High Performance Linear Hall Sensor XL47G

Features

- Specifically designed for Throttle Grip
- Built in reverse polarity protection on all pins (see Table 2)
- Built in anti-runaway function (see Figure 7 for chip characteristics)
- Built in active temperature compensation (see Figure 8 for chip characteristics)
- Anti-Surge of Input Terminal: >45V
- Operation Current: 5.5mA@V_{DD}=5.0V
- Wide Operating Voltage Range: 2.7V~7.5V
- Zero-point (No magnetic field) output voltage:2.50V@V_{DD}=5.0V
- Sensitivity: 2.90mV/Gs@V_{DD}=5.0V
- Linearity: ±1%
- Low Noise Output Without External Capacitor Filtering
- Temperature Grade 1: -40℃ to 125℃ Ambient Operating Temperature Range
- Device HBM ESD Classification Level Class3A
- TO92S-3 package

General Description

XL47G is a wide voltage, wide linear range, and wide temperature range linear Hall sensor optimized for Throttle grip applications. It has functions such as anti reverse connection of any pin, anti runaway, and active temperature compensation. Its output voltage varies proportionally with the induced magnetic field strength, and its linear output voltage range follows the changes in power supply voltage. The typical operating voltage of XL47G is 5.0V, and the zero point output voltage (without magnetic field) at V_{DD}=5.0V defaults to 2.50V. The operating temperature range supports -40 ℃~125 ℃. The XL47G integrates high precision current source, temperature compensation module, Hall array, amplifier, driver module and other circuit modules, which provides high linearity and strong immunity to electromagnetic interference over the full voltage range and full temperature range.

Applications

- Throttle Grip

Typical application schematic

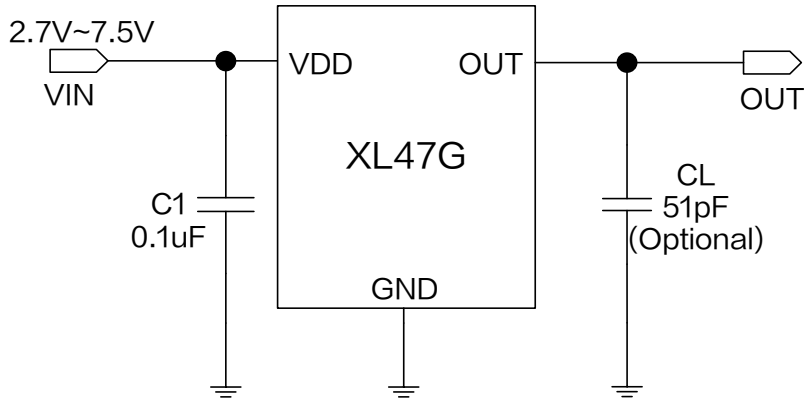


Figure1.XL47G Typical application schematic

High Performance Linear Hall Sensor XL47G

Pin Configurations

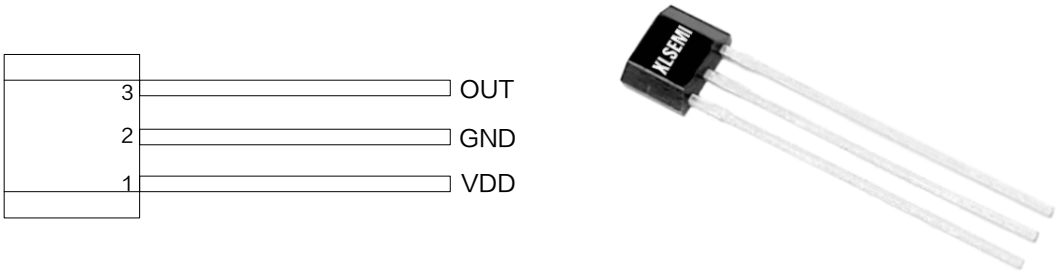


Figure2.Pin Configuration of XL47G

Table1.Pin Description

Pin Number	Pin Name	Description
1	VDD	Supply Voltage Input Pin，XL47G operates from 2.7V to 7.5V DC voltage
2	GND	Ground pin
3	OUT	Output Pin

Ordering Information

Order Information	Marking ID	Package Type	Eco Plan	Packing Type Supplied As
XL47G	XL47G	TO92S-3	RoHS & HF	1000 Units Per Bag

Function Block

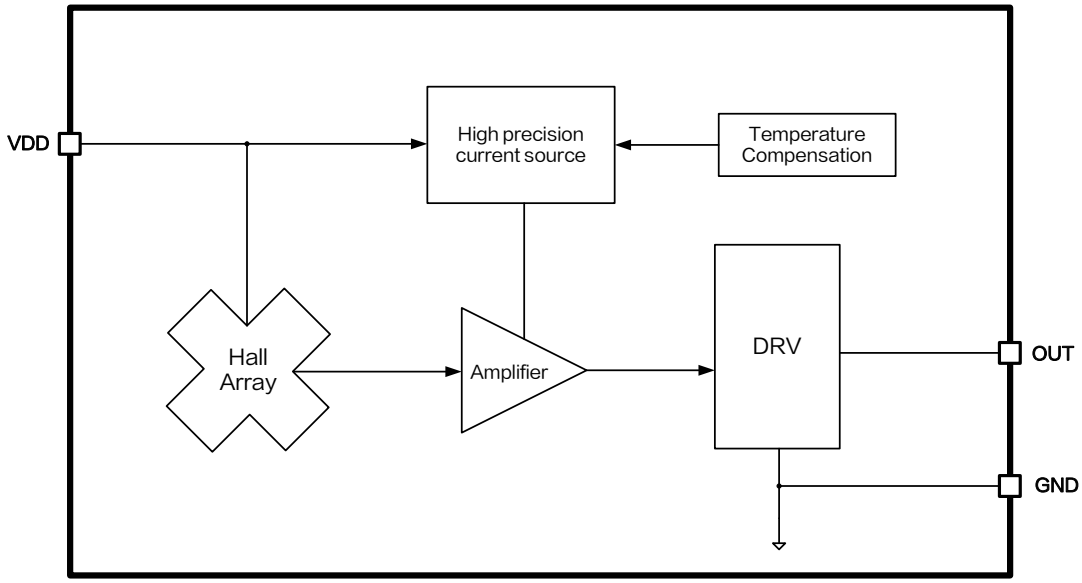


Figure3.Function Block Diagram of XL47G

Table2.Absolute Maximum Ratings (Note1)

Parameter	Symbol	Value	Unit
Input Pin Voltage	V_{DD}	−7.5～45	V
Output Pin Voltage	V_{OUT}	−10～10	V
Input−Output Pin Voltage	V_{DD-OUT}	−7.5~7.5	V
Anti−Surge of Input Terminal (D=25%,T=20μs, 10 cycles，B=0Gs)	V_{DD_Surge}	45	V
Thermal Resistance(TO92S−3) (Junction to Ambient，No Heatsink, Free Air)	R_{JA}	160	°C/W
Operating Temperature	T_A	−40～125	°C
Operating Junction Temperature	T_J	−40～150	°C
Storage Temperature	T_{STG}	−65～150	°C
Lead Temperature(Soldering,10sec)	T_{LEAD}	260	°C
ESD(HBM)	−	≥4500	V

Note1: Stresses greater than those listed under Maximum Ratings may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operation is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

XL47G Electrical Characteristics (Note2)

T_A = 25℃, V_{DD} = 5.0V, system parameters test circuit figure1, unless otherwise specified.

Parameters	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Operation Voltage	V_{DD}	–	2.7	5.0	7.5	V
Operation Current	I_{DD}	–	4.5	5.5	6.5	mA
Output Load Resistance	R_L	B=−1250Gs	–	8	–	kΩ
Output Voltage Range	$V_{OUT(H)}$	B=+1250Gs	4.2	4.25	4.3	V
	$V_{OUT(L)}$	B=−1250Gs	0.8	0.85	0.9	V
Static Output Voltage	$V_{OUT(Q)}$	B=0Gs	2.375	2.50	2.625	V
Linearity	Lin	–	−1	–	1	%
Ground Wire Open Circuit	$V_{GND-OFF}$	–	–	0.001	–	V
Output Resistance	R_{OUT}	–	–	40	100	Ω
Output Settling Time	–	B=0Gs	–	2	–	μs
Output Noise	–	Bandwidth= 10Hz to 10kHz	–	0.7	–	mV

Note2:

(1) Linearity is the degree to which the static characteristic curve between the input and output quantities deviates from a straight line.

(2) The output settling time is defined as the time interval for the output voltage to settle to 90% of its static output voltage level.

XL47G Magnetic Characteristics (Note3)

Parameters	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Sensitivity	Sens	V_{DD}=5.0V	2.726	2.90	3.074	mV/Gs

Note3:

(1) The magnetic South Pole (S) is defined as the positive magnetic field. The sensitivity in the table corresponds to measurements taken with the magnetic field perpendicular to the chip's marking surface.

(2) XL47G is optimized for throttle grip. When V_{DD}=5.0V, the sensitivity corresponding to output voltage is in the linear range of 0.9V~4.2V as shown in the table.

XL47G Output Characteristics

T_A = 25℃, system parameters test circuit figure1, test methods figure4, unless otherwise specified.

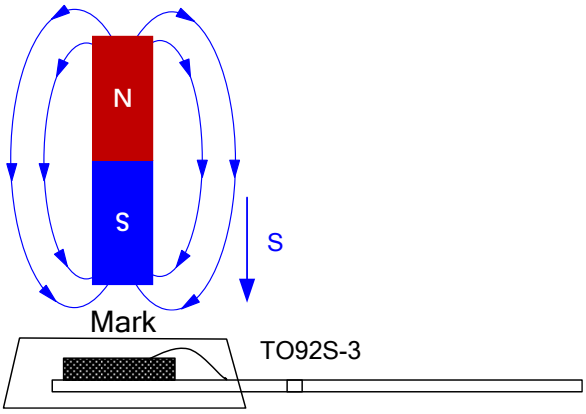


Figure4.Test Schematic of XL47G

XL47G Output Characteristics Curve

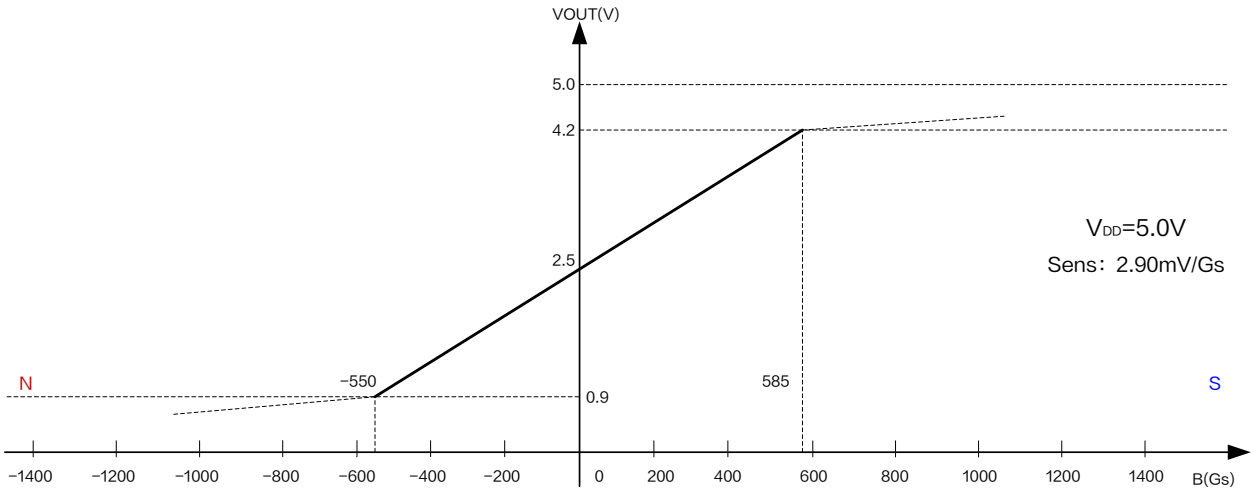


Figure5.Output Characteristic Curve of XL47G (V_{DD} = 5.0V)

Note4: At room temperature, when V_{DD}=5.0V, the linear range of chip unipolar is 0.9V~4.2V.

Input reverse polarity protection characteristic curve

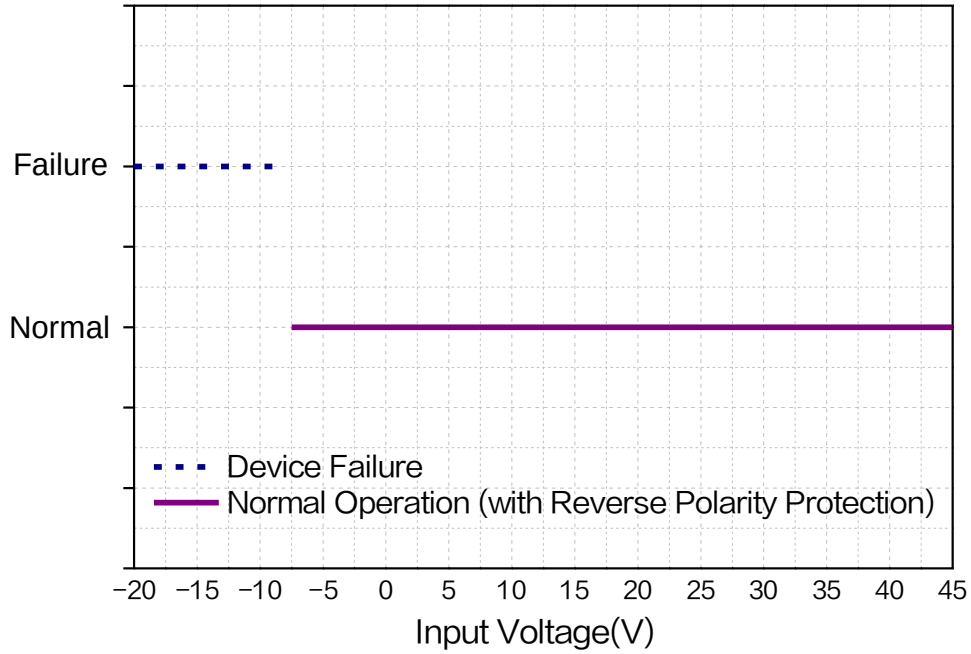


Figure 6. Input Reverse Polarity Protection Characteristic Curve of XL47G (V_{DD} = −7.5~45V)

Runaway Prevention Function Characteristic Curve

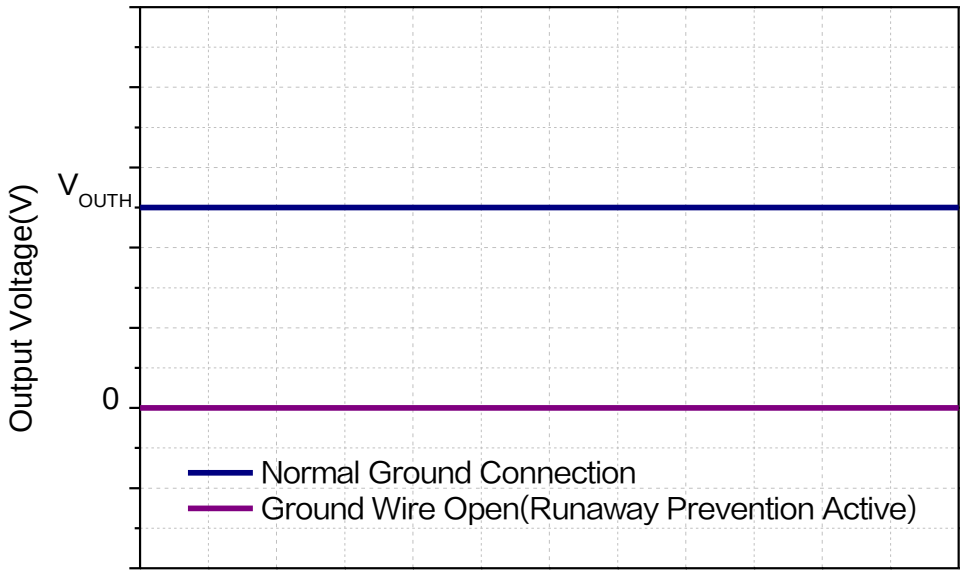


Figure 7. Runaway Prevention Function Characteristic Curve of XL47G (V_{DD} = 5.0V)

Note5: After the GND pin of the chip is disconnected, the OUT pin will be at a low level.

Active Temperature Compensation Function Characteristic Curve

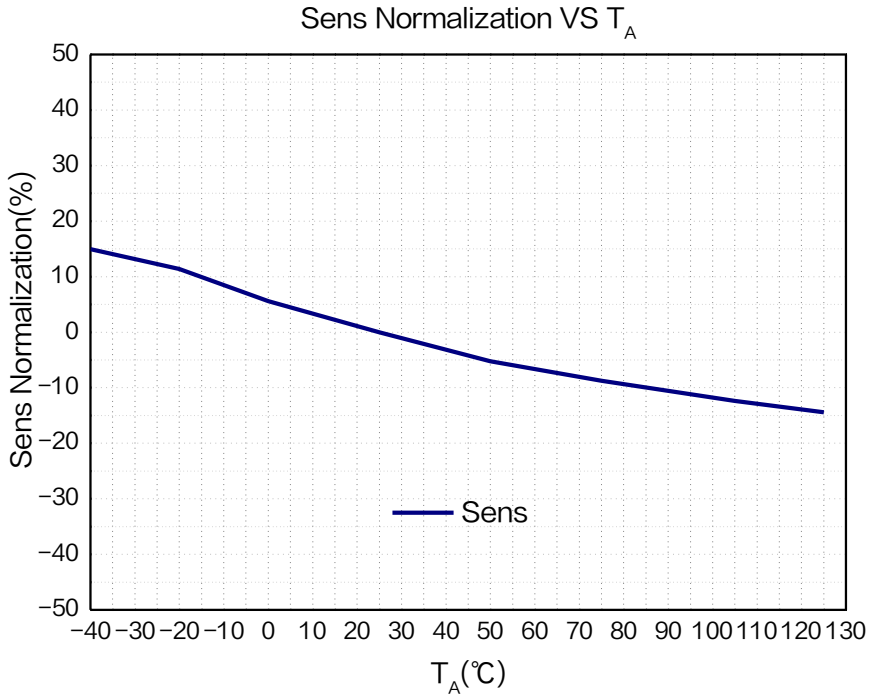


Figure 8. Sensitivity versus temperature curve of XL47G (V_{DD} = 5.0V)

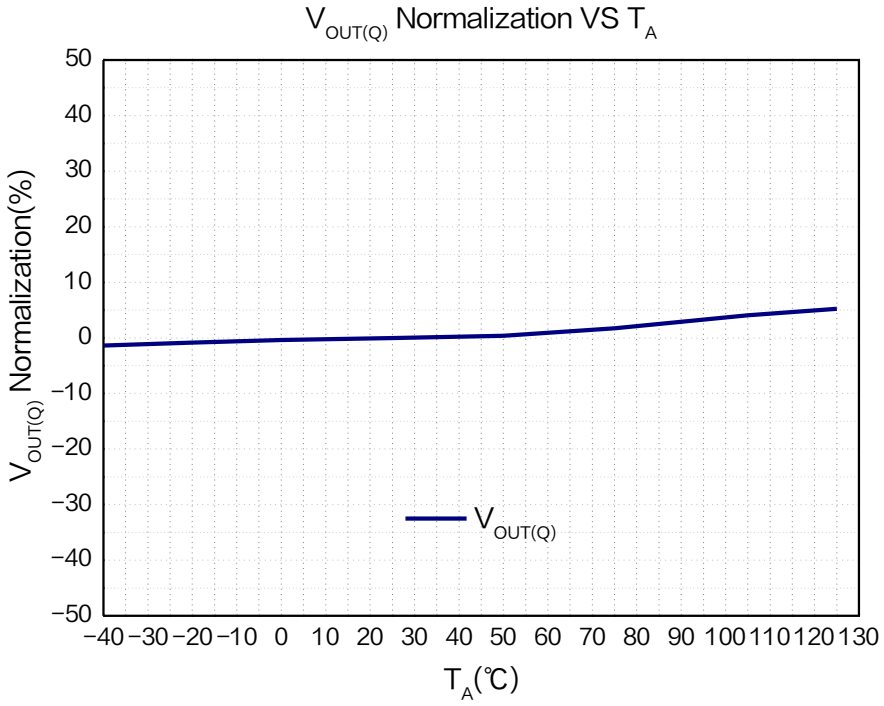


Figure 9. Static output voltage versus temperature curve of XL47G (V_{DD} = 5.0V)

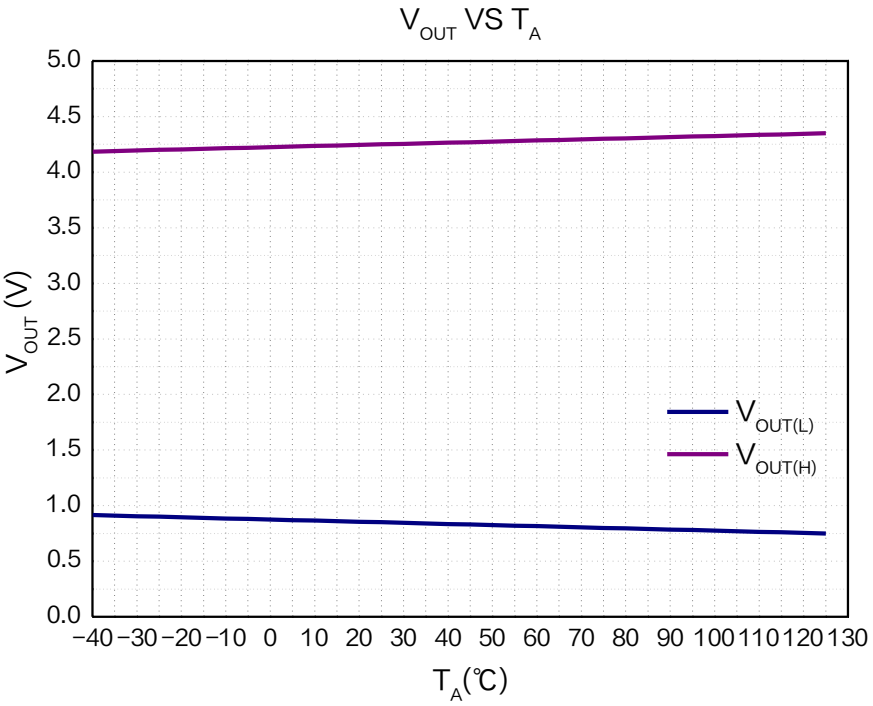
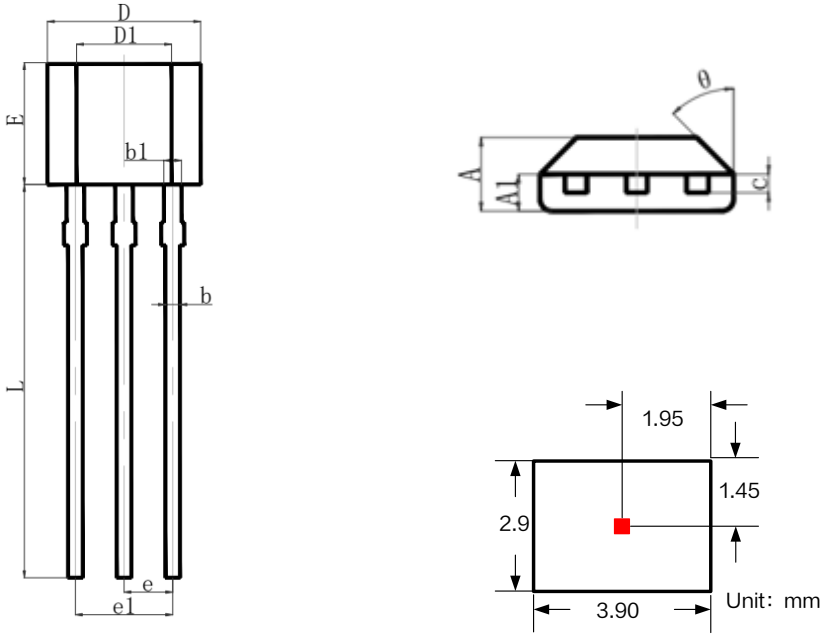


Figure 10. Output High/Low Level Temperature Characteristic Curve of XL47G

Package Information

TO92S-3



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.42	1.62	0.056	0.064
A1	0.66	0.87	0.026	0.034
b	0.33	0.56	0.013	0.022
b1	0.40	0.51	0.016	0.020
c	0.33	0.51	0.013	0.020
D	3.90	4.10	0.154	0.161
D1	2.28	2.68	0.090	0.106
E	2.90	3.25	0.114	0.128
e	1.27 REF		0.050 REF	
e1	2.44	2.64	0.096	0.104
L	13.50	15.50	0.531	0.610
θ	45° REF		45° REF	

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