

ISOFACE™

ISO1H811G

Galvanic Isolated 8 Channel High-Side Switch

# Datasheet

Revision 2.3, 2013-01-31

Power Management & Multimarket

Edition 2013-01-31

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Revision History							
Page or Item	Subjects (major changes since previous revision)						
Revision 2.3, 2	013-01-31						
Page 12	Page 12 table 4.1 Extended operating temperature added						
Revision 2.2							
Page 13	Page 13 table 4.3 updated						
Page 16	Page 16 table 4.8 updated						
Revision 2.1							
all	Data for parallel channels and UL approval added						
Revision 2.0							
all	Final Datasheet						

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# ISOFACETM ISO1H811G

# Coreless Transformer Isolated Digital Output 8 Channel 0.625 A High-Side Switch

## **Product Highlights**

- Coreless transformer isolated data interface
- Galvanic isolation
- 8 High-side output switches 0.625A
- μC compatible 8-bit parallel peripheral

#### **Features**

- Interface 3.3/5V CMOS operation compatible
- Parallel interface
- Direct control mode
- High common mode transient immunity
- Short circuit protection
- · Maximum current internally limited
- Overload protection
- Overvoltage protection (including load dump)
- Undervoltage shutdown with autorestart and hysteresis
- Switching inductive loads
- · Common output disable pin
- Thermal shutdown with restart
- Thermal independence of separate channels
- Common diagnostic output for overtemperature
- ESD protection
- Loss of GNDbb and loss of V<sub>bb</sub> protection
- Reverse Output Voltage protection
- Isolated return path for DIAG signal
- UL508 compliant
- · RoHS compliant

# Typical Application

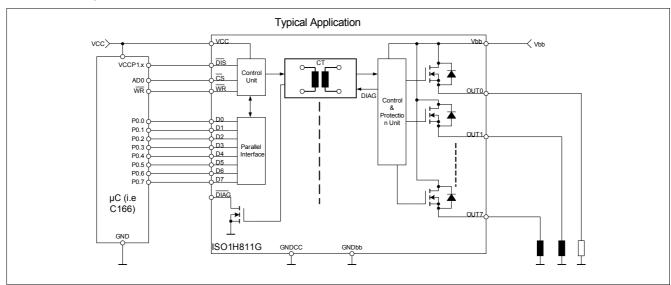
- Isolated switch for industrial applications (PLC)
- All types of resistive, inductive and capacitive loads
- µC compatible power switch for 24V DC applications
- · Driver for solenoid, relays and resistive loads

### Description

The ISO1H811G is a galvanically isolated 8 bit data interface in PG-DSO-36 package that provides 8 fully protected high-side power switches that are able to handle currents up to 625 mA.

An 8 bit parallel  $\mu C$  compatible interface allows to connect the IC directly to a  $\mu C$  system. The input interface supports also a direct control mode and is designed to operate with 3.3/5V CMOS compatible levels.

The data transfer from input to output side is realized by the integrated Coreless Transformer Technology.



Туре	On-state Resistance	Package
ISO1H811G	200mΩ	PG-DSO36



### Pin Configuration and Functionality

# 1 Pin Configuration and Functionality

# 1.1 Pin Configuration

Pin	Symbol	Function
1	N.C.	Not connected
2	VCC	Positive 3.3/5V logic supply
3	DIS	Output disable
4	CS	Chip select
5	WR	Parallel write
6	D0	Data input bit0
7	D1	Data input bit1
8	D2	Data input bit2
9	D3	Data input bit3
10	D4	Data input bit4
11	D5	Data input bit5
12	D6	Data input bit6
13	D7	Data input bit7
14	DIAG	Common diagnostic output for overtemperature
15	GNDCC	Input logic ground
16	N.C.	Not connected
17	N.C.	Not connected
18	N.C.	Not connected
19	GNDbb	Output driver ground
20	N.C	Not connected
21	OUT7	High-side output of channel 7
22	OUT7	High-side output of channel 7
23	OUT6	High-side output of channel 6
24	OUT6	High-side output of channel 6
25	OUT5	High-side output of channel 5
26	OUT5	High-side output of channel 5
27	OUT4	High-side output of channel 4
28	OUT4	High-side output of channel 4
29	OUT3	High-side output of channel 3
30	OUT3	High-side output of channel 3
31	OUT2	High-side output of channel 2
32	OUT2	High-side output of channel 2
33	OUT1	High-side output of channel 1
34	OUT1	High-side output of channel 1
35	OUT0	High-side output of channel 0
36	OUT0	High-side output of channel 0
TAB	Vbb	Positive driver power supply voltage

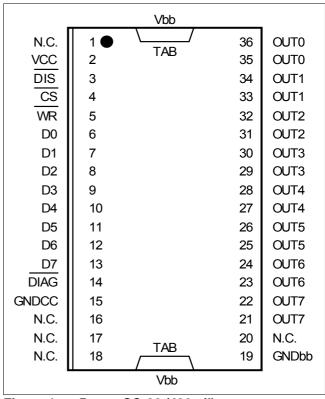


Figure 1 Power SO-36 (430mil)

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#### Pin Configuration and Functionality

## 1.2 Pin Functionality

#### VCC (Positive 3.3/5V logic supply)

The VCC supplies the input interface that is galvanically isolated from the output driver stage. The input interface can be supplied with 3.3/5V.

#### DIS (Output disable)

The high-side outputs OUT0...OUT7 can be immediately switched off by means of the low active pin  $\overline{\text{DIS}}$  that is an asynchronous signal. The input registers are also reset by the  $\overline{\text{DIS}}$  signal. The Output remains switched off after low-high transition of  $\overline{\text{DIS}}$  signal, till new information is written into the input register. Current Sink to GNDCC.

#### CS (Chip select)

The system microcontroller selects the ISO1H811G by means of the low active pin  $\overline{CS}$  to activate the parallel interface. By connecting the  $\overline{CS}$  pin and  $\overline{WR}$  pin to ground the parallel direct control is activated. Current Source to VCC.

#### WR (Parallel write)

In parallel mode data at the input pins (D0  $\dots$  D7) are latched by means of the rising edge of the low active signal  $\overline{WR}$  (write). Current Source to VCC.

#### D0 ... D7 (Data input bit0 ... bit7)

The present data can be latched on the rising edge of the write signal  $\overline{WR}$ . D0 ... D7 control the corresponding output channels OUT0 ...OUT7. By connecting CS and  $\overline{WR}$  to ground, the signals at D0 ... D7 directly control the outputs. Current Sink to GNDCC.

# DIAG (Common diagnostic output for overtemperature)

The low active  $\overline{\text{DIAG}}$  signal contains the OR-wired information of the separated overtemperature detection units for each channel. The output pin  $\overline{\text{DIAG}}$  provides an open drain functionality. A current source is also connected to the pin  $\overline{\text{DIAG}}$ . In normal operation the signal  $\overline{\text{DIAG}}$  is high. When overtemperature or Vbb below ON-Limit is detected the signal  $\overline{\text{DIAG}}$  changes to low.

#### **GNDCC (Ground for VCC domain)**

This pin acts as the ground reference for the input interface that is supplied by VCC.

#### **GNDbb** (Output driver ground domain)

This pin acts as the ground reference for the output

driver that is supplied by Vbb.

#### OUT0 ... OUT7 (High side output channel 0 ... 7)

The output high side channels are internally connected to Vbb and controlled by the corresponding data input pins D0 ... D7 in parallel mode.

#### TAB (Vbb, Positive supply for output driver)

The heatslug is connected to the positive supply port of the output interface.



**Blockdiagram** 

Blockdiagram 2

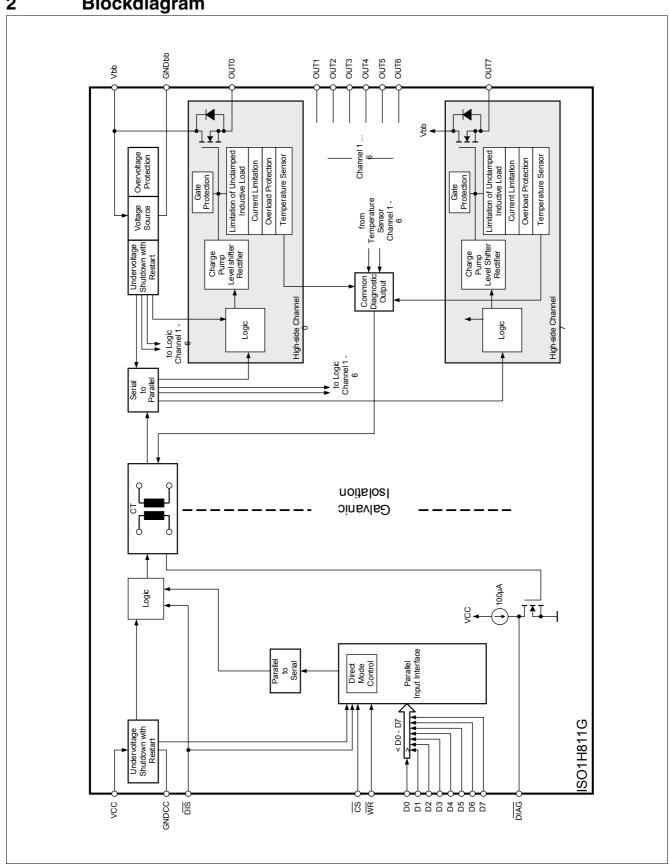


Figure 2 **Blockdiagram** 



## 3 Functional Description

#### 3.1 Introduction

The ISOFACE ISO1H811G includes 8 high-side power switches that are controlled by means of the integrated parallel interface. The interface is 8bit µC compatible. Furthermore a direct control mode can be selected that allows the direct control of the outputs OUT0...OUT7 by means of the inputs D0...D7 without any additional logic signal. The IC can replace 8 optocouplers and the 8 high-side switches in conventional I/O-Applications as a galvanic isolation is implemented by means of the integrated coreless transformer technology. The µC compatible interfaces allow a direct connection to the ports of a microcontroller without the need for other components. Each of the 8 high-side power switches is protected against short to Vbb, overload, overtemperature and against overvoltage by an active zener clamp.

The diagnostic logic on the power chip recognizes the overtemperature information of each power transistor. The information is send via the internal coreless transformer to the pin  $\overline{\text{DIAG}}$  at the input interface.

#### 3.2 Power Supply

The IC contains 2 galvanic isolated voltage domains that are independent from each other. The input interface is supplied at VCC and the output stage is supplied at Vbb. The different voltage domains can be switched on at different time. The output stage is only enabled once the input stage enters a stable state.

#### 3.3 Output Stage

Each channel contains a high-side vertical power FET that is protected by embedded protection functions.

The continous current for each channel is 625mA (all channels ON).

### 3.3.1 Output Stage Control

Each output is independently controlled by an output latch and a common reset line via the pin  $\overline{\text{DIS}}$  that disables all eight outputs and reset the latches. The parallel input data is transferred to the input latches with a high-to-low transition of the signal  $\overline{\text{WR}}$  (write) while the  $\overline{\text{CS}}$  is logic low. A low-to-high transition of  $\overline{\text{CS}}$  transfers then the data of the input latches to the output buffer.

# 3.3.2 Power Transistor Overvoltage Protection

Each of the eight output stages has it own zener clamp that causes a voltage limitation at the power transistor when solenoid loads are switched off.  $V_{ON}$  is then clamped to 47V (min.).

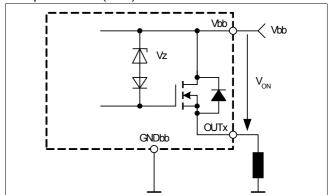


Figure 3 Inductive and overvoltage output clamp (each channel)

Energy is stored in the load inductance during an inductive load switch-off.

$$E_{L} = 1/2 \times L \times I_{L}^{2}$$

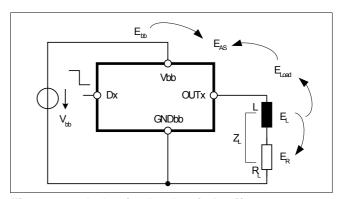


Figure 4 Inductive load switch-off energy dissipation (each channel)

While demagnetizing the load inductance, the energy dissipation in the DMOS is

$$E_{AS} = E_{bb} + E_L - E_R = V_{ON(CL)} \times i_L(t)dt$$
  
with an approximate solution for  $R_L > 0\Omega$ :

$$\mathbf{E}_{\mathrm{AS}} = \frac{\mathbf{I}_{\mathrm{L}} \times \mathbf{L}}{2 \times \mathbf{R}_{\mathrm{L}}} \times (\mathbf{V}_{\mathrm{bb}} + \left| \mathbf{V}_{\mathrm{ON(CL)}} \right|) \times \ln \left( 1 + \frac{\mathbf{I}_{\mathrm{L}} \times \mathbf{R}_{\mathrm{L}}}{\left| \mathbf{V}_{\mathrm{ON(CL)}} \right|} \right)$$



# 3.3.3 Power Transistor Overcurrent Protection

The outputs are provided with a current limitation that enters a repetitive switched mode after an initial peak current has been exceeded. The initial peak short circuit current limit is set to  $I_{L(SCp)}.$  During the repetitive mode short circuit current the limit is set to  $I_{L(SCr)}.$  If this operation leads to an overtemperature condition, a second protection level ( $T_{\rm j} > 135^{\circ} C)$  will change the output into a low duty cycle PWM (selective thermal shutdown with restart) to prevent critical chip temperatures.

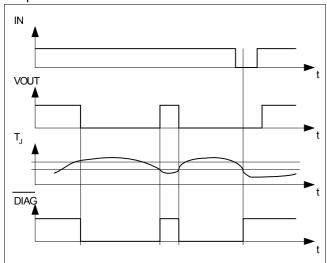


Figure 5 Overtemperature detection

The following figures show the timing for a turn on into short circuit and a short circuit in on-state. Heating up of the chip may require several milliseconds, depending on external conditions.

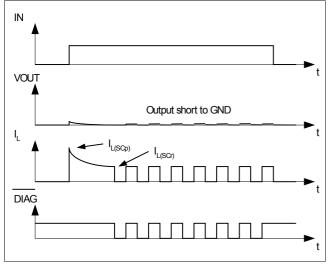


Figure 6 Turn on into short circuit, shut down by overtemperature, restart by cooling

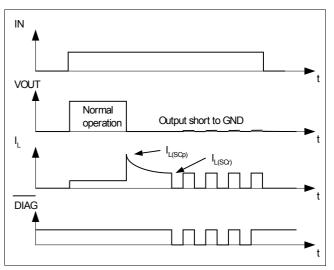


Figure 7 Short circuit in on-state, shut down down by overtemperature, restart by cooling

### 3.4 Common Diagnostic Output

The overtemperature detection information are ORwired in the common diagnostic output block. The information is send via the integrated coreless transformer to the input interface. The output stage at pin DIAG has an open drain functionality combined with a current source.

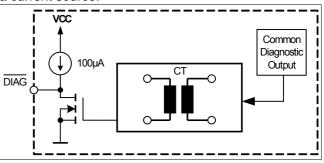


Figure 8 Common diagnostic output



#### 3.5 Parallel Interface

The ISO1H811G contains a parallel interface that can be directly controlled by the microcontroller output ports. The parallel interface can also be switched over to a direct control that allows direct changes of the outputs OUT0 ... OUT7 by means of the corresponding inputs D0 ... D7 without additional logic signals. To activate the parallel direct control mode pin  $\overline{\text{CS}}$  and pin  $\overline{\text{WR}}$  have to be connected both to ground.

# 3.5.1 Parallel Interface Signal Description

 $\overline{\text{CS}}$  - Chip select. The system microcontroller selects the ISO1H811G by means of the  $\overline{\text{CS}}$  pin. Whenever the pin is in a logic low state, data can be transferred from the  $\mu\text{C}$ .

**CS** High to low transition:

Parallel input data can be written in from then on

**CS** Low to high transition:

 The data in the input latches is transferred to the output buffer

 $\overline{\text{WR}}$  - Write. The system controller enables the write procedure in the ISO1H811G by means of the signal  $\overline{\text{WR}}$ . A logic low state signal at pin  $\overline{\text{WR}}$  writes the input data into the input latches when the  $\overline{\text{CS}}$  pin is in a logic low state.

WR Logic low level:

 Parallel input data at the pins D0 - D7 is written into the input latches

WR Logic high level:

 The parallel input data is latched in the input latches. Any changes at the pins D0 - D7 after the low-to-high transition of WR do not affect the input latches.

**D0** ... **D7** - Parallel input. Parallel data bits are fed into the pins D0 ... D7. The data is written into the input latches when  $\overline{WR}$  is logic low.

#### 3.5.2 uC Control Mode

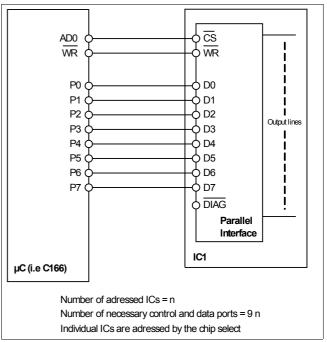


Figure 9 Parallel bus configuration

#### 3.5.3 Direct Control Mode

Beside the use of the parallel  $\mu C$  compatible interface a parallel direct control mode can be choosen. In this mode the output OUT0...OUT7 can be directly controlled via the inputs D0...D7 without the need for additional logic signals. To activate this mode pin  $\overline{CS}$  and  $\overline{WR}$  need to be connected to ground.

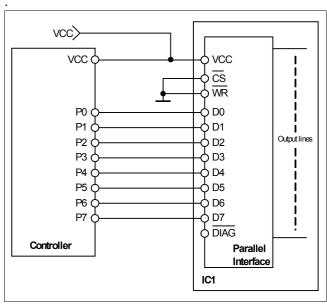


Figure 10 Parallel Direct Control



# 3.6 Parallel Interface Timing

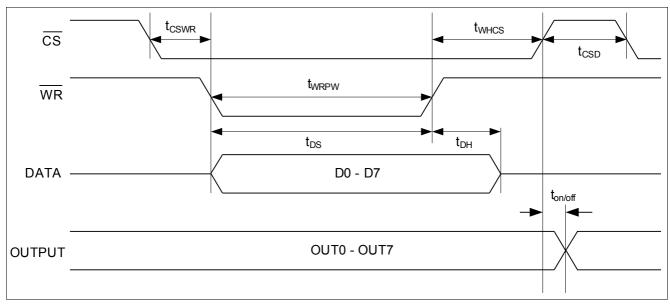


Figure 11 Parallel input - output timing diagram

#### 3.7 Transmission Failure Detection

There is a failure detection unit integrated to ensure also a stable functionality during the integrated coreless transformer transmission. This unit decides wether the transmitted data is valid or not. If four times serial data coming in from the internal registers is not accepted, the output stages are switched off until the next valid data is received. (see also table 4.3)



#### 4 Electrical Characteristics

Note: All voltages at pins 2 to 14 are measured with respect to ground GNDCC (pin 15). All voltages at pin 20 to pin 36 and TAB are measured with respect to ground GNDbb (pin 19). The voltage levels are valid if other ratings are not violated. The two voltage domains  $V_{CC}$  and  $V_{bb}$  are internally galvanic isolated.

#### 4.1 Absolute Maximum Ratings

Note: Absolute maximum ratings are defined as ratings, which when being exceeded may lead to destruction of the integrated circuit. For the same reason make sure, that any capacitor that will be connected to pin 2 (VCC) and TAB (Vbb) is discharged before assembling the application circuit. Supply voltages higher than V<sub>bb(AZ)</sub> require an external current limit for the GNDbb pin, e.g. with a 15Ω resistor in GNDbb connection. Operating at absolute maximum ratings can lead to a reduced lifetime.

Parameter	Symbol	Limit	Unit	
at $T_j = -40 \dots 135^{\circ}C$ , unless otherwise specified		min.	max.	
Supply voltage input interface (VCC)	V <sub>CC</sub>	-0.5	6.5	V
Supply voltage output interface (Vbb)	$V_{bb}$	-1 <sup>1)</sup>	45	
Continuos voltage at data inputs (D0 D7)	$V_{Dx}$	-0.5	6.5	
Continuos voltage at pin CS	V <sub>CS</sub>	-0.5	6.5	
Continuos voltage at pin WR	$V_{WR}$	-0.5	6.5	
Continuos voltage at pin DIS	$V_{DIS}$	-0.5	6.5	
Continuos voltage at pin DIAG	$V_{DIAG}$	-0.5	6.5	
Load current (short-circuit current)	IL		self limited	Α
Reverse current through GNDbb <sup>1)</sup>	I <sub>GNDbb</sub>	-1.6	_	
Operating Temperature	T <sub>j</sub>	-25	internal limited	°C
Extended Operation Temperature <sup>2)</sup>	T <sub>j</sub>	-40	internal limited	
Storage Temperature	T <sub>stg</sub>	-50	150	
Power Dissipation <sup>3)</sup>	P <sub>tot</sub>		3.3	W
Inductive load switch-off energy dissipation <sup>4)</sup> single	E <sub>AS</sub>	_	_	J
pulse, $T_j = 125^{\circ}C$ , $I_L = 0.625A$		_	-	
one channel active			10 1	
all channel simultaneously active (each channel)			I	.,
Load dump protection <sup>3)</sup> V <sub>loadDump</sub> <sup>5)</sup> =V <sub>A</sub> + V <sub>S</sub> V <sub>IN</sub> = low or high	$V_{Loaddump}$	_	_	V
$V_{IN} = 1000 \text{ of flight}$ $t_{rl} = 400 \text{ms}, R_{l} = 2\Omega, R_{l} = 27\Omega, V_{A} = 13.5 \text{V}$		_	90	
$t_d = 350 \text{ms}, R_1 = 2\Omega, R_L = 57\Omega, V_A = 27V$			117	
Electrostatic discharge voltage (Human Body Model)	V <sub>ESD</sub>	_		kV
according to JESD22-A114-B	200		2	
Electrostatic discharge voltage (Charge Device Model)	$V_{ESD}$	_		kV
according to ESD STM5.3.1 - 1999			1	
Continuos reverse drain current <sup>1)3)</sup> , each channel	$I_S$	<del></del>	4	Α

<sup>1)</sup> defined by P<sub>tot</sub>

<sup>2)</sup> not subject to production test, slight deviation of electrical parameters possible.

<sup>3)</sup> Device on 50mm\*50mm\*1.5mm epoxy PCB FR4 with 6cm² (one layer, 70µm thick) copper area for drain connection. PCB is vertical without blown air.

<sup>4)</sup> not subject to production test, specified by design

<sup>5)</sup>  $V_{Loaddump}$  is setup without the DUT connected to the generator per ISO7637-1 and DIN40839



## 4.2 Thermal Characteristics

Parameter	Symbol	Limit Values			Unit	<b>Test Condition</b>
at $T_j$ = -25 125°C, $V_{bb}$ =1530V, $V_{CC}$ =3.05.5V, unless otherwise specified		min.	typ.	max.		
Thermal resistance junction - case	$R_{thJC}$	_	_	1.5		
Thermal resistance @ min. footprint	R <sub>th(JA)</sub>	_		50	K/W	
Thermal resistance @ 6cm² cooling area <sup>1)</sup>	R <sub>th(JA)</sub>	_		38		

<sup>1)</sup> Device on 50mm\*50mm\*1.5mm epoxy PCB FR4 with 6cm² (one layer, 70μm thick) copper area for drain connection. PCB is vertical without blown air.

## 4.3 Load Switching Capabilities and Characteristics

Parameter	Symbol	Li	Limit Values			<b>Test Condition</b>
at $T_j$ = -25 125°C, $V_{bb}$ =1530V, $V_{CC}$ =3.05.5V, unless otherwise specified		min.	typ.	max.		
On-state resistance, $I_L = 0.5A$ , each channel $T_j = 25^{\circ}C$ $T_j = 125^{\circ}C$ two parallel channels, $T_j = 25^{\circ}C:^{1)}$ four parallel channels, $T_j = 25^{\circ}C:^{1)}$	R <sub>ON</sub>	_	150 270 75 38	200 320 100 50	mΩ	
Nominal load current Device on PCB 38K/W, $T_a = 85^{\circ}C$ , $T_j < 125^{\circ}C$ one channel: <sup>1)</sup> two parallel channels: <sup>1)</sup> four parallel channels: <sup>1)</sup>	I <sub>L(NOM)</sub>		0.7 1.1 2.2		A	
Turn-on time to 90% $V_{OUT}^{2)}$ $R_L = 47\Omega$ , $V_{Dx} = 0$ to 5V	t <sub>on</sub>	_	64	120		
Turn-off time to 10% $V_{OUT}^{2)}$ $R_L = 47\Omega$ , $V_{Dx} = 5$ to 0V	t <sub>off</sub>		89	170	– µs	
Slew rate on 10 to 30% $V_{OUT}$ $R_L = 47\Omega$ , $V_{bb} = 15V$	dV/dt <sub>on</sub>		1	2	V/	
Slew rate off 70 to 40% $V_{OUT}$ $R_L = 47\Omega$ , $V_{bb} = 15V$	-dV/dt <sub>off</sub>		1	2	V/µs	
Internal data transmission period	t <sub>idt</sub>			17,8	μs	1)
Failure shutdowm time	t <sub>fs</sub>			64	μs	1)

<sup>1)</sup> not subject to production test, specified by design

<sup>2)</sup> The turn-on and turn-off time includes the switching time of the high-side switch and the transmission time via the coreless transformer in normal operating mode. During a failure on the coreless transformer transmission turn-on or turn-off time can increase by up to 50µs.



# 4.4 Operating Parameters

Parameter at $T_j = -25 \dots 125^{\circ}\text{C}$ , $V_{bb} = 15 \dots 30 \text{V}$ , $V_{CC} = 3.0 \dots 5.5 \text{V}$ , unless otherwise specified		Symbol	mit Valu	es	Unit	<b>Test Condition</b>	
			min.	typ.	max.		
Common mode trans	ient immunity <sup>1)</sup>	$\Delta V_{ISO}/dt$	-25	-	25	kV/μs	$\Delta V_{ISO} = 200V$
Magnetic field immur	nity <sup>1)</sup>	H <sub>IM</sub>	100			A/m	IEC61000-4-8
Voltage domain V <sub>bb</sub>	Operating voltage	$V_{bb}$	11		35	V	
(Output interface)	Undervoltage shutdown	V <sub>bb(under)</sub>	7	_	10.5		
	Undervoltage restart	$V_{bb(u\_rst)}$	_	_	11		
	Undervoltage hysteresis	$\Delta V_{bb(under)}$		0.5	_		
	Undervoltage current	I <sub>bb(uvlo)</sub>		1	2.5	mA	$V_{bb} < 7V$
	Operating current	I <sub>GNDL</sub>		10	14	mA	All Channels ON - no load
	Leakage output current (included in I <sub>bb(off)</sub> ) V <sub>Dx</sub> = low, each channel	I <sub>L(off)</sub>	_	5	30	μΑ	
Voltage domain V <sub>CC</sub>	Operating voltage	V <sub>CC</sub>	3.0	_	5.5	٧	
(Input interface)	Undervoltage shutdown	V <sub>CC(under)</sub>	2.5		2.9		
	Undervoltage restart	V <sub>CC(u_rst)</sub>			3		
	Undervoltage hysteresis	$\Delta V_{CC(under)}$		0.1			
	Undervoltage current	I <sub>CC(uvlo)</sub>		1	2	mA	V <sub>cc</sub> < 2.5V
	Operating current	I <sub>CC(on)</sub>		4.5	6	mA	

<sup>1)</sup> not subject to production test



# 4.5 Output Protection Functions

Parameter <sup>1)</sup>	Symbol	Liı	mit Valu	es	Unit	<b>Test Condition</b>
at $T_j$ = -25 125°C, $V_{bb}$ =1530V, $V_{CC}$ =3.05.5V, unless otherwise specified		min.	typ.	max.		
Initial peak short circuit current limit, each channel: $T_j = -25$ °C, $V_{bb} = 30$ V, $t_m = 700\mu$ s	I <sub>L(SCp)</sub>			1.9	А	
$T_{j} = 25^{\circ}C$		0.7	1.4			
$T_j = 125^{\circ}C$		0.7				
two parallel channels: <sup>3)</sup> four parallel channels: <sup>3)</sup>		e current the curre				
Repetitive short circuit current limit					1	
$T_i = T_{it}$ (see timing diagrams)						
each channel:	I <sub>L(SCr)</sub>		1.1			
two parallel channels: <sup>3)</sup>			1.1			
four parallel channels: <sup>3)</sup>			1.1			
Output clamp (inductive load switch off) <sup>2)</sup>	V <sub>ON(CL)</sub>	47	53	60	٧	
at $V_{OUT} = V_{bb} - V_{ON(CL)}$						
Overvoltage protection	$V_{bb(AZ)}$	47				
Thermal overload trip temperature <sup>3)</sup>	T <sub>jt</sub>	135			°C	
Thermal hysteresis <sup>3)</sup>	$\Delta T_{jt}$		10		K	

<sup>1)</sup> Integrated protection functions are designed to prevent IC destruction under fault conditions described in the data sheet. Fault conditions are considered as "outside" normal operating range. Protection functions are not designed for continous repetitive operation.

- 2) If channels are connected in parallel, output clamp is usually accomplished by the channel with the lowest  $V_{\text{ON(CL)}}$
- 3) not subject to production test, specified by design

# 4.6 Diagnostic Characteristics at pin DIAG

Parameter	Symbol	Limit Values			Unit	<b>Test Condition</b>	
at $T_j$ = -25 125°C, $V_{bb}$ =1530V, $V_{CC}$ =3.05.5V, unless otherwise specified		min.	typ.	max.			
Common diagnostic sink current (overtemperature of any channel) $T_j = 135^{\circ}C$	I <sub>diagsink</sub>			5	mA	V <sub>diagon</sub> < 0.25xVCC	
Common diagnostic source current	I <sub>diagsource</sub>		100		μΑ		



# 4.7 Input Interface

Parameter	Symbol	Li	mit Valu	es	Unit	<b>Test Condition</b>
at T <sub>j</sub> = -25 125°C, $V_{bb}$ =1530V, $V_{CC}$ =3.05.5V, unless otherwise specified		min.	typ.	max.		
Input low state voltage (D0 D7, DIS, CS, WR)	V <sub>IL</sub>	-0.3		0.3 x V <sub>CC</sub>	V	
Input high state voltage (D0 D7, DIS, CS, WR)	V <sub>IH</sub>	0.7 x V <sub>CC</sub>	_	V <sub>CC</sub> + 0.3		
Input voltage hysteresis (D0 D7, DIS, CS, WR)	V <sub>IHys</sub>		100		mV	
Input pull down current (D0 D7, DIS)	I <sub>Idown</sub>		100		μΑ	
Input pull up current (CS, WR)	-I <sub>lup</sub>		100			
Output disable time (transition $\overline{DIS}$ to logic low) <sup>1)2)</sup> Normal operation Turn-off time to 10% $V_{OUT}$ $R_L = 47\Omega$	t <sub>DIS</sub>		85	170	μs	
Output disable time (transition $\overline{DIS}$ to logic low) <sup>1)2)3)</sup> Disturbed operation Turn-off time to 10% $V_{OUT}$ $R_L = 47\Omega$	t <sub>DIS</sub>			230		

- 1) The time includes the turn-on/off time of the high-side switch and the transmission time via the coreless transformer.
- 2) If Pin DIS is set to low the outputs are set to low; after DIS set to high a new write cycle is necessary to set the output again.
- 3) The parameter is not subject to production test verified by design/characterization

# 4.8 Parallel Interface Input Timing

Parameter	Symbol	Li	mit Valu	es	Unit	<b>Test Condition</b>
at $T_j = -25 \dots 125$ °C, $V_{bb} = 15 \dots 30$ V, $V_{CC} = 3.0 \dots 5.5$ V, unless otherwise specified		min.	typ.	max.		
WR pulse width	t <sub>WRPW</sub>	20			ns	
Data setup time before WR	t <sub>DS</sub>	20				
Data hold time after WR	t <sub>DH</sub>	10				
Chip select valid to WR	t <sub>CSWR</sub>	0				
WR logic high to CS logic high	t <sub>whcs</sub>	10				
Delay to next CS cycle	t <sub>CSD</sub>	17,8			μs	1)
Input to output data transmission jitter in direct mode	t <sub>IOJ</sub>	8		17,8		1)

<sup>1)</sup> not subject to production test, specified by design



# 4.9 Reverse Voltage

Parameter	Symbol	Limit Values			Unit	<b>Test Condition</b>
at $T_j$ = -25 125°C, $V_{bb}$ =1530V, $V_{CC}$ =3.05.5V, unless otherwise specified		min.	typ.	max.		
Reverse voltage <sup>1)2)</sup>	-V <sub>bb</sub>				٧	
$R_{GND} = 0 \Omega$				1		
$R_{GND} = 150 \Omega$				45		
Diode forward on voltage	-V <sub>ON</sub>					
$IF = 1.25A$ , $V_{Dx} = low$ , each channel				1.2		

<sup>1)</sup> defined by Ptot

## 4.10 Isolation and Safety-Related Specification

Parameter Measured from input terminals to output terminals, unless otherwise specified	Value	Unit	Conditions
Rated dielectric isolation voltage V <sub>ISO</sub>	500	V <sub>AC</sub>	1 - minute duration <sup>1)</sup>
Short term temporary overvoltage	1250	V	5s acc. DIN EN60664-1 1)
Minimum external air gap (clearance)	2.6	mm	shortest distance through air.
Minimum external tracking (creepage)	2.6	mm	shortest distance path along body.
Minimum Internal Gap	0.01	mm	Insulation distance through insulation

<sup>1)</sup> The parameter is not subject to production test, verified by characterization; Production Test with 1100V, 100ms duration

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## **Approvals:**

UL508, CSA C22.2 NO.14

Certificate Number: 20090514-E329661

## 4.11 Reliability

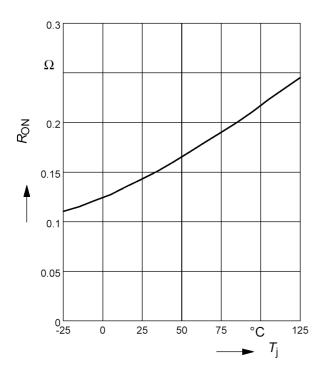
For Qualification Report please contact your local Infineon Technologies office!

<sup>2)</sup> not subject to production test, specified by design



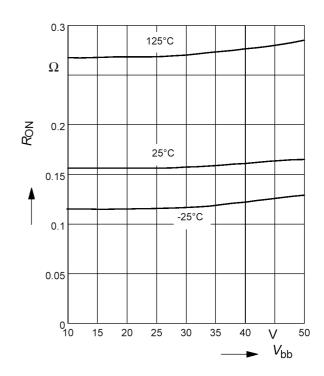
Typ. on-state resistance

$$R_{ON} = f(T_j)$$
;  $V_{bb} = 15V$ ;  $V_{in} = high$ 



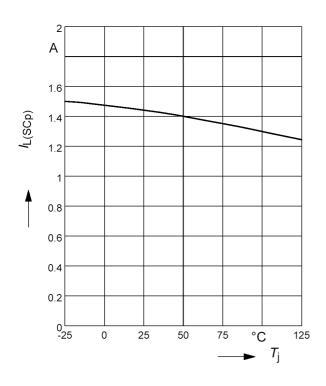
Typ. on-state resistance

$$R_{ON} = f(V_{bb}); I_{L} = 0.5A; V_{in} = high$$



Typ. initial peak short circuit current limit

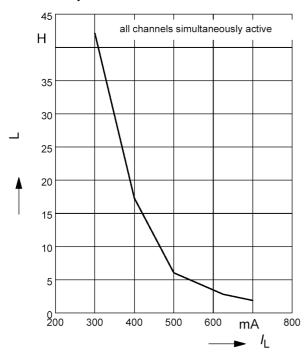
$$I_{L(SCp)} = f(T_j) ; V_{bb} = 24V$$





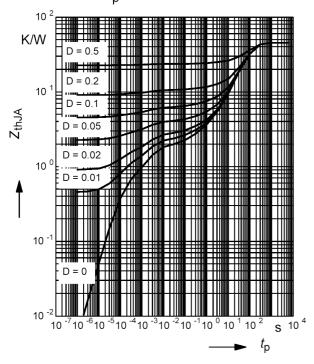
# Maximum allowable load inductance for a single switch off, calculated

$$L = f(I_L)$$
;  $T_{jstart}$ =125°C,  $V_{bb}$ =24V,  $R_L$ =0 $\Omega$ 



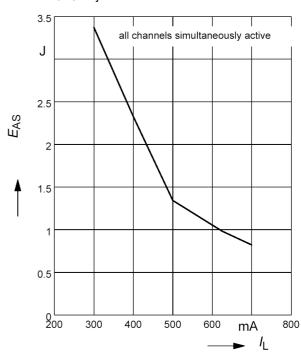
# Typ. transient thermal impedance $Z_{\text{thJA}} = f(t_{\text{p}})$ @ min. footprint

Parameter:  $D=t_{n}/T$ 



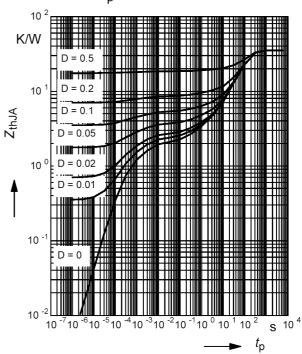
# Maximum allowable inductive switch-off energy, single pulse

 $E_{AS} = f(I_L); T_{jstart} = 125^{\circ}C, V_{bb} = 24V$ 



Typ. transient thermal impedance  $Z_{\text{thJA}}$ =f( $t_{\text{p}}$ ) @ 6cm<sup>2</sup> heatsink area

Parameter:  $D=t_{\rm p}/T$ 





**Package Outlines** 

# 5 Package Outlines

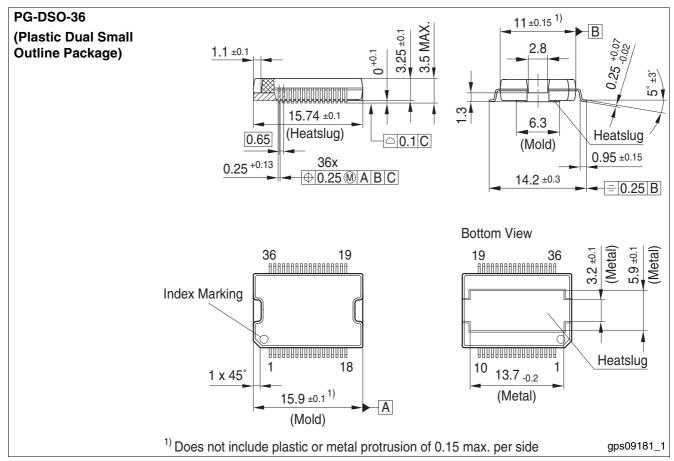


Figure 12 PG-DSO36

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- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
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