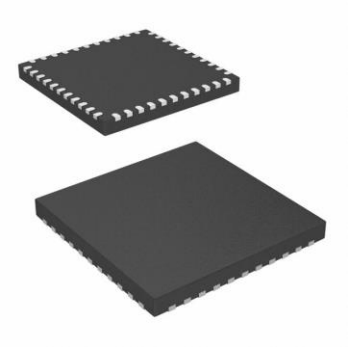
Lens Driver IC for Camcorder and Surveillance Camera(Built-in Iris Control)

PRODUCT DESCRIPTION

MS41908M is a lens driver chip for camcorder and surveillance camera.

The chip incorporates iris control. It can enable extra-low noise microstep drive by voltage driving way and torque ripple correction technology.



QFN44

FEATURES

- Voltage Driving Way,
  256 Microstep Drive Circuit (Two Channels)
- Built-in Iris Control Circuit
- Four-line Serial Bus Communication Control Motor
- Built-in Open-drain Dual Systems for LED Drive

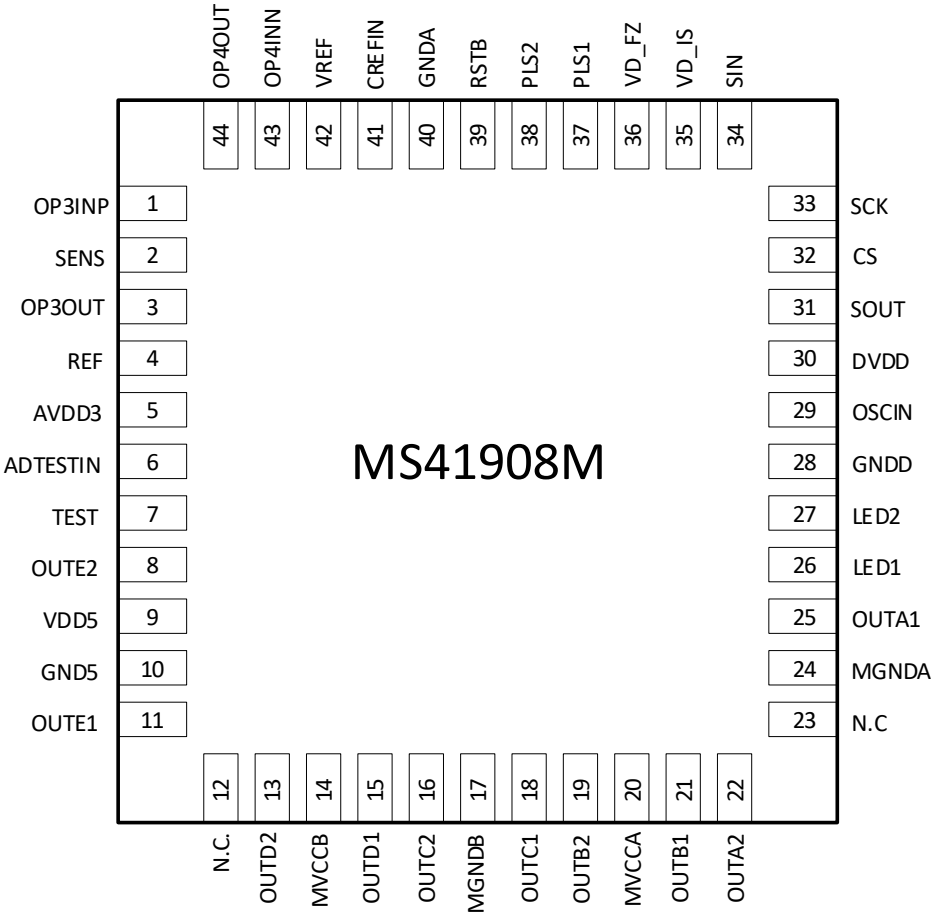
APPLICATIONS

- Camcorder
- Surveillance Camera

PRODUCT SPECIFICATION

Part Number	Package	Marking
MS41908M	QFN44	MS41908M

PIN CONFIGURATION

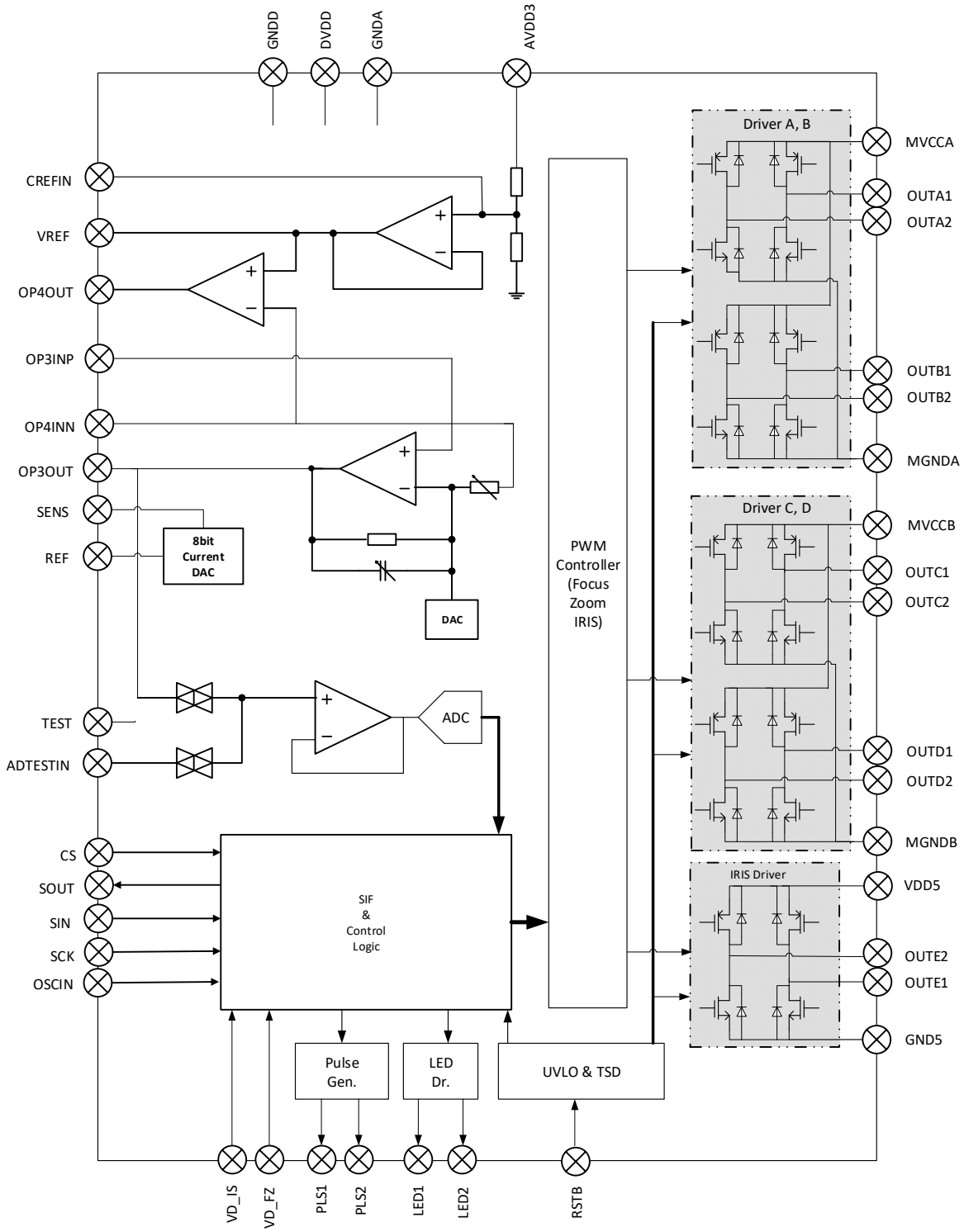


PIN DESCRIPTION

Pin	Name	Type	Description
1	OP3INP	I	Hall Signal Amplifier Positive Input
2	SENS	O	Hall Current Bias Output
3	OP3OUT	O	Hall Signal Amplifier Output
4	REF	-	Hall Current Bias Setting Impedance Connection Terminal
5	AVDD3	P	3V Analog Power Supply
6	ADTESTIN	I	ADC Test Input
7	TEST	I	Test Mode Input
8	OUTE2	O	Motor Output E2
9	VDD5	P	Iris Control Power Supply
10	GND5	-	Iris Control GND
11	OUTE1	O	Motor Output E1
12	N.C.	-	Not Connection
13	OUTD2	O	Motor Output D2
14	MVCCB	P	Motor Power Supply B
15	OUTD1	O	Motor Output D1
16	OUTC2	O	Motor Output C2
17	MGNDB	-	Motor GND B
18	OUTC1	O	Motor Output C1
19	OUTB2	O	Motor Output B2
20	MVCCA	P	Motor Power Supply A
21	OUTB1	O	Motor Output B1
22	OUTA2	O	Motor Output A2
23	N.C.	-	Not Connection
24	MGNDA	-	Motor GND A
25	OUTA1	O	Motor Output A1
26	LED1	O	Open-drain 1 for LED Drive
27	LED2	O	Open-drain 2 for LED Drive
28	GNDD	-	Digital GND

Pin	Name	Type	Description
29	OSCIN	I	OSCIN Input
30	DVDD	P	3V Digital Power Supply
31	SOUT	O	Serial Data Output
32	CS	I	Chip Selection Signal Input
33	SCK	I	Serial Clock Input
34	SIN	I	Serial Data Input
35	VD_IS	I	Iris Control Image Synchronization Signal Input
36	VD_FZ	I	Adjust Focal Length and Magnification for Image Synchronization Signal Input
37	PLS1	O	Pulse 1 Output
38	PLS2	O	Pulse 2 Output
39	RSTB	I	Signal Input Initialization
40	GNDA	-	3V Analog GND
41	CREFIN	-	(AVDD3)/2 Voltage Output Connection Capacitor Terminal
42	VREF	O	Hall Sensor Output with Reference Voltage
43	OP4INN	I	Amplifier Reverse Input Biased at the Intermediate Point
44	OP4OUT	O	Amplifier Output Biased at the Intermediate Point

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Absolute Maximum Ratings

Note: Under no circumstances should the maximum ratings be exceeded in the application.

Parameter	Symbol	Rating	Unit
Power Supply for Control Section[1]	AVDD3	-0.3 ~ +4.0	V
	DVDD	-0.3 ~ +4.0	
Power Supply for Motor Control 1 [1]	MVCCx	-0.3 ~ +6.0	V
Power Supply for Motor Control 2 [1]	VDD5	-0.3 ~ +6.0	V
Tolerance Loss Value[2]	P_D	141.1	mW
Operating Temperature[3]	Topr	-40 ~ +100	°C
Storage Temperature[3]	Tstg	-55 ~ +125	°C
Motor Drive 1(Focus, Magnification) H-bridge Drive Current	$I_{M1(CD)}$	± 0.25	A/ch
Motor Drive(Iris) H-bridge Drive Current	$I_{M2(CD)}$	± 0.15	A/ch
Instantaneous H-bridge Drive Current	$I_{M(pluse)}$	± 0.4	A/ch
Digital Input Voltage[4]	Vin	-0.3 ~ (DVDD + 0.3)	V
ESD	HBM	± 3k	V

Note: 1. The absolute maximum ratings can be applied within the tolerance range.

2. Tolerance loss value refers to the value of independent package at Ta = 85°C. When in practical use, it is expected to carry out the heat dissipation design which does not exceed the tolerance loss value on the base of technical data and PD - Ta characteristics diagram according to the power supply, load, operating temperature.

3. Except for the tolerance loss value, operating temperature and storage temperature, all ratings are for Ta = 25°C.

4. (DVDD + 0.3) voltage should not exceed 4.0V.

Operating Supply Voltage Range

Parameter	Symbol	Range			Unit
		Min	Typ	Max	
Supply Voltage Range	AVDD3	2.7	3.1	3.6	V
	DVDD	2.7	3.1	3.6	
	MVCCx	3.0	4.8	5.5	
	VDD5	3.0	4.8	5.5	

Terminal Allowable Current and Voltage Range

Note: 1. Terminal allowable current and voltage range, which is not allowed to exceed this electrical parameter range under any circumstances.

2. Rated Voltage value referS to the voltage applied to GND terminals. GND refers to the voltage of GNDA, GNDD, MGNDA and MGNDB. In addition, GND = GNDA = GNDD = GND5 = MGNDA = MGNDB.

3. 3V power supply refers to the voltage of AVDD and DVDD. In addition, AVDD3 = DVDD.

4. Voltage and current input from outside are strictly prohibited except for the terminals described below.

5. For current, "+" indicates the current flowing to IC, "-" indicates the current flowing from IC.

Pin	Port Name	Range	Unit
1	OP3INP	-0.3 ~ (AVDD3 + 0.3)	V
6	ADTESTIN	-0.3 ~ (AVDD3 + 0.3)	V
7	TEST	-0.3 ~ (DVDD + 0.3)	V
29	OSCIN	-0.3 ~ (DVDD + 0.3)	V
32	CS	-0.3 ~ (DVDD + 0.3)	V
33	SCK	-0.3 ~ (DVDD + 0.3)	V
34	SIN	-0.3 ~ (DVDD + 0.3)	V
35	VD_IS	-0.3 ~ (DVDD + 0.3)	V
36	VD_FZ	-0.3 ~ (DVDD + 0.3)	V
39	RSTB	-0.3 ~ (DVDD + 0.3)	V
43	OP4INN	-0.3 ~ (AVDD3 + 0.3)	V
8	OUTE2	± 0.15	A
11	OUTE1	± 0.15	A
13	OUTD2	± 0.25	A
15	OUTD1	± 0.25	A
16	OUTC2	± 0.25	A
18	OUTC1	± 0.25	A
19	OUTB2	± 0.25	A
21	OUTB1	± 0.25	A
22	OUTA2	± 0.25	A
25	OUTA1	± 0.25	A
26	LED1	30	mA
27	LED2	30	mA

Note: (AVDD3 + 0.3) voltage should not exceed 4.0 V. And (DVDD + 0.3) voltage should not exceed 4.0 V.

ELECTRICAL CHARACTERISTICS

VDD5 = MVCCx = 4.8 V, DVDD = AVDD3 = 3.1 V. Unless otherwise noted, Ta = 25°C±2°C.

Current Circuit, Common Circuit

Parameter	Symbol	Condition	Min	Typ	Max	Unit
MVCC Supply Current on Reset	$I_{Omdisable}$	No Load, No 27MHz Input		0	3	μA
MVCC Supply Current on Enable	$I_{menable}$	Output Open Circuit		0.5	1.5	mA
3V Supply Current on Reset	$Icc3_{reset}$	No 27MHz Input		0	10	μA
3V Supply Current on Enable	$Icc3_{enable}$	Output Open Circuit		3.6	20	mA
VDD5 Supply Current on Reset	$Icc5_{reset}$	No 27MHz Input		0	3	μA
VDD5 Supply Current on Enable	$Icc5_{enable}$	Output Open Circuit		0.3	1	mA
Supply Current on Standby	$Icc_{standby}$	RSTB = High, Output Open Circuit, 27MHz Input, Total Current		4	10	mA
Supply Current When FZ = Enable, Iris = Power Save	ICC_{ps}	RSTB = High, Output Open Circuit, 27MHz Input, FZ = Enable, Total Current		5	12	mA

Digital Input/Output

Parameter	Symbol	Condition	Min	Typ	Max	Unit
High-level Input	$V_{in(H)}$	RSTB	0.54×DVDD		DVDD+0.3	V
Low-level Input	$V_{in(L)}$	RSTB	-0.3		0.2×DVDD	V
SOUT High-level Output	$V_{out(H)}$: SDATA	[SOUT] 1mA Current Source	DVDD-0.5			V
SOUT Low-level Output	$V_{out(L)}$: SDATA	[SOUT] 1mA Current Sink			0.5	V
PLS1~2 High-level Output	$V_{out(H)}$: MUX		0.9×DVDD			V
PLS1~2 Low-level Output	$V_{out(L)}$: MUX				0.1×DVDD	V
Input Pull-down Impedance	$R_{pullret}$	RSTB	50	100	200	kΩ

Motor Drive Section 1 (Focal Length, Magnification)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Upper-side ON Resistance	R_{onFZHS}	IM =200mA		0.8		Ω
Lower-side ON Resistance	R_{onFZLS}	IM =200mA		0.7		Ω
H-bridge Leakage Current	I_{leakFZ}				0.8	μA

Motor Drive Section (Iris)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Upper-side ON Resistance	R_{onISHS}	IM = 200mA		1.75		Ω
Lower-side ON Resistance	R_{onISLS}	IM = 200mA		1		Ω
H-bridge Leakage Current	I_{leakFZ}				0.8	μA

LED Drive

Parameter	Symbol	Condition	Min	Typ	Max	Unit
LED1 Output ON resistance	R_{onLED1}	IM = 20mA, 5V Cell		2		Ω
LED2 Output ON resistance	R_{onLED2}	IM = 20mA, 5V Cell		2.6		Ω
Output Leakage Current	$I_{leakLED}$				0.8	μA

OPAMP3 (HALL Sensor Output Amplifier)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Input Voltage Range	V_{IN}		½ AVDD3-0.5	½ AVDD3	½ AVDD3+0.5	V
Input Offset Voltage	V_{OF}		-15		+15	mV
Output Voltage (Low)	V_{OL}	ILOAD = - 100 μA		0.1	0.2	V
Output Voltage (High)	V_{OH}	ILOAD = 100 μA	AVDD3-0.2	AVDD3-0.15		V
Gain	V_{OG}	Gain Set Value: 0h	20.5	21.8	22.8	V/V

OPAMP4 (Amplifier for Eliminating HALL Sensor Common-mode Voltage)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Input Voltage Range	VIN		½ AVDD3-0.1		½ AVDD3+0.1	V
Input Offset Voltage	VOF		-10		+10	mV
Output Voltage (Low)	VOL	ILOAD = - 10μA		0.1	0.2	V
Output Voltage (High)	VOH	ILOAD = 3 mA	AVDD3-0.5	AVDD3-0.2		V

Reference Voltage Output Section

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Output Voltage 1	VREF	ILOAD = 0 A, CVREF = 100pF	½ AVDD3-0.1	½ AVDD3	½ AVDD3+0.1	V
Output Voltage 2	VREFL	ILOAD = ±100μA, CVREF = 100 pF	½ AVDD3-0.1	½ AVDD3	½ AVDD3+0.1	V

Hall Bias Control Section (SENS Terminal Output)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Minimum Output Current	IBL	REF = 10kΩ, SENS = 0.7V Set Value: 00h	0	0	0.1	mA
Output Current Accuracy 1	IB40H	REF = 10kΩ, SENS = 0.7V Set Value: 40h	0.9	0.99	1.1	mA
Output Current Accuracy 2	IBBFH	REF = 10kΩ, SENS = 0.7V Set Value: BEh	2.8	2.95	3.1	mA

Digital Input/Output

Parameter	Symbol	Condition	Min	Typ	Max	Unit
High Input Threshold Voltage	$V_{in(H)}$	SCK,SIN,CS,OSCIN, VD_IS,VD_FZ,TEST		1.36		V
Low Input Threshold Voltage	$V_{in(L)}$	SCK,SIN,CS,OSCIN, VD_IS,VD_FZ,TEST		1.02		V
RSTB Signal Pulse	T_{rst}		100			μs
Input Maximum Hysteresis Error	V_{hysin}	SCK,SIN,CS,OSCIN, VD_IS,VD_FZ,TEST		0.34		V
Image Synchronization Signal Width	VD_w		80			μs
Waiting Signal 1 of CS Signal	$T_{(VD-CS)}$		400			ns
Waiting Signal 2 of CS Signal	$T_{(CS-DT1)}$		5			μs

Pulse Generating Circuit

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Wait Time for Pulse 1 to Arrive	PL1wait	OSCIN = 27MHz		20.1		μs
Pulse 1 Width	PL1width	OSCIN = 27MHz		1.2		μs
Wait Time for Pulse 2 to Arrive	PL2wait	OSCIN = 27MHz		20.1		μs

Iris Control

Parameter	Symbol	Condition	Min	Typ	Max	Unit
AD Referenced Frequency	$IRIS_{Sample}$	OSCIN = 27MHz		500		kHz

Overheat Protection

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Overheat Protection Operating Temperature	Ttsd			145		°C
Maximum Hysteresis Error of Overheat Protection	ΔTtsd			35		°C

Power Supply Voltage Monitoring Circuit

Parameter	Symbol	Condition	Min	Typ	Max	Unit
3.3V Reset	Vrston			2.48		V
3.3V Reset Maximum Hysteresis Error	Vrsthys			0.2		V
MVCCx Reset	VrstFZon			2.42		V
MVCCx Reset Maximum Hysteresis Error	VrstFZhys			0.21		V
VDD5 Reset	VrstlSon			2.42		V
VDD5 Reset Maximum Hysteresis Error	VrstlShys			0.21		V

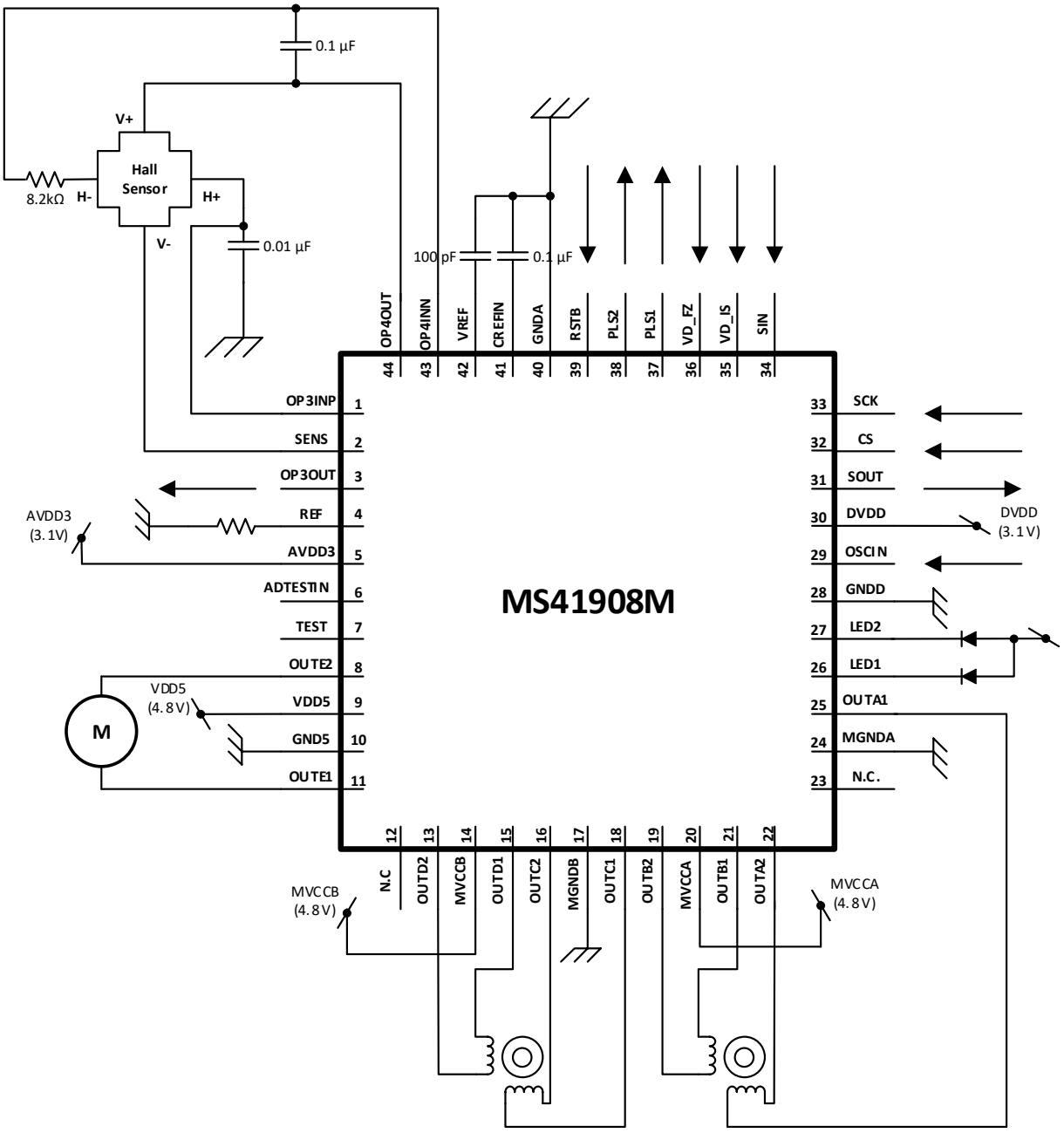
8-bit DAC for Hall Offset Adjustment

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Adjustment Range (High)	DAOTHof			AVDD3		V
Adjustment Range (Low)	DAOTLof			0		V

10-bit ADC

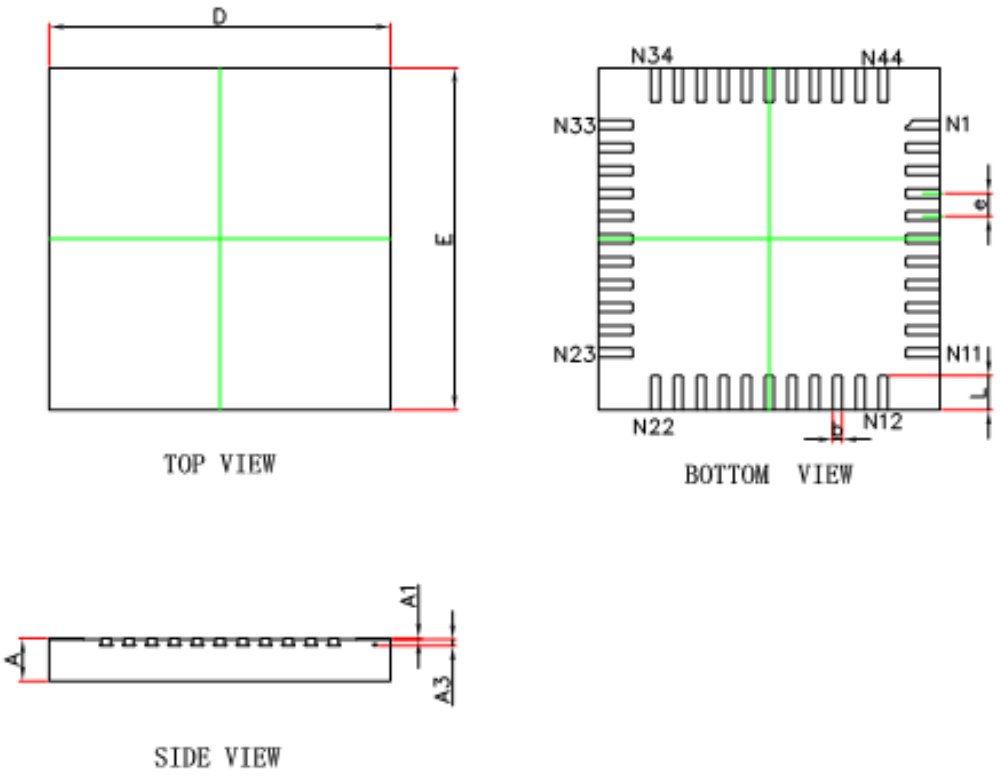
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Input Range (High)	$V_{in(H)}$				AVDD3-0.2	V
Input Range (Low)	$V_{in(L)}$		0.2			V
Differential Linearity Error	DNL_{10A}			1.0		LSB
Integral Linearity Error	INL_{10A}			2.0		LSB

TYPICAL APPLICATION CIRCUIT DIAGRAM



PACKAGE OUTLINE DIMENSIONS

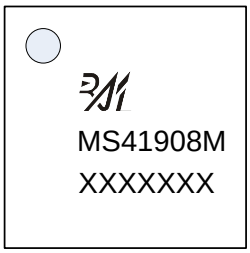
QFN44(0606X0.75-0.4)



Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	0.700	0.800	0.028	0.031
A1	-0.004	0.046	0.000	0.002
A3	0.110REF		0.004REF	
D	5.900	6.100	0.232	0.240
E	5.900	6.100	0.232	0.240
D1	-	-	-	-
E1	-	-	-	-
b	0.110	0.210	0.004	0.008
e	0.400TYP		0.016TYP	
L	0.524	0.676	0.021	0.027

MARKING and PACKAGING SPECIFICATIONS

1. Marking Drawing Description



Product Name: MS41908M

Product Code: XXXXXXX

2. Marking Drawing Demand

Laser printing, contents in the middle, font type Arial.

3. Packaging Specification

Device	Package	Piece/Reel	Reel/Box	Piece /Box	Box/Carton	Piece/Carton
MS41908M	QFN44	4000	1	4000	8	32000

STATEMENT

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MOS CIRCUIT OPERATION PRECAUTIONS

Static electricity can be generated in many places. The following precautions can be taken to effectively prevent the damage of MOS circuit caused by electrostatic discharge:

1. The operator shall ground through the anti-static wristband.
2. The equipment shell must be grounded.
3. The tools used in the assembly process must be grounded.
4. Must use conductor packaging or anti-static materials packaging or transportation.

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