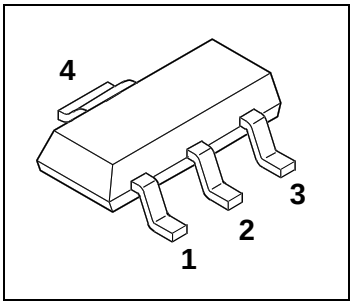
MiniPROFET

- High-side switch
- Short-circuit protection
- Input protection
- Overtemperature protection with hysteresis
- Overload protection
- Overvoltage protection
- Switching inductive load
- Clamp of negative output voltage with inductive loads
- Undervoltage shutdown
- Maximum current internally limited
- **E**lectro**s**tatic **d**ischarge (**ESD**) protection
- Reverse battery protection[1)]



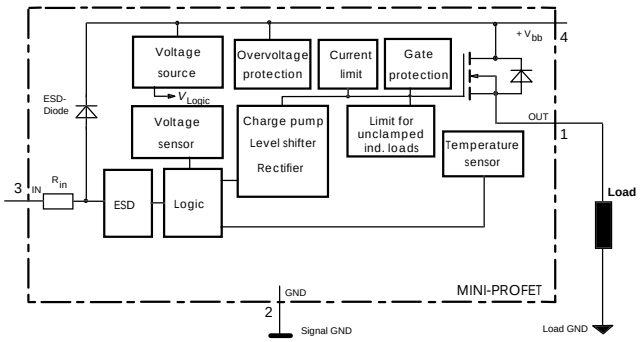
Package: SOT 223

Type	Ordering code
BSP 550	Q67000-S311

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

Maximum Ratings

Parameter	Symbol	Values	Unit
Supply voltage range	V_{bb}	-0.3...48	V
Load current self-limited	I_L	$I_{L(SC)}$	A
Maximum input voltage[2)]	V_{IN}	-5.0... V_{bb}	V
Maximum input current	I_{IN}	±5	mA
Inductive load switch-off energy dissipation single pulse I_L = 1.0A , T_A = 85°C	E_{AS}	0.3	J
Operating temperature range Storage temperature range	T_j T_{stg}	-40 ...+125 -55 ...+150	°C
Max. power dissipation (DC)[3)] T_A = 25 °C	P_{tot}	1.4	W
Electrostatic discharge capability (ESD)[4)]	V_{ESD}	±1	kV
Thermal resistance chip - soldering point: chip - ambient[3)]	R_{thJS} R_{thJA}	7 70	K/W



1) With resistor R_{GND}=150 Ω in GND connection, resistor in series with IN connections reverse load current limited by connected load.
2) At V_{IN} > V_{bb}, the input current is not allowed to exceed ±5 mA.
3) BSP 550 on epoxy pcb 40 mm x 40 mm x 1.5 mm with 6 cm^2 copper area for V_{bb} connection
4) HBM according to MIL-STD 883D, Methode 3015.7

Electrical Characteristics

Parameter and Conditions at T_j = 25 °C, V_{bb} = 24V unless otherwise specified	Symbol	Values			Unit
		min	typ	max	
Load Switching Capabilities and Characteristics					
On-state resistance (pin 4 to 1) I_L = 1.0 A, V_{in} = high T_j = 25°C T_j = 125°C	R_{ON}	-- --	0.16 --	0.2 0.38	Ω
Nominal load current (pin 4 to 1)[5] ISO Standard: V_{ON} = V_{bb} - V_{OUT} = 0.5 V T_S = 85 °C	$I_{L(ISO)}$	1.7	--	--	A
Turn-on time to 90% V_{OUT} Turn-off time to 10% V_{OUT} R_L = 24 Ω	t_{on} t_{off}	-- --	60 90	100 150	µs
Slew rate on 10 to 30% V_{OUT}, R_L = 24 Ω	dV/dt_{on}	--	2	4	V/µs
Slew rate off 70 to 40% V_{OUT}, R_L = 24 Ω	$-dV/dt_{off}$	--	2	4	V/µs
Input					
Allowable input voltage range, (pin 3 to 2)	V_{IN}	-3.0	--	V_{bb}	V
Input turn-on threshold voltage V_{bb} = 18...30V T_j = -25...+125°C	$V_{IN(T+)}$	--	--	3.0	V
Input turn-off threshold voltage V_{bb} = 18...30V T_j = -25...+125°C	$V_{IN(T-)}$	1.82	--	--	V
Input threshold hysteresis	$\Delta V_{IN(T)}$	--	0.1	--	V
Off state input current (pin 3) $V_{IN(off)}$ = 1.82 V T_j = -25...+125°C	$I_{IN(off)}$	20	--	--	µA
On state input current (pin 3) $V_{IN(on)}$ = 3.0 V to V_{bb} T_j = -25...+125°C	$I_{IN(on)}$	--	--	110	µA
Input resistance T_j = -25...+125°C	R_{IN}	1.5	2.8	3.5	kΩ

[5] $I_{L(ISO)}$ characterizes the MOSFET part of the device and may be higher than the shortcircuit $I_{L(SC)}$ current of the whole device

Parameter and Conditions at T_j = 25 °C, V_{bb} = 24V unless otherwise specified	Symbol	Values			Unit
		min	typ	max	
Operating Parameters					
Operating voltage T_j =-25...+125°C	$V_{bb(on)}$	12		40	V
Undervoltage shutdown T_j =-25...+125°C	$V_{bb(under)}$	7	--	10.5	V
Undervoltage restart T_j =-25...+125°C:	$V_{bb(u\ rst)}$	--	--	11	V
Undervoltage hysteresis	$\Delta V_{bb(under)}$	--	0.4	--	V
Standby current (pin 4), V_{in} = low T_j =-25...+100°C T_j =125°C[6]	$I_{bb(off)}$	--	10	25 50	µA
Operating current (pin 2), V_{in} = high T_j =-25...+125°C	I_{GND}	--	1	1.6	mA
leakage current (pin 1) V_{in} = low T_j =-25...+125°C	$I_{L(off)}$	--	--	2	µA
Protection Functions					
Current limit (pin 4 to 1) T_j = 25°C T_j = -25...+125°C	$I_{L(SC)}$	1.4 1.4	2.5 --	4.0 4.8	A
Overvoltage protection I_{bb}=4mA T_j =-25...+125°C	$V_{bb(AZ)}$	48	--	--	V
Output clamp (ind. load switch off) V_{OUT} = V_{bb} - $V_{ON(CL)}$, I_{bb} = 4mA	$V_{ON(CL)}$	--	72	--	V
Thermal overload trip temperature	T_{jt}	135	150	--	°C
Thermal hysteresis	ΔT_{jt}	--	10	--	K
Inductive load switch-off energy dissipation[7] $T_{j\ Start}$ = 85 °C, single pulse, I_L = 1.0 A, V_{bb} = 12 V	E_{AS}	--	--	0.3	J
Reverse Battery					
Reverse battery voltage[8]	$-V_{bb}$			30	V
Continious reverse drain current T_A = 25°C	$-I_S$	--	--	1	A
Drain-Source diode voltage I_F = 1 A, V_{in} = low V_{OUT}>V_{bb}	$-V_{ON}$	--	--	1.2	V

6) increase of standby current at T_j = 125°C caused by temperature sense current

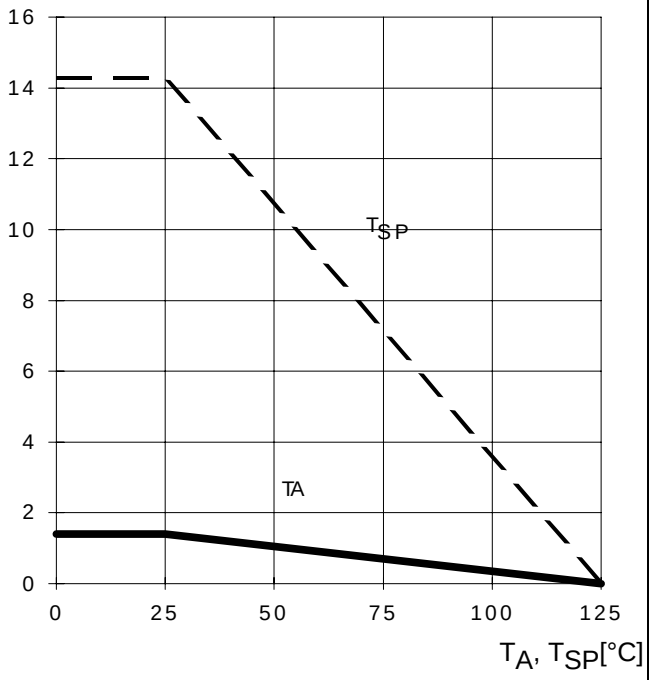
7) while demagnetizing load inductance, dissipated energy is $E_{AS} = \int (V_{ON(CL)} * i_L(t)\ dt$,
approx. $E_{AS} = {}^1/_2 * L * I_L^2 * \left(\frac{V_{ON(CL)}}{V_{ON(CL)} - V_{bb}} \right)$

8) Requires 150 Ω resistor in GND connection. Reverse load current (through intrinsic drain-source diode) is normally limited by the connected load.

Max allowable power dissipation

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

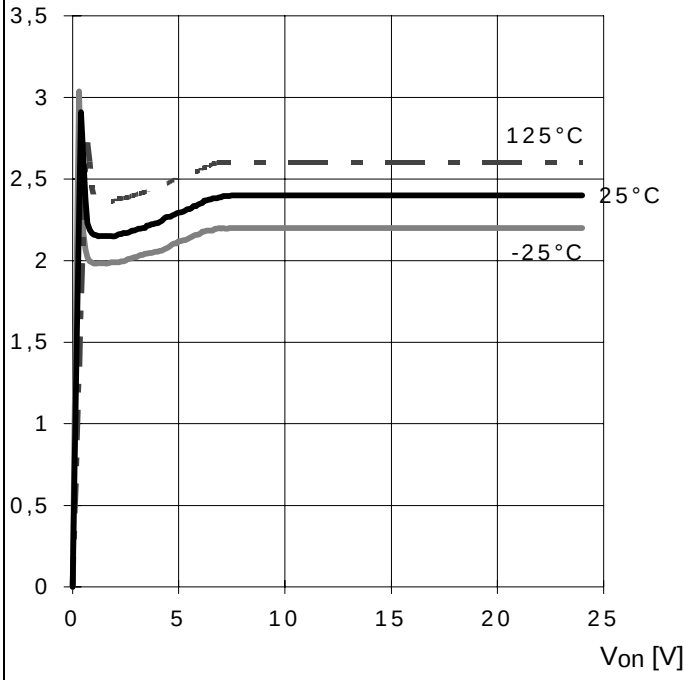
P_{tot} [W]



Current limit characteristic

$I_{L(SC)} = f(V_{on})$, (V_{on} see testcircuit)

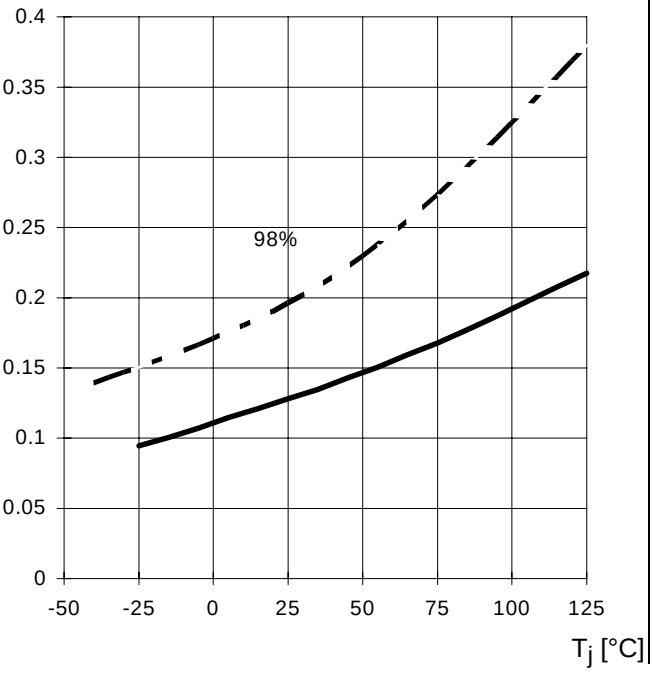
$I_{L(SC)}$ [A]



On state resistance (Vbb-pin to OUT pin)

$R_{ON} = f(T_j)$; V_{bb} = 24 V; I_L = 1.0 A

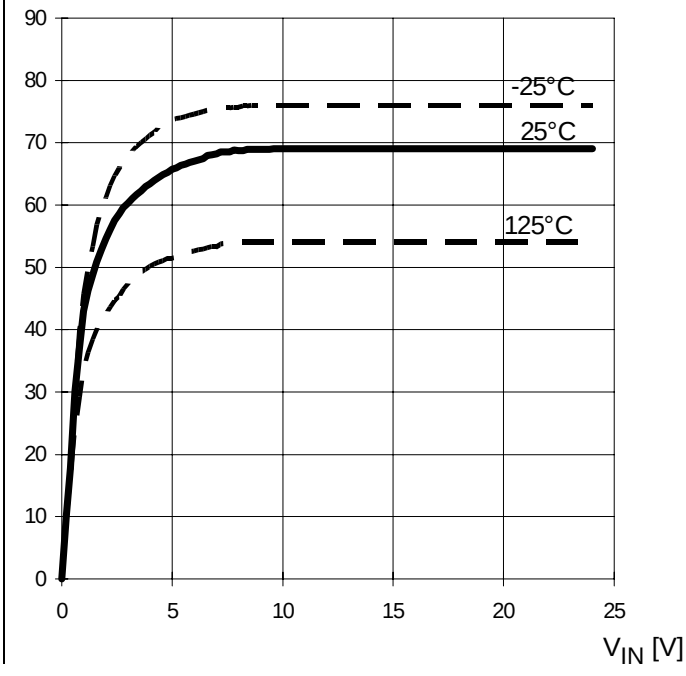
R_{ON} [Ω]



Typ. input current

$I_{IN} = f(V_{IN})$; V_{bb} = 24 V

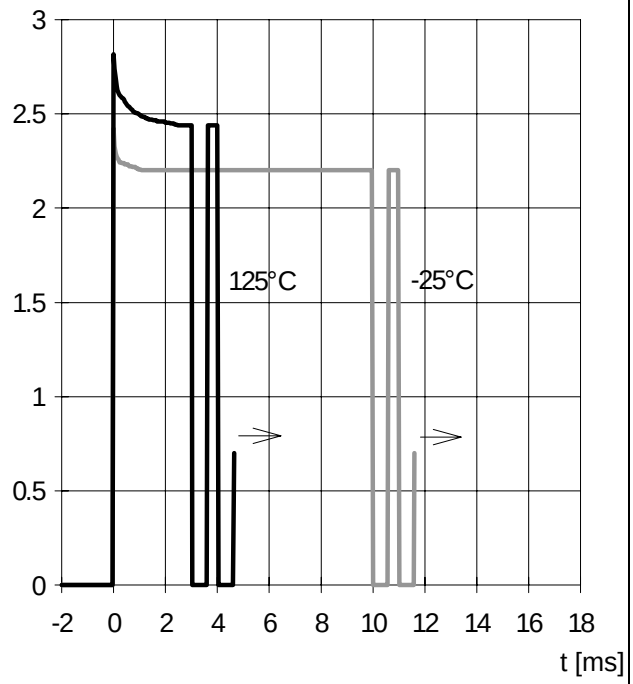
I_{IN} [µA]



Typ. overload current

$I_{L(lim)}$ = f (t), V_{bb}=24V, no heatsink, Param.:T_{jstart}

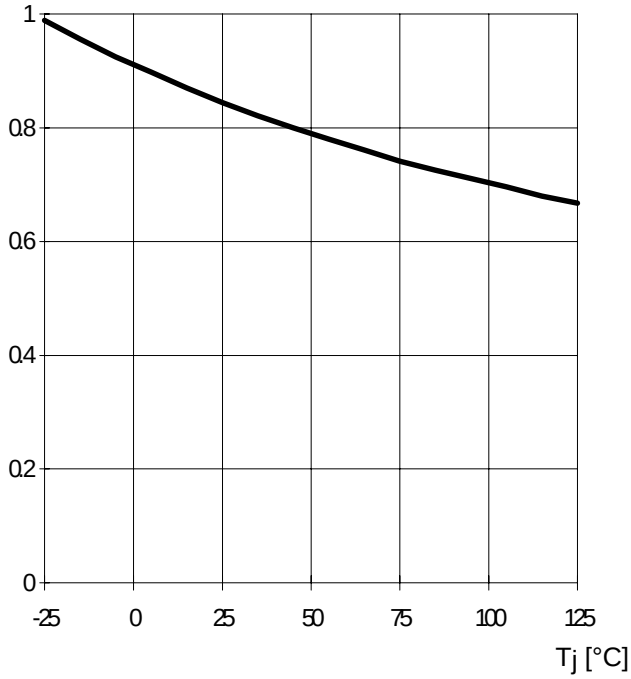
$I_{L(lim)}$ [A]



Typ. operating current

I_{GND} = f (Tj), V_{bb}=30V, V_{IN}=high

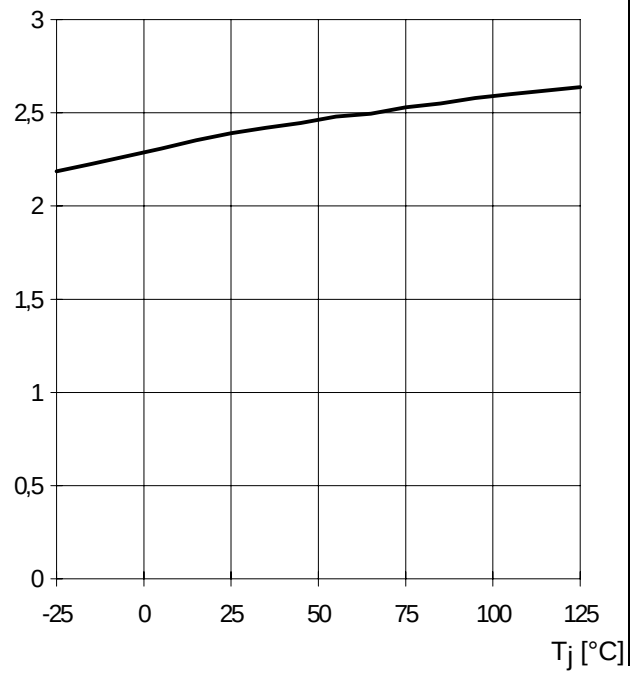
I_{GND} [mA]



Short circuit current

$I_{L(SC)}$ = f (T_j); V_{bb} = 30 V;

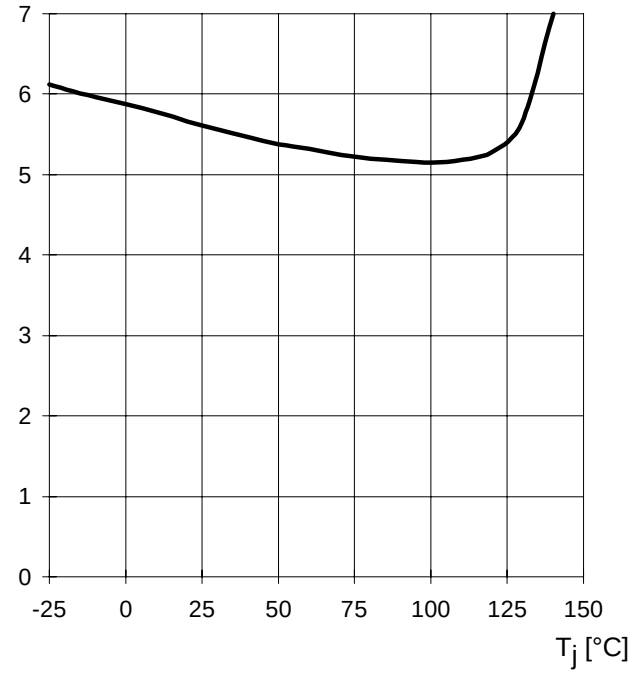
$I_{L(SC)}$ [A]



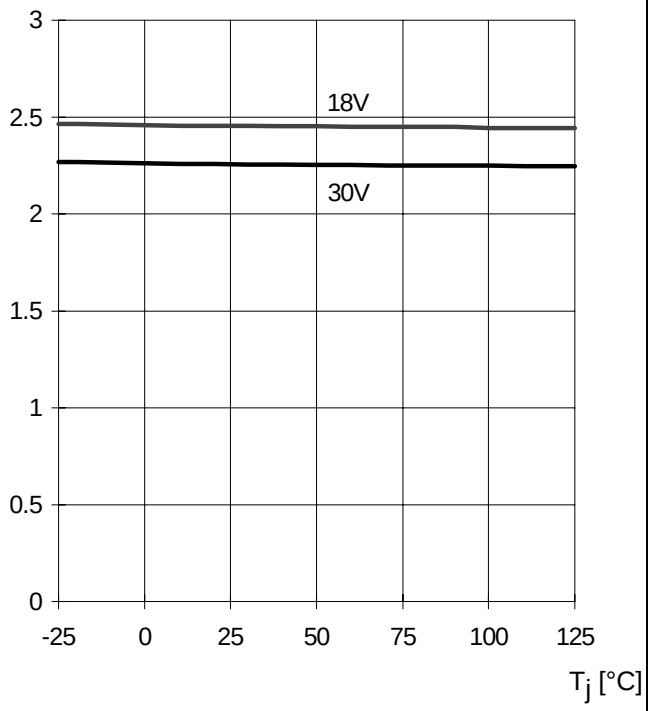
Typ. standby current

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

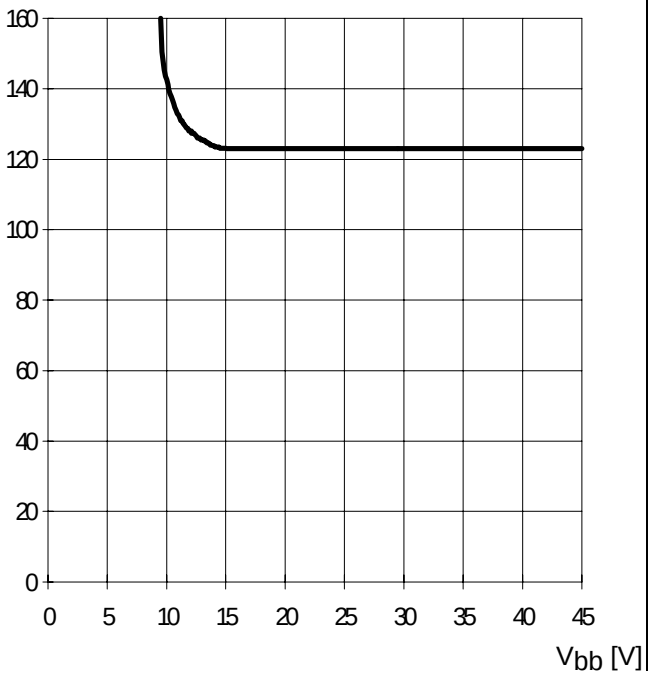
$I_{bb(off)}$ [µA]



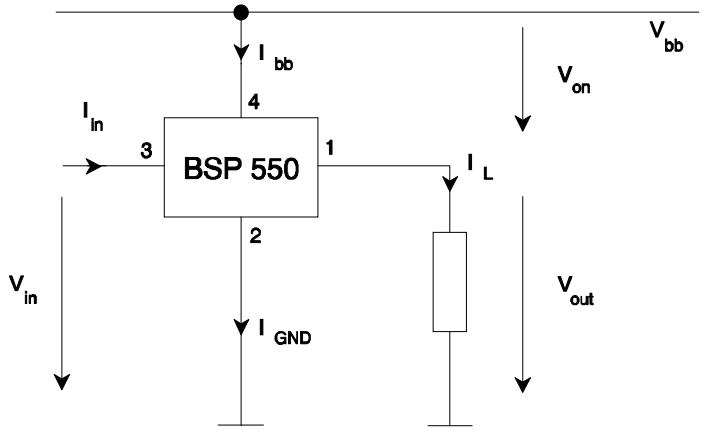
Typ. input turn on voltage threshold
$V_{IN(T+)} = f(T_j)$
$V_{IN(T+)}$ [V]



Typ. on-state resistance (Vbb-Pin to OUT-Pin)
$R_{ON} = f(V_{bb})$; I_L = 1.0A, T_j = 25 °C;
R_{ON} [mΩ]



Test circuit



Package:

all dimensions in mm.

SOT 223/4: