DCC read amplifier TDA1317

FEATURES

- Low-noise amplifier inputs
- Pre-equalization for compensating the MRH characteristic
- Anti-aliasing filters
- Single +5 V supply.

DIGITAL dcc COMPACT CASSETTE

GENERAL DESCRIPTION

The IC is designed to be used with a Magneto-Resistive thin-film Head (MRH) which is suitable for the DCC (Digital Compact Cassette) systems and normal CC (Compact Cassette) systems. The primary function of the IC is to provide preamplification and filtering. However, the IC also incorporates two amplifiers to provide magnetic feedback to the CC heads.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{DD}	supply voltage; DCC part		4.5	5.0	5.5	V
V_{CCA}	supply voltage; CC part		4.5	5.0	5.5	V
V_{CCM}	supply voltage; feedback amplifier		4.5	5.0	5.5	V
I_{DD}	supply current; DCC part		24.5	36.0	47.5	mA
I_{CCA}	supply current; CC part		5.9	9.0	12.1	mA
I_{CCM}	supply current; feedback amplifier	no load	2.3	3.4	4.5	mA
T_{amb}	operating ambient temperature		–30	–	+85	°C

ORDERING INFORMATION

EXTENDED TYPE NUMBER	PACKAGE			
	PINS	PIN POSITION	MATERIAL	CODE
TDA1317	44	QFP	plastic	SOT307-1

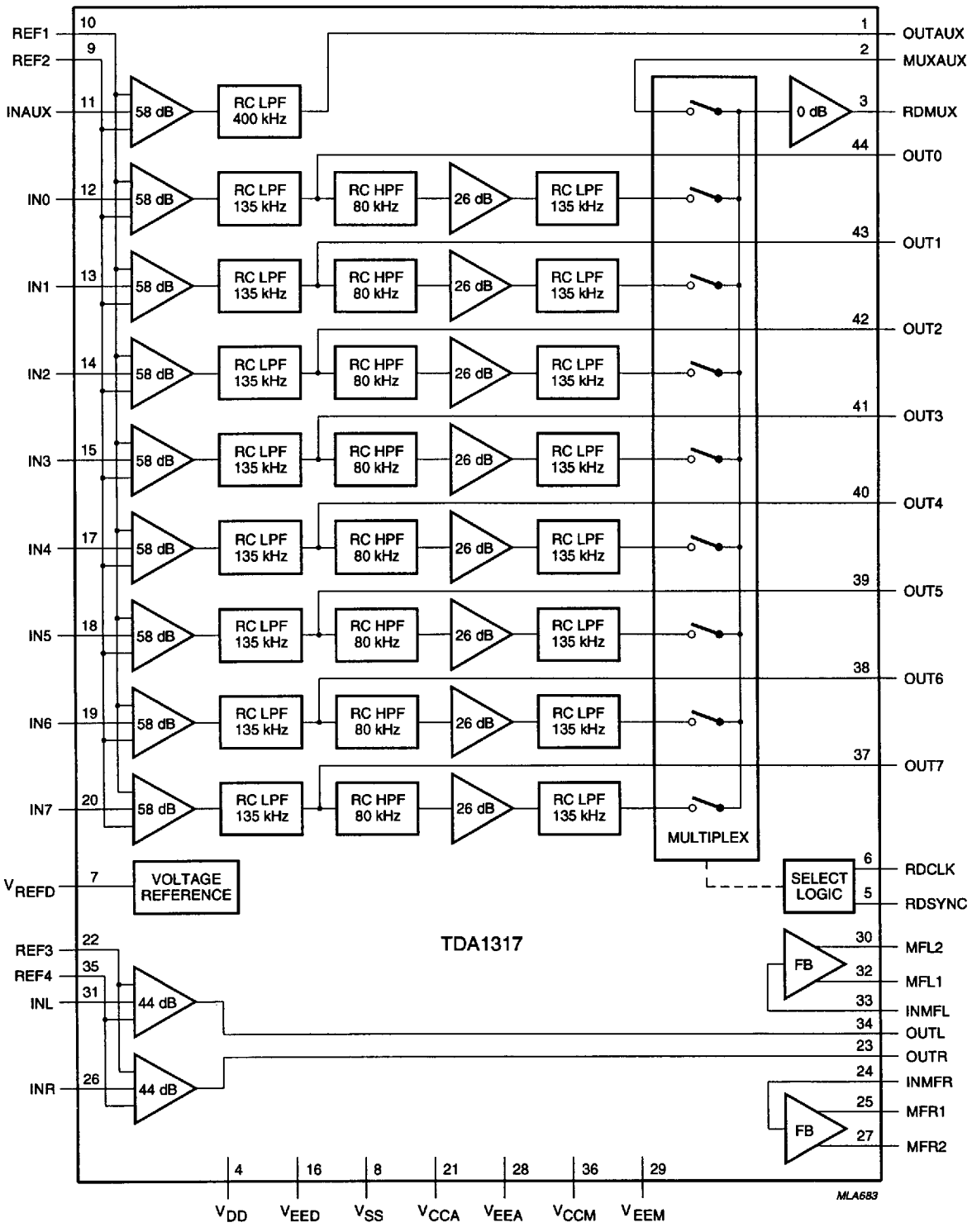


Fig.1 Block diagram.

PINNING

SYMBOL	PIN	DESCRIPTION
OUTAUX	1	auxiliary data output
MUXAUX	2	auxiliary multiplexer input
RDMUX	3	read multiplexer output
V_{DD}	4	supply voltage (DCC part) +5 V
RDSYNC	5	read sync input
RDCLK	6	read clock input
V_{REFD}	7	voltage reference (digital)
V_{SS}	8	ground
REF2	9	reference voltage 2
REF1	10	reference voltage 1
INAUX	11	auxiliary data input
IN0	12	main data input 0
IN1	13	main data input 1
IN2	14	main data input 2
IN3	15	main data input 3
V_{EED}	16	digital ground
IN4	17	main data input 4
IN5	18	main data input 5
IN6	19	main data input 6
IN7	20	main data input 7
V_{CCA}	21	supply voltage (CC part) +5 V
REF3	22	reference voltage 3
OUTR	23	analog (CC) output right
INMFR	24	feedback amplifier input right
MFR1	25	feedback amplifier output right 1
INR	26	analog (CC) input right
MFR	27	feedback amplifier output right 2
V_{EEA}	28	analog ground
V_{EEM}	29	ground for feedback amplifier
MFL2	30	feedback amplifier output left 2
INL	31	analog (CC) input left
MFL1	32	feedback amplifier output left 1
INMFL	33	feedback amplifier input left
OUTL	34	analog (CC) output left
REF4	35	reference voltage 4
V_{CCM}	36	supply voltage (feedback amplifier) +5 V
OUT7	37	main data output 7
OUT6	38	main data output 6
OUT5	39	main data output 5
OUT4	40	main data output 4
OUT3	41	main data output 3
OUT2	42	main data output 2
OUT1	43	main data output 1
OUT0	44	main data output 0

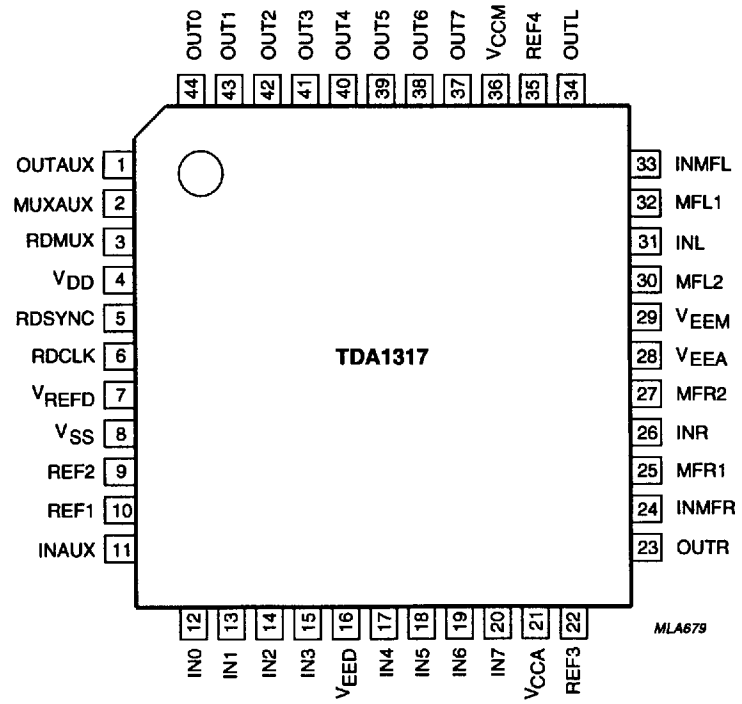


Fig.2 Pin configuration.

FUNCTIONAL DESCRIPTION

Digital preamplifiers

When being used for DCC the IC employs 8 main data channels and 1 auxiliary channel (see Fig.1). The main data channels use low-noise preamplifiers.
Pre-equalization, for frequencies from 1 kHz to 50 kHz, is obtained using 1st order high-pass filters (–3 dB at 80 kHz). Anti-aliasing is achieved using 2nd order low-pass filters (–6 dB at 135 kHz).

The auxiliary channel uses a preamplifier with a 1st order low-pass filter (–3 dB at 400 kHz). All inputs must be AC coupled. The frequency response for the main data and auxiliary data channels is illustrated in Fig.3.

Multiplexer

The IC employs a multiplexer circuit to switch the digital channels, sequentially, to the output. The effective sampling frequency is one tenth of the clock frequency at RDCLK (pin 6). A timing diagram is given in Fig.4.

Analog preamplifiers

When being used for Compact Cassette the IC employs two low-noise preamplifiers and two amplifiers to provide the necessary magnetic feedback current. The analog amplifier inputs must be AC coupled.

Feedback amplifiers

Two feedback amplifiers are provided for driving a coil in the Compact Cassette MRH. This provides a feedback loop in order to improve the linearity of the analog audio response.

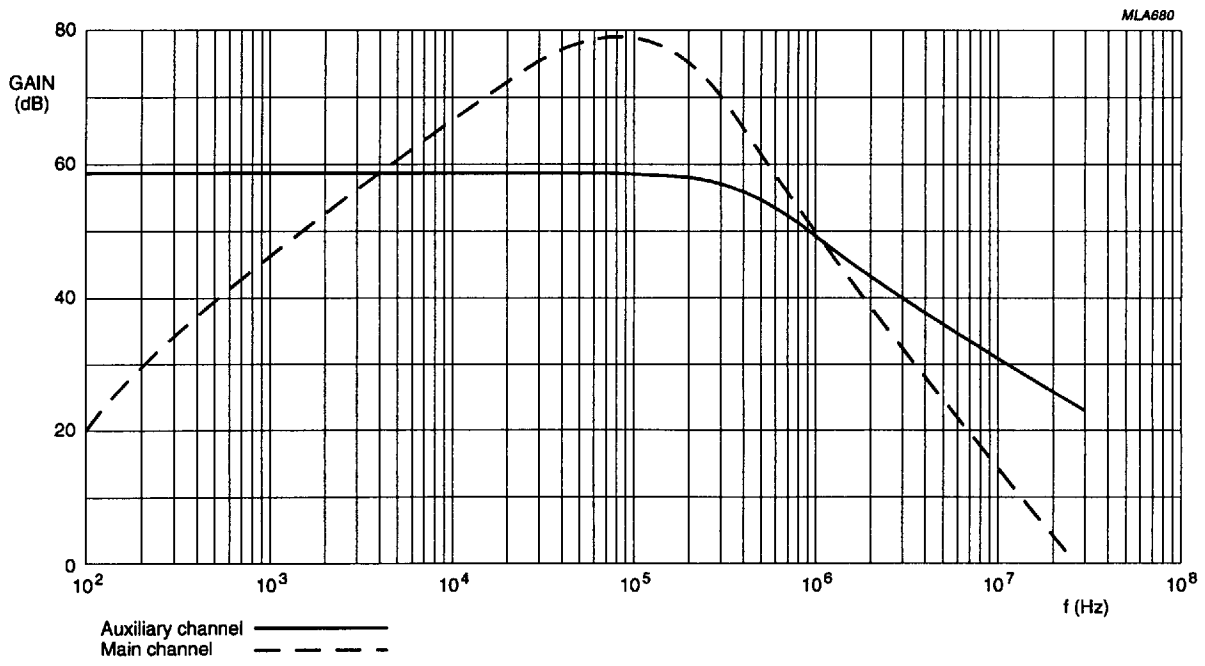


Fig.3 Frequency response of the auxiliary data and main data channels.

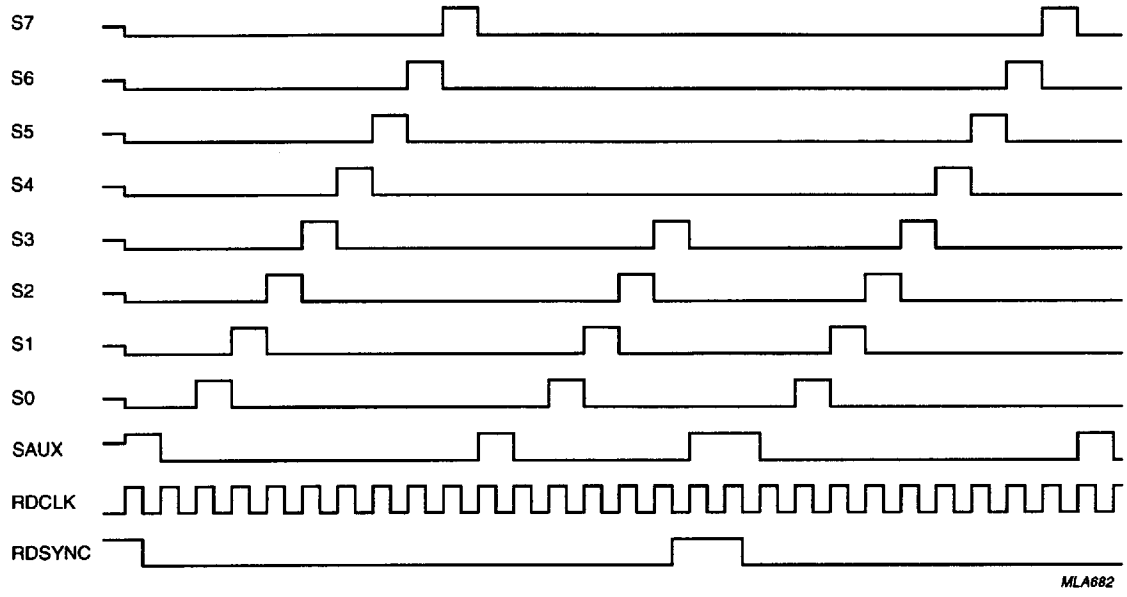


Fig.4 Multiplexer sequence timing.

LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DD}	supply voltage; DCC part		−0.3	+5.5	V
V_{CCA}	supply voltage; CC part		−0.3	+5.5	V
V_{CCM}	supply voltage; feedback amplifier		−0.3	+5.5	V
I_{max}	maximum current on pins 4, 8, 16, 25, 27, 29, 30, 32 and 36		−	80	mA
I_{max}	maximum current on all other pins		−	20	mA
P_{tot}	total power dissipation		−	450	mW
V_{es}	electrostatic handling	note 1	−2000	+2000	V
T_{amb}	operating ambient temperature		−30	+85	°C
T_{stg}	storage temperature		−55	+150	°C

Note

1. Equivalent to discharging a 100 pF capacitor through a 1.5 kΩ series resistor.

THERMAL RESISTANCE

SYMBOL	PARAMETER	THERMAL RESISTANCE
$R_{th\ j\text{-}a}$	from junction to ambient in free air	100 K/W

CHARACTERISTICS

Supply voltage = 5 V; T_{amb} = 25 °C; all voltages with respect to ground; unless otherwise specified.

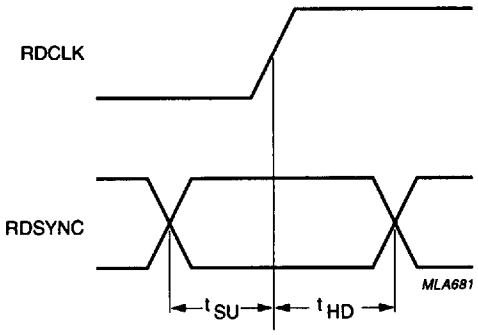
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Supply						
V_{DD}	supply voltage; DCC part		4.5	5.0	5.5	V
V_{CCA}	supply voltage; CC part		4.5	5.0	5.5	V
V_{CCM}	supply voltage; feedback amplifier		4.5	5.0	5.5	V
I_{DD}	supply current; DCC part		24.5	36.0	47.5	mA
I_{CCA}	supply current; CC part		5.9	9.0	12.1	mA
I_{CCM}	supply current; feedback amplifier	no load	2.3	3.4	4.5	mA
V_{REFD}	reference voltage (digital)		2.75	2.9	3.05	V

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Digital channels						
DIGITAL FIRST STAGE						
V_I	DC input voltage		640	670	700	mV
V_{OMAIN}	DC output voltage (main)		1.75	2.3	2.65	V
V_{OAUX}	DC output voltage (auxiliary)		1.75	2.6	2.85	V
V_{REF1}	DC reference voltage level 1		1.7	1.9	2.1	V
V_{REF2}	DC reference voltage level 2		640	670	700	mV
G	gain main data output (1st stage)	f = 10 kHz	55	57	59	dB
$V_{O(rms)}$	maximum AC output voltage (RMS value)	R_L > 10 kΩ	0.5	–	–	V
B	bandwidth	at –3 dB				
	main data channels		95	135	175	kHz
	auxiliary channel		300	400	500	kHz
Z_I	input impedance	f = 10 kHz	670	925	–	Ω
N_{ir}	input referred noise		–	1.5	–	nV/√Hz
THD	total harmonic distortion (auxiliary channel)	V_{OAUX} = 0.5 V (RMS); f = 10 kHz	–	–33	–26	dB
DIGITAL SECOND STAGE PLUS MULTIPLEXER						
V_{RDMUX}	DC output voltage (pin 3)		1.8	2.1	2.4	V
ΔV_{RDMUX}	DC offset voltage between channels (pin 3)		–	–	200	mV
G	gain	excluding filters	24.5	26	27.5	dB
f_{LP}	low-pass filter frequency	at –3 dB	95	135	175	kHz
f_{HP}	high-pass filter frequency	at –3 dB	64	80	96	kHz
$V_{O(rms)}$	maximum AC output voltage (RMS value)	R_L > 2 kΩ	0.5	–	–	V
THD	total harmonic distortion					
	RDMUX (pin 3)	V_{MUX} = 0.5 V (RMS); f = 10 kHz	–	–40	–30	dB
	auxiliary channel	V_{OAUX} = 0.5 V (RMS); f = 10 kHz	–	–33	–26	dB
α_{ct}	overall crosstalk		–	–40	–34	dB
t_s	settling time	C_L = 30 pF (1%)	–	100	–	ns
DIGITAL INPUTS (PINS 5 AND 6)						
V_{IH}	HIGH level input voltage		3.5	–	5.0	V
V_{IL}	LOW level input voltage		0	–	1.5	V
f_s	sample frequency		–	3.072	–	MHz
	timing relationship between RDCLK and RDSYNC	note 1	–	–	–	–

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
ANALOG CHANNELS						
V_I	DC input voltage		700	750	800	mV
V_O	DC output voltage		1.65	2.1	2.55	V
V_{REF3}	DC reference voltage level 3		700	760	800	mV
V_{REF4}	DC reference voltage level 4		3.1	3.3	3.5	V
G	gain	f = 1 kHz	42	44	46	dB
Z_I	input impedance	f = 1 kHz	800	1050	–	Ω
$V_{O(rms)}$	maximum AC output voltage (RMS value)	R_L > 10 kΩ	0.5	–	–	V
THD	total harmonic distortion	V_O = 0.5 V (RMS); f = 1 kHz	–	–50	–	dB
α_{ct}	crosstalk		–	–40	–	dB
N_{ir}	input referred noise		–	2.7	–	nV/√Hz
MAGNETIC FEEDBACK AMPLIFIERS						
THD	total harmonic distortion	V_O = 0.5 V (RMS); I_O = 25 mA (top); note 2	–	–50	–	dB
$I_{25/27/30/32}$	maximum output current (peak value)		25	–	–	mA

Notes

1. Timing relationship between edges of RDCLK and RDSYNC, see Fig.5.
2. Measured from INL/INR (pins 31 and 26) to FB outputs, in accordance with test circuit shown in Fig.6.



Minimum set-up time (t_{SU}) = 20 ns.
Minimum hold time (t_{HD}) = 20 ns.

Fig.5 Timing relationship between edges of RDCLK and RDSYNC.

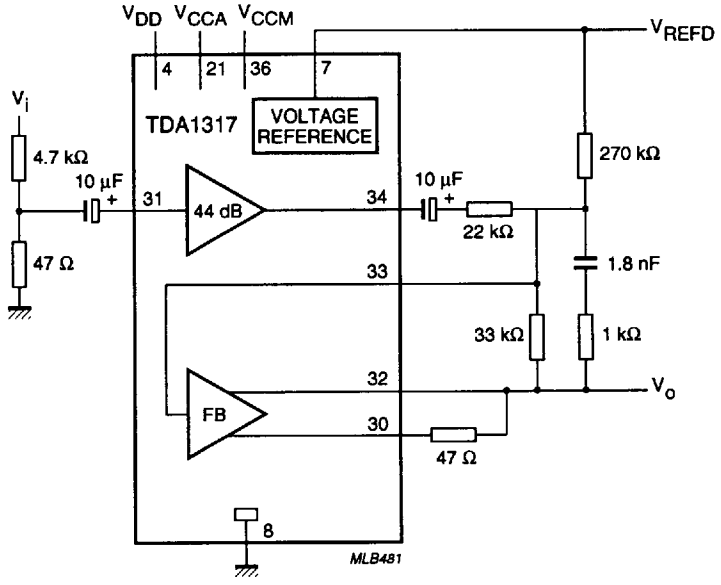


Fig.6 Test circuit for THD of magnetic feedback amplifiers.

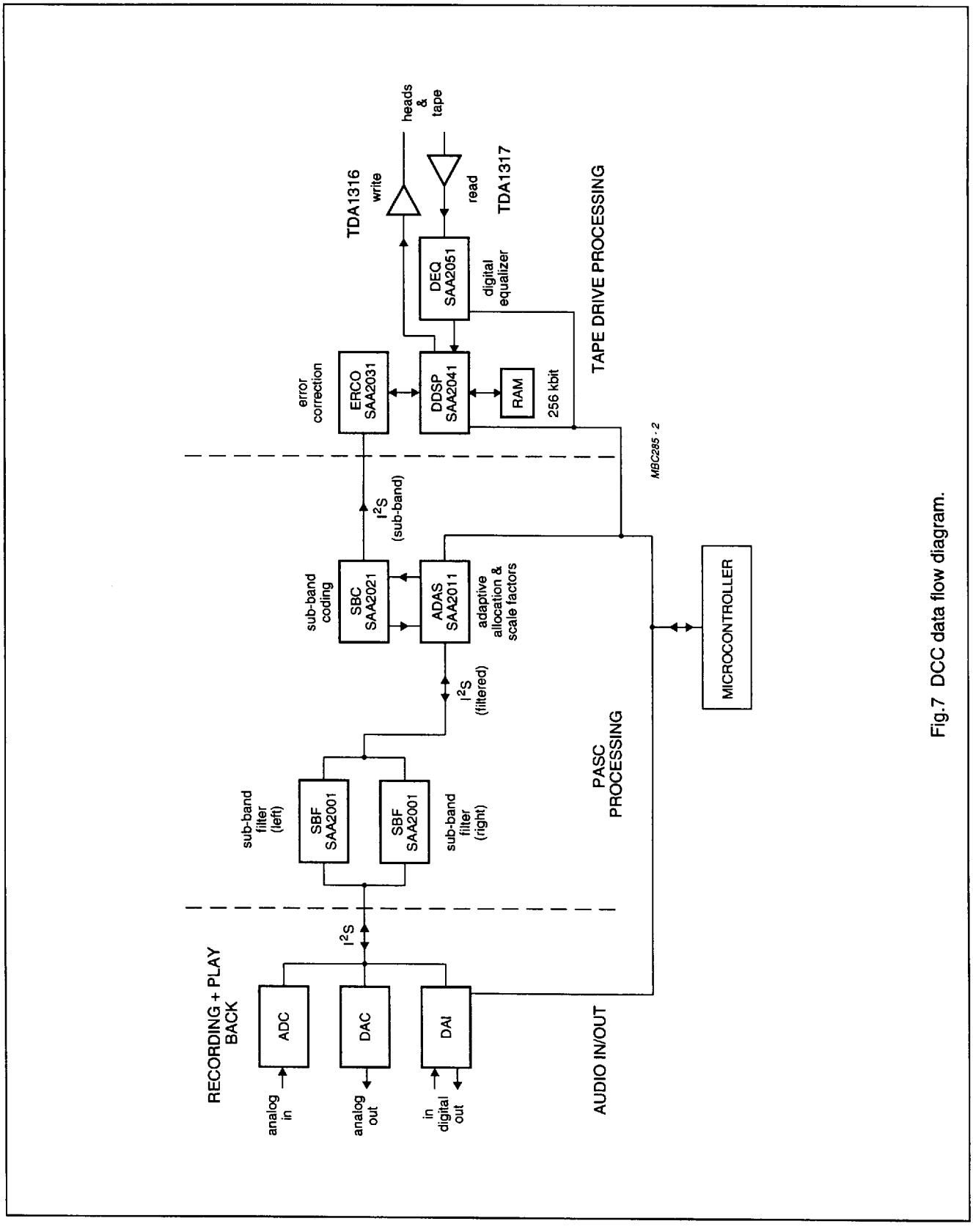
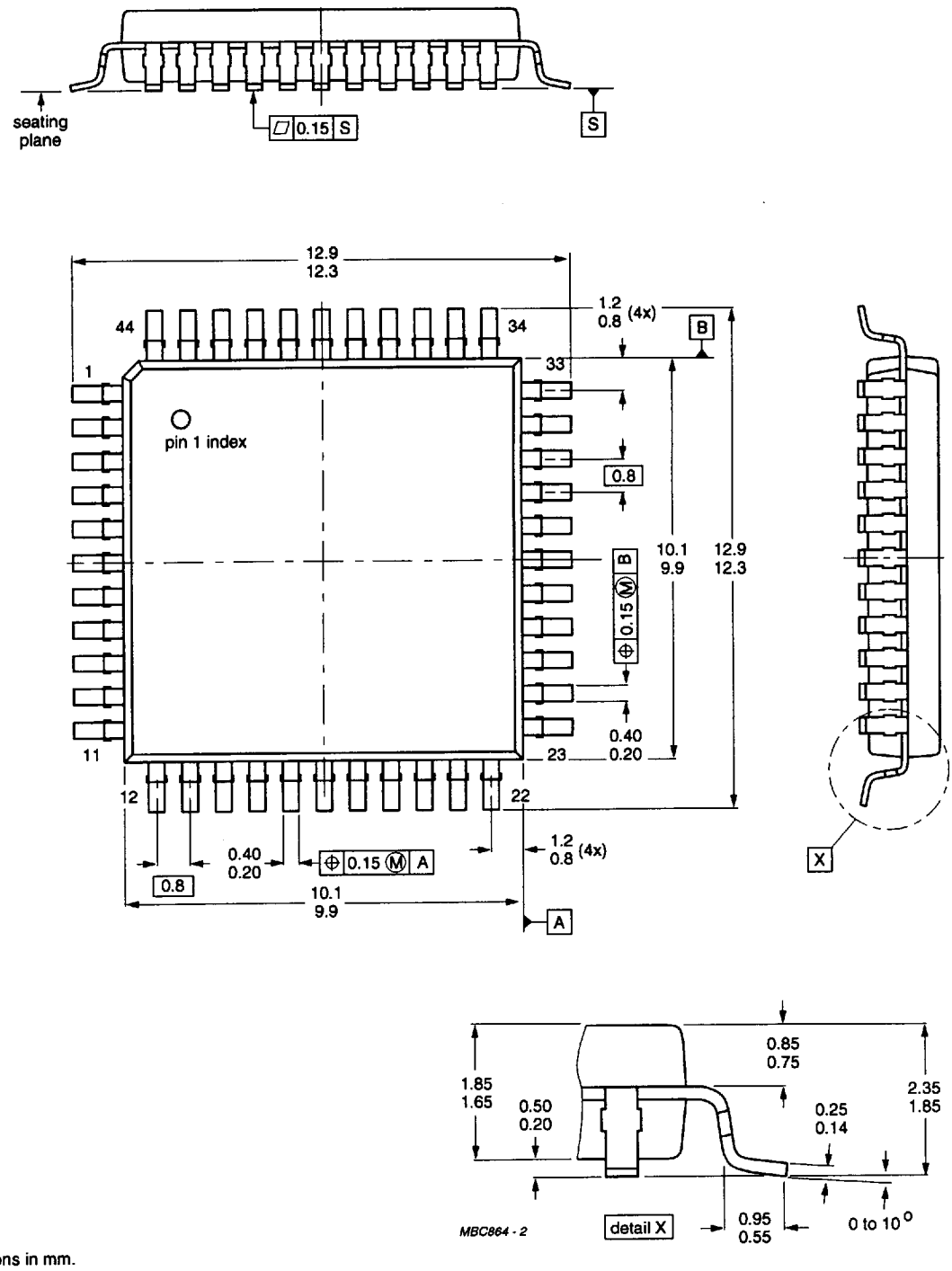


Fig.7 DCC data flow diagram.

PACKAGE OUTLINE



Dimensions in mm.

Fig.8 Plastic quad flat pack, 44 pins (SOT307-1).

SOLDERING

Plastic quad flat-packs

BY WAVE

During placement and before soldering, the component must be fixed with a droplet of adhesive. After curing the adhesive, the component can be soldered. The adhesive can be applied by screen printing, pin transfer or syringe dispensing.

Maximum permissible solder temperature is 260 °C, and maximum duration of package immersion in solder bath is 10 s, if allowed to cool to less than 150 °C within 6 s. Typical dwell time is 4 s at 250 °C.

A modified wave soldering technique is recommended using two solder waves (dual-wave), in which a turbulent wave with high upward pressure is followed by a smooth laminar wave. Using a mildly-activated flux eliminates the need for removal of corrosive residues in most applications.

BY SOLDER PASTE REFLOW

Reflow soldering requires the solder paste (a suspension of fine solder particles, flux and binding agent) to be applied to the substrate by screen printing, stencilling or pressure-syringe dispensing before device placement.

Several techniques exist for reflowing; for example, thermal conduction by heated belt, infrared, and vapour-phase reflow. Dwell times vary between 50 and 300 s according to method. Typical reflow temperatures range from 215 to 250 °C.

Preheating is necessary to dry the paste and evaporate the binding agent. Preheating duration: 45 min at 45 °C.

REPAIRING SOLDERED JOINTS (BY HAND-HELD SOLDERING IRON OR PULSE-HEATED SOLDER TOOL)

Fix the component by first soldering two, diagonally opposite, end pins. Apply the heating tool to the flat part of the pin only. Contact time must be limited to 10 s at up to 300 °C. When using proper tools, all other pins can be soldered in one operation within 2 to 5 s at between 270 and 320 °C. (Pulse-heated soldering is not recommended for SO packages.)

For pulse-heated solder tool (resistance) soldering of VSO packages, solder is applied to the substrate by dipping or by an extra thick tin/lead plating before package placement.

DEFINITIONS

Data sheet status	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
Limiting values	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

LIFE SUPPORT APPLICATIONS

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