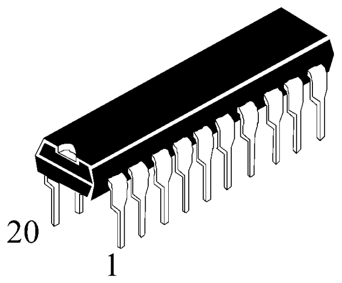
PCM CODEC - FILTER

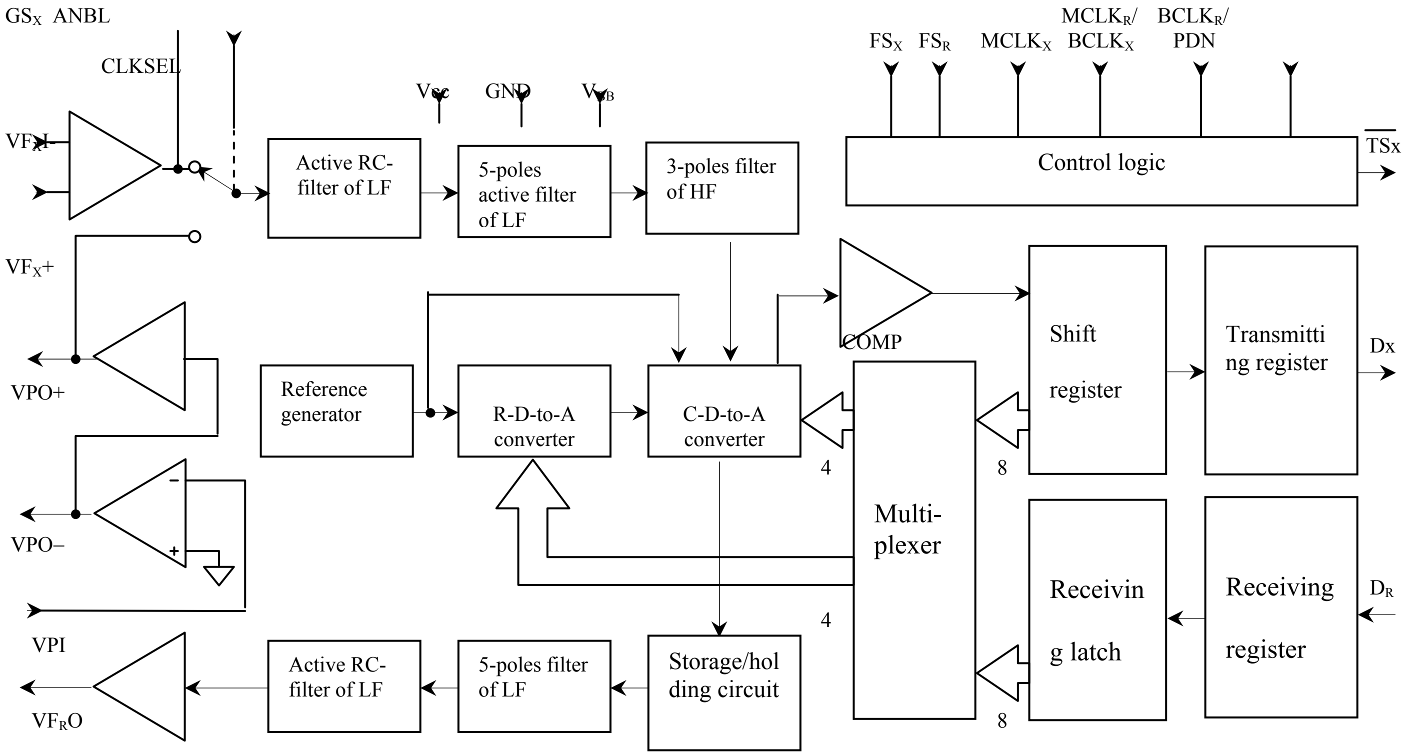
IL145567

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-low and full differential processing of analogue signals for reduction of noises. Typical dissipated power is 40mW, under reduced power – 1 mW at ±5 V.

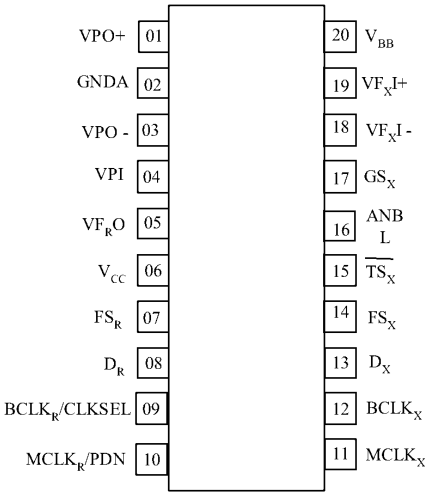


ORDERING INFORMATION
IL145567N Plastic DIP
T_A = -40° to 85° C



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_RO	Output of digital signal audio frequency
06	Vcc	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	MCLKx	Input of main clock oscillator for transmission
12	BCLKx	Input of clock oscillator for data transmission (synchronised with MCLKx)
13	Dx	Output of transmitted digital data
14	FSx	Input of transmission cycle synchronisation
15	$\overline{TSx}$	Output of transmission temporary interval indicator
16	ANBL	Input of feedback loop control
17	GSx	Output of input OA
18	VFxI-	Input of transmitted audio frequency (inverting)
19	VFxI+	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)	 VPI = V_{BB}	_	70 60	mW
Consumption power in sleep mode (without load)	 VPI = V_{BB}	_	5.0 3.0	

Digital signal strength

(V_{CC} = 5V ± 5%, V_{BB} = -5V ± 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 ≤ V_{in} ≤ V_{CC}	I_{IL}	-10	+10	mkA
Input current High	GNDA ≤ V_{in} ≤ V_{CC}	I_{IH}	-10	+10	
Output current in the third state	GNDA ≤ D_X ≤ 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 8th 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 2nd 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 ± 5%, V_{BB} = -5V ± 5%, VF_XI- connected to GS_X)

Characteristic		min	typical	max	Unit
Input current (-2.5 V ≤ V_{in} ≤ 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} ≥ 10 kOhm)		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} ≥ 10 kOhm)			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 kOhm relat. GNDA R_{load} = 600 Ohm relat. GNDA		- 3.5 - 2.8	+ 3.5 + 2.8	V
Output current (-2.8 V ≤ V_{out} ≤ 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 V ± 5%, V_{BB} = -5 V ± 5%, GNDA = 0 V, dBm0 = 1.2276Vrms = 4 dBm with load 600 Ohm, FS_X = FS_R = 8 kHz, $BCLK_X$ = $MCLK_X$ = 2.048 MHz at synchronous operation, VF_{XI-} 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 °C, at V_{CC} = 5V, V_{BB} = -5V)		–	–	-0.25	0.25	-0.25	0.25	dB
Change of amplification ratio depending on temperature	0 to 70°C –40 to + 85°C	– –	– –	– –	±0.03 ±0.06	– –	±0.03 ±0.06	dB
Change of amplification ratio depending on supply voltage (V_{CC} = 5V, ± 5%, V_{BB} = 5V ±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 from –40 to –50 dB from –50 to –55 dB	-0.4 -0.8 -1.6	0.4 0.8 1.6	-0.2 -0.4 -0.8	0.2 0.4 0.8	-0.2 -0.4 -0.8	-0.2 -0.4 -0.8	dB
Total distortions of signal at frequency 1 kHz	3 dBм0 0 ÷ - 30 dBm0 -40 dBm0 -45 dBm0 -55 dBm0	33 35 29 24 15	–	33 36 30 25 15	–	33 36 30 25 15	–	dB
Total distortions with pseudonoise as per CCITT G.714	-3 dBm0 6 ÷ - 27 dBm0 -34 dBm0 -40 dBm0 -55 dBm0	27.5 35 33.1 28.2 13.2	–	28 35.5 33.5 28.5 13.5	–	28.5 36 34.2 30 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 dBm0 at frequency 1.02 kHz) *	15 Hz 50 Hz 60 Hz 200 Hz from 300 to 3000 Hz 3300 Hz 3400 Hz 4000 Hz 4600 Hz	– – – – -0.3 -0.70 -1.6 – –	-40 -30 -26 – 0.3 0.3 0 -28 -60	– – – -1.0 -0.15 -0.35 -0.8 – –	-40 -30 -26 -0.4 0.15 0.15 0 -14 -32	-0.15 -0.15 -0.15 -0.15 -0.15 -0.35 -0.8 – –	0 0 0 0 0.15 0.15 0 -14 -30	dB
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 from 7600 to 8400 Hz from 8400 to 100000 Hz	– – –	-30 -40 -30	– – –	– – –	– – –	-30 -40 -30	dB

IK Semiconductor

continued

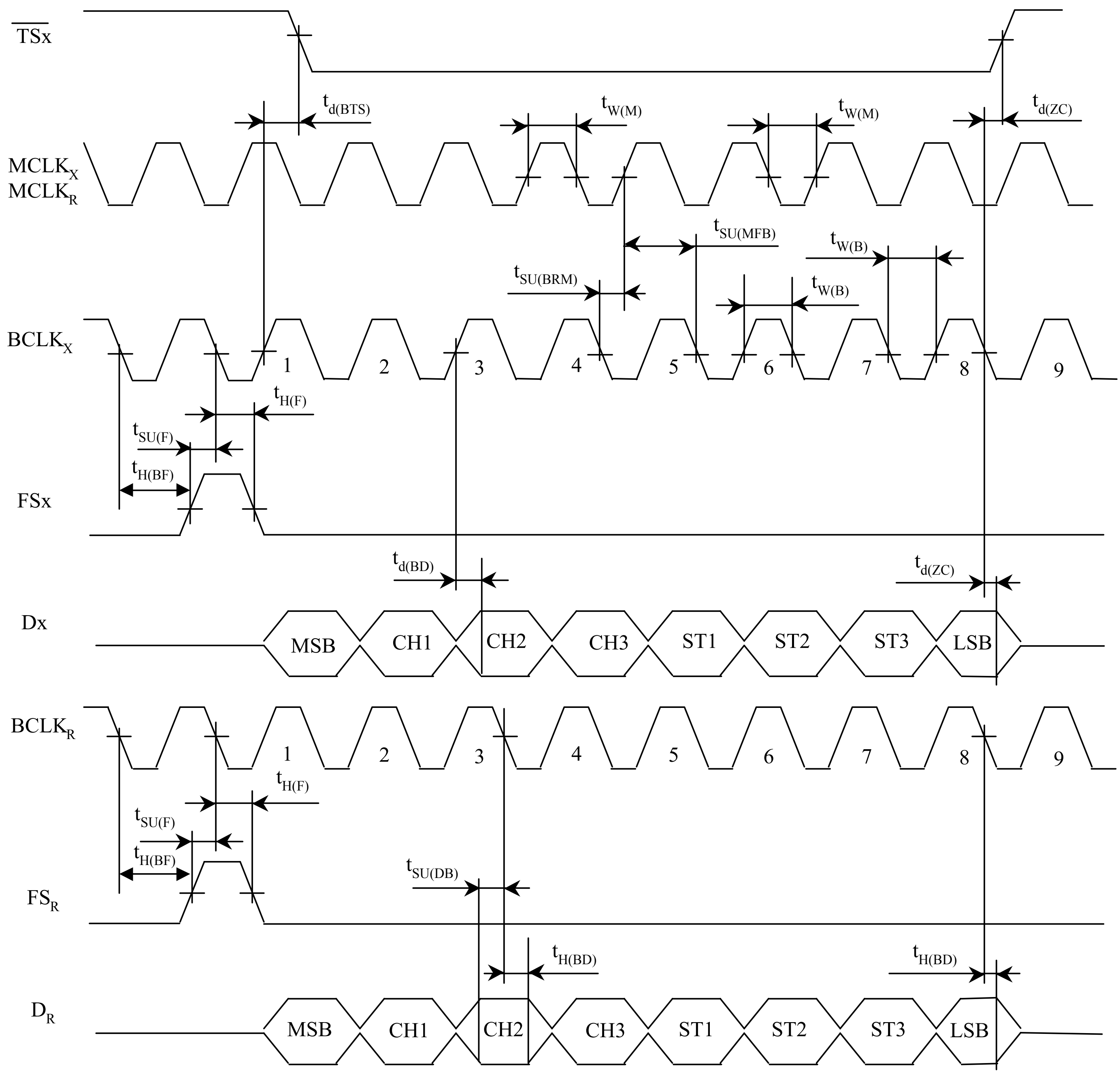
Characteristic	Trough channel		Channel AD		Channel DA		Unit
	min	max	min	max	min	max	
Noise of "silent" selected channel (for frequency 8 kHz. Input – GNDA)	–	-70	–	–	–	-70	dBm
Absolute delay (on frequency 1600 Hz)	–	–	–	315	–	215	mks
Group delay relatively to signal of frequency 1600 Hz							
500 ÷ 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

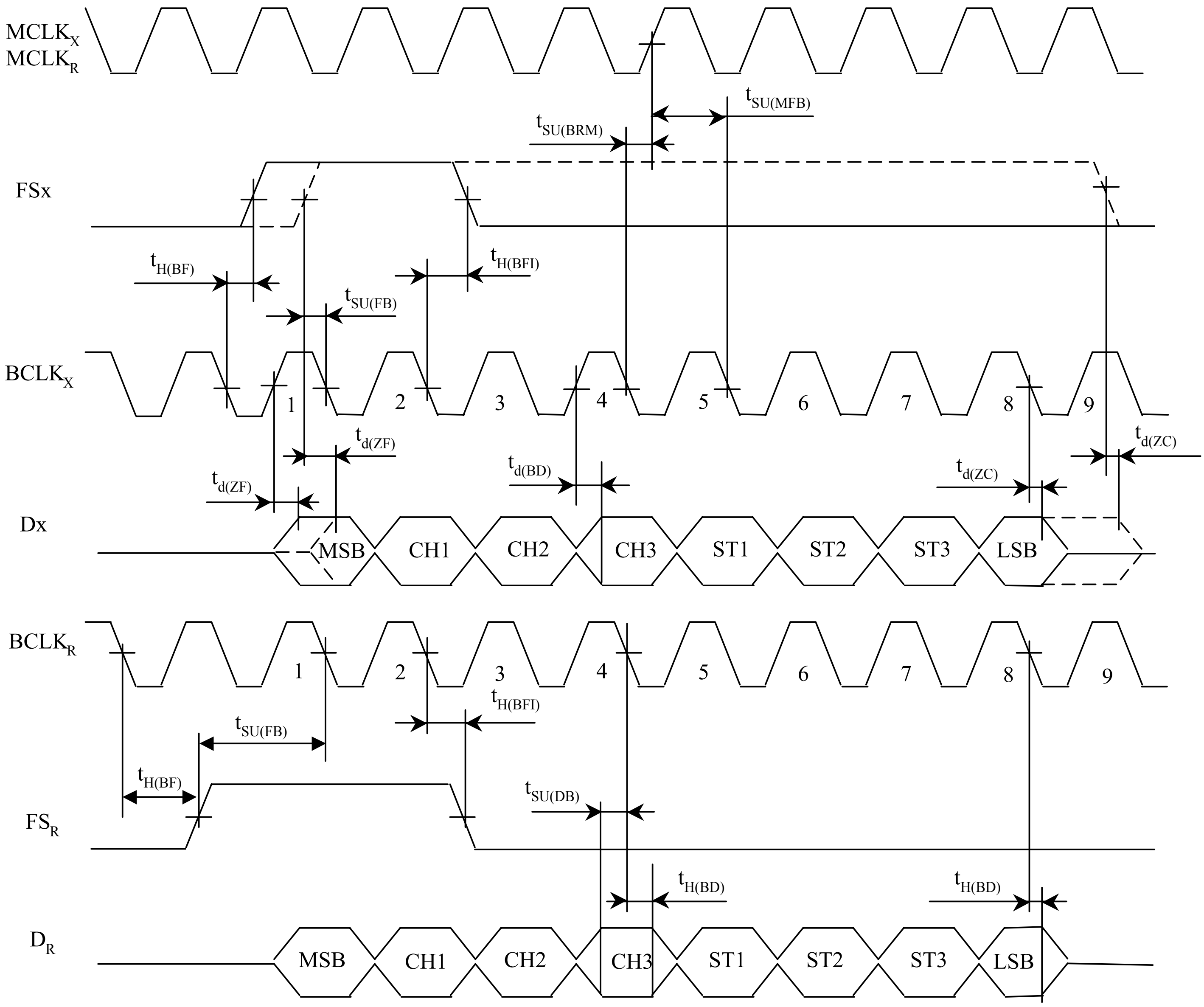
Characteristic		min	typical	max	Unit
Input current (-1 V ≤ VPI ≤ 1V)	VPI	–	–	± 0.5	mkA
Input resistance (-1 V ≤ VPI ≤ 1 V)	VPI	5	10	–	MOhm
Input bias voltage (VPI connected to VPO-)	VPI	–	–	± 50	mV
Output resistance	VPO–or VPO+	–	1	–	Ohm
Amplification ratio from VPO– to VPO+ (R_{load} = 300 Ohm, VPO+ to GNDA, level on VPO– equals 1.77Vrms, 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 Ohm	3.3	–	–	Vrms *
	R_{load} = 1200 Ohm	3.5			
	R_{load} = 10 кOhm	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} ≥ 300 Ohm)	VPO+ or VPO– to GNDA	0		1000	

* dBm0 = 1.2276Vrms = 4 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

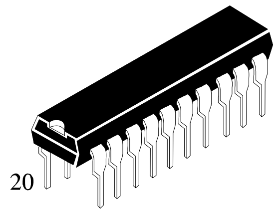


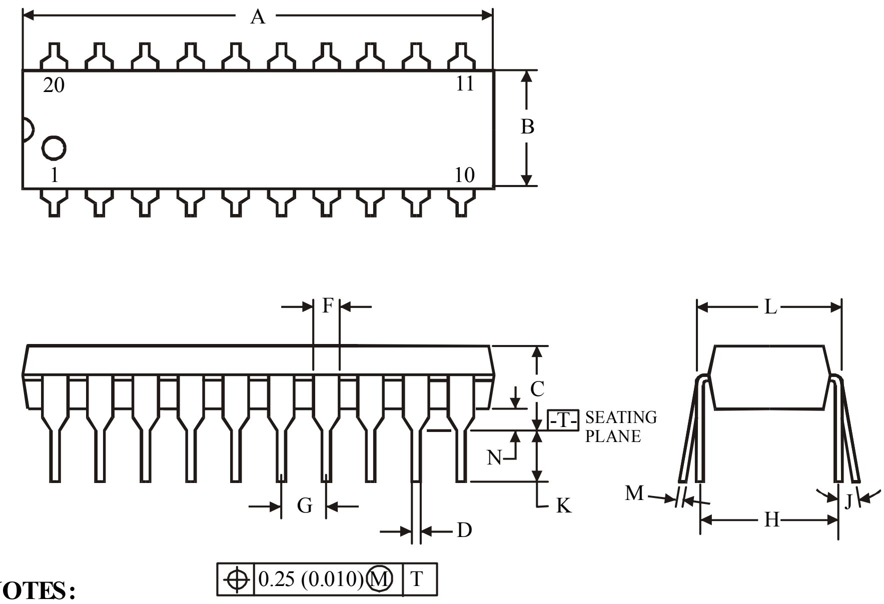
At Long Frame synchronisation, synchronisation pulses FSx or FS_R should have duration not less than 3 bits of clock generator MCLK.

Figure 4 – Time diagram at Long Frame synchronisation

Package Dimension

N SUFFIX PLASTIC DIP
(MS - 001AD)





	Dimension, mm	
Symbol	**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:

1. Dimensions “A”, “B” do not include mold flash or protrusions.
   Maximum mold flash or protrusions 0.25 mm (0.010) per side.