

CML Semiconductor Products

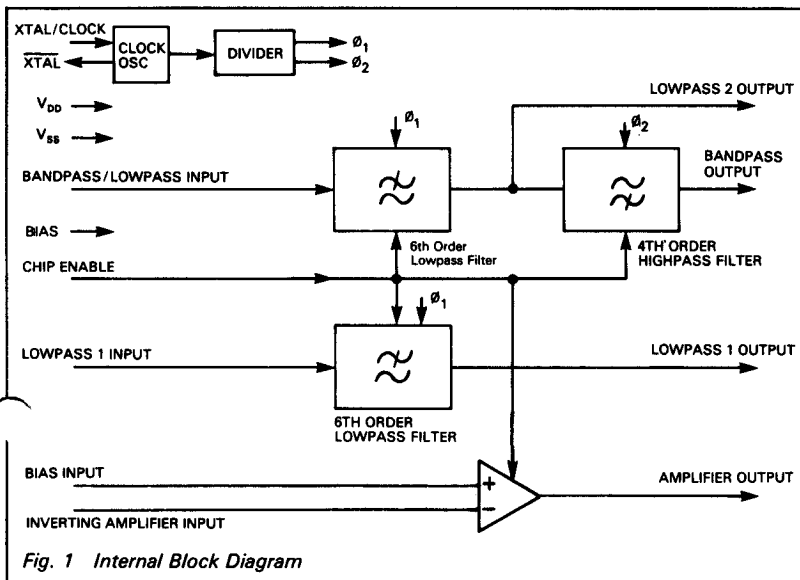
PRODUCT INFORMATION

FX306 Audio Filter Array

Publication D/306/6 July 1994

Features/Applications

- Cellular Radio Audio Processing to NMT TACS AMPS Specification
- Low Group Delay Distortion
- Switched Capacitor Filters
- On-Chip Uncommitted Amplifier
- Xtal Controlled
- Chip Enable Powersave Feature
- Low-Power CMOS Process
- Choice of Package Styles
- Few External Components
- Single 5-Volt Supply



FX306

Brief Description

The FX306 is a low-power CMOS switched capacitor filter array designed to meet the NMT TACS and AMPS audio processing specifications. The device consists of:

- (1) a 3.4 kHz lowpass filter.
- (2) a 300 Hz—3.4 kHz bandpass filter (lowpass filter identical to that of (1) in series with a highpass filter).
- (3) an uncommitted amplifier.

The two 6th order lowpass filters provide a low group delay distortion path. The amplifier

may be used for any specific applications such as, pre-emphasis, de-emphasis, buffering etc. An on-chip oscillator uses a 1 MHz Xtal and provides all reference clocks for the switched capacitor filters via a divider chain. Alternatively an external clock maybe used.

The chip enable feature is used to disable the filter sections and the amplifier, thus reducing current consumption.

Pin Number**Function**

FX306P	FX306LG	
1	1	Amp O/P: Uncommitted amplifier output.
2	2	V_{SS}: Negative Supply.
3	6	LP (2) O/P: Buffered output from the intermediate lowpass filter (Bandpass arrangement).
4	7	Chip Enable: Internally pulled to V _{DD} . A logic '0' applied to this input will disable all filters (powersave mode).
5	8	Xtal: 1 MHz Xtal O/P. Inverting output of on-chip oscillator.
6	9	Xtal/Clock: 1 MHz Xtal I/P or externally derived clock can be injected into this I/P. Input to on-chip inverting oscillator.
7	11	LP (1) O/P: Output of separate lowpass filter.
8	12	V_{SS}: Negative Supply.
9	13	LP (1) I/P: Input of separate lowpass filter.
10	14	V_{SS}: Negative Supply.
11	17	BP I/P LP (2) I/P: Bandpass/lowpass filter (2) input.
12	18	Bias: V _{SS} /2 Bias Pin. Externally decoupled by C ₄ and C ₅ . (See Fig 2, Note 1.)
13	20	BP O/P: Bandpass filter output.
14	21	Bias: I/P: Connect externally to 'Bias' pin.
15	23	Amp I/P: Uncommitted inverting amplifier input.
16	24	V_{DD}: Positive Supply.

FX306LG Pin numbers 3, 4, 5, 10, 15, 16, 19, 22 are not connected.

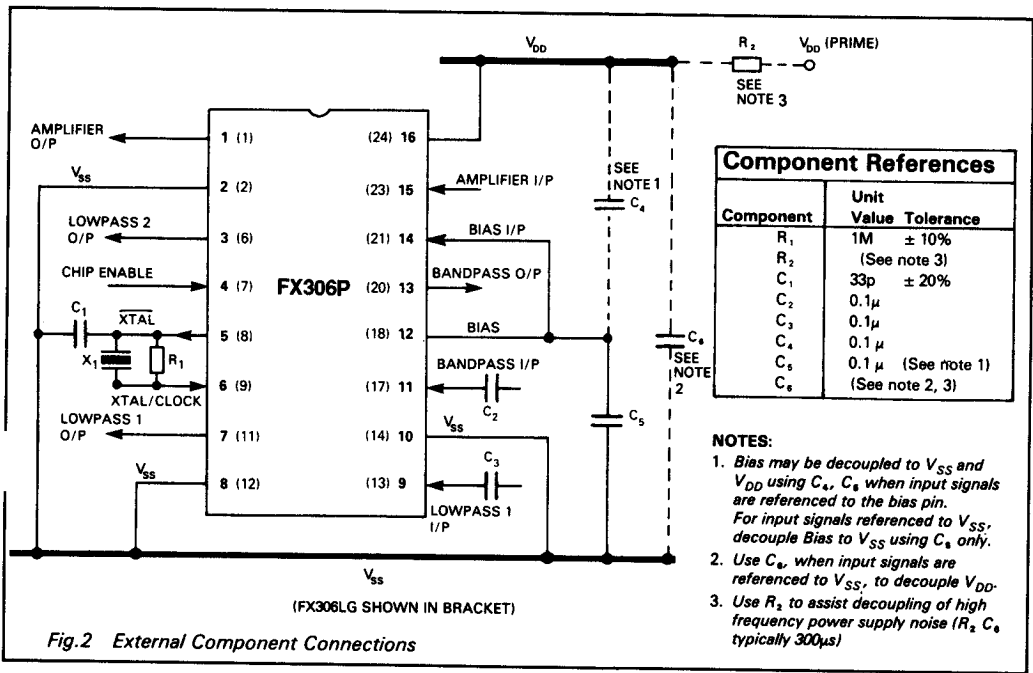


Fig. 2 External Component Connections

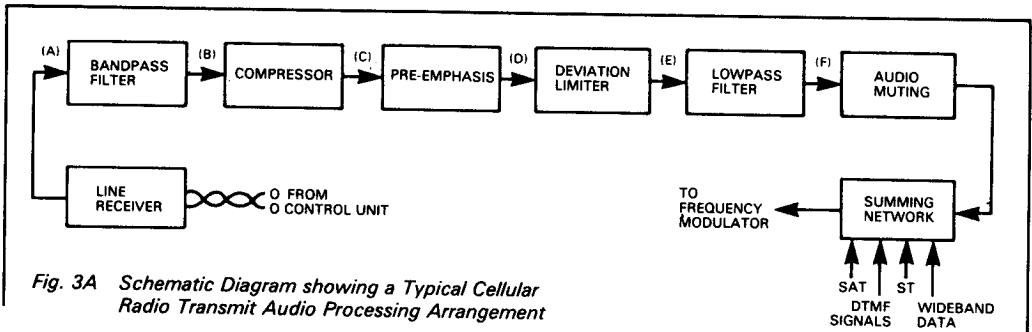


Fig. 3A Schematic Diagram showing a Typical Cellular Radio Transmit Audio Processing Arrangement

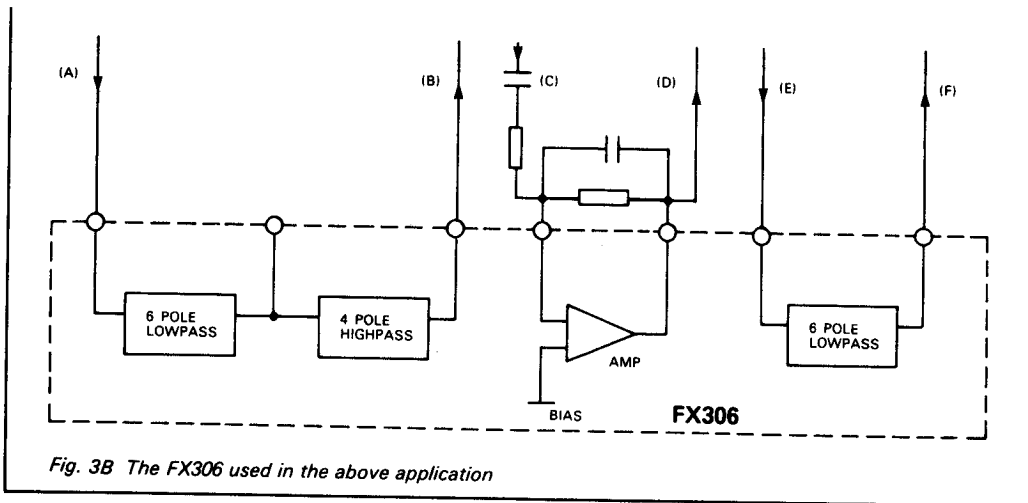


Fig. 3B The FX306 used in the above application

Specification

Exceeding the maximum rating can result in device damage. Operation of the device outside the operating limits is not implied.

Supply voltage		-0.3V to 7.0V
Input voltage at any pin (ref $V_{SS} = 0V$)		-0.3V to ($V_{DD} + 0.3V$)
Output sink/source current (total)		20mA
Operating Temperature:	FX306LG/P	-30°C to +70°C
Storage Temperature:	FX306LG/P	-40°C to +85°C
Maximum device dissipation:	all versions	100mW

Operating Limits

All characteristics measured using the following parameters unless otherwise specified:

$V_{DD} = 5V$, $T_{amb} = 25^{\circ}C$, $\phi = 1MHz$, $\Delta f \phi = 0$, $f_{in} = 1kHz$.

Characteristics	See Note	Min	Typ	Max	Unit
Static Characteristics					
Supply voltage		4.5	5	5.5	V
Supply current (Enabled)		—	3.5		mA
Supply current (Disabled)		—	500		μA
Input impedance (Filters & Amplifier)		100		—	k Ω
Output impedance (Filters)		—	3		k Ω
Output impedance (Amplifier open loop)		—	800		Ω
Output impedance (Amplifier closed loop)		—	6		Ω
Input logic '1'		3.5	—	—	V
Input logic '0'		—	—	1.5	V
Dynamic Characteristics					
Signal input dynamic range LP	1		40		dB
BP	1		40		dB
Cut off frequency (-3dB) LP			3400		Hz
HP			260		Hz
Group Delay (900—2100Hz) LP			30	60	μs
BP			60		μs
Noise and Distortion LP	2		45		dB sinad
BP	2		35		dB sinad
Passband ripple (400—3000Hz)				2	dB absolute
Lowpass attenuation $f > 4kHz$	3		10		dB
$f > 6kHz$	3		35		dB
Highpass attenuation $f < 200Hz$	3		15		dB
Insertion loss $f = 1kHz$			0		dB
Inverting Amplifier					
Open loop gain	3		30		dB
Gain bandwidth product			1		MHz

- Note:**
1. For 20dB sinad (psophometrically weighted)
 2. -6dBm input (psophometrically weighted)
 3. Relative to 1kHz 100mV rms input level

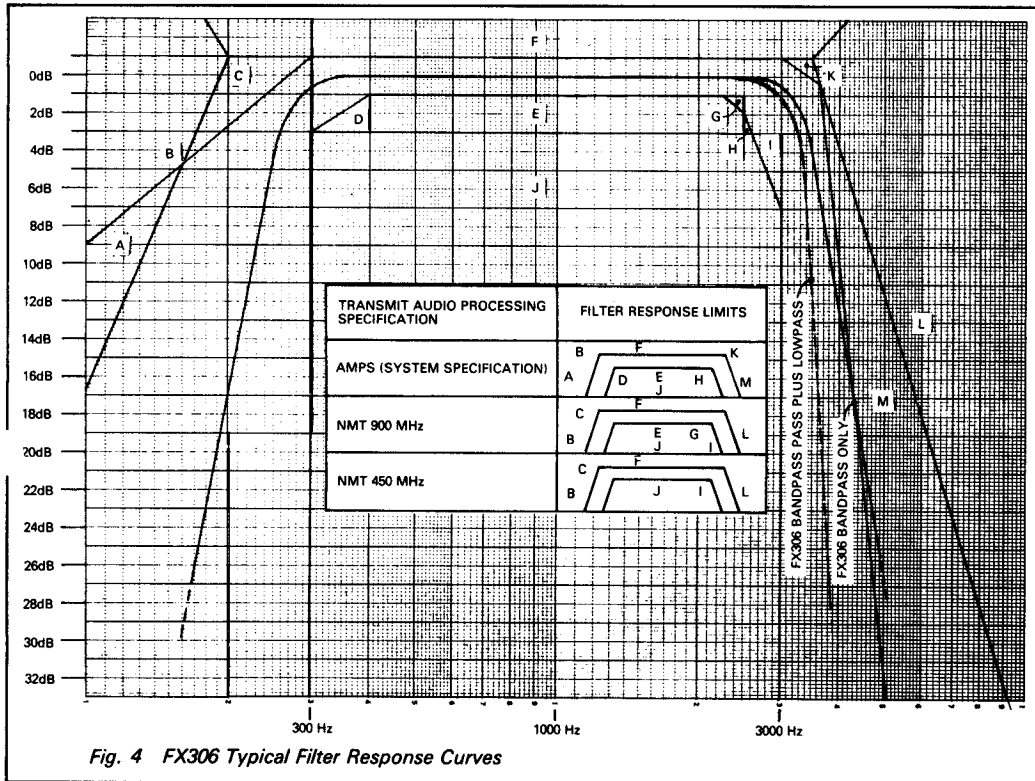


Fig. 4 FX306 Typical Filter Response Curves

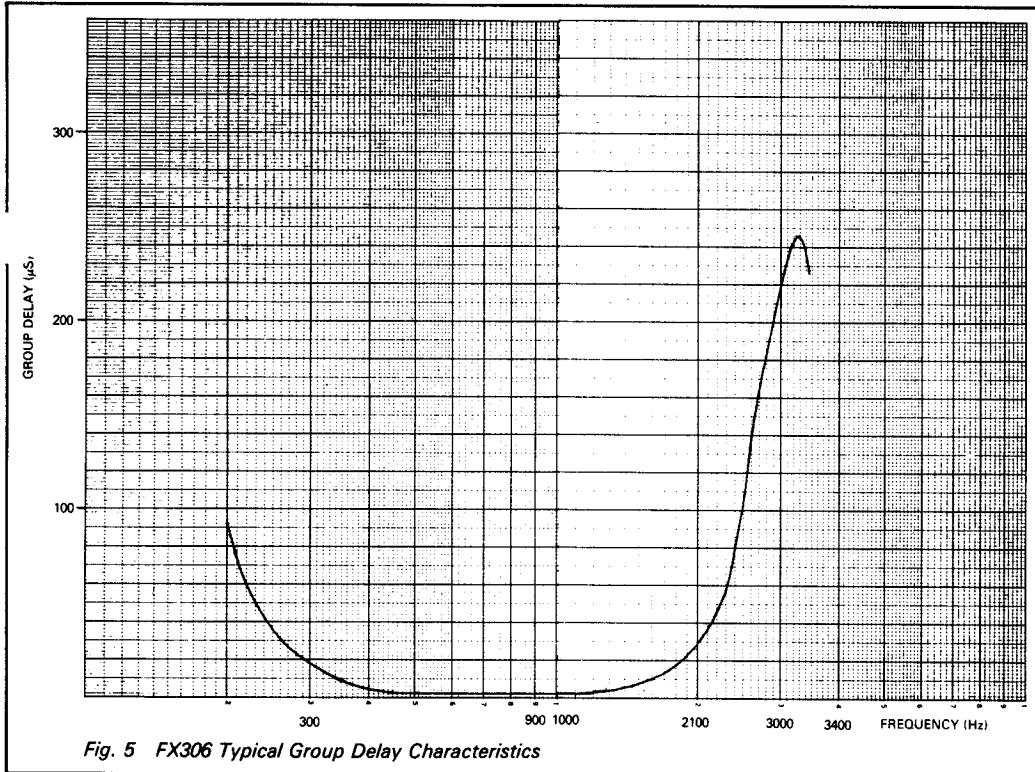


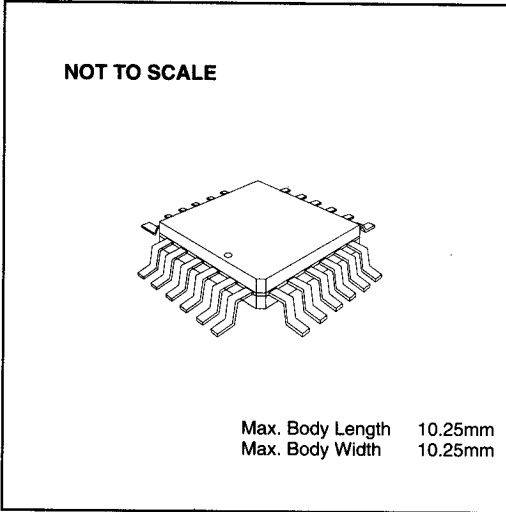
Fig. 5 FX306 Typical Group Delay Characteristics

Package Outlines

The FX306 is available in the package styles outlined below. Mechanical package diagrams and specifications are detailed in Section 10 of this document.

Pin 1 identification marking is shown on the relevant diagram and pins on all package styles number anti-clockwise when viewed from the top.

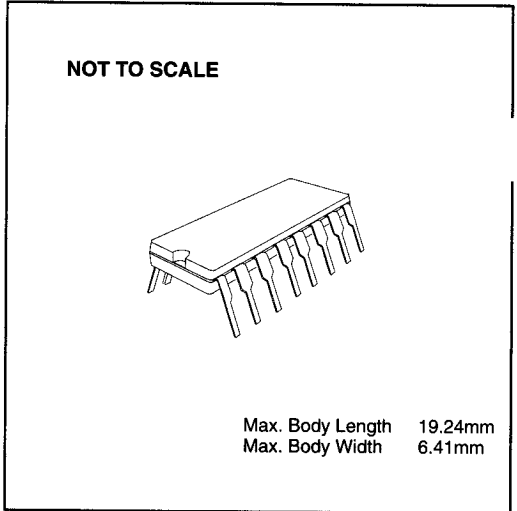
FX306LG 24-pin quad plastic encapsulated bent and cropped (L1)



Handling Precautions

The FX306 is a CMOS LSI circuit which includes input protection. However precautions should be taken to prevent static discharges which may cause damage.

FX306P 16-pin plastic DIL (P3)



Ordering Information

FX306LG 24-pin encapsulated bent and cropped (L1)

FX306P 16-pin plastic DIL (P3)