

**Smart motor driver with embedded Hall sensor**

**Features**

- 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 FG(frequency generation) signal output
- Available in SIP-5L, SOT89-5L packages
- For 12V systems



**General Description**

FD115CH/FD115CA 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.

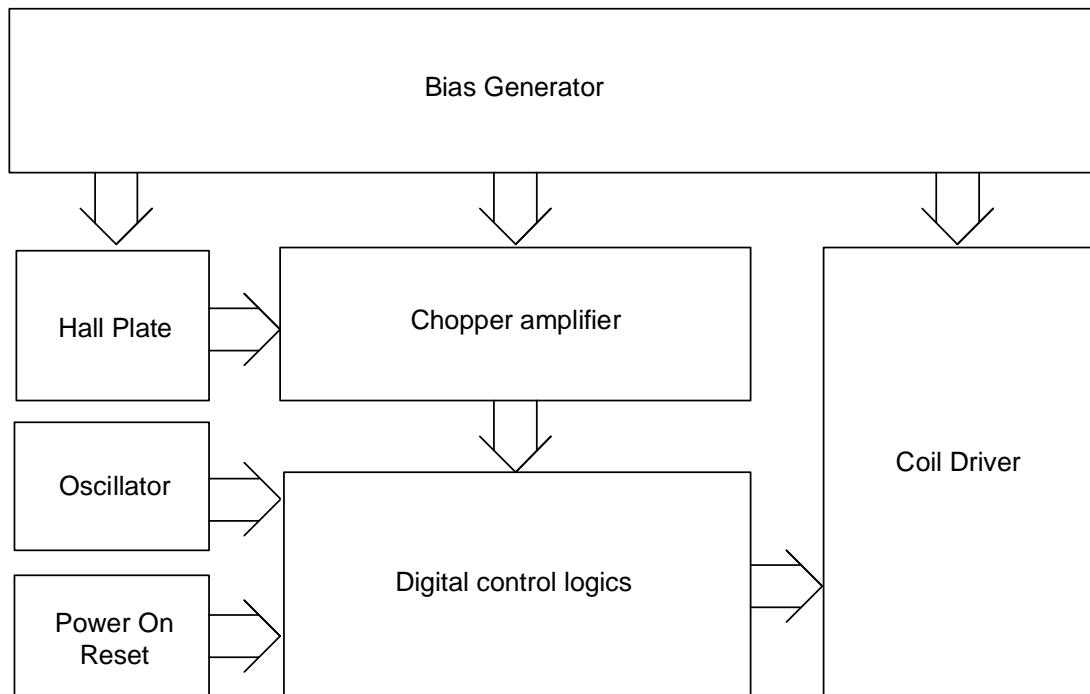
Lock-shutdown and auto-restart function keeps the motor from being over-heated and restarts the motor after being locked.

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

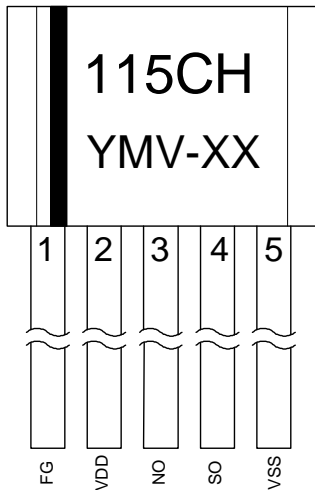
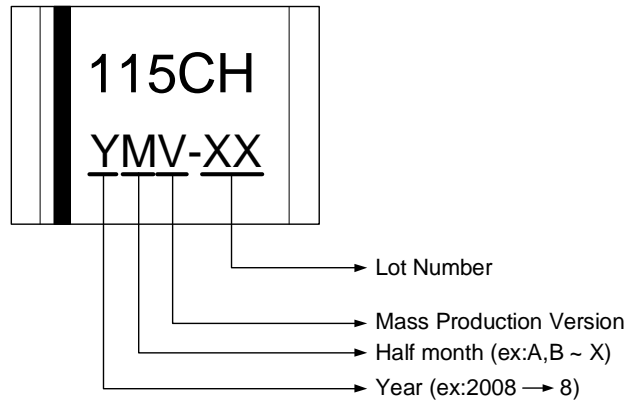
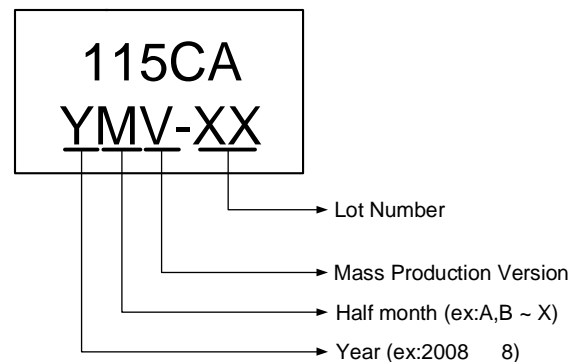
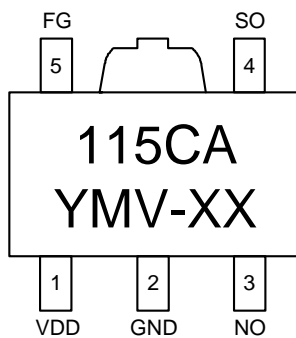
Thermal-shutdown protection ensures the motor driver to operate under specified temperature ranges.

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	FD115CH	FD115CA	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
FG	O	1	5	Frequency generation signal

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

### Functional Descriptions

Refer to the block diagram (Figure.1), FD115CH/FD115CA 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.

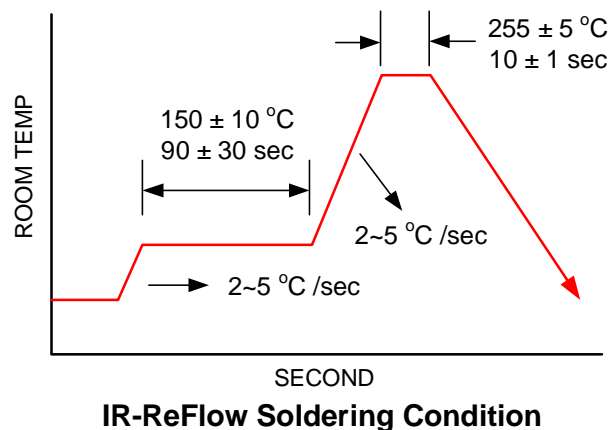
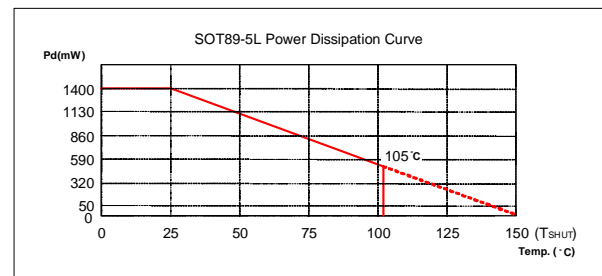
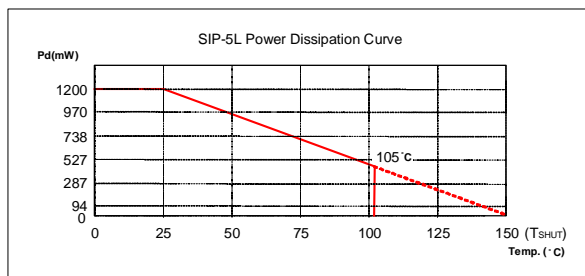
- Digital control logics

- 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 <sub>OP</sub>	-	-20		105	°C
Storage Temperature	T <sub>ST</sub>	-	-40		150	°C
Output clamp Voltage	V <sub>C</sub>		25		27	V
DC Supply Voltage	V <sub>DD</sub>	-			18 <sup>(1)</sup>	V
Supply Current	I <sub>DD</sub>	-			6	mA
Continuous Current	I <sub>O(CONT)</sub>				600	mA
Hold Current	I <sub>O(HOLD)</sub>				900	mA
Peak Current	I <sub>O(PEAK)</sub>	<100µs			1200	mA
Junction temperature	T <sub>J</sub>				180	°C
Power Dissipation	P <sub>D</sub>	SIP-5L			1200	mW
		SOT89-5L			1400	
Thermal Resistance	θ <sub>JC</sub>	SIP-5L		62		°C/W
		SOT89-5L		55		
	θ <sub>JA</sub>	SIP-5L		104		°C/W
		SOT89-5L		98		
Magnetic Flux Density	B				Unlimited	Gauss
IR-Reflow Lead Temperature		10sec			260	°C

**Note 1:** V<sub>DD</sub>=18V, If V<sub>BEMF</sub> is lower than the output clamp voltage (V<sub>C</sub>).



**Recommended Operating Conditions**

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Supply Voltage	$V_{DD}$	-	3.0		16 <sup>(1)</sup>	V
Operating Temperature Range	$T_A$	-	-20		85	°C

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

**Electrical Characteristics  $V_{DD}=12.0V$ ,  $T_A=25^\circ C$  (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)	$R_{DSON}$	$T_A=25^\circ C$ , $I_{out}=300mA$		1		Ohm
Thermal Shutdown Threshold	$T_{SHUT}$			165		°C
Locked Rotor Period	$T_{ON}$			0.4		s
Locked Rotor Period	$T_{OFF}$			2.8		s

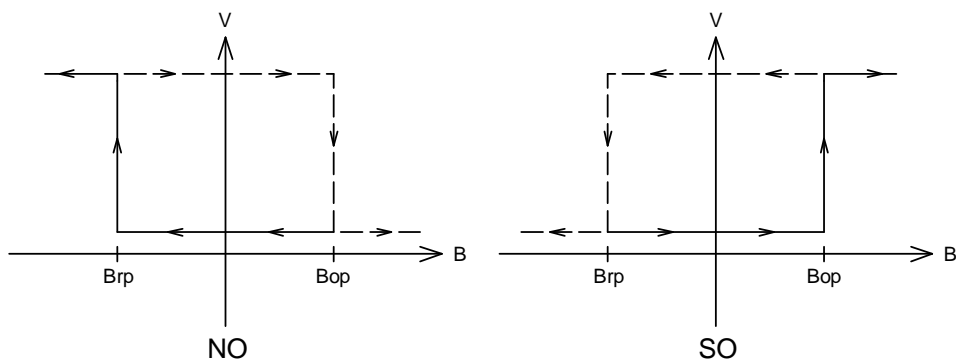
**Magnetic Characteristics**

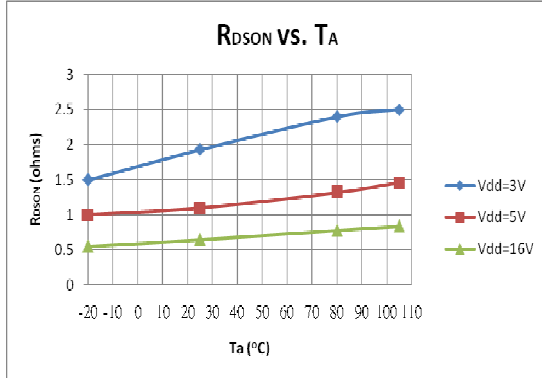
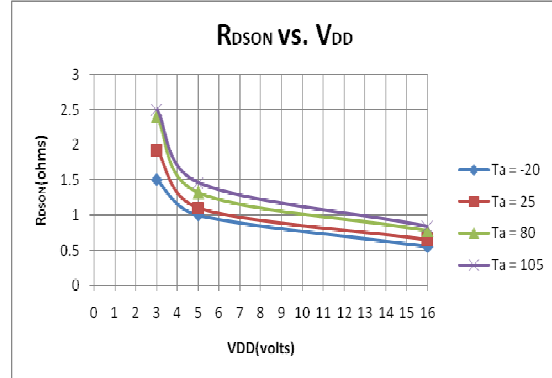
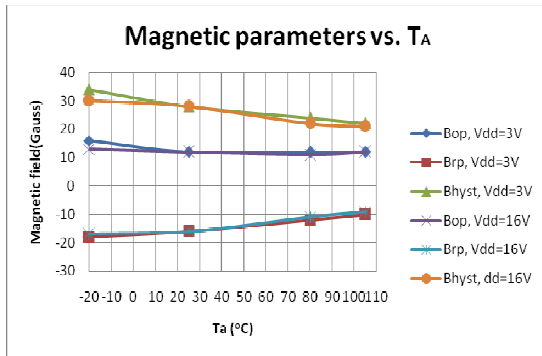
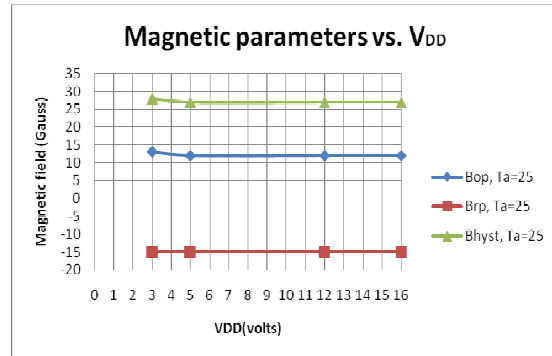
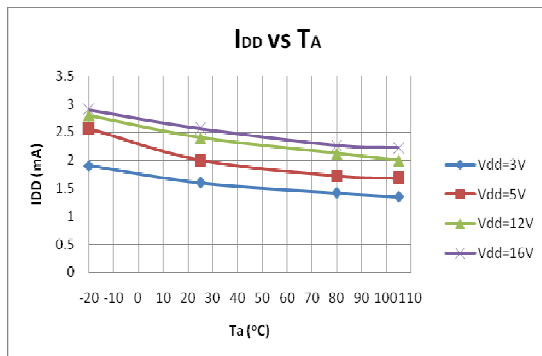
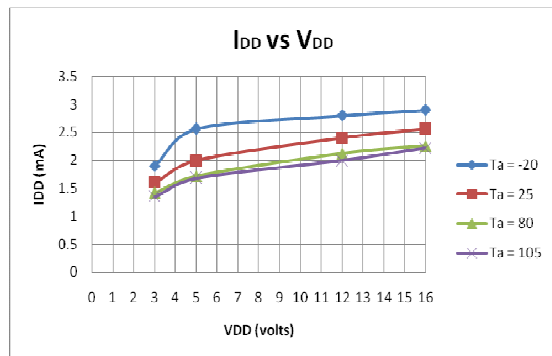
Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Operate Points	$B_{OP}$		5	20	40	G
Release Points	$B_{RP}$		-5	-20	-40	G

**Driver output vs. Magnetic Pole**

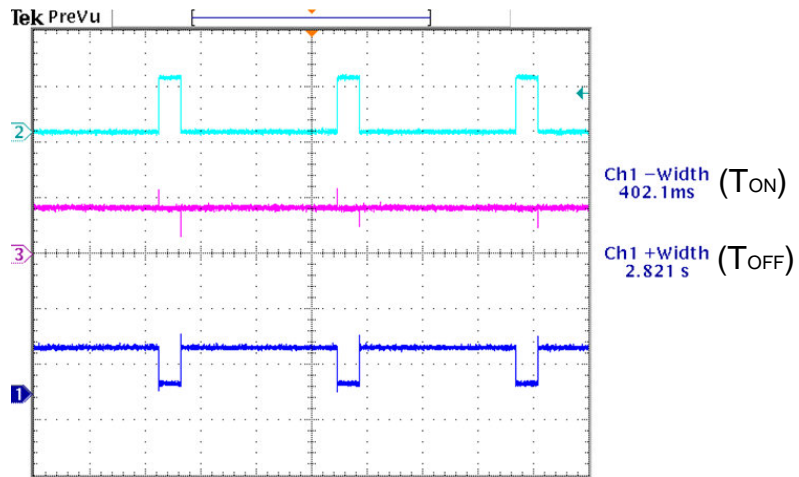
Parameter	Test Conditions	NO	SO
North pole	$B < B_{rp}$	High	Low
South pole	$B > B_{op}$	Low	High

**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:**

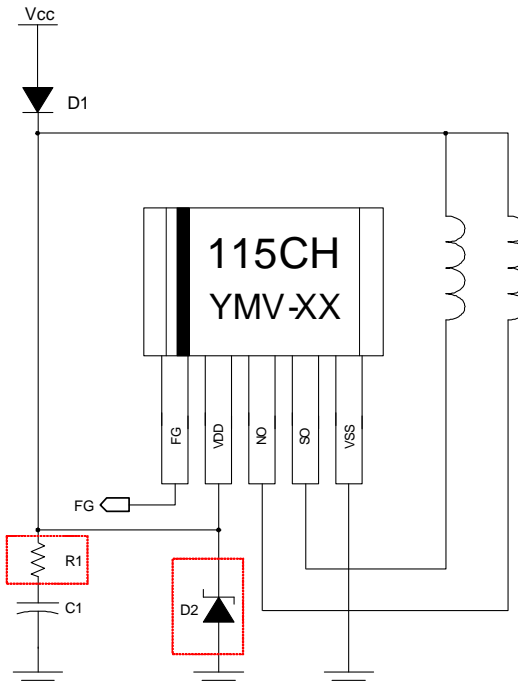
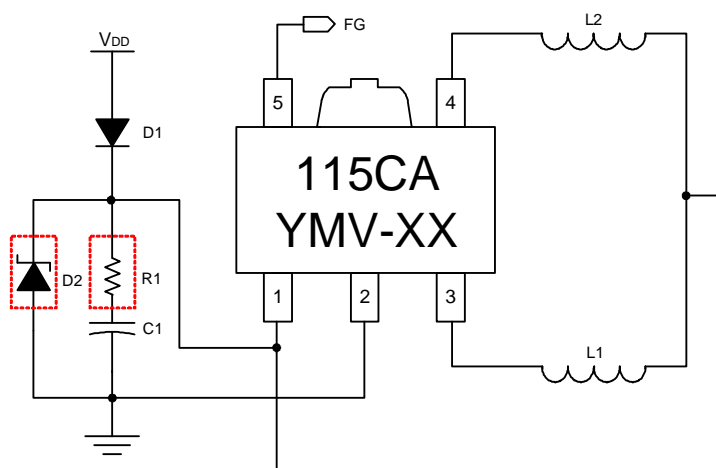


Channel2: V<sub>DD</sub> pin current waveform

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.

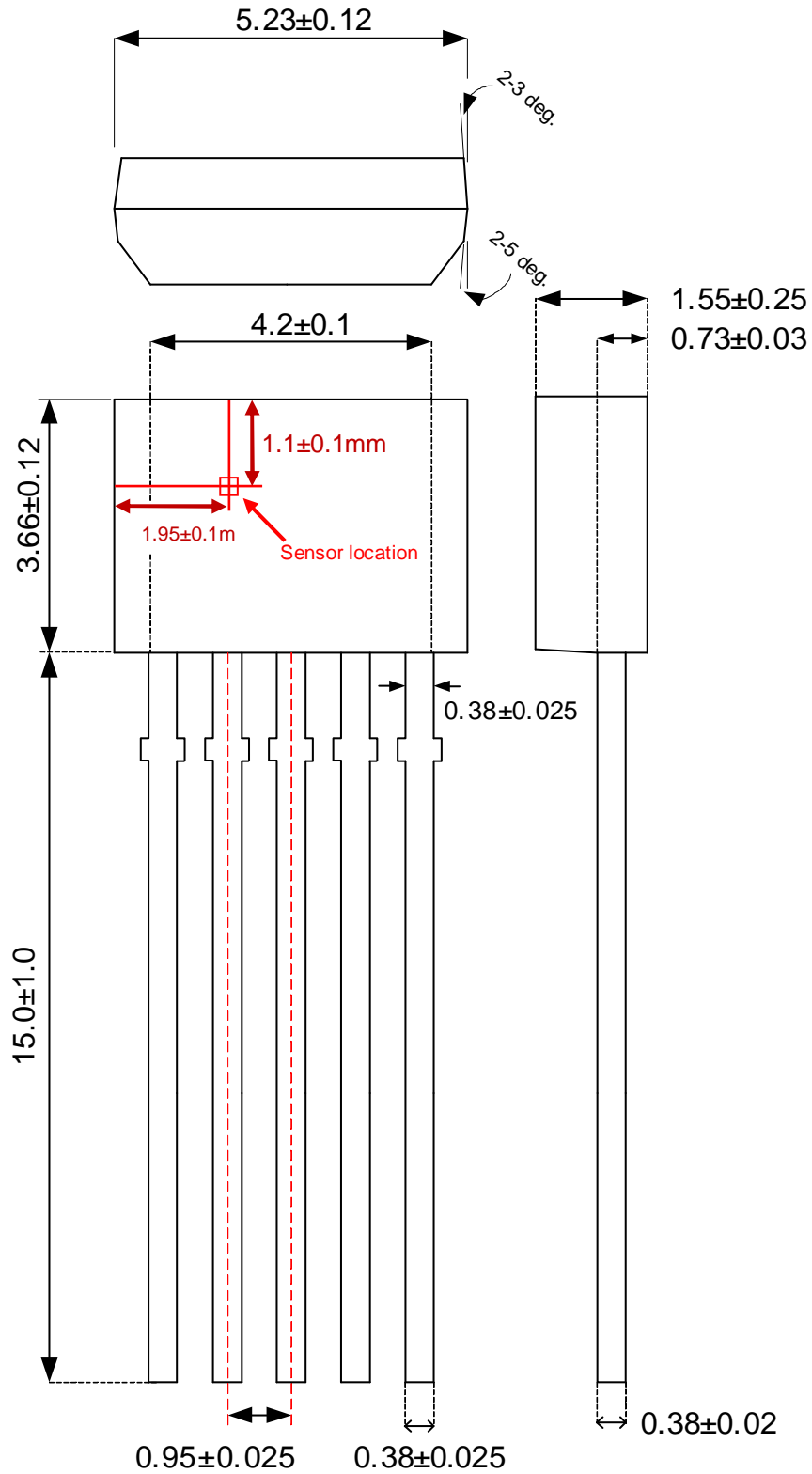
**Application Circuit Reference**

**Figure.10**

**Figure.11**

**Note:**  $C1=1\mu F$ ,  $R1=2\sim 5\ \Omega$ (option),  $D2$ (option) breakdown voltage 16V



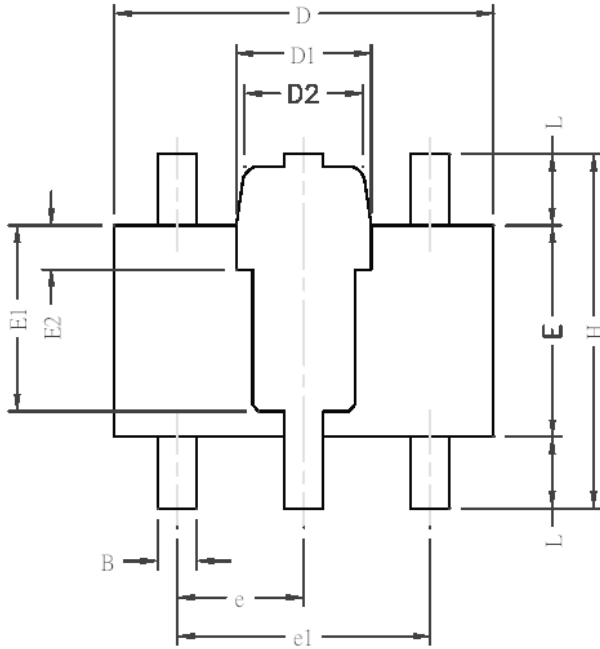


Package Dimension (Unit: mm)  
SIP-5L(Halogen Free)

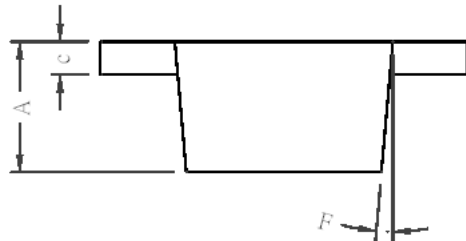
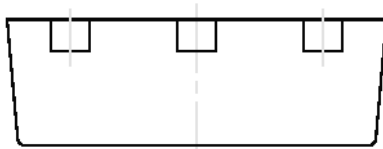




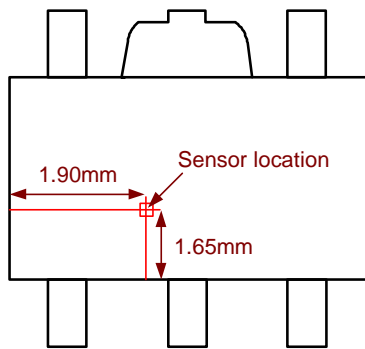
**SOT89-5L(Halogen Free)**



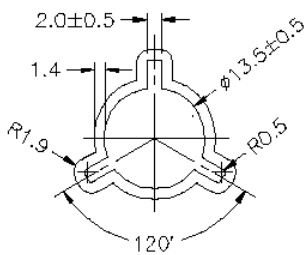
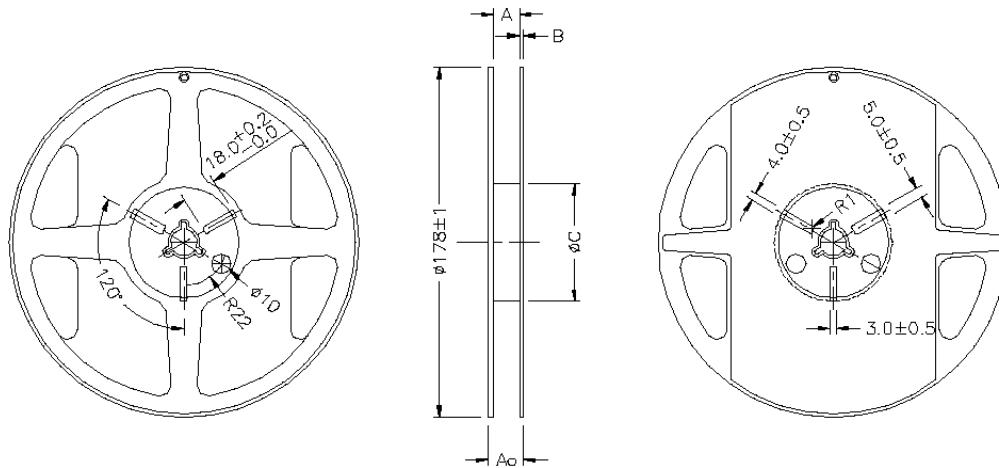
REF.	DIMENSIONS	
	Millimeters	
	Min.	Max.
A	1.40	1.60
B	0.40	0.52
c	0.35	0.41
D	4.40	4.60
D1	1.50	1.70
D2	1.30	1.50
E	2.40	2.60
E1	2.20 REF.	
E2	0.52 REF.	
e	1.50 REF.	
e1	3.00 REF.	
F	5° TYP.	
H	4.05	4.25
L	0.80	-



**Sensor Location:**



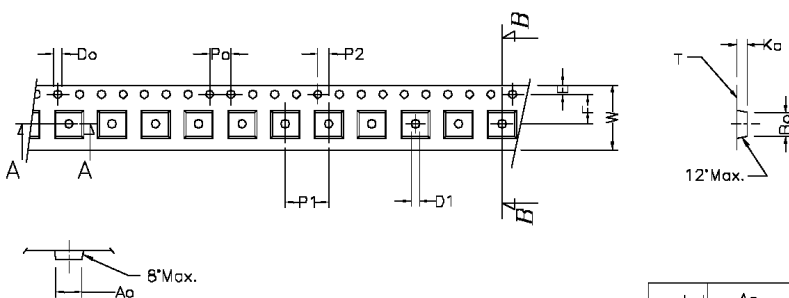
**TOP VIEW**

**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			
φC ± <sub>0</sub> <sup>1</sup>	60	60	60			

**NOTE :**

1. Material : Anti-static polystyrene.
2. Surface resistivity 10<sup>8</sup> ohm/square


**A-A SECTION**

symbol	Ao	Bo	Ko	Pa	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 <sub>-0.1</sub> <sup>+0.3</sup>	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
FD115CH-G1	-20 °C to +85 °C	SIP-5L	±20G (B)	1Kea
FD115CA-G1	-20 °C to +85 °C	SOT89-5L	±20G (B)	1Kea/real