SkyLabGPS
Design document

June 3

2015

This document describes the embedded software design of SkyLabGPS SKM53 module. This module is GSM/GPRS Module.

Version 1.0

Revision History

Date	Version	Description	Author	Role
3/6/2015	1.0	Document creation	Ibrahim Mostafa	Junior ES Engineer

Table of Contents

Table of Figures

1 Introduction

1.1 Purpose

The purpose of this document is to describe the detailed design of the SkyLabGPS module and how it works.

1.2 Definitions, Acronyms, and Abbreviations

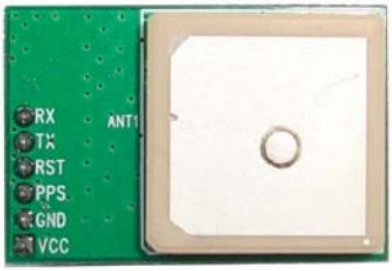
GPS	Global Positioning System
GGA	Global positioning system fixed data
GSA	GNSS DOP and active satellites
RMC	Recommended minimum specific GNSS data
GSV	GNSS satellites in view

1.3 References

Item	Name	link
[1]	SKM53_Datasheet	
[2]	NMEA Reference Manual-Rev2.1-Dec07	

1.4 Overview

The SkyNav SKM53 Series with embedded GPS antenna enables high performance navigation in the most stringent applications and solid fix even in harsh GPS visibility environments. Using this module helps in getting the position by the latitude and longitude, getting the date and the time.



1.5 Folders and files structure

SkyLabGPS module was implemented by two files: SkyLabGPS.c and SkyLabGPS.h .

1.6 Features

- Ultra high sensitivity: -165dBm
- 22 tracking/66 acquisition-channel receiver
- NMEA protocols (default speed: 9600 bps)
- Internal back-up battery

- One serial port
- Embedded patch antenna 18.2 x 18.2 x 4.0 mm

1.7 Applications:

- LBS (Location Based Service)
- Vehicle navigation system
- PND (Portable Navigation Device)
- GPS mouse and Bluetooth GPS receiver
- Timing application

1.8 Hardware Configuration:

Regulated power for the SKM53 series is required. The input voltage Vcc should be 5V, current is no less than 150mA.
The serial connections are at **2.85V LVTTL** logic levels. the data format is however fixed: X, N, 8, 1, i.e. X baud rate, no parity, eight data bits and one stop bit, no other data formats are supported, LSB is sent first. The modules default baud rate is set up 9600bps.

2 Detailed Design

2.1 Software Protocol:

SkyLAbGPS depend on NMEA 0183 protocol. The NMEA protocol is an ASCII-based protocol, Records start with a $ and with carriage return/line feed.
GPS specific messages all start with $GPxxx where xxx is a three-letter identifier of the message data that follows. NMEA messages have a checksum, which allows detection of corrupted data transfers.
The SkyNav SKM53 module supports some NMEA-0183 messages like: GGA, GSA, GSV, and RMC. The module default NMEA-0183 output is set up GGA, GSA, GSV and RMC. These Default message is sent every 1 second.

2.2 Getting Position

Every Received Message Frame starts with $ character. GP RMC Frame is selected to check if data is valid or not, then if data is valid, extract the latitude and longitude from the frame and the direction North or South and East or West.

This Message RMC contains the recommended minimum fix information. Such as :
$GPRMC,075747.000,A,2232.8990,N,11405.3368,E,3.9,357.8,260210,,,A*6A.

Name	Example	Unit	Description
Message ID	$GPRMC		RMC protocol header
UTC Time	161229.487		hhmmss.sss
Status[1]	A		A=data valid or V=data not valid
Latitude	3723.2475		ddmm.mmmm
N/S Indicator	N		N=north or S=south
Longitude	12158.3416		dddmm.mmmm
E/W Indicator	W		E=east or W=west
Speed Over Ground	0.13	knots	
Course Over Ground	309.62	degrees	True
Date	120598		ddmmyy
Magnetic Variation[2]		degrees	E=east or W=west
East/West Indicator[2]	E		E=east
Mode	*A*		*A=Autonomous, D=DGPS, E=DR*
Checksum	*10		
<CR> <LF>			End of message termination

3 Driver Functions

3.1 Internal Functions

3.1.1 DegreeToDecimal

Format	DegreeToDecimal (U8_t DegreeMinute, BOOLEAN LatOrLong)
Description	convert the array of degree and minutes (DDMM.MMMM)/(DDDMM.MMMM) to decimal decimal = degree + minutes/60
Argument	DegreeMinute: array of degree and minutes LatOrLong : take enum LATITUDE or LONGITUDE, to define the array is (DDMM.MMMM) or (DDDMM.MMMM)
Return value	double Decimal

3.1.2 void_InitConsole

Format	void_InitConsole(void)
Description	initialize the UART Utility in TIVA C
Argument	None
Return value	None

3.2 Global Functions

3.2.1 EF_B_SkyLabGPS_Init

Format	EF_B_SkyLabGPS_Init()
Description	initialize the UART and LCD/ UART Utility
Argument	NONE
Return value	BOOLEAN to check for Errors

3.2.2 EF_B_SkyLabGPS_GetPosition

Format	EF_B_SkyLabGPS_GetPosition(double D_LatitudePtr, double D_LongitudePtr)
Description	receive the frames which is sent by GPS module every 1sec, and parse it to get the latitude and longitude after converting them to double if data is valid
Argument	D_LatitudePtr: pointer to return the latitude "double" in it D_LongitudePtr: pointer to return the longitude "double" in it
Return value	returns DATA_NOT_VAILD or DATA_VAILD

3.2.3 EF_B_SkyLabGPS_PrintPosition

Format	EF_B_SkyLabGPS_PrintPosition(double D_Latitude, double D_longitude)
Description	display the latitude and longitude in LCD/ UART Utility
Argument	D_Latitude latitude in double D_longitude longitude in double
Return value	BOOLEAN to check for Errors