

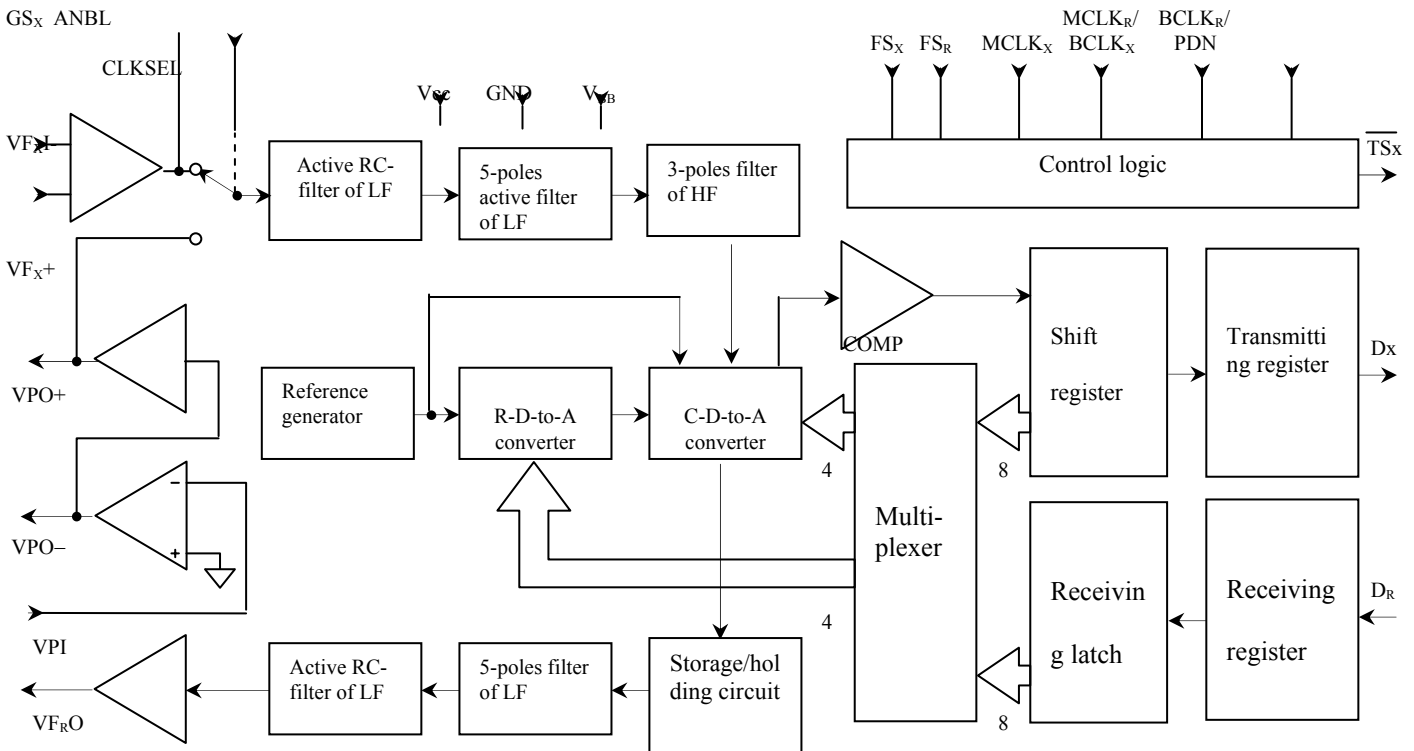
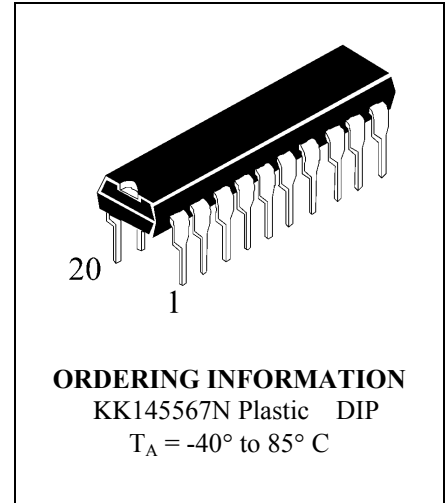
**PCM CODEC - FILTER**

**KK145567**

KK145567N 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:

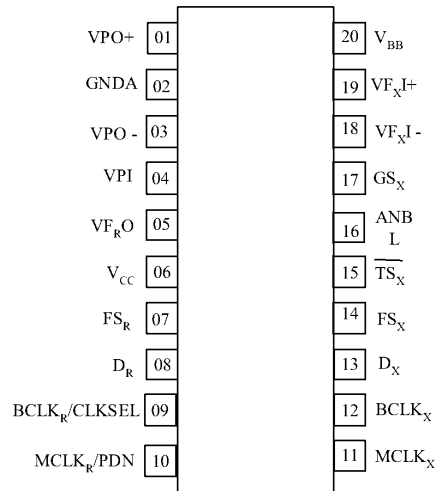
- reference generator;
- filters on switching capacitors in transmission and receipt channels ;
- two operational amplifiers.

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  $\pm 5$  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 <sub>R</sub> O	Output of digital signal audio frequency
06	V <sub>cc</sub>	Supply 5 V
07	FS <sub>R</sub>	Input of receipt cycle synchronisation
08	D <sub>R</sub>	Input of digital data receipt
09	BCLK <sub>R</sub> /CLKSEL	Input of clock oscillator and selector of basic oscillator frequency
10	MCLK <sub>R</sub> /PDN	Input of main clock oscillator and underconsumption control
11	MCLK <sub>x</sub>	Input of main clock oscillator for transmission
12	BCLK <sub>x</sub>	Input of clock oscillator for data transmission (synchronised with MCLK <sub>x</sub> )
13	D <sub>x</sub>	Output of transmitted digital data
14	FS <sub>x</sub>	Input of transmission cycle synchronisation
15	TS <sub>x</sub>	Output of transmission temporary interval indicator
16	ANBL	Input of feedback loop control
17	GS <sub>x</sub>	Output of input OA
18	VF <sub>x</sub> I-	Input of transmitted audio frequency (inverting)
19	VF <sub>x</sub> I+	Input of transmitted audio frequency (noninverting)
20	V <sub>BB</sub>	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	mW
			60	
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

( $V_{CC} = 5V \pm 5\%$ ,  $V_{BB} = -5V \pm 5\%$ , values of all signals are indicated relatively to GNDA)

Characteristics	Symbol	min	typical	max	Unit
Frequencies of main clock oscillators MCLK <sub>X</sub> or MCLK <sub>R</sub>	f <sub>m</sub>	–	1.544 2.048	–	MHz
Min width of high or low pulse MCLK <sub>X</sub> or MCLK <sub>R</sub>	t <sub>w(M)</sub>	100	–	–	ns
Min width of high or low pulse BCLK <sub>X</sub> or BCLK <sub>R</sub>	t <sub>w(B)</sub>	50	–	–	ns
Min width of low pulse FS <sub>X</sub> or FS <sub>R</sub>	t <sub>w(FL)</sub>	50	–	–	ns
Rise time	t <sub>r</sub>	50	–	–	ns
Fall time	t <sub>f</sub>	50	–	–	ns
Ratings of data bit synchronisation BCLK <sub>X</sub> or BCLK <sub>R</sub>	f <sub>B</sub>	128	–	4096	kHz
Presetting time of from low BCLK <sub>X</sub> to high MCLK <sub>R</sub>	t <sub>su(BRM)</sub>	50	–	–	ns
Presetting time from high MCLK <sub>X</sub> to low BCLK <sub>X</sub>	t <sub>su(MFB)</sub>	20	–	–	ns
Holding time from low BCLK <sub>X</sub> (BCLK <sub>R</sub> ) to high FS <sub>X</sub> (FS <sub>R</sub> )	t <sub>h(BF)</sub>	20	–	–	ns
Presetting time from high FS <sub>X</sub> (FS <sub>R</sub> ) to low BCLK <sub>X</sub> (BCLK <sub>R</sub> ) for long frames	t <sub>su(FB)</sub>	80	–	–	ns
Delay time from high BCLK <sub>X</sub> to setting correct data on D <sub>X</sub>	t <sub>d(BD)</sub>	20	–	140	ns
Delay time from high BCLK <sub>X</sub> to low $\overline{TS}_X$	t <sub>d(BTS)</sub>	20	–	140	ns
Delay time of inhibition of output data D <sub>X</sub> relatively to 8 <sup>th</sup> clock pulse BCLK <sub>X</sub>	t <sub>d(ZC)</sub>	50	–	140	ns
Time of setting correct data after entry of signals FS <sub>X</sub> or BCLK <sub>X</sub> ( the later of them)	t <sub>d(ZF)</sub>	20	–	140	ns
Time of presetting data D <sub>R</sub> relatively to clock pulse BCLK <sub>R</sub> edge	t <sub>su(DB)</sub>	0	–	–	ns
Holding time from low BCLK <sub>R</sub> to switching off D <sub>R</sub>	t <sub>h(BD)</sub>	50	–	–	ns
Presetting time from high level FS <sub>X</sub> (FS <sub>R</sub> ) to low level BCLK <sub>X</sub> (BCLK <sub>R</sub> ) under synchronisation standard Short Frame	t <sub>su(F)</sub>	50	–	–	ns
Holding time from low level BCLK <sub>X</sub> (BCLK <sub>R</sub> ) to low level FS <sub>X</sub> (FS <sub>R</sub> ) for synchronisation Short Frame	t <sub>h(F)</sub>	50	–	–	ns
Holding time from 2 <sup>nd</sup> period of low level BCLK <sub>X</sub> (BCLK <sub>R</sub> ) to low level FS <sub>X</sub> (FS <sub>R</sub> ) for synchronisation Long Frame	t <sub>h(BFI)</sub>	–	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 ( $-2.5 V \leq V_{in} \leq 2.5 V$ )	$VF_{XI+}, VF_{XI-}$	–	–	$\pm 0.2$	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	$VF_{XI+}, VF_{XI-}$	–		$\pm 25$	mV
Range of input common-mode voltages	$VF_{XI+}, VF_{XI-}$	- 2.5		2.5	V
Amplification ratio without feedback $GS_X$ Op Amp ( $R_{load} \geq 10$ 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 ( $R_{load} \geq 10$ 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 ( $-2.8 V \leq V_{out} \leq 2.8 V$ )	$GS_X, VF_{RO}$		$\pm 5.0$	–	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		–		$\pm 100$	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  $600\text{ Ohm}$ ,  $\text{FS}_X = \text{FS}_R = 8\text{ kHz}$ ,  $\text{BCLK}_X = \text{MCLK}_X = 2.048\text{ MHz}$  at synchronous operation,  $\text{VF}_{X1}$ - connected to  $\text{GS}_X$ )

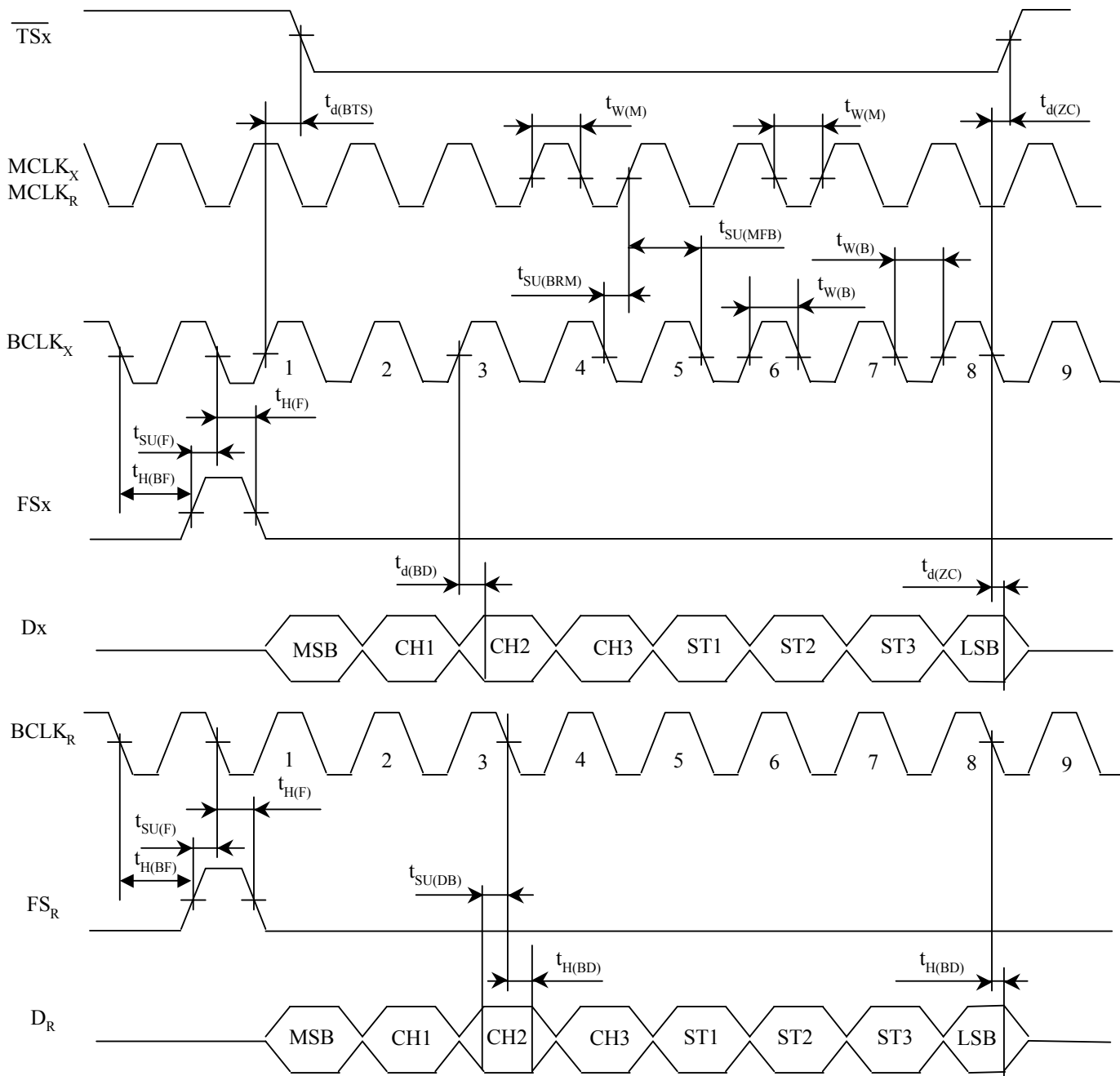
Characteristic		Through channel		Channel AD		Channel DA		Unit
		min	max	min	max	min	max	
Change of amplification ratio (relatively to level 0 dBm0 on frequency 1.02 kHz, $T_A = 25\text{ }^\circ\text{C}$ , at $V_{CC} = 5\text{V}$ , $V_{BB} = -5\text{V}$ )		-	-	-0.25	0.25	-0.25	0.25	dB
Change of amplification ratio depending on temperature								
0 to 70°C		-	-	-	$\pm 0.03$	-	$\pm 0.03$	dB
-40 to + 85°C		-	-	-	$\pm 0.06$	-	$\pm 0.06$	dB
Change of amplification ratio depending on supply voltage ( $V_{CC} = 5\text{V}$ , $\pm 5\%$ , $V_{BB} = 5\text{V} \pm 5\%$ )		-	-	-	$\pm 0.02$	-	$\pm 0.02$	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**

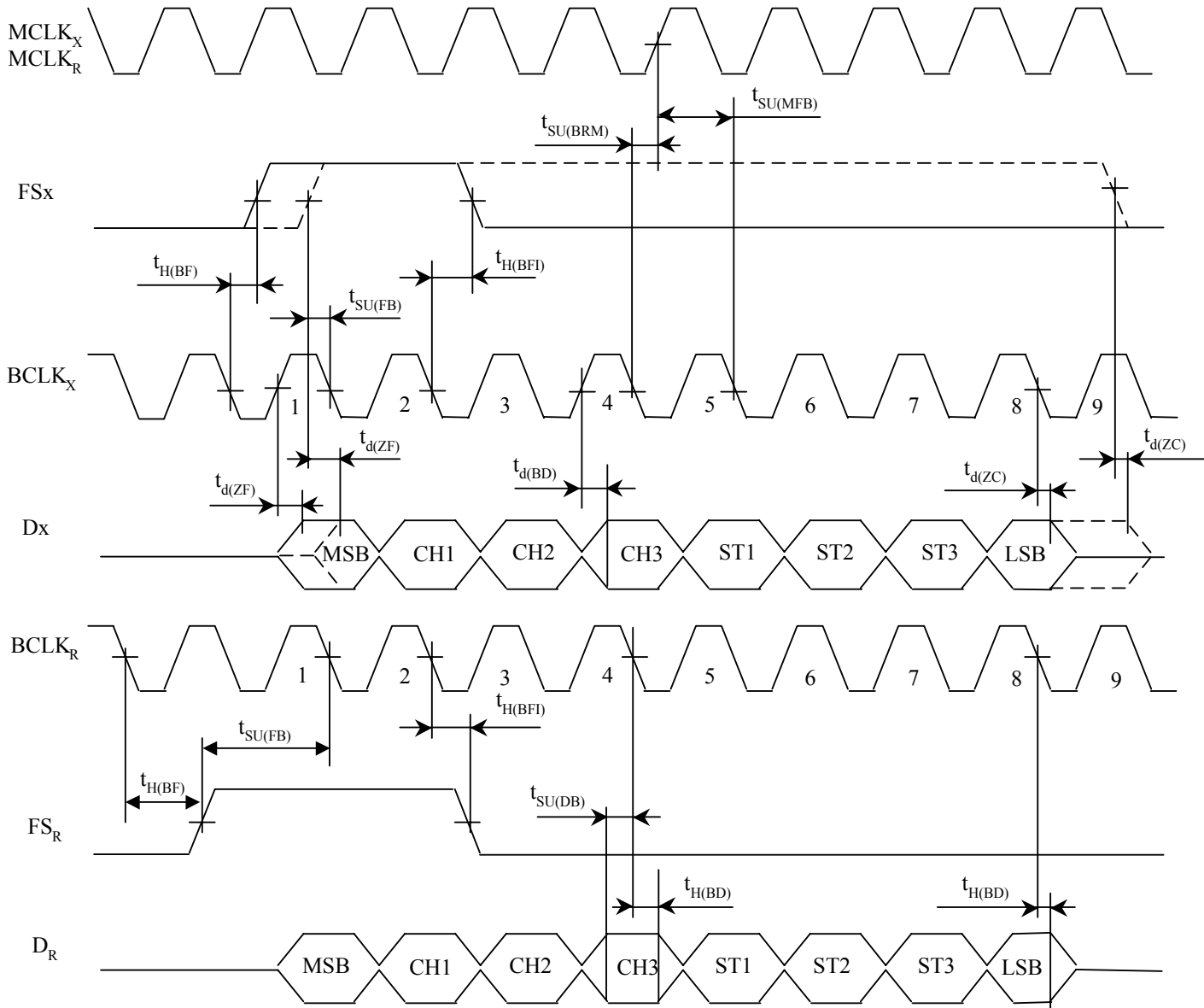
Characteristic	min	typical	max	Unit
Input current (-1 V ≤ VPI ≤ 1 V)	VPI	–	± 0.5	mA
Input resistance (-1 V ≤ VPI ≤ 1 V)	VPI	5	–	MΩ
Input bias voltage (VPI connected to VPO-)	VPI	–	± 50	mV
Output resistance	VPO– or VPO+	–	1	Ω
Amplification ratio from VPO– to VPO+ (R <sub>load</sub> = 300 Ω, VPO+ to GNDA, level on VPO– equals 1.77V <sub>rms</sub> , 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 <sub>load</sub> between VPO+ and VPO)				
R <sub>load</sub> = 600 Ω	3.3	–	–	V <sub>rms</sub> *
R <sub>load</sub> = 1200 Ω	3.5			
R <sub>load</sub> = 10 kΩ	4.0			
Noise attenuation on supply on V <sub>cc</sub> or V <sub>BB</sub> (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 <sub>cc</sub> or V <sub>BB</sub> (VPO- connected to VPI), VPO– connected to VPO+, 0 – 50 kHz	50			dB
Load capacitance (R <sub>load</sub> ≥ 300 Ω)	VPO+ or VPO– to GNDA	0	1000	
* dBm0 = 1.2276V <sub>rms</sub> = 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**



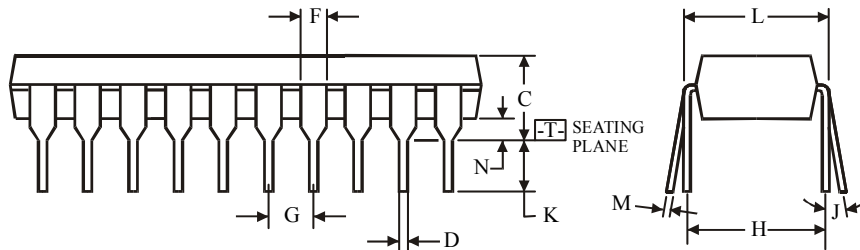
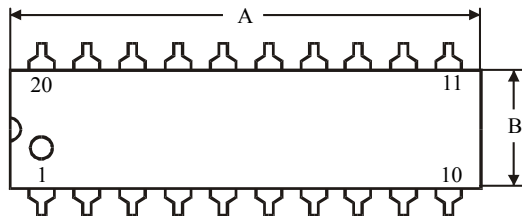
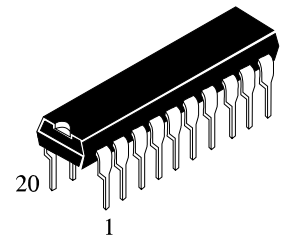


At Long Frame synchronisation, synchronisation pulses FS<sub>x</sub> or FS<sub>R</sub> should have duration not less than 3 bits of clock generator MCLK.

**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.