Smart High-Side Power Switch
RM75200 Datasheet

1.Basic Features

- Short circuit protection
- Current limitation
- Overload protection
- Over voltage protection
- Over temperature protection
- Undervoltage shutdown with auto- restart and hysteresis
- Clamp of negative voltage at output with inductive loads
- Very low standby current
- Reverse battery protection with external resistor
- Green Product(RoHS compliant)
- AEC-Q100 qualified

2.Description

RM75200 is a Smart High-side Power Switch that guarantees smooth on-off of the power tube under all conditions, while being able to connect to inductive loads and having inductive load fast.

RM75200 integrates multiple protection functions. Overload protection, Current limitation, Short circuit protection, Over temperature protection, Over voltage protection, Clamp of negative voltage at output, Fast deenergizing of inductive loads, Electrostatic discharge (ESD) protection.

3.Application

- µC compatible power switch for 12 V and 24 V DC applications
- All types of resistive, inductive and capacitive loads
- Replaces electromechanical relays, fuses and discrete circuits

4.Product Summary

Overvoltage protection	$V_{bb(AZ)}$	53	V
Operating voltage	$V_{bb(ON)}$	6...45	V
On-state resistance	R_{ON}	200	mΩ
Nominal load current	$I_{L(NOM)}$	0.7	A
Short circuit current limit	$I_{L(SCP)}$	1.2	A

5.Ordering Code

Device	Package Type	Marking	Materials	Package			Package Qty
RM75200SS	SOT-223	RM75200SS	Halogen free	Tape&reel	10 reels/box	30k/box	3000/reel
RM75200ESA	ESOP8L	RM75200ESA	Halogen free	Tape&reel	10 reels/box	40k/box	4000/reel
RM75200ESB	ESOP8L	RM75200ESB	Halogen free	Tape&reel	10 reels/box	40k/box	4000/reel

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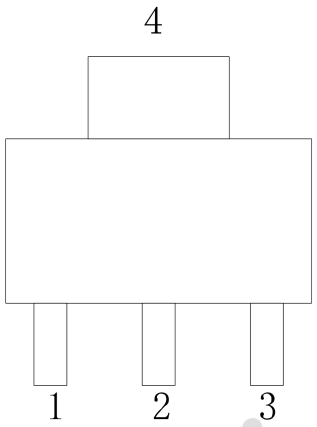
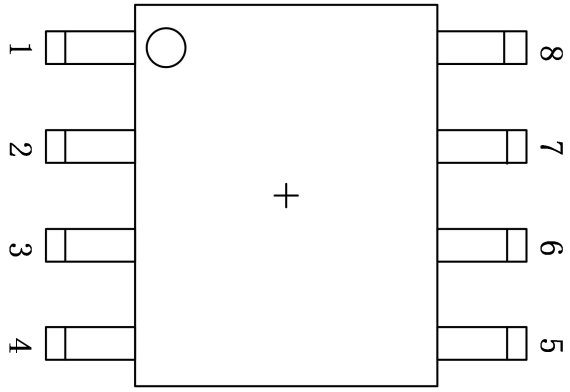
6.Pin Configuration

RM75200SS (SOT-223)



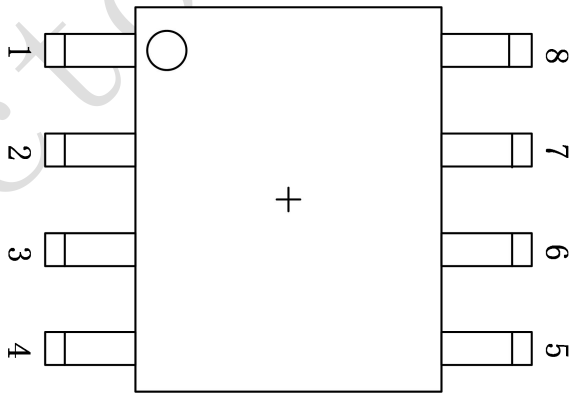
Pin	Symbol	Function
1	OUT	Output to the load
2	GND	Logic ground
3	IN	Input; activates the power switch in case of logic high signal
4	Vbb	Positive power supply voltage

RM75200ESA (ESOP8L)



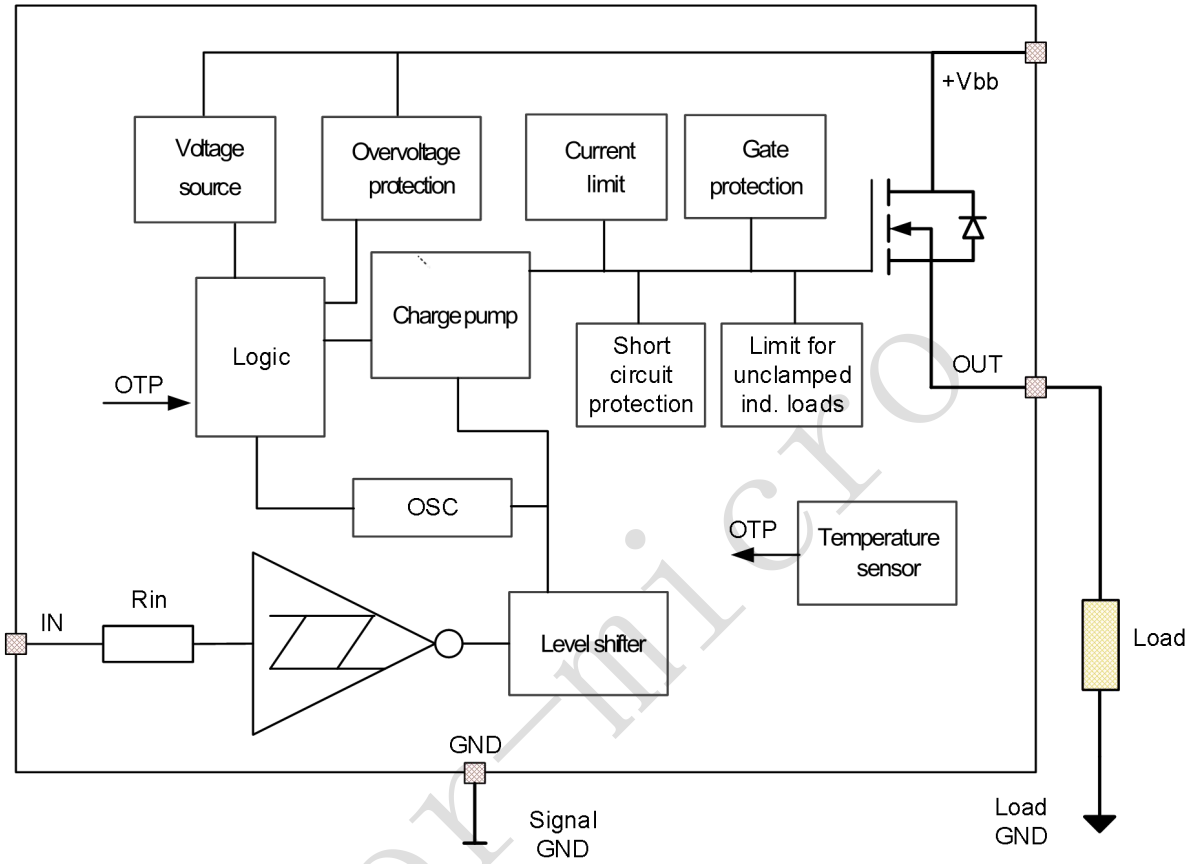
Pin	Symbol	Function
1	GND	Logic ground
2	IN	Input; activates the power switch in case of logic high signal
3/4/5	NC	No internal connection to the chip
6/7/8	OUT	Output to the load
Tab	V_{bb}	Positive power supply voltage

RM75200ESB (ESOP8L)



Pin	Symbol	Function
1/2	V_{bb}	Positive power supply voltage
3/6	NC	No internal connection to the chip
4	GND	Logic ground
5	IN	Input; activates the power switch in case of logic high signal
7/8	OUT	Output to the load

7.Block Diagram



8.Absolute Maximum Ratings

(Maximum Ratings at T j = 25 °C unless otherwise specified)

Parameter	Symbol	Values	Unit
Supply voltage	V_{bb}	45	V
Load dump protection $V_{LoadDump}=V_A+Vs$, $R_I=2\Omega$, $t_d=400ms$, VIN=low or high, $V_A=13.5V$, $R_L=47\Omega$	$V_{Load\ dump}$	83	V
Power dissipation (DC), $T_C \leq 25$ °C	P_{tot}	1.4	W
Continuous input voltage	V_{IN}	-10...V_{bb}	V
Operating temperature	T_j	-40 to 150	℃
Ambient temperature	Ta	-40 to 125	℃
Storage temperature	Tstg	-55 to 150	℃

Notes:

1. Stresses above the ones listed here may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

9.Electrical Characteristics

(T_J = -40°C to +150°C unless otherwise specified)

Symbol	Parameter	Test Condition	Values			Unit
			Min	Typ	Max	
R_{thJS}	Thermal resistance	junction - soldering point	-	-	9	K/W
R_{on}	On-state resistance	V_{bb}=24V, V_{in}=5V, I_{OUT}=0.5A, T_j=25℃	-	150	200	mΩ
		V_{bb}=24V, V_{in}=5V, I_{OUT}=0.5A, T_j=150℃	-	270	320	
$I_{L(nom)}$	Nominal load current	V_{bb}=15V, V_{in}=5V, R_{load}=18Ω	0.7	-	-	A
t_{on}	Turn-ON time	I_{IN} Turn-ON time to V_{OUT} =90%V_{bb}, R_L=47Ω, V_{bb}=15V	-	57	100	us
t_{off}	Turn-OFF time	I_{IN} Turn-OFF time to V_{OUT} =10%V_{bb}, R_L=47Ω, V_{bb}=15V	-	55	150	us
dV/d_{ton}	Turn-ON Slew rate	V_{out} From 10%V_{bb} to 30%V_{bb}, R_L=47Ω, V_{bb}=15V	-	0.9	2	V/us
$-dV/d_{toff}$	Turn-OFF Slew rate	V_{out} From 70%V_{bb} to 40%V_{bb}, R_L=47Ω, V_{bb}=15V	0.7	-	-	V/us
$V_{bb(on)}$	Operating voltage	V_{in}=5V, R_{load}=100Ω	6.0	-	45	V
$V_{bb(under)}$	Under voltage shutdown	V_{bb}=6V, V_{in}=5V, R_L=100Ω	4.5	-	5.5	V
$V_{bb(urst)}$	Under voltage restart	V_{bb}=3V, V_{in}=5V, R_L=100Ω	-	-	5.8	V
$\Delta V_{bb(under)}$	Under voltage hysteresis		-	-	0.5	V
$I_{bb(off)}$	Standby current	V_{IN}=0, V_{bb}=30V, T_j≤25℃	-	11	25	uA
I_{GND}	Operating current	V_{bb}=30V, V_{in}=5V, V_{out} floating	-	-	1.6	mA
$I_{L(off)}$	Leakage output current	V_{bb}=15, V_{in}=0V	-	-	10	uA
$I_{L(SCP)}$	Initial peak short circuit current limit	V_{bb}=30V, V_{in}=5V, R_L=100Ω, T_a=25℃	0.7	1.2	2.4	A
$V_{ON(CL)}$	Output clamp (inductive load switch off)	V_{bb}=30V, V_{in}=5V, f=20Hz, D=10%, R_L=1H	62	68	-	V
T_{jt}	Thermal overload trip temperature	V_{bb}=12V, V_{in}=5V, R_L=18Ω	135	-	-	℃
ΔT_{jt}	Thermal hysteresis		-	10	-	℃
$V_{bb(AZ)}$	Over voltage protection	V_{bb}=30V, V_{in}=5V, R_L=100Ω, R_{GND}=620Ω	47	53	-	V
$V_{IN(T+)}$	Input turn-on threshold voltage	V_{bb}=15V, R_L=47Ω, V_{IN}=1.5V	-	2.5	3	V
$V_{IN(T-)}$	Input turn-off threshold voltage	V_{bb}=15V, R_L=47Ω, V_{IN}=3V	1.7	2.3	-	V
$V_{IN(T)}$	Input threshold hysteresis		-	0.2	1.0	V
$I_{IN(on)}$	Off state input current	V_{bb}=15V, R_L=47Ω, V_{IN}=3V	10	-	110	uA

$I_{IN(off)}$	On state input current	V_{bb}=15V, R_L=47Ω, V_{IN}=1.8V	10	-	110	uA
$t_{d(Vbbon)}$	Input delay time at switch on V_{bb}	V_{bb}=15V, V_{IN}=5V, R_L=47Ω	150	230	-	us
V_{ON}	Drain-source diode voltage	V_{BB}=24V, T_j=25℃	-	-	1.2	V

10.Timing diagrams

Figure 1:Vbb turn on

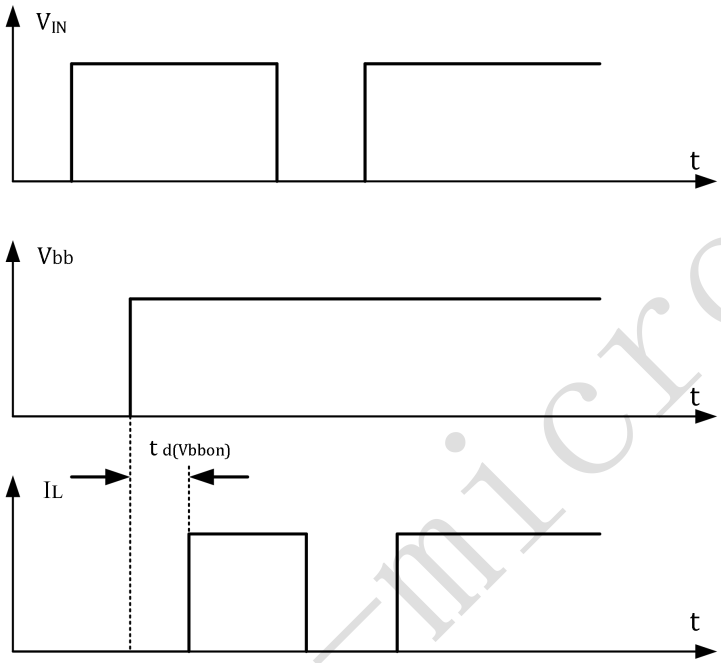


Figure 2a: Switching a resistive load, turn-on/off time and slew rate definition

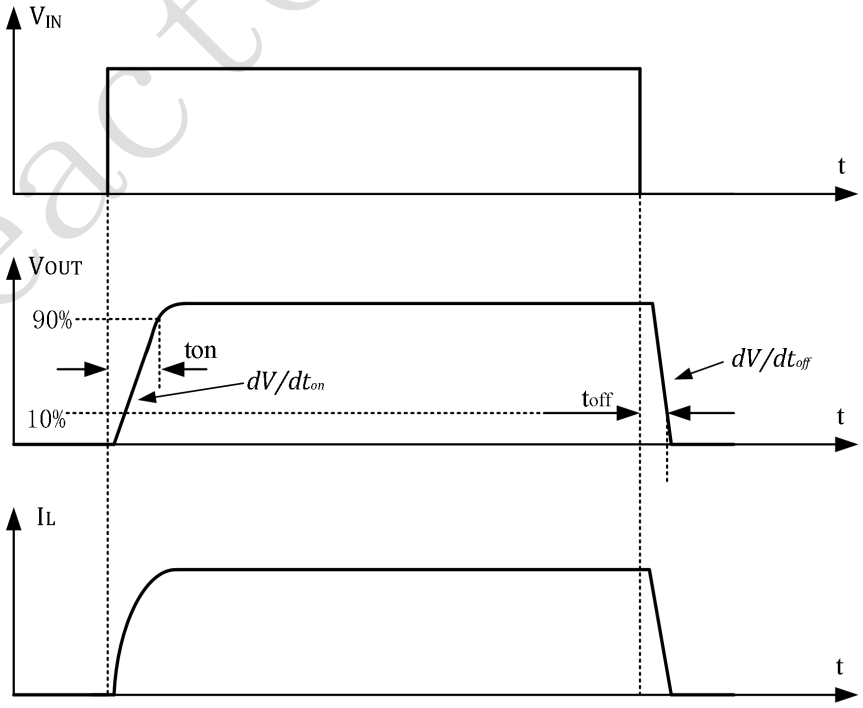


Figure 2b: Switching a lamp

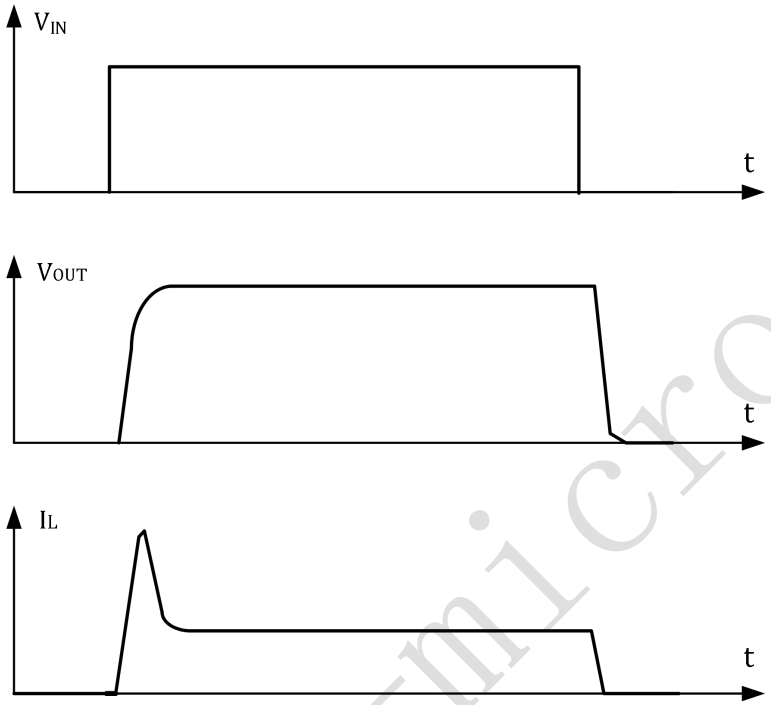


Figure 2c: Switching an inductive load

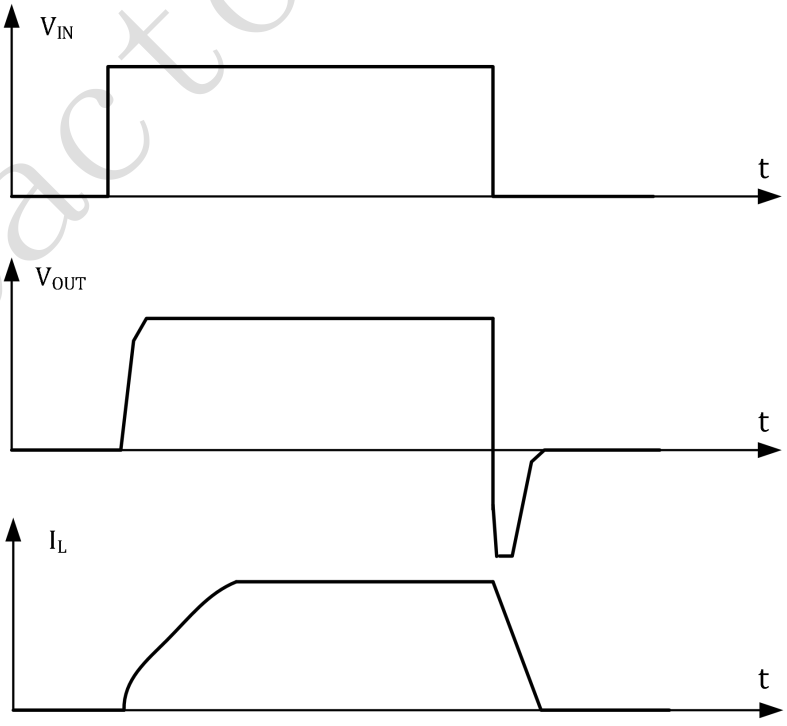


Figure 3a: Turn on into short circuit, shut down by overtemperature, restart by cooling

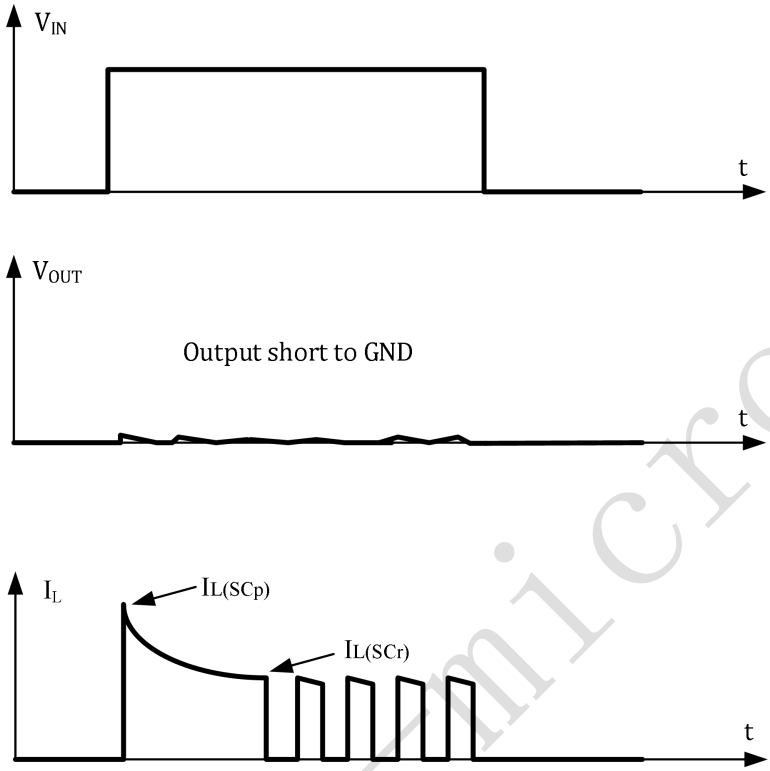


Figure3b: Short circuit in on-state shut down by overtemperature, restart by cooling

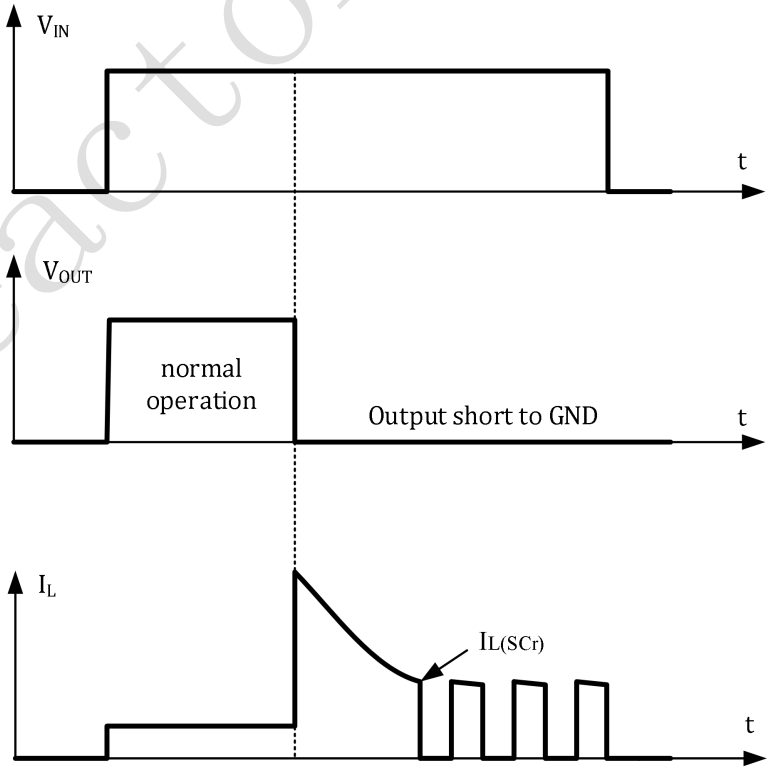


Figure4:Overtemperature: Reset if $T_j < T_{jt}$

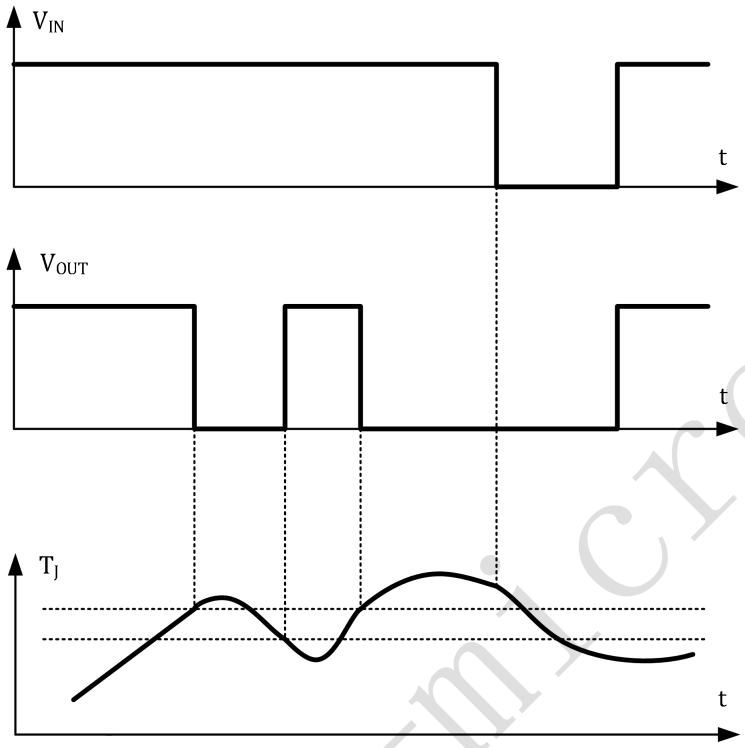
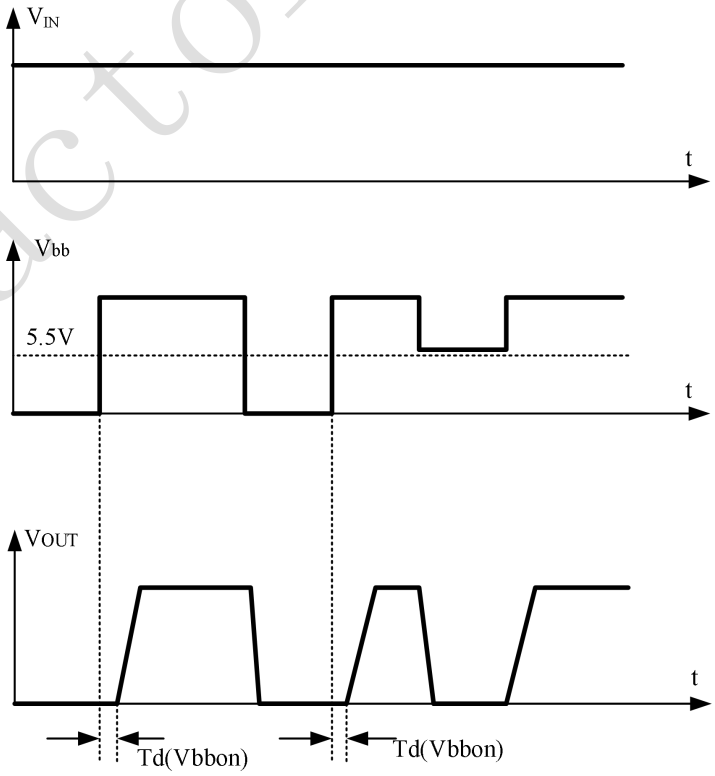
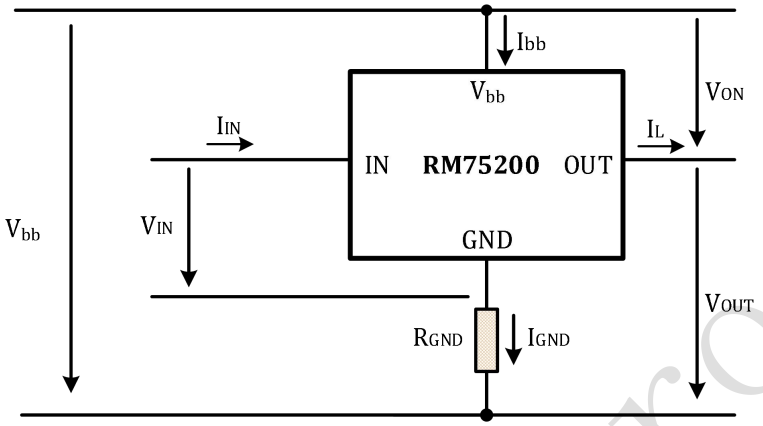


Figure5: Undervoltage shutdown and restart

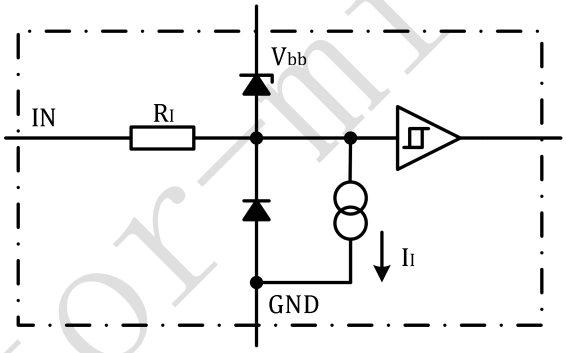


11.Functions

11.1 Terms

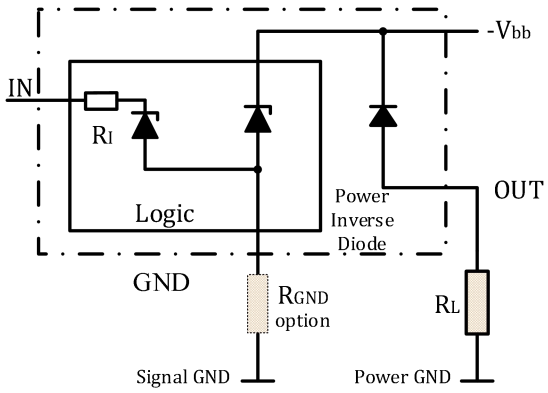


11.2 Input circuit (ESD protection)



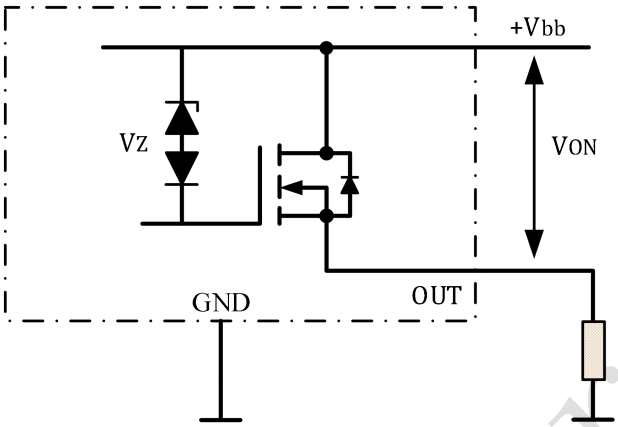
The use of ESD zener diodes as voltage clamp at DC conditions is not recommended

11.3 Reverse battery protection



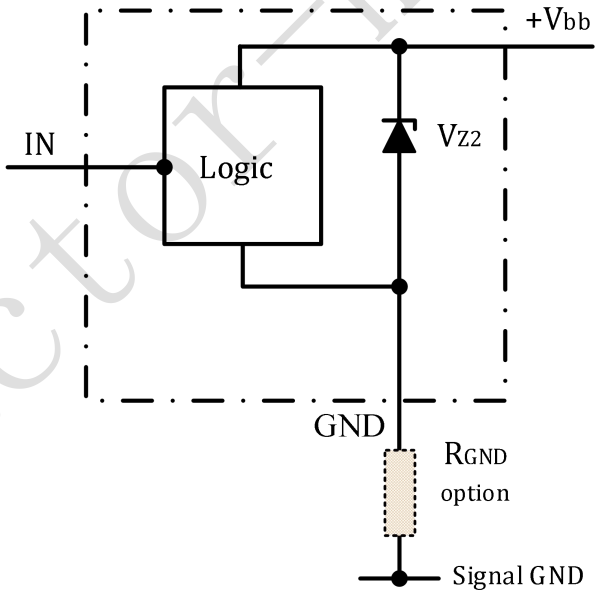
R_{GND}=150Ω, R_I=3kΩ typ.Temperature protection is not active during inverse current.

11.4 Inductive and overvoltage output clamp



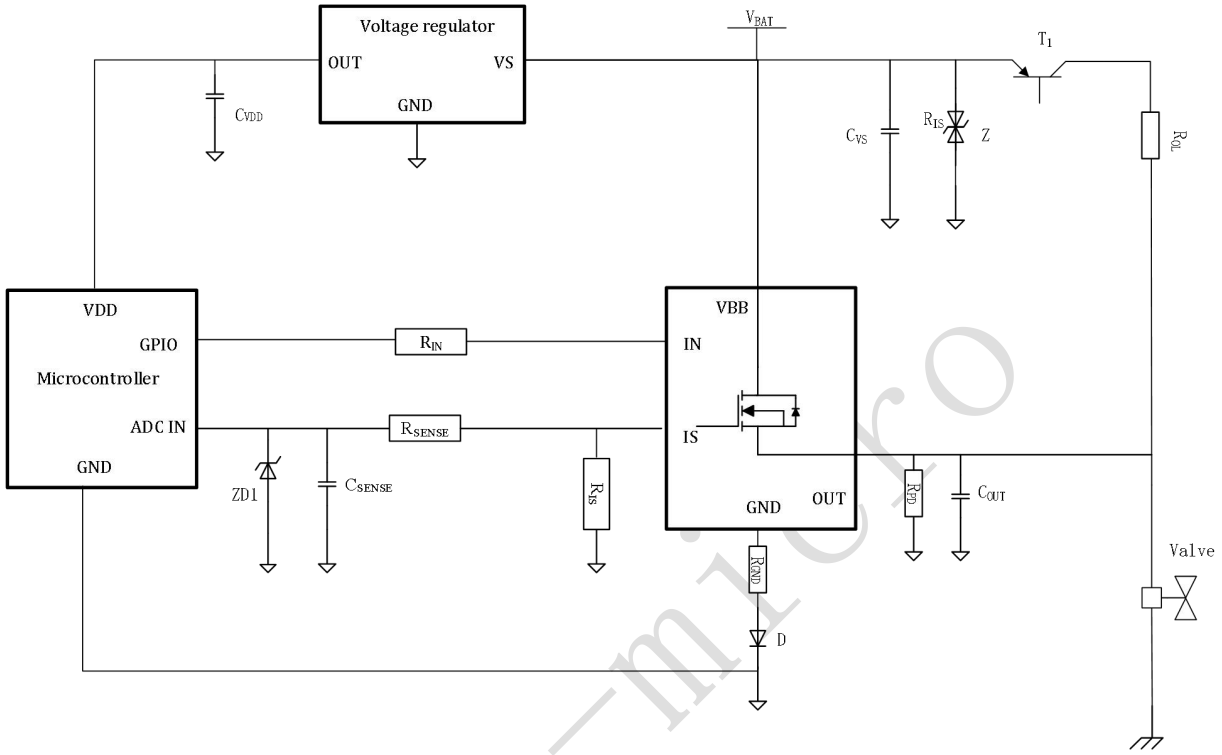
V_{ON} clamped to 62 V min.

11.5 Over voltage protection of logic part



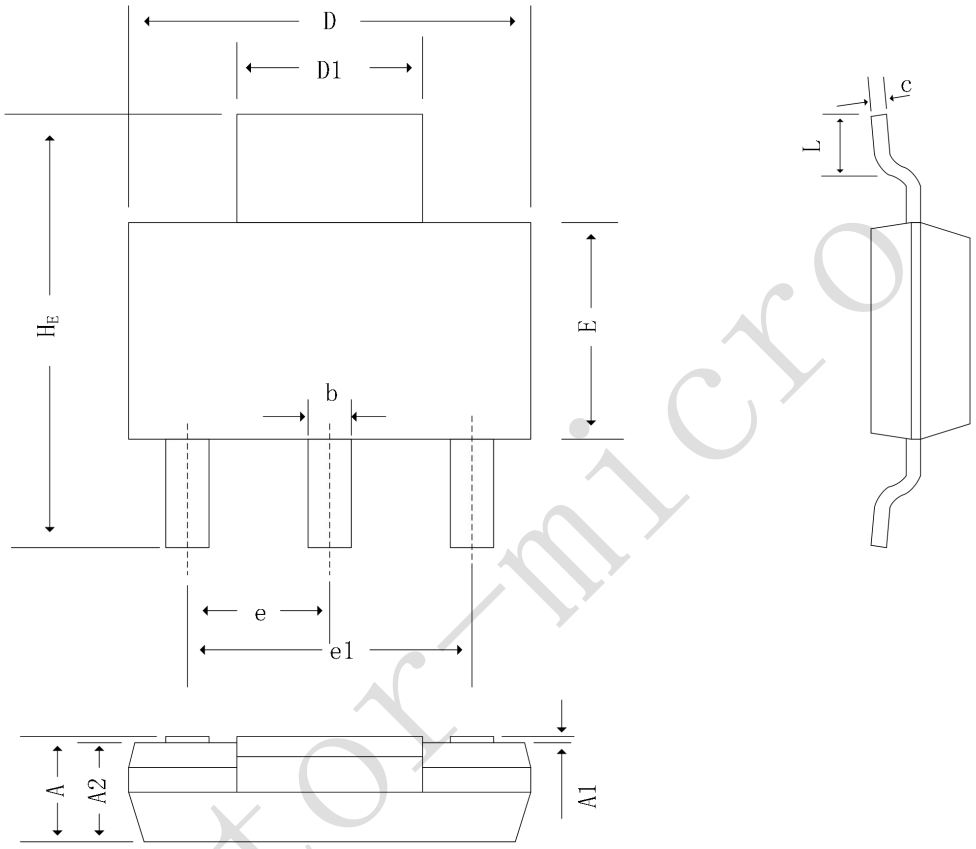
$V_{Z2}=V_{bb(AZ)}$=47V min., R_I=3 kΩ typ., R_{GND}=150Ω

12.Application Information



13.Package

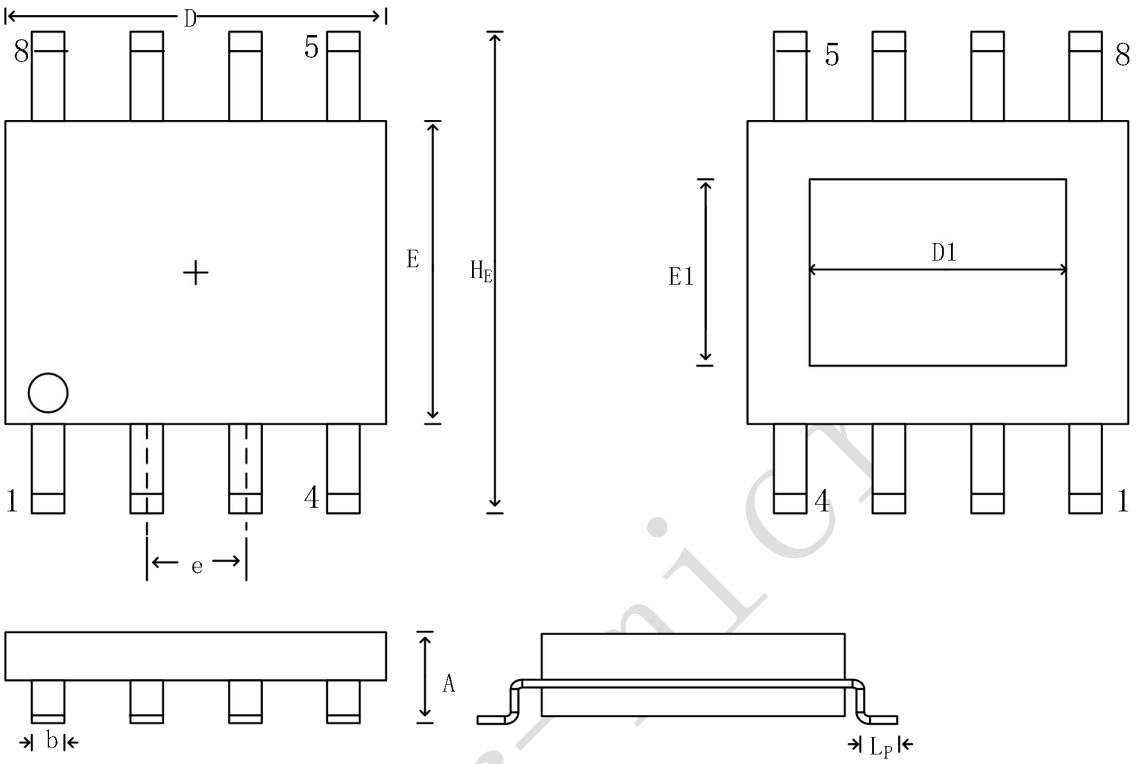
SOT-223



Unit :mm

Symbol	MIN	NOM	MAX
A	/	/	1.80
A1	0.02	/	0.10
A2	1.50	1.60	1.70
b	0.66	0.71	0.84
c	0.23	0.30	0.35
D	6.30	6.50	6.70
D1	2.90	3.00	3.10
E	3.30	3.50	3.70
H_E	6.70	7.00	7.30
e	2.300(BSC)		
e1	4.600(BSC)		
L	0.750	/	/

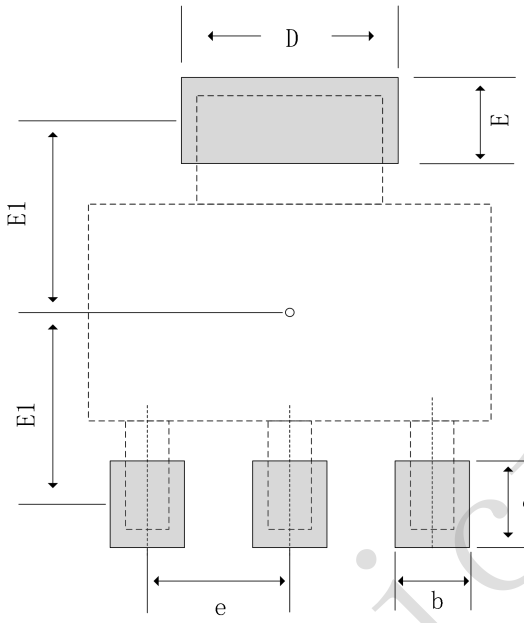
ESOP8L



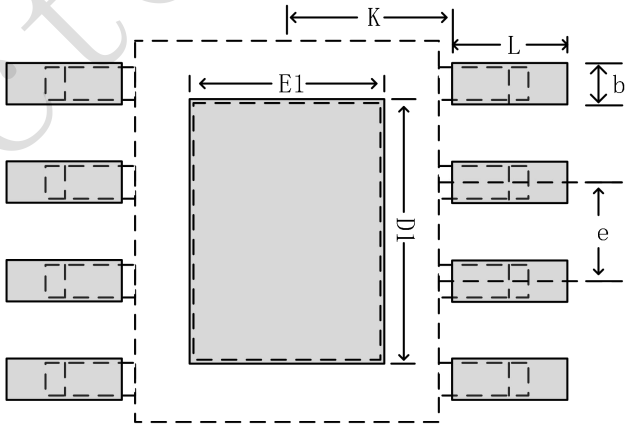
Unit :mm

Symbol	MIN	NOM	MAX
D	4.70	4.90	5.10
E	3.70	3.90	4.10
H_E	6	6.20	6.40
e		1.27BSC	
D1	3.10	3.30	3.50
E1	2.20	2.40	2.60
A	1.35	1.55	1.75
b	0.35	0.42	0.49
L_P	0.40	0.825	1.25

14.Recommended Soldering Footprint



Symbol	NOM	Symbol	NOM
D	3.5	E	1.4
E1	3.1	L	1.4
b	1.2	e	2.3



Symbol	NOM	Symbol	NOM
e	1.27	D1	3.6
b	0.6	E1	2.7
L	1.8	K	2.1

15.Revision History

Version	Change Description	Date
1.0	Initial Version	2024/08/13