NEC

BIPOLAR ANALOG INTEGRATED CIRCUIT

μPC2775GR/GS

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

DESCRIPTION

The μPC2775GR/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; μPC2775GR) or 20 pins SOP (small outline package; μPC2775GS) 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
μPC2775GR-E1	20 pin plastic SSOP (225 mil)	Embossed tape 12 mm wide, 2.5 k/REEL Pin 1 indicates pull-out direction of tape
μPC2775GS-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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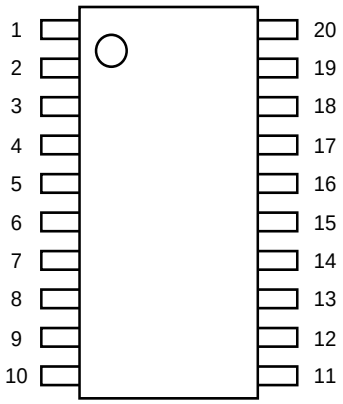
Printed in Japan

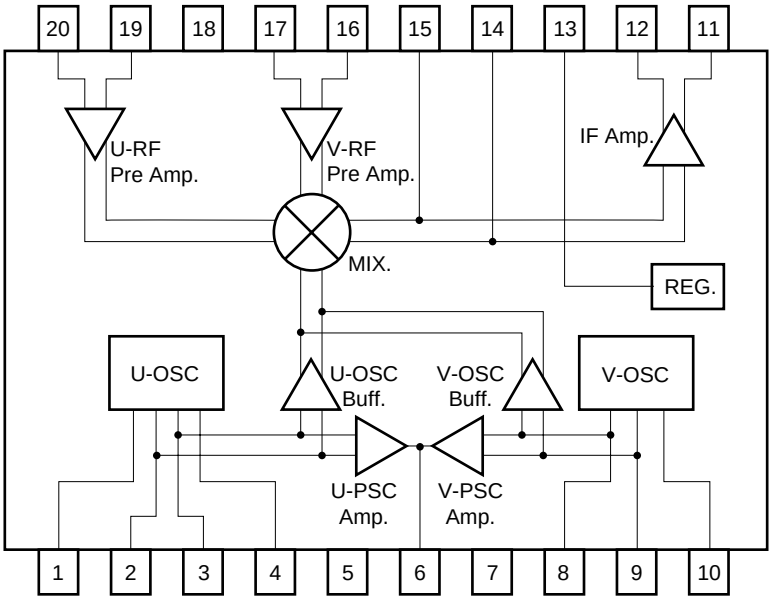
The mark ★ shows major revised points.

PIN CONFIGURATION (Top View)

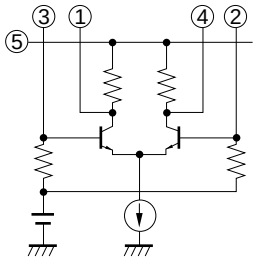
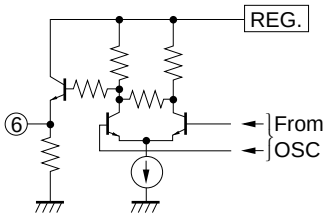
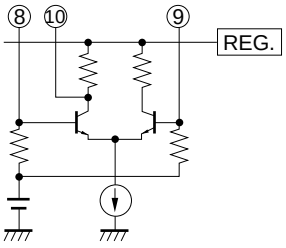


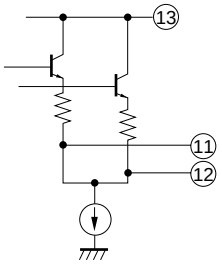
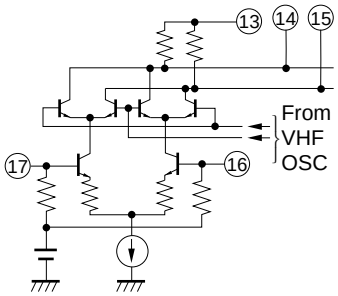
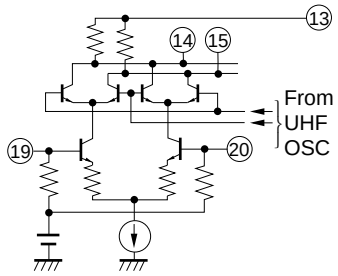
1. UOSC COLLECTOR (Tr.1)
2. UOSC BASE (Tr.2)
3. UOSC BASE (Tr.1)
4. UOSC COLLECTOR (Tr.2)
5. UB
6. OSC OUTPUT
7. GND
8. VHF OSC BASE (Tr.1)
9. VHF OSC BASE (Tr.2)
10. VHF OSC COLLECTOR (Tr.1)
11. IF OUTPUT
12. IF OUTPUT
13. VCC
14. MIXER OUTPUT1
15. MIXER OUTPUT2
16. VHF RF INPUT1
17. VHF RF INPUT2
18. GND
19. UHF RF INPUT1
20. UHF RF INPUT2

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 registor (ex. 470 Ω) to the ground.	
13	V_{CC}	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 °C)

μPC2775GR

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 °C Note 1
Operating temperature range	T_A	–40 to +75	°C	
Storage temperature range	T_{stg}	–60 to +150	°C	

μPC2775GS

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 °C Note 1
Operating temperature range	T_A	–40 to +80	°C	
Storage temperature range	T_{stg}	–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_{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	°C

μPC2775GS

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	°C

ELECTRICAL CHARACTERISTICS (T_A = 25 °C, V_{CC} = 9 V, Note 2)

μPC2775GR/GS

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

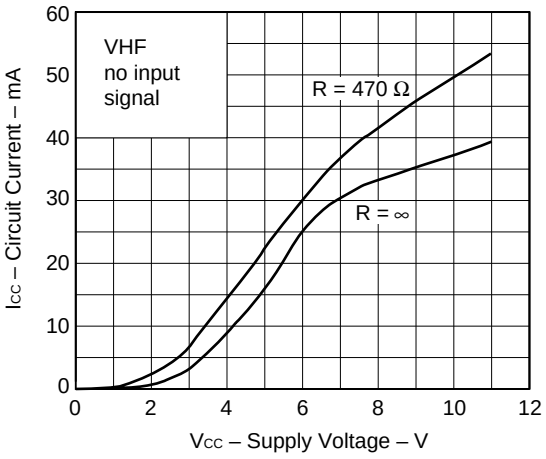
STANDARD CHARACTERISTICS (T_A = 25 °C, V_{CC} = 9 V)

μPC2775GR/GS

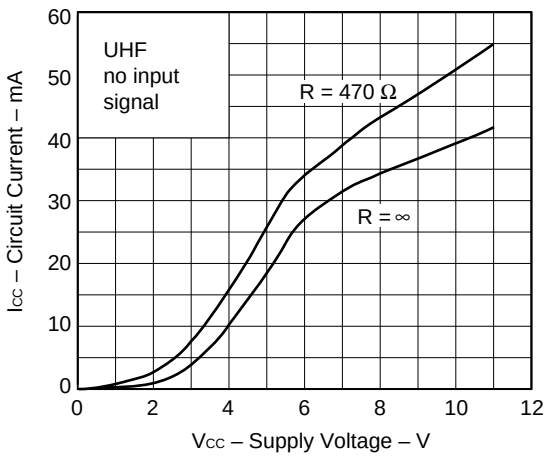
PARAMETER		SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
1 % Cross-Modulation Distortion 1	($VHF_{(L)}$)	CM1	–	88.0	–	dBμ	f_{RF} = 55 MHz, P_{in} = –30 dBm
1 % Cross-Modulation Distortion 2	($VHF_{(M)}$)	CM2	–	88.0	–	dBμ	f_{RF} = 200 MHz, P_{in} = –30 dBm
1 % Cross-Modulation Distortion 3	($VHF_{(H)}$)	CM3	–	88.0	–	dBμ	f_{RF} = 470 MHz, P_{in} = –30 dBm
1 % Cross-Modulation Distortion 4	($UHF_{(L)}$)	CM4	–	83.0	–	dBμ	f_{RF} = 470 MHz, P_{in} = –30 dBm
1 % Cross-Modulation Distortion 5	($UHF_{(H)}$)	CM5	–	83.0	–	dBμ	f_{RF} = 890 MHz, P_{in} = –30 dBm

TYPICAL CHARACTERISTICS (T_A = 25 °C) - on Measurement Circuit -

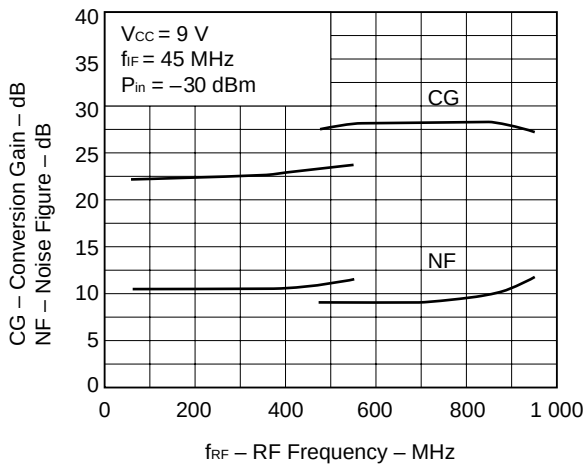
V_{CC} - I_{CC}



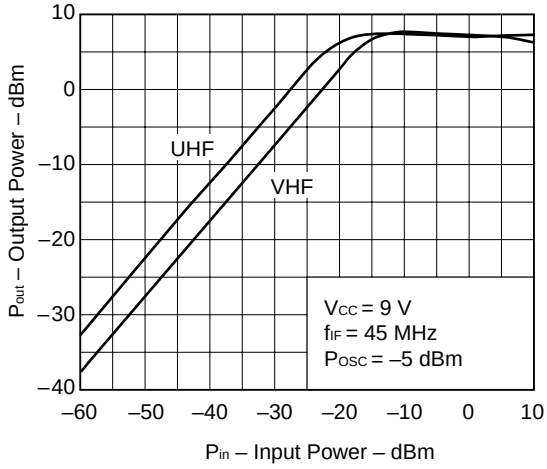
V_{CC} - I_{CC}



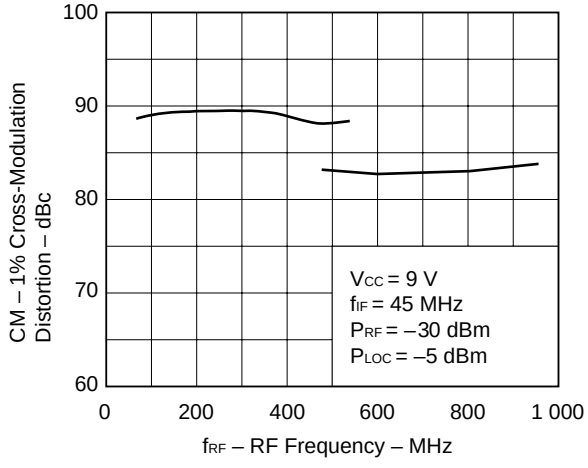
CG - f_{RF}



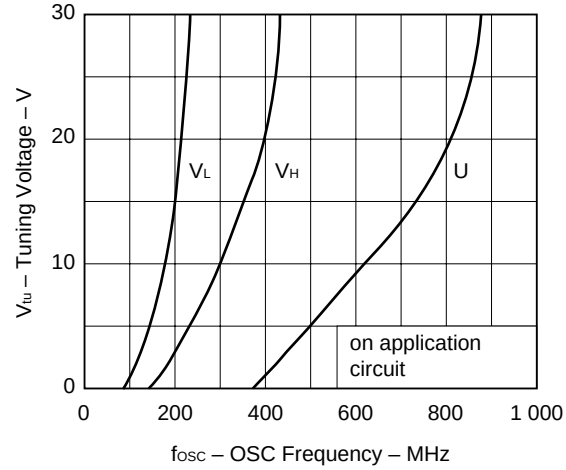
P_{in} - P_{out}



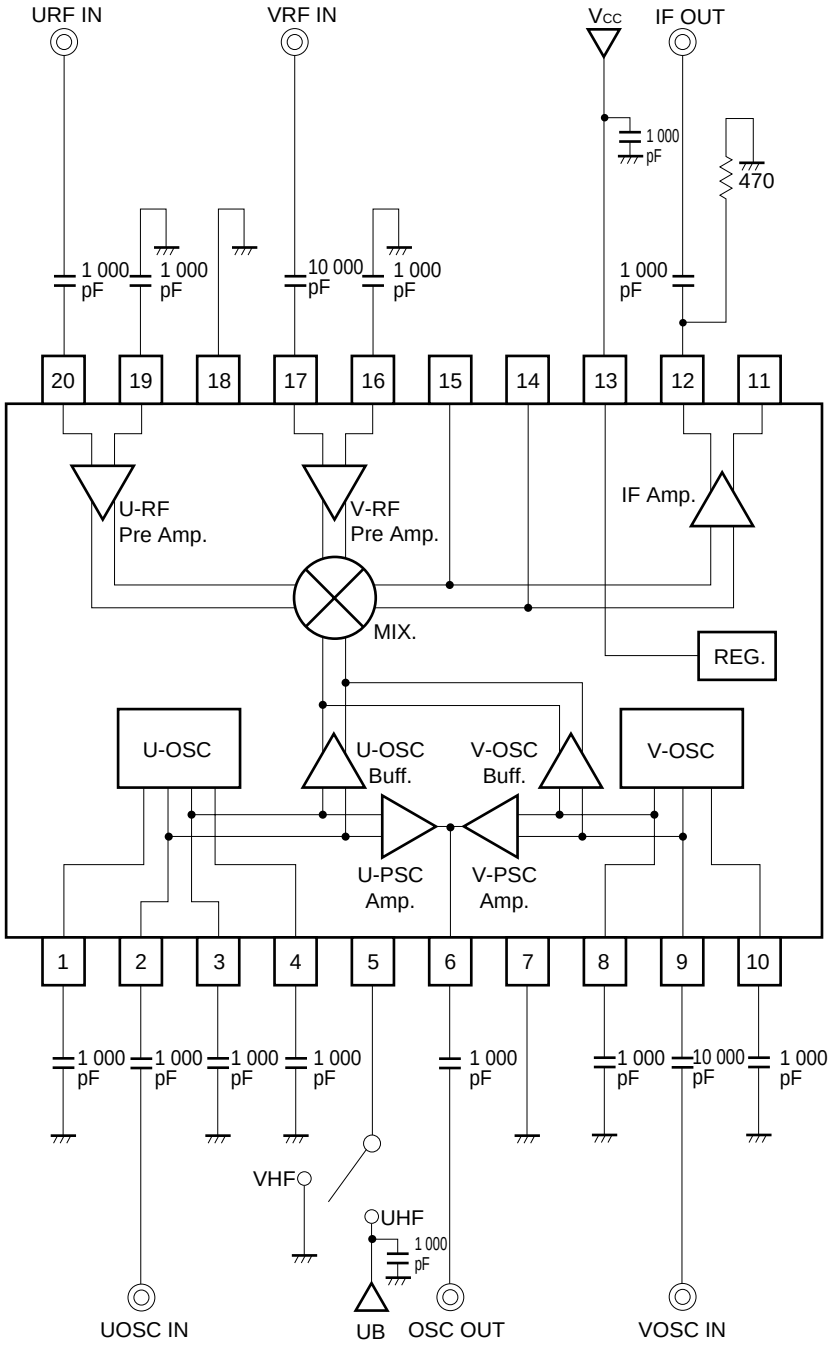
CM - f_{RF}



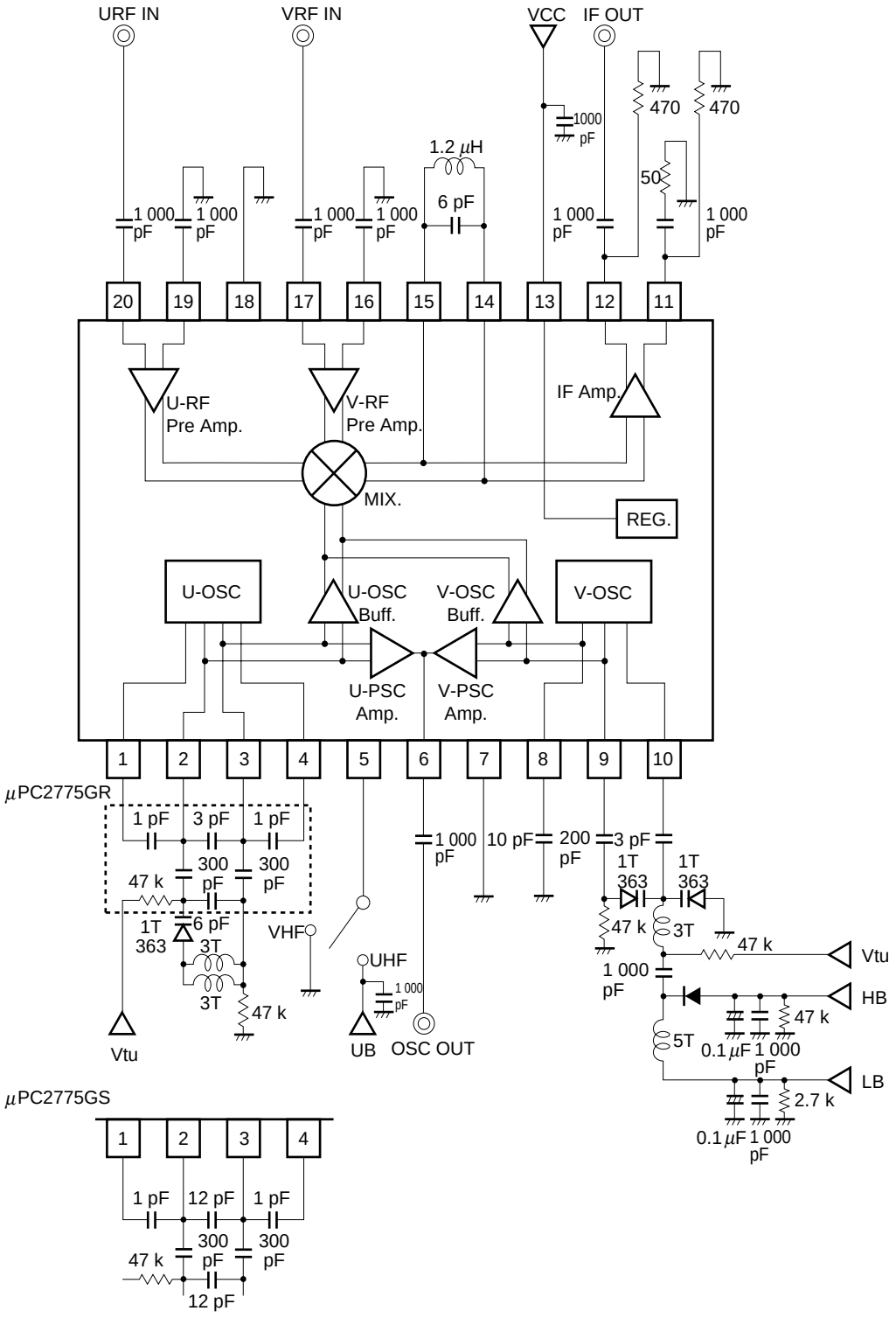
f_{OSC} - V_{tu}



MEASUREMENT CIRCUIT

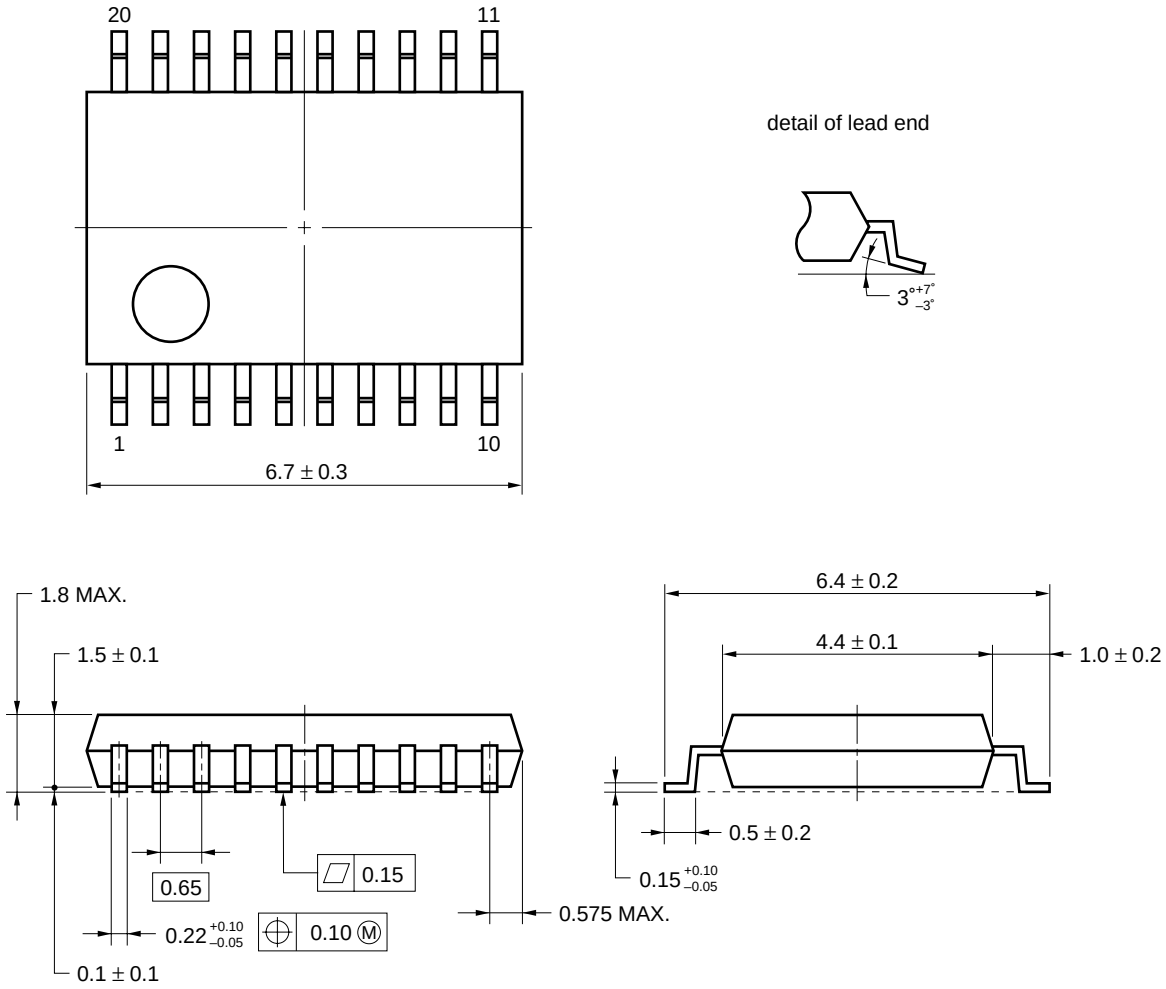


APPLICATION CIRCUIT EXAMPLE



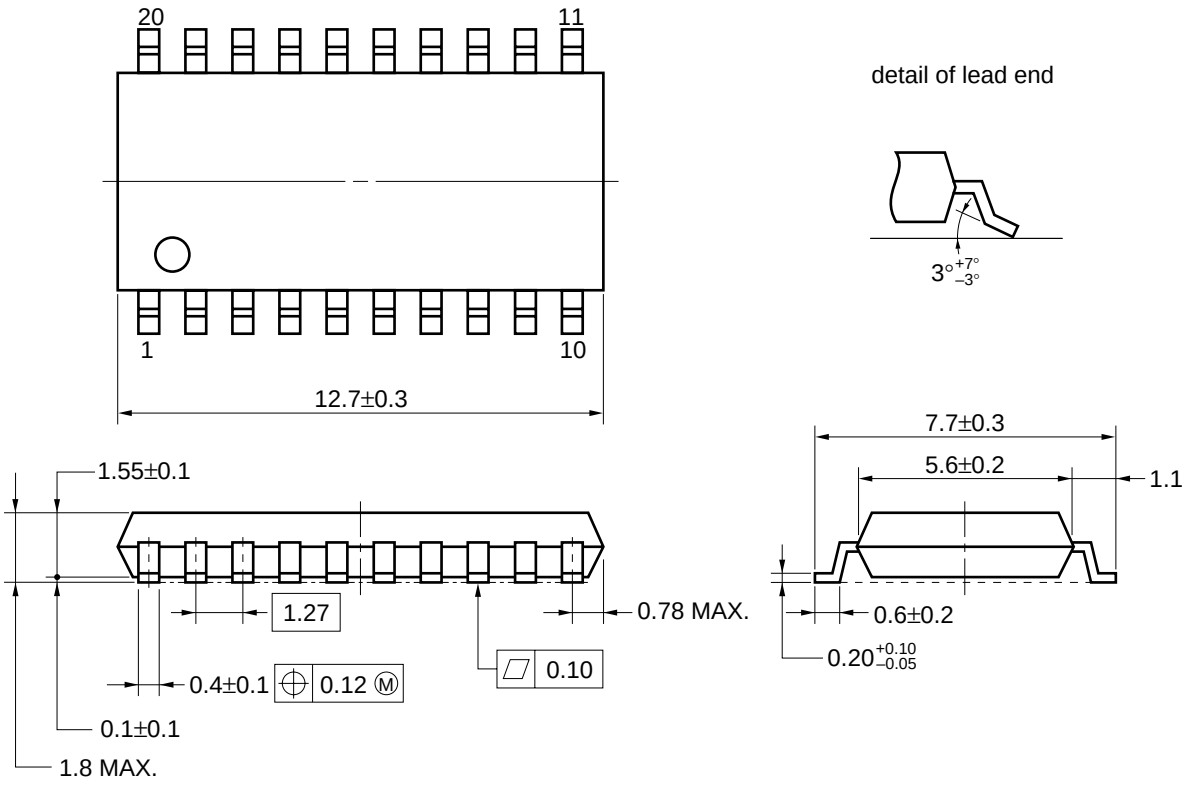
PACKAGE DIMENSIONS

★ **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).

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[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)
  - Specific: Aircraft, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems or medical equipment for life support, etc.

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