## FEATURES

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

## APPLICATIONS

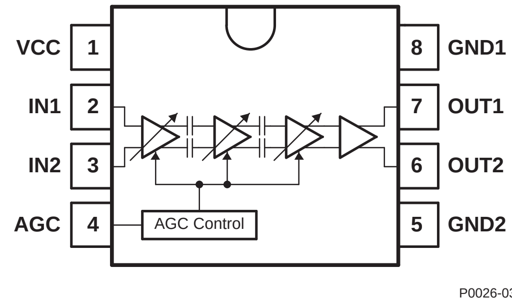
- Digital TVs
- Digital CATVs
- Digital Set-Top Boxes (STBs)

## DESCRIPTION

The SN761666 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.

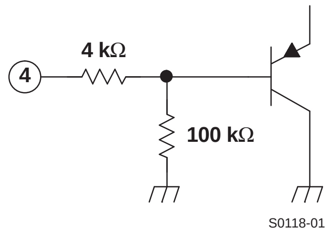
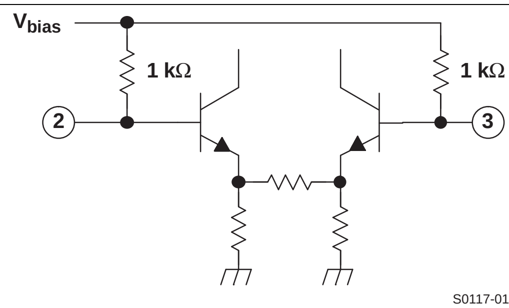
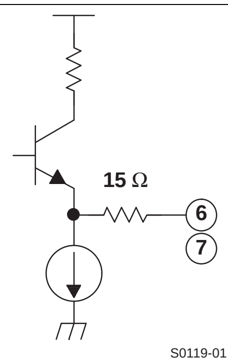
DGK PACKAGE
(TOP VIEW)




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 | | I/O | EQUIVALENT CIRCUIT | DESCRIPTION |
|---|---|---|---|---|
| NAME | NO. | | | |
| AGC | 4 | I |  | Gain-control voltage |
| GND1<br>GND2 | 8<br>5 | – | | Ground |
| IN1<br>IN2 | 2<br>3 | I |  | AGC amplifier input |
| OUT1<br>OUT2 | 7<br>6 | O |  | AGC amplifier output |
| $V_{CC}$ | 1 | – | | 5-V power supply |

## 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 | $V_{CC}$ + 0.4 | V |
| | 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 | | | 32 | | mA |
| $I_{IAGC}$ | Input current (AGC) | $V_{AGC}$ = 3 V | | 30 | 60 | µA |
| $V_{AGCMAX}$ | AGC maximum gain control voltage | Maximum gain | 2.5 | | $V_{CC}$ | V |
| $V_{AGCMIN}$ | AGC minimum gain control voltage | Minimum gain | 0 | | 0.4 | 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 |
|---|---|---|---|---|---|---|
| $G_{MAX}$ | Maximum gain | $V_{AGC}$ = 3 V | 49 | 53 | 57 | dB |
| $G_{MIN}$ | Minimum gain | $V_{AGC}$ = 0 V | –5 | –2 | –1 | dB |
| GCR | Gain control range | $V_{AGC}$ = 0 V–3 V | | 55 | | dB |
| $V_{OUT}$ | Output voltage | Single-ended output | | 2.6 | | Vp-p |
| NF | Noise figure | Maximum gain | | 7 | | dB |
| IM3 | Third-order intermodulation distortion | $f_{IN1}$ = 43 MHz, $f_{IN2}$ = 44 MHz, $V_{OUT}$ = –2 dBm, Maximum gain | | –50 | | dBc |
| IIP3 | Input intercept point | Minimum gain | | 11 | | dBm |
| $R_{IN}$ | Input resistance (IN1, IN2) | | | 1 | | kΩ |

## TYPICAL CHARACTERISTICS

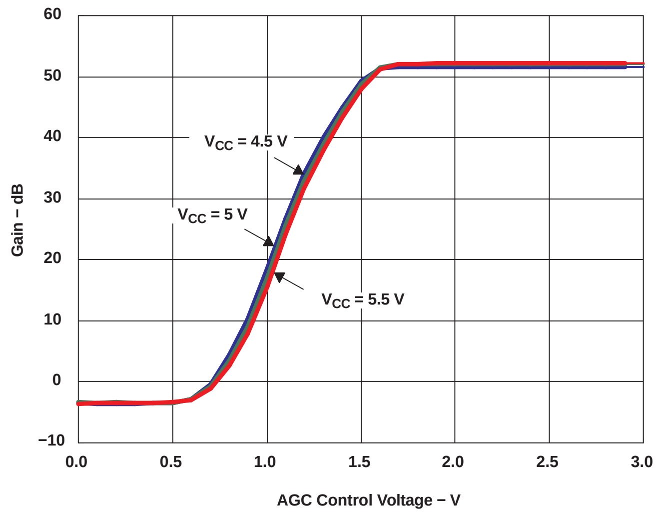



Figure 1. Gain vs VAGC ($T_A$ = 25°C)

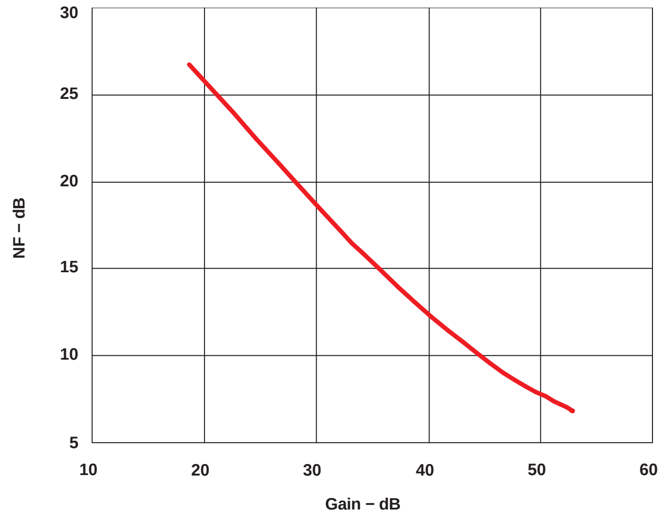



Figure 2. Noise Figure vs Gain ($V_{CC}$ = 5 V, $T_A$ = 25°C)

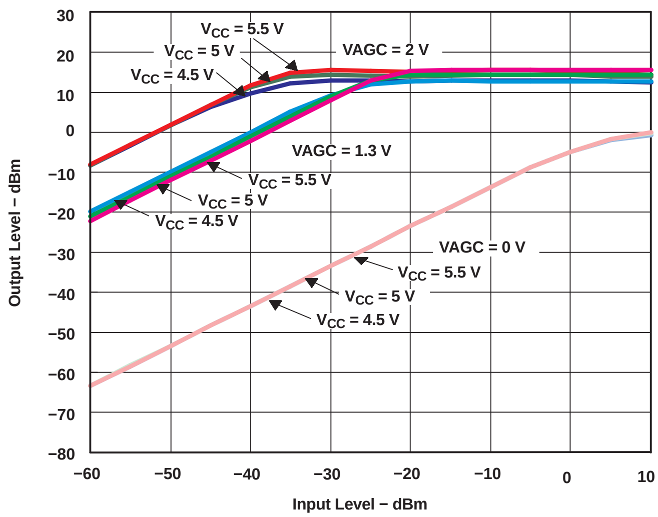



Figure 3. Output Level vs Input Level ($T_A$ = 25°C)

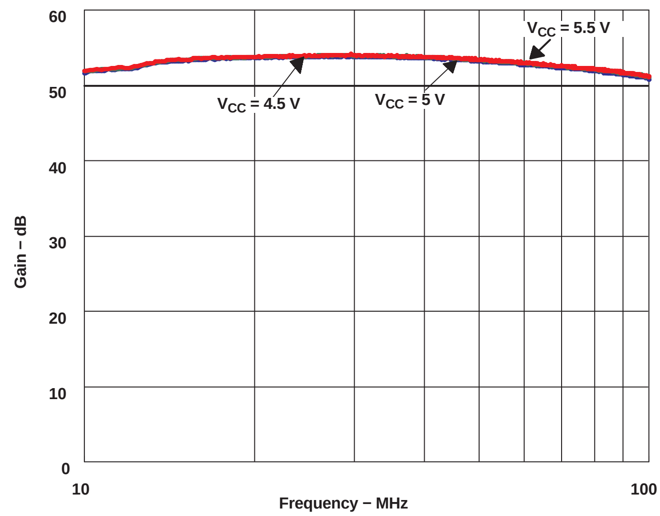



Figure 4. Gain vs Frequency (Gain = Max, $T_A$ = 25°C)

## TYPICAL CHARACTERISTICS (continued)

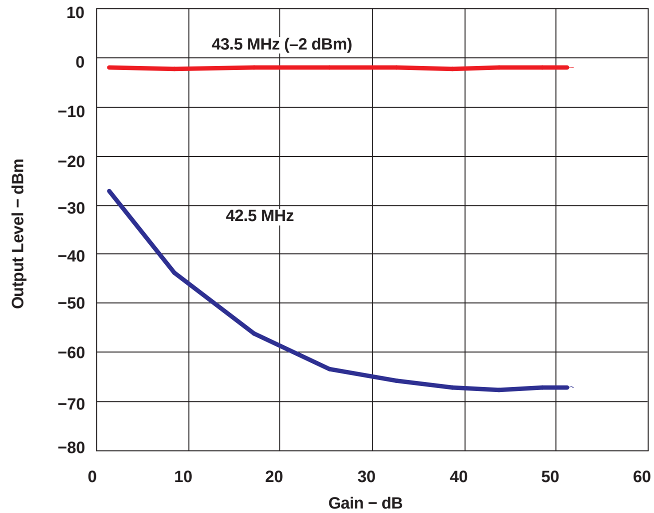



Figure 5. IM3 vs Gain ($V_{CC}$ = 5 V, $T_A$ = 25°C)

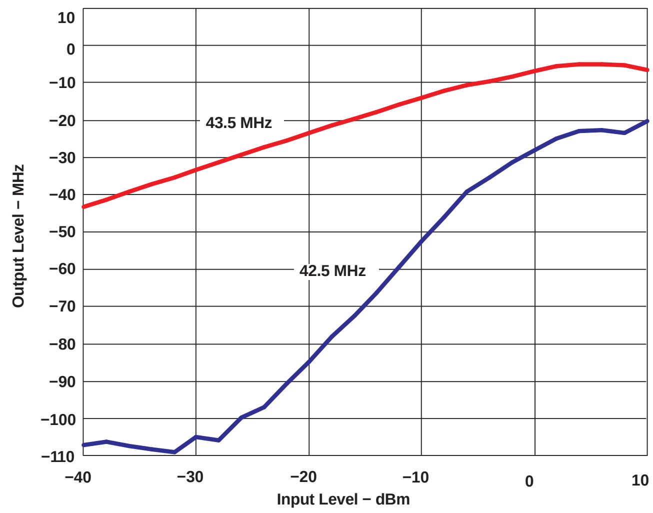



Figure 6. IM3 (Gain = Min, $V_{CC}$ = 5 V, $T_A$ = 25°C)

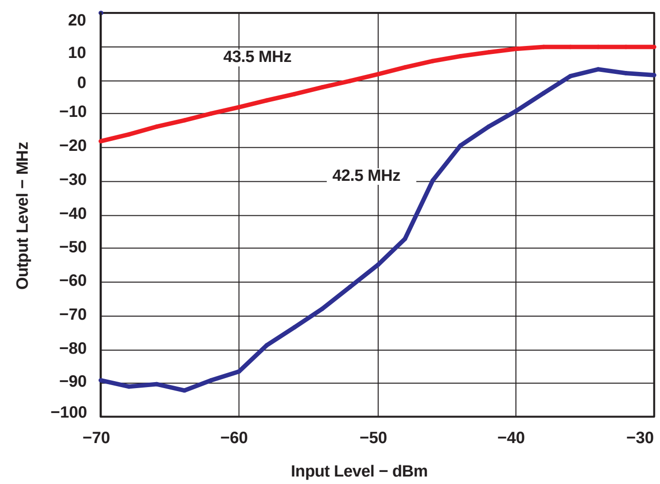



Figure 7. IM3 (Gain = Max, $V_{CC}$ = 5 V, $T_A$ = 25°C)

## APPLICATION INFORMATION

### Test Circuits

Figure 8 and Figure 9 are test circuits for the SN761666. Figure 8 is the circuit for measurement of gain and output voltage. Figure 9 is the circuit for measurement of intermodulation distortion and input intercept point. This application information is advisory, and a performance check is required for actual application circuits.

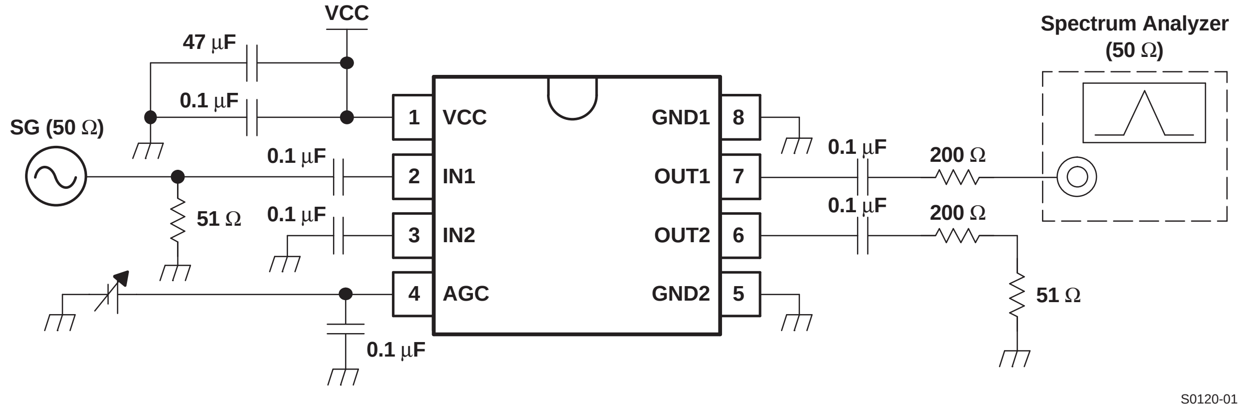



**Figure 8. Measurement Circuit for Gain and Output Voltage**

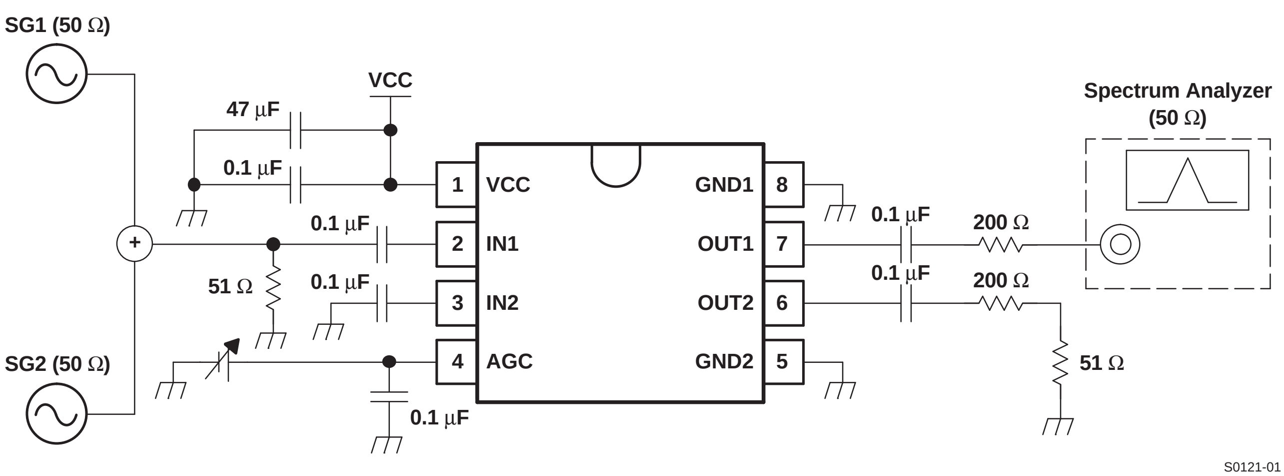



**Figure 9. Measurement Circuit for IM3 and IIP3**

## PACKAGING INFORMATION

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SN761666DGK | OBSOLETE | VSSOP | DGK | 8 | | TBD | Call TI | Call TI | -20 to 85 | | |
| SN761666DGKG4 | OBSOLETE | VSSOP | DGK | 8 | | TBD | Call TI | Call TI | -20 to 85 | | |
| SN761666DGKR | OBSOLETE | VSSOP | DGK | 8 | | TBD | Call TI | Call TI | -20 to 85 | BSQ | |

(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.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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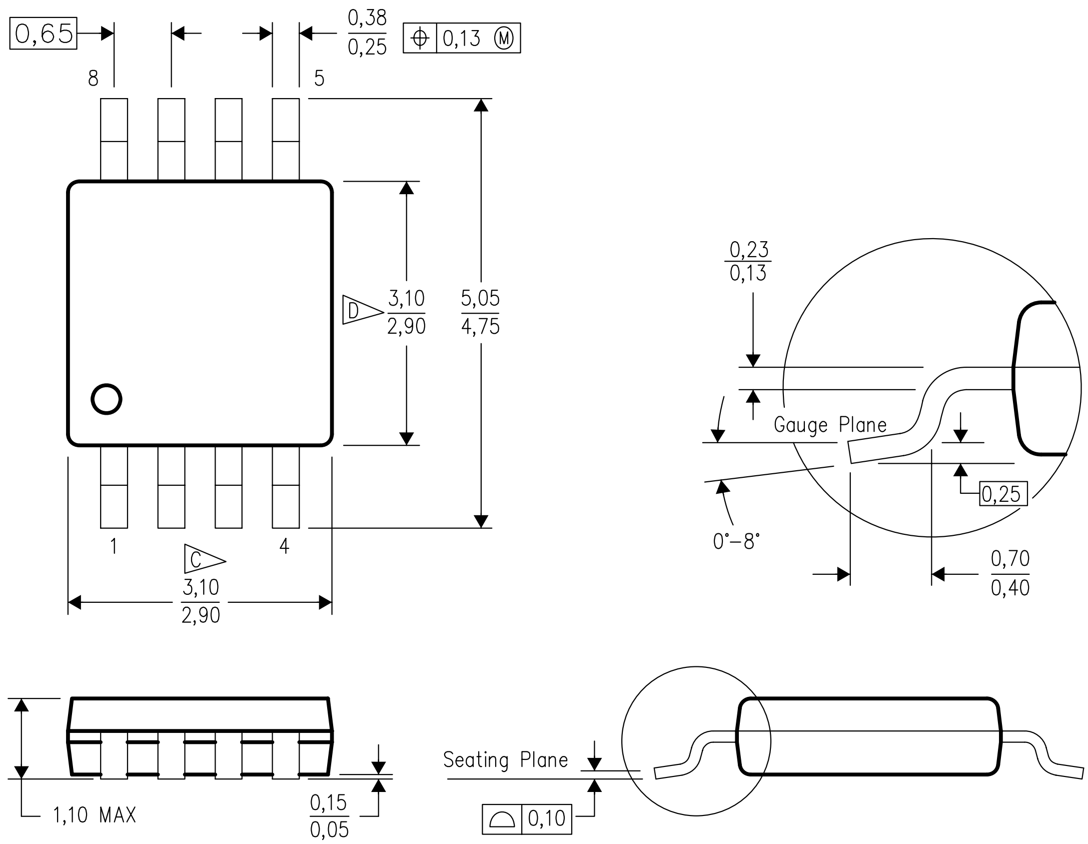
## DGK (S–PDSO–G8) PLASTIC SMALL–OUTLINE PACKAGE

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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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