

TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

TA8041HA

Dual Voltage Regulator with Watchdog Timer

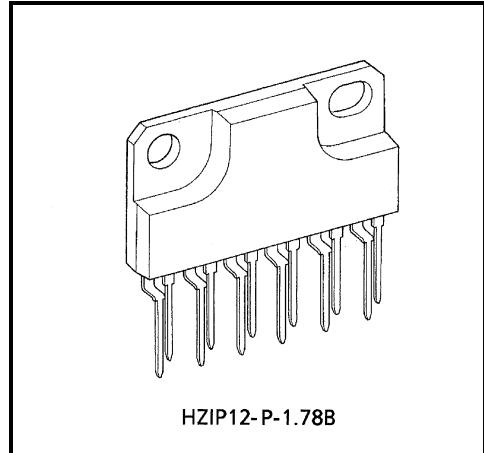
The TA8041HA is an IC specially designed for microcomputer systems. It incorporates a highly accurate $5 \pm 0.15V$ constant-voltage power supply and various system reset functions.

The power supply section produces two outputs : main output and sub-output. The main output can be controlled for its on / off through the EN pin.

For system reset, it has a voltage monitoring function as well as a watchdog timer which can self-diagnose the microcomputer system so that program runaway can be prevented.

It also has a reverse battery protection function, a current limiter and a thermal protection function.

Since its standby current is as small as 1mA, it can be connected directly to an automotive battery.

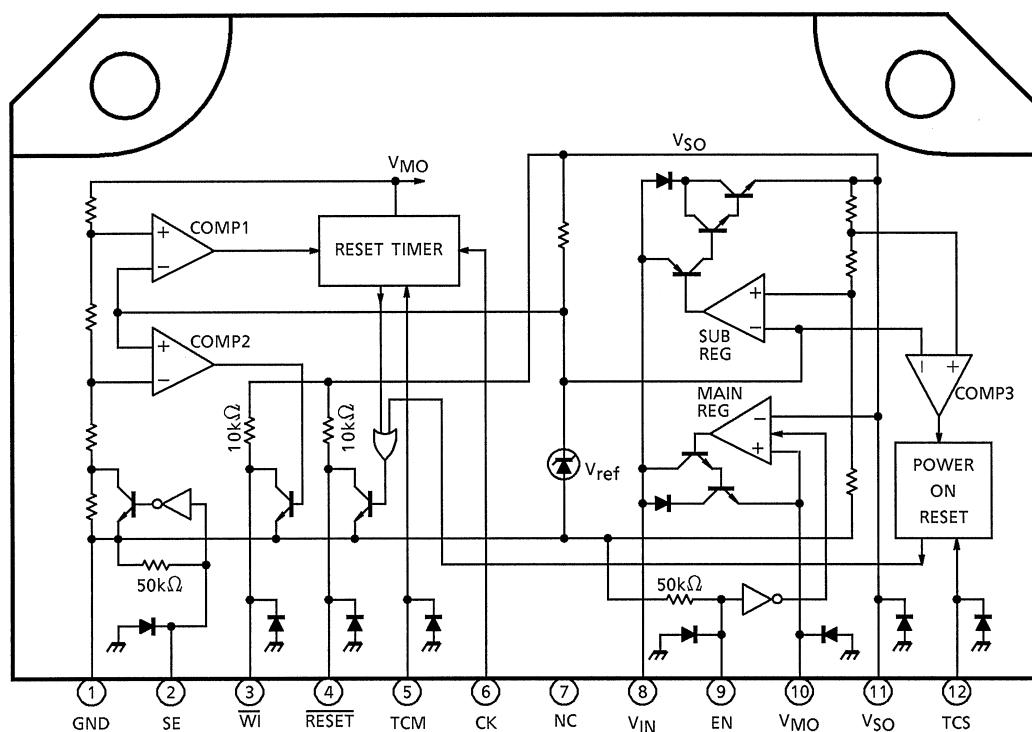


Weight: 4.0 g (typ.)

Features

- Accurate output : $5 \pm 0.15V$
- Difference between main and sub output voltage : $\pm 25mV$
- Output power transistor incorporated Current capacity : Main : 250mA (max)
Sub : 100mA (max)
- Low standby current : 1mA (max)
- Multiple protective function: Reverse battery connection, thermal-shutdown, current limiter
- Reset function : Power-on reset, watchdog timer, low voltage detection
- Plastic HZIP-12pin

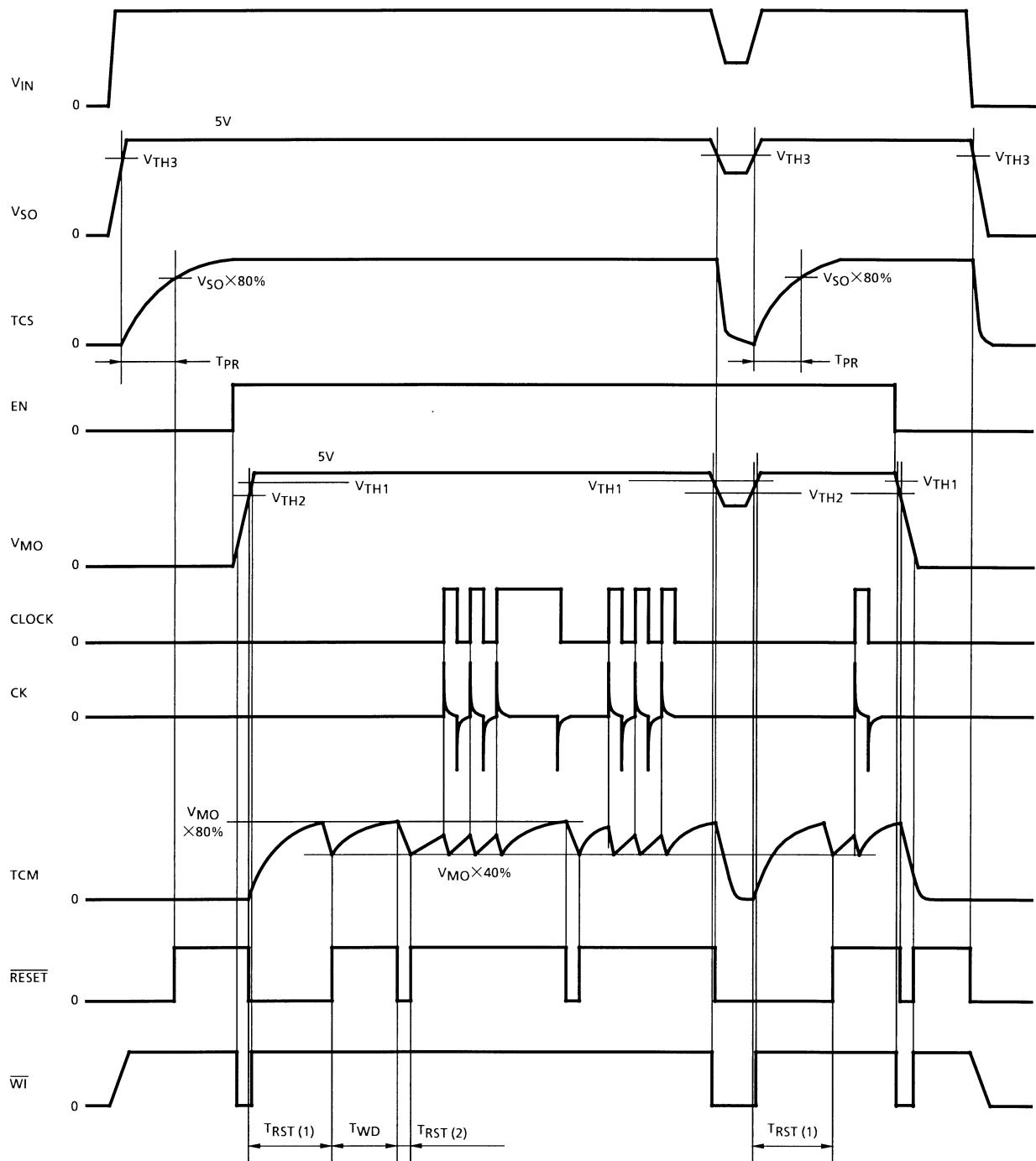
Block Diagram and Pin Layout



Pin Description

Pin No.	Symbol	Description
1	GND	Grounded.
2	SE	Detection voltage select pin for power monitoring : Low : $V_{TH1} = 4.80V$, $V_{TH2} = 4.40V$ High : $V_{TH1} = 4.60V$, $V_{TH2} = 4.20V$ It connects to $50k\Omega$ resistor which is pulled down to GND.
3	\overline{WI}	Reset detect voltage V_{TH1} output pin. The reset detect voltage has a hysteresis of 0.2V. It is the output from the collector of an NPN transistor with a pull-up resistor ($10k\Omega$).
4	\overline{RESET}	Watchdog timer reset pin. <ul style="list-style-type: none">Generates a reset signal which is determined by the C_{T2}, R_{T2} combination connected to the TCM pin.Intermittently generates reset pulses if no clock is supplied to the CK pin. The RESET signal is the output from the collector of an NPN transistor with a pull-up resistor ($10k\Omega$).
5	TCM	Pin for setting a time for the reset timer and watchdog timer. It connects to a resistor R_{T2} which leads to V_{MO} and a capacitor C_{T2} which is grounded.
6	CK	Clock input pin for the watchdog timer. If it is used for a power-on reset timer only, it is pulled up to V_{MO} .
7	NC	Not connected. (Electrically, this pin is completely open.)
8	V_{IN}	Power supply pin for both main and sub power supplies.
9	EN	Enable pin for ON / OFF control of the main power output. The main output is 5V when the signal at this pin is high ; it is in standby state when the signal is low. It connects to $50k\Omega$ resistor which is pulled down to GND.
10	V_{MO}	Main output pin for 5V constant-voltage power supply. It has a current capacity of up to 250mA. This pin is also a power supply pin for the reset timer. The ON/OFF control of power supply is possible by setting EN pin.
11	V_{SO}	Sub output pin for 5V constant-voltage power supply. It has a current capacity of up to 100mA.
12	TCS	Pin for setting a time for the power-on reset timer of sub output. It connects to a resistor R_{T1} which leads to V_{MO} and a capacitor C_{T1} which is grounded. It connects to $50k\Omega$ resistor which is pulled down to GND.

Timing Chart



Note: See Electrical Characteristics for symbols in the timing chart.

Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Pin	Rating	Unit
Input Voltage	V _{IN1}	V _{IN}	60 (1s)	V
	V _{IN2}	V _{IN}	-30 (Note)	
	V _{IN3}	CK	-5~V _{SO}	
	V _{IN3}	EN, SE	-0.5~V _{IN}	
Output Current	I _{LOAD-M}	V _{MO}	250	mA
	I _{LOAD-S}	V _{SO}	100	
	I _{OUT}	RESET, WI	2	
Output Voltage	V _{OUT}	RESET, WI	V _{SO}	V
Power Dissipation	P _D	—	25	W
Operating Temperature	T _{opr}	—	-40~105	°C
Storage Temperature	T _{stg}	—	-55~150	°C
Lead Temperature-time	T _{sol}	—	260 (10s)	°C

Note: REVERSE BATTERY

*: On Board Condition. (Infinite radiation board)

*

Electrical Characteristics (V_{IN} = 7~18V, I_{LOAD-M} = 10mA, I_{LOAD-S} = 10mA, T_c = -40~105°C)

Characteristics	Symbol	Pin	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Operating Voltage	V _{SUB}	V _{SO}	—	—	4.85	5.0	5.15	V
Difference between Main and Sub Output Voltages	V _{SO} -V _{MO}	V _{SO} -V _{MO}	—	—	-25	—	25	mV
Line Regulation	V _{LINE}	V _{MO, SO}	—	V _{IN} = 7~40V	—	2.5	5.0	%
Load Regulation	V _{LOAD-M}	V _{MO}	—	I _{LOAD} = 1~100mA	—	0.5	2.0	%
	V _{LOAD-S}	V _{SO}	—	I _{LOAD} = 1~50mA	—	0.3	1.0	
Temperature Coefficient	—	V _{SO}	—	—	—	0.01	—	% / °C
Drop Out Voltage between I / O	V _{DROP-M}	V _{MO}	—	I _{LOAD} = 300mA	—	1.5	2.3	V
	V _{DROP-S}	V _{SO}	—	I _{LOAD} = 100mA	—	2.6	3.9	
Current Limiter	I _{LIMIT}	V _{MO}	—	—	—	250	—	mA
Thermal-Shutdown Temperature	T _{SD}	—	—	—	—	150	—	°C
Input Current	I _{IN}	EN, SE	—	V _{IN} = 5V	—	100	200	μA
				V _{IN} = 0V	—	—	10	
Input Voltage	V _{IH}	EN, SE	—	—	2.0	—	—	V
	V _{IL}		—	—	—	—	1.0	
Output Voltage	V _{OL}	WI, RESET	—	I _{OL} = 1mA	—	—	0.5	V
Input Current	I _{IN}	TCS	—	V _{IN} = 0~V _{SO}	-3	—	3	μA

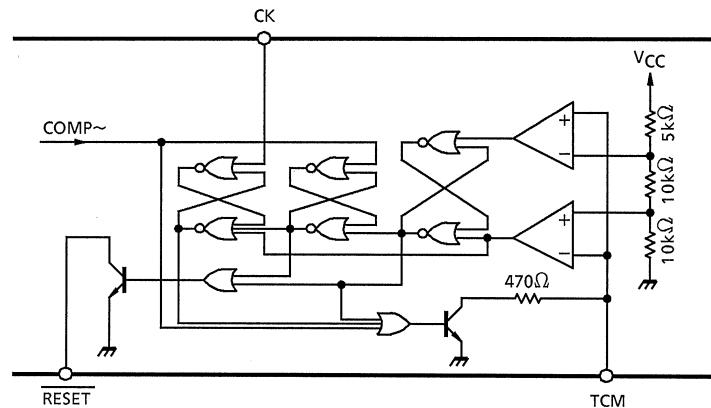
Characteristic	Symbol	Pin	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Threshold Voltage	V_{TH}	TCS	—	—	—	$V_{SO} \times 80\%$	—	V
Input Current	I_{IN}	TCM	—	$V_{IN} = 0 \sim 3.5V$	-3	—	3	μA
Threshold Voltage	V_{IH}	TCM	—	—	—	$V_{MO} \times 80\%$	—	V
	V_{IL}		—	—	—	$V_{MO} \times 40\%$	—	
Input Current	I_{IN}	CK	—	$V_{IN} = 5V$	—	0.17	0.35	mA
Input Voltage	V_{IH}	CK	—	—	2.0	—	—	V
	V_{IL}		—	—	—	—	0.5	
Reset Threshold Voltage	V_{TH1-H}	VMO	—	SE = GND	—	$V_{MO} \times 96\%$	—	V
	V_{TH1-L}		—	SE = V_{REG}	—	$V_{MO} \times 92\%$	—	
	V_{TH2-H}		—	SE = GND	—	$V_{MO} \times 88\%$	—	
	V_{TH2-L}		—	SE = V_{REG}	—	$V_{MO} \times 84\%$	—	
	V_{TH3}	V_{SO}	—	—	—	$V_{SO} \times 84\%$	—	
Standby Current	I_{ST}	V_{IN}	—	$V_{IN} = 14V$ $EN = "L"$	—	0.5	1.0	mA
Power-on Reset	T_{PR}	\overline{RESET}	—	—	$1.3 \times C_{T1} \times R_{T1}$	$1.6 \times C_{T1} \times R_{T1}$	$1.9 \times C_{T1} \times R_{T1}$	ms
Watchdog Timer	T_{WD}	\overline{RESET}	—	—	$0.9 \times C_{T2} \times R_{T2}$	$1.1 \times C_{T2} \times R_{T2}$	$1.3 \times C_{T2} \times R_{T2}$	ms
Reset Timer (1)	$T_{RST(1)}$	\overline{RESET}	—	—	$1.3 \times C_{T2} \times R_{T2}$	$1.6 \times C_{T2} \times R_{T2}$	$1.9 \times C_{T2} \times R_{T2}$	ms
Reset Timer (2)	$T_{RST(2)}$	\overline{RESET}	—	—	$0.3 \times C_{T2}$	$0.7 \times C_{T2}$	$1.5 \times C_{T2}$	ms
Clock Pulse Width	T_W	CK	—	—	3	—	—	μs

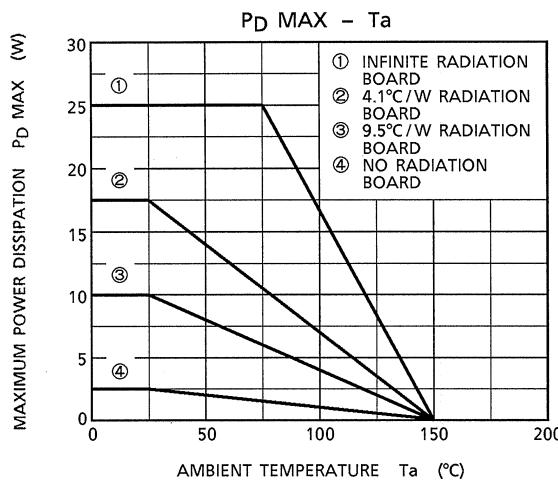
VREG: Regulated Voltage of V_{SO}

Note 1: The unit for C_{T1} and C_{T2} is μF , the unit for R_{T1} and R_{T2} is $k\Omega$.

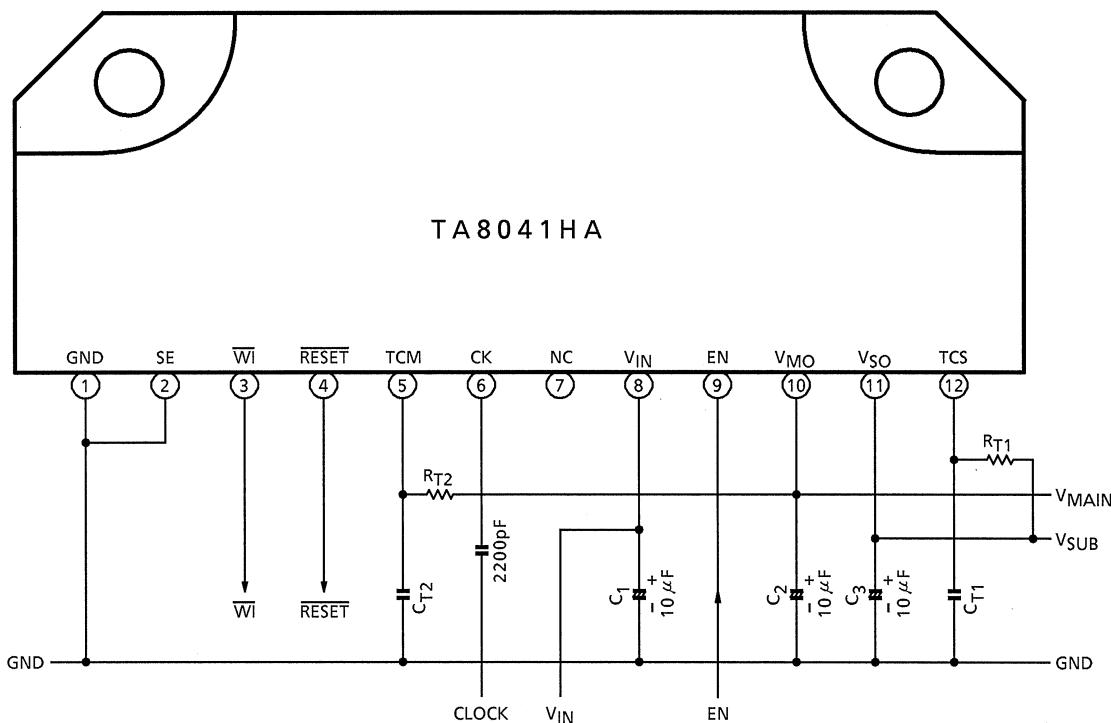
Note 2: The specification values of Power-on Reset, Watchdog Timer and Reset Timer above are intended to guarantee only for this IC. Note that the fluctuations of C_T and R_T values should be taken into consideration for practical use of the IC.

Reset Timer Equivalent Circuit





Example of Application Circuit



*: Caution for Wiring

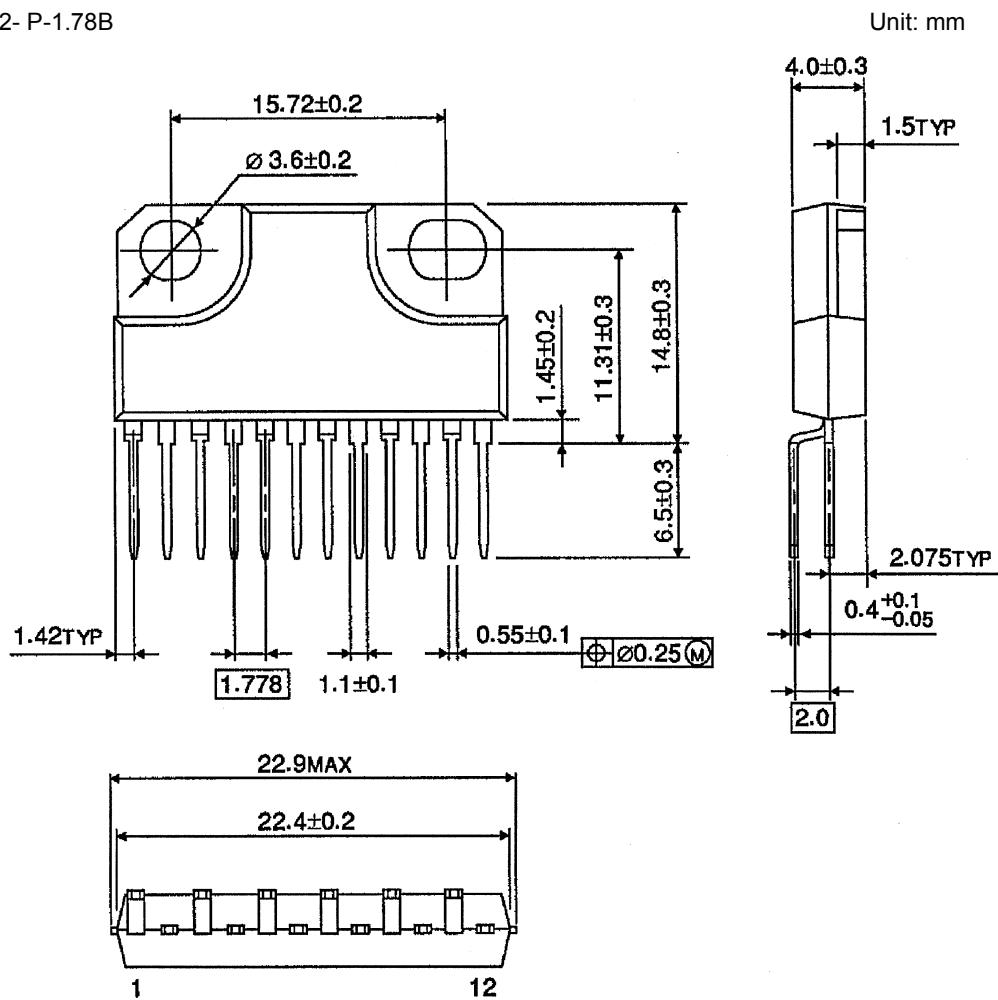
1. C₁, C₂ and C₃ are for absorbing disturbance, noise, etc.
Connect them as close to the IC as possible.

Recommended Conditions

PART NAME	MIN	MAX	UNIT
C _{T1} , C _{T2}	0.01	100	μF
R _{T1} , R _{T2}	5	100	kΩ

Package Dimensions

HZIP12- P-1.78B



Weight: 4.0 g (typ.)

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