FEELING TECHNOLOGY

FD115MH
FD115MA

Smart motor driver with embedded Hall sensor

Features

Halogen Free

- Motor driver with integrated Hall sensor
- Lock-shutdown protection & auto-restart function
- Precise magnetic switching thresholds
- “Soft-switch” phase-switching technique to reduce vibration and acoustic noise
- Thermal shutdown protection
- Built-in RD((Rotation Detect)) signal output
- Available in SIP-5L, SOT89-5L packages
- For 12V systems

General Description

FD115MH/FD115MA is a two coil motor driver with embedded Hall sensor. It integrates the motor driver with the Hall sensor, which simplifies the PCB(printed circuit board) design and make the fabrication of small-size motors possible.

Lock-shutdown and auto-restart function keeps the motor from being over-heated and restarts the motor after being locked.

“Soft-switch” phase-switching technique is used to reduce the vibration and acoustic noise.

Thermal-shutdown protection ensures the motor driver to operate under specified temperature ranges.

All the protection mechanisms mentioned above combine to provide a complete protecting scenario for the motor system, keep the motor system from possible damages and guarantee correct operations.

Block Diagram

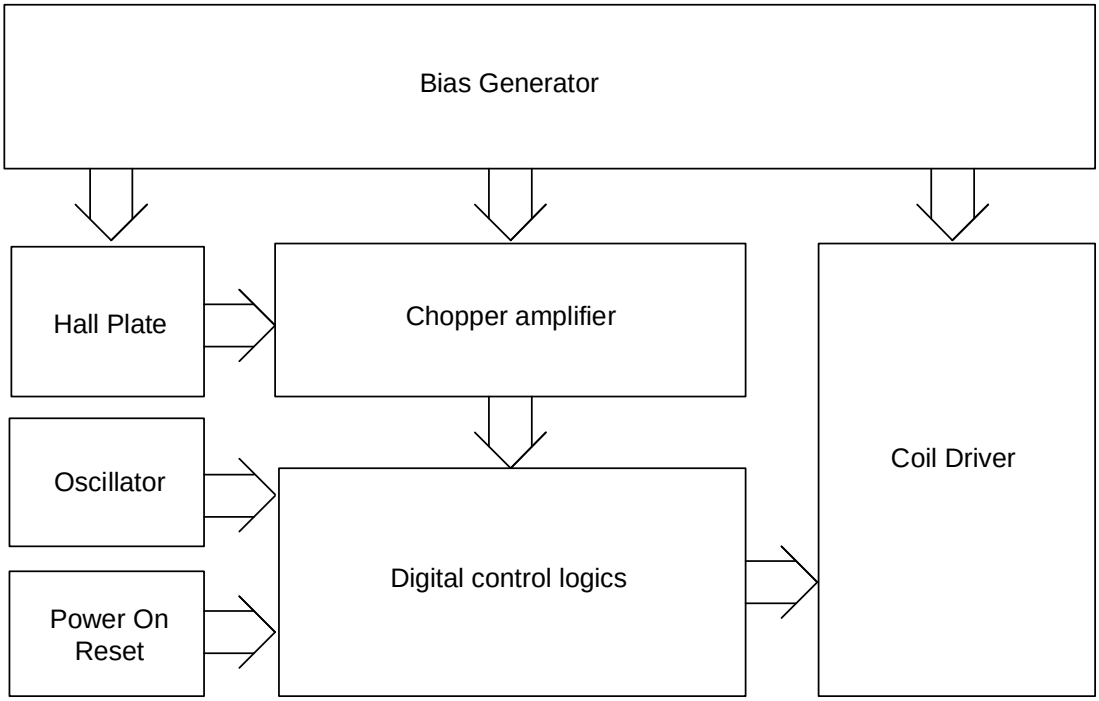


Figure.1

Pin Connection **Marking Distinguish**

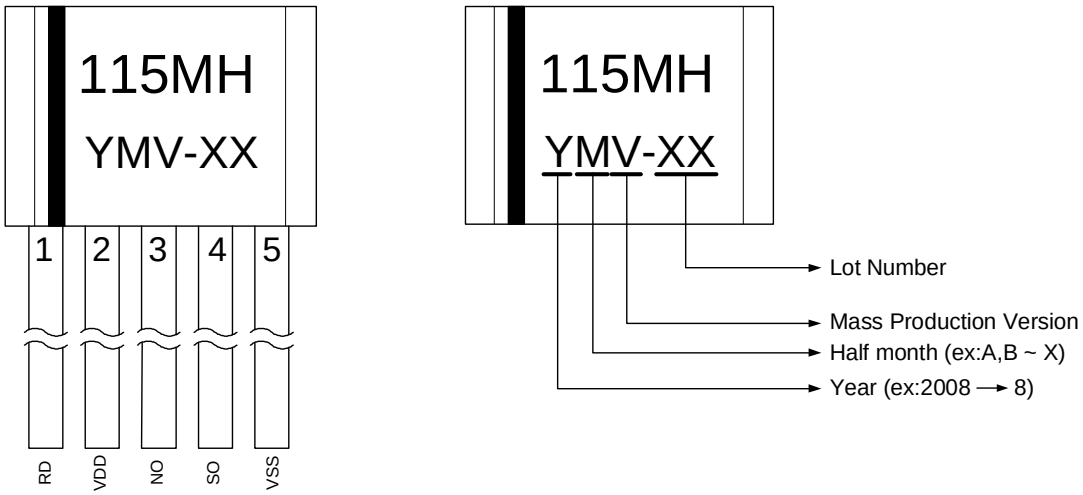


Figure.2

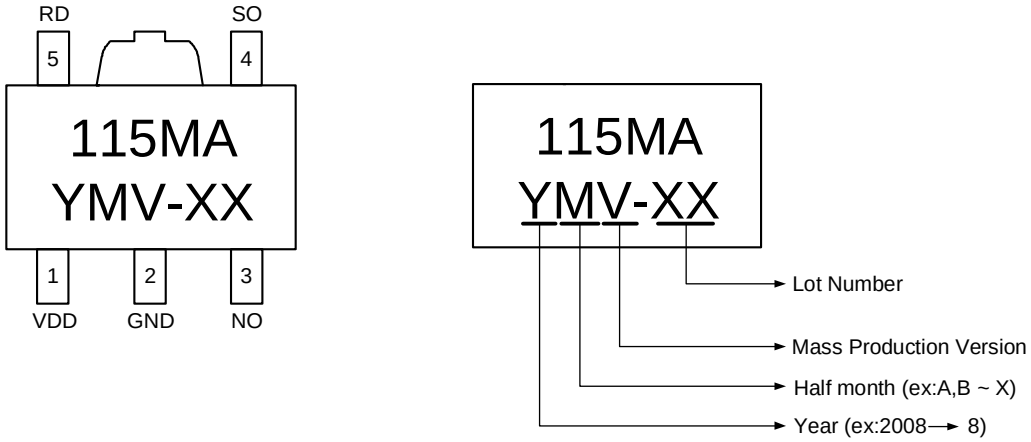


Figure.3

Pin Descriptions

Name	I/O	FD115MH	FD115MA	Description
VSS	G	5	2	Ground
SO	O	4	4	Driver output
NO	O	3	3	Driver output
VDD	P	2	1	Positive power supply
RD	O	1	5	Rotation detect signal

Legend: I=input, O=output, I/O=input/output, P=power supply, G=ground

Functional Descriptions

Refer to the block diagram (Figure.1), FD115MH/FD115MA is composed of the following building blocks:

- Bias generator

The bias generator provides precise, temperature- and process-insensitive bias references for the analog circuit blocks. These references guarantee proper operation of the IC under all conditions specified in this specification.

- Oscillator

The built-in oscillator provides the clock signal for the digital control logics

- Power-on Reset

Used to detect the power-up ramp and reset the digital circuits to achieve correct operation as soon as the power is ready.

- Chopper Amplifier

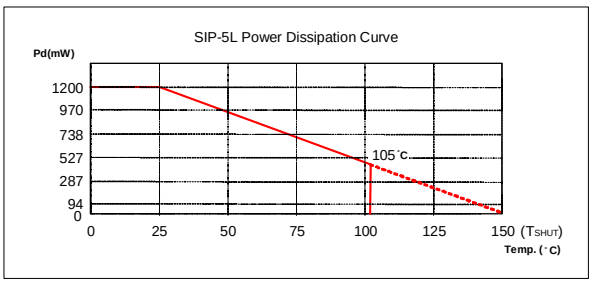
To achieve a higher magnetic sensitivity the chopper amplifier structure is adopted in this design. Use of this structure dynamically removes both the offset and flicker noise at the same time.

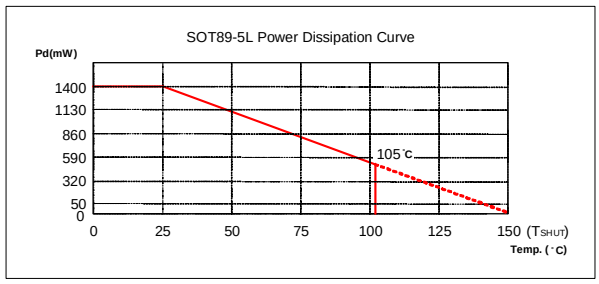
- Digital control logics
  - Hall sensor part – generates controlling signals for the Hall sensor.
  - Coil driver part – generates controlling signals for the Coil driver.

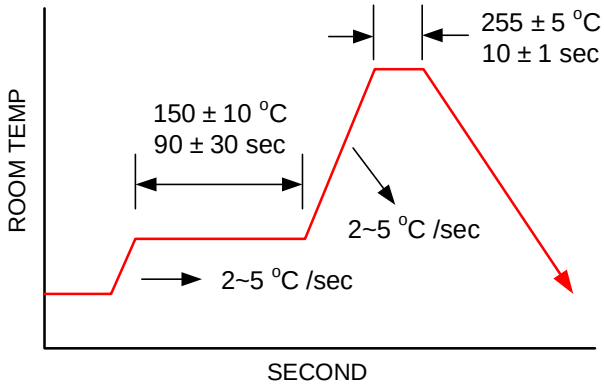
Absolute Maximum Ratings

Parameter	Symbol	Conditions	Values			Unit
			min.	Typ.	max.	
Operating Temperature	T_{OP}	-	-20		105	℃
Storage Temperature	T_{ST}	-	-40		150	℃
Output clamp Voltage	V_C		25		27	V
DC Supply Voltage	V_{DD}	-			18(1)	V
Supply Current	I_{DD}	-			6	mA
Continuous Current	$I_{O(CONT)}$				600	mA
Hold Current	$I_{O(HOLD)}$				900	mA
Peak Current	$I_{O(PEAK)}$	<100μs			1200	mA
Junction temperature	T_J				180	℃
Power Dissipation	P_D	SIP-5L			1200	mW
		SOT89-5L			1400	
Thermal Resistance	θ_{JC}	SIP-5L		62		℃/W
		SOT89-5L		55		
	θ_{JA}	SIP-5L		104		℃/W
		SOT89-5L		98		
Magnetic Flux Density	B				Unlimited	Gauss
IR-Reflow Lead Temperature		10sec			260	℃

Note 1: *V_{DD}=18V,If V_{BEMF} is lower than the output clamp voltage (Vc).*







IR-ReFlow Soldering Condition

Recommended Operating Conditions

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Supply Voltage	V_{DD}	-	3.0		16(1)	V
Operating Temperature Range	T_A	-	-20		85	℃

Note 1: *V_{DD}=16V,If V_{BEMF} is lower than the output clamp voltage (Vc).*

Electrical Characteristics V_{DD}=12.0V, T_A=25℃ (unless otherwise specified)

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Average Supply Current(no load)	I_{DD}			2.5		mA
On resistance (NO, SO pin)	R_{DSON}	T_A=25 °C, Iout=300mA		1		Ohm
Thermal Shutdown Threshold	T_{SHUT}			165		℃
Locked Rotor Period	T_{ON}			0.4		s
Locked Rotor Period	T_{OFF}			2.8		s

Magnetic Characteristics

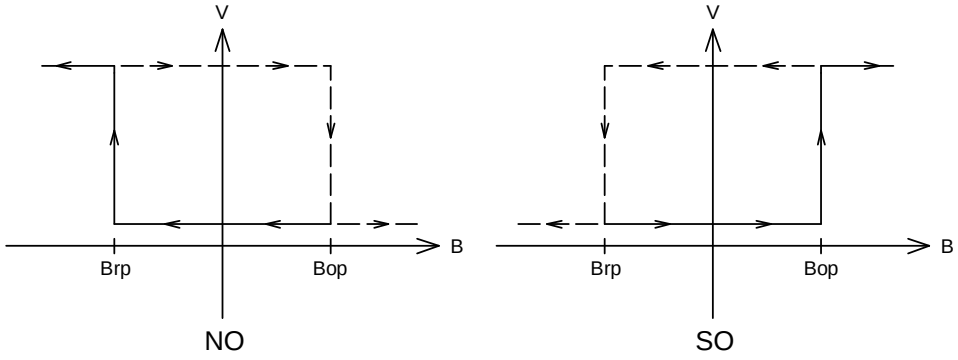
Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Operate Points	B_{OP}		5	20	40	G
Release Points	B_{RP}		-5	-20	-40	G

Driver output vs. Magnetic Pole

Parameter	Test Conditions	NO	SO
North pole	B < Brp	High	Low
South pole	B > Bop	Low	High

Note: *The magnetic pole is applied facing the branded side of the package*

Hysteresis Characteristics



Performance Graphs

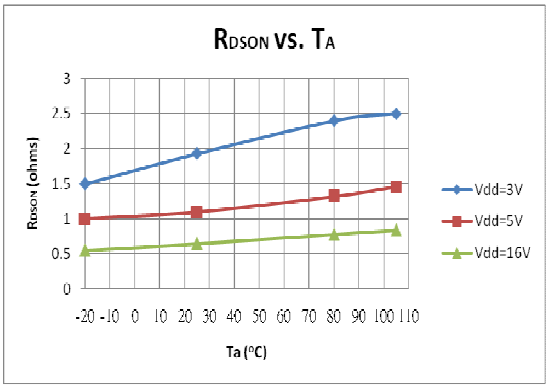


Figure.4

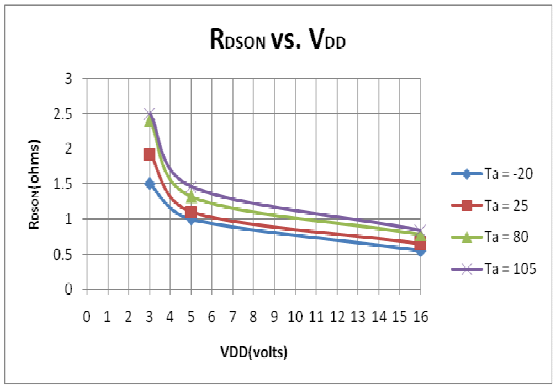


Figure.5

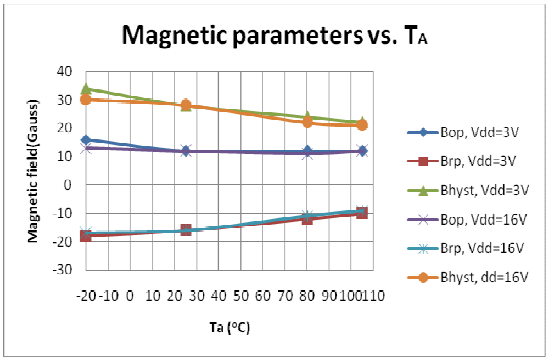


Figure.6

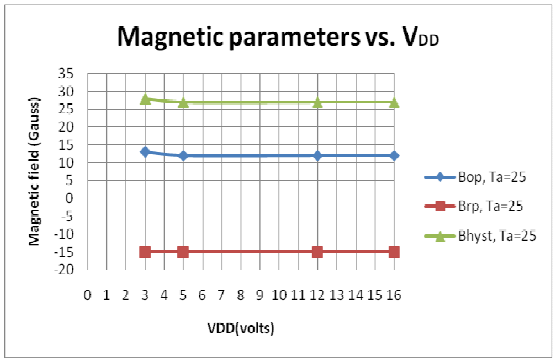


Figure.7

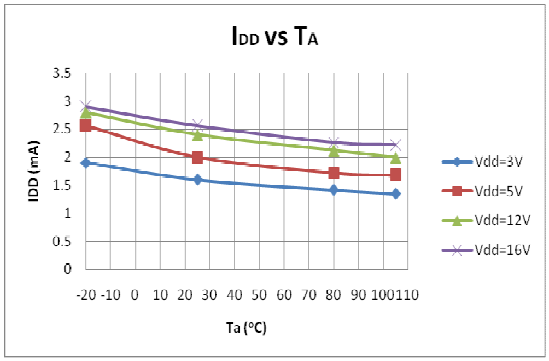


Figure.8

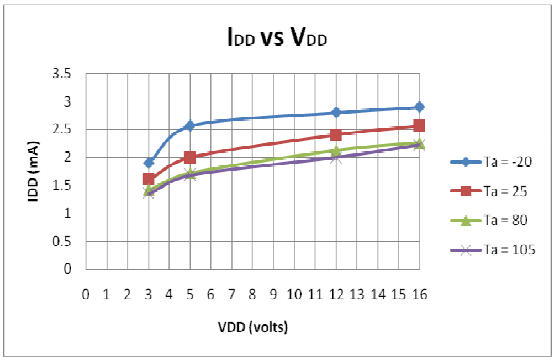
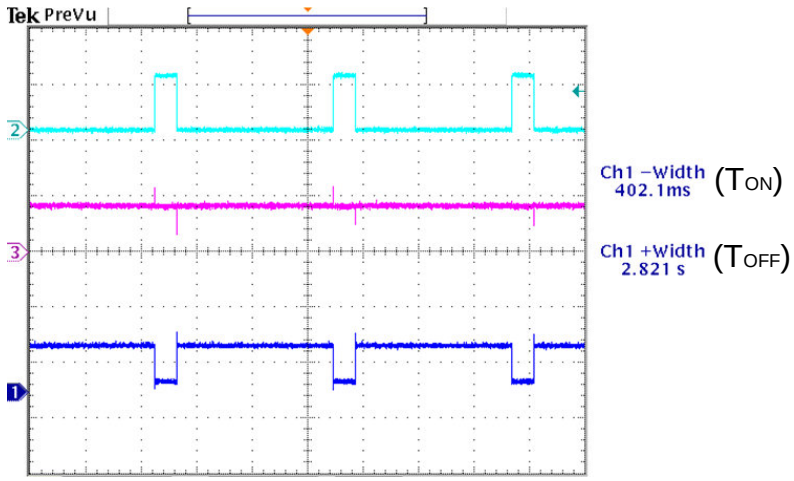


Figure.9

Lock shutdown – Restart Timing Description:



Channel2: V_{DD} pin current waveform
Channel3: Output (SO pin) voltage waveform
Channel1: Output (NO pin) voltage waveform

Note: *The North pole (B > Bop) is applied facing the branded side of the package.*

Application Circuit Reference

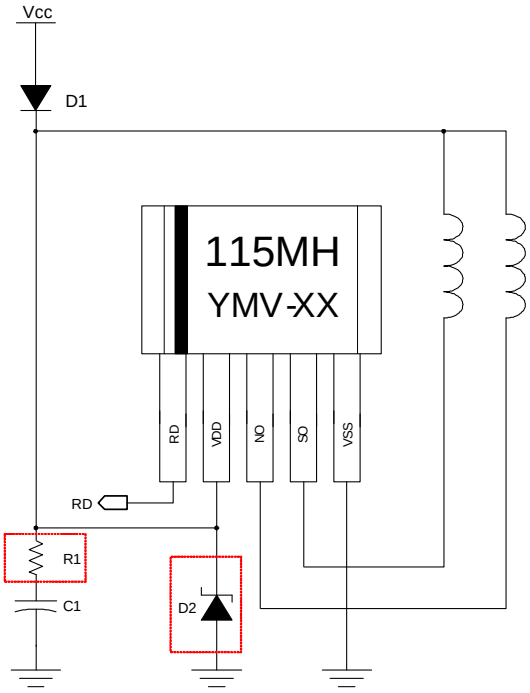


Figure.10

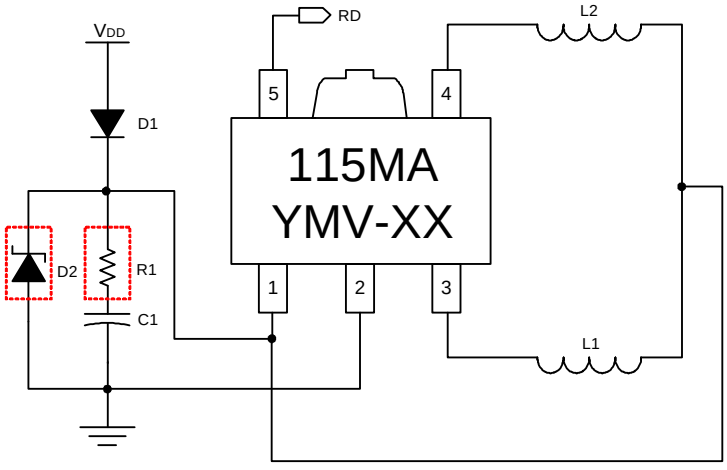
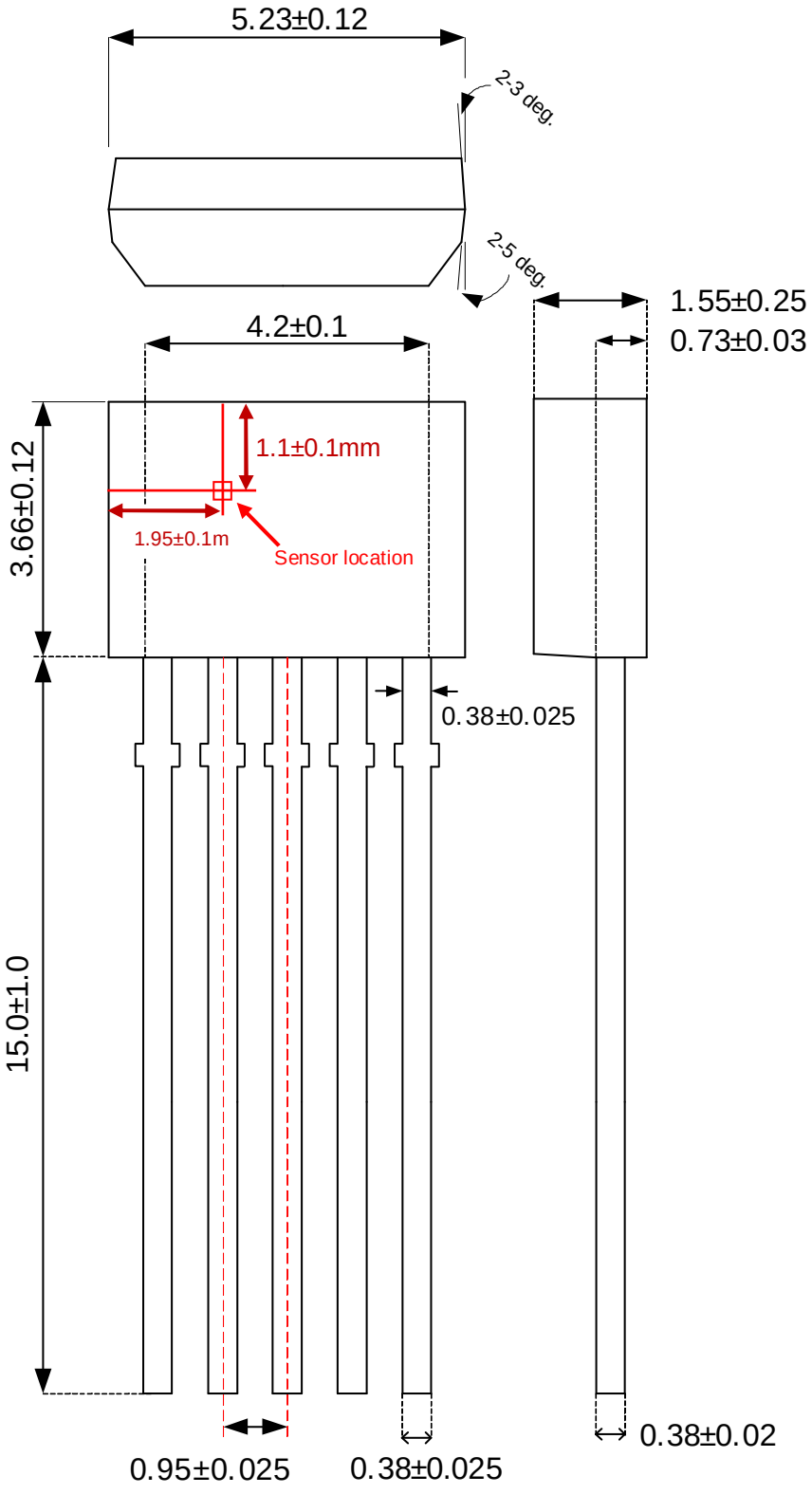


Figure.11

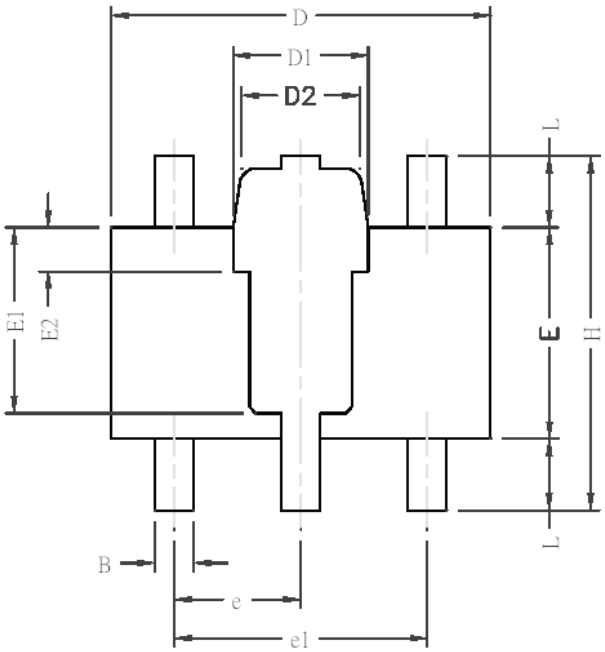
Note: *C1=1uF, R1=2~5 Ω(option),D2(option) breakdown voltage 16V*

Package Dimension (Unit: mm)

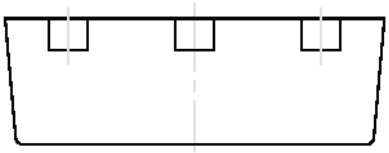
SIP-5L(Halogen Free)

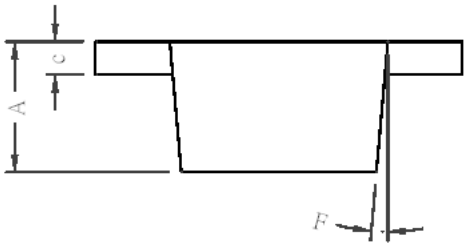


SOT89-5L(Halogen Free)

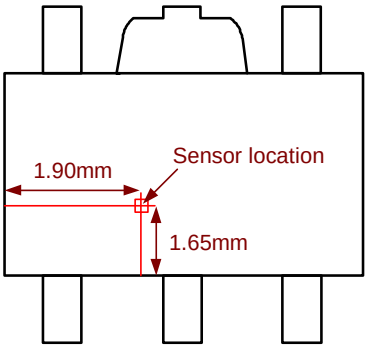


REF.	DIMENSIONS	
	Millimeters	
	Min.	Max.
A	1.40	1.60
B	0.40	0.52
c	0.35	0.41
D	4.40	4.60
D1	1.50	1.70
D2	1.30	1.50
E	2.40	2.60
E1	2.20 REF.	
E2	0.52 REF.	
e	1.50 REF.	
e1	3.00 REF.	
F	5° TYP.	
H	4.05	4.25
L	0.80	–





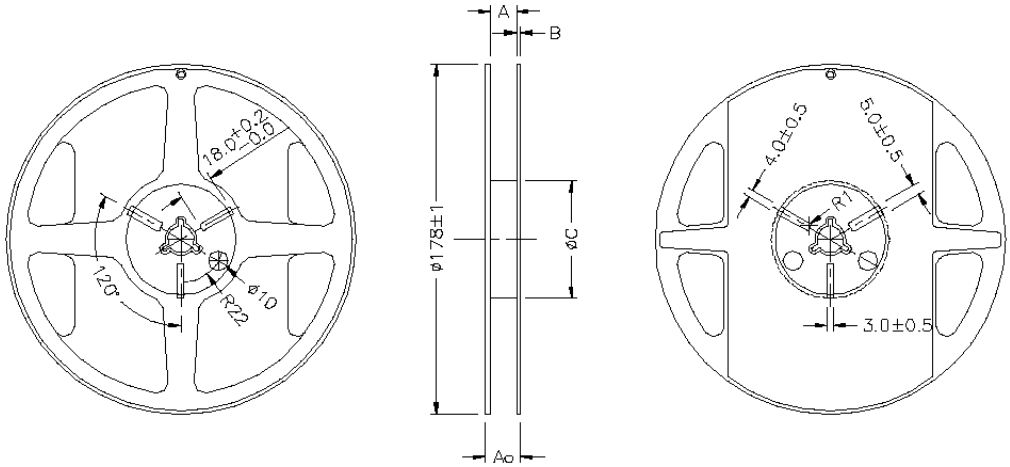
Sensor Location:

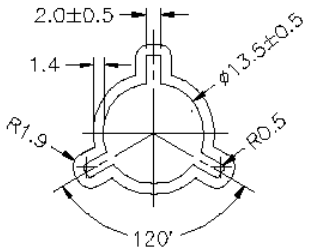


TOP VIEW

Packing Specification

SOT89-5L

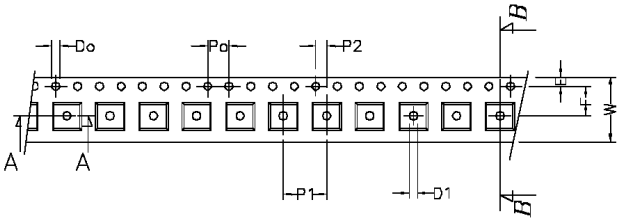


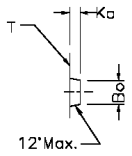


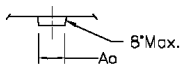
Width of carrier tape	8	12	16				
A±0.05	9.0	13.0	17.0				
Ao±0.05	12.0	16.0	20.0				
B	1.5	1.5	1.5				
øC $^{+1}_{0}$	60	60	60				

NOTE :

1. Material : Anti-static polystyrene.
2. Surface resistivity 10 ^{9}ohm/square







A–A SECTION

symbol	Ao	Bo	Ko	Po	P1	P2	T
Spec	4.85±0.1	4.45±0.1	1.85±0.1	4.0±0.1	8.0±0.10	2.0±0.05	0.254±0.02
symbol	E	F	Do	D1	W	10Po	
Spec	1.75±0.1	5.5±0.05	1.50±0.1	1.5±0.25	12.0 $^{+0.3}_{-0.1}$	40.0±0.2	

Packing Quantity Specifications

1000 ea / 1 Reel

4 Reels / 1 INSIDE BOX

Order Information

Part Number	Operating Temperature	Package	Description	MOQ
FD115MH-G1	-20 °C to +85 °C	SIP-5L	±20G (B)	1Kea
FD115MA-G1	-20 °C to +85 °C	SOT89-5L	±20G (B)	1Kea/real