東楠科技股份有限公司
Tungnan Technology Co., Ltd.

MOTOR
M4206

DC MOTOR DRIVER FOR SERVO
DRIVER APPLICATIONS

GENERAL DESCRIPTION

The M4206 is an H-Bridge Driver with fully protected. It is designed for automotive headlight beam control and industrial servo control applications. External resisters can amplify the difference between REF (Reference) and FB (Feedback). The shift base voltage can be set by external resistor. The dead band and hysteresis parameter are programmable with external resistors.

The function of short-circuit-protection is built in. The short circuit protection method is direct short circuit , the protection will active immediately to make protection. Others, if supply voltage is under spec. Defined the minimum voltage, or the supply voltage is over the spec. Defined maximum voltage, the protect will active. If the temperature is over the spec, the protection will active with hysteresis.

FEATURES

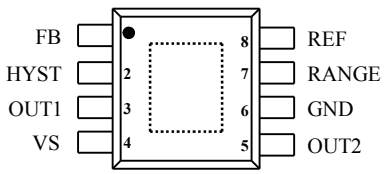
- Applications to control headlight beam
- Output current up to 0.8A
- Output short circuit protected
- Over- and under-voltage protect
- Non-overlap current in cross
- Thermal shutdown protected with hysteresis
- REF pin under- and over- voltage protected

APPLICATIONS

- Headlight beam control
- Industrial servo control

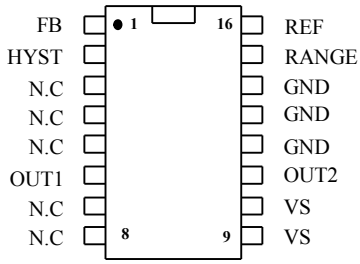
PIN CONFIGURATION

M4206



SOP-8
(Exposed Pad)

M4206



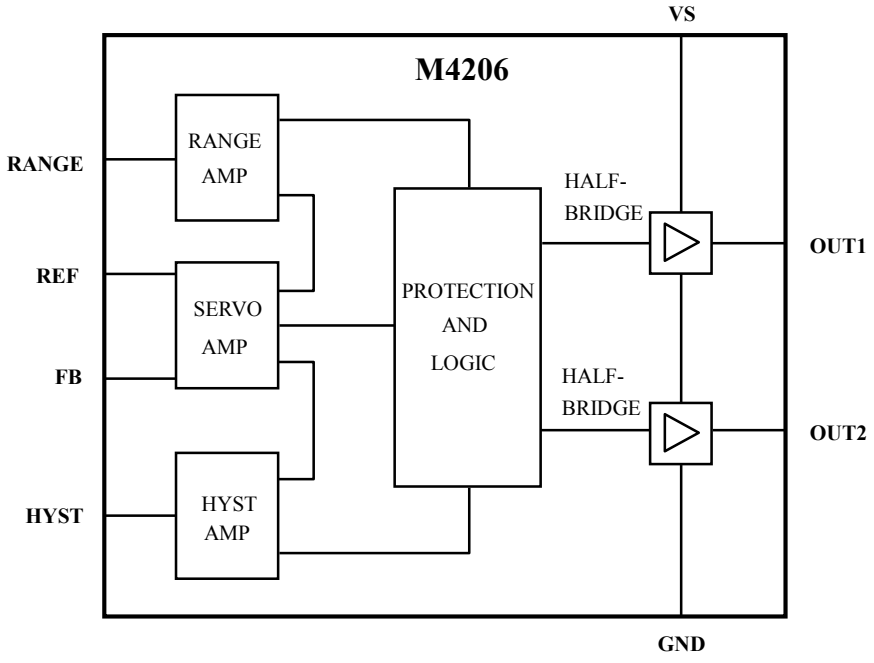
SOP-16

DC MOTOR DRIVER FOR SERVO
DRIVER APPLICATIONS

PIN DESCRIPTION

PIN NO.		PIN NAME	DESCRIPTION
8 PIN	16 PIN		
1	1	FB	Feedback input
2	2	HYST	Define hysteresis range
3	6	OUT1	Output 1
4	9 , 10	VS	Power supply positive
5	11	OUT2	Output 2
6	12 , 13 , 14	GND	Ground (Power supply negative)
7	15	RANGE	Range detect input
8	16	REF	Reference input

BLOCK DIAGRAM



DC MOTOR DRIVER FOR SERVO
DRIVER APPLICATIONS

ABSOLUTE MAXIMUM RATING

Stresses above those listed here may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Parameter	Symbol	Min	Max	Unit	Remarks
Supply voltage	V_S	-0.3	20	V	
Supply voltage	V_S	-1	—	V	t<0.5s；I_S >-2A
Logic input voltages (FB, REF, RANGE, HYST)	V_I	-0.3	20	V	
Output current (OUT1,OUT2)	I_{OUT}	—	—	A	Internally limited
Input current (FB, REF, RANGE, HYST)	I_{IN}	-5	5	mA	
Junction temperature	T_J	-40	150	℃	
Storage temperature	T_{STG}	-50	150	℃	

OPERATING RANGE

Parameter	Symbol	Min	Max	Unit	Remarks
Supply voltage	V_S	8	18	V	After V_S rising above $V_{UV\,ON}$
Supply voltage increasing	V_S	-0.3	$V_{UV\,ON}$	V	Outputs in tristate
Supply voltage decreasing	V_S	-0.3	$V_{UV\,OFF}$	V	Outputs in tristate
Output current	I_{OUT1-2}	-0.8	0.8	A	-
Input current (FB, REF)	I_{IN}	-50	500	μA	-
Junction temperature	T_J	-40	150	C	-

ELECTRICAL CHARACTERISTICS

9V < V_S < 17V；I_{OUT1-2} = 0 A；– 40℃ < T_J < 150℃ (unless otherwise specified)

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Conditions
Supply current	I_S	—	6	20	mA	
Over- and Under Voltage Lockout						
UV Switch ON Voltage	$V_{UV\,ON}$	—	7.1	9	V	V_S increasing
UV Switch OFF Voltage	$V_{UV\,OFF}$	6.0	6.6	—	V	V_S decreasing
UV ON/OFF Hysteresis	$V_{UV\,HY}$	—	0.5	—	V	$V_{UV\,ON} - V_{UV\,OFF}$
OV Switch OFF Voltage	$V_{OV\,OFF}$	—	17.5	19.5	V	V_S increasing
OV Switch ON Voltage	$V_{OV\,ON}$	16	16.5	—	V	V_S decreasing
OV ON/OFF Hysteresis	$V_{OV\,HY}$	—	1	—	V	$V_{OV\,OFF} - V_{OV\,ON}$
Outputs OUT1-2, Saturation Voltages						
Source (upper) I_{OUT} = -0.2A	$V_{SAT\,U}$	—	0.85	1.15	V	T_J = 25℃
Source (upper) I_{OUT} = -0.4A	$V_{SAT\,U}$	—	0.90	1.20	V	T_J = 25℃
Sink (upper) I_{OUT} = -0.8A	$V_{SAT\,U}$	—	1.10	1.50	V	T_J = 25℃
Sink (lower) I_{OUT} = 0.2A	$V_{SAT\,L}$	—	0.15	0.23	V	T_J = 25℃
Sink (lower) I_{OUT} = 0.4A	$V_{SAT\,L}$	—	0.25	0.40	V	T_J = 25℃
Sink (lower) I_{OUT} = 0.8A	$V_{SAT\,L}$	—	0.45	0.75	V	T_j = 25℃
Total drop I_{OUT} = 0.2A	V_{SAT}	—	1.0	1.4	V	$V_{SAT} = V_{SAT\,U} + V_{SAT\,L}$
Total drop I_{OUT} = 0.4A	V_{SAT}	—	1.2	1.7	V	$V_{SAT} = V_{SAT\,U} + V_{SAT\,L}$
Total drop I_{OUT} = 0.8A	V_{SAT}	—	1.6	2.5	V	$V_{SAT} = V_{SAT\,U} + V_{SAT\,L}$

ELECTRICAL CHARACTERISTICS

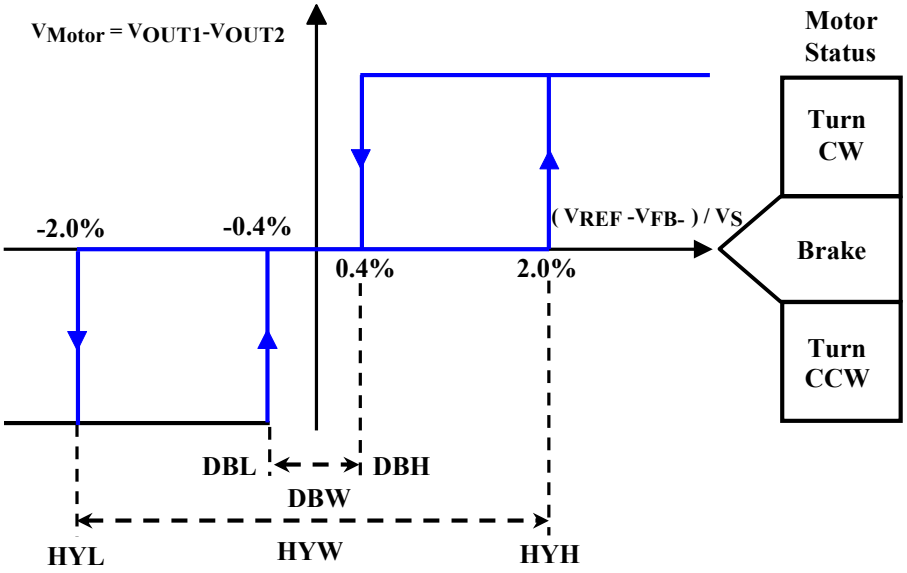
9V < Vs < 17V ; I_{OUT1-2} = 0 A ; – 40℃ < Tj < 150℃ (unless otherwise specified)

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input-Interface, Input REF						
Quiescent voltage	V_{REFq}	—	200	240	mV	I_{REF} = 0μA
Input resistance	R_{REF}	4.5	6.0	7.5	KΩ	0V < V_{REF} < 0.5V
Input-Interface, Input FB						
Quiescent voltage	V_{FBq}	—	200	240	mV	I_{FB} = 0μA
Input resistance	R_{FB}	4.5	6.0	7.5	KΩ	0V < V_{FB} < 0.5V
Input-Interface, Input / Output HYST						
Current Offset	$I_{HYSTIO\ 250}$	-2	0.35	3	μA	I_{REF} = I_{FB} = 250μA V_{HYST} = Vs / 2
	$I_{HYSTIO\ 40}$	-1.3	0	1.3	μA	I_{REF} = I_{FB} = 40μA V_{HYST} = Vs / 2
Current Amplification $A_{HYST} = I_{HYST} / (I_{REF} – I_{FB})$	A_{HYST}	0.8	0.95	1.1	—	– 20μA < I_{HYST} < – 10μA; 10μA < I_{HYST} < 20μA; I_{REF} = 250μA V_{HYST} = Vs / 2
Threshold Voltage High	V_{HYH} / Vs	—	52	—	%	—
Deadband Voltage High	V_{DBH} / Vs	—	50.4	—	%	—
Threshold Voltage Low	V_{HYL} / Vs	—	48	—	%	—
Deadband Voltage Low	V_{DBL} / Vs	—	49.6	—	%	—
Hysteresis Window	V_{HYW} / Vs	3.0	4.0	5.0	%	(V_{HYH} - V_{HYL}) / Vs
Deadband Window	V_{DBW} / Vs	0.4	0.8	1.2	%	(V_{DBH} - V_{DBL}) / Vs
Input-Interface, Input Range						
Input Current	I_{RANGE}	-1	—	1	μA	0V < V_{RANGE} < Vs
Switch-OFF Voltage High	V_{OFFH}	-25	0	100	mV	refer to Vs
Switch-OFF Voltage Low	V_{OFFL}	300	400	500	mV	refer to GND
Thermal Shutdown						
Thermal Shutdown Junction Temperature	T_{JSD}	150	175	200	℃	Not subject to production test , specified by design.
Thermal Switch-on Junction Temperature	T_{JSO}	120	—	170	℃	
Temperature hystereis	ΔT	—	30	—	K	—

Note：

The listed characteristics are ensured over the operating range of the integrated circuit. Typical characteristics specify mean values expected over the production spread. If not otherwise specified, typical characteristics apply at TA = 25℃ and the given supply voltage.

Hysteresis, Phaselag and Deadband-Definitions



Expressions：

HY = Hysteresis

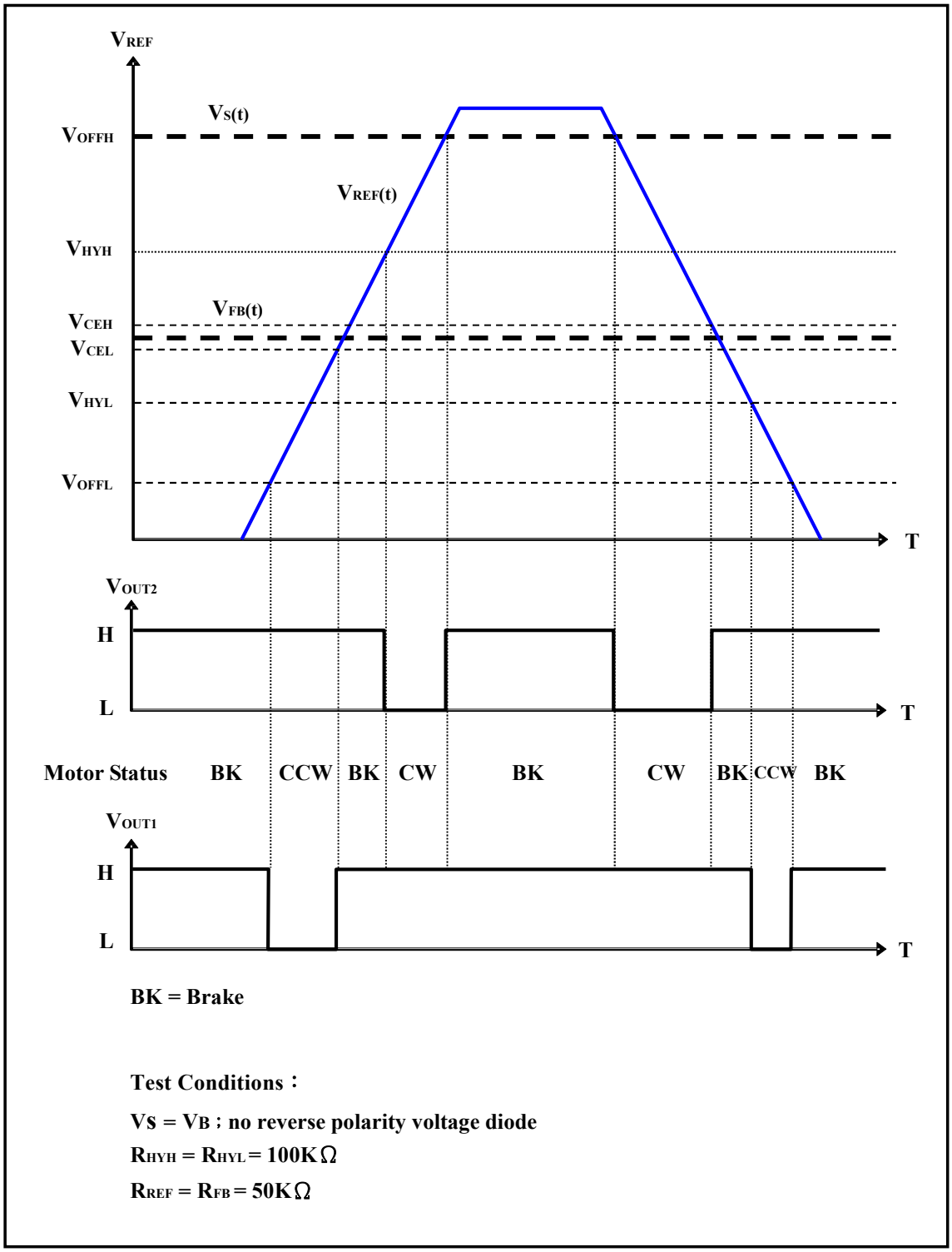
DB = Deadband

H = High

L = Low

W = Window

TIMING AND PHASE-LAG



BK = Brake

Test Conditions：

VS = VB；no reverse polarity voltage diode

RHYH = RHYL = 100KΩ

RREF = RFB = 50KΩ

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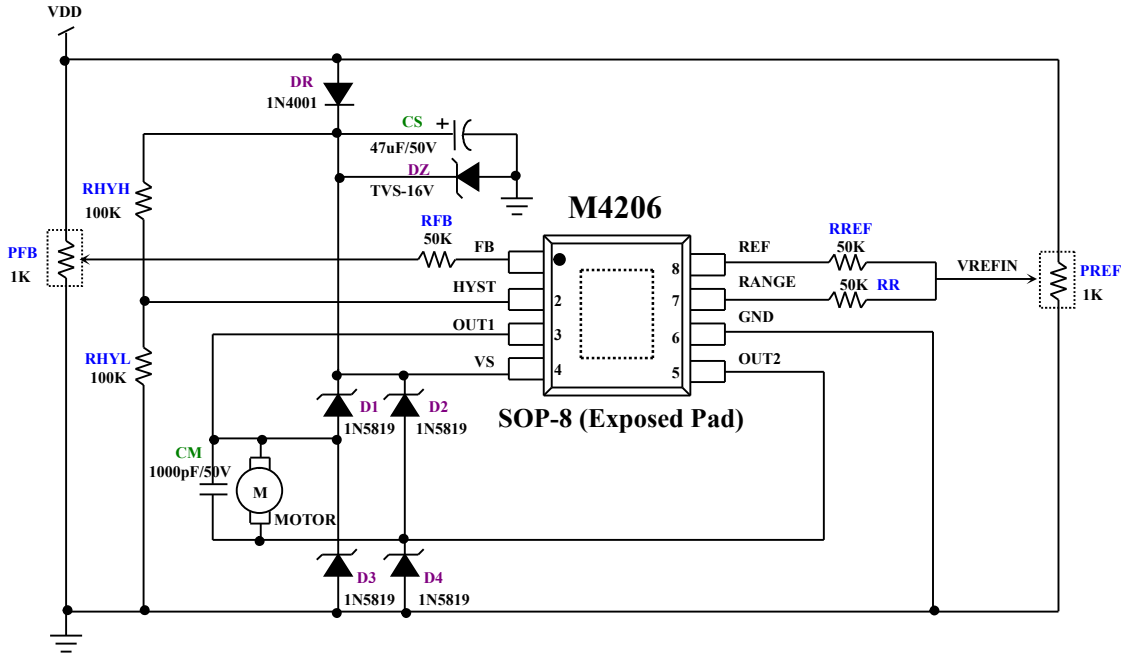
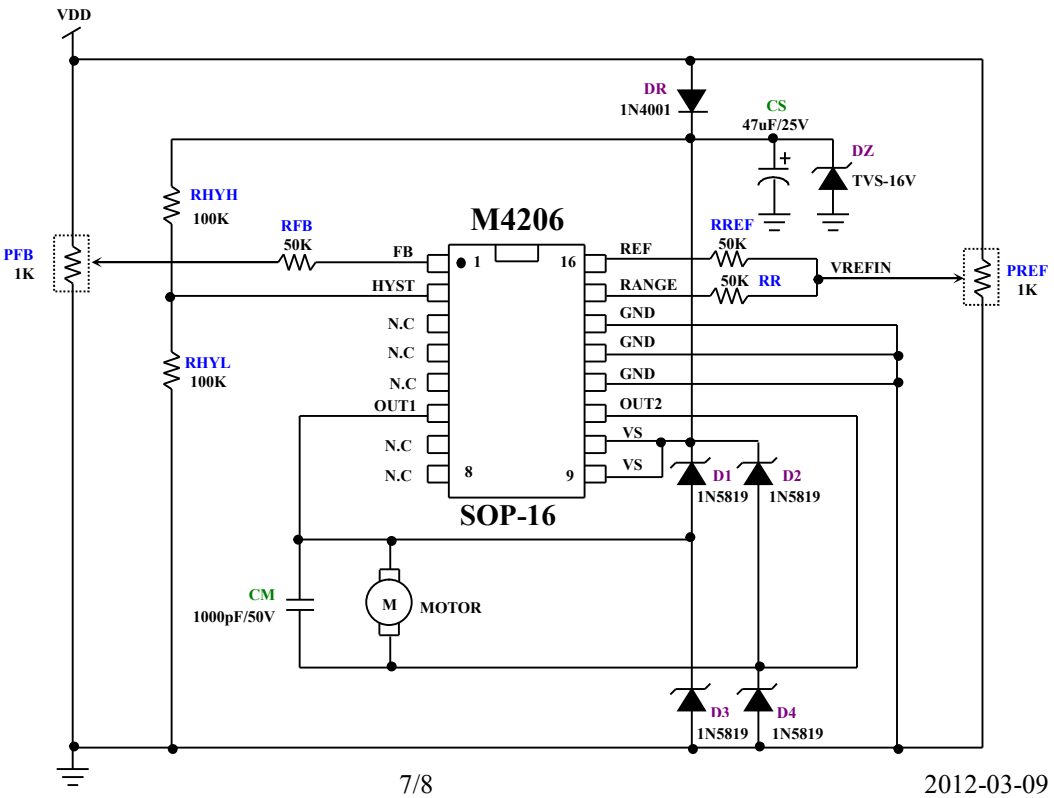
APPLICATIONS CIRCUIT

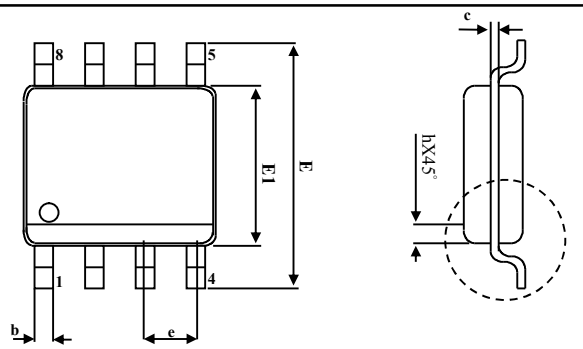


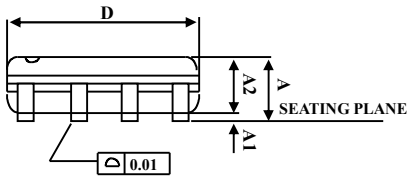
Note：

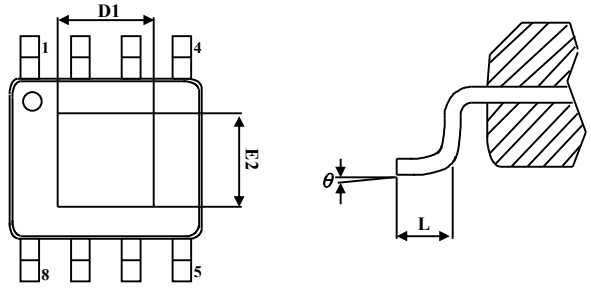
1. OUT1 (PIN3) and OUT2 (PIN5) should be connected Schottky Diodes (1N5819/40V） to VS (PIN4) and GND (PIN6).
2. Two pads of the motor on the PCB, should be linked with an 1000pF/50V (CM) electric capacity, it is the better to be and the more close to the motor.
3. Among two pins VS (PIN4) and GND (PIN6) of IC, should use the electric capacity of one 20uF~50uF/50V (CS) to link, it is the better to be and the more close to IC.
4. All application components should be normally working over 105℃ (ambient temperature).



PACKAGE OUTLINE







THERMAL VARIATIONS ONLY

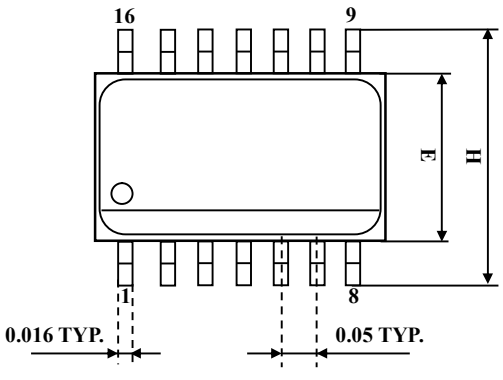
SYMBOLS	MIN	MAX
A	—	1.70
A1	0.00	0.15
A2	1.25	—
b	0.31	0.51
c	0.10	0.25
D	4.90 BSC.	
E	6.00 BSC.	
E1	3.90 BSC.	
e	1.27 BSC.	
L	0.40	1.27
h	0.25	0.50
θ	0°	8°

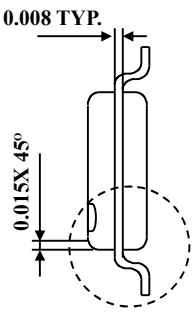
THERMALLY ENHANCED DIMENSIONS

PAD SIZE	E2		D1	
A	MIN	MAX	MIN	MAX
A1	1.94	2.29	1.94	2.29
A2	2.05	2.41	2.81	3.30
b	1.78	2.44	2.90	3.56

Unit：MM

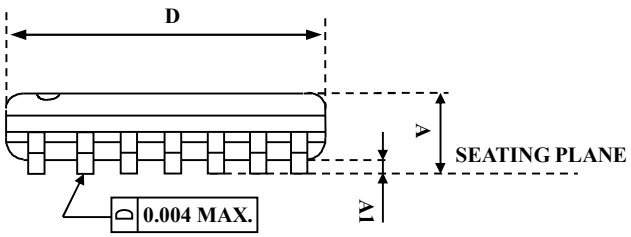
SOP-EP 8L

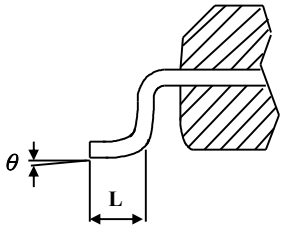




SYMBOLS	MIN	MAX
A	0.053	0.069
A1	0.004	0.010
D	0.386	0.394
E	0.150	0.157
H	0.228	0.244
L	0.016	0.050
θ	0	8

Unit：INCH





SOP-16
(150 mil)