



---

# Technical Documentation

## AGC 1.X - OVERVIEW

---

<b>Document Number:</b>	L1D_AS330
<b>TI Department</b>	European Wireless Terminal Chipset Business Unit
<b>Version:</b>	1.3
<b>Status:</b>	APPROVED
<b>Date:</b>	March 16, 2006

## IMPORTANT NOTICE

Texas Instruments Incorporated and / or its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products, software and services at any time and to discontinue any product, software or service without notice. Customers should obtain the latest relevant information during product design and before placing orders and should verify that such information is current and complete.

All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment. TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI products, software and / or services. To minimize the risks associated with customer products and applications, customers should provide adequate design, testing and operating safeguards.

Any access to and / or use of TI software described in this document is subject to Customers entering into formal license agreements and payment of associated license fees. TI software may solely be used and / or copied subject to and strictly in accordance with all the terms of such license agreements.

Customer acknowledges and agrees that TI products and / or software may be based on or implements industry recognized standards and that certain third party may claim intellectual property rights therein. The supply of products and / or the licensing of software do not convey a license from TI to any third party intellectual property rights and TI expressly disclaims liability for infringement of third party intellectual property rights.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products, software or services are used.

Information published by TI regarding third-party products, software or services does not constitute a license from TI to use such products, software or services or a warranty, endorsement thereof or statement regarding their availability. Use of such information, products, software or services may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

No part of this document may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, for any purpose without the express written permission of TI.

## History

Date of change	Changed by	Approved by	Date of approval	Version	Notes
March 08, 2005	Thierry Le Gall			0.1	(1)
March 15, 2005	Thierry Le Gall	Sébastien Guiriec	Mar. 15, 2003	1.0	(2)
April 06, 2005	Thierry Le Gall		April 06, 2005	1.1	(3)
April 13, 2005	Thierry Le Gall			1.2	(4)
July 25, 2005	Thierry Le Gall			1.3	(5)

## Notes

- (1) Creation.
- (2) Approval.
- (3) Minor updates in (Table 4.1).
- (4) Minor update in (Table 4.1).
- (5) Updated reference table.

## Glossary

AGC	Automatic Gain Control
VAD	Voice Activity Detector

## References

- [1] [L1D\\_AS331-1 – AGC 1.x – API Definition](#)
- [2] [L1D\\_AS250 – VAD 1.x, 2.x - Overview](#)

## Table of Contents

<b>1</b>	<b>Introduction.....</b>	<b>5</b>
<b>2</b>	<b>AGC Overview .....</b>	<b>5</b>
<b>3</b>	<b>AGC Use Cases .....</b>	<b>5</b>
<b>4</b>	<b>AGC Features.....</b>	<b>8</b>

## List of Figures and Tables

Figure 2.1	The AGC 1.x – Module Overview.....	5
Figure 3.1	The AGC 1.x – Level Amplification in Long Term .....	6
Figure 3.2	The AGC 1.x – Level Reduction in Long Term .....	6
Figure 3.3	The AGC 1.x – Use Case – Handsfree Conferencing .....	7
Figure 3.4	The AGC 1.x – Level Compensation – Handsfree Conferencing .....	7
Table 4.1	The AGC 1.x – Features .....	8

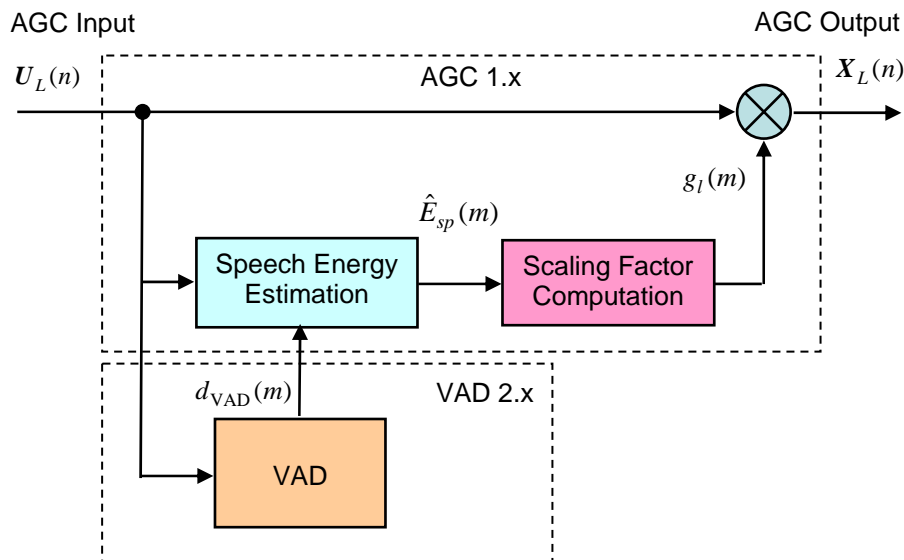
# 1 Introduction

This document provides an overview of the Automatic Gain Control (AGC) module. This document applies to AGC 1.x [1]. The AGC 1.x uses the Voice Activity Detector (VAD) 2.x module as external submodule **Error! Reference source not found..**

## 2 AGC Overview

The primary goal of the AGC is to adjust the input speech signal to a targeted level in the output. As the incoming signal is time varying, AGC relies on an adaptive strategy to track the level variations in the input and so to adjust a variable gain to reach the targeted level in the output.

The AGC adjusts the voice level as fast as possible while minimizing the output signal distortions such as peak clipping. Also, AGC avoids amplifying background noise to target level thanks to VAD that helps to discriminate between speech and noise (Figure 2.1).



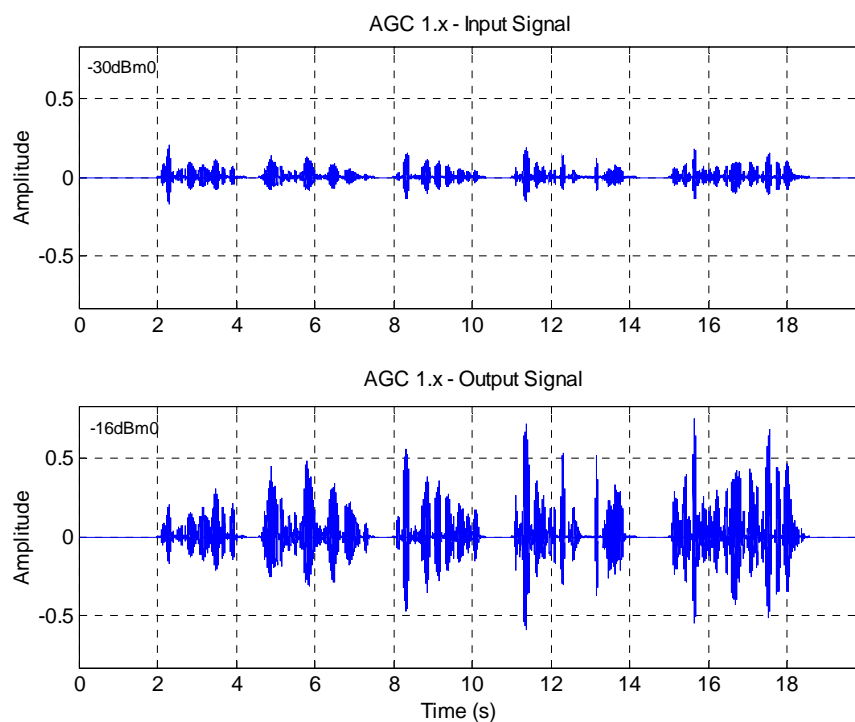
**Figure 2.1 The AGC 1.x – Module Overview**

The AGC 1.x, computation is based on 10ms or 20ms frames processing at 8kHz or 16kHz. The user can specify the targeted level in dBm0 (power) of AGC output. The maximum amplification provided by AGC could be limited at a specific value in dB (amplitude) [1].

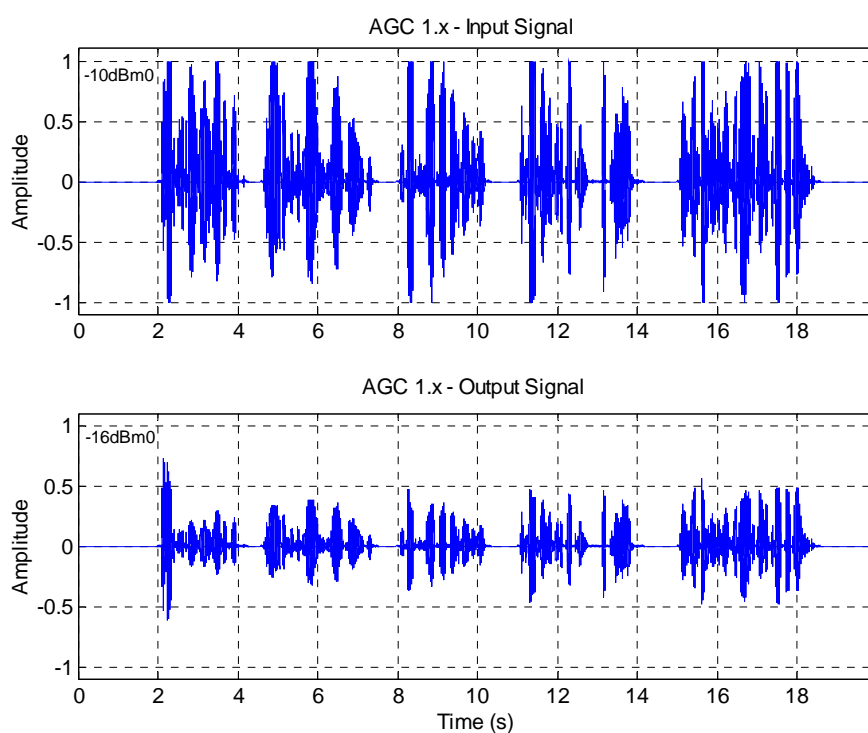
## 3 AGC Use Cases

In case of AGC implemented in the downlink or in the uplink, it keeps the far end or the near end speech signal at a predefined level (Figure 3.1), (Figure 3.2). This feature is particularly suitable in case of variation of the distance between the mouth and the microphone (handset mode) on both sides of the communication.

In case of several speakers at various levels (handsfree mode, conferencing) on one side, the uplink AGC is able to compensate the speech level variations due to various loudness between speakers and to various distances between speakers and microphone (Figure 3.3), (Figure 3.4).



**Figure 3.1 The AGC 1.x – Level Amplification in Long Term**



**Figure 3.2 The AGC 1.x – Level Reduction in Long Term**

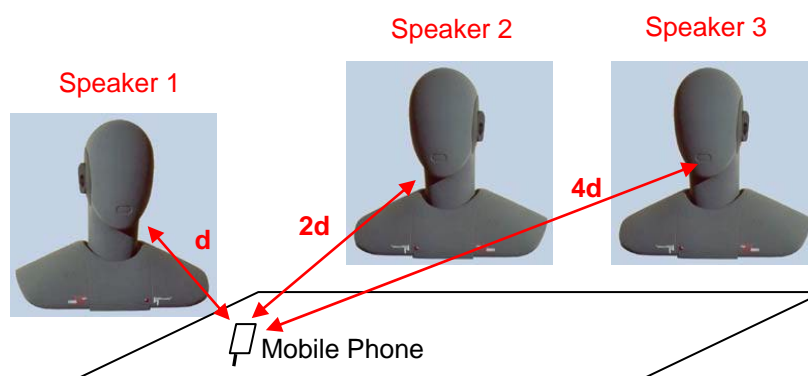


Figure 3.3 The AGC 1.x – Use Case – Handsfree Conferencing

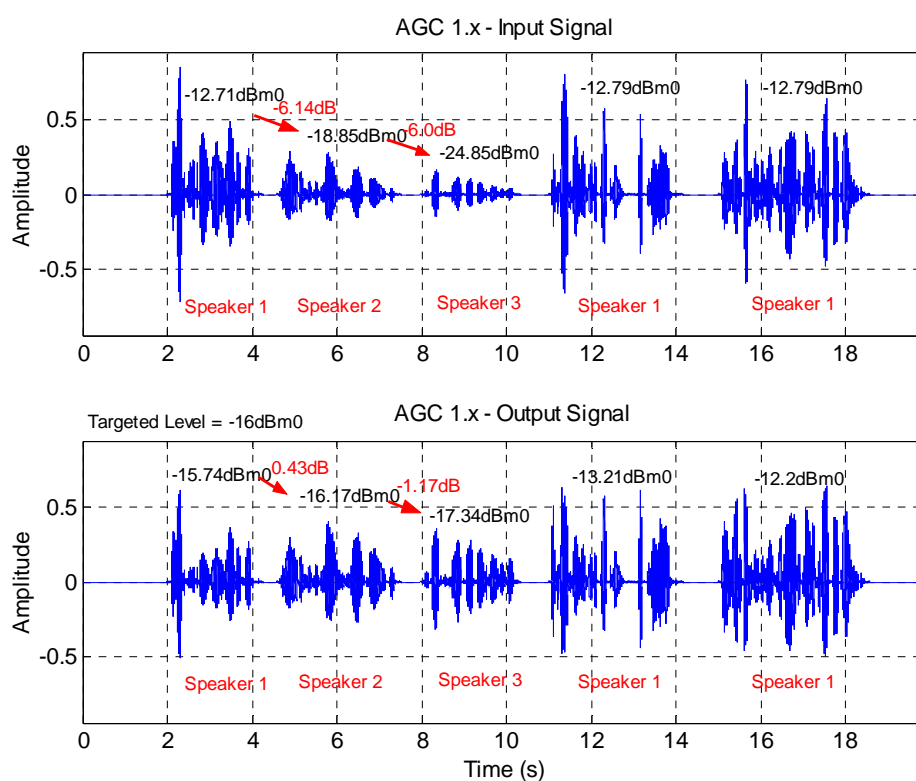


Figure 3.4 The AGC 1.x – Level Compensation – Handsfree Conferencing

## 4 AGC Features

The AGC 1.x features are summarized below (Table 4.1).

Features	Values	Comments
Sampling frequency	8000 Hz, 16000 Hz	
IO Digital amplitude	16-bits [-32768; 32767]	
IO Frame duration	10 ms, 20 ms	80, 160, 320 samples
Processing sub-frame duration	10ms	80, 160 samples
Processing delay	none	
Dynamic gain on the fly	Yes	see note (1)

**Table 4.1 The AGC 1.x – Features**

- (1) The AGC targeted level can be updated on the fly from frame to frame without re-initialization. For example, the targeted level can be changed from -16dBm0 to -10dBm0 from frame m to frame m + 1.