

# MX-COM, INC. MiXed Signal ICs

DATA BULLETIN

## MX316

## NMT Audio Filter Array

### FEATURES:

- 12th Order Lowpass Filter for S.A.T.\* Rejection
- 4 KHz S.A.T. Recovery Bandpass Filter
- Low Group Delay Distortion
- Single 5V CMOS Power Requirement

### APPLICATIONS:

- Nordic Mobile Telephone (NMT) 450/900 MHz Mobile and Base Specifications

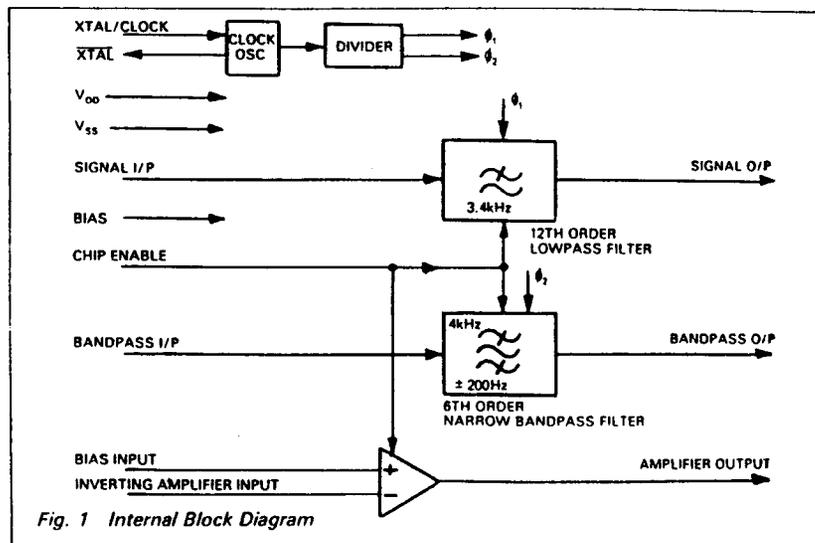
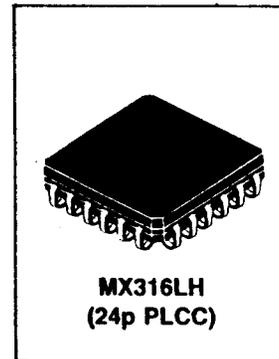
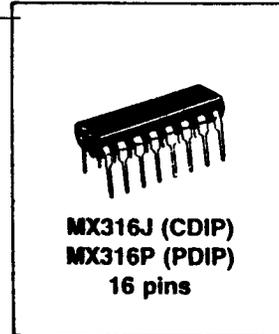
### DESCRIPTION:

The MX316 is a low power CMOS switched capacitor filter array designed to meet Nordic Mobile Telephone base and mobile specifications. As depicted in Figure 1, the device is comprised of:

- 1) a 12th order, 3.4 KHz lowpass filter which meets NMT 450 and 900 MHz base and mobile filter response specifications. Group delay distortion is minimized through this filter.
- 2) a 6th order, 4 KHz narrow bandpass filter which meets NMT 450 and 900 MHz S.A.T. recovery specifications.
- 3) an uncommitted amplifier, which may be used for a variety of applications, such as pre-emphasis, de-emphasis, and buffering.

An on-chip oscillator is driven by a 1 MHz crystal and provides all reference clocks for the switched capacitor filters via a divider chain. Alternatively, an external clock may be used. In standby mode, the chip enable feature is used to disable the three circuit elements.

\*Supervisory Audio Tone



## MX316 PIN FUNCTION TABLE

PIN		FUNCTION	DESCRIPTION
MX316J MX316P	MX316LH		
1	1	<b>Xtal/Clock</b>	Connect 1 MHz crystal or externally derived clock to this input. Drives the on-chip inverting oscillator.
2	2	$\overline{\text{Xtal}}$	1 MHz crystal O/P. Inverting output of on-chip oscillator.
3	5	<b>Chip Enable</b>	Internally pulled to $V_{dd}$ . A logic "0" applied to this pin will disable all filters and the uncommitted amplifier (powersave).
4	6	<b>Signal I/P</b>	Input to the lowpass filter. This input is internally biased and externally a.c. coupled by C2.
5	7	<b>Signal O/P</b>	Lowpass filter output internally biased to $V_{dd}/2$ .
6	8	$V_{ss}$	Negative supply voltage
7	10	<b>BP I/P</b>	Input to bandpass filter. Internally biased and externally a.c. coupled by C3.
8	12	$V_{ss}$	Negative supply voltage
9	13	<b>BP O/P</b>	Bandpass filter output. Internally biased to $V_{dd}/2$ .
10	14	<b>Bias</b>	$V_{dd}/2$ Bias Pin. Externally decoupled by C5 (see fig. 2, note 1).
11	17	<b>Amp O/P</b>	Uncommitted amplifier output
12	18	<b>Amp I/P</b>	Uncommitted amplifier inverting input
13	19	<b>Bias I/P</b>	Connect externally to "Bias" pin.
14	20	<b>N/C</b>	Internally connected. Leave open circuit.
15	23	<b>N/C</b>	Internally connected. Leave open circuit.
16	24	$V_{dd}$	Positive supply voltage

Note: MX316LH pin numbers 3,4,9,11,15,16,21, and 22 are not connected.

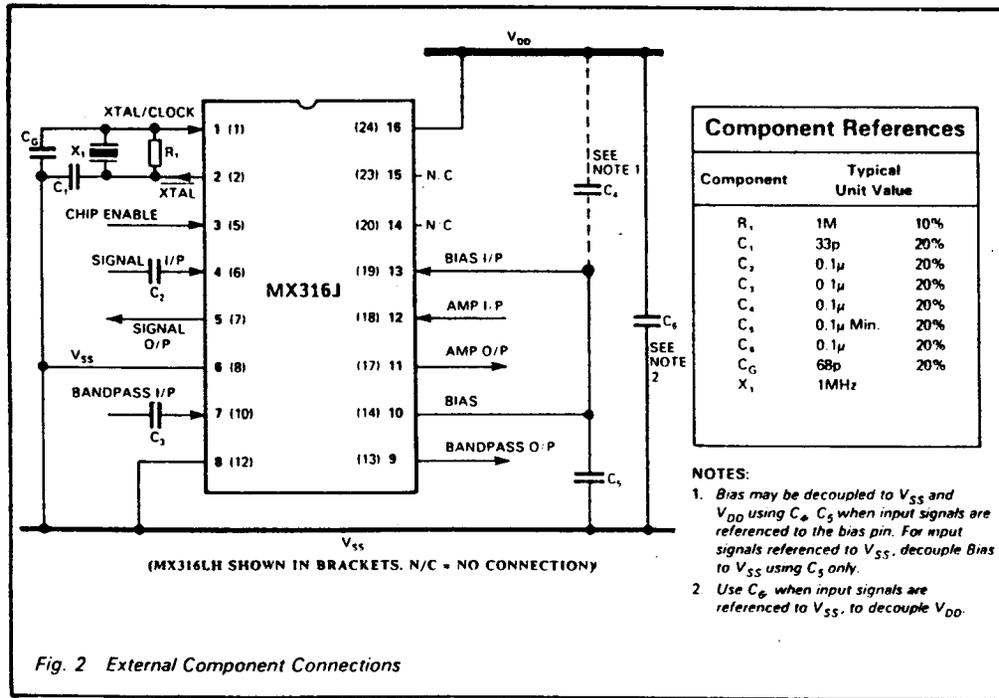


Fig. 2 External Component Connections

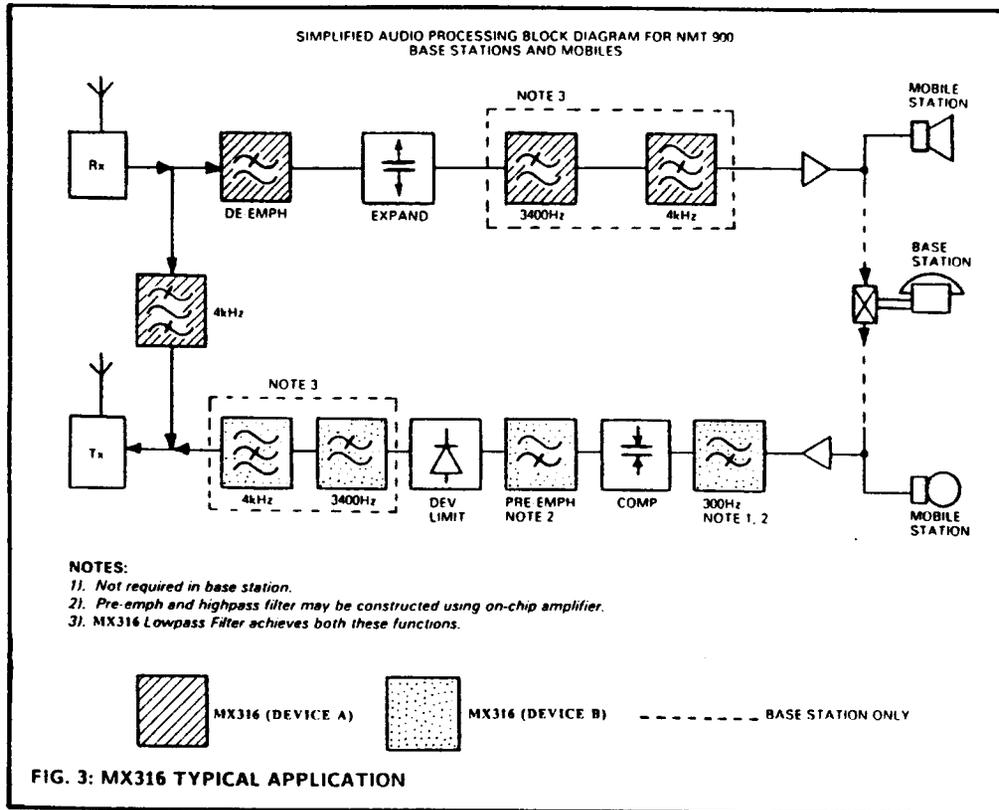


FIG. 3: MX316 TYPICAL APPLICATION

## MX316 ELECTRICAL SPECIFICATIONS

### 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 $V_{SS} = 0V$ )		-0.3V to ( $V_{DD} + 0.3V$ )
Output sink/source current (total)		20mA
Operating temperature range:	MX316J	-30°C to +85°C
	MX316LH, MX316P	-30°C to +70°C
Storage temperature range:	MX316J	-55°C to +125°C
	MX316LH, MX316P	-40°C to +85°C
Maximum device dissipation:		All versions 100mW

### Operating Limits

All characteristics measured using the following parameters unless otherwise specified:

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

Characteristics	See Note	Min	Typ	Max	Unit
<b>Static Characteristics</b>					
Supply voltage		4.5	5	5.5	V
Supply current (Enabled)		—	6.0		mA
Supply current (Disabled)		—	700		$\mu A$
Input impedance (Filters & Amplifier)		100	1000	—	k $\Omega$
Output impedance (Filters)		—	3	—	k $\Omega$
Output impedance (Amplifier open loop)		—	800	—	$\Omega$
Output impedance (Amplifier closed loop)		—	6	—	$\Omega$
Input logic '1'		3.5	—	—	V
Input logic '0'		—	—	1.5	V
<b>Dynamic Characteristics</b>					
Passband Ripple	(300-3000Hz) LP	5	—	2	dB
	(4kHz $\pm$ 55Hz) BP	5	—	2	dB
Cut off frequency	(-3dB) LP	4,5	3000	3450	Hz
	(-6dB) BP	4,5	4200	3800	Hz
Attenuation	(3800-4200Hz) LP	4,5	36	46	dB
	(<2000Hz, >6000Hz) BP	4,5	35	37	dB
Group Delay Distortion	(900-2100Hz) LP	—	80	—	$\mu s$
	(600-3000Hz) LP	—	450	—	$\mu s$
Output Noise (rms)	LP	1	—	1.6	mV
	BP	1	—	1	mV
Signal Input (rms)	LP	2	—	0.4	V
	BP	2	—	0.4	V
Insertion loss (1kHz)	LP	—	0	—	dB
	(4kHz) BP	—	0	—	dB
Aliasing Frequency		50	—	—	kHz
<b>Inverting Amplifier</b>					
Open loop gain		3	—	30	dB
Gain bandwidth product		—	1	—	MHz

Note: 1. Measured with input a.c. s/c.

2. 'MAX' figure specified for nominal 3% distortion (30dB SINAD).

'TYP' figure specified for minimum distortion (MAX SINAD).

3. Relative to 1kHz, 100mV rms input level.

4. Refer to Figs. 4 and 5.

5. Specified over the full operating voltage and temperature range.

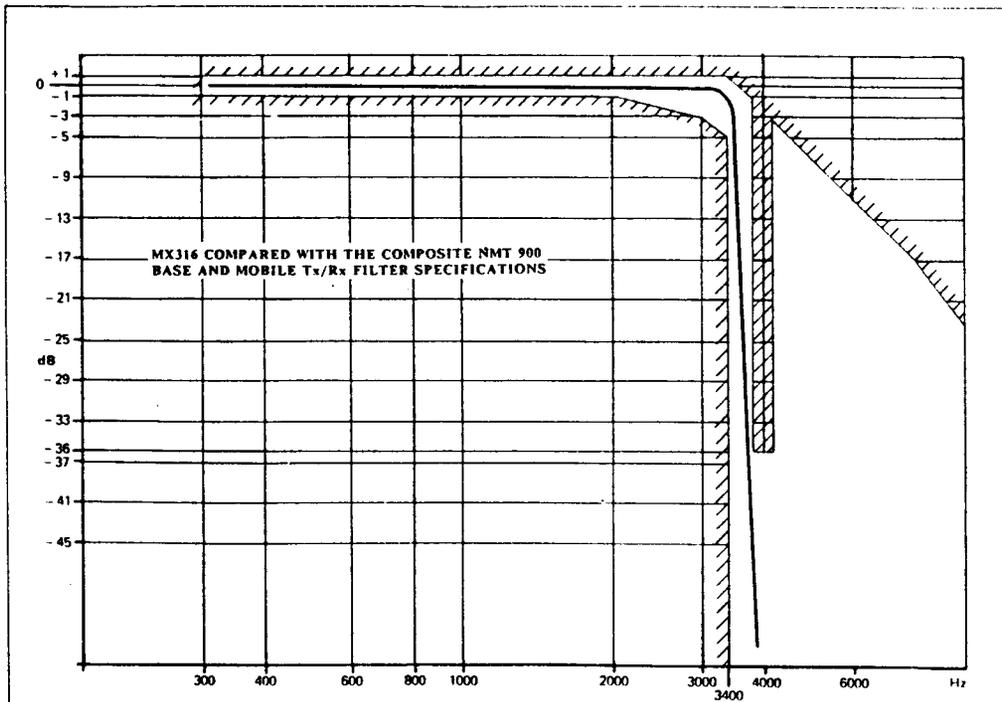


FIG. 4: TYPICAL MX316 LOWPASS FILTER RESPONSE

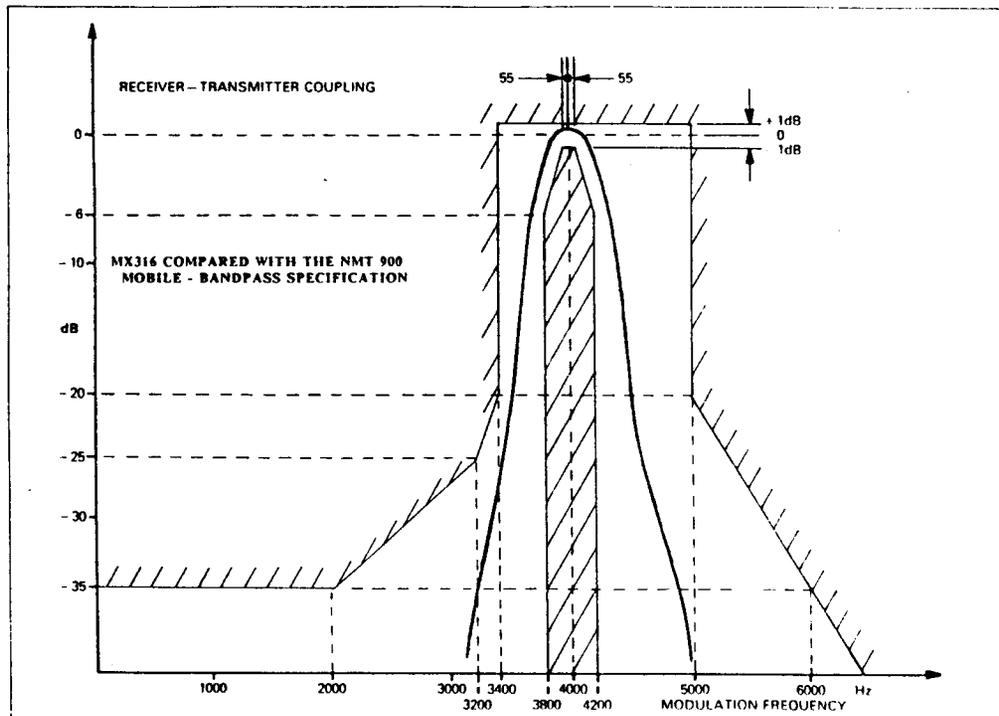


FIG. 5: TYPICAL MX316 4kHz BANDPASS FILTER RESPONSE

Packaging

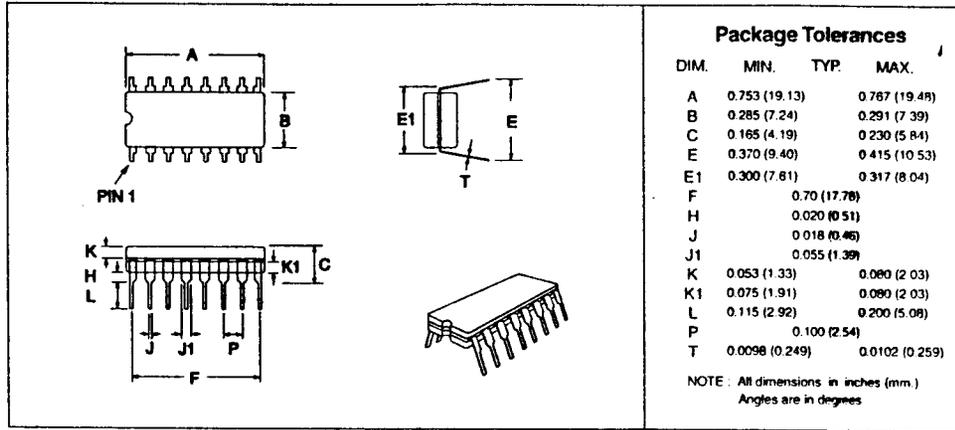


Figure 6: 16-pin CDIP Mechanical Outline: order as part no. MX316P

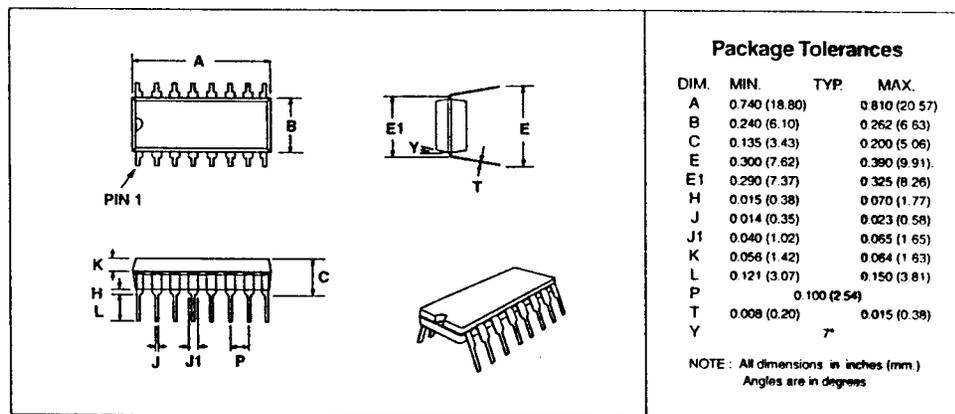


Figure 7: 16-pin PDIP Mechanical Outline: order as part no. MX316P

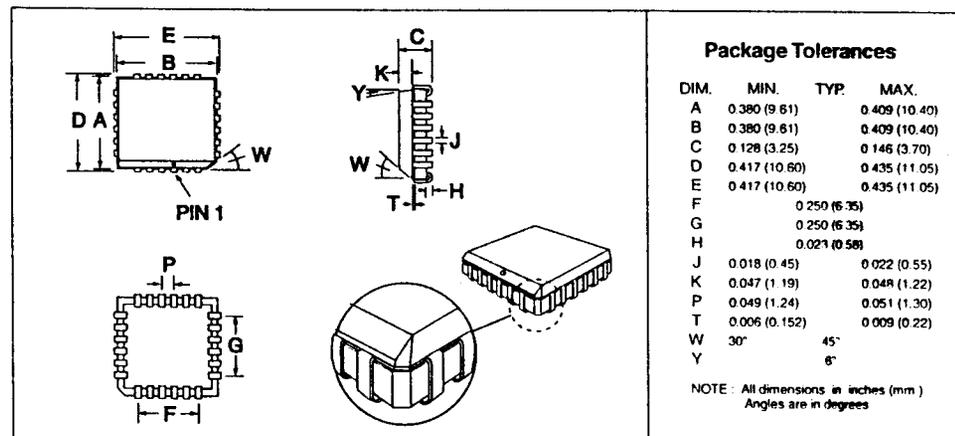


Figure 8: 24-pin PLCC Mechanical Outline: order as part no. MX316LH



**CML Microcircuits**

COMMUNICATION SEMICONDUCTORS

## CML Product Data

In the process of creating a more global image, the three standard product semiconductor companies of CML Microsystems Plc (*Consumer Microcircuits Limited (UK)*, *MX-COM, Inc (USA)* and *CML Microcircuits (Singapore) Pte Ltd*) have undergone name changes and, whilst maintaining their separate new names (*CML Microcircuits (UK) Ltd*, *CML Microcircuits (USA) Inc* and *CML Microcircuits (Singapore) Pte Ltd*), now operate under the single title **CML Microcircuits**.

These companies are all 100% owned operating companies of the CML Microsystems Plc Group and these changes are purely changes of name and do not change any underlying legal entities and hence will have no effect on any agreements or contacts currently in force.

### CML Microcircuits Product Prefix Codes

Until the latter part of 1996, the differentiator between products manufactured and sold from MXCOM, Inc. and Consumer Microcircuits Limited were denoted by the prefixes MX and FX respectively. These products use the same silicon etc. and today still carry the same prefixes. In the latter part of 1996, both companies adopted the common prefix: CMX.

This notification is relevant product information to which it is attached.

### CML Microcircuits (USA) [formerly MX-COM, Inc.] Product Textual Marking

On CML Microcircuits (USA) products, the '**MX-COM**' textual logo is being replaced by a '**CML**' textual logo.

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