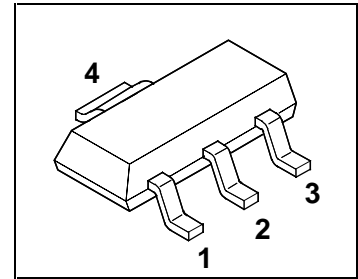


### MiniPROFET

- High-side switch
- Short-circuit protection
- Overtemperature protection with hysteresis
- Overload protection
- Overvoltage protection
- Reverse battery protection<sup>1)</sup>
- Switching inductive load
- Clamp of negative output voltage with inductive loads
- Maximum current internally limited



Package: SOT 223

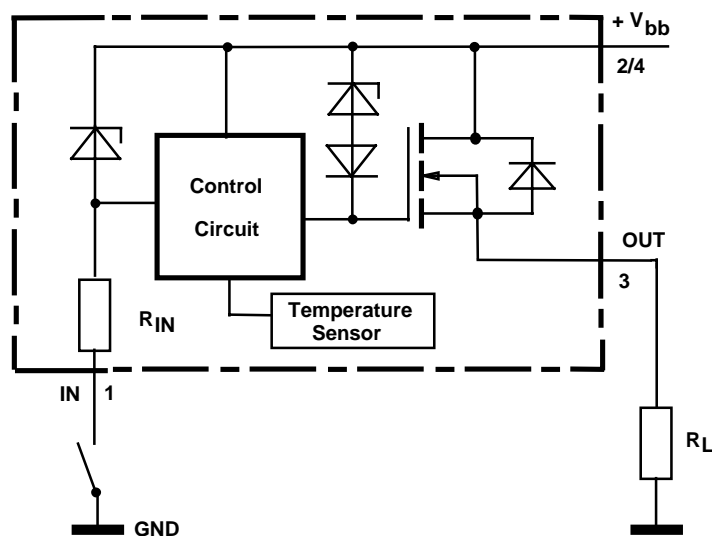
Type	Ordering code
BSP 350	Q67000-S227

Pins:

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

### Maximum Ratings

Parameter	Symbol	Values	Unit
Supply voltage	$V_{bb}$	50	V
Load current	$I_L$	self-limited $I_{L(SC)}$	A
Maximum current through input pin (DC) see internal circuit diagram	$I_{IN}$	$\pm 15$	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) <sup>2)</sup>	$P_{tot}$	$T_A = 25\text{ °C}$ 1.7	W
Thermal resistance	chip - soldering point:	$R_{thJS}$	17
	chip - ambient: <sup>2)</sup>	$R_{thJA}$	72



<sup>1)</sup> For 12 V applications only. Reverse load current only limited by connected load.

<sup>2)</sup> BSP 350 on epoxy pcb 40 mm x 40 mm x 1.5 mm with 6 cm<sup>2</sup> copper area for  $V_{bb}$  connection

**Electrical Characteristics**

Parameter and Conditions at $T_j = 25^\circ\text{C}$ , $V_{bb} = 13.5\text{V}$ unless otherwise specified	Symbol	Values			Unit
		min	typ	max	

**Load Switching Capabilities and Characteristics**

On-state resistance (pin 2 to 3) $I_L = 0.07\text{ A}$ , pin 1 = GND $T_j = 25^\circ\text{C}$ $T_j = 150^\circ\text{C}$ $V_{bb} = 6\text{ V}$ , $T_j = 25^\circ\text{C}$	$R_{ON}$	--	4	5	$\Omega$
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	$\mu\text{s}$
Turn-off time to 10% $V_{OUT}$ $R_L = 270\ \Omega$	$t_{off}$	--	70	140	
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	

**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) <sup>3)</sup> $T_j = -40\dots+150^\circ\text{C}$	$I_{IN(on)}$	--	0.3	1	mA

**Operating Parameters**

Operating voltage (pin 1 grounded) <sup>4)</sup> $T_j = -40\dots+150^\circ\text{C}$	$V_{bb(on)}$	4.9	--	45	V
Leakage current (pin 2 to 3, pin 1 open) $T_j = 25^\circ\text{C}$ $T_j = 150^\circ\text{C}$	$I_{bb(off)}$	--	1	10	$\mu\text{A}$
		--	1.2	10	

<sup>3)</sup> Driver circuit must be capable to drive currents >1mA.

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

Parameter and Conditions at $T_j = 25\text{ °C}$ , $V_{bb} = 13.5\text{V}$ unless otherwise specified	Symbol	Values			Unit
		min	typ	max	

## Protection Functions

Current limit (pin 2 to 3) <sup>5)</sup>	$T_j = 25\text{ °C}$	$I_{L(SC)}$	0.2	0.5	1	A
	$T_j = -40\dots+150\text{ °C}$		0.1	--	1.2	
Thermal overload trip temperature		$T_{jt}$	150	--	--	°C
Thermal hysteresis		$\Delta T_{jt}$	--	20	--	K
Overvoltage protection	$T_j = -40\dots+150\text{ °C}$	$V_{bbin(AZ)}$	50	56	--	V
Output clamp (ind. load switch off) at $V_{OUT} = V_{bb} - V_{ON(CL)}$		$V_{ON(CL)}$	--	56	--	V
Inductive load switch-off energy dissipation <sup>6)</sup>		$E_{AS}$	--	--	5	mJ
Reverse battery resistor (pin 1 to 2)		$R_{IN}$	--	1	--	kΩ

## Reverse Diode

Continuous reverse drain current	$T_j = 25\text{ °C}$	$I_S$	--	--	0.2	A
Pulsed reverse drain current	$T_j = 25\text{ °C}$	$I_{SM}$	--	--	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

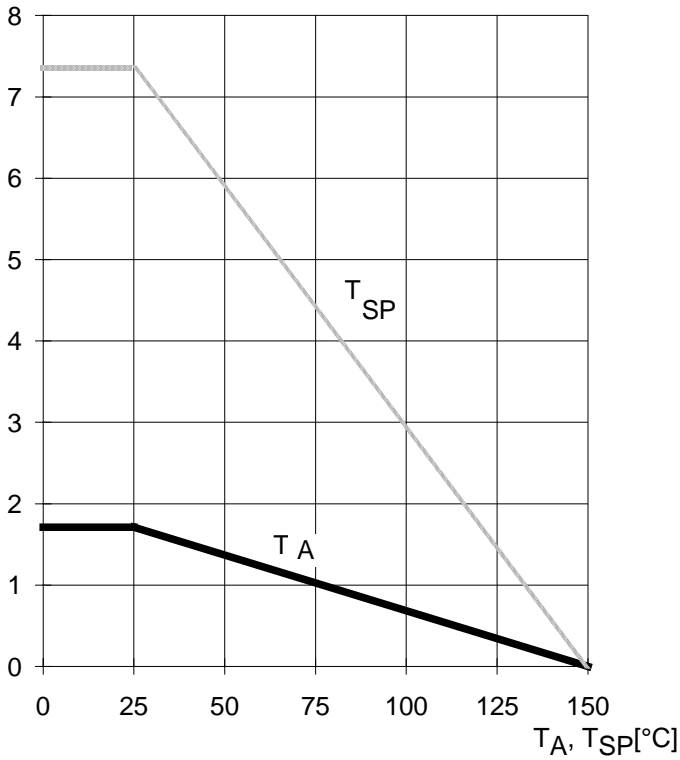
<sup>5)</sup> load current limits onset at  $I_L \cdot R_{ON}$  approx. 1V  
short circuit protection: combination of current limit and thermal overload switch off

<sup>6)</sup> 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

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

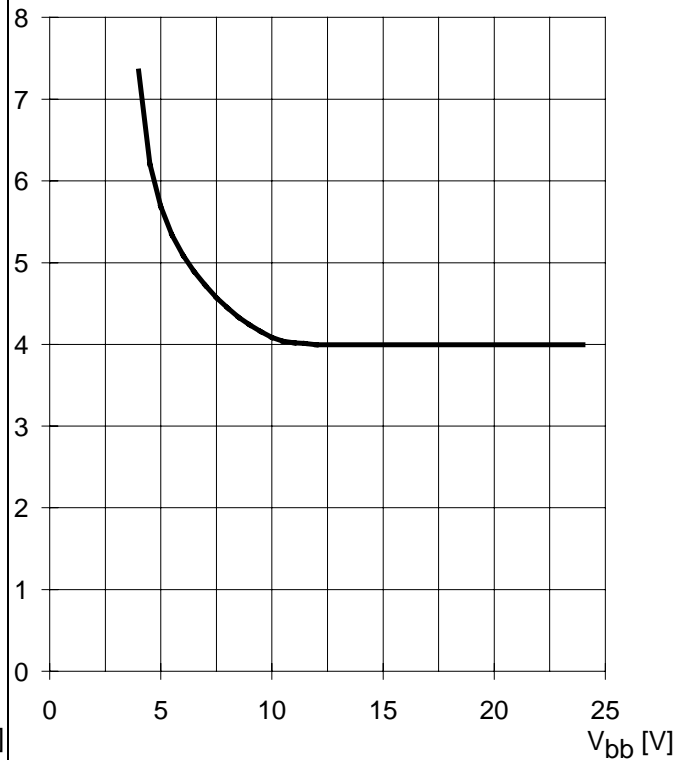
$P_{tot}$  [W]



Typ. on state resistance (Vbb- pin to OUT pin)

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

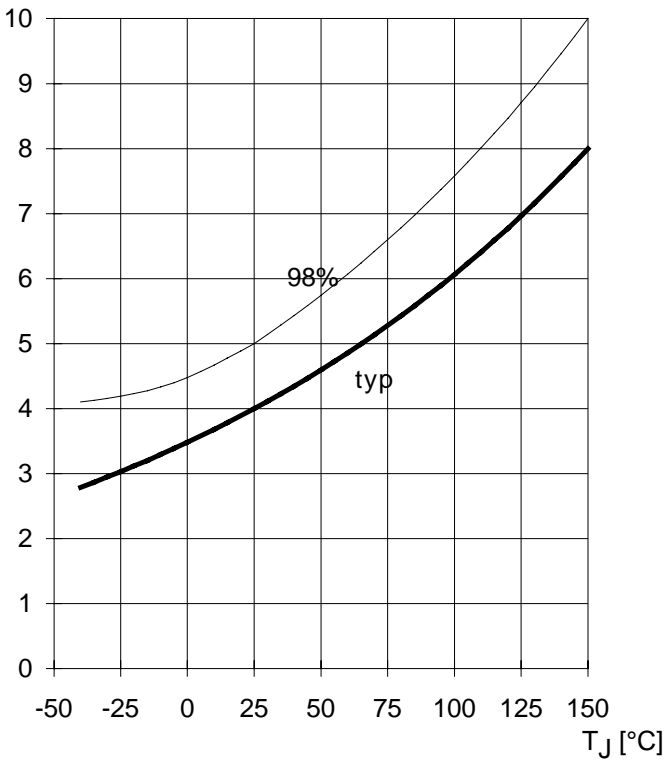
$R_{ON}$  [ $\Omega$ ]



On state resistance (Vbb- pin to OUT pin)

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

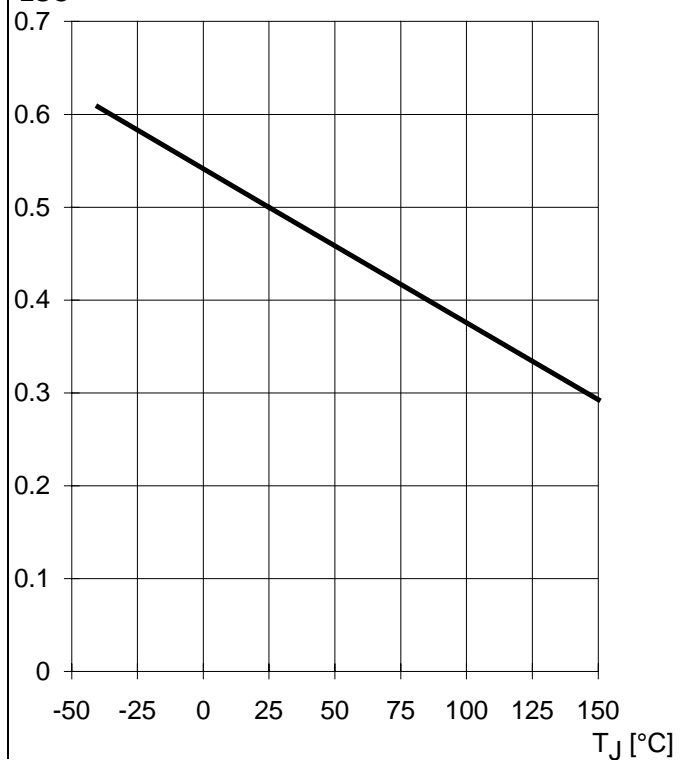
$R_{ON}$  [ $\Omega$ ]



Typ. short circuit current

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

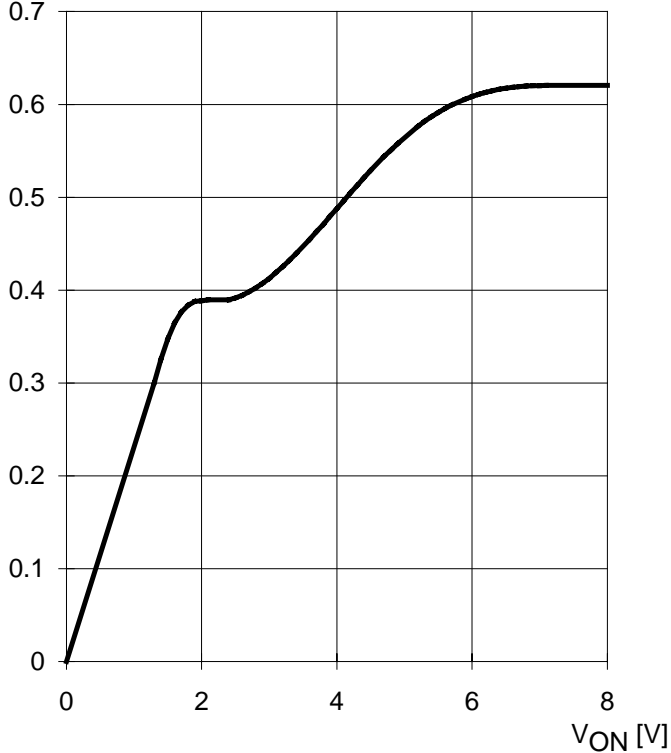
$I_{LSC}$  [A]



Typ. short circuit current

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

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

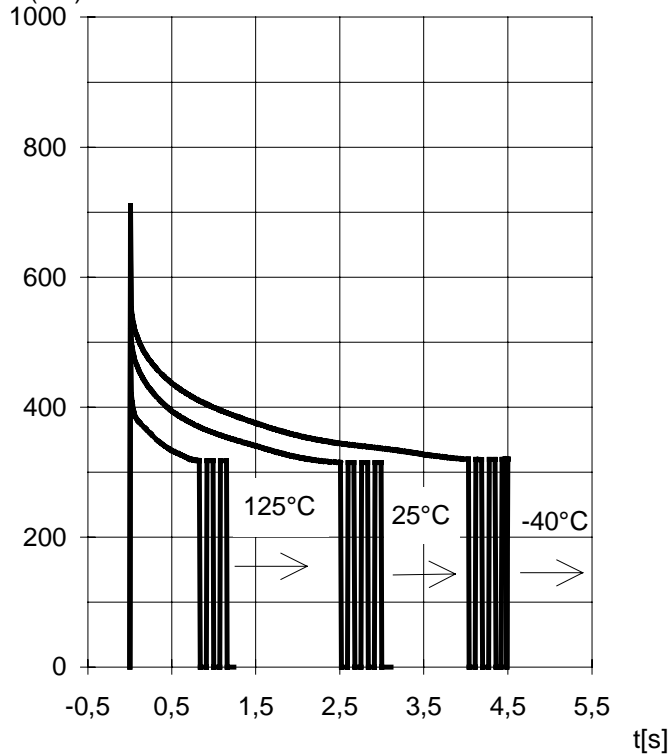


Typ. short circuit current

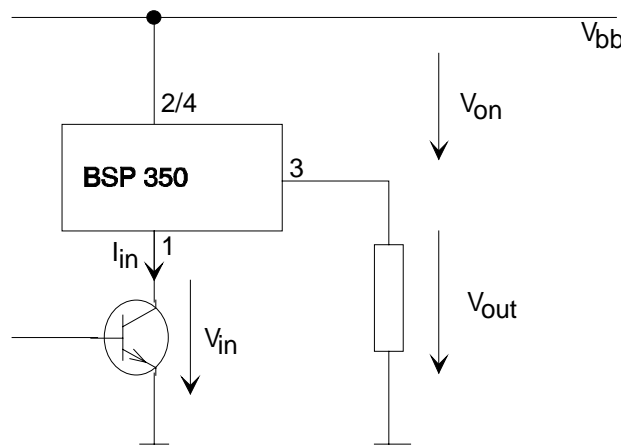
$I_{L(SC)} = f(t); V_{bb} = 13.5V$

no heatsink; Parameter: T<sub>jStart</sub>

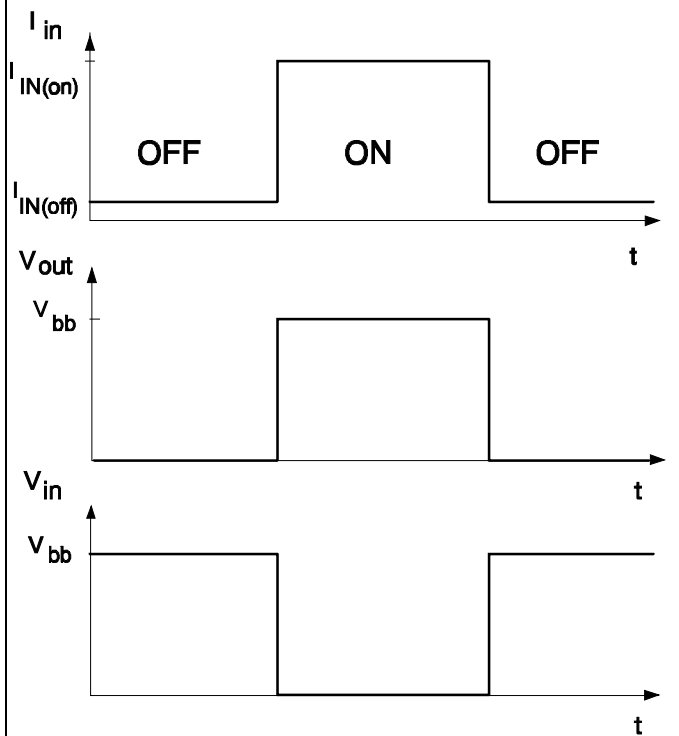
$I_{L(SC)} [mA]$



Test circuit

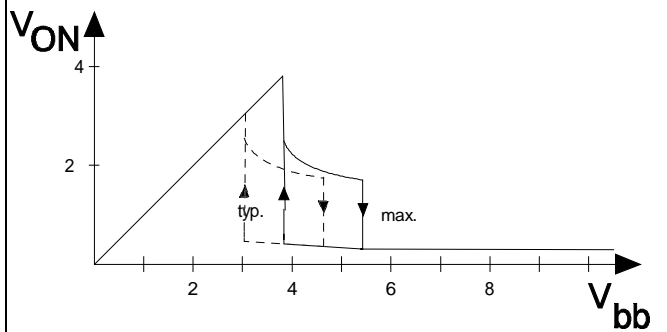


Turn on conditions



Chargepump threshold

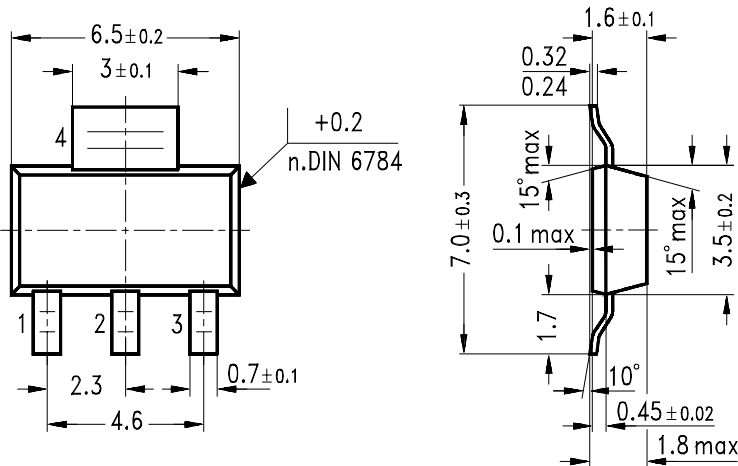
$V_{ON} = f(V_{bb})$



## Package:

all dimensions in mm.

SOT 223/3:



GPS05560

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