

NEC

14 GHz DIVIDE-BY-8
DYNAMIC PRESCALER

UPG506B

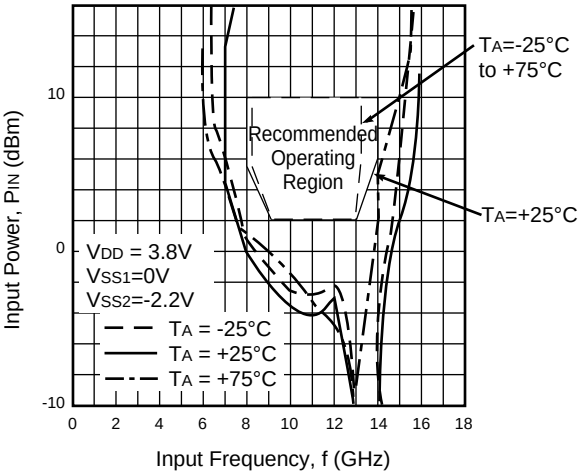
FEATURES

- **WIDE OPERATING FREQUENCY RANGE:**
f = 8 to 14 GHz (TA = 25°C)
- **LOW PHASE NOISE**
- **GUARANTEED OPERATING TEMPERATURE RANGE**
(TA = -25°C to +75°C)

DESCRIPTION

The UPG506B is a GaAs divide-by-8 prescaler capable of operating up to 14 GHz. It is designed for use in frequency synthesizers of microwave communication systems and measurement equipment. The UPG506B is a dynamic frequency divider and employs BFL (Buffered FET Logic) circuits. The UPG506B is available in a hermetic 8-lead ceramic flat package.

INPUT POWER vs. INPUT FREQUENCY



ELECTRICAL CHARACTERISTICS (TA = 25°C, VDD = +3.8 V, VSS1 = 0 V, VSS2 = -2.2 V)

PART NUMBER PACKAGE OUTLINE			UPG506B BF08		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX
IDD	Supply Current	mA	70	105	140
ISS1	Sink Current ¹ ISS1 = IDD - ISS2	mA		35	
ISS2	Sink Current ¹	mA	44	70	96
fIN(U)	Upper Limit of Input Frequency at PIN = +6 dBm	GHz	14		
fIN(L)	Lower Limit of Input Frequency at PIN = +6 dBm	GHz			8
PIN	Input Power at f = 9 to 13 GHz	dBm	2.0		10.0
POUT	Output Power at fIN = 14 GHz	dBm	0	2.0	
RTH(CH-C)	Thermal Resistance (Channel to Case)	°C/W		10.0	

Note:
1. Current is positive into the IDD pin and returns through the ISS1 and ISS2 pins.

ELECTRICAL CHARACTERISTICS ($T_A = -25^{\circ}\text{C}$ to $+75^{\circ}\text{C}$, $V_{DD} = +3.8\text{ V}$, $V_{SS1} = 0\text{ V}$, $V_{SS2} = -2.2\text{ V}$)

PART NUMBER PACKAGE OUTLINE			UPG506B BF08		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX
I_{DD}	Supply Current	mA		105	
I_{SS1}	Sink Current ¹ $I_{SS1} = I_{DD} - I_{SS2}$	mA		35	
I_{SS2}	Sink Current ¹	mA		70	
$f_{IN(U)}$	Upper Limit of Input Frequency at $P_{IN} = +6\text{ dBm}$	GHz	13.2		
$f_{IN(L)}$	Lower Limit of Input Frequency at $P_{IN} = +6\text{ dBm}$	GHz			8.2
P_{IN}	Input Power at $f = 9$ to 13 GHz	dBm	2.0		10.0
P_{OUT}	Output Power at $f_{IN} = 14\text{ GHz}$	dBm	-1.0	1.0	

Note:

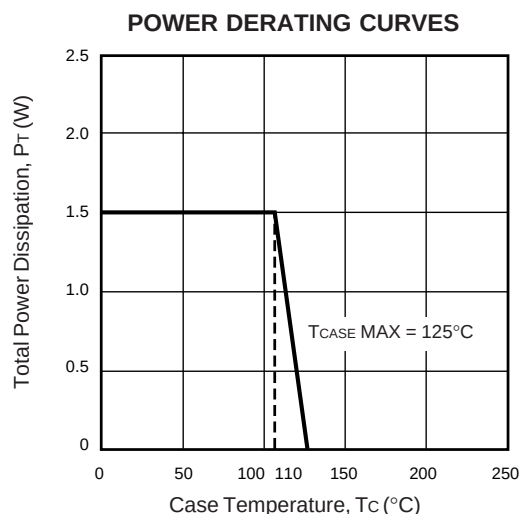
- Current is positive into the I_{DD} pin and returns through the I_{SS1} and I_{SS2} pins.

ABSOLUTE MAXIMUM RATINGS¹ ($T_A = 25^{\circ}\text{C}$)

SYMBOLS	PARAMETERS	UNITS	RATINGS
$V_{DD} - V_{SS1}$	Supply Voltage	V	5
$V_{SS2} - V_{SS1}$	Supply Current	mA	-5
P_T	Total Power Dissipation ²	W	1.5
P_{IN}	Input Power Level	dBm	13
T_C	Case Temperature	$^{\circ}\text{C}$	-65 to +125
T_{STG}	Storage Temperature	$^{\circ}\text{C}$	-65 to +175

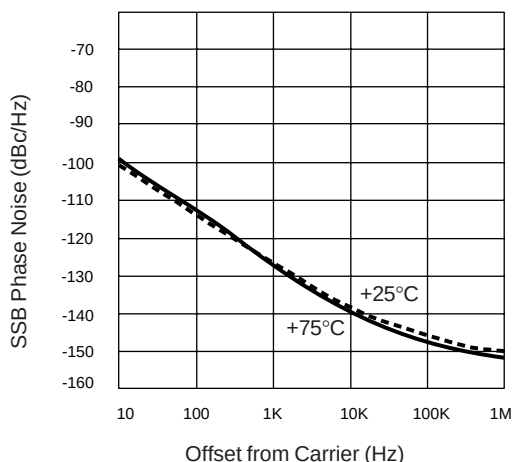
Notes:

- Operation in excess of any one of these conditions may result in permanent damage.
- $T_C \leq 125^{\circ}\text{C}$.

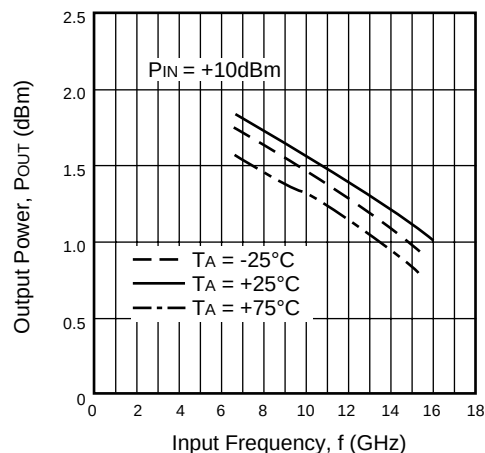


TYPICAL PERFORMANCE CURVES ($T_A = 25^{\circ}\text{C}$)

SSB PHASE NOISE vs. OFFSET FROM CARRIER
 $f_{IN} = 12.7\text{ GHz}$

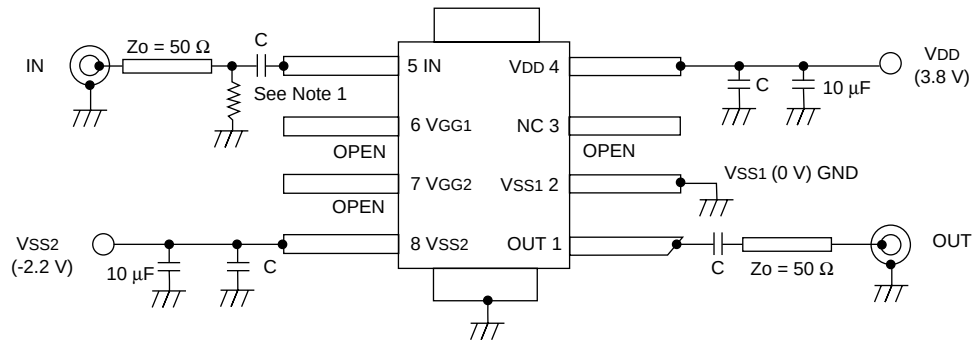


OUTPUT POWER vs. INPUT FREQUENCY



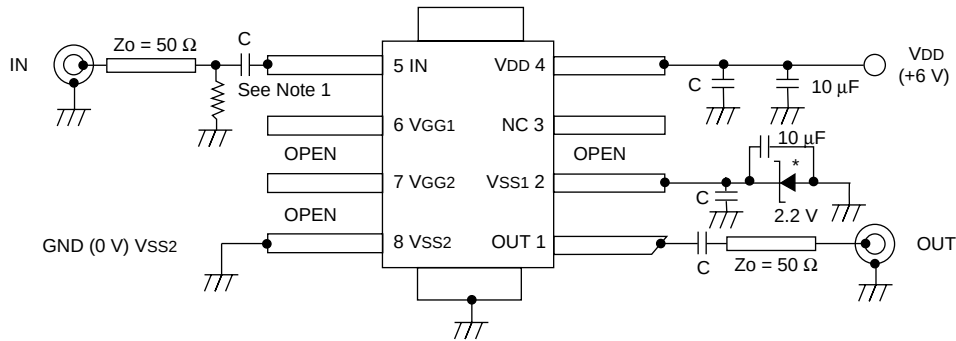
TEST CIRCUITS

CONFIGURATION 1
2 Bias Supply



VDD = 3.8 V
VSS1 = 0 V (GND)
VSS2 = -2.2 V
C: 1000 - 5000 pF Chip Capacitor

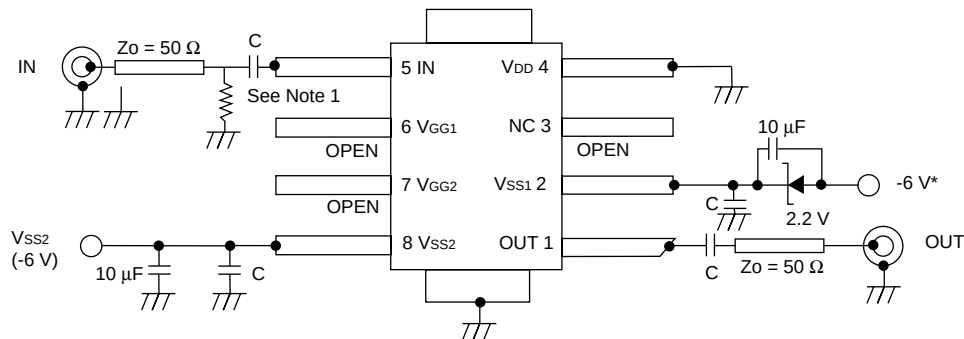
CONFIGURATION 2
Single Positive Bias Supply



VDD = +6.0 V
VSS2 = 0 V (GND)
C: 1000 - 5000 pF Chip Capacitor

* VSS1 should be connected to GND through a 2.2 V Zener Diode (RD2.2FB or IN3394).

CONFIGURATION 3
Single Negative Bias Supply



VDD = 0 V (GND)
VSS2 = -6 V
C: 1000 - 5000 pF Chip Capacitor

* For VSS1, the bias voltage of -6.0 should be applied through a 2.2 V Zener Diode (RD2.2FB or IN3394).

Notes:

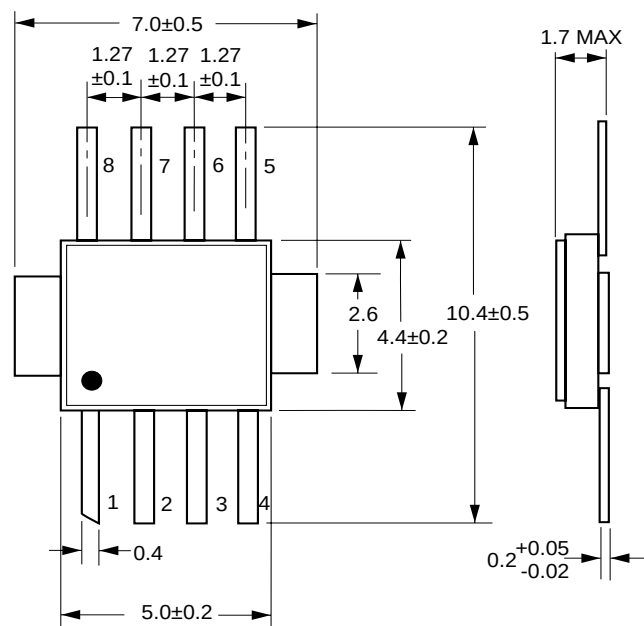
1. Because of the high internal gain and gain compression of the UPG506B, the device is prone to self-oscillation in the absence of an RF input signal. This self-oscillation can be suppressed by either of the following means:

- Add a shunt resistor to the RF input line. Typically a resistor value between 50 and 1000 ohms will suppress the self-oscillation (see the test circuit schematic).
- Apply a negative voltage through a 1000 ohm resistor to the normally open VGG1 connection. Typically voltages between 0 and -9 volts will suppress the self-oscillation.

Both of these approaches will reduce the input sensitivity of the device (by as much as 3 dB for a 50 ohm shunt resistor), but otherwise have no effect on the reliability or electrical characteristics of the device.

OUTLINE DIMENSIONS (Units in mm)

UPG506B
PACKAGE OUTLINE BFO8



LEAD CONNECTIONS

- | | |
|-----------|----------|
| 1. OUTPUT | 5. INPUT |
| 2. VSS1 | 6. VGG1 |
| 3. NC* | 7. VGG2 |
| 4. VDD | 8. VSS2 |

* No Connection

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