

Single-Ended Bus Driver

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 Si9241 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_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.

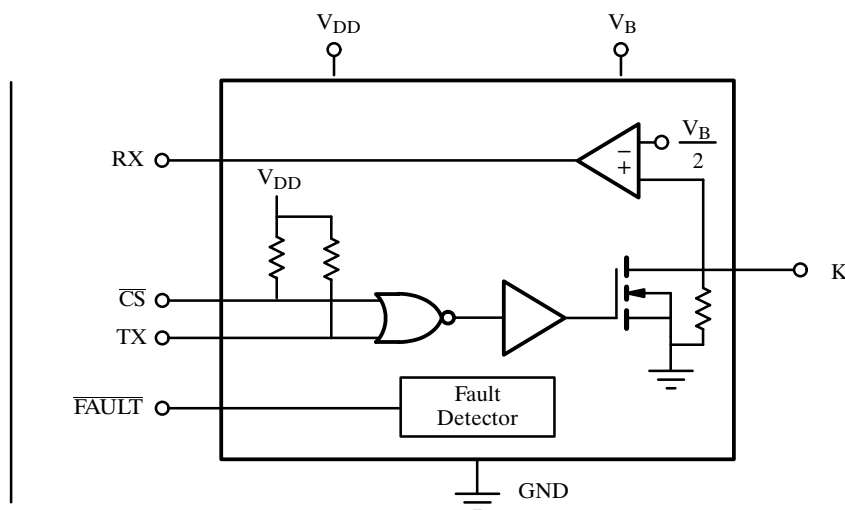
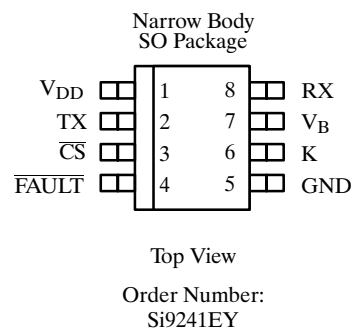
For bi-directional communication, \overline{CS} must be High for “receive” and Low for “transmit”. If \overline{CS} is Low, while IC is receiving data, an incorrect fault signal will occur. To inhibit the open load and short detect, tie \overline{CS} and Tx together.

The Si9241 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.

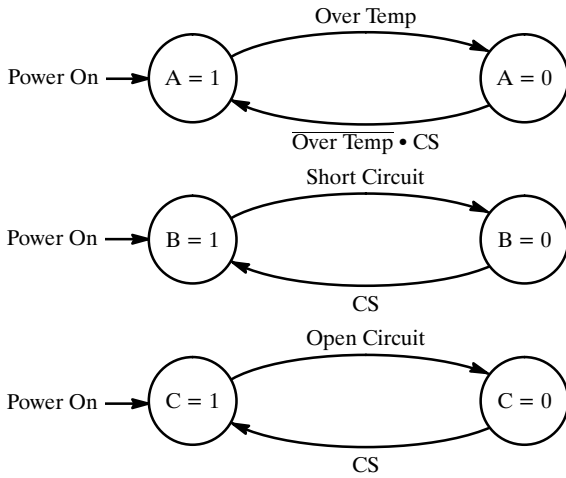
The Si9241 is available in a space efficient 8-pin SO package. It operates reliably over the automotive temperature range (-40 to 125°C).

Pin Configurations and Functional Block Diagram



Si9241

Output Table and State Diagrams



Inputs		State Variable			Output Table			Comments
\overline{CS}	TX	A	B	C	RX	K	\overline{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	
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} 45 V
 Voltage K -16 to $V_{BAT} + 1$ V
 Voltage or Max. Current On Any Pin
 (Except V_{BAT} , K) -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 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			Unit
				Min ^b	Typ ^c	Max ^b	
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}	$R_L = 510 \Omega$, $C_L = 10$ nF $V_{BAT} = 35$ V, $V_{DD} = 4.5$ V	Full			4.9	
			Full			$0.2 V_{BAT}$	
K Output High Voltage	V_{OHK}	$R_L = 510 \Omega$, $C_L = 10$ nF See Test Circuit	Full	$0.91 V_{BAT}$			
K Rise, Fall Times	t_r, t_f		Full			9.6	
K Output Sink Resistance	R_{si}	$\overline{CS} = 0$ 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	μ A

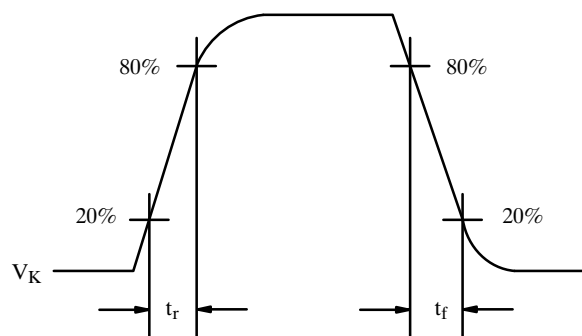
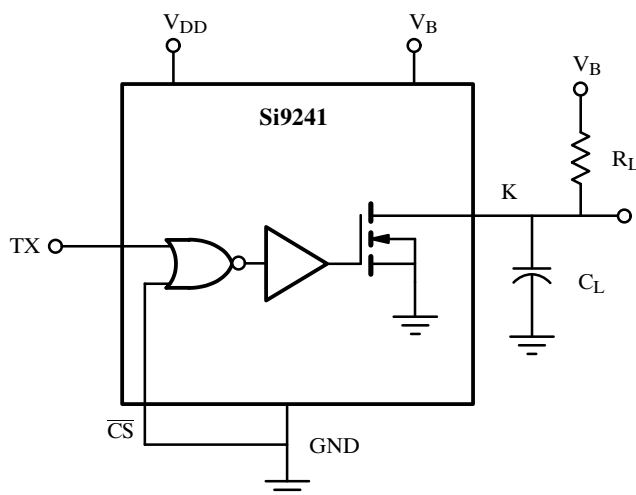
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					Min ^b	Typ ^c	Max ^b	
Receiver								
K Input Low Voltage	V_{ILK}			Full		$0.4 V_{BAT}$	$0.33 V_{BAT}$	V
K Input High Voltage	V_{IHK}			Full	$0.70 V_{BAT}$	$0.6 V_{BAT}$		
K Input Hysteresis ^d	V_{HYS}			Full	$0.1 V_{BAT}$			
RX Output Low Voltage	V_{OLR}	$\overline{CS} = 4$ V	$V_{ILK} = 0.33 V_{BAT}$ $I_{OLR} = 1$ mA	Full			0.4	μA
RX High Voltage	V_{OHR}		$V_{IHK} = 0.70 V_{BAT}$ $I_{OHR} = -40$ μA	Full	4.0			
K Input Currents	I_{IHK}		$V_{IHK} = V_{BAT}$	Full	1.5		20	
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	$R_L = 510 \Omega$, $C_L = 10$ nF		Full	10.4			k Baud
Fault Output Low Voltage	V_{OLF}	$\overline{CS} = T_X = 0$ V, K = V_B , $I_{OLF} = 1$ mA		Full			0.4	V
\overline{CS} Minimum Pulse Width ^{d, e}	t_{cs}			Full	1.0			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

