High-Speed Isolated CAN Transceiver with ±70V Bus Fault Protection and Standby mode

UMISO1052H *WSOP16*
UMISO1472H *WSSOP10*

1 Description

The UMISO1052H and UMISO1472H are isolated CAN transceivers with up to ±70V CAN bus fault tolerant which are fully compatible with the ISO11898-2 standard. The devices have logic input and output buffers separated by a silicon oxide (SiO_2) insulation barrier that provides galvanic isolation of up to 5000 V_{RMS} for WSOP16 and WSSOP10 packages, which provides high electromagnetic immunity and low emissions.

The UMISO1052H and UMISO1472H differ in terms of pin configuration and package type. The UMISO1472H and the UMISO1052H feature standby mode and remote wake-up function. The data rate of the devices is up to 5Mbps. The device is designed for operation in especially harsh environments that feature cross-wire, overvoltage and loss of ground protection from -70V to 70V, as well as -30V to 30V common-mode range. The devices also provide thermal protection and transmit data dominant time out function.

The UMISO1052H is available in WSOP16 package. The UMISO1472H is available in WSSOP10 package. All devices operate over -40℃ to 125℃ temperature range.

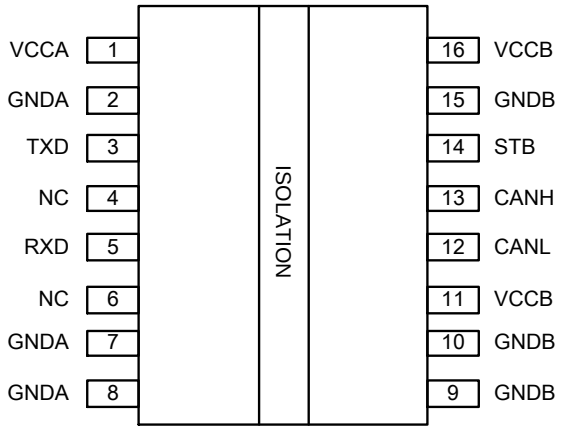
2 Features

- Fully compatible with the ISO11898-2 standard
- I/O voltage range supports 3.3 V and 5 V microprocessors
- Data rate: up to 5Mbps
- Standby mode
- Low loop delay: 180ns (typical)
- Integrated protection increases robustness
  - Up to 5000 V_{RMS} isolation rating (WSOP, WSSOP package)
  - ±200 kV/μs typical CMTI
  - High lifetime: >40 years
  - Transmit data (TXD) dominant time out function
  - Bus fault protection of -70V to +70V
  - Over current and over temperature protection
- Compliant with safety regulatory
  - DIN EN IEC 60747-17 (VDE 0884-17)
  - UL according to UL1577
  - IEC 61010-1 and GB 4943.1-2022
- Extended ambient temperature range: -40℃ to 125℃
- Available in WSOP16 and WSSOP10 packages

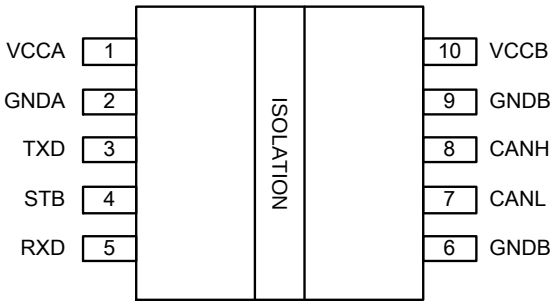
3 Applications

- Industrial Automation
- HVAC Automation
- Solar Inverter
- Medical Systems
- Motor Control
- Telcom

4 Functional Block Diagrams



UMISO1052H
WSOP16 package



UMISO1472H
WSSOP10 package

5 Ordering Information

Part Number	Marking Code	Isolation Rating (V_{RMS})	Package Type	Shipping Qty
UMISO1052HWSG	UMISO1052H	5000	WSOP16	1500pcs/13Inch Tape & Reel
UMISO1472HWAB	UMISO1472H	5000	WSSOP10	4000pcs/13Inch Tape & Reel

6 Pin Configuration and Function

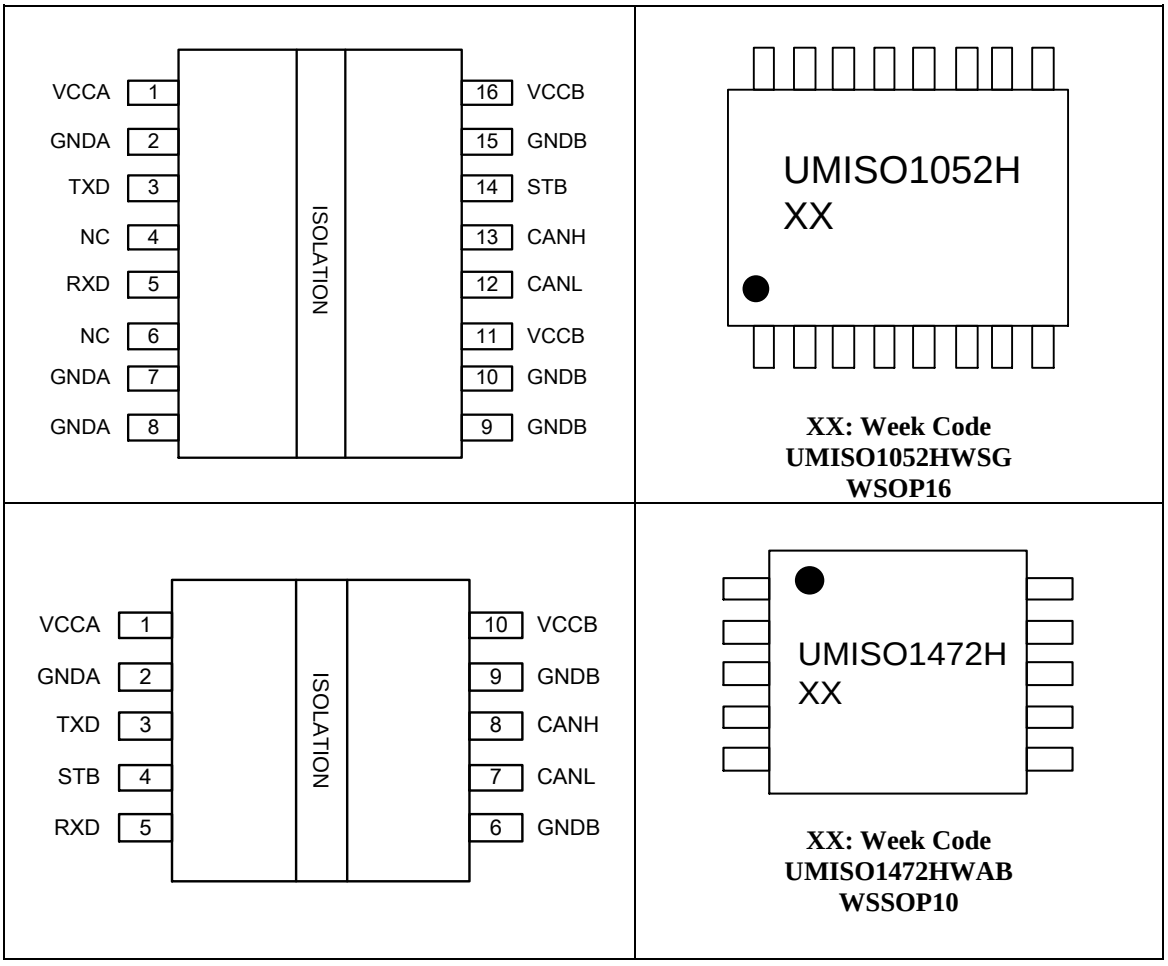


Table 6-1. Pin Functions

Pin Name	Function
VCCA	Power supply for isolator Logic side.
GNDA	Ground reference for isolator Logic side.
RXD	Receive data output.
TXD	Transmit data input.
STB	Standby mode control input.
NC	Not connected internally. Can be connected to supply, ground or left open on PCB.
GNDB	Ground reference for isolator Bus side.
CANL	Low-level CAN bus line.
CANH	High-level CAN bus line.
VCCB	Power supply for isolator Bus side. All VCCB pins must be powered by a common supply on PCB.

7 Specifications

7.1 Absolute Maximum Ratings (Note 1, 2)

Symbol	Parameter		Min	Typ	Max	Unit
V_{CCA}	Power supply for isolator Logic side		-0.5		6.5	V
V_{CCB}	Power supply for isolator Bus side		-0.5		6.5	V
V_{BUS}	Voltage range on CANH, CANL		-70		70	V
V_I	Voltage range on TXD, STB (Note 3)		-0.5		V_{CCX}+0.5	V
V_O	Voltage range on RXD (Note 3)		-0.5		V_{CCX}+0.5	V
V_{ESD}	Human body model (HBM), per ANSI/ESDA/JEDEC JS-001	All pins		±8		kV
	Contact discharge, per IEC 61000-4-2	Bus terminals to GNDB		±8		kV
I_{LU}	Latch up, per JEDEC JESD78			±200		mA
T_J	Junction temperature				150	℃
T_{STG}	Storage temperature		-65		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_{CCX} is the pin-side supply V_{CC}. Maximum voltage must not exceed 6.5 V.

7.2 Recommended Operating Conditions

Symbol	Parameter	Min	Typ	Max	Unit
V_{CCA}	Power supply for isolator Logic side	3.0		5.5	V
V_{CCB}	Power supply for isolator Bus side	4.5		5.5	V
V_{IH}	Input High Voltage for TXD , STB (Note1)	0.7V_{CCX}			V
V_{IL}	Input Low Voltage for TXD , STB (Note1)			0.3V_{CCX}	V
T_A	Ambient temperature	-40		125	℃

Note 1: V_{CCX} is the pin-side supply V_{CC}.

7.3 Thermal Information

Symbol	Parameter		Value	Unit
$R_{\theta JA}$	Junction to ambient thermal resistance	WSOP16	82	°C/W
		WSSOP10	99	°C/W

7.4 Insulation Specifications

Symbol	Parameter	Conditions	Value		Unit
			WSOP16	WSSOP10	
CLR	External clearance	Shortest terminal-to-terminal distance through air	8	8	mm
CPG	External creepage	Shortest terminal-to-terminal distance across the package surface	8	8	mm
DTI	Distance through the insulation	Minimum internal gap (internal clearance)	>20	>20	μm
CTI	Comparative tracking index	DIN EN 60112 (VDE 0303-11); IEC 60112	>600	>600	V
	Material group	Per IEC 60664-1	I	I	
	Overvoltage category per IEC 60664-1	Rated mains voltage ≤ 150 V_{RMS}	I-IV	I-IV	
		Rated mains voltage ≤ 300 V_{RMS}	I-IV	I-IV	
		Rated mains voltage ≤ 600 V_{RMS}	I-IV	I-IV	
		Rated mains voltage ≤ 1000 V_{RMS}	I-II	I-II	
DIN V VDE V 0884-17:2021-10 (Note 1)					
V_{IORM}	Maximum repetitive peak isolation voltage	AC voltage (bipolar)	1414	1414	V_{PK}
V_{IOWM}	Maximum operating isolation voltage	AC voltage; time-dependent dielectric breakdown (TDDB) test	1000	1000	V_{RMS}
		DC voltage	1414	1414	V_{DC}
V_{IOTM}	Maximum transient isolation voltage	$V_{TEST} = V_{IOTM}$, t = 60 s (certified); $V_{TEST} = 1.2 \times V_{IOTM}$, t = 1 s (100% product test)	7070	7070	V_{PK}
V_{IMP}	Maximum impulse voltage	Tested in air, 1.2/50 μs waveform per IEC 62368-1,	7500	7500	V_{PK}
V_{IOSM}	Maximum surge isolation voltage	$V_{IOSM} \geq 1.3 \times V_{IMP}$; Tested in oil (qualification test), 1.2/50 μs waveform per IEC 62368-1	10000	10000	V_{PK}

7.4 Insulation Specifications (Continued)

Symbol	Parameter	Conditions	Value		Unit
			WSOP16	WSSOP10	
q_{pd}	Apparent charge (Note 2)	Method a, after input/output safety test of the subgroup 2/3, $V_{ini} = V_{IOTM}$, t_{ini} = 60 s; $V_{pd(m)} = 1.2 \times V_{IORM}$, t_m = 10 s	≤5	≤5	pC
		Method a, after environmental test of the subgroup 1, $V_{ini} = V_{IOTM}$, t_{ini} = 60 s; $V_{pd(m)} = 1.3 \times V_{IORM}$, t_m = 10 s	≤5	≤5	pC
		Method b, at routine test (100% production test) and preconditioning (type test) $V_{ini} = 1.2 \times V_{IOTM}$, t_{ini} = 1 s; $V_{pd(m)} = 1.875 \times V_{IORM}$ (for reinforced devices) or $V_{pd(m)} = 1.5 \times V_{IORM}$ (for basic devices), t_m = 1 s (method b1) or $V_{pd(m)} = V_{ini}$, $t_m = t_{ini}$ (method b2)	≤5	≤5	pC
C_{IO}	Barrier capacitance, input to output (Note 3)	V_{IO} = 0.4 × sin (2πft), f = 1 MHz	1.0	1.0	pF
R_{IO}	Isolation resistance (Note 3)	V_{IO} = 500 V, T_A = 25 ℃	$>10^{12}$	$>10^{12}$	Ω
		V_{IO} = 500 V, 100 ℃ ≤ T_A ≤ 125 ℃	$>10^{11}$	$>10^{11}$	
		V_{IO} = 500 V at T_S = 150 ℃	$>10^{9}$	$>10^{9}$	
	Pollution degree		2	2	
UL 1577					
V_{ISO}	Maximum withstanding isolation voltage	$V_{TEST} = V_{ISO}$, t = 60s (qualification) $V_{TEST} = 1.2 \times V_{ISO}$, t = 1 s (100% production test)	5000	5000	V_{RMS}

Note 1: This coupler is suitable for "safe electrical insulation" only within the safety ratings. Compliance with the safety ratings shall be ensured by means of suitable protective circuits.
Note 2: The characterization charge is discharging charge (pd) caused by partial discharge.
Note 3: Capacitance and resistance are measured with all pins on field-side and logic-side tied together.

7.5 Electrical Characteristics

T_J = -40℃ to 150℃, V_{CCA} = 3.0 V to 5.5 V, V_{CCB} = 4.5 V to 5.5 V, R_L = 60Ω, C_L = 100pF (unless otherwise noted). Typical values are at V_{CCA} = 3.3 V, V_{CCB} = 5 V, T_A = 25℃.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Power supply						
I_{CCA}	Supply current logic side	V_{TXD} = V_{CCA}, V_{CCA} = 5.0 V		1.3	3.6	mA
I_{CCA}	Supply current logic side	V_{TXD} = 0 V, V_{CCA} = 5.0 V		2.3	4.5	mA
I_{CCB}	Supply current bus side	V_{STB} = 0 V, V_{TXD} = 0 V, bus dominant, R_L = 60 Ω		48	73	mA
I_{CCB}	Supply current bus side	V_{STB} = 0 V, V_{TXD} = V_{CCA}		5.9	12	mA
I_{CCB}	Supply current bus side (Note 1)	V_{STB} = V_{CCX}, V_{TXD} = V_{CCA}		1.3	3.6	mA
$V_{CCA(UVLO)RIS}$	Rising undervoltage detection, V_{CCA}		2.6	2.7	2.9	V
$V_{CCA(UVLO)FAL}$	Falling undervoltage detection, V_{CCA}		2.4	2.6	2.7	V
$V_{CCB(STB)RIS}$	Rising standby undervoltage detection,		3.2	3.75	4.5	V
$V_{CCB(STB)FAL}$	Falling standby undervoltage detection,		3.0	3.55	4.3	V
$V_{CCB(UVLO)RIS}$	Rising undervoltage detection, V_{CCB}		2.6	2.7	2.9	V
$V_{CCB(UVLO)FAL}$	Falling undervoltage detection, V_{CCB}		2.4	2.6	2.7	V
Standby mode control input; pin STB						
V_{IH}	High-level input voltage (Note 1)		0.7V_{CCX}			V
V_{IL}	Low-level input voltage (Note 1)				0.3V_{CCX}	V
I_{IH}	High-level input current (Note 1)	STB = V_{CCX}			10	uA
I_{IL}	Low-level input current	STB = 0 V	-10			uA
CAN transmit data input; pin TXD						
V_{IH}	High-level input voltage		0.7V_{CCA}			V
V_{IL}	Low-level input voltage				0.3V_{CCA}	V
I_{IH}	High-level input current	TXD = V_{CCA}			10	uA
I_{IL}	Low-level input current	TXD = 0 V	-10			uA
C_I	Input capacitance			5	10	pF

7.5 Electrical Characteristics (continued)

T_J = -40℃ to 150℃, V_{CCA} = 3.0 V to 5.5 V, V_{CCB} = 4.5 V to 5.5 V, R_L = 60Ω, C_L = 100pF (unless otherwise noted). Typical values are at V_{CCA} = 3.3 V, V_{CCB} = 5 V, T_A = 25℃.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
CAN receive data output; pin RXD						
V_{OH}	High level output voltage	I_{OH} = -4mA, see figure 8-6	V_{CCA} -0.4	V_{CCA} -0.2		V
		I_{OH} = -20uA, see figure 8-6	V_{CCA} -0.1	V_{CCA}		V
V_{OL}	Low level output voltage	I_{OL} = 4mA, see figure 8-6		0.2	0.4	V
		I_{OL} = 20uA, see figure 8-6		0	0.1	V
Driver						
$V_{O(DOM)}$	Dominant output voltage	V_{STB} = 0 V, TXD = 0V; t< $t_{DTO(TXD)}$ V_{CC} = 4.75V to 5.25V R_L = 60 Ω; pin CANH, see figure 8-1 and 8-2	2.75	3.5	4.5	V
		V_{STB} = 0 V, TXD = 0V; t< $t_{DTO(TXD)}$ V_{CC} = 4.75V to 5.25V R_L = 60 Ω; pin CANL, see figure 8-1 and 8-2	0.5	1.5	2.25	V
$V_{OD(DOM)}$	Dominant differential output voltage	V_{STB} = 0 V, TXD = 0V; t< $t_{DTO(TXD)}$ V_{CC} = 4.75V to 5.25V 50 Ω ≤ R_L ≤ 65 Ω, see figure 8-1 and 8-2	1.5		3	V
		V_{STB} = 0 V, TXD = 0V; t< $t_{DTO(TXD)}$ V_{CC} = 4.75V to 5.25V 45 Ω ≤ R_L ≤ 70 Ω, see figure 8-1 and 8-2	1.4		3.3	V
		V_{STB} = 0 V, TXD = 0V; t< $t_{DTO(TXD)}$ V_{CC} = 4.75V to 5.25V R_L = 2240 Ω, see figure 8-1 and 8-2	1.5		5	V
$V_{O(REC)}$	Recessive output voltage	V_{STB} = 0 V, TXD = V_{CCA}; R_L = 60 Ω, see figure 8-1 and 8-2	2	2.5	3	V
$V_{OD(REC)}$	Recessive differential output voltage	V_{STB} = 0 V, TXD = V_{CCA}; R_L = open	-100		100	mV
		V_{STB} = 0 V, TXD = V_{CCA}; R_L = 60 Ω, see figure 8-1 and 8-2	-50		50	mV

7.5 Electrical Characteristics (continued)

T_J = -40℃ to 150℃, V_{CCA} = 3.0 V to 5.5 V, V_{CCB} = 4.5 V to 5.5 V, R_L = 60Ω, C_L = 100pF (unless otherwise noted). Typical values are at V_{CCA} = 3.3 V, V_{CCB} = 5 V, T_A = 25℃.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Driver						
$V_{OC(DOM)}$	Common-mode output voltage (Dominant)	See figure 8-7	2	2.5	3	V
$V_{OC(PP)}$	Peak-to-peak common-mode output voltage	See figure 8-7		0.3		V
$I_{OS(DOM)}$	Dominant short-circuit output current	V_{STB} = 0 V, TXD = 0 V; CANH = -15 V to 40 V; CANL = open	-100	-75		mA
		V_{STB} = 0 V, TXD = 0 V; CANL = -15 V to 40 V; CANH = open		75	100	mA
$I_{OS(REC)}$	Recessive short-circuit output current	V_{STB} = 0 V, TXD = V_{CCA}; -27 V ≤ CANH = CANL ≤ 32 V	-5		5	mA
Receiver						
V_{TH}	Differential receiver threshold voltage	V_{STB} = 0 V, -30 V ≤ CANH, CANL ≤ 30 V	0.5		0.9	V
$V_{ID(DOM)}$	Receiver dominant voltage	V_{STB} = 0 V, -30 V ≤ CANH, CANL ≤ 30 V	0.9		9	V
$V_{ID(REC)}$	Receiver recessive voltage	V_{STB} = 0 V, -30 V ≤ CANH, CANL ≤ 30 V	-4		0.5	V
V_{HYS}	Differential receiver hysteresis voltage	V_{STB} = 0 V, -30 V ≤ CANH, CANL ≤ 30 V	50		300	mV
$V_{TH（STB）}$	Differential receiver threshold voltage (Note 1)	V_{STB} = V_{CCX}, -30 V ≤ CANH, CANL ≤ 30 V	0.4		1.15	V
$V_{ID(DOM)STB}$	Receiver dominant voltage (Note 1)	V_{STB} = V_{CCX}, -30 V ≤ CANH, CANL ≤ 30 V	1.15		9	V
$V_{ID(REC)STB}$	Receiver recessive voltage (Note 1)	V_{STB} = V_{CCX}, -30 V ≤ CANH, CANL ≤ 30 V	-4		0.4	V
R_I	Input resistance	V_{STB} = 0 V, TXD = V_{CCA};	15	30	40	kΩ
ΔR_I	Input resistance deviation, [1 – ($R_{IN(CANH)}$ / $R_{IN(CANL)}$)] × 100 %	V_{STB} = 0 V, TXD = V_{CCA};	-3		3	%
R_{ID}	Differential input resistance	V_{STB} = 0 V, TXD = V_{CCA};	30	60	80	kΩ
C_{IN}	Common-mode input capacitance to ground			20		pF
C_{ID}	Differential input capacitance			10		pF

7.5 Electrical Characteristics (continued)

T_J = -40℃ to 150℃, V_{CCA} = 3.0 V to 5.5 V, V_{CCB} = 4.5 V to 5.5 V, R_L = 60Ω, C_L = 100pF (unless otherwise noted). Typical values are at V_{CCA} = 3.3 V, V_{CCB} = 5 V, T_A = 25℃.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
CMTI	Common-mode transient immunity	V_I = V_{CCA} or 0 V, V_{CM} = 1200 V, see figure 8-12	±150	±200		kV/μs
Thermal Protection						
$T_{J(SD)}$	Thermal shutdown threshold	Temperature rising		185		℃

Note 1: V_{CCX} is the pin-side supply V_{CC}.

7.6 Switching Characteristics

T_J = -40℃ to 150℃, V_{CCA} = 3.0 V to 5.5 V, V_{CCB} = 4.5 V to 5.5 V, R_L = 60Ω, C_L = 100pF (unless otherwise noted). Typical values are at V_{CCA} = 3.3 V, V_{CCB} = 5 V, T_A = 25℃.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Device switching characteristics						
$t_{PROP(LOOP1)}$	Total loop delay, driver input TXD to receiver RXD, recessive to dominant	See figure 8-8	90	180	255	ns
$t_{PROP(LOOP2)}$	Total loop delay, driver input TXD to receiver RXD, dominant to recessive	See figure 8-8	90	180	255	ns
Driver switching characteristics						
t_{PLH}	Propagation delay time, recessive to dominant output	See figure 8-4		85	110	ns
t_{PHL}	Propagation delay time, dominant to recessive output			80	110	ns
t_R	Differential output signal rise time			25	50	ns
t_F	Differential output signal fall time			35	63	ns
$t_{DTO(TXD)}$	TXD dominant time-out time	C_L = 100pF, see figure 8-9	0.8	2.6	6.5	ms
Receiver switching characteristics						
t_{PLH}	Propagation delay time, low to high level output	See figure 8-6		95	130	ns
t_{PHL}	Propagation delay time, high to low level output			93	130	ns
t_R	Output signal rise time(RXD)			2.6	6	ns
t_F	Output signal rise time(RXD)			2	6	ns
FD timing parameters, see figure 8-11						
$t_{BIT(BUS)}$	Transmitted recessive bit width	$t_{BIT(TXD)}$ = 500ns	435		530	ns
		$t_{BIT(TXD)}$ = 200ns	155		210	ns
$t_{BIT(RXD)}$	Bit time on pin RXD	$t_{BIT(TXD)}$ = 500ns	400		550	ns
		$t_{BIT(TXD)}$ = 200ns	120		220	ns
Δt_{REC}	Receiver timing symmetry	$t_{BIT(TXD)}$ = 500ns	-65		40	ns
		$t_{BIT(TXD)}$ = 200ns	-45		15	ns

7.6 Switching Characteristics (continued)

T_J = -40℃ to 150℃, V_{CCA} = 3.0 V to 5.5 V, V_{CCB} = 4.5 V to 5.5 V, R_L = 60Ω, C_L = 100pF (unless otherwise noted). Typical values are at V_{CCA} = 3.3 V, V_{CCB} = 5 V, T_A = 25℃.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Bus wake-up times; pins CANH and CANL, see figure 9-1						
$t_{WK(BUSDOM)}$	Bus dominant wake-up time	STB = V_{CCX} (Note 1)	0.5		1.8	us
$t_{WK(BUSREC)}$	Bus recessive wake-up time	STB = V_{CCX} (Note 1)	0.5		1.8	us
$t_{TO(WK)BUS}$	Bus wake-up time-out time	STB = V_{CCX} (Note 1)	0.8		9	ms
$t_{FLTR(WK)BUS}$	Bus wake-up filter time	STB = V_{CCX} (Note 1)			1.8	us
$t_{STARTUP(RXD)}$	RXD start-up time	After wake-up detected; (Note 2)	4		20	us

Note 1: V_{CCX} is the pin-side supply V_{CC}.
Note 2: When a wake-up is detected, RXD start-up time is between the min and max values. RXD cannot be relied on below the min value; RXD can be relied on above the max value; see Figure 9-1.

8 Parameter Measurement Information

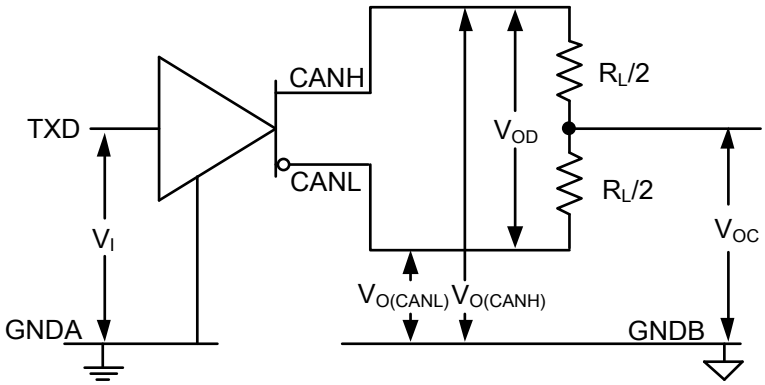


Figure 8-1. Driver Voltage, Current and Test Definitions

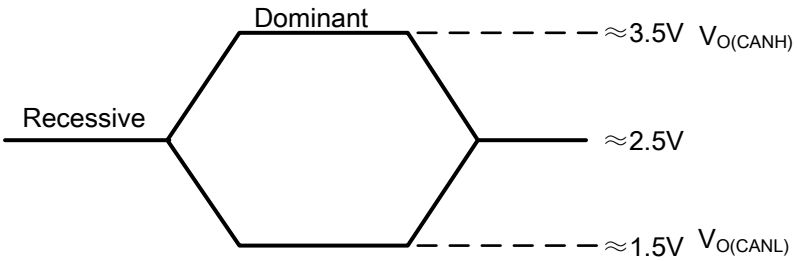


Figure 8-2. Bus Logic State Voltage Definitions

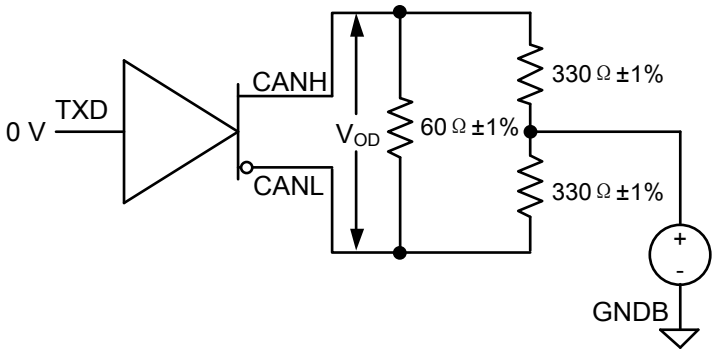
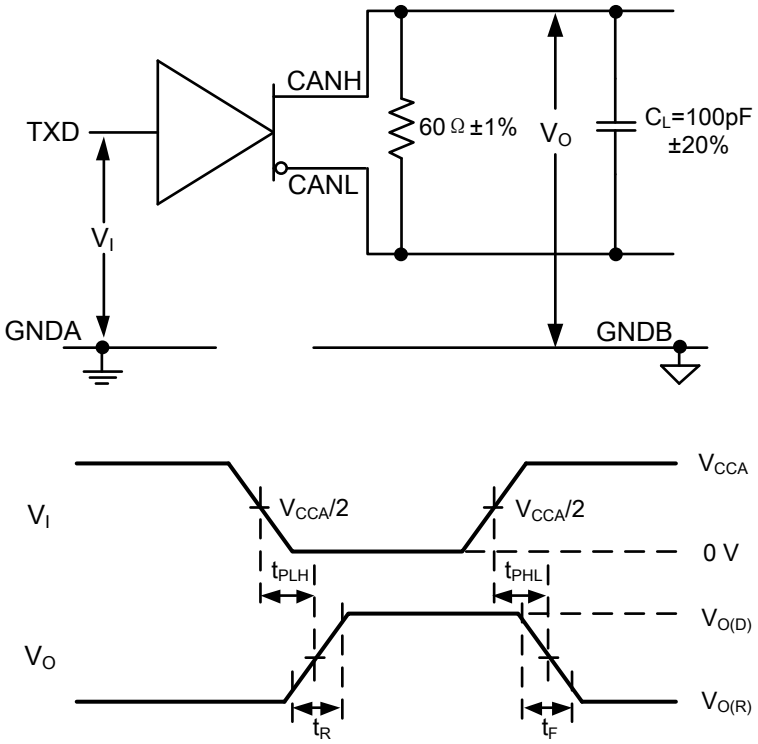


Figure 8-3. Driver V_{OD} with Common-Mode Loading Test Circuit

8 Parameter Measurement Information (continued)



Note 1: The input pulse is supplied by a generator having the following characteristics: PRR≤125 kHz, 50% duty cycle, t_R≤6 ns, t_F≤6 ns, Z_O = 50 Ω.
Note 2: C_L includes instrumentation and fixture capacitance within ±20%.

Figure 8-4. Driver Test Circuit and Voltage Waveforms

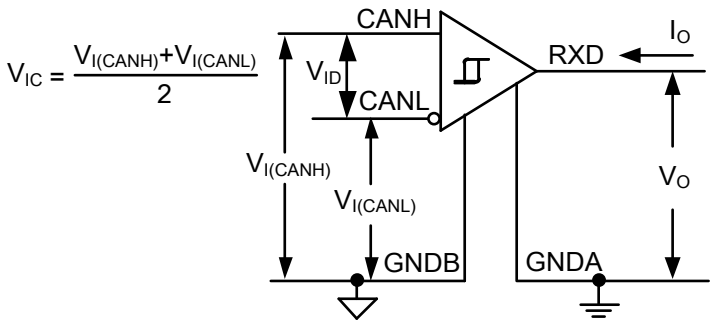
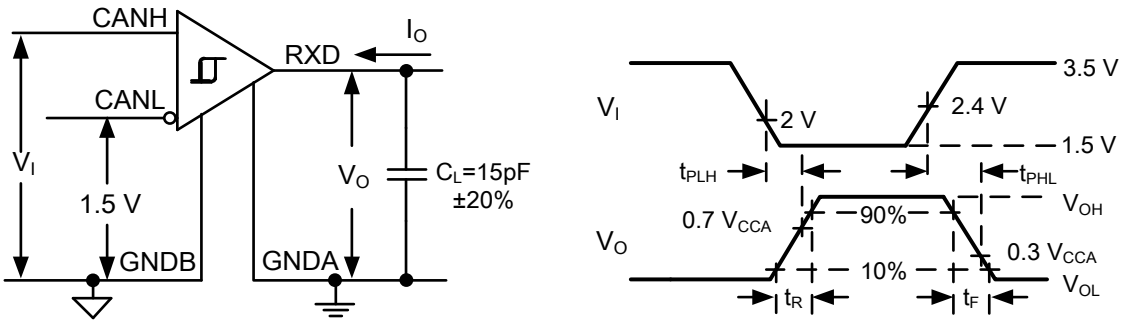


Figure 8-5. Receiver Voltage and Current Definitions

8 Parameter Measurement Information (continued)



Note 1: The input pulse is supplied by a generator having the following characteristics: PRR≤125 kHz, 50% duty cycle, t_R≤6 ns, t_F≤6 ns, Z_O = 50 Ω.
Note 2: C_L includes instrumentation and fixture capacitance within ±20%.

Figure 8-6. Receiver Test Circuit and Voltage Waveforms

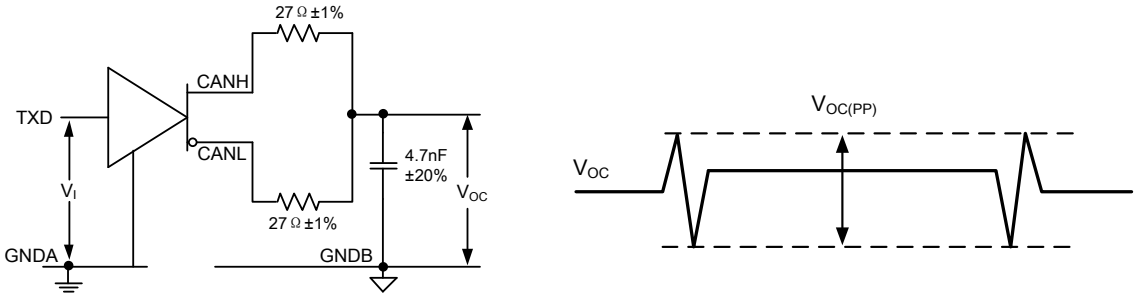


Figure 8-7. Peak-to-Peak Output Voltage Test Circuit and Waveform

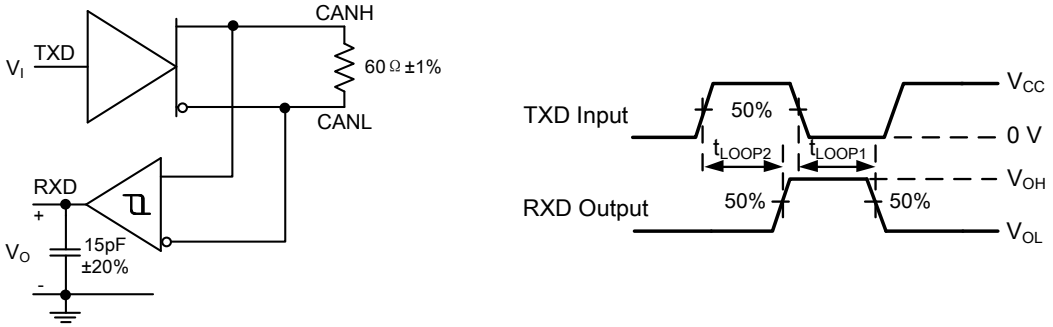


Figure 8-8. t_{LOOP} Test Circuit and Voltage Waveforms

8 Parameter Measurement Information (continued)

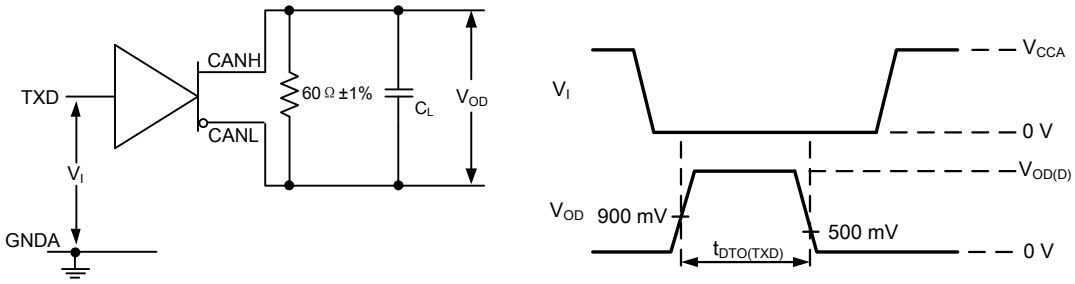


Figure 8-9. Dominant Time-out Test Circuit and Voltage Waveforms

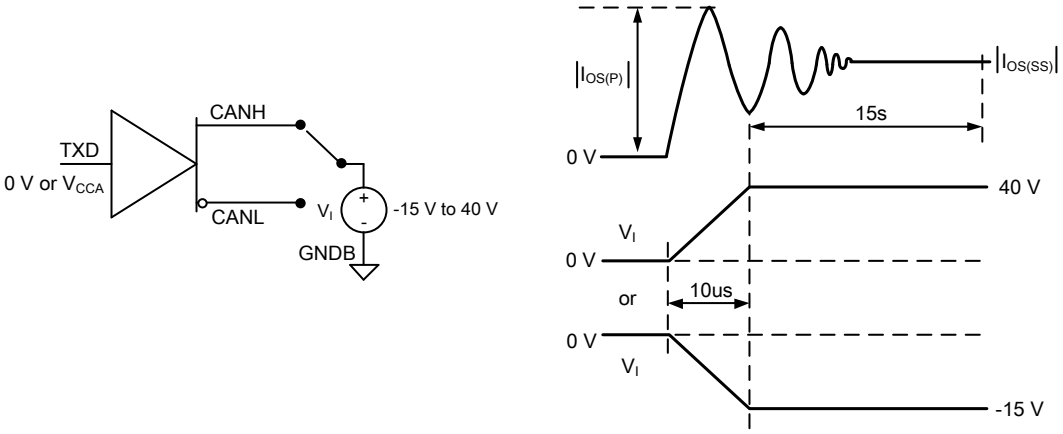


Figure 8-10. Driver Short-Circuit Current Test Circuit and Waveforms

8 Parameter Measurement Information (continued)

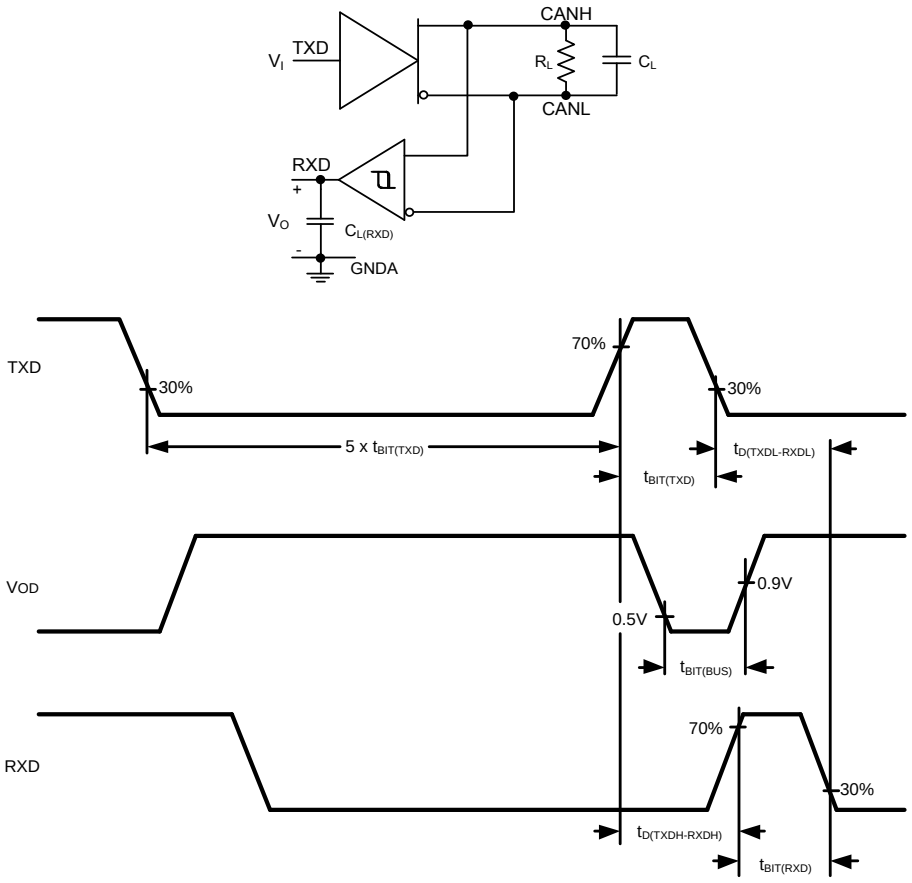
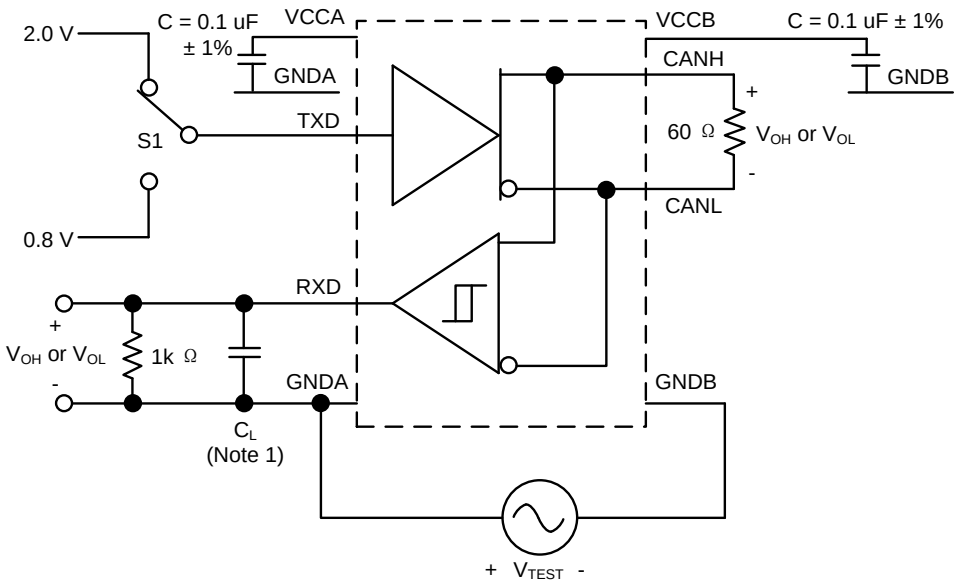


Figure 8-11. CAN FD Timing Parameter Measurement



Note 1: C_L includes probe and jig capacitance.

Figure 8-12. Common-Mode Transient Immunity Test Circuit

9 Detailed Description

9.1 Overview

The UMISO1052H and UMISO1472H are isolated CAN transceivers which provide galvanic isolation of up to 5000 V_{RMS} (WSOP16/WSSOP10 package), and which is fully compatible with the ISO11898-2 standard. Additionally, the device can achieve efficient and stable communication across isolation barrier with ±200kV/μs CMTI and up to 5 Mbps data rate. The logic side power supply is 3.0V to 5.5V which makes the devices ideal for communication with the microcontroller in applications like solar inters, motor control and HVAC systems. The device is designed for operation in especially harsh environments that feature cross-wire, overvoltage and loss of ground protection from -70 V to 70 V, as well as -30V to 30V common-mode range. The devices also feature thermal protection and transmit data dominant time out function.

9.2 Normal mode

A LOW level on pin STB selects Normal mode ($V_{CCB} > V_{CCB(STB)RIS}$). In this mode, the transceiver can 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 on pin RXD. The slopes of the output signals on the bus lines are controlled internally and are optimized in a way that guarantees the lowest possible EME.

The CAN bus has two states during operation: dominant and recessive. A dominant bus state, equivalent to logic low, is when the bus is driven differentially by a driver. A recessive bus state, equivalent to a logic high, is when the bus is biased to a common mode of $V_{CCB}/2$.

Table 9-1. Driver Function Table (Note 1)

V_{CCA}	V_{CCB}	Input	TXD Low-Level Time	Outputs		Bus State
		TXD		CANH	CANL	
Power On	Power On	L	$< t_{DTO(TXD)}$	H	L	Dominant state
		L	$> t_{DTO(TXD)}$	$V_{CCB}/2$	$V_{CCB}/2$	Recessive state
		H or Open	X	$V_{CCB}/2$	$V_{CCB}/2$	Recessive state
Power On	Power Down	X	X	Z	Z	Z
Power Down	Power On	X	X	$V_{CCB}/2$	$V_{CCB}/2$	Recessive state

Note 1: X = Don't care, H = high level, L = low level, Z = high impedance.

Table 9-2. Receiver Function Table (Note 1)

$V_{ID} = V_{CANH}-V_{CANL}$	Bus State	RXD
$V_{ID} \geq 0.9V$	Dominant state	L
$0.5V < V_{ID} < 0.9V$	Indeterminate	Indeterminate
$V_{ID} \leq 0.5V$	Recessive state	H
Open	Open	H

Note 1: X = Don't care, H = high level, L = low level, Z = high impedance.

9.3 Standby Mode

A HIGH level on pin STB selects Standby mode ($V_{CCB} > V_{CCB(STB)RIS}$). The devices also switch to Standby mode when an undervoltage is detected on V_{CCB} ($V_{CCB(UVLO)RIS} < V_{CCB} < V_{CCB(STB)FAL}$). In Standby mode, the transceiver is not able to transmit or correctly receive data via the bus lines. The transmitter and Normal mode receiver 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. Pin RXD follows the bus after a wake-up request has been detected.

9.4 Remote wake-up (via the CAN bus)

The UMISO1052H/UMISO1472H wakes up from Standby mode when a dedicated wake-up pattern 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 UMISO1052H/UMISO1472H 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 device switches to Normal mode
- The complete wake-up pattern was not received within $t_{TO(WK)BUS}$
- A V_{CC} undervoltage is detected

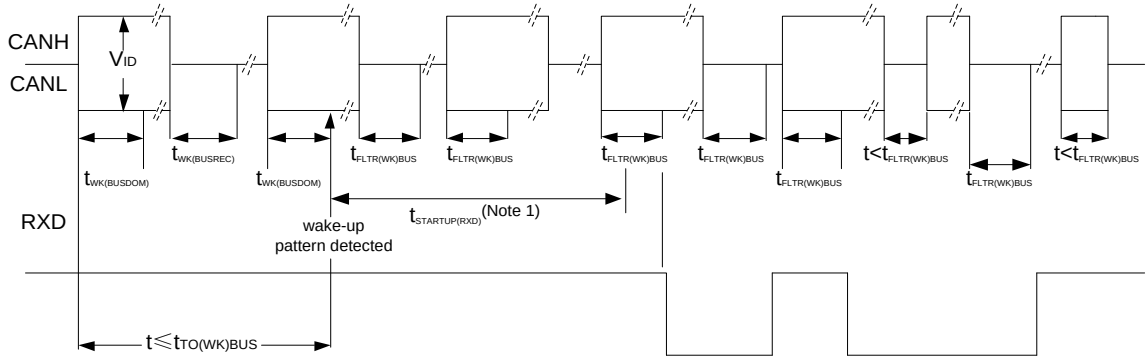


Figure 9-1. Wake-up Timing

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.

9.5 Fail-Safe Features

9.5.1 TXD dominant time-out function

A 'TXD dominant time-out' timer is started when pin TXD is set LOW. If the LOW state on pin TXD persists for longer than $t_{DTO(TXD)}$, 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.

9.5.2 Overtemperature protection

The output drivers are protected against overtemperature conditions. If the operating junction temperature exceeds the shutdown junction temperature, $T_{J(SD)}$, the output drivers will be disabled until the operating junction temperature falls below $T_{J(SD)}$ and TXD becomes recessive again. Including the TXD condition ensures that output driver oscillations due to temperature drift are avoided.

10 Application Information

10.1 Typical Application

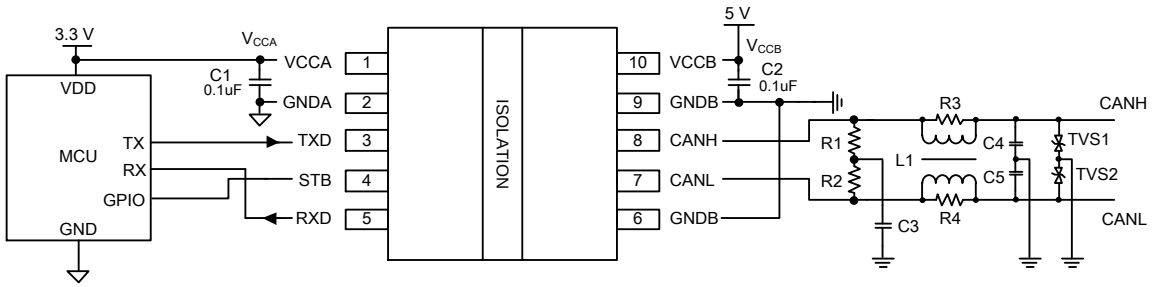
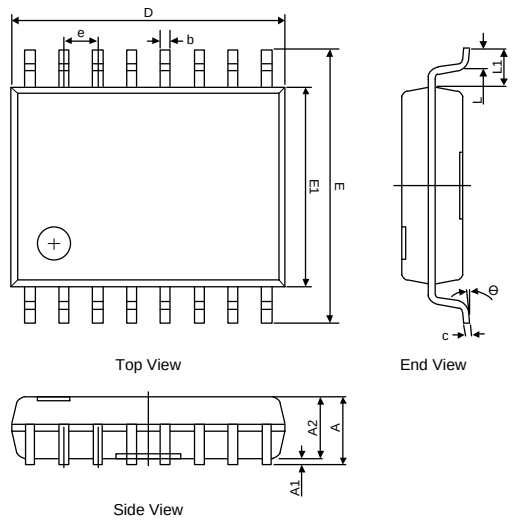


Figure 10-1. UMISO1472H Application Circuit

11 Package Information

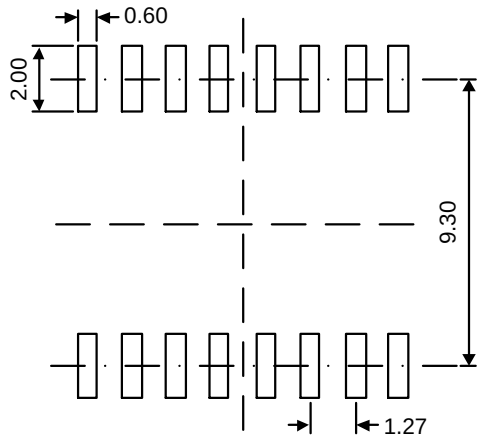
WSOP16

Outline Drawing



DIMENSIONS						
Symbol	MILLIMETERS			INCHES		
	Min	Typ	Max	Min	Typ	Max
A	-	-	2.65	-	-	0.104
A1	0.10	-	0.30	0.004	-	0.012
A2	2.25	-	2.35	0.089	-	0.093
b	0.35	-	0.43	0.014	-	0.017
c	0.24	-	0.29	0.009	-	0.011
D	10.2	10.3	10.4	0.402	0.406	0.409
E	10.1	10.3	10.5	0.398	0.406	0.413
E1	7.4	7.5	7.6	0.291	0.295	0.299
e	1.27BSC			0.050 BSC		
L	0.55	-	0.85	0.022	-	0.033
L1	1.40REF			0.060REF		
θ	0 °	-	8 °	0 °	-	8 °

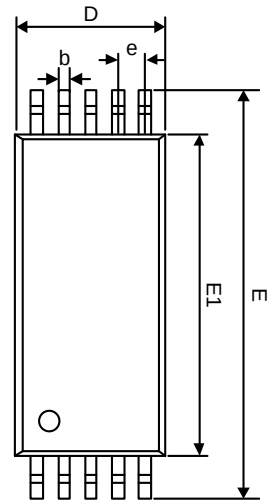
Land Pattern



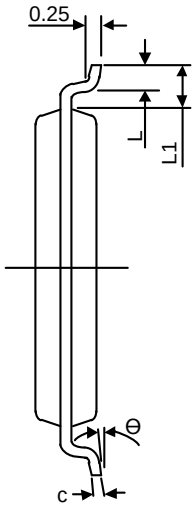
NOTES:
1. Unit: mm;
2. General tolerance ±0.05mm unless otherwise specified;
3. The layout is just for reference.

WSSOP10

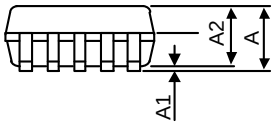
Outline Drawing



Top View



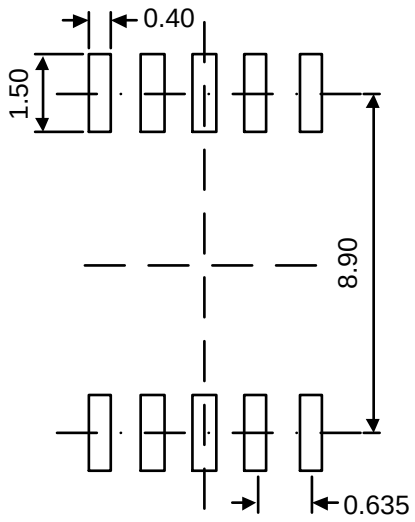
End View



Side View

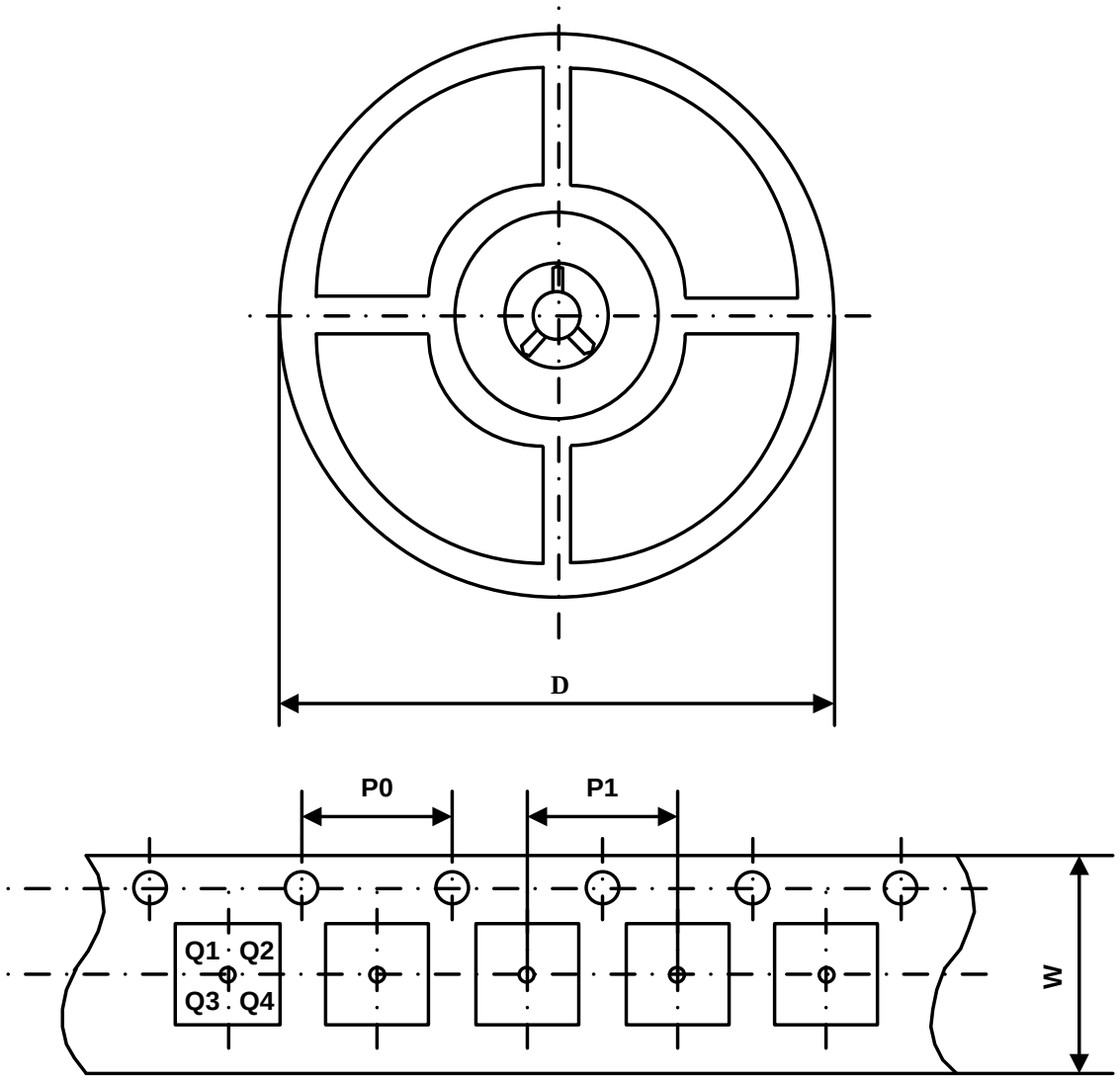
DIMENSIONS						
Symbol	MILLIMETERS			INCHES		
	Min	Typ	Max	Min	Typ	Max
A	-	-	1.65	-	-	0.066
A1	0.05	-	0.20	0.002	-	0.008
A2	1.35	1.40	1.45	0.054	0.056	0.058
b	0.23	-	0.31	0.009	-	0.013
c	0.20	-	0.24	0.008	-	0.009
D	3.40	3.50	3.60	0.136	0.140	0.144
E	9.30	9.50	9.70	0.372	0.380	0.388
E1	7.40	7.50	7.60	0.296	0.300	0.304
e	0.635BSC			0.0254BSC		
L	0.45	-	0.75	0.018	-	0.030
L1	1.00REF			0.040REF		
θ	0°	-	7°	0°	-	7°

Land Pattern



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

12 Packing Information



Part Number	Package Type	Carrier Width (W)	Pitch (P0)	Pitch (P1)	Reel Size (D)	PIN 1 Quadrant
UMISO1052HWSG	WSOP16	16 mm	4 mm	12 mm	330 mm	Q1
UMISO1472HWAB	WSSOP10	16 mm	4 mm	8 mm	330 mm	Q2

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