NEC

DIVIDE- BY- 64/65/128/129 PRESCALER

UPB1502GR
UPB1502GR(1)

FEATURES

- **LOW POWER CONSUMPTION:** 20 mW
- **WIDE BAND APPLICATION:** 0.5 to 1.7 GHz
- **SINGLE SUPPLY VOLTAGE:** V_{CC} = 3 V ±10%
- **SMALL PACKAGE**
- **SUITABLE FOR HAND HELD (BATTERY) APPLICATIONS**

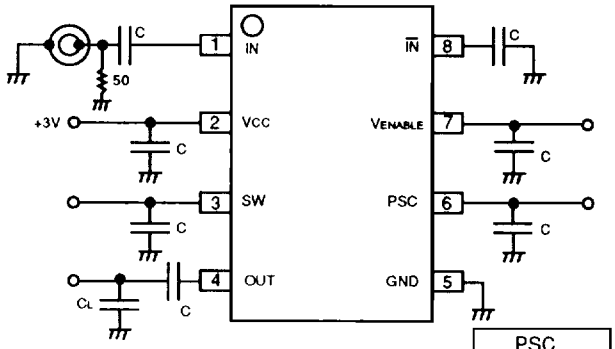
DESCRIPTION

The UPB1502GR prescaler operates from 0.5 to 1.7 GHz at division ratios of 64, 65, 128 or 129. The 3 volt, 7 mA DC power requirements of this device make it highly desirable for hand-held, battery-operated systems. The low cost 8-pin plastic package is suitable for surface mount applications.

RECOMMENDED OPERATING CONDITIONS (T_A = 25°C)

SYMBOL	PARAMETER	UNITS	RATINGS
V_{CC}	Supply Voltage	V	3.0±0.3
T_{OP}	Operating Temperature	°C	-40 to +85

TEST CIRCUIT



		PSC	
		V_{CC}	GND
SW	V_{CC}	1/64	1/65
	Open/GND	1/128	1/129

Notes:

1. All Capacitors 1000 pF except load capacitor on output should be 8 pF. Capacitors on SW and PSC are not required if these pins are grounded.
2. Connect V_{ENABLE} pin to +3 volts for normal operation. Connect to GND to disable device.
3. To minimize self-oscillation, circuit board traces to the input and output pins should be isolated from each other as much as possible.

ELECTRICAL CHARACTERISTICS (T_A = -40 to +85°C, V_{CC} = 2.7 to 3.3 V)

PART NUMBER PACKAGE OUTLINE			UPB1502GR, UPB1502GR(1) G08		
SYMBOLS	**PARAMETERS AND CONDITIONS**	**UNITS**	**MIN**	**TYP**	**MAX**
I_{CC}	Supply Current $V_{ENABLE} = V_{CC}$	mA	3.2	6.7	11.0
	$V_{ENABLE} \leq 0.8$ V	µA		5	20
f_{IN}	Input Frequency at				
	P_{IN} = -15 to -11 dBm (UPB1502GR)	GHz	0.8		1.7
	P_{IN} = -11 to -6 dBm (UPB1502GR)	GHz	0.5		1.7
	P_{IN} = -6 to 0 dBm (UPB1502GR)	GHz	0.5		1.5
	P_{IN} = -15 to -14 dBm (UPB1502GR(1))	GHz	0.8		1.7
	P_{IN} = -14 to -11 dBm (UPB1502GR(1))	GHz	0.8		2.0
	P_{IN} = -11 to -9 dBm (UPB1502GR(1))	GHz	0.5		2.0
	P_{IN} = -9 to -1 dBm (UPB1502GR(1))	GHz	0.5		1.7
	P_{IN} = -1 to 0 dBm (UPB1502GR(1))	GHz	0.5		1.5
P_{IN}	Input Power at				
	f_{IN} = 0.5 to 0.8 GHz	dBm	-11		0
	f_{IN} = 0.8 to 1.5 GHz	dBm	-15		0
	f_{IN} = 1.5 to 1.7 GHz (UPB1502GR)	dBm	-15		-6
	f_{IN} = 1.5 to 1.7 GHz (UPB1502GR(1))	dBm	-15		-1
	f_{IN} = 1.7 to 2.0 GHz (UPB1502GR(1))	dBm	-14		-9
V_{OUT}	Output Voltage Swing, C_L = 8 pF	V_{PP}	0.8	1.1	
V_{MH}	Modulus Control, Input High (PSC)	V	2.5		
V_{ML}	Modulus Control, Input Low (PSC)	V			0.8
V_{DH}	Divide Ratio Control, Input High (SW)	V	V_{CC}		
V_{DL}	Divide Ratio Control, Input Low (SW)[1]	V		OPEN	
T_{SET}	Modulus Set-up Time (PSC) f_{IN} = 1.7 GHz	ns		11	
$R_{TH(CH-A)}$	Thermal Resistance (Channel to Ambient)	°C/W			260

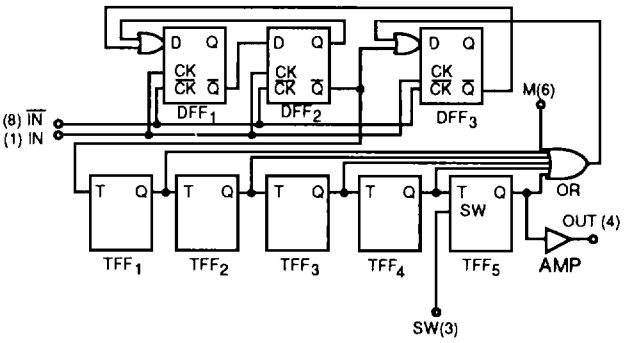
Note:
1. GND is acceptable.

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 V_{CC} + 0.5
P_T	Total Power Dissipation[2]	mW	250
T_{OP}	Operating Temperature	°C	-40 to +85
T_{STG}	Storage Temperature	°C	-65 to +150

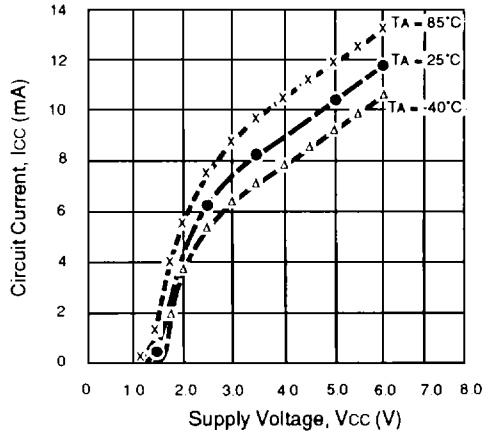
Notes:
1. Operation above any one of these parameters may result in permanent damage.
2. Mounted on 50 x 50 x 1.6 mm epoxy glass circuit board, (T_A = 85°C)

INTERNAL BLOCK DIAGRAM

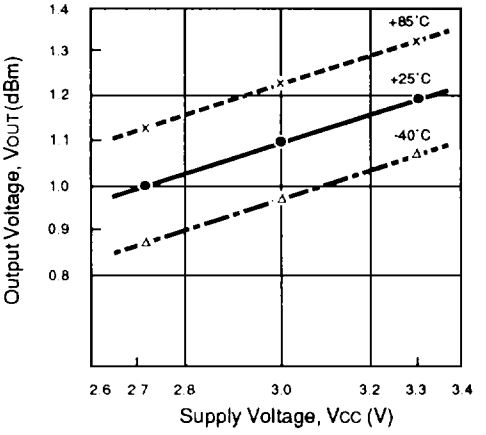


TYPICAL PERFORMANCE CURVES

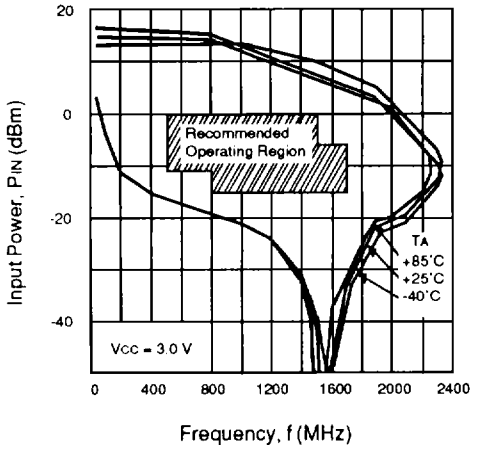
CIRCUIT CURRENT vs. SUPPLY VOLTAGE AND TEMPERATURE



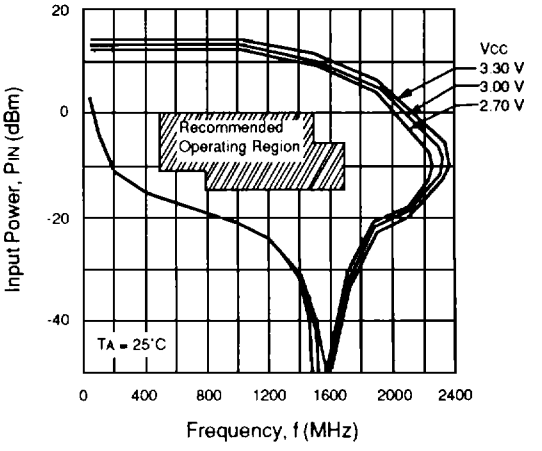
OUTPUT VOLTAGE vs. SUPPLY VOLTAGE AND TEMPERATURE



UPB1502GR INPUT POWER vs. FREQUENCY AND TEMPERATURE



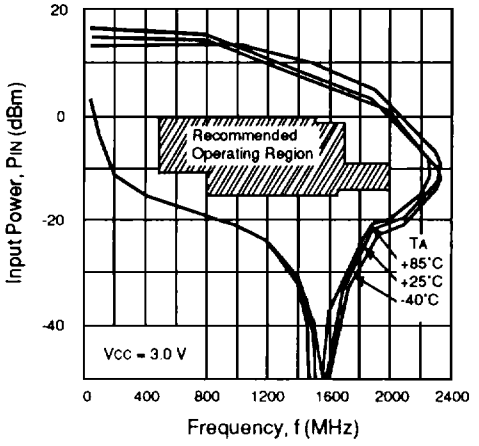
UPB1502GR INPUT POWER vs. FREQUENCY AND SUPPLY VOLTAGE (T_A = 25°C)



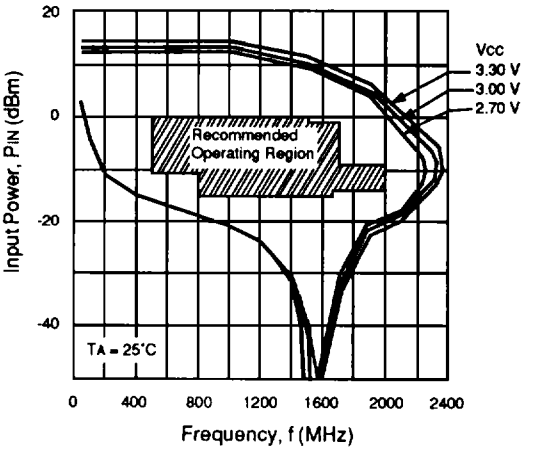
5

TYPICAL PERFORMANCE CURVES

UPB1502GR(1)
INPUT POWER vs. FREQUENCY
AND TEMPERATURE



UPB1502GR(1)
INPUT POWER vs. FREQUENCY
AND SUPPLY VOLTAGE
(TA = 25°C)



TYPICAL SCATTERING PARAMETERS (TA = 25°C)

Divide-by-sixty-four mode **SW = High, PSC = High**
VCC = 3.0 V, ICC = 6.7 mA

FREQUENCY	S11		FREQUENCY	S22	
(MHz)	MAG	ANG	(MHz)	MAG	ANG
250	0.811	-13	50	0.976	-6
500	0.778	-26	100	0.924	-12
750	0.733	-41	150	0.817	-17
1000	0.654	-54	200	0.733	-16
1250	0.585	-68	250	0.693	-15
1500	0.511	-82			
1750	0.484	-95			
2000	0.462	-116			
2250	0.447	-144			
2500	0.430	-173			

Divide-by-sixty-five mode **SW = High, PSC = Low**
VCC = 3.0 V, ICC = 6.7 mA

FREQUENCY	S11		FREQUENCY	S22	
(MHz)	MAG	ANG	(MHz)	MAG	ANG
250	0.810	-13	50	0.972	-6
500	0.775	-26	100	0.924	-12
750	0.731	-41	150	0.817	-17
1000	0.652	-55	200	0.733	-16
1250	0.579	-68	250	0.693	-15
1500	0.501	-82			
1750	0.465	-96			
2000	0.454	-116			
2250	0.436	-144			
2500	0.420	-174			

Divide-by-one-twenty-eight mode **SW = Low, PSC = High**
VCC = 3.0 V, ICC = 6.7 mA

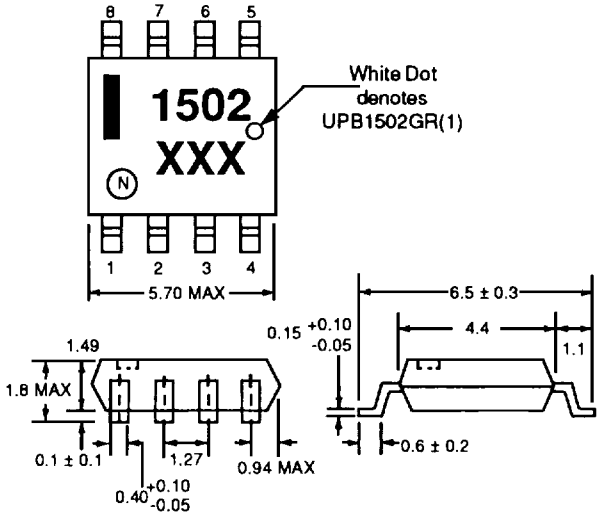
FREQUENCY	S11		FREQUENCY	S22	
(MHz)	MAG	ANG	(MHz)	MAG	ANG
250	0.801	-13	50	0.980	-6
500	0.767	-26	100	0.921	-13
750	0.724	-41	150	0.801	-18
1000	0.637	-54	200	0.712	-18
1250	0.573	-68	250	0.666	-16
1500	0.505	-82			
1750	0.474	-96			
2000	0.459	-116			
2250	0.442	-145			
2500	0.425	-172			

Divide-by-one-twenty-nine mode **SW = Low, PSC = Low**
VCC = 3.0 V, ICC = 6.7 mA

FREQUENCY	S11		FREQUENCY	S22	
(MHz)	MAG	ANG	(MHz)	MAG	ANG
250	0.804	-13	50	0.981	-6
500	0.769	-26	100	0.921	-13
750	0.727	-41	150	0.801	-18
1000	0.650	-54	200	0.712	-17
1250	0.581	-68	250	0.667	-16
1500	0.508	-82			
1750	0.467	-96			
2000	0.452	-115			
2250	0.435	-144			
2500	0.413	-171			

OUTLINE DIMENSIONS (Units in mm)

UPB1502GR
PACKAGE OUTLINE G08



Lead Material: Alloy 42
Lead Plating: Lead-Tin Alloy

PIN CONNECTION	DESCRIPTION
1. IN	Signal Input
2. Vcc	DC Supply Voltage
3. SW	Divide Ratio Control*
4. OUT	Signal Output
5. GND	Ground
6. PSC	Modulus Control*
7. STBY	Stand By Operation*
8. $\overline{IN}$	Signal Input Reference

* See Application Circuit

ORDERING INFORMATION

PART NUMBER	QUANTITY
UPB1502GR-E1	2500/REEL
UPB1502GR(1)-E1	2500/REEL

Note:
Embossed tape, 12 mm wide.
Pins 1-4 are in tape pull-out direction.

5