CEL

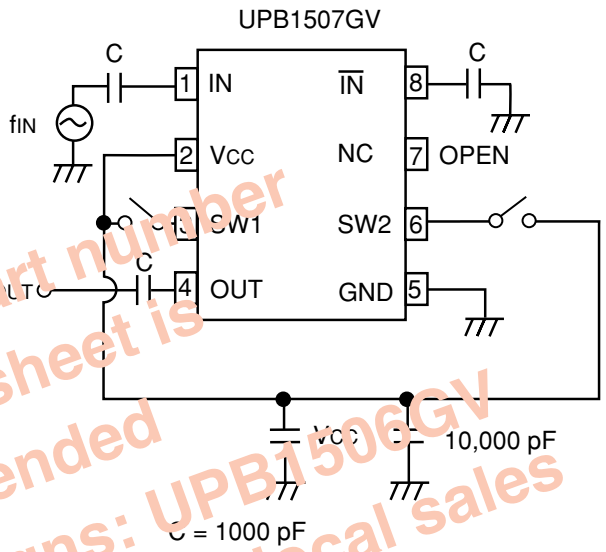
NEC's 3.0 GHz DIVIDE BY 64/128/256 PRESCALER

~~UPB1506GV~~
UPB1507GV

FEATURES

- **HIGH FREQUENCY OPERATION TO 3 GHz**
- **SELECTABLE DIVIDE RATIO:** ÷64, ÷128, ÷256
- **LOW CURRENT CONSUMPTION:** 19 mA at 5 V
- **SMALL PACKAGE:** 8 pin SSOP
- **AVAILABLE IN TAPE AND REEL**

TEST CIRCUIT



DESCRIPTION

NEC's UPB1506GV and UPB1507GV are Silicon MMIC digital prescalers manufactured with the NESAT™ IV silicon bipolar process. They feature high frequency response to 3 GHz, selectable divide-by-64, 128, or 256 modes, and operate on a 5 volt supply while drawing only 19 mA. The devices are housed in a small 8 pin SSOP package that contributes to system miniaturization. These devices are designed for use in a PLL synthesizer for DBS and CATV settop and WLAN applications.

ELECTRICAL CHARACTERISTICS (T_A = -40 to +85°C, V_{CC} = 4.5 to 5.5 V, Zs = 50Ω)

PART NUMBER PACKAGE OUTLINE			UPB1506GV,UPB1507GV S08		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX
I_{CC}	Circuit Current	mA	12.5	19	26.5
$f_{IN(U)}$	Upper Limit Operating Frequency, P_{IN} = -15 to +6 dBm	GHz		3.0	
$f_{IN(L)1}$	Lower Limit Operating Frequency, P_{IN} = -10 to +6 dBm	GHz			0.5
$f_{IN(L)2}$	Lower Limit Operating Frequency, P_{IN} = -15 to +6 dBm	GHz			1.0
P_{IN1}	Input Power, f_{IN} = 1.0 to 3.0 GHz	dBm	-15		+6
P_{IN2}	Input Power, f_{IN} = 0.5 to 1.0 GHz	dBm	-10		+6
V_{OUT}	Output Voltage, C_L = 0.8 pF	V_{P-P}	1.2	1.6	
$V_{IN(H)}$	Division Ratio Control Input High	V		V_{CC}	
$V_{IN(L)}$	Division Ratio Control Input Low	V		OPEN or GND	

ABSOLUTE MAXIMUM RATINGS[1] (T_A = 25°C)

SYMBOLS	PARAMETERS	UNITS	RATINGS
V_{CC}	Supply Voltage	V	-0.5 to 6.0
V_{IN}	Input Voltage	V	-0.5 to Vcc + 0.5
P_{IN}	Input Power	dBm	+10
P_D	Power Dissipation[2]	mW	250
T_{OP}	Operating Temperature	°C	-45 to +85
T_{STG}	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_A = +85°C).

RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	UNITS	MIN	TYP	MAX
V_{CC}	Supply Voltage	V	4.5	5.0	5.5
T_{OP}	Operating Temperature	°C	-40	+25	+85

PIN DESCRIPTIONS

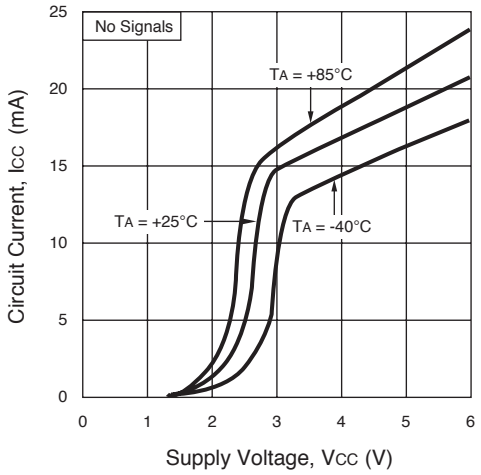
Pin No.		Pin Name	Applied Voltage (V)	Pin Voltage (V)	Description
UPB1506GV	UPB1507GV				
2	1	IN	–	2.9	Signal input pin. This pin should be coupled to the source with a capacitor (eg 1000 pF).
3	8	$\overline{IN}$	–	2.9	Signal input bypass pin. This pin must be equipped with a bypass capacitor (eg 1000 pF) to ground.
4	5	GND	0	–	Ground pin. Ground pattern on the board should be formed as wide as possible to minimize ground impedance.
1	3	SW1	H/L	–	Divided ratio input pin. The ratio can be controlled by the following input data to these pins.
6	6	SW2			
8	2	VCC	4.5 to 5.5	–	Power supply pin. This pin must be equipped with bypass capacitor (eg 1000 pF) to ground.
7	4	OUT	–	2.6 to 4.7	Divided frequency output pin. This pin is designed as an emitter follower output. This pin can be connected to CMOS input due to 1.2 Vp-p MIN output.
5	7	NC	–	–	No connection. This pin must be opened.

		SW2	
		H	L
SW1	H	÷64	÷128
	L	÷128	÷256

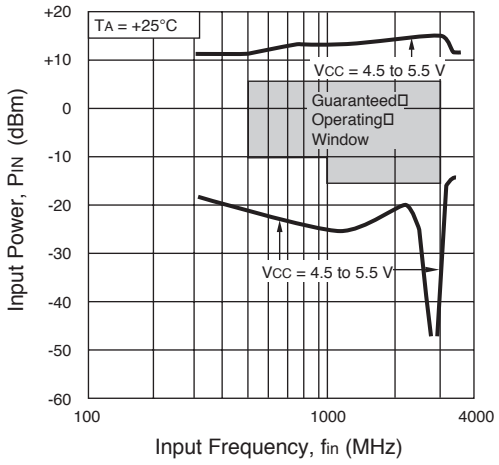
These pins should be equipped with a bypass capacitor (e.g. 1000 pF) to ground.

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

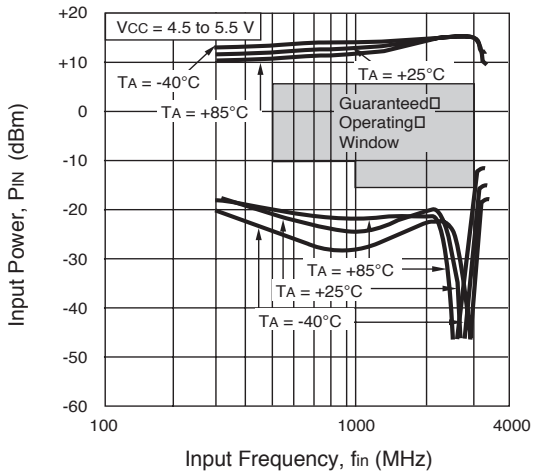
CURRENT vs. VOLTAGE and TEMPERATURE



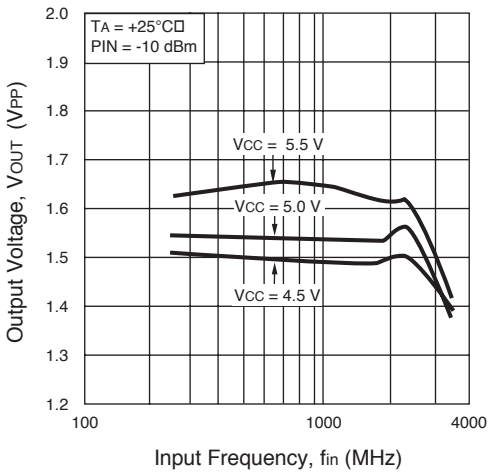
INPUT POWER vs. INPUT FREQUENCY and VOLTAGE



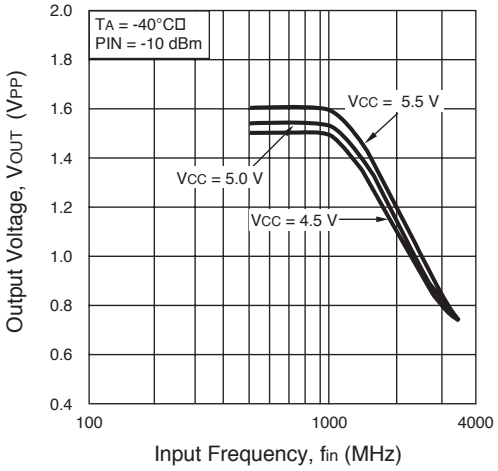
INPUT POWER vs. INPUT FREQUENCY and TEMPERATURE



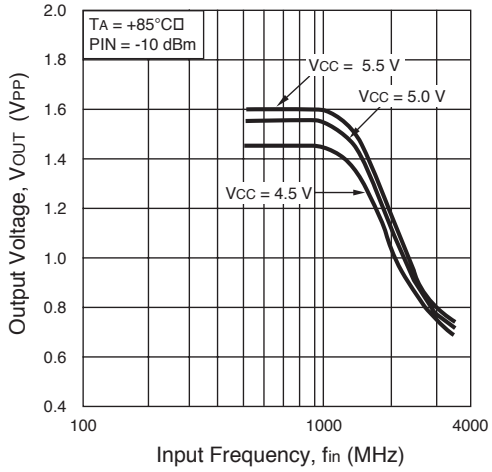
OUTPUT VOLTAGE vs. INPUT FREQUENCY and VOLTAGE



OUTPUT VOLTAGE vs. INPUT FREQUENCY and VOLTAGE

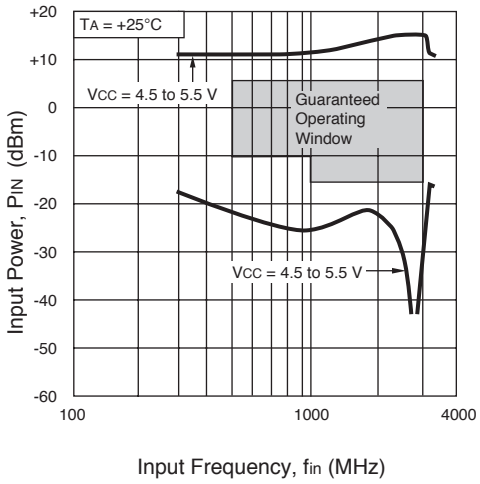


OUTPUT VOLTAGE vs. INPUT FREQUENCY and VOLTAGE

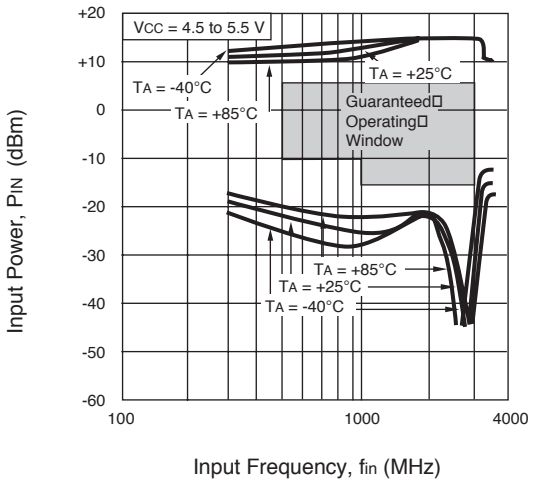


TYPICAL PERFORMANCE CURVES (TA = +25°C unless otherwise noted)

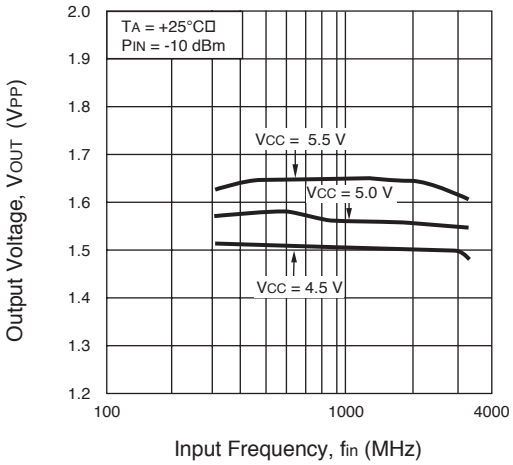
INPUT POWER vs. INPUT FREQUENCY and VOLTAGE



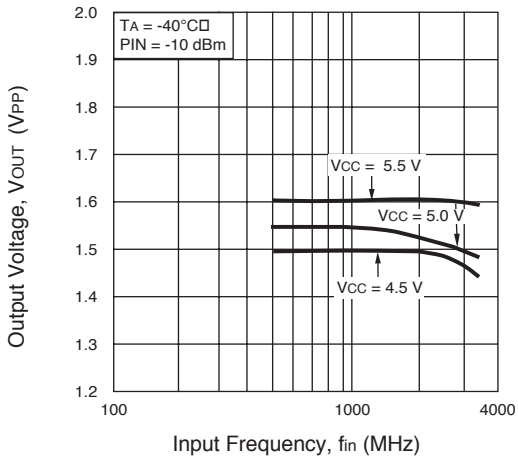
INPUT POWER vs. INPUT FREQUENCY and TEMPERATURE



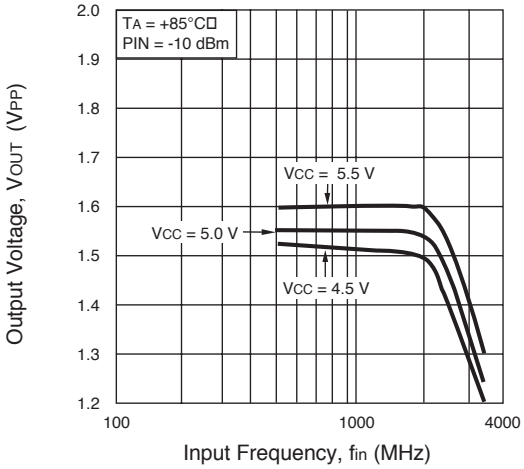
OUTPUT VOLTAGE vs. INPUT FREQUENCY and VOLTAGE



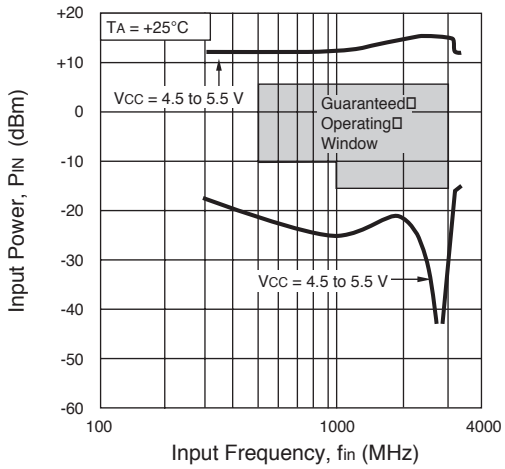
OUTPUT VOLTAGE vs. INPUT FREQUENCY and VOLTAGE



OUTPUT VOLTAGE vs. INPUT FREQUENCY and VOLTAGE

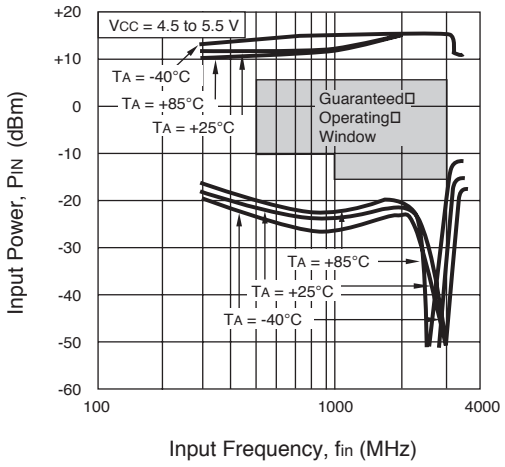


INPUT POWER vs. INPUT FREQUENCY and VOLTAGE

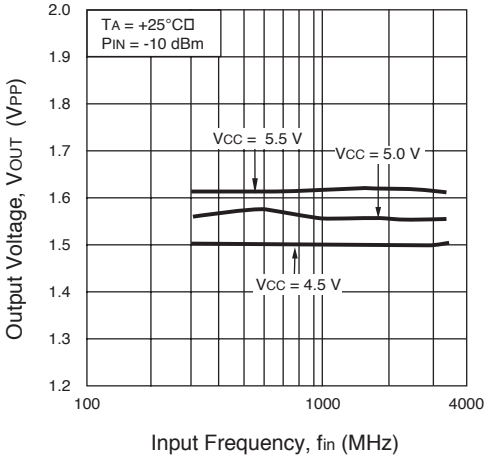


TYPICAL PERFORMANCE CURVES (TA = +25°C unless otherwise noted)

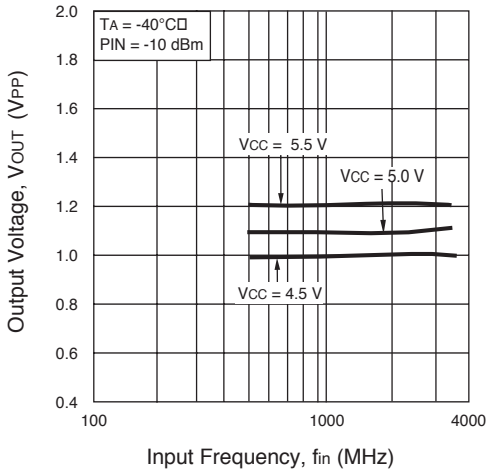
INPUT POWER vs. INPUT FREQUENCY and VOLTAGE



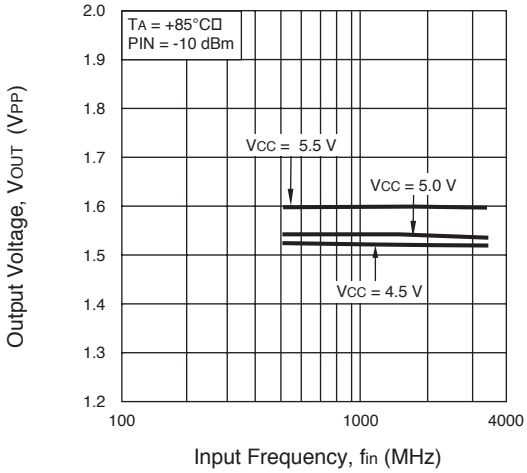
OUTPUT VOLTAGE vs. INPUT FREQUENCY and VOLTAGE



OUTPUT VOLTAGE vs. INPUT FREQUENCY and VOLTAGE



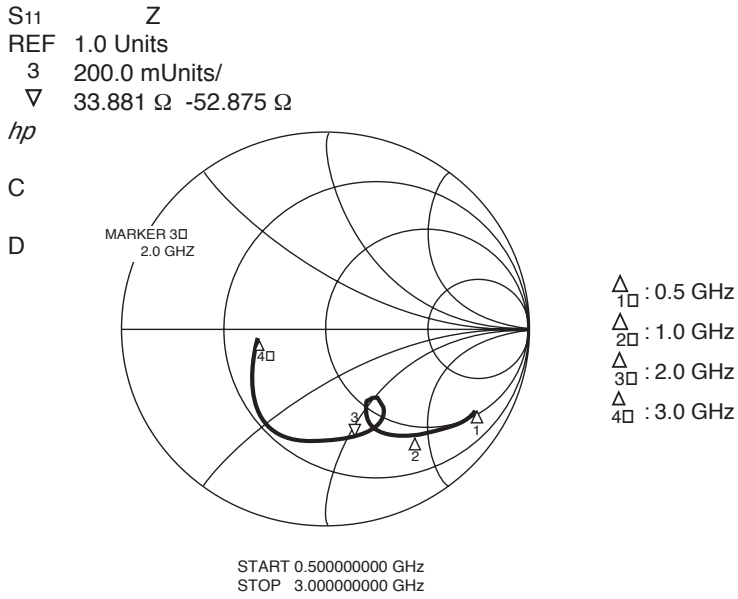
OUTPUT VOLTAGE vs. INPUT FREQUENCY and VOLTAGE



TYPICAL SCATTERING PARAMETERS (T_A = 25°C)

UPB1506GV

S_{11} vs. INPUT FREQUENCY
V_{CC} = 5.0 V

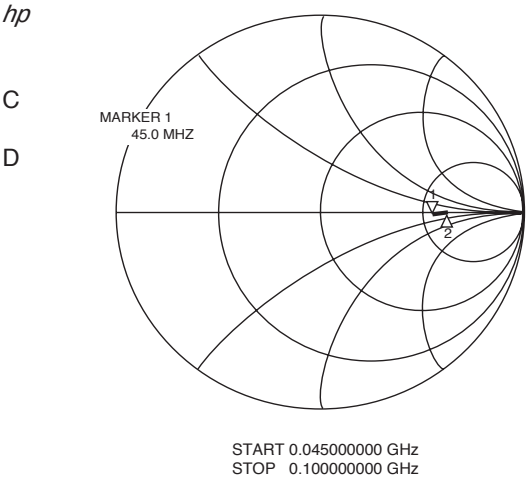


△1□ : 0.5 GHz
△2□ : 1.0 GHz
△3□ : 2.0 GHz
△4□ : 3.0 GHz

FREQUENCY	S_{11}	
GHz	MAG	ANG
0.5	0.868	-26.6
0.6	0.828	-32.6
0.7	0.794	-37.4
0.8	0.761	-41.9
0.9	0.721	-46.5
1.0	0.706	-49.3
1.1	0.662	-54.0
1.2	0.629	-57.2
1.3	0.595	60.2
1.4	0.554	-62.9
1.5	0.516	-64.8
1.6	0.440	-61.9
1.7	0.428	51.0
1.8	0.543	-61.5
1.9	0.555	-68.4
2.0	0.560	-74.7
2.1	0.558	- 79.5
2.2	0.564	-84.9
2.3	0.570	-90.9
2.4	0.574	-98.3
2.5	0.574	-107.9
2.6	0.564	- 118.3
2.7	0.530	-131.4
2.8	0.476	- 144.6
2.9	0.411	- 159.1
3.0	0.331	- 175.8

UPB1506GV

S_{22} vs. OUTPUT FREQUENCY
Divide by 64 mode, V_{CC} = 5.0 V



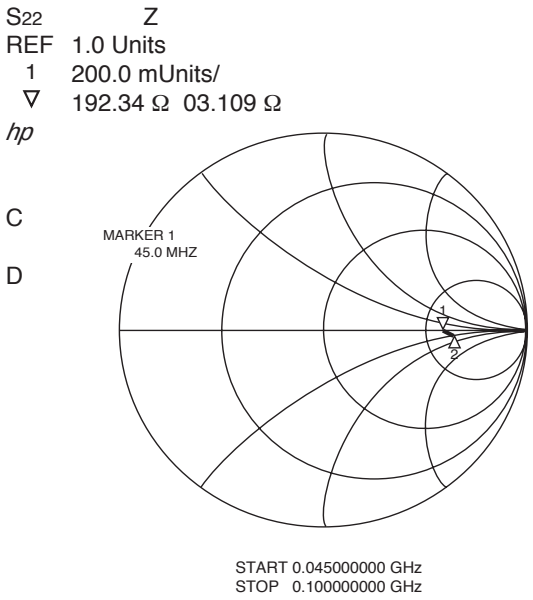
△1□ : 45 MHz
△2□ : 100 MHz

FREQUENCY	S_{22}	
MHz	MAG	ANG
45.0	0.542	-1.4
50.0	0.602	-0.3
55.0	0.616	0.0
60.0	0.605	1.1
65.0	0.609	0.7
70.0	0.616	0.3
75.0	0.620	0.1
80.0	0.622	0.0
85.0	0.619	0.6
90.0	0.610	0.9
95.0	0.626	-0.7
100.0	0.623	-1.7

TYPICAL SCATTERING PARAMETERS (T_A = 25°C)

UPB1506GV

S_{22} vs. OUTPUT FREQUENCY
Divide by 128 mode, V_{CC} = 5.0 V

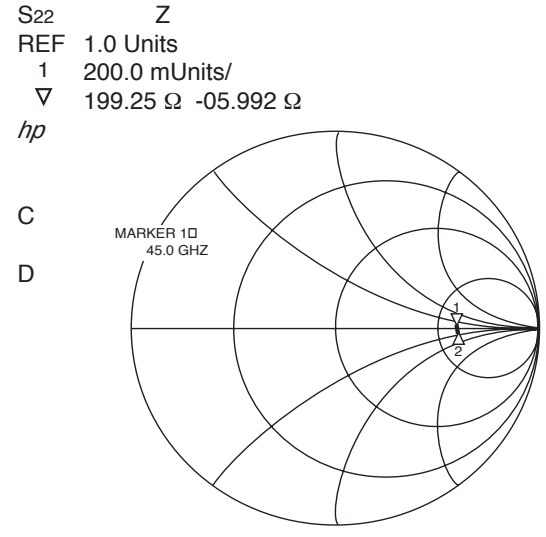


△1□ : 45 MHz
△2□ : 100 MHz

FREQUENCY	S_{22}	
MHz	MAG	ANG
45.0	0.590	-0.4
50.0	0.604	-1.0
55.0	0.610	-1.1
60.0	0.607	-0.8
65.0	0.548	-5.9
70.0	0.630	-0.0
75.0	0.615	-1.0
80.0	0.618	-1.4
85.0	0.617	-1.2
90.0	0.616	-2.2
95.0	0.623	-2.4
100.0	0.624	-2.3

UPB1506GV

S_{22} vs. OUTPUT FREQUENCY
Divide by 256 mode, V_{CC} = 5.0 V



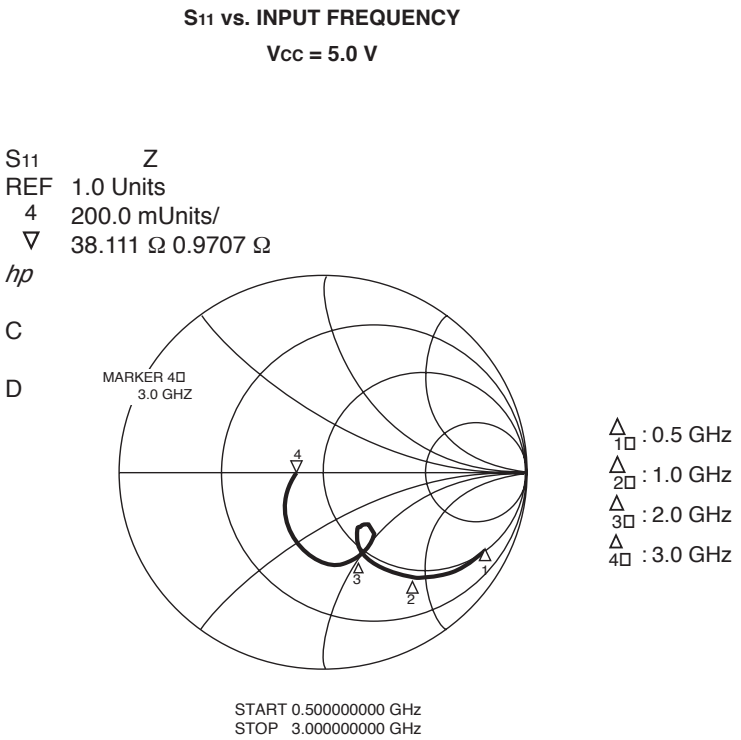
△1□ : 45 MHz
△2□ : 100 MHz

FREQUENCY	S_{22}	
MHz	MAG	ANG
45.0	0.601	-0.9
50.0	0.609	-1.6
55.0	0.611	-1.5
60.0	0.620	-1.4
65.0	0.607	-2.1
70.0	0.615	-1.9
75.0	0.613	-3.2
80.0	0.611	-2.8
85.0	0.607	-2.5
90.0	0.605	-2.4
95.0	0.610	-3.0
100.0	0.608	-2.8

TYPICAL SCATTERING PARAMETERS (T_A = 25°C)

UPB1507GV

S_{11} vs. INPUT FREQUENCY
V_{CC} = 5.0 V

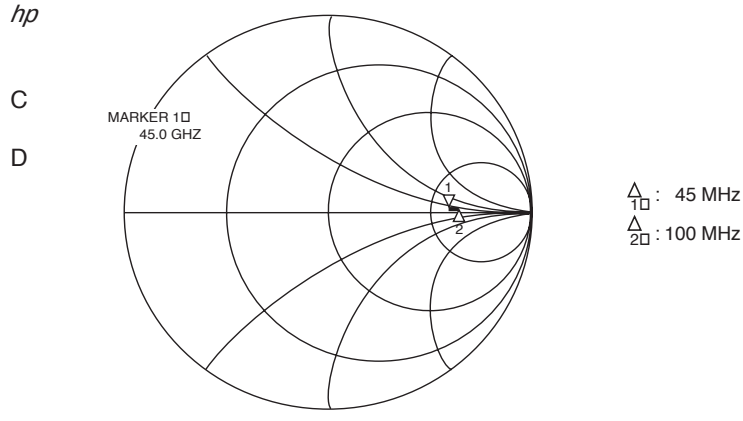


△1□ : 0.5 GHz
△2□ : 1.0 GHz
△3□ : 2.0 GHz
△4□ : 3.0 GHz

FREQUENCY	S_{11}	
GHz	MAG	ANG
0.5	0.857	-27.5
0.6	0.849	-32.0
0.7	0.800	-38.9
0.8	0.764	-43.8
0.9	0.725	-49.0
1.0	0.665	-50.9
1.1	0.619	-55.3
1.2	0.573	-59.3
1.3	0.531	-61.3
1.4	0.484	-62.8
1.5	0.439	-63.0
1.6	0.377	-59.1
1.7	0.340	-54.1
1.8	0.377	-54.7
1.9	0.441	-59.5
2.0	0.464	-67.2
2.1	0.443	-67.4
2.2	0.466	-74.5
2.3	0.465	-81.3
2.4	0.454	-89.4
2.5	0.433	-99.2
2.6	0.383	-109.6
2.7	0.350	-114.0
2.8	0.332	-124.2
2.9	0.271	-141.2
3.0	0.185	-163.6

UPB1507GV

S_{22} vs. OUTPUT FREQUENCY
Divide by 64 mode, V_{CC} = 5.0 V



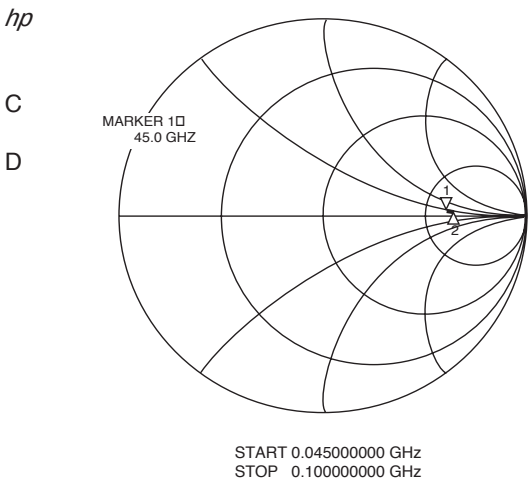
△1□ : 45 MHz
△2□ : 100 MHz

FREQUENCY	S_{22}	
MHz	MAG	ANG
45.0	0.580	3.4
50.0	0.572	2.5
55.0	0.574	3.0
60.0	0.574	2.7
65.0	0.584	3.0
70.0	0.587	2.6
75.0	0.592	2.4
80.0	0.587	2.6
85.0	0.589	2.9
90.0	0.591	2.9
95.0	0.573	1.7
100.0	0.604	2.9

TYPICAL SCATTERING PARAMETERS (T_A = 25°C)

UPB1507GV

S_{22} vs. OUTPUT FREQUENCY
Divide by 128 mode, V_{CC} = 5.0 V

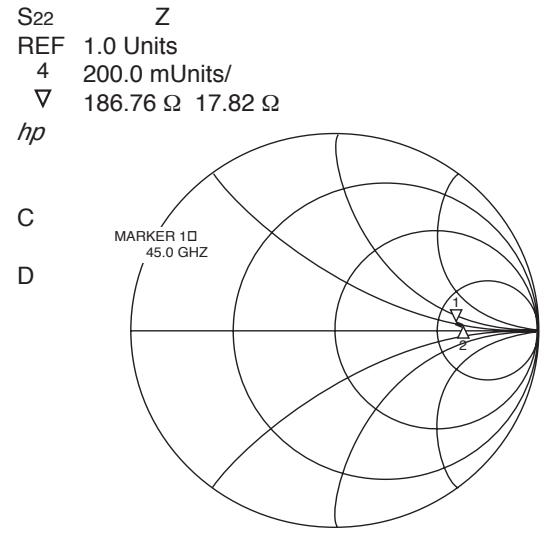


△1□ : 45 MHz
△2□ : 100 MHz

FREQUENCY	S_{22}	
MHz	MAG	ANG
45.0	0.578	3.2
50.0	0.571	2.8
55.0	0.572	3.3
60.0	0.576	3.0
65.0	0.584	3.1
70.0	0.587	2.8
75.0	0.589	2.4
80.0	0.589	2.8
85.0	0.588	3.0
90.0	0.593	2.8
95.0	0.598	3.0
100.0	0.602	2.9

UPB1507GV

S_{22} vs. OUTPUT FREQUENCY
Divide by 256 mode, V_{CC} = 5.0 V

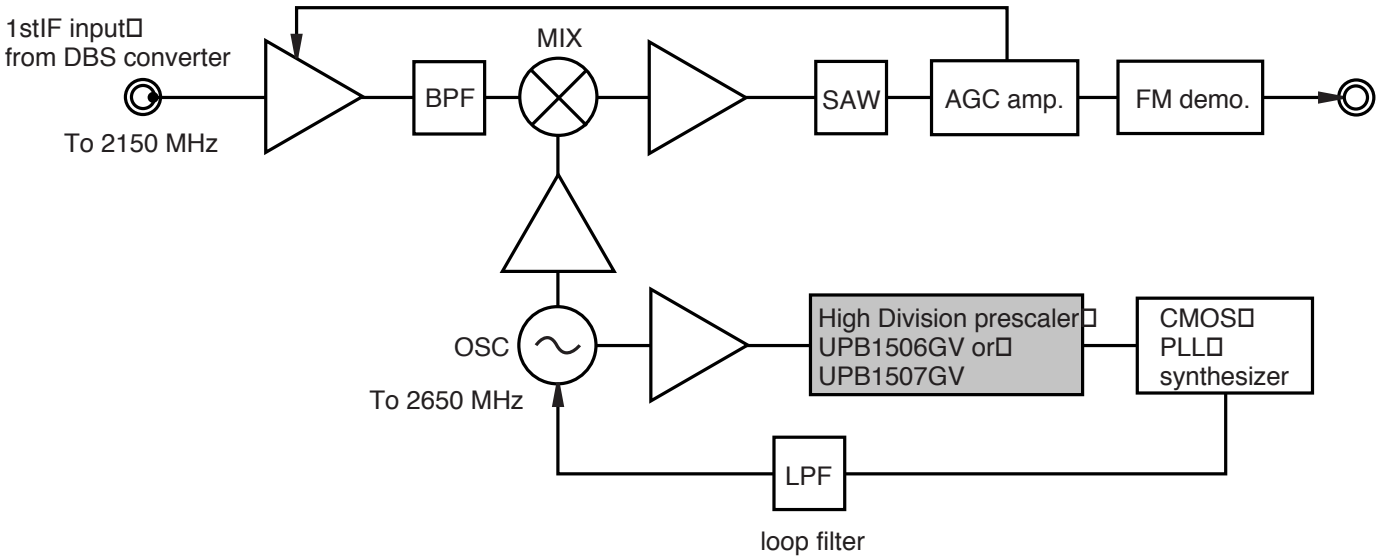


△1□ : 45 MHz
△2□ : 100 MHz

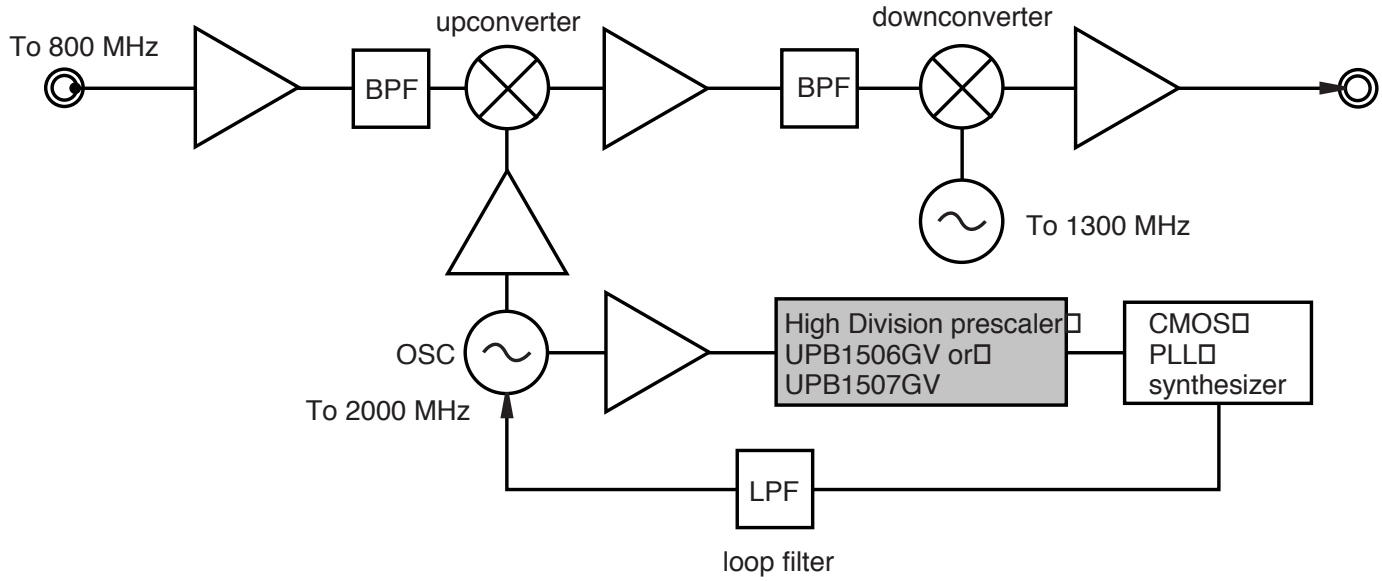
FREQUENCY	S_{22}	
MHz	MAG	ANG
45.0	0.580	3.0
50.0	0.572	2.8
55.0	0.571	2.9
60.0	0.576	2.9
65.0	0.585	3.2
70.0	0.590	2.8
75.0	0.589	2.5
80.0	0.590	2.6
85.0	0.588	2.9
90.0	0.597	2.9
95.0	0.600	3.1
100.0	0.601	3.1

SYSTEM APPLICATION EXAMPLE

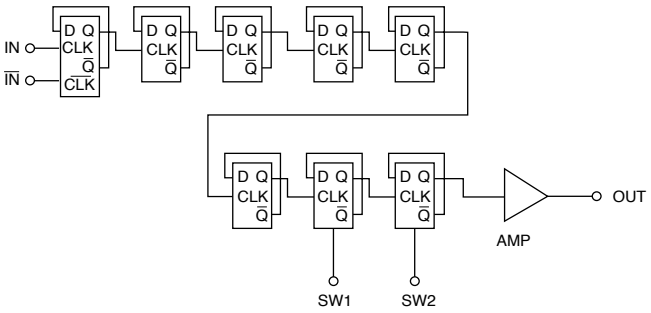
RF unit block of Analog DBS tuners



RF unit block of Analog CATV converter

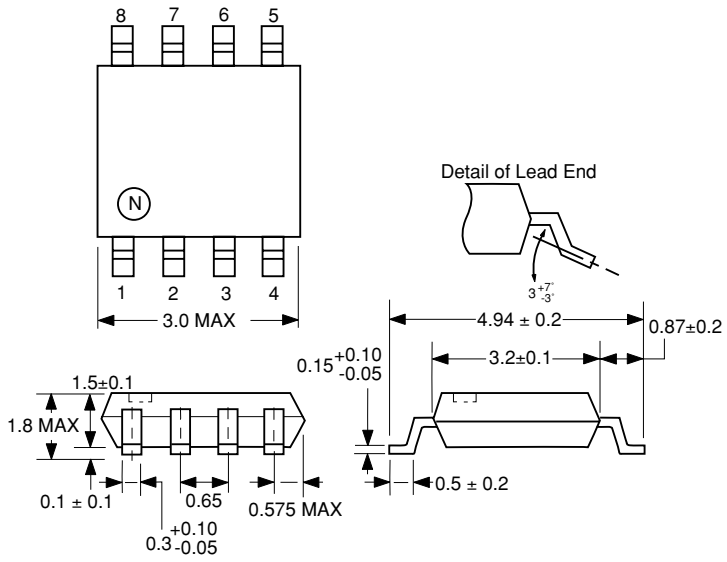


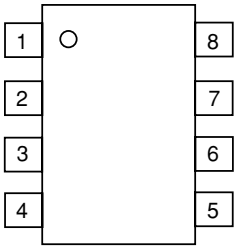
INTERNAL BLOCK DIAGRAM



OUTLINE DIMENSIONS (Units in mm)

PACKAGE OUTLINE S08





PIN CONNECTIONS

Pin No.	UPB1506GV	UPB1507GV
1	SW1	IN
2	IN	Vcc
3	$\overline{IN}$	SW1
4	GND	OUT
5	OPEN	GND
6	SW2	SW2
7	OUT	OPEN
8	Vcc	$\overline{IN}$

ORDERING INFORMATION

PART NUMBER	QUANTITY	MARKING
UPB1506GV-E1	1000/Reel	1506
UPB1507GV-E1-A	1000/Reel	1507

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

Life Support Applications
These NEC products are not intended for use in life support devices, appliances, or systems where the malfunction of these products can reasonably be expected to result in personal injury. The customers of CEL using or selling these products for use in such applications do so at their own risk and agree to fully indemnify CEL for all damages resulting from such improper use or sale.

CEL California Eastern Laboratories, Your source for NEC RF, Microwave, Optoelectronic, and Fiber Optic Semiconductor Devices.
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CEL California Eastern Laboratories

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Subject: Compliance with EU Directives

CEL certifies, to its knowledge, that semiconductor and laser products detailed below are compliant with the requirements of European Union (EU) Directive 2002/95/EC Restriction on Use of Hazardous Substances in electrical and electronic equipment (RoHS) and the requirements of EU Directive 2003/11/EC Restriction on Penta and Octa BDE.

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	
Lead (Pb)	< 1000 PPM	-A	-AZ
		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	

If you should have any additional questions regarding our devices and compliance to environmental standards, please do not hesitate to contact your local representative.