# TEMIC

# Si9243

## Single-Ended Bus Driver

## Features

- Single-Ended Transceiver
- Survives Shorts and Transients on Automotive Bus
- Wide Power Supply Voltage Range
- Fault Detection
- ISO9141 Compatible

## Description

The Si9243 is a monolithic bus driver designed to provide bidirectional serial communication in automotive diagnostic applications.

The device incorporates protection against overvoltages and short circuits to GND or $V_{BAT}$. The transceiver pin is protected and can be driven beyond the $V_{BAT}$ voltage.

The temperature and short circuit fault detection feature is still active as in the Si9242, but the $\overline{FAULT}$ signal is not brought out. In the transmit mode, load shorts and opens are generally detected by the processor monitoring RXK and TX. When the two mirror each other there is no fault, but the Si9243 will turn off the K output in the event of over temperature or short circuit

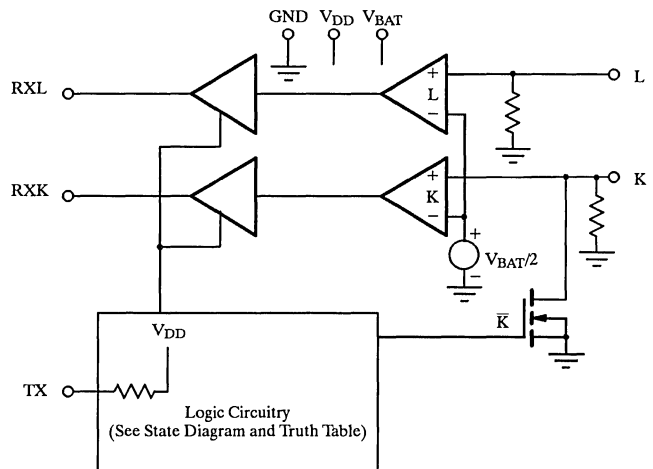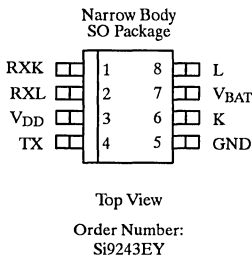to protect the IC. The fault will be reset when TX toggles "high".

TX is set "high" for receive only.

The RX output is capable of driving CMOS or 1 × LSTTL load.

The Si9243 is built on the Siliconix BiC/DMOS process. This process supports bipolar transistors, CMOS and DMOS. An epitaxial layer prevents latchup.

The Si9243 is available in a 8-pin SO package and operates over the automotive temperature range (−40 to 125°C).

## Pin Configurations and Functional Block Diagram



Narrow Body
SO Package

RXK — 1 | 8 — L
RXL — 2 | 7 — $V_{BAT}$
$V_{DD}$ — 3 | 6 — K
TX — 4 | 5 — GND

Top View

Order Number:
Si9243EY

**Bus Interface** **5**

# Output Table and State Diagrams



Over Temp

Power On → ( A = 1 ) ⟷ ( A = 0 )

Over Temp • TX

Short Circuit

Power On → ( B = 1 ) ⟷ ( B = 0 )

TX
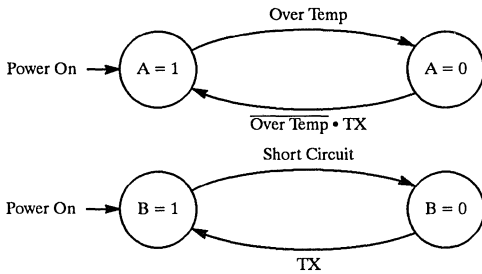
Note: Over Temp is a condition and not meant to be a logic signal.

| Inputs | State Variable | | Output Table | | | | |
|--------|----------------|---|--------------|---|---|-----|----------|
| TX | A | B | K | RXK | L | RXL | Comments |
| 0 | 1 | 1 | 0 | 0 | 0 | 0 | |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| 0 | 1 | 1 | 0 | 0 | 1 | 1 | |
| 1 | 1 | 1 | 1 | 1 | 0 | 0 | |
| x | 0 | 1 | HiZ | K | L | L | Over Temp |
| 0 | 1 | 0 | HiZ | 1 | L | L | Short Circuit |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | Receive Mode |
| 1 | 1 | 1 | 0 | 0 | 0 | 0 | |

X = "1" or "0"
HiZ = High Impedance State

# Absolute Maximum Ratings

Voltage Referenced to Ground

Voltage On $V_{BAT}$ . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 45 V

Voltage K , L . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . $-3$ to $V_{BAT}$ + 1 V

Voltage On Any Pin (Except $V_{BAT}$, K)
or Max. Current . . . . . . . . . . . . . . . . . $-0.3$ to $V_{DD}$ + 0.3 V or 10 mA

Voltage on $V_{DD}$ . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 7 V

Short Circuit Duration (to $V_{BAT}$ or GND) . . . . . . . . . . Continuous

Operating Temperature ($T_A$) . . . . . . . . . . . . . . . . . . . . $-40$ to 125°C

Junction and Storage Temperature . . . . . . . . . . . . . . . . . -55 to 150°C

Thermal Resistance $\Theta_{JA}$ . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . TBD

# Specifications[a]

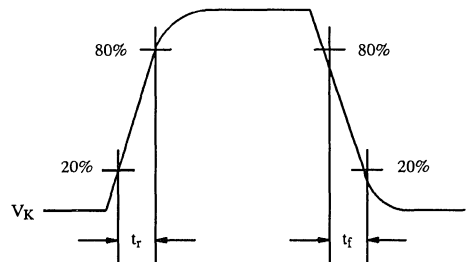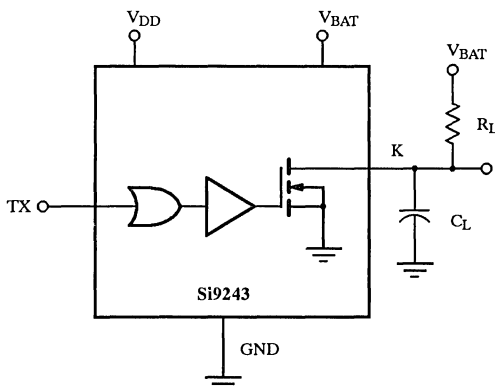| Parameter | Symbol | Test Conditions Unless Otherwise Specified $V_{DD}$ = 4.5 to 5.5 V, $V_{BAT}$ = 8 to 35 V | Temp[b] | Limits E Suffix: $-40$ to 125°C | | | Unit |
|-----------|--------|---------------------------------------------------------------------------------------------|---------|---------------------------------|--------|-----------------|------|
| | | | | Min[c] | Typ[d] | Max[c] | |
| **Transmitter and Logic Levels** | | | | | | | |
| TX Input Low Voltage | $V_{ILT}$ | | Full | | | 1.5 | V |
| TX Input High Voltage | $V_{IHT}$ | | Full | 3.5 | | | |
| K Output Low Voltage | $V_{OLK}$ | $R_L$ = 510 Ω, $C_L$ = 10 nF See Test Circuit | Full | | | 0.2 $V_{BAT}$ | |
| K Output High Voltage | $V_{OHK}$ | | Full | 0.91 $V_{BAT}$ | | | |
| K Rise, Fall Times | $t_r$, $t_f$ | | Full | | | 9.6 | µs |
| K Output Sink Resistance | Rsi | TX = 0 V | Full | | | 110 | Ω |
| K Output Capacitance[e] | $C_O$ | | Full | | | 20 | pF |
| TX Input Capacitance[e] | $C_{INT}$ | | Full | | | 10 | |
| TX Input Current | $I_{INT}$ | | Full | $-60$ | | $-4$ | µA |

## Specifications[a]

| Parameter | Symbol | Test Conditions Unless Otherwise Specified $V_{DD}$ = 4.5 to 5.5 V, $V_{BAT}$ = 8 to 35 V | | Temp[b] | Limits E Suffix: −40 to 125°C Min[c] | Typ[d] | Max[c] | Unit |
|---|---|---|---|---|---|---|---|---|
| **Receiver** | | | | | | | | |
| L and K Input Low Voltage[f] | $V_{ILK}$ | | | Full | | 0.4 $V_{BAT}$ | 0.3 $V_{BAT}$ | |
| L and K Input High Voltage[f] | $V_{IHK}$ | | | Full | 0.7 $V_{BAT}$ | 0.6 $V_{BAT}$ | | V |
| RXL and RXK Output Low Voltage | $V_{OLR}$ | TX = 4 V | $V_{ILK}, V_{ILL}$ = 0 30 $V_{BAT}$ $I_{OLR}$ = 1 mA | Full | | | 0.4 | |
| RXL and RXK High Voltage | $V_{OHR}$ | | $V_{IHK}, V_{IHL}$ = 0.70 $V_{BAT}$ $I_{OHR}$ = −40 μA | Full | 2.8 | | | |
| L and K Input Currents | $I_{IHK}$ | | $V_{IHK} = V_{BAT}$ | Full | 1.5 | | 20 | μA |
| **Supplies** | | | | | | | | |
| Bat Supply Current | $I_{BAT}$ | TX = 1.5 V, K, L Open | | Full | | 2.7 | 5.0 | mA |
| Logic Supply Current | $I_{DD}$ | TX = 1.5 V, K, L Open | | Full | | 1 | 3.0 | |
| **Miscellaneous** | | | | | | | | |
| Baud Rate | BR | $R_L$ = 510 Ω, $C_L$ = 10 nF | | Full | 10.4 | | | k Baud |

Notes
a    Refer to PROCESS OPTION FLOWCHART for additional information.
b.   Room = 25°C, Cold and Hot = as determined by the operating temperature suffix.
c.   The algebraic convention whereby the most negative value is a minimum and the most positive a maximum, is used in this data sheet.
d.   Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.
e.   Guaranteed by design, not subject to production test.
f.   Hysterisis 0.2 $V_{BAT}$ typical.

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**Bus Interface**

## Test Circuit

## Application



ECU = Electronic Control Unit