

## 6-GHz Frequency Divider

### Description

U 6024/28 BS are high speed frequency dividers using TELEFUNKEN's advanced bipolar technology. The input frequency ranges from 3 to 6 GHz. Output buffer and

voltage regulator are integrated. The devices are suitable for satellite communications, instrumentation and telecommunications.

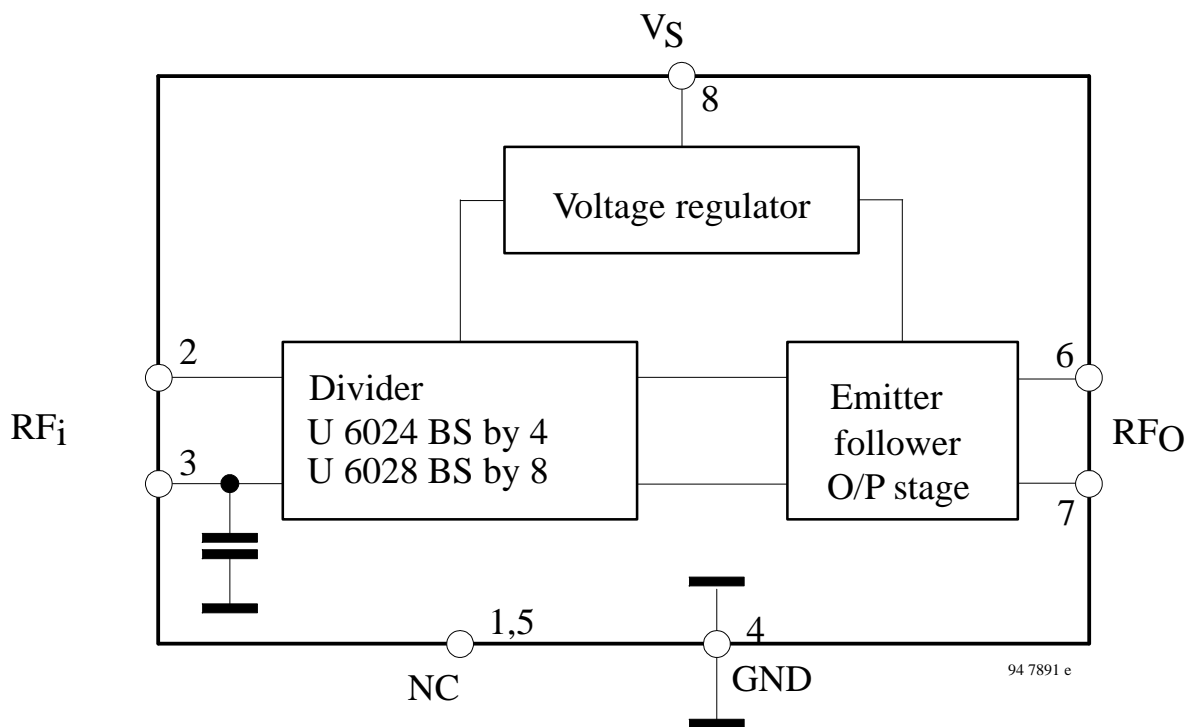
### Features

- U 6024 BS divides by 4
- U 6028 BS divides by 8
- Very low current consumption (45 mA typical)
- 6-GHz maximum operating frequency
- 5-V (typical) supply voltage
- ESD protected according to MIL-STD.883 method 3015 class 2
- SO-8 package

### Benefits

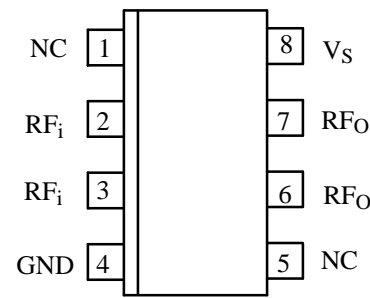
- Extended operation time due to low current consumption
- Only three external components
- Low RF input level reduces radiation problems

### Block Diagram



## Pin Description

Pin	Symbol	Function
1	NC	Not connected
2	RF <sub>i</sub>	RF input
3	RF <sub>i</sub>	RF input with internal decoupling capacitor
4	GND	Ground
5	NC	Not connected
6	RF <sub>o</sub>	RF Output
7	RF <sub>o</sub>	RF Output
8	V <sub>S</sub>	Supply voltage



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## Absolute Maximum Ratings

Parameters	Symbol	Value	Unit
Supply voltage	V <sub>S</sub>	6	V
Input voltage range	V <sub>i</sub>	0 to V <sub>S</sub>	V
Junction temperature	T <sub>j</sub>	125	°C
Storage temperature range	T <sub>stg</sub>	-40 to +125	°C

## Operating Range

Parameters	Symbol	Value	Unit
Supply voltage range	V <sub>S</sub>	4.5 to 5.5	V
Ambient temperature range	T <sub>amb</sub>	-25 to +80	°C

## Thermal Resistance

Parameters	Symbol	Value	Unit
Junction ambient, SO-8	R <sub>thja</sub>	175	K/W

## Electrical Characteristics

Test conditions (unless otherwise specified): V<sub>S</sub> = 4.5 to 5.5 V, T<sub>amb</sub> = 0 to 70°C., referred to test circuit

Parameters	Test Conditions / Pin	Symbol	Min	Typ	Max	Unit
Supply current	V <sub>S</sub> = 5 V Pin 8	I <sub>S</sub>		45		mA
<b>RF input</b>	Pin 2	RF <sub>i</sub>				
Input sensitivity	R <sub>S</sub> = 50 Ω	V <sub>RFi</sub>		Figure 2		
Large signal compatibility	R <sub>S</sub> = 50 Ω	V <sub>maxRFi</sub>		Figure 2		
Input frequency range		f <sub>imin</sub> f <sub>imax</sub>	6000		3000	MHz
<b>RF output</b>	Pins 6 and 7	RF <sub>o</sub>				
Output level		V <sub>RFo</sub>		200		mV <sub>pp</sub>
DC output level	V <sub>S</sub> = 5 V	RF <sub>DCH</sub>		3.6		V
High	R <sub>L</sub> ≥ 10 kΩ	RF <sub>DCL</sub>		3.1		V
Low						

Note: 1 RMS-voltage calculated from the measured available power  
R<sub>S</sub> = system resistance, R<sub>L</sub> = load resistance

## Output stage

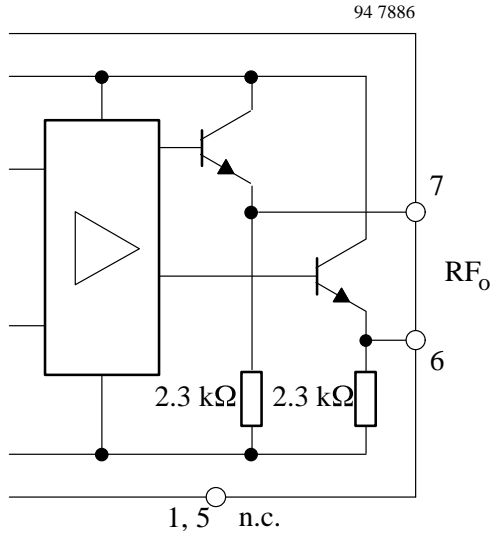


Figure 1

## Input sensitivity vs. frequency

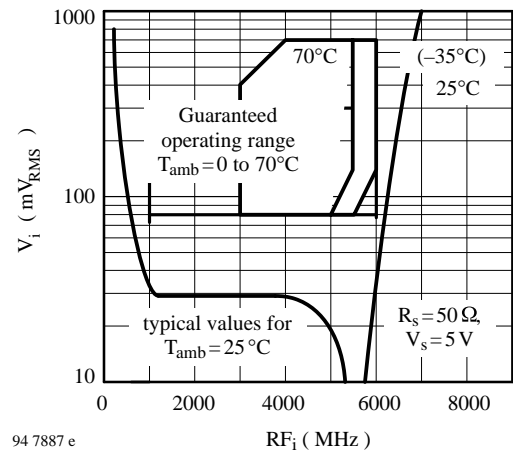


Figure 2

**Input impedance S11**

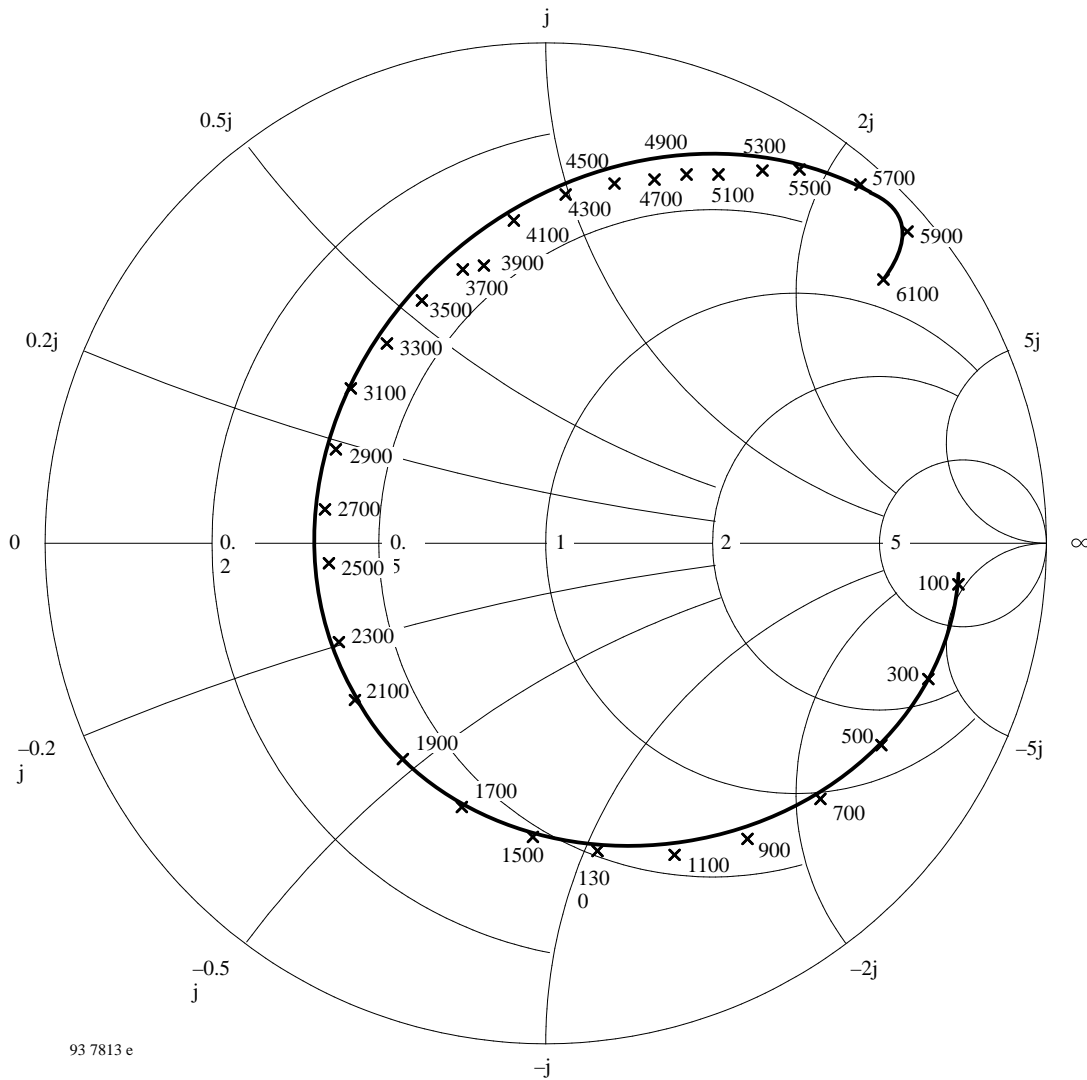


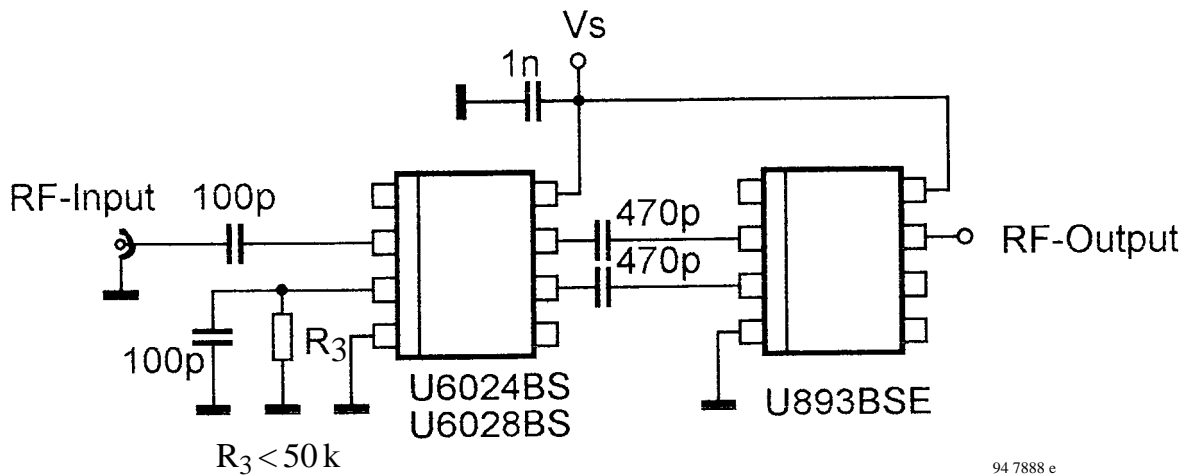
Figure 3

## Application

Master-Slave-D-Flip-Flops (MS-D-FF's) can be used for frequency division by feeding back the inverted output to the data input. Typical for this kind of dividers is a free running oscillation of the first divider stage. Here the input sensitivity of the circuit has a minimum (see input sensitivity vs. frequency). An oscillation frequency of e.g. 5.6 GHz (related to the input) will result in an output frequency of 5.6 GHz : 8 = 700 MHz. TEMIC's self oscillating frequency dividers are indicated with suffix "S" (U 6028 BS-AFP). This oscillation often is used for quality

control of IC's: the higher the frequency, the better the performance.

On the other hand, if this oscillation causes problems e.g. in frequency counters an external offset can be added. This can simply be done by connecting an ohmic resistor from pin 3 (RF INPUT) to ground. A value of  $R_3 = 47 \text{ k}\Omega$  will stop self oscillation without degrading the input sensitivity markedly. Smaller values will decrease the sensitivity especially at higher frequencies.

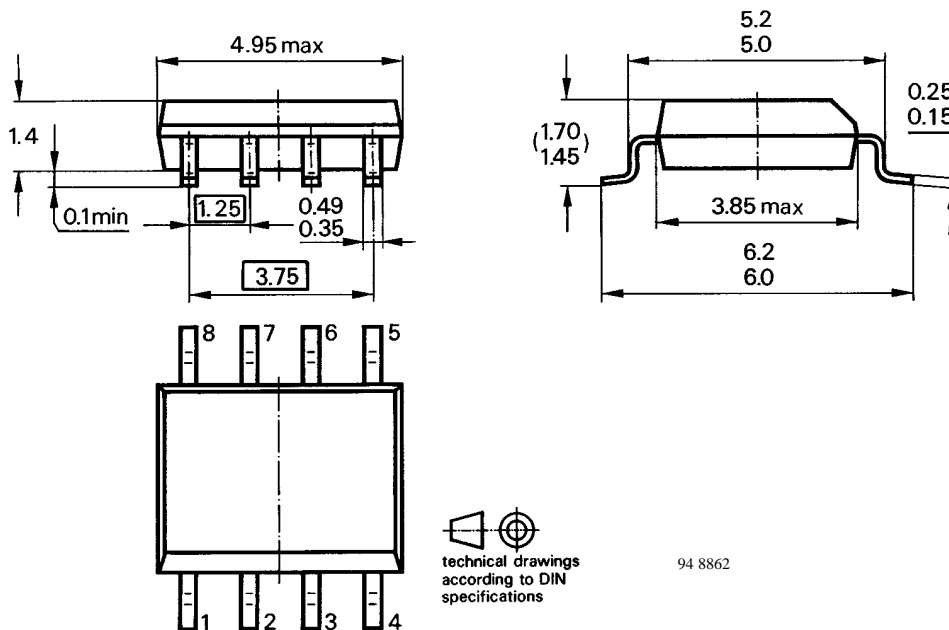


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Figure 4 Application Circuitry

## Dimensions in mm

Package: SO 8



technical drawings  
according to DIN  
specifications

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**OZONE DEPLETING SUBSTANCES POLICY STATEMENT**

It is the policy of **TEMIC TELEFUNKEN microelectronic GmbH** to

1. Meet all present and future national and international statutory requirements and
2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

Of particular concern is the control or elimination of releases into the atmosphere of those substances which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) will soon severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

**TEMIC TELEFUNKEN microelectronic GmbH** semiconductor division has been able to use its policy of continuous improvements to eliminate the use of any ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively
2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA and
3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

**TEMIC** can certify that our semiconductors are not manufactured with and do not contain ozone depleting substances.

**We reserve the right to make changes without further notice to improve technical design.**

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