



# 3.0 GHz DIVIDE BY 4 PRESCALER

# UPB1510GV

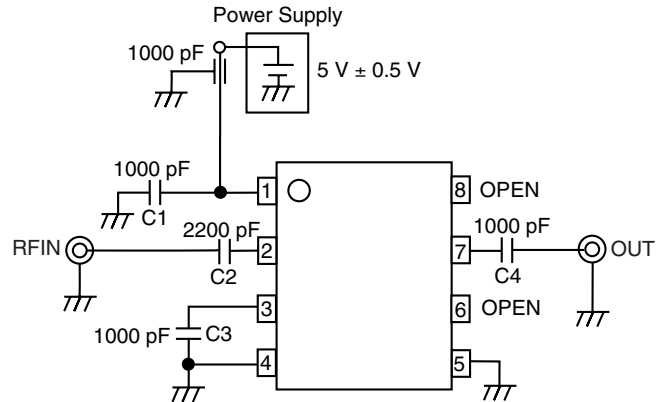
## FEATURES

- HIGH FREQUENCY OPERATION TO 3 GHz
- FIXED DIVIDE RATIO: ÷ 4
- LOW CURRENT CONSUMPTION: 15 mA at 5 V
- SMALL PACKAGE: 8 PIN SSOP
- AVAILABLE IN TAPE AND REEL

## DESCRIPTION

NEC's UPB1510GV is a Silicon RFIC digital prescaler manufactured with the NESAT™ IV silicon bipolar process. It features frequency response to 3 GHz, a divide-by-four ratio, and operates on a 5 volt supply while drawing only 15 mA. The device is housed in a small 8 pin SSOP package that contributes to system miniaturization. The low power consumption and wide frequency operation makes the device well suited for use in a PLL synthesizer for UHF/VHF TV and DBS tuner applications.

## TEST CIRCUIT



## ELECTRICAL CHARACTERISTICS (TA = -40 to +85°C, VCC = 4.5 to 5.5 V, ZS = ZL = 50 Ω)

PART NUMBER PACKAGE OUTLINE			UPB1510GV S08		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX
Icc	Circuit Current, No Input Signal	mA	10.5	14	17
fIN (u)1	Upper Limit Operating Frequency 1, PIN = -10 to +6 dBm	GHz	3.0		
fIN (u)2	Upper Limit Operating Frequency 2, PIN = -15 to +6 dBm	GHz	2.7		
fIN (L)	Lower Limit Operating Frequency, PIN = -15 to +6 dBm	GHz			0.5
PIN1	Input Power 1, fIN = 2.7 to 3.0 GHz	dBm	-10		+6
PIN2	Input Power 2, fIN = 1.0 to 2.7 GHz	dBm	-15		+6
POUT	Output Power, PIN = 0 dBm, fIN = 2.0 GHz	dBm	-12	-7	

# UPB1510GV

## ABSOLUTE MAXIMUM RATINGS<sup>1</sup> (T<sub>A</sub> = 25°C)

SYMBOLS	PARAMETERS	UNITS	RATINGS
V <sub>CC</sub>	Supply Voltage	V	6.0
V <sub>IN</sub>	Input Voltage	V	6.0
P <sub>D</sub>	Total Power Dissipation <sup>2</sup>	mW	250
T <sub>A</sub>	Operating Ambient Temp.	°C	-40 to +85
T <sub>STG</sub>	Storage Temperature	°C	-55 to +150

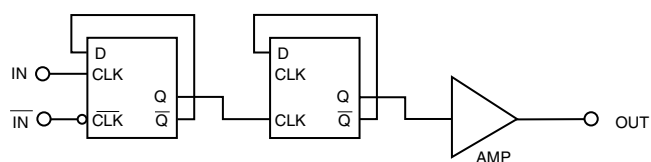
### Notes:

1. Operation in excess of any one of these parameters may result in permanent damage.
2. Mounted on a double-sided copper clad 50x50x1.6 mm epoxy glass PWB (T<sub>A</sub> = +85°C).

## RECOMMENDED OPERATING CONDITIONS

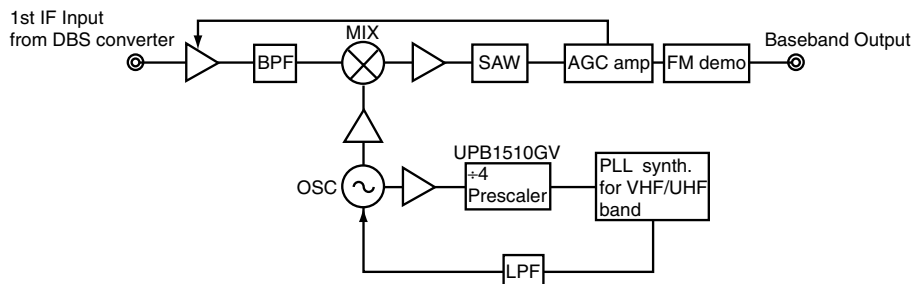
SYMBOL	PARAMETER	UNITS	MIN	TYP	MAX
V <sub>CC</sub>	Supply Voltage	V	4.5	5.0	5.5
T <sub>A</sub>	Operating Ambient Temp.	°C	-40	+25	+85

## INTERNAL BLOCK DIAGRAM



## SYSTEM APPLICATION EXAMPLE

### RF UNIT BLOCK OF DBS TUNER

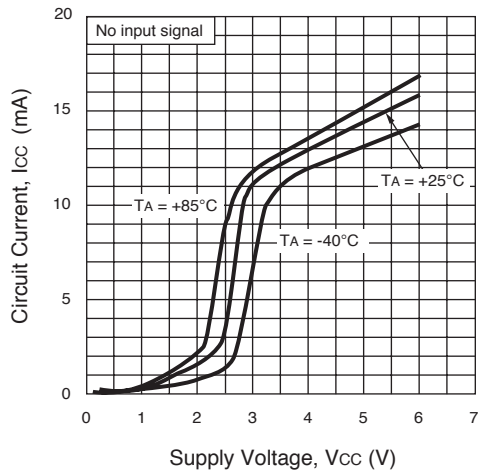


## PIN DESCRIPTIONS

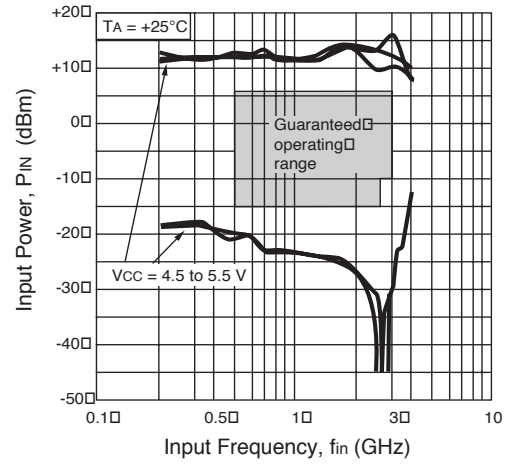
Pin No.	Symbol	Applied Voltage	Description
1	VCC	4.5 to 5.5 1000 pF).	Power supply pin. This pin must be decoupled with a bypass capacitor (e.g.
2	IN	–	Signal input pin. This pin should be coupled to source with a capacitor (e.g. 1000 pF).
3	$\overline{\text{IN}}$	–	Signal input bypass pin. This pin must be equipped with a bypass capacitor (e.g. 1000 pF) to ground.
4	GND	0	Ground pin. Ground pattern on the board should be formed as wide as possible to minimize ground impedance.
5	GND	0	
6	NC	–	No connection, this pin should be left open.
7	OUT	–	Divided frequency output pin. This pin is designed as an emitter follower output, and should be coupled to the load with a capacitor (e.g. 1000 pF).
8	NC	–	No connection, this pin should be left open.

**TYPICAL PERFORMANCE CURVES** (TA = +25°C unless otherwise noted)

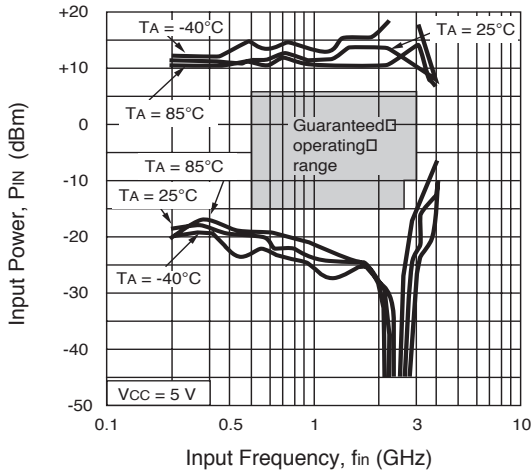
**CURRENT vs. VOLTAGE and TEMPERATURE**



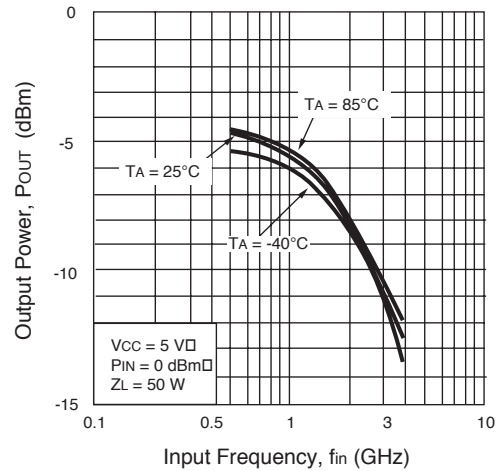
**INPUT POWER vs. INPUT FREQUENCY and VOLTAGE**



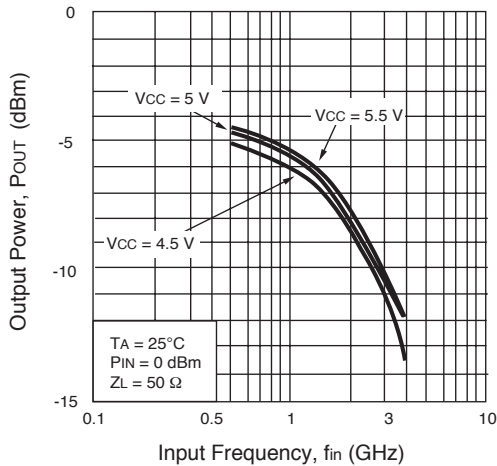
**INPUT POWER vs. INPUT FREQUENCY and TEMPERATURE**



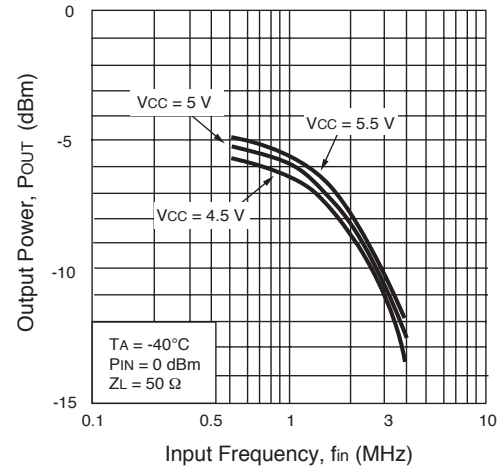
**OUTPUT POWER vs. INPUT FREQUENCY and VOLTAGE**



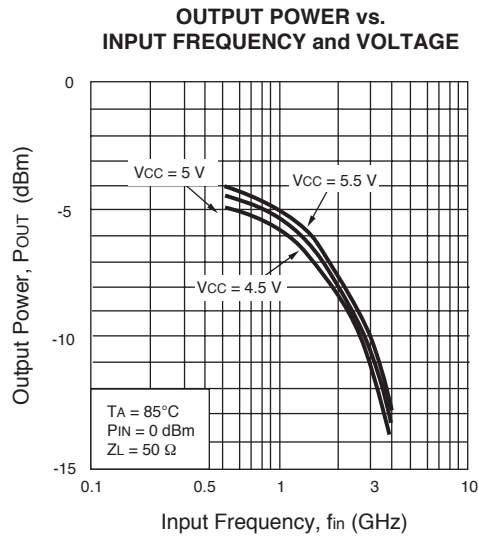
**OUTPUT POWER vs. INPUT FREQUENCY and VOLTAGE**



**OUTPUT POWER vs. INPUT FREQUENCY and VOLTAGE**



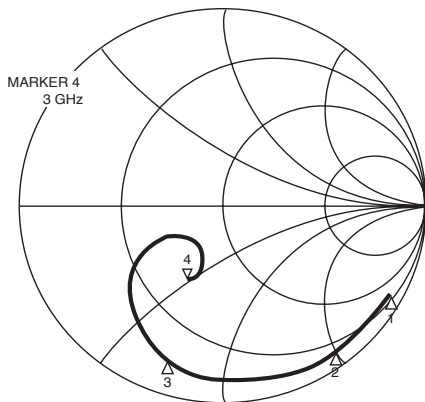
**TYPICAL PERFORMANCE CURVES** ( $T_A = +25^\circ\text{C}$  unless otherwise noted)



**TYPICAL SCATTERING PARAMETERS** ( $T_A = 25^\circ\text{C}$ )

**S<sub>11</sub> vs. INPUT FREQUENCY**  
 $V_{CC} = 5.0\text{ V}$ ,  $T_A = 25^\circ\text{C}$ ,  $Z_0 = 50\ \Omega$

$S_{11}$              $Z$   
 REF 1.0 Units  
 4 200.0 mUnits/  
 $\nabla$  27.159  $\Omega$  -27.582  $\Omega$   
*hp*



- $\nabla$  1 : 500 MHz
- $\nabla$  2 : 1000 MHz
- $\nabla$  3 : 2000 MHz
- $\nabla$  4 : 3000 MHz

FREQUENCY MHz	S <sub>11</sub> ( $\Omega$ )
500	37.1 - j207.8
1000	14.2 - j105.1
2000	7.9 - j35.8
3000	27.1 - j27.5

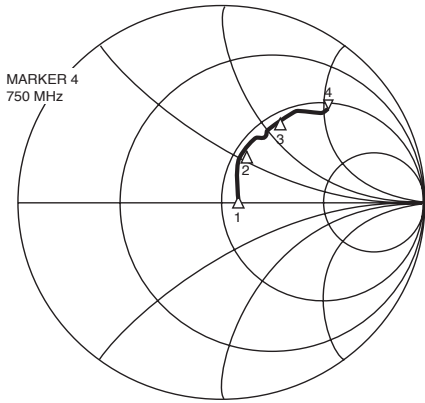
START 0.500000000 GHz  
 STOP 3.000000000 GHz

**TYPICAL SCATTERING PARAMETERS** ( $T_A = 25^\circ\text{C}$ )

**S<sub>22</sub> vs. OUTPUT FREQUENCY**

V<sub>CC</sub> = 5.0 V, f<sub>in</sub> = 500 MHz, T<sub>A</sub> = 25°C, Z<sub>o</sub> = 50 Ω

S<sub>22</sub> Z  
 REF 1.0 Units  
 4 200.0 mUnits/  
 ▽ 60.925 Ω 104.77 Ω  
 hp



- ▽<sub>1</sub> : 125 MHz
- ▽<sub>2</sub> : 250 MHz
- ▽<sub>3</sub> : 500 MHz
- ▽<sub>4</sub> : 750 MHz

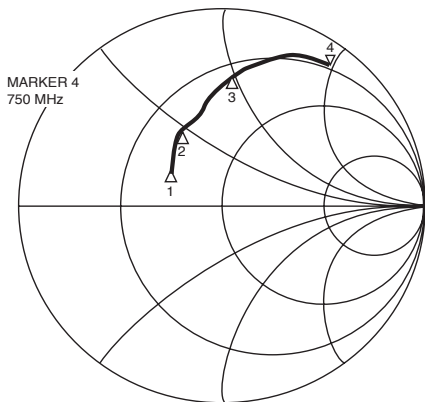
FREQUENCY MHz	S <sub>22</sub> (Ω)
125	55.5 + j6.7
250	53.7 + j30.4
500	55.0 + j60.3
750	60.9 + j104.8

START 0.125000000 GHz  
 STOP 0.750000000 GHz

**S<sub>22</sub> vs. OUTPUT FREQUENCY**

V<sub>CC</sub> = 5.0 V, f<sub>in</sub> = 3 GHz, T<sub>A</sub> = 25°C, Z<sub>o</sub> = 50 Ω

S<sub>22</sub> Z  
 REF 1.0 Units  
 4 200.0 mUnits/  
 ▽ 15.613 Ω 98.168 Ω  
 hp



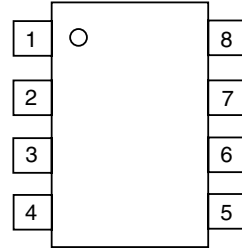
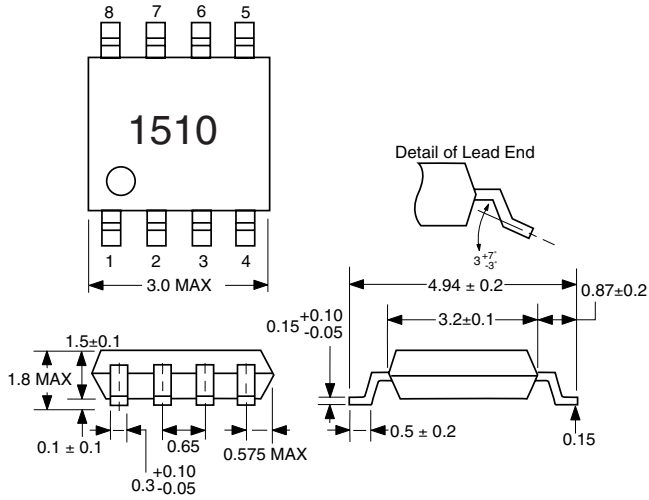
- ▽<sub>1</sub> : 125 MHz
- ▽<sub>2</sub> : 250 MHz
- ▽<sub>3</sub> : 500 MHz
- ▽<sub>4</sub> : 750 MHz

FREQUENCY MHz	S <sub>22</sub> (Ω)
125	28.5 + j11.5
250	27.6 + j23.6
500	20.5 + j50.7
750	15.6 + j98.2

START 0.125000000 GHz  
 STOP 0.750000000 GHz

**OUTLINE DIMENSIONS** (Units in mm)

**PACKAGE OUTLINE S08**



**PIN CONNECTIONS**

- 1. Vcc      5. GND
- 2. IN      6. NC
- 3.  $\overline{\text{IN}}$     7. OUT
- 4. GND     8. NC

**ORDERING INFORMATION**

PART NUMBER	QUANTITY
UPB1510GV-E1-A	1000/Reel

**Note:**

- 1. Embossed tape 8 mm wide.  
Pin 1 is in the tape pull-out direction.

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CEL Pb-free products have the same base part number with a suffix added. The suffix –A indicates that the device is Pb-free. The –AZ suffix is used to designate devices containing Pb which are exempted from the requirement of RoHS directive (\*). In all cases the devices have Pb-free terminals. All devices with these suffixes meet the requirements of the RoHS directive.

This status is based on CEL’s understanding of the EU Directives and knowledge of the materials that go into its products as of the date of disclosure of this information.

Restricted Substance per RoHS	Concentration Limit per RoHS (values are not yet fixed)	Concentration contained in CEL devices	
		-A	-AZ
Lead (Pb)	< 1000 PPM	Not Detected	(*)
Mercury	< 1000 PPM	Not Detected	
Cadmium	< 100 PPM	Not Detected	
Hexavalent Chromium	< 1000 PPM	Not Detected	
PBB	< 1000 PPM	Not Detected	
PBDE	< 1000 PPM	Not Detected	

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