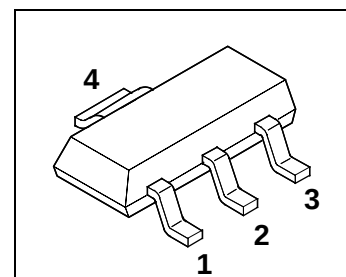


MiniSmart

- High-side switch
- Short-circuit protection
- Overtemperature protection with hysteresis
- Overload protection
- Overvoltage protection
- Reverse battery protection¹⁾
- Switching inductive load
- Clamp of negative output voltage with inductive loads
- Maximum current internally limited



Package: SOT 223

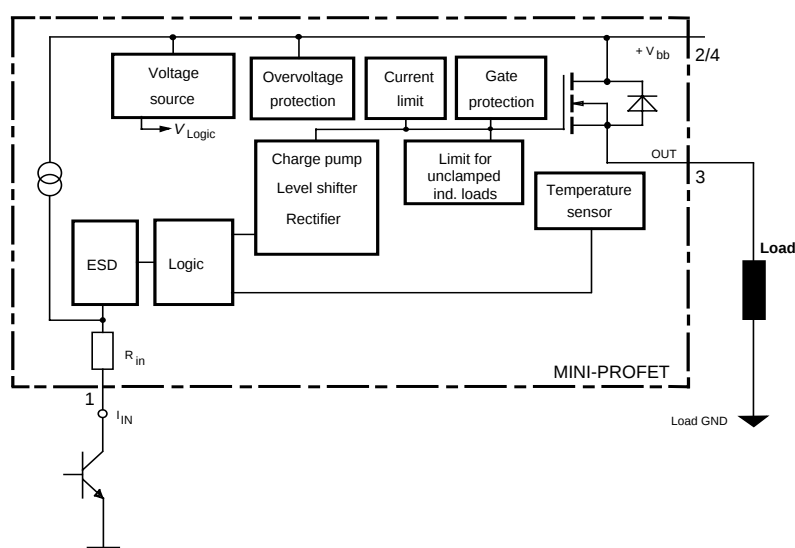
Type	Ordering code
BSP 365	Q67050-M1

Pins:

1	2	3	4
IN	V_{bb}	OUT	V_{bb}

Maximum Ratings

Parameter	Symbol	Values	Unit
Supply voltage	V_{bb}	65	V
Load current self-limited	I_L	$I_{L(SC)}$	A
Maximum current through input pin (DC) see internal circuit diagram	I_{IN}	± 15	mA
Inductive load switch-off energy dissipation	E_{AS}	5	mJ
Operating temperature range	T_j	-40 ... +150	°C
Storage temperature range	T_{stg}	-55 ... +150	
Max. power dissipation (DC) ²⁾ $T_A = 25\text{ °C}$	P_{tot}	1.7	W
Thermal resistance chip - soldering point: chip - ambient: ²⁾	R_{thJS}	17	K/W
	R_{thJA}	72	



¹⁾ For 12 V applications only. Reverse load current only limited by connected load.

²⁾ BSP 365 on epoxy pcb 40 mm x 40 mm x 1.5 mm with 6 cm² copper area for V_{bb} connection

Electrical Characteristics

Parameter and Conditions at $T_j = 25^\circ\text{C}$, $V_{bb} = 24\text{ V}$ unless otherwise specified	Symbol	Values			Unit
		min	typ	max	

Load Switching Capabilities and Characteristics

On-state resistance (pin 2 to 3) $I_L = 100\text{ mA}$, pin 1 = GND $T_j = 25^\circ\text{C}$ $T_j = 150^\circ\text{C}$ $I_L = 50\text{ mA}$, $V_{bb} = 4,9\text{ V}$, $T_j = 25^\circ\text{C}$	R_{ON}	--	4 8 --	5 10 15	Ω
Nominal load current (pin 2 to 3) ISO Standard: $V_{ON} = V_{bb} - V_{OUT} = 0,5\text{ V}$ $T_s = 85^\circ\text{C}$	$I_{L(ISO)}$	0.07	--	--	A
Turn-on time to 90% V_{OUT}	t_{on}	--	60	100	μs
Turn-off time to 10% V_{OUT} $R_L = 270\ \Omega$	t_{off}	--	70	100	μs
Slew rate on 10 to 30% V_{OUT} , $R_L = 270\ \Omega$	dV/dt_{on}	--	4	6	$\text{V}/\mu\text{s}$
Slew rate off 70 to 40% V_{OUT} , $R_L = 270\ \Omega$	$-dV/dt_{off}$	--	2	6	$\text{V}/\mu\text{s}$

Input

OFF state input current $T_j = -40\dots+150^\circ\text{C}$ $R_L = 270\ \Omega$, $V_{OUT} \leq 0,1\text{ V}$	$I_{IN(off)}$	--	--	0.05	mA
ON state input current, (pin 1 grounded) ³⁾ $T_j = -40\dots+150^\circ\text{C}$	$I_{IN(on)}$	--	0.35	1	mA

Operating Parameters

Operating voltage (pin 1 grounded) ⁴⁾ $T_j = -40\dots+150^\circ\text{C}$	$V_{bb(on)}$	4.9	--	60	V
Leakage current (pin 2 to 3, pin 1 open) $T_j = -40\dots+150^\circ\text{C}$ $V_{bb} = 60\text{ V}$, $T_j = -40\dots+150^\circ\text{C}$	$I_{bb(off)}$	--	1.2 --	10 60	μA

³⁾ Driver circuit must be capable to drive currents $>1\text{ mA}$.

⁴⁾ Below $V_{bb}=4.5\text{ V}$ typ. without chargepump, $V_{out} \approx V_{bb} - 2\text{ V}$

Parameter and Conditions at $T_j = 25^\circ\text{C}$, $V_{bb} = 24\text{V}$ unless otherwise specified	Symbol	Values			Unit
		min	typ	max	

Protection Functions

Current limit (pin 2 to 3) ⁵⁾	$T_j = 25^\circ\text{C}$	$I_{L(SC)}$	0.2	0.5	1	A
	$T_j = -40\dots+150^\circ$		0.2	--	1.2	
Thermal overload trip temperature		T_{jt}	150	--	--	$^\circ\text{C}$
Thermal hysteresis		ΔT_{jt}	--	10	--	K
Overvoltage protection	$T_j = -40\dots+150^\circ\text{C}$	$V_{bbin(AZ)}$	65	72	--	V
Output clamp (ind. load switch off) at $V_{OUT} = V_{bb} - V_{ON(CL)}$		$V_{ON(CL)}$	--	72	--	V
Inductive load switch-off energy dissipation ⁶⁾		E_{AS}	--	--	5	mJ
Reverse battery resistor (pin 1 to 2)		R_{IN}	--	1	--	k Ω

Reverse Diode

Continuous reverse drain current	$T_j = 25^\circ\text{C}$	I_S	--	--	0.2	A
Pulsed reverse drain current	$T_j = 25^\circ\text{C}$	I_{SM}	--	--	0.8	A
Diode forward on voltage $I_F = 0.2\text{ A}$, $I_{IN} = \leq 0.05\text{ mA}$		V_{SD}	--	0.9	1.2	V

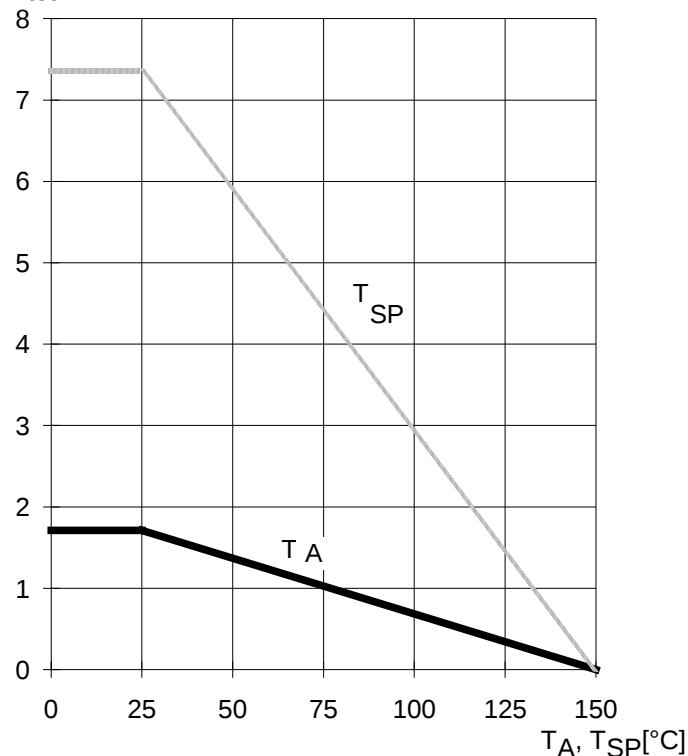
⁵⁾ load current limits onset at $I_L \cdot R_{ON}$ approx. 1V
short circuit protection: combination of current limit and thermal overload switch off

⁶⁾ while demagnetizing load inductance, dissipated energy is $E_{AS} = \int (V_{ON(CL)} \cdot i_L(t) dt$,
approx. $E_{AS} = \frac{1}{2} \cdot L \cdot I_L^2 \cdot \left(\frac{V_{ON(CL)}}{V_{ON(CL)} - V_{bb}} \right)$

Max allowable power dissipation

$$P_{\text{tot}} = f(T_A, T_{\text{SP}})$$

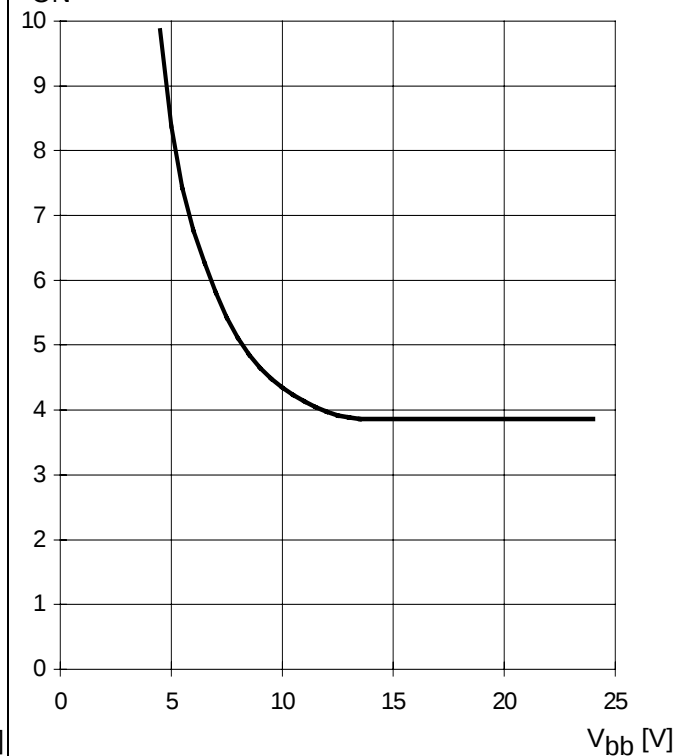
P_{tot} [W]



Typ. on state resistance (V_{bb} pin to OUT pin)

$$R_{\text{ON}} = f(V_{\text{bb}}); I_L = 70 \text{ mA}; T_j = 25^\circ\text{C}$$

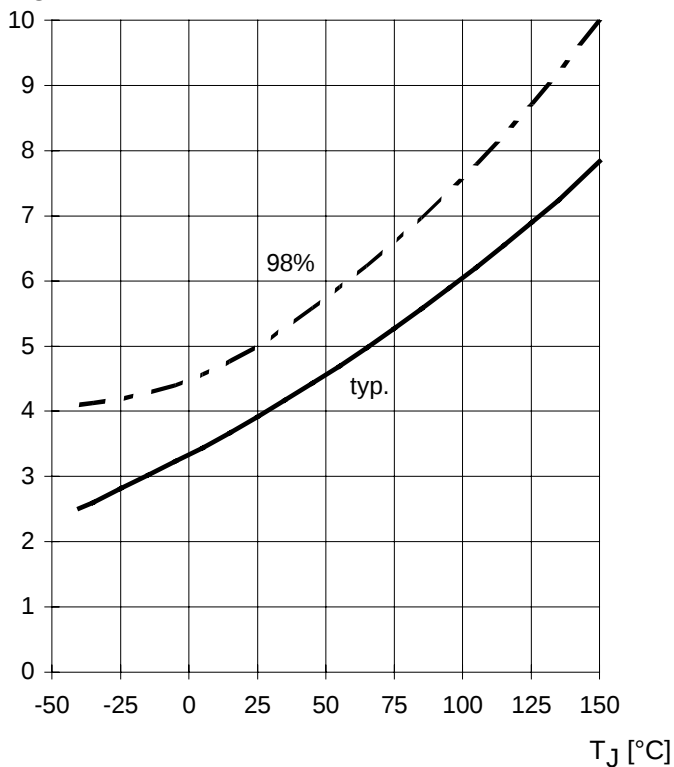
R_{ON} [Ω]



On state resistance (V_{bb} pin to OUT pin)

$$R_{\text{ON}} = f(T_j); V_{\text{bb}} = 13.5 \text{ V}; I_L = 70 \text{ mA}$$

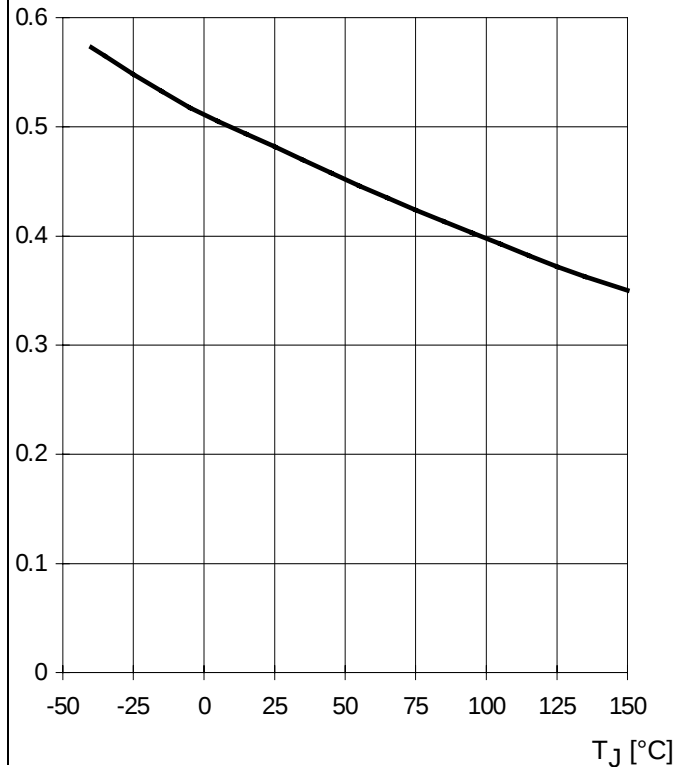
R_{ON} [Ω]



Typ. short circuit current

$$I_{\text{L(SC)}} = f(T_j); V_{\text{bb}} = 13.5 \text{ V}$$

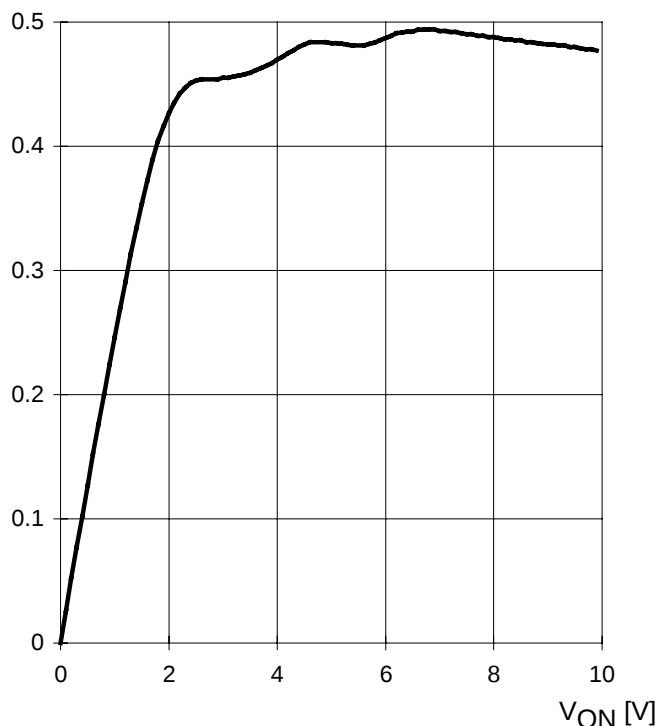
$I_{\text{L(SC)}}$ [A]



Typ. short circuit current

$$I_{L(SC)} = f(V_{ON}); V_{bb} = 13.5V; T_j = 25^\circ C$$

$I_{L(SC)} [A]$

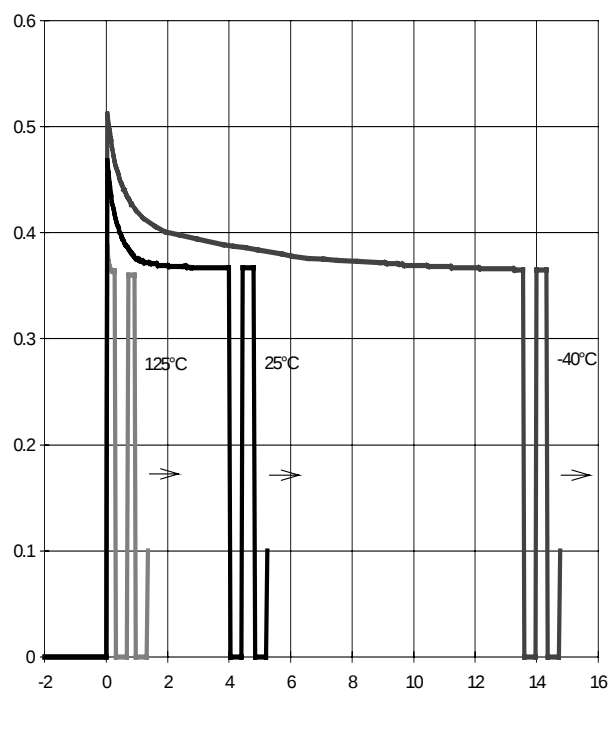


Typ. short circuit current

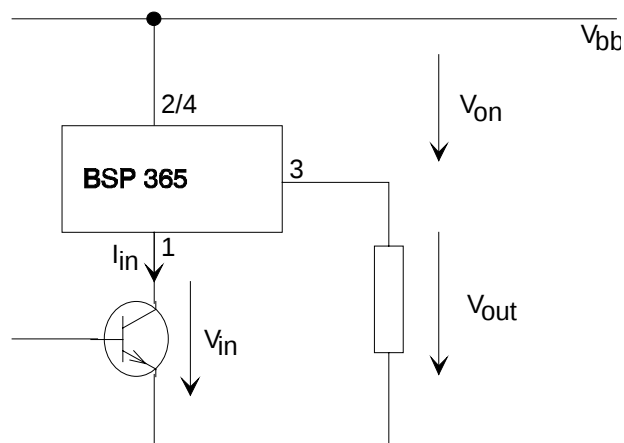
$$I_{L(SC)} = f(t); V_{bb} = 13.5V$$

no heatsink; Parameter: T_{jStart}

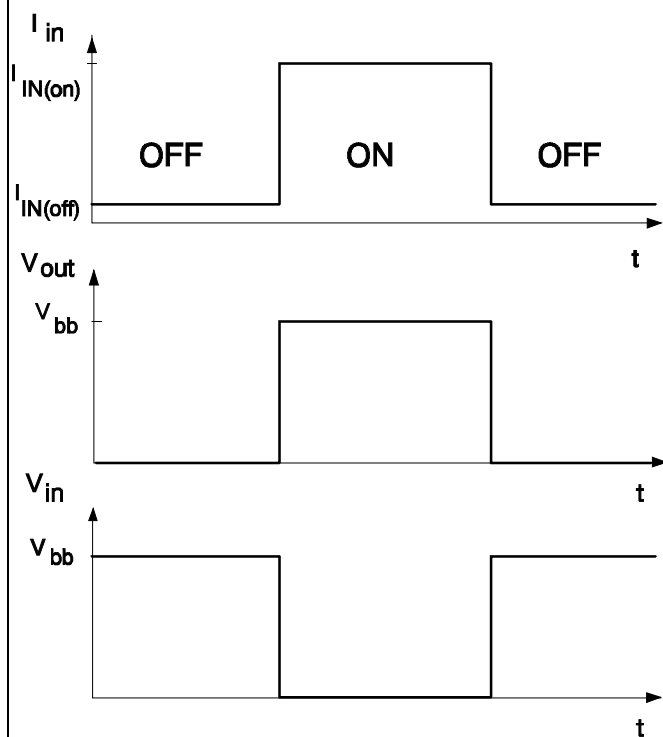
$I_{L(SC)} [A]$



Test circuit

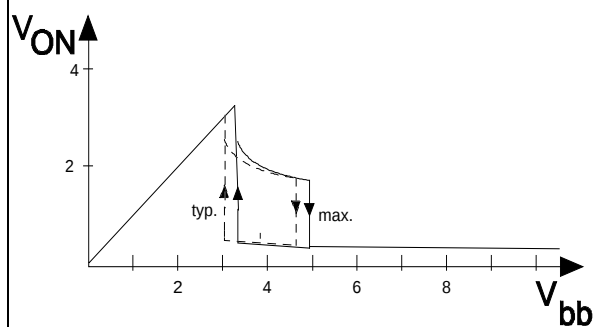


Turn on conditions



Chargepump threshold

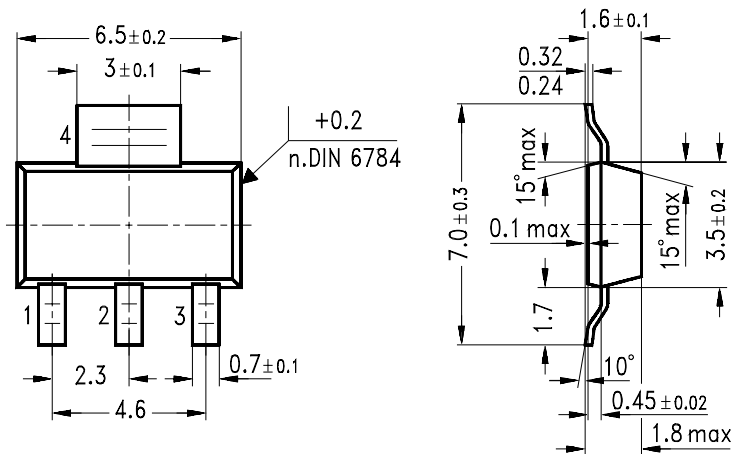
$$V_{ON} = f(V_{bb})$$



Package:

all dimensions in mm.

SOT 223/3:



GPS05560

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