



UU6046B

LINEAR INTEGRATED CIRCUIT

REAR WINDOW HEATING TIMER

DESCRIPTION

The bipolar integrated circuit UTC **UU6046B** is designed as a window heating timer. Due to time controlled functions, they reduce the current consumptions of high loads i.e., heating resistors.

An ON-relay can be switched off after a preset delay time. The relay time can be interrupted manually, whereas a retrigger function is not provided.

FEATURES

- * Delay time range: 3.7s to 20h
- * Relay driver with Z-diode
- * RC oscillator determines switching characteristics
- * Debounced input for toggle switch
- * Two debounced inputs: ON and OFF
- * Load-dump protection
- * RF interference protected
- * Inputs switched to V_{Batt}

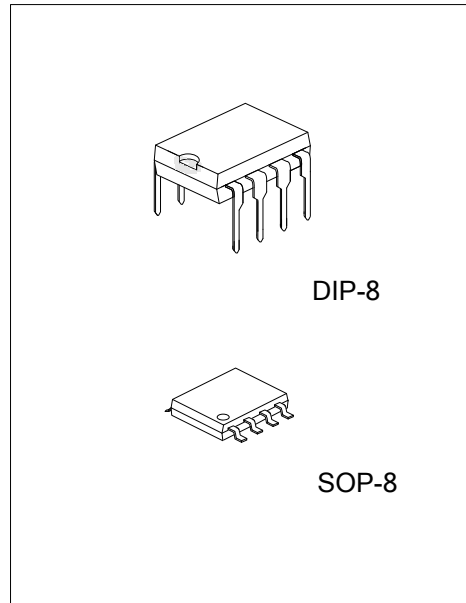
ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
UU6046BL-D08-T	UU6046BG-D08-T	DIP-8	Tube
UU6046BL-S08-R	UU6046BG-S08-R	SOP-8	Tape Reel

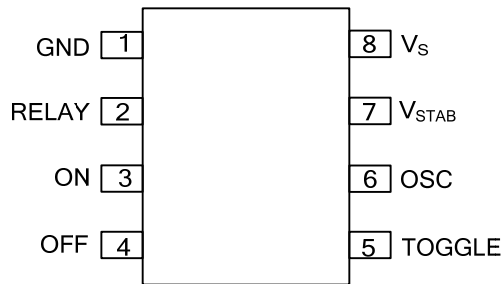
<p>UU6046BG-D08-T</p>	<p>(1) T: Tube, R: Tape Reel</p> <p>(2) D08: DIP-8, S08: SOP-8</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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MARKING

DIP-8	SOP-8



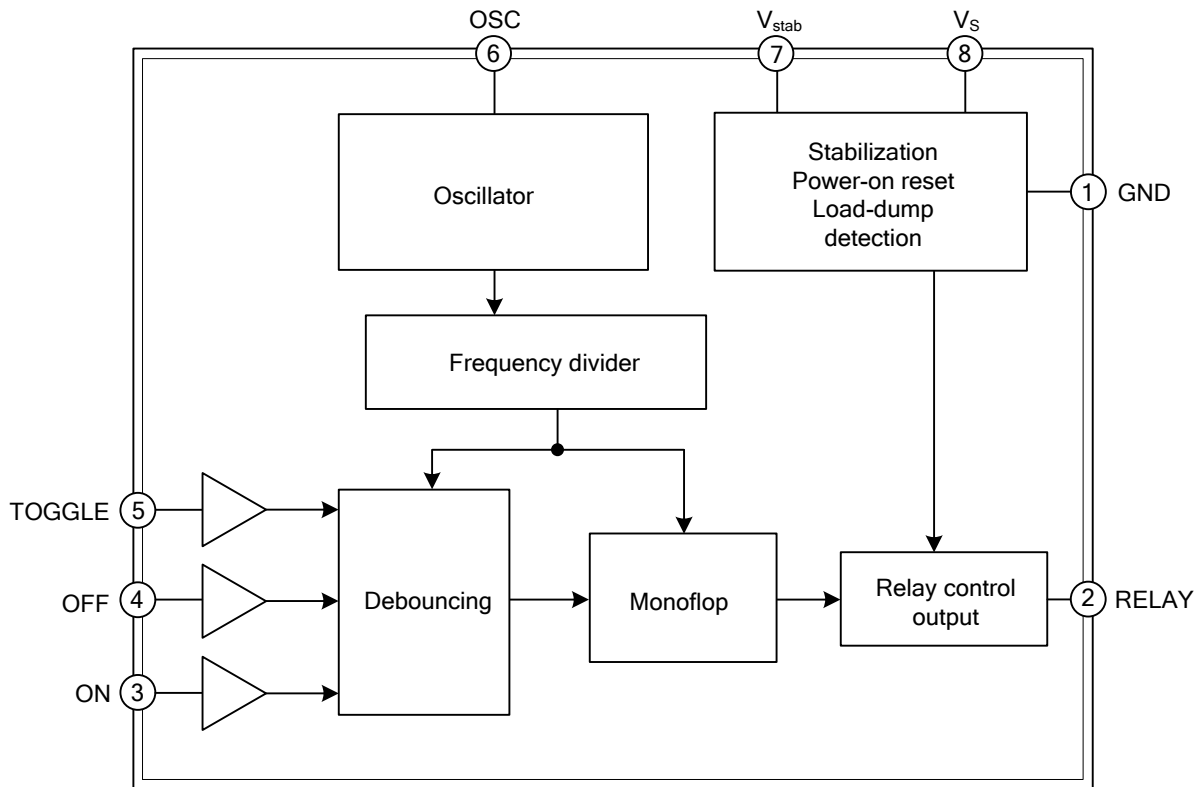
■ PIN CONFIGURATION



■ PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION
1	GND	Reference point, ground
2	RELAY	Relay control output
3	ON	Switch-on input
4	OFF	Switch-off input
5	TOGGLE	Toggle input
6	OSC	RC oscillator input
7	V _{STAB}	Stabilized voltage
8	V _S	Supply voltage

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATINGS	UNIT
Operating Voltage, Static, 5 min	V_{Batt}	24	V
Ambient Temperature Range	T_A	-40 ~ +125	°C
Junction Temperature	T_J	150	°C
Storage Temperature Range	T_{STG}	-55 ~ +125	°C

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

■ THERMAL RESISTANCE

PARAMETER	SYMBOL	RATINGS	UNIT
Junction Ambient	DIP-8	110	K/W
	SOP-8	160	K/W

■ ELECTRICAL CHARACTERISTICS

($V_{Batt}=13.5V$, $T_{AMB}=25^{\circ}C$, reference point ground, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Operating Voltage	V_{Batt}	$R_1 \geq 510\Omega$	6		16	V
		$t < 5min$			24	V
		$t < 60min$			18	V
5V Supply	V_8, V_7	Without R_1, C_1 Pins 7 and 8	4.3		6.0	V
Stabilized Voltage	V_7	$V_{Batt}=12V$, Pin 7		5.5		V
Undervoltage Threshold	V_S	Power on Reset	3.0		4.2	V
Supply Current	I_S	All Push Buttons Open, Pin8		1.3	2.0	mA
Internal Z-Diode	V_Z	$I_8=10mA$, Pin 8	13.5	14	16	V
Relay control output (Pin 2)						
Saturation Voltage	V_2	$I_2=200mA$		1.2		V
		$I_2=300mA$		1.3		V
Leakage Current	I_{lkg}	$V_2=14V$		2	100	μA
Output Current	I_2				300	mA
Output pulse current						
Load Dump Pulse	I_2	$t \leq 300ms$			1.5	A
Internal Z-Diode	V_Z	$I_2=10mA$	20	22	24	V
Oscillator input (f = 0.001~40 kHz, see table 1) (Pin 6)						
Internal Discharge Resistance	R_6	$V_6=5V$		2.0		k Ω
Switching Voltage	V_{6L}	Lower	0.9	1.1	1.4	V
	V_{6H}	Upper		3.1		V
Input Current	$-I_6$	$V_6=0V$			1	μA
Switching times						
Debounce Time	t_3			6		cycles
Delay Time	t_d		72704		74752	cycles
Inputs ON, OFF, TOGGLE (Pins 3, 4 and 5)						
Switching Threshold Voltage	$V_{3,4,5}$			2.0		V
Internal Z-Diode	V_Z	$I_{3,4,5}=10mA$	6.5	7.1	8.0	V
Pull-Down Resistance	$R_{3,4,5}$	$V_{3,4,5}=5V$	13	20	50	k Ω

■ OSCILLATOR FREQUENCY, DEBOUNCE TIME, DELAY TIME. DIMENSIONING

Oscillator, Pin 6

Oscillator frequency, f , is determined mainly by the R_2C_2 circuit. Resistance, R_2 , determines the charge time, and the integrated resistance ($2k\Omega$) is responsible for discharge time. For the stability of the oscillator frequency, it is recommended that the selected R_2 value be much greater than the internal resistance ($2k\Omega$) because the temperature response and the tolerances of the integrated resistance are considerably greater than the external resistance value.

Oscillator frequency, f , is calculated as follows:

$$f = \frac{1}{t_1 + t_2}$$

where

$$t_1 = \text{charge time} = \alpha_1 \times R_2 \times C_2$$

$$t_2 = \text{discharge time} = \alpha_2 \times 2k\Omega \times C_2$$

α_1 and α_2 are constants as such

$$\alpha_1 = 0.833 \text{ and } \alpha_2 = 1.551 \text{ when } C_2 = 47 \text{ pF to } 10\text{nF}$$

$$\alpha_1 = 0.746 \text{ and } \alpha_2 = 1.284 \text{ when } C_2 = 10\text{nF to } 4700\text{nF}$$

The debounce time, t_3 , and the delay time, t_d , depend on the oscillator frequency, f , as follows:

$$t_3 = 6 \times \frac{1}{f}$$

$$t_d = 73728 \times \frac{1}{f}$$

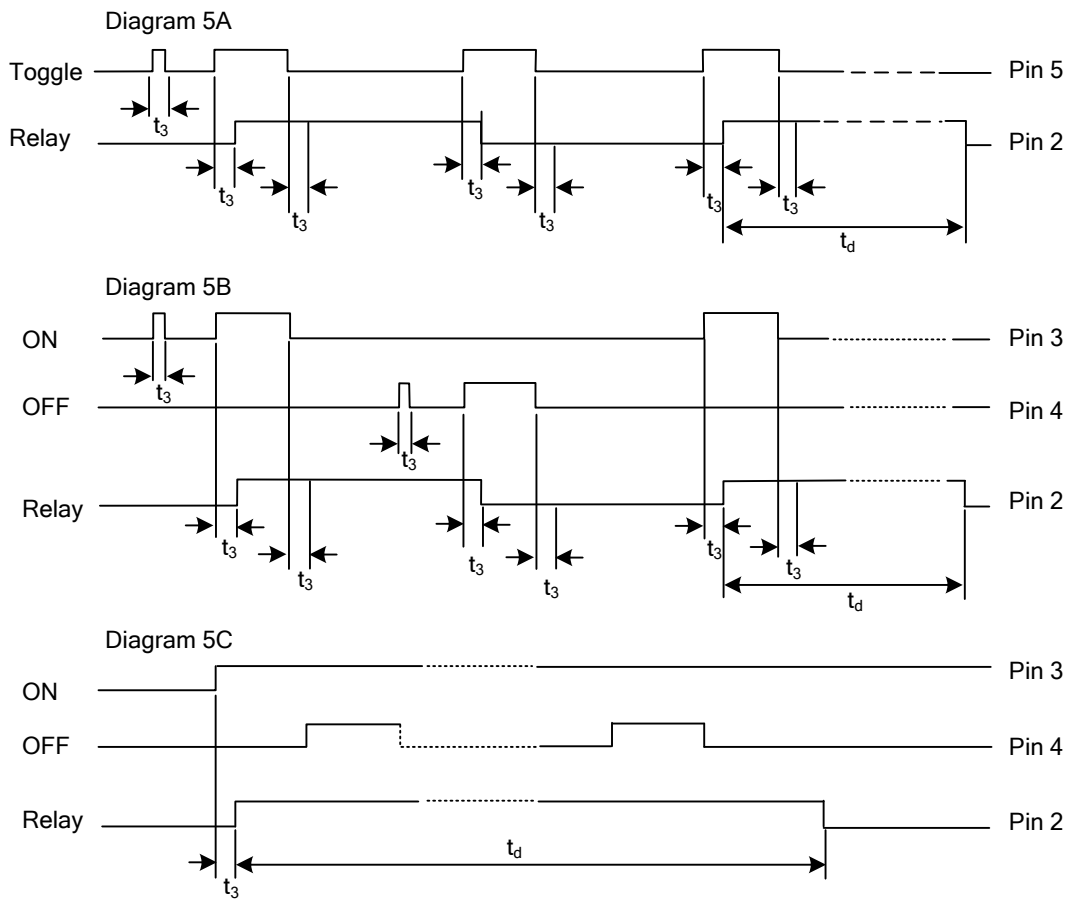
Table 1 shows relationships between t_3 , t_d , C_2 , R_2 and frequencies from 1 Hz to 20 kHz.

■ OSCILLATOR FREQUENCY, DEBOUNCE TIME, DELAY TIME. DIMENSIONING (Cont.)

Table 1. Oscillator frequency, debounce time, delay time. dimensioning

Frequency f	Debounce time t_3	Delay time t_d		C_2	R_2
		min	s		
1	6000	1229		4700	280
2	3000	614		1000	650
3	2000	410		1000	440
4	1500	307		1000	330
5	1200	246		1000	260
6	1000	205		1000	220
7	857	176		1000	190
8	750	154		1000	160
9	667	137		1000	140
10	600	123		1000	130
20	300	61		100	650
30	200	41		100	440
40	150	31		100	330
50	120	25		100	260
60	100	20		100	220
70	86	18		100	190
80	75	15		100	160
90	67	14		100	140
100	60	12		100	130
200	30		369	10	600
300	20		246	10	400
400	15		184	10	300
500	12		147	10	240
600	10		123	10	200
700	9.00		105	10	170
800	8.00		92	10	150
900	7.00		82	10	130
1000	6.00		74	10	120
2000	3.00		37	1	600
3000	2.00		25	1	400
4000	1.50		18	1	300
5000	1.20		15	1	240
6000	1.00		12	1	200
7000	0.86		11	1	170
8000	0.75		9	1	150
9000	0.67		8	1	130
10000	0.60		7	1	120
11000	0.55		6.7	1	110
12000	0.50		6.1	1	99
13000	0.46		5.7	1	91
14000	0.43		5.3	1	85
15000	0.40		4.9	1	79
16000	0.38		4.6	1	74
17000	0.35		4.3	1	70
18000	0.33		4.1	1	66
19000	0.32		3.9	1	62
20000	0.30		3.7	1	59

■ TIMING WAVEFORM



Behavior of the Relay Control Output as a Function of Input Condition

■ TYPICAL APPLICATION CIRCUIT

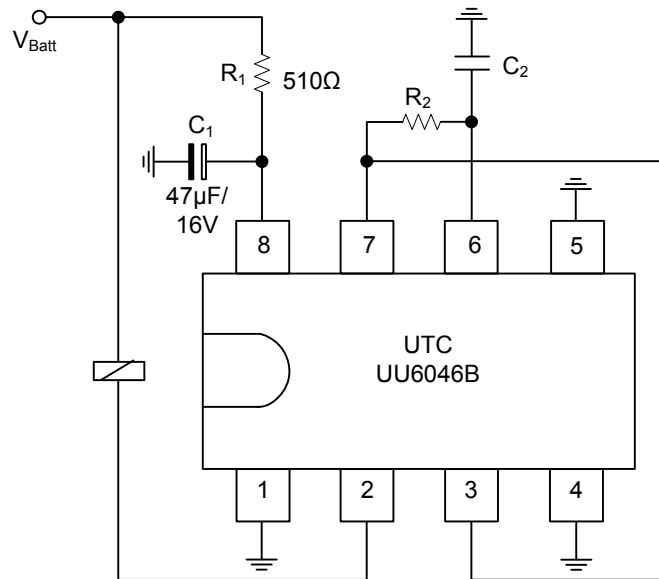


Figure 1. Generation of a monostable delay time, t_d , caused by applying the operating voltage V_{Batt} , not externally deactivatable.

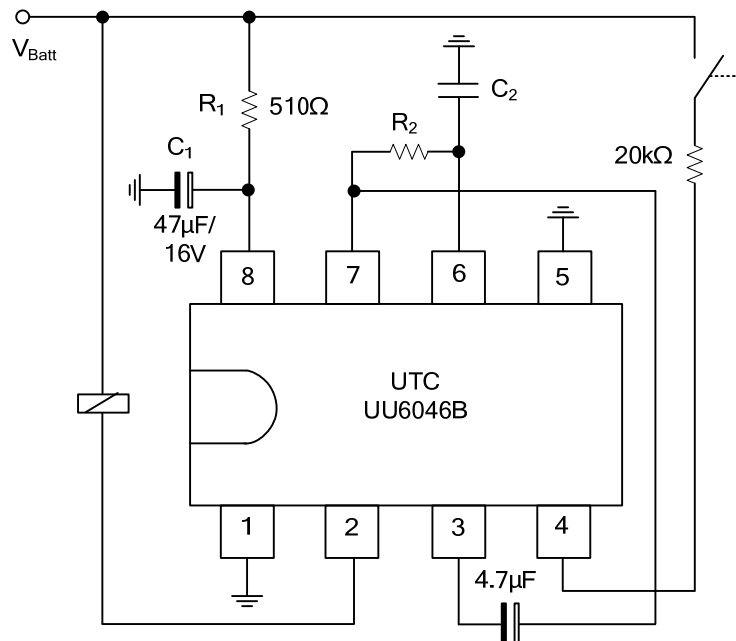


Figure 2. Generation of a monostable delay time, t_d , by applying the operating voltage V_{Batt} , deactivatable by the OFF push-button

■ TYPICAL APPLICATION CIRCUIT (Cont.)

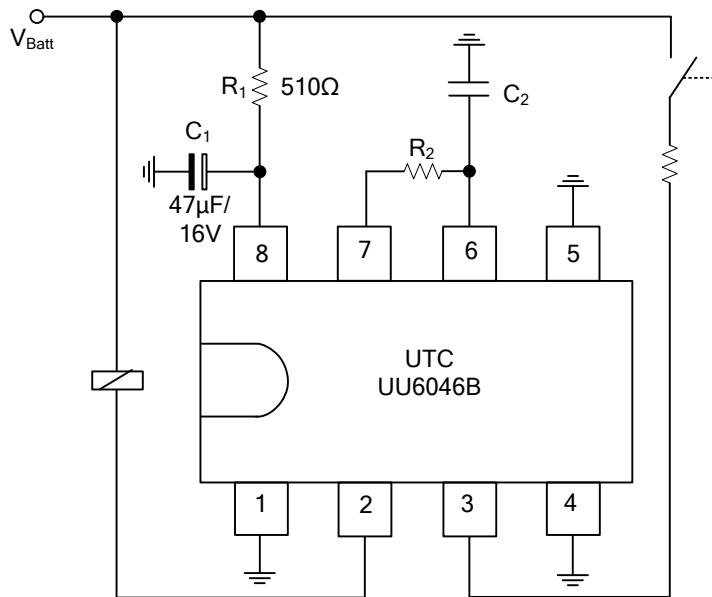


Figure 3. Monostable delay time, t_d , can be activated by the ON push-button, not externally deactivatable

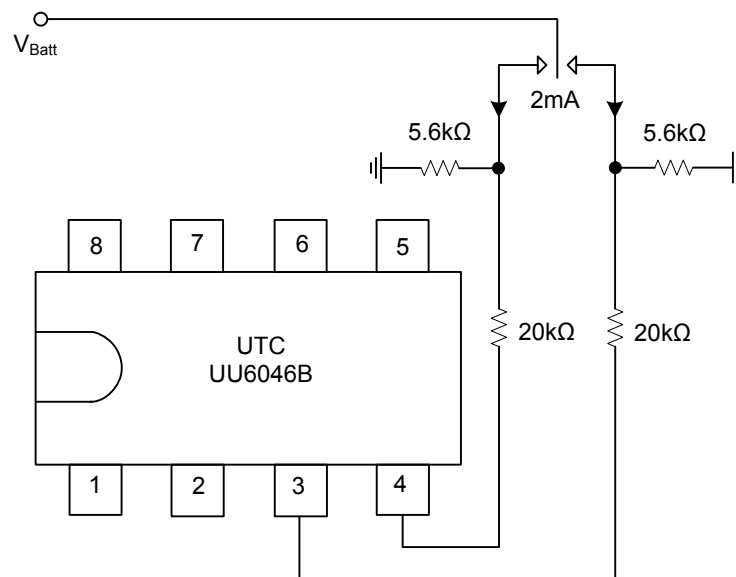


Figure 4. Increasing the contact current by parallel resistors

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