Consumer Microcircuits Limited

PRODUCT INFORMATION

FX306 Audio Filter Array

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Features

- 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

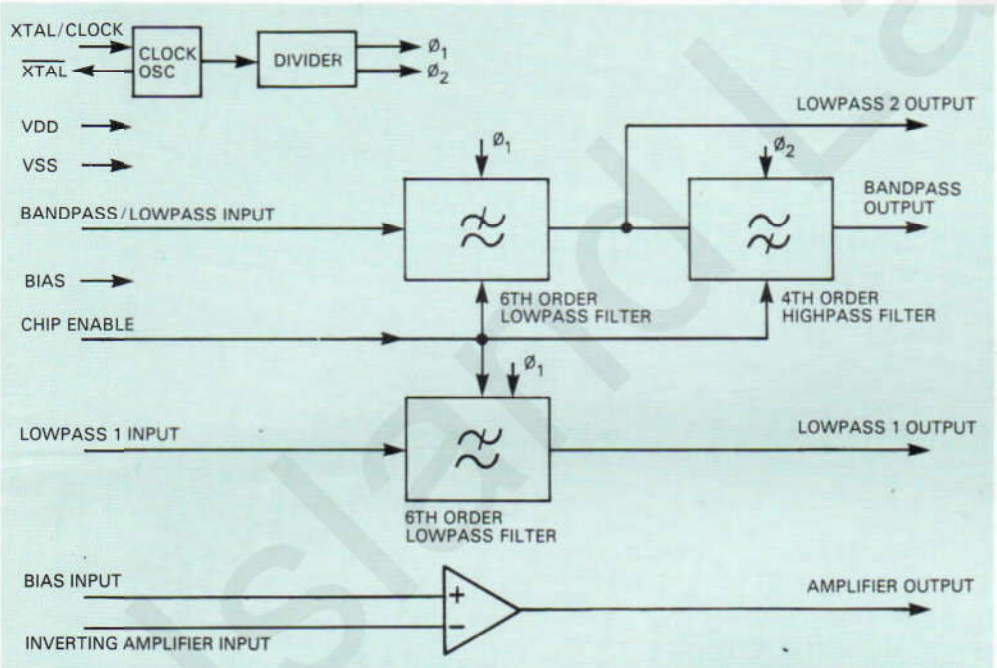


Fig. 1 Internal Block Diagram

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.

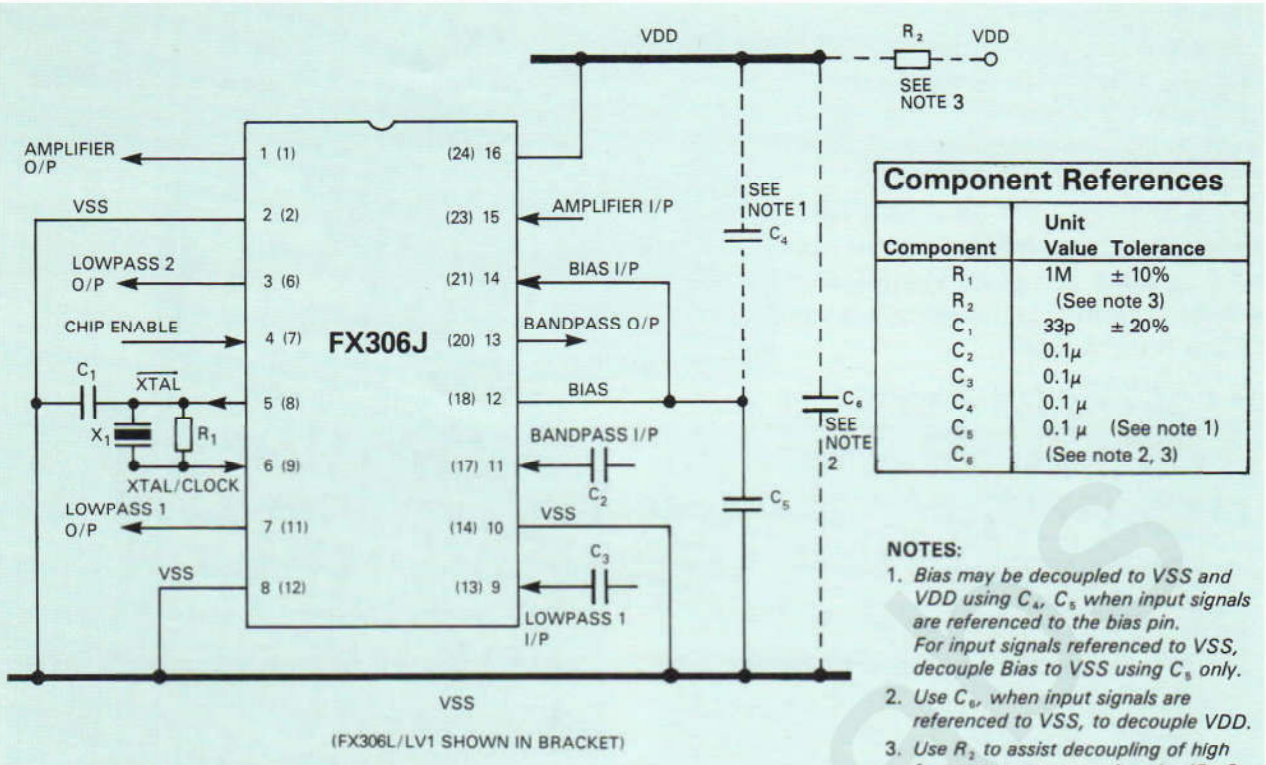
The two 6th order lowpass filters provide a low group delay distortion path. The amplifier may be used for any specific applications such as, pre-emphasis, de-emphasis, buffering etc. An on-chip oscillator uses a 1 MHz xtal and provides all reference clocks for the switched capacitor filters via a divider chain. Alternatively an external clock maybe used.

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

Pin Description Function

D.I.L. FX306J	Quad Plastic FX306L/LV1	
1	1	**Amp O/P:** Uncommitted amplifier output.
2	2	**VSS:** Negative Supply.
3	6	**LP (2) O/P:** Buffered output from the intermediate lowpass filter (Bandpass arrangement).
4	7	**Chip Enable:** Internally pulled to VDD. A logic '0' applied to this input will disable all filters (powersave mode).
5	8	**$\overline{\text{Xtal}}$:** 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	**VSS:** Negative Supply.
9	13	**LP (1) I/P:** Input of separate lowpass filter.
10	14	**VSS** Negative Supply.
11	17	**BP I/P / LP (2) I/P:** Bandpass/lowpass filter (2) input.
12	18	**Bias:** VDD/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	**VDD:** Positive Supply.

FX306L/LV1 Pin numbers 3, 4, 5, 10, 15, 16, 19, 22 are not connected.



Component References		
Component	Value	Unit Tolerance
R_1	1M	± 10%
R_2	(See note 3)	
C_1	33p	± 20%
C_2	0.1μ	
C_3	0.1μ	
C_4	0.1 μ	
C_5	0.1 μ	(See note 1)
C_6	(See note 2, 3)	

NOTES:

1. *Bias may be decoupled to VSS and VDD using C_4, C_5 when input signals are referenced to the bias pin. For input signals referenced to VSS, decouple Bias to VSS using C_5 only.*
2. *Use C_6, when input signals are referenced to VSS, to decouple VDD.*
3. *Use R_2 to assist decoupling of high frequency power supply noise (R_2 C_6 typically 300μs)*

Fig.2 External Component Connections

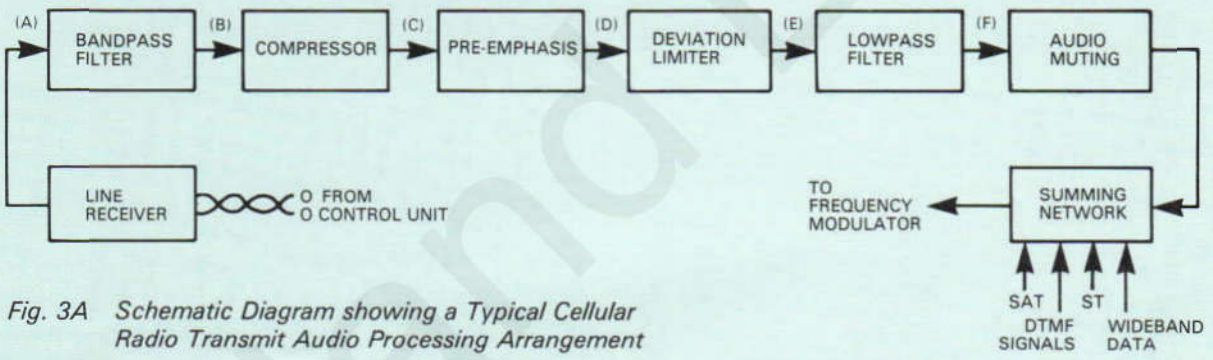


Fig. 3A Schematic Diagram showing a Typical Cellular Radio Transmit Audio Processing Arrangement

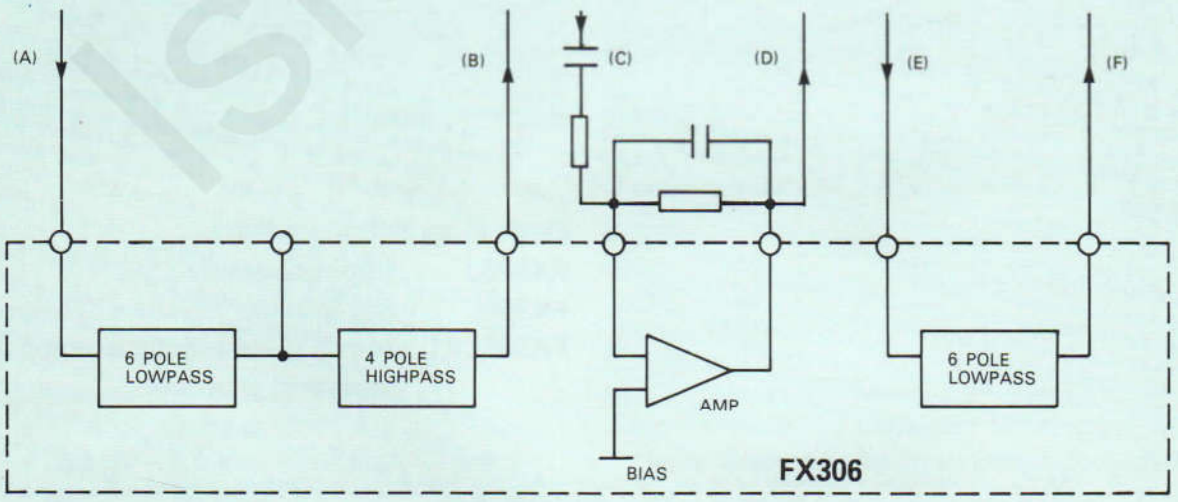


Fig. 3B The FX306 used in the above application

Specification

Absolute Maximum Ratings

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 VSS = OV)		−0.3V to (VDD + 0.3V)
Output sink/source current (total)		20mA
Operating temperature range:	FX306J	−30°C to + 85°C
	FX306L	−30°C to + 70°C
Storage temperature range:	FX306J	−55°C to +125°C
	FX306L	−40°C to +85°C

Operating Limits

All characteristics measured using the following parameters unless otherwise specified:
VDD = 5V, T_A = 25°C, ϕ = 1MHz, $\Delta f \phi = 0$, fin = 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		—	kΩ
Output impedance (Filters)		—	3		kΩ
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 $f > 4$kHz	3		10		dB
$f > 6$kHz	3		35		dB
Highpass attenuation $f < 200$Hz	3		15		dB
Insertion loss f = 1kHz			0		dB
Inverting Amplifier					
Gain open loop	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.

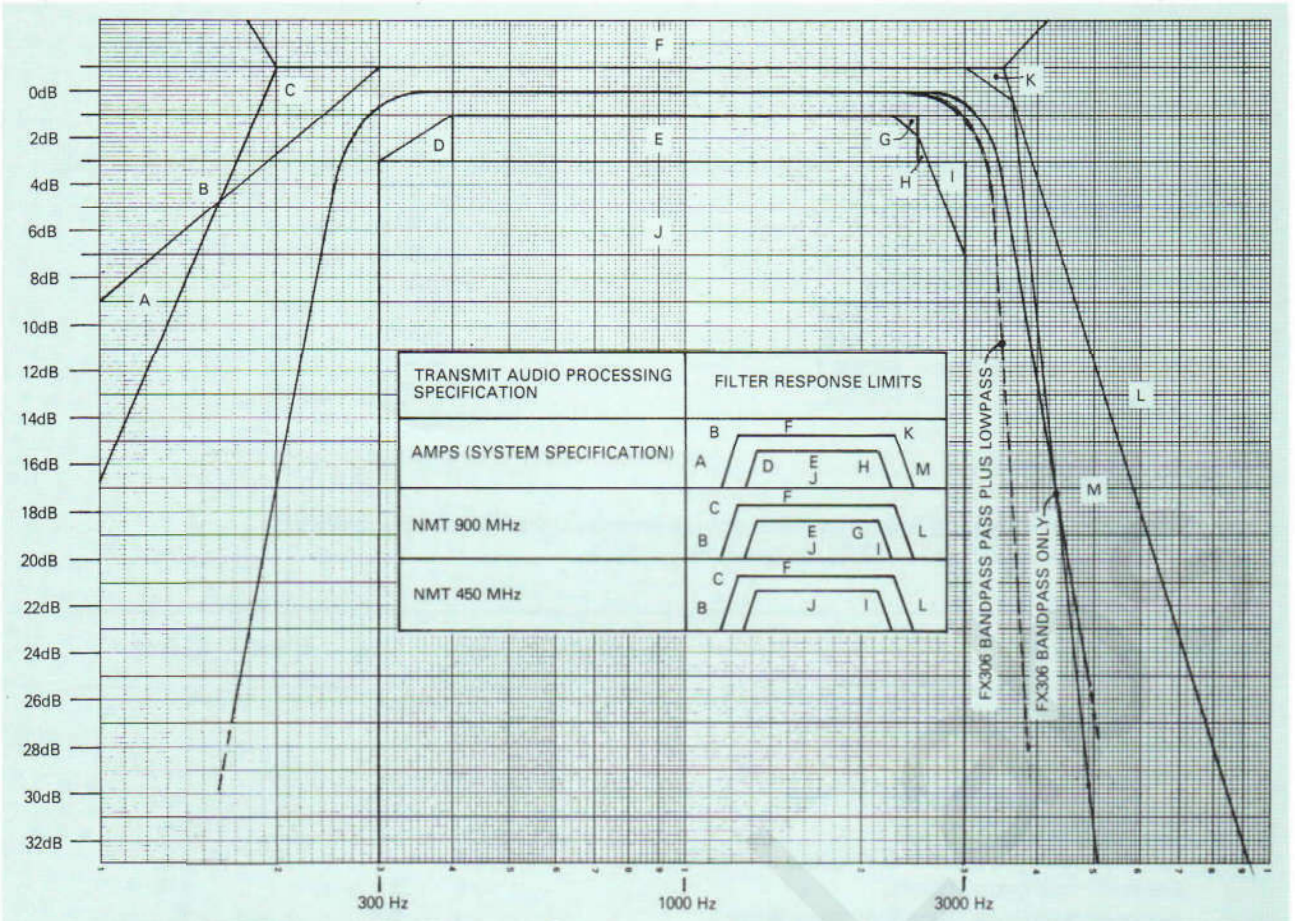


Fig. 4 FX306 Typical Filter Response Curves

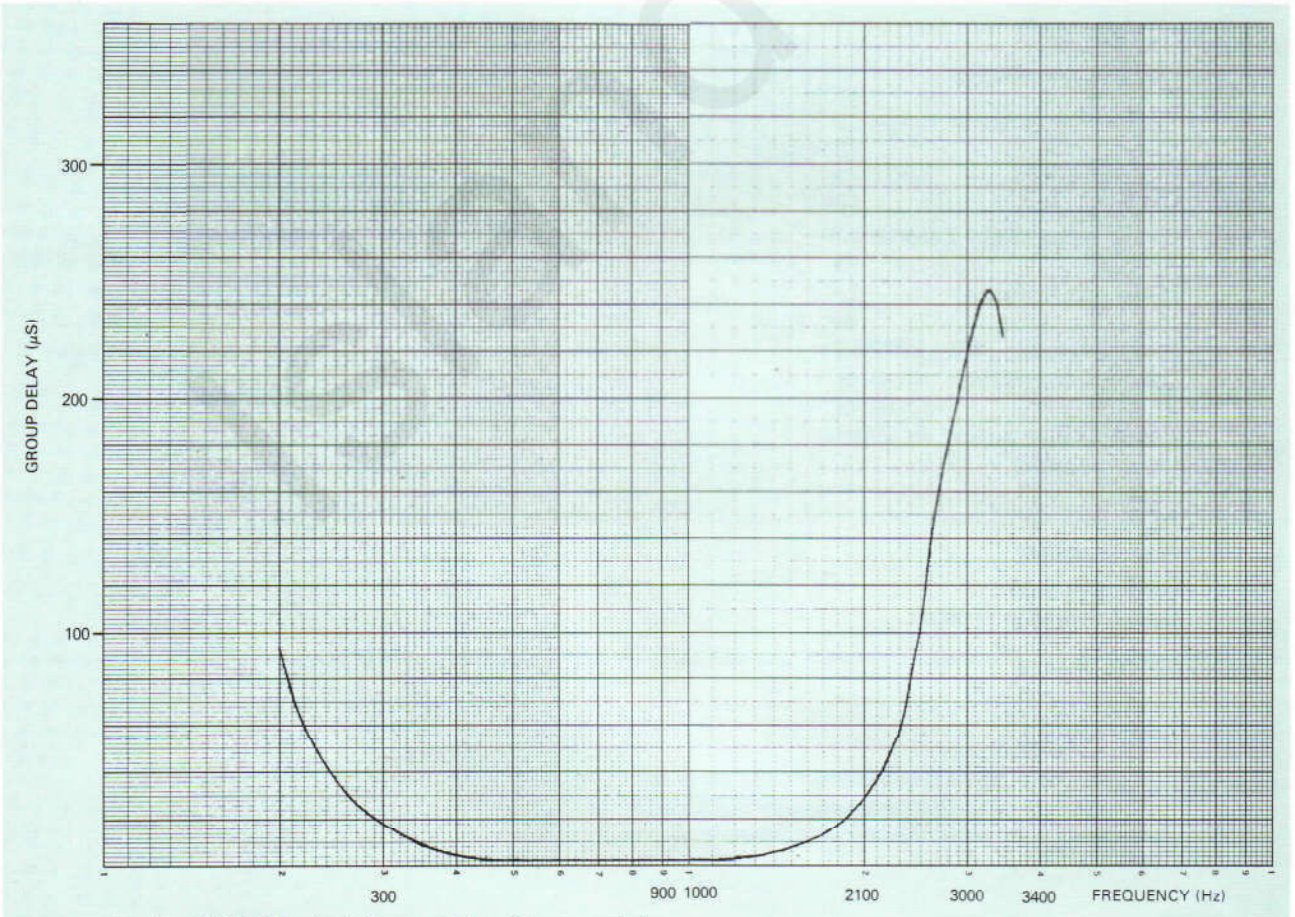


Fig. 5 FX306 Typical Group Delay Characteristics

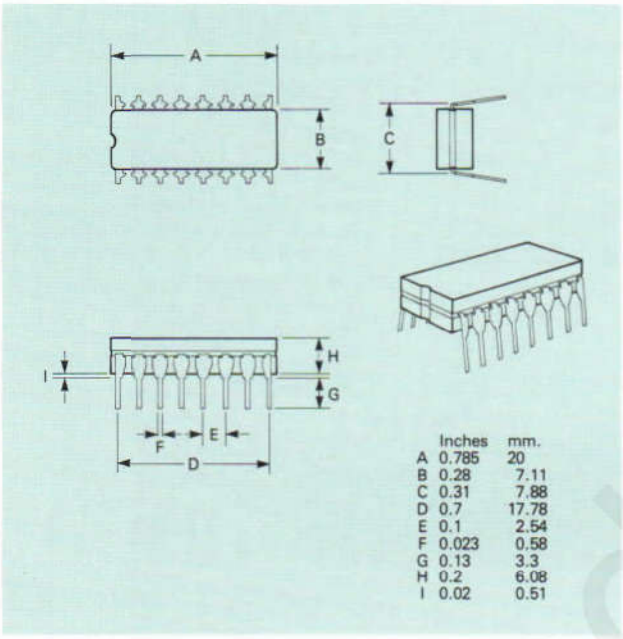
Package Outlines

The cerdip package of the FX306J is shown in *Figure 6.* The plastic encapsulated FX306L of *Figure 7* is supplied in the disposable carrier for handling convenience. The FX306LV1 of *Figure 8* is supplied in a conductive tray.
The FX306L/LV1 has an indent (spot) adjacent to Pin 1 and a chamfered corner between Pins 3 and 4 to allow complete identification. Pins number counter-clockwise when viewed from the top (indent side).

Handling Precautions

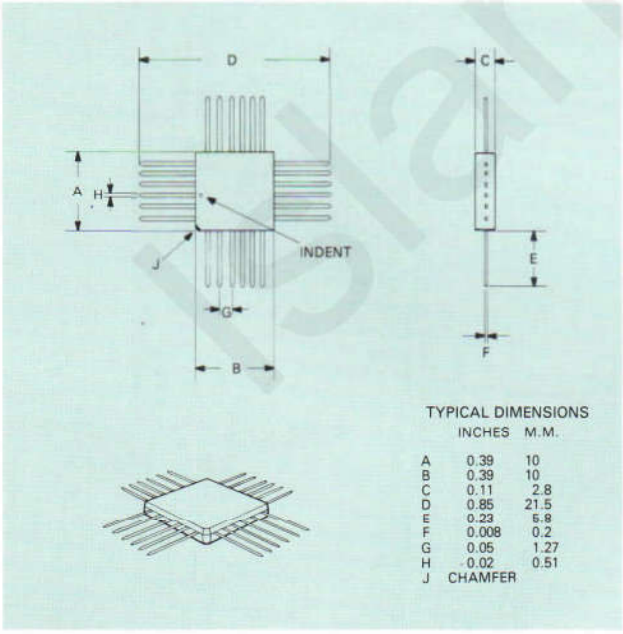
The FX306J/L/LV1 is a CMOS LSI circuit which includes input protection. However, precautions should be taken to prevent static discharges which can cause damage.

Fig. 6 ***FX306J*** *D.I.L. Package*



	Inches	mm.
A	0.785	20
B	0.28	7.11
C	0.31	7.88
D	0.7	17.78
E	0.1	2.54
F	0.023	0.58
G	0.13	3.3
H	0.2	6.08
I	0.02	0.51

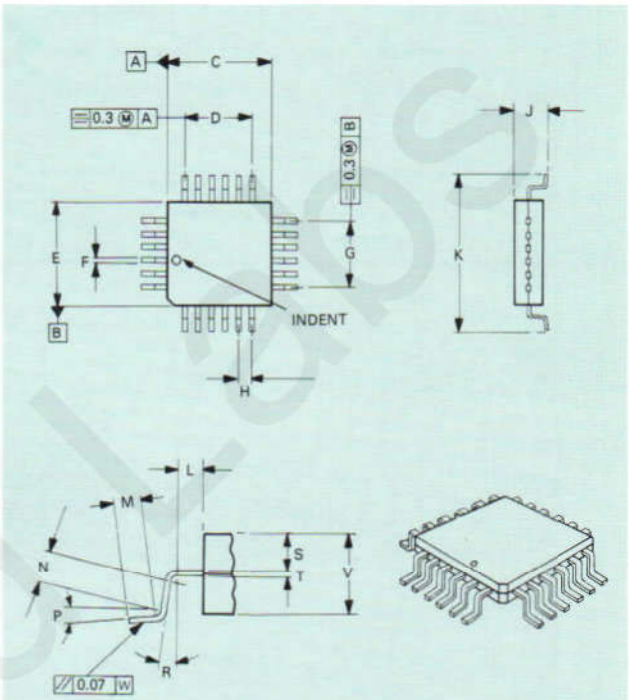
Fig. 7 ***FX306L*** *Package*



TYPICAL DIMENSIONS

	INCHES	M.M.
A	0.39	10
B	0.39	10
C	0.11	2.8
D	0.85	21.5
E	0.23	5.8
F	0.008	0.2
G	0.05	1.27
H	0.02	0.51
J	CHAMFER	

Fig. 8 ***FX306LV1*** *Package*



NOTE: All dimensions in mm. Angles in degrees.

DIMENSION	MAX.	MIN.	DIMENSION	MAX.	MIN
A, B	Datum & Symmetry		M	1.0	0.8
			N	1.15	1.0
C	10.25	10.0	P	6.0°	5.0°
D	6.38	6.32	ϑ	5.5°	4.5°
E	10.25	10.0	S	1.40	1.14
F	0.55	0.47	T	0.22	0.16
G	6.38	6.32	V	3.02	2.44
H	1.30	1.24	W//	0.07	—
J	3.40	3.33			
K	15.65	—			
L	1.0	0.85			

Ordering Information

FX306J	**16-pin Ceramic D.I.L.**
FX306L	**24-pin quad plastic encapsulated.**
FX306LV1	**24-pin quad plastic encapsulated, bent and cropped.**

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