Features and Benefits

- Small package (SOIC20)
- Short-circuit protection
- Diagnostic features
- Current limitation
- Low-power consumption
- Over-temperature protection
- Direct micro controller compatible
- Integrated free wheel diodes

Applications

- Automotive climate Control
- Dashboard
- Industrial Actuator control

Ordering Information

Part No.	Temperature Suffix	Package	Temperature Range
MLX10410CA	N/A	SOIC-20	-40C to 85C Automotive

Functional Diagram

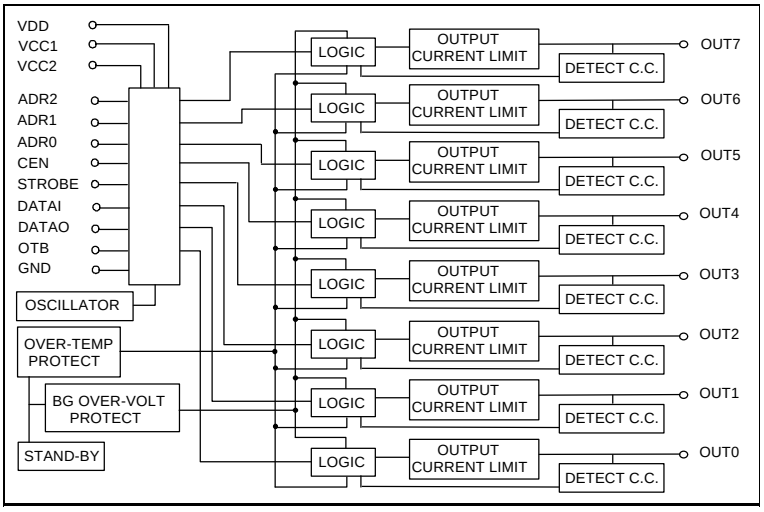

Figure 1

Description

The 10410 is a high-side driver for automotive applications. It can drive small lamps, relays, coils etc. The output current can be up to 250mA per driver (current limit at minimum 250mA).

The IC will only react to commands on the bus if the CEN (chip enable) signal is high. The CEN signal has nothing to do with the power down mode, the IC will react to the micro controller commands if CEN is high.

In order to switch a particular output, it is necessary to apply its address on the 3 bit bus and the data on the input DATAI. A high level on STROBE will latch the data and switch the output. When the IC is in active mode and CEN is high, the logic level of the addressed output will be available on the pin DATAO.

When all 8 outputs are inactive (latched value is low) the circuit automatically switches to power down mode.

Diagnostic mode: when the DATAI is low and the STROBE is high, a 50K pull up to VCC is switched on, on the corresponding output channel (addressed by ADR2, ADR1, ADR0) to see whether there is a load connected. The logic level of the output can be observed on the pin DATAO. In this way, it is possible to scan all the outputs for an open circuit.

When the IC is in active mode, then there is an over-temperature sensor that monitors the temperature of the IC. If the die temperature goes above 165°C, all outputs are switched off and the output OTB will go low. As soon as the temperature decreases below 125°C all outputs are switched back to their previous state.

The outputs are short-circuit proof against GND and VCC. When an output is shorted to GND, the current is limited and, after a delay of typically 20ms, the output is switched off and the output OTB goes low. A delay is used to guarantee that the output does not detect a short circuit when a normal lamp is driven. The latched value of the ouput is set to 0. A rising edge on CEN will set OTB back to 1. When an output is shorted to a supply larger than VCC+100mV, the output driver bulk is immediately disconnect from VCC, and after a delay of typically 20ms, the output is switched off and the output OTB goes low. The latched value of the ouput is set to 0. A rising edge on CEN will set OTB back to 1

There is an over-voltage shut off that switches all the outputs off when the VCC voltage is above 18V for at least 1ms. When an over-voltage occurs, CEN being low, DATAO pin will go low. The outputs will come on again as soon as the voltage decreases below 18V. The status of all 8 outputs stays latched.
Every output stage is protected with a free wheel diode both to ground and to VCC.

Table 1

Active mode					
CEN	**STROBE**	**DATA I**	**Description**	**DATA O**	**OTB**
0	0	0	Chip Disabled	0 Over-voltage 1 No Over-voltage	0 Over-temperature OR Short-circuit to GND
0	0	1			
0	1	0			
0	1	1			
1	0	0	No Command	Addressed output logic level	
1	0	1	No Command		
1	1	0	Addressed output turned OFF (Diagnostic mode)	0 Load 1 No Load	1 No Over-temperature
1	1	1	Addressed output turned ON	Addressed output logic level (always 1)	

ABSOLUTE MAXIMUM RATINGS

VCC	-0.3 to 40V
VDD	-0.3 to 5.5V
Maximum Output Voltage	-0.3V to VCC+0.3V
Maximum Output Current	±550mA
Maximum Free-Wheel Diodes Current	±250mA
Die Temperature	+170°C
Thermal Resistance Package	85°K/W
Storage Temperature	-55 °C to 125°C
ESD Protection all pins (human body model)	2KV

DYNAMIC CHARACTERISTICS

Characteristics	Description	Limits			
		Min	Typ	Max	Units
t_{sw}	STROBE pulse width	1.0			us
t_{sds}	DATAI to STROBE setup time	0.1			us
t_{hds}	DATAI to STROBE hold time	0.1			us
t_{scs}	CEN to STROBE setup time	0.1			us
t_{shs}	CEN to STROBE hold time	0.1			us
t_{dso}	STROBE to OUTPUT delay (R_{on} reached 20% of nominal value)			10	us
t_{dov}	Delay between Over voltage detection and outputs switched off	0.5	1.0	2.0	ms
t_{dso}	Delay between short circuit detection and output switched off	12	20	40	ms
t_{rov}	Recovery time from an over voltage detection			10	us

Electrical Characteristics

Following characteristics are valid over the temperature range from –40°C to +85°C unless otherwise specified.

Characteristics	Test Conditions	Limits			
		Min	Typ	Max	Units
Supply voltage VDD		4.5	5.0	5.5	V
Supply voltage VCC		4.5		25	V
Supply current Iccs	all outputs switched off			200	µA
Supply current Icca	all outputs on and no load			1000	µA
Supply current Icci	VCC=12V, one output on and no load			200	µA
Supply current Iccm	VCC=12V, one output on, no load, per supplementary output on			25	µA
Supply current Idds	all outputs switched off			100	µA
Supply current Idda	all outputs on and no load			500	µA
Supply current Iddi	one output on and no load			150	µA
Input threshold ADR2, ADR1, ADR0, DATAI, STROBE, CEN		0.25*VDD		0.75*VDD	V
Input hysteresis ADR2, ADR1, ADR0, DATAI, STROBE, CEN			0.1*VDD		V
Input current ADR2, ADR1, ADR0, DATAI, STROBE, CEN	VDD = 5 V and 0<Vin<VDD	-1.0	0.0	1.0	µA
Vol DATAO, OTB	Iout=1mA			0.5	V
Voh DATAO	Iout=1mA	VDD-0.5			V
Iohl OTB	Vout=5V	-1.0		1.0	µA
Input threshold OUT7-0	diagnostic mode	0.2*VDD		0.3*VDD	V
Pull up resistor	diagnostic mode	25	50	100	KΩ
Output resistance Ron(OUT7-0)	active mode Iout=200mA, VCC=12V		2.5	4.0	Ω
Output current limitation Ilim(OUT7-0)	VCC=12V and Vout=0V	250		500	mA
Output short circuit threshold (OUT7-0)		2/3VCC -0.5	2/3VCC	2/3VCC +0.5	V
Over voltage Shut-Off threshold	VCC	18.0	21.0	24	V
Over voltage Shut-Off Hysteresis	VCC		1.0		V
Over temperature Shut-Off	Tj	150	165	180	°C

Name	Function
VCC1, VCC2	power inputs, both inputs need to be connected.
GND	circuit ground
VDD	5V logic supply
OUT7,	OUT0 power outputs
DATAI	data input
STROBE	data is latched on the high level of strobe
ADR2, ADR1, ADR0	address for output selection
DATAO	data output
OTB	open drain output that indicates that the IC is in over temperature protection
CEN	chip enable signal (in a system with only one IC, it is possible to connect this signal directly to VDD).

Pin Assignment	
Pin 1: VDD	Pin 20: CEN
Pin 2: OTB	Pin 19: DATAO
Pin 3: GND	Pin 18: OUT7
Pin 4: OUT0	Pin 17: OUT6
Pin 5: OUT1	Pin 16: VCC
Pin 6: VCC	Pin 15: OUT5
Pin 7: OUT2	Pin 14: OUT4
Pin 8: OUT3	Pin 13:STROBE
Pin 9:ADR2	Pin 12:DATAI
Pin 10:ADR1	Pin 11: ADR0

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Go to our website at:
www.melexis.com
Or for additional information
contact Melexis Direct:

USA
Melexis Inc.
41 Locke Road, Concord, NH 03301
Phone: +1 603 223 2362 Fax: +1 603 223 9614
E-mail: sales_usa@melexis.com

United Kingdom
Silicon Concepts
PCB Lynchborough Road, Hampshire GU30 7SB, United Kingdom
Phone: +44 1428 751 617 Fax: +44 1428 751 603
E-mail: sales_uk@melexis.com

Germany
Am Seestern 8, 40547 Düsseldorf, Germany
Phone: +49 211 5360212 Fax: +49 211 5360250
E-mail: sales_de@melexis.com

France
Melexis France
Tour Arago, 5 rue Bellini, 92806 Puteaux-La-Défense, France.
Phone: +33 1 47 78 11 34 Fax: +33 1 47 78 06 35
E-mail: sales_france@melexis.com

Italy
Dimacred IRL
Via Papa Giovanni XXIII no. 25, 20046 Biassono, Italy
Phone: +39 039 249 4856 Fax: +39 039 491773
E-mail: sales_italy@melexis.com

Japan
Satori Electric Co., LTD
1-14-10 Shiba, Minato-Ku, Tokyo, Japan
Phone: +81 3 3452 7171 Fax: +81 3 3769 2197
E-mail: sales_japan@melexis.com

Taiwan
Beechwood Int'l Taiwan Co.
Room 8, 17F, No. 189, Taipei, Taiwan
Phone: +886 2 2739 3322 Fax: +886 2 2739 3090
E-mail: sales_taiwan@melexis.com