

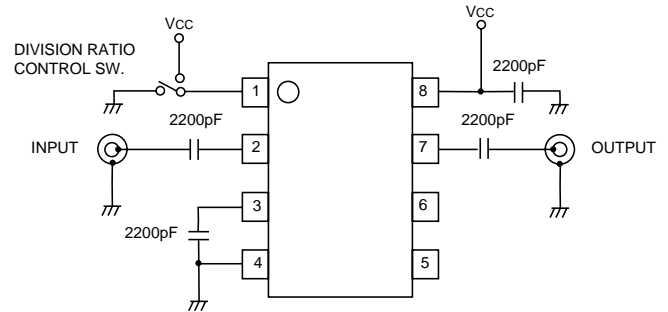
### FEATURES

- HIGH FREQUENCY OPERATION TO 2.5 GHz
- WIDE BAND OPERATION
- SINGLE SUPPLY VOLTAGE:  $V_{CC} = 5\text{ V} \pm 10\%$
- AVAILABLE IN TAPE AND REEL (G08 PACKAGE)

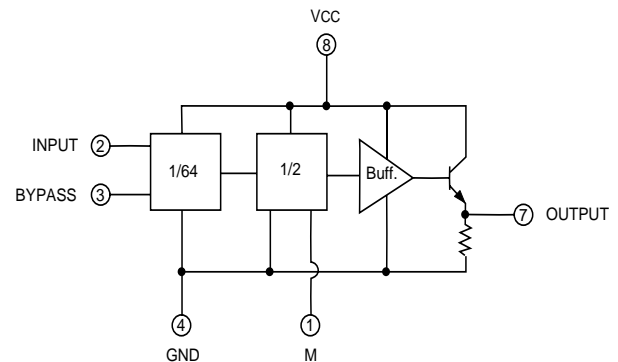
### DESCRIPTION

The UPB588 series of devices are silicon bipolar digital prescalers which can be operated in divide-by-64 or divide-by-128 mode. They feature high frequency response to 2.5 GHz, and operate from a single 5 volt supply. The series is available in two package styles: 8 lead ceramic flat pack (UPB588B) and an 8 pin plastic mini-flat package (UPB588G). Applications include: synthesizer for DBS receiver and telecommunication applications.

### TEST CIRCUIT



### BLOCK DIAGRAM



### ELECTRICAL CHARACTERISTICS<sup>1</sup> ( $T_A = -20$ to $+75^\circ\text{C}$ , $V_{CC} = 5\text{ V}$ )

PART NUMBER PACKAGE OUTLINE			UPB588B, UPB588G BF08, G08		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX
$I_{CC}$	Supply Current, $T_A = 25^\circ\text{C}$	mA	18	26	34
$f_{IN}$	Frequency Response at $P_{IN} = -15$ to $-10$ dBm $P_{IN} = -10$ to $-5$ dBm $P_{IN} = -5$ to $+5$ dBm	GHz	0.5		2.3
$P_{IN}$	Input Power at $f_{IN} = 0.5$ to $1.3$ GHz $f_{IN} = 1.3$ to $2.3$ GHz $f_{IN} = 2.3$ to $2.5$ GHz	dBm	-15		-5
$P_{OUT}^3$	Power Output at $f_{IN} = 2$ GHz, $P_{IN} = 0$ dBm, $T_A = 25^\circ\text{C}$	dBm	-11	-7	
$R_{TH} (J-C)$	Thermal Resistance, Junction to Case (UPB584B)	$^\circ\text{C/W}$			50
$R_{TH} (J-A)$	Thermal Resistance, Junction to Ambient (UPB584G) <sup>2</sup>	$^\circ\text{C/W}$			270

Note:

1. Unless otherwise noted:  $V_{CC} = 5\text{ V} \pm 10\%$ ,  $Z_s = Z_o = 50\ \Omega$ .
2. Mounted on a  $5 \times 5 \times 0.16$  mm epoxy glass circuit board.

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

SYMBOLS	PARAMETERS	UNITS	RATINGS
V <sub>CC</sub>	Supply Voltage	V	-0.5 to 6.0
V <sub>IN</sub> , V <sub>M</sub>	Input Voltage, Ratio Control Voltage	V	-0.5 to V <sub>CC</sub> + 0.5
P <sub>IN</sub>	Input Power	dBm	+10
P <sub>T</sub>	Power Dissipation UPB588B UPB588G	W mW	1.5 (T <sub>A</sub> = +125°C) 250 (T <sub>A</sub> = +85°C)
T <sub>OP</sub>	Operating Temperature UPB588B UPB588G	°C °C	-55 to +125 -40 to +85
T <sub>STG</sub>	Storage Temperature UPB588B	°C	-55 to +200

Notes:

1. Operation in excess of any one of these parameters may result in permanent damage.

**RECOMMENDED OPERATING CONDITIONS**

SYMBOL	PARAMETER	UNITS	RATINGS
V <sub>CC</sub>	Supply Voltage	V	4.5 to 5.5
T <sub>OP</sub>	Operating Temperature	°C	-20 to +75

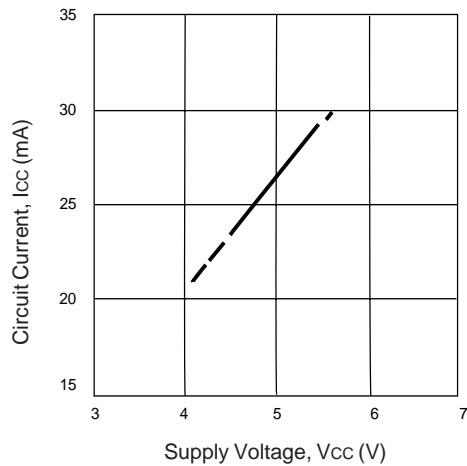
Note: Because of the high internal gain and gain compression of the UPB588, this device is prone to self-oscillation in the absence of an RF input signal. If the device will be used in an application where DC power will be applied in the absence of an RF input signal, this self-oscillation can be suppressed by any of the following means:

- \* Add a shunt resistor from the RF input line to ground. The blocking capacitor should be between the resistor and the UPB588, but physical separation should be minimized. Typically a resistor value between 50 and 100 ohms will suppress the self-oscillation.
- \* Apply a DC offset voltage of +3.0 volts to the INPUT pin. The voltage source should be isolated from the INPUT pin by a series 1000 ohm resistor.
- \* Apply a DC offset voltage of +1.5 volts to the BYPASS pin. The voltage source should be isolated from the BYPASS pin by a series 1000 ohm resistor.

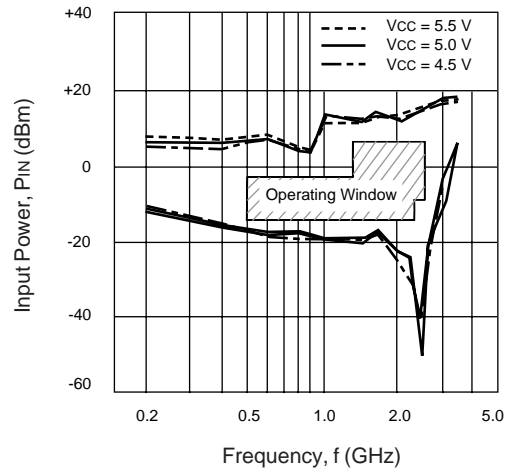
All these approaches reduce the input sensitivity of the UPB588 (by as much as 3 dB for the example of a 50 ohm shunt resistor), but otherwise have no affect on the reliability or other electrical characteristics of this device.

**TYPICAL PERFORMANCE CURVES** (T<sub>A</sub> = 25°C)

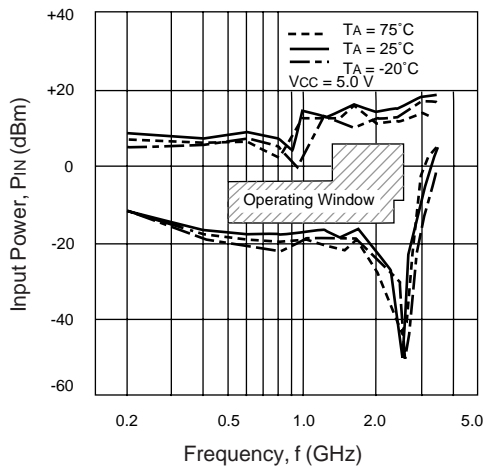
CIRCUIT CURRENT vs. SUPPLY VOLTAGE



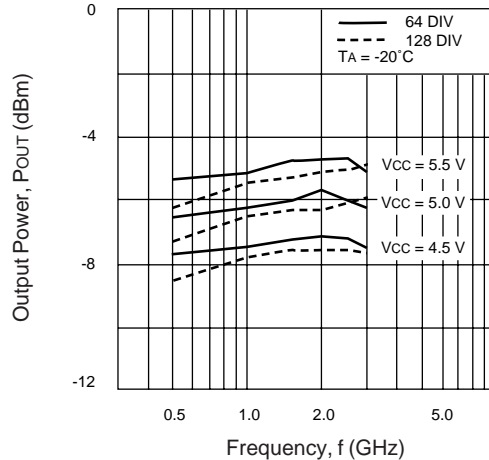
INPUT POWER vs. FREQUENCY AND VOLTAGE



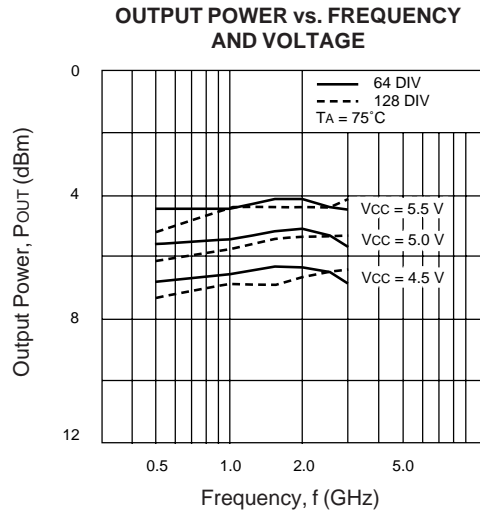
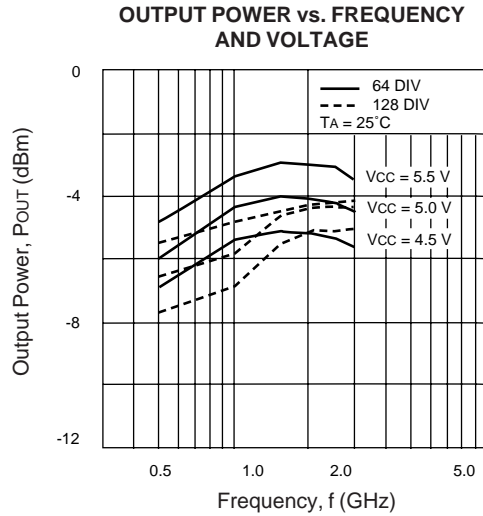
INPUT POWER vs. FREQUENCY AND TEMPERATURE



OUTPUT POWER vs. FREQUENCY AND VOLTAGE



TYPICAL PERFORMANCE CURVES (TA = 25°C)



UPB588B  
INPUT AND OUTPUT S-PARAMETERS

Vcc = 5 V, Icc = 26 mA

DIVIDE-BY-64 MODE

FREQUENCY			FREQUENCY		
S11			S22		
(GHz)	MAG	ANG	(GHz)	MAG	ANG
0.20	0.764	-15	0.10	0.553	-6
0.40	0.794	-30	0.20	0.542	-14
0.60	0.730	-44	0.30	0.537	-20
0.80	0.712	-59	0.40	0.533	-27
1.00	0.697	-72	0.50	0.535	-33
1.20	0.685	-72	0.60	0.529	-41z
1.40	0.663	-101	0.70	0.521	-47
1.60	0.629	-115	0.80	0.516	-54
1.80	0.594	-128	0.90	0.511	-61
2.00	0.554	-141	1.00	0.500	-67
2.20	0.511	-154			
2.40	0.469	-165			
2.60	0.430	-175			
2.80	0.402	177			
3.00	0.387	167			

DIVIDE-BY-128 MODE

Frequency			FREQUENCY		
S11			S22		
(GHz)	MAG	ANG	(GHz)	MAG	ANG
0.20	0.764	-15	0.10	0.554	-6
0.40	0.794	-30	0.20	0.541	-14
0.60	0.730	-44	0.30	0.539	-20
0.80	0.712	-59	0.40	0.533	-27
1.00	0.697	-72	0.50	0.539	-33
1.20	0.685	-72	0.60	0.530	-41
1.40	0.662	-101	0.70	0.523	-47
1.60	0.629	-115	0.80	0.518	-54
1.80	0.595	-128	0.90	0.509	-61
2.00	0.554	-142	1.00	0.539	-71
2.20	0.510	-154			
2.40	0.467	-166			
2.60	0.425	-176			
2.80	0.393	176			
3.00	0.371	167			

UPB588G  
INPUT AND OUTPUT S-PARAMETERS

Vcc = 5 V, Icc = 26 mA

DIVIDE-BY-64 MODE

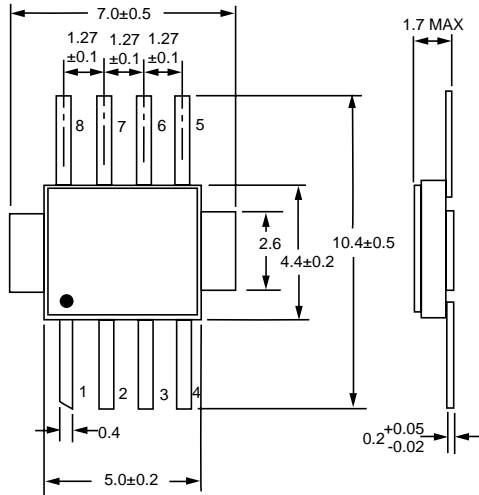
FREQUENCY			FREQUENCY		
S11			S22		
(GHz)	MAG	ANG	(GHz)	MAG	ANG
0.20	0.768	-7.5	0.10	0.596	-1.1
0.40	0.741	-15.4	0.20	0.552	-6.3
0.60	0.707	-22.8	0.30	0.545	-8.6
0.80	0.669	-29.4	0.40	0.543	-9.6
1.00	0.634	-36.0	0.50	0.529	-13.4
1.20	0.595	-42.4	0.60	0.520	-14.8
1.40	0.549	-48.1	0.70	0.522	-17.4
1.60	0.497	-55.3	0.80	0.513	-19.1
1.80	0.450	-61.0	0.90	0.500	-21.4
2.00	0.397	-66.3	1.00	0.496	-23.7
2.20	0.343	-71.2			
2.40	0.284	-75.7			

DIVIDE-BY-128 MODE

FREQUENCY			FREQUENCY		
S11			S22		
(GHz)	MAG	ANG	(GHz)	MAG	ANG
0.20	0.768	-7.6	0.10	0.561	-2.3
0.40	0.741	-15.6	0.20	0.544	-6.5
0.60	0.706	-23.1	0.30	0.556	-8.0
0.80	0.669	-29.8	0.40	0.545	-10.3
1.00	0.633	-36.4	0.50	0.530	-12.0
1.20	0.594	-43.0	0.60	0.521	-14.7
1.40	0.548	-49.8	0.70	0.514	-16.6
1.60	0.494	-56.0	0.80	0.503	-18.7
1.80	0.445	-62.0	0.90	0.491	-21.2
2.00	0.393	-67.5	1.00	0.480	-22.6
2.20	0.336	-72.7			
2.40	0.281	-78.2			

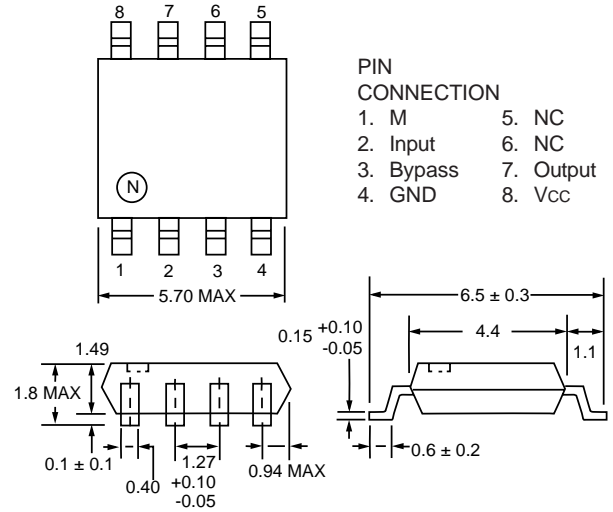
OUTLINE DIMENSIONS (Units in mm)

UPB588B  
PACKAGE OUTLINE BF08



PIN CONNECTION  
 1. M                    5. NC  
 2. Input                6. NC  
 3. Bypass              7. Output  
 4. GND                  8. Vcc

UPB588G  
PACKAGE OUTLINE G08



PIN CONNECTION  
 1. M                    5. NC  
 2. Input                6. NC  
 3. Bypass              7. Output  
 4. GND                  8. Vcc

ORDERING INFORMATION

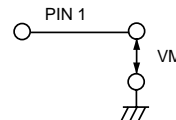
PART NUMBER	QTY
UPB588G-E1	2500/Reel

PIN DESCRIPTION

PIN NO.	SYMBOL	DESCRIPTION	
1	M	Division Ratio Control <sup>1</sup>	
		M	Division Ratio
		L (GND)	1/128
		H (Vcc)	1/64
2	INPUT	Signal Input Pin	
3	BYPASS	Input Bypass Pin, shall be connected to ground through bypass capacitor	
4	GND	Ground Pin	
5	NC	No Connection	
6	NC	No Connection	
7	OUTPUT	Output Pin	
8	Vcc	Power Supply	

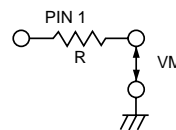
Note:

1. Control Voltages:



WITHOUT EXTERNAL RESISTOR

		MIN	MAX
VM	HIGH	Vcc - 0.2 V	Vcc+0.5 V
	LOW	0 V	Vcc - 0.3 V



WITH EXTERNAL RESISTOR (R = 300 kW)

		MIN	MAX
VM	HIGH	Vcc	Vcc+1.1 V
	LOW	0 V	Vcc - 0.5 V

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