



Typical Applications

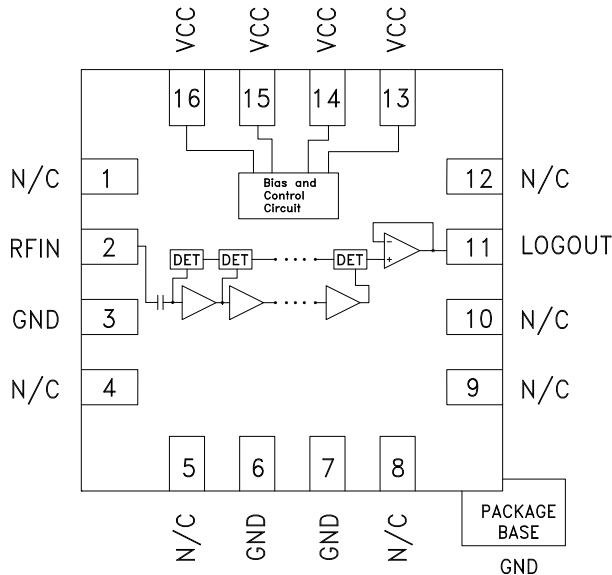
The HMC948LP3E is ideal for:

- Point-to-Point Microwave Radio
- VSAT
- Wideband Power Monitoring
- Receiver Signal Strength Indication (RSSI)
- Test & Measurement

Features

- Wide Input Bandwidth: 1 to 23 GHz
- Wide Dynamic Range: 54 dB up to 23 GHz
- Single Positive Supply: +3.3V
- Excellent Stability Over Temperature
- Fast Rise / Fall Time: 5 / 7 ns
- 16 Lead 3x3 mm SMT Package: 9 mm²

Functional Diagram



General Description

The HMC948LP3E Logarithmic Detector converts RF signals at its input, to a proportional DC voltage at its output. The HMC948LP3E employs successive compression topology which delivers high dynamic range over a wide input frequency range. As the input power is increased, successive amplifiers move into saturation one by one creating an approximation of the logarithm function. The output of a series of square law detectors is summed, converted into the voltage domain and buffered to drive the LOG OUT output. The HMC948LP3E provides a nominal logarithmic slope of +14.2 mV/dB and an intercept of -111 dBm at 23 GHz. Ideal as a log detector for high volume microwave radio and VSAT applications, the HMC948LP3E is housed in a compact 3x3 mm RoHS compliant SMT plastic package.

Electrical Specifications, $T_A = +25\text{ C}$ $V_{CC} = +3.3\text{V}$

Parameter	Typ.	Typ.	Typ.	Typ.	Typ.	Typ.	Typ.	Units
Input Frequency ^[1]	1	5	10	14	18	20	23	GHz
±3 dB Dynamic Range	53	54	54	55	55	55	55	dB
±3 dB Dynamic Range Center	-23	-25	-24	-22	-20	-15	-15	dBm
Log Error Over Temperature (-40 to +85)	±1	±1	±1	±1.5	±1.5	±1.5	±1.5	dB
Output Intercept	-104	-107	-109	-112	-113	-108	-111	dBm
Output Slope	16.8	16.7	15.9	15.2	14.6	14.4	14.2	mV/dB

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

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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



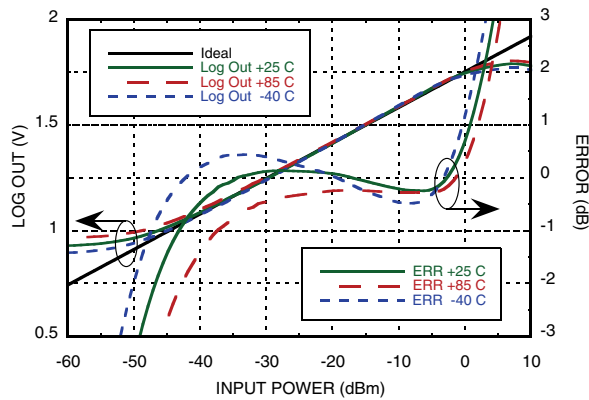
54 dB, LOGARITHMIC DETECTOR, 1 - 23 GHz

Electrical Specifications, (continued)

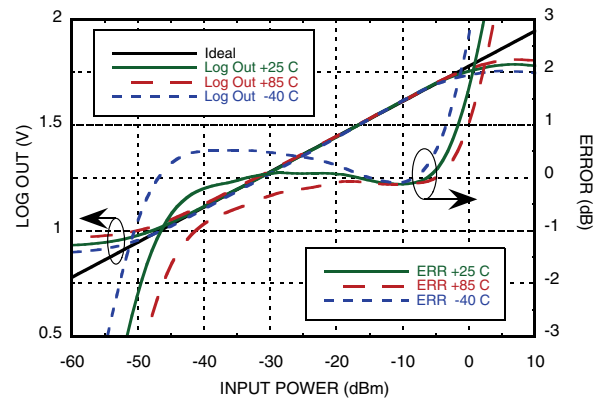
Parameter	Conditions	Min.	Typ.	Max.	Units
LOGOUT Interface					
Output Voltage Range		0.9		1.8	V
Output Rise Time ^[1] / Fall Time ^[2]	f = 10 GHz		5 / 7		ns
Power Supply (Vcc)					
Operating Voltage Range		3.15	3.3	3.45	V
Supply Current in Normal Mode			91		mA

[1] 0 dBm Input Pulsed; measured from 10% to 90%
 [2] 0 dBm Input Pulsed; measured from 90% to 10%

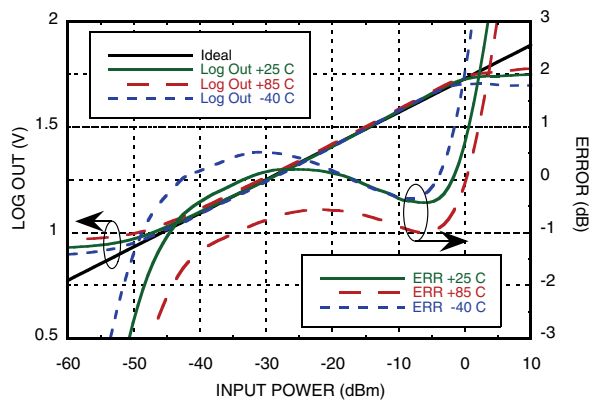
LOG OUT & Error vs. Input Power, Fin = 1 GHz



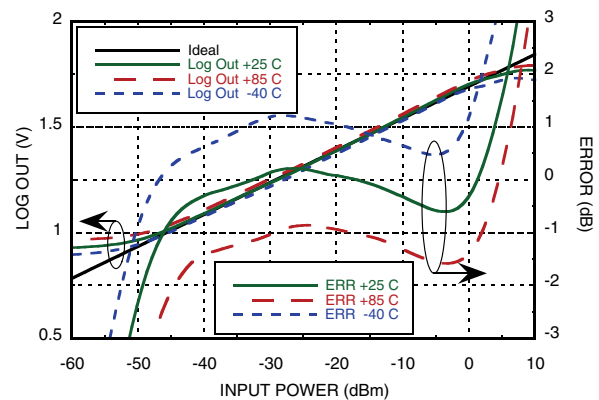
LOG OUT & Error vs. Input Power, Fin = 5 GHz



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



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



Unless otherwise noted: Vcc = +3.3V, TA = +25 °C

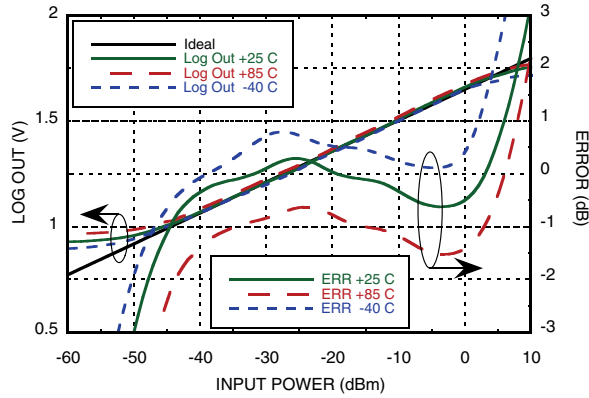
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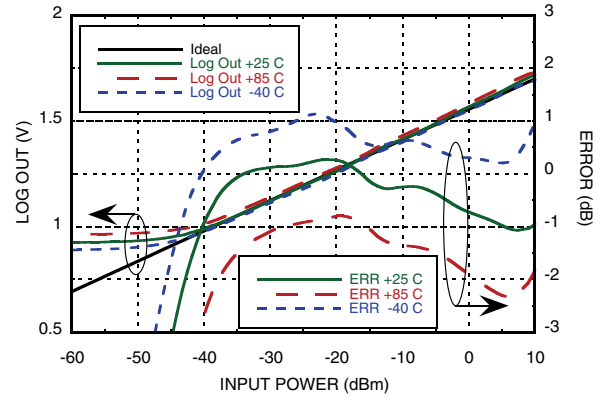


54 dB, LOGARITHMIC DETECTOR, 1 - 23 GHz

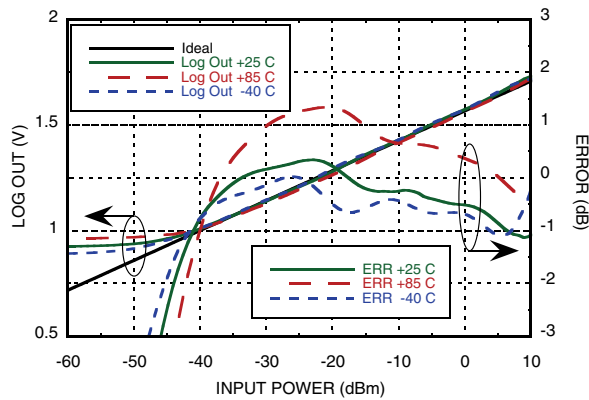
LOG OUT & Error vs. Input Power, Fin = 18 GHz



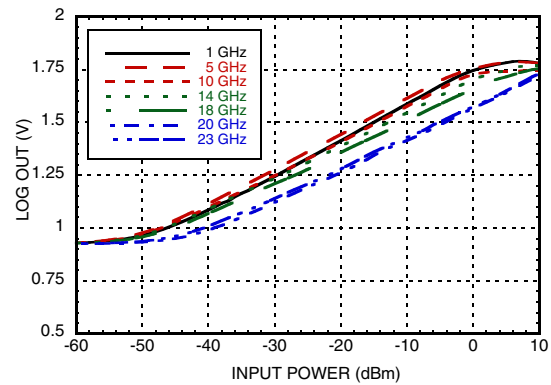
LOG OUT & Error vs. Input Power, Fin = 20 GHz



LOG OUT & Error vs. Input Power, Fin = 23 GHz



LOG OUT vs. Frequency



Unless otherwise noted: $V_{cc} = +3.3V$, $T_A = +25^\circ C$

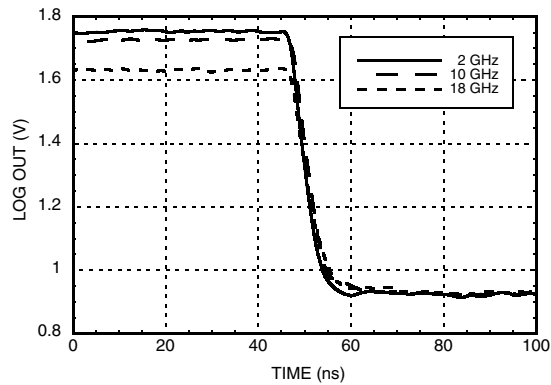
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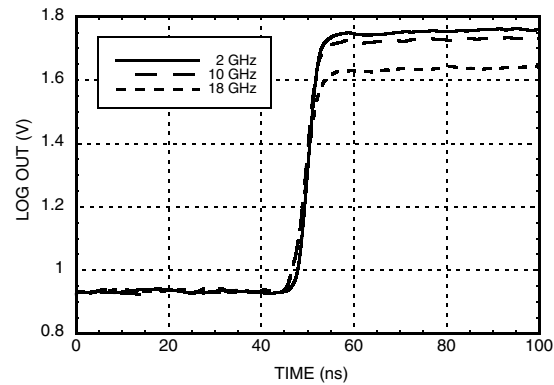
**54 dB, LOGARITHMIC
DETECTOR, 1 - 23 GHz**



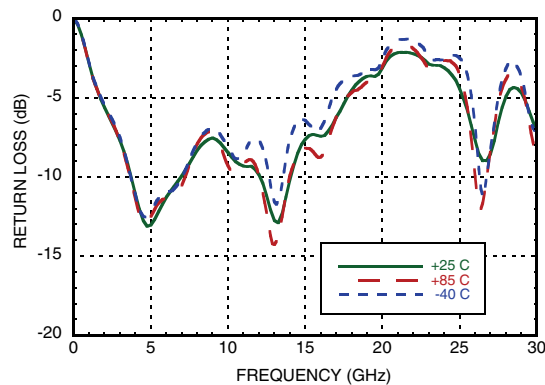
Fall Time for Various Frequencies @ 0 dBm



Rise Time for Various Frequencies @ 0 dBm



Input Return Loss



Unless otherwise noted: $V_{cc} = +3.3V$, $T_A = +25\text{ }^\circ\text{C}$

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54 dB, LOGARITHMIC DETECTOR, 1 - 23 GHz

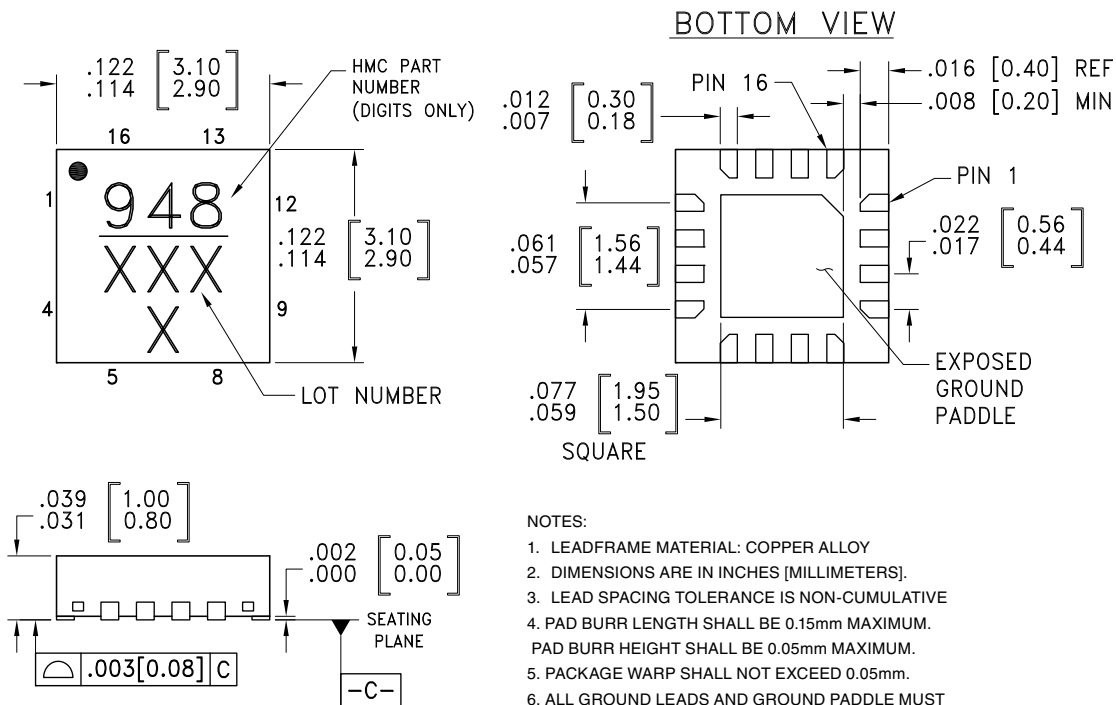
Absolute Maximum Ratings

Vcc	+3.6V
RF Input Power	+15 dBm
Junction Temperature	125 °C
Continuous Pdiss (T = 85°C) (Derate 11.62 mW/°C above 85°C)	0.46W
Thermal Resistance (R _{th}) (junction to ground paddle)	86.09 °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:

- LEADFRAME MATERIAL: COPPER ALLOY
- DIMENSIONS ARE IN INCHES [MILLIMETERS].
- LEAD SPACING TOLERANCE IS NON-CUMULATIVE
- PAD BURR LENGTH SHALL BE 0.15mm MAXIMUM. PAD BURR HEIGHT SHALL BE 0.05mm MAXIMUM.
- PACKAGE WARP SHALL NOT EXCEED 0.05mm.
- ALL GROUND LEADS AND GROUND PADDLE MUST BE SOLDERED TO PCB RF GROUND.
- REFER TO HMC APPLICATION NOTE FOR SUGGESTED PCB LAND PATTERN.

Package Information

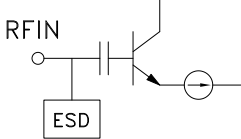

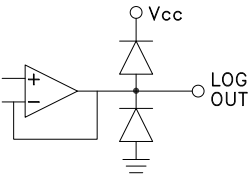
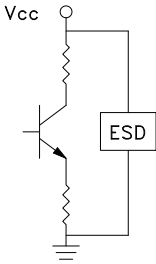
Part Number	Package Body Material	Lead Finish	MSL Rating	Package Marking ^[1]
HMC948LP3E	RoHS-compliant Low Stress Injection Molded Plastic	100% matte Sn	MSL1 ^[2]	948 XXX

[1] 4-Digit lot number XXXX

[2] Max peak reflow temperature of 260 °C



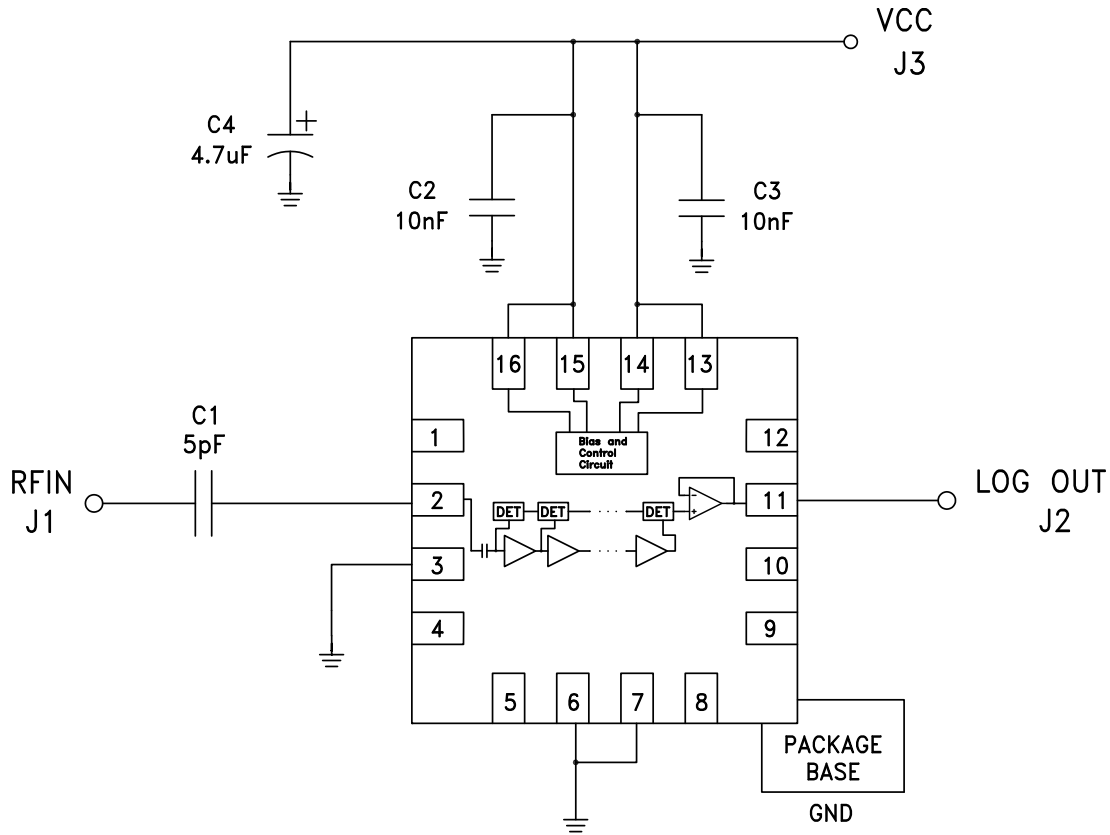
Pin Descriptions

Pin Number	Function	Description	Interface Schematic
1, 4, 5, 8, 9, 10, 12	N/C	No connection necessary. These pins may be connected to RF/DC ground without affecting performance.	
2	RFIN	RF input pin.	
3, 6, 7	GND	These pins and the exposed package bottom must be connected to a high quality RF/DC ground.	
11	LOG OUT	Log out load should be at least 1K Ohm or higher.	
13 - 16	Vcc	Bias Supply. Connect supply voltage to these pins with appropriate filtering. To ensure proper start-up supply rise time should be faster than 100usec	



54 dB, LOGARITHMIC DETECTOR, 1 - 23 GHz

Application & Evaluation PCB Schematic



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