

CYL60X Linear Hall Effect Sensor ICs

The CYL60X Series are high performance small versatile linear Hall Effect devices which are operated by the magnetic field from a permanent magnet or an electromagnet. The ratio metric output voltage is set by the supply voltage and varies in proportion to the strength of the magnetic field. The CYL60X family has a quiescent output voltage that is 50% of the supply voltage and output sensitivity options from 1.2mV/G to 3.25mV/G. The integrated circuitry provides increased temperature stability and sensitivity. The CYL60X provides high accuracy and temperature compensation. These linear position sensors have an operating temperature range of -40°C to +150°C, appropriate for industrial and automotive environments. They respond to either positive or negative magnetic field, monitoring either or both magnetic poles. The sensor is available in 2 package styles, which are TO92 and SOT23.

Features

- 3.0 to 12.0 V operation
- Single current sourcing or current sinking output
- Precise sensitivity and temperature compensation
- Power consumption of 5mA at 5 VDC for energy efficiency
- Output voltage proportional to magnetic flux density
- Temperature range of -40°C to 150°C
- Highest ESD performance up to ± 4 kV
- Robust EMC protection
- React differently to the Antarctic and Arctic magnetic fields

Applications

- Current sensing
- Position sensing
- Magnetic code reading
- Motor control
- Weight and liquid level sensing
- Motion detection
- Proximity detection
- Speed detection

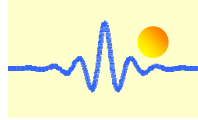
Absolute Maximum Ratings

| | |
|-------------------------------------|----------------|
| Supply Voltage V_{DD} | 15V |
| Supply Current I_{DD} | 10mA |
| Output Sink Current, I_{OUT} | 5mA |
| Operating Temperature Range, T_A | -40°C ~ +150°C |
| Storage Temperature Range, T_S | -40°C ~ +165°C |
| Maximum Junction Temperature, T_J | 165°C |

ESD Protection

Human Body Model (HBM) tests according to: standard EIA/JESD22-A114-B HBM

| Parameter | Symbol | Min. | Max. | Unit |
|------------------------|-----------|-------|------|------|
| HBM ESD stress voltage | V_{ESD} | -4000 | 4000 | V |



Electrical Specifications

DC Operating Parameters $T_A = 25^\circ\text{C}$, $V_{DD} = 5\text{V}$ (unless otherwise specified)

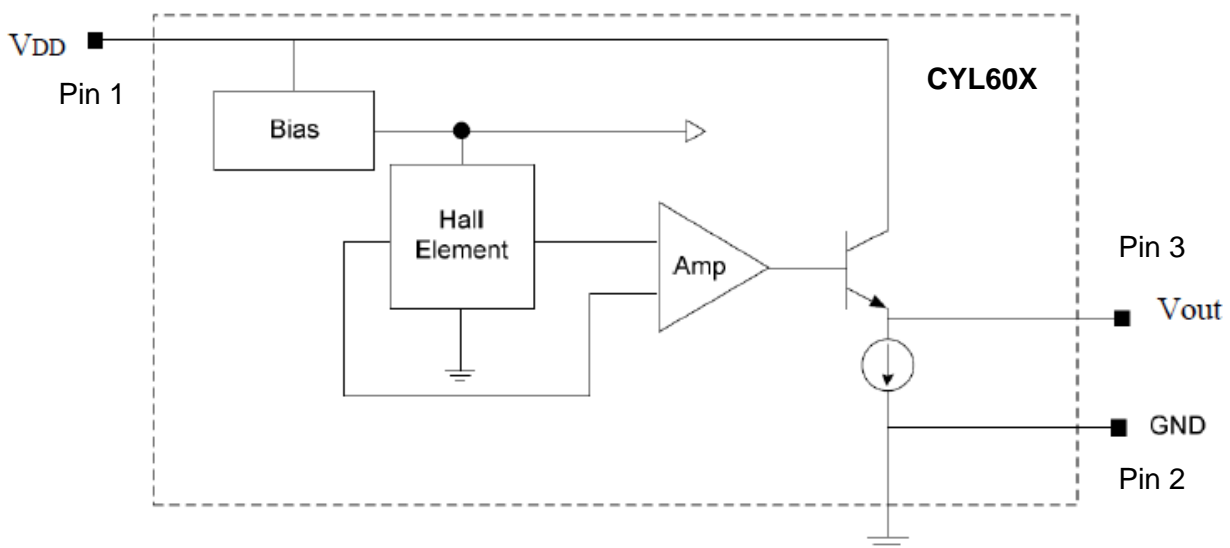
| Parameter | Symbol | Test Conditions | Min | Typ | Max | Units |
|----------------------------|------------|---|------|-----|------|---------------|
| Supply Voltage | V_{DD} | Operating | 3.0 | 5.0 | 12 | V |
| Supply Current | I_{DD} | $V_{DD} = 5\text{V}$, $T_A = 25^\circ\text{C}$ | 3.0 | 5.0 | 8.0 | mA |
| Quiescent Output Voltage | V_{null} | $B = 0$, $T_A = 25^\circ\text{C}$, $V_{DD} = 5\text{V}$ | 2.25 | 2.5 | 2.75 | V |
| Output Voltage | CYL601 | $B = -1250\text{Gs} \sim 1250\text{Gs}$ | 1.0 | 2.5 | 4.0 | V |
| | CYL602 | $B = -600\text{Gs} \sim 600\text{Gs}$ | 1.0 | 2.5 | 4.0 | V |
| | CYL603 | $B = -460\text{Gs} \sim 460\text{Gs}$ | 1.0 | 2.5 | 4.0 | V |
| Output Current | I_{out} | $B \rightarrow 0$ | | | 1.5 | mA |
| Step response time | t_r | Output signal reaching 90% | | 3 | | μs |
| Output load resistance | R_L | $ \Delta V_{OUT} < 15\text{mV}$ | 200 | | | k Ω |
| Frequency bandwidth (-3dB) | f_B | | 0 | 200 | 250 | kHz |

Magnetic Specifications

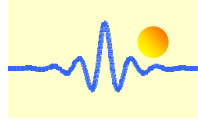
DC Operating Parameters $T_A = 25^\circ\text{C}$, $V_{DD} = 5\text{V}$ (unless otherwise specified)

| Parameter | Symbol | Part Name | Min | Typ | Max | Units |
|------------------------------|----------------|---------------|------|------|-----------|-----------------------|
| Sensitivity | Sens | CYL601 | 9.0 | 12.0 | 15.0 | mV/mT |
| | | CYL602 | 22.0 | 25.0 | 28.0 | mV/mT |
| | | CYL603 | 29.5 | 32.5 | 35.5 | mV/mT |
| Linearity | Lin | CYL60X Series | | | ± 1.0 | % |
| Thermal drift of zero offset | | CYL60X Series | | 300 | | ppm/ $^\circ\text{C}$ |
| Radiometry, V_{null} | V_{null} (V) | CYL60X Series | | | ± 2.0 | % |

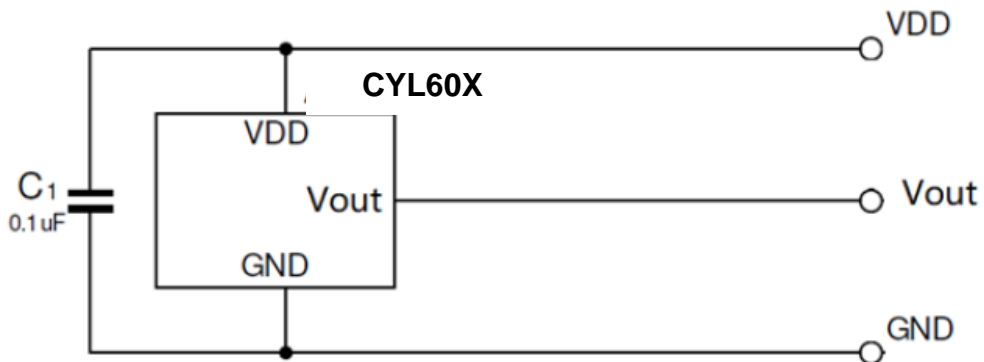
Functional Diagram



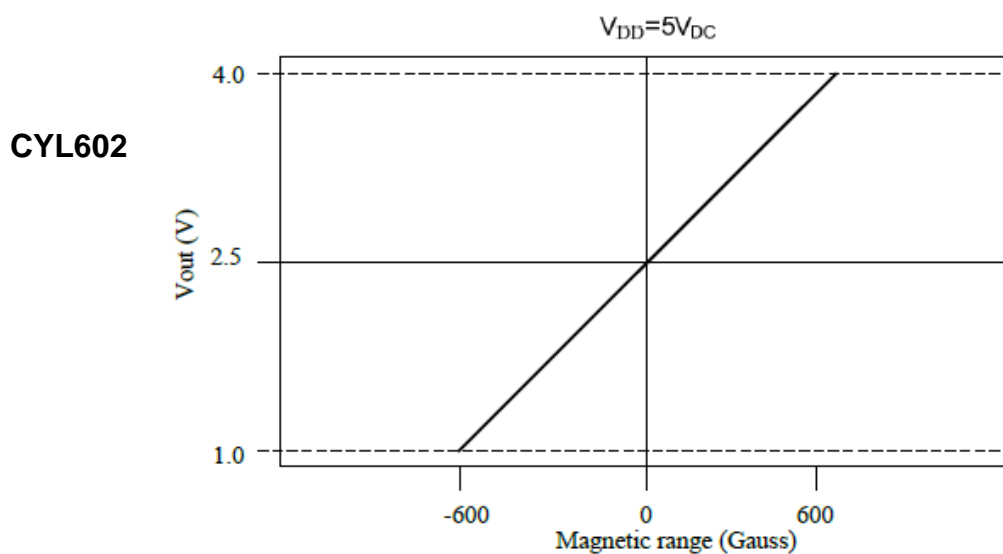
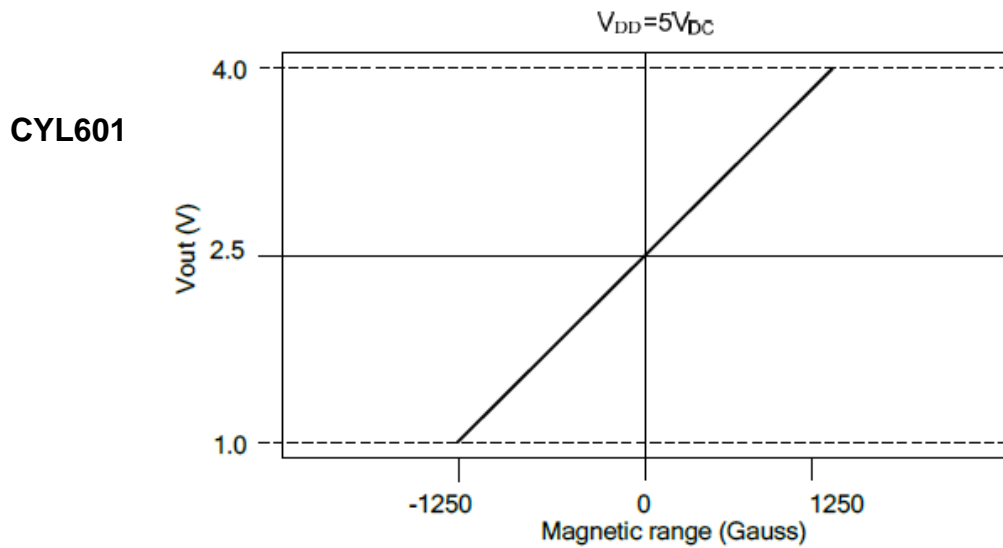
Pin 1: VDD (Voltage Supply)
Pin 2: GND (Ground)
Pin 3: Vout (Signal Output)

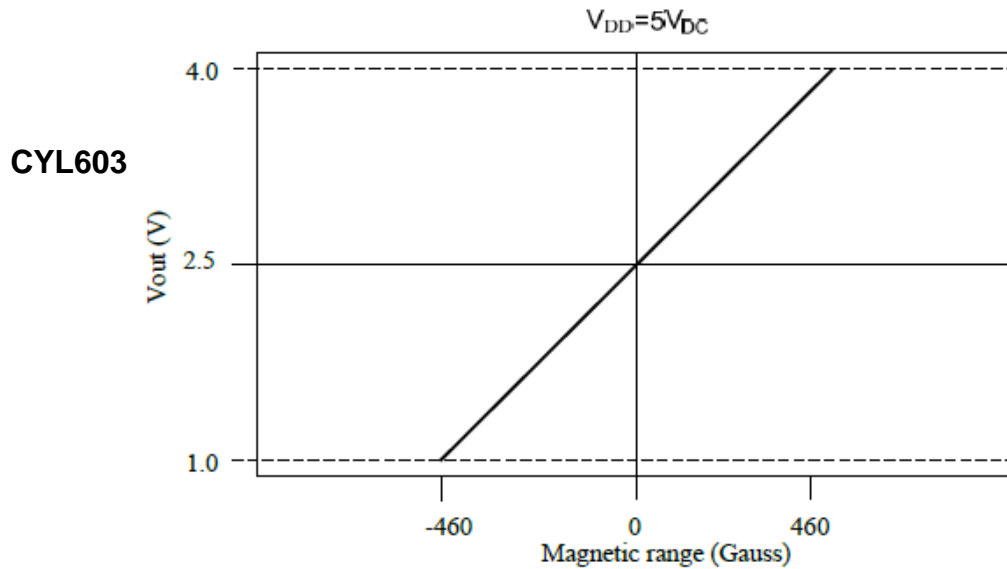
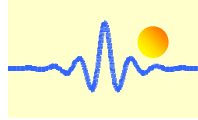


Typical Application Connection



Transfer Characteristics at $V_{DD}=5.0V_{DC}$

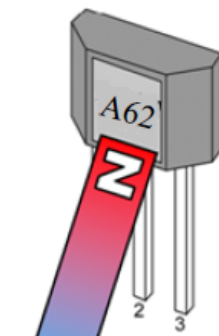




Application example: VDD =5V

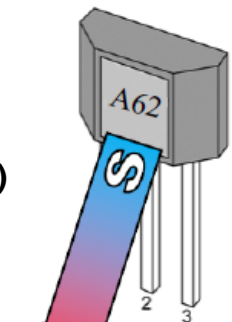
TO92S Package:

CYL601UA
CYL602UA
CYL603UA



$V_{OUT}= 1.0 \text{ to } 2.5 \text{ V}$

TO92S (CYL602UA)



$V_{OUT}= 2.5 \text{ to } 4 \text{ V}$

SOT23 Package:

CYL601SU
CYL602SU
CYL603SU



SOT23 (CYL602SU)

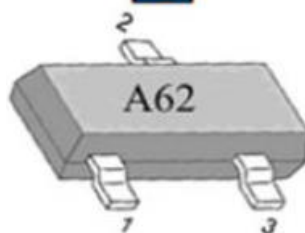


Marking:

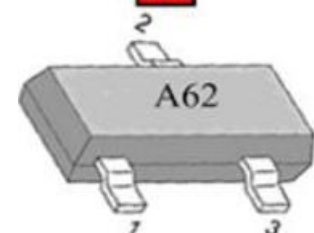
CYL601: A61
CYL602: A62
CYL603: A63

Pin Arrangement:

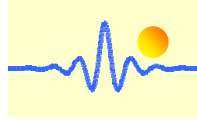
Pin 1: VDD (Voltage Supply)
Pin 2: GND (Ground)
Pin 3: Vout (Signal Output)



$V_{OUT}= 1.0 \text{ to } 2.5 \text{ V}$

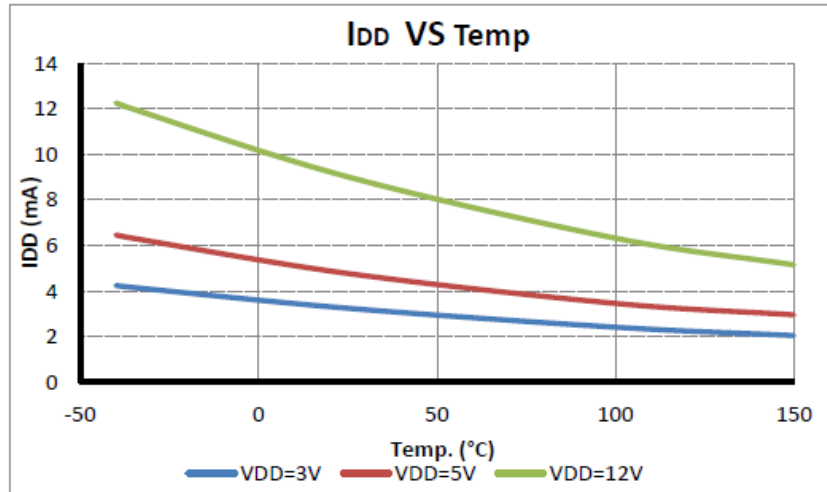


$V_{OUT}= 2.5 \text{ to } 4 \text{ V}$

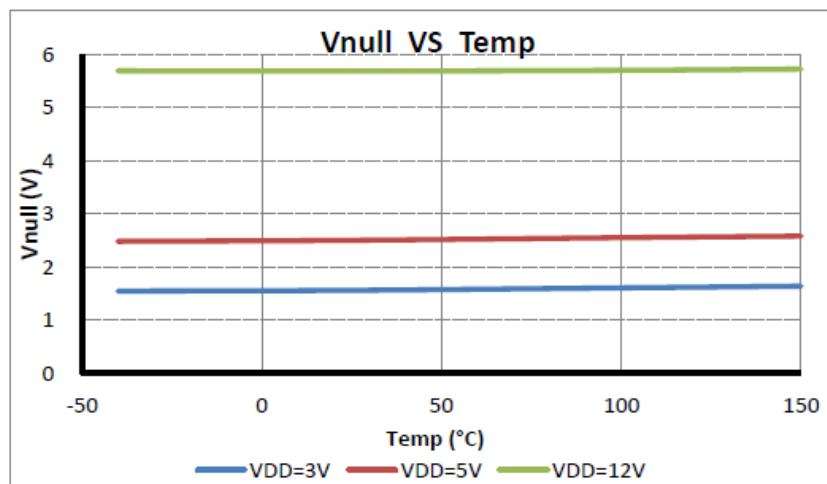


Typical characteristic Curves

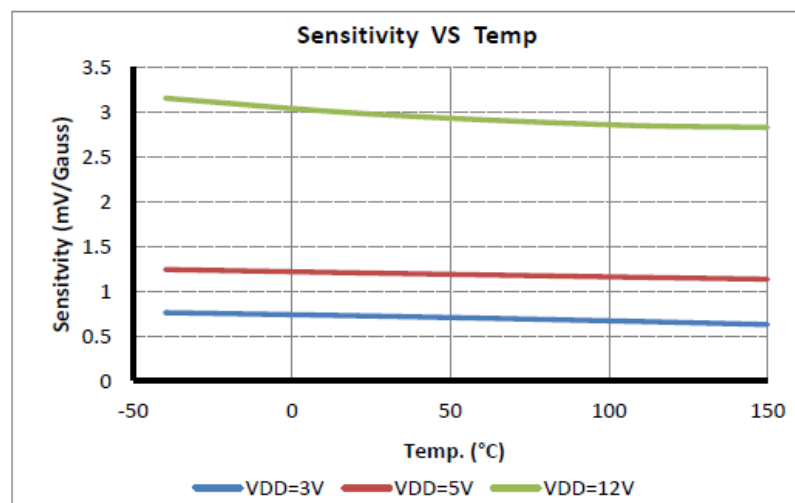
CYL601

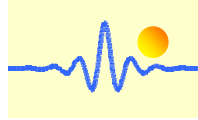


CYL601

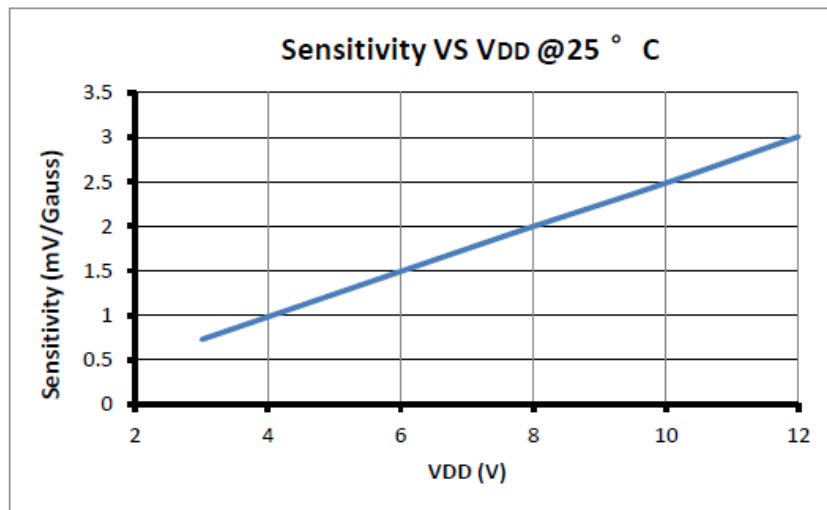


CYL601

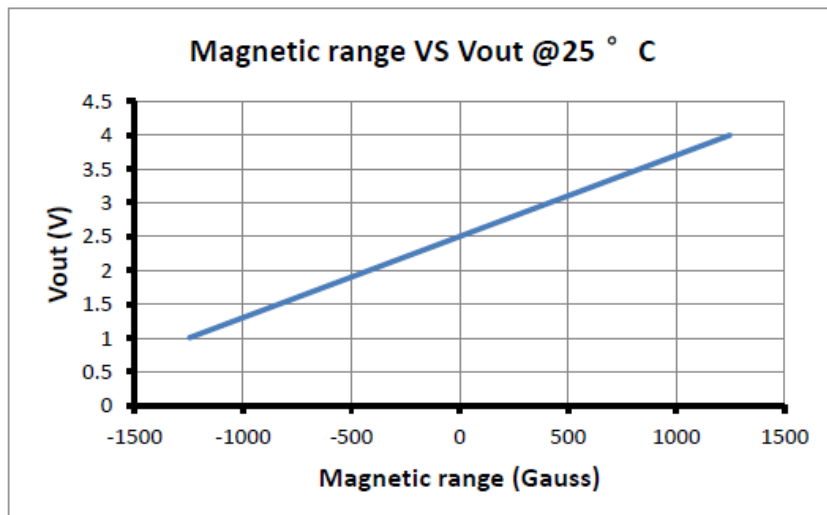




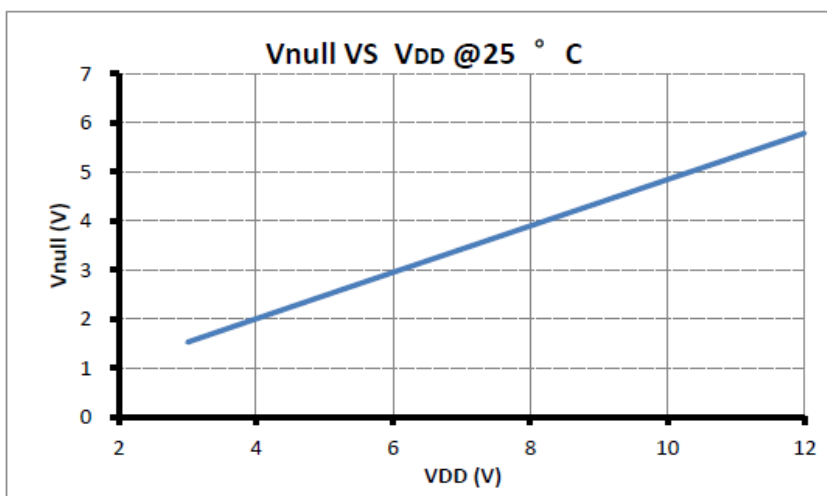
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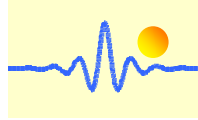


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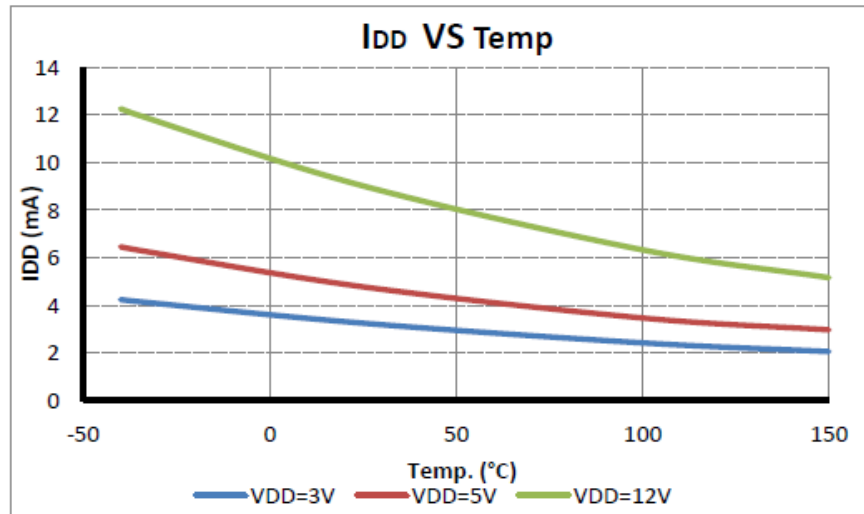


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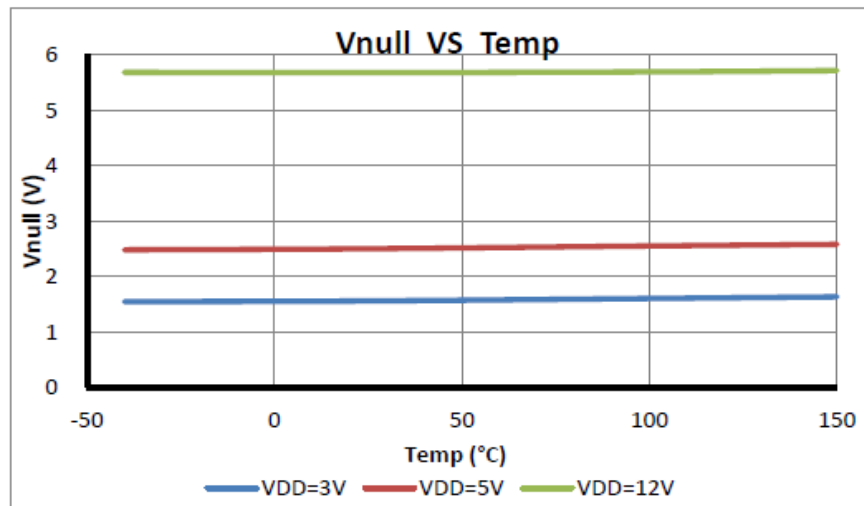




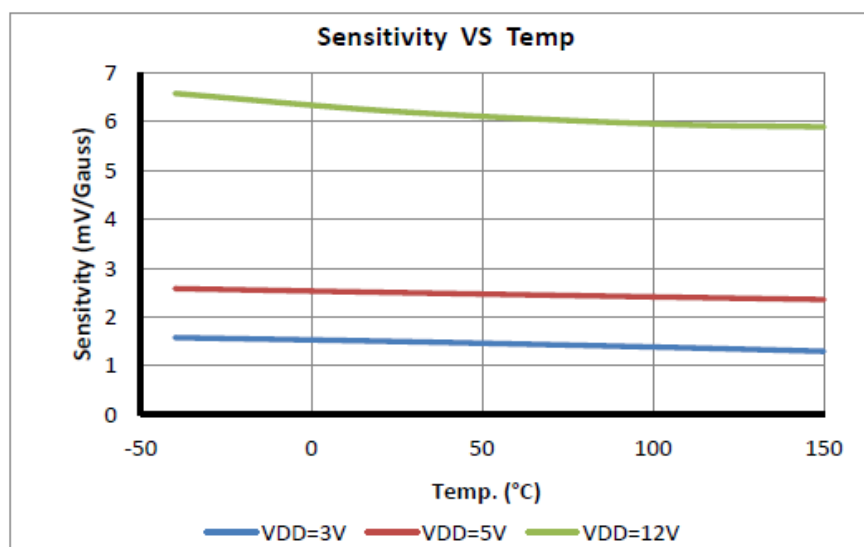
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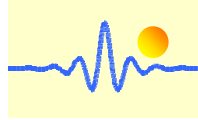


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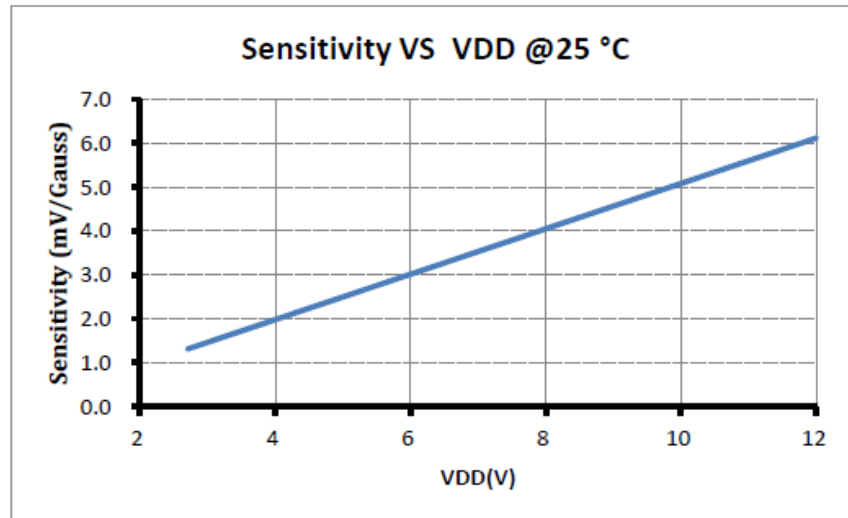


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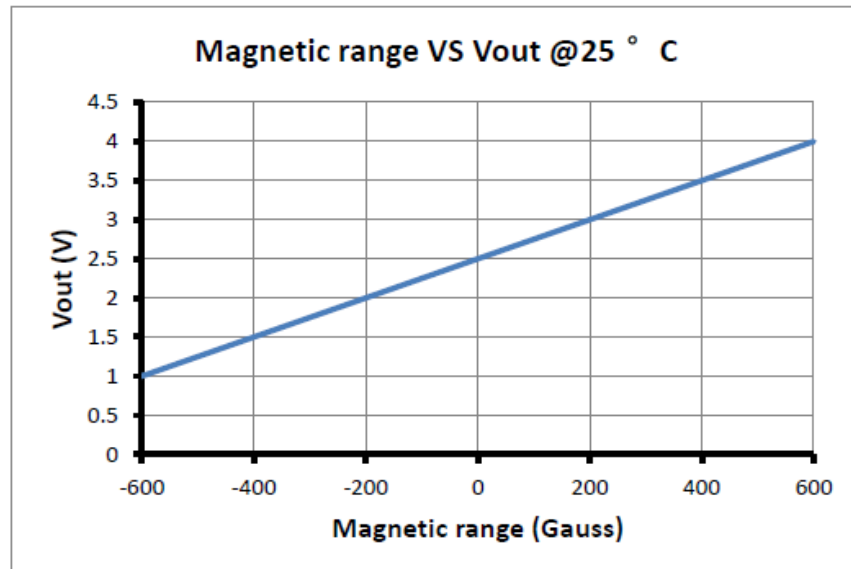




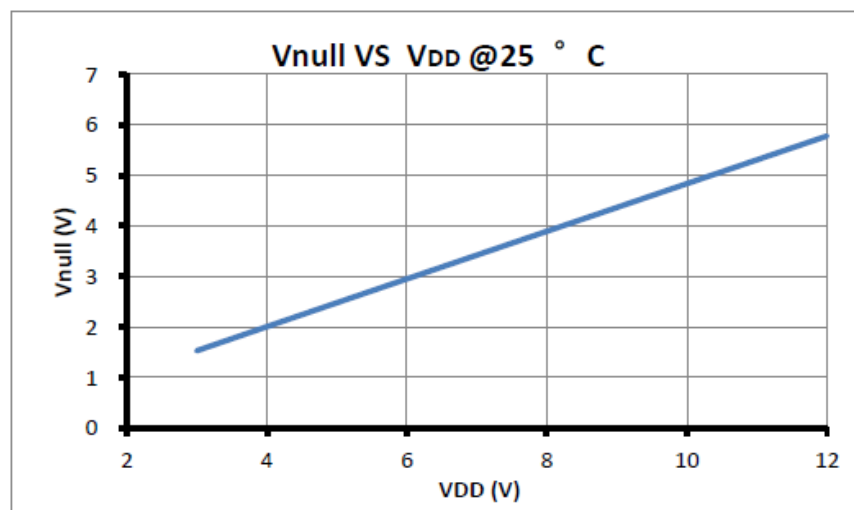
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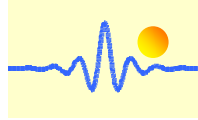


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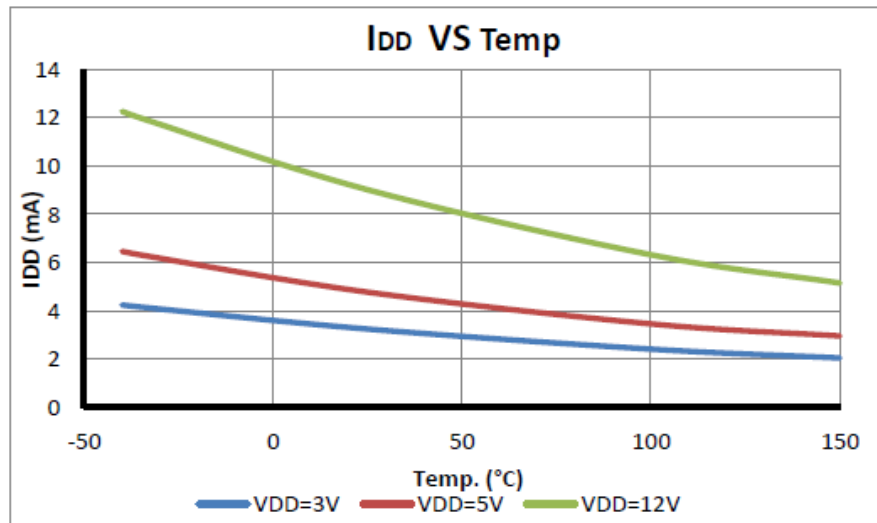


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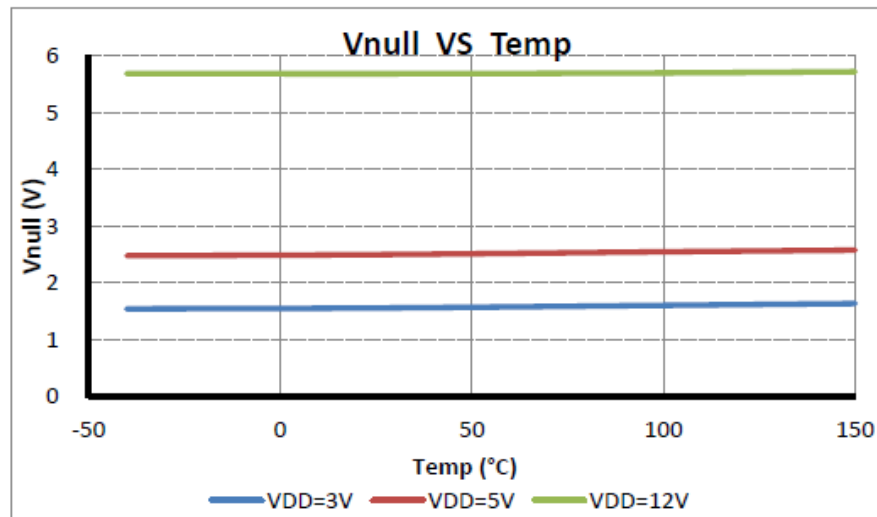




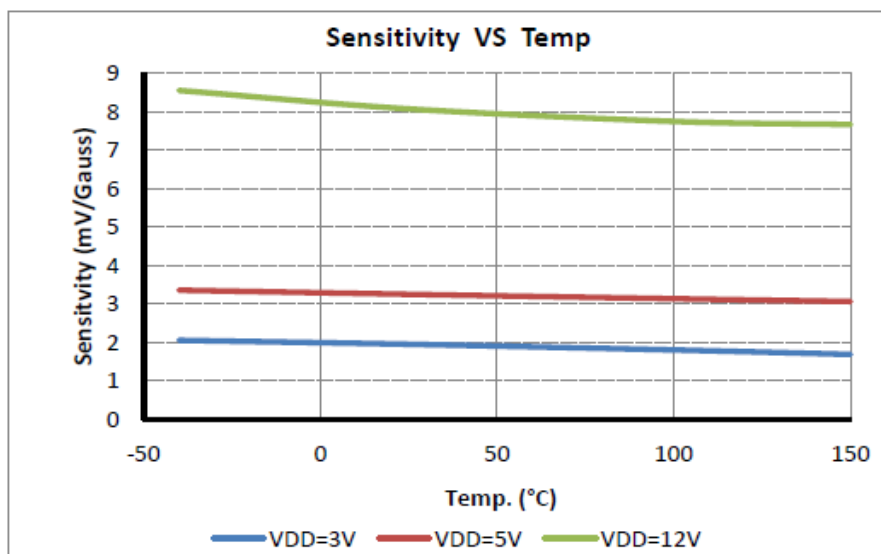
CYL603

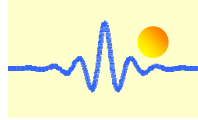


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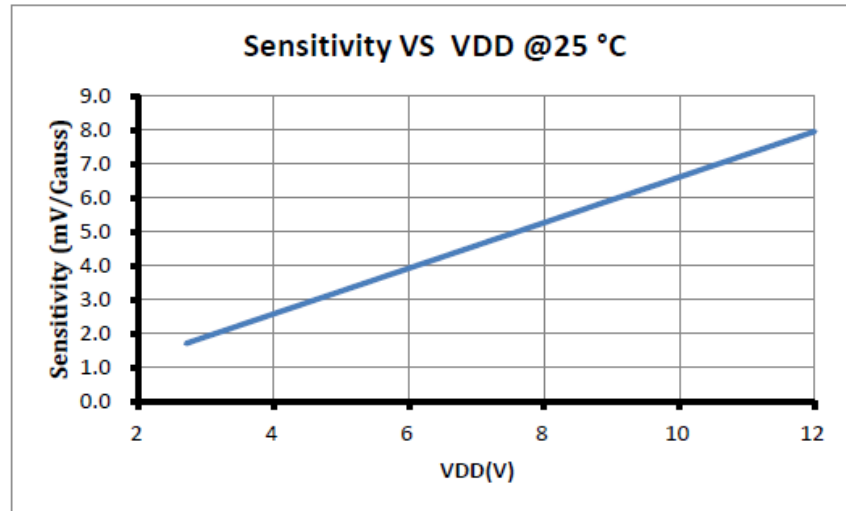


CYL603

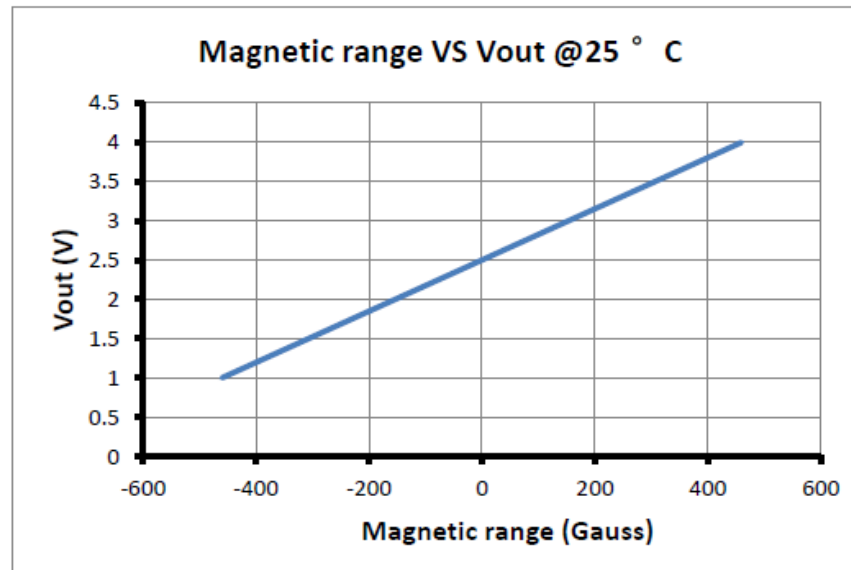




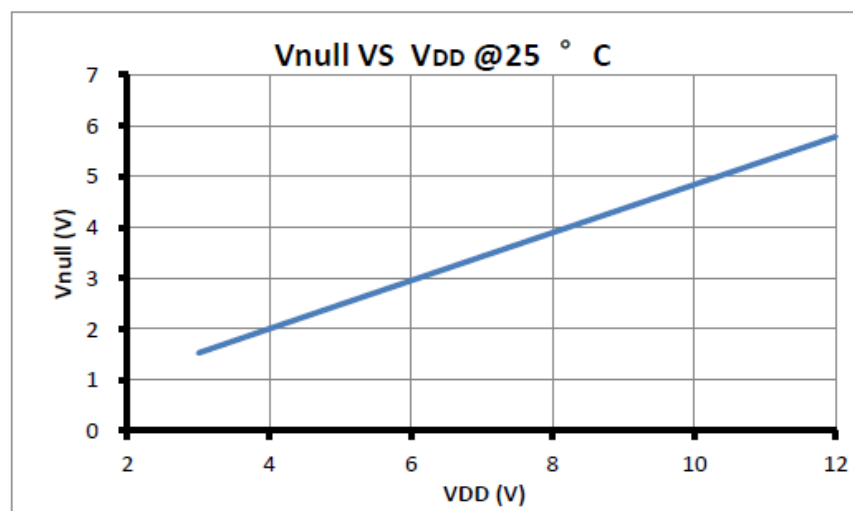
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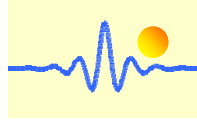


CYL603



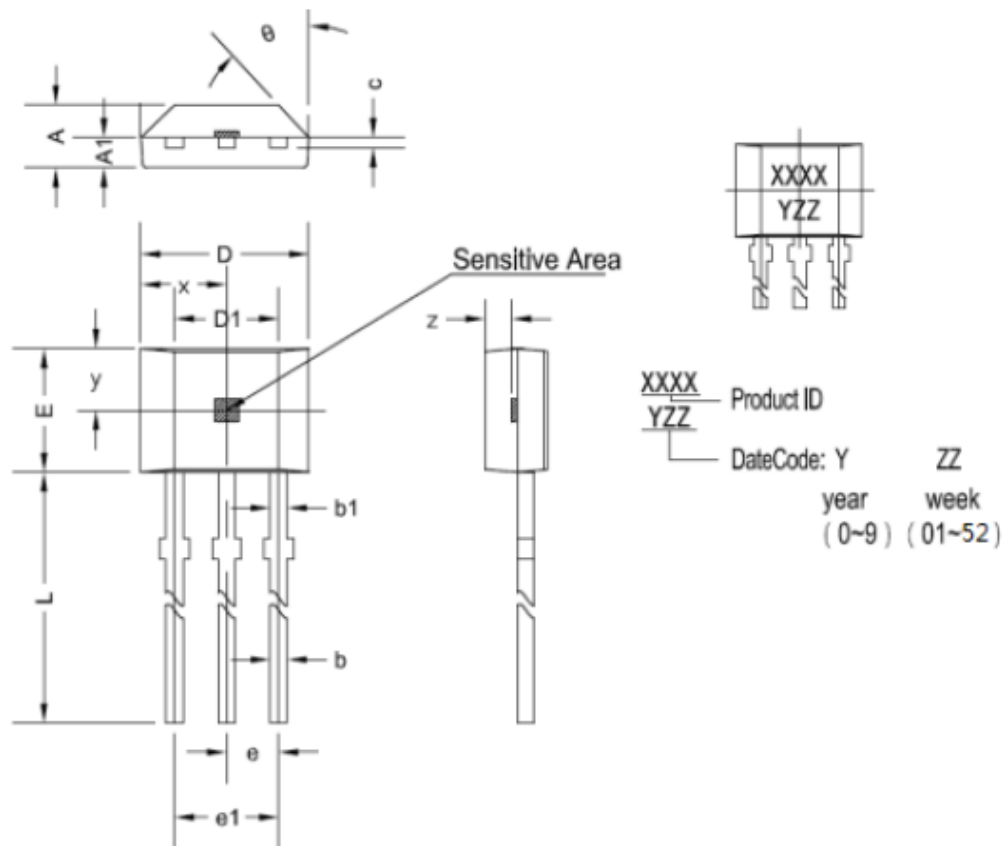
CYL603



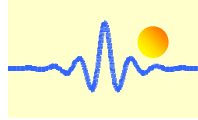


Package Dimensions

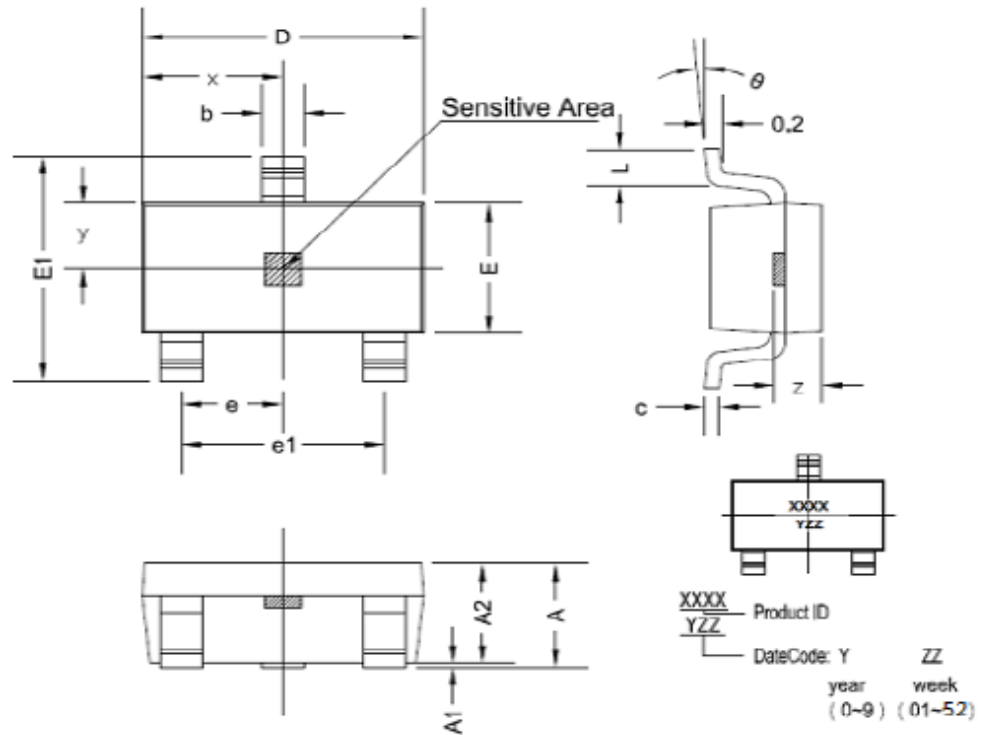
TO92S



| symbol | Size (mm) | | Size (in inches) | |
|----------|-----------|---------|------------------|---------|
| | minimum | maximum | minimum | maximum |
| A | 1.42 | 1.67 | 0.056 | 0.066 |
| A1 | 0.66 | 0.86 | 0.026 | 0.034 |
| b | 0.35 | 0.56 | 0.014 | 0.022 |
| b1 | 0.4 | 0.55 | 0.016 | 0.022 |
| C | 0.36 | 0.51 | 0.014 | 0.02 |
| D | 3.9 | 4.2 | 0.154 | 0.165 |
| D1 | 2.97 | 3.27 | 0.117 | 0.129 |
| E | 2.9 | 3.28 | 0.114 | 0.129 |
| e | 1.270 TYP | | 0.050 TYP | |
| e1 | 2.44 | 2.64 | 0.096 | 0.104 |
| L | 13.5 | 15.5 | 0.531 | 0.61 |
| x | 2.025TYP | | 0.080TYP | |
| y | 1.545TYP | | 0.061TYP | |
| z | 0.500TYP | | 0.020TYP | |
| θ | 45°TYP | | 45°TYP | |



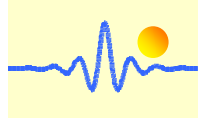
SOT23



| symbol | Size (mm) | | Size (in inches) | |
|----------|-----------|---------|------------------|---------|
| | minimum | maximum | minimum | maximum |
| A | 1.05 | 1.25 | 0.041 | 0.049 |
| A1 | 0 | 0.1 | 0 | 0.004 |
| A2 | 1.05 | 1.15 | 0.041 | 0.045 |
| b | 0.3 | 0.5 | 0.012 | 0.02 |
| c | 0.100 | 0.2 | 0.004 | 0.008 |
| D | 2.82 | 3.02 | 0.111 | 0.119 |
| E | 1.5 | 1.7 | 0.059 | 0.067 |
| E1 | 2.65 | 2.95 | 0.104 | 0.116 |
| e | 0.950 TYP | | 0.037 TYP | |
| e1 | 1.8 | 2 | 0.071 | 0.079 |
| L | 0.3 | 0.6 | 0.012 | 0.024 |
| x | 1.460TYP | | 0.057TYP | |
| y | 0.800TYP | | 0.032TYP | |
| z | 0.600TYP | | 0.024TYP | |
| θ | 0° | 8° | 0° | 8° |

Notes:

1. Exact body and lead configuration at vendor's option within limits shown
2. Height does not include mold gate flash
3. Where no tolerance is specified, dimension is nominal



Order Information:

| Sensor | Part number | Package | Quantity per Packing |
|--------|-------------|---------|-------------------------|
| CYL601 | CYL601UA | TO92S | 500pcs or 1000pcs / bag |
| | CYL601SU | SOT23 | 3000pcs /reel |
| CYL602 | CYL602UA | TO92S | 500pcs or 1000pcs / bag |
| | CYL602SU | SOT23 | 3000pcs /reel |
| CYL603 | CYL603UA | TO92S | 500pcs or 1000pcs / bag |
| | CYL603SU | SOT23 | 3000pcs /reel |

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