54F/74F500

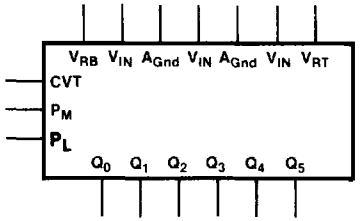
6-Bit Analog-to-Digital Flash Converter

Description

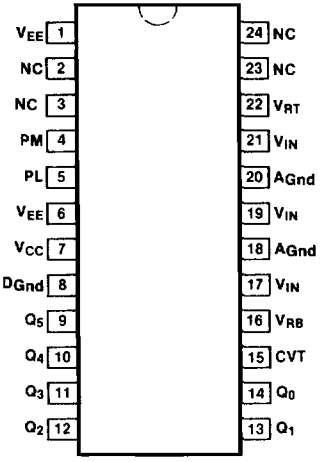
The F500 is a 6-bit, fully parallel analog-to-digital converter capable of sampling rates from 0 to 50 MHz. Conversion is accomplished by 63 comparators spaced one quanta apart on a voltage reference ladder. All comparators measure the analog input against their reference simultaneously. The most significant comparator that finds the analog input to be greater than its reference has its output encoded to a 6-bit, active HIGH binary number and latched. Two polarity control inputs are provided: P_M complements the most significant output bit and P_L complements the lesser five output bits. The circuit operates from +5.0 V and −6.0 V supplies and has separate digital and analog grounds. Both ends of the reference ladder are brought out one to V_{RT} (nominally zero volts) and the other to V_{RB} (nominally −1.0 V).

Ordering Code: See Section 5

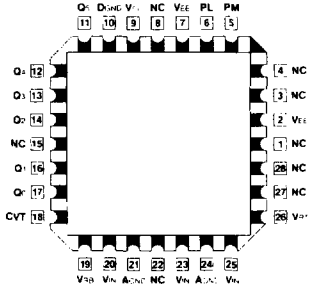
Logic Symbol



Connection Diagrams



Pin Assignment for DIP and SOIC

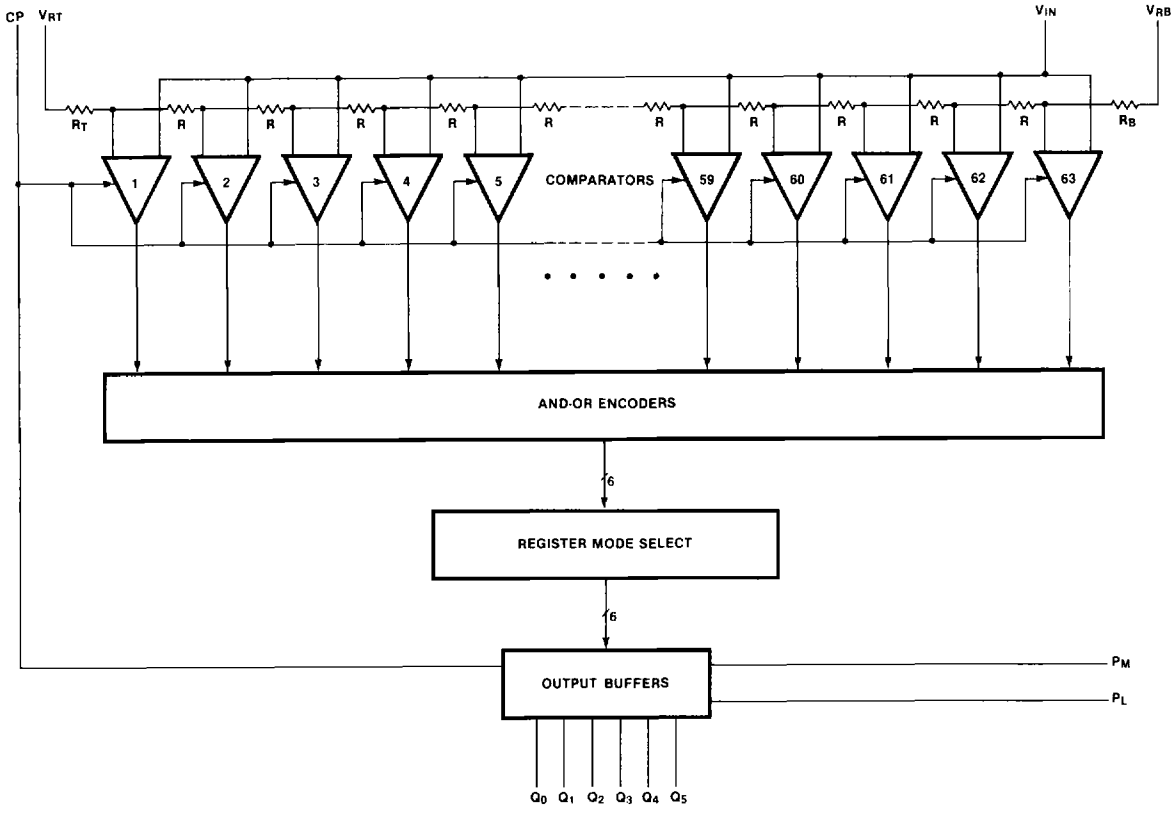


Pin Assignment for LCC and PCC

Input Loading/Fan-Out: See Section 3 for U.L. definitions

Pin Names	Description	54F/74F(U.L.) HIGH/LOW
AV_{EE}	Analog Supply Voltage	N/A
DV_{CC}	TTL Supply Voltage	N/A
D_{GND}	TTL Ground	N/A
A_{GND}	Analog Ground	N/A
Q_0-Q_5	Digital Output, Q_0 = MSB, Q_5 = LSB	25/12.5
P_M	Polarity Control MSB Output	0.5/0.375
P_L	Polarity Control LSB Outputs	0.5/0.375
V_{RT}	Reference Voltage (Top)	N/A
V_{RB}	Reference Voltage (Bottom)	N/A
V_{IN}	Analog Voltage Input	N/A
CNV	Convert	0.5/0.375

Block Diagram



Performance Characteristics over Recommended Operating Temperature Range

Parameter	54F/74F			Units
	Min	Typ	Max	
Resolution		6 1.6		Bits %
Input Range		1.0		V
Linearity Error		0.4		%
Offset Error, Top Bottom		+27 −27		mV
Aperture Jitter		30		psec
Bandwidth, Small Signal 3.0 dB 0.1 dB		 45 8		 MHz
Transient Response		20		ns
Signal-to-Noise Ratio Peak Signal/RMS Noise RMS Signal/RMS Noise		 43 42 34 33		 dB
Noise Power Ratio		25.5		dB

Interface Specifications over Recommended Operating Temperature Range

Power Supply

Symbol	Parameter	54F/74F $T_A = +25°C$ V_{CC} (TTL) = +5.0 V V_{EE} (Analog) = −5.0 V $C_L = 50$ pF			Units
		Min	Typ	Max	
I_{CC}	Supply Current		20	30	mA
I_{EE}	Supply Current		−105	−150	mA
V_{CC}	Supply Voltage	+4.50	+5.00	+5.50	V
V_{EE}	Supply Voltage	−5.75	−6.00	−6.25	V

Analog

Symbol	Parameter	54F/74F			Units
		$T_A = +25°C$ V_{CC} (TTL) = +5.0 V V_{EE} (Analog) = −5.0 V C_L = 50 pF			
		Min	Typ	Max	
Signal Input:					
V_{IN}	Input Voltage				V
R_{IN}	Equivalent Input Impedance	15		∞	KΩ
C_{IN}	Input Capacitance			85	pF
I_{BIAS}	Constant Input Bus			110	μA
I_B	Clock Synchronous Bias			25	μA
Reference Input:					
I_{RT}	Reference Current, Top			8	mA
I_{RB}	Reference Current Bottom			−8	mA
R	Reference Resistor	1.9	2.0		Ω
V_{RT}	Reference Voltage	−1.1	0	+0.1	V
V_{RB}	Reference Voltage	−0.9	−1.0	−2.1	V
V_{RT}-V_{RB}	Input Voltage Range	0.8	1.0	1.2	V

AC Characteristics

Symbol	Parameter	54F/74F			54F		74F		Units
		$T_A = +25°C$ V_{CC} (TTL) = +5.0 V V_{EE} (Analog) = −6.0 V C_L = 50 pF			$T_A = -55°C$ to $+125°C$ V_{CC} (TTL) = +5.0 V ± 10% V_{EE} (Analog) = −6.0 V + 0.25 V C_L = 50 pF		$T_A = 0°C$ to $+70°C$ V_{CC} (TTL) = +5.0 V ± 5% V_{EE} (Analog) = −6.0 V ± 0.25 V C_L = 50 pF		
		Min	Typ	Max	Min	Max	Min	Max	
f_{max}	Maximum Clock Frequency	25	40						MHz
t_{PLH} t_{PHL}	Propagation Delay Aperture Delay		18.0 18.0						ns
t_A	Aperture Delay		10.0						ns
$t_w(H)$ $t_w(L)$	Convert Pulse Width HIGH or LOW	12.0 12.0							ns