Description

ECS1493 is a linear Hall-effect sensor, is composed of Hall sensor, linear amplifier and Totem-Pole output stage. It features low noise output, which makes it unnecessary to use external filtering. It also can provide increased temperature stability and accuracy. The linear Hall sensor has a wide operating temperature range of -40 ℃ to +105℃, appropriate for commercial, consumer, and industrial environments.

The high sensitivity of Hall-effect sensor accurately tracks extremely weak changes in magnetic flux density. The linear sourcing output voltage is set by the supply voltage and in proportion of vary of the magnetic flux density. Typical operation current is 2.5 mA and operating voltage range is 2.8 volts to 6.0 volts. Trim version is available for an ultra low offset products.

The three package styles available provide magnetically optimized solutions for most applications. Package types YR is an SOT23-3(1.1 mm nominal height), a miniature low-profile surface-mount package.

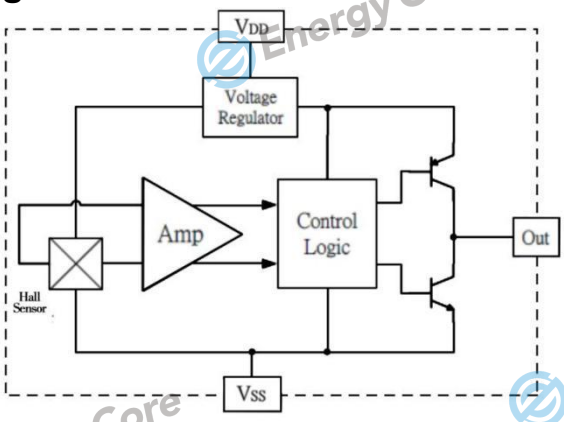
Feature

- Input voltage range : 2.8V~6V
- Power consumption of 2.5 mA at 5 VDC for energy efficiency
- Low-Noise Operation
- Linear output for circuit design flexibility
- Totem-Pole for a stable and accurate output
- Responds to either positive or negative gauss
- Robust ESD performance

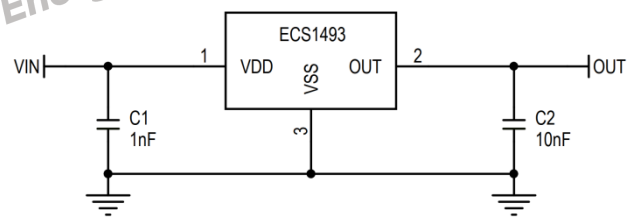
Application

- Current sensing
- Motor control
- Position sensing
- Magnetic code reading
- Rotary encoder
- Ferrous metal detector
- Vibration sensing
- Liquid level sensing
- Weight sensing

Functional Block Diagram



Typical Application



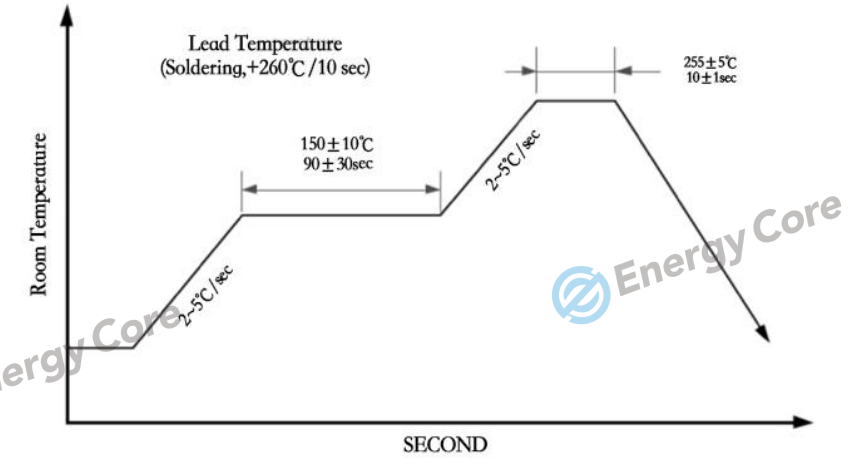
Absolute Maximum Ratings

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply Voltage	V_{VDD}				8	V
Output Voltage	V_{OUT}				8	V
Output Current	I_{OUT}				5	mA
Junction Temperature	TJ				+150	℃
Package Power Dissipation	PD	YR			230	mW

Electrical Characteristics V_{in}=5V,T_A=25℃(unless otherwise noted)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input Voltage	VDD		2.8		6	V
Input Current	I	B = 0 Gauss		3.3	5	mA
Output Current	I	VDD>3V	1	1.5		mA
Null Output Voltage	VNULL	B = 0 Gauss (T type)	2.375 (2.475)	2.5	2.625 (2.525)	V
High Output Voltage	VH	B>Max Magnetic Gauss		4.9	4.99	V
Low Output Voltage	VL	B>Min Magnetic Gauss	0.01	0.1		V
Output Voltage Span	VS			4.8		V
Output Referred Noise	VN			20		mV
Power-On Time	TP				100	uS
Output Switch Time	TSW				150	uS
Output Switch Frequency	FSW		3			KHz
Magnetic Range Gauss			±600			Gauss
Ratiometry Null output error	RVON			±1.5		%
Ratiometry Sensitivity error	RSEN			±1.5		%
Linearity	LIN			±1.5		%
Sensitivity		Standard (T type)	9.0 (9.5)	10	11 (10.5)	mV/G
Sensitivity Temperature Coefficient				±10		%/°C
Delta null voltage	ΔVON			20		mV
Electro-Static Discharge	HBM		4			KV

IR Reflow Curve



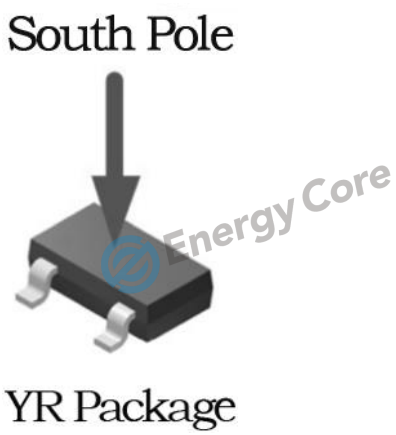
YR Soldering Condition

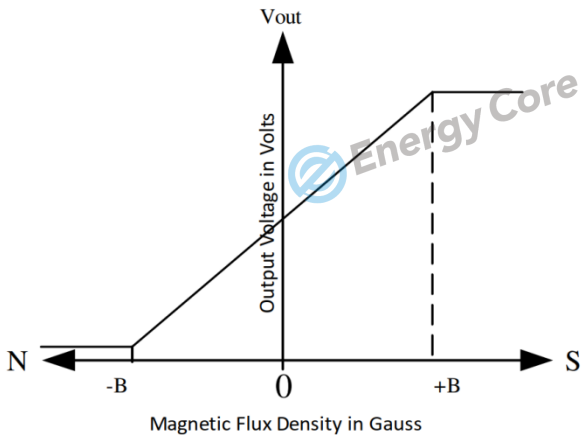
Ordering Information

Part Number*	Package	Top Marking
ECS1493-YR	SOT23-3	93XXX

Output Behavior Versus Magnetic Polar Vin=2.8-6V,TA=-40-105℃

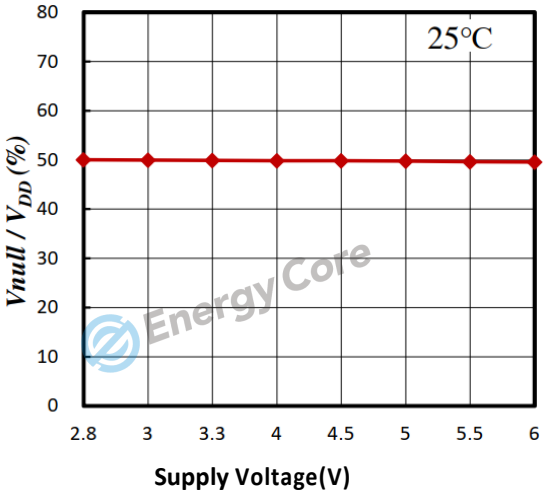
Parameter	Test Condition	OUT(YR)
South Pole	B > 0 Gauss	> V_{NULL}
North Pole	B < 0 Gauss	< V_{NULL}



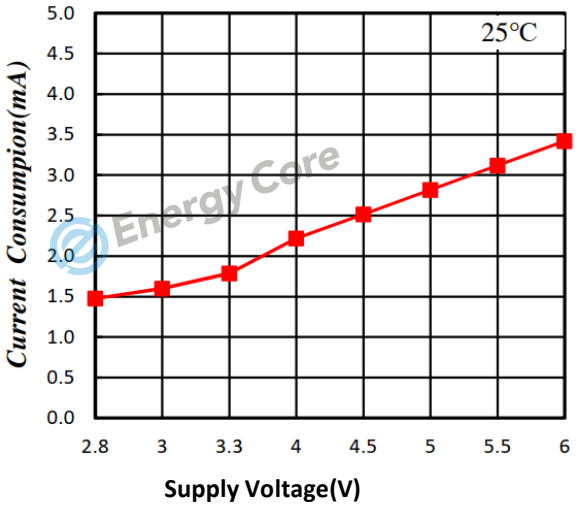


Performance Graph

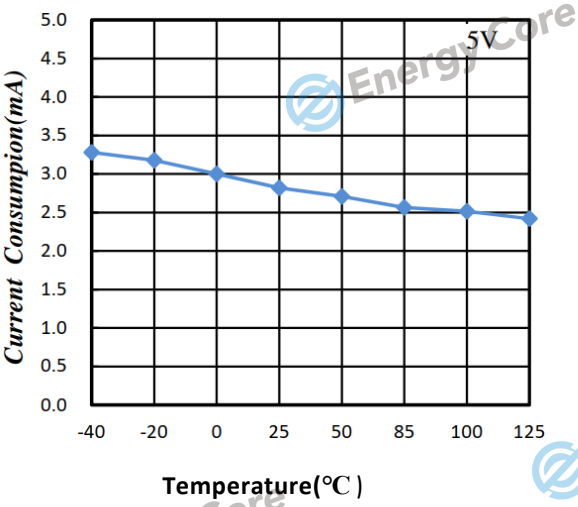
Typical Supply Voltage(VDD) Versus Ratio of Vnull to VDD



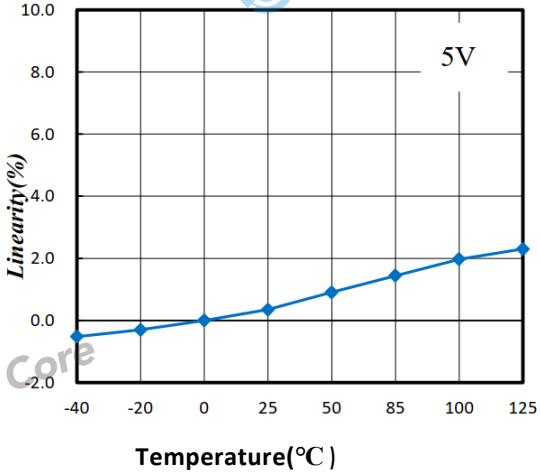
Typical Supply Voltage(VDD) Versus Supply Current(IDD)



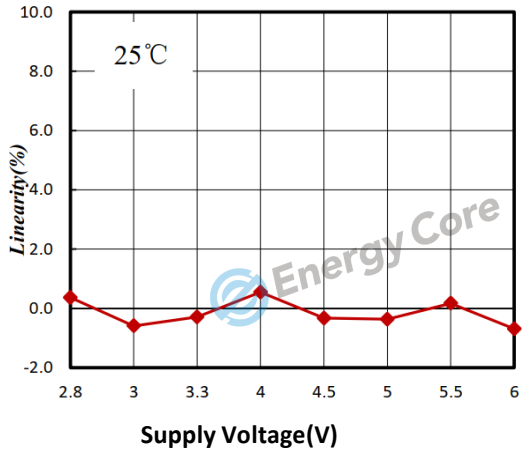
Typical Temperature(TA) Versus Supply Current(IDD)



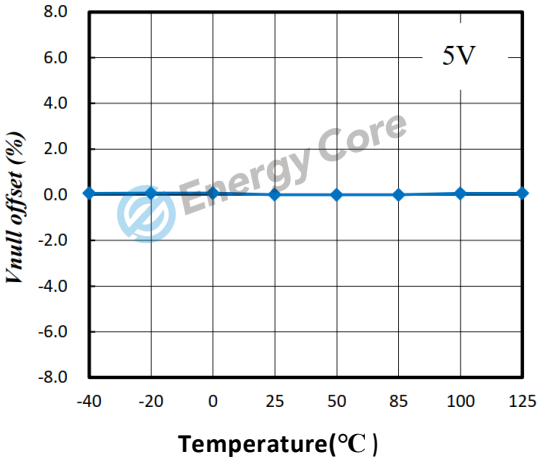
Typical Temperature(TA) Versus Linearity



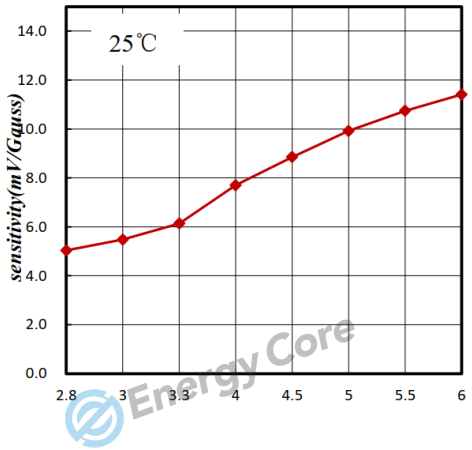
Typical Supply Voltage(VDD) Versus Linearity



Typical Temperature (TA) Versus Output Voltage Offset

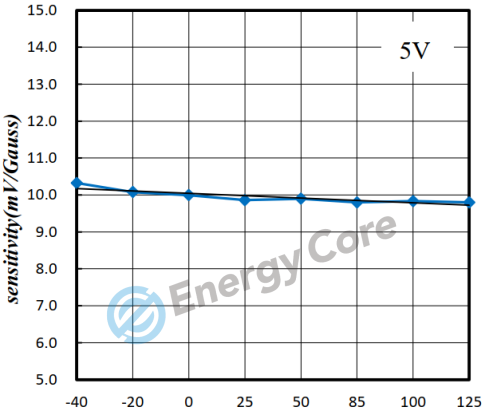


Typical Supply Voltage(VDD) Versus Sensitivity



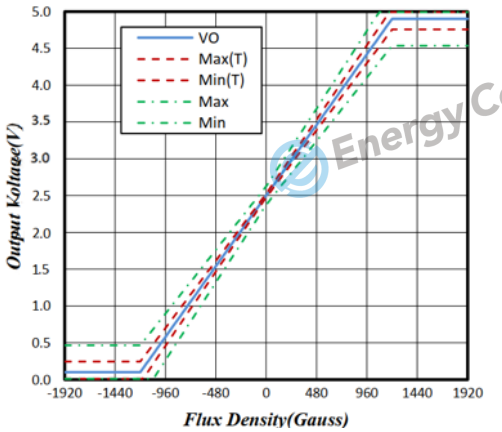
Supply Voltage(V)

Typical Temperature(TA) Versus Sensitivity



Temperature(℃)

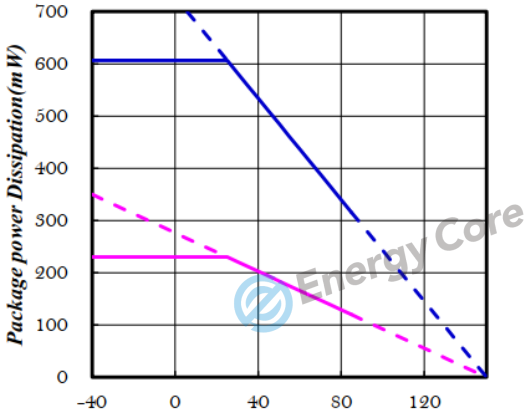
Typical Flux Density Versus Output Voltage



Temperature(℃)

Power Dissipation

Power Dissipation Versus Temperature(TA)



Temperature(℃)

Function Description

Power On Time

When the applied voltage is into the device, the device output requires a response time to react to the ratiometry magnetic field.

Null Voltage Output

In the zero magnetic field state, the output voltage is half of the applied voltage VDD.

Sensitivity

The amount of the output voltage is proportional to the magnetic field changes. This proportionality is specified as the below

$$Sens = \frac{V_{OUT(B+)} - V_{OUT(B-)}}{(B+) - (B-)}$$

Linearity

The device is designed to provide linear output in response to a ramping applied magnetic field. Consider two magnetic fields, B1 and B2. Ideally, the sensitivity of a device is the same for both fields, for a given applied voltage and temperature. The Linearity is calculated separately for positive and negative applied magnetic fields.

$$Lin_{B+} = (1 - \frac{Sens_{(B2+)}}{Sens_{(B1+)}}) \times 100(\%)$$

$$Lin_{B-} = (1 - \frac{Sens_{(B2-)}}{Sens_{(B1-)}}) \times 100(\%)$$

Ratiometry Error

The device provides ratiometric output. The means that Null voltage output, Vnull, and the magnetic sensitivity, Sens, are proportional to the applied voltage, VDD. The ratiometric amount is relative to 5V, and defined as the below

$$R_{Von} = (1 - \frac{Vnull_{VDD} / Vnull_{5V}}{V_{DD} / 5V}) \times 100(\%)$$

$$R_{Sen} = (1 - \frac{Sens_{VDD} / Sens_{5V}}{V_{DD} / 5V}) \times 100(\%)$$

Package Power Dissipation

The power dissipation of the Package is a function of the pad size. This can vary from the minimum pad size for soldering to a pad size given for maximum power dissipation. Power dissipation for a surface mount device is determined by $T_{J(\max)}$, the maximum rated junction temperature of the die, $R_{\theta JA}$, the thermal resistance from the device junction to ambient, and the operating temperature, Ta. Using the values provided on the data sheet for the package, PD can be calculated as follows:

$$P_D = \frac{T_{J(\max)} - T_a}{R_{\theta JA}}$$

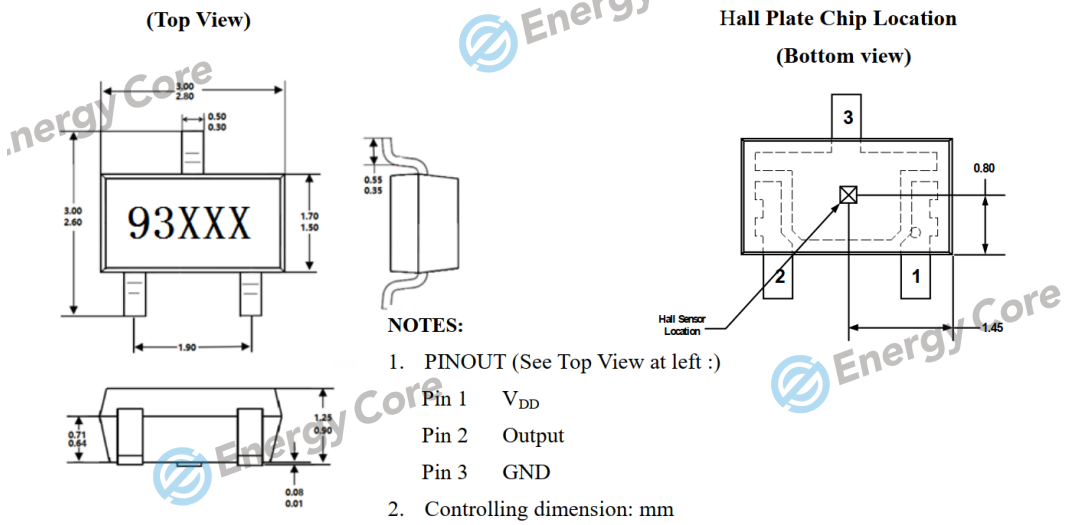
The values for the equation are found in the maximum ratings table on the data sheet. Substituting these values into the equation for an ambient temperature Ta of 25°C, one can calculate the power dissipation of the device which in this case is 230 milliwatts.

$$P_D(YR) = \frac{150\,°C - 25\,°C}{543\,°C/W} = 230\,mW$$

The 543℃/W for the YR package assumes the use of the recommended footprint on a glass epoxy printed circuit board to achieve a power dissipation of 230 milliwatts. There are other alternatives to achieving higher power dissipation from the Package. Another alternative would be to use a ceramic substrate or an aluminum core board such as Thermal Clad. Using a board material such as Thermal Clad, an aluminum core board, the power dissipation can be doubled using the same footprint.

Sensor Location, Package And Marking

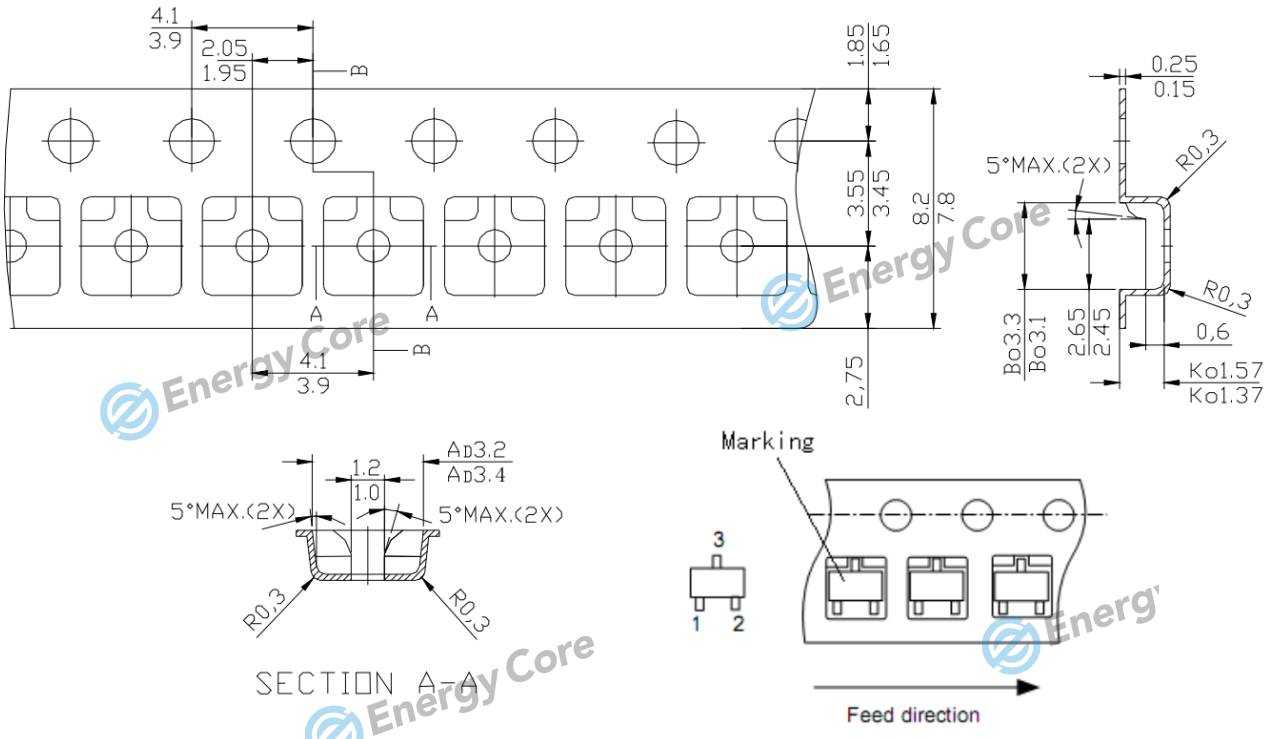
YR Package（SOT23-3）

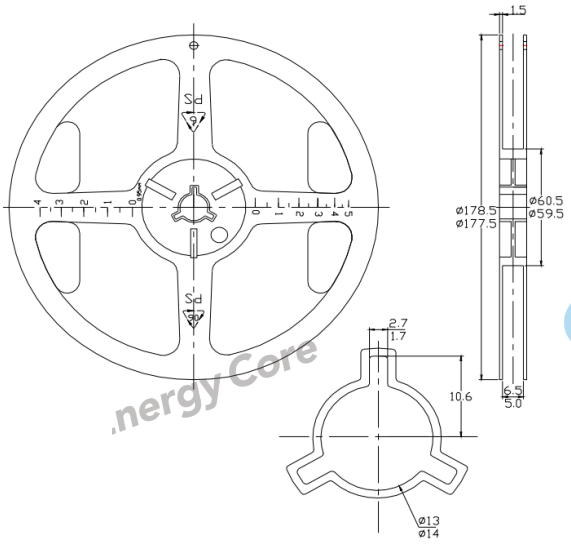


NOTES:

1. PINOUT (See Top View at left :)
   Pin 1 V_{DD}
   Pin 2 Output
   Pin 3 GND
2. Controlling dimension: mm
3. Lead thickness after solder plating will be 0.254mm maximum
4. Chip must be in PKG. center.

SOT23-3 Package Tape On Reel Dimension





NOTES:

1. Material: Conductive polystyrene;
2. DIM in mm;
3. 10 sprocket hole pitch cumulative tolerance ±0.2;
4. Camber not to exceed 1mm in 100mm;
5. Pocket position relative to sprocket hole measured as true position of pocket, not pocket hole;
6. (S.R. OHM/SQ) Means surface electric