

NemFX

Digital Multi-Effects Module



Features

- Low cost and high performance Digital Multi-Effects Module
- Superior sound quality
- 32 or 16 built-in Reverb, Delay, Chorus, Flanger and Multi-Effects programs
 - Semi-custom programs available
- 24-bit, 48 kHz ADC/DAC
- Stereo input, stereo output
- Optional input for a variable parameter
- Only requires a +5 V Power Supply
- **RoHS compliant, lead free!**

Applications

- Electric and Acoustic Guitar Amplifiers, Bass Amplifiers, Keyboard Amplifiers
- Mixing Consoles, Powered Audio Mixers, DJ Mixers
- Digital Pianos, Electric Pianos, Combo Organs
- Portable PA Systems
- Karaoke Systems

Description

Nemesis Technology, Inc. has introduced the NemFX Series of Multi-Effects Modules. The NemFX offers programs including Hall, Room, Plate, and Spring Reverbs, Delays, Choruses, Flangers, Phasers, and Tremolos. Nemesis can also provide semi-custom program banks.

Theory of Operation

The NemFX Module is a tiny daughter card assembly which can be installed on main boards in products such as guitar amplifiers and mixers. Connection to the NemFX is simple. It has two analog input pins and two analog output pins for easy stereo in and stereo out connection. Four digital input pins are used to select one of 16 DSP programs. A fifth digital input pin can be used to expand the program bank to 32 programs, or it can be configured as a parameter input to add a variable parameter per program.

Key Specifications*

Parameter	Typical
Dynamic Range, SNR (A-weighted)	102 dB
THD+N (A-weighted)	-90 dB
Frequency Response (Fs = 48 kHz)	20 Hz - 20 kHz, +0/-0.4 dB
Input Level	2.8 V _{pp} max
Output Level	2.8 V _{pp} max
Power Supply	5 V, 115 mA

*since we are continuously improving our products, specifications are subject to change without notice

Detailed Specifications

(Typical audio performance numbers at nominal supply voltages, 25°C operating temperature, with suggested I/O circuitry, 'Bypass' DSP program, 997Hz signal unless otherwise specified. All DC voltages relative to ground)

Audio Performance*

Parameter	Typical
SNR (A-weighted)	102 dB
Dynamic Range (A-weighted, -60 dBFS)	102 dB
THD+N (A-weighted, -1 dBFS)	-90 dB
Frequency Response (Fs = 48 kHz)	20 Hz - 20 kHz, +0/- .4 dB
Frequency Response (Fs = 32 kHz)	20 Hz - 15 kHz, +0/-1 dB
Full Scale Input Level	2.8 Vpp
Full Scale Output Level	2.8 Vpp

Recommended Operating Conditions*

Parameter	Min.	Typical	Max.	Unit
Source Impedance	-	-	< 1	Ω
Load Impedance	2 k	10 k	-	Ω
Full Scale Input Level	2.6	2.8	3.0	Vpp
Full Scale Output Level	2.6	2.8	3.0	Vpp
5V Power supply voltage	4.75	5	5.25	V
5V Power supply current	-	115	133	mA

Absolute Maximum Ratings*

Parameter	Min.	Max.	Unit
Analog Voltage Input Level	-0.3	5.3V	V
5V Power supply	-.3	5.3	V
Operating Temperature	0	70	°C

*since we are continuously improving our products, specifications are subject to change without notice

Module Block Diagram

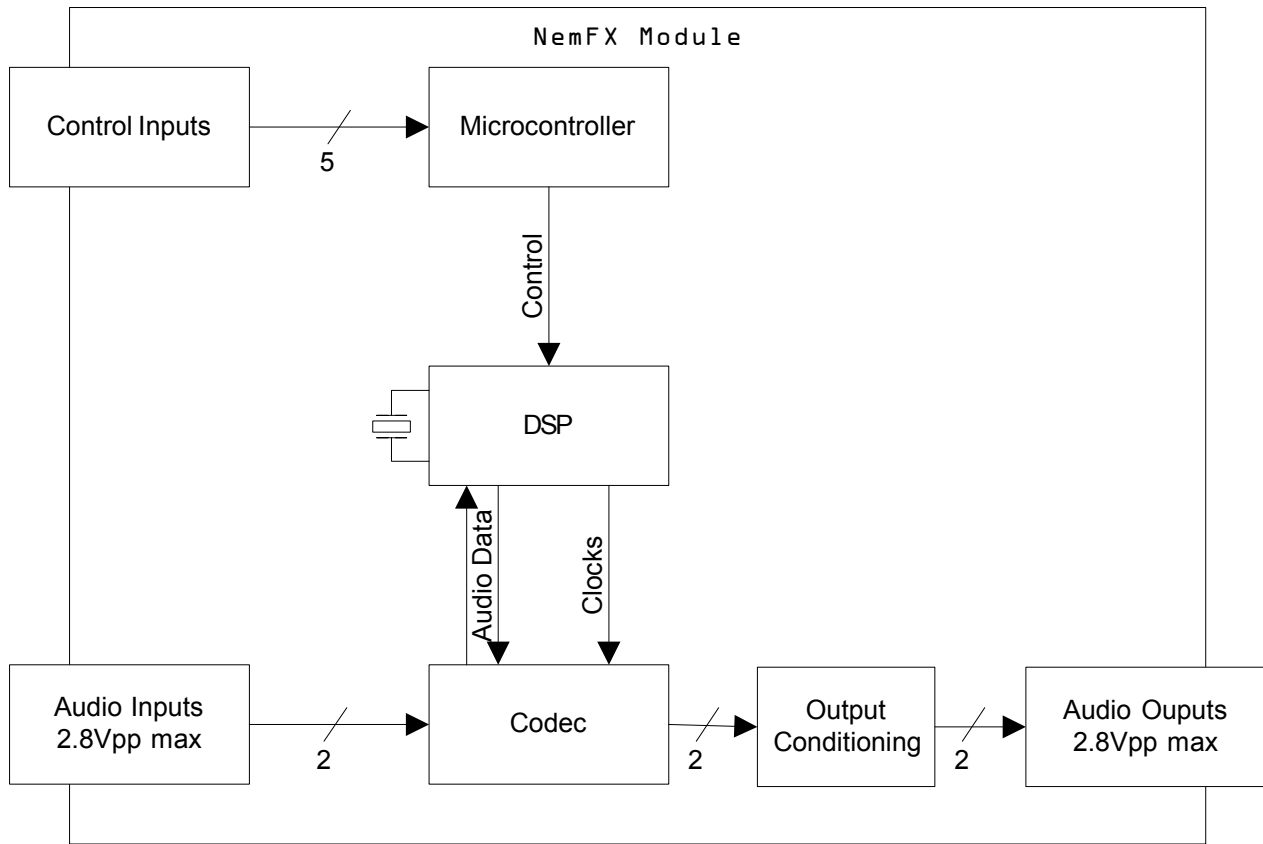


Figure 1: Block Diagram

Application Diagram

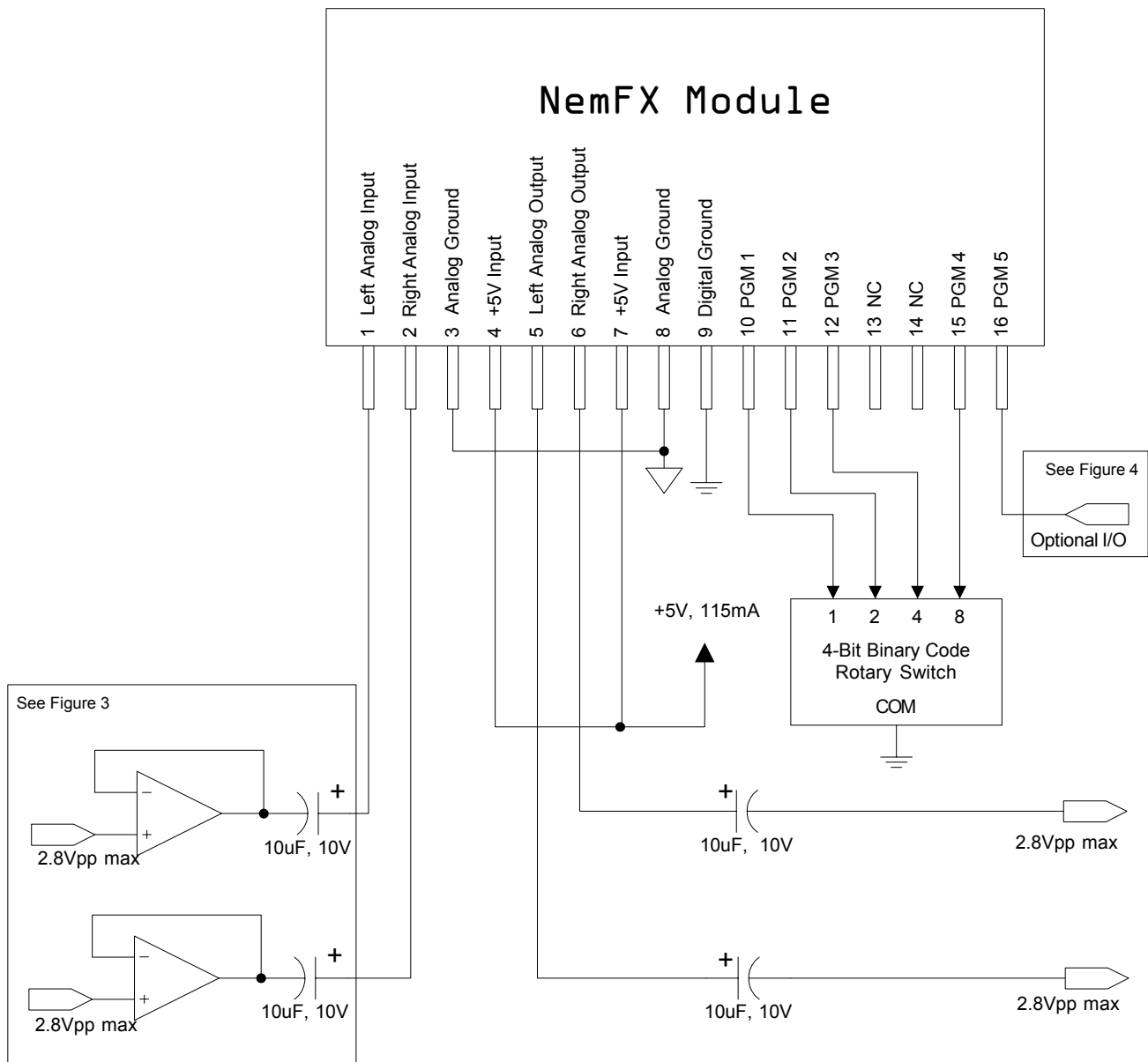


Figure 2: Application Diagram

Input Circuit

The NemFX Module requires a low impedance drive directly from the output of an opamp. A 10 uF capacitor for AC-coupling the input to the module is all that is required. Any resistance on the input connection to the NemFX Module will cause distortion on the input signal. The optional circuit shown in Figure 3 can be used if extra attenuation of high frequency noise is desired or if there is significant energy above 60 kHz in the input signal to the module. The input analog signal can be up to a maximum of 2.8 Vpp before

clipping occurs. Analog input signals must stay within the voltage range listed under 'Absolute Maximum Ratings' in the specifications section of the datasheet; otherwise, damage to the NemFX Module can occur. For applications that require a single channel, connect the input signal to both the Left and Right Analog Input pins. Otherwise, 6 dB of signal will be lost on DSP programs that expect a stereo input and sum the two inputs to mono.

Output Circuit

Interfacing to the analog output of the NemFX Module is also very simple. The output of the NemFX Module must be AC-coupled through a 10 uF capacitor. The output circuit on the module must drive a load greater than 2 k Ω . For applications that use only a single channel, connect only to the Left Analog Output. Additional filtering of signals above 60 kHz may be necessary on systems that are sensitive to high frequency noise.

Power Supply

The NemFX Module requires a regulated +5V power supply to achieve rated performance. Separate Analog and Digital Ground pins are provided to reduce the possibility of digital interference in the analog signal. The Analog and Digital Ground pins for the NemFX Module should be connected together near the power supply ground of the host system.

Application Information

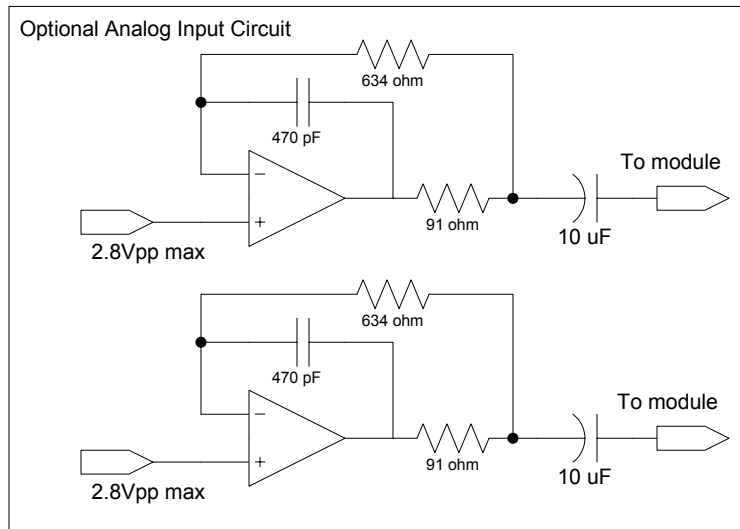


Figure 3: Optional Analog Input Circuit

The circuit show in Figure 3 should be used if any high frequency signals are present in the analog input to the NemFX Module. The module is sensitive to interference at 6.144MHz (4.096MHz for 32kHz sampling frequency) and any signals in this range must be attenuated.

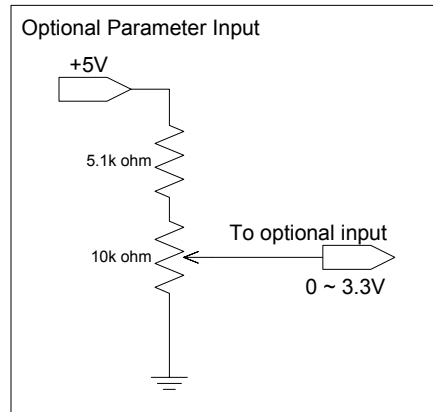


Figure 4: Optional Effects Parameter Input

If the NemFX Module is configured to use an analog input (say, from a rotary potentiometer) for varying parameters, the circuit shown in Figure 4 should be connected to the PGM 5 input.

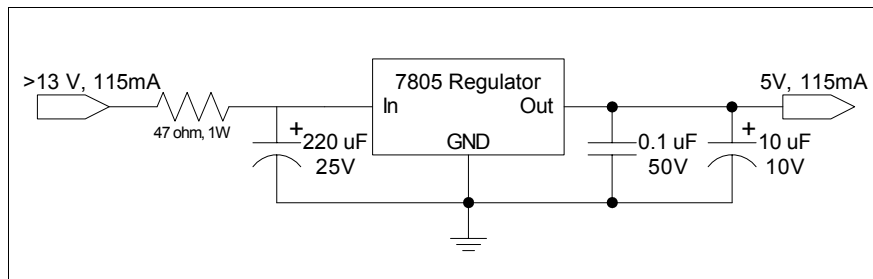
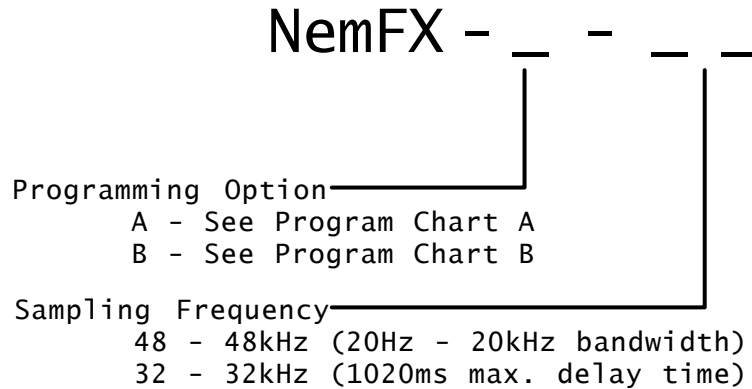


Figure 5: Suggested 5V Supply Circuit

The circuit shown in Figure 5 should be used when adding the NemFX Module to a design that currently does not have a 5V supply. This supply will isolate any digital noise that could be introduced into loosely regulated supplies that are commonly found inside guitar amplifiers. For systems that use regulators to supply other analog voltages, the low pass filter on the input of the regulator is not necessary to isolate any digital noise.

Ordering Options



Contact Nemesis Technology, Inc. for more information.

Program Chart A

16 programs, 32 kHz sampling frequency only

In-line effects configuration (i.e., dry signal is mixed in the DSP)

Prog #	PGM 4	PGM 3	PGM 2	PGM 1	Program Description
1	0	0	0	0	Small Room Reverb
2	0	0	0	1	Medium Room Reverb
3	0	0	1	0	Large Room Reverb
4	0	0	1	1	Concert Hall Reverb
5	0	1	0	0	Slapback with Reverb
6	0	1	0	1	Medium Delay with Reverb
7	0	1	1	0	Long Delay with Reverb
8	0	1	1	1	Slow Deep Flange with Reverb
9	1	0	0	0	Flange with Reverb and Delay
10	1	0	0	1	Chorus with Reverb
11	1	0	1	0	Chorus with Reverb and Delay
12	1	0	1	1	Rotating Speaker with Reverb
13	1	1	0	0	Octaver with Reverb
14	1	1	0	1	Tremolo with Reverb
15	1	1	1	0	Doubler
16	1	1	1	1	Bypass (no effect)

Note: PGM 5 input is unused.

Suggested rotary switch part number: CTS 288xxxxx163A2 or Belton BTDS20x-116-xxx-1 (where x=don't care) or electrical equivalent

Program Chart B

16 programs, 48 kHz sampling frequency only

Parallel effects configuration (i.e., dry signal is NOT mixed in the DSP).

Prog #	PGM 4	PGM 3	PGM 2	PGM 1	Program Description
1	0	0	0	0	Hall Reverb 1
2	0	0	0	1	Hall Reverb 2
3	0	0	1	0	Room Reverb 1
4	0	0	1	1	Room Reverb 2
5	0	1	0	0	Room Reverb 3
6	0	1	0	1	Plate Reverb 1
7	0	1	1	0	Plate Reverb 2
8	0	1	1	1	Spring Reverb
9	1	0	0	0	Delay 1
10	1	0	0	1	Delay 2
11	1	0	1	0	Delay 3
12	1	0	1	1	Delay 4
13	1	1	0	0	Delay 5
14	1	1	0	1	Delay 6
15	1	1	1	0	Delay 7
16	1	1	1	1	Delay 8

Note: PGM 5 input is unused.

Suggested rotary switch part number: CTS 288xxxxx163A2 or Belton BTDS20x-116-xxx-1 (where x=don't care) or electrical equivalent

Program Chart B2

16 programs, 48 kHz sampling frequency only

Parallel effects configuration (i.e., dry signal is NOT mixed in the DSP).

Prog #	PGM 4	PGM 3	PGM 2	PGM 1	Program Description
1	0	0	0	0	Hall Reverb (5.0 sec)
2	0	0	0	1	Hall Reverb (3.0 sec)
3	0	0	1	0	Room Reverb (2.0 sec)
4	0	0	1	1	Room Reverb (1.0 sec)
5	0	1	0	0	Plate Reverb (3.5 sec)
6	0	1	0	1	Plate Reverb (1.5 sec)
7	0	1	1	0	Echo (170 ms) + Reverb (3.0 sec)
8	0	1	1	1	Echo (300 ms) + Reverb (5.0 sec)
9	1	0	0	0	Echo (100 ms, 50% feedback)
10	1	0	0	1	Echo (200 ms, 50% feedback)
11	1	0	1	0	Echo (350 ms, 50% feedback)
12	1	0	1	1	Echo (500 ms, 50% feedback)
13	1	1	0	0	Chorus + Reverb (4.0 sec)
14	1	1	0	1	Chorus + Reverb (2.0 sec)
15	1	1	1	0	Flanger + Reverb (4.0 sec)
16	1	1	1	1	Flanger + Reverb (2.0 sec)

Note: PGM 5 input is unused.

Suggested rotary switch part number: CTS 288xxxxx163A2 or Belton BTDS20x-116-xxx-1 (where x=don't care) or electrical equivalent

Program Chart C

16 programs, 48 kHz sampling frequency only

Parallel effects configuration (i.e., dry signal is NOT mixed in the DSP).

Prog #	PGM 4	PGM 3	PGM 2	PGM 1	Program Description
1	0	0	0	0	Room Reverb
2	0	0	0	1	Hall Reverb
3	0	0	1	0	Plate Reverb
4	0	0	1	1	Spring Reverb
5	0	1	0	0	Slapback with Reverb
6	0	1	0	1	Medium Delay with Reverb
7	0	1	1	0	Long Delay with Reverb
8	0	1	1	1	Slow Tremolo Chorus with Reverb
9	1	0	0	0	Chorus Slow
10	1	0	0	1	Flange Fast
11	1	0	1	0	Slow Deep Flange with Reverb
12	1	0	1	1	Phaser
13	1	1	0	0	Tremolo with Reverb
14	1	1	0	1	Rotating Speaker Fast
15	1	1	1	0	Doubler
16	1	1	1	1	Octaver with Reverb

Note: PGM 5 input is unused.

Suggested rotary switch part number: CTS 288xxxxx163A2 or Belton BTDS20x-116-xxx-1 (where x=don't care) or electrical equivalent

Mechanical Drawing

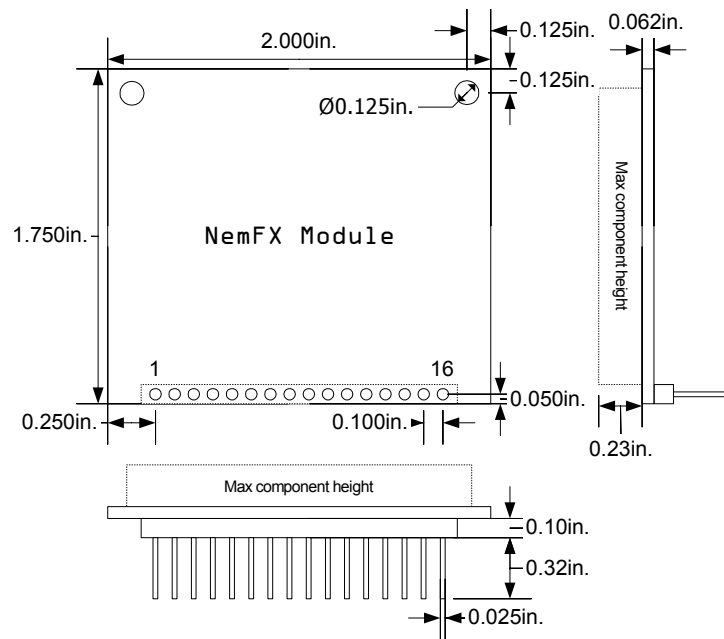


Figure 6: Mechanical Drawing

The module shown in Figure 6 is approximately actual size when this page is printed on 8 1/2" x 11" paper.

Important Information

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NemFX Modules are electronic devices and should be handled in static safe and otherwise appropriate manner. Nemesis Technology, Inc. will not be held responsible for any mishandling of NemFX Modules.

Nemesis Technology, Inc. will, however, accept responsibility for adding the sweet sounds of reverb and other effects to your audio products.

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