

TD551SCANHW3 SOIC package isolated CAN Transceiver

Features

- Ultra-small, ultra-thin, chip scale SOIC package
- Compliant with ISO11898-2 standard
- Integrated efficient isolation power supply
- I/O power supply range supports 4.5V and 5.5V
- High isolation to 5000VAC
- Bus-Pin ESD protection up to 8kV(HBM)
- Baud rate up to 5Mbps
- -40V to +40V bus fault protection
- High CMTI: ± 180 kV/ μ s (typical)
- TXD dominant time-out function
- Nanosecond level communication delay
- The bus supports maximum 110 nodes
- Industrial operating ambient temperature range: -40°C to +125°C

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

Package



Functional Description

TD551SCANHW3 is a isolated CAN Bus transceiver, which is compliant with ISO11898-2 standard. TD551SCANHW3 integrate 5V quarantine power. The TD551SCANHW3 provide differential transmitting and receiving capability between the CAN protocol controller and the physical layer bus. It is capable of running at data of rates up to 5Mbps. The device has over-voltage(-40V to 40V) and thermal shutdown so that it is especially suitable for working in harsh environment.

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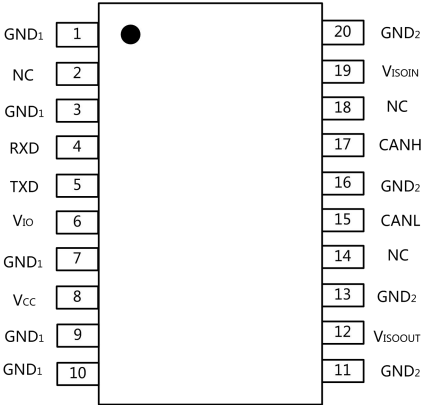
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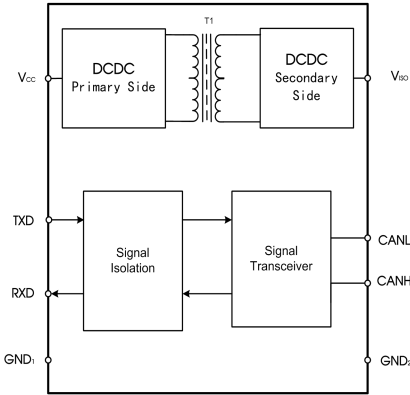
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Pin Connection



Note: All GND1 pins are internally connected;
Pin20 and Pin17 GND2 pins are internally connected;
Pin13 and Pin11 GND2 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

Input	Output		Bus State
	CANH	CANL	
TXD			
L	H	L	Dominant
H (Or No Connection)	Z	Z	Recessive

Table 2. Receiver Function table

V _{ID} =CANH-CANL	RXD	Bus State
V _{ID} ≥0.9V	L	Dominant
0.5< V _{ID} <0.9V	Uncertainty	Uncertainty
V _{ID} ≤0.5V	H	Recessive
Open	H	Recessive

Pin Descriptions

Pin Number	Pin Name	Pin Functions
1	GND ₁	Ground (Logic side)
2	NC	No connect
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 and 10uF ceramic capacitance ground GND ₁ .
7	GND ₁	Ground (Logic side)
8	V _{CC}	Power supply pin. By using 0.1uF and 10uF 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 0.1uF and 10uF ceramic capacitance ground GND ₂ . The pin needs to be connected to pin19 in application.
13	GND ₂	Ground (Bus side).The pin is connected with Pin11 internally and needs to be connected to pin16 in application.
14	NC	No connect
15	CANL	CANL pin
16	GND ₂	Ground (Bus side). The pin is connected with Pin20 internally and needs to be connected to pin13 in application.
17	CANH	CANH pin
18	NC	No connect
19	V _{ISOIN}	Insulation power input. By using 0.1uF and 10uF ceramic capacitance ground GND ₂ . The pin needs to be connected to pin11 in application.
20	GND ₂	Ground (Bus side)

Note: All GND1 pins are internally connected;
Pin20 and Pin17 GND2 pins are internally connected;
Pin13 and Pin11 GND2 pins are internally connected.

Absolute Maximum Ratings

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

Parameters	Unit
Supply voltage, (V _{CC})	-0.5V to +6V
Logic side input voltage V _{in}	-0.5V to V _{CC} +0.5V
Bus-side voltage (CANH, CANL)	-40 to 40V
Operating temperature range	-10mA to +10mA
Junction temperature T _J	< 150°C
Operating temperature range	-40°C to +125°C
Storage temperature range	-65°C to +150°C

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 _{CC}	Supply voltage, (V _{CC})	4.5	5	5.5	V
V _I or V _{IC}	Bus input pin withstand voltage (differential mode)	-40		40	V
V _{IH}	TXD Insulation characteristics	2		5.5	V
V _{IL}	TXD low level output voltage	0		0.8	V
T _A	Operating temperature range	-40		125	°C
T _J	Junction temperature T _J	-40		150	°C
T _J (shutdown)	Thermal shutdown temperature		165		°C
	Transfer rate			5000	kbps

Electrical Characteristics

General test conditions and $V_{CC}=V_{ISO}=5V$, $T_a=25^{\circ}C$ (unless otherwise specified).

Parameters		Conditions	Min.	Typ.	Max.	Unit
Driver						
V _{OD}	Dominant CANH output voltage	Figure 18; V _{TXD} = 0 V, R _L = 60 Ω	2.75	3.5	4.5	V
	Dominant CANL output voltage		0.5	1.5	2	
V _{O(R)}	Recessive bus voltage	V _{TXD} = 2 V, No load	2	2.5	3	V
V _{OD(D)}	Differential output voltage	V _{TXD} = 0 V, R _L = 60 Ω	1.5	2	3	V
V _{OD(R)}	Recessive differential output voltage	R _L = 60 Ω	-0.05	0	0.05	V
I _{IH}	TXD High-level input current	V _{TXD} = 2 V			20	μ A
I _{IL}	TXD Low-level input current	V _{TXD} = 0.8 V	-20			μ A
CMTI	Common Mode Transient Immunity	V _I = 0 or V _I = V _{CC}		180		kV/us
Receiver						
V _{IT+}	Positive-going input threshold voltage				900	mV
V _{IT-}	Negative-going input threshold voltage		500			mV
V _{hys}	Hysteresis voltage (V _{IT+} - V _{IT-})			120		mV
V _{OH}	High-level output voltage	Figure 19; I _{OH} = -4 mA	V _{CC} - 0.4	4.8		V
V _{OL}	Low-level output voltage	Figure 19; I _{OL} = 4 mA	0	0.2	0.4	V
R _{IN}	Input resistance (CANH or CANL)	V _{TXD} = 3 V	10		100	k Ω
R _{I(m)}	Input resistance matching: [1 - R _{IN(CANH)} / R _{IN(CANL)}] \times 100%	V _{CANH} = V _{CANL}	-5%	0%	5%	--
Supply and Protection						
V _{ISO}	Isolated power output voltage	No load, I _{ISO} =0mA	4.75	5.06	5.3	V
I _{VCC}	Supply Current (Logic side)	V _I = 0 V, R _L = 60 Ω , Access to the main dynamic protection		75	120	mA
		V _I = V _{CC} , hostage-taking		23	30	
ESD	HBM Mode	CANH, CANL inter-pin to GND			\pm 8	kV
	Contact discharge Mode	CANH, CANL			\pm 2	kV
Insulation characteristics	Isolation voltage	Input-Output, Leakage current<1mA Rise time 3s, Fall time 1s			5000	VAC
	Insulation resistance		1			G Ω

Transmission Characteristics

General test conditions and $V_{CC}=V_{IO}=5V$, $T_a=25^{\circ}C$ (unless otherwise specified).

Parameters		Conditions	Min.	Typ.	Max.	Unit
T _{loop}	T _{loop} delay			160	210	ns
t _{TXD_DTO}	Dominant time-out time	C _L =100 pF	0.3		5	ms
Drives						
t _{onTxD}	Propagation delay TXD On to bus active	Figure 20 R _L = 60 Ω, C _L = 100 pF		75	110	ns
t _{offTxD}	Propagation delay TXD Off to bus inactive			85	120	ns
t _r	Differential output signal rise time			30	60	ns
t _f	Differential output signal fall time			30	60	ns
Refraction						
t _{onRxD}	Propagation delay RXD On to receiver active	Figure 20 R _L = 60 Ω, C _L = 100 pF		85	130	ns
t _{offRxD}	Propagation delay RXD Off to receiver inactive			85	130	ns
t _r	Output Signal Rise			3	6	ns
t _f	Output Fall Time			3	6	ns

Parameters	Value	Unit
Weight	0.6(Typ.)	g

Test Circuits

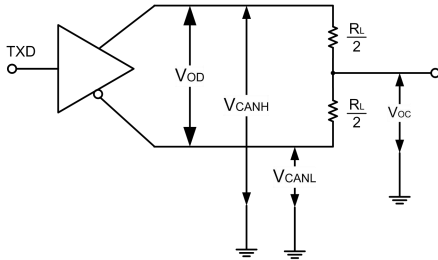


Figure 18. Driver test circuit

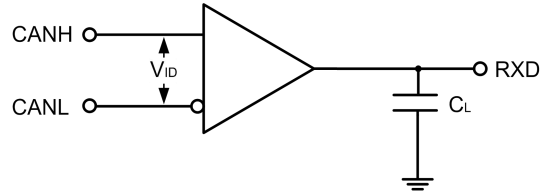


Figure 19. Receiver test circuit

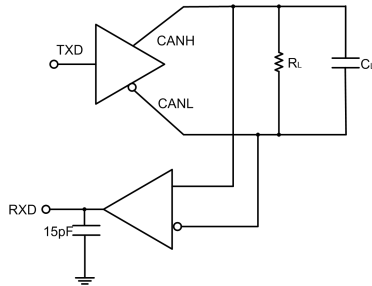


Figure 20. Switching characteristics test circuit

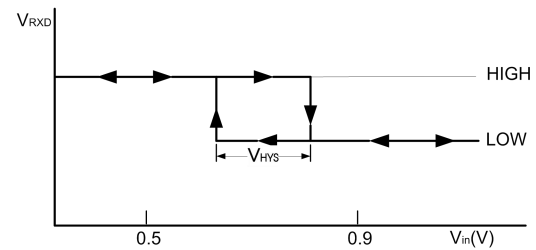


Figure 21. Receiver input hysteresis

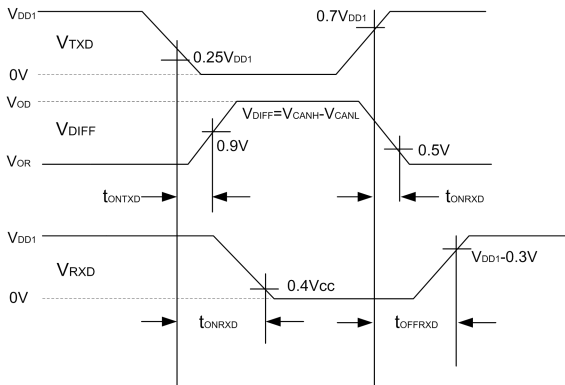


Figure 22. Drive and receiver propagation delay

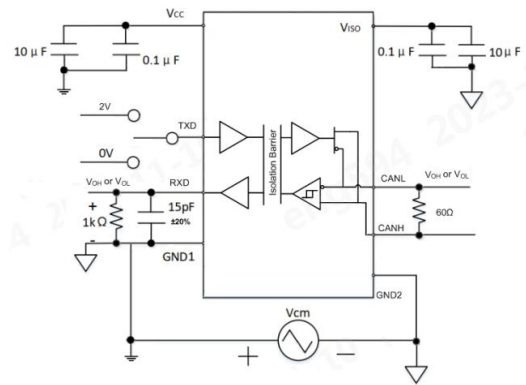


Figure 23. CMTI Test Circuit

Detailed Description

TD551SCANHW3 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: TD551SCANHW3 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: TD551SCANHW3 has over-temperature protection. When the junction temperature exceeds 150°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: TD551SCANHW3 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_OT} five bus will enter a recessive state. The timer is reset by the positive edge on pin TXD.

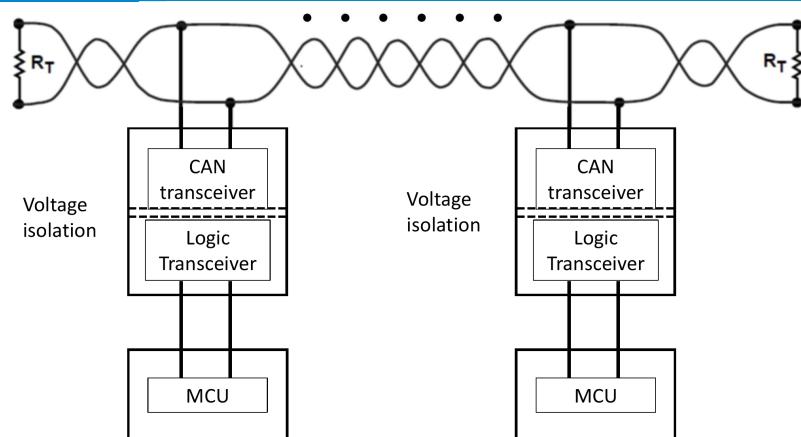


Figure24. Typical application circuit

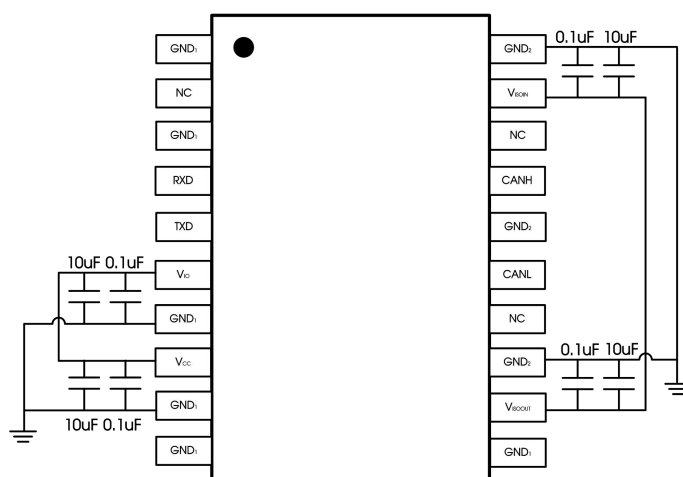


Figure25. Typical Application of PCB layout

PCB Design Instructions

1. The decoupling capacitors and energy storage capacitor of VCC and GND1, VISO and GND2 should be placed as close the chip pins as possible to the chip pins to reduce loop area and parasitic inductance of PCB traces. General control should be within 2mm. The decoupling capacitor is placed close the chip, and the energy storage capacitor is placed outside. As shown inFigure25-1.

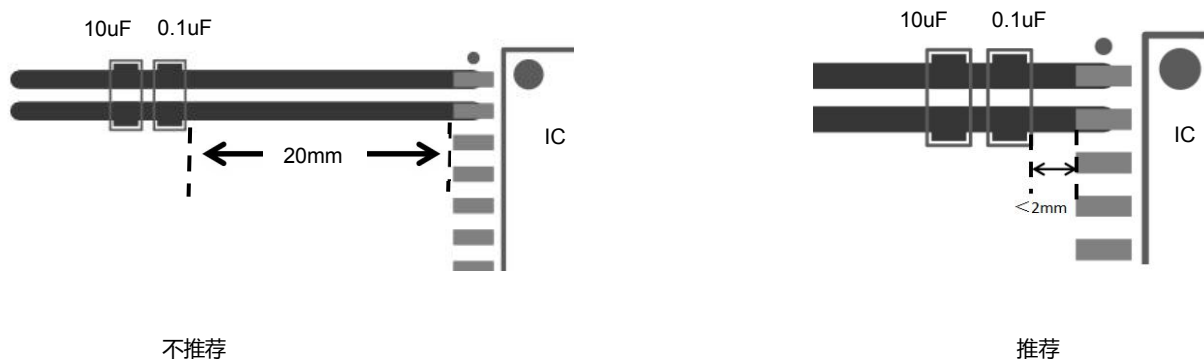


Figure 25-1

- The power line width should be designed at least 0.5mm when wiring.
- When it is necessary to place vias in the power supply line and the ground wire, the position of the vias should be placed on the outside of the capacitor relative to the chip pins ,rather than between the capacitor and the chip, as shown in the figure25-2 below to reduce the number of vias effect of parasitic inductance.

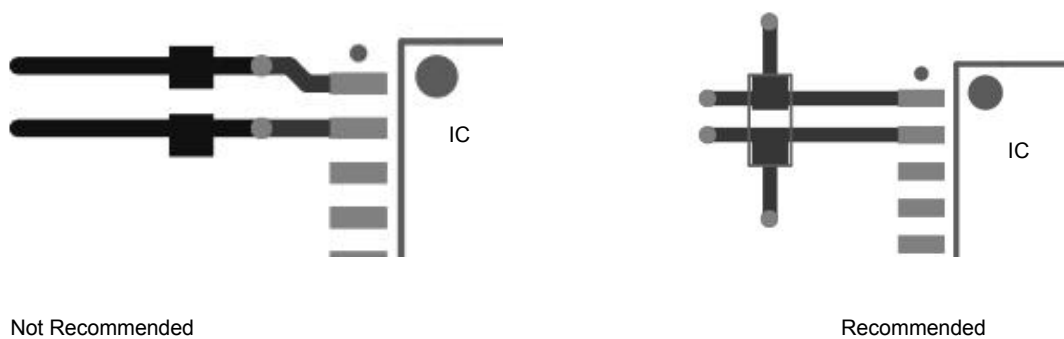


Figure 25-2

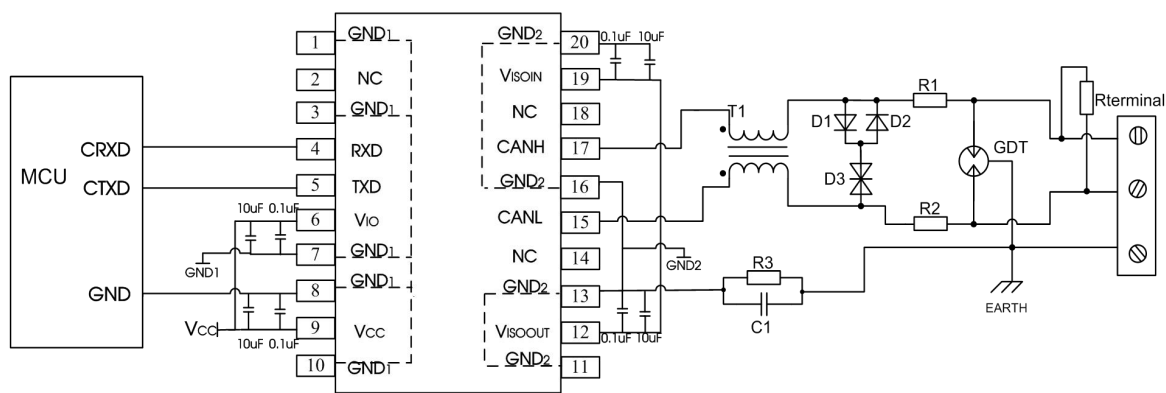


Figure26. Port protection circuit for harsh environments

Recommended components and values:

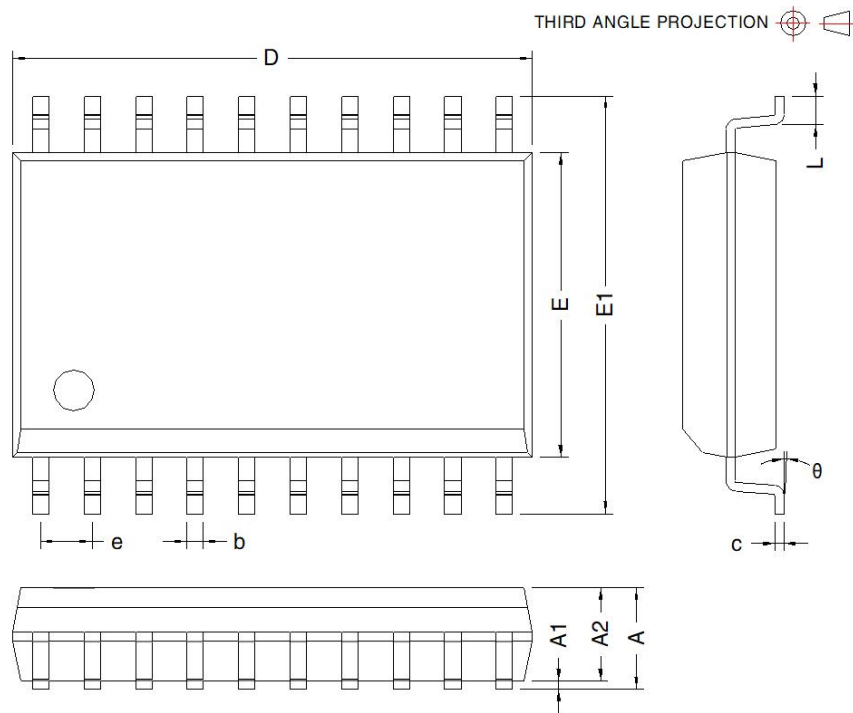
Component	Recommended part, value	Component	Recommended part, value
R3	1MΩ	D1、 D2	1N4007
C1	1nF, 2kV	D3	SMBJ30CA
T1	ACM2520-301-2P	R _{terminal}	120 Ω
GDT	B3D090L	R1、 R2	2.7Ω/2W

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 26 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.

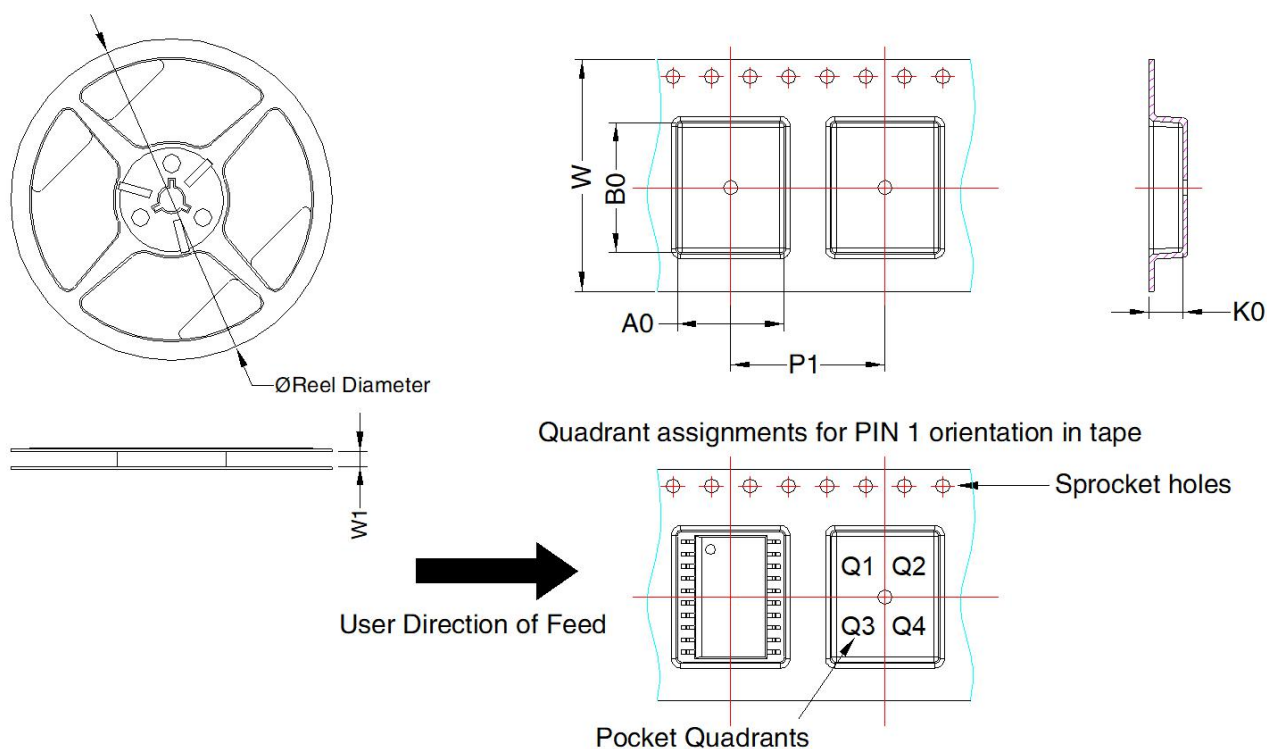
Note: The Recommended components and values is a general guideline only and must be verified for the actual user's application. We Recommended using PTC's for R1 and R2 and to use fast recovery diodes for D1 and D2.

Ordering Information

Part number	Package	Number of pins	Product marking	Tape & Reel
TD551SCANHW3	SOIC	20	TD551SCANHW3	290/REEL



SOIC-20				
Mark	Dimension(mm)		Dimension(inch)	
	Min	Max	Min	Max
A	—	2.65	—	0.104
A1	0.10	0.30	0.004	0.012
A2	2.25	2.35	0.089	0.093
D	12.70	12.90	0.500	0.508
E	7.40	7.60	0.291	0.299
E1	10.10	10.50	0.398	0.413
L	0.70	1.00	0.028	0.040
b	0.39	0.47	0.015	0.019
e	1.27(BSC)		0.05(BSC)	
c	0.25	0.29	0.010	0.011
θ	0°	8°	0°	8°



Device	Package Type	Pin	MPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
TD551SCANHW	SOIC-20	20	290	178	25.5	11.1	13.5	3.5	16.0	24.0	Q1

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