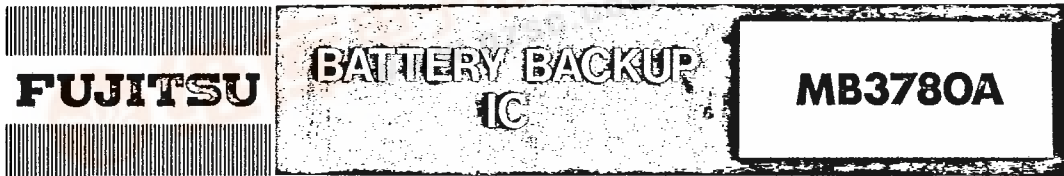


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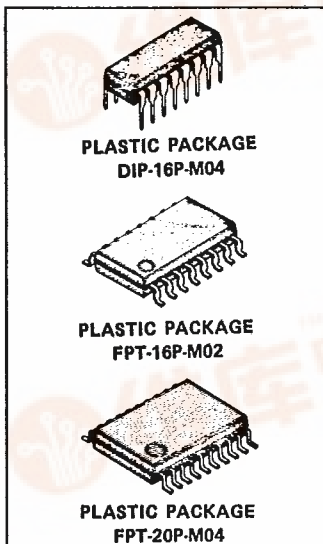
August 1989
Edition 1.0

BATTERY BACKUP IC

The Fujitsu MB3780A monolithic battery backup IC is fabricated with a bipolar linear IC technology, and is suitable for power supply of SRAM, ROM and Logic ICs.

The MB3780A generates a reset signal when power supply's ON/OFF or abnormal power supply. The MB3780A provides switching function for back up between modes such as primary battery which is non-chargeable and secondary battery which is chargeable. All necessary functions for battery backup are available on a chip. The MB3780A is available in 16-pin Dual In-Line, space saving Flat package, or 20-pin shrink small outline which is suitable for memory card.

- Input circuit power consumption when unloaded: 1.0 mA typical
- Output drive current: 200 mA maximum (can be increased with an external transistor)
- Input/output differential voltage: 230 mV typical
- Input loss voltage detection value: 4.2V ± 2.5%
- Onchip power-on reset circuit
- Low voltage detection value by primary battery: 2.65V, 2.37V
- Onchip secondary battery
- Output current at backup: 500 μA maximum
- Leak current at backup: 0.5 μA or less



ABSOLUTE MAXIMUM RATINGS (See Note)

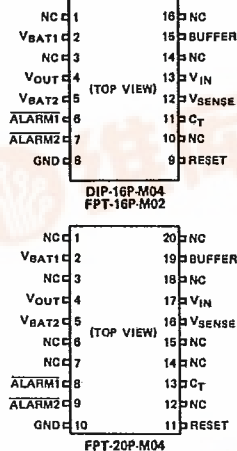
(T_A = 25°C)

Ratings	Symbol	Value	Unit
Input Voltage	V _{IN}	-0.3 to 7	V
Battery Voltage	V _{BAT}	-0.3 to 7	V
Output Reset Voltage	V _{RESET}	7	V
Output Alarm Voltage	V _{ALARM}	7	V
Output Current	I _{OUT}	250	mA
Output Buffer Current	I _{BUF}	55	mA
Power Dissipation	P _D	*900	mW
		**540	mW
		***450	mW
Operating Temperature	T _{OP}	-30 to 85	°C
Storage Temperature	T _{STG}	-55 to 125	°C

- NOTE:**
- * T_A ≤ 25°C DIP-16P-M04
 - ** T_A ≤ 25°C FPT-16P-M02
 - *** T_A ≤ 25°C FPT-20P-M04

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.

PIN ASSIGNMENT

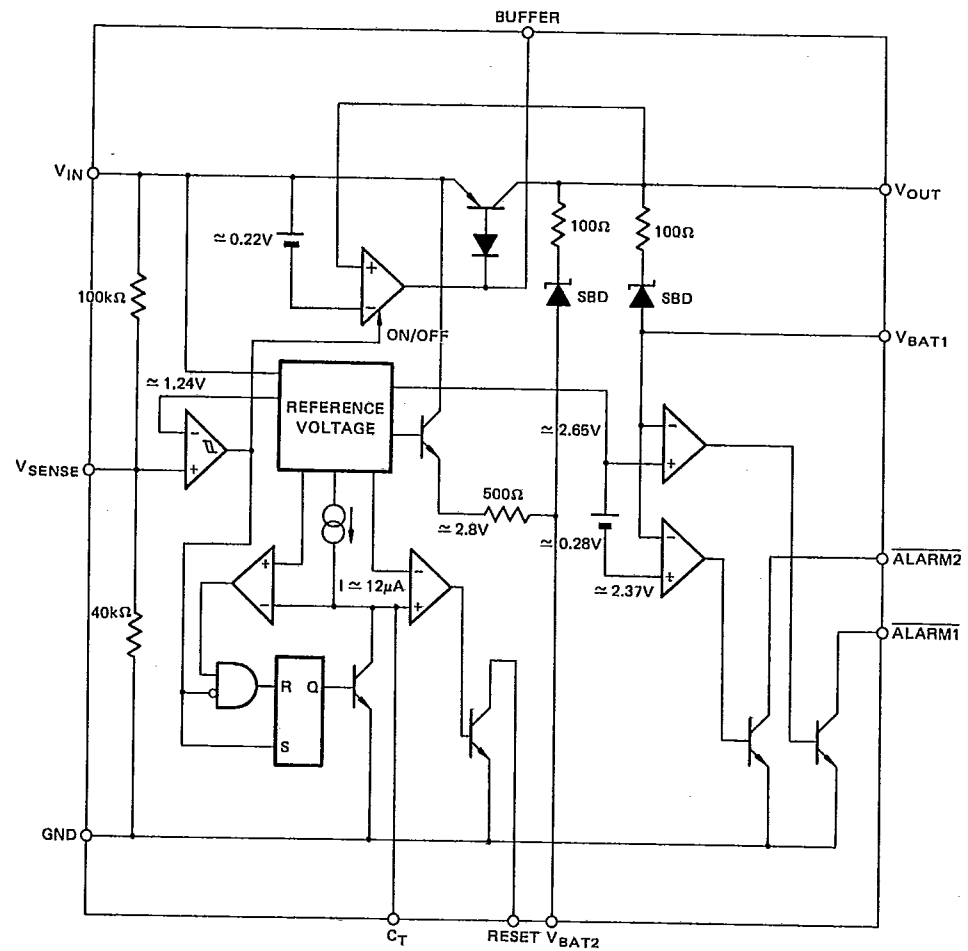


This device contains circuitry to protect the inputs against damage due to high static voltages or electric fields. However, it is advised that normal precautions be taken to avoid application of any voltage higher than maximum rated voltages to this high impedance circuit.



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Fig. 1 - MB3780A EQUIVALENT CIRCUIT



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RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Value			Unit
		Min	Typ	Max	
Input Voltage	V_{IN}		5.0	6.0	V
Output Reset Current	I_{RESET}			3	mA
Output Alarm Current	I_{ALARM}			3	mA
Secondary Battery Charging Current	I_{CHARGE}	-3			mA
Output Current	I_{OUT}			200	mA
Output Buffer Current	I_{BUF}			50	mA
Backup Current	I_{BU}			500	μA
Operating Temperature	T_{op}	-30		85	$^{\circ}C$
		-30		70	$^{**}C$




NOTE: * DIP-16P-M04
 ** FPT-16P-M02, FPT-20P-M04





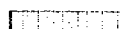
ELECTRICAL CHARACTERISTICS

($V_{IN} = 5V, T_A = 25^{\circ}C$)

Parameter	Symbol	Condition	Value			Unit
			Min	Typ	Max	
Whole Device						
Input Current	I_{IN1}	$I_{OUT} = 0mA$		1.0	1.5	mA
	I_{IN2}	$I_{OUT} = 200mA$		225	250	mA
	I_{IN3}	$V_{IN} = 4.0V$		1.0	1.5	mA
Backup System						
Input/Output Differential Voltage	DV_1	$I_{OUT} = 0mA$	0.18	0.21	0.24	V
	DV_2	$I_{OUT} = 200mA$	0.19	0.22	0.25	V
Output Delay Time	t_{rO}	$C_O = 0.01\mu F, C_T = 0$		2.0	10	μs
Output Buffer Current	I_{BUF}	$V_O = 4.7V, V_{BUF} = 4.0V$	50			mA
Buffer Leak Current	I_{OHB}	$V_{IN} = 0V, V_{BUF} = 4.5V$			100	nA
Power Supply Monitoring System						
Input Loss Voltage	V_{INL}	V_{IN} 	4.10	4.20	4.30	V
	V_{INH}	V_{IN} 	4.20	4.30	4.40	V
Hysteresis Width of Input Loss Voltage	DV_{IN}	$V_{INH} - V_{INL}$	50	100	150	mV
Output Reset Voltage	V_{RESET}	$I_{RESET} = 3mA$		0.15	0.4	V
Output Reset Leak Current	I_{OHR}	$V_{IN} = 4.0V, V_{RESET} = 6V$		0	100	nA
Reset Pulse Width	t_{pO}	$C_T = 0.01\mu F$	0.5	1.0	1.5	ms
Input Pulse Width	t_{pI}	$C_T = 0.01\mu F, V_{IN}$ 	5			μs
Reset Output Rising Time	t_{rR}	$C_T = 0.01\mu F$		2.0	3.0	μs
Reset Output Falling Time	t_{fR}	$R_L = 5.1k\Omega, C_L = 100pF$		0.1	0.5	μs
Reset Output Propagation Delay Time	t_{pdR}	$C_T = 0.01\mu F$		2.0	10	μs



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ELECTRICAL CHARACTERISTICS (continued)

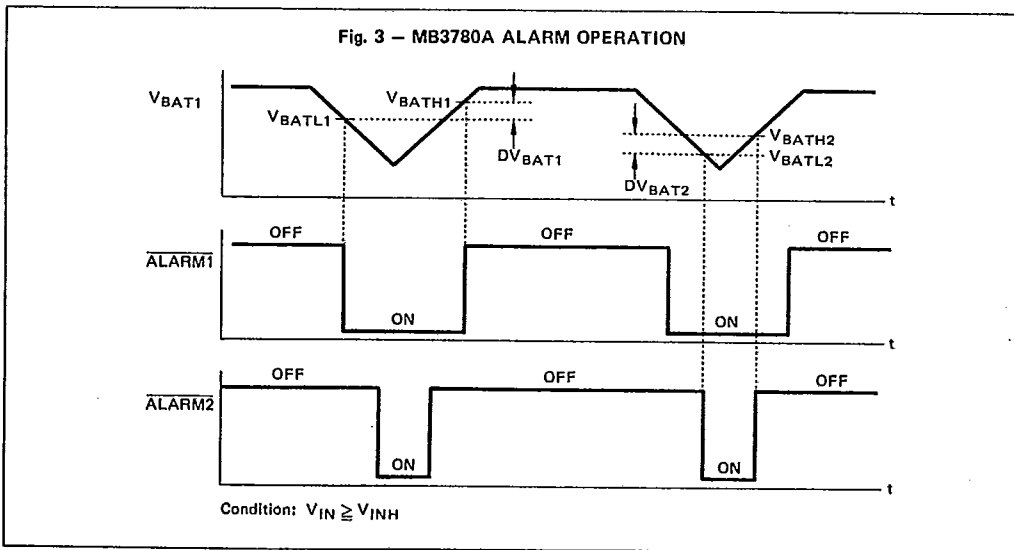
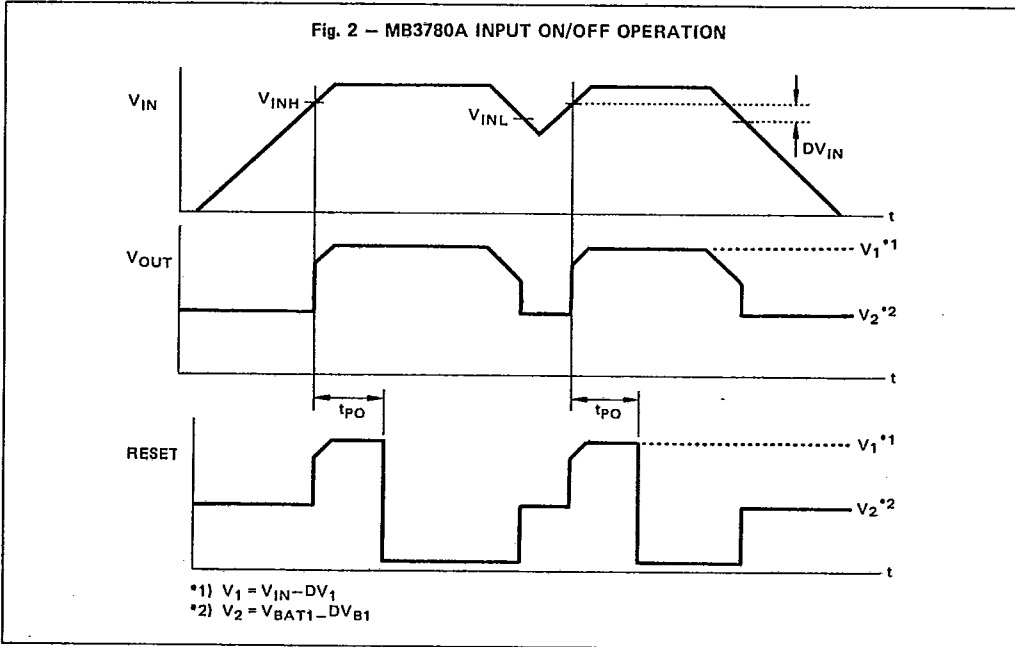
(V_{IN} = 5V, T_A = 25°C)

Parameter	Symbol	Condition	Value			Unit
			Min	Typ	Max	
Primary Battery Monitoring System						
Low Voltage Detection (Primary)	V _{BATL1}	V _{BAT1}	2.55	2.65	2.75	V
	V _{BATH1}	V _{BAT1}	2.59	2.69	2.79	V
Hysteresis Width of Low Voltage Detection (Primary)	DV _{BAT1}	V _{BATH1} - V _{BATL1}	20	40	60	mV
Low Voltage Detection (Secondary)	V _{BATL2}	V _{BAT1}	2.27	2.37	2.47	V
	V _{BATH2}	V _{BAT1}	2.31	2.41	2.51	V
Hysteresis Width of Low Voltage Detection (Secondary)	DV _{VAT2}	V _{BATH2} - V _{VATL2}	20	40	60	mV
Differential Detected Low Voltage	DV _{BAT}	V _{VATL1} - V _{BATL2}	0.26	0.28	0.30	V
Input Current	I _{VATA}	V _{BAT} = 3V, V _{IN} = 5V	-100		500	nA
	I _{VATB}	V _{BAT} = 3V, V _{IN} = 0V	-100		500	nA
Output Differential Voltage	DV _{B1}	I _{BAT1} = 100μA		0.30	0.35	V
Alarm Output Voltage	V _{ALARM1}	I _{ALARM1} = 3mA		0.15	0.4	V
	V _{ALARM2}	I _{ALARM2} = 3mA		0.15	0.4	V
Alarm Output Leak Current	I _{OHA1}	V _{ALARM1} = 6V		0	100	nA
	I _{OHA2}	V _{ALARM2} = 6V		0	100	nA
Alarm Output Rising Time	t _{rA}	R _L = 5.1kΩ, C _L = 100pF		2.0	3.0	μs
Alarm Output Falling Time	t _{fA}			0.1	0.5	μs
Alarm Output Propagation Delay Time	tp _{dA}	50mV over drive		2.0	10	μs
Secondary Battery Monitoring System						
Output Voltage	V _{CHG}	I _{CHG} = -10μA	2.65	2.80	2.95	V
Charging Current	I _{CHGL}	V _{CHG} = 2.0V	0.6	1.6	3.0	mA
	I _{CHGH}	V _{CHG} = 3.3V	-1	0	1	μA
Differential Output Voltage	DV _{B2}	I _{BAT2} = 100μA		0.30	0.35	V

NOTE: R_L and C_L are output logic of load resistance and capacitor.



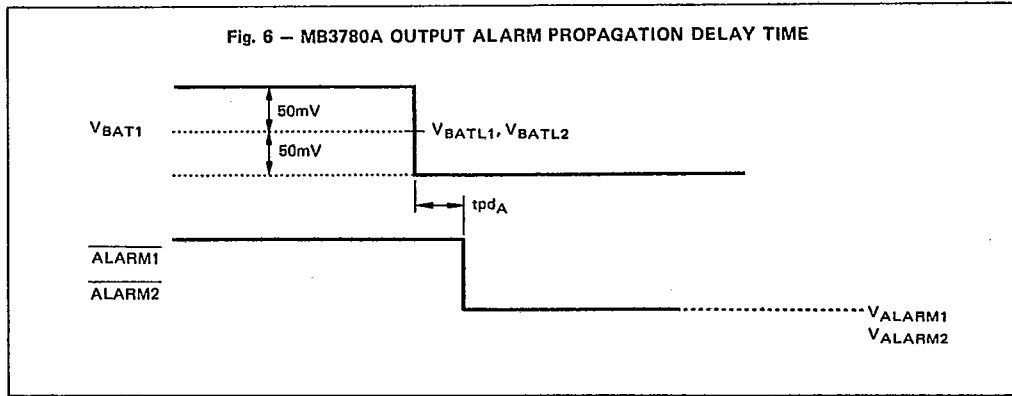
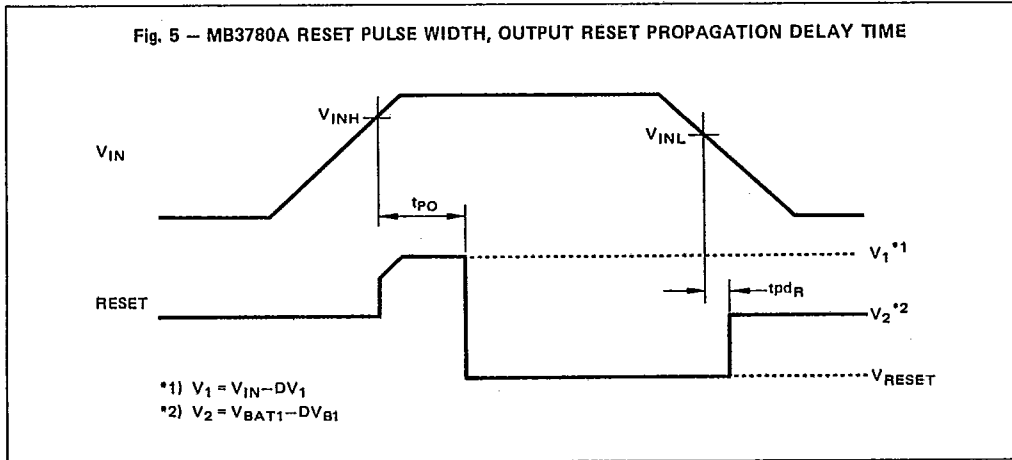
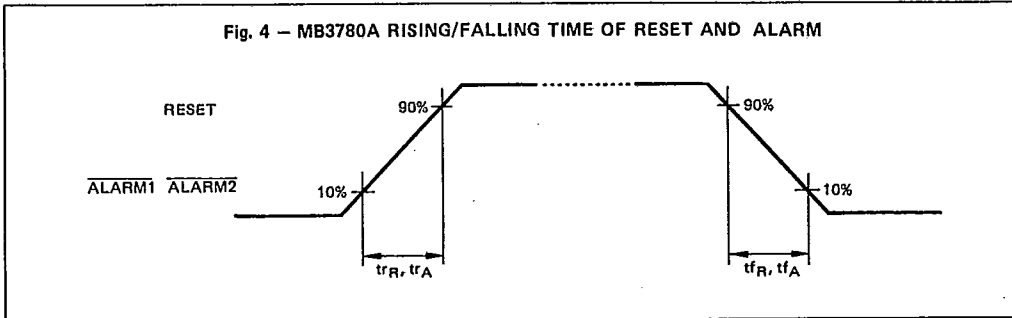
FUNCTION EXPLANATION

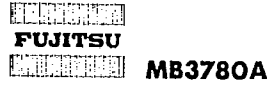




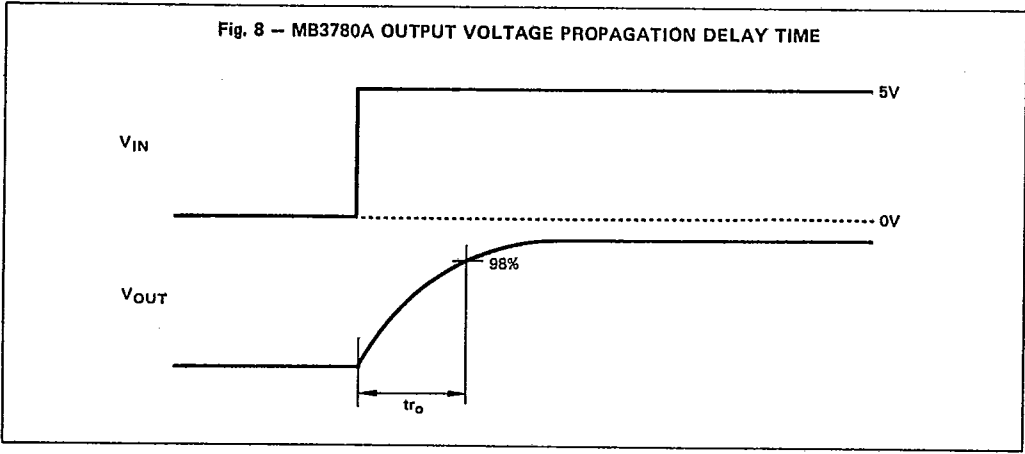
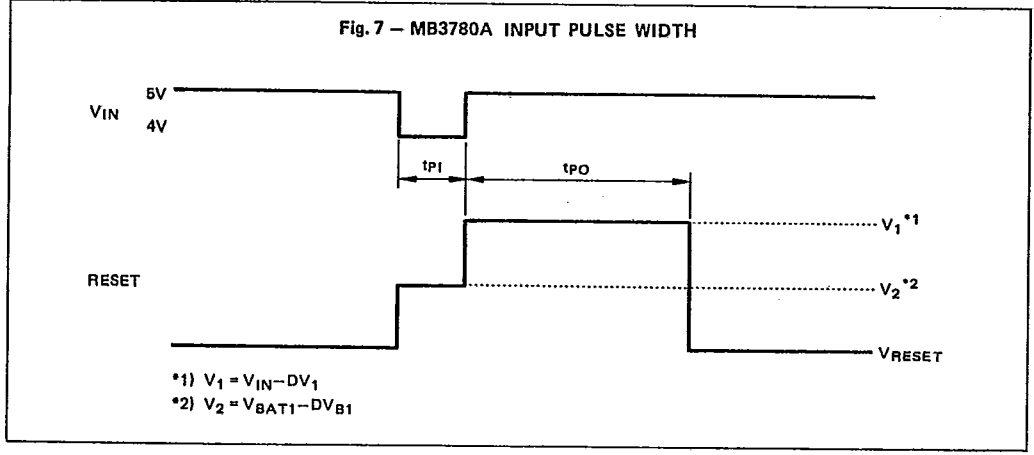
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TIMMING DIAGRAM





TIMING DIAGRAM (continued)

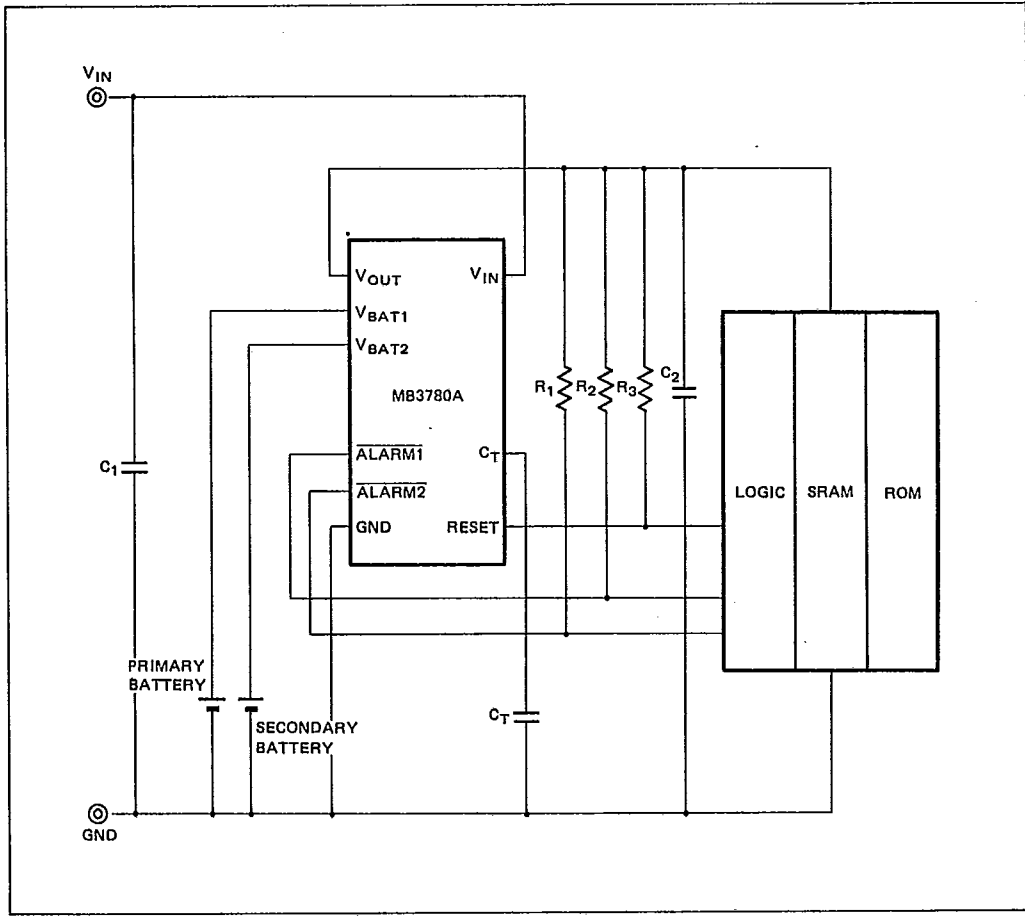


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APPLICATION EXAMPLE

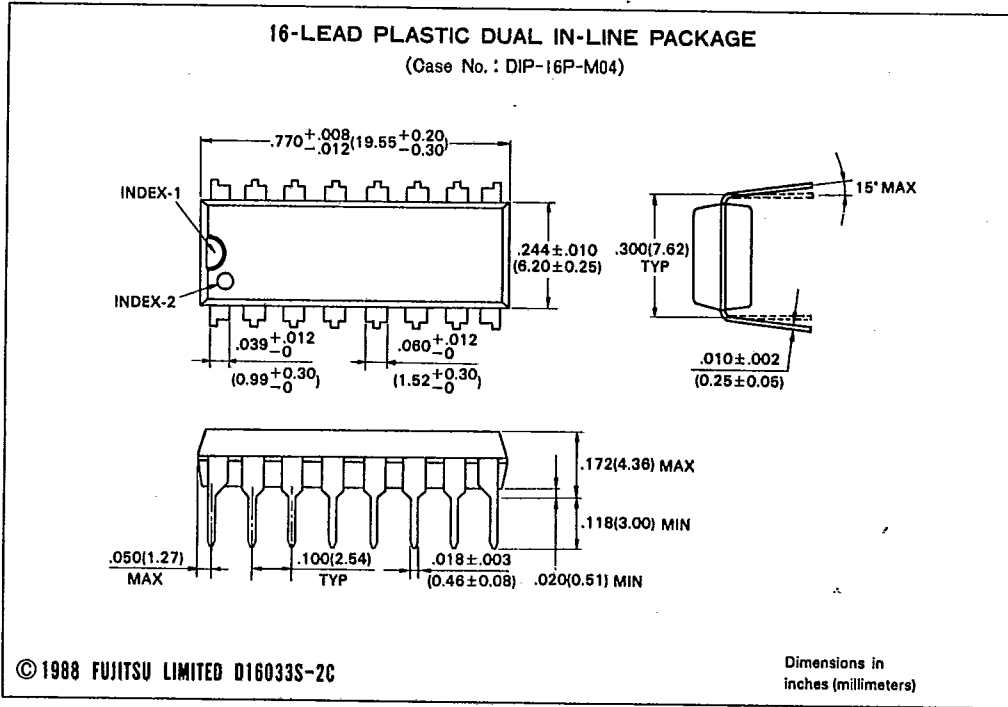


NOTE: The value of C₁ and C₂ should be more than 0.022μF.





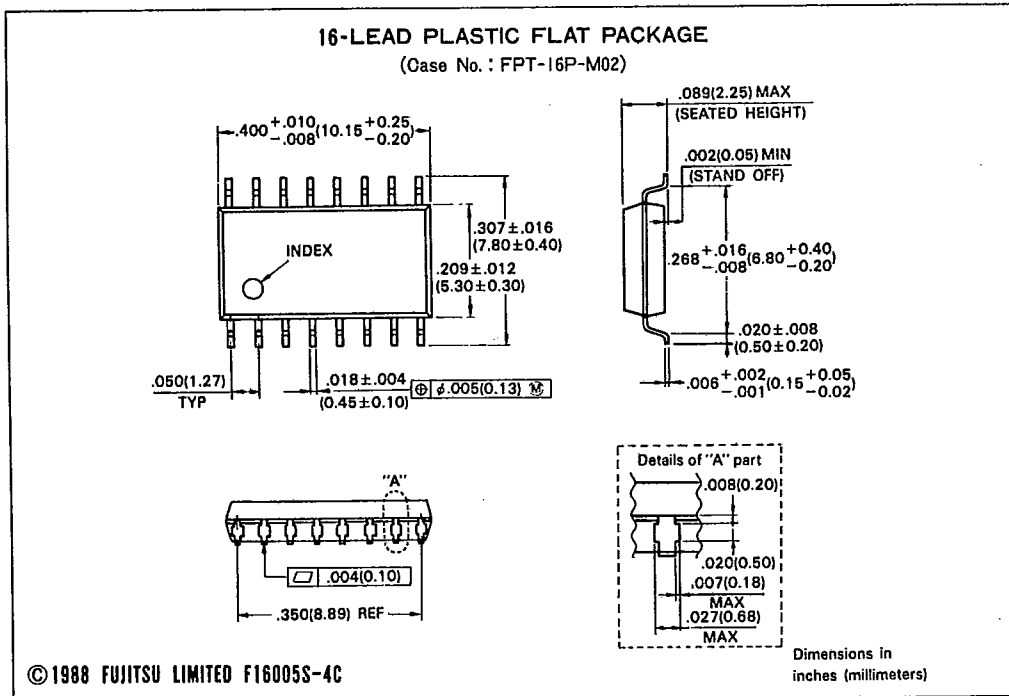
PACKAGE DIMENSIONS



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PACKAGE DIMENSIONS (continued)





PACKAGE DIMENSIONS (continued)

