

1.Basic Features

- Logic level input
- ESD protection
- Thermal shutdown with auto restart
- Overload protection
- Short circuit protection
- Overvoltage protection
- Current limitation
- Green Product (RoHS compliant)
- AEC-Q100 qualified

3.Application

- μ C compatible power switch for 12 V and 24 V
DC applications and for 42 Volt Powernet
- All types of resistive, inductive and capacitive
loads in switching applications
- Replaces electromechanical relays and discrete
circuits

2.Description

The RM56550SS is a monolithic Low-Side Switch with a logic level input, an open drain DMOS output stage and integrated protection functions. It is designed for all kind of resistive and inductive loads(relays, solenoid) in automotive and industrial applications.

RM56550SS integrates multiple protection functions. Over voltage protection, Current limitation, Over temperature protection, Short circuit protection.

4.Product Summary

Continuous drain source voltage	V_{DS}	60	V
On-state resistance	R_{ON}	450	m Ω
Nominal load current	$I_{L(Nom)}$	0.7	A

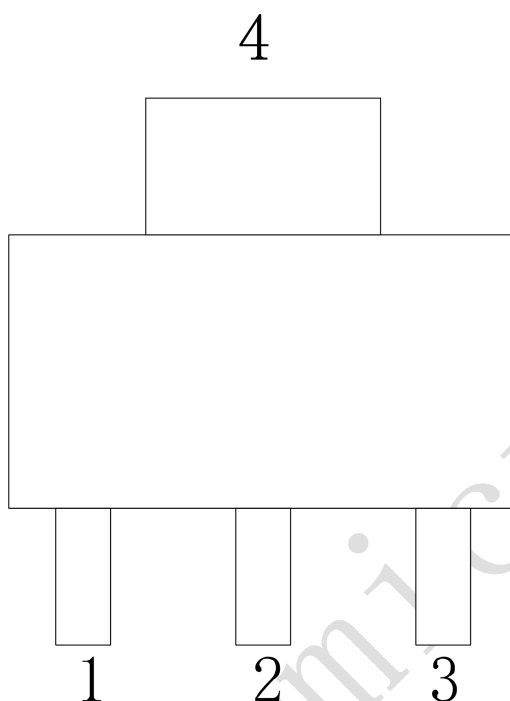
5.Ordering Code

Device	Package Type	Marking	Materials	Package			Package Qty
RM56550SS	SOT-223	RM56550SS	Halogen free	Tape&reel	10 reels/box	30k/box	3000/reel

Table of Contents

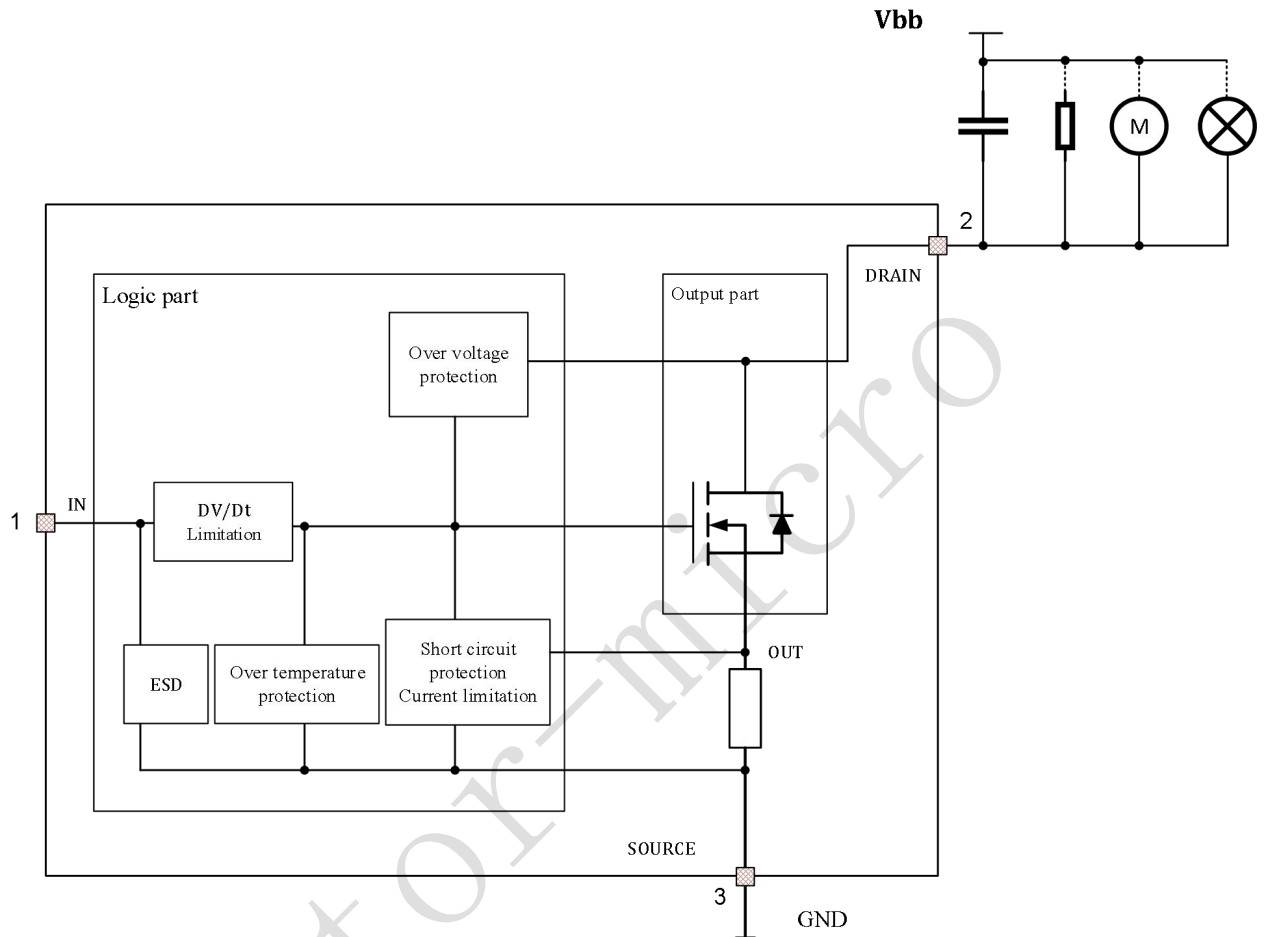
1.Basic Features	1
2.Description	1
3.Application	1
4.Product Summary	1
5.Ordering Code	1
6.Pin Configuration	3
7.Block Diagram	4
8.Absolute Maximum Ratings	5
9.Electrical Characteristics	6
10.Timing diagrams	7
11.Functions	9
12.Application Information	11
13.Package	12
14.Recommended Soldering Footprint	13
15.Revision History	14

6. Pin Configuration



Pin	Symbol	Function
1	IN	Input; activates output and supplies internal logic
2	DRAIN	Output to the load
3	SOURCE	Ground; pin3 and TAB are internally connected
4	SOURCE	Ground; pin3 and TAB are internally connected

7. Block Diagram



8. Absolute Maximum Ratings

(Maximum Ratings at $T_j = 25\text{ }^{\circ}\text{C}$ unless otherwise specified)

Parameter		Symbol	Values	Unit
Supply voltage		V_{DS}	60	V
Drain source voltage for short circuit protection		V_{DS}	36	V
Continuous input voltage		V_{IN}	-0.2...+10	V
peak input voltage		V_{IN}	-0.2...+20	V
Load dump protection	$I_{IN}=\text{low or high}(8\text{V}); R_L=50\Omega$	$V_{\text{Load dump}}$	80	V
	$I_{IN}=\text{high}(8\text{V}); R_L=22\Omega$		47	V
Power dissipation (DC)		P_{tot}	1.8	W
Operating temperature		T_j	-40...150	$^{\circ}\text{C}$
Storage temperature		T_{stg}	-40...150	$^{\circ}\text{C}$
Ambient temperature		T_a	-40...125	$^{\circ}\text{C}$
Thermal resistance junction - ambient (free air)		R_{thJA}	194.6	K/W
Thermal resistance chip - case		R_{thJC}	23.73	K/W

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

$T_J = 25^\circ\text{C}$, $V_{bb} = 12\text{V}$; (unless otherwise specified)

Symbol	Parameter	Test Condition	Values			Unit
			Min	Typ	Max	
Static characteristics:						
$V_{DS(AZ)}$	Drain source clamp voltage	$I_D=10\text{mA}; T_J=-40\ldots150^{\circ}\text{C}$	60	-	75	V
I_{DSS}	Output leakage current	$V_{IN}=0\text{V}; V_{DS}=32\text{V}; T_J=-40\ldots150^{\circ}\text{C}$	-	-	5	μA
$V_{IN(TH)}$	Input turn-on voltage	$I_D=600\text{mA}$	1.2	1.6	2	V
$V_{IN(OFF)}$	Input turn-off voltage		0.7	1.1	1.5	V
$I_{IN(1)}$ $I_{IN(2)}$ $I_{IN(3)}$	input current	(1)normal operation: $I_D<I_{DM}; V_{IN}=5\text{V};$	-	20	50	μA
		(2)current limitation mode: $I_D=I_{DM}; V_{IN}=5\text{V};$	-	200	400	
		(3)after thermal shutdown: $I_D=0\text{A}; V_{IN}=5\text{V};$	-	-	50	
$R_{DS(on)}$	On-state resistance	$I_D=0.7\text{A}; V_{bb}=12\text{V}; T_J=25^{\circ}\text{C}; V_{IN}=5\text{V};$	-	450	550	$\text{m}\Omega$
		$I_D=0.7\text{A}; V_{bb}=12\text{V}; T_J=150^{\circ}\text{C}; V_{IN}=5\text{V};$	-	800	1000	
$I_{D(Nom)}$	Nominal load current	$V_{bb}=12\text{V}; V_{DS}=0.5\text{V}; T_J<150^{\circ}\text{C}$	0.7	-	-	A
$I_{D(lim)}$	Current limit	$V_{IN}=10\text{V}; V_{DS}=12\text{V};$	-	2.3	4	A
$-V_{ON}$	Drain source diode voltage	$V_{bb}=-12\text{V}; R_L=8\Omega; T_J=25^{\circ}\text{C}$	-	0.85	1.1	V
Dynamic characteristics:						
t_{on}	Turn-ON time	$V_{IN}=0\text{ to }10\text{V}; R_L=22\Omega; V_{IN}\text{ to }90\%\text{ }I_D$	-	15	30	μs
t_{off}	Turn-OFF time	$V_{IN}=10\text{ to }0\text{V}; R_L=22\Omega; V_{IN}\text{ to }10\%\text{ }I_D$	-	5	20	μs
$-dV_{DS}/dt_{on}$	Turn-ON Slew rate	$V_{IN}=0\text{ to }10\text{V}; R_L=22\Omega; V_{DS}\text{ From }70\%\text{ to }50\%\text{ }V_{bb}$	-	5	10	$\text{V}/\mu\text{s}$
dV_{DS}/dt_{off}	Turn-OFF Slew rate	$V_{IN}=10\text{ to }0\text{V}; R_L=22\Omega; V_{DS}\text{ From }50\%\text{ to }70\%\text{ }V_{bb}$	-	5	10	$\text{V}/\mu\text{s}$
E_{AS}	Unclamped single pulse inductive energy	$T_J=25^{\circ}\text{C}$	-	400	-	mJ
Protection Functions:						
T_{jt}	Thermal overload trip temperature		150	160	180	$^{\circ}\text{C}$
ΔT_{jt}	Thermal hysteresis		-	10	-	K

10. Timing diagrams

Figure 1: Switching a Resistive Load

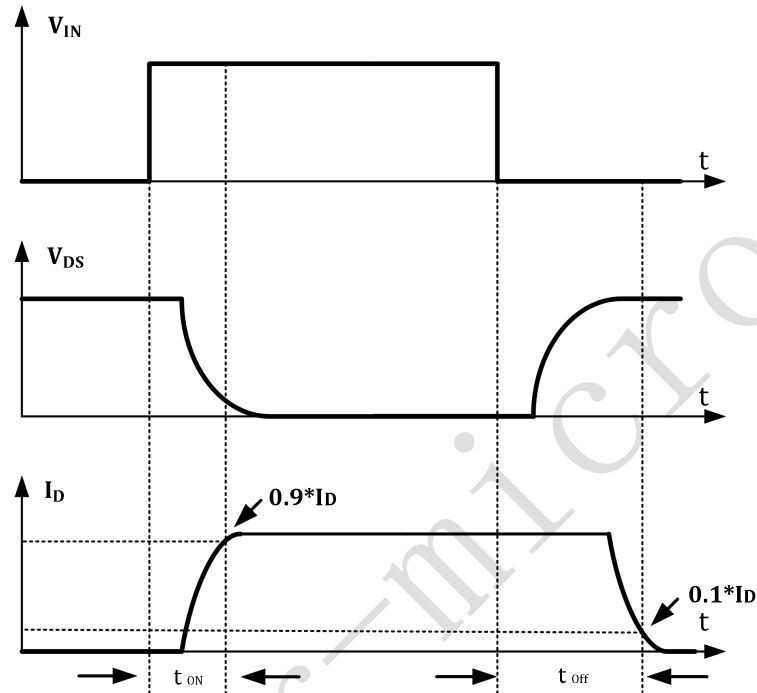


Figure 2: Switching an Inductive Load

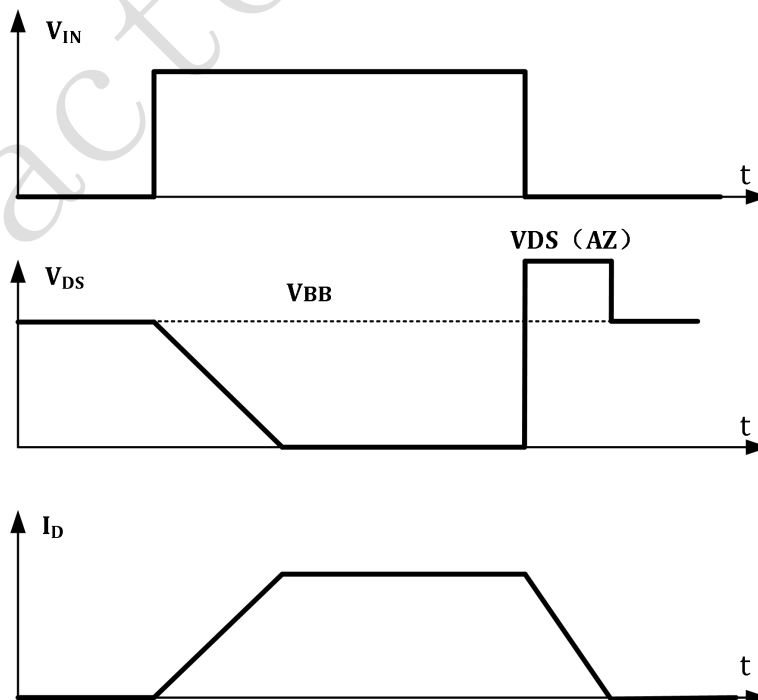
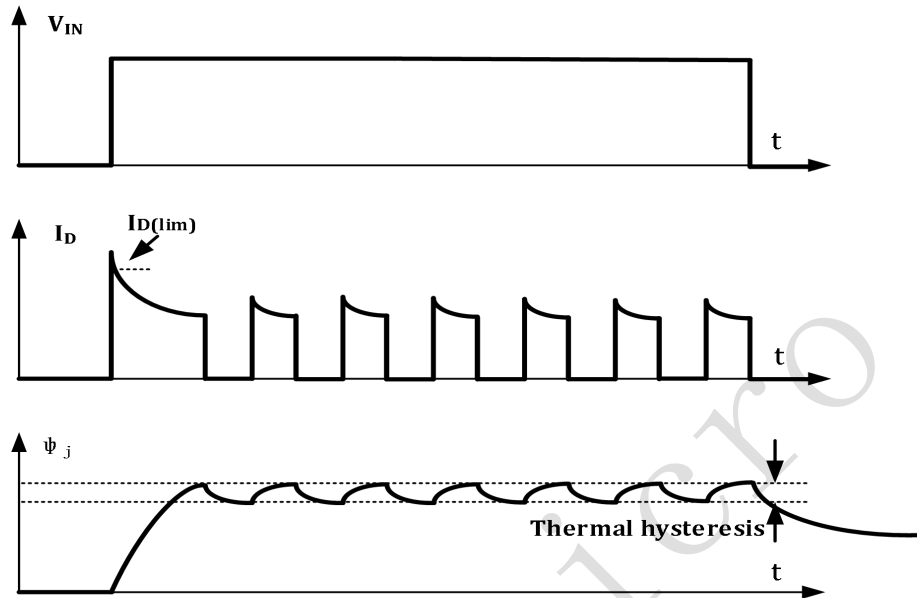
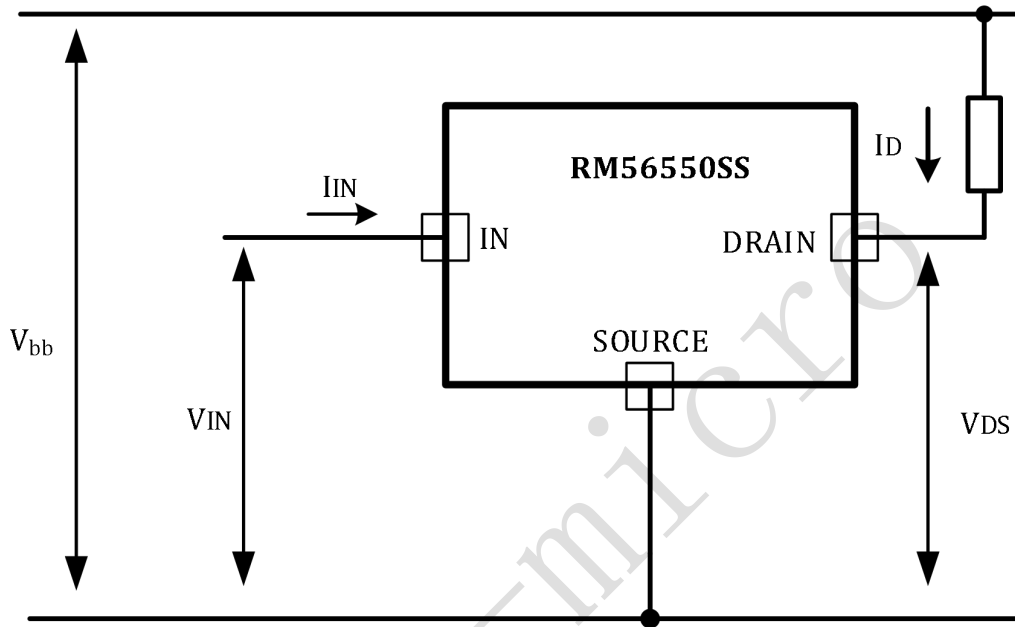


Figure 3: Short circuit

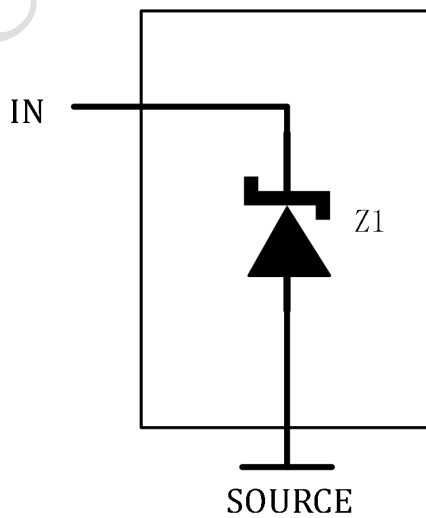


11.Functions

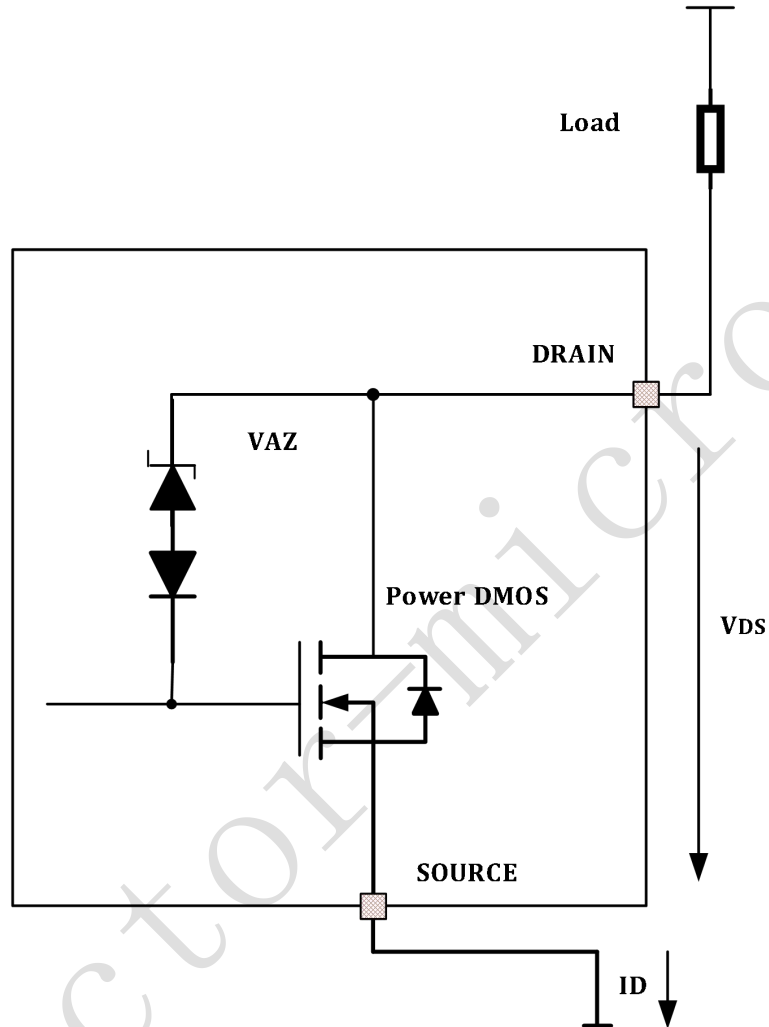
11.1 Terms



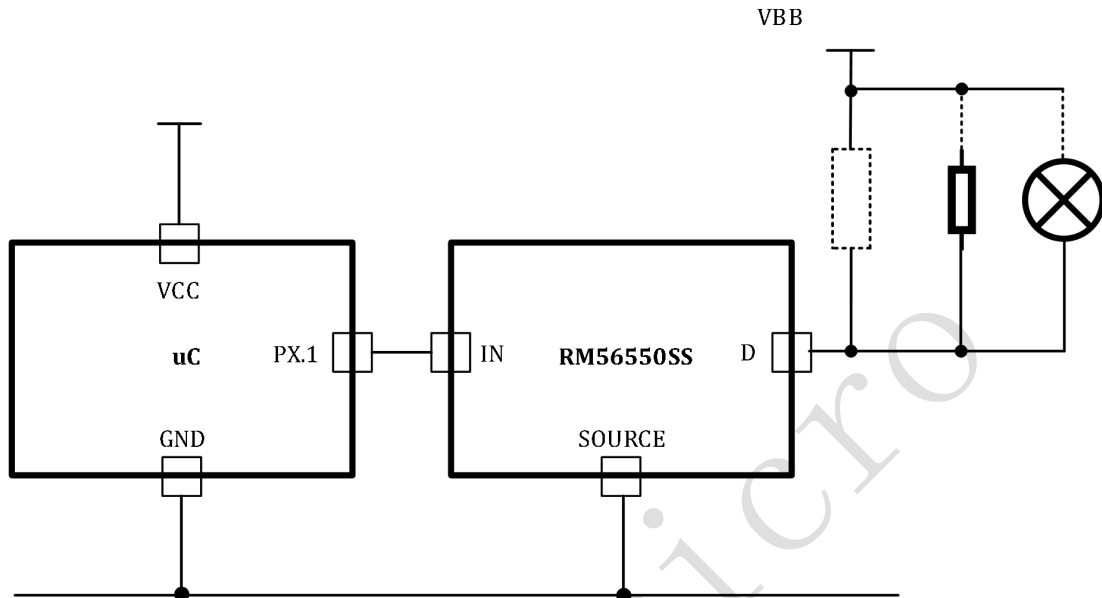
11.2 Input circuit (ESD protection)



11.3 Inductive and Over voltage Output Clampin

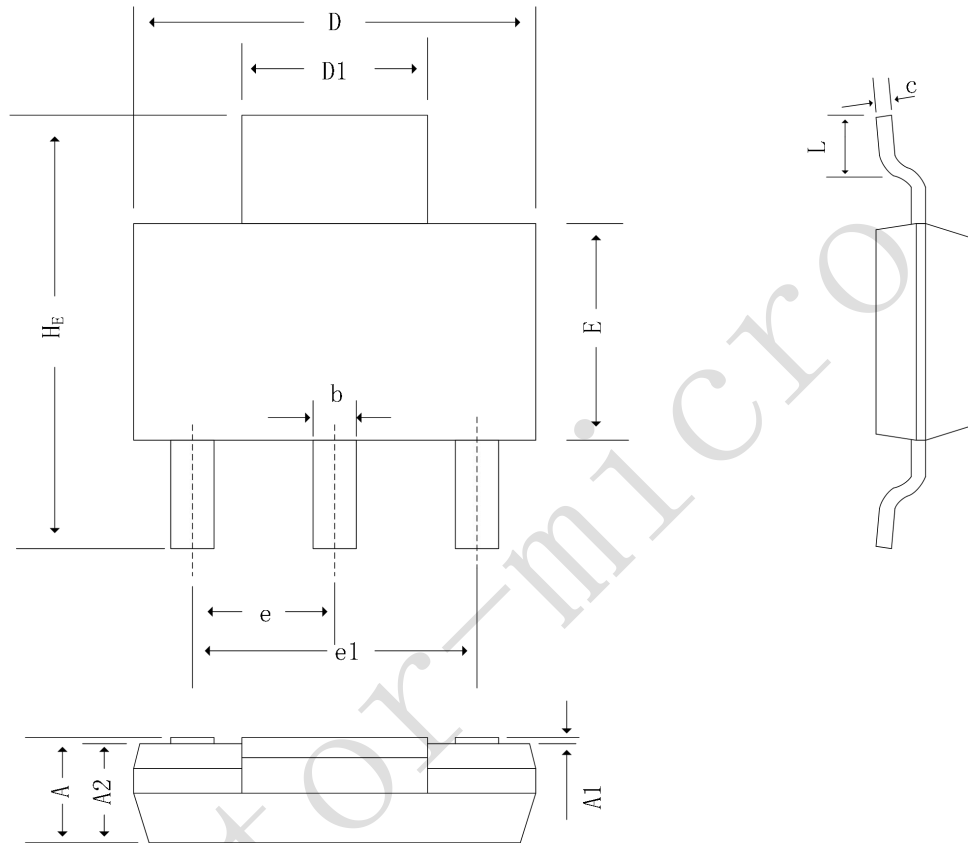


12.Application Information



13.Package

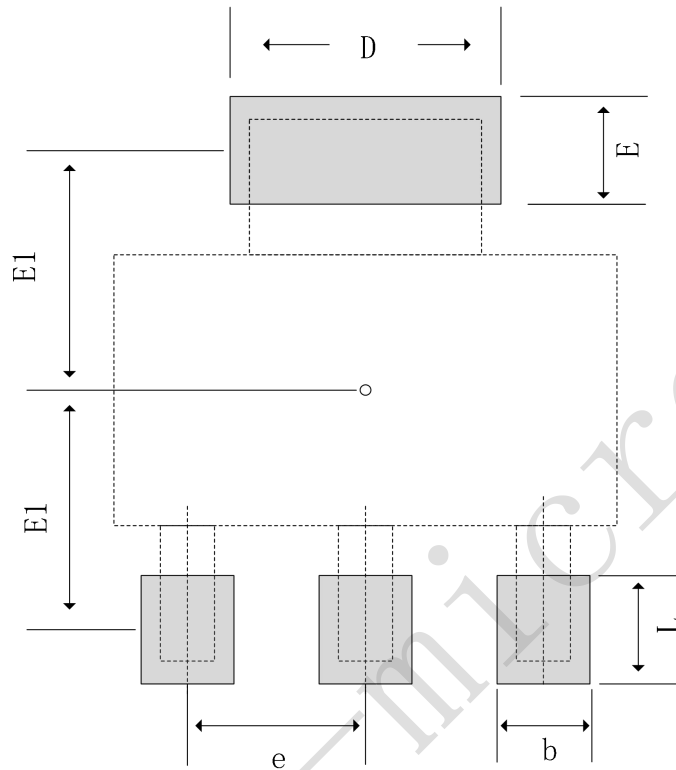
SOT-223



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	/	/

14.Recommended Soldering Footprint



Unit : mm

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

15.Revision History

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