

ASSP

VOLTAGE DETECTOR

MB3761

VOLTAGE DETECTOR

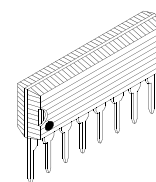
Designed for voltage detector applications, the Fujitsu MB3761 is a dual comparator with a built-in high precision reference voltage generator. Outputs are open-collector outputs and enable use of the OR-connection between both channels. Both channels have hysteresis control outputs. Because of a wide power supply voltage range and a low power supply current, the MB3761 is suitable for power supply monitors and battery backup systems.

- Wide power supply voltage range: 2.5 V to 40 V
- Low power and small voltage dependency supply current: 250 μ A typical.
- Built-in stable low voltage generator: 1.20 V typical.
- Easy-to-add hysteresis characteristics.
- Package: 8-pin Plastic SIP Package (Suffix: -PS)
8-pin Plastic DIP Package (Suffix: -P)
8-pin Plastic FPT Package (Suffix: -PF)

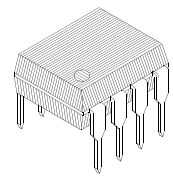
ABSOLUTE MAXIMUM RATINGS (See NOTE)

Rating	Symbol	Value	Unit
Power Supply Voltage	V _{CC}	41	V
Output Voltage	V _O	41	V
Output Current	I _O	50	mA
Input Voltage	V _{IN}	-0.3 to +6.5	V
Power Dissipation	P _D	350 (T _A $\leq$ 70°C)	mW
Storage Temperature	T _{STG}	-55 to 125	°C

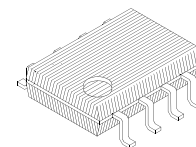
NOTE: Permanent device damage may occur if **ABSOLUTE MAXIMUM RATINGS** are exceeded. Functional operation should be restricted to the conditions as detailed in the operational sections of this data sheet. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.



PLASTIC PACKAGE
SIP-08P-M03



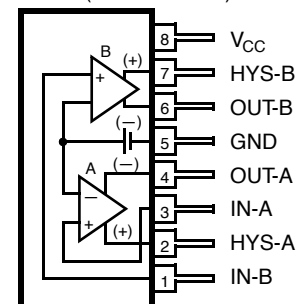
PLASTIC PACKAGE
DIP-08P-M01



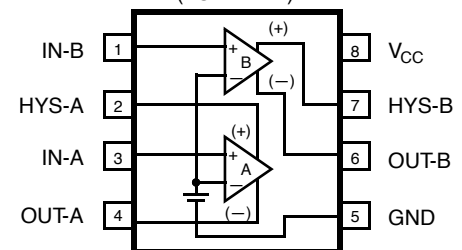
PLASTIC PACKAGE
FPT-08P-M01

PIN ASSIGNMENT

(FRONT VIEW)

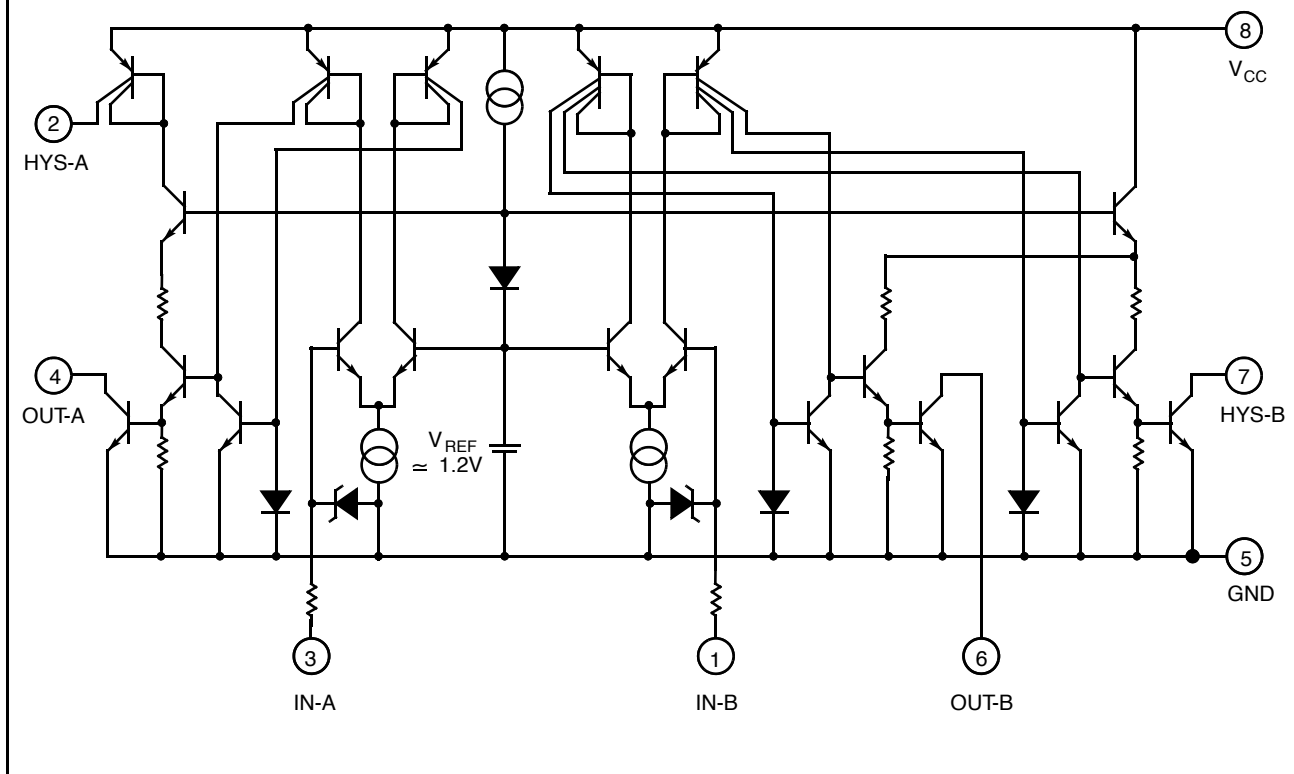


(TOP VIEW)



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.

Figure 1. MB3761 Equivalent Circuit



■ RECOMMENDED OPERATING CONDITIONS

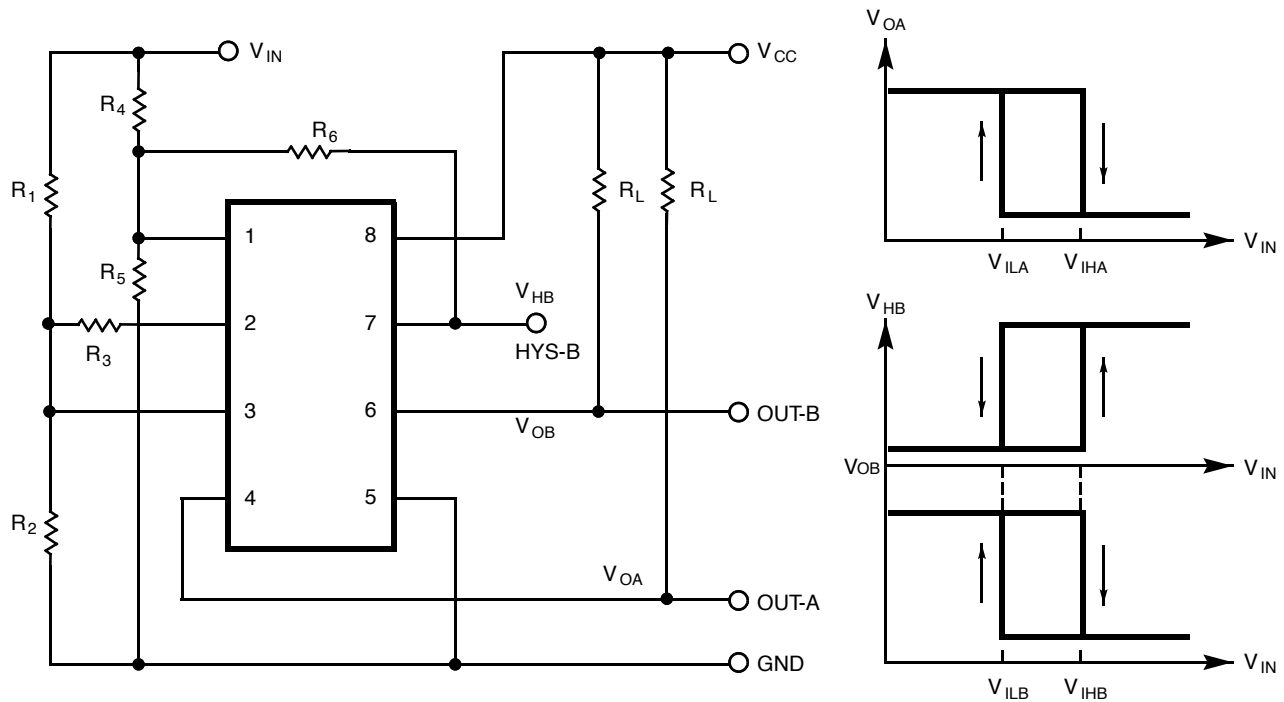
Parameter	Symbol	Value	Unit
Power Supply Voltage	V _{CC}	2.5 to 40	V
Operating Temperature	T _A	-20 to 75	°C
Output Current at pin 4	I _{O4}	4.5	mA
Output Current at pin 6	I _{O6}	3.0	mA

■ ELECTRICAL CHARACTERISTICS

$T_A=25^{\circ}\text{C}$, $V_{CC}=5\text{V}$

Parameter	Designator	Conditions	Values			Unit
			Min	Typ	Max	
Power Supply Voltage	ICCL	$V_{CC}=40\text{ V}$, $V_{IL}=1.0\text{ V}$	-	250	400	μA
	ICCH	$V_{CC}=40\text{ V}$, $V_{IH}=1.5\text{ V}$	-	400	600	μA
Threshold Voltage	V_{TH}	$I_O=2\text{ mA}$, $V_O=1\text{ V}$	1.15	1.20	1.25	V
Deviation of Threshold Voltage	ΔV_{TH1}	$2.5\text{ V} \leq V_{CC} \leq 5.5\text{ V}$	-	3	12	mV
	ΔV_{TH2}	$4.5\text{ V} \leq V_{CC} \leq 40\text{ V}$	-	10	40	mV
Offset Voltage between Outputs	V_{OOSA}	$I_{OA}=4.5\text{ mA}$, $V_{OA}=2\text{ V}$ $I_{HA}=20\text{ mA}$, $V_{HA}=3\text{ V}$	-	2.0	-	mV
	V_{OSSB}	$I_{OB}=3\text{ mA}$, $V_{OB}=2\text{ V}$ $I_{HB}=3\text{ mA}$, $V_{HB}=2\text{ V}$	-	2.0	-	mV
Temperature Coefficient of Threshold Voltage	α	$-20^{\circ}\text{C} \leq T_A \leq 70^{\circ}\text{C}$	-	± 0.05	-	$\text{mV}/^{\circ}\text{C}$
Difference Voltage on Threshold Voltage between Channel	ΔV_{THAB}		-10	-	-10	mV
Input Current	I_{IL}	$V_{IL}=1.0\text{ V}$	-	5		nA
	I_{IH}	$V_{IH}=1.5\text{ V}$	-	100	500	nA
Output Leakage Current	I_{OH}	$V_O=40\text{ V}$, $V_{IL}=1.0\text{ V}$	-	-	1	μA
Hysteresis Output Leakage Current	I_{HLA}	$V_{CC}=40\text{ V}$, $V_{HA}=0\text{ V}$, $V_{IL}=1.0\text{ V}$	-	-	0.1	μA
	I_{HHB}	$V_{HB}=40\text{ V}$, $V_{IH}=1.5\text{ V}$	-	-	1	μA
Output Sink Current	I_{OLA}	$V_O=1.0\text{ V}$, $V_{IH}=1.5\text{ V}$	6	12	-	mA
	I_{OLB}	$V_O=1.0\text{ V}$, $V_{IH}=1.5\text{ V}$	4	10	-	mA
Hysteresis Current	I_{HHA}	$V_H=0\text{ V}$, $V_{IH}=1.5\text{ V}$	40	80	-	μA
	I_{HLB}	$V_H=1.0\text{ V}$, $V_{IL}=1.0\text{ V}$	4	10	-	mA
Output Saturation Voltage	V_{OLA}	$I_O=4.5\text{ mA}$, $V_{IH}=1.5\text{ V}$	-	120	400	mV
	V_{OLB}	$I_O=3.0\text{ mA}$, $V_{IH}=1.5\text{ V}$	-	120	400	mV
Hysteresis Saturation	V_{HHA}	$I_H=20\text{ }\mu\text{A}$, $V_{IH}=1.5\text{ V}$	-	50	200	mV
	V_{HLB}	$I_H=3.0\text{ mA}$, $V_{IL}=1.0\text{ V}$	-	120	400	mV
Output Delay Time	t_{PHL}	$R_L=5\text{ K}\Omega$	-	2	-	μs
	t_{PLH}	$R_L=5\text{ K}\Omega$	-	3	-	μs

Figure 2. Operational Definitions



$$V_{IHA} = (1 + \frac{R_1}{R_2}) V_R$$

$$V_{ILA} = (1 + \frac{R_1}{R_2 // R_3}) V_R - \frac{R_1}{R_3} V_{CC}$$

$$V_{IHB} = (1 + \frac{R_4}{R_5 // R_6}) V_R$$

$$V_{ILB} = (1 + \frac{R_4}{R_5}) V_R$$

NOTE)

$$V_R \approx V_{TH} (\approx 1.20V)$$

$$R_2 // R_3 = \frac{R_2 R_3}{R_2 + R_3}$$

$$R_5 // R_6 = \frac{R_5 R_6}{R_5 + R_6}$$

■ TYPICAL PERFORMANCE CHARACTERISTICS

Fig. 3 - Power Supply Current vs Power Supply Voltage

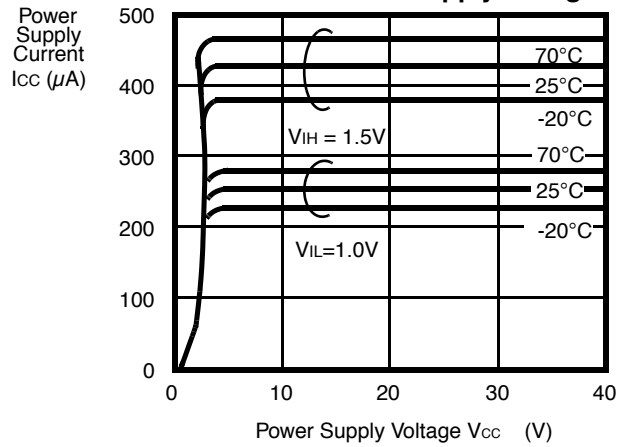


Fig. 4 - Hysteresis (A) Current vs Power Supply Voltage

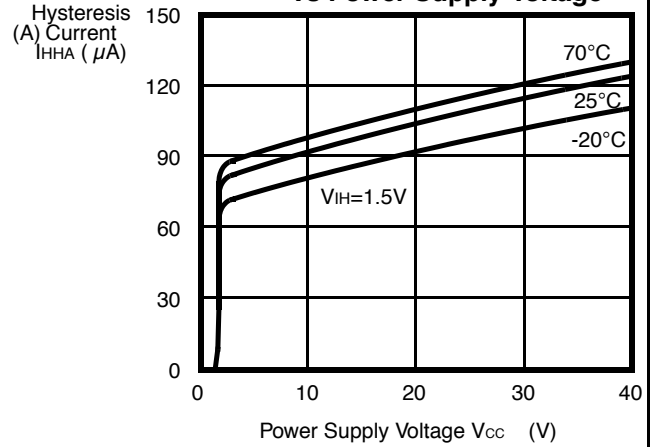


Fig. 5 - Output (A) Voltage vs. Output (A) Current

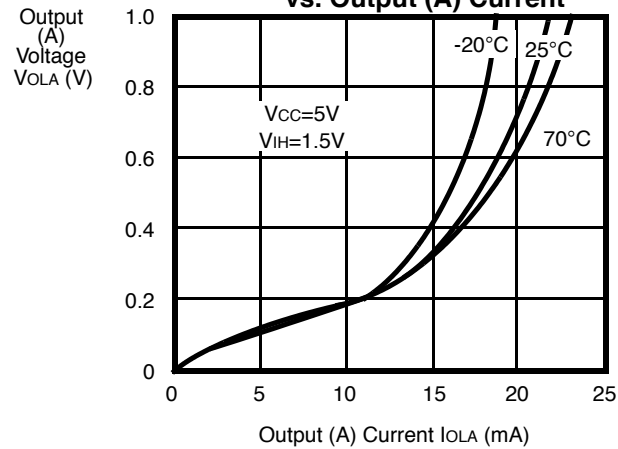


Fig. 6 - Output (B) Voltage vs. Output (B) Current

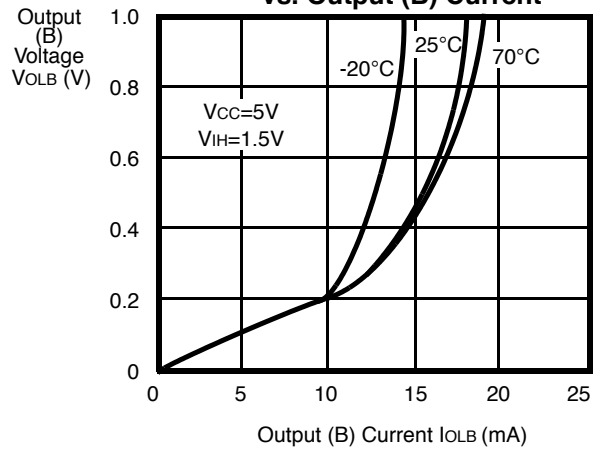


Fig. 7 - Threshold Voltage vs. Power Supply Voltage

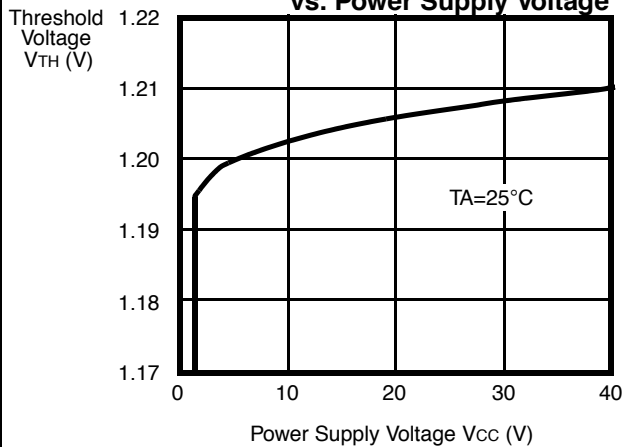
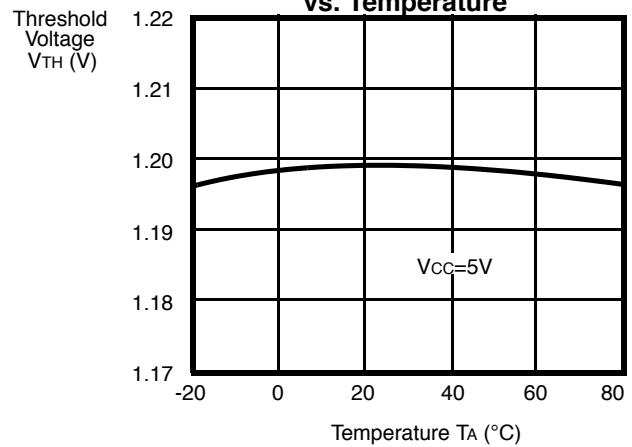
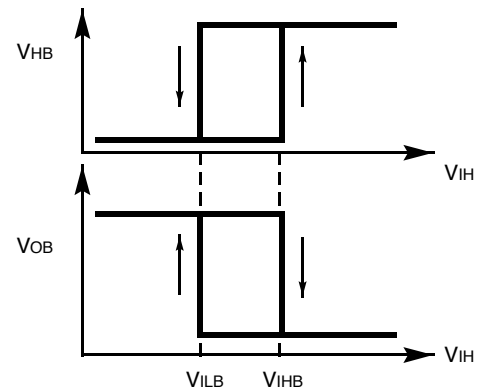
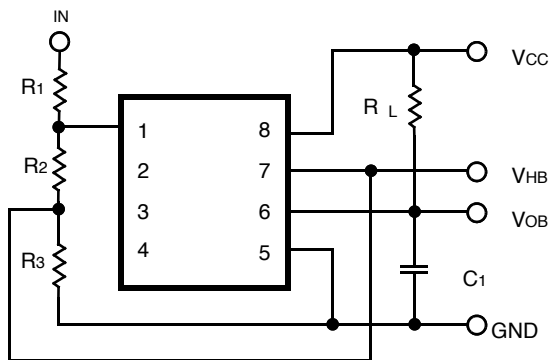
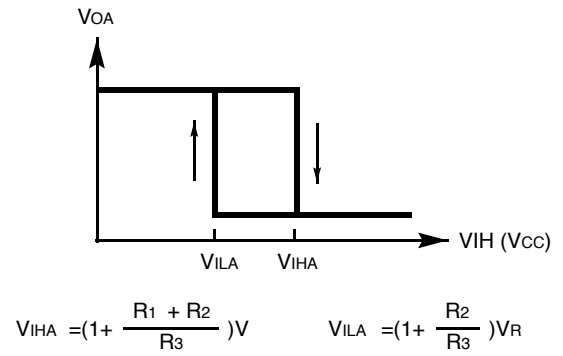
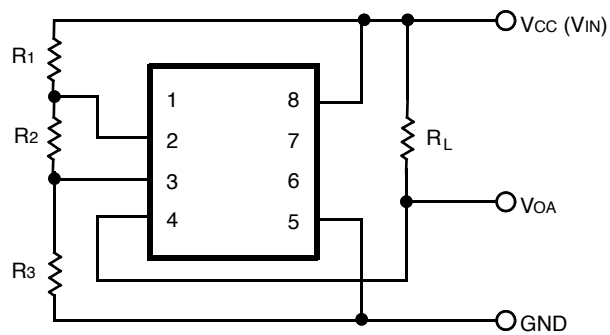


Fig. 8 - Threshold Voltage vs. Temperature



■ APPLICATION EXAMPLES

Figure 9. Addition of Hysteresis



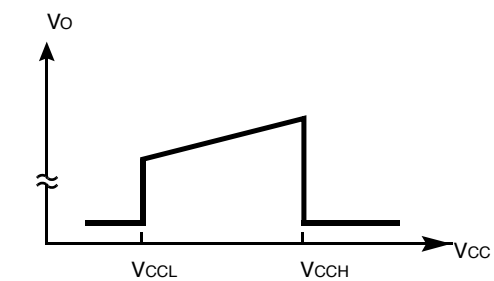
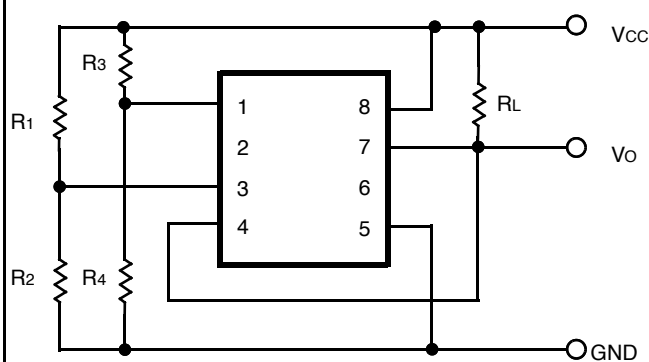
Note: All calculations occur with the output voltage at 0. The hysteresis values are adjusted for load condition and saturation voltage.

$$V_{IHB} = \left(1 + \frac{R_1}{R_2}\right) V_R$$

$$V_{ILB} = \left(1 + \frac{R_1}{R_2 + R_3}\right) V_R$$

■ APPLICATION EXAMPLES (Continued)

Figure 10. Voltage Detection for Alarm

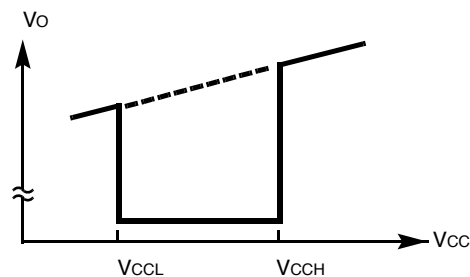
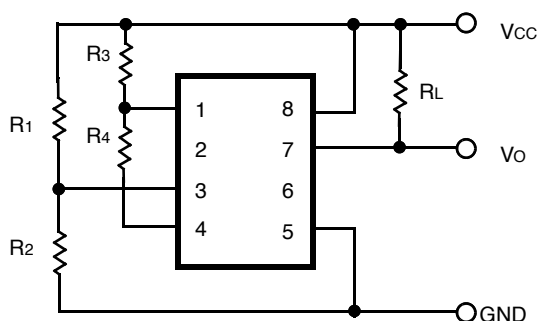


$$V_{CCH} = (1 + \frac{R_1}{R_2}) V_R \quad V_{CCL} = (1 + \frac{R_3}{R_4}) V_R$$

$$V_{CCL} \geq 2.5 \text{ V}$$

For hysteresis, a positive feedback from pin 2 or 7 is required.

Figure 11. Voltage Detection for Alarm

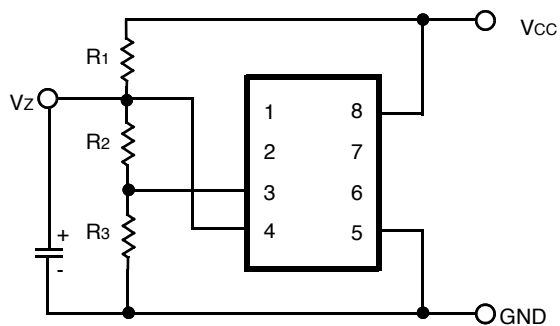


$$V_{CCH} = (1 + \frac{R_3}{R_4}) V_R \quad V_{CCL} = (1 + \frac{R_1}{R_2}) V_R$$

$$V_{CCL} \geq 2.5 \text{ V}$$

■ APPLICATION EXAMPLES (Continued)

Figure 12. Programmable Zener

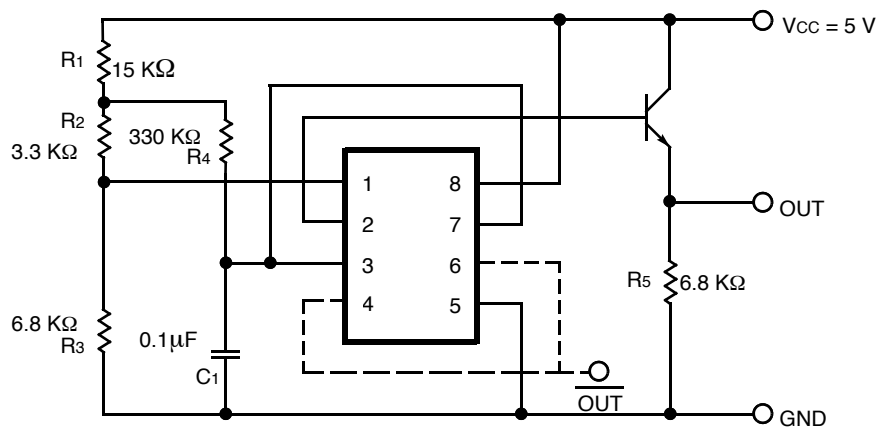


$$V_Z \approx \left(1 + \frac{R_2}{R_3}\right) V_R$$

$$\frac{V_Z}{R_2 + R_3} \leq \frac{V_{CC} - V_Z}{R_1} \leq 6\text{mA}$$

Channel B can be used independently.

Figure 13. Recovery Reset Circuit



■ TYPICAL CHARACTERISTICS

Figure 14. DC Characteristics

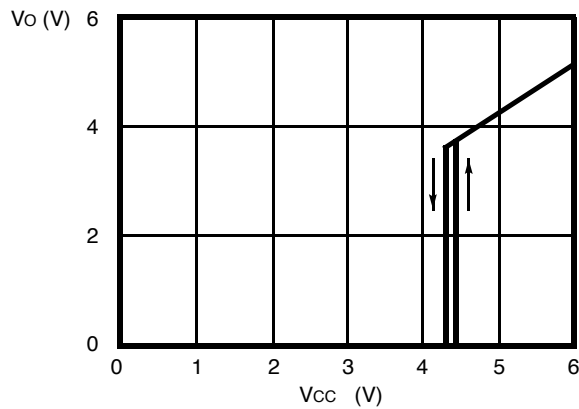
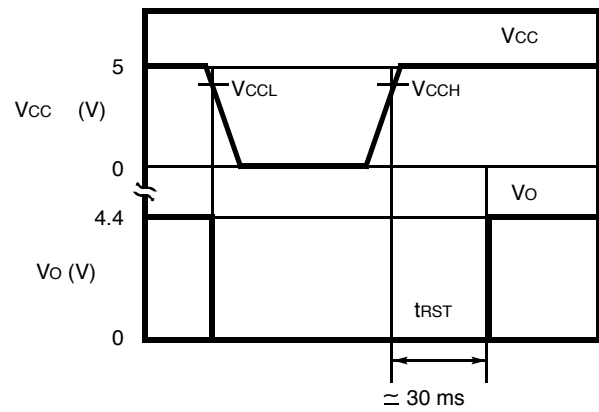


Figure 15. Response Characteristics



- Voltage Threshold Levels (V_{CCL} and V_{CCH}) and Hysteresis Width can be changed by the resistors (R_1 through R_4).

$$V_{CCL} = \frac{R_1 + R_2 + R_3}{R_3} V_{TH}$$

$$V_{CCH} = V_{CCL} + \frac{R_1 (R_2 + R_3)}{R_3 R_4} V_{TH}$$

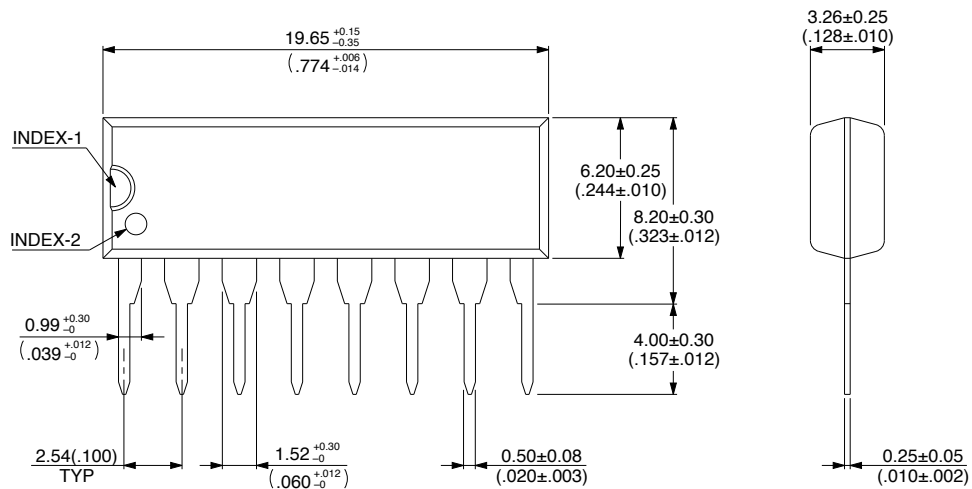
- Power-On Reset Time is provided by the following approximate equation:

$$t_{RST} = -C_1 R_4 \cdot \ln \left\{ 1 - \frac{V_{TH}}{V_{CC}} \left(1 + \frac{R_1}{R_2 + R_3} \right) \right\}$$

- The recommended value of h_{FE} of the external transistor is from 50 to 200.
- In the case of an instant power fail, the remaining charge in C_1 effects t_{RST} .
- If necessary, the reversed output is provided on HYS terminal

■ PACKAGE DIMENSIONS (Continued)

8 pin, Plastic SIP
(SIP-08P-M03)

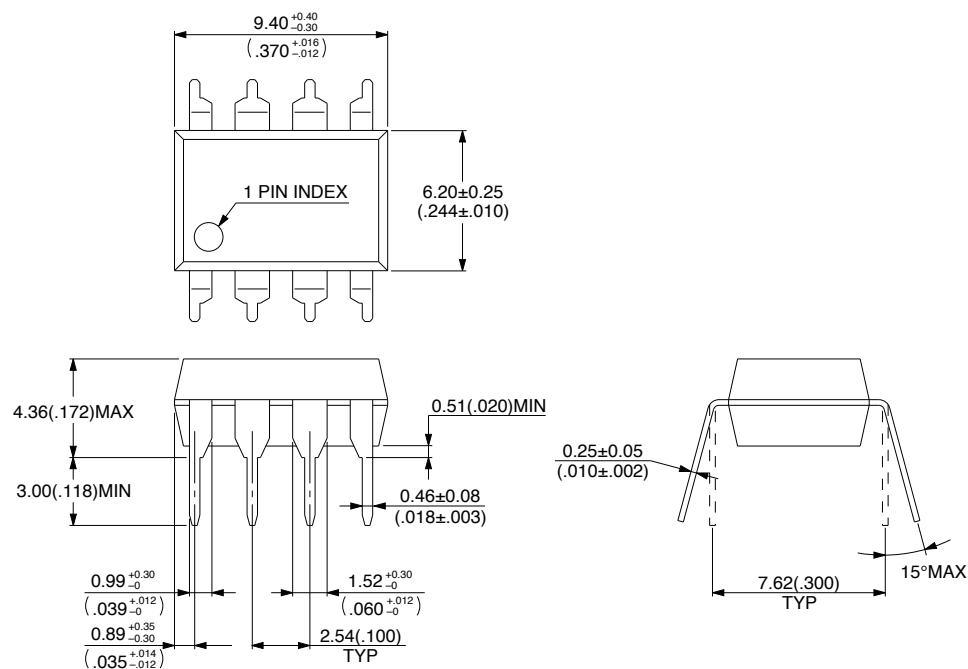


© 1994 FUJITSU LIMITED S08010S-3C-2

Dimensions in mm (inches).

■ PACKAGE DIMENSIONS (Continued)

8 pin, Plastic DIP
(DIP-08P-M01)

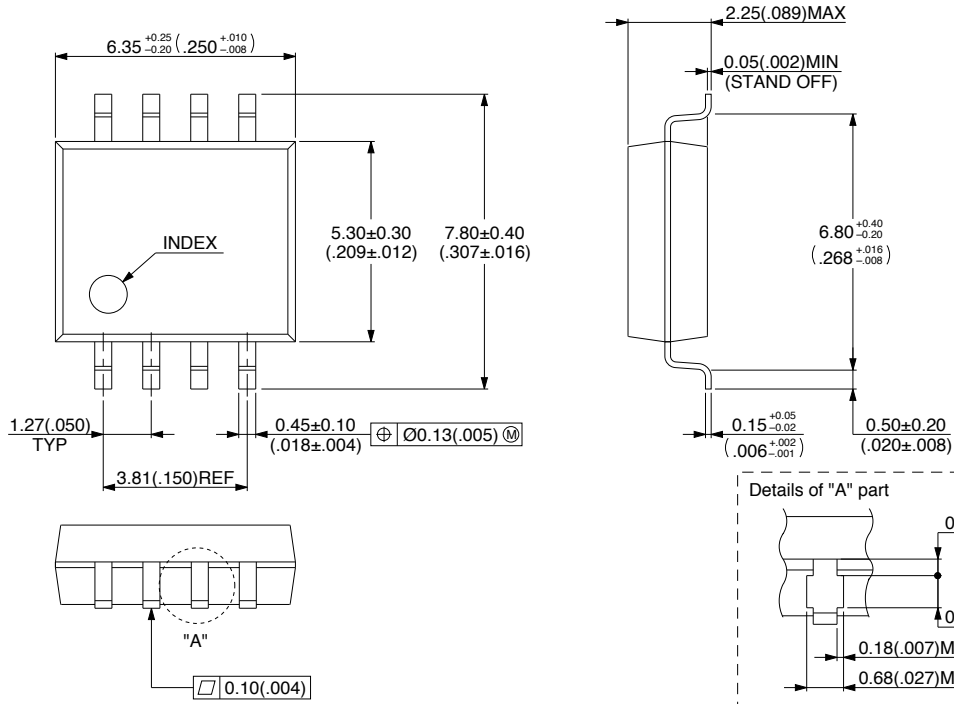


© 1994 FUJITSU LIMITED D08006S-2C-3

Dimensions in mm (inches).

■ PACKAGE DIMENSIONS (Continued)

8 pin, Plastic SOP
(FPT-08P-M01)



© 1994 FUJITSU LIMITED F08002S-4C-4

Dimensions in mm(inches).