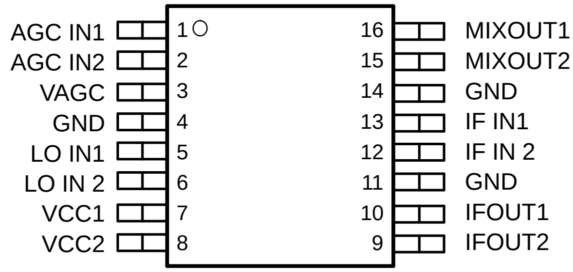
FEATURES

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

APPLICATION

- **CATV**

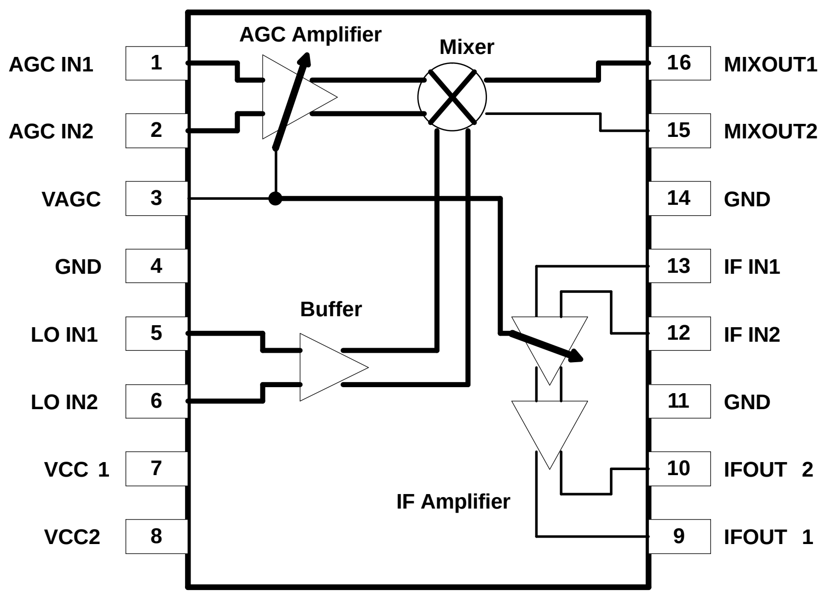
16-PIN TSSOP
(TOP VIEW)



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.

TERMINAL FUNCTIONS

TERMINAL NAME	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		

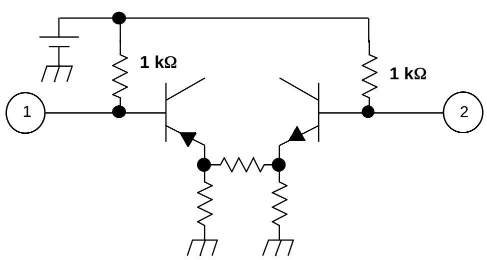


Figure 1.

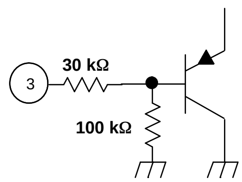


Figure 2.

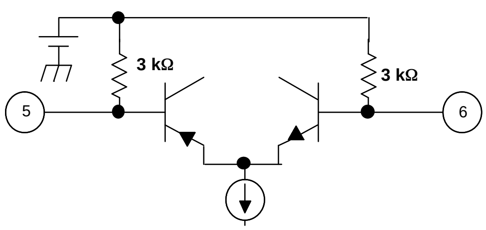


Figure 3.

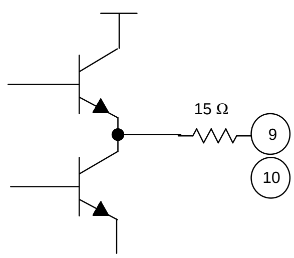


Figure 4.

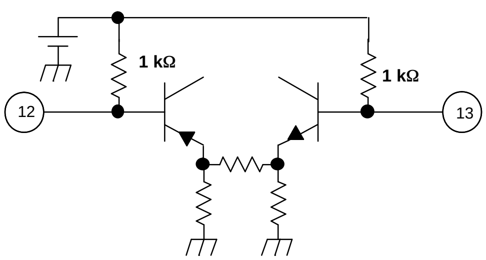


Figure 5.

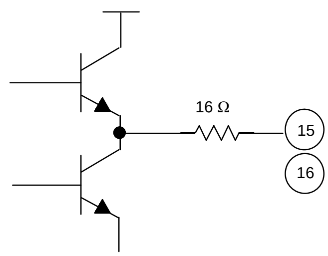


Figure 6.

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

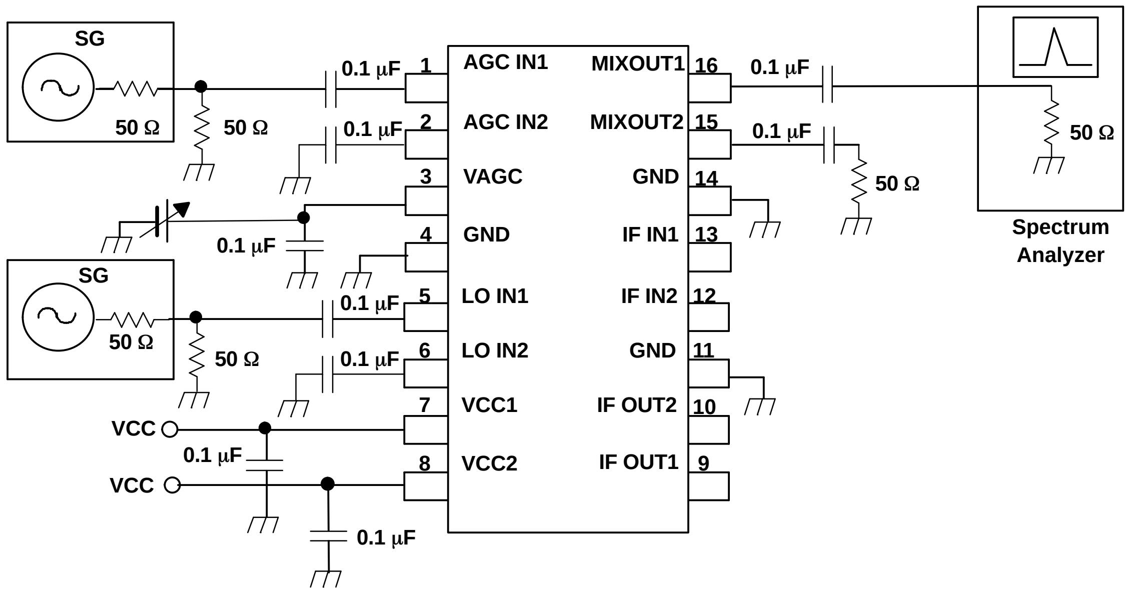


Figure 7. Measurement Circuit 1

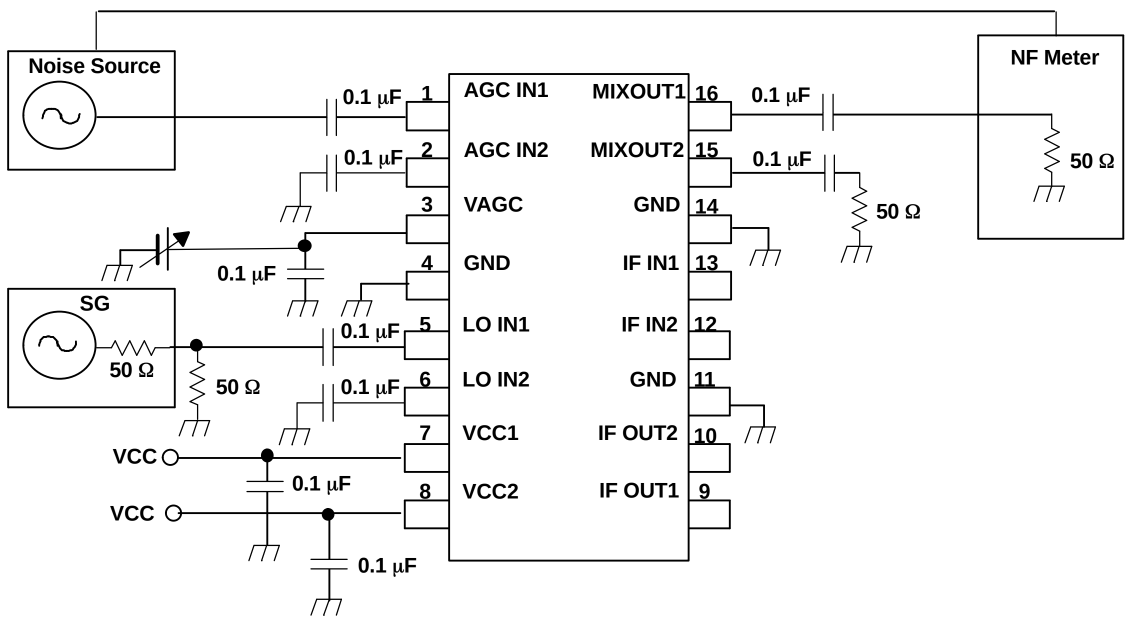


Figure 8. Measurement Circuit 2

APPLICATION INFORMATION (continued)

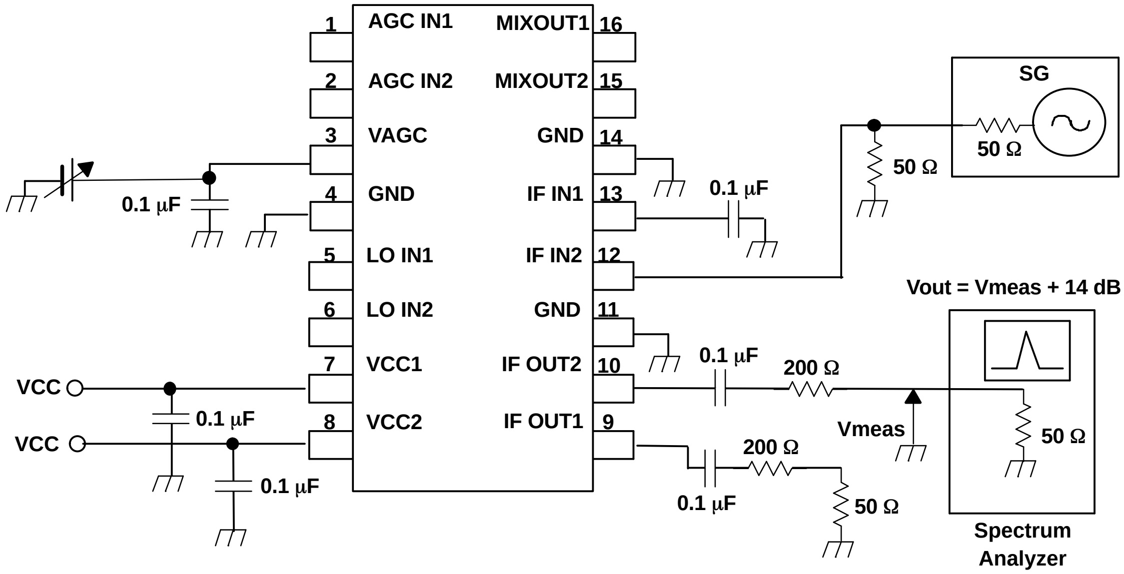


Figure 9. Measurement Circuit 3

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

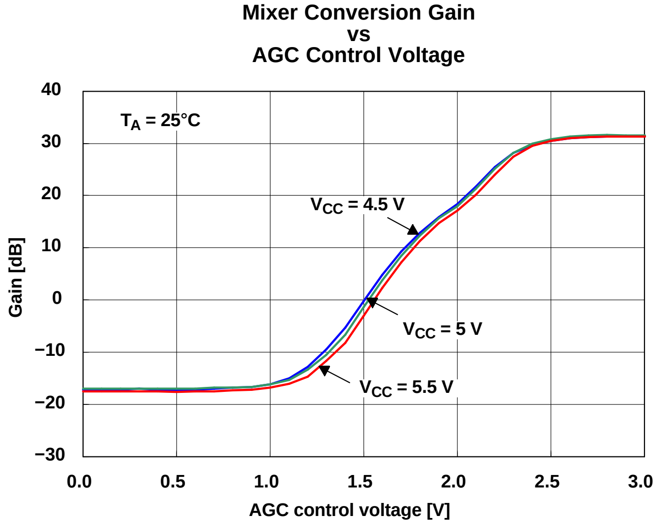


Figure 10.

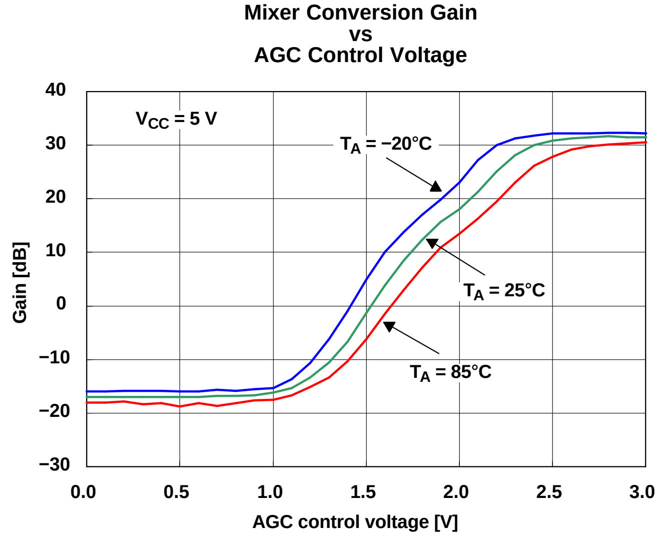


Figure 11.

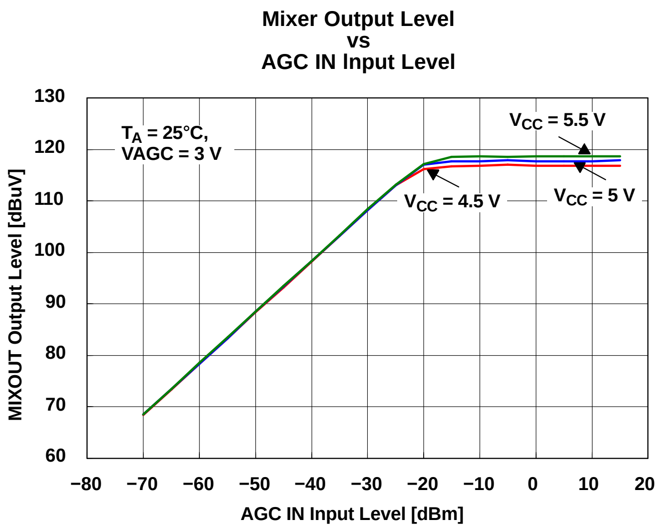


Figure 12.

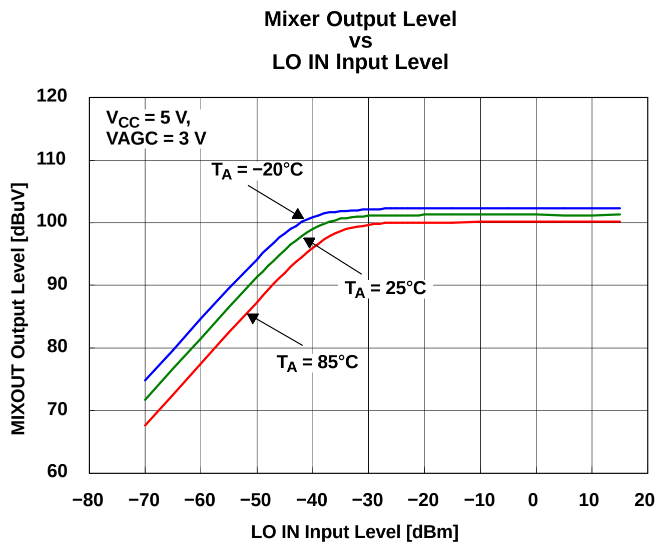


Figure 13.

TYPICAL CHARACTERISTICS (continued)

Mixer NF
vs
Gain

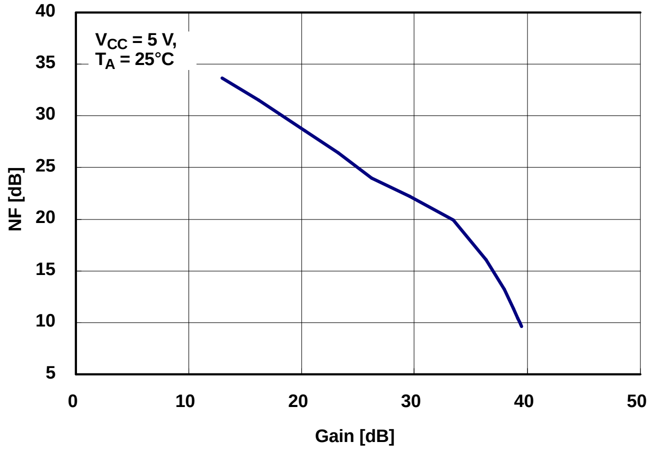


Figure 14.

Mixer IM3 (VAGC = 3 V)

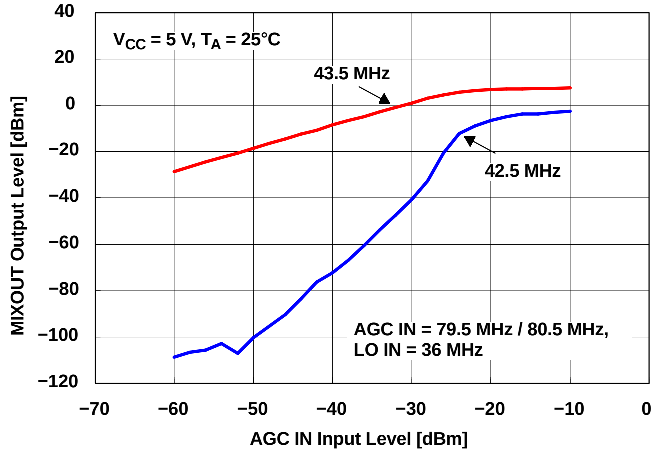


Figure 15.

Mixer Frequency Response

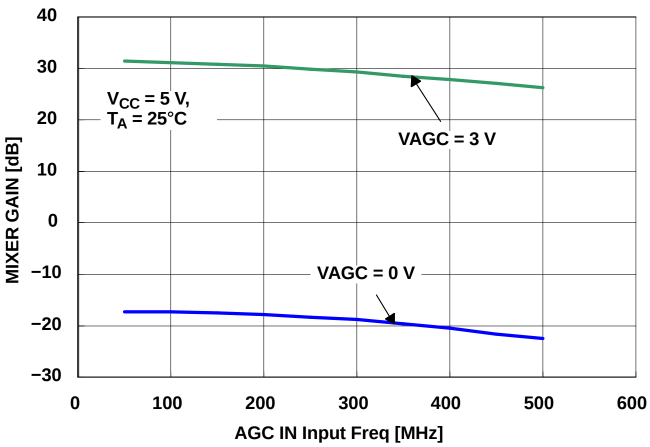


Figure 16.

IF Amp Gain
vs
AGC Control Voltage

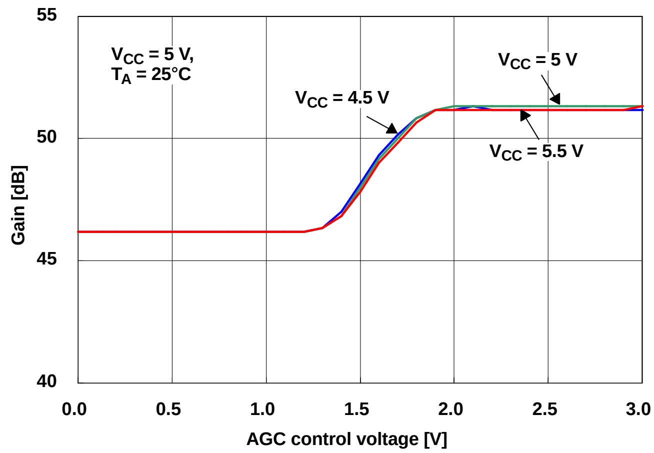


Figure 17.

TYPICAL CHARACTERISTICS (continued)

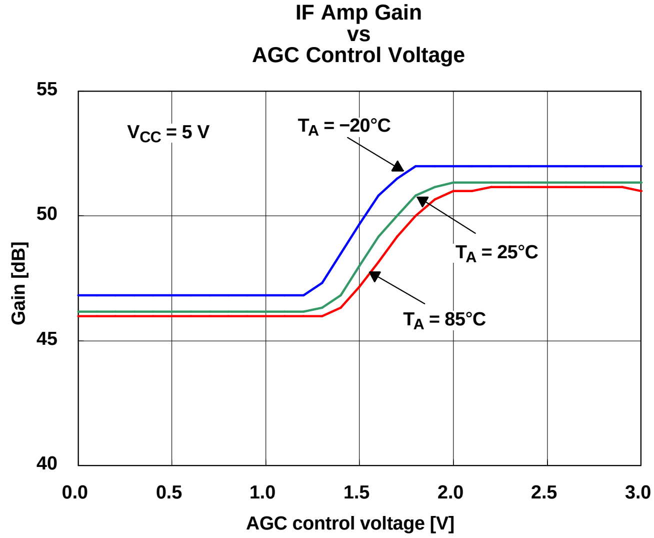
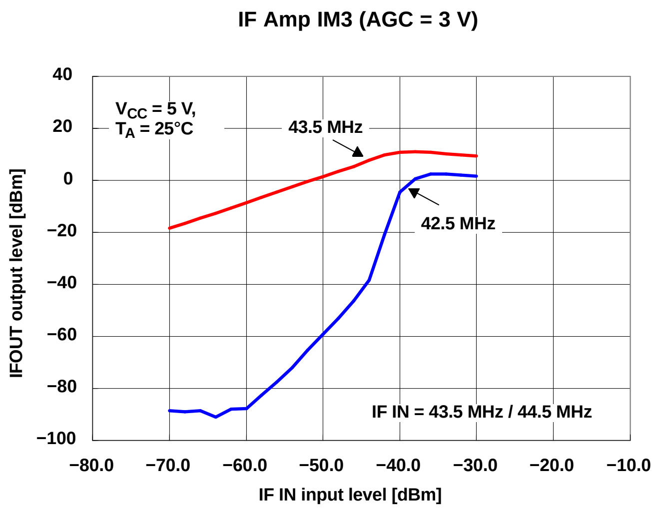


Figure 18.



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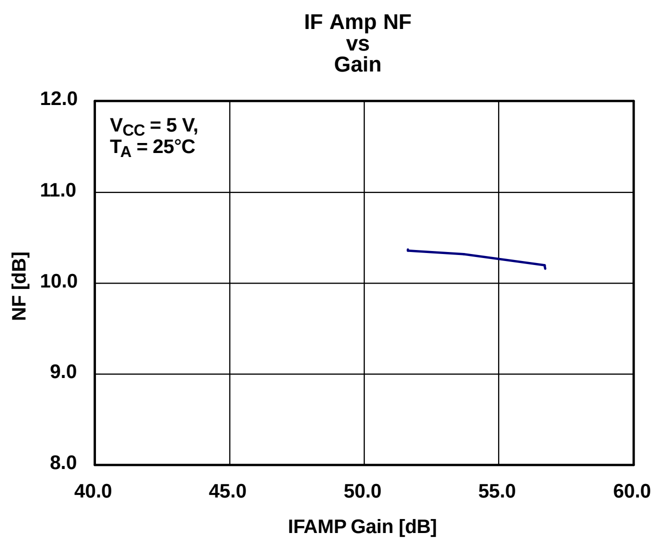

Figure 20.

TYPICAL CHARACTERISTICS (continued)

S-PARAMETER

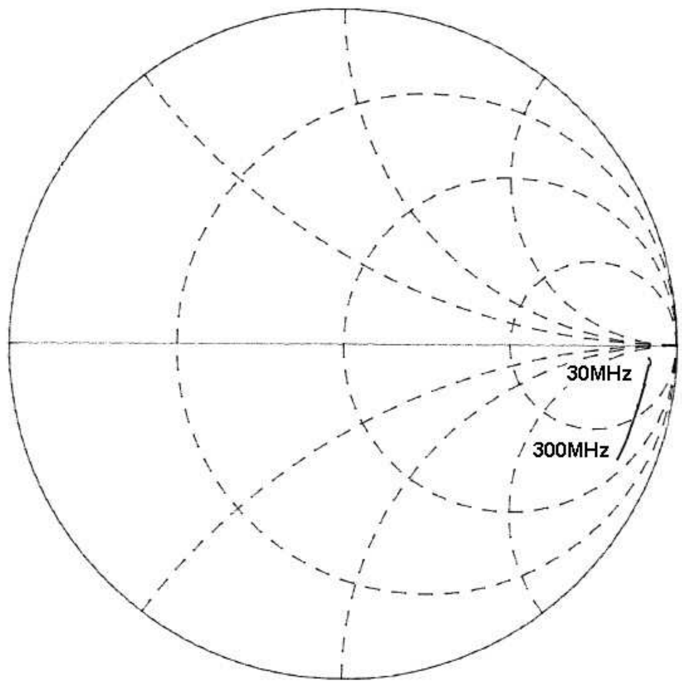

Figure 21. AGC IN

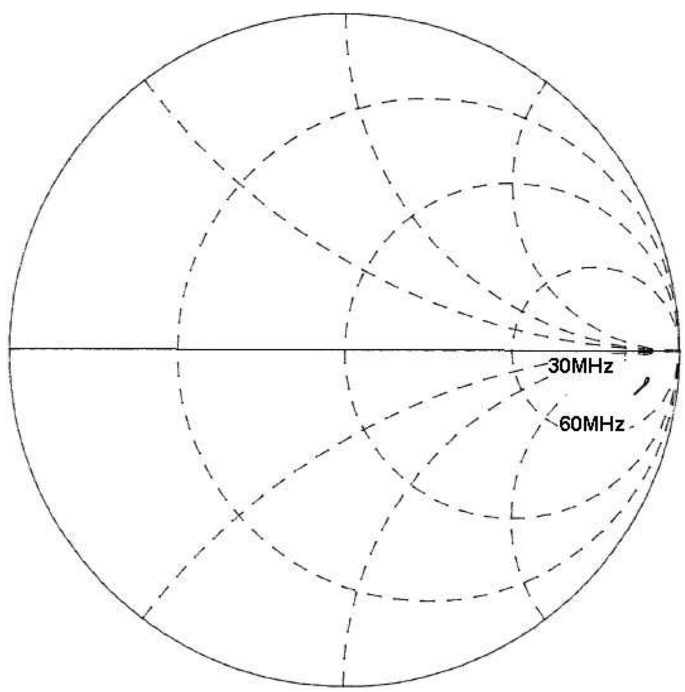

Figure 22. IF IN

TYPICAL CHARACTERISTICS (continued)

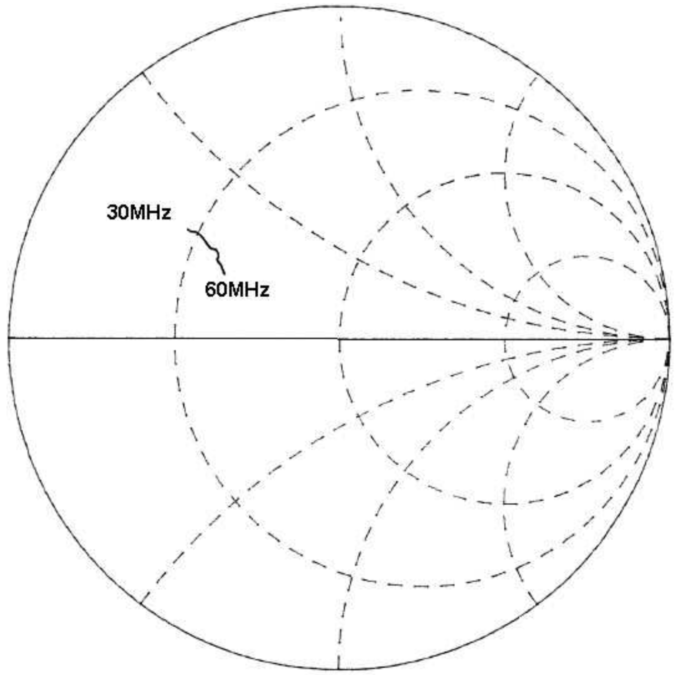

Figure 23. IF OUT

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/ Ball Finish	MSL Peak Temp (3)	Samples (Requires Login)
SN761688PW	ACTIVE	TSSOP	PW	16		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.

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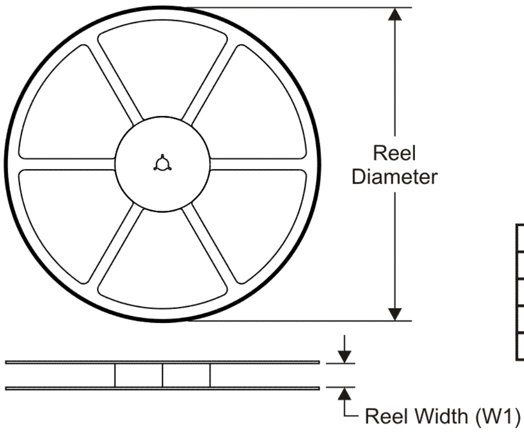
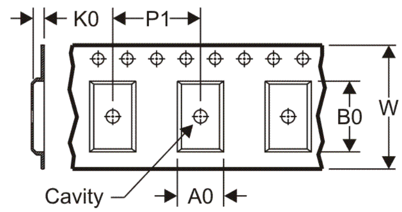
TAPE AND REEL INFORMATION

REEL DIMENSIONS

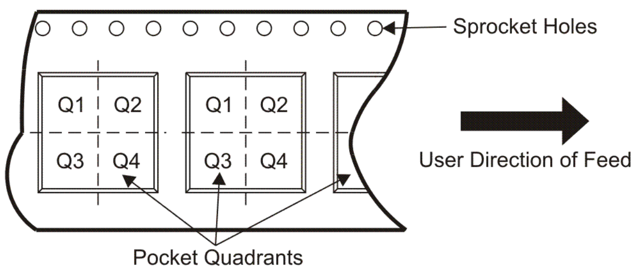


TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

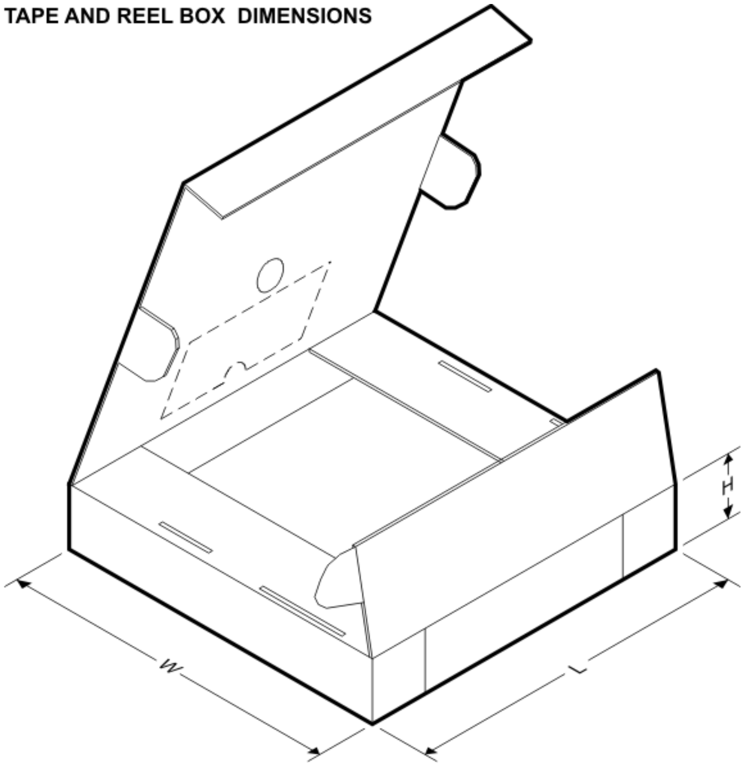
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN761688PWR	TSSOP	PW	16	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1

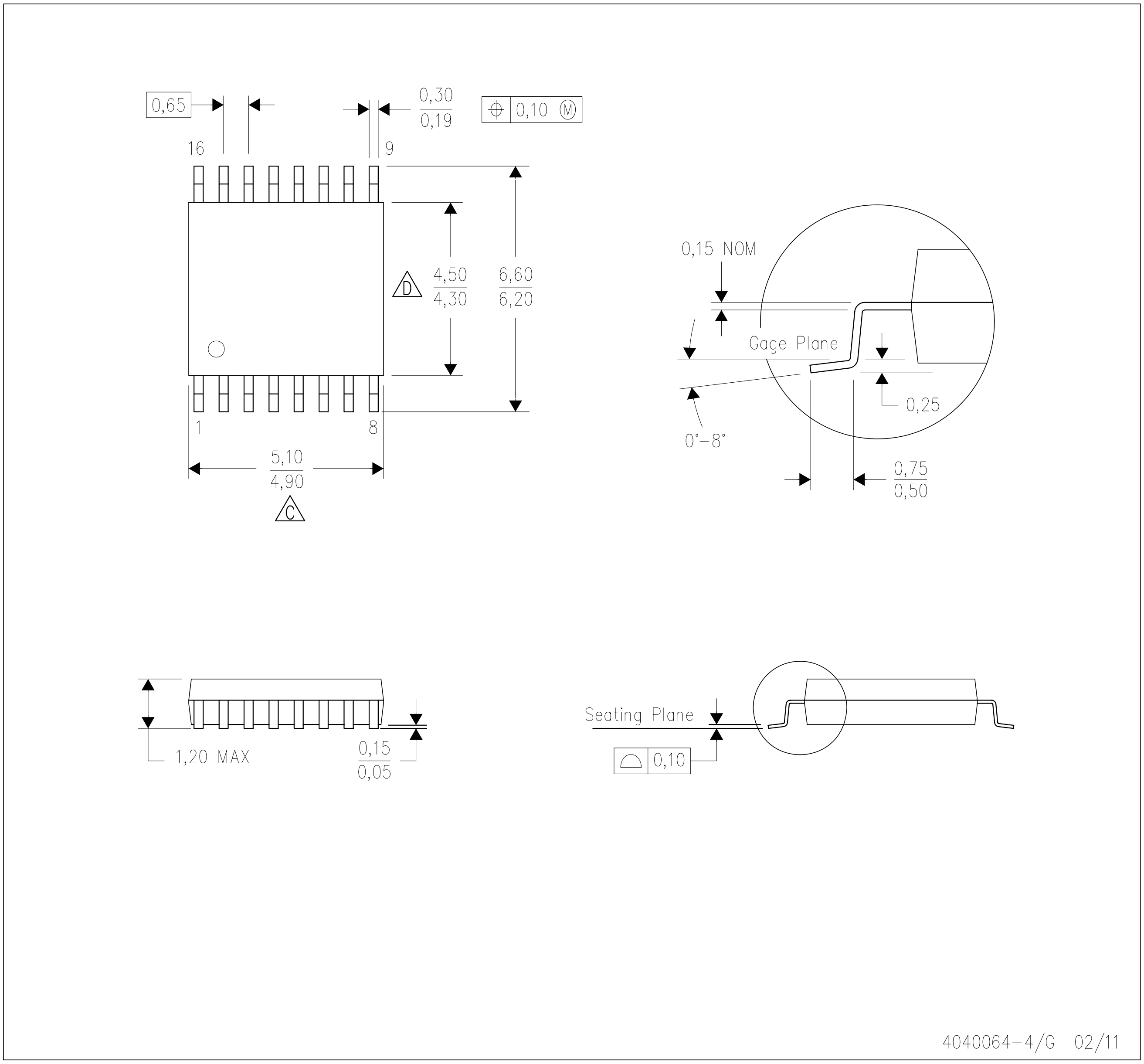
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

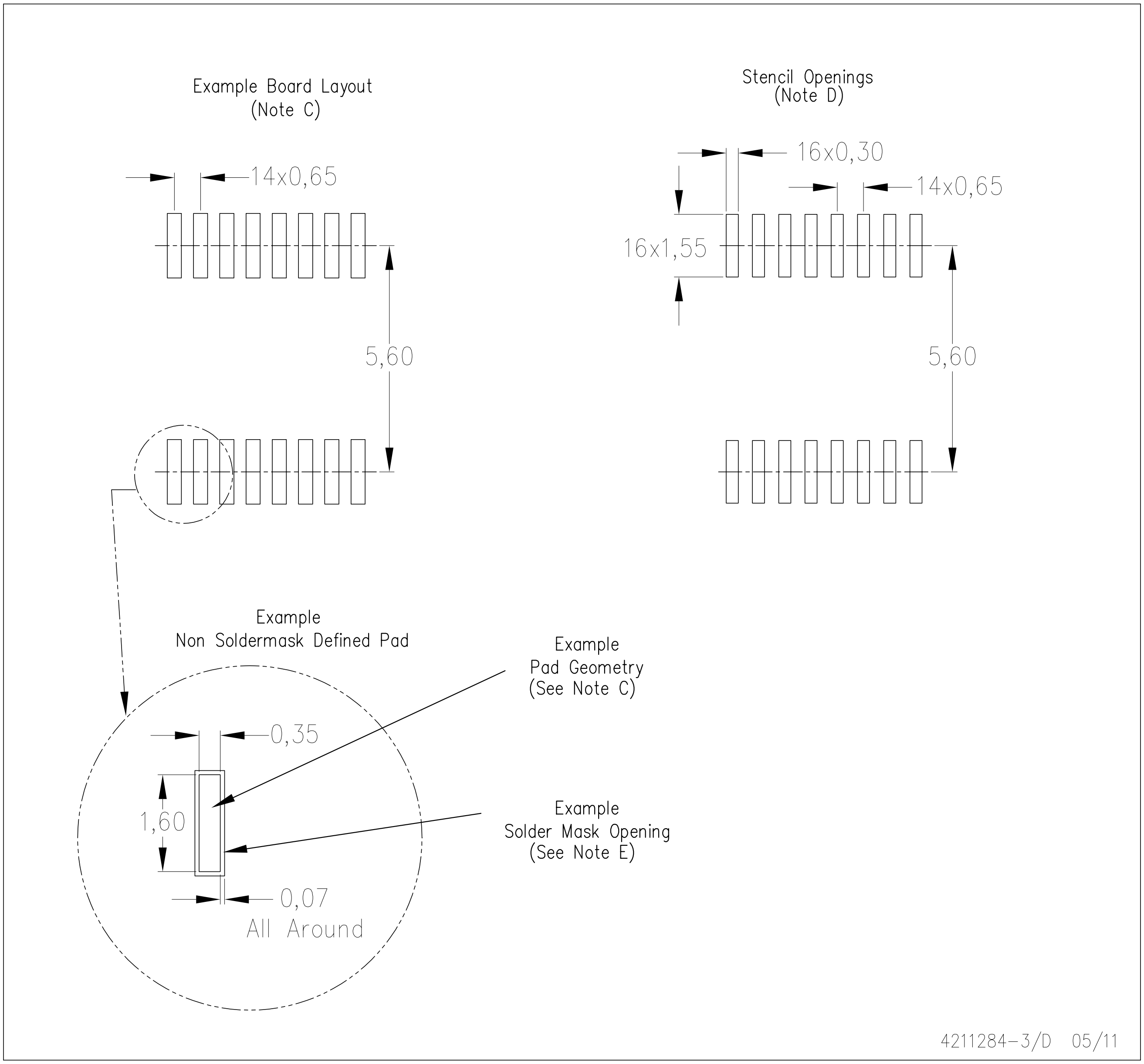
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN761688PWR	TSSOP	PW	16	2000	346.0	346.0	29.0

PW (R-PDSO-G16) PLASTIC SMALL OUTLINE



NOTES:
A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M–1994.
B. This drawing is subject to change without notice.
C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
D. Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
E. Falls within JEDEC MO-153

PW (R-PDSO-G16) PLASTIC SMALL OUTLINE



NOTES:
- A. All linear dimensions are in millimeters.
- B. This drawing is subject to change without notice.
- C. Publication IPC-7351 is recommended for alternate designs.
- D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
- E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.