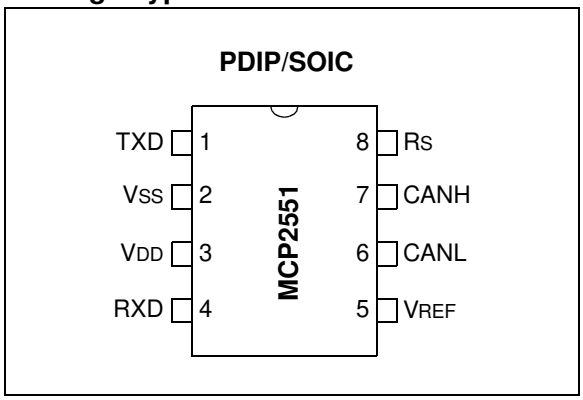
# MCP2551

## High-Speed CAN Transceiver

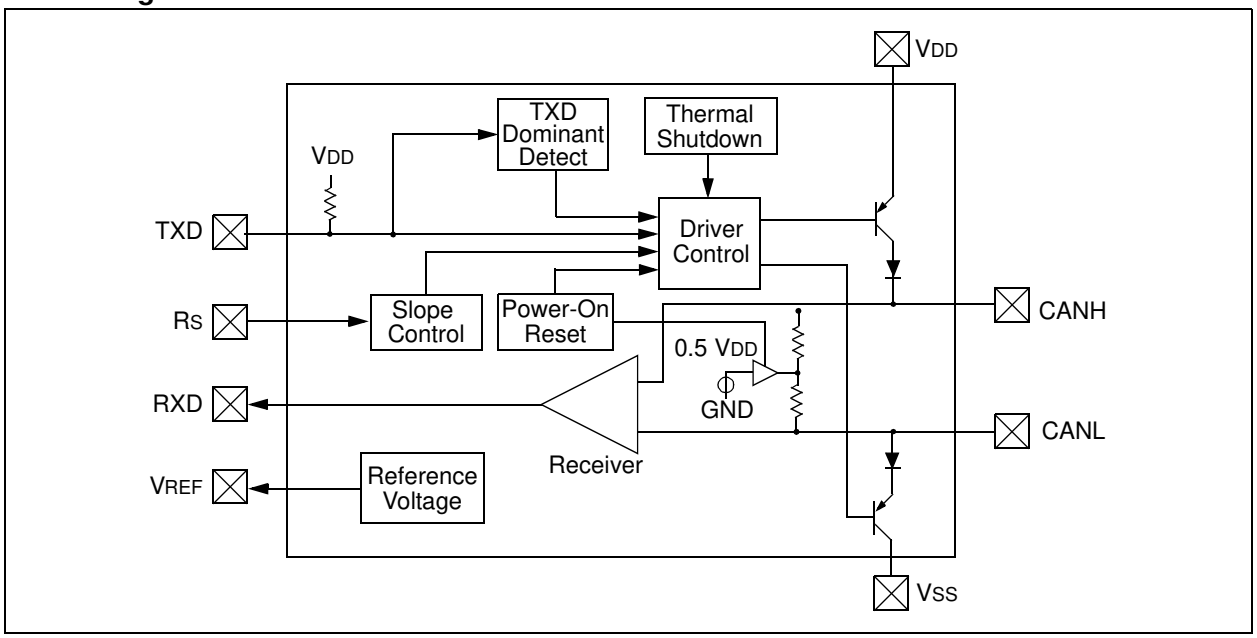
### Features

- Supports 1 Mb/s operation
- Implements ISO-11898 standard physical layer requirements
- Suitable for 12V and 24V systems
- Externally-controlled slope for reduced RFI emissions
- Detection of ground fault (permanent Dominant) on TXD input
- Power-on Reset and voltage brown-out protection
- An unpowered node or brown-out event will not disturb the CAN bus
- Low current standby operation
- Protection against damage due to short-circuit conditions (positive or negative battery voltage)
- Protection against high-voltage transients
- Automatic thermal shutdown protection
- Up to 112 nodes can be connected
- High-noise immunity due to differential bus implementation
- Temperature ranges:
  - Industrial (I): -40°C to +85°C
  - Extended (E): -40°C to +125°C

### Package Types




### Block Diagram



**NOTES:**

# 1.0 DEVICE OVERVIEW

The MCP2551 is a high-speed CAN, fault-tolerant device that serves as the interface between a CAN protocol controller and the physical bus. The MCP2551 device provides differential transmit and receive capability for the CAN protocol controller, and is fully compatible with the ISO-11898 standard, including 24V requirements. It will operate at speeds of up to 1 Mb/s.

Typically, each node in a CAN system must have a device to convert the digital signals generated by a CAN controller to signals suitable for transmission over the bus cabling (differential output). It also provides a buffer between the CAN controller and the high-voltage spikes that can be generated on the CAN bus by outside sources (EMI, ESD, electrical transients, etc.).

## 1.1 Transmitter Function

The CAN bus has two states: Dominant and Recessive. A Dominant state occurs when the differential voltage between CANH and CANL is greater than a defined voltage (e.g.,1.2V). A Recessive state occurs when the differential voltage is less than a defined voltage (typically 0V). The Dominant and Recessive states correspond to the Low and High state of the TXD input pin, respectively. However, a Dominant state initiated by another CAN node will override a Recessive state on the CAN bus.

### 1.1.1 MAXIMUM NUMBER OF NODES

The MCP2551 CAN outputs will drive a minimum load of 45Ω, allowing a maximum of 112 nodes to be connected (given a minimum differential input resistance of 20 kΩ and a nominal termination resistor value of 120Ω).

## 1.2 Receiver Function

The RXD output pin reflects the differential bus voltage between CANH and CANL. The Low and High states of the RXD output pin correspond to the Dominant and Recessive states of the CAN bus, respectively.

## 1.3 Internal Protection

CANH and CANL are protected against battery short-circuits and electrical transients that can occur on the CAN bus. This feature prevents destruction of the transmitter output stage during such a fault condition.

The device is further protected from excessive current loading by thermal shutdown circuitry that disables the output drivers when the junction temperature exceeds a nominal limit of 165°C. All other parts of the chip remain operational, and the chip temperature is lowered due to the decreased power dissipation in the transmitter outputs. This protection is essential to protect against bus line short-circuit-induced damage.

## 1.4 Operating Modes

The RS pin allows three modes of operation to be selected:

- High-Speed
- Slope-Control
- Standby

These modes are summarized in Table 1-1.

When in High-Speed or Slope-Control mode, the drivers for the CANH and CANL signals are internally regulated to provide controlled symmetry in order to minimize EMI emissions.

Additionally, the slope of the signal transitions on CANH and CANL can be controlled with a resistor connected from pin 8 (RS) to ground. The slope must be proportional to the current output at RS, which will further reduce EMI emissions.

### 1.4.1 HIGH-SPEED

High-Speed mode is selected by connecting the RS pin to VSS. In this mode, the transmitter output drivers have fast output rise and fall times to support high-speed CAN bus rates.

### 1.4.2 SLOPE-CONTROL

Slope-Control mode further reduces EMI by limiting the rise and fall times of CANH and CANL. The slope, or slew rate (SR), is controlled by connecting an external resistor (REXT) between RS and VOL (usually ground). The slope is proportional to the current output at the RS pin. Since the current is primarily determined by the slope-control resistance value REXT, a certain slew rate is achieved by applying a specific resistance. Figure 1-1 illustrates typical slew rate values as a function of the slope-control resistance value.

### 1.4.3 STANDBY MODE

The device may be placed in Standby or SLEEP mode by applying a high-level to the RS pin. In SLEEP mode, the transmitter is switched off and the receiver operates at a lower current. The receive pin on the controller side (RXD) is still functional, but will operate at a slower rate. The attached microcontroller can monitor RXD for CAN bus activity and place the transceiver into normal operation via the RS pin (at higher bus rates, the first CAN message may be lost).

**TABLE 1-1: MODES OF OPERATION**

| Mode | Current at $R_S$ Pin | Resulting Voltage at RS Pin |
|---|---|---|
| Standby | $-I_{RS} < 10\ \mu A$ | $V_{RS} > 0.75\ V_{DD}$ |
| Slope-Control | $10\ \mu A < -I_{RS} < 200\ \mu A$ | $0.4\ V_{DD} < V_{RS} < 0.6\ V_{DD}$ |
| High-Speed | $-I_{RS} < 610\ \mu A$ | $0 < V_{RS} < 0.3V_{DD}$ |

**TABLE 1-2: TRANSCEIVER TRUTH TABLE**

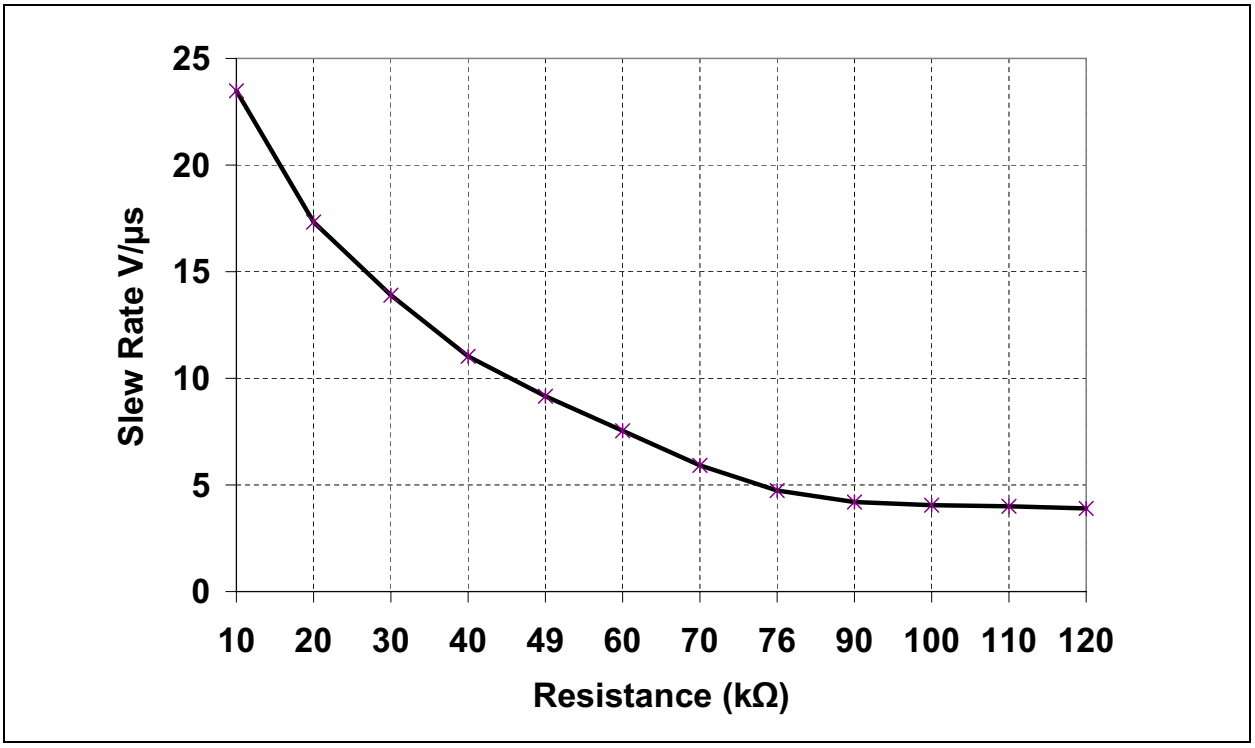
| VDD | VRS | TXD | CANH | CANL | Bus State(1) | RXD(1) |
|---|---|---|---|---|---|---|
| 4.5V ≤ VDD ≤ 5.5V | VRS < 0.75 VDD | 0 | HIGH | LOW | Dominant | 0 |
| | | 1 or floating | Not Driven | Not Driven | Recessive | 1 |
| | VRS > 0.75 VDD | X | Not Driven | Not Driven | Recessive | 1 |
| VPOR < VDD < 4.5V (See **Note 3**) | VRS < 0.75 VDD | 0 | HIGH | LOW | Dominant | 0 |
| | | 1 or floating | Not Driven | Not Driven | Recessive | 1 |
| | VRS > 0.75 VDD | X | Not Driven | Not Driven | Recessive | 1 |
| 0 < VDD < VPOR | X | X | Not Driven/ No Load | Not Driven/ No Load | High Impedance | X |

**Note 1:** If another bus node is transmitting a Dominant bit on the CAN bus, then RXD is a logic '0'.

**2:** X = "don't care".

**3:** Device drivers will function, although outputs are not ensured to meet the ISO-11898 specification.

**FIGURE 1-1: SLEW RATE VS. SLOPE-CONTROL RESISTANCE VALUE**



## 1.5 TXD Permanent Dominant Detection

If the MCP2551 detects an extended Low state on the TXD input, it will disable the CANH and CANL output drivers in order to prevent the corruption of data on the CAN bus. The drivers are disabled if TXD is Low for more than 1.25 ms (minimum). This implies a maximum bit time of 62.5 µs (16 kb/s bus rate), allowing up to 20 consecutive transmitted Dominant bits during a multiple bit error and error frame scenario. The drivers remain disabled as long as TXD remains Low. A rising edge on TXD will reset the timer logic and enable the CANH and CANL output drivers.

## 1.6 Power-on Reset

When the device is powered on, CANH and CANL remain in a high-impedance state until VDD reaches the voltage-level VPORH. In addition, CANH and CANL will remain in a high-impedance state if TXD is Low when VDD reaches VPORH. CANH and CANL will become active only after TXD is asserted High. Once powered on, CANH and CANL will enter a high-impedance state if the voltage level at VDD falls below VPORL, providing voltage brown-out protection during normal operation.

## 1.7 Pin Descriptions

The 8-pin pinout is listed in Table 1-3.

**TABLE 1-3: MCP2551 PINOUT**

| Pin Number | Pin Name | Pin Function |
|---|---|---|
| 1 | TXD | Transmit Data Input |
| 2 | VSS | Ground |
| 3 | VDD | Supply Voltage |
| 4 | RXD | Receive Data Output |
| 5 | VREF | Reference Output Voltage |
| 6 | CANL | CAN Low-Level Voltage I/O |
| 7 | CANH | CAN High-Level Voltage I/O |
| 8 | RS | Slope-Control Input |

### 1.7.1 TRANSMITTER DATA INPUT (TXD)

TXD is a TTL-compatible input pin. The data on this pin is driven out on the CANH and CANL differential output pins. It is usually connected to the transmitter data output of the CAN controller device. When TXD is Low, CANH and CANL are in the Dominant state. When TXD is High, CANH and CANL are in the Recessive state, provided that another CAN node is not driving the CAN bus with a Dominant state. TXD has an internal pull-up resistor (nominal 25 kΩ to VDD).

### 1.7.2 GROUND SUPPLY (VSS)

Ground supply pin.

### 1.7.3 SUPPLY VOLTAGE ($V_{DD}$)

Positive supply voltage pin.

### 1.7.4 RECEIVER DATA OUTPUT (RXD)

RXD is a CMOS-compatible output that drives High or Low depending on the differential signals on the CANH and CANL pins and is usually connected to the receiver data input of the CAN controller device. RXD is High when the CAN bus is Recessive and Low in the Dominant state.

### 1.7.5 REFERENCE VOLTAGE (VREF)

Reference Voltage Output (defined as VDD/2).

### 1.7.6 CAN LOW (CANL)

The CANL output drives the Low side of the CAN differential bus. This pin is also tied internally to the receive input comparator.

### 1.7.7 CAN HIGH (CANH)

The CANH output drives the high-side of the CAN differential bus. This pin is also tied internally to the receive input comparator.

### 1.7.8 SLOPE RESISTOR INPUT (RS)

The RS pin is used to select High-Speed, Slope-Control or Standby modes via an external biasing resistor.

**NOTES:**

# 2.0 ELECTRICAL CHARACTERISTICS

## 2.1 Terms and Definitions

A number of terms are defined in ISO-11898 that are used to describe the electrical characteristics of a CAN transceiver device. These terms and definitions are summarized in this section.

### 2.1.1 BUS VOLTAGE

$V_{CANL}$ and $V_{CANH}$ denote the voltages of the bus line wires CANL and CANH relative to ground of each individual CAN node.

### 2.1.2 COMMON MODE BUS VOLTAGE RANGE

Boundary voltage levels of $V_{CANL}$ and $V_{CANH}$ with respect to ground, for which proper operation will occur, if up to the maximum number of CAN nodes are connected to the bus.

### 2.1.3 DIFFERENTIAL INTERNAL CAPACITANCE, $C_{DIFF}$ (OF A CAN NODE)

Capacitance seen between CANL and CANH during the Recessive state when the CAN node is disconnected from the bus (see Figure 2-1).

### 2.1.4 DIFFERENTIAL INTERNAL RESISTANCE, $R_{DIFF}$ (OF A CAN NODE)

Resistance seen between CANL and CANH during the Recessive state when the CAN node is disconnected from the bus (see Figure 2-1).

### 2.1.5 DIFFERENTIAL VOLTAGE, $V_{DIFF}$ (OF CAN BUS)

Differential voltage of the two-wire CAN bus, value $V_{DIFF} = V_{CANH} - V_{CANL}$.

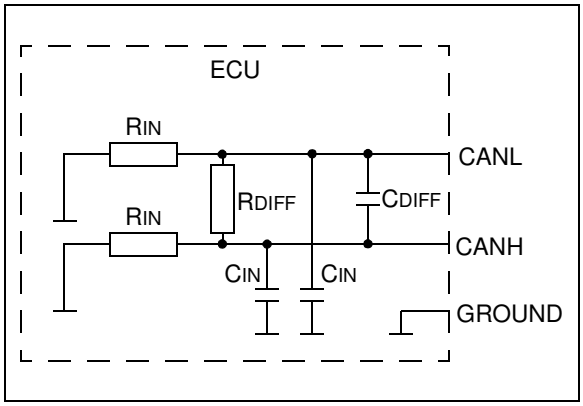
### 2.1.6 INTERNAL CAPACITANCE, $C_{IN}$ (OF A CAN NODE)

Capacitance seen between CANL (or CANH) and ground during the Recessive state when the CAN node is disconnected from the bus (see Figure 2-1).

### 2.1.7 INTERNAL RESISTANCE, $R_{IN}$ (OF A CAN NODE)

Resistance seen between CANL (or CANH) and ground during the Recessive state when the CAN node is disconnected from the bus (see Figure 2-1).

**FIGURE 2-1: PHYSICAL LAYER DEFINITIONS**



## Absolute Maximum Ratings†

$V_{DD}$ ..... 7.0V

DC Voltage at TXD, RXD, $V_{REF}$ and $V_S$ ..... -0.3V to $V_{DD}$ + 0.3V

DC Voltage at CANH, CANL (**Note 1**) ..... -42V to +42V

Transient Voltage on Pins 6 and 7 (**Note 2**) ..... -250V to +250V

Storage temperature ..... -55°C to +150°C

Operating ambient temperature ..... -40°C to +125°C

Virtual Junction Temperature, $T_{VJ}$ (**Note 3**) ..... -40°C to +150°C

Soldering temperature of leads (10 seconds) ..... +300°C

ESD protection on CANH and CANL pins (**Note 4**) ..... 6 kV

ESD protection on all other pins (**Note 4**) ..... 4 kV

**Note 1:** Short-circuit applied when TXD is High and Low.

**2:** In accordance with ISO-7637.

**3:** In accordance with IEC 60747-1.

**4:** Classification A: Human Body Model.

**† NOTICE:** Stresses above those listed under “Maximum ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at those or any other conditions above those indicated in the operational listings of this specification is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

## 2.2 DC Characteristics

| DC Specifications | | | Electrical Characteristics: Industrial (I): $T_{AMB}$ = -40°C to +85°C $V_{DD}$ = 4.5V to 5.5V Extended (E): $T_{AMB}$ = -40°C to +125°C $V_{DD}$ = 4.5V to 5.5V | | | |
|---|---|---|---|---|---|---|
| **Param No.** | **Sym** | **Characteristic** | **Min** | **Max** | **Units** | **Conditions** |
| **Supply** | | | | | | |
| D1 | $I_{DD}$ | Supply Current | — | 75 | mA | Dominant; $V_{TXD}$ = 0.8V; $V_{DD}$ |
| D2 | | | — | 10 | mA | Recessive; $V_{TXD}$ = +2V; $R_S$ = 47 kW |
| D3 | | | — | 365 | µA | -40°C ≤ $T_{AMB}$ ≤ +85°C, Standby; **(Note 2)** |
| | | | — | 465 | µA | -40°C ≤ $T_{AMB}$ ≤ +125°C, Standby; **(Note 2)** |
| D4 | $V_{PORH}$ | High-level of the Power-on Reset comparator | 3.8 | 4.3 | V | CANH, CANL outputs are active when $V_{DD}$ > $V_{PORH}$ |
| D5 | $V_{PORL}$ | Low-level of the Power-on Reset comparator | 3.4 | 4.0 | V | CANH, CANL outputs are not active when $V_{DD}$ < $V_{PORL}$ |
| D6 | $V_{PORD}$ | Hysteresis of Power-on Reset comparator | 0.3 | 0.8 | V | **Note 1** |
| **Bus Line (CANH; CANL) Transmitter** | | | | | | |
| D7 | $V_{CANH(r)}$; $V_{CANL(r)}$ | CANH, CANL Recessive bus voltage | 2.0 | 3.0 | V | $V_{TXD}$ = $V_{DD}$; no load. |
| D8 | $I_{O(CANH)(reces)}$ $I_{O(CANL)(reces)}$ | Recessive output current | -2 | +2 | mA | -2V < $V_{(CAHL,CANH)}$ < +7V, 0V < $V_{DD}$ < 5.5V |
| D9 | | | -10 | +10 | mA | -5V < $V_{(CANL,CANH)}$ < +40V, 0V < $V_{DD}$ < 5.5V |
| D10 | $V_{O(CANH)}$ | CANH Dominant output voltage | 2.75 | 4.5 | V | $V_{TXD}$ = 0.8V |
| D11 | $V_{O(CANL)}$ | CANL Dominant output voltage | 0.5 | 2.25 | V | $V_{TXD}$ = 0.8V |
| D12 | $V_{DIFF(r)(o)}$ | Recessive differential output voltage | -500 | +50 | mV | $V_{TXD}$ = 2V; no load |
| D13 | $V_{DIFF(d)(o)}$ | Dominant differential output voltage | 1.5 | 3.0 | V | $V_{TXD}$ = 0.8V; $V_{DD}$ = 5V 40W < $R_L$ < 60W **(Note 2)** |
| D14 | $I_{O(SC)(CANH)}$ | CANH short-circuit output current | — | -200 | mA | $V_{CANH}$ = -5V |
| D15 | | | — | -100 (typical) | mA | $V_{CANH}$ = -40V, +40V. **(Note 1)** |
| D16 | $I_{O(SC)(CANL)I}$ | CANL short-circuit output current | — | 200 | mA | $V_{CANL}$ = -40V, +40V. **(Note 1)** |
| D17 | $V_{DIFF(r)(i)}$ | Recessive differential input voltage | -1.0 | +0.5 | V | -2V < $V_{(CANL, CANH)}$ < +7V **(Note 3)** |
| | | | -1.0 | +0.4 | V | -12V < $V_{(CANL, CANH)}$ < +12V **(Note 3)** |

**Note 1:** This parameter is periodically sampled and not 100% tested.

**2:** $I_{TXD}$ = $I_{RXD}$ = $I_{VREF}$ = 0 mA; 0V < $V_{CANL}$ < $V_{DD}$; 0V < $V_{CANH}$ < $V_{DD}$; $V_{RS}$ = $V_{DD}$.

**3:** This is valid for the receiver in all modes; High-speed, Slope-control and Standby.

## 2.2 DC Characteristics (Continued)

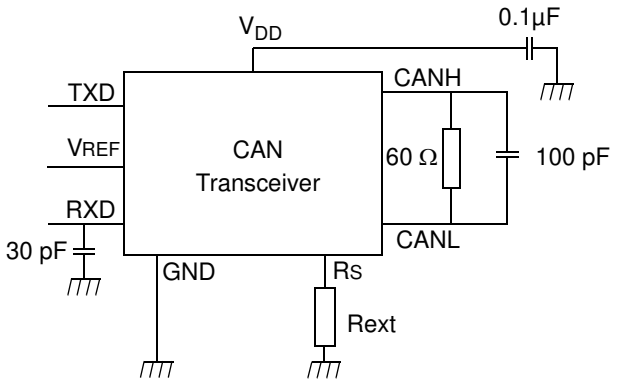
| DC Specifications (Continued) | | | Electrical Characteristics: Industrial (I): $T_{AMB}$ = -40°C to +85°C $V_{DD}$ = 4.5V to 5.5V Extended (E): $T_{AMB}$ = -40°C to +125°C $V_{DD}$ = 4.5V to 5.5V | | | |
|---|---|---|---|---|---|---|
| **Param No.** | **Sym** | **Characteristic** | **Min** | **Max** | **Units** | **Conditions** |
| **Bus Line (CANH; CANL) Receiver: [TXD = 2V; pins 6 and 7 externally driven]** | | | | | | |
| D18 | $V_{DIFF(d)(i)}$ | Dominant differential input voltage | 0.9 | 5.0 | V | -2V < V(CANL, CANH) < +7V **(Note 3)** |
| | | | 1.0 | 5.0 | V | -12V < V(CANL, CANH) < +12V **(Note 3)** |
| D19 | $V_{DIFF(h)(i)}$ | Differential input hysteresis | 100 | 200 | mV | See **Figure 2-3** **(Note 1)** |
| D20 | $R_{IN}$ | CANH, CANL Common-mode input resistance | 5 | 50 | kW | |
| D21 | $R_{IN(d)}$ | Deviation between CANH and CANL Common-mode input resistance | -3 | +3 | % | $V_{CANH} = V_{CANL}$ |
| **Bus Line (CANH; CANL) Receiver: [TXD = 2V; pins 6 and 7 externally driven]** | | | | | | |
| D22 | $R_{DIFF}$ | Differential input resistance | 20 | 100 | kW | |
| D24 | $I_{LI}$ | CANH, CANL input leakage current | — | 150 | µA | $V_{DD} < V_{POR}$; $V_{CANH} = V_{CANL}$ = +5V |
| **Transmitter Data Input (TXD)** | | | | | | |
| D25 | $V_{IH}$ | High-level input voltage | 2.0 | $V_{DD}$ | V | Output Recessive |
| D26 | $V_{IL}$ | Low-level input voltage | $V_{SS}$ | +0.8 | V | Output Dominant |
| D27 | $I_{IH}$ | High-level input current | -1 | +1 | µA | $V_{TXD} = V_{DD}$ |
| D28 | $I_{IL}$ | Low-level input current | -100 | -400 | µA | $V_{TXD}$ = 0V |
| **Receiver Data Output (RXD)** | | | | | | |
| D31 | $V_{OH}$ | High-level output voltage | 0.7 $V_{DD}$ | — | V | $I_{OH}$ = 8 mA |
| D32 | $V_{OL}$ | Low-level output voltage | — | 0.8 | V | $I_{OL}$ = 8 mA |
| **Voltage Reference Output ($V_{REF}$)** | | | | | | |
| D33 | $V_{REF}$ | Reference output voltage | 0.45 $V_{DD}$ | 0.55 $V_{DD}$ | V | -50 µA < $I_{VREF}$ < 50 µA |
| **Standby/Slope-Control ($R_S$ pin)** | | | | | | |
| D34 | $V_{STB}$ | Input voltage for standby mode | 0.75 $V_{DD}$ | — | V | |
| D35 | $I_{SLOPE}$ | Slope-control mode current | -10 | -200 | µA | |
| D36 | $V_{SLOPE}$ | Slope-control mode voltage | 0.4 $V_{DD}$ | 0.6 $V_{DD}$ | V | |
| **Thermal Shutdown** | | | | | | |
| D37 | $T_{J(sd)}$ | Shutdown junction temperature | 155 | 180 | °C | **Note 1** |
| D38 | $T_{J(h)}$ | Shutdown temperature hysteresis | 20 | 30 | °C | -12V < V(CANL, CANH) < +12V **(Note 3)** |

**Note 1:** This parameter is periodically sampled and not 100% tested.

**2:** $I_{TXD} = I_{RXD} = I_{VREF}$ = 0 mA; 0V < $V_{CANL}$ < $V_{DD}$; 0V < $V_{CANH}$ < $V_{DD}$; $V_{RS} = V_{DD}$.

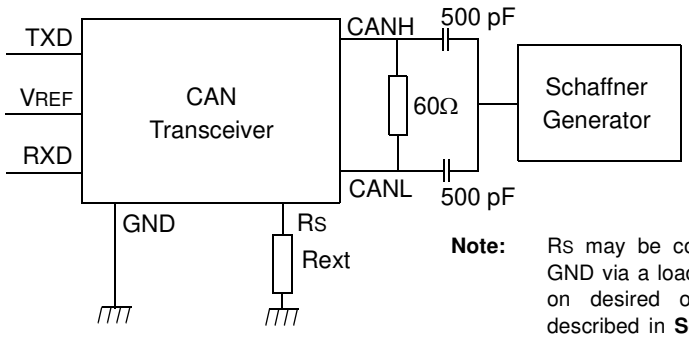
**3:** This is valid for the receiver in all modes; High-speed, Slope-control and Standby.

**FIGURE 2-1: TEST CIRCUIT FOR ELECTRICAL CHARACTERISTICS**




**Note:** RS may be connected to VDD or GND via a load resistor depending on desired operating mode as described in **Section 1.7.3 "Supply Voltage ($V_{DD}$)"**.

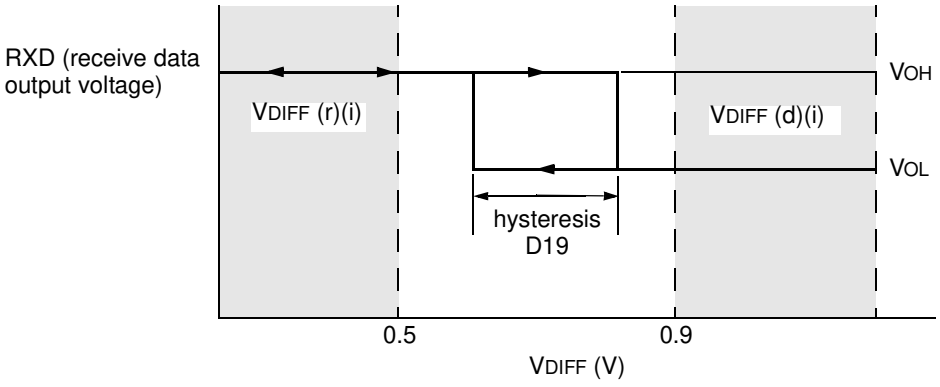
**FIGURE 2-2: TEST CIRCUIT FOR AUTOMOTIVE TRANSIENTS**




**Note:** RS may be connected to VDD or GND via a load resistor depending on desired operating mode as described in **Section 1.7.8 "Slope Resistor Input (Rs)"**.

The wave forms of the applied transients shall be in accordance with "ISO-7637, Part 1", test pulses 1, 2, 3a and 3b.

**FIGURE 2-3: HYSTERESIS OF THE RECEIVER**



## 2.3 AC Characteristics

| AC Specifications | | | Electrical Characteristics: Industrial (I): TAMB = -40°C to +85°C VDD = 4.5V to 5.5V Extended (E): TAMB = -40°C to +125°C VDD = 4.5V to 5.5V | | | |
|---|---|---|---|---|---|---|
| **Param No.** | **Sym** | **Characteristic** | **Min** | **Max** | **Units** | **Conditions** |
| 1 | tBIT | Bit time | 1 | 62.5 | µs | VRS = 0V |
| 2 | fBIT | Bit frequency | 16 | 1000 | kHz | VRS = 0V |
| 3 | TtxL2bus(d) | Delay TXD to bus active | — | 70 | ns | -40°C ≤ TAMB ≤ +125°C, VRS = 0V |
| 4 | TtxH2bus(r) | Delay TXD to bus inactive | — | 125 | ns | -40°C ≤ TAMB ≤ +85°C, VRS = 0V |
| | | | — | 170 | ns | -40°C ≤ TAMB ≤ +125°C, VRS = 0V |
| 5 | TtxL2rx(d) | Delay TXD to receive active | — | 130 | ns | -40°C ≤ TAMB ≤ +125°C, VRS = 0V |
| | | | — | 250 | ns | -40°C ≤ TAMB ≤ +125°C, RS = 47 kΩ |
| 6 | TtxH2rx(r) | Delay TXD to receiver inactive | — | 175 | ns | -40°C ≤ TAMB ≤ +85°C, VRS = 0V |
| | | | — | 225 | ns | -40°C ≤ TAMB ≤ +85°C, RS = 47 kΩ |
| | | | — | 235 | ns | -40°C ≤ TAMB ≤ +125°C, VRS = 0V |
| | | | — | 400 | ns | -40°C ≤ TAMB ≤ +125°C, RS = 47 kΩ |
| 7 | SR | CANH, CANL slew rate | 5.5 | 8.5 | V/µs | Refer to **Figure 2-1**; RS = 47 kΩ, (**Note 1)** |
| 10 | tWAKE | Wake-up time from standby (Rs pin) | — | 5 | µs | See **Figure 2-5** |
| 11 | TbusD2rx(s) | Bus Dominant to RXD Low (Standby mode) | — | 550 | ns | VRS = +4V; (See **Figure 2-6**) |
| 12 | CIN(CANH) CIN(CANL) | CANH; CANL input capacitance | — | 20 (typical) | pF | 1 Mb/s data rate; VTXD = VDD, **(Note 1)** |
| 13 | CDIFF | Differential input capacitance | — | 10 (typical) | pF | 1 Mb/s data rate **(Note 1)** |
| 14 | TtxL2busZ | TX Permanent Dominant Timer Disable Time | 1.25 | 4 | ms | |
| 15 | TtxR2pdt(res) | TX Permanent Dominant Timer Reset Time | — | 1 | µs | Rising edge on TXD while device is in permanent Dominant state |

**Note 1:** This parameter is periodically sampled and not 100% tested.

## 2.4 Timing Diagrams and Specifications

**FIGURE 2-4: TIMING DIAGRAM FOR AC CHARACTERISTICS**

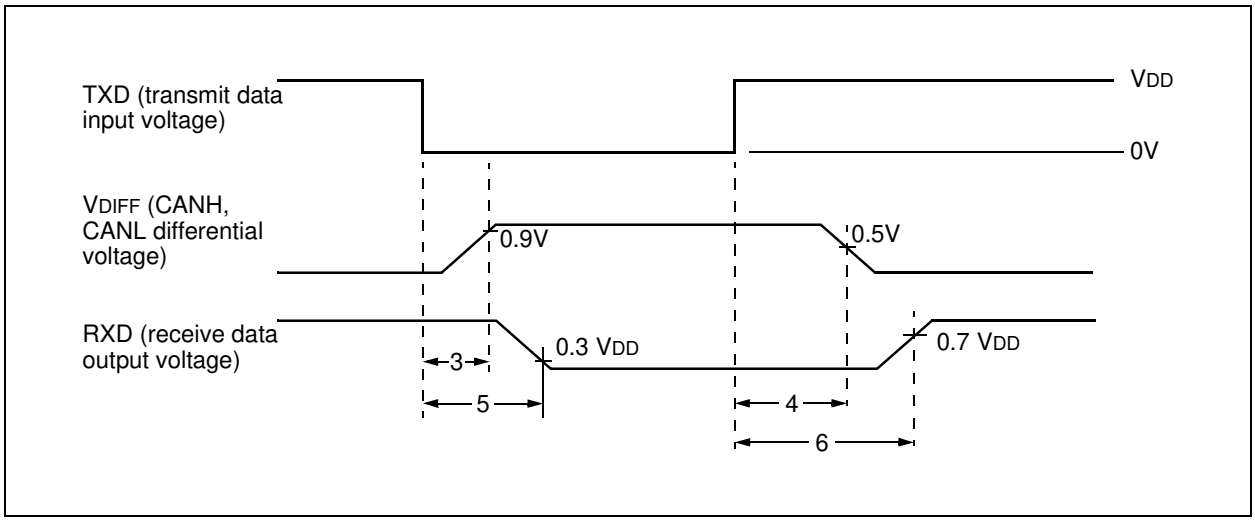



**FIGURE 2-5: TIMING DIAGRAM FOR WAKE-UP FROM STANDBY**

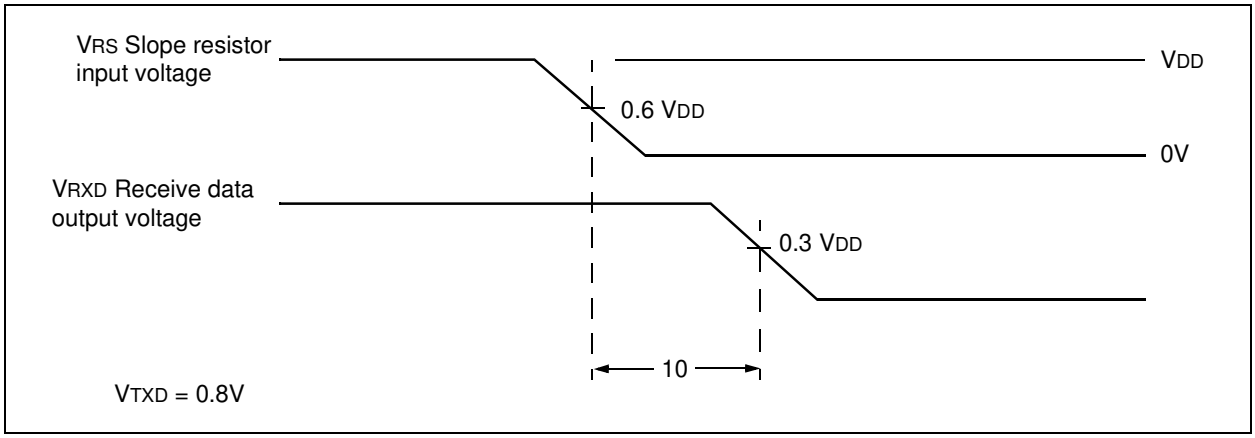
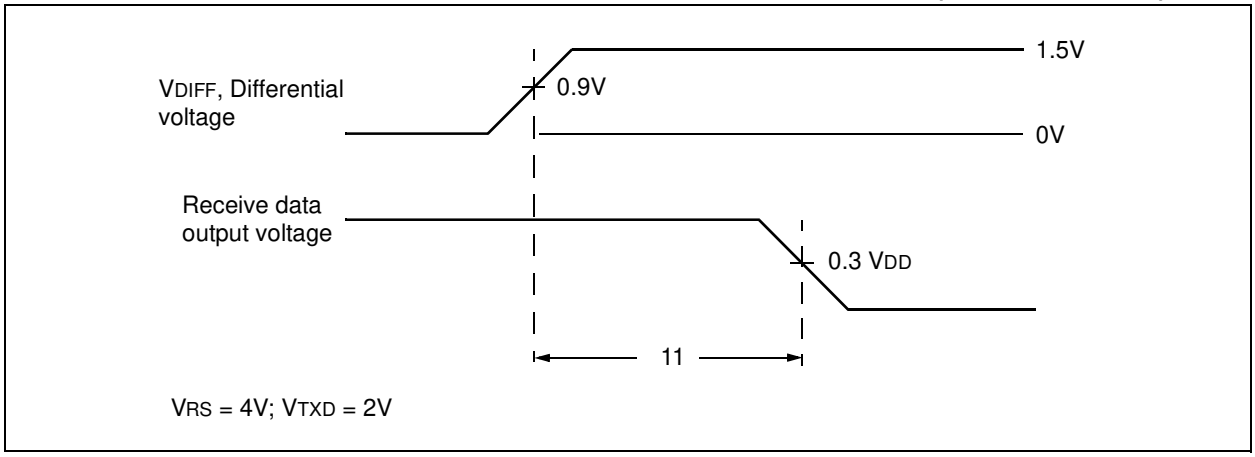



**FIGURE 2-6: TIMING DIAGRAM FOR BUS DOMINANT TO RXD LOW (STANDBY MODE)**

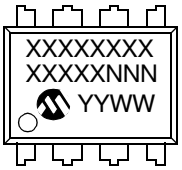


**NOTES:**

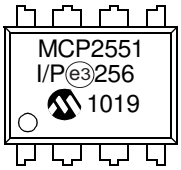
## 3.0 PACKAGING INFORMATION

### 3.1 Package Marking Information

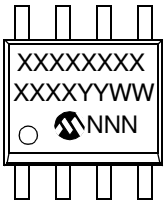
8-Lead PDIP (300 mil)




Example:




8-Lead SOIC (150 mil)



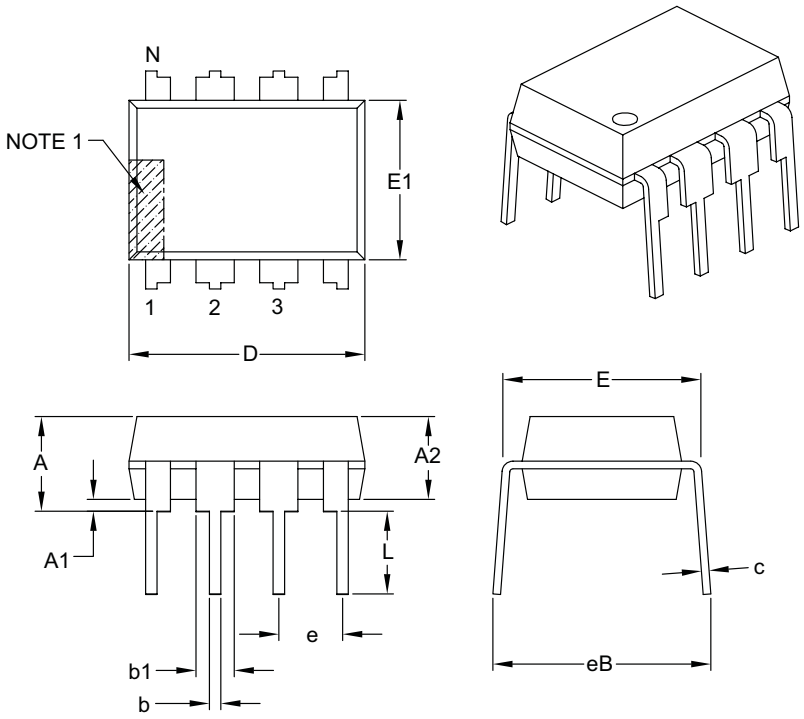

Example:


| | | |
|---|---|---|
| **Legend:** | XX...X | Customer-specific information |
| | Y | Year code (last digit of calendar year) |
| | YY | Year code (last 2 digits of calendar year) |
| | WW | Week code (week of January 1 is week ‘01’) |
| | NNN | Alphanumeric traceability code |
| | (e3) | Pb-free JEDEC designator for Matte Tin (Sn) |
| | * | This package is Pb-free. The Pb-free JEDEC designator ((e3)) can be found on the outer packaging for this package. |

**Note**: In the event the full Microchip part number cannot be marked on one line, it will be carried over to the next line, thus limiting the number of available characters for customer-specific information.

## 8-Lead Plastic Dual In-Line (P) – 300 mil Body [PDIP]

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging




| Units | | INCHES | | |
|---|---|---|---|---|
| Dimension Limits | | MIN | NOM | MAX |
| Number of Pins | N | | 8 | |
| Pitch | e | | .100 BSC | |
| Top to Seating Plane | A | – | – | .210 |
| Molded Package Thickness | A2 | .115 | .130 | .195 |
| Base to Seating Plane | A1 | .015 | – | – |
| Shoulder to Shoulder Width | E | .290 | .310 | .325 |
| Molded Package Width | E1 | .240 | .250 | .280 |
| Overall Length | D | .348 | .365 | .400 |
| Tip to Seating Plane | L | .115 | .130 | .150 |
| Lead Thickness | c | .008 | .010 | .015 |
| Upper Lead Width | b1 | .040 | .060 | .070 |
| Lower Lead Width | b | .014 | .018 | .022 |
| Overall Row Spacing § | eB | – | – | .430 |

**Notes:**

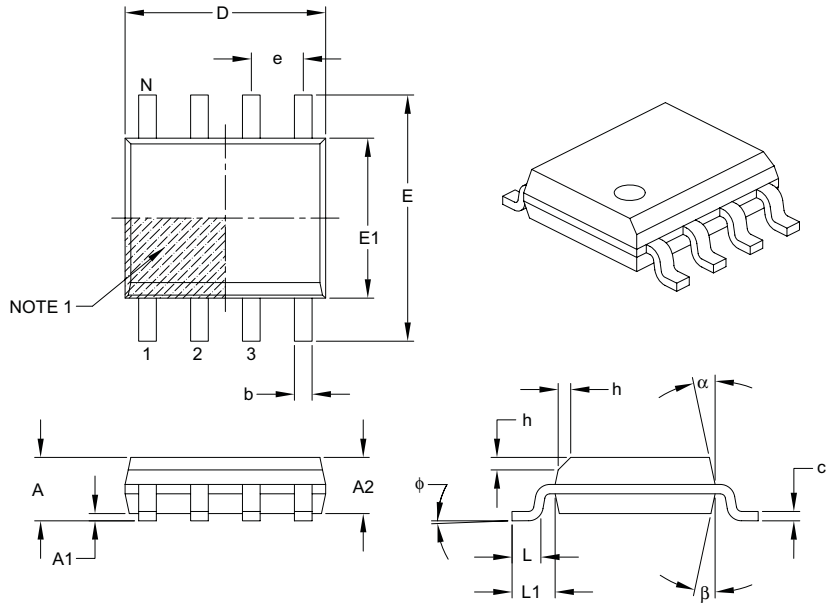
1. Pin 1 visual index feature may vary, but must be located with the hatched area.
2. § Significant Characteristic.
3. Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" per side.
4. Dimensioning and tolerancing per ASME Y14.5M.

   BSC: Basic Dimension. Theoretically exact value shown without tolerances.

Microchip Technology Drawing C04-018E

## 8-Lead Plastic Small Outline (SN) – Narrow, 3.90 mm Body [SOIC]

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging




| Units | | MILLIMETERS | | |
|---|---|---|---|---|
| Dimension Limits | | MIN | NOM | MAX |
| Number of Pins | N | | 8 | |
| Pitch | e | | 1.27 BSC | |
| Overall Height | A | – | – | 1.75 |
| Molded Package Thickness | A2 | 1.25 | – | – |
| Standoff § | A1 | 0.10 | – | 0.25 |
| Overall Width | E | | 6.00 BSC | |
| Molded Package Width | E1 | | 3.90 BSC | |
| Overall Length | D | | 4.90 BSC | |
| Chamfer (optional) | h | 0.25 | – | 0.50 |
| Foot Length | L | 0.40 | – | 1.27 |
| Footprint | L1 | | 1.04 REF | |
| Foot Angle | φ | 0° | – | 8° |
| Lead Thickness | c | 0.17 | – | 0.25 |
| Lead Width | b | 0.31 | – | 0.51 |
| Mold Draft Angle Top | α | 5° | – | 15° |
| Mold Draft Angle Bottom | β | 5° | – | 15° |

**Notes:**

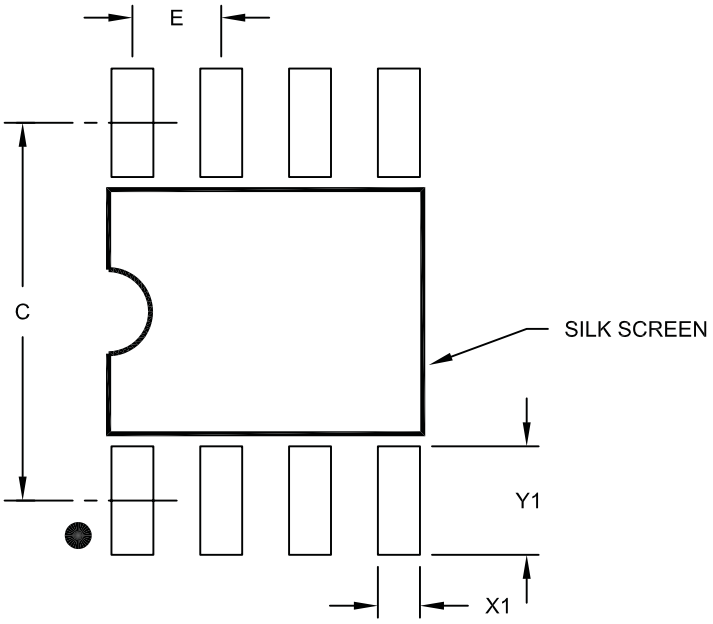
1. Pin 1 visual index feature may vary, but must be located within the hatched area.
2. § Significant Characteristic.
3. Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.15 mm per side.
4. Dimensioning and tolerancing per ASME Y14.5M.

BSC: Basic Dimension. Theoretically exact value shown without tolerances.
REF: Reference Dimension, usually without tolerance, for information purposes only.

Microchip Technology Drawing C04-057B

### 8-Lead Plastic Small Outline (SN) – Narrow, 3.90 mm Body [SOIC]

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging




RECOMMENDED LAND PATTERN

| Units | | MILLIMETERS | | |
|---|---|---|---|---|
| Dimension Limits | | MIN | NOM | MAX |
| Contact Pitch | E | | 1.27 BSC | |
| Contact Pad Spacing | C | | 5.40 | |
| Contact Pad Width (X8) | X1 | | | 0.60 |
| Contact Pad Length (X8) | Y1 | | | 1.55 |

Notes:

1. Dimensioning and tolerancing per ASME Y14.5M

BSC: Basic Dimension. Theoretically exact value shown without tolerances.

Microchip Technology Drawing No. C04-2057A

# APPENDIX A: REVISION HISTORY

## Revision F (July 2010)

The following is the list of modifications:

1. Updates to the packaging diagrams.

## Revision E (January 2007)

The following is the list of modifications:

1. Updates to the packaging diagrams.

## Revision D (October 2003)

The following is the list of modifications:

1. Undocumented changes.

## Revision C (November 2002)

The following is the list of modifications:

1. Undocumented changes.

## Revision B (June 2002)

The following is the list of modifications:

1. Undocumented changes.

## Revision A (June 2001)

- Original Release of this Document.

**NOTES:**

## PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, e.g., on pricing or delivery, refer to the factory or the listed sales office.

| PART NO. | -X | /XX | XXX |
|---|---|---|---|
| Device | Temperature Range | Package | Pattern |

| | | |
|---|---|---|
| Device: | MCP2551: | High-Speed CAN Transceiver |
| | MCP2551T: | High-Speed CAN Transceiver (Tape and Reel) |
| Temperature Range: | I = | -40°C to +85°C |
| | E = | -40°C to +125°C |
| Package: | P = | Plastic DIP (300 mil Body) 8-lead |
| | SN = | Plastic SOIC (150 mil Body) 8-lead |

**Examples:**

a) MCP2551-I/P: Industrial temperature, PDIP package.

b) MCP2551-E/P: Extended temperature, PDIP package.

c) MCP2551-I/SN: Industrial temperature, SOIC package.

d) MCP2551T-I/SN: Tape and Reel, Industrial Temperature, SOIC package.

e) MCP2551T-E/SN: Tape and Reel, Extended Temperature, SOIC package.

f) MCP2551-E/SN: Extended Temperature, SOIC package.

**NOTES:**

**Note the following details of the code protection feature on Microchip devices:**

- Microchip products meet the specification contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is one of the most secure families of its kind on the market today, when used in the intended manner and under normal conditions.
- There are dishonest and possibly illegal methods used to breach the code protection feature. All of these methods, to our knowledge, require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Most likely, the person doing so is engaged in theft of intellectual property.
- Microchip is willing to work with the customer who is concerned about the integrity of their code.
- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of their code. Code protection does not mean that we are guaranteeing the product as "unbreakable."

Code protection is constantly evolving. We at Microchip are committed to continuously improving the code protection features of our products. Attempts to break Microchip's code protection feature may be a violation of the Digital Millennium Copyright Act. If such acts allow unauthorized access to your software or other copyrighted work, you may have a right to sue for relief under that Act.



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