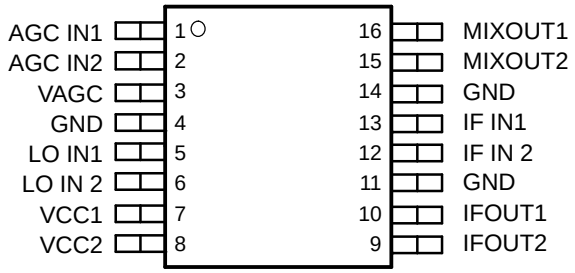
FEATURES

- **RF AGC Amplifier, Mixer, and IF Amplifier Circuits**
- **Low Distortion**
- **5-V Power Supply**
- **16-Pin TSSOP Package**

APPLICATION

- **CATV**

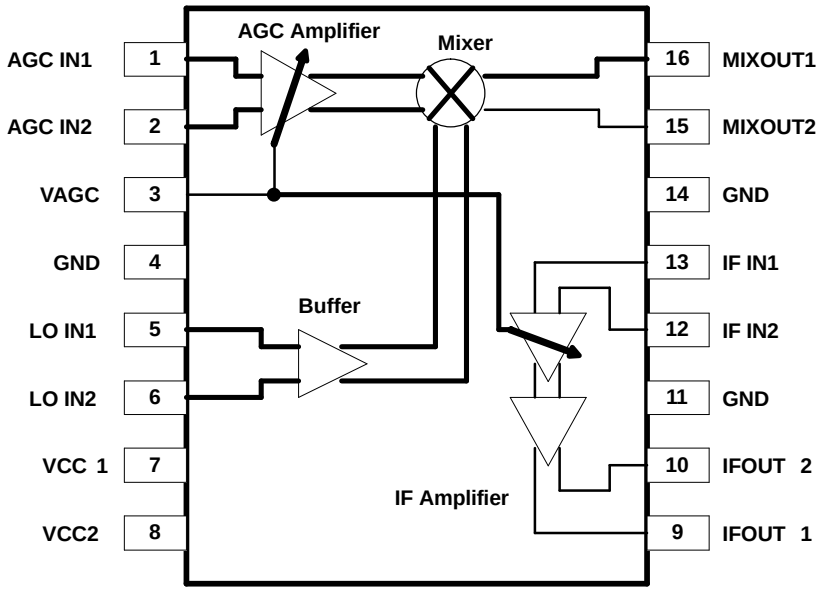
16-PIN TSSOP
(TOP VIEW)



DESCRIPTION

The SN761688 is a monolithic IC designed as an out-of-band tuner for CATV. The circuit consists of an RF AGC amplifier, mixer, and IF amplifier, and is available in a small-outline package.

FUNCTIONAL BLOCK DIAGRAM



This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

TERMINAL FUNCTIONS

TERMINAL NAME	TERMINAL NO.	DESCRIPTION	SCHEMATIC
AGC IN1	1	Input of AGC amplifier	Figure 1
AGC IN2	2		
VAGC	3	Input of gain control voltage	Figure 2
GND	4, 11, 14	Ground	
LO IN1	5	Input of local OSC	Figure 3
LO IN2	6		
VCC1	7	5 V power supply; AGC/Mixer/Buffer	
VCC2	8	5 V power supply; IF amplifier	
IF OUT1	9	Output of IF amplifier	Figure 4
IF OUT2	10		
IF IN2	12	Input of IF amplifier	Figure 5
IF IN1	13		
MIXOUT2	15	Output of Mixer	Figure 6
MIXOUT1	16		

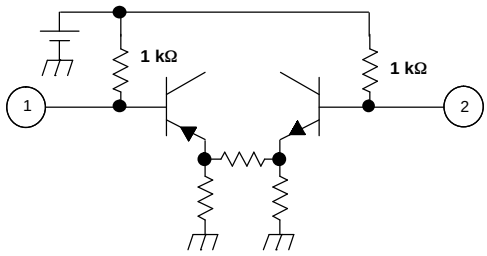


Figure 1.

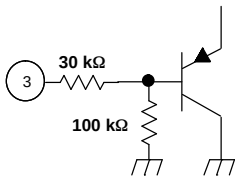


Figure 2.

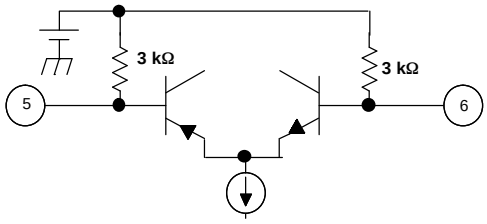


Figure 3.

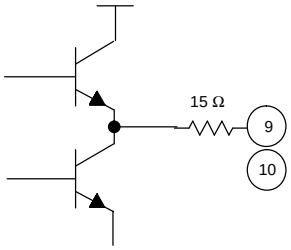


Figure 4.

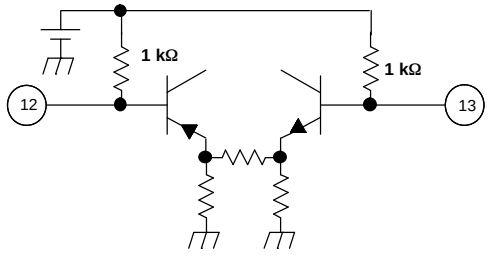


Figure 5.

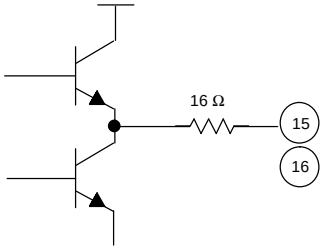


Figure 6.

ABSOLUTE MAXIMUM RATINGS

over operating free-air temperature range (unless otherwise noted) (1)

Supply voltage, V_{CC} (2)	VCC1,2 (Pin 7, 8)	–0.4 V to 6.5 V
Input voltage (2)	V_{IN} (Pins 1, 2, 3, 5, 6, 12, 13)	–0.4 V to VCC
Continuous total dissipation, P_D (3)	$T_A \leq 25°C$	775 mW
Maximum junction temperature, T_J		150°C

(1) Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
(2) Voltage values are with respect to the GND of the circuit.
(3) Derating factor is 6.2 mW/°C for $T_A \geq 25°C$.

RECOMMENDED OPERATING CONDITIONS

over operating free-air temperature range (unless otherwise noted)

		MIN	NOM	MAX	UNIT
Supply voltage, V_{CC}		4.5	5	5.5	V
Operating free-air temperature, T_A		–20		85	°C

DC ELECTRICAL CHARACTERISTICS

V_{CC} = 5 V, T_A = 25°C, unless otherwise noted

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
I_{CC}	Supply current	No signal, V_{AGC} = 0 V		67		mA
I_{IAGC}	Input current (VAGC)	V_{AGC} = 3 V		22	33	µA
V_{AGCMAX}	AGC voltage high at maximum gain		3		V_{CC}	V
V_{AGCMIN}	AGC voltage low at minimum gain		0		0.5	V

AC ELECTRICAL CHARACTERISTICS

V_{CC} = 5 V, T_A = 25°C, unless otherwise noted

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
	AGC amplifier and mixer (1)					
GC_{MAX}	Maximum conversion gain	V_{AGC} = 3 V	27	30	33	dB
GC_{MIN}	Minimum conversion gain	V_{AGC} = 0 V	-21	-18	-15	dB
GCR_{MIX}	Gain control range	V_{AGC} = 0 V to 3 V		48		dB
V_{MIXOUT}	Mixer output voltage	V_{AGC} = 3 V, Single-ended output		117		dBµV
NF	Noise figure (2)	V_{AGC} = 3 V		10		dB
$IM3_{GMX}$	Third order intermodulation distortion	f_{IN1} = 79.5 MHz, f_{IN2} = 80.5 MHz, V_{OUT} = -10 dBm, V_{AGC} = 3 V		-60		dBc
$OIP3_{GMX}$	Output intercept point	f_{IN1} = 79.5 MHz, f_{IN2} = 80.5 MHz, V_{AGC} = 3 V		20		dBm
	IF amplifier (3)					
GV_{IFMAX}	Maximum voltage gain	V_{AGC} = 3 V		51		dB
GV_{IFMIN}	Minimum voltage gain	V_{AGC} = 0 V		46		dB
GVR_{IF}	Gain control range	V_{AGC} = 0 V to 3 V		5		dB
$IM3_{IF}$	Third order intermodulation distortion	f_{IN1} = 43.5 MHz, f_{IN2} = 445 MHz, V_{IFOUT} = 1 dBm, V_{AGC} = 3 V		-60		dBc
V_{IFOUT}	IF amplifier output voltage	V_{AGC} = 3 V, Single-ended output		122		dBµV

(1) Measurement Circuit 1 except for Noise Figure measurement. AGC IN = 80 MHz/-37 dBm, LO IN = 36 MHz / -20 dBm, IF = 44 MHz, unless otherwise noted.
(2) Measurement Circuit 2.
(3) Measurement Circuit 3. IF IN = 44 MHz / -50 dBm, unless otherwise noted.

APPLICATION INFORMATION

MEASUREMENT CIRCUITS

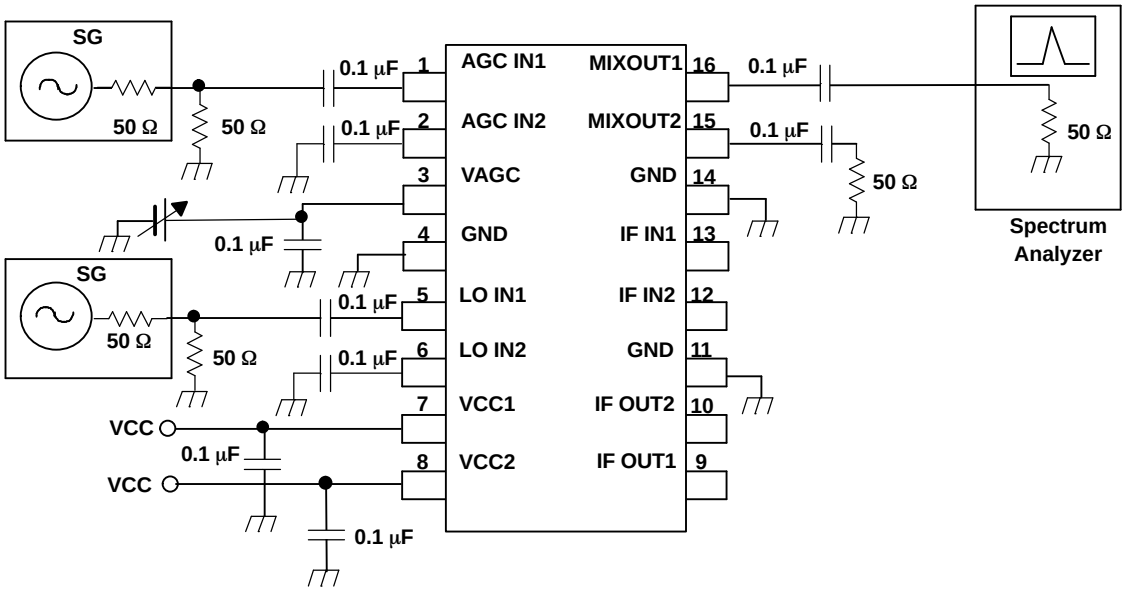


Figure 7. Measurement Circuit 1

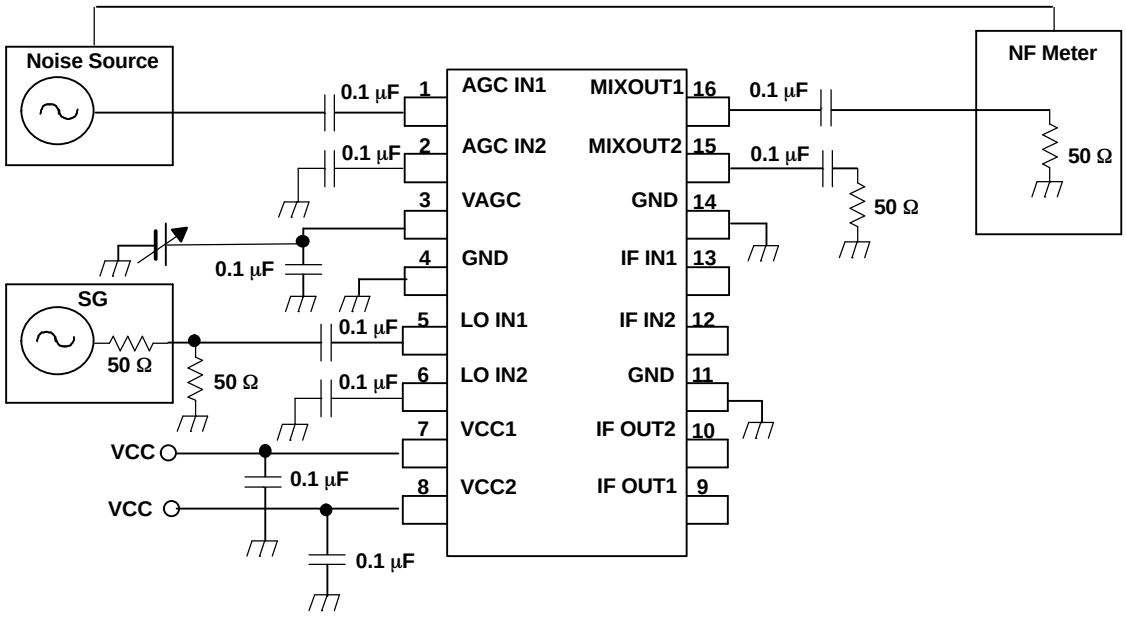


Figure 8. Measurement Circuit 2

APPLICATION INFORMATION (continued)

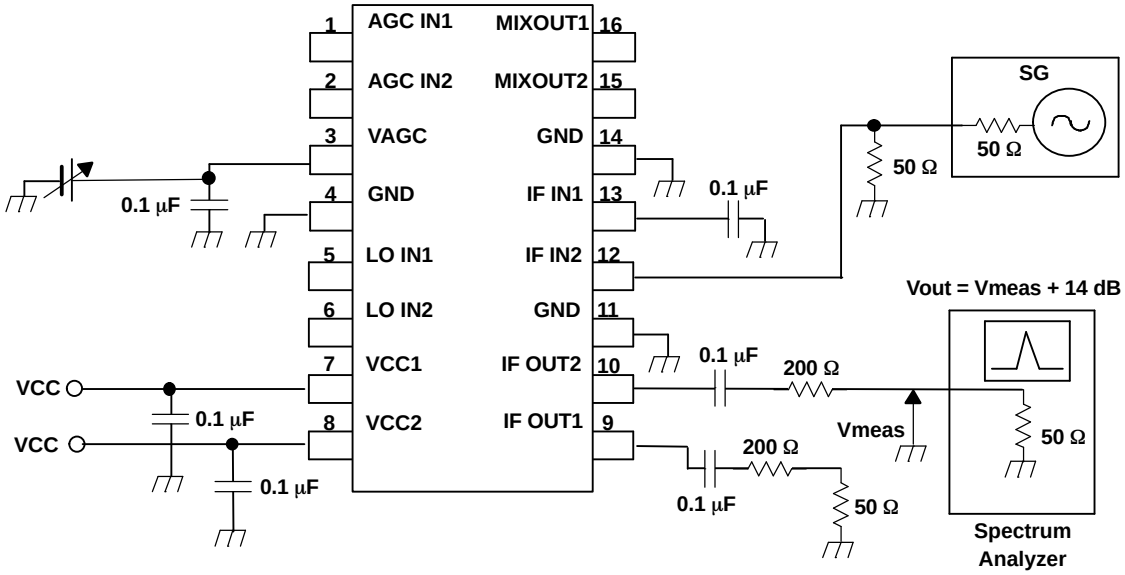


Figure 9. Measurement Circuit 3

NOTE:

This application information is advisory and a performance check is required at the actual application circuits.

Texas Instruments assumes no responsibility for the consequences of use of these application circuits, such as infringement of intellectual property rights or other rights, including patents, of third parties.

TYPICAL CHARACTERISTICS

Mixer Conversion Gain
vs
AGC Control Voltage

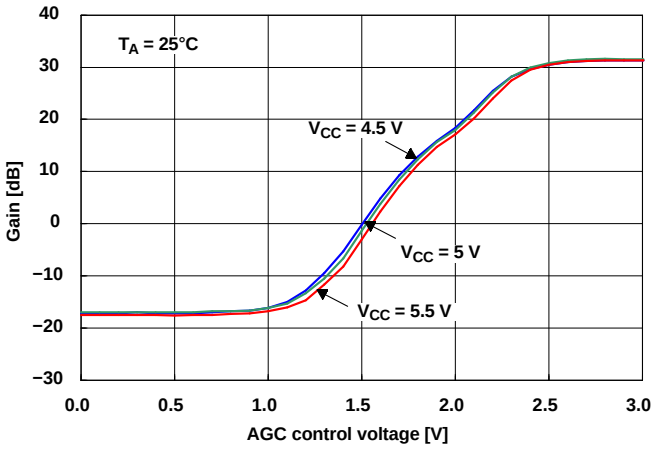


Figure 10.

Mixer Conversion Gain
vs
AGC Control Voltage

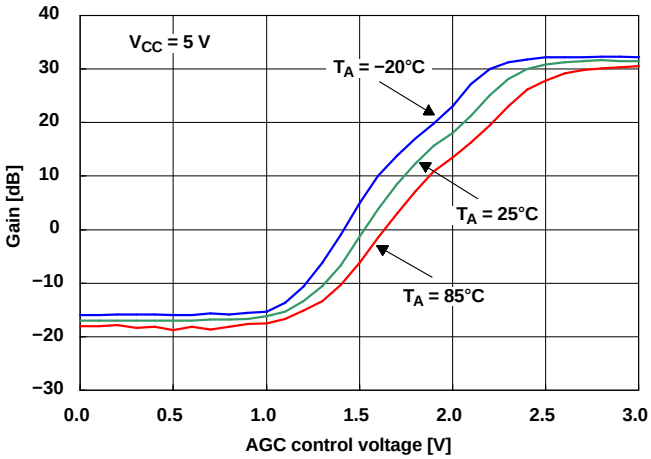


Figure 11.

Mixer Output Level
vs
AGC IN Input Level

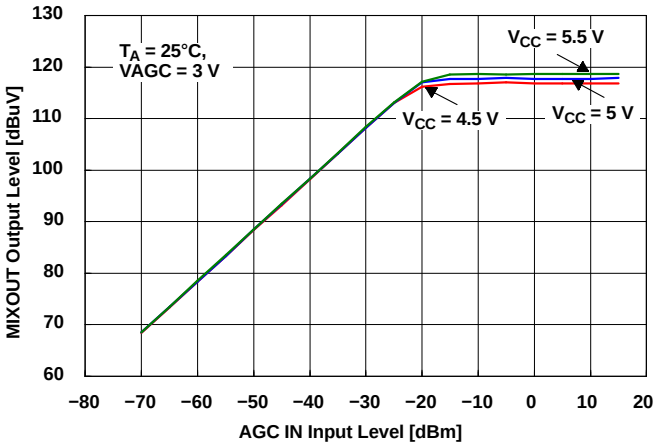


Figure 12.

Mixer Output Level
vs
LO IN Input Level

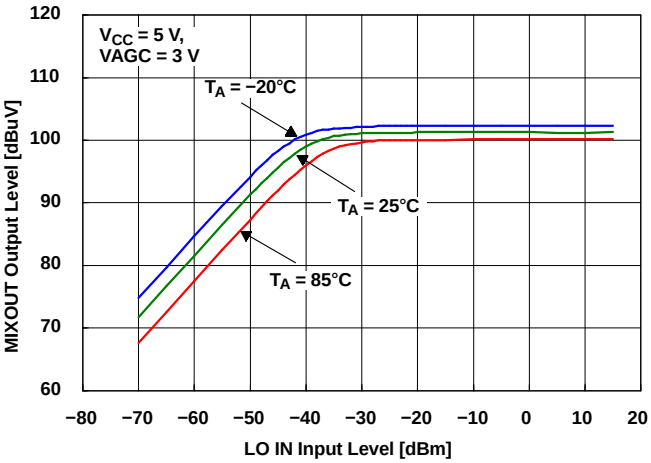


Figure 13.

TYPICAL CHARACTERISTICS (continued)

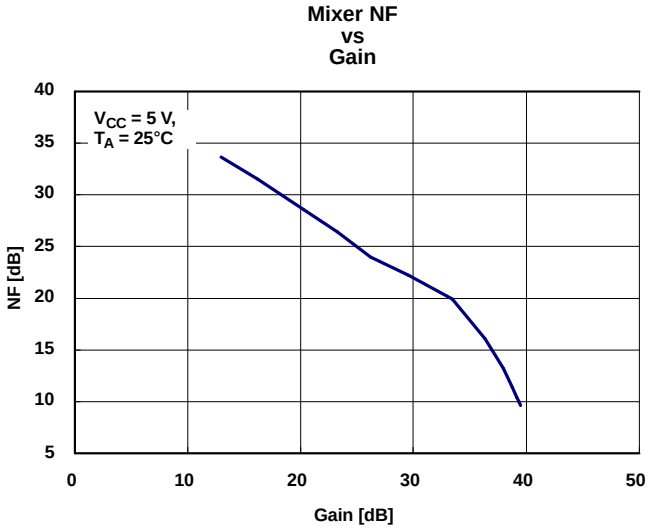
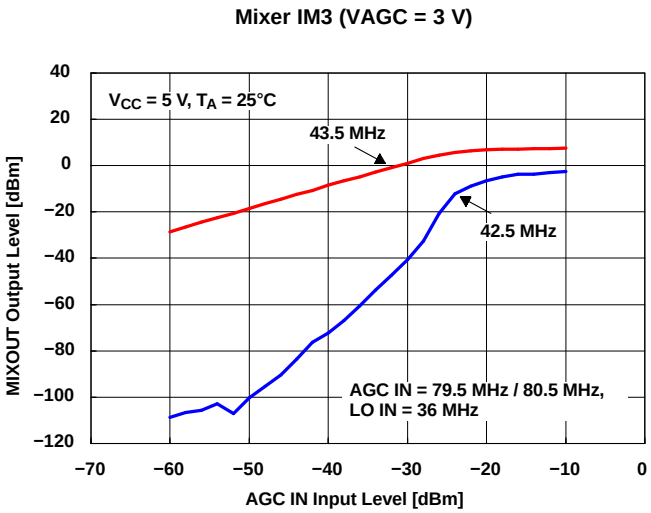


Figure 14.



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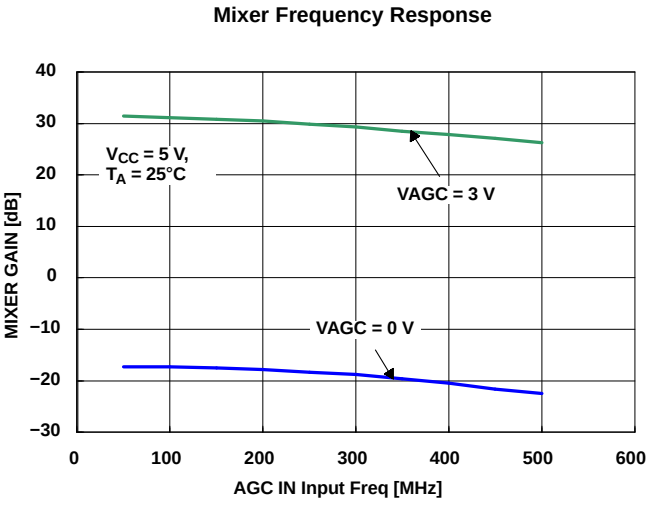


Figure 16.

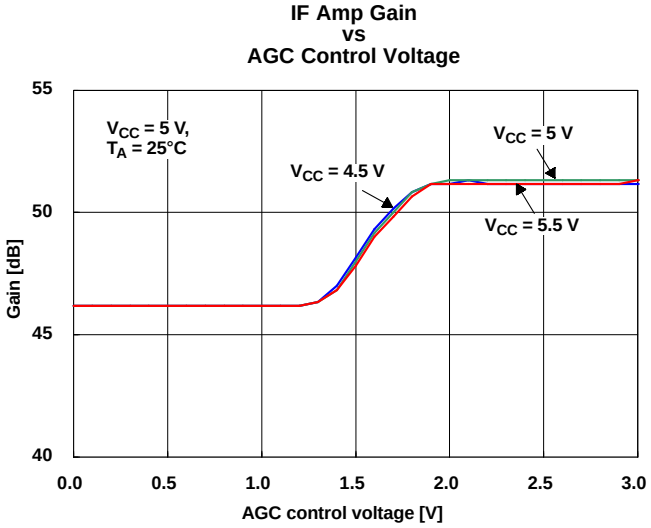


Figure 17.

TYPICAL CHARACTERISTICS (continued)

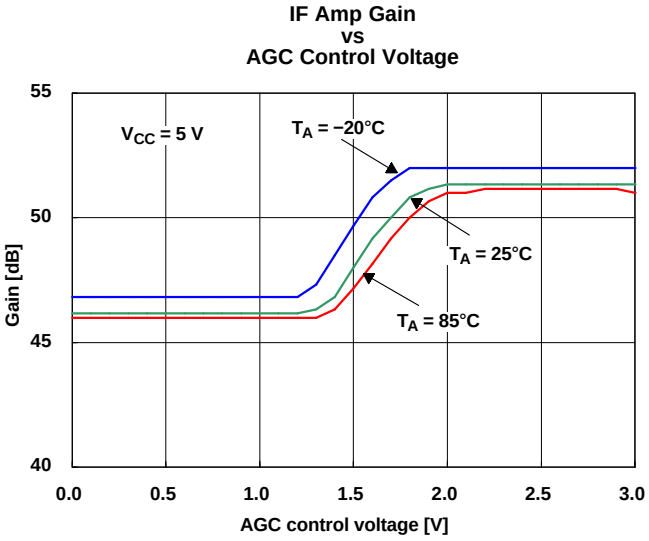


Figure 18.

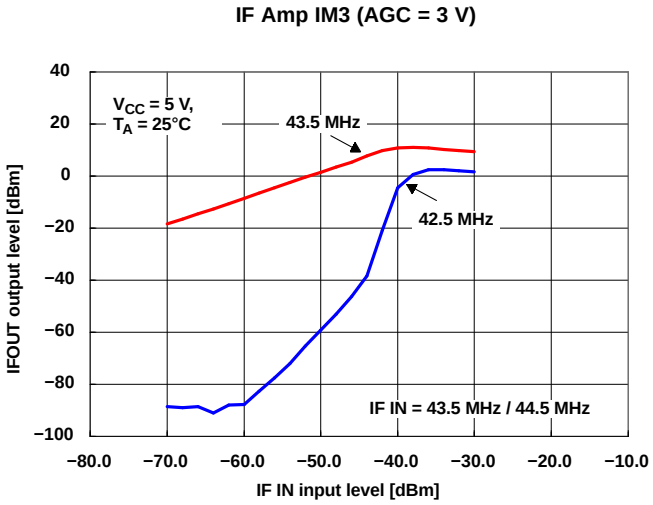


Figure 19.

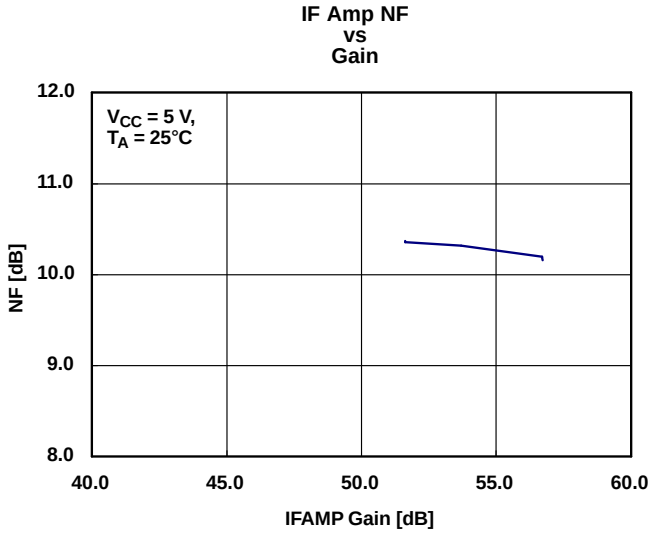


Figure 20.

TYPICAL CHARACTERISTICS (continued)

S-PARAMETER

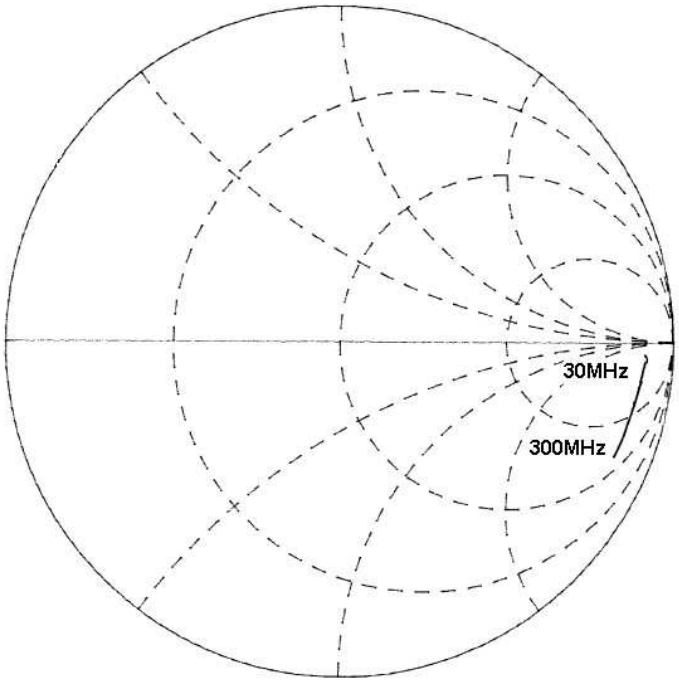


Figure 21. AGC IN

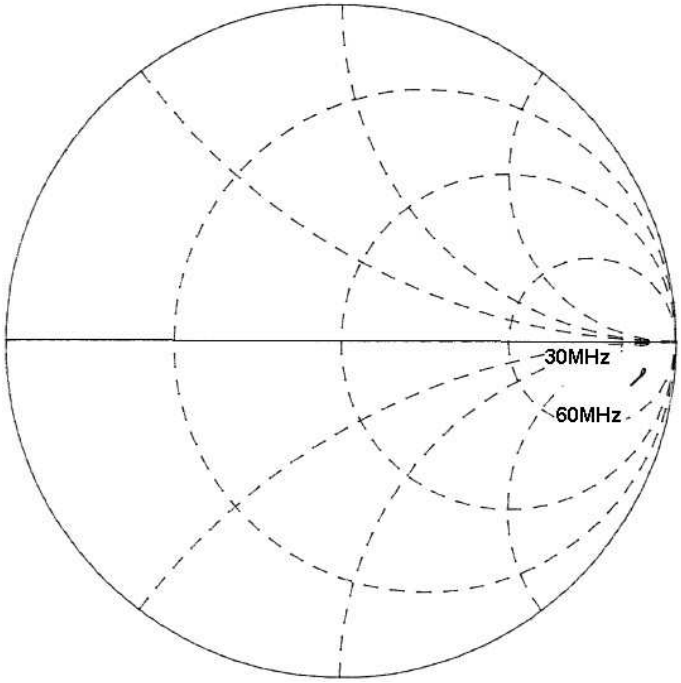


Figure 22. IF IN

TYPICAL CHARACTERISTICS (continued)

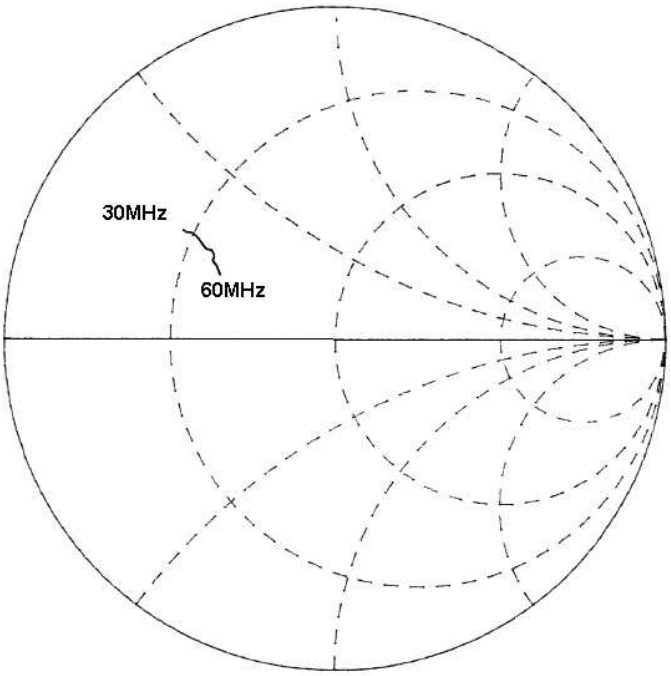


Figure 23. IF OUT

PACKAGING INFORMATION

Orderable Device	Status [1]	Package Type	Package Drawing	Pins	Package Qty	Eco Plan [2]	Lead/Ball Finish	MSL Peak Temp [3]
SN761688PW	ACTIVE	TSSOP	PW	16	90	TBD	Call TI	Call TI
SN761688PWR	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN761688PWRG4	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

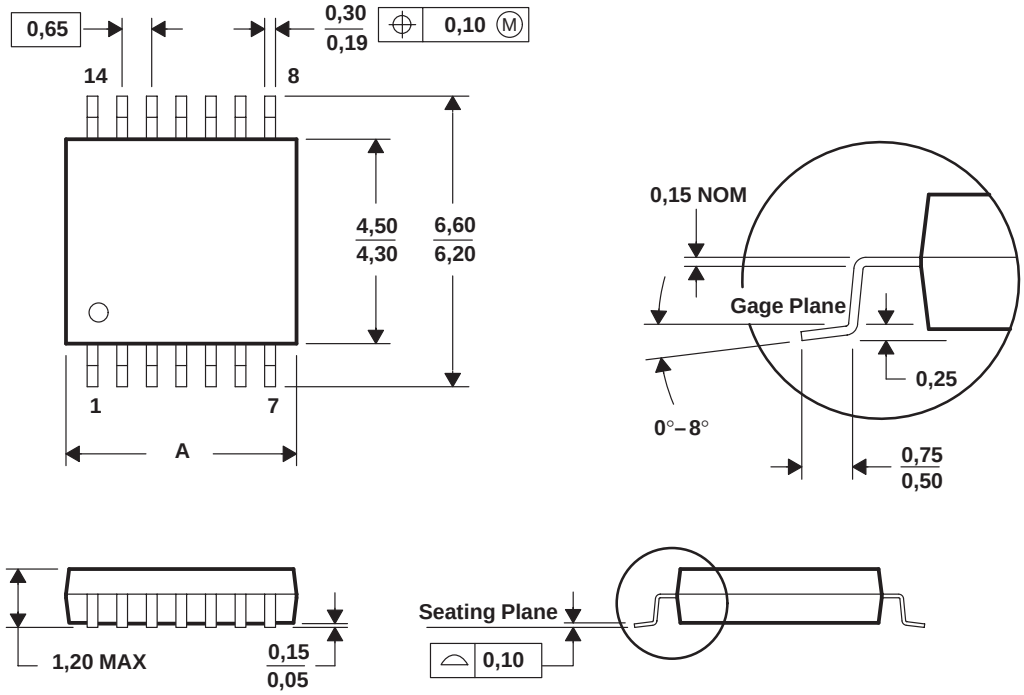
[1] The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
PREVIEW: Device has been announced but is not in production. Samples may or may not be available.
OBSOLETE: TI has discontinued the production of the device.

[2] Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
TBD: The Pb-Free/Green conversion plan has not been defined.
Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.
Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

[3] MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

PW (R-PDSO-G)** **PLASTIC SMALL-OUTLINE PACKAGE**

14 PINS SHOWN



DIM \ PINS **	8	14	16	20	24	28
A MAX	3,10	5,10	5,10	6,60	7,90	9,80
A MIN	2,90	4,90	4,90	6,40	7,70	9,60

4040064/F 01/97

NOTES: A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.
D. Falls within JEDEC MO-153

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