# HMC1013LP4E

v02.0913

## SUCCESSIVE DETECTION LOG VIDEO AMPLIFIER (SDLVA), 0.5 - 18.5 GHz

## Typical Applications

The HMC1013LP4E 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: 67 dB (-62 to +5 dBm)

Output Frequency Flatness: ±2 dB

Log Linearity: ±2 dB

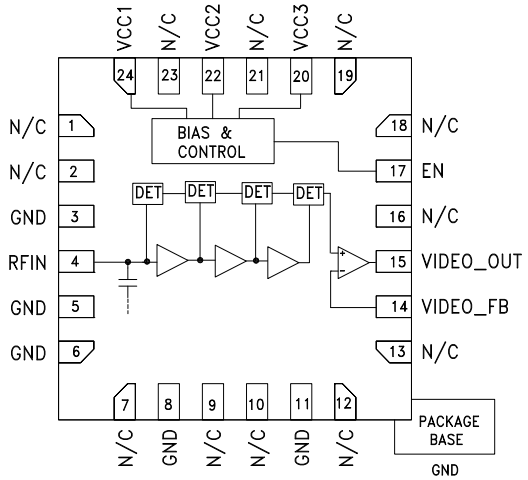
Fast Rise/Fall Times: 5/15 ns

Single Positive Supply: +3.3V

ESD Sensitivity (HBM): Class 1A

24 Lead 4x4mm SMT Package: $16mm^2$

## Functional Diagram




## General Description

The HMC1013LP4E is a Successive Detection Log Video Amplifier which operates from 0.5 to 18.5 GHz. The HMC1013LP4E provides a logging range of 67 dB. This device offers typical fast rise/fall times of 5/15 ns and a superior delay time of only 10 ns. The HMC1013LP4E log video output slope is typically 15 mV/dB. Maximum recovery times are less than 40 ns. The HMC1013LP4E is available in a highly compact 4x4 mm SMT plastic package and is ideal for high speed channelized receiver applications.

## Electrical Specifications, $T_A$ = +25 °C Vcc1 = Vcc2 = Vcc3= +3.3V, EN=3.3V

| Parameter | Conditions | Typ. | Units |
|---|---|---|---|
| Input Frequency Range [1] | | 0.5 - 18.5 | GHz |
| Frequency Flatness | | ±2 | dB |
| Log Linearity | Pin = -60 to +5 dBm | ±2 | dB |
| Log Linearity over Temperature | | ±2 | dB |
| Minimum Logging Range | to ±3 dB error | -62 | dBm |
| Maximum Logging Range | to ±3 dB error | +5 | dBm |
| Input Return Loss | | 8 | dB |
| Log Video Minimum Output Voltage | | 0.9 | V |
| Log Video Maximum Output Voltage | | 1.9 | V |
| Log Video Output Rise Time | 10% to 90% | 5 | ns |
| Log Video Output Fall Time | 90% to 10% | 15 | ns |
| Log Video Recovery Time | @ 10 GHz | 38 | ns |
| Log Video Output Slope | | 15 | mV/dB |
| Log Video Output Slope Variation over Temperature | @ 10 GHz | 6.2 | µV/dB°C |
| Log Video Propagation Delay | | 10 | ns |
| Supply Current (Icc1) | | 7 | mA |
| Supply Current (Icc2) | | 90 | mA |
| Supply Current (Icc3) | | 86 | mA |

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



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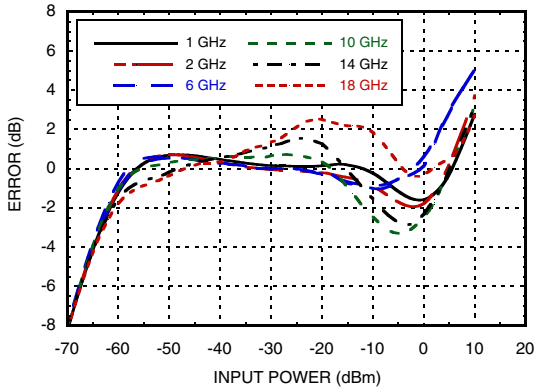
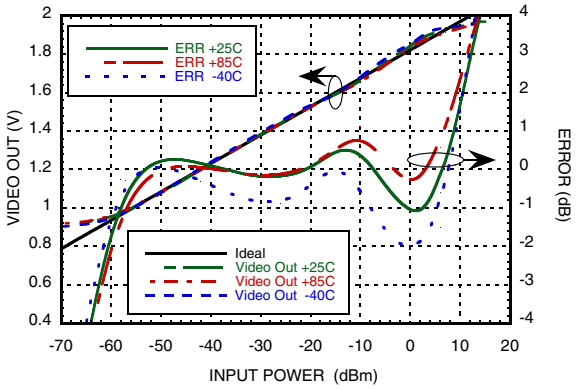
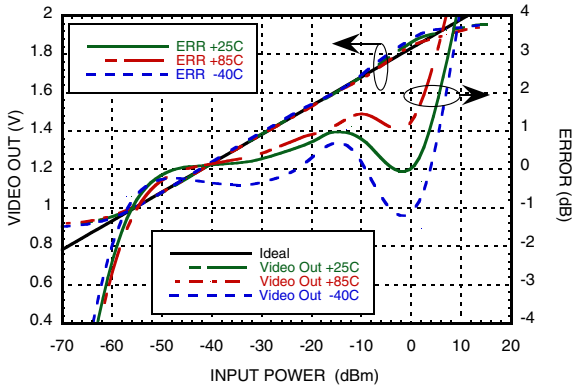
### Error Flatness vs. Input Power Over Frequency [1] [2]



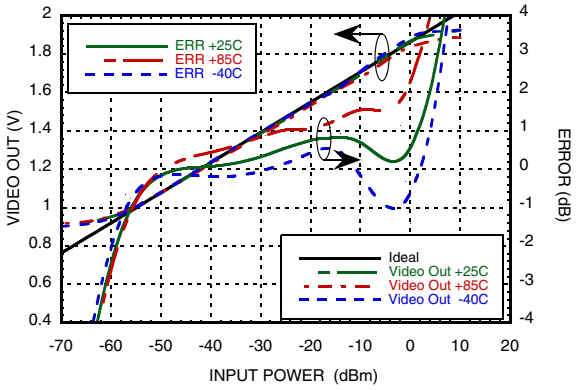

### VIDEO OUT & Error vs. Input Power, Fin = 500 MHz



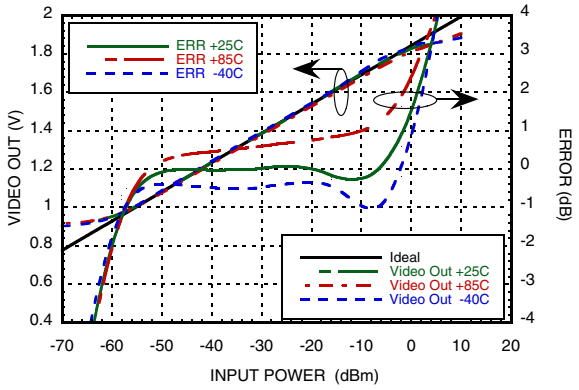

### VIDEO OUT & Error vs. Input Power, Fin = 1 GHz



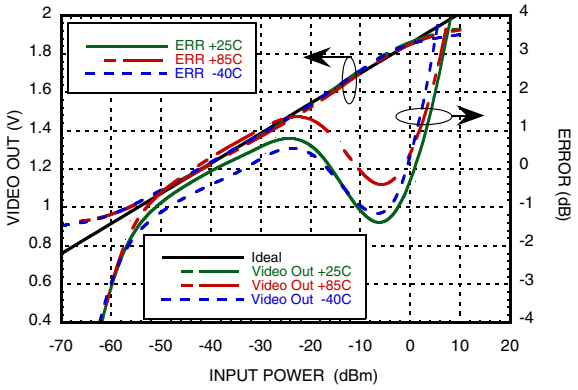

### VIDEO OUT & Error vs. Input Power, Fin = 2 GHz




### VIDEO OUT & Error vs. Input Power, Fin = 6 GHz




### VIDEO OUT & Error vs. Input Power, Fin = 10 GHz




[1] An average ideal line is used to calculate error curves.
[2] At 25°C.



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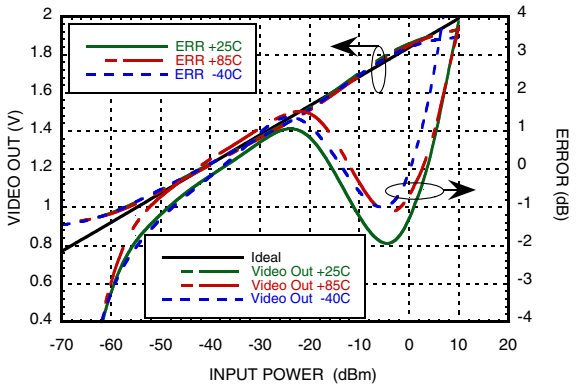
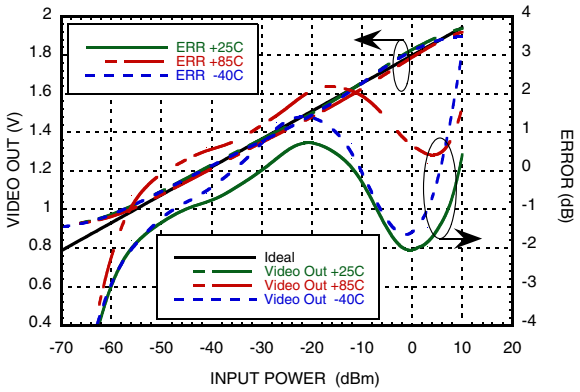
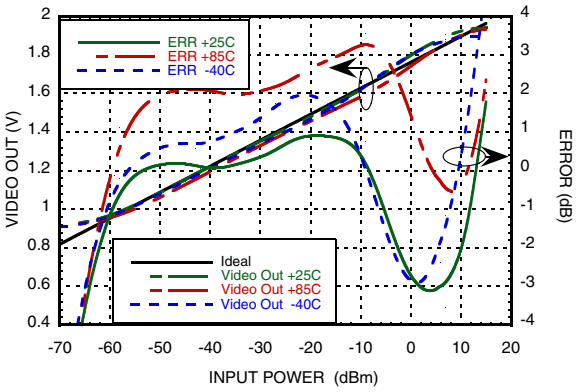
### VIDEO OUT & Error vs. Input Power, Fin = 14 GHz



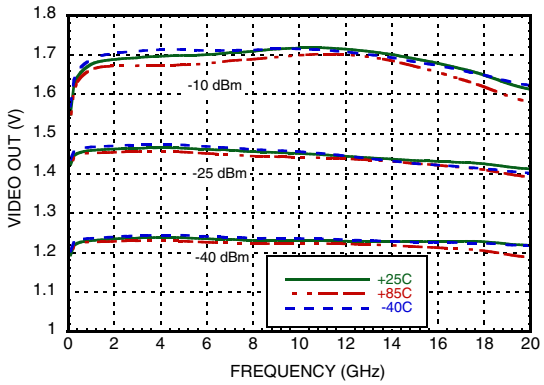

### VIDEO OUT & Error vs. Input Power, Fin = 18 GHz



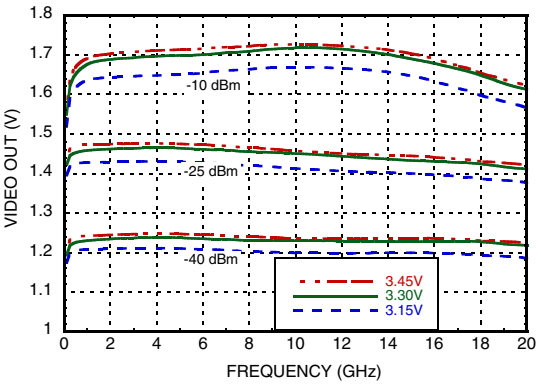

### VIDEO OUT & Error vs. Input Power, Fin = 20 GHz




### VIDEO OUT vs. Frequency Over Input Power & Temperature




### VIDEO OUT vs. Frequency Over Input Power & Bias Voltage



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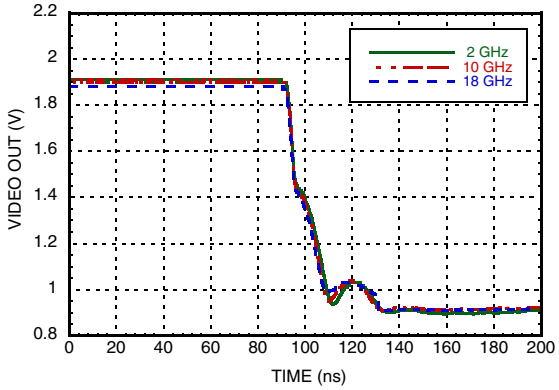
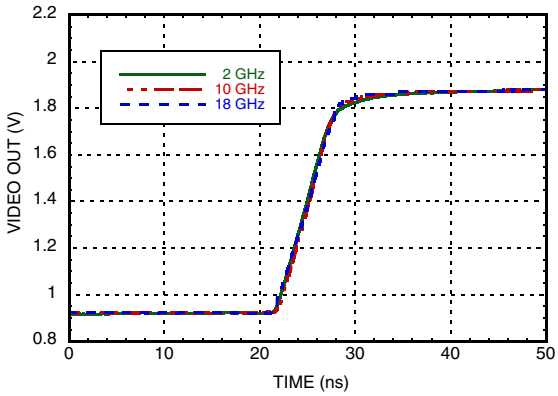
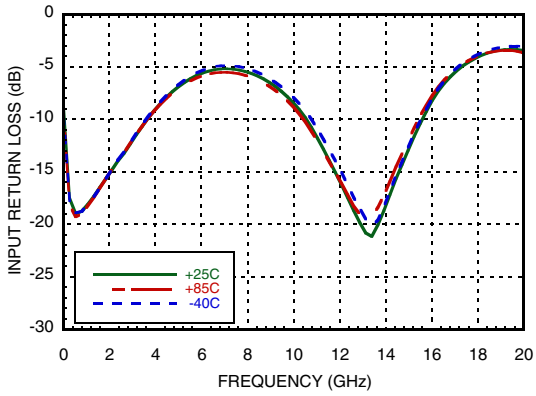
### Fall Time for Various Frequencies @ 0 dBm




### Rise Time for Various Frequencies @ 0 dBm




### Input Return Loss vs. Frequency




### Absolute Maximum Ratings

| | |
|---|---|
| Vcc | +3.6V |
| Enable | +3.6V |
| RF Input Power | +13 dBm |
| Junction Temperature | 125 °C |
| Continuous Pdiss (T=85 °C) Derate 35.22 mW/°C above 85 °C | 1.41 W |
| Thermal Resistance ($R_{th}$) (junction to package bottom) | 28.4 °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



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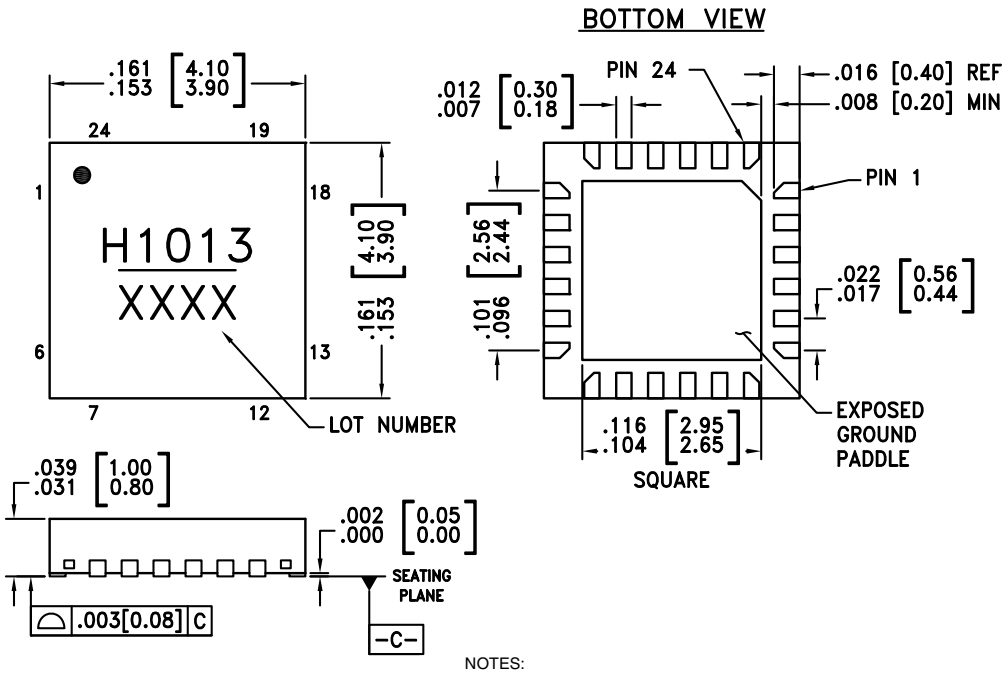
# SUCCESSIVE DETECTION LOG VIDEO AMPLIFIER (SDLVA), 0.5 - 18.5 GHz



## Outline Drawing




NOTES:

1. PACKAGE BODY MATERIAL: LOW STRESS INJECTION MOLDED PLASTIC SILICA AND SILICON IMPREGNATED.
2. LEAD AND GROUND PADDLE MATERIAL: COPPER ALLOY.
3. LEAD AND GROUND PADDLE PLATING: 100% MATTE TIN
4. DIMENSIONS ARE IN INCHES [MILLIMETERS].
5. LEAD SPACING TOLERANCE IS NON-CUMULATIVE.
6. CHARACTERS TO BE HELVETICA MEDIUM, .025 HIGH, WHITE INK, OR LASER MARK LOCATED APPROX. AS SHOWN.
7. PAD BURR LENGTH SHALL BE 0.15mm MAX. PAD BURR HEIGHT SHALL BE 0.05mm MAX.
8. PACKAGE WARP SHALL NOT EXCEED 0.05mm
9. ALL GROUND LEADS AND GROUND PADDLE MUST BE SOLDERED TO PCB RF GROUND.
10. REFER TO HITTITE APPLICATION NOTE FOR SUGGESTED PCB LAND PATTERN

## Package Information

| Part Number | Package Body Material | Lead Finish | MSL Rating | Package Marking [1] |
|---|---|---|---|---|
| HMC1013LP4E | RoHS-compliant Low Stress Injection Molded Plastic | 100% matte Sn | MSL1 [2] | H1013<br>XXXX |

[1] 4-Digit lot number XXXX

[2] Max peak reflow temperature of 260 °C



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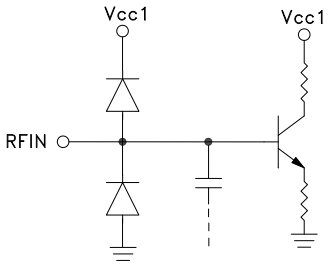
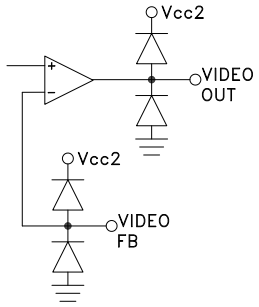
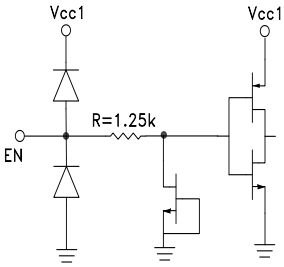
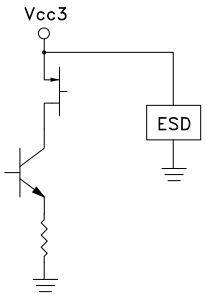
## Pin Descriptions

| Pin Number | Function | Description | Interface Schematic |
|---|---|---|---|
| 1-2, 7, 9-10, 12-13, 16, 18-19, 21, 23 | N/C | The pins are not connected internally; however, all data shown herein was measured with these pins connected to RF/DC ground externally. | |
| 3, 5-6, 8, 11 | GND | These pins and the exposed package bottom must be connected to a high quality RF/DC ground. |   |
| 4 | RFIN | RF Input pin |   |
| 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, connect to 3.3V supply for normal operation. Total supply current reduced to less than 11mA when EN is set to 0V. |   |
| 20 | VCC3 | Bias Supply. Connect supply voltage to these pins with appropriate filtering. See application circuit To ensure proper start-up supply rise time should be faster than 100usec. |   |



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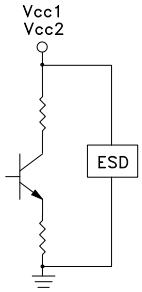
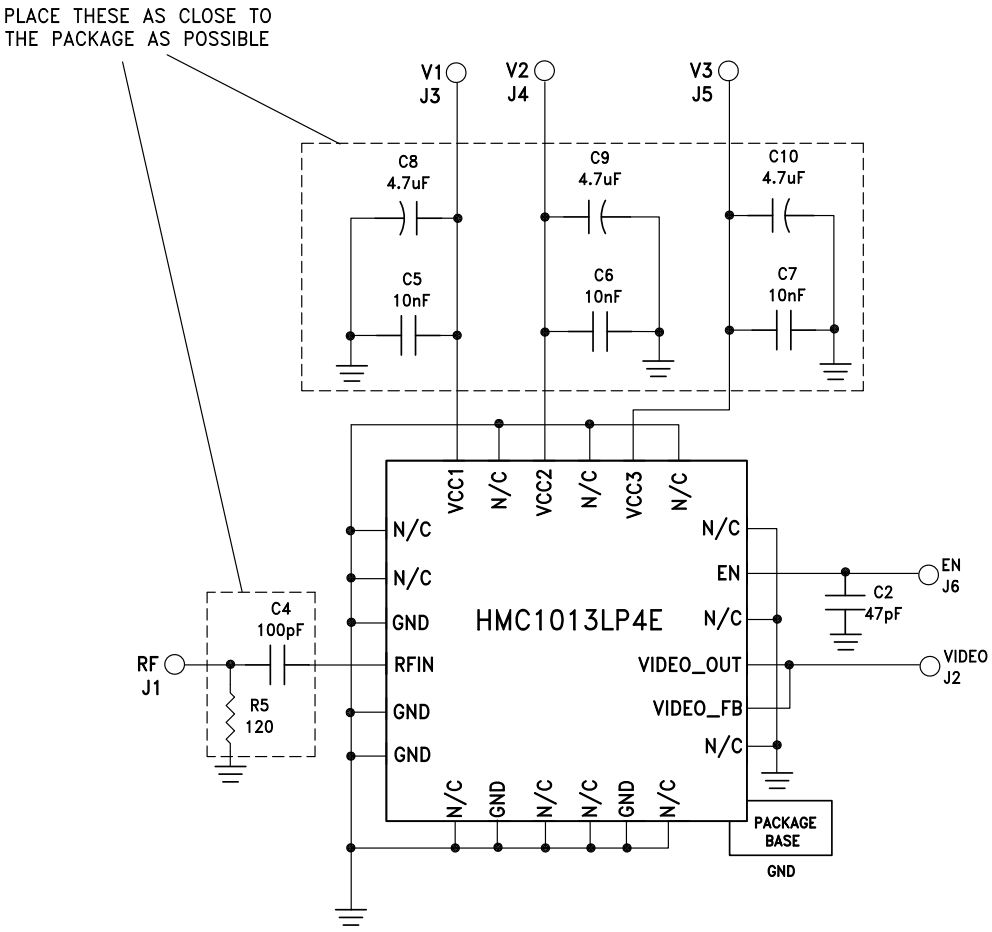
## Pin Descriptions *(continued)*

| Pin Number | Function | Description | Interface Schematic |
|---|---|---|---|
| 22, 24 | VCC2, VCC1 | 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. |  |

## Application Circuit




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



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