FUJITSU SEMICONDUCTOR
DATA SHEET

DS04-28319-2E

ASSP

CMOS

50 MSPS 3ch 8-bit D/A Converter

MB40C958V

■ DESCRIPTION

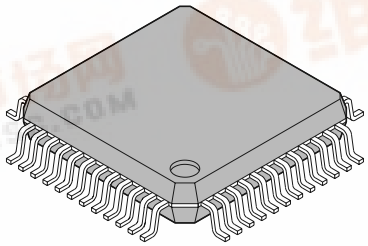
The MB40C958V is a high-speed CMOS process based D/A converter provided with the three-channel I/O for RGB, allowing for independent control of the three channels.

■ FEATURES

- Resolution : 8 bits
- Linearity error : ±0.5 LSB (max)
- Differential linearity error : ±1.0 LSB (max)
- Maximum conversion rate : 50 MSPS (min)
- Supply voltage : single +5 V
- Digital input voltage range : TTL level
- Analog output voltage range : 2 Vp-p (0 to 2 V)
- Dissipation power : 220 mW (standard: analog output for RL = 200 Ω, 2 Vp-p output)
- Additional capabilities : Reference voltage generator, power saving function, independent 3-ch V_{REF}
- Package : LQFP48

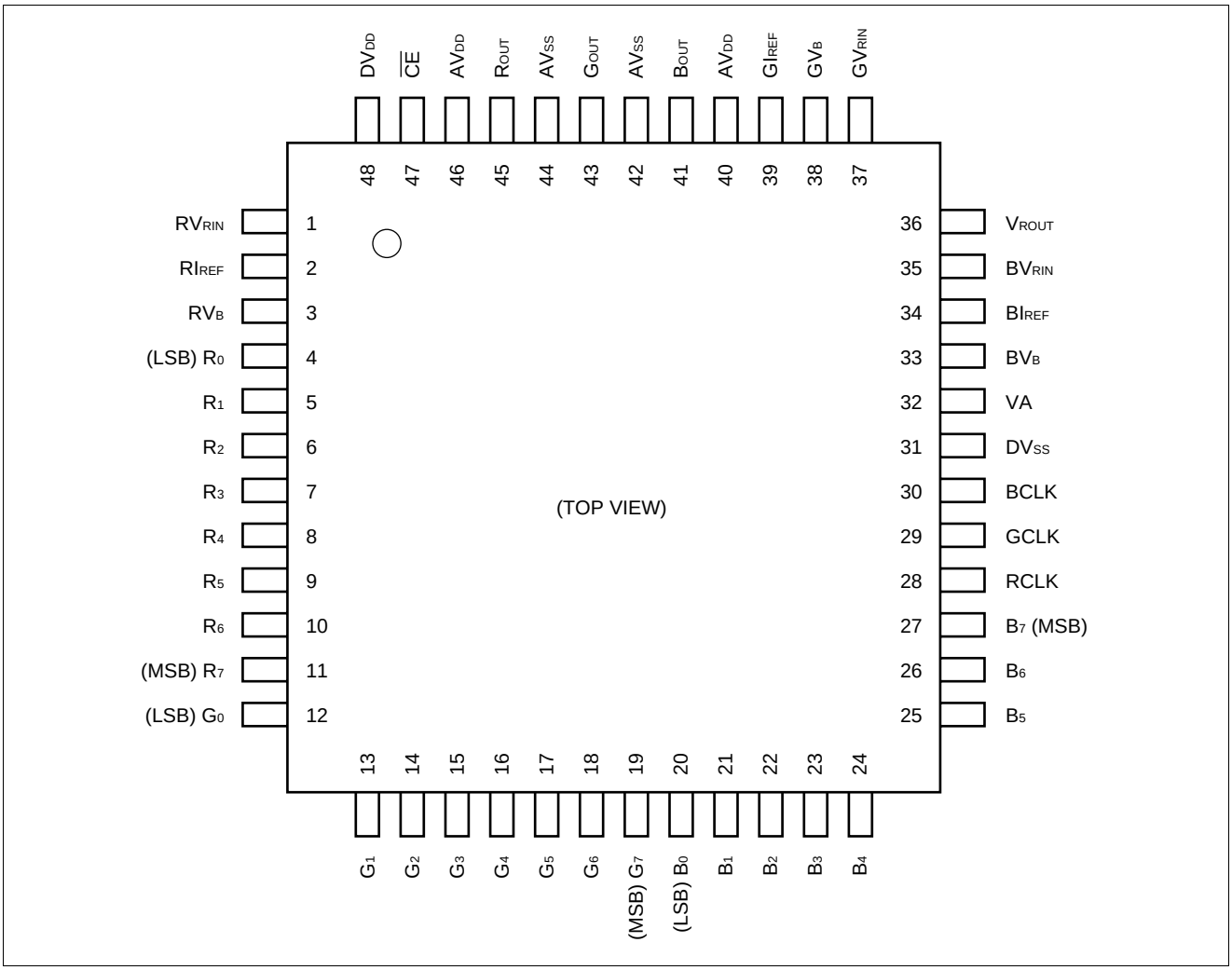
■ PACKAGE

48-pin Plastic LQFP



(FPT-48P-M05)

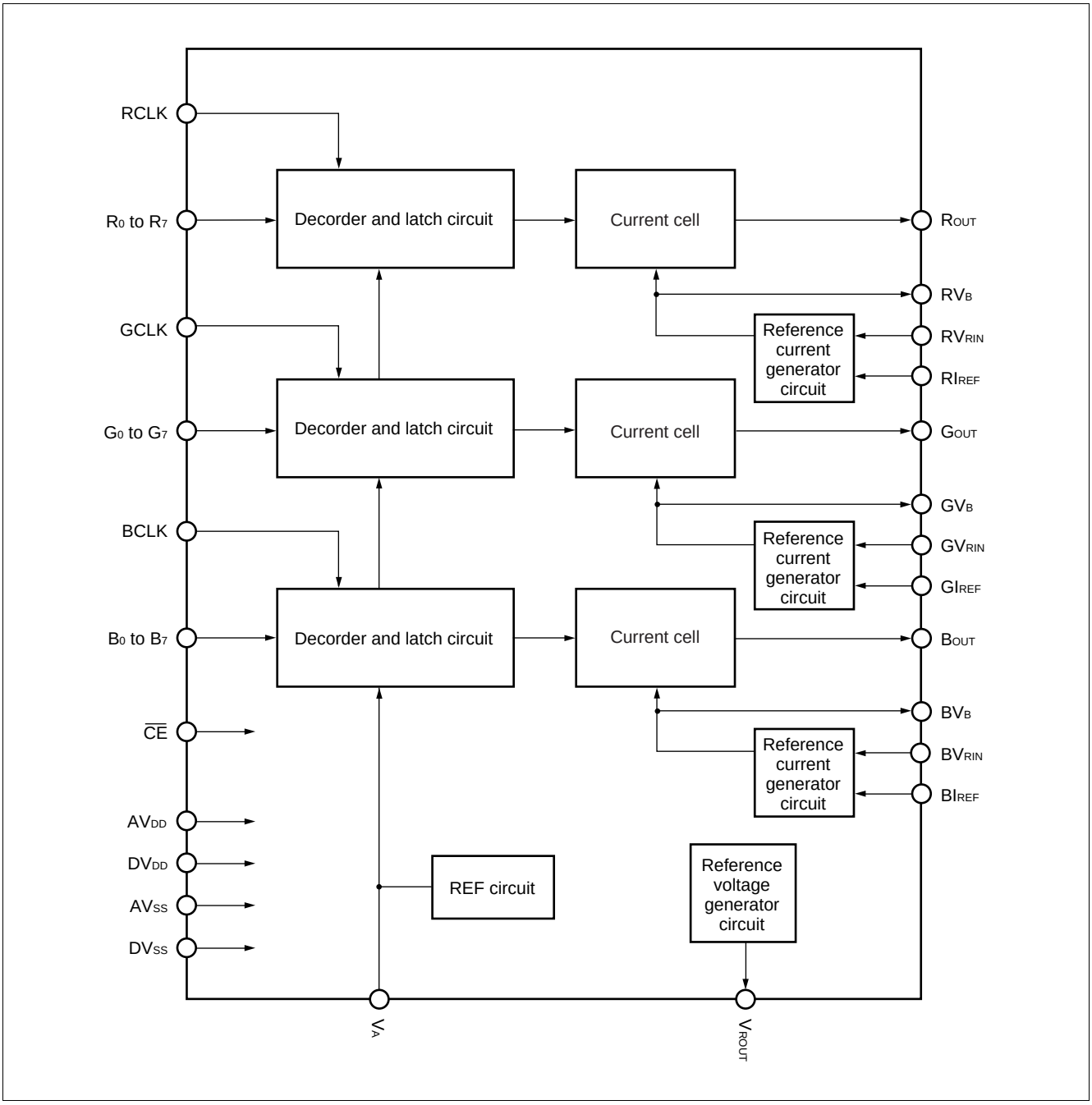
■ PIN ASSIGNMENT



■ PIN DESCRIPTION

Pin No.	Symbol	I/O	Description
4 to 11 12 to 19 20 to 27	R_0 to R_7 G_0 to G_7 B_0 to B_7	I	Data signal incoming terminal for Rch, Gch and Bch LSB: R_0, G_0, B_0 MSB: R_7, G_7,B_7
28 29 30	RCLK GCLK BCLK	I	Clock signal incoming terminal for Rch, Gch and Bch (TTL compatible)
47	$\overline{CE}$	I	Power saving signal incoming terminal. Power saving enabled for High
48	DV_{DD}	—	Digital power supply terminal (standard 5 V)
40, 46	AV_{DD}	—	Analog power supply terminal (standard 5 V)
31	DV_{SS}	—	Digital ground terminal
42, 44	AV_{SS}	—	Analog ground terminal
36	V_{ROUT}	O	Rererence voltage output terminal (standard: 2 V)
1 37 35	RV_{RIN} GV_{RIN} BV_{RIN}	I	Reference voltage incoming terminal for Rch, Gch and Bch (standard: 2 V)
2 39 34	RI_{REF} GI_{REF} BI_{REF}	—	Reference resistor connection terminal for Rch, Gch and Bch
3 38 33	RV_B GV_B BV_B	—	Connect >0.1 μF capacitor to the AV_{DD} terminal
32	VA	—	Connect >0.1 μF capacitor to the AV_{SS} terminal
45 43 41	R_{OUT} G_{OUT} B_{OUT}	O	Analog signal output terminals for Rch, Gch and Bch

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Rating		Unit
		Min.	Max.	
Power supply voltage	V_{DD}	–0.3	+7.0	V
Digital input voltage	V_{ID}	–0.3	V_{DD}+0.3	V
Analog output voltage	V_O	–0.3	V_{DD}+0.3	V
Analog output current	I_O	0	12	mA
Storage temperature	Tstg	–55	+125	°C

WARNING: Semiconductor devices can be permanently damaged by application of stress (voltage, current, temperature, etc.) in excess of absolute maximum ratings. Do not exceed these ratings.

■ RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
Analog power supply voltage	AV_{DD}	4.75	5.0	5.25	V
Digital power supply voltage	DV_{DD}	4.75	5.0	5.25	V
Power supply voltage difference	$AV_{DD} – DV_{DD}$	–0.2	—	0.2	V
Reference input voltage	V_{RIN}	1.0	2.0	2.2	V
Full-scale current*1	I_{FS}	0	—	12	mA
Full-scale output voltage*2	V_{FS}	—	2.0	2.3	V
Digital “H” level input voltage	V_{IHD}	2.4	—	DV_{DD}	V
Digital “L” level input voltage	V_{ILD}	0	—	0.5	V
Clock frequency	f_{CLK}	—	—	50	MHz
Setup time	t_s	6	—	—	ns
Hold time	t_h	3	—	—	ns
“H” level minimum pulse width	t_{WH}	6.5	—	—	ns
“L” level minimum pulse width	t_{WL}	6.5	—	—	ns
Operating ambient temperature	T_{op}	–20	—	+85	°C

*1: $I_{FS} = V_{RIN}/R_{REF} \times 15.9$

*2: $V_{FS} = I_{FS} \times R_L$

WARNING: The recommended operating conditions are required in order to ensure the normal operation of the semiconductor device. All of the device's electrical characteristics are warranted when the device is operated within these ranges.

Always use semiconductor devices within the recommended operating conditions. Operation outside these ranges may adversely affect reliability and could result in device failure.

No warranty is made with respect to uses, operating conditions, or combinations not represented on the data sheet. Users considering application outside the listed conditions are advised to contact their FUJITSU representatives beforehand.

■ ELECTRICAL CHARACTERISTICS

1. DC Characteristics

(AV_{DD} = DV_{DD} = 4.75 V to 5.25 V, V_{RIN} = 2 V, R_{REF} = 3.3 kΩ, R_L = 200 Ω, Ta = –20°C to +85°C)

Parameter	Symbol	Condition	Value			Unit
			Min.	Typ.	Max.	
Resolution	—	—	—	8	—	bit
Linearity error	LE	DC Accuracy	—	—	±0.5	LSB
Differential linearity error	DLE		—	—	±1.0	LSB
Digital input current	I_{ID}	—	–5	—	5	µA
Reference output voltage	V_{ROUT}	AV_{DD} = DV_{DD} = 5.00 V	1.95	2.0	2.05	V
Full-scale output voltage	V_{OFS}	—	1.85	1.94	2.03	V
Zero-scale output voltage	V_{OZS}	—	0	—	10	mV
Analog power supply current	AI_{DD}	—	—	30	35	mA
Digital power supply current	DI_{DD}	—	—	13	20	mA

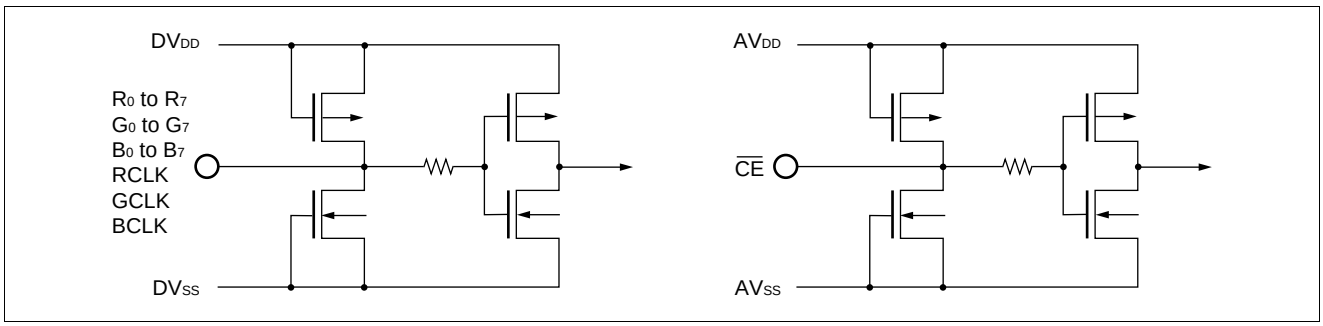
2. AC Characteristics

(AV_{DD} = DV_{DD} = 4.75 V to 5.25 V, V_{RIN} = 2 V, R_{REF} = 3.3 kΩ, R_L = 200 Ω, C_L = 15 pF, Ta = –20°C to +85°C)

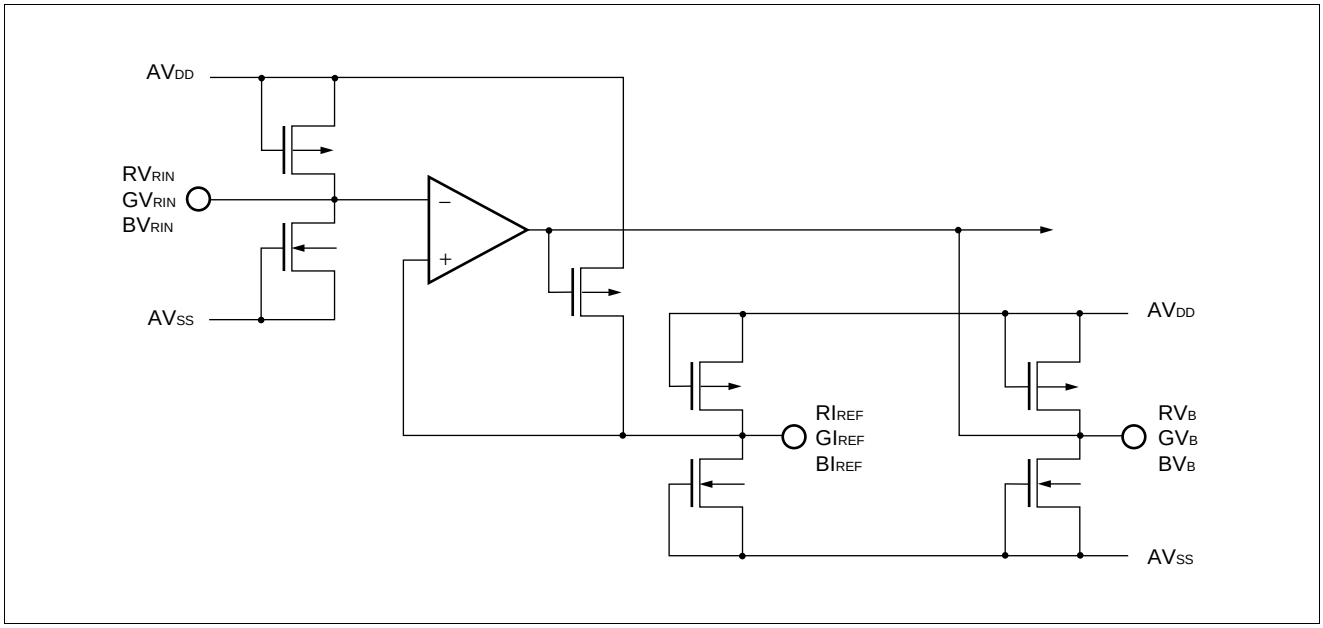
Parameter	Symbol	Condition	Value			Unit
			Min.	Typ.	Max.	
Maximum conversion rate	f_S	—	50	—	—	MSPS
Output propagation delay time	t_{pd}		—	10	—	ns
Output rising time	t_r		—	11	—	ns
Output falling time	t_f		—	11	—	ns
Setting time	t_{set}		—	30	—	ns

■ EQUIVALENT CIRCUIT

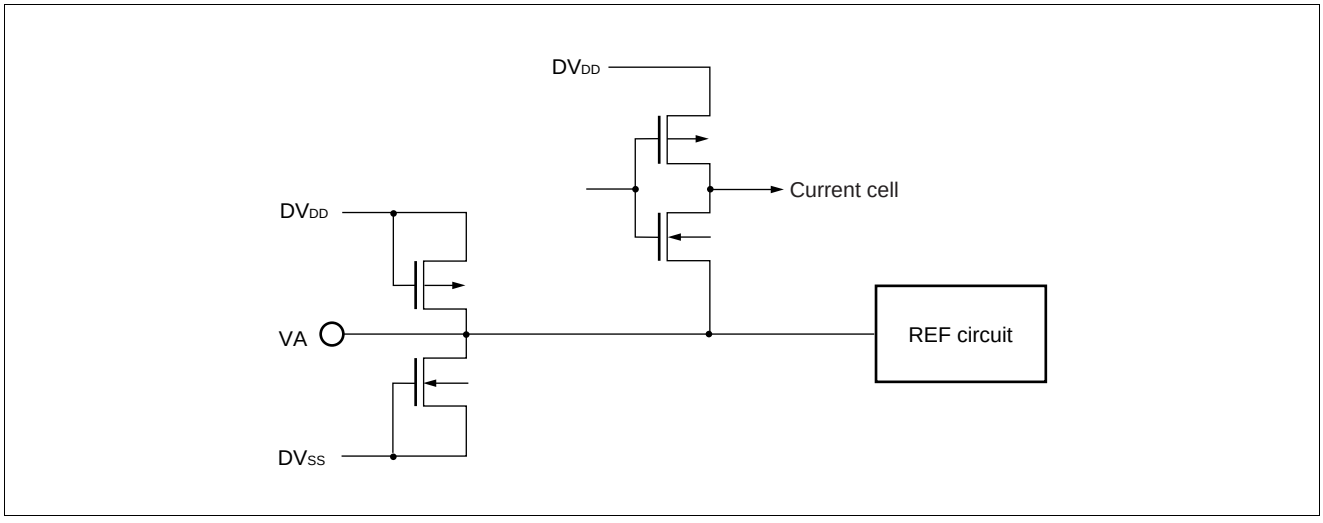
- Digital input



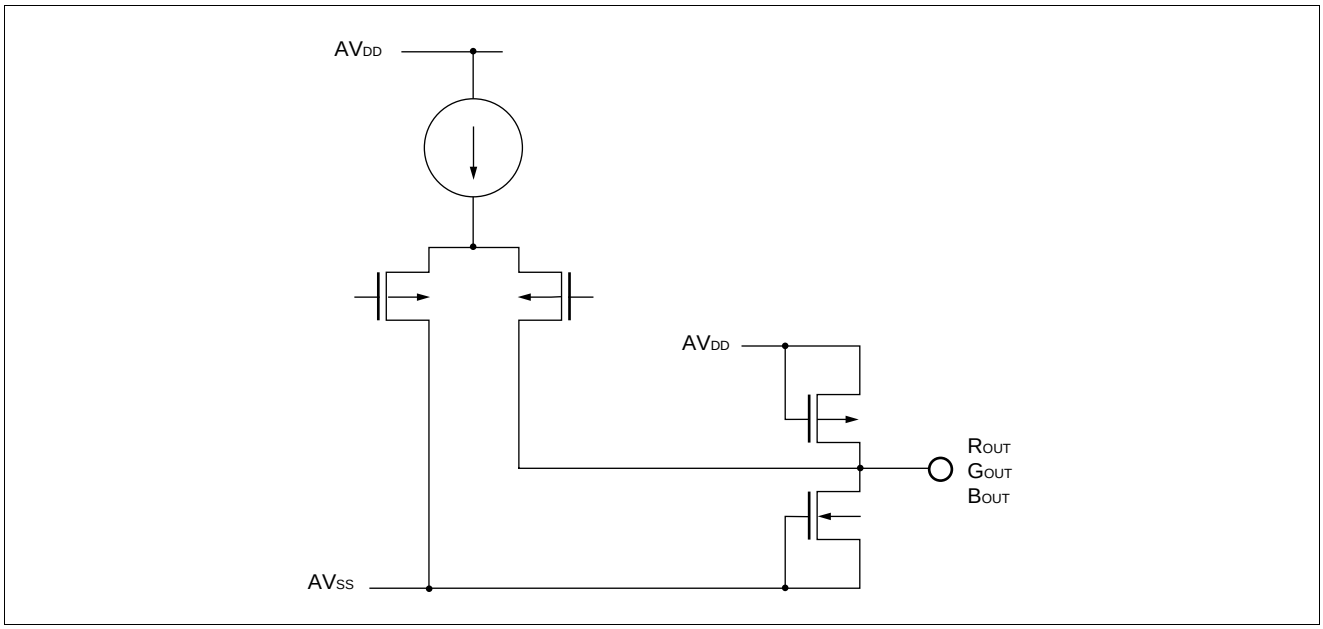
- Reference voltage input



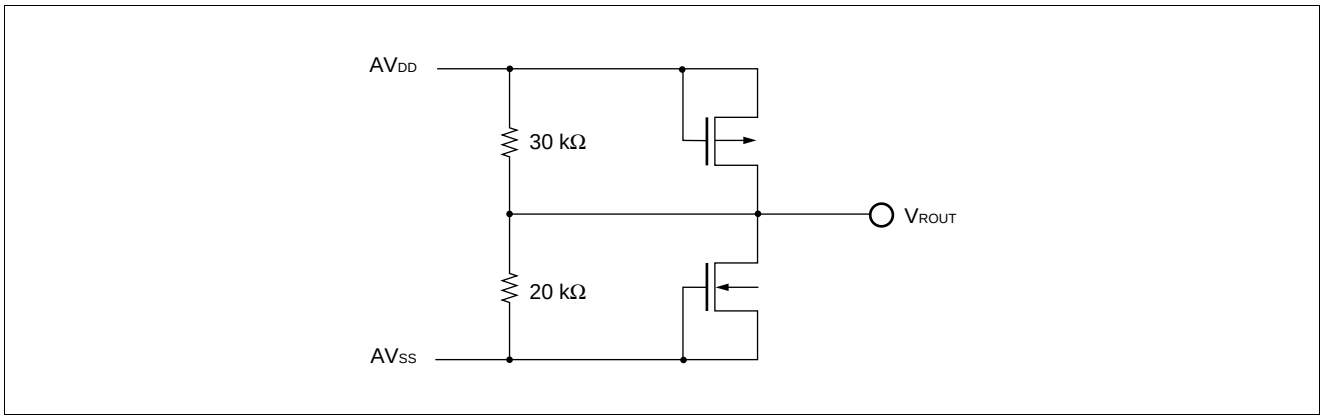
- VA pin



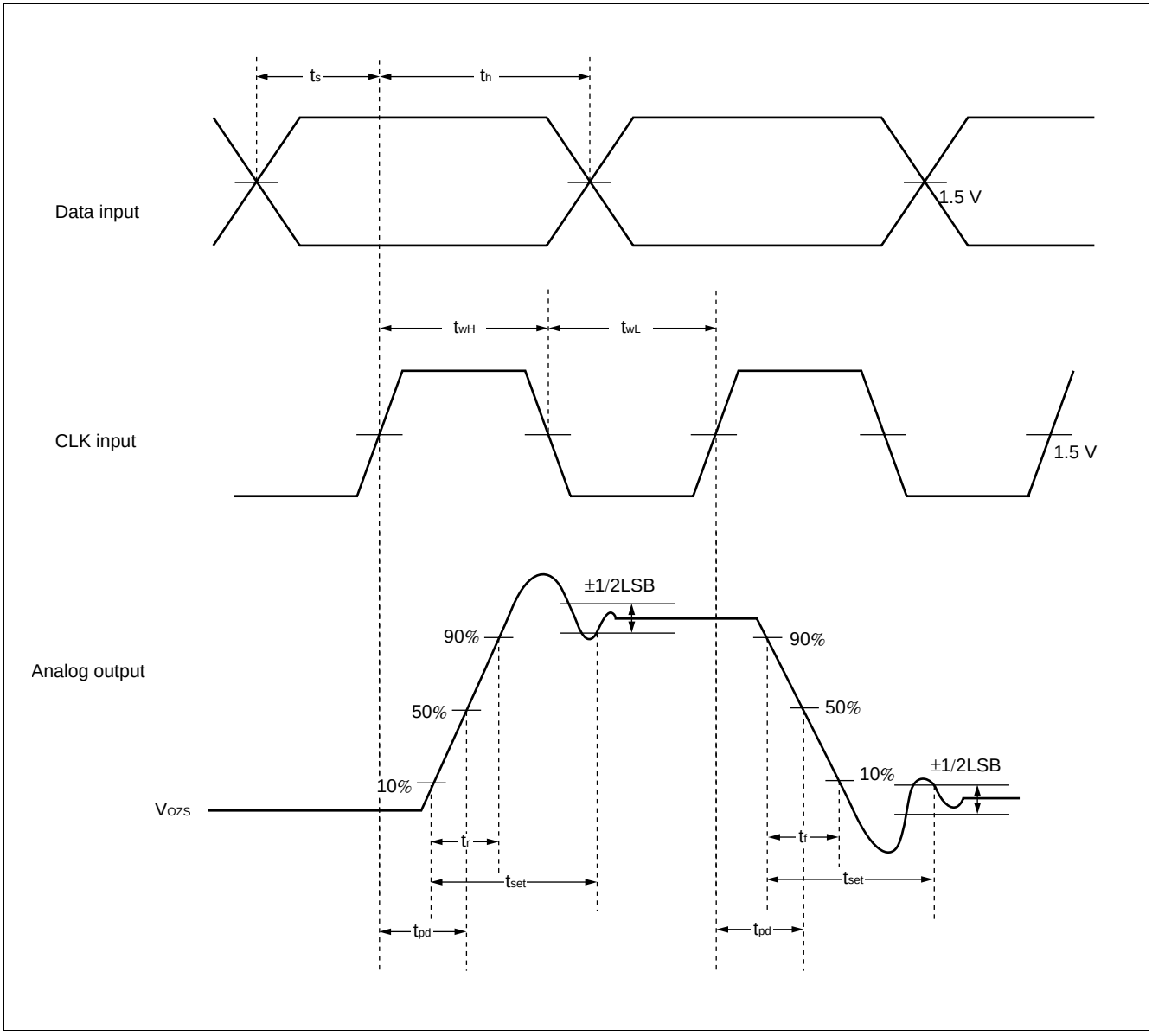
- Analog output



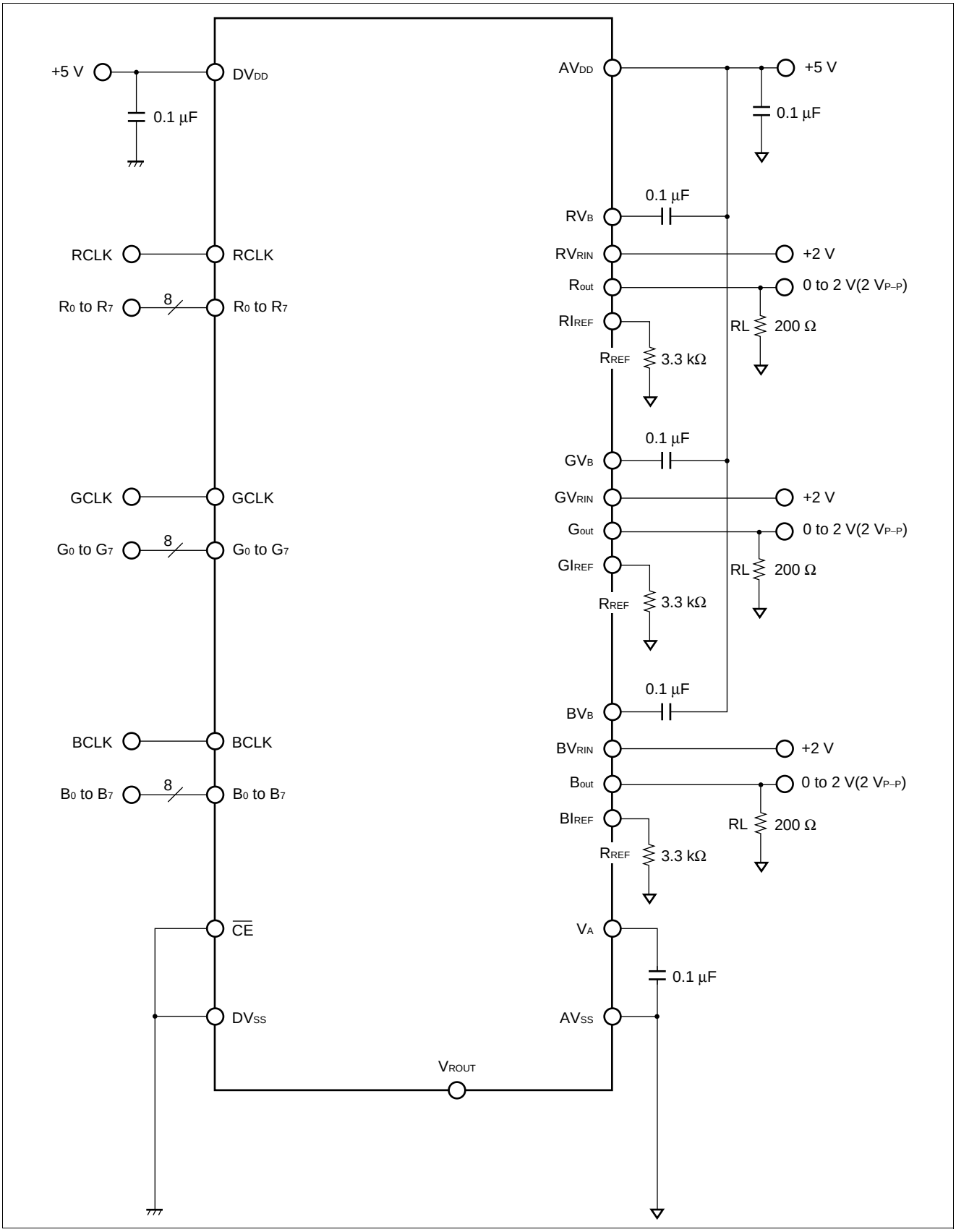
- Reference voltage output



■ TIMING DIAGRAM



■ TYPICAL APPLICATION

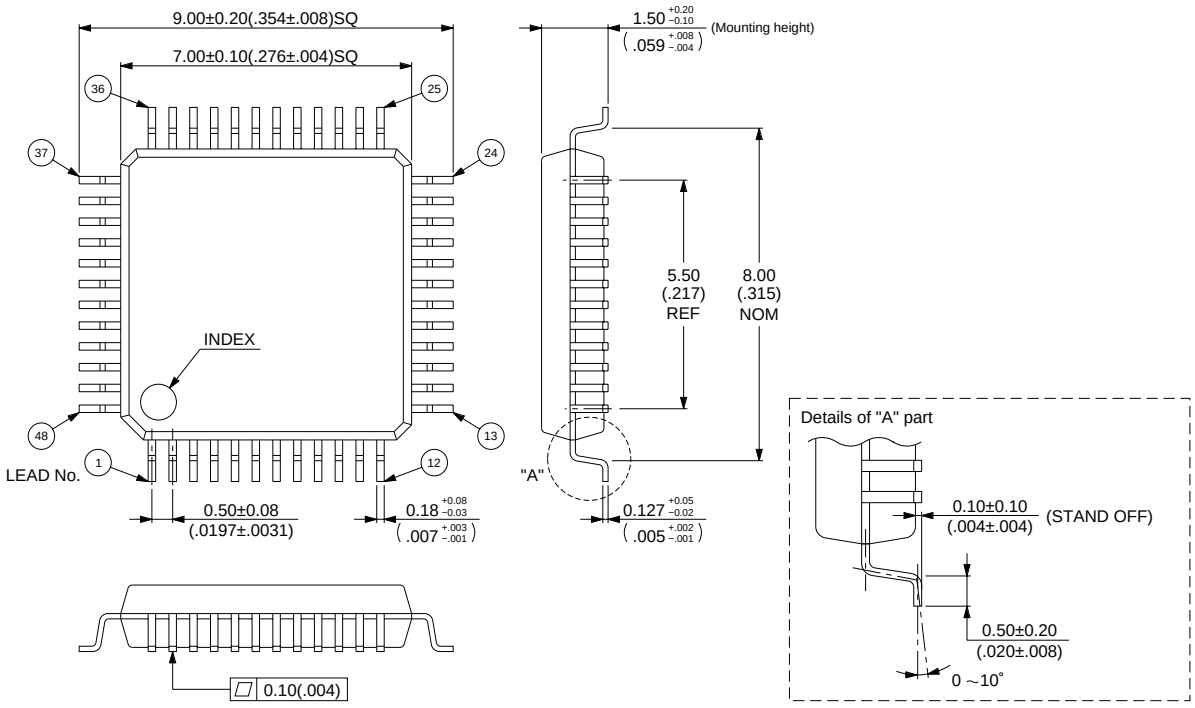


■ ORDERING INFORMATION

Part number	Package	Remarks
MB40C958VPFV	48-pin Plastic LQFP (FPT-48P-M05)	

■ PACKAGE DIMENSION

48-pin Plastic LQFP
(FPT-48P-M05)



Dimensions in mm (inches).

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