



## SUCCESSIVE DETECTION LOG VIDEO AMPLIFIER (SDLVA), 0.6 - 20 GHz

### Typical Applications

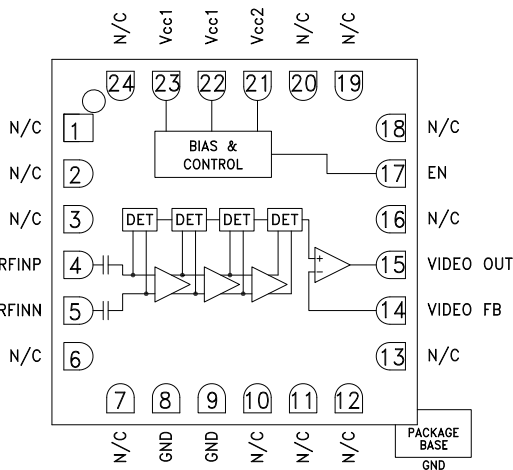
The HMC913LC4B is ideal for:

- EW, ELINT & IFM Receivers
- DF Radar Systems
- ECM Systems
- Broadband Test & Measurement
- Power Measurement & Control Circuits
- Military & Space Applications

### Features

- High Logging Range: 59 dB (-54 to +5 dBm) @ 18 GHz
- Output Frequency Flatness:  $\pm 2$  dB
- Log Linearity:  $\pm 1$  dB
- Fast Rise/Fall Times: 5/10 ns
- Single Positive Supply: +3.3V
- ESD Sensitivity (HBM): Class 1A
- 24 Lead 4x4mm SMT Package: 16mm<sup>2</sup>

### Functional Diagram



### General Description

The HMC913LC4B is a Successive Detection Log Video Amplifier (SDLVA) which operates from 0.6 to 20 GHz. The HMC913LC4B provides a logging range of 59 dB. This device offers typical fast rise/fall times of 5/10 ns and a superior delay time of only 14 ns. The HMC913LC4B log video output slope is typically 14 mV/dB. Maximum recovery times are less than 30 ns. The HMC913LC4B is available in a highly compact 4x4 mm SMT ceramic package and is ideal for high speed channelized receiver applications.

### Electrical Specifications, $T_A = +25^\circ\text{C}$ $V_{cc1} = V_{cc2} = +3.3\text{V}$

| Parameter   | Conditions                   | Typ.         | Units                          |
|---|------------------------------|--------------|--------------------------------|
| Input Frequency Range <sup>[1][2]</sup>           |                              | 0.6 - 20     | GHz                            |
| Frequency Flatness                                | Pin = -25 dBm                | $\pm 2$      | dB                             |
| Log Linearity                                     | Pin = -50 to +3 dBm          | $\pm 1$      | dB                             |
| Log Linearity over Temperature                    | Pin = -25 dBm                | $\pm 1$      | dB                             |
| Minimum Logging Range                             | to $\pm 3$ dB error @ 18 GHz | -54 @ 18 GHz | dBm                            |
| Maximum Logging Range                             | to $\pm 3$ dB error @ 18 GHz | +5 @ 18 GHz  | dBm                            |
| Input Return Loss                                 |                              | 7            | dB                             |
| Log Video Minimum Output Voltage                  |                              | 1            | V                              |
| Log Video Maximum Output Voltage                  |                              | 1.8          | V                              |
| Log Video Output Rise Time                        | 10% to 90%                   | 5            | ns                             |
| Log Video Output Fall Time                        | 90% to 10%                   | 10           | ns                             |
| Log Video Recovery Time                           |                              | 25           | ns                             |
| Log Video Output Slope                            |                              | 14           | mV/dB                          |
| Log Video Output Slope Variation over Temperature | @ 10 GHz                     | 5            | $\mu\text{V/dB}^\circ\text{C}$ |
| Log Video Propagation Delay                       |                              | 14           | ns                             |
| Supply Current (Icc1)                             |                              | 80           | mA                             |
| Supply Current (Icc2)                             | @ Pin = -30 dBm              | 8            | mA                             |

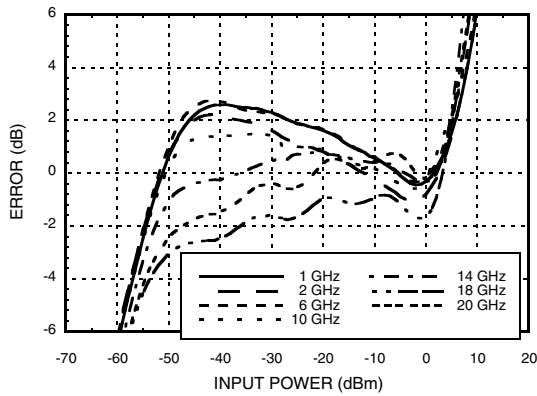
[1] Electrical specs and performance plots are given for single-ended operation

[2] Video output load should be 1K Ohm or higher.

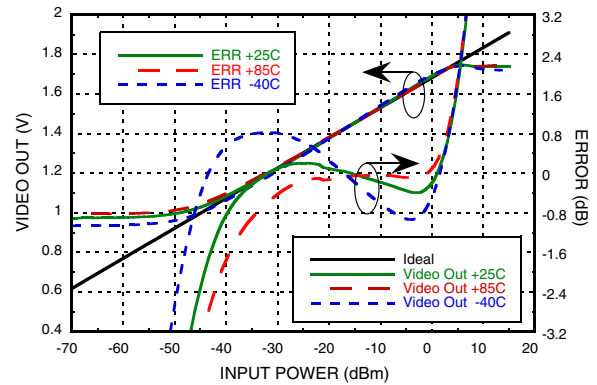


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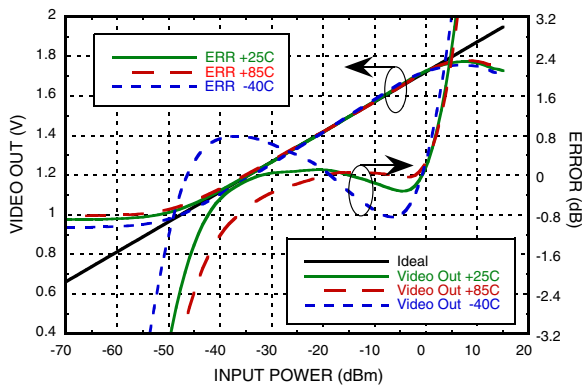
**Error Flatness vs. Input Power Over Frequency [1][2]**



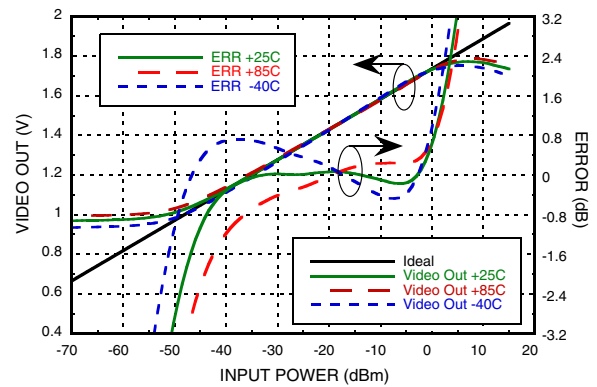
**VIDEO OUT & Error vs. Input Power, Fin = 500 MHz [1]**



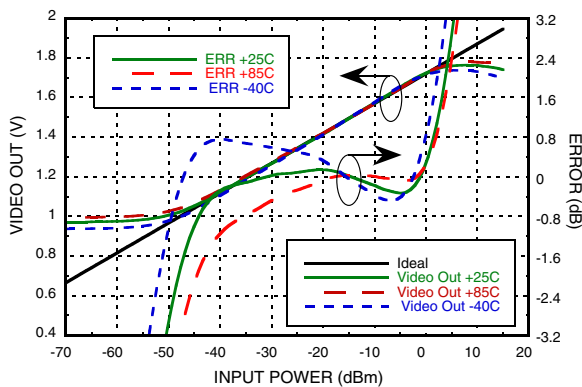
**VIDEO OUT & Error vs. Input Power, Fin = 1 GHz [1]**



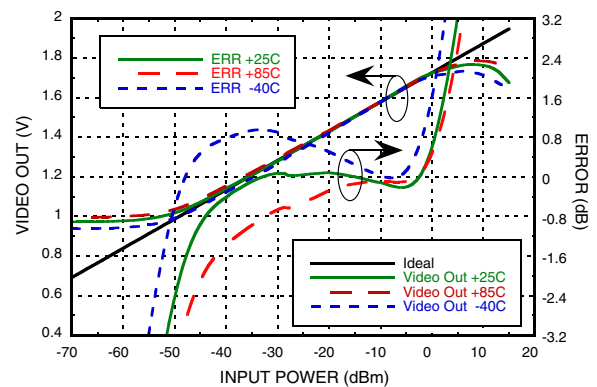
**VIDEO OUT & Error vs. Input Power, Fin = 2 GHz [1]**



**VIDEO OUT & Error vs. Input Power, Fin = 6 GHz [1]**



**VIDEO OUT & Error vs. Input Power, Fin = 10 GHz [1]**



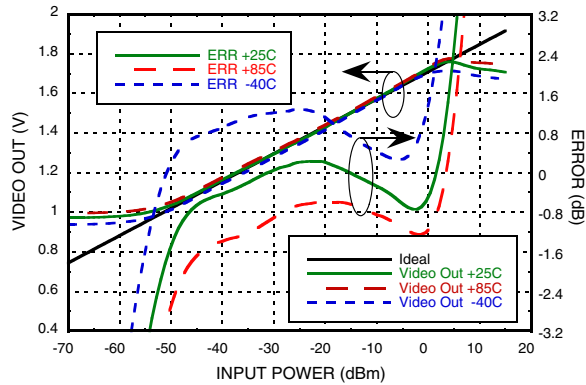
[1] Electrical Specs and performance plots are given for single-ended operation  
 [2] An average ideal line is used to calculate error curves.



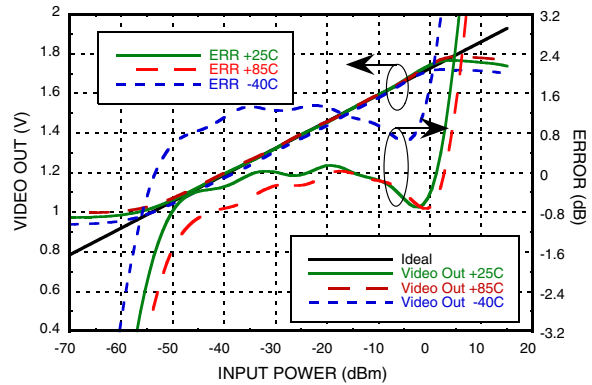
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SDLVAS - SMT

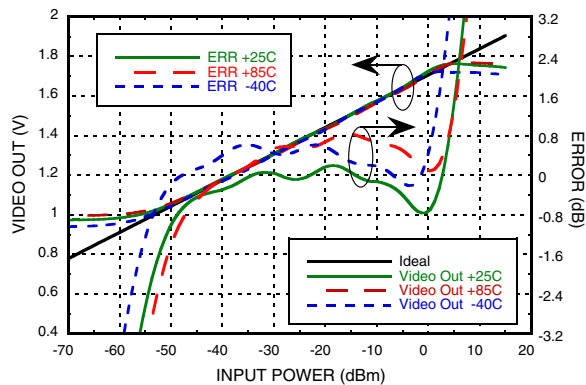
**VIDEO OUT & Error vs. Input Power,  $F_{in} = 14$  GHz [1]**



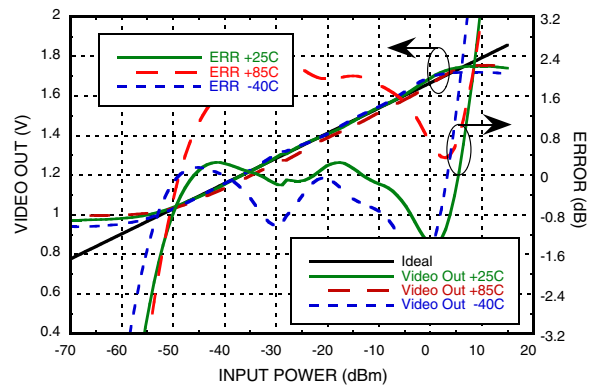
**VIDEO OUT & Error vs. Input Power,  $F_{in} = 18$  GHz [1]**



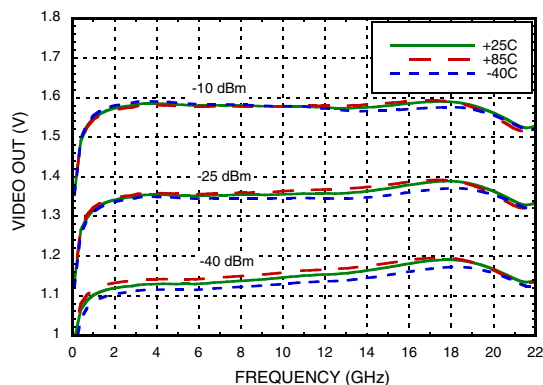
**VIDEO OUT & Error vs. Input Power,  $F_{in} = 20$  GHz [1]**



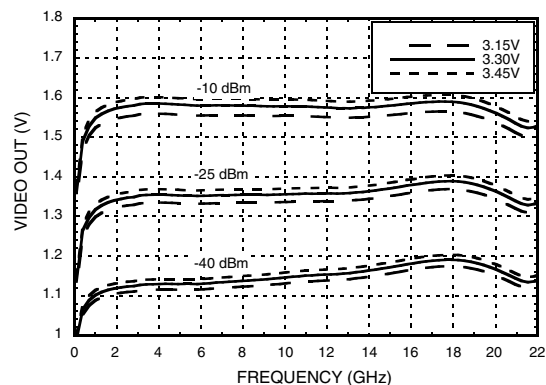
**VIDEO OUT & Error vs. Input Power,  $F_{in} = 26$  GHz [1]**



**VIDEO OUT vs. Frequency Over Input Power & Temperature [1]**



**VIDEO OUT vs. Frequency Over Input Power & Bias Voltage [1]**



[1] Electrical Specs and performance plots are given for single-ended operation

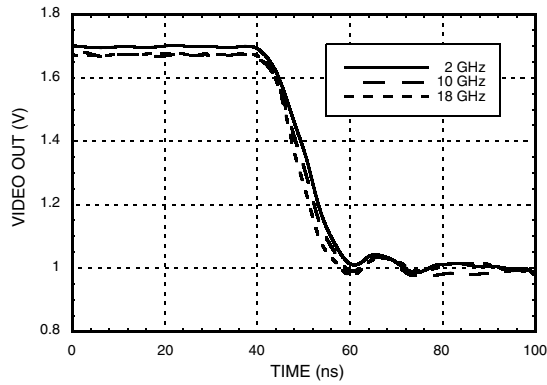
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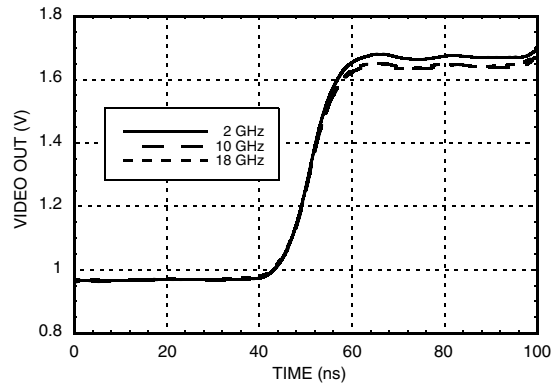


**SUCCESSIVE DETECTION LOG VIDEO  
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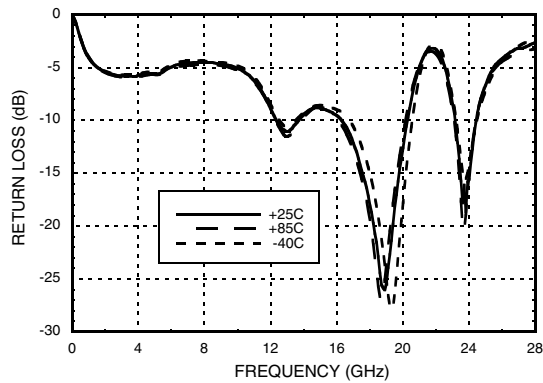
**Fall Time for Various Frequencies  
@ 0 dBm [1]**



**Rise Time for Various Frequencies  
@ 0 dBm [1]**



**Input Return Loss vs. Frequency [1]**



[1] Electrical Specs and performance plots are given for single-ended operation



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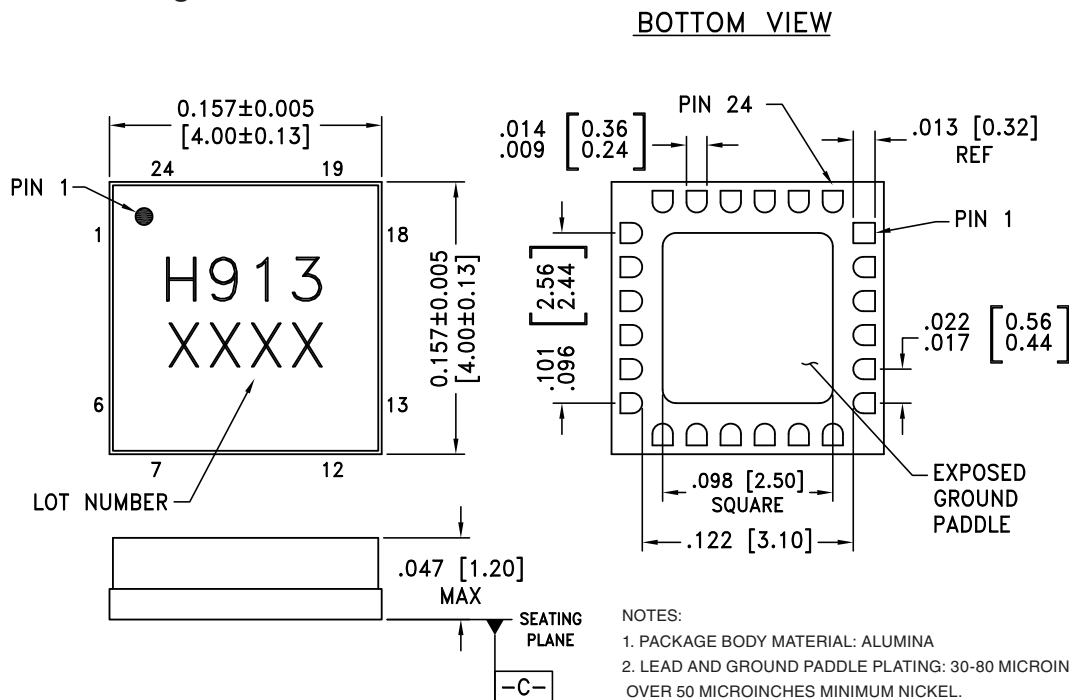
### Absolute Maximum Ratings

|   |                |
|---|----------------|
| Vcc   | +3.6V          |
| Enable  | +3.6V          |
| RF Input Power  | +15 dBm        |
| Junction Temperature  | 125 °C         |
| Continuous Pdiss (T=85 °C)<br>Derate 12.63 mW/°C above 85 °C          | 0.51 W         |
| Thermal Resistance (R <sub>th</sub> )<br>(junction to package bottom) | 79.2 °C/W      |
| Storage Temperature   | -65 to +150 °C |
| Operating Temperature   | -40 to +85 °C  |
| ESD Sensitivity (HBM)   | Class 1A       |



ELECTROSTATIC SENSITIVE DEVICE  
OBSERVE HANDLING PRECAUTIONS

### Outline Drawing



- NOTES:
1. PACKAGE BODY MATERIAL: ALUMINA
  2. LEAD AND GROUND PADDLE PLATING: 30-80 MICROINCHES GOLD OVER 50 MICROINCHES MINIMUM NICKEL.
  3. DIMENSIONS ARE IN INCHES [MILLIMETERS].
  4. LEAD SPACING TOLERANCE IS NON-CUMULATIVE
  5. PACKAGE WARP SHALL NOT EXCEED 0.05mm DATUM -C-
  6. ALL GROUND LEADS AND GROUND PADDLE MUST BE SOLDERED TO PCB RF GROUND.

### Package Information

| Part Number | Package Body Material | Lead Finish      | MSL Rating          | Package Marking <sup>[2]</sup> |
|-------------|-----------------------|------------------|---------------------|--------------------------------|
| HMC913LC4B  | Alumina, White        | Gold over Nickel | MSL3 <sup>[1]</sup> | H913<br>XXXX                   |

[1] Max peak reflow temperature of 260 °C

[2] 4-Digit lot number XXXX

## SUCCESSIVE DETECTION LOG VIDEO AMPLIFIER (SDLVA), 0.6 - 20 GHz



### Pin Descriptions

| Pin Number                            | Function            | Description  | Interface Schematic |
|---------------------------------------|---------------------|--|---------------------|
| 1 - 3, 6, 7, 10 - 13, 16, 18 - 20, 24 | N/C                 | The pins are not connected internally; however, all data shown herein was measured with these pins connected to RF/DC ground externally.   |                     |
| 4, 5                                  | RFINP, RFINN        | RF Input pins Connect RF to RFINP and AC couple RFINN to ground via 50 Ohm for single ended operation  |                     |
| 8, 9                                  | GND                 | These pins and the exposed package bottom must be connected to a high quality RF/DC ground.  |                     |
| 14, 15                                | VIDEO FB, VIDEO OUT | Video out and feedback. These pins should be shorted to each other (see application circuit). Video out load should be at least 1K Ohm or higher.  |                     |
| 17                                    | EN                  | Enable pin connected to Vcc1 or Vcc2 for normal operation. Total supply current reduced to less than 3mA when EN is set to 0V.   |                     |
| 21                                    | Vcc2                | Bias Supply. Connect supply voltage to these pins with appropriate filtering. Connect Vcc2 with Vcc1. See application circuit.<br>To ensure proper start-up supply rise time should be faster than 100usec |                     |



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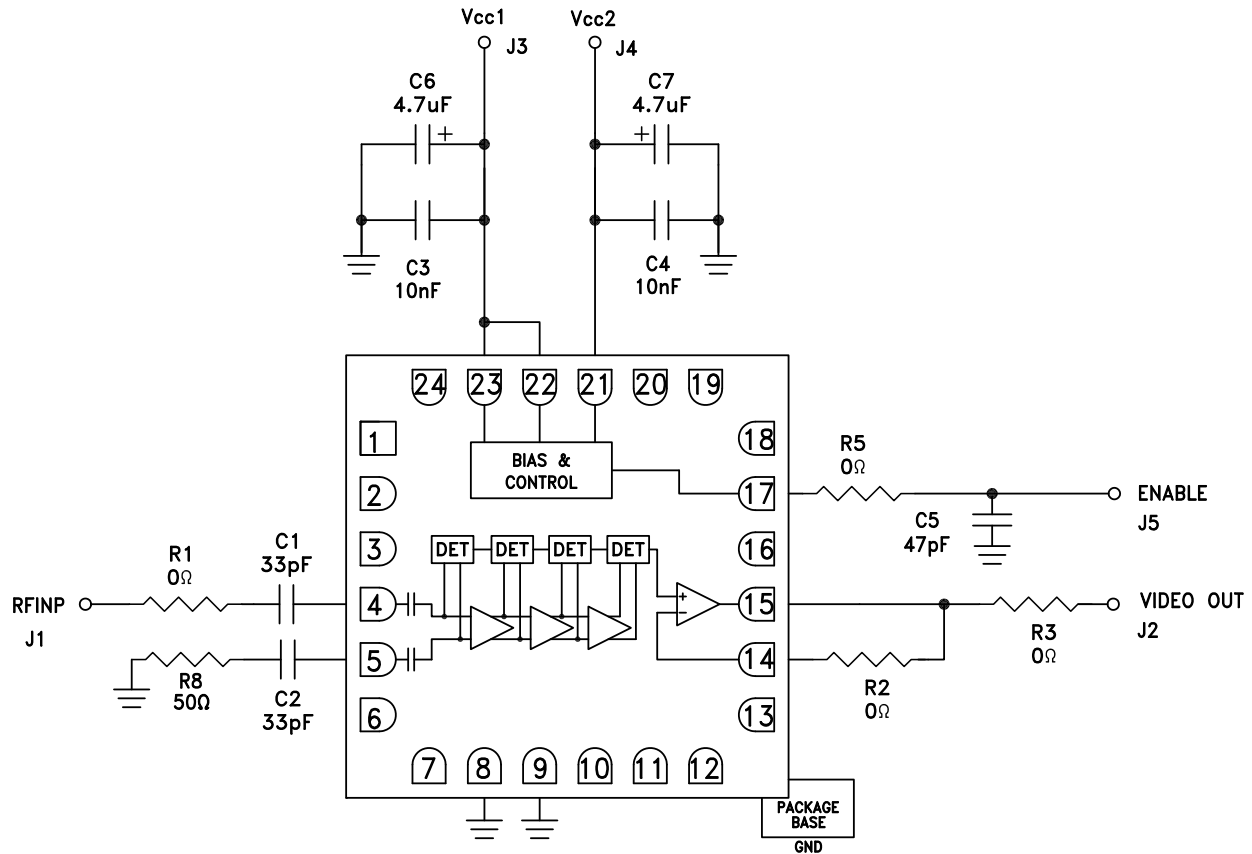
**Pin Descriptions**

| Pin Number | Function | Description   | Interface Schematic |
|------------|----------|---|---------------------|
| 22, 23     | Vcc1     | <p>Bias Supply. Connect Supply Voltage to these pins with appropriate filtering. Connect Vcc2 with Vcc1. See application circuit.</p> <p>To ensure proper start-up supply rise time should be faster than 100usec</p> |                     |



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**Application Circuit**



Note1: Connect Vcc2 and Vcc1 together for Nominal operation.

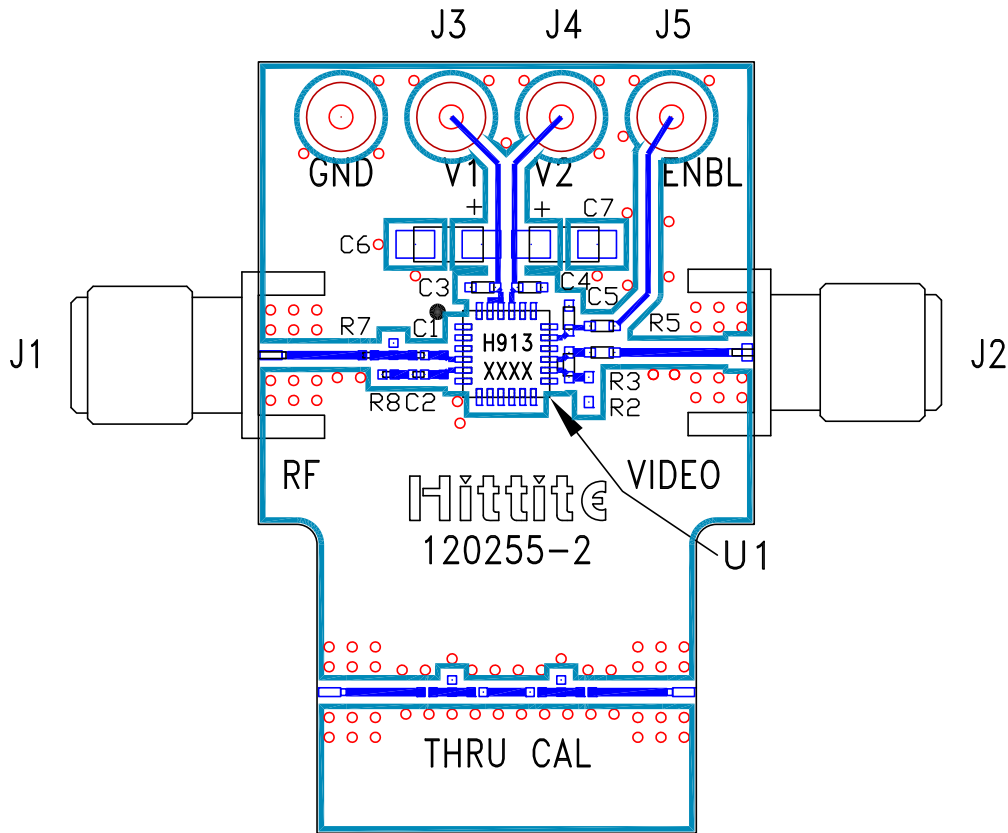
Note2: Video output load should be 1K Ohm or higher.





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**Evaluation PCB**



**List of Materials for Evaluation PCB 120257 [1]**

| Item       | Description                   |
|------------|-------------------------------|
| J1         | K-Type Connector              |
| J2         | SMA Connector                 |
| J3 - J5    | DC Pins                       |
| C1, C2     | 33 pF Capacitor, 0201 Pkg.    |
| C3, C4     | 10k pF Capacitor, 0402 Pkg.   |
| C5         | 47 pF Capacitor, 0402 Pkg.    |
| C6, C7     | 4.7 μF Capacitor, CASE A Pkg. |
| R2, R3, R5 | 0 Ohm Resistor, 0402 Pkg.     |
| R7         | 0 Ohm Resistor, 0201 Pkg.     |
| R8         | 49.9 Ohm Resistor, 0201 Pkg.  |
| U1         | HMC913LC4B SDLVA              |
| PCB [2]    | 120255 Evaluation PCB         |

[1] Reference this number when ordering complete evaluation PCB

[2] Circuit Board Material: Rogers 4350 or Arlon 25 FR

The circuit board used in the application should use RF circuit design techniques. Signal lines should have 50 ohm impedance while the package ground leads and exposed paddle should be connected directly to the ground plane similar to that shown. A sufficient number of via holes should be used to connect the top and bottom ground planes. The evaluation circuit board shown is available from Hittite upon request.

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