

8-BIT ULTRA-HIGH SPEED A/D CONVERTER

MB 40547-7
MB 40547-8

May 1984
Edition 2.0

8-BIT ULTRA HIGH SPEED A/D CONVERTER

The Fujitsu MB 40547 is an ultra-high A/D converter which is fabricated with Fujitsu Advanced Bipolar Technology. The MB 40547 uses the full-parallel comparison technique (flash method) for high speed conversion and can convert wide-band analog signals such as video to digital signals at a sampling rate from DC to 30 Megasamples/sec. without any sampling/holding circuit. Because of such high-speed operation, the MB 40547 is suitable for applications such as color-TV coding, video processing with computer, or radar signal processing.

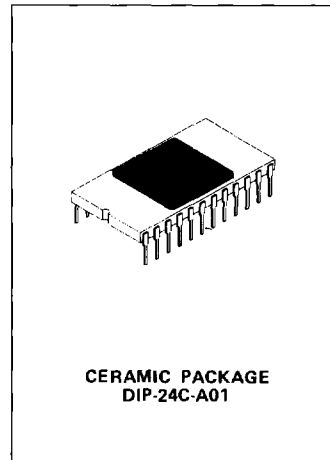
- Resolution: 8 bits
- Linearity: MB 40547-7 : ± 1 LSB
MB 40547-8 : $\pm 1/2$ LSB
- Conversion Rate: 30 MSPS typ.
- Analog Input Voltage: 0 to -2 V
- No need for external sampling/holding circuit
- Digital I/O level: 10 K ECL level
- Output modes: Binary/2's Complement
- Single Power Supply: -5.2 V
- Power consumption: 900 mW typ.
- Package: Standard 24-pin DIP

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Ratings	Unit
Power Supply Voltage	V_{EE}	+0.5 to -7.0	V
Digital Input Voltage	V_{IND}	+0.5 to V_{EE}	V
Analog Input Voltage	V_{INA}	+0.5 to V_{EE}	V
Analog Reference Voltage	V_R	+0.5 to V_{EE}	V
Output Current	I_O	-12*	mA
Storage Temperature	T_{STG}	-55 to +150	°C

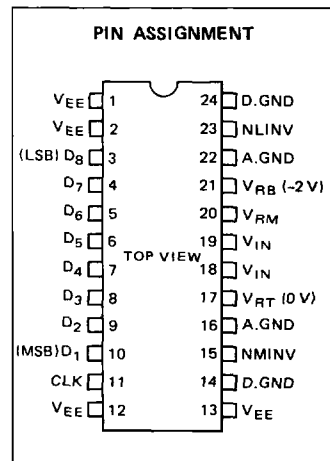
* Negative value of current means that the current flows from the device.

NOTE: Permanent device damage may occur if ABSOLUTE MAXIMUM RATINGS are exceeded. Functional operation should be restricted to the conditions as detailed in the operational sections of this data sheet. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

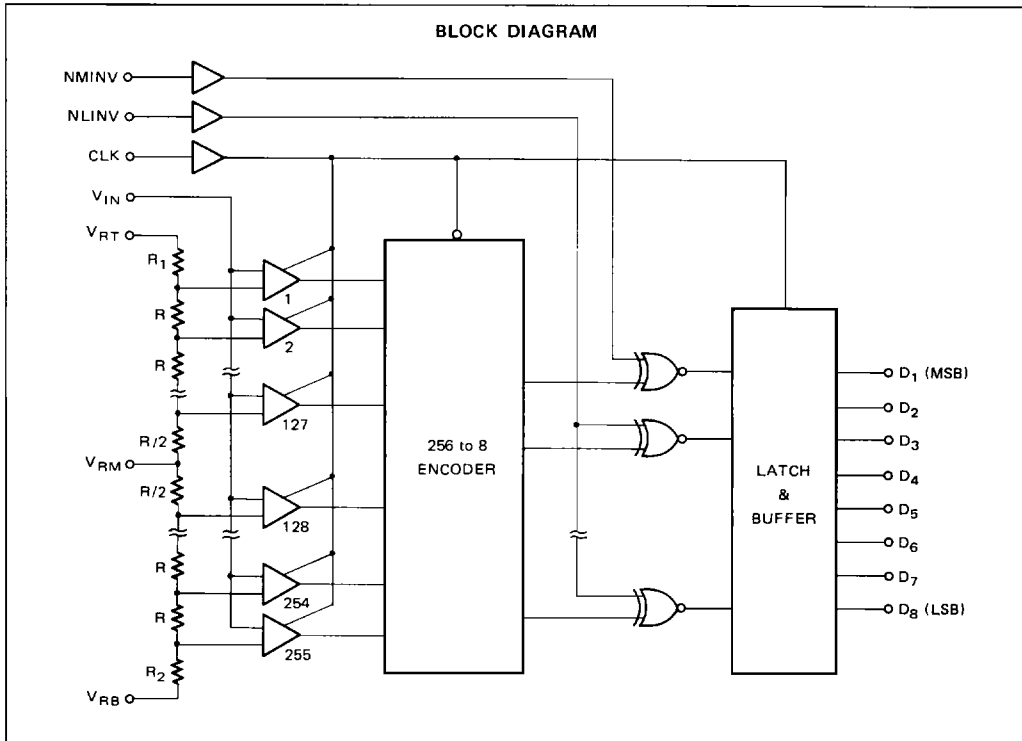


7

PIN ASSIGNMENT



This device contains circuitry to protect the inputs against damage due to high static voltages or electric fields. However, it is advised that normal precautions be taken to avoid application of any voltage higher than maximum rated voltages to this high impedance circuit.



7

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Value			Unit
		Min	Typ	Max	
Power Supply Voltage	V_{EE}	-5.46	-5.20	-4.94	V
Analog Input Voltage	V_{INA}	-2.0		0	V
Analog Reference Voltage (Top Side)	V_{RT}		0	0.1	V
Analog Reference Voltage (Bottom Side)	V_{RB}	-2.1	-2.0		V
Clock Pulse Width at High level	t_{w+}	25			ns
Clock Pulse Width at Low level	t_{w-}	25			ns
Operating Temperature	T_A	0		70	°C

DC CHARACTERISTICS

($V_{EE} = -5.2\text{ V}$, $T_A = 0\text{ to }+70^\circ\text{C}$, Output Circuits: See TEST LOAD CIRCUIT)

Parameter	Symbol	Value			Unit
		Max	Typ	Max	
Resolution				8	bits
Linearity Error	MB 40547-7	E_R		± 0.4	%
	MB 40547-8			± 0.2	
Equivalent Input Resistance	R_{INA}	25			k Ω
Input Capacitance	C_{INA}		130	250	pF
High-level Input Current	I_{IHA}			300	μA
Low-level Input Current	I_{ILA}			290	μA
Reference Current	I_{RB}	-36	-20		mA

AC CHARACTERISTICS

($V_{EE} = -5.2\text{ V}$, $T_A = 0\text{ to }+70^\circ\text{C}$, Output Circuit: See TEST LOAD CIRCUIT)

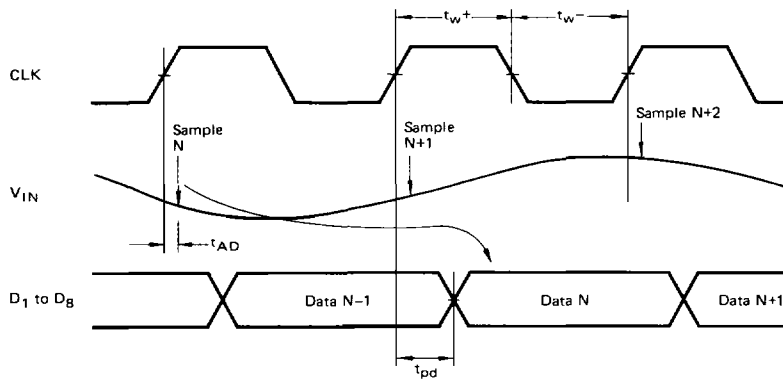
Parameter	Symbol	T_A ($^\circ\text{C}$)	Value			Unit
			Min	Typ	Max	
High-level Output Voltage	V_{OH}	0	-1.000		-0.840	V
		+25	-0.960		-0.810	
		+70	-0.900		-0.720	
Low-level Output Voltage	V_{OL}	0	-1.870		-1.665	V
		+25	-1.850		-1.650	
		+70	-1.830		-1.625	
High-level Input Voltage	V_{IHD}	0	-1.145			V
		+25	-1.105			
		+70	-1.045			
Low-level Input Voltage	V_{ILD}	0			-1.490	V
		+25			-1.475	
		+70			-1.450	
High-level Input Current	I_{IHD}			220	μA	
Low-level Input Current	I_{ILD}			180	μA	
Power Supply Current	I_{EE}		-280	-170	mA	

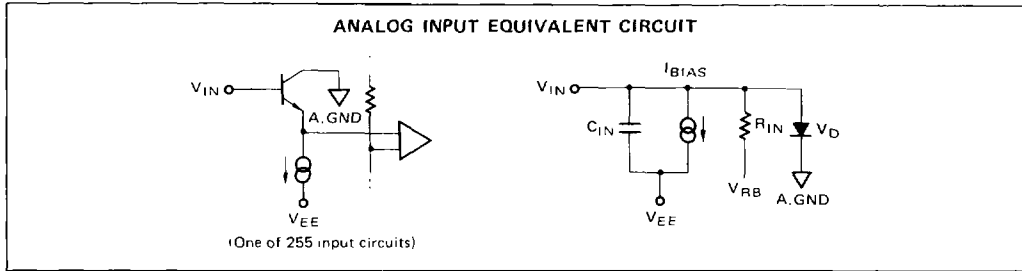
SWITCHING CHARACTERISTICS

($V_{EE} = -5.2\text{ V}$, $T_A = +25^\circ\text{C}$)

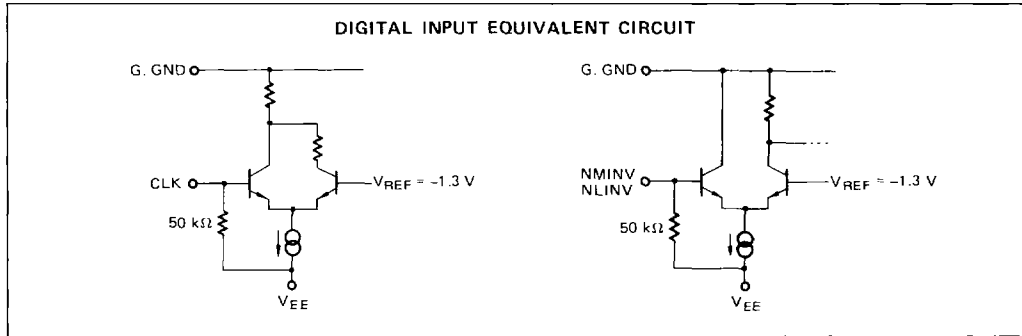
Parameter	Symbol	Value			Unit
		Min	Typ	Max	
Maximum Conversion Rate	FS	20	30		MHz
Aperture Delay	t_{AD}				ns
Digital Output Delay	t_{pd}		15	25	ns

TIMING DIAGRAM

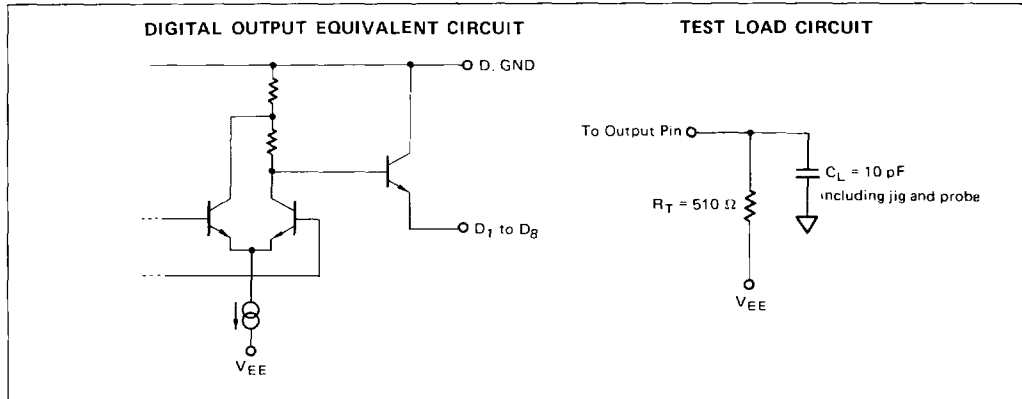




- C_{IN} : Non-linear Emitter-follower Junction Capacitance
- R_{IN} : Linear Resistance Model for Input Current Transition by Comparator Switching:
 Infinite value for $V_{IN} < V_{RB}$ or when CLK = HIGH.
- V_{RB} : Voltage at V_{RB} Terminal.
- I_{BIAS} : Constant Input Bias Current
- V_D : Diode consisting of the base-collector junction of emitter-follower transistor.



7





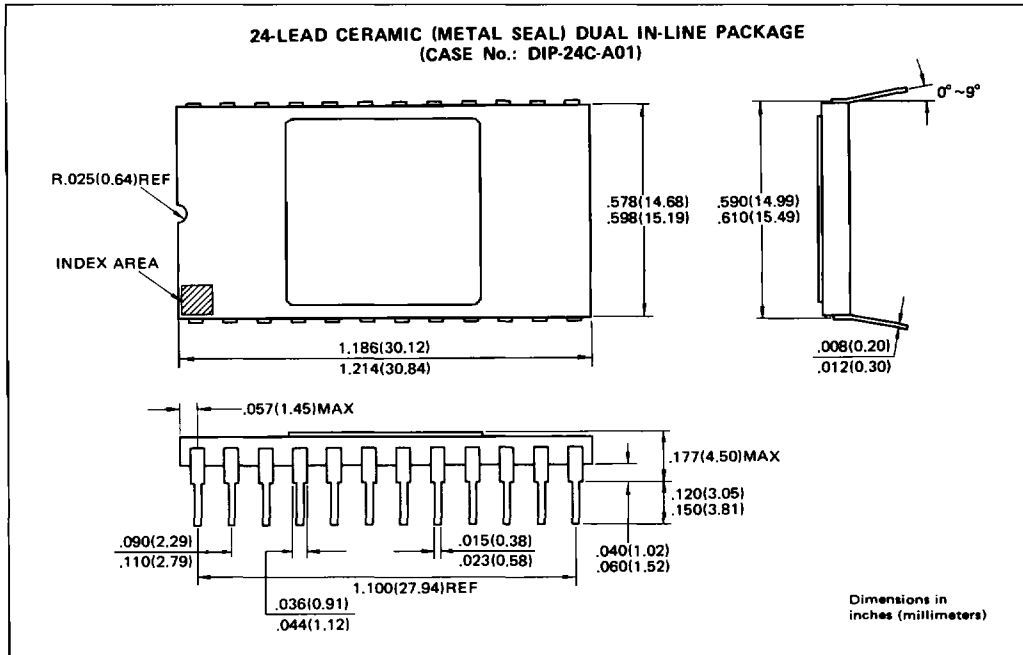
OUTPUT CODES

(Recommended Operating Conditions unless Otherwise noted, $V_{RT} \doteq 0V$, $V_{RD} = -1,000V$, Positive Logic)

STEP	RANGE		BINARY		OFFSET 2'S COMPLEMENT	
	-2.0000 V FS 7.8431 mV Step*1 (V)	-2.0000 V FS 8.000 mV Step*1 (V)	TRUE NMINV = 1 NLINV = 1	INVERTED NMINV = 0 NLINV = 1	TRUE NMINV = 0 NLINV = 0	INVERTED NMINV = 1 NLINV = 0
000	0.0000	0.0000	00000000	11111111	10000000	01111111
⋮	⋮	⋮	⋮	⋮	⋮	⋮
⋮	⋮	⋮	⋮	⋮	⋮	⋮
127	-0.9961	-1.0160	01111111	10000000	11111111	00000000
128	-1.0039	-1.0240	10000000	01111111	00000000	11111111
129	-1.0118	-1.0320	10000001	01111110	00000001	11111110
⋮	⋮	⋮	⋮	⋮	⋮	⋮
⋮	⋮	⋮	⋮	⋮	⋮	⋮
255	-2.0000	-2.0400	11111111	00000000	01111111	10000000

Note *1: Value of analog voltage is defined as value at the center of the step.

PACKAGE DIMENSIONS



7