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.

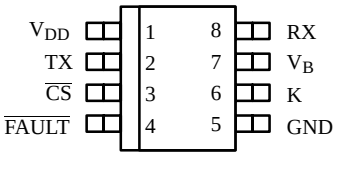
The Si9241EY is built on the Siliconix BiC/DMOS process. An epitaxial layer prevents latchup.

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

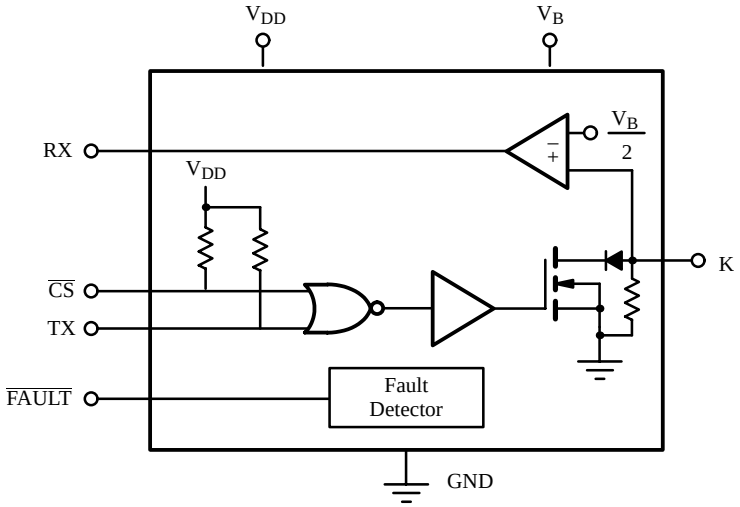
Pin Configuration and Functional Block Diagram

Narrow Body
SO Package



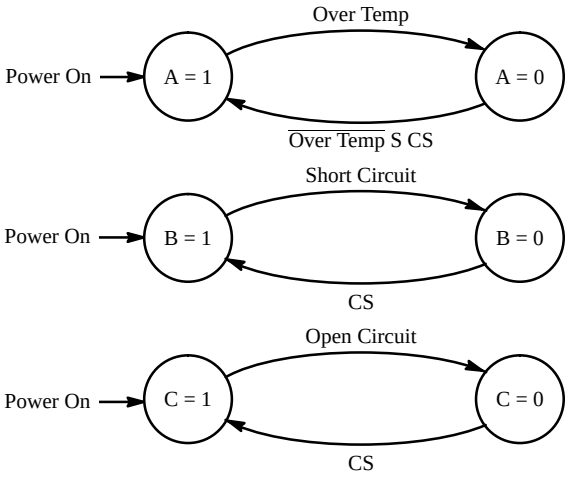
Top View

Order Number:
Si9241EY



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			
$\overline{CS}$	TX	A	B	C	RX	K	$\overline{FAULT}$	Comments
0	0	1	1	1	0	0	1	
0	1	1	1	1	1	1	1	
X	X	0	1	1	K	HiZ	0	Over Temp
0	X	1	0	1	K	HiZ	0	Short Circuit
0	X	1	1	0	K	HiZ	0	Open Circuit
1	X	1	1	1	0	0	1	Receive Mode
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} . . . . . 45 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 Θ_{JA} . . . . . 125°C/W

Specifications

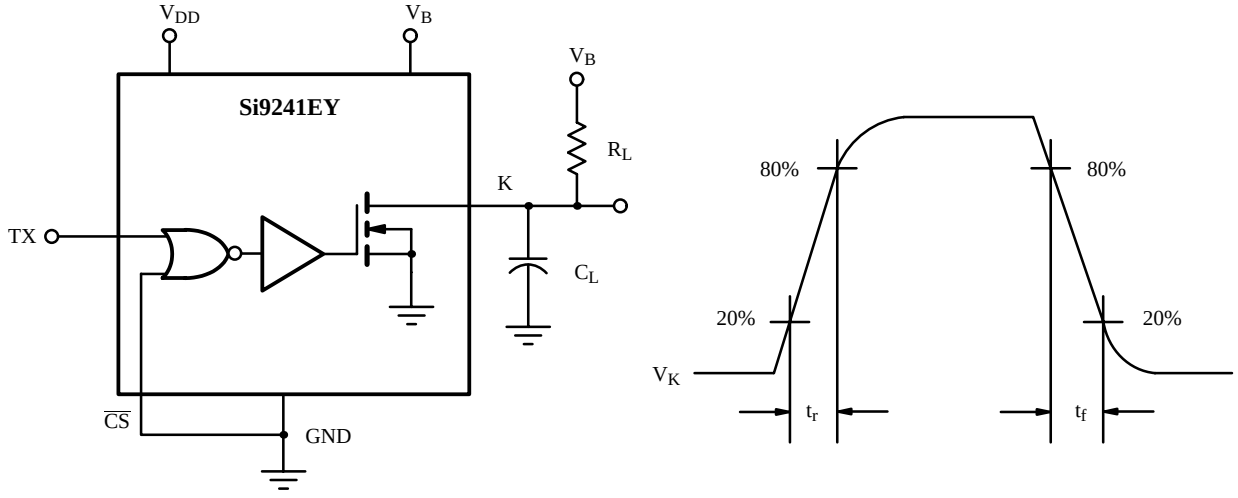
Parameter	Symbol	Test Conditions Unless Otherwise Specified V_{DD} = 4.5 to 5.5 V, V_{BAT} = 7.25 to 35 V	Temp[a]	Limits E Suffix: –40 to 125°C Min[b]	Typ[c]	Max[b]	Unit
Transmitter and Logic Levels							
$\overline{CS}$, TX Input Low Voltage	V_{ILT}		Full			1.5	V
$\overline{CS}$, TX Input High Voltage	V_{IHT}		Full	3.5			
K Output Low Voltage	V_{OLK}	R_L = 510 Ω, C_L = 10 nF V_{BAT} = 35 V, V_{DD} = 4.5 V	Full			4.9	
		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	$\overline{CS}$ = 0 V, TX = 0 V	Full			110	Ω
K Output Capacitance[d]	C_O	$\overline{CS}$ = 0 V	Full			20	pF
TX Input Capacitance[d]	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	µA

Specifications

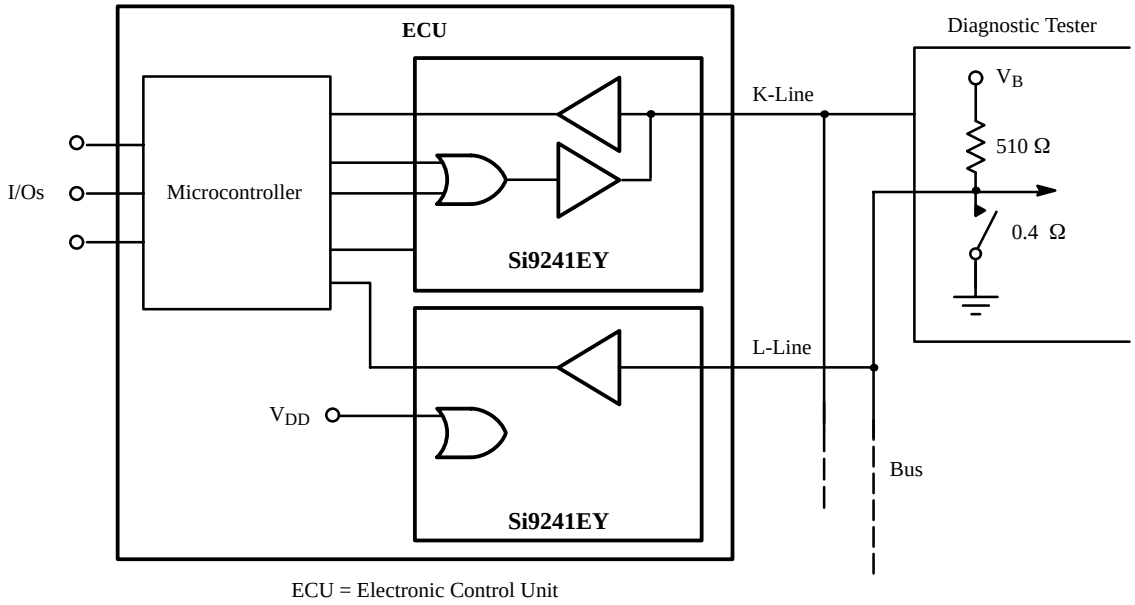
Parameter	Symbol	Test Conditions Unless Otherwise Specified V_{DD} = 4.5 to 5.5 V, V_B = 7.25 to 35 V		Temp[a]	Limits E Suffix: –40 to 125°C Min[b]	Typ[c]	Max[b]	Unit
Receiver								
K Input Low Voltage	V_{ILK}			Full		0.4 V_{BAT}	0.33 V_{BAT}	V
K Input High Voltage	V_{IHK}			Full	0.7 V_{BAT}	0.6 V_{BAT}		
K Input Hysteresis[d]	V_{HYS}			Full	0.1 V_{BAT}			
RX Output Low Voltage	V_{OLR}	$\overline{CS}$ = 4 V	V_{ILK} = 0.33 V_BAT I_{OLR} = 1 mA	Full			0.4	
RX High Voltage	V_{OHR}		V_{IHK} = 0.70 V_BAT I_{OHR} = –40 µA	Full	4			
K Input Currents	I_{IHK}		V_{IHK} = V_{BAT}	Full	1.5		20	µA
Supplies								
Bat Supply Current	I_{BAT}	$\overline{CS}$, TX = 1.5 V, K Open		Full		2.7	5.0	mA
Logic Supply Current	I_{DD}			Full		1	3.0	
Miscellaneous								
Baud Rate	BR	R_L = 510 Ω, C_L = 10 nF		Full	10.4			kBaud
Fault Output Low Voltage	V_{OLF}	$\overline{CS}$ = T_X = 0V, K = V_B, I_{OLF} = 1 mA		Full			0.4	V
$\overline{CS}$ Minimum Pulse Width[d, e]	t_{cs}			Full	1			µs

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

Test Circuit (Transmit Only)



Application Circuit



ECU = Electronic Control Unit