Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!


# Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

Email & Skype: info@chipsmall.com Web: www.chipsmall.com

Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China

RoHS ✓ EARTH FRIENDLY

# DUAL RMS POWER DETECTOR
# DC - 3.9 GHz



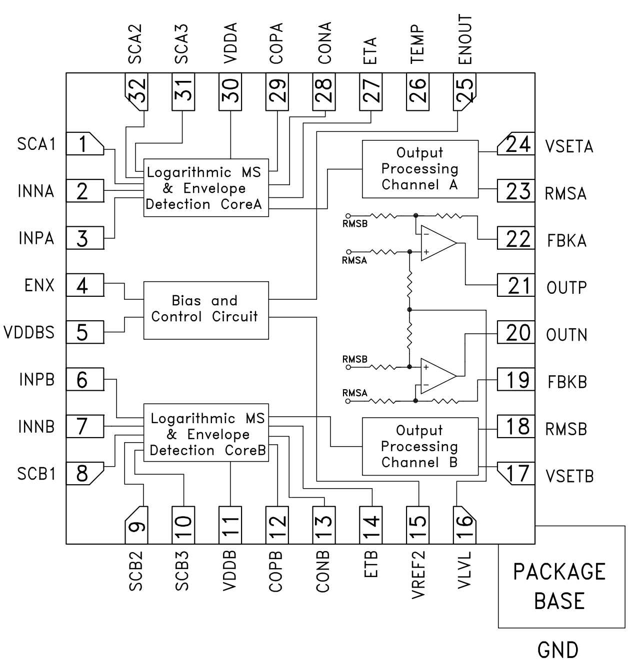
## Features

- Crest Factor (Peak-to-Average Power Ratio) Measurement
- Envelope-to-Average Power Ratio Measurement
- Dual channel and channel difference output ports
- Excellent Channel Matching and Channel Isolation
- RF Signal Wave Shape & Crest Factor Independent
- Supports Controller Mode
- ± 1 dB Detection Accuracy to 3.9 GHz
- Input Dynamic Range -55 dBm to +15 dBm
- +5V Operation from -40° C to +85° C
- Excellent Temperature Stability
- Integrated Temperature Sensor
- Power-Down Mode
- 32 Lead 5x5mm SMT Package: 25mm²

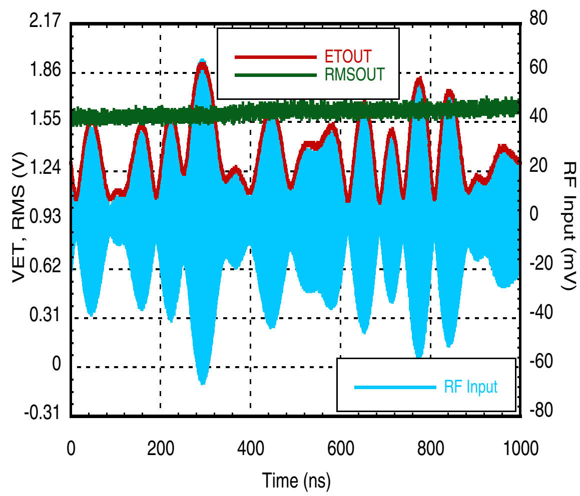
## Typical Applications

- Log -> Root - Mean - Square (RMS) Conversion
- Transmitter Power Control
- Receiver Automatic Gain Control
- Antenna VSWR Monitor
- Received Signal Strength Indication (RSSI)
- Transmitter Signal Strength Indication (TSSI)
- Dual Channel wireless infrastructure radio

## Functional Diagram




**RMS & Envelope Response to WCDMA 4 Carrier with -20dBm RF Input @ 0.9 GHz**






*For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106*
*Phone: 781-329-4700 • Order online at www.analog.com*
*Application Support: Phone: 1-800-ANALOG-D*

# HMC1030* PRODUCT PAGE QUICK LINKS

**Last Content Update: 02/23/2017**

## COMPARABLE PARTS

View a parametric search of comparable parts.

## EVALUATION KITS

- HMC1030LP5E Evaluation Board

## DOCUMENTATION

**Data Sheet**

- HMC1030 Data Sheet

## REFERENCE MATERIALS

**Quality Documentation**

- HMC Legacy PCN: LP6CE and LP6GE QFN - Alternate assembly source
- Package/Assembly Qualification Test Report: 32L 5x5mm QFN Package (QTR: 10009 REV: 05)
- Package/Assembly Qualification Test Report: LP5 & LP5G (QTR: 2014-00150 REV: 02)
- Semiconductor Qualification Test Report: BiCMOS-A (QTR: 2013-00235)

## DESIGN RESOURCES

- HMC1030 Material Declaration
- PCN-PDN Information
- Quality And Reliability
- Symbols and Footprints

## DISCUSSIONS

View all HMC1030 EngineerZone Discussions.

## SAMPLE AND BUY

Visit the product page to see pricing options.

## TECHNICAL SUPPORT

Submit a technical question or find your regional support number.

## DOCUMENT FEEDBACK

Submit feedback for this data sheet.

## General Description

The HMC1030LP5E is a dual-channel RMS power detector designed for high accuracy RF power signal measurement and control applications over the 0.1 to 3.9 GHz frequency range. The device can be used with input signals having RMS values from -60 dBm to +10 dBm referenced to 50 Ohm and large crest factors with no accuracy degradation.

Each RMS detection channel is fully specified for operation up to 3.9 GHz, over a wide dynamic range of 70 dB. The HMC1030LP5E operates from a single +5V supply and provides two linear-in-dB detection outputs at the RMSA and RMSB pins with scaled slopes of 37 mV/dB. The RMSA and RMSB channel outputs provide RMS detection performance in terms of dynamic range, logarithmic linearity and temperature stability similar to Hittite's HMC1021LP4E RMS Detector. The RMSA and RMSB outputs provide a read of average input signal power, or true-RMS power. Frequency detection up to 3.9 GHz is possible, with excellent channel matching of less than 1 dB, over a wide range of input frequencies and with low temperature drift.

The HMC1030LP5E also provides "channel difference" output ports via pins OUTP and OUTN, permitting measurements of the input signal power ratio between the two power detection channels. These outputs may be used in single-ended or differential configurations. An input voltage applied to the VLVL input pin is used to set the common mode voltage reference level for OUTP and OUTN. On the Hittite evaluation board, the VLVL pin is shorted to VREF2 output to provide a nominal bias voltage of 2.5V; but any external bias voltage may be used to set VLVL.

The HMC1030LP5E features ETA and ETB pins which provide an accurate voltage output which is linearly proportional to the envelope amplitude of the RF input signal for modulation bandwidths up to 150 MHz. The high bandwidth envelope detection of the HMC1030LP5E makes it ideal for detecting broadband and high crest factor RF signals commonly used in CDMA2000, WCDMA, and LTE systems. Additionally, the instantaneous envelope output can be used to create fast, excessive RF power protection, PA linearization, and efficiency enhancing envelope tracking PA implementations.

The HMC1030LP5E includes a buffered PTAT temperature sensor output with a temperature scaling factor of 2 mV/°C yielding a typical output voltage of 567 mV at 0°C.

The HMC1030LP5E operates over the -40 to +85°C temperature range, and is available in a compact, 32-lead 5x5 mm leadless QFN package.

## Electrical Specifications I, *$T_A$ = +25°C, VCCA = VCCB = VCCBS = 5V, Sci3 = Sci1 = 0V, Sci2= 5V, Unless Otherwise Noted*

| Parameter | Typ. | Typ. | Typ. | Typ. | Typ. | Typ. | Typ. | Units |
|---|---|---|---|---|---|---|---|---|
| **Dynamic Range** (± 1 dB measurement error) [1] | | | | | | | | |
| Input Signal Frequency | 100 | 900 | 1900 | 2200 | 2700 | 3500 | 3900 | MHz |
| RMSA Output | 73 | 73 | 71 | 69 | 57 | 48 | 42 | dB |
| RMSB Output | 74 | 74 | 72 | 70 | 63 | 50 | 44 | dB |
| ETA Output | | 19 | 20 | 20 | 19 | 19 | 19 | dB |
| ETB Output | | 19 | 20 | 19 | 19 | 19 | 19 | dB |
| **Channel Isolations** | | | | | | | | |
| Input Signal Frequency | 100 | 900 | 1900 | 2200 | 2700 | 3500 | 3900 | MHz |
| Input A to $RMS_B$ Isolation ($PIN_B$ = -45 dBm, $RMS_B$ = $RMSB_{INB}$ ±1 dB) | > 55 | > 55 | 52 | 49 | 49 | | | dB |
| Input B to $RMS_A$ Isolation ($PIN_A$ = -45 dBm, $RMS_A$ = $RMSA_{INA}$ ±1 dB) | > 55 | > 55 | 50 | 46 | 45 | | | dB |
| Input A to $RMS_B$ Isolation ($PIN_B$ = -40 dBm, $RMS_B$ = $RMSB_{INB}$ ±1 dB) | | | | | | 44 | 39 | dB |
| Input B to $RMS_A$ Isolation ($PIN_A$= -40 dBm, $RMS_A$=$RMSA_{INA}$ ±1 dB) | | | | | | 47 | 41 | dB |
| **Deviation vs Temperature:** (Over full temperature range -40°C to 85°C). Deviation is measured from reference, which is the same WCDMA input at 25 °C | | | | | | 1 | | dB |
| **Channel Mismatch** | | | | | | <1 | | dB |

[1] With WCDMA 4 Carrier (TM1-64 DPCH)



*For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106*
*Phone: 781-329-4700 • Order online at www.analog.com*
*Application Support: Phone: 1-800-ANALOG-D*

## Electrical Specifications II, $T_A$ = +25 °C, VCCA = VCCB = VCCBS = 5V, Sci3= Sci1 = 0V, Sci2 = 5V, Unless Otherwise Noted

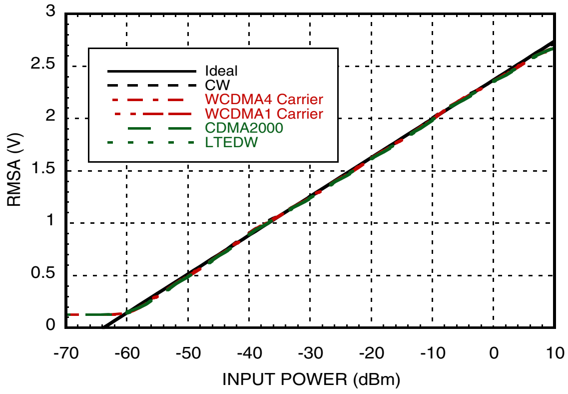
| Parameter | Typ. | Typ. | Typ. | Typ. | Typ. | Typ. | Typ. | Units |
|---|---|---|---|---|---|---|---|---|
| Input Signal Frequency | 100 | 900 | 1900 | 2200 | 2700 | 3500 | 3900 | MHz |
| **Modulation Deviation** (Output deviation from reference, which is measured with CW input at equivalent input signal power) | | | | | | | | |
| WCDMA 4 Carrier (TM1-64 DPCH) at +25 °C | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | dB |
| WCDMA 4 Carrier (TM1-64 DPCH) at +85 °C | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | dB |
| WCDMA 4 Carrier (TM1-64 DPCH) at -40 °C | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | dB |
| **RMSA Logarithmic Slope and Intercept** [1] | | | | | | | | |
| Logarithmic Slope | 35.5 | 38.5 | 37.3 | 38.2 | 40.3 | 45.8 | 49.9 | mV/dB |
| Logarithmic Intercept | -66.4 | -65.8 | -63.4 | -62 | -58.9 | -53 | -49.5 | dBm |
| Max. Input Power at ±1 dB Error | 10 | 10 | 10 | 10 | 1 | -3 | -5 | dBm |
| Min. Input Power at ±1 dB Error | -62 | -62 | -60 | -58 | -56 | -51 | -47 | dBm |
| **RMSB Logarithmic Slope and Intercept** [1] | | | | | | | | |
| Logarithmic Slope | 34.7 | 34.9 | 36.2 | 37 | 38.8 | 43.6 | 47.2 | mV/dB |
| Logarithmic Intercept | -67.5 | -67 | -65 | -63.5 | -60.7 | -55.2 | -51.7 | dBm |
| Max. Input Power at ±1 dB Error | 10 | 10 | 10 | 10 | 1 | -3 | -5 | dBm |
| Min. Input Power at ±1 dB Error | -64 | -64 | -62 | -61 | -58 | -53 | -49 | dBm |
| **ETA Linear Slope and Intercept** | | | | | | | | |
| Linear Slope | | 14.3 | 12.3 | 11.8 | 10.5 | 9.1 | 8.4 | V/V |
| Linear Intercept | | -65.5 | -75.8 | -79 | -88.2 | -102.6 | -111.32 | mV |
| Max. Input Power at ±1 dB Error | | -12 | -10 | -9 | -9 | -8 | -8 | dBm |
| Min. Input Power at ±1 dB Error | | -31 | -30 | -29 | -28 | -27 | -27 | dBm |
| **ETB Linear Slope and Intercept** | | | | | | | | |
| Linear Slope | | 14.5 | 12.6 | 12.2 | 11.1 | 9.7 | 8.9 | V/V |
| Linear Intercept | | -64.1 | -73.7 | -76.1 | -82.9 | -95.1 | -103.7 | mV |
| Max. Input Power at ±1 dB Error | | -12 | -10 | -10 | -9 | -8 | -8 | dBm |
| Min. Input Power at ±1 dB Error | | -31 | -30 | -29 | -28 | -27 | -27 | dBm |

[1] With WCDMA 4 Carrier (TM1-64 DPCH)

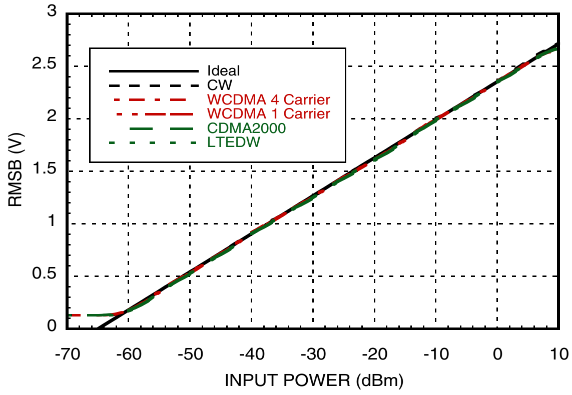


For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106
Phone: 781-329-4700 • Order online at www.analog.com
Application Support: Phone: 1-800-ANALOG-D

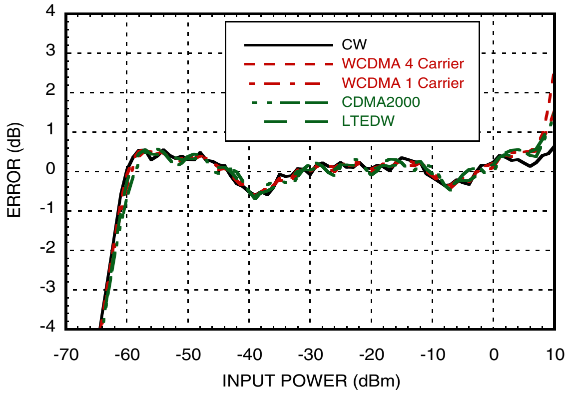
### RMSA vs. Pin with Different Modulations @ 1900 MHz[1]



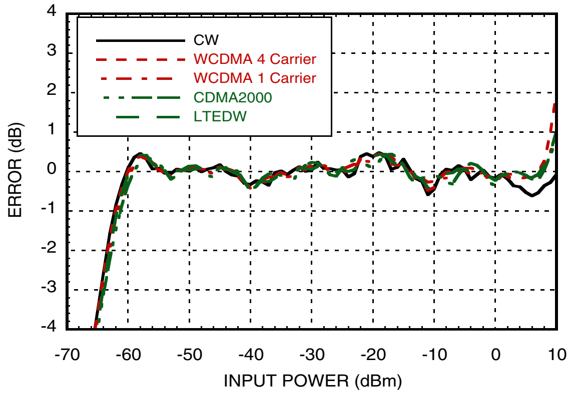

### RMSB vs. Pin with Different Modulations @ 1900 MHz[1]




### RMSA Error vs. Pin with Different Modulations @ 1900 MHz[1]




### RMSB Error vs. Pin with Different Modulations @ 1900 MHz[1]




## Electrical Specifications III,

*$T_A$ = +25 °C, VCCA = VCCB = VCCBS = 5V, Sci3 = Sci1 = 0V, Sci2 = 5V, Unless Otherwise Noted*

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| **Single-Ended Input Configuration** | | | | | |
| Input Network Return Loss | up to 4 GHz | | > 15 | | dB |
| Input Resistance between $INP_A$ and $INN_A$ | Between pins 2 and 3 | | 110 | | Ohm |
| Input Resistance between $INP_B$ and $INN_B$ | Between pins 6 and 7 | | 110 | | Ohm |
| Input Voltage Range | $V_{DIFFINA} = V_{INPA} - V_{INNA}$ and $V_{DIFFINB} = V_{INPB} - V_{INNB}$ | | | 2.25 | V |
| **RMS [A,B] Output** | | | | | |
| Output Voltage Range | | | 0.1 to 3 | | V |
| Open-loop Output Voltage Range | RMS-VSET disconnected for control applications | | 0.4 to Vcc-1 | | V |
| Source/Sink Current Compliance | Measured with 0.9GHz input RF signal at -25 dBm power | | 8/1.98 | | mA |
| Output Slew Rate (rise/fall) | Sci3=Sci2=Sci1=0V, Cofs=1nF | | 33 / 1.5 | | $10^6$ V/sec |

[1] SCA1=SCA3=SCB1=SCB3=0V, SCA2=SCB2=5V



*For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106 Phone: 781-329-4700 • Order online at www.analog.com Application Support: Phone: 1-800-ANALOG-D*

## *Electrical Specifications III (continued),*

*$T_A$ = +25 °C, VCCA = VCCB = VCCBS = 5V, Sci3 = Sci1 = 0V, Sci2 = 5V, Unless Otherwise Noted*

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| **ET [A, B] Outputs** | | | | | |
| Modulation Bandwidth | | | 100 | | MHz |
| Output Voltage Range | | | 1 to 2.1 | | V |
| Source/Sink Current Compliance | Measured with 0.9 GHz input RF signal at -18 dBm power | | 8 / 2.95 | | mA |
| Output Slew Rate (rise/fall) | | | 83.3 / 250 | | $10^6$ V/sec |
| **$V_{SET}$ [A,B] Outputs** | | | | | |
| Input Voltage Range [1] | For control applications with nominal slope/intercept settings | | 0.13 to 2.7 | | V |
| Input Resistance | | | 1 | | kOhm |
| **OUTP and OUTN Outputs** | | | | | |
| Output Voltage Range | $R_L$=1k Ohm, $C_L$=4.7pF [1] | | 1 to 3.9 | | V |
| Open-loop Output Voltage Range | OUTP-FBKA and OUTN-FBKB disconnected for control applications | | 0.1 to Vcc-0.9 | | V |
| Source/Sink Current Compliance | Measured with 0.9 GHz input RF signal at -30 dBm power | | 8 / 2.2 | | mA |
| **$V_{LVL}$, Common Mode Reference Level for OUT[P,N]** | | | | | |
| Voltage Range | OUT[P,N]=FBK[A,B] | 0 | | 5 | V |
| Input Resistance | | | 6 | | kOhm |
| **$V_{REF2}$, Voltage Reference Output** | | | | | |
| Output Voltage | | | 2.43 | | V |
| Temperature Sensitivity | | | 0.15 | | mV/°C |
| Source/Sink Current Compliance | | | 5.5 / 2.6 | | mA |
| **TEMP, Temperature Sensor Output** | | | | | |
| Output Voltage | measured at 0°C | | 0.6 | | V |
| Temperature Sensitivity | | | 2.2 | | mV/°C |
| Source/Sink Current Compliance | | | 1.7 / 0.5 | | mA |
| **SCI1-3 Inputs, ENX Logic Input, Power Down Control** | | | | | |
| Input High Voltage | | $0.7xV_{CC}$ | | | V |
| Input Low Voltage | | | | $0.3xV_{CC}$ | V |
| Input Capacitance | | | 0.5 | | pF |
| **Power Supply** | | | | | |
| Supply Voltage | | 4.5 | 5 | 5.5 | V |
| Supply Current with no input power | 120.6 mA nominal at -40°C; 159.5 mA nominal at 85°C | | 143 | | mA |
| Supply Current with 0 dBm at one channel | 128 mA nominal at -40°C; 168.2 mA nominal at 85°C | | 151.7 | | mA |
| Supply Current with 0 dBm at both channels | | | 160 | | mA |
| Standby Mode Supply Current | | | 13 | | mA |

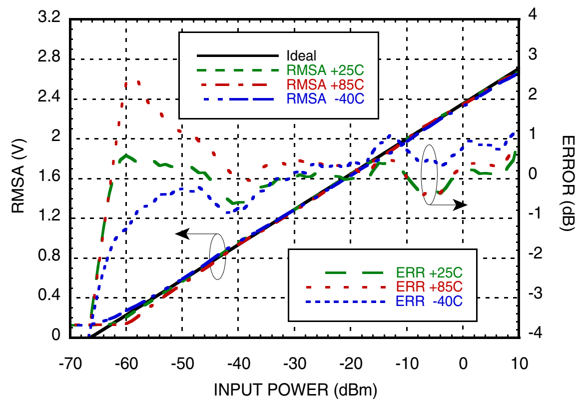
[1] For nominal slope/intercept setting, please see application section to change this range



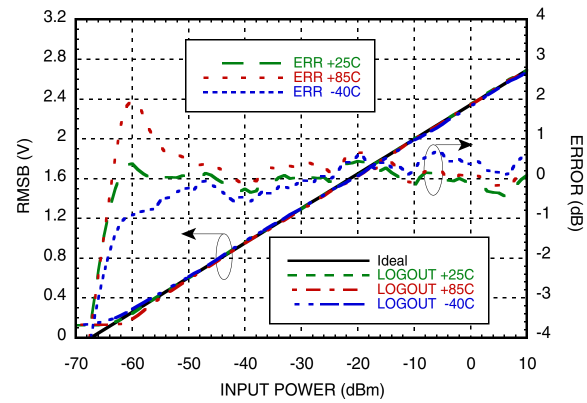
*For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106*
*Phone: 781-329-4700 • Order online at www.analog.com*
*Application Support: Phone: 1-800-ANALOG-D*

## DUAL RMS POWER DETECTOR DC - 3.9 GHz

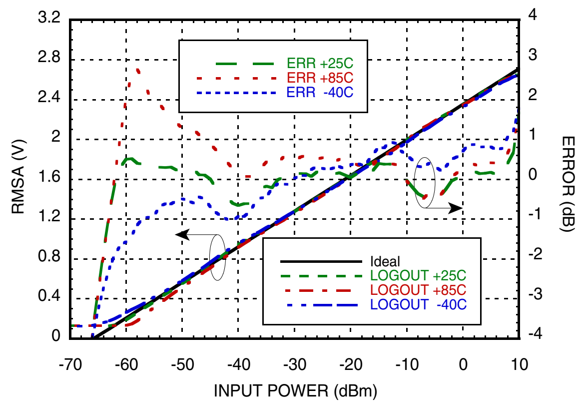
### RMSA & Error vs. Pin @ 100 MHz [1]



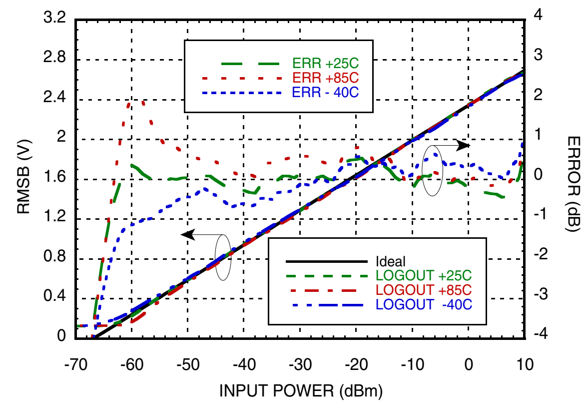

### RMSB & Error vs. Pin @ 100 MHz [1]



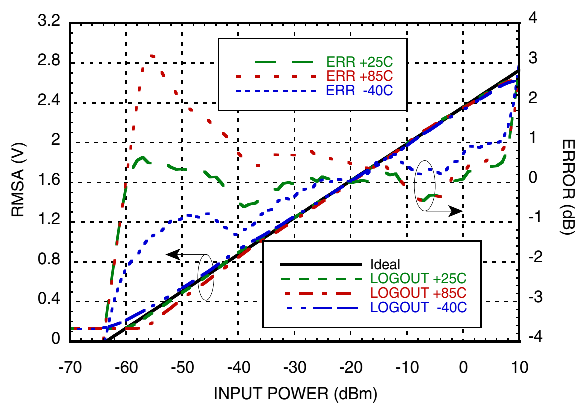

### RMSA & Error vs. Pin @ 900 MHz [1]



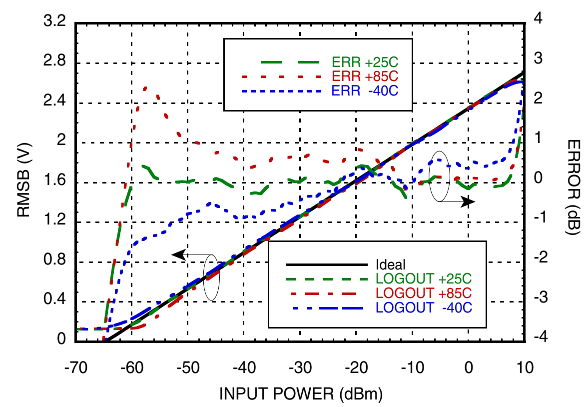

### RMSB & Error vs. Pin @ 900 MHz [1]




### RMSA & Error vs. Pin @ 1900 MHz [1]




### RMSB & Error vs. Pin @ 1900 MHz [1]



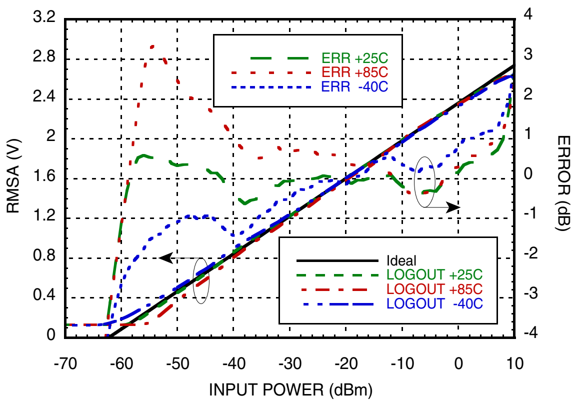

[1] WCDMA Input Waveform



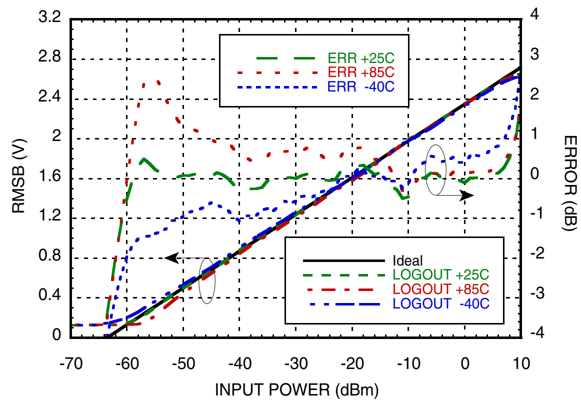
For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106
Phone: 781-329-4700 • Order online at www.analog.com
Application Support: Phone: 1-800-ANALOG-D

## DUAL RMS POWER DETECTOR DC - 3.9 GHz

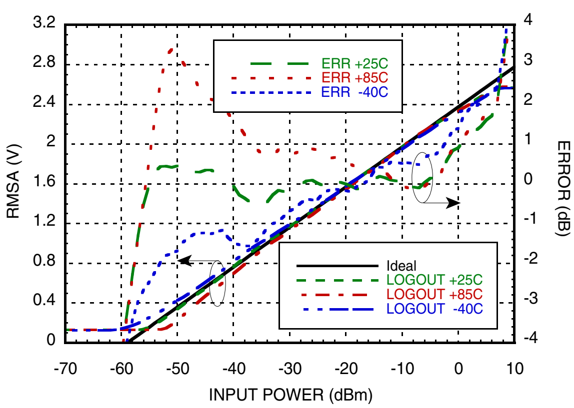
### RMSA & Error vs. Pin @ 2200 MHz [1]



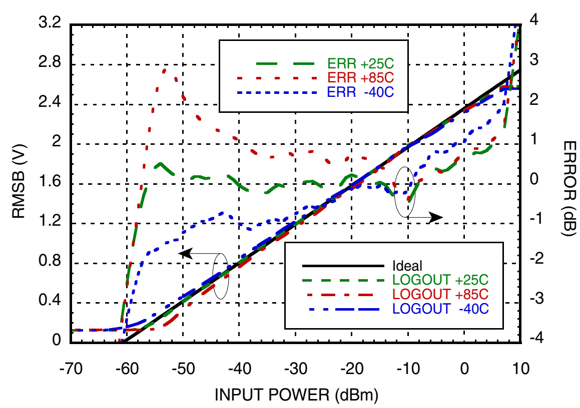

### RMSB & Error vs. Pin @ 2200 MHz [1]



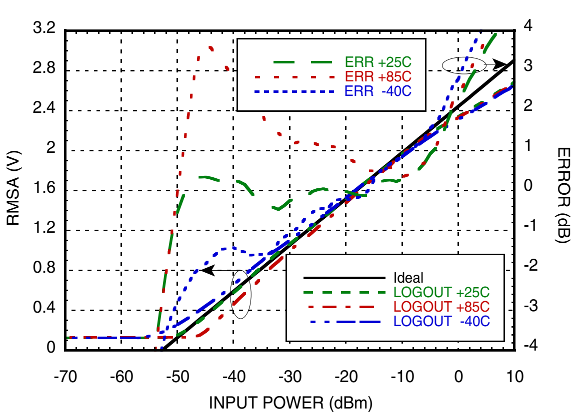

### RMSA & Error vs. Pin @ 2700 MHz [1]



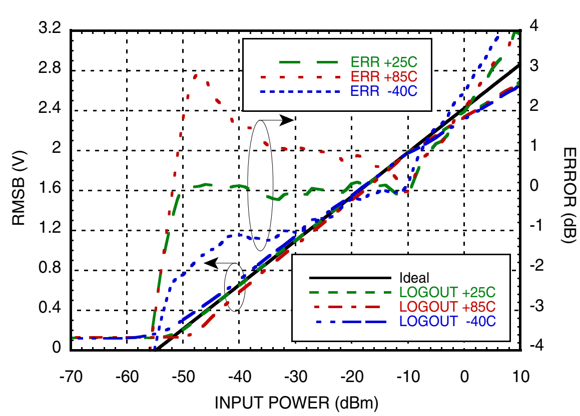

### RMSB & Error vs. Pin @ 2700 MHz [1]




### RMSA & Error vs. Pin @ 3500 MHz [1]




### RMSB & Error vs. Pin @ 3500 MHz [1]

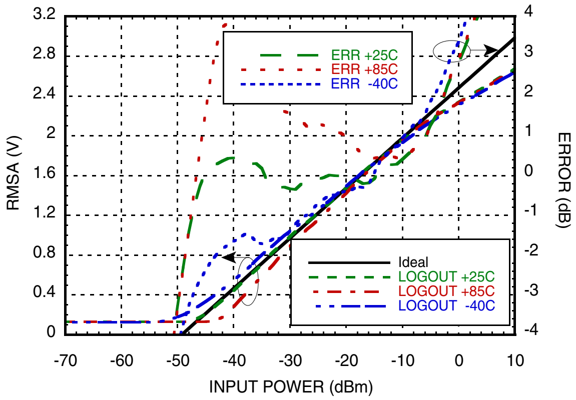



[1] WCDMA Input Waveform

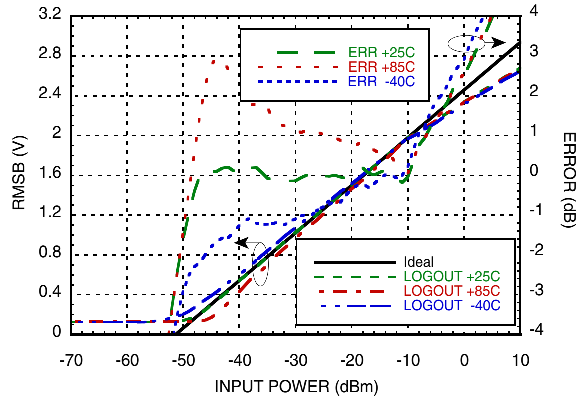
# DUAL RMS POWER DETECTOR DC - 3.9 GHz



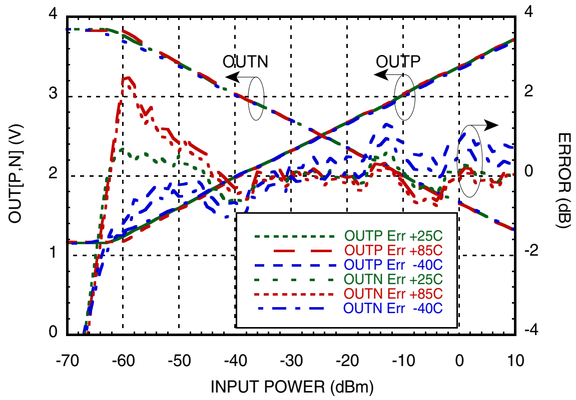
### RMSA & Error vs. Pin @ 3900 MHz [1]



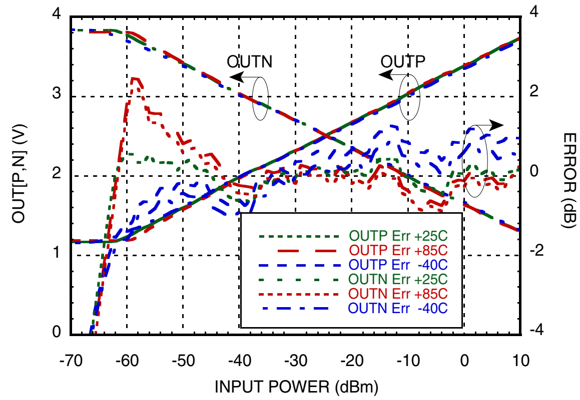

### RMSB & Error vs. Pin @ 3900 MHz [1]



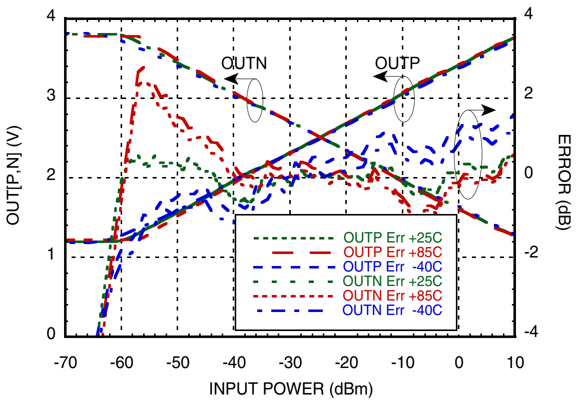

### OUT [P,N] & Error vs. Pin @ 100 MHz [1] [2]



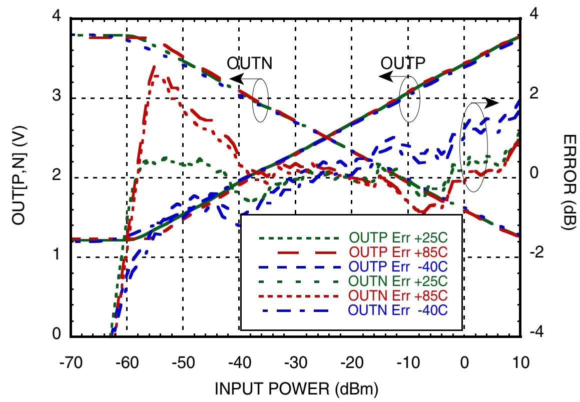

### OUT [P,N] & Error vs. Pin @ 900 MHz [1] [2]




### OUT [P,N] & Error vs. Pin @ 1900 MHz [1][2]




### OUT [P,N] & Error vs. Pin @ 2200 MHz [1][2]



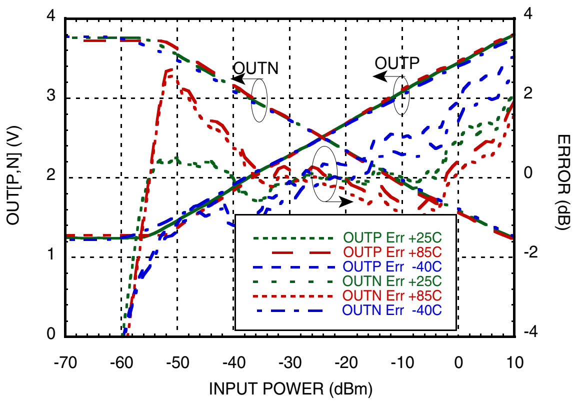

[1] WCDMA Input Waveform

[2] INPA Power Swept, INPB Fixed Power @ -25 dBm

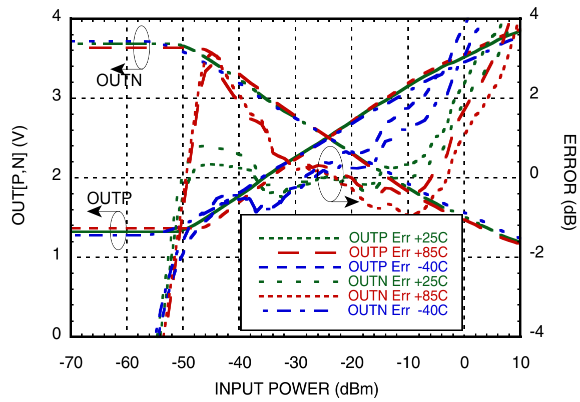


*For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106*
*Phone: 781-329-4700 • Order online at www.analog.com*
*Application Support: Phone: 1-800-ANALOG-D*

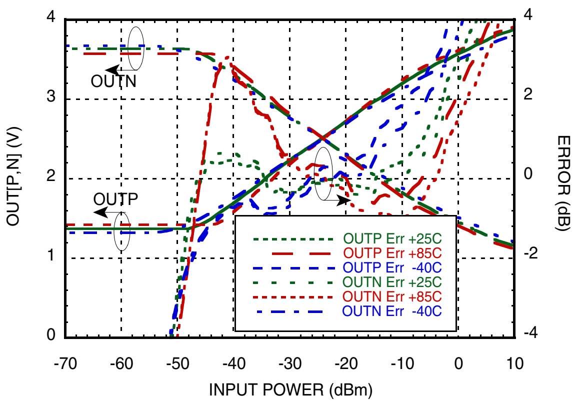
### OUT [P,N] & Error vs. Pin @ 2700 MHz [1][2]



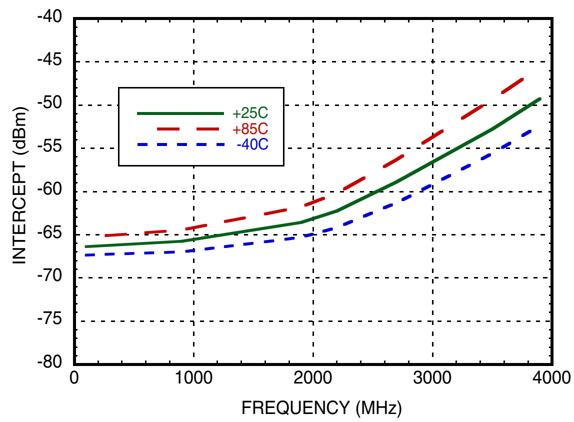

### OUT [P,N] & Error vs. Pin @ 3500 MHz[1][2]



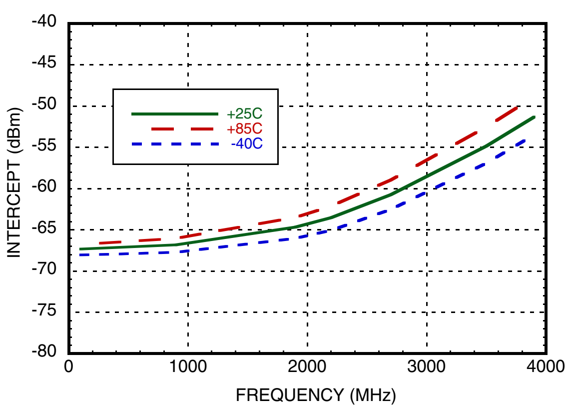

### OUT [P,N] & Error vs. Pin @ 3900 MHz [1][2]



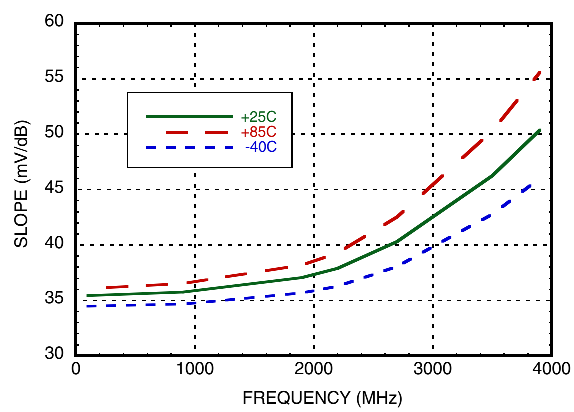

### RMSA Intercept vs. Frequency [1]




### RMSB Intercept vs. Frequency [1]




### RMSA Slope vs. Frequency [1]



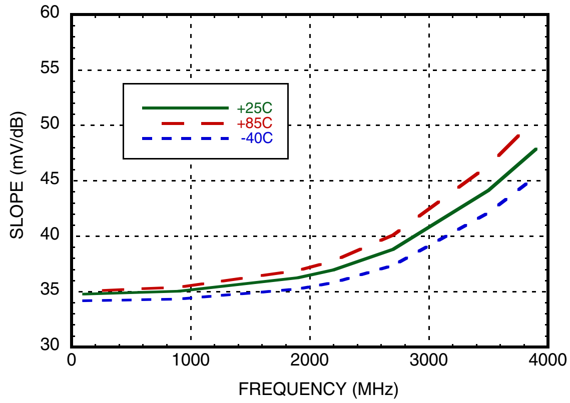

[1] WCDMA Input Waveform

[2] INPA Power Swept, INPB Fixed Power @ -25 dBm

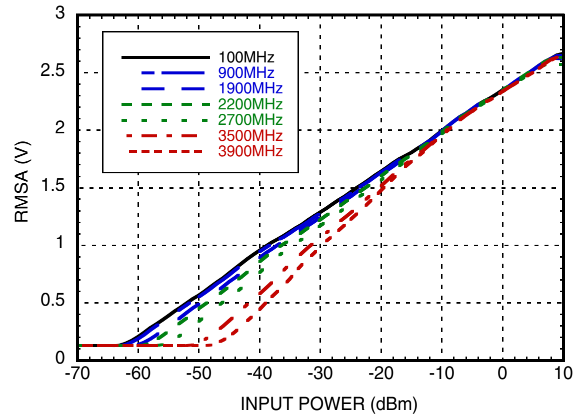
RoHS ✓ EARTH FRIENDLY

# DUAL RMS POWER DETECTOR DC - 3.9 GHz

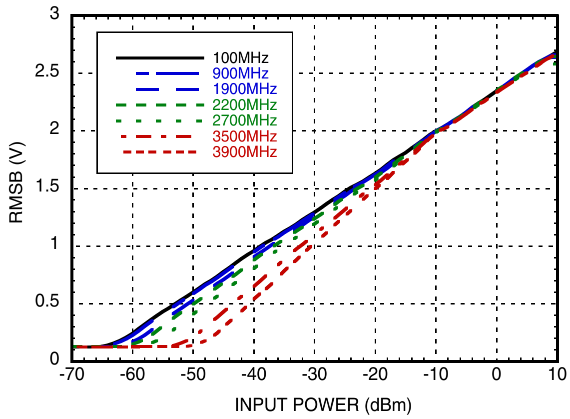
### *RMSB Slope vs. Frequency [1]*



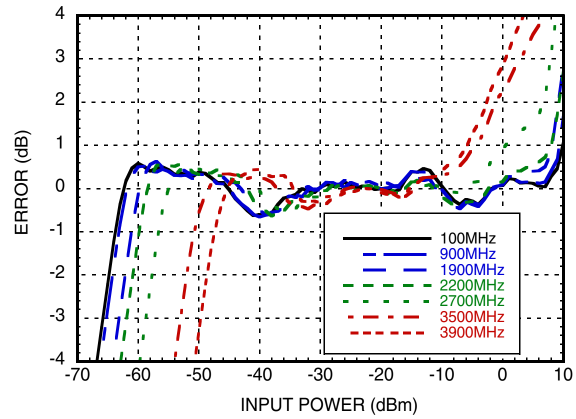

### *RMSA vs. Pin with WCDMA 4 Carrier @ +25°C [1] [2]*



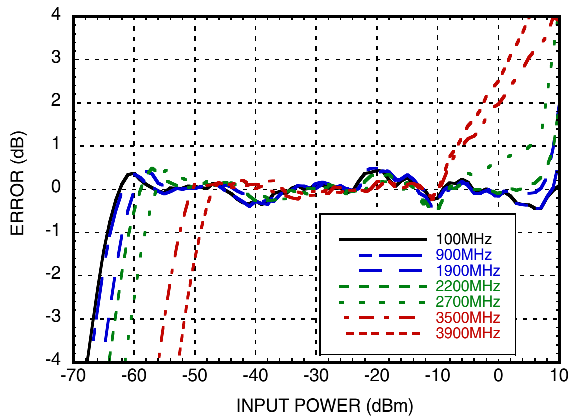

### *RMSB vs. Pin with WCDMA 4 Carrier @ +25°C [1] [2]*



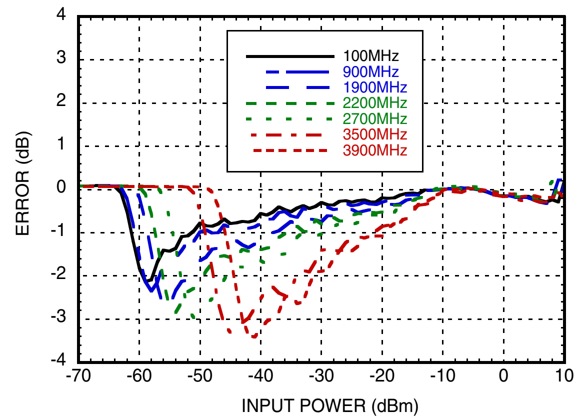

### *RMSA Error vs. Pin with WCDMA 4 Carrier @ +25°C [1] [2]*




### *RMSB Error vs. Pin with WCDMA 4 Carrier @ +25°C [1] [2]*




### *RMSA Error vs. Pin with WCDMA 4 Carrier @ +85°C wrt +25°C Response [1] [2]*



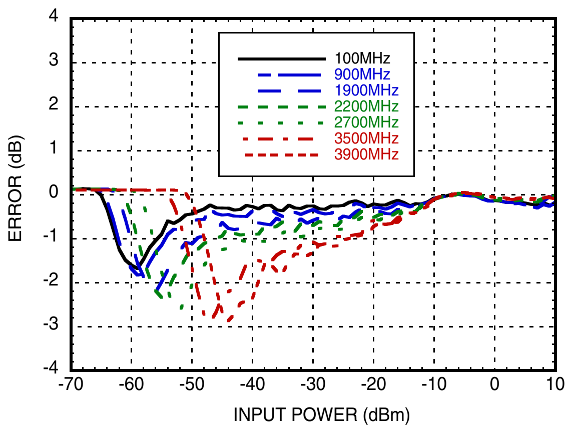

[1] WCDMA Input Waveform

[2] SCA1=SCA3=SCB1=SCB3=0V, SCA2=SCB2=5V

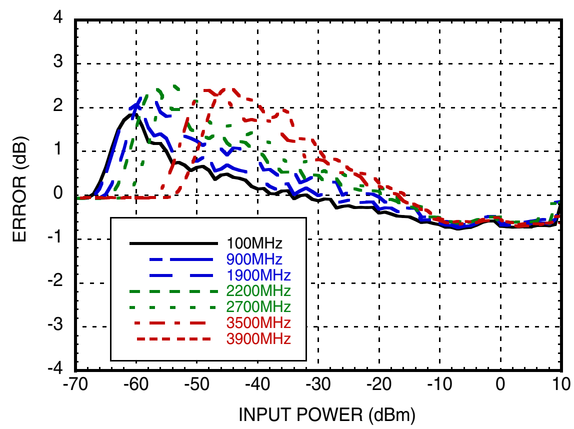


*For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106*
*Phone: 781-329-4700 • Order online at www.analog.com*
*Application Support: Phone: 1-800-ANALOG-D*

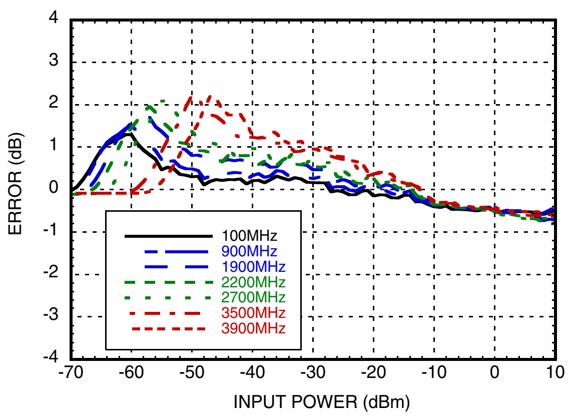
### RMSB Error vs. Pin with WCDMA 4 Carrier @ +85°C wrt +25°C Response [1] [2]



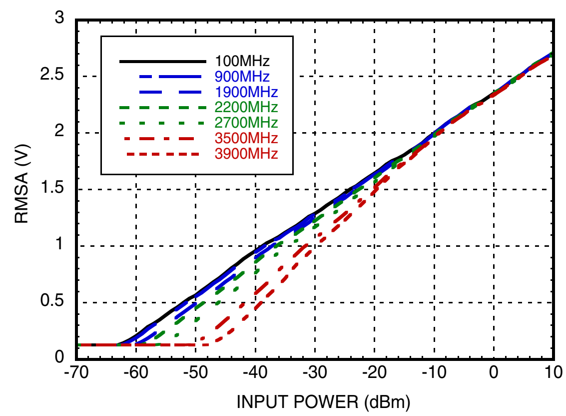

### RMSA Error vs. Pin with WCDMA 4 Carrier @ -40°C wrt +25°C Response [1] [2]



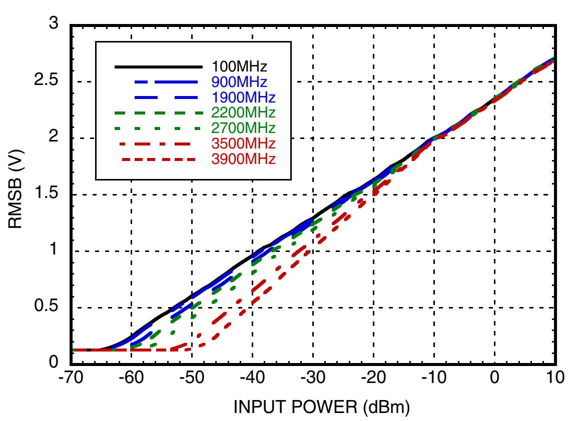

### RMSB Error vs. Pin with WCDMA 4 Carrier @ -40°C wrt +25°C Response [1] [2]



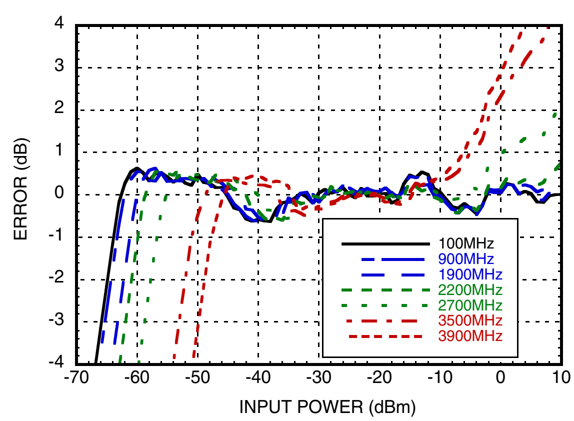

### RMSA vs. Pin with CW @ +25°C [1] [2]




### RMSB vs. Pin with CW @ +25°C [1] [2]




### RMSA Error vs. Pin with CW @ +25°C [1] [2]



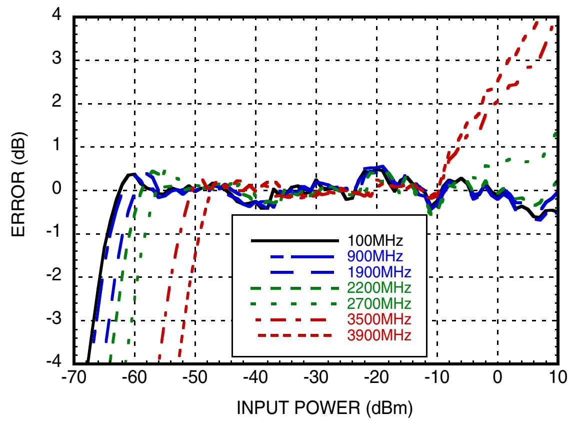

[1] WCDMA Input Waveform

[2] SCA1=SCA3=SCB1=SCB3=0V, SCA2=SCB2=5V

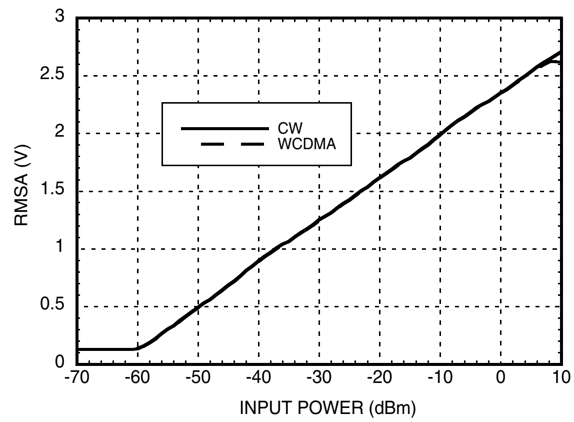


*For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106
Phone: 781-329-4700 • Order online at www.analog.com
Application Support: Phone: 1-800-ANALOG-D*

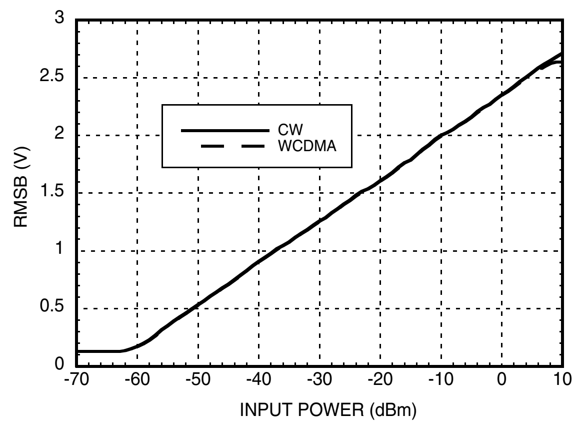
### RMSB Error vs. Pin with CW @ +25°C [1] [2]



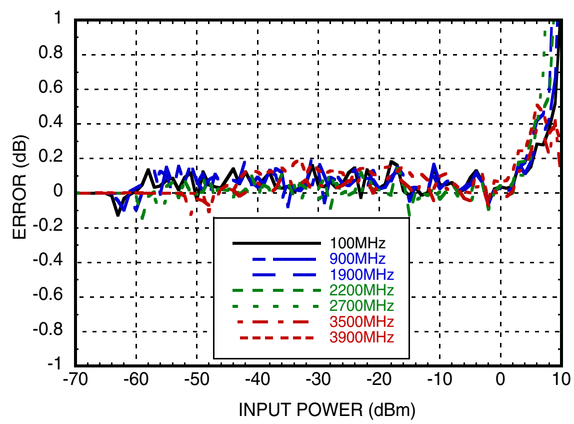

### RMSA vs. Pin w/ CW & WCDMA 4 Carrier @ 1900 MHz & +25°C [1] [2]



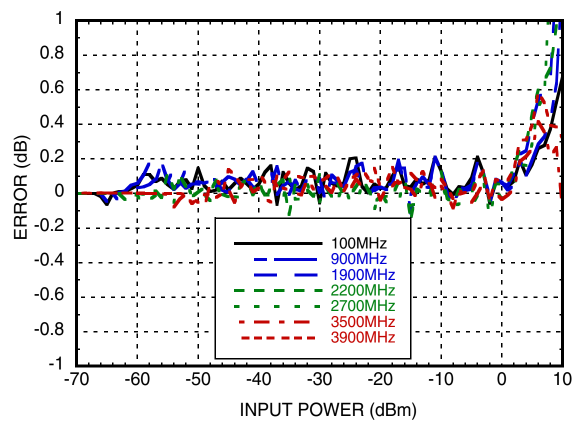

### RMSB vs. Pin w/ CW & WCDMA 4 Carrier @ 1900 MHz & +25°C [1] [2]



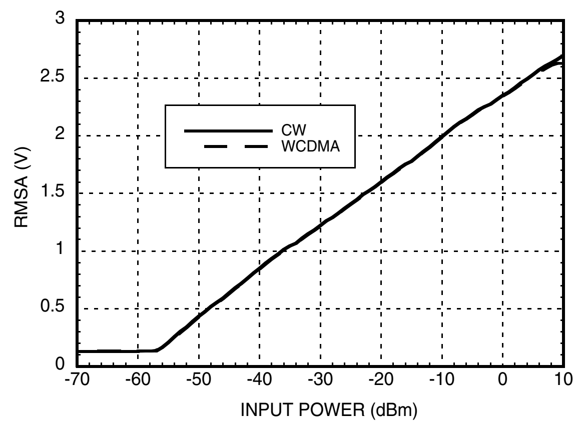

### RMSA Reading Error for WCDMA wrt CW Response @ +25°C [1] [2]




### RMSB Reading Error for WCDMA wrt CW Response @ +25°C [1] [2]




### RMSA vs. Pin w/ CW & WCDMA 4 Carrier @ 1900MHz & +85°C [1] [2]



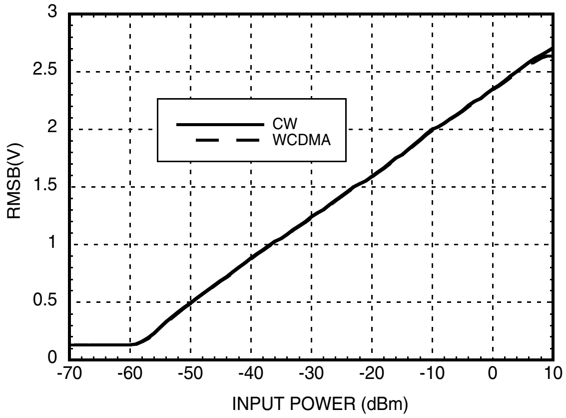

[1] WCDMA Input Waveform

[2] SCA1=SCA3=SCB1=SCB3=0V, SCA2=SCB2=5V

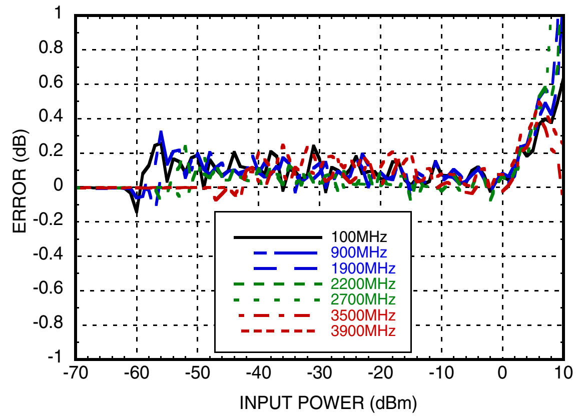
# DUAL RMS POWER DETECTOR DC - 3.9 GHz



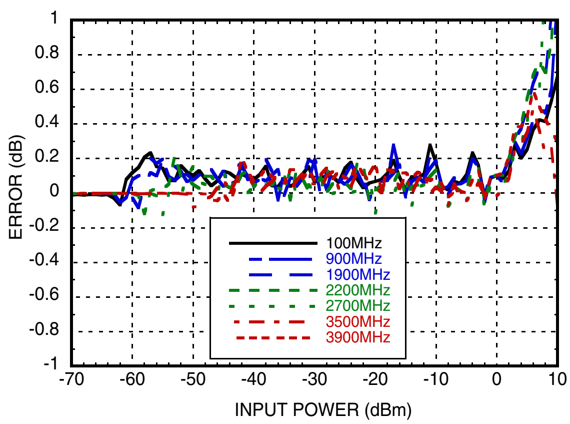
### RMSB vs. Pin w/ CW & WCDMA 4 Carrier @ 1900 MHz & +85°C [1] [2]



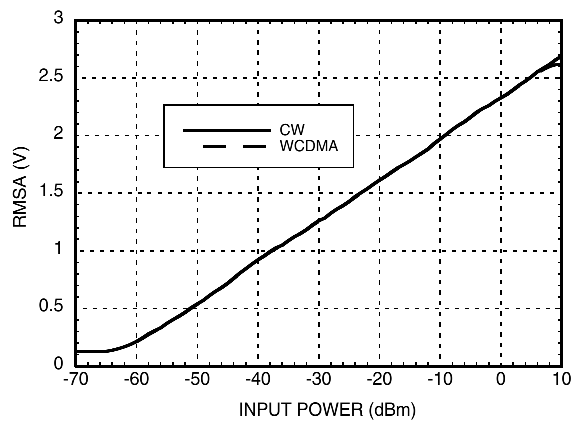

### RMSA Reading Error for WCDMA wrt CW Response @ +85°C [1] [2]



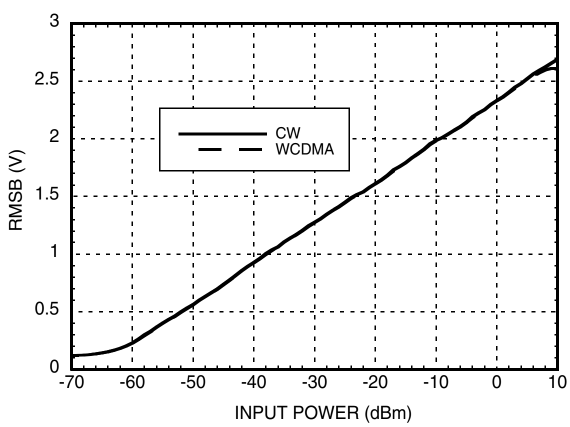

### RMSB Reading Error for WCDMA wrt CW Response @ +85°C [1] [2]



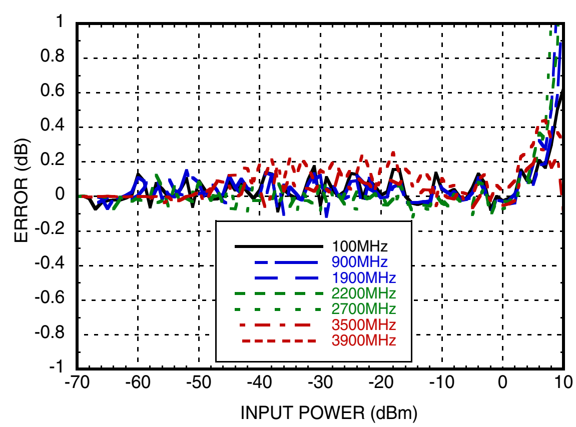

### RMSA vs. Pin w/ CW & WCDMA 4 Carrier @ 1900 MHz & -40°C [1] [2]




### RMSB vs. Pin w/ CW & WCDMA 4 Carrier @ 1900 MHz & -40°C [1] [2]




### RMSA Reading Error for WCDMA wrt CW Response @ -40°C [1] [2]




[1] WCDMA Input Waveform

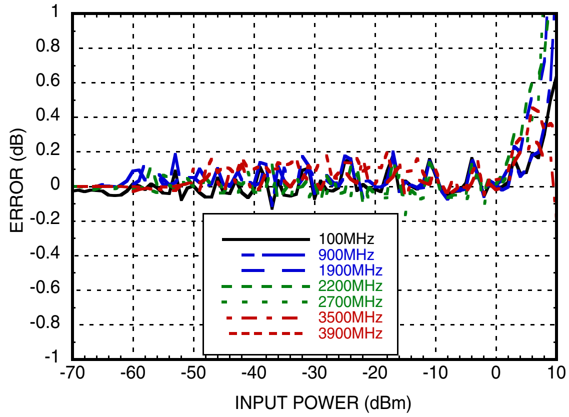
[2] SCA1=SCA3=SCB1=SCB3=0V, SCA2=SCB2=5V



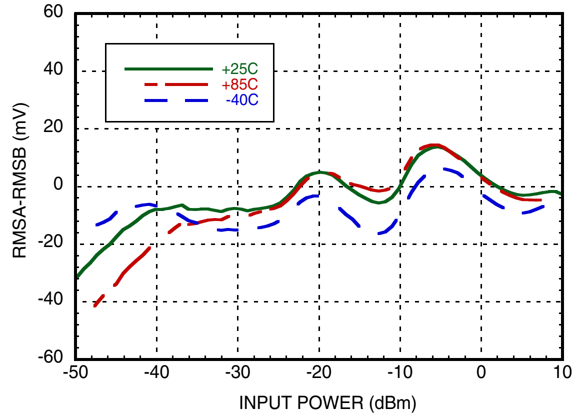
*For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106*
*Phone: 781-329-4700 • Order online at www.analog.com*
*Application Support: Phone: 1-800-ANALOG-D*

# DUAL RMS POWER DETECTOR DC - 3.9 GHz

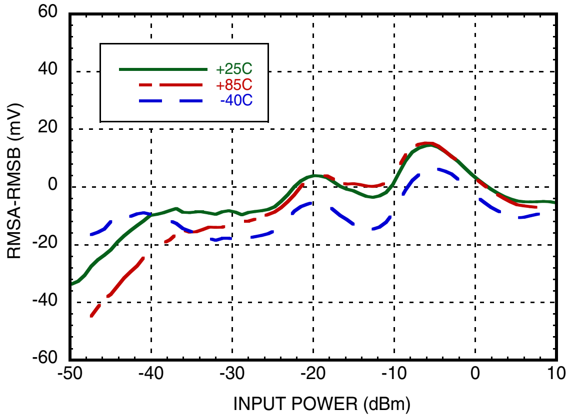
### RMSB Reading Error for WCDMA wrt CW Response @ -40°C [1] [2]



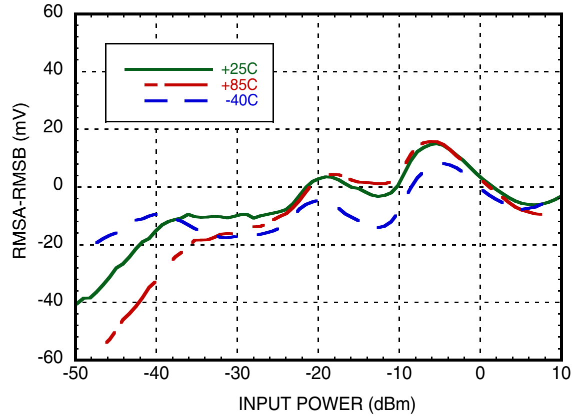

### RMSA-RMSB, Channel Matching vs. Pin over Temperature @ 100 MHz [2] [3]



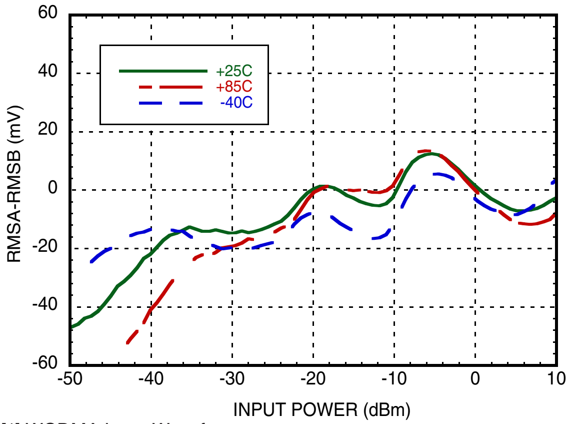

### RMSA-RMSB, Channel Matching vs. Pin over Temperature @ 900 MHz [2] [3]



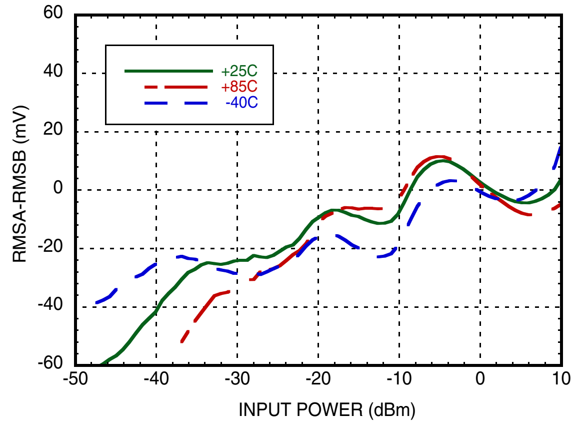

### RMSA-RMSB, Channel Matching vs. Pin over Temperature @ 1900 MHz [2] [3]




### RMSA-RMSB, Channel Matching vs. Pin over Temperature @ 2200 MHz [2] [3]




### RMSA-RMSB, Channel Matching vs. Pin over Temperature @ 2700 MHz [2] [3]




[1] WCDMA Input Waveform

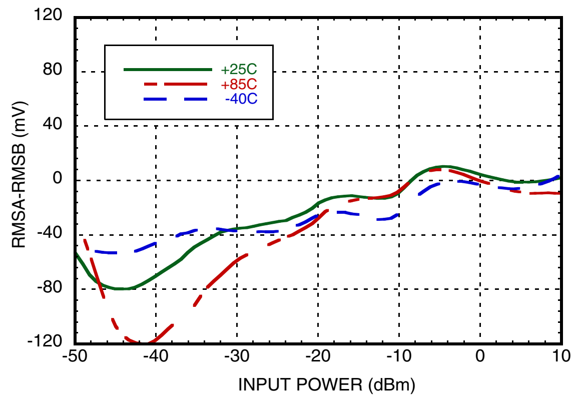
[2] SCA1=SCA3=SCB1=SCB3=0V, SCA2=SCB2=5V

[3] CW Input Waveform, RMSA Referenced

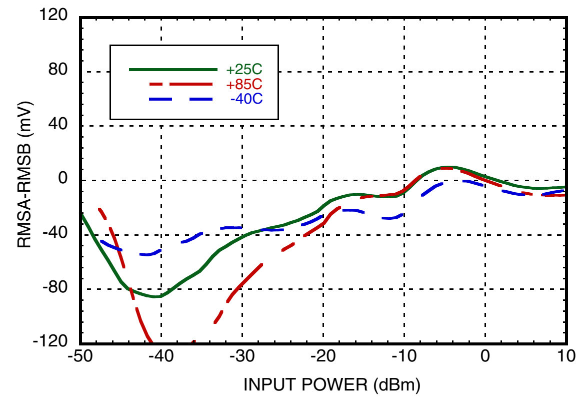


*For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106 Phone: 781-329-4700 • Order online at www.analog.com Application Support: Phone: 1-800-ANALOG-D*

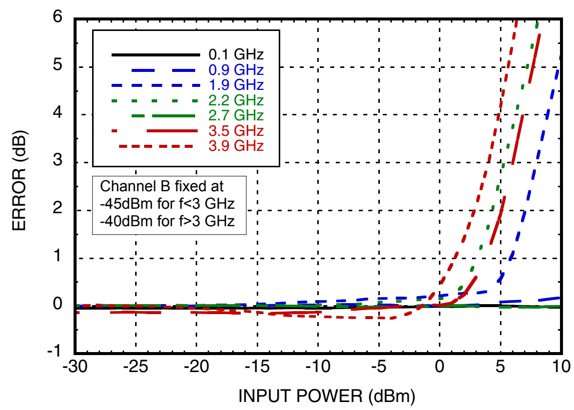
### RMSA-RMSB, Channel Matching vs. Pin over Temperature @ 3500 MHz [1] [2]



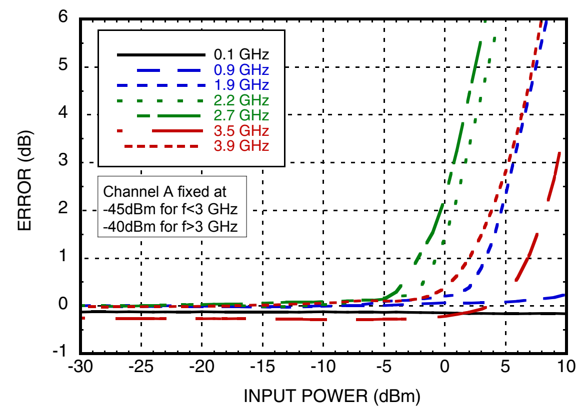

### RMSA-RMSB, Channel Matching vs. Pin over Temperature @ 3900 MHz [1] [2]



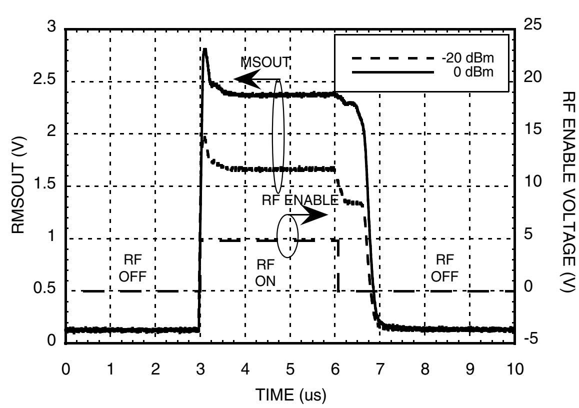

### Interference to an Input Signal (INB Power Fixed) with Interfering Signal on the other Channel (INA Power Swept) [1]



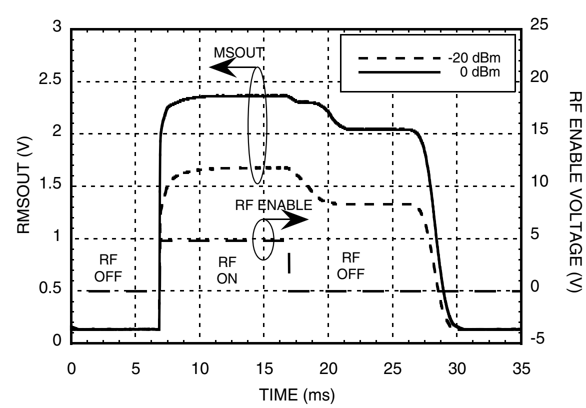

### Interference to an Input Signal (INA Power Fixed) with Interfering Signal on the other Channel (INB Power Swept) [1]




### RMS [A, B] Output Response with SCI = 000 @ 1900 MHz



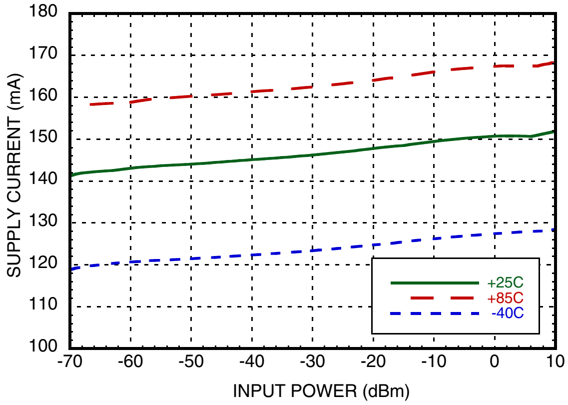

### RMS [A, B] Output Response with SCI = 111 @ 1900 MHz



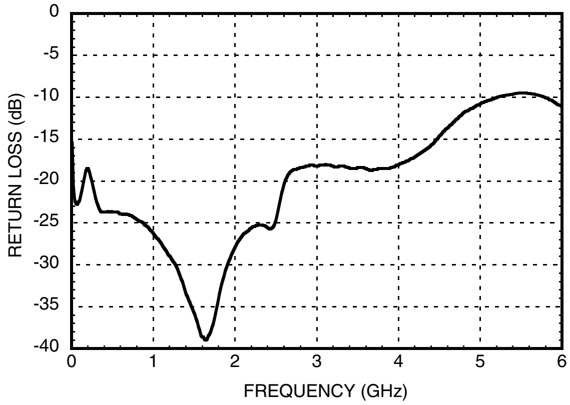

[1] CW Input Waveform

[2] RMSA referenced

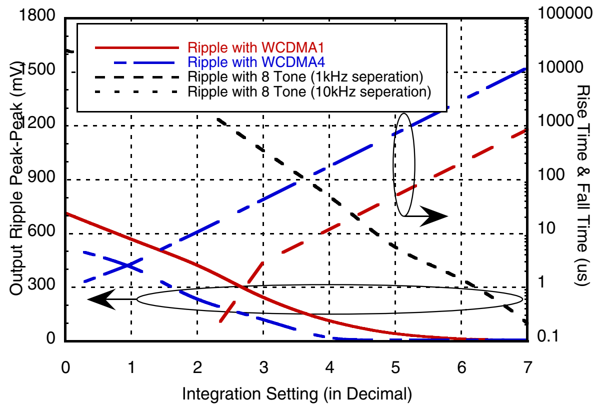
### Typical Supply Current vs. Pin, Vcc=5V [1]




### Input Return Loss vs. Frequency

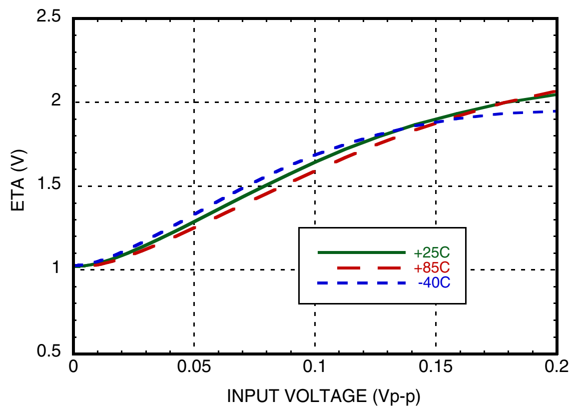



### Output Ripple & Rise/Fall Time vs. Integration Setting[Sci4,Sci3,Sci2,Sci1] in Decimal

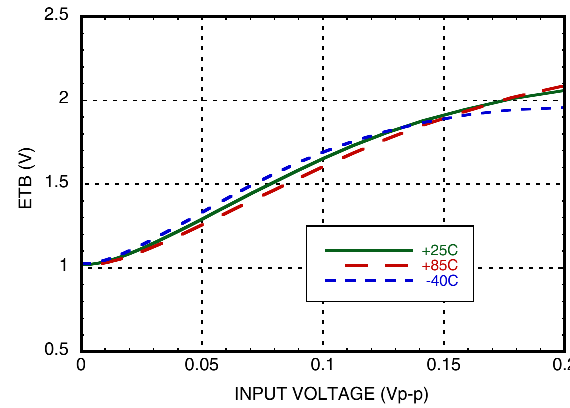



[1] CW Input Waveform

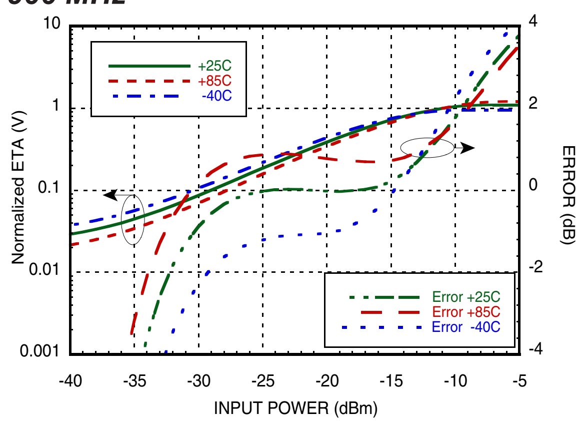
### ETA vs. Pin with CW @ 900 MHz



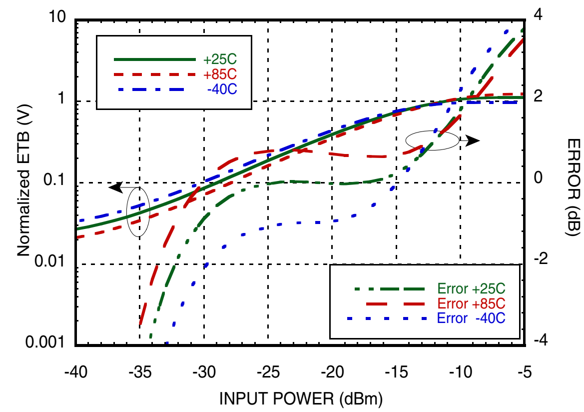

### ETB vs. Pin with CW @ 900 MHz



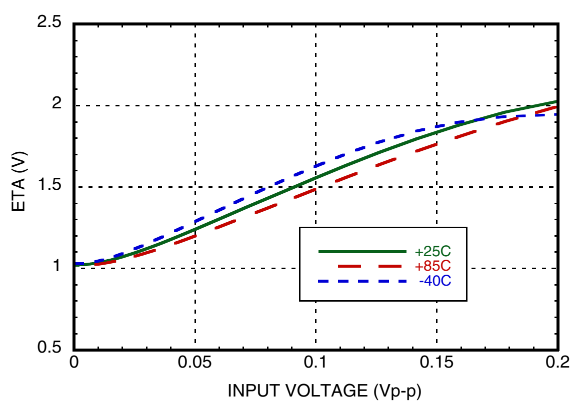

### ETA & ETA Error vs. Pin with CW @ 900 MHz



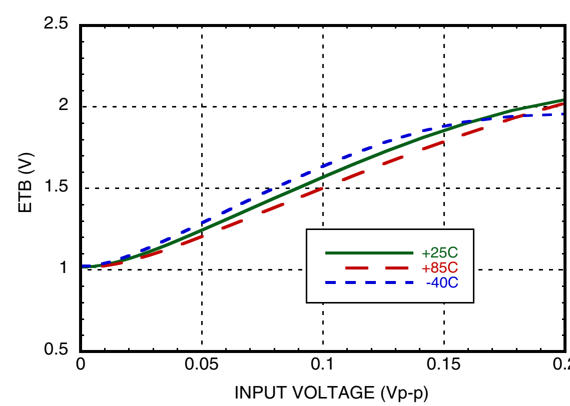

### ETB & ETB Error vs. Pin with CW @ 900 MHz




### ETA vs. Pin with CW @ 1900 MHz




### ETB vs. Pin with CW @ 1900 MHz

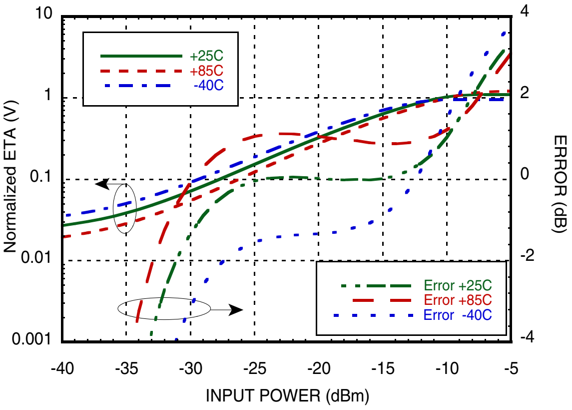




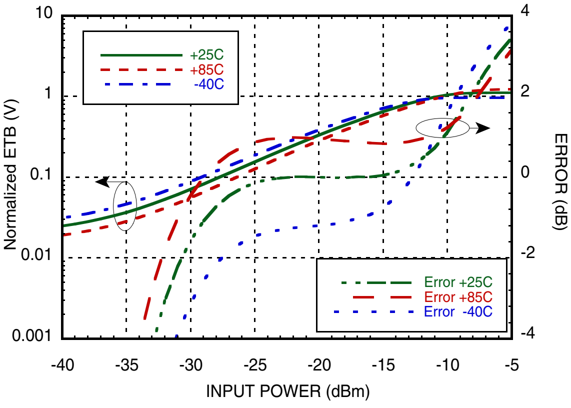

*For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106*
*Phone: 781-329-4700 • Order online at www.analog.com*
*Application Support: Phone: 1-800-ANALOG-D*

## DUAL RMS POWER DETECTOR DC - 3.9 GHz

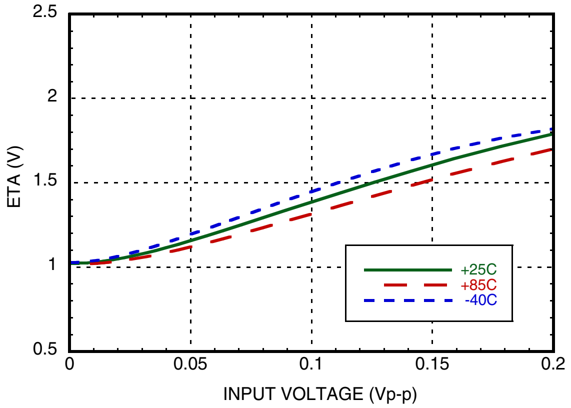
### ETA & ETA Error vs. Pin with CW @ 1900 MHz



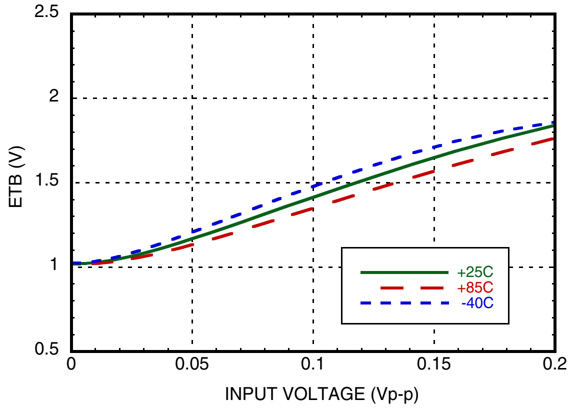

### ETB & ETB Error vs. Pin with CW @ 1900 MHz



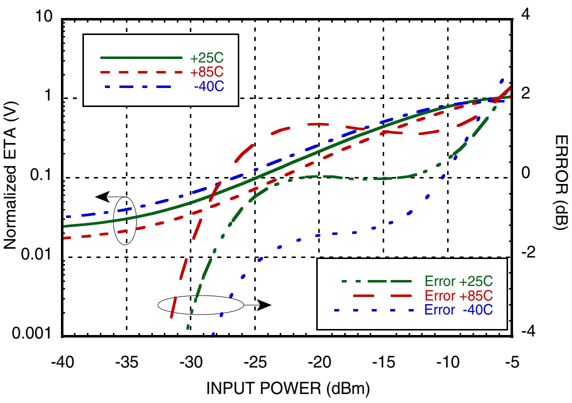

### ETA vs. Pin with CW @ 3500 MHz



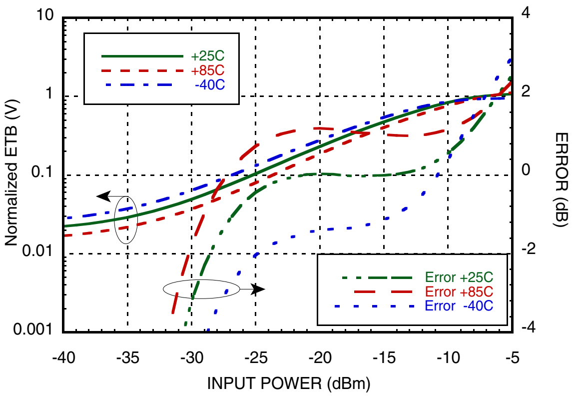

### ETB vs. Pin with CW @ 3500 MHz




### ETA & ETA Error vs. Pin with CW @ 3500 MHz




### ETB & ETB Error vs. Pin with CW @ 3500 MHz

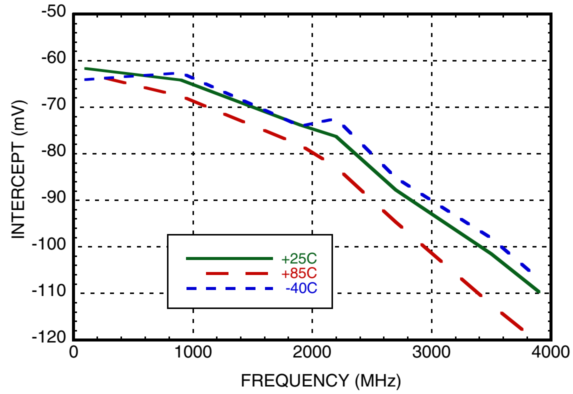




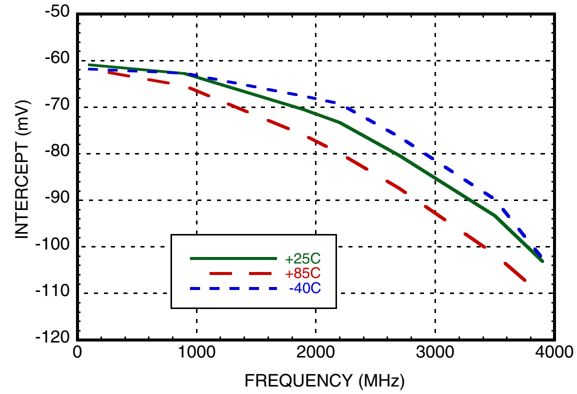

*For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106 Phone: 781-329-4700 • Order online at www.analog.com Application Support: Phone: 1-800-ANALOG-D*

## DUAL RMS POWER DETECTOR DC - 3.9 GHz

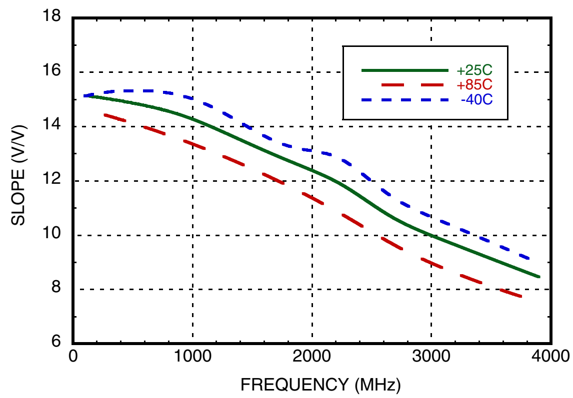
### ETA Intercept vs. Frequency with CW



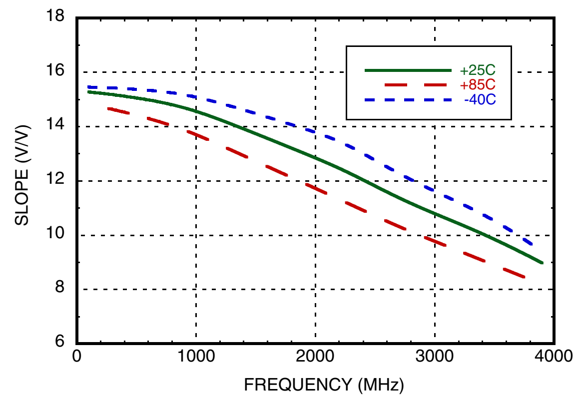

### ETB Intercept vs. Frequency with CW



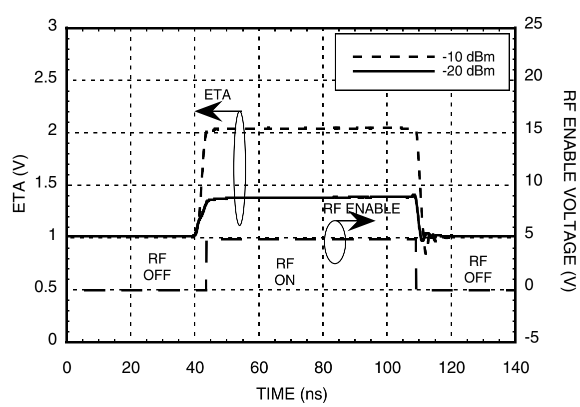

### ETA Slope vs. Frequency with CW



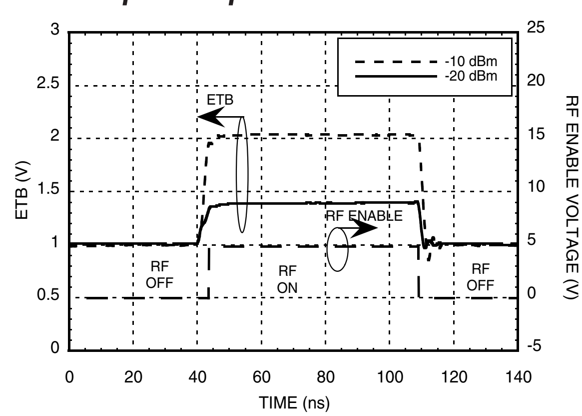

### ETB Slope vs. Frequency with CW




### ETA Output Response @ 1900 MHz




### ETB Output Response @ 1900 MHz






*For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106
Phone: 781-329-4700 • Order online at www.analog.com
Application Support: Phone: 1-800-ANALOG-D*

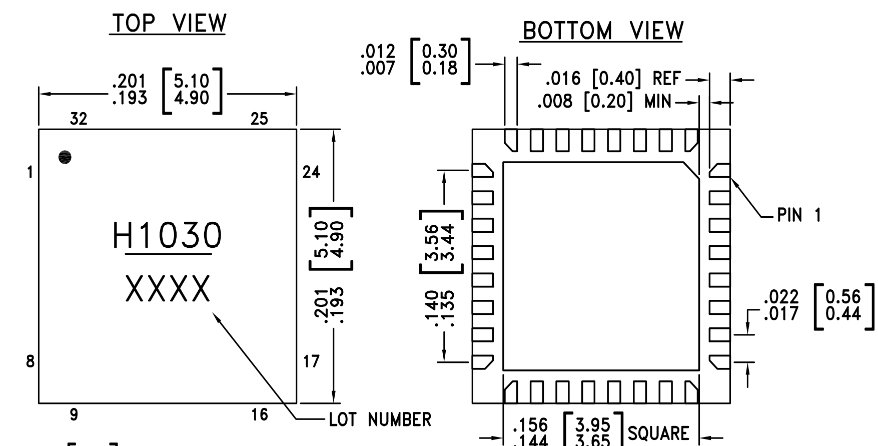
## DUAL RMS POWER DETECTOR DC - 3.9 GHz

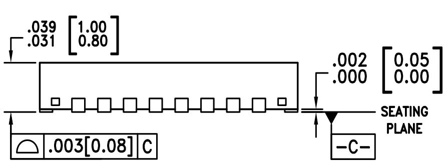
### Absolute Maximum Ratings

| | |
|---|---|
| Supply Voltage | 5.6V |
| Single-Ended RF Input Power | 10 dBm |
| Input Voltage | VCC ± 0.6V |
| Channel / Junction Temperature | 125°C |
| Continuous Pdiss (T = 85°C) (Derate 55.29 mW/°C above 85°C) | 2.21 Watts |
| Thermal Resistance ($R_{th}$) (junction to ground paddle) | 18.09 °C/W |
| Storage Temperature | -65 to +150 °C |
| Operating Temperature | -40 to +85 °C |
| ESD Sensitivity (HBM) | Class 1B |

ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

### 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 0.25mm 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

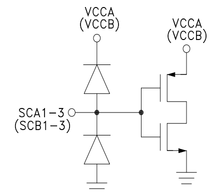
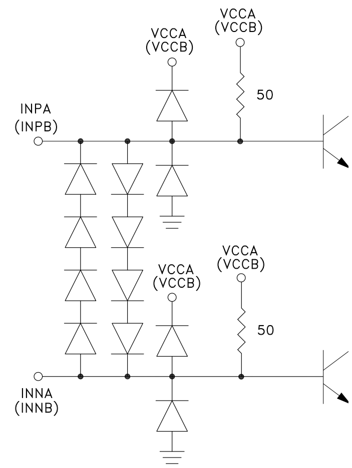
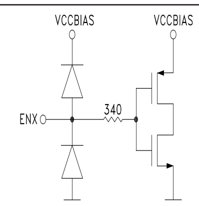
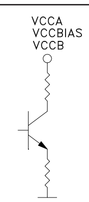
| Part Number | Package Body Material | Lead Finish | MSL Rating | Package Marking [2] |
|---|---|---|---|---|
| HMC1030LP5E | RoHS-compliant Low Stress Injection Molded Plastic | 100% matte Sn | MSL1 [1] | H1030<br>XXXX |

[1] Max peak reflow temperature of 260 °C
[2] 4-Digit lot number XXXX



For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106
Phone: 781-329-4700 • Order online at www.analog.com
Application Support: Phone: 1-800-ANALOG-D

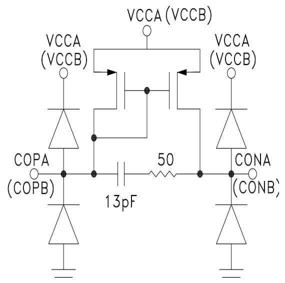
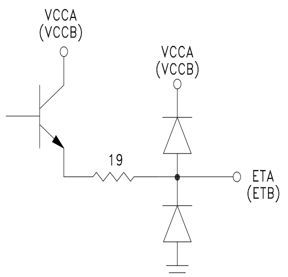
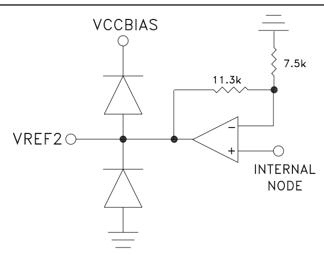
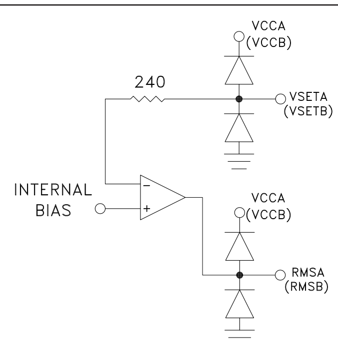
## Pin Descriptions

| Pin Number | Function | Description | Interface Schematic |
|---|---|---|---|
| 1, 8, 9, 10, 31,32 | SCA1, SCB1, SCB2, SCB3, SCA3, SCA2 | Digital input pins that control the internal integration time constant for mean square calculation. SCA(B)3 is the most significant bit. Set V>0.2xVcc to disable. Shortest integration time is for SCA(B)=000, longest integration time is for SCA(B)=111. Each step changes the integration time by 1 octave. |   |
| 2, 3<br>6, 7 | INNA, INPA<br>INPB, INNB | RF Input Pins. |   |
| 4, 25 | ENX, ENOUT | The ENX input is the active low enable pin of the whole device. The ENOUT input is the active high enable pin of the integrated OpAmps driving OUTA & OUTB, ETA & ETB. For normal operation, ENX should be connected to GND and ENOUT should be connected to Vcc. |   |
| 5, 11, 30 | VCCBS, VCCB, VCCA | Bias Supply. Connect supply voltage to these pins with appropriate filtering. |   |

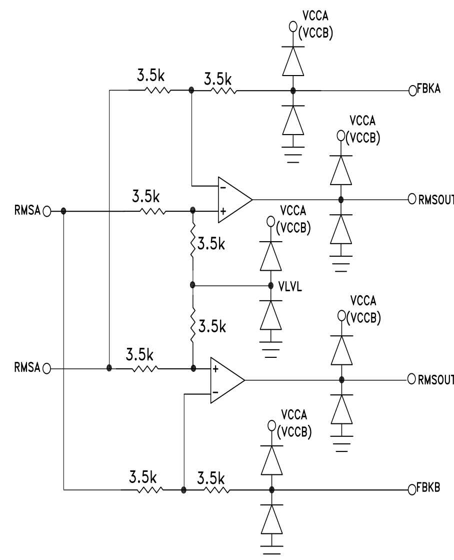
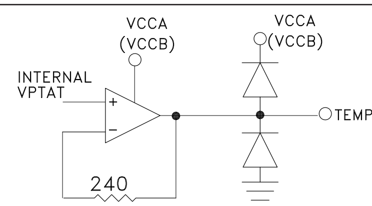


For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106
Phone: 781-329-4700 • Order online at www.analog.com
Application Support: Phone: 1-800-ANALOG-D

### Pin Descriptions (Continued)

| Pin Number | Function | Description | Interface Schematic |
|---|---|---|---|
| 12, 13, 28, 29 | COPB, CONB, CONA, COPA | Input high pass filter capacitor. Connect a capacitor between COPA(COPB) and CONA (CONB) to determine 3 dB point of input signal high-pass filter. |  |
| 14, 27 | ETB, ETA | Linear output that provides an indication of envelope of the input signal. |  |
| 15 | VREF2 | 2.5V Reference voltage output. |  |
| 16 | VLVL | Reference level input for OUTP and OUTN. Connect to VREF for normal operation. | |
| 17, 24 | VSETB, VSETA | VSET inputs. Set point inputs for controller mode. |  |
| 18, 23 | RMSB, RMSA | Logarithmic outputs that convert the input power to a DC level for channel A and channel B. | |

## Pin Descriptions (Continued)

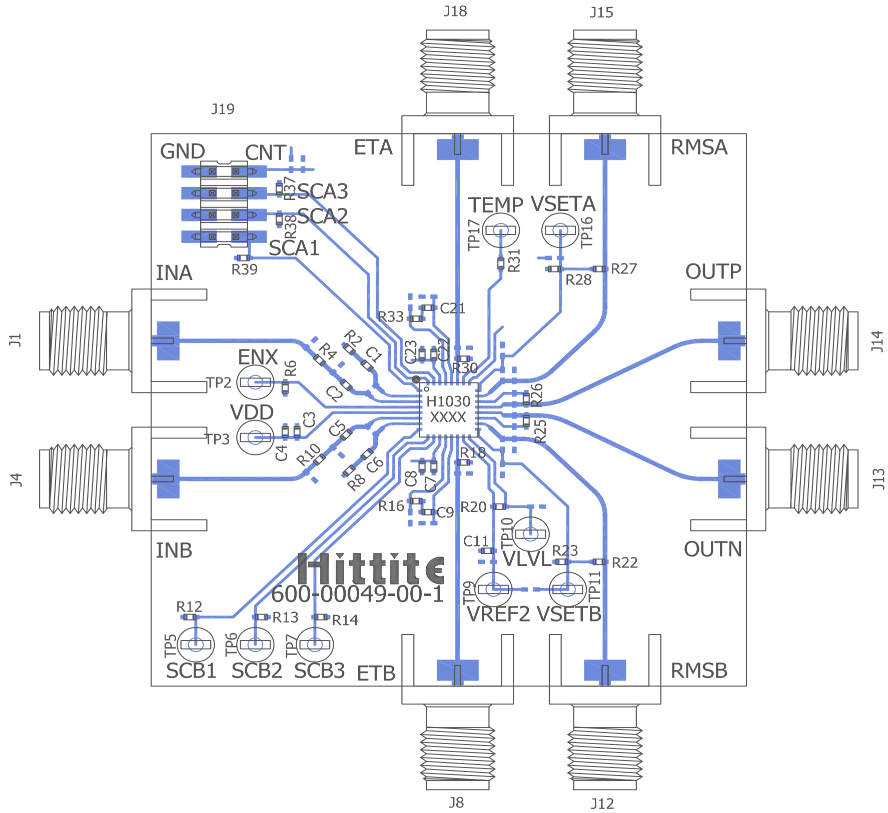
| Pin Number | Function | Description | Interface Schematic |
|---|---|---|---|
| 19 | FBKB | Feedback through 3.5k Ohm to the negative terminal of the integrated Op Amp driving OUTN |   |
| 20 | OUTN | Output providing the difference of RMS outputs using an Op Amp. For normal operation, connected to FBKB to provide the function: OUTN = RMSB - RMSA + VLVL | |
| 21 | OUTP | Output providing the difference of RMS outputs using an Op Amp. For normal operation, connected to FBKA to provide the function: OUTP = RMSA - RMSB + VLVL | |
| 22 | FBKA | Feedback through 3.5K Ohms to the negative terminal of the integrated Op Amp driving OUTP | |
| 26 | TEMP | Temperature sensor output. See Application Note section. |   |
| | GND | Package bottom has an exposed metal paddle that must be connected to RF/DC ground. |   |



For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106
Phone: 781-329-4700 • Order online at www.analog.com
Application Support: Phone: 1-800-ANALOG-D

## DUAL RMS POWER DETECTOR
## DC - 3.9 GHz

### Evaluation PCB - Wideband Single-Ended




### List of Materials for Evaluation PCB EVAL01-HMC1030LP5E[1]

| Item | Description |
|---|---|
| J1, J4, J8, J12, J13, J14, J15, J18 | SMA Connector |
| J19, TP2, TP3, TP5, TP6, TP7, TP9, TP10, TP11, TP16, TP17 | DC Pin |
| C1, C2, C5, C6, C9, C21 | 1 nF Capacitor, 0402 Pkg. |
| C3,C7, C11, C22 | 100 pF Capacitor, 0402 Pkg. |
| C4,C8,C23 | 100 nF Capacitor, 0402 Pkg. |
| R2, R8 | 49.9 Ohm Resistor, 0402 Pkg. |
| R18, R30 | 560 Ohm Resistor, 0402 Pkg. |
| R22, R23, R27, R28, R31 | 1K Ohm Resistor, 0402 Pkg. |
| R6, R12-14,R37-39 | 10K Ohm Resistor, 0402 Pkg. |
| R4, R10,R16, R20,R25-26, R33 | 0 Ohm Resistor, 0402 Pkg. |
| U1 | HMC1030LP5E Single-Ended Dual RMS Power Detector |
| PCB [2] | 600-00049-00-1 Evaluation PCB |

The circuit board used in the final 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.

[1] Reference this number when ordering complete evaluation PCB

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



*For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106*
*Phone: 781-329-4700 • Order online at www.analog.com*
*Application Support: Phone: 1-800-ANALOG-D*