Converting between dB and Hex Values when programming the QF1Da512 Gain Registers

1) Introduction

The QF1Da512 SavFIRe is an enhanced version of the QF1D512 SavFIRe, offering several new features. One such feature is the integration of a dedicated digital gain stage after the FIR computation function. The gain value applied to the data samples is defined by two configuration registers in the QF1Da512.

2) Gain Registers

The two registers used for the gain are located at offsets 0x0F and 0x10, with 0x10 being the MSB and 0x0F being the LSB. The LSB is concatenated to the MSB to create a 16-bit value. This value is unsigned with 4 integer bits and 12 fractional bits (u4.12). The operation applied to the samples is a linear multiply. The range is decimal 0 to just under 16. The format is described in more detail in the QF1Da512 datasheet.

3) dB to Linear Gain Table

The dB scale is often preferred over a linear gain scale when referring to audio loudness levels. Below is a table of linear gain values that can be written to the registers, with values listed in 1 dB steps. You can also enter more precise values (i.e. -16.25 db). However, this table gives a good example of values that are typically used for volume control.

Please feel free to contact Quickfilter if you need assistance determining the linear value that corresponds to a specific dB value.

Gain value (dB)	Gain Value (Hex)	Reg 0x10	Reg 0x0F
muted	0000	00	00
-72	0001	00	01
-66	0002	00	02
-62	0003	00	03
-60	0004	00	04
-58	0005	00	05
-56	0006	00	06
-55	0007	00	07
-54	0008	00	08
-53	0009	00	09
-52	000A	00	0A
-51	000B	00	0B
-50	000C	00	0C
-49	000E	00	0E
-48	0010	00	10
-47	0012	00	12
-46	0014	00	14
-45	0017	00	17
-44	0019	00	19
-43	001C	00	1C
-42	0020	00	20
-41	0024	00	24
-40	0028	00	28
-39	002D	00	2D
-38	0033	00	33
-37	0039	00	39
-36	0040	00	40
-35	0048	00	48
-34	0051	00	51
-33	005B	00	5B
-32	0066	00	66
-31	0073	00	73
-30	0081	00	81
-29	0091	00	91
-28	00A3	00	A3
-27	00B6	00	B6
-26	00CD	00	CD
-25	00E6	00	E6
-24	0102	01	02
-23	0121	01	21
-22	0145	01	45
-21	016D	01	6D
-20	0199	01	99
-19	01CB	01	CB

Gain value (dB)	Gain Value (Hex)	Reg 0x10	Reg 0x0F
-18	0203	02	03
-17	0242	02	42
-16	0289	02	89
-15	02D8	02	D8
-14	0331	03	31
-13	0394	03	94
-12	0404	04	04
-11	0482	04	82
-10	050F	05	0F
-9	05AD	05	AD
-8	065E	06	5E
-7	0725	07	25
-6	0804	08	04
-5	08FF	08	FF
-4	0A18	0A	18
-3	0B53	0B	53
-2	0CB5	0C	B5
-1	0E42	0E	42
+0	1000	10	00
+1	11F3	11	F3
+2	1424	14	24
+3	1699	16	99
+4	195B	19	5B
+5	1C73	1C	73
+6	1FEC	1F	EC
+7	23D1	23	D1
+8	2830	28	30
+9	2D18	2D	18
+10	3298	32	98
+11	38C5	38	C5
+12	3FB2	3F	B2
+13	4778	47	78
+14	5030	50	30
+15	59F9	59	F9
+16	64F4	64	F4
+17	7145	71	45
+18	7F17	7F	17
+19	8E99	8E	99
+20	A000	A0	00
+21	B385	B3	85
+22	C96D	C9	6D
+23	E201	E2	01
+24	FD95	FD	95

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