TEMIC
Semiconductors

U690B

Rear Wiper Interval/Wipe-Wash Control

Description

The bipolar integrated circuit, U690B, is designed with a time coded input for the rear pane wiper application. The length of the input signal determines the mode of operation i.e., intermittent or wipe/ wash; therefore, only one signal line is sufficient from the input switch to the electronic module.

Features

- Time controlled interval/ wipe-wash
- Wiper arm's park position control
- Interval pause typ. 7 s
- Dry wiping time typ. 4.4 s
- Multipurpose frequency comparator
- Relay driver with Z-diode
- RC-oscillator determines switching characteristics
- Debounced main signal input
- Power-on reset by low-voltage identification
- Protection according to ISO / TR 7637–1 (VDE 0839)
- Load-dump protection

Applications

Speed or R.P.M. detection

Ordering Information

Extended Type Number	Package	Remarks
U690B	DIP8	

Pin Configuration

Pin	Symbol	Function
1	GND	Ground
2	Output	Relay control output
3	Input	Signal input
4	Retrigger	Retrigger
5	Program	Program input
6	OSC	RC-oscillator
7	Hyst	Hysteresis output
8	V_{stab}	Supply voltage 7.3 V

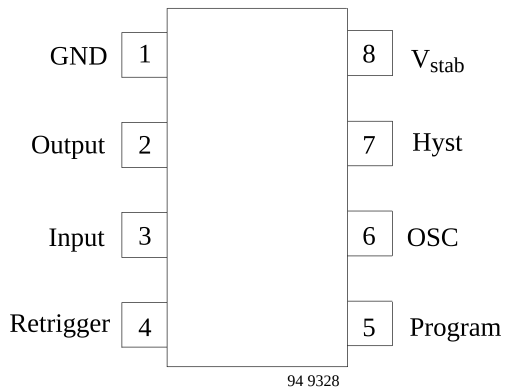


Figure 4. Pinning

Block Diagram

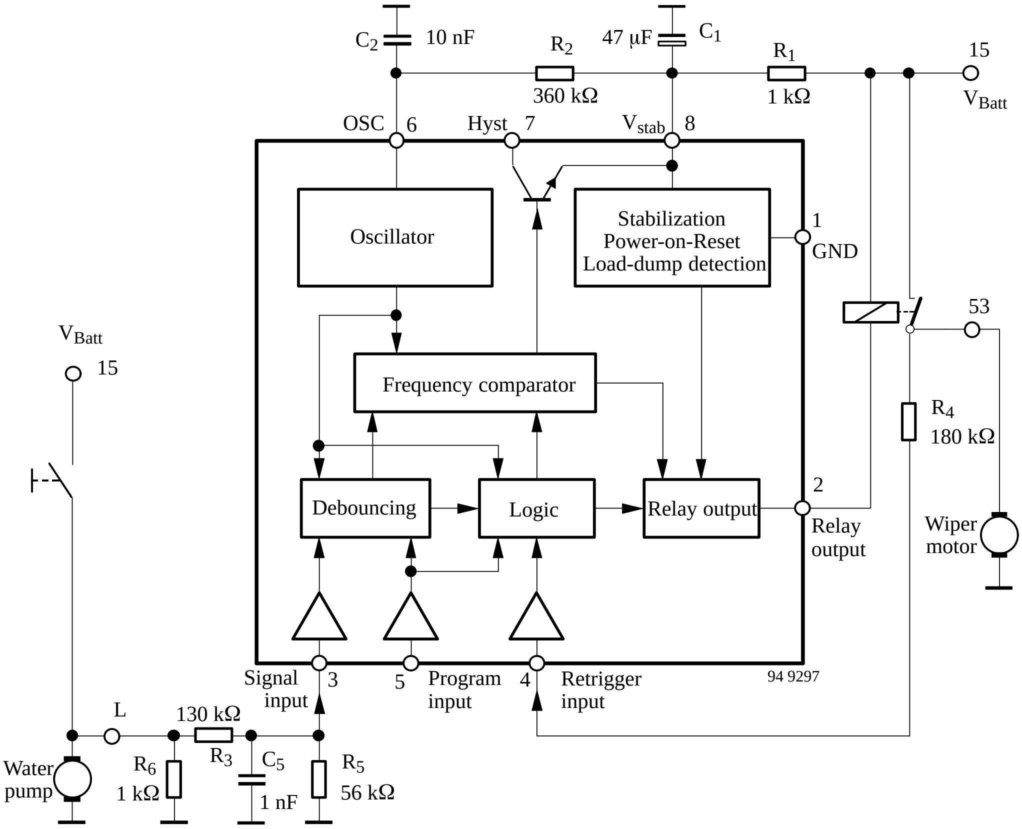


Figure 1. Application circuit for rear wiper interval/wipe-wash control

Functional Description

Power Supply, Pin 8

For reasons of interference protection and surge immunity, the supply voltage (Pin 8) must be provided with an RC-circuit as shown in figure 2. Dropper resistor, R_1, limits the current in case of overvoltage, whereas C_1 smoothes the supply voltage at Pin 8.

Recommended values are: R_1 = 1 kΩ, C_1 = 47 µF.

An integratd Z-diode (7.3 V) generates the stabilized voltage, V_{stab}, therefore, the operation of the IC is possible between 6 V and 16 V, supplied by V_{Batt} (Terminal 15).

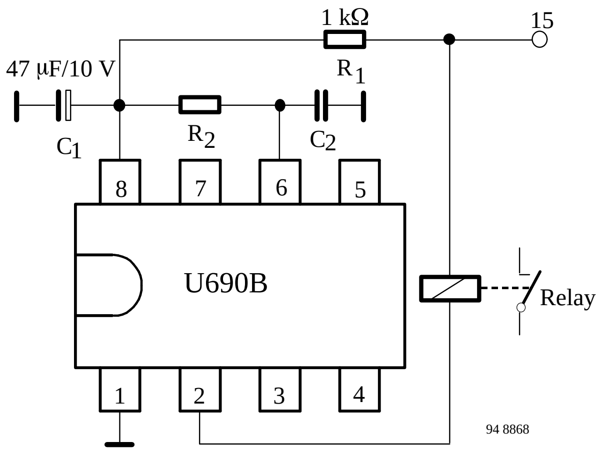


Figure 2. Basic circuitry

Interference Voltages and Load-Dump, Pins 3 and 4

Pin 3 (signal input) and Pin 4 (retrigger input) are protected against short interference peaks via the integrated Z-diodes and external series resistance.

Relay Control Output, Pin 2

The relay control output is an open collector Darlington circuit with an integrated 21-V Z-diode for limitation of the inductive cut-off pulse of the relay coil. The maximum static collector current must not exceed 200 mA and the saturation voltage is typically 1.0 V @ 100 mA, whereas the typical resistive load is 80 Ω.

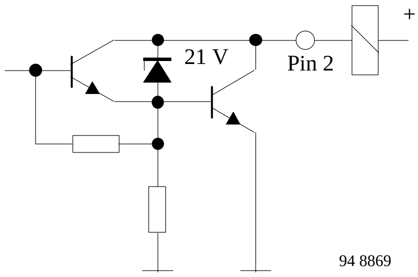


Figure 3. Relay control output

Oscillator, Pin 6

Oscillator frequency, f, is determined mainly by the R_2C_2 circuit. The resistance, R_2, determines the charge time, and the integrated resistance (2 kΩ) 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 (2 kΩ), 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:

$$f = 1/C_2 \cdot (0.632 \cdot R_2 + 1900)$$

Minimum value for R_2 = 68 kΩ
Maximum oscillator frequency is 20 kHz.

For further information, please refer to table 1, regarding relationship between oscillator frequency and different timings.

Rear Wiper Interval/Wipe-Wash Control, Figures 1 and 4

A single high-side switch at terminal L is responsible for all switching sequences. The water pump motor is connected at terminal L and the wiper motor is connected at terminal 53, as shown in figure 1.

Figure 4 shows three different modes of operation. The input signal pulse width, t_p, (see figure 1, terminal L) determines the operation mode, with an assumed oscillator frequency of f = 400 Hz. Pin 5 and Pin 7 are open. As a debouncing measure, input pulses of t_p less than 50 ms do not activate the relay.

Further explanation is given with typical values. For detailed information, please refer to table 1.

– Interval mode: 50 ms $\leq t_p \leq$ 610 ms
  Pin 2 (relay control output) is activated for 640 ms,
  where the interval pause, t_3, is approximately 7 s.

– Wipe/wash mode: $t_p \geq$ 610 ms
  Dry wiping time is 4.4 s after the negative edge of t_p.

– Wipe/wash mode with retrigger

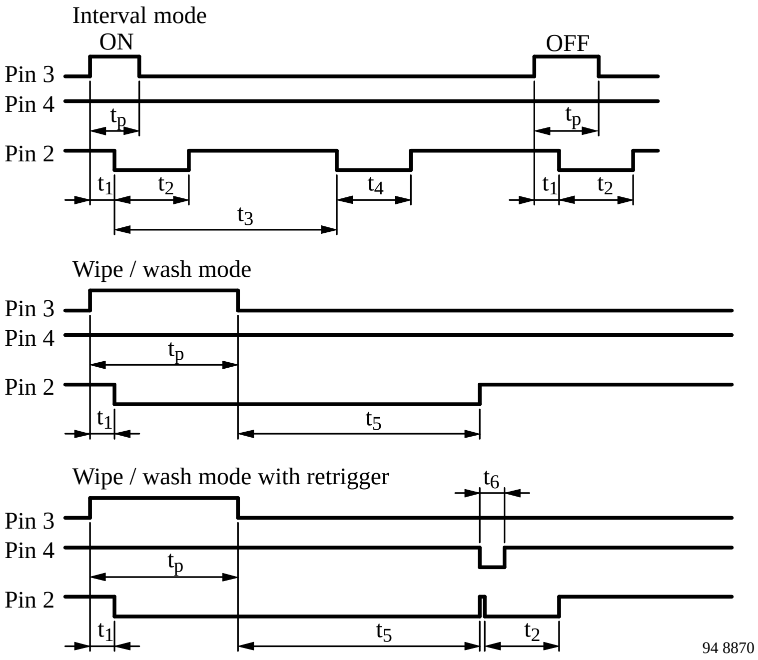
Retriggering for Large Park Segment

After dry wiping, the slip ring contact cuts off the supply of the wiper motor and stops the wiper in its parking position.

However due to mechanical tolerances, the contact may pass over the park segment so that the wiper is switched off by the relay. The wiper arm then stops at an undefined position on the screen.

By retriggering the U690B prevents the wiper arm from stopping anywhere other than its parking position. The voltage of the relay contact is fed back to the retrigger input which detects the negative switch off pulse (see figure 4) and reactivates the wiper motor immediately for approximately 640 ms. After another turn, the wiper is switched off correctly via the slip ring contact.

The interval mode can be activated during the dry wiping time, but the retriggering mode is switched-off during this time.



t_p: Operating time
t_1: Debounce time
t_2: Relay active
t_3: Interval time
t_4: Interval pulse
t_5: Dry wiping time
t_6: Retrigger

Figure 4. Pulse diagram for different modes – wipe/wash

Table 1. Time for rear wiper interval operation

Index t	Description	Oscillator Clocks
1	Interval ON (first pulse)	252
2	Interval ON (following pulses)	256
3	Interval pause (except first pause)	2816
4	Pause (dry wiping interval pulse)	1024
5	Dry wiping time min/max	1738/1810
6	Gate for retrigger	8
7	Min/max lengthening at retrigger	248/256
8	Debounce time min/max	16/24
9	Recognition time for dry wiping min/max	240/248

f_{osc} (Hz)	1 (ms)	2 (ms)	3 (s)	4 (s)	5_{min} (s)	5_{max} (s)	6 (ms)	7_{min} (ms)	7_{max} (ms)	8_{min} (ms)	8_{max} (ms)	9_{min} (ms)	9_{max} (ms)
300	840	853	9.387	3.410	5.790	6.030	27	827	853	53	80	800	827
310	813	826	9.084	3.300	5.603	5.835	26	800	826	52	77	774	800
320	788	800	8.800	3.197	5.428	5.653	25	775	800	50	75	750	775
330	764	776	8.533	3.100	5.264	5.482	24	752	776	48	73	727	752
340	741	753	8.282	3.009	5.109	5.321	24	729	753	47	71	706	729
350	720	731	8.064	2.923	4.963	5.169	23	709	731	46	69	686	709
360	700	711	7.822	2.842	4.825	5.025	22	689	711	44	67	667	689
370	681	692	7.611	2.765	4.695	4.889	22	670	692	43	65	649	670
380	663	674	7.411	2.692	4.571	4.761	21	653	674	42	63	632	653
390	646	656	7.221	2.623	4.454	4.638	21	636	656	41	62	615	636
400	630	640	7.040	2.558	4.343	4.523	20	620	640	40	60	600	620
410	615	624	6.868	2.495	4.237	4.412	20	605	624	39	59	585	605
420	600	610	6.705	2.436	4.136	4.307	19	590	610	38	57	571	590
430	586	595	6.549	2.379	4.040	4.207	19	577	595	37	56	558	577
440	573	582	6.400	2.325	3.948	4.111	18	564	582	36	55	545	564
450	560	569	6.258	2.273	3.860	4.020	18	551	569	36	53	533	551
460	548	557	6.122	2.224	3.776	3.933	17	539	557	35	52	522	539
470	536	545	5.991	2.177	3.696	3.849	17	528	545	34	51	511	528
480	525	533	5.867	2.131	3.619	3.769	17	517	533	33	50	500	517
490	514	522	5.747	2.088	3.545	3.692	16	506	522	33	49	490	506
500	504	512	5.632	2.046	3.474	3.618	16	496	512	32	48	480	496

Absolute Maximum Ratings

Reference point Pin 1 (31), unless otherwise specified

Parameters	Symbol	Value	Unit
Operating voltage, static 5 min., Terminal 15	V_{Batt}	24	V
Ambient temperature range	T_{amb}	–40 to +95	°C
Storage temperature range	T_{stg}	–55 to +125	°C
Junction temperature	T_j	150	°C

Thermal Resistance

Parameters	Symbol	Value	Unit
Junction ambient DIP 8	R_{thJA}	110	K/W

Electrical Characteristics

Reference point Ground (Pin 1), T_{amb} = 25°C, V_{Batt} = 12 V, unless otherwise specified, see basic circuitry figure 2

Parameters	Test Conditions / Pin	Symbol	Min	Typ	Max	Unit
Operating voltage	$R_1 \geq 1$ kΩ t < 5 min t < 60 min	V_{Batt}	6.0		16.0 24.0 18.0	V
Stabilized voltage	I_8 = 10 mA Pin 8	V_8		7.35		V
Low voltage detection	Terminal 15	V_{Batt}	4.0	4.5	5.0	V
Relay control output Pin 2						
Saturation voltage	I ≤ 200 mA I ≤ 100 mA	V_2			1.5 1.2	V
Internal Z-diode	I_2 = 10 mA Pin 2	V_z	20	21	23	V
Oscillator f = 0.001 to 20 kHz Pin 6						
Integrated discharge resistor	$V_6 = V_8$	r_6	1.6	2.0	2.4	kΩ
Switching threshold voltage	lower upper	V_{6L} V_{6H}		1.8 4.6		V
Input current	V_6 = 0 V	$–I_6$			1	µA
Hysteresis current	Pin 7	$–I_7$			200	µA
Saturation voltage	I_7 = –l00 µA Pin 7	$V_{7–8}$		100	200	mV
Programming input Pin 5						
Pull-up resistor		r_5	40	50	60	kΩ
Temperature drift of r_5		TC		0.45		%/deg.
Switching threshold voltage		V_5		2		V
Signal input, R_3 = 1 kΩ (min), fig.1, Pin 3						
Input current	V_3 = 2 V	$– I_3$			0.5	µA
Threshold voltage	ON OFF	V_3	2.1 1.6		2.3 1.8	V
Internal Z-diode	I_3 = 10 mA I_3 = –10 mA	V_3 $–V_3$		7.5 0.7		V
Retrigger R_4 = 1 kΩ (min), fig. 1, Pin 4						
Threshold voltage	ON OFF	V_4	2.1 1.6		2.3 1.8	V
Internal Z-diode	I_4 = 10 mA I_4 = –10 mA	V_4 $–V_4$		7.5 0.7		V
Integrated pull-up resistor		r_4	40	50	60	kΩ
Temperature drift of r_4		TC		0.45		%/deg.

Applications

Frequency Comparator

Speed Depending Switch with Hysteresis, Figure 5

This circuit can be used to activate a load, such as a warning lamp or buzzer via the relay (terminal A) at a certain speed. The speed information is applied to signal input, Pin 3, e.g. from Hall generator via terminal V.

It is compared in the integrated circuit with a reference frequency created by the oscillator. The oscillator frequency, f, is generated with external resistor, $R_2||R_7$, and capacitor, C_2.

If the frequency at Pin 3 is less than f/64, the relay control ouput is deactivated.

If the frequency at Pin 3 is greater than f/64, the relay control output is activated and at the same time the hysteresis output, Pin 7, is disabled, the frequency is reduced. This means Pin 7 supplies no current for charging the capacitor, C_2; therefore, R_2 and C_2 alone define the oscillator frequency i.e., $f \approx R_2 \cdot C_2$.

The hysteresis frequency is determined with the resistor, R_7.

Motor Speed Depending Switch with Hysteresis, Figure 6

This circuit, figure 6, has the same function as the speed with hysteresis mentioned above.

Information regarding motor speed (rpm) from the ignition coil is delivered to signal input, Pin 3, via terminal 1. Resistor values, R_3 and R_5 are so dimensioned, that there is a peak voltage of nearly 3 V at Pin 3 (from the ignition coil). Pin 4 is connected to GND, so that there is a bypass for debouncing. In this way, ignition pulse is supplied to frequency comparator.

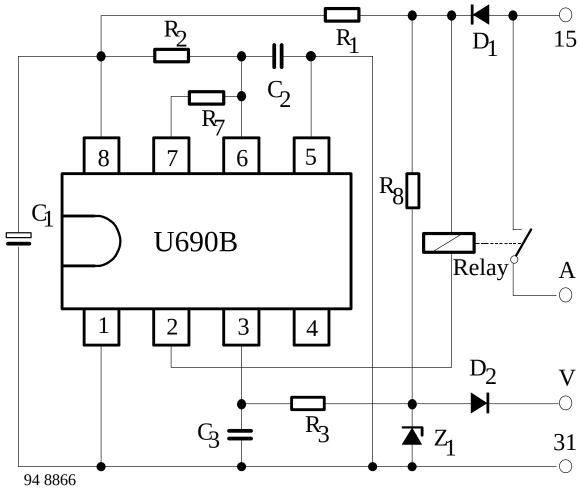


Figure 5. Speed switch

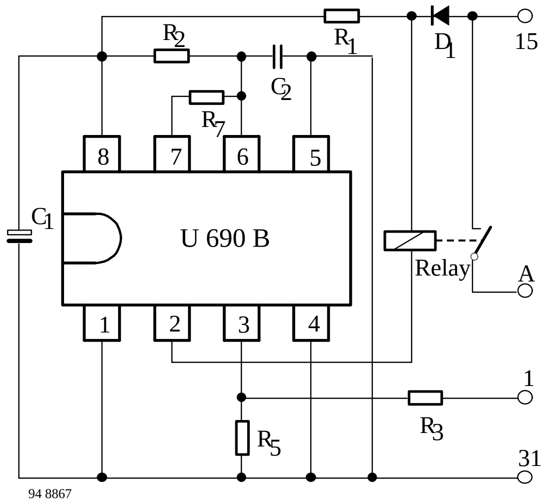
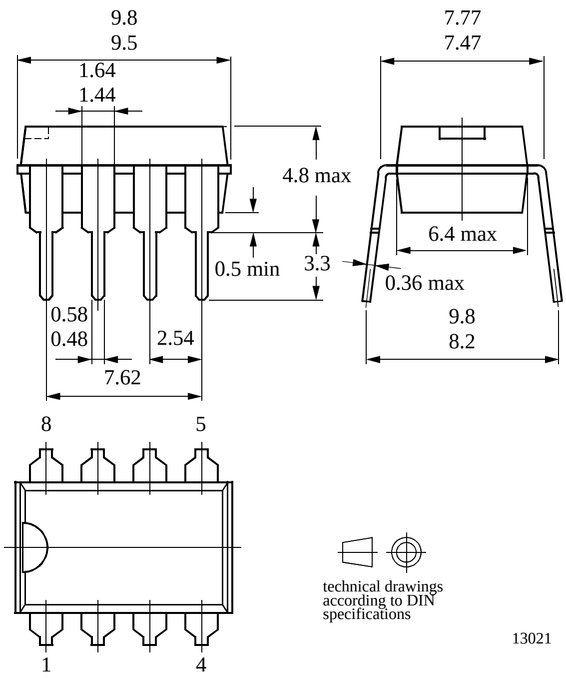


Figure 6. Motor speed switch with hysteresis

Package Information

Package DIP8

Dimensions in mm



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It is the policy of **TEMIC TELEFUNKEN microelectronic GmbH** to

1. Meet all present and future national and international statutory requirements.

2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

TEMIC TELEFUNKEN microelectronic GmbH semiconductor division has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively

2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA

3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

TEMIC can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.

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