

# ITS4880R

Smart Power High-Side-Switch for Industrial Applications, Eight Channels: 8 x 200 m $\Omega$

Industrial PROFET

Data Sheet

Rev. 1.2 2014-12-10

Standard Power

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<b>1</b>	<b>Overview</b> .....	<b>3</b>
<b>2</b>	<b>Block Diagram</b> .....	<b>4</b>
<b>3</b>	<b>Pin Configuration</b> .....	<b>5</b>
<b>4</b>	<b>General Product Characteristics</b> .....	<b>6</b>
4.1	Maximum Ratings .....	6
4.2	Thermal Characteristics .....	7
<b>5</b>	<b>Electrical Characteristics</b> .....	<b>8</b>
5.1	Load Switching Capabilities and Characteristics .....	8
5.2	Operating Parameters .....	8
5.3	Protection Functions .....	9
5.4	Input .....	9
5.5	Diagnostic Characteristics .....	10
5.6	Reverse Battery .....	11
<b>6</b>	<b>Application Information</b> .....	<b>12</b>
6.1	Truth table for common diagnostic pin (LED-driver) .....	12
6.2	Programmable input .....	13
6.3	Functional description LS-Pin .....	13
<b>7</b>	<b>Typical Performance Graphs</b> .....	<b>16</b>
<b>8</b>	<b>Package outlines and footprint</b> .....	<b>24</b>
<b>9</b>	<b>Revision History</b> .....	<b>25</b>

## Smart Power High-Side-Switch for Industrial Applications, Eight Channels: 8 x 200 mΩ

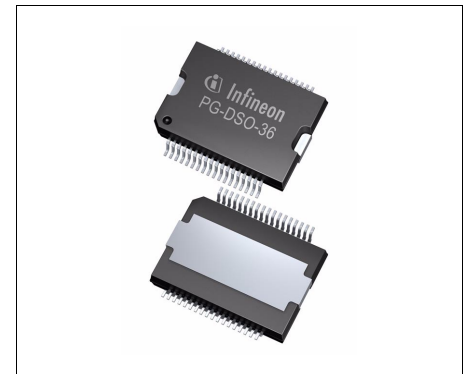
ITS4880R



### 1 Overview

#### Features

- Output current 0.625 A per channel
- Short circuit protection
- Maximum current internally limited
- Overload protection
- Input protection
- Overvoltage protection (including load dump)
- Undervoltage shutdown with auto-restart and hysteresis
- Switching inductive loads
- Thermal shutdown with restart
- Thermal independence of separate channels
- ESD-Protection
- Loss of GND and loss of  $V_{bb}$  protection
- Very low standby current
- Reverse battery protection
- Programmable input for CMOS or  $V_{bb}/2$
- Common diagnostic output (current output for overtemperature)
- Green Product (RoHS Compliant)



PG-DSO-36-26

#### Application

- Output driver for industrial applications (PLC)
- All types of resistive, inductive and capacitive loads
- $\mu$ C or optocoupler compatible power switch for 24 V DC industrial applications
- Replaces electromechanical relays and discrete circuits

#### General Description

N channel vertical power FET with charge pump, ground referenced CMOS or  $V_{bb}/2$  compatible input and common diagnostic feedback, monolithically integrated in Smart SIPMOS<sup>®</sup> technology. Providing embedded protective functions.

#### Product Summary

Overvoltage protection:  $V_{bbAZmin} = 47$  V

Operating voltage:  $11$  V <  $V_{bb(on)}$  <  $45$  V

On-state resistance:  $R_{ON} = 200$  mΩ

Operating Temperature:  $T_a = -30$  °C to  $85$  °C

Type	Package	Marking
ITS4880R	PG-DSO-36-26	ITS 4880R

Block Diagram

2 Block Diagram

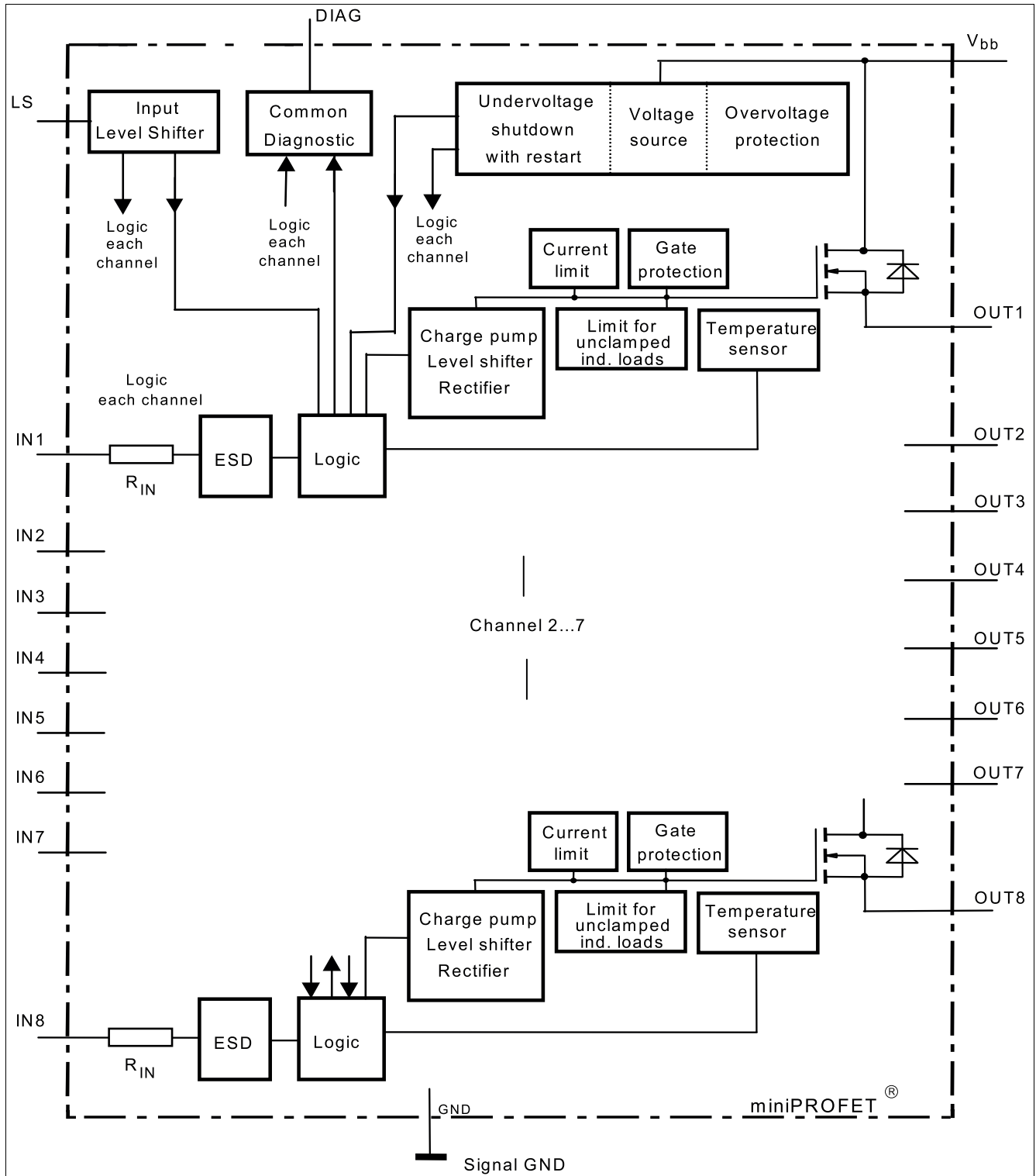


Figure 1 Block diagram

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**Pin Configuration**

### 3 Pin Configuration

1,2,4,5	NC	not connected
3	LS	Enable pin for switching the input-levels to $V_{bb}$
6	IN1	Input, activates channel 1 in case of logic high signal
7	IN2	Input, activates channel 2 in case of logic high signal
8	IN3	Input, activates channel 3 in case of logic high signal
9	IN4	Input, activates channel 4 in case of logic high signal
10	IN5	Input, activates channel 5 in case of logic high signal
11	IN6	Input, activates channel 6 in case of logic high signal
12	IN7	Input, activates channel 7 in case of logic high signal
13	IN8	Input, activates channel 8 in case of logic high signal
14-18	NC	not connected
19	GND	Logic ground
20	DIAG	Common diagnostic output for overtemperature
21	OUT8	High-side output of channel 8
22	OUT8	High-side output of channel 8
23	OUT7	High-side output of channel 7
24	OUT7	High-side output of channel 7
25	OUT6	High-side output of channel 6
26	OUT6	High-side output of channel 6
27	OUT5	High-side output of channel 5
28	OUT5	High-side output of channel 5
29	OUT4	High-side output of channel 4
30	OUT4	High-side output of channel 4
31	OUT3	High-side output of channel 3
32	OUT3	High-side output of channel 3
33	OUT2	High-side output of channel 2
34	OUT2	High-side output of channel 2
35	OUT1	High-side output of channel 1
36	OUT1	High-side output of channel 1
TAB	$V_{bb}$	Positive power supply voltage

## General Product Characteristics

### 4 General Product Characteristics

#### 4.1 Maximum Ratings

**Table 1** Maximum ratings at  $T_j = -40\text{ °C} \dots 135\text{ °C}$ , unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition	Number
		Min.	Typ.	Max.			
Supply Voltage	$V_{bb}$	-1 <sup>1)</sup>	-	45	V	-	-
Continuous input Voltage <sup>2)</sup>	$V_{IN}$	-10	-	$V_{bb}$	V	-	-
Continuous input Voltage at LS-pin	$V_{LS}$	-1	-	$V_{bb}$	V	-	-
Load current (Short circuit current see <a href="#">Page 9</a> )	$I_L$	-	-	-	A	self limited	-
Current through input pin (DC), each channel	$I_{IN}$	-5	-	5	mA	-	-
Reverse current through GND-pin <sup>1)</sup>	$-I_{GND}$	-	-	1.6	A	-	-
Junction Temperature	$T_j$	-	-	-	°C	internal limited	-
Operating Temperature	$T_a$	-30	-	85	°C	-	-
Storage Temperature	$T_{stg}$	-40	-	105	°C	-	-
Power dissipation <sup>3)</sup>	$P_{tot}$	-	-	3.3	W	-	-
Inductive load switch-off energy dissipation <sup>4)</sup> , $T_j = 125\text{ °C}$ , $I_L = 0.625\text{ A}$ , one channel active	$E_{AS}$	-	-	10	J	single pulse	-
Inductive load switch-off energy dissipation <sup>4)</sup> , $T_j = 125\text{ °C}$ , $I_L = 0.625\text{ A}$ , all channels simultaneously active	$E_{AS}$	-	-	1	J	single pulse	-
Load dump protection <sup>4)</sup> $V_{Loaddump}$ <sup>5)</sup> = $V_A + V_S$ , $V_{IN}$ = low or high, $t_d = 400\text{ ms}$ , $R_I = 2\ \Omega$ , $R_L = 27\ \Omega$ , $V_A = 13.5\text{ V}$	$V_{Loaddump}$	-	-	90	V	-	-
Load dump protection <sup>4)</sup> $V_{Loaddump}$ <sup>5)</sup> = $V_A + V_S$ , $V_{IN}$ = low or high, $t_d = 350\text{ ms}$ , $R_I = 2\ \Omega$ , $R_L = 47\ \Omega$ , $V_A = 27\text{ V}$	$V_{Loaddump}$	-	-	117	V	-	-
<b>Electrostatic discharge voltage</b> (Human Body Model) according to ANSI EOS/ESD - S5.1 - 1993, ESD STM5.1 - 1998; Input pin, LS pin, Common diagnostic pin	$V_{ESD}$	-1	-	1	kV	-	-

## General Product Characteristics

**Table 1** Maximum ratings at  $T_j = -40\text{ °C} \dots 135\text{ °C}$ , unless otherwise specified (cont'd)

Parameter	Symbol	Values			Unit	Note / Test Condition	Number
		Min.	Typ.	Max.			
Electrostatic discharge voltage (Human Body Model) according to ANSI EOS/ESD - S5.1 - 1993, ESD STM5.1 - 1998; all other pins	$V_{ESD}$	-5	-	5	kV	-	-
Continuous reverse drain current <sup>1) 4)</sup> , each channel	$I_S$	-	-	4	A	-	-

1) defined by  $P_{tot}$

2) At  $V_{IN} > V_{bb}$  the input current is not allowed to exceed  $\pm 5$  mA.

3) Device on 50mm\*50mm\*1.5mm epoxy PCB FR4 with 6 cm<sup>2</sup> (one layer, 70µm thick) copper area for drain connection. PCB is vertical without blown air.

4) not subject to production test, specified by design

5)  $V_{LoadDump}$  is set up without the DUT connected to the generator per ISO 7637-1 and DIN 40839. Supply voltages higher than  $V_{bb(AZ)}$  require an external current limit for the GND pin, e.g. with a 150 Ω resistor in GND connection. A resistor for the protection of the input is integrated.

## 4.2 Thermal Characteristics

**Table 2** Thermal Characteristics at  $T_j = -25\text{ °C} \dots 125\text{ °C}$ , unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition	Number
		Min.	Typ.	Max.			
Thermal resistance junction to case	$R_{thJC}$	-	-	1.5	K/W	-	-
Thermal resistance @ min. footprint	$R_{th(JA)}$	-	-	50	K/W	-	-
Thermal resistance @ 6 cm <sup>2</sup> cooling area <sup>1)</sup>	$R_{th(JA)}$	-	-	38	K/W	-	-

1) Device on 50mm\*50mm\*1.5mm epoxy PCB FR4 with 6 cm<sup>2</sup> (one layer, 70µm thick) copper area for drain connection. PCB is vertical without blown air.

## Electrical Characteristics

### 5 Electrical Characteristics

#### 5.1 Load Switching Capabilities and Characteristics

**Table 3 Load Switching Capabilities and Characteristics**

Parameter	Symbol	Values			Unit	Note / Test Condition	Number
		Min.	Typ.	Max.			
On-state resistance	$R_{ON}$	–	150	200	m $\Omega$	$T_j = 25\text{ }^\circ\text{C}$ $I_L = 0.5\text{ A}$	–
On-state resistance	$R_{ON}$	–	270	320	m $\Omega$	$T_j = 125\text{ }^\circ\text{C}$	–
Turn-on-time to 90% $V_{OUT}$	$t_{on}$	–	50	100	$\mu\text{s}$	$R_L = 47\ \Omega$ , $V_{IN} = 0\text{ to }10\text{ V}$	–
Turn-off-time to 10% of $V_{OUT}$	$t_{off}$	–	75	150	$\mu\text{s}$	$R_L = 47\ \Omega$ , $V_{IN} = 10\text{ to }0\text{ V}$	–
Slew rate on, 10 to 30% $V_{OUT}$	$dV/dt_{on}$	–	1	2	V/ $\mu\text{s}$	$R_L = 47\ \Omega$ , $V_{bb} = 15\text{ V}$	–
Slew rate off, 70 to 40% $V_{OUT}$	$-dV/dt_{off}$	–	1	2	V/ $\mu\text{s}$	$R_L = 47\ \Omega$ , $V_{bb} = 15\text{ V}$	–

#### 5.2 Operating Parameters

**Table 4 Operating Parameters at  $T_j = -25\text{ }^\circ\text{C} \dots 125\text{ }^\circ\text{C}$ ,  $V_{bb} = 15 \dots 30\text{ V}$ , unless otherwise specified**

Parameter	Symbol	Values			Unit	Note / Test Condition	Number
		Min.	Typ.	Max.			
Operating Voltage	$V_{bb(on)}$	11	–	45	V	–	–
Undervoltage shutdown	$V_{bb(under)}$	7	–	10.5	V	–	–
Undervoltage restart	$V_{bb(u\text{ rst})}$	–	–	11	V	–	–
Undervoltage hysteresis	$\Delta V_{bb(under)}$	–	0.5	–	V	$\Delta V_{bb(under)} = V_{bb(u\text{ rst})} - V_{bb(under)}$	–
Standby current	$I_{bb(off)}$	–	50	150	$\mu\text{A}$	–	–
Operating current <sup>1)</sup>	$I_{GND}$	–	5	12	mA	–	–
Leakage output current (included in $I_{bb(off)}$ )	$I_{L(off)}$	–	5	10	$\mu\text{A}$	$V_{IN} = \text{low}$ , each channel	–

1) Contains all input currents.

## Electrical Characteristics

### 5.3 Protection Functions

**Table 5 Protection Functions** <sup>1)</sup>

Parameter	Symbol	Values			Unit	Note / Test Condition	Number
		Min.	Typ.	Max.			
Initial peak short circuit current limit	$I_{L(SCp)}$	–	–	1.9	A	$T_j = -25\text{ °C};$ $V_{bb} = 30\text{ V};$ $t_m = 700\mu\text{s}$	–
Initial peak short circuit current limit	$I_{L(SCp)}$	–	1.4	–	A	$T_j = 25\text{ °C}$	–
Initial peak short circuit current limit	$I_{L(SCp)}$	0.7	–	–	A	$T_j = 125\text{ °C}$	–
Repetitive short circuit current limit $T_j = T_{jt}$ (see timing diagrams)	$I_{L(SCr)}$	–	1.1	–	A	–	–
Output clamp (inductive load switch off) at $V_{OUT} = V_{bb} - V_{ON(CL)}$	$V_{ON(CL)}$	47	53	60	V	–	–
Oversvoltage protection <sup>2)</sup>	$V_{bb(AZ)}$	47	–	–	V	–	–
Thermal overload trip temperature <sup>3)</sup>	$T_{jt}$	135	–	–	°C	–	–
Thermal hysteresis	$\Delta T_{jt}$	–	10	–	K	–	–

- 1) 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 continuous repetitive operation.
- 2) see also  $V_{ON(CL)}$  in circuit diagram on Page 14
- 3) higher operating temperature at normal function for each channel available

### 5.4 Input

**Table 6 Input at  $T_j = -25\text{ °C} \dots 125\text{ °C}$ ,  $V_{bb} = 15 \dots 30\text{ V}$ , unless otherwise specified**

Parameter	Symbol	Values			Unit	Note / Test Condition	Number
		Min.	Typ.	Max.			
Continuous input voltage <sup>1)</sup>	$V_{IN}$	-10	–	$V_{bb}$	V	–	–
Input turn-on threshold voltage CMOS <sup>2)</sup>	$V_{IN(T+)}$	–	–	2.2	V	–	–
Input turn-off threshold voltage CMOS <sup>2)</sup>	$V_{IN(T-)}$	0.8	–	–	V	–	–
Input turn-on threshold voltage $V_{bb}/2$ <sup>2)</sup>	$V_{IN(T+)}$	–	–	$V_{bb}/2 + 1$	V	–	–

## Electrical Characteristics

**Table 6** Input at  $T_j = -25\text{ °C} \dots 125\text{ °C}$ ,  $V_{bb} = 15 \dots 30\text{ V}$ , unless otherwise specified (cont'd)

Parameter	Symbol	Values			Unit	Note / Test Condition	Number
		Min.	Typ.	Max.			
Input turn-off threshold voltage $V_{bb} / 2$ <sup>2)</sup>	$V_{IN(T-)}$	$V_{bb} / 2 - 1$	-	-	V	-	-
Input threshold hysteresis	$\Delta V_{IN(T)}$	-	0.3	-	V	-	-
Off state input current CMOS (each channel)	$I_{IN(off)}$	8	-	-	$\mu\text{A}$	-	-
On state input current CMOS (each channel)	$I_{IN(on)}$	-	-	70	$\mu\text{A}$	-	-
Off state input current $V_{bb} / 2$ (each channel)	$I_{IN(off)}$	80	-	-	$\mu\text{A}$	-	-
On state input current $V_{bb} / 2$ (each channel)	$I_{IN(on)}$	-	-	260	$\mu\text{A}$	-	-
Input delay time at switch on $V_{bb}$	$t_{d(V_{bbon})}$	150	340	-	$\mu\text{s}$	-	-
Input resistance (see Page 14)	$R_I$	2	3	4	$\text{k}\Omega$	-	-
Internal pull down resistor at LS-pin <sup>3)</sup>	$R_{LS}$	300	800	-	$\text{k}\Omega$	-	-

1) At  $V_{IN} > V_{bb}$  the input current is not allowed to exceed  $\pm 5\text{ mA}$ .

2) see page [Page 13](#)

3) LS-pin is connected to  $V_{bb}$

## 5.5 Diagnostic Characteristics

**Table 7** Diagnostic Characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition	Number
		Min.	Typ.	Max.			
Common diagnostic output current <sup>1)</sup> (overtemperature of any channel) $T_j = 135\text{ °C}$	$I_{diag}$	2	3	4	$\text{mA}$	-	-
Common diagnostic output leakage current	$I_{diag(high)}$	-	-	2	$\mu\text{A}$	-	-

1) see Page 14

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**Electrical Characteristics**
**5.6 Reverse Battery**
**Table 8 Reverse Battery at  $T_j = -25\text{ °C} \dots 125\text{ °C}$ ,  $V_{bb} = 15 \dots 30\text{ V}$ , unless otherwise specified**

Parameter	Symbol	Values			Unit	Note / Test Condition	Number
		Min.	Typ.	Max.			
Reverse battery voltage <sup>1)</sup>	$-V_{bb}$	-	-	1	V	$R_{GND} = 0\ \Omega$	-
Reverse battery voltage	$-V_{bb}$	-	-	45	V	$R_{GND} = 150\ \Omega$	-
Diode forward on voltage	$-V_{ON}$	-	-	1.2	V	$I_F = 1.25\text{ A}$ ; $V_{IN} = \text{low}$ , each channel	-

1) defined by  $P_{tot}$

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**Application Information**

## 6 Application Information

### 6.1 Truth table for common diagnostic pin (LED-driver)

**Table 9 Truth table for common diagnostic pin (LED-driver)**

	Input level	Output level	Diagnostic
Normal Operation	L	L	L
Normal Operation	H	H	L
Short circuit to GND	L	L	L
Short circuit to GND	H	L	L
Undervoltage	L	L	L
Undervoltage	H	L	L
Overtemperature	L	L	L
Overtemperature	H	L	H <sup>1)</sup>

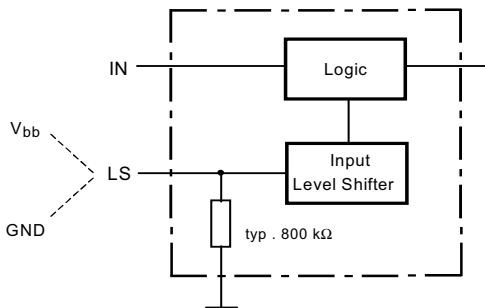
1) toggling with restart

L = no diagnostic output current

H = diagnostic output current typ. 2 mA (see [Page 10](#))

## Application Information

### 6.2 Programmable input



**Figure 2 Programmable input**

### 6.3 Functional description LS-Pin

With using the LS-pin it is possible to change the input turn-on and -off threshold voltage between CMOS and half supply voltage level.

Therefore you have either to connect the LS-pin to GND (state 1) or to supply voltage (state 2).

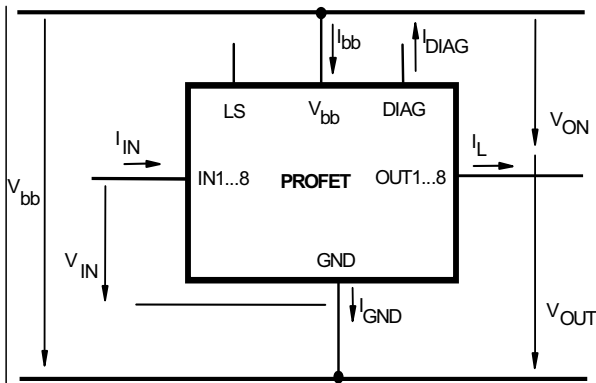
State 1: LS-Pin to GND                      CMOS-Input level

State 2: LS-Pin to supply voltage         $V_{bb}/2$  - Input level

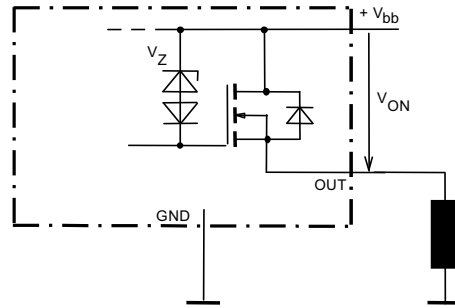
**Application Information**

**Terms**

each channel



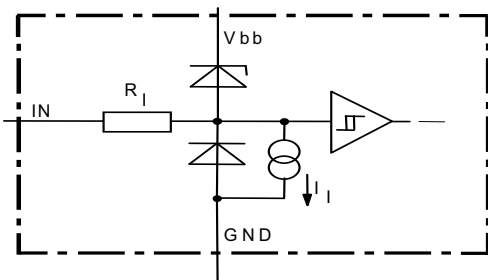
**Inductive and overvoltage output clamp**  
each channel



$V_{ON}$  clamped to 47 V min.

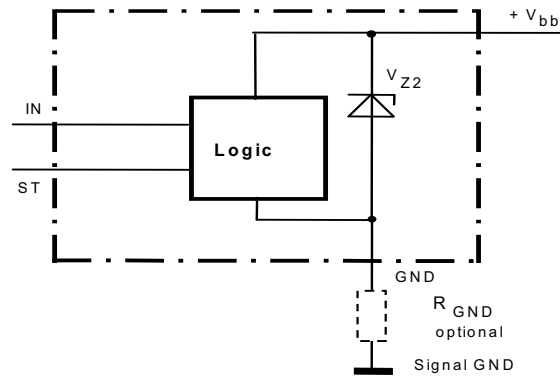
**Input circuit (ESD protection)**

each channel



The use of ESD zener diodes as voltage clamp at DC conditions is not recommended

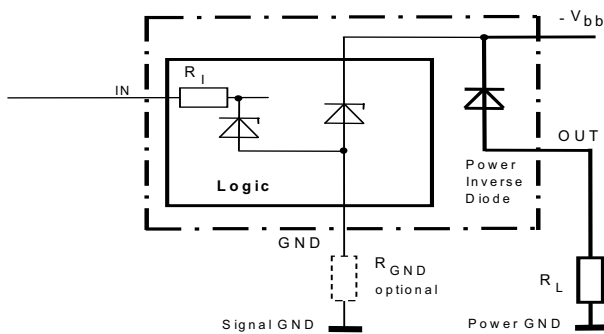
**Overvoltage protection of logic part**



$V_{Z2}=V_{bb(AZ)}=47$  V min.,  
 $R_I=3$  k $\Omega$  typ.,  $R_{GND}=150\Omega$

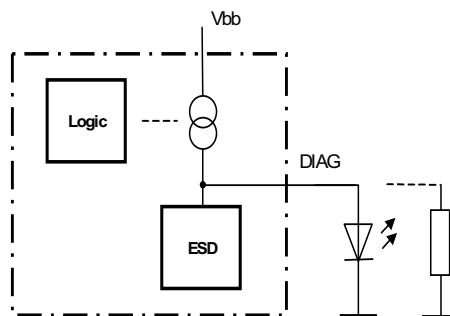
**Reverse battery protection**

each channel



$R_{GND}=150\Omega$ ,  $R_I=3k\Omega$  typ.,  
Temperature protection is not active during inverse current

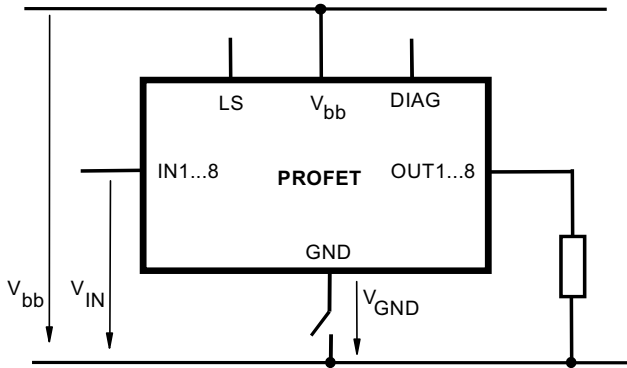
**Common diagnostic output**



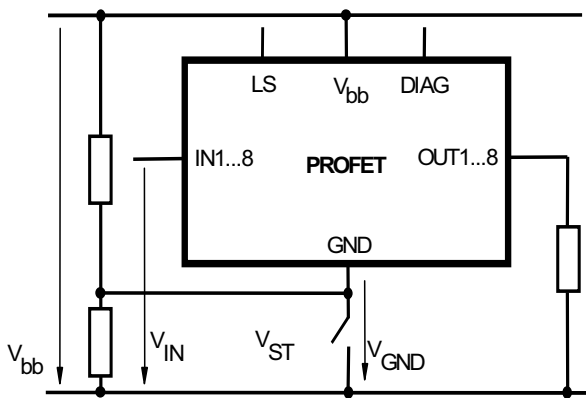
Output current typ. 2 mA

Application Information

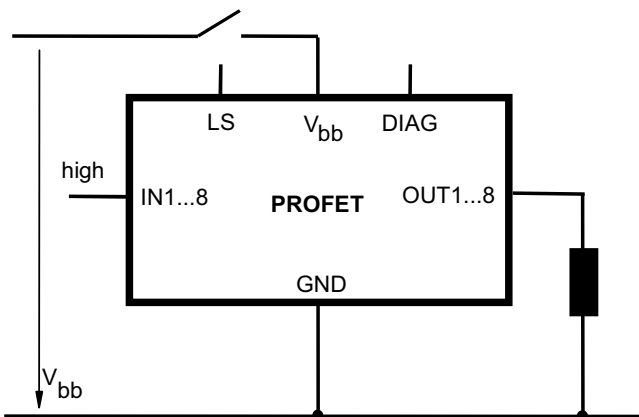
GND disconnect



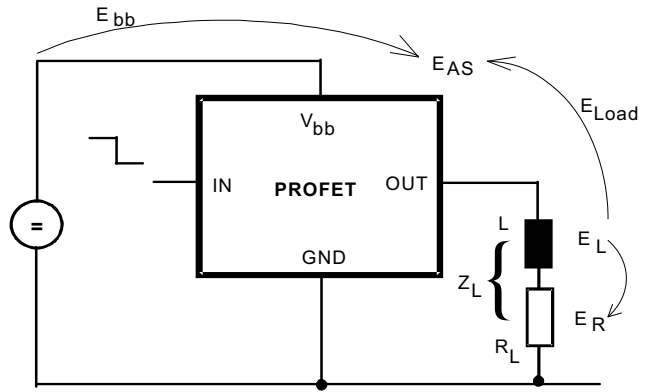
GND disconnect with GND pull up



V<sub>bb</sub> disconnect with charged inductive load



Inductive Load switch-off energy dissipation, each channel



Energy stored in load inductance:  $E_L = \frac{1}{2} * L * I_L^2$

While demagnetizing load inductance, the energy dissipated in PROFET is  $E_{AS} = E_{bb} + E_L - E_R = V_{ON(CL)} * i_L(t) dt$ , with an approximate solution for  $R_L > 0\Omega$ :

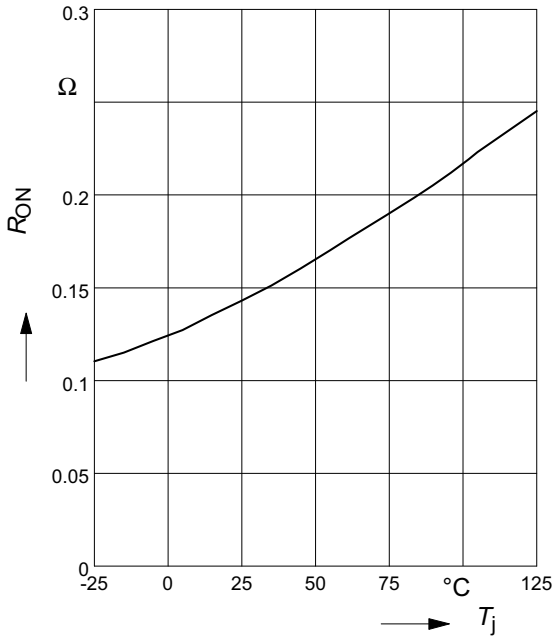
$$E_{AS} = V_{OUT(CL)} * \frac{L}{R_L} * \left[ \frac{V_{BB} - V_{OUT(CL)}}{R_L} * \ln \left( 1 - \frac{R_L * I_L}{V_{BB} - V_{OUT(CL)}} \right) + I_L \right]$$

Typical Performance Graphs

7 Typical Performance Graphs

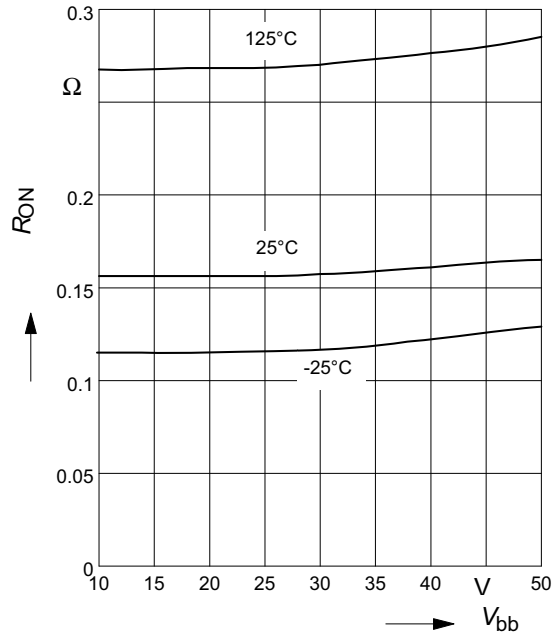
Typ. on-state resistance

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



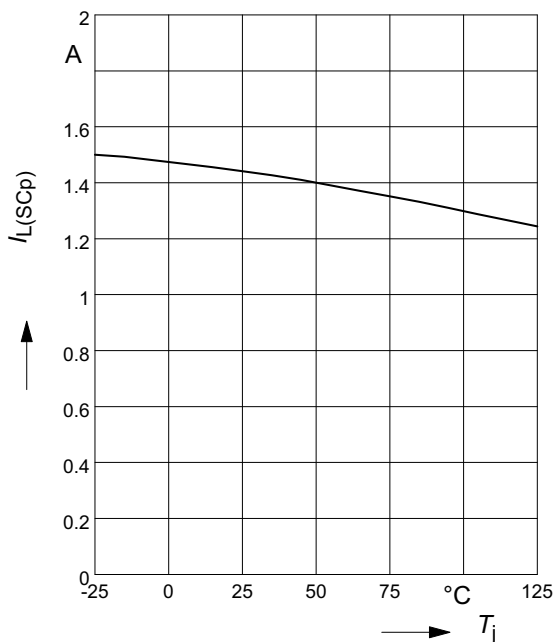
Typ. on-state resistance

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



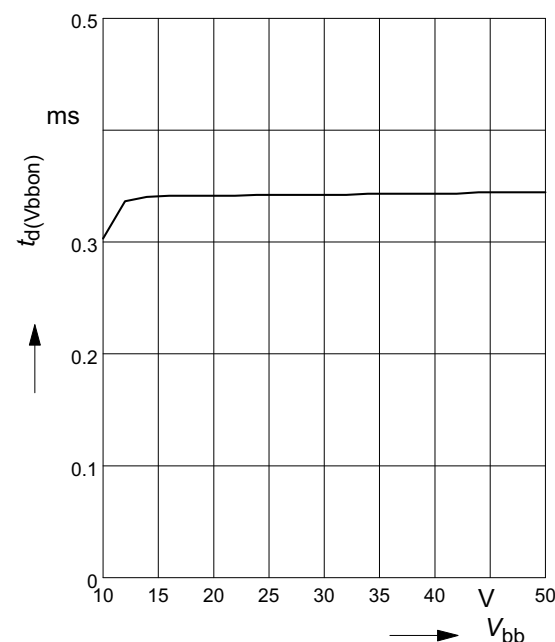
Typ. initial peak short circuit current limit

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



Typ. input delay time at switch on  $V_{bb}$

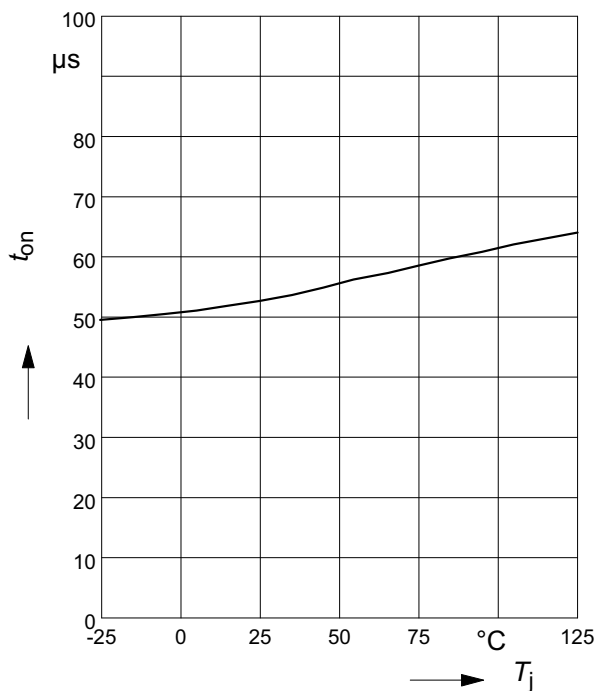
$t_d(V_{bbon}) = f(V_{bb})$ ;  $T_j = -25...125^{\circ}C$



Typical Performance Graphs

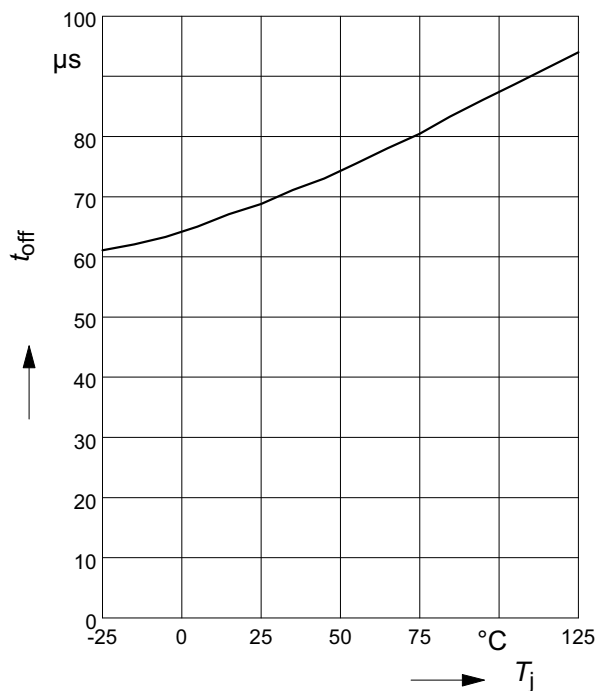
Typ. turn on time

$t_{on} = f(T_j); R_L = 47\Omega$



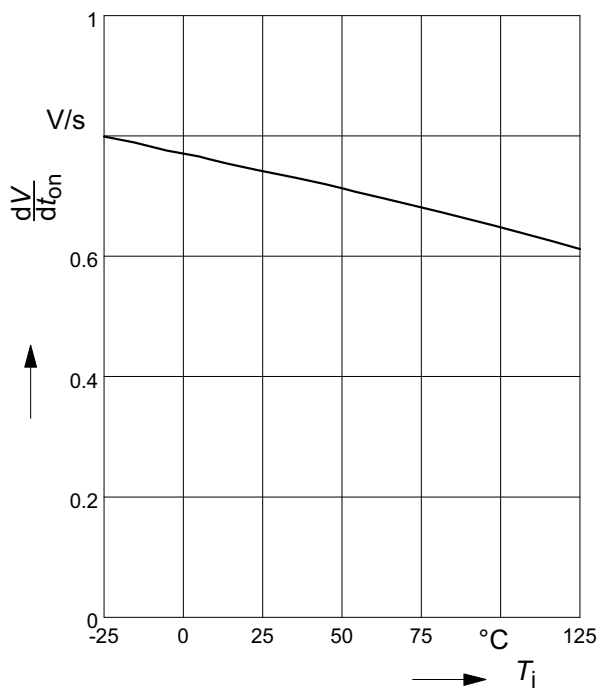
Typ. turn off time

$t_{off} = f(T_j); R_L = 47\Omega$



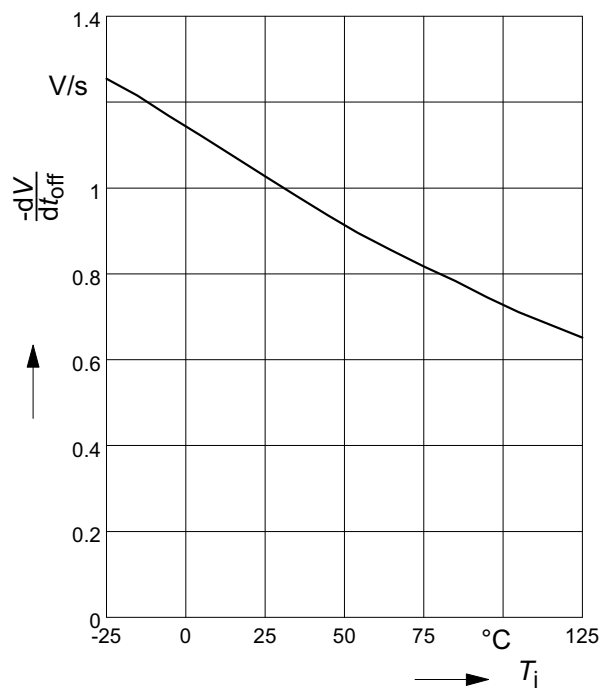
Typ. slew rate on

$dV/dt_{on} = f(T_j); R_L = 47\Omega, V_{bb} = 15V$



Typ. slew rate off

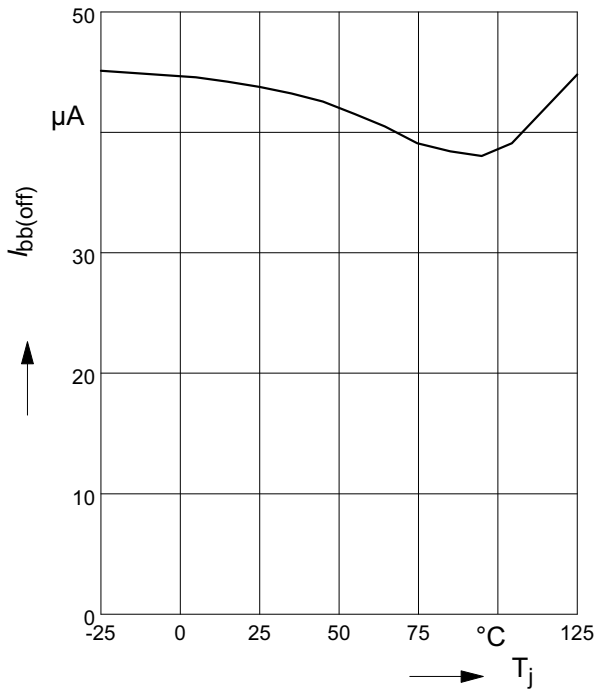
$-dV/dt_{off} = f(T_j); R_L = 47\Omega, V_{bb} = 15V$



Typical Performance Graphs

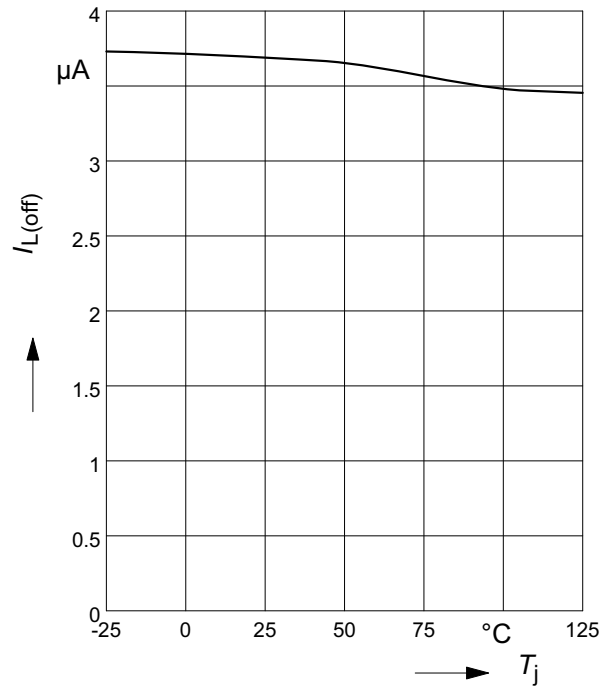
Typ. standby current

$I_{bb(off)} = f(T_j)$ ;  $V_{bb} = 30V$ ;  $V_{IN} = low$



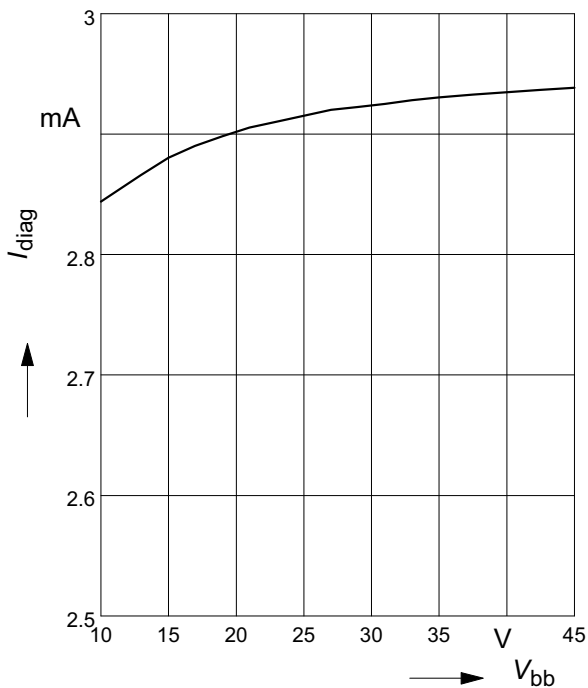
Typ. leakage current

$I_{L(off)} = f(T_j)$ ;  $V_{bb} = 30V$ ;  $V_{IN} = low$



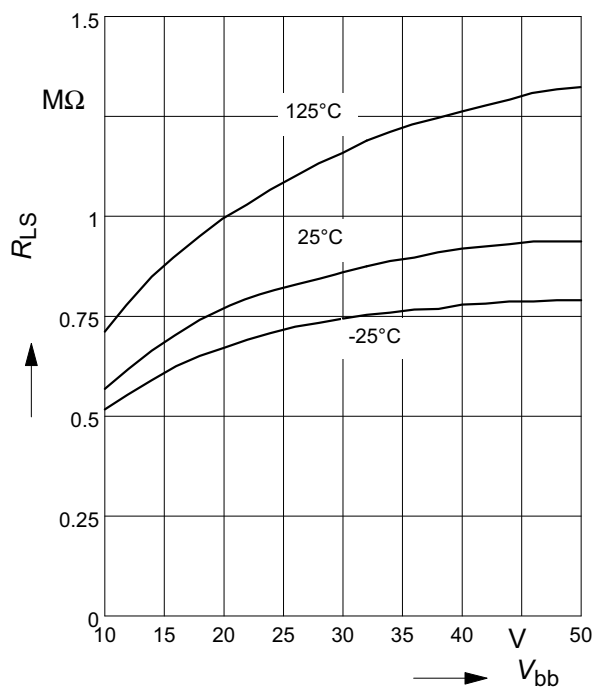
Typ. common diagnostic output current

$I_{diag} = f(V_{bb})$ ;  $T_j = 135°C$



Typ. internal pull down resistor at LS-pin

$R_{LS} = f(V_{bb})$ ;  $V_{LS} = V_{bb}$

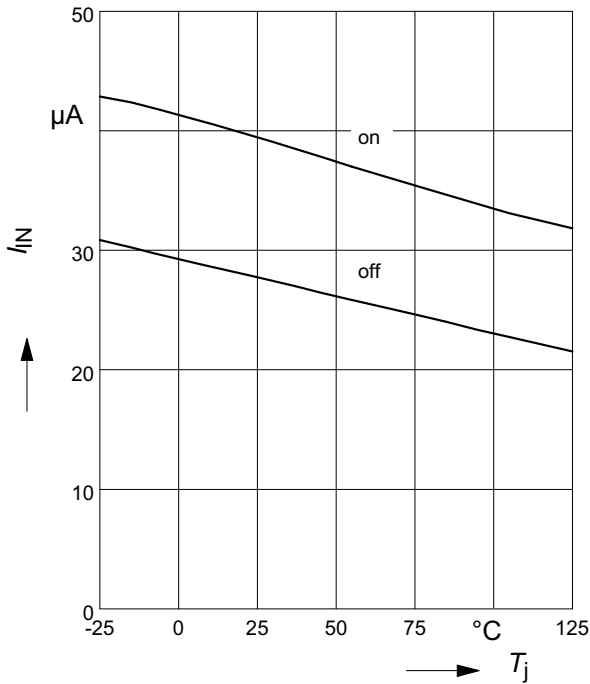


Typical Performance Graphs

Typ. input current @ CMOS level

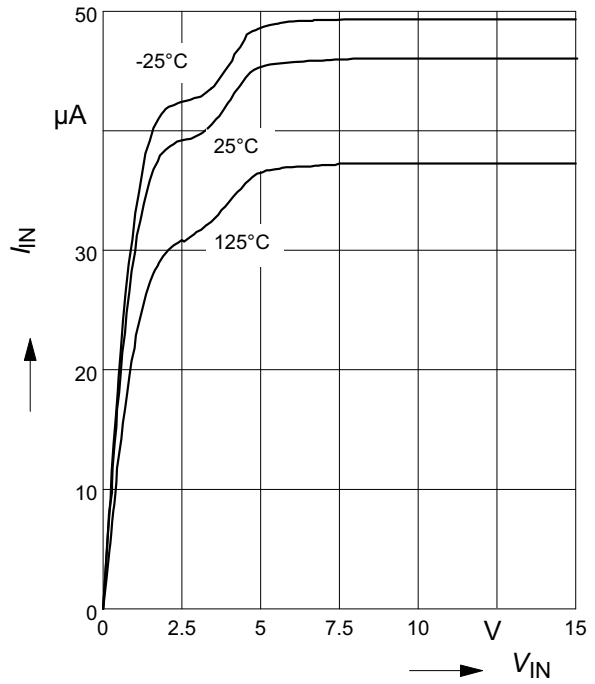
$I_{IN(on/off)} = f(T_j)$ ;  $V_{bb} = 15V$ ;  $V_{IN} = \text{low/high}$

$V_{INlow} \leq 0,8V$ ;  $V_{INhigh} = 2,2V$



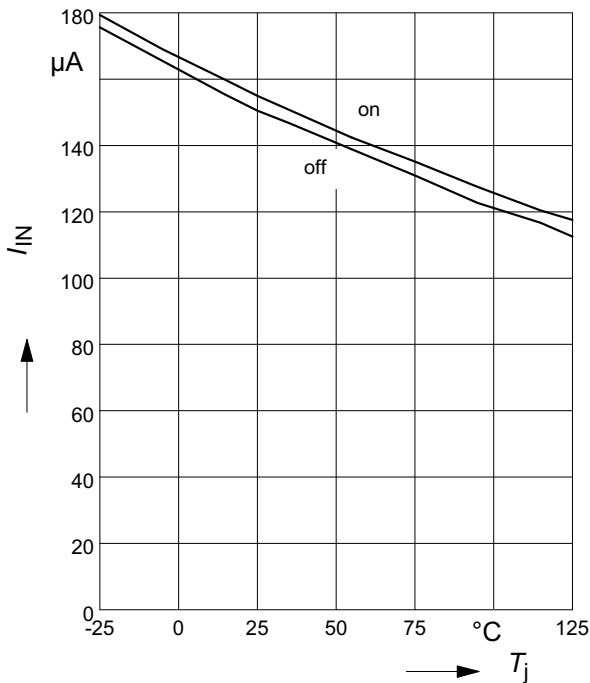
Typ. input current @ CMOS level

$I_{IN} = f(V_{IN})$ ;  $V_{bb} = 15V$



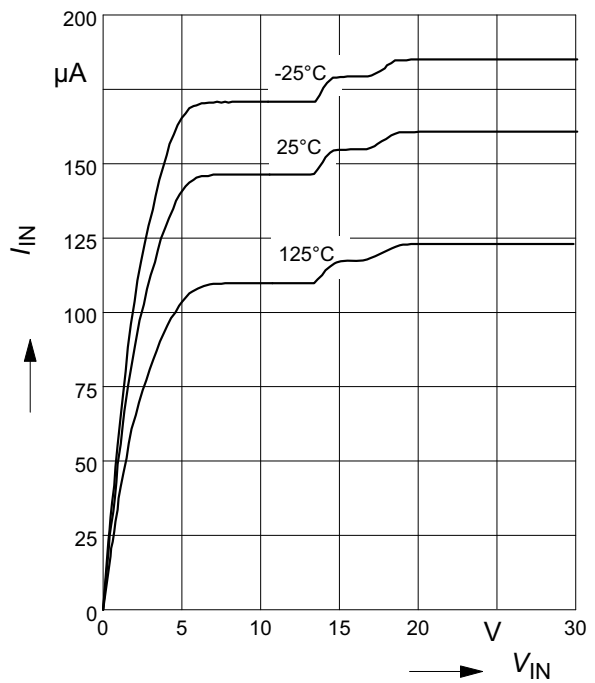
Typ. input current @ V<sub>bb</sub>/2 level

$I_{IN(on/off)} = f(T_j)$ ;  $V_{bb} = 30V$ ;  $V_{IN} = \text{low/high}$



Typ. input current @ V<sub>bb</sub>/2 level

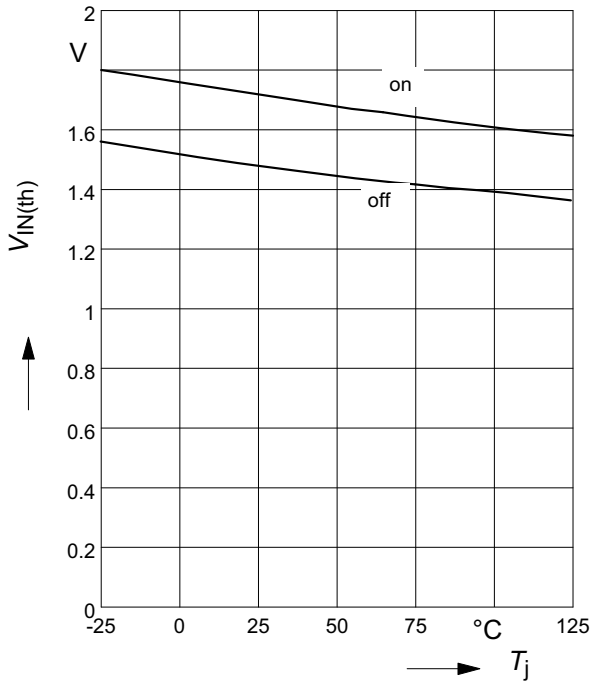
$I_{IN} = f(V_{IN})$ ;  $V_{bb} = 30 V$



Typical Performance Graphs

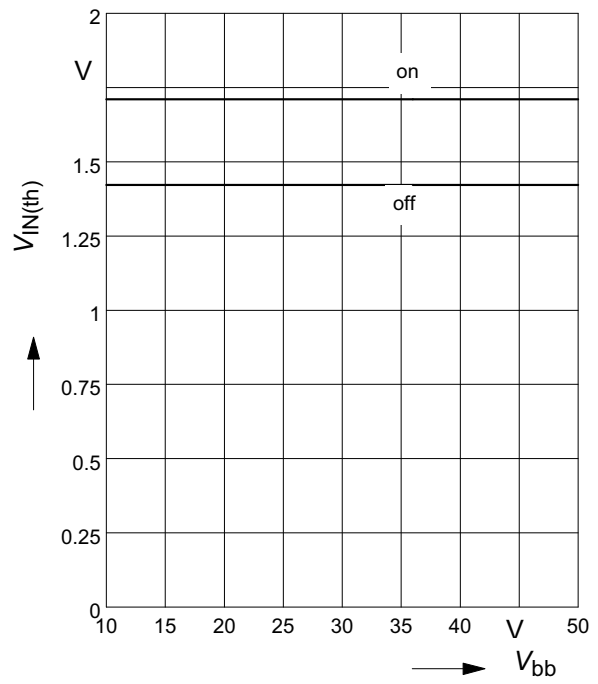
Typ. input threshold voltage  
@ CMOS level

$V_{IN(th)} = f(T_j) ; V_{bb} = 15V$



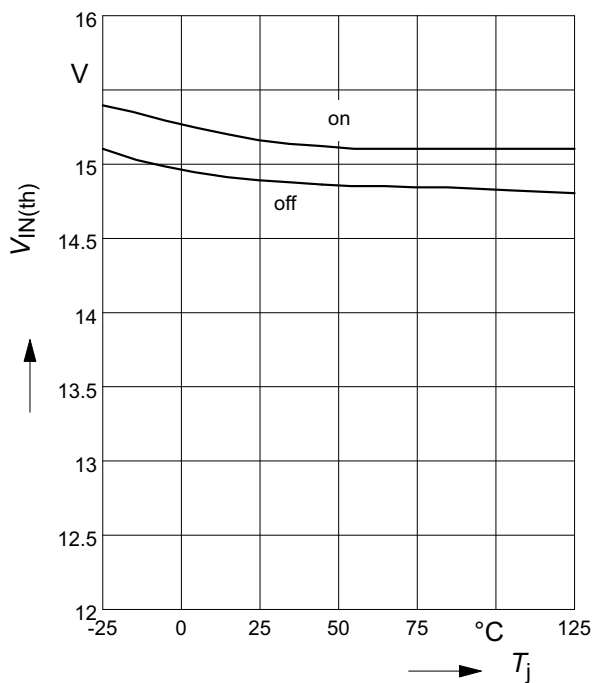
Typ. input threshold voltage  
@ CMOS level

$V_{IN(th)} = f(V_{bb}) ; T_j = 25^{\circ}C$



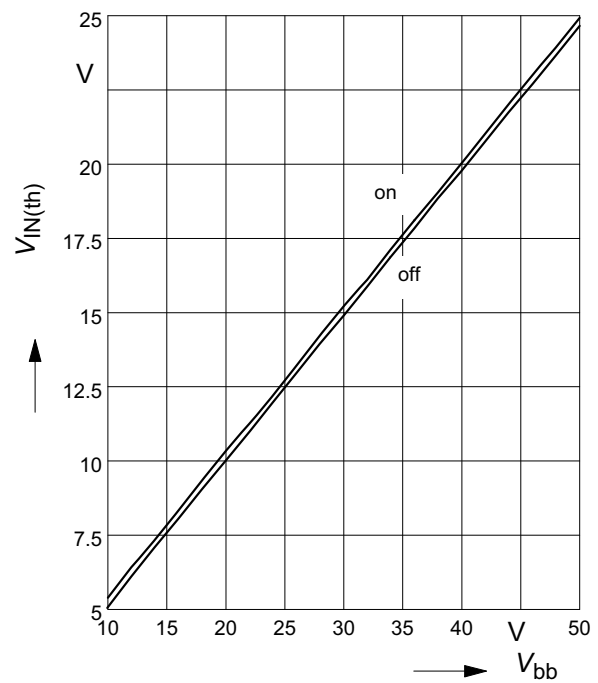
Typ. input threshold voltage  
@ V<sub>bb</sub>/2 level

$V_{IN(th)} = f(T_j) ; V_{bb} = 30V$



Typ. input threshold voltage  
@ V<sub>bb</sub>/2 level: LS-pin connected to V<sub>bb</sub>

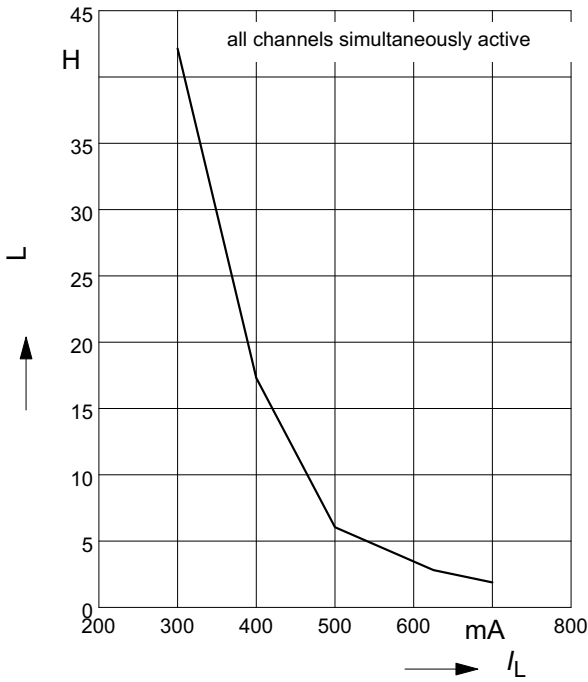
$V_{IN(th)} = f(V_{bb}) ; T_j = 25^{\circ}C$



Typical Performance Graphs

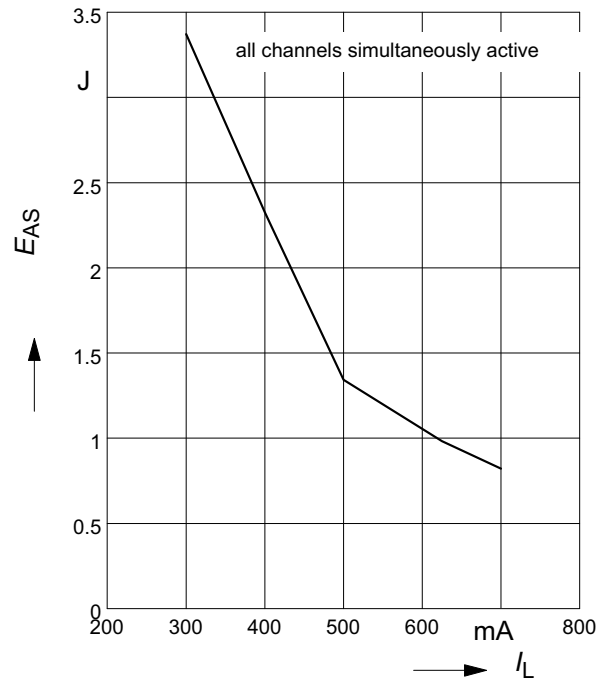
**Maximum allowable load inductance for a single switch off, calculated**

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



**Maximum allowable inductive switch-off energy, single pulse**

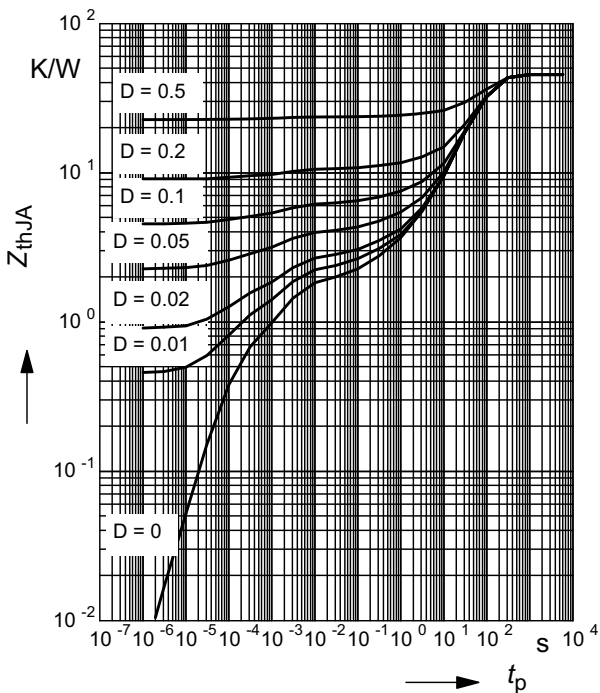
$E_{AS} = f(I_L); T_{jstart} = 125^{\circ}C, V_{bb} = 24V$



**Typ. transient thermal impedance**

$Z_{thJA}=f(t_p)$  @ min. footprint

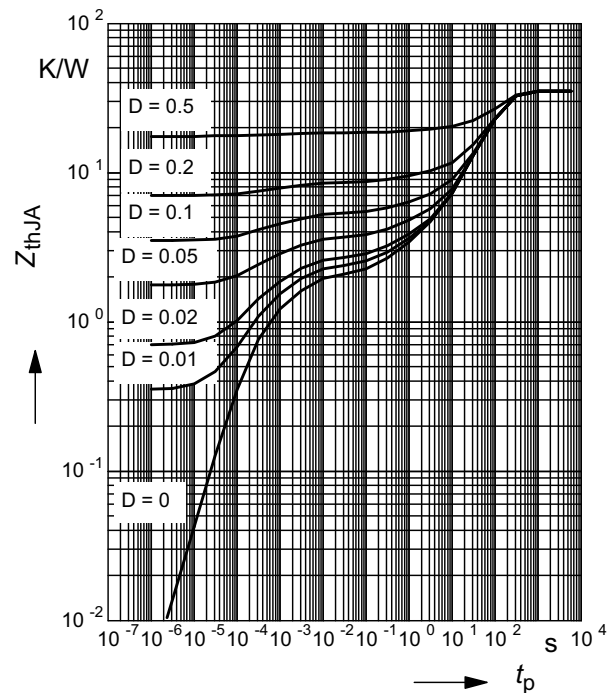
Parameter:  $D=t_p/T$



**Typ. transient thermal impedance**

$Z_{thJA}=f(t_p)$  @ 6cm<sup>2</sup> heatsink area

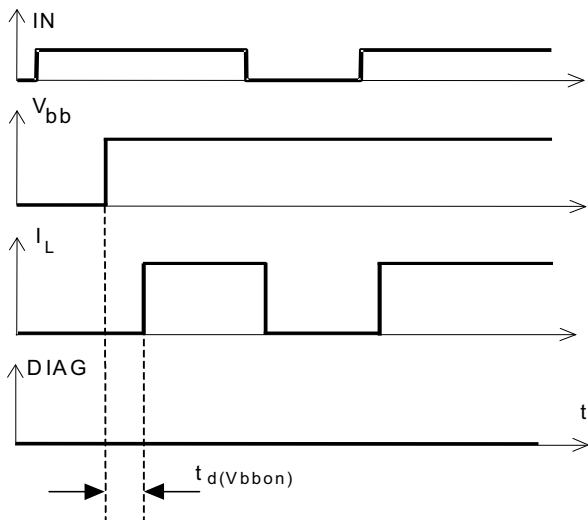
Parameter:  $D=t_p/T$



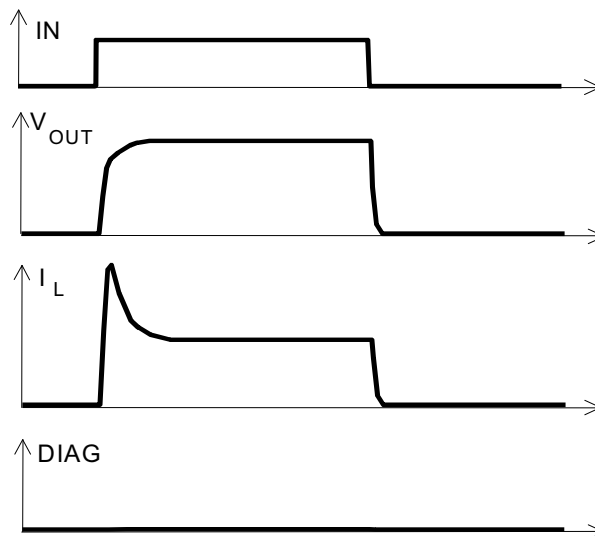
Typical Performance Graphs

**Timing diagrams**

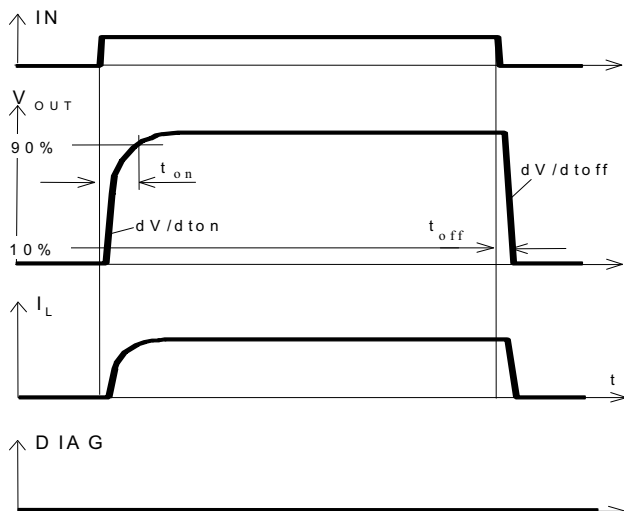
**Figure 1a: V<sub>bb</sub> turn on:**



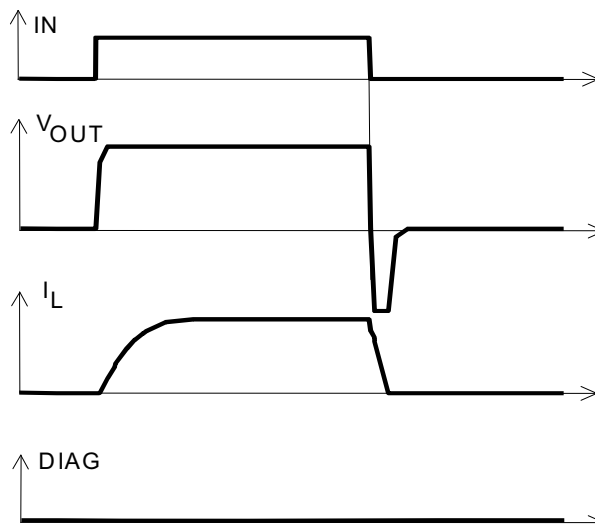
**Figure 2b: Switching a lamp**



**Figure 2a: Switching a resistive load, turn-on/off time and slew rate definition**

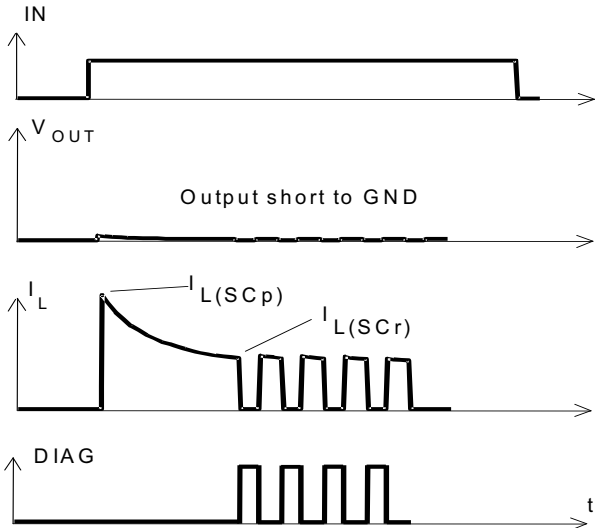


**Figure 2c: Switching an inductive load**



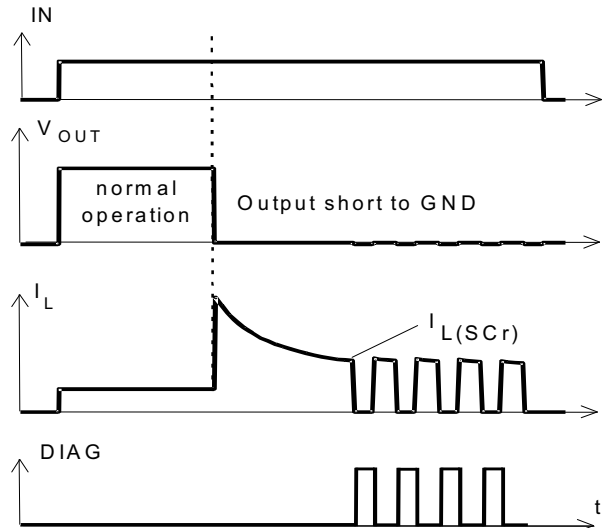
Typical Performance Graphs

**Figure 3a:** Turn on into short circuit, shut down by overtemperature, restart by cooling

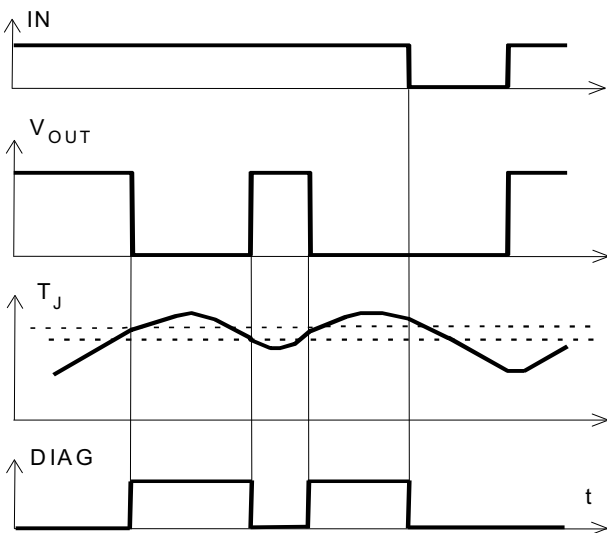


Heating up of the chip may require several milliseconds, depending on external conditions.

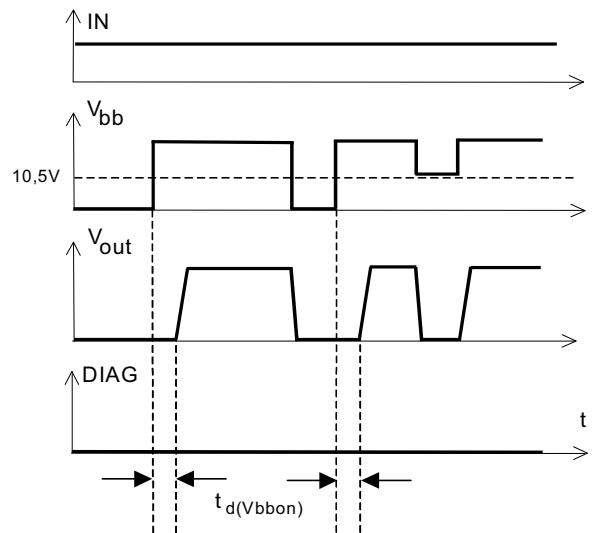
**Figure 3b:** Short circuit in on-state shut down by overtemperature, restart by cooling



**Figure 4:** Overtemperature: Reset if  $T_j < T_{jt}$



**Figure 5:** Undervoltage shutdown and restart



Package outlines and footprint

8 Package outlines and footprint

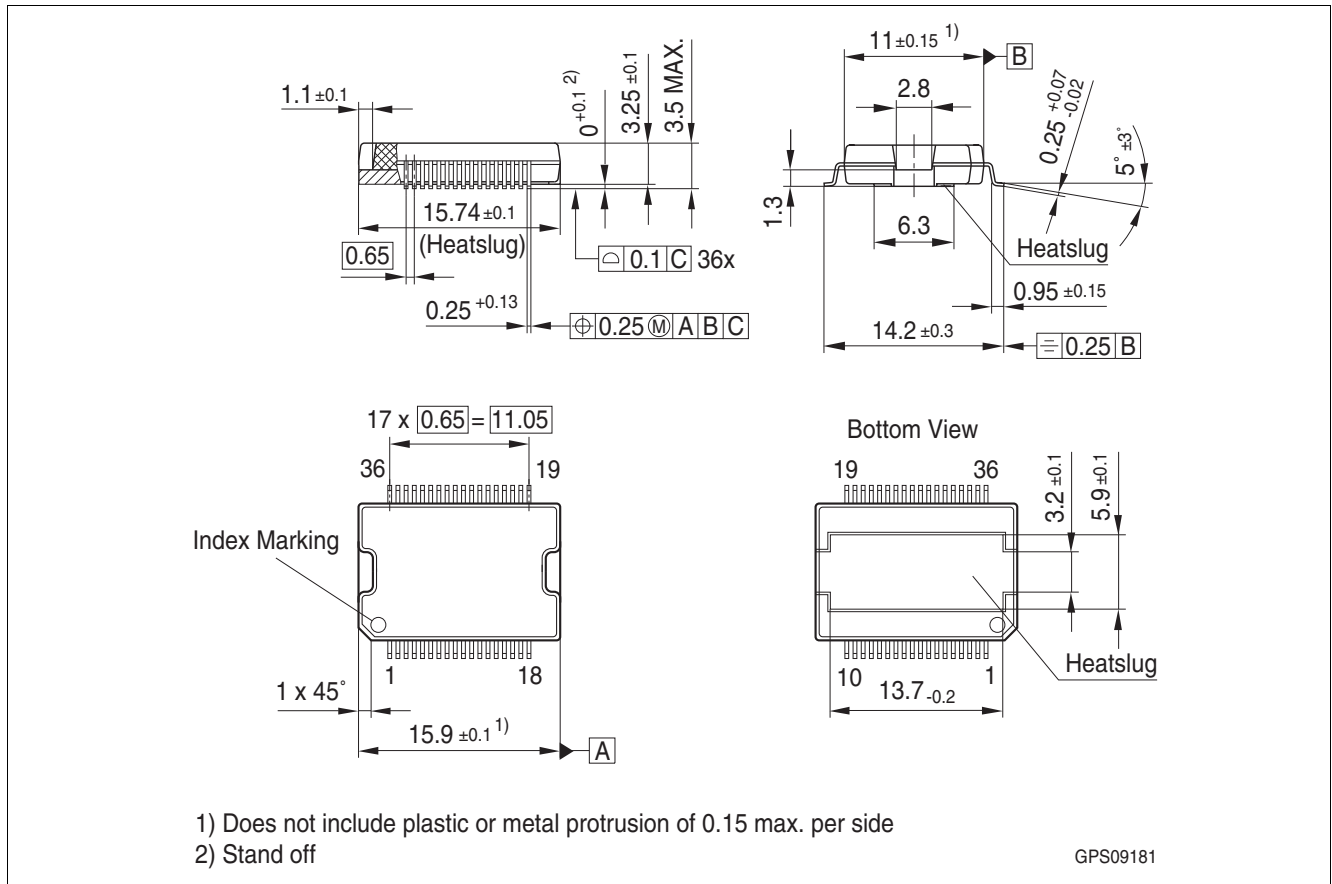


Figure 3 PG-DSO-36-26

Green Product (RoHS compliant)

To meet the world-wide customer requirements for environmentally friendly products and to be compliant with government regulations the device is available as a green product. Green products are RoHS-Compliant (i.e. Pb-free finish on leads and suitable for Pb-free soldering according to IPC/JEDEC J-STD-020).

For further information on alternative packages, please visit our website:

<http://www.infineon.com/packages>

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**Revision History****9 Revision History**

<b>Revision</b>	<b>Date</b>	<b>Changes</b>
1.2	2014-12-10	Update of functional description LS-pin on page 13. Changed wording of the sentence : “Therefore you have either to connect the LS-pin to device GND (state 1) or to supply voltage (State 2).” Changed energy formula New style guide.
1.1	2008-09-30	release all pages: added new Infineon logo Initial version of RoHS-compliant derivate of the ITS4880R Page 1 and 17: added RoHS compliance statement and Green product feature Page 1, 17: Package changed to RoHS compliant version Page 18: added Revision history Page 19: update of disclaimer

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