19-1298; Rev 0; 10/97

MAXIM

# ±15kV ESD-Protected, 3.0V to 5.5V, 250kbps RS-232 Transceiver



## General Description

The MAX3241E is a 3V-powered EIA/TIA-232 and V.28/V.24 communications interface with low power requirements, high data-rate capabilities, and enhanced electrostatic discharge (ESD) protection. All transmitter outputs and receiver inputs are protected to ±15kV using IEC 1000-4-2 Air-Gap Discharge, ±8kV using IEC 1000-4-2 Contact Discharge, and ±15kV using the Human Body Model.

The transceivers have a proprietary low-dropout transmitter output stage enabling true RS-232 performance from a 3.0V to 5.5V supply with a dual charge pump. The device is guaranteed to run at data rates of 250kbps while maintaining RS-232 output levels.

The MAX3241E 3-driver/5-receiver complete serial port is ideal for notebook or subnotebook computers. It features a shutdown mode in which all receivers can remain active while using only 1µA supply current. The device includes two noninverting receiver outputs that are always active. It is available in SO and space-saving SSOP packages.

## Applications

Notebook, Subnotebook, and Palmtop Computers

Battery-Powered Equipment

Hand-Held Equipment

Peripherals

Printers

***Typical Operating Circuit appears at end of data sheet.***

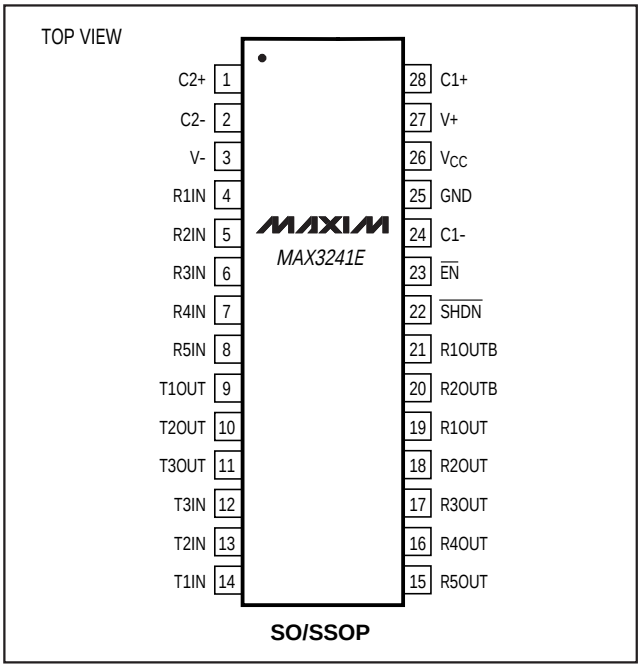
## Features

- **Enhanced ESD Protection:**
  **±15kV (Human Body Model)**
  **±8kV (IEC1000-4-2, Contact Discharge)**
  **±15kV (IEC1000-4-2, Air-Gap Discharge)**
- **Low Supply Current: 300µA**
- **Guaranteed Data Rate: 250kbps**
- **1µA Low-Power Shutdown**
- **Meets EIA/TIA-232 Specifications Down to 3.0V**
- **Guaranteed Slew Rate: 6V/µs min**
  **30V/µs max**
- **Guaranteed Mouse Driveability**
- **Small, 0.1µF Capacitors**

## Ordering Information

| PART | TEMP. RANGE | PIN-PACKAGE |
|---|---|---|
| MAX3241ECWI | 0°C to +70°C | 28 SO |
| MAX3241ECAI | 0°C to +70°C | 28 SSOP |
| MAX3241EEWI | -40°C to +85°C | 28 SO |
| MAX3241EEAI | -40°C to +85°C | 28 SSOP |

## Pin Configuration




**SO/SSOP**

# ±15kV ESD-Protected, 3.0V to 5.5V, 250kbps RS-232 Transceiver

## ABSOLUTE MAXIMUM RATINGS

$V_{CC}$ .....-0.3V to +6V
V+ .....-0.3V to +7V
V- .....+0.3V to -7V
V+ + |V-| .....+13V
Input Voltages
T_IN, $\overline{EN}$, $\overline{SHDN}$ .....-0.3V to +6V
R_IN .....±25V
Output Voltages
T_OUT .....±13.2V
R_OUT, R_OUTB .....-0.3V to ($V_{CC}$ + 0.3V)
Short-Circuit Duration
T_OUT (one at a time) .....Continuous
Continuous Power Dissipation ($T_A$ = +70°C)
SO (derate 12.5mW/°C above +70°C) .....1000mW
SSOP (derate 9.52mW/°C above +70°C) .....762mW
Operating Temperature Ranges
MAX3241EC_ I .....0°C to +70°C
MAX3241EE_ I .....-40°C to +85°C
Storage Temperature Range .....-65°C to +150°C
Lead Temperature (soldering, 10sec) .....+300°C

*Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.*

## ELECTRICAL CHARACTERISTICS

($V_{CC}$ = +3.0V to +5.5V; C1–C4 = 0.1µF, tested at 3.3V ±10%; C1 = 0.047µF, C2–C4 = 0.33µF, tested at 5.0V ±10%; $T_A$ = $T_{MIN}$ to $T_{MAX}$; unless otherwise noted. Typical values are at $T_A$ = +25°C.)

| PARAMETER | CONDITIONS | | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| **DC CHARACTERISTICS** | | | | | | |
| Supply Current | No load, $V_{CC}$ = 3.3V or 5.0V, $T_A$ = +25°C, $\overline{SHDN}$ = $V_{CC}$ | | | 0.3 | 1.0 | mA |
| Shutdown Supply Current | $\overline{SHDN}$ = GND, $T_A$ = +25°C | | | 1.0 | 10.0 | µA |
| **LOGIC INPUTS AND RECEIVER OUTPUTS** | | | | | | |
| Input Logic Threshold Low | T_IN, $\overline{EN}$, $\overline{SHDN}$ | | | | 0.8 | V |
| Input Logic Threshold High | T_IN, $\overline{EN}$, $\overline{SHDN}$ | $V_{CC}$ = 3.3V | 2.0 | | | V |
| | | $V_{CC}$ = 5.0V | 2.4 | | | |
| Transmitter Input Hysteresis | | | | 0.5 | | V |
| Input Leakage Current | T_IN, $\overline{EN}$, $\overline{SHDN}$ | | | ±0.01 | ±1.0 | µA |
| Output Leakage Current | Receivers disabled | | | ±0.05 | ±10.0 | µA |
| Output Voltage Low | $I_{OUT}$ = 1.6mA | | | | 0.4 | V |
| Output Voltage High | $I_{OUT}$ = -1.0mA | | $V_{CC}$ - 0.6 | $V_{CC}$ - 0.1 | | V |
| **RECEIVER INPUTS** | | | | | | |
| Input Voltage Range | | | -25 | | 25 | V |
| Input Threshold Low | $V_{CC}$ = 3.3V | | 0.6 | 1.1 | | V |
| | $V_{CC}$ = 5.0V | | 0.8 | 1.4 | | |
| Input Threshold High | $V_{CC}$ = 3.3V | | | 1.6 | 2.4 | V |
| | $V_{CC}$ = 5.0V | | | 1.9 | 2.4 | |
| Input Hysteresis | | | | 0.5 | | V |
| Input Resistance | $T_A$ = +25°C | | 3 | 5 | 7 | kΩ |
| **TRANSMITTER OUTPUTS** | | | | | | |
| Output Voltage Swing | All transmitter outputs loaded with 3kΩ to ground | | ±5.0 | ±5.4 | | V |
| Output Resistance | $V_{CC}$ = V+ = V- = 0V, transmitter output = ±2V | | 300 | 10M | | Ω |
| Output Short-Circuit Current | | | | ±35 | ±60 | mA |
| Output Leakage Current | $V_{CC}$ = 0V to 5.5V, transmitter output = ±12V, transmitters disabled | | | | ±25 | µA |

## ELECTRICAL CHARACTERISTICS (continued)

($V_{CC}$ = +3.0V to +5.5V; C1–C4 = 0.1µF, tested at 3.3V ±10%; C1 = 0.047µF, C2–C4 = 0.33µF, tested at 5.0V ±10%; $T_A$ = $T_{MIN}$ to $T_{MAX}$; unless otherwise noted. Typical values are at $T_A$ = +25°C.)

| PARAMETER | CONDITIONS | | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| **MOUSE DRIVEABILITY** | | | | | | |
| Transmitter Output Voltage | T1IN = T2IN = GND, T3IN = $V_{CC}$, T3OUT loaded with 3kΩ to ground, T1OUT and T2OUT loaded with 2.5mA each | | ±5.0 | | | V |
| **ESD CHARACTERISTICS** | | | | | | |
| ESD Protection | R_IN, T_OUT | Human Body Model | | ±15 | | kV |
| | | IEC 1000-4-2 (Contact Discharge) | | ±8 | | |
| | | IEC 1000-4-2 (Air-Gap Discharge) | | ±15 | | |

## TIMING CHARACTERISTICS

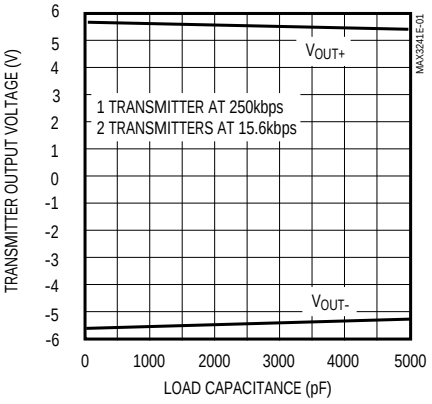
($V_{CC}$ = +3.0V to +5.5V; C1–C4 = 0.1µF, tested at 3.3V ±10%; C1 = 0.047µF, C2–C4 = 0.33µF, tested at 5.0V ±10%; $T_A$ = $T_{MIN}$ to $T_{MAX}$; unless otherwise noted. Typical values are at $T_A$ = +25°C.)

| PARAMETER | CONDITIONS | | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| Maximum Data Rate | $R_L$ = 3kΩ, $C_L$ = 1000pF, one transmitter switching | | 250 | | | kbps |
| Receiver Propagation Delay | R_IN to R_OUT, $C_L$ = 150pF | $t_{PHL}$ | | 0.15 | | µs |
| | | $t_{PLH}$ | | 0.15 | | |
| Receiver Output Enable Time | Normal operation | | | 200 | | ns |
| Receiver Output Disable Time | Normal operation | | | 200 | | ns |
| Transmitter Skew | $\lvert t_{PHL} - t_{PLH} \rvert$ | | | 100 | | ns |
| Receiver Skew | $\lvert t_{PHL} - t_{PLH} \rvert$ | | | 50 | | ns |
| Transition-Region Slew Rate | $V_{CC}$ = 3.3V, $T_A$ = +25°C, $R_L$ = 3kΩ to 7kΩ, measured from +3V to -3V or -3V to +3V | $C_L$ = 150pF to 1000pF | 6 | | 30 | V/µs |
| | | $C_L$ = 150pF to 2500pF | 4 | | 30 | |

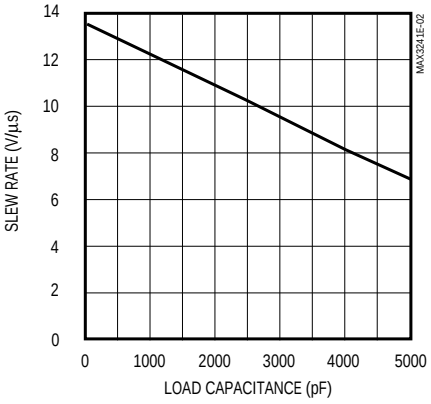
## Typical Operating Characteristics

($V_{CC}$ = +3.3V, 250kbps data rate, 0.1µF capacitors, all transmitters loaded with 3kΩ, $T_A$ = +25°C, unless otherwise noted.)

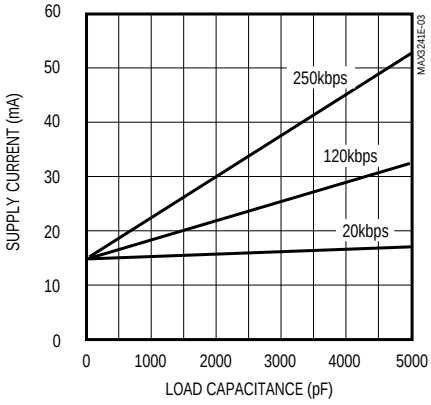
**TRANSMITTER OUTPUT VOLTAGE vs. LOAD CAPACITANCE**




**SLEW RATE vs. LOAD CAPACITANCE**




**SUPPLY CURRENT vs. LOAD CAPACITANCE**



# ±15kV ESD-Protected, 3.0V to 5.5V, 250kbps RS-232 Transceiver

## Pin Description

| PIN | NAME | FUNCTION |
|---|---|---|
| 1 | C2+ | Positive Terminal of Inverting Charge-Pump Capacitor |
| 2 | C2- | Negative Terminal of Inverting Charge-Pump Capacitor |
| 3 | V- | -5.5V Generated by the Charge Pump |
| 4–8 | R1IN–R5IN | RS-232 Receiver Inputs |
| 9, 10, 11 | T1OUT, T2OUT, T3OUT | RS-232 Transmitter Outputs |
| 12, 13, 14 | T3IN, T2IN, T1IN | TTL/CMOS Transmitter Inputs |
| 15–19 | R5OUT–R1OUT | TTL/CMOS Receiver Outputs |
| 20, 21 | R2OUTB, R1OUTB | Noninverting Complementary Receiver Outputs, always active |
| 22 | $\overline{SHDN}$ | Shutdown Control, active low |
| 23 | $\overline{EN}$ | Receiver Enable, active low |
| 24 | C1- | Negative Terminal of Voltage-Doubler Charge-Pump Capacitor |
| 25 | GND | Ground |
| 26 | $V_{CC}$ | +3.0V to +5.5V Supply Voltage |
| 27 | V+ | +5.5V Generated by the Charge Pump |
| 28 | C1+ | Positive Terminal of Voltage-Doubler Charge-Pump Capacitor |

## Detailed Description

### Dual Charge-Pump Voltage Converter

The MAX3241E's internal power supply consists of a regulated dual charge pump that provides output voltages of +5.5V (doubling charge pump) and -5.5V (inverting charge pump) for supply voltages ($V_{CC}$) over the 3.0V to 5.5V range. The charge pumps operate in a discontinuous mode: if the magnitude of the output voltages is less than 5.5V, the charge pumps are enabled; if the magnitude exceeds 5.5V, the charge pumps are disabled. The charge pump requires two flying capacitors (C1, C2) and two reservoir capacitors (C3, C4) to generate the V+ and V- supplies.

### RS-232 Transmitters

The MAX3241E's transmitters are inverting level translators that convert CMOS-logic levels to 5.0V EIA/TIA-232 levels. They guarantee a 250kbps data rate with worst-case loads of 3kΩ in parallel with 1000pF, providing compatibility with PC-to-PC communication software (such as LapLink™). Transmitters can be paralleled to drive multiple receivers.

When $\overline{SHDN}$ is driven to ground, the transmitters are disabled and the outputs are high impedance. In shutdown or when the power is off, the MAX3241E permits the transmitter outputs to be driven up to ±12V.

The transmitter inputs do not have pull-up resistors. Connect unused inputs to GND or $V_{CC}$.

### RS-232 Receivers

The receivers convert RS-232 signals to CMOS-logic output levels. All receivers have inverting three-state outputs, and can be either active or inactive (Table 1). The complementary noninverting outputs (R1OUTB, R2OUTB) are always active, regardless of the state of $\overline{EN}$ or $\overline{SHDN}$. This allows ring indicator applications to be monitored without forward biasing other devices connected to the receiver outputs. This is ideal for systems where $V_{CC}$ is set to 0V in shutdown to accommodate peripherals, such as UARTs (Figure 1).

*LapLink is a trademark of Traveling Software.*

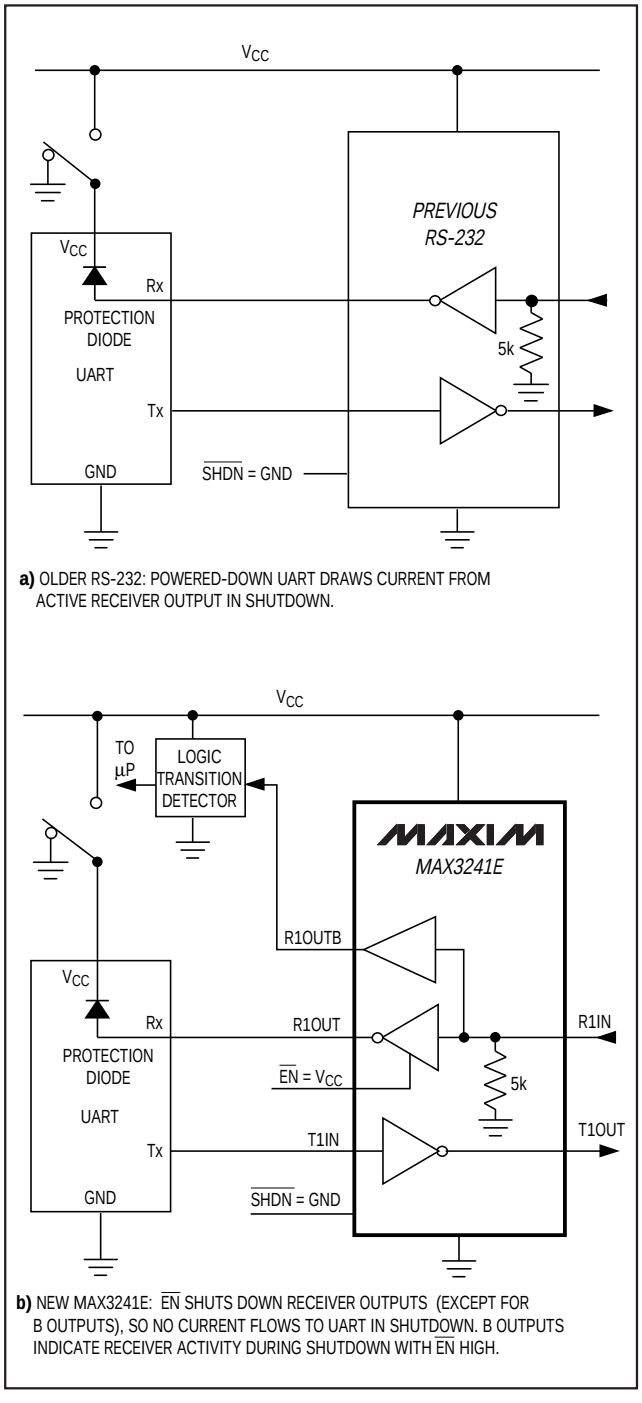



*Figure 1. Detection of RS-232 Activity when the UART and Interface are Shut Down: Comparison of MAX3241E (b) with Previous Traces (a).*

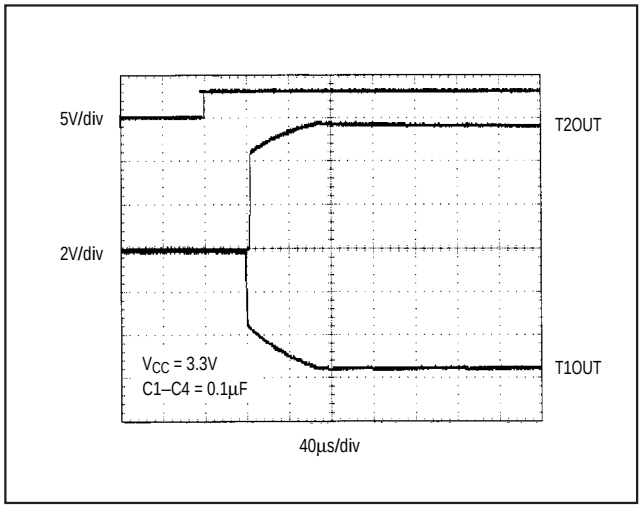



*Figure 2. Transmitter Outputs Exiting Shutdown or Powering Up*

### *Shutdown Mode*

Supply current falls to less than 1µA in shutdown mode ($\overline{SHDN}$ = low). When shut down, the device's charge pumps are turned off, V+ is pulled down to VCC, V- is pulled to ground, and the transmitter outputs are disabled (high impedance). The time required to exit shutdown is typically 100µs, as shown in Figure 2. Connect $\overline{SHDN}$ to VCC if the shutdown mode is not used. $\overline{SHDN}$ has no effect on R_OUT or R_OUTB.

### *Enable Mode*

The inverting receiver outputs (R_OUT) are put into a high-impedance state when $\overline{EN}$ is high. The complementary outputs (R1OUTB, R2OUTB) are always active, regardless of the state of $\overline{EN}$ and $\overline{SHDN}$ (Table 1). $\overline{EN}$ has no effect on T_OUT.

## Table 1. MAX3241E Shutdown and Enable Control Truth Table

| $\overline{SHDN}$ | $\overline{EN}$ | T_OUT | R_OUT | R_OUTB |
|---|---|---|---|---|
| 0 | 0 | High-Z | Active | Active |
| 0 | 1 | High-Z | High-Z | Active |
| 1 | 0 | Active | Active | Active |
| 1 | 1 | Active | High-Z | Active |

# ±15kV ESD-Protected, 3.0V to 5.5V, 250kbps RS-232 Transceiver

### ±15kV ESD Protection

As with all Maxim devices, ESD protection structures are incorporated on all pins to protect against electrostatic discharges encountered during handling and assembly. The MAX3241E transmitter outputs and receiver inputs have extra protection against static electricity found in normal operation. Maxim's engineers have developed state-of-the-art structures to protect these pins against ESD of ±15kV without damage.

ESD protection can be tested in various ways; transmitter outputs and receiver inputs are characterized for protection to the following:

1) ±15kV using the Human Body Model
2) ±8kV using the Contact Discharge method specified in IEC 1000-4-2 (formerly IEC 801-2)
3) ±15kV using the Air-Gap Discharge method specified in IEC 1000-4-2 (formerly IEC 801-2).

### ESD Test Conditions

Contact Maxim for a reliability report that documents test setup, methodology, and results.

### Human Body Model

Figure 3 shows the Human Body Model, and Figure 4 shows the current waveform it generates when discharged into a low impedance. This model consists of a 100pF capacitor charged to the ESD voltage of interest, which is then discharged into the test device through a 1.5kΩ resistor.

### IEC 1000-4-2

The IEC 100-4-2 standard covers ESD testing and performance of finished equipment; it does not specifically refer to integrated circuits. The MAX3241E enables the design of equipment that meets Level 4 (the highest level) of IEC 1000-4-2, without additional ESD protection components.

The major difference between tests done using the Human Body Model and IEC 1000-4-2 is higher peak current in IEC 1000-4-2. Because series resistance is lower in the IEC 1000-4-2 ESD test model (Figure 5), the ESD withstand voltage measured to this standard is generally lower than that measured using the Human Body Model. Figure 6 shows the current waveform for the ±8kV IEC 1000-4-2 Level 4 ESD Contact Discharge test.

The Air-Gap test involves approaching the device with a charged probe. The Contact Discharge method connects the probe to the device before the probe is energized.

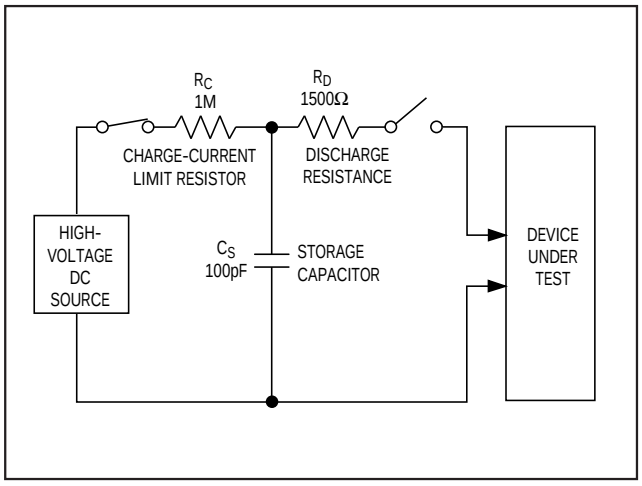



*Figure 3. Human Body ESD Test Model*

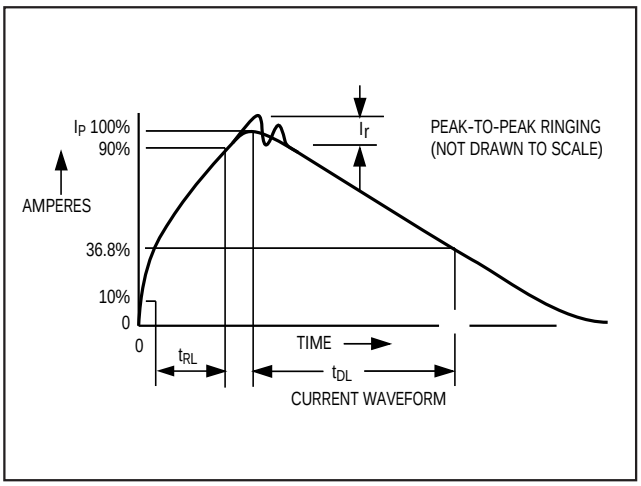



*Figure 4. Human Body Model Current Waveform*

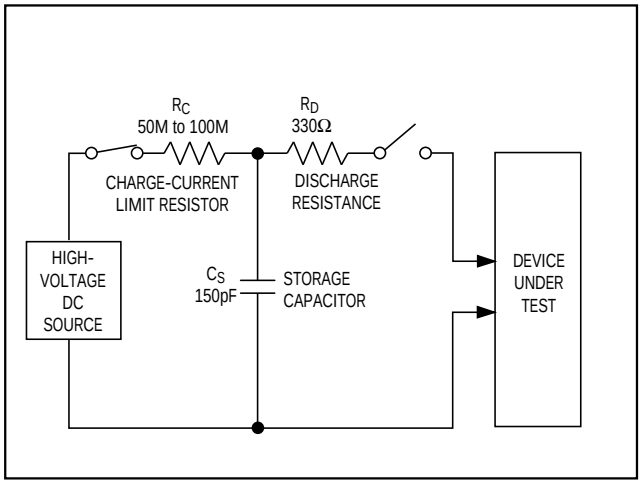



*Figure 5. IEC 1000-4-2 ESD Test Model*

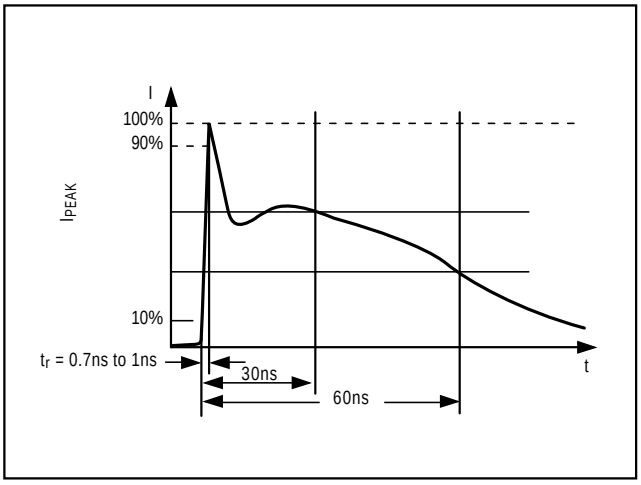



*Figure 6. IEC 1000-4-2 ESD Generator Current Waveform*

## Applications Information

### Capacitor Selection

The capacitor type used for C1–C4 is not critical for proper operation; polarized or nonpolarized capacitors can be used. The charge pump requires 0.1µF capacitors for 3.3V operation. For other supply voltages, refer to Table 2 for required capacitor values. Do not use values smaller than those listed in Table 2. Increasing the capacitor values reduces ripple on the transmitter outputs and slightly reduces power consumption. C2, C3, and C4 can be increased without changing C1's value. **However, do not increase C1 without also increasing the values of C2, C3, C4, and $C_{BYPASS}$, to maintain the proper ratios (C1 to the other capacitors).**

When using the minimum required capacitor values, make sure the capacitance value does not degrade excessively with temperature. If in doubt, use capacitors with a larger nominal value. The capacitor's equivalent series resistance (ESR), which usually rises at low temperatures, influences the amount of ripple on V+ and V-.

## Table 2. Required Minimum Capacitance Values

| SUPPLY VOLTAGE (V) | C1 (µF) | C2, C3, C4, $C_{BYPASS}$ (µF) |
|---|---|---|
| 3.0 to 3.6 | 0.1 | 0.1 |
| 4.5 to 5.5 | 0.047 | 0.33 |
| 3.0 to 5.5 | 0.1 | 0.47 |

### Power-Supply Decoupling

In applications that are sensitive to power-supply noise, decouple $V_{CC}$ to ground with a capacitor of the same value as reservoir capacitors C2, C3, and C4. Connect the bypass capacitor as close to the IC as possible.

### Transmitter Outputs when Exiting Shutdown

Figure 2 shows two transmitter outputs when exiting shutdown mode. As they become active, the two transmitter outputs are shown going to opposite RS-232 levels (one transmitter input is high, the other is low). Each transmitter is loaded with 3kΩ in parallel with 2500pF. The transmitter outputs display no ringing or undesirable transients as they come out of shutdown. Note that the transmitters are enabled only when V- exceeds approximately -3V.

### High Data Rates

The MAX3241E maintains the RS-232 ±5.0V minimum transmitter output voltage, even at high data rates. Figure 7 shows a transmitter loopback test circuit. Figure 8 shows a loopback test result at 120kbps, and Figure 9 shows the same test at 250kbps. For Figure 8, all transmitters were driven simultaneously at 120kbps into RS-232 loads in parallel with 1000pF. For Figure 9, a single transmitter was driven at 250kbps, and all transmitters were loaded with an RS-232 receiver in parallel with 1000pF.

# ±15kV ESD-Protected, 3.0V to 5.5V, 250kbps RS-232 Transceiver

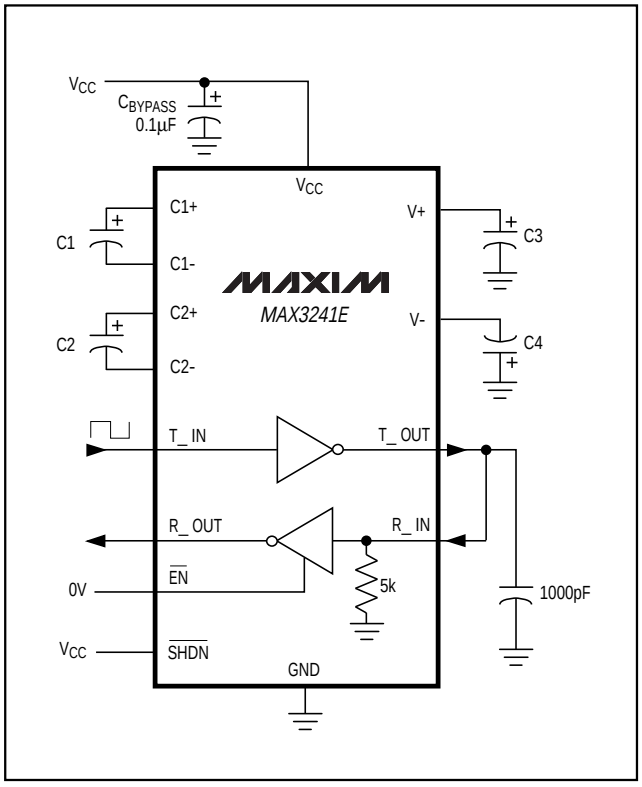



*Figure 7. Loopback Test Circuit*

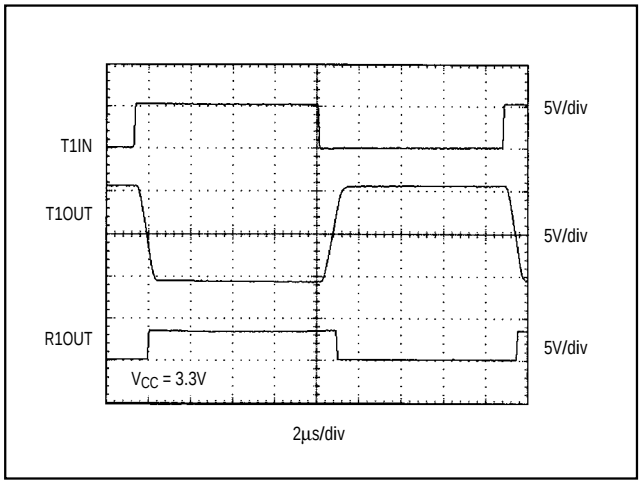



*Figure 8. Loopback Test Result at 120kbps*

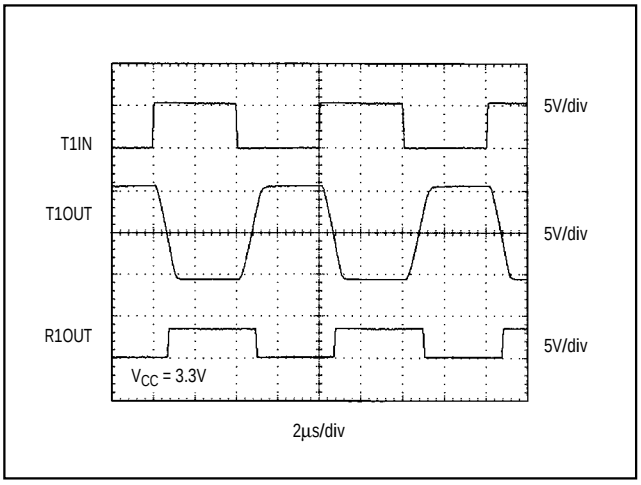



*Figure 9. Loopback Test Result at 250kbps*

### *Interconnection with 3V and 5V Logic*

The MAX3241E can directly interface with various 5V logic families, including ACT and HCT CMOS. See Table 3 for more information on possible combinations of interconnections.

## Table 3. Logic Family Compatibility with Various Supply Voltages

| SYSTEM POWER-SUPPLY VOLTAGE (V) | VCC SUPPLY VOLTAGE (V) | COMPATIBILITY |
|---|---|---|
| 3.3 | 3.3 | Compatible with all CMOS families. |
| 5 | 5 | Compatible with all TTL and CMOS families |
| 5 | 3.3 | Compatible with ACT and HCT CMOS, and with AC, HC, or CD4000 CMOS. |

### Mouse Driveability

The MAX3241E has been specifically designed to power serial mice while operating from low-voltage power supplies. It has been tested with leading mouse brands from manufacturers such as Microsoft and Logitech. The MAX3241E successfully drove all serial mice tested, and met their respective current and voltage requirements. Figure 10a shows the transmitter outputs under increasing load current. The MAX3241E switching regulator ensures the transmitters will supply at least ±5V under worst-case conditions. Figure 10b shows a typical mouse connection.

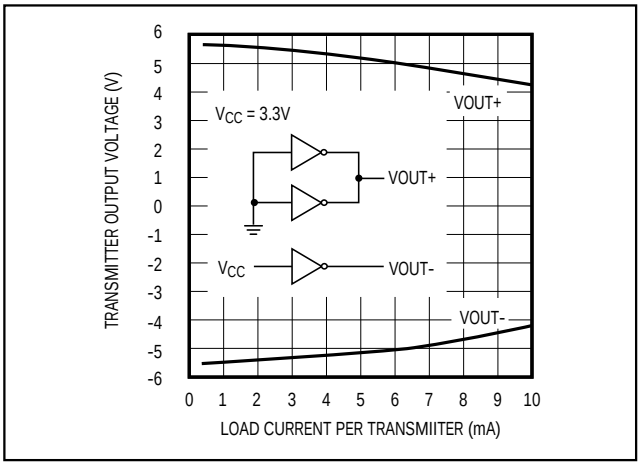



*Figure 10a. Transmitter Output Voltage vs. Load Current per Transmitter*

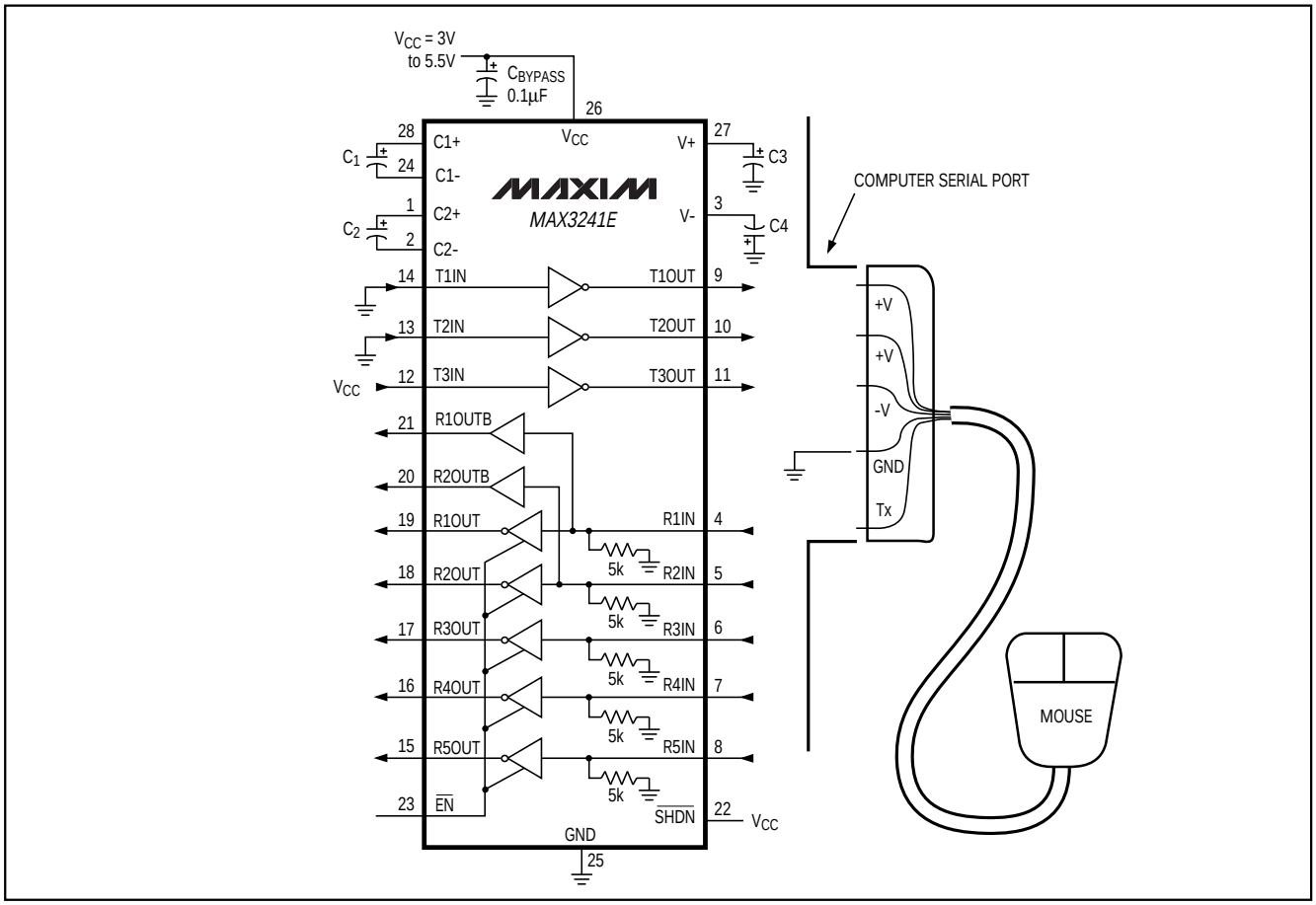
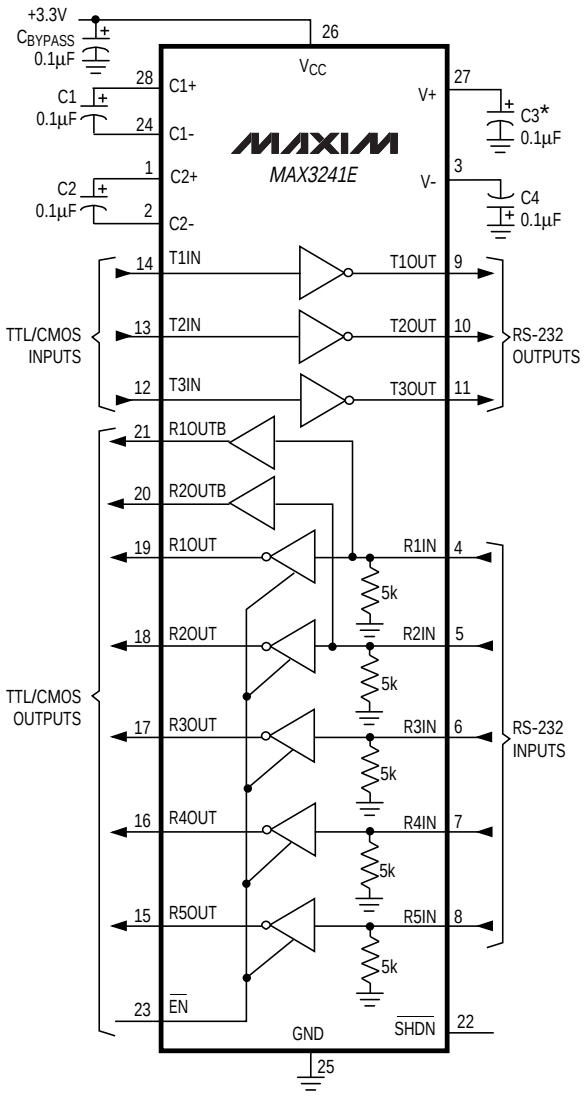



*Figure 10b. Mouse Driver Test Circuit*

# ±15kV ESD-Protected, 3.0V to 5.5V, 250kbps RS-232 Transceiver

## Typical Operating Circuit

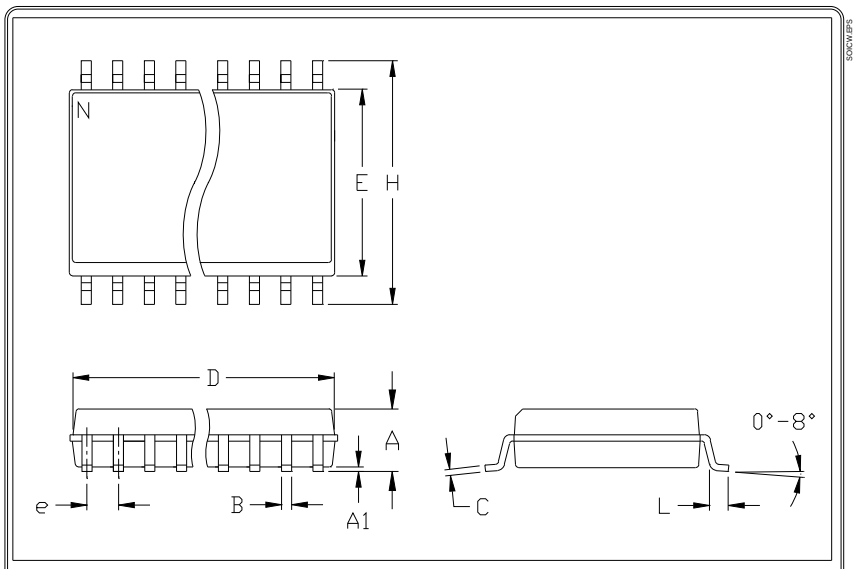



* C3 CAN BE RETURNED TO EITHER $V_{CC}$ OR GROUND.

## Chip Information

TRANSISTOR COUNT: 1335

## Package Information




| | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 0.093 | 0.104 | 2.35 | 2.65 |
| A1 | 0.004 | 0.012 | 0.10 | 0.30 |
| B | 0.014 | 0.019 | 0.35 | 0.49 |
| C | 0.009 | 0.013 | 0.23 | 0.32 |
| e | 0.050 | | 1.27 | |
| E | 0.291 | 0.299 | 7.40 | 7.60 |
| H | 0.394 | 0.419 | 10.00 | 10.65 |
| h | 0.010 | 0.030 | 0.25 | 0.75 |
| L | 0.016 | 0.050 | 0.40 | 1.27 |

| | INCHES | | MILLIMETERS | | | |
|---|---|---|---|---|---|---|
| | MIN | MAX | MIN | MAX | N | MS013 |
| D | 0.398 | 0.413 | 10.10 | 10.50 | 16 | AA |
| D | 0.447 | 0.463 | 11.35 | 11.75 | 18 | AB |
| D | 0.496 | 0.512 | 12.60 | 13.00 | 20 | AC |
| D | 0.598 | 0.614 | 15.20 | 15.60 | 24 | AD |
| D | 0.697 | 0.713 | 17.70 | 18.10 | 28 | AE |

NOTES:
1. D&E DO NOT INCLUDE MOLD FLASH
2. MOLD FLASH OR PROTRUSIONS NOT TO EXCEED .15mm (.006")
3. LEADS TO BE COPLANAR WITHIN .102mm (.004")
4. CONTROLLING DIMENSION: MILLIMETER
5. MEETS JEDEC MS013-XX AS SHOWN IN ABOVE TABLE
6. N = NUMBER OF PINS

MAXIM — 120 SAN GABRIEL DR SUNNYVALE CA 94086 FAX (408) 737 7194 PROPRIETARY INFORMATION

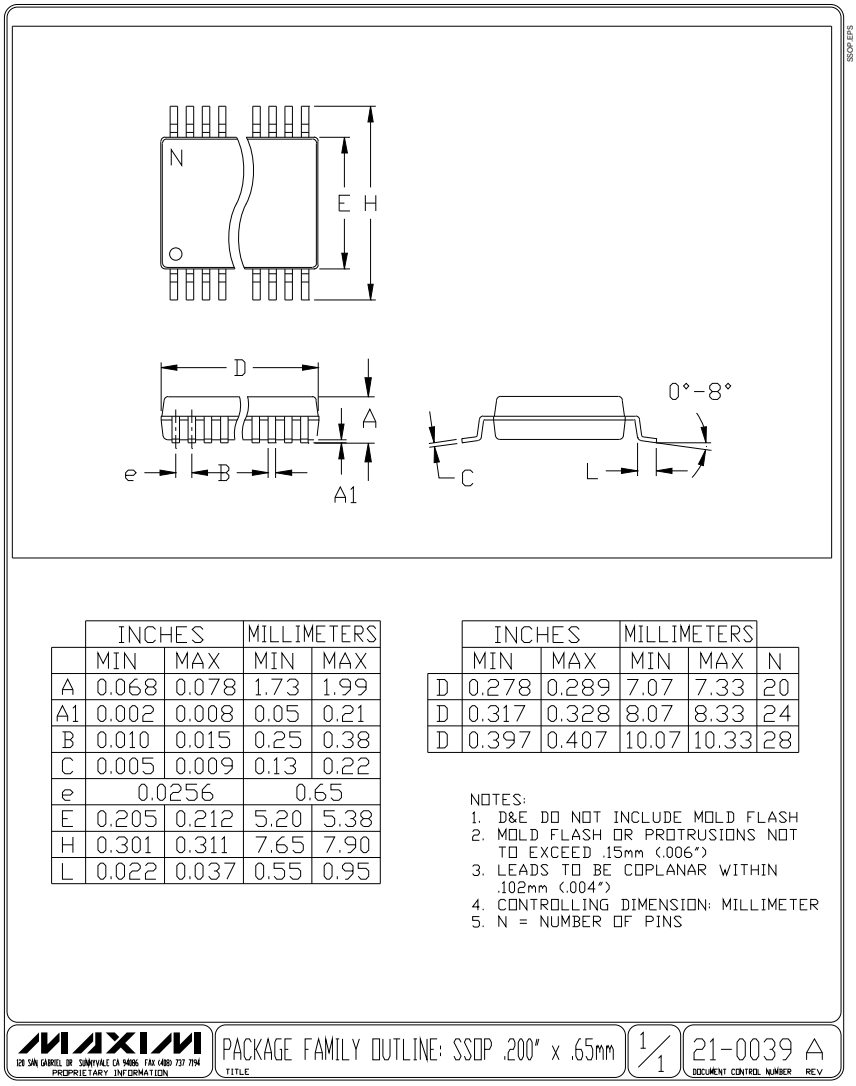
PACKAGE FAMILY OUTLINE: SOIC .300" — TITLE

1/1

21-0042 A — DOCUMENT CONTROL NUMBER — REV.

# ±15kV ESD-Protected, 3.0V to 5.5V, 250kbps RS-232 Transceiver

## Package Information (continued)




| | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 0.068 | 0.078 | 1.73 | 1.99 |
| A1 | 0.002 | 0.008 | 0.05 | 0.21 |
| B | 0.010 | 0.015 | 0.25 | 0.38 |
| C | 0.005 | 0.009 | 0.13 | 0.22 |
| e | 0.0256 | | 0.65 | |
| E | 0.205 | 0.212 | 5.20 | 5.38 |
| H | 0.301 | 0.311 | 7.65 | 7.90 |
| L | 0.022 | 0.037 | 0.55 | 0.95 |

| | INCHES | | MILLIMETERS | | |
|---|---|---|---|---|---|
| | MIN | MAX | MIN | MAX | N |
| D | 0.278 | 0.289 | 7.07 | 7.33 | 20 |
| D | 0.317 | 0.328 | 8.07 | 8.33 | 24 |
| D | 0.397 | 0.407 | 10.07 | 10.33 | 28 |

NOTES:
1. D&E DO NOT INCLUDE MOLD FLASH
2. MOLD FLASH OR PROTRUSIONS NOT TO EXCEED .15mm (.006")
3. LEADS TO BE COPLANAR WITHIN .102mm (.004")
4. CONTROLLING DIMENSION: MILLIMETER
5. N = NUMBER OF PINS

MAXIM 120 SAN GABRIEL DR SUNNYVALE CA 94086 FAX (408) 737 7194
PROPRIETARY INFORMATION

PACKAGE FAMILY OUTLINE: SSOP .200" x .65mm
TITLE

1/1

21-0039 A
DOCUMENT CONTROL NUMBER REV