

# BIPOLAR ANALOG INTEGRATED CIRCUIT

# $\mu$ PC2775GR/GS

## FREQUENCY DOWN CONVERTER FOR VHF-UHF BAND TV/VCR TUNER

### DESCRIPTION

The  $\mu$ PC2775GR/GS are Silicon monolithic ICs designed for TV/VCR tuner applications. These ICs consist of double balanced mixers (DBM), local oscillator, preamplifiers for prescaler operation, IF amplifier, regulator, UHF/VHF switching circuit, and so on. These one chip ICs cover a wide frequency band from VHF to UHF bands. These ICs are packaged in a 20 pins SSOP (shrink small outline package;  $\mu$ PC2775GR) or 20 pins SOP (small outline package;  $\mu$ PC2775GS) suitable for surface mounting. So, these ICs enable to produce economical and physically small or high-density VHF - UHF tuner and reduce the tuner development time.

### FEATURES

- VHF to UHF band operation.
- Low oscillation frequency drift against supply voltage and temperature fluctuation due to balanced type UHF oscillator.
- These ICs can be used in single ended or differential IF outputs.
- Supply voltage: 9 V
- Packaged in 20 pins SSOP or 20 pins SOP suitable for surface mounting

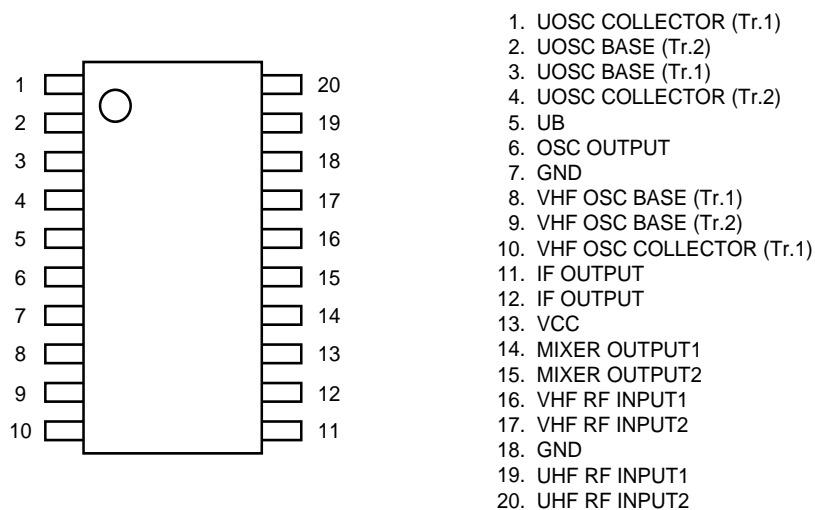
### ORDERING INFORMATION

PART NUMBER	PACKAGE	PACKAGE STYLE
$\mu$ PC2775GR-E1	20 pin plastic SSOP (225 mil)	Embossed tape 12 mm wide, 2.5 k/REEL Pin 1 indicates pull-out direction of tape
$\mu$ PC2775GS-E1	20 pin plastic SOP (300 mil)	Embossed tape 24 mm wide, 2.5 k/REEL Pin 1 indicates pull-out direction of tape

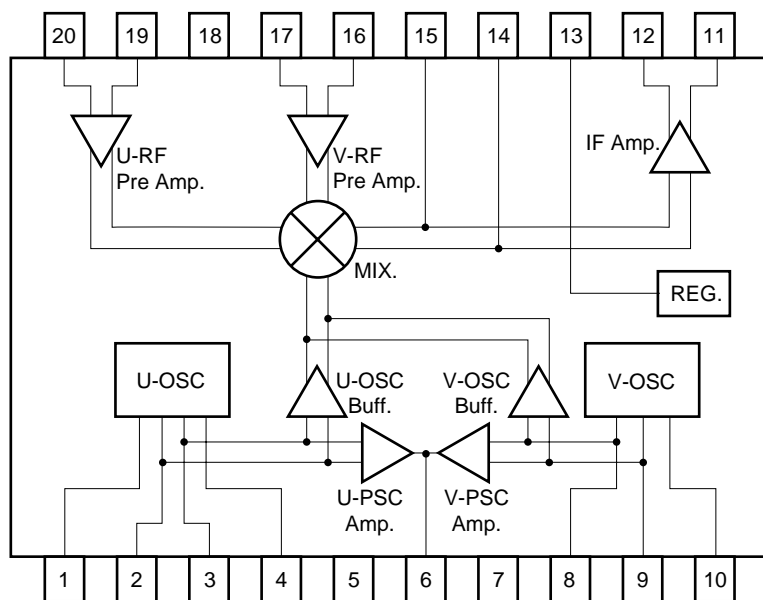
### Caution electro-static sensitive device

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

**PIN CONFIGURATION (Top View)**

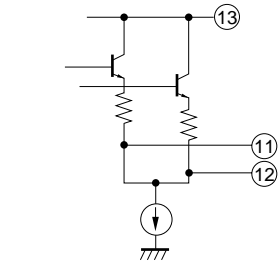
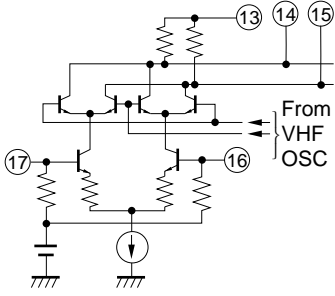
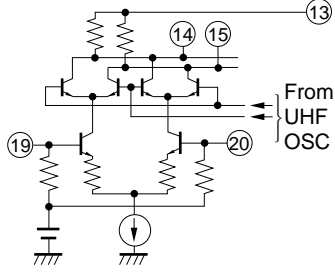


**INTERNAL BLOCK DIAGRAM**



PIN EXPLANATION

Pin No.	Symbol	Pin voltage TYP. above: V mode (V) below: U mode (U)	Function and Explanation	Equivalent circuit
1	UOSC collector (Tr. 1)	6.90 ----- 6.25	Collector pin of UHF oscillator. Assemble LC resonator with 2 pin through capacitor $\approx 1$ pF to oscillate with active feedback Loop.	
2	UOSC base (Tr. 2)	6.00 ----- 3.90	Base pin of UHF oscillator with balance amplifier. Connected to LC resonator through feedback capacitor $\approx 300$ pF.	
3	UOSC base (Tr. 1)	6.00 ----- 3.90	Base pin of UHF oscillator with balance amplifier. Connected to LC resonator through feedback capacitor $\approx 300$ pF.	
4	UOSC collector (Tr. 2)	6.90 ----- 6.25	Collector pin of UHF oscillator with balance amplifier. Assemble LC resonator with 3 pin through capacitor $\approx 1$ pF to oscillate with active feedback Loop. Double balanced oscillator with transistor 1 and transistor 2.	
5	UB	0.0 ----- 9.0	Switching pin for VHF or UHF operation. UHF operation = 9.0 V VHF operation = GND	
6	OSC output	5.40 ----- 5.40	UHF and VHF oscillator output pin. In case of F/S tuner application, connected PLL synthesizer IC's input pin.	
7	GND	0.0 ----- 0.0	VHF and UHF oscillators' GND pin.	
8	VOSC base (Tr. 1)	3.50 ----- 5.90	Base pin of VHF oscillator with balance amplifier. Grounded through capacitor $\approx 10$ pF.	
9	VOSC base (Tr. 2)	3.50 ----- 5.90	Base pin of VHF oscillator with balance amplifier. Assemble LC resonator with 10 pin to oscillate with active feedback Loop.	
10	VOSC collector (Tr. 1)	6.20 ----- 6.90	Base pin of VHF oscillator with balance amplifier. Connected to LC resonator through feedback capacitor $\approx 3$ pF.	

Pin No.	Symbol	Pin voltage TYP. above: V mode (V) below: U mode (U)	Function and Explanation	Equivalent circuit
11 12	IF output	5.80 ----- 5.65	IF output pins of VHF-UHF band functions. Higher output power can be obtained by connecting resistor (ex. 470 Ω) to the ground.	
13	Vcc	9.0 ----- 9.0	Power supply for VHF-UHF band functions.	
14 15	MIX output 1 MIX output 2	7.05 ----- 6.95 7.05 ----- 6.95	VHF and UHF MIX output pin. These pins should be equipped with tank circuit to adjust frequency.	
16	VRF input (bypass)	2.75 ----- 2.80	VRF signal input pin from antenna.	
17	VRF input	2.75 ----- 2.80	Bypass pin for VHF MIX input. Grounded through capacitor.	
18	GND	0 ----- 0	GND pin of MIX, IF amplifier and regulator.	
19	URF input (bypass)	— ----- 2.65	Bypass pin for UHF MIX input. Grounded through capacitor.	
20	URF input	— ----- 2.65	URF signal input pin from antenna.	

**ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25 °C)**

**μPC2775GR**

PARAMETER	SYMBOL	RATING	UNIT	TEST CONDITION
Supply voltage 1	V <sub>CC</sub>	11.0	V	
Supply voltage 2	UB	11.0	V	
Power dissipation	P <sub>D</sub>	500	mW	T <sub>A</sub> = 75 °C <b>Note 1</b>
Operating temperature range	T <sub>A</sub>	-40 to +75	°C	
Storage temperature range	T <sub>stg</sub>	-60 to +150	°C	

**μPC2775GS**

PARAMETER	SYMBOL	RATING	UNIT	TEST CONDITION
Supply voltage 1	V <sub>CC</sub>	11.0	V	
Supply voltage 2	UB	11.0	V	
Power dissipation	P <sub>D</sub>	700	mW	T <sub>A</sub> = 80 °C <b>Note 1</b>
Operating temperature range	T <sub>A</sub>	-40 to +80	°C	
Storage temperature range	T <sub>stg</sub>	-60 to +150	°C	

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

**RECOMMENDED OPERATING RANGE**

**μPC2775GR**

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply voltage 1	V <sub>CC</sub>	8.0	9.0	10.0	V
Supply voltage 2	UB	8.0	9.0	10.0	V
Operating temperature range	T <sub>A</sub>	-20	+25	+75	°C

**μPC2775GS**

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply voltage 1	V <sub>CC</sub>	8.0	9.0	10.0	V
Supply voltage 2	UB	8.0	9.0	10.0	V
Operating temperature range	T <sub>A</sub>	-20	+25	+80	°C

**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C, V<sub>CC</sub> = 9 V, Note 2)**

**μPC2775GR/GS**

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Circuit Current 1 (VHF)	I <sub>CC1</sub>	27.0	35.0	44.0	mA	no input signal <b>Note 3</b>
Circuit Current 2 (UHF)	I <sub>CC2</sub>	28.0	36.0	45.0	mA	no input signal <b>Note 3</b>
Conversion Gain 1 (VHF(L))	CG1	18.5	22.0	25.5	dB	f <sub>RF</sub> = 55 MHz, P <sub>in</sub> = -30 dBm
Conversion Gain 2 (VHF(M))	CG2	18.5	22.0	25.5	dB	f <sub>RF</sub> = 200 MHz, P <sub>in</sub> = -30 dBm
Conversion Gain 3 (VHF(H))	CG3	18.5	22.0	25.5	dB	f <sub>RF</sub> = 470 MHz, P <sub>in</sub> = -30 dBm
Conversion Gain 4 (UHF(L))	CG4	24.5	28.0	31.5	dB	f <sub>RF</sub> = 470 MHz, P <sub>in</sub> = -30 dBm
Conversion Gain 5 (UHF(H))	CG5	24.5	28.0	31.5	dB	f <sub>RF</sub> = 890 MHz, P <sub>in</sub> = -30 dBm
Noise Figure 1 (VHF(L))	NF1	-	10.0	13.0	dB	f <sub>RF</sub> = 55 MHz
Noise Figure 2 (VHF(M))	NF2	-	10.0	13.0	dB	f <sub>RF</sub> = 200 MHz
Noise Figure 3 (VHF(H))	NF3	-	10.0	13.0	dB	f <sub>RF</sub> = 470 MHz
Noise Figure 4 (UHF(L))	NF4	-	9.0	12.0	dB	f <sub>RF</sub> = 470 MHz
Noise Figure 5 (UHF(H))	NF5	-	10.0	13.0	dB	f <sub>RF</sub> = 890 MHz
Maximum Output Level 1 (VHF(L))	P <sub>O(SAT)1</sub>	4.0	7.0	-	dBm	f <sub>RF</sub> = 55 MHz, P <sub>in</sub> = 0 dBm
Maximum Output Level 2 (VHF(M))	P <sub>O(SAT)2</sub>	4.0	7.0	-	dBm	f <sub>RF</sub> = 200 MHz, P <sub>in</sub> = 0 dBm
Maximum Output Level 3 (VHF(H))	P <sub>O(SAT)3</sub>	4.0	7.0	-	dBm	f <sub>RF</sub> = 470 MHz, P <sub>in</sub> = 0 dBm
Maximum Output Level 4 (UHF(L))	P <sub>O(SAT)4</sub>	3.5	6.5	-	dBm	f <sub>RF</sub> = 470 MHz, P <sub>in</sub> = 0 dBm
Maximum Output Level 5 (UHF(H))	P <sub>O(SAT)5</sub>	3.5	6.5	-	dBm	f <sub>RF</sub> = 890 MHz, P <sub>in</sub> = 0 dBm

**Notes 2** By measurement circuit

**3** no resistance of IF output

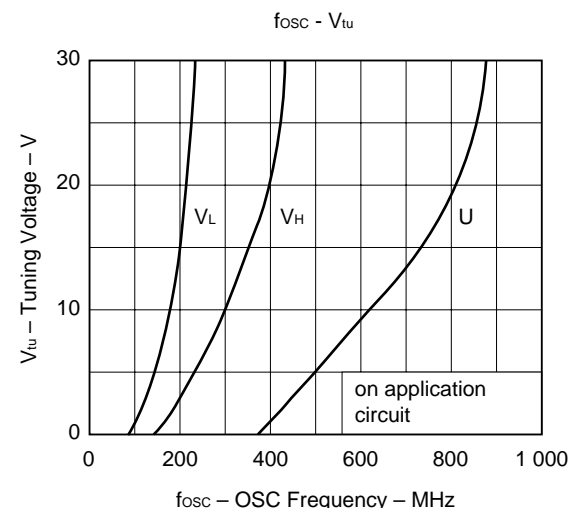
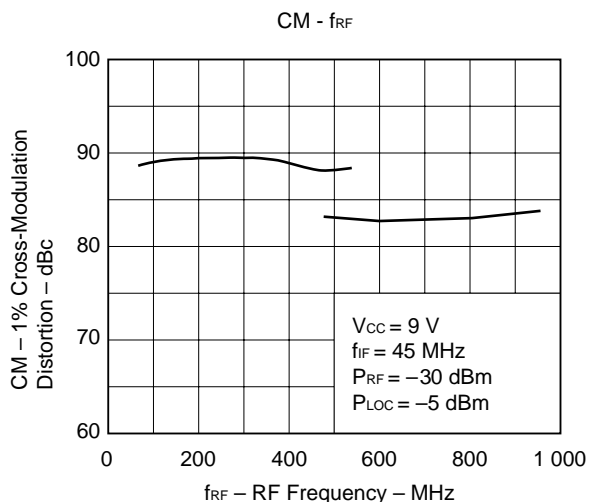
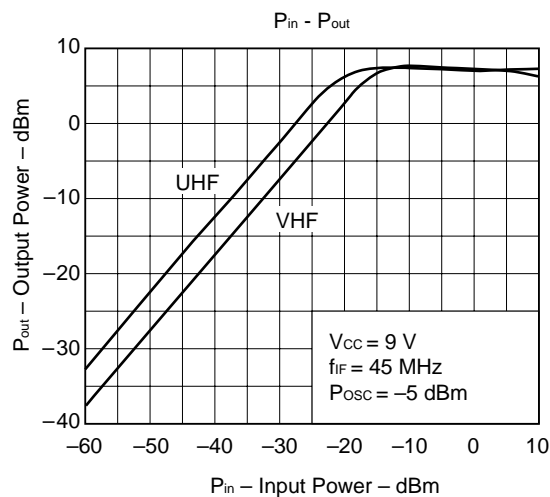
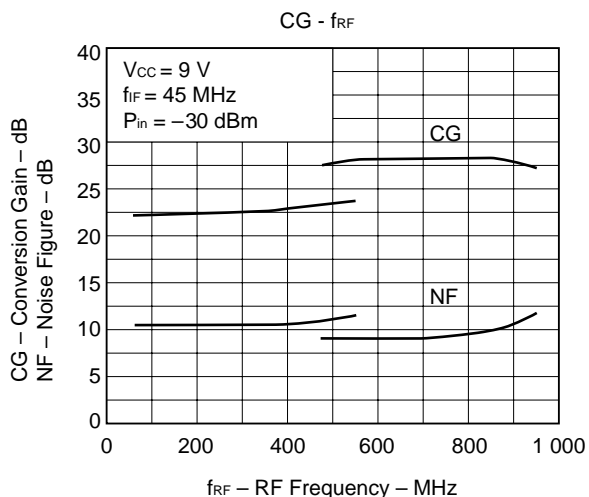
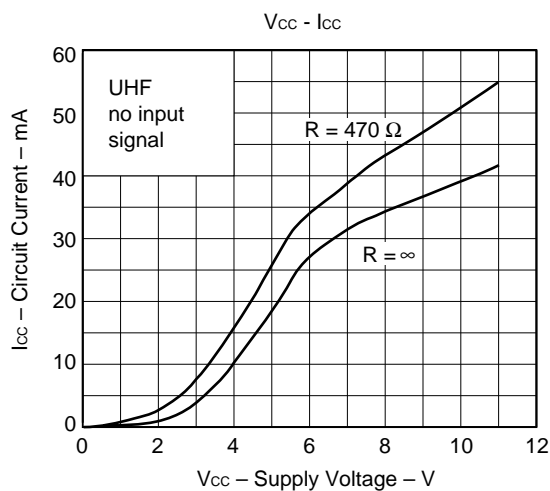
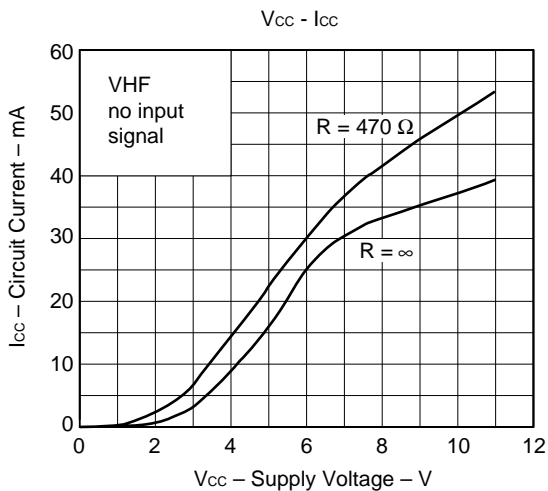
In case of R = 470 Ω; VHF: 45.2 mA (TYP.), UHF: 46.7 mA (TYP.)

**STANDARD CHARACTERISTICS (T<sub>A</sub> = 25 °C, V<sub>CC</sub> = 9 V)**

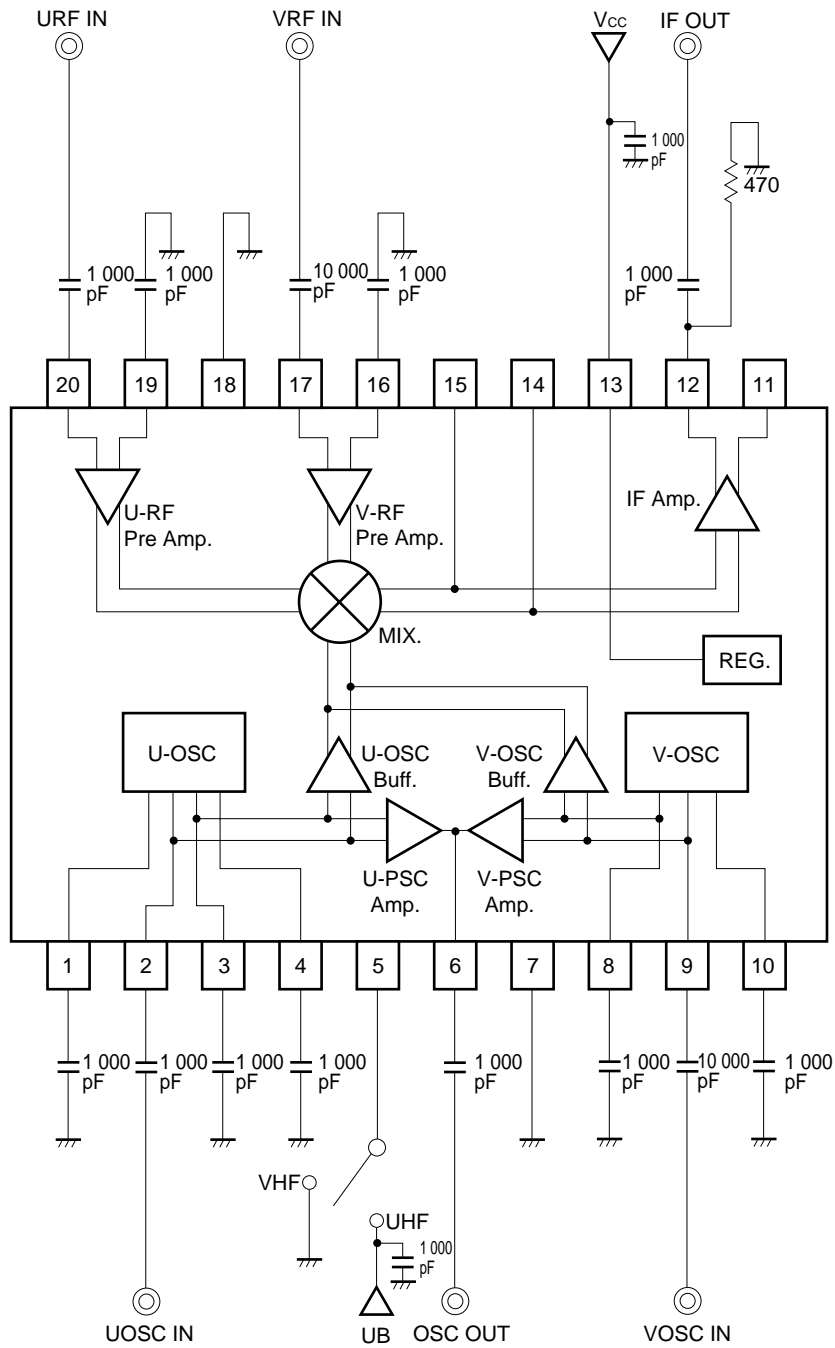
**μPC2775GR/GS**

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
1 % Cross-Modulation Distortion 1 (VHF(L))	CM1	-	88.0	-	dBμ	f <sub>RF</sub> = 55 MHz, P <sub>in</sub> = -30 dBm
1 % Cross-Modulation Distortion 2 (VHF(M))	CM2	-	88.0	-	dBμ	f <sub>RF</sub> = 200 MHz, P <sub>in</sub> = -30 dBm
1 % Cross-Modulation Distortion 3 (VHF(H))	CM3	-	88.0	-	dBμ	f <sub>RF</sub> = 470 MHz, P <sub>in</sub> = -30 dBm
1 % Cross-Modulation Distortion 4 (UHF(L))	CM4	-	83.0	-	dBμ	f <sub>RF</sub> = 470 MHz, P <sub>in</sub> = -30 dBm
1 % Cross-Modulation Distortion 5 (UHF(H))	CM5	-	83.0	-	dBμ	f <sub>RF</sub> = 890 MHz, P <sub>in</sub> = -30 dBm

TYPICAL CHARACTERISTICS ( $T_A = 25\text{ }^\circ\text{C}$ ) - on Measurement Circuit -

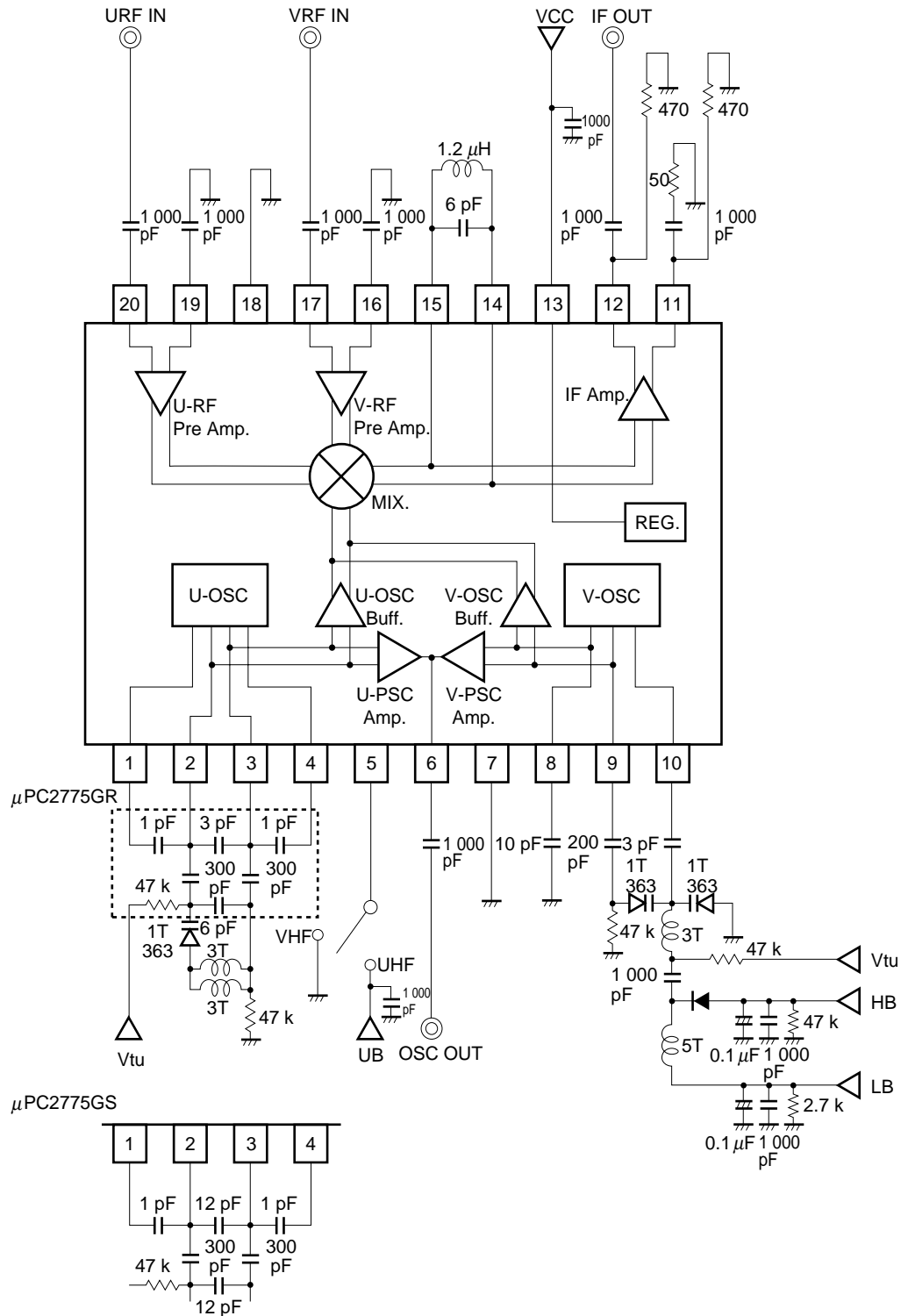


MEASUREMENT CIRCUIT



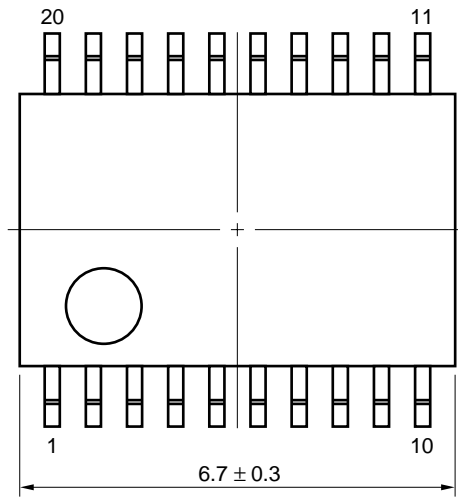


APPLICATION CIRCUIT EXAMPLE

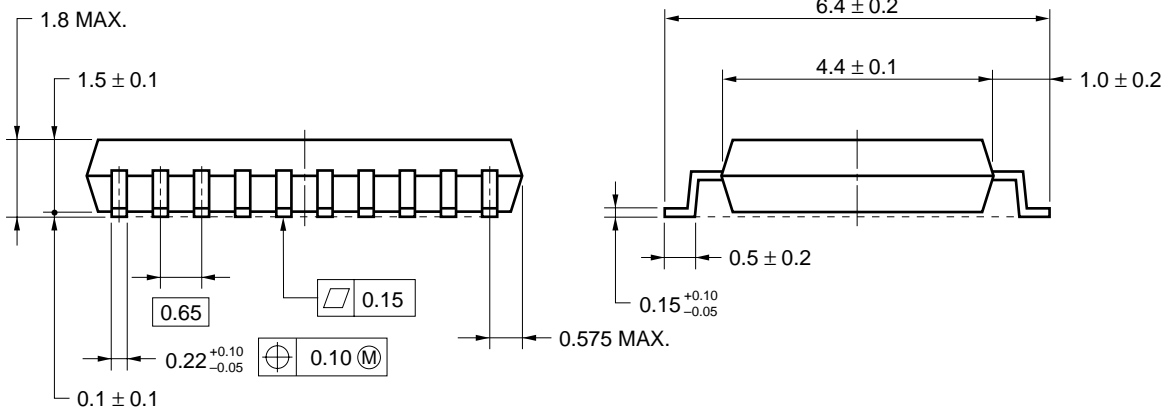
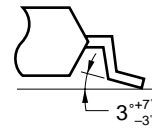


PACKAGE DIMENSIONS

★ 20 PIN PLASTIC SSOP (225 mil) (UNIT: mm)

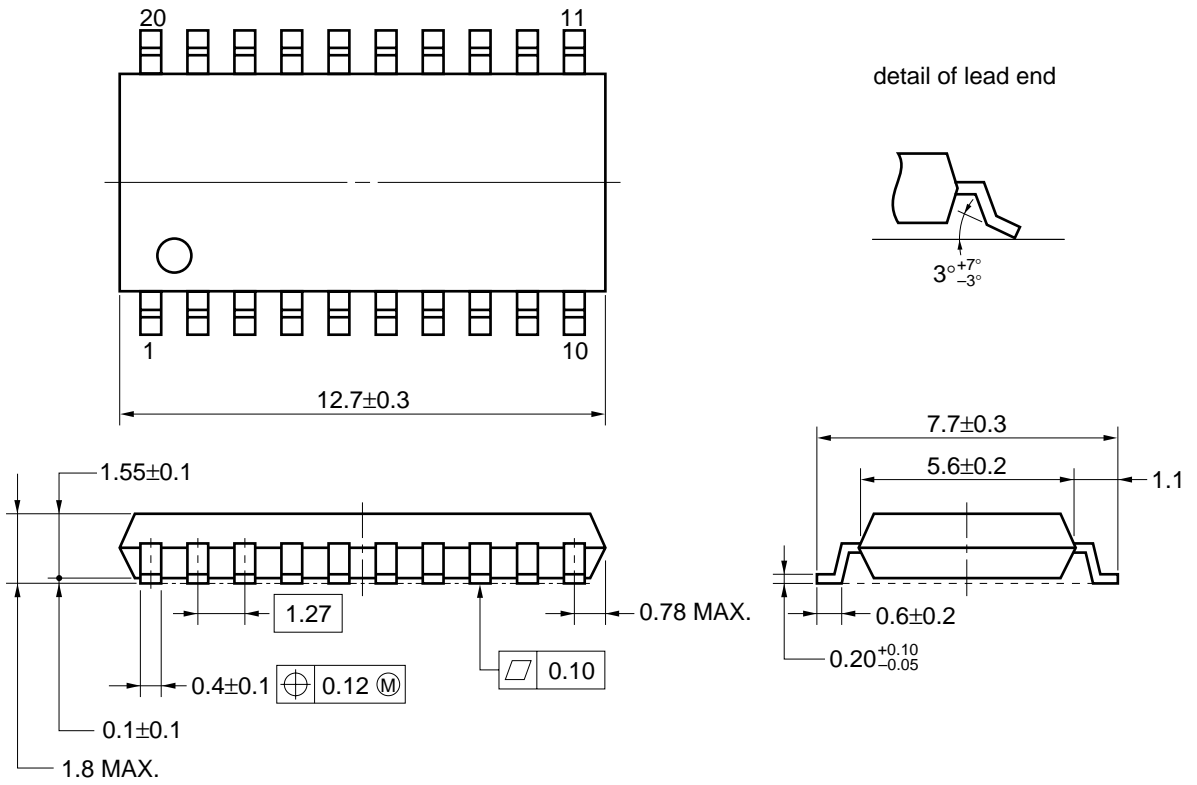


detail of lead end



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

★ 20 PIN PLASTIC SOP (300 mil) (UNIT: mm)



**NOTE** Each lead centerline is located within 0.12 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 offices 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).

**μPC2775GR/GS**

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: 2, Exposure limit <sup>Note</sup> : None	IR35-00-2
VPS	Peak package's surface temperature: 215 °C or below, Reflow time: 40 seconds or below (200 °C or higher), Number of reflow process: 2, Exposure limit <sup>Note</sup> : None	VP15-00-2
Partial heating method	Terminal temperature: 300 °C or below, Flow time: 3 seconds or below, Exposure limit <sup>Note</sup> : 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 for “Partial heating method”.

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