High-Speed CAN Transceiver with Standby Mode

UMCAN1462VS8 ***SOP8***

UMCAN1462NS8 ***SOP8***

UMCAN1462VDA ***DFN8 3.0×3.0***

UMCAN1462NDA ***DFN8 3.0×3.0***

1 Description

The UMCAN1462 is a high-speed CAN transceiver that provides an interface between a Controller Area Network (CAN) protocol controller and the physical two-wire CAN bus. The transceiver is designed for high-speed CAN applications in the automotive industry, providing the differential transmit and receive capability to (a microcontroller with) a CAN protocol controller.

The UMCAN1462 offers a feature set optimized for 12 V automotive applications and excellent ElectroMagnetic Compatibility (EMC) performance. Additionally, the UMCAN1462 features:

- Ideal passive behavior to the CAN bus when the supply voltage is off
- A very low–current Standby mode with bus wake–up capability
- Excellent EMC performance, even without a common mode choke
- Variants with a V_{IO} pin can be interfaced directly with microcontrollers with supply voltages from 3.3 V and 5 V

The UMCAN1462 implements the CAN physical layer as defined in ISO 11898-2:2016 and SAE J2284-1 to SAE J2284-5. This implementation enables reliable communication in the CAN FD fast phase at data rates up to 5 Mbit/s. These features make the UMCAN1462 an excellent choice for all types of HS-CAN networks, in nodes that require a standby mode with wake-up capability via the bus.

The UMCAN1462 also includes CAN Signal Improvement Capability (SIC), as defined in CiA 601-4:2019. CAN signal improvement significantly reduces signal ringing in a network, allowing reliable CAN FD communication to function in larger topologies.

2 Applications

- High-speed CAN applications in the automotive industry
- Infrastructure and farm equipment
- Elevator
- Networked sensors/actuators

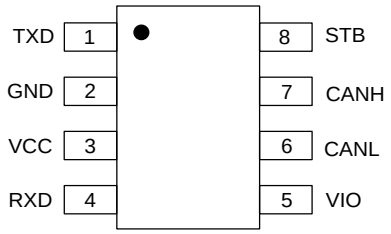
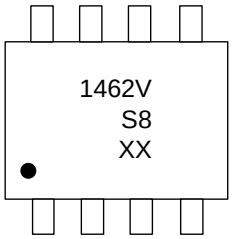
3 Features

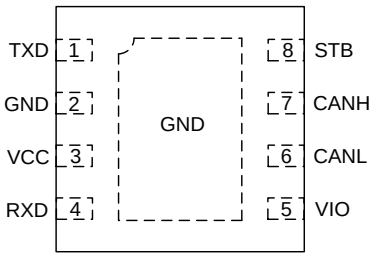
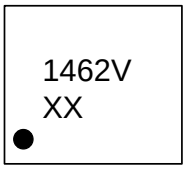
- Fully ISO 11898-2:2016, SAE J2284-1 to SAE J2284-5 and SAE J1939-14 compliant
- Signal Improvement Capability
- Very low-current Standby mode with local and bus wake-up capability
- Optimized for use in 12 V automotive systems
- Low Electromagnetic Emission (EME) and high Electromagnetic Immunity (EMI), according to proposed EMC Standards IEC 62228-3 and SAE J2962-2
- Up to 8 Mbps

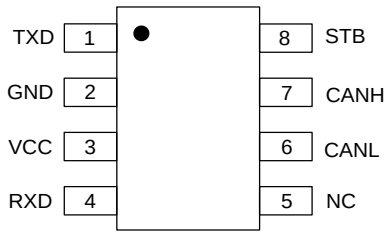
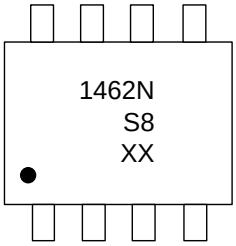
4 Ordering Information

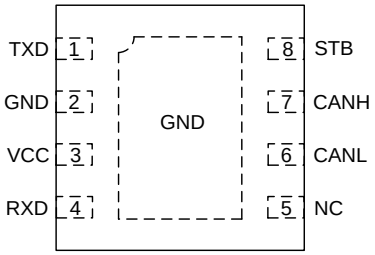
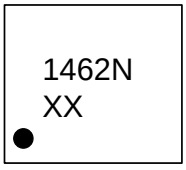
Part Number	Marking Code	Package Type	Shipping Qty
UMCAN1462VS8	1462VS8	SOP8	3000pcs/13Inch Tape & Reel
UMCAN1462VDA	1462V	DFN8 3.0×3.0	3000pcs/13Inch Tape & Reel
UMCAN1462NS8	1462NS8	SOP8	3000pcs/13Inch Tape & Reel
UMCAN1462NDA	1462N	DFN8 3.0×3.0	3000pcs/13Inch Tape & Reel

5 Pin Configuration and Function

<table>
<tr>
<td> 
</td>
<td> 

XX: Week Code
UMCAN1462VS8
SOP8</td>
</tr>
<tr>
<td> 
</td>
<td> 

XX: Week Code
UMCAN1462VDA
DFN8 3.0×3.0</td>
</tr>
<tr>
<td> 
</td>
<td> 

XX: Week Code
UMCAN1462NS8
SOP8</td>
</tr>
<tr>
<td> 
</td>
<td> 

XX: Week Code
UMCAN1462NDA
DFN8 3.0×3.0</td>
</tr>
</table>

Table 5-1. Pin Functions

Pin Number	Symbol	Description
1	TXD	Transmit data input
2	GND	Ground (Note 1)
3	V_{CC}	Supply voltage
4	RXD	Receive data output; reads out data from the bus lines
5	N.C.	Not connected in UMCAN1462NS8 and UMCAN1462NDA version
	V_{IO}	Supply voltage for I/O level adapter in UMCAN1462VS8 and UMCAN1462VDA version
6	CANL	Low-level CAN bus line
7	CANH	High-level CAN bus line
8	STB	Standby mode control input

Note 1: DFN8 package die supply ground is connected to both the GND pin and the exposed center pad. The GND pin must be soldered to board ground. For enhanced thermal and electrical performance, it is recommended that the exposed center pad also be soldered to board ground.

6 Specifications

6.1 Recommended Operating Conditions

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CC}	Bus supply voltage		4.5		5.5	V
V_{IO}	Supply voltage I/O level shifter		2.9		5.5	V
T_A	Operating ambient temperature		-40		125	℃

6.2 Absolute Maximum Ratings (Note 1, 2, 3)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CC}	Bus supply voltage		-0.3		+7	V
V_{IO}	Supply voltage I/O level shifter		-0.3		+7	V
V_{BUS}	Voltage range on CANH, CANL		-40		+40	V
V_{DIF}	Voltage range between CANH and CANL		-40		+40	V
V_I	Voltage range on STB	Note 4	-0.3		V_{IO}+0.3	V
	Voltage range on TXD	Note 4	-0.3		V_{IO}+0.3	V
V_O	Voltage range on RXD	Note 4	-0.3		V_{IO}+0.3	V
V_{ESD}	Human body model (HBM), per ANSI/ESDA/JEDEC JS-001	All pins		±5		kV
	Contact discharge, per IEC 61000-4-2	Bus pins		±10		kV
I_{LU}	Latch up, per JEDEC JESD78F.01			200		mA
T_{VJ}	Virtual junction temperature		-40		150	℃
T_{STG}	Storage temperature		-55		150	℃

Note 1: Operation outside the Absolute Maximum Ratings may cause permanent device damage. Absolute Maximum Ratings do not imply functional operation of the device at these or any other conditions beyond those listed under Recommended Operating Conditions. If used outside the Recommended Operating Conditions but within the Absolute Maximum Ratings, the device may not be fully functional, and this may affect device reliability, functionality, performance, and shorten the device lifetime.
Note 2: All voltage values, except differential I/O bus voltages, are with respect to ground terminal.
Note 3: $V_{IO} = V_{CC}$ in non-VIO product variants.
Note 4: Maximum voltage should never exceed 7 V.

6.3 Electrical Characteristics (Static) (Note 1)

T_J = -40℃ to +150℃; V_{CC} = 4.5V to 5.5V; V_{IO} = 2.9V to 5.5V (Note1); R_L = 60Ω; C_L = 100pF unless otherwise specified; All voltages are defined with respect to ground; positive currents flow into the IC.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Supply; pin VCC						
$V_{UVD(STB)}$	Standby undervoltage detection voltage on pin VCC		3.5	4	4.3	V
$V_{UVD(SWOFF)}$	Switch-off undervoltage detection voltage on pin VCC	Variants without VIO	2.4	2.6	2.8	V
I_{CC}	Supply current	Variants without a VIO pin; STB = V_{CC}; TXD = V_{CC}		10	17.5	uA
		Variants with a VIO pin; STB = V_{IO}; TXD = V_{IO}		0.1	1	uA
		STB = 0 V; TXD = V_{IO}	2	5	10	mA
		STB = 0 V; TXD = 0 V	20	45	60	mA
		STB = 0 V; TXD = 0 V; short circuit on bus lines; -3V < (CANH=CANL) < 18V	2	80	110	mA
I/O level adapter supply; pin VIO						
$V_{UVD(SWOFF)}$	Switch-off undervoltage detection voltage on pin VIO	Variants with a VIO pin	2.4	2.6	2.8	V
I_{IO}	supply current on pin VIO	STB = V_{IO}; TXD = V_{IO}		10	16.5	uA
		STB = 0 V; TXD = V_{IO}	10	17	30	uA
		STB = 0 V; TXD = 0V		170	300	uA
Standby mode control input; pin STB						
V_{IH}	High-level input voltage		0.7V_{IO}			V
V_{IL}	Low-level input voltage				0.3V_{IO}	V
I_{IH}	High-level input current	STB = V_{IO}	-1		1	uA
I_{IL}	Low-level input current	STB = 0 V	-15		-1	uA

6.3 Electrical Characteristics (Static)---continued (Note 1)

T_J = -40℃ to +150℃; V_{CC} = 4.5V to 5.5V; V_{IO} = 2.9V to 5.5V (Note1); R_L = 60Ω; C_L = 100pF unless otherwise specified; All voltages are defined with respect to ground; positive currents flow into the IC.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
CAN transmit data input; pin TXD						
V_{IH}	High-level input voltage		$0.7V_{IO}$			V
V_{IL}	Low-level input voltage				$0.3V_{IO}$	V
I_{IH}	High-level input current	TXD = V_{IO}	-5		5	uA
I_{IL}	Low-level input current	TXD = 0 V	-270	-150	-60	uA
C_I	Input capacitance			5	10	pF
CAN receive data output; pin RXD						
I_{OH}	High-level output current	RXD = V_{IO} - 0.4 V	-9	-3	-1	mA
I_{OL}	Low-level output current	RXD = 0.4V	1		12	mA
Driver						
$V_{O(DOM)}$	Dominant output voltage	STB = 0 V; TXD = 0 V; $t < t_{TO(DOM)TXD}$; 50 Ω ≤ R_L ≤ 65 Ω; pin CANH	2.75	3.5	4.5	V
		STB = 0 V; TXD = 0 V; $t < t_{TO(DOM)TXD}$; 50 Ω ≤ R_L ≤ 65 Ω; pin CANL	0.5	1.5	2.25	V
$V_{OD(DOM)}$	Dominant differential output voltage	STB = 0 V; TXD = 0 V; $t < t_{TO(DOM)TXD}$; 50 Ω ≤ R_L ≤ 65 Ω	1.5		3	V
		STB = 0 V; TXD = 0 V; $t < t_{TO(DOM)TXD}$; 45 Ω ≤ R_L ≤ 70 Ω	1.4		3.3	V
		STB = 0 V; TXD = 0 V; $t < t_{TO(DOM)TXD}$; R_L = 2240 Ω	1.5		5	V

6.3 Electrical Characteristics (Static)---continued (Note 1)

T_J = -40℃ to +150℃; V_{CC} = 4.5V to 5.5V; V_{IO} = 2.9V to 5.5V (Note1); R_L = 60Ω; C_L = 100pF unless otherwise specified; All voltages are defined with respect to ground; positive currents flow into the IC.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{SYM(DOM)}$	Dominant output voltage symmetry, V_{CC} - CANH – CANL	STB = 0 V; TXD = 0 V; $t < t_{TO(DOM)TXD}$; R_L = 60 Ω	-400		400	mV
$V_{O(REC)}$	Recessive output voltage	STB = 0 V; TXD = V_{IO}; R_L = open	2	0.5V_{CC}	3	V
$V_{OD(REC)}$	Recessive differential output voltage	STB = 0 V; TXD = V_{IO}; R_L = open	-50		50	mV
$V_{O(STB)}$	Bus output voltage, Standby Mode	STB = V_{IO}; TXD = V_{IO}; R_L = open	-100		100	mV
$V_{OD(STB)}$	Bus differential output voltage, Standby Mode	STB = V_{IO}; TXD = V_{IO}; R_L = open	-200		200	mV
$V_{SYM(TX)}$	Transmitter output voltage symmetry, (CANH + CANL)/V_{CC}	STB = 0 V; TXD = 250 kHz, 1 MHz, 2.5MHz; R_L = 60 Ω; C_{SPLIT} = 4.7 nF	0.9V_{CC}		1.1V_{CC}	V
$V_{CM(STEP)}$	Common mode voltage step		-150		150	mV
$V_{CM(PP)}$	Peak-to-peak common mode voltage		-300		300	mV
$I_{OS(DOM)}$	Dominant short-circuit output current	STB = 0 V; TXD = 0 V; VCC = 5 V; CANH = -15 V to 40 V; CANL = open	-100	-70		mA
		STB = 0 V; TXD = 0 V VCC = 5 V; CANL = -15 V to 40 V; CANH = open		70	100	mA
$I_{OS(REC)}$	Recessive short-circuit output current	STB = 0 V; TXD = V_{IO}; -27 V ≤ CANH = CANL ≤ 32 V	-5		5	mA
Receiver						
V_{TH}	Differential receiver threshold voltage, Normal mode	STB = 0 V; -15 V ≤ CANH, CANL ≤ 15 V	0.5		0.9	V
$V_{ID(DOM)}$	Receiver dominant voltage, Normal mode	STB = 0 V; -15 V ≤ CANH, CANL ≤ 15 V	0.9		9	V
$V_{ID(REC)}$	Receiver recessive voltage, Normal mode	STB = 0 V; -15 V ≤ CANH, CANL ≤ 15 V	-4		0.5	V
V_{HYS}	Differential receiver hysteresis voltage, Normal mode	STB = 0 V; -15 V ≤ CANH, CANL ≤ 15 V	50		300	mV

6.3 Electrical Characteristics (Static)---continued (Note 1)

T_J = -40℃ to +150℃; V_{CC} = 4.5V to 5.5V; V_{IO} = 2.9V to 5.5V (Note1); R_L = 60Ω; C_L = 100pF unless otherwise specified; All voltages are defined with respect to ground; positive currents flow into the IC.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{TH(STB)}$	Differential receiver threshold voltage, Standby mode	STB = V_{IO}; -15 V ≤ CANH, CANL ≤ 15 V	0.4		1.15	V
$V_{ID(DOM)STB}$	Receiver dominant voltage, Standby mode	STB = V_{IO}; -15 V ≤ CANH, CANL ≤ 15 V	1.15		9	V
$V_{ID(REC)STB}$	Receiver recessive voltage, Standby	STB = V_{IO}; -15 V ≤ CANH, CANL ≤ 15 V	-4		0.4	V
$I_{LKG(PD)}$	Unpowered Leakage current	V_{CC} = V_{IO} = 0 V or shorted to GND via 47 kΩ; CANH = CANL = 5 V	-5		5	uA
R_I	Input resistance	STB = 0 V; TXD = V_{IO}; -2 V ≤ CANH, CANL ≤ 7 V	9	15	28	kΩ
ΔR_I	Input resistance deviation, [1 – ($R_{IN(CANH)}$ / $R_{IN(CANL)}$)] × 100 %	STB = 0 V; TXD = V_{IO}; -2 V ≤ CANH, CANL ≤ 7 V	-3		3	%
R_{ID}	Differential input resistance	STB = 0 V; TXD = V_{IO}; -2 V ≤ CANH, CANL ≤ 7 V	19	30	52	kΩ
C_{IN}	Common-mode input capacitance to ground				20	pF
C_{ID}	Differential input capacitance				10	pF
Thermal Protection						
$T_{J(SD)}$	Thermal shutdown threshold	Temperature rising		185		℃

Note 1: V_{IO} = V_{CC} in non-VIO product variants.

6.4 Electrical Characteristics (Dynamic) (Note 1)

T_J = -40℃ to +150℃; V_{CC} = 4.5V to 5.5V; V_{IO} = 2.9V to 5.5V (Note1); R_L = 60Ω; C_L = 100pF unless otherwise specified; all voltages are defined with respect to ground.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
CAN timing characteristics; V_{CC} = 4.75 V to 5.25 V; $t_{BIT(TXD)}$ ≥ 125 ns; see Figure 7-1, Figure 7-3, Figure 7-4 and Figure 7-6						
$t_{D(TXD-BUSDOM)}$	Delay time from TXD to bus dominant	STB = 0 V			80	ns
$t_{D(TXD-BUSREC)}$	Delay time from TXD to bus recessive	STB = 0 V			80	ns
$t_{D(BUSDOM -RXD)}$	Delay time from bus dominant to RXD	STB = 0 V			110	ns
$t_{D(BUSREC -RXD)}$	Delay time from bus recessive to RXD	STB = 0 V			110	ns
$t_{D(TXDL-RXDL)}$	Delay time from TXD LOW to RXD LOW	STB = 0 V			190	ns
		STB = 0 V; V_{CC} = 4.5 V to 5.5 V			255	ns
$t_{D(TXDH-RXDH)}$	Delay time from TXD HIGH to RXD HIGH	STB = 0 V			190	ns
		STB = 0 V; V_{CC} = 4.5 V to 5.5 V			255	ns
$t_{SIC(TXD)BASE}$	delay time from TXD to bus active recessive end	STB = 0 V	335		480	ns
CAN FD timing characteristics according to CiA 601-4:2019; V_{CC} = 4.75 V to 5.25 V; $t_{BIT(TXD)}$ ≥ 125 ns; see Figure 7-1 and Figure 7-4						
$\Delta t_{BIT(BUS)}$	transmitted recessive bit width deviation	$\Delta t_{BIT(BUS)}= t_{BIT(BUS)}- t_{BIT(TXD)}$	-10		10	ns
Δt_{REC}	receiver timing symmetry	$\Delta t_{REC}= t_{BIT(RXD)}- t_{BIT(BUS)}$	-20		15	ns
$\Delta t_{BIT(RXD)}$	received recessive bit width deviation	$\Delta t_{BIT(RXD)}= t_{BIT(RXD)}- t_{BIT(TXD)}$	-30		20	ns
CAN FD timing characteristics according to ISO 11898-2:2016; V_{CC} = 4.75 V to 5.25 V; see Figure 7-1 and Figure 7-4						
$t_{BIT(BUS)}$	Transmitted recessive bit width	2 Mbit/s ($t_{BIT(TXD)}$ = 500 ns)				
		V_{CC} = 4.75 V to 5.25 V	490		510	ns
		V_{CC} = 4.5 V to 5.5 V	435		530	ns

6.4 Electrical Characteristics (Dynamic) ---continued (Note 1)

T_J = -40℃ to +150℃; V_{CC} = 4.5V to 5.5V; V_{IO} = 2.9V to 5.5V (Note1); R_L = 60Ω; C_L = 100pF unless otherwise specified; all voltages are defined with respect to ground.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$t_{BIT(BUS)}$	Transmitted recessive bit width (Note 2)	5 Mbit/s ($t_{BIT(TXD)}$ = 200 ns)				
		V_{CC} = 4.75 V to 5.25 V	190		210	ns
		V_{CC} = 4.5 V to 5.5 V	170		230	ns
		8 Mbit/s ($t_{BIT(TXD)}$ = 125 ns)				
		V_{CC} = 4.75 V to 5.25 V	115		135	ns
Δt_{REC}	Receiver timing symmetry	V_{CC} = 4.75 V to 5.25 V; for 2 Mbit/s, 5 Mbit/s and 8 Mbit/s	-20		15	ns
		V_{CC} = 4.5 V to 5.5 V; 2 Mbit/s	-65		40	ns
		V_{CC} = 4.5 V to 5.5 V; 5 Mbit/s	-45		15	ns
$t_{BIT(RXD)}$	Bit time on pin RXD (Note 3)	2 Mbit/s ($t_{BIT(TXD)}$ = 500 ns)				
		V_{CC} = 4.75 V to 5.25 V	470		520	ns
		V_{CC} = 4.5 V to 5.5 V	400		550	ns
		5 Mbit/s ($t_{BIT(TXD)}$ = 200 ns)				
		V_{CC} = 4.75 V to 5.25 V	170		220	ns
		V_{CC} = 4.5 V to 5.5 V	150		240	ns
		8 Mbit/s ($t_{BIT(TXD)}$ = 125 ns)				
		V_{CC} = 4.75 V to 5.25 V	95		145	ns
Dominant time-out time; pin TXD						
$t_{TO(DOM)TXD}$	TXD dominant time-out time	STB = 0 V; TXD = 0V	0.8		9	ms
Bus wake-up times; pins CANH and CANL; see Figure 9-4						
$t_{WK(BUSDOM)}$	Bus dominant wake-up time	STB = V_{IO}	0.5		1.8	us
$t_{WK(BUSREC)}$	Bus recessive wake-up time	STB = V_{IO}	0.5		1.8	us

6.4 Electrical Characteristics (Dynamic) ---continued (Note 1)

T_J = -40℃ to +150℃; V_{CC} = 4.5V to 5.5V; V_{IO} = 2.9V to 5.5V (Note1); R_L = 60Ω; C_L = 100pF unless otherwise specified; all voltages are defined with respect to ground.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$t_{TO(WK)BUS}$	Bus wake-up time-out time	STB = V_{IO}	0.8		9	ms
$t_{FLTR(WK)BUS}$	Bus wake-up filter time	STB = V_{IO}			1.8	us
Mode transitions						
$t_{D(STB-NRM)}$	Mode change time, from standby to normal				50	us
$t_{STARTUP}$	Start-up time				1.5	ms
$t_{STARTUP(RXD)}$	RXD start-up time	After wake-up detected	4		20	us
IO filter; pin STB						
$t_{FLTR(IO)}$	IO filter time	on pin STB	1		5	us

Note 1: V_{IO} = V_{CC} in non-VIO product variants.
Note 2: $t_{BIT(BUS)} = \Delta t_{BIT(BUS)} + t_{BIT(TXD)}$.
Note 3: $t_{BIT(RXD)} = \Delta t_{BIT(RXD)} + t_{BIT(TXD)}$.

7 Parameter Measurement Information

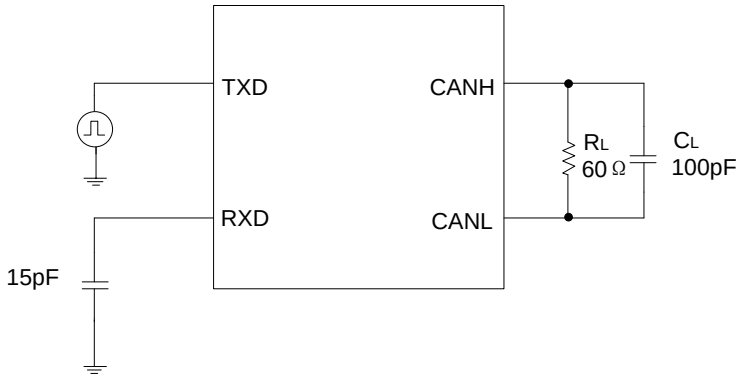


Figure 7-1. CAN transceiver timing test circuit

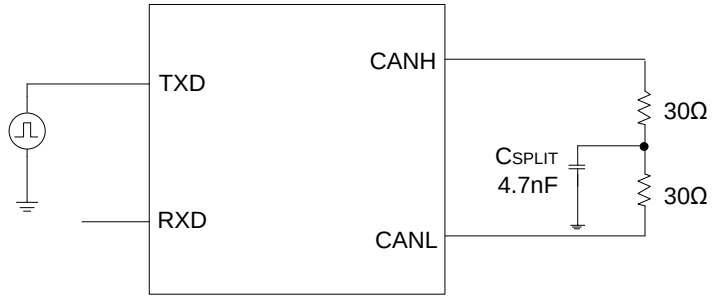


Figure 7-2. Test circuit for measuring transceiver transmitter driver symmetry

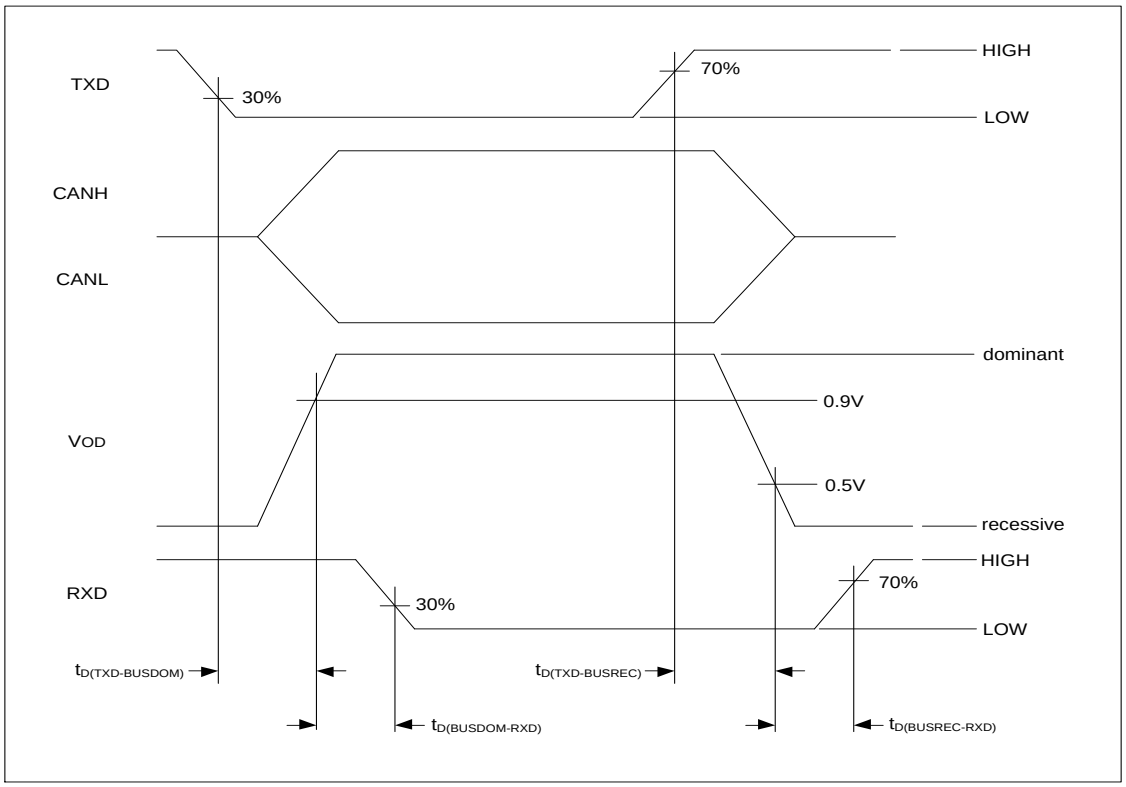


Figure 7-3. CAN transceiver timing diagram

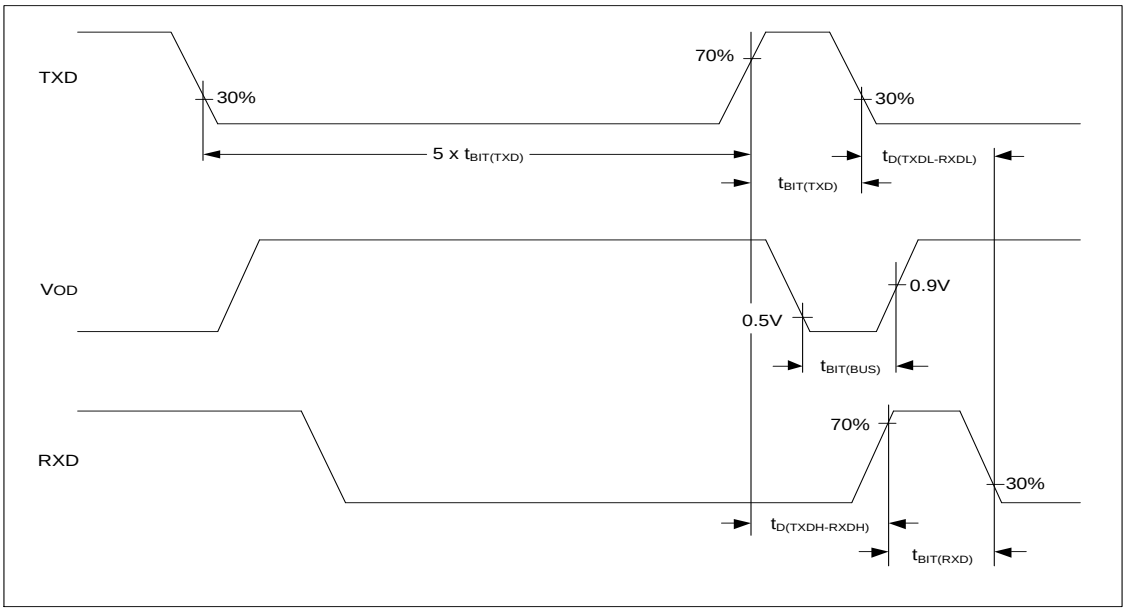


Figure 7-4. CAN FD timing definitions according to ISO 11898-2:2016

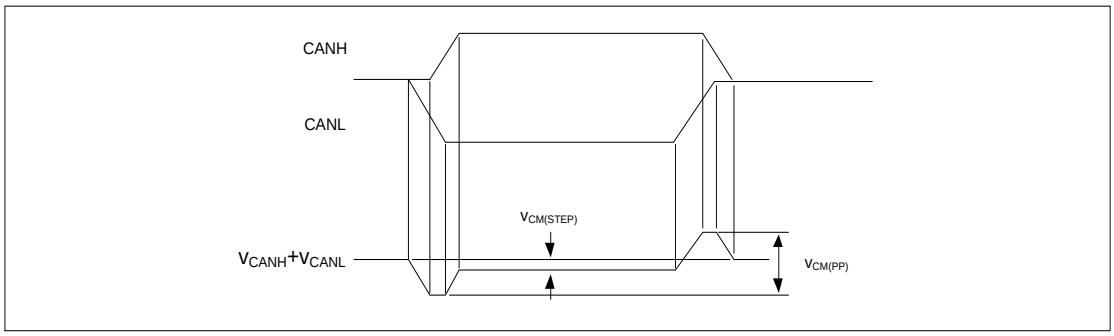


Figure 7-5. CAN bus common-mode voltage according to SAE 1939-14

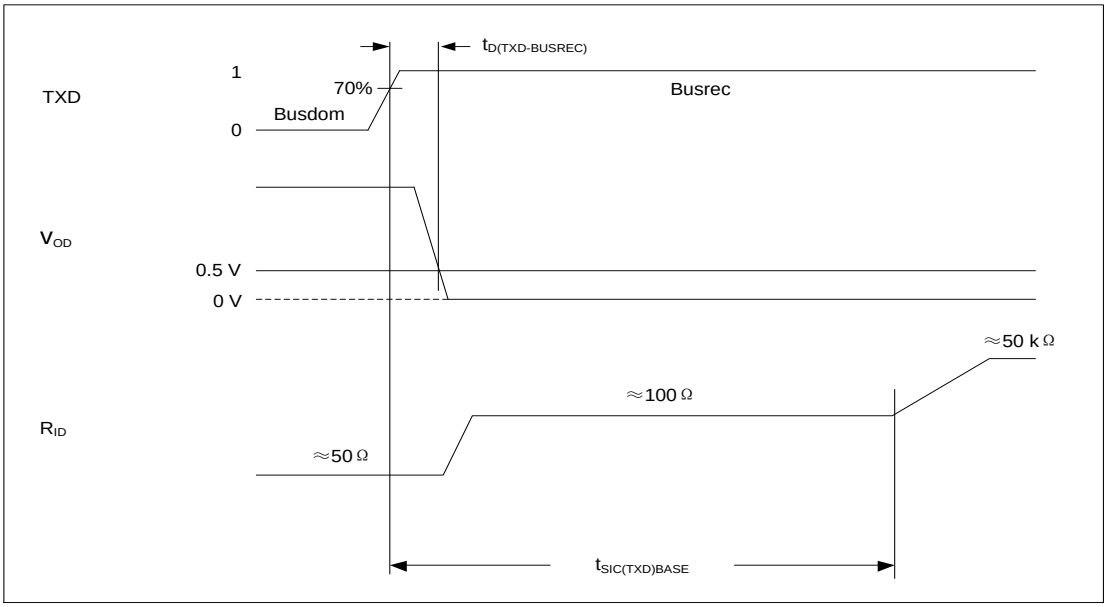


Figure 7-6. UMCAN1462 transmitter impedance and timing diagram for dominant-to-passive recessive transition

8 Block diagram

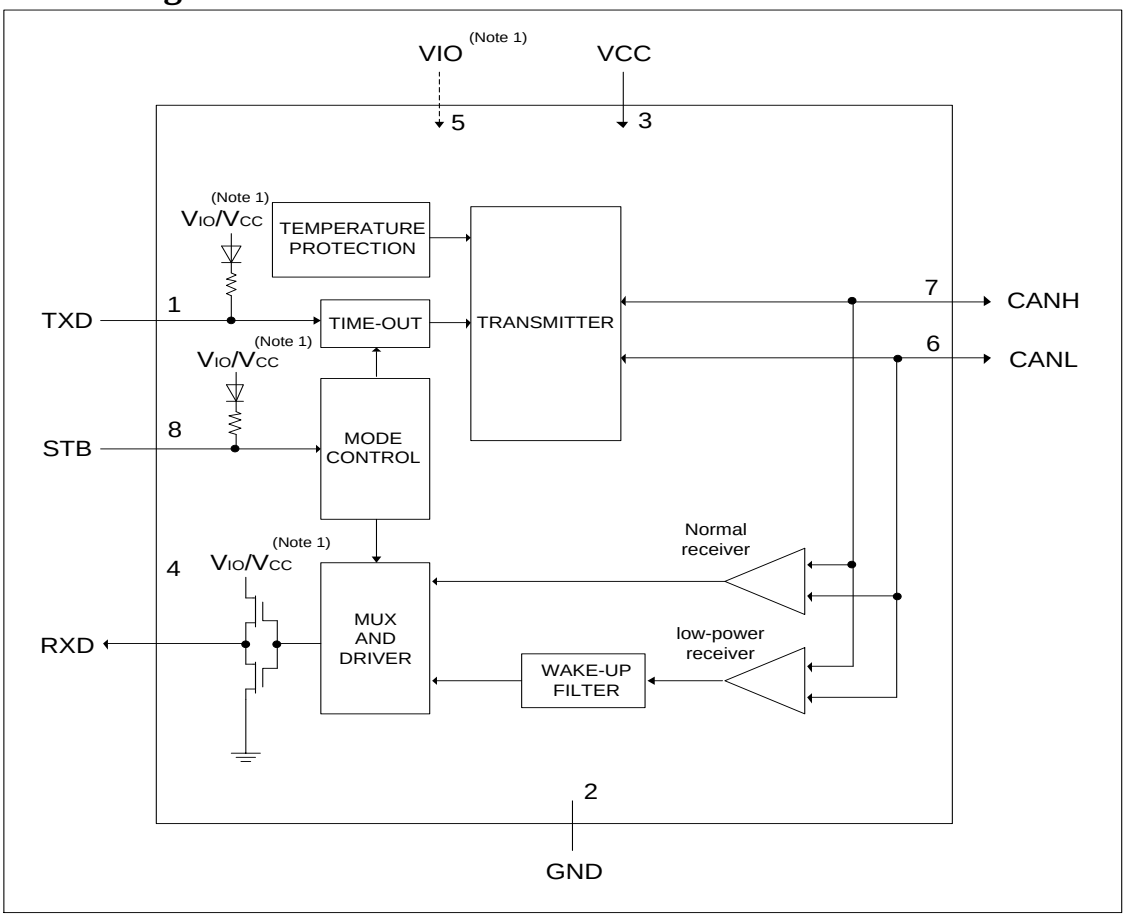


Figure 8-1. Block diagram

Note 1: $V_{IO} = V_{CC}$ in non-VIO product variants.

9 Detailed Description

9.1 Operating modes

The UMCAN1462 supports two operating modes, Normal and Standby. The operating mode is selected via pin STB. See Table for a description of the operating modes under normal supply conditions.

Mode	**Inputs**		**Outputs**	
	Pin STB	**Pin TXD**	**CAN driver**	**Pin RXD**
Normal	LOW	LOW	dominant	LOW
		HIGH	recessive	LOW when bus dominant
				HIGH when bus recessive
Standby	HIGH	x (Note1)	biased to ground	follows BUS when wake-up detected
				HIGH when no wake-up detected
Off	x	x	high-ohmic state	high-ohmic state

Note1: ‘x’ = don’t care.

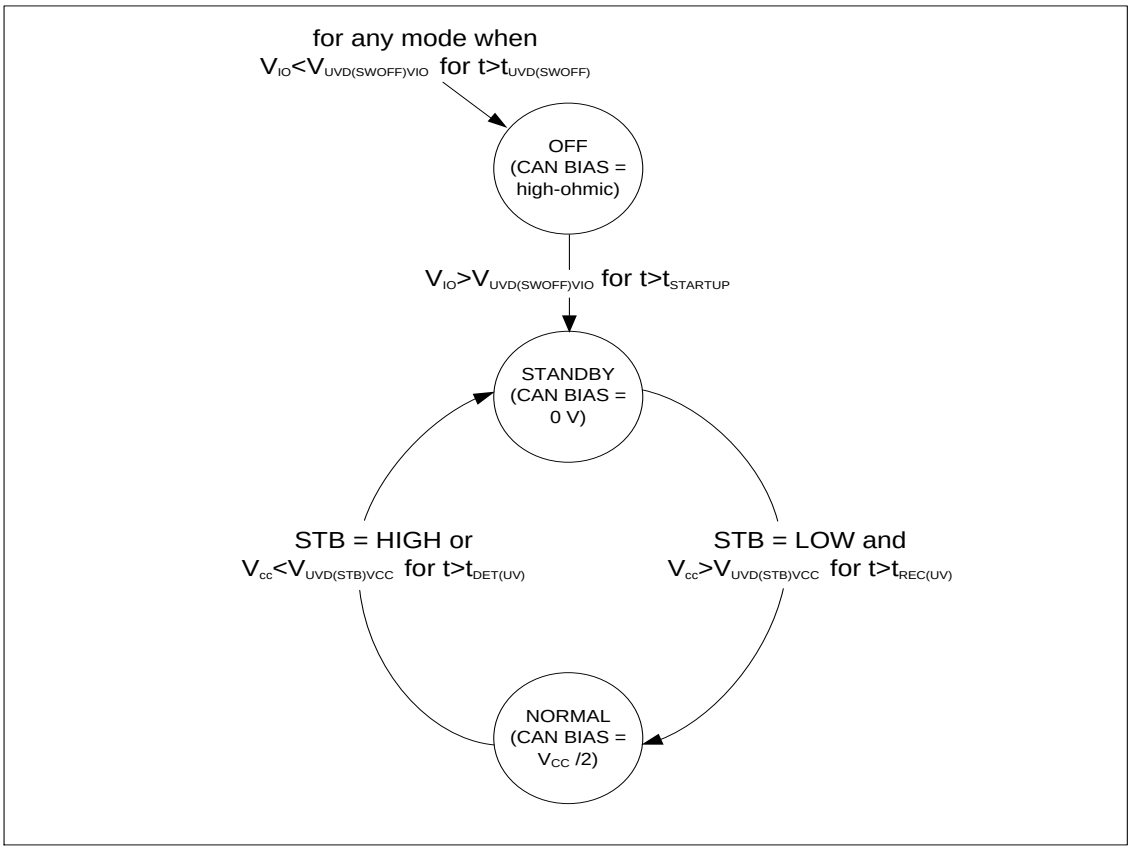


Figure 9-1. UMCAN1462V state diagram

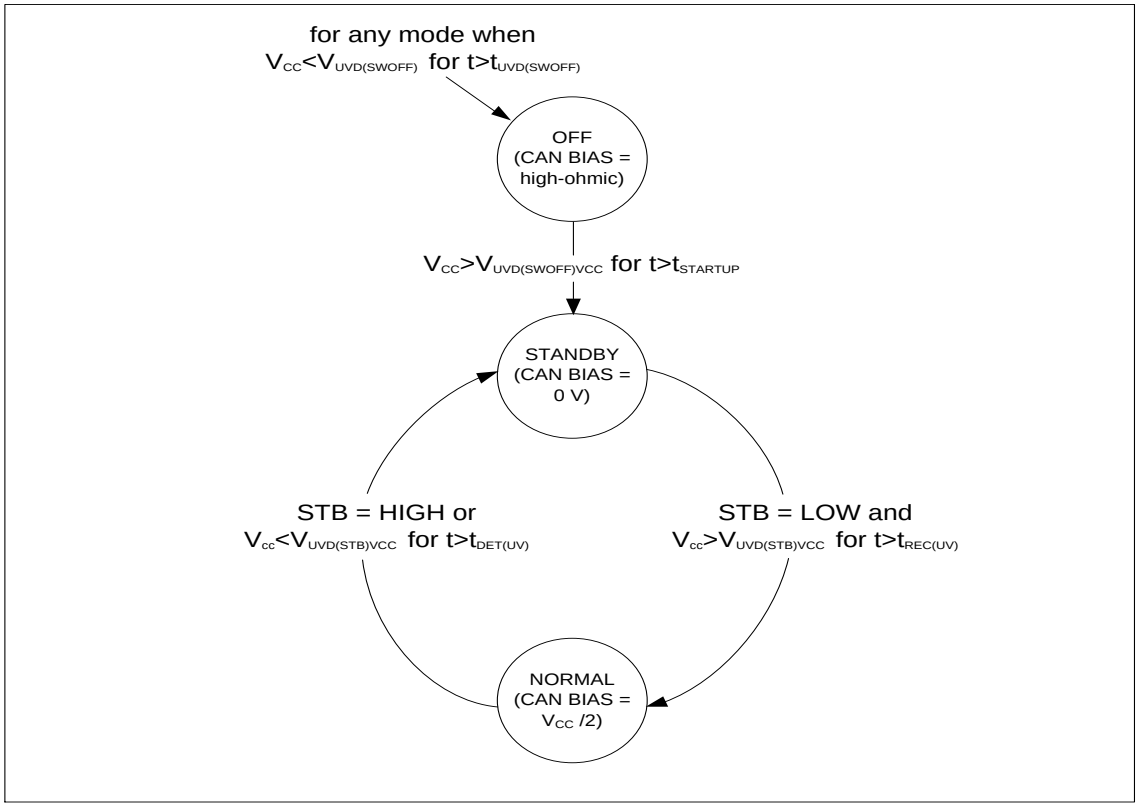


Figure 9-2. UMCAN1462N state diagram

9.1.1 Normal mode

A LOW level on pin STB selects Normal mode. In this mode, the transceiver can transmit and receive data via the bus lines CANH and CANL (see Figure 8-1 for the block diagram). The differential receiver converts the analog data on the bus lines into digital data which is output on pin RXD. The slopes of the output signals on the bus lines are controlled internally.

9.1.2 Standby mode

A HIGH level on pin STB selects Standby mode. In Standby mode, the transceiver is not able to transmit or correctly receive data via the bus lines. The transmitter and Normal mode receiver blocks are switched off to reduce supply current, and only a low-power differential receiver monitors the bus lines for activity. In Standby mode, the bus lines are biased to ground to minimize system supply current. The low-power receiver is supplied from VIO (VCC in non-VIO variants) and can detect CAN bus activity even if VIO is the only available supply voltage. Pin RXD follows the bus after a wake-up request has been detected. A transition to Normal mode is triggered when STB is forced LOW.

9.1.3 Off mode

The UMCAN1462 switches to Off mode from any mode when the supply voltage (on pin VIO in the UMCAN1462V and VCC in the UMCAN1462N) falls below the switch-off undervoltage threshold ($V_{UVD(SWOFF)VCC}$ or $V_{UVD(SWOFF)VIO}$). This is the default mode when the supply is first connected.

In Off mode, the CAN pins and pin RXD are in a high-ohmic state.

9.1.4 Operating modes and gap-free operation

Gap-free operation guarantees defined behavior at all voltage levels. Supply voltage-to-operating mode mapping is detailed in Figure 9-3 and in the state diagrams (Figure 9-1 and Figure 9-2).

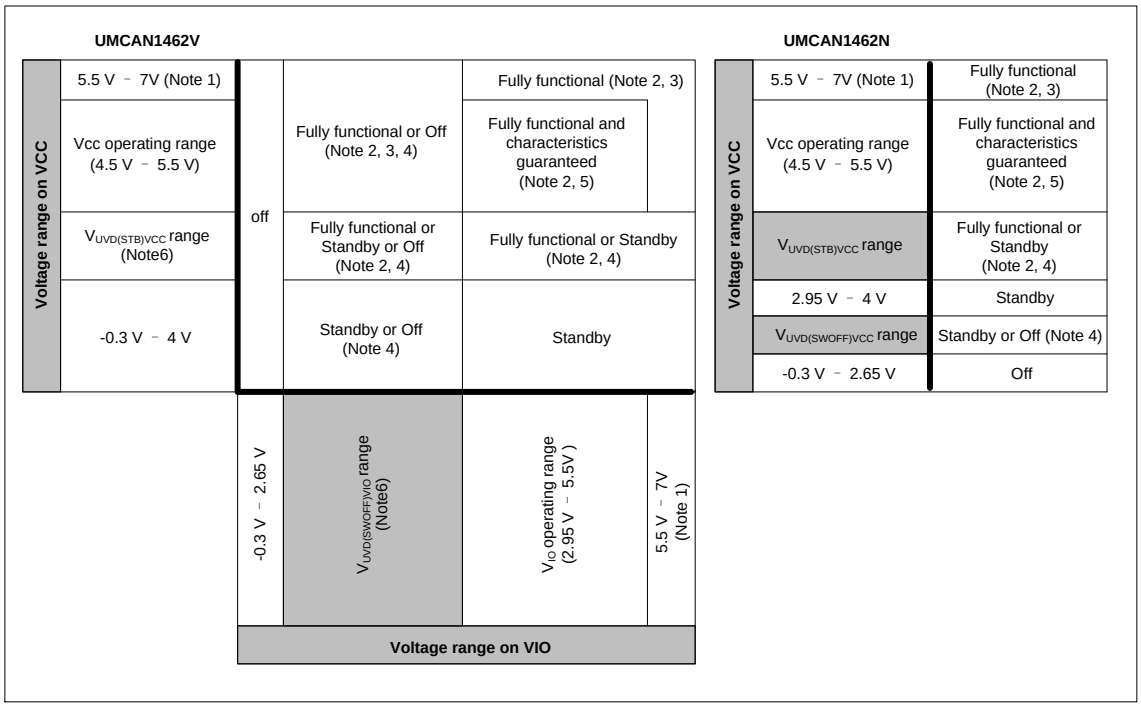


Figure 9-3. Supply voltage ranges and gap-free operation

Note 1: Maximum voltage should never exceed 7 V.
Note 2: Target transceiver functionality as described in this datasheet is applicable.

Note 3: Prolonged operation of the device outside the operating range may impact reliability over lifetime. Returning to the operating range, datasheet characteristics are guaranteed provided the AMR has not been exceeded.
Note 4: For a given value of V_{CC} (and V_{IO} in UMCAN1462V), a specific device will be in a single defined state determined by its undervoltage detection thresholds ($V_{UVD(STB)VCC}$, $V_{UVD(SWOFF)VIO}$ and $V_{UVD(SWOFF)VCC}$). The actual thresholds can vary between devices (within the ranges specified in this datasheet). To guarantee the device will be in a specific state, V_{IO} and V_{CC} must be either above the maximum or below the minimum thresholds specified for these undervoltage detection ranges.
Note 5: Datasheet characteristics are guaranteed within the V_{CC} and V_{IO} operating ranges. Exceptions are described in the Static and Dynamic characteristics tables.
Note 6: The following applies to UMCAN1462V:

- If both V_{CC} and V_{IO} are above the undervoltage threshold, the device is fully functional.
- If V_{CC} is below and V_{IO} above the undervoltage threshold, the device is in Standby mode.
- If V_{IO} is below the undervoltage threshold, the device is in Off mode, regardless of V_{CC}.

9.2 Remote wake-up (via the CAN bus)

The UMCAN1462 wakes up from Standby mode when a dedicated wake-up pattern (specified in ISO 11898-2:2016) is detected on the bus. This filtering helps avoid spurious wake-up events. A spurious wake-up sequence could be triggered by, for example, a dominant clamped bus or by dominant phases due to noise or spikes on the bus.
The wake-up pattern consists of:

- a dominant phase of at least $t_{WK(BUSDOM)}$ followed by
- a recessive phase of at least $t_{WK(BUSREC)}$ followed by
- a dominant phase of at least $t_{WK(BUSDOM)}$

Dominant or recessive bits between the above mentioned phases that are shorter than $t_{WK(BUSDOM)}$ and $t_{WK(BUSREC)}$ respectively are ignored.
The complete dominant-recessive-dominant pattern must be received within $t_{TO(WK)BUS}$ to be recognized as a valid wake-up pattern. Otherwise, the internal wake-up logic is reset. The complete wake-up pattern will then need to be retransmitted to trigger a wake-up event. Pin RXD remains HIGH until the wake-up event has been triggered.
After a wake-up sequence has been detected, the UMCAN1462 will remain in Standby mode with the bus signals reflected on RXD after $t_{STARTUP(RXD)}$. Note that dominant or recessive phases lasting less than $t_{FLTR(WK)BUS}$ will not be detected by the low-power differential receiver and will not be reflected on RXD in Standby mode.
A wake-up event is not flagged on RXD if any of the following events occurs while a valid wake-up pattern is being received:

- The UMCAN1462 switches to Normal mode
- The complete wake-up pattern was not received within $t_{TO(WK)BUS}$
- A V_{CC} or V_{IO} undervoltage is detected ($V_{CC} < V_{UVD(SWOFF)VCC}$ or $V_{IO} < V_{UVD(SWOFF)VIO}$)

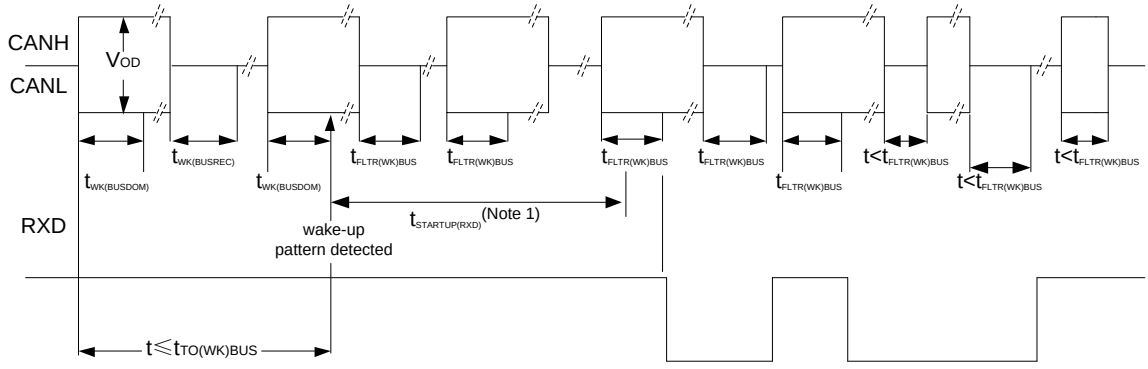


Figure 9-4. Wake-up timing

Note 1: During $t_{STARTUP(RXD)}$, the low-power receiver is on but pin RXD is not active (i.e. HIGH/recessive). The first dominant pulse of width ≥ $t_{FLTR(WK)BUS}$ that ends after $t_{STARTUP(RXD)}$ will trigger RXD to go LOW/dominant.

9.3 Fail-safe features

9.3.1 TXD dominant time-out function

A 'TXD dominant time-out' timer is started when pin TXD is set LOW. If the LOW state on this pin persists for longer than $t_{TO(DOM)TXD}$, the transmitter is disabled, releasing the bus lines to recessive state. This function prevents a hardware and/or software application failure from driving the bus lines to a permanent dominant state (blocking all network communications). The TXD dominant time-out timer is reset when pin TXD is set HIGH.

9.3.2 Internal biasing of TXD and STB input pins

Pins TXD and STB have internal pull-ups to VCC (VIO for variants with a VIO pin) to ensure a safe, defined state in case one or both of these pins are left floating. Pull-up currents flow in these pins in all states; both pins should be held HIGH in Standby mode to minimize supply current.

9.3.3 Undervoltage detection on pins VCC and VIO

If V_{CC} drops below the standby undervoltage detection level, $V_{UVD(STB)VCC}$, the transceiver switches to Standby mode. The logic state of pin STB is ignored until V_{CC} has recovered.

In versions with a V_{IO} pin, if V_{IO} drops below the switch-off undervoltage detection level ($V_{UVD(SWOFF)VIO}$), the transceiver switches off and disengages from the bus (zero load) until V_{IO} has recovered.

In versions without a V_{IO} pin, if V_{CC} drops below the switch-off undervoltage detection level ($V_{UVD(SWOFF)VCC}$), the transceiver switches off and disengages from the bus (zero load) until V_{CC} has recovered.

9.3.4 Overtemperature protection

The output drivers are protected against overtemperature conditions. If the virtual junction temperature exceeds the shutdown junction temperature, $T_{J(SD)}$, both output drivers are disabled. When the virtual junction temperature drops below $T_{J(SD)}$ again, the output drivers recover once TXD has been reset to HIGH. Including the TXD condition prevents output driver oscillation due to small variations in temperature.

9.3.5 VIO supply pin (UMCAN1462VS8 and UMCAN1462VDA variants)

Pin V_{IO} should be connected to the microcontroller supply voltage. This will adjust the signal levels of pins TXD, RXD and STB to the I/O levels of the microcontroller. Pin V_{IO} also provides the internal supply voltage for the low-power differential receiver in the transceiver. For applications running in low-power mode, this allows the bus lines to be monitored for activity even if there is no supply voltage on pin V_{CC}.

For variants of the UMCAN1462 without a V_{IO} pin, all circuitry is connected to V_{CC} (pin 5 is not bonded). The signal levels of pins TXD, RXD and STB are then compatible with 5 V microcontrollers. This allows the device to interface with both 3.3 V and 5 V-supplied microcontrollers, provided the microcontroller I/Os are 5 V tolerant.

9.4 Signal Improvement

Signal improvement is an additional capability added to CAN FD transceiver that enhances the maximum data rate achievable in complex star topologies by minimizing signal ringing. Signal ringing is the result of reflections caused by impedance mismatch at various points in a CAN network due to the nodes that act as stubs.

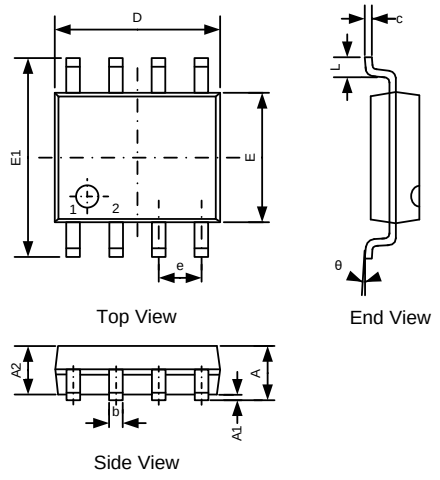
Recessive-to-dominant signal edge is usually clean as it is strongly driven by the transmitter. Transmitter output impedance of CAN transceiver is ≈ 50 Ω and matches to the network characteristic impedance. For a regular CAN FD transceiver, dominant-to-recessive edge is when the driver output impedance goes to ≈ 50 kΩ and signal reflected back experiences impedance mismatch which causes

ringing. UMCAN1462 resolves this issue by TX-based Signal improvement capability (SIC). The device continues to drive the bus recessive until $t_{SIC(TXD)BASE}$ so that reflections die down and recessive bit is clean at sampling point. In the active recessive phase, transmitter output impedance is low (≈ 100 Ω). After this phase is over and device goes to passive recessive phase, driver output impedance goes to high-Z. This phenomenon is explained with Figure 7-6.

10 Package Information

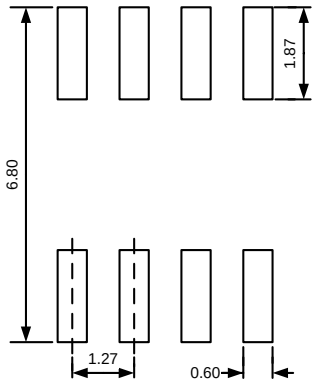
SOP8

Outline Drawing



Symbol	DIMENSIONS					
	MILLIMETERS			INCHES		
	Min	Typ	Max	Min	Typ	Max
A	1.35	1.55	1.75	0.053	0.061	0.069
A1	0.10	–	0.25	0.004	–	0.010
A2	1.25	–	1.65	0.049	–	0.065
b	0.30	–	0.51	0.012	–	0.020
c	0.15	–	0.25	0.006	–	0.010
D	4.70	4.90	5.10	0.185	0.193	0.200
E	3.80	3.90	4.00	0.150	0.154	0.157
E1	5.80	6.00	6.20	0.228	0.236	0.244
e	1.27BSC			0.050 BSC		
L	0.40	–	1.27	0.015	–	0.050
θ	0 °	–	8 °	0 °	–	8 °

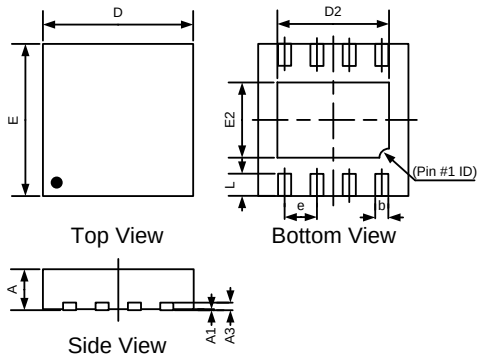
Land Pattern



NOTES:
1. Compound dimension: 4.90×3.90;
2. Unit: mm;
3. General tolerance ±0.05mm unless otherwise specified;
4. The layout is just for reference.

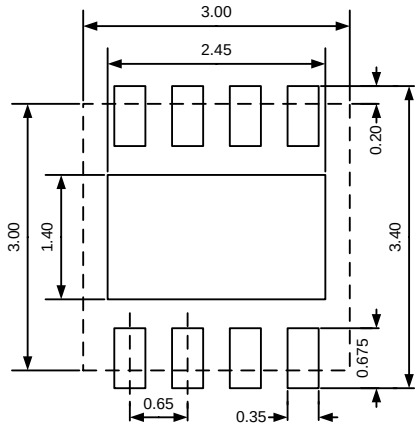
DFN8 3.0×3.0

Outline Drawing



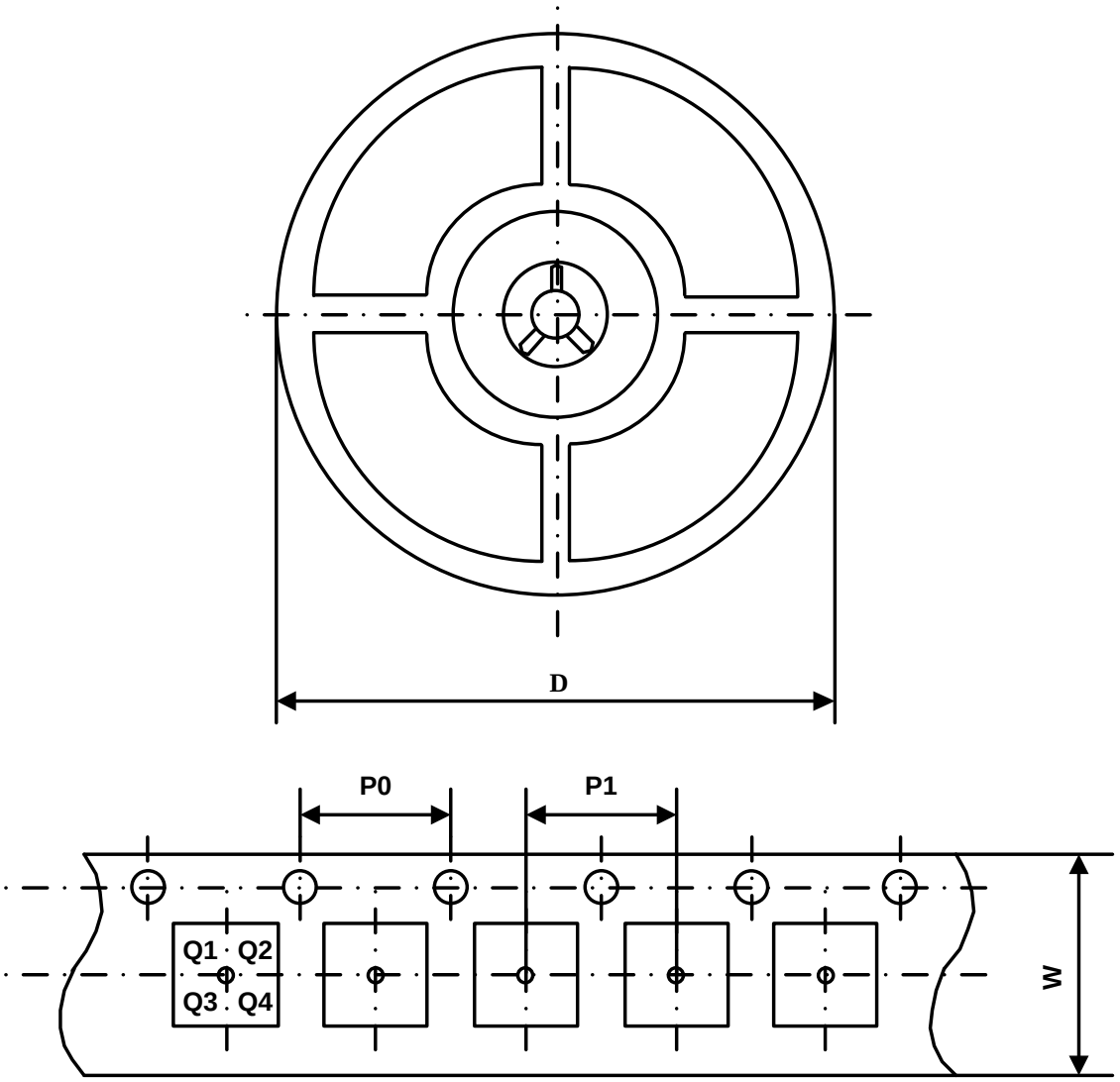
DIMENSIONS						
Symbol	MILLIMETERS			INCHES		
	Min	Typ	Max	Min	Typ	Max
A	0.57	-	0.80	0.022	-	0.031
A1	0.00	-	0.05	0.000	-	0.002
A3	0.20REF			0.008REF		
b	0.20	-	0.35	0.008	-	0.014
D	2.90	3.00	3.10	0.114	0.118	0.122
D2	2.15	-	2.55	0.085	-	0.100
E	2.90	3.00	3.10	0.114	0.118	0.122
E2	1.40	-	1.75	0.055	-	0.069
e	0.65BSC			0.026BSC		
L	0.30	-	0.60	0.012	-	0.024

Land Pattern



NOTES:
1. Compound dimension: 3.00×3.00;
2. Unit: mm;
3. General tolerance ±0.05mm unless otherwise specified;
4. The layout is just for reference.

Packing Information



Part Number	Package Type	Carrier Width (W)	Pitch (P0)	Pitch (P1)	Reel Size (D)	PIN 1 Quadrant
UMCAN1462VS8	SOP8	12 mm	4 mm	8 mm	330 mm	Q1
UMCAN1462VDA	DFN8 3.0×3.0	12 mm	4 mm	8 mm	330 mm	Q1
UMCAN1462NS8	SOP8	12 mm	4 mm	8 mm	330 mm	Q1
UMCAN1462NDA	DFN8 3.0×3.0	12 mm	4 mm	8 mm	330 mm	Q1

GREEN COMPLIANCE

Union Semiconductor is committed to environmental excellence in all aspects of its operations including meeting or exceeding regulatory requirements with respect to the use of hazardous substances. Numerous successful programs have been implemented to reduce the use of hazardous substances and/or emissions.
All Union components are compliant with the RoHS directive, which helps to support customers in their compliance with environmental directives. For more green compliance information, please visit:
http://www.union–ic.com/index.aspx?cat_code=RoHSDeclaration

IMPORTANT NOTICE

The information in this document has been carefully reviewed and is believed to be accurate. Nonetheless, this document is subject to change without notice. Union assumes no responsibility for any inaccuracies that may be contained in this document, and makes no commitment to update or to keep current the contained information, or to notify a person or organization of any update. Union reserves the right to make changes, at any time, in order to improve reliability, function or design and to attempt to supply the best product possible.

Union Semiconductor, Inc
Add: Unit 606, No.570 Shengxia Road, Shanghai 201210
Tel: 021–51093966
Fax: 021–51026018
Website: www.union–ic.com