AT&T Microelectronics

# LH1263 E & M Signaling Circuit

## Features

- Switches controlled by TTL compatible data inputs
- One switch with 250 mA current-break capability
- Two switches have low ON-resistance
  — <8 Ω at 250 mA
  — <35 Ω at 85 mA (current-limit switch)
- No EMI
- 180 mA driver circuit for external relays (TTL compatible)
- Clean, bounce-free switching
- Solid-state reliability
- High-voltage monolithic IC fabricated in a dielectric process

## Description

The LH1263AE E & M Signaling Circuit replaces electromechanical relays and discrete components that are utilized in line signaling interface circuits such as E & M trunk signaling and FX ground-start applications. This IC is comprised of logic-programmable, latched switch control; three high-voltage switches (one for overcurrent protection); a ground-reference comparator, and a driver for external relays. The latches store data, which establishes this IC as a Type I, II, III, IV, or V interface. The ground reference comparator and a few resistors provide the E lead and M lead detector. The overcurrent protection eliminates the need for a positive temperature coefficient (PTC) resistor or a ballast lamp on the M lead battery supply.

The LH1263AE device can be configured to perform Type I, II, III, IV, and V interfaces. Multiple ICs are required for some of the interfaces. The LH1263AE device is available in a 20-pin, plastic DIP.



0050026 0019748 242

## Description (continued)

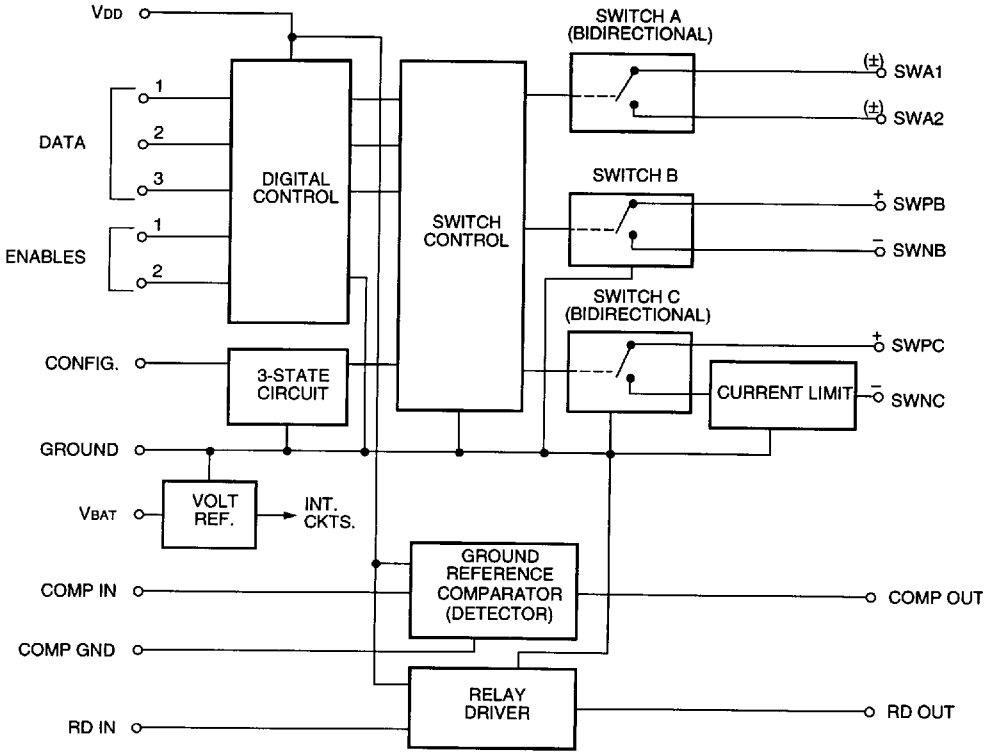



**Figure 1. Functional Block Diagram**



0050026 0019749 189

## Pin Information

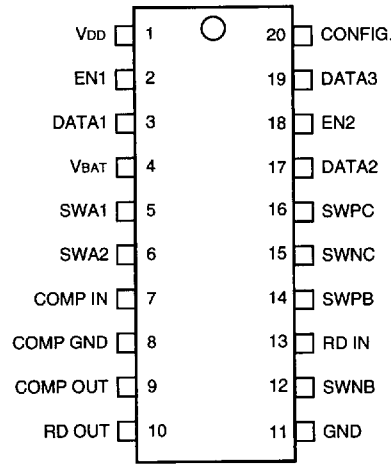



**Figure 2. Pin Diagram**

**Table 1. Pin Descriptions**

| Pin | Symbol | Name/Function |
|---|---|---|
| 1 | $V_{DD}$ | **Positive Supply Voltage.** Operating voltage is +5.0 V (±0.25 V). |
| 2<br>18 | EN1<br>EN2 | **ENABLE.** These TTL compatible inputs enable (logic-high) or disable (logic-low) inputs DATA1 and DATA3 respectively. |
| 3<br>17<br>19 | DATA1<br>DATA2<br>DATA3 | **DATA.** These TTL-compatible inputs provide the logic for controlling switches 1, 2, and 3. |
| 4 | $V_{BAT}$ | **$V_{BAT}$.** Connections for the negative external power (operating voltage is –42.5 V to –60 V). This pin is typically connected to a central office supply in telephone applications. |
| 5<br>6 | SWA1<br>SWA2 | **Outputs for Bidirectional Switch A.** Loads can be connected to these outputs irrespective of polarity. |
| 7<br>9 | COMP IN<br>COMP OUT | **Comparator.** Ground reference comparator input and output respectively. |
| 8 | COMP GND | **Comparator Ground.** An independent ground or common for the comparator. |
| 10<br>13 | RD OUT<br>RD IN | **Relay I/O.** Relay output and input respectively. |
| 11 | GND | **Ground.** Common ground point for device circuitry (except the comparator). |
| 12<br>14 | SWNB<br>SWPB | **Outputs for Switch B.** SWNB and SWPB connect to the negative and positive potentials respectively of a load for Switch B. |
| 15<br>16 | SWNC<br>SWPC | **Outputs for Switch C.** SWNC and SWPC connect to the negative and positive potentials respectively of a load for Switch C. |
| 20 | CONFIG | **Configuration.** Pin for determining one of three possible logic combinations for switch control (see Table 7). |



0050026 0019750 9T0

## Absolute Maximum Ratings ($T_A$ = 25 °C)

Stresses in excess of the Absolute Maximum Ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of the data sheet. Exposure to Absolute Maximum Ratings for extended periods of time can adversely affect device reliability.

**Table 2. Absolute Maximum Ratings**

| Parameter | Symbol | Min | Max | Unit |
|---|---|---|---|---|
| Ambient Operating Temperature Range | $T_A$ | –40 | +85 | °C |
| Storage Temperature Range | $T_{stg}$ | –40 | +125 | °C |
| Pin Soldering Temperature (t = 15 s max) | $T_S$ | — | 300 | °C |
| Supply Voltage ($V_{DD}$ to Common) | $V_S$ | — | 5.50 | V |
| Supply Voltage ($V_{NEG}$ to Common) | $V_S$ | –60 | — | V |
| Switch A and B Terminal Voltage | — | –200 | +200 | V |
| Switch C Terminal Voltage<br>Pin 15 (Pin 16 at GND)<br>Pin 16 (Pin 15 at –48 V) | <br>—<br>— | <br>–80<br>–200 | <br>+200<br>+152 | <br>V<br>V |
| dc Switch Current Capacity<br>Switch A and B<br>Switch C | <br>—<br>— | <br>—<br>— | <br>360<br>* | <br>mA<br>mA |

* Switch C is current limited between 140 mA and 360 mA.

**Table 3. Excessive Fault Conditions**

| Description | Condition | Specifications | Switch |
|---|---|---|---|
| Fault Current | On<br>On<br>Shutdown | 4 A to 0.8 A in 10 ms<br>1.5 A for 1 s<br>Between 140 mAdc & 360 mAdc | A<br>A<br>C |
| Lightning | On/Off | 1000 V, 10 x 1000 µs, 2.5 A peak<br>1000 V, 10 x 1000 µs, 50 mA peak | A<br>B, C |
| Power Cross | On/Off | 600 Vrms — 1 s, 1 kΩ | A |

## Recommended Operating Conditions

**Table 4. Supply Voltages**

| Name | Symbol | Value | Unit |
|---|---|---|---|
| Supply Voltage | $V_{DD}$ | +5.0 ± 0.25 | V |
| Supply Voltage | $V_{BAT}$ | –42.5 to –52.5 | V |

**Table 5. Comparator Operation (BAT/GND Detector)**

COMP GND pin is connected to an external ground reference.

| Input Voltage at COMP IN* | Resulting Output Voltage at COMP OUT | Operational Conditions at COMP OUT |
|---|---|---|
| +50 mV to $V_{DD}$ | 2.4 V to $V_{DD}$ (TTL high) | Sources current up to 50 µA |
| ≤–50 mV | 0 V to 0.4 V (TTL low) | Sinks current up to 500 µA |

* COMP IN is internally diode clamped to $V_{DD}$ and COMP GND with a maximum current of 20 mA.



0050026 0019751 837

## Recommended Operating Conditions (continued)

**Table 6. Relay Driver Operation**

| Input Voltage at RD IN | Resulting Output Voltage at RD OUT | Operational Conditions at RD OUT |
|---|---|---|
| Low — 0 V to 0.8 V | ≤0.9 V | Sinks current ≤ 180 mA |
| High — 2.2 V to $V_{DD}$ | Open circuit | ≤50 µA leakage at ≤ $V_{DD}$ |

## Electrical Characteristics $T_A$ = 25 °C

| Parameter | Test Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Power Supply Current $V_{DD}$ | Measure $I_{VDD}$ (See Figure 7.) | — | 0.5 | 5.0 | mA |
| Power Supply Current $V_{BAT}$ | Measure $I_{BAT}$ (See Figure 7.) | — | 1.6 | 2.5 | mA |
| Switch A On Voltage | Measure pin 6 = +85 mA (See Figure 8.) | — | 1.0 | 2.0 | V |
| | Measure pin 6 = –85 mA (See Figure 8.) | — | 1.0 | 2.0 | V |
| Switch B On Voltage | Measure pin 14 = 250 mA (See Figure 9.) | — | 1.6 | 2.0 | V |
| Switch C On Voltage | Measure pin 16 = 85 mA (See Figure 10.) | — | 2.2 | 3.0 | V |
| Switch A Break Current* | Pin 6 = +130 mA (See Figure 11.) | — | | | |
| | Pin 6 = –130 mA (See Figure 11.) | | | | |
| Switch B Break Current* | Pin 14 = 250 mA (See Figure 12.) | — | | | |
| Switch A Leakage Current | Vs = +200 V, Measure +I (See Figure 13.) | — | <1.0 | 10 | µA |
| | Vs = –200 V, Measure –I (See Figure 13.) | — | <–1.0 | –10 | µA |
| | Vs = +152 V, Measure +I (See Figure 14.) | — | <1.0 | 10 | µA |
| | Vs = –248 V, Measure –I (See Figure 14.) | — | <–1.0 | –10 | µA |
| Switch B Leakage Current | Vs = +200 V, Measure +I (See Figure 15.) | — | <1.0 | 10 | µA |
| | Vs = –200 V, Measure –I (See Figure 15.) | — | <–1.0 | –10 | µA |
| | Vs = +152 V, Measure +I (See Figure 16.) | — | <1.0 | 10 | µA |
| | Vs = –248 V, Measure –I (See Figure 16.) | — | <–1.0 | –10 | µA |
| Switch C Leakage Current | Vs = +200 V, Measure +I (See Figure 17.) | — | <1.0 | 10 | µA |
| | Vs = –80 V, Measure –I (See Figure 17.) | — | <–1.0 | –10 | µA |
| | Vs = +152 V, Measure +I (See Figure 18.) | — | <1.0 | 10 | µA |
| | Vs = –200 V, Measure –I (See Figure 18.) | — | <–1.0 | –10 | µA |
| Relay Driver On Voltage | Measure Pin 10 (See Figure 19.) | — | — | 0.9 | V |
| Relay Driver Output Leakage Current | (See Figure 20.) | — | — | 50 | µA |
| Comparator Output: | Measure Pin 9 (See Figure 21.) | | | | |
| On Voltage | Vs = –50 mV, Pin 9 = +500 µA | — | — | 0.4 | V |
| Off Voltage | Vs = +50 mV, Pin 9 = –50 µA | 2.4 | — | — | V |
| Switch C Shutdown† | (See Figure 22.) | — | | | |
| Digital Input Low-level Voltage | — | — | — | 0.8 | V |
| Digital Input High-level Voltage | — | 2.2 | — | — | V |
| Feedthrough Capacitance: | | | | | |
| Switch A | Switch off, f = 1 MHz | — | 9.0 | — | pF |
| Switch B | Switch off, f = 1 MHz | — | 2.0 | — | pF |
| Switch C | Switch off, f = 1 MHz | — | 65 | — | pF |

* The test figures show the initial setup conditions (relay in the normally closed position). The relay is activated to complete the break-current capability test.

† This switch has overcurrent protection. Figure 22 describes the fault condition. S1 is to be closed after all other connections have been made. Typical average current on pin 15 during a fault is less than 30 mA. The shutdown current window is between 140 mA and 360 mA.



0050026 0019752 773

## Typical Characteristic Curves

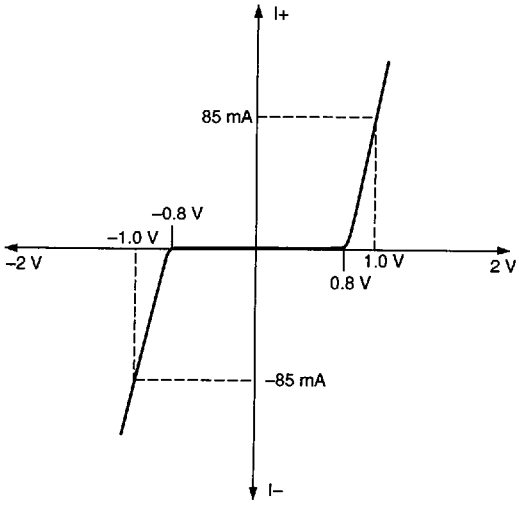



Figure 3. Typical ON Characteristics Switch A

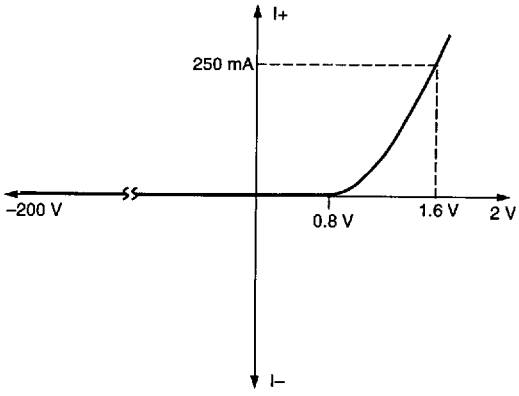



Figure 4. Typical ON Characteristics Switch C

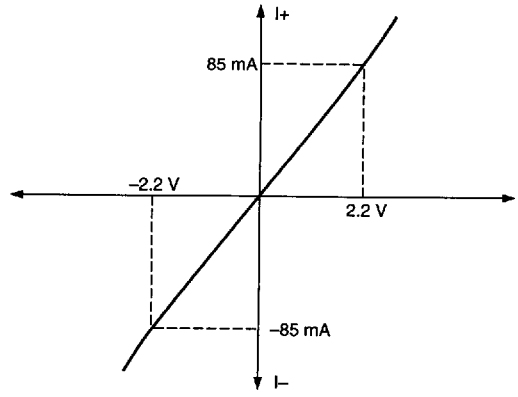



Figure 5. Typical ON Characteristics Switch B

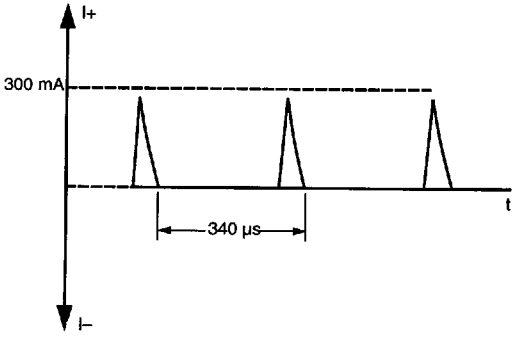



Figure 6. Switch C, Current-Limit Mode



0050026 0019753 60T

## Logic Table

**Table 7. Logic Table**

Pins EN1 and EN2 are enabled (logic high).

| Inputs | | | | Device State | | |
|---|---|---|---|---|---|---|
| DATA1 | DATA2 | DATA3 | CONFIG | Switch A | Switch B | Switch C |
| Low | Low | Low | Ground | Closed | Open | Open |
| Low | Low | High | Ground | Closed | Open | Open |
| Low | High | Low | Ground | Open | Open | Open |
| Low | High | High | Ground | Open | Open | Open |
| High | Low | Low | Ground | Closed | Open | Open |
| High | Low | High | Ground | Closed | Closed | Closed |
| High | High | Low | Ground | Open | Open | Open |
| High | High | High | Ground | Open | Closed | Closed |
| Low | Low | Low | N/C | Closed | Open | Open |
| Low | Low | High | N/C | Closed | Open | Closed |
| Low | High | Low | N/C | Open | Open | Open |
| Low | High | High | N/C | Open | Open | Closed |
| High | Low | Low | N/C | Closed | Open | Open |
| High | Low | High | N/C | Closed | Open | Closed |
| High | High | Low | N/C | Open | Closed | Open |
| High | High | High | N/C | Open | Closed | Closed |
| Low | Low | Low | $V_{BAT}$ | Closed | Open | Open |
| Low | Low | High | $V_{BAT}$ | Closed | Open | Closed |
| Low | High | Low | $V_{BAT}$ | Open | Open | Open |
| Low | High | High | $V_{BAT}$ | Open | Open | Closed |
| High | Low | Low | $V_{BAT}$ | Open | Closed | Open |
| High | Low | High | $V_{BAT}$ | Open | Closed | Closed |
| High | High | Low | $V_{BAT}$ | Open | Open | Open |
| High | High | High | $V_{BAT}$ | Open | Open | Closed |



0050026 0019754 546

## Test Circuits

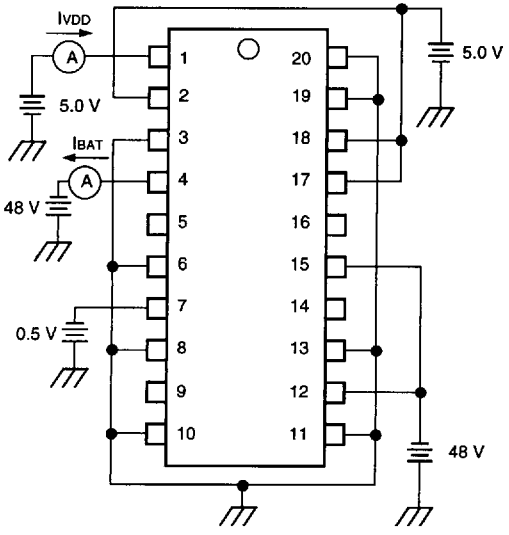



Figure 7. Supply Currents

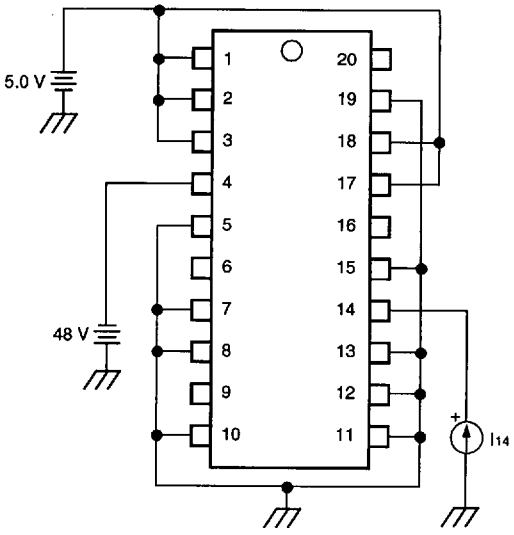



Figure 9. Positive ON Voltage — Switch B

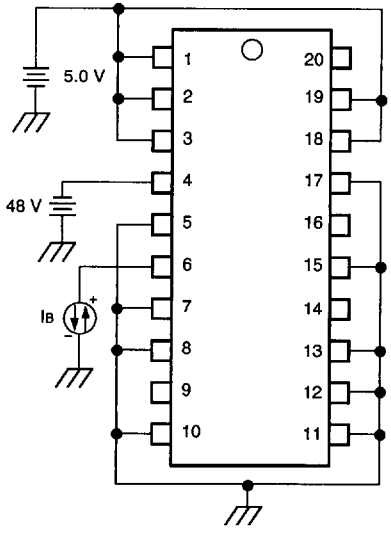



Figure 8. Positive/Negative ON Voltage — Switch A

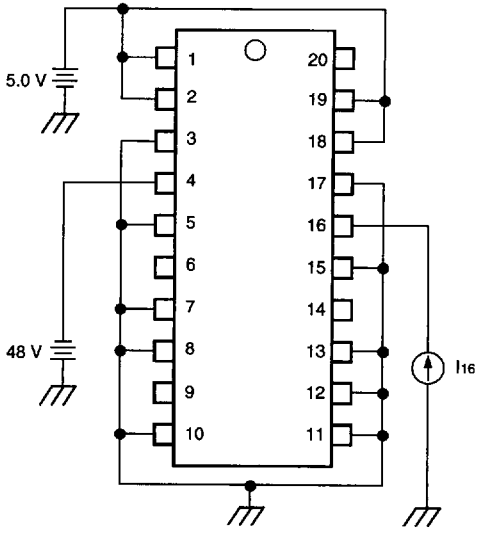



Figure 10. Positive ON Voltage — Switch C



0050026 0019755 482

## Test Circuits (continued)

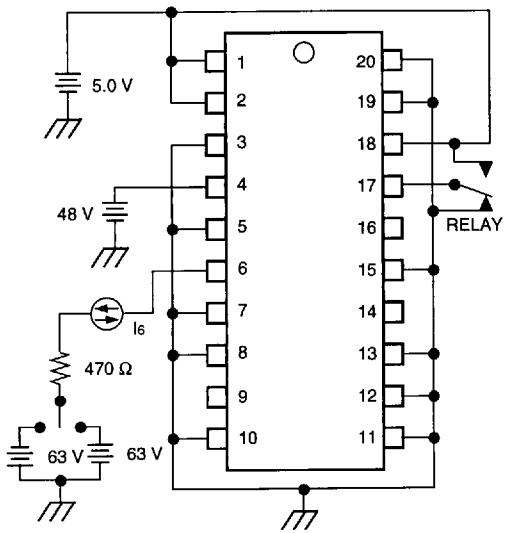



Figure 11. Break-Current Capability — Switch A

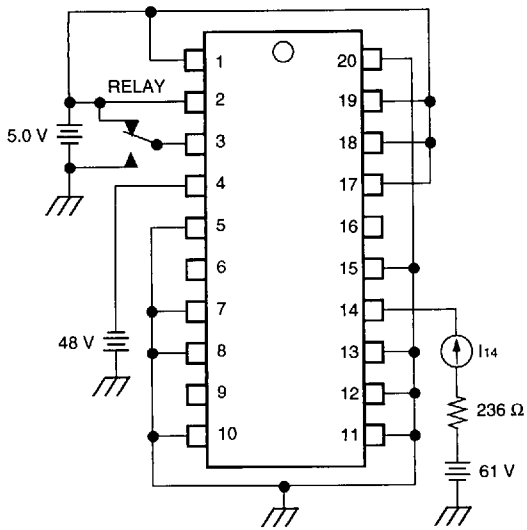



Figure 12. Break-Current Capability — Switch B

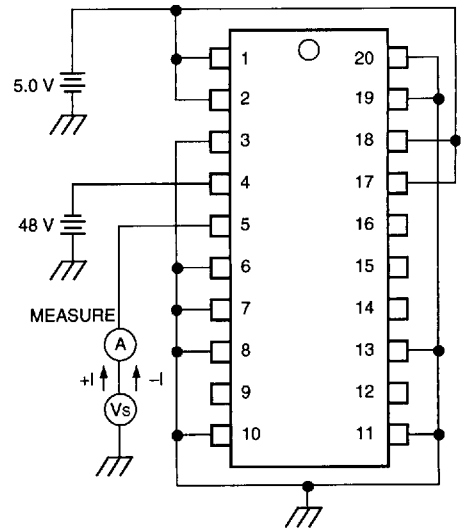



Figure 13. High-Voltage Leakage Current — Switch A

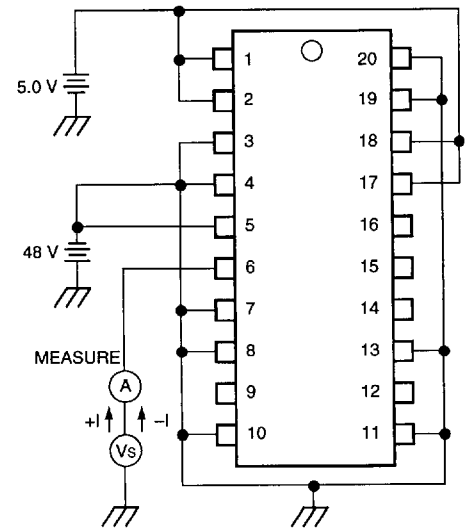



Figure 14. High-Voltage Leakage Current — Switch A



0050026 0019756 319

## Test Circuits (continued)

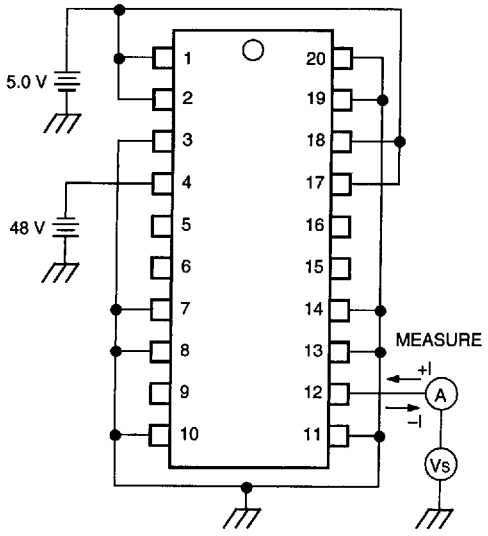



Figure 15. High-Voltage Leakage Current — Switch B

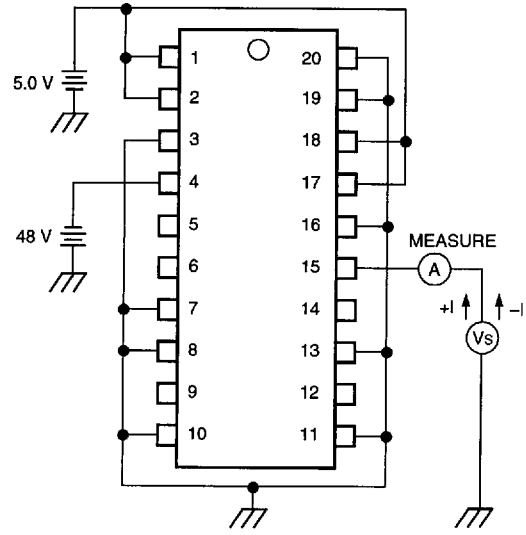



Figure 17. High-Voltage Leakage Current — Switch C

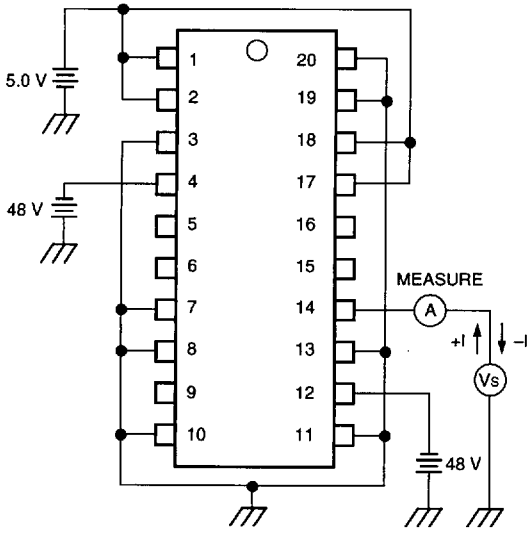



Figure 16. High-Voltage Leakage Current — Switch B

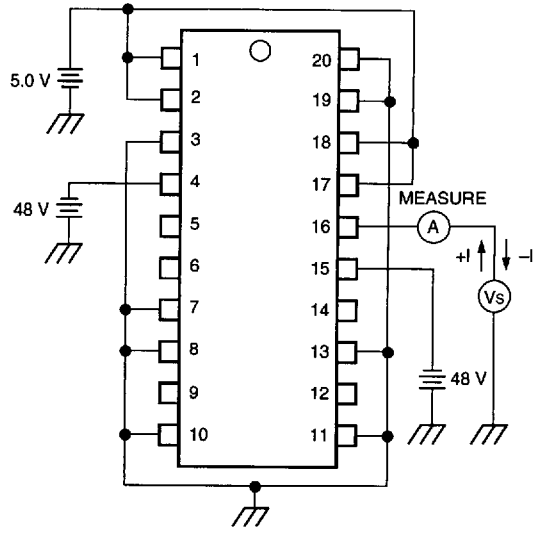



Figure 18. High-Voltage Leakage Current — Switch C



0050026 0019757 255

## Test Circuits (continued)

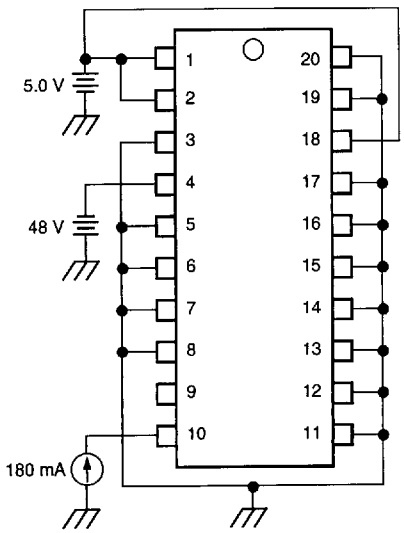



Figure 19. Relay Driver ON Voltage

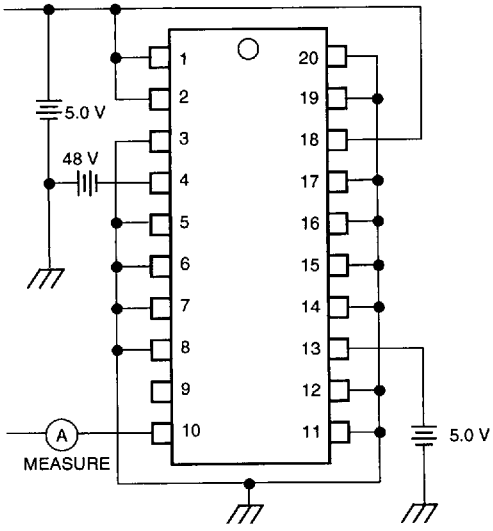



Figure 20. Relay Driver Output, Leakage Current

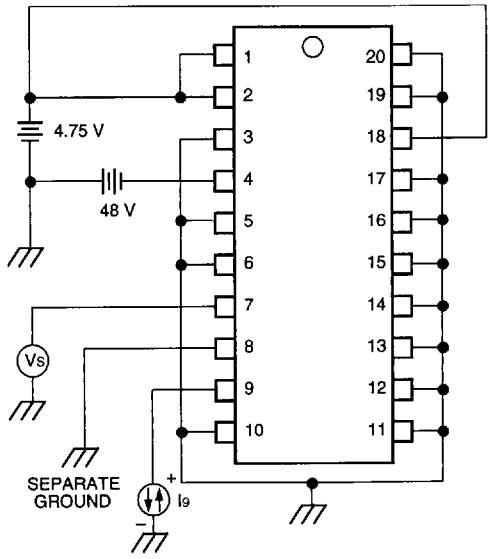



Figure 21. Comparator ON/OFF Voltage

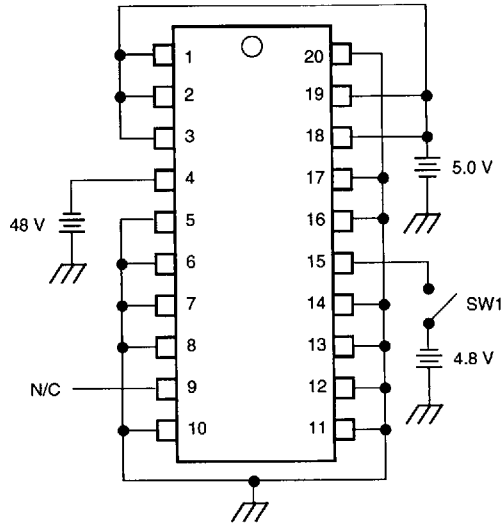



Figure 22. Switch C Shutdown Test



0050026 0019758 191

## Simplified Output Circuits

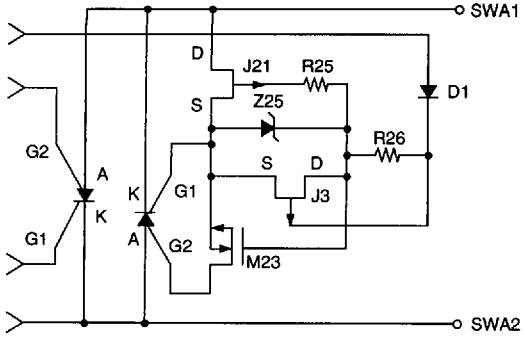



Figure 23. Switch A Output

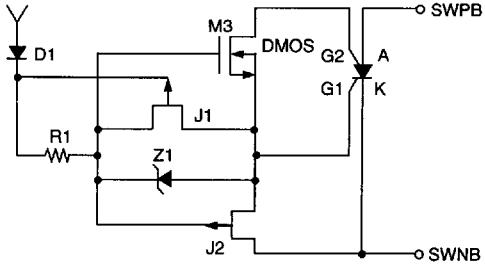



Figure 24. Switch B Output

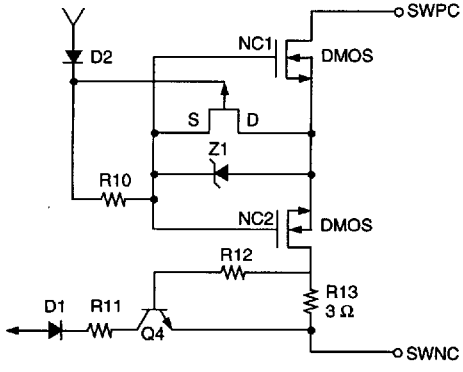



Figure 25. Switch C Output

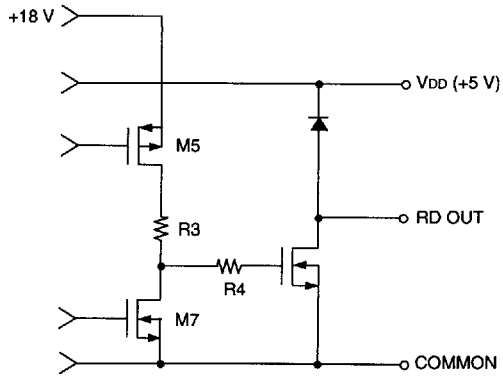



Figure 26. Relay Driver Output

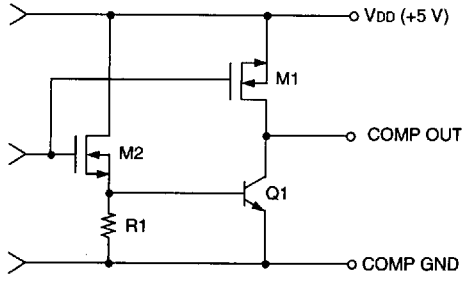



Figure 27. Comparator (Detector) Output



0050026 0019759 028

## Applications

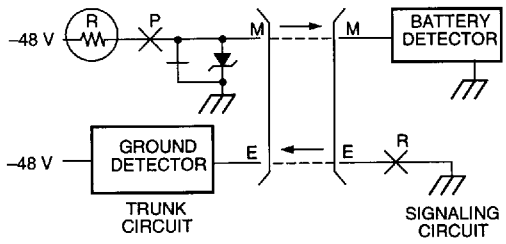



**Figure 28. Type I Interface**

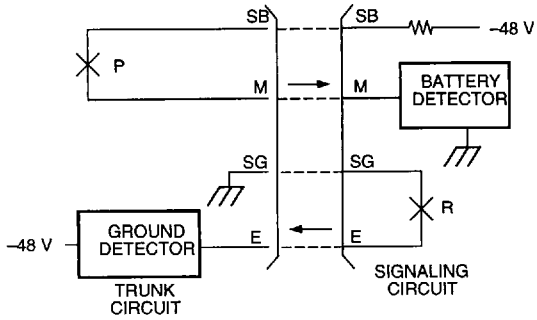



**Figure 29. Type II Interface**

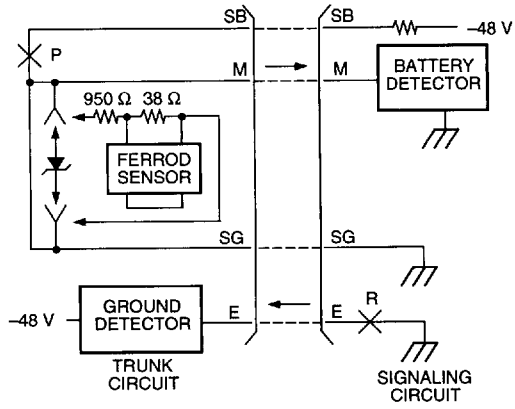



**Figure 30. Type III Interface**

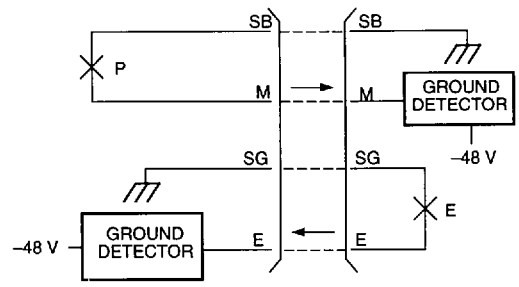



**Figure 31. Type IV Interface**

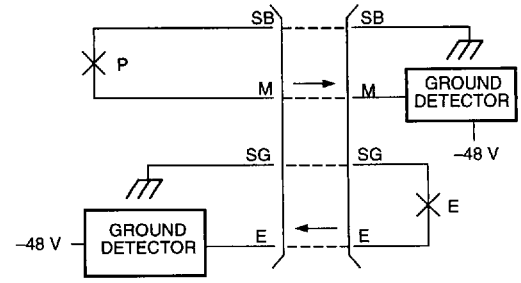



**Figure 32. Type V Interface**

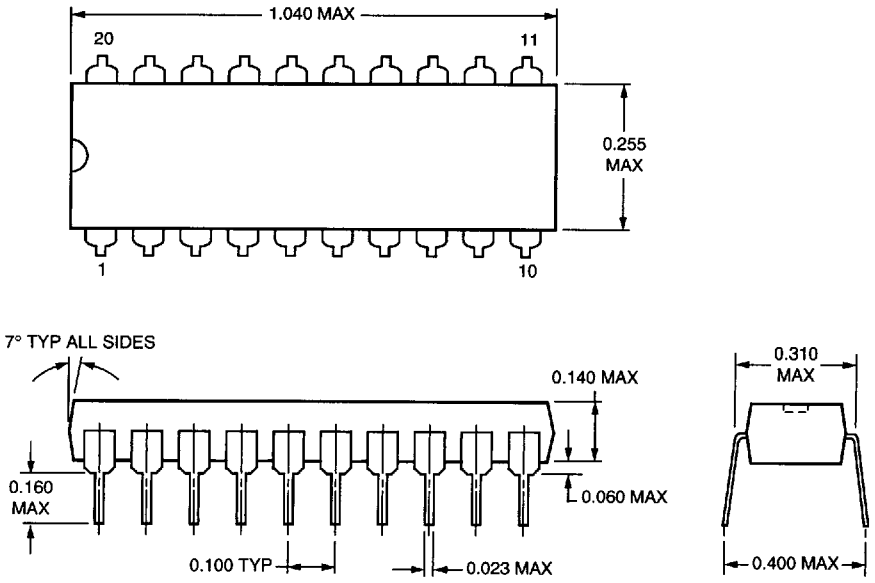


0050026 0019760 84T

# Outline Diagrams

## 20-Pin Plastic DIP (LH1263AE)

Dimensions are in inches and (millimeters).






0050026 0019761 786

# Packaging and Ordering Information

Throughout this section the following abbreviations are used:

DIP — Dual in-line package; SOG — Small-outline gull wing; SOJ — Small-outline J-lead; SONB — Small-outline narrow body; PLCC — Plastic leaded chip carrier.

| Device Code | Package Type | Temperature |
|---|---|---|
| ATTL7551AP | 44-Pin PLCC | –40 °C to +85 °C |
| ATTL7551AF | 24-Pin DIP | –40 °C to +85 °C |
| ATTL7554AP | 44-Pin PLCC | –40 °C to +85 °C |
| ATTL7556AAU | 32-Pin PLCC | –40 °C to +85 °C |
| ATTL7557AAU | | |
| ATTL7561AP | 44-Pin PLCC | –40 °C to +85 °C |
| ATTL7564AP | | |
| ATTL7581AC/BC | 16-Pin DIP | –40 °C to +85 °C |
| ATTL7581AAE/BAE | 16-Pin Plastic SOG | –40 °C to +85 °C |
| ATTL7582AE/BE | 16-Pin Plastic DIP | –40 °C to +85 °C |
| ATTL7582AAE/BAE | 16-Pin Plastic SOG | –40 °C to +85 °C |
| ATTL7583AF/BF | 24-Pin Plastic DIP (600 mil) | –40 °C to +85 °C |
| ATTL7583ACG/BCG | 24-Pin Plastic DIP (300 mil) | –40 °C to +85 °C |
| ATTL7583AAJ/BAJ | 28-Pin Plastic SOG | –40 °C to +85 °C |
| ATTL7590AAF | 14-Pin | –40 °C to +85 °C |
| ATTL7591AB | 8-Pin, DIP | –40 °C to +85 °C |
| ATTL7591AS | 8-Pin, SONB | –40 °C to +85 °C |
| LB1011AB | 8-Pin, DIP | –20 °C to +70 °C |
| LB1013AD | 18-Pin, DIP | –25 °C to +85 °C |
| LB1060AB | 8-Pin, DIP | –40 °C to +65 °C |
| LB1201AB | 8-Pin, DIP | –40 °C to +85 °C |
| LB1201AS | 8-Pin, SONB | –40 °C to +85 °C |
| LB1208AAJ | 28-pin SOG | –40 °C to +85 °C |
| LB1276AP | 44-Pin PLCC | –40 °C to +85 °C |
| LB1276AF | 24-Pin DIP | –40 °C to +85 °C |
| LB1356AF | 24-Pin DIP | –40 °C to +85 °C |
| LH1263AR | 20-Pin Plastic DIP | –40 °C to +85 °C |
| LH1571AB | 8-pin Plastic DIP | –40 °C to +85 °C |
| LH1571AAC | 8-pin SOG | –40 °C to +85 °C |
| T - 7503 - - - EL | 20-Pin, SOJ | –40 °C to +85 °C |
| T - 7503 - - 1EC | 20-Pin, SOJ | 0 °C to 70 °C |
| T - 7504 - - - PL | 28-Pin, DIP | –40 °C to +85 °C |
| T - 7504 - - - ML | 28-Pin, PLCC | –40 °C to +85 °C |
| T - 5504 - - - PL | 28-Pin, DIP | –40 °C to +85 °C |
| T - 5504 - - - ML | 28-Pin, PLCC | –40 °C to +85 °C |
| T - 7513B - - EE | 20-Pin, SOJ | –40 °C to +85 °C |
| T - 7513B - - PE | 20-Pin, DIP | –40 °C to +85 °C |
| T - 7517A - - EE | 16-Pin, DIP | –40 °C to +85 °C |
| T - 7517A - - PE | 16-Pin, SOJ | –40 °C to +85 °C |
| T - 7548 - - - ME2 | 28-Pin, PLCC | 0 °C to 85 °C |
| T - 7570 - - - ML2 | 28-Pin, PLCC | –40 °C to +85 °C |

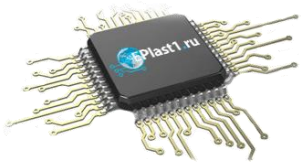
Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits,General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.




**Как с нами связаться**

**Телефон:** 8 (812) 309 58 32 (многоканальный)
**Факс:** 8 (812) 320-02-42
**Электронная почта:** org@eplast1.ru
**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.