

LTC5596

100MHz to 40GHz RMS Power Detector

DESCRIPTION

Demonstration circuit 2158A hosts a high accuracy RMS Power Detector featuring the [LTC®5596 IC](#). This device is a wide dynamic range RMS RF Power Detector operational from 100MHz to 40GHz. The input dynamic range with 1dB accuracy is up to 35dB depending on frequency. The detector output voltage slope is normally 29mV/dB. The DC2158A Demo Circuit is optimized for wide operational frequency range up to 40GHz with 2.9mm SMK edge mount connector. Input impedance to LTC5596 is internally matched to 50Ω. It is suitable for RMS measurements of high crest factor waveforms up to 12dB peak/average ratio. No external coupling capacitor is necessary if DC voltage at RF_{IN} pin is kept below 1.0V. Contact applications support for more information.

Design files for this circuit board are available at <http://www.linear.com/demo/DC2158A>

ABSOLUTE MAXIMUM INPUT RATINGS

(Note 1)

Supply Voltage (V _{CC}):	3.8V
DC Voltage at RF _{IN} :	−0.3V to 1.0V
DC Voltage at FLTR:	−0.3V to 0.4V
DC Voltage at EN:	−0.3V to 3.8V
RF _{IN} Input Power-Average:	15dBm
T _{JMAX} :	150°C
Case Operating Temperature Range:	−40°C to 105°C
Storage Temperature Range:	−65°C to 150°C

Note 1: Voltage on all pins must not exceed V_{CC}+0.3V or be less than −0.3V.

CAUTION: This part is sensitive to electrostatic discharge (ESD). Observe proper ESD precautions when handling the LTC5596.

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TEST SETUP

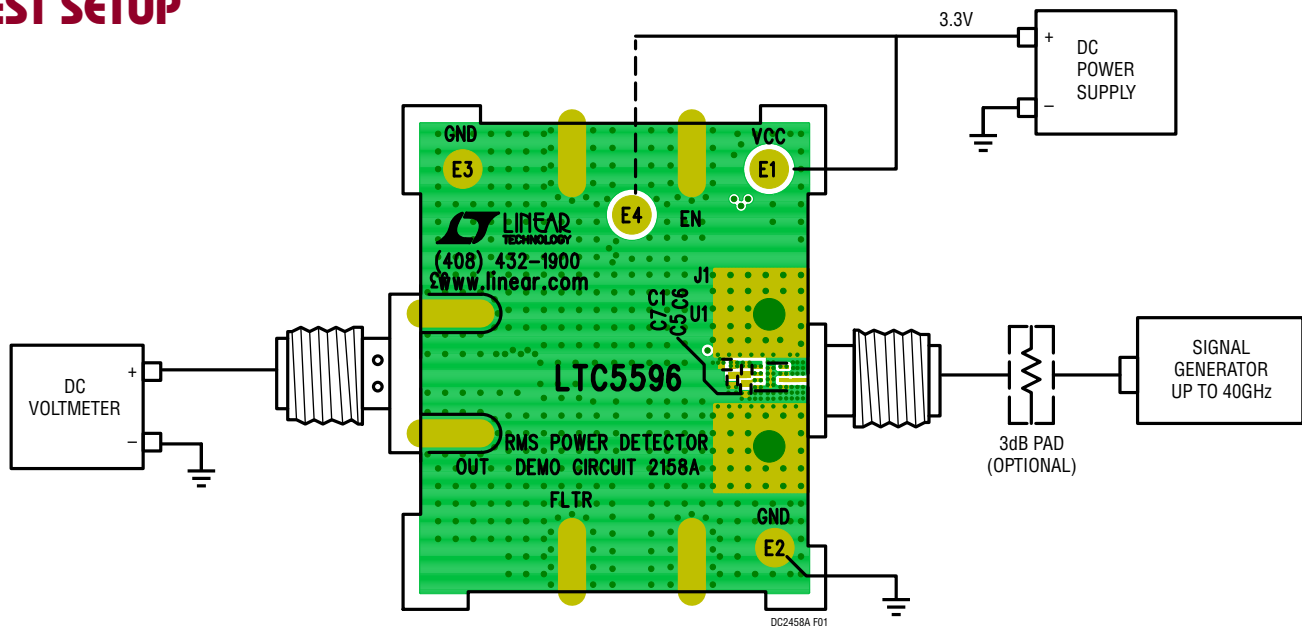


Figure 1: Test Setup for RF Performance Measurements

NOTES ON TEST EQUIPMENT AND SETUP

- Use a high performance signal generator with accurate output power levels up to 40GHz, such as Rohde & Schwarz SMF100A.
- Demo Board DC2158A includes the SMK 2.9mm connector for best performance up to 40GHz.
- Connecting cable for RF signal should be rated up to 40GHz for the best performance.
- Optional input attenuation can be used to improve return loss, but also shifts the log intercept point accordingly.
- Use high quality power supply with low noise, able to support 3.3V with 40mA of current.

QUICK START PROCEDURE

1. Remove the DC2158A from its protective packaging in an ESD-safe working area (see Figure 1).
2. With power supply turned off, connect V_{CC} and EN turret to the supply positive output. And GND to the negative supply output. Keep the leads to be as short as possible to avoid voltage overshoot.
3. Slowly ramp up the V_{CC} together with EN supply to 3.3V. Recommended ramp time is 1ms minimum. Do not float EN.
4. Connect the RF input to the signal generator at the 2.92mm connector.
5. Set the frequency and power level (less than +10dBm) of the signal generator.
6. Measure the output voltage with the DMM.
7. Sweep the power level to generate the transfer curve V_{OUT} vs Input Power.

DEMO BOARD USAGE NOTES

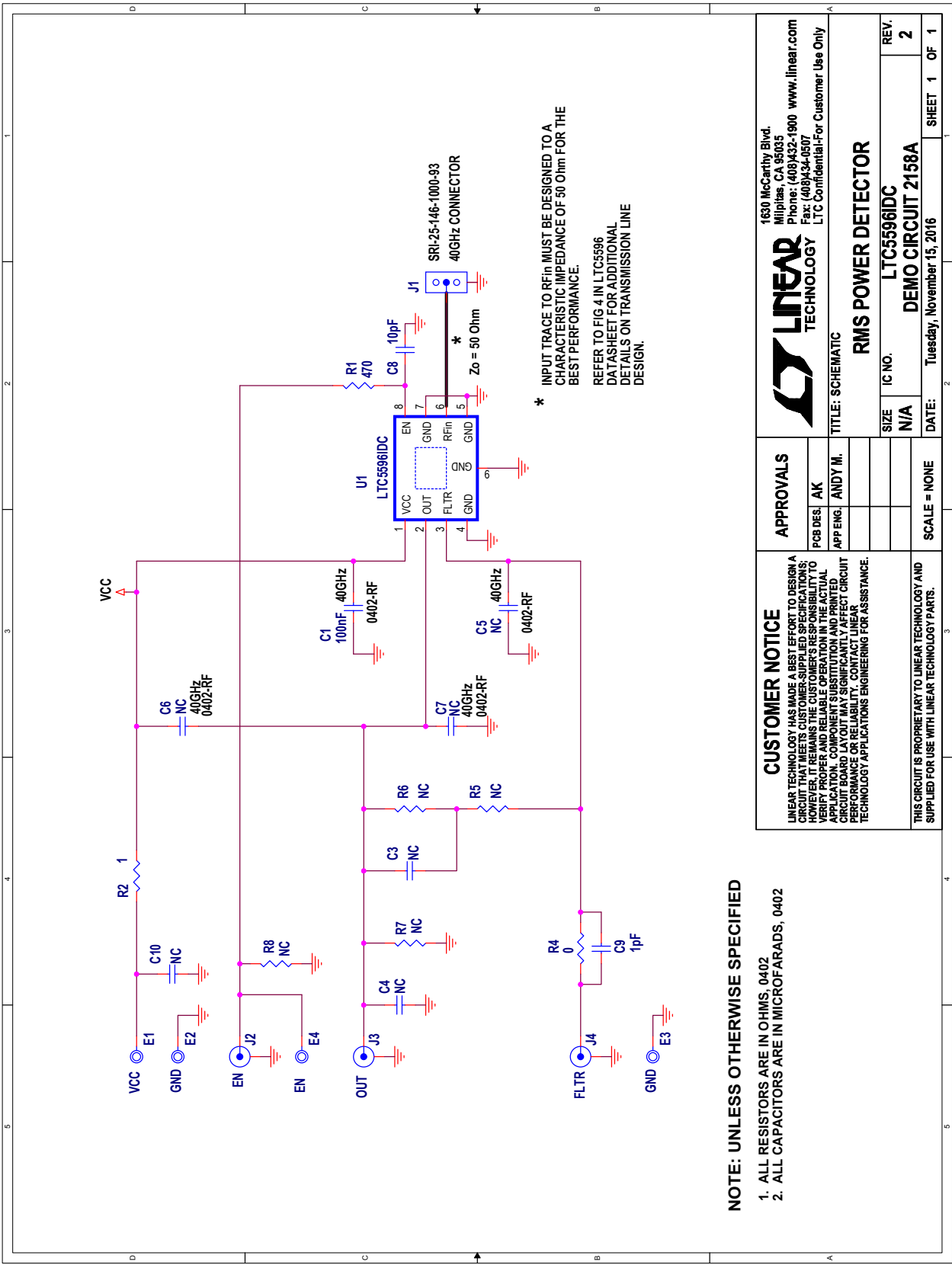
1. Demo Board DC2158A has provisions for interstage filter cap. Additional capacitor (C3) can be installed to slow down the transient response to reduce the output ripple. Short R5 and install C3. The range for C3 is 10pF to 1nF.
2. The detector output slope is approximately 29mV/dB.
3. Linear regression is used to generate the slope and intercept point from the best fit straight line.
4. Linearity Error= $V_{OUT}/\text{Slope} + \text{Log Intercept} - \text{Input Power}$.
5. A minimum two point calibration is necessary for most applications. Additional calibration points will improve the accuracy of the power detection.

DEMO MANUAL DC2158A

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	1	C1	CAP, 100nF, FOR 40GHz, 0402	
2	7	C3, C4, R5, R6, R7, R8, C10	NC, 0402	
3	3	C5, C6, C7	NC, 0402	
4	1	C8	CAP, NPO, 10pF, 5%, 50V, 0402	MURATA, GRM1555C1H100JA01D
5	1	C9	NC, 0402	
6	4	E1-E4	TURRET, PAD .061"	MILL-MAX, 2308-2-00-80-00-00-07-0
8	1	J1	CONN, 2.9mm JACK TO EDGE-LAUNCH, DC - 40GHz	SRI CON., 25-146-1000-93
9	3	J2-J4	CONN, SMA 50Ω EDGE-LAUNCH	E. F. JOHNSON, 142-0701-851
10	1	R1	RES, CHIP, 470, 1%, 0402	VISHAY, CRCW0402470RFKED
11	1	R2	RES, CHIP, 1, 1%, 0402	VISHAY, CRCW04021R00FNED
12	1	R4	NC, 0402	
13	1	U1	IC, LINEAR TECHNOLOGY, LTC5596IDC, DFN 2 × 2	LINEAR TECH., LTC5596IDC

SCHEMATIC DIAGRAM



CUSTOMER NOTICE LINEAR TECHNOLOGY HAS MADE A BEST EFFORT TO DESIGN A CIRCUIT THAT MEETS CUSTOMER-SUPPLIED SPECIFICATIONS. HOWEVER, IT REMAINS THE CUSTOMER'S RESPONSIBILITY TO VERIFY PROPER AND RELIABLE OPERATION IN THE ACTUAL APPLICATION. COMPONENT SUBSTITUTION AND PRINTED CIRCUIT BOARD MANUFACTURING TOLERANCES MAY AFFECT CIRCUIT PERFORMANCE OR RELIABILITY. CONTACT LINEAR TECHNOLOGY APPLICATIONS ENGINEERING FOR ASSISTANCE.		APPROVALS PCB DES. AK APP ENG. ANDY M.		LINEAR TECHNOLOGY 1630 McCarthy Blvd. Milpitas, CA 95035 Phone: (408) 432-1900 www.linear.com Fax: (408) 434-0807 LTC Confidential-For Customer Use Only	
				TITLE: SCHEMATIC	
				RMS POWER DETECTOR	
		SIZE	IC NO.	REV.	
		N/A	LTC5596DC	2	
		DATE: Tuesday, November 15, 2016		SHEET 1 OF 1	
		SCALE = NONE		DEMO CIRCUIT 2158A	

DEMO MANUAL DC2158A

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This notice contains important safety information about temperatures and voltages. For further safety concerns, please contact a LTC application engineer.

Mailing Address:

Linear Technology
1630 McCarthy Blvd.
Milpitas, CA 95035

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