

## 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

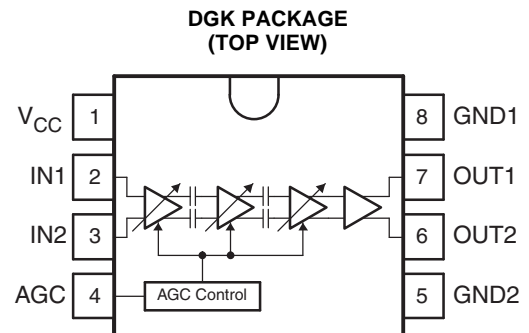
### APPLICATIONS

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

### 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.

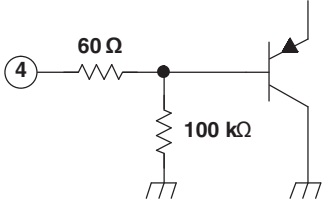
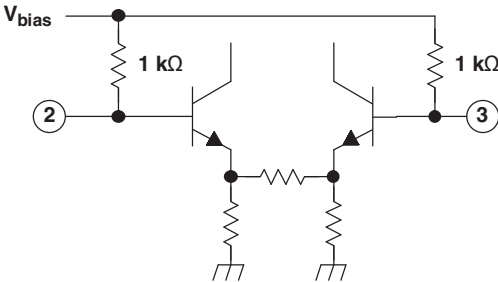
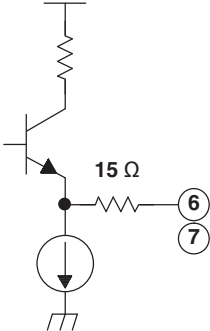


This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

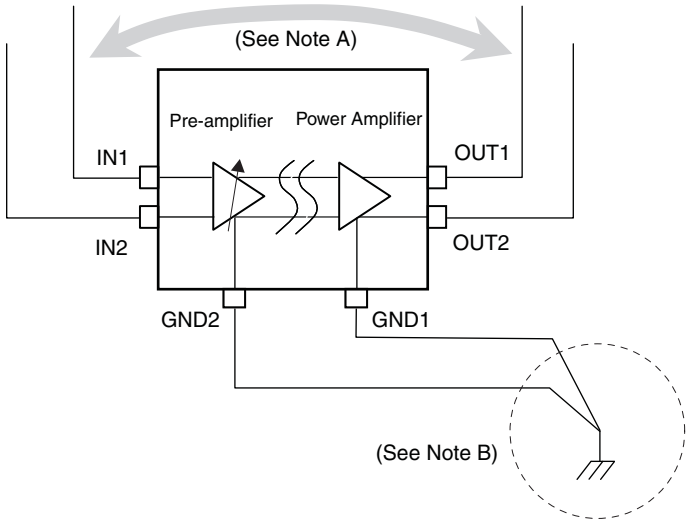


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TERMINAL FUNCTIONS

| 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<br>IN2      | 2<br>3 | I   |  | AGC amplifier input        |
| OUT1<br>OUT2    | 7<br>6 | O   |  | AGC amplifier output       |
| V <sub>CC</sub> | 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<sup>(1)</sup>

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

|                 |   |                         | MIN  | MAX             | UNIT |
|-----------------|---|-------------------------|------|-----------------|------|
| V <sub>CC</sub> | Supply voltage range <sup>(2)</sup>         | V <sub>CC</sub> (pin 1) | –0.4 | 6.5             | V    |
| V <sub>I</sub>  | Input voltage range <sup>(2)</sup>          | AGC (pin 4)             | –0.4 | V <sub>CC</sub> | V    |
| P <sub>D</sub>  | Continuous total dissipation <sup>(3)</sup> |                         |      | 477             | mW   |
| T <sub>JC</sub> | 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<sub>A</sub> ≤ 25°C. For T<sub>A</sub> > 25°C, the derating factor is 3.82 mW/°C.

## RECOMMENDED OPERATING CONDITIONS

|                 |                                |  | MIN | NOM | MAX | UNIT |
|-----------------|--------------------------------|--|-----|-----|-----|------|
| V <sub>CC</sub> | Supply voltage                 |  | 4.5 | 5   | 5.5 | V    |
| T <sub>OP</sub> | Operating free-air temperature |  | –20 |     | 85  | °C   |

## DC ELECTRICAL CHARACTERISTICS

V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C (unless otherwise noted)

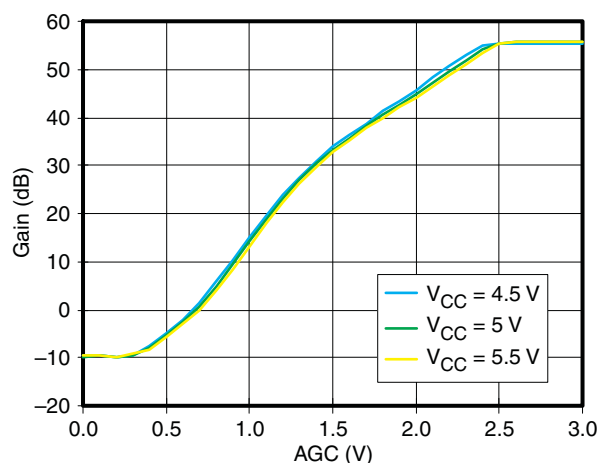
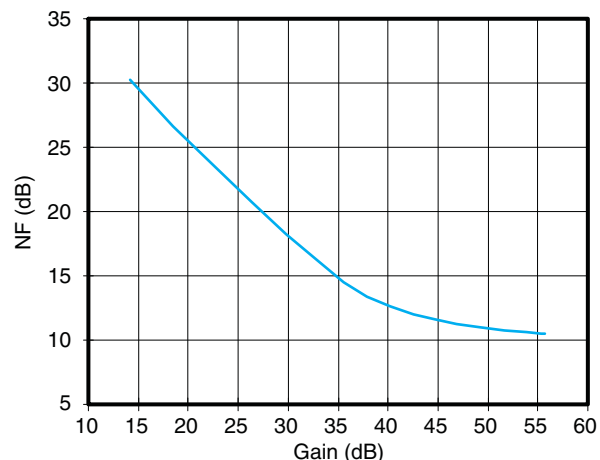
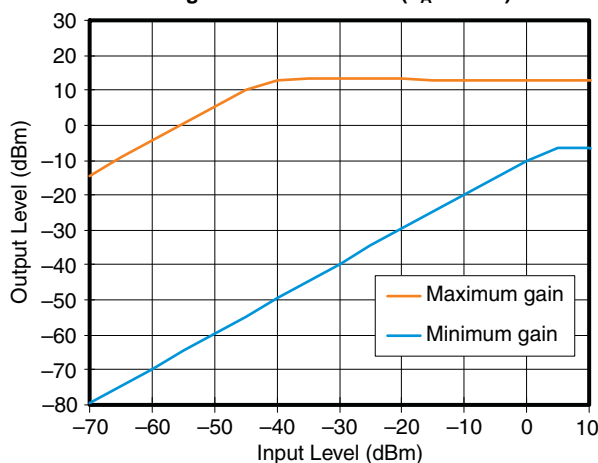
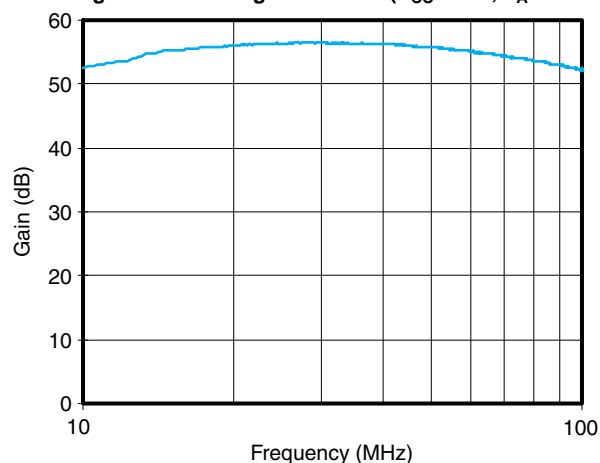
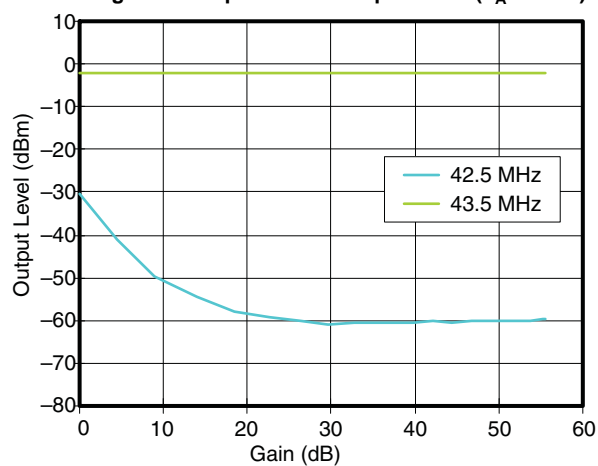
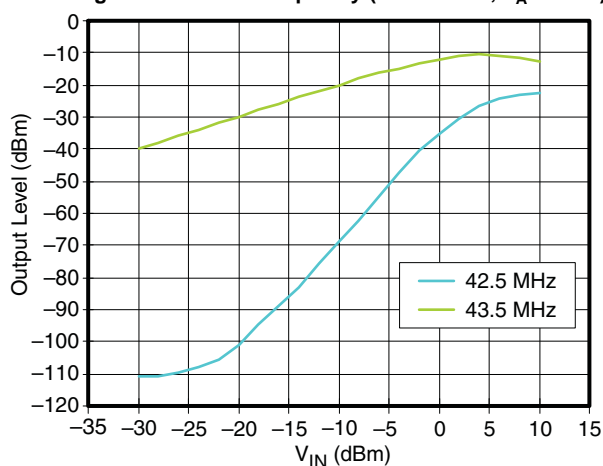
| PARAMETER            | TEST CONDITIONS                  | MIN                    | TYP | MAX             | UNIT |
|----------------------|----------------------------------|------------------------|-----|-----------------|------|
| I <sub>CC</sub>      | Supply current                   | V <sub>AGC</sub> = 3 V | 28  |                 | mA   |
| I <sub>IAGC</sub>    | Input current (AGC)              | V <sub>AGC</sub> = 3 V | 30  | 60              | μA   |
| V <sub>AGC</sub> MAX | AGC maximum gain control voltage | Maximum gain           | 3   | V <sub>CC</sub> | V    |
| V <sub>AGC</sub> MIN | AGC minimum gain control voltage | Minimum gain           | 0   | 0.2             | V    |

## AC ELECTRICAL CHARACTERISTICS

V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C, parameters measured in test circuit (unless otherwise noted)

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

## TYPICAL CHARACTERISTICS

Figure 1. Gain vs AGC ( $T_A = 25^\circ\text{C}$ )Figure 2. Noise Figure vs Gain ( $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$ )Figure 3. Output Level vs Input Level ( $T_A = 25^\circ\text{C}$ )Figure 4. Gain vs Frequency (Gain = Max,  $T_A = 25^\circ\text{C}$ )Figure 5. IM3 vs Gain ( $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$ )Figure 6. IM3 (Gain = Min,  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$ )

### TYPICAL CHARACTERISTICS (continued)

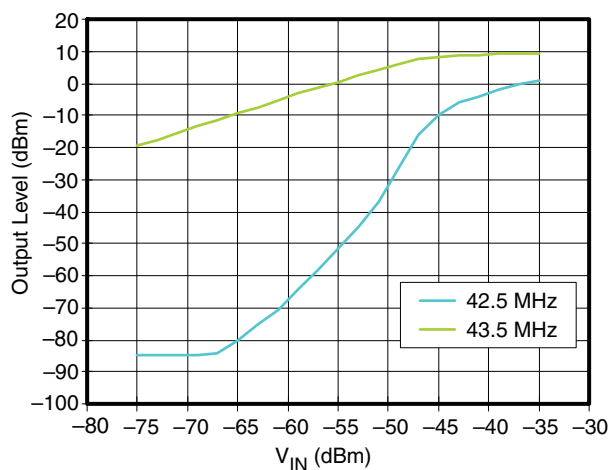


Figure 7. IM3 (Gain = Max,  $V_{CC} = 5$  V,  $T_A = 25^\circ\text{C}$ )

### S-Parameter

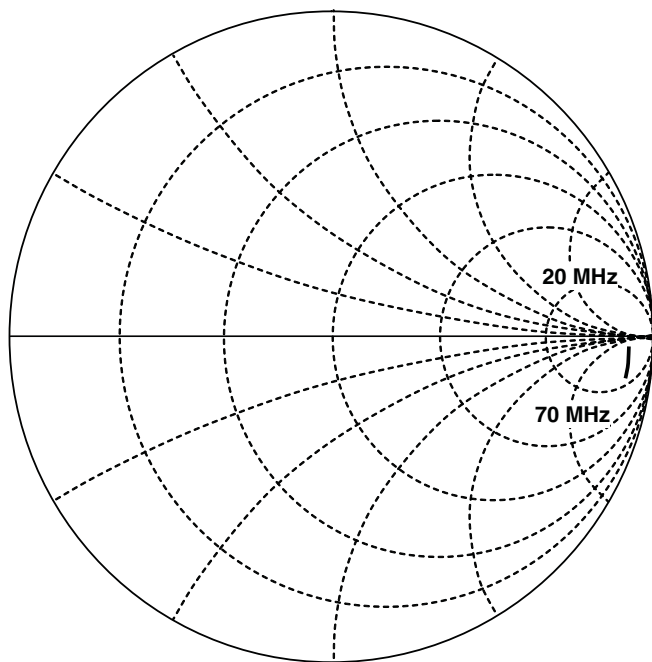


Figure 8. IN1

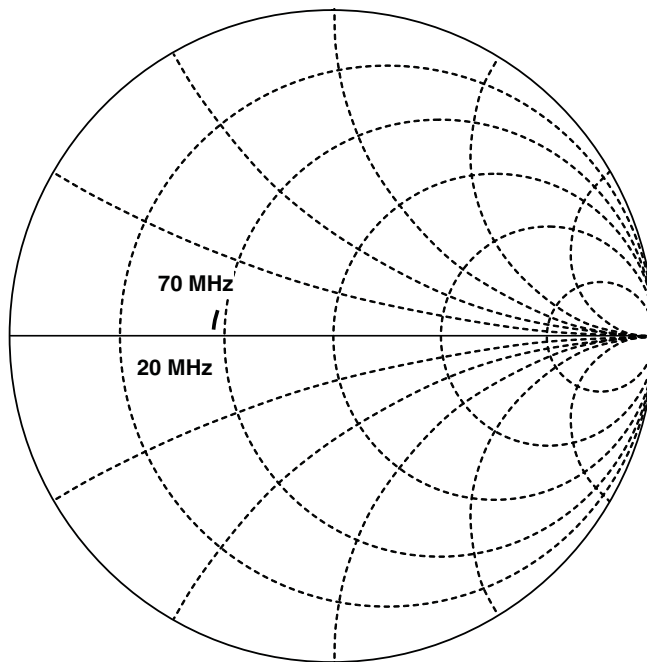


Figure 9. OUT1

## APPLICATION INFORMATION

### Test Circuits

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

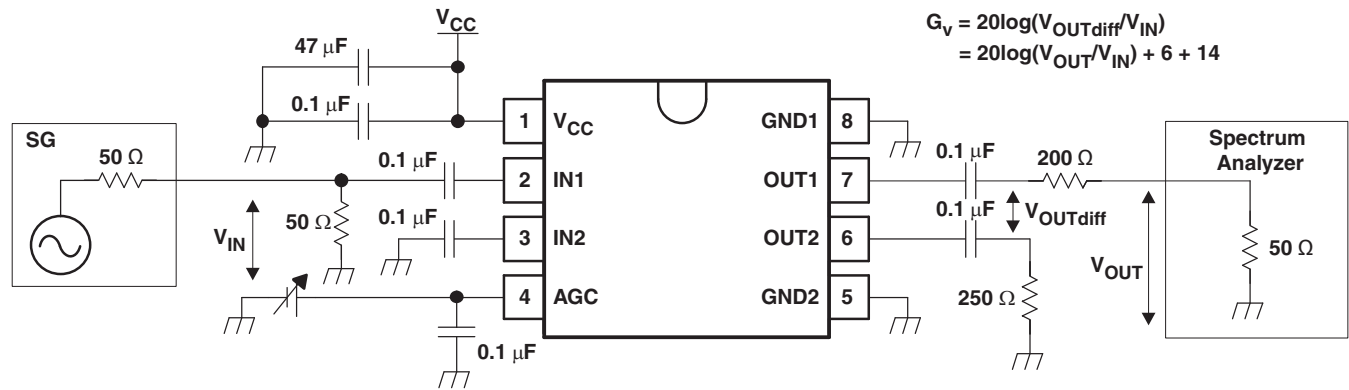


Figure 10. Measurement Circuit for Gain and Output Voltage 1

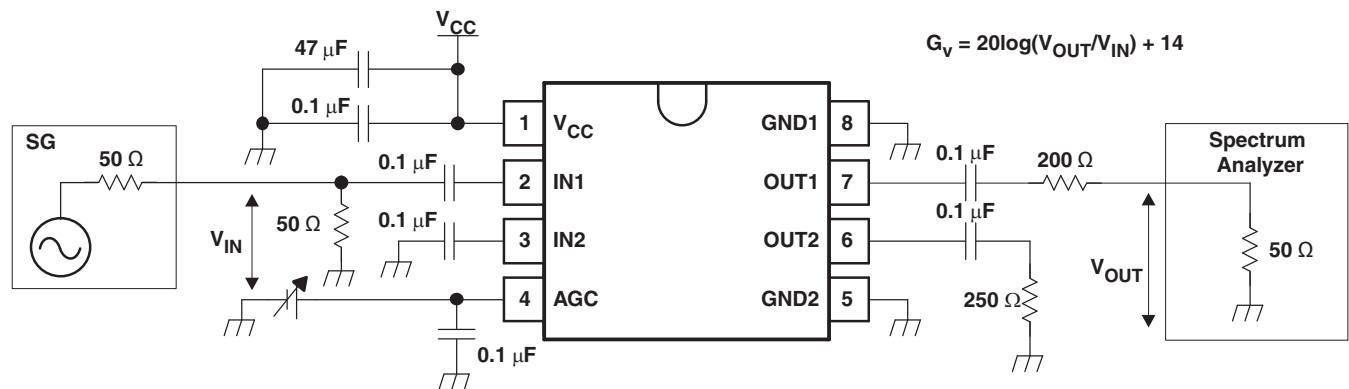


Figure 11. Measurement Circuit for Gain and Output Voltage 2

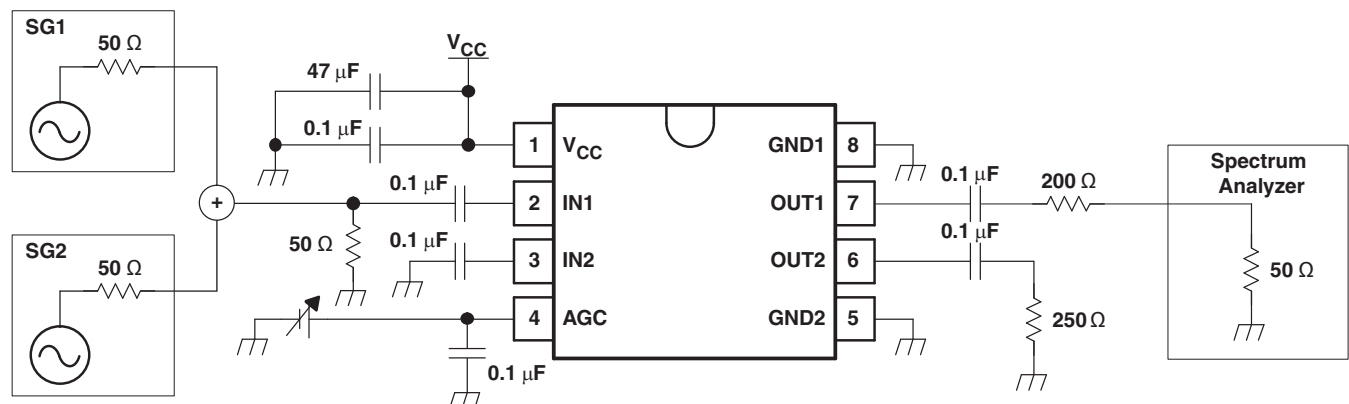


Figure 12. Measurement Circuit for IM3 and IIP3

## DGK (S-PDSO-G8)

## PLASTIC SMALL-OUTLINE PACKAGE



- 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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