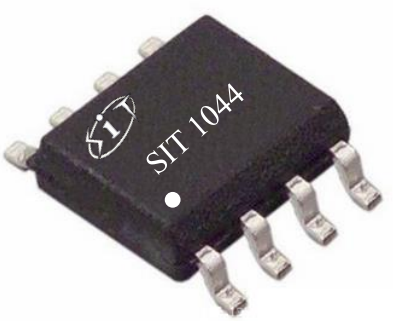
FEATURES

- Fully compatible with the ISO 11898 standard
- Thermally protected
- ±40V BUS Protection
- Transmit Data (TXD) dominant time-out function
- Low-power standby mode with wake-up function
- SIT1044T/3 and SIT1044TK/3 can be interfaced directly to microcontrollers with supply voltages from 3.3V to 5V
- Under-voltage protection
- Timing guaranteed for data rates up to 5 Mbps in the (CAN FD) fast phase
- Very low ElectroMagnetic Emission (EME)
- Transceiver in unpowered state disengages from the bus （zero load）
- The typical loop delay from TXD to RXD is less than 100ns
- Provide DFN3*3-8/HVSON8 package

PRODUCT APPEARENCE



Provide Green and Environmentally Friendly Lead-free package

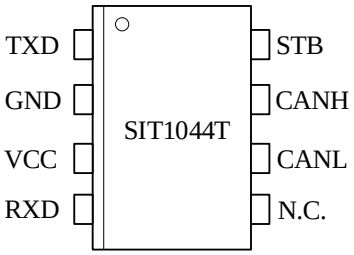
*Provide HVSON8 / DFN3*3-8, Small Outline, Leadless Package

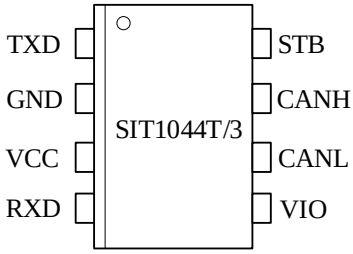
DESCRIPTION

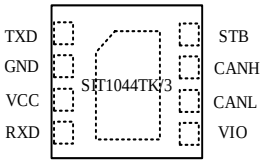
SIT1044 is an interface chip used between the CAN protocol controller and the physical bus. It can be used in trucks, buses, cars, industrial control and other fields. It supports 5Mbps (CAN FD) flexible data rate, and has a connection between the bus and the CAN protocol controller. The ability to perform differential signal transmission between.

PARAMETER	SYMBOL	CONDITION	MIN.	MAX.	UNIT
Supply voltage	VCC		4.75	5.25	V
VIO voltage	VIO		2.95	5.25	V
Maximum transmission rate	$1/t_{bit}$	Non-return to zero code	5		Mbaud
CANH/CANL input or output voltage	V_{can}		-40	+40	V
Bus differential voltage	V_{diff}		1.5	3.0	V
Virtual junction temperature	T_j		-40	150	℃

PIN CONFIGURATION







LIMITING VALUES

PARAMETER	SYMBOL	VALUE	UNIT
Supply voltage	VCC	-0.3~+7	V
MCU side port	TXD, RXD, STB, VIO	-0.3~+7	V
Bus side input voltage	CANL, CANH	-40~+40	V
Bus differential breakdown voltage	$V_{CANH-CANL}$	-27~27	V
Storage temperature		-55~150	℃
Virtual junction temperature		-40~150	℃
Welding temperature range		300	℃
Continuous power consumption	SOP8	400	mW

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.

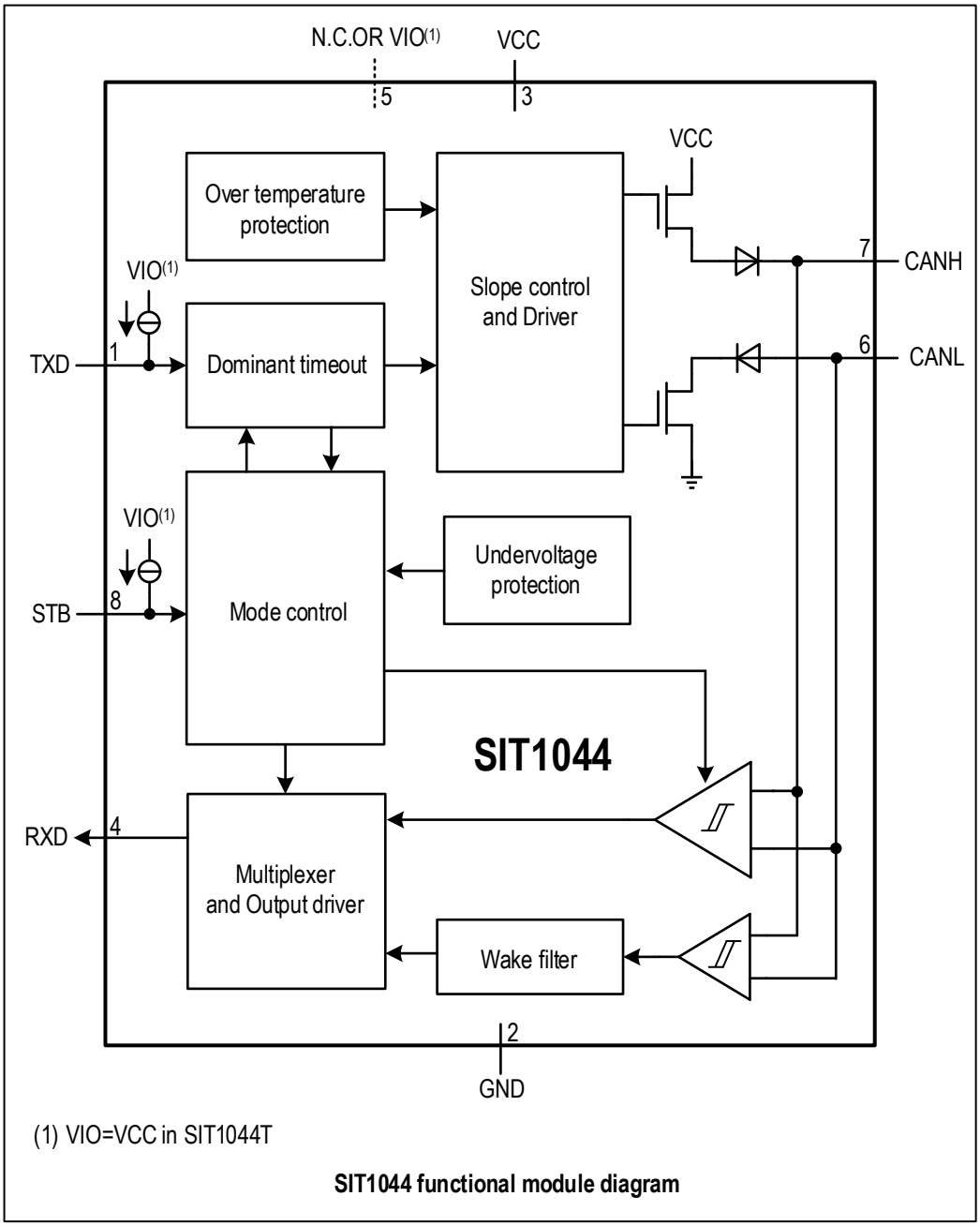
PINNING

PIN	SYMBOL	DESCRIPTION
1	TXD	transmit data input
2	GND	ground

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 (SIT1044T/3)
5	N.C.	not connected (SIT1044T)
6	CANL	LOW-level CAN bus line
7	CANH	HIGH-level CAN bus line
8	STB	standby mode control input

Note: The metal pad on the back of the SIT1044TK/3 package is recommended to be grounded

FUNCTIONAL BLOCK DIAGRAM



SIT1044 functional module diagram

DRIVER ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
CANH dominant output voltage	$V_{OH(D)}$	TXD=0V, STB=0V, R_L=60Ω, Fig.1, Fig.2	2.75	3.5	4.5	V
CANL dominant output voltage	$V_{OL(D)}$		0.5	1.5	2.25	V
Bus recessive output voltage	$V_{O(R)}$	TXD=VIO, STB=0V, R_L=60Ω, Fig.1, Fig.2	2	2.5	3	V
Bus dominant differential output voltage	$V_{OD(D)}$	TXD=0V，STB=0V，R_L=60Ω，Fig.1, Fig.2	1.5		3	V
Bus recessive differential output voltage	$V_{OD(R)}$	TXD=VIO, STB=0V, Fig.1, Fig.2	-0.012		0.012	V
		TXD=VIO, STB=0V, NO LOAD	-0.5		0.05	V
Transmitter dominant voltage symmetry	$V_{dom(TX)sym}$	$V_{dom(TX)sym}$=VCC-V_{CANH} - V_{CANL}	-400		400	mV
Transmitter voltage symmetry	V_{TXsym}	V_{TXsym}= V_{CANH} + V_{CANL}	0.9VCC		1.1VCC	V
Common-mode output voltage	V_{OC}	STB=0V, Fig.7	2	0.5V_{CC}	3	V
Short-circuit output current	I_{OS}	CANH=-12V, CANL=open, Fig.10	-100	-70		mA
		CANH=12V, CANL=open, Fig.10		0.36	1	mA
		CANL=-12V, CANH=open, Fig.10	-1	0.5		mA
		CANL=12V, CANH=open, Fig.10		70	100	mA
Recessive output current	$I_{O(R)}$	TXD=VIO, -27V<CANH<32V	-5		5	mA

（VCC=5V±5% and Temp=T_{MIN}~T_{MAX} unless specified otherwise; typical in VCC=+5V, VIO=+5V and Temp＝25℃）

DRIVER SWITCHING CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Propagation delay time,low-to-high-level output	t_{PLH}	STB=0V, Fig.4		90		ns
Propagation delay time,low-to-high-level output	t_{PHL}			65		ns
Differential output signal rise time	t_r			45		ns
Differential output signal fall time	t_f			45		ns
Enable time from standby mode to dominant	t_{stb_nom}			10	45	μs
TXD dominant time-out	t_{dom_TXD}	Fig 9	0.8	3	6.5	ms
Bus dominant time-out time	t_{filter_WAKE}	standby, Fig 12	0.5		3	μs
Bus wake-up filter time	t_{dom_WAKE}	standby, Fig 12	0.8	3	6.5	ms

（VCC=5V±5% and Temp=T_{MIN}~T_{MAX} unless specified otherwise; typical in VCC=+5V, VIO=+5V and Temp＝25℃）

RECEIVER ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Positive-going input threshold voltage	V_{IT+}	Normal mode Fig 5			900	mV
Negative-going input threshold voltage	V_{IT-}	Normal mode Fig 5	500			mV
Hysteresis voltage ($V_{IT+} – V_{IT-}$)	V_{HYS}	Normal mode Fig 5		120		mV

Positive-going input threshold voltage (standby mode)	$V_{IT+(STB)}$	standby mode			1150	mV
Negative-going input threshold voltage (standby mode)	$V_{IT-(STB)}$	standby mode	400			mV
Power-off bus input current	$I_{(OFF)}$	CANH=CANL=5V, GND=VCC=VIO=0 V	-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	kΩ
Differential input resistance	R_{ID}		19	30	52	kΩ
Input resistance matching	RI_{match}	CANH=CANL	-2		2	%
The range of commen-mode voltage	V_{COM}		-12		12	V

（VCC=5V±5% and Temp=T_{MIN}~T_{MAX} unless specified otherwise; typical in VCC=+5V, VIO=+5V and Temp=25℃）

RECEIVER SWITCHING CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Propagation delay time,low-to-high-level output	t_{PLH}	STB=0V, Fig.6		65		ns
Propagation delay time,low-to-high-level output	t_{PHL}			60		ns

RXD signal rise time	t_r			10		ns
RXD signal fall time	t_f			10		ns

（VCC=5V±5% and Temp=T_{MIN}~T_{MAX} unless specified otherwise; typical in VCC=+5V, VIO=+5V and Temp＝25℃）

DEVICE SWITCHING CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Loop delay1, driver input to receiver output, Recessive to Dominant	t_{loop1}	STB=0V，Fig.8		80	220	ns
Loop delay 2, driver input to receiver output, Dominant to Recessive	t_{loop2}	STB=0V，Fig.8		90	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

（VCC=5V±5% and Temp=T_{MIN}~T_{MAX} unless specified otherwise; typical in V_{CC}=+5V, V_{IO}=+5V and Temp＝25℃）

OVER TEMPERATURE PROTECTION

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Shutdown junction temperature	Tj(sd)			190		℃

（VCC=5V±5% and Temp=T_{MIN}~T_{MAX} unless specified otherwise; typical in V_{CC}=+5V, VIO=+5V and Temp=25℃）

UNDER-VOLATAGE PROTECTION

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
VCC under-voltage protection	V_{uvd_VCC}		3.5	3.9	4.3	V
VIO under-voltage protection	V_{uvd_VIO}		2.1	2.5	2.7	V

（VCC=5V±5% and Temp=T_{MIN}~T_{MAX} unless specified otherwise; typical in V_{CC}=+5V, VIO=+5V and Temp=25℃）

TXD PIN CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
HIGH-level input current	I_{IH}(TXD)	TXD=VIO	-5		5	μA
LOW-level input current	I_{IL}(TXD)	TXD=0V	-260	-150	-30	μA
When VCC=0V，current on TXD pin	I_O(off)	VCC=VIO=0V，TXD=VIO	-1		1	μA
HIGH-level input voltage	V_{IH}		0.7V_{IO}①		V_{IO}①+0.3	V
LOW-level input voltage	V_{IL}		-0.3		0.3V_{IO}①	V

Open voltage on TXD pin	TXD_O		H	logic

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

STB PIN CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
HIGH-level input current	I_{IH}(STB)	STB=VIO	-2		2	μA
LOW-level input current	I_{IL}(STB)	STB=0V	-15		-1	μA
When VCC=0V，current on STB pin	I_O(off)	VCC=VIO=0V，STB=VIO	-1		1	μA
HIGH-level input voltage	V_{IH}		0.7V_{IO}①		V_{IO}①+0.3	V
LOW-level input voltage	V_{IL}		-0.3		0.3V_{IO}①	V
Open voltage on STB pin	STB_O		H			logic

① SIT1044T model V_{IO}=V_{CC}

（VCC=5V±5% and Temp=T_{MIN}~T_{MAX} unless specified otherwise; typical in VCC=+5V, VIO=5V and Temp＝25℃）

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	1		12	mA
When VCC=0V，current on STB pin	I_O(off)	VCC=VIO=0V, RXD=VIO	-1		1	μA

（VCC=5V±5% and Temp=T_{MIN}~T_{MAX} unless specified otherwise; typical in VCC=+5V, VIO=5V and Temp＝25℃）

SUPPLY CURRENT

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
VCC current (standby mode)	I_{CC}	STB=VCC, TXD=VIO, SIT1044T/3			5	μA
		STB=VCC, TXD=VCC, SIT1044T		15	30	μA
VCC current (Dominant)		TXD=VIO, STB=0V, LOAD=60Ω		45	70	mA
VCC current (Recessive)		TXD=VIO, STB=0V, NO LOAD		5	10	mA
VIO current (standby mode)	I_{IO}	STB=TXD=VIO		14	28	μA
VIO current (Dominant)		TXD=0V, STB=0V		180	500	μA
VIO current (Recessive)		TXD=VIO, STB=0V		30	200	μA

（VCC=5V±5% and Temp=T_{MIN}~T_{MAX} unless specified otherwise; typical in VCC=+5V, VIO=5V and Temp=25℃）

ESD PERFORMANCE

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
CAN bus pin contact discharge model （IEC）	V_{ESD_IEC}	IEC 61000-4-2: Contact discharge	-4		+4	kV
CAN bus pin human body discharge model （HBM）	V_{ESD_HBM}		-8		+8	kV

FUNCTION TABLE

Table1. CAN TRANSCEIVER TRUTH TABLE

TXD(1)	STB(1)	CANH(1)	CANL(1)	BUS STATE	RXD(1)
L	L	H	L	Dominate	L
H or Open	L	0.5VCC	0.5VCC	Recessive	H
X	H or Open	GND	GND	Recessive	H

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

Table 2. RECEIVER FUNCTION TABLE

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

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

Table 3. Under-voltage protection status table

VCC	VIO(1)	BUS STATE	BUS OUT(2)	RXD(2)
VCC>V_{uvd_VCC}	VIO>V_{uvd_VIO}	normal	According to STB and TXD	Follow the bus
VCC<V_{uvd_VCC}	VIO>V_{uvd_VIO}	Protected state	GND	H
VCC>V_{uvd_VCC}	VIO<V_{uvd_VIO}	Protected state	Z	H
VCC<V_{uvd_VCC}	VIO<V_{uvd_VIO}	Protected state	Z	H

(1) Only SIT1044T/3 version;

(2) H=high level; Z=high impedance state;

TEST CIRCUIT

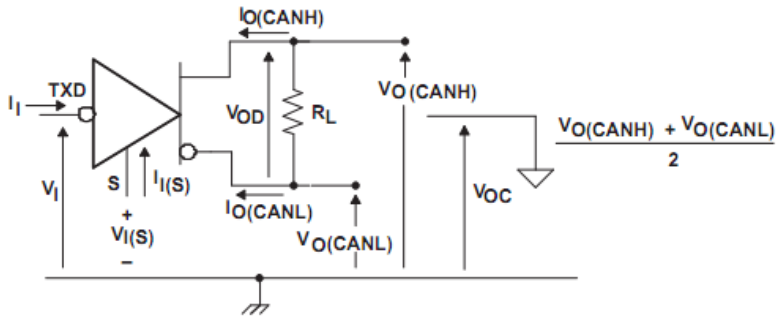


Fig.1 Driver Voltage, Current, and Test Definition

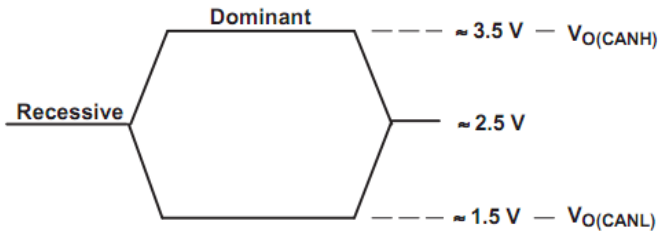


Fig.2 Bus Logic State Voltage Definition

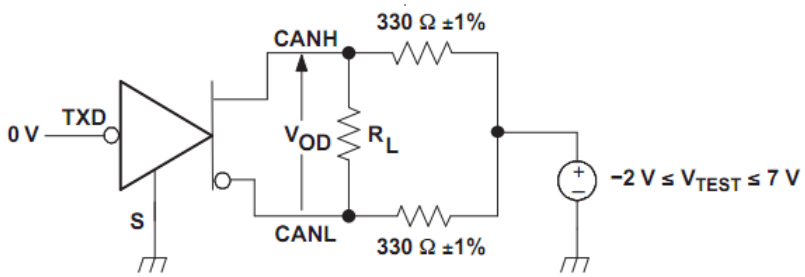


Fig.3 Driver V_{OD} Test Circuit

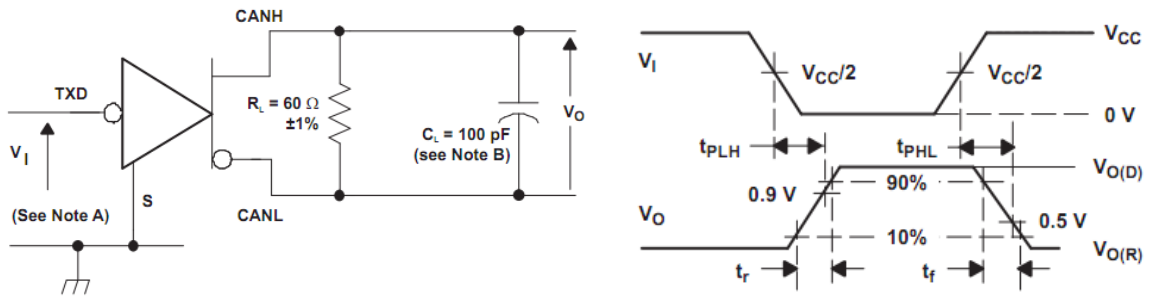


Fig.4 Driver Test Circuit and Waveform

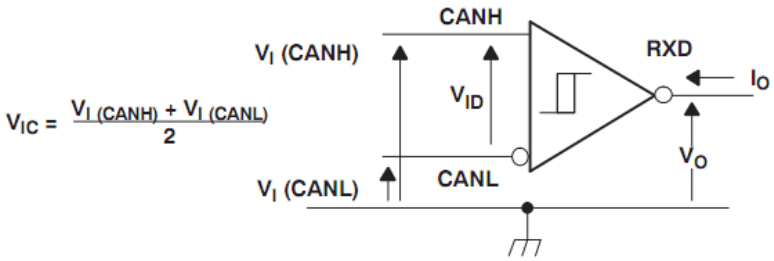
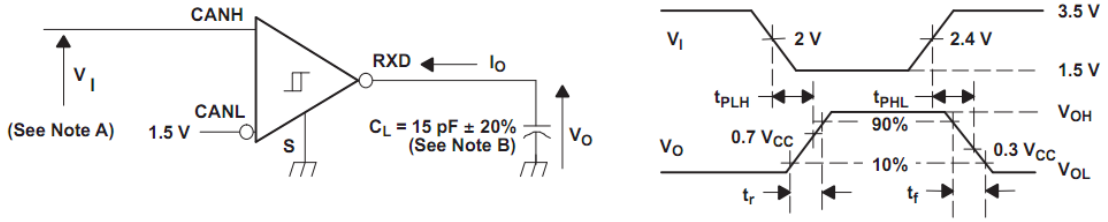


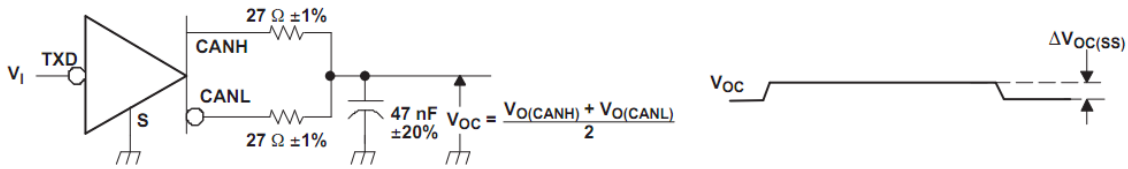
Fig.5 Receiver Voltage and Current Definition



A. The input pulse is supplied by a generator having the following characteristics: PRR ≤ 125 kHz, 50% duty cycle, t_r ≤ 6 ns, t_f ≤ 6ns, Z_O = 50 Ω.

B. C_L includes instrumentation and fixture capacitance within ±20%.

Fig.6 Receiver Test Circuit and Waveform



Note: VI from 0~VCC，The input pulse is supplied by a generator having the following characteristics: PRR ≤ 125 kHz, 50% duty cycle, t_r ≤ 6 ns, t_f ≤ 6ns, Z_O = 50 Ω.

Fig.7 Common mode output voltage test and waveform

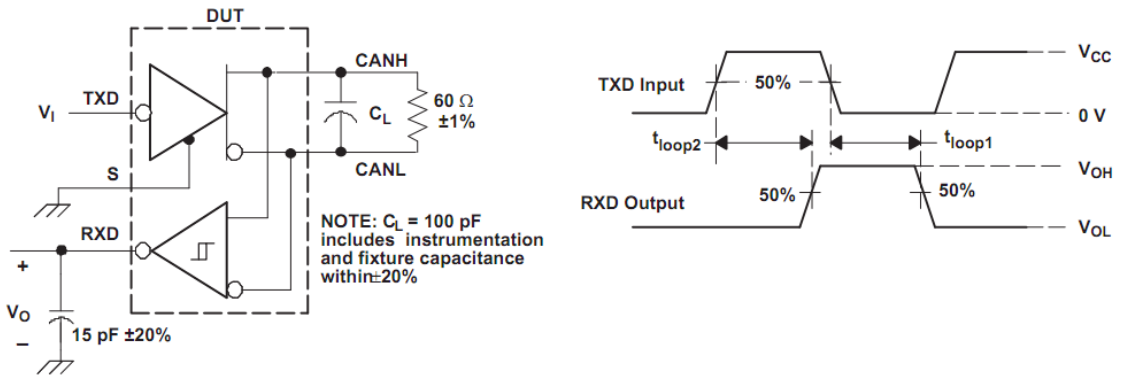


Fig.8 t_{loop} test circuit and waveform

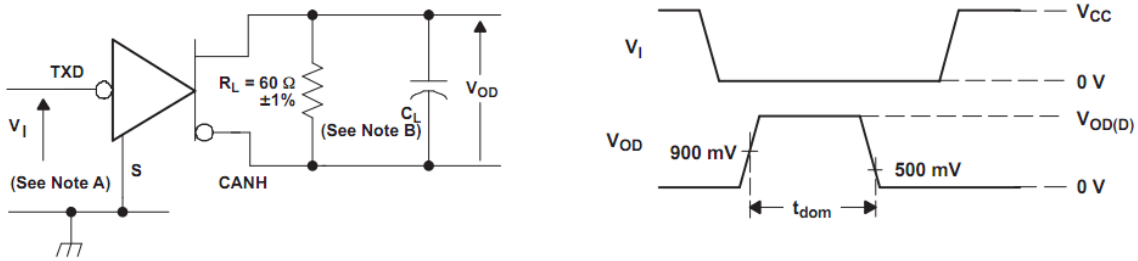


Fig.9 Dominant overtime test circuit and waveform

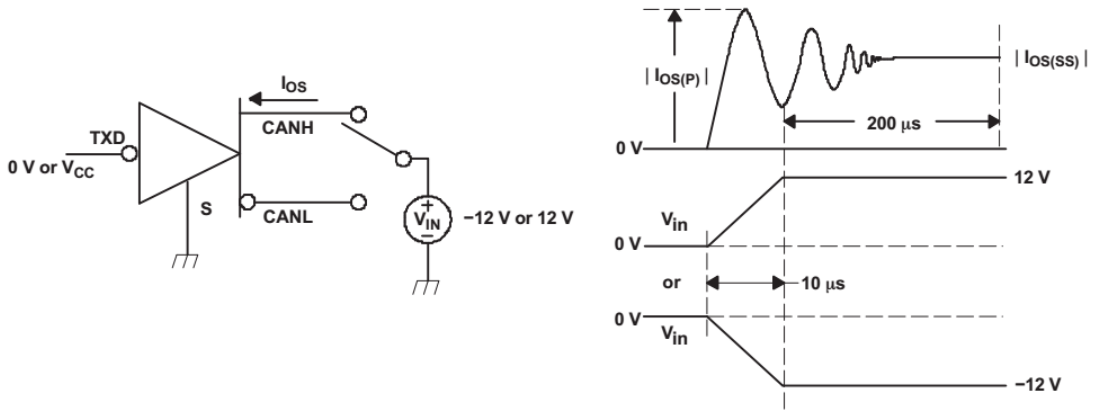


Fig.10 Driver short circuit current test circuit and waveform

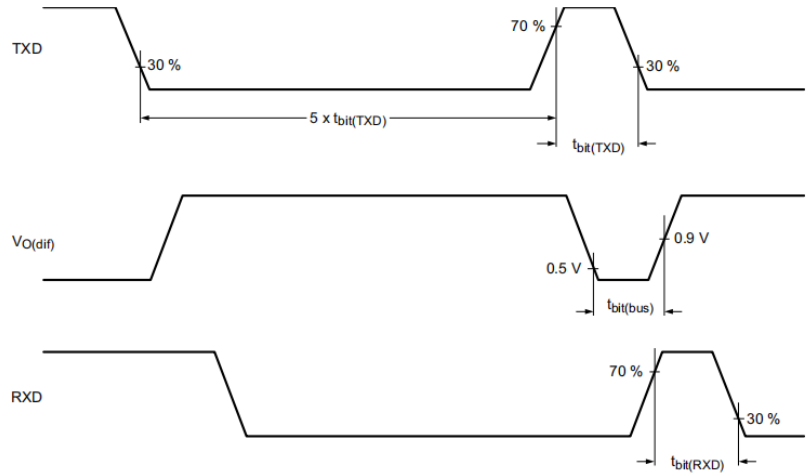
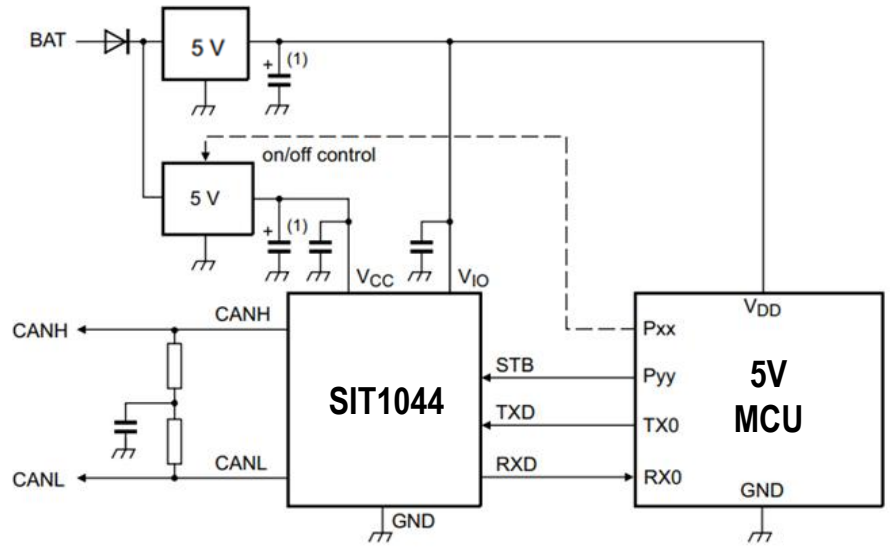


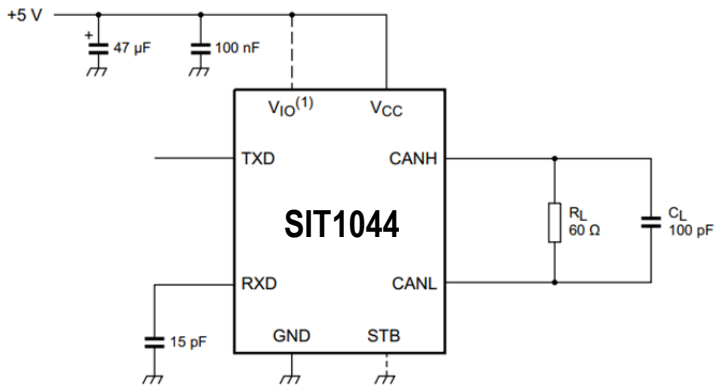
Fig.11 t_{bit} test circuit and waveform

TYPICAL APPLICATION TEST



（1）SIT1044T/3 can be applied to 3V or 5V MCU

SIT1044 typical application diagram



（1）VIO is limited to SIT1044T/3, VIO=VCC in SIT1044T

SIT1044 typical high-speed mode test chart

ADDITIONAL DESCRIPTION

1 Sketch

SIT1044 is an interface chip applied 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 them is fully compatible with the "ISO 11898-2: 2016" standard.

2 Over temperature protection

SIT1044 has an over-temperature protection function. After the over-temperature protection is triggered, the drive tube will be turned off, because the drive tube is the main energy-consuming component. Turning off the drive tube can reduce power consumption and thus reduce the chip temperature. At the same time, other parts of the chip are still working normally.

3 Under-voltage protection

The SIT1044 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} (if applicable).

4 Operating modes

The control pin STB allows two working modes to be selected: high-speed mode and standby mode.

The high-speed mode is a normal operating mode and is selected by grounding the pin STB. Both the CAN driver and the receiver can operate normally and CAN communication is carried out in both directions.

Set the pin STB to high level, and the standby module will detect the signal on the bus. When complete dominant-recessive-dominant pattern within t_{dom_WAKE} to be recognized as a valid wake up pattern（see Figure12）.Otherwise, the internel wake up is reset. The complete wake up pattern will then need to be re-transmitted to trigger a wake-up event. Pin RXD remains HIGH until the wake up event has been triggered.

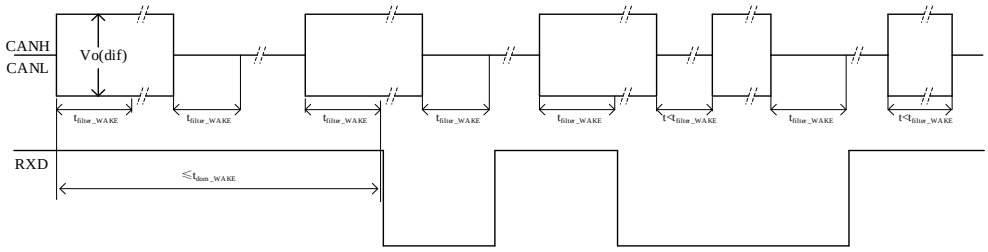


Fig 12 Wake-up timing

5 Explicit timeout function

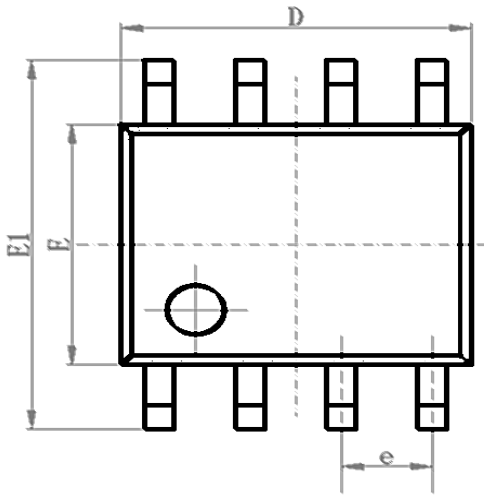
In high-speed mode, if the low-level duration on pin TXD exceeds the internal timer value (tdom_BUS), the transmitter will be disabled and drive the bus into a recessive state. It can prevent the pin TXD from being forced to a permanent low level due to a hardware or software application failure, causing the bus line to be

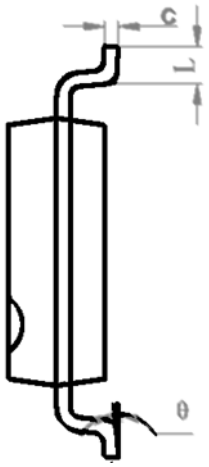
driven to a permanent dominant state (blocking all network communications). A rising edge signal on pin TXD can be reset.

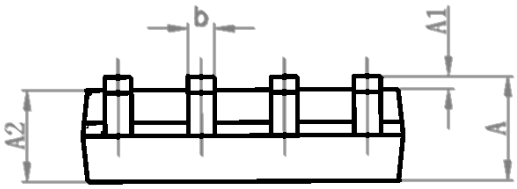
SOP8 DIMENSIONS

PACKAGE SIZE

SYMBOL	MIN./mm	TYP./mm	MAX./mm
A	1.40	-	1.80
A1	0.10	-	0.25
A2	1.30	1.40	1.50
b	0.38	-	0.51
D	4.80	4.90	5.00
E	3.80	3.90	4.00
E1	5.80	6.00	6.20
e		1.27BSC	
L	0.40	0.60	0.80
c	0.20	-	0.25
θ	0°	-	8°



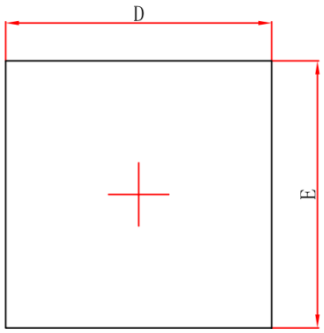


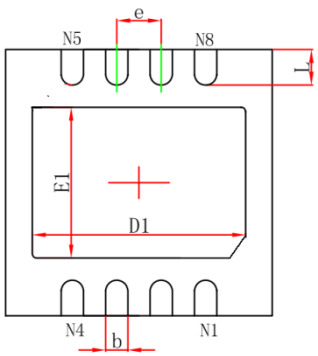


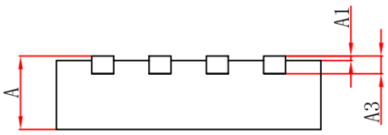
DFN3*3-8 /HVSON8 DIMENSIONS

PACKAGE SIZE

SYMBOL	MIN./mm	TYP./mm	MAX./mm
A	0.70		0.80
A1	0.00	0.02	0.05
A3	0.203 REF		
D	2.90	3.00	3.10
E	2.90	3.00	3.10
D1	2.35	2.3	2.55
E1	1.55	1.65	1.75
b	0.2	0.25	0.33
e	0.65 TYP		
L	0.35		0.45







ORDERING INFORMATION

TYPE NUMBER	TEMPERATURE	PACKAGE
SIT1044T	-40℃~150℃	SOP8
SIT1044T/3	-40℃~150℃	SOP8
SIT1044TK/3	-40℃~150℃	HVSON8 / DFN3*3-8，Small Outline, Leadless

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

Important statement

SIT reserves the right to change the above-mentioned information without prior notice.