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February 2007

# FAN7547A
# LCD Backlight Inverter Drive IC

## Features

- Backlight Lamp Ballast and Soft Dimming
- Reduced Number of Components
- Wide Range of Operating Voltage (6 to 30V)
- Precision Voltage Reference Reduced to 3.4%
- Low Standby Current (Typically 50µA)
- Soft-Start Function
- PWM Control
- Analog, Mixed, and PWM Dimming Function
- P-Channel MOSFET Drive
- Open-Lamp Protections (OLP)
- Shutdown Protections (SDP)
- 14-Pin SOP

## Description

The FAN7547A provides all control functions for a current-fed, push-pull, self-oscillation type converter and also contains a pulse-width-modulated (PWM) controller to develop a supply voltage. Typical operating frequency range is from 30kHz to 100kHz, depending on the cold cathode fluorescent lamp (CCFL) and the transformer's characteristics.

**14-SOP**



## Ordering Information

| Part Number | Package | Pb-Free | Operating Temperature Range | Packing Method |
|---|---|---|---|---|
| FAN7547AM | 14-SOP | Yes | -25°C ~ +85°C | Tube |
| FAN7547AMX | | | | Tape & Reel |

# Internal Block Diagram
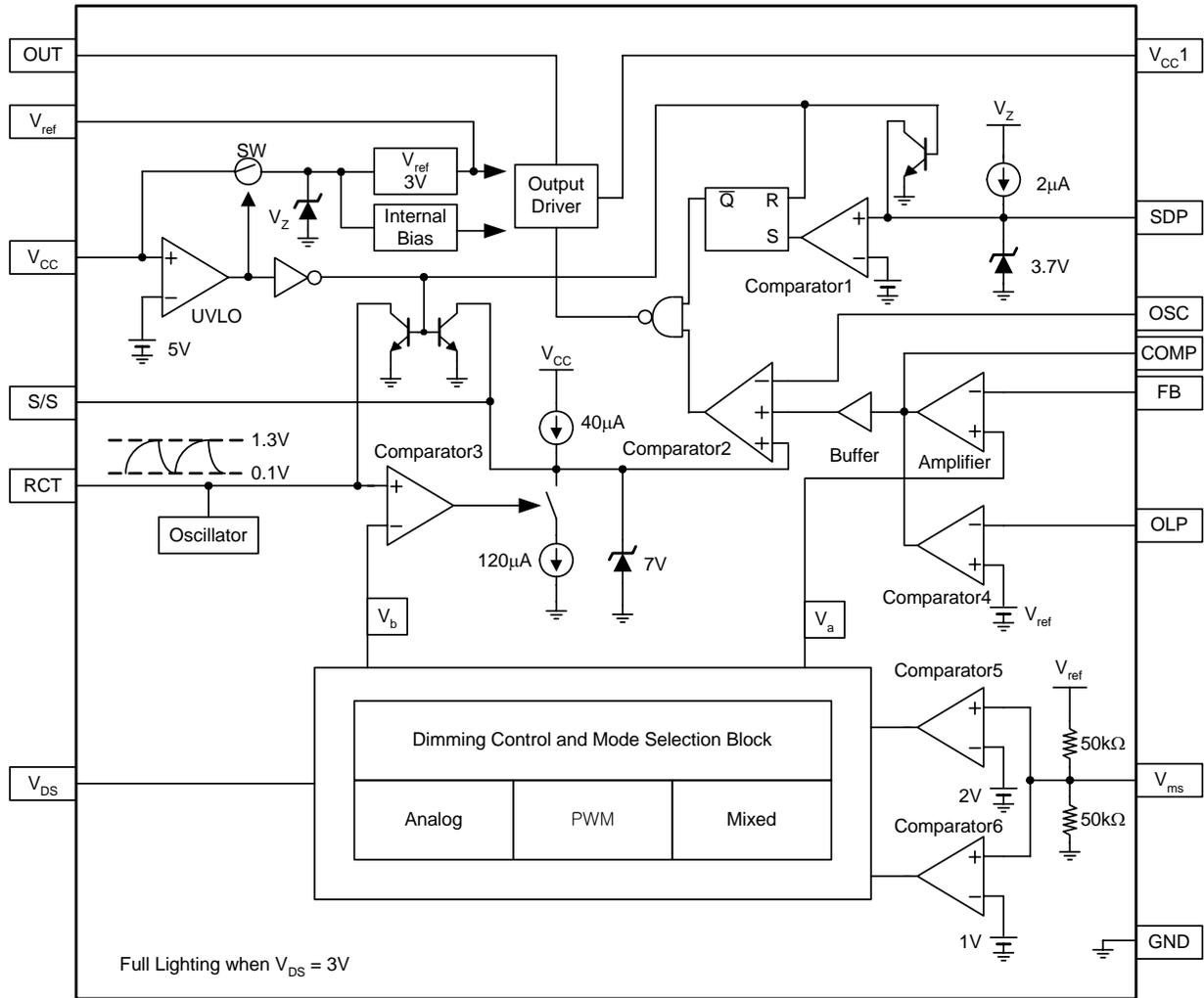


FAN7547A Rev. 1.01

**Figure 1. Functional Block Diagram of FAN7547A**

## Pin Configuration

| OUT | V$_{CC}$1 | V$_{CC}$ | OSC | S/S | COMP | FB |
|-----|-----|-----|-----|-----|------|----|
| 14 | 13 | 12 | 11 | 10 | 9 | 8 |

**FAN7545A**

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| GND | V$_{DS}$ | V$_{ref}$ | V$_{ms}$ | RCT | OLP | SDP |

FAN7547A Rev. 1.00
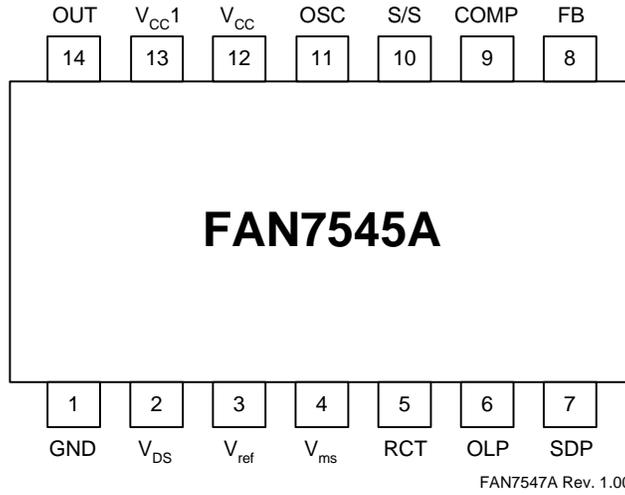
**Figure 2. Pin Configuration (Top View)**

## Pin Definitions

| Pin # | Name | I/O | Description |
|-------|------|-----|-------------|
| 1 | GND | | Ground |
| 2 | V$_{DS}$ | I | Dimming Voltage Input |
| 3 | V$_{ref}$ | O | Reference Voltage |
| 4 | V$_{ms}$ | I | Dimming Mode Selection |
| 5 | RCT | | Burst Dimming Frequency Set |
| 6 | OLP | I | Open-Lamp Protection |
| 7 | SDP | I | Shutdown Protection |
| 8 | FB | I | Feedback Input |
| 9 | COMP | | Error Amplifier Output |
| 10 | S/S | | Soft-Start |
| 11 | OSC | I | Main Ct |
| 12 | V$_{CC}$ | I | Supply Voltage |
| 13 | V$_{CC}$1 | I | Output Drive Source Voltage |
| 14 | OUT | O | Output Drive |

## Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only. $-25°C \leq T_A \leq 85°C$ and $V_{CC}$=10V unless otherwise specified.

| Symbol | Parameter | Value | Unit |
|--------|-----------|-------|------|
| $V_{CC}$ | Supply Voltage | 6 to 30 | V |
| $T_J$ | Operating Junction Temperature | 150 | °C |
| $T_A$ | Operating Temperature Range | -25 to 85 | °C |
| $T_{STG}$ | Storage Temperature Range | -65 to 150 | °C |
| $P_D$ | Power Dissipation | 0.5 | W |

## Electrical Characteristics

Unless otherwise noted, these specifications apply to the operating ambient temperatures for the FAN7547A with
$-25°C \leq T_A \leq 85°C$ and $V_{CC} = 10V$.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|--------|-----------|------------|------|------|------|------|
| **UVLO SECTION** | | | | | | |
| $V_{ST}$ | Start Voltage | | 4.9 | 5.4 | 5.9 | V |
| $I_{ST}$ | Start Current | $V_{CC} = 4.5V$ | | 50 | 200 | μA |
| $I_{CC}$ | Operating Current | $7V < V_{CC} < 30V$ | | 5.5 | 8.0 | mA |
| **REFERENCE SECTION** | | | | | | |
| $V_{ref}$ | Reference Voltage | $T_J = 25°C$, $I_{ref} = 0mA$, $7V < V_{CC} < 30V$ | 2.95 | 3.05 | 3.15 | V |
| **SOFT-START SECTION** | | | | | | |
| $I_{SS}$ | Soft -Start Charge Current | $C_{SS} = 4V$ | 33 | 40 | 47 | μA |
| $I_{pwm}$ | PWM Discharge Current | $C_{SS} = 4V$ | 48 | 70 | 85 | μA |
| **OSCILLATOR SECTION** | | | | | | |
| $f_{pwm}$ | Operating Frequency | $7V < V_{CC} < 30V$ | 170 | 200 | 230 | Hz |
| $V_{pwmh}$ | Osc High Voltage | | | 1.3 | | V |
| $V_{pwml}$ | Osc Low Voltage | | | 0.1 | | V |
| **DIMMING SECTION** | | | | | | |
| $V_a$ | Analog Dimming Range | $V_{ms} > 2V$ | 0 | | 3 | V |
| $V_b$ | | | | 3 | | V |
| $V_a$ | PWM Dimming Range | $V_{ms} < 1V$ | 2.1 | 2.5 | 2.9 | V |
| $V_b$ | | | 0 | | 2.5 | V |
| $V_a$ | Mixed Dimming Range | $V_{ms} = 1.5V$ or open | 1.2 | | 3.0 | V |
| $V_b$ | | | 0 | | 3 | V |
| **MODE SELECTION** | | | | | | |
| $V_{sa}$ | Analog Dimming Select Voltage | | 1.5 | 2.0 | 2.5 | V |
| $V_{sp}$ | PWM Dimming Select Voltage | | 0.7 | 1.0 | 1.3 | V |
| $V_{sc}$ | Mixed Dimming Select Voltage | | 1.2 | 1.5 | 1.8 | V |
| **OPEN-LAMP PROTECTION** | | | | | | |
| $V_{open}$ | Open-Lamp Detect Voltage | $7V < V_{CC} < 30V$ | 2.5 | 3.0 | 3.5 | V |
| **SHUTDOWN PROTECTION** | | | | | | |
| $I_{sd}$ | Shutdown Current | $7V < V_{CC} < 30V$ | 1 | 2 | 3 | μA |
| $V_{sd}$ | Shutdown Voltage | | 2.5 | 3.0 | 3.5 | V |
| **OUTPUT SECTION** | | | | | | |
| $V_{OH}$ | Output High Voltage | $V_{CC} = 10V$ | 8 | 9 | 10 | V |
| $V_{OL}$ | Output Low Voltage | $V_{CC} = 10V$ | | | 1 | V |
| $t_r$ | Rising Time | $V_{CC} = 10V$ | | 120 | 200 | ns |
| $t_f$ | Falling Time | $V_{CC} = 10V$ | | 60 | 120 | ns |
| $V_{UV}$ | Output Voltage with UVLO Activated | $V_{CC} = 4V$ | 2 | | 4 | V |

## Typical Characteristics
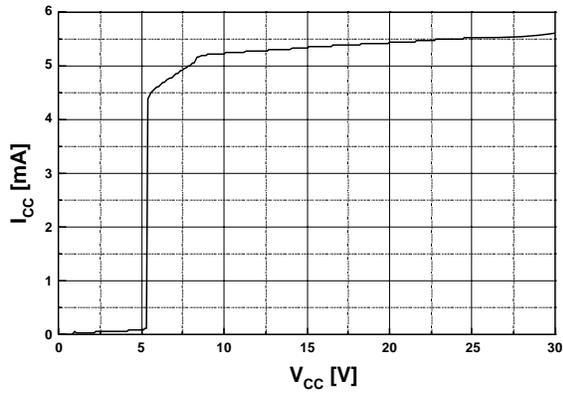


**Figure 3. Start Voltage**
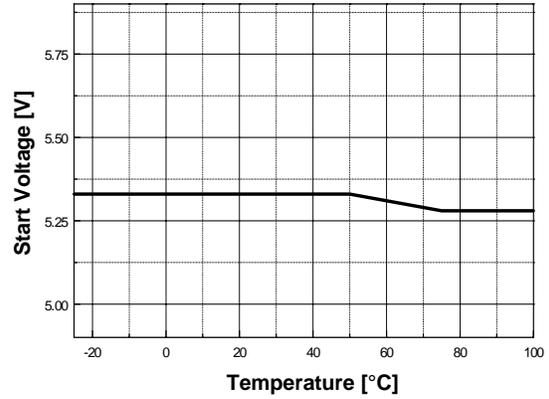


**Figure 4.  Start Voltage vs. Temperature**
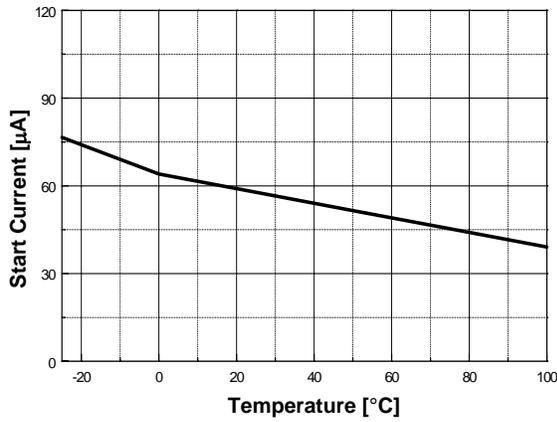


**Figure 5.  Output vs. Temperature**
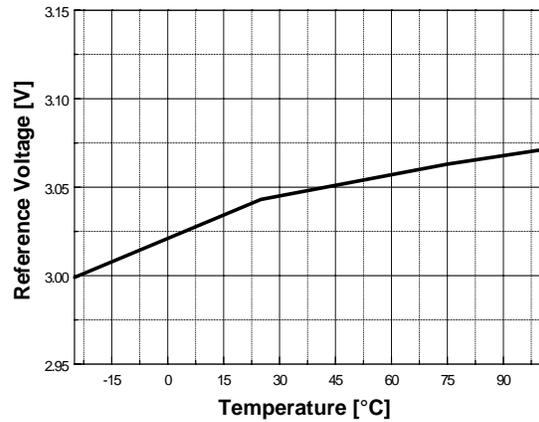


**Figure 6. Reference Voltage vs. Temperature**
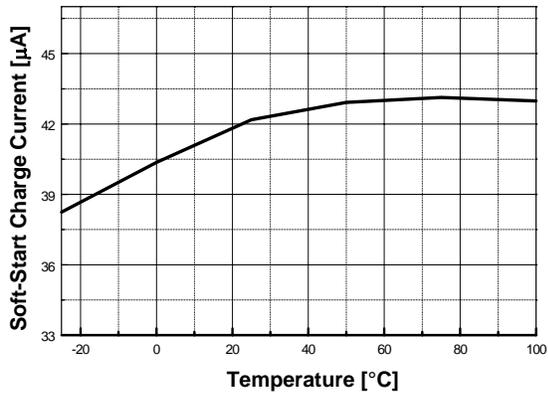


**Figure 7. Soft-Start Charge Current vs. Temperature**
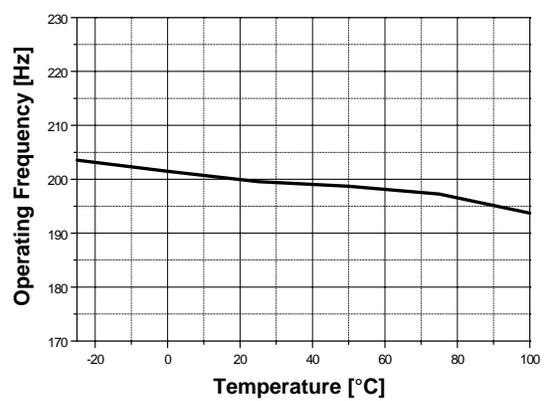


**Figure 8. Operating Frequency vs. Temperature**

## Typical Characteristics (Continued)
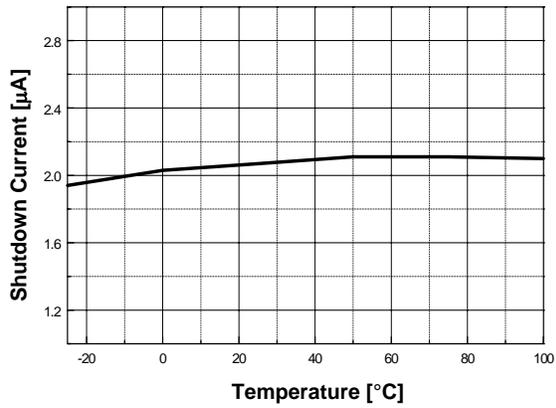


**Figure 9. Protection Current vs. Temperature**
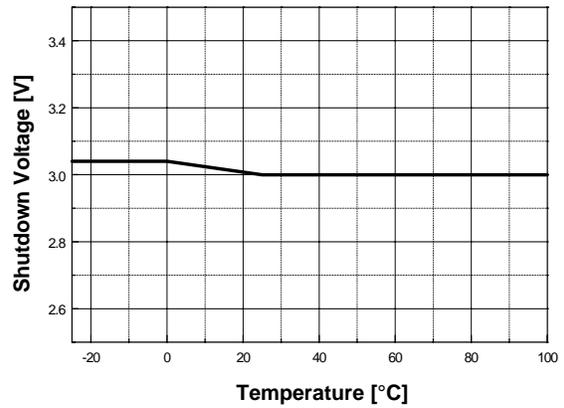


**Figure 10. Protection Voltage vs. Temperature**
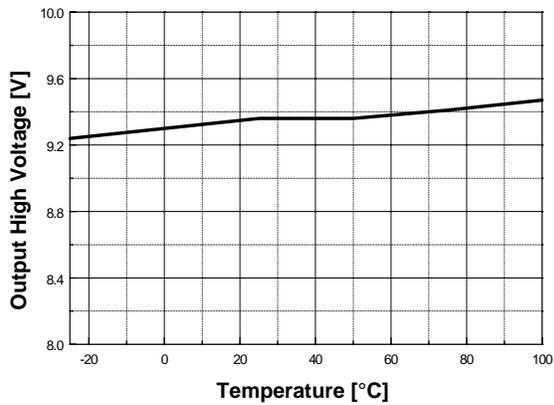


**Figure 11.  Output High Voltage vs. Temperature**
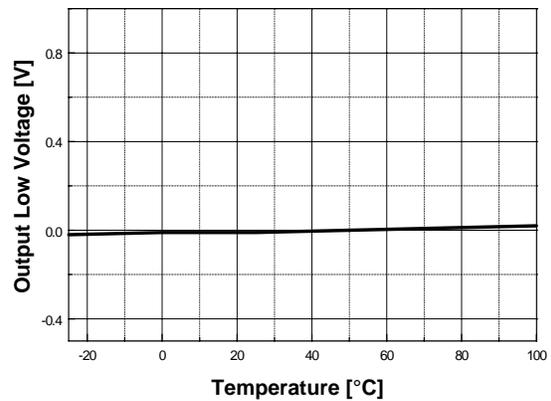


**Figure 12. Output Low Voltage vs. Temperature**
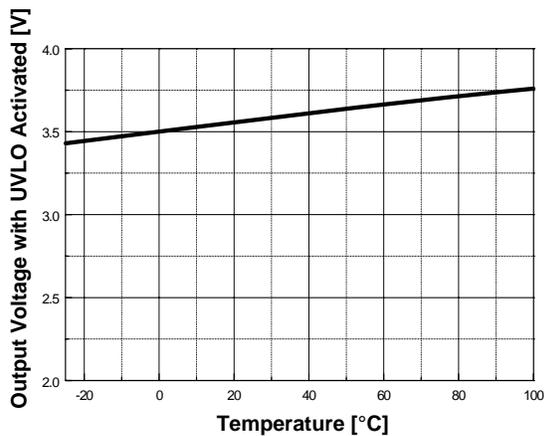


**Figure 13. Output Voltage with UVLO Activated vs. Temperature**

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## Package Dimensions

### 14-SOP

Dimensions are in millimeters unless otherwise noted.

8.60±0.10 [A]

7.62

14       8

[B]

6.00

3.90±0.10

PIN ONE
INDICATOR

1       7

(0.33)

0.51
0.35

1.27

⊕ 0.25Ⓜ C B A

7.40

4.00

(1.70)

1.27       0.75

7.62

LAND PATTERN RECOMMENDATION

1.75 MAX

1.45 +0.05
    −0.20

△ 0.10 C [C]

0.15 +0.10
     −0.05

SEE DETAIL A

0.25
0.19

0.50
0.25 X 45°

(R0.10)

(R0.10)

GAGE PLANE

0.36

8°
0°

SEATING PLANE

0.70±0.20

(1.04)

M14AREVL

DETAIL A

SCALE: 20:1
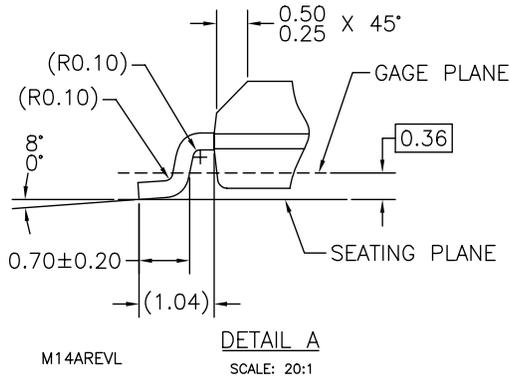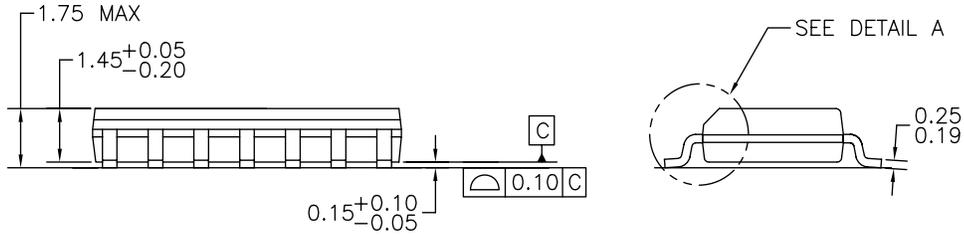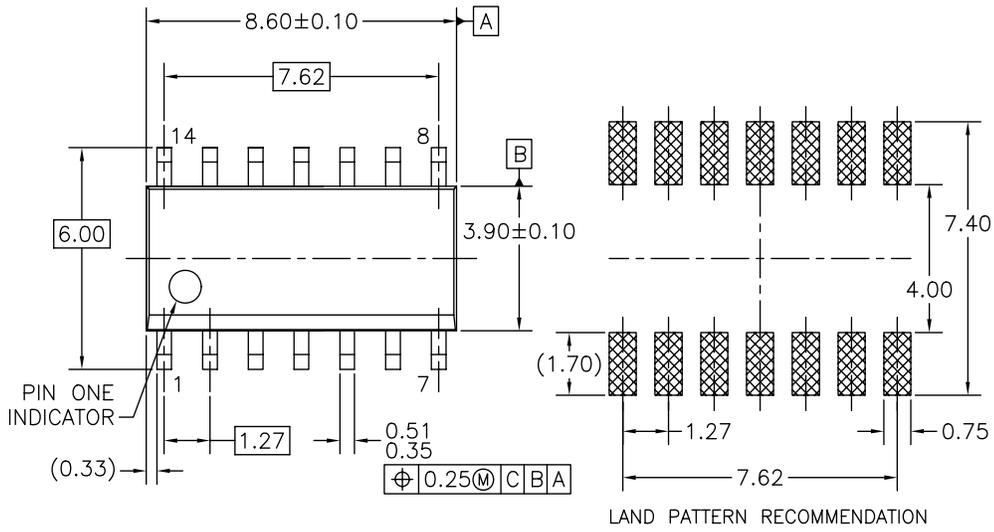
NOTES: UNLESS OTHERWISE SPECIFIED

A)  THIS PACKAGE CONFORMS TO JEDEC
    MS−012, VARIATION AB, ISSUE C,
    DATED MAY 1990.
B)  ALL DIMENSIONS ARE IN MILLIMETERS.
C)  DIMENSIONS DO NOT INCLUDE MOLD
    FLASH OR BURRS.

**Figure 14. 14-Lead Small Outline Package (SOP)**

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Wire™

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