

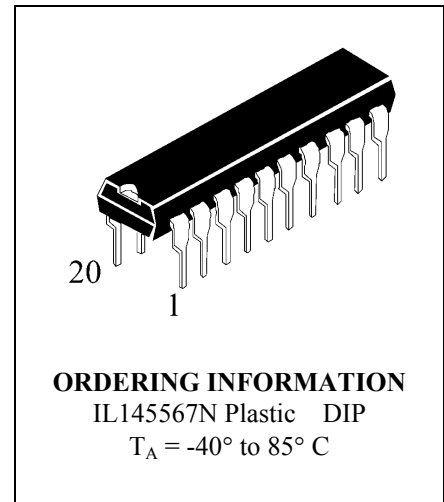
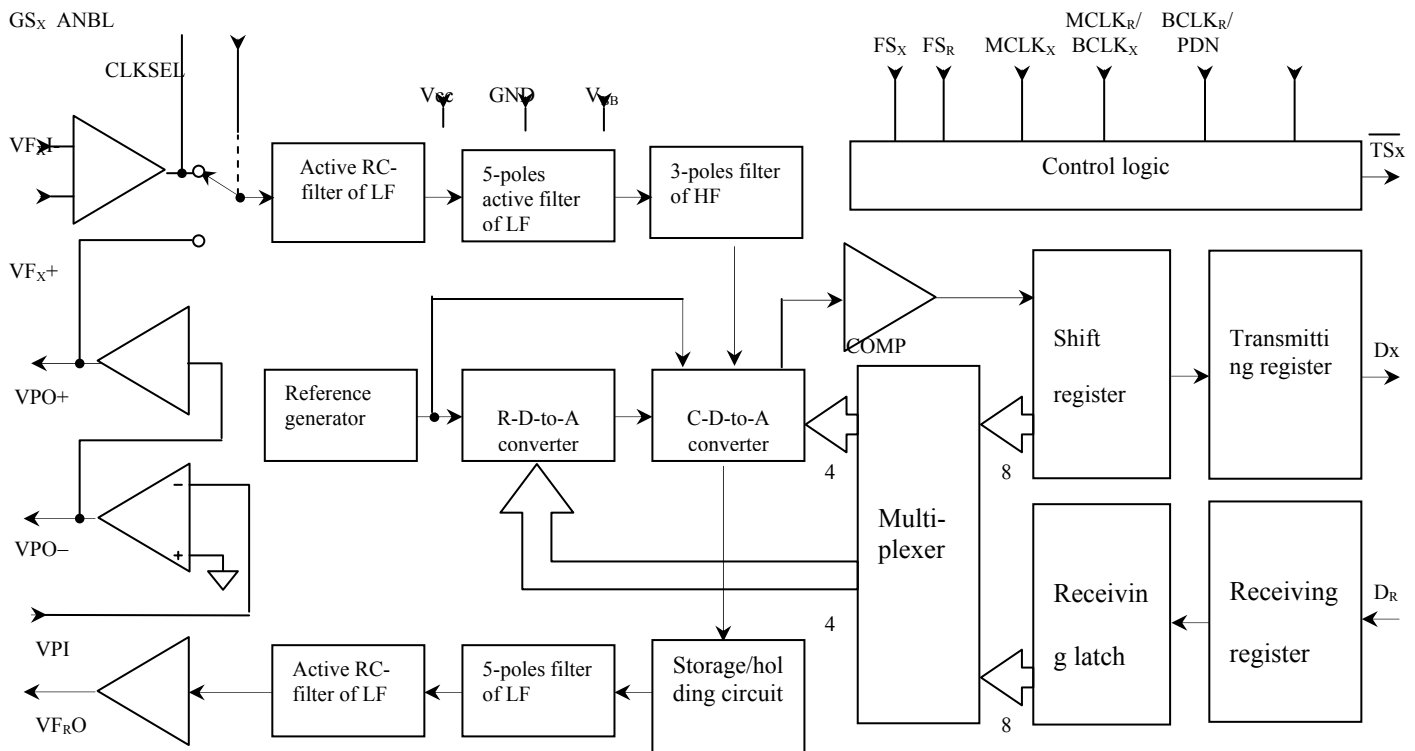
PCM CODEC - FILTER

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:

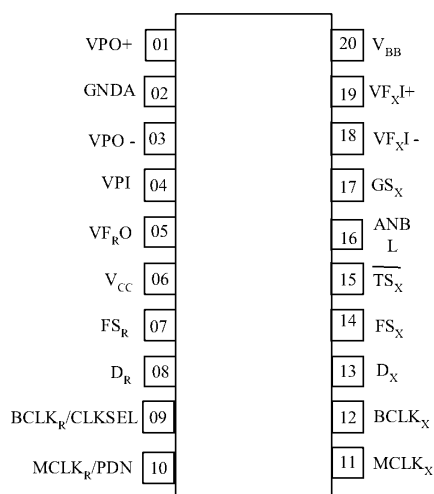
- reference generator;
- filters on switching capacitors in transmission and receipt channels ;
- two operational amplifiers.

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	ANB _L	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}	4.75	5.25	V
	V_{BB}	- 4.75	- 5.25	
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

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

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	$GNDA \leq V_{in} \leq V_{CC}$	I_{IL}	-10	+10	mA
Input current High	$GNDA \leq V_{in} \leq V_{CC}$	I_{IH}	-10	+10	
Output current in the third state	$GNDA \leq D_X \leq V_{CC}$	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	f _m	—	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

($V_{CC} = 5V \pm 5\%$, $V_{BB} = -5V \pm 5\%$, VF_{XI-} connected to GS_X)

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

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)

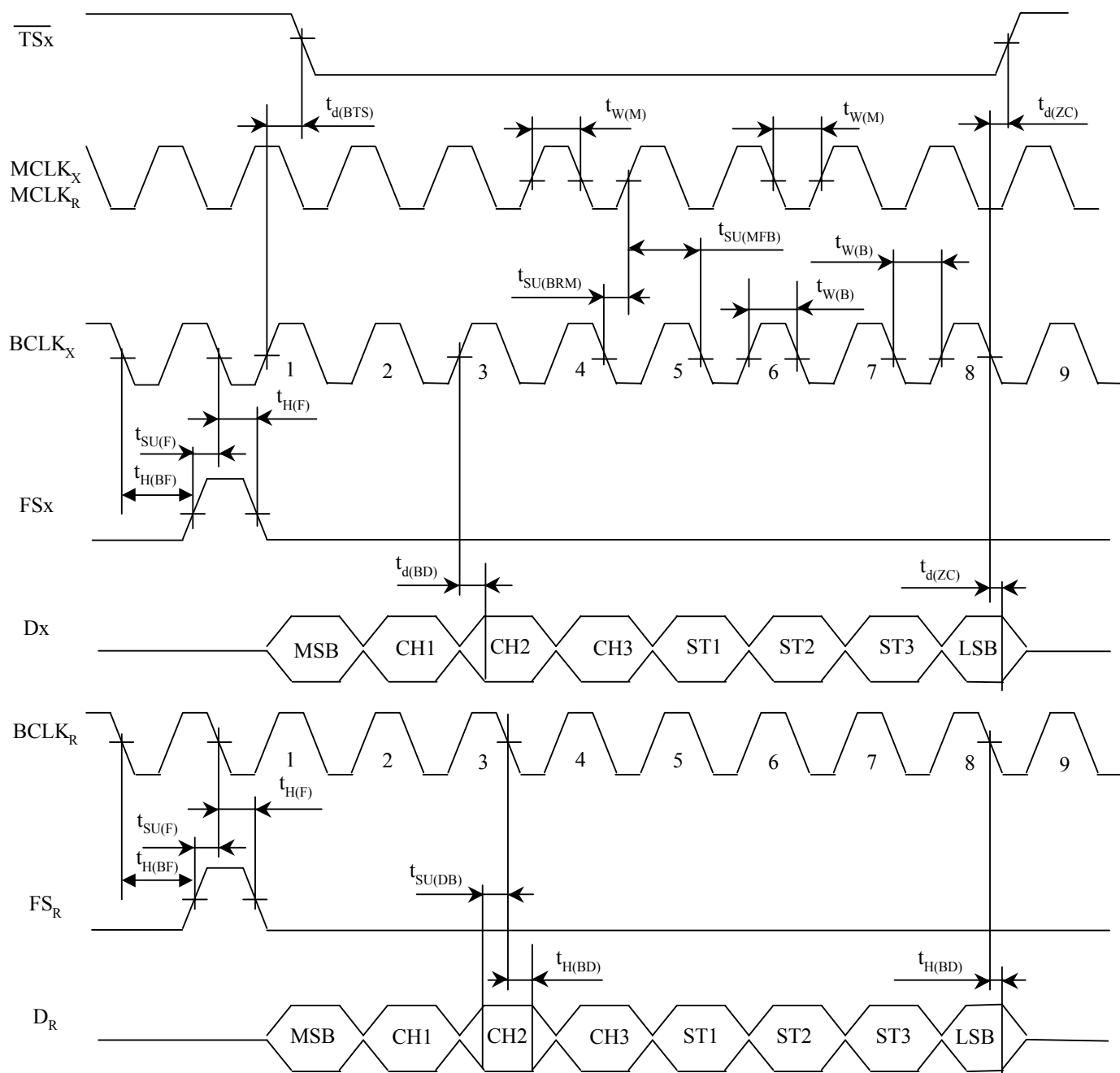
Characteristic		Through channel		Channel AD		Channel DA		Unit
		min	max	min	max	min	max	
Change of amplification ratio (relatively to level 0 dBm ₀ on frequency 1.02 kHz, $T_A = 25\text{ }^\circ\text{C}$, at $V_{CC} = 5\text{V}$, $V_{BB} = -5\text{V}$)		–	–	-0.25	0.25	-0.25	0.25	dB
Change of amplification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

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							

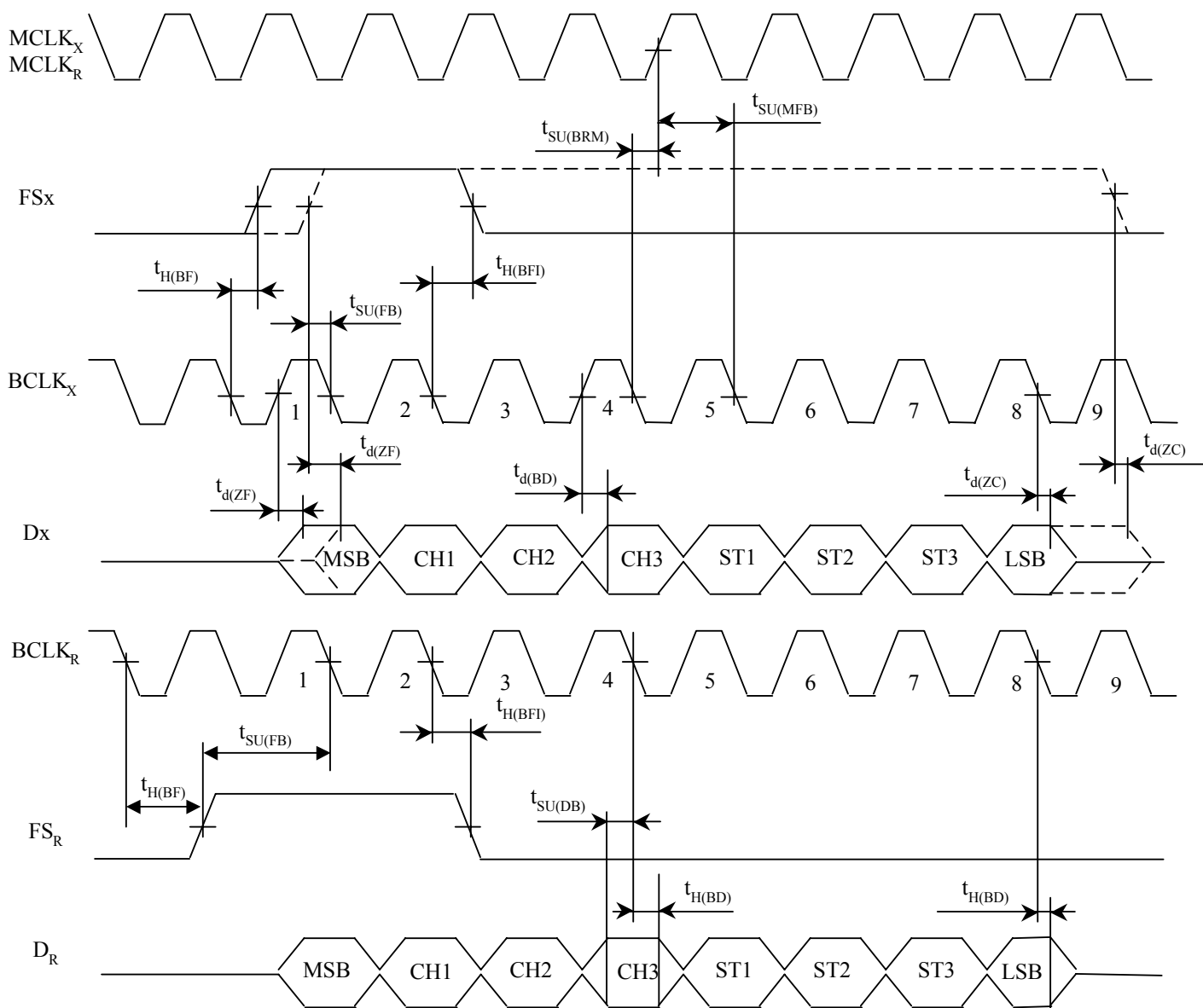
Power OA

Characteristic		min	typical	max	Unit
Input current (-1 V ≤ VPI ≤ 1V)	VPI	–	–	± 0.5	mA
Input resistance (-1 V ≤ VPI ≤ 1 V)	VPI	5	10	–	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 Ω, 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 Ω	3.3	–	–	V _{rms} *
	R _{load} = 1200 Ω	3.5			
	R _{load} = 10 kΩ	4.0			
Noise attenuation on supply on V _{cc} 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 V _{cc} or V _{BB} (VPO- connected to VPI), VPO– connected to VPO+, 0 – 50 kHz		50			dB
Load capacitance (R _{load} ≥ 300 Ω)	VPO+ or VPO– to GNDA	0		1000	
* dBm0 = 1.2276V _{rms} = 4 dBm					



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

Figure 3 – Time diagram at Short Frame synchronisation

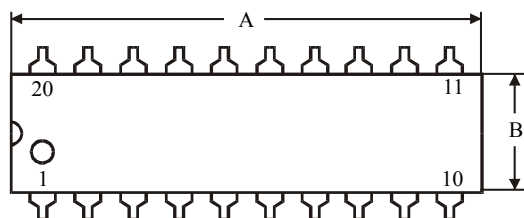
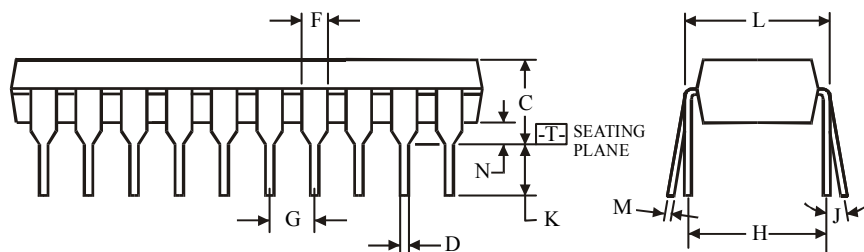


At Long Frame synchronisation, synchronisation pulses FS_X or FS_R should have duration not less than 3 bits of clock generator MCLK.

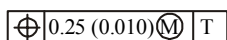
Figure 4 – Time diagram at Long Frame synchronisation

Package Dimension

N SUFFIX PLASTIC DIP (MS - 001AD)

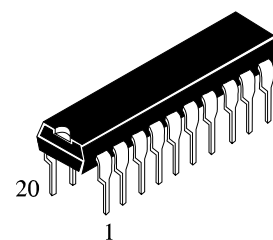


NOTES:



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

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



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	