Three Channels Power Motor Driver AM1229D

The AM1229D is a three-channel driver for DC motors and it integrates the Motor and Logic supply Pins. The AM1229D provides a high integrated motor-driver solution for Helicopters. The output driver block consists of two open-drain N-MOS; one H-bridge to drive motor winding and a built-in Low Dropout Linear Regulator (LDO).The built-in LDO output voltage can be used to the microcontroller (MCU), the gyroscopes (GYRO)…etc.

The AM1229D operates on a device power-supply voltage from 3.0 V to 6.5 V. CH_A can supply up to 0.8A of output continuous current and 2.0 A of output maximum current ; CH_B and CH_C can supply up to 3.0A of output continuous current and 4.0 A of output maximum current.

The AM1229D has internal shutdown function for Over-temperature protection (TSDp = 150 ° C) , Over-temperature protection recover (TSDr = 125 ° C) , Power reverse-connect protection to prevent the IC damage in any wrong using ,the CH_B/CH_C have the shutdown function for Over-current protection(I_{OCP} = 4.5 A) and the built-in LDO output voltage V_{LDO}=2.94 V。

Its package material is Pb-Free and Halogen-Free (Green) for the purpose of environmental protection and for the sustainable development of the Earth.

Applications

- Helicopters

Features

1) Surface mount package (DFN-3X3)
2) Built-in steady voltage output
3) Lower supply current
4) Lower VCC standby current
5) Lower MOSFETs On-resistance
6) Over-temperature protection
7) Over-temperature protection recover
8) Over-current protection (CH_B&C)

Ordering Information

Orderable Part Number	Package	Marking
AM1229D	DFN-3X3	AM1229D

● Absolute Maximum Ratings (T_A=25℃)

Parameter	Symbol	Limits	Unit
Supply voltage	VCC	7.0	V
CH_A Output continuous current	Iocont	0.8	A
CH_A Output maximum current	Iomax	2.0	A
CH_B&CH_C Output continuous current	Iocont	3.0	A
CH_B&CH_C Output maximum current	Iomax	4.0	A
Operate temperature range	T_{opr}	-40～+125	℃
Storage temperature range	T_{stg}	-40～+150	℃

● Recommended operating conditions (T_A =25℃)

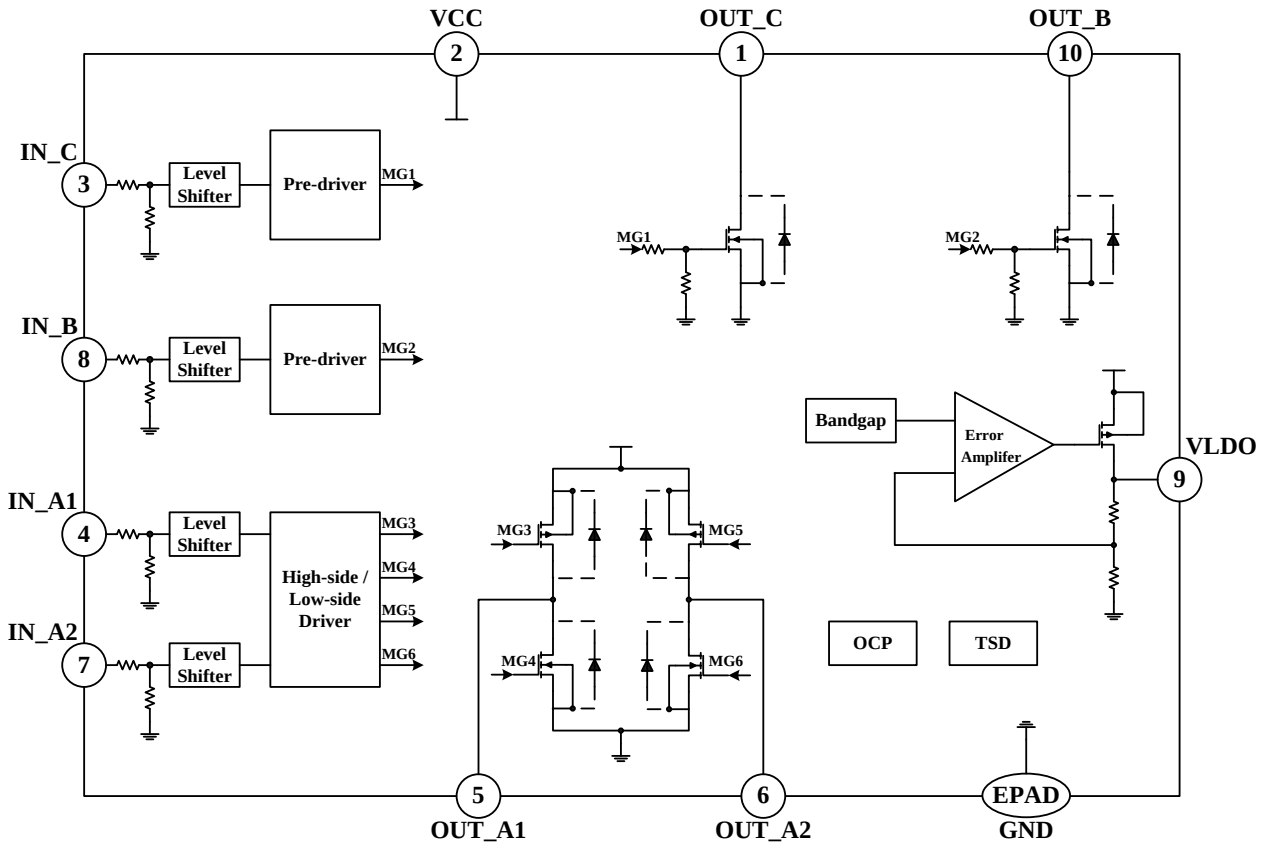
(Set the power supply voltage taking allowable dissipation into considering)

Parameter	Symbol	Min	Typ	Max	Unit
Operating supply voltage range	VCC	3.0		6.5	V
IN_AX and IN_B/C	V_{IN}	-0.3		Vcc+0.3	V
CH_A output current	I_{OUT}	0		0.8	A
CH_B/C output current	I_{OUT}	0		3.0	A
Externally applied PWM frequency	f_{PWM}	0.02		65	KHz

- **Electrical Characteristics (Unless otherwise specified, T_A = 25℃,VCC=5V)**

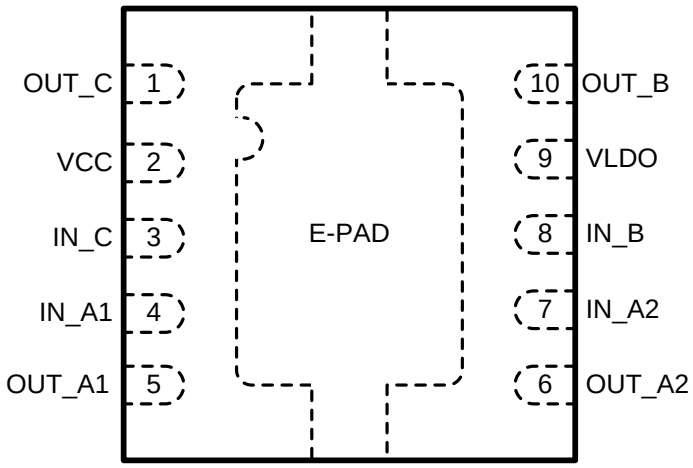
Parameter	Symbol	Limit			Unit	Conditions
		Min	Typ	Max		
Power Supplies						
VCC Supply current	I_{CC}		25		μA	Input signal IN_AX=H, IN_/B/C= L, No load on OUT_A/B/C & VLDO terminal
VCC Standby current	I_{STB}		5	10	μA	Input signal IN_AX/B/C=L, No load on OUT_A/B/C & VLDO terminal
PWM Inputs						
Input H level voltage	V_{PWMH}	2.5		V_{CC}	V	
Input L level voltage	V_{PWML}	0		0.7	V	
Input H level current	I_{PWMH}		30		μA	V_{CC} = 5 V , V_{IN} = 3 V
Input frequency	F_{PWM}	0.02		65	KHz	
Input pulldown resistance	R_{IPD}		100		KΩ	
Output						
CH_A on-resistance	$R_{ds(on)}$		0.72		Ω	I_O = 200mA Upper and Lower total
CH_B on-resistance	$R_{ds(on)}$		0.12		Ω	I_O = 600mA Lower total
CH_C on-resistance	$R_{ds(on)}$		0.12		Ω	I_O = 600mA Lower total
TSD Protections						
Thermal shutdown protection	TSDp		150		℃	
Thermal shutdown release	TSDr		125		℃	
LDO parameter						
LDO output voltage	V_{LDO}	2.85	2.94	3.03	V	I_{Load}= 35mA
Output Load transient	$\triangle V_{RL}$			25	mV	I_{Load}= 0~35mA
Output Line transient	$\triangle V_{VCC}$			50	mV	(V_{CC}=3.2v~6.5v),I_{Load}=35mA

Block Diagram



- **Pin configuration**

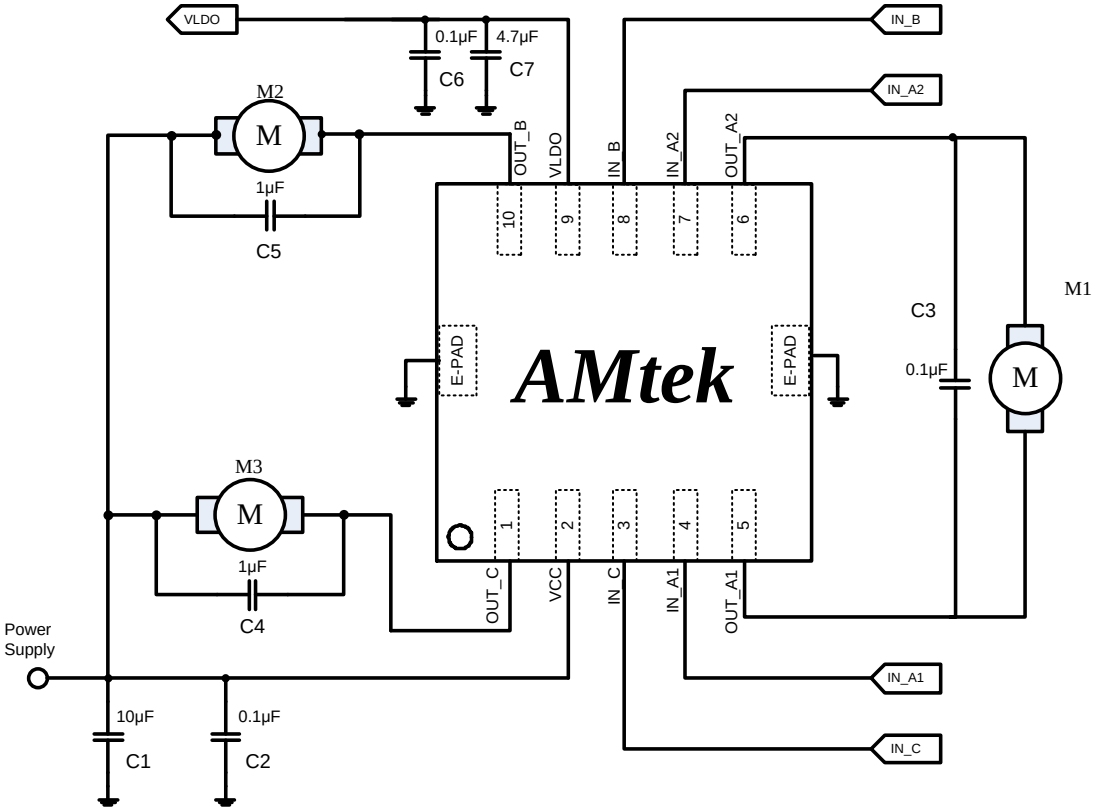
TOP VIEW



- **Pin Description**

PIN No	Pin Name	I/O	Description
1	OUT_C	O	CH_C Output terminal
2	VCC	-	Power input
3	IN_C	I	CH_C Input signal
4	IN_A1	I	CH_A Input positive signal
5	OUT_A1	O	CH_A Output positive terminal
6	OUT_A2	O	CH_A Output negative terminal
7	IN_A2	I	CH_A Input negative signal
8	IN_B	I	CH_B Input signal
9	VLDO	O	LDO Output terminal
10	OUT_B	O	CH_B Output terminal
11	E-PAD	-	Ground

Application



Circuit Descriptions

The functional description of capacitors on the application circuits:

I. C1, C2: V_{CC} input capacitor:

1) The capacitor can reduce the power spike from the motor, to avoid the IC being directly damaged by the peak voltage. It also can stabilize the Vcc voltage and decay its ripples.
2) The capacitor can offer motor the compensated power in motor start running.
3) The capacitor value depends on the value of the VCC and motor loading. In general, a 10μF capacitor is enough in low voltage power (VCC). If the large voltage power or a heavy loading motor is used, a larger capacitor should be chosen.
4) On the PCB configuration, the C1&C2 must be mounted as close as possible to VCC (PIN2).

II. C3, C4, C5: The across-motor capacitor:

1) The C3 capacitors can reduce the power spike of motor in start running. A 0.1μF capacitor is recommended.
2) The C4&C5 capacitors can reduce the power spike of motor in start running. A 1μF capacitor is recommended

III. C6, C7: The LDO output capacitor

1) The capacitor can reduce the voltage spike and It also can stabilize the VLDO voltage and decay its ripples.

- **Input Logic Description**

Function truth table of CH_A

IN_A1	IN_A2	OUT_A1	OUT_A2	Mode
L	L	L	L	Stop
L	H	L	H	Forward
H	L	H	L	Reverse
H	H	L	L	Stop/Brake

Function truth table of CH_B/CH_C

IN_B/IN_C	OUT_B/OUT_C	Mode
L	H	Open
H	L	Active

※Low standby current function when IN_A1 = IN_A2 = IN_B = IN_C = Low level

Operating Mode Descriptions

1) H-Bridge basic operation mode

a) Forward mode

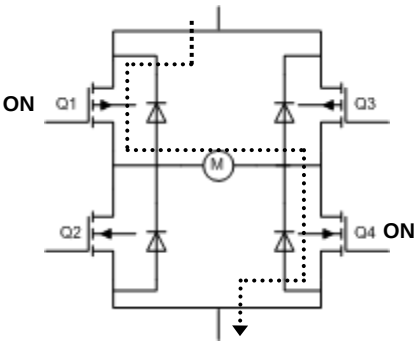
Definition：When IN_A1=H，IN_ A2=L，then OUT_A1=H，OUT_A2=L

b) Reverse mode

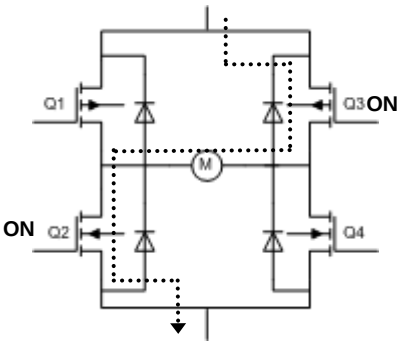
Definition：When IN_A1=L，IN_ A2=H，then OUT_A1=L，OUT_ A2=H

c) Stop/Break mode

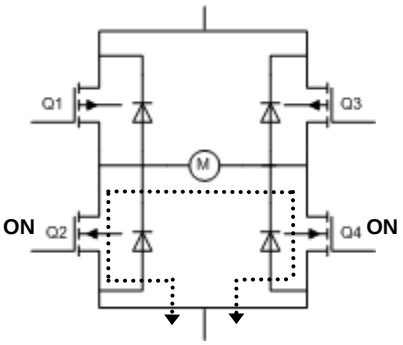
Definition：When IN_A1=IN_ A2=L or H，then OUT_A1=OUT_ A2=L



(1) Forward mode



(2) Reverse mode



(3) Stop/Break mode

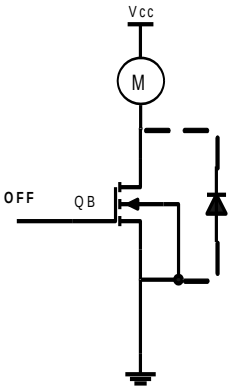
2) CH_B/C basic operation mode

a) Stop mode

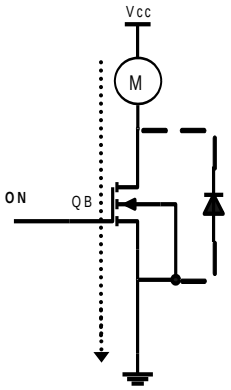
Definition : When IN_B/C = L，then OUT_B/C = H

b) Start mode

Definition : When IN_B/C = H，then OUT_B/C = L



(1)Stop mode



(2) Start mode

Protection Descriptions

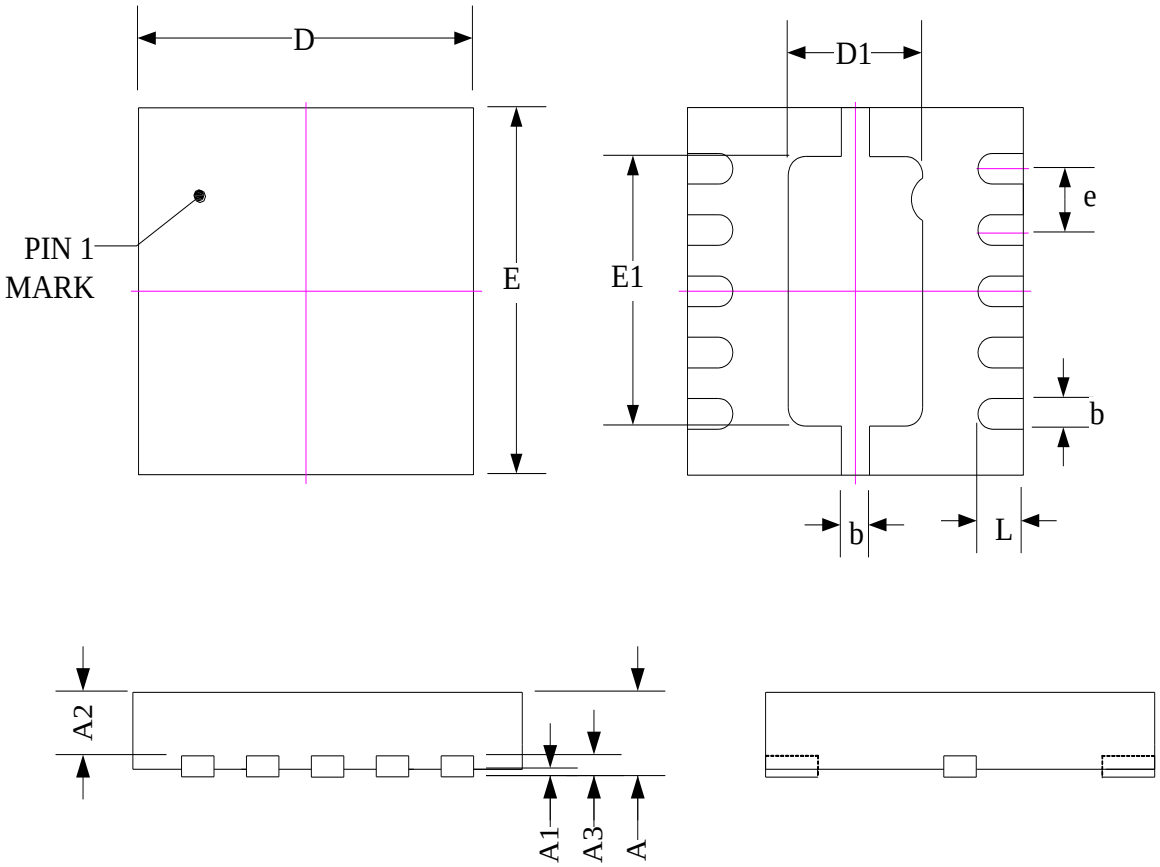
1) Over-temperature protection

If the IC junction temperature exceeds 150° C (Typ), the internal over-temperature protection circuits will be triggered and all the FETs in H-bridge are disabled to ensure the safety of customers' products. If it falls to 125° C(Typ), the IC resumes automatically.

2) Over-current protection (OCP)

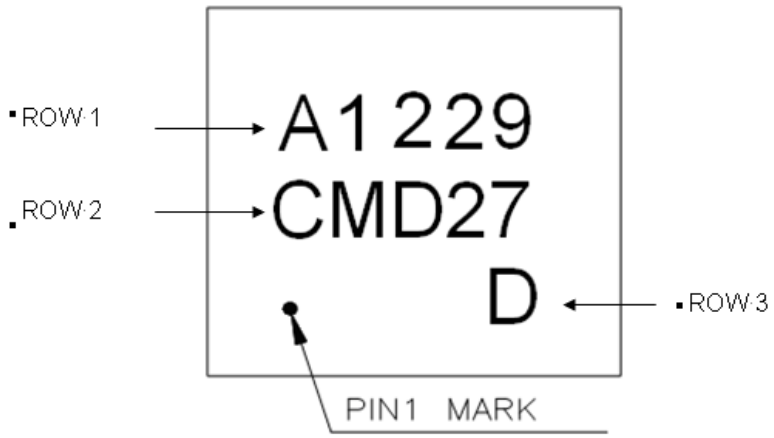
While the CH_B/C passes through a large current, 4.5A (Typ), the internal OCP circuits will be triggered and entry a protection mode of auto-recover to avoid damage in IC and EE system of device.

● **Packaging outline --- DFN-3X3** **Unit : mm**



SYMBOL	MILLIMETERS		INCHES	
	Min.	Max.	Min.	Max.
A	-	0.60	-	0.023
A1	-	0.05	-	0.002
A2	-	0.43	-	0.017
A3	0.15 REF		0.006 REF	
b	0.18	0.30	0.007	0.012
D/E	3.00 BSC		0.118 BSC	
D1	1.10	1.30	0.043	0.051
E1	2.10	2.30	0.083	0.091
L	0.30	0.50	0.012	0.020
e	0.5 BSC		0.020 BSC	

- **Marking Identification**

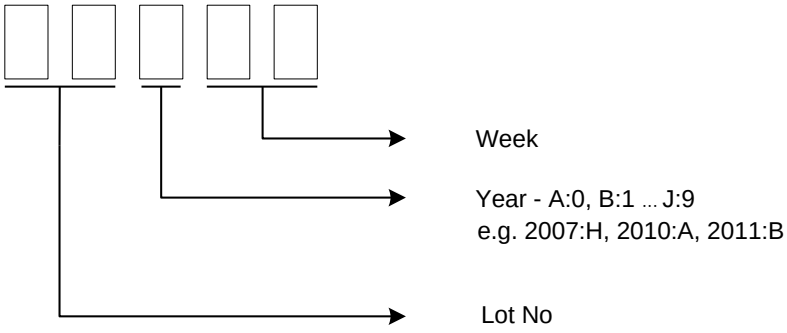


Row 1

A1229

Row 2

Date & Lot number



Row 3

D for DFN