FUJITSU SEMICONDUCTOR
DATA SHEET

DS04-28305-5E

ASSP

3-Channel 8-Bit RGB D/A Converter

MB40978

■ DESCRIPTION

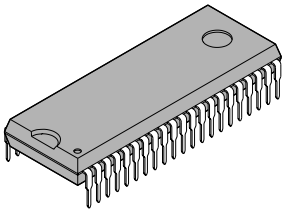
The Fujitsu MB40978 is a 8-bit ultra high speed digital to analog converter for video frequency band fabricated by Fujitsu Advanced Bipolar Technology. Owing to adoption of RGB 3-channel input/output, it is suitable for digital TV, graphic display etc.

■ FEATURES

- Resolution : 8bits
- Linearity : ±0.2% max.
- Maximum Conversion Rate : 60MSPS min.
- Analog Output Voltage Range : V_{CC} to V_{CC} -1(V)
- Digital Input Voltage : TTL Compatible
- Single Power Supply Voltage : +5.0V
- Power Dissipation : 350mW typ.
- Package : Plastic DIP Package (Suffix: -P)
  : Plastic Flat Package (Suffix: -PFQ)

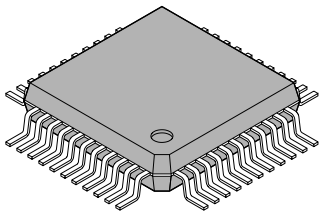
■ PACKAGES

42 pin, Plastic SH-DIP



(DIP-42P-M02)

44 pin, Plastic FPT

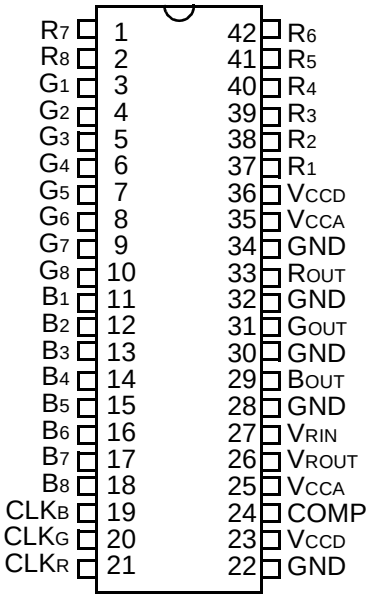


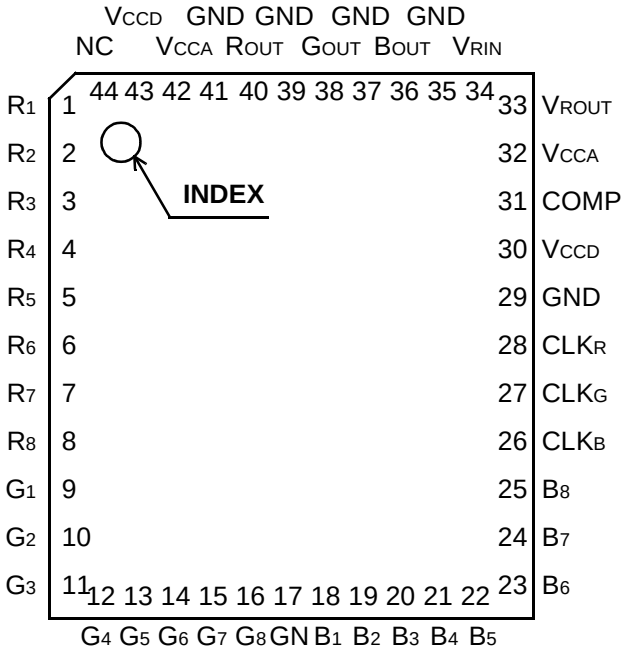
(FPT-44P-M11)

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.

■ PIN ASSIGNMENTS

(TOP VIEW)

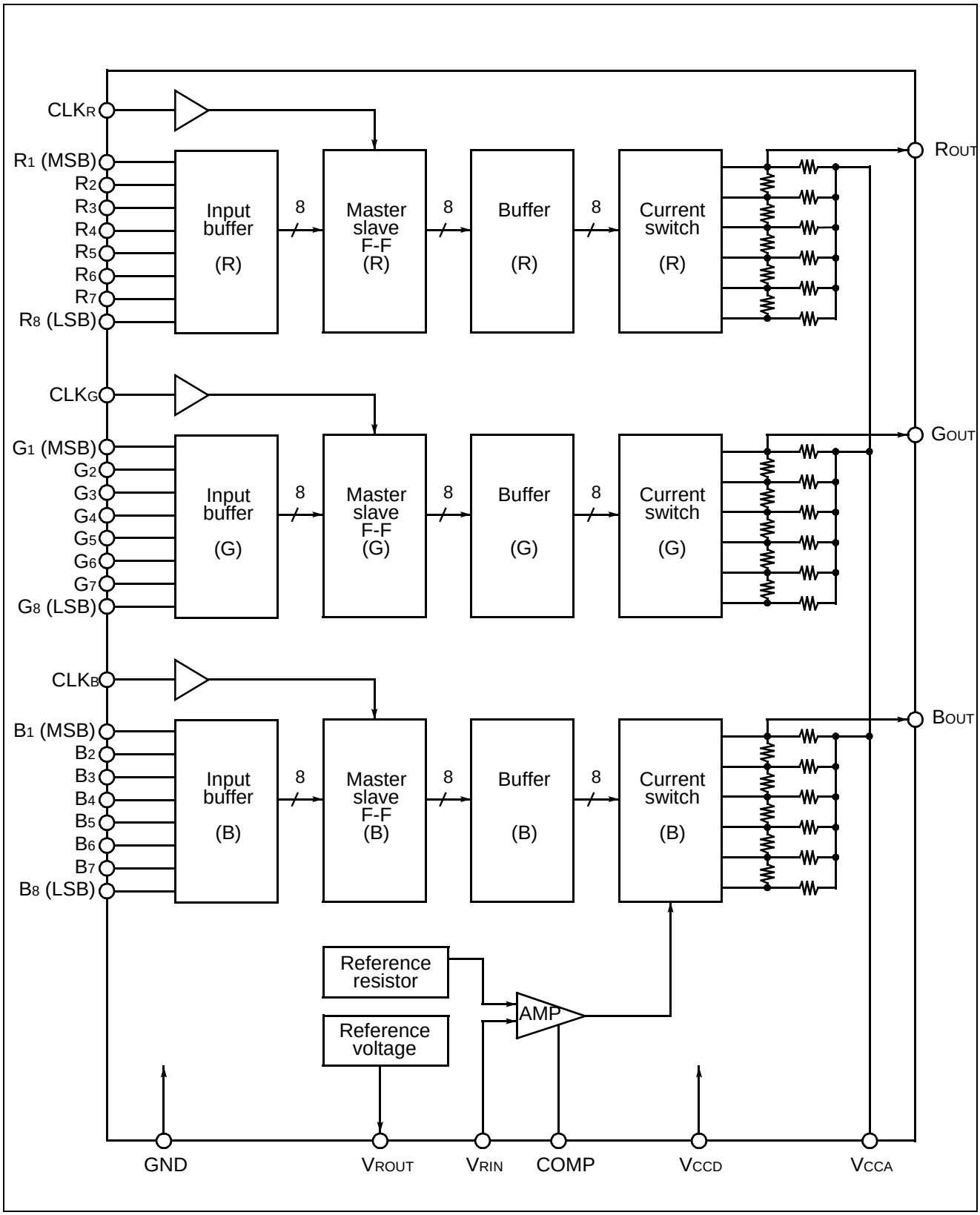




■ PIN DESCRIPTION

Pin Number		Symbol	Description
DIP	QFP		
1, 2, 37 to 42	1 to 8	R1 to R8	R-channel Digital Signal Inputs V_{IH}=2.0V min. V_{IL}=0.8V max.
3 to 10	9 to 16	G1 to G8	G-channel Digital Signal Inputs
11 to 18	18 to 25	B1 to B8	B-channel Digital Signal Inputs
33	40	R_{OUT}	R-channel Analog Signal Output
31	38	G_{OUT}	G-channel Analog Signal Output
29	36	B_{OUT}	B-channel Analog Signal Output
21	28	CLK_R	R-channel Clock Input V_{IH}=2.0V min. V_{IL}=0.8V max.
20	27	CLK_G	G-channel Clock Input
19	26	CLK_B	B-channel Clock Input
27	34	V_{RIN}	Reference Voltage Input
26	33	V_{ROUT}	Reference Voltage Output
24	31	COMP	This pin is provided to connect a phase compensation capacitance. 1µF min capacitor is connected between GND.
25, 35	32, 42	V_{CCA}	Power Supply for Analog Circuit 5V ±5%
23, 36	30, 43	V_{CCD}	Power Supply for Digital Circuit 5V ±5%
22, 28, 30, 32, 34	17, 29, 35, 37, 39, 41	GND	Ground
—	44	N.C.	No connection

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Rating	Unit
Power supply voltage	V_{CCA}, V_{CCD}	–0.5 to +7.0	V
Analog reference voltage	V_{RIN}	–0.5 to V_{CCA} +0.5	V
Digital input voltage	V_{ID}	–0.5 to +7.0	V
Storage temperature	T_{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	V_{CCA}, V_{CCD} (V_{CCA} – V_{CCD})	4.75 (–0.2)	5.0	5.25 (0.2)	V
Analog reference voltage	V_{RIN}	3.70	4.00	4.30	V
Digital high-level input voltage	V_{IHD}	2.0	—	—	V
Digital low-level voltage	V_{ILD}	—	—	0.8	V
Clock frequency	f_{CLK}	—	—	60	MHz
Set-up time	t_S	10	—	—	ns
Hold time	t_H	4.0	—	—	ns
Minimum high pulse width	t_{W+}	7.5	—	—	ns
Minimum low pulse width	$t_{W–}$	7.5	—	—	ns
Phase compensation capacitance	C_{COPM}	1.0	—	—	µF
Operating temperature	Ta	0	—	70	°C

Note: V_{CCA} - $V_{REF} \leq 1.2V$

■ ELECTRICAL CHARACTERISTICS

(V_{CCA} = V_{CCD} = 4.75 to 5.25V, Ta = 0 to 70°C)

Parameter	Symbol	Condition	Value			Unit
			Min.	Typ.	Max.	
Resolution	—	—	—	—	8	Bits
Linearity error	LE	—	—	—	±0.2	%
Reference input current	I_{RIN}	V_{RIN}, V_{ROUT} Short	—	—	10	µA
Reference output voltage	V_{ROUT}	V_{CC}=5.00V	3.900	4.000	4.100	V
Digital high-level input curren	I_{IHD}	V_{IHD}=2.7V	—	—	20	µA
Digital low-level input current	I_{ILD}	V_{ILD}=0.4V	–100	—	—	µA
RGB output voltage ratio	FSR	—	0	2	6	%
Full-scale output voltage	V_{OFS}	V_{CCA}=5.000V V_{RIN}, V_{ROUT} Short	V_{CCA} –15	V_{CCA}	—	mV
Zero-scale output voltage	V_{OZS}	V_{CCA}=V_{CCD}=5.000V V_{RIN}=4.00V	3.944	4.004	4.064	V
		V_{CCA}=V_{CCD}=5.000V V_{RIN}, V_{ROUT} Short	3.884	4.004	4.124	V
Output resistance	R_O	—	—	240	—	Ω
Power supply current	I_{CC}	V_{CC}=5.25V V_{RIN}, V_{ROUT} Short	—	*70	102	mA

Note: V_{CCA} = V_{CCD} = 5.00V

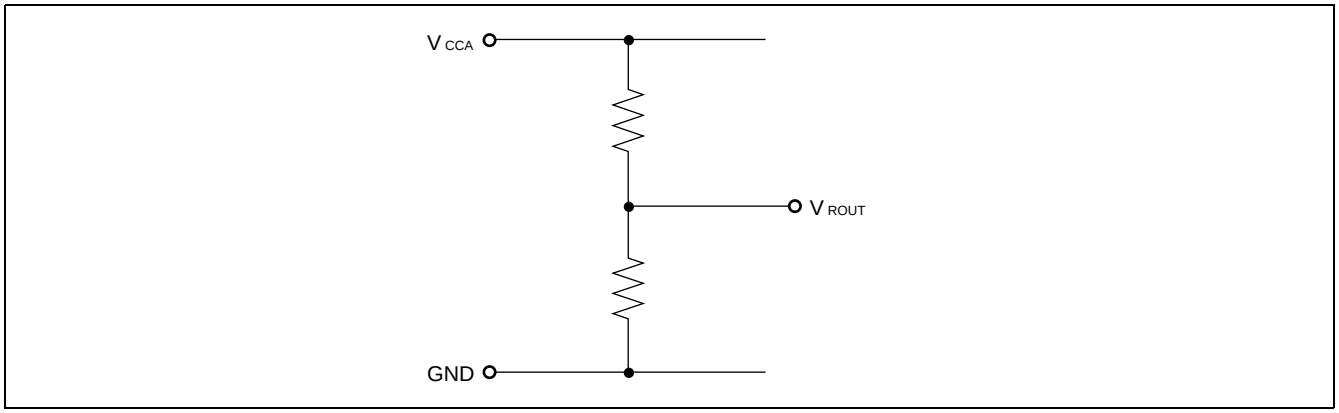
■ SWITCHING CHARACTERISTICS

(V_{CCA} = V_{CCD} = 4.75 to 5.25V, Ta = 0 to 70°C)

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
Maximum conversion rate	F_S	60	—	—	MSPS
Output delay time	t_{PLH} t_{PHL}	—	10	—	ns
Output rise time	t_r	—	5	—	ns
Output fall time	t_f	—	5	—	ns

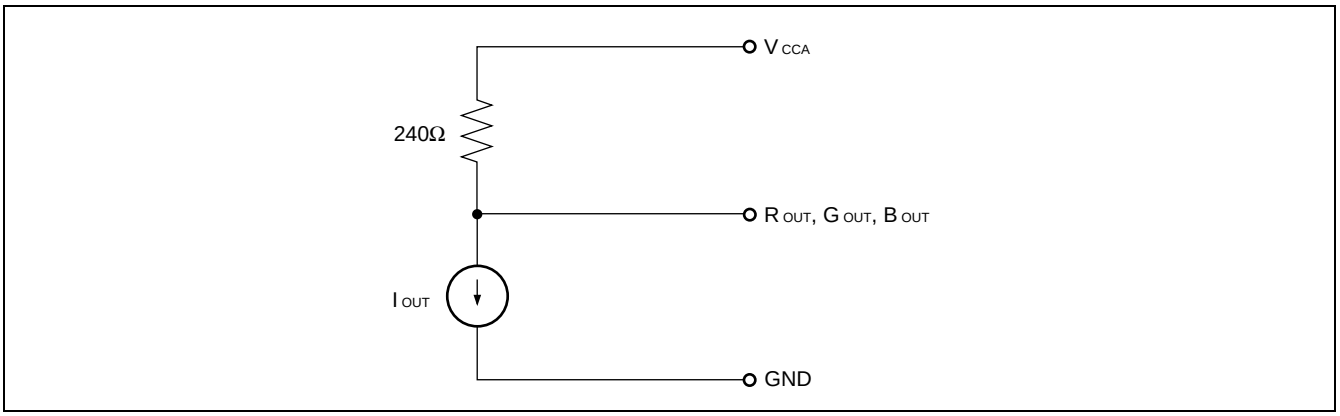
■ REFERENCE VOLTAGE OUTPUT EQUIVALENT CIRCUIT

- V_{ROUT}

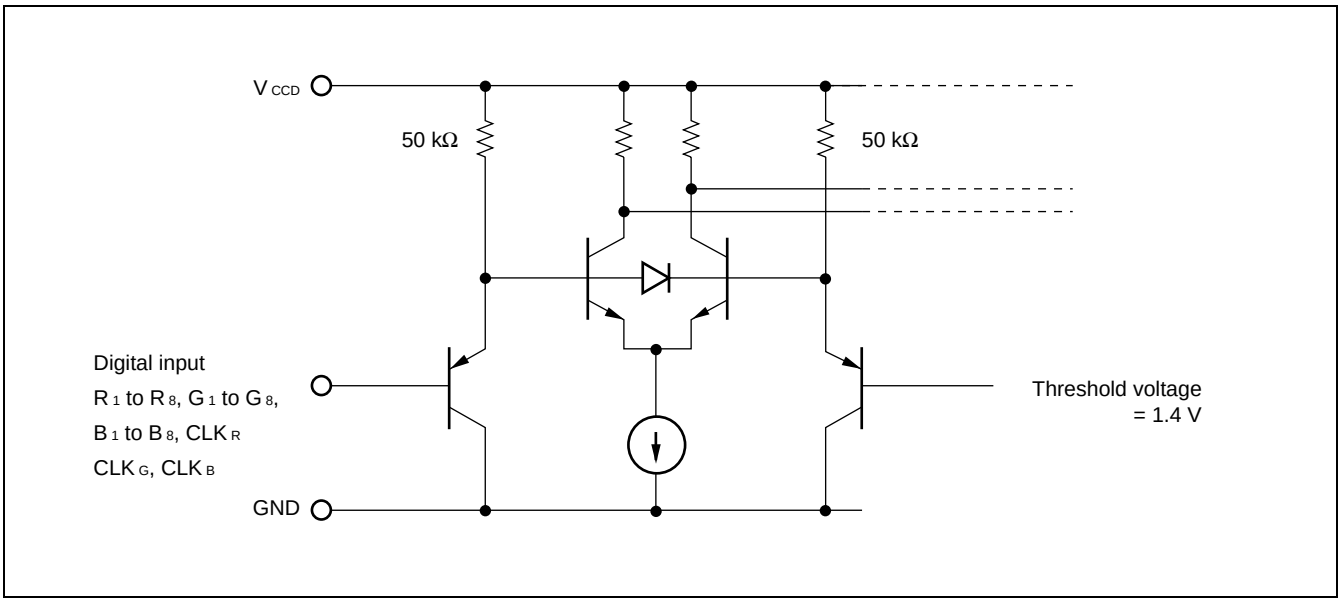


■ ANALOG OUTPUT EQUIVALENT CIRCUIT

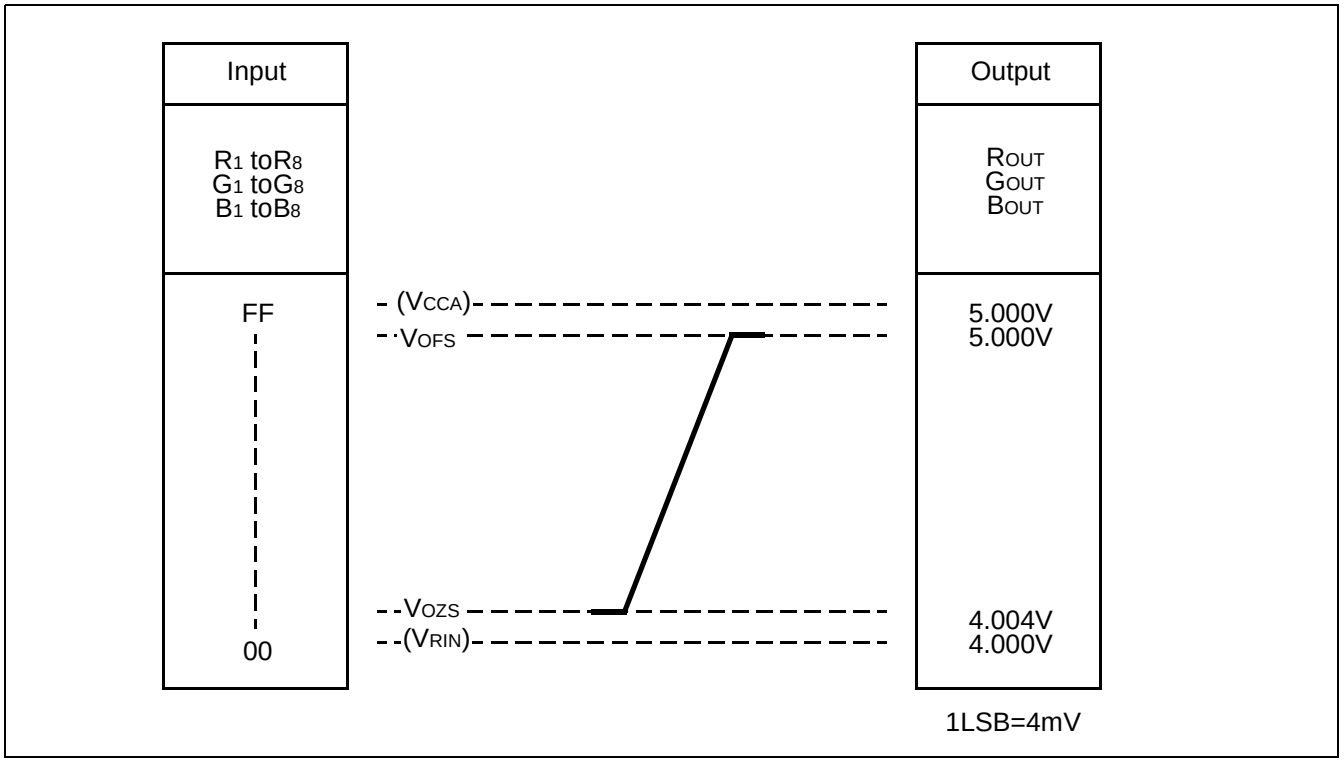
- R_{OUT}, G_{OUT}, B_{OUT}



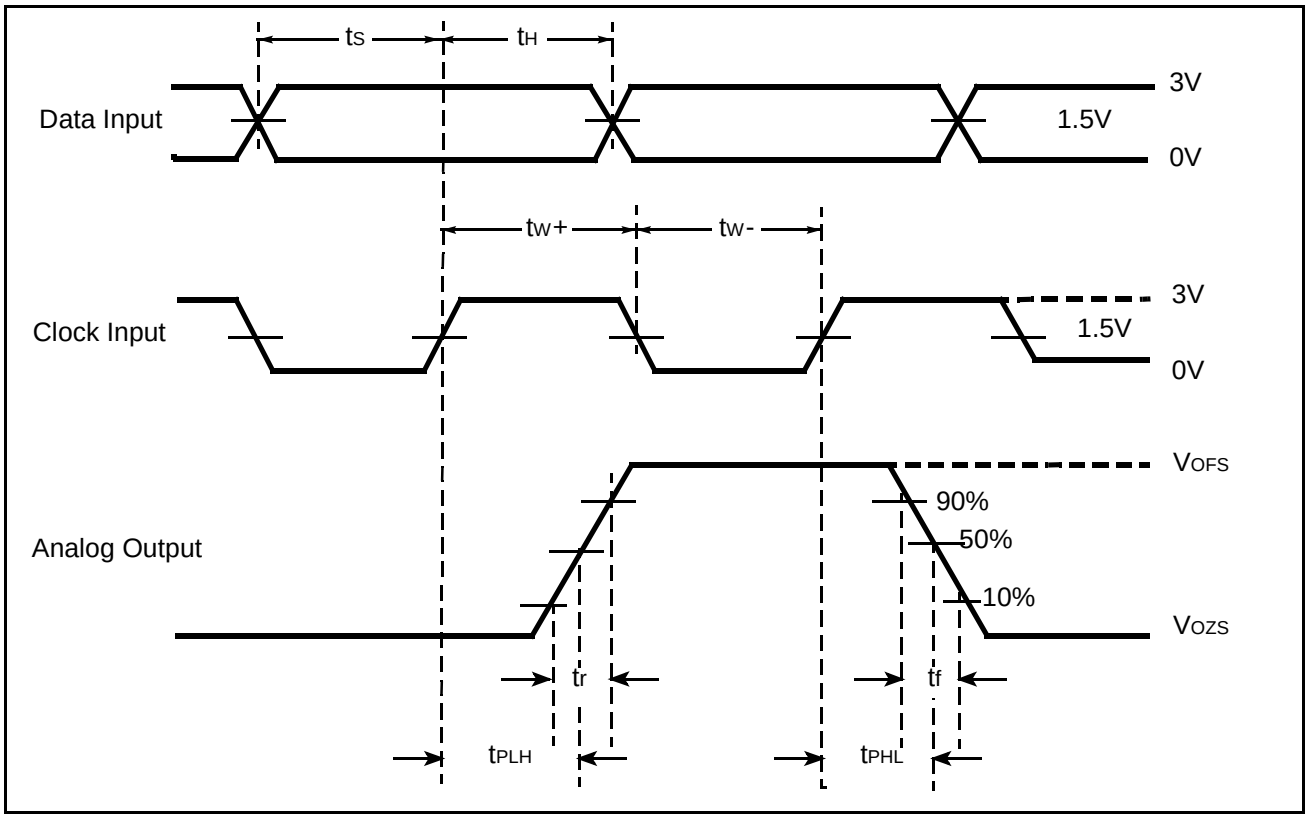
■ DIGITAL INPUT EQUIVALENT CIRCUIT



■ DAC OUTPUT VOLTAGE

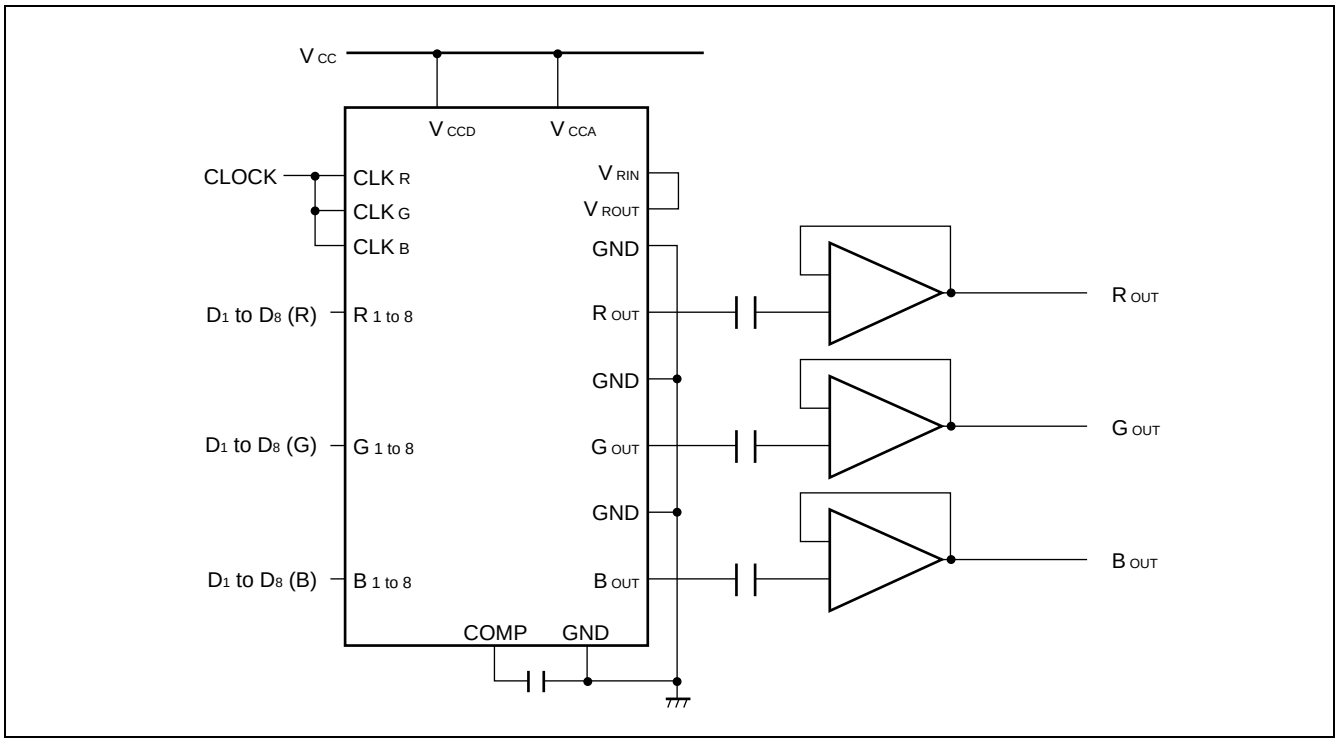


■ TIMING DIAGRAM

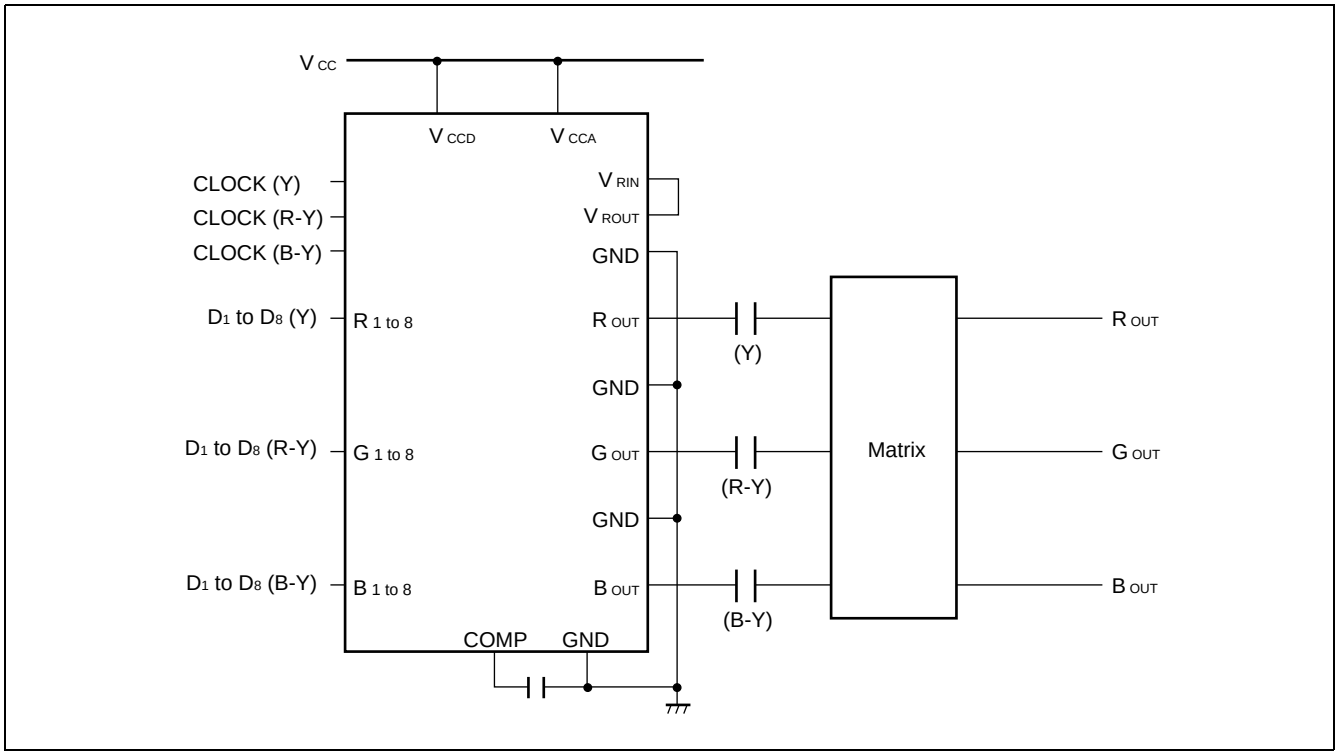


■ APPLICATION EXAMPLES

1. RGB Signal Process

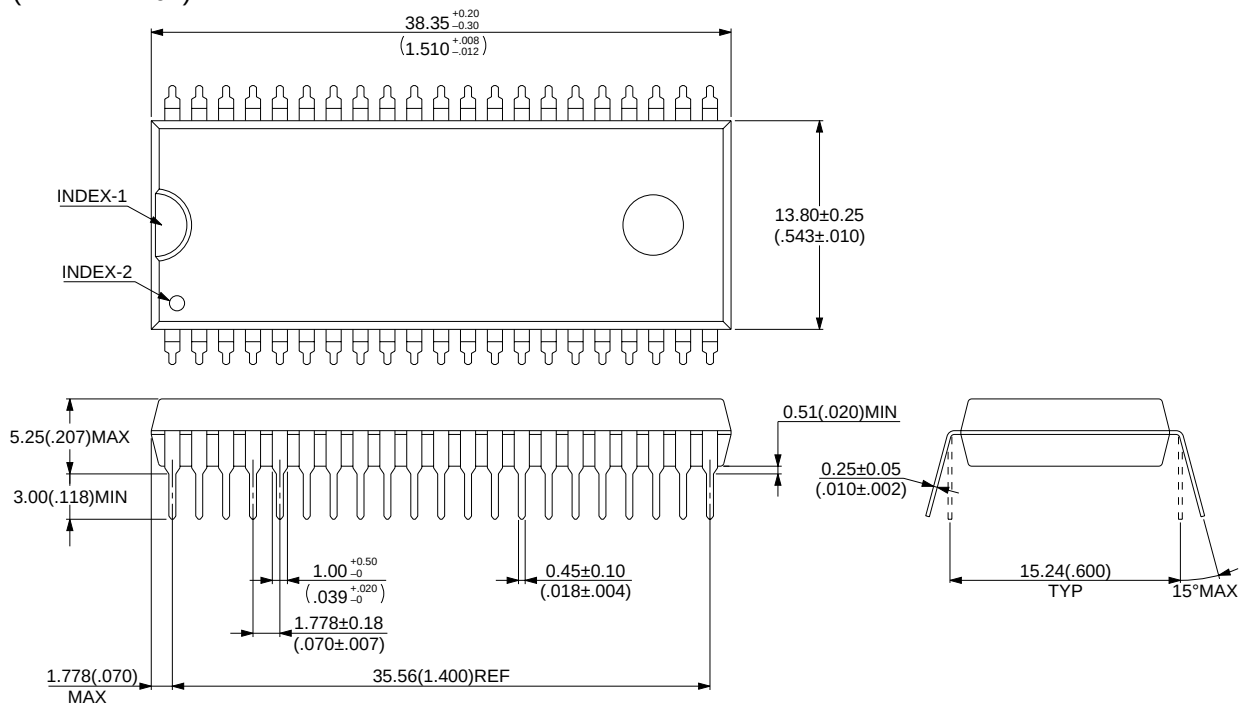


2. Component Signal Processing



■ PACKAGE DIMENSIONS

42 pin, Plastic DIP
(DIP-42P-M02)

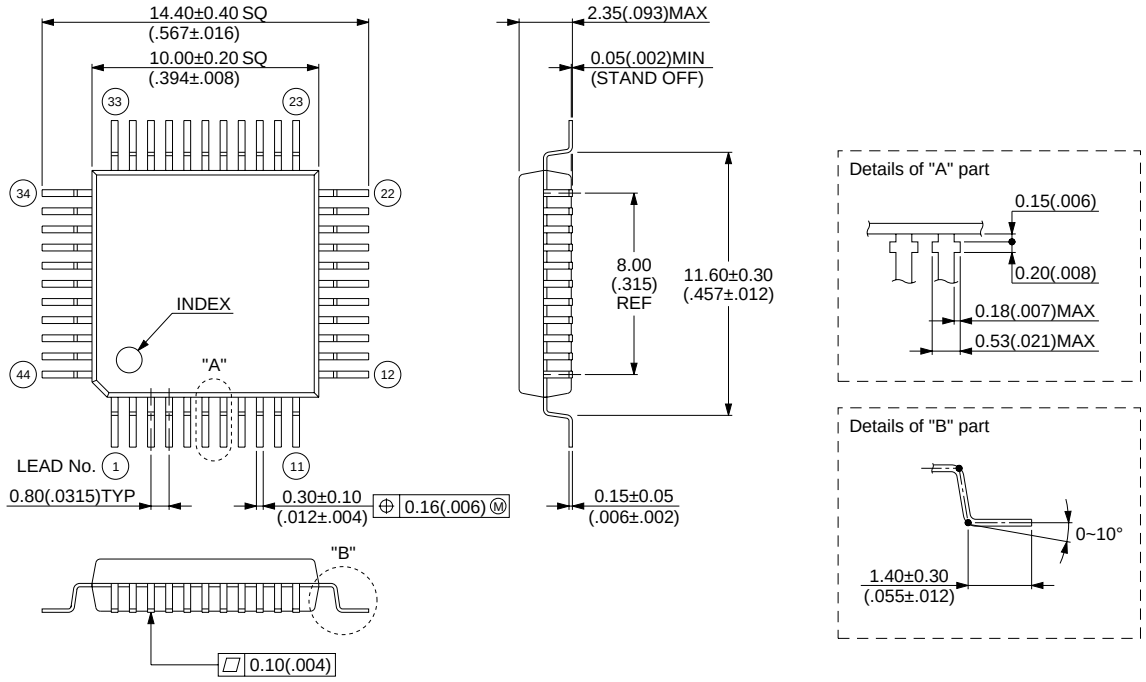


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Dimensions in mm (inches).

(Continued)

44 pin, Plastic FPT
(FPT-44P-M11)



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Dimensions in mm (inches).

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