



**Cosemitech**

**CH603/CH604/CH605**

**Automotive Product Group**

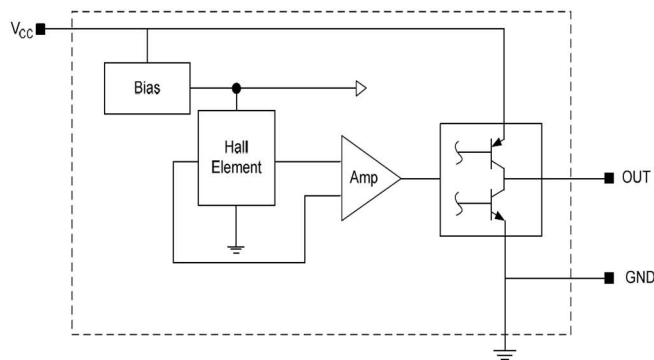
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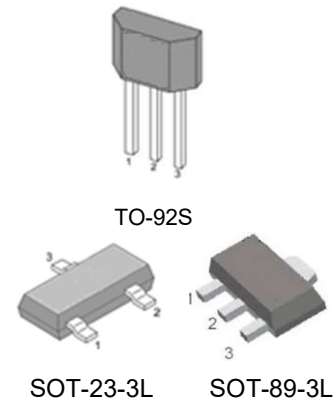
**FEATURES and FUNCTIONAL DIAGRAM**

- Power consumption of 4 mA at 5 VDC for energy efficiency
- Single Current Sinking or Current Sourcing Output
- Linear output for circuit design flexibility
- Ratiometric Rail to Rail Linear Output
- Precise Sensitivity and Temperature Compensation
- Wide Operating Voltage Range: Supply Voltage 3.0~15V
- Sensitivity at 5V:
  - 3.3mV/Gauss (CH603)
  - 2.5mV/Gauss (CH604)
  - 5.0mV/Gauss (CH605)
- Sensitivity at 3.3V:
  - 2.15mV/Gauss (CH603)
  - 1.6mV/Gauss (CH604)
  - 3.15mV/Gauss (CH605)
- Specified Operating Temperature Range: From -40°C~150°C
- Responds to either positive or negative gauss
- Quad Hall sensing element for stable output
- Lead Free Package: Flat TO-92, SOT-89-3L, SOT-23-3L
- High ESD Protection
- RoHS Compliant 2011/65/EU

**Functional Block Diagram**



**PACKAGE**




**APPLICATIONS**

Automotive, Industrial, Home, appliances,  
 Current sensing  
 Speed Detection  
 Position Detection  
 Magnetic Encoder  
 Solid-State Switch  
 Ferrous metal sensing  
 Liquid level sensing  
 Vibration sensing  
 Weight sensing

**DESCRIPTION**

The CH603/CH604/CH605 family is high performance ratiometric linear hall effect sensor, produced with Bipolar technology; it is high performance small versatile linear Hall-effect devices which are operated by the magnetic field from a permanent magnet or an electromagnet. The ratiometric output voltage is set by the supply voltage and varies in proportion to the strength of the magnetic field. The CH603/CH604/CH605 family has a quiescent output voltage that is 50% of the supply voltage.


The integrated circuitry provides increased temperature stability and sensitivity. The CH603/CH604/CH605 provide high accuracy and temperature compensation. The linear hall sensors have an operating temperature range from -40 to +150 °C, appropriate for home appliances, industrial and automotive environments. They respond to either South or North pole.

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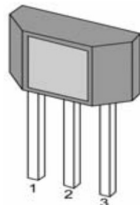
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## 1. Product Family Members

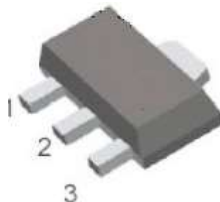
Part Number	Marking ID	Description
CH603ATB	C603	Linear Hall sensor IC, flat, TO-92S package, bulk packing (1000 units per bag)
CH603AER	C603	Linear Hall sensor IC, SOT-89-3L package, tape and reel packing (1000 units per reel)
CH603ASR	C603	Linear Hall sensor IC, SOT-23-3L package, tape and reel packing (3000 units per reel)
CH604ATB	C604	Linear Hall sensor IC, flat, TO-92S package, bulk packing (1000 units per bag)
CH604AER	C604	Linear Hall sensor IC, SOT-89-3L package, tape and reel packing (1000 units per reel)
CH604ASR	C604	Linear Hall sensor IC, SOT-23-3L package, tape and reel packing (3000 units per reel)
CH605ATB	C605	Linear Hall sensor IC, flat, TO-92S package, bulk packing (1000 units per bag)
CH605AER	C605	Linear Hall sensor IC, SOT-89-3L package, tape and reel packing (1000 units per reel)
CH605ASR	C605	Linear Hall sensor IC, SOT-23-3L package, tape and reel packing (3000 units per reel)

## 2. Pin Definitions and Descriptions

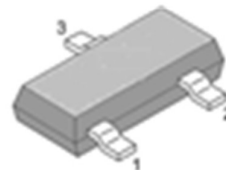
TO-92S (T)	SOT-89-3L (E)	SOT-23-3L (E)	Name	Type	Function
1	1	1	VDD	Supply	Supply Voltage pin
2	2	3	GND	Ground	Ground pin
3	3	2	OUT	Output	Output pin



**TO-92S**



**SOT-89-3L**




**SOT-23-3L**

## 3. Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Units
Supply Voltage	$V_{DD}$	-	18	V
VDD Reverse Voltage $V_{DD}$	$V_{R_{DD}}$	-	-0.3	V
Output Voltage	$V_{OUT}$	-0.3	18	V
Output Current	$I_{OUT}$	-	5	mA
Operating Ambient Temperature	$T_A$	-40	150	°C
Storage Temperature	$T_S$	-50	150	°C
Junction temperature	$T_J$	-50	165	°C
Magnetic Flux	B	No Limit		Gauss

Note: Exceeding the absolute maximum ratings may cause permanent damage. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

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#### 4. ESD Protections

Parameter	Value	Unit
All pins <sup>1)</sup>	+/-6000	V
All pins <sup>2)</sup>	+/-400	V
All pins <sup>3)</sup>	+/-1500	V

1) HBM (human body mode, 100pF, 1.5 kohm ) according to MIL-STD-883H Method 3015.8

2) MM (Machine Mode C=200pF, R=0Ω) according to JEDEC EIA/JESD22-A115

3) CDM (charged device mode) according to JEDEC EIA/JESD22-C101F

#### 5. Function Description

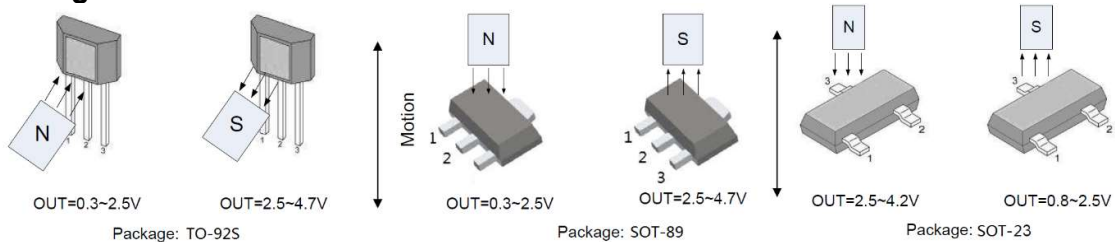
The CH603/CH604/CH605 family MRL (Miniature Ratiometric Linear) sensors are small, versatile linear Hall effect devices which are operated by the magnetic field from a permanent magnet or an electromagnet. The ratiometric output voltage is set by the supply voltage and varies in proportion to the strength of the magnetic field.

The integrated circuitry provides increased temperature stability, sensitivity 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 gauss, monitoring either or both magnetic poles.

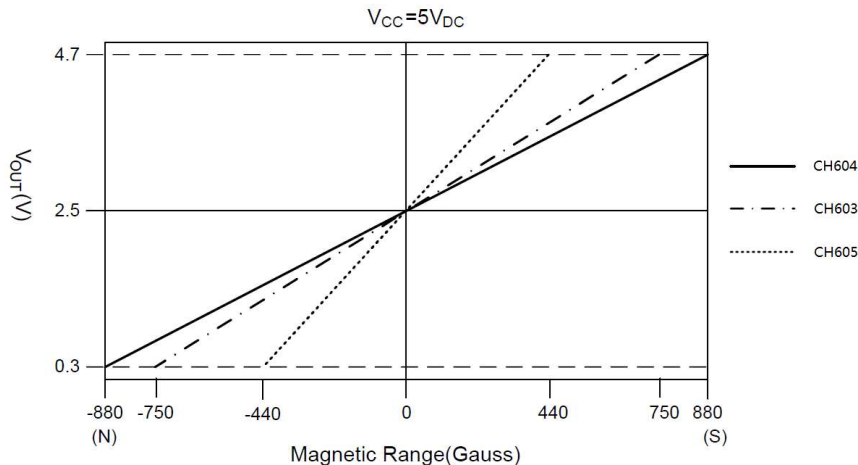
The quad Hall sensing element minimizes the effects of mechanical or thermal stress on the output. The product providing a robust design over a wide temperature range. Rail-to-rail operation (over full voltage range) provides a more usable signal for higher accuracy.

The CH603/CH604/CH605 family has a typical sinking or sourcing output of 1.5 mA continuous, uses 4 mA of supply current at 5.0 volts and 25°C, and provides predictable performance over the full temperature range. The CH603/CH604/CH605 family Series sensors have wider null and sensitivity tolerances.

#### 6. Magnetic Activation



#### 7. Transfer Characteristics



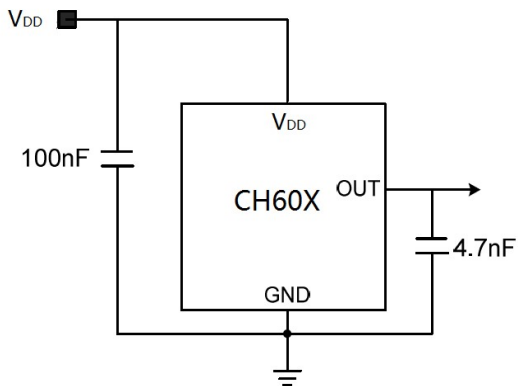
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**8. Parameters Specification (At  $V_{DD}=5V$ ,  $T_A=-40\text{ }^\circ\text{C}$  to  $150\text{ }^\circ\text{C}$  except where otherwise specified.)**

Symbol	Parameter	Test Condition	Min	Typ	Max	Units
$V_{DD}$	Supply voltage	$-40\text{ }^\circ\text{C}$ to $150\text{ }^\circ\text{C}$	3.0	5.0	15	V
$I_{DD}$	Supply Current	$B=0$		4	8	mA
$V_H$	Output voltage	$B=+1000\text{ Gs}$			0.4	V
$V_L$		$B=-1000\text{ Gs}$	4.7			V
$V_{NULL}$	Quiescent Voltage	$B=0, 25\text{ }^\circ\text{C}, V_{DD}=5V$	2.45	2.5	2.55	V
		$B=0, 25\text{ }^\circ\text{C}, V_{DD}=3.3V$	1.60	1.65	1.70	V
$I_{SINK}$	Sink Current	$V_{DD}=3V, T_A=25\text{ }^\circ\text{C}$	-0.8			mA
$I_{SINK}$		$V_{DD}=5V, T_A=25\text{ }^\circ\text{C}$	-1			mA
$I_{SOURCE}$	Source Current	$V_{DD}=3V, T_A=25\text{ }^\circ\text{C}$			1.5	mA
$I_{SOURCE}$		$V_{DD}=5V, T_A=25\text{ }^\circ\text{C}$			2.0	mA
$V_N$	Output Referred Noise(CH605)	$T_A = 25\text{ }^\circ\text{C}, CL = 0.1\text{ }\mu\text{F}$		4.2		mV(p-p)
	Output Referred Noise(CH603)	$T_A = 25\text{ }^\circ\text{C}, CL = 0.1\text{ }\mu\text{F}$		3.1		mV(p-p)
	Output Referred Noise(CH604)	$T_A = 25\text{ }^\circ\text{C}, CL = 0.1\text{ }\mu\text{F}$		2.6		mV(p-p)
$L_{IN}$	Linearity		-5		+5	%
$V_{NULL}(T)$	Delta Vnull as temperature		-5		+5	%
$V_{NULL}(V)$	Ratiometry, Vnull		-5		+5	%
$SENS(T)$	Delta Sens as temperature		-10		+10	%
$S_{ENS}$	Sensitivity(CH603)	$T_A=25\text{ }^\circ\text{C}, V_{DD}=5V$		3.3		mV/Gs
$S_{ENS}$	Sensitivity(CH604)		2.5		mV/Gs	
$S_{ENS}$	Sensitivity(CH605)		5		mV/Gs	
$S_{ENS}$	Sensitivity(CH603)	$T_A=25\text{ }^\circ\text{C}, V_{DD}=3.3V$		2.15		mV/Gs
$S_{ENS}$	Sensitivity(CH604)		1.6		mV/Gs	
$S_{ENS}$	Sensitivity(CH605)		3.15		mV/Gs	
B+	Magnetic Range (CH603)	$T_A=25\text{ }^\circ\text{C}, V_{DD}=5V$		666		Gauss
B-				-666		Gauss
B+	Magnetic Range (CH604)			880		Gauss
B-				-880		Gauss
B+	Magnetic Range (CH605)			440		Gauss
B-				-440		Gauss
B+	Magnetic Range (CH603)	$T_A=25\text{ }^\circ\text{C}, V_{DD}=3.3V$		650		Gauss
B-				-650		Gauss
B+	Magnetic Range (CH604)			850		Gauss
B-				-850		Gauss
B+	Magnetic Range (CH605)			430		Gauss
B-				-430		Gauss

**9. Typical Application Circuit**





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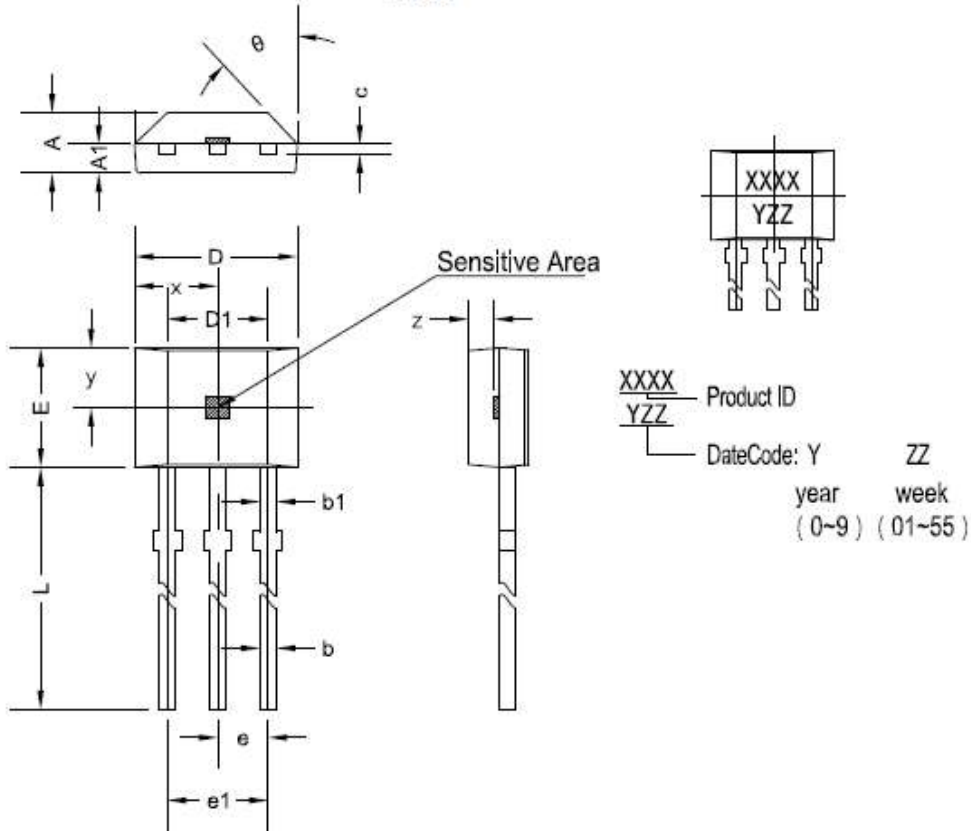
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**10. Package Information:**

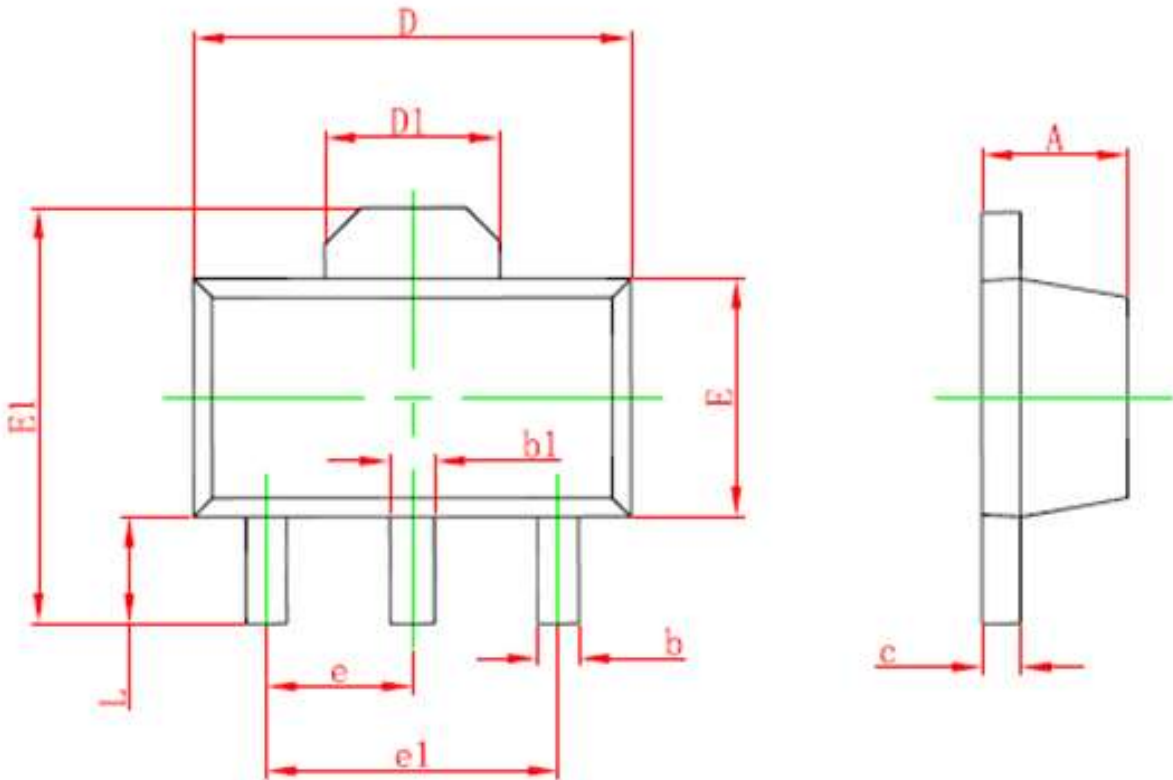
**PACKAGE DESIGNATOR**

TO-92



Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	1.420	1.670	0.056	0.066
A1	0.660	0.860	0.026	0.034
b	0.350	0.560	0.014	0.022
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	2.900	3.280	0.114	0.129
e	1.270 TYP		0.050 TYP	
e1	2.440	2.640	0.096	0.104
L	13.500	15.500	0.531	0.610
x	2.025 TYP		0.080 TYP	
y	1.545 TYP		0.061 TYP	
z	0.500 TYP		0.020 TYP	
$\theta$	45° TYP		45° TYP	

**PACKAGE DESIGNATOR**  
**SOT-89-3L**



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.020
b1	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF.		0.061 REF.	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TYP.		0.060 TYP.	
e1	3.000 TYP.		0.118 TYP.	
L	0.900	1.200	0.035	0.047





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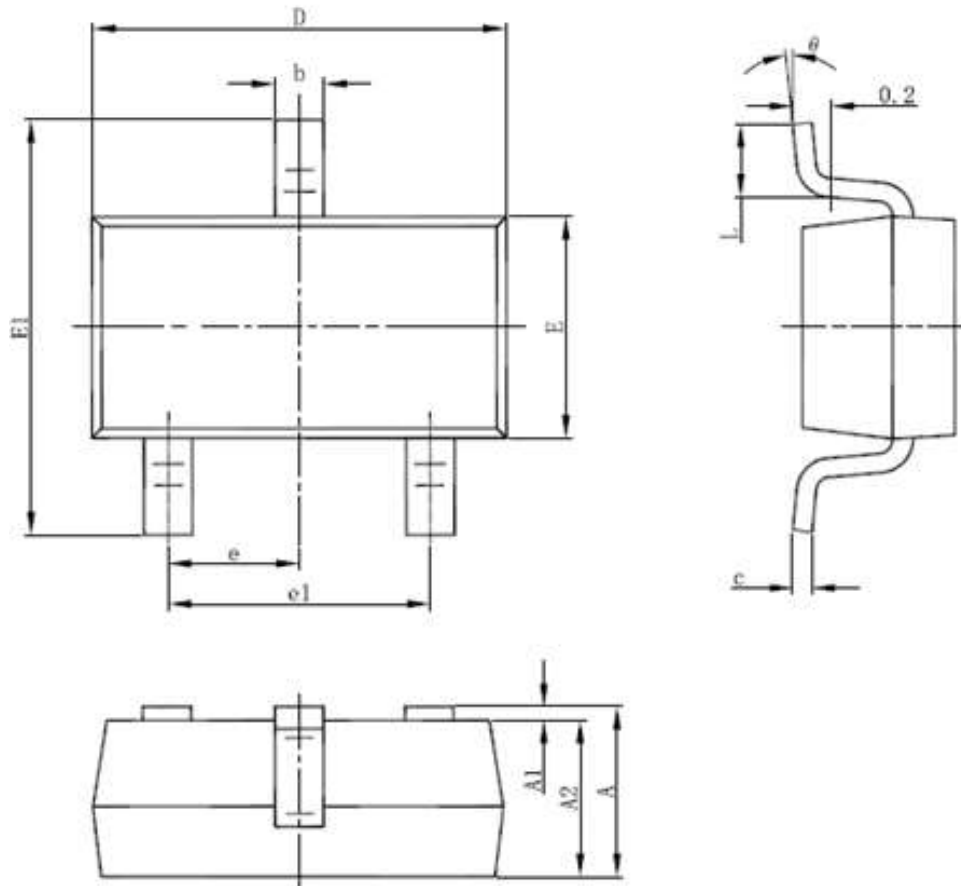
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**PACKAGE DESIGNATOR  
SOT-23-3L**



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	0.500	0.012	0.020
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	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
theta	0°	8°	0°	8°



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