TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

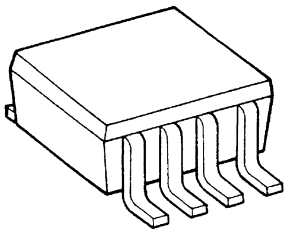
TC75W60FU, TC75W60FK

Dual Operational Amplifier

Features

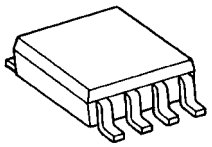
- High slew rate : SR (V_{DD} = 3 V) = 5.1 V/μs (typ.)
- Single and dual power Supply operations are possible.
  : V_{DD} = ±0.9 to 3.5 V or 1.8 to 7 V
- Lower supply current than general-purpose bipolar type op amps
  : I_{DD} (V_{DD} = 3 V) = 660 μA (typ.)
- The internally phase compensated operational amplifier.
- Small package

TC75W60FU



SSOP8-P-0.65

TC75W60FK



SSOP8-P-0.50A

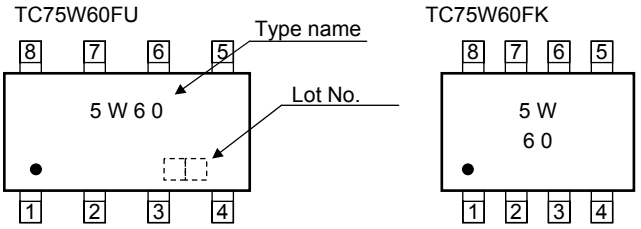
Weight
SSOP8-P-0.65 : 0.021 g (typ.)
SSOP8-P-0.50A : 0.01 g (typ.)

Absolute Maximum Ratings (Ta = 25°C)

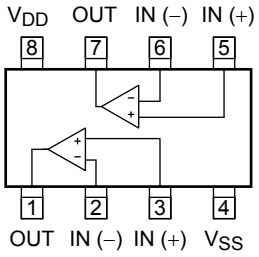
Characteristics		Symbol	Rating	Unit
Supply voltage		V_{DD}, V_{SS}	7	V
Differential input voltage		DV_{IN}	± 7	V
Input voltage		V_{IN}	V_{DD} to V_{SS}	V
Power dissipation	TC75W60FU	P_D	250	mW
	TC75W60FK		200	
Operating temperature		T_{opr}	−40 to 85	°C
Storage temperature		T_{stg}	−55 to 125	°C

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings and the operating ranges.
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook (“Handling Precautions”/“Derating Concept and Methods”) and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Marking (top view)



Pin Connection (top view)



Electrical Characteristics

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

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Input offset voltage	V_{IO}	—	R_S = 1 kΩ	—	2	7	mV
Input offset current	I_{IO}	—	—	—	1	—	pA
Input bias current	I_I	—	—	—	1	—	pA
Common mode input voltage	CMV_{IN}	—	—	0.0	—	2.1	V
Voltage gain (open loop)	G_V	—	—	60	70	—	dB
Maximum output voltage	V_{OH}	—	R_L = 100 kΩ	2.9	—	—	V
	V_{OL}	—	R_L = 100 kΩ	—	—	0.1	
Common mode rejection ratio	CMRR	—	V_{IN} = 0.0 to 2.1 V	54	70	—	dB
Suuply voltage rejection ratio	SVRR	—	V_{DD} = 1.8 to 7.0 V	60	70	—	dB
Supply current	I_{DD}	—	—	—	660	1000	μA
Source current	I_{source}	—	—	330	700	—	μA
Sink current	I_{sink}	—	—	600	1250	—	μA

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

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Input offset voltage	V_{IO}	—	R_S = 1 kΩ	—	2	7	mV
Input offset current	I_{IO}	—	—	—	1	—	pA
Input bias current	I_I	—	—	—	1	—	pA
Common mode input voltage	CMV_{IN}	—	—	0.3	—	0.9	V
Voltage gain (open loop)	G_V	—	—	—	70	—	dB
maximum output voltage	V_{OH}	—	R_L = 100 kΩ	1.7	—	—	V
	V_{OL}	—	R_L = 100 kΩ	—	—	0.1	
Common mode rejection ratio	CMRR	—	V_{IN} = 0.3 to 0.9 V	50	60	—	dB
Supply current	I_{DD}	—	—	—	600	900	μA
Source current	I_{source}	—	—	300	700	—	μA
Sink current	I_{sink}	—	—	550	1150	—	μA

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

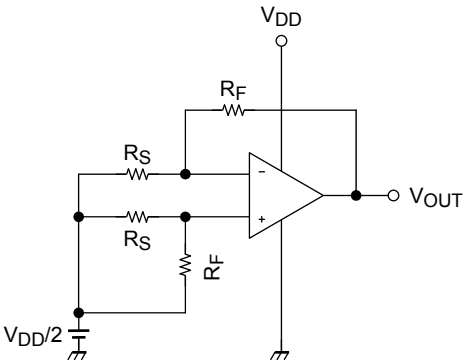
Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Slew rate	SR	—	—	—	5.1	—	V/μs
Unity gain cross frequency	f_T	—	—	—	3.7	—	MHz

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

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Slew rate	SR	—	—	—	4.0	—	V/μs
Unity gain cross frequency	f_T	—	—	—	3.0	—	MHz

TEST CIRCUIT

(1) SVRR, V_{IO}



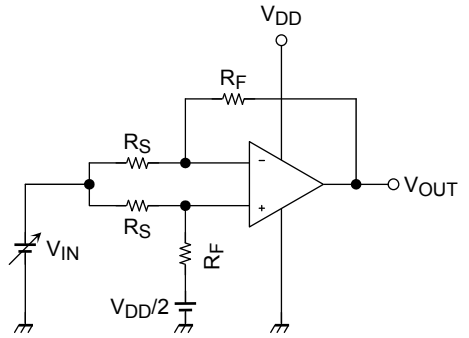
- SVRR
  V_{DD} = 1.5 V : $V_{DD} = V_{DD}1$, $V_{OUT} = V_{OUT}1$
  V_{DD} = 7.0 V : $V_{DD} = V_{DD}2$, $V_{OUT} = V_{OUT}2$

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

- V_{IO}

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

(2) CMRR, CMV_{IN}

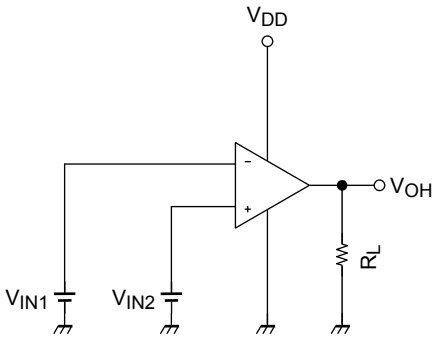


- CMRR
  V_{IN} = 0.0 V : $V_{IN} = V_{DD}1$, $V_{OUT} = V_{OUT}1$
  V_{IN} = 2.5 V : $V_{IN} = V_{DD}2$, $V_{OUT} = V_{OUT}2$

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

- CMV_{IN}

(3) V_{OH}

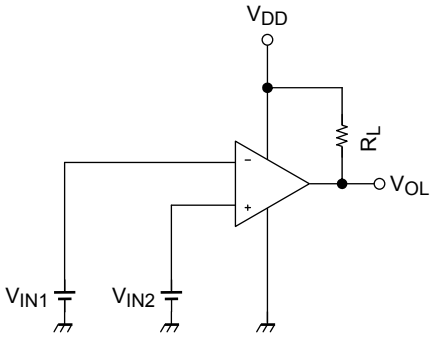


- V_{OH}

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

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

(4) V_{OL}

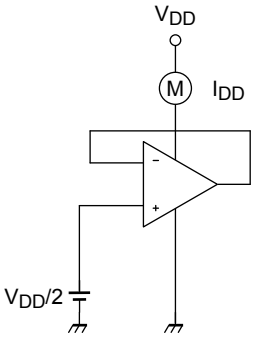


- V_{OL}

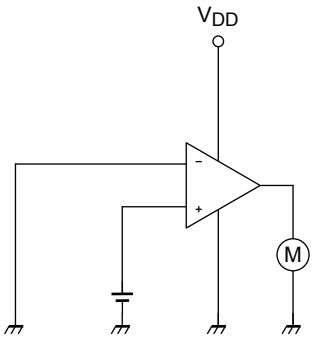
$$V_{IN1} = \frac{V_{DD}}{2} + 0.05\ V$$

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

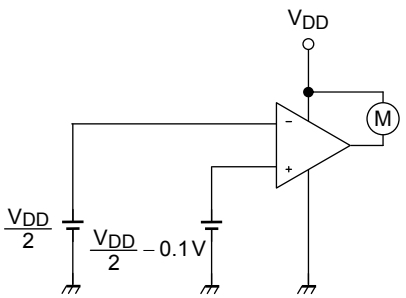
(5) I_{DD}



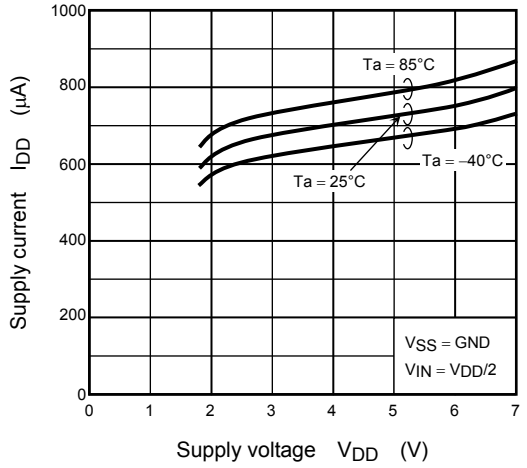
(6) I_{source}



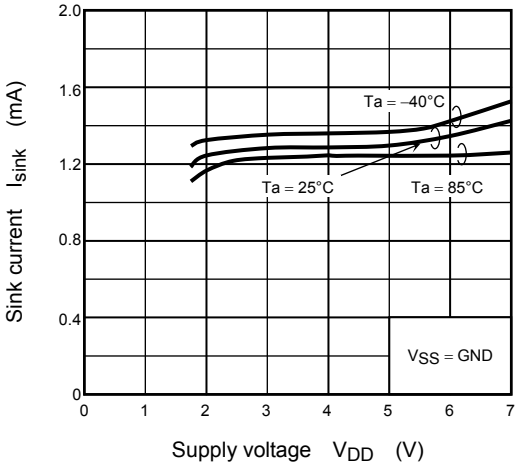
(7) I_{sink}



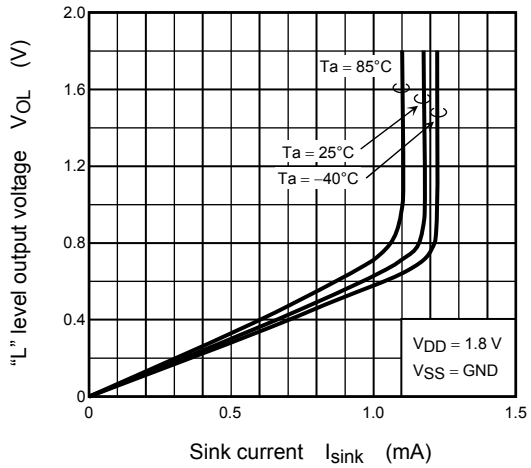
$I_{DD} - V_{DD}$



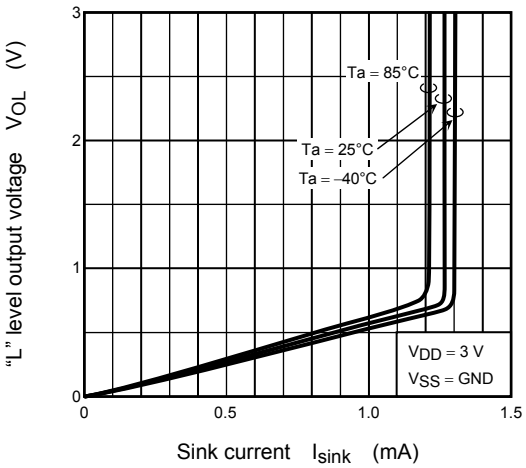
$I_{sink} - V_{DD}$



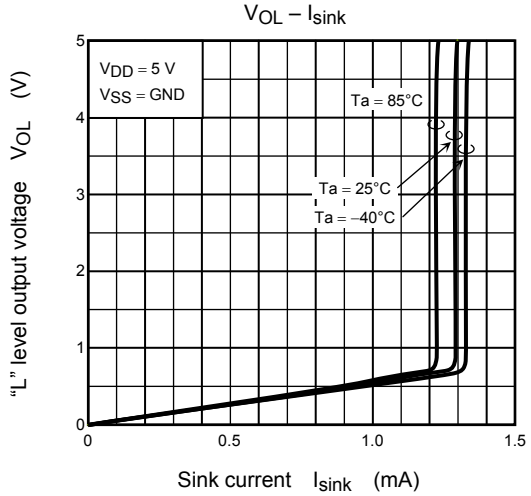
$V_{OL} - I_{sink}$



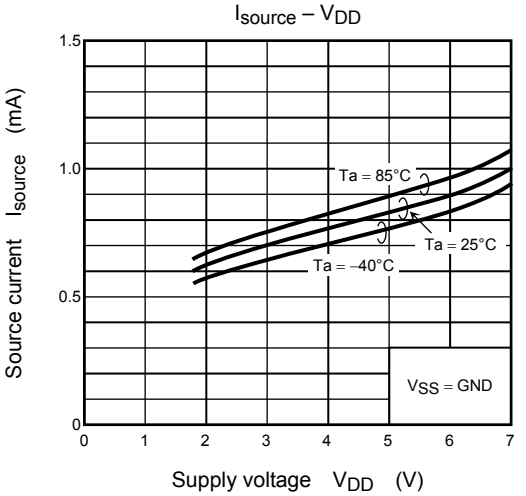
$V_{OL} - I_{sink}$



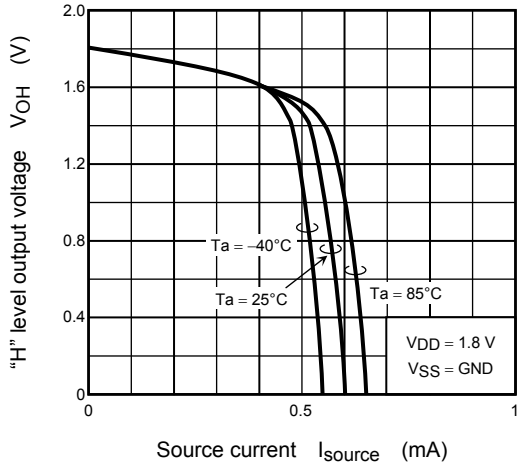
$V_{OL} - I_{sink}$



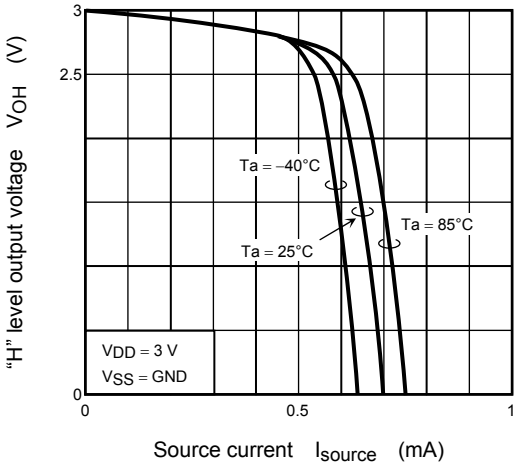
$I_{source} - V_{DD}$



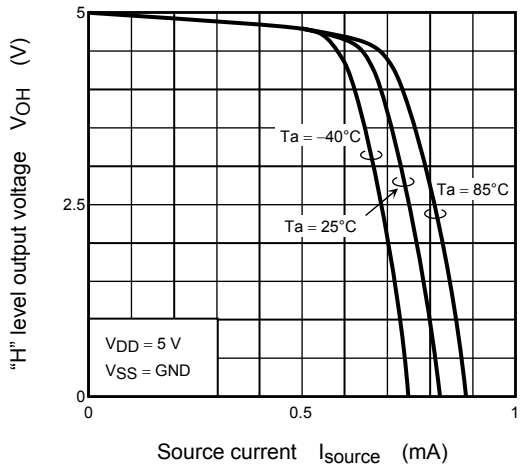
V_{OH} – I_{source}



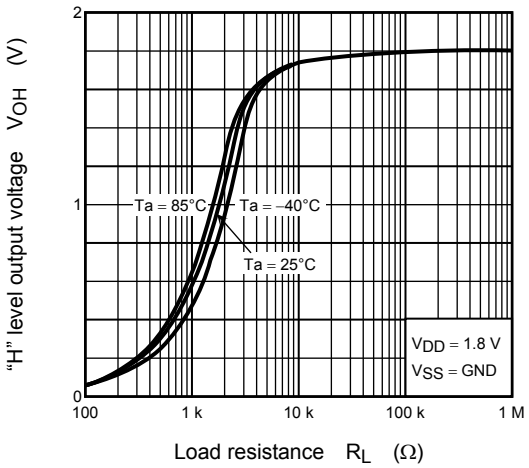
V_{OH} – I_{source}



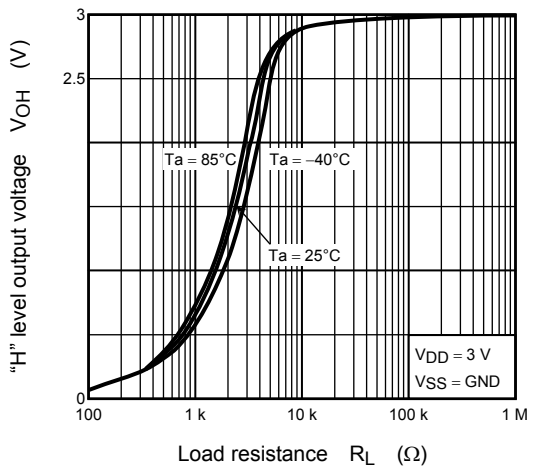
V_{OH} – I_{source}



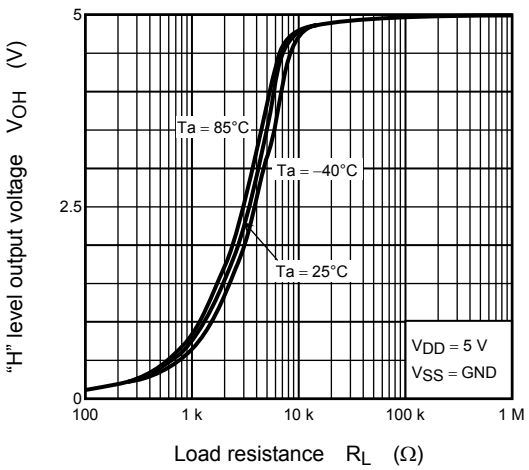
V_{OH} – R_L



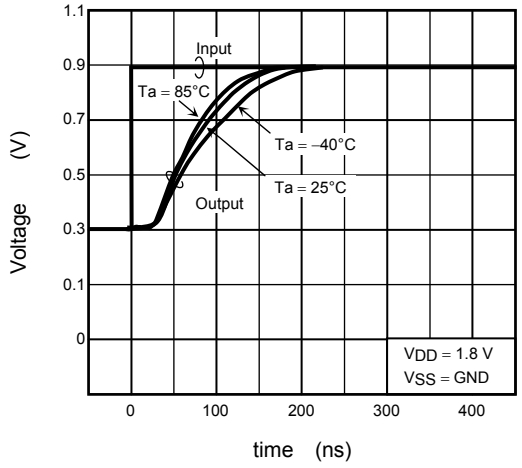
V_{OH} – R_L



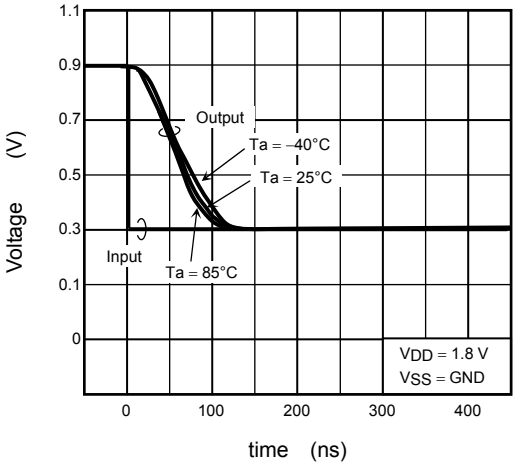
V_{OH} – R_L



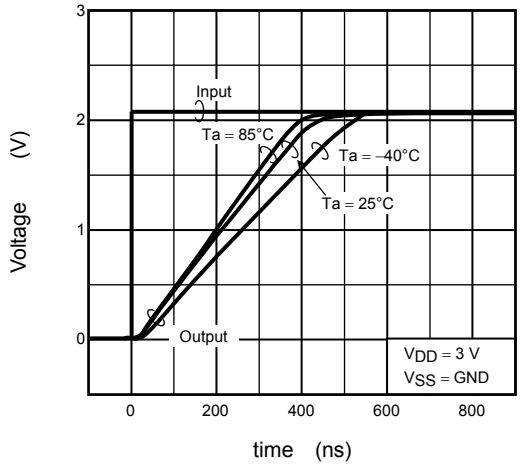
Pulse response (Rise)



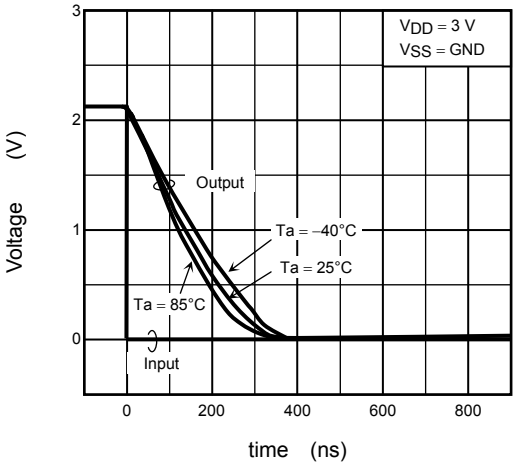
Pulse response (Fall)



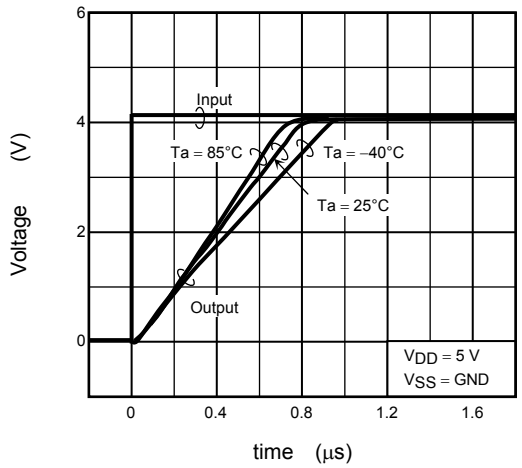
Pulse response (Rise)



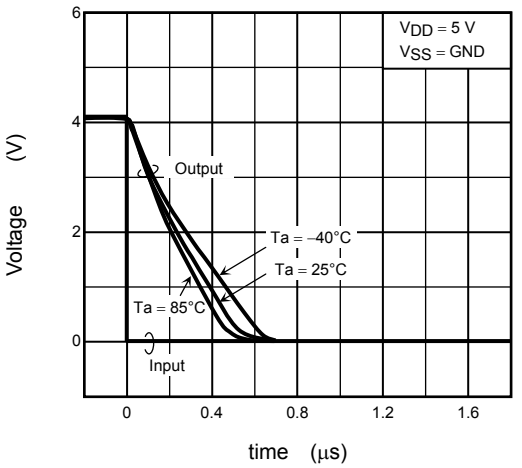
Pulse response (Fall)

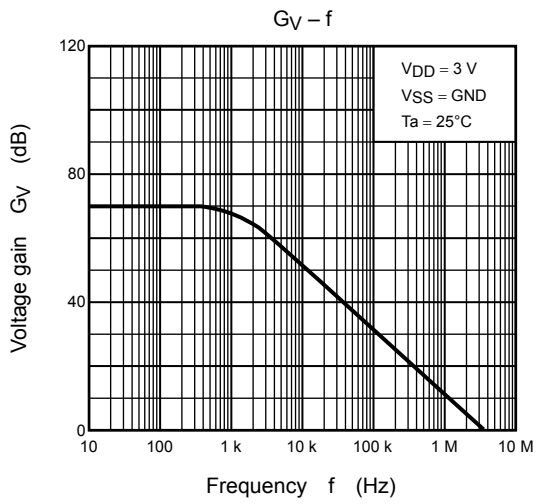


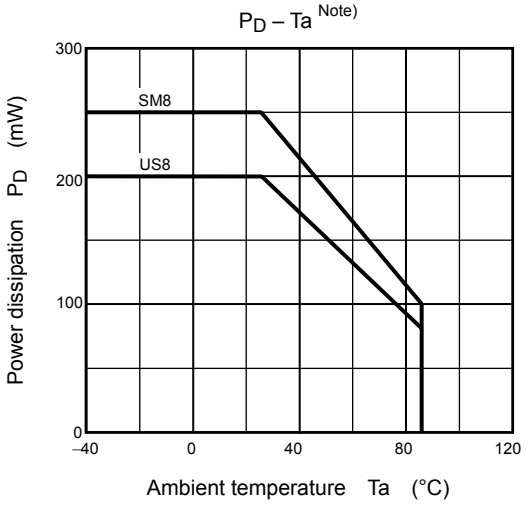
Pulse response (Rise)



Pulse response (Fall)







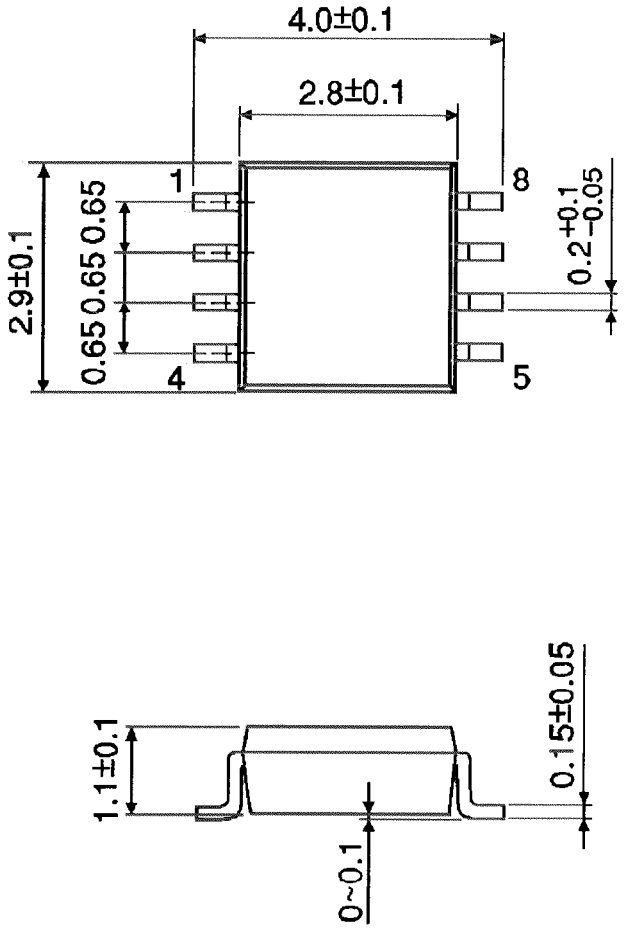
Note):

These power dissipation curves are given by measurement of only IC on the air and, in general, it become higher when mounted on PCB.

Since the power dissipation depends on mounted condition, please be sure to design.

Package Dimensions

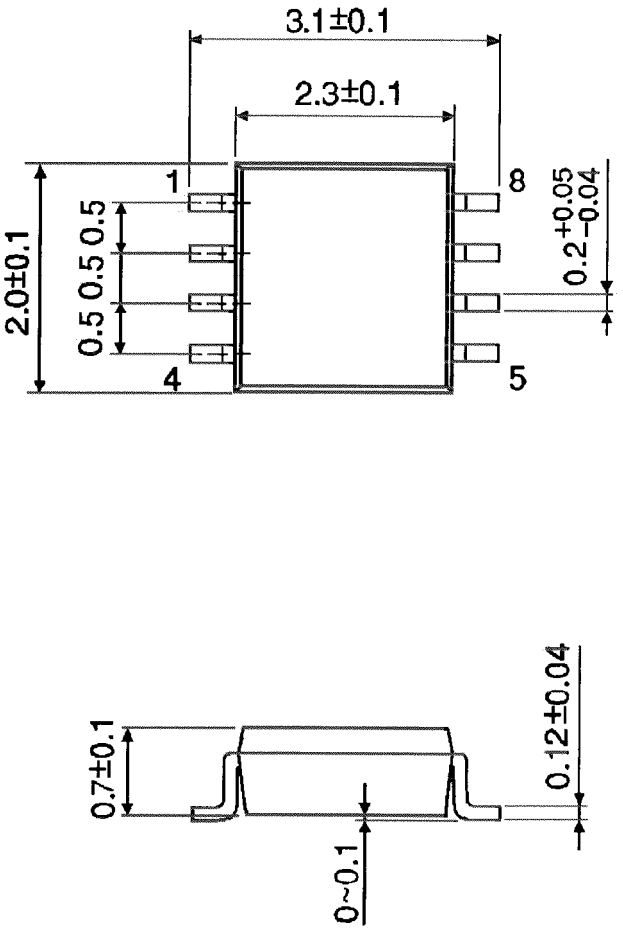
SSOP8-P-0.65 Unit : mm



Weight: 0.021 g (typ.)

Package Dimensions

SSOP8-P-0.50A Unit : mm



Weight: 0.01 g (typ.)

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