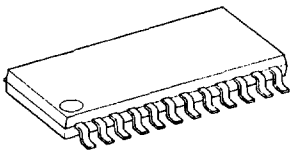
FM IF DETECTION IC FOR CORDLESS TELEPHONE·MOBILE TELEPHONE

FEATURES

- Built-in 2nd MIX

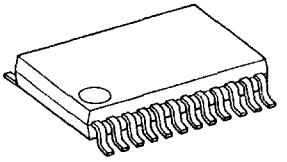
  MIX Operating Frequency : 10~100MHz
- 2 IF amp. circuits can limit a Band width according to a usage
- IF amp. has high performance carrier detection (RSSI)
  : it is available to diversity application
- Built-in 4 circuits (INVERTER AMP, NOISE AMP, noise rectifier and comparator) for noise detection
- Low consumption current (Typ. : 3.4mA)
- Operating supply voltage range : 2.7~6.0V

TA31132F



SSOP24-P-300

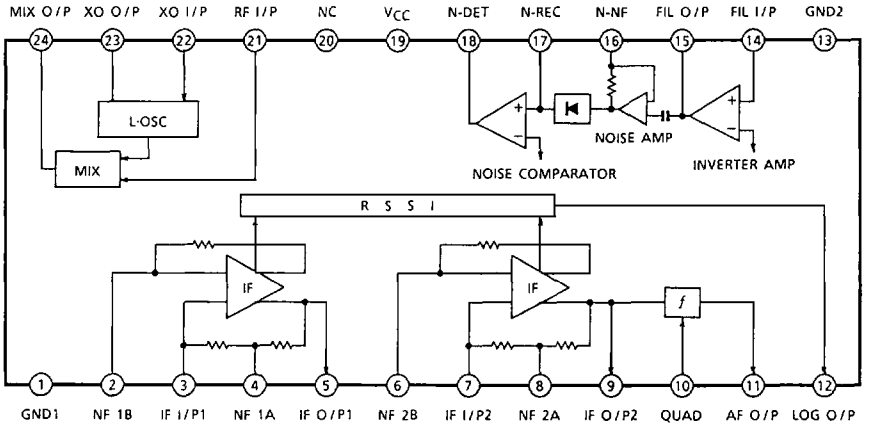
TA31132FN



SSOP24-P-300A

Weight SSOP24-P-300 : 1.2g (Typ.)
SSOP24-P-300A : 0.14g (Typ.)

BLOCK DIAGRAM



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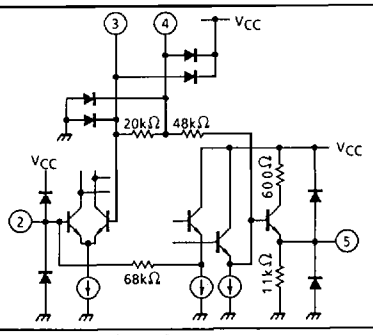
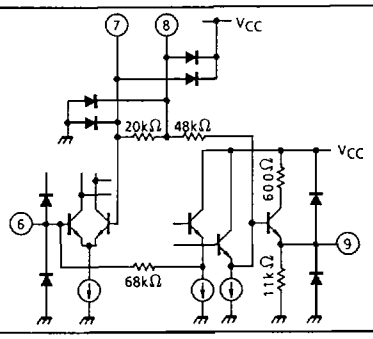
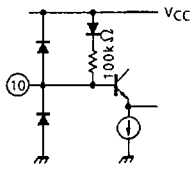
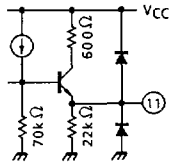
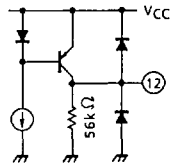
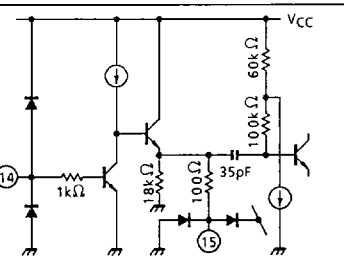
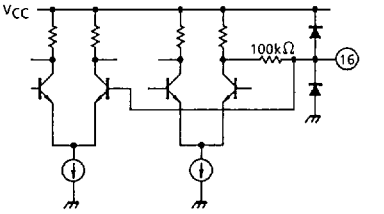
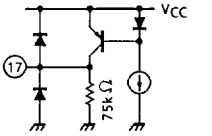
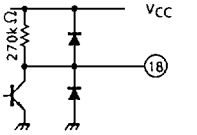
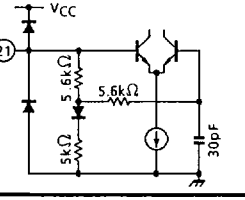
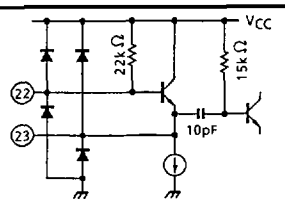
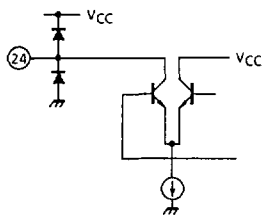
TA31132F/FN-1

PIN FUNCTION (The values of resistor and capacitor are typical.)

PIN No.	PIN NAME	FUNCTION	INTERNAL EQUIVALENT CIRCUIT
1	GND1	GND for IF1, MIX etc.	—
2	NF 1B	Negative feedback (NF) pin to IF1 amp. Connect GND through a capacitor.	
3	IF I/P1	Input pin for IF1 amp. Connect a capacitor for coupling.	
4	NF 1A	Connect a coupling capacitor for feedback loop of IF1 amp.	
5	IF O/P1	Output for IF1 amp. In case of connecting a ceramic filter, connect a resistance for matching.	
6	NF 2B	Negative feedback (NF) pin to IF2 amp. Connect GND through a capacitor.	
7	IF I/P2	Input pin for IF2 amp. Connect a capacitor for coupling.	
8	NF 2A	Connect a coupling capacitor for feedback loop of IF2 amp.	
9	IF O/P2	Output pin for IF2 amp. Connect to a detection coil through a capacitor.	
10	QUAD	Input pin for FM demodulator. Connect to a detection coil through a capacitor.	
11	AF O/P	Output pin for FM demodulator. Output impedance is around 1kΩ. Connect a De Emp, BPF circuit for excepting IF frequency element on this pin.	
12	LOG O/P	RSSI output pin. Output impedance is around 56kΩ. Connect the capacitor 1000pF for smoothing.	

PIN No.	PIN NAME	FUNCTION	INTERNAL EQUIVALENT CIRCUIT
13	GND2	GND for IF2 amp., noise detector etc.	—
14	FIL I/P	Input pin for BPF Adjustable frequency with a capacitor and resistance. Application circuit has around 26kHz.	
15	FIL O/P	Output pin for BPF	
16	N-NF	NF pin for NOISE AMP	
17	N-REC	Rectifier output pin. Connect a capacitor for smoothing.	
18	N-DET	NOISE COMPARATOR output pin.	
19	V_{CC}	Power supply terminal.	—
20	NC	NC terminal.	—
21	RF I/P	Input pin for MIX. Input impedance is around 7kΩ. Double-balance mix. method is used.	

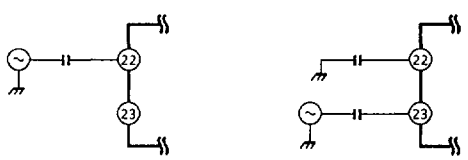
PIN No.	PIN NAME	FUNCTION	INTERNAL EQUIVALENT CIRCUIT
22	XO I/P	L·OSC input pin. Available to connect X'tal oscillator.	
23	XO O/P	L·OSC output pin. In case of injecting L·OSC, inject from pin 22 or 23 through a capacitor.	
24	MIX O/P	MIX output pin. For open collector output circuit, connect to V_{CC} through load.	

1. MIX

   This IC uses the MIX of double-balanced type.
   Connect a proper external circuit to match the Input impedance around 7kΩ.
   The application circuit has a matched LC resonance circuit, and the gain of around 10dB.
   Connect matching resistance for ceramic filter between output pin (pin 24) and V_{CC} because of open collector output (pin 24).

2. L·OSC

   Osc. level of X'tal osc. circuit is 110dBμV (316mV_{rms}, typ.).
   In case of directly inputting.
   Local osc signal, connect as follows.

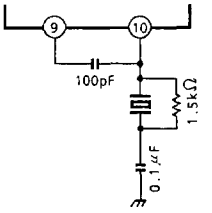


3. IF limiter and ceramic filter

   This IC has double constitution of IF limiter amp.
   It is available to be larger separation between 2 channels by changing band width of sub-filter.
   Connect a filter to serve an application.

4. Detector

This IC uses a quadrature FM detection circuit.
Input to pin 10 the signal to shift the phase of IF amp. Output in 90 degree with RCL resonance circuit. Tune with tank circuit.
(Recommended tank circuit : 4164-102 (SUMIDA ELECTRONICS CO., LTD.))
In case of connecting the discriminator, connect as follows.



Ceramic discriminator
CDBM450C21

5. Demodulator output

The demodulated signal is output from pin 11.
Connect de-emphasis circuit and BPF for excepting carrier element in the demodulator output (pin 11). On the TA31132F test circuit, connect the de-emphasis (0dB (at 1kHz), −6dB / OCT.) and BPF (300Hz~3kHz).

6. RSSI circuit

Available to detect the input signal level with DC voltage on RSSI circuit.
IF input level keeps the linear characteristic period between 20dBμV and 100dBμV.
The temperature regulation is very small.
The RSSI output is DC voltage on pin 12.
To change the output voltage is to connect a resistance between pin 12 and GND (in parallel with internal resistance 56kΩ). But this IC has no temperature regulation internally, so note temperature regulation of external resistance. (In case of changing RSSI output voltage, connect the resistance to have small temperature regulation.)

7. Noise detection circuit

Noise detection circuit has INVERTER AMP for filter, NOISE AMP and Noise rectifier circuit and comparator.
The BPF is constituted by INVERTER AMP In case of changing input frequency, change the value for resistance and capacitor of pin 14, 15. (on the test circuit, $f_O = 26kHz$)
The gain of Noise AMP is around 67dB. Connect the smoothing capacitor (0.1μF) for rectified output on pin 17.
The reference of NOISE COMPARATOR is 0.85V (typ.)
When Noise level is large, the comparator output (pin 18) change from H to L level.
When BPF does not get the frequency to be needed, NOISE COMPARATOR output may be unstable. Give attention to connection in Noise detection circuit.

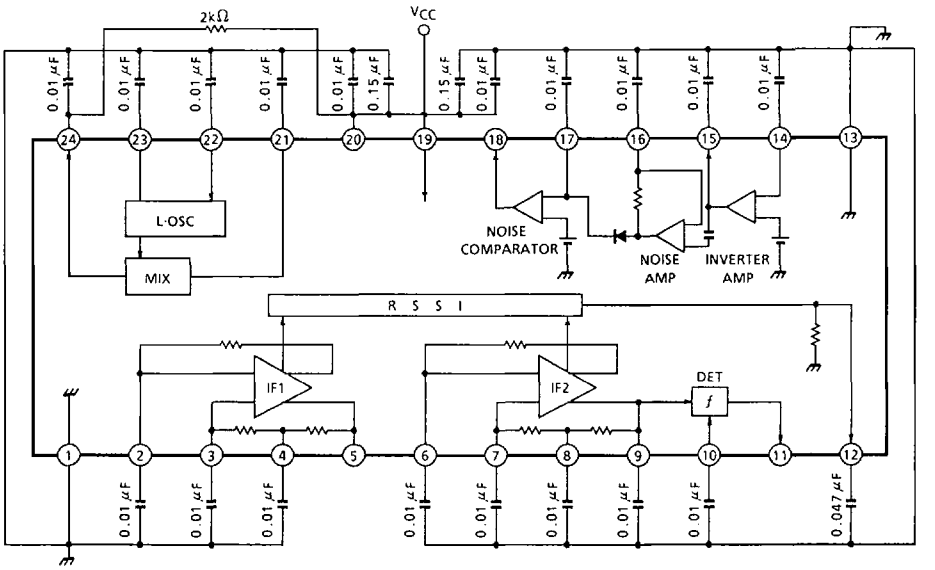
MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Supply Voltage		V_{CC}	6.5	V
Power Dissipation	31132FN	P_D	350	mW
	31132F		450	
Operating Temperature		T_{opr}	−30~85	°C
Storage Temperature		T_{stg}	−50~150	°C

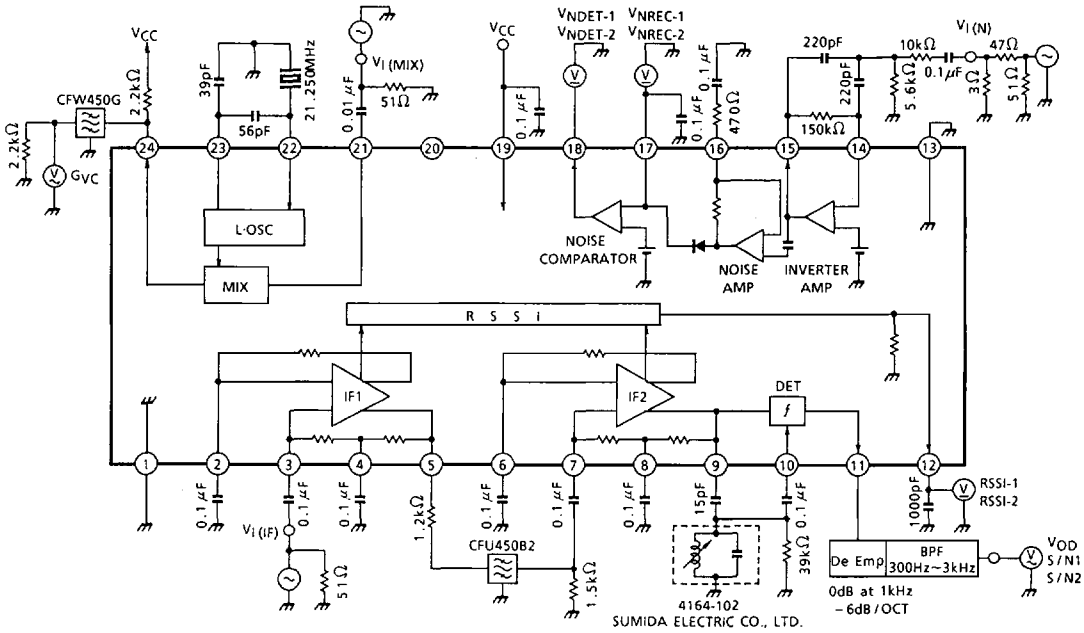
ELECTRICAL CHARACTERISTICS (Unless otherwise specified, Ta = 25°C, V_{CC} = 3.5V, $f_{I\,(MIX)}$ = 21.7MHz, Δf = ± 1.75kHz, f_{MOD} = 1kHz, $f_{I\,(IF)}$ = 450kHz)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Quiescent Current	I_{CCQ}	1	—	2.4	3.4	5.0	mA
MIX Conversion Gain	G_{VC}	2	$V_{I\,(MIX)}$ = 20dBμV	15	20	26	dB
Local Oscillation Voltage	V_{LO}	—	—	—	110	—	dBμV
Pre-stage IF Amp. Gain	G_{IF1}	—	—	—	66	—	dB
Following-stage IF Amp. Gain	G_{IF2}	—	—	—	52	—	dB
Level Detection Output 1	V_{RSSI-1}	2	$V_{I\,(IF)}$ = 20dBμV	0.3	0.42	0.6	V
Level Detection Output 2	V_{RSSI-2}	2	$V_{I\,(IF)}$ = 100dBμV	1.8	2.1	2.5	V
Demodulation Output	V_{OD}	2	$V_{I\,(IF)}$ = 60dBμV, with De Emp and BPF	32	45	56	mV_{rms}
Noise Rectifier Output 1	V_{NREC-1}	2	f_N = 26kHz, $V_{I\,(N)}$ = 1mV_{rms}	—	0.1	0.6	V
Noise Rectifier Output 2	V_{NREC-2}	2	f_N = 26kHz, $V_{I\,(N)}$ = 10mV_{rms}	1.7	2.2	2.5	V
Noise Detection Output 1	V_{NDET-1}	2	f_N = 26kHz, $V_{I\,(N)}$ = 1mV_{rms}	—	—	100	mV
Noise Detection Output 2	V_{NDET-2}	2	f_N = 26kHz, $V_{I\,(N)}$ = 10mV_{rms}	3.2	—	—	V
Signal To Noise Ratio	S/N-1	2	$V_{I\,(IF)}$ = 20dBμV	22	25	—	dB
Signal To Noise Ratio	S/N-2	2	$V_{I\,(IF)}$ = 70dBμV	50	55	—	dB
AM Rejection Ratio	AMR	—	$V_{I\,(IF)}$ = 70dBμV, AM = 30%	—	45	—	dB
MIX Input Impedance	$R_{IN\,(MIX)}$	—	—	—	7	—	kΩ

TEST CIRCUIT (1)



TEST CIRCUIT (2)



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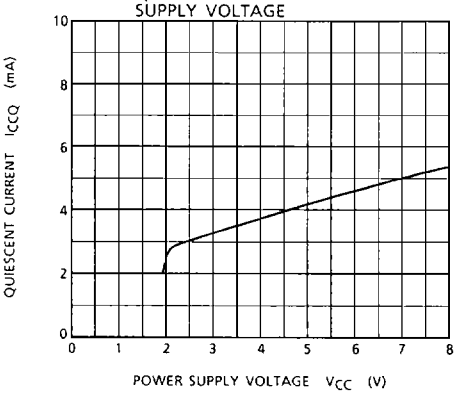
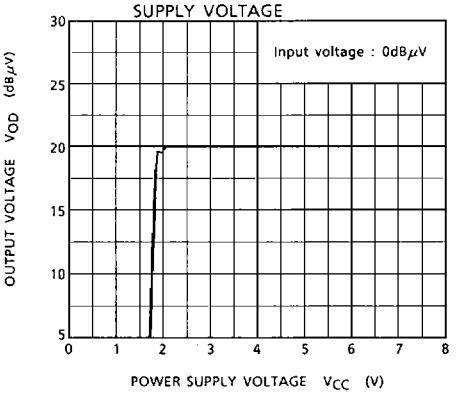
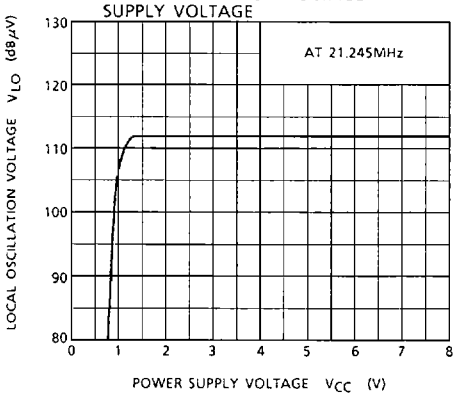
QUIESCENT CURRENT – SUPPLY VOLTAGE



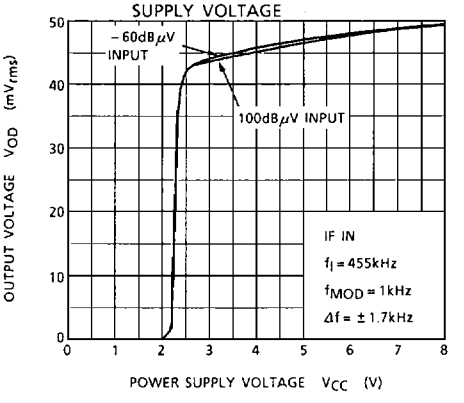
MIX. OUTPUT VOLTAGE – SUPPLY VOLTAGE



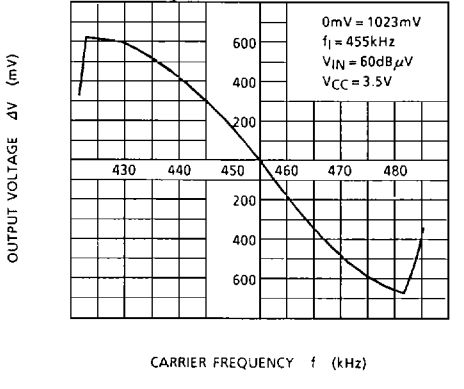
LOCAL OSCILLATION VOLTAGE – SUPPLY VOLTAGE



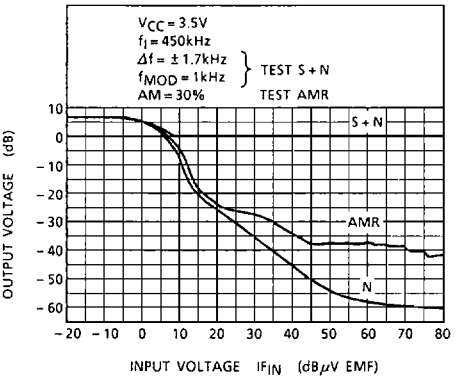
DEMODULATION OUTPUT – SUPPLY VOLTAGE



OUTPUT VOLTAGE – CARRIER FREQUENCY



IF CHARACTERISTICS



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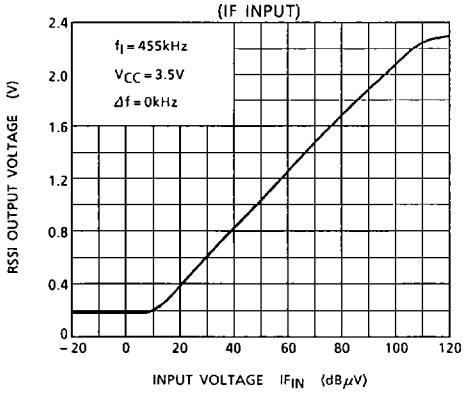
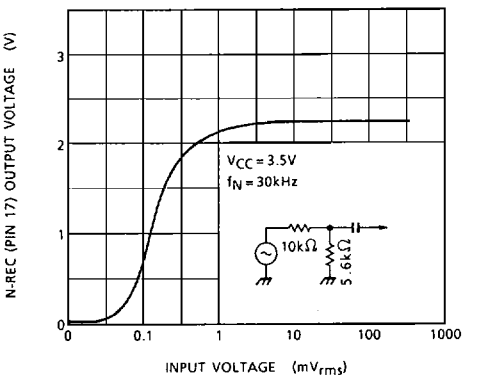
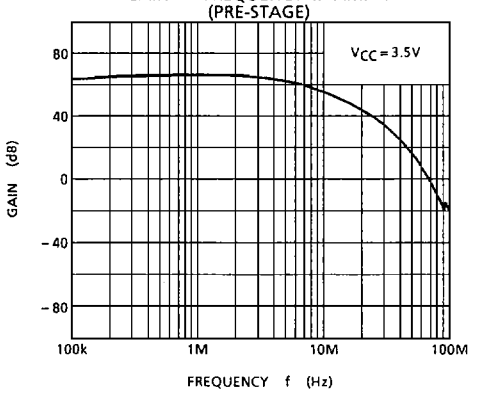
RSSI INPUT OUTPUT CHARACTERISTICS
(IF INPUT)



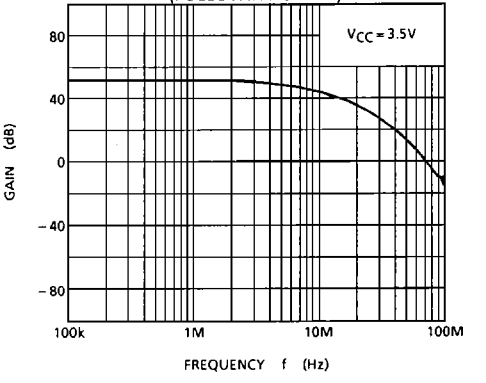
N-REC INPUT OUTPUT CHARACTERISTICS



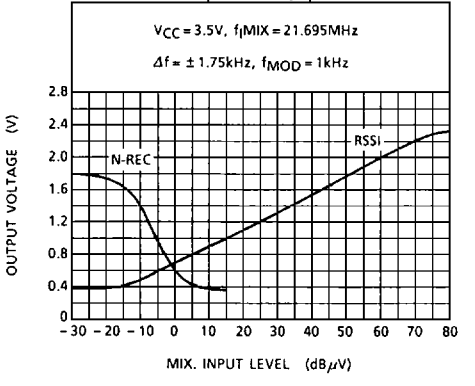
GAIN – FREQUENCY IF AMP 1
(PRE-STAGE)



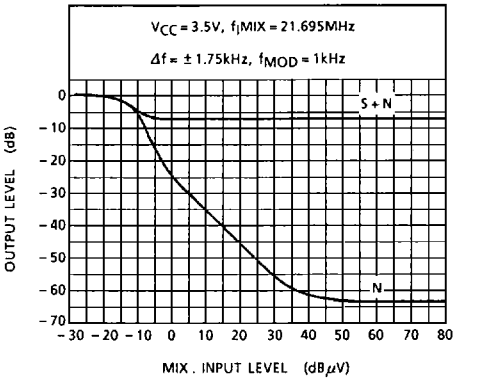
GAIN – FREQUENCY IF AMP 2
(FOLLOWING-STAGE)



RSSI. N-REC OUTPUT VOLTAGE
(MIX. INPUT)



S / N RATIO (MIX. INPUT)



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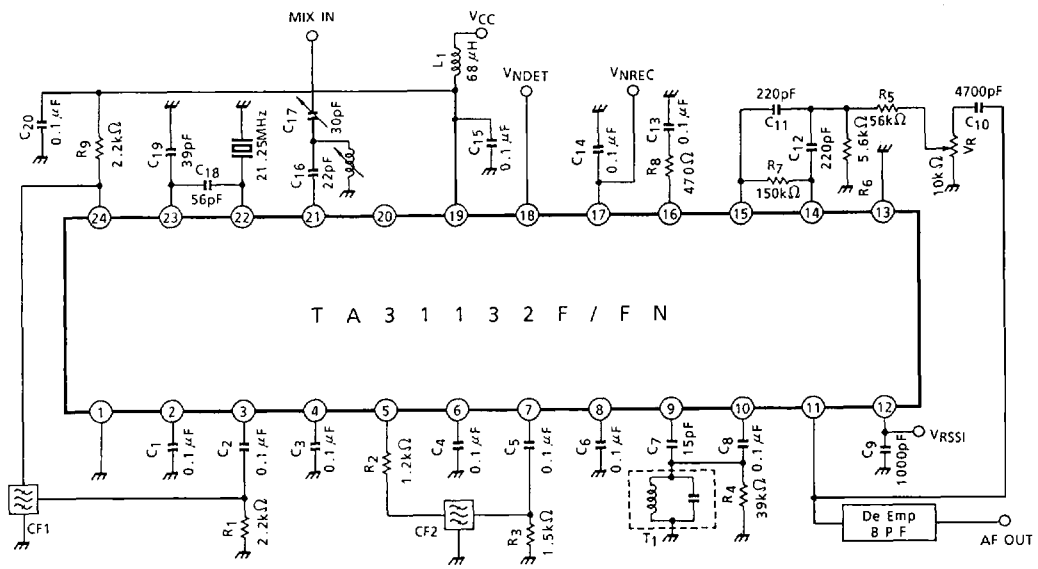
TA31132F/FN-9

REFERENCE CIRCUIT



CF1 : CFW450G (MURATA MFG. CO.,LTD)
CF2 : CFU450B2 (MURATA MFG. CO.,LTD)
T1 : 4164-102 (SUMIDA ELECTRIC CO.,LTD)