

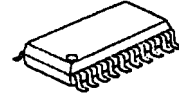
## FM IF IC FOR PAGERS

### ■ 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

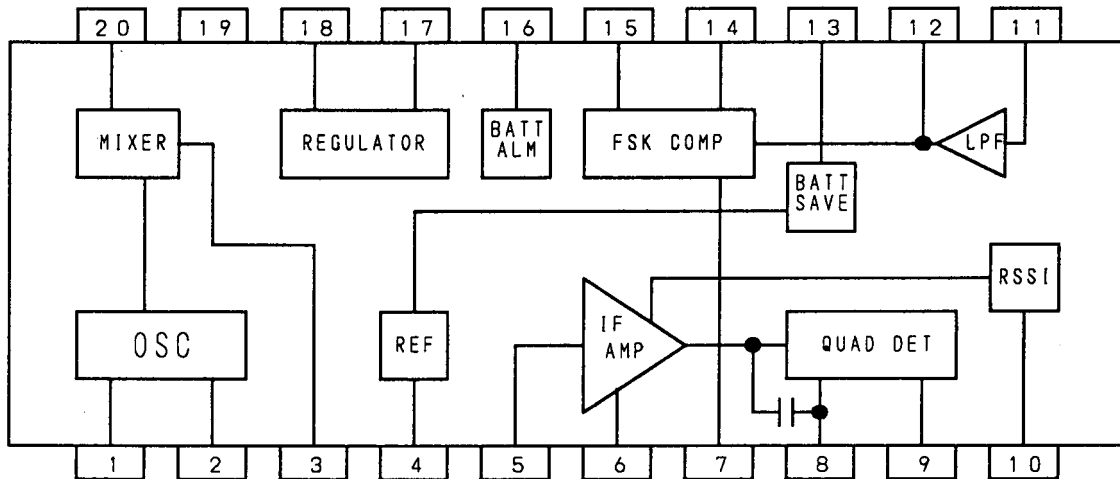


**NJM2537V**

### ■ FEATURES

- Low Operating Voltage            1.1 to 4.0V
- Low Operating Current            1.2mA typ.at V<sup>+</sup>=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 <sup>+</sup> | 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

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

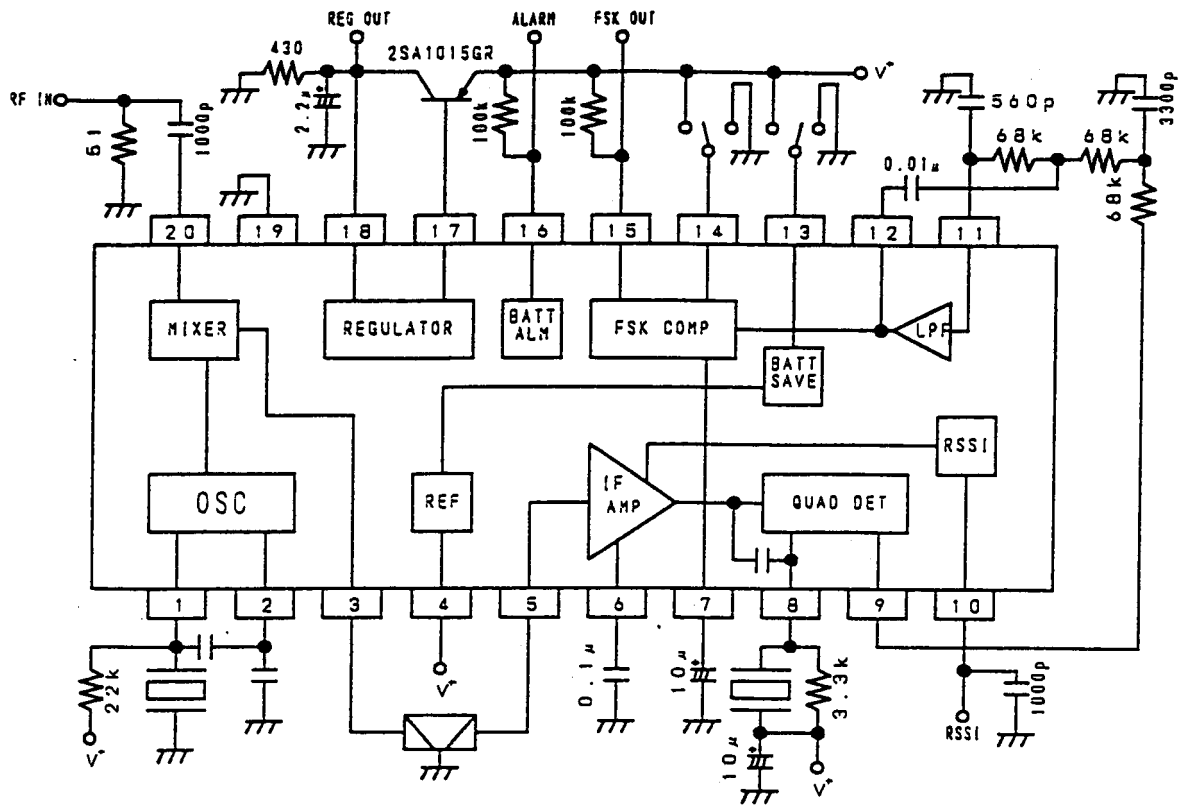
PARAMETER	SYMBOL	RATINGS	UNIT
Supply voltage	$V_{CC}$	4.0	V
Power Dissipation	$P_D$	300	mW
Operating Temperature Range	$T_{opr}$	-30 to +85	$^\circ\text{C}$
Storage Temperature Range	$T_{stg}$	-40 to +125	$^\circ\text{C}$

## ■ 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	$\mu\text{A}$
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	$\mu\text{A}$
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	$\mu\text{A}$
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	$\mu\text{A}$
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.	

# NJM2537

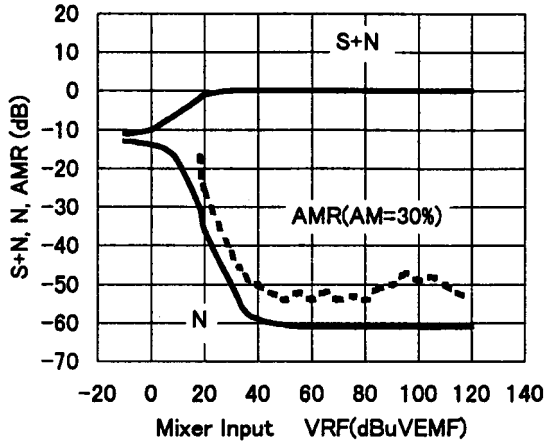
## ■ TERMINAL FUNCTION

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

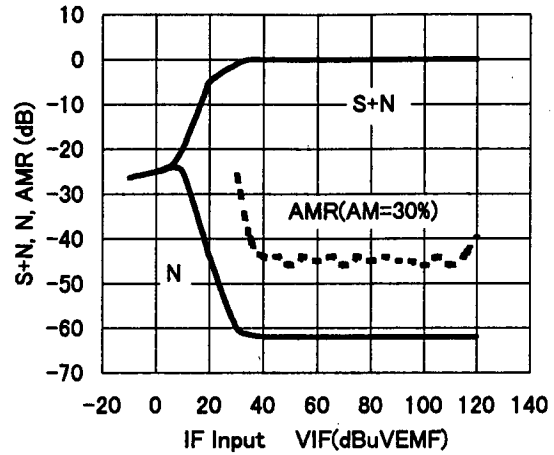
**S+N, N, AMR vs. Mixer Input**

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



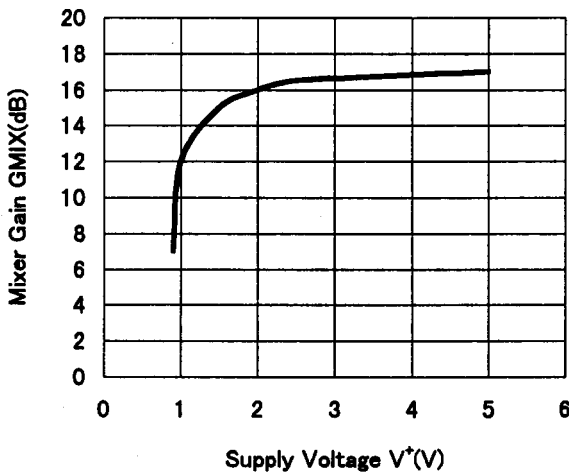
**S+N, N, AMR vs. IF Input**

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



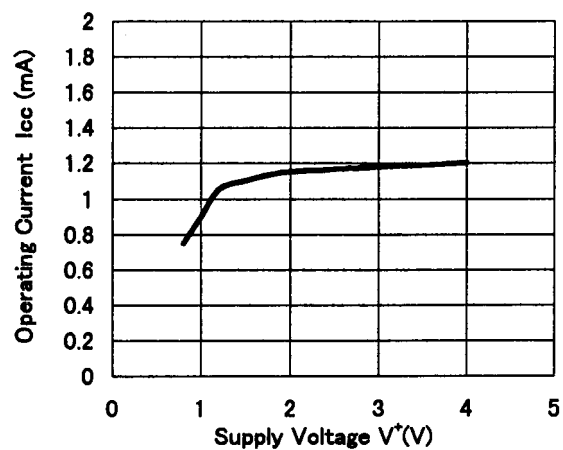
**Mixer Gain vs. Supply Voltage**

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



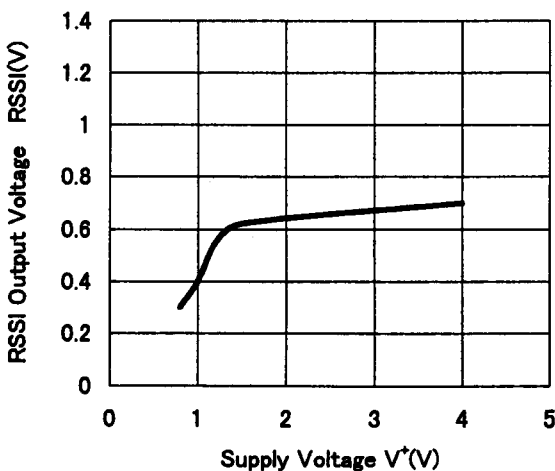
**Operating Current vs. Supply Voltage**

(No Signal)



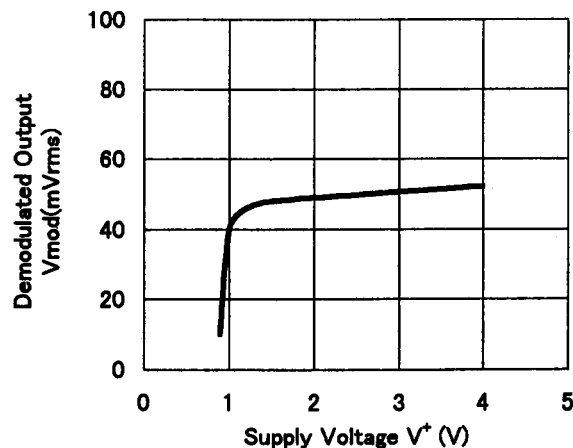
**RSSI vs. Supply Voltage**

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



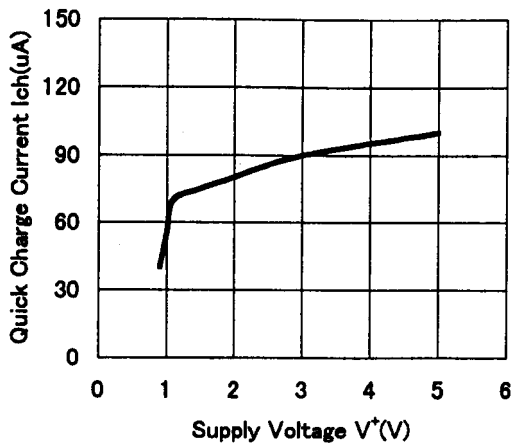
**Demodulated Output vs. Supply Voltage**

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

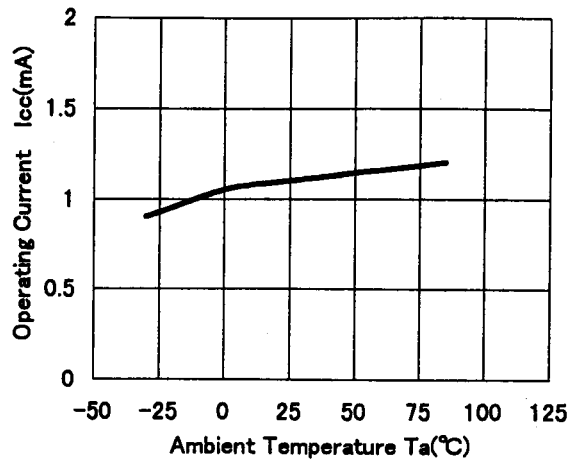


## ■ TYPICAL CHARACTERISTICS

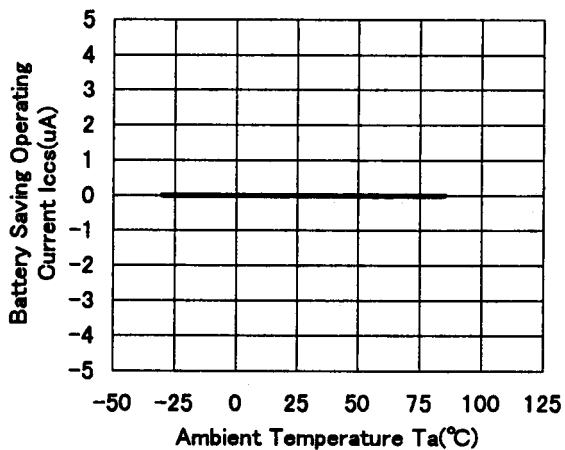
**Quick Charge Current vs. Supply Current**  
(12pin=0.18V)



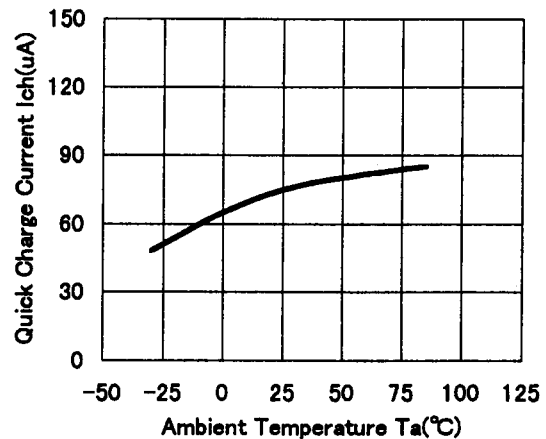
**Operating Current vs. Temperature**  
(V<sup>+</sup>=1.4V)



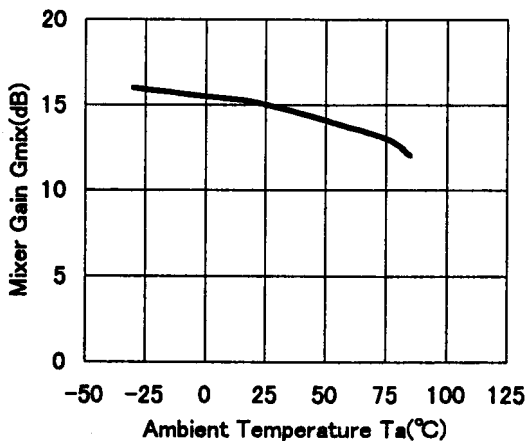
**Battery Saving Operating Current vs. Temperature**  
(V<sup>+</sup>=1.4V)



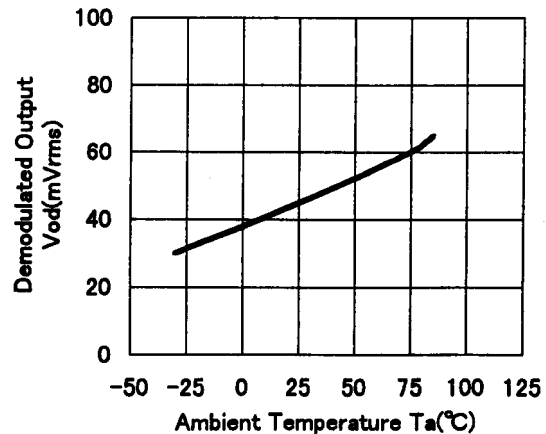
**Quick Charge Current vs. Temperature**  
(V<sup>+</sup>=1.4V, 12pin=0.18V)



**Mixer Gain vs. Temperature**  
(V<sup>+</sup>=1.4V, f<sub>RF</sub>=21.7MHz, V<sub>in</sub>=60dBμV)



**Demodulated Output vs. Temperature**  
(V<sup>+</sup>=1.4V, f<sub>IF</sub>=455kHz, V<sub>in</sub>=60dBμVEMF, f<sub>mod</sub>=600Hz)

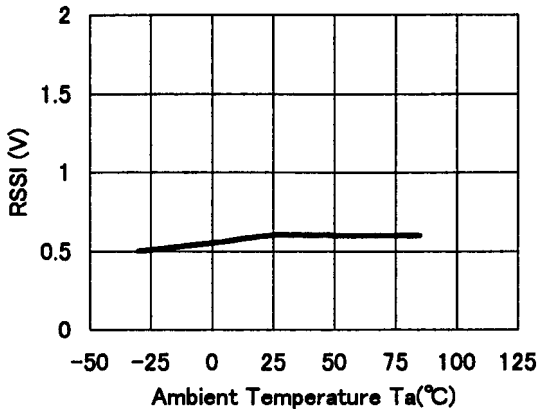




## ■ TYPICAL CHARACTERISTICS

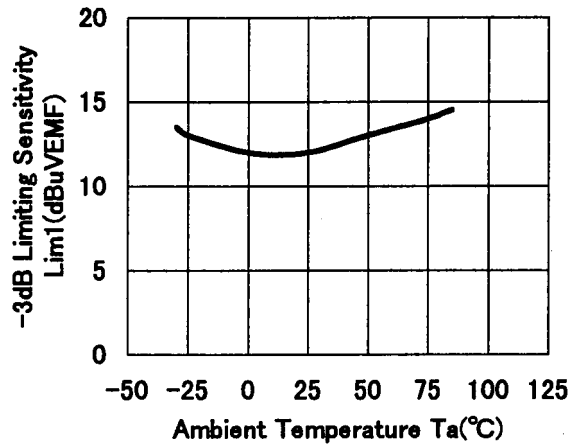
**RSSI vs. Temperature**

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



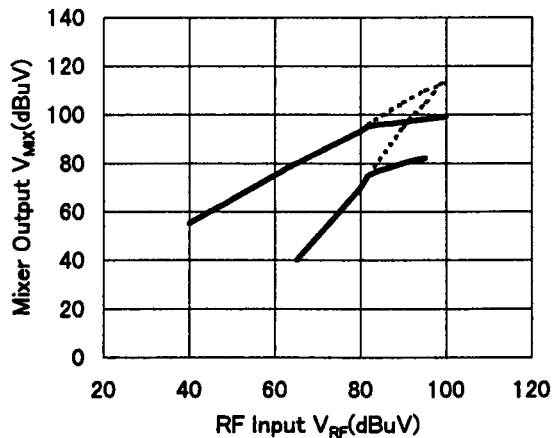
**-3dB Limiting Sensitivity vs. Temperature**

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



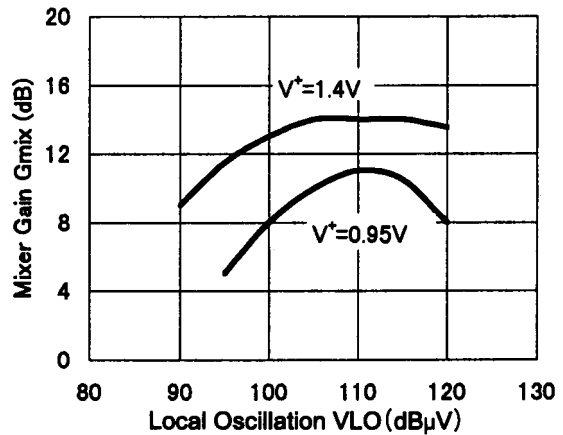
**Mixer Output vs. RF Input**

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



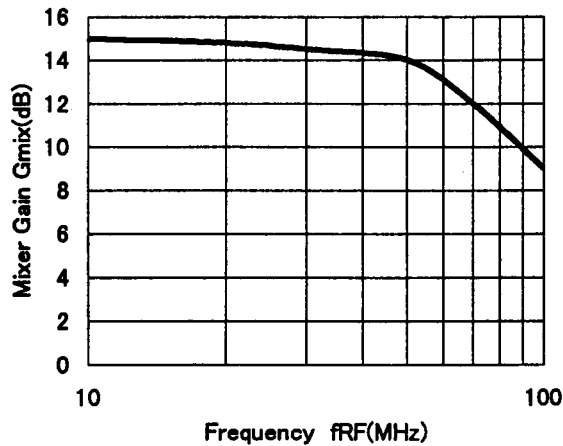
**Mixer Gain vs. Local Oscillation**

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



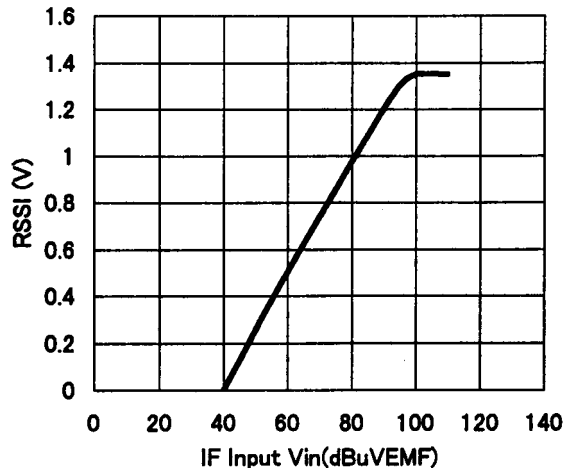
**Mixer Gain vs. Frequency**

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



**RSSI vs. IF Input**

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



[CAUTION]

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