NEC

BIPOLAR ANALOG INTEGRATED CIRCUIT

μPC2721, μPC2722

GENERAL PURPOSE L-BAND DOWN CONVERTER ICs

DESCRIPTION

The μPC2721/2722 are Silicon monolithic ICs designed for L-band down converter. These ICs consist of double balanced mixer, local oscillator, local oscillation buffer amplifier, IF amplifier, and voltage regulator.

The packages are 8 pin SOP or SSOP suitable for high-density surface mount.

FEATURES

- Wide band operation f_{RF} = 0.9 to 2.0 GHz
- Two products in IF output variation are prepared
  μPC2721: Emitter follower output type = 50 Ω constant resistive impedance
  μPC2722: Open collector output type = High impedance output dependent on external inductance.
- Single-end push-pull IF amplifier suppresses fluctuation in output impedance.
- Supply voltage: 5 V
- Low current consumption (μPC2721: I_{CC} = 38 mA typ., μPC2722: I_{CC} = 28 mA typ.)
- Packaged in 8 pin SOP or SSOP suitable for high-density mounting

ORDERING INFORMATION

PART NUMBER	PACKAGE	PACKAGE STYLE
μPC2721GR-E1 μPC2722GR-E1	8 pin Plastic SOP (225 mil)	Embossed tape 12 mm wide 2.5 k/REEL. Pin 1 indicates pull-out direction of tape.
μPC2721GR-E2 μPC2722GR-E2	8 pin Plastic SOP (225 mil)	Embossed tape 12 mm wide 2.5 k/REEL. Pin 1 indicates roll-in direction of tape.
μPC2721GV-E1 μPC2722GV-E1	8 pin Plastic SSOP (175 mil)	Embossed tape 8 mm wide 1 k/REEL. Pin 1 indicates pull-out direction of tape.

For evaluation sample order, please contact your local NEC office.
(Part number for sample order: μPC2721GR, μPC2722GR, μPC2721GV, μPC2722GV)

Caution electro-static sensitive device

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Not all devices/types available in every country. Please check with local NEC representative for availability and additional information.

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The mark ★ shows major revised points.

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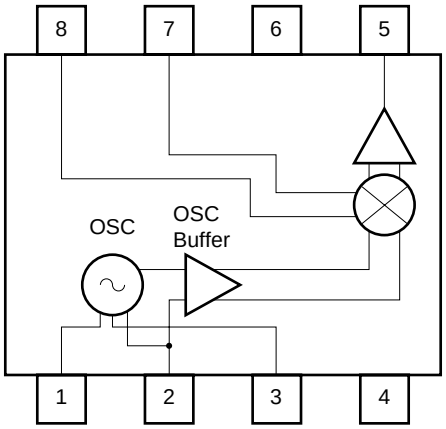
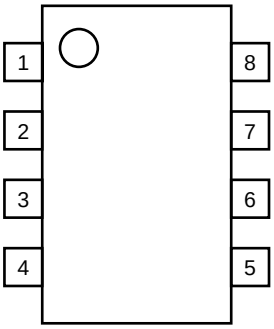
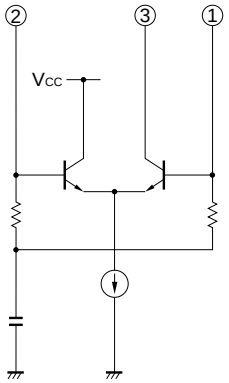
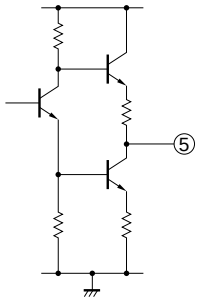
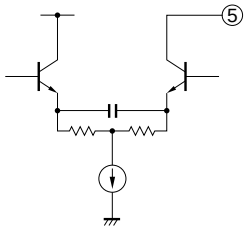
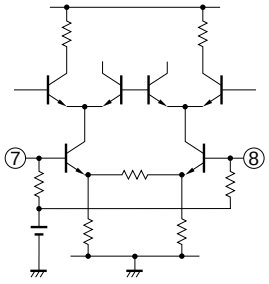
INTERNAL BLOCK DIAGRAM



PIN CONFIGURATION (Top View)



1. OSC base (bypass)
2. OSC base (feedback)
3. OSC collector (coupling)
4. V_{CC}
5. IF output
6. GND
7. RF input 2 (bypass)
8. RF input 1

PIN No.	SYMBOL	PIN VOLT TYP.(V)	Function and Explanation	Equivalent circuit
1	OSC base (bypass)	2.9	Internal oscillator consists in balance amplifier. 2 pin and 3 pin should be externally equipped with tank resonator circuit in order to oscillate with feedback loop. 1 pin should be grounded through coupling capacitor to 0.5 pF. 3 pin is defined as open collector. This pin should be coupled through resistor or chock coil in order to adjust Q and be supplied voltage. In case of abnormal oscillation, adjust its Q lower to stabilize the operation.	
2	OSC base (feedback)	2.9		
3	OSC collector (coupling)	5.0		
4	Vcc	5.0	Supply voltage pin for the IC.	
5	IF output	μPC2721 2.9	In μPC2721, IF amplifier is designed as single-end push-pull amplifier. This pin is assigned for the emitter follower output with 50 Ω constant resistive impedance in wide band.	μPC2721 
		μPC2722 5.0	In μPC2722, IF amplifier is designed as balance amplifier. This pin is assigned for the open collector output with high impedance dependent on external inductance.	μPC2722 
6	GND	0.0	GND pin for the IC.	
7	RF input 2 (bypass)	2.4	7 pin and 8 pin are inputs for mixer designed as double balanced type. Either pin can be assigned for input and another for ground.	
8	RF input 1	2.4		

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATING	UNIT	TEST CONDITION
Supply Voltage	V_{CC}	6.0	V	T_A = 25 °C
Power Dissipation	P_D	250	mW	T_A = 85 °C[Note 1]
Operating temperature range	T_A	–40 to +85	°C	
Storage temperature range	T_{stg}	–65 to +150	°C	

Note 1: Mounted on 50 × 50 × 1.6 mm double copper clad epoxy glass board.

RECOMMENDED OPERATING RANGE

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply Voltage	V_{CC}	4.5	5.0	5.5	V
Operating temperature range	T_A	–40	+25	+85	°C

ELECTRICAL CHARACTERISTICS (V_{CC} = 5.0 V, T_A = +25 °C[Note 2])

PARAMETER	SYMBOL	μPC2721			μPC2722			UNIT	TEST CONDITIONS
		MIN.	TYP.	MAX	MIN.	TYP.	MAX		
Circuit Current	I_{CC}	29	38	45.5	19	28	37	mA	no input signal
Lower Input Frequency	$f_{RF}1$			0.9			0.9	GHz	f_{IF} = 50 to 600 MHz (C2721) f_{IF} = DC to 600 MHz (C2722)
Upper Input Frequency	$f_{RF}2$	2.0			2.0			GHz	
Conversion Gain 1	CG1	18	21	24	15	18	21	dB	f_{RF} = 900 MHz, f_{IF} = 402.8 MHz
Conversion Gain 2	CG2	18	21	24	15	18	21	dB	f_{RF} = 2.0 GHz, f_{IF} = 402. 8 MHz
Noise Figure 1	NF1	–	9	13	–	9	13	dB	f_{RF} = 900 MHz, f_{IF} = 402.8 MHz
Noise Figure 2	NF2	–	11	15	–	9	13	dB	f_{RF} = 2.0 GHz, f_{IF} = 402.8 MHz
Maximum output power 1	$P_{O(SAT)}1$	+2	+7	–	+2	+6	–	dBm	f_{RF} = 900 MHz, f_{IF} = 402.8 MHz
Maximum output power 2	$P_{O(SAT)}2$	+2	+7	–	+2	+6	–	dBm	f_{RF} = 2.0 GHz, f_{IF} = 402.8 MHz

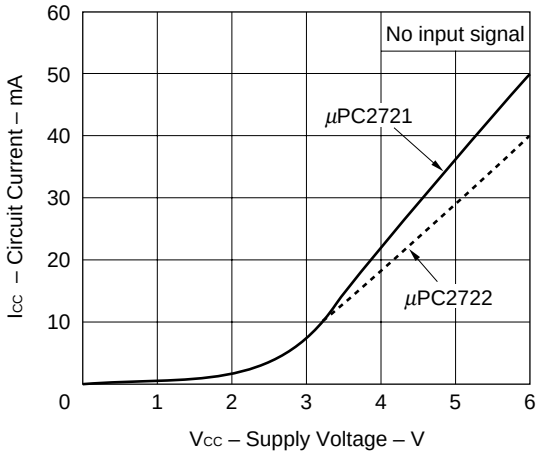
Note 2: on test circuit

STANDARD CHARACTERISTICS (FOR REFERENCE) (V_{CC} = 5 V, T_A = 25 °C[Note 2])

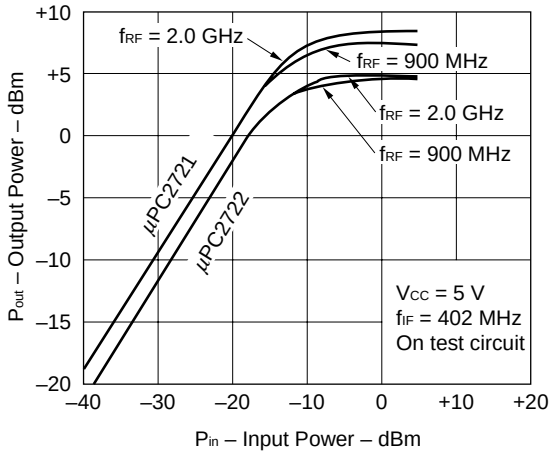
PARAMETER	SYMBOL	REFERENCE VALUES		UNIT	TEST CONDITIONS
		μPC2721	μPV2722		
Conversion Gain 3	CG3	22	19	dB	f_{RF} = 900 MHz, f_{IF} = 50 MHz
Conversion Gain 4	CG4	22	19	dB	f_{RF} = 2.0 MHz, f_{IF} = 50 MHz
Conversion Gain 5	CG5	21	18	dB	f_{RF} = 900 MHz, f_{IF} = 479.5 MHz
Conversion Gain 6	CG6	21	18	dB	f_{RF} = 2.0 MHz, f_{IF} = 479.5 MHz
Conversion Gain 7	CG7	19.5	17	dB	f_{RF} = 900 MHz, f_{IF} = 600 MHz
Conversion Gain 8	CG8	19.5	17	dB	f_{RF} = 2.0 MHz, f_{IF} = 600 MHz
Third Intermodulation Distortion 1	$IM_3$1	38.0	42.0	dBc	f_{RF} = 900, 938 MHz, P_{in} = –30 dBm
Third Intermodulation Distortion 2	$IM_3$2	38.0	42.0	dBc	f_{RF} = 2.0, 2.038 GHz, P_{in} = –30 dBm

TYPICAL CHARACTERISTICS (T_A = +25 °C)

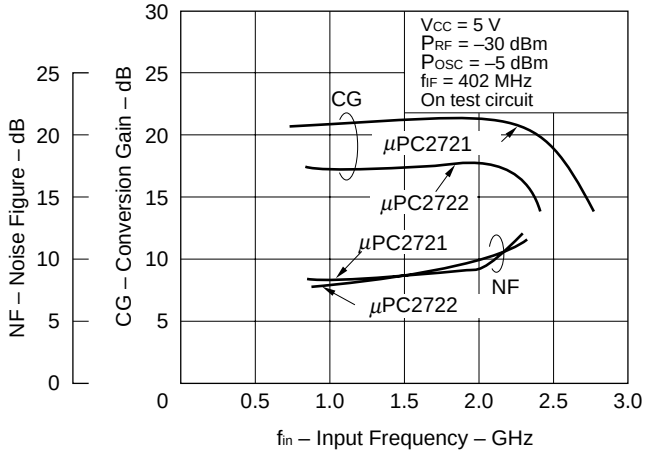
CIRCUIT CURRENT vs. SUPPLY VOLTAGE



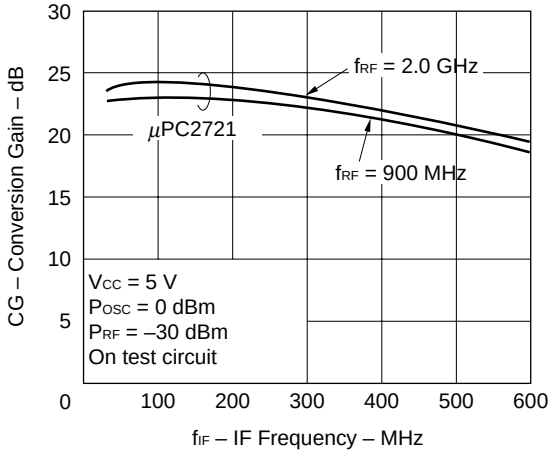
OUTPUT POWER vs. INPUT POWER



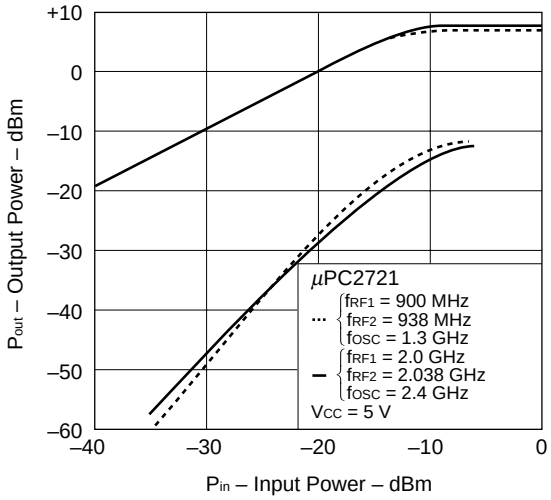
CONVERSION GAIN AND NOISE FIGURE vs. INPUT FREQUENCY



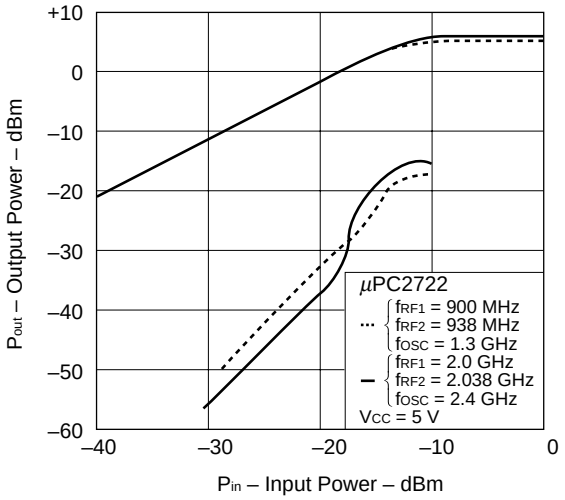
CONVERSION GAIN vs. IF FREQUENCY



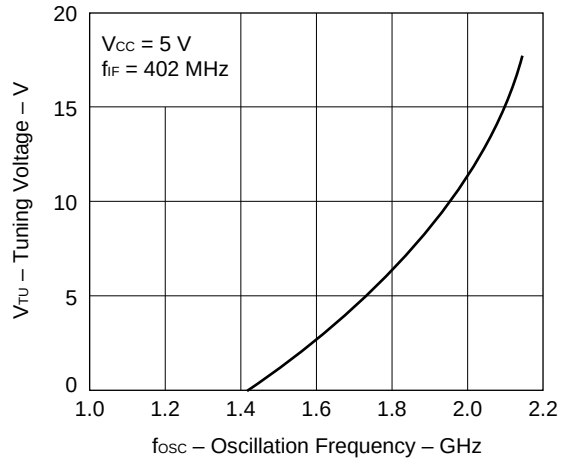
IM3 AND OUTPUT POWER vs. INPUT POWER



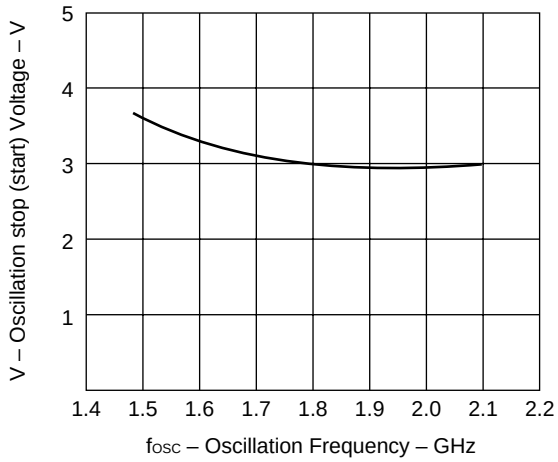
IM3 AND OUTPUT POWER vs. INPUT POWER



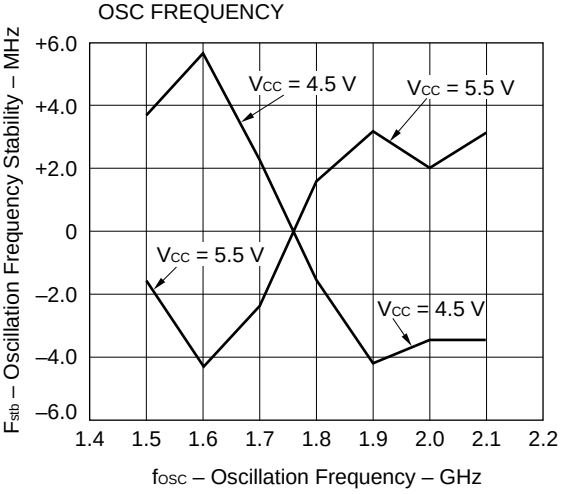
OSC-TUNING VOLTAGE vs. OSC FREQUENCY



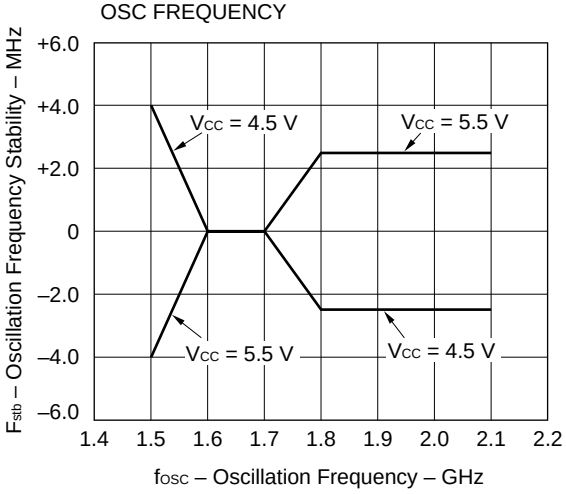
LOWER VCC VOLTAGE IN OSC OPERATION vs. OSC FREQUENCY



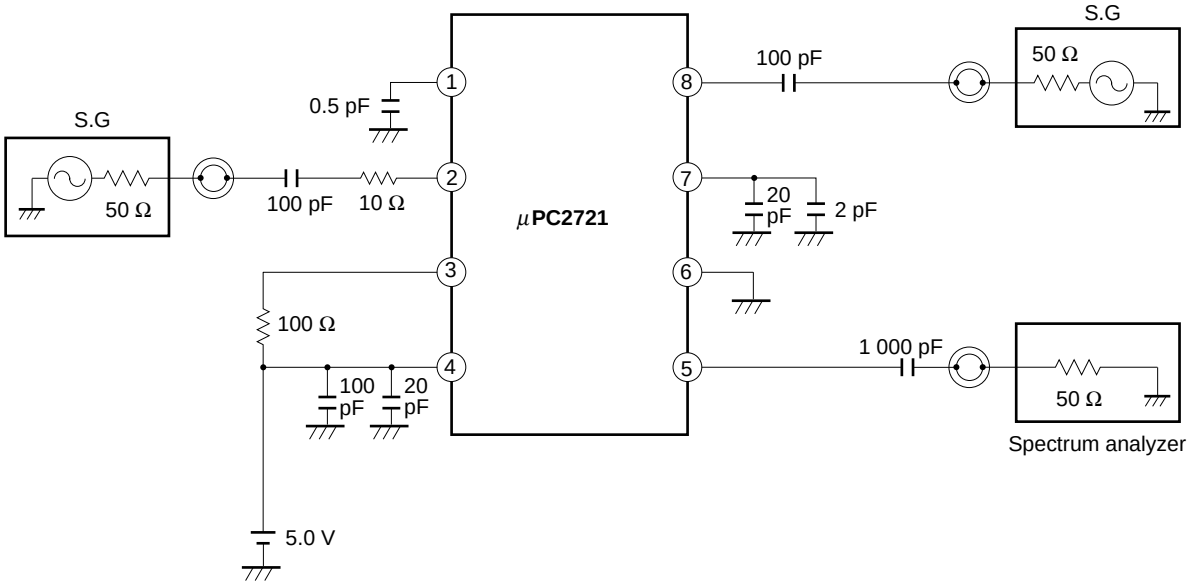
μPC2721 OSC FREQUENCY STABILITY vs. OSC FREQUENCY



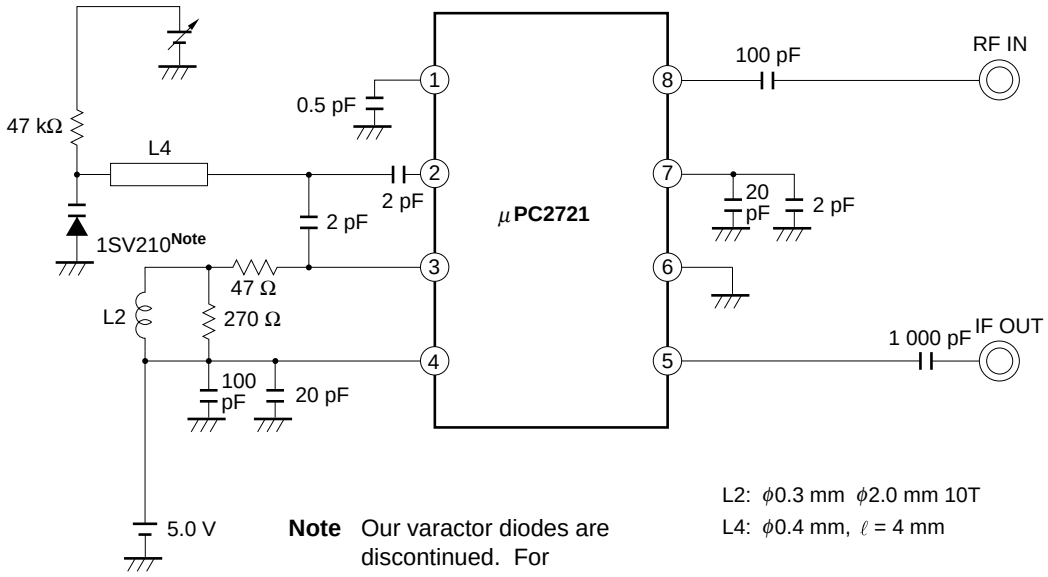
μPC2722 OSC FREQUENCY STABILITY vs. OSC FREQUENCY



TEST CIRCUIT



APPLICATION CIRCUIT FOR REFERENCE

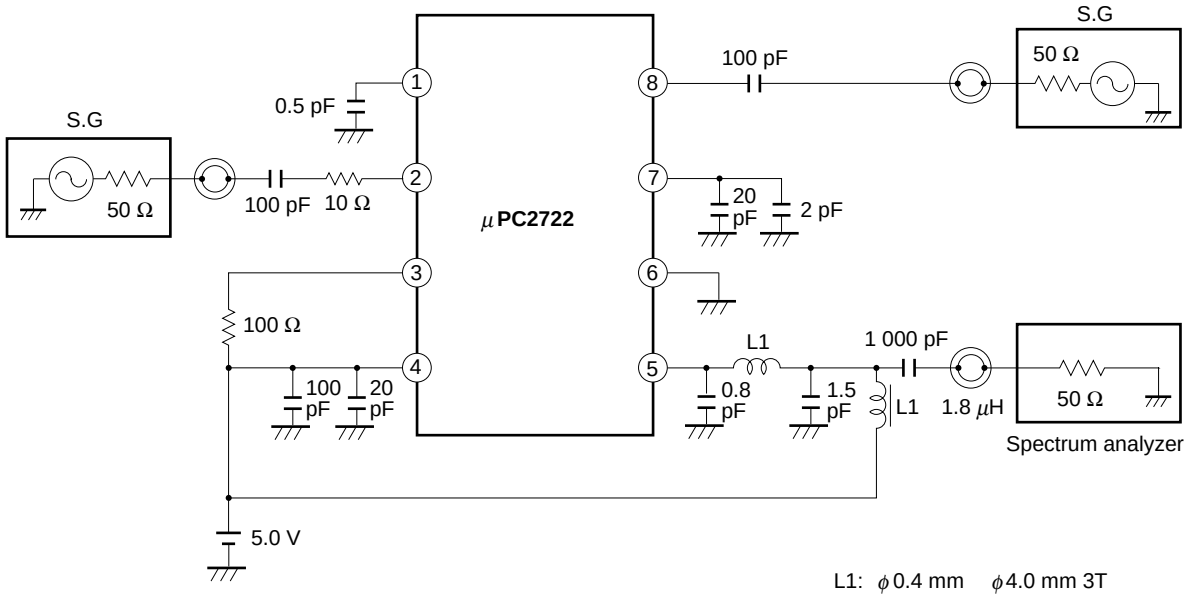


Note Our varactor diodes are discontinued. For varactor diode, contact other supplier.

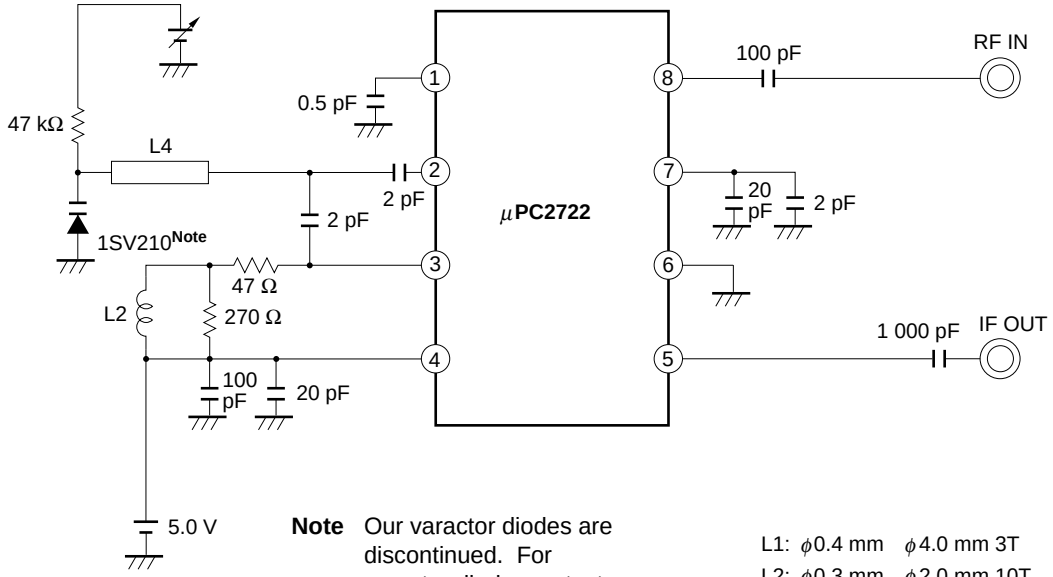
L2: ϕ0.3 mm ϕ2.0 mm 10T
L4: ϕ0.4 mm, ℓ = 4 mm

The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

TEST CIRCUIT



APPLICATION CIRCUIT FOR REFERENCE



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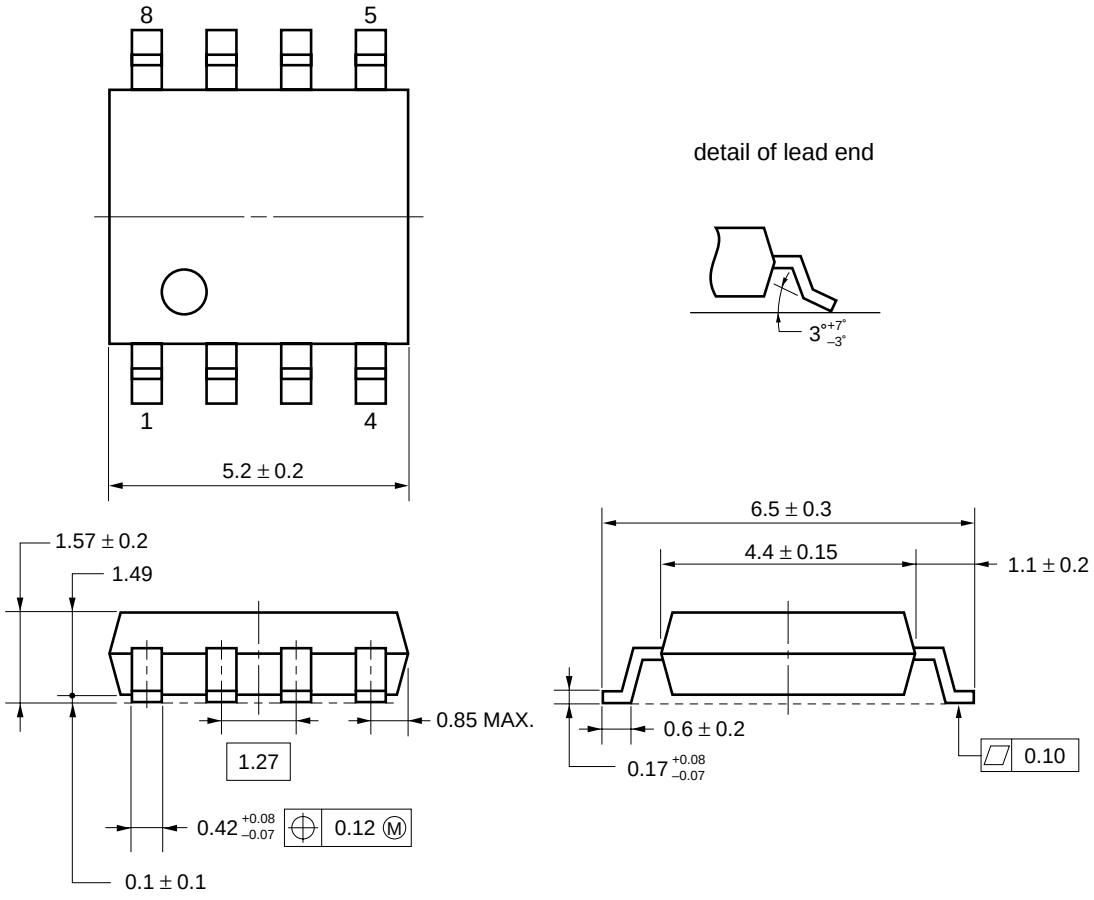
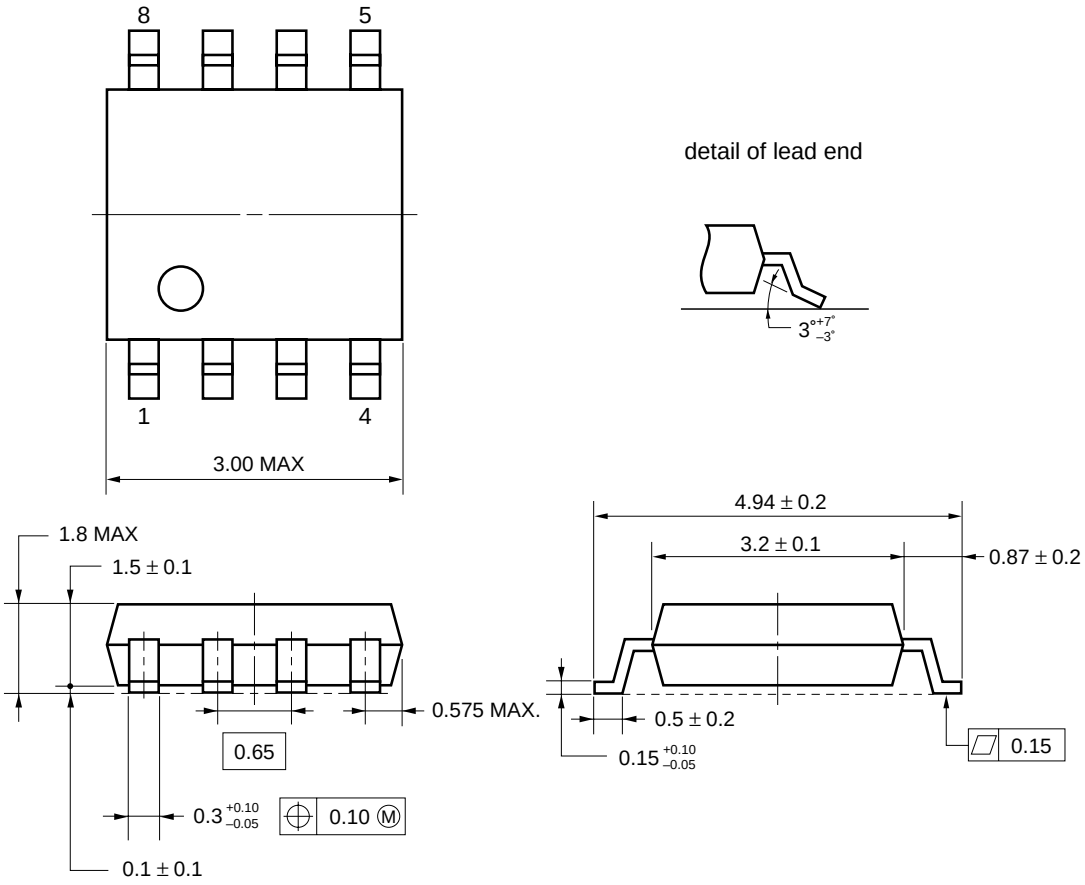
PACKAGE DIMENSIONS

★ **8 PIN PLASTIC SOP (225 mil) (UNIT: mm)**



NOTE Each lead centerline is located within 0.12 mm of its true position (T.P.) at maximum material condition.

8 PIN PLASTIC SSOP (175 mil) (UNIT: mm)



NOTE Each lead centerline is located within 0.10 mm of its true position (T.P.) at maximum material condition.

RECOMMENDED SOLDERING CONDITIONS

The following conditions (see table below) must be met when soldering this product.

Please consult with our sales officers in case other soldering process is used or in case soldering is done under different conditions.

For details of recommended soldering conditions for surface mounting, refer to information document SEMICONDUCTOR DEVICE MOUNTING TECHNOLOGY MANUAL (C10535E).

μPC2721/22

Soldering process	Soldering conditions	Symbol
Infrared ray reflow	Peak package's surface temperature: 235 °C or below, Reflow time: 30 seconds or below (210 °C or higher), Number of reflow process: 3, Exposure limit[Note]: None	IR35-00-3
VPS	Peak package's surface temperature: 215 °C or below, Reflow time: 40 seconds or below (200 °C or higher), Number of reflow process: 3, Exposure limit[Note]: None	VP15-00-3
Wave soldering	Solder temperature: 260 °C or below, Flow time: 10 seconds or below, Number of flow process: 1, Exposure limit[Note]: None	WS60-00-1
Partial heating method	Terminal temperature: 300 °C or below, Flow time: 3 seconds or below, Exposure limitNote: None	

Note Exposure limit before soldering after dry-pack package is opened.
Storage conditions: 25 °C and relative humidity at 65 % or less.

Caution Do not apply more than single process at once, except the "Partial heating method".

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  - Special: Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support)
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