

# FAN8741/FAN8742

## Spindle Motor and 6-CH Driver

### [Spindle(PWM), Sled 2-CH(PWM) 4-CH(Linear)]

#### Features

##### Common

- Built-in thermal shutdown circuit (TSD)
- 8 Independent voltage sources
- Corresponds to 3.3V or 5V DSP
- 4 selectable mute inputs

##### Spindle

- Output PWM mode control
- FG output: open collector type
- Selectable brake(short & reverse brake)
- Built-in hall bias
- 180° commutation(compatible with conventional BLDC spindle motor)
- Built in short-through protection function

##### BTL(Sled 2-channels)

- Output PWM mode control
- Built in short-through protection function

##### BTL(Other 4-channels)

- Output linear mode control

#### Typical Applications

- CD-ROM
- CD-RW
- DVD-ROM
- DVD-RAM
- DVD Player (DVDP)
- Other compact disk media
- Game consoles

#### Description

Suitable for a 3-phase BLDC (Brush-Less Direct Current) spindle motor driver with PWM, the monolithic FAN8741/FAN8742 IC also includes 2-ch motor drivers with PWM for sled motors and 4-ch linear drivers which drive the focus actuator, tracking actuator, tilt actuator, and loading motor in optical media applications. Designed specifically for high-speed/high-density optical media applications, the FAN8741/FAN8742's power stage is created by D-MOS transistors which have extremely low  $R_{DS(ON)}$ . This enables less heat generation and guarantees improved reliability.

**The FAN8741G/FAN8742G is available in a 56-SSOP-HS package, which has high-power dissipation and the leadframe is exposed to the top side.**

**The FAN8741MTF/FAN8742MTF is available in a 56-TSSOP-EP package, which is very thin and the leadframe is exposed to the bottom side.**

#### Ordering Information

| Device      | Package     | Operating Temp. |
|-------------|-------------|-----------------|
| FAN8741G    | 56-SSOP-HS  | -25°C to +75°C  |
| FAN8741GX   | 56-SSOP-HS  | -25°C to +75°C  |
| FAN8742G    | 56-SSOP-HS  | -25°C to +75°C  |
| FAN8742GX   | 56-SSOP-HS  | -25°C to +75°C  |
| FAN8741MTF  | 56-TSSOP-EP | -25°C to +75°C  |
| FAN8741MTFX | 56-TSSOP-EP | -25°C to +75°C  |
| FAN8742MTF  | 56-TSSOP-EP | -25°C to +75°C  |
| FAN8742MTFX | 56-TSSOP-EP | -25°C to +75°C  |

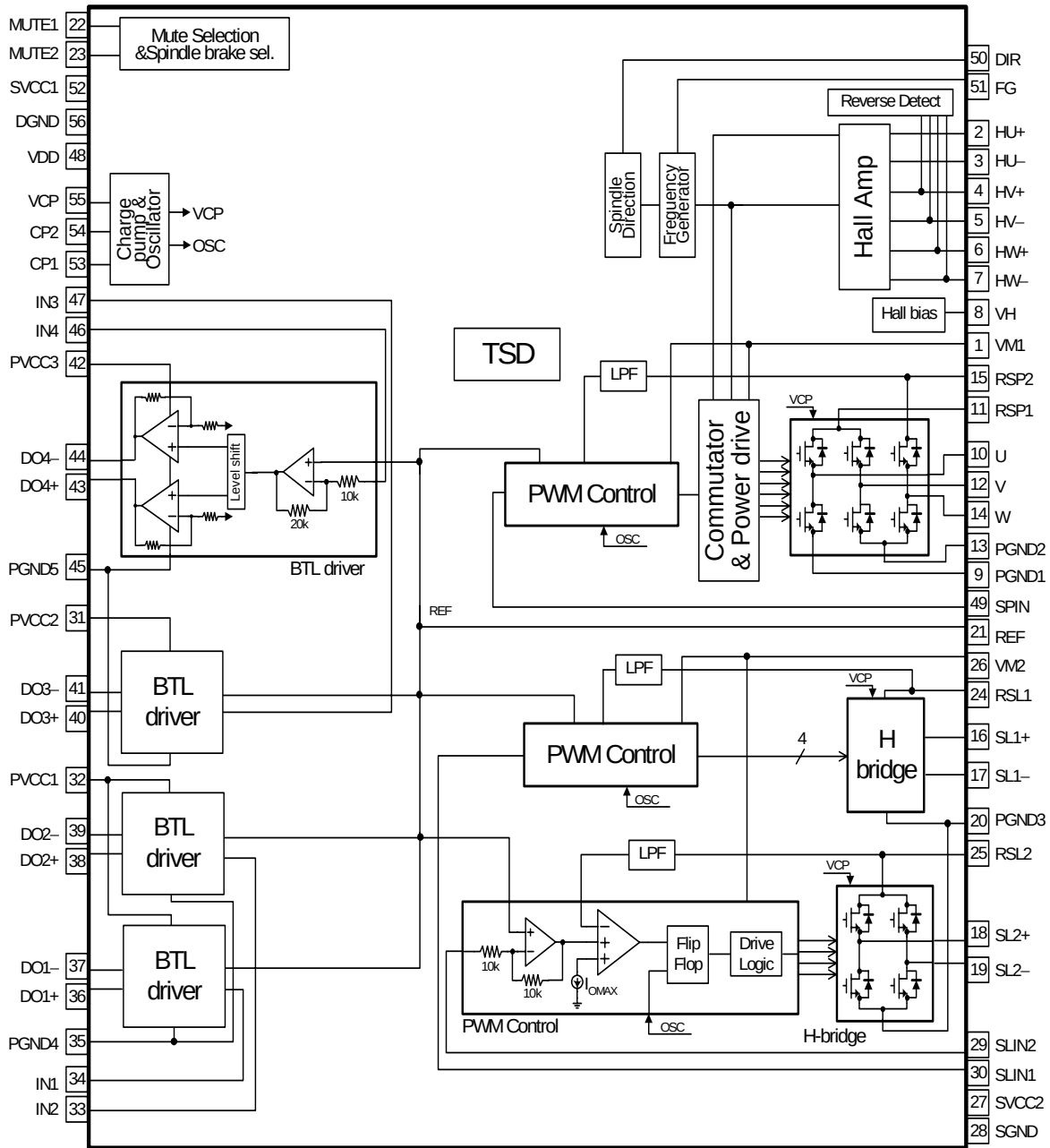
HS=HeatSlug, EP=ExposedPad

**X:Tape & Reel type**

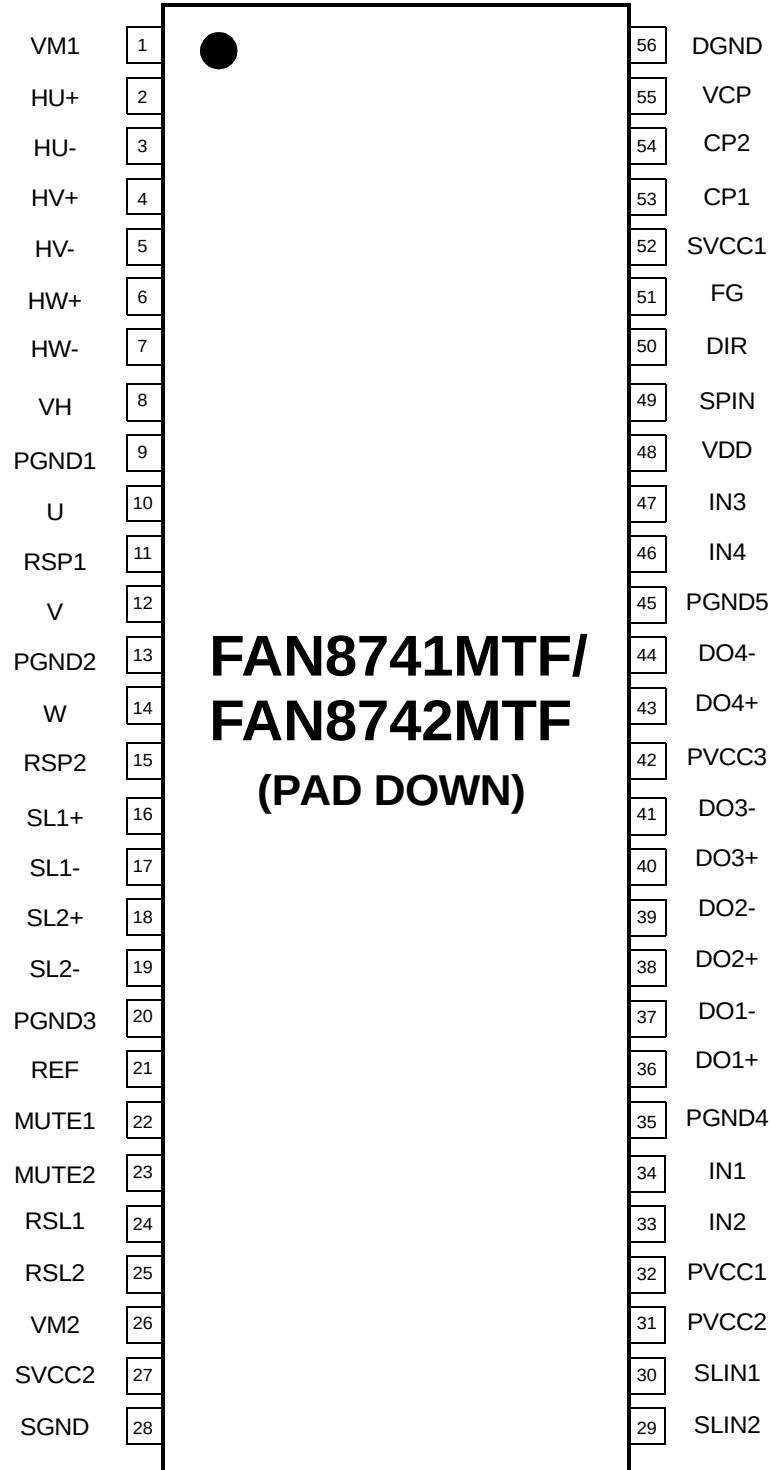
**FAN8741:FG3X**

**FAN8742:FG1X**

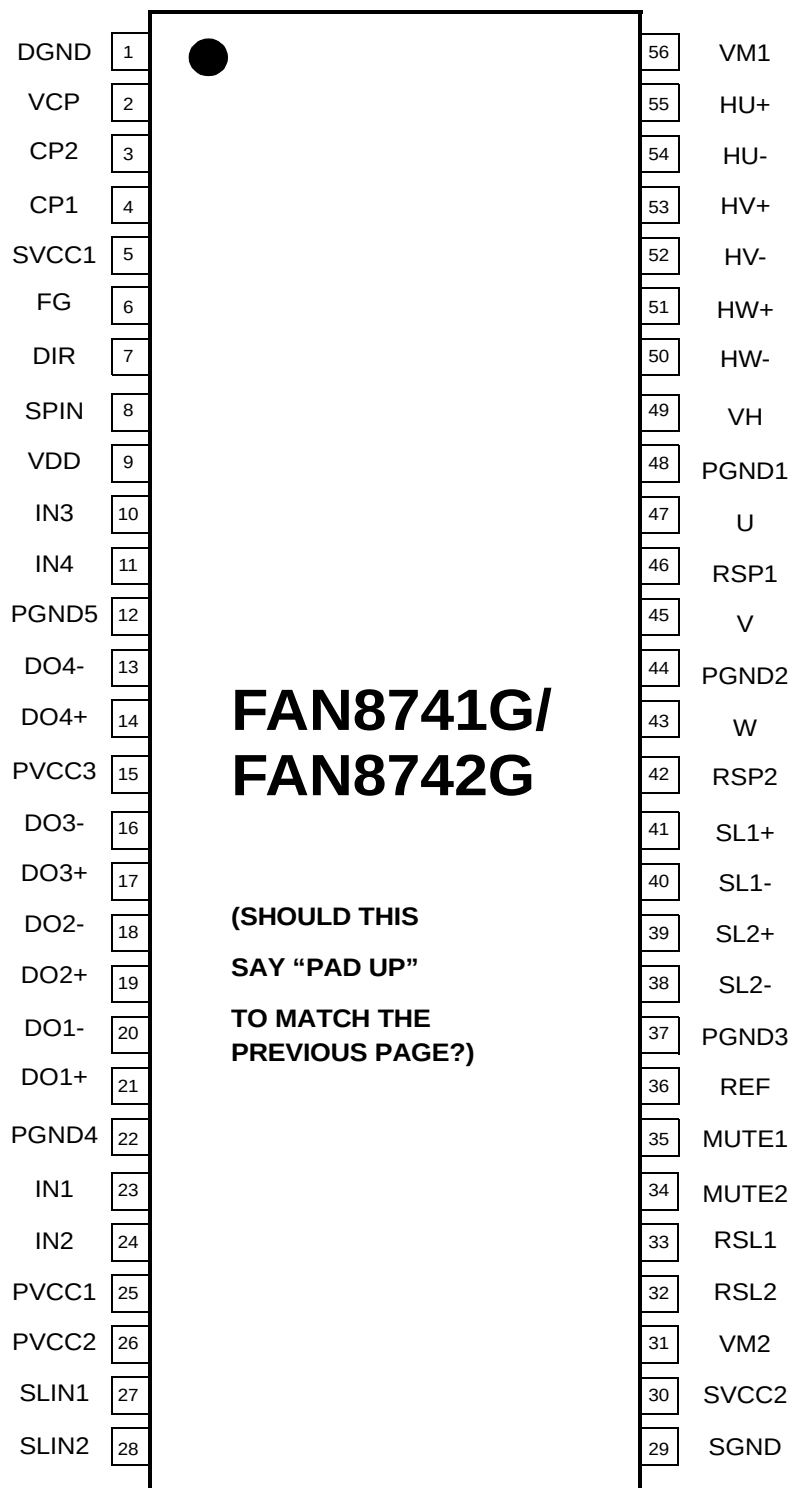
**Internal Block Diagram**(Pins numbered according to the FAN8741MTF--Leadframe exposed to the bottom)



## Pin Assignments (Leadframe exposed to the bottom side)



## Pin Assignments (Leadframe exposed to the top side)



## Pin Definitions

| Pin Number<br>(exposed to bottom) | Pin Number<br>(exposed to top) | Pin Name | I/O | Pin Function Description           |
|-----------------------------------|--------------------------------|----------|-----|------------------------------------|
| 1                                 | 56                             | VM1      | P   | Power supply for spindle           |
| 2                                 | 55                             | HU+      | A   | Hall signal input(Hu+)             |
| 3                                 | 54                             | HU-      | A   | Hall signal input(Hu-)             |
| 4                                 | 53                             | HV+      | A   | Hall signal input(Hv+)             |
| 5                                 | 52                             | HV-      | A   | Hall signal input(Hv-)             |
| 6                                 | 51                             | HW+      | A   | Hall signal input(Hw+)             |
| 7                                 | 50                             | HW-      | A   | Hall signal input(Hw-)             |
| 8                                 | 49                             | VH       | A   | Hall bias                          |
| 9                                 | 48                             | PGND1    | P   | Power ground 1 for spindle channel |
| 10                                | 47                             | U        | A   | 3-phase output U for spindle       |
| 11                                | 46                             | RSP1     | A   | Spindle current sensing 1          |
| 12                                | 45                             | V        | A   | 3-phase output V for spindle       |
| 13                                | 44                             | PGND2    | P   | Power ground 2 for spindle channel |
| 14                                | 43                             | W        | A   | 3-phase output W for spindle       |
| 15                                | 42                             | RSP2     | A   | Spindle current sensing 2          |
| 16                                | 41                             | SL1+     | A   | Sled channel 1 drive output +      |
| 17                                | 40                             | SL1-     | A   | Sled channel 1 drive output -      |
| 18                                | 39                             | SL2+     | A   | Sled channel 2 drive output +      |
| 19                                | 38                             | SL2-     | A   | Sled channel 2 drive output -      |
| 20                                | 37                             | PGND3    | P   | Power ground for sled channels     |
| 21                                | 36                             | REF      | A   | Reference voltage input            |
| 22                                | 35                             | MUTE1    | A   | Mute input 1                       |
| 23                                | 34                             | MUTE2    | A   | Mute input 2                       |
| 24                                | 33                             | RSL1     | A   | Sled current sensing 1             |
| 25                                | 32                             | RSL2     | A   | Sled current sensing 2             |
| 26                                | 31                             | VM2      | P   | Power supply for sled              |
| 27                                | 30                             | SVCC2    | P   | Power supply for BTL Pre driver    |
| 28                                | 29                             | SGND     | P   | Signal ground for BTL signal block |
| 29                                | 28                             | SLIN2    | A   | Sled channel 2 input               |
| 30                                | 27                             | SLIN1    | A   | Sled channel 1 input               |
| 31                                | 26                             | PVCC2    | P   | Power supply for BTL CH3           |
| 32                                | 25                             | PVCC1    | P   | Power supply for BTL CH1/2         |
| 33                                | 24                             | IN2      | A   | Channel 2 input                    |
| 34                                | 23                             | IN1      | A   | Channel 1 input                    |
| 35                                | 22                             | PGND4    | P   | Power ground for BTL CH1/2         |
| 36                                | 21                             | DO1 +    | A   | Channel 1 drive output +           |
| 37                                | 20                             | DO1 -    | A   | Channel 1 drive output -           |
| 38                                | 19                             | DO2 +    | A   | Channel 2 drive output +           |
| 39                                | 18                             | DO2 -    | A   | Channel 2 drive output -           |
| 40                                | 17                             | DO3 +    | A   | Channel 3 drive output +           |
| 41                                | 16                             | DO3 -    | A   | Channel 3 drive output -           |
| 42                                | 15                             | PVCC3    | P   | Power supply for BTL CH4           |

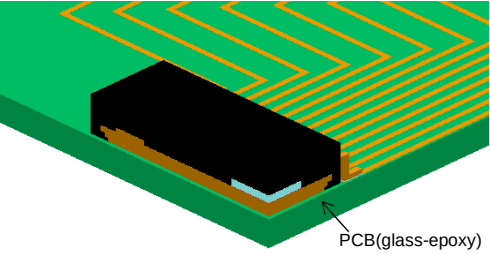
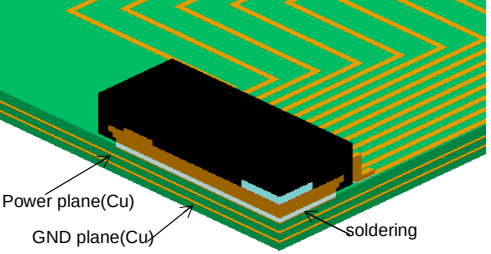
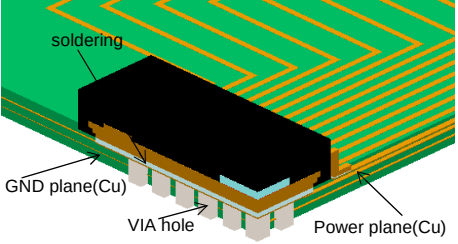
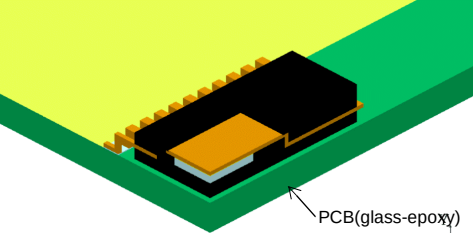
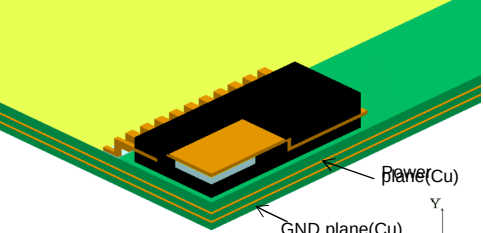
**Pin Definitions(continued)**

| <b>Pin Number</b><br>(exposed to bottom) | <b>Pin Number</b><br>(exposed to top) | <b>Pin Name</b> | <b>I/O</b> | <b>Pin Function Description</b>                             |
|------------------------------------------|---------------------------------------|-----------------|------------|-------------------------------------------------------------|
| 43                                       | 14                                    | DO4 +           | A          | Channel 4 drive output +                                    |
| 44                                       | 13                                    | DO4 -           | A          | Channel 4 drive output -                                    |
| 45                                       | 12                                    | PGND5           | P          | Power ground for BTL CH3/4                                  |
| 46                                       | 11                                    | IN4             | A          | Channel 4 input                                             |
| 47                                       | 10                                    | IN3             | A          | Channel 3 input                                             |
| 48                                       | 9                                     | VDD             | P          | Power supply for digital block                              |
| 49                                       | 8                                     | SPIN            | A          | Spindle channel input                                       |
| 50                                       | 7                                     | DIR             | O          | Spindle rotational direction output                         |
| 51                                       | 6                                     | FG              | O          | Spindle frequency generator<br>FAN8741MTF=3X, FAN8742MTF=1X |
| 52                                       | 5                                     | SVCC1           | P          | Power supply for signal block                               |
| 53                                       | 4                                     | CP1             | A          | Charge pump capacitor1                                      |
| 54                                       | 3                                     | CP2             | A          | Charge pump capacitor2                                      |
| 55                                       | 2                                     | VCP             | A          | Charge pumped voltage                                       |
| 56                                       | 1                                     | DGND            | P          | Ground for digital block                                    |

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

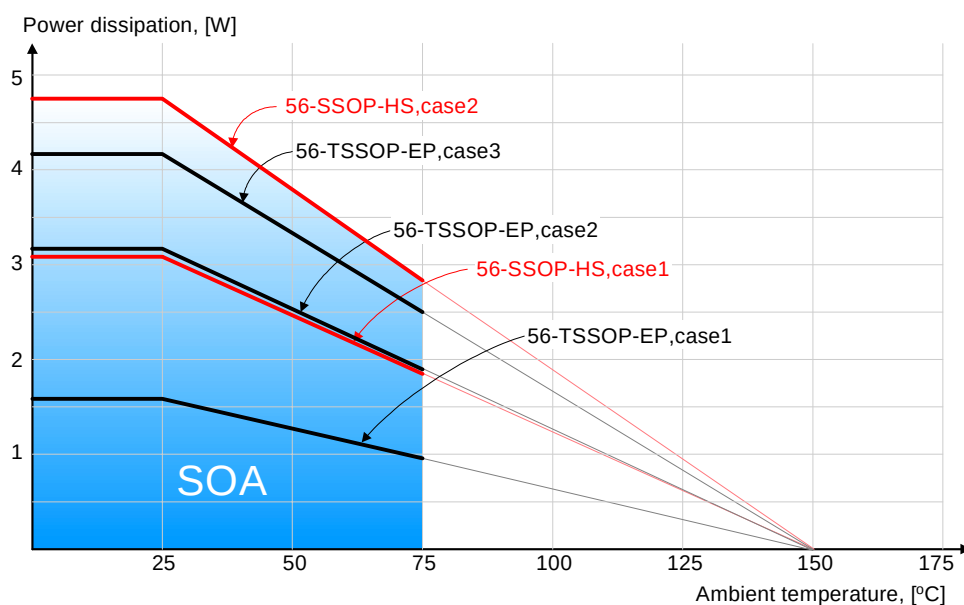
| Parameter                                        | Value           | Unit |
|--------------------------------------------------|-----------------|------|
| Supply Voltage (Signal block)                    | 7               | V    |
| Supply Voltage (Digital block)                   | 7               | V    |
| Supply Voltage (Spindle/Sled/BTL/BTL pre driver) | 15              | V    |
| Power Dissipation (56-TSSOP-EP)                  | 1.6 / 3.2 / 4.1 | W    |
| Power Dissipation (56-SSOP-HS)                   | 3.1 / 4.7       | W    |
| Operating Temperature Range                      | -20 to +75      | °C   |
| Storage Temperature Range                        | -40 to +150     | °C   |
| Maximum Output Current (Spindle)                 | 2.0             | A    |
| Maximum Output Current (CH1/2/3/4, Sled)         | 1.0             | A    |

**NOTE:**

| 56-TSSOP-EP, Case 1                                                                 | 56-TSSOP-EP, Case 2                                                                  | Remark                                          |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|-------------------------------------------------|
|   |   | Pd is measured base on the JEDEC/STD(JESD 51-2) |
| Pd=1.6 W                                                                            | Pd=3.2 W                                                                             |                                                 |
| 56-TSSOP-EP, Case 3                                                                 |                                                                                      |                                                 |
|  |                                                                                      |                                                 |
| Pd=4.1 W                                                                            |                                                                                      |                                                 |
| 56-SSOP-HS, Case 1                                                                  | 56-SSOP-HS, Case 2                                                                   |                                                 |
|  |  |                                                 |
| Pd=3.1W                                                                             | Pd=4.7W                                                                              |                                                 |

1. 56-TSSOP-EP, Case 1: Single layer PCB with 1 signal plane only, PCB size is 76mm × 114mm × 1.6mm.
2. 56-TSSOP-EP, Case 2: Multi layer PCB with 1 signal, 1 power and 1 ground planes, PCB size is 76mm × 114mm × 1.6mm, Cu plane sizes for power and ground is 74mm × 62mm × 0.035mm. Down pad of IC is soldered on the PCB.
3. 56-TSSOP-EP, Case 3: PCB condition is same to case 2 except via holes, which penetrate PCB all layers. Down pad of IC is soldered on the PCB.
4. 56-SSOP-HS, Case 1: Single layer PCB with 1 signal plane only, PCB size is 76mm × 114mm × 1.6mm.
5. 56-SSOP-HS, Case 2: Multi layer PCB with 1 signal, 1 power and 1 ground planes, PCB size is 76mm × 114mm × 1.6mm, Cu plane sizes for power and ground is 74mm × 62mm × 0.035mm.
6. Power dissipation is reduced by -12.8mW/°C for using above Ta=25°C in 56-TSSOP-EP, case 1.
7. Power dissipation is reduced by -25.6mW/°C for using above Ta=25°C in 56-TSSOP-EP, case 2.
8. Power dissipation is reduced by -32.8mW/°C for using above Ta=25°C in 56-TSSOP-EP, case 3.
9. Power dissipation is reduced by -24.8mW/°C for using above Ta=25°C in 56-SSOP-HS, case 1.
10. Power dissipation is reduced by -37.6mW/°C for using above Ta=25°C in 56-SSOP-HS, case 2.
11. Do not exceed P<sub>D</sub> and SOA (Safe Operating Area).

### Power Dissipation Curve



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

| Parameter                                | Min. | Typ. | Max.              | Unit |
|------------------------------------------|------|------|-------------------|------|
| Supply Voltage (Spindle Signal block)    | 4.5  | 5    | 5.5               | V    |
| Supply Voltage (Digital block)           | 4.5  | 5    | 5.5               | V    |
| Supply Voltage (Spindle driver)          | 4.5  | 12   | 13.2              | V    |
| Supply Voltage (Sled driver)             | 4.5  | 12   | 13.2              | V    |
| Supply Voltage (BTL driver)              | 4.5  | 12   | SV <sub>CC2</sub> | V    |
| Supply Voltage (BTL signal block)        | 4.5  | 12   | 13.2              | V    |
| Output current(Spindle)                  | -    | 1.0  | 1.5               | A    |
| Output current(Focus, Tracking, Loading) | -    | 0.5  | 0.8               | A    |
| Output current(Sled)                     | -    | 0.5  | 0.8               | A    |



**ELECTRICAL CHARACTERISTICS (Ta = 25°C)**

(Ta=25°C, SVCC1=VDD=PVCC1=VM2=5V, VM1=SVCC2=PVCC2=PVCC3=12V unless otherwise noted)

| Parameter                        | Condition                                                            | Min. | Typ. | Max. | Units |
|----------------------------------|----------------------------------------------------------------------|------|------|------|-------|
| <b>COMMON PART</b>               |                                                                      |      |      |      |       |
| Quiescent Circuit Current 1      | Mute1=L, Mute2=L                                                     | -    | 1    | -    | mA    |
|                                  |                                                                      | -    | 1    | -    |       |
| Quiescent Circuit Current 2      | Mute1=L, Mute2=H                                                     | -    | 1.5  | -    | mA    |
|                                  |                                                                      | -    | 9.5  | -    |       |
| Quiescent Circuit Current 3      | Mute1=H, Mute2=H                                                     | -    | 4    | -    | mA    |
|                                  |                                                                      | -    | 13   | -    |       |
| Mute Low Voltage                 | MUTE=variation                                                       | -    | -    | 0.8  | V     |
| Mute High Voltage                | MUTE=variation                                                       | 3.0  | -    | -    | V     |
| Mute Input Current               | MUTE=5V                                                              | -    | 130  | -    | μA    |
| Charge Pump Voltage 1            | I <sub>PUMP</sub> =0mA                                               | -    | 19   | -    | V     |
| Charge Pump Voltage 2            | I <sub>PUMP</sub> =-1mA                                              | -    | 18   | -    | V     |
| <b>THERMAL SHUTDOWN</b>          |                                                                      |      |      |      |       |
| Operating Temperature*           | -                                                                    | -    | 150  | -    | °C    |
| Hysteresis Temperature*          | -                                                                    | -    | 25   | -    | °C    |
| <b>SPINDLE DRIVE PART</b>        |                                                                      |      |      |      |       |
| Control Input Deadzone11         | SPIN>VREF                                                            | 20   | 50   | 100  | mV    |
| Control Input Deadzone12         | SPIN<VREF                                                            | -100 | -50  | -20  | mV    |
| Control Voltage Input Range      |                                                                      | 0    | -    | 5    | V     |
| Output Gain                      | $G_{MSP}=G_{VO}/RCS_{SP}$<br>$RCS_{SP}=0.33\Omega$ , $G_{VO}=1[V/V]$ | 2.55 | 3.0  | 3.45 | A/V   |
| Output On Resistance(upper)      | I <sub>O</sub> =500mA                                                | -    | 0.4  | -    | Ω     |
| Output On Resistance(lower)      | I <sub>O</sub> =500mA                                                | -    | 0.4  | -    | Ω     |
| Output Limit Current             | $RCS_{SP}=0.33\Omega$                                                | -    | 1.5  | -    | A     |
| Hall Amp Common Mode Input Range | -                                                                    | 1    | -    | 4    | V     |
| Minimum Hall Input Level*        | -                                                                    | 50   | -    | -    | mV    |
| Hall Bias Output Voltage         | I <sub>HB</sub> =10mA                                                | 0.5  | 1.0  | 1.5  | V     |
| Hall Bias Input Current          |                                                                      | -    | 1    | 5    | μA    |
| FG Low Voltage                   | I <sub>FG</sub> =3mA                                                 | -    | -    | 0.5  | V     |
| DIR Low Voltage                  | I <sub>DIR</sub> =3mA                                                | -    | -    | 0.5  | V     |
| <b>SLED DRIVE PART</b>           |                                                                      |      |      |      |       |
| Control Input Deadzone21         | SLIN1/SLIN2 > VREF                                                   | 0    | 15   | 30   | mV    |
| Control Input Deadzone22         | SLIN1/SLIN2 < VREF                                                   | -30  | -15  | 0    | mV    |
| Output Gain                      | $G_{MSL}=G_{VO}/RCS_{SL}$<br>$RCS_{SL}=1\Omega$ , $G_{VO}=1[V/V]$    | 0.85 | 1.0  | 1.15 | A/V   |
| Output On Resistance(upper)      | I <sub>O</sub> =250mA                                                | -    | 1.0  | -    | Ω     |
| Output On Resistance(lower)      | I <sub>O</sub> =250mA                                                | -    | 1.0  | -    | Ω     |
| Output Limit Current             | $RCS_{SL}=1\Omega$                                                   | -    | 0.5  | -    | A     |

\*: Design guarantee specification

**ELECTRICAL CHARACTERISTICS (Ta = 25°C, continued)**

(Ta=25°C, SVCC1=VDD=PVCC1=VM2=5V,VM1=SVCC2=PVCC2=PVCC3=12V unless otherwise noted)

| Parameter                                                         | Condition                               | Min. | Typ. | Max. | Units |
|-------------------------------------------------------------------|-----------------------------------------|------|------|------|-------|
| <b>CH1,CH2 DRIVE PART (TYPICALLY ACTUATOR DRIVER)</b>             |                                         |      |      |      |       |
| Output Saturation Voltage H                                       | I <sub>O</sub> =500mA                   |      | 0.5  |      | V     |
| Output Saturation Voltage L                                       | I <sub>O</sub> =500mA                   |      | 0.5  |      | V     |
| Closed Loop Voltage Gain                                          | -                                       | 16.5 | 18   | 19.5 | dB    |
| Output Offset Voltage                                             | VREF=IN1=IN2=1.65V                      | -50  | -    | 50   | mV    |
| <b>CH3,CH4 DRIVE PART (TYPICALLY TILT,LOADING DRIVER)</b>         |                                         |      |      |      |       |
| Output Saturation Voltage H                                       | I <sub>O</sub> =500mA                   |      | 1.0  |      | V     |
| Output Saturation Voltage L                                       | I <sub>O</sub> =500mA                   |      | 0.5  |      | V     |
| Closed Loop Voltage Gain                                          | -                                       | 16.5 | 18   | 19.5 | dB    |
| Output Offset Voltage                                             | VREF=IN3=IN4=1.65V                      | -50  | -    | 50   | mV    |
| <b>CH1,CH3 GAIN DIFFERENCE SPEC (TYPICALLY FOCUS,TILT DRIVER)</b> |                                         |      |      |      |       |
| CH1-CH3 Gain Difference                                           | G <sub>VFT12</sub> - G <sub>VFT34</sub> | -0.5 | 0    | 0.5  | dB    |

# **Equivalent Circuits**(Pins numbered according to FAN8741MTF)

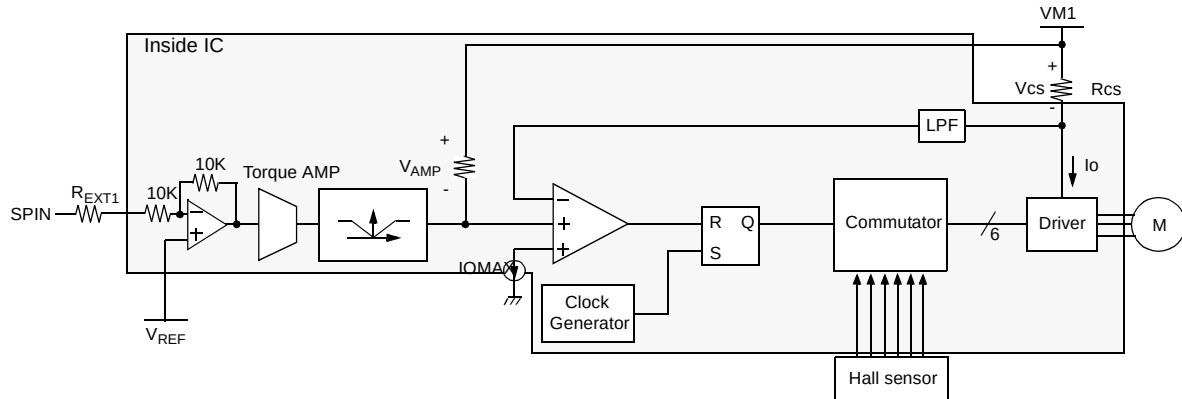
| Charge Pump Outputs   | FG/DIR Outputs                |
|-----------------------|-------------------------------|
|                       |                               |
| Spin Input            | Hall Inputs                   |
|                       |                               |
| Hall Bias Input       | Mute1 & 2 Inputs              |
|                       |                               |
| Spindle Drive Outputs | Spindle Current Sensing Input |
|                       |                               |

**Equivalent Circuits(continued)**(Pins numbered according to FAN8741MTF)

| Sled 1 & 2 Inputs               | Sled Drive Outputs                |
|---------------------------------|-----------------------------------|
|                                 |                                   |
| CH1/2/3/4 (BTL Channels) Inputs | Sled 1 & 2 Current Sensing Inputs |
|                                 |                                   |
| Reference Input                 | CH4 Outputs                       |
|                                 |                                   |
| CH3 Outputs                     | CH1 & 2 Outputs                   |
|                                 |                                   |

## Application Information

### 1. Torque Control & Output Current Control of 3-phase Bldc Motor

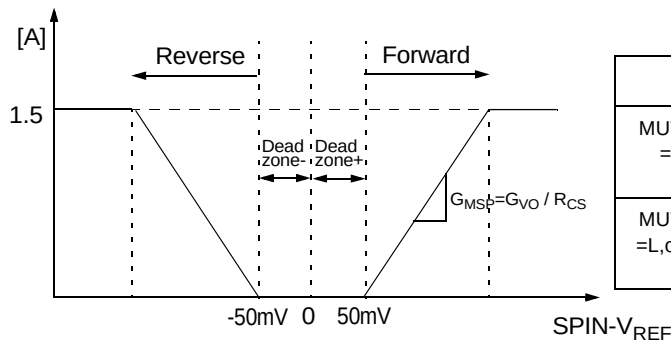


- 1) By amplifying the voltage difference between  $V_{REF}$  and SPIN from Servo IC(or DSP), the Torque AMP produces the input voltage( $V_{AMP}$ ) which means input current command.
- 2) The output current ( $I_O$ ) is converted into the voltage ( $V_{CS}$ ) through the sense resistor ( $R_{CS}$ ) and compared with the  $V_{AMP}$ .
- 3) The clock generator always make the RS latch become set periodically, this enables the output driver's on state, when the  $V_{CS}$  and the  $V_{AMP}$  are equal the state becomes off.
- 4) By the negative feedback loop, the sensed output voltage  $V_{CS}$  equals to the  $V_{AMP}$ .
- 5) Commuting sequence is selected by hall sensor input, and the minimum hall input is 50mV.
- 6) The gain and limit currents are calculated as shown in the table below. ( $G_{VO} = V_{AMP} / (SPIN - V_{REF}) = 1[V/V]$ ).

| Limit current        | Input/Output gain[A/V]                                   | Remark                                      |
|----------------------|----------------------------------------------------------|---------------------------------------------|
| $\frac{0.5}{R_{CS}}$ | $\frac{10K}{R_{EXT1} + 10K} \cdot \frac{G_{VO}}{R_{CS}}$ | $\frac{10K}{R_{EXT1} + 10K}$ is gain scaler |

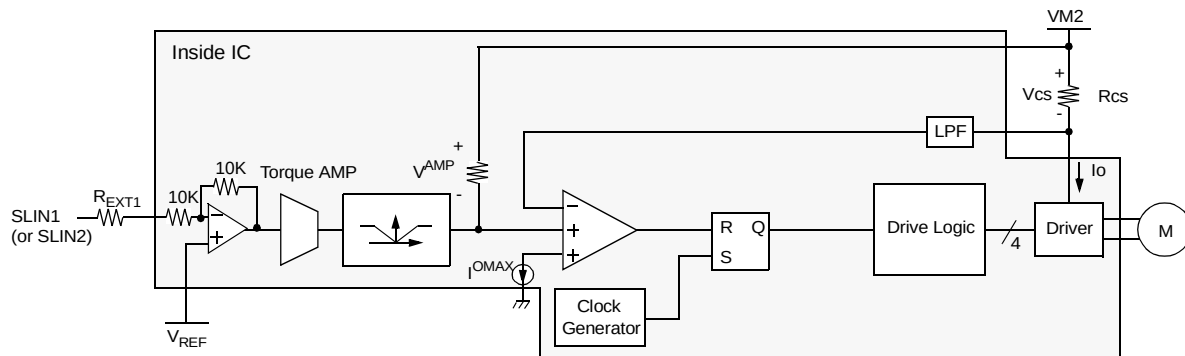
- 7) Spindle block adopts 180° commutation methodology which is fully compatible with a conventional BLDC spindle motor. Users don't need to change or modify their spindle motor.
- 8) The range of the input voltage is as shown below when  $R_{CS} = 0.33\Omega$ ,  $R_{EXT1} = 0$ .

Current



|                 |                  | Rotation         |
|-----------------|------------------|------------------|
| MUTE2 = H       | SPIN > $V_{REF}$ | Forward rotation |
|                 | SPIN < $V_{REF}$ | Reverse brake    |
| MUTE2 = L, open | -                | Short brake      |
|                 | -                | Short brake      |

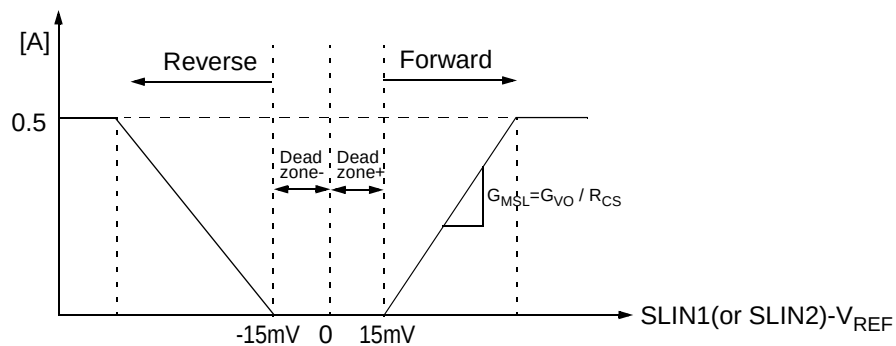
## 2. Torque Control & Output Current Control Of Sled Motor(2-phase Step Motor)



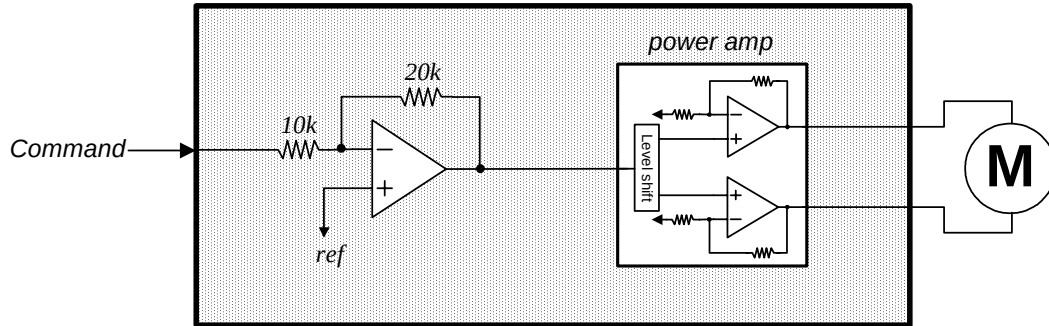
- 1) By amplifying the voltage difference between  $V_{REF}$  and SLIN1(or SLIN2) from Servo IC(or DSP), the Torque AMP produces the input voltage( $V_{AMP}$ ) which means input current command.
- 2) The output current ( $I_O$ ) is converted into the voltage ( $V_{CS}$ ) through the sense resistor ( $R_{CS}$ ) and compared with the  $V_{AMP}$ .
- 3) The clock generator always make the RS latch become set periodically, this enables the output driver's on state, when the  $V_{CS}$  and the  $V_{AMP}$  are equal the state becomes off.
- 4) By the negative feedback loop, the sensed output voltage  $V_{CS}$  equals to the  $V_{AMP}$ .
- 5) To avoid output upper and lower transistor's short through, a switch trick is needed. Turn on delay time is 1usec, so the phase delay time,when changing the current direction, is 1usec.
- 6) The gain and limit currents are calculated as shown in the table below. ( $G_{VO}=V_{AMP}/[SLIN1(or SLIN2)-V_{REF}]=1[V/V]$ )

| Torque limit current | Input/Output gain[A/V]                                   | Remark                                      |
|----------------------|----------------------------------------------------------|---------------------------------------------|
| $\frac{0.5}{R_{CS}}$ | $\frac{10K}{R_{EXT1} + 10K} \cdot \frac{G_{VO}}{R_{CS}}$ | $\frac{10K}{R_{EXT1} + 10K}$ is gain scaler |

- 7) The range of the torque voltage is as shown below when  $R_{CS}=1W$ ,  $R_{EXT1}=0$ .



### 3. Channel 1~4 Schematic



- The reference voltage(ref) is given externally through pin21.
- The input OP-amp output signal is amplified by (20K/10K) times and then fed to the power amplifier. The gain of power amplifier is 4 so the total max gain of channels 1 through 4 is 8.

### 4. Mute Inputs

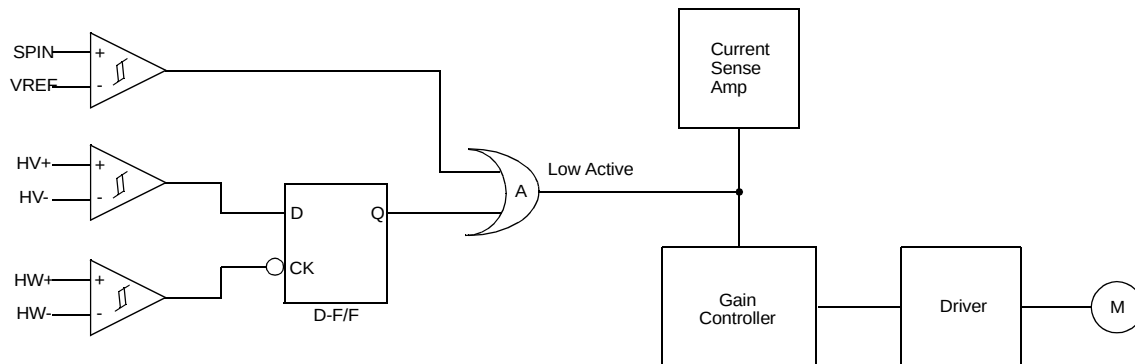
FAN8741 has 2 independent mute pins: Pin #22(MUTE1) and Pin #23(MUTE2). Details are shown below.

| MUTE1 | MUTE2 | SPIN-DLE | SLED   | CH1/2/3 | CH4(typ. loading driver) | SPINDLE brake type                                |
|-------|-------|----------|--------|---------|--------------------------|---------------------------------------------------|
| H     | H     | Enable   |        |         | Disable                  | Reverse brake when SPIN<VREF                      |
| H     | L     | Enable   |        |         | Disable                  | Short brake<br>SPIN $\neq$ VREF <sup>(note)</sup> |
| L     | H     | Disable  | Enable | Disable | Enable                   | -                                                 |
| L     | L     | Disable  |        |         |                          | -                                                 |

Note:

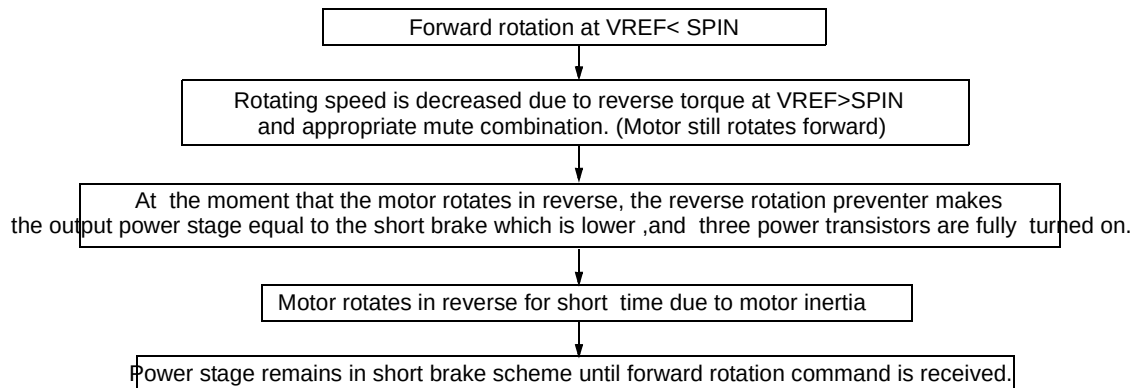
To make the spindle short brake, MUTE2 goes low and the spindle command must not be in deadzone( $\pm 50\text{mV}$ ). When the spindle command is within the deadzone, the spindle block enters disable mode even though MUTE2 is low.

## 5. Reverse Rotation Prevention(Spindle)



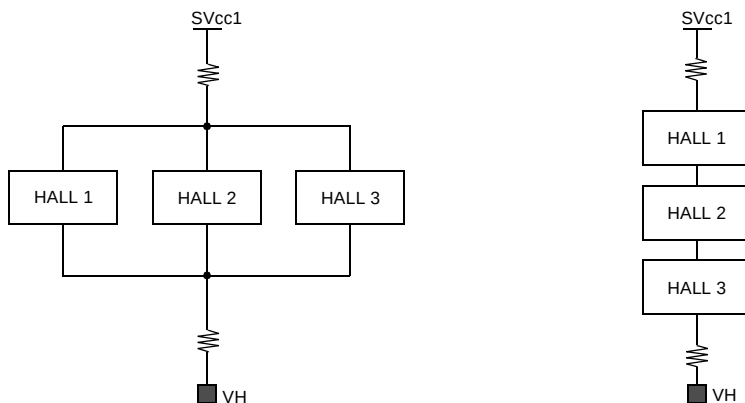
- 1) As in the state of the forward rotation, the D-F/F output, Q is HIGH and the motor rotates normally. At this state, if the control input is changed such that  $V_{REF} > SPIN$ , then the motor rotates slowly by the reverse commutation in the driver. When the motor begins to rotate in the reverse direction, the D-F/F output becomes Low and the OR Gate output becomes Low. This prevents the motor from continuing to rotate in the reverse direction. This operation principle is shown in the following table and flow chart.

| Rotation | HV | HW  | D-F/F<br>(Q) | Reverse Rotation Preventer |                  |
|----------|----|-----|--------------|----------------------------|------------------|
|          |    |     |              | $V_{REF} < SPIN$           | $V_{REF} > SPIN$ |
| Forward  | H  | H→L | H            | Forward                    | -                |
| Reverse  | L  | H→L | L            | -                          | Brake and Stop   |





## 6. Hall Sensor Connection



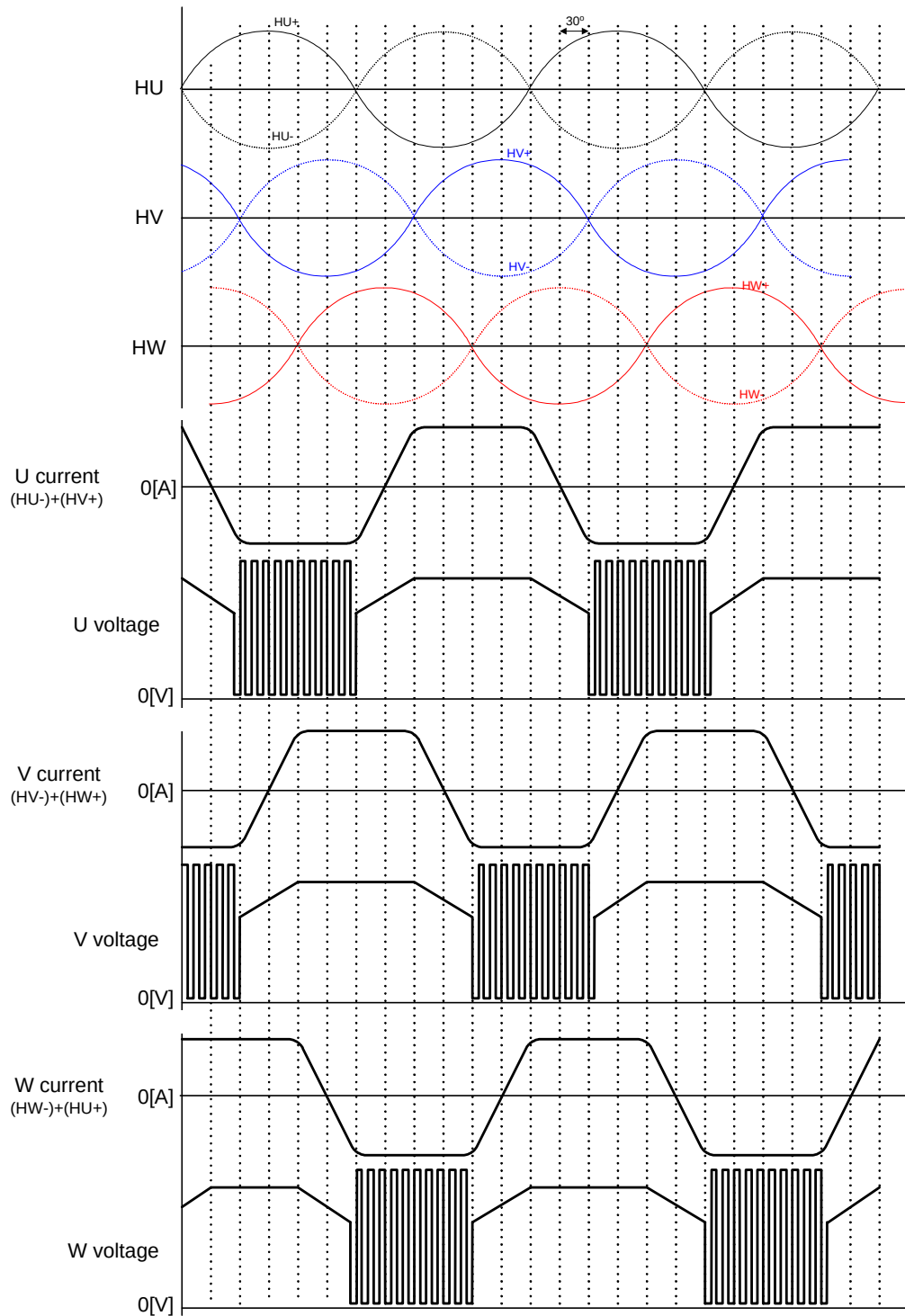
## 7. PWM frequency

The PWM operation of the spindle and sled channels are controlled by an internal clock generator with a typical frequency of 100KHz.

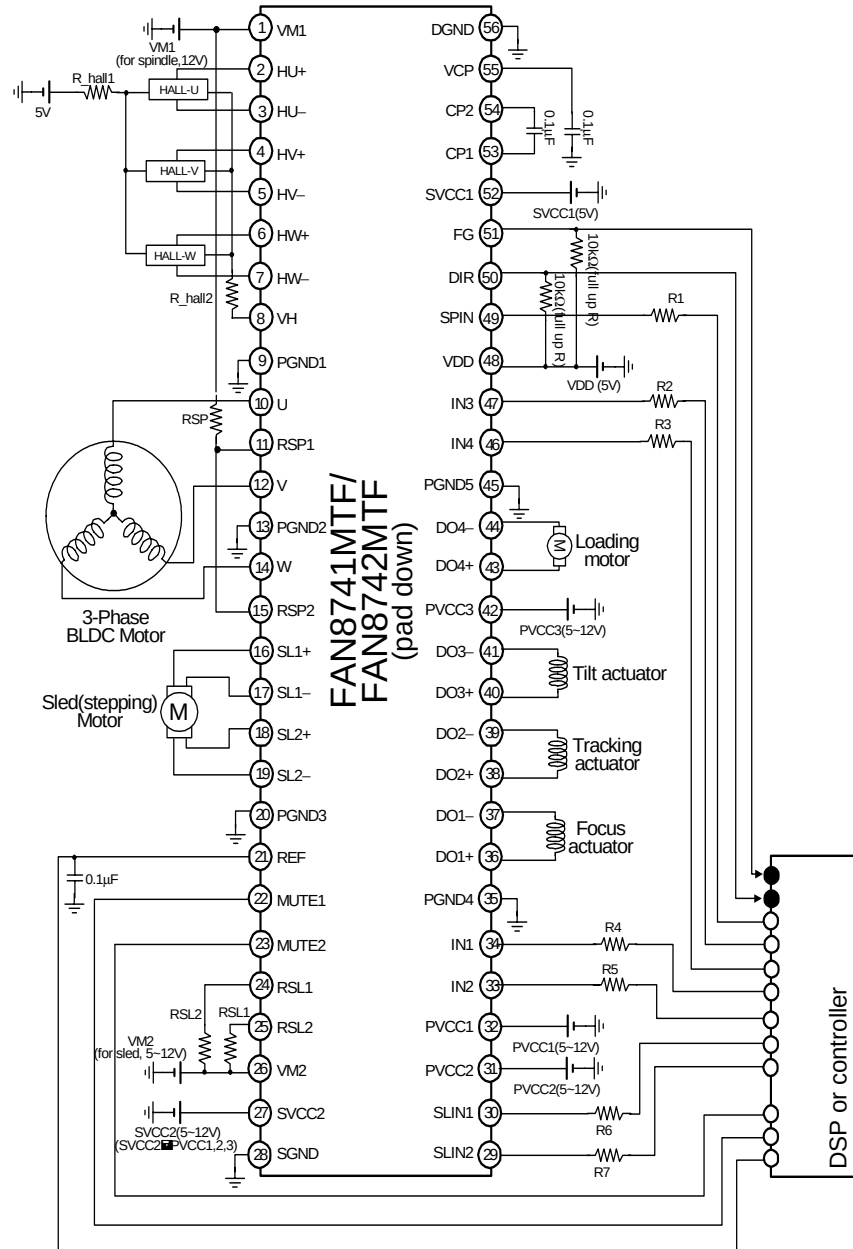
## 8. ETC

- 1) FG and DIR output s are open-collector types.
- 2) By-pass capacitors are recommended at hall sensor and power supply inputs.

## 9. Spindle Part Input-output Timing Chart

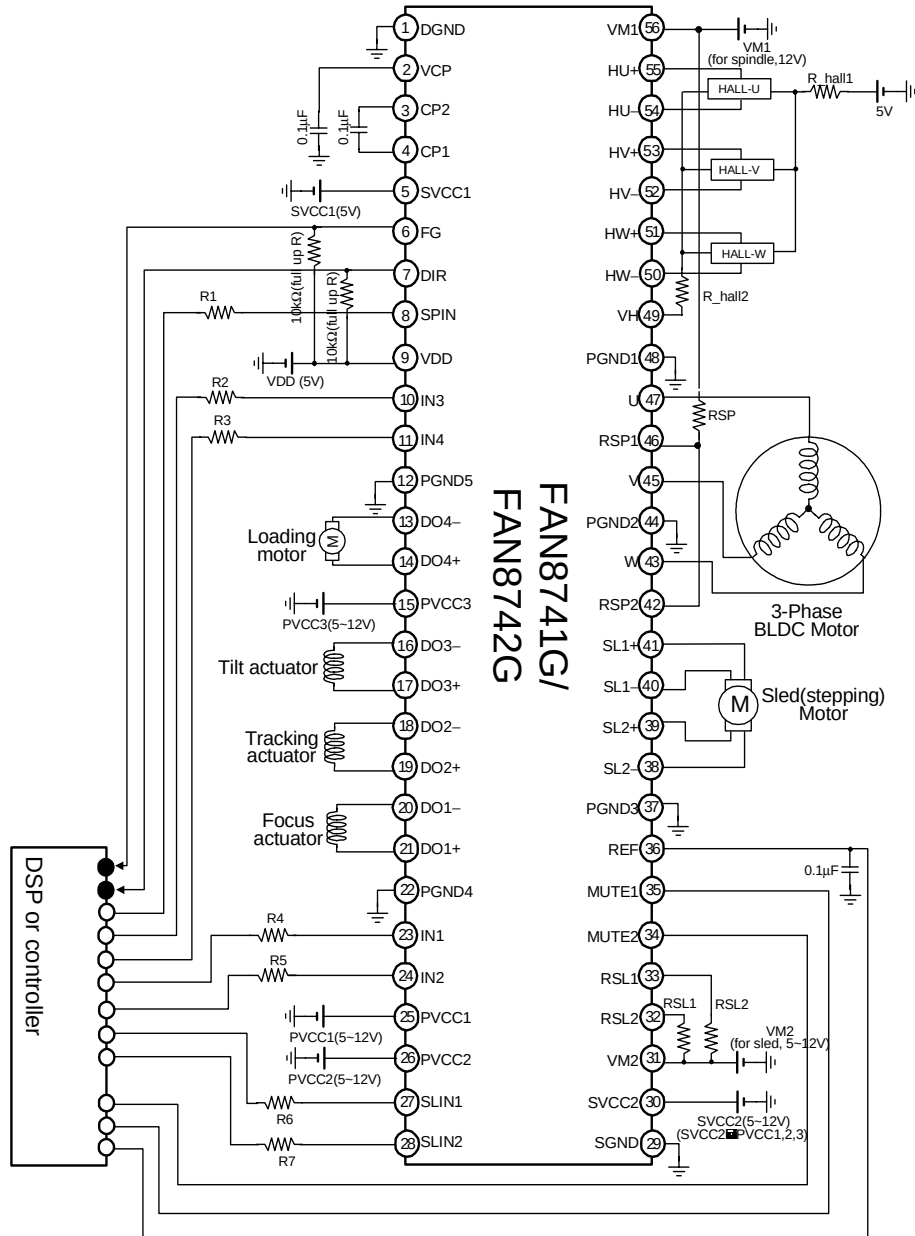


# Typical Application Circuits(FAN8741MTF example)



| Component                                                                        | Reference value | Remark                                                        |
|----------------------------------------------------------------------------------|-----------------|---------------------------------------------------------------|
| R1~R7                                                                            | 10kΩ            | Gain scaling resistors. Please refer to pages 12,13, and 14.  |
| R_hall1,R_hall2                                                                  | 100Ω            | Hall bias resistors                                           |
| RSL1,RSL2                                                                        | 1Ω              | Rcs at sled driver. (I_limit=0.5A,Gain=0.5A/V@R6,R7 are 10kΩ) |
| RSP                                                                              | 0.33Ω           | Rcs at spindle driver. (I_limit=1.5A,Gain=1.5A/V@R1 is 10kΩ)  |
| Bypass electrolytic capacitors(47~100μF) are recommended at power supply inputs. |                 |                                                               |

# Typical Application Circuits(FAN8741G example)

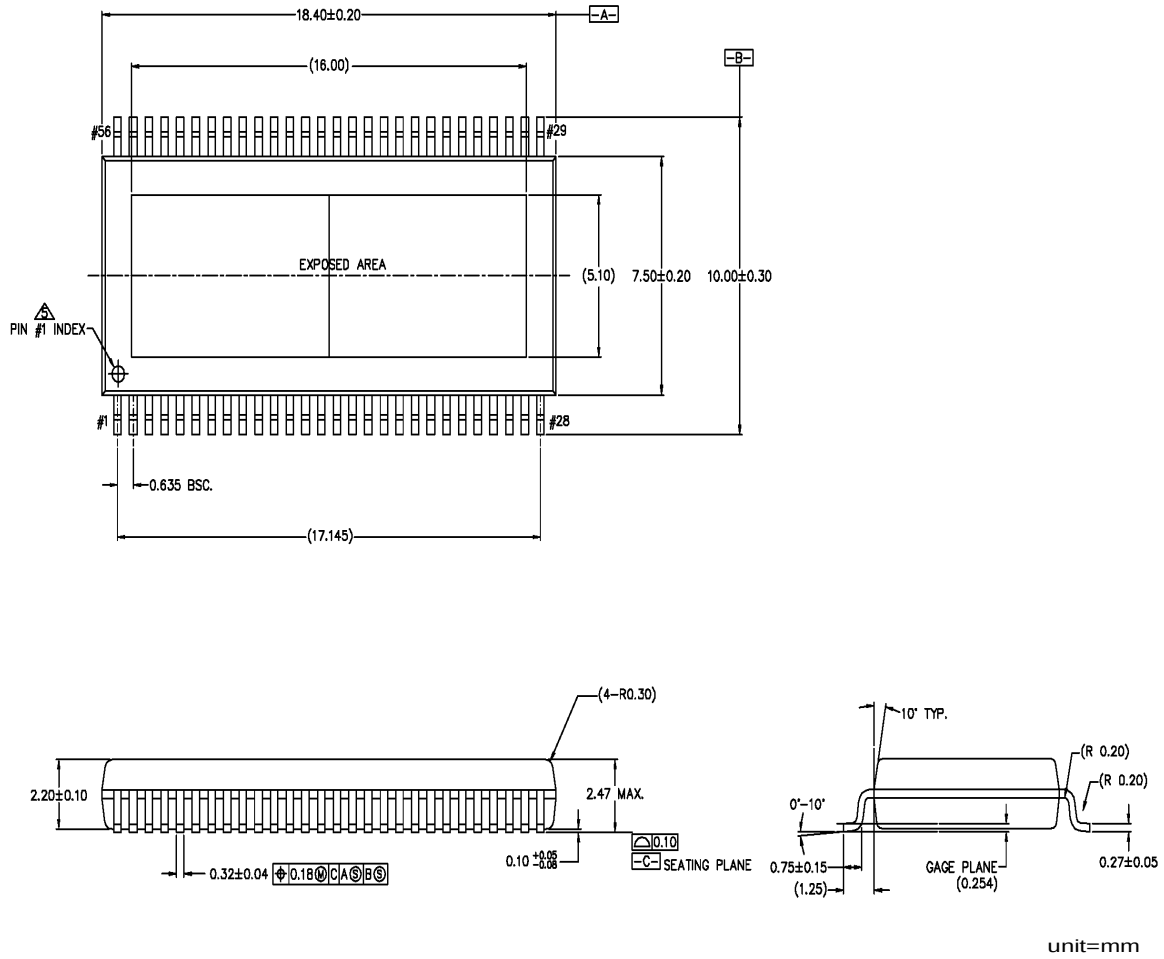


| Component                                                                        | Reference value | Remark                                                        |
|----------------------------------------------------------------------------------|-----------------|---------------------------------------------------------------|
| R1~R7                                                                            | 10kΩ            | Gain scaling resistors. Please refer to 12,13,14 pages.       |
| R_hall1,R_hall2                                                                  | 100Ω            | Hall bias resistors                                           |
| RSL1,RSL2                                                                        | 1Ω              | Rcs at sled driver. (I_limit=0.5A,Gain=0.5A/V@R6,R7 are 10kΩ) |
| RSP                                                                              | 0.33Ω           | Rcs at spindle driver. (I_limit=1.5A,Gain=1.5A/V@R1 is 10kΩ)  |
| Bypass electrolytic capacitors(47~100µF) are recommended at power supply inputs. |                 |                                                               |



# Package Dimensions of 56-SSOP-HS(lead frame is exposed to the top)

## 56-SSOP-HS



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| Bottomless™                          | FAST <sub>r</sub> ™ | MICROCOUPLER™ | PowerTrench®        | SuperSOT™-6     |
| CoolFET™                             | FPST™               | MicroFET™     | QFET®               | SuperSOT™-8     |
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