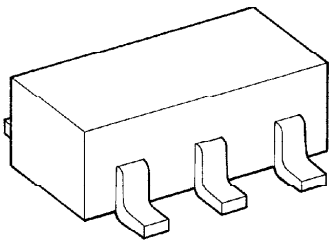
TOSHIBA CMOS LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

TC75S54F

SINGLE OPERATIONAL AMPLIFIER

TC75S54F is a CMOS operational amplifier with low supply voltage, low supply current.



SSOP5-P-0.95

Weight : 0.014g (Typ.)

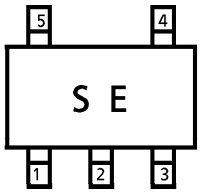
FEATURES

- Low supply voltage : $V_{DD} = \pm 0.9 \sim 3.5V$ or $1.8 \sim 7V$
- Low supply current : I_{DD} ($V_{DD} = 3V$) = 100μA (Typ.)
- The internally phase compensated operational amplifier.
- Small package

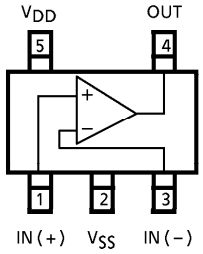
MAXIMUM RATINGS (Ta = 25°C)

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)



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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	—	2	10	mV
Input Offset Current	I_{IO}	—	—	—	1	—	pA
Input Bias Current	I_I	—	—	—	1	—	pA
Common Mode Input Voltage	CMV_{IN}	2	—	0.0	—	2.1	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	
Common Mode Input Signal Rejection Ratio	CMRR	2	V_{IN} = 0.0~2.1V	60	70	—	dB
Supply Voltage Rejection Ratio	SVRR	1	V_{DD} = 1.8~7.0V	60	70	—	dB
Supply Current	I_{DD}	5	—	—	100	200	μA
Source Current	I_{source}	6	—	100	200	—	μA
Sink Current	I_{sink}	7	—	200	700	—	μA

DC CHARACTERISTICS (V_{DD} = 1.8V, 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	—	2	10	mV
Input Offset Current	I_{IO}	—	—	—	1	—	pA
Input Bias Current	I_I	—	—	—	1	—	pA
Common Mode Input Voltage	CMV_{IN}	2	—	0.2	—	0.9	V
Voltage Gain (Open Loop)	G_V	—	—	60	70	—	dB
Maximum Output Voltage	V_{OH}	3	$R_L \geqq$ 100kΩ	1.7	—	—	V
	V_{OL}	4	$R_L \geqq$ 100kΩ	—	—	0.1	
Supply Current	I_{DD}	5	—	—	80	160	μA
Source Current	I_{source}	6	—	80	160	—	μA
Sink Current	I_{sink}	7	—	200	600	—	μA

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

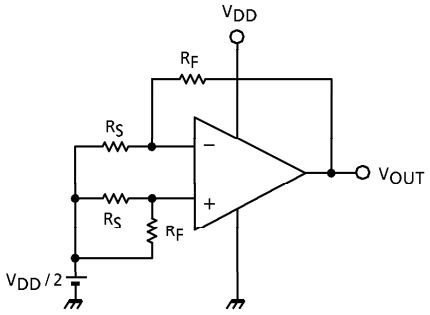
CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Slew Rate	SR	—	—	—	0.7	—	V / μs
Unity Gain Cross Frequency	f_T	—	—	—	0.9	—	MHz

AC CHARACTERISTICS (V_{DD} = 1.8V, V_{SS} = GND, Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Slew Rate	SR	—	—	—	0.6	—	V / μs
Unity Gain Cross Frequency	f_T	—	—	—	0.8	—	MHz

TEST CIRCUIT

1. SVRR, V_{IO}



- SVRR

  $V_{DD} = 1.8V$: $V_{DD} = V_{DD}1$, $V_{OUT} = V_{OUT}1$

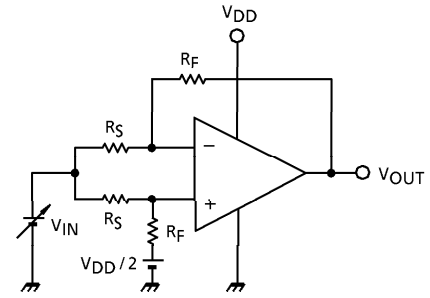
  $V_{DD} = 7.0V$: $V_{DD} = V_{DD}2$, $V_{OUT} = V_{OUT}2$

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

- 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

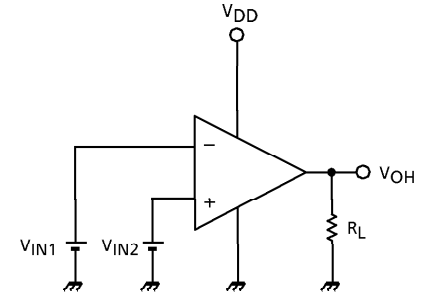
  $V_{IN} = 0.0V$: $V_{IN} = V_{IN}1$, $V_{OUT} = V_{OUT}1$

  $V_{IN} = 2.1V$: $V_{IN} = V_{IN}2$, $V_{OUT} = V_{OUT}2$

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

- CMV_{IN}

3. V_{OH}

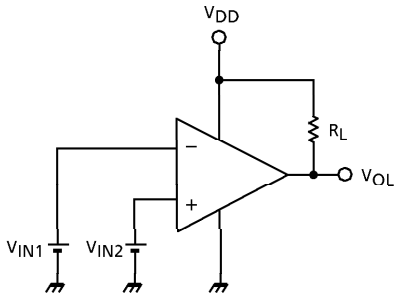


- V_{OH}

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

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

4. V_{OL}

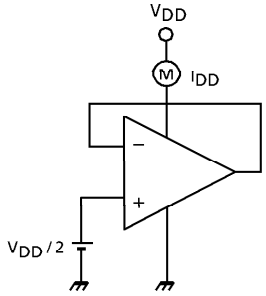


- V_{OL}

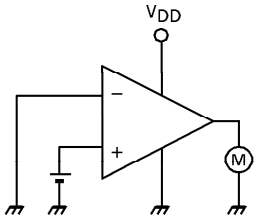
$$V_{IN1} = \frac{V_{DD}}{2} + 0.05V$$

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

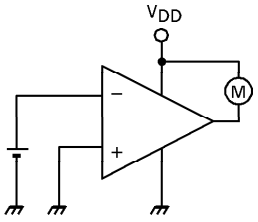
5. I_{DD}



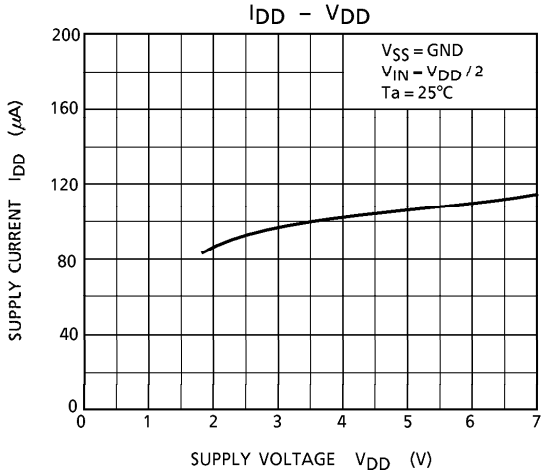
6. I_{source}



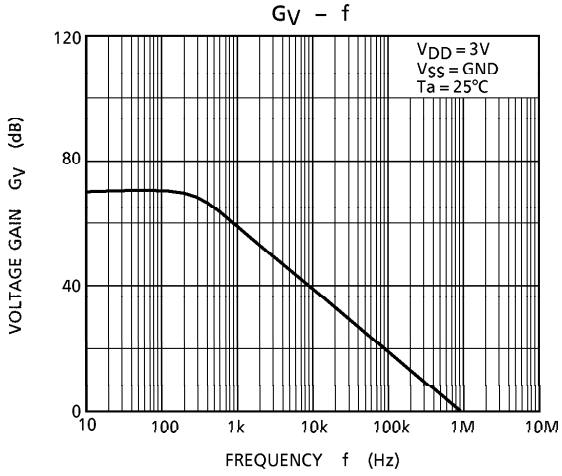
7. I_{sink}



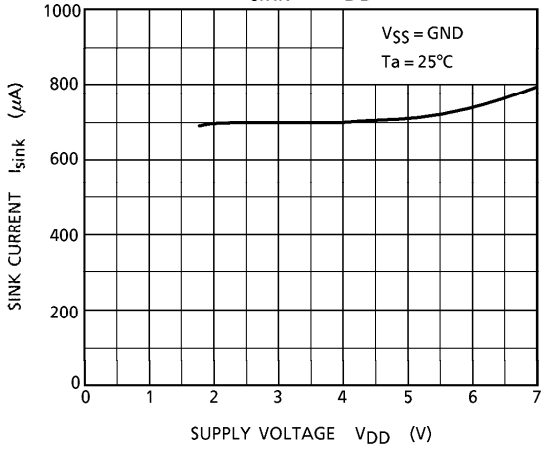
I_{DD} – V_{DD}



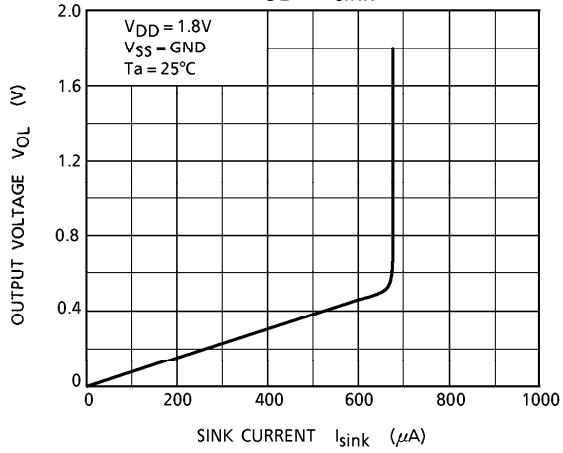
G_V – f



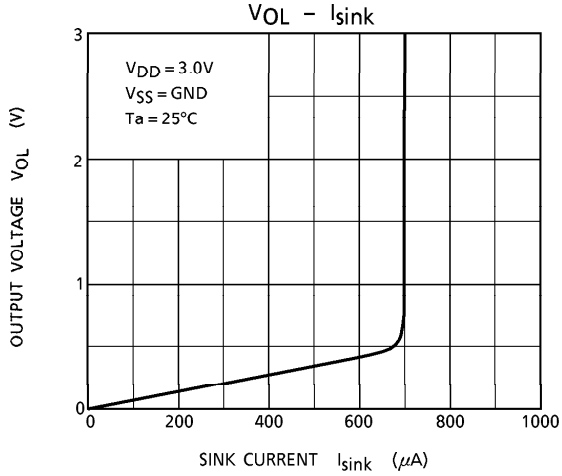
I_{sink} – V_{DD}



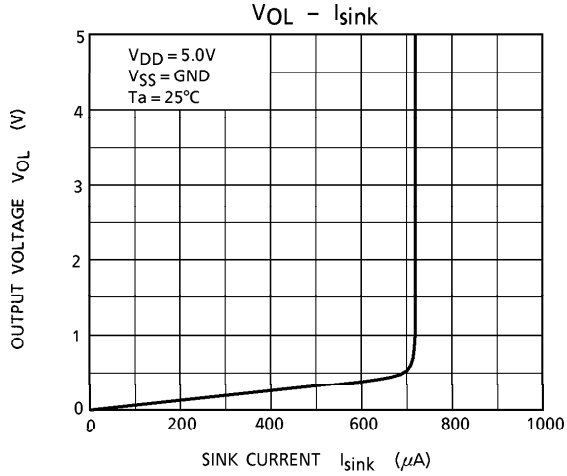
V_{OL} – I_{sink}



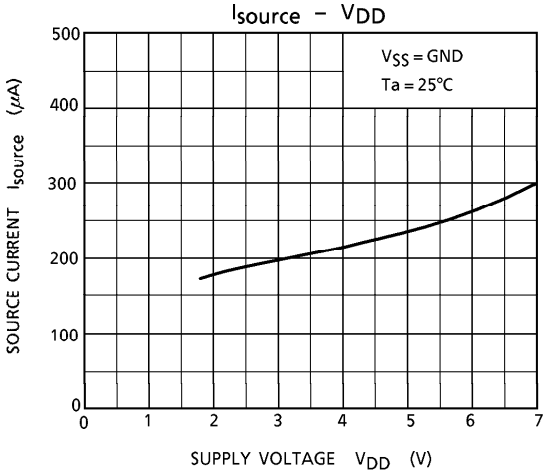
V_{OL} – I_{sink}



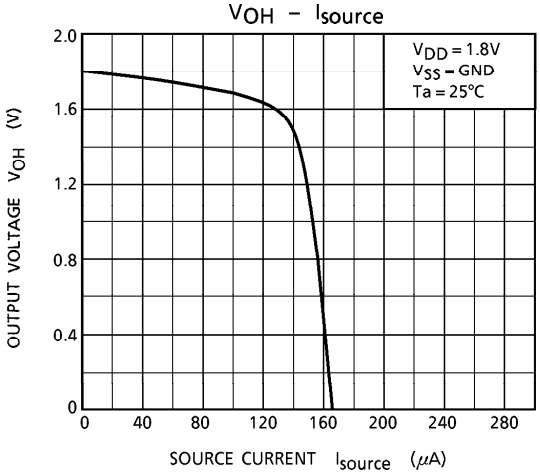
V_{OL} – I_{sink}



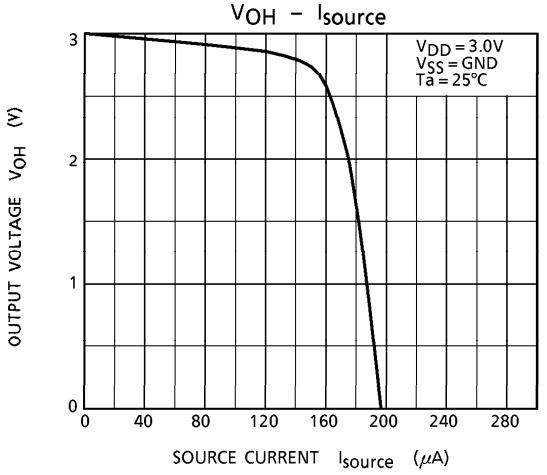
I_{source} – V_{DD}



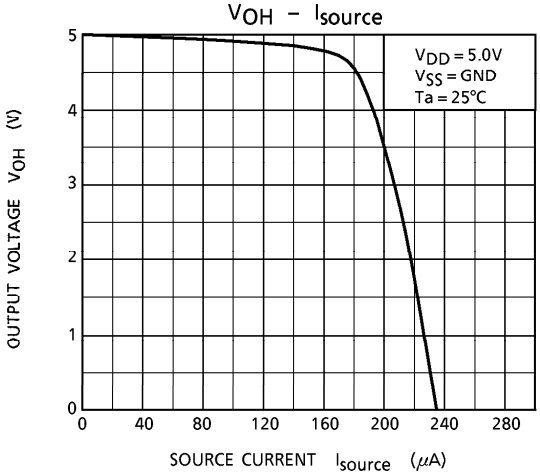
V_{OH} – I_{source}



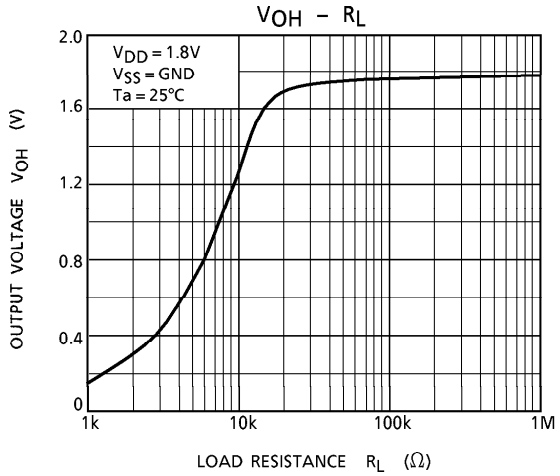
V_{OH} – I_{source}



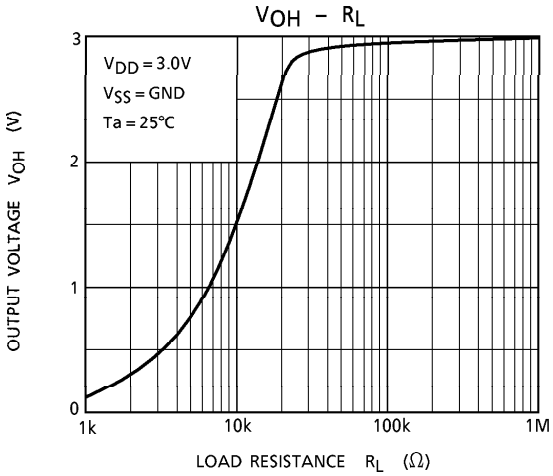
V_{OH} – I_{source}

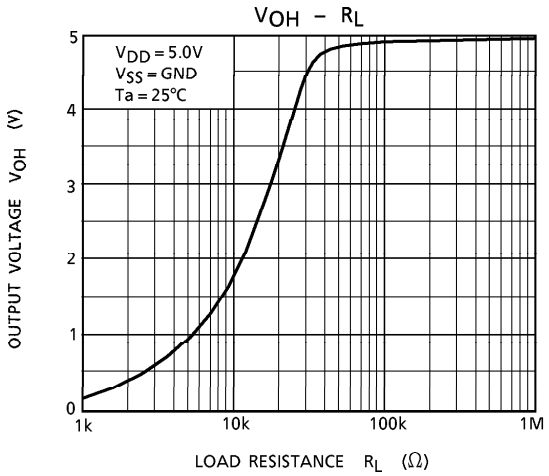


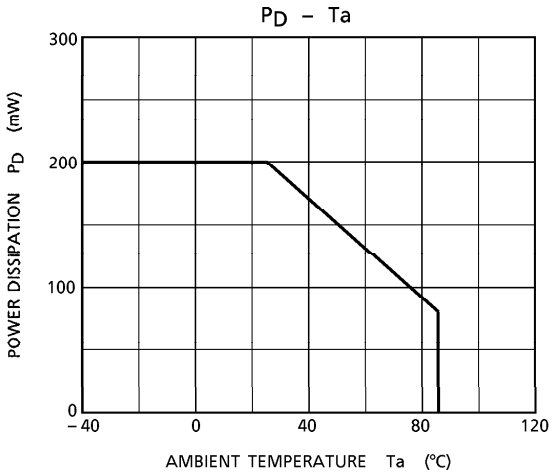
V_{OH} – R_L



V_{OH} – R_L



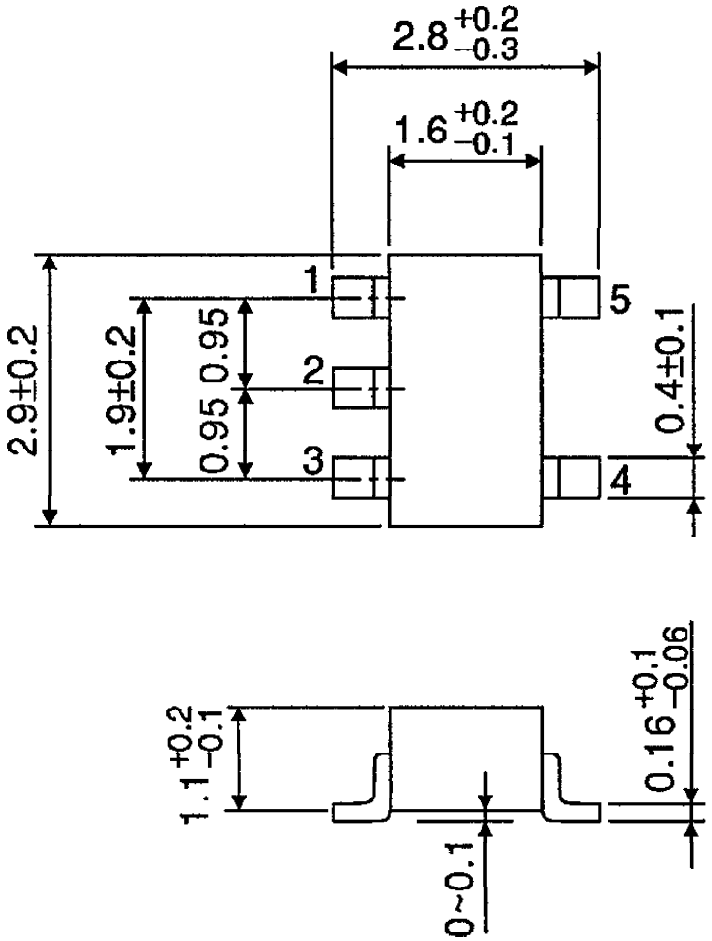

V_{OH} – R_L
V_{DD} = 5.0V
V_{SS} = GND
Ta = 25°C
OUTPUT VOLTAGE V_{OH} (V)
LOAD RESISTANCE R_L (Ω)
0
1
2
3
4
5
1k
10k
100k
1M


P_D – Ta
POWER DISSIPATION P_D (mW)
AMBIENT TEMPERATURE Ta (°C)
0
100
200
300
– 40
0
40
80
120

OUTLINE DRAWING

SSOP5-P-0.95

Unit : mm



Weight : 0.014g (Typ.)