
HA1835P/HA1848P

Watchdog Timer

HITACHI

ADE-204-059 (Z)

Rev. 0

Dec. 2000

Description

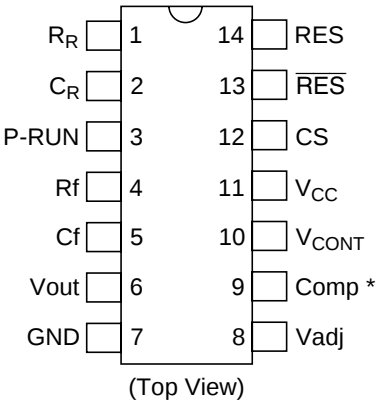
The HA1835P and HA1848P is a monolithic voltage regulator control designed for microcomputer systems. In addition to the voltage regulator, it include watchdog timer function and power-on reset function.

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; $V_{CC} = 6\text{ V to }30\text{ V}$
 - 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 (R_f) and capacitance (C_f)
- Automatic reset
 - Automatic power-on reset
 - Pulse generator characteristics can be set by external resistor (R_R) and capacitance (C_R)
 - Alternative between $\overline{\text{RES}}$ and RES output

Pin Arrangement



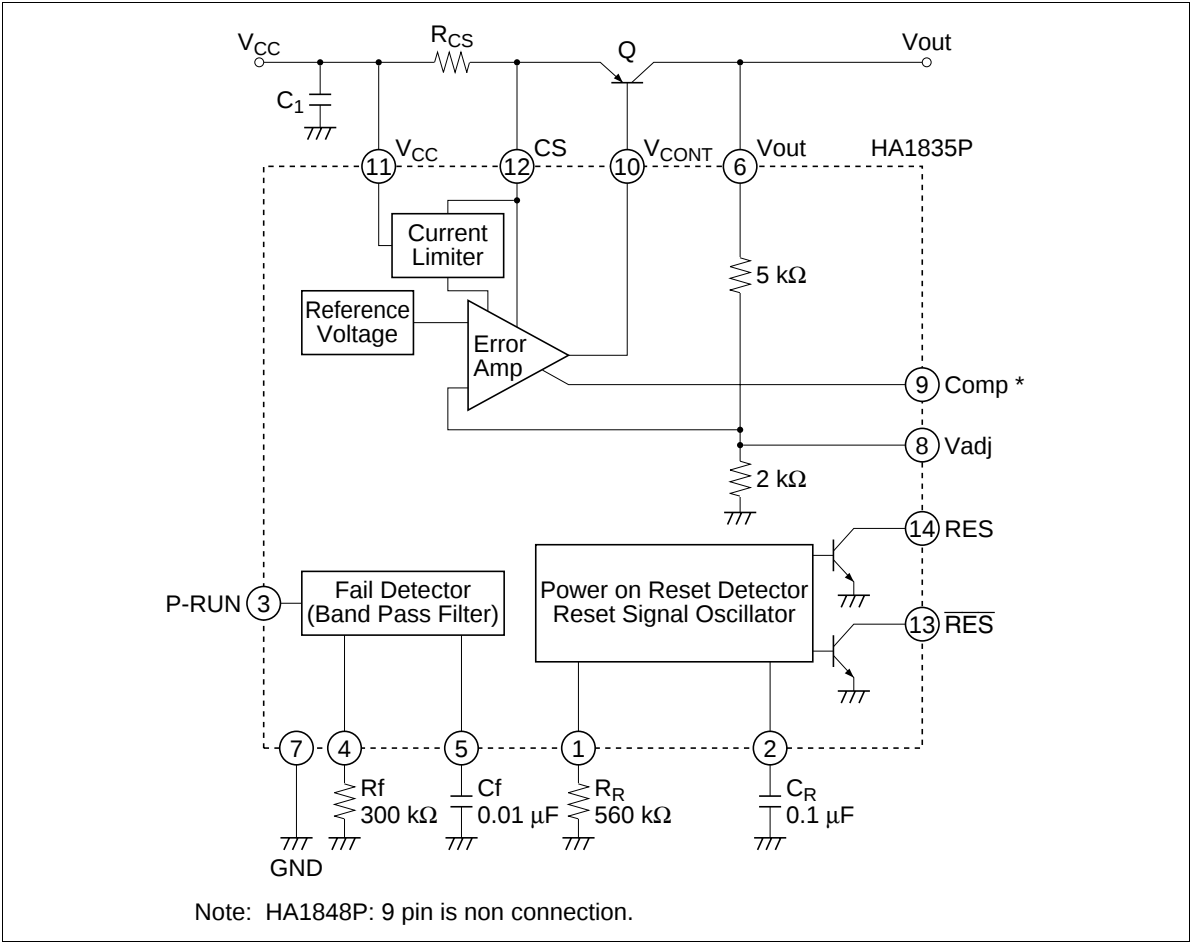
Note: HA1848P: 9 pin is non connection.

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	R _f	Frequency band width of filter circuit depends on resistance connected to R _f Recommended range: 100 kΩ to 500 kΩ
5	C _f	Frequency band width of filter circuit depends on capacitance connected to C _f
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	RES *	Reset pulse output terminal for low level reset type microcomputer
14	RES *	Reset pulse output terminal for high level reset type microcomputer

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

Block Diagram



Absolute Maximum Ratings (Ta = 25°C)

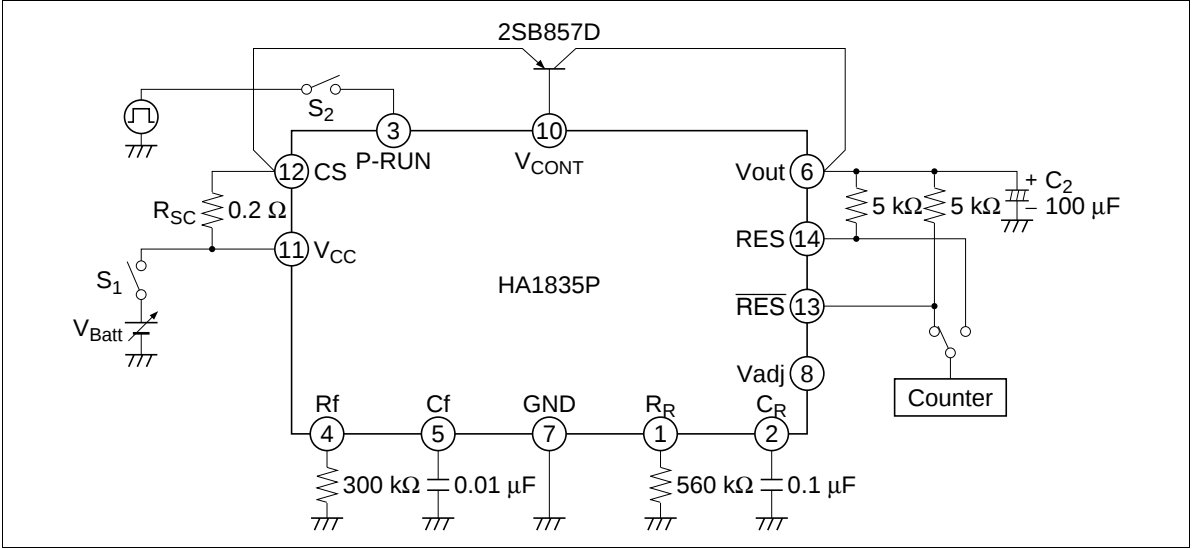
Item	Symbol	Rating	Unit
Supply voltage	V _{CC}	30	V
P-RUN input voltage	V _{P-RUN}	−0.3 to V _{out}	V
Output voltage	V _{RES}	17.5	V
	V _{RES}	17.5	V
Output current	I _{RES}	2	mA
	I _{RES}	2	mA
Control terminal voltage	V _{CONT}	V _{CC}	V
Control terminal current	I _{CONT}	20	mA
Power dissipation (Note)	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 ($V_{CC} = 12\text{ V}$, $V_{out} = 5\text{ V}$, $T_a = 25^\circ\text{C}$)

Item		Symbol	Min	Typ	Max	Unit	Test Conditions
Power supply terminal current		I_{CC}	—	6.3	12	mA	$V_{CC} = 17.5\text{ V}$ (No load), with PNP transistor
Regulator section	Output voltage	V_{out1}	4.75	5.00	5.25	V	$V_{CC} = 6\text{ to }17.5\text{ V}$, $I_{out} = 0.5\text{ A}$
		V_{out2}	4.70	5.00	5.30	V	$V_{CC} = 6\text{ to }17.5\text{ V}$, $I_{out} = 1\text{ A}$
	Line regulation	δV_{Oline}	-50	—	+50	mV	$V_{CC} = 6\text{ to }17.5\text{ V}$, $I_{out} = 1\text{ A}$
	Load regulation	δV_{Oload}	-100	—	+100	mV	$I_{out} = 10\text{ mA to }0.5\text{ A}$
	Ripple rejection	R_{REJ}	40	75	—	dB	$e_i = 0.5\text{ Vrms}$, $f_i = 1\text{ kHz}$
	Limiter operating current	I_{CS}	1.0	—	2.0	A	$R_{SC} = 0.2\ \Omega$
	Output voltage temperature coefficient	$\delta V_{out}/\delta T$	—	-0.6	—	mV/ $^\circ\text{C}$	
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	$V_{IL} = 0\text{ V}$
	High-level input current	I_{IH}	—	1.8	3.0	mA	$V_{out} = 5\text{ V}$, $V_{IH} = 5\text{ V}$
Reset circuit section	Reset terminal low-level voltage	V_{OL1}	—	—	0.4	V	$I_{OL} = 2\text{ mA}$
	Reset terminal	I_{OH1}	—	—	5.0	μA	$V_{OH} = 5\text{ V}$
	leakage current	I_{OH3}	—	—	30	μA	$V_{OH} = 17.5\text{ V}$
Reset time	Power on time	t_{on}	80	130	200	ms	$R_f = 300\text{ k}\Omega$, $R_R = 560\text{ k}\Omega$,
	Clock off reset time	t_{off}	60	130	220	ms	$C_f = 0.01\ \mu\text{F}$, $C_R = 0.1\ \mu\text{F}$
	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 ($V_{CC} = 6\text{ V}$ to 17.5 V). The external PNP transistor should be selected according to the supply current demand of the system. Connect a more than $100\text{ }\mu\text{F}$ 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.

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

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

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:

$$R_{SC} \approx \frac{0.3\text{ V}}{I_{\text{out}}(\text{Limit})} \quad (\text{at } T_a = 25^\circ\text{C})$$

Power-On Reset

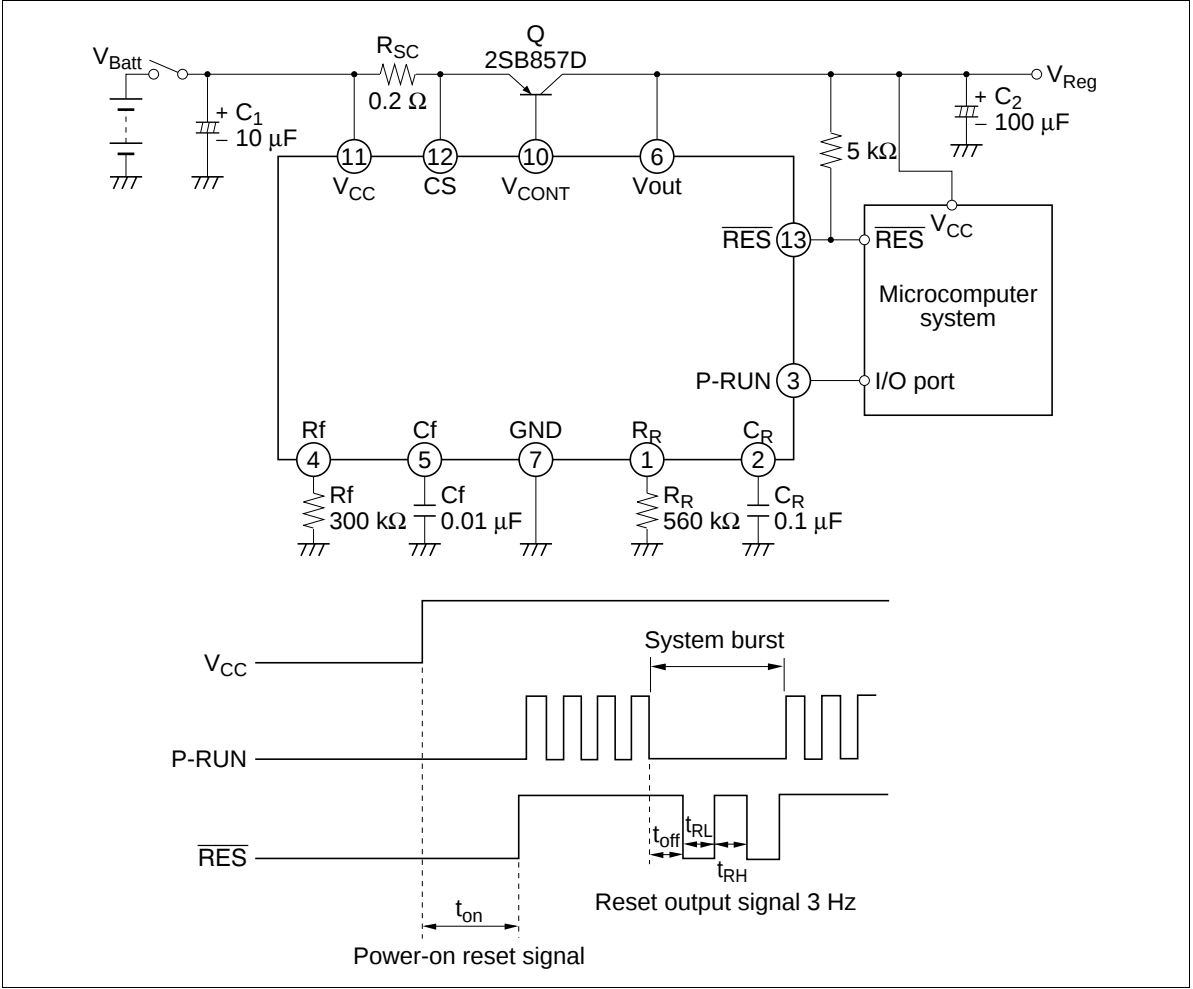
The HA1835P, and HA1848P can output a reset pulse to start the microcomputer at power on (figure 6). The external resistor R_R and capacitor C_R determine the power-on reset timing.

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

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 by 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 R_f and C_f 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

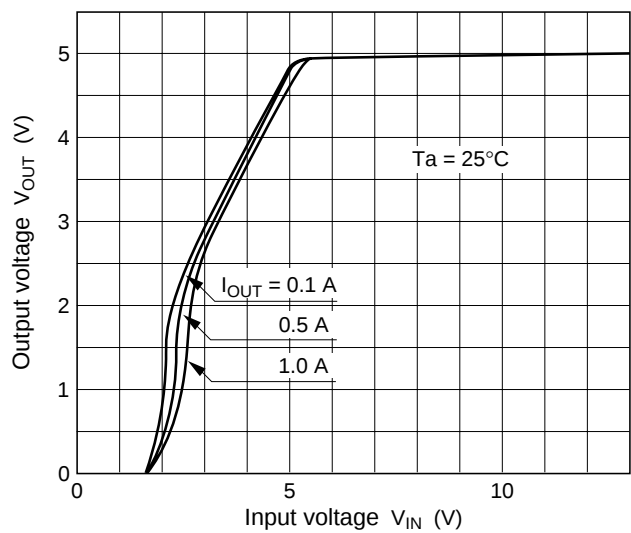


Figure 1 Output Voltage vs. Input Voltage

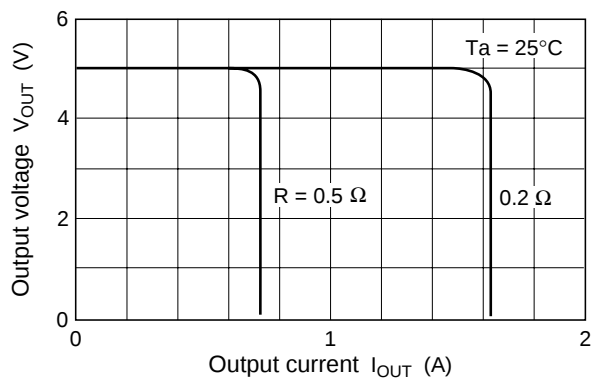


Figure 2 Output Voltage vs. Output Current

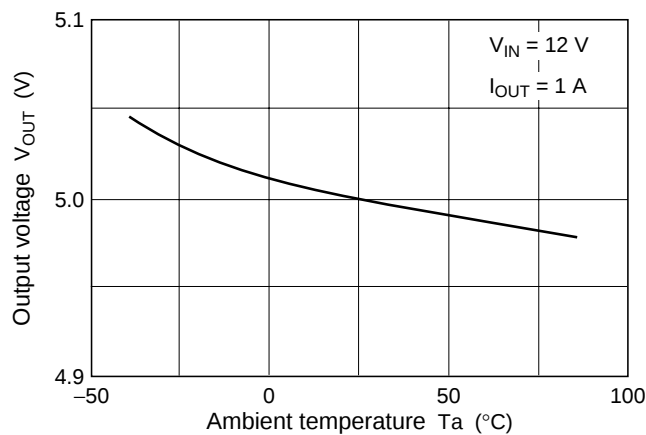


Figure 3 Output Voltage vs. Ambient Temperature

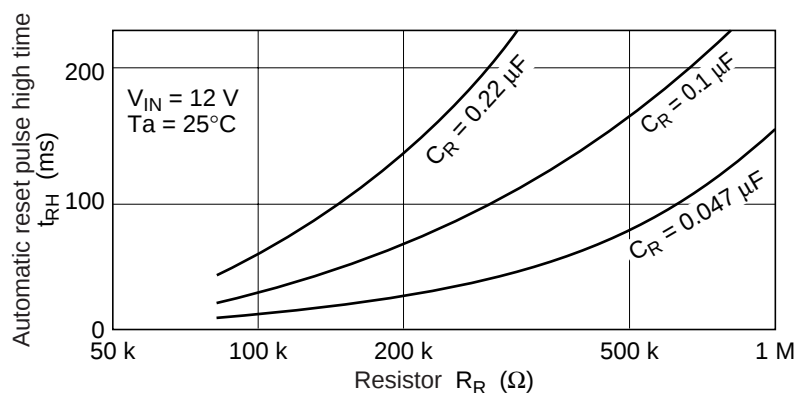


Figure 4 Automatic Reset Pulse High Time vs. Resistor

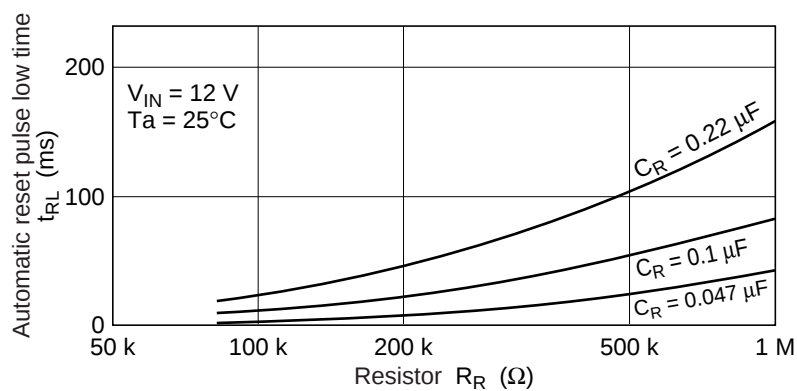


Figure 5 Automatic Reset Pulse Low Time vs. Resistor

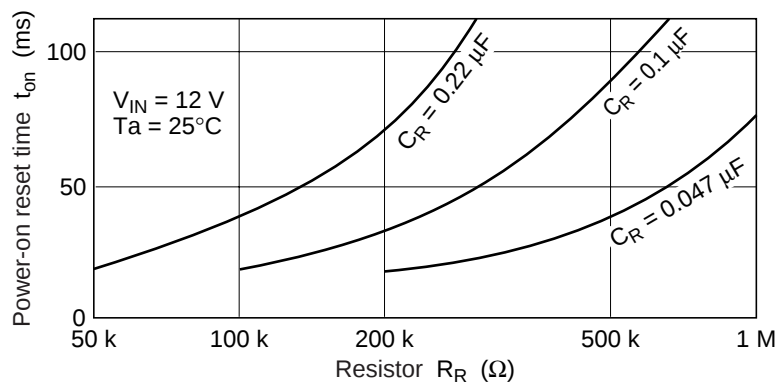


Figure 6 Power-on Reset Time vs. Resistor

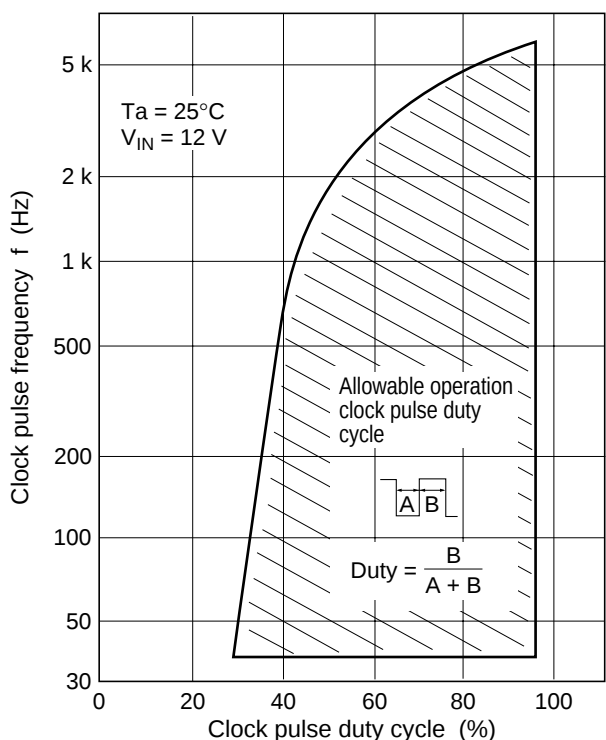


Figure 7 Clock Pulse Frequency vs. Clock Pulse Duty Cycle

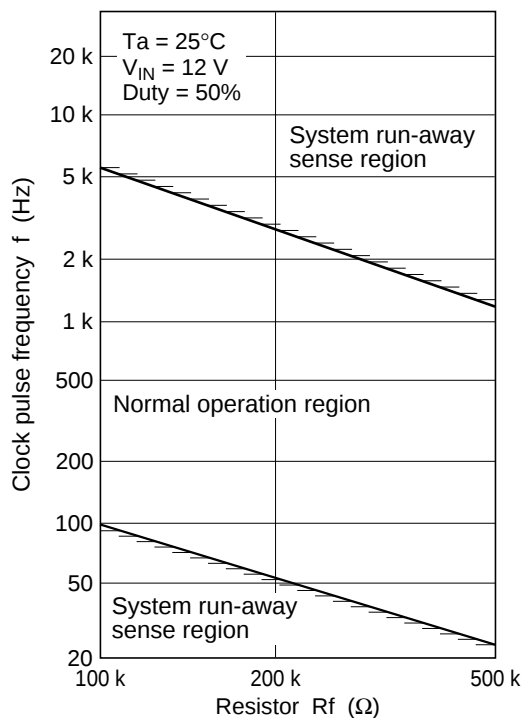
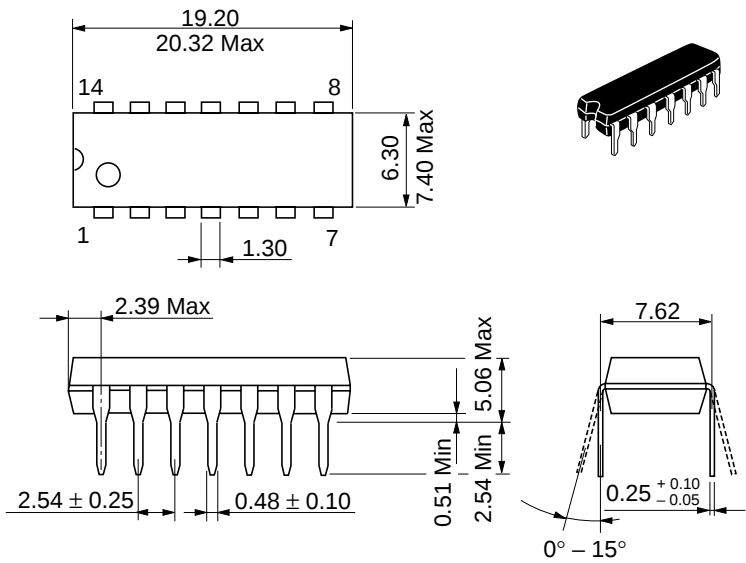


Figure 8 Clock Pulse Frequency vs. Resistor

Package Dimensions

Unit: mm



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

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