NEC

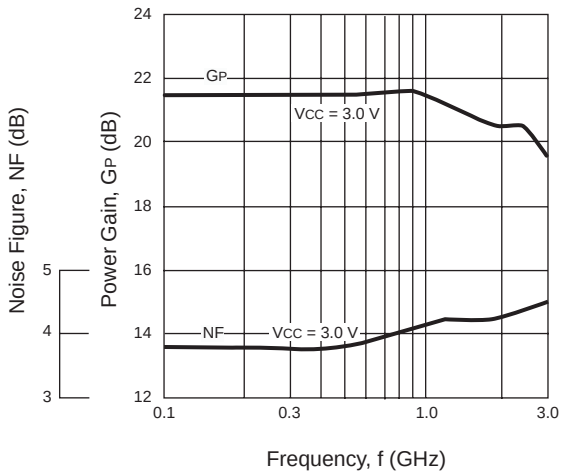
3 V, 2.9 GHz SILICON MMIC MEDIUM OUTPUT POWER AMPLIFIER FOR MOBILE COMMUNICATIONS

UPC8182TB

FEATURES

- **SUPPLY VOLTAGE:**
  V_{CC} = 2.7 to 3.3 V
- **CIRCUIT CURRENT:**
  I_{CC} = 30 mA TYP at V_{CC} = 3.0 V
- **MEDIUM OUTPUT POWER:**
  $P_{O(1dB)}$ = +9.5 dBm TYP at f = 0.9 GHz
  $P_{O(1dB)}$ = +9.0 dBm TYP at f = 1.9 GHz
  $P_{O(1dB)}$ = +8.0 dBm TYP at f = 2.4 GHz
- **POWER GAIN:**
  G_P = 21.5 dB TYP at f = 0.9 GHz
  G_P = 20.5 dB TYP at f = 1.9 GHz
  G_P = 20.5 dB TYP at f = 2.4 GHz
- **UPPER LIMIT OPERATING FREQUENCY:**
  f_U = 2.9 GHz TYP at 3 dB bandwidth
- **HIGH-DENSITY SURFACE MOUNTING:**
  6-pin super minimold package (2.0 x 1.25 x 0.9 mm)

NOISE FIGURE, POWER GAIN vs. FREQUENCY



DESCRIPTION

The UPC8182TB is a silicon monothilic integrated circuit designed as amplifier for mobile communications. This IC has low current consumption and wider band than UPC2771TB.

This IC is manufactured using NEC's 25 GHz f_T UHSO 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.

APPLICATIONS

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

ELECTRICAL CHARACTERISTICS

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

PART NUMBER PACKAGE OUTLINE				UPC8182TB S06		
SYMBOLS	**PARAMETERS AND CONDITIONS**		**UNITS**	**MIN**	**TYP**	**MAX**
I_{CC}	Circuit Current (no signal)		mA	22.0	30.0	38.0
G_P	Power Gain,	f = 0.9 GHz f = 1.9 GHz f = 2.4 GHz	dB	19.0 17.5 18.0	21.5 20.5 20.5	25.0 23.5 24.0
N_F	Noise Figure,	f = 0.9 GHz f = 1.9 GHz f = 2.4 GHz	dB	– – –	4.5 4.5 5.0	6.0 6.0 6.5
f_U	Upper Limit Operating Frequency, 3 dB down below from gain at f = 1.0 GHz		GHz	2.8	2.9	
ISL	Isolation,	f = 0.9 GHz f = 1.9 GHz f = 2.4 GHz	dB	30 27 28	33 32 31	– – –

ELECTRICAL CHARACTERISTICS, cont.

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

PART NUMBER PACKAGE OUTLINE			UPC8182TB S06		
SYMBOLS	**PARAMETERS AND CONDITIONS**	**UNITS**	**MIN**	**TYP**	**MAX**
RL_{in}	Input Return Loss, f = 0.9 GHz f = 1.9 GHz f = 2.4 GHz	dB	6 8 9	8 10 12	– – –
RL_{out}	Output Return Loss, f = 0.9 GHz f = 1.9 GHz f = 2.4 GHz	dB	8 9 11	10 11 14	– – –
$P_{O(1dB)}$	1 dB Gain Compression Output Level, f = 0.9 GHz f = 1.9 GHz f = 2.4 GHz	dBm	+7.5 +7.0 +5.5	+9.5 +9.0 +8.0	– – –
$P_{O(SAT)}$	Saturated Output Power Level, f = 0.9 GHz, P_{IN} = -5 dBm f = 1.9 GHz, P_{IN} = -5 dBm f = 2.4 GHz, P_{IN} = -5 dBm	dBm	– – –	+10.5 +10.0 +9.5	– – –

ABSOLUTE MAXIMUM RATINGS[1] (T_A = +25°C)

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	200
T_A	Operating Ambient Temperature	°C	-40 to +85
T_{STG}	Storage Temperature	°C	-55 to +150
P_{IN}	Input Power	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.

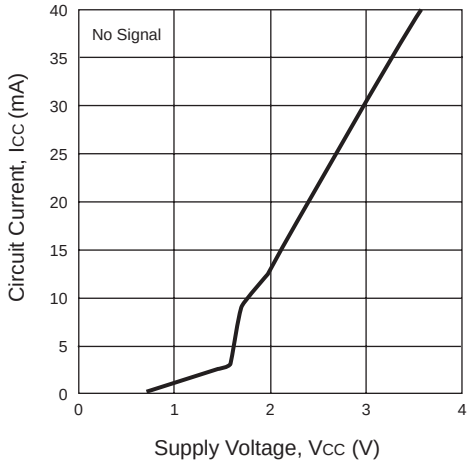
RECOMMENDED OPERATING CONDITIONS

SYMBOLS	PARAMETERS	UNITS	MIN	TYP	MAX
V_{CC}	Supply Voltage[1]	V	2.7	3.0	3.3
T_A	Ambient Temperature	˚C	-40	+25	+85

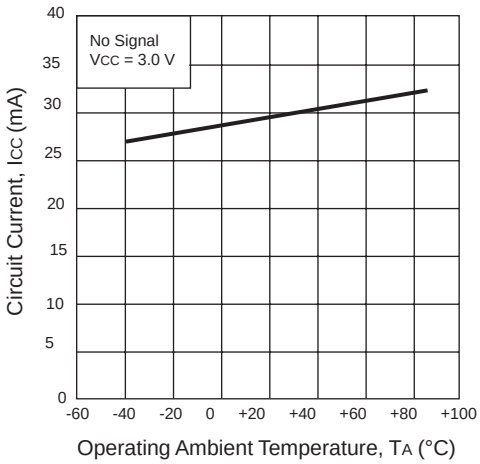
Note:
1. Same voltage applied to pins 4 and 6

TYPICAL PERFORMANCE CURVES (Unless otherwise specified, T_A = 25˚C)

CIRCUIT CURRENT vs. SUPPLY VOLTAGE

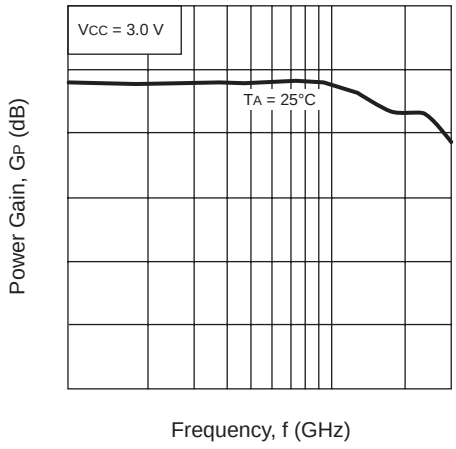


CIRCUIT CURRENT vs. OPERATING AMBIENT TEMPERATURE

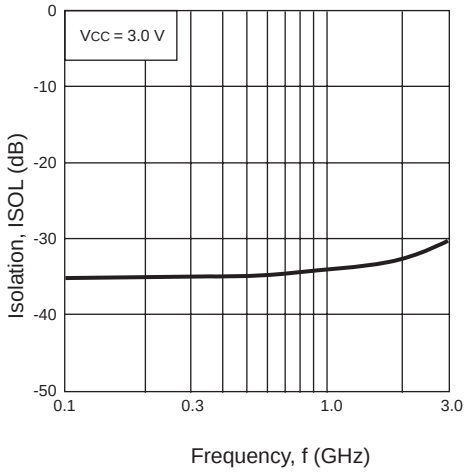


TYPICAL PERFORMANCE CURVES, cont. (Unless otherwise specified, T_A = 25°C)

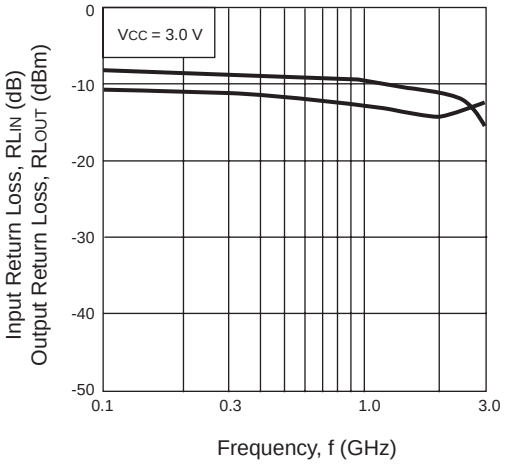
POWER GAIN vs. FREQUENCY



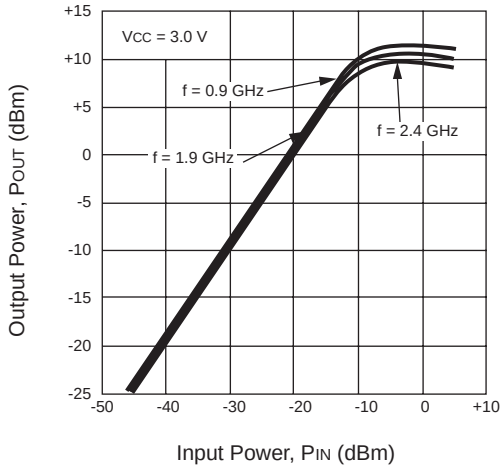
ISOLATION vs. FREQUENCY



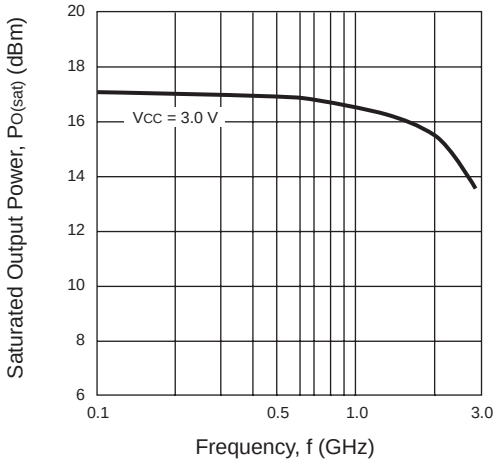
INPUT RETURN LOSS, OUTPUT RETURN LOSS vs. FREQUENCY



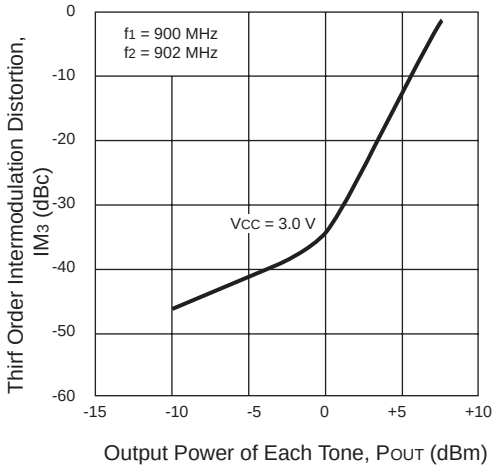
OUTPUT POWER vs. INPUT POWER



SATURATED OUTPUT POWER vs. FREQUENCY

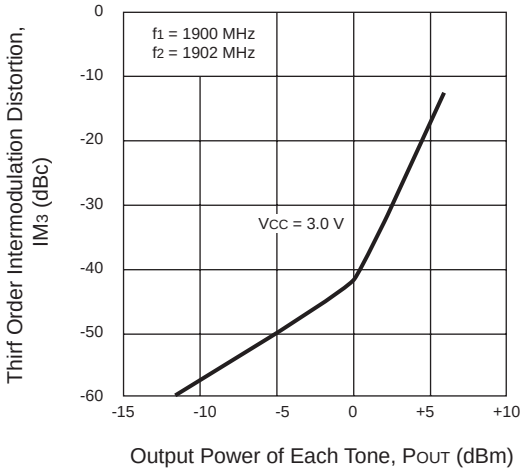


THIRD ORDER INTERMODULATION DISTORTION vs. OUTPUT POWER OF EACH TONE

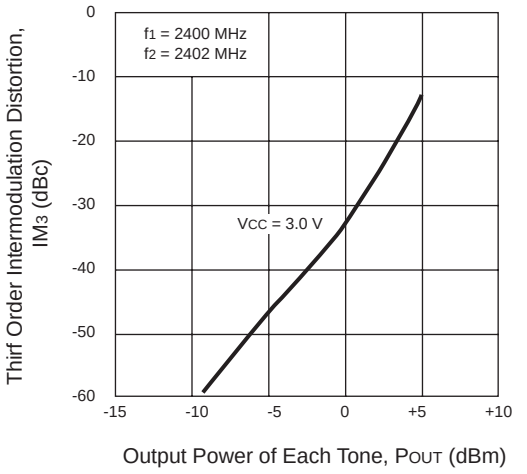


TYPICAL PERFORMANCE CURVES (Unless otherwise specified, T_A = 25°C)

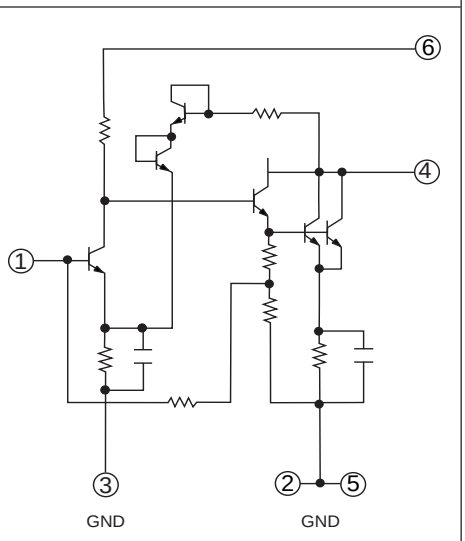
THIRD ORDER INTERMODULATION DISTORTION vs. OUTPUT POWER OF EACH TONE



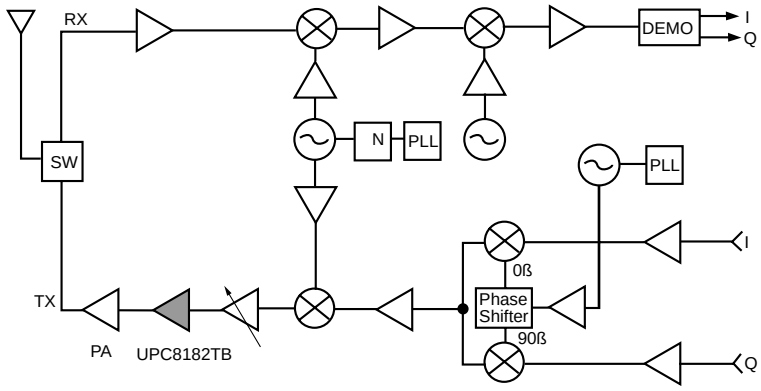
THIRD ORDER INTERMODULATION DISTORTION vs. OUTPUT POWER OF EACH TONE



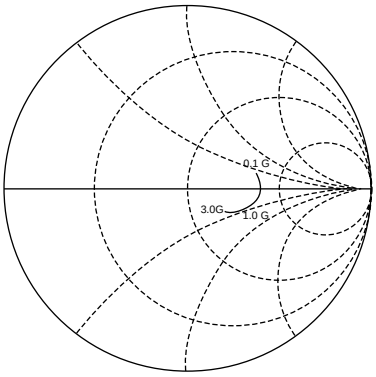
PIN FUNCTIONS (Pin Voltage is measured at V_{CC} = 3.0 V)

Pin No.	Pin Name	Applied Voltage	Pin Voltage	Description	Equivalent Circuit
1	INPUT	—	—	Signal input pin. A 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.	
4	OUTPUT	Voltage 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.	
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.	

APPLICATION EXAMPLE (Digital Cellular Telephone)

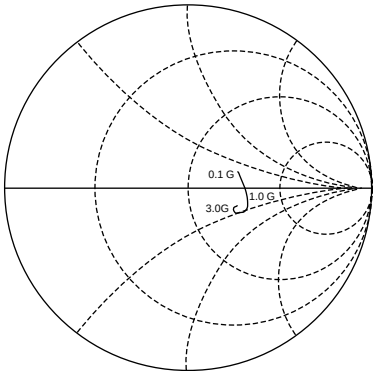


TYPICAL SCATTERING PARAMETERS (T_A = 25°C)



S11

Frequency in GHz
V_{CC} = V_{OUT} = 3.0 V, I_{CC} = 30.0 mA



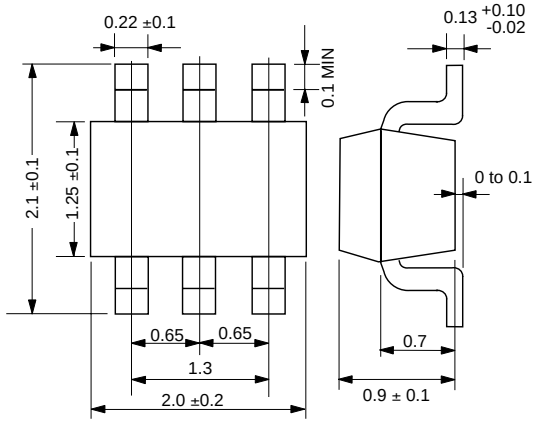
S22

V_{CC} = V_{OUT} = 3.0 V, I_{CC} = 30 .0 mA

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}		
GHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	K
0.1	0.452	-2.7	9.078	-2.0	0.020	4.3	0.338	-1.6	1.89
0.1	0.391	-2.6	12.933	-4.4	0.016	1.8	0.293	-2.7	1.84
0.2	0.391	-6.2	12.999	-8.0	0.017	3.5	0.287	-5.1	1.80
0.3	0.387	-10.2	13.174	-11.8	0.016	7.6	0.282	-6.8	1.86
0.4	0.382	-13.8	13.322	-16.4	0.016	9.2	0.279	-8.4	1.82
0.5	0.371	-16.7	13.391	-20.7	0.017	13.2	0.276	-9.1	1.79
0.6	0.365	-19.5	13.407	-25.7	0.017	15.9	0.279	-10.0	1.78
0.7	0.354	-21.6	13.549	-30.4	0.018	21.0	0.278	-11.0	1.73
0.8	0.347	-23.7	13.475	-35.3	0.020	22.3	0.285	-11.7	1.57
0.9	0.343	-25.8	13.426	-40.1	0.020	21.2	0.290	-13.5	1.52
1.0	0.334	-28.1	13.474	-44.9	0.019	27.0	0.293	-15.1	1.62
1.1	0.330	-30.8	13.386	-50.0	0.018	28.1	0.296	-17.6	1.69
1.2	0.324	-32.1	13.185	-54.6	0.020	27.6	0.302	-20.3	1.61
1.3	0.317	-34.2	13.121	-59.4	0.020	31.7	0.303	-21.9	1.62
1.4	0.318	-35.7	13.151	-64.2	0.021	32.1	0.309	-24.6	1.51
1.5	0.313	-38.0	12.866	-69.4	0.022	34.0	0.315	-27.1	1.47
1.6	0.309	-39.8	12.814	-73.9	0.023	34.6	0.318	-29.5	1.43
1.7	0.303	-42.5	12.508	-78.2	0.022	34.3	0.314	-33.1	1.52
1.8	0.302	-44.3	12.357	-83.2	0.024	35.9	0.319	-35.6	1.44
1.9	0.298	-45.5	12.090	-86.7	0.026	36.9	0.322	-37.6	1.39
2.0	0.290	-47.5	12.035	-90.9	0.025	40.0	0.313	-40.5	1.43
2.1	0.291	-50.1	11.984	-95.4	0.027	36.5	0.321	-43.5	1.36
2.2	0.283	-52.6	11.662	-99.9	0.026	38.2	0.314	-46.0	1.43
2.3	0.277	-54.1	11.711	-104.0	0.027	40.0	0.310	-48.6	1.41
2.4	0.274	-56.7	11.629	-108.6	0.028	38.4	0.309	-51.6	1.37
2.5	0.270	-58.0	11.475	-113.7	0.029	39.1	0.304	-54.1	1.35
2.6	0.261	-59.8	11.308	-118.5	0.029	39.9	0.297	-55.3	1.39
2.7	0.264	-61.4	11.198	-123.5	0.032	38.6	0.303	-56.5	1.29
2.8	0.253	-62.0	10.803	-129.4	0.031	42.8	0.295	-57.3	1.39
2.9	0.258	-63.9	10.670	-134.8	0.032	41.3	0.307	-57.9	1.33
3.0	0.255	-65.7	10.086	-139.5	0.033	40.9	0.316	-60.0	1.35
3.1	0.250	-67.9	9.683	-145.4	0.032	39.8	0.321	-63.1	1.44

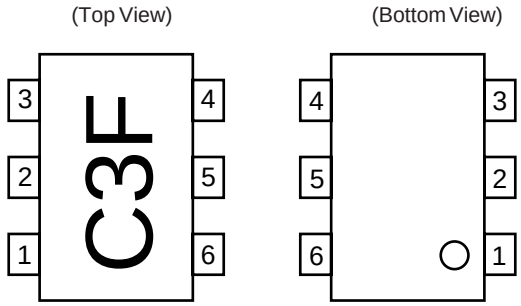
OUTLINE DIMENSIONS (Units in mm)

PACKAGE OUTLINE S06



Note:
All dimensions are typical unless otherwise specified.

LEAD CONNECTIONS



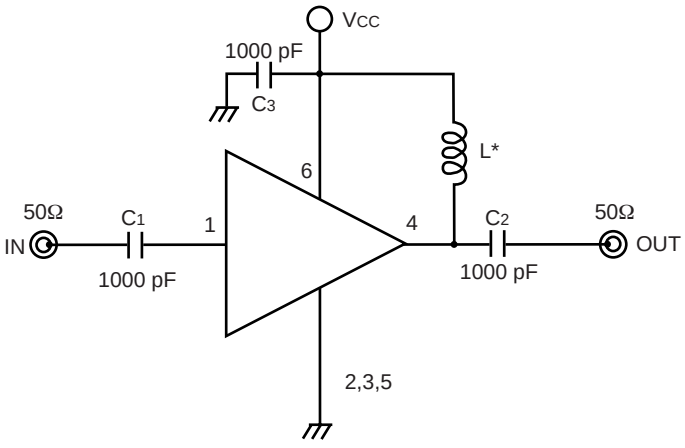
1. INPUT
2. GND
3. GND
4. OUTPUT
5. GND
6. V_{CC}

ORDERING INFORMATION

PART NUMBER	QUANTITY
UPC8182TB-E3	3K/Reel

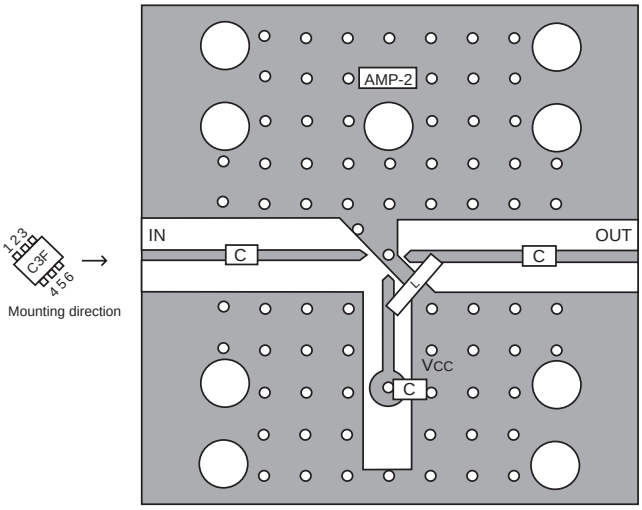
Note: Embossed tape 8 mm wide. Pins 1,2,3 face tape perforation side.

TEST CIRCUIT



*L: 100 nH for f = 100 MHz and higher
10 nH for f = 2.0 GHz and higher

APPLICATION BOARD



Life Support Applications
These NEC products are not intended for use in life support devices, appliances, or systems where the malfunction of these products can reasonably be expected to result in personal injury. The customers of CEL using or selling these products for use in such applications do so at their own risk and agree to fully indemnify CEL for all damages resulting from such improper use or sale.