DATA SHEET

NEC

BIPOLAR ANALOG INTEGRATED CIRCUIT

μPC2766GR/GS

WIDE BAND IQ DEMODULATOR FOR DIGITAL VIDEO/DATA RECEIVER

DESCRIPTION

The μPC2766GR/GS is a Silicon monolithic IC designed for use as IQ demodulator in wide dynamic range compressed video or spread spectrum receivers. This IC consists of a wide band RF amplifier, gain control amplifier, dual balanced mixers (DBM), Lo buffers, and I & Q output buffer amplifiers.

The package is 20 pin SSOP (shrink small outline package: μPC2766GR) or 20 pin SOP (μPC2766GS) suitable for high-density surface mount.

FEATURES

- Broadband operation — RF & LO up to 1 000 MHz; IF (IQ) up to 200 MHz
- Wideband IQ phase and amplitude balance — Amplitude balance ±0.3 dB (TYP.); Phase balance ±0.3 degree (TYP.)
- AGC dynamic range 45 dB
- Low distortion; IM_3 30 dBc
- Supply Voltage 5 V
- Packaged in 20 pin SSOP or 20 pin SOP suitable for high-density surface mount

ORDERING INFORMATION

PART NUMBER	PACKAGE	PACKAGE STYLE
μPC2766GR-E1	20 pin plastic SSOP (225 mil)	Embossed tape 12 mm wide. 2.5 k/REEL Pin 1 indicates pull-out direction of tape
μPC2766GS-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

The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version.
Not all devices/types available in every country. Please check with local NEC representative for availability and additional information.

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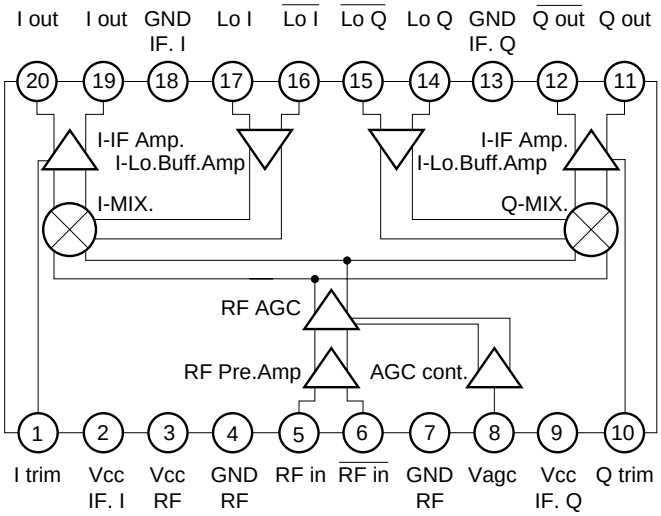
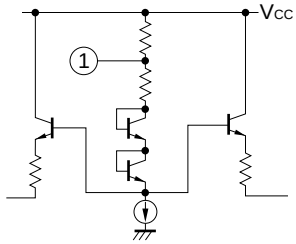
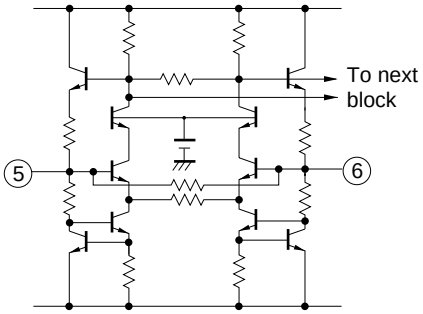
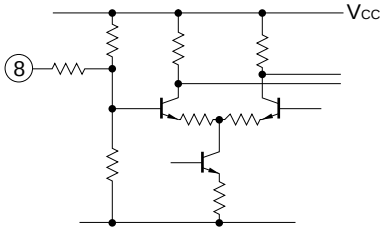
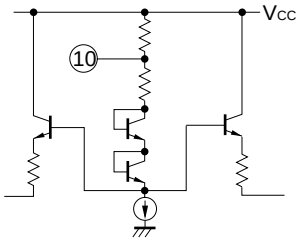
Date Published October 1999 N CP(K)
Printed in Japan

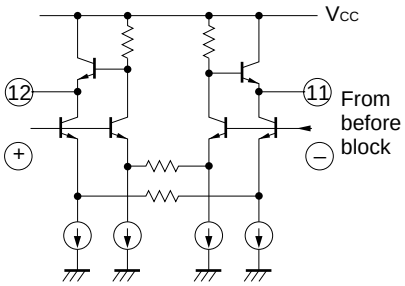
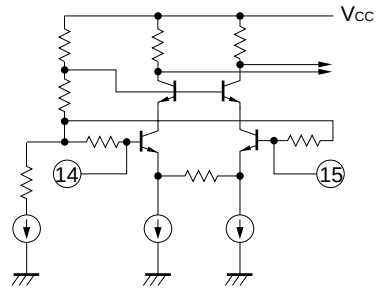
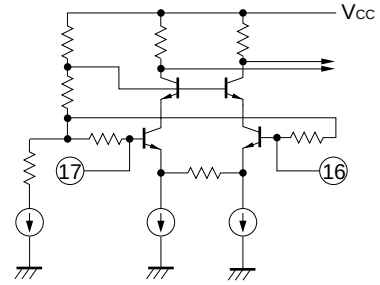
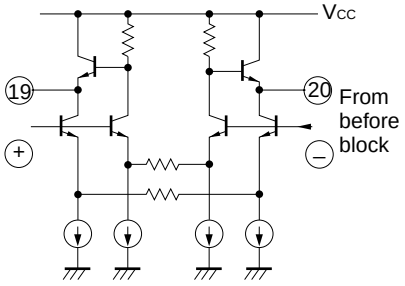
The mark ★ shows major revised points.

INTERNAL BLOCK DIAGRAM



PIN FUNCTIONS

PIN No.	PIN NAME	PIN VOLTAGE TYP. (V)	FUNCTION AND EXPLANATION	EQUIVALENT CIRCUIT
1	I Trim	4.2	Trimming pin for I-IF output.	
2	VccIF I	5.0	Power supply pin for I-MIXER.	
3	VccRF	5.0	Power supply pin for RF and AGC block.	
4	GND RF	0.0	Ground pin of RF and AGC block.	
5	RFin	2.6	RF input pin. In case of single input, 6 pin should be grounded through capacitor.	
6	$\overline{\text{RFin}}$	2.6		
7	GND RF	0.0	Ground pin of RF and AGC block.	
8	V_{AGC}	0 to 5	Gain control pin. • V_{AGC} = 0 V: Full gain • V_{AGC} = 5 V: Maximum reduction	
9	VccIF Q	5.0	Power supply pin for Q-MIXER.	
10	Q Trim	4.2	Trimming pin for Q-IF output.	

PIN No.	PIN NAME	PIN VOLTAGE TYP. (V)	FUNCTION AND EXPLANATION	EQUIVALENT CIRCUIT
11	Qout	3.3	Q-IF output pin. 11 pin and 12 pin are balance outputs.	
12	$\overline{\text{Qout}}$	3.3		
13	GNDIF Q	0.0	Ground pin of Q-IF block.	
14	Lo Q	2.2	Oscillator signal input pin of Q-MIXER. In case of single input, 15 pin should be grounded through capacitor.	
15	$\overline{\text{Lo Q}}$	2.2		
16	$\overline{\text{Lo I}}$	2.2	Oscillator signal input pin of I-MIXER. In case of single input, 16 pin should be grounded through capacitor.	
17	Lo I	2.2		
18	GNDIF I	0.0	Ground pin of I-IF block.	
19	$\overline{\text{Iout}}$	3.3	I-IF output pin. 19 pin and 20 pin are balance outputs.	
20	Iout	3.3		

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C)

μPC2766GR

PARAMETER	SYMBOL	RATING	UNIT	TEST CONDITIONS
Supply voltage	V_{CC}	6.0	V	
Power dissipation	P_D	430	mW	T_A = 85 °C Note 1
Operating temperature range	T_A	–40 to +85	°C	
Storage temperature range	T_{stg}	–55 to +150	°C	

μPC2766GS

PARAMETER	SYMBOL	RATING	UNIT	TEST CONDITIONS
Supply voltage	V_{CC}	6.0	V	
Power dissipation	P_D	650	mW	T_A = 85 °C Note 1
Operating temperature range	T_A	–40 to +85	°C	
Storage temperature range	T_{stg}	–55 to +150	°C	

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

RECOMMENDED OPERATING RANGE

μPC2766GR/GS

PARAMETER	SYMBOL	MAX.	TYP.	MIN.	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 V, T_A = 25 °C, Z_L = 250 Ω)

μPC2766GR/GS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Supply current	I_{CC}	–	60	78	mA	no input signal
RF input bandwidth	RF BW	DC - 750	DC - 1000	–	MHz	f_{IF} = 40 MHz, $f_{RF} > f_{LO}$ IQ phase balance ≤ ±1.5°
IF output bandwidth	IF BW	DC	200	–	MHz	f_{RF} = 480 MHz, P_{LO} = –10 dBm $f_{RF} > f_{LO}$, –3 dB down, Vagc = 0 V
Gain control range	G_{GC}	40	45	–	dB	f_{RF} = 480 MHz, f_{IF} = 40 MHz P_{RF} = –30 dBm, P_{LO} = –10 dBm Vagc = 0 – 5 V
IQ phase balance	$\Delta\phi$	–	±0.3	±1.5	deg	f_{RF} = 480 MHz, f_{IF} = 40 MHz P_{RF} = –30 dBm, P_{LO} = –10 dBm
IQ amplitude balance	ΔG	–	±0.3	±0.5	dB	f_{RF} = 480 MHz, f_{IF} = 40 MHz P_{RF} = –30 dBm, P_{LO} = –10 dBm Vagc = 0 V
Output voltage	V_O	1.2	1.5	–	V_{P-P}	f_{RF} = 480 MHz, f_{IF} = 40 MHz P_{LO} = –10 dBm, Z_L = 250 Ω
Conversion gain	CG	15	20	25	dB	f_{RF} = 480 MHz, f_{IF} = 40 MHz Vagc = 0 V

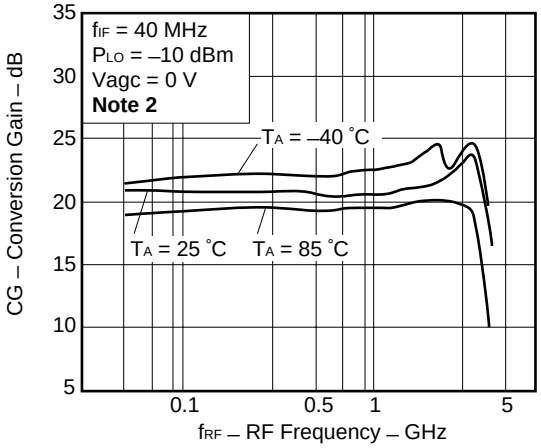
STANDARD CHARACTERISTICS (REFERENCE VALUES) (V_{CC} = 5 V, T_A = 25 °C, Z_L = 250 Ω)

μPC2766GR/GS

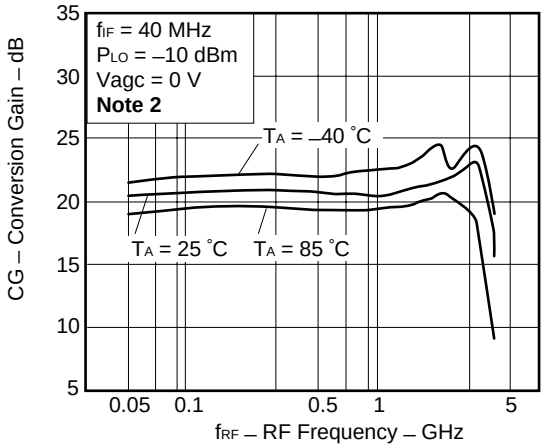
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Noise figure	NF	–	21	–	dB	f_{RF} = 480 MHz, f_{IF} = 40 MHz P_{LO} = –10 dBm, Vagc = 0 V
LO to RF isolation	LO-RF_{isol}	–	55	–	dB	f_{LO} = 440 MHz, P_{LO} = –10 dBm Vagc = 0 V
LO to IF isolation	LO-IF_{isol}	–	10	–	dB	f_{LO} = 440 MHz, P_{LO} = –10 dBm Vagc = 0 V
3rd order intermodulation distortion	IM_3	–	30	–	dBc	f_{RF1} = 480 MHz, f_{RF2} = 490 MHz f_{LO} = 440 MHz, Pin = –20 dBm P_{LO} = –10 dBm, Vagc = 1 V
Saturated output level	$P_{O(SAT)}$	–	+2	–	dBm	f_{RF} = 480 MHz, f_{IF} = 40 MHz P_{RF} = –10 dBm

TYPICAL CHARACTERISTICS – on Measurement Circuit – (**Note 2** Lower local)

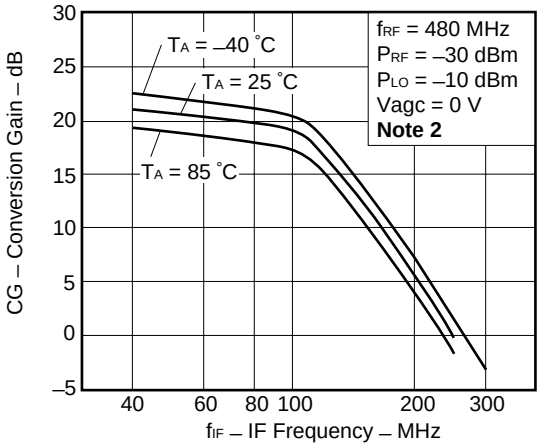
CG vs. f_{RF} (Iout)



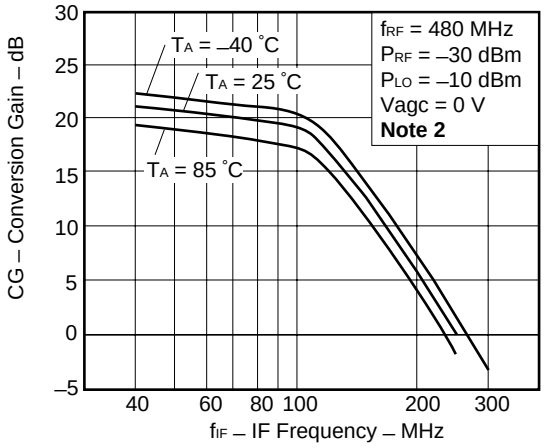
CG vs. f_{RF} (Qout)



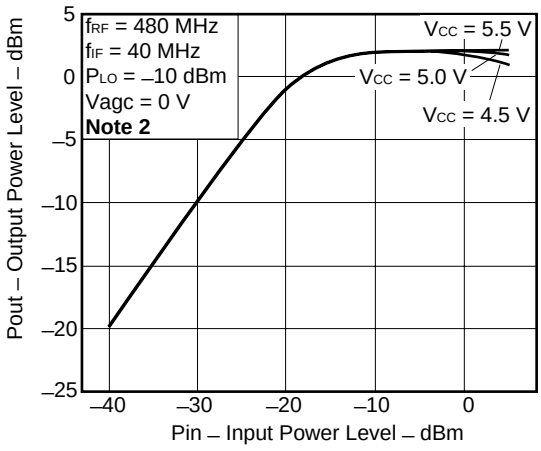
CG vs. f_{IF} (Iout)



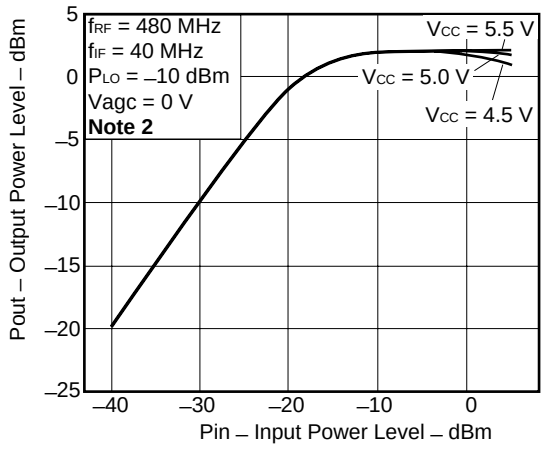
CG vs. f_{IF} (Qout)



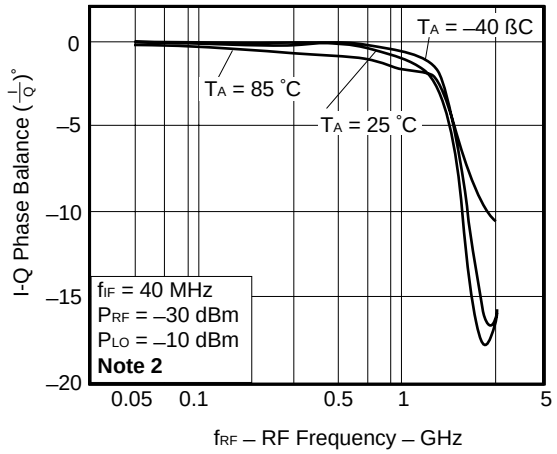
Pin vs. Pout (Iout)



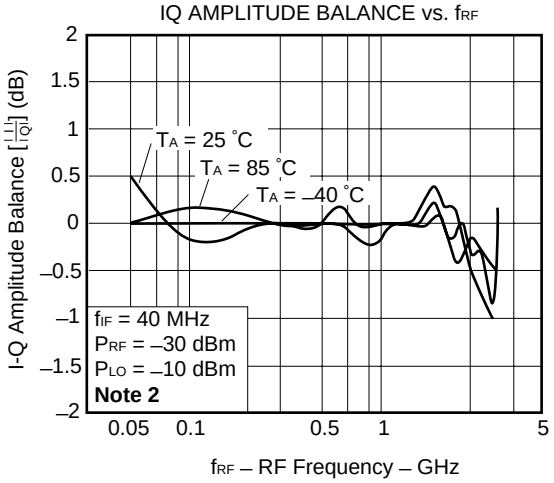
Pin vs. Pout (Qout)



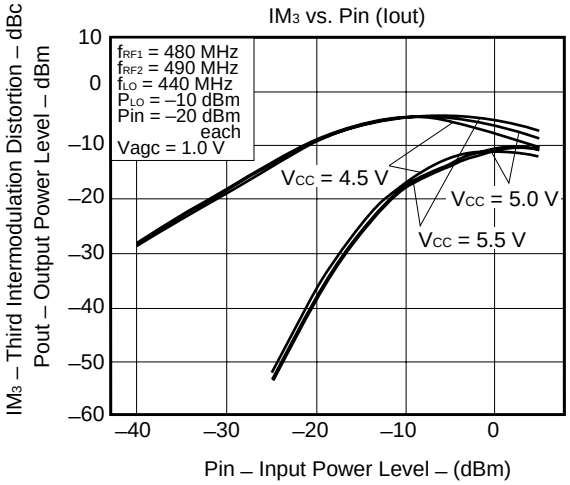
IQ PHASE BALANCE vs. f_{RF}



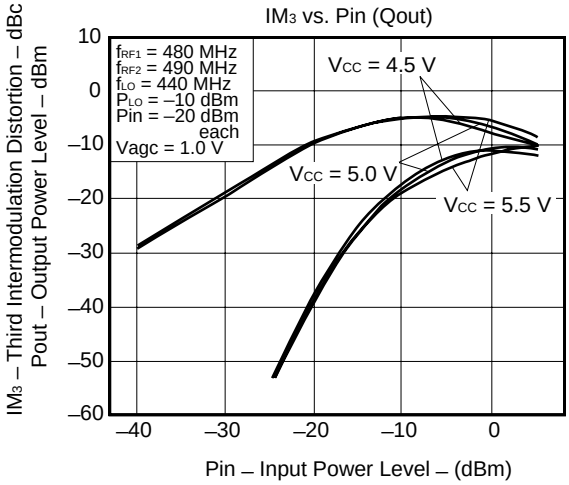
IQ AMPLITUDE BALANCE vs. f_{RF}



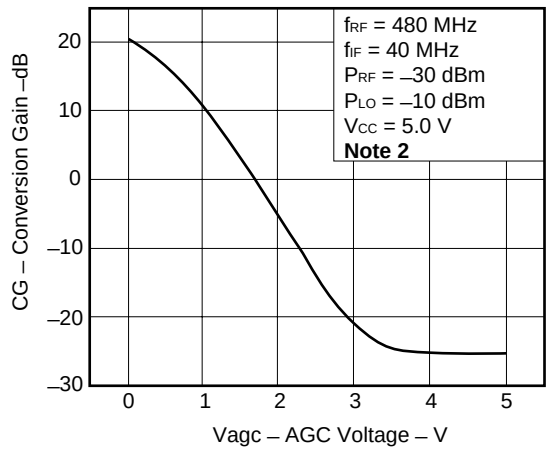
IM_3 vs. Pin (Iout)



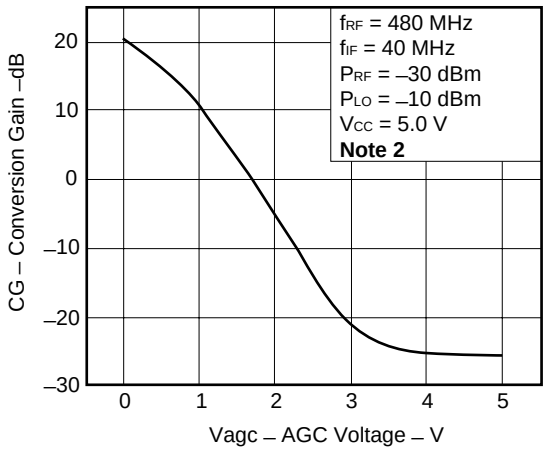
IM_3 vs. Pin (Qout)



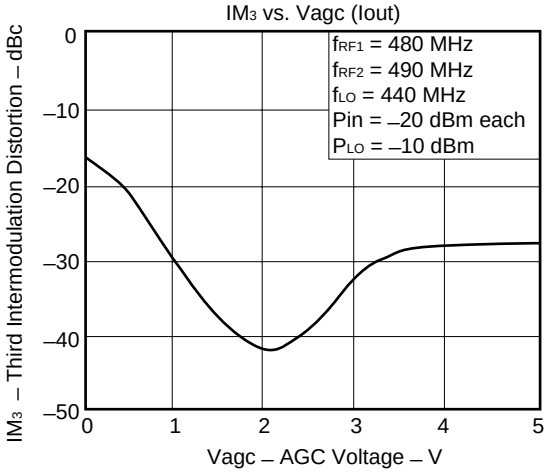
CG vs. Vagc (Iout)



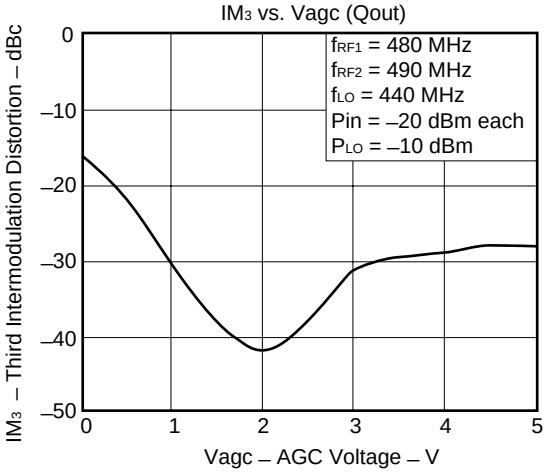
CG vs. Vagc (Qout)



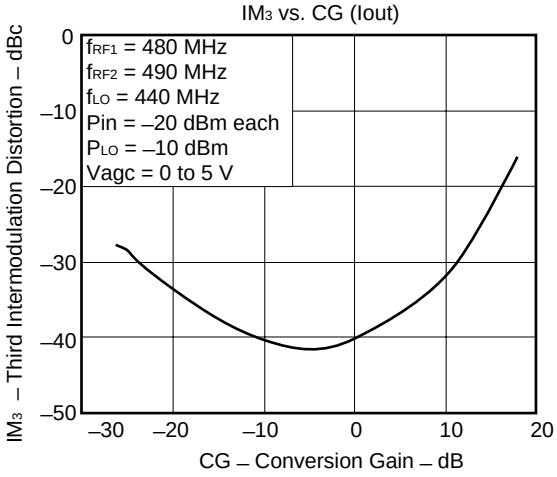
IM3 vs. Vagc (Iout)



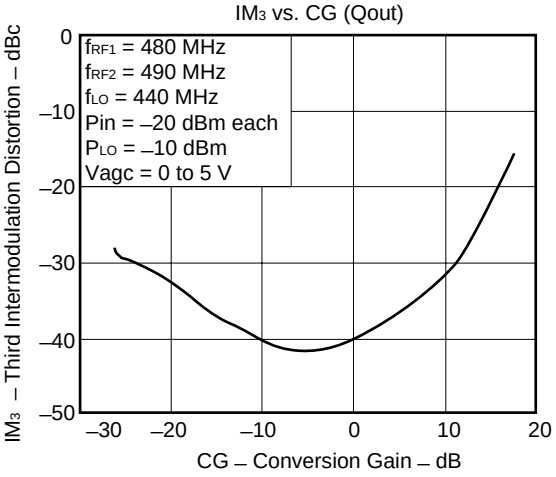
IM3 vs. Vagc (Qout)



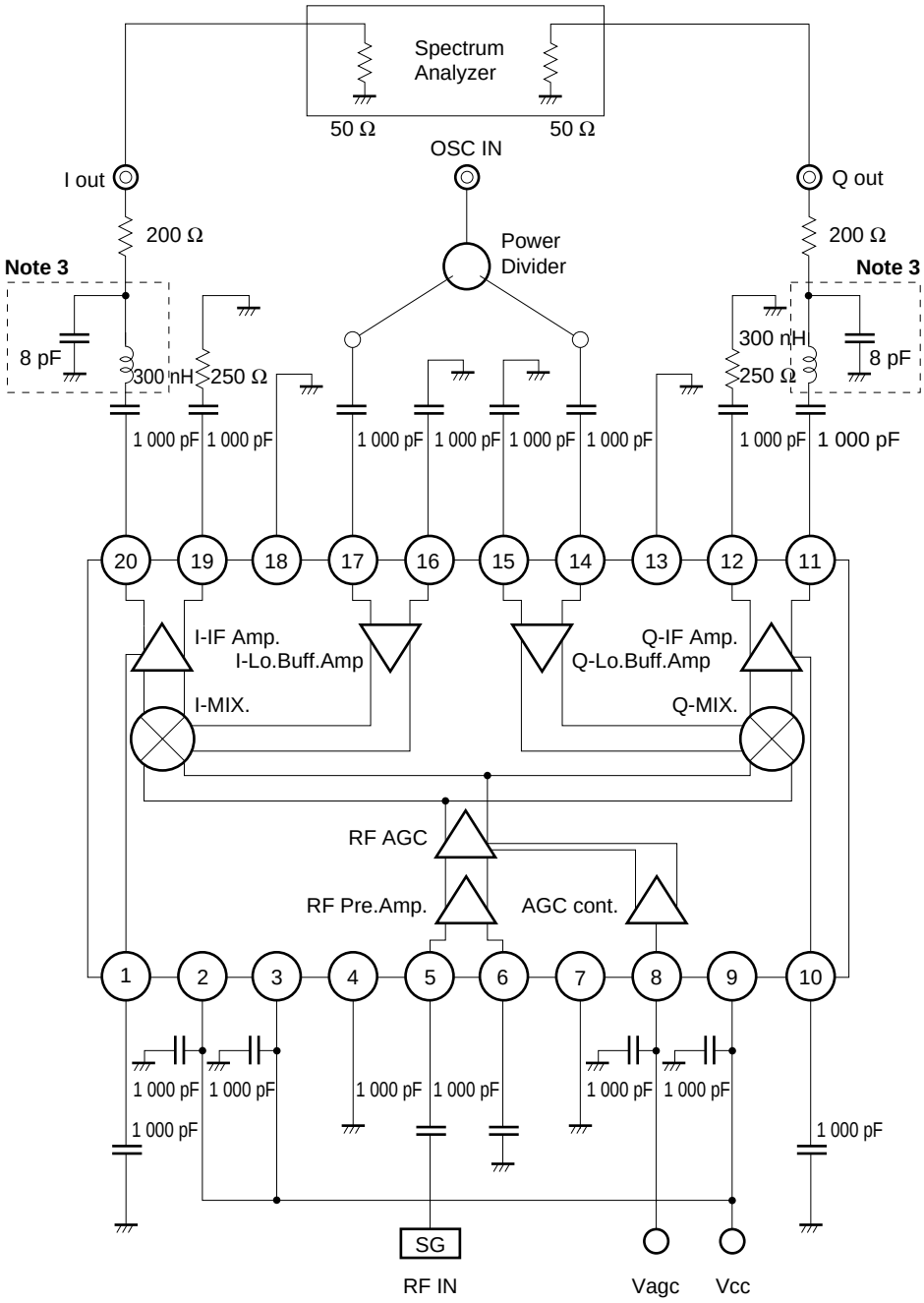
IM3 vs. CG (Iout)



IM3 vs. CG (Qout)

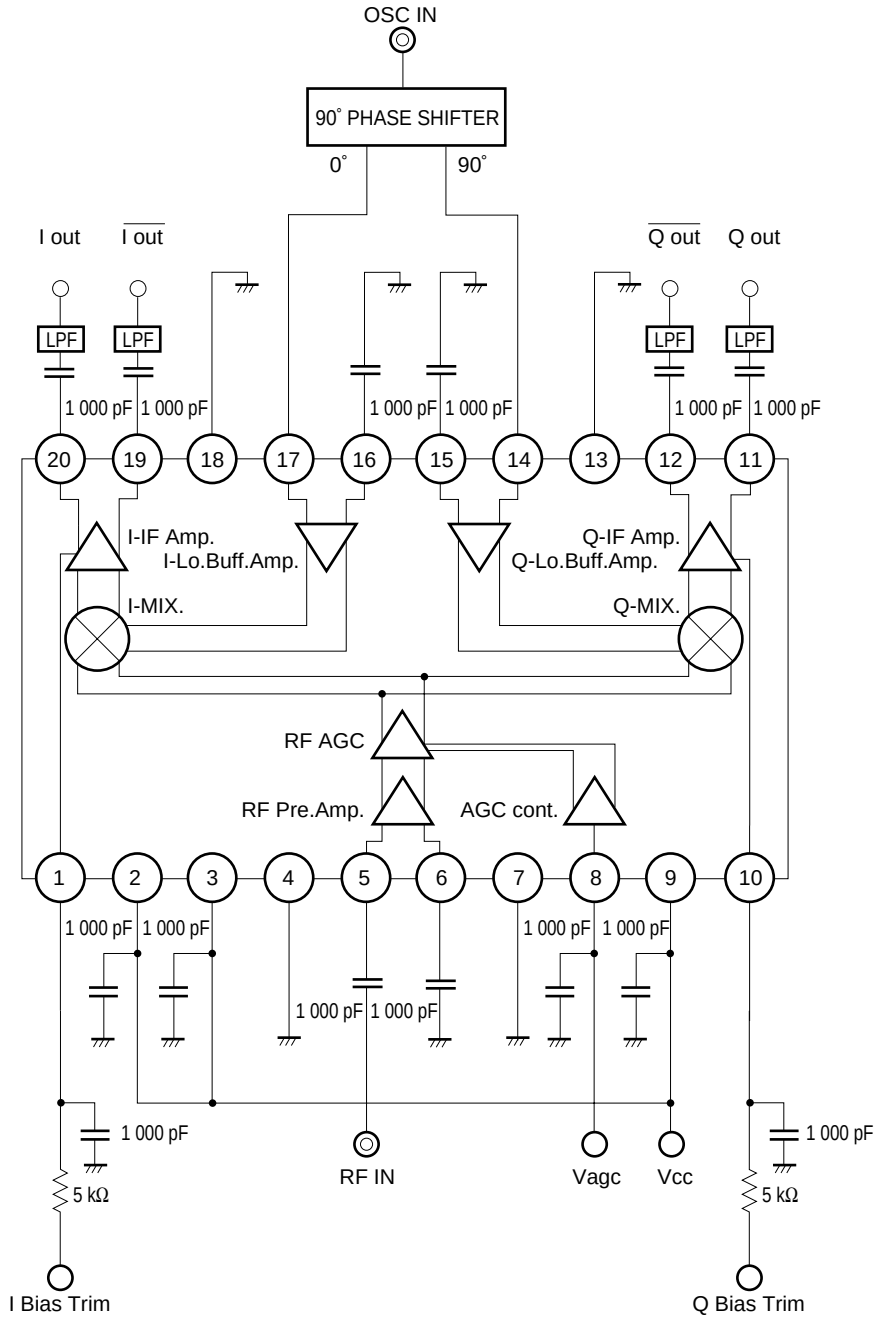


MEASUREMENT CIRCUIT
(@ Z_L = 250 Ω)



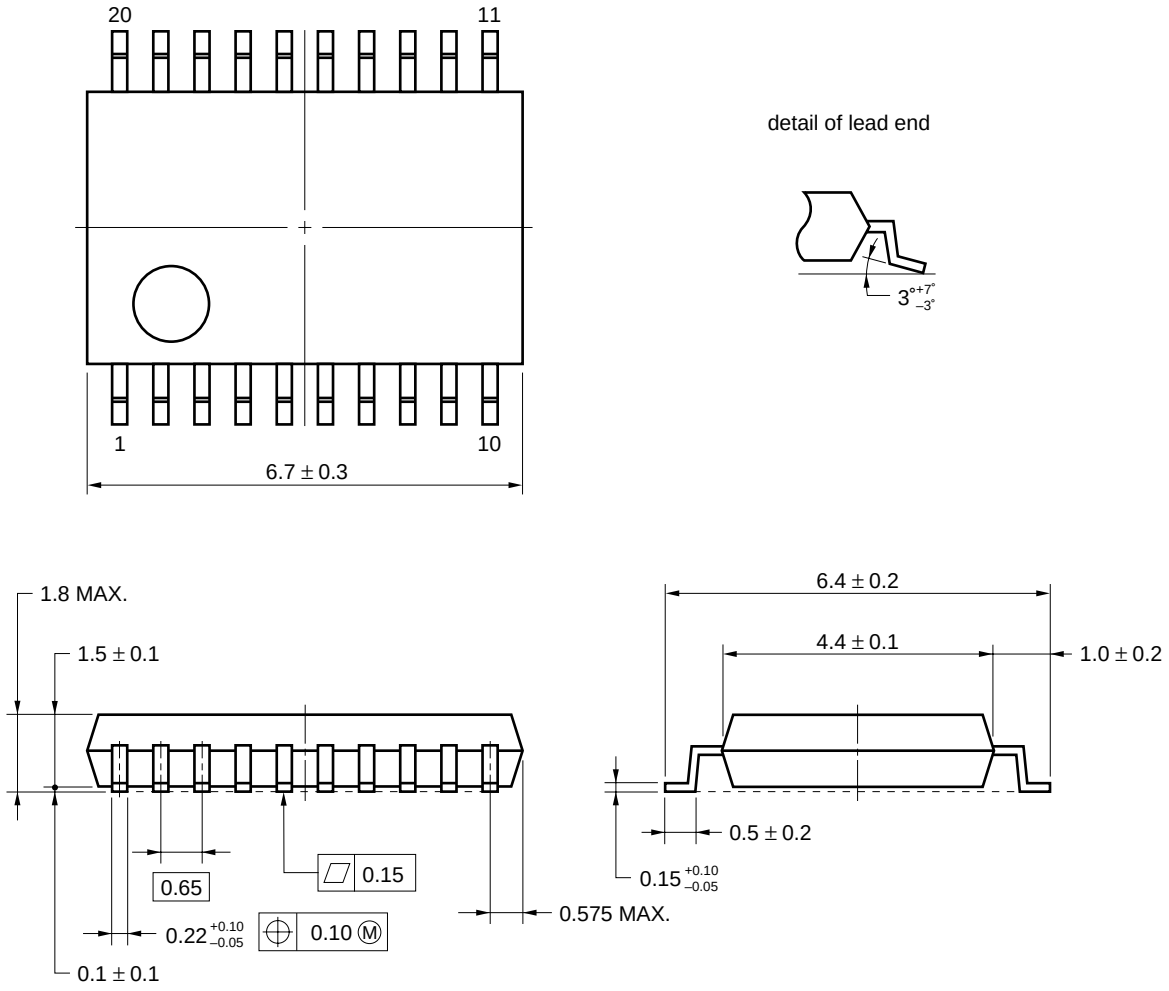
Note 3 ⬚ is Low pass filter in order to eliminate local leak.

APPLICATION CIRCUIT EXAMPLE



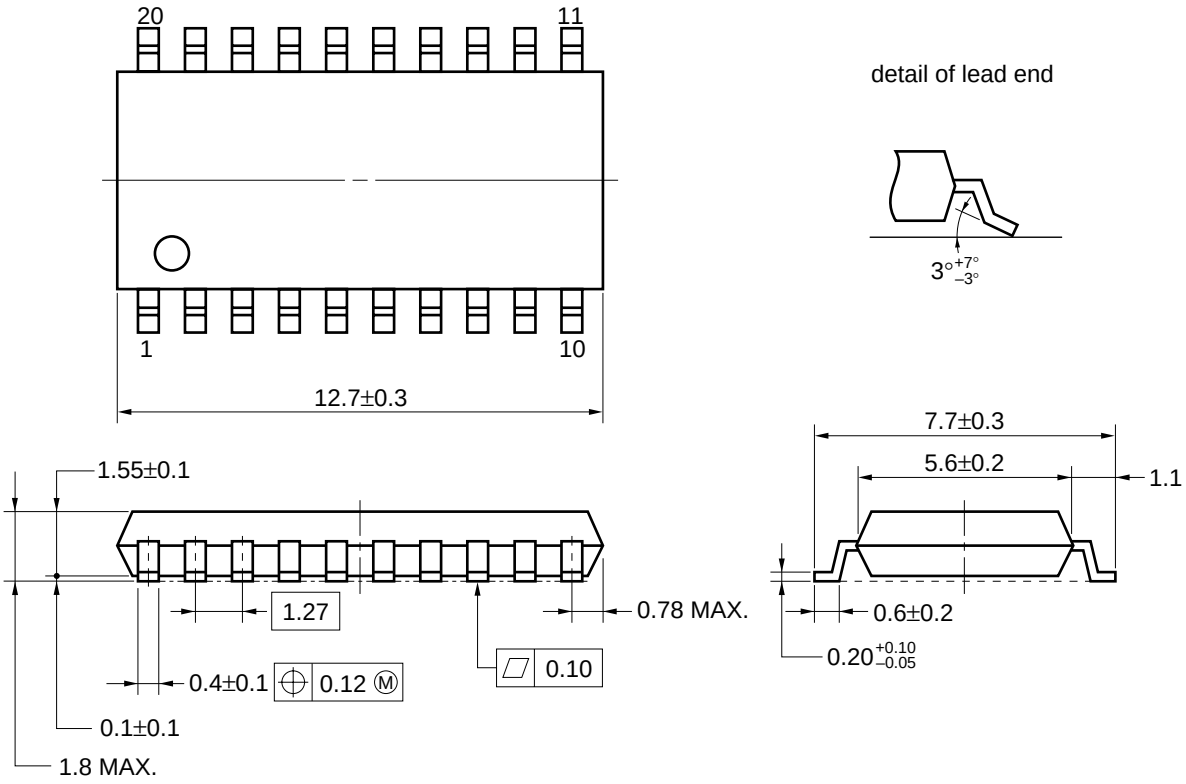
PACKAGE DIMENSIONS

★ **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)**.

μPC2766GR

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 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".

[MEMO]

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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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