

# MAS1016

## AM Receiver IC

- **Wide Supply Voltage Range**
- **Power Down and Power Up Control**
- **Control for AGC On**

### DESCRIPTION

The MAS1016 AM-Receiver chip is a highly sensitive, simple to use AM receiver specially intended to receive time signals in the frequency range from 40 kHz to 100 kHz. There are only a few external components needed. The circuit has a

preamplifier, wide range automatic gain control, demodulator and output comparator built in. The output signal can be processed directly with an additional digital circuitry to extract the data from the received signal.

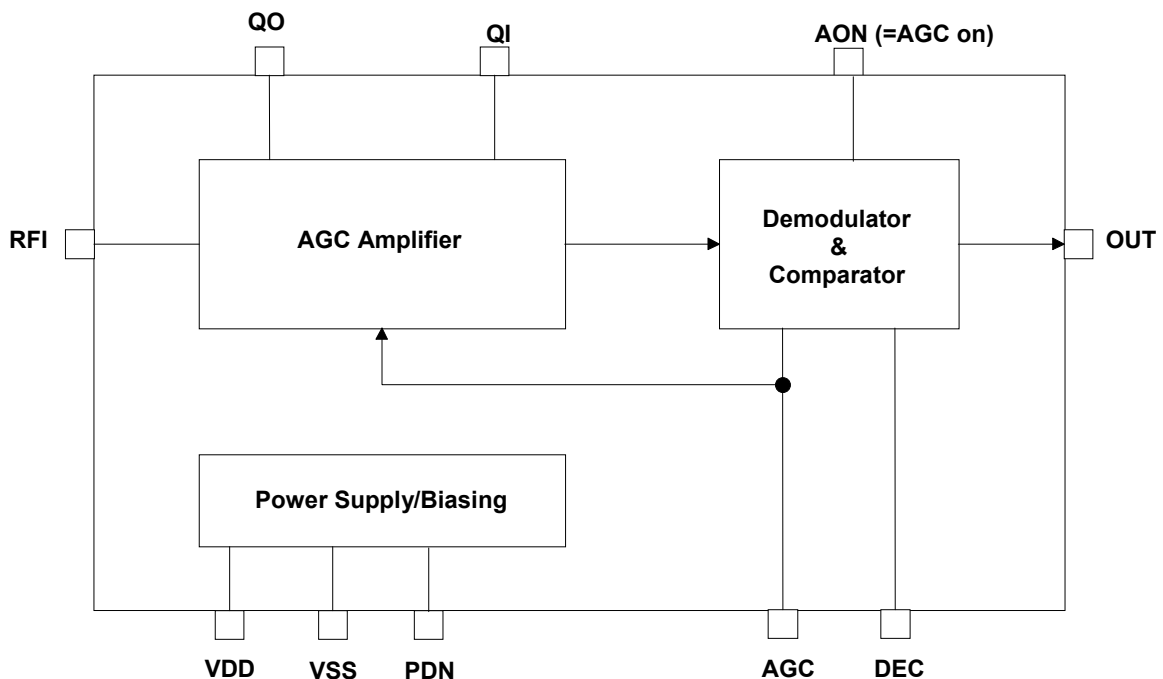
### FEATURES

- Wide Supply Voltage Range
- Power Down Control
- Only a Few External Components Needed
- Highly Sensitive AM Receiver
- Control for AGC On

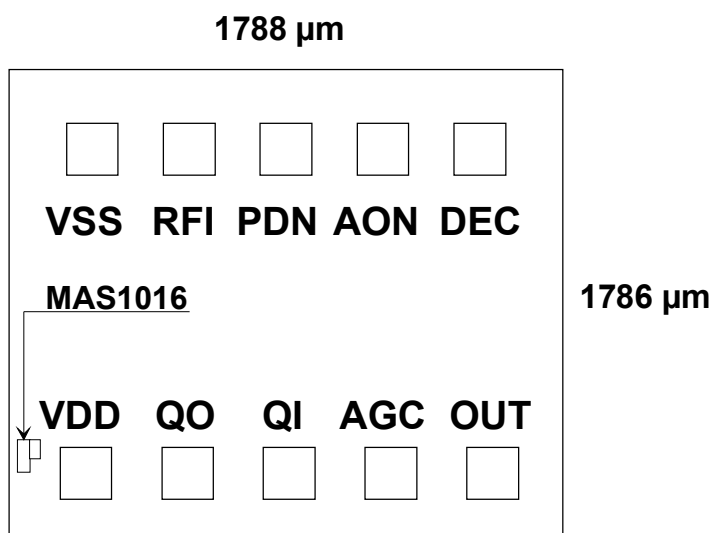
### APPLICATIONS

- Time Signal Receiver designed for MSF (British), WWVB (USA), JG2AS (Japan) and DCF77 (Germany)

### BLOCK DIAGRAM



## PAD LAYOUT



DIE size = 1.79 x 1.79 mm; PAD size = 100 x 100 μm  
Substrate is connected to Vdd.

Note: Coordinates are calculated using Vdd as a centre point

Pad Identification	Name	X-coordinate	Y-coordinate	Note
Power Supply Voltage	VDD	0 μm	0 μm	
Quarz Filter Output	QO	306 μm	19 μm	
Quarz Filter Input	QI	587 μm	19 μm	
AGC Capacitor	AGC	866 μm	19 μm	
Receiver Output	OUT	1143 μm	19 μm	3
Demodulator Capacitor	DEC	1111 μm	1436 μm	
AGC On Control	AON	868 μm	1436 μm	2
Power Down Input	PDN	551 μm	1436 μm	1
Receiver Input	RFI	309 μm	1436 μm	
Power Supply Ground	VSS	16 μm	1415 μm	

### Notes:

- 1) Level = VSS means receiver on; VDD = receiver off
- 2) Level = VSS means AGC hold; VDD = AGC on (working)
  - Internal pull-up with current < 1 μA which is switched off in power down
  - During AGC hold the receiver output OUT is hold down to VSS
- 3) 100% AM results in Level = VSS; 25% AM results in Level = VDD
  - the output is a current source/sink with  $|I_{OUT}| > 5 \mu A$
  - at power down the output is tri-state

## ABSOLUTE MAXIMUM RATINGS

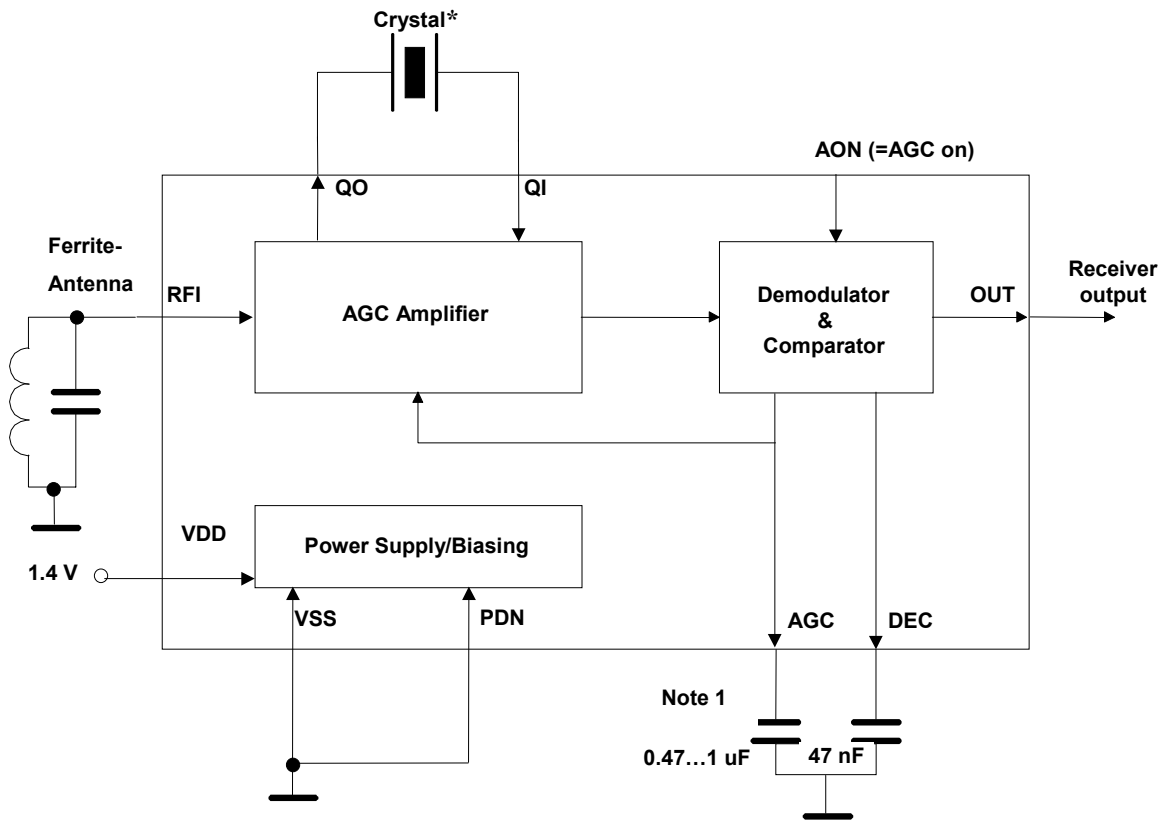
Parameter	Symbol	Conditions	Min	Max	Unit
Supply Voltage	$V_{DD}-V_{SS}$		-0.3	5.0	V
Input Voltage	$V_{IN}$		$V_{SS}-0.3$	$V_{DD}+0.3$	V
Power Dissipation	$P_{MAX}$			100	mW
Operating Temperature	$T_{OP}$		-20	70	°C
Storage Temperature	$T_{ST}$		-40	120	°C

## ELECTRICAL CHARACTERISTICS

 Operating Conditions:  $V_{DD} = 1.4V$ , Temperature = 25°C

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Operating Voltage	$V_{DD}$		1.10		3.60	V
Current Consumption	$I_{DD}$			50	200	μA
Stand-By Current	$I_{DDoff}$				0.1	μA
Input Range	$f_{IN}$		40		100	kHz
Sensitivity	$V_{IN}$		0.001		50	mVrms
Input Levels $ I_{IN}  < 0.5 \mu A$	$V_{IL}$ $V_{IH}$		$0.8 V_{DD}$		$0.2 V_{DD}$	V
Output Current $V_{OL} < 0.2 V_{DD}; V_{OH} > 0.8 V_{DD}$	$ I_{OUT} $		5			μA
Output Pulse	$T_0$		65		125	ms
	$T_1$		150		220	ms
Startup Time	$T_{Start}$			8		s
Output Delay Time	$T_{Delay}$			50	100	ms

## TYPICAL APPLICATION



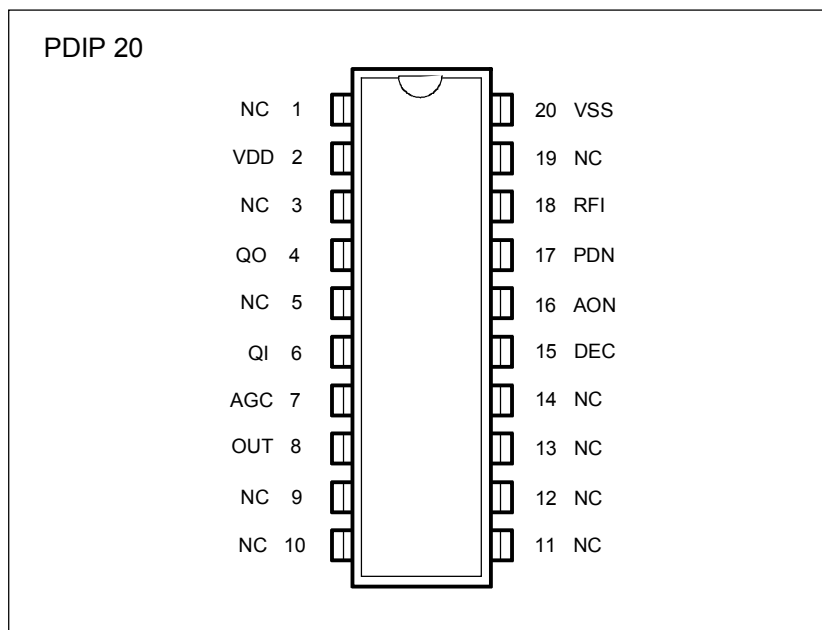
Crystal frequencies:

77.503 kHz for DCF77 Receiver,  
60 kHz for WWVB (USA) and MSF (British) Receiver  
40 kHz JG2AS (Japan) Receiver

### Note 1: AGC Capacitor

DCF77 Receiver 0.47 to 1.0  $\mu\text{F}$   
WWVB (USA), MSF (British) and JG2AS (Japan) 220 nF (external control of AON (=AGC on) is needed, for more details see also DAEV1016)

## PACKAGE FOR SAMPLES



## PIN DESCRIPTION

Pin Name	Pin	Type	Function	Note
NC	1			
VDD	2	P	Positive Power Supply	
NC	3			
QO	4	AO	Quartz Filter Output	
NC	5			
QI	6	AI	Quartz Filter Input	
AGC	7	AO	AGC Capacitor	
OUT	8	DO	Receiver Output	3
NC	9			
NC	10			
NC	11			
NC	12			
NC	13			
NC	14			
DEC	15	AO	Demodulator Capacitor	
AON	16	DI	AGC On Control	2
PDN	17	AI	Power Down Input	1
RFI	18	AI	Receiver Input	
NC	19			
VSS	20	G	Power Supply Ground	

### Notes:

- Level = VSS means receiver on; VDD = receiver off
- Level = VDD means receiver on; VSS = receiver off (PDN = VDD)  
Internal pull-down resistor > 1MΩ to VSS
- 100 % AM results in Level = VSS; 25 % AM results in Level = VDD  
- the output is a current source/sink with  $I_{out} > 5 \mu A$   
- at power down the output is tri-state

---

## ORDERING INFORMATION

---

Product Code	Product	Package	Comments
MAS1016ATB1	AM-Receiver IC	Wafer, EWS-tested	Thickness 480 µm
MAS1016ATC1	AM-Receiver IC	Wafer, EWS-tested	Thickness 400 µm

Please contact Micro Analog Systems Oy for other wafer thickness options.

---

## LOCAL DISTRIBUTOR

---

--

---

## MICRO ANALOG SYSTEMS OY CONTACTS

---

Micro Analog Systems Oy Kamreerintie 2, P.O.Box 51 FIN-02771 Espoo, FINLAND	Tel. +358 9 80 521 Fax +358 9 805 3213 <a href="http://www.mas-oy.com">http://www.mas-oy.com</a>
---	--

### NOTICE

Micro Analog Systems Oy reserves the right to make changes to the products contained in this data sheet in order to improve the design or performance and to supply the best possible products. Micro Analog Systems Oy assumes no responsibility for the use of any circuits shown in this data sheet, conveys no license under any patent or other rights unless otherwise specified in this data sheet, and makes no claim that the circuits are free from patent infringement. Applications for any devices shown in this data sheet are for illustration only and Micro Analog Systems Oy makes no claim or warranty that such applications will be suitable for the use specified without further testing or modification.