

Features

- Micropower consumption
- 2.0V~5.5V power supply
- Chopper stabilized amplifier stage
- CMOS output
- Unipolar Hall Switch
- Very High Sensitivity Hall Sensor
- Package: SOT23, SOT23-3, TO92S, SOT553
- High ESD protection, HBM>4KV

Applications

- Solid State Switch
- PDA
- Pad PC
- Handheld Wireless Handset Awake Switch
- Magnet Proximity Sensor for Switch Replacement in Low Duty Cycle Applications

General Description

The PT Ǧ I is fabricated from mixed signal CMOS technology. It internally includes an on-chip Hall voltage generator, a voltage regulator for operation with supply voltages of 2.0 to 5.5V, a sleep/awake logic for low power consumption, temperature compensation circuitry, small-signal amplifier, Hall sensor with dynamic offset cancellation system, Schmitt trigger and an open-drain output.

A south pole of sufficient strength will turn the sensor output on. The output will be turned off

under no magnetic field. While the magnetic flux density (B) is larger than operating point (Bop), the output will be turned on (low), the output is held until B is lower than release point (Brp), and then turned off.

The total power consumption in normal operation is typically 10μW with a 2.7V power source. Operating temperature range of the HM254 is from -40°C to 85°C.

Block Diagram

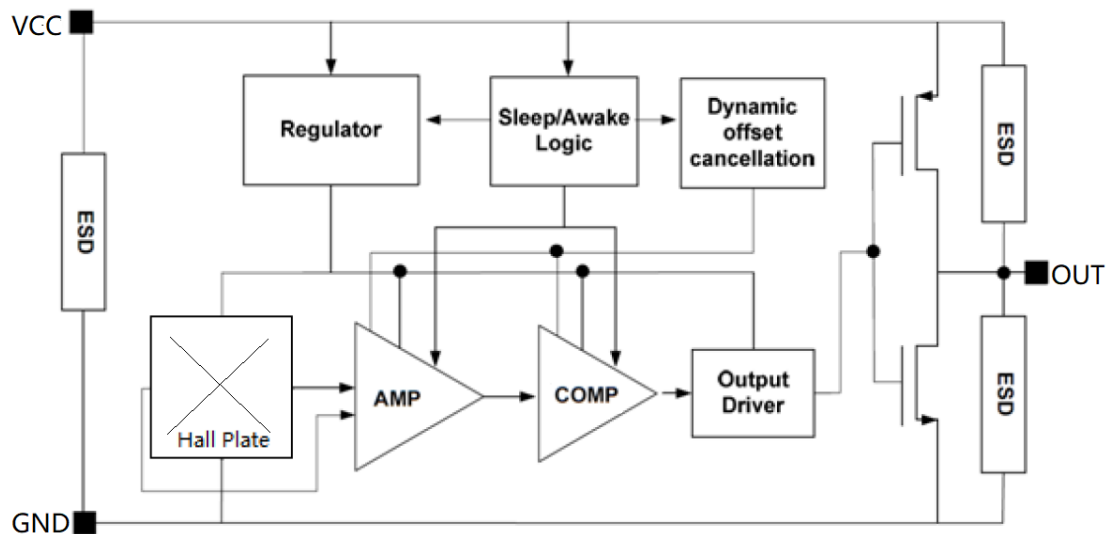


Fig 1

Pin Assignment

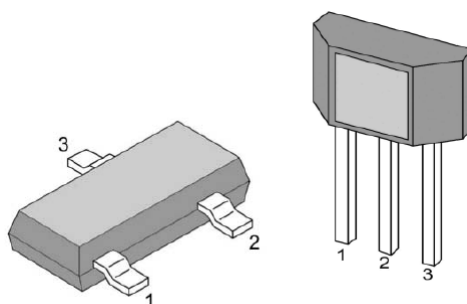


Fig2 SOT23 or SOT23-3

T092S

Pin Description1

SOT Pin Number	SIP Pin Number	Pin Name	Function
1	1	VCC	Supply Voltage
2	3	OUT	CMOS Output
3	2	GND	Ground

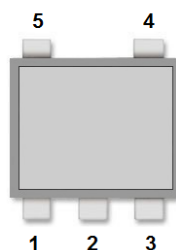


Fig3 SOT553

Pin Description2

Pin Name	Pin No.	I/O	Pin Function
	SOT553		
VCC	5	P	Input Power Supply
GND	2	P	Ground
NC	1, 3	-	Not Connected
OUT	4	O	Output Pin

Order Information

Order number	Description	Mark Number	Magnetic direction
HM254N	SOT23 package, tape and reel packaging(3000pcs/bag), Rohs/Pb Free	254N	South pole
HM254Ù	SOT23-3 package, tape and reel packaging(3000pcs/bag), Rohs/Pb Free	254Ù	North pole
HM254V	TO92Sp package, bulk packaging (1000pcs/bag), Rohs/Pb Free	254V	South pole
HM254F	SOT553 package, tape and reel packaging(3000pcs/bag), Rohs/Pb Free	254F	South pole

Absolute Maximum Ratings

Symbol	Parameter		Value	Unit
V _{CC}	Supply Voltage		-0.5~6.0	V
I _{dd}	Supply Current		5	mA
B	Magnetic Flux Density		Unlimited	Gauss
T _j	Operating Junction Temperature Range		-40 to 150	°C
T _s	Storage Temperature		-65 to 150	°C
PD	Power Dissipation	3Pin SIP	550	mW
		SOT23-3	230	mW
		SOT553	230	mW

Note: Stresses greater than those listed under “Absolut Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of these or any other conditions beyond those indicated under “Recommended Operating Conditions” is not implied. “Absolute Maximum Ratings” for extended period may affect device reliability.

Recommended Operating Conditions

(TA=25°C unless otherwise noted)

Parameter	Symbol	Min	Max	Unit
Supply Voltage	V _{CC}	2.0	5.5	V
Ambient Temperature	T _a	-40	85	°C

Electrical Characteristics

(VCC=3.3V Ta=25℃, unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I _{CC}	Average Supply Current	V _{CC} =3.3V, Output Open	-	4	10	uA
I _{ON}	Supply current (operating mode)	V _{CC} =3.3V	-	1.2	-	mA
I _{ST}	Supply current (stand-by mode)	V _{CC} =3.3V	-	2.5	-	uA
V _{SAT}	Output Saturation Voltage	I _O =2mA, B>Bop	-	0.05	-	V
I _{OL}	Output Leakage Current	V _{OUT} =5V, B<Brp	-	<0.1	1	uA
T _{awake}	Awake Time	V _{CC} =3.3V	-	90	-	us
T _{period}	Period	V _{CC} =3.3V	-	115	-	ms
ESD	Electro-Static Discharge	HBM		4		KV

Magnetic Characteristics

(VCC=3.3V Ta=25℃, unless otherwise specified)

Characteristics	Symbol	Min	Typ	Max	Unit
Operating Point	Bop	+20	+35	+50	Gs
Releasing Point	Brp	+10	+25	+40	Gs
Hysteresis	Bhys	-	10	-	GS

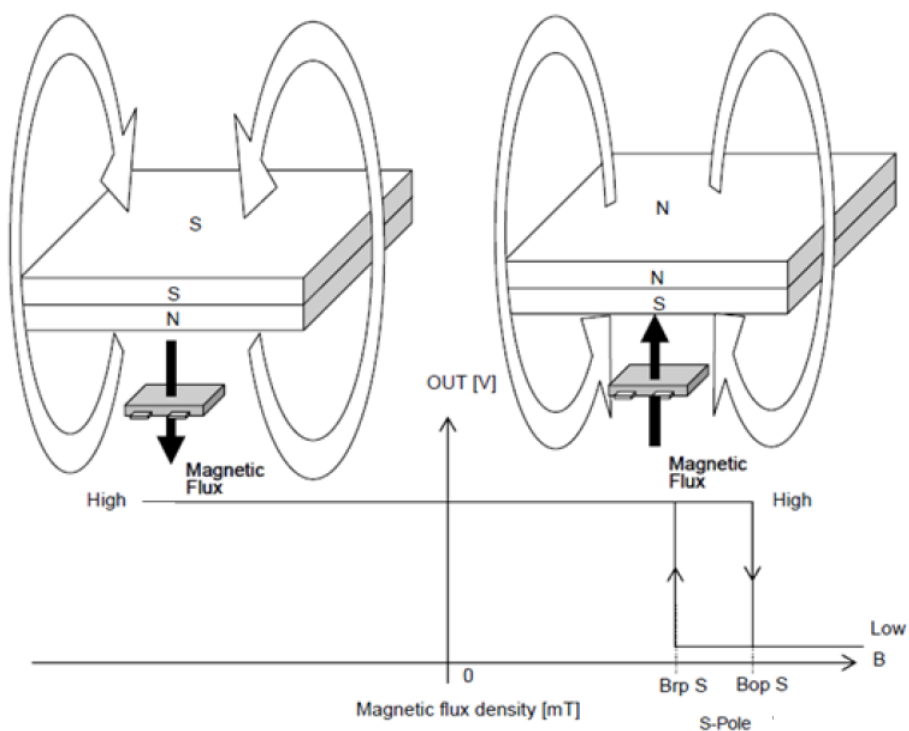


Fig 4 Magnetic Operation Characteristic of HM254N/HM254F/HM254S

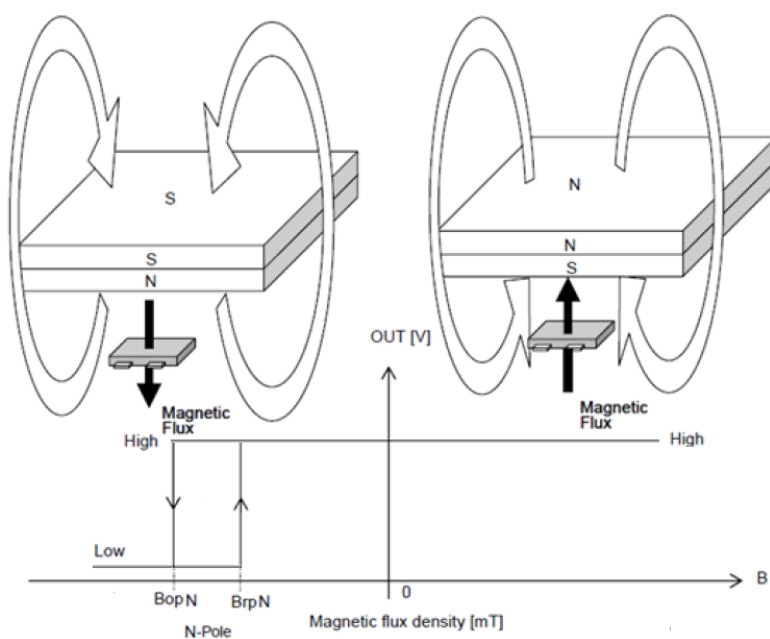


Fig 5 Magnetic Operation Characteristic of HM254T

Application Circuits

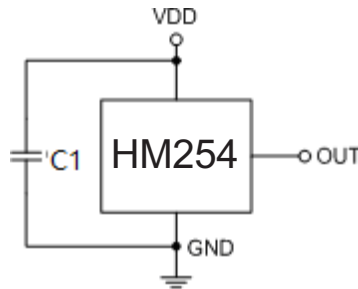


Fig 6

HM254's pole-independent sensing technique allows for operation with south pole magnet orientation, enhancing the manufacturability of the device.

C1 serves two purposes: minimizing ripples on the input voltage and enhancing immunity from RF transmission noises within close proximity. Recommended values are between 10nF and 100nF. The larger the capacitance, the better the noise immunity is for the HM254.

It is strongly recommended that an external bypass capacitor be connected (in close proximity to the Hall sensor) between the supply and ground of the device to reduce both external noise and noise generated by the chopper-stabilization technique. This is especially true due to the relatively high impedance of battery supplies. The simplest form of magnet that will operate these devices is a bar magnet with south pole near the branded surface of the device.

Thermal Considerations

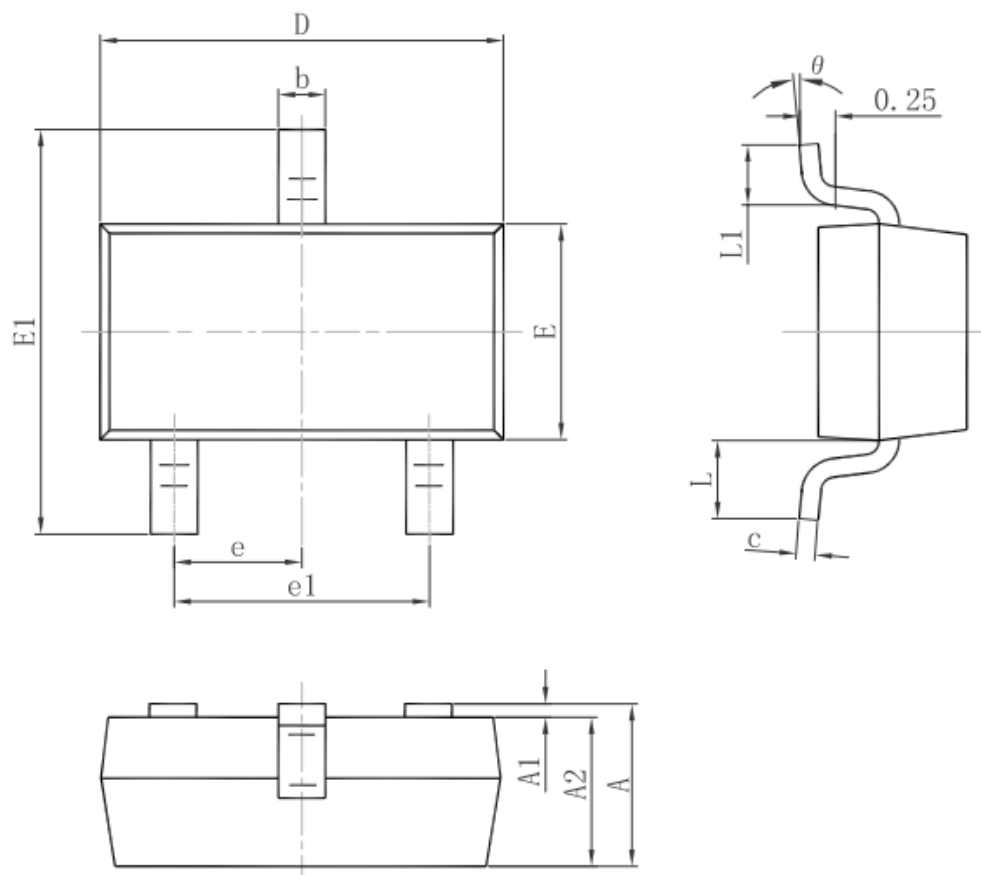
The maximum IC junction temperature should be restricted to 125°C under normal operating conditions. This restriction limits the power dissipation of the HM254. Calculate the maximum allowable dissipation, PD(max), and keep the actual dissipation less than or equal to PD(max). The maximum-power-dissipation limit is determined using following equation:

$$P_{D(MAX)} = \frac{125^{\circ}\text{C} - T_A}{R_{\theta JA}}$$

Where, T_A is the maximum ambient temperature for the application. R_{θJA} is the thermal resistance junction-to-ambient given in Power Dissipation Table.

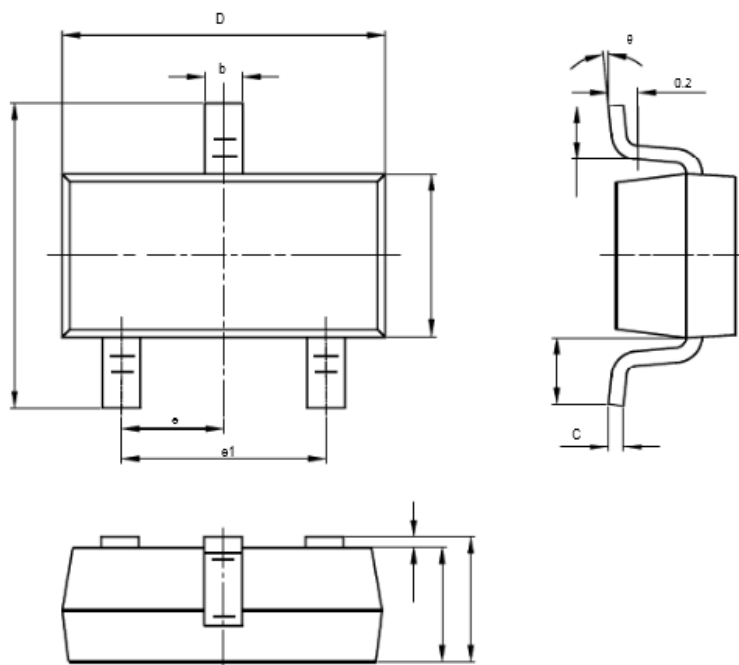
Package Information

PACKAGE DESIGNATOR SOT23 (HM254N)



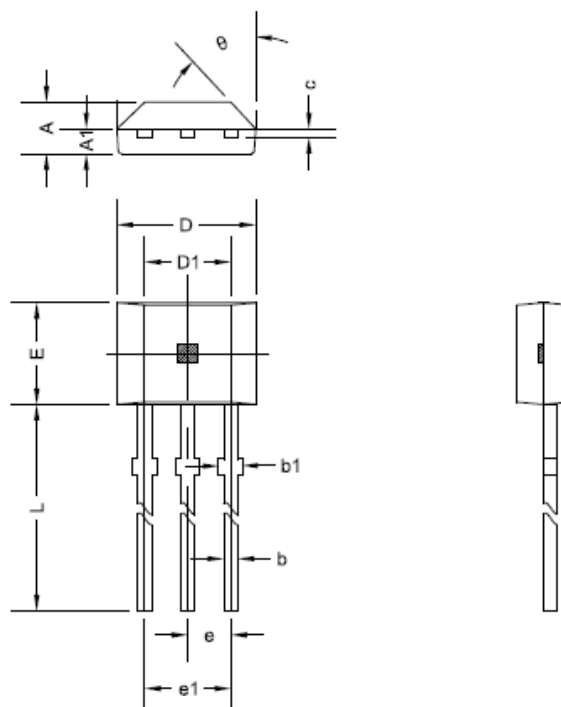
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950 TYP.		0.037 TYP.	
e1	1.800	2.000	0.071	0.079
L	0.550 REF.		0.022 REF.	
L1	0.300	0.500	0.012	0.020
θ	0°	8°	0°	8°

PACKAGE DESIGNATOR SOT23-3(HM254T)



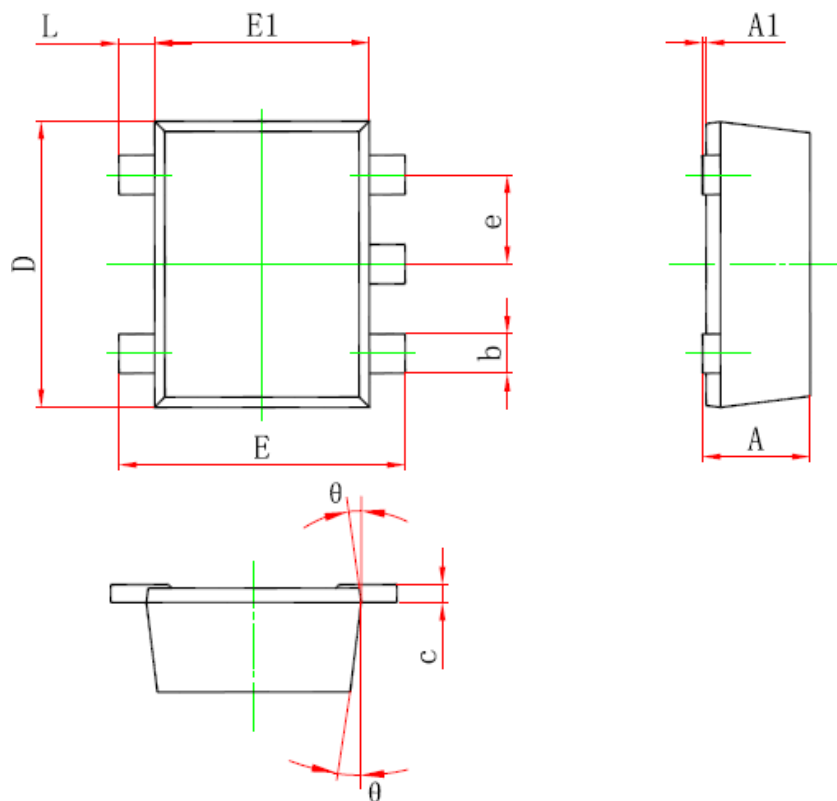
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.400	0.012	0.016
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950TPY		0.037TPY	
e1	1.800	2.000	0.071	0.079
L	0.700REF		0.028REF	
L1	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

PACKAGE DESIGNATOR TO92S (HM254S)



Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	1.420	1.620	0.056	0.064
A1	0.660	0.860	0.026	0.034
b	0.350	0.480	0.014	0.019
b1	0.400	0.550	0.016	0.022
C	0.360	0.510	0.014	0.020
D	3.900	4.200	0.154	0.165
D1	2.970	3.270	0.117	0.129
E	2.870	3.124	0.113	0.123
e	1.270 TYP.		0.050 TYP.	
e1	2.440	2.640	0.096	0.104
L	13.600	15.500	0.535	0.610
θ	45° TYP.		45° TYP.	

PACKAGE DESIGNATOR SOT553(HM254F)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.525	0.600	0.021	0.024
A1	0.000	0.050	0.000	0.002
e	0.450	0.550	0.018	0.022
c	0.090	0.160	0.004	0.006
D	1.500	1.700	0.059	0.067
b	0.170	0.270	0.007	0.011
E1	1.100	1.300	0.043	0.051
E	1.500	1.700	0.059	0.067
θ	7° REF		7° REF	
L	0.100	0.300	0.004	0.012