

BIPOLAR ANALOG INTEGRATED CIRCUIT

μ PC2775GR/GS

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

DESCRIPTION

The μ 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; μ PC2775GR) or 20 pins SOP (small outline package; μ 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

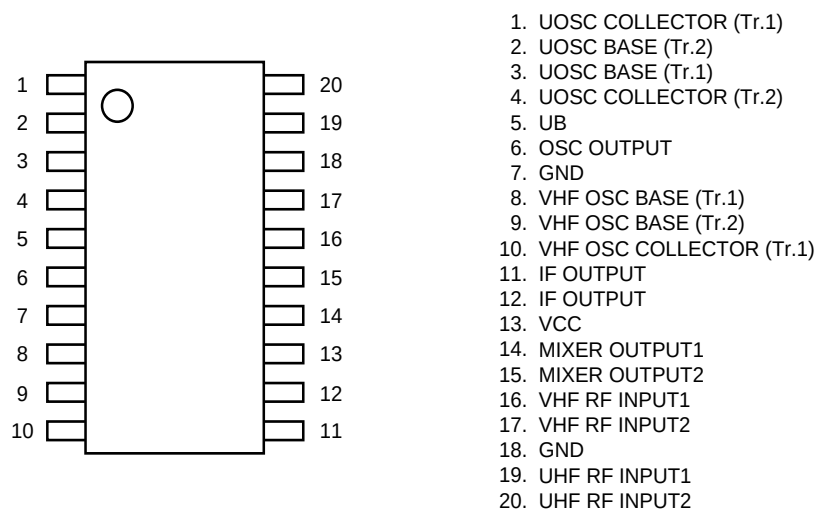
ORDERING INFORMATION

PART NUMBER	PACKAGE	PACKAGE STYLE
μ 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
μ 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

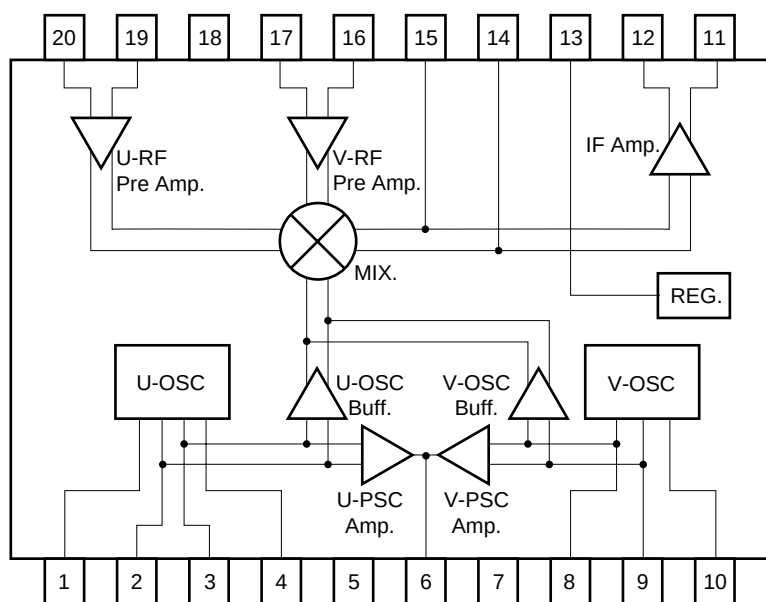
Caution electro-static sensitive device

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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 ≈ 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 ≈ 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 ≈ 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 ≈ 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 ≈ 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 ≈ 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	MIX output 1	7.05 ----- 6.95	VHF and UHF MIX output pin. These pins should be equipped with tank circuit to adjust frequency.	
15	MIX output 2	7.05 ----- 6.95		
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 ($T_A = 25\text{ }^{\circ}\text{C}$) **μ PC2775GR**

PARAMETER	SYMBOL	RATING	UNIT	TEST CONDITION
Supply voltage 1	V_{CC}	11.0	V	
Supply voltage 2	UB	11.0	V	
Power dissipation	P_D	500	mW	$T_A = 75\text{ }^{\circ}\text{C}$ Note 1
Operating temperature range	T_A	-40 to +75	$^{\circ}\text{C}$	
Storage temperature range	T_{stg}	-60 to +150	$^{\circ}\text{C}$	

 μ PC2775GS

PARAMETER	SYMBOL	RATING	UNIT	TEST CONDITION
Supply voltage 1	V_{CC}	11.0	V	
Supply voltage 2	UB	11.0	V	
Power dissipation	P_D	700	mW	$T_A = 80\text{ }^{\circ}\text{C}$ Note 1
Operating temperature range	T_A	-40 to +80	$^{\circ}\text{C}$	
Storage temperature range	T_{stg}	-60 to +150	$^{\circ}\text{C}$	

Note 1 Mounted on $50 \times 50 \times 1.6$ mm double copper epoxy glass board.

RECOMMENDED OPERATING RANGE **μ PC2775GR**

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply voltage 1	V_{CC}	8.0	9.0	10.0	V
Supply voltage 2	UB	8.0	9.0	10.0	V
Operating temperature range	T_A	-20	+25	+75	$^{\circ}\text{C}$

 μ PC2775GS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply voltage 1	V_{CC}	8.0	9.0	10.0	V
Supply voltage 2	UB	8.0	9.0	10.0	V
Operating temperature range	T_A	-20	+25	+80	$^{\circ}\text{C}$

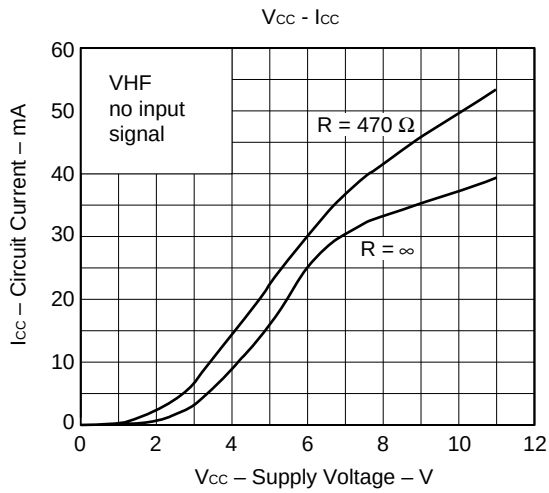
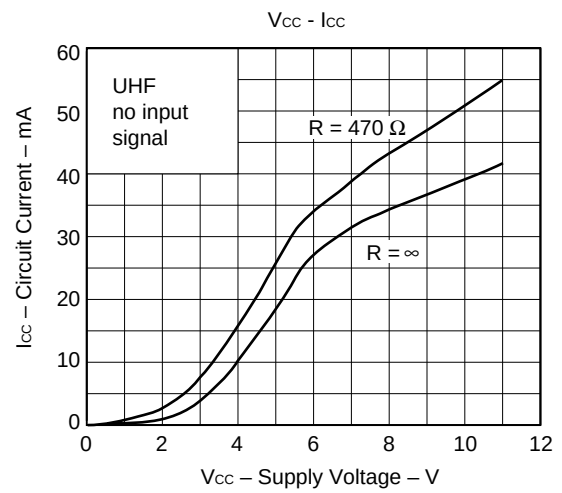
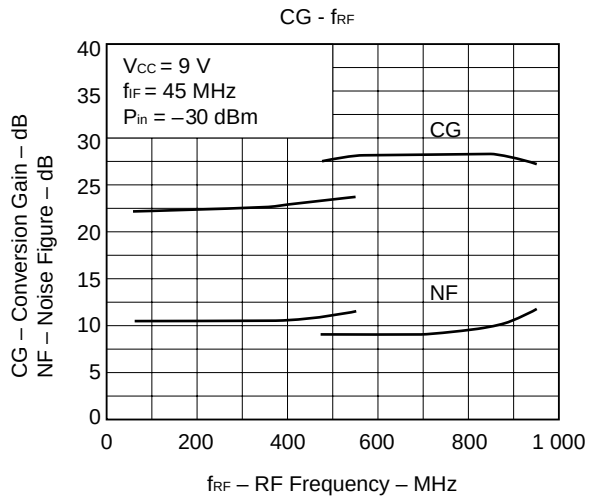
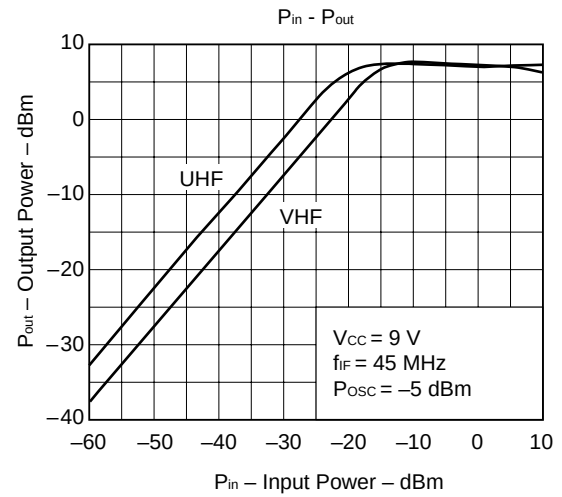
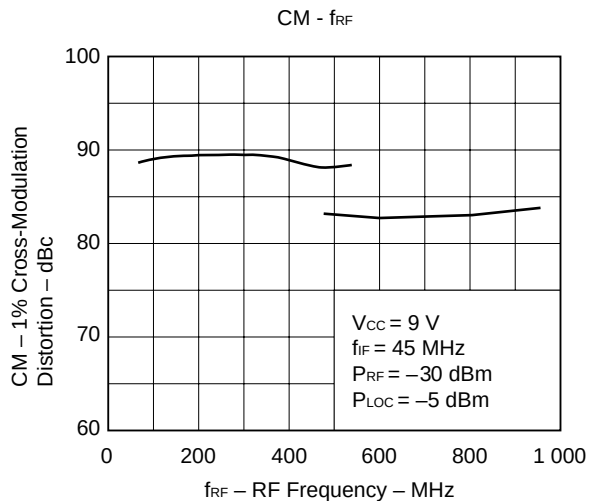
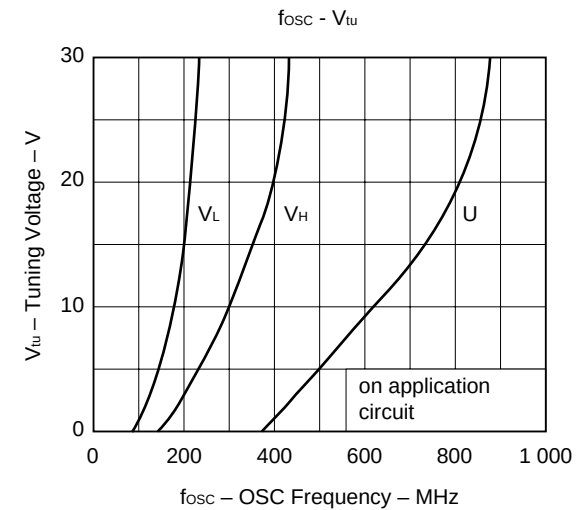
ELECTRICAL CHARACTERISTICS ($T_A = 25\text{ }^{\circ}\text{C}$, $V_{CC} = 9\text{ V}$, Note 2) μ PC2775GR/GS

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

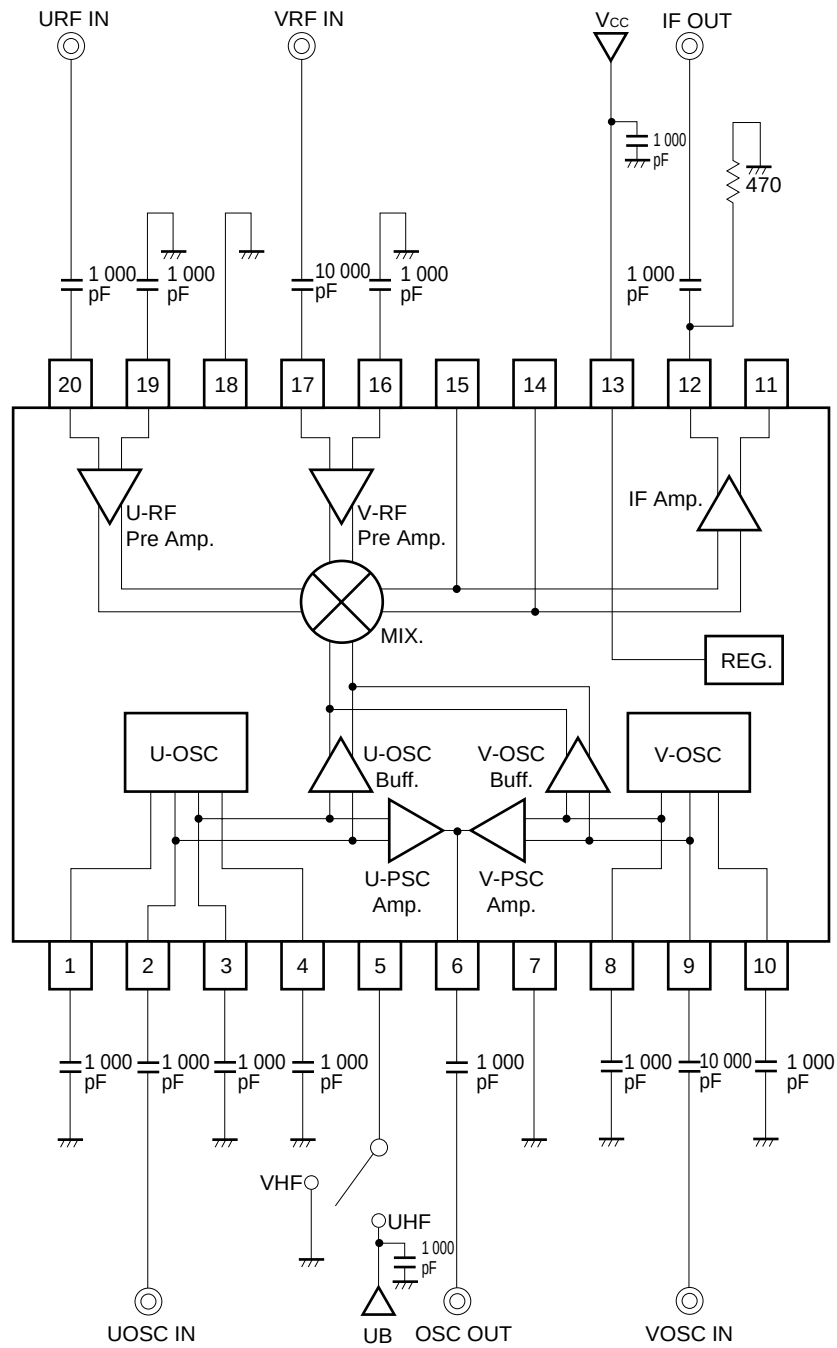
Notes 2 By measurement circuit**3** no resistance of IF outputIn case of $R = 470\text{ }\Omega$; VHF: 45.2 mA (TYP.), UHF: 46.7 mA (TYP.)**STANDARD CHARACTERISTICS** ($T_A = 25\text{ }^{\circ}\text{C}$, $V_{CC} = 9\text{ V}$) μ PC2775GR/GS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
1 % Cross-Modulation Distortion 1 (VHF _(L))	CM1	—	88.0	—	dB μ	$f_{RF} = 55\text{ MHz}$, $P_{in} = -30\text{ dBm}$
1 % Cross-Modulation Distortion 2 (VHF _(M))	CM2	—	88.0	—	dB μ	$f_{RF} = 200\text{ MHz}$, $P_{in} = -30\text{ dBm}$
1 % Cross-Modulation Distortion 3 (VHF _(H))	CM3	—	88.0	—	dB μ	$f_{RF} = 470\text{ MHz}$, $P_{in} = -30\text{ dBm}$
1 % Cross-Modulation Distortion 4 (UHF _(L))	CM4	—	83.0	—	dB μ	$f_{RF} = 470\text{ MHz}$, $P_{in} = -30\text{ dBm}$
1 % Cross-Modulation Distortion 5 (UHF _(H))	CM5	—	83.0	—	dB μ	$f_{RF} = 890\text{ MHz}$, $P_{in} = -30\text{ dBm}$

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



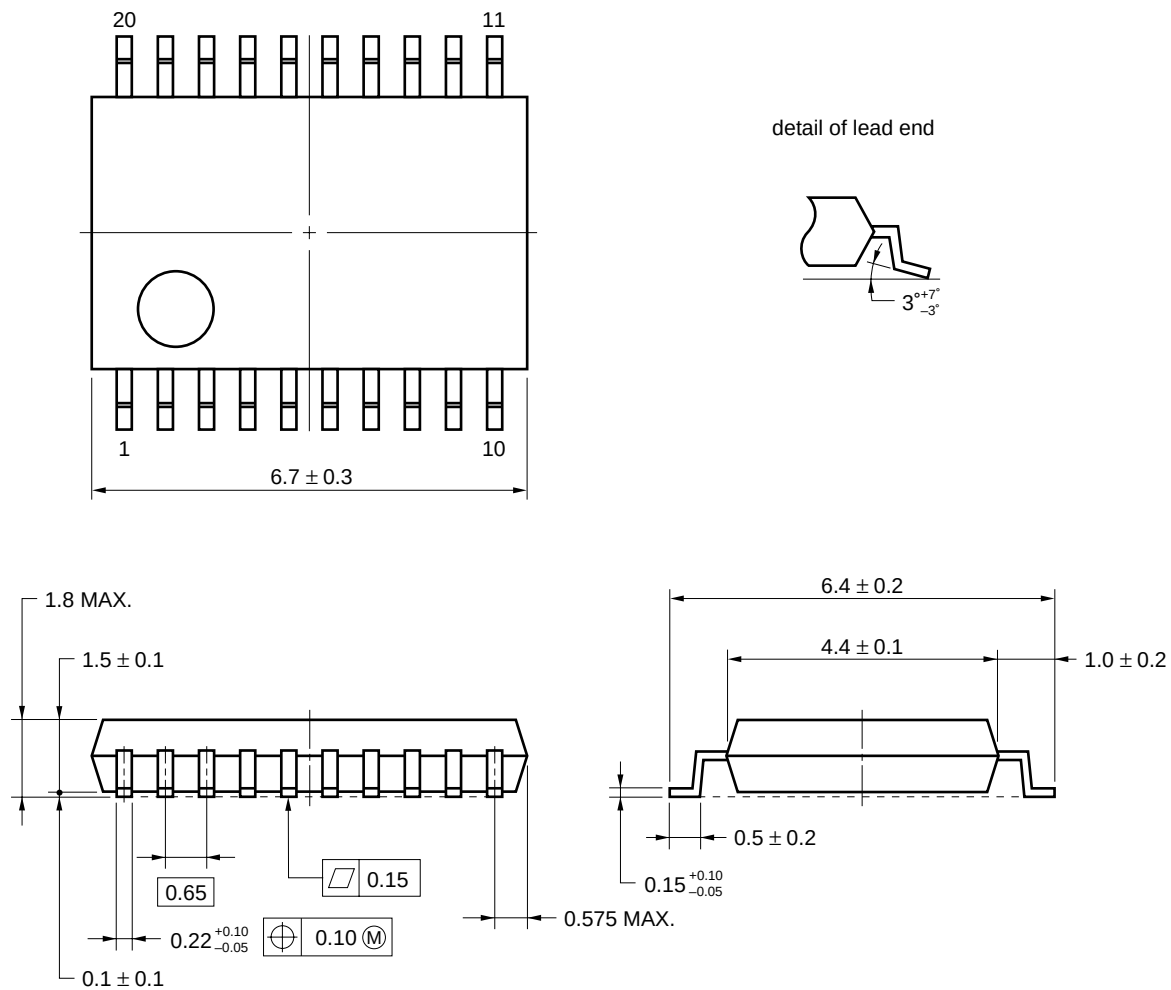
MEASUREMENT CIRCUIT



The schematic diagram illustrates the internal architecture of the PC2775 receiver IC. The chip is divided into two main sections: the top section (pins 11-20) and the bottom section (pins 1-10). The top section contains the U-RF Pre Amp, V-RF Pre Amp, MIX, U-OSC, V-OSC, U-PSC Amp, and V-PSC Amp. The bottom section contains the U-OSC, V-OSC, U-PSC Amp, and V-PSC Amp. The diagram shows various external components connected to the pins, including capacitors (1000 pF, 100 pF, 10 pF, 1 pF, 0.1 μF, 0.01 μF, 0.001 μF), inductors (1.2 μH, 50 nH, 470 nH, 47 nH, 5T, 1T, 3T, 300 pF), and resistors (47 k, 100 k, 10 k, 1 k, 100 Ω, 10 Ω, 1 Ω). The diagram also shows the connections for the Vtu, HB, LB, and OSC OUT signals.

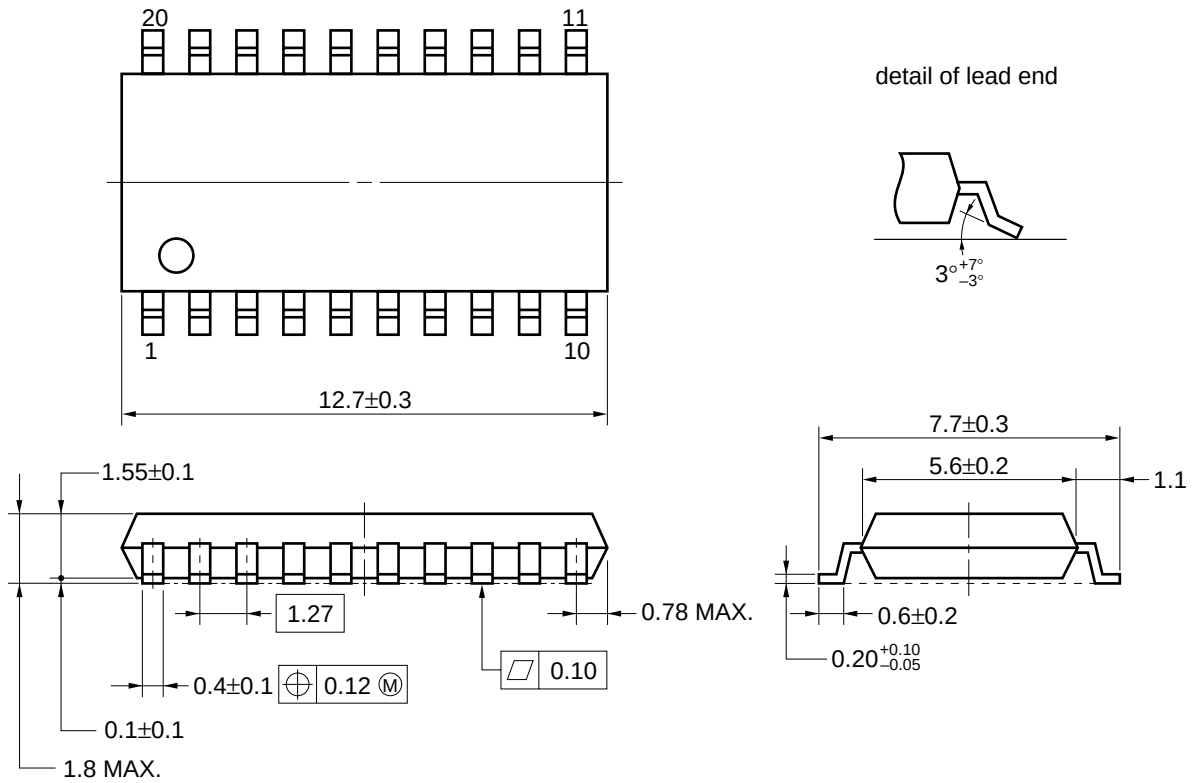
PACKAGE DIMENSIONS

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



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).

 μ PC2775GR/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 ^{Note} : 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 ^{Note} : None	VP15-00-2
Partial heating method	Terminal temperature: 300 °C or below, Flow time: 3 seconds or below, Exposure limit ^{Note} : 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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 - 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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