

FAN8024ED

4-Channel Motor Driver

Features

- 2-Channel BTL driver with current feedback
- 2-Channel BTL DC motor driver
- Built-in thermal shutdown circuit
- Built-in mute circuit
- Operating supply voltage: 4.5~13.2V

Typical Applications

- Compact disk ROM (CD-ROM)
- Compact disk RW (CD-RW)
- Digital video disk ROM (DVD-ROM)
- Digital video disk RAM (DVD-RAM)
- Digital video disk player (DVDP)
- Other compact disk media

Description

The FAN8024ED is a monolithic IC, suitable for 2-ch BTL DC motor drivers and 2-ch motor drivers with current feedback which drive the focus and tracking actuators of a CD media system.

28-SSOPH-375

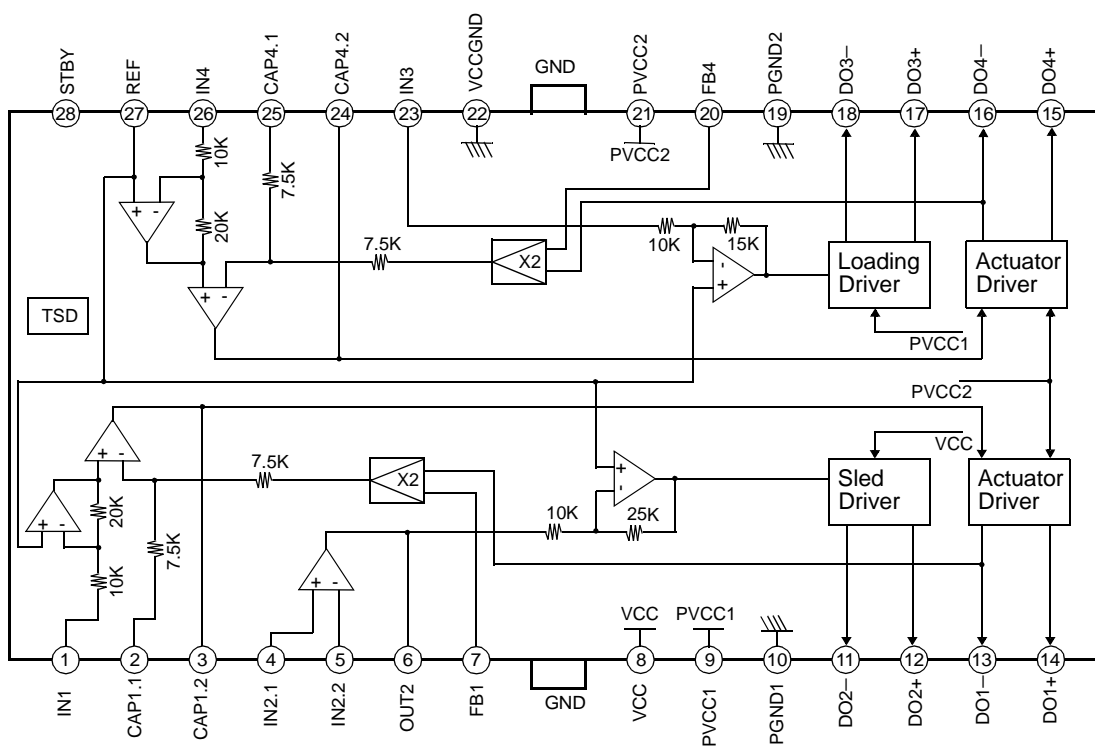


Ordering Information

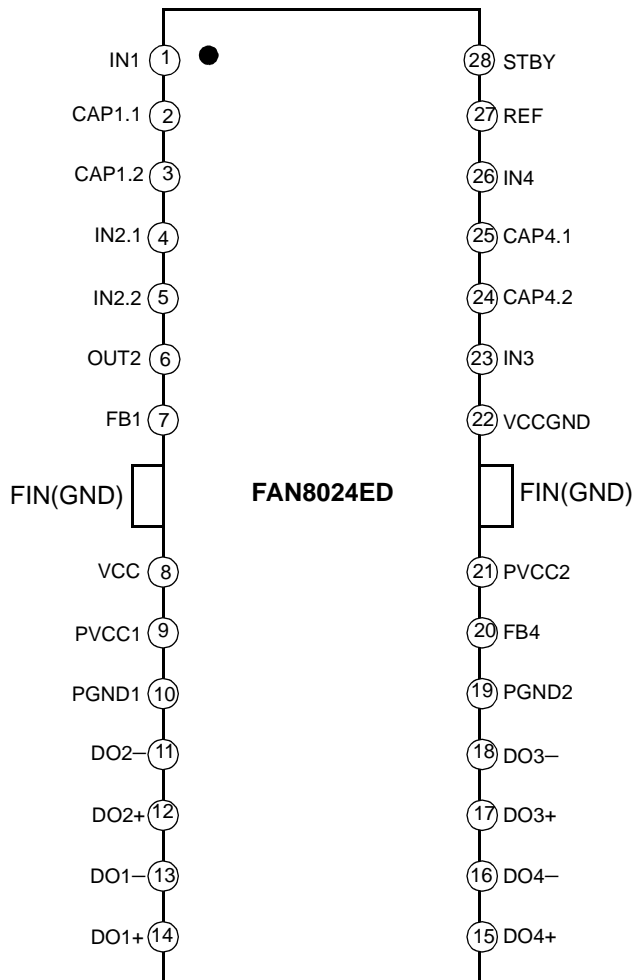
| Device | Package | Operating Temp. |
|-------------|--------------|-----------------|
| FAN8024ED | 28-SSOPH-375 | -25 °C ~ 85 °C |
| FAN8024EDTF | 28-SSOPH-375 | -25 °C ~ 85 °C |

TF: Tape & Reel type

Block Diagrams



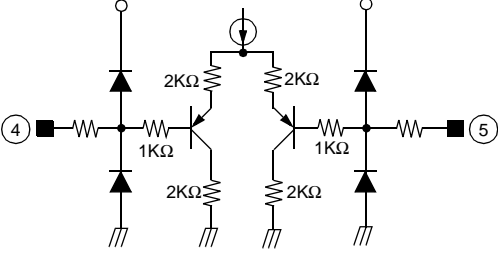
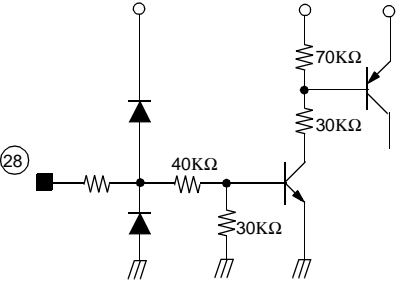
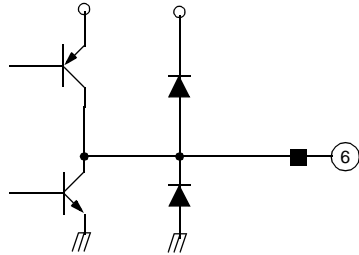
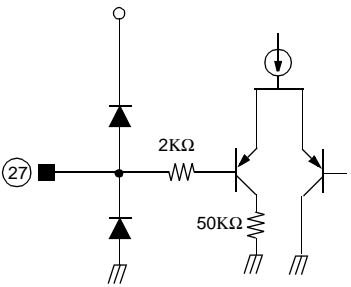
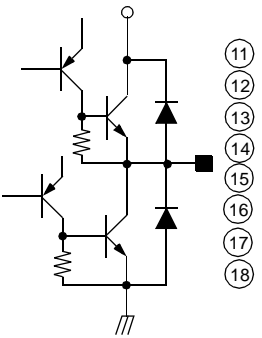
Pin Assignments



Pin Definitions

| Pin Number | Pin Name | I/O | Pin Function Description |
|------------|----------|-----|-----------------------------------|
| 1 | IN1 | I | CH1 input |
| 2 | CAP1.1 | - | Connection with capacitor for CH1 |
| 3 | CAP1.2 | - | |
| 4 | IN2.1 | I | OP-AMP CH2 input(+) |
| 5 | IN2.2 | I | OP-AMP CH2 input(-) |
| 6 | OUT2 | O | OP-AMP CH2 output |
| 7 | FB1 | I | Feedback for CH1 |
| 8 | VCC | - | Signal Vcc |
| 9 | PVCC1 | - | Power Supply 1 |
| 10 | PGND1 | - | Power Ground 1 |
| 11 | DO2- | O | Drive2 Output (-) |
| 12 | DO2+ | O | Drive2 Output (+) |
| 13 | DO1- | O | Drive1 Output (-) |
| 14 | DO1+ | O | Drive1 Output (+) |
| 15 | DO4+ | O | Drive4 Output (+) |
| 16 | DO4- | O | Drive4 Output (-) |
| 17 | DO3+ | O | Drive3 Output (+) |
| 18 | DO3- | O | Drive3 Output (-) |
| 19 | PGND2 | - | Power Ground 2 |
| 20 | FB4 | - | Feedback for CH4 |
| 21 | PVCC2 | - | Power Supply 2 |
| 22 | VCCGND | - | Vcc ground |
| 23 | IN3 | I | CH3 input |
| 24 | CAP4.2 | - | Connection with capacitor for CH4 |
| 25 | CAP4.1 | - | |
| 26 | IN4 | I | CH4 input |
| 27 | REF | I | Bias voltage input |
| 28 | STBY | I | Stand-by input |

Equivalent Circuits

| ERROR AMP INPUT | STAND-BY INPUT |
|--|--|
|  <p>Figure 1. Error Amp Input</p> |  <p>Figure 4. Stand-By Input</p> |
|  <p>Figure 2. Error Amp Output</p> |  <p>Figure 5. Signal Reference Input</p> |
|  <p>Figure 3. Power Amp Output</p> | |

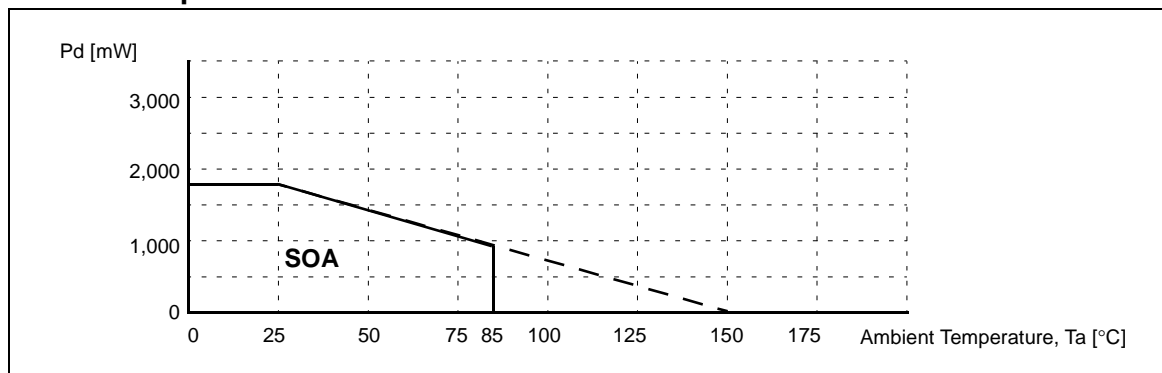
Absolute Maximum Ratings (Ta = 25°C)

| Parameter | Symbol | Value | Unit |
|-----------------------------|--------------------|---------------------|------|
| Maximum supply voltage | V _{CCmax} | 15 | V |
| Power dissipation | P _D | 1.7 ^{note} | W |
| Operating temperature range | T _{OPR} | -25 ~ +85 | °C |
| Storage temperature range | T _{STG} | -55 ~ +150 | °C |

Note:

1. When mounted on a 50mm × 50mm × 1mm PCB (Phenolic Resin Material).
2. Power dissipation derating rate: -13.6mW/°C (Ta ≥ 25°C).
3. Must not exceed Pd (Power dissipation) and SOA (Safe operating area).

Power Dissipation Curve



Recommended Operating Conditions (Ta = 25°C)

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|----------------|---------------------------------------|------|-----------------|------|------|
| Supply Voltage | V _{CC} | 4.5 | - | 13.2 | V |
| Supply Voltage | PV _{CC1} , PV _{CC2} | - | V _{CC} | - | V |

Electrical Characteristics

(Unless otherwise specified, $T_a = 25\text{ }^\circ\text{C}$, $V_{CC} = 12\text{V}$, $PV_{CC1,2} = 5\text{V}$)

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|---------------------------------|--------------|--|------|------|------|------|
| Quiescent Current1 | I_{CC1} | Stand-by off | - | 18 | 27 | mA |
| Quiescent Current2 | I_{CC2} | Stand-by on | - | - | 0.5 | mA |
| Stand-by On Voltage | V_{STon} | - | - | - | 0.5 | V |
| Stand-by Off Voltage | V_{SToff} | - | 2.0 | - | - | V |
| ACTUATOR DRIVE CIRCUIT | | | | | | |
| Output Offset Current | $I_{OO1,4}$ | - | -6 | 0 | +6 | mA |
| Maximum Output Voltage1 | $V_{OM1,4}$ | - | 3.6 | 4.0 | - | V |
| Transconductance | $G_{M1,4}$ | $V_{IN} = 100\text{mVp-p}$, $f=1\text{kHz}$ | 1.5 | 1.7 | 1.9 | A/V |
| PRE OP AMP (SLED DRIVER) | | | | | | |
| Common mode Input Range* | V_{OOM} | - | 0 | - | 11.0 | V |
| Input Bias Current | I_B | - | -300 | -30 | - | nA |
| Low Level Output Voltage | V_{OL} | - | - | 0.1 | 0.3 | V |
| High Level Output Voltage | V_{OH} | - | 10 | 10.9 | - | V |
| Output Source Current | I_{SOURCE} | - | 1 | 4 | - | mA |
| Output Sink Current | I_{SINK} | - | 5 | 10 | - | mA |
| SLED DRIVE CIRCUIT | | | | | | |
| Output Offset voltage2 | V_{OF2} | - | -100 | 0 | +100 | mV |
| Maximum Output Voltage2 | V_{OM2} | - | 10.0 | 10.9 | - | V |
| Closed loop Voltage Gain2 | G_{VLO2} | $V_{IN} = 100\text{mVp-p}$, $f=1\text{kHz}$ | 18.0 | 20.0 | 22.0 | dB |
| Loading DRIVE CIRCUIT | | | | | | |
| Output Offset Voltage3 | V_{OF3} | - | -50 | 0 | 50 | mV |
| Maximum Output Voltage 3 | V_{OM3} | - | 3.6 | 4.0 | - | V |
| Closed loop Voltage Gain 3 | G_{VLO3} | $V_{IN} = 100\text{mVp-p}$, $f=1\text{kHz}$ | 13.5 | 15.5 | 17.5 | dB |

*: Guaranteed design value

Application Information

1. Reference Input & Stand-by Function

- Reference input (PIN 27)
The applied voltage at the reference input pin must be between 0.8V and 6.5V_r when V_{CC}=8.5V.
- Stand-by input (PIN 28)
The following input conditions must be satisfied for the stand-by function.

| Stand-by input voltage | OPERATION |
|------------------------|---|
| Below 0.5V or open | The stand-by function is activated so the bias block and power block are disabled |
| Above 2.0V | Recover the normal operation |

2. Protection Function

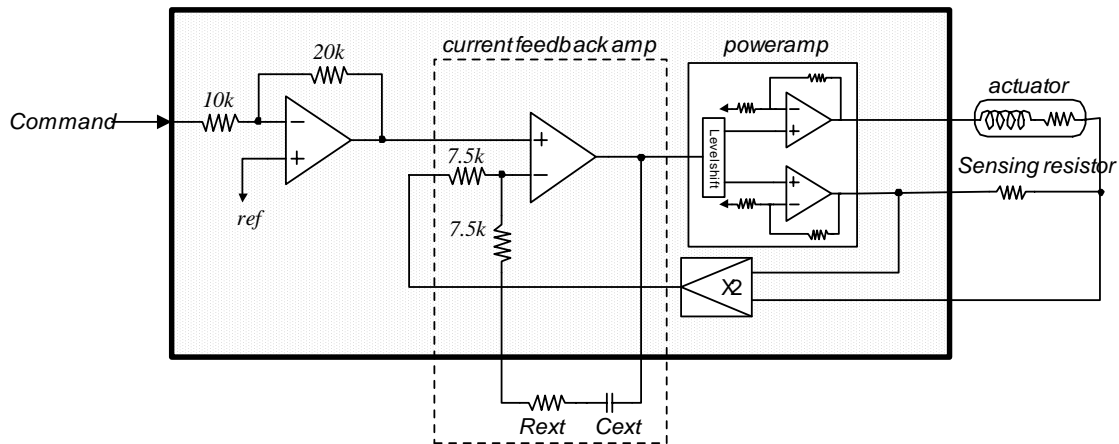
Thermal shutdown (TSD)

If the chip temperature rises above 175°C, the thermal shutdown (TSD) circuit is activated and the output circuit enters the mute state, which is off state. The TSD circuit has a temperature hysteresis of 25°C.

3. Separation of Power Supply

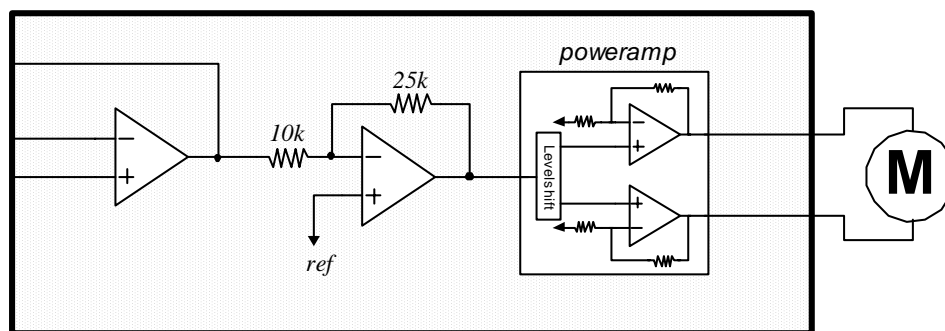
- PV_{CC1} (PIN 9)
PV_{CC1} is the power supply for the loading driver. The range is between 5V~12V.
- PV_{CC2} (PIN 21)
PV_{CC2} is the power supply for the actuator drivers that include focus and tracking actuators. The range is between 5V~12V
- V_{CC} (PIN 8)
V_{CC} pin supplies power for the sled driver and the signal logic part. V_{CC} ≥ PV_{CC1}(PV_{CC2}).

4. Current feedback channels (channel 1 & and 4)



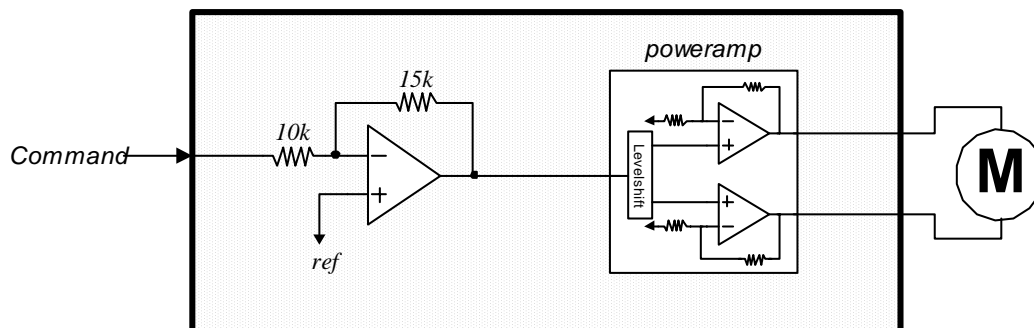
- The reference voltage(ref) is supplied externally through pin 27.
- The input OP-amp output signal is amplified by (20K/10K) times and then fed to the current feedback amplifier.
- The current feedback amplifier compares the output current sensed input and command input and then makes the controlled output to eliminate delay effect of the load. Please refer to the Application Note 4109 for additional information about current feedback theory (<http://www.fairchildsemi.com/an/AN/AN-4109.pdf>).
- The DC gain of current feedback amplifier and power amplifier is unity, which is 1 [A/V]. Users can change the gain by adding external resistor at the command input.

5. Channel 2 Schematic



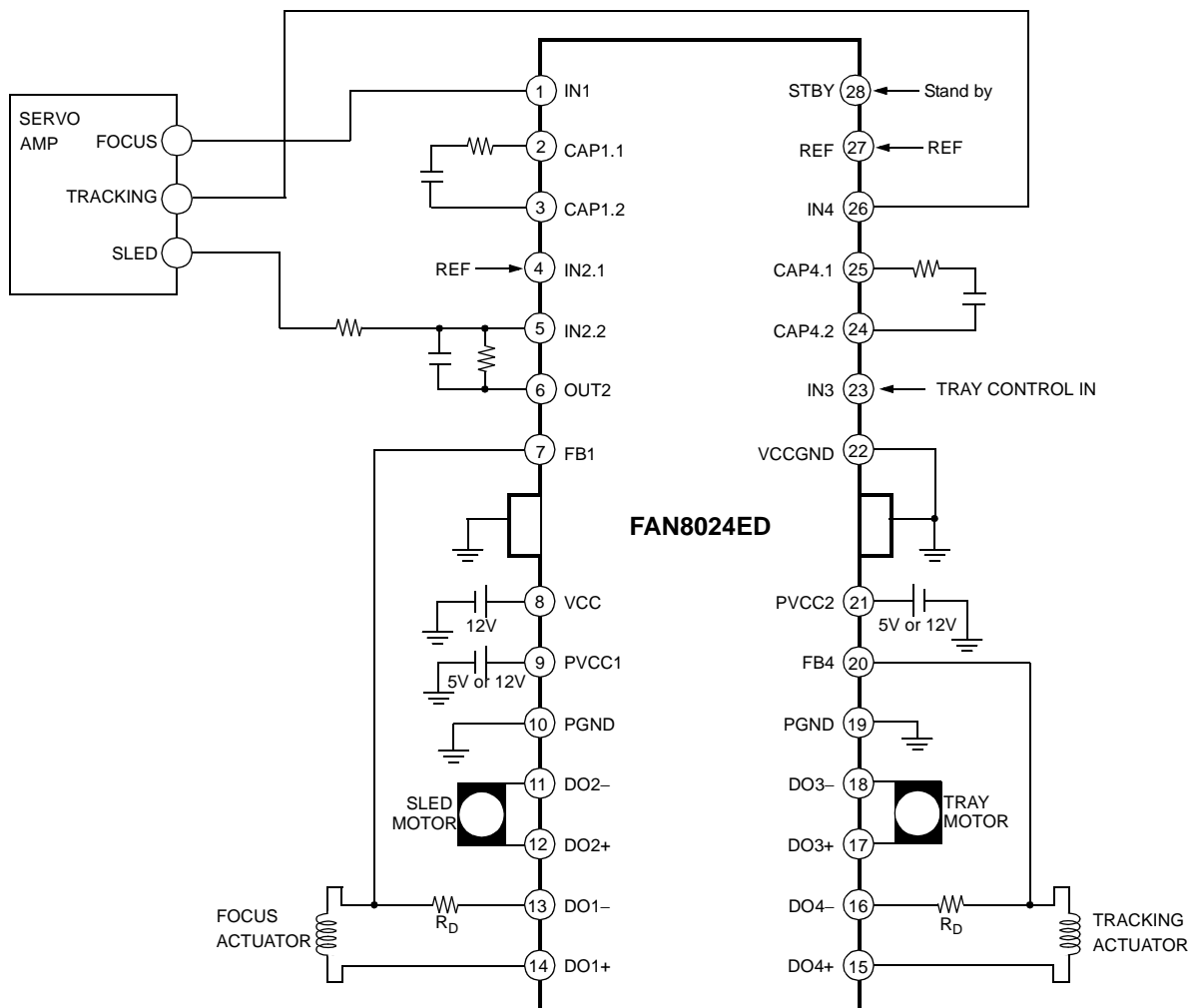
- The reference voltage(ref) is given externally through pin 27.
- The input OP-amp can be used for several purposes, for example low pass filter, differential input coordinator, gain scaler and so on.

6. Channel 3 Schematic



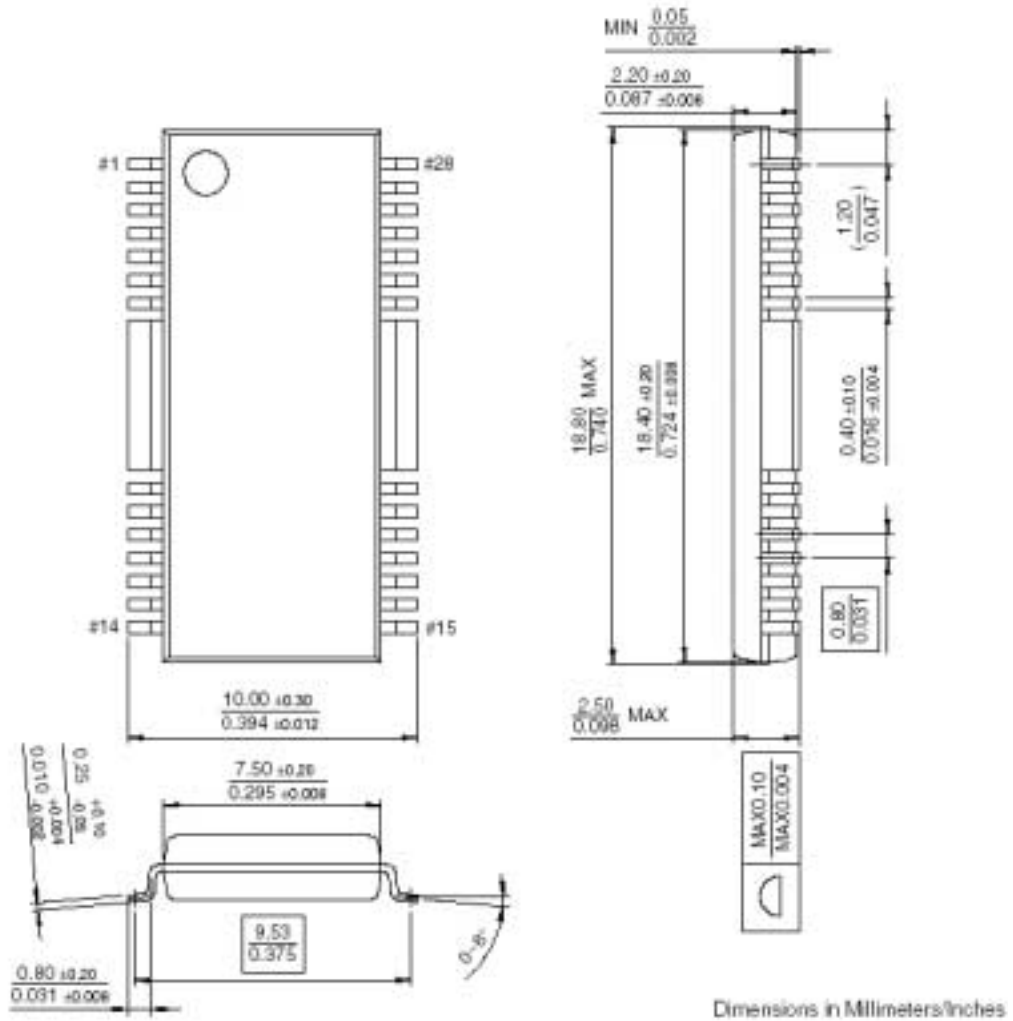
- The reference voltage(ref) is given externally through pin 27.
- The input OP-amp output signal is amplified by $(15K/10K)$ times and then fed to the power amplifier. The gain of power amplifier is 4; therefore, the total max gain of channel 3 is 6.
- Users must check input command range to use max output voltage because the total gain is relatively smaller than other channels.

Typical Application Circuits



Package Dimensions

28-SSOPH-375



TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

| | | | | |
|--------------------------------------|---------------------|---------------|---------------------|-----------------|
| ACEx™ | FACT Quiet Series™ | ISOPLANAR™ | POP™ | SuperFET™ |
| ActiveArray™ | FAST® | LittleFET™ | Power247™ | SuperSOT™-3 |
| Bottomless™ | FASTr™ | MICROCOUPLER™ | PowerTrench® | SuperSOT™-6 |
| CoolFET™ | FPST™ | MicroFET™ | QFET® | SuperSOT™-8 |
| CROSSVOLT™ | FRFET™ | MicroPak™ | QST™ | SyncFET™ |
| DOME™ | GlobalOptoisolator™ | MICROWIRE™ | QT Optoelectronics™ | TinyLogic® |
| EcoSPARK™ | GTO™ | MSX™ | Quiet Series™ | TINYOPTO™ |
| E ² CMOS™ | HiSeC™ | MSXPro™ | RapidConfigure™ | TruTranslation™ |
| EnSigna™ | I ² C™ | OCX™ | RapidConnect™ | UHC™ |
| FACT™ | ImpliedDisconnect™ | OCXPro™ | SILENT SWITCHER® | UltraFET® |
| Across the board. Around the world.™ | | OPTOLOGIC® | SMART START™ | VCX™ |
| The Power Franchise™ | | OPTOPLANAR™ | SPM™ | |
| Programmable Active Droop™ | | PACMAN™ | Stealth™ | |

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

PRODUCT STATUS DEFINITIONS

Definition of Terms

| Datasheet Identification | Product Status | Definition |
|--------------------------|------------------------|---|
| Advance Information | Formative or In Design | This datasheet contains the design specifications for product development. Specifications may change in any manner without notice. |
| Preliminary | First Production | This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design. |
| No Identification Needed | Full Production | This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design. |
| Obsolete | Not In Production | This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only. |

Rev. 17