DS04-28315-2E

ASSP

3-Channel 8-Bit D/A Converter

MB40958

■ DESCRIPTION

The MB40958 is an 8-bit resolution high-speed digital-to-analog converter, designed for video processing applications.

The MB40958 has 8-bit resolution 3 channel D/A converters. Digital signals are input to the 8-bit digital input ports, and the input digital data are converted to the analog signals in minimum 60 Mega sample per seconds (MSPS). The analog output voltage is provided in a range of DC +3V to +5V (2Vp-p level).

The MB40958 is fabricated by the Fujitsu's advanced bipolar process and housed in a 48-pin plastic QFP.

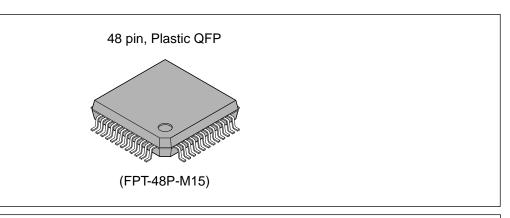
The MB40958 is designed for video signal processing applications, and it is suitable for TVs and VCRs.

■ FEATURES

- 8-bit x 3 channels D/A converters
- Max. 60 MHz input clock frequency providing 60 MSPS data conversion rate
- Linearity error : Max. +/-0.2%
- Analog input voltage range: 3V to 5V (2Vp-p level)
- Digital input voltage level: TTL level

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■ PACKAGE

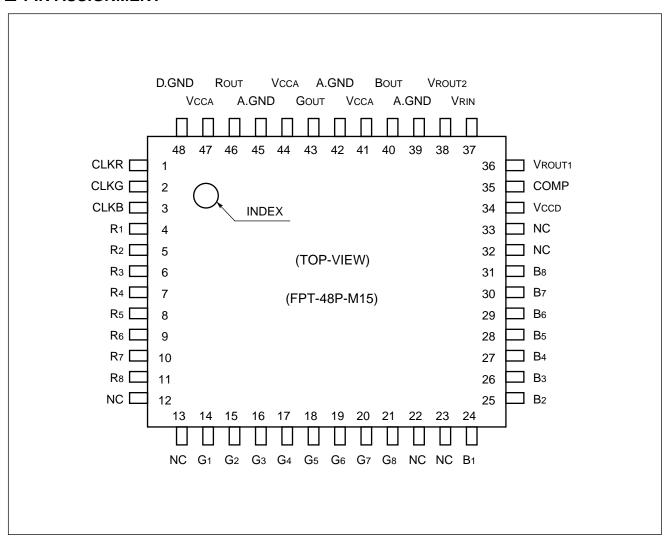


This device contains circuitry to protect the inputs against damage due to high static voltages or electric fields. However, it is advised that normal precautions be taken to avoid application of any voltage higher than maximum rated voltages to this high impedance circuit.

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- On-chip reference voltage outputs :
 - Output by resistor divided (0.6 x Vcca)
 - Output by band gap reference (Vcca 2[V])
- Low power consumption : Typical 400mW at 2Vp-p analog output voltage
 Typical 300mW at 1Vp-p analog output voltage
- Single +5V power supply
- Operating temperature range : -20°c to +70°c
- Fujitsu's advanced bipolar process
- Package: 48-pin plastic QFP (Suffix:-PF)

■ PIN ASSIGNMENT



■ PIN DESCRIPTION

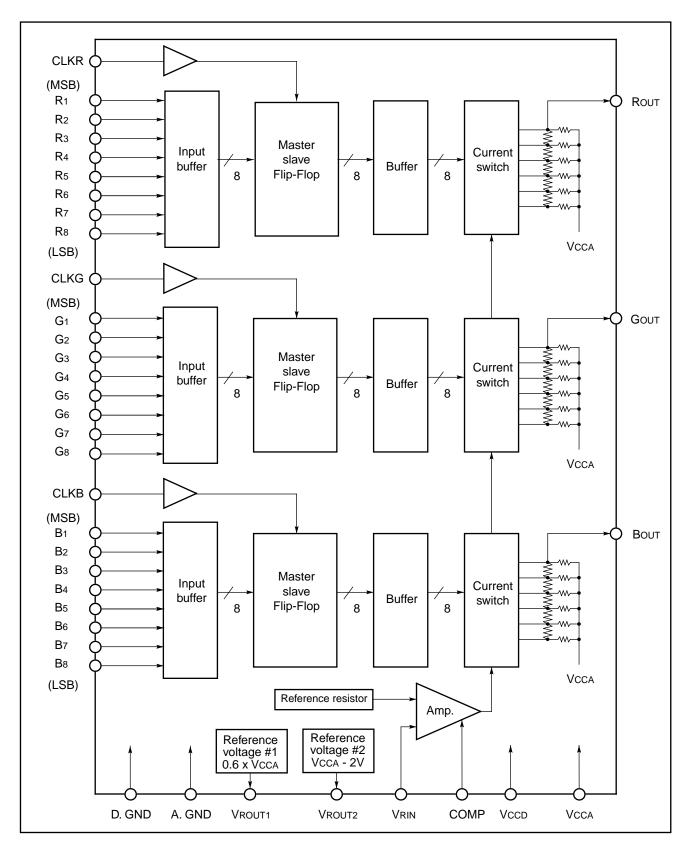
Symbol	Pin No.	Туре	Name & Function				
Power Supply							
VCCD	34	_	+5V DC power supply pins for digital block.				
D. GND	48	_	Ground pin for digital block.				
VCCA	41, 44, 47	_	DC power supply pins for analog block.				
A. GND	39, 42, 45	_	Ground pins for analog block.				
Clock		•					
CLKR	1	I	Clock input pin for R channel.				
CLKG	2	I	Clock input pin for G channel.				
CLKB	3	I	Clock input pin for B channel.				
Digital Input							
R1 R2 R3 R4 R5 R6 R7 R8	4 5 6 7 8 9 10	I	Digital data input pins for R channel. 8-bit data is input to the pins. The R ₁ pin is the MSB and the R ₈ pin is the LSB.				
G1 G2 G3 G4 G5 G6 G7 G8	14 15 16 17 18 19 20 21	I	Digital data input pins for G channel. 8-bit data is input to the pins. The G ₁ pin is the MSB and the G ₈ pin is the LSB.				
B1 B2 B3 B4 B5 B6 B7 B8	24 25 26 27 28 29 30 31	I	Digital data input pins for B channel. 8-bit data is input to the pins. The B ₁ pin is the MSB and the B ₈ pin is the LSB.				

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(Continued)

Symbol	Pin No.	Туре	Name & Function				
Analog Output	'						
Rout	46	0	Analog signal output pin for R channel.				
Gout	43	0	Analog signal output pin for G channel.				
Воит	40	0	Analog signal output pin for B channel.				
Reference Volta	ige						
VRIN	37	I	Reference voltage input pin. This pin is used to set the analog output dynamic range. When the internal reference voltage is used, this pin is connected with VROUT1 pin (36 pin) or VROUT2 pin (38 pin). When the reference voltage is supplied from the external generator, 2.65V to 4.3V or VCCA - VRIN = 0.7V to 2.2V is input to this pin.				
VROUT1	36	0	Reference voltage output #1 pin. The output voltage is set to 0.6 x VCCA by the resistor divided method. When this pin is connected w VRIN pin (37 pin), an analog voltage is output from this pin in a rang 0.6 x VCCA to VCCA.				
VROUT2	38	0	Reference voltage output #2 pin. The output voltage is set to VCCA - 2V by the band-gap reference method. When this pin is connected with VRIN pin (37 pin), an analog voltage is output from this pin in a range of VCCA - 2V to VCCA.				
Compesation C	apacitor						
COMP	35	_	Phase compesation capacitor pin. A phase compesation capacitor of 0.1µF or greater is connected between this pin and A. GND pin.				
No Connection							
NC	12, 13, 22, 23, 32, 33	_	No connection, Leave those pins open.				

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATINGS

(A. GND = D. GND = 0V)

Parameter	Symbol	Rating	Unit	
Power supply voltage	Vcca, Vccd	-0.5 to +7.0	V	
Power supply voltage difference	VCCD — VCCA	1.5	V	
Analog reference voltage	Vrin	-0.5 to Vcca +7.0	V	
Digital input Voltage	VID	-0.5 to +7.0	V	
Storage temperature	Tstg	-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

(A. GND = D. GND = 0V)

Parameter	Symbol		Unit		
Parameter	Symbol	Min.	Тур.	Max.	
Power supply voltage	Vcca, Vccd	4.75	5.00	5.25	V
Power supply voltage difference	Vcca – Vccd	-0.2	_	0.2	V
Analog reference voltage	Vcca – Vrin	0.70	2.00	2.20	V
Analog reference voltage	Vrin	2.65	3.00	4.30	V
Digital "H" level input voltage	VIHD	2.0	_	_	V
Digital "L" level input voltage	VILD	_	_	0.8	V
Clock frequency	fclk	_	_	60	MHz
Setup time	tsu	8.0	_	_	ns
Hold time	th	2.0	_	_	ns
Minimum clock "H" level pulse width	tw⊢	6.5	_	_	ns
Minimum clock "L" level pulse width	twL	6.5	_	_	ns
Phase compesation capacitance	Ссомр	0.1	_	_	μF
Operating ambient temperature	Тор	-20	_	70	°C

■ ELECTRICAL CHARACTERISTICS (Recommended Operating Conditions Otherwise Noted)

1. DC Characteristics

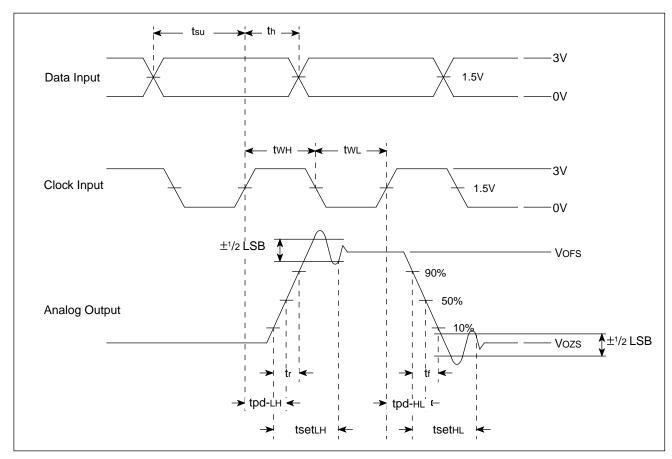
Parameter	Symbol	Value			Unit	Remark	
Farameter	Symbol	Min.	Тур.	Max.	Onit	Keiliaik	
Resolution	_		_	8	bit	_	
Linearity error	LE	_	_	±0.2	%	DC Accuracy	
Digital "H" level input current	IIHD			20	μΑ	VIHD = 2.7 (V)	
Digital "L" level input current	lild	-100	_	_	μΑ	VILD = 0.4 (V)	
Reference input current	IRIN	_	_	10	μΑ	VRIN = 3.000 (V)	
Reference voltage (Resister divided)	VROUT1	2.900	3.000	3.100	V	VCCA = VCCD = 5.00 (V)	
Reference voltage (BGR)	VROUT2	VCCA -2.100	VCCA -2.000	VCCA -1.900	V	_	
Reference voltage (BGR)	_	_	100	_	ppm/°C	_	
RGB output voltage ratio	FSR	0	_	6	%	VCCA = VCCD = 5.00 (V)	
Full-scale output voltage	Vofs	VCCA -20	VCCA	_	mV	_	
Zero-scale output voltage	Vozs	2.938	3.008	3.078	V	VCCA = VCCD = 5.00 (V) VRIN = 3.000 (V)	
Output resistance	Ro	192	240	288	Ω	Ta = 25°C	
Supply current	Icc	_	80*	133	mA	VCCA = VCCD = 5.25 (V) VRIN = VROUT1	

^{*:} VCCA = VCCD = 5.00V

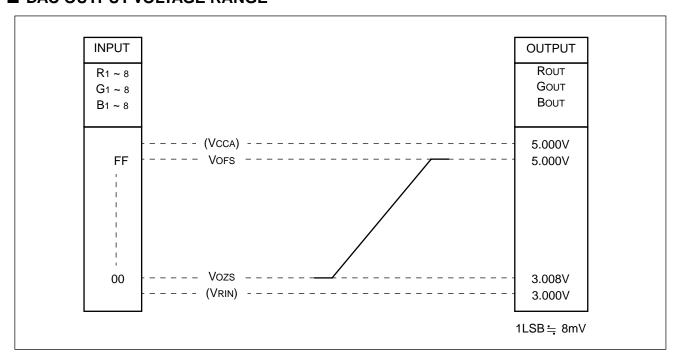
2. AC Characteristics

Parameter	Symbol	Value			Unit	Remark	
Farameter	Symbol	Min.	Тур.	Max.	Oill	Nemark	
Maximum conversion rate	Fs	60	_	_	MSPS		
Output propagation delay time	tpd	_	7	_	ns	Terminated A. OUT pin with 240Ω, CL = 15pF	
Output rising time	tr	_	5	_	ns		
Output falling time	tf	_	5		ns	Will 2 1012, OL = 10p1	
Setting time	tset		15		ns		

■ ACTIMINT CHART



■ DAC OUTPUT VOLTAGE RANGE



■ CALCULATION OF DAC OUTPUT VOLTAGE AT IDEAL CONVERSION

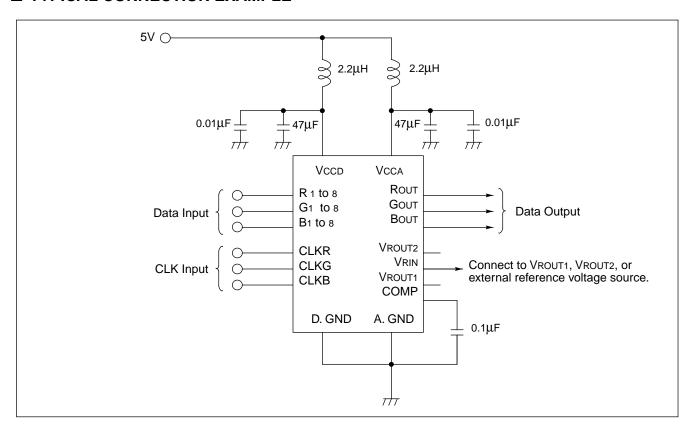
ROUT (GOUT, BOUT) = VCCA
$$-\frac{255-N}{256}$$
 X (VCCA - VRIN)

[N : Digital Input Code (0 to 255)]

VOFS = VCCA

VOZS = VCCA $-\frac{255}{256}$ X (VCCA - VRIN)

■ TYPICAL CONNECTION EXAMPLE



■ NOTES ON USE

1. Power Supply Patterns of the PCB

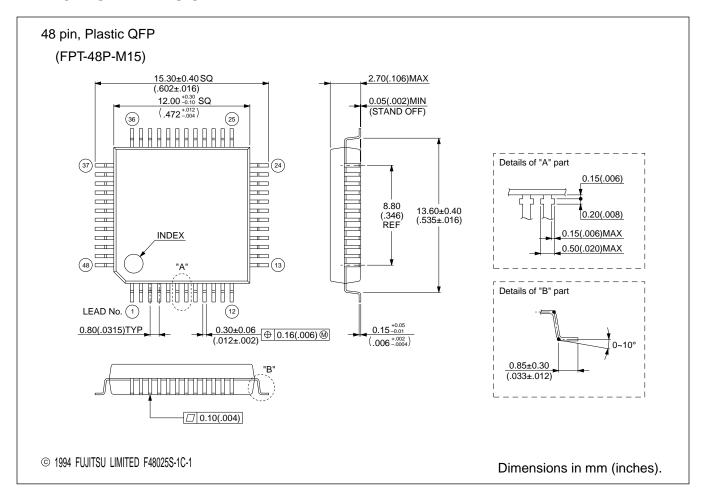
The power supply wire patterns (Vcc and GND patterns) of the PCB should be designed as wide as possible in order to reduce parasitic impedance.

2. Switching Noise

In order to reduce switching noise as much as possible, noise limit capacitor must be connected between Vccd and D. GND pins and Vcca and A. GND pins.

In this case, the capacitor should be connected to the GND pins side as near as possible.

■ PACKAGE DIMENSION



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