

3 V, SILICON MMIC 150 MHz QUADRATURE MODULATOR

UPC8101GR

FEATURES

- **OPERATING FREQUENCY:** 50 to 150 MHz
- **I/Q INPUT FREQUENCY RANGE:** DC to 500 kHz
- **DIGITAL 90° PHASE SHIFTER**
- **ALLOWABLE BIAS VOLTAGE:** 2.7 to 5.5 V
- **POWER SAVE: "SLEEP" MODE**
- **SMALL SIZE SSOP20 SURFACE MOUNT PACKAGE**
- **TAPE AND REEL PACKAGING OPTION AVAILABLE**

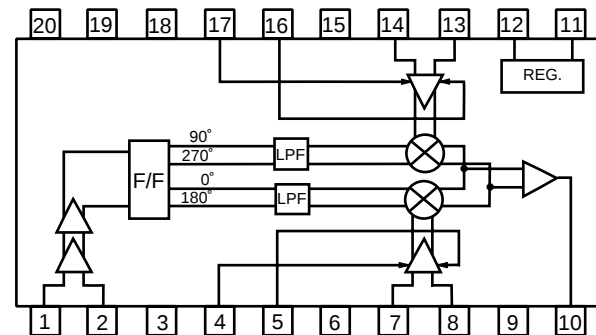
DESCRIPTION

The UPC8101GR is a Silicon Monolithic Integrated Circuit (MMIC) which is manufactured using NEC's 20 GHz fr NESAT III process. The Quadrature Modulator was designed for digital mobile communications in general, and the CT2 band requirements in particular. Operating on DC bias voltages as low as 2.7 volts, this IC is ideal for handheld/portable designs.

The UPC8101GR takes an external LO signal, and digitally divides its frequency by two to generate the quadrature LO required for the dual internal mixer circuits. These mixers also receive external in-phase (I) and quadrature (Q) signals. The up-converted outputs of the mixers are combined in a differential output amplifier. The resultant output signal is at frequency of $f_{LO}/2 + f_{I/Q}$. Buffers are provided at the LO, I and Q inputs, and filtering is provided between the digital frequency divider and the mixers. The device can be powered down by grounding the Enable pin.

NEC's stringent quality assurance and test procedures ensure the highest reliability and performance.

INTERNAL BLOCK DIAGRAM



- | | |
|---------------|-------------|
| 1. LOCAL IN | 11. VCC |
| 2. LOCAL IN | 12. VENABLE |
| 3. GND | 13. I-INPUT |
| 4. Q-BIAS | 14. I-INPUT |
| 5. Q-BIAS | 15. GND |
| 6. GND | 16. I-BIAS |
| 7. Q-INPUT | 17. I-BIAS |
| 8. Q-INPUT | 18. GND |
| 9. GND | 19. N.C. |
| 10. IF OUTPUT | 20. GND |

Note: N.C. = No Connection

ELECTRICAL CHARACTERISTICS (T_A = 25°C, LO PIN = -10 dBm, VENABLE ⊕1.8 V, Z_L = 50 Ω)

PART NUMBER PACKAGE OUTLINE			UPC8101GR S20 (SSOP 20)					
			V _{CC} = 2.7 V			V _{CC} = 5.5 V		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX	MIN	TYP	MAX
I _{CC}	Circuit Current V _{ENABLE} ≤ 1.0 V	mA	10	15	22	17	24.5	32
P _{SAT}	Saturated Output Power	dBm	-16	-11	-8	-13	-8	-5
L _O LEAK	LO Leakage at IF Port (f _{LO} /2)	dBm		-49	-37		-39	-28
I _M REJ	Image Rejection at IF Port (f _{LO} /2 - f _{I/Q}) ¹	dBc	28.5	37		28.5	38	
I _M 3	Third Order Intermodulation Distortion ¹	dBc		37			56	
Z _{I/Q}	I/Q Port Input Impedance	KΩ	500	1000		500	700	
R _{LLO}	LO Port Return Loss	dB		26			26	
R _{LIF}	IF Port Return Loss	dB		21			21	
τ	Power Enable Response Time	μsec		1	5		1	5
	Turn on	μsec		1	3		1	3
	Turn off	μsec						
V _{ENABLE}	Power Enable Control Voltage	V	1.8		5.5	1.8		5.5
	On	V			1.0			1.0
	Off	V						

Note:

1. f_{LO} = 300.1 MHz, f_{I/Q} = 36 kHz at V_{CC}/2 + 1 V_{p-p}.

ABSOLUTE MAXIMUM RATINGS¹ (T_A = 25°C)

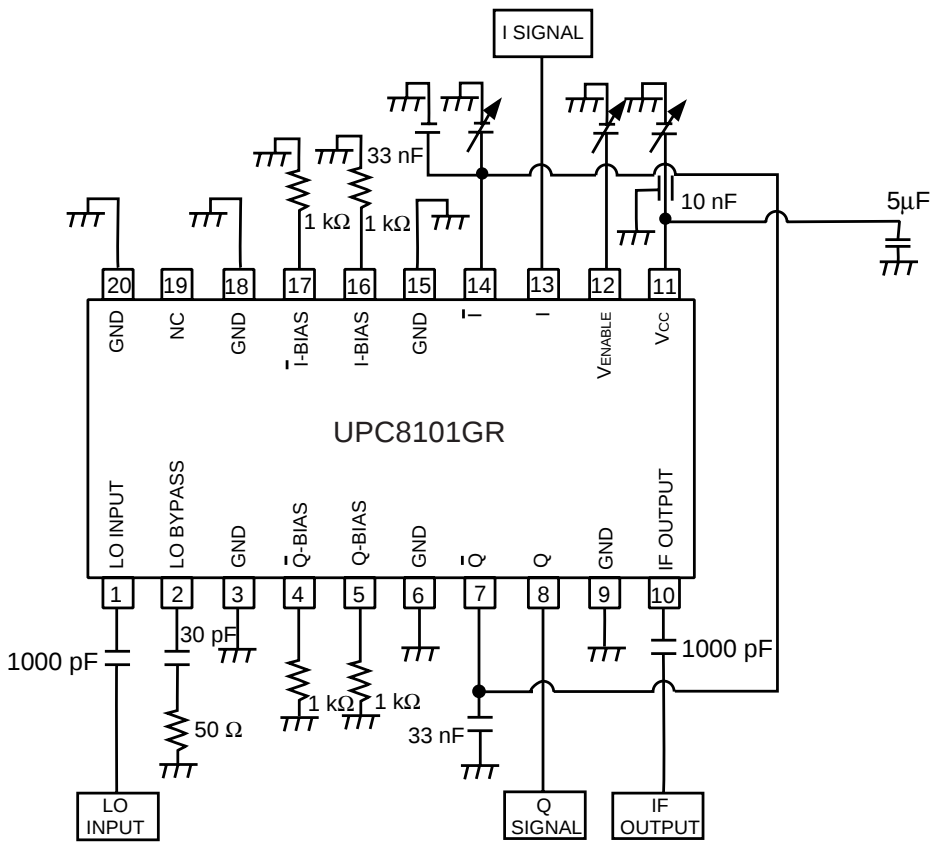
SYMBOLS	PARAMETERS	UNITS	RATINGS
V _{CC}	Supply Voltage	V	6.0
P _D	Power Dissipation ²	mW	530
T _{OP}	Operating Temperature	°C	-20 to +70
T _{STG}	Storage Temperature	°C	-65 to +150

- Notes:
1. Operation in excess of any one of these parameters may result in permanent damage.
 2. Mounted on a 50 x 50 x 1.6 mm epoxy glass PWB (T_A = +70°C).

RECOMMENDED
OPERATING CONDITIONS

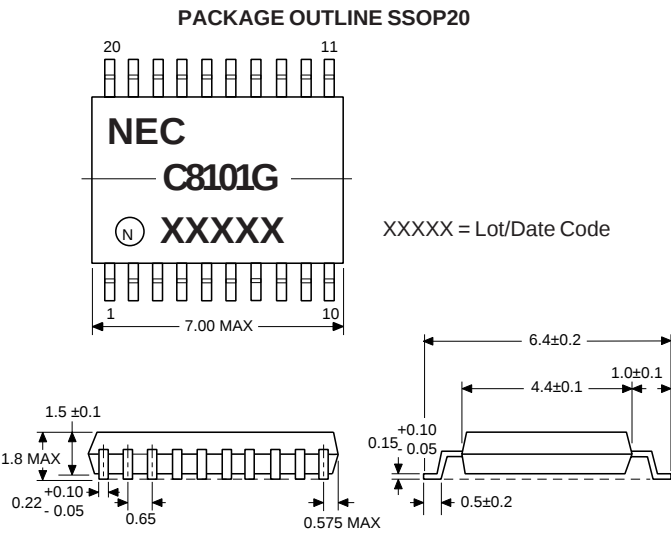
SYMBOLS	PARAMETERS	UNITS	MIN	TYP	MAX
V _{CC}	Supply Voltage	V	2.7	3.0	5.5
T _{OP}	Operating Temperature	°C	-20	+25	+70
f _{I/Q}	I/Q Frequency	kHz	DC		500
f _{LO}	LO Frequency	MHz	100		300
f _{IF}	IF Frequency	MHz	50		150
V _{I/Q}	I/Q Voltage	V		V _{CC} /2 +1 V _{p-p}	

TEST CIRCUIT



SIGNAL	f (MHz)	P _{IN}	
LO	300.1 MHz	-10 dBm	
I Signal	36 kHz	1Vp-p	I/Q phase difference = 90 ° For the LO leakage test, I/Q signal is applied as only DC.
Q Signal	36 kHz	1 Vp-p	

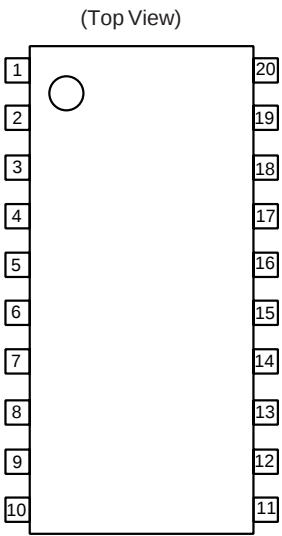
OUTLINE DIMENSIONS (Units in mm)



Note:
All dimensions are typical unless otherwise specified.

LEAD CONNECTIONS

- 1. LOCAL IN
- 2. LOCAL IN
- 3. GND
- 4. Q-BIAS
- 5. Q-BIAS
- 6. GND
- 7. Q-INPUT
- 8. Q-INPUT
- 9. GND
- 10. IF OUTPUT
- 11. Vcc
- 12. VENABLE
- 13. I-INPUT
- 14. I-INPUT
- 15. GND
- 16. I-BIAS
- 17. I-BIAS
- 18. GND
- 19. N.C.
- 20. GND



ORDERING INFORMATION

PART NUMBER	QTY
UPC8101GR-E2	2500/Reel

Note:
Embossed Tape, 12 mm wide.
Pin 1 indicates roll-in direction of tape.