

Description

The Reticon RM5636B is a monolithic, switched-capacitor combination filter IC designed for use in 2400 BPS modem applications. This four-filter device, fabricated using an industry-standard double-poly NMOS process, is offered in a 22-pin package. The pinout configuration is shown in Figure 1, a block diagram of the device is in Figure 2, and package dimensions are shown in Figure 12.

The RM5636B integrates four switched-capacitor filters: a receiver bandpass filter; a fixed compromise delay equalizer filter; a 75/150 BPS secondary channel filter; and a 3 kHz transmit low-pass filter.

The filters are self-contained. One uncommitted op amp is provided on-chip for user-designated functions, such as gain adjustment, antialiasing or clock filters. For convenience, 4.8 kHz and 57.6 kHz clocks are brought out for operating other circuitry.

Key Features

- Four-filter combo
 - CCITT V.26/Bell 201(2400 BPS) compatible bandpass filter
 - Fixed compromise delay equalizer filter with a nominally flat (0 dB) amplitude response, designed to compensate for both the mean range of group delay distortion encountered in United States applications and the passband of the 2400 BPS filter (800 Hz to 2800 Hz)
 - CCITT V.23/Bell 202 (75/150 Baud) secondary channel compatible bandpass filter
 - 3 kHz transmit low-pass filter used between the D/A and telephone line
- 1 uncommitted op amp for user-designated functions
- Excellent adjacent channel rejection
- Auxiliary clock outputs of 4.8 kHz and 57.6 kHz
- $\pm 5V$ to $\pm 10V$ power supply range
- TTL/CMOS compatible clock input
- Industry-proven NMOS switched capacitor technology
- 22-pin package

Device Operation

For operation, the RM5636B requires plus/minus power supplies and either an external TTL (or CMOS) 3.6864 MHz clock or a 3.6864 MHz crystal.

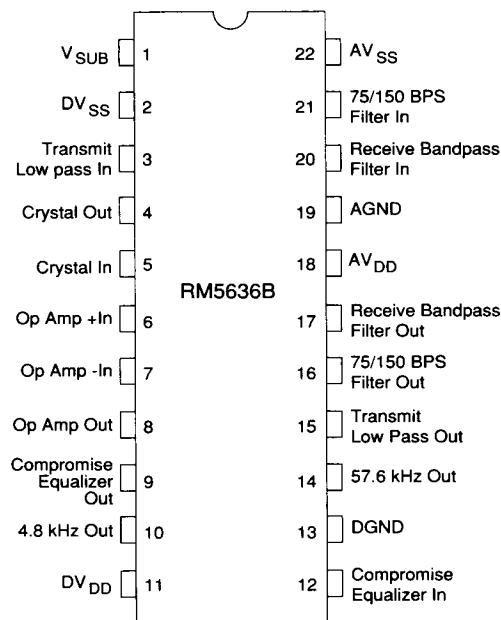


Figure 1. Pinout Configuration

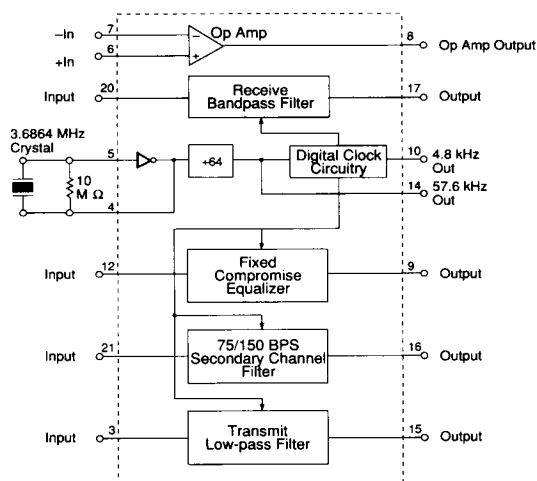


Figure 2. Block Diagram

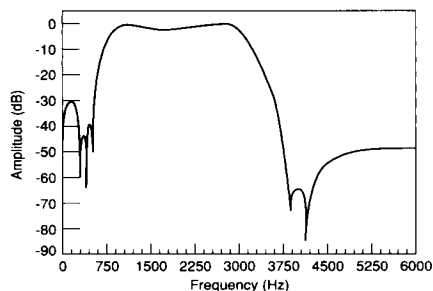


Figure 3. Amplitude Response 2400 BPS Bandpass Filter

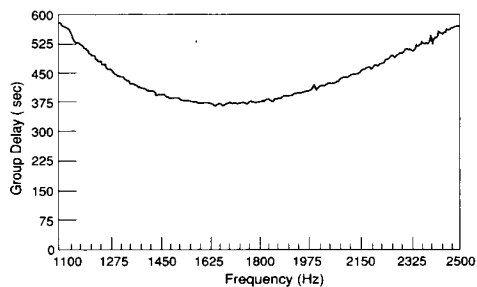


Figure 4. Group Delay Response 2400 BPS Bandpass Filter

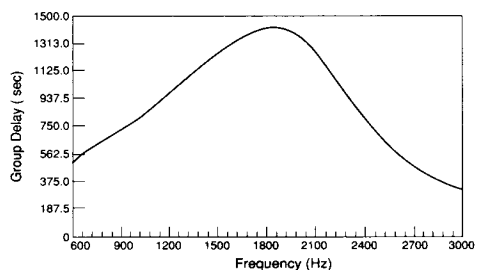


Figure 5. Group Delay Response - Fixed Compromise Equalizer Filter

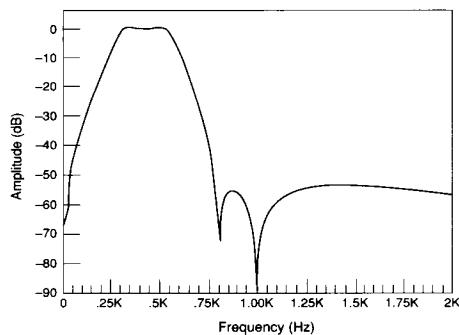


Figure 6. Amplitude Response 75/150 BPS Bandpass Filter

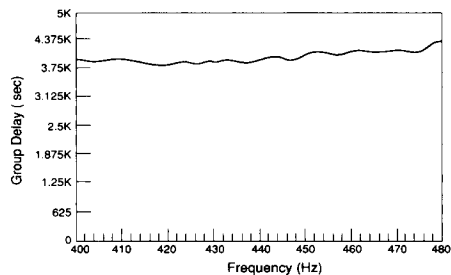


Figure 7. Group Delay Response 75/150 BPS Bandpass Filter

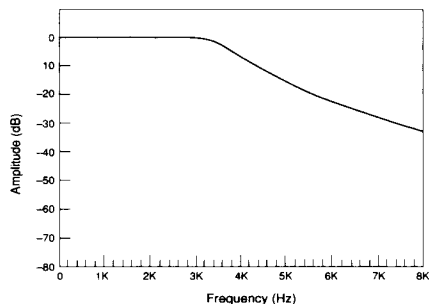


Figure 8. Amplitude Response Transmit Low-pass Filter

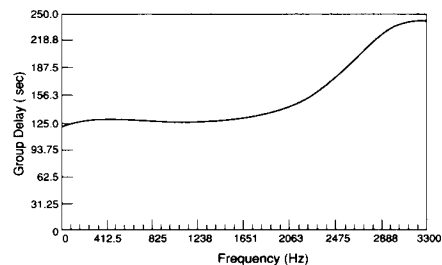


Figure 9. Group Delay Response Transmit Low-pass Filter

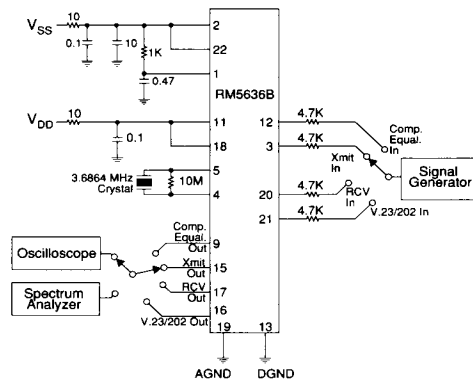


Figure 10. Test Circuit

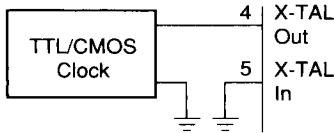


Figure 11. External Clock Drive Scheme

Table 1. 2400 BPS Bandpass Filter ¹

Parameter	Sym	Typ	Units
Center frequency	f_o	1800	Hz
1 dB Bandwidth	BW	2100 (760 to 2860)	Hz
Passband ripple	A_r	0.5	dB
Adjacent channel rejection		55	dB
Sampling frequency	f_s	57.6	kHz
Stopband rejection @			
200 Hz		30	dB
300 Hz		55	dB
400 Hz		50	dB
500 Hz		48	dB
3500 Hz		35	dB
3700 Hz		50	dB
4000 Hz		60	dB
5000 to 12000 Hz		55	dB
Group delay variation	GD	200	μ sec
1100 Hz - 2500 Hz			
Gain @ center frequency	G_0	0	dB

Note:

¹ See Figures 3 and 4

Table 2. Compromise Equalizer Filter ²

Parameter	Sym	Typ	Units
Center frequency	f_o	1800	Hz
Gain @ center frequency	G_0	-0.5	dB
Passband ripple	A_r		
(800 Hz - 2800 Hz)		0.5	dB
Sampling frequency	f_s	57.6	kHz
Absolute group delay @	GD		
800 Hz		400	μ sec
1000 Hz		800	μ sec
1200 Hz		1000	μ sec
1400 Hz		1200	μ sec
1600 Hz		1350	μ sec
1800 Hz		1450	μ sec
2000 Hz		1370	μ sec
2200 Hz		1050	μ sec
2400 Hz		800	μ sec
2600 Hz		570	μ sec
2800 Hz		430	μ sec

Note:

² See Figure 5

Table 3. 75/150 BPS Bandpass Filter ³

Parameter	Sym	Typ	Units
Center frequency	f_o	420/440	Hz
3 dB Bandwidth	BW	250	Hz
Passband ripple	A_r	1	dB
(310 Hz to 520 Hz)			
Sampling frequency	f_s	57.6	kHz
Adjacent channel rejection		55	dB
Group delay variation	GD	± 100	μ sec
in passband			
Gain @ center frequency	G_0	-0.5	dB

Note:

³ See Figures 6 and 7

Table 4. Transmit Low-pass Filter ⁴

Parameter	Sym	Typ	Units
1 dB bandwidth	BW ₁	3200	Hz
3 dB bandwidth	BW ₃	3500	Hz
Passband ripple	A_r	0.5	dB
Sampling frequency	f_s	57.6	kHz
Stopband rejection @			
4000 Hz		10	dB
5000 Hz		15	dB
6000 Hz		22	dB
8000 Hz		32	dB
10,000 Hz		40	dB
Group delay variation	GD	<100	μ sec
0 to 4 kHz			

Note:

⁴ See Figures 8 and 9

Table 5. Absolute Minimum/Maximum Ratings

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

Table 6. Device Characteristics and Operation Range Limits

@ 25°C, V_{DD} = +6.5V, V_{SS} = -6.5V (unless otherwise indicated)

Parameter	Conditions & Comments	Sym	Min	Typ	Max	Units
Supply voltages		V _{DD} V _{SS}	+5 -5		+10 -10	V V
Quiescent current (each supply)	±5V supplies ±10V	I _{QDD} , I _{QSS}		14 20		mA mA
Clock frequency	Crystal or TTL/CMOS clock	f _c		3.6864		MHz
Clock pulse width		T _{cp}	200	sq. wave	10 ⁹ /f _c -200	nsec
Input clock levels		V _{IL} V _{IH}	V _{SS}	0.8 2.2	V _{DD}	V V
Sampling frequency		f _s		57.6		kHz
Output signal (R _L =27KΩ)	±5V supplies ±10V supplies	V _o		7 12		V _{p-p} V _{p-p}
Input impedance(s)		R _i C _i		10 10		MΩ pF
Load impedance		R _L C _L		27 500		KΩ pF

Table 7. Performance Standards ¹

@ 25°C, V_{DD} = +6.5V, V_{SS} = -6.5V (unless otherwise indicated)

Parameter	Conditions & Comments	Sym	Min	Typ	Max	Units
Dynamic range	V _{out (rms)} /rms noise (e _n)	DR		72		dB
Total harmonic distortion	f _{in} = 1 kHz	THD		-45		dB
Output noise		e _n		1.2		mV _{rms}

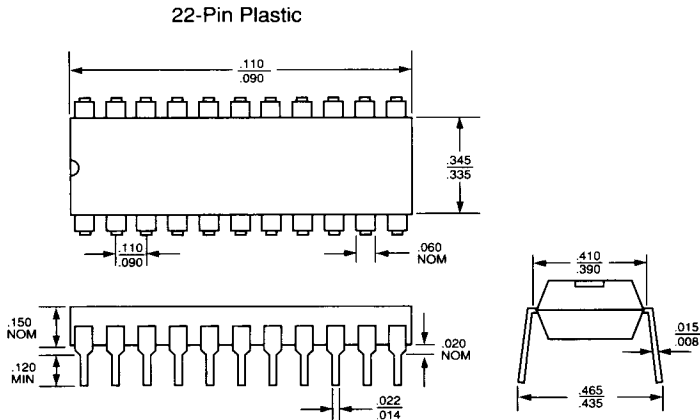


Figure 12. Package Dimensions

Ordering Information

Part Number	Description
RM5636BNP-011	2400 BPS, CCITT V.26/Bell 201 modem filter combination