

VM6110

4-CHANNEL, MAGNETO-RESISTIVE HEAD, READ/WRITE PREAMPLIFIER

ADVANCE INFORMATION

July, 1993

FEATURES

- High Performance:
 - Read Gain: $TF = 300 \text{ V/V}$
 $MR = 350 \text{ V/V}$
 - MR Current Range = 6 - 20 mA
 - Low Input Noise = $0.5 \text{ nV}/\sqrt{\text{Hz}}$ typical
 - Write Current Range = 10 - 60 mAp-p
 - Head Inductance Range = 400 nH - 1 μH
 - Rise Time = 7 ns maximum
- Operates on $\pm 5 \text{ Volt}$ Power Supplies
- Fault Detection Capability
- Designed for use with Four-Terminal MR Heads
- MR Element Resistance of 10 - 25 Ω

DESCRIPTION

The VM6110 is a high-performance read/write preamplifier designed for use with four-terminal magneto-resistive recording heads. The VM6110 consists of a thin-film head writer, a thin-film head reader and a magneto-resistive reader. This device supplies write current switching to the thin-film head, reads back the signal from the thin-film head and provides sense current to the MR element.

The VM6110 operates from +5V and -5V power supplies and is available as a 4-channel device. The VM6110 is available in a variety of package options. Please consult VTC for details.

In the write mode, the circuit operates as a thin-film head write current switch, driving the thin-film write element of the MR head. The magnitude of the write current is externally programmed either by a resistor or a current source. The writer has a current gain of 20mA/mA.

In the read mode, the circuit operates as a low-noise differential amplifier which senses resistance changes in the MR element which corresponds to flux changes on the disk. The amplitude of the sense current is set by either an external resistor or a current source. The circuit also operates as a thin-film head reader to read signals from the thin-film part of the MR head.

In the idle mode, the read and write current generators and the associated bias circuitry is turned off to reduce power dissipation.

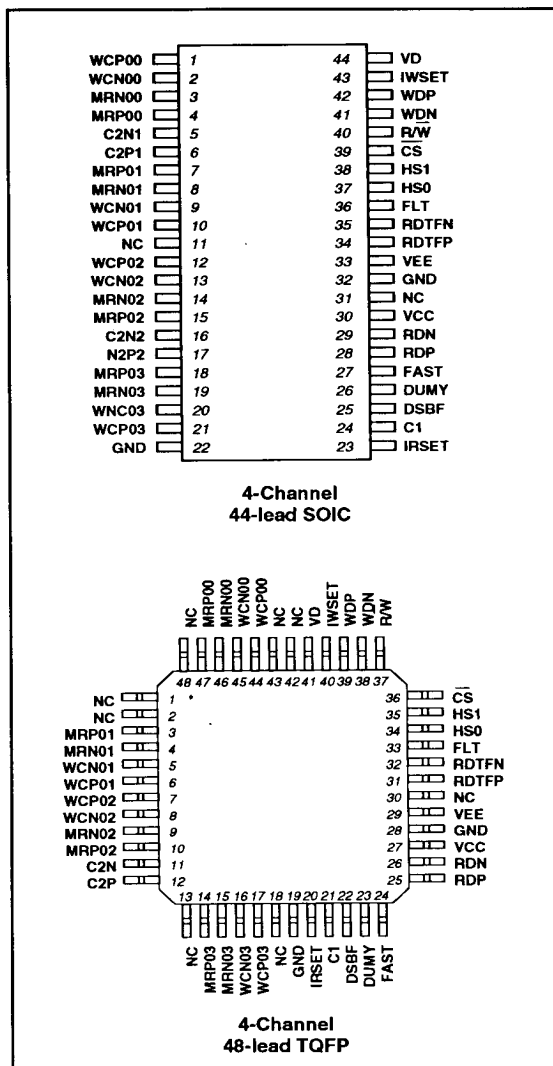
The VM6110 is equipped with fault detection circuitry for both the read and write mode. In the write mode, the device detects the following unsafe conditions:

- Low power supply
- Open head
- Low write data frequency
- Low write current

In the read mode, the device detects the following unsafe conditions:

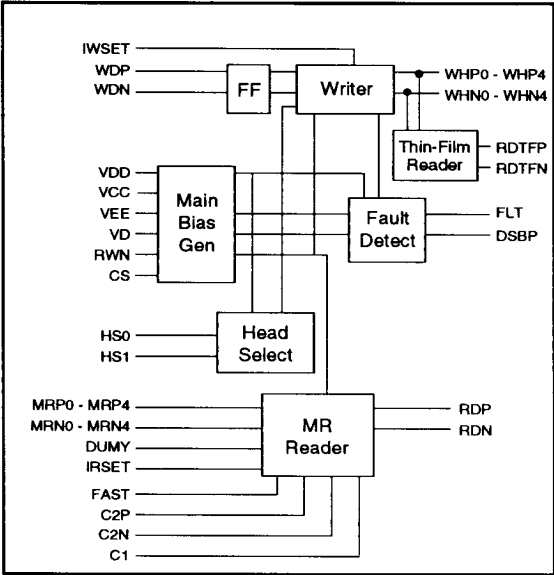
- Low power supply
- Open head or head resistance too high

CONNECTION DIAGRAM



VM6110

BLOCK DIAGRAM



DC CHARACTERISTICS Recommended operating conditions apply unless otherwise specified. $0^{\circ}\text{C} < T_A < 80^{\circ}\text{C}$, $4.5\text{V} < V_{DD} < 5.5\text{V}$, $-5.0\text{V} < V_{EE} < -4.0\text{V}$.

PARAMETER	SYM	CONDITIONS	MIN	TYP (Note 1)	MAX	UNITS
V _{DD} Supply Current	I _{DD}	Read Mode, I _{MR} = 18mA			95	mA
		Write Mode, I _W = 30mA			140	
		Idle Mode			12	
		Positive Supply Fault Threshold	3.75	4	4.25	V
V _{EE} Supply Current	I _{EE}	Read Mode, I _{MR} = 18mA			70	mA
		Write Mode			65	
		Idle Mode			10	
		Negative Supply Fault Threshold	-3.75	-3.5	-3.25	V
Power Supply Power Dissipation	P _D	Read Mode, I _{MR} = 18mA			910	mW
		Write Mode, I _W = 30mA			1130	
		Idle Mode			125	

Note 1: Typical values are given at V_{CC} = 5V and T_A = 25°C.

READ CHARACTERISTICS Recommended operating conditions apply unless otherwise specified; C_L (RDX, RDY) < 20pF, R_L (RDX, RDY) = 1k Ω .

PARAMETER	SYM	CONDITIONS	MIN	TYP (Note 1)	MAX	UNITS
MR HEAD AMPLIFIER						
Differential Voltage Gain	A _V	V _{IN} = 1mVrms, 1MHz, R _{MR} = 12		350		V/V
Passband Upper Frequency Limit	BW	-1dB Z _s < 5 Ω , V _{IN} = 1mVp-p	25	40		MHz
		-3dB Z _s < 5 Ω , V _{IN} = 1mVp-p	60	100		
Input Noise Voltage	e _{in}	L _{ex} = 230nH, R = 13		0.55	0.65	nV/√Hz
Differential Input Capacitance	C _{IN}	V _{IN} = 1mVp-p, f = 5MHz			10	pF
Differential Input Resistance	R _{IN}	V _{IN} = 1mVp-p, f = 5MHz, I _{MR} = 16mA			4	Ω
Common Mode Rejection Ratio	CMRR	V _{CM} = 100mVp-p @ 5MHz	35			dB
Power Supply Rejection Ratio	PSRR	100mVp-p @ 5MHz on V _{CC}	30			dB
Channel Separation	CS	Unselected channels: V _{IN} = 20mVp-p @ 5MHz V _{IN} = 0 on selected head	50			dB
IMR Reference Voltage		Reference for IMR		2.5		V
MR Sense Current			6	18	20	mA
THIN-FILM HEAD AMPLIFIER						
Differential Voltage Gain	A _V	V _{IN} = 1mVrms, 1MHz, R _{MR} = 12	260	300	340	V/V
Passband Upper Frequency Limit	BW	-1dB Z _s < 5 Ω , V _{IN} = 1mVp-p	25	40		MHz
		-3dB Z _s < 5 Ω , V _{IN} = 1mVp-p	65	85		
Input Noise Voltage	e _{in}	L _{ex} = 230nH, R = 13		0.5	0.65	nV/√Hz
Differential Input Capacitance	C _{IN}	V _{IN} = 1mVp-p, f = 5MHz		26	33	pF
Differential Input Resistance	R _{IN}	V _{IN} = 1mVp-p, f = 5MHz, I _{MR} = 16mA	280	1000		Ω

WRITE CHARACTERISTICS Recommended operating conditions apply unless otherwise specified; L_H = 1 μ H, R_H = 30 Ω , I_W = 20mA, f_{DATA} = 5MHz.

PARAMETER	SYM	CONDITIONS	MIN	TYP (Note 1)	MAX	UNITS
Write Current Range	I _W		10		60	mA-p-p
Write Current Rise Time		I _W = 40mA-p-p, L _H = 550nH, R _H = 40, 20%, 80%			7	ns
Asymmetry					0.2	ns
Write Current Reference Voltage				2.5		V
Differential Head Voltage	V _{DH}			4.5		V
Propagation Delay		Write Data to WHPA, WHNB			30	ns
UNSAFE MODE						
Open Head to Fault					0.5	s
Frequency Detect to Fault					2.4	s
IW Low to Fault					500	ns

Note 1: Typical values are given at V_{CC} = 5V and T_A = 25 $^{\circ}$ C