



5 V AGC AMPLIFIER + VIDEO AMPLIFIER

UPC3217GV UPC3218GV

FEATURES

- **ON-CHIP LOW DISTORTION AMPLIFIER:**
IIP₃ = -4 dBm at minimum gain
- **WIDE AGC DYNAMIC RANGE:**
GCR = 53 dB TYP
- **ON-CHIP VIDEO AMPLIFIER:**
V_{OUT} = 1.25 V_{P-P} at single-ended output
- **SUPPLY VOLTAGE:**
V_{CC} = 5 V
- **PACKAGED IN 8 PIN SSOP SUITABLE FOR SURFACE MOUNTING**

DESCRIPTION

NEC's UPC3217GV and UPC3218GV are Silicon Monolithic ICs designed for use as AGC amplifiers for digital CATV, cable modems and IP telephony systems. These ICs consist of a two stage gain control amplifier and a fixed video gain amplifier. The devices provide a differential input and differential output for noise performance, which eliminates shielding requirements.

The package is 8-pin SSOP (Shrink Small Outline Package) suitable for surface mount.

These ICs are manufactured using NEC's 10 GHz ft NESAT™ II AL silicon bipolar process. This process uses silicon nitride passivation film. This material can protect chip surface from external pollution and prevent corrosion/migration. Thus, these ICs have excellent performance, uniformity and reliability.

NEC's stringent quality assurance and test procedures ensure the highest reliability and performance.

ELECTRICAL CHARACTERISTICS

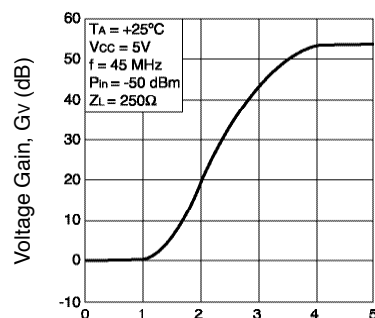
(T_A = 25°C, V_{CC} = 5 V, Z_S = 1 K Ω, Z_L = 240 Ω, f_{IN} = 45 MHz, Unless otherwise specified)

| PART NUMBER PACKAGE OUTLINE | | UPC3217GV S08 | | | UPC3218GV S08 | | | |
|--------------------------------|---|------------------|------|------|------------------|------|------|------|
| SYMBOLS | PARAMETERS AND CONDITIONS | UNITS | MIN | TYP | MAX | MIN | TYP | MAX |
| DC Characteristics | | | | | | | | |
| I _{CC} | Circuit Current (no input signal) | mA | 15 | 23 | 34 | 15 | 23 | 34 |
| RF Characteristics | | | | | | | | |
| BW | Frequency Bandwidth, V _{AGC} * = 4.5 V ¹ | MHz | | 100 | | | 100 | |
| G _{MAX} | Maximum Gain, V _{AGC} * = 4.5 V | dB | 50 | 53 | 56 | 60 | 63 | 66 |
| G _{MIN} | Minimum Gain, V _{AGC} * = 0.5 V | dB | -4.5 | 0 | 3.5 | 4.5 | 10 | 13.5 |
| GCR | Gain Control Range, V _{AGC} * = 0.5 to 4.5 V | dB | 46.5 | 53 | | 46.5 | 53 | |
| N _{FAGC} | Noise Figure, V _{AGC} * = 4.5 V at MAX Gain | dB | | 6.5 | 8.0 | | 3.5 | 4.5 |
| V _{OUT} | Output Voltage, Single Ended Output | V _{P-P} | | 1.25 | | | 1.25 | |
| IM ₃ | Third Order Intermodulation Distortion, f _{IN1} = 44 MHz, f _{IN2} = 45 MHz, V _{IN} = 30 dBmV per tone ² | dBc | | 55 | | | 55 | |

Note:

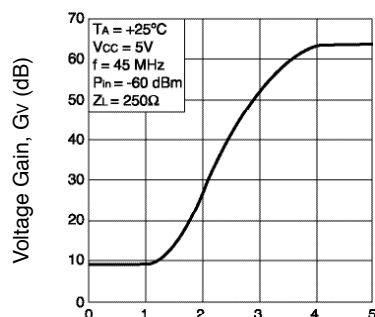
1. -3dB with respect to 10 MHz gain
2. V_{AGC} is adjusted to establish V_{OUT} = 1.25 V_{P-P} per tone

VOLTAGE GAIN vs.
AUTOMATIC GAIN CONTROL VOLTAGE*



UPC3217GV

Automatic Gain Control Voltage, V_{AGC}* (V)



UPC3218GV

Automatic Gain Control Voltage, V_{AGC}* (V)

APPLICATIONS

- Digital CATV
- Cable modem receivers
- IP Telephony Receivers

* V_{AGC} shown as applied in the evaluation circuit (see page 5) through a resistive bridge (voltage divider). Actual voltage range on the pin of the IC is 0 to 3 V.

UPC3217GV, UPC3218GV

ABSOLUTE MAXIMUM RATINGS¹

(T_A = 25°C, unless otherwise specified)

| SYMBOLS | PARAMETERS | UNITS | RATINGS |
|------------------|---|-------|-------------|
| V _{CC} | Supply Voltage | V | 6.0 |
| P _D | Power Dissipation ² , T _A = 85°C | mW | 250 |
| T _{OP1} | Operating Ambient Temp. | °C | -40 to +85 |
| T _{STG} | Storage Temperature | °C | -50 to +150 |

Notes:

1. Operation in excess of any one of these parameters may result

in permanent damage.

2. Mounted on a 50 x 50 x 1.6 mm epoxy glass PWB, with copper patterning on both sides.

RECOMMENDED OPERATING CONDITIONS

| SYMBOL | PARAMETER | UNITS | MIN | TYP | MAX |
|-------------------------------|--------------------------------------|-------|-----|-----|-----|
| V _{CC} | Supply Voltage | V | 4.5 | 5.0 | 5.5 |
| T _A | Operating Ambient Temp. ¹ | °C | -40 | +25 | +85 |
| V _{AGC} ² | Gain Control Voltage Range | V | 0 | - | 3.0 |
| V _{IN} | Video Input Signal Range | dBmV | 8 | | 30 |

Note:

1. V_{CC} = 4.5 to 5.5 V

2. AGC range at pin 4 of the IC

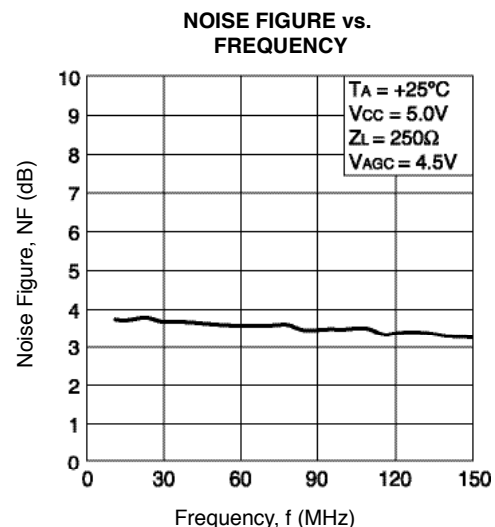
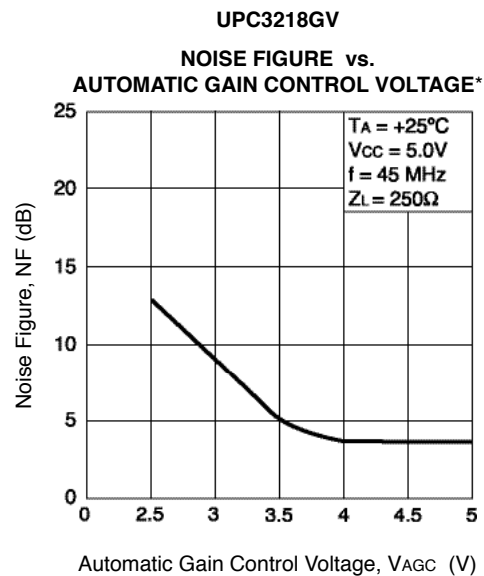
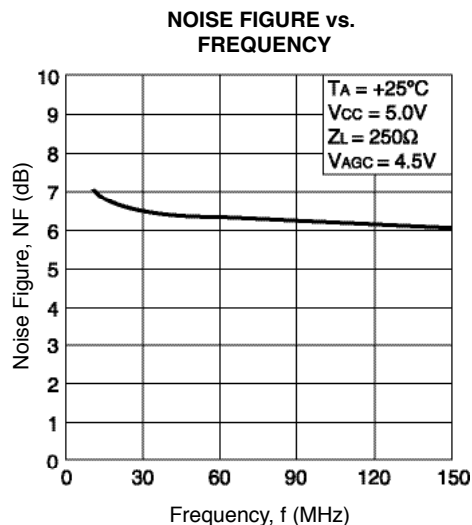
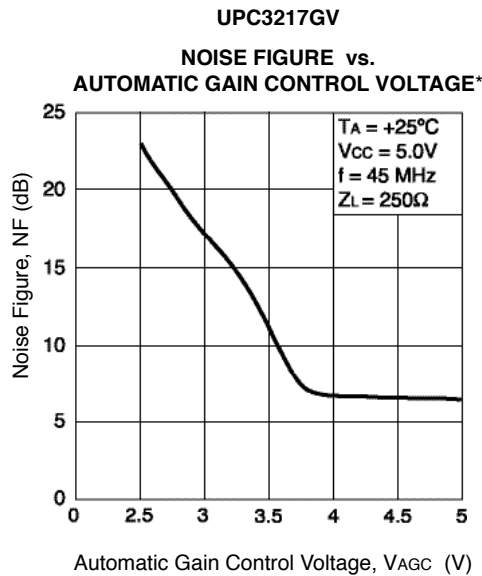
ORDERING INFORMATION

| PART NUMBER | QUANTITY |
|----------------|-----------|
| UPC3217GV-E1-A | 1 kp/Reel |
| UPC3218GV-E1-A | 1 kp/Reel |

Note:

Embossed tape 8 mm wide. Pin 1 indicates pull-out direction of tape.

TYPICAL PERFORMANCE CURVES (T_A = 25°C, unless otherwise specified)

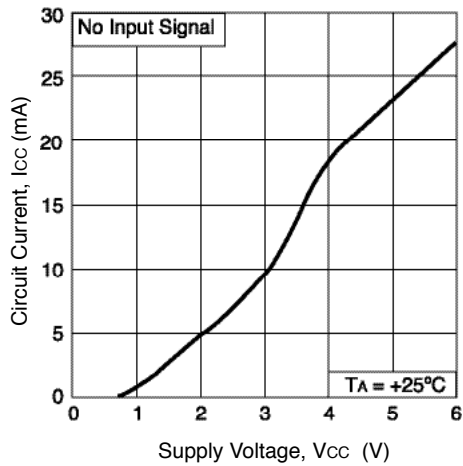


* V_{AGC} shown as applied in the evaluation circuit (see page 5) through a resistive bridge (voltage divider). Actual voltage range on the pin of the IC is 0 to 3 V.

TYPICAL PERFORMANCE CURVES ($T_A = 25^\circ\text{C}$, unless otherwise specified)

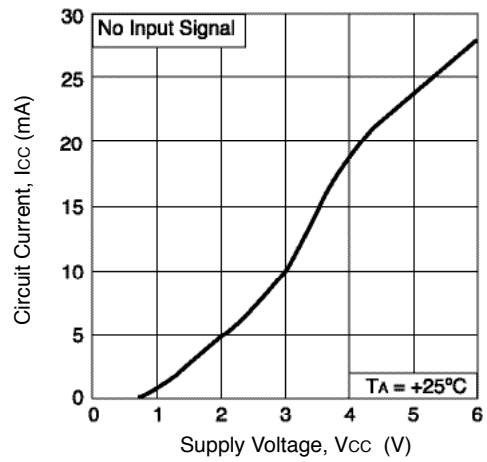
UPC3217GV

CIRCUIT CURRENT vs. SUPPLY VOLTAGE

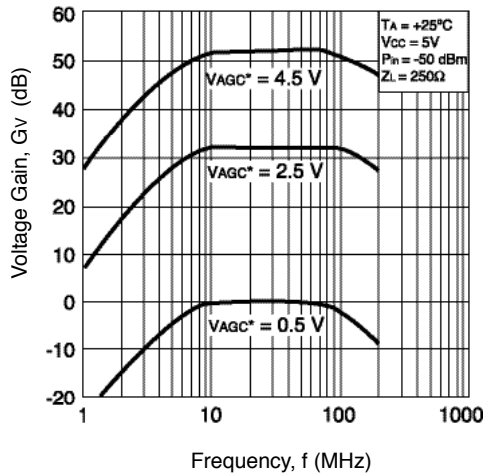


UPC3218GV

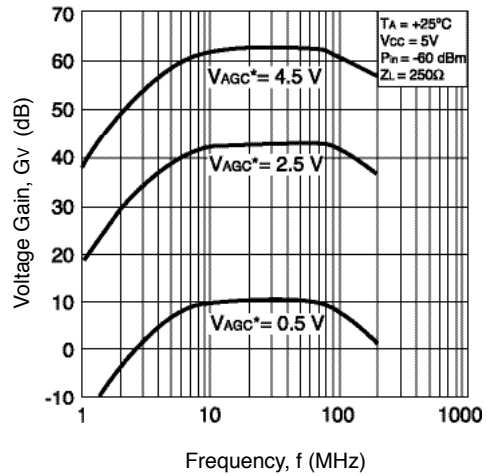
CIRCUIT CURRENT vs. SUPPLY VOLTAGE



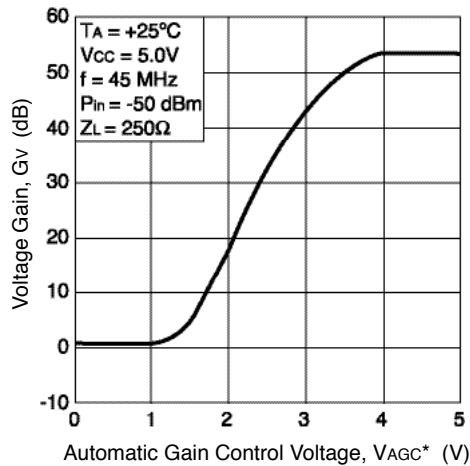
VOLTAGE GAIN vs. FREQUENCY



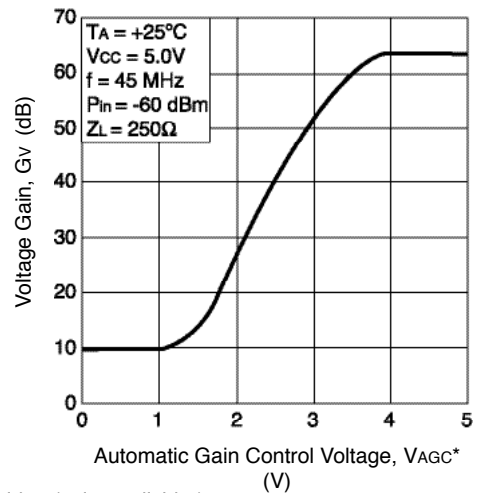
VOLTAGE GAIN vs. FREQUENCY



VOLTAGE GAIN vs. AUTOMATIC GAIN CONTROL VOLTAGE*



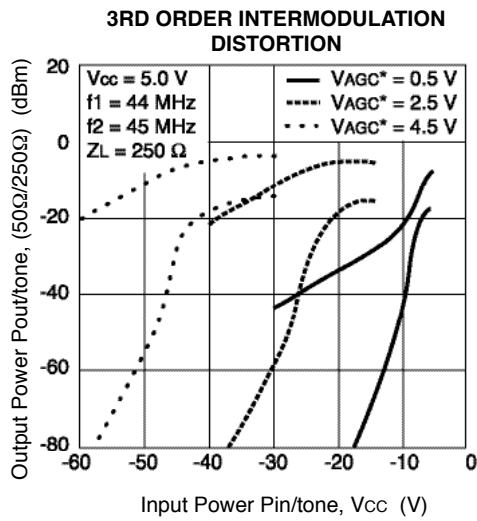
VOLTAGE GAIN vs. AUTOMATIC GAIN CONTROL VOLTAGE*



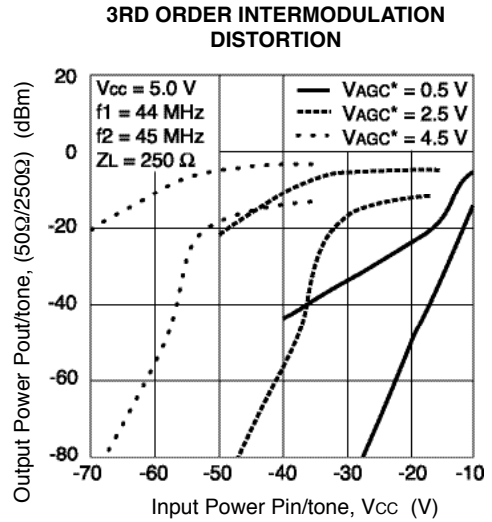
* V_{AGC} shown as applied in the evaluation circuit (see page 5) through a resistive bridge (voltage divider). Actual voltage range on the pin of the IC is 0 to 3 V.

TYPICAL PERFORMANCE CURVES, cont. (TA = 25°C, unless otherwise specified)

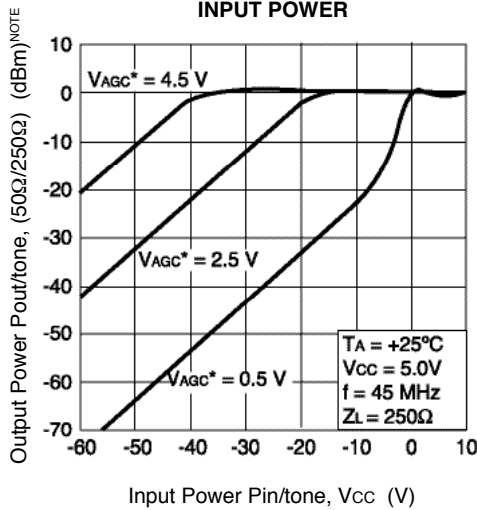
UPC3217GV



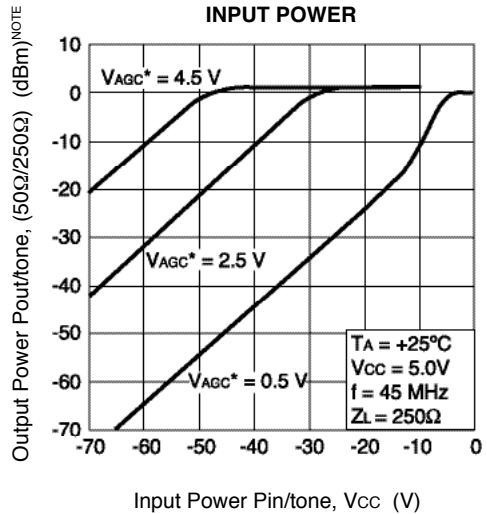
UPC3218GV



OUTPUT POWER vs. INPUT POWER



OUTPUT POWER vs. INPUT POWER

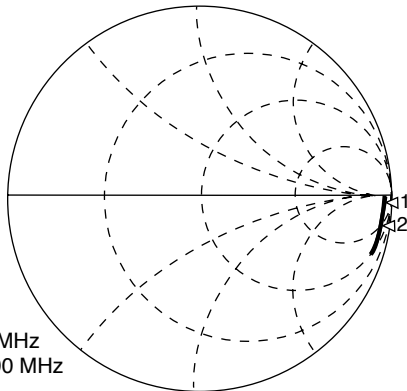


NOTE: Measurement value with spectrum analyzer.

* VAGC shown as applied in the evaluation circuit (see page 5) through a resistive bridge (voltage divider). Actual voltage range on the pin of the IC is 0 to 3 V.

TYPICAL SCATTERING PARAMETERS

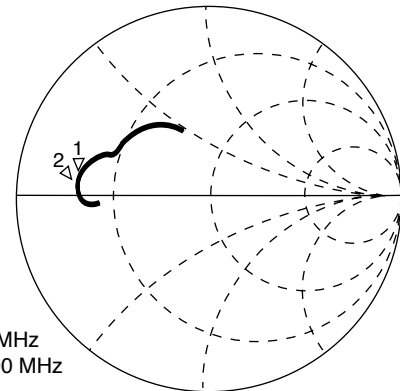
S11-FREQUENCY



Start 1 MHz
Stop 500 MHz

| | |
|------------------|-------------------|
| Marker 1 | 45 MHz |
| UPC3217GV | 1.339k-j 1.556 kΩ |
| Marker 2 | 45 MHz |
| UPC3218GV | 1.024k-j 1.124 kΩ |

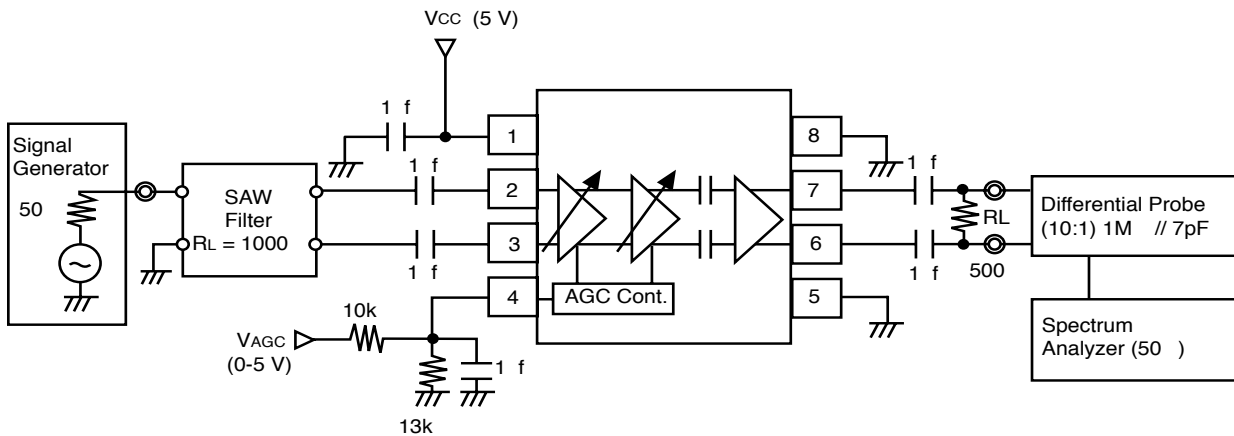
S22-FREQUENCY



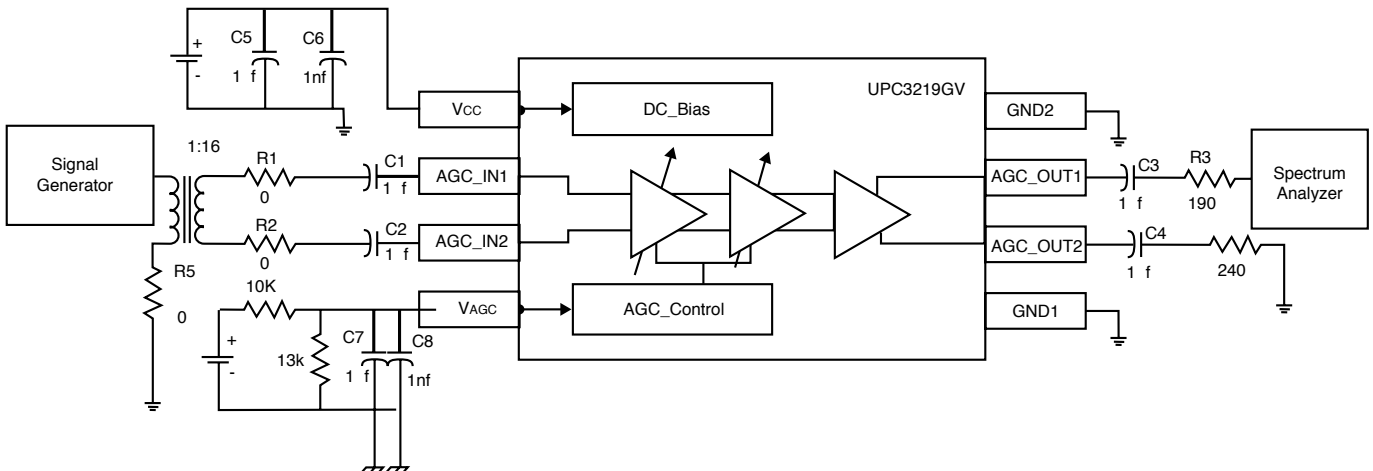
Start 1 MHz
Stop 500 MHz

| | |
|------------------|-------------------|
| Marker 1 | 45 MHz |
| UPC3217GV | 9.511 + j 3.869 Ω |
| Marker 2 | 45 MHz |
| UPC3218GV | 9.493 + j 4.317 Ω |

SYSTEM APPLICATION EXAMPLE

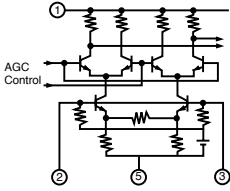
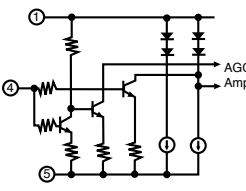
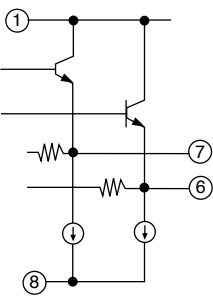


EVALUATION BOARD SCHEMATIC AND TEST



UPC3217GV, UPC3218GV

PIN EXPLANATIONS (UPC3217GV, UPC3218GV common)

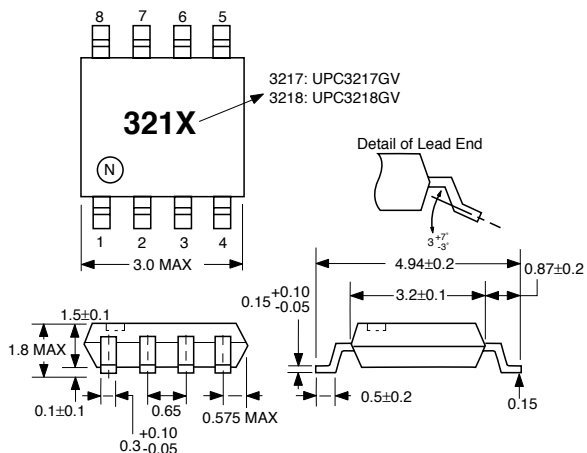
| Pin No. | Name | Applied Voltage (v) | Pin Voltage (v) ¹ | Description | Internal Equivalent Circuit |
|---------|---------|---------------------|------------------------------|---|--|
| 1 | Vcc | 4.5 to 5.5 | | Power supply pin. This pin should be externally equipped with bypass capacitor to minimize ground impedance. | |
| 2 | INPUT1 | | 1.45 | Signal input pins of AGC amplifier. |  |
| 3 | INPUT2 | | 1.45 | | |
| 4 | VAGC | 0 to 3.0 Vcc | | Gain control pin. This pin's bias govern the AGC output level. Minimum Gain at VAGC = 0.5 V Maximum Gain at VAGC = 4.5 V Recommended to use a 0 to 5 V AGC range for the system and divide this voltage through a resistive bridge (see evaluation board). This helps make the AGC slope less steep. |  |
| 5 | GND 2 | 0 | | Ground pin. This pin should be connected to system ground with minimum inductance. Ground pattern on the board should be formed as wide as possible. | |
| 6 | OUTPUT2 | | 2.2 | Signal output pins of video amplifier |  |
| 7 | OUTPUT1 | | 2.2 | | |
| 8 | GND 1 | 0 | | Ground pin. This pin should be connected to system ground with minimum inductance. Ground pattern on the board should be formed as wide as possible. All ground pins must be connected together with wide ground pattern to decrease impedance difference. | |

Note:

1. PIN is measured at Vcc = 5 V

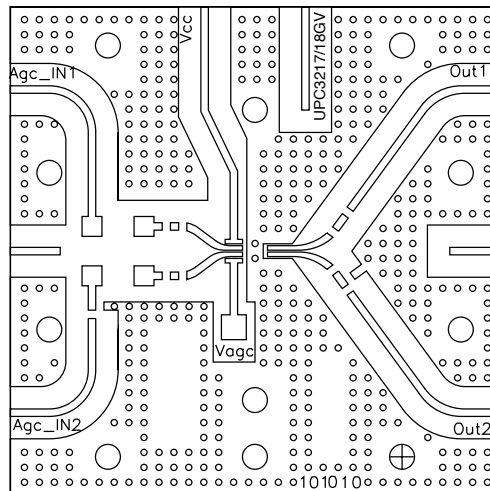
OUTLINE DIMENSIONS (Units in mm)

PACKAGE OUTLINE S08



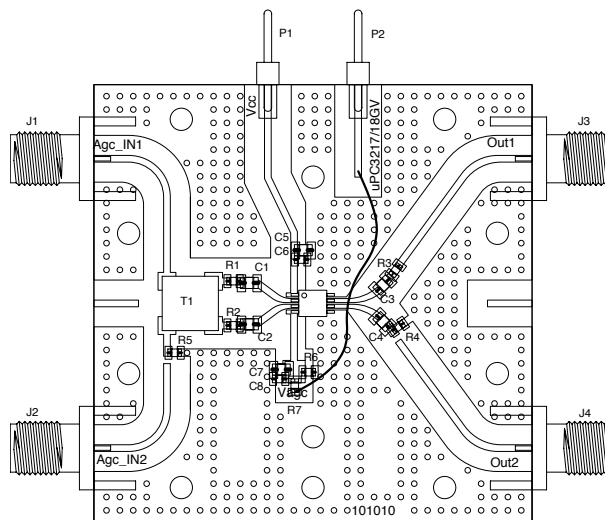
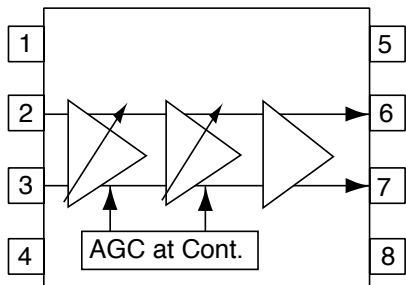
All dimensions are typical unless specified otherwise.

EVALUATION BOARD



EVALUATION BOARD ASSEMBLY

INTERNAL BLOCK DIAGRAM



| | |
|-----------|-----------------------------|
| T1 | Transformer 4:1 Coilcraft |
| R7 | 0603 10K OHM RES ROHM |
| R6 | 0603 13K OHM RES ROHM |
| R4 | 0603 240 OHM RES ROHM |
| R3 | 0603 191 OHM RES ROHM |
| R1,R2,R5 | 0603 0 OHM RES ROHM |
| C6, C8 | 0603 1000pF CAP ROHM |
| C1-C5, C7 | 0805 1uF CAP ROHM |
| U1 | IC NEC, UPC3217/18GV IC NEC |

Life Support Applications

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05/14/2008

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CEL Pb-free products have the same base part number with a suffix added. The suffix –A indicates that the device is Pb-free. The –AZ suffix is used to designate devices containing Pb which are exempted from the requirement of RoHS directive (*). In all cases the devices have Pb-free terminals. All devices with these suffixes meet the requirements of the RoHS directive.

This status is based on CEL’s understanding of the EU Directives and knowledge of the materials that go into its products as of the date of disclosure of this information.

| Restricted Substance per RoHS | Concentration Limit per RoHS (values are not yet fixed) | Concentration contained in CEL devices | |
|-------------------------------|---|--|-----|
| | | -A | -AZ |
| Lead (Pb) | < 1000 PPM | Not Detected | (*) |
| Mercury | < 1000 PPM | Not Detected | |
| Cadmium | < 100 PPM | Not Detected | |
| Hexavalent Chromium | < 1000 PPM | Not Detected | |
| PBB | < 1000 PPM | Not Detected | |
| PBDE | < 1000 PPM | Not Detected | |

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