FUJITSU SEMICONDUCTOR
DATA SHEET

DS04-28202-6E

ASSP

1 CHANNEL 8-BIT VIDEO A/D CONVERTER

MB40578

■ DESCRIPTION

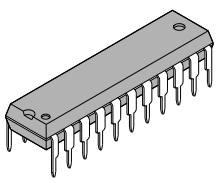
The Fujitsu MB40578 is a low power ultra-high speed video A/D converter fabricated with Fujitsu Advanced Bipolar Technology. The MB40578 also adopts the fully-parallel comparison technique (flash method) for high speed convertion and can convert wide band analog signal such as video signal to digital signal at a sampling rate of DC through 20 Mega-samples/sec. Because of such high-speed poeration, the MB40578 is suitable for digital video applications such as the digital TV, video processing with computer, or radar signal processing.

■ FEATURES

- Resolution: 8 bits
- Linearity error: ±0.2% max. (MB40578)
- Maximum conversion rate: 20 MSPS min.
- Analog input voltage: 3.0V to 5.0V
- Digital I/O level: TTL compatible
- Single power supply: +5V
- Power Dissipation: 480mW typ.
- Package: Standard 22-pin DIP Package: Suffix: -P

■ PACKAGE

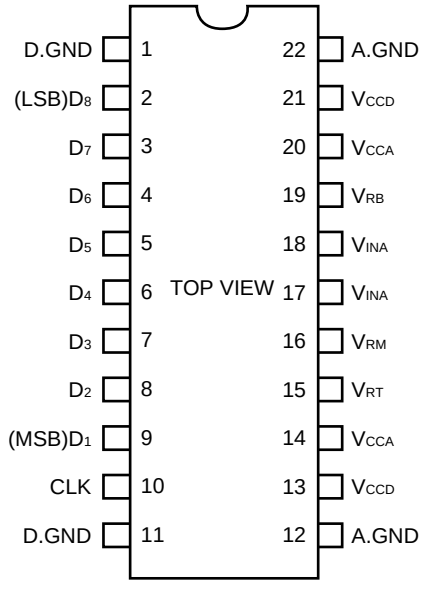
Plastic DIP, 22 pin



(DIP-22P-M04)

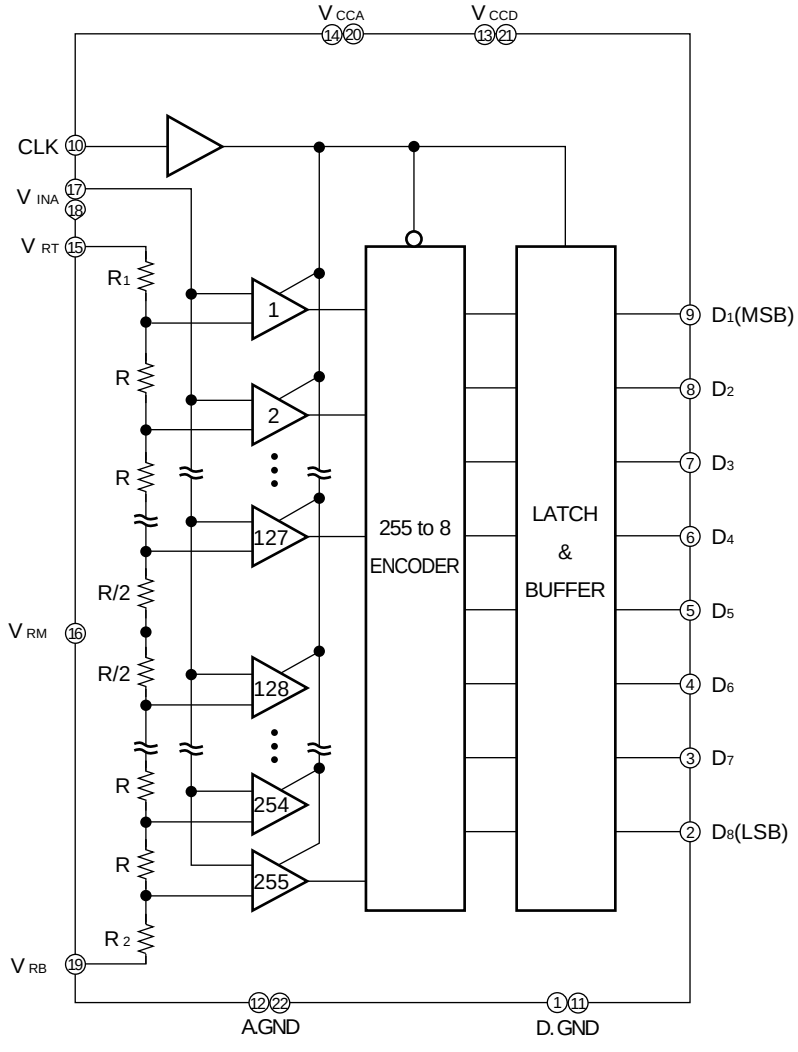
MB40578

■ PIN ASSIGNMENT



MB40578

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Rating	Unit
Power supply voltage	V_{CCA} V_{CCD}	–0.5 to +7.0	V
Digital input voltage	V_{IND}	–0.5 to +7.0	V
Analog input voltage	V_{INA}	–0.5 to V_{CC}+0.5	V
Analog reference voltage	V_{RT}, V_{RB}	–0.5 to V_{CC}+0.5	V
Storage temperature	V_{STG}	–55 to +125	°C

Note: Permanent device damage may occur if the above 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.

■ RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Value			Unit
		Min	Typ	Max	
Power supply voltage*1	V_{CCA} V_{CCD}	4.75	5.00	5.25	V
Analog input voltage*2	V_{INA}	3	—	5	V
Analog reference voltage (Top side)*2	V_{RT}	—	5	5.1	V
Analog reference voltage (Bottom side)*2	V_{RB}	2.9	3	—	V
Digital high-level output current	I_{OHD}	–400	—	—	µA
Digital low-level output current	I_{OLD}	—	—	4	mA
Clock pulse width at high level	t_{W+}	25	—	—	ns
Clock pulse width at low level	t_{W-}	25	—	—	ns
Operating temperature	Ta	0	—	70	°C

Notes: *1: Please keep V_{CCA} and V_{CCD} at the same potential.
*2: $V_{RB} < V_{INA} < V_{RT}$, $V_{RT} - V_{RB} = 2V + 0.1V$.

■ ELECTRICAL CHARACTERISTICS

1. Analog DC Characteristics

(V_{CCA} = V_{CCD} = 5V ± 5%, Ta = 0 to 70°C)

Parameter	Symbol	Condition	Value			Unit
			Min	Typ	Max	
Resolution			—	—	8	bits
Linearity error	LE	DC	—	—	±0.2	%
Equivalent resistance for analog input	R_{INA}		50	—	—	kΩ
Analog input capacitance	C_{INA}		—	120	230	pF
Analog high-level input current	I_{IHA}		—	—	150	µA
Analog low-level input current	I_{ILA}		—	—	145	µA
Reference current	I_{RB}	V_{RT} = 5V V_{RB} = 3V	–15	–9	—	mA

2. Digital DC Characteristics

(V_{CCA} = V_{CCD} = 5V ± 5%, Ta = 0 to 70°C)

Parameter	Symbol	Condition	Value			Unit
			Min	Typ	Max	
High-level output voltage	V_{OH}	I_{OH} = –400 µA	2.7	—	—	V
Low-level output voltage	V_{OL}	I_{OL} = 1.6 mA	—	—	0.4	V
High-level input voltage	V_{IHD}		2	—	—	V
Low-level input voltage	V_{ILD}		—	—	0.8	V
Maximum input current	I_{ID}	V_{ID} = 7V	—	—	100	µA
High-level input current	I_{IHD}	V_{IHD} = 2.7V	—	0	20	µA
Low level input current	I_{ILD}	V_{ILD} = 0.4V	–400	–40	—	µA
Power supply current	I_{CC}		—	92	160	mA

3. Switching Characteristics

(V_{CCA} = V_{CCD} = 5V ± 5%, Ta = 0 to 70°C)

Parameter	Symbol	Condition	Value			Unit
			Min	Typ	Max	
Maximum conversion rate	FS		20	30	—	MSPS
Digital output delay time	tpd		5	15	40	ns

Figure 1 Timing Diagram

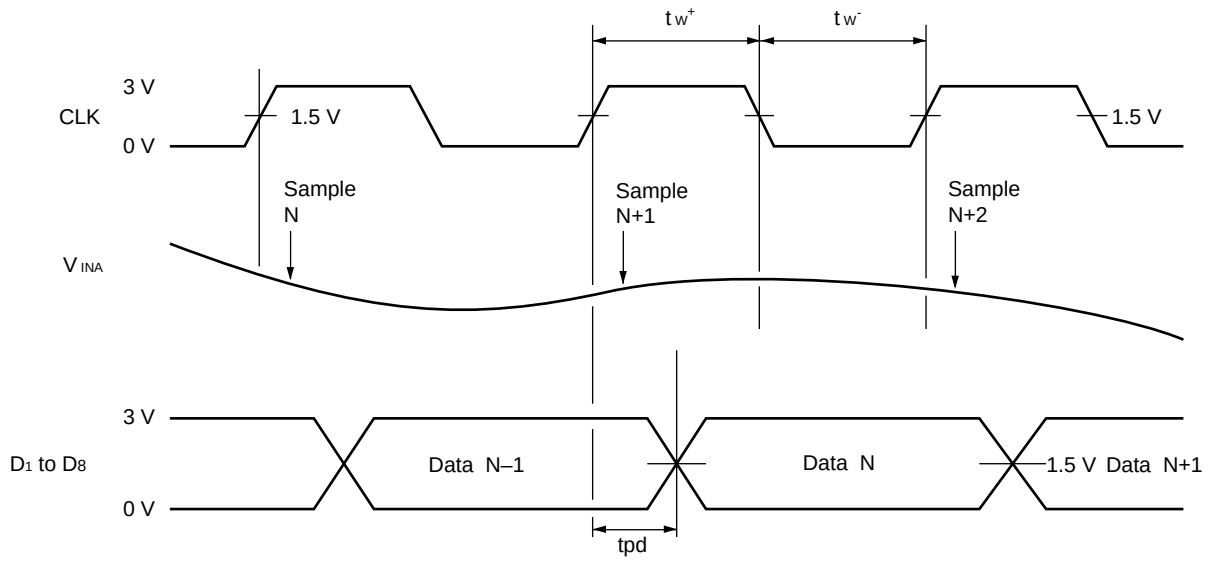
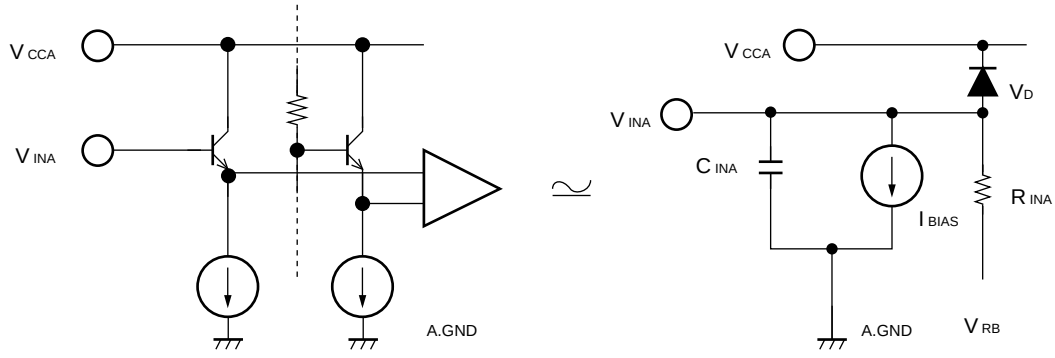


Figure 2 Analog Input Equivalent Circuit



X255 Circuits

C_{INA}: Non-linear Emitter-follower Junction Capacitance
R_{INA}: 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: The base-collector junction diode of emitter-follower transistor.

Figure 3 Digital Input Equivalent

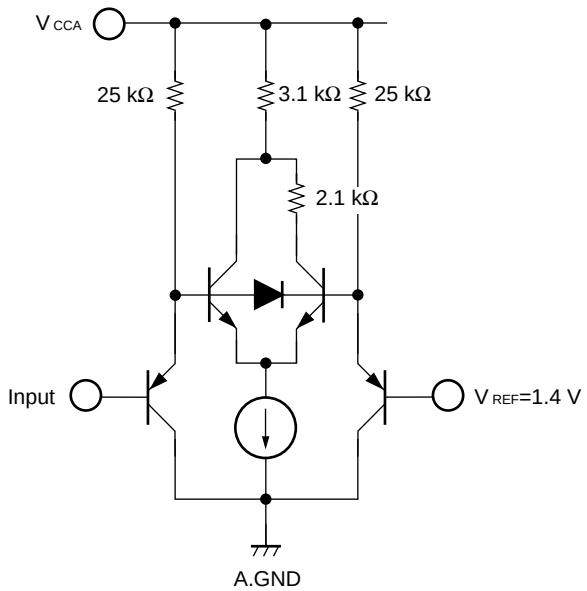
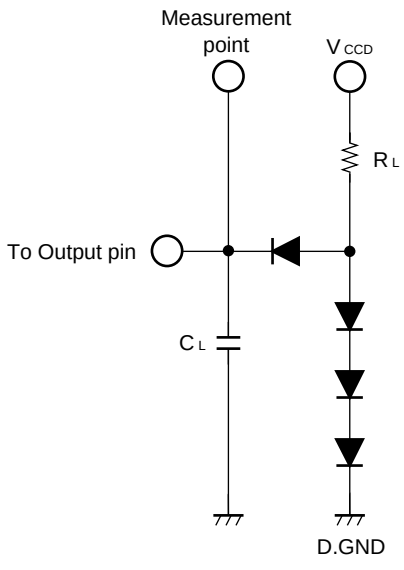


Figure 4 Load Circuit for Output Buffer



Note RL = 2 kΩ
CL = 15 pF including scope and jig capacitance
Diodes:IN3064 or equivalent

Figure 5 Output Code

(V_{CC}=5.0 V,V_{RT}≒5.0 V,V_{RB}≒3.0 V)

Step	Analog Input Voltage	OUTPUT VOLTAGE(V)
0	2.960 V	00000000
1	2.968 V	00000001
•	•	•
•	•	•
•	•	•
127	3.976 V	01111111
128	3.984 V	10000000
129	3.992 V	10000001
•	•	•
•	•	•
•	•	•
245	4.992 V	1111110
255	5.000 V	11111111

Note : Ajust V_{ZT}=2.964 V and V_{FT}=4.996 V with V_{RT} and V_{RB}.The Analog Input Voltage are the center values of each step.

Figure 6 Ideal Conversion Characteristics

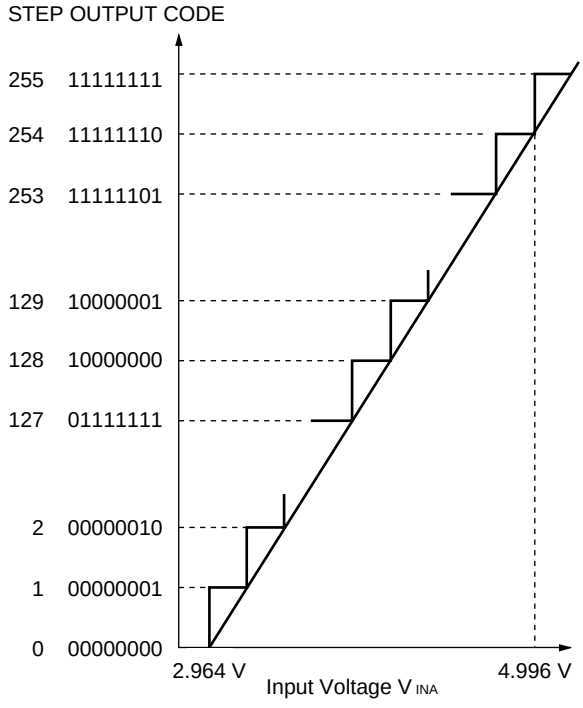
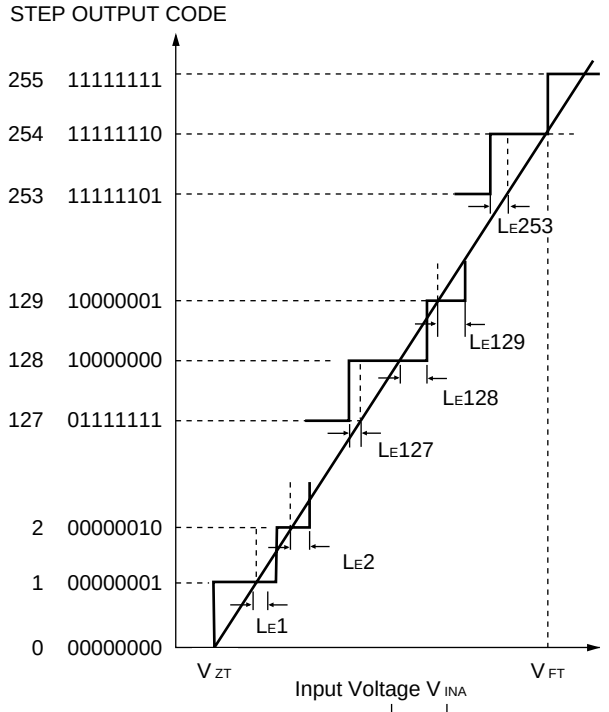
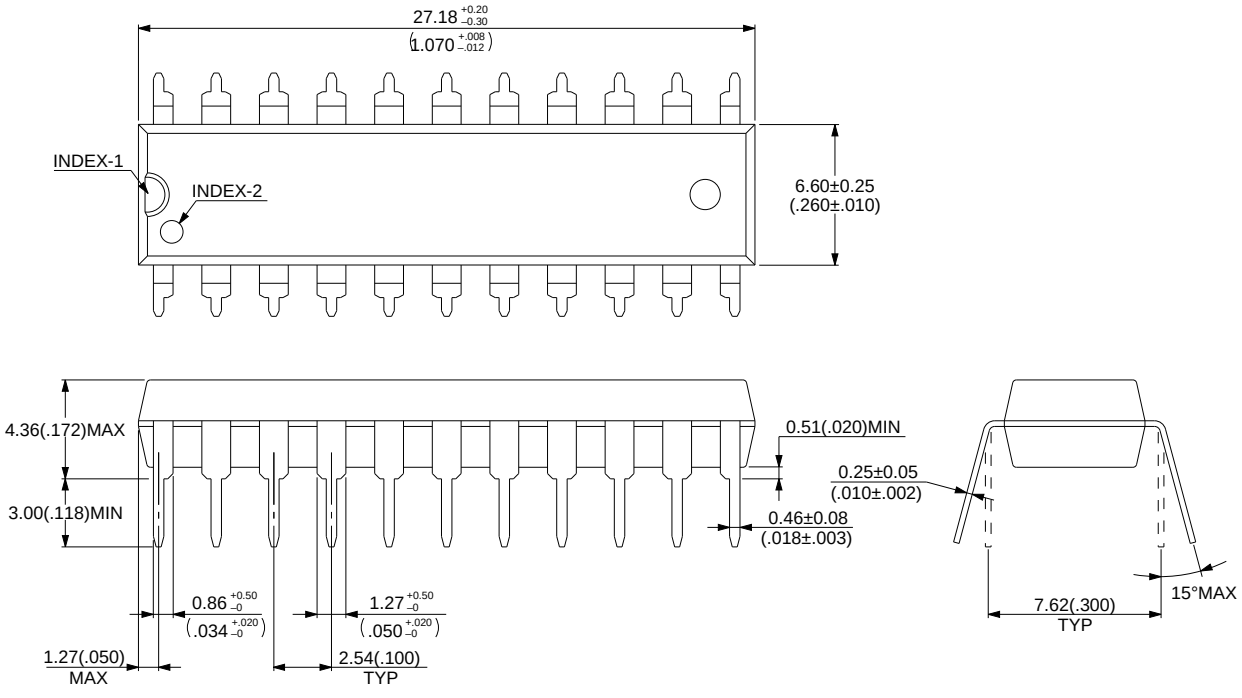


Figure 7 Actual Conversion Characteristics



■ PACKAGE DIMENSION

Plastic DIP, 22 pin
(DIP-22P-M04)



Dimensions in mm (inch)

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