

# KA7405D

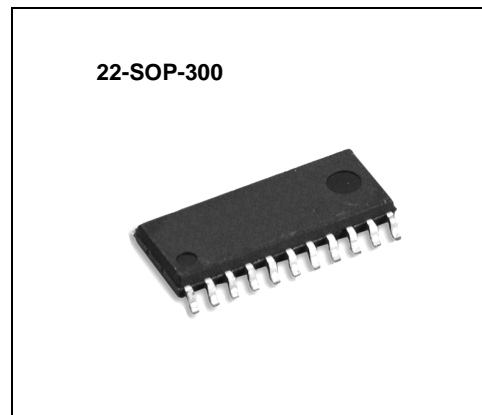
## 2-Channel DC Motor Drive IC

### Features

- Output current up to 1.5A (Each channel).
- 4-function modes (CW, CCW, stop and brake) are controlled by 2-logic circuits.
- Operating voltage range:  $V_{CC} = 2.5 \sim 6.0V$ .
- Built-in spike killer diode.
- Low saturation voltage.

### Description

The KA7405D is a monolithic integrated circuit, and suitable for the zoom and reel motor driver for camera, tape deck, any other consumer and industrial applications.



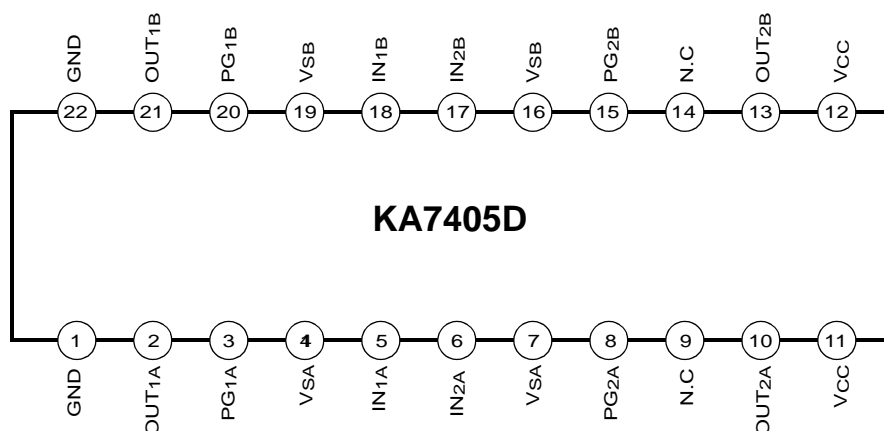
### Typical Applications

- Camera zoom and film motors
- General DC motor

### Ordering Information

| Device  | Package    | Operating Temp. |
|---------|------------|-----------------|
| KA7405D | 22-SOP-300 | -25°C to +75°C  |

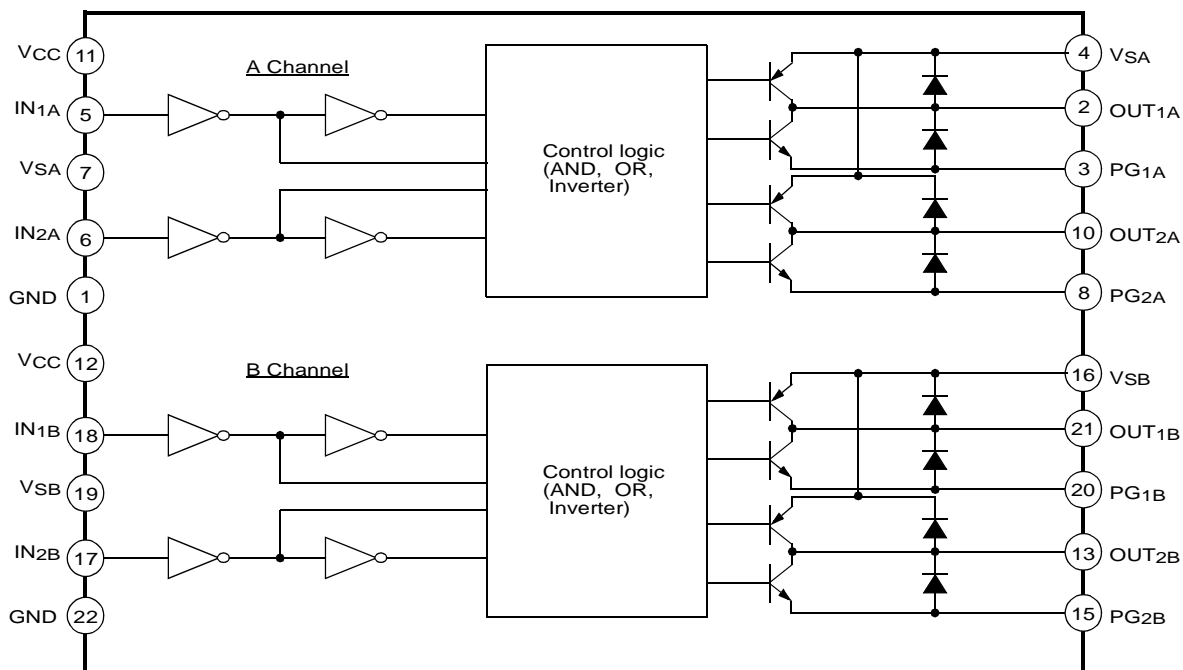
## Pin Assignments



## Pin Definitions

| Pin Number | Pin Name | I/O | Pin Function Description | Remark    |
|------------|----------|-----|--------------------------|-----------|
| 1          | GND      | -   | Signal ground            | -         |
| 2          | OUT1A    | O   | Output 1                 | Channel A |
| 3          | PG1A     | -   | Power ground 1           | Channel A |
| 4          | VSA      | -   | Output supply voltage    | Channel A |
| 5          | IN1A     | I   | Input 1                  | Channel A |
| 6          | IN2A     | I   | Input 2                  | Channel A |
| 7          | VSA      | -   | Output supply voltage    | Channel A |
| 8          | PG2A     | -   | Power ground 2           | Channel A |
| 9          | NC       | -   | No connection            | -         |
| 10         | OUT2A    | O   | Output 2                 | -         |
| 11         | VCC      | -   | Supply voltage           | -         |
| 12         | VCC      | -   | Supply voltage           | -         |
| 13         | OUT2B    | O   | Output 2                 | Channel B |
| 14         | NC       | -   | No connection            | -         |
| 15         | PG2B     | -   | Power ground 2           | Channel B |
| 16         | VSB      | -   | Output supply voltage    | Channel B |
| 17         | IN2B     | I   | Input 2                  | Channel B |
| 18         | IN1B     | I   | Input 1                  | Channel B |
| 19         | VSB      | -   | Output supply voltage    | Channel B |
| 20         | PG1B     | -   | Power ground 1           | Channel B |
| 21         | OUT1B    | O   | Output 1                 | Channel B |
| 22         | GND      | -   | Signal ground            | -         |

## Internal Block Diagram



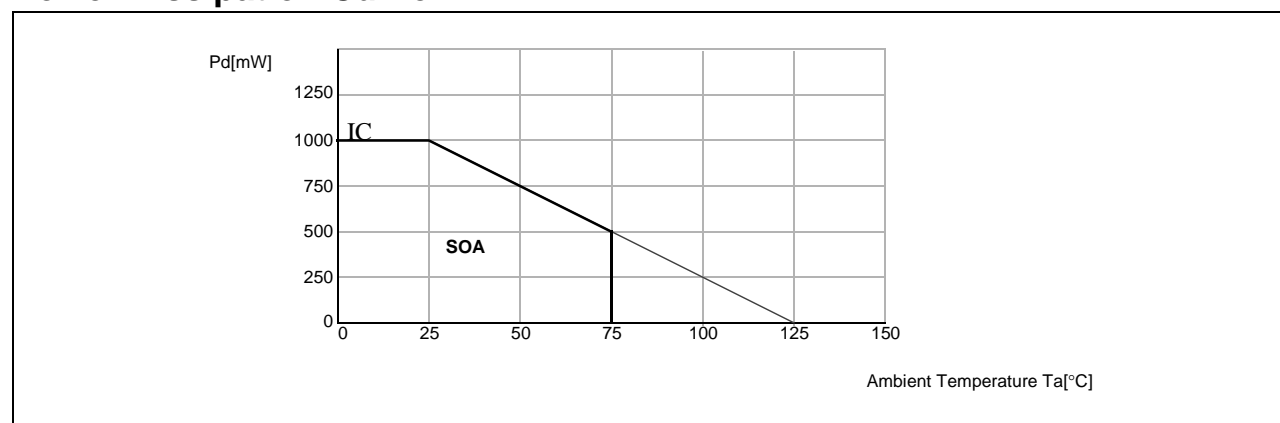
## Equivalent Circuits

| Description   | Pin No. | Internal Circuit |
|---------------|---------|------------------|
| Control Input |         |                  |
| IN1A          | 5       |                  |
| IN2A          | 6       |                  |
| IN1B          | 18      |                  |
| IN2B          | 17      |                  |
| VCC           | 11, 12  |                  |
| GND           | 1, 22   |                  |
| Motor Output  |         |                  |
| OUT1A         | 2       |                  |
| OUT2A         | 10      |                  |
| OUT1B         | 21      |                  |
| OUT2B         | 13      |                  |
| VSA           | 4, 7    |                  |
| VSB           | 16, 19  |                  |
| PG1A          | 3       |                  |
| PG2A          | 8       |                  |
| PG1B          | 20      |                  |
| PG2B          | 15      |                  |

## Absolute Maximum Ratings (Ta = 25°C)

| Parameter              | Symbol             | Value      | Unit |
|------------------------|--------------------|------------|------|
| Power supply voltage   | V <sub>CCMAX</sub> | 6.0        | V    |
| Channel supply voltage | V <sub>SMAX</sub>  | 6.0        | V    |
| Power dissipation      | P <sub>D</sub>     | 1000       | mW   |
| Operating temperature  | T <sub>OPR</sub>   | -25 ~ +75  | °C   |
| Storage temperature    | T <sub>STG</sub>   | -40 ~ +125 | °C   |
| Output current         | I <sub>OMAX</sub>  | 1.5        | A    |

## Power Dissipation Curve



## Recommended Operating Conditions (Ta = 25°C)

| Parameter                | Symbol          | Min. | Typ. | Max. | Unit |
|--------------------------|-----------------|------|------|------|------|
| Operating supply voltage | V <sub>CC</sub> | 2.5  | -    | 6.0  | V    |

## Electrical Characteristics

(VCC=3V, Ta=25°C, unless otherwise specified)

| Parameter                                       | Symbol           | Conditions                                     | Min. | Typ. | Max. | Unit |
|---|------------------|--|------|------|------|------|
| Supply current 1                                | ICC1             | V <sub>IN(all)</sub> = 0V, V <sub>CC</sub> =5V | -    | 0.1  | 10   | μA   |
| Supply current 2                                | ICC2             | V <sub>IN1</sub> =3V, V <sub>CC</sub> =5V      | -    | 15   | 30   | mA   |
| Supply current 3                                | ICC3             | V <sub>IN2</sub> =3V, V <sub>CC</sub> =5V      | -    | 15   | 30   | mA   |
| Supply current 4                                | ICC4             | V <sub>IN</sub> =3V                            | -    | 30   | 50   | mA   |
| Input current                                   | I <sub>IN</sub>  | V <sub>CC</sub> =6V, V <sub>IN</sub> =2V       | -    | 45   | 80   | μA   |
| Leakage current                                 | I <sub>IK</sub>  | V <sub>CC</sub> =5V                            | -    | 0.1  | 10   | μA   |
| Upper spark diode forward voltage               | V <sub>SF1</sub> | I <sub>O</sub> =500mA                          | -    | 1.0  | 1.7  | V    |
| Lower spark diode forward voltage               | V <sub>SF2</sub> | I <sub>O</sub> =500mA                          | -    | 1.0  | 1.7  | V    |
| Output saturation voltage (1A)                  | V <sub>O1A</sub> | I <sub>O</sub> A=300mA, V <sub>IN1A</sub> =3V  | -    | 0.45 | 0.70 | V    |
| Output saturation voltage (1B)                  | V <sub>O1B</sub> | I <sub>O</sub> B=300mA, V <sub>IN1B</sub> =3V  | -    | 0.45 | 0.70 | V    |
| Output saturation voltage (2A)                  | V <sub>O2A</sub> | I <sub>O</sub> A=600mA, V <sub>IN1A</sub> =3V  | -    | 1.0  | 1.5  | V    |
| Output saturation voltage (2B)                  | V <sub>O2B</sub> | I <sub>O</sub> B=600mA, V <sub>IN1B</sub> =3V  | -    | 1.0  | 1.5  | V    |
| Output saturation voltage (3A)                  | V <sub>O3A</sub> | I <sub>O</sub> A=300mA, V <sub>IN2A</sub> =3V  | -    | 0.45 | 0.70 | V    |
| Output saturation voltage (3B)                  | V <sub>O3B</sub> | I <sub>O</sub> B=300mA, V <sub>IN2B</sub> =3V  | -    | 0.45 | 0.70 | V    |
| Output saturation voltage (4A)                  | V <sub>O4A</sub> | I <sub>O</sub> A=600mA, V <sub>IN2A</sub> =3V  | -    | 1.0  | 1.5  | V    |
| Output saturation voltage (4B)                  | V <sub>O4B</sub> | I <sub>O</sub> B=600mA, V <sub>IN2B</sub> =3V  | -    | 1.0  | 1.5  | V    |
| Output saturation voltage 5                     | V <sub>O5</sub>  | I <sub>O</sub> B=600mA, V <sub>IN1</sub> =3V   | -    | 0.6  | 0.8  | V    |
| Output saturation voltage 6                     | V <sub>O6</sub>  | I <sub>O</sub> =600mA, V <sub>IN2</sub> =3V    | -    | 0.6  | 0.8  | V    |
| Output saturation voltage 7                     | V <sub>O7</sub>  | I <sub>O</sub> =1200mA, V <sub>IN1</sub> =3V   | -    | 1.2  | 1.6  | V    |
| Output saturation voltage 8                     | V <sub>O8</sub>  | I <sub>O</sub> =1200mA, V <sub>IN2</sub> =3V   | -    | 1.2  | 1.6  | V    |
| Output sustain voltage                          | V <sub>SUS</sub> | I <sub>O</sub> =200mA                          | 10   | 15   | -    | V    |
| Output saturation low voltage A <sup>note</sup> | V <sub>OLA</sub> | V <sub>CC</sub> =1.9V, I <sub>O</sub> A=400mA  | -    | 0.45 | 0.90 | V    |
| Output saturation low voltage B <sup>note</sup> | V <sub>OLB</sub> | V <sub>CC</sub> =1.9V, I <sub>O</sub> B=400mA  | -    | 0.45 | 0.90 | V    |

### Notes:

User's option.

## Operation Truth Table

| Input/Output<br>Motor Operation | Input 1 | Input 2 | Output 1 | Output 2 | Remark         |
|---------------------------------|---------|---------|----------|----------|----------------|
| Stop                            | Low     | Low     | Off      | Off      | High impedance |
| Forward Operation               | Low     | High    | Low      | High     | CW / CCW       |
| Backward Operation              | High    | Low     | High     | Low      | CCW / CW       |
| Fast stop                       | High    | High    | Low      | Low      | Brake          |

## Typical Performance Characteristics

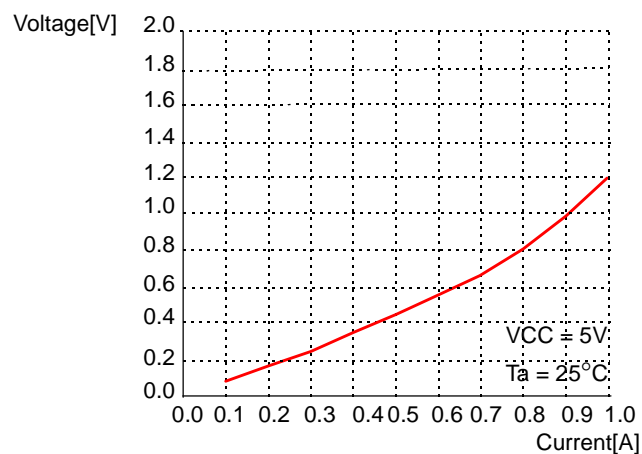


Figure 1. PNP Saturation Voltage

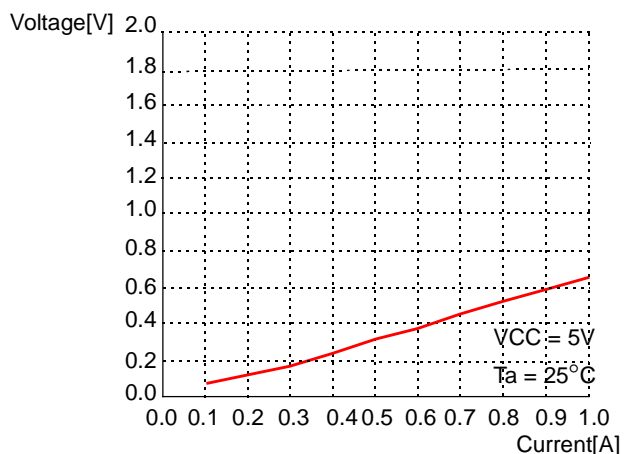
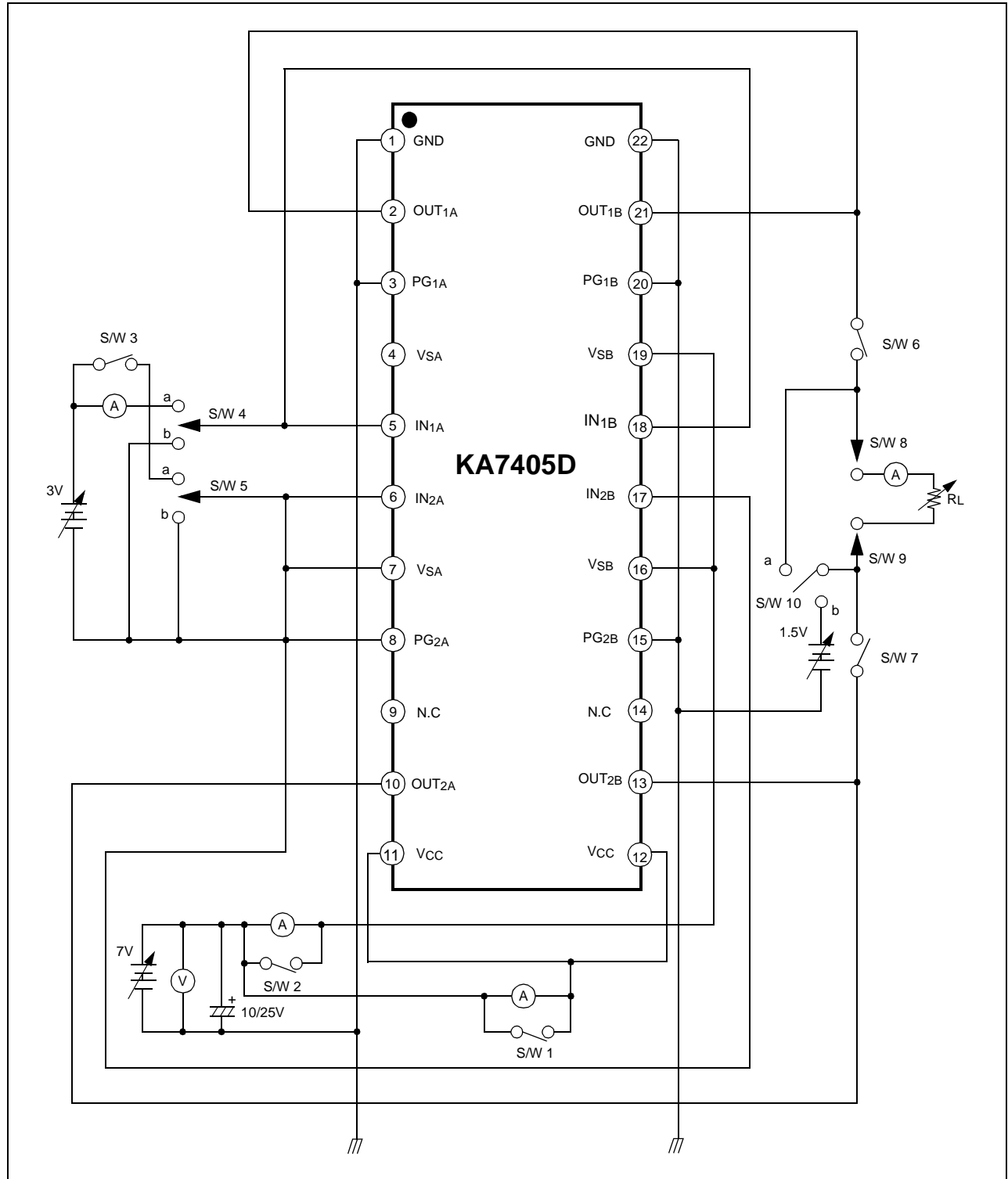


Figure 2. PNP Saturation Voltage

# Test Circuits





## Test Conditions

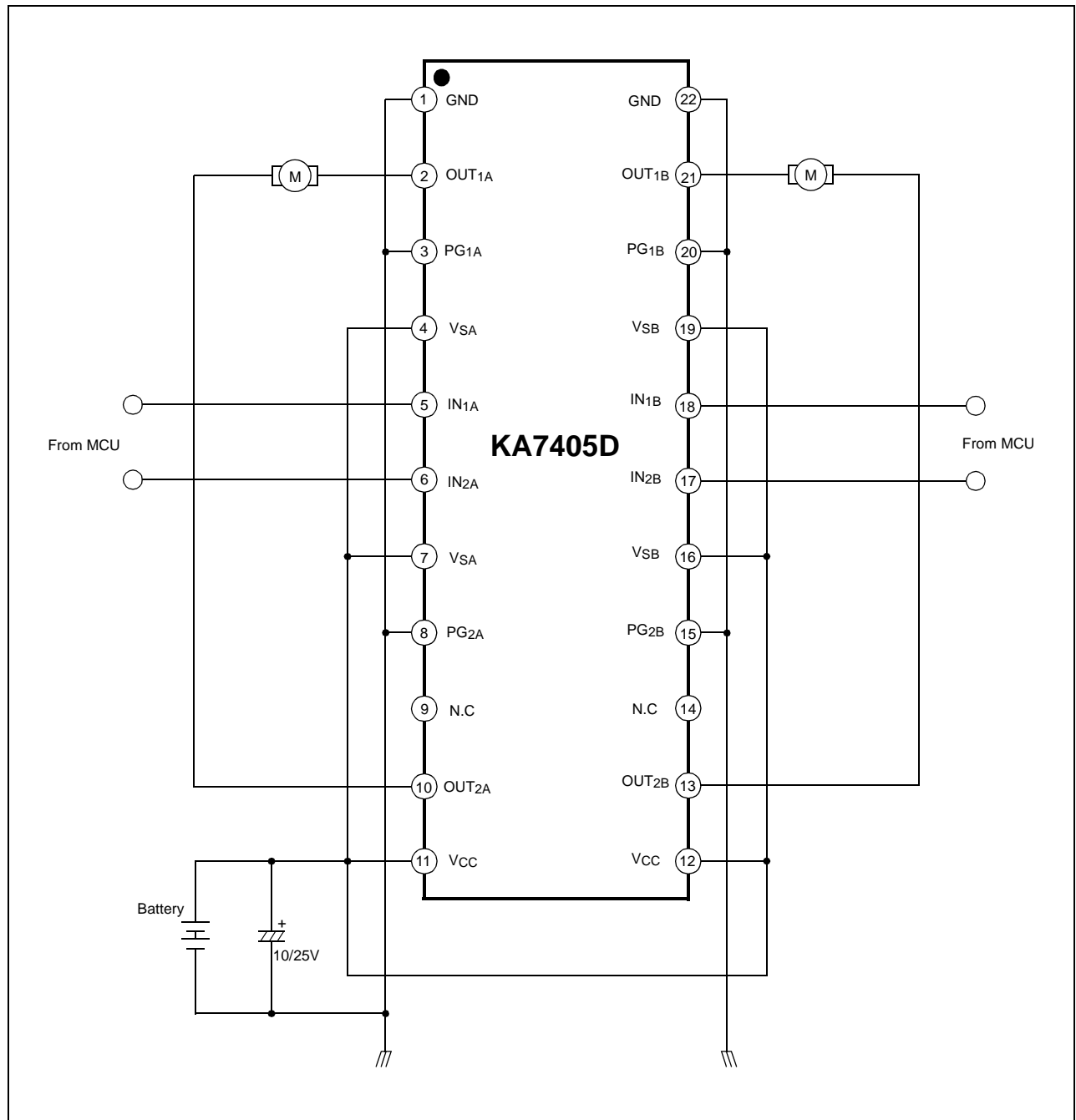
| Characteristics | SW1 | SW2 | SW3 | SW4 | SW5 | SW6 | SW7 | SW8 | SW9 | SW10 | Remark          |
|-----------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|-----------------|
| ICC1            | Off | Off | X   | b   | b   | Off | Off | X   | X   | Off  | Supply current  |
| ICC2            | Off | Off | On  | a   | b   | Off | Off | X   | X   | Off  | Supply current  |
| ICC3            | Off | Off | On  | b   | a   | Off | Off | X   | X   | Off  | Supply current  |
| ICC4            | Off | Off | On  | a   | a   | Off | Off | X   | X   | Off  | Supply current  |
| IIN             | On  | On  | On  | a   | a   | Off | Off | X   | X   | Off  | Input current   |
| IIK             | Off | Off | Off | b   | b   | Off | Off | X   | X   | Off  | Leakage current |
| VSF1            | On  | On  | On  | a   | b   | On  | On  | Off | Off | a    | Spark diode     |
| VSF2            | On  | On  | On  | b   | a   | On  | On  | Off | Off | b    | Spark diode     |
| VO1A            | On  | On  | On  | a   | b   | On  | On  | On  | On  | Off  | Single mode     |
| VO2A            | On  | On  | On  | b   | a   | On  | On  | On  | On  | Off  | Single mode     |
| VO3A            | On  | On  | On  | a   | b   | On  | On  | On  | On  | Off  | Single mode     |
| VO4A            | On  | On  | On  | b   | a   | On  | On  | On  | On  | Off  | Single mode     |
| VO5             | On  | On  | On  | a   | b   | On  | On  | On  | On  | Off  | Parallel mode   |
| VO6             | On  | On  | On  | b   | a   | On  | On  | On  | On  | Off  | Parallel mode   |
| VO7             | On  | On  | On  | a   | b   | On  | On  | On  | On  | Off  | Parallel mode   |
| VO8             | On  | On  | On  | b   | a   | On  | On  | On  | On  | Off  | Parallel mode   |
| VSUS            | Off | Off | X   | b   | b   | On  | On  | On  | On  | Off  | Sustain voltage |

**Notes:**

' X ' : Don't care.

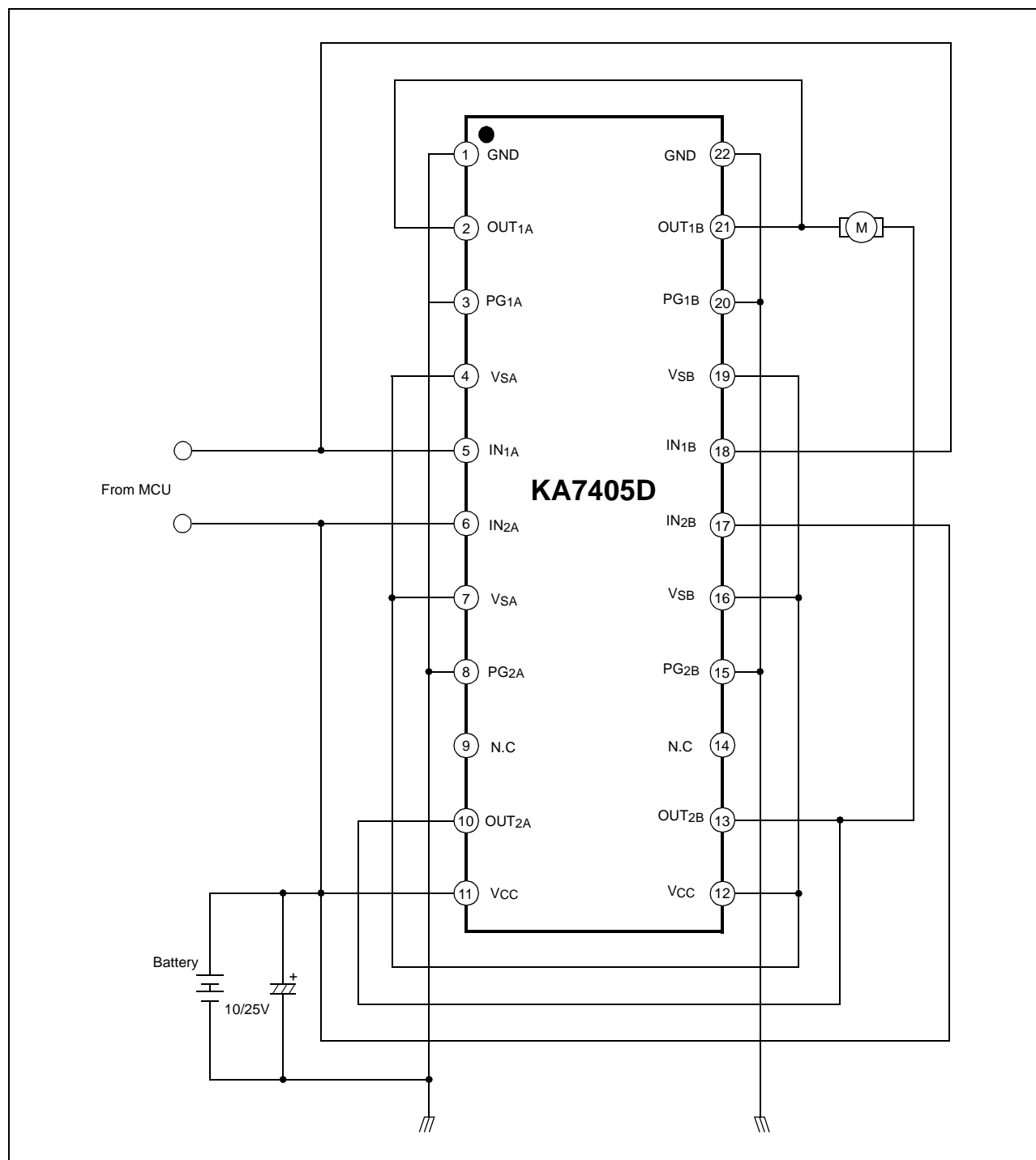
# Typical Application Circuits 1

(Single drive mode)



## Typical Application Circuits 2

(Parallel drive mode)



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