

Description

The Reticon RM5635A is a monolithic, switched-capacitor filter IC designed for use in full-duplex CCITT V.22 bis 2400 BPS modem filtering applications.

This device contains two channels of bandpass filters, fabricated using an industry-standard double-poly NMOS process, and is offered in a 16-pin package. The bandpass filters are centered at 1200 Hz (low band) and 2400 (high band). Switching the filters between the transmit and receive modes is accomplished by an external TTL-compatible input pin.

Included on the chip is a select pin for switching either the 550 Hz or 1800 Hz guard tone notch filter, a TTL-compatible input pin for self-test mode, and lowpass clock filters in the transmit and receive paths. The modem filters are self-contained and require only plus and minus supplies and an external TTL (or CMOS) 153.6 kHz Input Clock to operate.

The pinout configuration is shown in Figure 1, the block diagram of the RM5635A is shown in Figure 2, and the package dimensions are presented in Figure 9.

Note: These are MOS devices. Although static protection has been built into them MOS handling procedures should be followed.

1	V _{SUB}	Mode Select	16
2	AV _{SS}	Self-Test	15
3	CLK	Receive In	14
4	Xmit In	DV _{DD}	13
5	AV _{DD}	Digital GND	12
6	Analog GND	Notch Select	11
7	212 Out	DV _{SS}	10
8	Xmit Out	Receive Out	9

Figure 1. Pinout Configuration

Key Features

- CCITT V.22 bis (2400 BPS) compatible filters
- Excellent rejection at 550 Hz and 1800 Hz
- On-chip MUX switches
- Industry-proven NMOS switched-capacitor technology
- Up to 950 Hz bandwidth
- TTL/CMOS-compatible digital inputs
- Switchable low-band guard tone notches at 550 Hz and 1800 Hz
- Greater than 55 dB of adjacent channel rejection
- On-chip lowpass clock filters
- $\pm 5V$ to $\pm 10V$ power supply range
- Better than $\pm 1\%$ center frequency accuracy

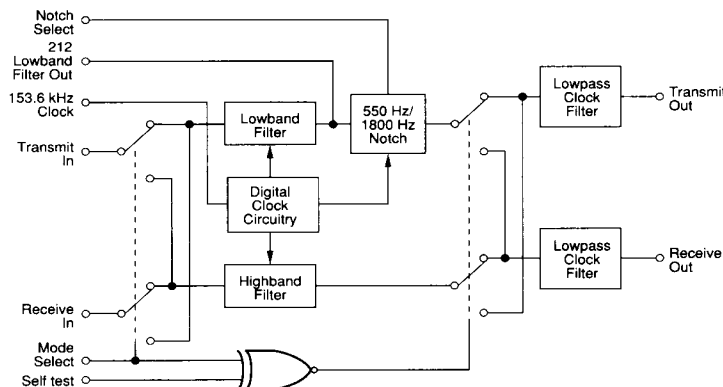


Figure 2. Block Diagram

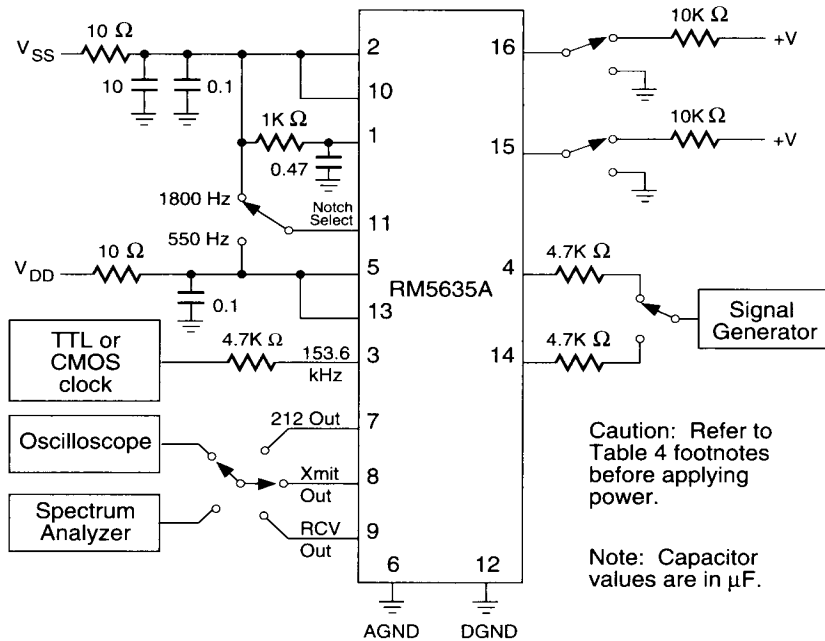


Figure 3. Test Circuit

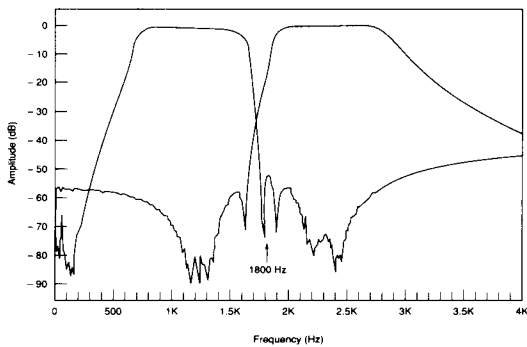


Figure 4. Typical Response of Lowband (with 1800 Hz Notch) and Highband Filters

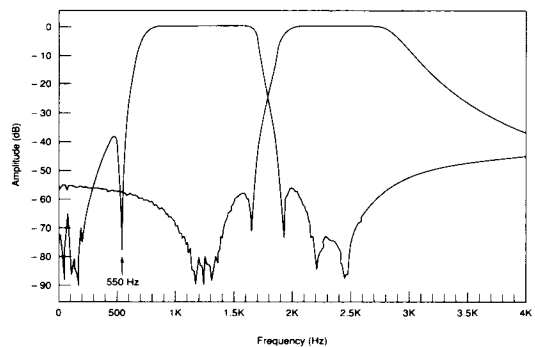


Figure 5. Typical Response of Lowband (with 550 Hz Notch) and Highband Filters

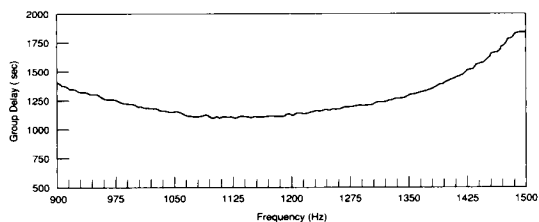


Figure 6. Typical Lowband Group Delay Response (with 1800 Hz Notch Filter)

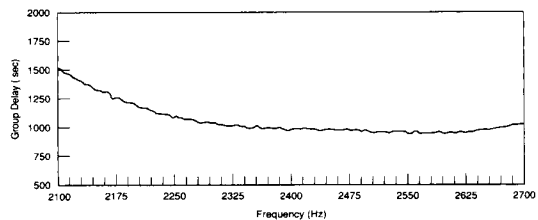


Figure 8. Typical Highband Group Delay Response

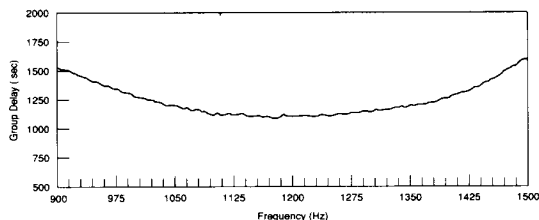


Figure 7. Typical Lowband Group Delay Response (with 550 Hz Notch Filter)

Table 1. Device Characteristics and Operating Range Limits ¹

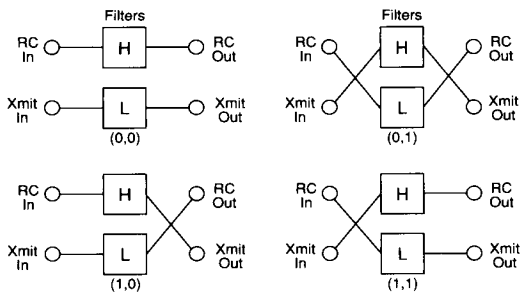
Parameter	Conditions & Comments	Sym	Min	Typ	Max	Units
Supply voltages		V _{DD}	+5		+10	V
		V _{SS}	-5		-10	V
Supply currents	No load	I _{DD}			20	mA
		I _{SS}			-20	mA
Clock frequency	$f_c = 2(f_s)$	f _c		153.6		kHz
Clock pulse width		T _{cp}	200	sq. wave		nsec
Center frequency	Lowband	f _{OL}		1200		Hz
	Highband	f _{OH}		2400		Hz
Input clock levels		V _{IL}	V _{SS}	0.8		V
		V _{IH}		2.2	V _{DD}	V
Max output signal	No load; THD<1%	V _o	2.8			V _{rms}
Input bias current		I _B		.001-.01	10	nA
Input impedance(s)		R _i	10			MΩ
		C _i			10	pF
Load impedance(s)		R _L	10	27		KΩ
		C _L		500	1000	pF
Dynamic output impedance	Lowband	R _o		2	10	Ω
	Highband			2	10	Ω

¹ V_{DD} = +10V, V_{SS} = -10V, T = 25°C

Table 2. Performance Standards

Parameter	Conditions & Comments	Sym	Min	Typ	Max	Units
Output noise	Both bands/notches	e_n			12	mV _{rms}
Crosstalk	Both bands/notches				-48	dB
Clock feedthrough	Both bands/notches				12	mV _{rms}
Total harmonic distortion	$V_{in} = 3.5V_{rms}$ @ 1 kHz	THD			1	%
Dynamic range		DR	50			dB
3 dB bandwidth	Lowband w/550	BW	910		980	Hz
	Lowband w/1800		880		960	Hz
	Highband		960		1030	Hz
Passband ripple					1.5	dB
Power supply	V_{DD} , lowband	PSRR			12	dB
Rejection ratio	V_{DD} , highband				33	dB
	V_{SS} , lowband				6	dB
	V_{SS} , highband				25	dB
	V_{SUB} , lowband				3	dB
	V_{SUB} , highband				22	dB
Output DC offset		V_{off}	-0.5	±0.2	0.5	V
Stopband rejection						
• Lowband w/550 notch	200 Hz		45			dB
	550 Hz		45			dB
	1800 Hz		25			dB
	2000 Hz		45			dB
	2400 Hz		45			dB
• Lowband w/1800 notch	200 Hz		20			dB
	550 Hz		45			dB
	1800 Hz		45			dB
	2000 Hz		45			dB
	2400 Hz		45			dB
• Highband	500 Hz		45			dB
	1000 Hz		45			dB
	1200 Hz		45			dB
	1700 Hz		40			dB
	4000 Hz		35			dB
Group delay response						
• Lowband w/550 notch	900 Hz		1430		1730	μsec
	1000 Hz		1130		1430	μsec
	1100 Hz		970		1270	μsec
	1200 Hz		970		1270	μsec
	1300 Hz		970		1270	μsec
	1400 Hz		1030		1430	μsec
• Lowband w/1800 notch	900 Hz		1280		1580	μsec
	1000 Hz		960		1360	μsec
	1100 Hz		950		1250	μsec
	1200 Hz		990		1290	μsec
	1300 Hz		1040		1340	μsec
	1400 Hz		1270		1570	μsec
	1500 Hz		1600		2100	μsec
• Highband	2100 Hz		1360		1760	μsec
	2200 Hz		1010		1410	μsec
	2300 Hz		800		1200	μsec
	2400 Hz		800		1200	μsec
	2500 Hz		790		1090	μsec
	2600 Hz		720		1120	μsec
	2700 Hz		910		1210	μsec

Table 3. Operational Programming



Self Test	Mode	Xmit In	Xmit Out	RC In	RC Out
0	0	L	L	H	H
0	1	H	H	L	L
1	0	L	H	H	L
1	1	H	L	L	H

L = Lowband filter H = Highband filter
Connecting Pin 11 to V_{DD} selects the 550 Hz notch for the lowband filter; connecting pin 11 to V_{SS} selects the 1800 Hz notch for the lowband filter.

Table 4. Absolute Minimum/Maximum Ratings

	Min	Max	Units
Input voltage - any terminal with respect to substrate, pin 1 (V _{SS})	-0.4	21	V
Output short-circuit duration - any terminal	Indefinite		
Operating temperature	0	70	°C
Storage temperature	-55	125	°C
Lead temperature (soldering, 10 sec.)		300	°C

Caution: Observe MOS handling and operating procedures

Note: This table shows stress ratings *exclusively*: functional operation of this product under any conditions beyond those listed under standard operating conditions is not suggested by the table. Permanent damage may result if the device is subject to stresses beyond these absolute min/max values. Moreover, reliability may be diminished if the device is run for protracted periods at absolute maximum values.

Although devices are internally gate-protected to minimize the possibility of static damage, MOS handling precautions should be observed. Do not apply instantaneous supply voltages to the device or insert or remove device from socket while under power. Use decoupling networks to suppress power supply turn-off/ on switching transients and ripple. Applying AC signals or clock to device with power off may exceed negative limit.

Ordering Information

Part Number	Description
RM5635ANP-011	2400 BPS modem filter, CCITT V.22 bis compatible

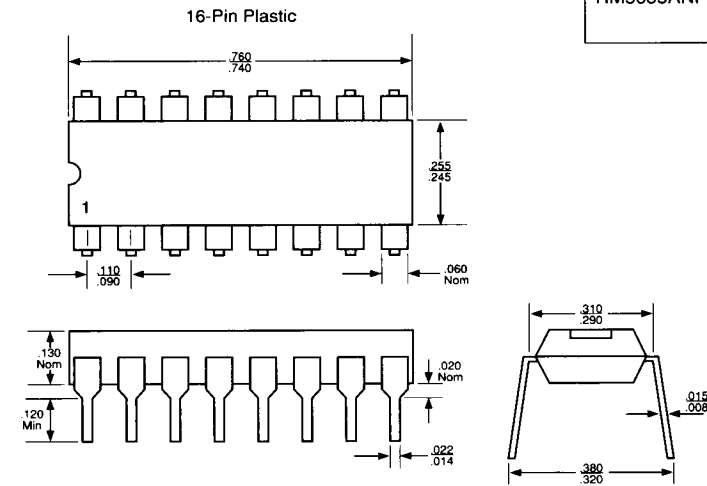


Figure 9. Package Dimensions