

Smart motor driver with embedded Hall sensor

FEATURES

- Motor driver with integrated Hall sensor
- High current driving capability
- Lock-shutdown protection & auto-restart function
- Built-in RD (rotation-detection) signal output(FD0292K)
- Built-in FG (or 1/2 FG optional) frequency generation signal output
- Precise magnetic switching thresholds
- Available in SOT25 packages



GENERAL DESCRIPTION

FD0291K/FD029HK/FD0292K is a Motor driver with on-chip 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.

BLOCK DIAGRAM

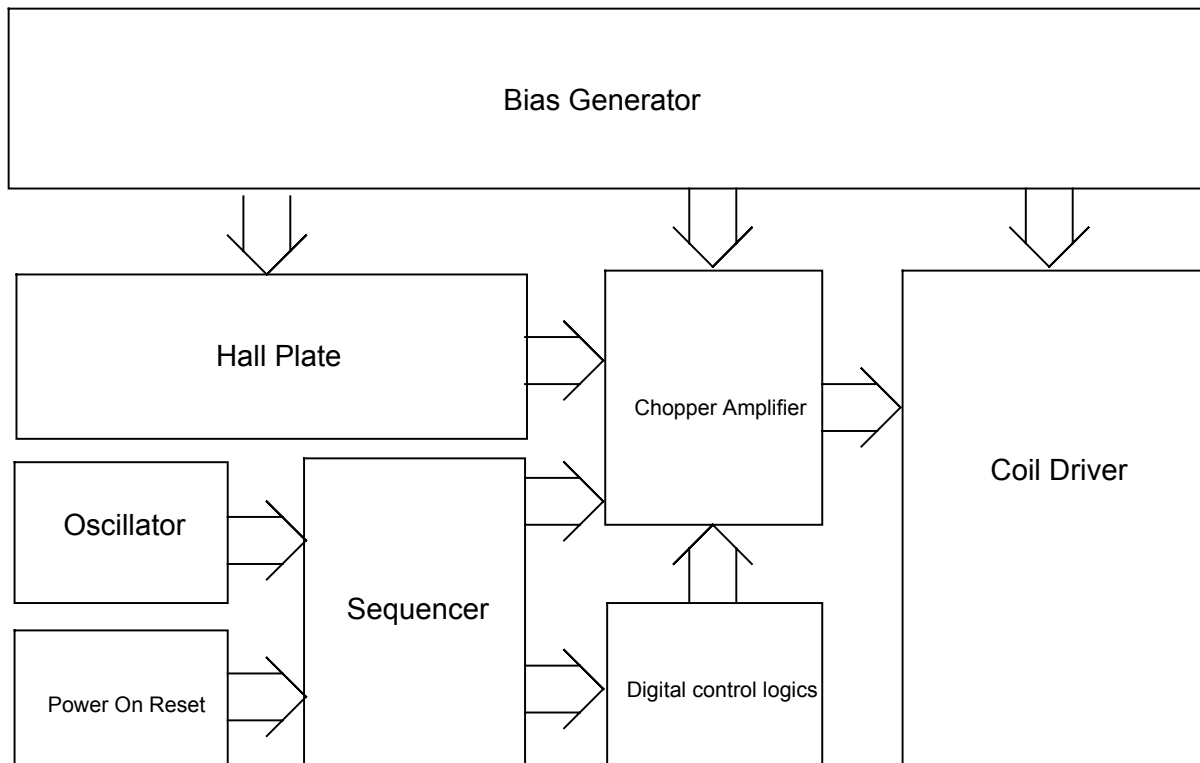
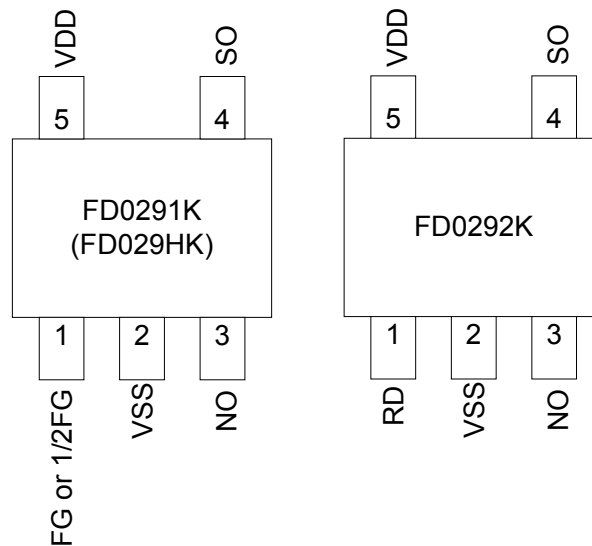


Figure.1

PIN CONNECTION


ps. FD029HK for 1/2FG

Figure.2

PIN DESCRIPTIONS

	I/O	FD0291K FD029HK	FD0292K	Description
*FG(1/2FG)/RD	O	1	1	Frequency generation / Rotation-detection
VSS	G	2	2	Ground
NO	O	3	3	Driver output
SO	O	4	4	Driver output
VDD	P	5	5	Positive power supply

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

* FD029HK for 1/2FG, FD0292K for RD

FUNCTIONAL DESCRIPTIONS

Refer to the block diagram (Figure.1), FD0291K/FD029HK/FD0292K is composed of the following building blocks:

- Bias generator

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

- Oscillator + Sequencer

The built-in oscillator provides the clock signal, which is taken by the sequencer to generate the sequential signals necessary for both the Hall sensor and the digital control logics

- Power on Reset

Used to detect the power-up ramp and reset the digital circuits to attain 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.

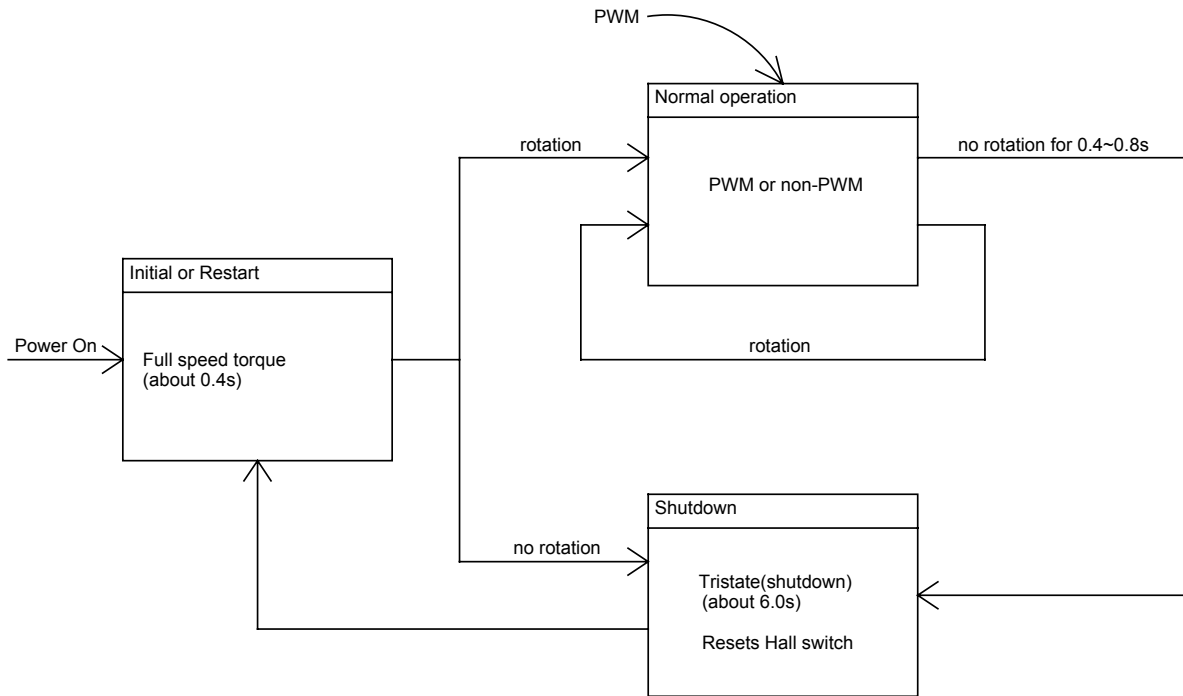


Figure.3

Refer to the figure above(Figure.3), the driver will enter the “Initial or Restart” state after power-on.

FD0291K/FD029HK/FD0292K will apply full speed torque to the motor for about 0.4s and monitor the status of the motor at the same time.

If the motor rotation is detected, FD0291K/FD029HK/FD0292K will enter “Normal operation” state; otherwise, it will enter the “Shutdown” state.

FD0291K/FD029HK/FD0292K will stay in the “Normal operation” state as long as the motor keeps rotating.

If the motor is locked for more than 0.4 to 0.8s, FD0291K/FD029HK/FD0292K will enter the “Shutdown” state.

Once entering the “Shutdown” state, FD0291K/FD029HK/FD0292K will stop providing driving current to the motor for about 6.0s and then enter the “Initial or Restart” state.

Alternating state changes between the “Initial or Restart” state and the “Shutdown” state will remain until the motor starts rotating. This will restart the motor and on the other hand prevent the motor (coil) from damages caused by over-heating.

ABSOLUTE MAXIMUM RATINGS

Parameter	Conditions	Values		Unit
		min.	max.	
Ambient Operating Temperature	-	-20	105	°C
Storage Temperature	-	-40	150	°C
DC Supply Voltage	-	1.8	6.5	V
FG Pull High Voltage	-		6.5	V
FG Sink current	-		12	mA
Supply Current	-		3	mA
Continous Current	-		500	mA
Hold current	-		800	mA
Junction temperature	-		150	°C

OPERATING CONDITIONS

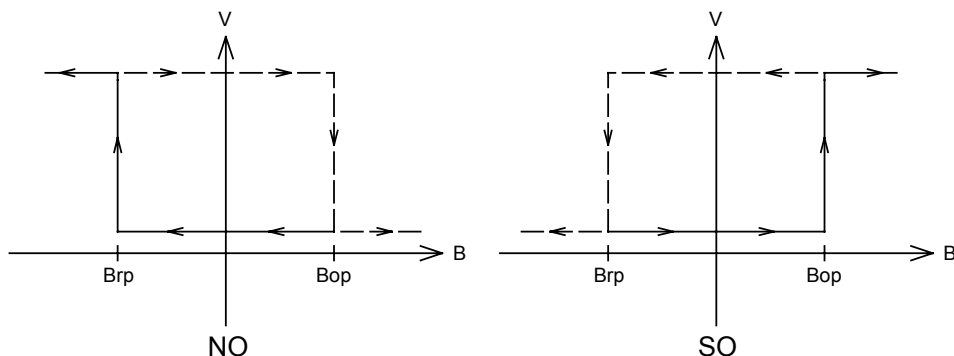
Parameter	Conditions	Values			Unit
		min.	typ.	max.	
Supply Voltage	-	1.8		6.5	V
Ambient Temperature	-	-20		105	°C

ELECTRICAL CHARACTERISTICS @ VDD=5.0V

Parameter	Conditions	Values			Unit
		min.	typ.	max.	
Average Supply Current(no load)			1.8		mA
Output Saturation Voltage(FG)	I _{out} = 10mA			0.5	V
Output leakage current(FG)	V _{out} =5V			1	uA
On resistance(R _{pmos} +R _{nmos})			1.6		Ohm

MAGNETIC CHARACTERISTICS

Parameter	Conditions	Values			Unit
		min.	typ.	max.	
Operate Points (B _{OP})			25		G
Release Points (B _{RP})			-25		G
Hysteresis			50		G

HYSTERESIS CHARACTERISTICS




Application Circuit Reference

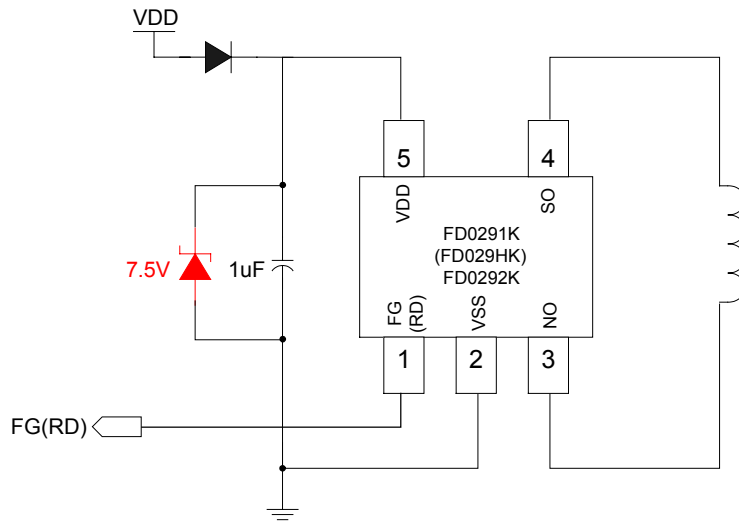


Figure.4

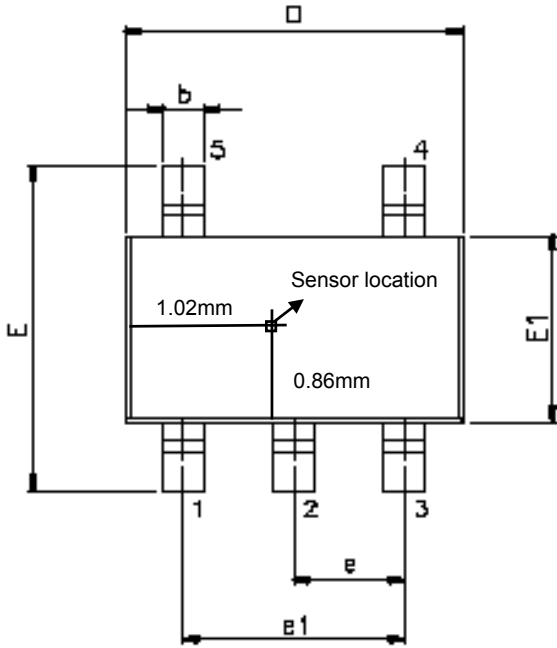
Note. Must use least 1uF(electrolytic) capacitor and 7.5V zener diode for the decoupling between VDD and VSS and place the capacitor as close to the IC as possible.

FG pull high voltage must less than 6.5V.

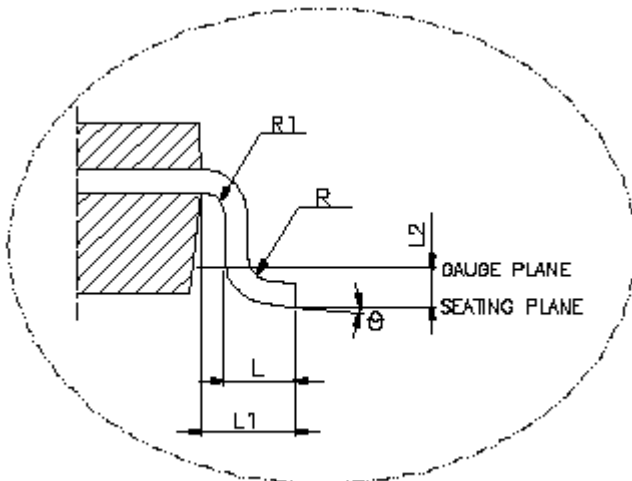


PACKAGE DIMENSION

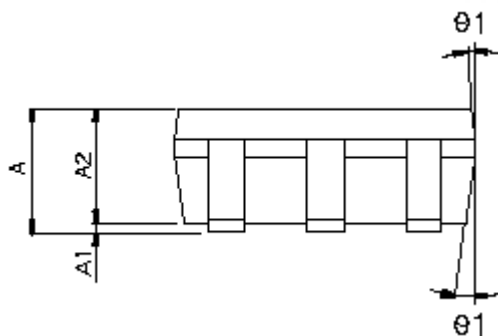
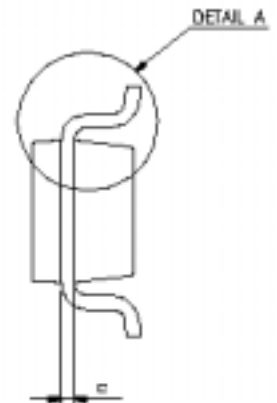
SOT26-5L

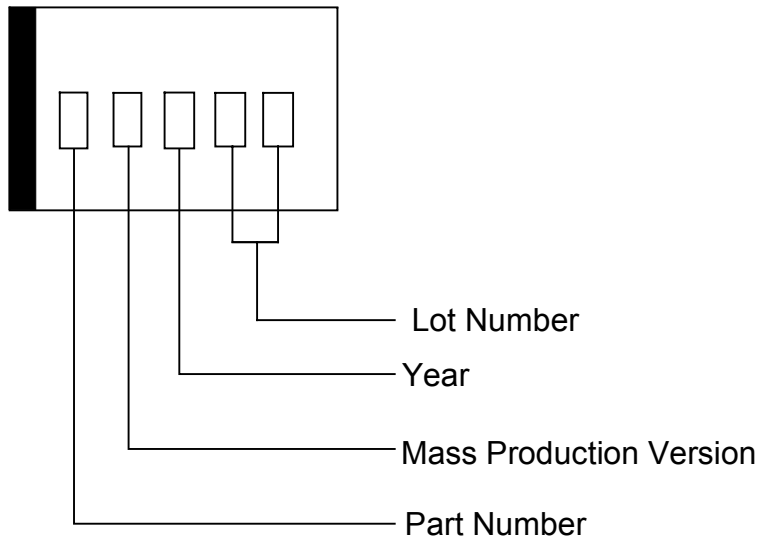


Symbols	Dimension In Millimeters		
	Min	Nom	Max
A	-	-	1.45
A1	-	-	0.15
A2	0.90	1.15	1.30
b	0.30	-	0.50
c	0.08	-	0.22
D	2.90BSC		
E	2.80BSC		
E1	1.60BSC		
e	0.95BSC		
e1	1.90BSC		
L	0.30	0.45	0.60
L1	0.60BSC		
L2	0.25BSC		
R	0.10	-	-
R1	0..10	-	0.25
Θ	0°	4°	8°
$\Theta 1$	5°	10°	15°



DETAIL A



IC DATE CODE DISTINGUISH

ORDER INFORMATION

Part Number	Operating Temperature	Package	Description	Marking
FD0291K-LF	-20 °C to +105 °C	SOT25	±25G (B)	JXXXX
FD029HK-LF	-20 °C to +105 °C	SOT25	±25G (B)	LXXXX
FD0292K-LF	-20 °C to +105 °C	SOT25	±25G (B)	KXXXX

Product Part Number Vs. Function Table

Part Number	Auto lock-shutdown restart	Rotation-detection (RD)	Frequency generation (FG)	1/2 Frequency generation (1/2FG)
FD0291K				
FD029HK				
FD0292K				