

Smart Highside High Current Power Switch

Features

- Overload protection
- Current limitation
- Short circuit protection
- Overtemperature protection
- Overvoltage protection (including load dump)
- Clamp of negative voltage at output
- Fast deenergizing of inductive loads ¹⁾
- Low ohmic inverse current operation
- Reverse battery protection
- Diagnostic feedback with load current sense
- Open load detection via current sense
- Loss of V_{bb} protection²⁾
- **Electrostatic discharge (ESD)** protection

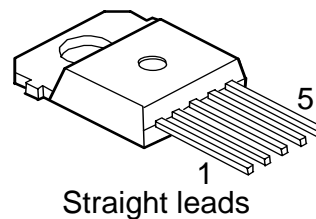
Product Summary

Overvoltage protection	$V_{bb(AZ)}$	63	V
Output clamp	$V_{ON(CL)}$	42	V
Operating voltage	$V_{bb(on)}$	5.0 ... 34	V
On-state resistance	R_{ON}	2.9	m Ω
Load current (ISO)	$I_L(ISO)$	132	A
Short circuit current limitation	$I_L(SCp)$	400	A
Current sense ratio	$I_L : I_S$	25 000	

Application

- Power switch with current sense diagnostic feedback for 12V and 24V DC grounded loads
- Most suitable for loads with high inrush current like lamps and motors; all types of resistive and inductive loads
- Replaces electromechanical relays, fuses and discrete circuits

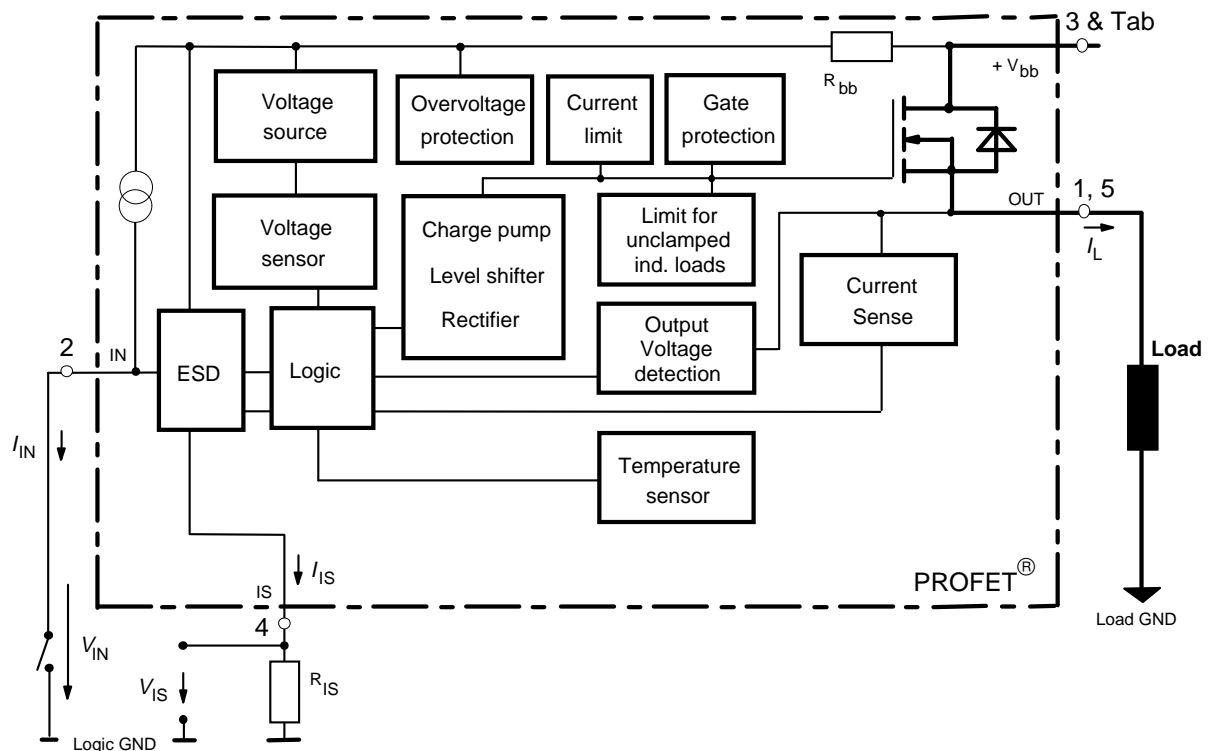
TO-218AB/5



Straight leads

General Description

N channel vertical power FET with charge pump, current controlled input and diagnostic feedback with load current sense, integrated in Smart SiPMOS[®] chip on chip technology. Fully protected by embedded protection functions.



1) With additional external diode.

2) Additional external diode required for energized inductive loads (see page9).

Pin	Symbol	Function
1	OUT O	Output to the load. The pins 1 and 5 must be shorted with each other especially in high current applications ³⁾
2	IN I	Input, activates the power switch in case of short to ground
3	V _{bb} +	Positive power supply voltage, the tab is electrically connected to this pin. In high current applications the tab should be used for the V _{bb} connection instead of this pin ⁴⁾ .
4	IS S	Diagnostic feedback providing a sense current proportional to the load current; zero current on failure (see Truth Table on page 7)
5	OUT O	Output to the load. The pins 1 and 5 must be shorted with each other especially in high current applications ³⁾

Maximum Ratings at $T_j = 25\text{ °C}$ unless otherwise specified

Parameter	Symbol	Values	Unit
Supply voltage (overvoltage protection see page 4)	V_{bb}	42	V
Supply voltage for full short circuit protection, resistive load or $L < t_{bd} \mu\text{H}$ $T_{j,start} = -40 \dots +150\text{ °C}$:	V_{bb}	34	V
Load current (short circuit current, see page 5)	I_L	self-limited	A
Load dump protection $V_{LoadDump} = U_A + V_S$, $U_A = 13.5\text{ V}$ $R_1^{5)} = 2\ \Omega$, $R_L = 0.1\ \Omega$, $t_d = 200\text{ ms}$, IN, IS = open or grounded	$V_{Load\ dump}^{6)}$	80	V
Operating temperature range	T_j	-40 ... +150	°C
Storage temperature range	T_{stg}	-55 ... +150	
Power dissipation (DC), $T_C \leq 25\text{ °C}$	P_{tot}	310	W
Inductive load switch-off energy dissipation, single pulse $V_{bb} = 12\text{ V}$, $T_{j,start} = 150\text{ °C}$, $T_C = 150\text{ °C const.}$, $I_L = t_{bd} (>=20)\text{ A}$, $Z_L = t_{bd}\text{ mH}$, $0\ \Omega$, see diagrams on page 10	E_{AS}	tbd	J
Electrostatic discharge capability (ESD) Human Body Model acc. MIL-STD883D, method 3015.7 and ESD assn. std. S5.1-1993, $C = 100\text{ pF}$, $R = 1.5\text{ k}\Omega$	V_{ESD}	2.0	kV
Current through input pin (DC)	I_{IN}	+15, -250	mA
Current through current sense status pin (DC) see internal circuit diagrams on page 8	I_{IS}	+15, -250	

3) Not shorting all outputs will considerably increase the on-state resistance, reduce the peak current capability and decrease the current sense accuracy

4) Otherwise add up to $0.5\text{ m}\Omega$ (depending on used length of the pin) to the R_{ON} if the pin is used instead of the tab.

5) R_1 = internal resistance of the load dump test pulse generator.

6) $V_{Load\ dump}$ is setup without the DUT connected to the generator per ISO 7637-1 and DIN 40839.



Thermal Characteristics

Parameter and Conditions	Symbol	Values			Unit
		min	typ	max	
Thermal resistance chip - case: junction - ambient (free air):	$R_{thJC}^{7)}$	--	--	0.40	K/W
	R_{thJA}	--	30	--	

Electrical Characteristics

Parameter and Conditions	Symbol	Values			Unit
		min	typ	max	
at $T_j = -40 \dots +150^\circ\text{C}$, $V_{bb} = 12\text{V}$ unless otherwise specified					

Load Switching Capabilities and Characteristics

On-state resistance (Tab to pins 1,5, see measurement circuit page 8) $I_L = \text{tbd} (>=20)\text{A}$, $T_j = 25^\circ\text{C}$: $V_{IN} = 0$, $I_L = \text{tbd} (>=20)\text{A}$, $T_j = 150^\circ\text{C}$: $I_L = \text{tbd A}$, $T_j = 150^\circ\text{C}$: $V_{bb} = \text{tbd V}^8)$, $I_L = \text{tbd A}$, $T_j = 150^\circ\text{C}$:	R_{ON} $R_{ON(Static)}$	--	2.4 4.6 tbd tbd	2.9 5.7 tbd tbd	$m\Omega$
Nominal load current ⁹⁾ (Tab to pins 1,5) ISO 10483-1/6.7: $V_{ON} = 0.5\text{V}$, $T_C = 85^\circ\text{C}$ ¹⁰⁾	$I_{L(ISO)}$	111	132	--	
Maximum load current in resistive range (Tab to pins 1,5) $V_{ON} = 1.8\text{V}$, $T_C = 25^\circ\text{C}$: see diagram on page 13 $V_{ON} = 1.8\text{V}$, $T_C = 150^\circ\text{C}$:	$I_{L(Max)}$	tbd tbd	-- --	-- --	A
Turn-on time ¹¹⁾ I_{IN}  to 90% V_{OUT} :	t_{on}	130	--	550	μs
Turn-off time I_{IN}  to 10% V_{OUT} : $R_L = 1\Omega$, $T_j = -40\dots+150^\circ\text{C}$	t_{off}	60	--	240	
Slew rate on ¹¹⁾ (10 to 30% V_{OUT}) $R_L = 1\Omega$	dV/dt_{on}	--	0.8	--	$\text{V}/\mu\text{s}$
Slew rate off ¹¹⁾ (70 to 40% V_{OUT}) $R_L = 1\Omega$	$-dV/dt_{off}$	--	0.8	--	$\text{V}/\mu\text{s}$

Inverse Load Current Operation

On-state resistance (Pins 1,5 to pin 3) $V_{bIN} = 12\text{V}$, $I_L = -\text{tbd} (>=20)\text{A}$ see diagram on page 10	$T_j = 25^\circ\text{C}$: $T_j = 150^\circ\text{C}$: $R_{ON(inv)}$	--	2.4 4.6	2.9 5.7	$m\Omega$
Nominal inverse load current (Pins 1,5 to Tab) $V_{ON} = -0.5\text{V}$, $T_C = 85^\circ\text{C}$ ¹⁰⁾	$I_{L(inv)}$	111	132	--	
Drain-source diode voltage ($V_{out} > V_{bb}$) $I_L = -\text{tbd} (>=20)\text{A}$, $I_{IN} = 0$, $T_j = +150^\circ\text{C}$	$-V_{ON}$	--	tbd	--	mV

7) Thermal resistance R_{thCH} case to heatsink (about 0.25 K/W with silicone paste) not included!

8) Decrease of V_{bb} below 10 V causes slowly a dynamic increase of R_{ON} to a higher value of $R_{ON(Static)}$. As long as $V_{bIN} > V_{bIN(u) \text{max}}$, R_{ON} increase is less than 10 % per second for $T_j < 85^\circ\text{C}$.

9) Not tested, specified by design.

10) T_j is about 105°C under these conditions.

11) See timing diagram on page 14.

Parameter and Conditions at $T_j = -40 \dots +150^\circ\text{C}$, $V_{bb} = 12\text{V}$ unless otherwise specified	Symbol	Values			Unit
		min	typ	max	

Operating Parameters

Operating voltage ($V_{IN} = 0$) Fehler! Textmarke nicht definiert, 12)	$V_{bb(on)}$	5.0	--	34	V	
Undervoltage shutdown 13)	$V_{bIN(u)}$	--	3.5	4.5	V	
Undervoltage start of charge pump see diagram page 15	$V_{bIN(ucp)}$	--	5	6.5	V	
Overvoltage protection ¹⁴⁾ $I_{bb} = 15\text{ mA}$	$V_{bIN(z)}$	$T_j = -40^\circ\text{C}$: $T_j = 25\dots+150^\circ\text{C}$:	60 62	-- 66	-- --	V
Standby current $I_{IN} = 0$	$I_{bb(off)}$	$T_j = -40\dots+25^\circ\text{C}$: $T_j = 150^\circ\text{C}$:	-- --	15 25	25 60	μA

Protection Functions

Short circuit current limit (Tab to pins 1,5) $V_{ON} = 12\text{V}$, time until shutdown max. $300\mu\text{s}$	$I_L(SCp)$	$T_c = -40^\circ\text{C}$: $T_c = 25^\circ\text{C}$: $T_c = +150^\circ\text{C}$:	-- tbd tbd	460 400 280	-- tbd tbd	A
Short circuit shutdown delay after input current positive slope, $V_{ON} > V_{ON(SC)}$ min. value valid only if input "off-signal" time exceeds $30\mu\text{s}$	$t_d(SC)$		80	--	300	μs
Output clamp ¹⁵⁾ (inductive load switch off)	$-V_{OUT(CL)}$	$I_L = 40\text{ mA}$: $I_L = 20\text{ A}$:	-- --	15 17	-- --	V
Output clamp (inductive load switch off) at $V_{OUT} = V_{bb} - V_{ON(CL)}$ (e.g. overvoltage) $I_L = 40\text{ mA}$	$V_{ON(CL)}$		39	42	46	V
Short circuit shutdown detection voltage (pin 3 to pins 1,5)	$V_{ON(SC)}$		--	6	--	V

¹²⁾ For all voltages $0 \dots 34\text{V}$ the device is fully protected against overtemperature and short circuit.

¹³⁾ $V_{bIN} = V_{bb} - V_{IN}$ see diagram on page 8. When V_{bIN} increases from less than $V_{bIN(u)}$ up to $V_{bIN(ucp)} = 5\text{V}$ (typ.) the charge pump is not active and $V_{OUT} \approx V_{bb} - 3\text{V}$.

¹⁴⁾ See also $V_{ON(CL)}$ in circuit diagram on page 9.

¹⁵⁾ This output clamp can be "switched off" by using an additional diode at the IS-Pin (see page 8). If the diode is used, V_{OUT} is clamped to $V_{bb} - V_{ON(CL)}$ at inductive load switch off.

Parameter and Conditions at $T_j = -40 \dots +150 \text{ }^\circ\text{C}$, $V_{bb} = 12 \text{ V}$ unless otherwise specified	Symbol	Values			Unit
		min	typ	max	
Thermal overload trip temperature	T_{jt}	150	--	--	$^\circ\text{C}$
Thermal hysteresis	ΔT_{jt}	--	10	--	K

Reverse Battery

Reverse battery voltage ¹⁶⁾	$-V_{bb}$	--	--	16	V
On-state resistance (Pins 1,5 to pin 3) $T_j = 25 \text{ }^\circ\text{C}$: $V_{bb} = -12 \text{ V}$, $V_{IN} = 0$, $I_L = -\text{tbd}$ (≥ 20) A, $R_{IS} = 1 \text{ k}\Omega$ $T_j = 150 \text{ }^\circ\text{C}$:	$R_{ON(\text{rev})}$	--	2.8 0	tbd 0	$\text{m}\Omega$
Integrated resistor in V_{bb} line	R_{bb}	--	120	--	Ω

Diagnostic Characteristics

Current sense ratio, static on-condition, $k_{ILIS} = I_L : I_{IS}$, $V_{ON} < 1.5 \text{ V}^{17)}$, $V_{IS} < V_{OUT} - 5 \text{ V}$, $V_{bIN} > 4.5 \text{ V}$	k_{ILIS}	-40 $^\circ\text{C}$: 25 $^\circ\text{C}$: 150 $^\circ\text{C}$:	-- -- --	26 530 25 430 23 520	-- -- --
see diagram on page 12 $I_L = 180 \text{ A}$: $I_L = 50 \text{ A}$: $I_L = 25 \text{ A}$: $I_L = 10 \text{ A}$: $I_{IN} = 0$ (e.g. during deenergizing of inductive loads):				-40 $^\circ\text{C}$: +25 $^\circ\text{C}$: 150 $^\circ\text{C}$: $\pm 4.5\%$ $\pm 4.2\%$ $\pm 4.0\%$ $\pm 8.9\%$ $\pm 7.5\%$ $\pm 6.1\%$ $\pm 15\%$ $\pm 12\%$ $\pm 9.0\%$ $\pm 46\%$ $\pm 36\%$ $\pm 24\%$	
Sense current saturation	$I_{IS,lim}$		6.5	--	--
Current sense leakage current $I_{IN} = 0$, $V_{IS} = 0$: $V_{IN} = 0$, $V_{IS} = 0$, $I_L \leq 0$:	$I_{IS(LL)}$ $I_{IS(LH)}$		--	--	0.5 --
Current sense settling time ¹⁸⁾ after positive input slope (90% of I_{IS} static) $I_L = 0 / \text{tbd}$ (≥ 20) A:	$t_{son(IS)}$		--	tbd	500
Current sense settling time ¹⁸⁾ after negative input slope (10% of I_{IS} static) $I_L = \text{tbd}$ (≥ 20) / 0 A:	$t_{soff(IS)}$		--	tbd	500
Current sense settling time ¹⁸⁾ after change of load current (60% to 90%) $I_L = 15 / \text{tbd}$ (≥ 20) A:	$t_{slc(IS)}$		--	tbd	500
Overvoltage protection $I_{bb} = 15 \text{ mA}$	$V_{bIS(Z)}$	$T_j = -40 \text{ }^\circ\text{C}$: $T_j = 25 \dots +150 \text{ }^\circ\text{C}$:	60 62	-- 66	-- --

¹⁶⁾ The reverse load current through the intrinsic drain-source diode has to be limited by the connected load (as it is done with all polarity symmetric loads). Note that under off-conditions ($I_{IN} = I_{IS} = 0$) the power transistor is not activated. This results in raised power dissipation due to the higher voltage drop across the intrinsic drain-source diode. The temperature protection is not active during reverse current operation! Increasing reverse battery voltage capability is simply possible as described on page 9.

¹⁷⁾ If V_{ON} is higher, the sense current is no longer proportional to the load current due to sense current saturation, see $I_{IS,lim}$.

¹⁸⁾ Not tested, specified by design.

Parameter and Conditions at $T_j = -40 \dots +150 \text{ }^\circ\text{C}$, $V_{bb} = 12 \text{ V}$ unless otherwise specified	Symbol	Values			Unit
		min	typ	max	

Input

Input and operating current (see diagram page 13) IN grounded ($V_{IN} = 0$)	$I_{IN(on)}$	--	1	2	mA
Input current for turn-off ¹⁹⁾	$I_{IN(off)}$	--	--	80	μA

Truth Table

	Input current level	Output level	Current Sense I_{IS}	Remark
Normal operation	L H	L H	0 nominal	$=I_L / k_{IIS}$, up to $I_{IS}=I_{IS,lim}$
Very high load current	H	H	$I_{IS,lim}$	up to $V_{ON}=V_{ON(Fold\ back)}$ I_{IS} no longer proportional to I_L
Current-limitation	H	H	0	$V_{ON} > V_{ON(Fold\ back)}$ if $V_{ON} > V_{ON(SC)}$, shutdown will occur
Short circuit to GND	L	L	0	
	H	L	0	
Over-temperature	L	L	0	
	H	L	0	
Short circuit to V_{bb}	L	H	0	
	H	H	<nominal ²⁰⁾	
Open load	L	Z ²¹⁾	0	
	H	H	0	
Negative output voltage clamp	L	L	0	
Inverse load current	L	H	0	
	H	H	0	

L = "Low" Level

H = "High" Level

Overtemperature reset via input: $I_{IN}=\text{low}$ and $T_j < T_{jt}$ (see diagram on page Fehler! Textmarke nicht definiert.)

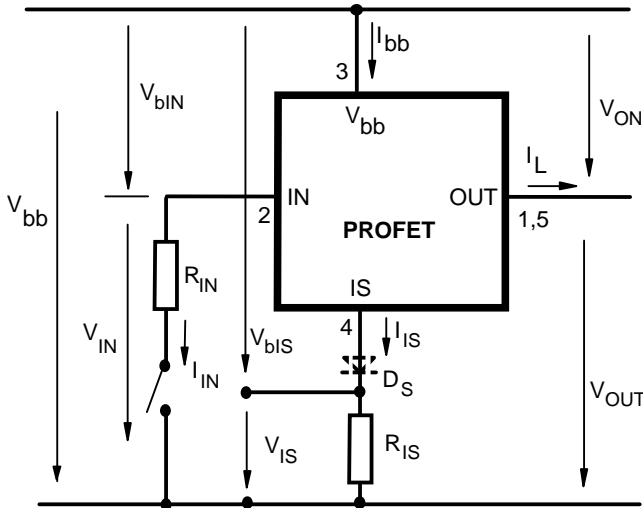
Short circuit to GND: Shutdown remains latched until next reset via input (see diagram on page 14)

¹⁹⁾ We recommend the resistance between IN and GND to be less than $0.5 \text{ k}\Omega$ for turn-on and more than $500 \text{ k}\Omega$ for turn-off. Consider that when the device is switched off ($I_{IN} = 0$) the voltage between IN and GND reaches almost V_{bb} .

²⁰⁾ Low ohmic short to V_{bb} may reduce the output current I_L and can thus be detected via the sense current I_{IS} .

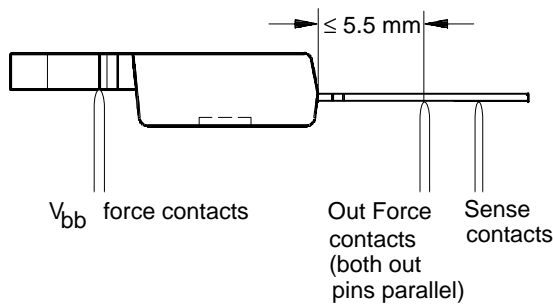
²¹⁾ Power Transistor "OFF", potential defined by external impedance.

Terms

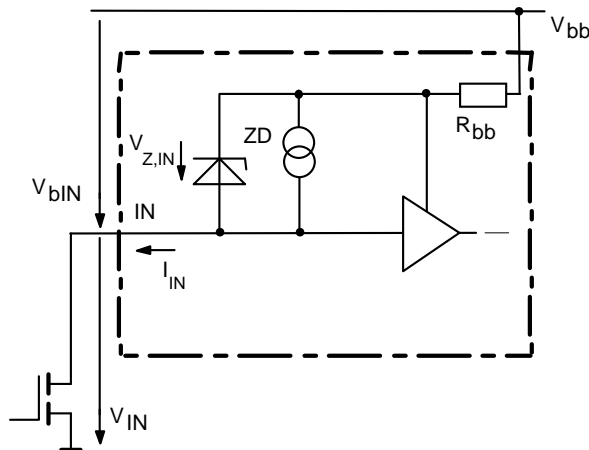


Two or more devices can easily be connected in parallel to increase load current capability.

R_{ON} measurement layout

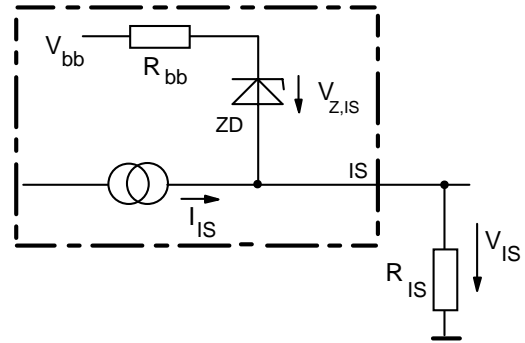


Input circuit (ESD protection)



When the device is switched off ($I_{IN} = 0$) the voltage between IN and GND reaches almost V_{bb} . Use a mechanical switch, a bipolar or MOS transistor with appropriate breakdown voltage as driver.
 $V_{Z,IN} = 66 \text{ V (typ.)}$.

Current sense status output

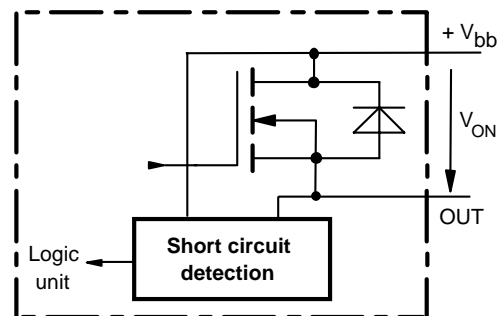


$V_{Z,IS} = 66 \text{ V (typ.)}$, $R_{IS} = 1 \text{ k}\Omega$ nominal (or $1 \text{ k}\Omega / n$, if n devices are connected in parallel). $I_S = I_L / K_{IIS}$ can be only driven by the internal circuit as long as $V_{out} - V_{IS} > 5 \text{ V}$. If you want to measure load currents up to $I_{L(M)}$, R_{IS} should be less than $\frac{V_{bb} - 5 \text{ V}}{I_{L(M)} / K_{IIS}}$.

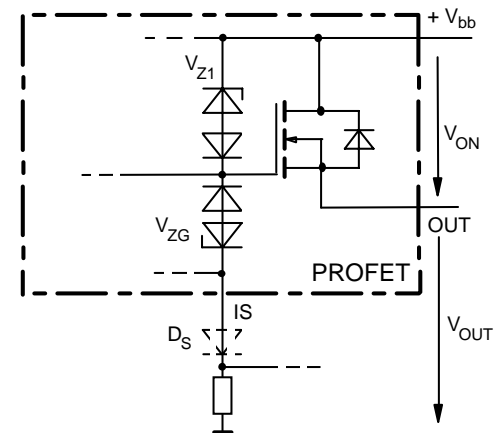
Note: For large values of R_{IS} the voltage V_{IS} can reach almost V_{bb} . See also overvoltage protection. If you don't use the current sense output in your application, you can leave it open.

Short circuit detection

Fault Condition: $V_{ON} > V_{ON(SC)}$ (6 V typ.) and $t > t_{d(SC)}$ ($80 \dots 300 \mu\text{s}$).



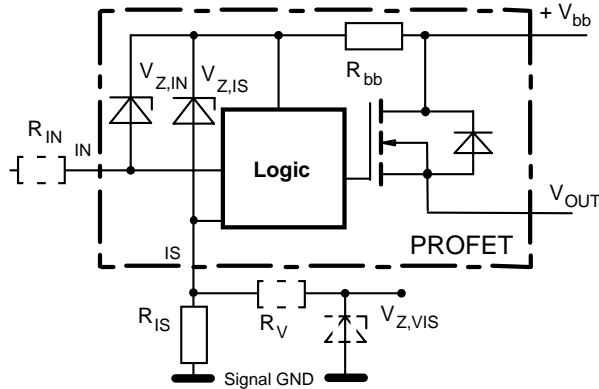
Inductive and overvoltage output clamp



V_{ON} is clamped to $V_{ON(CL)} = 42 \text{ V typ.}$ At inductive load switch-off without D_S , V_{OUT} is clamped to $V_{OUT(CL)} = -15 \text{ V typ.}$ via V_{ZG} . With D_S , V_{OUT} is clamped to $V_{bb} - V_{ON(CL)}$ via V_{Z1} . Using D_S gives faster deenergizing of

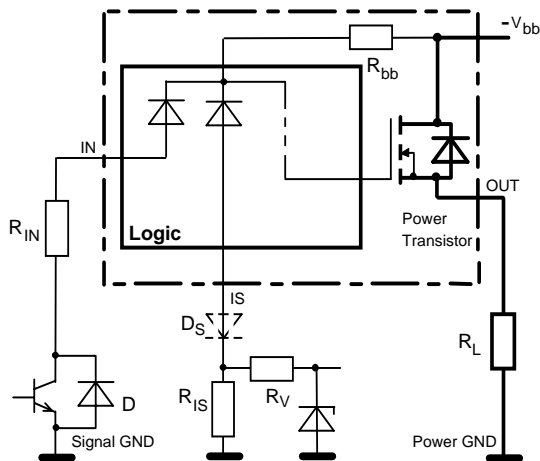
the inductive load, but higher peak power dissipation in the PROFET.

Overvoltage protection of logic part



$R_{bb} = 120\Omega$ typ., $V_{Z,IN} = V_{Z,IS} = 66V$ typ., $R_{IS} = 1k\Omega$ nominal. Note that when overvoltage exceeds $71V$ typ. a voltage above $5V$ can occur between IS and GND, if R_V , $V_{Z,VIS}$ are not used.

Reverse battery protection



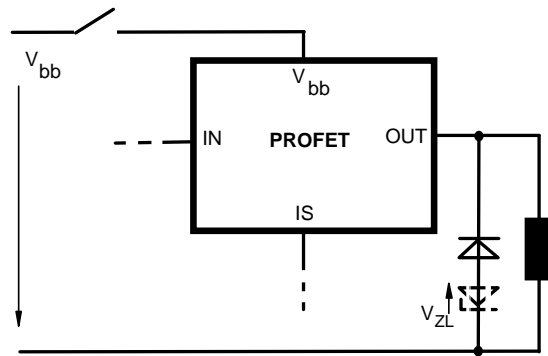
$R_V \geq 1k\Omega$, $R_{IS} = 1k\Omega$ nominal. Add R_{IN} for reverse battery protection in applications with V_{bb} above $16V^{(16)}$; recommended value: $\frac{1}{R_{IN}} + \frac{1}{R_{IS}} + \frac{1}{R_V} = \frac{0.1A}{|V_{bb}| - 12V}$ if D_S is not used (or $\frac{1}{R_{IN}} = \frac{0.1A}{|V_{bb}| - 12V}$ if D_S is used).

To minimize power dissipation at reverse battery operation, the summarized current into the IN and IS pin should be about $120mA$. The current can be provided by using a small signal diode D in parallel to the input switch, by using a MOSFET input switch or by proper adjusting the current through R_{IS} and R_V .

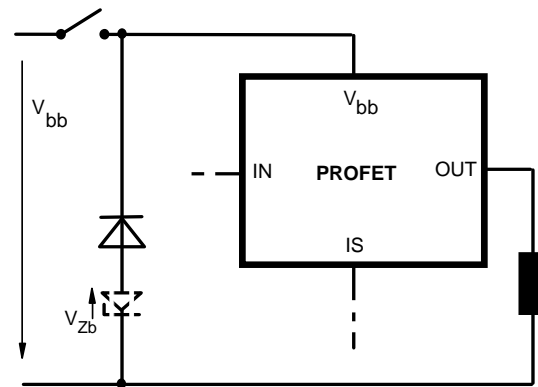
V_{bb} disconnect with energized inductive load

Provide a current path with load current capability by using a diode, a Z-diode, or a varistor. ($V_{ZL} < 72V$ or $V_{Zb} < 30V$ if $R_{IN}=0$). For higher clamp voltages currents at IN and IS have to be limited to $250mA$.

Version a:

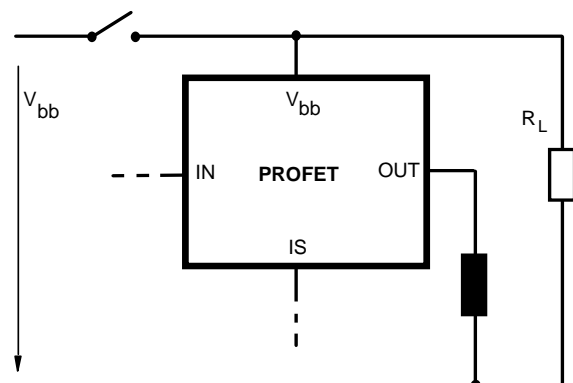


Version b:

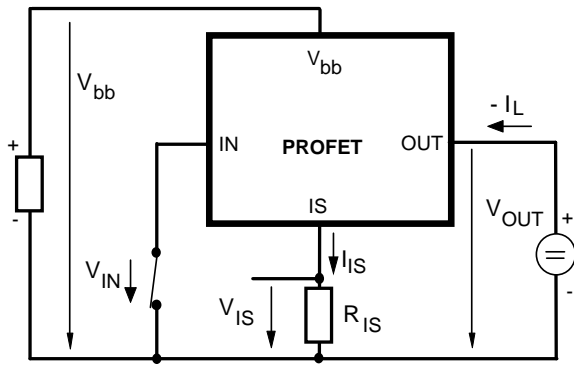


Note that there is no reverse battery protection when using a diode without additional Z-diode V_{ZL} , V_{Zb} .

Version c: Sometimes a necessary voltage clamp is given by non inductive loads R_L connected to the same switch and eliminates the need of clamping circuit:



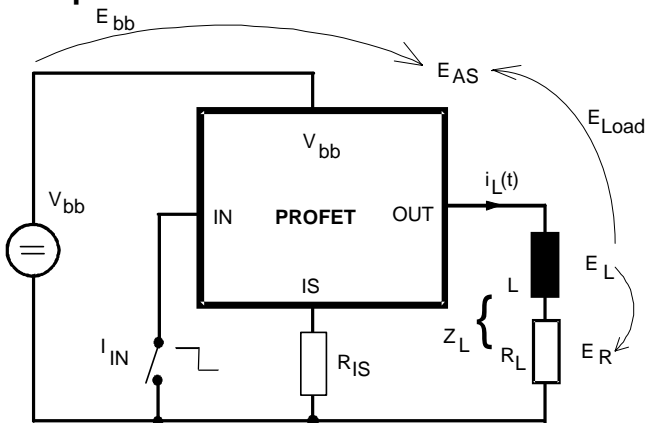
Inverse load current operation



The device is specified for inverse load current operation ($V_{OUT} > V_{bb} > 0V$). The current sense feature is not available during this kind of operation ($I_{IS} = 0$). With $I_{IN} = 0$ (e.g. input open) only the intrinsic drain source diode is conducting resulting in considerably increased power dissipation. If the device is switched on ($V_{IN} = 0$), this power dissipation is decreased to the much lower value $R_{ON(INV)} \cdot I^2$ (specifications see page 4).

Note: *Temperature protection during inverse load current operation is not possible!*

Inductive load switch-off energy dissipation



Energy stored in load inductance:

$$E_L = \frac{1}{2} \cdot L \cdot I_L^2$$

While demagnetizing load inductance, the energy dissipated in PROFET is

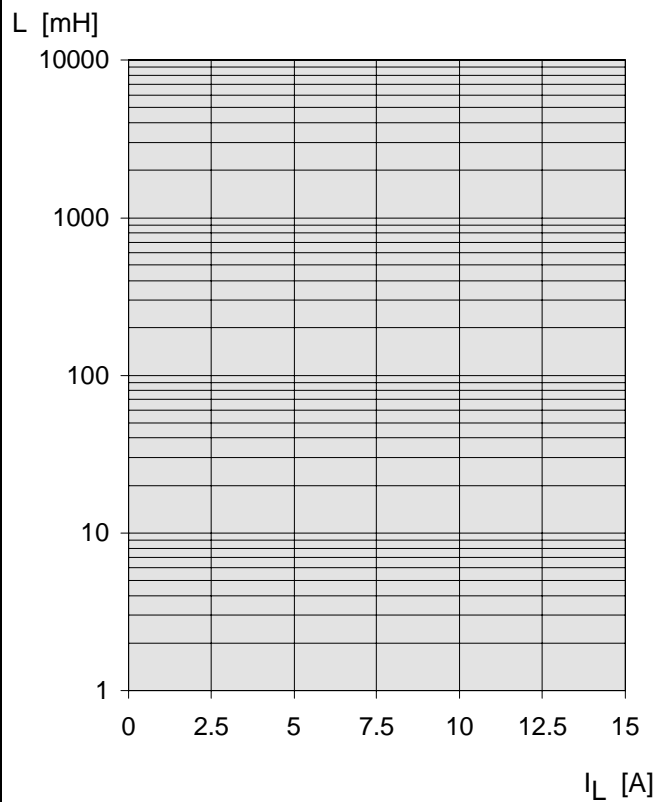
$$E_{AS} = E_{bb} + E_L - E_R = \int V_{ON(CL)} \cdot i_L(t) dt,$$

with an approximate solution for $R_L > 0 \Omega$:

$$E_{AS} = \frac{I_L \cdot L}{2 \cdot R_L} (V_{bb} + |V_{OUT(CL)}|) \ln \left(1 + \frac{I_L \cdot R_L}{|V_{OUT(CL)}|} \right)$$

Maximum allowable load inductance for a single switch off

$L = f(I_L)$; $T_{j,start} = 150^\circ C$, $V_{bb} = 12V$, $R_L = 0 \Omega$



Options Overview

Type	BTS	550P 650P	555
Overtemperature protection with hysteresis $T_j > 150\text{ °C}$, latch function ²²⁾		X	X
$T_j > 150\text{ °C}$, with auto-restart on cooling		X	
Short circuit to GND protection switches off when $V_{ON} > 6\text{ V}$ typ. (when first turned on after approx. $180\text{ }\mu\text{s}$)		X	X
Overvoltage shutdown		-	-
Output negative voltage transient limit to $V_{bb} - V_{ON(CL)}$ to $V_{OUT} = -15\text{ V}$ typ		X X ²³⁾	X X ²³⁾

²²⁾ Latch except when $V_{bb} - V_{OUT} < V_{ON(SC)}$ after shutdown. In most cases $V_{OUT} = 0\text{ V}$ after shutdown ($V_{OUT} \neq 0\text{ V}$ only if forced externally). So the device remains latched unless $V_{bb} < V_{ON(SC)}$ (see page 5). No latch between turn on and $t_{d(SC)}$.

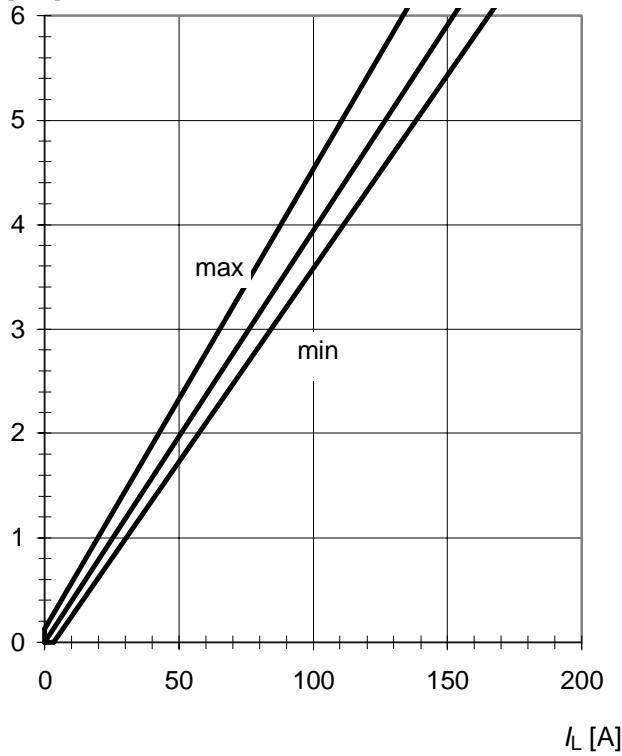
²³⁾ Can be "switched off" by using a diode D_S (see page 8) or leaving open the current sense output.

Characteristics

Current sense versus load current:

$$I_{IS} = f(I_L)$$

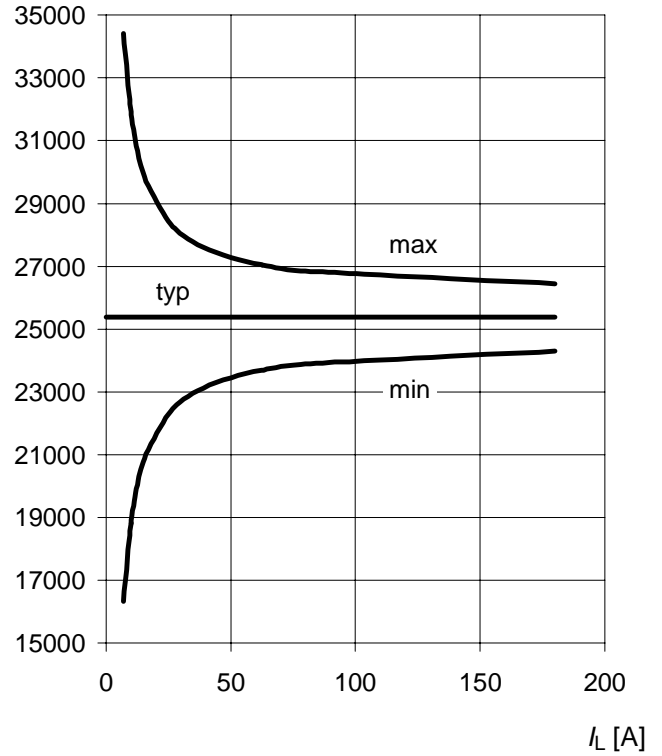
I_{IS} [mA]



Current sense ratio:

$$K_{ILIS} = f(I_L), T_J = 25\text{ °C}$$

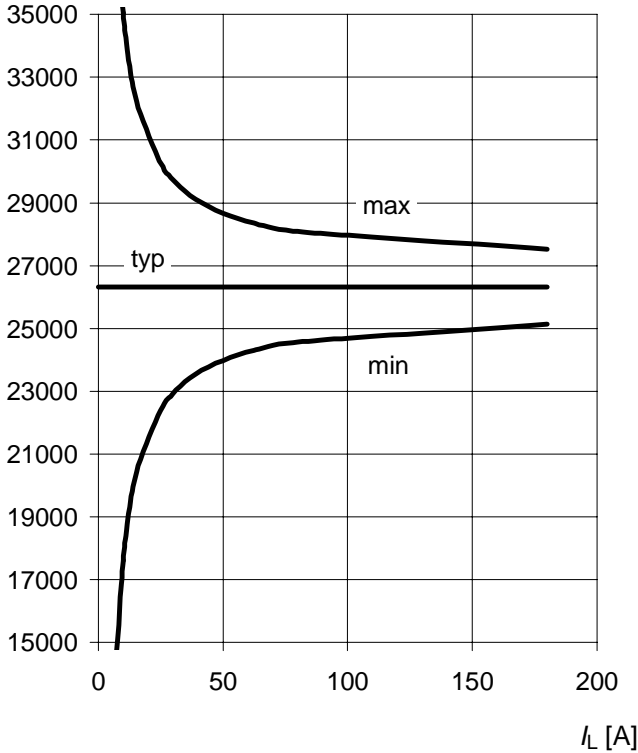
K_{ILIS}



Current sense ratio:

$$K_{ILIS} = f(I_L), T_J = -40\text{ °C}$$

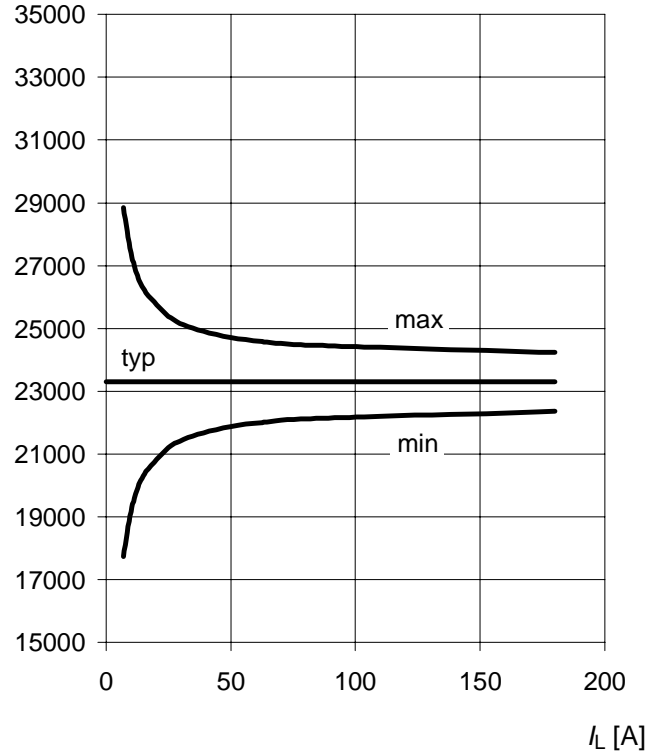
K_{ILIS}



Current sense ratio:

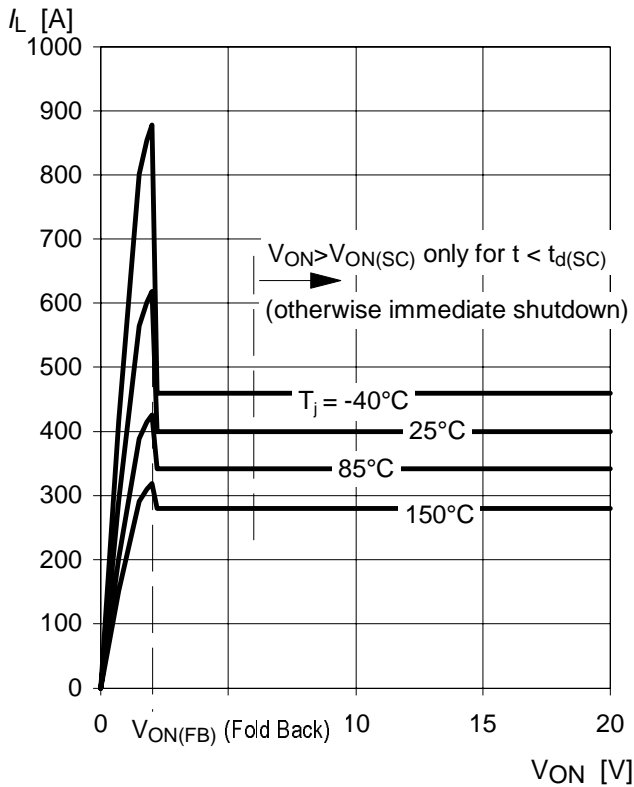
$$K_{ILIS} = f(I_L), T_J = 150\text{ °C}$$

K_{ILIS}



Typ. current limitation characteristic

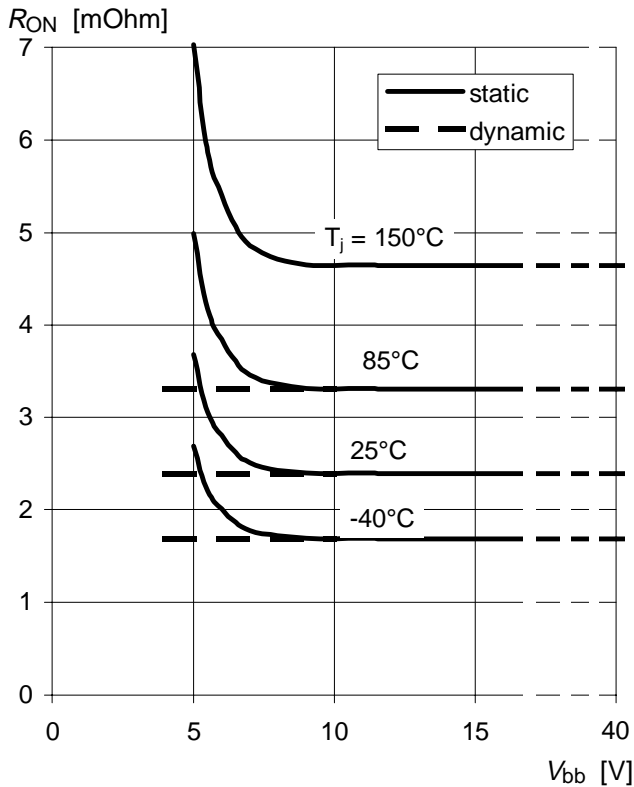
$$I_L = f(V_{ON}, T_j)$$



In case of $V_{ON} > V_{ON(SC)}$ (typ. 6 V) the device will be switched off by internal short circuit detection.

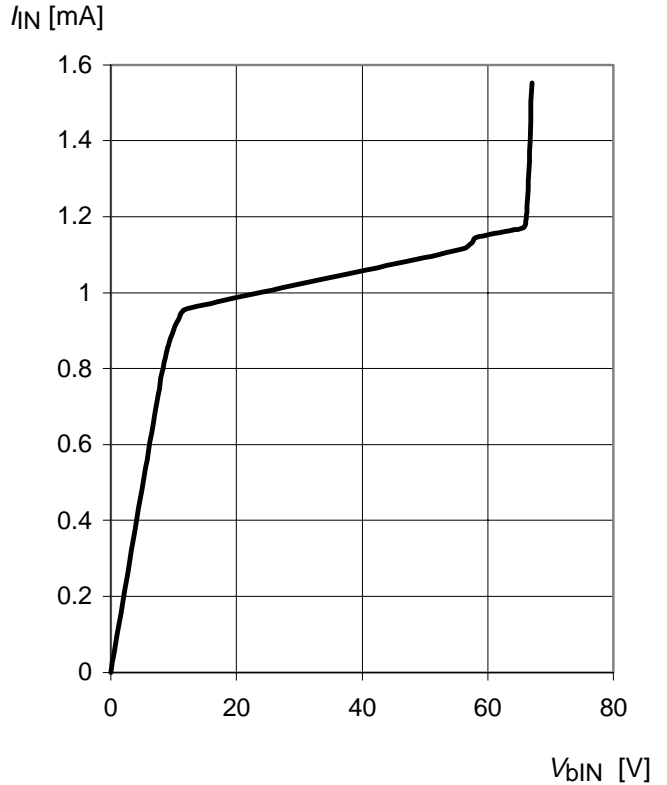
Typ. on-state resistance

$$R_{ON} = f(V_{bb}, T_j); I_L = t_{bd} (>=20) \text{ A}; V_{IN} = 0$$



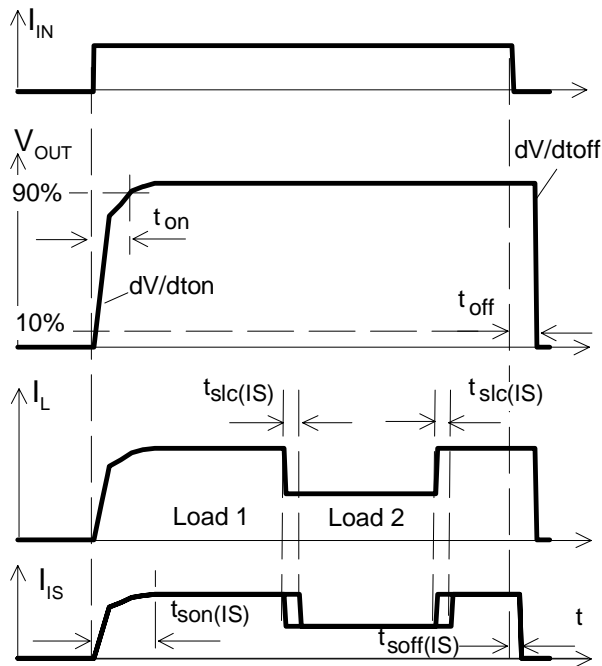
Typ. input current

$$I_{IN} = f(V_{bIN}), V_{bIN} = V_{bb} - V_{IN}$$



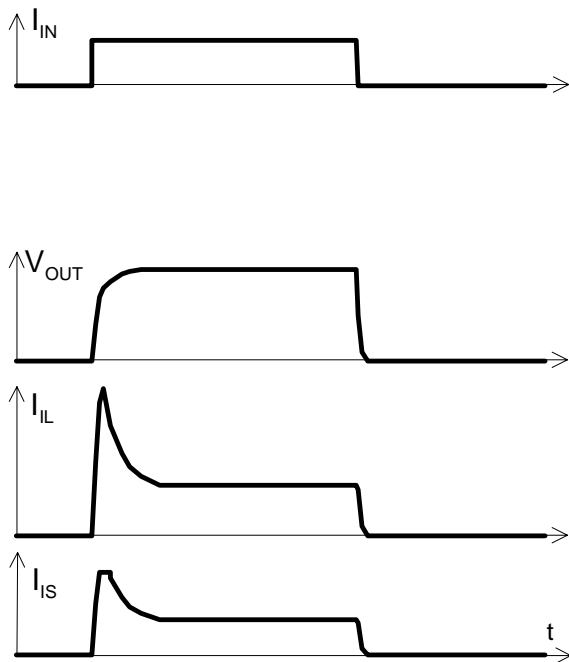
Timing diagrams

Figure 1a: Switching a resistive load, change of load current in on-condition:



The sense signal is not valid during a settling time after turn-on/off and after change of load current.

Figure 2a: Switching motors and lamps:



Sense current saturation can occur at very high inrush currents (see $I_{IS,lim}$ on page 6).

Figure 2b: Switching an inductive load:

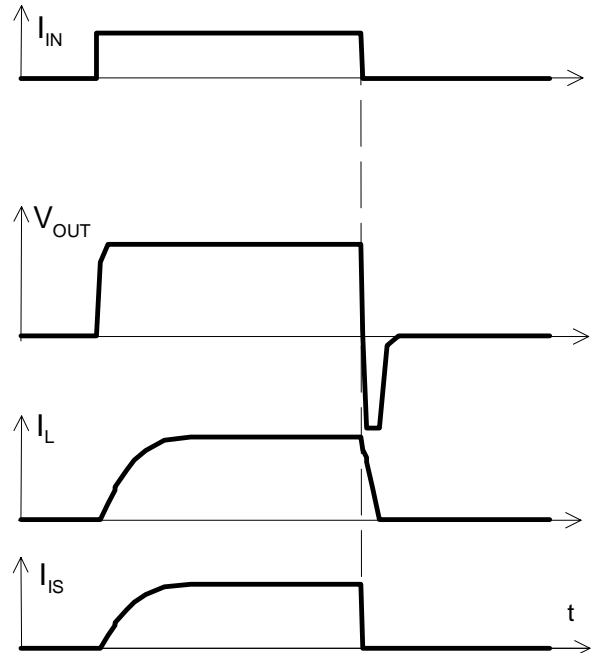
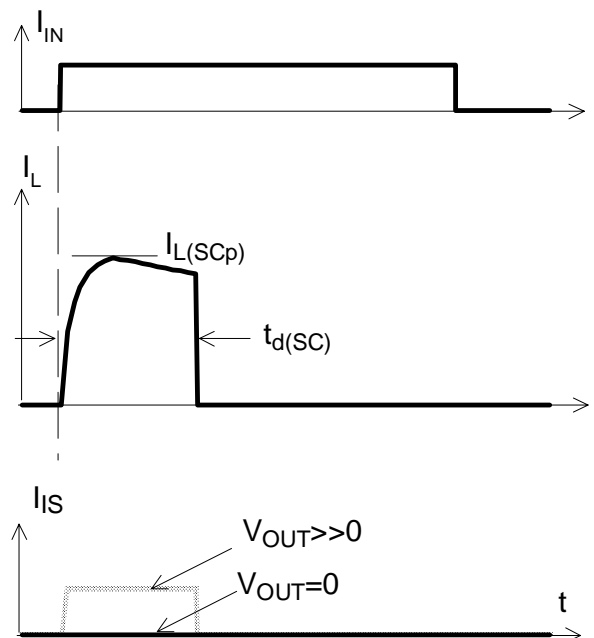


Figure 3a: Short circuit:

shut down by short circuit detection, reset by $I_{IN} = 0$.



Shut down remains latched until next reset via input.

Figure 4a: Overtemperature, Reset if (I_{IN} =low) and ($T_j < T_{jt}$)

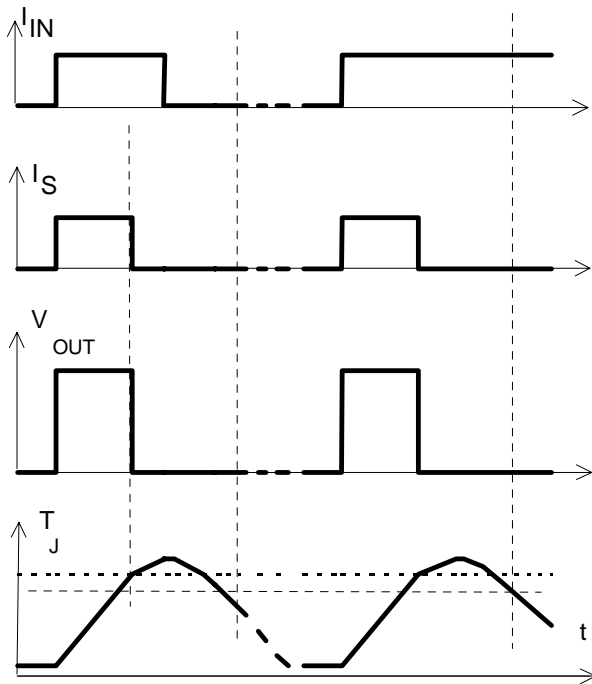
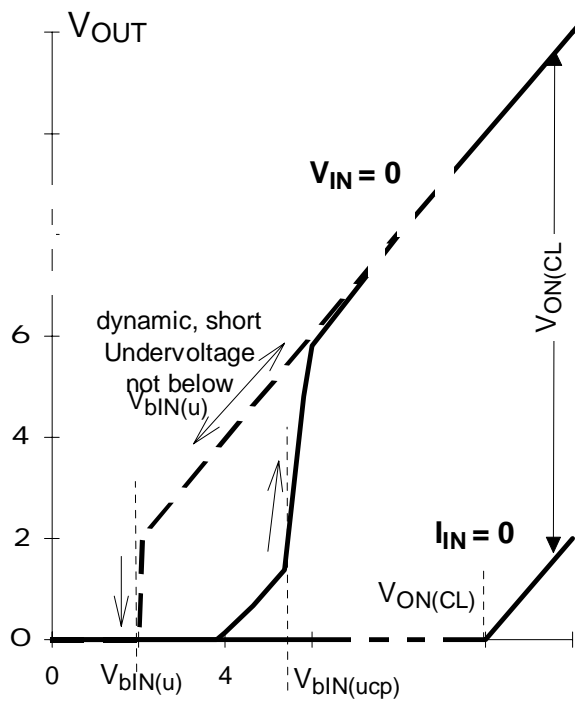


Figure 6a: Undervoltage restart of charge pump, overvoltage clamp



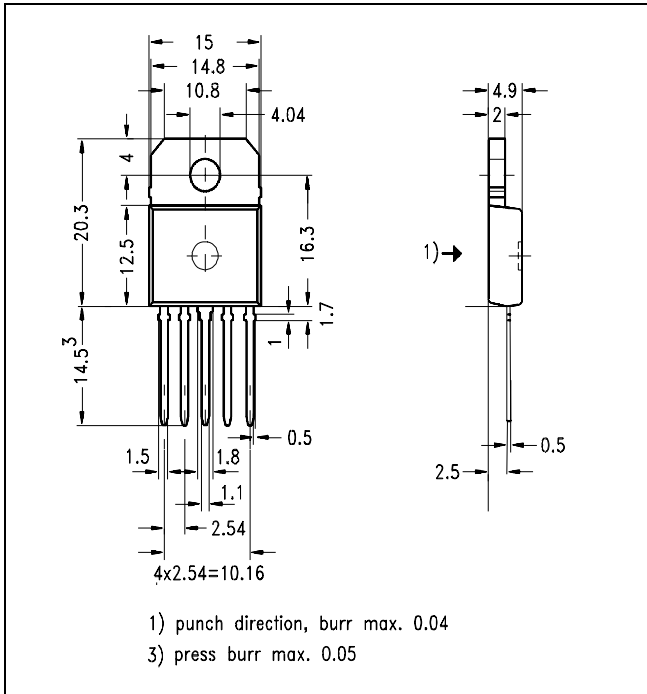
Package and Ordering Code

All dimensions in mm

TO-218AB/5 Option E3146 Ordering code

BTS555 E3146

Q67060-S6953A3



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