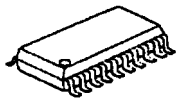
FM IF IC FOR PAGERS

■ 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 interberence when strong signal is received.

■PACKAGE OUTLINE

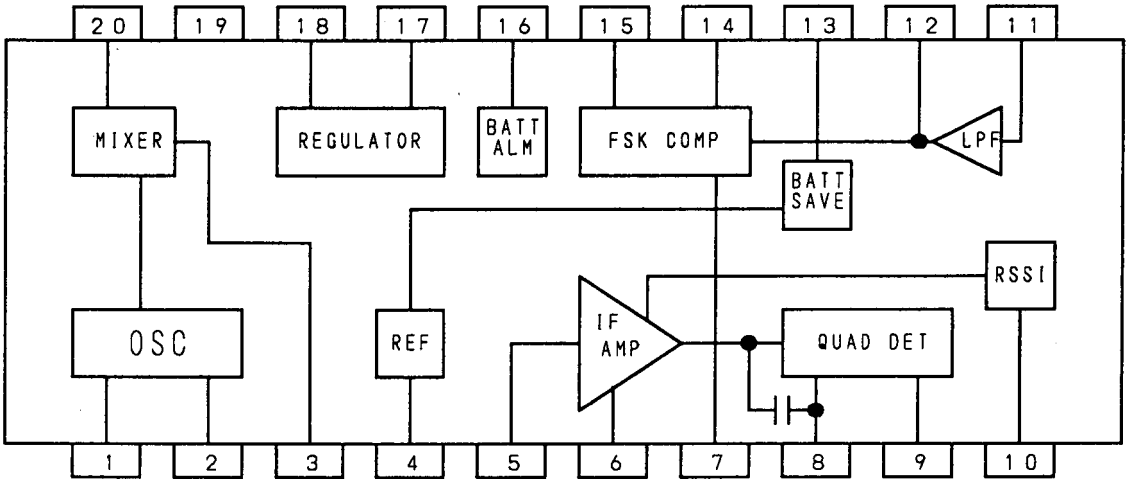


NJM2537V

■ 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

■ ABSOLUTE MAXIMUM RATINGS

(T_a=25°C)

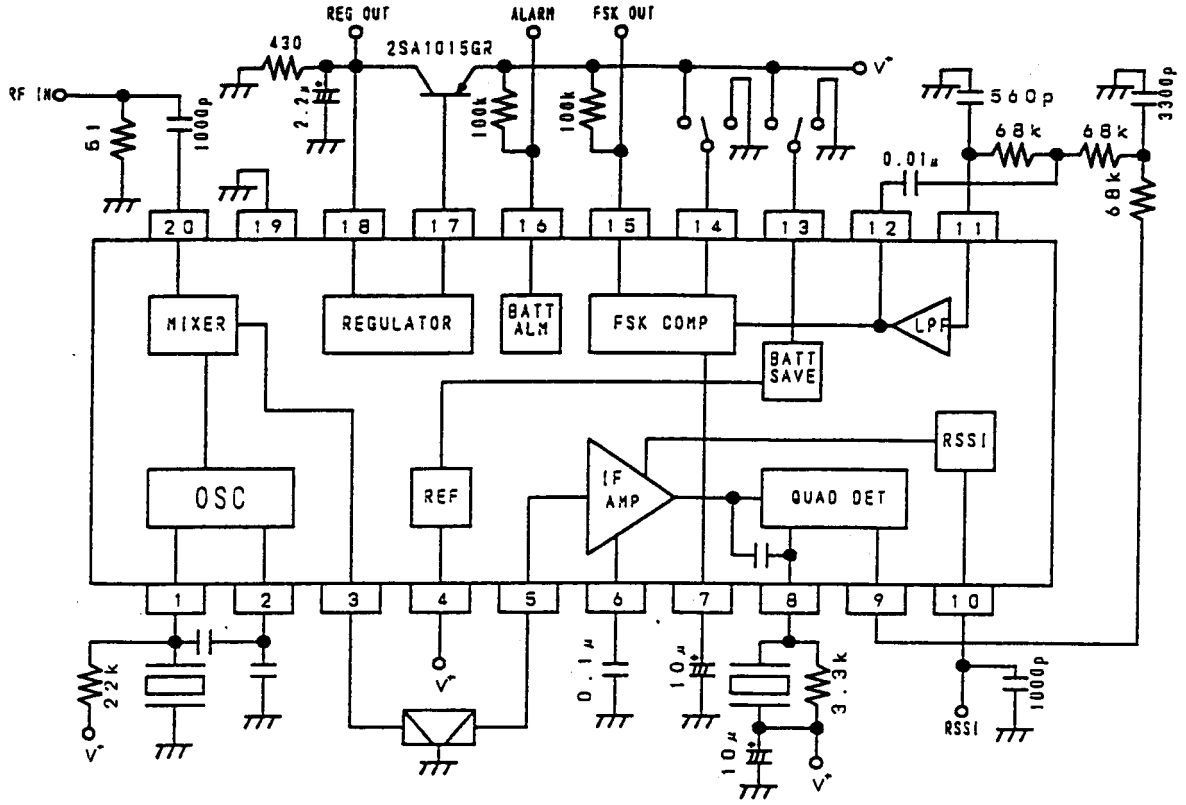
PARAMETER	SYMBOL	RATINGS	UNIT
Supply voltage	V_{CC}	4.0	V
Power Dissipation	P_D	300	mW
Operating Temperature Range	T_{opr}	-30 to +85	°C
Storange Temperature Range	T_{stg}	-40 to +125	°C

■ ELECTRICAL CHARACTERISTICS

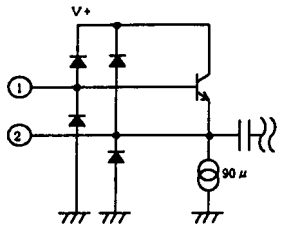
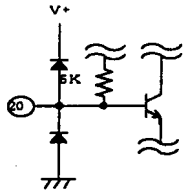
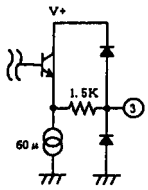
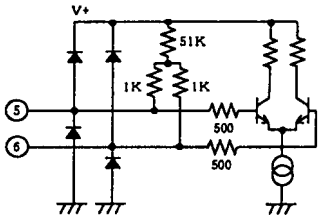
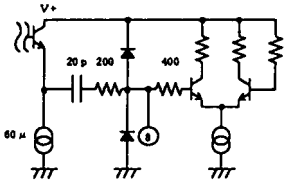
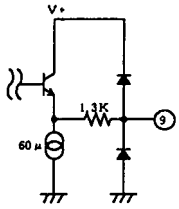
(V^+=1.4V, f_C=21.7MHz, fIF=455kHz, fmod=600Hz, fdev=±4kHz, T_a=25°C)

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	-	dBµVEMF
Mixer Input Resistance	R_{in}MIX		-	5	-	kΩ
Mixer Output Resistance	R_OMIX		-	2	-	kΩ
IF Amplifier Input Resistance	R_{in}IF		-	2	-	kΩ
S / N 1	S / N 1	MIXER Input, V_I=60dBµVEMF	-	63	-	dB
S / N 2	S / N 2	IF Input, V_I=60dBµVEMF	-	63	-	dB
S / N 3	S / N 3	IF Input, V_I=22dBµVEMF	-	25	-	dB
-3dB Limiting Sensitivity 1	LIM1	MIXER Input	-	12	17	dBµVEMF
-3dB Limiting Sensitivity 2	LIM2	IF Input	-	22	27	dBµVEMF
Demodulated Output Level	Vod	IF Input, V_I=60dBµVEMF	30	46	65	mVrms
AM Rejection Ratio	AMR	IF Input, V_I=60dBµVEMF, AM=30%	-	50	-	dB
Duty Ratio at Wave Shaped Output	DR	IF Input, V_I=60dBµVEMF	40	50	60	%
RSSI Output Voltage	V_{rssi}	IF Input, V_I=65dBµVEMF	0.48	0.62	0.76	V
RSSI Output Resistance	R_{rssi}		-	62	-	kΩ
Quick Charge / Discharge Current	I_{ch}	GND, 0.18V	40	70	115	µA
Alarm Detection Voltage	Valm		1.05	1.10	1.15	V
Regulator Output Voltage	Vreg	RL=430Ω	0.95	1.00	1.05	V
Low level Output Voltage of VALM Terminal	ValmL	IL=100µA	-	0.1	0.4	V
High Level Leak Current of VALM Terminal	IalmH		-	0	2	µA
Low Level Output Voltage of FSK-OUT Terminal	VfskL	IL=100µA	-	0.1	0.4	V
High Level Leak Current of FSK-OUT Terminal	IfskH		-	0	2	µA
Low Level Output Voltage of REG-OUT Terminal	VregL	IL=100µA	-	-	0.6	V

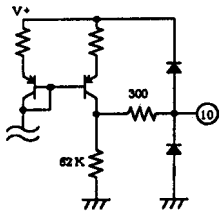
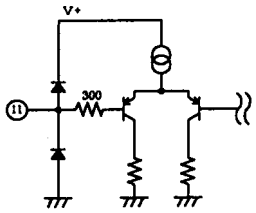
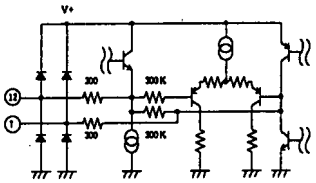
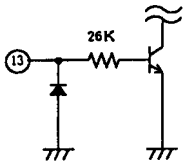
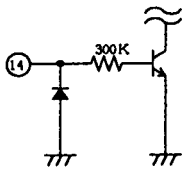
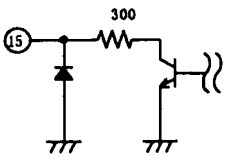
■ APPLICATION CIRCUIT



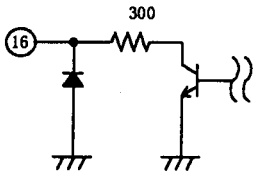
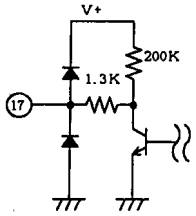
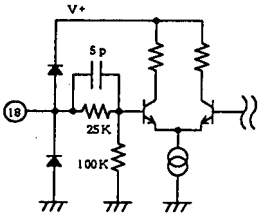
■ TERMINAL FUNCTION

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 filrter.	
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.	

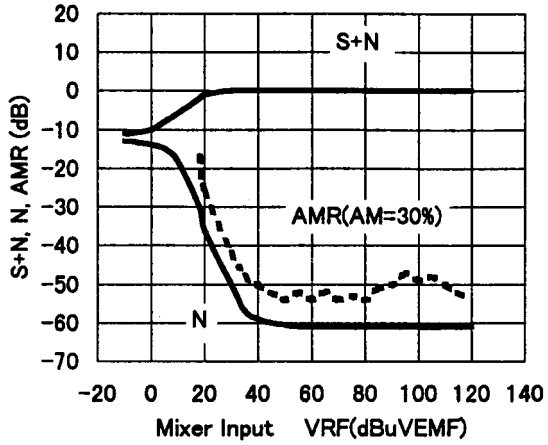
■ TERMINAL FUNCTION

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

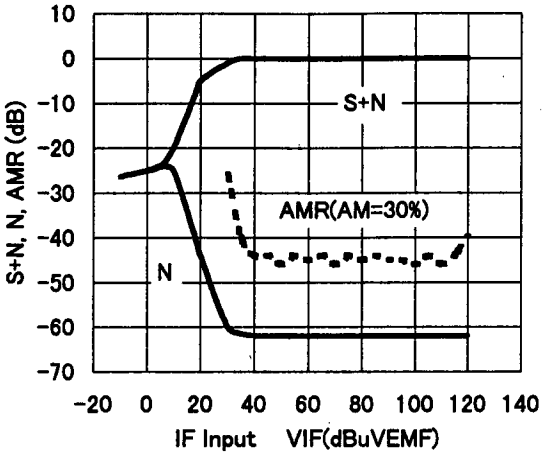
S+N N, AMR vs. Mixer Input

(V^+ = 1.4V, fRF = 21.7MHz, fLO = 22.155MHz
VLO = 110dBuV, fdev = ±4kHz, f mod = 600Hz)



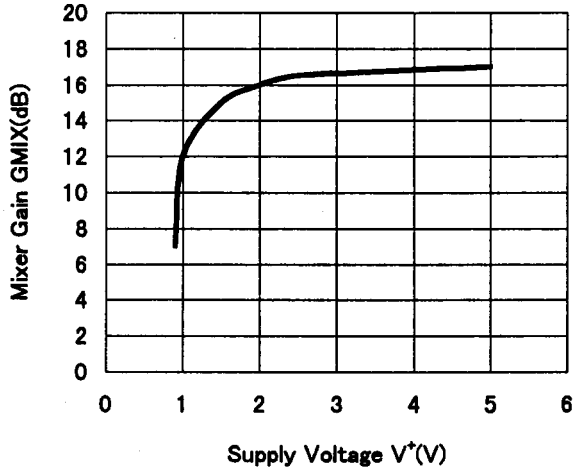
S+N, N, AMR vs. IF Input

(V^+=1.4V, fIF=455kHz, fdev=±4kHz, fmod=600Hz)



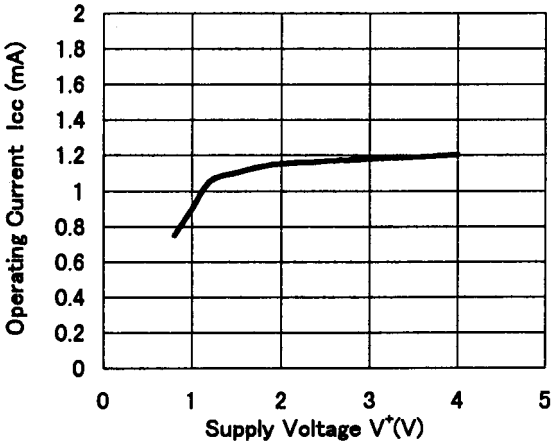
Mixer Gain vs. Supply Voltage

(f_{in}=21.7MHz, VRF=60dBuV, fLO=22.155MHz, VLO=110dBu)



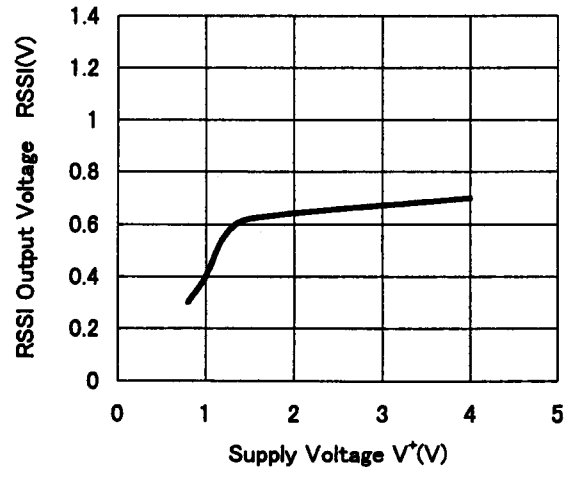
Operating Current vs. Supply Voltage

(No Signal)



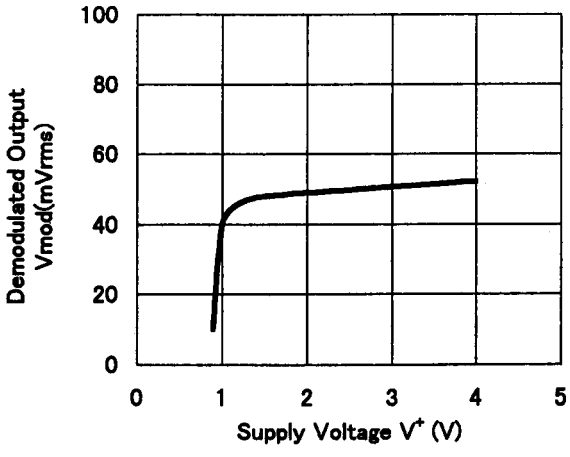
RSSI vs. Supply Voltage

(VIF=65dBuVEMF, fIF=455kHz)



Demodulated Output vs. Supply Voltage

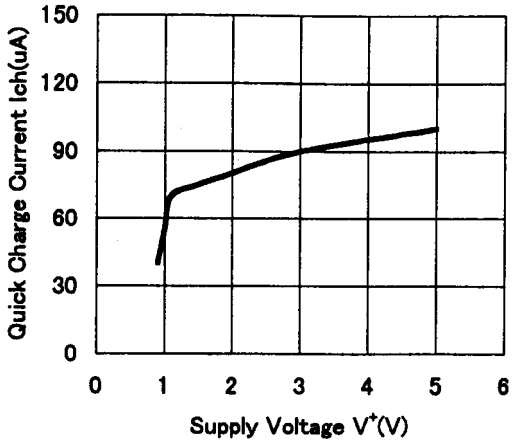
(V_{in}=60dBuVEMF, fIF=455kHz, fmod=600Hz)



■ TYPICAL CHARACTERISTICS

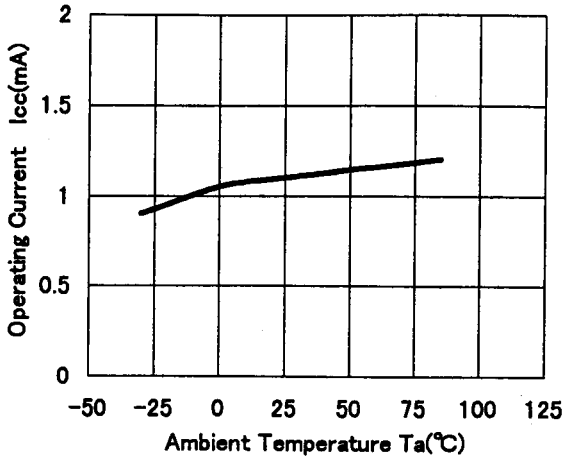
Quick Charge Current vs. Supply Current

(12pin=0.18V)



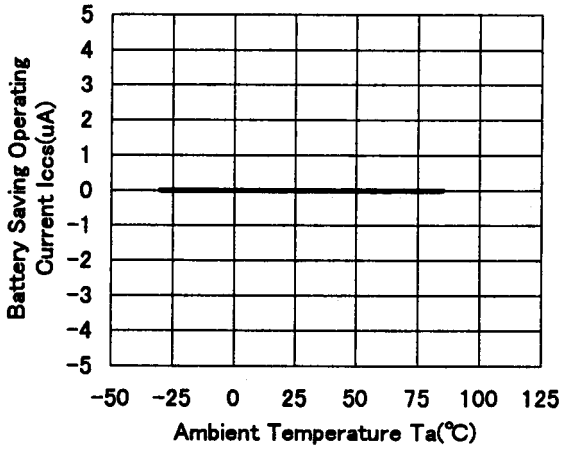
Operating Current vs. Temperature

(V^+=1.4V)



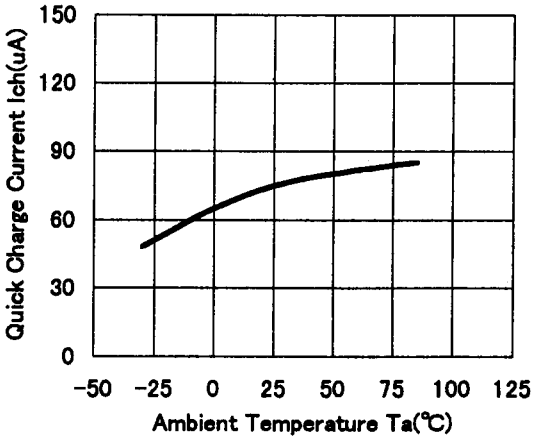
Battery Saving Operating Current vs. Temperature

(V^+=1.4V)



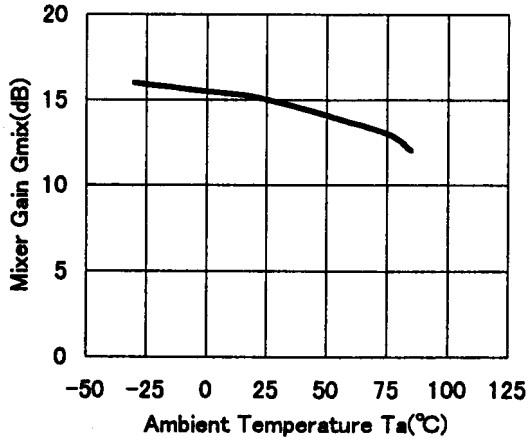
Quick Charge Current vs. Temperature

(V^+=1.4V, 12pin=0.18V)



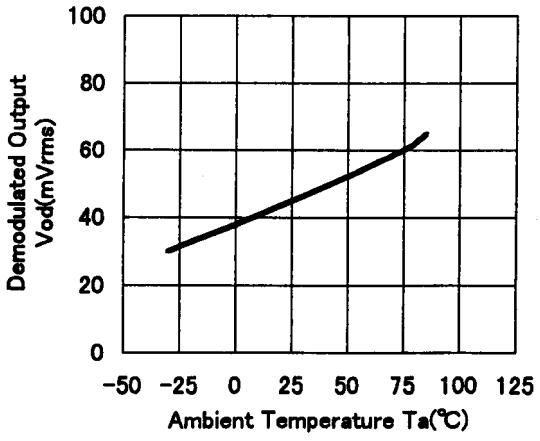
Mixer Gain vs. Temperature

(V^+=1.4V, fRF=21.7MHz, Vin=60dBμV)



Demodulated Output vs. Temperature

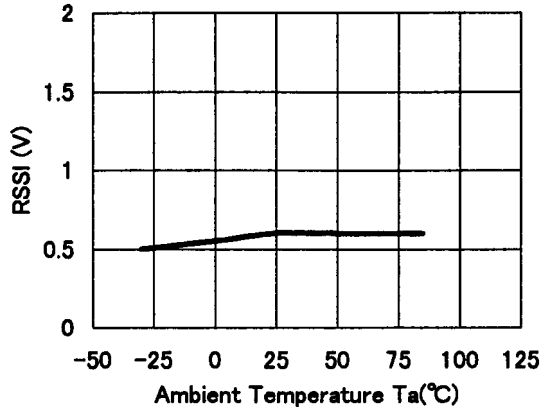
(V^+=1.4V, fIF=455kHz, V_{in}=60dBμVEMF, fmod=600Hz)



■ TYPICAL CHARACTERISTICS

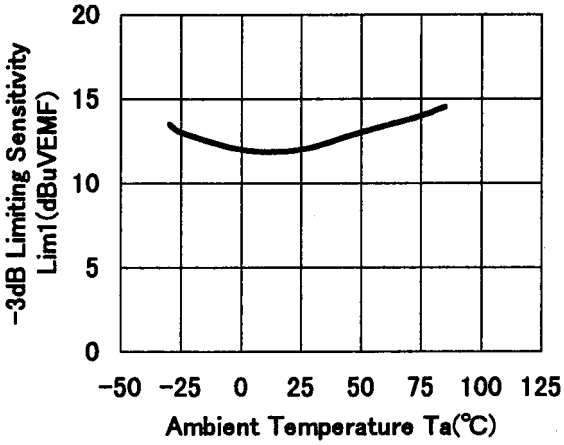
RSSI vs. Temperature

(V^+ = 1.4V, fRF21.7MHz, VRF = 50dBuVEMF, fLO = 22.155MHz, VLO = 110dBuV, mod = OFF)



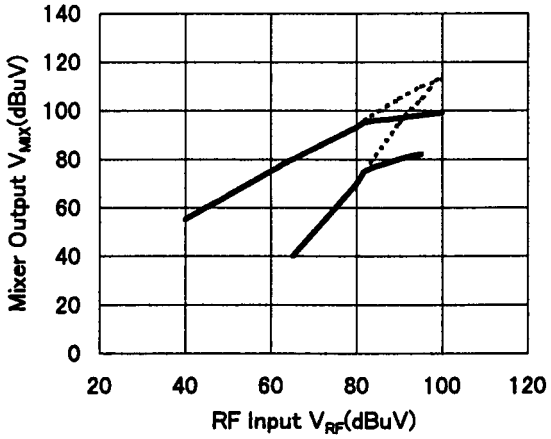
-3dB Limiting Sensitivity vs. Temperature

(V^+=1.4V, Mixer input, fRF=21.7MHz, fmod=600Hz)



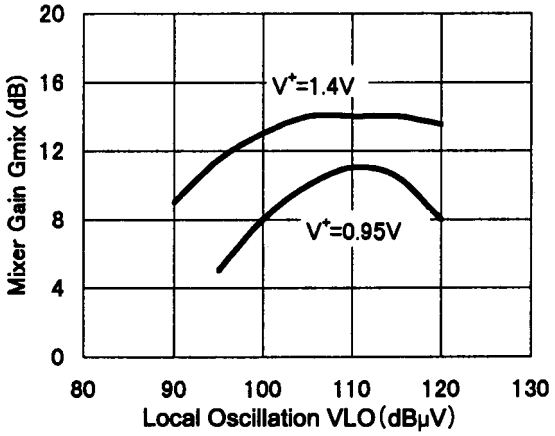
Mixer Output vs. RF Input

(V^+=1.4V, fRF=21.7MHz, fLO=22.155MHz, VLO=110dBuV)



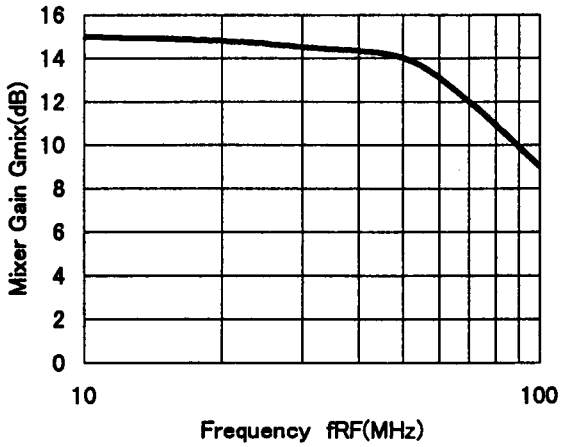
Mixer Gain vs. Local Oscillation

(V^+ = 1.4V, fRF = 21.7MHz, VRF = 60dBuV, fLO = 22.155MHz, V_{in} = 60dBuV)



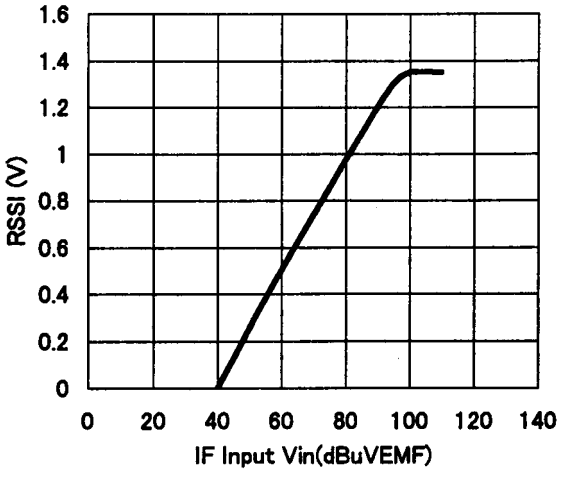
Mixer Gain vs. Frequency

(V^+=1.4V, VRF=60dBuV, VLO=110dBuV, fLO=fRF+455kHz)



RSSI vs. IF Input

(V^+=1.4V, fIF=455kHz)



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