

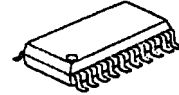
FM IF IC FOR PAGERS

■ GENERAL DESCRIPTION

The **NJM2537** is a low power FM IF IC for pagers.

It is capable of designing dual conversion pager system because of including a mixer circuit. Also it includes RSSI function, so that it is easy to design automatic gain control (AGC) which improves interference when strong signal is received.

■ PACKAGE OUTLINE

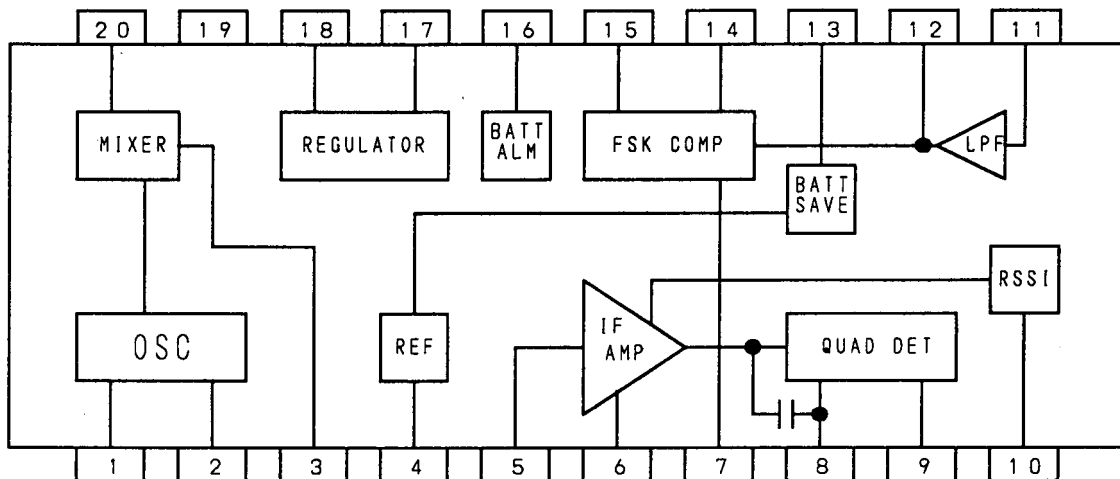


NJM2537V

■ FEATURES

- Low Operating Voltage 1.1 to 4.0V
- Low Operating Current 1.2mA typ.at V⁺=1.4V
- RF Input Frequency 10 to 50MHz
- 2nd Mixer
- Package Outline SSOP20

■ PIN FUNCTION AND BLOCK DIAGRAM



- | | |
|-------------------|--------------|
| 1. OSC IN | 11. LPF IN |
| 2. OSC OUT | 12. LPF OUT |
| 3. MIXER OUT | 13. BS |
| 4. V ⁺ | 14. CHARGE |
| 5. IF IN | 15. FSK OUT |
| 6. DECOUPLING | 16. VALM |
| 7. FSK REF | 17. REG CONT |
| 8. QUAD IN | 18. REG OUT |
| 9. AF OUT | 19. GND |
| 10. RSSI | 20. MIXER IN |

NJM2537

■ ABSOLUTE MAXIMUM RATINGS

($T_a=25^{\circ}\text{C}$)

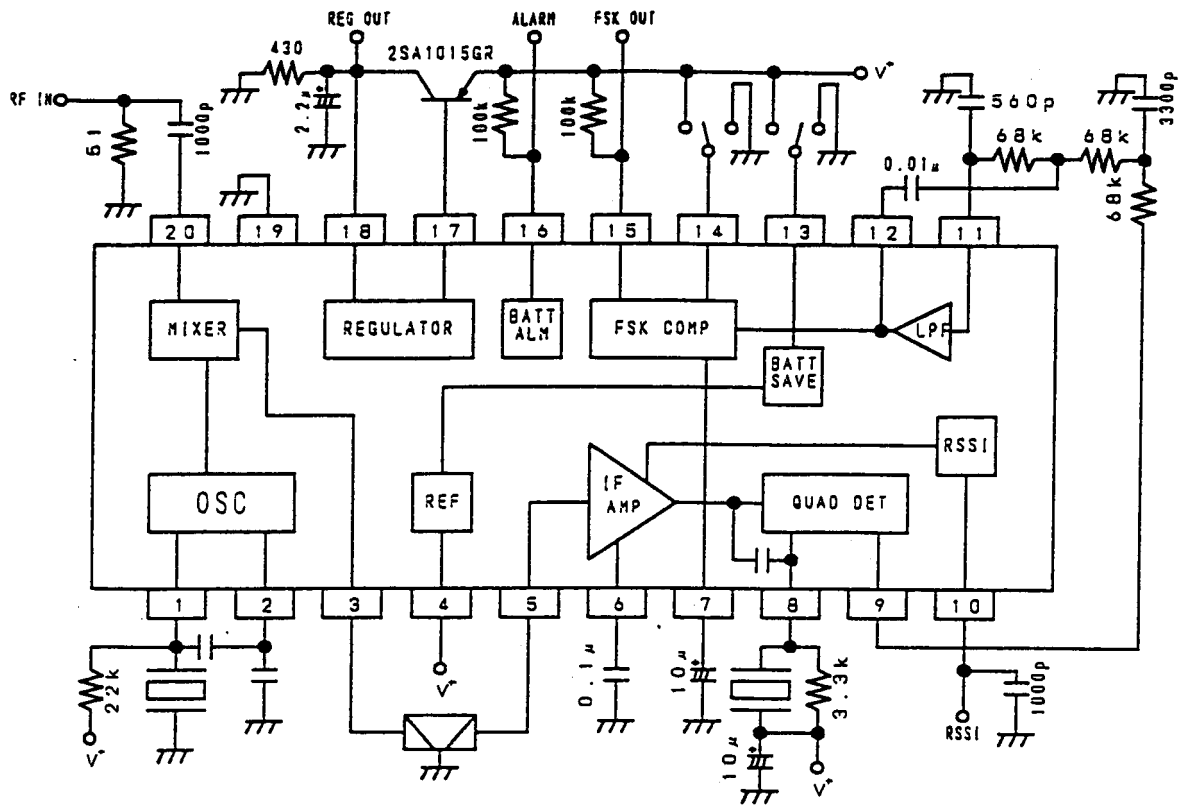
PARAMETER	SYMBOL	RATINGS	UNIT
Supply voltage	V_{CC}	4.0	V
Power Dissipation	P_D	300	mW
Operating Temperature Range	T_{opr}	-30 to +85	$^{\circ}\text{C}$
Storage Temperature Range	T_{stg}	-40 to +125	$^{\circ}\text{C}$

■ ELECTRICAL CHARACTERISTICS

($V^+=1.4\text{V}$, $f_c=21.7\text{MHz}$, $f_{IF}=455\text{kHz}$, $f_{mod}=600\text{Hz}$, $f_{dev}=\pm 4\text{kHz}$, $T_a=25^{\circ}\text{C}$)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
No Signal Operating Current	I_{CCQ}		-	1.2	1.5	mA
Battery Saving	I_{CCS}		-	0	5	μA
Operating Current Mixer Gain	GMIX	After Ceramic Filter	11	14.5	18	dB
Mixer Intercept Point	IP		-	103	-	$\text{dB}\mu\text{VEMF}$
Mixer Input Resistance	R_{inMIX}		-	5	-	$\text{k}\Omega$
Mixer Output Resistance	R_{oMIX}		-	2	-	$\text{k}\Omega$
IF Amplifier Input Resistance	R_{inIF}		-	2	-	$\text{k}\Omega$
S / N 1	S / N 1	MIXER Input, $V_i=60\text{dB}\mu\text{VEMF}$	-	63	-	dB
S / N 2	S / N 2	IF Input, $V_i=60\text{dB}\mu\text{VEMF}$	-	63	-	dB
S / N 3	S / N 3	IF Input, $V_i=22\text{dB}\mu\text{VEMF}$	-	25	-	dB
-3dB Limiting Sensitivity 1	LIM1	MIXER Input	-	12	17	$\text{dB}\mu\text{VEMF}$
-3dB Limiting Sensitivity 2	LIM2	IF Input	-	22	27	$\text{dB}\mu\text{VEMF}$
Demodulated Output Level	V_{od}	IF Input, $V_i=60\text{dB}\mu\text{VEMF}$	30	46	65	mVrms
AM Rejection Ratio	AMR	IF Input, $V_i=60\text{dB}\mu\text{VEMF}$, AM=30%	-	50	-	dB
Duty Ratio at Wave Shaped Output	DR	IF Input, $V_i=60\text{dB}\mu\text{VEMF}$	40	50	60	%
RSSI Output Voltage	V_{rssi}	IF Input, $V_i=65\text{dB}\mu\text{VEMF}$	0.48	0.62	0.76	V
RSSI Output Resistance	R_{rssi}		-	62	-	$\text{k}\Omega$
Quick Charge / Discharge Current	I_{ch}	GND, 0.18V	40	70	115	μA
Alarm Detection Voltage	V_{alm}		1.05	1.10	1.15	V
Regulator Output Voltage	V_{reg}	$R_L=430\Omega$	0.95	1.00	1.05	V
Low level Output Voltage of VALM Terminal	V_{almL}	$I_L=100\mu\text{A}$	-	0.1	0.4	V
High Level Leak Current of VALM Terminal	I_{almH}		-	0	2	μA
Low Level Output Voltage of FSK-OUT Terminal	V_{fskL}	$I_L=100\mu\text{A}$	-	0.1	0.4	V
High Level Leak Current of FSK-OUT Terminal	I_{fskH}		-	0	2	μA
Low Level Output Voltage of REG-OUT Terminal	V_{regL}	$I_L=100\mu\text{A}$	-	-	0.6	V

APPLICATION CIRCUIT



NJM2537

■ TERMINAL FUNCTION

PIN NO.	SYMBOL	PIN VOLTAGE (V)	FUNCTION	EQUIVALENT CIRCUIT
1	OSC IN	1.38	Local Oscillator Input. In case of using a crystal oscillator, it is connected.	
2	OSC OUT	0.68	Local Oscillator Output. In case of using an external oscillator, the external clock is input.	
20	MIX IN	0.8	Mixer input. Input resistance is 5kΩ typical.	
3	MIX OUT	0.7	Mixer output. Output resistance is 2kΩ typical.	
5	IF IN	1.38	Limiter amplifier input. Input resistance is 2kΩ typical.	
6	DEC	1.38	Decoupling for bias.	
8	QUAD IN	1.4	Input of quadrature detection circuit. A ceramic discriminator is connected.	
9	AF OUT	0.16	Demodulated signal Output.	

■ TERMINAL FUNCTION

PIN NO.	SYMBOL	PIN VOLTAGE (V)	FUNCTION	EQUIVALENT CIRCUIT
10	RSSI	0	RSSI output	
11	LPF IN	0.18	Input of a low pass filter. It is biased from AF-OUT (9pin) through an external RC filter.	
12	LPF OUT	0.18	Output of a low pass filter.	
7	FSK REF	0.18	Reference input of a wave shaping comparator. An external capacitor is connected.	
13	BS	-	Control of a battery saving circuit. Hi : active Lo : suspended	
14	CHARGE	-	Control of a quick charge / discharge circuit. Hi : Its circuit turns ON Lo : Its circuit turns OFF	
15	FSK OUT	-	Output of a wave shaping circuit. The output signal is inverted against LPF output signal.	

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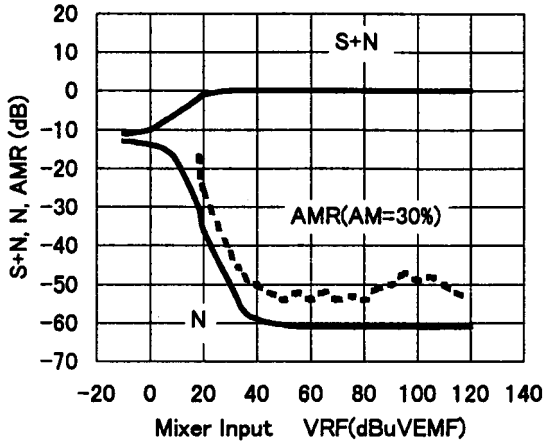
■ TERMINAL FUNCTION

PIN NO.	SYMBOL	PIN VOLTAGE (V)	FUNCTION	EQUIVALENT CIRCUIT
16	VALM	0.1	Output of the alarm signal. When V^+ drops down to 1.1V, this output becomes high.	
17	REG CONT	0.6	Control of an external PNP transistor used for the regulator.	
18	REG OUT	1.0	Monitoring of the regulator.	
4	V^+	-	Power Supply	-
19	GND	-	Ground	-

■ TYPICAL CHARACTERISTICS

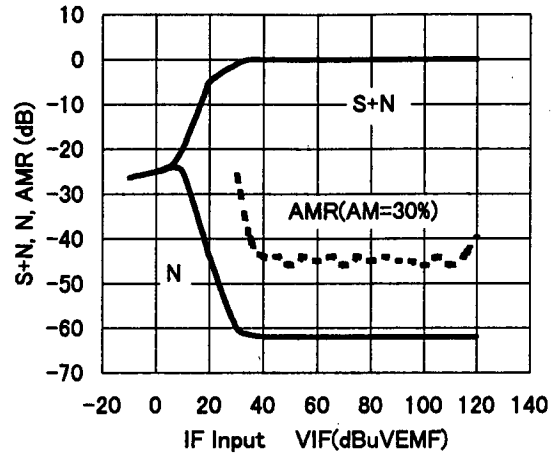
S+N, N, AMR vs. Mixer Input

($V^+ = 1.4V$, $f_{RF} = 21.7MHz$, $f_{LO} = 22.155MHz$
 $V_{LO} = 110dBuV$, $f_{dev} = \pm 4kHz$, $f_{mod} = 600Hz$)



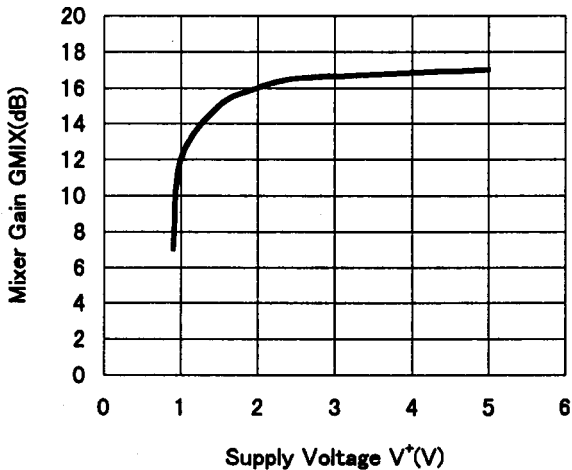
S+N, N, AMR vs. IF Input

($V^+ = 1.4V$, $f_{IF} = 455kHz$, $f_{dev} = \pm 4kHz$, $f_{mod} = 600Hz$)



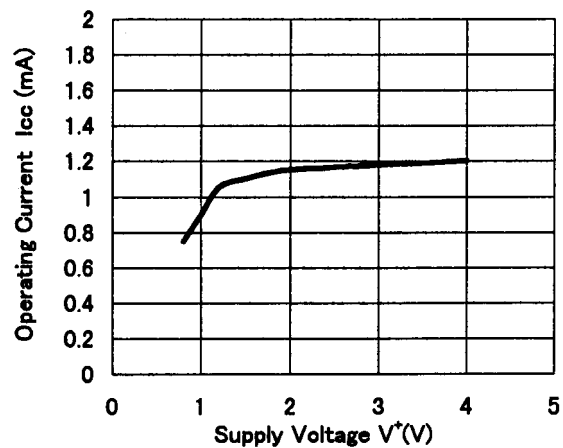
Mixer Gain vs. Supply Voltage

($f_{in} = 21.7MHz$, $V_{RF} = 60dBuV$, $f_{LO} = 22.155MHz$, $V_{LO} = 110dBuV$)



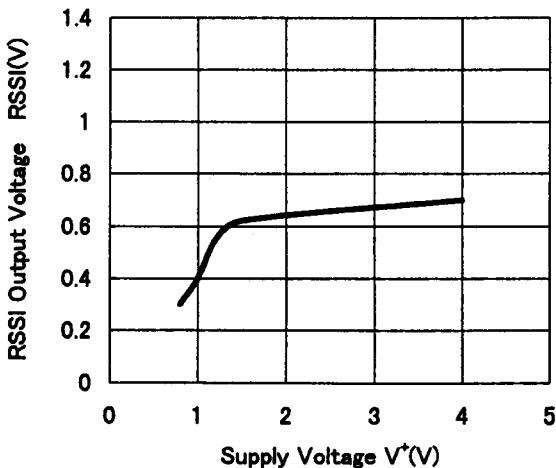
Operating Current vs. Supply Voltage

(No Signal)



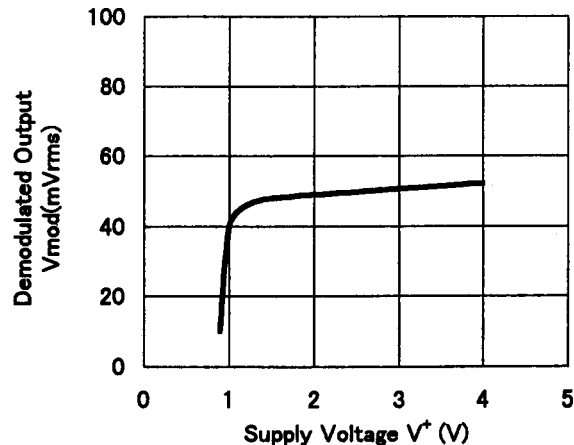
RSSI vs. Supply Voltage

($V_{IF} = 65dBuVEMF$, $f_{IF} = 455kHz$)



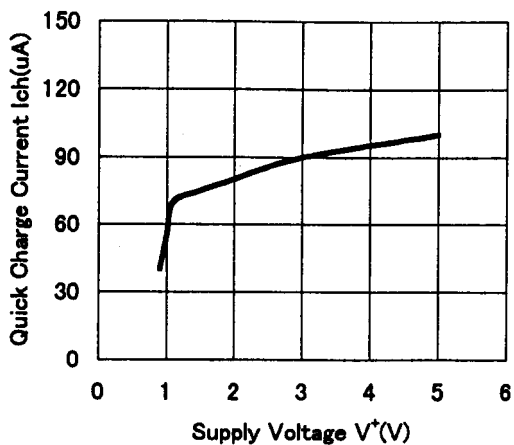
Demodulated Output vs. Supply Voltage

($V_{in} = 60dBuVEMF$, $f_{IF} = 455kHz$, $f_{mod} = 600Hz$)

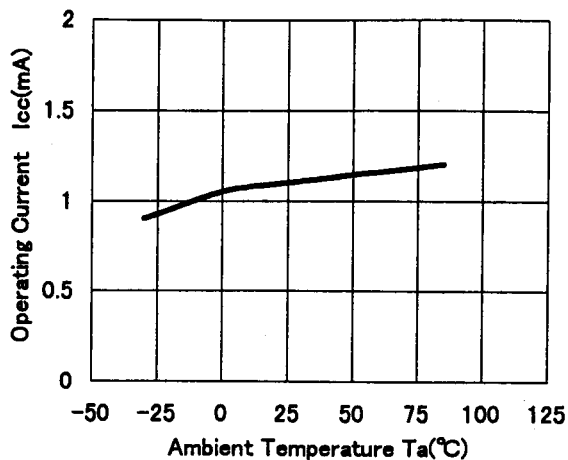


■ TYPICAL CHARACTERISTICS

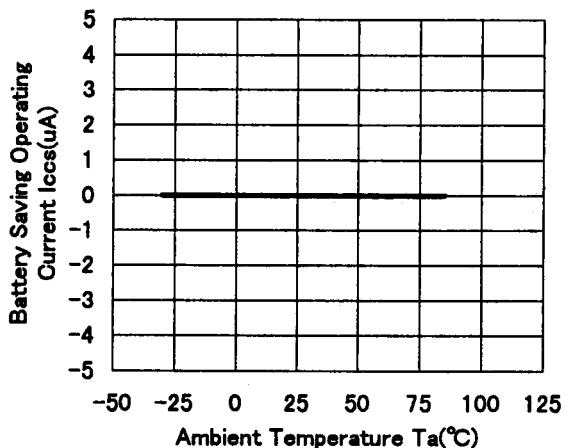
Quick Charge Current vs. Supply Current
(12pin=0.18V)



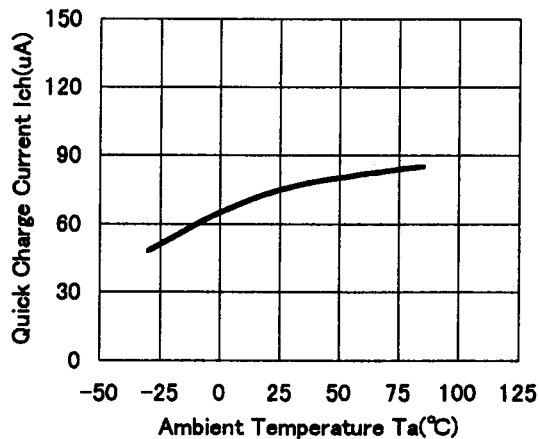
Operating Current vs. Temperature
($V^+=1.4V$)



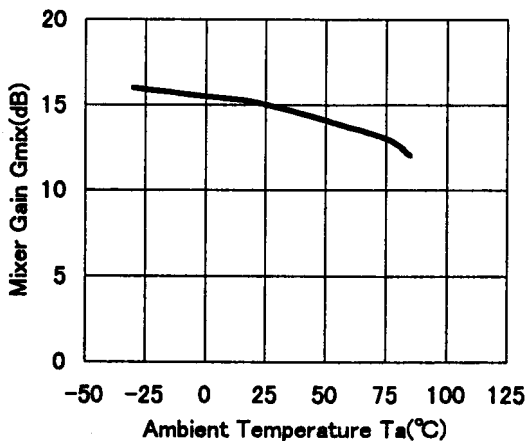
Battery Saving Operating Current vs. Temperature
($V^+=1.4V$)



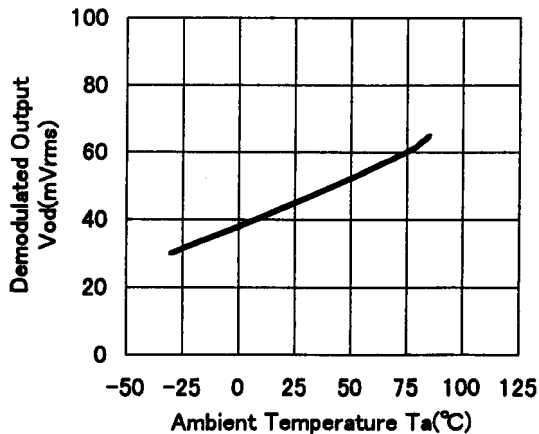
Quick Charge Current vs. Temperature
($V^+=1.4V$, 12pin=0.18V)



Mixer Gain vs. Temperature
($V^+=1.4V$, $f_{RF}=21.7MHz$, $V_{in}=60dB\mu V$)



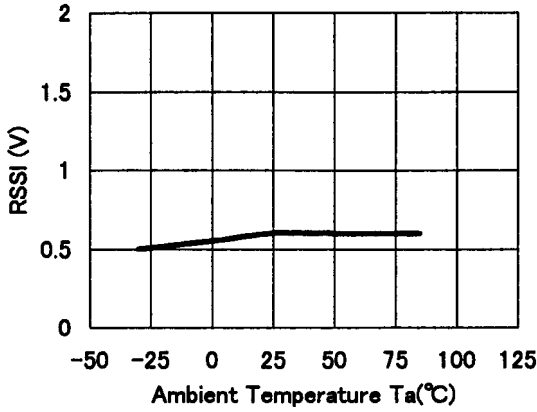
Demodulated Output vs. Temperature
($V^+=1.4V$, $f_{IF}=455kHz$, $V_{in}=60dB\mu VEMF$, $f_{mod}=600Hz$)



■ TYPICAL CHARACTERISTICS

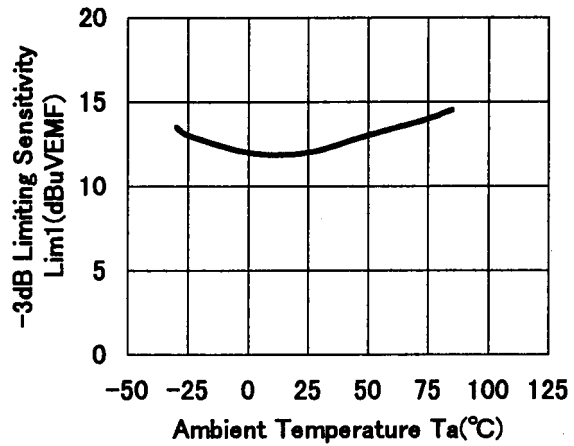
RSSI vs. Temperature

($V^+ = 1.4V$, $f_{RF} = 21.7MHz$, $V_{RF} = 50dBuVEMF$,
 $f_{LO} = 22.155MHz$, $V_{LO} = 110dBuV$, $mod = OFF$)



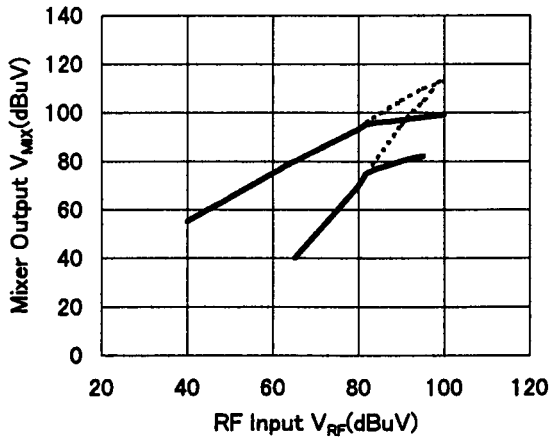
-3dB Limiting Sensitivity vs. Temperature

($V^+ = 1.4V$, Mixer input, $f_{RF} = 21.7MHz$, $f_{mod} = 600Hz$)



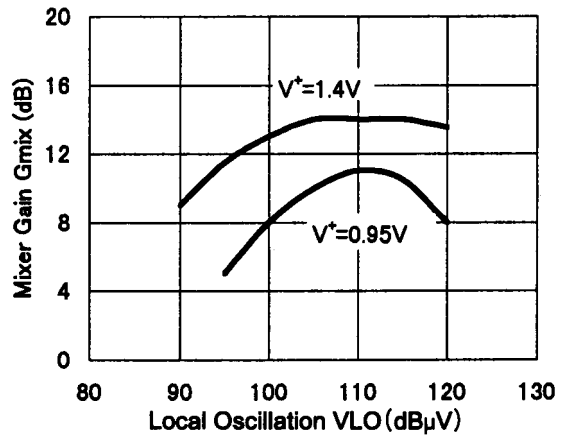
Mixer Output vs. RF Input

($V^+ = 1.4V$, $f_{RF} = 21.7MHz$, $f_{LO} = 22.155MHz$, $V_{LO} = 110dBuV$)



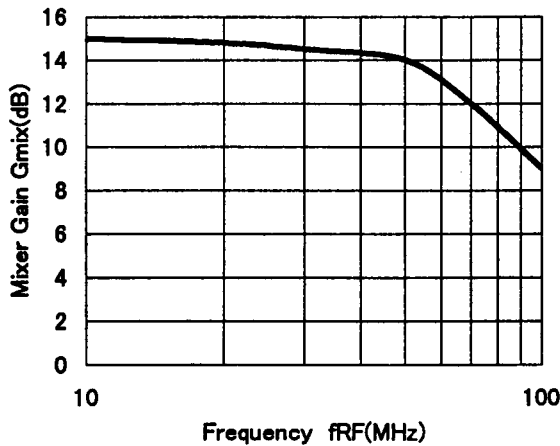
Mixer Gain vs. Local Oscillation

($V^+ = 1.4V$, $f_{RF} = 21.7MHz$, $V_{RF} = 60dBuV$,
 $f_{LO} = 22.155MHz$, $V_{in} = 60dBuV$)



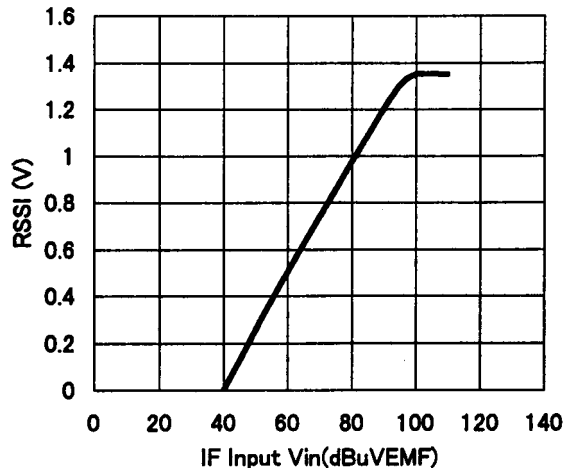
Mixer Gain vs. Frequency

($V^+ = 1.4V$, $V_{RF} = 60dBuV$, $V_{LO} = 110dBuV$, $f_{LO} = f_{RF} + 455kHz$)



RSSI vs. IF Input

($V^+ = 1.4V$, $f_{IF} = 455kHz$)



[CAUTION]

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