

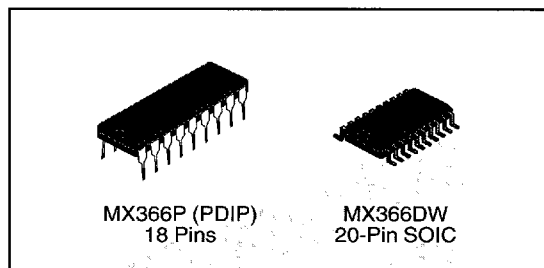
QUAD FILTER ARRAY

Features

- Pair of Independent Lowpass Filters
- Pair of Audio Bandpass Filters (300-3000 Hz)
- Input Gain Adjustments
- Output Enable/Mute for Squelch Functions
- Low Power CMOS

Applications

- ACSB
- AMPS/TACS/N-AMPS
- Cellular Phones



DESCRIPTION

The MX366 Quad Filter Array is comprised of 4 separate filter/gain blocks on a single IC as described below:

- 1) A pair of 10th order 3.1 kHz lowpass filters.
- 2) A pair of 14th order channel bandpass filters (300-3000 Hz).
- 3) Op-amps that allow external components to set input gains and pre- or de-emphasis.

- 4) A buffered low noise output with switching clock filter.
- 5) Output-enabled switching circuitry for squelch control.

This simple, comprehensive amplifier/filter combination eliminates the need for several separate ICs, and therefore saves power and space.

The MX366 uses CMOS switched-capacitor filter technology and requires a supply of 4.5 V to 5.5 V to facilitate battery operation.

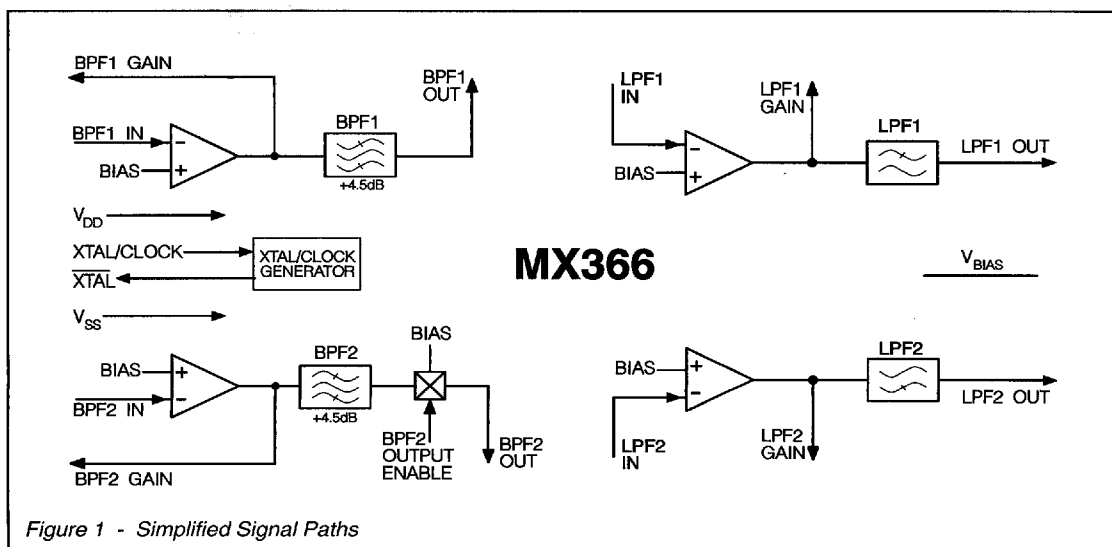
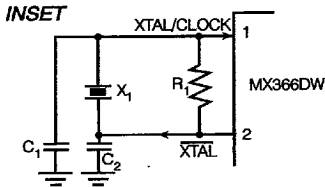
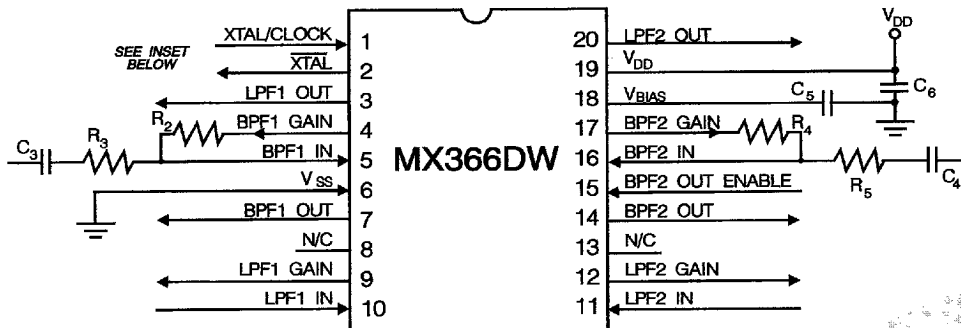


Figure 1 - Simplified Signal Paths



Component	Value
R1	100kΩ
C1	33pF
C2	47pF
C5	1.0μF
C6	0.47μF
X1	See Table 1

Tolerances: R = ±10%, C = ±20%

- Notes:**
1. R2, R3, C3, R4, R5 and C4 should be chosen with respect to the specific configuration used.
 2. Xtal circuitry shown is in accordance with MX-COM's Application Note on Crystal Oscillators (page 354 of the 1991 Product Handbook).
 3. Operation of any MX-COM IC without a Xtal or clock may cause damage to the device. To minimize damage in the event of a Xtal/drive failure, a current limiting device (resistor fast-reaction fuse) should be installed on the power supply line (VDD).

Figure 2 - Recommended External Components

TABLE 1 - MX366 CRYSTAL FREQUENCY/FILTER RELATIONSHIP

Crystal Frequency	Bandpass Filter	Lowpass Filter
4.433619 MHz	300 - 3000 Hz	3100 Hz
4.40 MHz	298 - 2977 Hz	3076 Hz
4.096 MHz	277 - 2772 Hz	2864 Hz
4.032 MHz	272 - 2728 Hz	2819 Hz
4.00 MHz	270 - 2706 Hz	2797 Hz
3.579545 MHz	242 - 2422 Hz	2503 Hz

PIN FUNCTION CHART

Pin		Function
MX366J/P	MX366DW	
1	1	Xtal/Clock: A Xtal per Table 1 or an externally derived clock is injected at this pin.
2	2	$\overline{\text{Xtal}}$: This is the output of the clock oscillator inverter.
3	3	LPF1 Out: This is the output of the LPF1 filter/gain block.
4	4	BPF1 Gain: This is the output of the BPF1 gain-adjusting amplifier. This output is used with BPF1 In and external components.
5	5	BPF1 In: This is the input to the BPF1 filter/gain block.
6	6	V_{SS}: Negative supply (GND).
7	7	BPF1 Out: This is the output of BPF1.
	8	No Connect.
8	9	LPF1 Gain: This is the output of LPF1 gain-adjusting amplifier. This output is used with LPF1 Input and external components.
9	10	LPF1 In: This is the input to the LPF1 filter/gain block.
10	11	LPF2 In: This is the input to the LPF2 filter/gain block.
11	12	LPF2 Gain: This is the output of LPF2 gain-adjusting amplifier. This output is used with LPF2 Input and external components.
	13	No Connect.
12	14	BPF2 Out: This is the output of BPF2. It is under the control of the BPF2 Output Enable Input.
13	15	BPF2 Output Enable: This controls the status of BPF2 Out. Logic 1 = Enable, Logic 0 = Muted. This pin has an internal 1M Ω pullup resistor.
14	16	BPF2 In: This is the input to the BPF2 gain/filter block.
15	17	BPF2 Gain: This is the output of the BPF2 gain-adjusting amplifier. This output is used with BPF2 In and external components.
16	18	Bias: This is the analog bias line at V _{DD} /2. It should be coupled to V _{SS} by a 1.0 μ F or greater capacitor.
17	19	V_{DD}: Positive supply. A single +5 volt power supply is required. Levels and voltages within this device are dependent upon this supply.
18	20	LPF2 Out: This is the output of LPF2.

The MX366 in a System

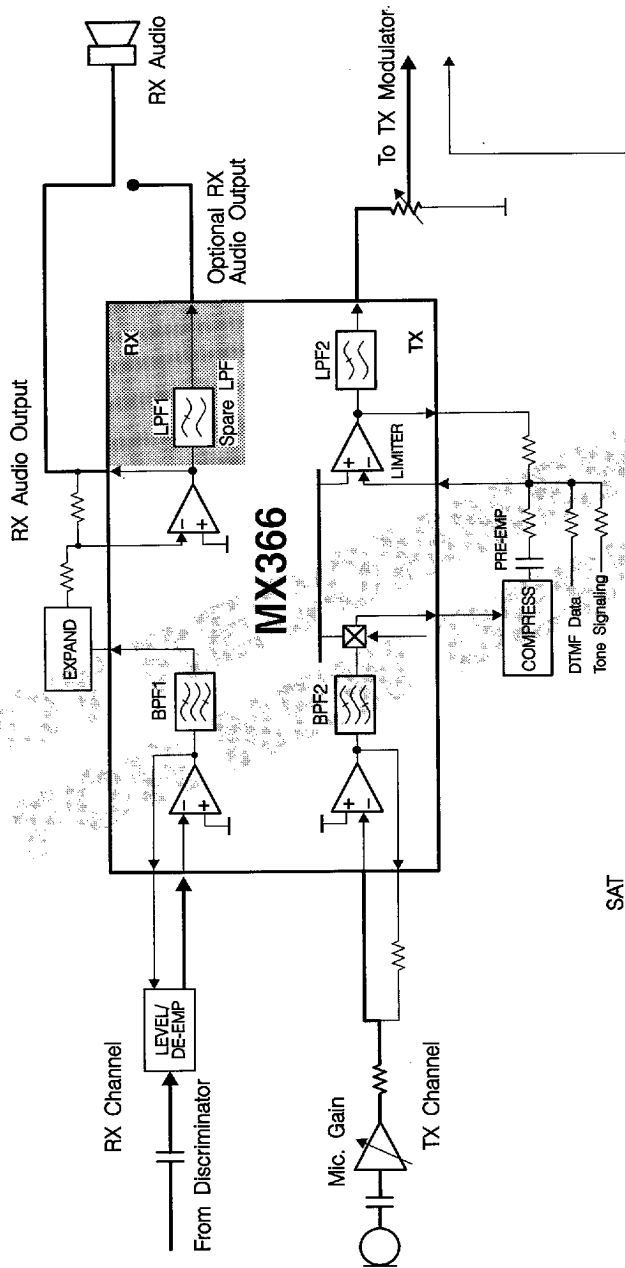
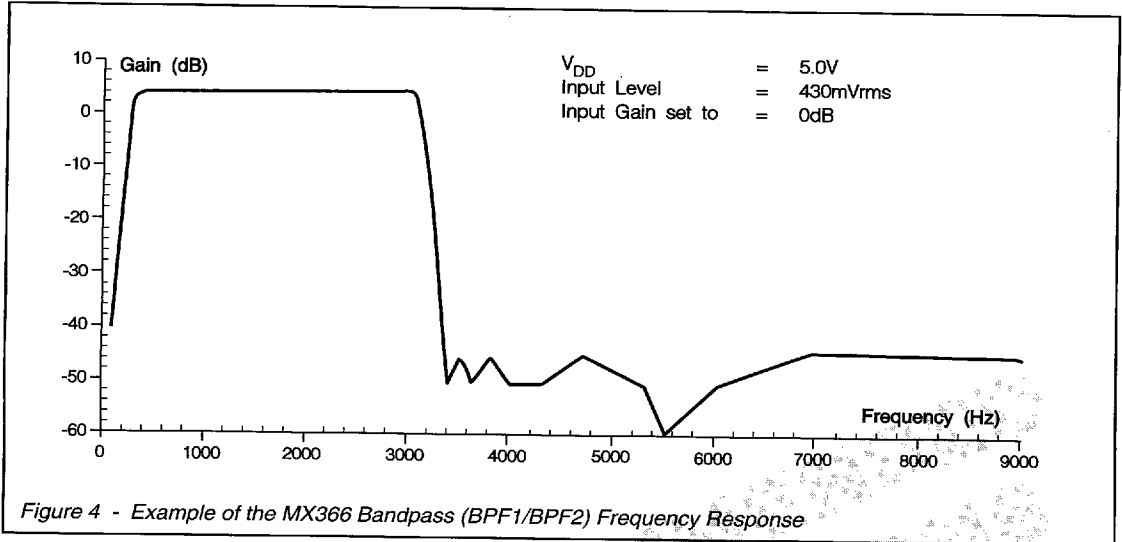


Figure 3 - Example of the MX366 Used in the Audio Stages of a TACS Operation

APPLICATION INFORMATION

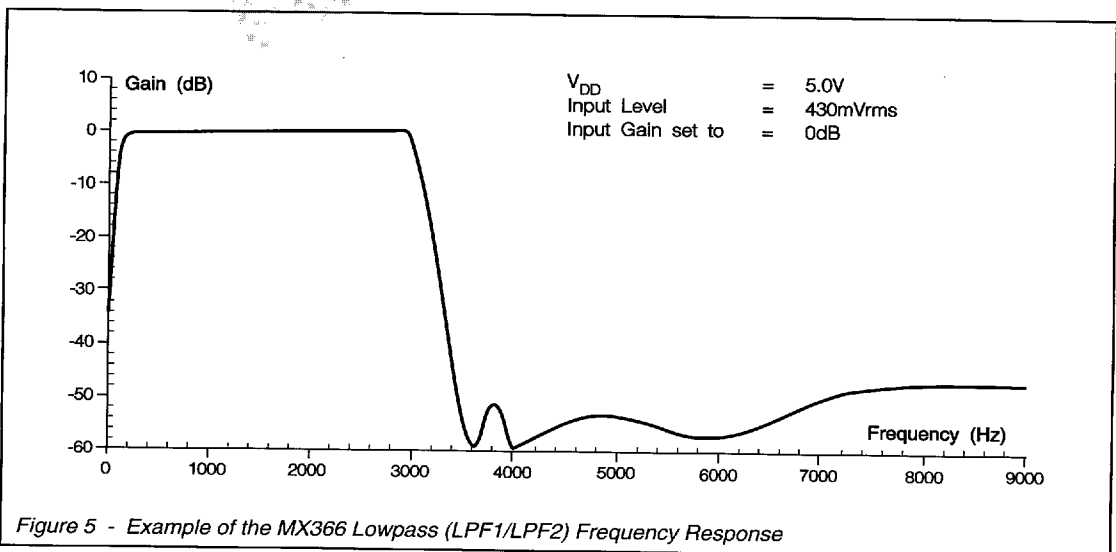
Bandpass Section Performance



When using the MX366 Quad Filter Array within a cellular system, the following should be considered:

- (1) Each bandpass filter section has a frequency range of 300 Hz to 3000 Hz and a typical passband gain of 4.5 dB.
- (2) Each lowpass filter section has a cut-off frequency of 3100 Hz and a typical passband gain of 0.5 dB
- (3) BPF2 Output Enable has an enable/disable operating time as shown in "Specifications."

Lowpass Section Performance



Specifications

Absolute Maximum Ratings

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

Supply Voltage	-0.3 to 7.0 V
Input Voltage at any pin (Ref. $V_{SS} = 0V$)	-0.3V to ($V_{DD} + 0.3V$)
Output sink/source current supply pins	±30mA
other pins	±20mA
Total Device Dissipation @ 25°C	800mW max. 10mW/°C
Derating	
Operating Temperature	-40°C to +85°C
Storage Temperature	-40°C to +85°C

Operating Limits

All limits were measured under the following conditions unless otherwise noted.

$$V_{DD} = 5.0 V$$

$$T_{AMB} = 25^{\circ}C$$

$$\text{Clock} = 4.433619 \text{ MHz}$$

$$\text{Audio Level } 0\text{dB Ref.} = 775 \text{ mVrms @ } 1 \text{ kHz}$$

Characteristics	See Note	Min.	Typ.	Max.	Unit
Static Values					
Supply Voltage		4.5	5.0	5.5	V
Supply Current		-	5.0	8.5	mA
Input Impedance (Amplifiers)		1.0	10.0	-	MΩ
Input Impedance (Digital)		100	-	-	kΩ
Output Impedance (LP & BP Filters)		-	2.0	-	kΩ
On-Chip Xtal Oscillator					
R_{IN}		10.0	-	-	MΩ
R_{OUT}		-	10.0	-	kΩ
Inverter D.C. Voltage Gain		-	10.0	-	V/V
Gain/Bandwidth Product		-	10.0	-	MHz
Dynamic Values					
Input Logic 1 Voltage		3.5	-	-	V
Input Logic 0 Voltage		-	-	1.5	V
Analog Signal Input Levels					
Lowpass Filter		-30.0	-	4.5	dB
Bandpass Filter		-30.0	-	-1.5	dB
Analog Signal Output Levels					
Lowpass Filter		-29.5	-	5.0	dB
Bandpass Filter		-26.0	-	2.5	dB
Analog Output Noise	2	-	-50.0	-	dBp
Bandpass Filter					
Passband Frequencies	1,3	300	-	3000	Hz
Passband Ripple		-	±1.0	-	dB
Low Frequency Roll-off (<200 Hz)		12	-	-	dB/oct.
High Frequency Attenuation at 3.4 kHz		-	48.0	-	dB
Passband Gain		3.5	4.5	5.5	dB
BPF2 Output Enable Time		-	8.0	-	μs
BPF2 Output Disable Time		-	20.0	-	μs
Lowpass Filter					
Cut-off Frequency (-3dB)	1,3	-	3100	-	Hz
Passband Ripple (300 to 3000 Hz)		-	±1.0	-	dB
Attenuation at 3.3 kHz		-	30.0	-	dB
Attenuation at 3.6 kHz		-	45.0	-	dB
Passband Gain		-	0.5	-	dB
Distortion	1,4	-	2.0	-	%

- NOTES:**
1. Measured with Input Level -3.8 dB (500 mVrms).
 2. Short circuit input, at any analog output and the measurement psophometrically weighted.
 3. Op Amp gain 0 dB.
 4. Measured in a 30 kHz bandwidth.