

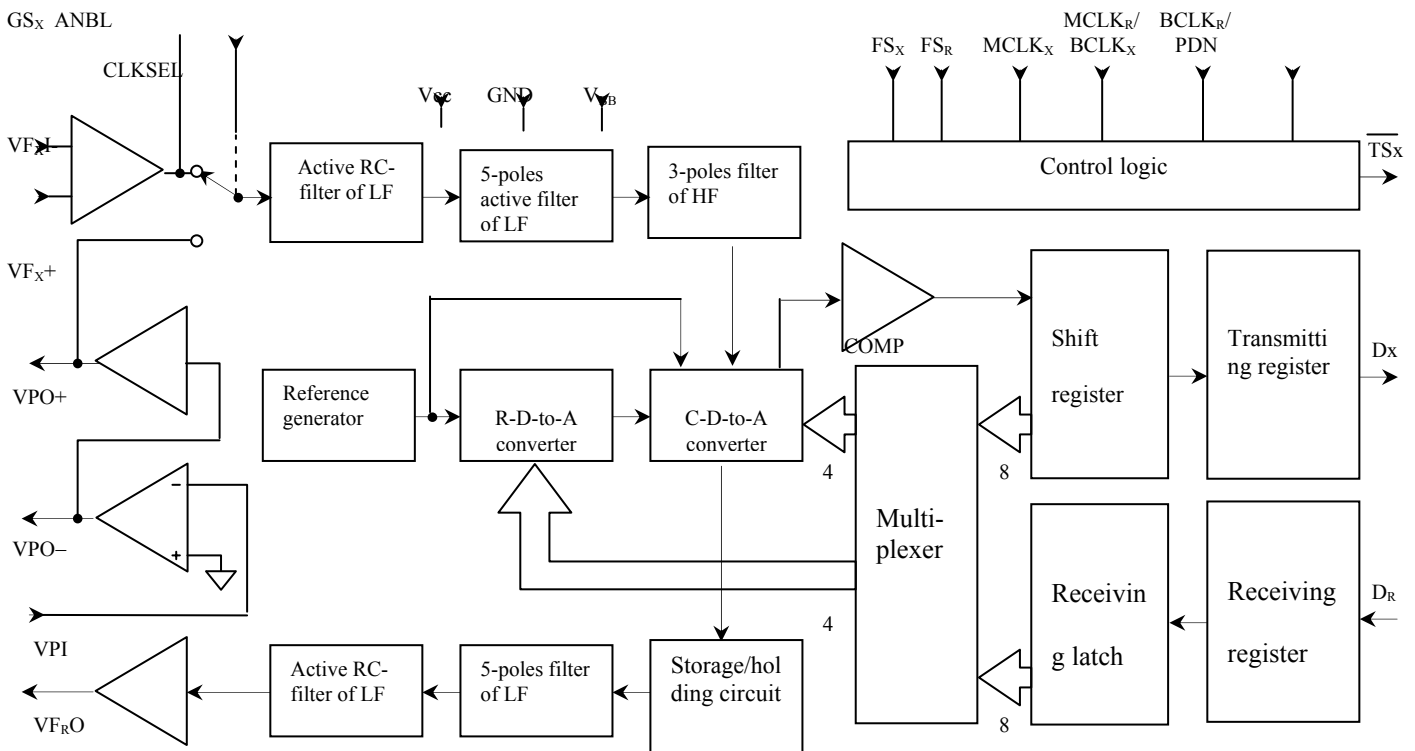
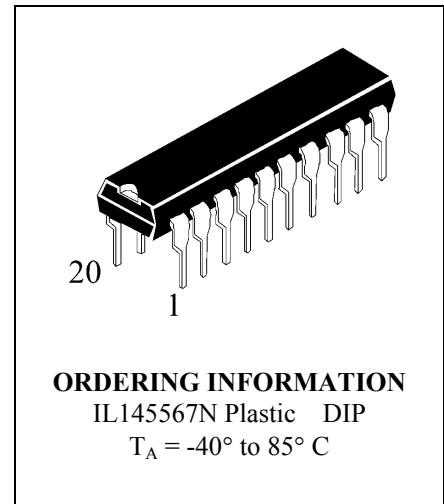
PCM CODEC - FILTER

IL145567

IL145567N is a one-chip PCM-cofidec which converts speech signal into digital form and backwards. The IC is design to operate in synchronous and asynchronous systems and is comprised of:

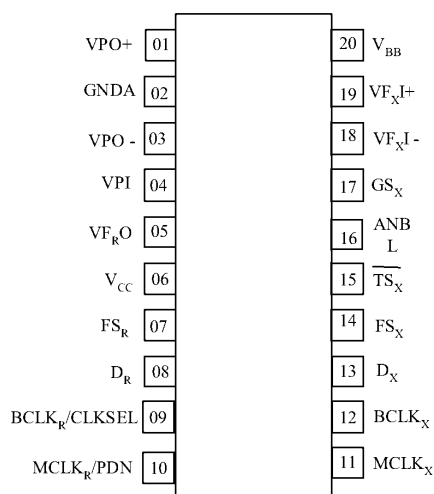
- reference generator;
- filters on switching capacitors in transmission and receipt channels ;
- two operational amplifiers.

The IC does signal companding under the A-law and full differential processing of analogue signals for reduction of noises. Typical dissipated power is 40mW, under reduced power – 1 mW at ± 5 V.



Note – COMP – comparator

Figure 1 – Block diagram



Pin arrangement in package

Pins description

Pin №	Symbol	Description
01	VPO+	Output of power OA
02	GND	Common output
03	VPO –	Output of power OA
04	VPI	Input of power OA
05	VF _R O	Output of digital signal audio frequency
06	V _{cc}	Supply 5 V
07	FS _R	Input of receipt cycle synchronisation
08	D _R	Input of digital data receipt
09	BCLK _R /CLKSEL	Input of clock oscillator and selector of basic oscillator frequency
10	MCLK _R /PDN	Input of main clock oscillator and underconsumption control
11	MCLK _x	Input of main clock oscillator for transmission
12	BCLK _x	Input of clock oscillator for data transmission (synchronised with MCLK _x)
13	D _x	Output of transmitted digital data
14	FS _x	Input of transmission cycle synchronisation
15	TS _x	Output of transmission temporary interval indicator
16	ANBL	Input of feedback loop control
17	GS _x	Output of input OA
18	VF _x I-	Input of transmitted audio frequency (inverting)
19	VF _x I+	Input of transmitted audio frequency (noninverting)
20	V _{BB}	Supply minus 5 V

Supply source

Characteristics		min	max	Unit
Supply voltage of constant current	V_{CC} V_{BB}	4.75 - 4.75	5.25 - 5.25	V
Consumption power in active mode (without load)	$V_{PI} = V_{BB}$	-	70 60	mW
Consumption power in sleep mode (without load)	$V_{PI} = V_{BB}$	-	5.0 3.0	

Digital signal strength

($V_{CC} = 5V \pm 5\%$, $V_{BB} = -5V \pm 5\%$, $G_{NDA} = 0V$)

Characteristics		Symbol	Min	Max	Unit
Input voltage Low		V_{IL}	-	0.6	V
Input voltage High		V_{IH}	2.2	-	
Output voltage Low	D_X or \overline{TS}_X , $I_{OL} = 3.2mA$	V_{OL}	-	0.4	
Output voltage High	D_X , $I_{OH} = -3.2mA$ $I_{OH} = -1.6mA$	V_{OH}	2.4 $V_{CC}-0.5$	- -	
Input current Low	$G_{NDA} \leq V_{in} \leq V_{CC}$	I_{IL}	-10	+10	mA
Input current High	$G_{NDA} \leq V_{in} \leq V_{CC}$	I_{IH}	-10	+10	
Output current in the third state	$G_{NDA} \leq D_X \leq V_{CC}$	I_{OZ}	-10	+10	

Dynamic characteristics of digital signals(V_{CC} = 5V ± 5%, V_{BB} = -5V ± 5%, values of all signals are indicated relatively to GNDA)

Characteristics	Symbol	min	typical	max	Unit
Frequencies of main clock oscillators MCLK _X or MCLK _R	fm	–	1.544 2.048	–	MHz
Min width of high or low pulse MCLK _X or MCLK _R	t _{w(M)}	100	–	–	ns
Min width of high or low pulse BCLK _X or BCLK _R	t _{w(B)}	50	–	–	ns
Min width of low pulse FS _X or FS _R	t _{w(FL)}	50	–	–	ns
Rise time	t _r	50	–	–	ns
Fall time	t _f	50	–	–	ns
Ratings of data bit synchronisation BCLK _X or BCLK _R	f _B	128	–	4096	kHz
Presetting time of from low BCLK _X to high MCLK _R	t _{su(BRM)}	50	–	–	ns
Presetting time from high MCLK _X to low BCLK _X	t _{su(MFB)}	20	–	–	ns
Holding time from low BCLK _X (BCLK _R) to high FS _X (FS _R)	t _{h(BF)}	20	–	–	ns
Presetting time from high FS _X (FS _R) to low BCLK _X (BCLK _R) for long frames	t _{su(FB)}	80	–	–	ns
Delay time from high BCLK _X to setting correct data on D _X	t _{d(BD)}	20	–	140	ns
Delay time from high BCLK _X to low \overline{TS}_X	t _{d(BTS)}	20	–	140	ns
Delay time of inhibition of output data D _X relatively to 8 th clock pulse BCLK _X	t _{d(ZC)}	50	–	140	ns
Time of setting correct data after entry of signals FS _X or BCLK _X (the later of them)	t _{d(ZF)}	20	–	140	ns
Time of presetting data D _R relatively to clock pulse BCLK _R edge	t _{su(DB)}	0	–	–	ns
Holding time from low BCLK _R to switching off D _R	t _{h(BD)}	50	–	–	ns
Presetting time from high level FS _X (FS _R) to low level BCLK _X (BCLK _R) under synchronisation standard Short Frame	t _{su(F)}	50	–	–	ns
Holding time from low level BCLK _X (BCLK _R) to low level FS _X (FS _R) for synchronisation Short Frame	t _{h(F)}	50	–	–	ns
Holding time from 2 nd period of low level BCLK _X (BCLK _R) to low level FS _X (FS _R) for synchronisation Long Frame	t _{h(BFI)}	–	50	–	ns

Analogue electrical characteristics $(V_{CC} = 5V \pm 5\%$, $V_{BB} = -5V \pm 5\%$, V_{FXI-} connected to GS_X)

Characteristic		min	typical	max	Unit
Input current ($-2.5 V \leq V_{in} \leq 2.5 V$)	V_{FXI+} , V_{FXI-}	–	–	± 0.2	mkA
Input impedance to GNDA at frequency 1 kHz	V_{FXI+} , V_{FXI-}	10		–	MOhm
Input capacitance	V_{FXI+} , V_{FXI-}	–		10	pF
Input bias voltage GS_X Op Amp	V_{FXI+} , V_{FXI-}	–		± 25	mV
Range of input common-mode voltages	V_{FXI+} , V_{FXI-}	- 2.5		2.5	V
Amplification ratio without feedback GS_X Op Amp ($R_{load} \geq 10$ kOhm)		75		–	dB
Attenuation factor of in-phase components on out. V_{FXI+} , V_{FXI-}			65		dB
Frequency band of unity gain on out. GS_X Op Amp ($R_{load} \geq 10$ kOhm)			1000		kHz
Equivalent input noise between out. V_{FXI+} , V_{FXI-} and GS_X			-20		dBm
Load capacitance for GS_X Op Amp		0		100	pF
Output range of voltages for GS_X	$R_{load} = 10$ kOhm relat. GNDA $R_{load} = 600$ Ohm relat. GNDA		- 3.5 - 2.8	+ 3.5 + 2.8	V
Output current ($-2.8 V \leq V_{out} \leq 2.8 V$)	GS_X , V_{FO}		± 5.0	–	mA
Output impedance on out. V_{FO} in the frequency range from 0 to 3.4 kHz			1		Ohm
Load capacitance for output V_{FO}		0		500	pF
Bias voltage for output V_{FO} relatively to GNDA		–		± 100	mV
Noise abatement on supply on transmission					dB
(+) – from 0 to 100 kHz;		45			
(-) - from 0 to 100 kHz;		45			

Analogue transmission characteristics

($V_{CC} = 5\text{ V} \pm 5\%$, $V_{BB} = -5\text{ V} \pm 5\%$, $G_{NDA} = 0\text{ V}$, $\text{dBm}_0 = 1.2276\text{V}_{\text{rms}} = 4\text{ dBm}$ with load 600 Ohm ,
 $\text{FS}_X = \text{FS}_R = 8\text{ kHz}$, $\text{BCLK}_X = \text{MCLK}_X = 2.048\text{ MHz}$ at synchronous operation, VF_{X1} - connected to GS_X)

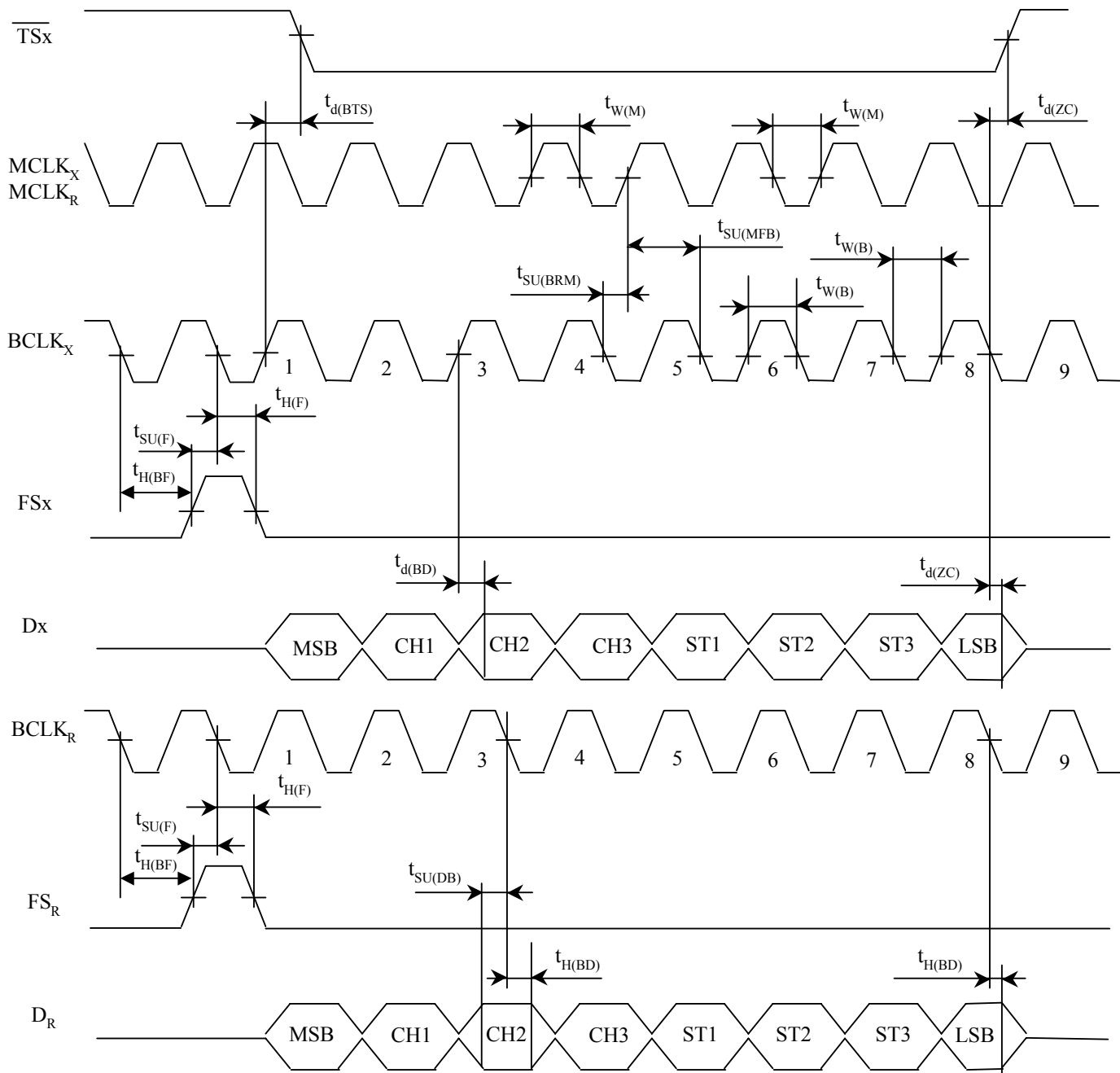
Characteristic		Through channel		Channel AD		Channel DA		Unit
		min	max	min	max	min	max	
Change of amplification ratio (relatively to level 0 dBm0 on frequency 1.02 kHz, $T_A = 25\text{ }^\circ\text{C}$, at $V_{CC} = 5\text{V}$, $V_{BB} = -5\text{V}$)		-	-	-0.25	0.25	-0.25	0.25	dB
Change of amplification ratio depending on temperature								
0 to 70°C		-	-	-	± 0.03	-	± 0.03	dB
-40 to + 85°C		-	-	-	± 0.06	-	± 0.06	
Change of amplification ratio depending on supply voltage ($V_{CC} = 5\text{V}$, $\pm 5\%$, $V_{BB} = 5\text{V} \pm 5\%$)		-	-	-	± 0.02	-	± 0.02	dB
Change of amplification ratio depending on signal strength (relatively to level -10 dBm0 on frequency 1.02 kHz) *	from 3 to -40 dB	-0.4	0.4	-0.2	0.2	-0.2	-0.2	dB
	from -40 to -50 dB	-0.8	0.8	-0.4	0.4	-0.4	-0.4	
	from -50 to -55 dB	-1.6	1.6	-0.8	0.8	-0.8	-0.8	
Total distortions of signal at frequency 1 kHz	3 dBm0	33	-	33	-	33	-	dB
	0 ÷ - 30 dBm0	35	-	36	-	36	-	
	-40 dBm0	29	-	30	-	30	-	
	-45 dBm0	24	-	25	-	25	-	
	-55 dBm0	15	-	15	-	15	-	
Total distortions with pseudonoise as per CCITT G.714	-3 dBm0	27.5	-	28	-	28.5	-	dB
	6 ÷ - 27 dBm0	35	-	35.5	-	36	-	
	-34 dBm0	33.1	-	33.5	-	34.2	-	
	-40 dBm0	28.2	-	28.5	-	30	-	
	-55 dBm0	13.2	-	13.5	-	15	-	
Noise of "silent" channel (for trough channel and channel AD psophometrically weighted)		-	-70	-	-70	-	-83	dBm
Amplitude-frequency characteristic (AFC). (Relatively to level 0 dBm0 at frequency 1.02 kHz) *	15 Hz	-	-40	-	-40	-0.15	0	dB
	50 Hz	-	-30	-	-30	-0.15	0	
	60 Hz	-	-26	-	-26	-0.15	0	
	200 Hz	-	-	-1.0	-0.4	-0.15	0	
	from 300 to 3000 Hz	-0.3	0.3	-0.15	0.15	-0.15	0.15	
	3300 Hz	-0.70	0.3	-0.35	0.15	-0.35	0.15	
	3400 Hz	-1.6	0	-0.8	0	-0.8	0	
	4000 Hz	-	-28	-	-14	-	-14	
4600 Hz	-	-60	-	-32	-	-30		
Noise level in the frequency range from 300 to 3000 Hz (relatively to level 0 dBm0 at frequency 1.02 kHz under transmission and receipt) *		-	-48	-	-48	-	-48	dB
Attenuation of parasitic harmonics beyond the limits of gating frequency VFRO VFRO (Relatively to input signal of frequency 300–3400 Hz and level 0 dBm0)	from 4600 to 7600 Hz	-	-30	-	-	-	-30	dB
	from 7600 to 8400 Hz	-	-40	-	-	-	-40	
	from 8400 to 100000 Hz	-	-30	-	-	-	-30	

continued

Characteristic	Trough channel		Channel AD		Channel DA		Unit
	min	max	min	max	min	max	
Noise of "silent" selected channel (for frequency 8 kHz. Input – GNDA)	–	-70	–	–	–	-70	dBm
Absolute delay (on frequency 1600 Hz)	–	–	–	315	–	215	mks
Group delay relatively to signal of frequency 1600 Hz							
500 ÷ 600 Hz	–	–	–	220	-40	–	mks
600 ÷ 800 Hz				145	-40	–	
800 ÷ 1000 Hz				75	-40	–	
1000 ÷ 1600 Hz				40	-30	–	
1600 ÷ 2600 Hz				75	–	90	
2600 ÷ 2800 Hz				105		125	
2800 ÷ 3000 Hz				155		175	
Crosstalk of signal of frequency 1020 Hz for AD or DA	–	–	–	-75	–	-75	dB
Intermodulation distortions of two signals with amplitude from minus 4 to minus 21 dBm0 for the range 300 ÷ 3400 Hz	–	-41	–	-41	–	-41	dB
* Parameters of the channels A/D and D/A are guaranteed by measuring through channel parameters							

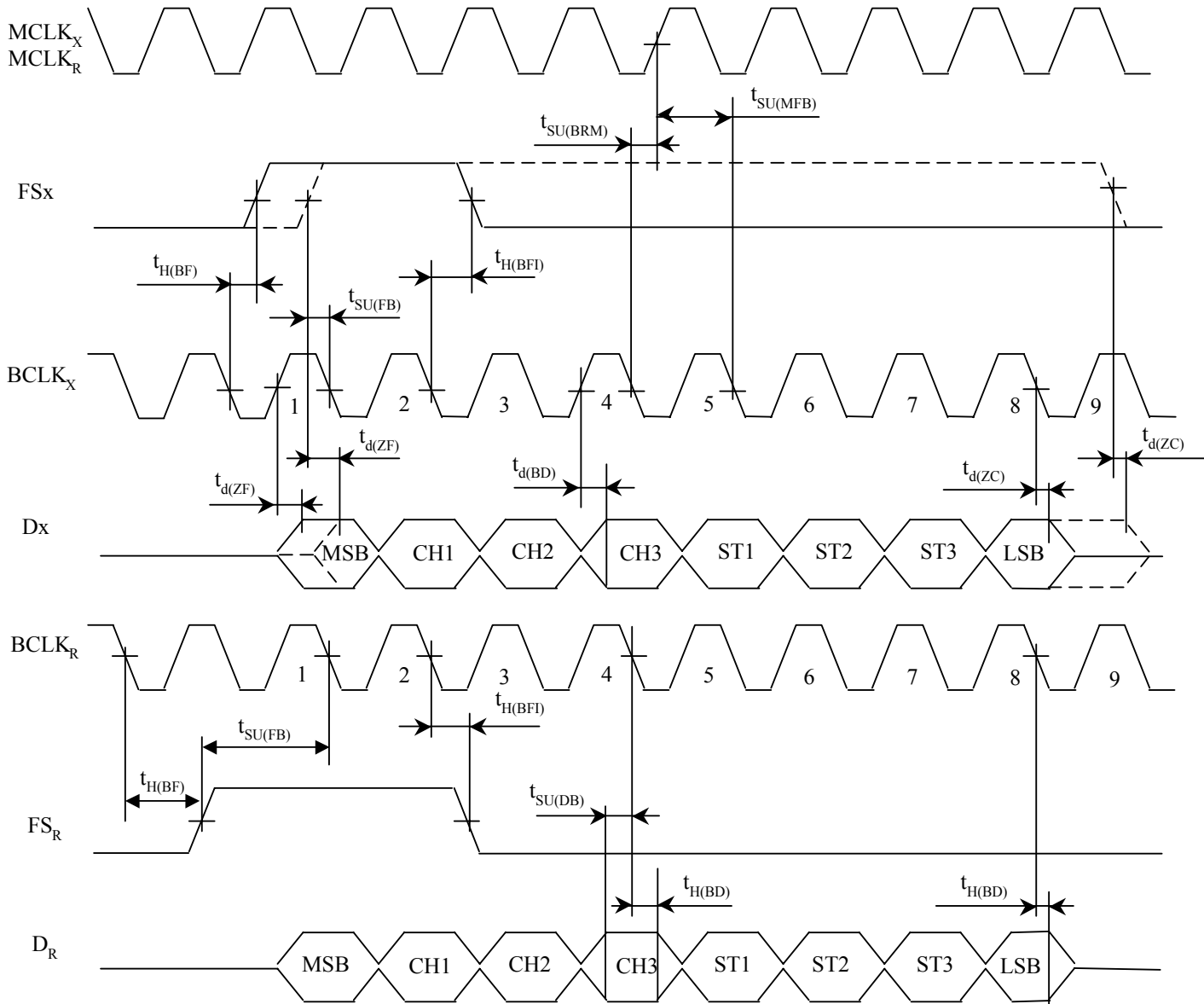
Power OA

Characteristic	min	typical	max	Unit
Input current ($-1\text{ V} \leq V_{PI} \leq 1\text{ V}$)	VPI	–	± 0.5	mA
Input resistance ($-1\text{ V} \leq V_{PI} \leq 1\text{ V}$)	VPI	5	–	MΩ
Input bias voltage (VPI connected to VPO-)	VPI	–	± 50	mV
Output resistance	VPO– or VPO+	–	1	Ω
Amplification ratio from VPO– to VPO+ ($R_{load} = 300\text{ Ohm}$, VPO+ to GNDA, level on VPO– equals $1.77V_{rms}$, 3 dBm0)		–	-1	V/V
Maximum level 0 dBm0 for better than ± 0.1 dB linearity in the range more than from –10 dBm0 to 3 dBm0 (for R_{load} between VPO+ and VPO)				
$R_{load} = 600\text{ Ohm}$	3.3	–	–	Vrms *
$R_{load} = 1200\text{ Ohm}$	3.5			
$R_{load} = 10\text{ kOhm}$	4.0			
Noise attenuation on supply on Vcc or V _{BB} (VPO- connected to VPI) VPO– or VPO+ connected to GNDA				dB
0 – 4 kHz	55			
4 – 50 kHz	35			
Differential noise attenuation on supply on Vcc or V _{BB} (VPO- connected to VPI), VPO– connected to VPO+, 0 – 50 kHz	50			dB
Load capacitance ($R_{load} \geq 300\text{ Ohm}$)	VPO+ or VPO– to GNDA	0	1000	
* dBm0 = $1.2276V_{rms} = 4\text{ dBm}$				



At Short Frame synchronisation, synchronisation pulses FSx or FS_R should have duration equal to duration of clock generator MCLK pulses.

Figure 3 – Time diagram at Short Frame synchronisation

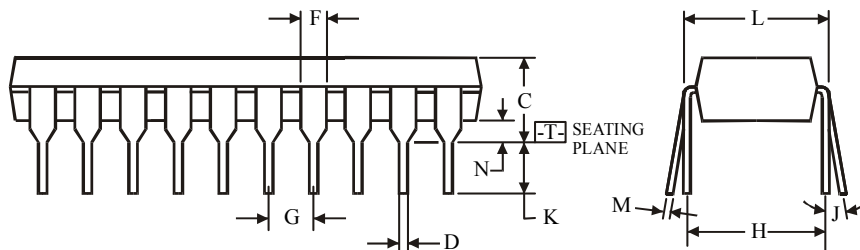
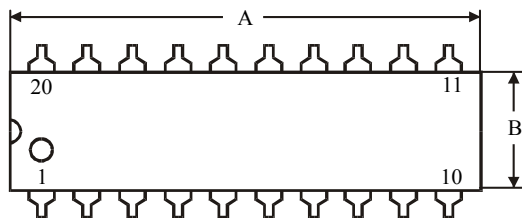
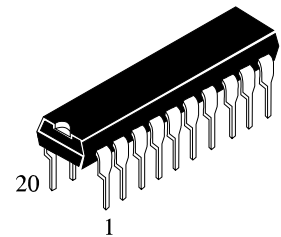


At Long Frame synchronisation, synchronisation pulses FSx or FSr should have duration not less than 3 bits of clock generator MCLK.

Figure 4 – Time diagram at Long Frame synchronisation

Package Dimension

**N SUFFIX PLASTIC DIP
(MS - 001AD)**



Symbol	Dimension, mm	
	MIN	MAX
A	24.89	26.92
B	6.10	7.11
C		5.33
D	0.36	0.56
F	1.14	1.78
G	2.54	
H	7.62	
J	0°	10°
K	2.92	3.81
L	7.62	8.26
M	0.20	0.36
N	0.38	

NOTES:

$\oplus 0.25 (0.010) \text{ M T}$

1. Dimensions "A", "B" do not include mold flash or protrusions.

Maximum mold flash or protrusions 0.25 mm (0.010) per side.