# CAN Bus Driver and Receiver

## FEATURES

- Survives Ground Shorts and Transients on Multiplexed Bus in Automotive and Industrial Applications
- Single Power Supply
- Compatible with Intel 82526 CAN Controller
- Direct Interface – No External Components Required
- Automotive Temperature Range (–40 to 125°C)

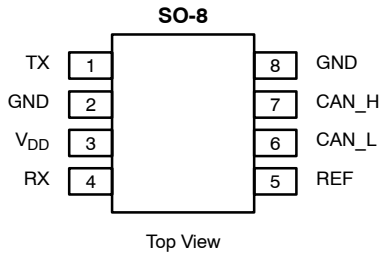
## DESCRIPTION

The Si9200EY is designed to interface between the Intel 82526 CAN controller and the physical bus to provide drive capability to the bus and differential receive capability to the controller. It is designed to absorb typical electrical transients on the bus which may occur in an automotive or industrial application, and protect itself against any abnormal bus conditions. The transmitter will be disabled during these conditions and will be re-enabled when the abnormal condition is cleared.

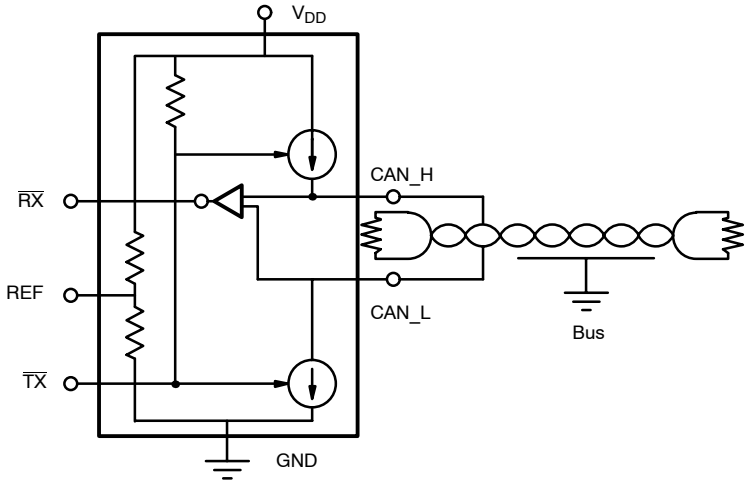
The Si9200EY is built using the Siliconix BiC/DMOS process. This process supports CMOS, DMOS, and isolated bipolar transistors and uses an epitaxial layer to prevent latchup. The bus line pins are diode protected and can be driven beyond the $V_{DD}$ to ground range.

The Si9200EY is offered in the space efficient 8-pin high-density surface-mount plastic package and is specified over the automotive temperature range (–40 to 125°C). The Si9200EY is available in lead free.

## PIN CONFIGURATION AND FUNCTIONAL BLOCK DIAGRAM




Ordering Information: Si9200EY-T1
Si9200EY-T1—E3 (Lead Free)



## ABSOLUTE MAXIMUM RATINGS[a]

Operating Temperature ($T_A$) . . . . . −40 to 125°C
Junction and Storage Temperature . . . . . -55 to 150°C
Voltage On Any Pin (Except CAN_H and CAN_L) with Respect to Ground . . . . . −0.3 to $V_{DD}$ +0.3 V
Voltage On CAN_H and CAN_L with Respect to Ground . . . . . −3 to +16 V
Supply Voltage, $V_{DD}$ . . . . . −0.3 to 12 V
Continuous Output Current . . . . . ±100 mA
Thermal Ratings[b]: $R_{\Theta JA}$ . . . . . 62.5°C/W (no airflow)

Notes
a. Extended exposure to the absolute maximum ratings or stresses beyond these ratings may affect device reliability or may cause permanent damage to the device. Functional operation at conditions other than the recommended operating conditions is not implied.
b. Mounted on 1-IN$^2$, FR4 PC Board.

## RECOMMENDED OPERATING CONDITIONS

$V_{DD}$ . . . . . 4.75 to 5.25 V
Bus Load Resistance . . . . . 60 Ω

## SPECIFICATIONS

| Parameter | Symbol | Test Conditions Unless Otherwise Specified $V_{DD}$ = 4.75 to 5.25 V | | Limits $T_A$ = −40 to 125°C Min[b] | Typ[a] | Max[b] | Unit |
|---|---|---|---|---|---|---|---|
| **Input** | | | | | | | |
| $\overline{TX}$ Input Voltage High | $V_{INH}$ | | | 4 | | | V |
| $\overline{TX}$ Input Voltage Low | $V_{INL}$ | | | | | 1 | |
| $\overline{TX}$ Input Current Low | $I_{IL}$ | $\overline{TX}$ = 0 V | | −50 | | −2.0 | µA |
| $\overline{TX}$ Input Current High | $I_{IH}$ | $\overline{TX}$ = $V_{DD}$ | | −1.0 | | 1.0 | |
| **Output** | | | | | | | |
| Bus Recessive | $V_{CAN\_HR}$, $V_{CAN\_LR}$ | $\overline{TX}$ = $V_{INH}$, $R_L$ = ∞ | | 2 | 2.5 | 3 | V |
| | $V_{DIF}$ = $V_{CAN\_HR}$ − $V_{CAN\_LR}$ | | | −0.5 | 0 | 0.05 | |
| Bus Dominant | $V_{CAN\_HD}$ | $\overline{TX}$ = $V_{INL}$, $R_L$ = 60 Ω | | 2.75 | 3.5 | 4.5 | |
| | $V_{CAN\_LD}$ | | | 0.5 | 1.5 | 2.25 | |
| | $V_{DIF}$ = $V_{CAN\_HD}$ − $V_{CAN\_LD}$ | | | 1.5 | 2 | 3 | |
| Reference Output | $V_{REF}$ | −25 µA ≤ $I_{REF}$ ≤ 25 µA | | 0.5 $V_{DD}$ −0.2 | 0.5 $V_{DD}$ | 0.5 $V_{DD}$ +0.2 | |
| Receive Output (Bus Recessive Conditions) | $V_{\overline{RXH}}$ | $\overline{TX}$ = $V_{INH}$<br>−2.0 V ≤ $V_{CAN\_H}$, $V_{CAN\_L}$ ≤ 7 V<br>−1 V ≤ $V_{CAN\_H}$ − $V_{CAN\_L}$ ≤ 0.5 V (Bus Recessive) | $I_{OUT}$ = −10 µA | $V_{DD}$ −0.3 | $V_{DD}$ −0.05 | | |
| | | | $I_{OUT}$ = −100 µA | $V_{DD}$ −1 | $V_{DD}$ −0.2 | | |
| | | | $I_{OUT}$ = −2 mA | $V_{DD}$ −1.75 | $V_{DD}$ −1 | | |
| Receive Output (Bus Dominant Conditions) | $V_{\overline{RXL}}$ | $\overline{TX}$ = $V_{INH}$<br>−0.8 V ≤ $V_{CAN\_H}$ ≤ 7 V<br>−2 V ≤ $V_{CAN\_L}$ ≤ 5.8 V<br>0.9 V ≤ $V_{CAN\_H}$ − $V_{CAN\_L}$ ≤ 5 V (Bus Dominant) | $I_{OUT}$ = 10 µA | | 0.05 | 0.3 | |
| | | | $I_{OUT}$ = 100 µA | | 0.2 | 1 | |
| | | | $I_{OUT}$ = 2 mA | | 1 | 1.75 | |
| Internal Resistance from Bus Pins | $R_{IN}$, BUS_L | $\overline{TX}$ = $V_{INH}$ (Recessive) | | 5 | | 50 | kΩ |
| | $R_{IN}$, BUS_H | | | 5 | | 50 | |
| | $R_{DIFF}$ | | | 10 | | 100 | |
| Internal Capacitance from Bus Pins[c] | $C_{IN}$ (CAN_H, CAN_L) | | | | | 50 | pF |

## SPECIFICATIONS

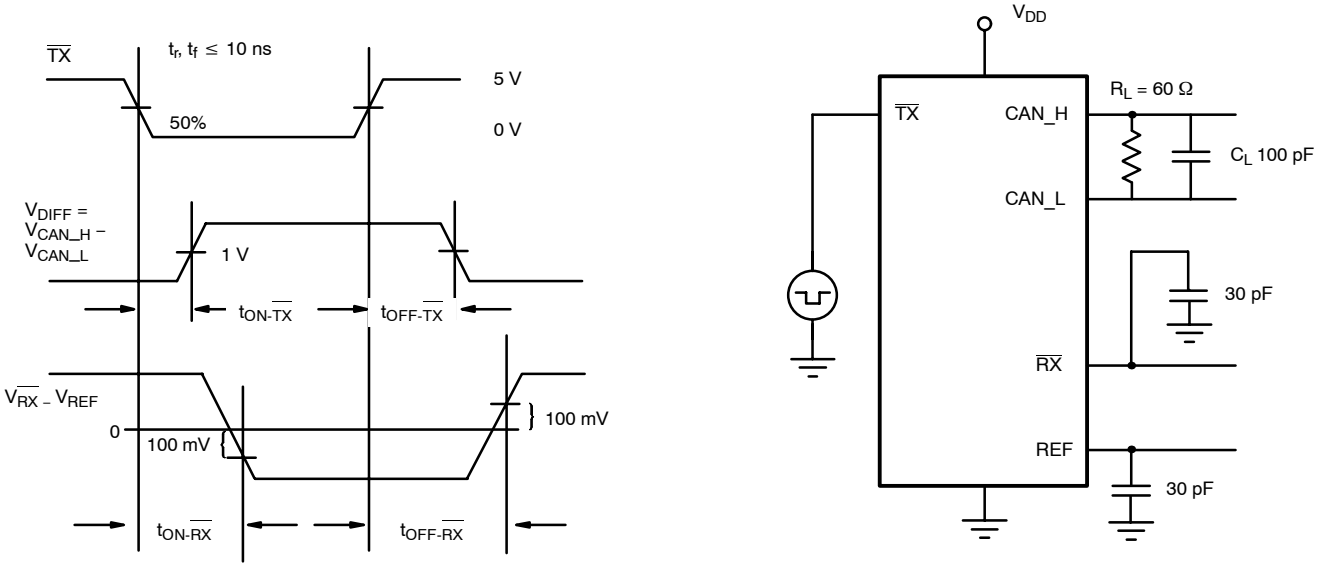
| Parameter | Symbol | Test Conditions Unless Otherwise Specified $V_{DD}$ = 4.75 to 5.25 V | Limits $T_A$ = −40 to 125°C Min[b] | Typ[a] | Max[b] | Unit |
|---|---|---|---|---|---|---|
| **Dynamic** | | | | | | |
| Propagation Delay – $\overline{TX}$ to $V_{DIFF}$ High | $t_{ON-\overline{TX}}$ | | | | 50 | ns |
| Propagation Delay – $\overline{TX}$ to $V_{DIFF}$ Low | $t_{OFF-\overline{TX}}$ | | | | 50 | |
| Propagation Delay – $\overline{TX}$ to Receive Low | $t_{ON-\overline{RX}}$ | | | | 120 | |
| Propagation Delay – $\overline{TX}$ to Receive High | $t_{OFF-\overline{RX}}$ | | | | 120 | |
| **Supply** | | | | | | |
| Supply Current | $I_{DD}$ | $\overline{TX}$ = $V_{INH}$, $V_{DD}$ = 5.25 V, $R_L$= 60 Ω (Recessive) | | | 25 | mA |
| | | $\overline{TX}$ = $V_{INL}$, $V_{DD}$ = 5.25 V, $R_L$= 60 Ω (Dominant) | 40 | | 75 | |
| **Transient[c]** | | | | | | |
| Electrostatic Discharge Human Body Model | $V_{ESD}$ | $C_L$ = 100 pF, $R_L$ = 1500 Ω MIL-STD-883D, Method 3015 | | 2000 | | V |
| Bus Transient Voltage | $V_{TRANS}$ | $R_S$ = 1000 Ω, 1 msec | −60 | | 60 | |
| **Protection** | | | | | | |
| Thermal Trip Point[c] | $T_{TRP}$ | | 150 | 165 | 180 | °C |
| Thermal Hysteresis[c] | $T_{HYS}$ | | 10 | 20 | 30 | |

Notes
a. Typical values are for DESIGN AID ONLY at $T_A$ = 25°C, not guaranteed nor subject to production testing.
b. The algebraic convention whereby the most negative value is a minimum and the most positive a maximum.
c. Guaranteed by design, not subject to production test.

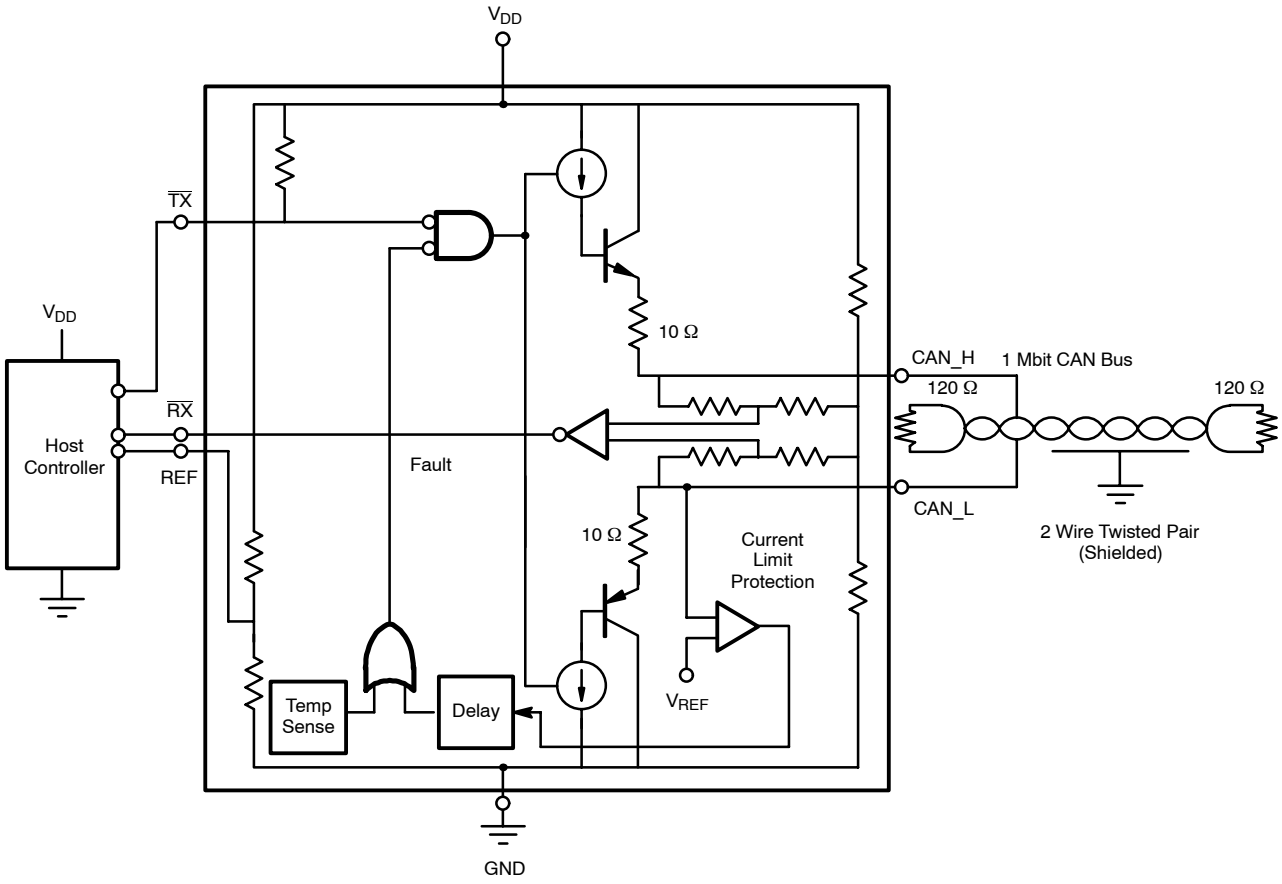
## TRUTH TABLE

| $\overline{TX}$ | Mode | Bus State | CAN_H | CAN_L | RX |
|---|---|---|---|---|---|
| Low | Transmit | Dominant | High | Low | Low |
| High (or Floating) | Transmit and Receive | Recessive | Floating | Floating | High |
| High (or Floating) | Receive | Recessive | High | Low | Low |

## SWITCHING TIME TEST CIRCUIT




## CIRCUIT SCHEMATIC



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