

10-BIT HIGH SPEED D/A CONVERTER

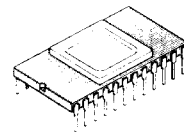
The Fujitsu MB40748 is a 10 bit Ultra-high speed low-power Digital to Analog Converter which is fabricated with Fujitsu Advanced Bipolar Technology. The device can convert 10-bit digital signals into analog signals from DC to 20 Mega-samples/sec. (MSPS). Because of such high speed operation, the device is suitable for applications such as color television decoding, digital TV system and video processing with computer.

- Resolution : 10 bits
- Linearity MB40748-8 : $\pm 0.2\%$ max. (8 bit accuracy)
MB40748-9 : $\pm 0.1\%$ max. (9 bit accuracy)
MB40748-10 : $\pm 0.05\%$ max. (10 bit accuracy)
- Conversion Rate : 20 MSPS min.
- Analog Output Voltage : 0V to $-1V$
- Digital Input Voltage : 10k ECL level
- Input Code : Binary or 2's complement
- Single Power Supply : $-5.2V$
- Power Dissipation : 300mW typ.
- Package : DIP-24C-A06
DIP-24C-A10

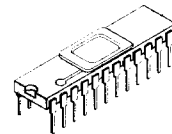
ABSOLUTE MAXIMUM RATINGS

| Parameter | Symbol | Ratings | Unit |
|--------------------------|-----------|------------------|-------------|
| Supply Voltage | V_{EE} | +0.5 to -7.0 | V |
| Digital Input Voltage | V_{IND} | +0.5 to V_{EE} | V |
| Analog Reference Voltage | V_{REF} | +0.5 to V_{EE} | V |
| Storage Temperature | T_{STG} | -55 to $+150$ | $^{\circ}C$ |

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.

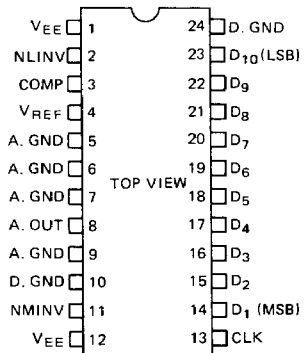


CERAMIC PACKAGE
DIP-24C-A06



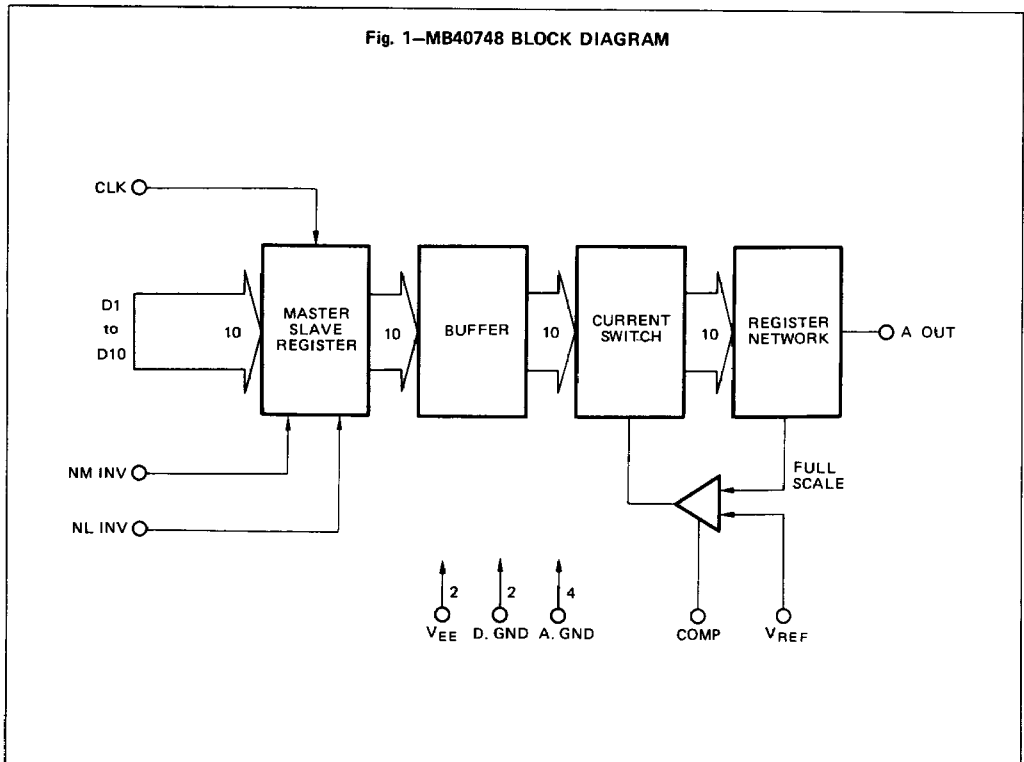
CERAMIC PACKAGE
DIP-24C-A10

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.

Fig. 1—MB40748 BLOCK DIAGRAM



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RECOMMENDED OPERATING CONDITIONS

| Parameter | Symbol | Value | | | Unit |
|---------------------------------|-------------|-------|-------|-------|------|
| | | Min | Typ | Max | |
| Supply Voltage | V_{EE} | -5.46 | -5.20 | -4.94 | V |
| Analog Reference Voltage | V_{REF} | -1.2 | -1.0 | -0.8 | V |
| Clock Pulse Width at High-level | t_{W}^{+} | 15 | | | ns |
| Clock Pulse Width at Low-level | t_{W}^{-} | 15 | — | | ns |
| Data Setup Time | t_S | 20 | | | ns |
| Data Hold Time | t_H | 0 | | | ns |
| Operating Temperature | T_A | 0 | | 70 | °C |
| Phase Compensation Capacitance* | C_{COMP} | 1 | | | μF |

Note: The capacitor should be connected between COMP and V_{EE}

ELECTRICAL CHARACTERISTICS

(Recommended Operating Conditions unless otherwise noted.) ($V_{EE} = -5.2\text{ V}$, $T_A = 0\text{ V to }+70\text{ V }^{\circ}\text{C}$)

ANALOG DC CHARACTERISTICS

| Parameter | Condition & Note | Symbol | Value | | | Unit |
|----------------------------------|--|-----------|-------|-------|-------|------|
| | | | Min | Typ | Max | |
| Resolution | | | | | 10 | bits |
| Linearity Error | MB40748-8 | LE | | | ±0.2 | % |
| | MB40748-9 | | | | ±0.1 | % |
| | MB40748-10 | | | | ±0.05 | % |
| Full-scale Analog Output Voltage | $V_{REF} = -1.00\text{V}$, A. OUT is open. | V_{OFS} | -1.06 | -1.00 | -0.94 | V |
| Zero-scale Analog Output Voltage | $V_{REF} = -1.00\text{V}$, A. OUT is open. | V_{OZS} | -15 | 0 | 15 | mV |
| Reference Input Current | $V_{REF} = -1.00\text{V}$ | I_{REF} | | | 10 | μA |
| Output Impedance | $T_A = 25^{\circ}\text{C}$ | Z_{OUT} | 70 | 80 | 90 | Ω |

ELECTRICAL CHARACTERISTICS (continued)

(Recommended Operating Conditions unless otherwise noted.) ($V_{EE} = -5.2\text{ V}$, $T_A = 0\text{ to }+70^\circ\text{C}$)

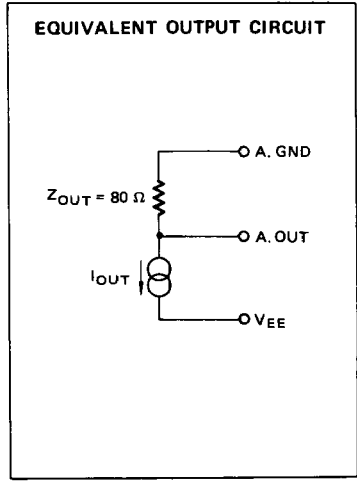
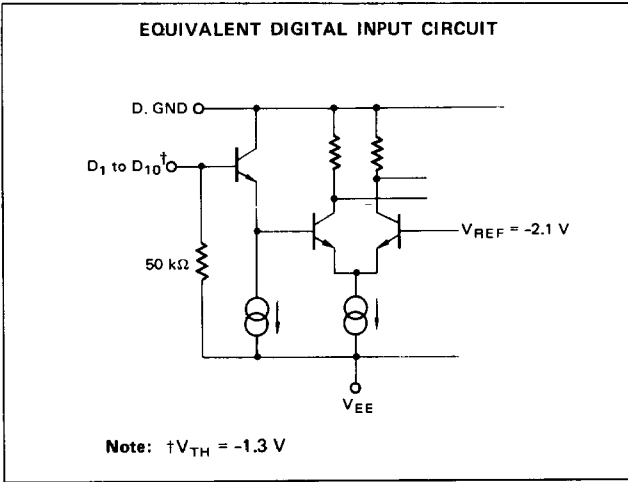
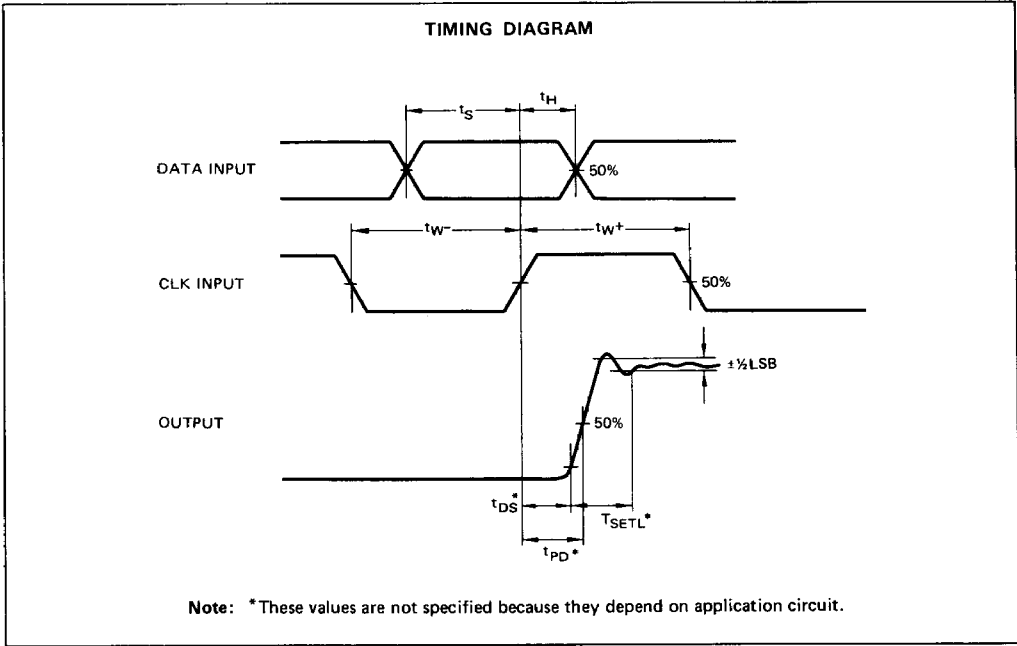
DIGITAL DC CHARACTERISTICS

| Parameter | Conditions | Symbol | Value | | | Unit |
|----------------------------------|----------------------------|-----------|--------|-----|--------|---------------|
| | | | Min | Typ | Max | |
| High-level Digital Input Voltage | $T_A = 0^\circ\text{C}$ | V_{IHD} | -1.145 | | | V |
| | $T_A = +25^\circ\text{C}$ | | -1.105 | | | |
| | $T_A = +70^\circ\text{C}$ | | -1.045 | | | |
| Low-level Digital Input Voltage | $T_A = 0^\circ\text{C}$ | V_{ILD} | | | -1.490 | V |
| | $T_A = +25^\circ\text{C}$ | | | | -1.475 | |
| | $T_A = +70^\circ\text{C}$ | | | | -1.450 | |
| High-level Digital Input Current | | I_{IHD} | | | 250 | μA |
| Low-level Digital Input Current | | I_{ILD} | 0.5 | | 200 | μA |
| Supply Current | $V_{REF} = -1.00\text{ V}$ | I_{EE} | -90 | -56 | | mA |

SWITCHING CHARACTERISTICS

($V_{EE} = -5.2\text{ V}$, $T_A = 0\text{ to }+70^\circ\text{C}$)

| Parameter | Conditions | Symbol | Value | | | Unit |
|-------------------------|------------|--------|-------|-----|-----|------|
| | | | Min | Typ | Max | |
| Maximum conversion Rate | | FS | 20 | 30 | | MSPS |



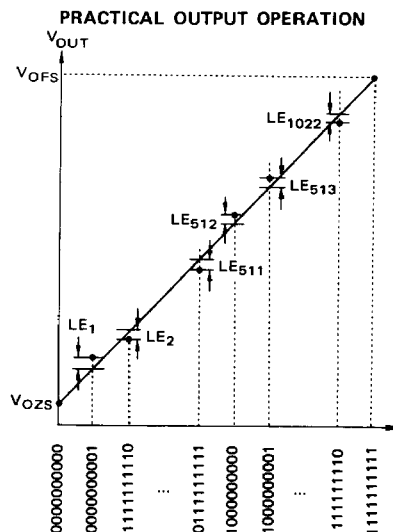
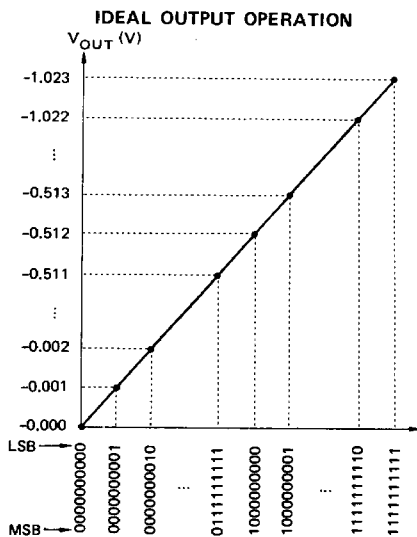
OUTPUT VOLTAGE

(Recommended Operating Conditions unless otherwise noted. $V_{REF} = -1.024$ V, Positive Logic)

(1 LSB = 1 mV)

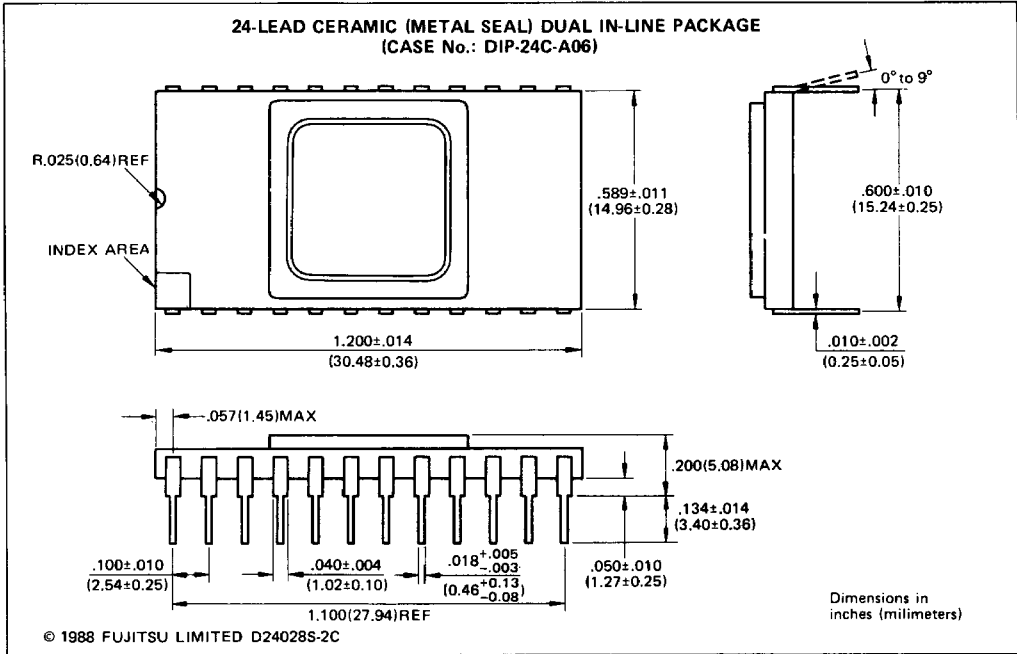
| STEP | BINARY | | | OFFSET 2'S COMPLEMENT | | Ideal Output Voltage (V) |
|------|---------------|---------------------|-----------------|-----------------------|-----------------|--------------------------|
| | Digital Input | Non-inverting Input | Inverting Input | Non-inverting Input | Inverting Input | |
| | NMINV | 1 | 0 | 0 | 1 | |
| | MLINV | 1 | 0 | 1 | 0 | |
| 0 | | 000000000 | 111111111 | 100000000 | 011111111 | -0.000 |
| 1 | | 000000001 | 111111110 | 100000001 | 011111110 | -0.001 |
| ⋮ | | ⋮ | ⋮ | ⋮ | ⋮ | ⋮ |
| 511 | | 011111111 | 100000000 | 111111111 | 000000000 | -0.511 |
| 512 | | 100000000 | 011111111 | 000000000 | 111111111 | -0.512 |
| 513 | | 100000001 | 011111110 | 000000001 | 111111110 | -0.513 |
| ⋮ | | ⋮ | ⋮ | ⋮ | ⋮ | ⋮ |
| 1022 | | 111111110 | 000000001 | 011111110 | 100000001 | -1.022 |
| 1023 | | 111111111 | 000000000 | 011111111 | 100000000 | -1.023 |

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$$\text{Linearity Error} = \frac{|LE_n|_{\max}}{|FS|}$$

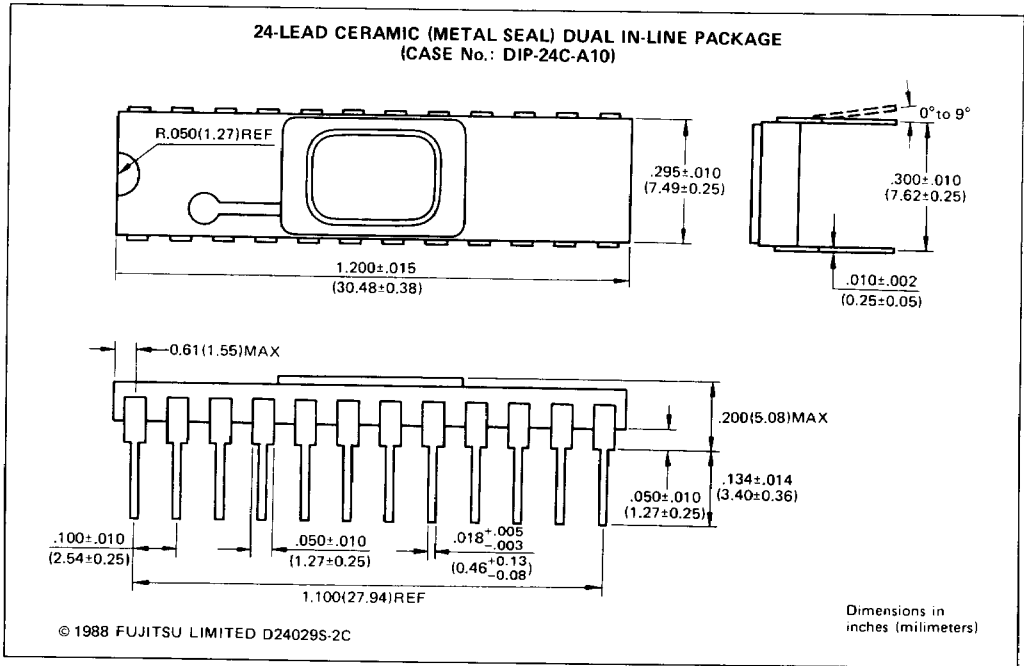
PACKAGE DIMENSIONS





MB40748-8
MB40748-9
MB40748-10

PACKAGE DIMENSIONS (continued)



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