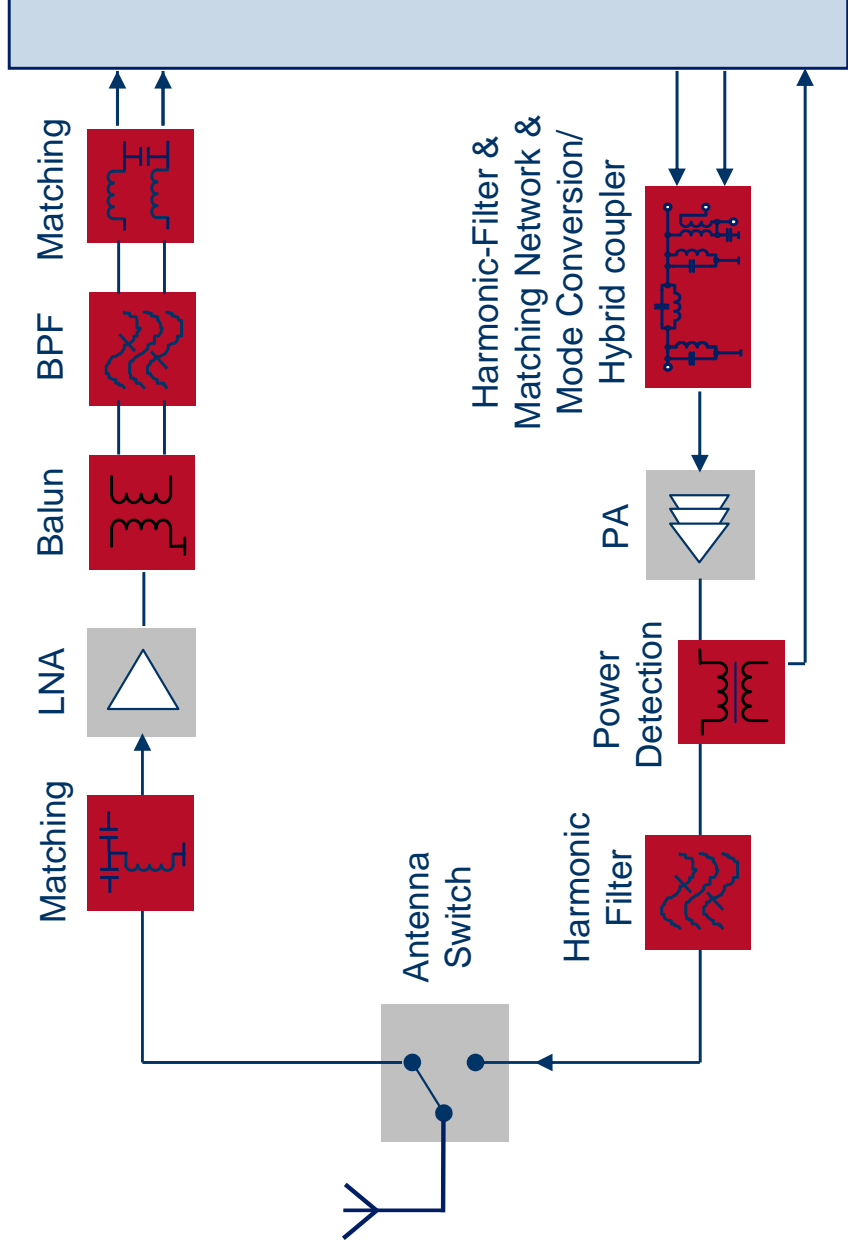


- ESD protection acc. IEC61000-4-2
 - 15 kV for Ext. I/O
 - 2 kV ESD for Int. I/O
- Integrated filter function for EMI reduction
- Capacity per Line CT: 44 pF
- 75 Ohm interface (video interface)
- Package: WLP-4
- Solder Ball Pitch: 400 μm
- SOP – Q3CY2007



HiPAC for Wireless Applications: Application Overview

> HiPAC, TVS Diodes, Silicon Microphone > HiPAC



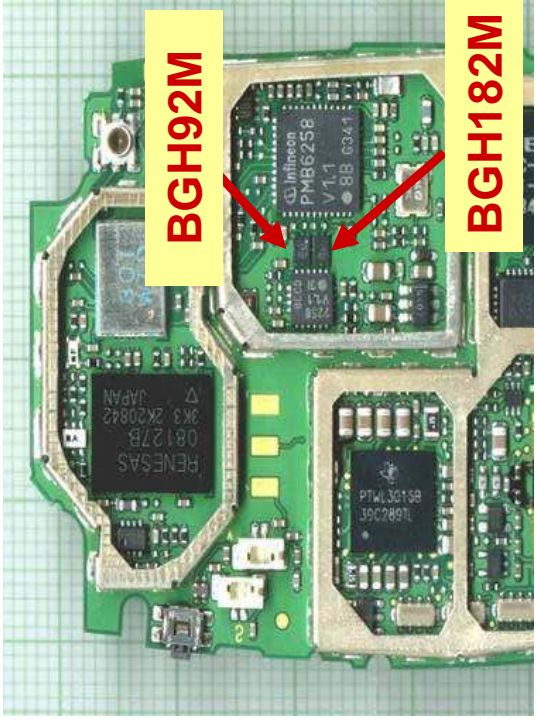
Use the benefits of our HiPAC technologies, the function blocks can be

- Matching Networks for e.g. TRX to PA, SAW/BAW to TRX, LNA...
- Filters (BP, LP, HP, Harmonic Filters)
- Balun/Auto-trafo for mode conversion
- Power detection through coupler
- Hybrid coupler

BGH92M/BGH182M

HiPAC for Wireless Applications: H3 – Filter

> HiPAC, TVS Diodes, Silicon Microphone > HiPAC



Features

- Passband insertion loss typ. 2.8 dB
- H3 suppression typ. 45 dB
- H4 common mode suppression typ. 45 dB
- Low amplitude ripple
- Balanced to single ended operation
 - Input 390 Ohm balanced
 - Output 50 Ohm single ended
- Integrated DC-biasing to in- and output
- TSLP 7

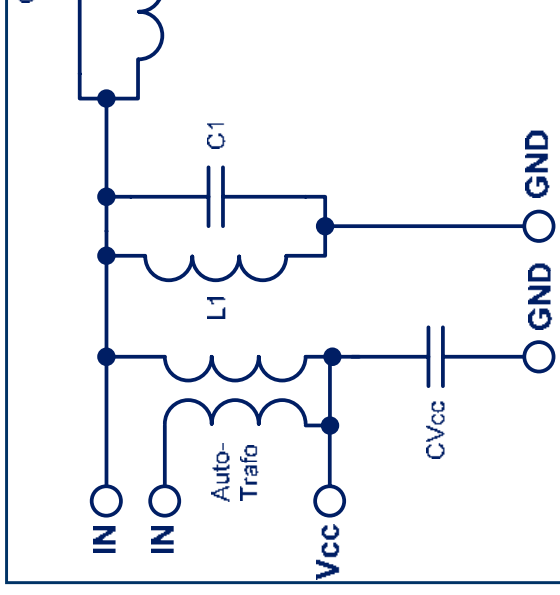
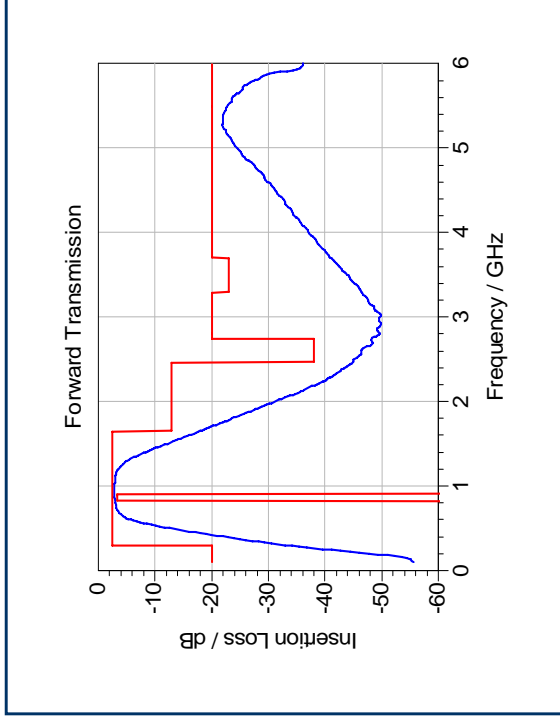


Table of Contents

■ HiPAC, TVS Diodes, Silicon Microphone

■ HiPAC

■ TVS Diodes

■ Silicon Microphone

1 or 2-Channel Low Capacitance bi-directional Diode in Ultra-Small TSLP Package

> HiPAC, TVS Diodes, Silicon Microphone > TVS Diodes

ESD8V0L1B-02LRH & ESD8V0L2B-03LRH

Package 0.4 mm height only

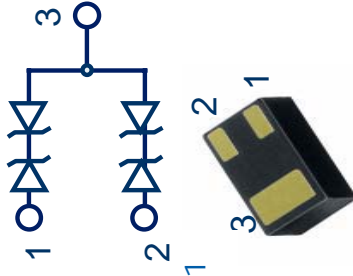
Target Application

ESD protection of high-speed data interfaces like USB 2.0, 10/100 Ethernet, Firewire, Video, Serial/Parallel and LAN/WAN ports; For applications from **3.3V** up to **14V**

Parameter Overview

| Parameter | Condition | Value |
|----------------|-----------|---------------------|
| • V_{RWM} | | 14V (V+) 8V (V-) |
| • I_{RWM} | 3V, 25°C | 100nA max |
| • C_L | 0V, 1MHz | 2pF/4pF/8.5pF |
| | typ. | |
| • IEC61000-4-2 | (contact) | >15kV |
| • IEC61000-4-4 | (5/50ns) | >40A |
| • IEC61000-4-5 | (8/20µs) | >1A / >2A |

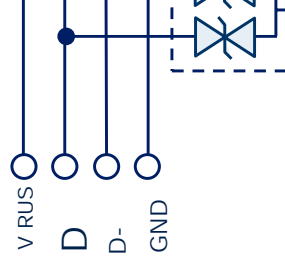
Schematic and



TSLP-3-1

1.0x0.6x0.4mm

Applica



Ultra Low Capacitance, Low Intermodulation, ESD Protection Diodes

> HiPAC, TVS Diodes, Silicon Microphone > TVS Diodes

ESDxPyRF-series

RF ESD Protection

Target Application

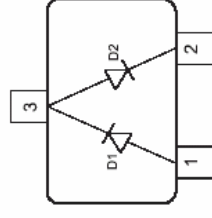
Applications in anti-parallel configuration

For low RF signal levels without superimposed DC voltage: e.g. GPS, XM-Radio, Sirius, DVB, DMB, DAB, Remote keyless entry

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

Schematic and



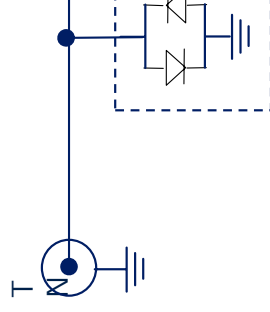
SOT323

TS
Siz
1.2

Parameter Overview

| Parameter | Condition | Value |
|------------------|------------------|--------|
| V_{CL} | 3A, 8/20 μ s | ~4V |
| C_L (ESD0P8RF) | 0V, 1MHz | 0.8pF |
| C_L (ESD1P0RF) | 0V, 1MHz | 1.0 pF |
| IEC61000-4-2 | (contact) | >15kV |
| IEC61000-4-4 | (5/50ns) | >40A |
| IEC61000-4-5 | (8/20 μ s) | >10A |

Applicati



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1- to 5-Channel TVS Diode Arrays for General Purpose Protection

> HiPAC, TVS Diodes, Silicon Microphone > TVS Diodes

ESD5V0S1U-03W / ESD5V0S2U / ESD5V0S4US / ESD5V0S2U



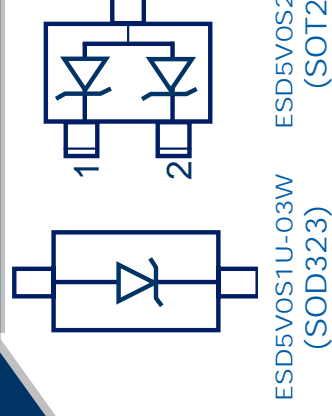
Target Application

ESD, EFT & lightning protection; Low speed data interface (Power Line, Microphone, Speaker, Headset, Flash Card) in **5V applications** (Cellular phone, PDA, Digital Still Camera, MP3-player, etc.)

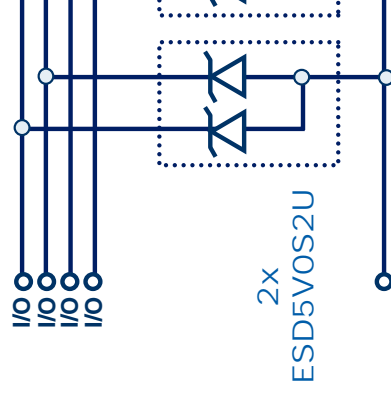
Parameter Overview

| Parameter | Condition | Value |
|----------------|------------------|----------------|
| • V_{RWM} | | 5V max |
| • V_{CL} | 5A, 8/20 μ s | 8.8V max |
| • I_{RWM} | 5V, 25°C | 2 μ A typ. |
| • P_{PK} | 8/20 μ s | up to 330W |
| • C_L | 0V, 1MHz | <500pF |
| • IEC61000-4-2 | (contact) | \geq 25kV |
| • IEC61000-4-4 | (5/50ns) | up to 40A |
| • IEC61000-4-5 | (8/20 μ s) | up to 30A |

Schematic a



Applic



2-Channel Bi-Directional TVS Diode Array For CAN Bus Protection

> HiPAC, TVS Diodes, Silicon Microphone > TVS Diodes

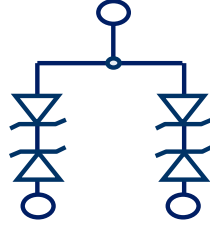
ESD24VS2B & ESD24VS2U

CAN BUS
TVS

Target Application

ESD, EFT & lightning protection; Low and High Speed **CAN Automotive** networks and or **Industrial Control Networks**
IC protection in **24V applications** (Notebooks, desktops, and servers)

Schematic an



ESD24VS2B
(SOT23)

Applica



^{1x}
ESD24VS2B

Parameter Overview (preliminary)

| Parameter | Condition | Value |
|----------------|------------------|----------------|
| • V_{RWM} | | 24V |
| • V_{CL} | 5A, 8/20 μ s | 40V |
| • I_{RWM} | 24V, 25°C | 10nA max |
| • P_{PK} | 8/20 μ s | 180W per diode |
| • C_L | 0V, 1MHz | 24pF typ. |
| • IEC61000-4-2 | (contact) | 30kV contact! |
| • IEC61000-4-4 | (5/50ns) | 40A |
| • IEC61000-4-5 | (8/20 μ s) | 5A per diode |

Ultra Low Capacitance Rail-to-Rail TVS Diode

> HiPAC, TVS Diodes, Silicon Microphone > TVS Diodes

ESD70VU2RR-07

ultra low cap
TVS

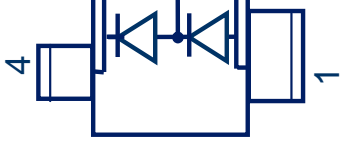
Target Application

ESD, EFT & lightning protection of ADSL, ISDN, WAN, LAN or other telecom application (*rail-to-rail*).

Parameter Overview (preliminary)

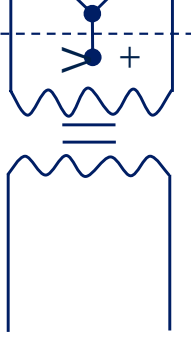
| Parameter | Condition | Value |
|----------------|-------------------|----------------|
| • V_{RWM} | | 70V max |
| • V_{CL} | 10A, 8/20 μ s | 4V max |
| • I_{RWM} | 70V, 25°C | 5 μ A max. |
| • P_{PK} | 8/20 μ s | up to 330W |
| • C_L | 0V, 1MHz | <5pF |
| • IEC61000-4-2 | (contact) | \geq 25kV |
| • IEC61000-4-4 | (5/50ns) | >40A |
| • IEC61000-4-5 | (8/20 μ s) | >24A |

Schematic and



ESD70VU2RR-07 (S

Applicat



ESD7

TVS Diodes Combine a Very Fast Response Speed with Lowest Clamping Voltages

> HiPAC, TVS Diodes, Silicon Microphone > TVS Diodes

| | TVS Diode | Zener Diode | MOV |
|--------------------------------------|------------------------|-------------------------------|----------------|
| Response Speed (Voltage Limit Speed) | Very Fast | Very Fast | Fast (~few ns) |
| Surge Handling Capability | Medium to High | Low to Medium (not specified) | Medium |
| Multi-strikes | Very good | Good | Poor |
| Line Capacitance | Low to Medium (>0.8pF) | Medium (>30pF) | Low to Medium |
| Clamping Voltage | Low | Medium | Very High |
| Precision of Clamping Voltage | Good | Poor | Poor |
| Wide Range of Breakdown Voltage | Very good | Good | Only > 60V |
| Uni-directional | Yes | Yes | No |
| Bi-directional | Yes | No | Yes |
| Leakage Current | Low | Middle | High |
| Comment | | | Critical |

Table of Contents

■ HiPAC, TVS Diodes, Silicon Microphone

■ HiPAC

■ TVS Diodes

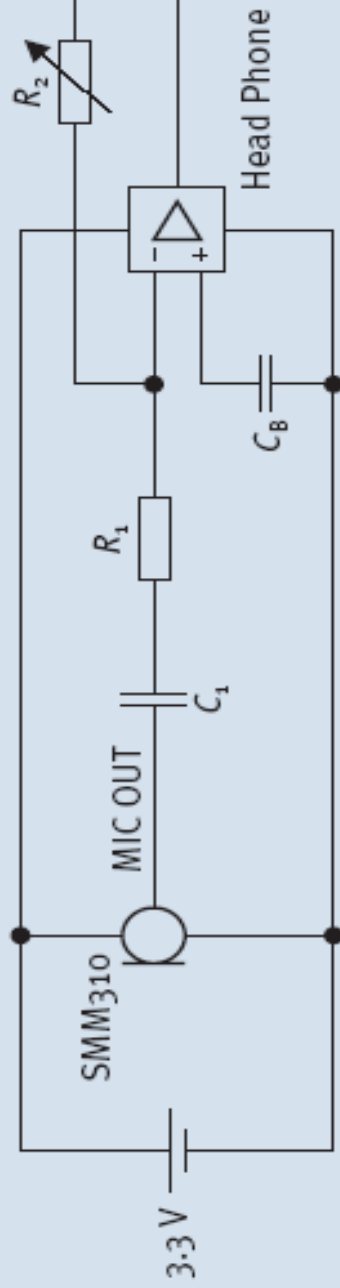
■ Silicon Microphone

Application example: Hands Free

> HiPAC, TVS Diodes, Silicon Microphone > Silicon Microphone

- Hands-Free in the car: Low body noise coupling (vibration of the car)
- Directionality with arrays of microphones
- Integration in noise reduction and echo cancellation systems

Microphone Demonstrator Application Example



SMM310

Analog Microphone for Mobile Applications

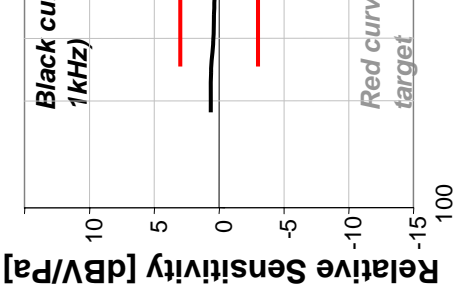
> HiPAC, TVS Diodes, Silicon Microphone > Silicon Microphone

Description



- Silicon MEMS Microphone
- Surface mount assembly
- Green package (260°C)
- Integrated EMI filtering
- 2kV ESD protection (HBM)
- Small size: 4.72x3.76x1.25mm³
- Part number: MM 310 E6433
- Sales code: SP000267598

Frequency response



Characteristics

| Parameter | Typical Value | Unit | Conditions |
|------------------------------|---------------|---------|---------------------------------|
| Sensitivity | -42 | dBV/Pa | 1 kHz, 94 dB SPL |
| Input-Referred Noise | 28.5 | dB | 1 Pa, psophometrically weighted |
| Signal to Noise | 59 | dB(A) | 1 Pa, A-weighted |
| Maximum Sound Pressure Level | 110 | dB | Total Harmonic Distortion <3% |
| Supply Voltage | 1.5 – 3.3 | V | |
| Current Consumption | 70 | µA | |
| Output Impedance | < 100 | | |
| Output Drive Capability | <100 >10 | pF k | output (Pin 1) |
| PSRR | 65 | dB | |

Focus applications

- Mobile

Further applications

- Consumer
- Notebook
- Camera
- Industrial
- Automotive

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- **LED Drivers**
- AF Discretes
- General Information

Problematic issues faced at operating LEDs

> LED Drivers

1 **Inhomogenous light emission in LED branches in comparison to each other**

→ due to statistical variations of LED properties like voltage of up to $\pm 20\%$ the current variation in LED can be very high

2 **Variation of brightness of all LED branches**

→ due to fluctuations of the voltage supply

3 **Degradation of light emission of LEDs**

→ due to thermal overload or even thermal runaway with the decline of the forward voltage of LEDs vs

4 **Increased cost of customers for LEDs**

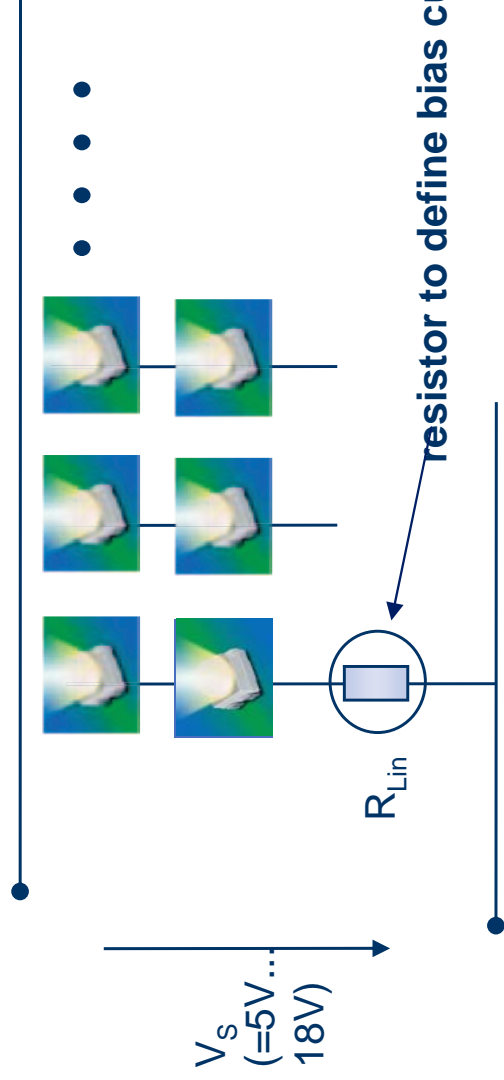
→ due to required binning for same forward voltage brightness and colour temperature index

Countermeasures against problems in operation

1st option: pure resistor biasing

> LED Drivers

Typical setup without LED driver

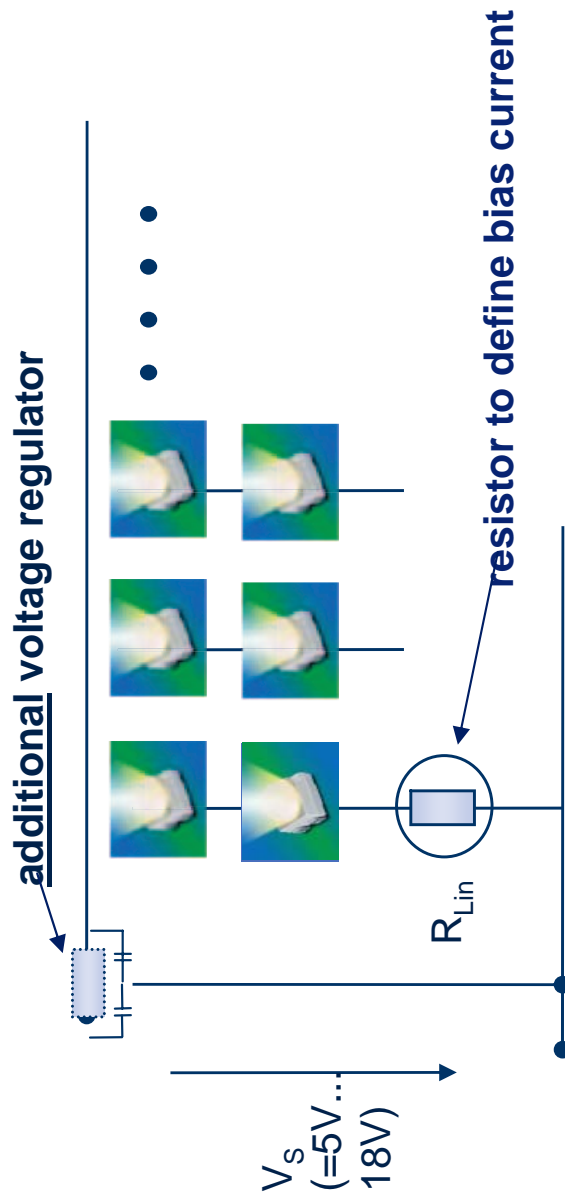


- + inhomogenous light emission can be solved,
 - but at the cost of high voltage drop
 - brightness variations due to fluctuations of V_s remains
 - danger of degradation due to thermal overload of LEDs remains
- Conclusion:
- high voltage drop can result in less number of LEDs in respect
 - thermal overload can lead to degradation of LEDs neutralizing the selling argument of long life expectancy of LEDs
 - cheapest countermeasure, but doesn't solve most critical problems of operating LEDs

Countermeasures against problems in operation

2nd option: voltage regulator in addition to resistor bias

> LED Drivers



- + inhomogenous light emission can be solved, but
- at the cost of high voltage drop
- + brightness variations due to fluctuations of V_s , but
- at the cost of 0,15 USD and
- danger of degradation due to thermal overload of LEDs remains

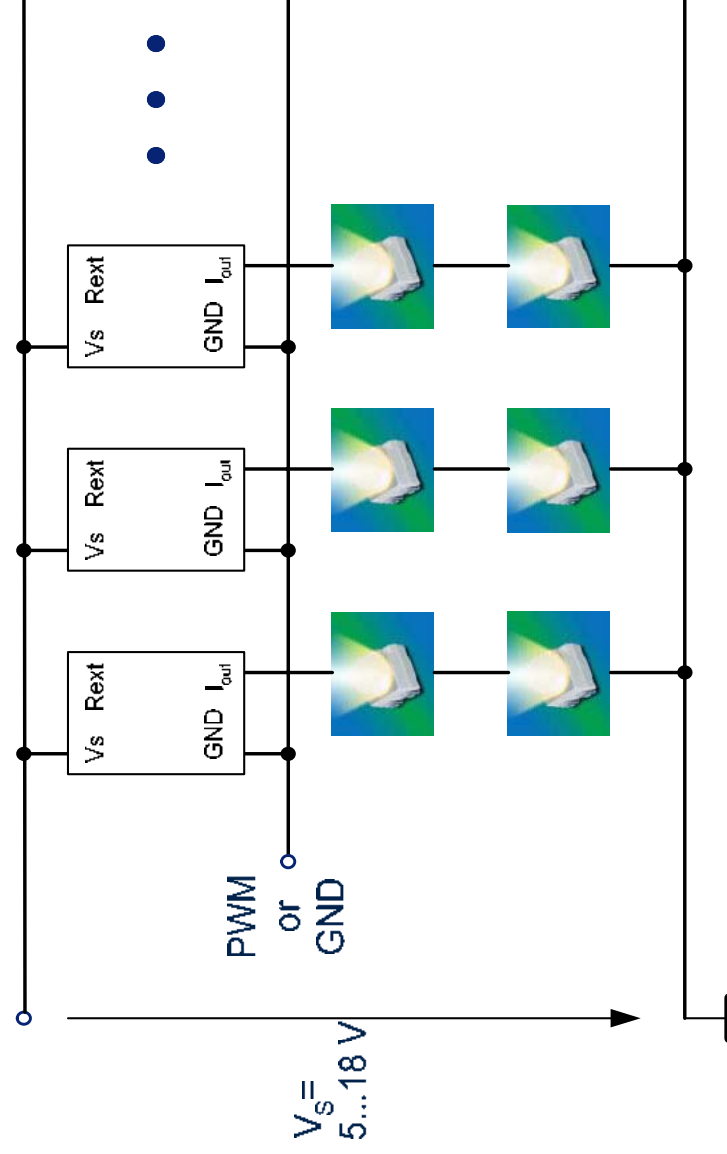
Conclusion:

- high voltage drop can result in less number of LEDs in respect branches
- thermal overload can lead to degradation of LEDs neutralizing the selling argument of long life expectancy of LEDs
- despite significant cost adder, still most critical problems of operation remain unsolved

Countermeasures against problems in operation

3rd option: linear mode LED driver from Infineon

> LED Drivers



- + inhomogenous light emission can be solved with controller in each
- + low voltage drop
- + brightness variations due to fluctuations of V_s solved by controller
- + danger of degradation due to thermal overload of LEDs solved due negative temperature coefficient of LED driver
- + no voltage regulator required

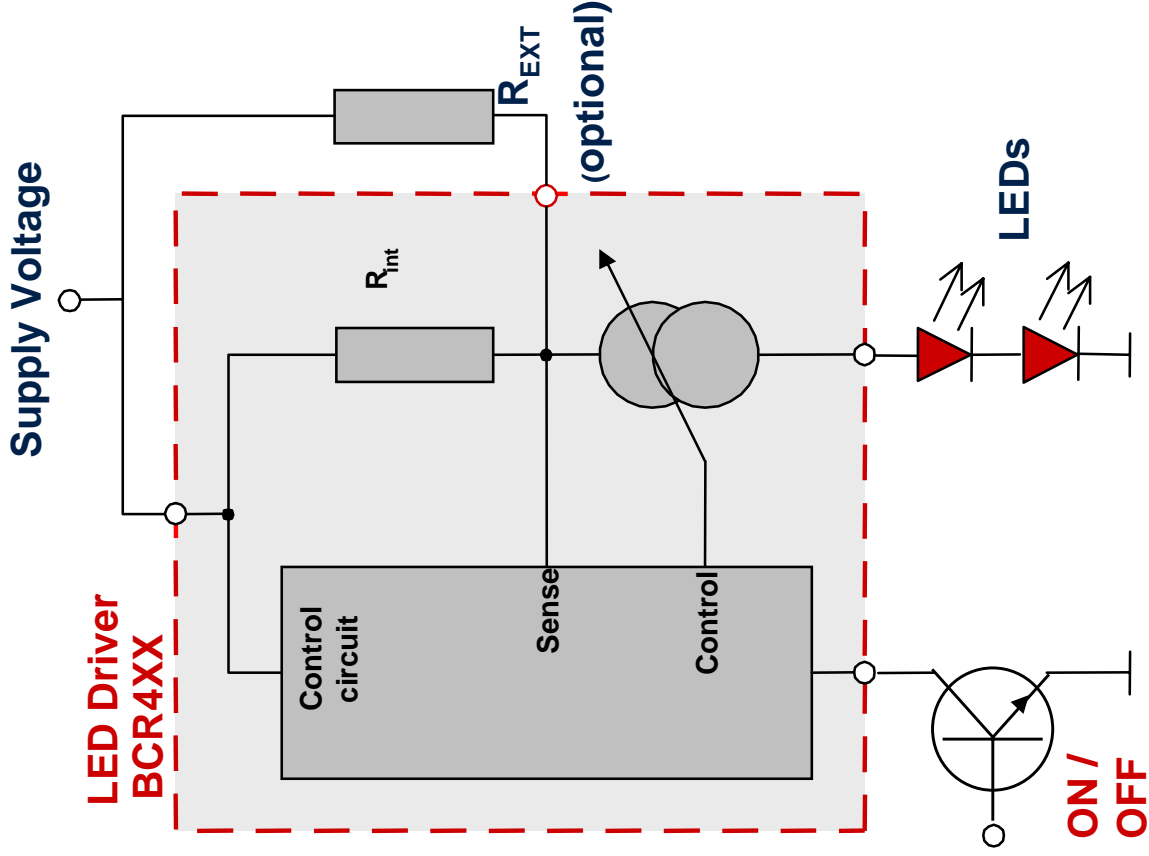
Conclusion:

→ Most critical problems of operating LEDs solved at reasonable cost

Linear mode LED-drivers from Infineon

BCR 4xx in SOT1143R, SOT343 and SC74

> LED Drivers



Benefits

- Low cost and by far the most resistor based solution
- Output current adjustable by an external resistor
- Suitable for Pulse Width Modulation (PWM), possibility of dimming
- Negative temperature coefficient as protection for LED at higher temperatures

Application Note

- AN066

Overview of general purpose linear mode LED

> LED Drivers

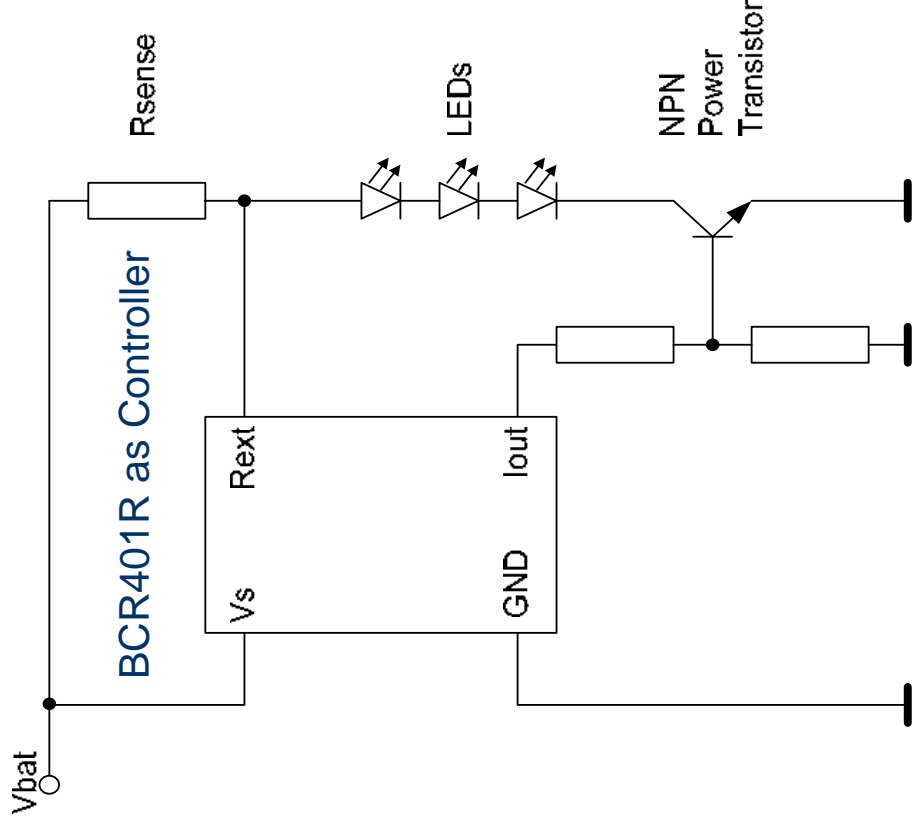
| | Application | Package | Vcc, max | Id,typ | Id,max | Vdrop |
|---------------------------|-------------------------|---------------|----------|--------|--------|-------|
| BCR401R | low current LED Driver | SOT143R | 18V | 10mA | 60mA | 1.2V |
| BCR402R | universal LED Driver | SOT143R | 18V | 20mA | 60mA | 1.4V |
| NEW! BCR401W | low current LED Driver | SOT343 | 18V | 10mA | 60mA | 1.2V |
| NEW! BCR402W | universal LED Driver | SOT343 | 18V | 20mA | 60mA | 1.4V |
| Brand NEW! BCR401U | med. current LED Driver | SC74 | 40V | 10mA | 65mA | 1.4V |
| BCR402U | med. current LED Driver | SC74 | 40V | 20mA | 65mA | 1.4V |
| BCR405U | high current LED Driver | SC74 | 40V | 50mA | 65mA | 1.5V |

→ 3 new products added into the portfolio closing the g

Application Note – AN101

Driving high current LED's using BCR401R

> LED Drivers



Features

- High LED currents of up to 1A, with a sweet spot from 600mA to 1A, mainly for 0,5W & 1W LEDs

Benefits

- Reasonable overall efficiency
- Stable light emission
- Suitable for Pulse Width Modulation (PWM), possibility of dimming
- Negative temperature coefficient, as protection for LED at high temperatures

Recommended Power Transistors

- BCX65-25 (in SOT89 package) for mass production
- BC817SU (in SC74 package) for low current samples available)

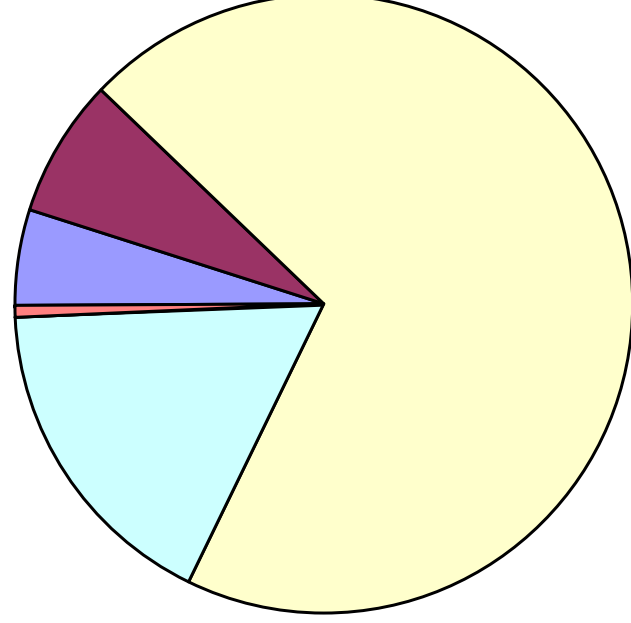
Application Note – AN101: 70% efficiency for driving LED's with linear solution

> LED Drivers

Pie Chart showing power dissipation in circuit elements.

Note that ~ 70% of the available power (4008mW) is consumed in the Light

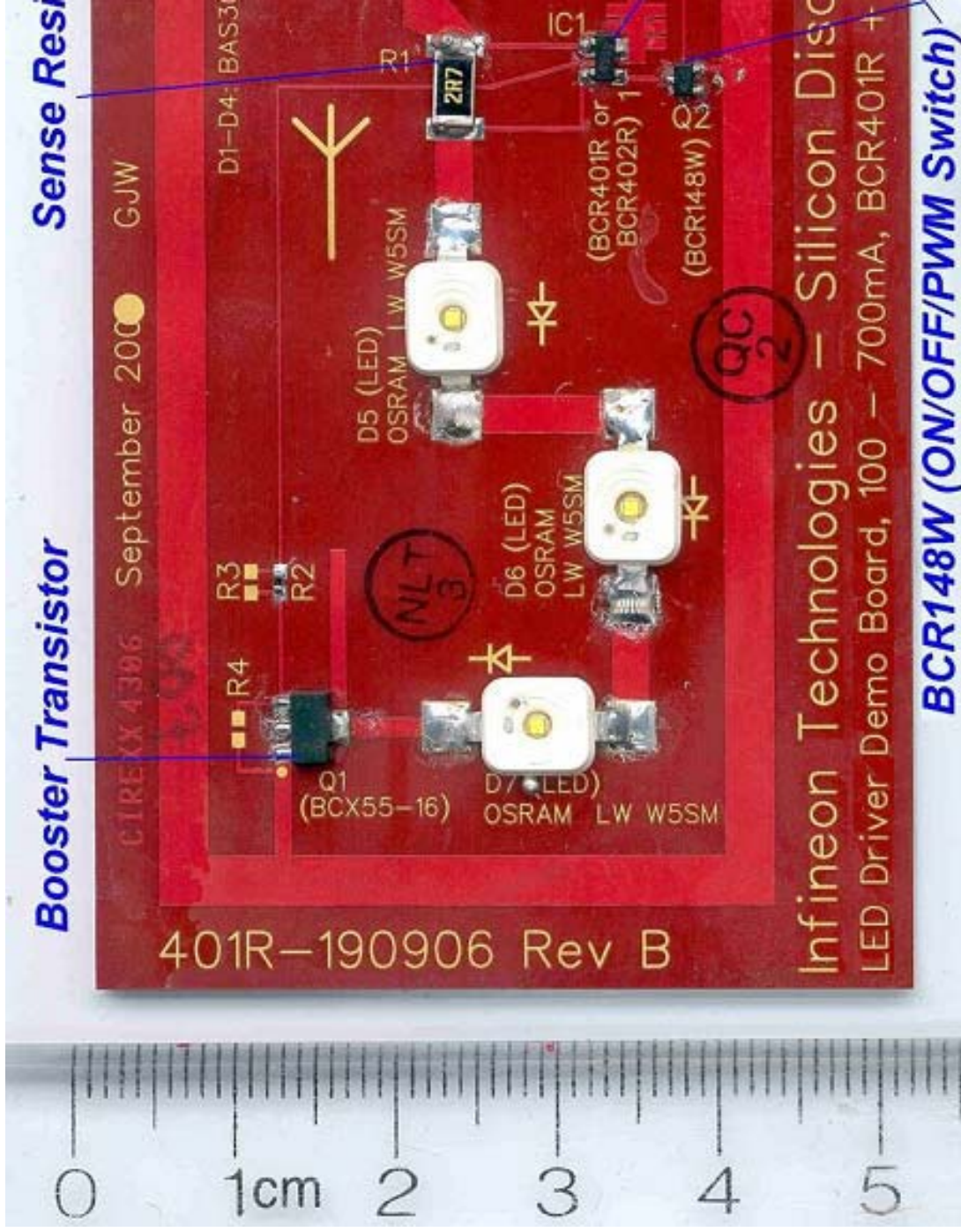
Power Dissipation Budget, LED Driver Application Board Supply, 334mA LED Current (Three 1-Watt LEDs, White OSRAM "Golden Dragon" LW W5



- Schottky Diode (Reverse Power)
- Sense Resistor (Determines LED Current)
- LEDs D5, D6
- Booster Transistor
- Base Resistor
- BCR401R LED Driver

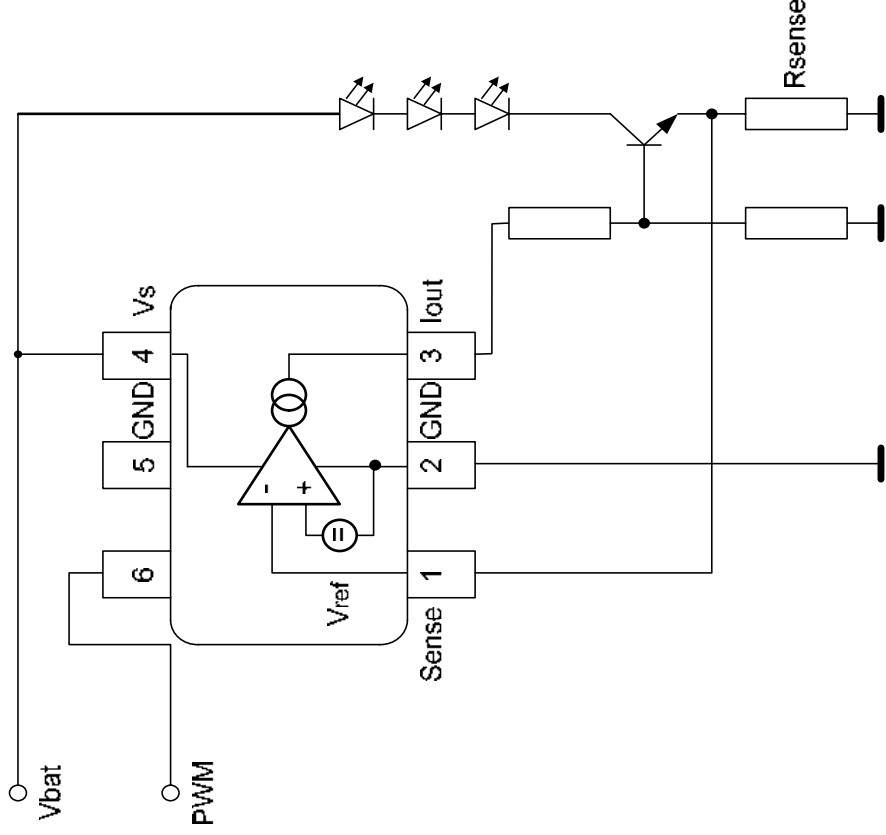
Application Note – AN101: Driving high current LED's using BCR401R

> LED Drivers



High Precision Controller for High Brightness BCR450

> LED Drivers



Features

- Typ. 150mV voltage
- Current variation smaller over the whole operating range (-25 to 125°C)
- Microcontroller enabled Digital Transistor Thermal shutdown
- Operates up to 27 V

Benefits

- Lower part count
 - no digital transistor
 - no capacitors needed
- Higher number of LEDs to low voltage drop
- Protection of LEDs due to LED brightness constant

Recommended Power

- BCX65-25 (SOT89)
- BC817SU (SC74, same)

- Samples for LED controller, April 2007,
- Volume, starting mid 2007

Comparison High Current LED controller solutions

Low cost BCR401R vs NEW medium cost BCR450

> LED Drivers

Application Note - AN101 based on existing products

NEW!!! -- Volume

BCR401R

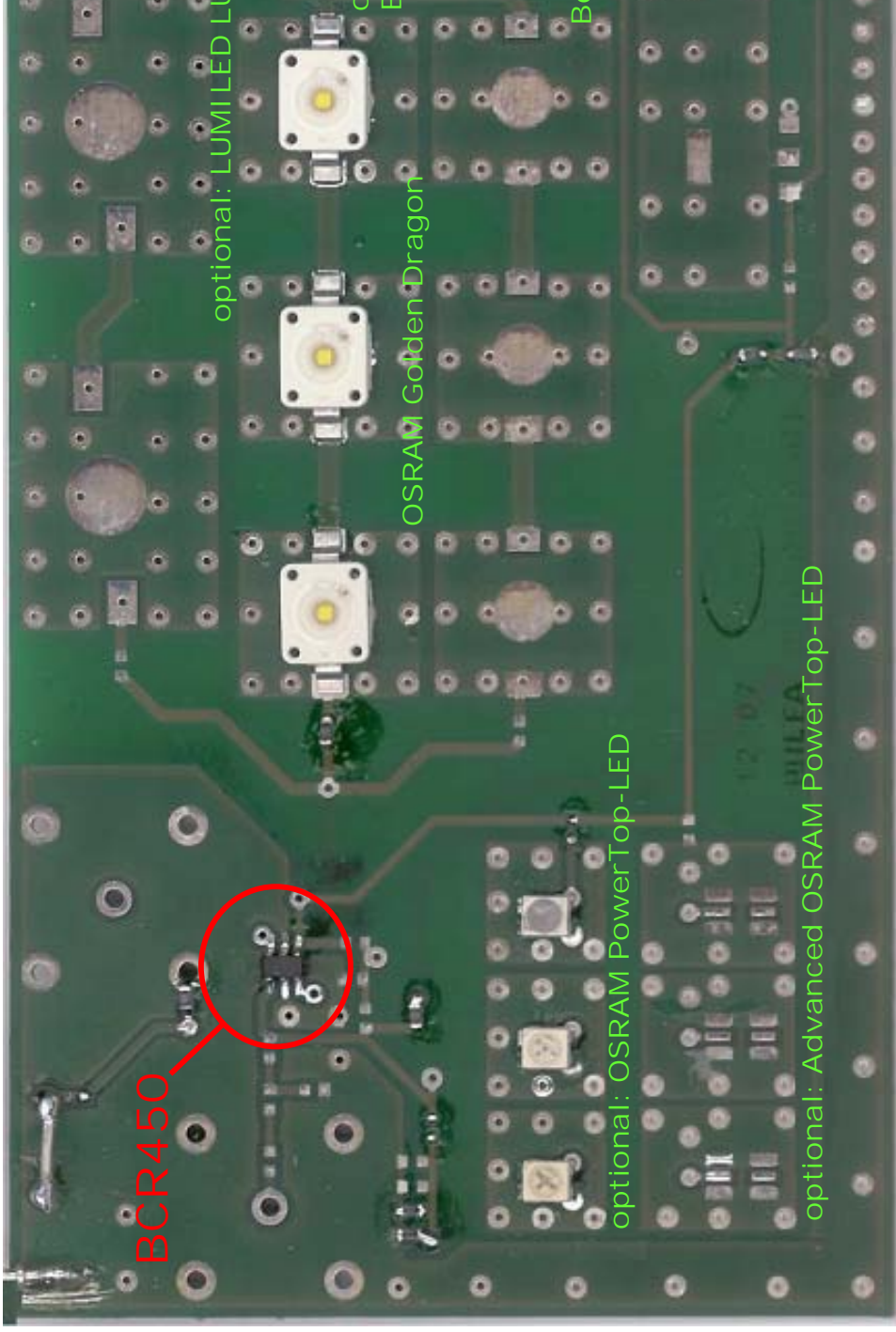
- → Voltage overhead min. 1.1V, using external power stage, $V_{ref} = 0.85\text{ V}$
- → Precision of I out:
 - $\pm 10\%$ initial (@ $V_s = 10\text{V}$; $T_j = 25^\circ\text{C}$)
 - + V_{supply} variation (1 %/V)
 - + temperature coefficient (-0.2 %/K)

BCR450

- → Voltage overhead min. 0.4V, using $V_{ref} = 0.15\text{ V}$
- → Precision of I out:
 - $\pm 10\%$ in V_{supply} ; T_j
- → Thermal shutdown lamp modules for overstress
- → Microcontroler, enable input for

Demo Board for High Current Application using BCR450

> LED Drivers



Summary

> LED Drivers

- Infineon small signal discretes offers a range of low cost LED 10mA up to 700mA
- LED drivers can be used either
 - as standalone drivers for currents 10mA to 65mA or
 - as LED controller in combination with a booster transistor for currents from 65mA up to 700mA see AN101
- Main applications so far are
 - neon bulb replacement for signage / advertising & advertising
 - side markers at trucks, low cost applications in cars, etc.
 - big LED displays etc
 - further cost sensitive applications
- The Infineon portfolio was further complemented by three new BCR401W, BCR402W and BCR401U in the low cost segment
- For higher requirements for LED drivers the new BCR450
 - low voltage drop / high precision LED controller will be available in mid 2007, samples available in April 2007

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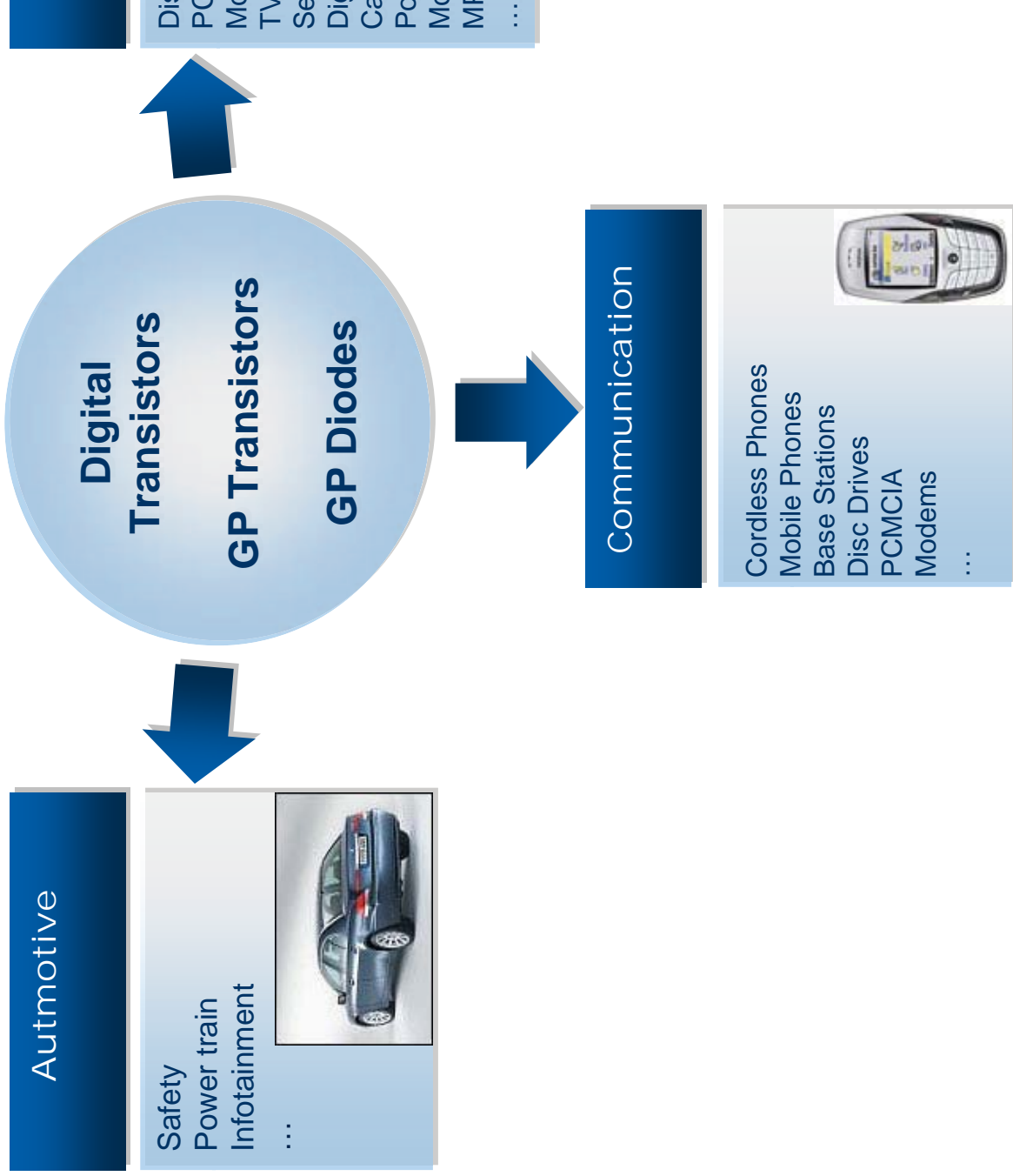
■ Digital Transistors

■ General Purpose Transistors

■ General Purpose Diodes

Our Core Know-how is Used Across Many Applications

> AF Discretes > Introduction



AF small signal discretes with higher value price

> AF Discretes > Introduction

Digital transistors

- 500mA digital transistors in SOT23 like BCR503, BCR505

AF transistors

- Current mirror applications (BCV61 / BCV62)
- Precision matched current mirror (BCM846S / BCM856)
- High voltage applications (BCV26,27,46,47 & BCX41,4
- High current transistors (BDP9x)

AF diodes

- Low leakage diodes (BAS116, BAV170, 199, BAW156)
- BAS28 & BAW101 in SOT143 and BAS28W SOT343
- High reverse voltage BAW78 & BAW79
- Bridge rectifier BGX50A

General

- Double die packages SOT363 & SC74 like BAV99S, BC
- BAS21U, BC817UPN, BC807U, BCR523U, and many other

→ Look for applications for these products
promote strongly these products

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■ AF Discretes

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■ General Purpose Diodes

Value proposition with Digital Transistors

GP Transistors with Built-in Resistor Network

> AF Discretes > Digital Transistors

Higher value proposition

- Double die packages SOT363 & SC74 like BCR133S, BCR523U etc)

Main application:

Automotive, Industry other

Major competition:

Rohm, NXP, ON Semi

- 500mA single die package SOT23 like BCR503, BCR505 etc)

Main application:

Automotive, Industry other

Major competition:

Rohm, NXP, ON Semi

→ 1st priority for promotion

- 100mA single die package SOT23 like BCR108, BCR133

Main application:

Automotive, Industry other

Major competition:

Rohm, NXP

→ 2nd priority for promotion

Digital Transistors Single Chip Versions

> AF Discretes > Digital Transistors

| R1 (kOhm) | R2 (kOhm) | SOT23 $V_{C80} 50V, I_C 100mA$ | | SOT323 $V_{C80} 50V, I_C 100mA$ | | V_{CE} |
|--------------|--------------|-----------------------------------|--------|------------------------------------|---------|----------|
| | | npn | npn | nnp | npn | |
| 100 | 100 | --- | --- | --- | --- | --- |
| 2.2 | 2.2 | BCR103 | BCR153 | --- | --- | B |
| 2.2 | 10 | --- | --- | --- | --- | B |
| 2.2 | 47 | BCR108 | BCR158 | BCR108W | BCR158W | |
| 4,7 | 4.7 | BCR112 | BCR162 | BCR112W | --- | |
| 4,7 | 10 | BCR114 | --- | --- | --- | |
| 4,7 | 47 | BCR116 | BCR166 | BCR116W | BCR166W | |
| 4,7 | | BCR119 | BCR169 | BCR119W | BCr169W | |
| 1 | 1 | --- | --- | --- | --- | B |
| 1 | 10 | --- | --- | --- | --- | B |
| 10 | | BCR129 | --- | BCR129W | --- | |
| 10 | 10 | BCR133 | BCR183 | BCR133W | BCR183W | B |
| 10 | 47 | BCR135 | BCR185 | BCR135W | BCR185W | |
| 22 | | BCR139 | BCR189 | --- | --- | |
| 22 | 22 | BCR141 | BCR191 | BCR141W | BCR191W | |
| 22 | 47 | BCR142 | BCR192 | BCR142W | BCR192W | |
| 47 | 22 | BCR146 | BCR196 | BCR146W | BCR196W | |
| 47 | 47 | BCR148 | BCR198 | BCR148W | BCR198W | |
| 47 | | --- | --- | --- | --- | |

Not listed resistor values / combinations can be offered on demand

Digital Transistors Multichip Versions

> AF Discretes > Digital Transistors

| SOT363 | | | | | | |
|--------|--------|-------------------------------|---------|---|--------------------|--|
| R1 | R2 | Dual digital transistor array | | [V _{CE0} 50V ; I _c 100mA] | Dual di transistor | |
| [kOhm] | [kOhm] | 2 * npn | 2 * pnp | npn + pnp | 2 * npn | |
| 2,2 | 2,2 | | | | | |
| 2,2 | 47 | BCR108S | | BCR08PN | | |
| 4,7 | 4,7 | | | | | |
| 4,7 | 47 | BCR116S | | | | |
| 4,7 | | BCR119S | BCR169S | | | |
| 1 | 10 | | | | BCR523U | |
| 10 | | BCR129S | | | | |
| 10 | 10 | BCR133S | BCR183S | BCR10PN | | |
| 10 | 47 | BCR135S | BCR185S | BCR35PN | | |
| 22 | | | | | | |
| 22 | 22 | BCR141S | | BCR22PN | | |
| 22 | 47 | | | | | |
| 47 | 22 | | | | | |
| 47 | 47 | BCR148S | BCR198S | | | |
| 47 | 47 | nnp | | BCR48PN | | |
| 2,2 | 47 | pnp | | | | |

Not listed resistor values / combinations can be offered on demand

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Higher value proposition with General Purpose Transistors

> AF Discretes > General Purpose Transistors

Higher value proposition

- Double die packages SOT363 & SC74 (BCM846S, BC847PN, BC817UPN, BC807U etc)

Main application: Automotive, Industry other

Major competition: NXP, ON Semi, other

- Current mirror applications (BCV61 / BCV62)

Main application: Automotive, Industry other

Major competition: NXP, ON Semi, other

- Precision matched current mirror (BCM846S / BCM8462)

Main application: Automotive, Industry other

Major competition: NXP

- High voltage applications (BCV26,27,46,47 & BCX41)

Main application: Automotive, Industry other

Major competition: NXP

- High current transistors (BDP9x)

Main application: Telecommunication

Major competition: Zetex

→ 1st priority for promotion

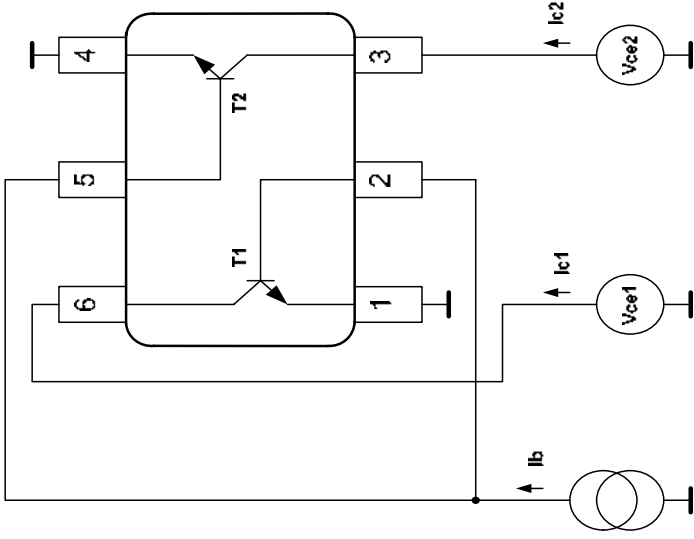
General Purpose AF Transistors

> AF Discretes > General Purpose Transistors

| | Package | SOT89 | SOT223 | SOT23 | SOT323 | SOT1 |
|---|---------|----------------------------------|---|---|--------------------------------------|--------------|
| Current Mirror | | | | | | BCV6 BCV6 |
| Precision matched current mirror | | | | | | |
| Low Noise Transistors (Noise Figure <4dB@1kHz) | | | | BCW60FF BC850B BC860B | | |
| Darlington ($h_{FE}>2000$) | | BCV29/49 BCV28/48 | BCP49 BSP5x BSP6x PZTA14 | BCV27 BCV26 BCV47 BCV46 SMBTA14 | | |
| Fast switching (Storage time <1µs) | | | | SMBT3904 SMBT3906 | | |
| High Voltage (VCEO>100V) | | BFN18 BFN19 | BFN38 BFN39 PZTA42 PZTA92 | BCX41 BCX42 BFN24/26 BFN27 SMBTA42/MMBTA42 SMBTA92/MMBTA92 | | |
| General Purpose- | | BCX5x BCX5x BCX68 BCX69 | BDP9xx BDP9xx BCP5x BCP5x _____ _____ _____ | BC81x BC80x BC84x BC85x BCW6x BCW6x | BC81xW BC80xW BC84xW BC85xW | |
| | | NPN-Type | PNP-Type | | | |

BCM846S / BCM856S Matched Dual Transistor Arrays

> AF Discretes > General Purpose Transistors



SOT363 package

Features

- $\pm 10\%$ ΔI_c match circuit
- $V_{ce0} > 65$ V
- $I_c = 100$ mA
- $h_{FE} = 200 - 450$

Ideal for:

- Current mirror circuit
- Current-sense amplifier
- Discrete Voltage Reference

Available as:

- NPN (BCM846S)
- Small footprint (SOT363)
- Application slides

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General Purpose Diodes

> AF Discretes > General Purpose Diodes

Functionalities

- Rectifier
- Switching / High Speed switching
- Circuit protection

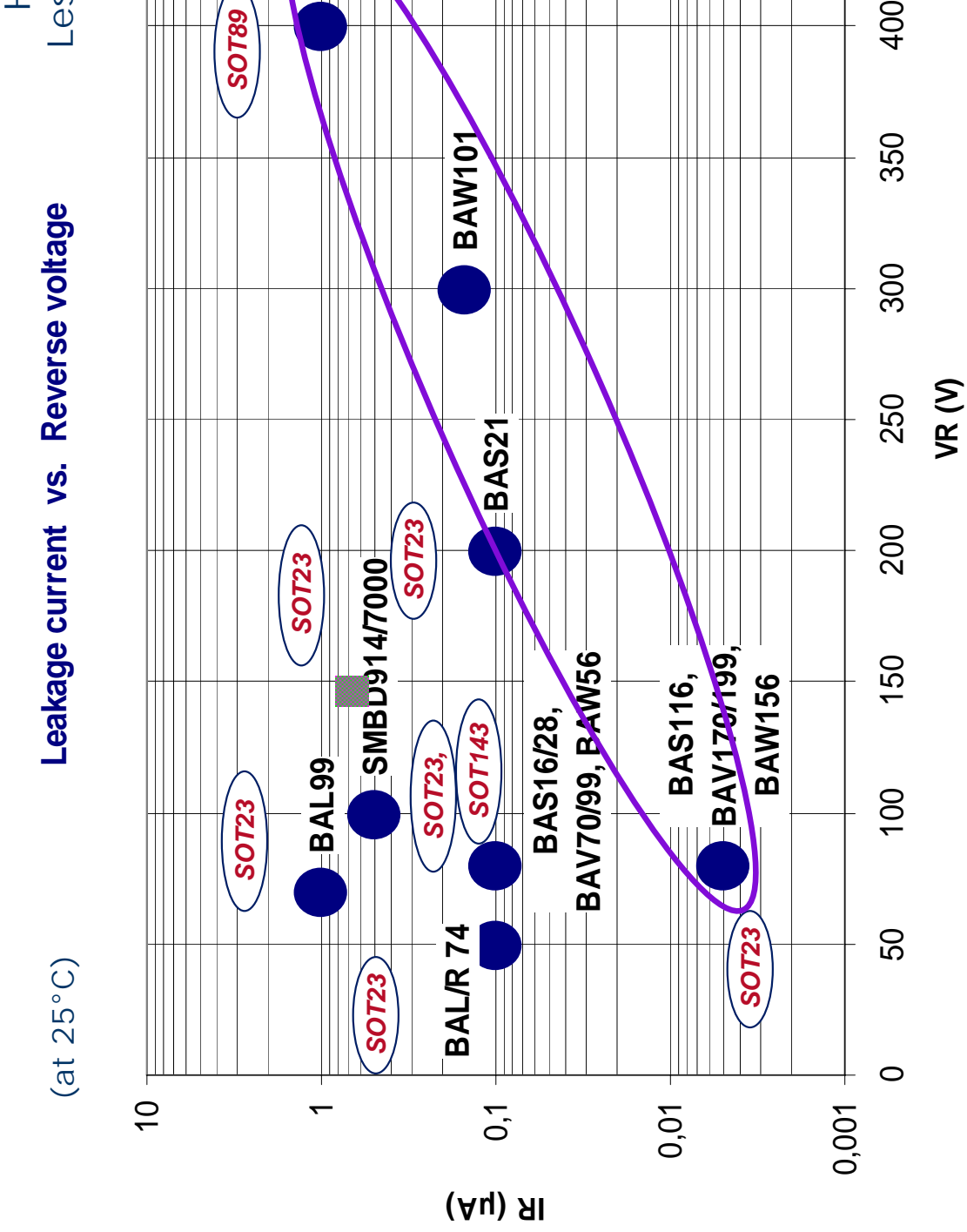
Requirements

- High voltage diodes (V_R)
- Low leakage current (I_R)
- High variation of allowable current (I_F)
- Fast recovery time (t_{rr})
- Small diode capacitance (CT)
- Small packages and more elements / package

Broad AF Diode product portfolio

Customer can optimize Reverse Current vs Reverse Voltage

> AF Discretes > General Purpose Diodes



Higher value proposition with General Purpose Diodes

> AF Discretes > General Purpose Diodes

Higher value proposition

- Multiple (>2) die packages SOT363 & SC74 (BAV70S, BAV99S, BAW56S, BAS16S, BAS21U etc)

Main application:

Automotive, Industry other

Major competition:

NXP, ON Semi, other

- Low leakage diodes (BAS116, BAV170, 199, BAW156)

Main application:

Automotive, Consumer, other especially temperature applications to limit leakage ex avoid battery discharge

Major competition:

NXP

- BAS28 & BAW101 in SOT143 and BAS28W SOT343

Main application:

Automotive, Industry other two galvanically isolated diodes, BAS28 for 100V, BAW101 for 300V reverse voltage

Major competition:

NXP

- High reverse voltage BAW78 & BAW79 (400V, 1A)

Main application:

Rectifier diode for Automotive, Industry other

Major competition:

NXP

- Bridge rectifier BGX50A

Main application:

Rectifier for Automotive, Industry other

Major competition:

NXP

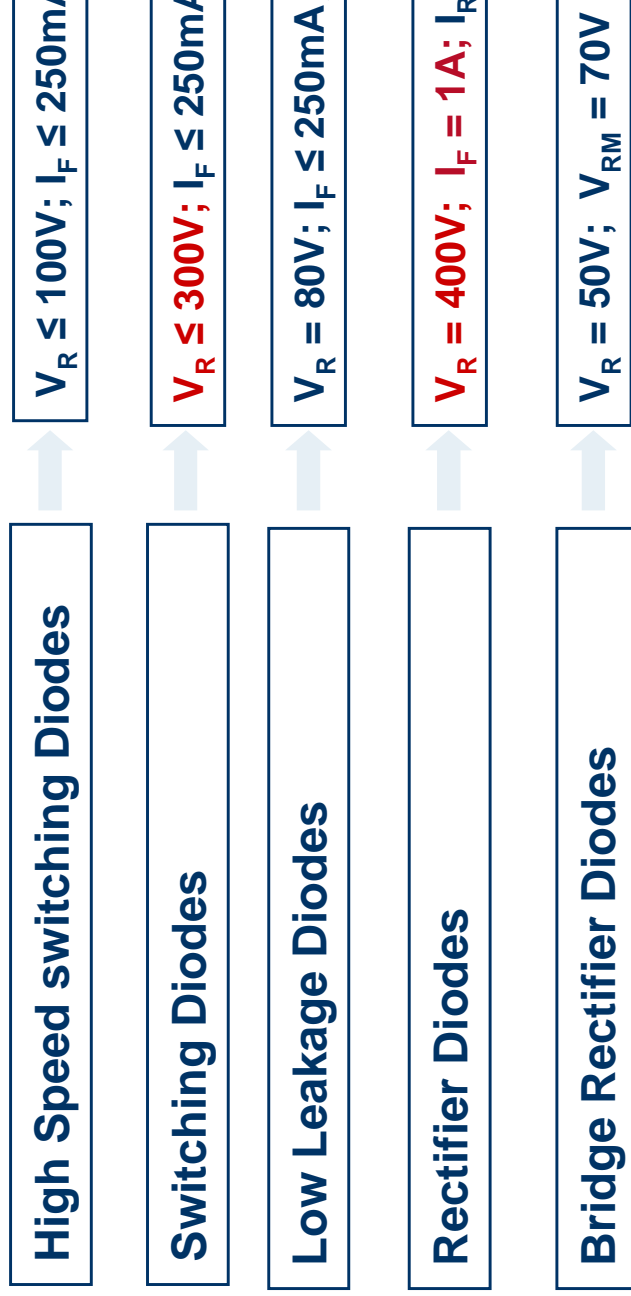
→ 1st priority for promotion

General Purpose Diodes Product Portfolio

> AF Discretes > General Purpose Diodes

Infinion offers a variety of General Purpose Diodes

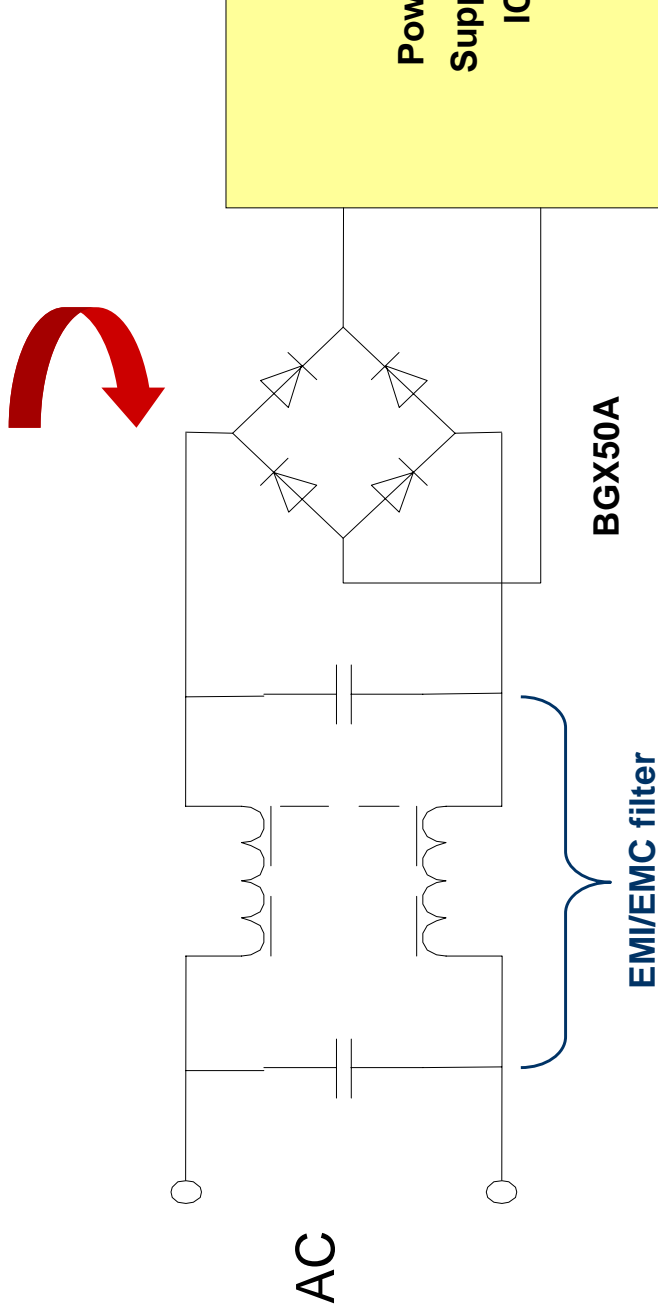
- Today > 60 types
- Available in different packages and configurations
- Customer can choose ideal product for specific application



General Purpose Diodes

> AF Discretes > General Purpose Diodes

Application Power Supply

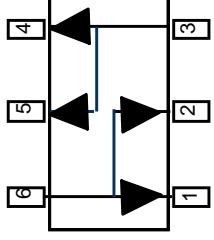
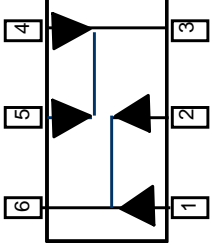
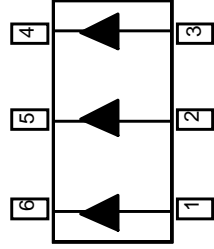


| Product | V_{rmax} / V | I_{fmax} / mA | V_{BR} / V | $I_R / \mu A$ | @ V_R / V | V_F / V |
|---------|----------------|-----------------|--------------|---------------|-------------|-----------|
| BGX50A | 50 | 140 | 50 | < 0.20 | 50 | < 2.60 |
| BGX400 | 400 | 250 | >400 | < 1.00 | 400 | < 2.00 |

General Purpose Diodes

> AF Discretes > General Purpose Diodes

| Device Family | V R [V] | I F [mA] | Configuration | SOT 143 SC61 |
|--|---------|----------|--------------------------|-----------------|
| g.p. diodes for rectifying & switching & clamping | 50 | 140 | fullbridge rectifier | BGX 50 A |
| | 70 | 200 | dual 2* comm. Cathode | |
| | 75 | 250 | Three parallel | |
| | 70 | 200 | dual 2* series connected | |
| | 70 | 200 | dual 2* comm. Anode | |
| | 200 | 250 | Three parallel | |



Switching and Rectifier Diodes

> AF Discretes > General Purpose Diodes

| Product | VRmax | IFmax | IFSmax | IR @VRmax | VF | @ IF |
|----------------------------------|-------|--------|--------|--------------|----------|--------|
| BAS21xx | 200 V | 250 mA | 4.5 A | < 100 nA | < 1.25 V | 200 mA |
| BAW101 | 300 V | 250 mA | 4.5 A | < 150 nA | < 1.3 V | 100 mA |
| BAW78xx BAW79xx | 400 V | 1 A | 10 A | < 1 µA | < 1.6 V | 1 A |



Three basic types - Different packages and configurations
Main Application: Switching, where high breakdown voltage
→ e.g. modems

Low Leakage Diodes

> AF Discretes > General Purpose Diodes

| Product | VRmax | IFmax | IFSmax | IR @VR=75V | VF | @ IF |
|--------------------------------------|-------|-------------------|--------|---------------|----------|--------|
| BAS116 BAW156 BAV170 BAV199 | 80 V | 200 ... 250 mA | 4.5 | < 5 nA | < 1.25 V | 150 mA |



One basic type - Different packages and configurations
Main Application: Low leakage switching applications especially at high temperature applications

High Speed Switching Diodes

Mainly commodity parts

> AF Discretes > General Purpose Diodes

| Product | VRmax | IFmax | IFSmax | IR @ Vrmax | VF | @ IF |
|----------|--------|---------|--------|---------------|-----------|-------|
| BAS16xx | | | | | | |
| BAS28xx | | | | | | |
| BAV70xx | | | | | | |
| BAV99xx | | | | | | |
| BAW56xx | 50 ... | 200 ... | 4.5 A | < 100 ... | >1.00 ... | 100 . |
| BAR74 | 100 V | 250 mA | | < 500 nA | < 1.25 V | 150 m |
| BAL74 | | | | | | |
| BAL99 | | | | | | |
| SMBD914 | | | | | | |
| SMBD7000 | | | | | | |



One basic type - Different packages and configurations
Main Application: High Speed Switching

Summary AF discretes

> AF Discretes

- Not all AF products are pure commodity, there are some offer higher value to customer
- For AF discretes rather than small packages like SC75, double / triple die packages seem to provide higher value like saving board space
- Also current mirror applications, higher voltage and high power components seem to be less commoditized and hence less price pressure

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■ RF Discretes

■ Schottky Diodes

■ HiPAC, TVS Diodes, Silicon Microphone

■ LED Drivers

■ AF Discretes

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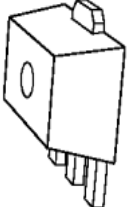







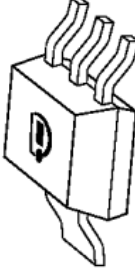

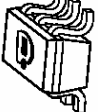


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Packages for Silicon Discretes

> General Information > Packages

| | |
|----------|--|
| WLP |  S-WLP-11 (2116)  S-WLP-8 (1616)  S-WLP-10 (20165)  S-WLP-16 |
| Leadless |  TSLP-2-1  TSLP-4-3  TSLP-4-4  TSLP-2-7 (RH*)  TSLP-3-1/4  TSLP-6-1  TSLP-4-7 (RH*)  TSLP-3-7/8 (RH*)  TSLP-3-9 (LH) |
| Flatlead |  SOT89  SCD80  SC79  TSFP-3  TSFP-4  TSSFP-3 |
| Gullwing |  SOT23  SOD323  SOT223  SOT343  SOT363  SC74  SC75 |

Diode packages on the way for smallest size

> General Information > Packages

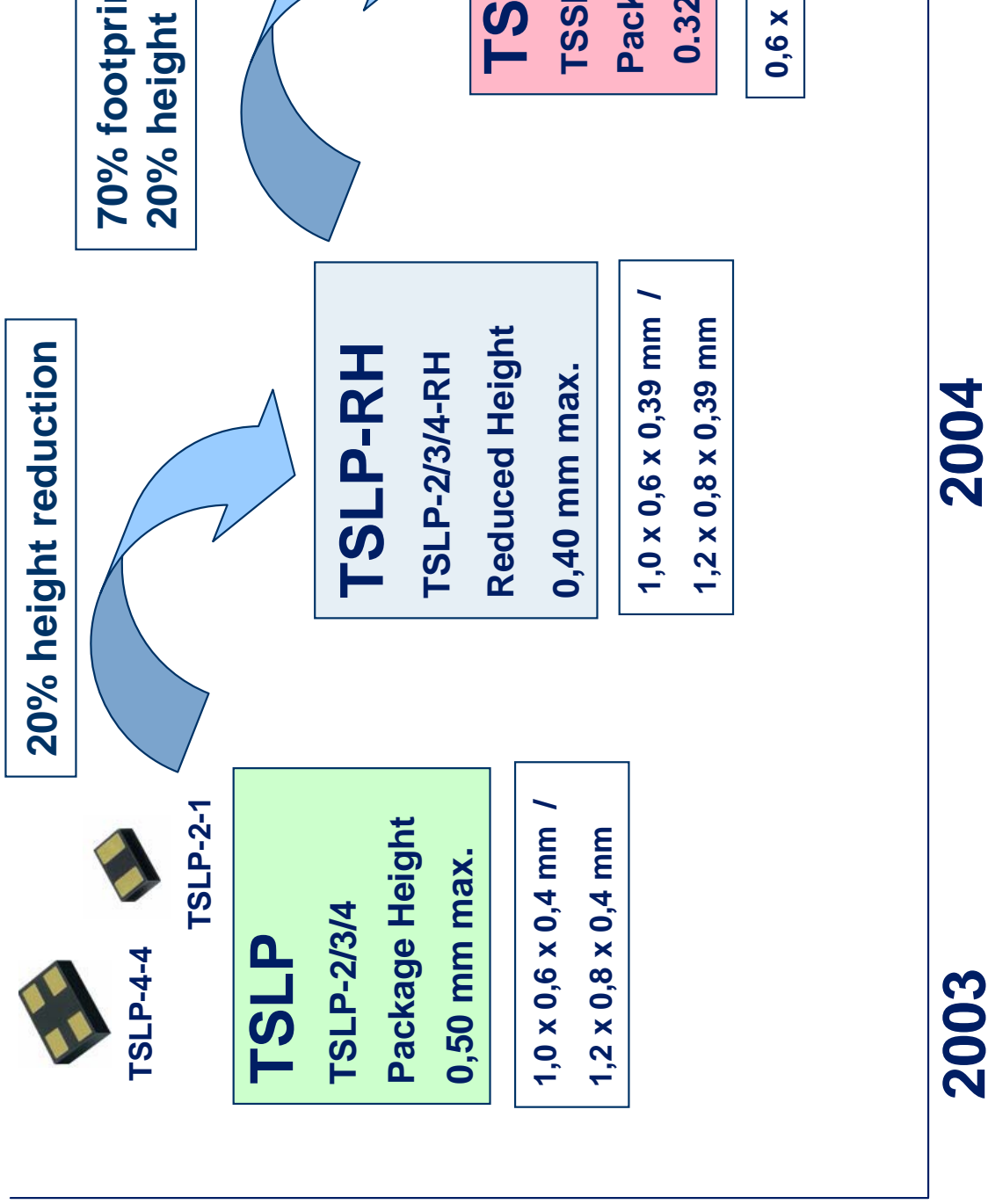


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Internet – Quick Online Navigation

> General Information > Internet Navigation

www.infineon.com/smallsignaldiscretes

www.infineon.com/rfmmics

www.infineon.com

www.infineon.com/rfbipolartransistors

www.infineon.com

www.infineon.com/digitaltransistors

www.infineon.com

www.infineon.com/generalpurposetransistors

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www.infineon.com/generalpurpose diodes

www.infineon.com/schottky diodes

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Application Notes

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| Product Group | AN - Number | Title |
|----------------------|-------------|--|
| General | 022 | Simple Microstrip Matching for all Impedances |
| General | 077 | Thermal Resistance Calculation |
| ESD / EMI Protection | 079 | ESD tests according to the Human Body Model (HBM) |
| ESD / EMI Protection | 100 | ESD Protection ESD8VOL series |
| Diodes | 007 | DECT (1.9 GHz) Transmit-Receive PIN-Diode Switch |
| Diodes | 013 | 800-1000 MHz PIN-Diode Transmit-Receive Switch |
| Diodes | 025 | 1400-1600 MHz PIN-Diode Transmit-Receive Switch |
| Diodes | 033 | GSM + PCN Dual-Band Transmit-Receive Switch |
| Diodes | 034 | Carrier Lifetime and Forward Resistance in RF PIN Diode |
| Diodes | 047 | Matching Methods for Variable Capacitance Diodes |
| Diodes | 049 | DECT Transmit-Receive Switch Using Ultra Small PIN Di |
| Diodes | 058 | Predict Distortion in PIN-Diode Switches |
| Diodes | 061 | W-CDMA 2.3 GHz VCO using BFR360F and BBY58-02V |
| Diodes | 065 | Schottky Diodes for Clipping, Clamping and Transient Su |
| Monolithic Ics | 014 | Application Considerations for the Integrated Bias Contr |
| Monolithic Ics | 027 | A 1.9 GHz Low Noise Amplifier Board using Si-MMIC BGA |
| Monolithic Ics | 030 | A 1.9 GHz Low Noise Amplifier Board using Si-MMIC BGA |
| Monolithic Ics | 062 | A Low Parts Count Low Noise Amplifier for GPS Applicati |

Application Notes

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| Product Group | AN - Number | Title |
|----------------|-------------|--|
| Monolithic Ics | 063 | A 1.85 GHz High Gain Low Noise Transistor Amplifier using |
| Monolithic Ics | 064 | Using the BCR410W Bias Controller with BFP405 in Amplifier |
| Monolithic Ics | 066 | Constant Current LED Driver |
| Monolithic Ics | 067 | General Purpose Wide Band Driver Amplifier using BGA614 |
| Monolithic Ics | 069 | The BGA622 SiGe Universal LNA MMIC in 1800 - 2500 MHz |
| Monolithic Ics | 086 | ESD Protection (1: Simple protection structures, 2: BGA622 |
| Monolithic Ics | 089 | The BGA622L7 SiGe Universal Low Noise Amplifier MMIC in |
| Monolithic Ics | 090 | The BGA622L7 SiGe Universal Low Noise Amplifier MMIC in |
| Monolithic Ics | 091 | BGA615L7 S11 improved |
| Monolithic Ics | 093 | BGA615L7 area improved |
| Monolithic Ics | 098 | MMICs for TV-tuner applications |
| Monolithic Ics | 101 | High current LED driver using BCR402U |
| Transistors | 001 | SIEGET 25 Low Noise Amplifier with BFP420 Transistor at 2 |
| Transistors | 002 | SIEGET 25 Silicon Bipolar Dielectric Resonator Oscillator (D |
| Transistors | 003 | The Vceo-Mystery or How to use Low-Vceo-Transistors with |
| Transistors | 008 | Define a Small Signal RF-Transistor: S-Parameters, Noise F |
| Transistors | 015 | Low Noise Amplifier Optimized for Minimum Noise Figure at |
| Transistors | 016 | Low Noise Amplifier Optimized for Input and Output Return |
| Transistors | 017 | A Low Noise Amplifier with good IP3out Performance at 1.9 |

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| Product Group | AN - Number | Title |
|---------------|-------------|---|
| Transistors | 018 | A Low Noise Amplifier at 900 MHz using SIEGET BFP420 |
| Transistors | 019 | A Low Noise Amplifier with good IP3out Performance at 1.9 GHz using BFP405 |
| Transistors | 020 | A Low Noise Amplifier at 1.9GHz using BFP405 |
| Transistors | 021 | A Low Noise Amplifier shows good Noise Figure Performance |
| Transistors | 023 | Designing Oscillators with low 1/f-Noise |
| Transistors | 024 | Capacitances in Bipolar Junction Transistors |
| Transistors | 026 | A Medium Power Amplifier at 1.9 GHz using BFP450 |
| Transistors | 031 | A Low Noise Amplifier at 1.9 GHz offers +14 dBm Input Intermodulation |
| Transistors | 050 | A Power Amplifier Module at 1.9 GHz using BFP450 and BFP405 |
| Transistors | 051 | SIEGET 45 - Low Noise Amplifier with BFP520 Transistor at 1.9 GHz |
| Transistors | 057 | A 1.9 GHz Low Noise Amplifier Optimized for High IP3 using BFP405 |
| Transistors | 060 | A High Third-Order Intercept Low Noise Amplifier for 1900 MHz |
| Transistors | 061 | W-CDMA 2.3 GHz VCO using BFR360F and BBY58-02V |
| Transistors | 075 | High Third-Order Input Intercept Point CDMA 800 Low Noise Amplifier |
| Transistors | 082 | A Low-Cost, Two-Stage Low Noise Amplifier for 5 - 6 GHz Applications |
| Transistors | 095 | Evaluation report and application guide for low-voltage-capable transistors |
| Transistors | 099 | 315 MHz Oscillator Solution for Remote Keyless Entry System |

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Nomenclature – Type Designation Guide Discretes

> General Information > Nomenclature

Diodes

| | |
|----------------|--|
| BA... | PIN / Switching diodes, mainly for Consumer market |
| BB... | Varactor diodes, mainly for Consumer market |
| BAR... | PIN diodes, mainly for Mobile Comm market |
| BAS.../ BAT... | Schottky diodes |
| BBY... | Varactor diodes for VCO application |
| ESD... | TVS and ESD protection diodes |

Varactor Diodes Tuner Applications

| | | |
|---------------|-------|---------------------|
| SOD323 | SCD80 | SC79 |
| BB639 → +20 = | BB659 | + ext.02V BB659-02V |
| BB535 → +20 = | BB555 | + ext.02V BB555-02V |
| ... | ... | ... |

Nomenclature – Type Designation Guide Discretes

> General Information > Nomenclature

Transistors

BF...

RF MOSFETs or Bipolar Transistor. Mainly for consume

BG...

Dual RF MOSFETs in SOT363

BFR...

RF Bipolar Transistor in SOT23

BFP...

RF Bipolar Transistor in SOT143

BFS...

Dual RF Bipolar Transistor in SOT363

BFG...

RF Bipolar Transistor in SOT223

BFQ...

RF Bipolar Transistor in SOT89

BGA

RF MMICs

BC...

AF Transistor

BCR...

AF Transistor with built in resistors (=Dual Transistor)

BCR1xx = 100mA types, BCR5xx = 500mA types.

(<150 = NPN; >149 = PNP)

BCR4....

AF Small Scale Integrated Ciccuits SSIC

SIEGET®

BFP4xx, BFP5xx series (Siemens Grounded Emitter Tra

SiGe

BFP6xx series (Silicon Germanium Transistor)

SiGe:C

BFP7xx series (Silicon Germanium Carbon Transistor)

Nomenclature – Type Designation Guide Discretes

> General Information > Nomenclature

Extensions

| | |
|-----------------------|--|
| R | Reverse pinning |
| W | !!! SOT343 is always in reverse pinning, i.e. there is no e.g. BF203 Next smaller package e.g. BFR181 (SOT23) → BFR181W (SOT !!! SIEGETs are in SOT343 but have no “W” as there are no SIE |
| S | SOT363 package |
| T | SC75 package |
| U | SC74 package |
| F | Flat lead package (TSFP3/4) |
| RH | Reduced Height version of TSLP package (max. 0.4 mm) |
| L3LH | Low Height version of 3pin transistor TSLP package (max. 0.32 r |
| L3 / L4 / L6 | Leadless Package TSLP3 / TSLP4 / TSLP6 |
| -02V / -02W | Diodes in SC79 / SCD80 package |
| -02L / -02LRH / -02LS | Diodes in TSLP2 / TSLP2-RH / TSSLP package |
| -07LRH/098LRH/099LRH | Dual Diodes in TSLP4-RH package |
| -03W | SOD323 package (for IT and AF diodes) |
| -04 / 05 / 06 | Dual diodes in SOT23 package (series/com. cath/com. anod.) |
| -04W / 05W / 06W | Dual diodes in SOT323 package (series/com. cath/com. anod.) |
| -07 / -07W | Dual diodes in SOT143 / SOT343 package (parallel) |
| PN | Dual transistors (1pnp + 1 npn) in one package |

Further extensions for AF components

A, B, C, ... or
-16, -25, -40
Current gain groups (same chip), e.g. BC846A, BC846B, ...

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MatQ - Product Material Declaration

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How are materials declared?

- Substances and materials contained in IFX products are declared in the **U-Spec** in accordance to IEC 61906
- The U-Spec declares full materials present in Infineon product(s) in concentrations above 0.1 % by weight (1000 ppm)
- Trace concentrations of materials (i.e. those < 0.1 % by weight) are marked with an "X" if they are intentionally added substances (e.g. [CEPIC-EECA-EICTA](#)).

How to obtain U-Specs?

- Please contact your Infineon Sales interfacing unit

RoHS Compliance

> General Information > MatQ

Infiniteon products DO NOT contain

Chromium-VI (Cr-VI) 

Cadmium (Cd) 

Mercury (Hg) 

polybrominated diphenylethers (PBDE) 

polybrominated biphenyls (PBB) 

in compliance with the [RoHS Directive \(2002/95/EC\)](#).

Lead (Pb) 

is currently being phased out in our [Green conversion strategy](#)
(www.infineon.com – product – packages)

Declarations

> General Information > MatQ

What declarations and statements are currently available?

Declaration of non-use of substances of concern

RoHS Declaration

Umbrella Spec or Material Content Data Sheet

Declaration of RoHS compliance throughout the supply chain

**For these, please contact your Infineon interfacing unit
www.infineon.com/matq**

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