

Quadravox

QV606m1 type 1 - RS232 controlled sound playback module (QV306m1 emulation)

The QV606m1 MP3-based digital message module with type 1 firmware is intended to replace the QV306m1 Winbond ISD ChipCorder® based system. It therefore duplicates the size, pinout, and command structure of the QV306m1, but is significantly improved in sound quality and capacity.

Features:

- standard model QV606m1(-16) has approximately 14 minutes capacity at a 20kbps coding rate suitable for voice.
- up to 240 messages
- four addressing modes
- low power dissipation: <2mA at 5V, less than 1uA in power down mode
- single 3.6-5.5V supply (3V is generated on-board)
- separate amplifier power control and busy functions
- digitally controlled volume control (64 levels to match QV306m1)
- 1.3W class-D BTL amplifier
- built-in directory for sounds
- free recording software (QV600s) from our website
- programmed via the QV460P USB programmer or QV430P RS232 programmer
- for use with simple RXD/TXD RS232 controls

Changes from the QV306m1:

- stereo line output is available
- capacity varies with coding rate chosen: two minutes of near-CD-quality stereo up to 35 minutes of intelligible mono voice grade output are available with the standard 16Mbit memory.
- coding rate/quality can be chosen independently for each file.
- amplifier is typically 86% efficient driving an 8 ohm load with a 5V supply
- baud rate is selected via configuration data programmed at the same time as the audio data, but for compatibility the standard code interprets BR0 and BR1 as did the 306m1.

General description:

The QV606m1 module provides a simple method of adding voice and sound to your system. It comprises a controller, MP3 decoder, serial flash memory, and mono audio amplifier. In standard form, it contains two control algorithms with the selection made in the configuration section of the data. One option is a simple two-wire RS232 connection and the other is six-wire parallel control.

The prototype pictured is identical to production except for the PCB finishing. The QV606m1 is programmed and tested in production without the header connected. It can be delivered without header to allow different mounting orientations.

QV606m1 pinout and control lines in RS232 mode:

Control lines	pin	level	Function
RXD (3.3-5.0V)	1	--	RS232 receive line
TXD (3.3-5.0V)	2	--	RS232 transmit line
BUSY_	3	low	indicates system is busy (same signal as RECLE D)
BR1	4	--	baud rate selection; connect to 0 or 3.3-5.0V(or float)
BR0	5	--	baud rate selection; connect to 0 or 3.3-5.0V(or float)
RECLE D_	6	low	can be used to sink current for record LED. The external system must provide the current-limiting resistor.
+5V	7	+5	system power
GND	8	0	system ground
T6	9	--	not used
T7	10	--	not used
GND	11	0	System ground
Right	12	--	right channel output – 32 ohms via 1uF
Left	13	--	left channel output – 32 ohms via 1uF
RESET_	14	low	system reset, active low
SP-	15	--	speaker output; bridge tied load
SP+	16	--	speaker output; bridge tied load

Baud rate selection:

BR1	BR0	Rate
0	0	2400b
0	1	4800b
1	0	9600b
1	1	19200b

RS232 Commands:

Value (hex)	Function
000h-0efh	play file 0-239
0f0h	set play mode to direct addressing
0f1h	set play mode to linear sequence
0f2h	loop current file (0f7h clears)
0f3h	set play mode to random sequence
0f4h	pause playback
0f5h	resume playback
0f6h	stop play immediately
0f7h	stop play at end of current file
0f8h	sleep
0f9h	open string
0fah	close string
0fbh	play string
0fch	set volume with next byte transmitted. Only values 0-63 are valid
0fdh	software reset
0feh	return version byte (00ch)
0ffh	return type byte (066h)

Setting the addressing mode:

For compatibility with the QV306m1, the QV606m1 offers three modes of playback addressing for individual phrases. The modes are selected using the two low-order bits of the set mode command. Bit 0 selects direct or sequential addressing. In direct addressing (bit 0 = 0), the value transferred in the command byte is used to select the phrase of the same number. If a value exceeding the maximum number of recorded phrases is sent, the last phrase in the memory will be played. If bit 0 is set to one, the phrase played will lie within the bounds of zero and the number transferred in the command byte. If bit 1 of the mode value is 0, the phrases in this range will be played in sequence, rolling back to zero after the top phrase (the one corresponding to the command byte) has been played. If bit 1 is 1, a randomly-selected one of the same range will be played. The previously unused 0f2h command now causes indefinite looping in the mode determined by commands 0f0h, 0f1h, and 0f3h.

The mode can be changed at any time, so system operation can combine the different addressing options. For example, to have ten phrases triggered by specific events and a different set of ten randomly selected by a fifth event, do the following:

- Record the phrases in order with the ten randomly selected ones as the first ten in the list.
- To randomly select one of the bottom group, first issue a set mode command specifying "random sequence" (0f3h). Repeatedly sending a command byte of "9" will produce a random selection of phrases 0-9.
- To select one of the fixed phrases, issue a set mode command for "direct" (0f0h), then send the number of the phrase to be played.
- If you desire that the phrases in the first group be played in sequence, issue a set mode "linear sequence" (0f1h) instead of 0f3h.

Playing messages:

To play a message, first ensure that the mode (as explained as above) matches your intentions. Then, issue a single byte in a contiguous range from 0 to the number of recorded messages – 1 (maximum 239). When the phrase has completed, a byte with the number of the phrase spoken will be returned.

Message play can be stopped by issuing a stop command (0f6h). There is no return code for a stop command. The BUSY_ line can also be used to determine when the message is complete.

String play:

In some cases it is desirable to set up a long string of words or phrases to be played as one utterance. This simplifies message management and allows the segments to be contiguous as the amplifier does not need to be powered down between phrases. To use the string mode, open a new string by sending the command 0f9h. Send up to 64 phrase numbers. The phrases will not be spoken in this process. Send the close string command, 0fah. Until you change the string by reopening it, the stored sequence can be played by issuing the play string command, 0fbh. Individual words are still accessible in the usual way- playing them does not affect the stored string.

Power management:

The QV606m1 keeps the decoder, memory, and amplifier in standby mode until a phrase is spoken. The only significant power dissipation between messages is the controller power, typically 400uA. A sleep command reduces total power to approximately 80uA, but requires either a RESET_ or dummy RS232 command to awaken the module. The dummy command will not be recognized.

Message development software:

The QV600s software and QV460P or QV430P programming hardware provide a low-cost method of programming the 606m1 modules. The QV600s software is available free from the Quadravox website. The QV430P transfers data at 115200B for programming the embedded data memory or reloading the flash processor. The QV460P performs the same functions, but at baud rates exceeding 1Mbps. In either case, the data are loaded and then verified by a check sum.

The QV606m1 uses standard MPEG 1 layer 3 formatted files. It can play both VBR and CBR files and can accept coding rates from 8kbps to 320kbps. For licensing reasons, the QV600s software does not include the MP3 encoder function, but many are available at reasonable cost, or free for non commercial use. The capacities listed in the specification are based on 20kbps mono files with a sampling rate of 16kHz and a nominal bandwidth of 8kHz, double that of the telephone standard and better than AM radio. For voice announcements the quality is essentially transparent. However, it is also possible to use lower rates to extend capacity or higher ones (especially when using the stereo line-level outputs) for better quality. Capacity will be inversely proportional to the data rate. The coding rate need not be fixed – each file can have a rate suited to its use. 8192 bits (1024 bytes) of the digital memory is reserved for the directory. Even in the smallest memory option 99.9% of the memory is available for sound data, so the simple calculation of capacity is (memory size in bits) / (coding rate in bits per second).

The QV600s software allows the user to define a collection of files as a project, to order them as desired, and to set any of the options mentioned, as well as to generate the appropriate randomization file if that feature is used. The software communicates with the QV460P programmer via full-speed USB1.1 or with the QV430P via standard RS232. The time required for programming is determined by the fixed bulk erase time of the memory and by the programming and verification times, which are proportional to the project size. The following table gives estimates for a fully used memory.

Memory timing:

Memory size	Erase time	Program/verify time	Capacity at 20kbps
16Mbit (standard)	17-40 sec	15 sec	13 min, 58 sec
32Mbit	34-80 sec	30 sec	27 min, 56 sec
64Mbit	68-160 sec	60 sec	55 min, 54 sec

Electrical Characteristics:

Absolute Maximum Ratings:

Stresses above these limits may cause permanent damage to the PIC16F627A controller device. This is a stress rating only and functional operation of the device at those or any other conditions above those indicated in the operation listings of this specification is not implied. Exposure to maximum rating conditions for extended periods may effect device reliability.

Ambient temperature under bias	-40°C to +125°C
Storage temperature	-65°C to +150°C
Voltage on VDD with respect to Vss	0 to +6.0 V
Voltage on all other pins with respect to Vss	-0.6 v to (VDD + 0.6V)
Total power dissipation	700 mW
Maximum current out of Vss pin	150 mA
Maximum current into VDD pin	125 mA
Input clamp current, I _{IK} (V _I < 0 or V _I > VDD)	+/- 5 mA
Output clamp current, I _{OK} (V _O < 0 or V _O > VDD)	+/- 5 mA
Maximum output current sunk by any output pin	20 mA
Maximum output current sourced by any input pin	20 mA

DC Characteristics: standard operating temperature 0°C ≤ TA ≤ +70°C

Power supply pins:

Symbol	Description	Min	Typ ⁽¹⁾	Max	Units	Conditions
VDD	Supply voltage	3.5		5.5	V	
VPOR	VDD start voltage to ensure power-on reset	--	Vss	--	V	See section on power-on reset for details
SVDD	VDD rise rate to ensure power-on reset	0.05	--	--	V	See section on power-on reset for details
IDD	Supply current operating⁽³⁾	--	60	100	mA	VDD = 5.0V ⁽⁴⁾
IDI	Supply current idle⁽³⁾		470	600	µA	VDD = 5.0V
IPD	Power down current⁽³⁾	--	40	80	µA	VDD = 5.0V
VIL	Input low voltage RXD, BR0-1-	Vss	--	0.5	V	
VIH	Input high voltage RXD, BR0-1	2.0	--	VDD	V	4.5 ≤ VDD ≤ 5.5V
IIL	Input leakage current⁽²⁾ RXD, BR0-1	--	--	+/- 1	µA	Vss ≤ VPIN ≤ VDD
VOL	Output low voltage RECLE _D , TXD	--	--	0.6	V	IOL=8.5mA, IDD=4.5V
VOH	Output high voltage RECLE _D , TXD	VDD-0.7	--	--	V	
CIO	Capacitive loading specs on output pins	--	--	50	pF	

Note 1: Data in the typical ("typ") column is based on characterization results at 25°C. This data is for design guidance only and is not tested.

2: Negative current is defined as current out of the pin

- 3: Estimates; to be finalized in production spec
- 4: Does not include speaker current which depends on volume setting and load impedance.

AC Characteristics: standard operating temperature $0^{\circ}\text{C} \leq T_A \leq +70^{\circ}\text{C}$

Symbol	Description	Min	Typ ⁽¹⁾	Max	Units	Conditions
TioR	Pin output rise time	--	10	25 ⁽²⁾	ns	
TioF	Pin output fall time	--	10	25 ⁽²⁾	ns	

Note 1: Data in the typical (“typ”) column is based on characterization results at 5V, 25°C. These parameters are for design guidance only and are not tested.

2: These parameters are design targets and are not tested. No Characterization data available.

Online Support:

Quadravox maintains the latest specifications, schematic diagrams, and support software in the support section of our web site <www.quadravox.com>.

For questions not answered there or for other inquiries, please write us at support@quadravox.com, or call 1-972-669-4002.

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