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TEWS TECHNOLOGIES

TIP710

16 Digital Outputs, 6V to 48V DC, High Side Switch

Version 1.0

User Manual

Issue 1.0.5

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TEWS TECHNOLOGIES GmbH
Am Bahnhof 7
25469 Halstenbek, Germany
www.tews.com
Phone: +49-(0)4101-4058-0
Fax: +49-(0)4101-4058-19
e-mail: info@tews.com

TEWS TECHNOLOGIES LLC
9190 Double Diamond Parkway,
Suite 127, Reno, NV 89521, USA
www.tews.com
Phone: +1 (775) 850 5830
Fax: +1 (775) 201 0347
e-mail: usasales@tews.com

TIP710-10

16 Digital Outputs, 6V to 48V DC

High Side Switch

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Style Conventions

Hexadecimal characters are specified with prefix 0x, i.e. 0x029E (that means hexadecimal value 029E).

For signals on hardware products, an ‚Active Low' is represented by the signal name with # following, i.e. IP_RESET#.

Access terms are described as:

W	Write Only
R	Read Only
R/W	Read/Write
R/C	Read/Clear
R/S	Read/Set

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Issue	Description	Date
1.0	Initial Issue	February 2002
1.1	Correction Technical Specification	October 2002
1.2	General Revision	September 2006
1.3	Additional Information about Register Reset Values	April 2008
1.4	Additionally description of output wiring	July 2008
1.0.5	New notation of User Manual Issue	March 2009

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1 Product Description

The TIP710 is an IndustryPack® compatible module providing 16 digital outputs configured as high side switch with galvanic isolation via optocouplers.

The TIP710 directly controls up to 16 lines of all kinds of resistive, capacitive and inductive loads.

The outputs are capable of driving 1A continuous per channel at an external supply voltage of 6V to 48V.

All outputs resist short-circuits and are protected against thermal overload.

After power-on or reset all channels are in the off state. A hardware watchdog clears all outputs in case of trigger failure.

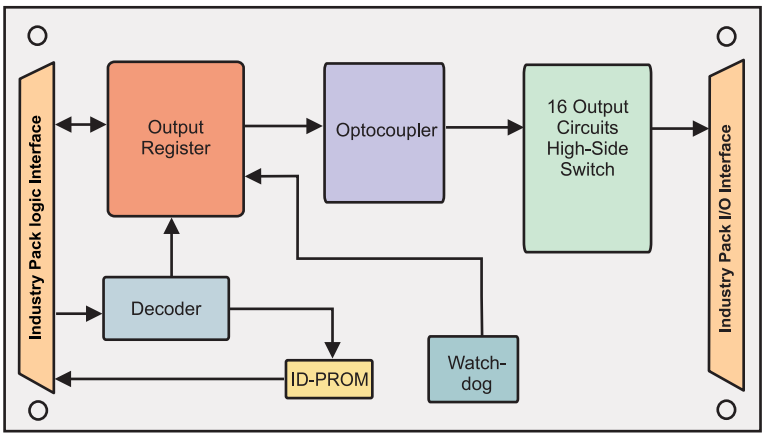


Figure 1-1 : Block Diagram

2 Technical Specification

IP Interface	Single Size IndustryPack® Logic Interface	
Module Specific Data		
Number of Outputs	16 digital Outputs	
Output Isolation	Optocouplers for galvanic isolation to logical interface, all channels share the same power supply and ground	
External Output Voltage	24V DC typical, 6V DC minimum, 48V DC maximum	
Output Current	1A maximum	
Short Circuit Current	4.5A typical	
Output Turn On/Off Time	Turn-on time: 85µs typical RL = 47Ω, Vbb = 25V DC	Turn-off time.: 150µs typical RL = 47Ω, Vbb = 25V DC
Output Protection	Overload, short circuit, GND and Vbb open wire protection, thermal shutdown	
Watchdog	Maximum Trigger distance = 100 ms	
Wait States	No wait states	
Interface Connector	50-conductor flat cable	
Power Requirements	250 mA typical @ +5V DC	
Temperature Range	Operating Storage	-40 °C to +85 °C -50°C to +125 °C
MTBF	279000 h	
Humidity	5 – 95 % non-condensing	
Weight	27 g	

Table 2-1 : Technical Specification

3 ID Prom Contents

Address	Function	Content
0x01	ASCII ‘I’	0x49
0x03	ASCII ‘P’	0x50
0x05	ASCII ‘A’	0x41
0x07	ASCII ‘C’	0x43
0x09	Manufacturer ID	0xB3
0x0B	Model Number	0x33
0x0C	Revision	0x10
0x0F	RESERVED	0x00
0x11	Driver-ID Low-Byte	0x00
0x13	Driver-ID High-Byte	0x00
0x15	Number of bytes used	0x0C
0x17	CRC	0x7F

Table 3-1 : ID PROM Contents

4 IP Addressing

4.1 IP Bus Address Map

The TIP710 is accessed in the I/O space though the following set of two direct accessible register.

Register Name	Register Symbol	Size	Address
Output Data Register	OUTDAT	16 bit	0x00
Watchdog Control Register	WDGCSR	16 bit	0x02

Table 4-1 : I/O Space Register

4.1.1 Output Data Register (IP Base Address + 0x00)

The Data Output Register is a word wide read/write register. The status of the digital output channels can be set or reset directly by writing to the Output Data Register. Bit 0 represents OUTPUT 1 and bit 15 represents OUTPUT 16.

Bit Number	Bit Symbol	Access	Description	Reset Value
15 (MSB)	OUTPUT 16	R/W	To set an output channel active, write a '1' to the corresponding bit. For the inactive state write a '0' to the corresponding bit. 0 : inactive 1 : active	0x0000
14	OUTPUT 15			
13	OUTPUT 14			
12	OUTPUT 13			
11	OUTPUT 12			
10	OUTPUT 11			
9	OUTPUT 10			
8	OUTPUT 9			
7	OUTPUT 8			
6	OUTPUT 7			
5	OUTPUT 6			
4	OUTPUT 5			
3	OUTPUT 4			
2	OUTPUT 3			
1	OUTPUT 2			
0 (LSB)	OUTPUT 1			

Table 4-2 : Output Data Register (IP Base Address + 0x00)

After power up or reset all 16 digital outputs are inactive and the output value is set to 0V independent of used external supply voltage (VBB).

4.1.2 Watchdog Control Register (IP Base Address + 0x02)

The output watchdog is controlled by the Watchdog Control Register WDGCSR. Bit 0 of this register is a write only bit. When it is set to the logic level '1' the watchdog is enabled.

Bit Number	Bit Symbol	Access	Description	Reset Value
15 (MSB)	reserved			
14	reserved			
13	reserved			
12	reserved			
11	reserved			
10	reserved			
9	reserved			
8	reserved			
7	reserved			
6	reserved			
5	reserved			
4	reserved			
3	reserved			
2	reserved			
1	reserved			
0 (LSB)	WD enable	W	0 : disable watchdog 1 : enable watchdog	0

Table 4-3 : Watchdog Control Register (IP Base Address + 0x02)

The watchdog is disabled after power up or reset.

5 Functional Description

5.1 Digital Outputs

The TIP710 has 16 digital outputs. The standard signal level for these outputs is 24V DC.

A maximum voltage of 48V DC and a minimum voltage of 6V DC are possible. Only one external power supply is possible for all 16 digital Outputs.

5.1.1 Optical Isolation

All digital outputs are galvanic isolated by optocouplers to the computer system.

5.1.2 Overload Protection

The output drivers are implemented by Smart Power switches BSP752T. The maximum continuous output current is 1A per channel. The output circuits are protected against short circuit, thermal overload and overvoltage. In case of such a failure the corresponding output will be disabled until the error condition is removed. Then the output returns automatically to normal operation.

Please check the maximum current of the used CPU board, IP carrier and the connection cable. Some standard cables (AWG28 50 pol.) are limited to 0.75 A per lead.

5.1.3 Output Watchdog

The TIP710 includes an output watchdog which can be enabled under software control. When the watchdog is active, a mono stabile flip-flop is retriggered with each write accesses to the Output Data Register. If there is no write access within approximately 120msec the watchdog sets all outputs in inactive state.

The watchdog is disabled after power up or reset.

6 Installation

6.1 Output Wiring

The outputs are optically isolated from the logic circuit. One supply voltage VBB and one GND is used for all output channels.

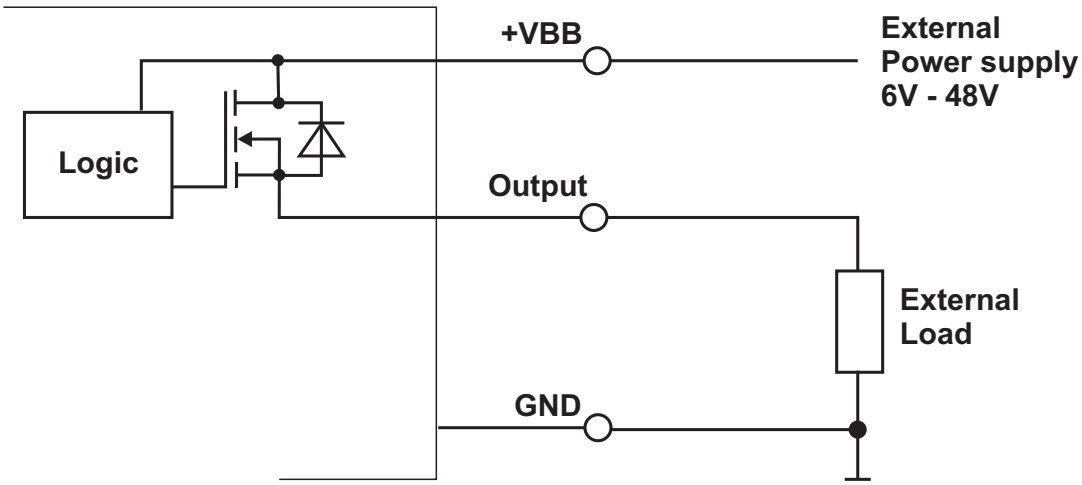


Figure 6-1 : Output Wiring of one Channel

If maximum output current of 1A is to be used than all VBB power supply pins of the TIP710 must be used.

7 I/O Pin Assignment

I/O Pin Number	Function	Signal Name
1	Output Channel 1	OUT 1
2	external Power supply 6V – 48V	VBB
3	Output Channel 2	OUT 2
4	external Power supply 6V – 48V	VBB
5	Output Channel 3	OUT 3
6	external Power supply 6V – 48V	VBB
7	Output Channel 4	OUT 4
8	external Power supply 6V – 48V	VBB
9	Output Channel 5	OUT 5
10	external Power supply 6V – 48V	VBB
11	Output Channel 6	OUT 6
12	external Power supply 6V – 48V	VBB
13	Output Channel 7	OUT 7
14	external Power supply 6V – 48V	VBB
15	Output Channel 8	OUT 8
16	external Power supply 6V – 48V	VBB
17	Output Channel 9	OUT 9
18	external Power supply 6V – 48V	VBB
19	Output Channel 10	OUT 10
20	external Power supply 6V – 48V	VBB
21	Output Channel 11	OUT 11
22	external Power supply 6V – 48V	VBB
23	Output Channel 12	OUT 12
24	external Power supply 6V – 48V	VBB
25	Output Channel 13	OUT 13
26	external Power supply 6V – 48V	VBB
27	Output Channel 14	OUT 14
28	external Power supply 6V – 48V	VBB
29	Output Channel 15	OUT 15
30	external Power supply 6V – 48V	VBB
31	Output Channel 16	OUT 16
32	external Power supply 6V – 48V	VBB
33	n.c.	
34	n.c.	
35	n.c.	
36	n.c.	

I/O Pin Number	Function	Signal Name
37	n.c.	
38	n.c.	
39	n.c.	
40	n.c.	
41	n.c.	
42	n.c.	
43	Power Supply Ground	GND
44	Power Supply Ground	GND
45	Power Supply Ground	GND
46	Power Supply Ground	GND
47	Power Supply Ground	GND
48	Power Supply Ground	GND
49	Power Supply Ground	GND
50	Power Supply Ground	GND

Table 7-1 : I/O Pin Assignment

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