



**VTC Inc.**  
Value the Customer™

# VM326

**10-CHANNEL, HIGH-PERFORMANCE,  
THIN-FILM HEAD, READ/WRITE  
PREAMPLIFIER**

July, 1992

## FEATURES

- High Performance:
  - Read mode gain = 150V/V
  - Low input noise = 0.8nV/√Hz maximum
  - Input capacitance = 30pF maximum
  - Write current range = 10mA to 40mA
  - Head inductance range = 200nH to 3μH
  - Head voltage swing = 5.5Vp-p minimum
  - Write current rise time = 5ns
  - Differential ECL write data inputs
- Low Power Dissipation
- Enhanced System Write-to-Read Recovery Time
- Power Supply Fault Protection
- Schottky Isolated Damping Resistor Standard
- Write Unsafe Detection
- +5V and -5V Power Supply
- Operates Off ±5V Power Supplies

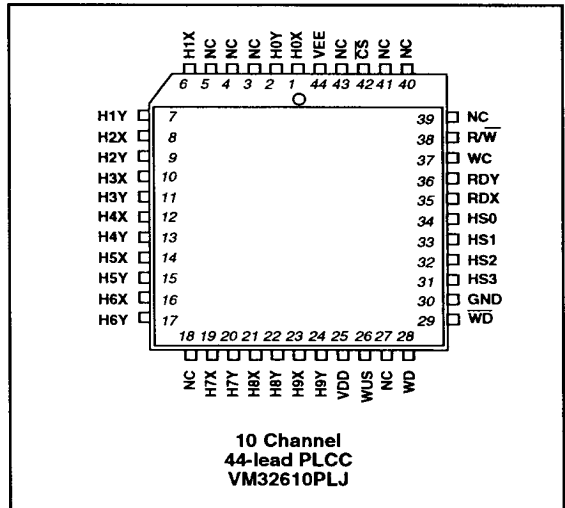
## DESCRIPTION

The VM326 is a high-performance, low-power, bipolar monolithic read / write preamplifier designed for use with two-terminal thin-film recording heads. It provides write current control, data protection circuitry and a low-noise read preamplifier for ten channels. When unselected, the device enters a **sleep mode**, with power dissipation reduced to less than 160 mW. Fault protection is provided so that during power supply sequencing the write current generator is disabled. System write-to-read recovery time is minimized by maintaining the read channel common-mode output voltage in the write mode.

Very low power dissipation from +5V and -5V supplies is achieved through use of high-speed bipolar processing and innovative circuit design techniques. A 400-ohm damping resistor is included on-chip in series with a Schottky diode pair to maintain high input resistance in the read mode.

The VM326 is available in a variety of package configurations including a mirror-image pinout to facilitate multiple device applications. Channel count options are available in 2, 4, 6, 8, 9 and 10 channels in a variety of packages. Please consult VTC for all packaging options.

## CONNECTION DIAGRAM





# VM326

Table 1: Head Select

HS3	HS2	HS1	HS0	HEAD
0	0	0	0	0
0	0	0	1	1
0	0	1	0	2
0	0	1	1	3
0	1	0	0	4
0	1	0	1	5
0	1	1	0	6
0	1	1	1	7
1	0	0	0	8
1	0	0	1	9

Table 2: Mode Select

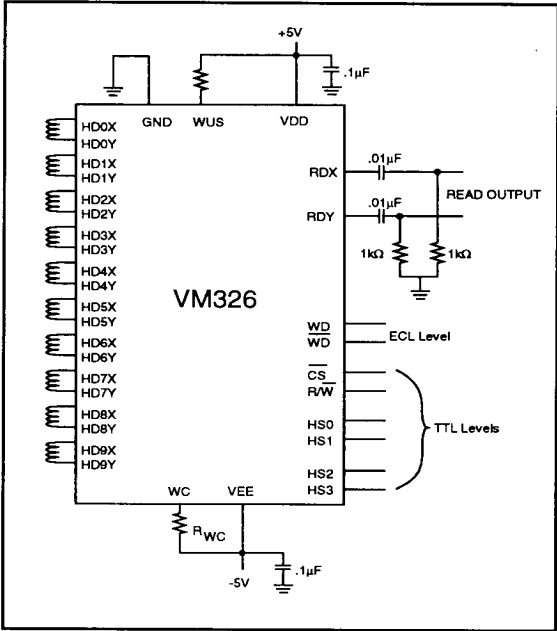
$\overline{CS}$	$R/\overline{W}$	MODE
0	0	Write
0	1	Read
1	X	Idle

## PIN DESCRIPTIONS

NAME	TYPE	DESCRIPTION
HS0-HS3	I*	Head Select: selects one of ten heads
$\overline{CS}$	I	Chip Select: a low level enables the device
$R/\overline{W}$	I*	Read/Write: a high level selects Read mode
WUS	O*	Write Unsafe: Open collector output, high level indicates an unsafe writing condition
$WD, \overline{WD}$	I*	Write Data In: a negative transition ( $WD-\overline{WD}$ ) toggles the direction of the head current
H0X - H9X H0Y - H9Y	I/O	X,Y Head Connections
RDX, RDY	O*	X,Y Read Data: differential read data output
WC	*	Write Current: used to set the magnitude of the write current
GND	-	Ground
VDD	-	+5V
VEE	-	-5V

\* When more than one  $R/\overline{W}$  device is used, these signals can be wire OR'ed

## TYPICAL APPLICATION



**DC CHARACTERISTICS** Unless otherwise specified, recommended operating conditions apply.

PARAMETER		CONDITIONS	MIN	TYP	MAX	UNITS
VDD Supply Current	$I_{DD}$	Read Mode			31	mA
		Write Mode			$30 + I_W$	
		Idle Mode			12	
VEE Supply Current	$I_{CC}$	Read Mode			78	mA
		Write Mode			$57 + I_W$	
		Idle Mode			16	
Power Dissipation ( $T_J = 125^\circ\text{C}$ )	$P_D$	Read Mode		450	600	mW
		Write Mode: $I_W = 20\text{mA}$		550	700	
		Idle Mode		95	160	
Input Low Voltage	$V_{IL}$				0.8	V
Input High Voltage	$V_{IH}$		2.0			V
Input Low Current	$I_{IL}$	$V_{IL} = 0.8\text{V}$	-0.4			mA
Input High Current	$I_{IH}$	$V_{IH} = 2.0\text{V}$			100	$\mu\text{A}$
WD, $\overline{\text{WD}}$ Input High Voltage	$V_{IH}$	ECL	-1.0		-0.7	V
WD, $\overline{\text{WD}}$ Input Low Voltage	$V_{IL}$	ECL	-1.9		-1.6	V
WD, $\overline{\text{WD}}$ Input High Current	$I_{IH}$	$V_{IH} = -0.7\text{V}$			100	$\mu\text{A}$
WD, $\overline{\text{WD}}$ Input Low Current	$I_{IL}$	$V_{IH} = -1.6\text{V}$			80	$\mu\text{A}$
WUS Output Low Voltage	$V_{OL}$	$I_{OL} = 8\text{mA}$			0.5	V
VDD Fault Voltage	$V_{DDF}$		3.8		4.3	V
VEE Fault Voltage	$V_{EEF}$		-4.3		-3.8	V
Head Current (HnX, HnY)	$I_H$	Write Mode, $0 < V_{CC} \leq 3.8\text{V}$ $0 < V_{DD} < 9\text{V}$	-200		+200	$\mu\text{A}$
		Read/Idle Mode, $0 < V_{CC} < 5.5\text{V}$ $-5.5\text{V} < V_{DD} < 0$	-200		+200	

TWO-TERMINAL  
READ/WRITE PREAMPS

**READ CHARACTERISTICS** Unless otherwise specified, recommended operating conditions apply  $C_L$  (RDX, RDY) < 20pF and  $R_L$  (RDX, RDY) = 1k $\Omega$ .

PARAMETER	SYM	CONDITIONS	MIN	TYP	MAX	UNITS
Differential Voltage Gain	$A_V$	$V_{IN} = 1\text{mVp-p} @ 300\text{KHz}$	125		175	V/V
Bandwidth	BW	-1dB $ Z_s  < 5\Omega$ $V_{IN} = 1\text{mVp-p} @ 300\text{KHz}$	25			MHz
		-3dB $ Z_s  < 5\Omega$ $V_{IN} = 1\text{mVp-p} @ 300\text{KHz}$	45			
Input Noise Voltage	$e_{in}$	BW = 15MHz, $L_H = 0$ , $R_H = 0$		0.65	0.8	nV/ $\sqrt{\text{Hz}}$
Differential Input Capacitance	$C_{IN}$	$V_{IN} = 1\text{mVp-p}$ , $f = 5\text{MHz}$		23	30	pF
Differential Input Resistance	$R_{IN}$	$V_{IN} = 1\text{mVp-p}$ , $f = 5\text{MHz}$ (25°C < $T_A$ < 125°C)	500	1000		$\Omega$
Dynamic Range	DR	AC input voltage where the gain falls to 90% of the gain @ 0.2mVrms input, $f = 5\text{MHz}$	2			mVrms
Common Mode Rejection Ratio	CMRR	$V_{IN} = 0\text{VDC} + 100\text{mVp-p} @ 5\text{MHz}$	54			dB
Power Supply Rejection Ratio	PSRR	100mVp-p @ 5MHz on $V_{DD}$ 100mVp-p @ 5MHz on $V_{CC}$	54			dB
Channel Separation	CS	Unselected channels driven with 100mVp-p @ 5MHz Selected Channels $V_{IN} = 0\text{mVp-p}$	45			dB
Output Offset Voltage	$V_{OS}$		-250		+250	mV
RDX,RDY Common Mode Output Voltage	$V_{OCM}$	Read Mode	-2.8	-2.3	-2.0	V
		Write Mode	-2.8	-2.3	-2.0	
Single-Ended Output Resistance	$R_{SEO}$	$f = 5\text{MHz}$			30	$\Omega$
Output Current	$I_O$	AC Coupled Load, RDX to RDY	3.2			mA

**WRITE CHARACTERISTICS** Unless otherwise specified, recommended operating conditions apply,  $I_W = 20\text{mA}$ ,  $L_H = 1.0\mu\text{H}$ ,  $R_H = 30\Omega$  and  $f_{DATA} = 5\text{MHz}$ .

PARAMETER	SYM	CONDITIONS	MIN	TYP	MAX	UNITS
WC Pin Voltage	$V_{WC}$			1.71		V
Differential Head Voltage Swing	$V_{DH}$	$I_W = 40\text{mA}$	5.5			Vp-p
Unselected Head Current	$I_{UH}$				1	mA(pk)
Differential Output Capacitance	$C_{OUT}$				25	pF
Differential Output Resistance	$R_{OUT}$		3.2			k $\Omega$
WDI Transition Frequency	$f_{DATA}$	WUS = Low	1.7			MHz
Write Current Range	$I_W$	$41.25\Omega < R_{WC} < 165\Omega$	10		40	mA
Write Current Tolerance	$\Delta I_W$	$I_W$ range 10mA to 40mA	-8		+8	%

**SWITCHING CHARACTERISTICS** (See Figure 1) Unless otherwise specified, recommended operating conditions apply,  $I_W = 20\text{mA}$ ,  $L_H = 1.0\mu\text{H}$ ,  $R_H = 30\Omega$  and  $f_{\text{DATA}} = 5\text{MHz}$ .

PARAMETER	SYM	CONDITIONS	MIN	TYP	MAX	UNITS
Read to Write Mode	$t_{RW}$	Delay to 90% of write current			0.6	$\mu\text{s}$
$\overline{R/W}$ to Read Mode	$t_{WR}$	Delay to 90% of 100mV, 10MHz Read Signal envelope or to 90% decay of write current			0.6	$\mu\text{s}$
$\overline{CS}$ to Select	$t_{IR}$	Delay to 90% of write current or to 90% of 100mV, 10MHz Read signal envelope			0.6	$\mu\text{s}$
CS to Unselect	$t_{IW}$	Delay to 10% of write current			0.6	$\mu\text{s}$
HS0, 1, 2, 3, to Any Head	$t_{HS}$	Delay to 90% of 100mV, 10MHz Read signal envelope			0.4	$\mu\text{s}$
Safe to Unsafe	$t_{D1}$	50% WDI to 50% WUS	0.6		3.6	$\mu\text{s}$
Unsafe to Safe	$t_{D2}$	50% WDI to 50% WUS			1	$\mu\text{s}$
Prop. Delay	$t_{D3}$	From 50% points, $L_H = 0$ , $R_H = 0$			32	ns
Asymmetry	ASYM	WDI has 50% duty cycle & 1ns rise/fall time, $L_H = 0$ , $R_H = 0$			1	ns
Rise/Fall Time	$t_r/t_f$	10%-90% points, $I_W = 20\text{mA}$ $L_H = 0$ , $R_H = 0$			5	ns
Rise/Fall Time	$t_r/t_f$	10%-90% points, $I_W = 20\text{mA}$ $L_H = 600\text{nH}$ , $R_H = 20\Omega$			12	ns

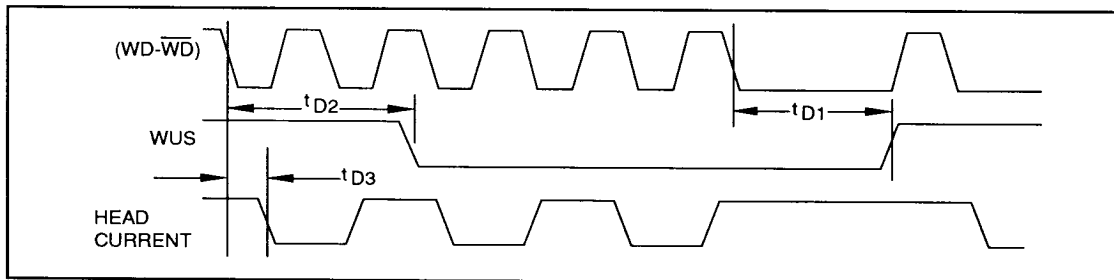


Figure 1: Write Mode Timing Diagram