TAS5538 Energy Manager

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Audio Applications

10/31/2013

Energy Manager

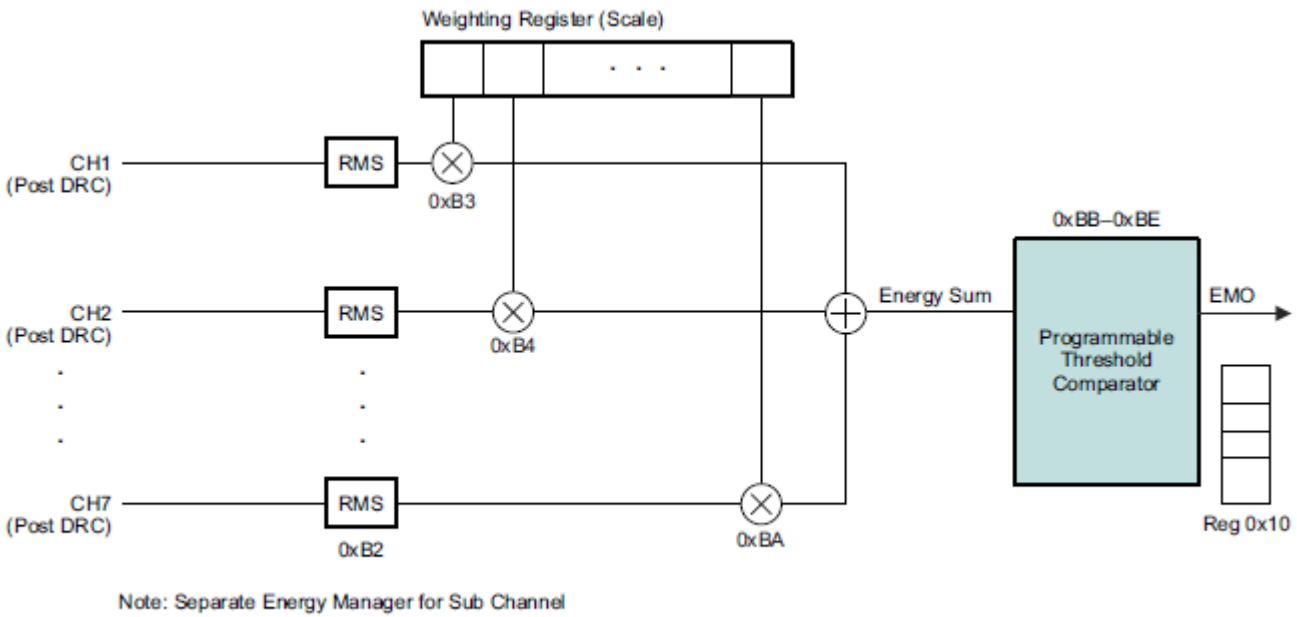
- Energy Manager provides external system controller notification allowing a system solution a system with the capability to reduce power for over power events AND auto-mute for under-power events would need a dual threshold (high and low) as shown below. This allows any threshold crossing to flag a EMO event. The end user could then monitor the 4 sticky bits to determine if they need to reduce volume for the overpower case or perhaps shutdown for the under energy case.

- See TAS5538 DS 5.1 – 5.2 for more description regarding Energy Manager

Features

- Ganged threshold and averaging control (satellite and sub unique setting)
- Channel specific enables, allowing users specification of participating channels based on coefficient values
- Sticky bit monitoring (clear only on I2C write zero), Set only on detected energy event
- EMO INT goes high indicates EMO event triggered.
- Energy above a high threshold allows users to shut things down - if so desired
- Energy below a low threshold allows users to auto-mute – is so desired

Energy Manager



Note: Separate Energy Manager for Sub Channel

Figure 5-1. Energy Manager

Registers

Energy Manager related registers are 0xB2 to 0xBE. 0xB2 is a 16 byte averaging filter for both satellite and sub channel. The scaling coefficients are 0xB3 to 0xBA that multiplies energy of each channel with a scaling factor. The threshold registers are 0xxBB, 0xBC, 0xBD and 0xBE and 0x10 for the results register

Table 5-1. Energy Manager Status register (x10)

D3	D2	D1	D0	FUNCTION
–	–	–	0/1	Energy below the low threshold for satellite channels
–	–	0/1	–	Energy above the high threshold for satellite channels
–	0/1	–	–	Energy below the low threshold for sub-woofer channel
0/1	–	–	–	Energy above the high threshold for sub-woofer channels

0xB2	16	Energy Manager Averaging coefficients(Two 28 bit coefficients for satellite and sub-woofer)	sat_channels_alpha[31:0], sat_channels_1-alpha[31:0] sub_channel_alpha[31:0], sub_channels_1-alpha[31:0]	0000 0000 0000 0000 0000 0000 0000 0000
0xB3	4	Energy Manager Weighting co-efficients(28-bit coefficient for channel1)	5.23 format	0000 0000
0xB4	4	Energy Manager Weighting co-efficients(28-bit coefficient for channel2)	5.23 format	0000 0000
0xB5	4	Energy Manager Weighting co-efficients(28-bit coefficient for channel3)	5.23 format	0000 0000
0xB6	4	Energy Manager Weighting co-efficients(28-bit coefficient for channel4)	5.23 format	0000 0000
0xB7	4	Energy Manager Weighting co-efficients(28-bit coefficient for channel5)	5.23 format	0000 0000
0xB8	4	Energy Manager Weighting co-efficients(28-bit coefficient for channel6)	5.23 format	0000 0000
0xB9	4	Energy Manager Weighting co-efficients(28-bit coefficient for channel7)	5.23 format	0000 0000
0xBA	4	Energy Manager Weighting co-efficients(28-bit coefficient for channel8)	5.23 format	0000 0000
0xBB	4	Energy Manager high threshold for satellite	5.23 format	0000 0000
0xBC	4	Energy Manager low threshold for satellite	5.23 format	0000 0000
0xBD	4	Energy Manager high threshold for sub-woofer	5.23 format	0000 0000
0xBE	4	Energy Manager low threshold for sub-woofer	5.23 format	0000 0000

Energy Manager Step by Step Guide

- RMS meter (alpha filter)
  - Given: Fs : serial data LRCLK, f : Lowest frequency of interest
  - Calculate tc = 100*(1/f) ... instead of 100 can use any value over 10 for faster response with more variation
  - Calculate USER= Fs*tc
  - Alpha[5.23] = 1-e^(-1000/USER)
  - Omega[5.23] = 1-Alpha
  - Here is example Fs=48k, f=1k
  - W 0xB2 0018 1278 0067 ED88 0018 1278 0067 ED88

Energy Manager Step by Step Guide

- Weighting (mixers)
  - Sattelite and Sub mixers should sum to 1 or there will be an offset to threshold comparison
  - W 0xB3 0080 0000
  - W 0xB4 0000 0000
  - W 0xB5 0000 0000
  - W 0xB6 0000 0000
  - W 0xB7 0000 0000
  - W 0xB8 0000 0000
  - W 0xB9 0000 0000
  - W 0xBA 0080 0000

Energy Manager Step by Step Guide

- Thresholds
  - Given: Desired threshold T(dB)
  - Toffset = T - 3.0103 ... this is to offset RMS comparison
  - Thresh[5.23] = 10^(Toffset/20)
  - Example -55dB thresholds on High/Low
  - W 0xBB 0000 2934
  - W 0xBD 0000 2934
  - W 0xBC 0000 2934
  - W 0xBE 0000 2934

Energy Manager Step by Step Guide

- Write 0x10 00 then read 0x10 to see status
  - Status will flag if channel is:
  - Under LOW threshold
  - Over HIGH threshold
  - Stable tone but close enough amplitude to both thresholds that it flags both (can be improved with tc in RMS filter)

BQ Coefficient Converter

	Before Dot	After Dot		
Format:	**5**	**27**		
Bi-Quad Coefficient	**Linear**	**Decimal**	**Hex**	**dB Gain**
b0	1.001151553	**134372286.8**	**08025BBE**	
b1	-1.997643144	**4026848172**	**F004D3AB**	
b2	0.996534379	**133752580.2**	**07F8E704**	
a1	1.997643144	**268119124.2**	**0FFB2C54**	
a2	-0.997685931	**4161060157**	**F804BD3D**	
Test	1	**134217728**	**08000000**	**0.00**
Calc Co-effiecient	**0.011753976**	**1577592**	181278	**-38.60**
Dynamic Base Enhancement/Loudness				
Gain	6			
DBE 1/Gain	0.166666667	**22369621.33**	**01555555**	
Scale	1.2	**161061273.6**	**09999999**	