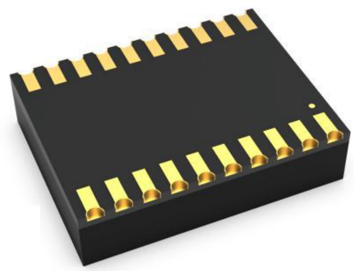
MORNSUN®

TD341SCANH
DFN package isolated CAN transceiver

Features

- Ultra-small, ultra-thin, chip scale DFN package
- Compliant with ISO11898-2 standard
- Integrate 3.3V efficiently power supply
- I/O power supply range supports 3.3V and 5V microprocessors
- High isolation to 5000VDC
- Bus-Pin ESD protection up to 15kV(HBM)
- Baud rate up to 1Mbps
- -40V to +40V bus fault protection
- >25kV/us CMTI
- TXD dominant time-out function
- Low communication delay
- The bus supports maximum 110 nodes
- Industrial operating ambient temperature range: -40℃ to +105℃
- Moisture Sensitivity Level (MSL) 3

Package



Applications

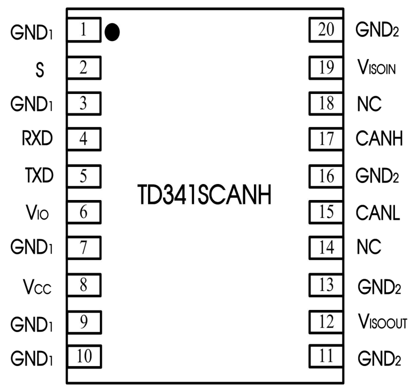
- Industrial automation, control, sensors and drive systems
- Building and greenhouse environmental control(HVAC) automation
- Security system
- Transport
- Medical treatment
- Telecommunication
- CAN Bus standard such as CAN open, Device Net, NMEA2000, ARNIC825, ISO11783, CAN Kingdom, CAN aerospace

Functional Description

TD341SCANH is a isolated CAN Bus transceiver, which is compliant with ISO11898-2 standard. Their logic side supports 3.3V and 5V logic level conversion.TD341SCANH integrate 3.3 V efficiently power. The TD341SCANH provide differential transmitting and receiving capability between the CAN protocol controller and the physical layer bus. It is capable of running at data rates of up to 1 Mbps. The device has the function of series line, over-voltage(-40V to 40V), ground loss protection and thermal shutdown so that it is especially suitable for working in harsh environment.

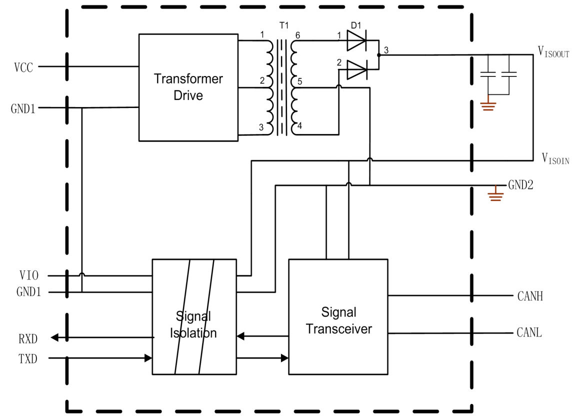
Contents

Pin Connection



Note: All GND_1 pins are internally connected;
All GND_2 pins are internally connected.

Internal Block Diagram



Function Table

Letter	Description
H	High-Level
L	Low-Level
X	Unrelated
Z	High Impedance

Table 1. Driver Function table

Inputs		Outputs		Bus State
TXD	S	CANH	CANL	
L	L (Or No Connection)	H	L	Dominant
H (Or No Connection)	X	Z	Z	Recessive
X	H	Z	Z	Recessive

Table 2. Receiver Function table

VID=CANH-CANL	RXD	Bus State
VID≥0.9V	L	Dominant
0.5< VID<0.9V	Uncertainty	Uncertainty
VID≤0.5V	H	Recessive
Open	H	Recessive

Pin Descriptions

Pin Number	Pin Name	Pin Functions
1	GND_1	Ground(Logic side)
2	S	Ground Pin. In normal applied, this pin no connect or connect to ground GND_1.
3	GND_1	Ground(Logic side)
4	RXD	Receiver output pin.
5	TXD	Driver input pin
6	V_{IO}	Isolation power supply pin. By using 0.1uF ceramic capacitance ground GND_1.
7	GND_1	Ground(Logic side)
8	V_{CC}	Power supply pin. By using 1uF ceramic capacitance ground GND_1.
9	GND_1	Ground(Logic side)
10	GND_1	Ground(Logic side)
11	GND_2	Ground (Bus side)
12	V_{ISOOUT}	Insulation power output. By using 1uF ceramic capacitance ground GND_2. The pin needs to be connected to pin19 in application.
13	GND_2	Ground (Bus Side)
14	NC	No connect
15	CANL	CANL pin
16	GND_2	Ground (Bus side)
17	CANH	CANH pin
18	NC	No connect
19	V_{ISOIN}	Insulation power input. By using 0.1uF ceramic capacitance ground GND_2. The pin needs to be connected to pin12 in application.
20	GND_2	Ground (Bus side)

Absolute Maximum Ratings

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

Parameters	Unit
Supply voltage, (Vcc)	-0.3V to +3.5V
Digital input voltage (TXD, RXD)	-0.3V to +5.5V
Bus voltage (CANH, CANL)	-40 to 40V
Receiver output current	-15 to 15mA
Operating temperature range	−40°C to +105°C
Storage temperature range	−50°C to +130°C
Reflow soldering temperature	Peak temp. ≤250℃, maximum duration ≤60s at 217℃. Please also refer to IPC/JEDEC J-STD-020D. 3.

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.

Recommended Operating Conditions

Parameters			Min.	Nom.	Max.	Unit
V_{CC}	Power supply		3.15	3.3	3.45	V
V_{IO}	Power supply(Logic Side)		2.375		5.5	V
V_I or V_{IC}	Voltage at any bus terminal (differential mode)		–12		12	V
V_{IH}	High-level input voltage(TXD)		2			V
V_{IL}	Low-level input voltage(TXD)				0.8	V
I_{OH}	High-level output current	Driver	-70			mA
		Receiver V_{CC}=3.3V	-4			
I_{OL}	Low-level output current	Driver			70	mA
		Receiver V_{CC}=3.3V			4	
T_A	Operating temperature range		-40		105	°C
I_{CC}	Recessive mode current			20	35	mA

I_{CC}	Working current	V_{CC}= 3.3V,RL= 60Ω；TXD signal：f=500kHz；Duty=50%		50	65	mA
	Signaling rate		40		1000	kbps

Electrical Characteristics

General test conditions and V_{CC}=V_{IO}= 3.3V, Ta = 25℃ (unless otherwise specified).

Parameters		Conditions	Min.	Nom.	Max.	Unit
Driver						
$\|V_{O(D)}\|$	Dominant CANH output voltage	Figure 8 V_{TXD} = 0 V, R_L = 60 Ω	2.75	3.5	4.5	V
	Dominant CANL output voltage		0.5	1.5	2.25	
$V_{O(R)}$	Recessive bus voltage	Figure 8 V_{TXD} = 2 V, R_L= 60 Ω	2	2.5	3	V
$V_{OD(D)}$	Differential output voltage	Figure 8 V_{TXD} = 0 V, t < $t_{to(dom)TXD}$, V_{CC}=3.15 V to 3.45 V, RL = 50 to 65 Ω	1.5		3	V
$V_{OD(R)}$	Recessive differential output voltage	Figure 8 V_{TXD} = 3.3 V, R_L = 60 Ω	–0.12		0.012	V
		V_{TXD} = 3.3 V, No load	–0.5		0.05	
I_{IH}	TXD High-level input current	V_{TXD} =2 V			20	uA
I_{IL}	TXD Low-level input current	V_{TXD} =0.8 V	-20			uA
R_{TXD}	Internal TXD Pull up Resistor			9.1		kΩ
Receiver						
V_{IT+}	Positive-going input threshold voltage	Figure 11		750	900	mV
V_{IT-}	Negative-going input threshold voltage		500	650		mV
V_{hys}	Hysteresis voltage (V_{IT+} - V_{IT-})			120		mV
V_{OH}	High-level output voltage	I_{OH} = –4 mA, Figure 9	V_{IO} –0.4	V_{IO} –0.2		V
		I_{OH} = –20 uA, Figure 9	V_{IO} –0.1			
V_{OL}	Low-level output voltage	I_{OL} = 4 mA, Figure 9		0.2	0.4	V
		I_{OL} = 20 uA, Figure 9		0	0.1	
C_I	Input capacitance to ground (CANH or CANL)	V_{TXD} = 3.3 V, V_I = 0.4 sin (4E6 π t) + 2.5 V		13		pF
C_{ID}	Differential input capacitance	V_{TXD} = 3.3 V, V_I = 0.4 sin (4E6 π t)		5		pF
R_{ID}	Differential input resistance	V_{TXD} =3.3V	15	30	40	kΩ
R_{IN}	Input resistance (CANH or CANL)	V_{TXD} =3.3 V	30		80	kΩ
$R_{I(m)}$	Input resistance matching: [1 − $R_{IN(CANH)}$ / $R_{IN(CANL)}$] × 100%	V_{CANH} = V_{CANL}	–3%	0%	3%	
ESD	HBM	CANH, CANL pin to GND			±15	kV
		Other pins			±2	kV
EFT	IEC61000-4-4：Perf. Criteria B	CANH, CANL and GND			±2	kV
Surge	IEC61000-4-5：Perf. Criteria B	CANH, CANL and GND(Common Mode)			±2	kV
Insulation characteristics	Isolation voltage				5000	VDC
	Insulation resistance		1			GΩ
	Isolation capacitor			3		pF
CMTI	Common Mode Transient Immunity	V_{TXD} = V_{CC} or 0 V, VCM = 1 kV, transient magnitude = 800 V	25			kV/us

Transmission Characteristics

General test conditions and V_{CC}=V_{IO}= 3.3V, Ta = 25℃ (unless otherwise specified).

Parameters		Conditions	Min.	Nom.	Max.	Unit
t_{onTxD}	Propagation delay TXD On to bus active	RL = 60 Ω, CL = 100 pF, see Figure 10 and Figure 12		80	150	ns
t_{offTxD}	Propagation delay TXD Off to bus inactive			80	200	ns
t_{onRxD}	Propagation delay RXD On to receiver active			60	300	ns
t_{offRxD}	Propagation delay RXD Off to receiver inactive			60	250	ns
t_{TXD_DTO}	Dominant time-out time	CL=100 pF	300	500	700	us

Physical Specifications

Parameters	Value	Unit
Weight	0.9(Typ.)	g

Typical Performance Curves

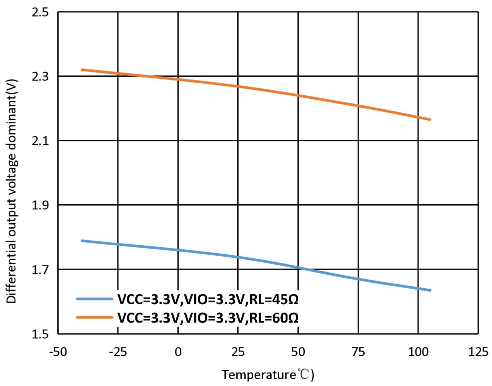


Figure 1. Drive differential output voltage dominant VS Temperature

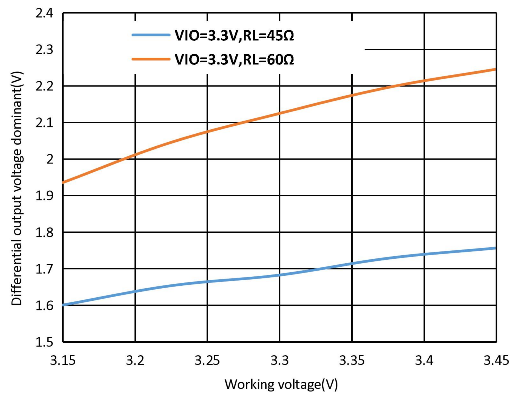


Figure 2. Drive differential output voltage dominant VS Working voltage

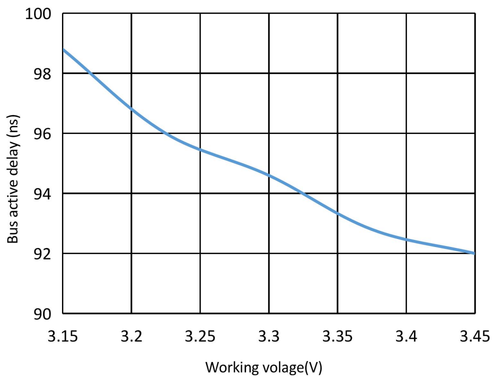


Figure 3. Propagation delay from TXD On to bus active VS Working voltage

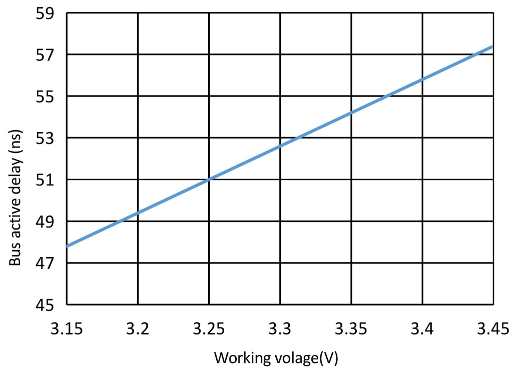


Figure 4. Propagation delay from TXD Off to bus inactive VS Working voltage

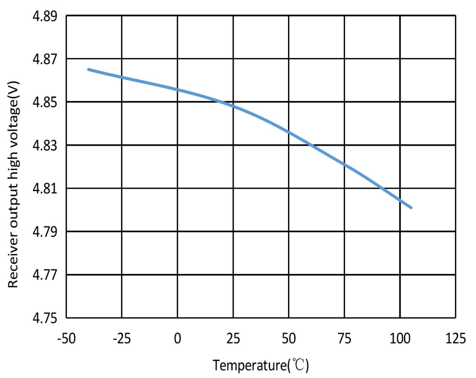


Figure 5. Receiver output high voltage VS Temperature

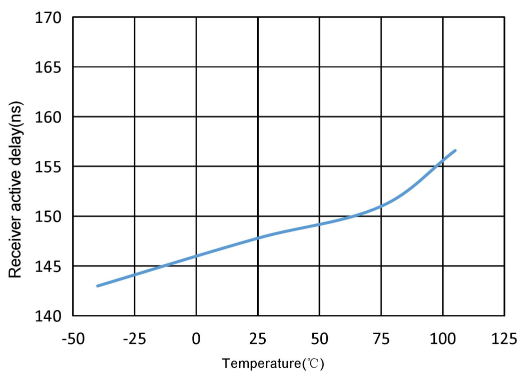


Figure 6. Receiver active delay VS Operating Temperature

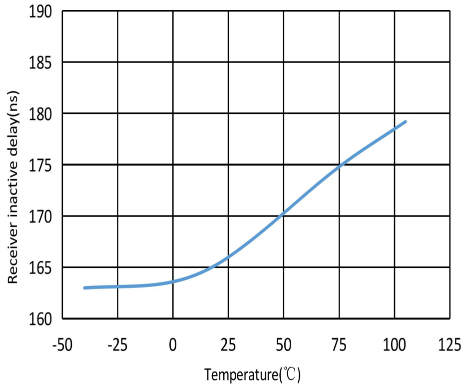


Figure 7. Receiver inactive delay VS Operating Temperature

Test Circuits

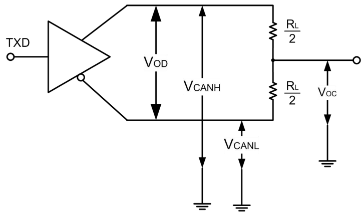


Figure 8. Driver test circuit

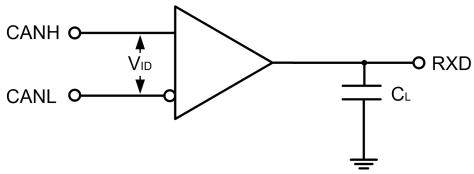


Figure 9. Receiver test circuit

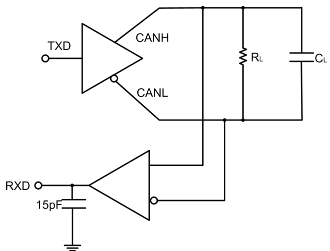


Figure 10. Switching characteristics test circuit

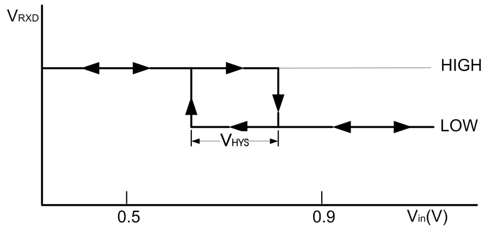


Figure 11. Receiver input hysteresis

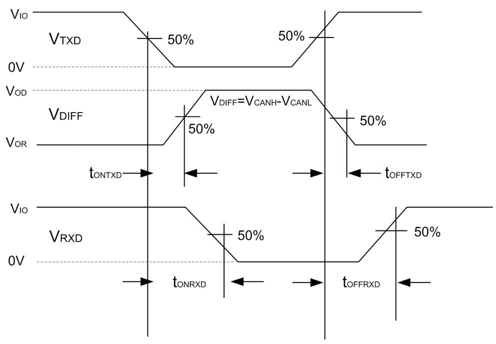


Figure 12. Drive and receiver propagation delay

Detailed Description

TD341SCANH 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: TD341SCANH 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: TD341SCANH 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: TD341SCANH 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_DTO}), 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

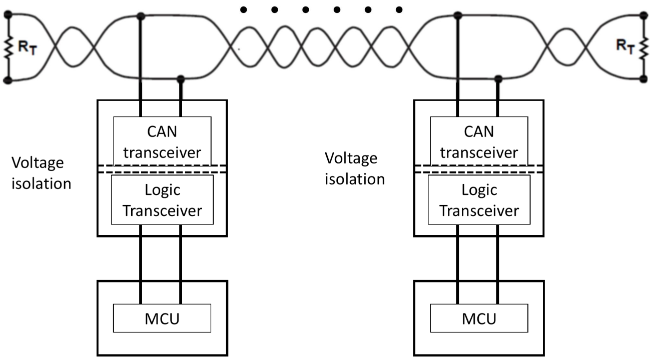


Figure13. Typical application circuit

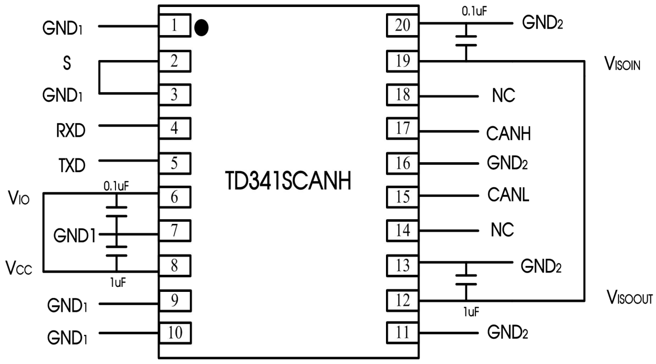


Figure14. Typical Application of PCB layout

In General, Vcc and V_{Io} can be shorted(Figure 14) .If the controller doesn't support 3.3V signal input, it can power 5V for V_{Io}.
When the module works in normal condition connect the S foot to GND1.

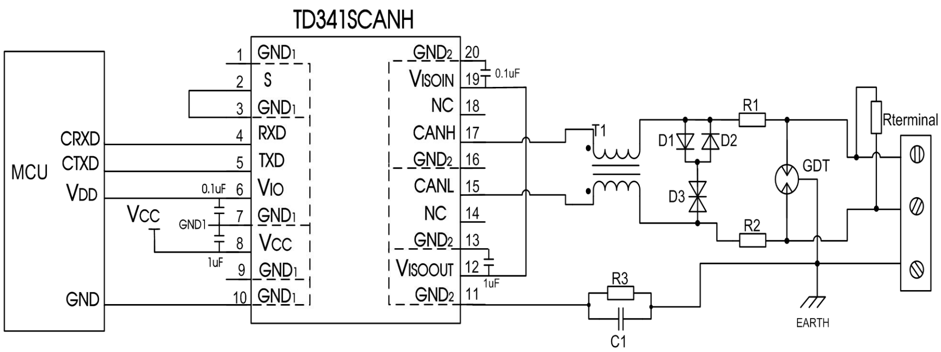


Figure15. Port protection circuit for harsh environments

Recommended components and values:

Component	Recommended part, value	Component	Recommended part, value
R3	1MΩ	D1、D2	1N4007
C1	1nF, 2kV	D3	SMBJ30CA
T1	ACM2520-301-2P	$R_{terminal}$	120Ω
GDT	B3D090L	R1、R2	2.7Ω/2W

When the module is used in applications with harsh environment, it can be susceptible to large energy like lightning strike, etc. in which case, it is essential to add an adequate protection circuit to the CAN signal ports to protect the system from failure and maintain a reliable bus communication. Figure 15 provides a recommended protection circuit design for high-energy lightning surges, with a degree of protection related to the selected protection device. Parameter description lists a set of recommended circuit parameters, which can be adjusted according to the actual application situation. Also, when using the shielded cable, the reliable single-point grounding of the shield must be achieved.

Note: The recommended components and values is a general guideline only and must be verified for the actual user's application. We recommended using PTC's for R1 and R2 and to use fast recovery diodes for D1 and D2.

Using Suggests

① Power isolation V_{ISOOUT} need through a series of capacitors connected to the output pin V_{ISOIN}, the power supply is not recommended for other purposes, otherwise it may cause the bus voltage did not meet the requirements of communication, causes the communication failure.

② Hot-swap is not supported.

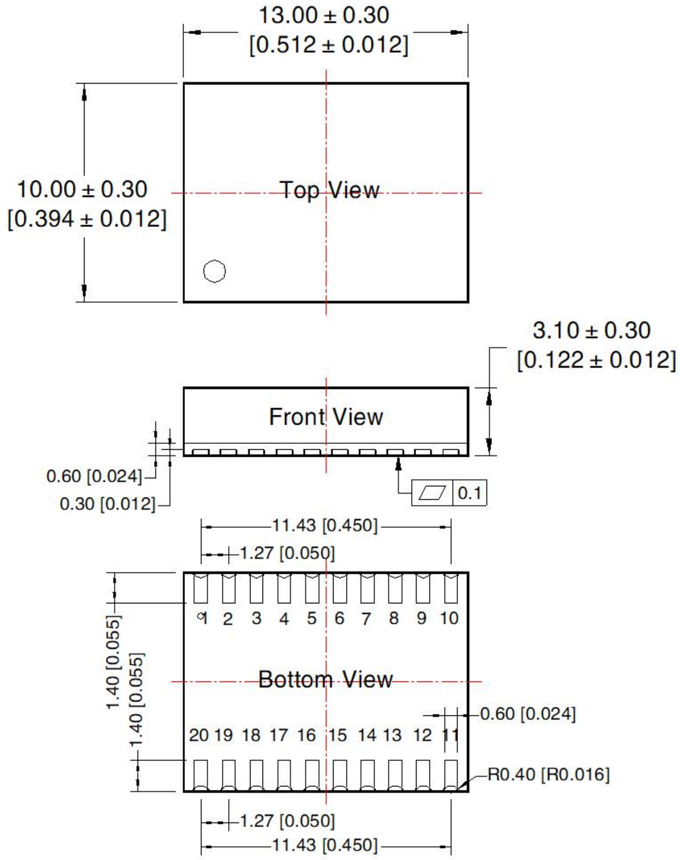
③ If the external input of TXD is insufficient, the pull-up resistor should be added according to the situation.

④ Refer 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*.

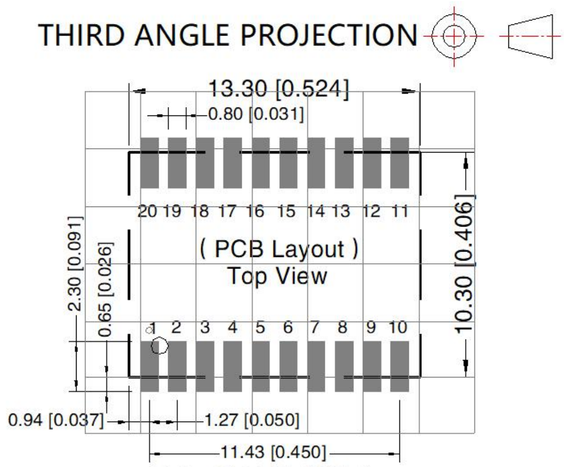
Ordering Information

Part number	Package	Number of pins	Product marking	Tape & Reel
TD341SCANH	DFN	20	TD341SCANH	300/REEL

Package Information

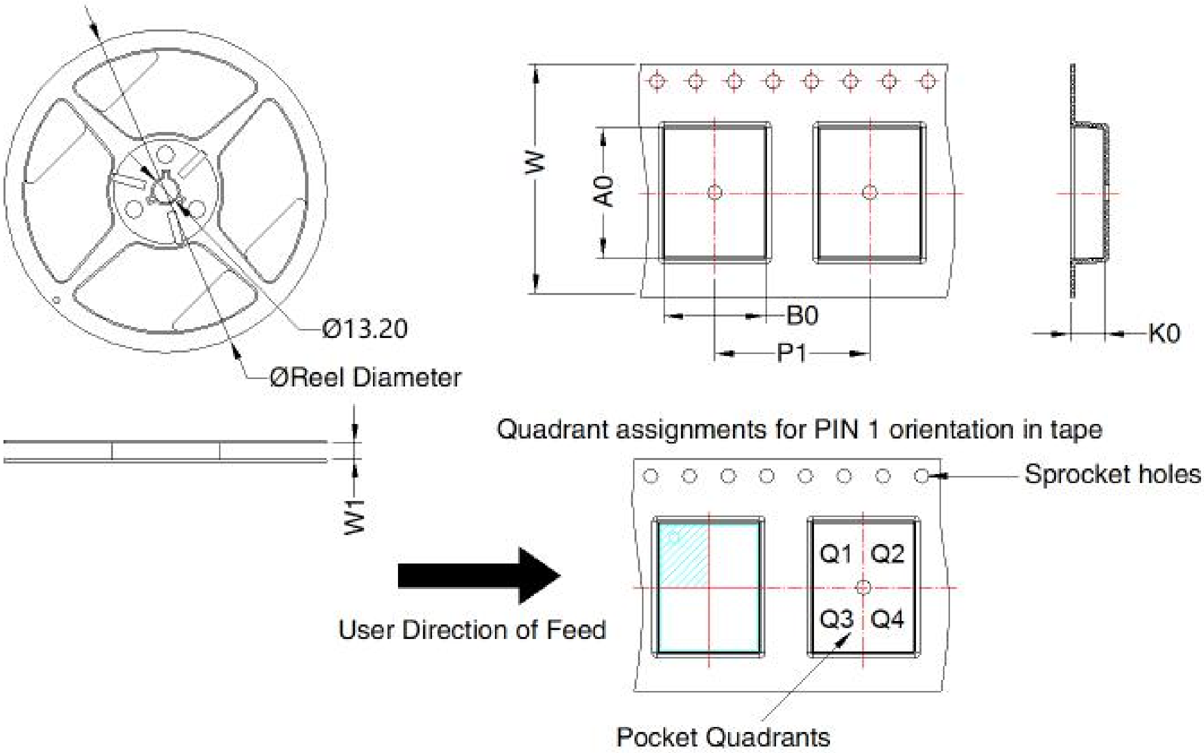


Note:
Unit: mm[inch]
Pin diameter tolerances : ± 0.10[± 0.004]



Note: Grid 2.54*2.54mm

Pin-Out			
Pin	Mark	Pin	Mark
1	GND_1	11	GND_2
2	S	12	V_{ISOOUT}
3	GND_1	13	GND_2
4	RXD	14	NC
5	TXD	15	CANL
6	V_{IO}	16	GND_2
7	GND_1	17	CANH
8	V_{CC}	18	NC
9	GND_1	19	V_{ISOIN}
10	GND_1	20	GND_2



Device	Package Type	Pin	MPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
TD341SCANH	DFN 10x13	20	300	180.0	24.4	13.52	10.52	3.5	16.0	24.0	Q1

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