NEC

3 V, SILICON MMIC MEDIUM OUTPUT POWER AMPLIFIER FOR MOBILE COMMUNICATIONS

UPC8181TB

FEATURES

- **HIGH-DENSITY SURFACE MOUNTING:**
  6-pin super minimold package (2.0 x 1.25 x 0.9 mm)
- **SUPPLY VOLTAGE:**
  V_{CC} = 2.7 to 3.3 V
- **CIRCUIT CURRENT:**
  I_{CC} = 23.0 mA TYP at V_{CC} = 3.0 V
- **MEDIUM OUTPUT POWER:**
  $P_{O(1dB)}$ = +8.0 dBm TYP at f = 0.9 GHz
  $P_{O(1dB)}$ = +7.0 dBm TYP at f = 1.9 GHz
  $P_{O(1dB)}$ = +7.0 dBm TYP at f = 2.4 GHz
- **POWER GAIN:**
  G_P = 19.0 dB TYP at f = 0.9 GHz
  G_P = 21.0 dB TYP at f = 1.9 GHz
  G_P = 22.0 dB TYP at f = 2.4 GHz
- **UPPER LIMIT OPERATING FREQUENCY:**
  f_U = 4.0 GHz TYP at 3 dB bandwidth (Standard value)

DESCRIPTION

The UPC8181TB is a silicon Monolithic Microwave Integrated Circuit designed as an amplifier for mobile communications. This IC operates at 3 volts. The medium output power is suitable for RF-TX of mobile communication systems.

This IC is manufactured using NEC's 30 GHz f_{max} UHS0 (Ultra High Speed process) silicon bipolar process. This process uses direct silicon nitride passivation film and gold electrodes. These materials can protect the chip surface from pollution and prevent corrosion/migration. This IC has excellent performance, uniformity, and reliability.

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

APPLICATIONS

- Buffer amplifiers for 1.9 GHz to 2.4 GHz mobile communication systems.

ELECTRICAL CHARACTERISTICS

(T_A = 25°C, V_{CC} = V_{OUT} = 3.0 V, Z_S = Z_L = 50Ω)

PART NUMBER PACKAGE OUTLINE				UPC8181TB S06		
SYMBOLS	**PARAMETERS AND CONDITIONS**		**UNITS**	**MIN**	**TYP**	**MAX**
I_{CC}	Circuit Current (no signal)		mA	–	23.0	30.0
G_P	Power Gain,	f = 0.9 GHz	dB	16.0	19.0	22.0
		f = 1.9 GHz		18.0	21.0	24.0
		f = 2.4 GHz		19.0	22.0	25.0
NF	Noise Figure,	f = 0.9 GHz	dB	–	4.5	6.0
		f = 1.9 GHz		–	4.5	6.0
		f = 2.4 GHz		–	4.5	6.0
f_U	Upper Limit Operating Frequency, 3 dB down below from gain at f = 0.1 GHz		GHz	–	4.0	–
ISL	Isolation,	f = 0.9 GHz	dB	28.0	33.0	–
		f = 1.9 GHz		27.0	32.0	–
		f = 2.4 GHz		26.5	31.5	–
RL_{in}	Input Return Loss,	f = 0.9 GHz	dB	4.5	7.5	–
		f = 1.9 GHz		7.5	10.5	–
		f = 2.4 GHz		8.0	11.0	–
RL_{out}	Output Return Loss,	f = 0.9 GHz	dB	6.0	9.0	–
		f = 1.9 GHz		7.0	10.0	–
		f = 2.4 GHz		9.0	12.0	–
$P_{O(1dB)}$	1 dB Gain Compression Output Level,					
		f = 0.9 GHz	dBm	+5.5	+8.0	–
		f = 1.9 GHz		+4.5	+7.0	–
		f = 2.4 GHz		+4.5	+7.0	–
$P_{O(SAT)}$	Saturated Output Power Level,					
		f = 0.9 GHz, P_{IN} = -5 dBm	dBm	–	+9.5	–
		f = 1.9 GHz, P_{IN} = -5 dBm		–	+9.0	–
		f = 2.4 GHz, P_{IN} = -5 dBm		–	+9.0	–

ABSOLUTE MAXIMUM RATINGS[1]

SYMBOLS	PARAMETERS	UNITS	RATINGS
V_{CC}	Supply Voltage[2]	V	3.6
I_{CC}	Total Cicuit Current	mA	60
P_D	Power Dissipation[3]	mW	270
T_A	Operating Ambient Temperature	°C	-40 to +85
T_{STG}	Storage Temperature	°C	-55 to +150
P_{IN}	Input Power[4]	dBm	+10

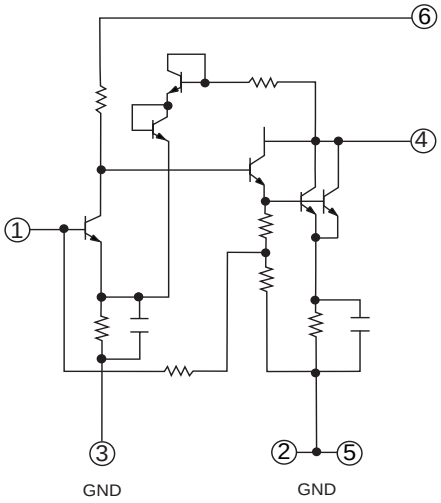
Notes:
1. Operation in excess of any one of these conditions may result in permanent damage.
2. T_A = 25°C, pins 4 and 6.
3. Mounted on a double-sided copper clad 50x50x1.6 mm epoxy glass PWB, T_A = +85°C.
4. T_A = +25 °C

RECOMMENDED OPERATING CONDITIONS

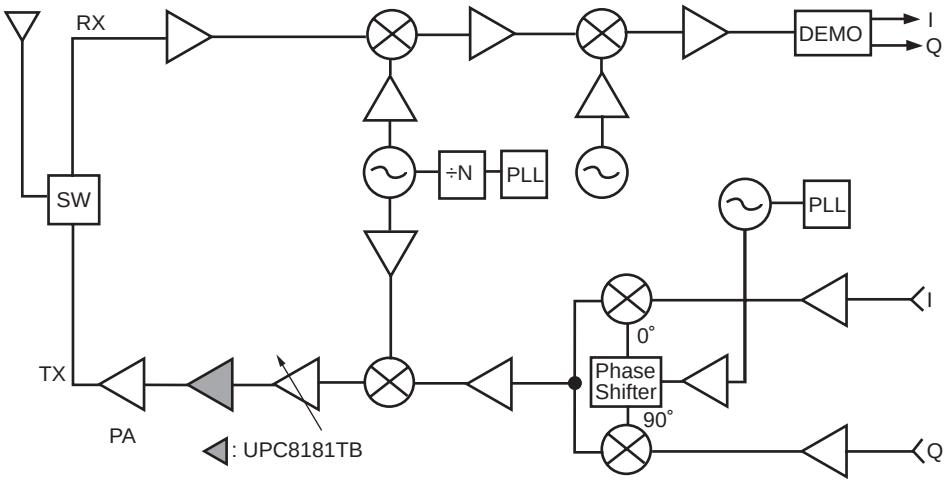
SYMBOLS	PARAMETERS	UNITS	MIN	TYP	MAX
V_{CC}	Supply Voltage[1]	V	2.7	3.0	3.3

Note:
1. Same voltage applied to pins 4 and 6

PIN FUNCTIONS (Pin Voltage is measured at V_{CC} = 3.0 V)

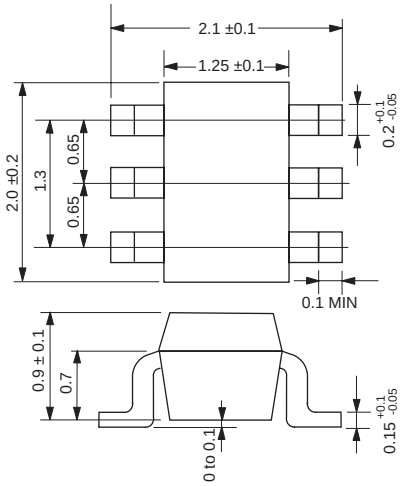
Pin No.	Pin Name	Applied Voltage	Pin Voltage	Description	Equivalent Circuit
1	INPUT	—	0.99	Signal input pin. An internal matching circuit, configured with resistors, enables 50 Ω connection over a wide band. A multi- feedback circuit is designed to cancel the deviations of h_{FE} and resistance. This pin must be coupled to signal source with capacitor for DC cut.	
2 3 5	GND	0	—	GND pin. This pin should be connected to the system ground with minimuim inductance. Ground pattern on the board should be formed as wide as possible. All the ground pins must be connected together with wide ground pattern to decrease impedance difference.	
4	OUTPUT	Voltage as same as V_{CC} through external inductor	—	Signal output pin. The inductor must be attached between V_{CC} and output pins to supply current to the internal output transistors.	
6	V_{CC}	2.7 to 3.3	—	Power supply pin, which biases the internal input transistor. This pin should be externally equipped with bypass capacitor to minimize its impedance.	

APPLICATION EXAMPLE (Digital Cellular Telephone

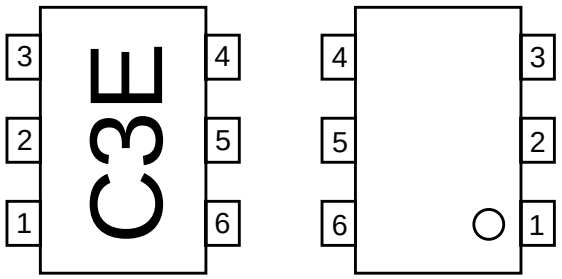


OUTLINE DIMENSIONS (Units in mm)

6-PIN SUPER MINIMOLD



LEAD CONNECTIONS



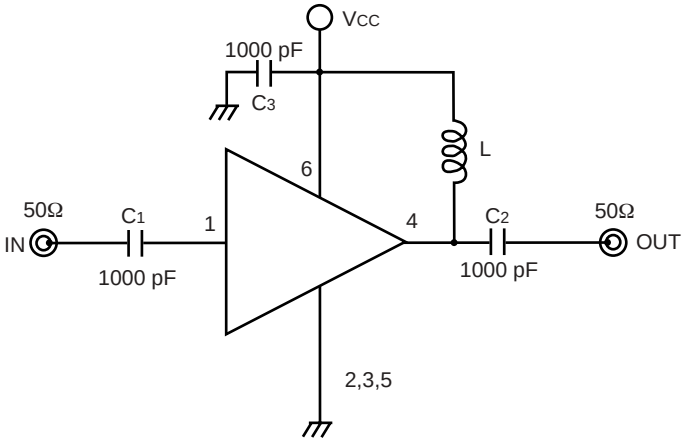
1. INPUT
2. GND
3. GND
4. OUTPUT
5. GND
6. Vcc

ORDERING INFORMATION

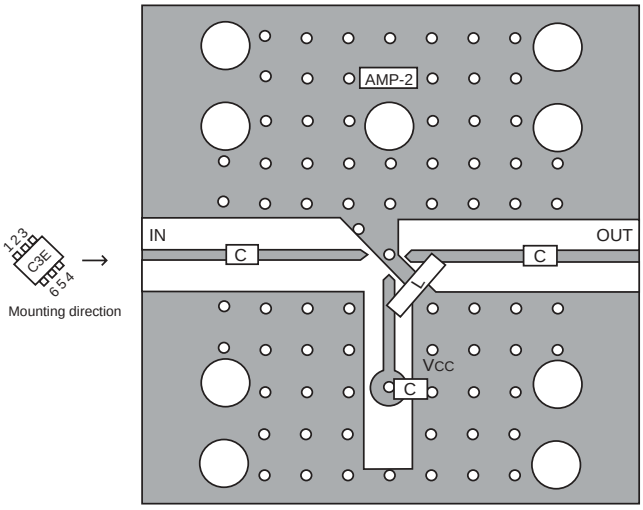
PART NUMBER	PACKAGE	QUANTITY
UPC8181TB-E3	6-pin super minimold	3kpcs/Reel

Note: Embossed tape 8 mm wide. Pins 1,2,3 face tape perforation side.

TEST CIRCUIT



APPLICATION BOARD



Note:
1. 30x30x0.4mm double sided copper clad polyimide board.
2. Back side: GND pattern.
3. Solder plated on patterns.
4. o O : Through holes.