FM Multipath Noise Cancellation

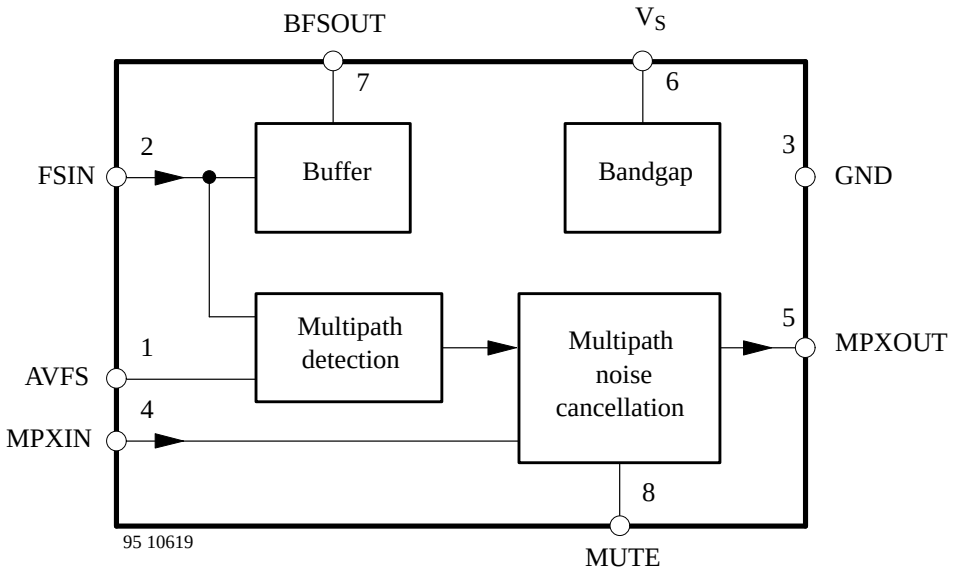
Description

The U4276B is a bipolar integrated multipath noise cancellation circuit. It is designed for high performance car radio applications.

Features

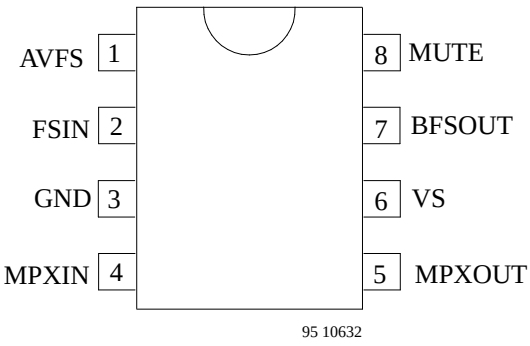
- Preparation of the fieldstrength signal
- Multipath noise cancellation
- Mute function controllable by microcomputer
- Suitable for analogue as well as digital processing
- Only a few external components necessary

Block Diagram

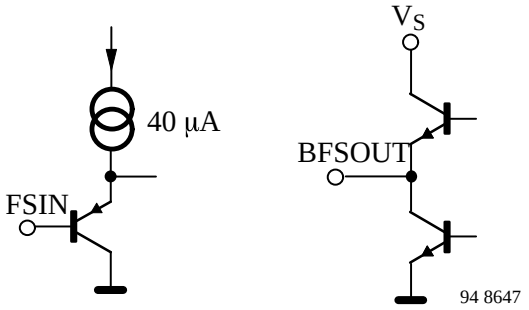


Pin Description

Pin	Symbol	Function
1	AVFS	Average of fieldstrength signal
2	FSIN	Fieldstrength input
3	GND	Ground
4	MPXIN	Multiplex input signal
5	MPXOUT	Multiplex output signal
6	VS	Supply voltage
7	BFSOUT	Buffered fieldstrength output
8	MUTE	External mute input

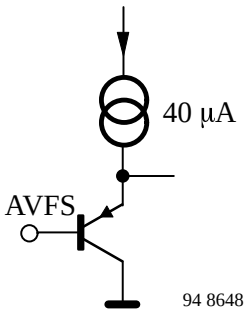


FSIN / BFSOUT



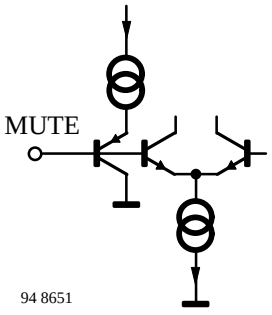
All information about reception conditions is derived from the fieldstrength signal. The fieldstrength signal at FSIN is initially buffered so as not to impair the characteristics of the IF IC and is available at BFSOUT.

AVFS



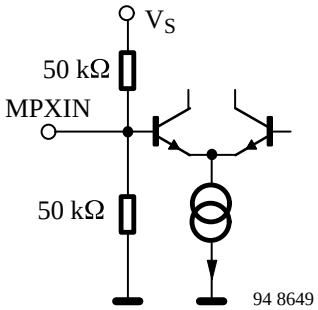
The fieldstrength signal at buffer output BFSOUT is averaged over time and applied to input AVFS via an RC low-pass filter with a large time constant.

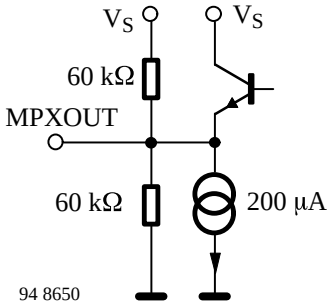
MUTE



The function unit MNC can be controlled externally via this pin. Blanking occurs when the voltage at the MUTE pin falls below 1 V.

MPXIN / MPXOUT





The MPX signal is fed directly from the FM demodulator to input MPXIN and is available amplified by a factor of 1.5 at MPXOUT. The MPX signal is blanked out in the event of multipath interference or when MUTE is activated externally in the circuit part MNC (Multipath Noise Canceller). In all other cases, the MPX signal passes through the IC unchanged.

Functional Description

Interference with FM reception can be triggered by various causes, such as multipath reception, adjacent and insufficient field strength. At the same time, multipath reception is responsible for the most frequently occurring types of interference.

Acoustically relevant multipath interference, since it requires a short reaction time, is suppressed directly by the circuit via a Multipath Noise Cancellation (MNC) function.

The U4276B can be used both in conventional receivers and in receivers with digital signal processing.

The following demands are placed on the field strength output of the IF amplifier:

1. A linear characteristic, i.e. the output voltage must be proportional to the logarithm of the IF voltage in the range of RF levels encountered in practice. Deviations from linearity lead to a different evaluation of interference signals of the same intensity of the signal levels are different.
2. The “signal level” output has to react to extremely fast dips in the field strength. Total field strength failures lasting 500 ns and occuring a voltage dip to approx. 0 V at the field strength output.

Restrictions

The field strength voltage becomes increasingly noisy in the range of low RF levels (< 30 dBµV). The noise prevents reliable detection of interference. Therefore, only the average field strength value can be evaluated over a relatively large time constant in this range.

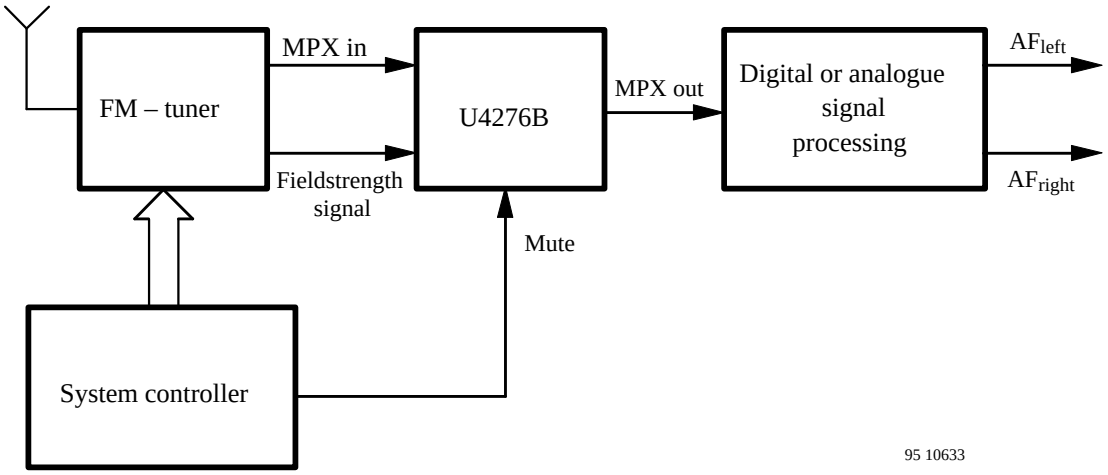


Figure 1. Block diagram

Multipath Noise Cancellation (MNC)

Extremely strong multipath interference remains audible in spite of the monoblend function. The remaining interference is reduced still further by the MNC circuit if the output MPXOUT is muted for a few microseconds while the interference is still occuring (figure 2).

In order to eliminate the possibility of malfunctions, activation of the MNC depends on the following condition:

– The average field strength must exceed a certain value so that the noise in the field strength signal does not cause the MNC to respond at low RF voltages

The MNC function can also be activated externally via the MUTE pin (low active). The circuit can therefore also be used as a fast high performance mute stage.

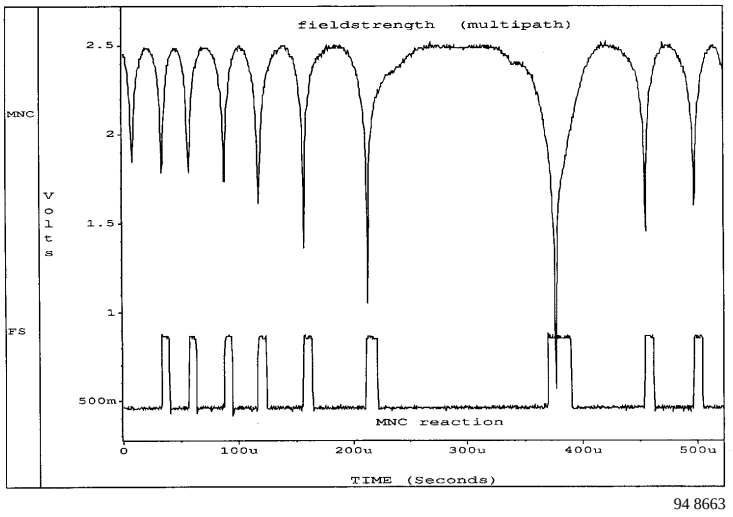


Figure 2.

In order to achieve best performance, the MNC-circuit has to be adapted well to the fieldstrength output of the IF-IC. This can be done by adjustment of the DC-level at Pin Mute (R2/R3, see figure 4) in the range of V/2 ± 1 V. The principle behaviour is shown in figure 3.

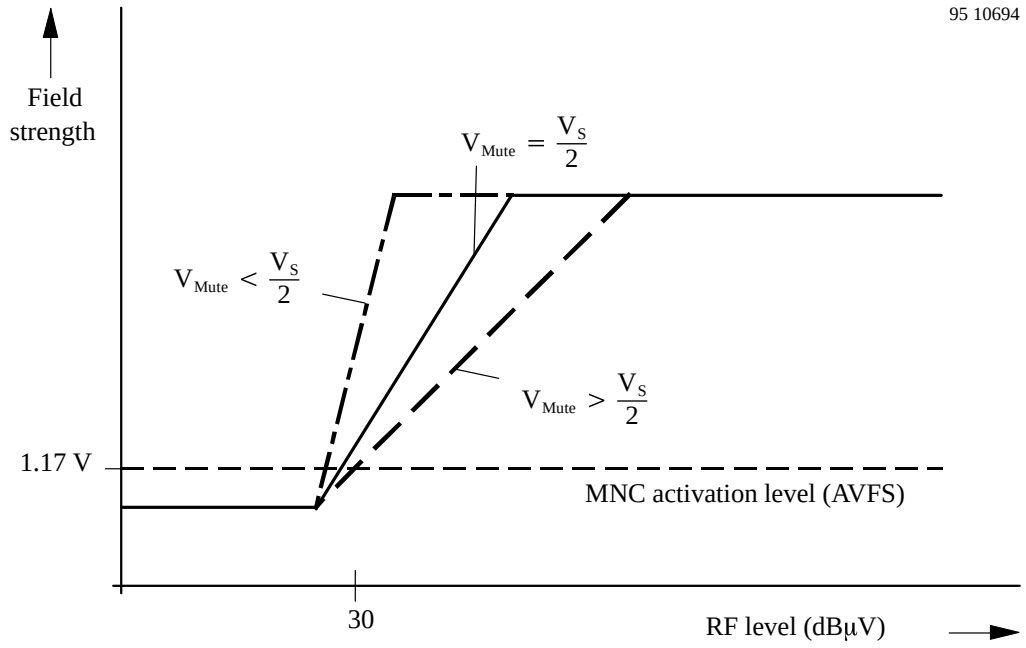


Figure 3.

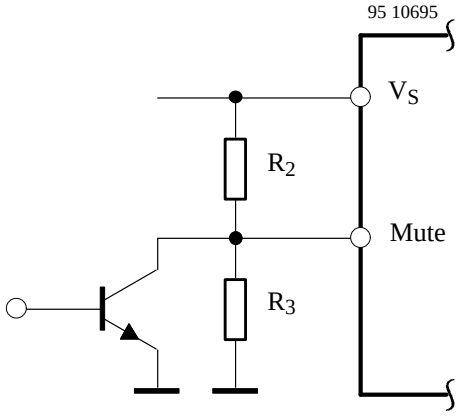


Figure 4.

Absolute Maximum Ratings

Reference point Pin 1b, unless otherwise specified

Parameters	Symbol	Value	Unit
Supply voltage Pin 6	V_S	10	V
Supply current Pin 6	I_S	t.b.d.	mA
Ambient temperature range	T_{amb}	– 30 to + 85	°C
Storage temperature range	T_{stg}	–55 to +150	°C
Junction temperature	T_j	125	°C
Electrostatic handling (MIL standard 883 C)	± V_{ESD}	2000	V

Thermal Resistance

Parameters	Symbol	Maximum	Unit
Junction ambient	R_{thJA}	t.b.d.	K/W

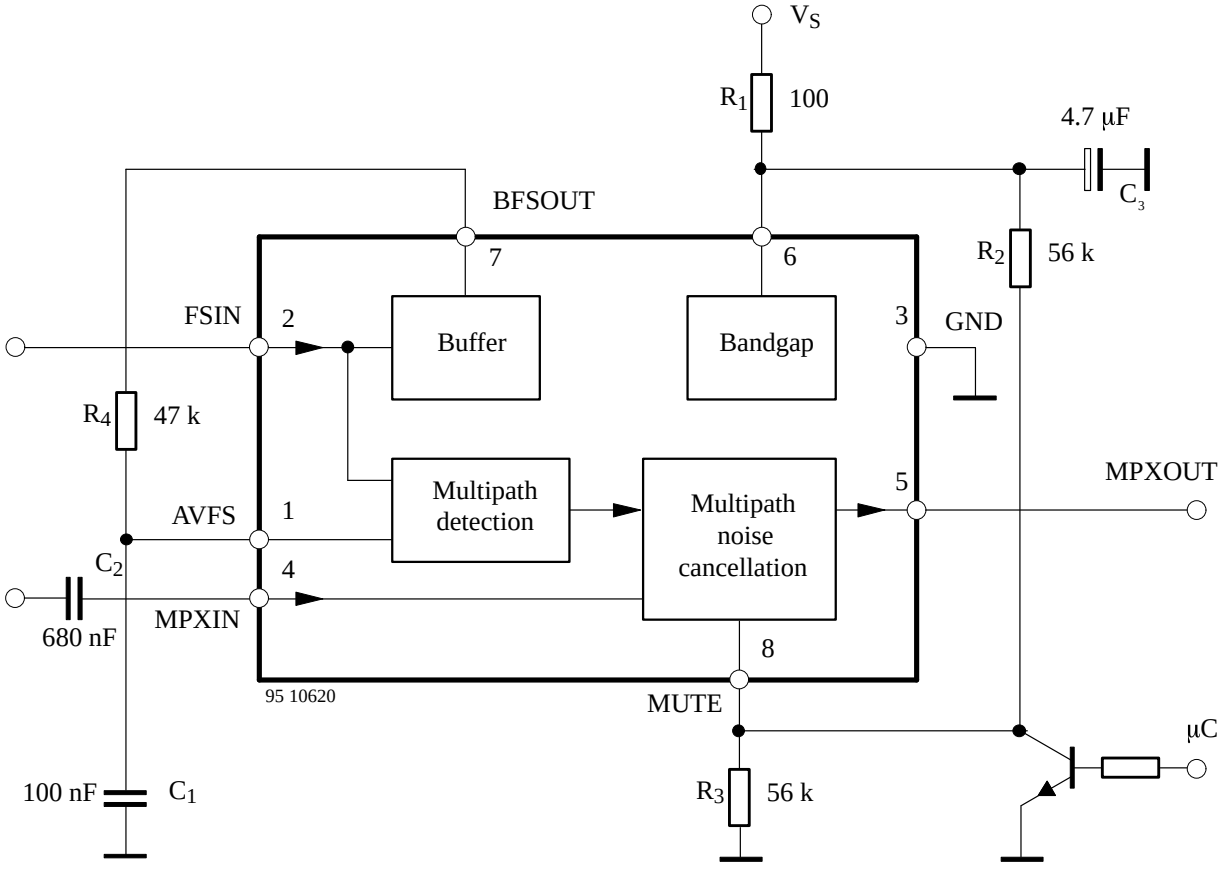
Electrical Characteristics

T_{amb} = 25°C, V_S = 8.5 V, unless otherwise specified

Parameters	Test conditions / Pins	Symbol	Min.	Typ.	Max.	Unit
Supply voltage	Pin 6	V_S	8	8.5	10	V
Supply current	Pin 6	I_S	2	3	5	mA
Fieldstrength						
Input voltage	Pin 2	V_i	0		5.0	V
Output voltage	R_{load} Pin 7 C_{load}	V_{out}	50		5000	mV
Bandwidth	Pin 7	BW	100			KHz
Input voltage	Pin 1	V	0		5	V

Parameters	Test conditions / Pins	Symbol	Min.	Typ.	Max.	Unit
Multipath Noise Cancellation						
MPX input voltage	Pin 4	V_{MPXIN}			350	V_{RMS}
MPX output voltage	R_L = 10 kΩ Pin 5	V_{MPXOUT}			525	V_{RMS}
THD	R_L = 10 kΩ Pin 5 V_{MPXIN} = 350 mV			0.06	0.2	%
Bandwidth	R_L = 10 kΩ Pin 5		300			kHz
Mute-depth	R_L = 10 kΩ Pin 5		75	82		dB
Gain	R_L = 10 kΩ Pin 5	G		3.5		dB
Mute						
Input voltage low high	Pin 8	V_{MUTE}	 0 3		 1 V_S	V

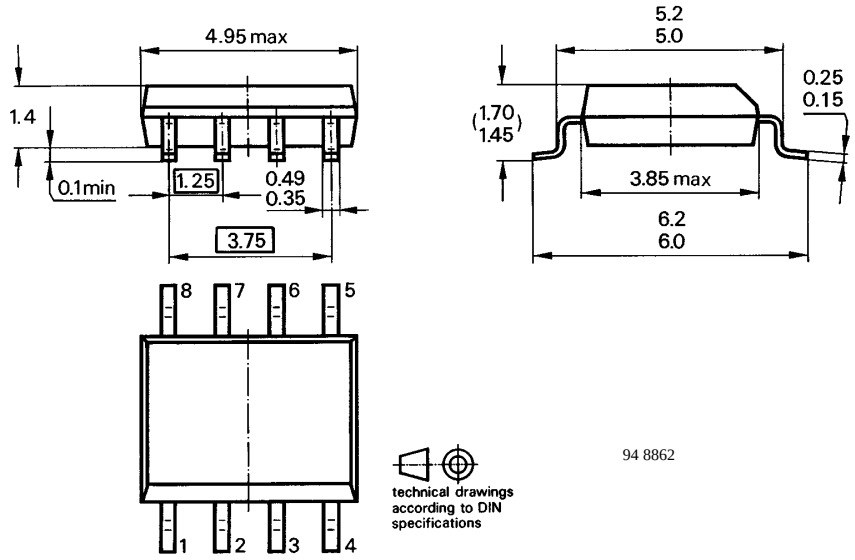
Application Circuit



Ordering Information

Extended type number	Package	Remarks
U4276B-AFP	SO8 plastic	
U4276B-AFPG3	SO8 plastic	Taping according to IEC-286-3

Dimensions in mm



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.

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.

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

The Montreal Protocol (1987) and its London Amendments (1990) intend to 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 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

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 ozone depleting substances and do not contain such substances.

We reserve the right to make changes to improve technical design and may do so without further notice.
Parameters can vary in different applications. All operating parameters must be validated for each customer application by the customer. Should the buyer use TEMIC products for any unintended or unauthorized application, the buyer shall indemnify TEMIC against all claims, costs, damages, and expenses, arising out of, directly or indirectly, any claim of personal damage, injury or death associated with such unintended or unauthorized use.

TEMIC TELEFUNKEN microelectronic GmbH, P.O.B. 3535, D-74025 Heilbronn, Germany
Telephone: 49 (0)7131 67 2831, Fax number: 49 (0)7131 67 2423