HA1835P/HA1848P

Watchdog Timer

HITACHI

Description

The HA1835P and HA1848P is a monolithic voltage regulator control designed for microcomputer systems. In addition to the voltage regulator, it include watchdog timer function and power-on reset function.

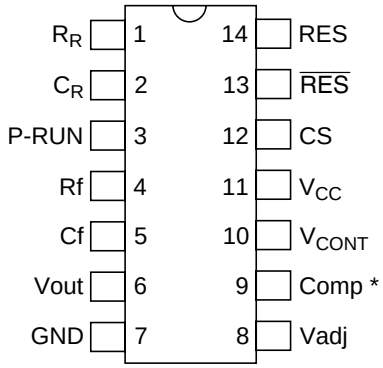
These ICs can perform many function in various microcomputer systems with few external parts.

Features

- Regulated power supply control function
  - Wide area of operational voltage; V_{CC} = 6 V to 30 V
  - Available external PNP-type transistor, suited to any system power supply
  - Built-in overcurrent limiter for external PNP-type transistor
  - Output voltage can be adjusted exactry in the range from 4 V to 6 V
- Watchdog timer
  - Internal bandpass filter control circuit (pulse width detect type) and reset signal oscillator
  - Fail-safe utility
  - Bandpass filter characteristics can be set by external resister (Rf) and capacitance (Cf)
- Automatic reset
  - Automatic power-on reset
  - Pulse generator characteristics can be set by external resistor (R_R) and capacitance (C_R)
  - Alternative between $\overline{RES}$ and RES output

Hitachi semiconductor

Pin Arrangement



(Top View)

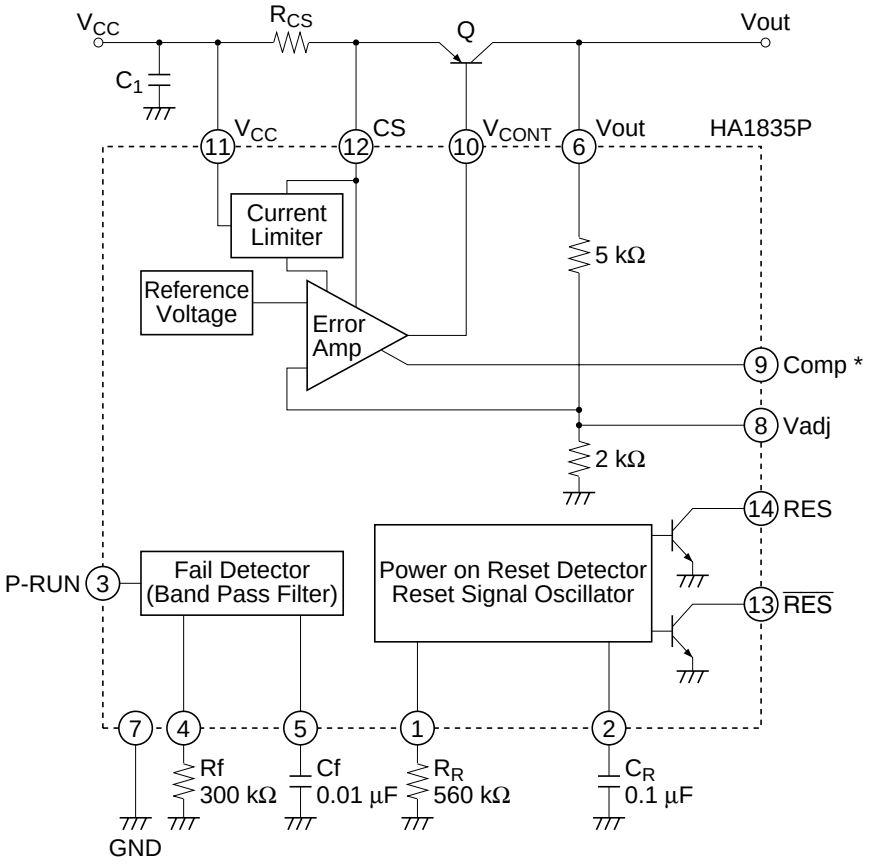
Note: HA1848P: 9 pin is non connection.

Pin Functions

Pin No.	Symbol	Functions
1	R_R	Reset pulse width depends on resistance connected to R_R Recommended range: 100 kΩ to 1 MΩ
2	C_R	Reset pulse width depends on capacitance connected to C_R
3	P-RUN	Clock pulse input terminal for watchdog timer
4	Rf	Frequency band width of filter circuit depends on resistance connected to Rf Recommended range: 100 kΩ to 500 kΩ
5	Cf	Frequency band width of filter circuit depends on capacitance connected to Cf
6	Vout	Connect to external PNP transistor's collector: This pin supplies 5 V regulated voltage for internal circuit
7	GND	Ground
8	Vadj	Output voltage fine tuning terminal
9	Comp	Phase compensation terminal: Connect less than 100 pF capacitor between V_{CC} and Comp. HA1848P is non connection
10	V_{CONT}	External PNP transistor's base control terminal
11	V_{CC}	Supply voltage terminal: Operating supply voltage range is 6 V to 30 V
12	CS	Connect current sense resistor, which protects the external PNP transistor, between V_{CC} and CS
13	$\overline{RES}$ *	Reset pulse output terminal for low level reset type microcomputer
14	RES *	Reset pulse output terminal for high level reset type microcomputer

Note: $\overline{RES}$ and RES are open-collector output terminals, so connect a pull-up resistor of about 5 kΩ.

Block Diagram



Note: HA1848P: 9 pin is non connection.

Absolute Maximum Ratings (Ta = 25°C)

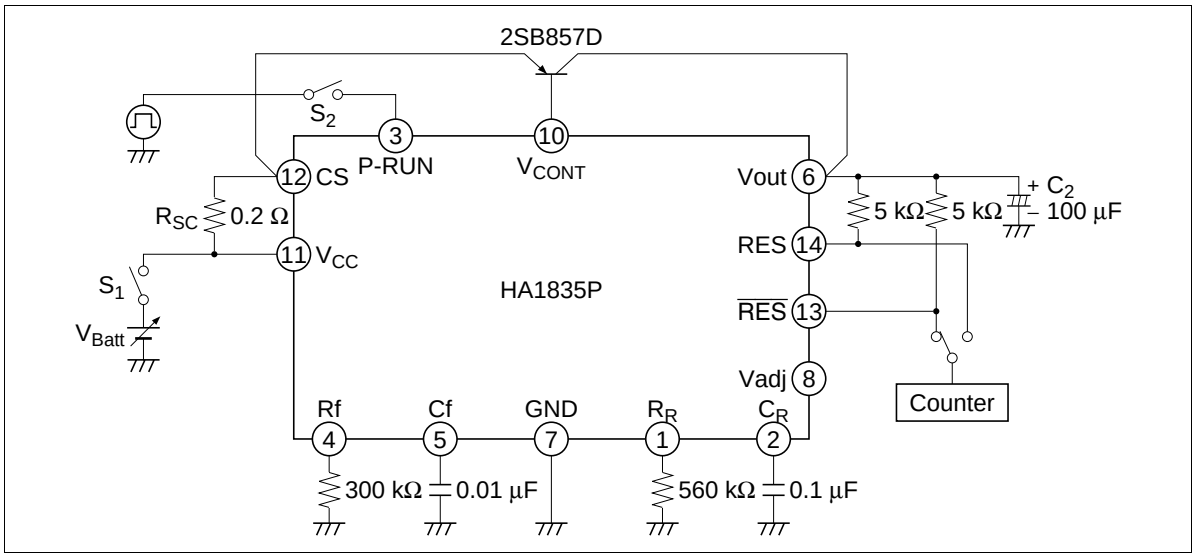
Item	Symbol	Rating	Unit
Supply voltage	V_{CC}	30	V
P-RUN input voltage	$V_{P\text{-}RUN}$	–0.3 to Vout	V
Output voltage	V_{RES}	17.5	V
	$V_{\overline{RES}}$	17.5	V
Output current	I_{RES}	2	mA
	$I_{\overline{RES}}$	2	mA
Control terminal voltage	V_{CONT}	V_{CC}	V
Control terminal current	I_{CONT}	20	mA
Power dissipation (Note)	P_T *	400	mW
Operating temperature range	Topr	–40 to +85	°C
Storage temperature range	Tstg	–50 to +125	°C
Soldering temperature	Tsol	+260 (< 10 sec)	°C

Note: Ta ≤ 77°C. If Ta > 77°C, derate by 8.3 mW/°C.

Electrical Characteristics (V_{CC} = 12 V, Vout = 5 V, Ta = 25°C)

Item		Symbol	Min	Typ	Max	Unit	Test Conditions
Power supply terminal current		I_{CC}	—	6.3	12	mA	V_{CC} = 17.5 V (No load), with PNP transistor
Regulator section	Output voltage	Vout1	4.75	5.00	5.25	V	V_{CC} = 6 to 17.5 V, Iout = 0.5 A
		Vout2	4.70	5.00	5.30	V	V_{CC} = 6 to 17.5 V, Iout = 1 A
	Line regulation	δV_{Oline}	–50	—	+50	mV	V_{CC} = 6 to 17.5 V, Iout = 1 A
	Load regulation	δV_{Oload}	–100	—	+100	mV	Iout = 10 mA to 0.5 A
	Ripple rejection	R_{REJ}	40	75	—	dB	e_i = 0.5 Vrms, f_i = 1 kHz
	Limiter operating current	I_{CS}	1.0	—	2.0	A	R_{SC} = 0.2 Ω
	Output voltage temperature coefficient	δVout/δT	—	–0.6	—	mV/°C	
P-RUN input section	Low-level input voltage	V_{IL}	—	—	0.8	V	
	High-level input voltage	V_{IH}	2.0	—	—	V	
	Low-level input current	I_{IL}	–120	–60	—	µA	V_{IL} = 0 V
	High-level input current	I_{IH}	—	1.8	3.0	mA	Vout = 5 V, V_{IH} = 5 V
Reset circuit section	Reset terminal low-level voltage	V_{OL1}	—	—	0.4	V	I_{OL} = 2 mA
	Reset terminal	I_{OH1}	—	—	5.0	µA	V_{OH} = 5 V
	leakage current	I_{OH3}	—	—	30	µA	V_{OH} = 17.5 V
Reset time	Power on time	t_{on}	80	130	200	ms	Rf = 300 kΩ, R_R = 560 kΩ,
	Clock off reset time	t_{off}	60	130	220	ms	Cf = 0.01 µF, C_R = 0.1 µF
	Reset pulse low-level time	t_{RL}	40	80	160	ms	
	Reset pulse high-level time	t_{RH}	50	100	200	ms	

Test Circuit



Functional Description

Voltage Regulator

The HA1835P, and HA1848P supplies 5 V regulated output from a wide V_{CC} input range (V_{CC} = 6 V to 17.5 V). The external PNP transistor should be selected according to the supply current demand of the system. Connect a more than 100 µF capacitor between Vout and GND to realize the 5 V regulated output.

The resistor connected from the Vadj terminal to the Vout or GND terminal fine tunes the output voltage. A resistor between Vadj and the Vout decreases the output voltage, and a resistor between Vadj and GND increases the output voltage.

$$R\ (Vout - Vadj) \approx \frac{5 \cdot Vout - 7.14}{5 - Vout} \quad (k\Omega)$$

$$R\ (Vadj - GND) \approx \frac{7.14}{Vout - 5} \quad (k\Omega)$$

Current Limiter

To protect the external transistor from overcurrent, connect a current-sense resistor between the CS terminal and the V_{CC} terminal. The value of this resistor should be:

$$R_{SC} \approx \frac{0.3\ V}{Iout\ (Limit)} \quad (at\ Ta = 25°C)$$

Power-On Reset

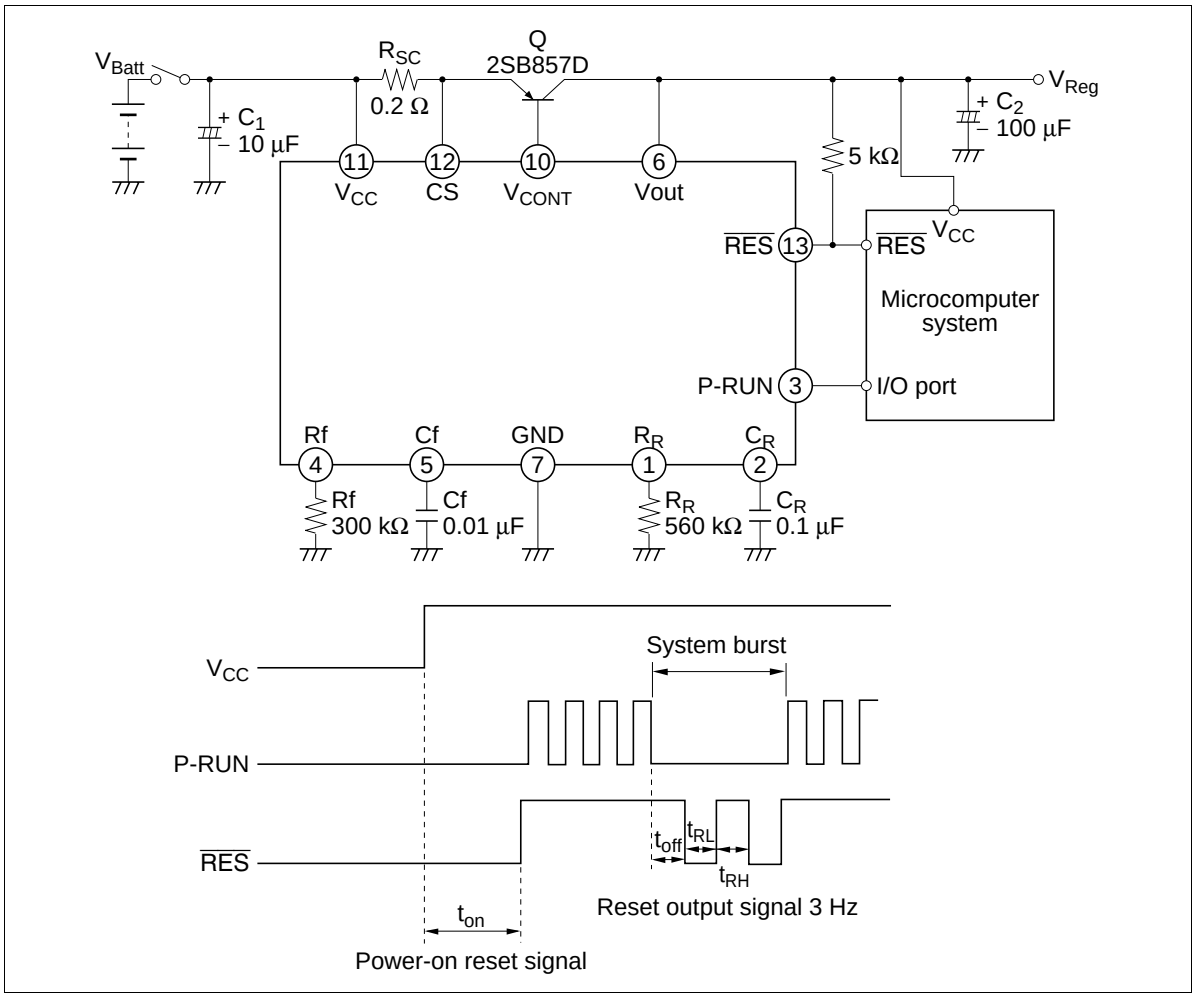
The HA1835P, and HA1848P can output a reset pulse to start the microcomputer at power on (figure 6). The external resistor R_R and capacitor C_R determine the power-on reset timing.

Note that $\overline{RES}$ and RES are open-collector terminals. They should therefore be connected to a pull-up resistor of about 5 kΩ.

Watchdog Timer

The watchdog timer is a fail-safe function. It can reset the microcomputer system if the system runs out of control. It does this be monitoring a pulse output by the system's software. It uses a bandpass filter to determine whether the pulse frequency is within the system's normal frequency band (figure 7, 8). External resistor and capacitor Rf and Cf determine the frequency range of the bandpass filter. If the pulse frequency is not within the frequency band, the HA1835P, and HA1848P outputs a reset pulse.

Application Circuit Example



Characteristic Curves

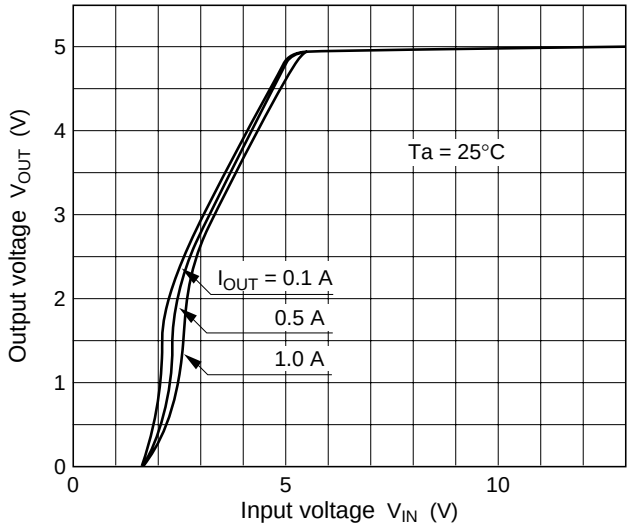


Figure 1 Output Voltage vs. Input Voltage

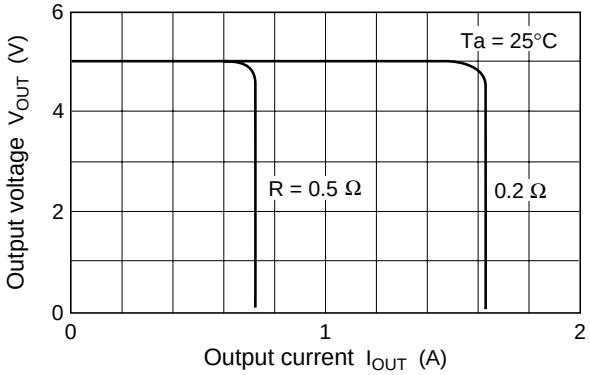


Figure 2 Output Voltage vs. Output Current

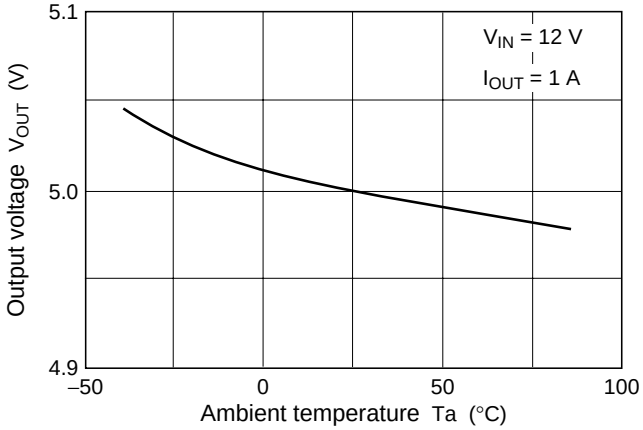


Figure 3 Output Voltage vs. Ambient Temperature

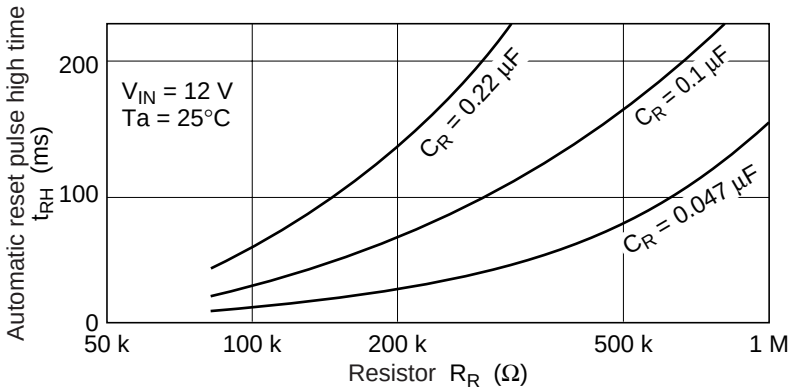


Figure 4 Automatic Reset Pulse High Time vs. Resistor

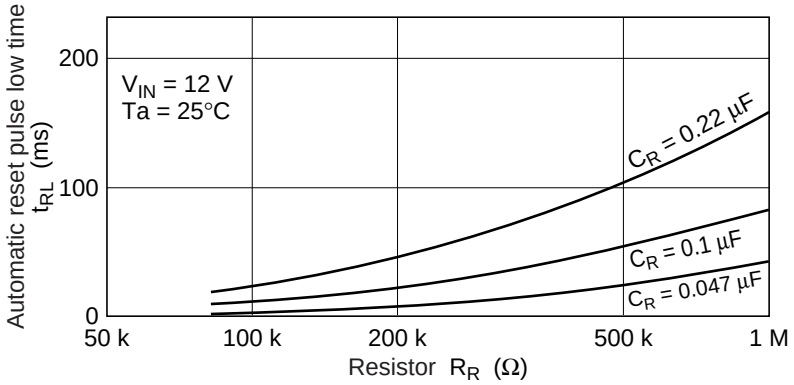


Figure 5 Automatic Reset Pulse Low Time vs. Resistor

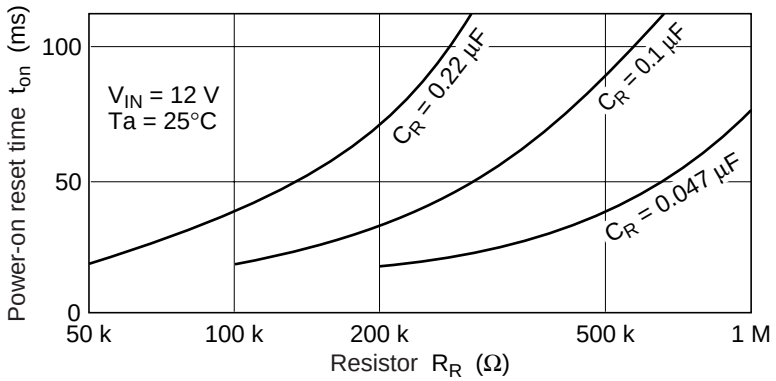


Figure 6 Power-on Reset Time vs. Resistor

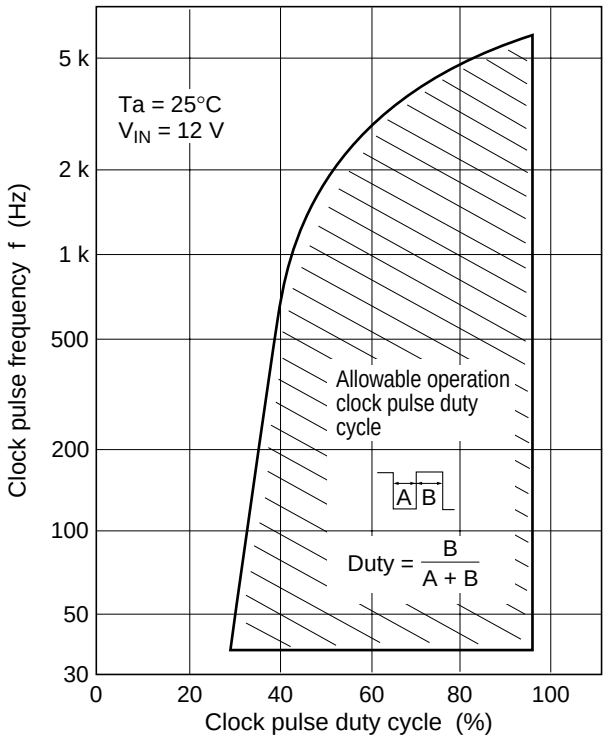


Figure 7 Clock Pulse Frequency vs. Clock Pulse Duty Cycle

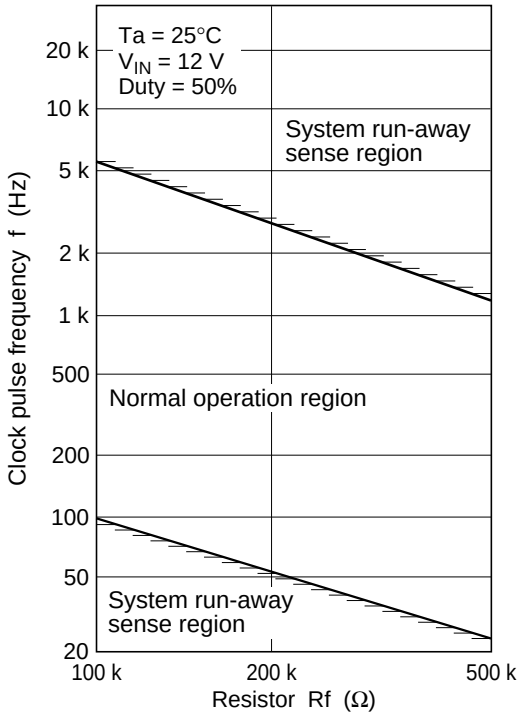
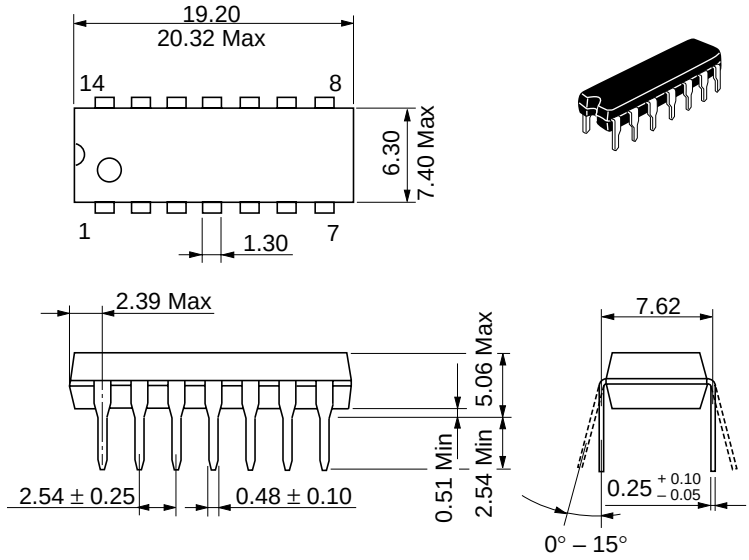


Figure 8 Clock Pulse Frequency vs. Resistor

Package Dimensions

Unit: mm



Hitachi Code	DP-14
JEDEC	Conforms
EIAJ	Conforms
Mass (reference value)	0.97 g

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HITACHI

Hitachi, Ltd.
Semiconductor & Integrated Circuits.
Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan
Tel: Tokyo (03) 3270-2111 Fax: (03) 3270-5109

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For further information write to:

Hitachi Semiconductor
(America) Inc.
179 East Tasman Drive,
San Jose,CA 95134
Tel: <1> (408) 433-1990
Fax: <1>(408) 433-0223

Hitachi Europe GmbH
Electronic components Group
Dornacher Straβe 3
D-85622 Feldkirchen, Munich
Germany
Tel: <49> (89) 9 9180-0
Fax: <49> (89) 9 29 30 00

Hitachi Europe Ltd.
Electronic Components Group.
Whitebrook Park
Lower Cookham Road
Maidenhead
Berkshire SL6 8YA, United Kingdom
Tel: <44> (1628) 585000
Fax: <44> (1628) 778322

Hitachi Asia Pte. Ltd.
16 Collyer Quay #20-00
Hitachi Tower
Singapore 049318
Tel: 535-2100
Fax: 535-1533

Hitachi Asia Ltd.
Taipei Branch Office
3F, Hung Kuo Building. No.167,
Tun-Hwa North Road, Taipei (105)
Tel: <886> (2) 2718-3666
Fax: <886> (2) 2718-8180

Hitachi Asia (Hong Kong) Ltd.
Group III (Electronic Components)
7/F., North Tower, World Finance Centre,
Harbour City, Canton Road, Tsim Sha Tsui,
Kowloon, Hong Kong
Tel: <852> (2) 735 9218
Fax: <852> (2) 730 0281
Telex: 40815 HITEC HX