MORNSUN®

SCM3422ASA High-speed CAN Transceiver

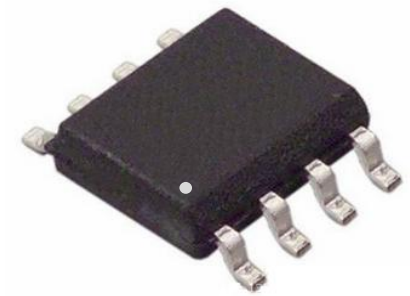
Features

- Compatible with the "ISO 11898" standard fully
- Thermal shutdown protection
- Over current protection
- Transmit data (TXD) dominant time-out function
- Low current standby mode with Wake-Up capability via CAN bus(typical value is 5μA)
- An unpowered node does not disturb the bus lines
- The bus supports maximum 110 nodes
- High-Speed CAN,communication speed up to 1Mbps
- High electromagnetic immunity

Applications

- Industrial automation
- Building automation
- Smart meter
- Long-distance signal interaction and transmission

Package

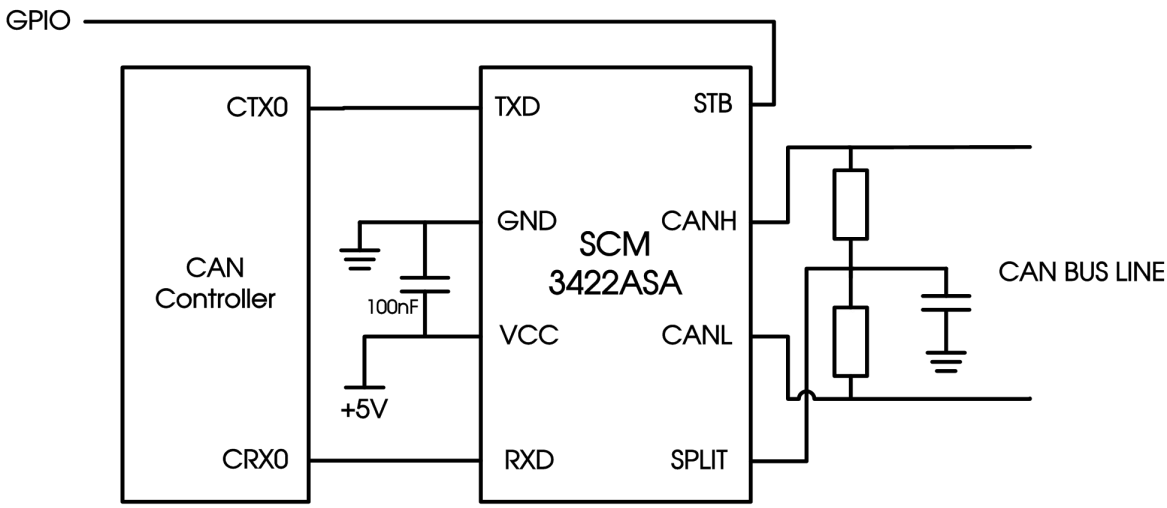


Product optional package: SOP-8, Screen Printing information please see "Order Information"

Functional Description

The SCM3422ASA is an interface chip used between the CAN protocol controller and the physical bus. It can be used in many fields such as trucks, buses, cars, industrial control. It can reach speeds up to 1Mbps. The SCM3422ASA has the ability to differentially transmit between the bus and the CAN protocol controller.

Typical Application

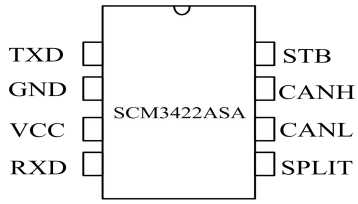


Note:GPIO means universal I/O port.

Contents

Feature....1
Applications....1
Functional Description....1
Typical Application....1
Pin Package....2
Truth Table....2
Pin Configurations and Functions....2
Absolute Maximum Ratings....3
Recommended Operating Conditions....3
Electrical Characteristics....3
Switching Characteristics....4
Other Characteristics....4
Parameter Test Circuit....5
General Description....7
Design Circuit Expansion....8
Power Usage Recommendations....8
Ordering Information....8
Packaging Information....9
Tape & Reel Information....9

Pin Package



Truth Table

TABLE 1 CAN transceiver truth table

VCC	TXD	STB	CANH	CANL	Bus State	RXD
4.5~5.5V	L	L	H	L	Dominate	L
4.5~5.5V	H(Or left floating)	X	0.5VCC	0.5VCC	Recessive	H
4.5~5.5V	X	H(or left floating)	0.5VCC	0.5VCC	Recessive	H
0<VCC<4.5V	X	X	0V<VCANH<VCC	0V<VCANL<VCC	recessive	X

(1)H=High-level ; L=Low-level ; X=Any level

TABLE 2 Device function table

Inputs		Outputs		Bus State
TXD	STB	CANH	CANL	
L	L	H	L	dominate
H (or left floating)	X	Z	Z	recessive
X	H(or left floating)	Z	Z	recessive

(2)H=High-level ; L=Low-level ; X=Any level

TABLE 3 Receiver function table

VID=CANH-CANL	RXD	Bus State
VID≥0.9V	L	dominate
0.5< VID<0.9V	?	?
VID≤0.5V	H	recessive
Open	H	recessive

(3)H=High-level ; L=Low-leve l ; ? =indeterminacy

Pin Configurations and Functions

Pins	Name	Pin Functions
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	SPLIT	Commom mode stable output
6	CANL	LOW-level CAN bus line
7	CANH	HIGH-level CAN bus line
8	STB	Standby mode and high-speed mode (Low is high-speed)

Absolute Maximum Ratings

Parameters	Sym.	Value.	Unit.
Supply Voltage	VCC	-0.3 ~ +6	V
MCU Side Port	TXD，RXD，STB	-0.3 ~ VCC+0.3	V
Bus Side Iinput Voltage	CANL，CANH，SPLIT	-40 ~ 40	V
Transient Voltage on 6, 7 Pin (See Figure 7)	V_{tr}	-200 ~ +200	V
Storage Temperature Range		-55 ~ 150	℃
Operating Ambient Temperature Range		-40 ~ 125	℃
Welding Temperature Range		300	℃
Continuous Power Dissipation	SOP8	400	mW
	DIP8	700	mW

(1)The above data was measured in a naturally ventilated, normal operating temperature range (unless otherwise stated).
(2)The maximum limit parameter value means that exceeding these values may cause irreparable damage to the device. Under these conditions, it is not conducive to the normal operation of the device. Continuous operation of the device at the maximum allowable rating may affect device reliability. The reference point for all voltages is ground.

Recommended Operating Conditions

Parameters	Sym.	Test Conditions	Min.	Max.	Units.
Supply Voltage	Vcc		4.5	5.5	V
Maximum Baud Rate	1/tbit	non-return to zero code	1		Mbaud
CANH、CANL Input Voltage	V_{can}		-40	+40	V
BUS Differential Output Voltage	V_{diff}		1.5	3.0	V
Operating Ambient Temperature Range	Tamb		-40	125	℃

Electrical Characteristics

Unless otherwise stated, VCC=5V±10%, Temp=TMIN~TMAX, typical value is VCC=+5V, Temp=25°C

Driver Electrical Characteristics						
Sym.	**Parameters**	**Test Conditions**	**Min.**	**Typ.**	**Max.**	**Units**
$V_{OH(D)}$	CANH output voltage(dominant)	VI=0V, STB=0V, RL=60Ω, Figure 1, Figure 2	2.9	3.4	4.5	V
$V_{OL(D)}$	CANL output voltage(dominant)		0.8		1.5	V
$V_{O(R)}$	Output voltage(dominant)	VI=3V, STB=0V, RL=60Ω, Figure 1, Figure 2	2	2.5	3	V
$V_{OD(D)}$	Bus differential output voltage (dominant)	VI=0V, STB=0V, RL=60Ω, Figure 1, Figure 2	1.5		3	V
$V_{OD(R)}$	Bus differential output voltage(recessive)	VI=3V, S=0V, Figure 1, Figure 2	-0.012		0.012	V
		VI=3V, STB=0V, NO LOAD	-0. 5		0.05	V
$V_{dom(TX)sym}$	Dominant output voltage symmetry	$V_{dom(TX)sym}=V_{CC}- V_{CANH} - V_{CANL}$	-400		400	mV
V_{TXsym}	Output voltage symmetr	$V_{TXsym}= V_{CANH} + V_{CANL}$	$0.9V_{CC}$		$1.1V_{CC}$	V
V_{OC}	Commom-mode output voltage	STB=0V, Figure 8	2	2.5	3	V
$\triangle V_{OC}$	Dominant recessive commom-mode output voltage difference			30		mV
I_{OS}	Short-circuit output current	CANH=-12V, CANL=open, Figure 11	-105	-72		mA
		CANH=12V, CANL=open, Figure 11		0.36	1	
		CANL=-12V, CANH=open, Figure 11	-1	0.5		
		CANL=12V, CANH=open, Figure 11		71	105	
$I_{O(R)}$	Output current(recessive)	-27V<CANH<32V 0<VCC<5.25V	-2.0		2.5	mA
Receiver Electrical Characteristics						
Sym.	**Parameters**	**Test Conditions**	**Min.**	**Typ.**	**Max.**	**Units**
V_{IT+}	Positive-going input threshold voltage	STB=0V, Figure5		800	900	mV
V_{IT-}	Negative-going input threshold voltage		500	650		
V_{HYS}	Hysteresis voltage (VIT+ - VIT–)		100	125		
V_{OH}	High-level output voltage	IO=-2mA, Figure6	4	4.6		V
V_{OL}	Low-level output voltage	IO=2mA, Figure6		0.2	0.4	V
$I_{(OFF)}$	Unpowered input current	CANH or CANL=5V, other pin=0V			5	μA
C_I	Input capacitance to ground (CANH or CANL)			13		pF
C_{ID}	Differential input capacitance			5		pF
R_{IN}	Input resistance (CANH or CANL)	TXD=3V, STB=0V	15	30	40	KΩ

R_{ID}	Differential input resistance		30		80	KΩ
RI_{match}	Input resistance matching: [1 – RIN(CANH) / RIN(CANL)] × 100%	CANH=CANL	-3%		3%	
V_{COM}	Common mode range		-12		12	V
Power Supply Features						
Sym.	**Parameters**	**Test Conditions**	**Min.**	**Typ.**	**Max.**	**Units**
I_{CC}	Stanby mode power dissipation	STB=VCC, V_I=VCC		5	12	μA
	Dominant power dissipation	V_I=0V, STB=0V, LOAD=60Ω		50	70	mA
	Recessive power dissipation	V_I=VCC, STB=0V, NO LOAD		6	10	mA

Switching Characteristics

Unless otherwise stated, VCC=5V±10%, Temp=TMIN~TMAX, typical value is VCC=+5V, Temp=25°C

Driver Switching Characteristics						
Sym.	**Parameters**	**Test Conditions**	**Min.**	**Typ.**	**Max.**	**Units**
tPLH	Driver propagation delay(L to H)	STB=0V, Figure4	25	65	120	ns
tPHL	Driver propagation delay(H to L)		25	45	90	ns
tr	Driver differential-output rise time			25		ns
tf	Driver differential-output fall time			50		ns
t_{EN}	Delay time from listening mode to dominant enable	Figure7			10	μs
t_{dom}	Dominant time-out time	Figure10	300	450	700	μs
t_{BUS}	Bus wake-up time		0.7		5	μs
Receiver Switching Characteristics						
Sym.	Parameters	Test Conditions	Min.	Typ.	Max.	Units
tPLH	Receiver propagation delay(L to H)	STB=0V or VCC, Figure6	60	100	130	ns
tPHL	Receiver propagation delay(H to L)		45	70	90	ns
tr	Receiver output rise time			8		ns
tf	Receiver output fall time			8		ns
Device Switching Characteristics						
Td(LOOP1)	Total loop delay1, driver input (TXD) to receiver output (RXD), recessive to dominant		90		190	ns
Td(LOOP2)	Total loop delay2, driver input (TXD) to receiver output (RXD), dominant to recessive		90		190	ns

Other Characteristics

Unless otherwise stated, VCC=5V±10%, Temp=TMIN~TMAX, typical value is VCC=+5V, Temp=25°C

Over temperature protection						
Sym.	**Parameters**	**Test Conditions**	**Min.**	**Typ.**	**Max.**	**Units**
Tj(sd)	Thermal shutdown of bus drivers			160		℃
TXD Characteristics						
Sym.	**Parameters**	**Test Conditions**	**Min.**	**Typ.**	**Max.**	**Units**
I_{IH}(TXD)	TXD pin High-level input current	VI=VCC	-2		2	μA
I_{IL}(TXD)	TXD pin Low-level input current	VI=0	-50		-10	μA
I_O(off)	VCC=0V, current of TXD	VCC=0V，TXD=5V			1	μA
V_{IH}	High-level input voltage		2		VCC+0.3	V
V_{IL}	Low-level input voltage		-0.3		0.8	V
TXD_O	TXD port suspension voltage			H		logic
Common stable output						
Sym.	**Parameters**	**Test Conditions**	**Min.**	**Typ.**	**Max.**	**Units**
V_O	Common stable output	-500uA<I_o<500uA	0.3V_{CC}		0.7V_{CC}	V
$I_{O(stb)}$	Leakage current	STB=2V，-12V<V_O<12V	-5		5	μA

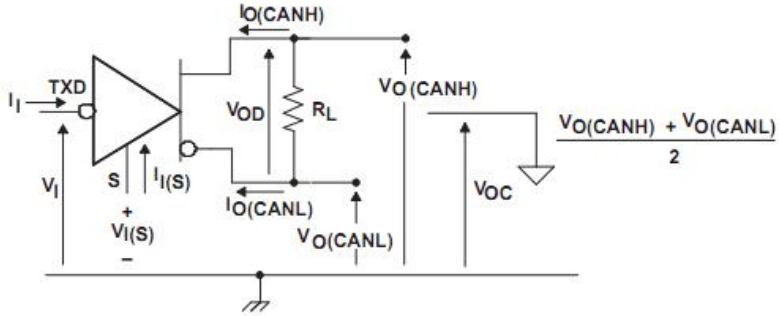


Figure 1. The driver voltage, current test defines

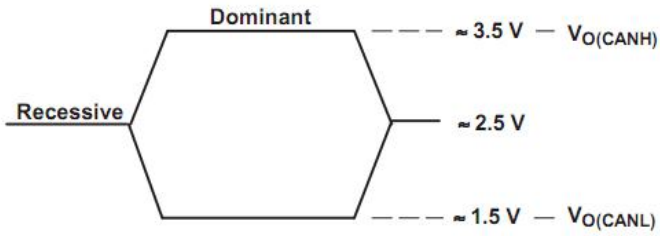


Figure 2. Bus logic voltage defines

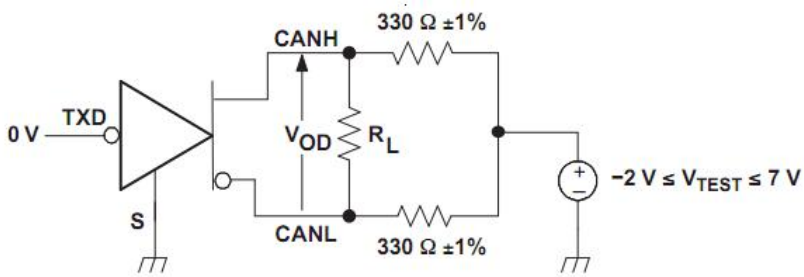


Figure3. Driver VOD testings telephone

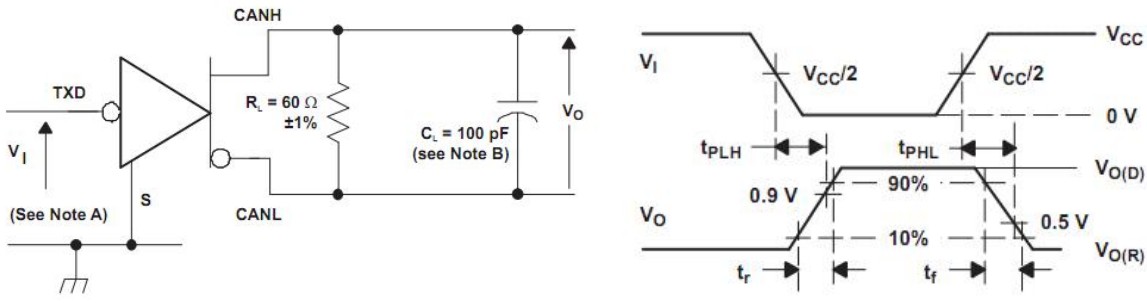


Figure 4.The driver testings telephone and electricity corrugating

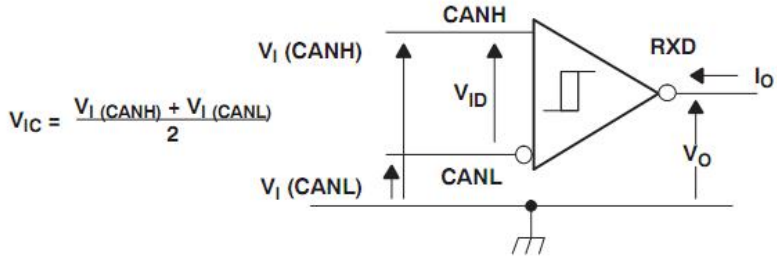


Figure 5. Receiver voltage and current definition

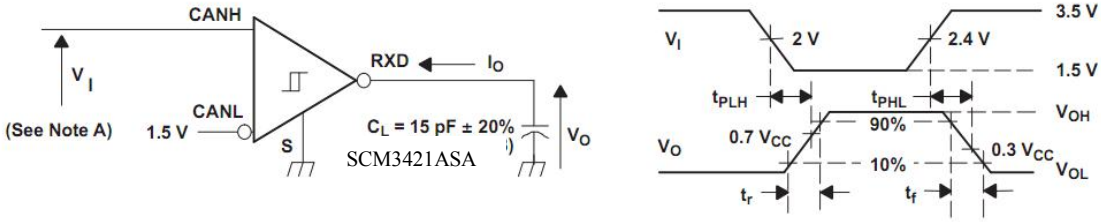


Figure 6. Receiver test telephone and electricity corrugating

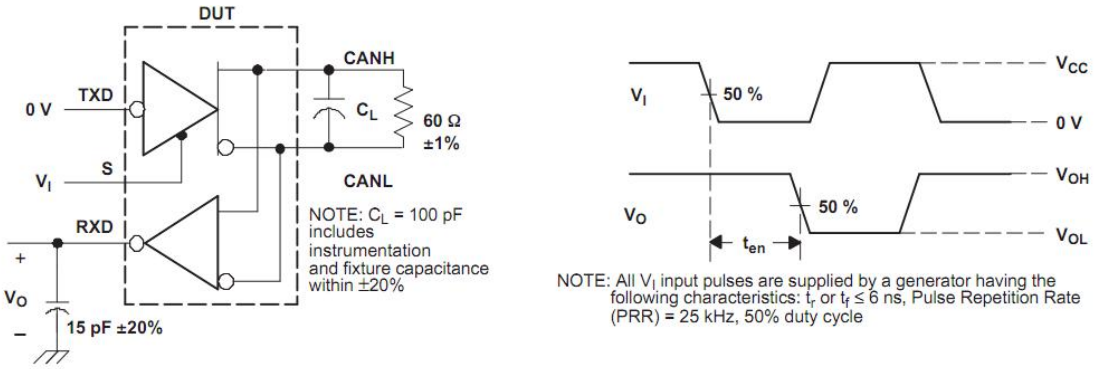


Figure 7. tEN test circuit and electricity corrugating

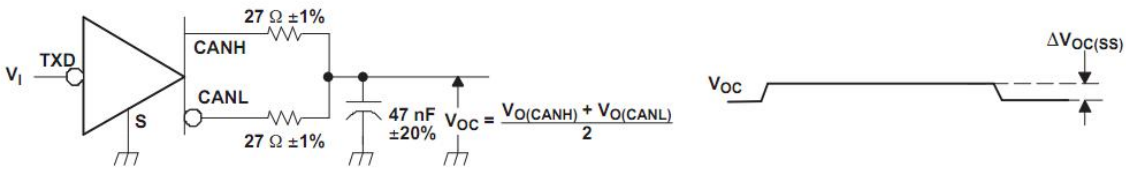


Figure 8. Common mode output voltage test and waveform

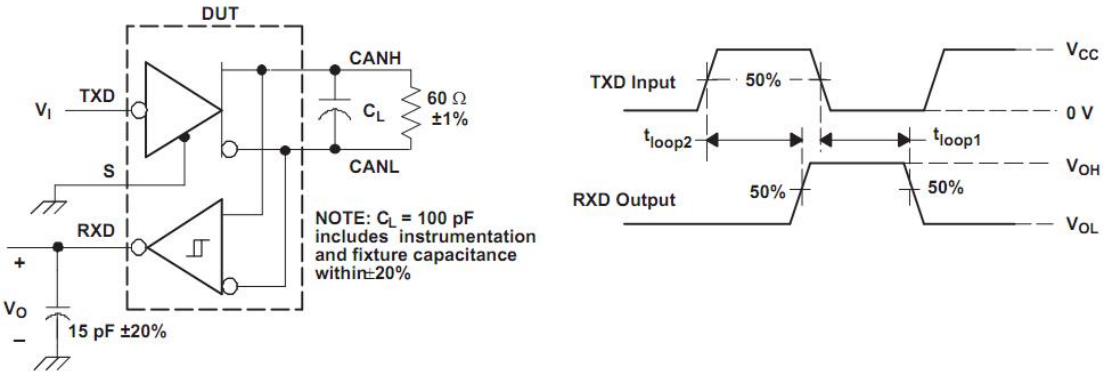


Figure 9. t(LOOP) Test Circuit and waveform

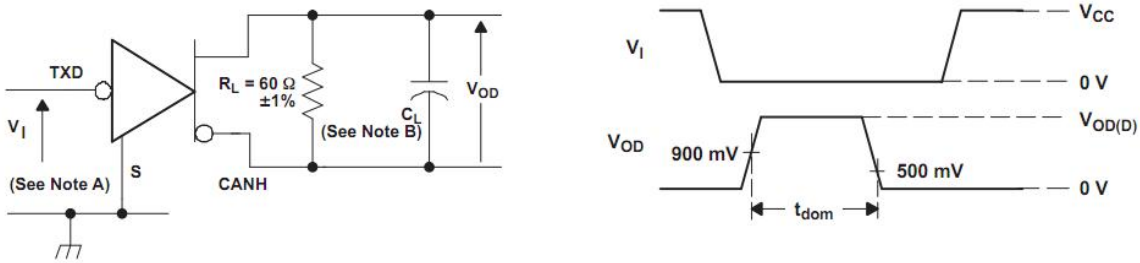


Figure 10. Dominant time-out test Circuit and waveform

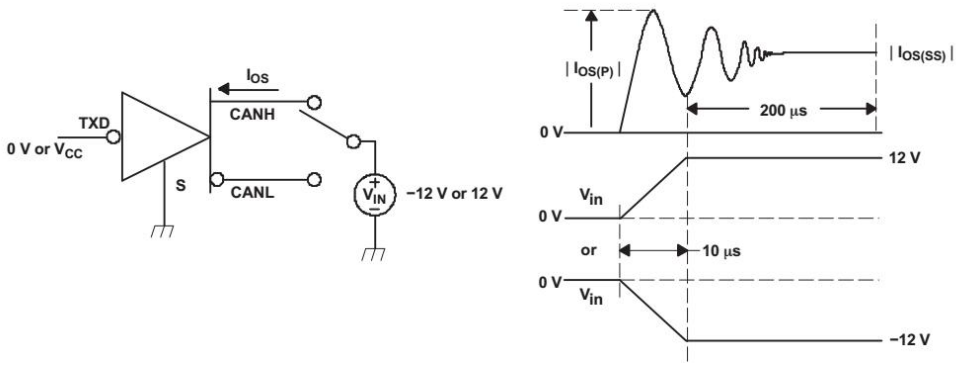


Figure 11. The driver short-circuit current test Circuit and waveform

General Description

The SCM3422ASA is an interface chip used between the CAN protocol controller and the physical bus. It can be used in many fields such as trucks, buses, cars, industrial control. It can reach speeds up to 1Mbps. The SCM3421ASA has the ability to differentially transmit between the bus and the CAN protocol controller. SCM3421ASA is compatible with the "ISO 11898" standard.

Short-circuit protection: The drive stage of the SCM3422ASA has current-limiting protection to prevent the drive circuit from short-circuiting to positive and negative supply voltages. The power dissipation increases when a short circuit occurs. The short-circuit protection function protects the driver stage from damage.

Fail-safe: The TXD pin is pulled up to the VCC path to ensure that the bus is in a recessive state when the TXD is not connected to power.
The STB pin is pulled up to the VCC path to ensure that the transceiver is in standby when the STB is not connected to power.
When the VCC supply is powered down, the TXD, STB, and RXD pins will become floating to prevent reverse supply through these pins.

Over-temperature protection: The SCM3422ASA has over-temperature protection. When the junction temperature exceeds 160°C, the current in the driver stage will decrease. Because the drive tube is the primary energy consuming component, current reduction can reduce power consumption and reduce chip temperature. At the same time, the rest of the chip remains functional.

Dominant time-out function：If the pin TXD is forced to a permanent low level due to a hardware or software application failure, the built-in TXD dominant timeout timer circuit prevents the bus line from being driven to a permanent dominant state (blocking all network traffic) . The timer is triggered by the negative edge on pin TXD.
If the low level on pin TXD lasts longer than the internal timer value (tdom), the transmitter will be disabled and the drive bus will enter a recessive state. The timer is reset by the positive edge on pin TXD.

Control mode: Control pin STB allows selection of two operating modes: high speed mode or standby mode.

The high speed mode is the normal operating mode and is selected by grounding the pin STB. The transceiver is capable of transmitting and receiving data over the buses CANH and CANL. The differential receiver converts the analog data on the bus to digital data and outputs it to pin RXD through a multiplexer (MUX).

If pin STB is tied high or not connected, it operates in standby mode. In standby mode, the transmitter and receiver are turned off and the bus line is monitored by a low power differential comparator. A high level on pin STB activates the low power receiver and wake-up filter, and once the low power differential comparator detects a dominant bus level that exceeds tBUS, pin RXD will go low.

Design Circuit Expansion

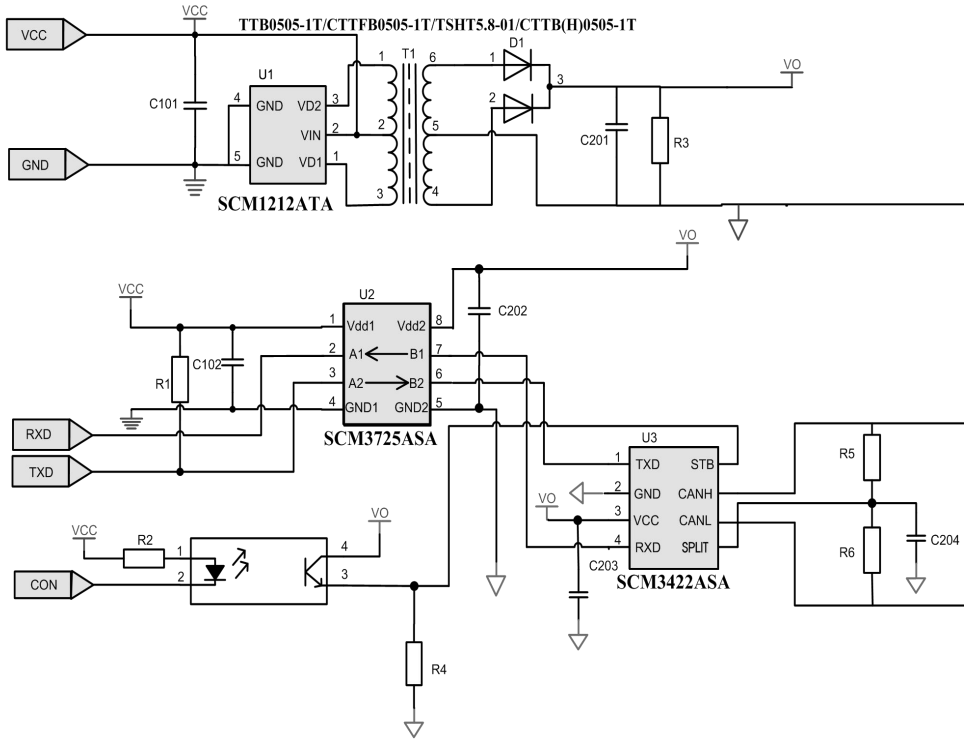


Figure 12.Isolated Application Circuit Schematic for Converting TTL/CMOS to CAN Bus

Power Usage Recommendations

Connecting the 0.1μF bypass capacitor as close as possible to the VCC pin of the device.

Ordering Information

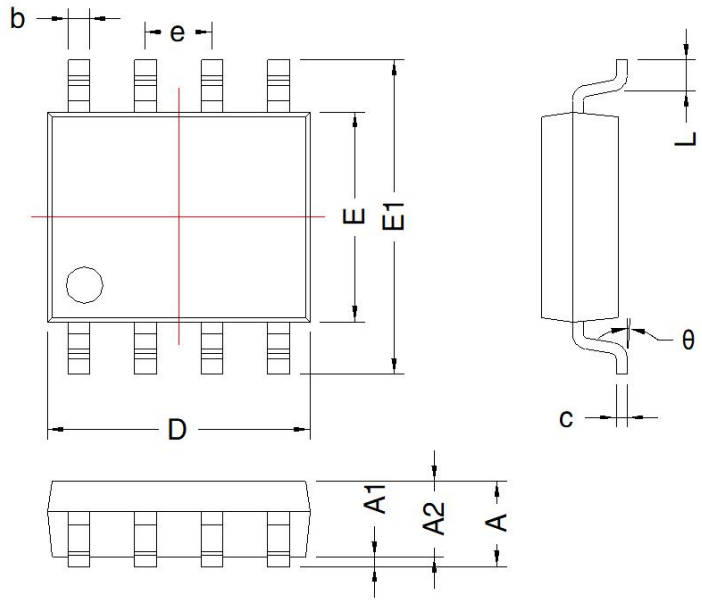
Product number	Package Type	Pins	Screen Printing	package
SCM3422ASA	SOP	8	SCM 3422ASA YM	2.5K/reel

Product model and Screen Printing instructions:

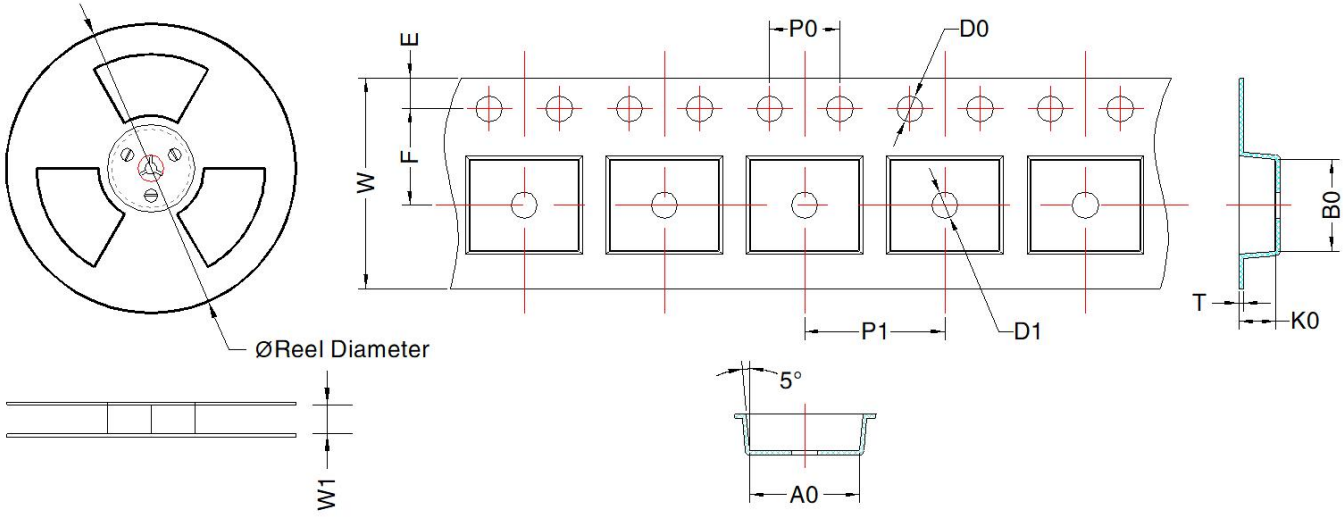
SCM3422XYZ：

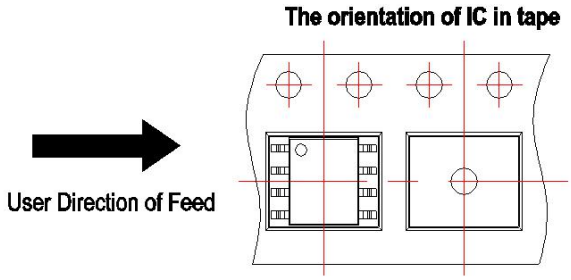
(1)SCM3422, Product Code.
(2)X = A-Z, Version code.
(3)Y = S Package code; S: SOP package.
(4)Z = C, I, A, M, Temperature class code; C: 0℃ - 70℃, I: -40℃ - 85℃, A：-40℃ - 125℃, M: -55℃ - 125℃.
(5)YM: Product traceability code; Y: Product year code, M: Product production month code.

THIRD ANGLE PROJECTION



SOP-8				
Mark	Dimension(mm)		Dimension(inch)	
	Min	Max	Min	Max
A	1.5	1.7	0.059	0.067
A1	0.1	0.2	0.004	0.008
A2	1.35	1.55	0.004	Min
D	4.8	5.0	0.053	0.197
E	3.78	3.98	0.149	0.157
E1	5.8	6.2	0.228	0.244
L	0.4	0.8	0.016	0.031
b	0.355	0.455	0.014	0.018
e	1.27 TYP		0.05 TYP	
c	0.153	0.253	0.006	0.001
θ	2°	6°	2°	6°





Device	Package Type	MPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	T (mm)	W (mm)	E (mm)	F (mm)	P1 (mm)	P0 (mm)	D0 (mm)	D1 (mm)
SCM3422ASA	SOP-8	2500	330.0	12.4	6.4±0.1	5.3±0.1	2.1±0.1	0.25±0.03	12.0±0.1	1.75±0.1	5.5±0.1	8±0.1	4±0.1	1.5±0.1	1.5±0.1

MORNSUN Guangzhou Science & Technology Co., Ltd.
Address: No. 5, Kehui St. 1, Kehui Development Center, Science Ave., Guangzhou Science City, Huangpu District, Guangzhou, P. R. China
Tel: 86-20-38601850 Fax: 86-20-38601272 E-mail: info@mornsun.cn www.mornsun-power.com