AGC AMPLIFIER

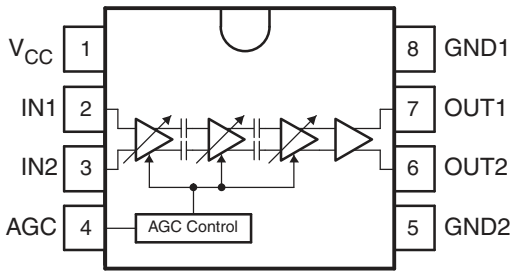
FEATURES

- **Low-Distortion Automatic Gain Control (AGC) Amplifier**
- **5-V Power Supply**
- **8-Pin Mini Small-Outline Package (MSOP)**
- **Wide Gain Control Range**

APPLICATIONS

- **Digital TVs**
- **Digital CATVs**
- **Digital Set-Top Boxes (STBs)**

DGK PACKAGE
(TOP VIEW)



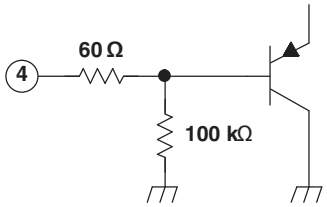
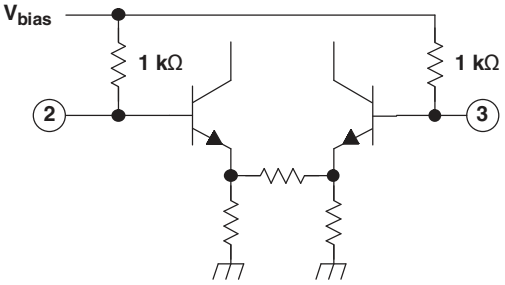
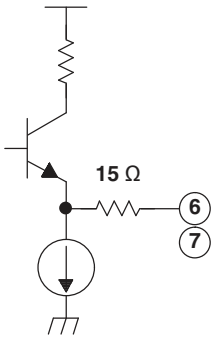
DESCRIPTION

The SN761643 is an automatic gain control (AGC) amplifier for the TV tuner system of a digital TV, CATV, or STB. The circuit consists of three stages of controlled-gain amplification, followed by a fixed-gain output amplifier.

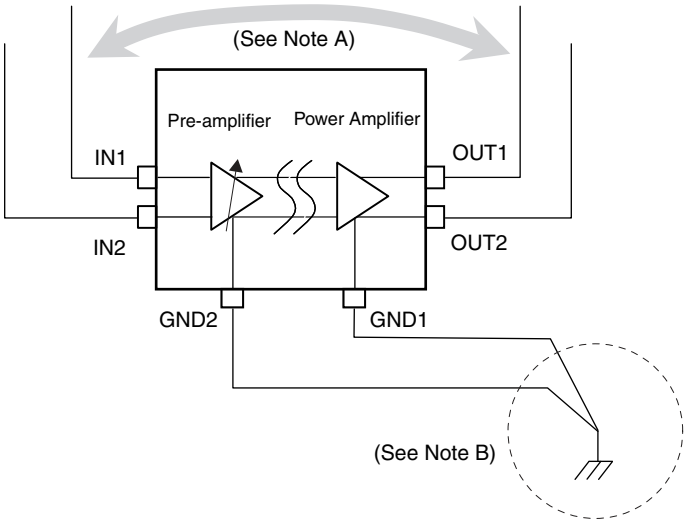
The device is packaged in an 8-pin MSOP suitable for surface mounting.

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.

TERMINAL FUNCTIONS

TERMINAL		I/O	EQUIVALENT CIRCUIT	DESCRIPTION
NAME	NO.			
AGC	4	I		Gain control voltage input
GND1	8			Power amplifier ground
GND2	5	–		Pre-amplifier ground
IN1 IN2	2 3	I		AGC amplifier input
OUT1 OUT2	7 6	O		AGC amplifier output
V_{CC}	1	–		5-V power supply

Correct Use



A. Be careful to keep enough isolation between input and output line.

B. Form a ground pattern as widely as possible. GND1 and GND2 should not have common impedance.

ABSOLUTE MAXIMUM RATINGS(1)

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

			MIN	MAX	UNIT
V_{CC}	Supply voltage range(2)	V_{CC} (pin 1)	–0.4	6.5	V
V_I	Input voltage range(2)	AGC (pin 4)	–0.4	V_{CC}	V
P_D	Continuous total dissipation(3)			477	mW
T_{JC}	Maximum junction temperature			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) At $T_A \leq 25°C$. For $T_A > 25°C$, the derating factor is 3.82 mW/°C.

RECOMMENDED OPERATING CONDITIONS

		MIN	NOM	MAX	UNIT
V_{CC}	Supply voltage	4.5	5	5.5	V
T_{OPE}	Operating free-air temperature	–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	V_{AGC} = 3 V		28		mA
I_{IAGC}	Input current (AGC)	V_{AGC} = 3 V		30	60	µA
V_{AGCMAX}	AGC maximum gain control voltage	Maximum gain	3		V_{CC}	V
V_{AGCMIN}	AGC minimum gain control voltage	Minimum gain	0		0.2	V

AC ELECTRICAL CHARACTERISTICS

V_{CC} = 5 V, T_A = 25°C, parameters measured in test circuit (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
G_{MAX1}	Maximum gain 1	V_{AGC} = 3 V, f_{IN} = 44 MHz, V_{IN} = –60 dBm, differential out, see Figure 10	57	61	65	dB
G_{MIN1}	Minimum gain 1	V_{AGC} = 0 V, f_{IN} = 44 MHz, V_{IN} = –60 dBm, differential out, see Figure 10	–7	–4	–1	dB
G_{MAX2}	Maximum gain 2	V_{AGC} = 3 V, f_{IN} = 44 MHz, V_{IN} = –60 dBm, see Figure 1 and Figure 11	51	55	59	dB
G_{MIN2}	Minimum gain 2	V_{AGC} = 0 V, f_{IN} = 44 MHz, V_{IN} = –60 dBm, see Figure 1 and Figure 11	–13	–10	–7	dB
GCR	Gain control range	V_{AGC} = 0 V to 3 V		65		dB
V_{OUT}	Output voltage	Single-ended output, see Figure 3		2.1		Vp-p
NF	Noise figure	Maximum gain, see Figure 2		11		dB
IM3	Third-order intermodulation distortion	f_{IN1} = 43.5 MHz, f_{IN2} = 44.5 MHz, Maximum gain, V_{OUT} = –2 dBm/tone, 1Vp-p See Figure 5 and Figure 12		–50		dBc
IIP3	Input intercept point	Minimum gain		11		dBm
r_{IN}	Input resistance (IN1, IN2)			1		kΩ
r_{OUT}	Output resistance (OUT1, OUT2)			25		Ω

TYPICAL CHARACTERISTICS

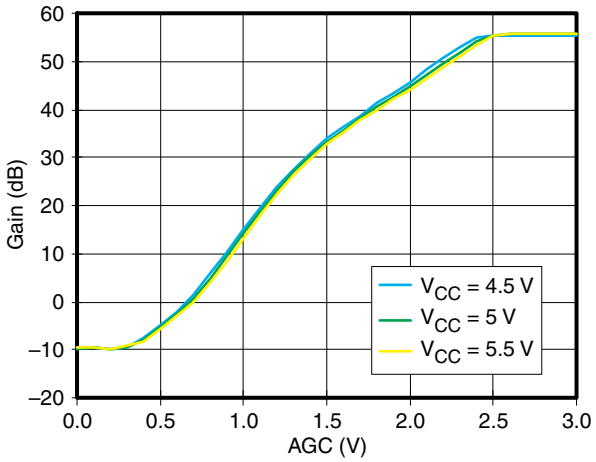


Figure 1. Gain vs AGC (T_A = 25°C)

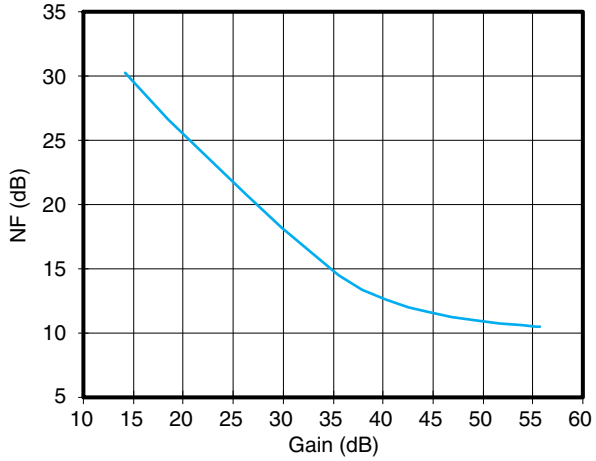


Figure 2. Noise Figure vs Gain (V_{CC} = 5 V, T_A = 25°C)

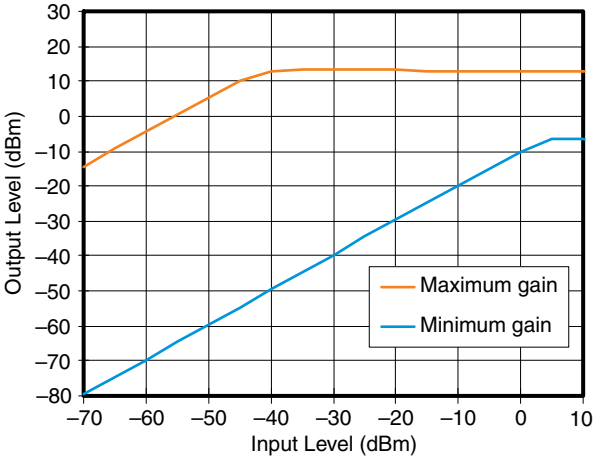


Figure 3. Output Level vs Input Level (T_A = 25°C)

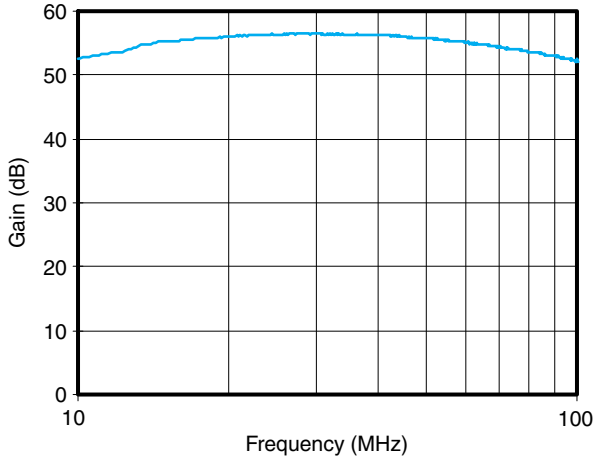


Figure 4. Gain vs Frequency (Gain = Max, T_A = 25°C)

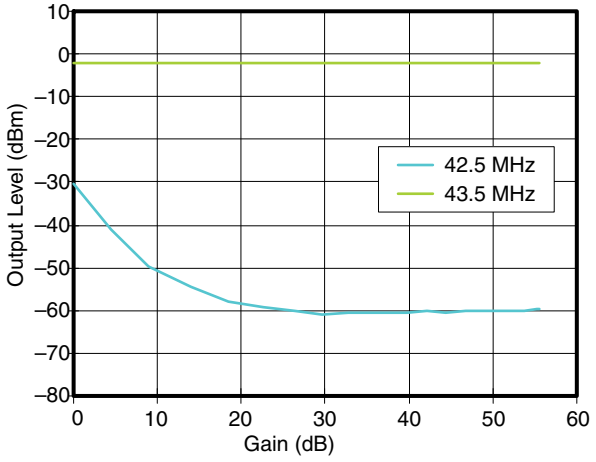


Figure 5. IM3 vs Gain (V_{CC} = 5 V, T_A = 25°C)

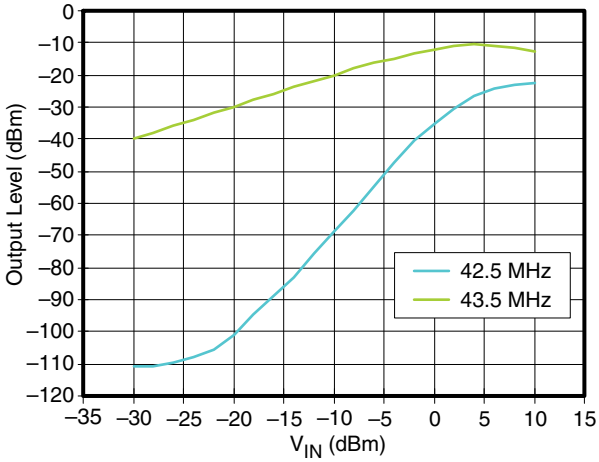


Figure 6. IM3 (Gain = Min, V_{CC} = 5 V, T_A = 25°C)

TYPICAL CHARACTERISTICS (continued)

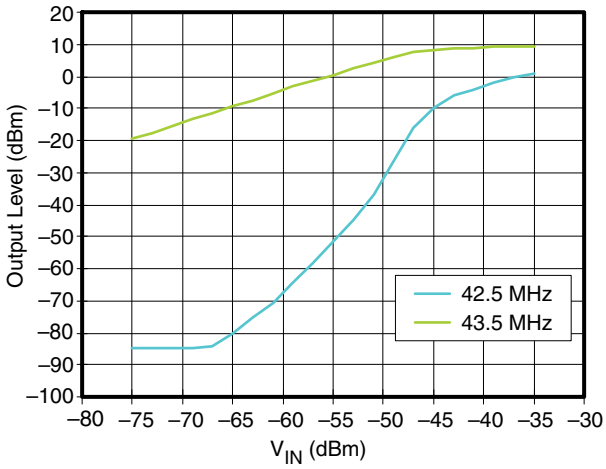


Figure 7. IM3 (Gain = Max, V_{CC} = 5 V, T_A = 25°C)

S-Parameter

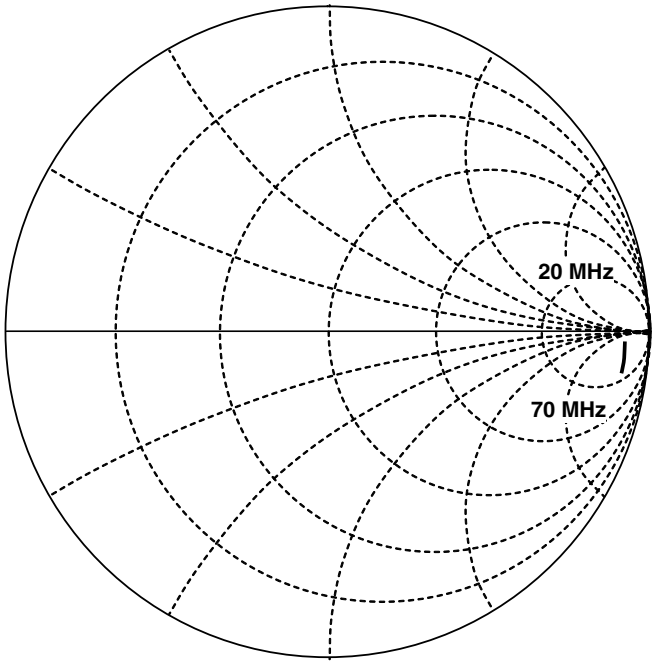


Figure 8. IN1

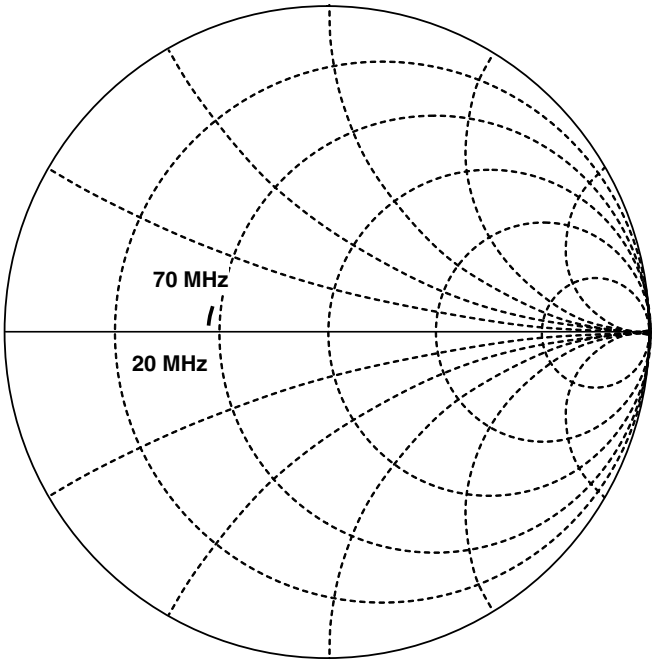


Figure 9. OUT1

APPLICATION INFORMATION

Test Circuits

This application information is advisory, and a performance check is required for actual application circuits.

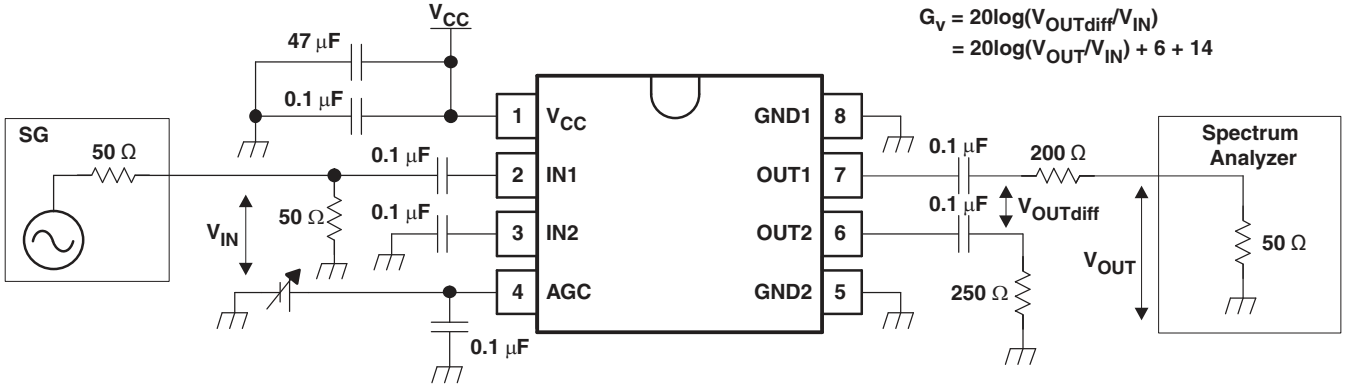


Figure 10. Measurement Circuit for Gain and Output Voltage 1

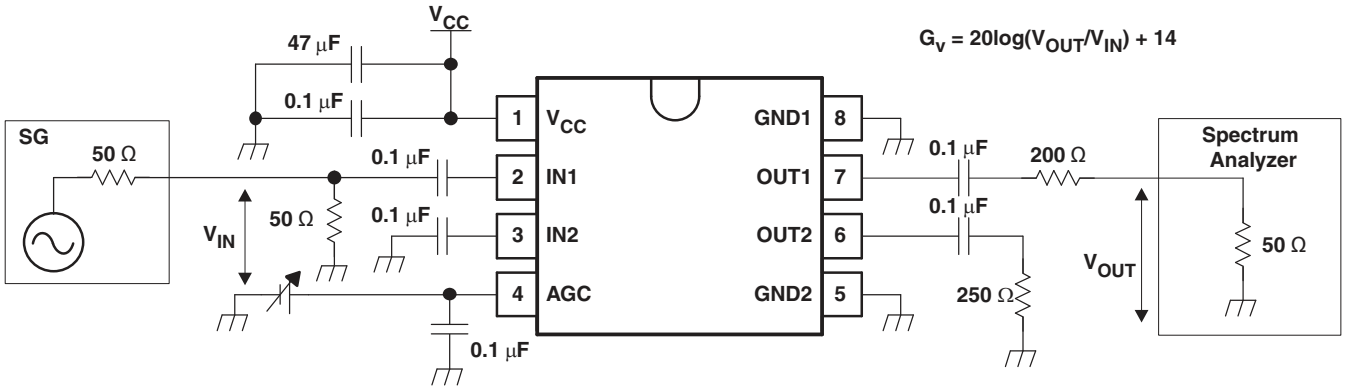


Figure 11. Measurement Circuit for Gain and Output Voltage 2

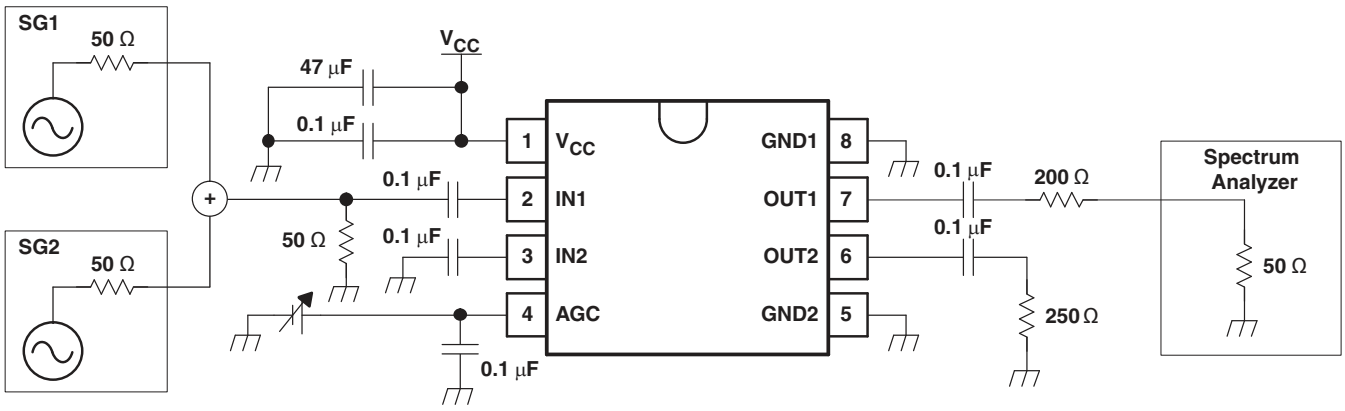
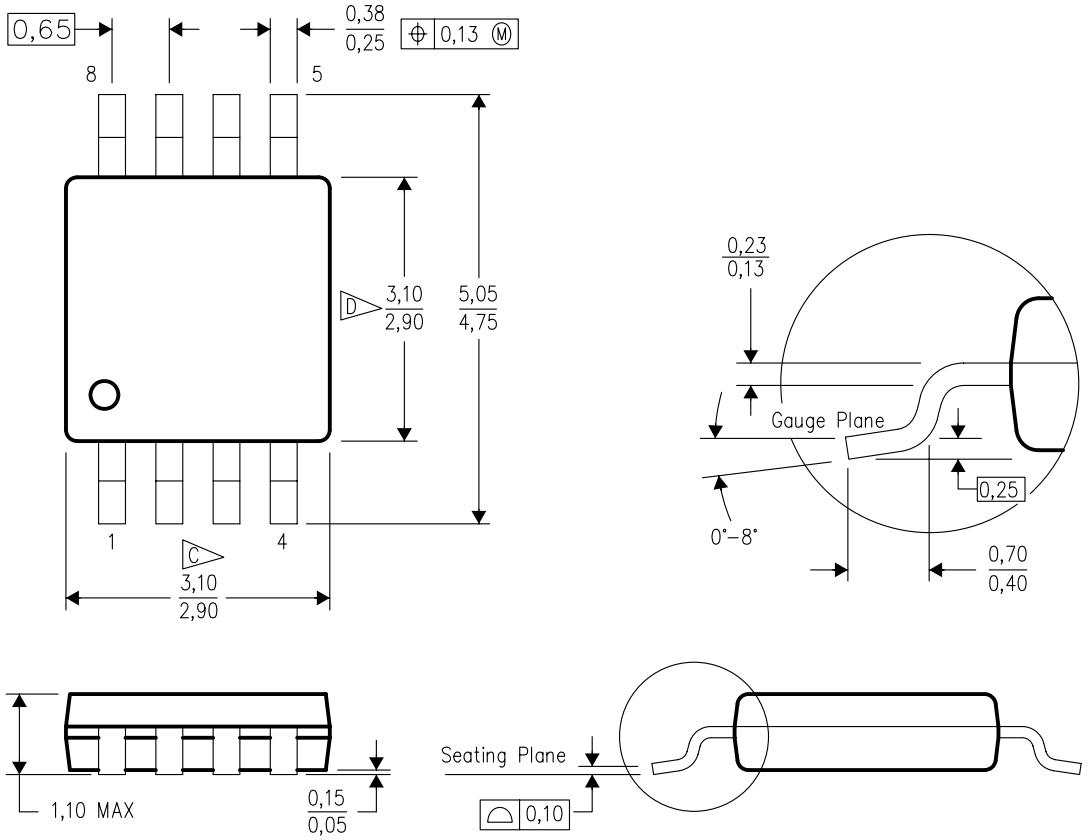


Figure 12. Measurement Circuit for IM3 and IIP3

DGK (S–PDSO–G8) PLASTIC SMALL–OUTLINE PACKAGE



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NOTES:
A. All linear dimensions are in millimeters.
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 per end.
D. Body width does not include interlead flash. Interlead flash shall not exceed 0.50 per side.
E. Falls within JEDEC MO–187 variation AA, except interlead flash.

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