SIEMENS AG IC-SPECIFICATION

TDA 4321 XS

Table of Contents

FM-IF IC with counter output, analog STS, field strength indicator, noise detector and mute setting

This specification replaces the previous editions

DOK-Nr.	date	DOK-Nr.	date
V66047-S1665-B100-V1	24.7.98		

Functional Description, Application

The FM-IF-Demodulator TDA 4321 XS has been developed especially for car radio applications. The on-chip multipath identification circuit activates an interference suppression circuit in case of multipath interferences.

The TDA 4321 XS includes an:

- 7stage limiter amplifier
- Coincidence demodulator
- Counter output with request input
- Field strength output
- Analog Multipath identification circuit
- Adjustable muting depth (with full muting ≥80dB)
- STS function.

This device is ESD protected.

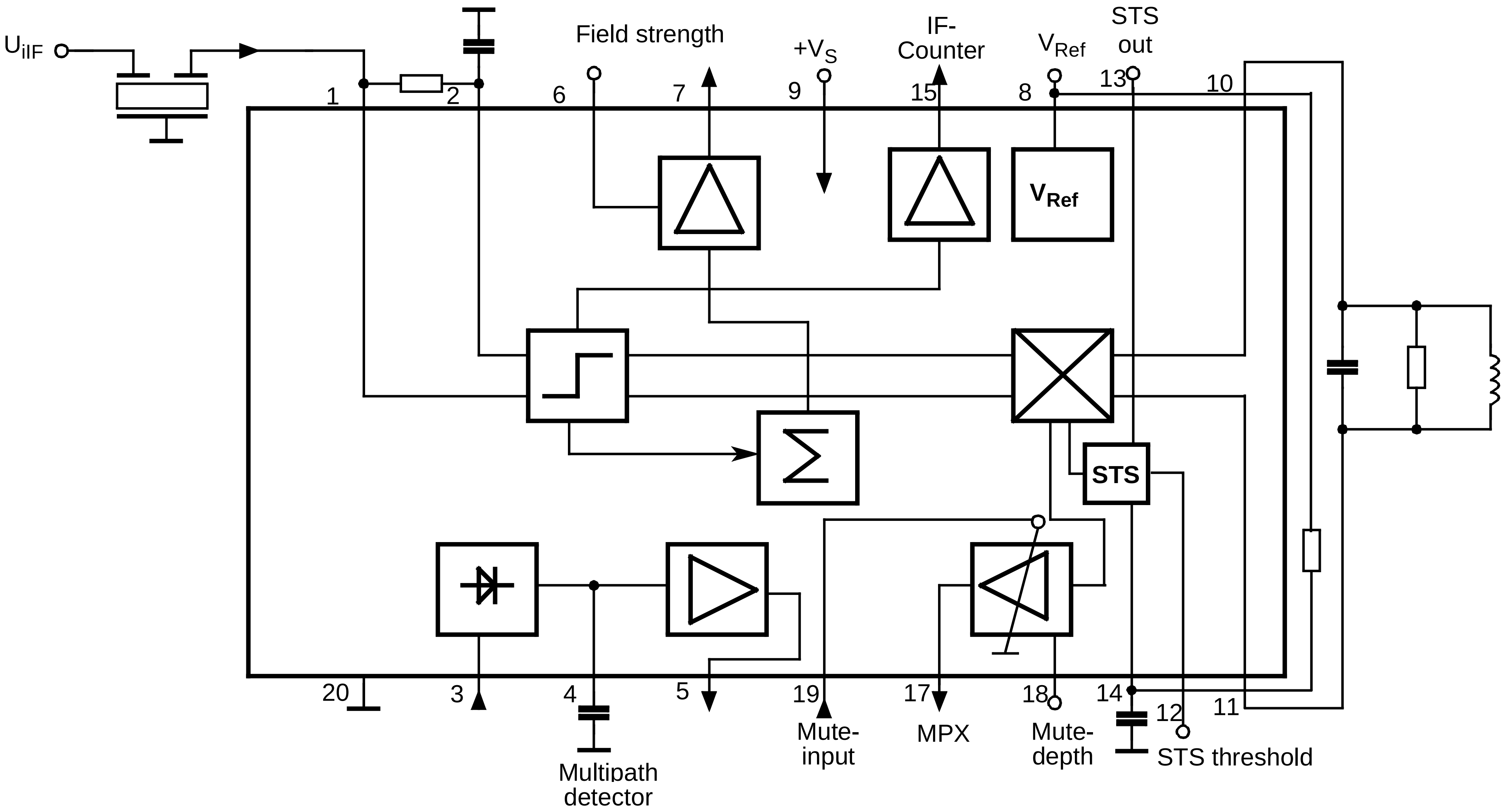
Circuit Description

The IC includes a 7 stage capacitive coupled-limiter amplifier with coincidence demodulator and AF output. The AF output signal can be continuously attenuated to decrease the noise.

In case of multipath interferences, the TDA 4321 XS includes an identification circuitry with analog output.

There is a field strength output (with min. 76 dB dynamic range, typ. ±1 dB nonlinearity and typ. ±3 dB temperature drift), an IF-Counter output and an adjustable muting (with full muting ≥80dB). An STS output with adjustable threshold and stop window is available.

Block Diagram



Pin Assignment

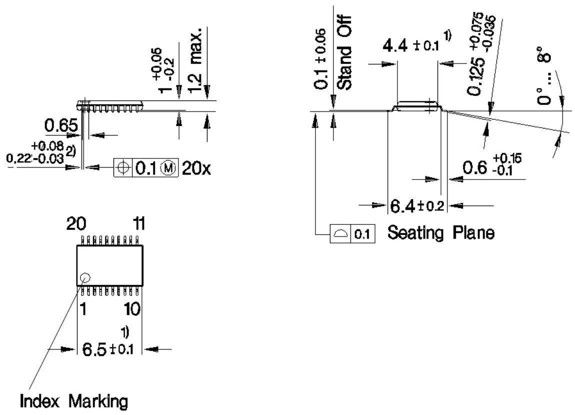
1	IF input
2	IF input bias
3	Multipath identification input
4	Rectifier time constant
5	Multipath identification output
6	Field strength adjust
7	Field strength output
8	Reference voltage output
9	Supply voltage
10	Demodulator circuit
11	Demodulator circuit
12	STS threshold
13	STS output
14	STS filter time constant and stop window width
15	IF-Counter output
16	NC
17	MPX output
18	Mute depth
19	Mute input
20	Ground

SIEMENS AG IC-SPECIFICATION

TDA 4321 XS

Package Outline

Plastic-Package
TSSO-P 20-1



1) Does not include plastic or metal protrusion of 0.15 max. per side
2) Does not include dambar protrusion of 0.08 max. per side

Absolute Maximum Ratings

The maximal ratings may not be exceeded under any circumstances, not even momentarily and individually, as permanent damage to the IC will result.

#	Max. Ratings for ambient temperature T_{amb} -40 °C to +85 °C	Symbol	Min	Max	Units	Remarks
1	Supply voltage	V_S	0	+13.5	V	
2	Junction temperature	T_j		+150	°C	
3	Storage temperature	T_s		+125	°C	
4	ESD voltage, HBM (1.5 kΩ ,100pF)	V_{ESD}	-4	+4	kV	
5	Thermal Resistance	Rthsa		115	K/W	

Operational Range

Within the operational range the IC operates as described in the circuit description. The AC / DC characteristic limits are not guaranteed.

#	Parameter	Symbol	Min	Max	Units	Remarks
1	Supply voltage	V_S	+7.5	+11	V	
2	Ambient temperature	T_{amb}	-40	+85	°C	

SIEMENS AG IC-SPECIFICATION

TDA 4321 XS

AC / DC Characteristics

AC / DC characteristics involve the spread of values guaranteed within the specified supply voltage and ambient temperature range. Typical characteristics are the median of the production.

Measuring condition:

V_S= 10 V; f_{iIF}=10.7 MHz; Δf= 75 kHz; f_{mod}= 1 kHz;V_{iIF} =10 mV_{rms}; T_{amb}= +25°C

#	Parameter	Symbol	Test Conditions	Test Circuit	Min	Typ	Max	Units
1	Current consumption	I_9	V_{19}=4.8V;V_{18}=4V	1		33	41	mA
2	Stabilized voltage	V_8	V_{19}=4.8V;V_{18}=4V	1	4.5	4.8	5.1	V
3	Field strength output	V_7	V_{19}=4.8V;V_{18}=4V					
	-dynamic range			D1	74	80		dB
	-nonlinearity			D2		±1		dB
	-temperature drift			D3			±3	dB
	-Load capacitance						50	pF
	-Load resistance				1			kΩ
		V_7	V_{1rms}=200mV	1	5	5.4	5.8	V
		V_7	V_{1rms}=1mV	1	2.3	2.7	3.1	V
		V_7	V_{1rms}=0mV	1	0		1.1	V
4	Input voltage for limiter threshold	V_1	V_{17}=- 3dB	1		20	30	μV_{rms}
5	AF-output voltage	V_{17}	V_{19}=4.8V;V_{18}=4V	1	460	550	640	mV_{rms}
6	AF-output voltage	V_{17}	V_{19}=4.8V;V_{18}=4V R_{10-11}=2k;Δf= 22,5 kHz	Lab		80		mV_{rms}
7	Total harmonic distoriton	THD_{17}	V_{19}=4.8V;V_{18}=4V	1			0.8	%
8	AM-suppression	a_{AM}	m=80 %	1	60			dB
			m=30 %	1	70			dB
9	Signal-to-noise ratio	$a_{S/N}$	V_{19}=4.8V;V_{18}=4V	1	76	84		dB
10	Counter-output voltage	V_{15}	C_L=5pF;R_{i15}=1.5k	1	50	80		mV_{rms}

SIEMENS AG IC-SPECIFICATION

TDA 4321 XS

AC / DC Characteristics

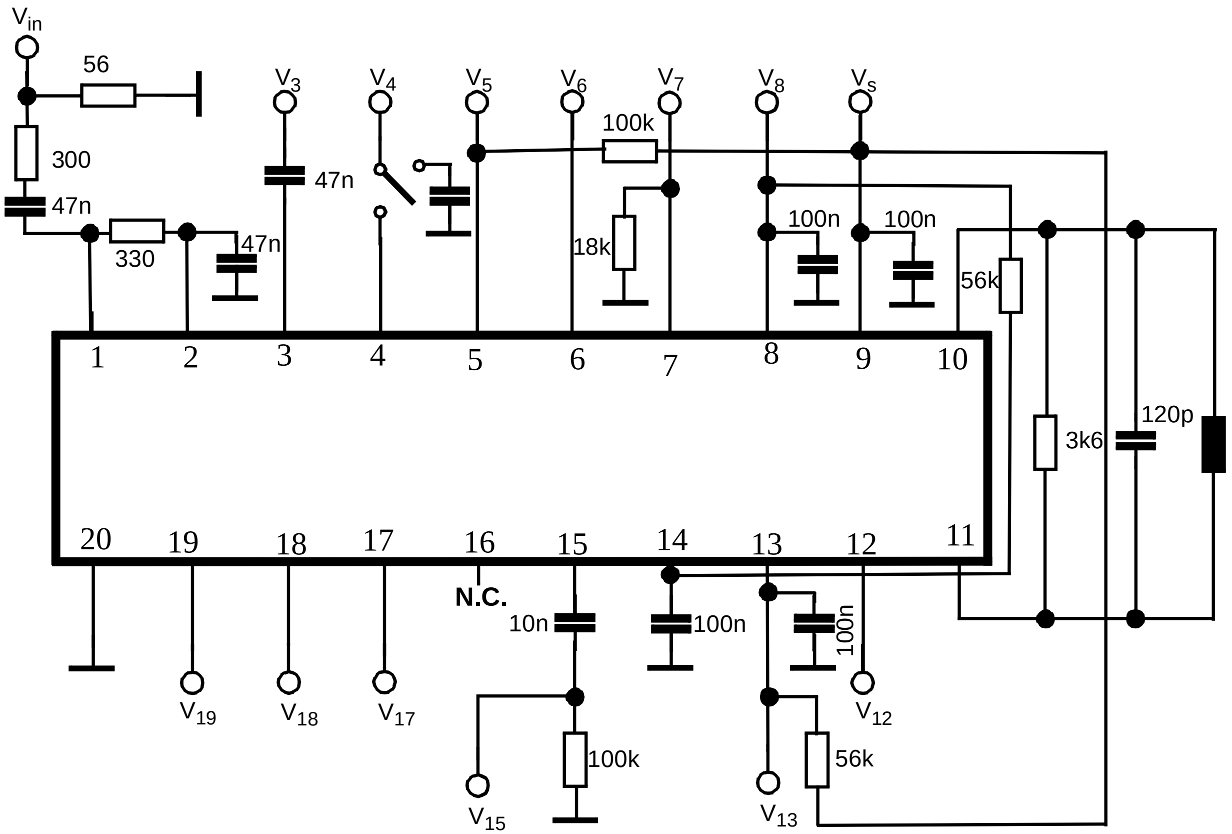
AC / DC characteristics involve the spread of values guaranteed within the specified supply voltage and ambient temperature range. Typical characteristics are the median of the production.

Measuring condition:
V_S= 10 V; f_{iIF}=10.7 MHz; Δf= 75 kHz; f_{mod}= 1 kHz; V_{iIF} =10 mV_{rms}; T_{amb}= +25°C

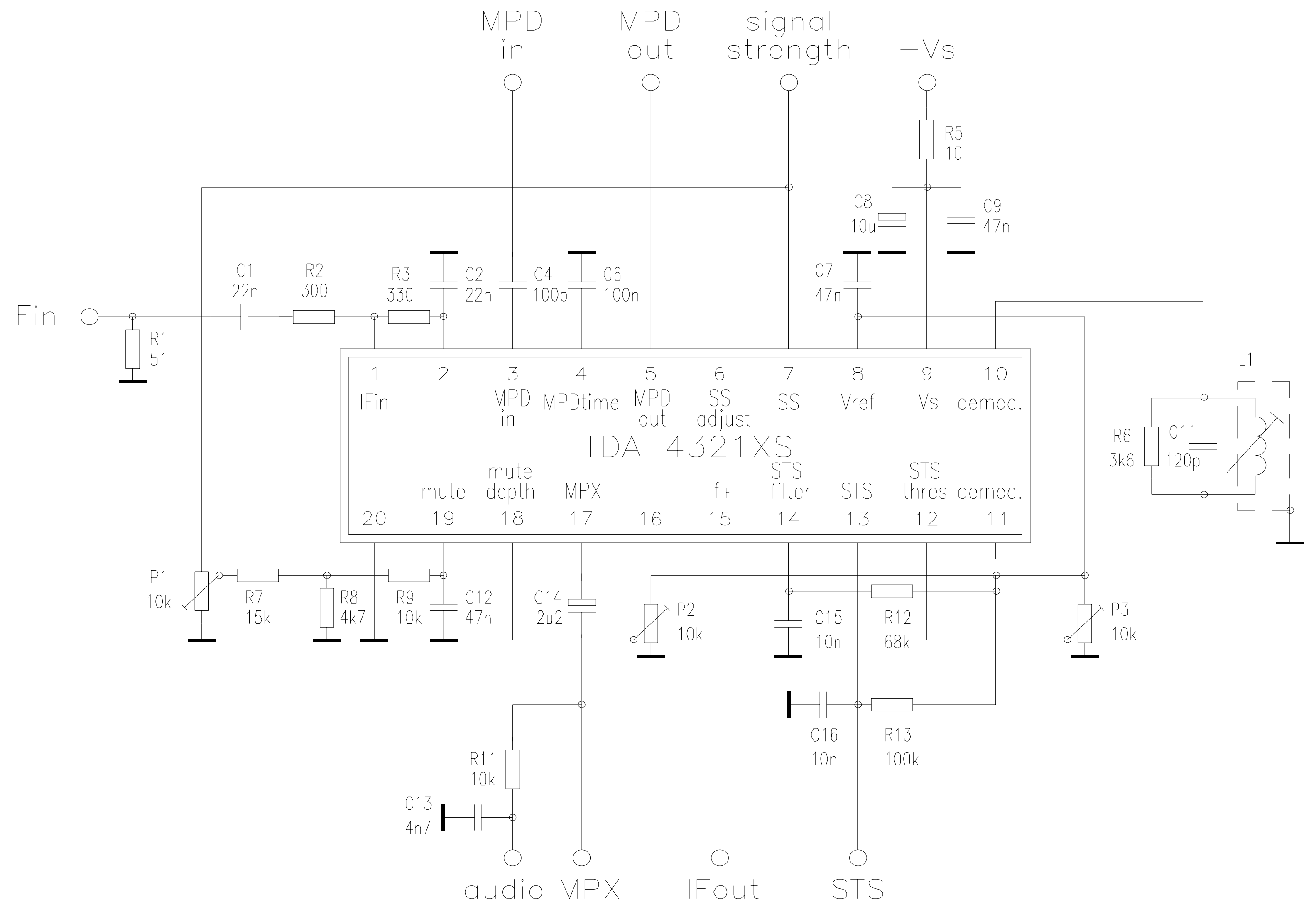
#	Parameter	Symbol	Test Conditions	Test Circuit	Min	Typ	Max	Units
14	Attack current	I_4*)	V_{3AC}=1V_{pp}; V_m=5.0V	1	700	900	1100	µA
15	Recovery current	I_4*)	V_{3AC}=0V; V_m=3.6V	1	-6	-9	-12	µA
16	Start voltage	V_{5Def}	V_{3AC}=0V	1	4.4	4.7		V
17	Detector characteristic	V_5	V_3 =100mV_{pp}	1	$V_{5Def-3.5V}$	$V_{5Def-3V}$	$V_{5Def-2.5V}$	V
18	Detector characteristic	V_5	V_3 =350mV_{pp}	1			500	mV
19	AF mute	a_{AF}	V_{19}=4.8V ;V_{18}=4.8V	D4		0		dB
			V_{19}=0V ;V_{18}=4.8V	D4	-2		2	dB
			V_{19}=0V ;V_{18}=2.4V	D4	32	38	44	dB
			V_{19}=4.8V ;V_{18}≤1.0V	D4	80			dB
			V_{19}=0V ;V_{18}≤ 1.0V	D4	80			dB
20	Voltage for mute off	V_{19}		1	0.5			V
21	Voltage for mute on	V_{19}		1	0		0.1	V
22	Search tuning stop window	f_{STS13}	R_{8-14} = 56kΩ	1			±25	kHz
23	Search tuning stop offset	f_{SToffs}	R_{8-14} = 56kΩ; THD = min	1			±10	kHz
24	Search tuning stop threshold FM	V_{iST1}	V_{12}=open	1	50	100	200	µV_{rms}
		V_{iST1}	V_{12}=2.4V	1	0.65	1.3	2.6	mV_{rms}

*) Integrator currents are measured between the output pin (- Pole of the measurement equipment) and a voltage source V_m (+ Pole)

Test Circuit

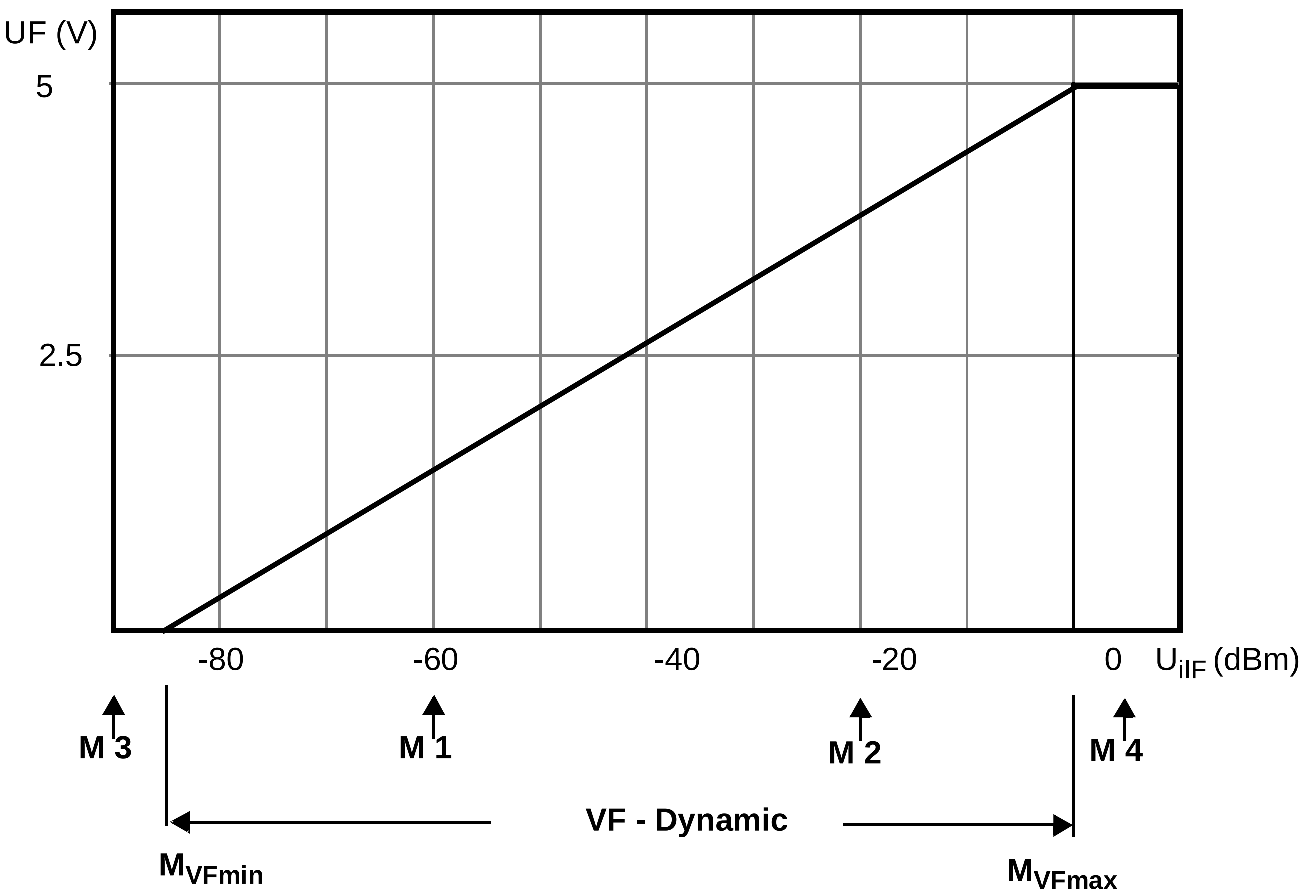


Application Circuit



Diagrams

V_F Characteristic **D1**



V_F - Dynamic :The dynamic range of VF voltage is determined by the test points M1 through M4 as follows:

M1: test point (at V_{iIF}= -60 dBm) supplies V_F (M1)
M2: test point (at V_{iIF}= -20 dBm) supplies V_F (M2)
M3: test point (at V_{iIF}= -90 dBm) supplies V_F (M3)
M4: test point (at V_{iIF}= +5 dBm) supplies V_F (M4)

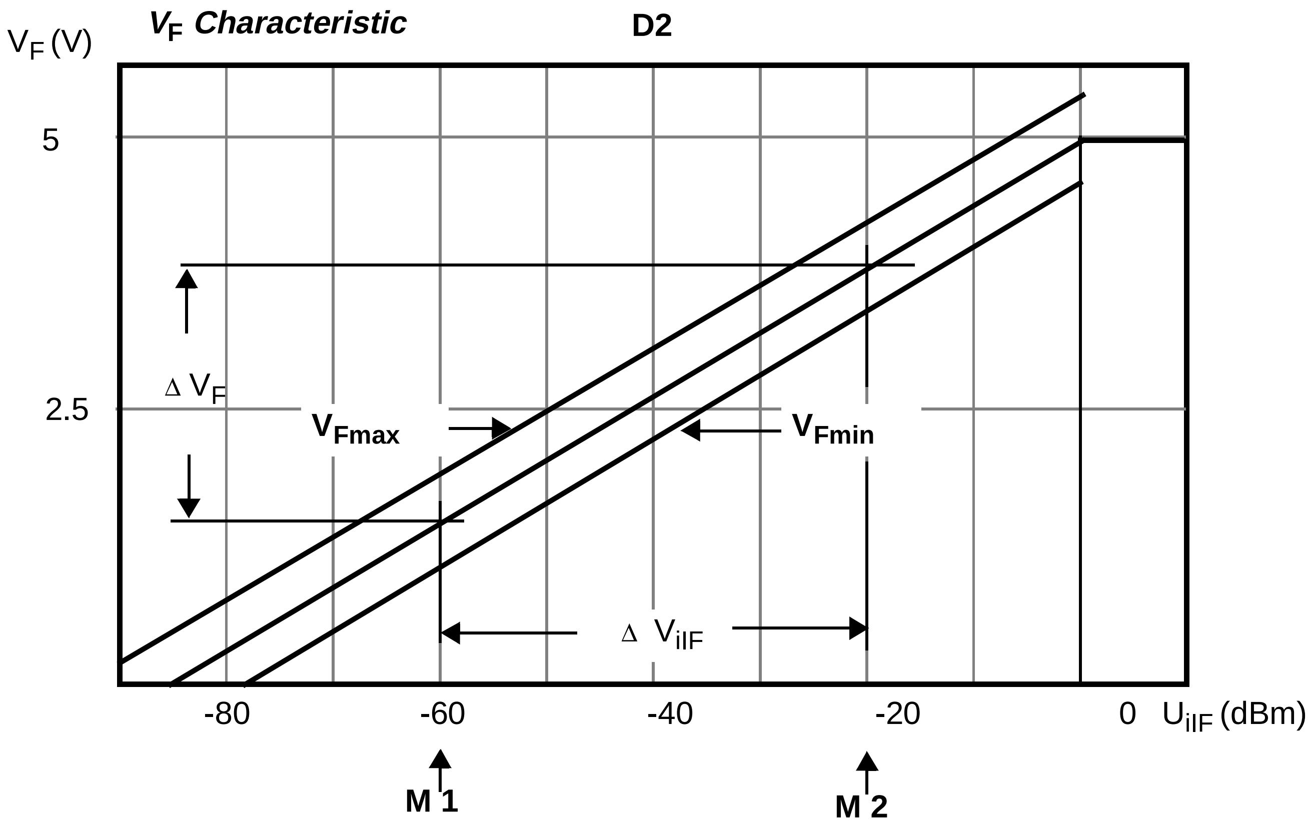
Hence follows :

$$M_{VFmax} := -20\ \text{dBm} + \frac{U_F(M4) - U_F(M2)}{U_F(M2) - U_F(M1)} \times 40\ \text{dB}$$

$$M_{VFmin} := -60\ \text{dBm} - \frac{U_F(M1) - U_F(M3)}{U_F(M2) - U_F(M1)} \times 40\ \text{dB}$$

VF - Dynamic = M_{VFmax} - M_{VFmin}

Diagrams



Test points to determine VF linearity

VF - Linearity:is determined at 25 °C

$$\text{Slope} \quad : m = \frac{V_F(M2) - V_F(M1)}{40\ \text{dB}}$$

The tolerance range of the VF - linearity is determined by two parallel lines:

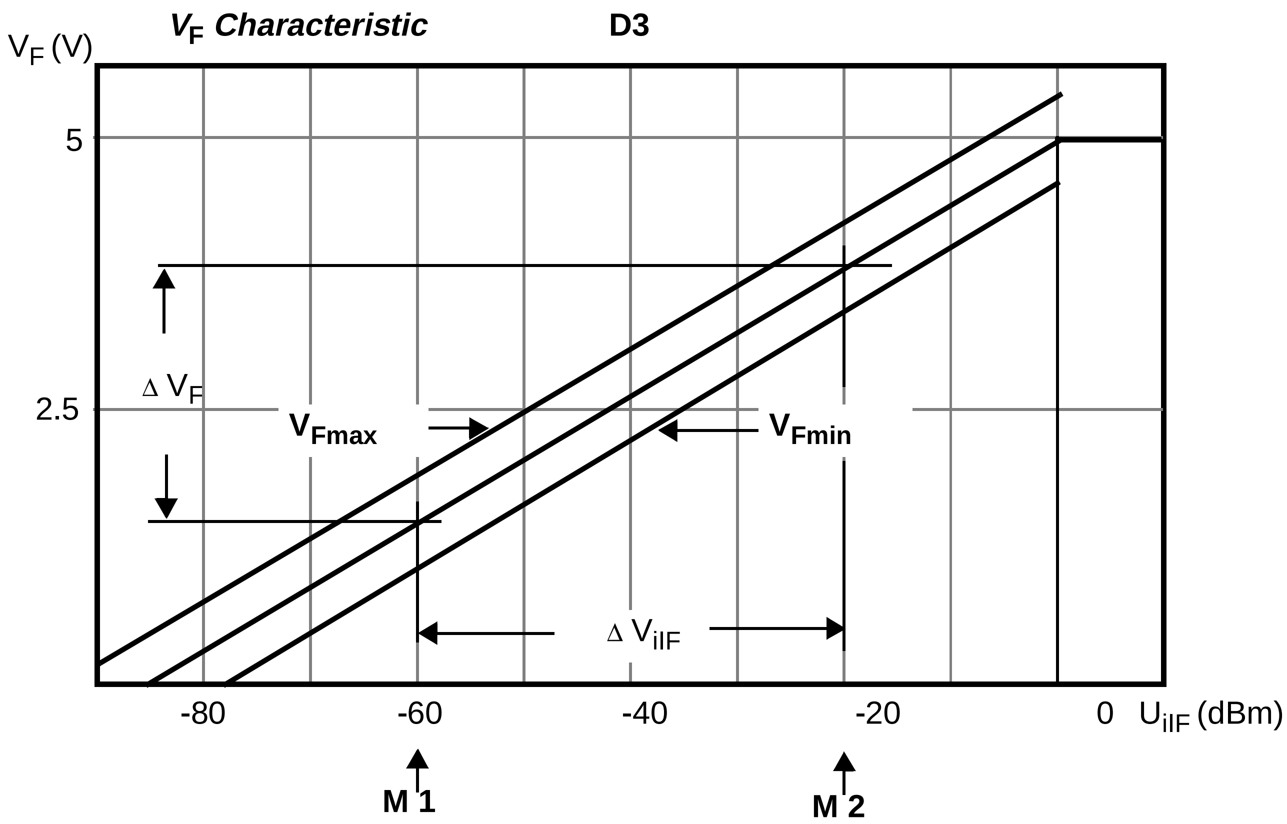
$V_{Fmax} = V_F\,(M1) + m\,(M + 60\ \text{dB} + 1\text{dB})$

$V_{Fmin} = V_F\,(M1) + m\,(M + 60\ \text{dB} - 1\text{dB})$

The V_F values within the V_F dynamic range ($M_{VFmin} \leq M \leq M_{VFmax}$) must be inside the predetermined tolerance range:

$$V_{Fmin} \leq V_F\,(M) \leq V_{Fmax}$$

Diagrams



Test points to determine V_F temperature drift

V_F -Temperatur - Drift : It is determined within -40 bis +85 °C

$$\text{Slope} \quad : m = \frac{U_{F\,(M2)} - U_{F\,(M1)}}{40\ \text{dB}} \quad (\text{at } 25\ °\text{C})$$

The tolerance range of the V_F temperature drift is determined by two parallel lines:

$V_{Fmax} = V_F$ (M1) + m (M + 60 dB+ 3dB)

$V_{Fmin} = V_F$ (M1) + m (M + 60 dB - 3dB)

The V_F values for temperatures between -40 to +85 °C within the V_F dynamic range ($M_{VFmin} \leq VF \leq M_{VFmax}$) must be inside the predetermined tolerance field:

$$V_{Fmin} \leq VF\ (M) \leq V_{Fmax}$$

Diagrams

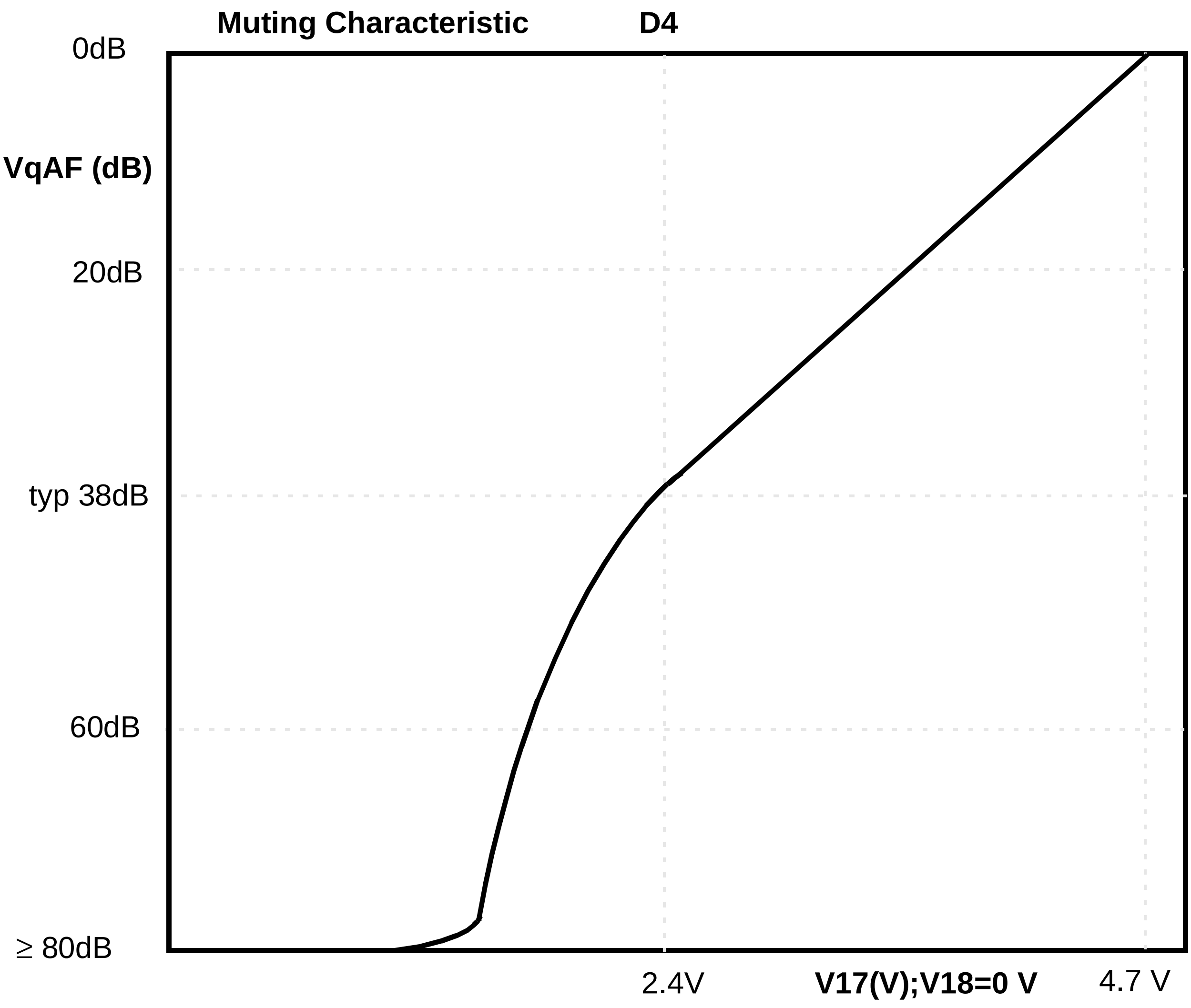


Diagram of Mute Characteristic