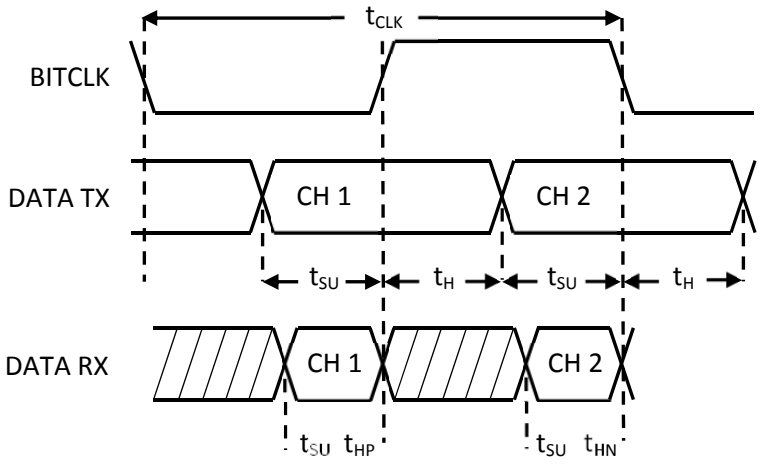
APx PDM Option: Specifications

Technical Specifications (with APx500 v3.1 software)

Parameter	Symbol	Test Conditions	Min	Typical	Max	Unit
TRANSMITTER						
Decimated Rate	F_S		4		216	kHz
Bit Clock Rate	F_B	Master or slave mode	0.128		24.576	MHz
INTERPOLATION FILTER						
Interpolation Ratio (F_B/F_S)	INTR	32, 33.33, 37.5, 42.67, 48, 50, 64, 66.67, 75, 85.33, 96, 100, 128, 150, 192, 200, 256, 300, 384, 400, 512, 500, 768, 800	32		800	
Passband Frequency Range			0		0.45	F_S
Passband Gain		INTR = 32, 64, 128, 256, 512	-0.0001		+0.0001	dB
		All other INTR values	-0.0063		+0.0001	dB
Stopband Frequency Range			0.55		INTR/2	F_S
Stopband Attenuation		INTR = 32, 64, 128, 256, 512	115			dB
		All other INTR values	100			dB
MODULATOR: GENERAL						
Passband Frequency Range			0		0.45	F_S
Passband Gain			-0.0001		0.0001	dB
Maximum Input Level	MIL				0	dBFS
Linearity		-100 dBFS to MIL (order 4, 5)	-0.010		0.001	dB
		MIL to 0 dBFS (order 4)	-0.005		0.002	dB
		MIL to 0 dBFS (order 5)	-0.030		0.001	dB
Ones Density at Full Scale			99.94	100		%
MODULATOR: ORDER 4, 64x OSR						
Overload Point	OLP	1 kHz			-7.8	dBFS
Total Harm. Dist. + Noise		@OLP; BW = 0.45 F_S			-105	dB
Signal-to-Noise Ratio	SNR	@OLP; BW = 0.45 F_S	106			dB
Dynamic Range	DNR	@MIL; F_S = 48 kHz; per AES17	115			dB
MODULATOR: ORDER 5, 64x OSR						
Overload Point	OLP	1 kHz			-9.4	dBFS
Total Harm. Dist. + Noise		@OLP; BW = 0.45 F_S			-116	dB
Signal-to-Noise Ratio	SNR	@OLP; BW = 0.45 F_S	116			dB
Dynamic Range	DNR	@MIL; F_S = 48 kHz; per AES17	125			dB
MODULATOR: ORDER 4, 128x OSR						
Overload Point	OLP	1 kHz			-7.9	dBFS
Total Harm. Dist. + Noise		@OLP; BW = 0.45 F_S			-127	dB
Signal-to-Noise Ratio	SNR	@OLP; BW = 0.45 F_S	127			dB
Dynamic Range	DNR	@MIL; F_S = 48 kHz; per AES17	135			dB
MODULATOR: ORDER 5, 128x OSR						
Overload Point	OLP	1 kHz			-9.6	dBFS
Total Harm. Dist. + Noise		@OLP; BW = 0.45 F_S			-127	dB
Signal-to-Noise Ratio	SNR	@OLP; BW = 0.45 F_S	126			dB
Dynamic Range	DNR	@MIL; F_S = 48 kHz; per AES17	136			dB
MODULATOR: ORDER 4, 256x OSR						
Overload Point	OLP	1 kHz			-8.0	dBFS
Total Harm. Dist. + Noise		@OLP; BW = 0.45 F_S			-130	dB
Signal-to-Noise Ratio	SNR	@OLP; BW = 0.45 F_S	129			dB
Dynamic Range	DNR	@MIL; F_S = 48 kHz; per AES17	137			dB
MODULATOR: ORDER 5, 256x OSR						
Overload Point	OLP	1 kHz			-9.8	dBFS
Total Harm. Dist. + Noise		@OLP; BW = 0.45 F_S			-128	dB
Signal-to-Noise Ratio	SNR	@OLP; BW = 0.45 F_S	127			dB
Dynamic Range	DNR	@MIL; F_S = 48 kHz; per AES17	137			dB
MODULATOR: ORDER 4, 512x OSR						
Overload Point	OLP	1 kHz			-8.2	dBFS
Total Harm. Dist. + Noise		@OLP; BW = 0.45 F_S			-130	dB
Signal-to-Noise Ratio	SNR	@OLP; BW = 0.45 F_S	129			dB
Dynamic Range	DNR	@MIL; F_S = 48 kHz; per AES17	137			dB

Parameter	Symbol	Test Conditions	Min	Typical	Max	Unit
MODULATOR: ORDER 5, 512x OSR						
Overload Point	OLP	1 kHz			-10.0	dBFS
Total Harm. Dist. + Noise		@OLP; BW = 0.45 F_S			-128	dB
Signal-to-Noise Ratio	SNR	@OLP; BW = 0.45 F_S	127			dB
Dynamic Range	DNR	@MIL; F_S = 48 kHz; per AES17	137			dB
RECEIVER						
Decimated Rate	F_S		0.160		768	kHz
Bit Clock Rate	F_B	Master or slave mode	0.128		24.576	MHz
DECIMATION FILTER						
Decimation Ratio (F_B/F_S)	DECR	32, 33.33, 37.5, 42.67, 48, 50, 64, 66.67, 75, 85.33, 96, 100, 128, 150, 192, 200, 256, 300, 384, 400, 512, 500, 768, 800	32		800	
Passband Frequency Range			0		0.45	F_S
Passband Gain			-0.0001		+0.0001	dB
Stopband Frequency Range			0.55		DECR/2	F_S
Stopband Attenuation		All DECR values	120			dB
BITSTREAM INPUT MODE						
Passband Frequency Range			0		0.5	F_B
LOGIC LEVEL						
Interface Voltage	V_{INT}		1.80		3.30	V
Resolution					0.01	V
Accuracy				±0.05		V
OUTPUT CHARACTERISTICS						
Output Voltage High	V_{OH}	I_{LOAD} = 0.5 mA	0.7×V_{INT}			V
Output Voltage Low	V_{OL}	I_{LOAD} = 0.5 mA			0.3×V_{INT}	V
VDD OUTPUT						
DC Voltage	V_{DD}		1.50		3.60	V
Resolution					0.01	V
Accuracy				±0.05		V
Maximum Current	I_{MAX}				15	mA
VDD MODULATION						
AC output level		All waveforms	0.01		$V_{DD}/5$	V_{pp}
Square/Pulse Frequency		Per GSM standard		216.667		Hz
Sine Frequency			10		22000	Hz
Frequency Accuracy				3		ppm

Timing Characteristics

Parameter	Description	Min	Max	Unit
PDM TRANSMITTER				
t_{CLKTX}	Clock period (master or slave mode)	41	7813	ns
t_H	Data hold time	20		ns
t_{SU}	Data setup time		t_{CLKTX}/2-30	ns
PDM RECEIVER				
t_{CLKRX}	Clock period (master or slave mode)	41	7813	ns
t_{HP}	Data hold time, rising edge	5		ns
t_{HN}	Data hold time, falling edge	10		ns
t_{SU}	Data setup time		5	ns

Timing Diagram