3.3-V Fault Protected High-Speed CAN FD Transceiver

Features

- 3.3-V Power Supply, I/O Voltage Range Supports 2.8-V to 5.5-V MCU Interface
- Compatible with ISO 11898-2:2016 Physical Layer Standards
- Supports CAN FD and Data Rating up to 5 Mbps
- Short Propagation Delay Times and Fast Loop Times
- Common-Mode Input Voltage: ±12 V
- Operation Modes:
  - Normal Mode
  - Standby Mode with Wake-up Function (TPT1334)
  - Silent Mode (TPT1330, TPT1337)
  - Shutdown Mode(TPT1330, TPT1334)
- Protection Feature:
  - IEC 61000-4-2 ESD Protection Exceeds ±6 kV
  - Bus Fault Protection: ±45 V
  - VCC Under-voltage Protection
  - TXD Dominant Time-out Function and Bus-Dominant Time-out Function
  - Thermal Shutdown Protection
- Available in SOP8 Package and SOT-23-8 Package

Applications

- All Devices Supporting Highly Loaded CAN Networks
- Field Industrial Automation, Sensors, and Drive Systems
- Building, Security Control Systems
- Energy Storage Systems
- Telecom Base Station Status and Control

Description

The TPT133x family of products are 3.3-V CAN transceivers that are compatible with the ISO11898 High-speed CAN (Controller Area Network) physical layer standard. The devices are designed to be used in CAN FD networks up to 5 Mbps, and to enhance timing margin and higher data rates in long and high-loading networks. As designed, the devices feature cross-wire, overvoltage, and loss of ground protection from −45 V to +45 V, overtemperature shutdown, and a −12 V to +12 V common-mode range. The devices come with standby mode, silent mode, and shutdown mode. The family includes many protection features to enhance device and network robustness.

The TPT133x is available in SOP-8 and SOT23-8 packages and characterized from –40°C to +125°C.

Typical Application Circuit

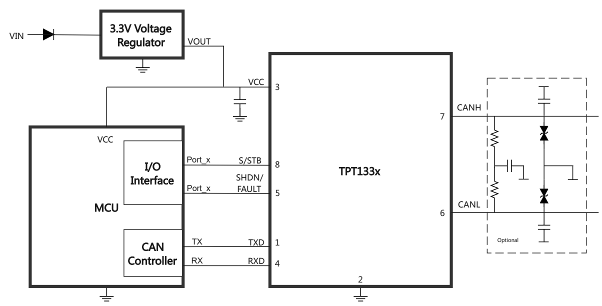


Table of Contents

Product Family Table

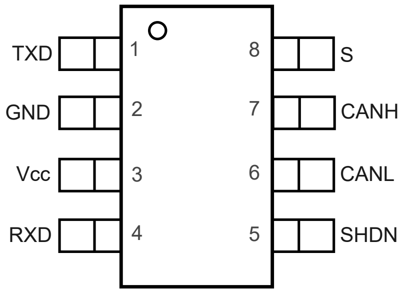
Order Number	Pin5	Pin8	Data Rate	Package
TPT1330-SO1R	SHDN(Shut down mode)	S(Silent Mode)	5 Mbps	SOP-8
TPT1330-T8TR	SHDN(Shut down mode)	S(Silent Mode)	5 Mbps	SOT23-8
TPT1334-SO1R	SHDN(Shut down mode)	STB(Standby Mode)	5 Mbps	SOP-8
TPT1334-T8TR	SHDN(Shut down mode)	STB(Standby Mode)	5 Mbps	SOT23-8
TPT1337-SO1R	FAULT(Fault output)	S(Silent Mode)	5 Mbps	SOP-8
TPT1337-T8TR	FAULT(Fault output)	S(Silent Mode)	5 Mbps	SOT23-8

Revision History

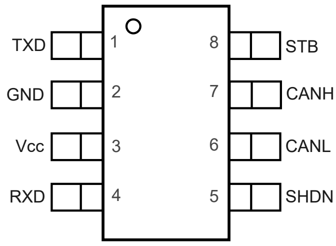
Date	Revision	Notes
2022-12-18	Rev.Pre.0	Initial version
2024-1-10	Rev.A.0	Released version

Pin Configuration and Functions

TPT1330
SOP8, SOT23-8 Package
Top View



TPT1334
DFN3X3-8, SOT23-8 Package
Top View



TPT1337
SOP8, SOT23-8 Package
Top View

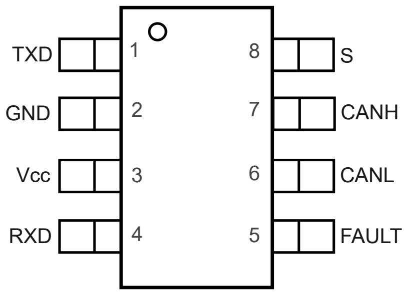


Table 1. Pin Functions: TPT133x

Pin				I/O	Description
TPT1330	TPT1334	TPT1337	Name		
1	1	1	TXD	I	CAN transmit data input (LOW for dominant and HIGH for recessive bus states)
2	2	2	GND	GND	Ground
3	3	3	VCC	POWER	Transceiver 3.3 V supply voltage
4	4	4	RXD	O	CAN receive data output (LOW for dominant and HIGH for recessive bus states)
5	5	-	SHDN	I	Shutdown mode (active high), internal pull-down
-	-	5	FAULT	O	Open drain fault output
6	6	6	CANL	BUS I/O	Low-level CAN bus input/output line
7	7	7	CANH	BUS I/O	High-level CAN bus Input/output line
8	8	-	S	I	Silent (listen-only) mode control (Active High), internal pull-down
-	-	8	STB	I	Standby mode control (Active High), internal pull-down

Specifications

Absolute Maximum Ratings

Parameter		Min	Max	Unit
V_{CC}	Supply voltage range	−0.3	5	V
V_{BUS}	CAN bus voltage range (CANH, CANL)	−45	45	V
V_{BUS_DIFF}	Differential output voltage of CAN bus,(CANH - CANL)	−45	45	V
V_{LOGIC_IN}	Logic input terminal voltage range (TXD, STB)	−0.3	5	V
V_{LOGIC_OUT}	Logic output terminal voltage range (RXD)	−0.3	5	V
I_{LOGIC_OUT}	Logic output current		8	mA
T_J	Junction temperature (2)	−55	150	°C
T_{STG}	Storage temperature	-55	150	°C

(1) Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. Exposure to any Absolute Maximum Rating condition for extended periods may affect device reliability and lifetime.
(2) This data was taken with the JEDEC low effective thermal conductivity test board.
(3) This data was taken with the JEDEC standard multilayer test boards.

ESD(Electrostatic Discharge Protection)

Parameter		Condition	Minimum Level	Max	Unit
V_{ESD}	Electrostatics discharge (1)(2)	IEC61000-4-2(150pF, 330Ω discharge circuit), contact discharge on bus pins(CANH, CANL)	−6	6	kV
		Human Body Model (HBM) on all pins	−8	8	kV
		Human Body Model (HBM) on bus pins(CANH, CANL)	−17	17	kV
		Charged Device Model (CDM) on all pins	−1.5	1.5	kV

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.
(2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

Recommended Operating Conditions

	Parameter	Min	Max	Unit
V_{CC}	Power supply	3	3.6	V
I_{OH_Logic}	Logic terminal high-level output current	−2	-	mA
I_{OL_Logic}	Logic terminal low-level output current	-	2	mA
T_A	Operating ambient temperature	−40	125	°C

Thermal Information

Package Type	$θ_{JA}$	$θ_{JC}$	Unit
SOP8	120.87	50.55	°C/W
SOT23-8	129.73	68.80	°C/W

Electrical Characteristics

All test conditions: All typical values are at 25℃, V_{CC} = 3.3 V, R_L = 60 Ω, unless otherwise noted.

Parameter		Conditions	Min	Typ	Max	Unit
Pin VCC						
V_{CC}	Supply Voltage		3		3.6	V
V_{UV_VCC}	Rising Undervoltage Detection on V_{CC} for Protected Mode			2.2	2.6	V
V_{UV_VCC}	Falling Undervoltage Detection on V_{CC} for Protected Mode		1.65	2		V
V_{HYS_UVVCC}	Hysteresis Voltage on V_{CC} Undervoltage Detection (1)			150		mV
I_{CC}	Normal Mode Supply Current	Dominant, V_{TXD}= 0 V; t < t_{TXD_DTO}; S, STB and SHDN = 0 V; V_S, V_{STB} and V_{SHDN} = 0 V; R_L = 60 Ω; C_L = Open			55	mA
I_{CC}	Normal Mode Supply Current	Dominant, V_{TXD}= 0 V; t < t_{TXD_DTO}; V_S, V_{STB} and V_{SHDN} = 0 V; R_L = 50 Ω; C_L = Open			60	mA
I_{CC}	Normal Mode Supply Current	Dominant bus fault, V_{TXD}= 0 V; short circuit on bus lines; -12V < (VCANH = VCANL) < +12 V; V_S, V_{STB} and V_{SHDN} = 0 V; R_L = 60 Ω; C_L = Open			180	mA
I_{CC}	Normal Mode Supply Current	Recessive; V_{TXD}=V_{CC}; S, STB and SHDN = 0 V			3.5	mA
I_{CC}	Silent Mode Supply Current	V_{TXD}=V_{CC}; V_S = V_{CC}; R_L = 50 Ω; C_L = Open			1	mA
I_{CC}	Standby Mode Supply Current	TA<85℃; V_{STB} = V_{CC}; V_{TXD} = V_{CC}; RXD floating;			15	μA
I_{CC}	Standby Mode Supply Current	V_{STB} = V_{CC}; V_{TXD} = V_{CC}; RXD floating;			17	μA
I_{CC}	Shutdown Mode Supply Current	TA<85℃; V_{SHDN} = V_{CC}; V_{TXD} = V_{CC}; RXD floating;			15	μA
I_{CC}	Shutdown Mode Supply Current	V_{SHDN} = V_{CC}; V_{TXD} = V_{CC}; RXD floating;			17	μA
Pin TXD						
V_{IH}	High-Level Input Voltage		2			V
V_{IL}	Low-Level Input Voltage				0.8	V
V_{HYS_TXD}	Hysteresis Voltage on Pin TXD			150		mV
I_{IH}	High-Level Input Leakage Current	V_{TXD} = V_{CC} = 3.6V	-2.5	0	3	μA
I_{IL}	Low-Level Input Leakage Current	V_{TXD} = 0 V; V_{CC} = 3.6 V	-4	0	0	μA

Parameter		Conditions	Min	Typ	Max	Unit
I_{LKG_OFF}	Unpowered Leakage Current	V_{TXD} = 3.6 V; V_{CC} = 0 V	-2	0	2.5	μA
C_{IN}	Input Capacitance (1)			2.5		pF
Pin RXD						
V_{OH}	High-Level Output Voltage	I_{IO} = -2 mA	0.8 x V_{CC}			V
V_{OL}	Low-Level Output Voltage	I_{IO} = 2 mA		0.2	0.4	V
I_{LKG_OFF}	Unpowered Leakage Current	V_{RXD} = 3.6 V; V_{CC} = 0 V;	-1	0	1	μA
Pin STB, S, SHDN						
V_{IH}	High-Level Input Voltage		2			V
V_{IL}	Low-Level Input Voltage				0.8	V
V_{HYS_TXD}	Hysteresis Voltage on Pin TXD			150		mV
I_{IH}	High-Level Input Leakage Current	V_{STB} = V_S = V_{SHDN} = V_{CC} = 3.6V	-3	0	10	μA
I_{IL}	Low-Level Input Leakage Current	V_{STB} = V_S = V_{SHDN} = 0 V; V_{CC} = 3.6 V	-4	0	1	μA
I_{LKG_OFF}	Unpowered Leakage Current	V_{STB} = V_S = V_{SHDN} = 3.6 V; V_{CC} = 0 V	-3	0	5	μA
Pin FAULT						
I_{OH}	High-Level Output Current	V_{FAULT} = V_{CC}	-10			μA
I_{OL}	Low-Level Output Current	V_{FAULT} = 0.4 V	4	12		mA
Pin CANH, CANL						
V_{O_DOM}	Dominant Output Voltage, CANH	Dominant, V_{TXD}= 0 V; t < t_{TXD_DTO}; R_L = 60 Ω	2.45		V_{CC}	V
V_{O_DOM}	Dominant Output Voltage, CANL	Dominant, V_{TXD}= 0 V; t < t_{TXD_DTO}; R_L = 60 Ω	0.5		1.25	V
V_{O_REC}	Recessive Output Voltage (1)	Recessive, V_{TXD}= V_{CC}; t < t_{TXD_DTO}; R_L = Open		1.85		V
V_{OD_DOM}	Dominant Differential Output Voltage	Normal mode; V_{TXD}= 0 V; t < t_{TXD_DTO}; 3 V ≤ V_{CC} ≤ 3.6V; 50 Ω ≤ R_L ≤ 65 Ω	1.6		3	V
V_{OD_DOM}	Dominant Differential Output Voltage	Normal mode; V_{TXD}= 0 V; t < t_{TXD_DTO}; 3 V ≤ V_{CC} ≤ 3.6V; 45 Ω ≤ R_L < 50 Ω	1.5		3	V
V_{OD_REC}	Recessive Differential Output Voltage	Normal mode; V_{TXD}= V_{CC}; R_L = 60 Ω	-120		12	mV
V_{OD_REC}	Recessive Differential Output Voltage	Normal mode; T_A < 85℃ ; V_{TXD}= V_{CC}; R_L = Open	-50		50	mV
V_{OD_REC}	Recessive Differential Output Voltage	Normal mode; V_{TXD}= V_{CC}; R_L = Open	-50		50	mV

Parameter		Conditions	Min	Typ	Max	Unit
V_{SYM}	Output Symmetry (dominant and recessive) V_{CANH_REC} + V_{CANL_REC} - V_{CANH_DOM} - V_{CANL_DOM} (1)	S, STB and SHDN = 0 V; V_S, V_{STB} and V_{SHDN} = 0 V; R_L = 60 Ω; C_L = Open	-400		400	mV
$V_{TH\_RX\_DIF}$	Differential Receiver Threshold Voltage	Normal mode; t < t_{TXD_DTO}; -12 V ≤ V_{CANH}/ V_{CANL} ≤ +12 V	0.5		0.9	V
$V_{TH\_RX\_DIF}$	Differential Receiver Threshold Voltage	Standby mode; t < t_{TXD_DTO}; -2 V ≤ V_{CANH}/ V_{CANL} ≤ +7 V	0.4		1.15	V
$V_{TH\_RX\_DIF}$	Differential Receiver Threshold Voltage	Standby mode; t < t_{TXD_DTO}; -12 V ≤ V_{CANH}/ V_{CANL} ≤ +12 V	0.4		1.35	V
$V_{HYS\_RX\_DIF}$	Differential Receiver Hysteretic Threshold	Normal mode; t < t_{TXD_DTO}; -12 V ≤ V_{CANH}/ V_{CANL} ≤ +12 V		120		mV
$I_{O\_SC\_DOM}$	Dominant Short-circuit Output Current	-12V ≤ V_{CANH}/ V_{CANL} ≤ +12V	-200		200	mA
$I_{O\_SC\_REC}$	Recessive Short-circuit Output Current	-12V ≤ V_{CANH}/ V_{CANL} ≤ +12V	-5		5	mA
I_L	Unpowered Bus Input Leakage Current	T_A < 85 ℃; V_{CC} = 0 V or pins shorted to GND via 47kΩ; V_{CANH} = V_{CANL} = 3.3V			6	μA
I_L	Unpowered Bus Input Leakage Current	V_{CC} = 0 V or pins shorted to GND via 47kΩ; V_{CANH} = V_{CANL} = 3.3V			12	μA
R_{IN}	CANH or CANL Input Resistance	-2V ≤ V_{CANH}/ V_{CANL} ≤ +7V	15		40	kΩ
ΔR_{IN}	Input Resistance Deviation	0V ≤ V_{CANH}= V_{CANL} ≤ 3.3V	-3		3	%
R_{IN_DIF}	Differential Input Resistance	-2V ≤ V_{CANH}/ V_{CANL} ≤ +7V	30		80	kΩ
C_{IN}	Common-mode Input Capacitance (1)				20	pF
C_{IN_DIF}	Differential Input Capacitance (1)				10	pF
Temperature Detection						
T_{J_SD}	Shutdown Junction Temperature		180		200	℃
$T_{J\_SD\_R}$	Recover Shutdown Junction Temperature		175		195	℃

(1) The test data is based on bench tests and design simulation.

AC Timing Requirements

All test conditions: All typical values are at 25℃, V_{CC} = 3.3 V, R_L = 60 Ω, unless otherwise noted.

Parameter		Conditions	Min	Typ	Max	Unit
CAN Timing Characteristics						
$t_{D\_TXDH\_RXDH}$	Loop delay time from TXD high to RXD high	Normal mode; R_L = 60 Ω; C_L = 100 pF, C_{L_RXD} = 15 pF		115	150	ns
$t_{D\_TXDH\_RXDH}$	Loop delay time from TXD high to RXD high	Normal mode; R_L = 120 Ω; C_L = 200 pF, C_{L_RXD} = 15 pF		130	195	ns
$t_{D\_TXDL\_RXDL}$	Loop delay time from TXD low to RXD low	Normal mode; R_L = 60 Ω; C_L = 100 pF, C_{L_RXD} = 15 pF		100	135	ns
$t_{D\_TXDL\_RXDL}$	Loop delay time from TXD low to RXD low	Normal mode; R_L = 120 Ω; C_L = 200 pF, C_{L_RXD} = 15 pF		125	180	ns
$t_{D\_TXD\_BUSDOM}$	Delay time from TXD to bus dominant	Normal mode; R_L = 60 Ω; C_L = 100 pF, C_{L_RXD} = 15 pF		35	60	ns
$t_{D\_TXD\_BUSREC}$	Delay time from TXD to bus recessive	Normal mode; R_L = 60 Ω; C_L = 100 pF, C_{L_RXD} = 15 pF		52	80	ns
t_{SK_P}	Pulse skew ($\lvert t_{D\_TXD\_BUSDOM} - t_{D\_TXD\_BUSREC} \rvert$)(1)	Normal mode; R_L = 60 Ω; C_L = 100 pF, C_{L_RXD} = 15 pF		18		ns
t_{R_D}	Differential output signal rise time	Normal mode; R_L = 60 Ω; C_L = 100 pF, C_{L_RXD} = 15 pF		22	90	ns
t_{F_D}	Differential output signal fall time	Normal mode; R_L = 60 Ω; C_L = 100 pF, C_{L_RXD} = 15 pF		25	60	ns
$t_{D\_BUSDOM\_RXD}$	Delay time from bus dominant to RXD	Normal mode; R_L = 60 Ω; C_L = 100 pF, C_{L_RXD} = 15 pF		40	80	ns
$t_{D\_BUSREC\_RXD}$	Delay time from bus recessive to RXD	Normal mode; R_L = 60 Ω; C_L = 100 pF, C_{L_RXD} = 15 pF		50	90	ns
t_{R_RXD}	RXD output signal rise time	Normal mode; R_L = 60 Ω; C_L = 100 pF, C_{L_RXD} = 15 pF		8	30	ns
t_{F_RXD}	RXD output signal fall time	Normal mode; R_L = 60 Ω; C_L = 100 pF, C_{L_RXD} = 15 pF		7	30	ns
t_{BIT_BUS}	Transmitted recessive bit width	2 Mbps, t_{BIT_TXD} = 500 ns;	435		530	ns
t_{BIT_BUS}	Transmitted recessive bit width	5 Mbps, t_{BIT_TXD} = 200 ns;	155		210	ns
Δt_{REC}	Receiver timing symmetry	2 Mbps, $\Delta t_{REC} = t_{BIT\_RXD} - t_{BIT\_BUS}$;	-65		40	ns
Δt_{REC}	Receiver timing symmetry	5 Mbps, $\Delta t_{REC} = t_{BIT\_RXD} - t_{BIT\_BUS}$;	-45		15	ns
t_{BIT_RXD}	RXD bit width	2 Mbps, t_{BIT_TXD} = 500 ns;	400		550	ns
t_{BIT_RXD}	RXD bit width	5 Mbps, t_{BIT_TXD} = 200 ns;	120		220	ns
AC Timing Characteristics						
t_{TXD_DTO}	TXD dominant time-out time (1)	Normal mode; V_{TXD} = 0 V	1.2	2.4	3.8	ms
t_{RXD_DTO}	RXD dominant time-out time (1)	Normal mode and Silent mode	1.6	3	5	ms

Parameter		Conditions	Min	Typ	Max	Unit
$t_{WAKE\_BUS\_FILTER}$	Bus wake-up filter time (1)	Standby mode	0.5		4	µs
t_{MODE}	Mode transition time (1)			5	10	µs
t_{UVR}	Undervoltage recovery time (1)	Pin VCC		280	800	µs

(1) The data is based on bench tests and design simulation.

Detailed Description

Overview

The TPT133x family of products are 3.3-V CAN transceivers that are compatible with the ISO11898 high-speed CAN (Controller Area Network) physical layer standard. The devices are designed to be used in CAN FD networks up to 5 Mbps, and to enhance timing margin and higher data rates in long and high-loading networks. As designed, the devices feature cross-wire, overvoltage, and loss of ground protection from −45 V to +45 V, overtemperature shutdown, and a −12 V to +12 V common-mode range. The devices come with standby mode, silent mode, and shutdown mode. The family includes many protection features to enhance device and network robustness.

Functional Block Diagram

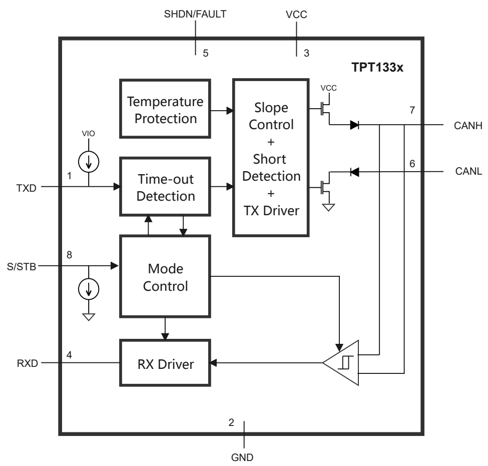


Figure 1. Functional Block Diagram

Feature Description

Remote Wake-up

A dedicated wake-up pattern wakes up the TPT133x from standby mode. This filtering prevents the device from being woken up by noise or spikes on the bus. The wake-up pattern consists of the following:

- a dominant phase of at least t wake (busdom) followed by
- a recessive phase of at least t wake (busrec) followed by
- a dominant phase of at least twake (busdom)

The complete wake-up pattern must be received within tto_wake_bus, otherwise, the wake-up logic will be reset to wait for the next valid wake-up pattern.

Fault Output

In the event of one or more faults, including TXD-Dominant Timeout, RXD Dominant Timeout, Thermal Shutdown, or Undervoltage Lockout, the FAULT pin (configured as open-drain) is deactivated, causing it to assume a high level when externally pulled up to the VCC supply.

Under-voltage Lockout Protection(UVLO)

The TPT133x uses an under-voltage lockout circuit to keep the device in shutdown mode until the supply voltage is higher than the UVLO threshold.

Table 2. Under-voltage Protection State Table

VCC	Device state	BUS Pin	RXD Pin
> UV_{VCC}	Operational	Per Operating Mode	Per Operating Mode
≤ UV_{VCC}	Protected	Common Mode bias to GND	High Impedance
No Power	Unpowered	High Impedance	High Impedance

Over Temperature Protection (OTP)

The TPT133x integrates a foldback circuit and over-temperature protection to prevent the device from beingover-heated and damage. When the junction temperature is higher than T_{OTP}, 150°C, a current thermal foldback circuit starts to work and decreases the device output charge current gradually with T_J rise. If T_J still rises and reaches 180°C, the device will shut down the charging loop until T_J drops below 100°C.

Time-out Function in TXD Dominant Mode

When the TXD pin is set to low, the timer of 'TXD dominant time-out' is started. If the low state on TXD persists for longer than t_{TXD_DTO}, the transmitter is disabled and the bus lines are in the recessive state. This function prevents a hardware and/or software application failure from driving the bus lines to a permanent dominant state which will block all network communications. The TXD dominant time-out timer is reset as TXD is pulled to high.

Over-temperature Protection (OTP)

The output drivers are protected against over-temperature conditions. If the virtual junction temperature exceeds the shutdown junction temperature T_{OTP} , the output drivers will be disabled until the virtual junction temperature falls below T_{OTP} and TXD becomes recessive again. Including the TXD condition to ensure output driver oscillation due to temperature drift is avoided.

Table 3. Driver Function Table

Device Mode	TXD Input	BUS Output		BUS State
		CANH	CANL	
Normal	L	H	L	Dominant
	H or Open	Z	Z	Biased recessive
Silent	X	Z	Z	Biased recessive
Standby	X	Z	Z	Weak pull to GND
Shutdown	X	Z	Z	Weak pull to GND

Table 4. Receiver Function Table Normal and Standby Modes

Device Mode	CAN Differential Input $V_{ID} = V_{CANH} – V_{CANL}$	BUS State	RXD Pin
Normal or Silent	$V_{ID} \geq 0.9$ V	Dominant	L
	0.5 V < V_{ID} < 0.9 V	Indeterminate.	Indeterminate.

Device Mode	CAN Differential Input $V_{ID} = V_{CANH} – V_{CANL}$	BUS State	RXD Pin
	$V_{ID} \le 0.5$ V	Recessive	H
Standby	$V_{ID} \ge 1.15$ V	Dominant	
	0.4 V < V_{ID} < 1.15 V	Indeterminate.	
	$V_{ID} \le 0.4$ V	Recessive	
Shutdown	Any	Recessive	H
Any	Open ($V_{ID} \approx 0$ V)	Open	H

Normal Mode

A low level on the S pin selects the normal mode. In this mode, the transceiver will transmit and receive data via the bus lines CANH and CANL. The differential receiver converts the analog data on the bus lines into digital data, which is output to the RXD pin. The slopes of the output signals on the bus lines are controlled internally and optimized to guarantee the lowest possibility for Electro Magnetic Emission (EME).

Silent Mode

A high level on the S pin selects the silent mode. In the silent mode, the transmitter is disabled, releasing the bus pins to the recessive state. All other IC functions, including the receiver, continue to operate as in the normal mode, just like the listen-only mode. Silent mode can be used to prevent a faulty CAN controller from disrupting all network communications.

Table 5. CAN Transceivers Silent Mode

S	Device Mode	Driver	Receiver	RXD Pin
HIGH	Silent Mode	Disabled	Enabled	Mirrors Bus State
LOW/NC	Normal Mode	Enabled	Enabled	

Standby Mode

Activate the low-power standby mode by setting the STB terminal high. In this mode, the bus transmitter will not send data, nor will the normal mode receiver accept data as the bus lines are biased to ground minimizing the system supply current. Only the low-power receiver will actively monitor the bus for activity. RXD indicates a valid wake-up event after a valid wake-up signal has been detected on the Bus.

Table 6. CAN Transceivers Standby Mode with Wake

STB	Device Mode	Driver	Receiver	RXD Terminal
HIGH	Standby Mode	Disabled	Low Power Receiver and Bus Monitor Enabled	High until WUP, then filtered mirrors of Bus State
LOW/NC	Normal Mode	Enabled	Enabled	Mirrors Bus State

Shutdown Mode

A high level on the SHDN pin selects the shutdown mode, which is the lowest power mode. In the shutdown mode, the transmitter and receiver are disabled, the bus pin is pulled to GND in this mode. All the functions of the device, including remote wake-up, will not operate in the shutdown mode.

Table 7. CAN Transceivers Shutdown Mode

SHDN Input	Device Mode	Driver	Receiver	RXD Terminal
HIGH	Lowest Current	Disabled	Disabled	High
LOW/NC	Normal Mode	Enabled	Enabled	Mirrors Bus State

Parameter Measurement Information

Test Circuit

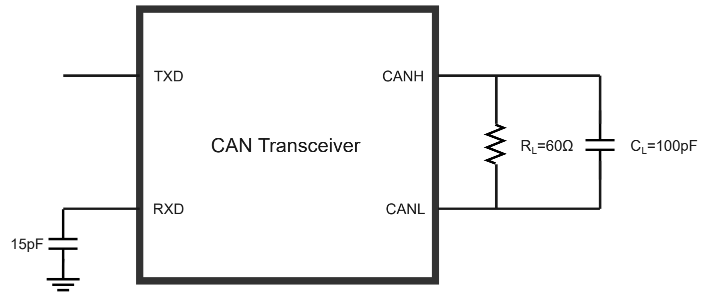


Figure 2. CAN Transceiver Timing Parameter Test Circuit

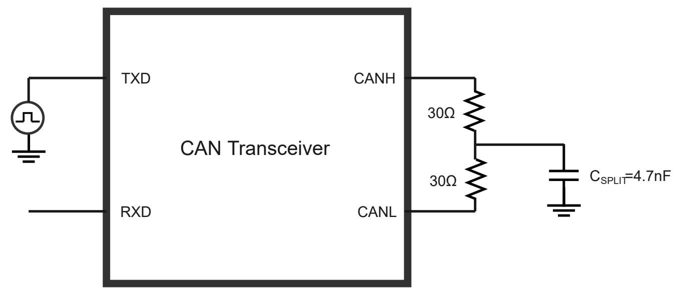


Figure 3. CAN Transceiver Driver Symmetry Test Circuit

Parameter Diagram

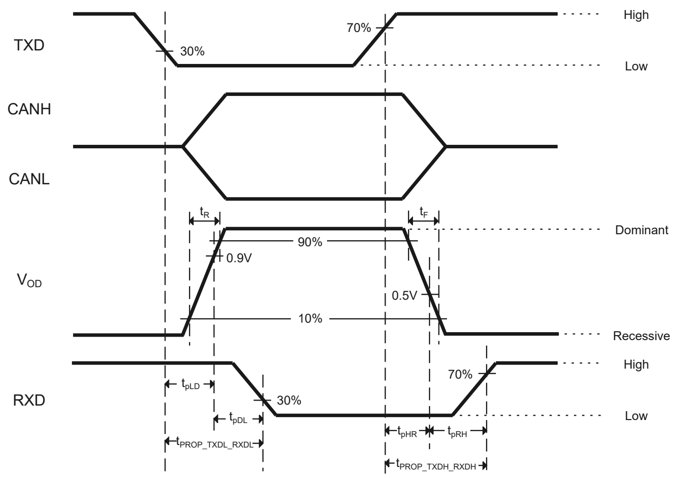


Figure 4. CAN Transceiver Timing Diagram

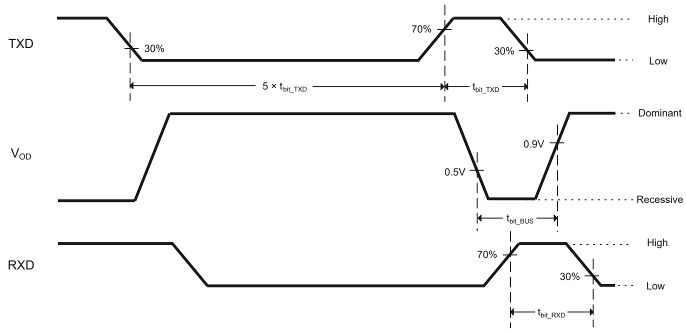


Figure 5. CAN FD Timing Parameter Diagram

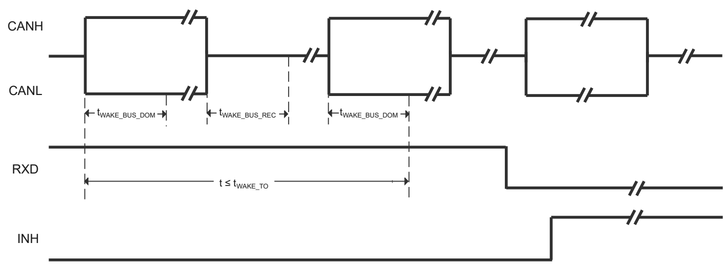


Figure 6. Wake-up Timing Diagram

Application and Implementation

Note

Information in the following application sections is not part of the 3PEAK's component specification and 3PEAK does not warrant its accuracy or completeness. 3PEAK's customers are responsible for determining suitability of components for their purposes. Customers should validate and test their design implementation to confirm system functionality.

Application Information

The following sections show typical applications of the TPT133x.

Typical Application

Figure 7 shows the typical application schematic of the TPT133x.

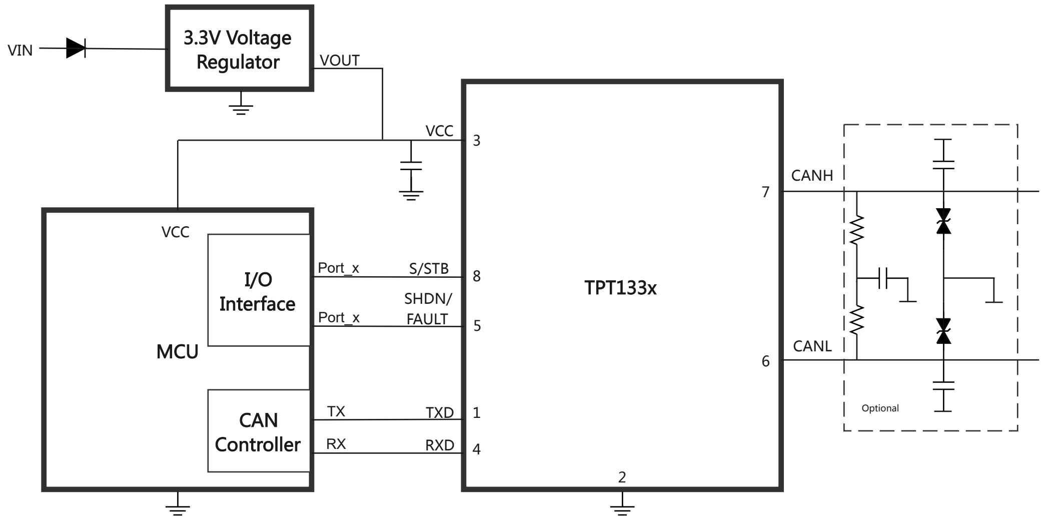
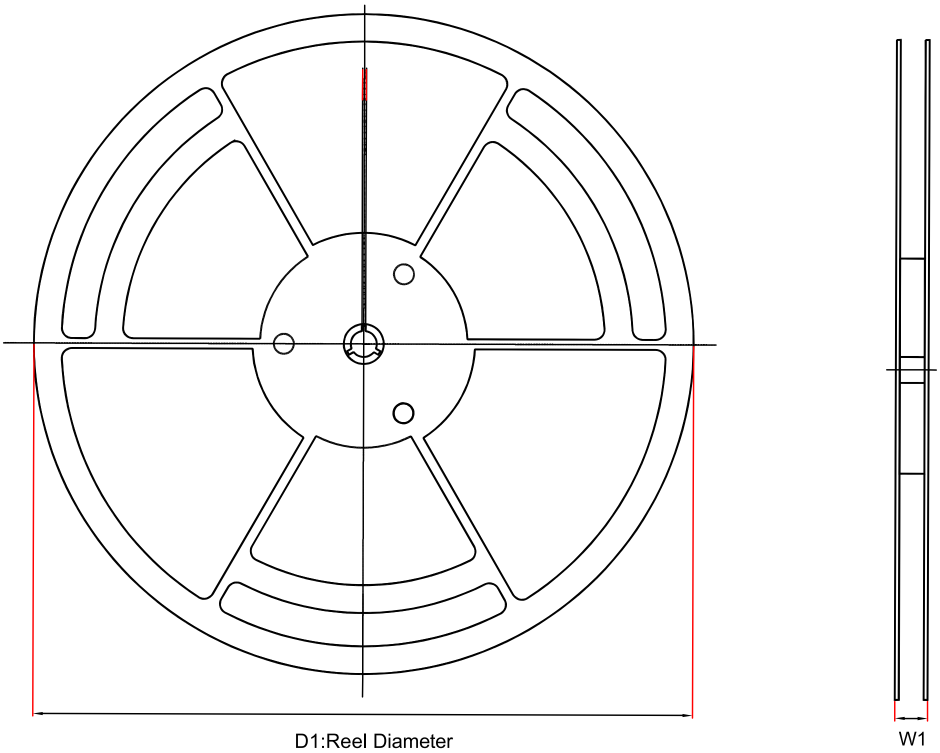
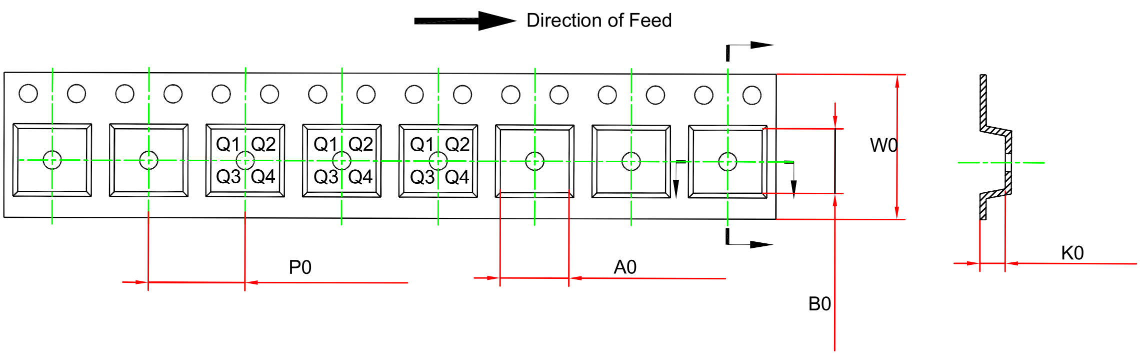


Figure 7. Typical Application Circuit

Tape and Reel Information



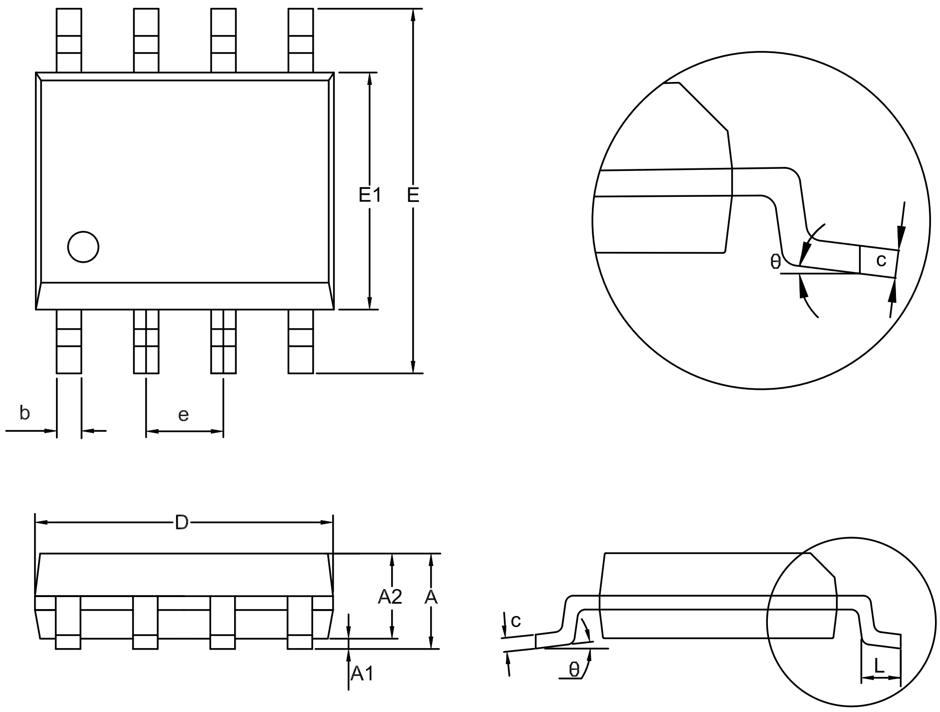


Order Number	Package	D1 (mm)	A0 (mm)	K0 (mm)	W0 (mm)	W1 (mm)	B0 (mm)	P0 (mm)	Pin1 Quadrant
TPT1330-SO1R	SOP8	330	6.5	2	12	17.6	5.4	8	Q1
TPT1330-T8TR	SOT23-8	180	3.2	1.4	8	13.1	3.2	4	Q3
TPT1334-SO1R	SOP8	330	6.5	2	12	17.6	5.4	8	Q1
TPT1334-T8TR	SOT23-8	180	3.2	1.4	8	13.1	3.2	4	Q3
TPT1337-SO1R	SOP8	330	6.5	2	12	17.6	5.4	8	Q1
TPT1337-T8TR	SOT23-8	180	3.2	1.4	8	13.1	3.2	4	Q3

Package Outline Dimensions

SOP-8

Package Outline Dimensions SO1(SOP-8-A)



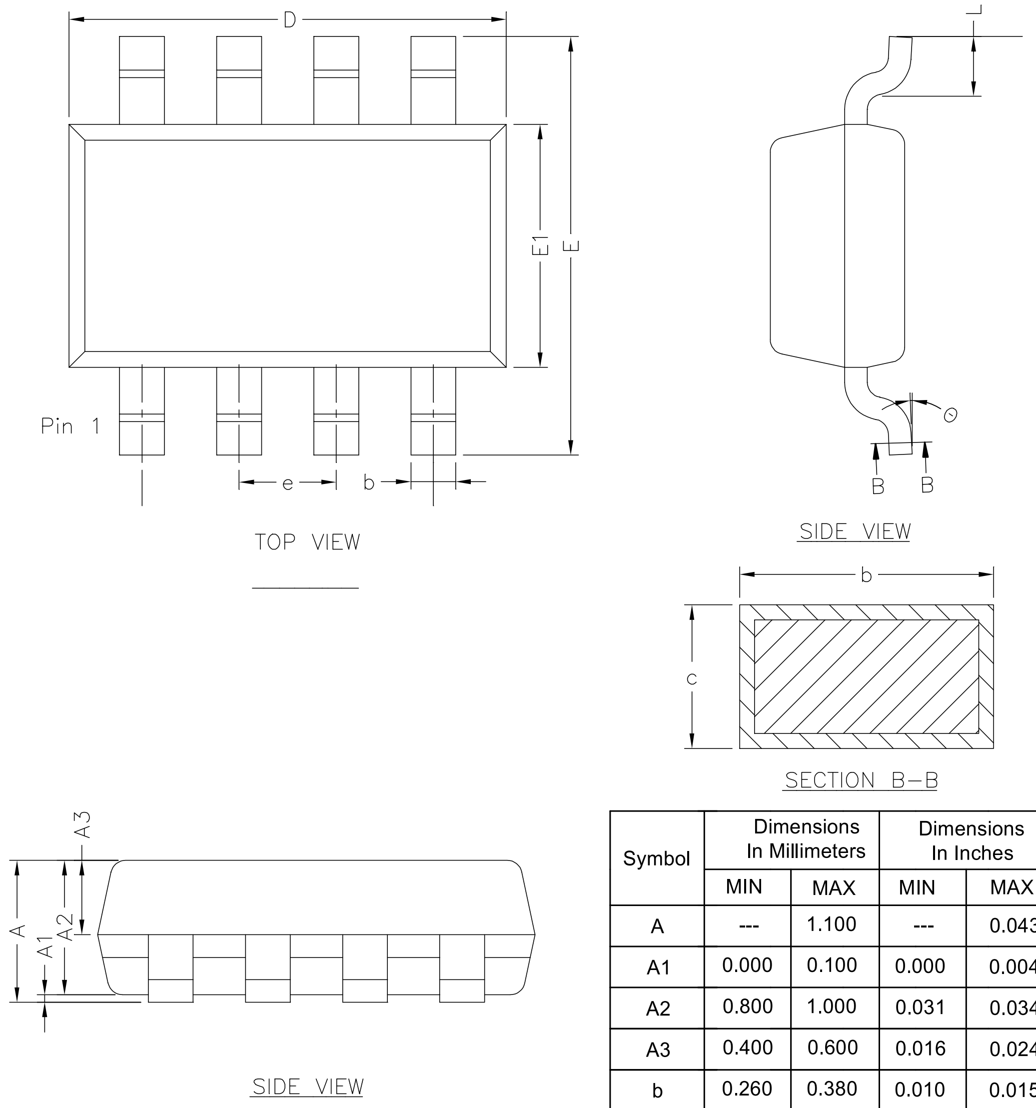
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.350	1.750	0.053	0.069
A1	0.050	0.250	0.002	0.010
A2	1.250	1.550	0.049	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	4.700	5.100	0.185	0.201
E	5.800	6.200	0.228	0.244
E1	3.800	4.000	0.150	0.157
e	1.270 BSC		0.050 BSC	
L	0.400	1.000	0.016	0.039
θ	0	8°	0	8°

NOTES

1. Do not include mold flash or protrusion.
2. This drawing is subject to change without notice.

SOT23-8

Package Outline Dimensions T8T(SOT23-8-B)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	---	1.100	---	0.043
A1	0.000	0.100	0.000	0.004
A2	0.800	1.000	0.031	0.034
A3	0.400	0.600	0.016	0.024
b	0.260	0.380	0.010	0.015
c	0.140	0.200	0.006	0.008
D	2.850	2.980	0.112	0.117
E	2.650	2.950	0.104	0.116
E1	1.550	1.680	0.061	0.066
e	0.650 BSC		0.026 BSC	
L	0.300	0.600	0.012	0.024
θ	0	8°	0	8°

NOTES

1. Do not include mold flash or protrusion.
2. This drawing is subject to change without notice.

Order Information

Order Number	Operating Temperature Range	Package	Marking Information	MSL	Transport Media, Quantity	Eco Plan
TPT1330-SO1R	−40 to 125°C	SOP8	T1330	MSL1	Tape and Reel, 4000	Green
TPT1330-T8TR	−40 to 125°C	SOT-23-8	330	MSL1	Tape and Reel, 3000	Green
TPT1334-SO1R	−40 to 125°C	SOP8	T1334	MSL1	Tape and Reel, 4000	Green
TPT1334-T8TR	−40 to 125°C	SOT-23-8	334	MSL1	Tape and Reel, 3000	Green
TPT1337-SO1R	−40 to 125°C	SOP8	T1337	MSL1	Tape and Reel, 4000	Green
TPT1337-T8TR	−40 to 125°C	SOT-23-8	337	MSL1	Tape and Reel, 3000	Green

Green: 3PEAK defines "Green" to mean RoHS compatible and free of halogen substances.

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