

NEC

3V, 450 MHz SILICON MMIC FREQUENCY CONVERTER

UPC2768GR

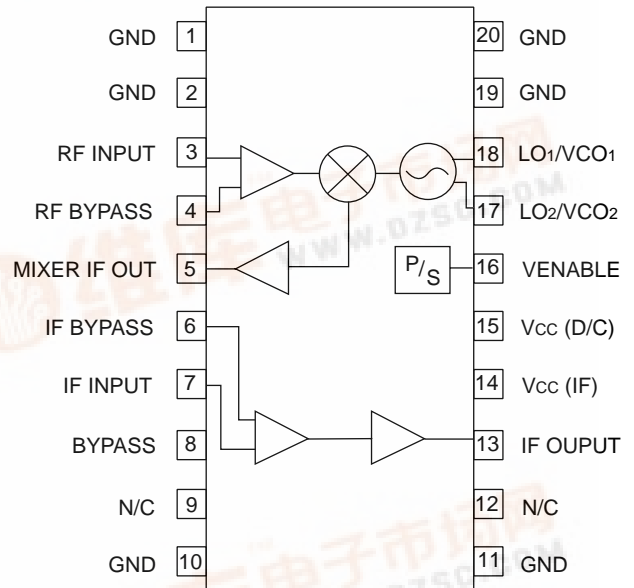
FEATURES

- **LOW POWER DISSIPATION**
Vcc = 3 V, Icc = 7 mA
- **HIGH CONVERSION GAIN**
80 dB
- **ON CHIP OSCILLATOR OR LO BUFFER:**
DC - 450 MHz
- **OUTPUT LIMITING**
450 mVp-p
- **BROADBAND OPERATION**
DC - 450 MHz
- **POWER SAVE FUNCTION**
Icc (ps) = <100 μA

DESCRIPTION

The UPC2768GR is a frequency converter manufactured with the NESAT III process. This product consists of an RF input amplifier, Gilbert cell mixer, Local Oscillator or LO buffer, IF amplifier, external filter port, and IF output limiting amplifier. The on-chip local oscillator only requires an external tank circuit. The power save feature enables users to minimize overall current consumption when dormant. This device was specifically designed for low-cost second IF receivers, key-less entry applications, security systems, GPS, and other low power Part 15 mobile radios.

INTERNAL BLOCK DIAGRAM



ELECTRICAL CHARACTERISTICS (Vcc = 3.0 V, TA = 25°C, ZL = Zs = 50 Ω, VENABLE ⊕ 2.5 V unless otherwise specified)

PART NUMBER PACKAGE OUTLINE			UPC2768GR S20 (SSOP 20)		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX
Icc	Circuit Current (VENABLE ≥ 2.5 V) ⁴ (VENABLE ≤ 0.5 V)	mA μA		7	100
Down Converter	fRF, fLO	RF and LO Input Frequency Range (3 dB BW) ¹ , fIF = 10 MHz	MHz	DC	450
	CG	Conversion Gain ² , fRF = 433 MHz, fIF = 25 MHz	dB	33	36
	NF	Noise Figure ² , fRF = 450 MHz, fIF = 10 MHz	dB		12
	Leak LO-RF	LO to RF Leakage ³ , fLO = 1 to 450 MHz	dBm		-62
	Leak LO-IF	LO to IF Leakage ³ , fLO = 1 to 450 MHz	dBm		-25
IF Amplifier	Gs	IF Amplifier Small Signal Gain fIF = 10.7 MHz fIF = 25.0 MHz	dB	40 38	44 42
	VOUT	Limiting Output Voltage, ZL = 2KΩ, fIF = 10 MHz	mVp-p		450
	PSAT	Saturated Output Power	dBm		-20

Notes:

1. Max freq. range is -3 dB from conversion gain for RF = 50 MHz
2. Down converter only (RFIN to mixer IFOUT).
3. PLO = -10 dBm external, or using internal LO.

4. Down converter and IF amp may be operated separately. Typical Icc for down converter is 5.5 mA (pin 15). Typical Icc for IF amp is 1.4 mA (pin 14).



UPC2768GR

ABSOLUTE MAXIMUM RATINGS¹ (T_A = 25°C)

SYMBOLS	PARAMETERS	UNITS	RATINGS
V _{CC}	Supply Voltage	V	5
P _T	Power Dissipation ²	mW	433
T _{OP}	Operating Temperature	°C	-40 to +85
T _{STG}	Storage Temperature	°C	-55 to +150

Note:

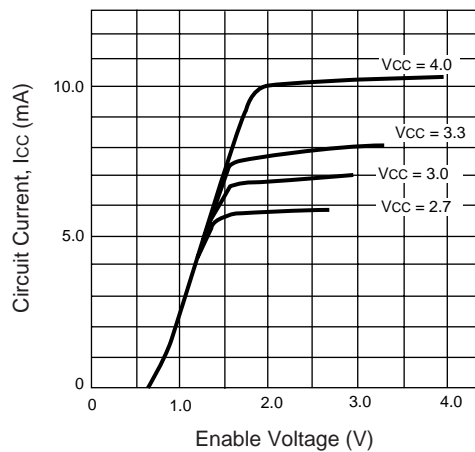
1. Operation in excess of any one of these parameters may result in permanent damage.
2. Mounted on a 50x50x1.6 mm epoxy glass PWB (T_A = 85°C).

RECOMMENDED OPERATING CONDITIONS

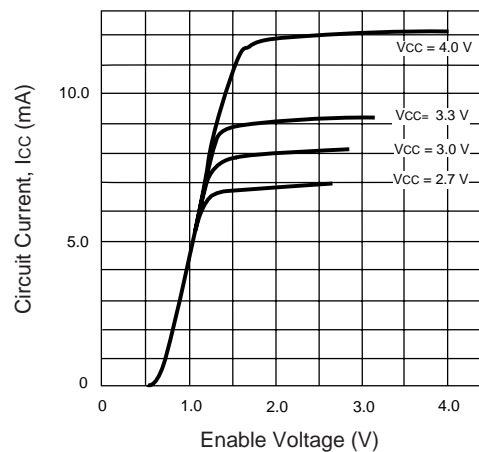
SYMBOLS	PARAMETERS	UNITS	MIN	TYP	MAX
V _{CC}	Supply Voltage	V	2.7	3.0	3.3
T _{OP}	Operating Temperature	°C	-40	25	85
f _{IF}	IF Frequency Range	MHz	DC		25

TYPICAL PERFORMANCE CURVES (T_A = 25°C, V_{CC} = 3.0 V, V_{ENABLE} ≥ 2.5 V unless otherwise specified)

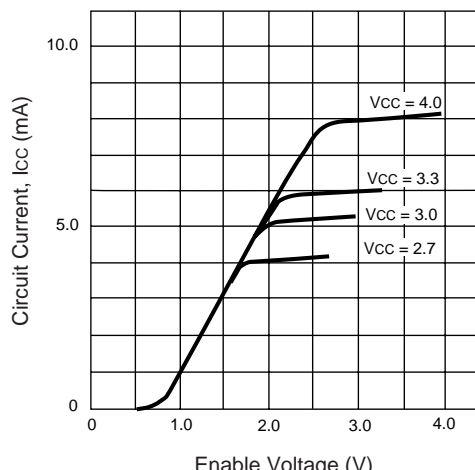
CIRCUIT CURRENT vs. SUPPLY VOLTAGE AND ENABLE VOLTAGE



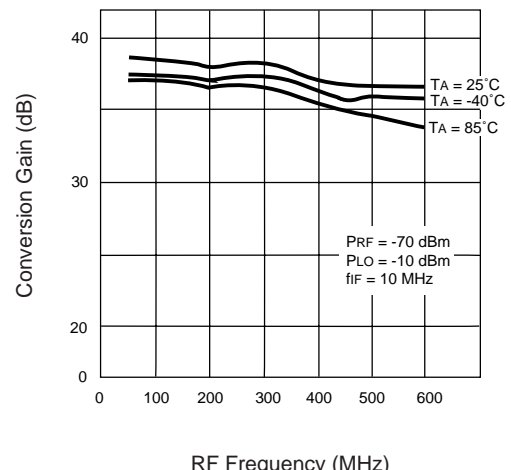
CIRCUIT CURRENT vs. SUPPLY VOLTAGE AND ENABLE VOLTAGE (T_A = 85°C)



CIRCUIT CURRENT vs. SUPPLY VOLTAGE AND ENABLE VOLTAGE (T_A = 40°C)

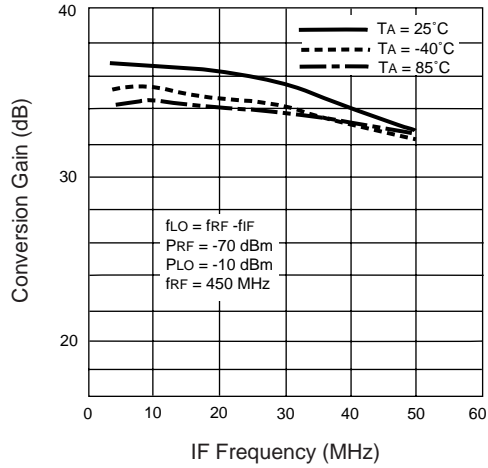


CONVERSION GAIN vs. RF FREQUENCY AND TEMPERATURE (DOWN CONVERTER ONLY)

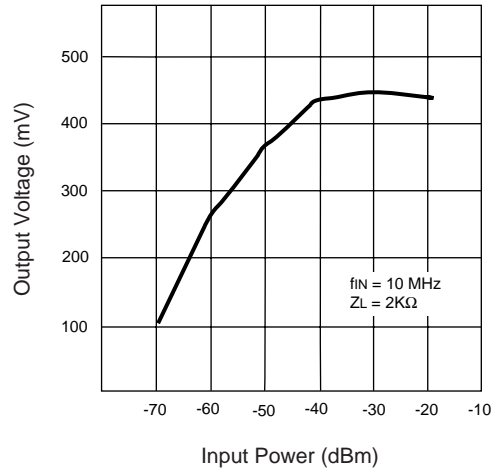


TYPICAL PERFORMANCE CURVES ($T_A = 25^\circ\text{C}$, $V_{CC} = 3.0\text{ V}$, $V_{ENABLE} \geq 2.5\text{ V}$ unless otherwise specified)

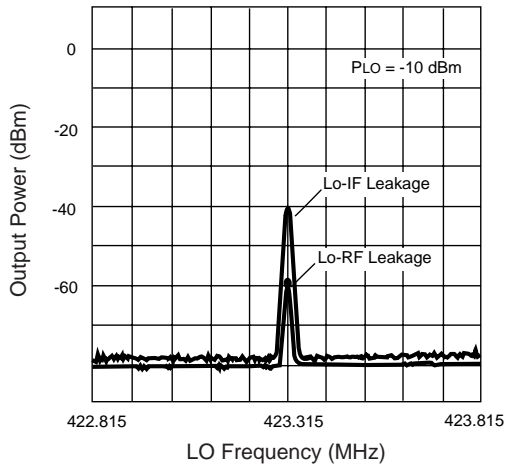
CONVERSION GAIN VS. IF FREQUENCY (DOWNCONVERTER ONLY)



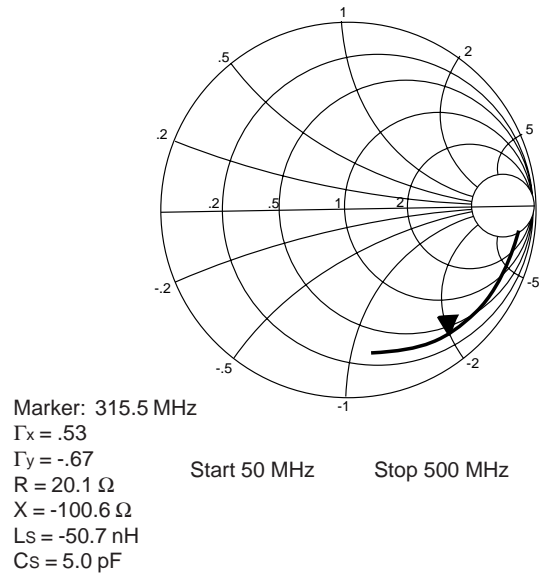
OUTPUT VOLTAGE vs. INPUT POWER



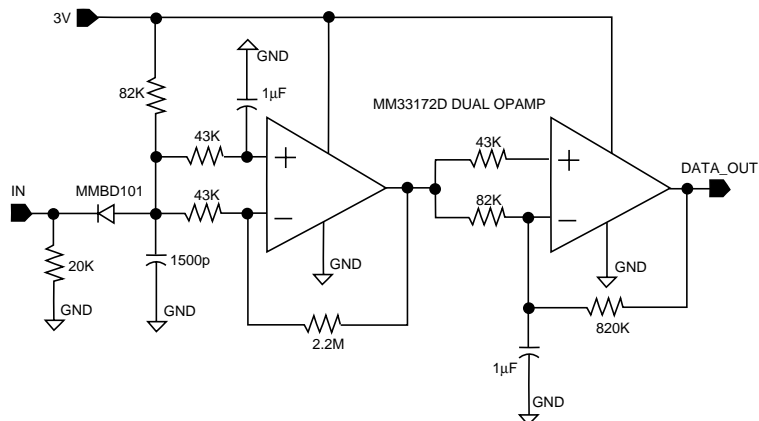
LO LEAKAGE vs. FREQUENCY



RF INPUT MATCH (S11)

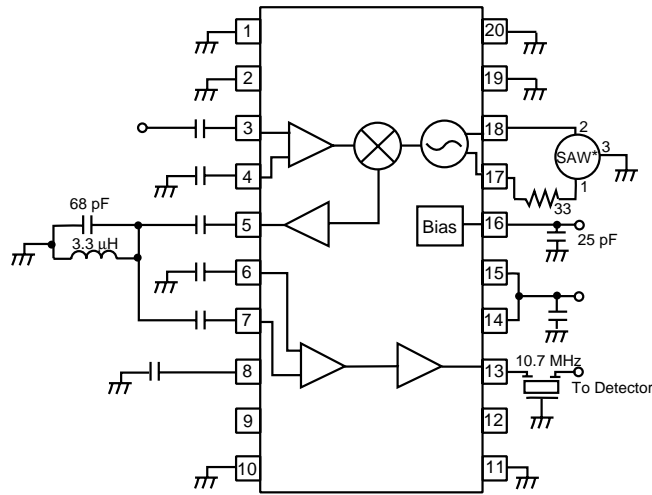


TYPICAL DETECTOR CIRCUIT



UPC2768GR

APPLICATION CIRCUIT



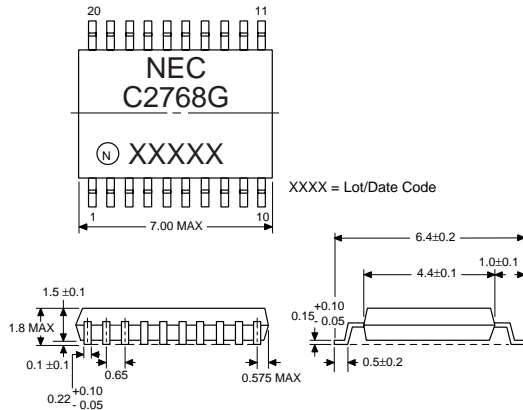
- | | |
|--------------|---------------|
| 1. GND | 20. GND |
| 2. GND | 19. GND |
| 3. RF Input | 18. Lo1/VCO1 |
| 4. RF Bypass | 17. Lo2/VCO2 |
| 5. Mixer IF | 16. VENABLE |
| 6. IF Bypass | 15. VCC (D/C) |
| 7. IF Input | 14. VCC (IF) |
| 8. Bypass | 13. IF OUTPUT |
| 9. N/C | 12. N/C |
| 10. GND | 11. GND |

* Recommended devices:
 RF Monolithics RO2125A for 304 MHz
 RF Monolithics RO2102A for 423 MHz
 or equivalent

All unmarked caps are 1000 pF

OUTLINE DIMENSIONS (Units in mm)

PACKAGE OUTLINE SSOP 20



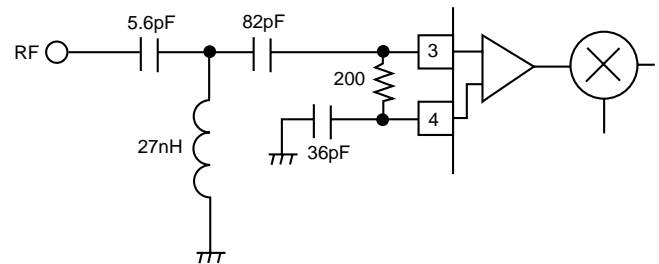
Lead Material: Alloy 42
 Lead Plating: Lead Tin Alloy

LEAD CONNECTIONS:

- | | |
|--------------|---------------|
| 1. GND | 11. GND |
| 2. GND | 12. N/C |
| 3. RF INPUT | 13. IF OUTPUT |
| 4. RF BYPASS | 14. VCC (IF) |
| 5. MIXER IF | 15. VCC (D/C) |
| 6. IF BYPASS | 16. VENABLE |
| 7. IF INPUT | 17. Lo2/VCO2 |
| 8. BYPASS | 18. Lo1/VCO1 |
| 9. N/C | 19. GND |
| 10. GND | 20. GND |

TYPICAL INPUT MATCHING CIRCUIT

3 pole high-pass network provides greater than 20 dB rejection in the FM band (<100 MHz) and a VSWR of 1.5:1 at 315 MHz.



ORDERING INFORMATION

PART NUMBER	QUANTITY
UPC2768GR-E1	2500/Reel

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