<Analog IC>

RT8H114C

PWM circuit

DESCRIPTION

RT8H114C is a PWM circuit suitable for LED drive, by changing the voltage value of the DUTY, it is possible to adjust the output duty ratio.
The oscillation frequency can be adjusted by changing the resistance and capacitance values externally connected to the CT.

FEATURES

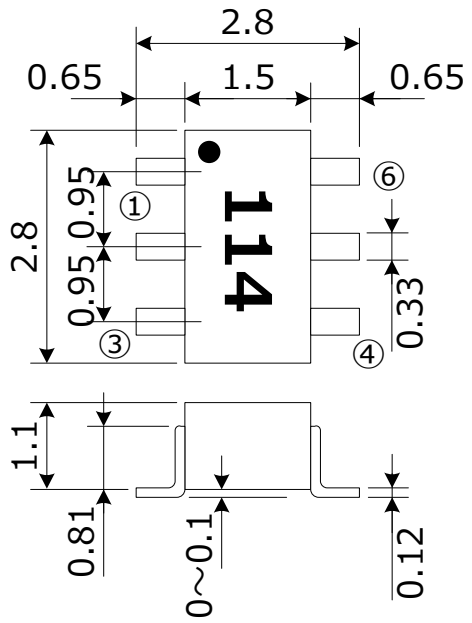
- The output duty ratio can be adjusted by changing the DUTY voltage.
- Frequency can be adjusted by externally connecting a capacitor and resistor to the CT.
- The output can be forcibly dropped to low by applying an input voltage to the ON/OFF.

APPLICATION

- LED drive circuit

OUTLINE DRAWING

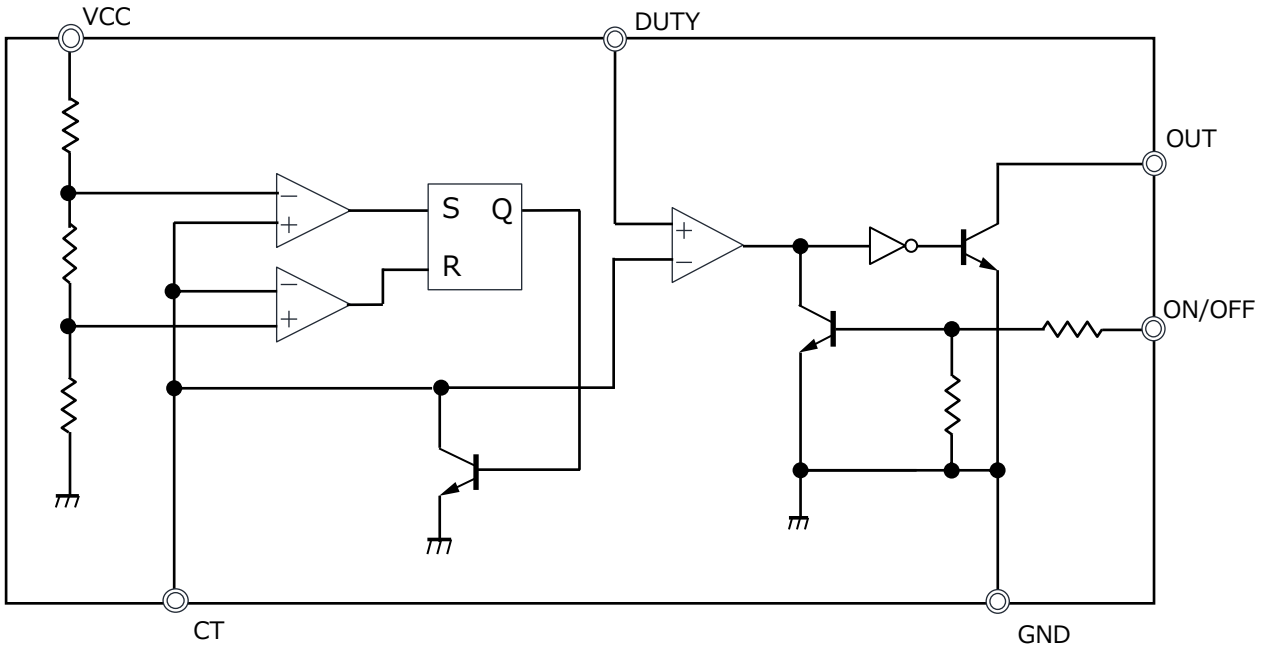
Unit：mm



PIN CONFIGURATION

①VCC	⑥DUTY
②OUT	⑤GND
③ON/OFF	

BLOCK DIAGRAM



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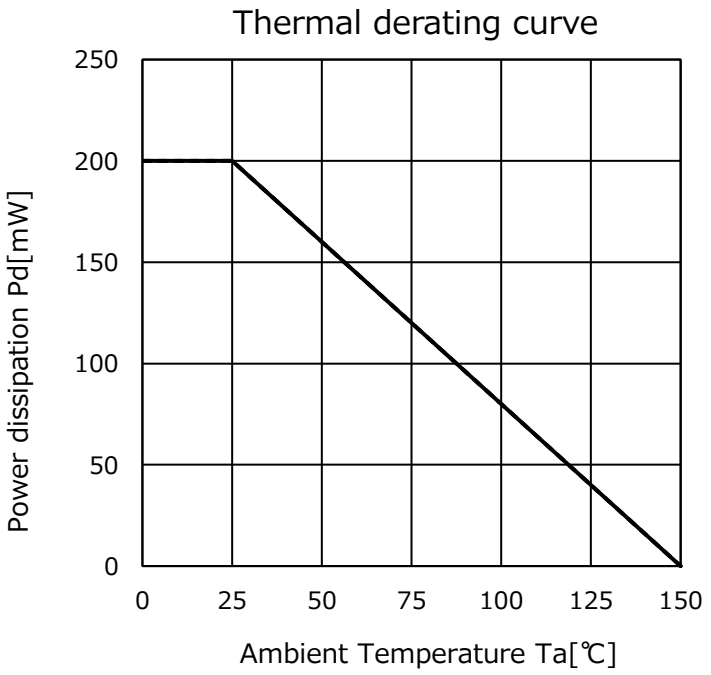
ABSOLUTE MAXIMUM RATINGS (Ta＝25℃, unless otherwise noted.)

Symbol	Parameter	Conditions	Rating	Unit
Vcc	Supply voltage		40	V
VCT	CT input voltage		-0.3~VCC	V
VDUTY	DUTY input voltage		-0.3~VCC	V
VON/OFF	ON/OFF input voltage		-0.3~VCC	V
VOUT	OUT input voltage		-0.3~40	V
IOUT	OUT current		10	mA
Pd	Internal power dissipation		200	mW
Kθ	Thermal derating	Ta≧25℃	1.6	mW/℃
Tj	Junction temperature		150	℃
Tstg	Storage temperature	(keep dry)	-40～150	℃
Topr	Operating temperature	Not to exceed Tj (keep dry)	-40～150	℃

ELECTRICAL CHARACTERISTIC(Ta＝25℃, VCC=12V unless otherwise noted.)

Symbol	Parameter	Test condition	Designed value			Unit
			Min.	Typ.	Max.	
VCC	Operating supply voltage range		6	12	36	V
ICC	Circuit current		0.8	1.0	1.5	mA
Vth1	Ramp wave upper limit voltage		10.52	10.85	11.18	V
Vth2	Ramp wave lower limit voltage		1.216	1.280	1.344	V
Duty1	ON DUTY	CT=62kΩ-VCC、0.022uF-GND	9.0	10.0	11.0	%
Duty2	DUTY operating range		1	-	90	%
OFFSET	DUTY offset voltage	VCT=1V	-10	-	10	mV
Vosat	Output saturation voltage	IOUT=3mA VCT=2V,VDUTY=1V	-	0.20	0.35	V
VOFFTH	ON/OFF threshold voltage	VCT=1V、VDUTY=2V	1.08	1.35	1.62	V
Icin	CT charge current	VCT=6V	-	0.20	3.0	uA
Icdis	CT discharge current	VCT=12V	0.75	3.40	-	mA

TYPICAL CHARACTERISTIC



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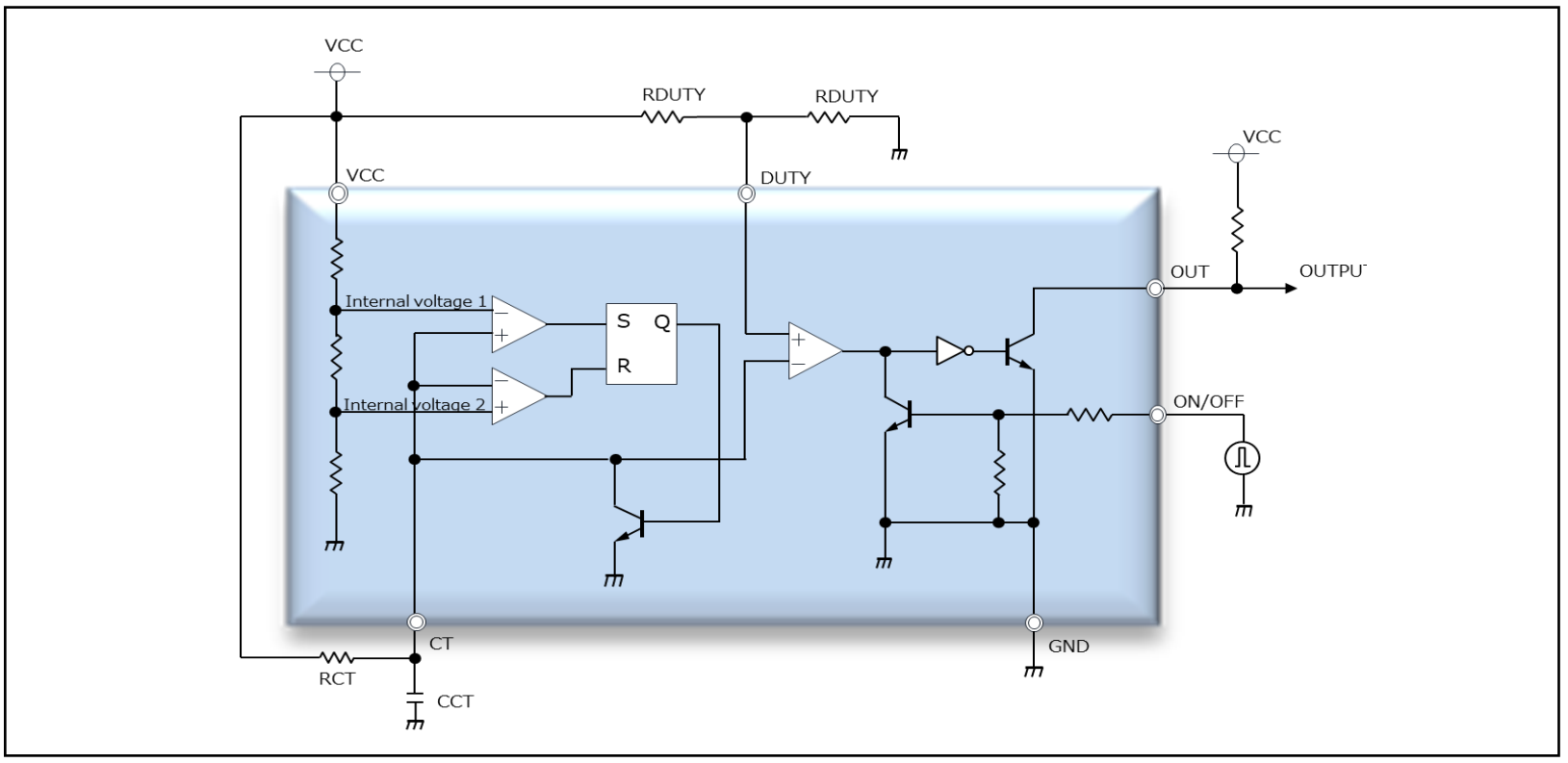
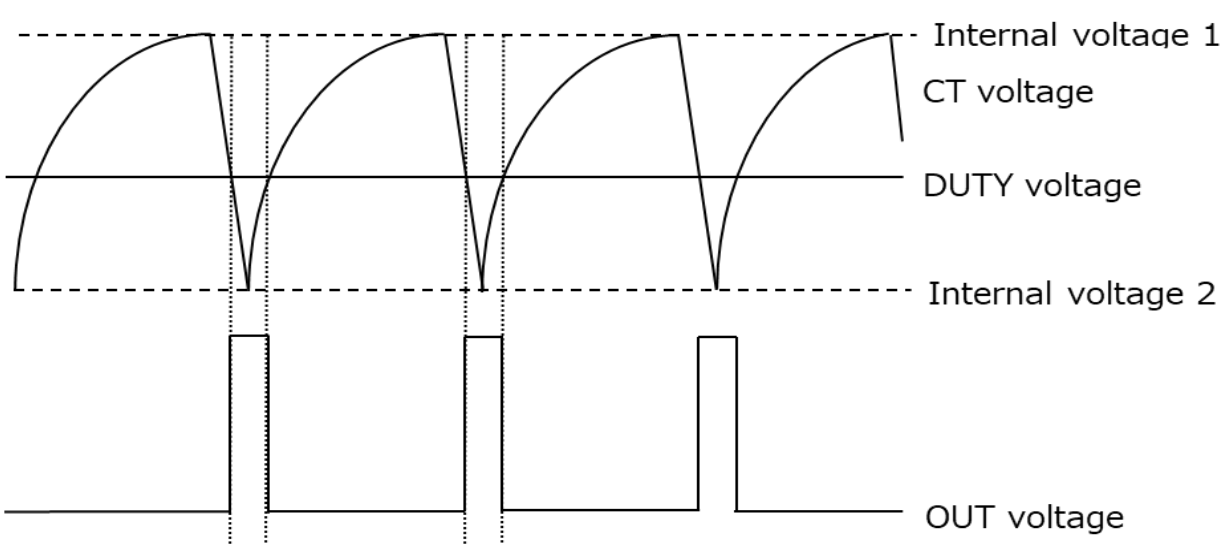
APPLICATION CIRCUIT EXAMPLES





① When VCC is applied, the CT capacitance starts to be charged, and when the CT voltage exceeds the internal voltage 1, the internal latch circuit enters the SET state and the CT capacitance is discharged.

② When discharging starts and the voltage of the CT falls below internal voltage 2, the internal latch circuit becomes RESET. After that, charging and discharging are repeated in the order of ①→②→①.

③ When the CT voltage is lower than the DUTY voltage, the OUT becomes High, and when it becomes higher than the DUTY voltage, the OUT becomes Low.

When the voltage value of the DUTY is high, the time that the OUT is High becomes longer, so the duty ratio becomes larger. When the voltage value of the DUTY is low, the time that the OUT is Low becomes longer, so the duty ratio becomes smaller.

・Setting the period of OUT voltage

The period T is determined by the sum of the time T1 and the discharge time T2 when the charging voltage of the CT resistance RCT and capacitor CCT reaches from the lower limit (Vth2) to the upper limit (Vth1) of the CT voltage set internally in the RT8H114C. The formula is as follows.

$$T1 = R_{CT} \cdot C_{CT} \cdot \ln \frac{V_{CC} - V_{th2}}{V_{CC} - V_{th1}}$$

$$T2 = C_{CT} \cdot (V_{th1} - V_{th2}) / I_{cdis}$$

$$T = T1 + T2$$

・About the DUTY ratio setting

The DUTY ratio can be set according to the DUTY voltage. The output voltage pulse width T3 can be calculated by replacing Vth1 in the above T formula with the DUTY voltage value.

$$T3 = R_{CT} \cdot C_{CT} \cdot \ln \frac{V_{CC} - V_{th2}}{V_{CC} - V_{DUTY}} + C_{CT} \cdot (V_{DUTY} - V_{th2}) / I_{cdis}$$

・Setting of constants for CCT and RCT

Please set the constants within the following range.

CCT : Not specified※

RCT : 8 kΩ or more, 4 MΩ or less

※When the CT voltage falls below Vth2 and the device switches from discharging to charging, it is designed to switch when the voltage drops by 200ns x Icdis/CCT from Vth2 due to the response speed of the internal transistor.

The capacitance value of CCT is not specified because even a low capacitance value of 1nF or less will not affect the operation, however, the lower the capacitance value, the more pronounced the drop in CT voltage becomes.

In addition, since the comparator inside the IC is not equipped with hysteresis, chattering may occur when the CCT capacitance value is large and the cycle is very long, and when the CT voltage is constant near the upper limit value.

Please evaluate the setting thoroughly.

・Frequency of use

Please use frequencies of 200 kHz or less.

Keep safety first in your circuit designs!

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