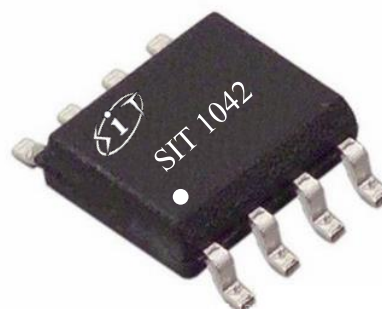


FEATURES

- Fully compatible with the ISO 11898 standard
- Thermally protected
- $\pm 70V$ BUS Protection
- Transmit Data (TXD) dominant time-out function
- Low-power standby mode with wake-up function
- SIT1042T/3 and SIT1042TK/3 can be interfaced directly to microcontrollers with supply voltages from 3V to 5V
- Under-voltage protection
- Timing guaranteed for data rates up to 5 Mbit/s in the CAN FD fast phase
- At least 110 nodes can be connected
- Very low Electro Magnetic Emission (EME)
- Unpowered nodes do not interfere with the bus

OUTLINE


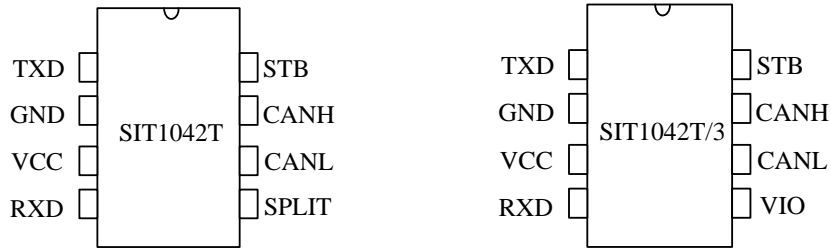
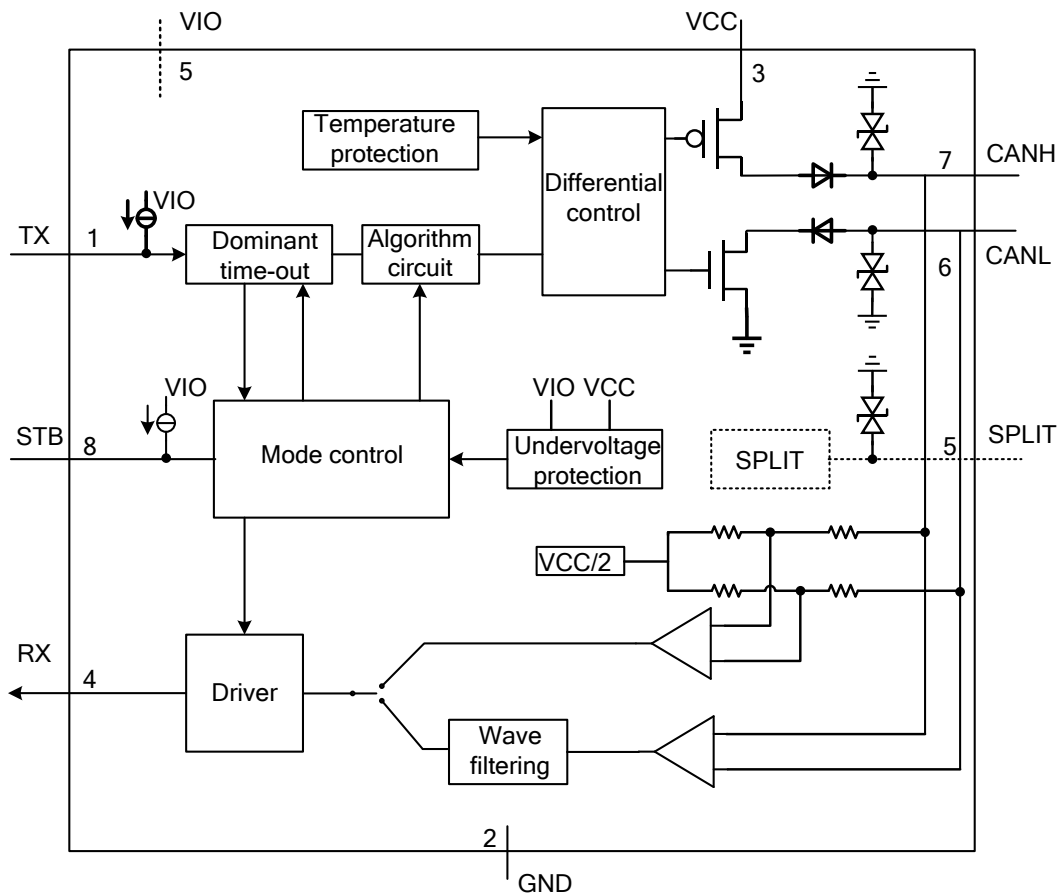
Provide Green and Environmentally Friendly Lead-free package

*Provide HVSON8 / DFN3*3-8, Small Outline, Leadless Package

DESCRIPTION

SIT1042 is an interface chip used between the CAN protocol controller and the physical bus. It can be used in trucks, buses, cars, industrial control and other fields. It supports 5Mbps CAN FD flexible data rate, and has a connection between the bus and the CAN protocol controller. The ability to perform differential signal transmission between.

PARAMETER	SYMBOL	CONDITION	MIN.	MAX.	UNIT
Supply voltage	V_{cc}		4.5	5.5	V
Maximum transmission rate	$1/t_{bit}$	Non-return to zero code	1		Mbaud
CANH/CANL input or output voltage	V_{can}		-70	+70	V
Bus differential voltage	V_{diff}		1.5	3.0	V
Virtual junction temperature	T_{amb}		-40	125	°C
Human Body Model	V_{HBM}		-8	+8	KV
Machine Model	V_{MM}		-300	+300	V
Charged Device Model	V_{CDM}		-750	+750	V

PIN CONFIGURATION

INTERNAL CIRCUIT BLOCK DIAGRAM

LIMITING VALUES

PARAMETER	SYMBOL	VALUE	UNIT
Supply voltage	V_{CC}	-0.3~+7	V
MCU side port	TXD, RXD, STB, VIO	-0.3~ $V_{CC}+0.3$	V
Bus side input voltage	CANL, CANH	-70~70	V

Transient voltage on pins CANH, CANL and SPLIT see Fig.7	V_{tr}	-200~+200	V
Storage temperature		-55~150	°C
Virtual junction temperature		-40~125	°C
Welding temperature range		300	°C

The maximum limit parameters means that exceeding these values may cause irreversible damage to the device. Under these conditions, it is not conducive to the normal operation of the device. The continuous operation of the device at the maximum allowable rating may affect the reliability of the device. The reference point for all voltages is ground.

PINNING

PIN	SYMBOL	DESCRIPTION
1	TXD	transmit data input
2	GND	ground supply
3	VCC	supply voltage
4	RXD	receive data output; reads out data from the bus lines
5	VIO	Transceiver I/O level conversion power supply voltage (SIT1042T/3 model)
5	SPLIT	common-mode stabilization output(SIT1042T model)
6	CANL	LOW-level CAN bus line
7	CANH	HIGH-level CAN bus line
8	STB	standby mode control input

DRIVER ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
CANH dominant output voltage	$V_{OH(D)}$	VI=0V, STB=0V, RL=60Ω, Fig.1, Fig.2	2.9	3.4	4.5	V
CANL dominant output voltage	$V_{OL(D)}$		0.8		1.5	V
Bus recessive output voltage	$V_{O(R)}$	VI=3V, STB=0V, RL=60Ω, Fig.1, Fig.2	2	2.5	3	V
Bus dominant differential output voltage	$V_{OD(D)}$	VI=0V, STB=0V, RL=60Ω, Fig.1, Fig.2	1.5		3	V
Bus recessive differential output voltage	$V_{OD(R)}$	VI=3V, S=0V, Fig.1, Fig.2	-0.012		0.012	V
		VI=3V, STB=0V, NO LOAD	-0.5		0.05	V
Transmitter dominant voltage symmetry	$V_{dom(TX)sym}$	$V_{dom(TX)sym}=V_{CC}-V_{CANH}-V_{CANL}$	-400		400	mV
Transmitter voltage symmetry	V_{TXsym}	$V_{TXsym}=V_{CANH}+V_{CANL}$	$0.9V_{CC}$		$1.1V_{CC}$	V
Common-mode output voltage	V_{OC}	STB=0V, Fig.8	2	2.5	3	V
Peak-to-peak Common-mode output voltage	ΔV_{OC}			30		mV
Short-circuit output current	I_{OS}	CANH=-12V, CANL=open, Fig.11	-105	-72		mA
		CANH=12V, CANL=open, Fig.11		0.36	1	mA
		CANL=-12V, CANH=open, Fig.11	-1	0.5		mA
		CANL=12V, CANH=open, Fig.11		71	105	mA
Recessive output current	$I_{O(R)}$	-27V<CANH<32V 0<VCC<5.25V	-2.0		2.5	mA

($V_{CC}=5V\pm 10\%$ and $Temp=T_{MIN}\sim T_{MAX}$ unless specified otherwise; typical in $V_{CC}=+5V$ and $Temp=25^{\circ}C$)

DRIVER SWITCHING CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Propagation delay time,low-to-high-level output	tPLH	STB=0V, Fig.4		90		ns
Propagation delay time,low-to-high-level output	tPHL			65		ns
Differential output signal rise time	tr			45		ns
Differential output signal fall time	tf			45		ns
Enable time from standby mode to dominant	tEN	Fig.7		1	45	μs
TXD dominant time-out	t _{dom_TXD}	Fig.10	0.8	2	4	ms
Bus dominant time-out time	T _{dom BUS}	Fig.10	0.8	2	4	ms
Bus wake-up filter time	tWAKE		0.5		5	μs

(V_{CC}=5V±10% and Temp=T_{MIN}~T_{MAX} unless specified otherwise; typical in V_{CC}=+5V and Temp=25°C)

RECEIVER ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Positive-going input threshold voltage	V _{IT+}	STB=0V, Fig.5		800	900	mV
Negative-going input threshold voltage	V _{IT-}		500	650		mV
Hysteresis voltage (V _{IT+} – V _{IT-})	V _{HYS}		50	120	200	mV
Power-off bus input current	I _(OFF)	CANH or CANL=5V, Other pin=0V	-5		5	μA

Input capacitance to ground, (CANH or CANL)	C_I			24		pF
Differential input capacitance	C_{ID}			12		pF
Input resistance, (CANH or CANL)	R_{IN}	TXD=VIO STB=0V	9	15	28	K Ω
Differential input resistance	R_{ID}		19	30	52	K Ω
Input resistance matching	$R_{I_{match}}$	CANH=CANL	-1%		1%	
The range of common-mode voltage	V_{COM}		-30		30	V

($V_{CC}=5V\pm 10\%$ and $Temp=T_{MIN}\sim T_{MAX}$ unless specified otherwise; typical in $V_{CC}=+5V$ and $Temp=25^{\circ}C$)

RECEIVER SWITCHING CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Propagation delay time, low-to-high-level output	tPLH	STB=0V, Fig.6		65		ns
Propagation delay time, low-to-high-level output	tPHL			60		ns
RXD signal rise time	tr			10		ns
RXD signal fall time	tf			10		ns

($V_{CC}=5V\pm 10\%$ and $Temp=T_{MIN}\sim T_{MAX}$ unless specified otherwise; typical in $V_{CC}=+5V$ and $Temp=25^{\circ}C$)

DEVICE SWITCHING CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Loop delay1, driver input to receiver output, Recessive to Dominant	Td(LOOP 1)	STB=0V, Fig.9		90	220	ns
Loop delay 2, driver input to receiver output, Dominant to Recessive	Td(LOOP 2)			100	220	ns
Bit time of BUS output pin	t _{bit(BUS)}	t _{bit(TXD)} =500ns	435		530	ns
		t _{bit(TXD)} =200ns	155		210	ns
Bit time of RXD output pin	t _{bit(RXD)}	t _{bit(TXD)} =500ns	400		550	ns
		t _{bit(TXD)} =200ns	120		220	ns

(V_{CC}=5V±10% and Temp=T_{MIN}~T_{MAX} unless specified otherwise; typical in V_{CC}=+5V and Temp=25°C)

OVER TEMPERATURE PROTECTION

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Shutdown junction temperature	T _{j(sd)}			190		°C

(V_{CC}=5V±10% and Temp=T_{MIN}~T_{MAX} unless specified otherwise; typical in V_{CC}=+5V and Temp=25°C)

UNDER-VOLATAGE PROTECTION

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
VCC under-voltage protection	V_{uvd_VCC}		3.5		4.5	V
VIO under-voltage protection	V_{uvd_VIO}		1.5		2.5	V

($V_{CC}=5V\pm 10\%$ and $Temp=T_{MIN}\sim T_{MAX}$ unless specified otherwise; typical in $V_{CC}=+5V$ and $Temp=25^{\circ}C$)

TXD PIN CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
HIGH-level input current	$I_{IH}(TXD)$	$V_I=V_{IO}$	-5		5	μA
LOW-level input current	$I_{IL}(TXD)$	$TXD=0V$	-260	-150	-30	μA
When $V_{CC}=0V$, current on TXD pin	$I_{O(off)}$	$V_{CC}=V_{IO}=0V$, $TXD=V_{IO}$	-1		1	μA
HIGH-level input voltage	V_{IH}		$0.7V_{IO}$		$V_{CC}+0.3$	V
LOW-level input voltage	V_{IL}		-0.3		$0.3V_{IO}$	V
Open voltage on TXD pin	TXD_O		H			logic

($V_{CC}=5V\pm 10\%$ and $Temp=T_{MIN}\sim T_{MAX}$ unless specified otherwise; typical in $V_{CC}=+5V$ and $Temp=25^{\circ}C$)

STB PIN CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
HIGH-level input current	$I_{IH}(STB)$	$STB=V_{IO}$	-2		2	μA
LOW-level input current	$I_{IL}(STB)$	$STB=0V$	-20		-2	μA

When VCC=0V, current on STB pin	I _{o(off)}	VCC=VIO=0V, STB=VIO	-1		1	uA
HIGH-level input voltage	V _{IH}		0.7V _{IO}		VCC+0.3	V
LOW-level input voltage	V _{IL}		-0.3		0.3V _{IO}	V
Open voltage on STB pin	STB _O		H			logic

(V_{CC}=5V±10% and Temp=T_{MIN}~T_{MAX} unless specified otherwise; typical in V_{CC}=+5V and Temp=25°C)

RXD PIN CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
HIGH-level input current	I _{OH} (RXD)	VIO=VCC, RXD=VIO-0.4V	-8	-3	-1	mA
LOW-level input current	I _{OL} (RXD)	RXD=0.4V, bus dominant	2	5	12	mA
When VCC=0V, current on STB pin	I _{o(off)}	VCC=VIO=0V, RXD=VIO	-1		1	uA

(V_{CC}=5V±10% and Temp=T_{MIN}~T_{MAX} unless specified otherwise; typical in V_{CC}=+5V and Temp=25°C)

COMMON-MODE STABILIZATION OUTPUT

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
SPLIT port output voltage	V _{SPLIT}	-500uA<I _{SPLIT} <500uA	0.3V _{CC}	0.5 V _{CC}	0.7V _{CC}	V

(V_{CC}=5V±10% and Temp=T_{MIN}~T_{MAX} unless specified otherwise; typical in V_{CC}=+5V and Temp=25°C)

SUPPLY CURRENT

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
VCC supply current	Normal dominant	I _{CC_D}	bus dominant	45	70	mA
	Normal recessive	I _{CC_R}	bus recessive	5	10	mA

	Standby	I_{CC_STB}	STB=VCC, TXD=VIO, (SIT1042T/3)	0.5	5	uA
			STB=VCC, TXD=VCC, (SIT1042T)	10	15	uA
VIO supply current	Normal dominant	I_{IO_D}	RXD open, STB=0V TXD=0V	350	1000	uA
	Normal recessive	I_{IO_R}	RXD open, STB=0V TXD=VIO	80	200	uA
	Standby	I_{IO_STB}	STB=TXD=VIO	12	17	uA

($V_{CC}=5V\pm 10\%$ and $Temp=T_{MIN}\sim T_{MAX}$ unless specified otherwise; typical in $V_{CC}=+5V$ and $Temp=25^{\circ}C$)

FUNCTION TABLE
Table1.CAN TRANSCEIVER TRUTH TABLE

V_{CC}	TXD ⁽¹⁾	STB ⁽¹⁾	CANH ⁽¹⁾	CANL ⁽¹⁾	BUS STATE	RXD ⁽¹⁾
4.5V~5.5V	L	L	H	L	Dominate	L
4.5V~5.5V	H or Open	X	$0.5V_{CC}$	$0.5V_{CC}$	Recessive	H
4.5V~5.5V	X	H or Open	$0.5V_{CC}$	$0.5V_{CC}$	Recessive	H
$0 < V_{CC} < 4.5V$	X	X	$0V < V_{CANH} < V_{CC}$	$0V < V_{CANL} < V_{CC}$	Recessive	X

(1) H=high level; L=low level; X=irrelevant

Table 2. DRIVER FUNCTION TABLE

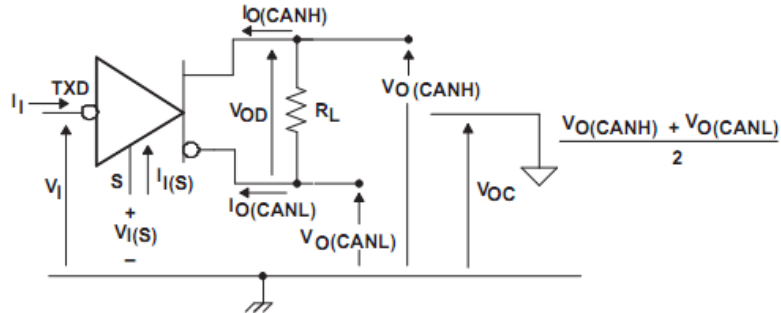
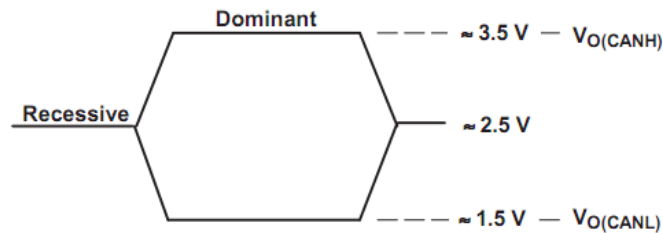
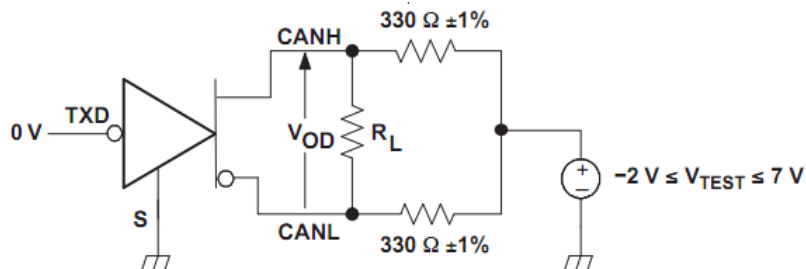
INPUTS		OUTPUTS		Bus State
TXD ⁽¹⁾	STB ⁽¹⁾	CANH ⁽¹⁾	CAL ⁽¹⁾	
L	L	H	L	Dominate
H or Open	X	Z	Z	Recessive
X	H or Open	Z	Z	Recessive

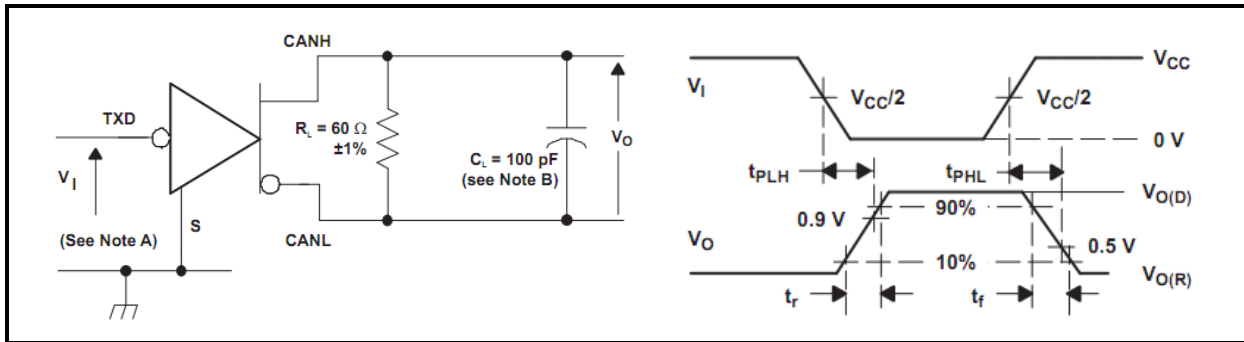
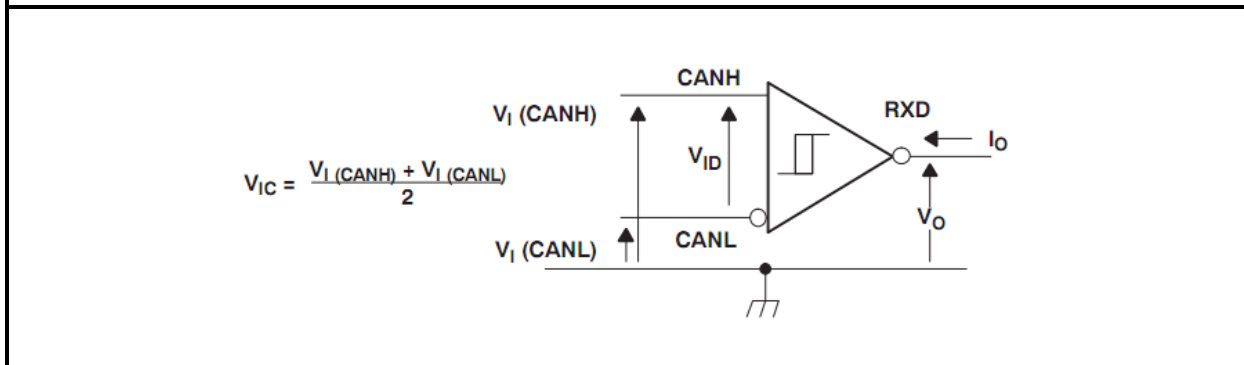
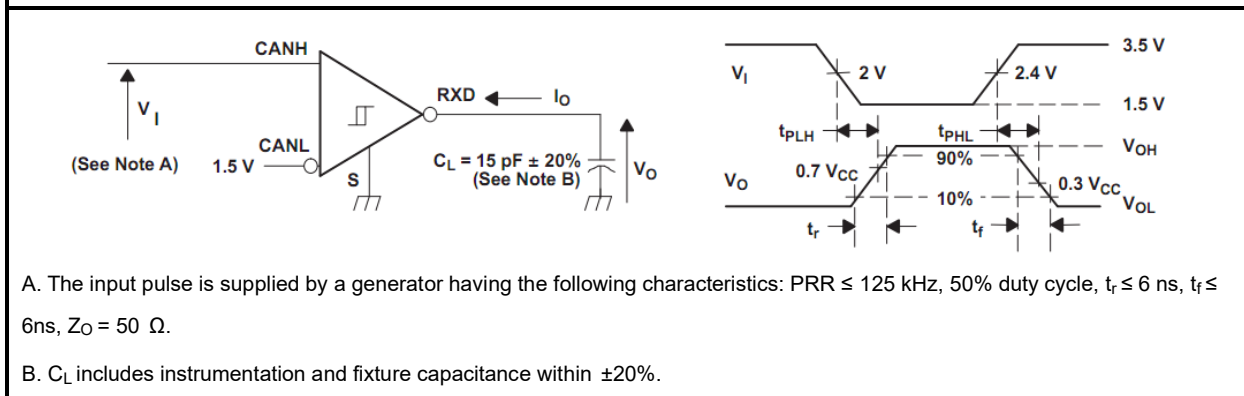
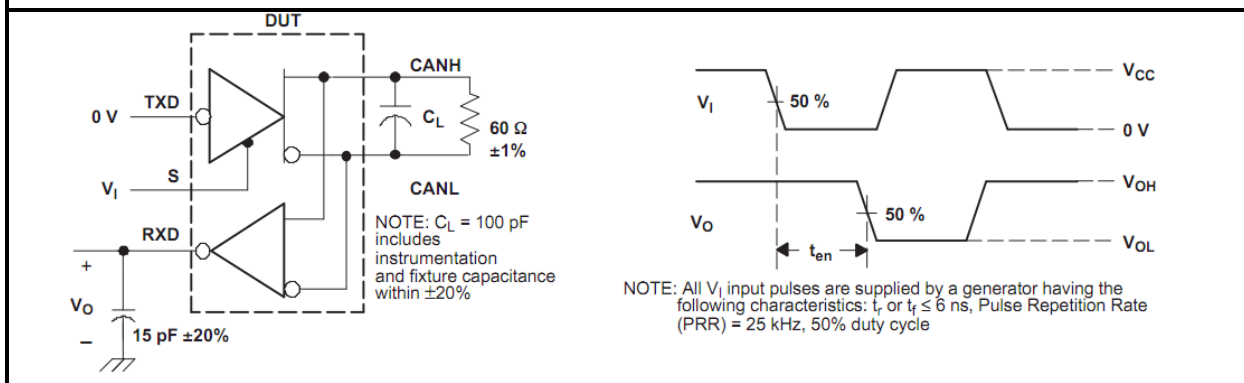
(1) H=high level; L=low level; X=irrelevant; Z=high impedance

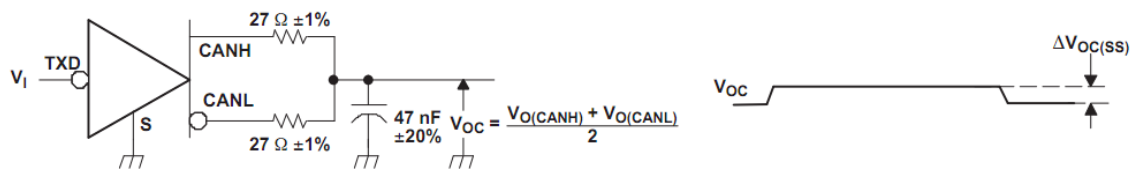
Table 3. RECEIVER FUNCTION TABLE

$V_{ID}=CANH-CANL$	RXD ⁽¹⁾	Bus State ⁽¹⁾
$V_{ID}\geq 0.9V$	L	Dominate
$0.5 < V_{ID} < 0.9V$?	?
$V_{ID}\leq 0.5V$	H	Recessive
Open	H	Recessive

(1) H=high-level; L=low-level; ?=uncertain

TEST CIRCUIT

Fig.1 Driver Voltage, Current, and Test Definition

Fig.2 Bus Logic State Voltage Definition

Fig.3 Driver Vod Test Circuit


Fig.4 Driver Test Circuit and Waveform

Fig.5 Receiver Voltage and Current Definition

Fig.6 Receiver Test Circuit and Waveform

Fig.7 t_{EN} Test Circuit and Waveform



A. All V_I input pulses are from 0 V to V_{CC} and supplied by a generator having the following characteristics: t_r or $t_f \leq 6$ ns. Pulse Repetition Rate (PRR) = 125 kHz, 50% duty cycle.

Fig.8 Peak-to-Peak Common Mode Output Voltage Test and Waveform

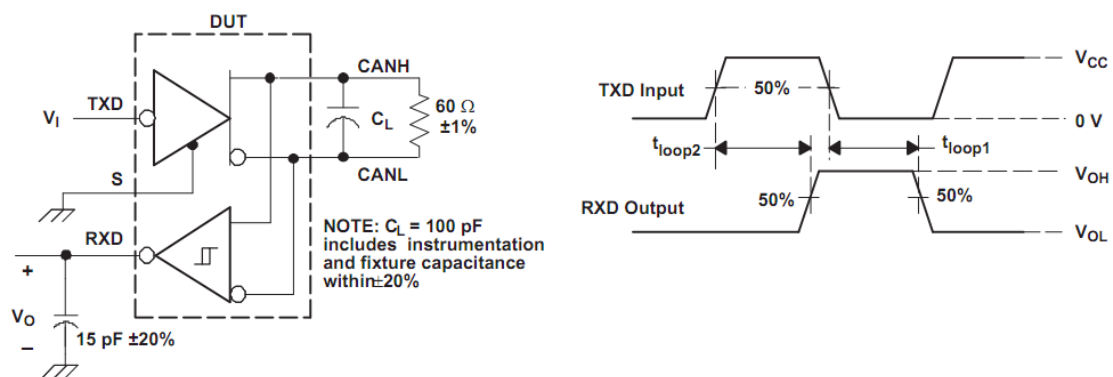


Fig.9 $t_{(LOOP)}$ Test Circuit and Waveform

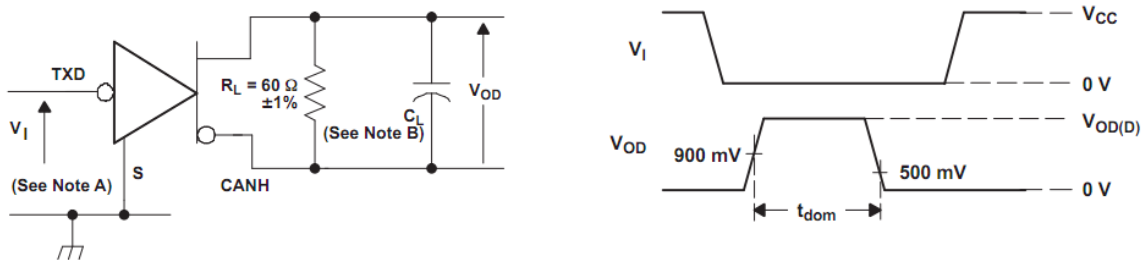


Fig.10 Dominant Time-Out Test Circuit and Waveform

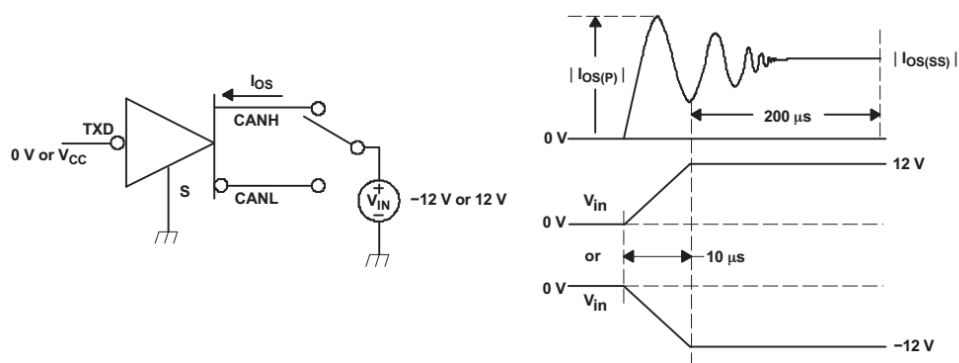


Fig.11 Driver Short-Circuit Current Test Circuit and Waveform

ADDITIONAL DESCRIPTION**1 Sketch**

The SIT1042 is the interface between the Controller Area Network (CAN) protocol controller and the physical bus, and can be applied to the fields of trucks, buses, cars, industrial control etc. Support 5Mbps CAN FD flexible data rate. The device provides differential transmit capability to the bus and differential receive capability to the CAN controller, and fully compatible with the ISO 11898 standard.

2 Current protection

A current-limiting circuit protects the transmitter output stage from damage caused by accidental short-circuit to either positive or negative supply voltage, although power dissipation increases during this fault condition.

3 Over temperature protection

The output drivers are protected against over-temperature conditions. If the virtual junction temperature exceeds the shutdown junction temperature $T_{j(sd)}$, the output drivers will be disabled until the virtual junction temperature becomes lower than $T_{j(sd)}$ and TXD becomes recessive again.

By including the TXD condition, the occurrence of output driver oscillation due to temperature drifts is avoided.

4 Under-voltage protection

The SIT1042 power supply pin has an under-voltage detection function, which can put the device in a protected mode. This protects the bus when VCC is lower than V_{uvd_VCC} or VIO is lower than V_{uvd_VIO} .

5 Operating modes

The SIT1042 provides two modes of operation which are selectable via pin STB:

High-speed mode and standby mode.

High-speed mode is normal working mode, by connecting STB to ground to set the SIT1042 to high-speed mode. In this mode the transceiver is able to transmit and receive data via the bus lines CANH and CANL. The differential receiver converts the analog data on the bus lines into digital data which is output to pin RXD via the multiplexer (MUX).

If a logic-high or open is applied to STB, the SIT1042 enters a low-current standby mode. In this mode the transmitter and receiver are switched off, and the low-power differential receiver will monitor the bus lines. A HIGH level on pin STB activates this low-power receiver and the wake-up filter, and after tBUS the state of the CAN bus is reflected on pin RXD.

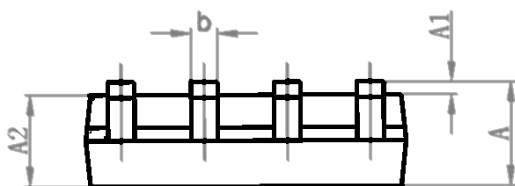
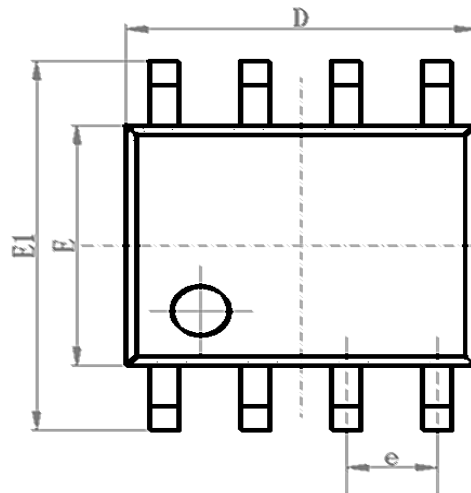
6 TXD dominant time-out function

A 'TXD dominant time-out' timer circuit prevents the bus lines from being driven to a permanent dominant state(blocking all network communication) if pin TXD is forced permanently LOW by a hardware and/or software application failure. The timer is triggered by a negative edge on pin TXD.

If the duration of the LOW level on pin TXD exceeds the internal timer value (tdom), the transmitter is disabled, driving the bus lines into a recessive state. The timer is reset by a positive edge on pin TXD.

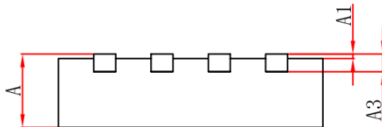
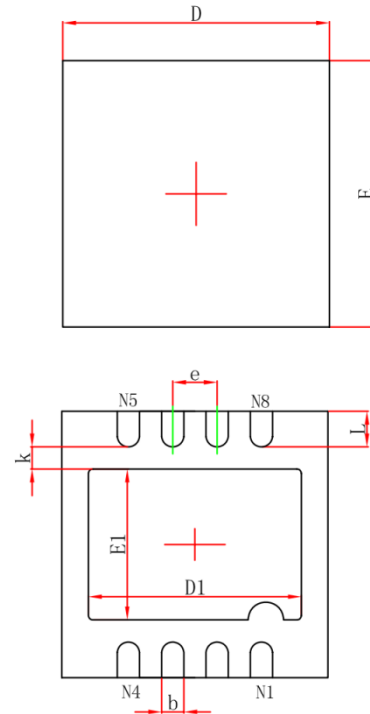
SOP8 DIMENSIONS
PACKAGE SIZE

SYMBOL	MIN./mm	TYP./mm	MAX./mm
A	1.50	1.60	1.70
A1	0.1	0.15	0.2
A2	1.35	1.45	1.55
b	0.355	0.400	0.455
D	4.800	4.900	5.00
E	3.780	3.880	3.980
E1	5.800	6.000	6.200
e		1.270BSC	
L	0.40	0.60	0.80
c	0.153	0.203	0.253
θ	-2°	-4°	-6°



DFN3*3-8 /HVSON8 DIMENSIONS
PACKAGE SIZE

SYMBOL	MIN/mm	TYP /mm	MAX/mm
A	0.700		0.900
A1	0.000	0.02	0.050
A3	0.203 REF		
D	2.900	3.000	3.100
E	2.900	3.000	3.100
D1	1.400	1.5	1.600
E1	2.200	2.3	2.400
k	0.275 REF		
b	0.2	0.25	0.33
e	0.650 TYP		
L	0.250		0.575


ORDERING INFORMATION

TYPE NUMBER	TEMPERATURE	PACKAGE
SIT1042T	-40°C~125°C	SOP8
SIT1042T/3	-40°C~150°C	SOP8
SIT1042TK/3	-40°C~125°C	HVSON8 / DFN3*3-8, Small Outline, Leadless

SOP8 package is 2500 pieces/disc. HVSON8 / DFN3*3-8 package is 5000 pieces/disc.