



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

Typical Applications

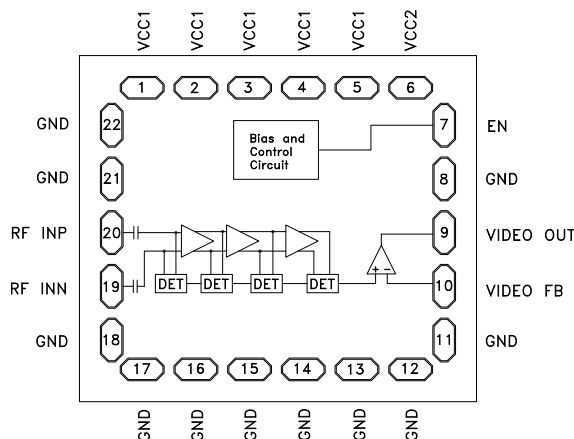
The HMC913 is ideal for:

- 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: ± 1.5 dB
- Log Linearity: ± 1 dB
- Fast Rise/Fall Times: 5/10 ns
- Single Positive Supply: +3.3V
- ESD Sensitivity (HBM): Class 1A

Functional Diagram



General Description

The HMC913 is a Successive Detection Log Video Amplifier (SDLVA) which operates from 0.6 to 20 GHz. The HMC913 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 HMC913 log video output slope is typically 14 mV/dB. Maximum recovery times are less than 30 ns. Ideal for high speed channelized receiver applications, the HMC913 operates from a single +3.3 V supply, and consumes only 80 mA. All data shown herein is measured with the chip in a 50 Ohm environment and contacted with RF probes.

Electrical Specifications, $T_A = +25^\circ\text{C}$, $V_{cc1} = V_{cc2} = 3.3\text{V}$ [1]

Parameter	Conditions	Typ.	Units
Input Frequency Range [1][2]		0.6 - 20	GHz
Frequency Flatness	Pin = -25 dBm	± 1.5	dB
Log Linearity	Pin = -50 to +3 dBm	± 1	dB
Log Linearity over Temperature (-55 °C to +85 °C)	Pin = -25 dBm	± 1.5	dB
Minimum Logging Range	to ± 3 dB error @ 18 GHz	-54 @ 18 GHz	dBm
Maximum Logging Range	to ± 3 dB error @ 18 GHz	+5 @ 18 GHz	dBm
Input Return Loss		5.5	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 ($I_{cc1} + I_{cc2}$)	@ Pin = -30 dBm	80	mA

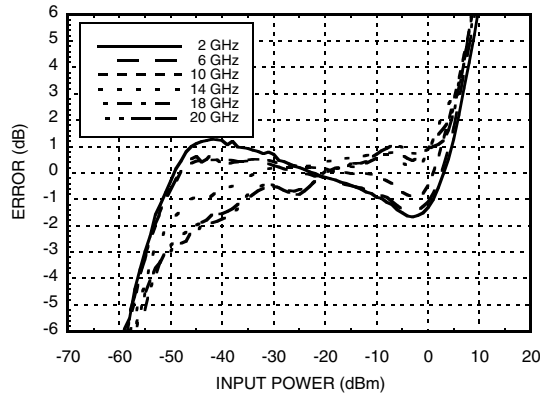
[1] Electrical specs and performance plots are given for single-ended operation

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

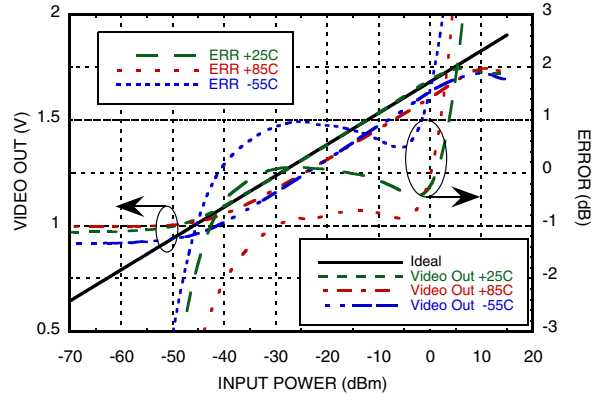


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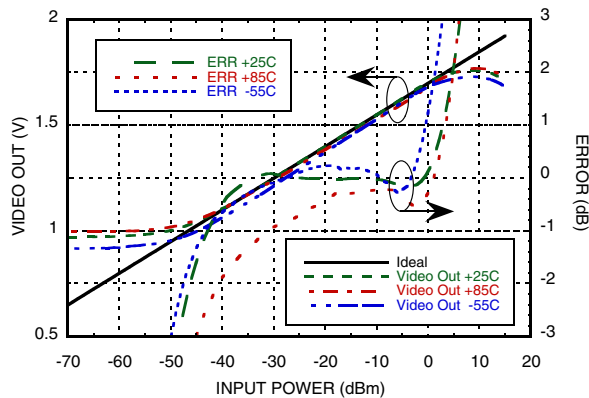
Error Flatness vs. Input Power Over Frequency [1][2]



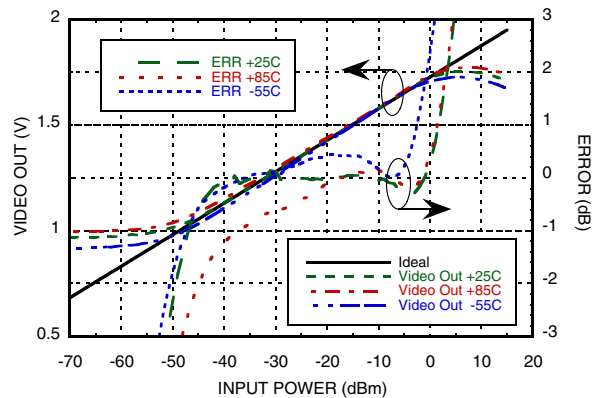
VIDEO OUT & Error vs. Input Power, Fin = 500 MHz [1]



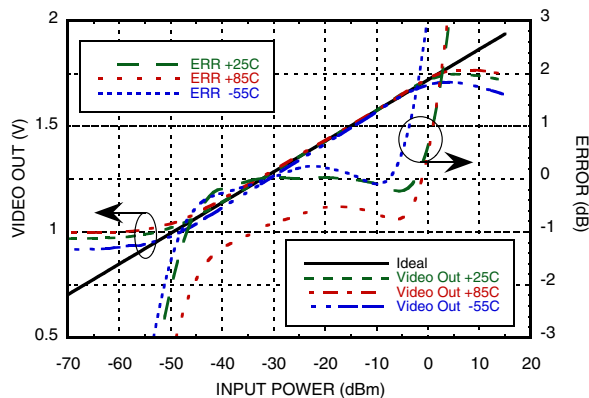
VIDEO OUT & Error vs. Input Power, Fin = 1 GHz [1]



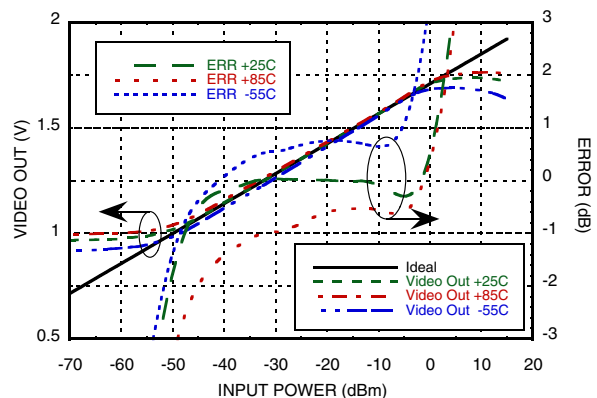
VIDEO OUT & Error vs. Input Power, Fin = 2 GHz [1]



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



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

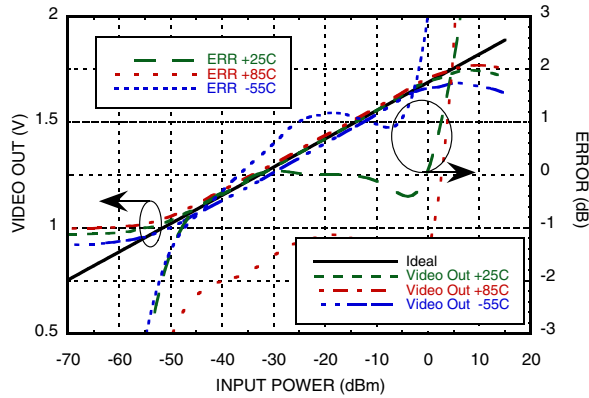


[1] Electrical specs and performance plots are given for single-ended operation
 [2] An average ideal line is used to calculate error curves.

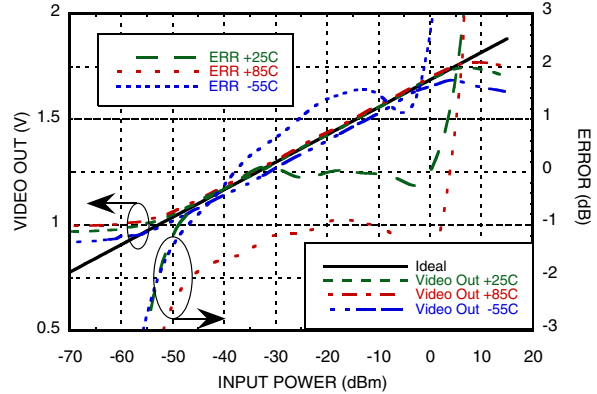


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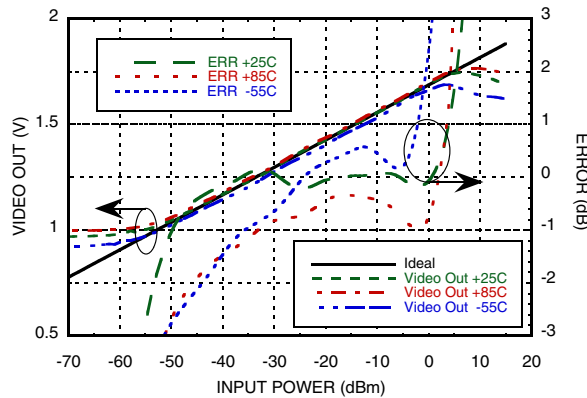
VIDEO OUT & Error vs. Input Power, $F_{in} = 14$ GHz [1]



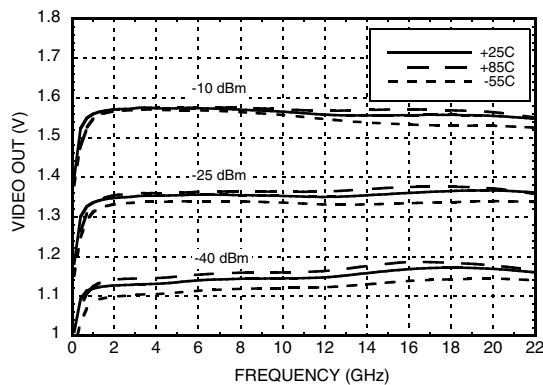
VIDEO OUT vs. Error vs. Input Power, $F_{in} = 18$ GHz [1]



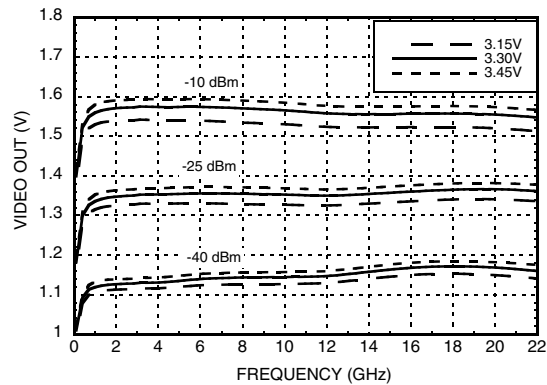
VIDEO OUT & Error vs. Input Power, $F_{in} = 20$ GHz [1]



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

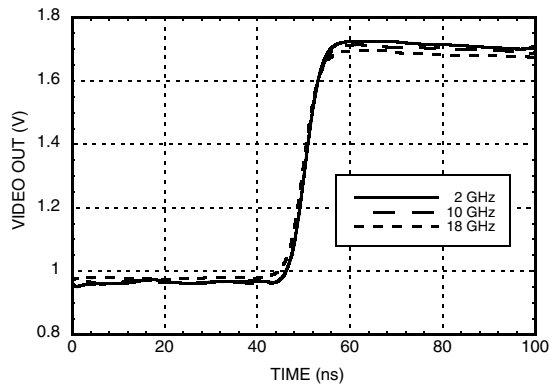
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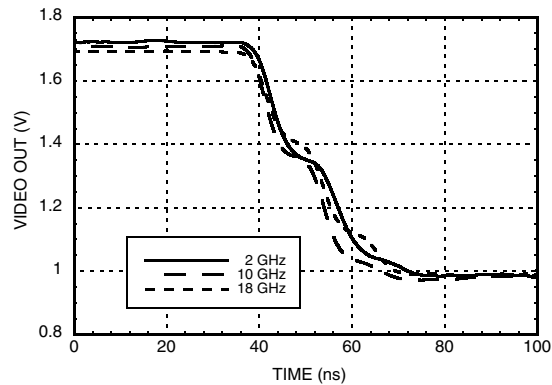


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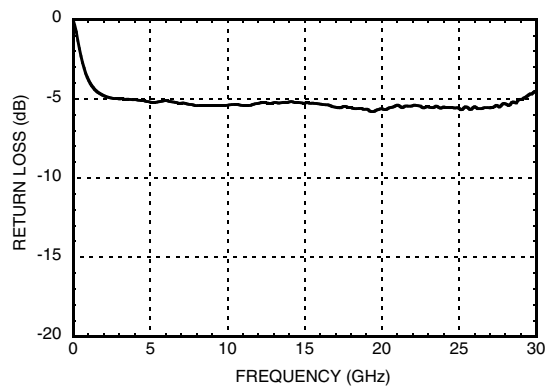
**Rise Time for Various Frequencies
@ 0 dBm [1]**



**Fall 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
ENBL	+3.6V
RF Input Power	+15 dBm
Channel Temperature	125 °C
Continuous P _{diss} (T=85°C) Derate 12.63 mW/°C above 85°C	0.51 W
Thermal Resistance R _{th} (Junction to die bottom)	33.94 °C/W
Storage Temperature	-65 to +150 °C
Operating Temperature	-55 to +85 °C
ESD Sensitivity (HBM)	Class 1A

Die Packaging Information ^[1]

Standard	Alternate
WP-3 (Waffle Pack)	[2]

[1] Refer to the "Packaging Information" section for die packaging dimensions.

[2] For alternate packaging information contact Hittite Microwave Corporation.

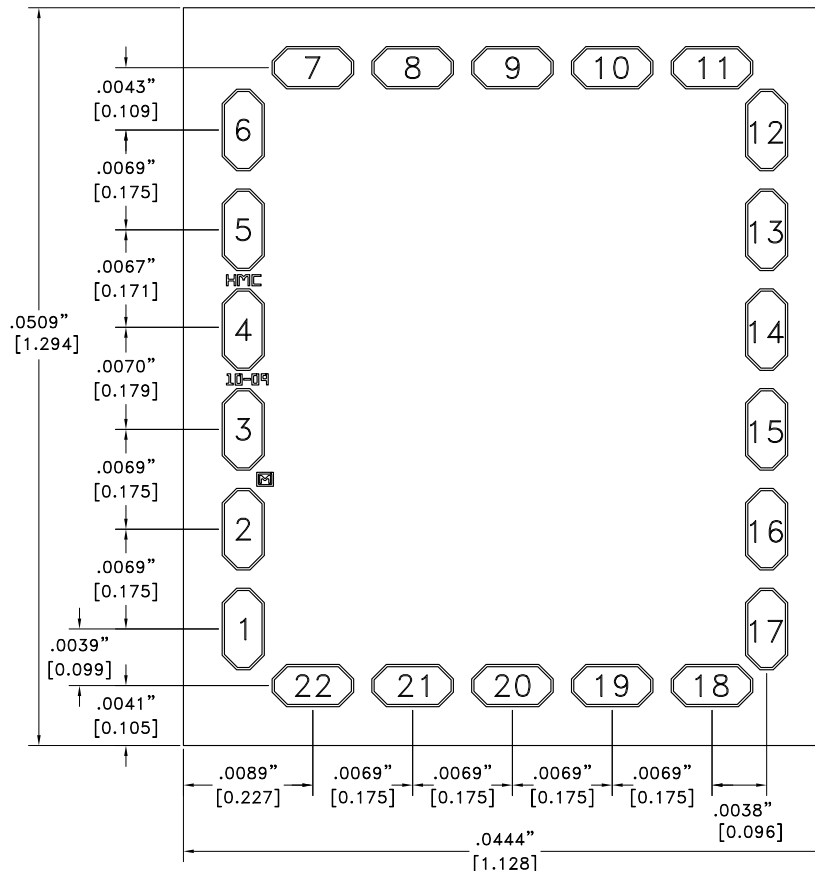
NOTES:

1. ALL DIMENSIONS IN INCHES [MILLIMETERS]
2. DIE THICKNESS IS 0.011 (0.279)
3. TYPICAL BOND PAD IS 0.0024 SQUARE
4. BOND PAD METALLIZATION: ALUMINUM
5. NO BACKSIDE METAL
6. NO CONNECTION REQUIRED FOR UNLABELED BOND PADS
7. OVERALL DIE SIZE IS ±.002



ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

Outline Drawing



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Pad Descriptions

Pad Number	Function	Description	Interface Schematic
1 - 5	VCC1	Bias Supply. Connect Supply Voltage to these pins with appropriate filtering. To ensure proper start-up supply rise time should be faster than 100usec	
6	VCC2	Bias Supply. Connect supply voltage to these pins with appropriate filtering. To ensure proper start-up supply rise time should be faster than 100usec	
7	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.	
8, 11 - 18, 21, 22 Die Bottom	GND	These pins and the die bottom must be connected to a high quality RF/DC ground.	
9, 10	VIDEO OUT, VIDEO FB	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.	

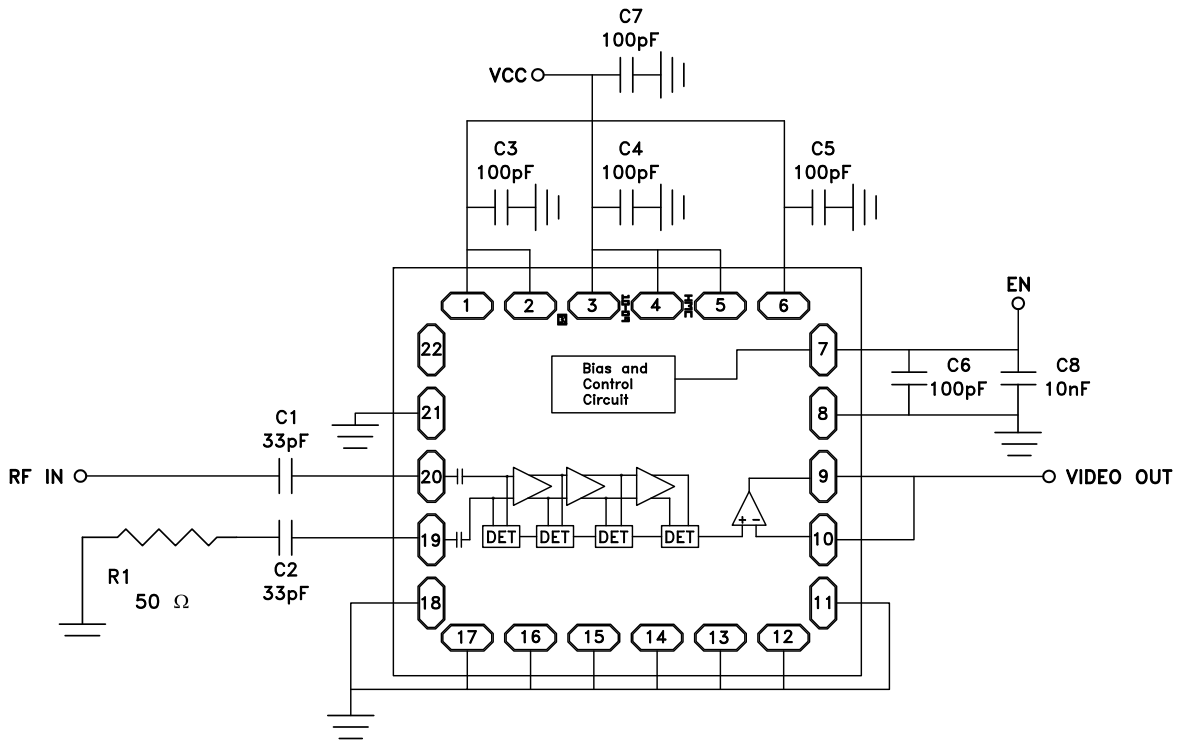


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Pad Descriptions (Continued)

Pad Number	Function	Description	Interface Schematic
19, 20	RFINN, RFINP	RF Input pins Connect RF to RFINP and AC couple RFINN to ground via 50 Ohm for single ended operation.	

Application Circuit

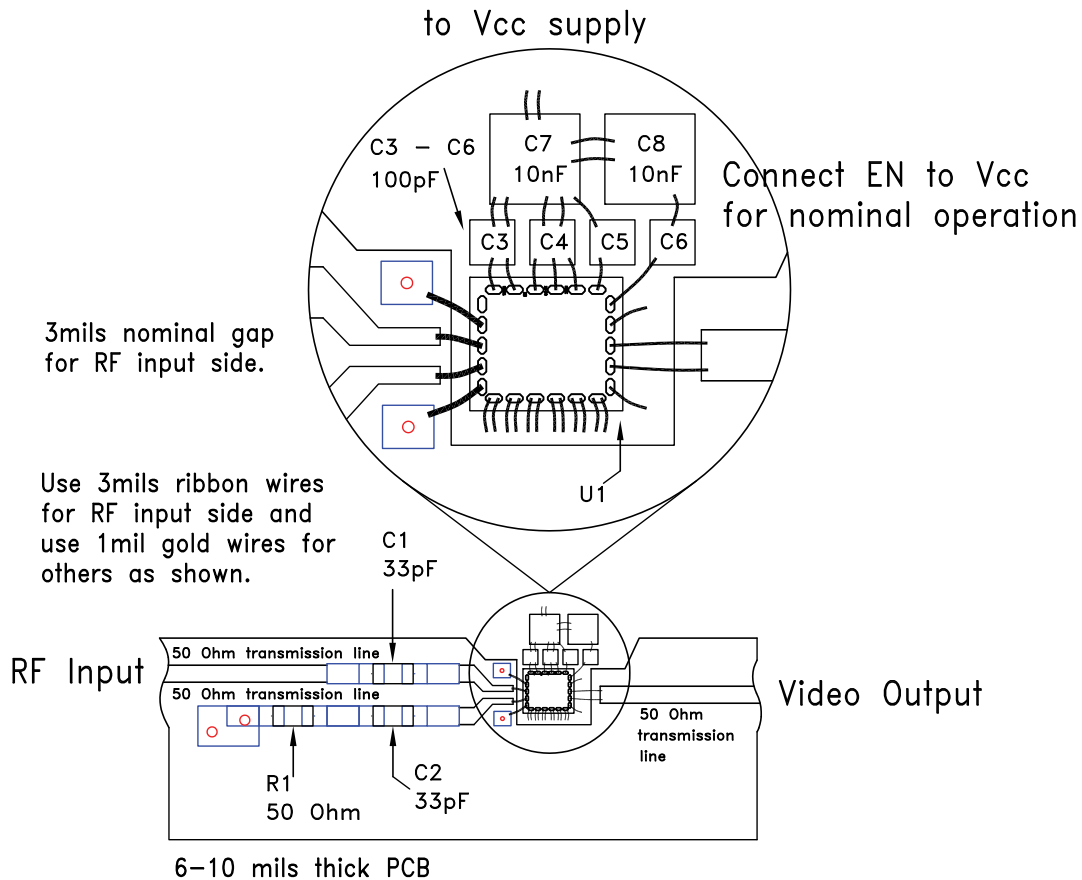


Note: Video output load should be 1K Ohm or higher.



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Assembly Diagram



List of Materials for Assembly Diagram

Item	Description
C1, C2	33 pF Capacitor, 0402 Pkg.
C3 - C6	100 pF SLC Capacitor, SA1212BX101M16VHXF
C7 - C8	10 nF SLC Capacitor, MVB3030X103ZGH5N
R1	50 Ohm Resistor, 0402 Pkg.
U1	HMC913 Die



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