SONY

CXD2755Q

Super Audio CD Format Book ANNEX D&E Conformal Metering

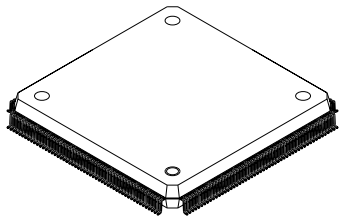
Description

The CXD2755Q is the signal processor for signal level measurement of DSD (Direct Stream Digital) conformed to ANNEX D&E of Super Audio CD Format Book V1.2. This LSI can measure up to 8 channel DSD signals to detect the maximum level of each frequency band specified in ANNEX D&E of Super Audio CD format and output the peak values of every 44.1kHz cycle for the signal level measurement and display.

Functions

- Up to 8 channels of 1bit, 2.8224MHz (44.1kHz × 64) DSD input supported.
- MaxPeak measurement (ANNEX D3):
  28-tap 1st-order moving average filter is used for MaxPeak level measurement.
- DC removal filter:
  DC removal filter (fc = about 0.1Hz) is inserted to HF/MF/LF filters.
- HF measurement (ANNEX D4):
  40kHz 5th-order Butterworth high-pass filter and 100kHz 5th-order Butterworth low-pass filter are used for HF band measurement. In addition, "Mean-Square" and "Square-Root" are calculated for RMS metering.
- MF measurement (ANNEX E2):
  20kHz 10th-order Butterworth high-pass filter and 50kHz 5th-order Butterworth low-pass filter are used for MF band measurement.
- LF measurement:
  20kHz 10th-order Butterworth low-pass filter is used for LF band measurement.
- DC measurement (ANNEX E4):
  0.1Hz 2nd-order low-pass filter is used for DC measurement.
- MF over warning flag (ANNEX E2):
  As the MF specification has the exceptional condition for warning, the signal level of MF and LF are continuously compared and output the warning status from this LSI.

208 pin QFP (Plastic)



Structure

Silicon gate CMOS IC

Absolute Maximum Ratings (Ta = 25°C)

• Supply voltage	V_{DD}	V_{SS} – 0.5 to + 4.6	V
• Input voltage	V_I	V_{SS} – 0.5 to V_{DD} + 0.5	V
• Output voltage	V_O	V_{SS} – 0.5 to V_{DD} + 0.5	V
• Storage temperature	Tstg	–55 to +150	°C

Recommended Operating Conditions

• Supply voltage	V_{DD}	3.0 to 3.6	V
• Operating temperature	Topr	–10 to +75	°C

Input/Output Capacitance

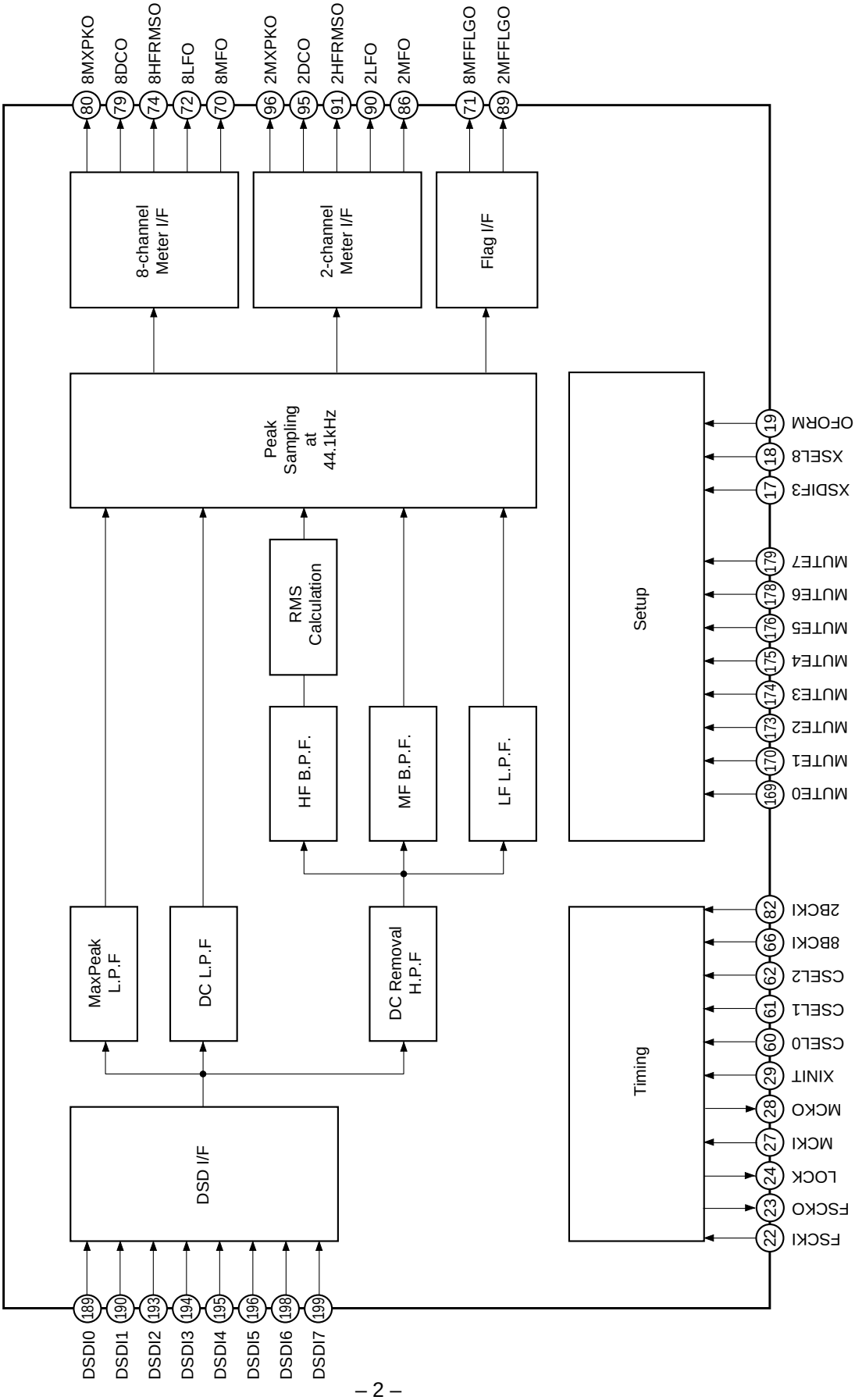
• Input capacitance	C_I	Max. 9pF
• Output capacitance	C_O	Max. 11pF

Note) Measurement conditions

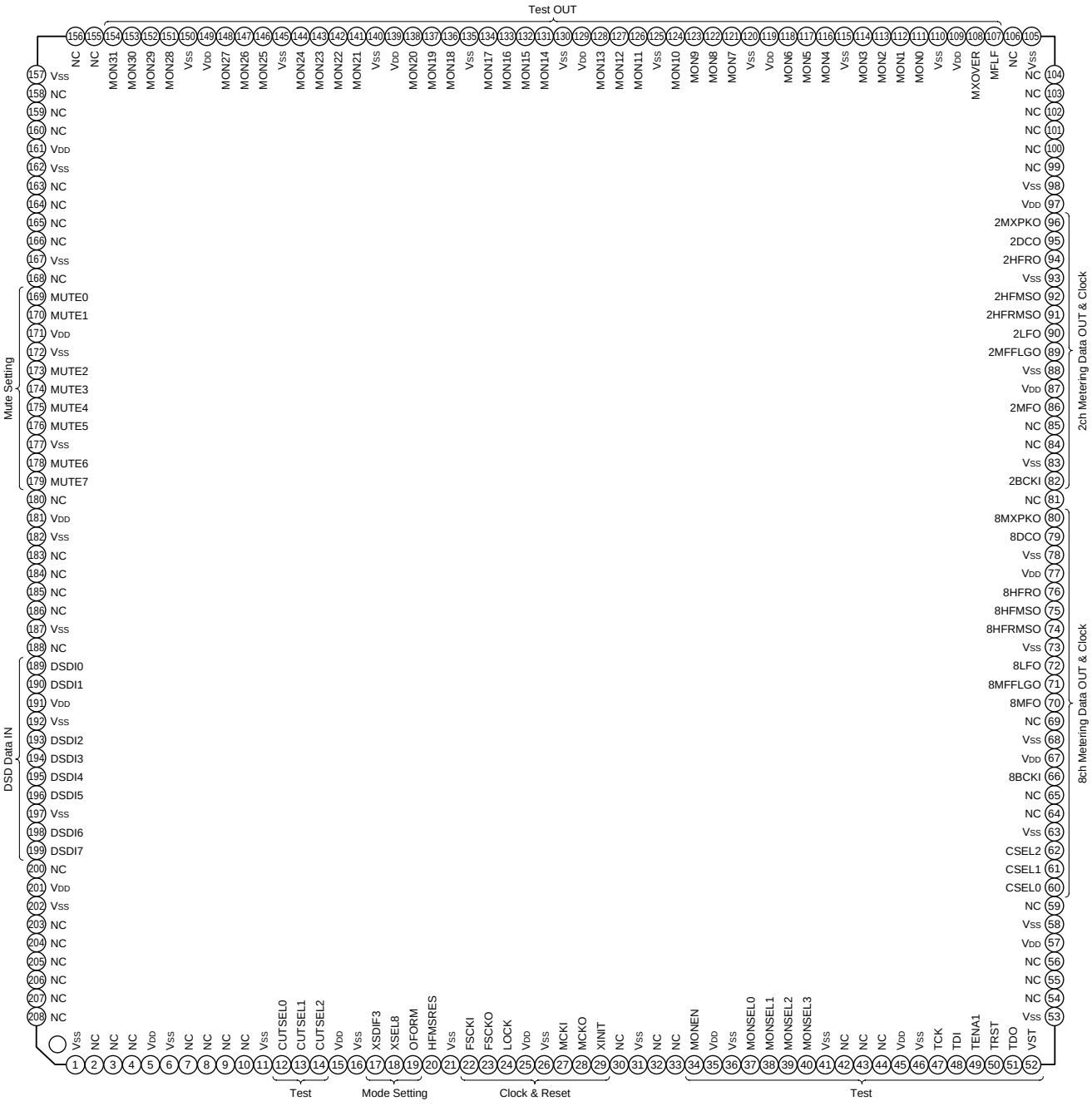
V_{DD} = V_I = 0V, f_M = 1MHz

E02559-PS

Block Diagram



Pin Configuration



Pin Description

Pin No.	Symbol	I/O	Description
1	V_{SS}		
2	NC		
3	NC		
4	NC		
5	V_{DD}		
6	V_{SS}		
7	NC		
8	NC		
9	NC		
10	NC		
11	V_{SS}		
12	CUTSEL0	Ipd	NC.
13	CUTSEL1	Ipd	NC.
14	CUTSEL2	Ipd	NC.
15	V_{DD}		
16	V_{SS}		
17	XSDIF3	Ipu	DSD input format setting. (High: DSD-raw/Low: SDIF-3)
18	XSEL8	Ipd	Output channels setting. (High: 2-channel/Low: 8-channel)
19	OFORM	Ipu	Output format setting. (High: MSB first, left justified/Low: LSB first, right justified)
20	HFMSRES	Ipu	NC.
21	V_{SS}		
22	FSCKI	I_{SC}	Base-band sampling frequency (Fs) input. Fs = 44.1kHz
23	FSCKO	O	Generated base-band sampling frequency (Fs) output. Fs = 44.1kHz
24	LOCK	O	Status flag of synchronization between FSCKI and FSCKO. (High: Locked/Low: Un-locked)
25	V_{DD}		
26	V_{SS}		
27	MCKI	I	Master clock input. MCKI = 22.5792MHz (512Fs)
28	MCKO	O	Buffered master clock output.
29	XINIT	Ipu	System initialization at Low level. (I/O clock is active while initializing.)
30	NC		
31	V_{SS}		
32	NC		
33	NC		
34	MONEN	Ipd	NC.
35	V_{DD}		

* Isc: Hysteresis (Schmitt) input / Ipu: Pulled-up input / Ipd: Pulled-down input

Pin No.	Symbol	I/O	Description
36	V_{SS}		
37	MONSEL0	Ipd	NC.
38	MONSEL1	Ipd	NC.
39	MONSEL2	Ipd	NC.
40	MONSEL3	Ipd	NC.
41	V_{SS}		
42	NC		
43	NC		
44	NC		
45	V_{DD}		
46	V_{SS}		
47	TCK	Ipu	NC.
48	TDI	Ipu	NC.
49	TENA1	Ipu	NC.
50	TRST	Ipu	Fixed to Low level or input Power on reset signal.
51	TDO	O	NC.
52	VST		GND. (V_{SS} for test circuit)
53	V_{SS}		
54	NC		
55	NC		
56	NC		
57	V_{DD}		
58	V_{SS}		
59	NC		
60	CSEL0	I	Channel select input 0 for 8-channel output stream. (Normally, 4Fs clock should be input.)
61	CSEL1	I	Channel select input 1 for 8-channel output stream. (Normally, 2Fs clock should be input.)
62	CSEL2	I	Channel select input 2 for 8-channel output stream. (Normally, 1Fs clock should be input.)
63	V_{SS}		
64	NC		
65	NC		
66	8BCKI	Isc	Bit clock input for 8-channel output stream. (Normally, 256Fs clock should be input.)
67	V_{DD}		
68	V_{SS}		
69	NC		

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Pin No.	Symbol	I/O	Description
70	8MFO	O	8-channel MF band (20kHz to 50kHz) data output.
71	8MFFLGO	O	8-channel MF band (20kHz to 50kHz) level warning status output.
72	8LFO	O	8-channel LF band (up to 20kHz) data output.
73	V_{SS}		
74	8HFRMSO	O	8-channel HF band (40kHz to 100kHz) RMS calculated data output.
75	8HFMSO	O	NC.
76	8HFRO	O	NC.
77	V_{DD}		
78	V_{SS}		
79	8DCO	O	8-channel DC (up to 0.1Hz) data output.
80	8MXPKO	O	8-channel MaxPeak (up to 50kHz) data output.
81	NC		
82	2BCKI	Isc	Bit clock input for 2-channel output stream. (Normally 64Fs clock should be input.)
83	V_{SS}		
84	NC		
85	NC		
86	2MFO	O	2-channel MF band (20kHz to 50kHz) data output.
87	V_{DD}		
88	V_{SS}		
89	2MFFLGO	O	2-channel MF band (20kHz to 50kHz) level warning status output.
90	2LFO	O	2-channel LF band (up to 20kHz) data output.
91	2HFRMSO	O	2-channel HF band (40kHz to 100kHz) RMS calculated data output.
92	2HFMSO	O	NC.
93	V_{SS}		
94	2HFRO	O	NC.
95	2DCO	O	2-channel DC (up to 0.1Hz) data output.
96	2MXPKO	O	2-channel MaxPeak (up to 50kHz) data output.
97	V_{DD}		
98	V_{SS}		
99	NC		
100	NC		
101	NC		
102	NC		
103	NC		
104	NC		
105	V_{SS}		

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Pin No.	Symbol	I/O	Description
106	NC		
107	MFLF	O	NC.
108	MXOVER	O	NC.
109	V_{DD}		
110	V_{SS}		
111	MON0	O	NC.
112	MON1	O	NC.
113	MON2	O	NC.
114	MON3	O	NC.
115	V_{SS}		
116	MON4	O	NC.
117	MON5	O	NC.
118	MON6	O	NC.
119	V_{DD}		
120	V_{SS}		
121	MON7	O	NC.
122	MON8	O	NC.
123	MON9	O	NC.
124	MON10	O	NC.
125	V_{SS}		
126	MON11	O	NC.
127	MON12	O	NC.
128	MON13	O	NC.
129	V_{DD}		
130	V_{SS}		
131	MON14	O	NC.
132	MON15	O	NC.
133	MON16	O	NC.
134	MON17	O	NC.
135	V_{SS}		
136	MON18	O	NC.
137	MON19	O	NC.
138	MON20	O	NC.
139	V_{DD}		
140	V_{SS}		
141	MON21	O	NC.

* Isc: Hysteresis (Schmitt) input / Ipu: Pulled-up input / Ipd: Pulled-down input

Pin No.	Symbol	I/O	Description
142	MON22	O	NC.
143	MON23	O	NC.
144	MON24	O	NC.
145	V_{SS}		
146	MON25	O	NC.
147	MON26	O	NC.
148	MON27	O	NC.
149	V_{DD}		
150	V_{SS}		
151	MON28	O	NC.
152	MON29	O	NC.
153	MON30	O	NC.
154	MON31	O	NC.
155	NC		
156	NC		
157	V_{SS}		
158	NC		
159	NC		
160	NC		
161	V_{DD}		
162	V_{SS}		
163	NC		
164	NC		
165	NC		
166	NC		
167	V_{SS}		
168	NC		
169	MUTE0	Ipd	DSD channel 0 input mute. (High: mute/Low: normal input)
170	MUTE1	Ipd	DSD channel 1 input mute. (High: mute/Low: normal input)
171	V_{DD}		
172	V_{SS}		
173	MUTE2	Ipd	DSD channel 2 input mute. (High: mute/Low: normal input)
174	MUTE3	Ipd	DSD channel 3 input mute. (High: mute/Low: normal input)
175	MUTE4	Ipd	DSD channel 4 input mute. (High: mute/Low: normal input)
176	MUTE5	Ipd	DSD channel 5 input mute. (High: mute/Low: normal input)
177	V_{SS}		

* Isc: Hysteresis (Schmitt) input / Ipu: Pulled-up input / Ipd: Pulled-down input

Pin No.	Symbol	I/O	Description
178	MUTE6	Ipd	DSD channel 6 input mute. (High: mute/Low: normal input)
179	MUTE7	Ipd	DSD channel 7 input mute. (High: mute/Low: normal input)
180	NC		
181	V_{DD}		
182	V_{SS}		
183	NC		
184	NC		
185	NC		
186	NC		
187	V_{SS}		
188	NC		
189	DSDI0	Isc	DSD channel 0 input.
190	DSDI1	Isc	DSD channel 1 input.
191	V_{DD}		
192	V_{SS}		
193	DSDI2	Isc	DSD channel 2 input.
194	DSDI3	Isc	DSD channel 3 input.
195	DSDI4	Isc	DSD channel 4 input.
196	DSDI5	Isc	DSD channel 5 input.
197	V_{SS}		
198	DSDI6	Isc	DSD channel 6 input.
199	DSDI7	Isc	DSD channel 7 input.
200	NC		
201	V_{DD}		
202	V_{SS}		
203	NC		
204	NC		
205	NC		
206	NC		
207	NC		
208	NC		

* Isc: Hysteresis (Schmitt) input / Ipu: Pulled-up input / Ipd: Pulled-down input

Electrical Characteristics

DC Characteristics

(V_{DD} = 3.0 to 3.6V, Topr = –20 to +75°C)

Item		Symbol	Conditions	Min.	Typ.	Max.	Unit	Applicable pins
Input voltage	High level	V_{IH}		0.7V_{DD}			V	*1, *3, *4
	Low level	V_{IL}				0.2V_{DD}	V	*1, *3, *4
Input voltage	High level	V_{T+}		0.7V_{DD}			V	*5
	Low level	V_{T-}				0.2V_{DD}	V	*5
	Hysteresis	$V_{T+} - V_{T-}$			0.5		V	*5
Output voltage	High level	V_{OH}	I_{OH} = –4.0mA	V_{DD} – 0.4			V	*2
	Low level	V_{OL}	I_{OL} = 4.0mA			0.4	V	*2
Input leak (1)		I_{IH}	$V_{IH} = V_{DD}$	40	100	240	µA	*4
Input leak (2)		I_{IL}	V_{IL} = 0V	–240	–100	–40	µA	*3
Input leak (3)		I_I	V = V_{DD} or 0V	–10		10	µA	*1, *5

*1 MCKI, CSEL0, CSEL1, CSEL2

*2 FSCKO, LOCK, MCKO, 8MFO, 8MFFLGO, 8LFO, 8HFRMSO, 8HFMSO, 8HFRO, 8DCO, 8MXPKO, 2MFO, 2MFFLGO, 2LFO, 2HFRMSO, 2HFMSO, 2HFRO, 2DCO, 2MXPKO, MFLF, MXOVER, MON0 to MON31

*3 XSDIF3, OFORM, HFMSRES, XINIT, TCK, TDI, TENA1, TRST

*4 CUTSEL0, CUTSEL1, CUTSEL2, XSEL8, MONEN, MONSEL0 to MONSEL3, MUTE0 to MUTE7

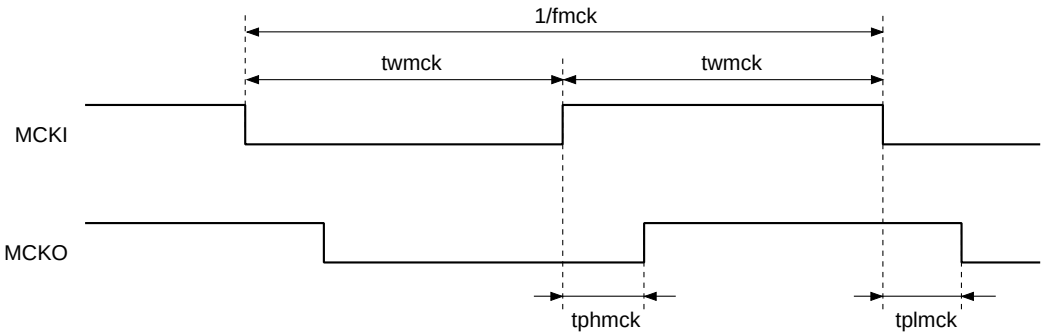
*5 FSCKI, 2BCKI, 8BCKI, DSDI0 to DSDI7

AC Characteristics

1. Master Clock (MCKI, MCKO pins)

(V_{DD} = 3.0 to 3.6V, Topr = –20 to +75°C)

Item	Symbol	Min.	Typ.	Max.	Unit
MCKI frequency	fmck	—	22.5792	—	MHz
MCKI pulse width	twmck	15.28	22.14	—	ns
Propagation delay from MCKI rise to MCKO rise	tphmck	5.12	10.73	22.24	ns
Propagation delay from MCKI fall to MCKO fall	tplmck	5.41	11.34	23.52	ns



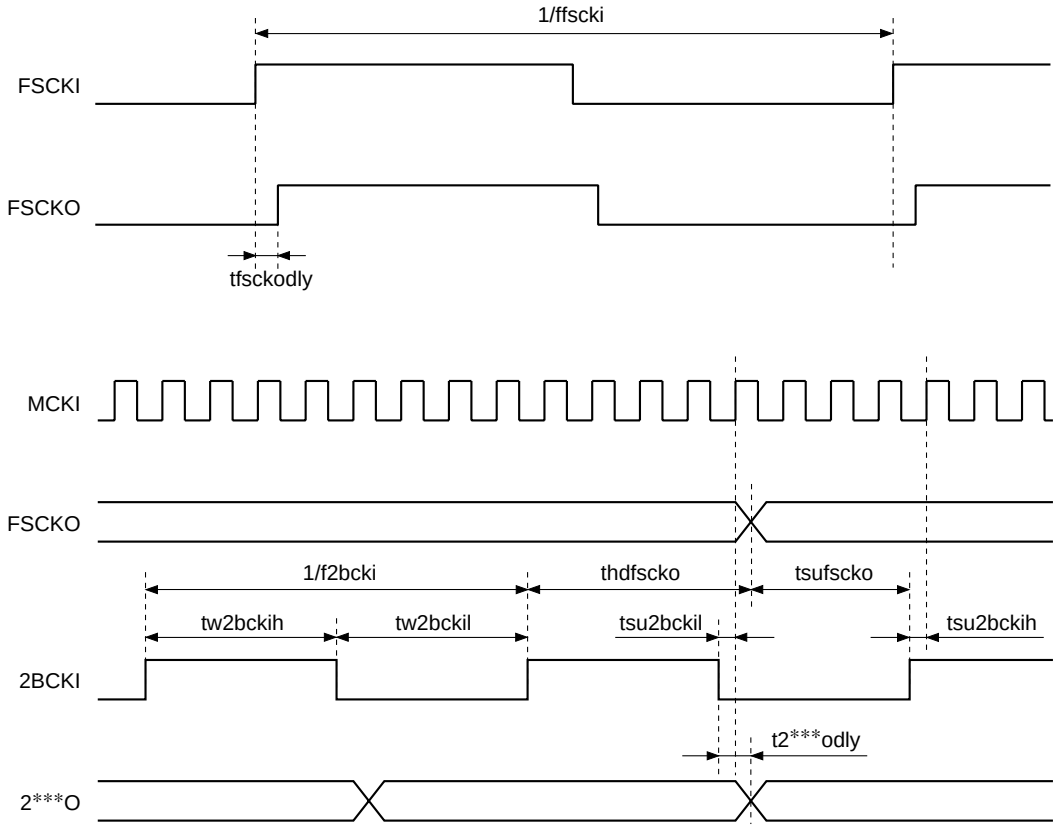
2. Output for 2-Channel Meter (FSCKI, FSCKO, 2BCKI, 2*O)** (V_{DD} = 3.0 to 3.6V, Topr = –20 to +75°C)

Item	Symbol	Min.	Typ.	Max.	Unit
FSCKI frequency	ffscki	—	44.1	—	kHz
FSCKO rise time from FSCKI rise	tfsckodly	–39.2*1	10.7*2	66.5*3	ns
2BCKI frequency	f2bcki	—	2.8224	—	MHz
2BCKI clock pulse width (High)	tw2bckih	143	177	211	ns
2BCKI clock pulse width (Low)	tw2bckil	143	177	211	ns
FSCKO setup time, relative to 2BCKI rise	tsufscko	143	177	211	ns
FSCKO hold time, relative to 2BCKI rise	thdfscko	143	177	211	ns
2BCKI fall setup time, relative to MCKI rise	tsu2bckil	2.3	5.0	10.3	ns
2BCKI rise setup time, relative to MCKI rise	tsu2bckih	2.2	4.7	9.8	ns
2***O change time from 2BCKI fall	t2***odly	12.1	25.6	52.9	ns

*1 Minimum gate delay –1MCK

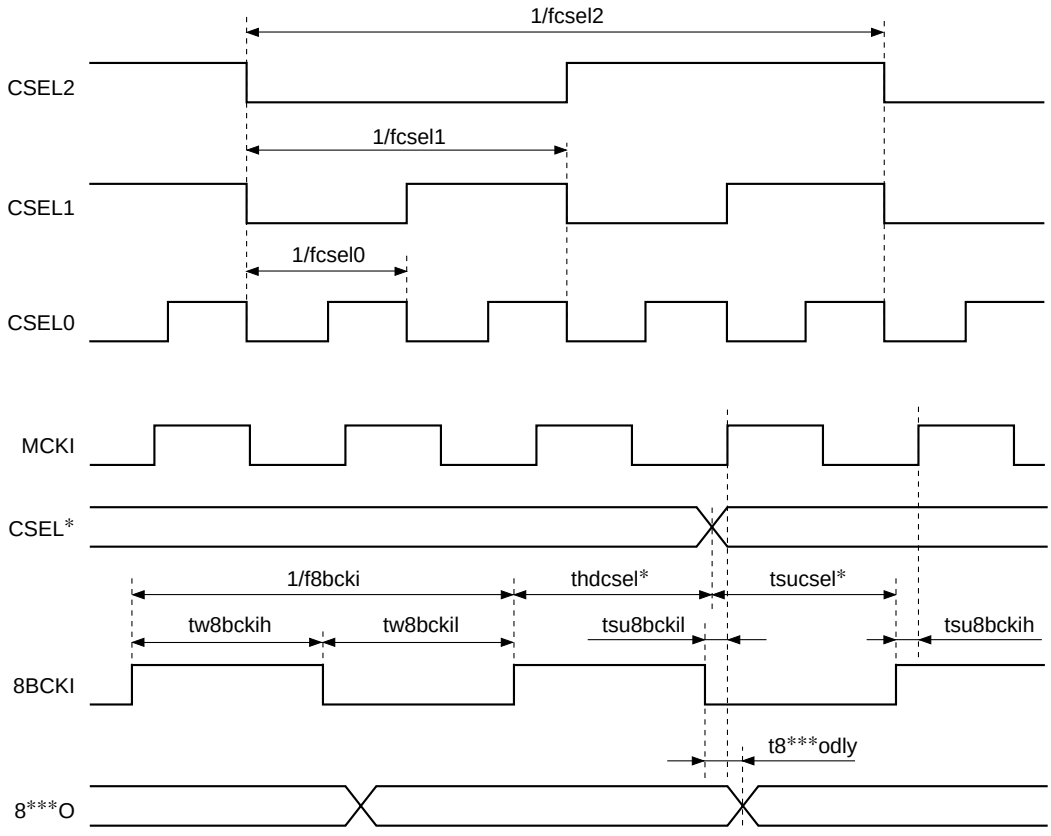
*2 Typical gate delay

*3 Maximum gate delay +1MCK



3. Output for 8-Channel Meter (CSEL*, 8BCKI, 8*O)** (V_{DD} = 3.0 to 3.6V, Topr = –20 to +75°C)

Item	Symbol	Min.	Typ.	Max.	Unit
CSEL0 frequency	fcsel0	—	176.4	—	kHz
CSEL1 frequency	fcsel1	—	88.2	—	kHz
CSEL2 frequency	fcsel2	—	44.1	—	kHz
8BCKI frequency	f8bcki	—	11.2896	—	MHz
8BCKI clock pulse width (High)	tw8bckih	—	44.3	—	ns
8BCKI clock pulse width (Low)	tw8bckil	—	44.3	—	ns
8BCKI fall setup time, relative to MCKI rise	tsu8bckil	3.6	7.6	15.8	ns
8BCKI rise setup time, relative to MCKI rise	tsu8bckih	3.1	6.6	13.8	ns
CSEL* setup time, relative to 8BCKI rise	tsufscko	–44.3		44.3	ns
CSEL* hold time, relative to 8BCKI rise	thdfscko	–44.3		44.3	ns
8***O change time from 8BCKI fall	t8***odly	13.4	28.2	58.4	ns



Description of Functions

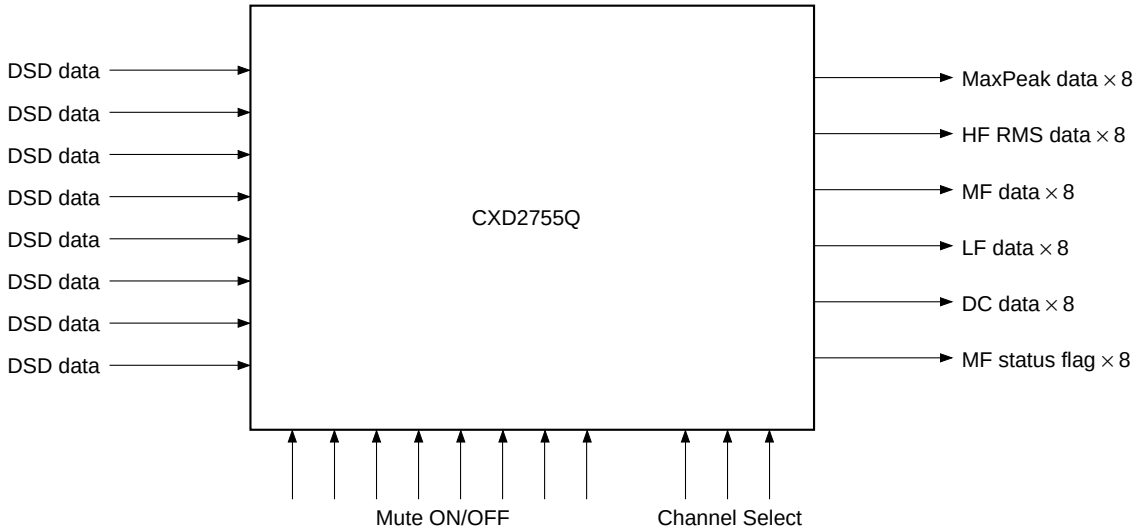
Description of Operation Modes

This LSI has two operating modes.

- 2-channel mode: Detect the maximum level of each frequency band specified in ANNEX D&E of Super Audio CD format and output the peak values of every 44.1kHz cycle for stereo signal level measurement and display.
- 8-channel mode: Detect the maximum level of each frequency band specified in ANNEX D&E of Super Audio CD format and output the peak values of every 44.1kHz cycle for signal level measurement and display up to 8 channels.

1) Description of 2-Channel Mode

2) Description of 8-Channel Mode



Setup

This LSI can setup the various functions by parallel setting which sets the functions according to the pin High and Low levels.

Setup Pins and Their Contents

Pin No.	Symbol	Contents	High	Low	Effective modes	
					2-channel	8-channel
17	XSDIF3	DSD input format setting	DSD-raw	SDIF-3	O	O
18	XSEL8	Output channel setting	2-channel	8-channel	O	O
19	OFORM	Output format setting	MSB first, left justified	LSB first, right justified	O	O
169	MUTE0	DSD channel 0 input mute	Mute	Normal input	O	O
170	MUTE1	DSD channel 1 input mute	Mute	Normal input	O	O
173	MUTE2	DSD channel 2 input mute	Mute	Normal input		O
174	MUTE3	DSD channel 3 input mute	Mute	Normal input		O
175	MUTE4	DSD channel 4 input mute	Mute	Normal input		O
176	MUTE5	DSD channel 5 input mute	Mute	Normal input		O
178	MUTE6	DSD channel 6 input mute	Mute	Normal input		O
179	MUTE7	DSD channel 7 input mute	Mute	Normal input		O

1. 2-Channel Mode

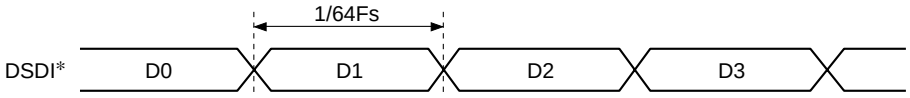
1-1. Input/Output Signals

DSDI0, DSDI1: Input the 2-channel DSD data
2MXPKO: Output the 2-channel MaxPeak (ANNEX D3) data
2HFRMSO: Output the 2-channel HF RMS (ANNEX D4) calculated data
2MFO: Output the 2-channel MF (ANNEX E2) data
2MFFLGO: Output the 2-channel status flags for MF (ANNEX E2) warning
2LFO: Output the 2-channel LF data
2DCO: Output the 2-channel DC (ANNEX E4) data

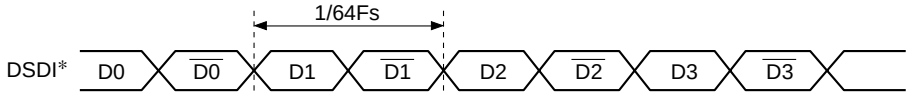
1-2. DSD Data Input

The 1-bit DSD data with 2.8224MHz (44.1kHz × 64) sampling frequency is input to the DSDI0 and DSDI1 pins. As the input circuit detects the data edge for data acquisition internally, any bit clock is not necessary. Assure the input signal format (DSD-raw or SDIF-3) and select the proper mode by the XSDIF3 pin.

XSDIF3 = High: DSD-raw format
XSDIF3 = Low: SDIF-3 format



DSD Data Input (DSD-raw)



DSD Data Input (SDIF-3)

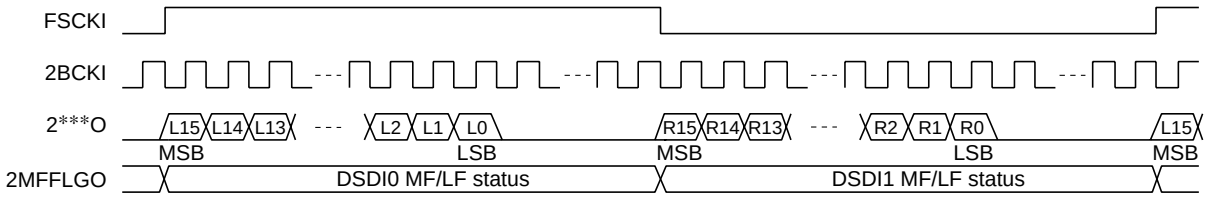
1-3. Metering Data Output

Each metering data output is expressed as two's complement data except for 2MFFLGO and formed to be the left justified MSB first or right justified LSB first by the OFORM pin setting. The resolution of each metering data is 16 bits and read out by 64Fs 2BCKI clock. The reference level of SACD (0dBSACD) corresponds to 3FFF (H) or C000 (H) in order to display up to +6dBSACD except for MaxPeak.

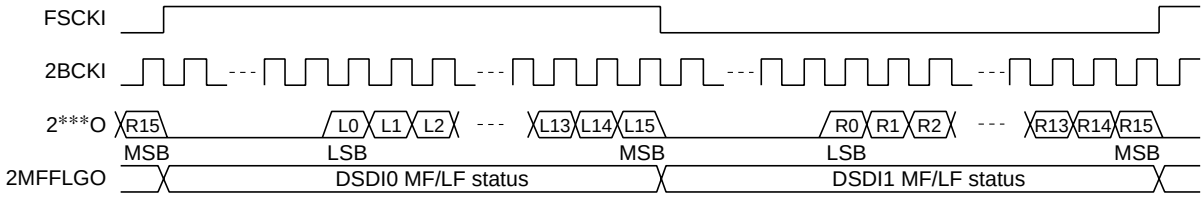
* 0dBSACD for MaxPeak is 3800 (H) or C800 (H), then 7000 (H) or 9000 (H) at +6dBSACD.

Output Format

OFORM = High: MSB first, left justified
OFORM = Low: LSB first, right justified



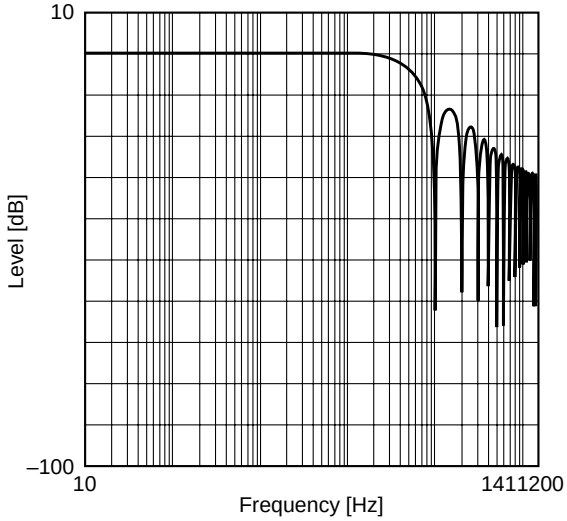
OFORM (MSB first, left justified)



OFORM (LSB first, right justified)

MaxPeak (ANNEX D3)

The MaxPeak filter consists of 28-tap 1st-order moving average filter for quasi-50kHz bandwidth signal level monitoring.



MaxPeak Filter Frequency Response

In the SACD Format Book V1.2, up to +3.1dBSACD MaxPeak is allowed and it corresponds to 5000 (H) or B000 (H). The correspondence between the MaxPeak signal level and the output codes is as follows.

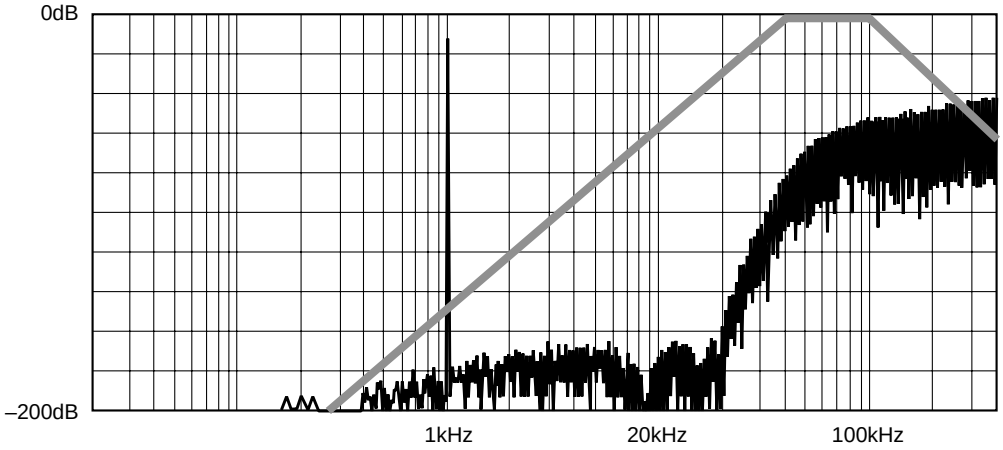
MaxPeak signal level	Output code		Status
+6.02dBSACD	7000 (H)	9000 (H)	Format Error
+5.38dBSACD	6800 (H)	9800 (H)	Format Error
+4.68dBSACD	6000 (H)	A000 (H)	Format Error
+3.93dBSACD	5800 (H)	A800 (H)	Format Error
+3.10dBSACD	5000 (H)	B000 (H)	OK
+2.18dBSACD	4800 (H)	B800 (H)	OK
+1.16dBSACD	4000 (H)	C000 (H)	OK
0dBSACD	3800 (H)	C800 (H)	OK
–1.34dBSACD	3000 (H)	D000 (H)	OK
–2.92dBSACD	2800 (H)	D800 (H)	OK
–4.86dBSACD	2000 (H)	E000 (H)	OK
–7.36dBSACD	1800 (H)	E800 (H)	OK
–10.88dBSACD	1000 (H)	F000 (H)	OK
–16.90dBSACD	0800 (H)	F800 (H)	OK
–∞dBSACD	0000 (H)		OK

MaxPeak Signal Level vs. Output Codes

As over +3.1dBSACD MaxPeak is prohibited, SACD mastering meter should indicate "Format Error" for over +3.1dBSACD MaxPeak signals.

HF RMS (ANNEX D4)

HF filter consists of 40kHz cut-off 5th-order Butterworth high-pass filter and 100kHz cut-off 5th-order Butterworth low-pass filter for high frequency noise power monitoring. For noise power monitoring, Mean-Square and Square-Root are calculated for RMS metering internally.



HF Filter Frequency Response

In the SACD Format Book V1.2, up to –20dBSACD HF RMS is allowed. As the output code contains –3.01dB offset for the sine wave input because of RMS calculation, +3.01dB offset should be added for actual metering and –23.01dB output becomes equivalent to –20dBSACD. Therefore, the correspondence between HF RMS and output codes is as follows.

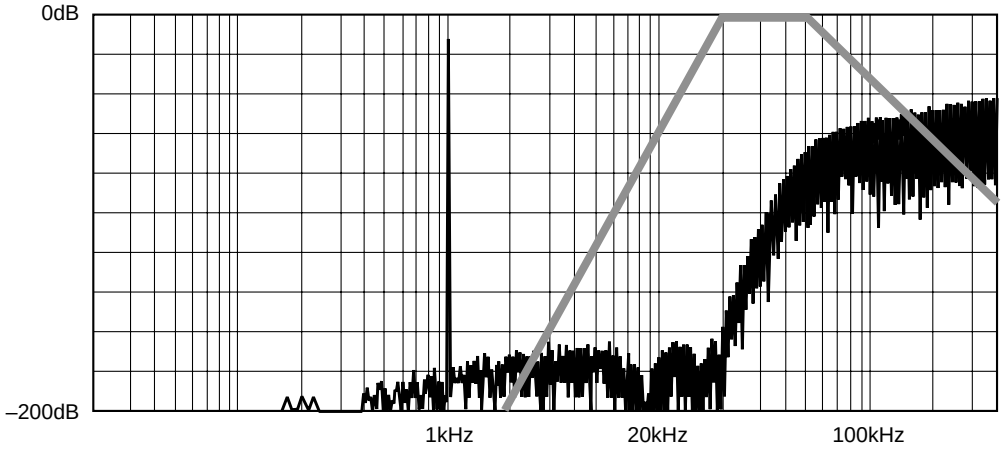
HF RMS signal level	Output readout	Output code		Status
:	:	:	:	:
+3.01dBSACD	+0dB	3FFF (H)	C000 (H)	Format Error
:	:	:	:	:
0dBSACD	–3.01dB	2D40 (H)	D2BF (H)	Format Error
:	:	:	:	:
–19.99dBSACD	–23.00dB	0487 (H)	FB78 (H)	Format Error
–20.00dBSACD	–23.01dB	0486 (H)	FB79 (H)	OK
:	:	:	:	:

HF RMS vs. Output Codes

As over –20dBSACD HF RMS is prohibited, the SACD mastering meter should indicate "Format Error" for over –20dBSACD HF RMS.

MF (ANNEX E2)

MF filter consists of 20kHz cut-off 10th-order Butterworth high-pass filter and 50kHz cut-off 5th-order Butterworth low-pass filter for high frequency signal and noise level monitoring.



MF Filter Frequency Response

In the SACD Format Book V1.2, over –28dBSACD MF signal is not recommended while LF is lower than MF. However, any MF signal is allowed if MF is lower than LF. The correspondence between the MF signal level and the output codes is as follows.

MF signal level	Output code		Status
:	:	:	:
0dBSACD	3FFF (H)	C000 (H)	See MFFLGO
:	:	:	:
–27.98dBSACD	028D (H)	FD72 (H)	See MFFLGO
–28.00dBSACD	028C (H)	FD73 (H)	OK
:	:	:	:

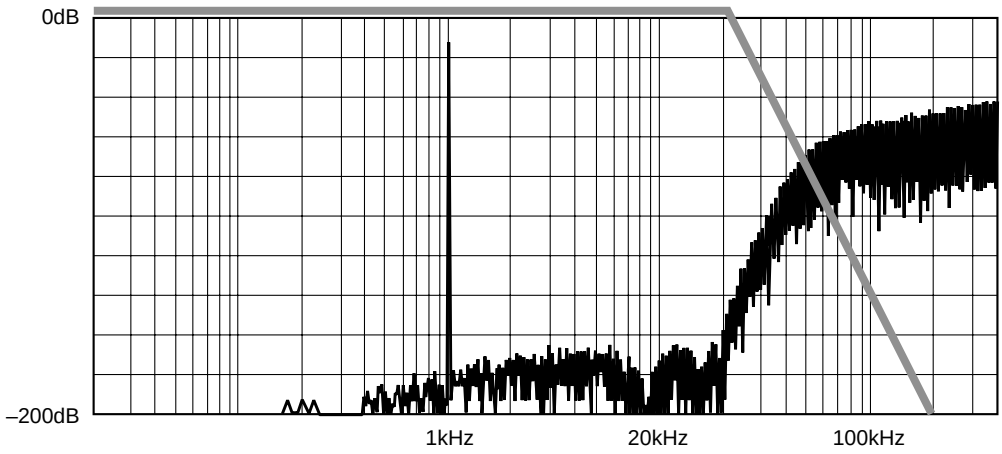
MF vs. Output Codes

MF Status Flags (ANNEX E2)

MF status flags indicate the ANNEX E2 warning condition. If the internal comparator detects over –28dBSACD MF signals while LF is lower than MF, 2MFFLGO becomes "High". If MF is lower than LF, 2MFFLGO stays "Low". Therefore, 2MFFLGO can be use for ANNEX E2 warning.

LF

LF filter consists of 20kHz cut-off 10th-order Butterworth low-pass filter for audio frequency signal level monitoring.



LF Filter Frequency Response

In the SACD Format Book V1.2, LF is not specified, however, LF is used for comparison with MF for MF warning. The correspondence between the LF signal level and the output codes is as follows.

LF signal level	Output code	
:	:	:
0dBSACD	3FFF (H)	C000 (H)
:	:	:

LF vs. Output Codes

DC (ANNEX E4)

The DC filter consists of 0.1Hz cut-off 2nd-order (cascaded 1st-order) low-pass filter for DC offset monitoring. In the SACD Format Book V1.2, over –50dBSACD DC offset is not recommended. The correspondence between the DC offset and the output codes is as follows.

DC signal level	Output code		Status
:	:	:	:
0dBSACD	3FFF (H)	C000 (H)	Warning
:	:	:	:
–49.96dBSACD	0034 (H)	FFCB (H)	Warning
–50.13dBSACD	0033 (H)	FFCC (H)	OK
:	:	:	:

DC vs. Output Codes

2. 8-Channel Mode

2-1. Input/Output Signals

DSDI0 to DSDI7: Input the 8-channel DSD data
CSEL0 to CSEL2: Input the channel select signal
8MXPKO: Output the 8-channel MaxPeak (ANNEX D3) data
8HFRMSO: Output the 8-channel HF RMS (ANNEX D4) calculated data
8MFO: Output the 8-channel MF (ANNEX E2) data
8MFFLGO: Output the 8-channel status flags for MF (ANNEX E2) warning
8LFO: Output the 8-channel LF data
8DCO: Output the 8-channel DC (ANNEX E4) data

2-2. DSD Data Input

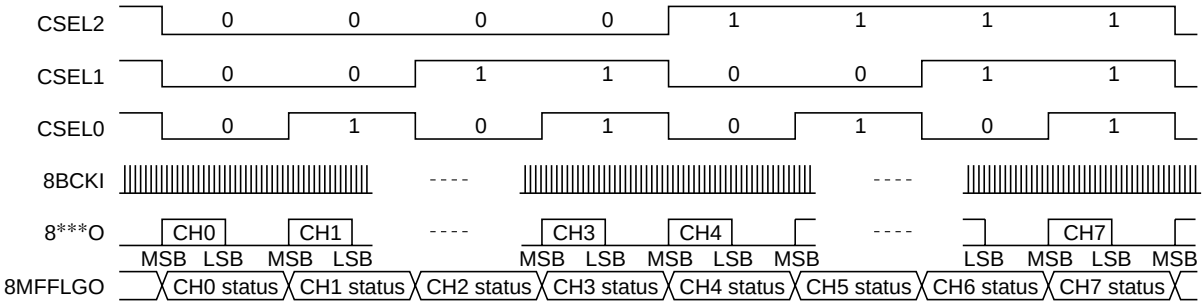
See 1-2.

2-3. Metering Data Output

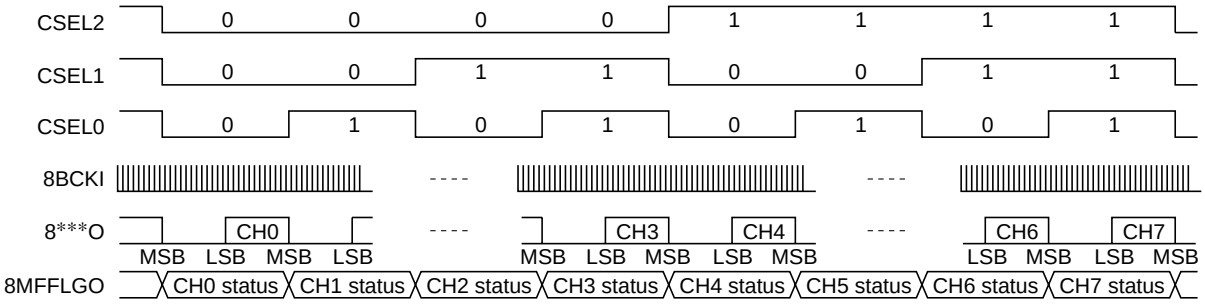
Each metering data output is expressed as two's complement data except for 8MFFLGO and formed to be the left justified MSB first or right justified LSB first by OFORM pin setting. The resolution of each metering data is 16 bits and read out with 256Fs 8BCKI clock. The reference level of SACD (0dBSACD) corresponds to 3FFF (H) or C000 (H) in order to display up to +6dBSACD except for MaxPeak.
*0dBSACD for MaxPeak is 3800 (H) or C800 (H), then 7000 (H) or 9000 (H) at +6dBSACD.

Output Format

OFORM = High: MSB first, left justified
OFORM = Low: LSB first, right justified



OFORM (MSB first, left justified)



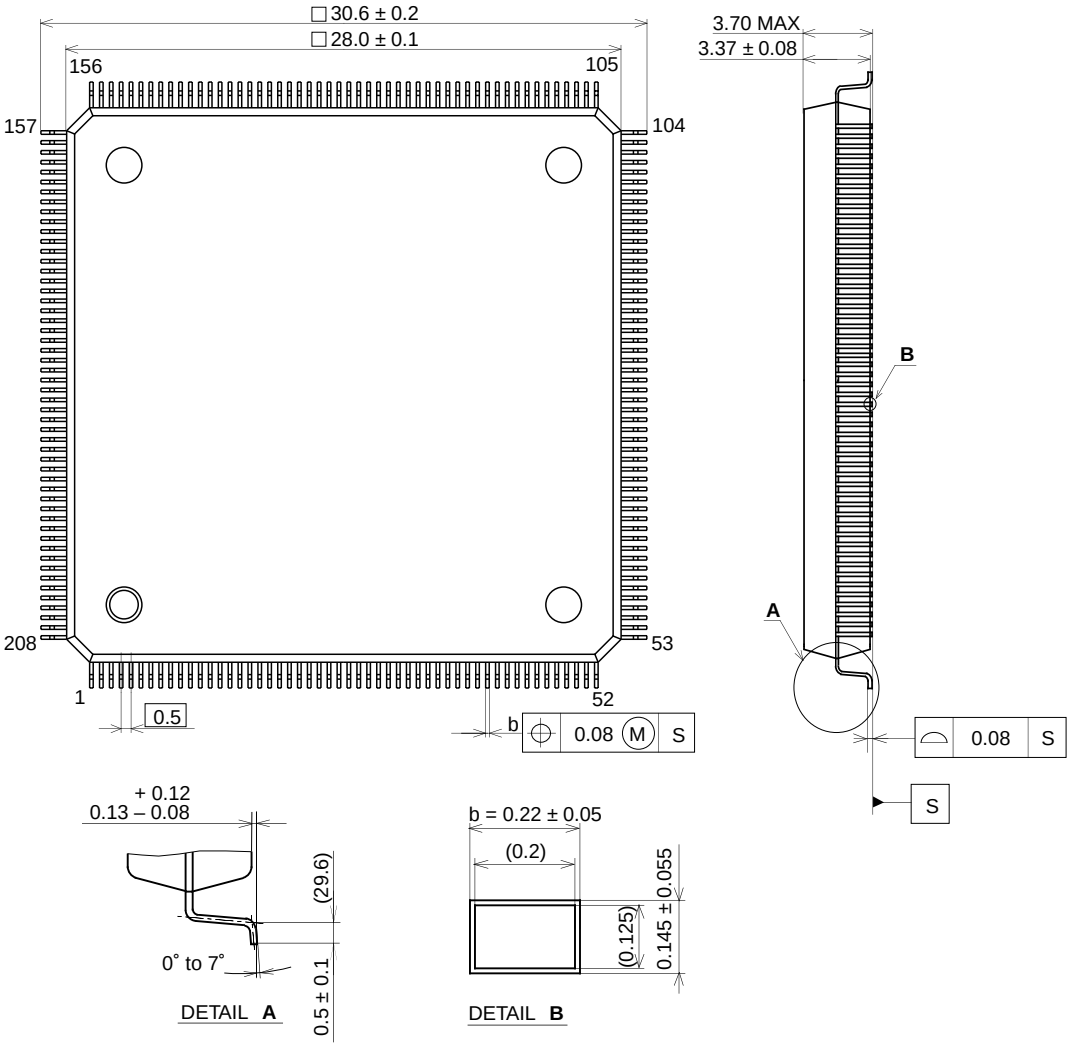
OFORM (LSB first, right justified)

MaxPeak (ANNEX D3)
HF RMS (ANNEX D4)
MF (ANNEX E2)
MF Status Flags (ANNEX E2)
LF
DC (ANNEX E4)

See 1-3.

Package Outline Unit: mm

208PIN QFP (PLASTIC)



PACKAGE STRUCTURE

PACKAGE MATERIAL	EPOXY RESIN
LEAD TREATMENT	SOLDER PLATING
LEAD MATERIAL	COPPER ALLOY
PACKAGE MASS	4.9g

SONY CODE	QFP-208P-L281
EIAJ CODE	P-QFP208-28X28-0.5
JEDEC CODE	————

LEAD PLATING SPECIFICATIONS

ITEM	SPEC.
LEAD MATERIAL	COPPER ALLOY
SOLDER COMPOSITION	Sn-Bi Bi:1-4wt%
PLATING THICKNESS	5-18µm