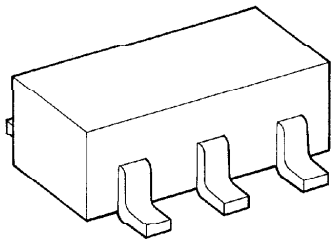
TOSHIBA CMOS LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

TC75S51F, TC75S51FU

SINGLE OPERATIONAL AMPLIFIER

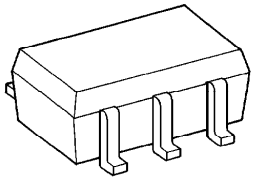
TC75S51F, TC75S51FU are CMOS operational amplifier with low supply voltage, low supply current.

TC75S51F



SSOP5-P-0.95

TC75S51FU



SSOP5-P-0.65A

Weight
SSOP5-P-0.95 : 0.014g (Typ.)
SSOP5-P-0.65A : 0.006g (Typ.)

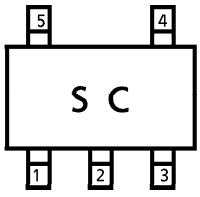
FEATURES

- Low supply voltage : $V_{DD} = \pm 0.75 \sim \pm 3.5V$ or $1.5 \sim 7V$
- Low supply current : I_{DD} ($V_{DD} = 3V$) = 60μA (Typ.)
- The internally phase compensated operational amplifier.
- Small package

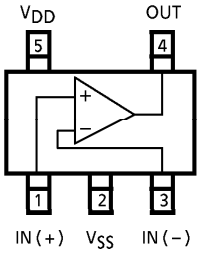
MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V_{DD}, V_{SS}	7	V
Differential Input Voltage	DV_{IN}	±7	V
Input Voltage	V_{IN}	$V_{DD} \sim V_{SS}$	V
Power Dissipation	P_D	200	mW
Operating Temperature	T_{opr}	−40~85	°C
Storage Temperature	T_{stg}	−55~125	°C

MARKING (TOP VIEW)



PIN CONNECTION (TOP VIEW)



961001EBA2

ELECTRICAL CHARACTERISTICS

DC CHARACTERISTICS (V_{DD} = 3.0V, V_{SS} = GND, Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Input Offset Voltage	V_{IO}	1	R_S = 1kΩ, R_F = 100kΩ	—	2	10	mV
Input Offset Current	I_{IO}	—	—	—	1	—	pA
Input Bias Current	I_I	—	—	—	1	—	pA
Common Mode Input Voltage	CMV_{IN}	2	R_S = 1kΩ, R_F = 100kΩ	0	—	2.5	V
Voltage Gain (Open Loop)	G_V	—	—	60	70	—	dB
Maximum Output Voltage	V_{OH}	3	$R_L \geqq$ 100kΩ	2.9	—	—	V
	V_{OL}	4	$R_L \geqq$ 100kΩ	—	—	0.1	V
Common Mode Input Signal Rejection Ratio	CMRR	2	V_{IN} = 0.0~2.5V	55	65	—	dB
Supply Voltage Rejection Ratio	SVRR	1	V_{DD} = 1.5~7.0V	60	70	—	dB
Supply Current	I_{DD}	5	—	—	60	200	μA

DC CHARACTERISTICS (V_{DD} = 1.5V, V_{SS} = GND, Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Input Offset Voltage	V_{IO}	1	R_S = 10kΩ, R_F = 100kΩ	—	2	10	mV
Input Offset Current	I_{IO}	—	—	—	1	—	pA
Input Bias Current	I_I	—	—	—	1	—	pA
Common Mode Input Voltage	CMV_{IN}	2	R_S = 10kΩ, R_F = 100kΩ	0	—	1.0	V
Voltage Gain (Open Loop)	G_V	—	—	60	70	—	dB
Maximum Output Voltage	V_{OH}	3	$R_L \geqq$ 100kΩ	1.4	—	—	V
	V_{OL}	4	$R_L \geqq$ 100kΩ	—	—	0.1	V
Supply Current	I_{DD}	5	—	—	50	150	μA

(Note) This device should be operated less than 70μA source current.

AC CHARACTERISTICS (V_{DD} = 3.0V, V_{SS} = GND, Ta = 25°C)

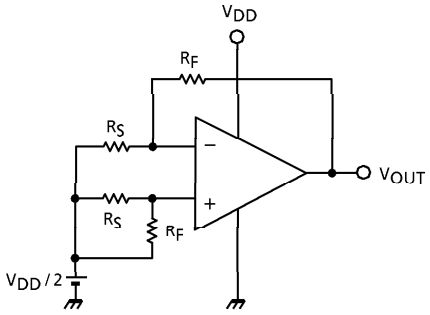
CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Slew Rate	SR	—	A_V = 0dB	—	0.5	—	V / μs
Unity Gain Cross Frequency	f_T	—	A_V = 40dB	—	0.6	—	MHz

AC CHARACTERISTICS (V_{DD} = 1.5V, V_{SS} = GND, Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Slew Rate	SR	—	A_V = 0dB	—	0.3	—	V / μs
Unity Gain Cross Frequency	f_T	—	A_V = 40dB	—	0.5	—	MHz

TEST CIRCUIT

1. SVRR, V_{IO}



- SVRR

  $V_{DD} = 1.5V$: $V_{DD} = V_{DD}1$, $V_{OUT} = V_{OUT}1$

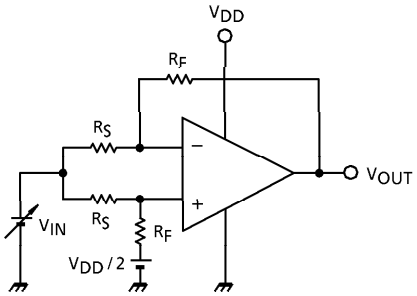
  $V_{DD} = 7.0V$: $V_{DD} = V_{DD}2$, $V_{OUT} = V_{OUT}2$

$$SVRR = 20\ell og \left(\left| \frac{V_{OUT}1 - V_{OUT}2}{V_{DD}1 - V_{DD}2} \right| \times \frac{R_S}{R_F + R_S} \right)$$

- V_{IO}

$$V_{IO} = \left(V_{OUT} - \frac{V_{DD}}{2} \right) \times \frac{R_S}{R_F + R_S}$$

2. CMRR, CMV_{IN}



- CMRR

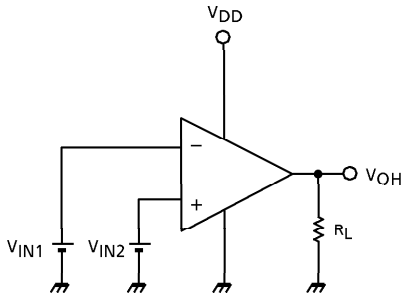
  $V_{IN} = 0.0V$: $V_{IN} = V_{IN}1$, $V_{OUT} = V_{OUT}1$

  $V_{IN} = 2.5V$: $V_{IN} = V_{IN}2$, $V_{OUT} = V_{OUT}2$

$$CMRR = 20\ell og \left(\left| \frac{V_{OUT}1 - V_{OUT}2}{V_{IN}1 - V_{IN}2} \right| \times \frac{R_S}{R_F + R_S} \right)$$

- CMV_{IN}

3. V_{OH}

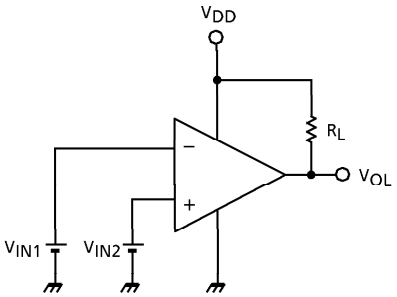


- V_{OH}

$$V_{IN1} = \frac{V_{DD}}{2} - 0.05V$$

$$V_{IN2} = \frac{V_{DD}}{2} + 0.05V$$

4. V_{OL}

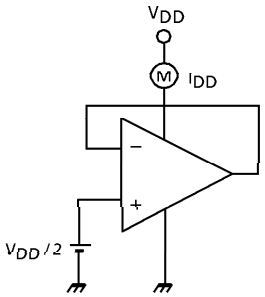


- V_{OL}

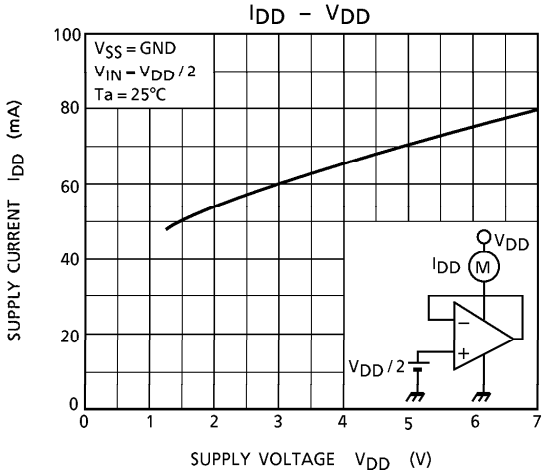
$$V_{IN1} = \frac{V_{DD}}{2} + 0.05V$$

$$V_{IN2} = \frac{V_{DD}}{2} - 0.05V$$

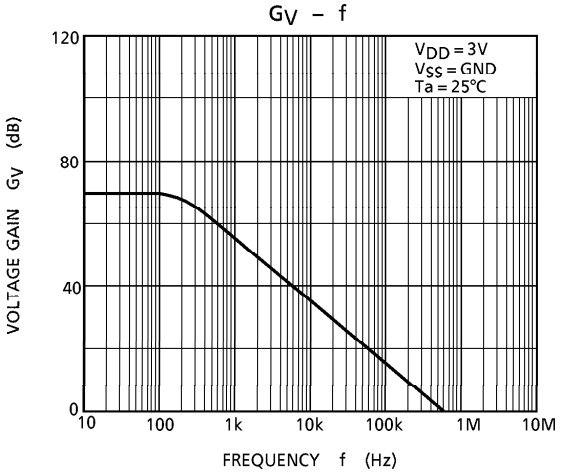
5. I_{DD}



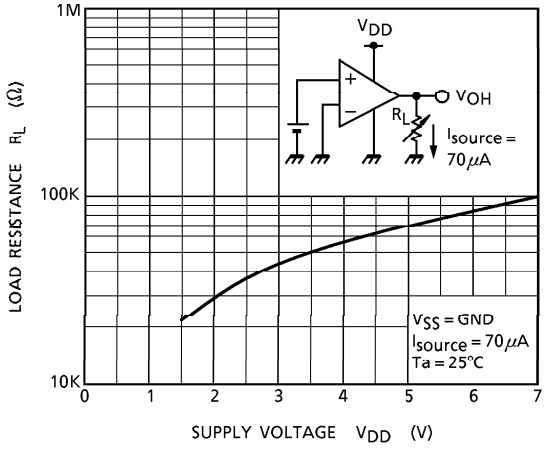
I_{DD} – V_{DD}



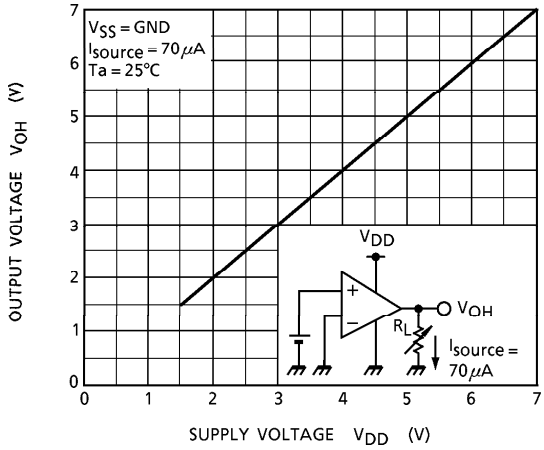
G_V – f



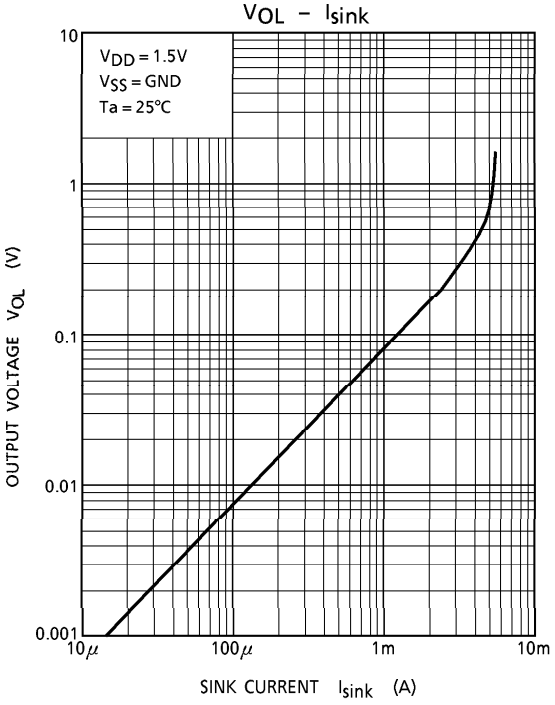
R_L – V_{DD}



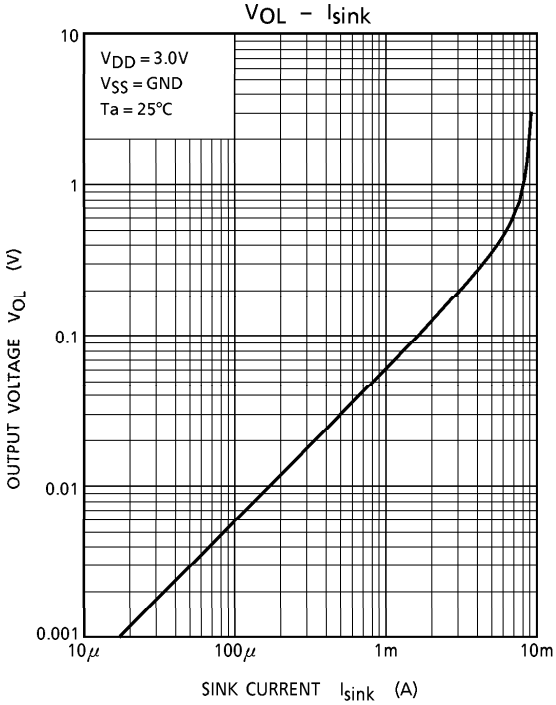
V_{OH} – V_{DD}



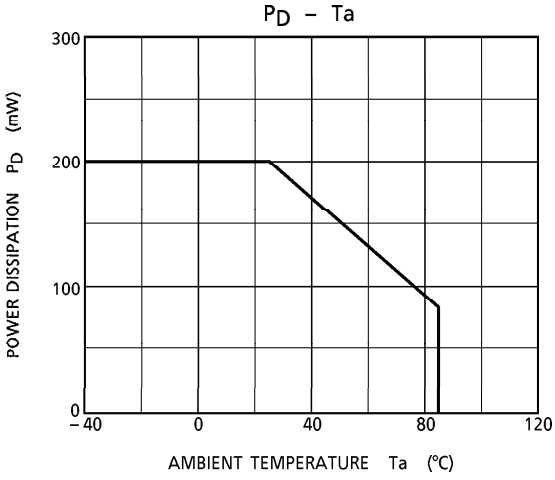
V_{OL} – I_{sink}



V_{OL} – I_{sink}



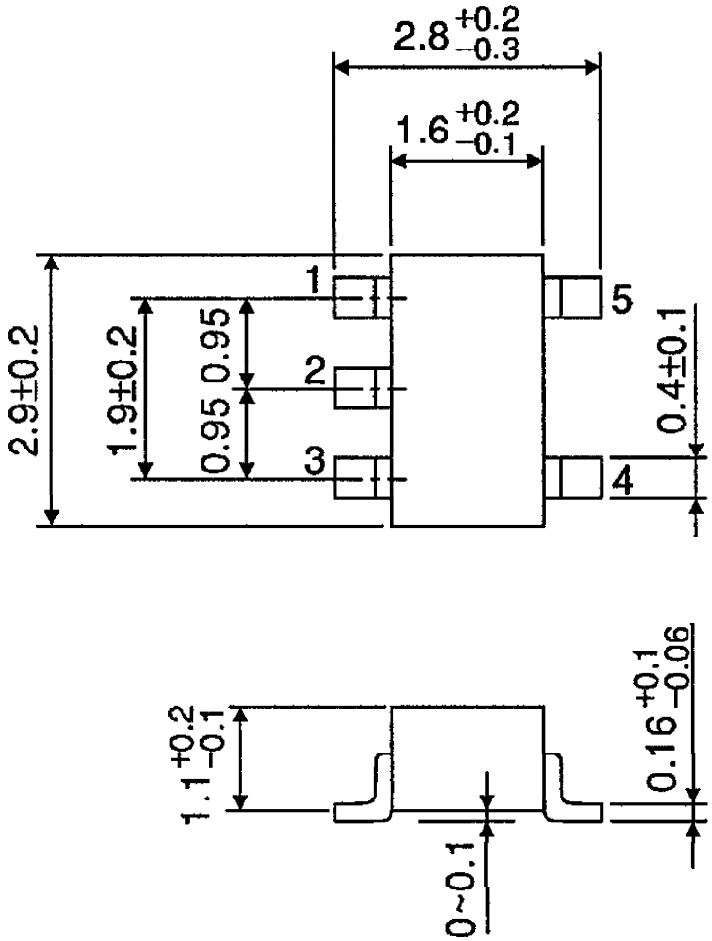
P_D – Ta



OUTLINE DRAWING

SSOP5-P-0.95

Unit : mm

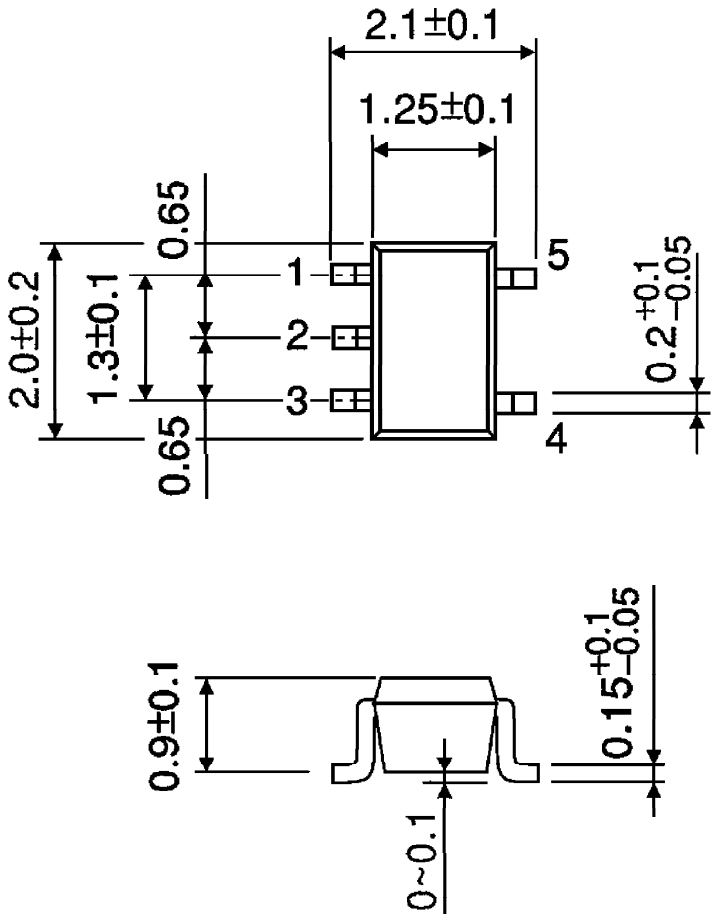


Weight : 0.014g (Typ.)

OUTLINE DRAWING

SSOP5-P-0.65A

Unit : mm



Weight : 0.006g (Typ.)