

## Single-Ended Bus Transceiver

### Features

- Single-Ended Transceiver
- Survives Shorts and Transients on Automotive Bus
- Wide Power Supply Voltage Range
- ISO 9141 Compatible
- Open Drain Fault Output

### Benefits

- Single-Wire Multiplexer Interface
- ISO Diagnosis Bus

### Applications

- Automobiles
- Trucks
- Tractors

### Description

The Si9241EY is a monolithic bus transceiver designed to provide bidirectional serial communication in automotive diagnostic applications.

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

A fault output provides an active low in case of a short circuit or an open load. In the event of an over temperature condition, the output is immediately switched off and a fault indicated. This condition can only be reset once the over temperature condition is removed, and  $\overline{CS}$  is toggled high.

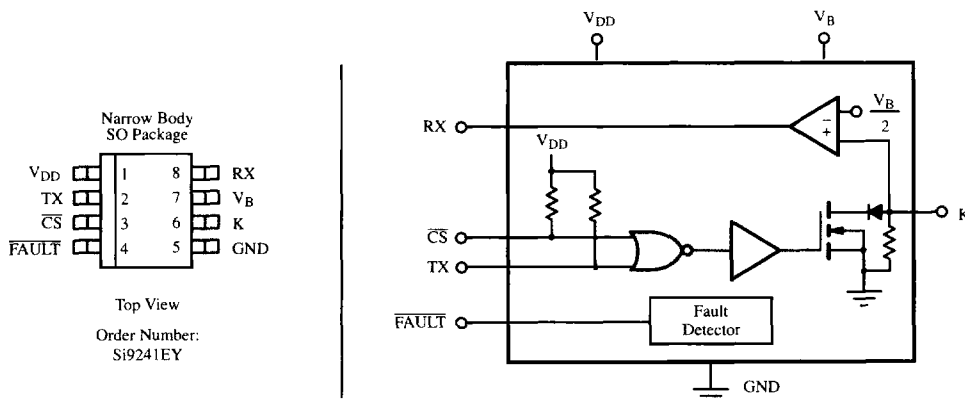
For bi-directional communication,  $\overline{CS}$  must be High for "receive" and Low for "transmit". If  $\overline{CS}$  is Low, while IC is receiving data, an incorrect fault signal will occur. To inhibit the open load and short detect, tie  $\overline{CS}$  and  $T_X$  together.

The Si9241EY is built on the Siliconix BiC/DMOS process. An epitaxial layer prevents latchup.

The RX output is capable of driving CMOS or  $1 \times$  LSTTL load.

The Si9241EY is available in a space efficient 8-pin SO package. It operates reliably over the automotive temperature range (-40 to 125°C).

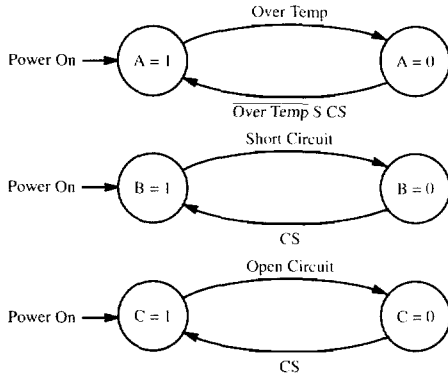
### Pin Configuration and Functional Block Diagram



**4**  
Interface

Updates to this data sheet may be obtained via facsimile by calling Siliconix FaxBack, 1-408-970-5600. Please request FaxBack document #70013. Application Note AN602 may also be obtained via FaxBack, request document #70573.

## Output Table and State Diagrams



Inputs		State Variable			Output Table			Comments
$\overline{CS}$	TX	A	B	C	RX	K	FAULT	
0	0	1	1	1	0	0	1	Over Temp Short Circuit Open Circuit
0	1	1	1	1	1	1	1	
X	X	0	1	1	K	HiZ	0	
0	X	1	0	1	K	HiZ	0	
0	X	1	1	0	K	HiZ	0	Receive Mode
1	X	1	1	1	0	0	1	
1	X	1	1	1	1	1	1	

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

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

## Absolute Maximum Ratings

Voltage Referenced to Ground  
 Voltage On  $V_{BAT}$  ..... 4.5 V  
 Voltage K ..... -16 V to ( $V_B + 1$ ) V  
 Voltage or Max. Current On Any Pin  
 (Except  $V_{BAT}$ , K) ..... -0.3 V 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  $\Theta_{JA}$  ..... 125°C/W

## Specifications

Parameter	Symbol	Test Conditions Unless Otherwise Specified $V_{DD} = 4.5$ to $5.5$ V, $V_{BAT} = 7.25$ to $35$ V	Temp <sup>a</sup>	Limits E Suffix: -40 to 125°C			Unit
				Min <sup>b</sup>	Typ <sup>c</sup>	Max <sup>b</sup>	
<b>Transmitter and Logic Levels</b>							
$\overline{CS}$ , TX Input Low Voltage	$V_{ILT}$		Full			1.5	V
$\overline{CS}$ , TX Input High Voltage	$V_{IHT}$		Full	3.5			
K Output Low Voltage	$V_{OLK}$	$R_L = 510 \Omega$ , $C_1 = 10$ nF $V_{BAT} = 35$ V, $V_{DD} = 4.5$ V	Full			4.9	
K Output High Voltage	$V_{OHK}$	$R_L = 510 \Omega$ , $C_1 = 10$ nF See Test Circuit	Full	0.91 $V_{BAT}$		0.2 $V_{BAT}$	
K Rise, Fall Times	$t_r$ , $t_f$		Full			9.6	$\mu$ s
K Output Sink Resistance	$R_{Si}$	$\overline{CS} = 0$ V, TX = 0 V	Full			110	$\Omega$
K Output Capacitance <sup>d</sup>	$C_O$	$\overline{CS} = 0$ V	Full			20	pF
TX Input Capacitance <sup>d</sup>	$C_{INT}$		Full			10	
$\overline{CS}$ , TX Input Current	$I_{INT}$	$V_{DD} = 5.5$ V, $V_{INT} = 1.5$ V, 3.5 V	Full	-60		-4	$\mu$ A

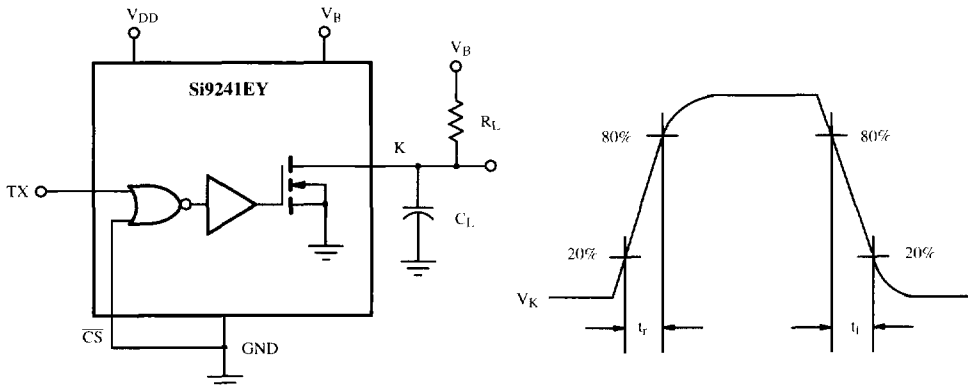
**Specifications**

Parameter	Symbol	Test Conditions Unless Otherwise Specified	Temp <sup>a</sup>	Limits E Suffix: -40 to 125°C			Unit
				Min <sup>b</sup>	Typ <sup>c</sup>	Max <sup>b</sup>	
<b>Receiver</b>							
K Input Low Voltage	V <sub>ILK</sub>		Full		0.4 V <sub>BAT</sub>	0.33 V <sub>BAT</sub>	V
K Input High Voltage	V <sub>IHK</sub>		Full	0.7 V <sub>BAT</sub>	0.6 V <sub>BAT</sub>		
K Input Hysteresis <sup>d</sup>	V <sub>HYS</sub>		Full	0.1 V <sub>BAT</sub>			
RX Output Low Voltage	V <sub>OLR</sub>	$\overline{CS} = 4\text{ V}$	Full			0.4	V
RX High Voltage	V <sub>OHR</sub>		$V_{ILK} = 0.33\text{ V}_{BAT}$ $I_{OLR} = 1\text{ mA}$	Full	4		
K Input Currents	I <sub>IHK</sub>		Full	1.5		20	μA
<b>Supplies</b>							
Bat Supply Current	I <sub>BAT</sub>	$\overline{CS}, TX = 1.5\text{ V}, K\text{ Open}$	Full		2.7	5.0	mA
Logic Supply Current	I <sub>DD</sub>		Full		1	3.0	
<b>Miscellaneous</b>							
Baud Rate	BR	R <sub>L</sub> = 510 Ω, C <sub>L</sub> = 10 nF	Full	10.4			kBaud
Fault Output Low Voltage	V <sub>OLF</sub>	$\overline{CS} = TX = 0\text{ V}, K = V_B, I_{OLF} = 1\text{ mA}$	Full			0.4	V
$\overline{CS}$ Minimum Pulse Width <sup>d, e</sup>	t <sub>cs</sub>		Full	1			μs

**Notes**

- Room = 25°C, Cold and Hot = as determined by the operating temperature suffix.
- The algebraic convention whereby the most negative value is a minimum and the most positive a maximum, is used in this data sheet.
- Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.
- Guaranteed by design, not subject to production test.
- Minimum pulse width to reset a fault condition.

**Test Circuit (Transmit Only)**



## Application Circuit

