# 5V, 1Mbps, Low Supply Current CAN Transceivers

## ABSOLUTE MAXIMUM RATINGS

V_CC to GND ............................................................-0.3V to +6V
TXD, RS, SHDN, TERM to GND...............................-0.3V to +6V
RXD to GND .............................................................-0.3V to +6V
CANH, CANL to GND (MAX3058)........................-7.5V to +12.5V
CANH, CANL to GND (MAX3059)..............-0.3V to (V_CC + 0.3V)

Continuous Power Dissipation (T_A = +70°C)
  8-Pin SO (derate 5.9mW/°C above +70°C).................470mW
Operating Temperature Range ........................-40°C to +125°C
Maximum Junction Temperature .....................................+150°C
Storage Temperature Range .............................-65°C to +150°C
Lead Temperature (soldering, 10s) .................................+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.*

## DC ELECTRICAL CHARACTERISTICS

(V_CC = +5V ±10%, T_A = T_MIN to T_MAX, R_L = 60Ω, C_L = 100pF. Typical values are at V_CC = +5V and T_A = +25°C.) (Note 1)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| Supply Current | I_S | Dominant | | 40 | 70 | mA |
| | | Recessive | | 2 | 5 | |
| Quiescent Current Standby Mode | I_Q | Standby, MAX3058 | | 15 | 80 | µA |
| Shutdown Current | I_SHDN | V_SHDN = V_CC, MAX3058 | | | 5 | µA |
| | | V_TERM = V_RS = V_CC, MAX3059 | | | 10 | |
| | | V_TERM = 0V, V_RS = V_CC, MAX3059 | | | 150 | |
| Thermal-Shutdown Threshold | V_TSH | | | 160 | | °C |
| Thermal-Shutdown Hysteresis | | | | 25 | | °C |
| **TXD INPUT LEVELS** | | | | | | |
| High-Level Input Voltage | V_IH | | 2 | | | V |
| Low-Level Input Voltage | V_IL | | | | 0.8 | V |
| Input Capacitance | C_IN | (Note 3) | | 5 | 20 | pF |
| Pullup Resistor | R_INTXD | | 50 | | 100 | kΩ |
| **TERM INPUT LEVELS (MAX3059)** | | | | | | |
| High-Level Input Voltage | V_TRH | | 2 | | | V |
| Low-Level Input Voltage | V_TRL | | | | 0.8 | V |
| TERM Pullup Resistor | R_PU | | 50 | | 100 | kΩ |
| **CANH, CANL TRANSMITTER** | | | | | | |
| Recessive Bus Voltage | V_CANH, V_CANL | V_TXD = V_CC, no load | 2 | | 3 | V |
| | | V_TXD = V_CC, no load, V_RS = V_CC (standby mode), MAX3058 | -100 | | +100 | mV |
| CANH Output Voltage | V_CANH | V_TXD = 0V | 2.75 | | V_CC - 0.8V | V |
| CANL Output Voltage | V_CANL | V_TXD = 0V | 0.5 | | 2.25 | V |
| Differential Output (V_CANH - V_CANL) | ΔV_CANH, V_CANL | V_TXD = 0V, V_CC = 5V ±5% | 1.5 | | 3 | V |
| | | V_TXD = 0V, V_CC = 5V ±10% | 1.5 | | 3.2 | |
| | | V_TXD = 0V, R_L = 45Ω | 1.2 | | 3 | |
| | | V_TXD = V_CC, no load | -500 | | +50 | mV |

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## DC ELECTRICAL CHARACTERISTICS (continued)

($V_{CC}$ = +5V ±10%, $T_A$ = $T_{MIN}$ to $T_{MAX}$, $R_L$ = 60Ω, $C_L$ = 100pF. Typical values are at $V_{CC}$ = +5V and $T_A$ = +25°C.) (Note 1)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| CANH Short-Circuit Current | $I_{CANHSC}$ | -7V ≤ $V_{CANH}$ ≤ 0V, MAX3058 | -200 | | -30 | mA |
| | | $V_{CANH}$ = 0V, MAX3059 | -200 | | -30 | |
| CANL Short-Circuit Current | $I_{CANLSC}$ | $V_{CC}$ ≤ $V_{CANL}$ ≤ 12V, MAX3058 | 30 | | 200 | mA |
| | | $V_{CANL}$ = $V_{CC}$, MAX3059 | 30 | | 200 | |
| Termination Resistor | $R_{TERM}$ | $V_{TERM}$ = $V_{CC}$, MAX3059 | 108 | 120 | 132 | Ω |
| **RXD OUTPUT LEVELS** | | | | | | |
| RXD High-Output Voltage Level | $V_{OH}$ | I = -100µA | 0.8 x $V_{CC}$ | | $V_{CC}$ | V |
| RXD Low-Output Voltage Level | $V_{OL}$ | I = 1.6mA | | | 0.4 | V |
| **DC BUS RECEIVER** (Note 2) | | | | | | |
| Differential Input Voltage (Recessive) | $V_{DIFF}$ | MAX3058 | -17 | | +0.5 | V |
| | | MAX3058, $V_{RS}$ = $V_{CC}$ (standby mode) | -17 | | +0.5 | |
| | | MAX3059 | -$V_{CC}$ | | +0.5 | |
| Differential Input Voltage (Dominant) | $V_{DIFF}$ | MAX3058 | 0.9 | | 17 | V |
| | | MAX3058, $V_{RS}$ = $V_{CC}$ (standby mode) | 1.1 | | 17 | |
| | | MAX3059 | 0.9 | | $V_{CC}$ | |
| Differential Input Hysteresis | $V_{DIFF(HYST)}$ | | | 100 | | mV |
| CANH and CANL Input Resistance | $R_I$ | | 5 | | 25 | kΩ |
| Differential Input Resistance | $R_{DIFF}$ | | 10 | | 100 | kΩ |
| **MODE SELECTION (RS)** | | | | | | |
| Input Voltage for High Speed | $V_{SLP}$ | | | | 0.3 x $V_{CC}$ | V |
| Input Voltage for Standby | $V_{STBY}$ | MAX3058 | 0.75 x $V_{CC}$ | | | V |
| | $V_{SHDN}$ | MAX3059 | | | | |
| Slope-Control Mode Voltage | $V_{SLOPE}$ | $R_{RS}$ = 25kΩ to 200kΩ | 0.4 x $V_{CC}$ | | 0.6 x $V_{CC}$ | V |
| Slope-Control Mode Current | $I_{SLOPE}$ | $R_{RS}$ = 25kΩ to 200kΩ | -10 | | -200 | µA |
| High-Speed Mode Current | $I_{HS}$ | $V_{RS}$ = 0V | | | -500 | µA |
| **SHUTDOWN (MAX3058)** | | | | | | |
| SHDN Input Voltage High | $V_{SHDNH}$ | | 2 | | | V |
| SHDN Input Voltage Low | $V_{SHDNL}$ | | | | 0.8 | V |
| SHDN Pulldown Resistor | $R_{INDHDN}$ | | 50 | | 100 | kΩ |

## TIMING CHARACTERISTICS

($V_{CC}$ = +5V ±10%, $R_L$ = 60Ω, $C_L$ = 100pF, $T_A$ = $T_{MIN}$ to $T_{MAX}$. Typical values are at $V_{CC}$ = +5V and $T_A$ = +25°C.)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| Delay TXD to Bus Active, Figure 1 | $t_{ONTXD}$ | $V_{RS}$ = 0V (≤ 1Mbps) | | | 50 | ns |
| | | $R_{RS}$ = 25kΩ (≤ 500kbps) | | 125 | | |
| | | $R_{RS}$ = 100kΩ (≤ 125kbps) | | 450 | | |
| | | $R_{RS}$ = 200kΩ (≤ 62.5kbps) | | 700 | | |
| Delay TXD to Bus Inactive, Figure 1 | $t_{OFFTXD}$ | $V_{RS}$ = 0V (≤ 1Mbps) | | | 70 | ns |
| | | $R_{RS}$ = 25kΩ (≤ 500kbps) | | 180 | | |
| | | $R_{RS}$ = 100kΩ (≤ 125kbps) | | 500 | | |
| | | $R_{RS}$ = 200kΩ (≤ 62.5kbps) | | 1000 | | |
| Delay Bus to Receiver Active, Figure 1 | $t_{ONRXD}$ | $V_{RS}$ = 0V (≤ 1Mbps) | | | 80 | ns |
| | | $R_{RS}$ = 25kΩ (≤ 500kbps) | | 150 | | |
| | | $R_{RS}$ = 100kΩ (≤ 125kbps) | | 500 | | |
| | | $R_{RS}$ = 200kΩ (≤ 62.5kbps) | | 800 | | |
| Delay Bus to Receiver Inactive, Figure 1 | $t_{OFFRXD}$ | $V_{RS}$ = 0V (≤ 1Mbps) | | | 100 | ns |
| | | $R_{RS}$ = 25kΩ (≤ 500kbps) | | 210 | | |
| | | $R_{RS}$ = 100kΩ (≤ 125kbps) | | 500 | | |
| | | $R_{RS}$ = 200kΩ (≤ 62.5kbps) | | 1100 | | |
| Differential Output Slew Rate | SR | $V_{RS}$ = 0V (≤ 1Mbps) | | 100 | | V/µs |
| | | $R_{RS}$ = 25kΩ (≤ 500kbps) | | 7 | | |
| | | $R_{RS}$ = 100kΩ (≤ 125kbps) | | 1.6 | | |
| | | $R_{RS}$ = 200kΩ (≤ 62.5kbps) | | 0.8 | | |
| Bus Dominant to RXD Active | $t_{DRXDL}$ | $V_{RS}$ > 0.8 x $V_{CC}$ (standby), MAX3058, Figure 2 | | | 1 | µs |
| Standby to Receiver Active | $t_{SBRXDL}$ | BUS dominant, MAX3058, Figure 2 | | | 4 | µs |
| SHDN to Bus Inactive | $t_{OFFSHDN}$ | TXD = GND, MAX3058, Figure 3 (Note 4) | | | 1 | µs |
| SHDN to Receiver Active | $t_{ONSHDN}$ | BUS dominant, MAX3058, Figure 3 (Note 5) | | | 4 | µs |
| RS to Bus Inactive | $t_{OFFSHDN}$ | TXD = GND, MAX3059, Figure 3 (Note 4) | | | 1 | µs |
| RS to Receiver Active | $t_{ONSHDN}$ | BUS dominant, MAX3059, Figure 3 (Note 5) | | | 4 | µs |
| TERM to Resistor Switched On | $t_{ONRT}$ | $V_{RS}$ = $V_{CC}$ (part in shutdown), MAX3059, Figure 4 | | | 400 | ns |
| TERM to Resistor Switched Off | $t_{OFFRT}$ | $V_{RS}$ = $V_{CC}$ (part in shutdown), MAX3059, Figure 4 | | | 400 | ns |
| ESD Protection | | Human Body Model | | 12 | | ±kV |

**Note 1:** All currents into device are positive; all currents out of the device are negative. All voltages are referenced to device ground, unless otherwise noted.

**Note 2:** ($V_{TXD}$ = $V_{CC}$; CANH and CANL externally driven; -7V < $V_{CANH}$, $V_{CANL}$ < 12V for MAX3058; 0V < $V_{CANH}$, $V_{CANL}$ < $V_{CC}$ for MAX3059, unless otherwise specified).

**Note 3:** Specification guaranteed by design, not production tested.

**Note 4:** No other devices on the BUS.

**Note 5:** BUS externally driven.

**MAXIM**
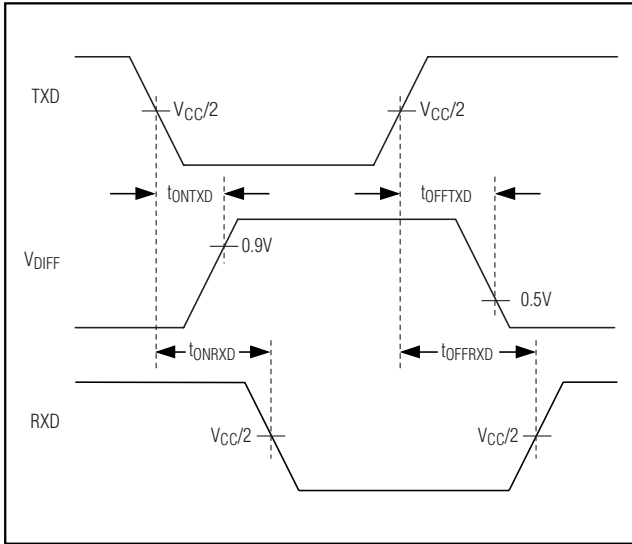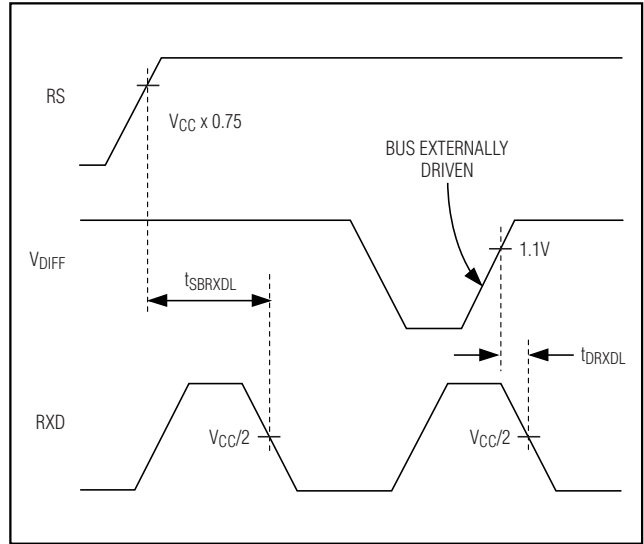
MAX3058/MAX3059



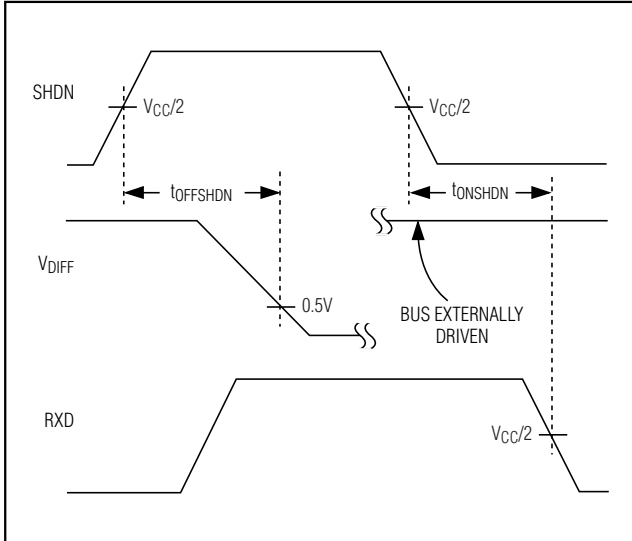Figure 1. Timing Diagram



Figure 2. Timing Diagram for Standby Signal (MAX3058)
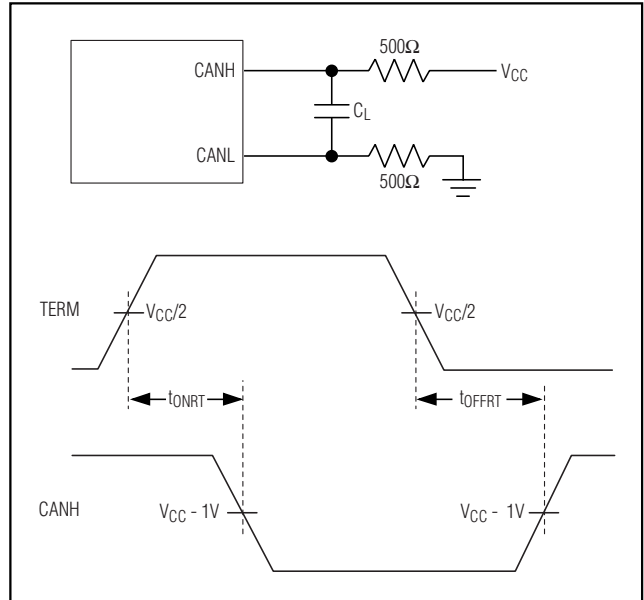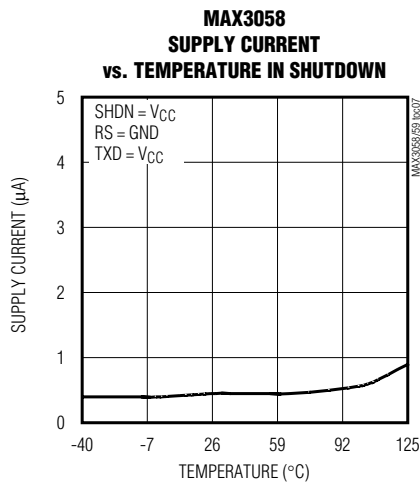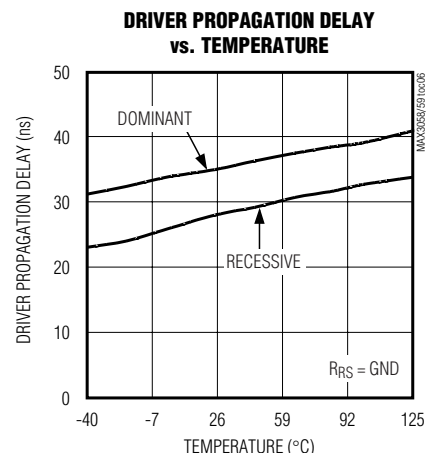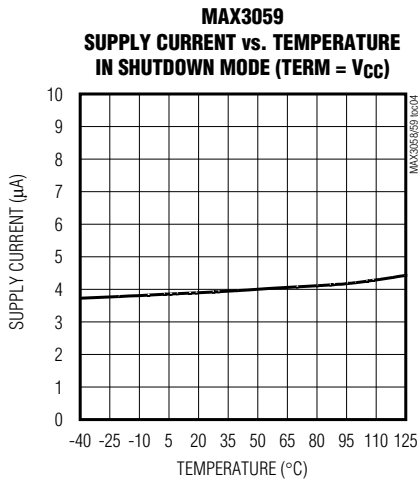


Figure 3. Timing Diagram for Shutdown Signal



Figure 4. Test Circuit and Diagram for TERM Timing (MAX3059)

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# 5V, 1Mbps, Low Supply Current
# CAN Transceivers

_____*Typical Operating Characteristics*

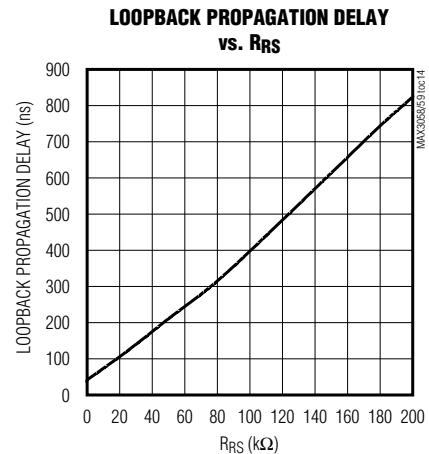(V_CC = +5V, R_L = 60Ω, C_L = 100pF, T_A = +25°C, unless otherwise specified.)

**SLEW RATE vs. R_RS AT 100kbps**

**SUPPLY CURRENT vs. DATA RATE**

**MAX3059
SUPPLY CURRENT vs. TEMPERATURE
IN SHUTDOWN MODE (TERM = GND)**

**MAX3059
SUPPLY CURRENT vs. TEMPERATURE
IN SHUTDOWN MODE (TERM = V_CC)**

**RECEIVER PROPAGATION DELAY
vs. TEMPERATURE**

**DRIVER PROPAGATION DELAY
vs. TEMPERATURE**

**MAX3058
SUPPLY CURRENT
vs. TEMPERATURE IN SHUTDOWN**

**RECEIVER OUTPUT LOW
vs. OUTPUT CURRENT**

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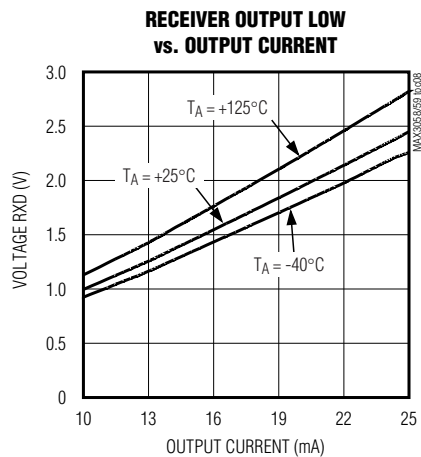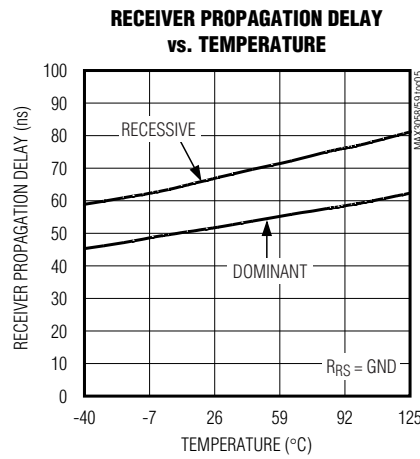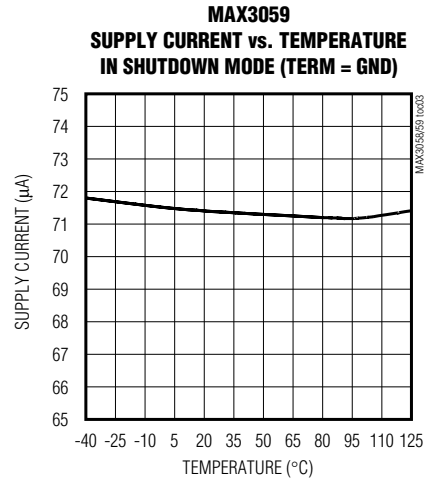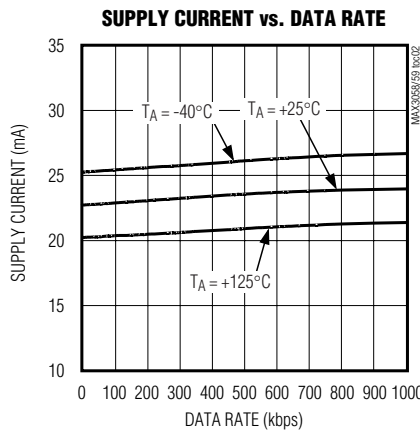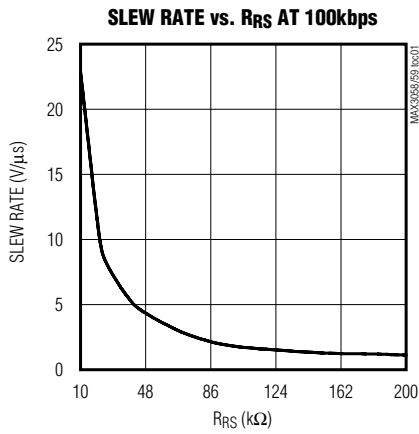
**MAX3058/MAX3059**

## Typical Operating Characteristics (continued)

($V_{CC}$ = +5V, $R_L$ = 60Ω, $C_L$ = 100pF, $T_A$ = +25°C, unless otherwise specified.)

### RECEIVER OUTPUT HIGH vs. OUTPUT CURRENT



### DIFFERENTIAL VOLTAGE vs. DIFFERENTIAL LOAD RL



### RECEIVER PROPAGATION DELAY



### DRIVER PROPAGATION DELAY



### DRIVER PROPAGATION DELAY (RS = GND)



### LOOPBACK PROPAGATION DELAY vs. $R_{RS}$
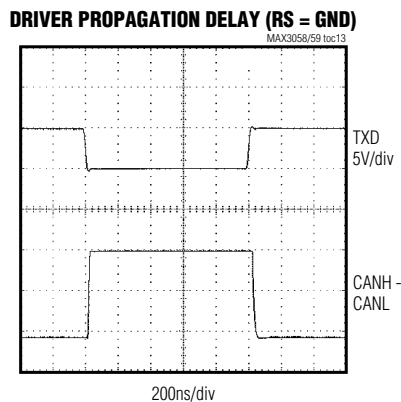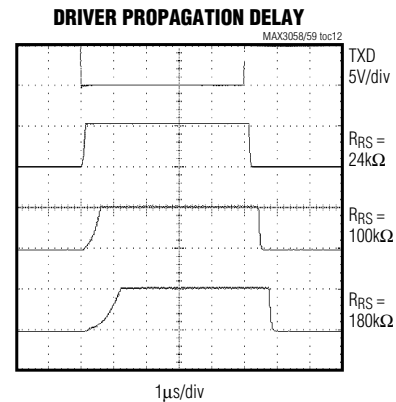
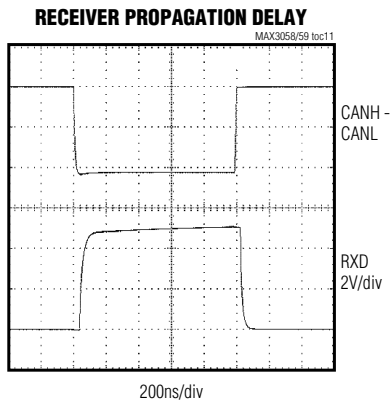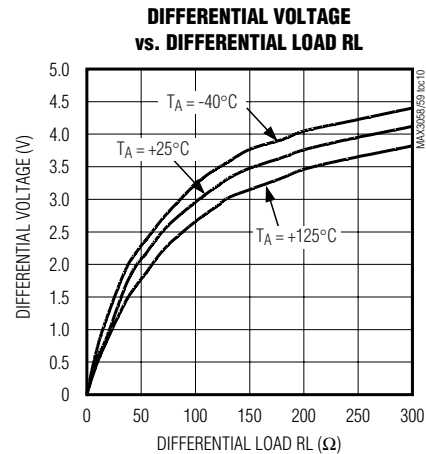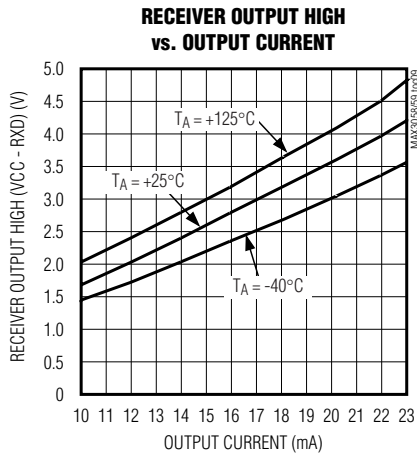# 5V, 1Mbps, Low Supply Current
# CAN Transceivers

## Pin Description

| PIN | | NAME | FUNCTION |
|-----|-----|------|----------|
| MAX3058 | MAX3059 | | |
| 1 | 1 | TXD | Transmit Data Input. TXD is a CMOS/TTL-compatible input from a CAN controller. TXD has an internal 75kΩ pullup resistor. |
| 2 | 2 | GND | Ground |
| 3 | 3 | V$_{CC}$ | Supply Voltage. Bypass V$_{CC}$ to GND with a 0.1µF capacitor. |
| 4 | 4 | RXD | Receive Data Output. RXD is a CMOS/TTL-compatible output. |
| 5 | — | SHDN | Shutdown Input, CMOS/TTL-Compatible Input. Drive SHDN high to put the IC into shutdown mode. SHDN has an internal 75kΩ pulldown resistor to GND. |
| 6 | 6 | CANL | CAN Bus Line Low |
| 7 | 7 | CANH | CAN Bus Line High |
| 8 | 8 | RS | Mode Select Input. Drive RS low or connect to GND for high-speed operation. Connect a resistor between RS and GND to control output slope. For the MAX3058, drive RS high to put into standby mode. (see *Mode Selection* section). For the MAX3059, drive RS above 0.75 x V$_{CC}$ to select shutdown mode. |
| — | 5 | TERM | Terminate Input, CMOS/TTL Compatible. Drive TERM high or leave floating to terminate the device with a 120Ω across the CANH and CANL. Drive TERM low to disconnect this resistor. TERM has an internal 75kΩ pullup resistor to V$_{CC}$. |

## Functional Diagram

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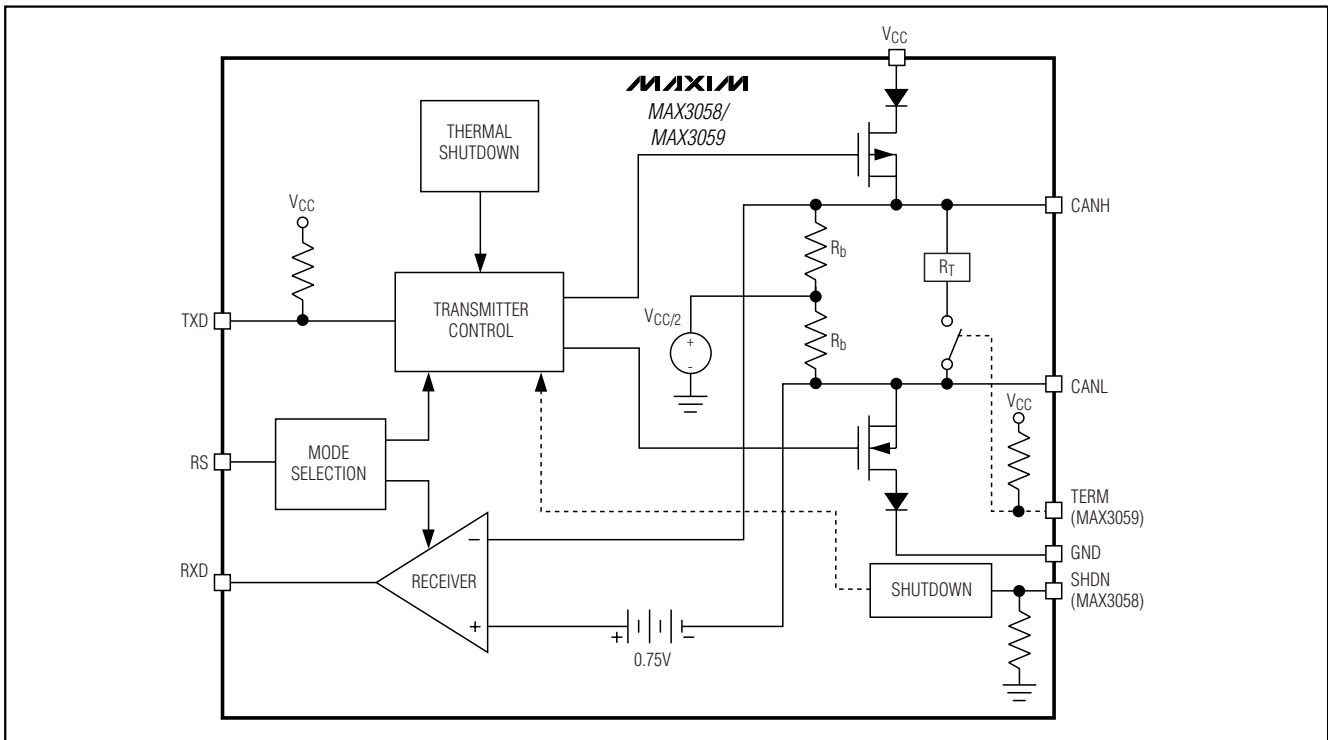
## Detailed Description

The MAX3058/MAX3059 interface between the protocol controller and the physical wires of the bus lines in a CAN. They are primarily intended for printer and tele-com backplane applications requiring data rates up to 1Mbps. These devices provide differential transmit capability to the bus and differential receive capability to the CAN controller.

The MAX3058 output common-mode range is from -7V to +12V. The MAX3059 output common-mode range is from 0V to $V_{CC}$. The MAX3059 contains an internal switch termination resistor that makes it ideal for JetLink applications.

The MAX3058 features four different modes of operation: high-speed, slope control, standby, and shut-down. The MAX3059 features three different modes of operation: high speed, slope control, and shutdown. High-speed mode allows data rates up to 1Mbps. In slope-control mode, the slew rate may be optimized for data rates up to 500kbps, so the effects of EMI are reduced, and unshielded twisted or parallel cable can be used. In standby mode, the transmitters are shut off and the receivers are put into low-current mode. In shutdown mode, the transmitter and receiver are switched off.

The transceivers operate from a single +5V supply and draw 40mA of supply current in dominant state and 2mA in recessive state. In standby mode, supply current is reduced to 15µA. In shutdown mode, supply current is 1µA for the MAX3058 and 5µA for the MAX3059.

CANH and CANL are output short-circuit current limited and are protected against excessive power dissipation by thermal-shutdown circuitry that places the driver outputs into a high-impedance state.

### Transmitter

The transmitter converts a single-ended input (TXD) from the CAN controller to differential outputs for the bus lines (CANH, CANL). The truth table for the trans-mitter and receiver is given in Tables 1 and 2.

**Table 1. Transmitter and Receiver Truth Table for MAX3058 When Not Connected to the Bus**

| TXD | RS | SHDN | CANH | CANL | BUS STATE | RXD |
|---|---|---|---|---|---|---|
| Low | $V_{RS} < 0.75 \times V_{CC}$ | Low | High | Low | Dominant | Low |
| High or float | $V_{RS} < 0.75 \times V_{CC}$ | Low | 5kΩ to 25kΩ to $V_{CC}/2$ | 5kΩ to 25kΩ to $V_{CC}/2$ | Recessive | High |
| X | $V_{RS} > 0.75 \times V_{CC}$ | Low | 5kΩ to 25kΩ to GND | 5kΩ to 25kΩ to GND | Recessive | High |
| X | X | High | Floating | Floating | Floating | High |

**Table 2. Transmitter and Receiver Truth Table for MAX3059 When Not Connected to the Bus**

| TXD | RS | TERM | CANH | CANL | BUS STATE | RXD |
|---|---|---|---|---|---|---|
| Low | $V_{RS} < 0.75 \times V_{CC}$ | Low | High | Low | Dominant | Low |
| Low | $V_{RS} < 0.75 \times V_{CC}$ | High | High | Low | Dominant | Low |
| | | | 120Ω terminating resistor across | | | |
| High or float | $V_{RS} < 0.75 \times V_{CC}$ | Low | 5kΩ to 25kΩ to $V_{CC}/2$ | 5kΩ to 25kΩ to $V_{CC}/2$ | Recessive | High |
| High or float | $V_{RS} < 0.75 \times V_{CC}$ | High | 5kΩ to 25kΩ to $V_{CC}/2$ | 5kΩ to 25kΩ to $V_{CC}/2$ | Recessive | High |
| | | | 120Ω terminating resistor across | | | |
| X | $V_{RS} > 0.75 \times V_{CC}$ | Low | Floating | Floating | Floating | High |
| X | $V_{RS} > 0.75 \times V_{CC}$ | High | Floating | Floating | Floating | High |
| | | | 120Ω terminating resistor across | | | |

### Receiver

The receiver reads differential input from the bus lines (CANH, CANL) and transfers this data as a single-ended output (RXD) to the CAN controller. It consists of a comparator that senses the difference $\Delta V = (CANH - CANL)$ with respect to an internal threshold of 0.7V. If this difference is positive (i.e., $\Delta V > 0.7$), a logic low is present at RXD. If negative (i.e., $\Delta V < 0.7V$), a logic high is present. The receiver always echoes the CAN BUS data.

The CANH and CANL common-mode range is -7V to +12V for the MAX3058, and 0V to $V_{CC}$ for the MAX3059. RXD is logic high when CANH and CANL are either shorted, or terminated and undriven.

### Mode Selection

#### High-Speed Mode

Connect RS to ground to set the MAX3058/MAX3059 to high-speed mode. When operating in high-speed mode, the MAX3058/MAX3059 can achieve transmission rates of up to 1Mbps. In high-speed mode, use shielded twisted-pair cable to avoid EMI problems.

#### Slope-Control Mode

Connect a resistor from RS to ground to select slope-control mode (Table 3). In slope-control mode, CANH and CANL slew rates are controlled by the resistor connected to the RS pin. Maximum transmission speeds are controlled by $R_{RS}$, and range from 40kbps to 500kbps. Controlling the rise and fall slopes reduces EMI and allows the use of an unshielded twisted pair or a parallel pair of wires as bus lines. The transfer function for selecting the resistor value is given by:

$$R_{RS} \ (k\Omega) \approx 12{,}500/(\text{maximum speed in kbps})$$

See the Slew Rate vs. $R_{RS}$ graph in the *Typical Operating Characteristics*.

### Standby Mode

If a logic-high level is applied to RS, the MAX3058 enters a low-current standby mode. In this mode, the transmitter is switched off and the receiver is switched to a low-current/low-speed state. If dominant bits are detected, RXD switches to low level. The microcontroller should react to this condition by switching the transceiver back to normal operation.

When the MAX3058 enters standby mode, RXD goes high for 4µs (max) regardless of the BUS state. However, after 4µs, RXD goes low only when the BUS is dominant; otherwise, RXD remains high (when the BUS is recessive). For proper measurement of standby to receiver active time ($t_{SBRXDL}$), the BUS should be in a dominant state (see Figure 2).

### Shutdown Mode

Drive SHDN high to enter shutdown mode on the MAX3058. Connect SHDN to ground or leave it floating for normal operation. On the MAX3059, drive RS high to enter shutdown.

### TERM

Drive TERM high (to $V_{CC}$) or leave it floating to terminate the MAX3059 with 120$\Omega$ resistor connected across the CANH and CANL. Connect TERM to ground to disconnect this resistor.

### Thermal Shutdown

If the junction temperature exceeds +160°C, the device is switched off. The hysteresis is approximately 25°C, disabling thermal shutdown once the temperature drops to +135°C. In thermal shutdown, CANH and CANL go recessive and all IC functions are disabled.

## Table 3. Mode Selection Truth Table

| CONDITION FORCED AT PIN RS | MODE | RESULTING CURRENT AT RS (µA) |
|---|---|---|
| $V_{RS} < 0.3 \times V_{CC}$ | High speed | $|I_{RS}| < 500$ |
| $0.4 \times V_{CC} < V_{RS} < 0.6 \times V_{CC}$ | Slope control | $10\mu A < |I_{RS}| < 200$ |
| $V_{RS} > 0.75 \times V_{CC}$ | Standby (MAX3058) | $|I_{RS}| < 10$ |
| $V_{RS} > 0.75 \times V_{CC}$ | Shutdown (MAX3059) | $|I_{RS}| < 10$ |

## Applications Information

### Reduced EMI and Reflections

In slope-control mode, the CANH and CANL outputs are slew-rate limited, minimizing EMI and reducing reflections caused by improperly terminated cables.

In multidrop CAN applications, it is important to maintain a direct point-to-point wiring scheme. A single pair of wires should connect each element of the CAN bus, and the two ends of the bus should be terminated with 120Ω resistors. A star configuration should never be used.

Any deviation from the point-to-point wiring scheme creates a stub. The high-speed edge of the CAN data on a stub can create reflections back down the bus. These reflections can cause data errors by eroding the noise margin of the system.

Although stubs are unavoidable in a multidrop system, care should be taken to keep these stubs as small as possible, especially in high-speed mode. In slope-control mode, the requirements are not as rigorous, but stub length should still be minimized.
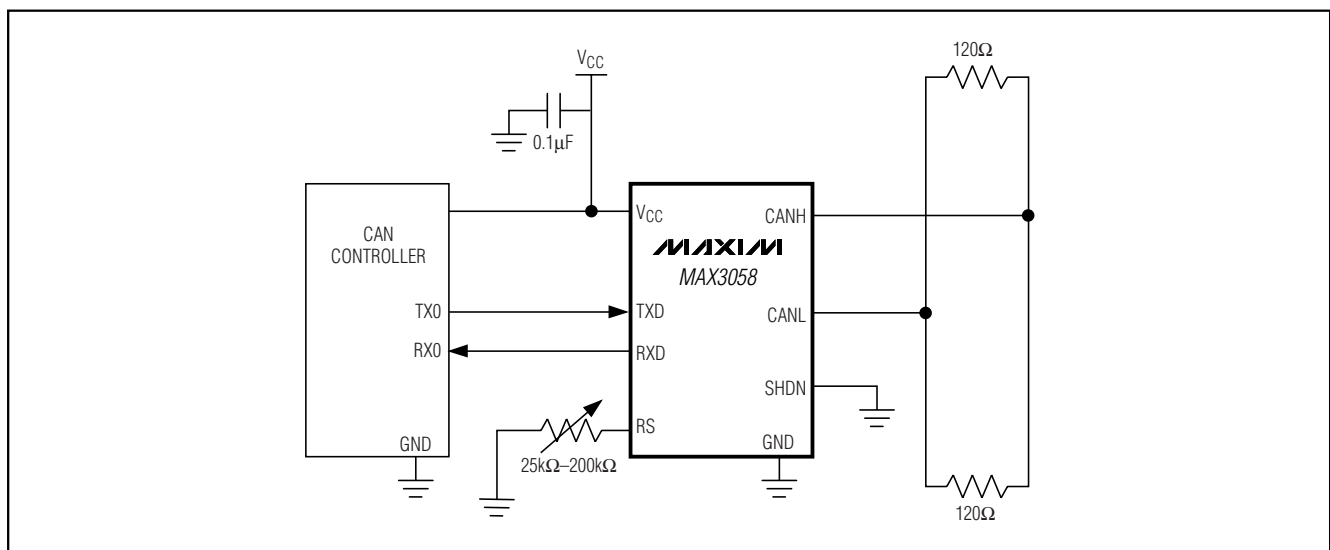
### Power Supply and Bypassing

The MAX3058/MAX3059 require no special layout considerations beyond common practices. Bypass $V_{CC}$ to GND with a 0.1μF ceramic capacitor mounted close to the IC with short lead lengths and wide trace widths.

## Chip Information

TRANSISTOR COUNT: 1024

PROCESS: BiCMOS

## Typical Operating Circuit

# 5V, 1Mbps, Low Supply Current
# CAN Transceivers

_____**Package Information**

(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information, go to **www.maxim-ic.com/packages**.)

SOICN.EPS

| DIM | INCHES | | MILLIMETERS | |
|-----|--------|--------|-------------|--------|
| | MIN | MAX | MIN | MAX |
| A | 0.053 | 0.069 | 1.35 | 1.75 |
| A1 | 0.004 | 0.010 | 0.10 | 0.25 |
| B | 0.014 | 0.019 | 0.35 | 0.49 |
| C | 0.007 | 0.010 | 0.19 | 0.25 |
| e | 0.050 BSC | | 1.27 BSC | |
| E | 0.150 | 0.157 | 3.80 | 4.00 |
| H | 0.228 | 0.244 | 5.80 | 6.20 |
| L | 0.016 | 0.050 | 0.40 | 1.27 |

VARIATIONS:

| DIM | INCHES | | MILLIMETERS | | N | MS012 |
|-----|--------|--------|-------------|--------|-----|-------|
| | MIN | MAX | MIN | MAX | | |
| D | 0.189 | 0.197 | 4.80 | 5.00 | 8 | AA |
| D | 0.337 | 0.344 | 8.55 | 8.75 | 14 | AB |
| D | 0.386 | 0.394 | 9.80 | 10.00 | 16 | AC |

TOP VIEW

FRONT VIEW

SIDE VIEW

NOTES:
1. D&E DO NOT INCLUDE MOLD FLASH.
2. MOLD FLASH OR PROTRUSIONS NOT TO EXCEED 0.15mm (.006").
3. LEADS TO BE COPLANAR WITHIN 0.10mm (.004").
4. CONTROLLING DIMENSION: MILLIMETERS.
5. MEETS JEDEC MS012.
6. N = NUMBER OF PINS.

**DALLAS** SEMICONDUCTOR **MAXIM**

PROPRIETARY INFORMATION

TITLE:
PACKAGE OUTLINE, .150" SOIC

| APPROVAL | DOCUMENT CONTROL NO. | REV. | |
|----------|---------------------|------|---|
| | 21-0041 | B | 1/1 |

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