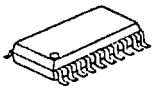
FM IF IC FOR PAGERS

■ 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

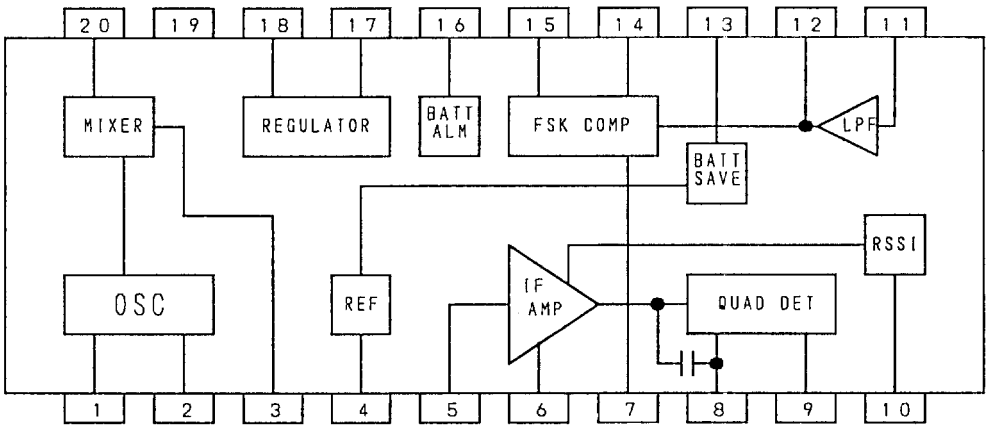


NJM2537V

■ FEATURES

- Low Operating Voltage — 1.1～4.0V
- Low Operating Current — 1.2mA typ. at V^+=1.4V
- RF Input Frequency — 10～50MHz
- 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

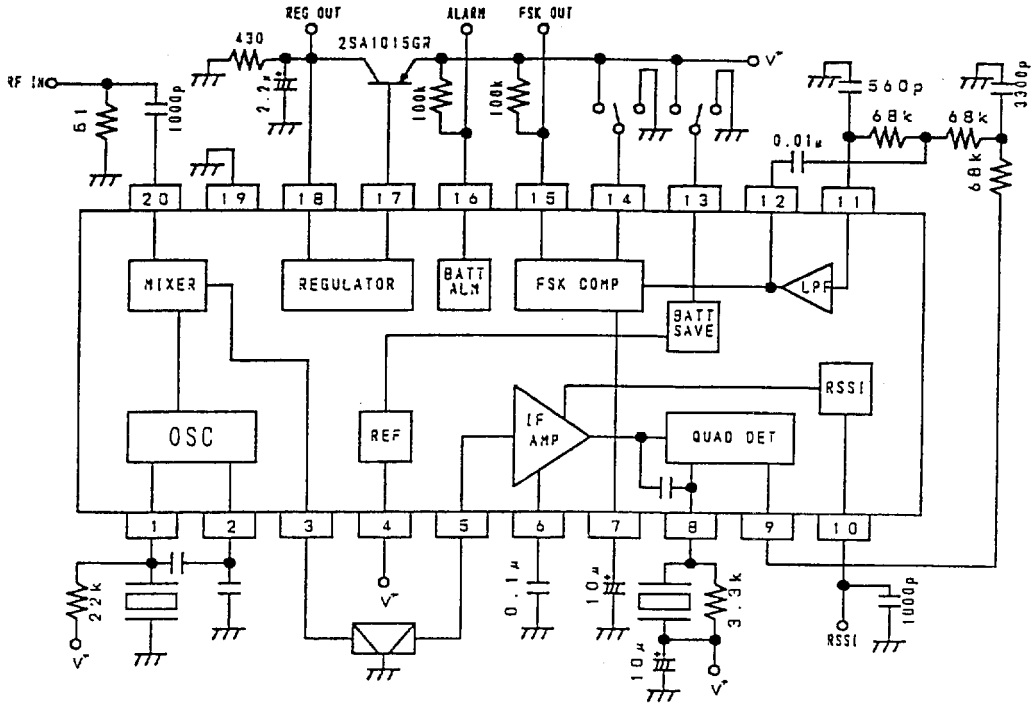
■ MAXIMUM ABSOLUTE RATING (Ta=25℃)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V_{CC}	4.0	V
Power Dissipation	P_D	300	mW
Operating Temperature Range	Topr	-30～+85	℃
Storange Temperature Range	Tstg	-40～+125	℃

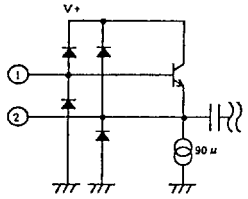
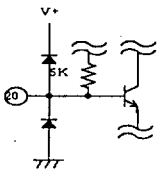
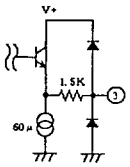
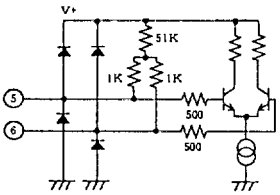
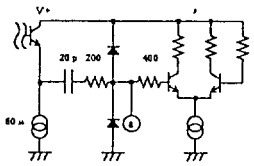
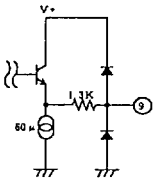
■ ELECTRICAL CHARACTERISTICS (V^+=1.4V, fc=21.7MHz, fIF=455kHz, fmod=600Hz, fdev=±4kHz, Ta=25℃)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
No Signal Operating Current	Iccq		-	1.2	1.5	mA
Battery Saving Operating Current	Iccs		-	0	5	μA
Mixer Gain	GMIX	After Ceramic Filter	11	14.5	18	dB
Mixer Intercept Point	IP		-	103	-	dBμVEMF
Mixer Input Resistance	RinMIX		-	5	-	kΩ
Mixer Output Resistance	RoMIX		-	2	-	kΩ
IF Amplifier Input Resistance	RinIF		-	2	-	kΩ
S/N 1	S/N1	MIXER Input, Vi=60dBμVEMF	-	63	-	dB
S/N 2	S/N2	IF Input, Vi=60dBμVEMF	-	63	-	dB
S/N 3	S/N3	IF Input, Vi=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, Vi=60dBμVEMF	30	46	65	mVrms
AM Rejection Ratio	AMR	IF Input, Vi=60dBμVEMF, AM=30%	-	50	-	dB
Duty Ratio at Wave Shaped Output	DR	IF Input, Vi=60dBμVEMF	40	50	60	%
RSSI Output Voltage	Vrssi	IF Input, Vi=65dBμVEMF	0.48	0.62	0.76	V
RSSI Output Resistance	Rrssi		-	62	-	kΩ
Quick Charge/ Discharge Current	Ich	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

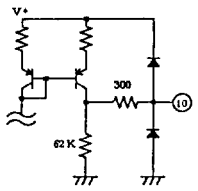
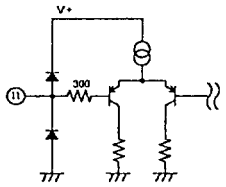
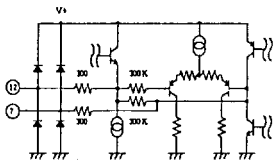
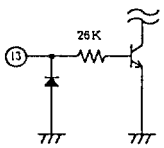
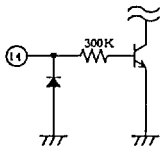
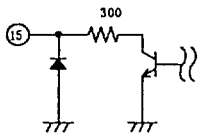
■ APPLICATION CIRCUIT



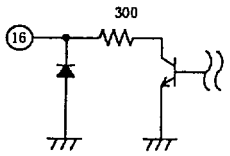
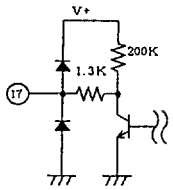
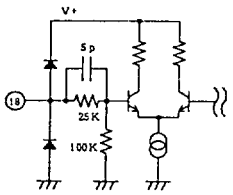
■ TERMINAL FUNCTION

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

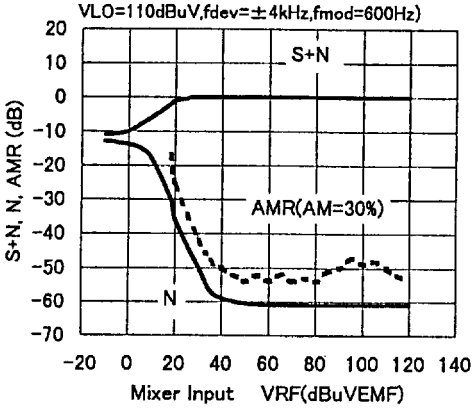
PIN NO.	SYMBOL	PIN VOLTAGE (V)	FUNCTION	EQUIVALENT CIRCUIT
10	RSSI	0	RSSI output.	
11	LPF IN	0.18	Input of a low pass filter. It is biased from AF-OUT (9pin) through an external RC filter.	
12	LPF OUT	0.18	Output of a low pass filter.	
7	FSK REF	0.18	Reference input of a wave shaping comparator. An external 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.	

■ TERMINAL FUNCTION

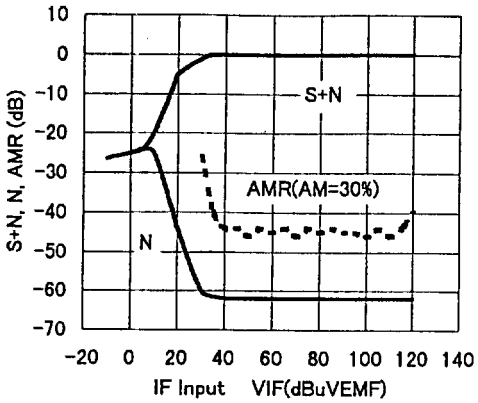
PIN NO.	SYMBOL	PIN VOLTAGE (V)	FUNCTION	EQUIVALENT CIRCUIT
16	VALM	0.1	Output of the alarm signal. When V^+ drops down to 1.1V, this output becomes high.	
17	REG CONT	0.6	Control of an external PNP transistor used for the regulator.	
18	REG OUT	1.0	Monitoring of the regulator.	
4	V^+	—	Power Supply.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

■ TYPICAL CHARACTERISTICS

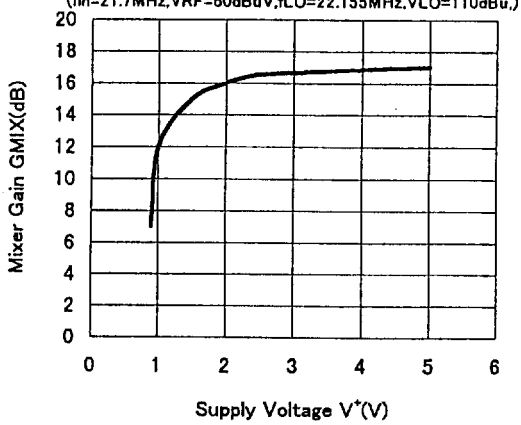
S+N, N, AMR vs. Mixer Input
(V+=1.4V,fRF=21.7MHz,fLO=22.155MHz,
VLO=110dBuV,fdev=±4kHz,fmod=600Hz)



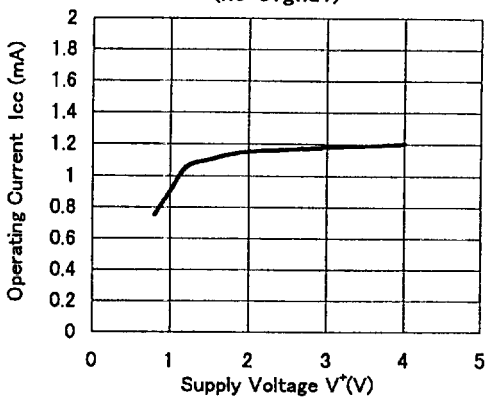
S+N, N, AMR vs. IF Input
(V+=1.4V,fIF=455kHz,fdev=±4kHz,fmod=600Hz)



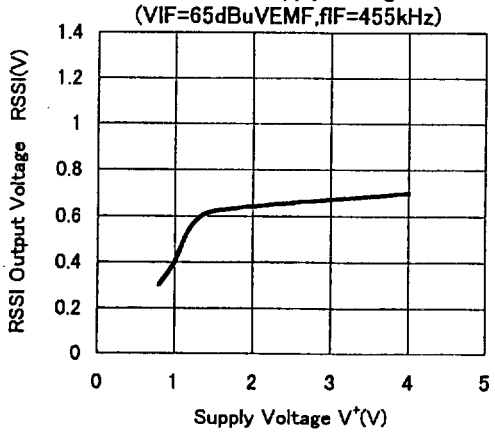
Mixer Gain vs. Supply Voltage
(fin=21.7MHz,VRF=60dBuV,fLO=22.155MHz,VLO=110dBu,)



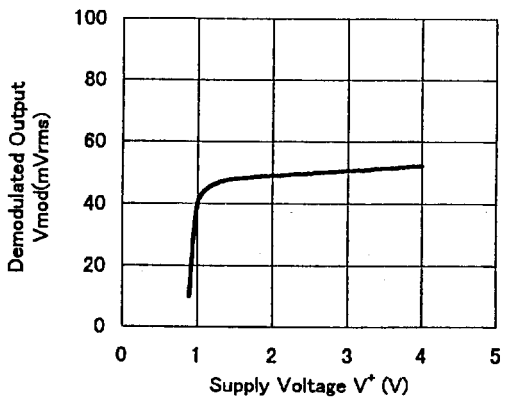
Operating Current vs. Supply Voltage
(No Signal)



RSSI vs. Supply Voltage
(VIF=65dBuVEMF,fIF=455kHz)

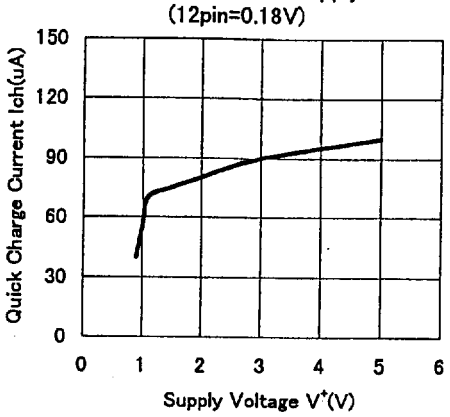


Demodulated Output vs. SupplyVoltage
(Vin=60dBuVEMF,fIF=455kHz,fmod=600Hz)

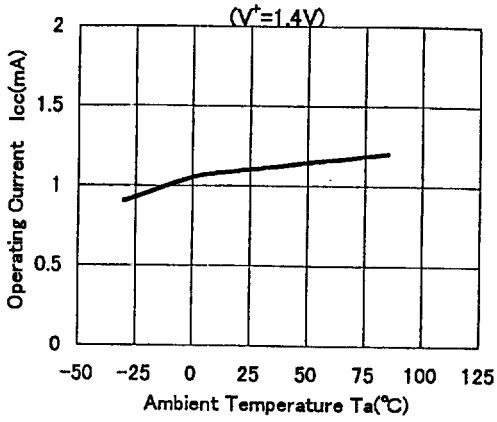


■ TYPICAL CHARACTERISTICS

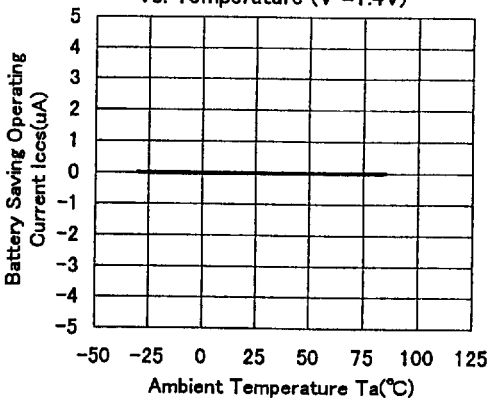
Quick Charge Current vs. Supply Current
(12pin=0.18V)



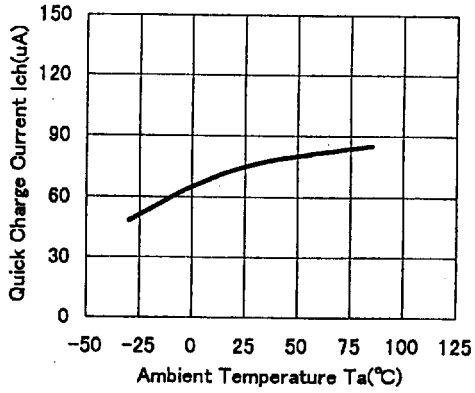
Operating Current vs. Temperature
(V^+=1.4V)



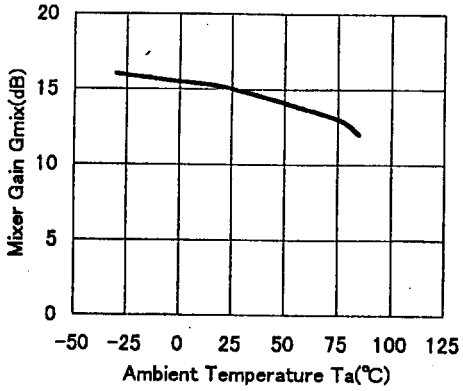
Battery Saving Operating Current
vs. Temperature (V^+=1.4V)



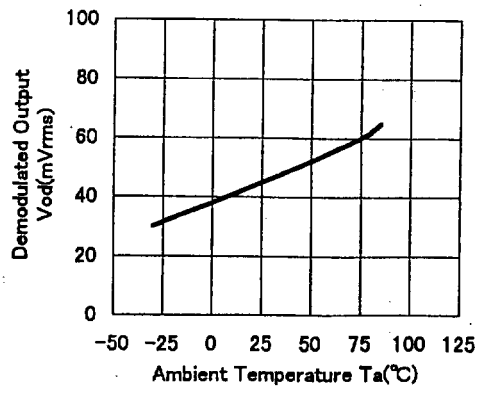
Quick Charge Current vs. Temperature
(V^+=1.4V,12pin=0.18V)



Mixer Gain vs. Temperature
(V^+=1.4V,fRF=21.7MHz,Vin=60dBuV)

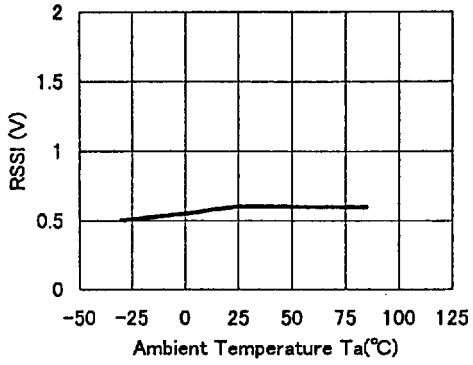


Demodulated Output vs. Temperature
(V^+=1.4V,fIF=455kHz,Vin=60dBuVEMF,fmod=600Hz)

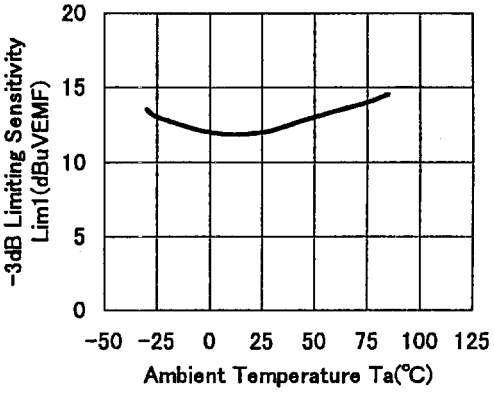


■ TYPICAL CHARACTERISTICS

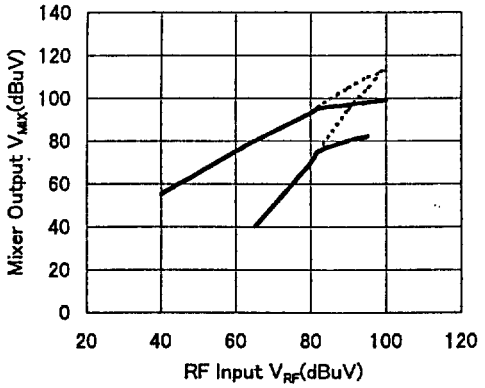
RSSI vs. Temperature
(V+=1.4V,fRF=21.7MHz,VRF=50dBuVEMF,
fLO=22.155MHz,VLO=110dBuV,mod=OFF)



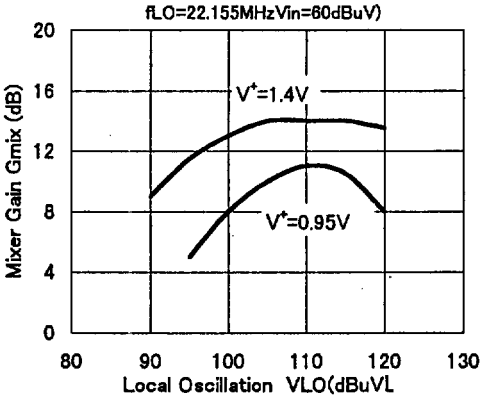
-3dB Limiting Sensitivity vs. Temperature
(V+=1.4V,Mixer input,fRF=21.7MHz,fmod=600Hz)



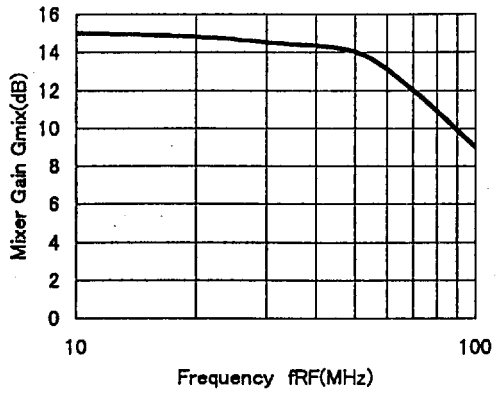
Mixer Output vs. RF Input
(V+=1.4V,fRF=21.7MHz,fLO=22.155MHz,VLO=110dBuV)



Mixer Gain vs. Local Oscillation
(V+=1.4V,fRF=21.7MHz,VRF=60dBuV,
fLO=22.155MHzVin=60dBuV)



Mixer Gain vs. Frequency
(V+=1.4V,VRF=60dBuV,VLO=110dBuV,fLO=fRF+455kHz)



RSSI vs. IF Input
(V+=1.4V,fIF=455kHz)