FEELING TECHNOLOGY

FD1257AH

Smart motor driver with embedded Hall sensor

Features

Halogen Free

- Motor driver with high sensitivity Hall-effect sensor
- H-Bridge MOS driver
- Lock-shutdown protection & auto-restart function
- “Soft-switch” phase-switching technique to reduce vibration and acoustic noise
- Thermal shutdown protection(TSD)
- Available in SIP-4L package
- For 5V and 12V DC motor / FAN systems

General Description

FD1257AH is a single-phase full wave motor driver with embedded Hall-effect sensor IC. It integrates a H-bridge MOS driver, a high sensitivity hall-effect sensor, an event timer for rotor locked in SIP-4L package, which make the motors’ PCBs(printed circuit boards) design easy and fabricate the high efficiency DC motors or FANs as simply as possible.

For safety, Lock-shutdown function would turn the IC’s internal drivers off avoiding over-heat when the rotor is locked, and IC will try to re-start the rotor’s torque after the time of these drivers’ shutdown.

Thermal-shutdown protection (TSD) ensures the internal drivers of IC are operating under a safe operating temperature range.

All the protection mechanisms mentioned above combine to provide a complete protecting scenario in the motor system and avoid any possible damages and guarantee under a correct and safe operation.

Block Diagram

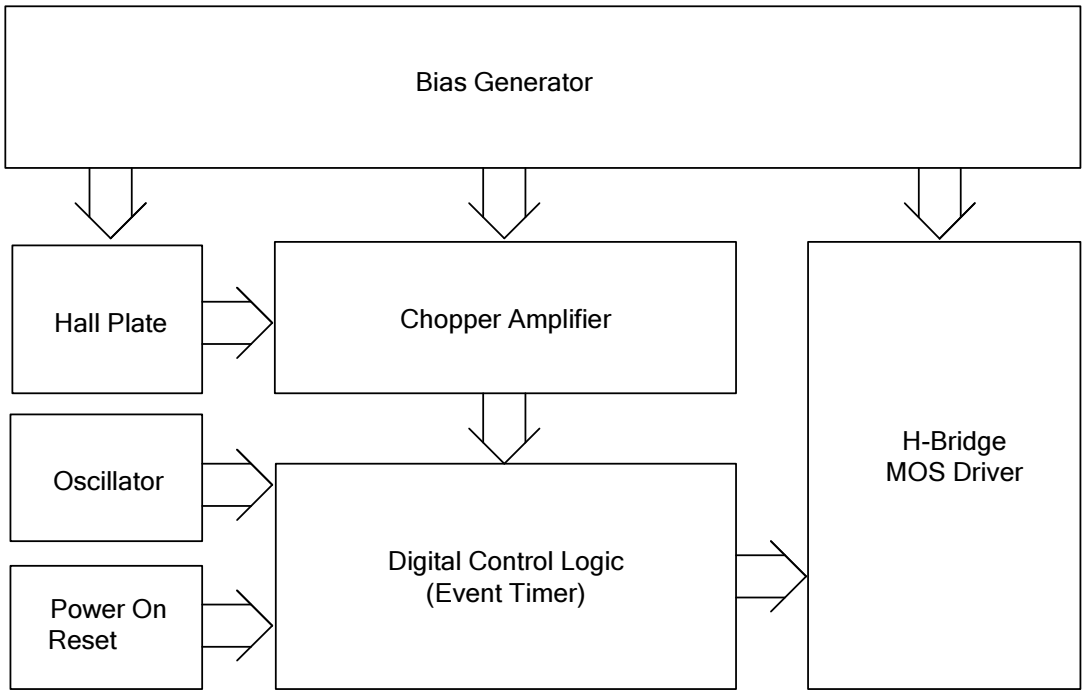


Figure.1

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Pin Connection

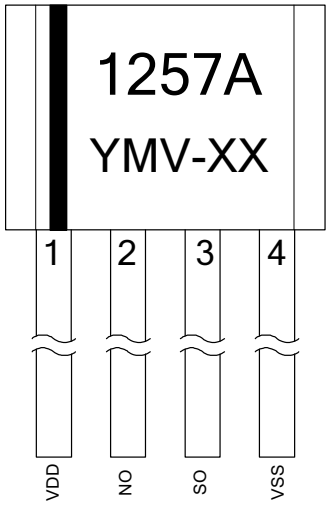


Figure.2

Marking Distinguish

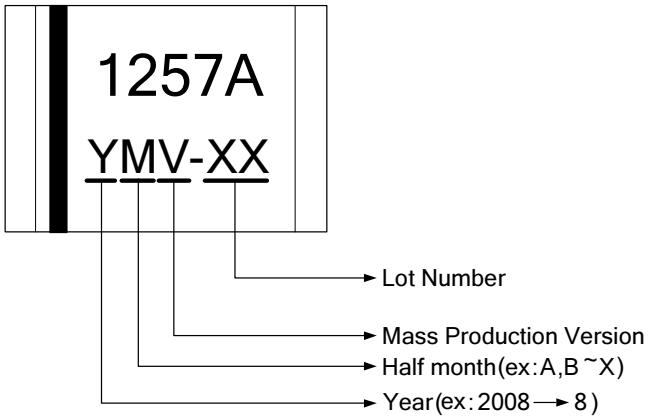


Figure.3

Pin Descriptions

Name	I/O	FD1257AH	Description
VDD	P	1	Positive Power Supply
NO	O	2	Driver Output 1
SO	O	3	Driver Output 2
VSS	G	4	Ground

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

Functional Descriptions

Refer to the block diagram (Figure.1), FD1257AH 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 IC under all conditions specified in this specification.

- Oscillator

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

- 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.

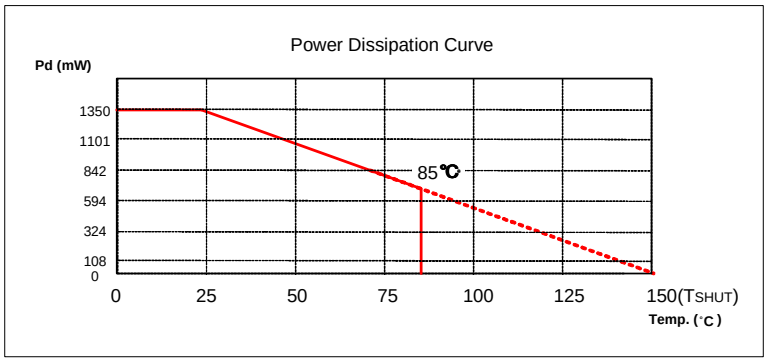
- Chopper Amplifier

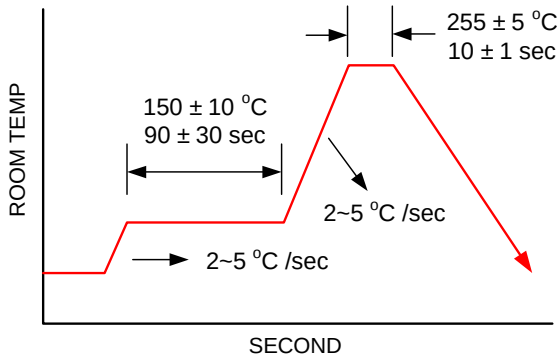
To achieve a higher magnetic sensitivity the chopper amplifier structure is adopted in this design. Use of this structure dynamically removes both the offset and flicker noise at the same time.

- Digital Control Logic
  - Hall sensor part – generates magnetic pole signals from the Hall-effect sensor.
  - Driver part – generates switching signals to the H-Bridge MOS driver.
  - Timer part – generates an interval of time when rotor locked event is occurred.

Absolute Maximum Ratings

Parameter	Symbol	Conditions	Values			Unit
			min.	Typ.	max.	
Operating Temperature	T_{OP}	-	-40		85	℃
Storage Temperature	T_{ST}	-	-55		150	℃
DC Supply Voltage	V_{DD}	$V_{SS} < V_{DD}$			18	V
Output Voltage (NO, SO)	V_{OUT}	V_{DD} = 2.5V ~ 15V			V_{DD} + 0.3V	V
Supply Current	I_{DD}	-			6	mA
Continuous Current	$I_{O(CONT)}$	T_a =25℃			450	mA
Hold Current	$I_{O(HOLD)}$	T_a =25℃			1000	mA
Peak Current	$I_{O(PEAK)}$	<100μs, T_a =25℃			1200	mA
Junction temperature	T_J				180	℃
Power Dissipation	P_D	SIP-4L			1350	mW
Thermal Resistance	θ_{JC}	SIP-4L		55		℃/W
Thermal Resistance	θ_{JA}	SIP-4L		92.6		℃/W
Magnetic Flux Density	B				Unlimited	Gauss
IR-Reflow Lead Temperature	T_P	10sec			260	℃





IR-ReFlow Soldering Condition

Recommended Operating Conditions

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Supply Voltage	V_{DD}	-	2.5		17	V
Operating Temperature Range	T_a	-	-40		85	℃

Electrical Characteristics T_a=25℃ (unless otherwise specified)

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Average Supply Current(no load)	I_{DD}	V_{DD} = 17V		3.5		mA
On resistance (R_{PMOS}+R_{NMOS})	$R_{DS(ON)}$	V_{DD} = 2.5V	4.5	5.0	5.5	Ω
		V_{DD} = 17V		2.5		
Thermal Shutdown Threshold	T_{SHUT}		150			℃
Locked Rotor Period	T_{ON}			0.4		s
Locked Rotor Period	T_{OFF}			4.1		s

Magnetic Characteristics

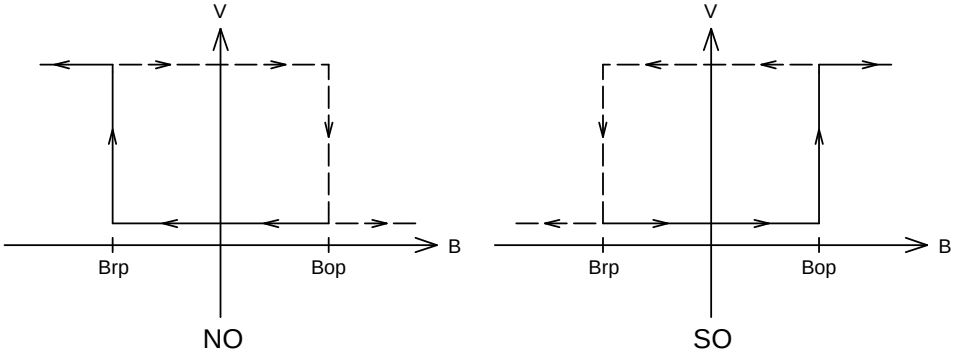
Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Operate Points	B_{OP}		5	25	50	G
Release Points	B_{RP}		-5	-25	-50	G
Hysteresis	B_{HYS}		10	50	100	G

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

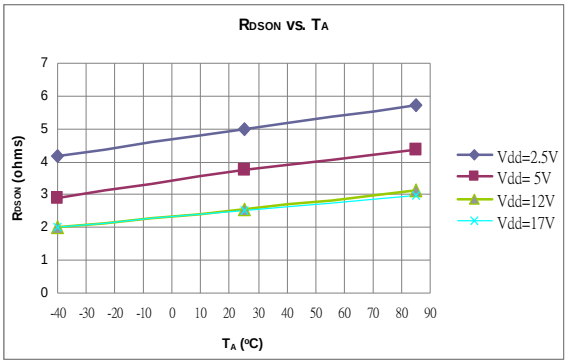


Figure.4

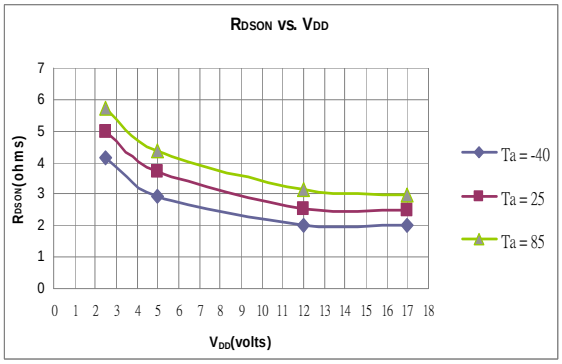


Figure.5

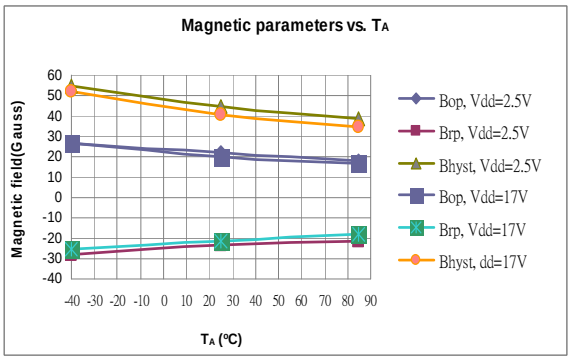


Figure.6

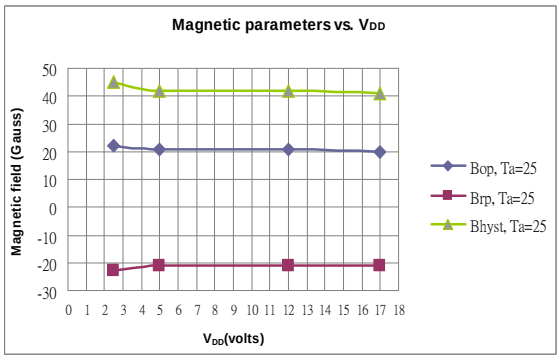


Figure.7

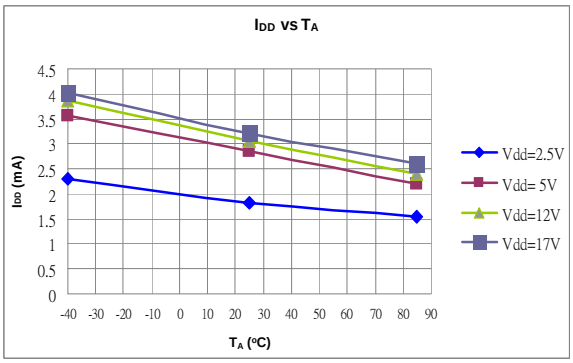


Figure.8

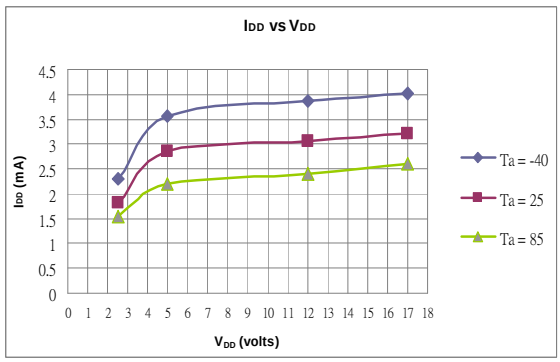
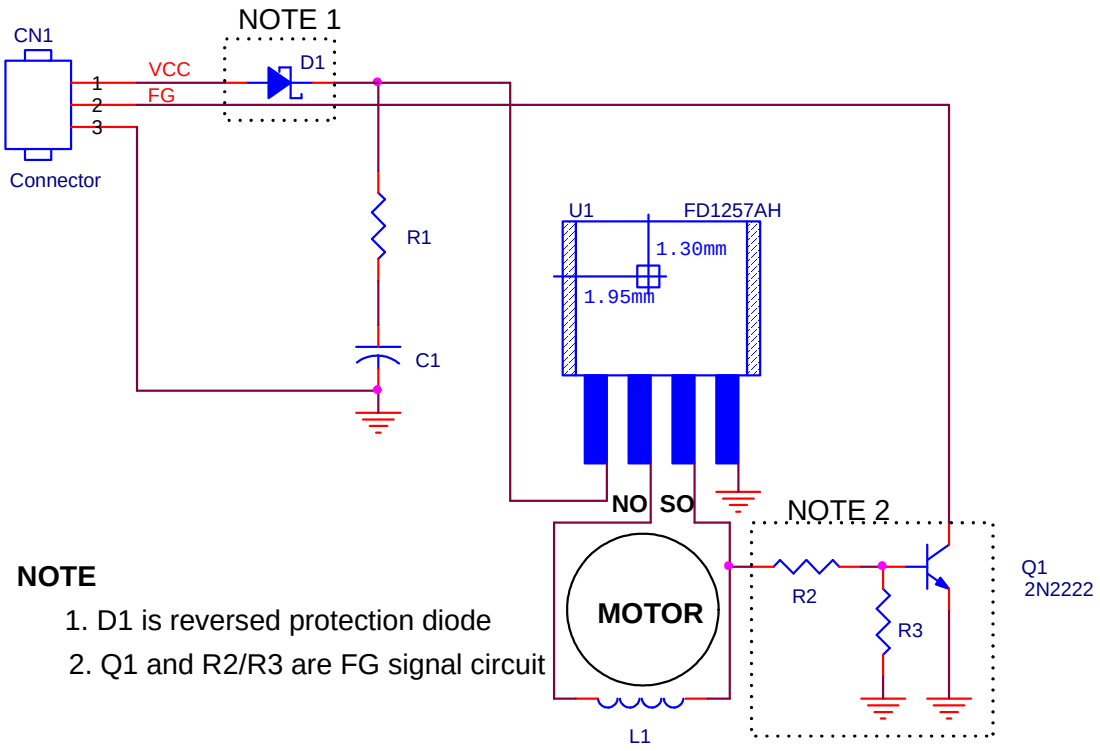


Figure.9

Application Circuit Reference



NOTE

1. D1 is reversed protection diode
2. Q1 and R2/R3 are FG signal circuit

Figure.10 FD1257AH Typical Application Circuits

Note:

1). Must use least C1=1μF(electrolytic) capacitor & R1=0~10 Ohm for the decoupling between V_{DD} and V_{SS} and place the capacitor as close to the IC as possible.

2).D1 is a low forward diode for IC reversed supply voltage protection.

FD1257AH Output Waveforms Description

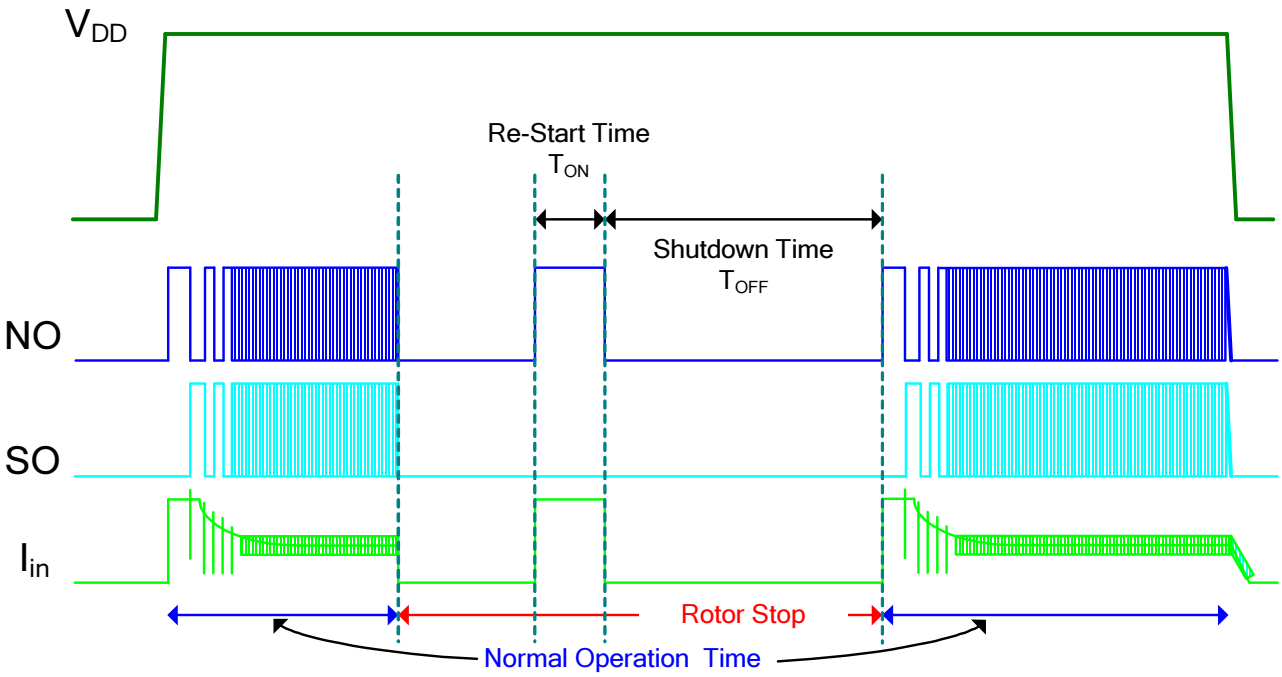
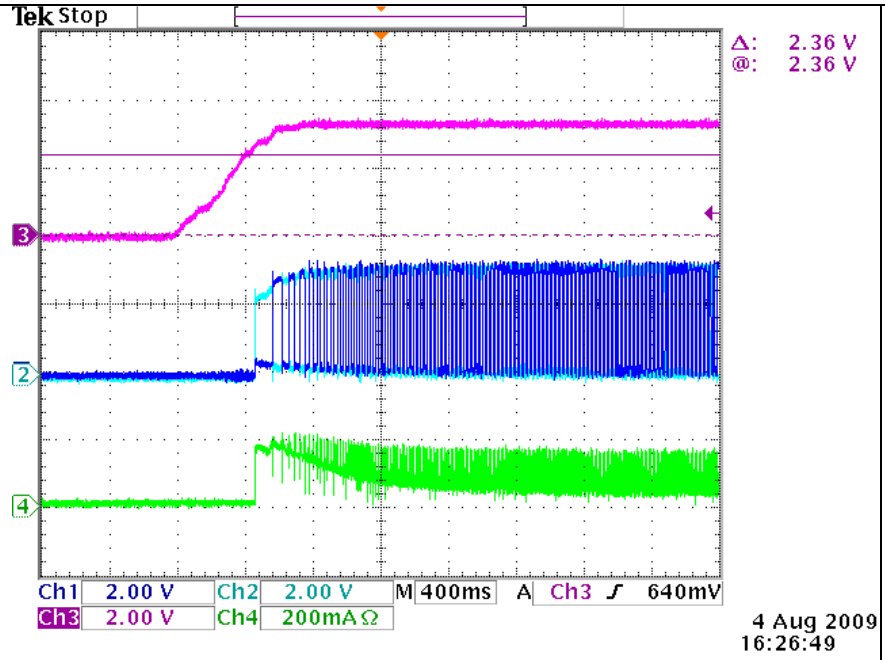


Figure.11

FD1257AH Output Waveforms Measurement

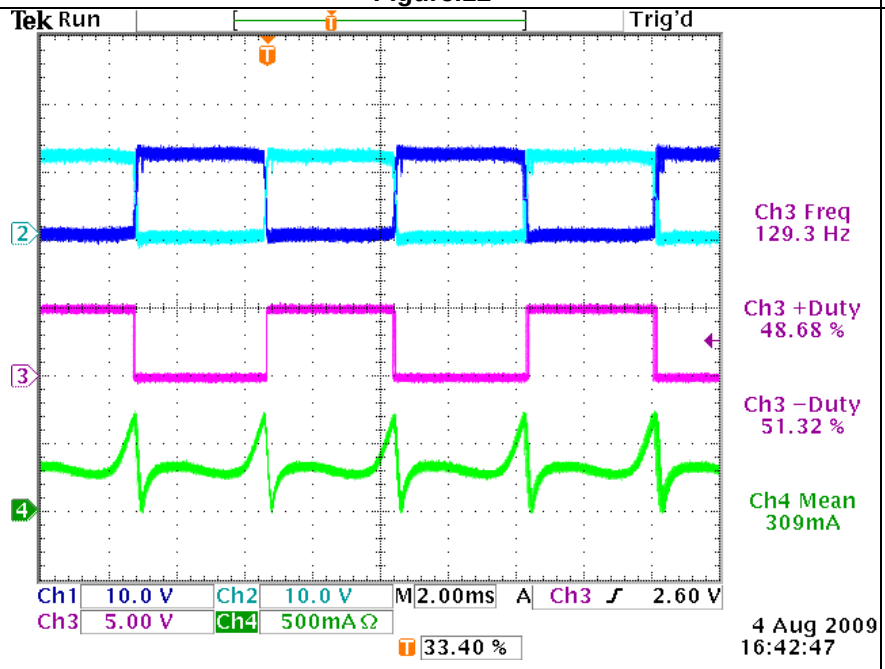


FD1257AH Start-up Voltage

Ch1: NO Output
Ch2: SO Output
Ch3: Input Voltage
Ch4: Input Current

Start-up Voltage (~ 2.36V)

Figure.12



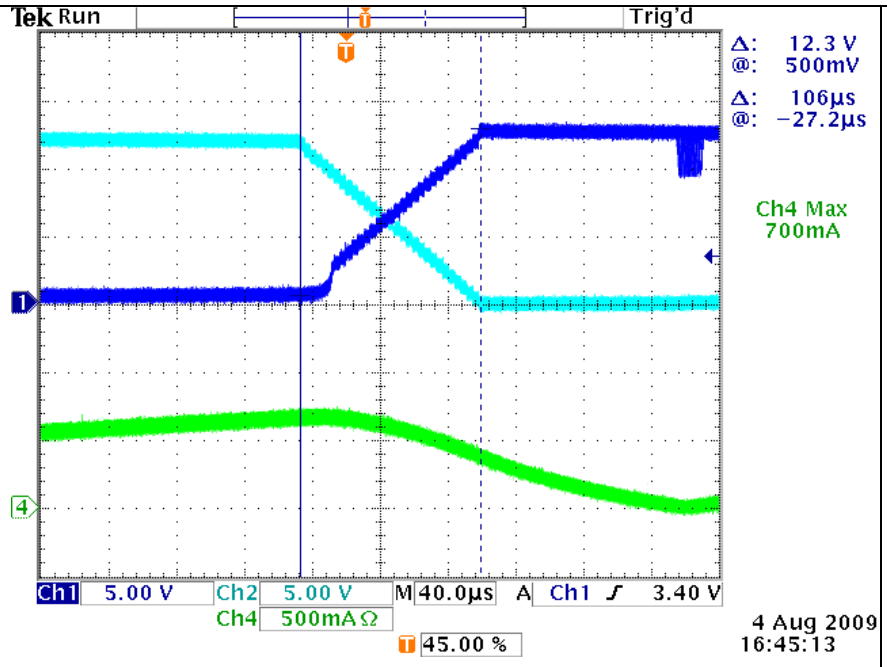
FD1257AH Normal Operation (+12.5V)

Ch1: NO Output
Ch2: SO Output
Ch3: FG Output
Ch4: Input Current

Motor Speed: (~ 3,879 rpm)

FG Duty Cycle Ratio: (~ 1.054)

Figure.13

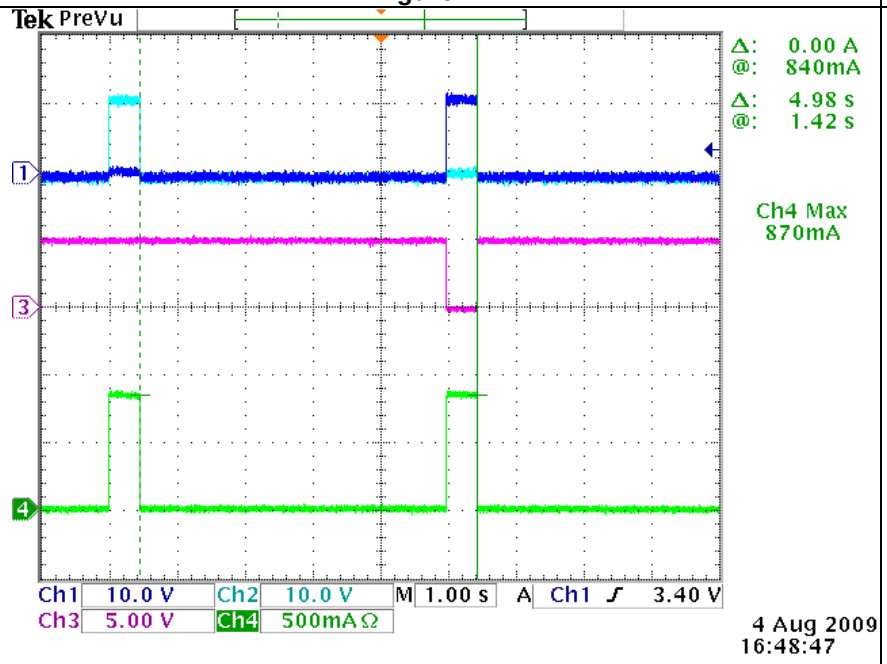


FD1257AH
Soft-Switching

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

Soft-Switching Time:
(~ 106µs)

Figure.14



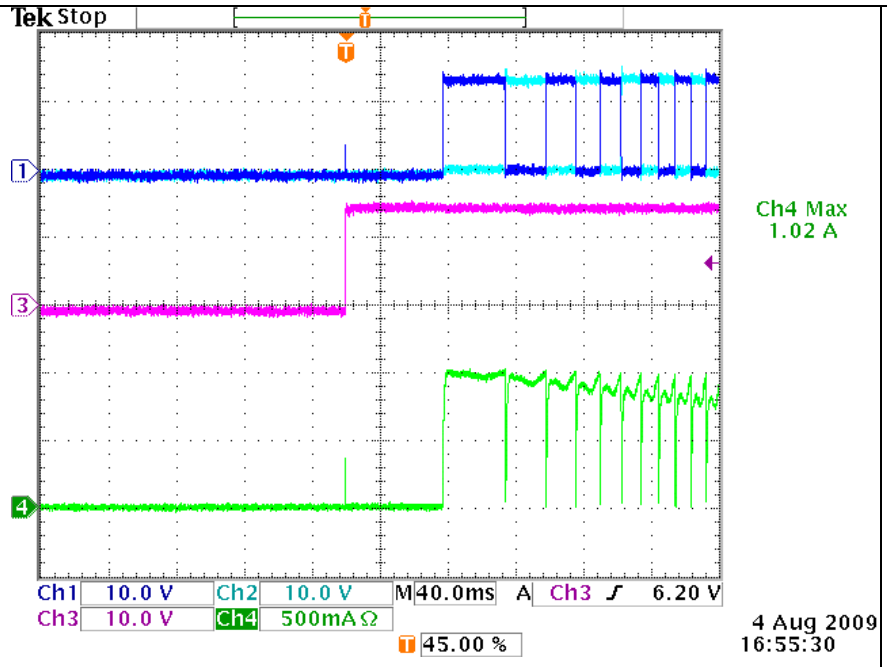
FD1257AH Rotor Locked and Auto Re-Start Rotation

Input Voltage: +12.5V

Ch1: NO Output
Ch2: SO Output
Ch3: FG Output
Ch4: Input Current

Off Time(T_{OFF}): ~ 4.58s
On Time(T_{ON}): ~ 0.4s

Figure.15

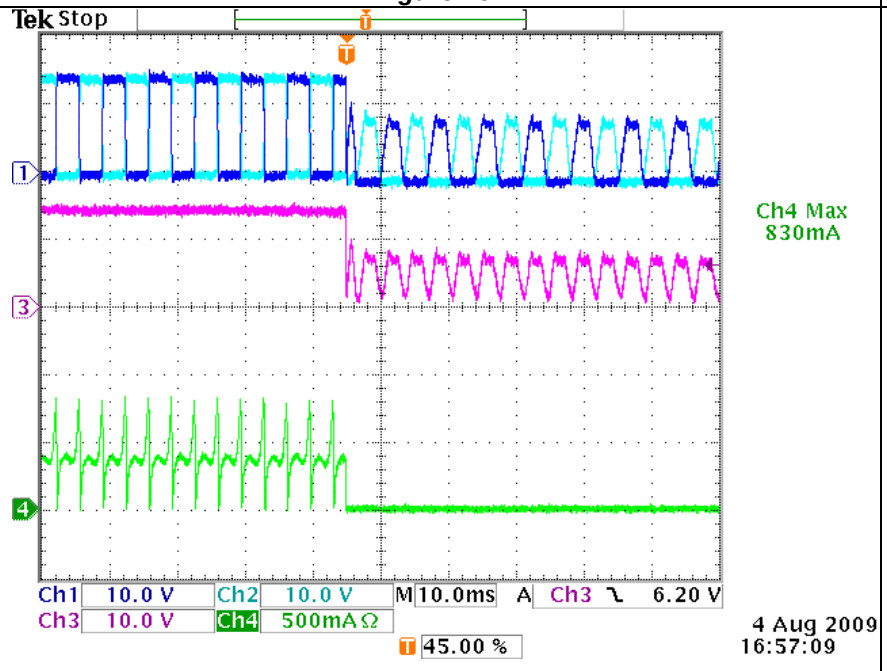


FD1257AH Power On

Input Voltage: +15.0V

Ch1: NO Output
Ch2: SO Output
Ch3: Input Voltage (No Diode)
Ch4: Input Current

Figure.16



FD1257AH Power Off

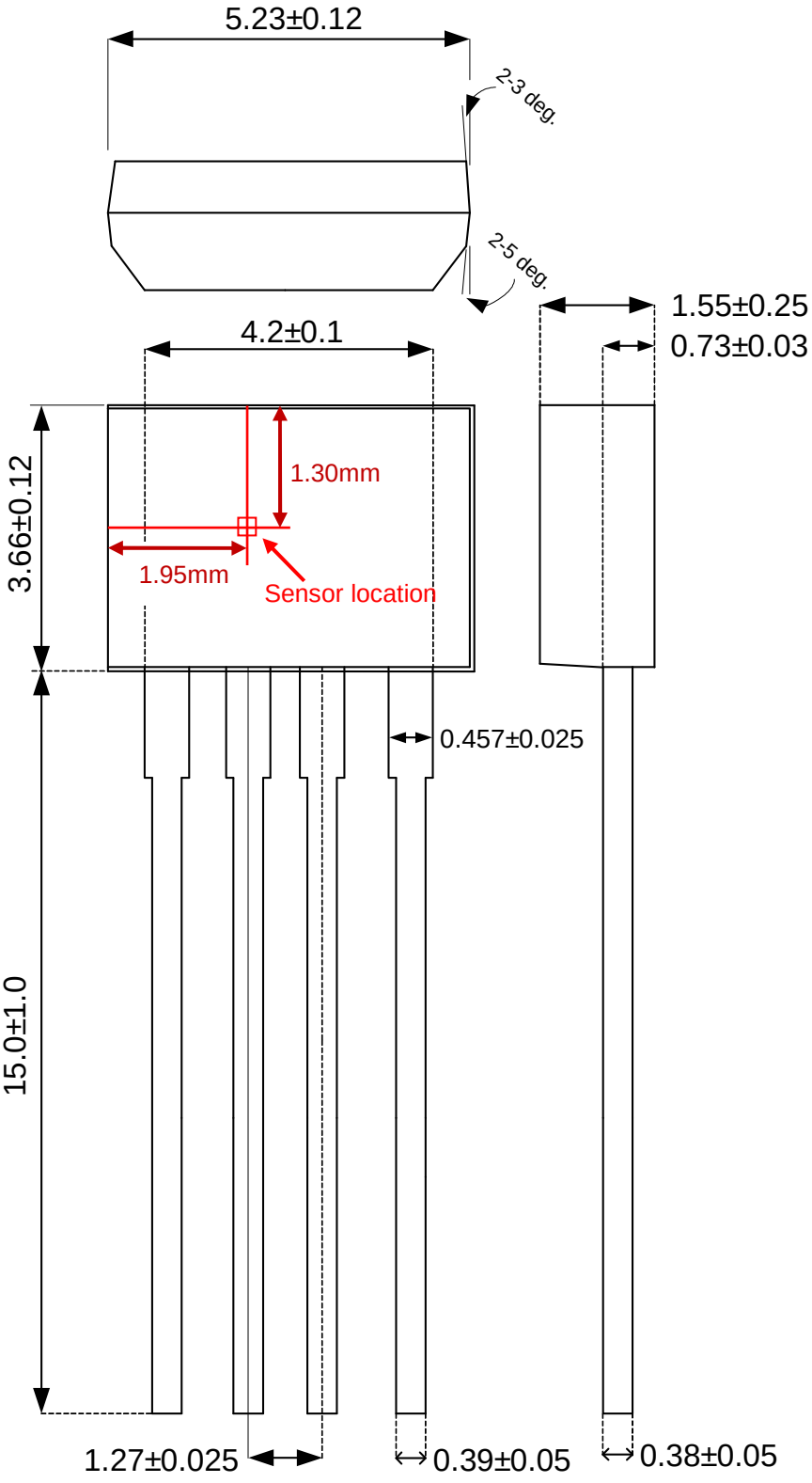
Input Voltage: +15.0V

Ch1: NO Output
Ch2: SO Output
Ch3: Input Voltage (No Diode)
Ch4: Input Current

Figure.17

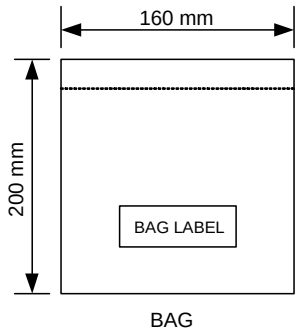
Package Dimension (Unit: mm)

SIP-4L(Halogen Free)

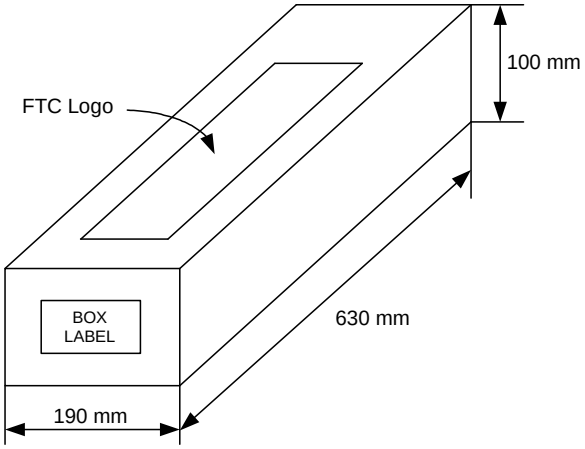


Packing Specification

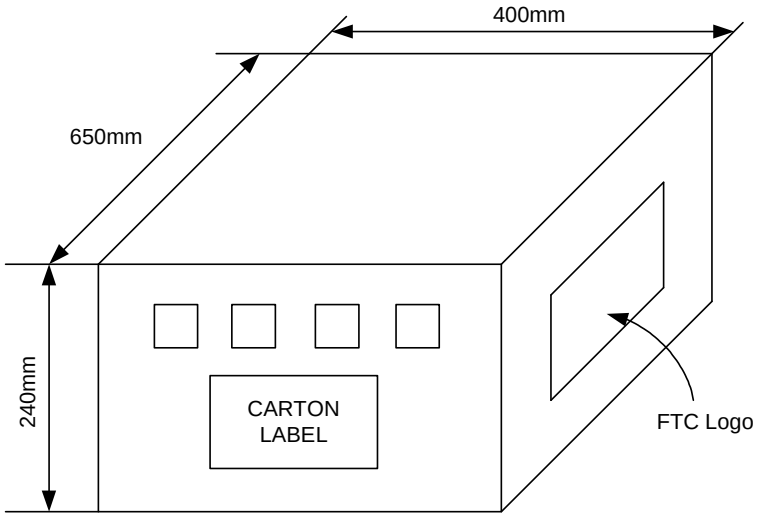
BAG & BOX DIMANSION



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	MOQ	MSL
FD1257AH-G1	-40 ℃ to +85 ℃	SIP-4L	±50G (B)	1,000 EA / BAG	3