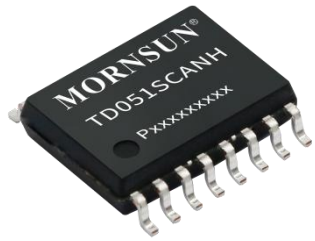
MORNSUN®

TD051SCANH
SOIC package isolated CAN Transceiver

Features

- Ultra-small, ultra-thin, chip scale SOIC package
- Compliant with ISO11898-2 standard
- I/O power supply range supports 3.3V and 5V microprocessors
- High isolation to 4000VAC/6000VDC
- Bus-Pin ESD protection up to 8kV(HBM)
- Baud rate up to 5Mbps
- -58V to +58V bus fault protection
- >180kV/μs CMTI
- TXD dominant time-out function
- Low loop delay
- The bus supports maximum 110 nodes
- Industrial operating ambient temperature range: -40℃ to +125℃
- Moisture Sensitivity Level (MSL) 3

Package



Applications

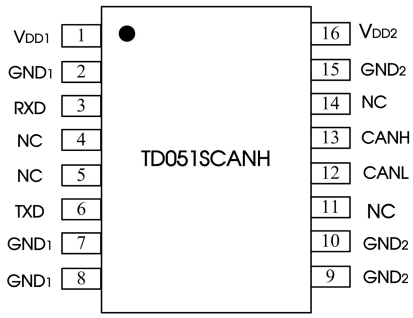
- Industrial automation, control, sensors and drive systems
- Building and greenhouse environmental control(HVAC) automation
- Security system
- Transport
- Medical treatment
- Telecommunication
- CAN Bus standard such as CAN open, Device Net, NMEA2000, ARNIC825, ISO11783, CAN Kingdom, CAN aerospace

Functional Description

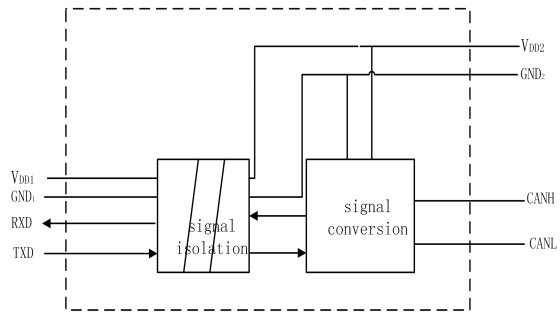
The TD051SCANH is an isolated CAN transponder that meets or exceeds the specifications of the ISO11898-2 standard. As a CAN transceiver, the device provides differential transmit and receive capability for the bus and CAN controller, respectively, It is capable of running at data rates of up to 5Mbps. Particularly suited for harsh environments, the device features protection against cross-wire, overvoltage, and ground loss (-58V to 58V), as well as thermal shutdown.The TD051SCANH is rated for operation over the -40°C to 125°C ambient temperature range.

Contents

Pin Connection



Internal Block Diagram



Note: All GND1 pins are internally connected;
All GND2 pins are internally connected.。

Function Table

Letter	Description
H	High-Level
L	Low-Level
I	Uncertainty
X	Unrelated
Z	High Impedance
NC	Connectionless

Table 1. Driver Function table

Supply status		Input	Output		
V_{DD1}	V_{DD2}	TXD	State	CANH	CANL
On	On	L	Dominant	H	L
On	On	H	Recessive	Z	Z
On	On	vacant	Recessive	Z	Z
Off	On	X	Recessive	Z	Z
On	Off	L	I	I	I

Table 2. Receiver Function table

Supply status		Input		Output
V_{DD1}	V_{DD2}	V_{ID} = CANH − CANL	Bus Status	RXD
On	On	≥0.9 V	Dominant	L
On	On	≤0.5 V	Recessive	H
On	On	0.5 V < V_{ID} < 0.9 V	I	I
On	On	Input open circuit	Recessive	H
Off	On	X	X	I
On	Off	X	X	H

Pin Descriptions

Pinout	Markings	Functionality
1	V_{DD1}	Power supply for the console.
2	GND_1	Console Ground.
3	RXD	CAN receiver outputs (L: bus state is explicit; H: bus state is implicit).
4	NC	No function pins, can be dangled.
5	NC	No function pins, can be dangled.
6	TXD	CAN receiver input (L: bus state is explicit; H: bus state is implicit).
7	GND_1	Console Ground.
8	GND_1	Console Ground.
9	GND_2	Bus End Ground.
10	GND_2	Bus End Ground.
11	NC	No function pins, can be dangled.
12	CANL	Low-potential CAN voltage inputs and outputs.
13	CANH	High-potential CAN voltage inputs and outputs.
14	NC	No function pins, can be dangled.
15	GND_2	Bus End Ground.。
16	V_{DD2}	Bus-side power supply.

Absolute Maximum Ratings

General test conditions: Free-air, normal operating temperature range (unless otherwise specified).

Parameters		Min.	Max.	Unit
V_{DD1},V_{DD2}	Supply Voltage	–0.5	6	V
V_I	Input Voltage (TXD)	−0.5	V_{DD1} + 0.5	V
$V_{O(RXD)}$	Output Voltage (RXD)	−0.5	V_{DD1} + 0.5	V
$V_{O(SENSE)}$	Output Voltage ($V_{DD2SENSE}$)	−0.5	V_{DD1} + 0.5	V
V_{CANH},V_{CANL}	Arbitrary bus terminal voltage (CANH, CANL)	-58	58	V
V_{REF}	Reference Voltage Output Value	−0.5	+6	V
T_A	Operating temperature range	−40	125	°C
T_{stg}	Storage temperature range	−65	150	°C
Reflow temperature		Peak temperature Tc ≤ 260°C, time above 217°C max. 60s. For practical application, please refer to IPC/JEDEC J-STD-020D.3 standard.		

Important: Exposure to absolute maximum rated conditions for an extended period may severely affect the device reliability, and stress levels exceeding the “Absolute Maximum Ratings” may result in permanent damage. All voltage values are based on the reference ground(GND) maximum voltage not exceeding 6V.

Recommended Operating Conditions

Parameters			Min.	Typ.	Max.	Unit
V_{DD1}	Supply voltage (control terminal)		2.375	3.3	5.5	V
V_{DD2}	Supply voltage (bus terminals)		4.5	5	5.5	V
V_I or V_{IC}	Bus Input Pin Withstand Voltage (Common Mode)		–58		58	V
V_{IH}	TXD high input voltage		2			V
V_{IL}	TXD low input voltage				0.8	V
I_{VDD1_S}	Console input quiescent current	V_{DD1}= 5.5V, V_{DD2}= 5.5V ,no signal		3.7	6	mA
I_{VDD2_S}	Power-side input quiescent current			5.5	10	
I_{VDD1_D}	The console dynamically sends current	V_{DD1}= 5.5V, V_{DD2}= 5.5V , RL= 60Ω ; TXD Pin Input Signal : f=500kHz ; Duty=50%		3.5	6	mA
I_{VDD2_D}	The console dynamically sends current			38	50	
P_D	Total power dissipation	V_{DD1}= 5.5V, V_{DD2}= 5.25V, T_A=105°C, RL= 60Ω ; TXD			300	mW
P_{D1}	Console power dissipation				30	

Parameters			Min.	Typ.	Max.	Unit
P_{D2}	Power Dissipation on Power Side	Pin Input Signal :f=500kHz ; Duty=50%			275	
	transmission rate				5000	kbps

Electrical Characteristics

General test conditions and V_{CC}=V_{IO}= 5V, Ta = 25℃ (unless otherwise specified).

Parameters		Conditions	Min.	Typ.	Max.	Unit
Drives						
V_{IH}	Logic Input High	TXD Pinout, Figure11	2			V
V_{IL}	Logic Input Low	TXD Pinout,Figure11			0.8	V
I_{IH}, I_{IL}	CMOS Logic Input Current	TXD Pinout,Figure 11			2	mA
V_{CANL},V_{CANH}	Implicit differential output bus voltage	V_{TXD} = high, R_L = ∞,Figure 11	2.0		3.0	V
V_{CANH}	CANH dominant differential output bus voltage	V_{TXD} = low, Figure11	2.75		4.5	V
V_{CANL}	CANL dominant differential output bus voltage	V_{TXD} = low, Figure11	0.5		2	V
V_{OD}	Differential Output Voltage	V_{TXD} = low, R_L = 50 Ω, Figure 11	1.5		3	V
		V_{TXD} = high, R_L = ∞, Figure 11	-500		+50	mV
Refraction						
V_{IT+}	Positive Input Threshold				900	mV
V_{IT-}	Negative Input Threshold		500			mV
V_{HYS}	Hysteresis voltage (VIT+ - VIT-)	Figure 14		150		mV
R_{DIFF}	Bus differential input impedance		15		40	kΩ
V_{OL}	Logic output low	I_{OUT} = 1.5 mA		0.2	0.4	V
V_{OH}	Logic Output High	I_{OUT} = −1.5 mA	V_{DD1} − 0.4	V_{DD1} − 0.2		V
C_I	Input capacitance to ground, (CANH or CANL)	TXD at 3 V, V_I = 0.4 sin (4E6 π t) + 2.5 V		13		pF
C_{ID}	Differential input capacitance	TXD at 3 V, V_I = 0.4 sin (4E6 π t)		5		pF
Other						
ESD	HBM Mode	CANH, CANL pins to GND			±8	kV
		Other Pins			±2	kV
	Contact IEC61000-4-2：Perf. Criteria B	CANH, CANL			±4	kV
V_{I-O}	Isolated Withstand Voltage	Leakage current <1mA, t=1s	6000			VDC
			4000			VAC
		Leakage current <1mA, t=60s	5000			VDC
			3500			VAC
R_{I-O}	Insulation impedance	500VDC	1000			MΩ
C_{I-O}	Isolation Capacitors			5.5		pF
CMTI	common mode transient immunity	TXD = V_{DD1} or 0 V, V_{CM} = 1 kV, transient magnitude = 800 V	150			kV/μs

Transmission Characteristics

Parameters		Conditions	Min.	Typ.	Max.	Unit
t_{LOOP1} t_{LOOP2}	Loop delay (TXD input to RXD output)	Figure 15		160	200	ns
Driver Characteristics						
t_{PLHD}	TXD propagation delay time (TXD input to bus dominant output)	Figure 13		75	100	ns
t_{PHLD}	TXD propagation delay time (TXD input to bus recessive output)			85	100	ns
t_r,t_f	Differential output signal rise,fall time			30	60	ns
t_{TXD_DTO}	Bus dominant time-out time		0.3		5	ms
Receiver Characteristics						
t_{PLHR}	RXD propagation delay time (Bus recessive to RXD output)	Figure 14		85	130	ns
t_{PHLR}	RXD propagation delay time (Bus dominant to RXD output)			85	130	ns
t_r,t_f	RXD signal rise,fall time			2.5	6	ns

Physical Specifications

Parameters	Value	Unit
Weight	0.4(Typ.)	g

Test Circuits

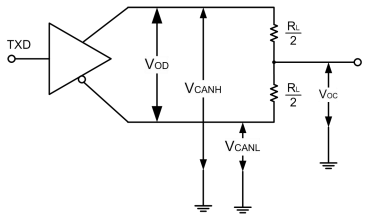


Figure 11.Driver test circuit

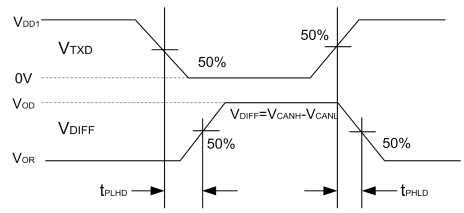


Figure 12.Drive and receiver propagation delay waveform

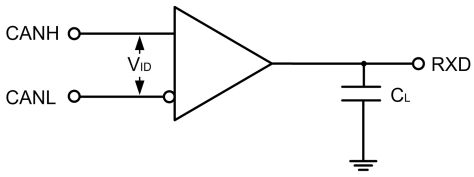


Figure 13.Receiver test circuit

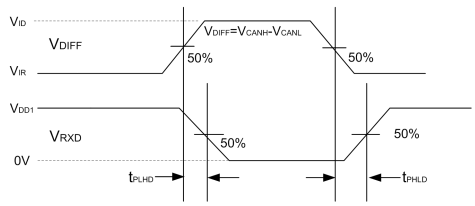


Figure 14.Receiver propagation delay waveform

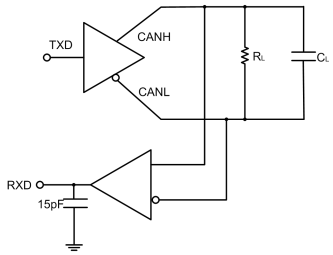


Figure 15. Propagation test circuit

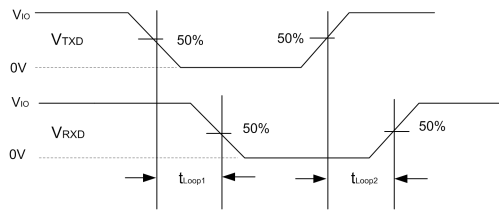


Figure 16.Loop delay waveform

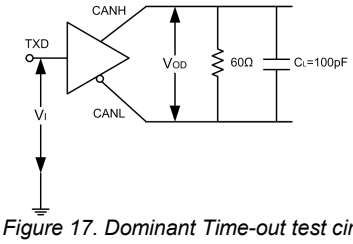


Figure 17. Dominant Time-out test circuit

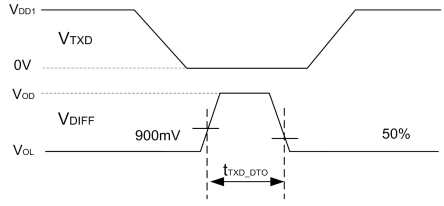


Figure 18. Dominant Time-out waveform

Detailed Description

TD051SCANH is a CAN of a style of separation transceiver with the ability of differential signal transmission between the bus and CAN protocol controller, it the inner integration insulate DC/DC power supply.which is compliant with ISO11898-2 standard.

Short-circuit protection: TD051SCANH 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.

Over-temperature protection: TD051SCANH has over-temperature protection. After over-temperature protection is triggered 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: TD051SCANH has dominant time-out function to prevent 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 (t_{TXD_OTD}), 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.

Application circuit

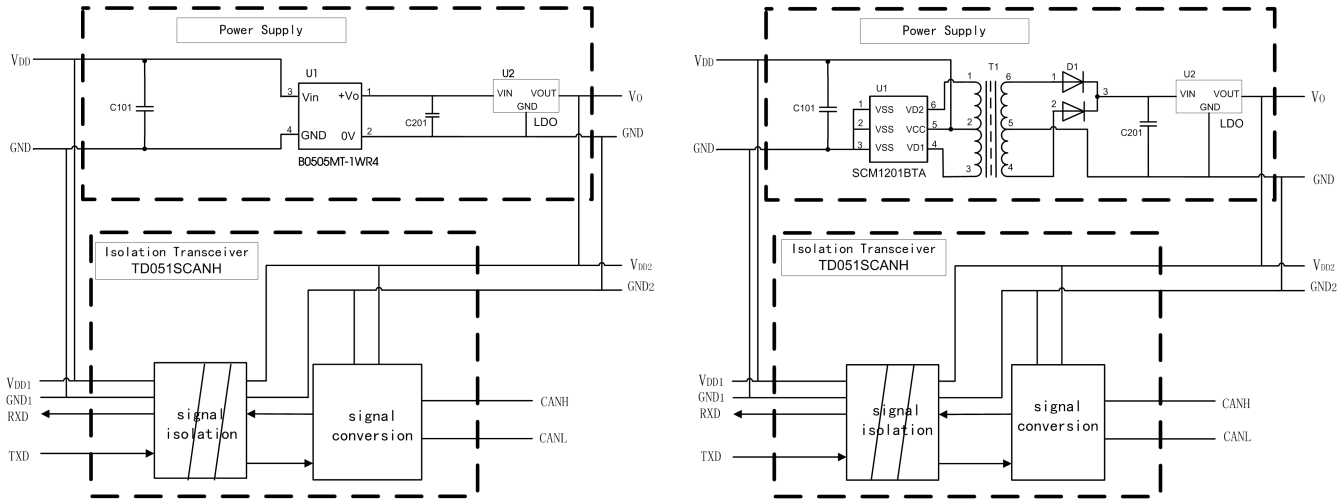


Figure16. Typical application circuit

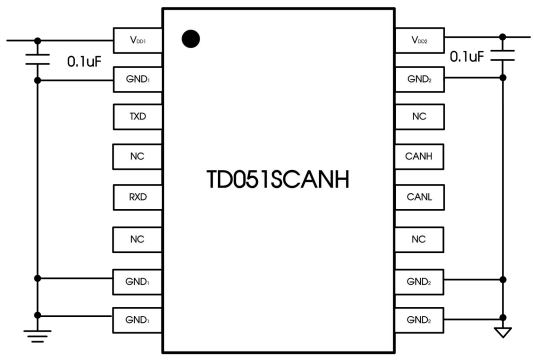


Figure17. Typical Application of PCB layout

Recommendations for use

①Hot-swap is not supported.

②If the external input of TXD is insufficient, the pull-up resistor should be added according to the situation.

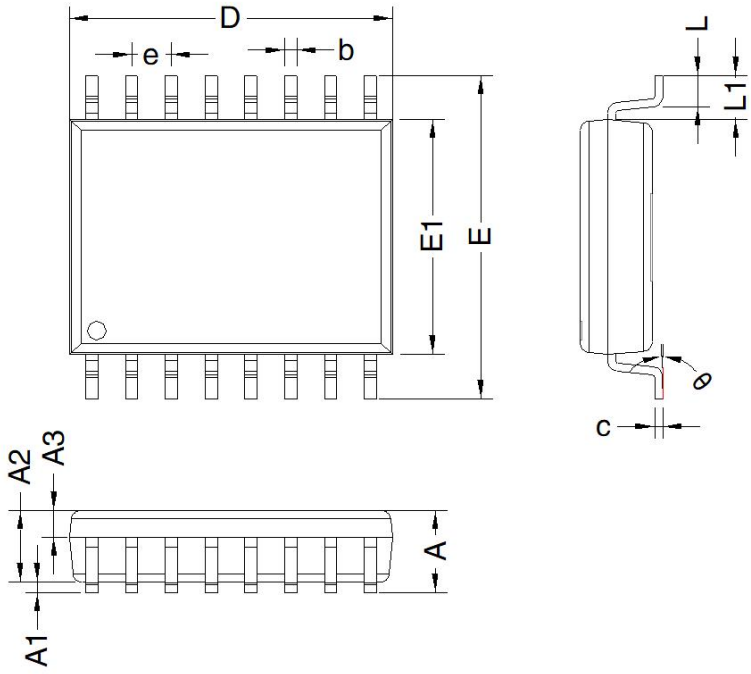
③Refer to IPC 7093 for the welding process design of this product. For detailed operation guidance, please refer to Hot Air Gun Welding Operation Instruction for DFN Package Product or Welding Operation Instruction for DFN Package Product.

Ordering Information

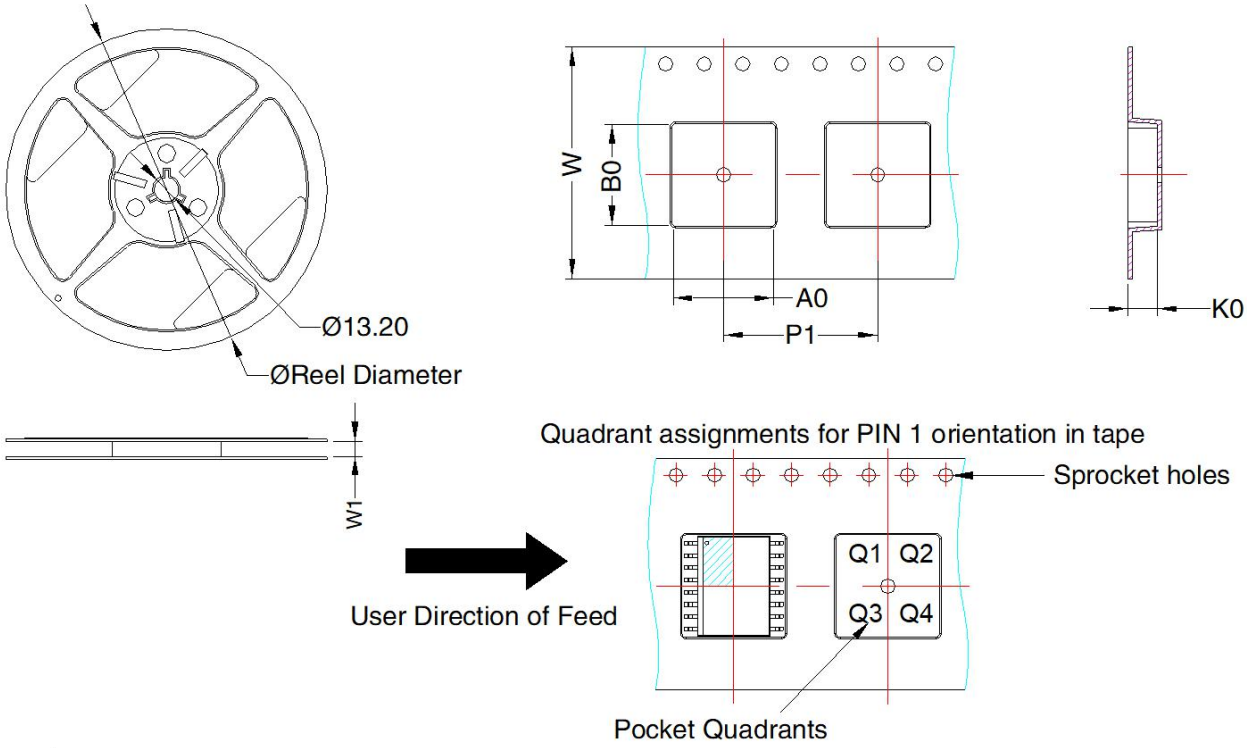
Part number	Package	Number of pins	Product marking	Tape & Reel
TD051SCANH	SOIC	16	TD051SCANH	1000/RELL

Package Information

THIRD ANGLE PROJECTION



Mark	Dimension(mm)	
	Min	Max
A	–	2.65
A1	0.10	0.30
A2	2.25	2.35
A3	0.97	1.07
b	0.35	0.43
c	0.24	0.29
D	10.20	10.40
e	1.27 BSC	
E	10.10	10.50
E1	7.40	7.60
L	0.55	0.85
L1	1.40 BSC	
θ	0°	8°



Device	Pin	MPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
TD051SCANH	16	340	180.0	16.4	10.74	10.65	3.05	16.0	16.0	Q1

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