11-MD114

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Motor Driver for Mobile Phone

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11-MD114

Motor Driver For Mobile Phone

General Specifications

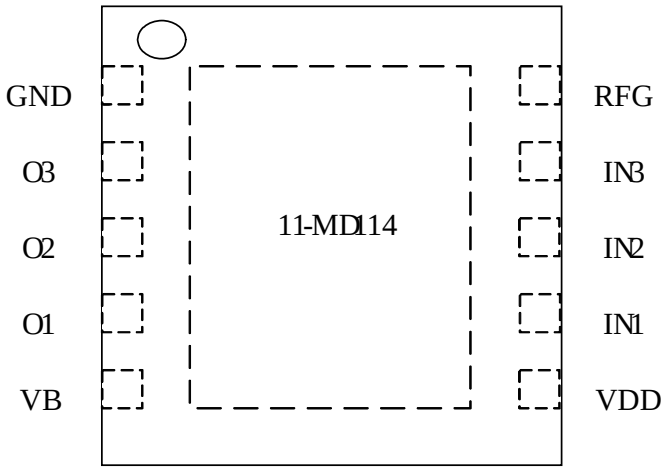
The 11-MD114 is a 1.5 channel with low current consumption, low saturation voltage type bi-directional motor driver IC. It contains 1.5 CH constant current control that is optimal for use in M-shutter and Iris. Its miniature package supports reduced -space mounting in camera mobile phone and other portable device.

Features and Benefits

- Low voltage operation
- Low saturation voltage
- Low input current
- 1.5 CH constant current control
- Thermal shutdown protection
- Flexibility power using
- Thin, highly reliable package : WLCSP(0.79*1.59*0.5), DFN-10(3*3*0.75)

Pin Assignment

Pin Assignment of DFN10

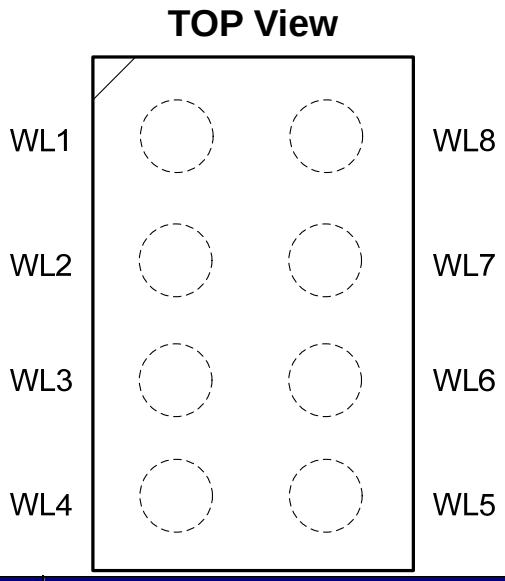


Pin Descriptions

Pin Assignment of DFN10

Pin NO.	Pin Name	Description
1	GND	Controller And Driver ground
2	O3	Motor output pin
3	O2	Motor output pin
4	O1	Motor output pin
5	VB	Power supply pin for motor driver
6	VDD	Power supply pin for controller.
7	IN1	Motor control input pin
8	IN2	Motor control input pin
9	IN3	Motor control input pin
10	RFG	Current sense resistor

*Pin Assignment of WLCSP (0.79*1.59*0.5mm)*



Pin NO.	Pin Name	Description
WL1	VDD	Power supply pin for motor driver and controller
WL2	O1	Motor output pin
WL3	O2	Motor output pin
WL4	O3	Motor output pin
WL5	VSS	Controller and Driver GND
WL6	IN3	Motor control input pin
WL7	IN2	Motor control input pin
WL8	IN1	Motor control input pin

Absolute Maximum Ratings *(Unless otherwise noted, T_A= 25℃)*

Characteristic	Symbol	Rating	Unit
Supply Voltage	V_{DD}	5.5	V
	V_B	5.5	V
Input Voltage	V_{IN}	V_{DD}+0.4	V
I_O Peak Current	I_{OPeak}	1	A
I_{ODC} Current	I_{ODC}	0.4	A
Power Dissipation	P_D	450	mW
Operating Temperature Range	T_{OPR}	-40 ~ 125	°C
Storage Temperature Range	T_{STG}	-65 ~ 150	°C

Electrical Characteristic

(Unless otherwise noted, T_A= 25℃ & V_{DD} = V_B = 3V)

DFN10						
Characteristic	Sym.	Condition	Limit			Unit
			Min.	Typ.	Max.	
Supply Voltage	V_{DD}		1.75	3	5.5	V
	V_B				5.5	V
Supply Current (I_{DD})	I_{STB1}	IN1=IN2=IN3=L		0.1	5	μA
	I_{STB2}	IN1=H, IN2=IN3=L		0.3	0.45	mA
	I_{ACT}	IN2,IN3≠L		0.4	0.6	mA
Reference Voltage						
Reference Voltage	V_{RFG}		0.19	0.2	0.21	V
IN1,IN2,IN3 Input Terminal (T_J = 25℃)						
Input Voltage “H”	V_{IH}	-	0.8*V_{DD}	-	V_{DD}+0.4	V
Input Voltage “L”	V_{IL}	-	-0.4	-	0.2*V_{DD}	V
Input Current “H”	I_{IH}	V_{IN} = V_{DD}	-	-	0.1	μA
Input Current “L”	I_{IL}	V_{IN} = 0 V	-	-	0.1	μA
Output Terminal (O1,O2,O3)						
Output Voltage (upper + lower)	V_{OUT}	I_{OUT} = 200 mA		0.3	0.45	V
Thermal Protection Circuit						
Protection Temperature	T_{TSD}	IN1=H, IN2, IN3≠L		160		℃

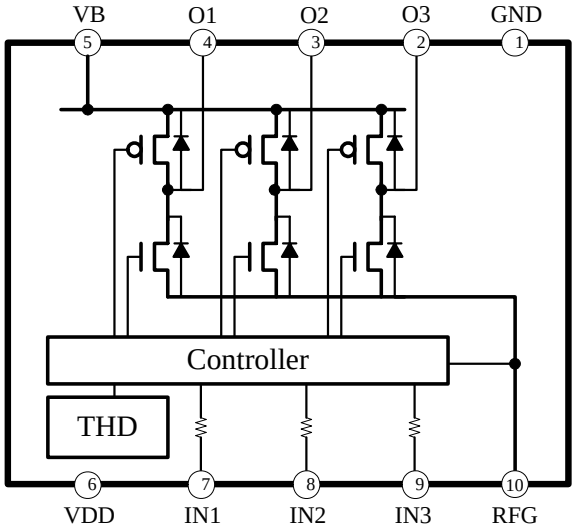
WLCSP						
Characteristic	Sym.	Condition	Limit			Unit
			Min.	Typ.	Max.	
Supply Voltage	V_{DD}		1.75	3	5.5	V
Supply Current (I_{DD})	I_{STB1}	IN1=IN2=IN3=L		0.1	5	μA
	I_{STB2}	IN1=H, IN2=IN3=L		0.3	0.45	mA
	I_{ACT}	IN2,IN3≠L		0.4	0.6	mA
Constant Output Current						
I_{OUT}	I_{OUT}	IN2,IN3≠L	190	200	210	mA
IN1,IN2,IN3 Input Terminal (T_J = 25℃)						
Input Voltage “H”	V_{IH}	-	0.52*V_{DD}	-	V_{DD}+0.4	V
Input Voltage “L”	V_{IL}	-	-0.4	-	0.2*V_{DD}	V
Input Current “H”	I_{IH}	V_{IN} = V_{DD}	-	-	0.1	μA
Input Current “L”	I_{IL}	V_{IN} = 0 V	-	-	0.1	μA
Output Terminal (O1,O2,O3)						
Voltage Drop (Upper + Lower+ Sense Resistor)	V_{OUT}	I_{OUT} = 200 mA		0.5	0.6	V
Thermal Protection Circuit						
Protection Temperature	T_{TSD}	IN1=H, IN2, IN3≠L		160		℃

Truth Table

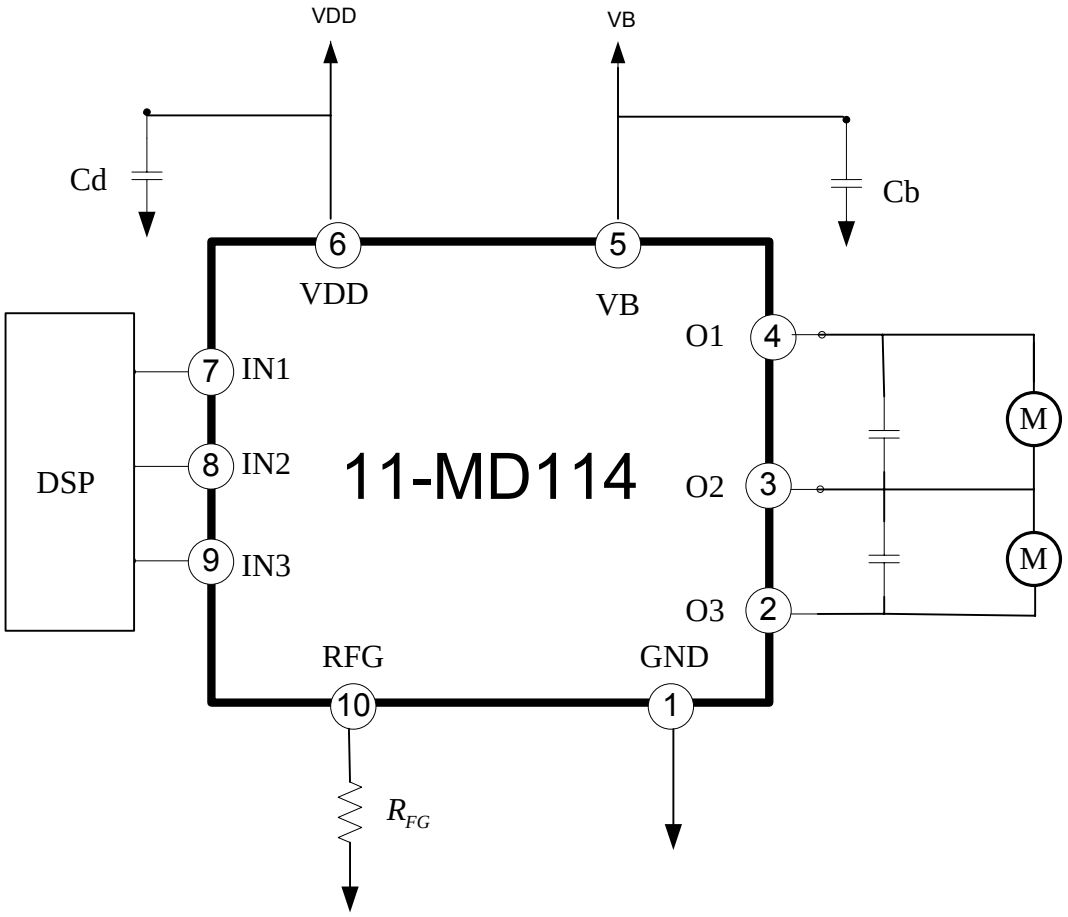
INPUT			OUPUT			MODE
IN1	IN2	IN3	O1	O2	O3	
L	L	L	-*	-	-	STANDBY1
L	L	H	L	H	-	O2→O1
L	H	L	H	L	-	O1→O2
L	H	H	H	H	-	O1,O2 Break
H	L	L	-	-	-	STANDBY2
H	L	H	-	L	H	O3→O2
H	H	L	-	H	L	O2→O3
H	H	H	-	H	H	O2,O3 Break

* : — : High Impedance

Function Block



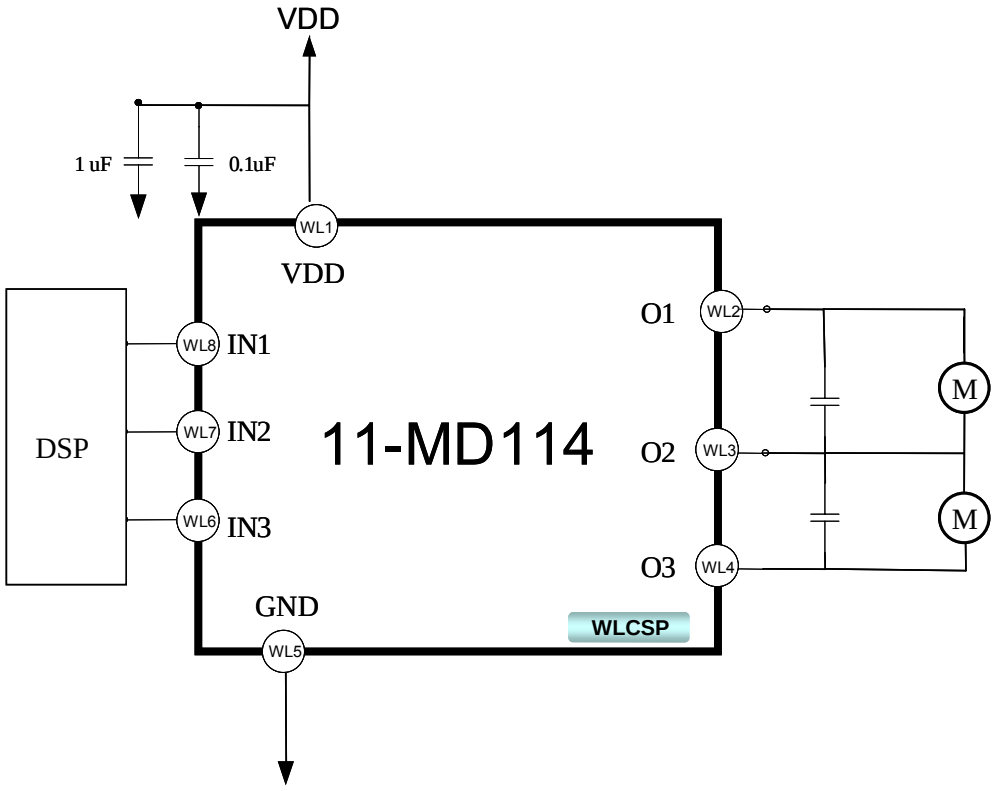
Application Circuit: (DFN10)



Note: 1. C_D and C_B are closed to IC.

2. Driver constant current $I = \dfrac{0.2}{R_{FG}(\Omega)}$ **(unit : A)**

Application Circuit: (WLCSP)



Note: R_{FG} (1ohm) is built inside.

Application Notes

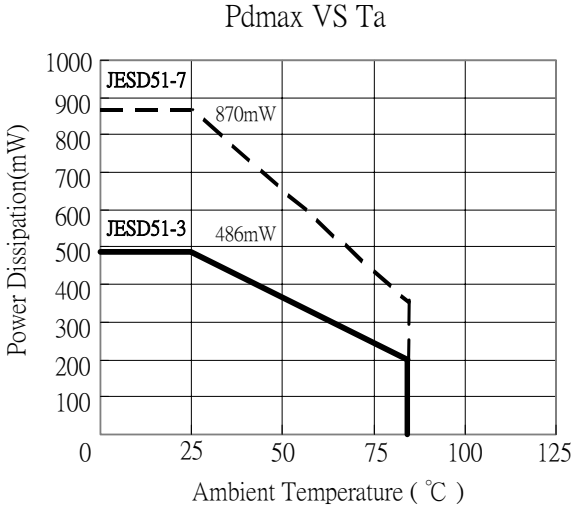
- The 11-MD114 is 1.5 CH constant current driver for use in M-shutter and Iris. The range of one supply voltage of 11-MD114, VDD is from 1.75V to 5.5V, and the other supply voltage of 11-MD114, VB, its maximum rating voltage can reach to 5.5V. The 11-MD114 input range is defined that logic “H” is from 0.8*VDD to VDD+0.4V and logic “L” is from –0.4V to 0.2*VDD. The input pins, IN1, IN2, IN3, are motor rotation selection pins.

- Normally VB should provide enough current for output loading, thus large value of capacitor such as is suggested for the terminal VB. Besides, 0.01uF~0.1uF of capacitors are also suggested between each output channel and output channel to ground.

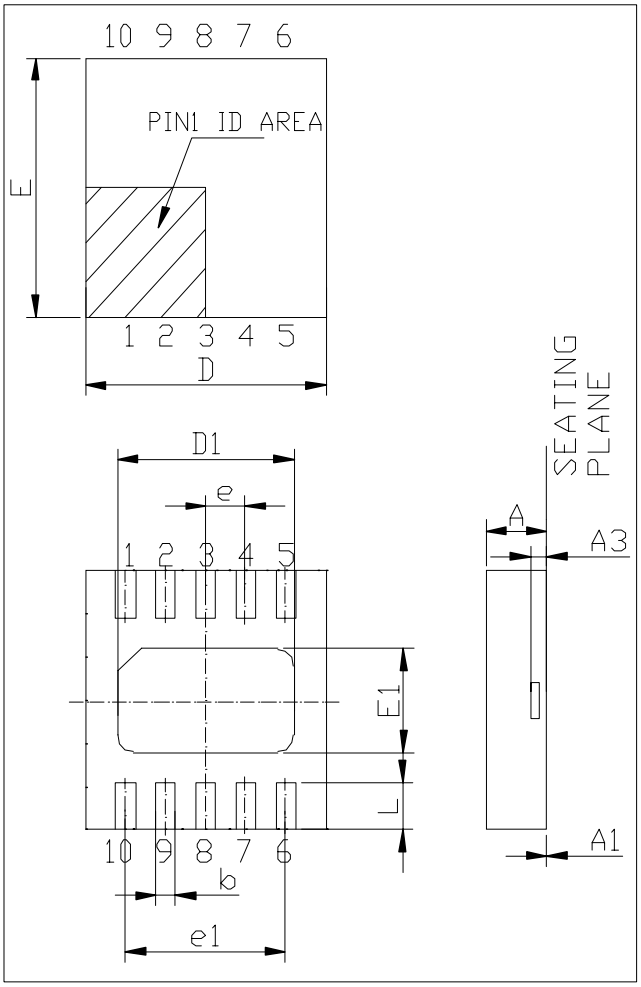
- The settling time from standby mode to output ready is about 10us. The main difference between STANDBY1 and STANDBY2 depends on voltage reference in the internal circuit is ready or not. In general, the rising time of constant current from the mode, STANDBY2, to the mode, O1 & O2 (or O2 & O3) should be faster than that of the mode, STANDBY1. However, the supply current I_{STB2} is larger than that of I_{STB1}, there is the tradeoff between the rising time and the amount of supply current.

- Constant current operation of 11-MD114 provides the current, which can be evaluated by the formula $I = \frac{0.2}{R_{FG}(\Omega)}\ (\mathrm{A})$. It is obviously that constant current depends on the loading resistance of the terminal, RFG. Therefore, how to reduce the effect of line resistance from the terminal, RFG, to GND, will decide the accuracy of constant current.

- The power dissipated by the IC varies widely with the supply voltage, the output current, and loading. It is important to ensure the application does not exceed the allowable power dissipation of the IC package. The recommended motor driver power dissipation versus temperature is depicted as follows:

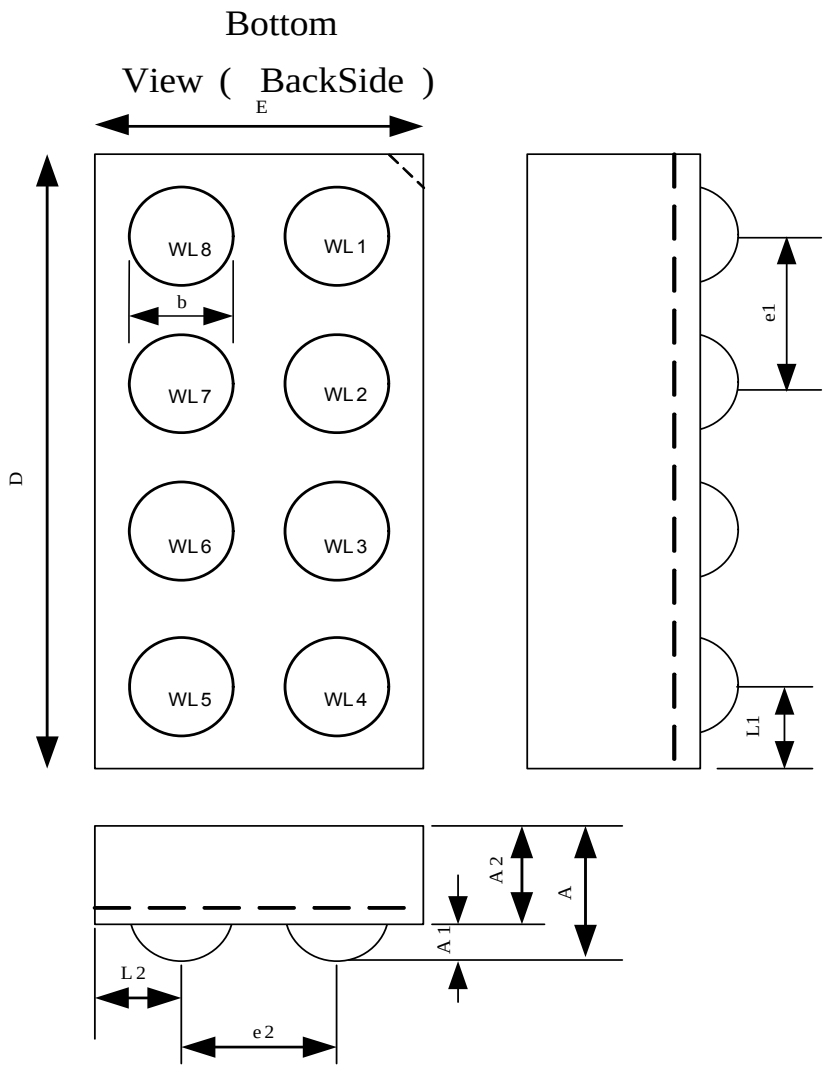


Package Specification
(DFN-10)



SYMBOL	DIMENSION (mm)			DIMENTION (mil)		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.70	0.75	0.80	28	30	32
A1	0.00	0.02	0.05	0	0.8	2
A3	0.203 REF			8 REF		
b	0.18	0.25	0.30	7	10	12
D	2.90	3.00	3.10	114	118	122
D1	2.10	2.20	2.30	83	87	91
E	2.90	3.00	3.10	114	118	122
E1	1.10	1.20	1.30	86	87	91
L	0.45	0.55	0.65	18	22	26
e	0.50 BASIC			20 BASIC		
e1	2.00 BASIC			80 BASIC		

Package Specification
(WLCSP)



SYMBOL	DIMENSION (mm)		
	MIN.	NOM.	MAX.
A	0.445	**0.50**	0.555
A1	0.17	0.20	0.23
A2	0.275	0.30	0.325
b	0.24	0.26	0.28
D	1.54	**1.59**	1.64
E	0.74	**0.79**	0.84
e1		0.40	
e2		0.40	
L1	0.170	0.195	0.220
L2	0.170	0.195	0.220

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