FEELING TECHNOLOGY

FD1157AH

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
- Available in SIP-4L packages
- For 12V systems

General Description

FD1157AH 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

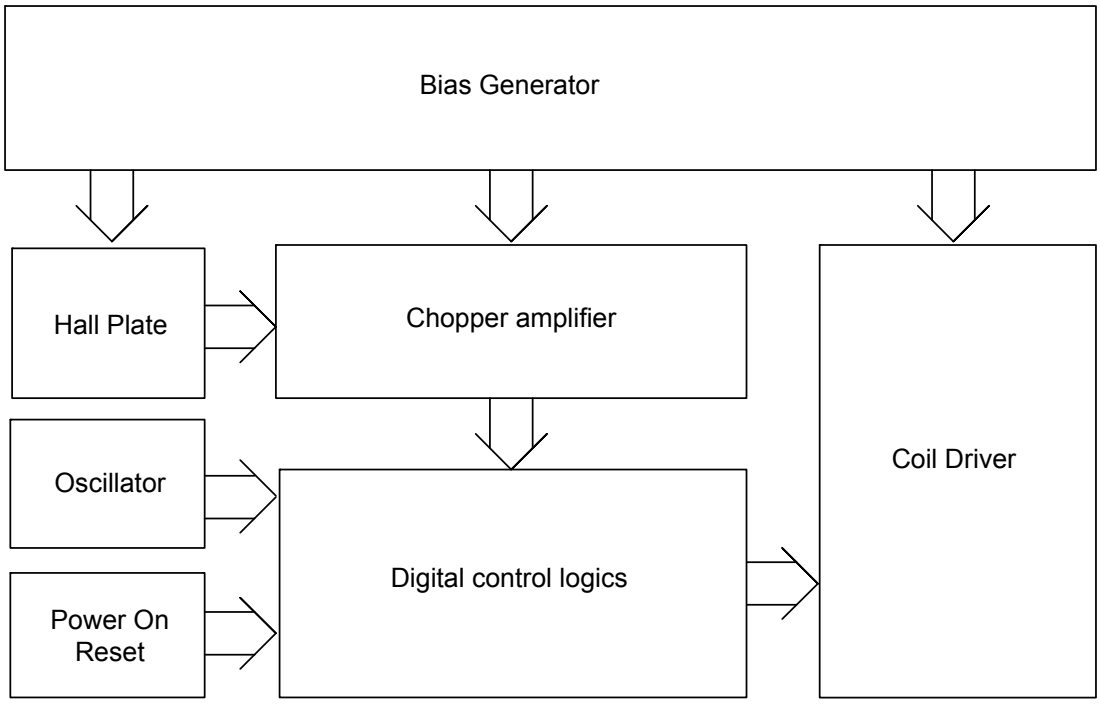


Figure.1

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Pin Connection

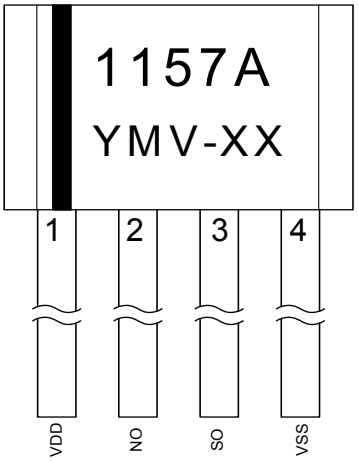


Figure.2

Marking Distinguish

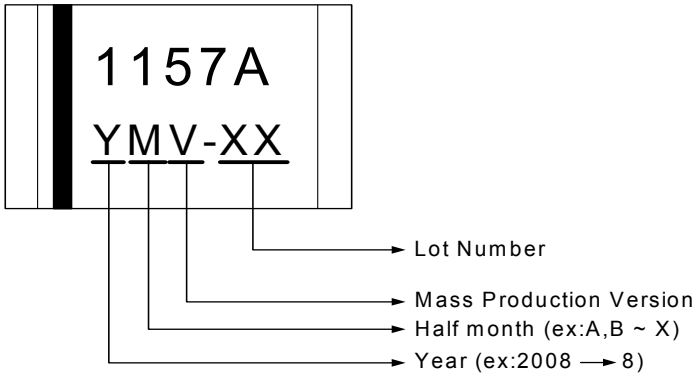


Figure.3

Pin Descriptions

Name	I/O	FD1157H	Description
VSS	G	4	Ground
SO	O	3	Driver output
NO	O	2	Driver output
VDD	P	1	Positive power supply

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

Functional Descriptions

Refer to the block diagram (Figure.1), FD1157AH 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

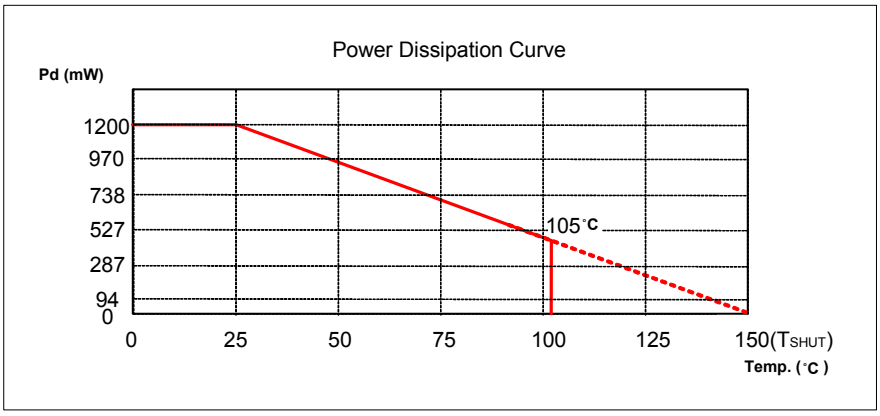
To achieve a higher magnetic sensitivity the chopper amplifier structure is adopted in this design. Use of this structure dynamically removes both the offset and flicker noise at the same time.

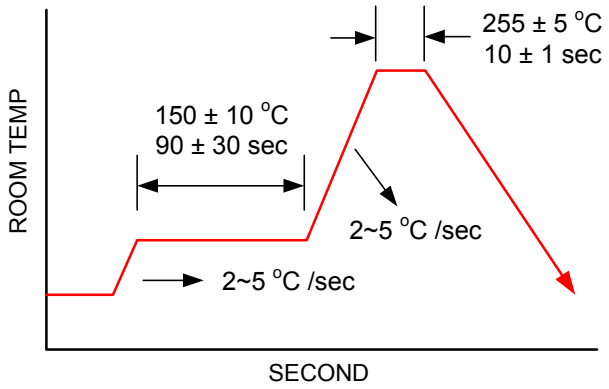
- Digital control logics
  - Hall sensor part – generates controlling signals for the Hall sensor.
  - Coil driver part – generates controlling signals for the Coil driver.

Absolute Maximum Ratings

Parameter	Symbol	Conditions	Values			Unit
			min.	Typ.	max.	
Operating Temperature	T_{OP}	-	-20		85	℃
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-4L			1200	mW
Thermal Resistance	θ_{JC}	SIP-4L		62		°C/W
Thermal Resistance	θ_{Ja}	SIP-4L		104		°C/W
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}	-	2.5		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}	V_{DD}=5V, T_A=25 °C, Iout=300mA		1		Ohm
Thermal Shutdown Threshold	T_{SHUT}		150			℃
Locked Rotor Period	T_{ON}			0.4		s
Locked Rotor Period	T_{OFF}			2.8		s

Magnetic Characteristics

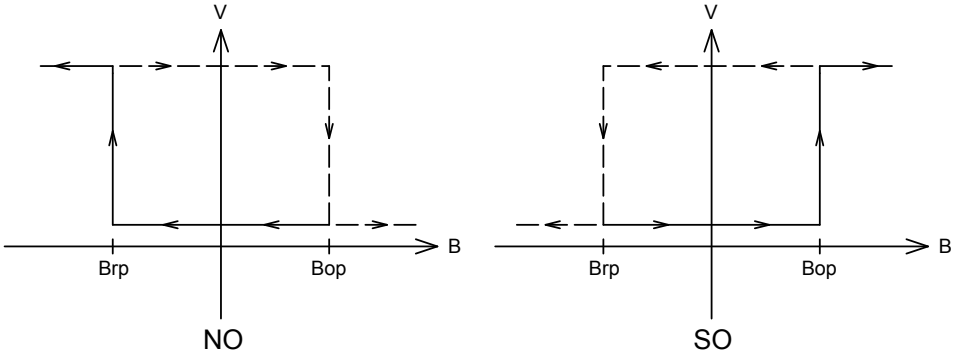
Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Operate Points	B_{OP}		5	20	50	G
Release Points	B_{RP}		-50	-20	-5	G

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

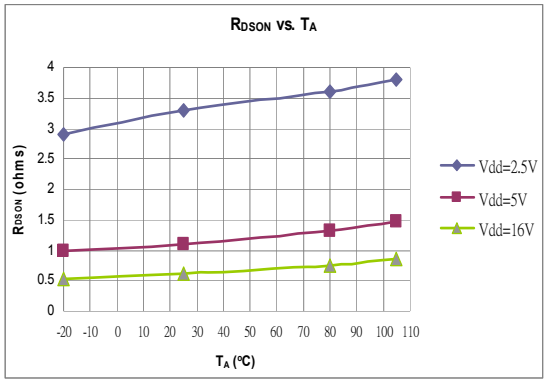


Figure.4

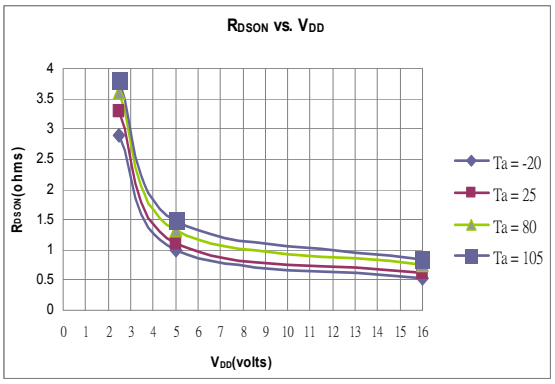


Figure.5

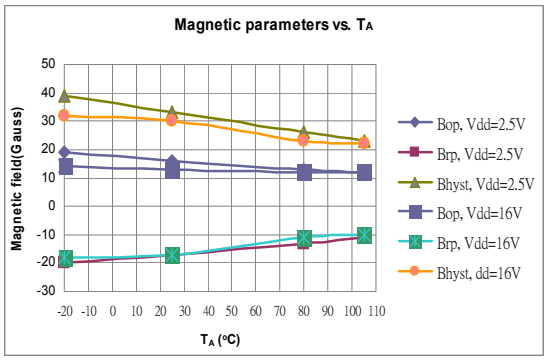


Figure.6

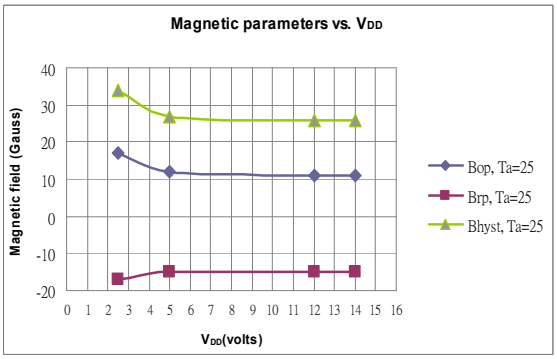


Figure.7

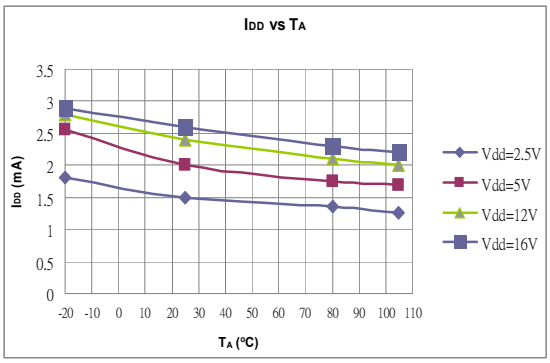


Figure.8

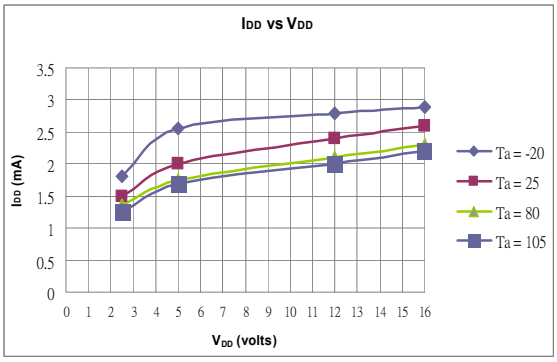


Figure.9

Application Circuit Reference

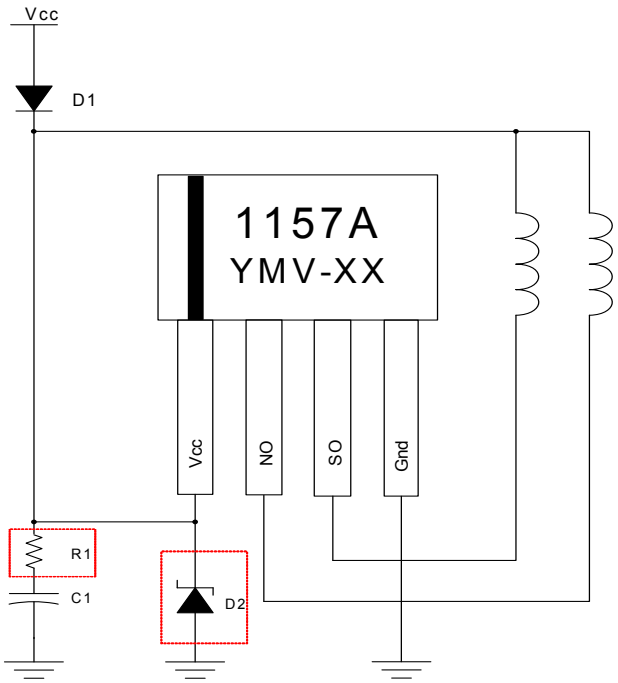


Figure.10

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

Output Waveforms Description

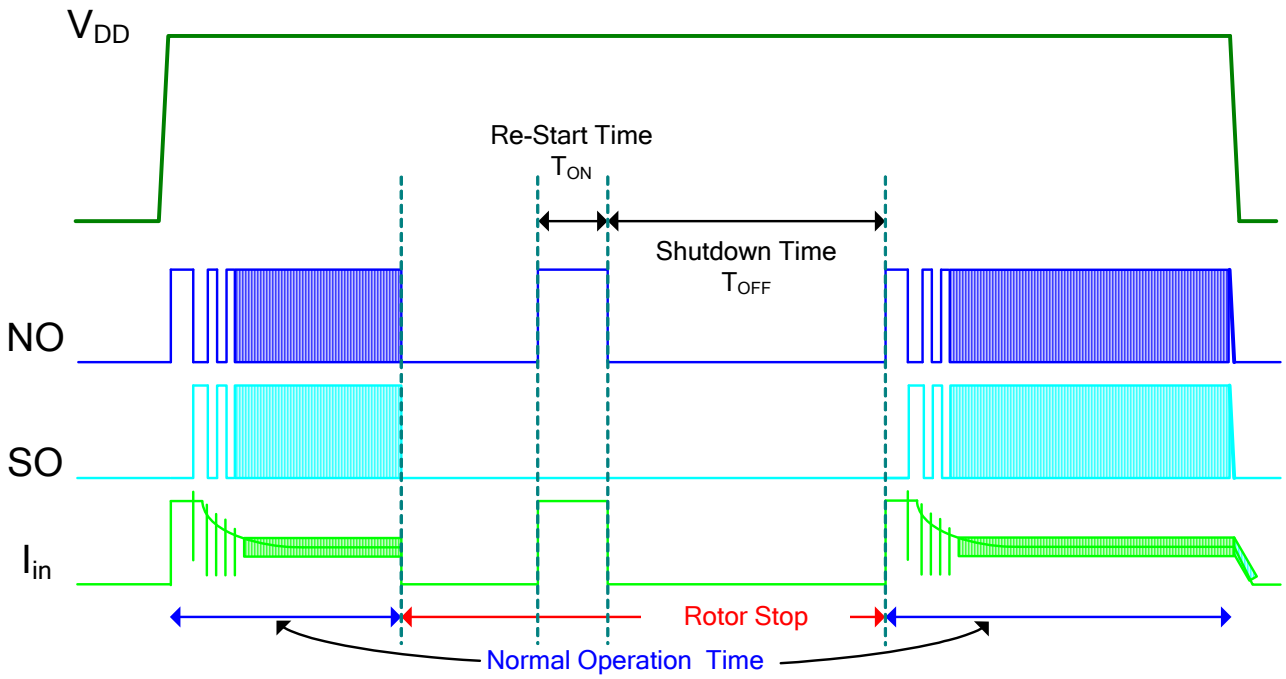
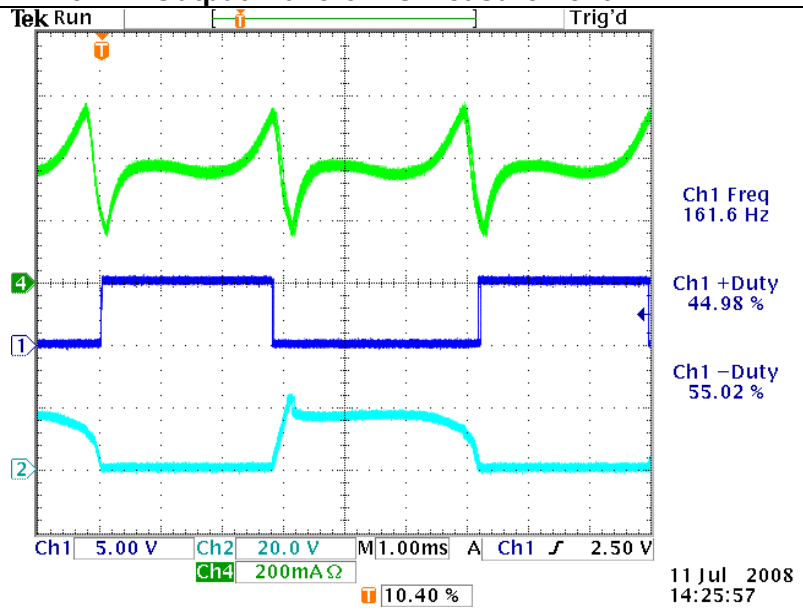


Figure.11 FD1157AH NO/SO Output Waveforms

FD1157AH Output Waveforms Measurement



Normal Operation (VDD = +12V)

Waveforms

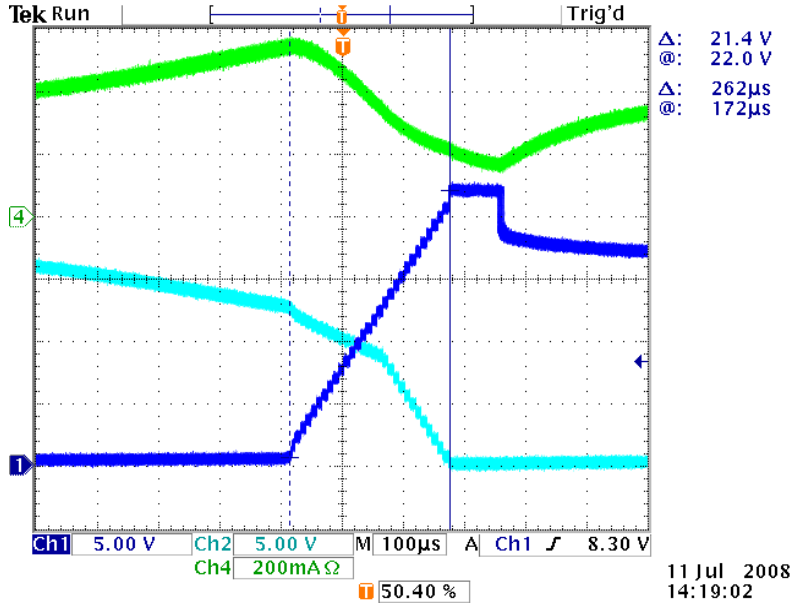
Ch1: FG Output

Ch2: SO Output

Ch4: Input Current

Rotation Speed (FG Readout)
(~ 4,840 rpm)

Figure 12



Soft-Switching

Waveforms

Ch1: NO Output

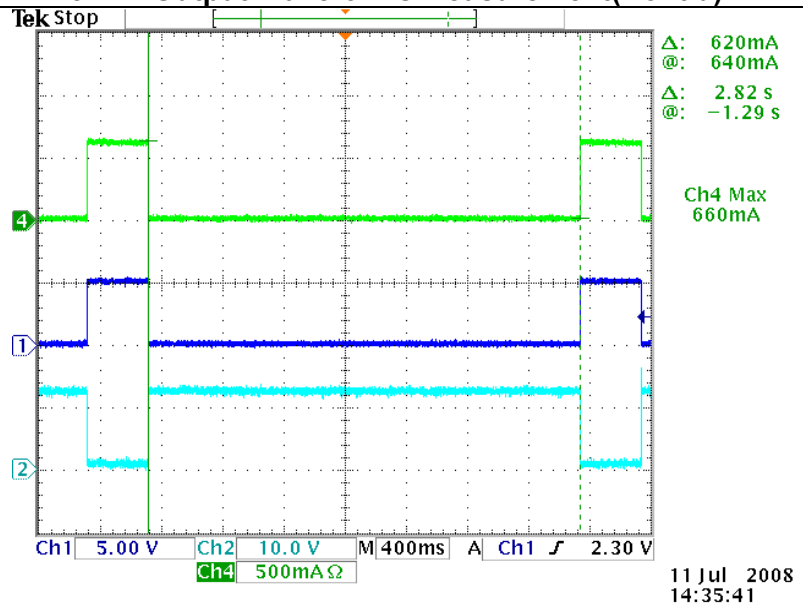
Ch2: SO Output

Ch4: Input Current

Switching Time: ~ 262µs

Figure 13

FD1157AH Output Waveforms Measurement(Cont'd)



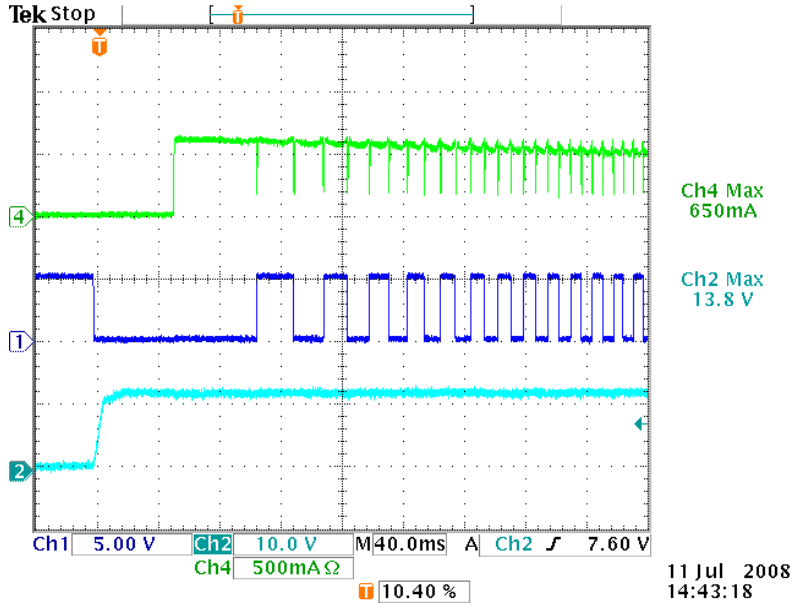
Rotor Locked (Shutdown & Re-Start)

Waveforms

Ch1: NO Output
Ch2: SO Output
Ch4: Input Current

Ton time: ~ 0.4s
Toff time: ~ 2.82s

Figure 14



Power-On

Waveforms

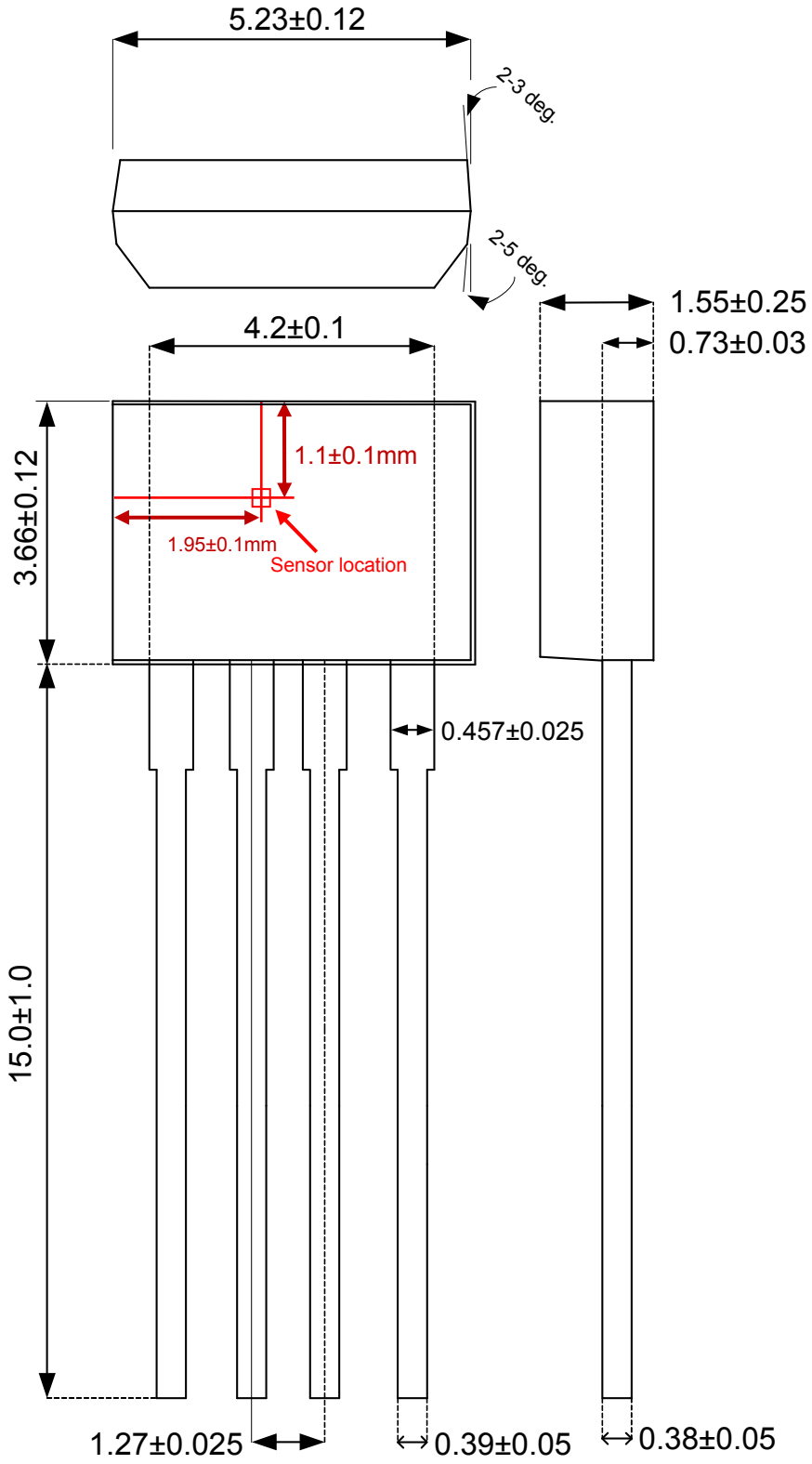
Ch1: FG Output
Ch2: VDD pin (+12V)
Ch4: Input Current

Start-up Current: ~ 650mA

Figure 15

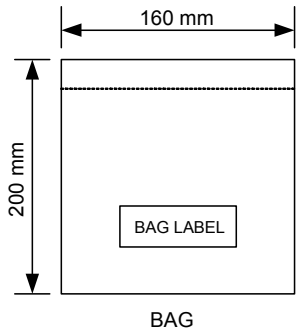
Package Dimension (Unit: mm)

SIP-4L(Halogen Free)

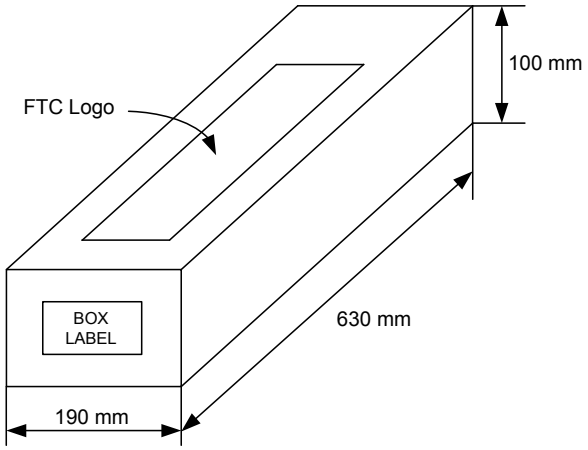


Packing Specification

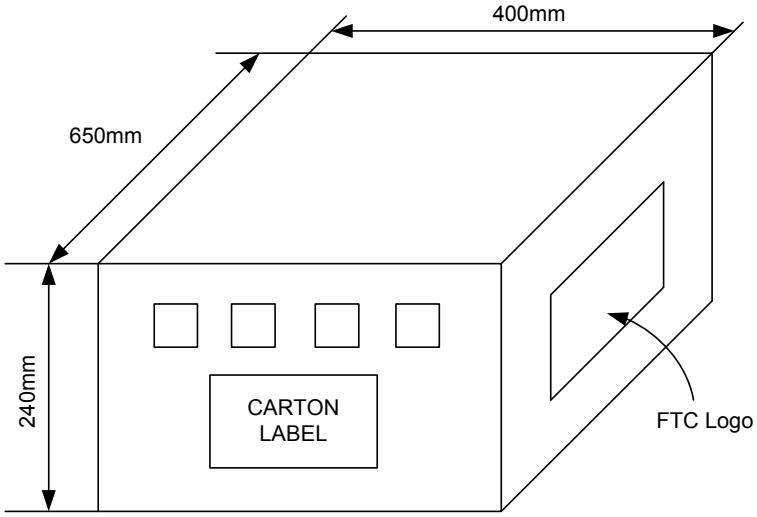
BAG & BOX DIMANSION



BAG



INSIDE BOX



CARTON

Packing Quantity Specifications

1000 EA / 1 BAG

20 BAGS / 1 INSIDE BOX

4 INSIDE BOXES / 1 CARTON

Order Information

Part Number	Operating Temperature	Package	Description	Marking
FD1157AH-G1	-20 °C to +85 °C	SIP-4L	±50G (B)	-