

Dual-channel Local Interconnect Network (LIN) transceiver

1. Features

- **AEC-Q100 Qualified for Automotive Application**
- **Meets LIN2.0、LIN2.1、LIN2.2、LIN2.2A and ISO 17987-4:2016(12V) Physical-layer (EPL) Standards**
- **Compliant to SAE J2602-1 and SAE J2602-2 LIN Physical-layer Specification**
- **Designed to Support 12V Applications with Wide Operating Supply Range:**
 - ◆ 5V to 28V supply range (V_{BAT})
- **Support up to 20kbps LIN Transmission Data Rate**
- **Operating Mode:**
 - ◆ Normal operation
 - ◆ Low-power Standby
 - ◆ Low-power Sleep
- **Wake-up from Low-power Mode:**
 - ◆ Remote wake-up via LINx bus
 - ◆ wake-up via SLPx_N pins
- **Integrated 30kΩ LIN pull-up Resistor**
- **Power-up/down Glitch-free Operation on LIN bus and RXD output**
- **Integrated Protection Increases Robustness**
 - ◆ $\pm 42V$ fault-tolerant LIN bus
 - ◆ 42V load dump protection
 - ◆ Enhanced ESD protection
 - ◆ Undervoltage protection on V_{BAT}
 - ◆ Transmitter dominant timeout prevents lockup
 - ◆ LINx bus short circuit protection functions.
 - ◆ TXDx dominant time-out function
 - ◆ Initial TXDx dominant check when switching to Normal mode
 - ◆ Thermal shutdown
 - ◆ System level fail-safe protection for the unpowered node or ground disconnection
- **Initial TXD dominant check when switching to Normal mode**
- **$-40^{\circ}C$ to $150^{\circ}C$ Junction Temperatures Range**
- **Available in SOIC14, DFN14 and QFN24 Packages**

2. Applications

- Body electronics
- Automotive gateway
- Infotainment and cluster

- Hybrid electric vehicles and powertrain systems

3. General Description

The CA-IF1022 is a Local Interconnect Network (LIN) dual channel transceiver, which is a low speed Universal Asynchronous Transceiver (UART) communication protocol that supports automotive in vehicle networks.

The CA-IF1022 transceiver controls the LIN bus state via the TXDx input and reports the bus state on output RXD between the protocol controller and physical LIN networks. These device features slew-rate control and wave-shaping to reach a very low level of electromagnetic emission (EME) within a broad frequency range.

The CA-IF1022 devices are designed to support 12V automotive applications with 5V to 18V wide V_{BAT} input voltage operating range and have up to $\pm 42V$ fault protection on LIN bus, with integrated ESD protection, these devices help to reduce external components in the design. In addition, CA-IF1022 also supports low-power sleep mode. This device supports the use of LINx and SLPx_N-pin wake-up function

Table 3-1. Device Information

Part number	Package	Package size(NOM)
CA-IF1022NF-Q1	SOIC14(NF)	3.9mm x 8.65mm
CA-IF1022DF-Q1	DFN14(DF)	3mm x 4.5mm
CA-IF1022F-Q1	QFN24(F)	3.5mm x 5.5mm

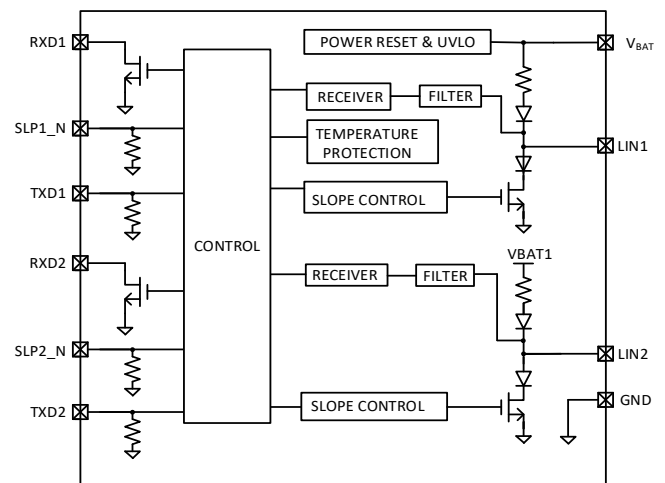


Figure3- 1. Simplified Block Diagram

4. Ordering Information

Table 4-1. Ordering Information

Part Number	Features	Package
CA-IF1022NF-Q1	Automotive qualified part	SOIC14(NF)
CA-IF1022DF-Q1	Automotive qualified part	DFN14(DF)
CA-IF1022F-Q1	Automotive qualified part	QFN24(F)

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5. Revision History

Revision Number	Description	Page Changed
V1.0	Initial Version	NA

6. Pin Configuration and Functions

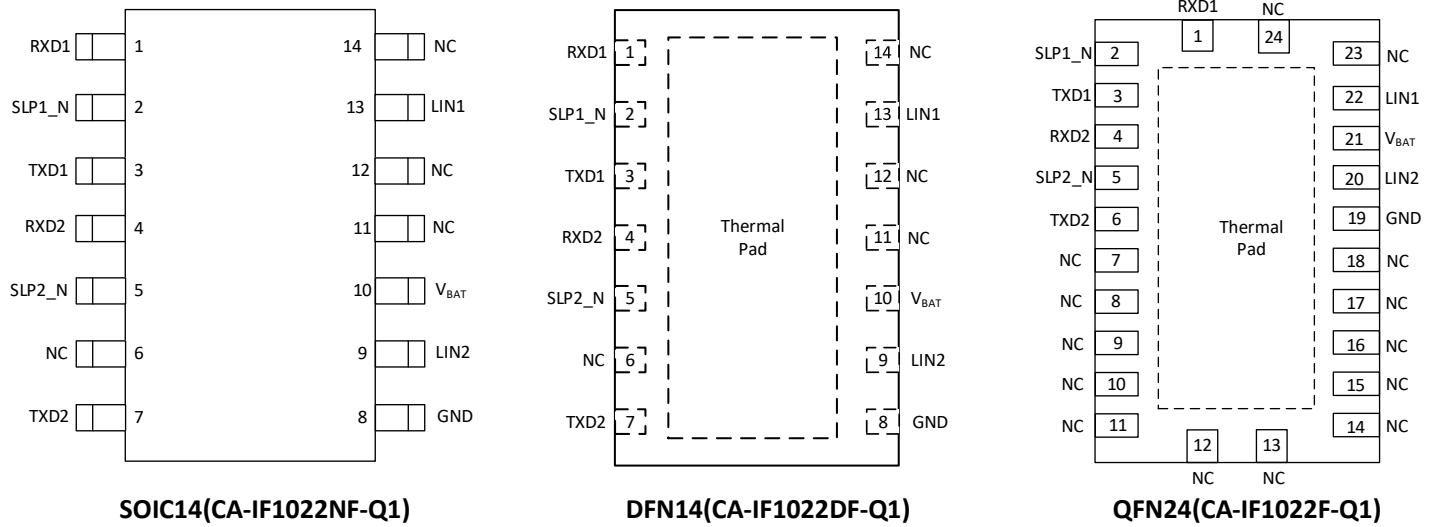


Figure6- 1. CA-IF1022NF-Q1 and CA-IF1022DF-Q1 Pin Configuration

引脚名称	引脚编号	类型	描述
RXD1	1	Output	Receive data output 1 (open-drain); active LOW after a wake-up event.
SLP1_N	2	Input	Enable input 1, high level enables devices into Normal mode, low level enables devices Sleep mode, reset the wake-up request on RXD1.
TXD1	3	Input	Transmit data input 1.
RXD2	4	Output	Receive data output 2 (open-drain); active LOW after a wake-up event.
SLP2_N	5	Input	Enable input 2, high level enables devices into Normal mode, low level enables devices Sleep mode, reset the wake-up request on RXD2.
NC	6		No internal connection.
TXD2	7	Input	Transmit data input 2.
GND ¹	8	GND	Ground
LIN2	9	Bus I/O	LIN2 bus input/output.
V _{BAT}	10	Power	Battery supply
NC	11		No internal connection.
NC	12		No internal connection.
LIN1	13	Bus I/O	LIN1 bus input/output.
NC	14		No internal connection.

Note:

- For enhanced thermal and electrical performance, the exposed center pad of the DFN14 package should be soldered to board ground.

Table 6-2. CA-IF1022F-Q1 Pin Configuration and Description

Pin Name	Pin #	Type	Description
RXD1	1	Output	Receive data output 1 (open-drain); active LOW after a wake-up event.
SLP1_N	2	Input	Enable input 1, high level enables devices into Normal mode, low level enables devices Sleep mode, reset the wake-up request on RXD1.
TXD1	3	Input	Transmit data input 1.
RXD2	4	Output	Receive data output 2 (open-drain); active LOW after a wake-up event.
SLP2_N	5	Input	Enable input 2, high level enables devices into Normal mode, low level enables devices Sleep mode, reset the wake-up request on RXD2.
TXD2	6	Input	Transmit data input 2.
NC	7~18		No internal connection.
GND ¹	19	GND	Ground
LIN2	20	Bus I/O	LIN2 bus input/output.
V _{BAT}	21	Power	Battery supply
LIN1	22	Bus I/O	LIN1 bus input/output.
NC	23,24		No internal connection.

Note:

1.For enhanced thermal and electrical performance, the exposed center pad of the QFN24 package should be soldered to board ground.

7. Specifications

7.1. Absolute Maximum Ratings¹

Symbol	PARAMETER	TEST CONDITIONS	Min.	Max.	Unit
V _{BAT}	Supply voltage range	To GND, To LIN	-0.3	42	V
V _{TXDx}	TXDx voltage range	Pins TXD1 ~TXD2 to GND	-0.3	7	V
V _{RXDx}	RXDx voltage range	Pins RXD1 ~RXD2 to GND	-0.3	7	V
V _{SLPx_N}	SLPx_N voltage range	Pins SLP1_N ~ SLP2_N to GND	-0.3	7	V
V _{LINx}	LINx voltage range	Pins LIN1 ~ LIN2 to GND Pins LIN1 ~ LIN2 to V _{BAT}	-42	42	V
ΔV _(LIN1-LIN2)	LINx voltage range	Pin LIN1 and pin LIN2	-42	42	V
T _{vj}	Virtual junction temperature range		-40	150	°C
T _{STG}	Storage temperature range		-55	150	°C

Note:

- The stresses listed under “Absolute Maximum Ratings” are stress ratings only, not for functional operation condition. Exposure to absolute maximum rating conditions for extended periods may cause permanent damage to the device.

7.2. ESD Ratings

PARAMETER	TEST CONDITIONS		Value	单位
HBM ESD	LIN, V _{BAT} pins		±14	kV
	RXDx, SLPx_N, TXDx pins		±8	
CDM ESD	Other pins to GND		±2	kV
System Level ESD	LINx and V _{BAT} to GND	IEC 61000-4-2: contact discharge, without power-up	±10	kV

7.3. Recommended Operating Conditions

PARAMETER		Min.	Max.	Unit
V _{BAT}	Battery voltage range	5	18	V
V _{LINx}	LIN bus voltage range	0	18	V
V _{LOGIC}	Logic voltage range (RXDx、SLPx_N 和 TXDx)	0	5.5	V
T _A	Operation Temperature Range	-40	125	°C

7.4. Recommended Operating Conditions

PARAMETER		SOIC14	DFN14	QFN24	Unit
R _{θJA}	Junction-to-ambient thermal resistance	81.2	46.3	41	°C/W

7.5. Electrical Characteristics

Over recommended operating conditions, $T_A = -40^{\circ}\text{C}$ to 125°C (unless otherwise noted), $V_{\text{BAT}}=12\text{V}$.

7.5.1. Power consumption

PARAMETER		TEST CONDITIONS	Min.	Typ.	Max.	Unit	
V_{BAT}	Battery supply voltage		5		18	V	
I_{BAT}	V_{BAT} Current	Sleep mode (both channels)	bus recessive: $V_{\text{LINx}}=V_{\text{BAT}}$, $V_{\text{SLPx}_N}=0\text{V}$, $V_{\text{BAT}}=12\text{V}$	3	20	30	μA
I_{BAT}	V_{BAT} Current			bus dominant: $V_{\text{LINx}}=0\text{V}$, $V_{\text{SLPx}_N}=0\text{V}$, $V_{\text{BAT}}=12\text{V}$	300	880	1600
I_{BAT}	V_{BAT} Current	Standby mode (both channels)	bus recessive: $V_{\text{LINx}}=V_{\text{BAT}}$, $V_{\text{SLPx}_N}=0\text{V}$, $V_{\text{BAT}}=12\text{V}$	3	20	30	μA
I_{BAT}	V_{BAT} Current			bus dominant: $V_{\text{BAT}}=12\text{V}$, $V_{\text{LINx}}=0\text{V}$, $V_{\text{SLPx}_N}=0\text{V}$	300	880	1600
I_{BAT}	V_{BAT} Current	Normal mode (both channels)	bus recessive: $V_{\text{LINx}}=V_{\text{BAT}}$, $V_{\text{TXDx}}=5\text{V}$, $V_{\text{SLPx}_N}=5\text{V}$	80	260	600	μA
I_{BAT}	V_{BAT} Current			bus dominant: $V_{\text{BAT}}=12\text{V}$, $V_{\text{TXDx}}=0\text{V}$, $V_{\text{SLPx}_N}=5\text{V}$	1	2.3	5

7.5.2. Power on reset(V_{BAT})

PARAMETER		TEST CONDITIONS	Min.	Typ.	Max.	Unit
$V_{\text{th(POR)L}}$	Low-level power-on reset threshold voltage		1.6	3.1	3.9	V
$V_{\text{th(POR)H}}$	High-level power-on reset threshold voltage		2.3	3.4	4.3	V
$V_{\text{hys(POR)}}$	Power-on reset hysteresis voltage		0.05	0.3	1	V
$V_{\text{th(VBAT)L}}$	Power-on reset hysteresis voltage		3.9	4.4	4.7	V
$V_{\text{th(VBAT)H}}$	High-level V_{BAT} LOW threshold voltage		4.2	4.7	4.9	V
$V_{\text{hys(VBAT)}}$	V_{BAT} LOW hysteresis voltage		0.15	0.3	0.6	V

7.5.3. TXDx¹ Pin

PARAMETER		TEST CONDITIONS	Min.	Typ.	Max.	Unit
V_{IH}	High-level input voltage		2		7	V
V_{IL}	Low-level input voltage		-0.3		0.8	V
V_{hys}	hysteresis voltage		50	200	400	mV
$R_{\text{PD(TXD)}}$	TXDx pull-up resistor	$V_{\text{TXDx}}=5\text{V}$	50	125	325	k Ω
I_{IL}	High-level leakage current	$V_{\text{TXDx}}=0\text{V}$	-5	0	5	μA

Note: 1.TXDx Refers to TXD1/ TXD2.

7.5.1. SLPx_N¹ Pin

PARAMETER		TEST CONDITIONS	Min.	Typ.	Max.	Unit
V_{IH}	High-level input voltage		2		7	V
V_{IL}	Low-level input voltage		-0.3		0.8	V
V_{hys}	hysteresis voltage		50	200	400	mV
$R_{\text{PD(SLP}_N)}$	SLPx _N pull-up resistor	$V_{\text{TXDx}}=5\text{V}$	100	250	650	k Ω
I_{IL}	High-level leakage current	$V_{\text{TXDx}}=0\text{V}$	-5	0	5	μA

Note: 1.SLPx_N Refers to SLP1_N / SLP2_N.

7.5.2. RXDx¹ Pin

PARAMETER		TEST CONDITIONS	Min.	Typ.	Max.	Unit
I_{OL}	Low-level output current	$V_{\text{RXDx}}=0.4\text{V}$	2			mA
I_{LH}	High-level leakage current		-5	0	5	μA

Note: 1.RXDx Refers to RXD1/RXD2.

7.5.3. LINx¹ Pin

PARAMETER		TEST CONDITIONS	Min.	Typ.	Max.	Unit
I _{BUS_LIM}	Driver output current limitation @dominant	V _{TXDx} =0V;V _{LINx} =V _{BAT} =18V	40		150	mA
I _{BUS_PAS_rec}	Receiver input leakage current@ recessive	V _{TXDx} =5V;V _{LINx} = 18V;V _{BAT} =5V			20	μA
I _{BUS_PAS_dom}	Receiver input leakage current@ dominant	Normal mode; V _{TXD} =V _{CC} ;V _{LIN} = 0V;V _{BAT} =12V	-600			μA
V _{SerDiode} ²	Voltage drop on the serial diode	in pull-up path with R _{slave} , I _{SerDiode} =0.9mA	0.4	0.7	1	V
I _{BUS_NO_GND}	Bus current @ loss ground	V _{BAT} =18V; V _{LINx} = 0V	-750		10	μA
I _{BUS_NO_BAT}	Bus current @ loss battery	V _{BAT} =0V; V _{LINx} = 18V			8	μA
V _{BUSdom}	LIN receiver dominant state	V _{BAT} =5V to 18V			0.4 V _{BAT}	V
V _{BUSrec}	LIN receiver recessive state	V _{BAT} =5V to 18V	0.6 V _{BAT}			V
V _{BUS_CNT}	LIN receiver center threshold	V _{BAT} =5V to 18V;V _{BUS_CNT} =(V _{BUSdom} + V _{BUSrec})/2	0.45 V _{BAT}	0.5V _{BAT}	0.55 V _{BAT}	V
V _{HYS}	LIN receiver hysteresis voltage	V _{BAT} =5V to 18V;V _{HYS} =V _{BUSrec} -V _{BUSdom}			0.175 V _{BAT}	V
R _{slave}	Slave resistance	Resistance between LIN and V _{BAT} , V _{LIN} =0V;V _{BAT} =12V	20	30	60	kΩ
C _{LINx} ²	Slave resistance				20	pF
V _{O(DOM)}	LIN dominant output	Normal mode;V _{TXD} =0V;V _{BAT} = 7V			1.4	V
		Normal mode;V _{TXD} =0V;V _{BAT} = 18V			2.0	V
Note: 1. LINx Refers to LIN1/LIN2. 2. The test data is based on bench test and design simulation.						

7.5.4. Duty cycle

PARAMETER		TEST CONDITIONS	Min.	Typ.	Max.	Unit
$\delta 1^{1,2}$	Duty cycle 1	$V_{th(rec)(max)}=0.744xV_{BAT}$; $V_{th(dom)(max)}=0.581xV_{BAT}$; $t_{bit}=50\mu s$; $V_{BAT}=7V\sim 18V$, see Figure8- 1	0.396			
		$V_{th(rec)(max)}=0.76xV_{BAT}$; $V_{th(dom)(max)}=0.593xV_{BAT}$; $t_{bit}=50\mu s$; $V_{BAT}=5V\sim 7V$, see Figure8- 1	0.396			
$\delta 2^{2,3}$	Duty cycle 2	$V_{th(rec)(min)}=0.422xV_{BAT}$; $V_{th(dom)(min)}=0.284xV_{BAT}$; $t_{bit}=50\mu s$; $V_{BAT}=7.6V\sim 18V$, see Figure8- 1			0.581	
		$V_{th(rec)(min)}=0.41xV_{BAT}$; $V_{th(dom)(min)}=0.275xV_{BAT}$; $t_{bit}=50\mu s$; $V_{BAT}=6.1V\sim 7.6V$, see Figure8- 1			0.581	
$\delta 3^{1,2}$	Duty cycle 3	$V_{th(rec)(max)}=0.778xV_{BAT}$; $V_{th(dom)(max)}=0.616xV_{BAT}$; $t_{bit}=96\mu s$; $V_{BAT}=7V\sim 18V$, see Figure8- 1	0.417			
		$V_{th(rec)(max)}=0.797xV_{BAT}$; $V_{th(dom)(max)}=0.630xV_{BAT}$; $t_{bit}=96\mu s$; $V_{BAT}=5V\sim 7V$, see Figure8- 1	0.417			
$\delta 4^{2,3}$	Duty cycle 14	$V_{th(rec)(min)}=0.389xV_{BAT}$; $V_{th(dom)(min)}=0.251xV_{BAT}$; $t_{bit}=96\mu s$; $V_{BAT}=7.6V\sim 18V$, see Figure8- 1			0.590	
		$V_{th(rec)(min)}=0.378xV_{BAT}$; $V_{th(dom)(min)}=0.242xV_{BAT}$; $t_{bit}=96\mu s$; $V_{BAT}=6.1V\sim 7.6V$, see Figure8- 1			0.590	

Note:

- $\delta 1, \delta 3 = \frac{t_{bus(rec)(min)}}{2 \times t_{bit}}$
- LIN bus load condition: (1) $C_{BUS}=1nF$, $R_{BUS}=1k\Omega$; (2) $C_{BUS}=6.8nF$, $R_{BUS}=660\Omega$; (3) $C_{BUS}=10nF$, $R_{BUS}=500\Omega$
- $\delta 2, \delta 4 = \frac{t_{bus(rec)(max)}}{2 \times t_{bit}}$

7.5.5. Thermal Shutdown

PARAMETER		TEST CONDITIONS	Min.	Typ.	Max.	Unit
$T_{th(act)otp}^1$	Thermal shutdown temperature		150	175	200	$^{\circ}C$
$T_{th(rel)otp}^1$	Thermal shutdown temperature recovery			20		$^{\circ}C$

Note:

- The test data is based on bench test and design simulation.

7.5.6. Switching Characteristics

PARAMETER		TEST CONDITIONS	Min.	Typ.	Max.	Unit
t_{rx_pd}	Receiver propagation delay	Rise and fall, $C_{RXDX}=20pF$, $R_{RXDX}=2.4k\Omega$			6	μs
t_{rx_sym}	Receiver propagation delay symmetry		-2		2	μs
$t_{wake(dom)LIN}$	LIN dominant wake-up time	Sleep mode	30	80	150	μs
$t_{gotonorm}$	Go to normal time		2	6	10	μs
$t_{init(norm)}^1$	Normal mode initialization time			12		μs
$t_{gotosleep}$	Go to sleep time		2	6	10	μs
$t_{to(dom)TXD}$	TXD-dominant timeout	$V_{TXDX}=0V$	6	12	50	ms

Note:

- The test data is based on bench test and design simulation.

8. Parameter Measurement Information

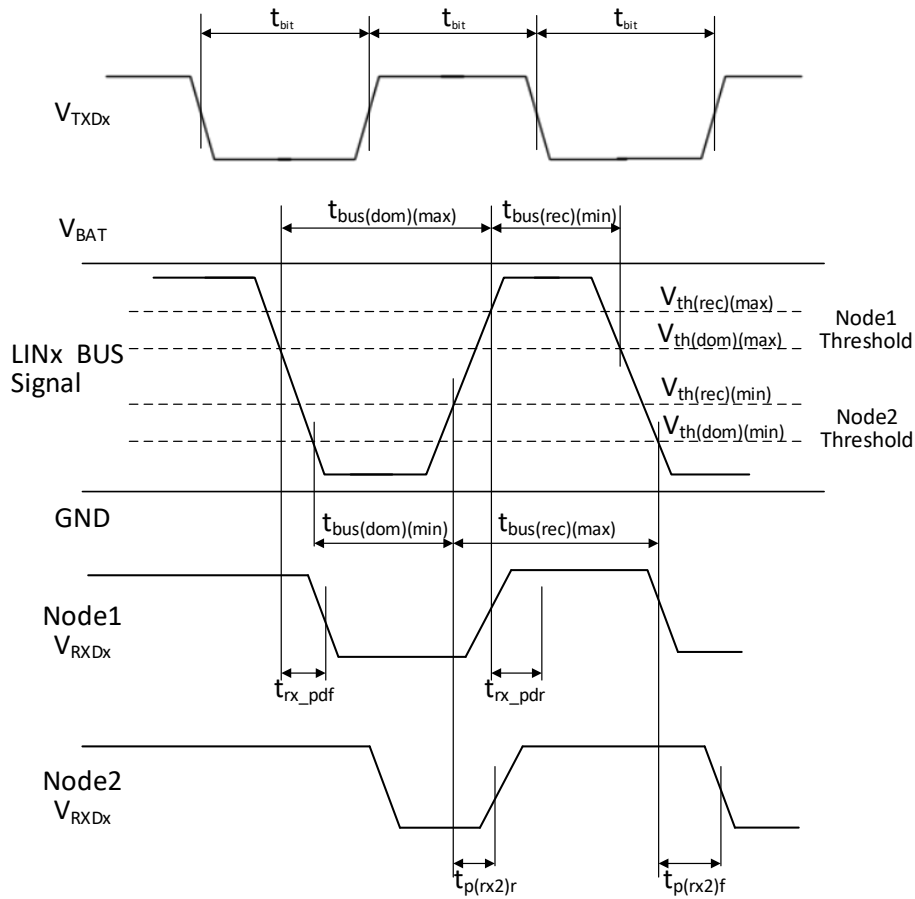


Figure8- 1. LIN Bus Transmission Timing Diagram

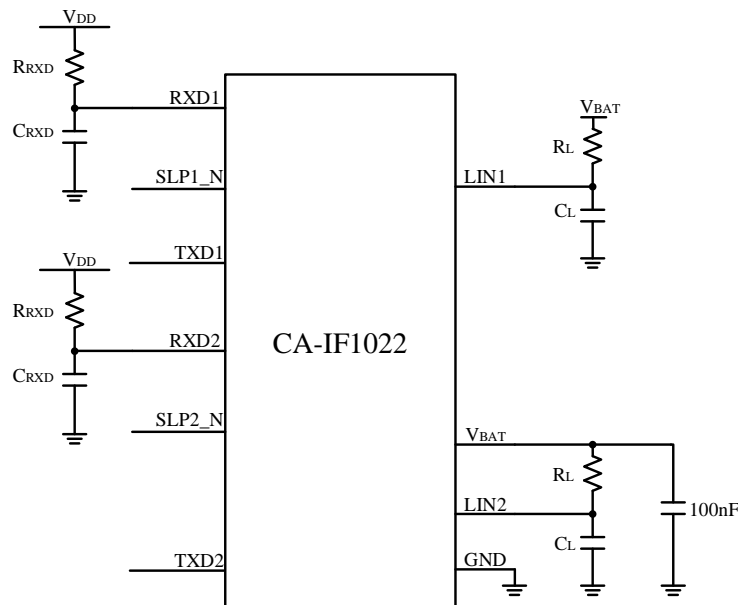


Figure8- 2. Switch characteristic testing circuit

9. Detailed Description

9.1. Overview

CA-IF1022 is a dual channel erface chip used between LIN protocol controllers and physical buses. It can be applied in fields such as trucks, buses, cars, and industrial control, with a transmission rate of up to 20kbps. CA-IF1022 has independent logic control circuit, power-on detection circuit and overtemperature protection circuit respectively.

CA-IF1022 receives the sending data stream from the protocol controller at the sending data input (TXDx) end and converts it into a bus signal with the best swing rate and waveform shaping; The input data on the LINx bus is output from the RXDx port of the receiver to an external microcontroller. This device is compatible with the "LIN 2. x/ISO 17987-4:2016/SAE J2602" standard.

The internal of the TXDx pin is pulled down to the ground to prevent the undefined floating state of the TXDx pin.

The internal of the SLPx_N pin is pulled down to the ground, and the corresponding LINx transceiver will enter the sleep mode when the SLPx_N pin is floating.

Pins RXD1 and RXD2 are set floating if V_{BAT} is disconnected.

The loss-of-ground condition has no effect on the bus port, and the bus port has no reverse current.

To avoid the effects caused by TXDx pins being forced to permanently low due to hardware and/or software application failures, after switching to normal mode, the LINx driver will be enabled only if a high TXDx level is detected.

9.2. Short-circuit Protection

When the LINx bus output of the driver is short circuited to V_{BAT} or GND, the current is limited. When the LINx bus is short circuited to V_{BAT} , the short-circuit current will be limited to I_{BUS_LIM} ; When the LINx bus is short circuited to GND, the short-circuit current will be limited to V_{BAT}/R_{slave} .

9.3. Thermal Shutdown

CA-IF1022 has an over temperature protection function. When a dual channel module inside the device exceeds the shutdown protection temperature $T_{j(sd)}$, the over temperature protection circuit will turn off the output driver (LIN1/LIN2) of the corresponding module. The drivers are enabled again when the junction temperature falls below $T_{jd(sd)} - T_{jd(hys)}$ and pin TXDx is HIGH.

9.4. Dominant timeout

The CA-IF1022 family of devices features a transmitter-dominant timeout($t_{to(dom)TXD}$) that prevents erroneous LINx controllers from clamping the bus to a dominant level by maintaining a permanently low TXDx signal. When TXDx remains in the dominant state (low) for longer than $t_{to(dom)TXD}$, the transmitter is disabled, releasing the bus to a recessive state. After a dominant timeout fault, the transmitter is re-enabled when receiving a rising edge driving TXDx. The transmitter-dominant timeout limits the minimum possible data rate.

9.5. Operate modes

The CA-IF1022 supports four operating modes: Normal, Standby, Sleep and Reset ,See Figure9- 1 for more details about the CA-IF1022 operating modes.

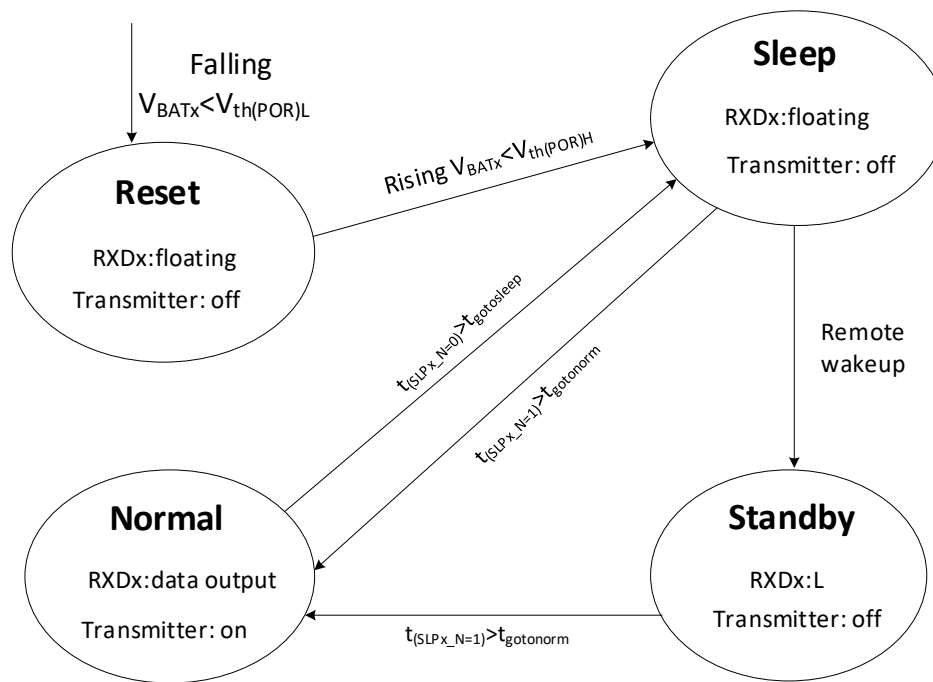


Figure9- 1. State Diagram

Sleep mode:

CA-IF1022 has very low static power consumption when all LIN transceivers of four channels enter sleep mode, but it can still remotely wake up the corresponding channel to enter standby mode through LINx pin, or directly switch to normal mode by pulling up SLPx_N pin.

In order to prevent the CA-IF1022 from waking up due to unexpected wake up events caused by car transient or EMI, filters are designed at the inputs LINx pin and SLPx_N pin of the receiver.

In normal mode, when SLPx_N pin has a falling edge and SLPx_N remains low for longer than $t_{gotosleep}$, the LIN transceiver of the corresponding channel of CA-IF1022 enters the sleep mode.

The necessary conditions for CA-IF1022 to be woken up in sleep mode are as follows: the remote wake-up time through LINx pin must be longer than $t_{wake(dom)LIN}$ (dominant wake time of bus); The direct wake-up time through the SLPx_N pin must be longer than the $t_{gotonorm}$.

Standby mode:

Standby mode is also a low-power mode of CA-IF1022 and is a transitional mode between sleep mode and normal mode. When CA-IF1022F-Q1 is in sleep mode, if a remote wake-up event is detected, the device will immediately enter standby mode, and the low level on the RXDx pin will indicate that the wake-up event has occurred.

Normal mode:

In Normal mode, the CA-IF1022 can transmit and receive data via the LIN bus lines. The transceivers operate independently, so one can be active while the others are off.

The receiver detects the data stream on the LIN bus and outputs it to the microcontroller via pin RXDx, and the high level of bus represents recessive and low level represents dominant. TXDx is the output of the driver, the data stream from protocol controller sent by TXDx to LINx pin output and waveform shaping to minimize electromagnetic radiation emission (EME).

In sleep or standby mode, as long as the high level hold time on the SLPx_N pin is longer than the $t_{gotonorm}$, the LIN transceiver of the corresponding channel will enter the normal mode. If the low level hold time on the SLPx_N pin is longer than $t_{gotosleep}$, the LIN transceiver on the corresponding channel switches to sleep mode.

Reset mode:

If the voltage on V_{BAT} is less than the low-level reset threshold $V_{th(VBAT)L}$ when powering on, the CA-IF1022 is in reset mode and all input and output functions are disabled; when the voltage on V_{BAT} is longer than the high-level reset threshold $V_{th(VBAT)H}$, or else CA-IF1022 enters sleep mode.

9.6. Remote Wake-up

The bus wake-up, also called remote wake-up, changes the transceiver’s operation mode from Sleep mode to Standby mode. A falling edge on the LIN Bus, followed by a valid dominant bus signal for $t > t_{wake(dom)LIN}$, bus results in a bus wake-up event. A transition to Standby mode is performed with the subsequent rising edge on the LIN bus(the change from dominant to recessive), see Figure9- 2.

When an effective remote wake-up event occurs, the chip enters Standby mode and RXD is continuously low to send an interrupt request to the microcontroller.

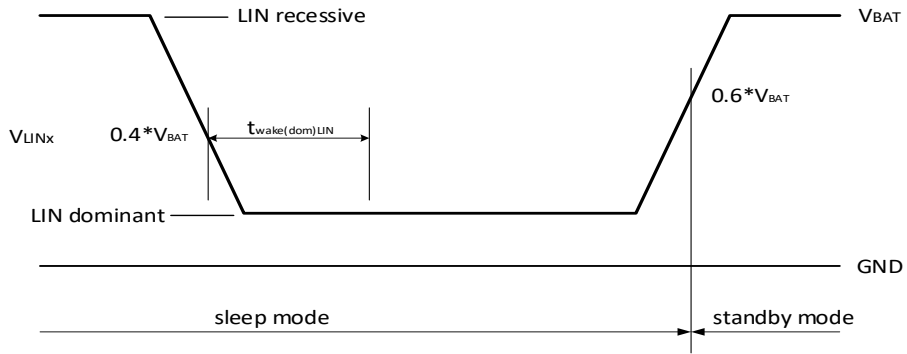


Figure9- 2. Remote Wake-up

10. Application Information

In multi-point LIN networking applications, the master node needs to use blocking diodes and 1kΩ resistors in series to pull up the bus. The slave node does not need these two devices, but can rely on internal chip pull-up. Usually, the main node bus is connected to ground with a 1nF capacitor, while the node bus is connected to ground with a 220pF capacitor.

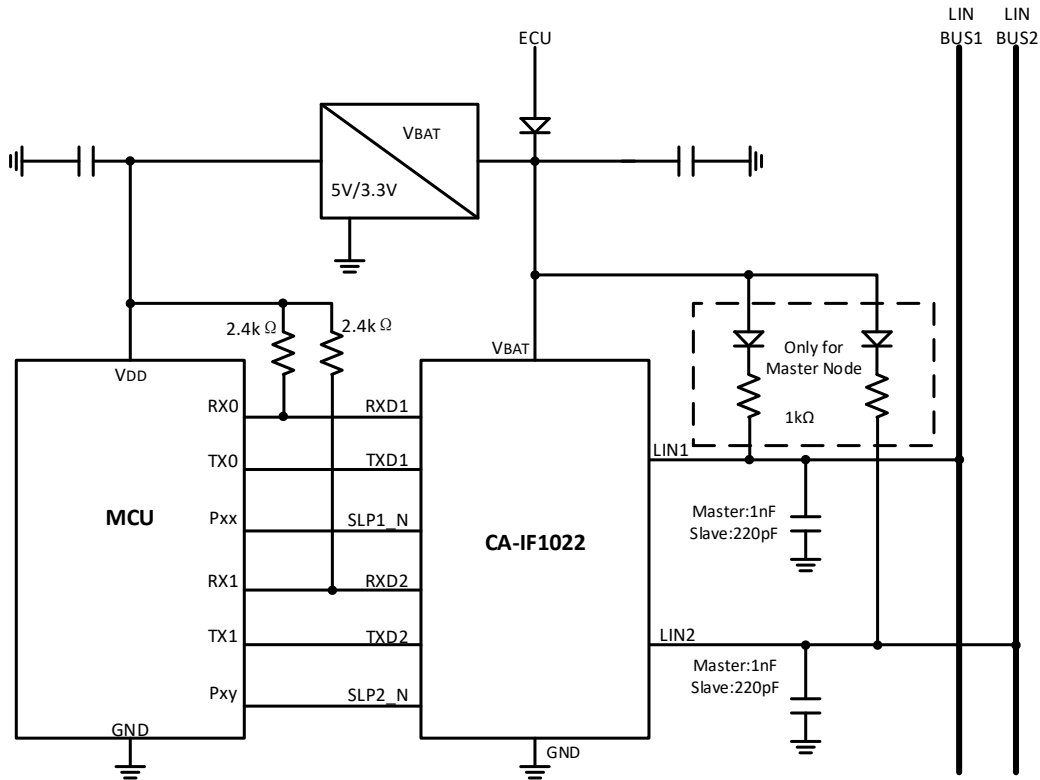
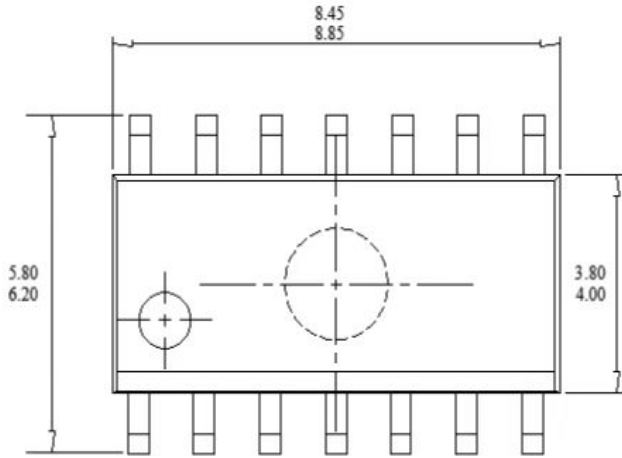


Figure 10- 1. Typical Application Circuit in LIN Bus

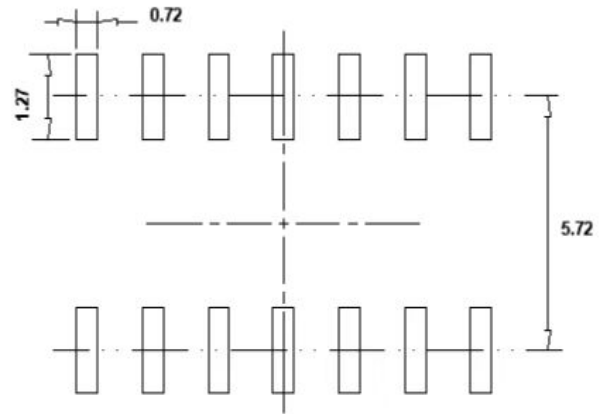
11. Package Information

SOIC14 Package Outline

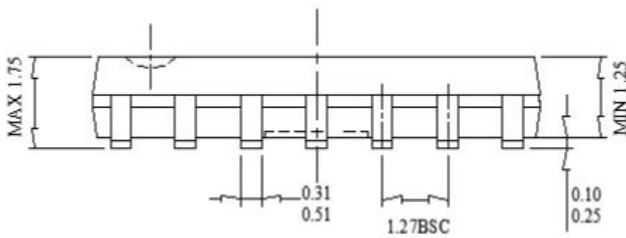
SOIC14 package size drawing and recommended pad size drawing. Dimensions in millimeters.



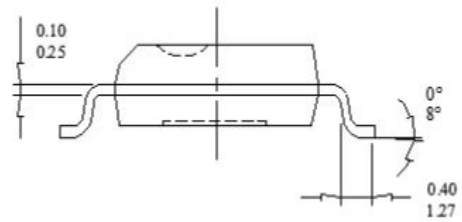
TOP VIEW



RECOMMENDED LAND PATTERN



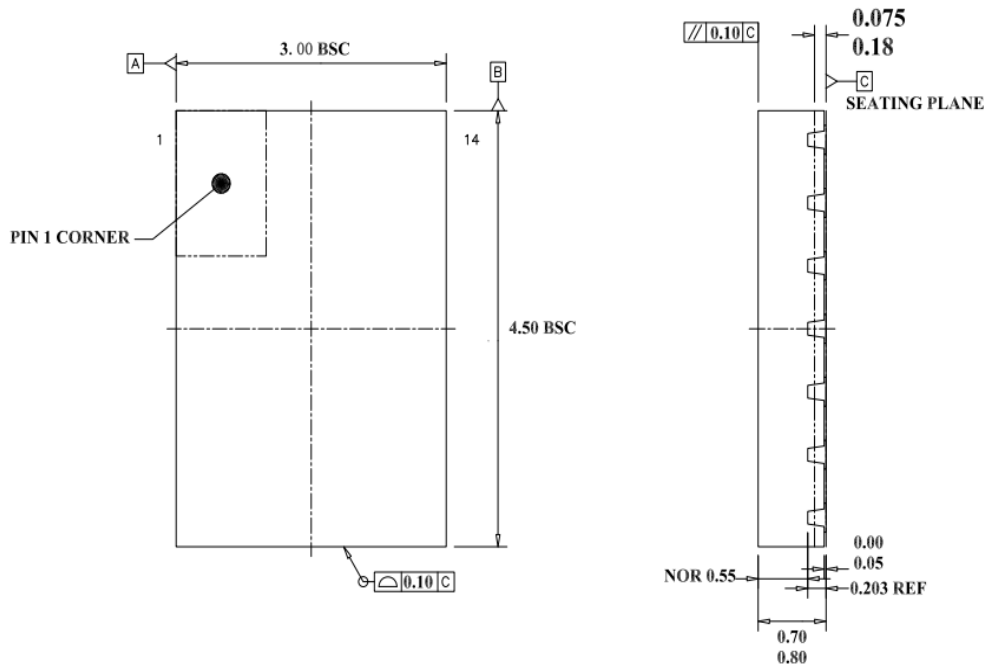
BOTTOM VIEW



LEFT SIDE VIEW

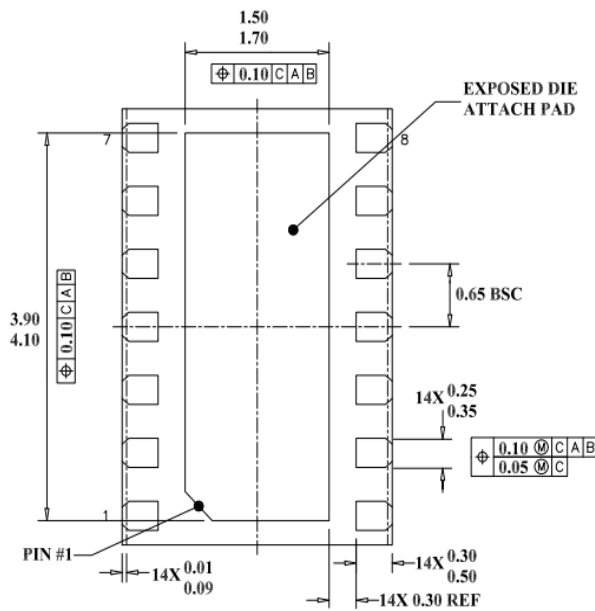
DFN14 Package Outline

DFN14 package size drawing and recommended pad size drawing. Dimensions in millimeters.



TOP VIEW

SIDE VIEW



BOTTOM VIEW

QFN24 Package Outline

QFN24 package size drawing and recommended pad size drawing. Dimensions in millimeters.

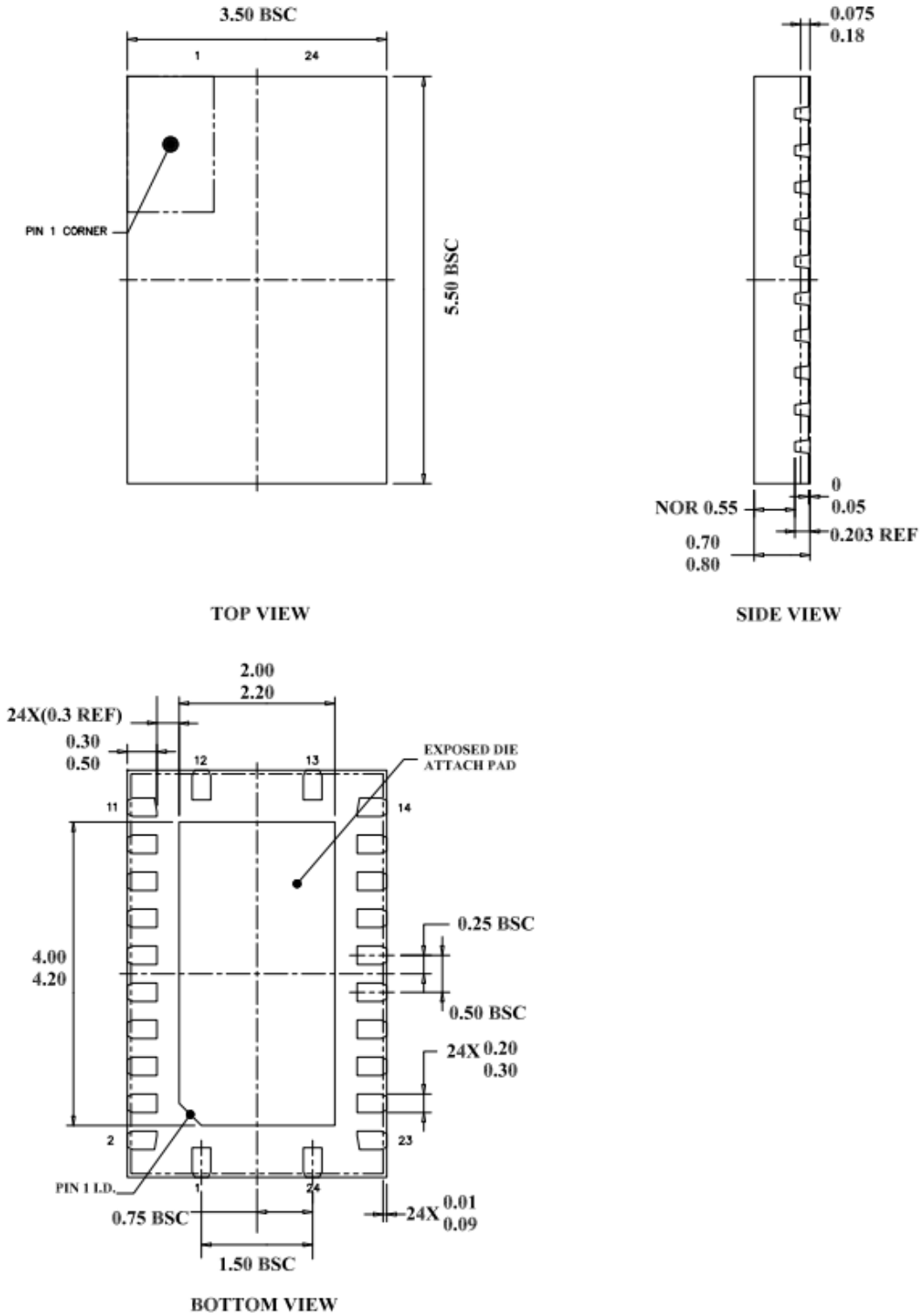


Figure 11.QFN24 Package Outline

12. Soldering Temperature (reflow) Profile

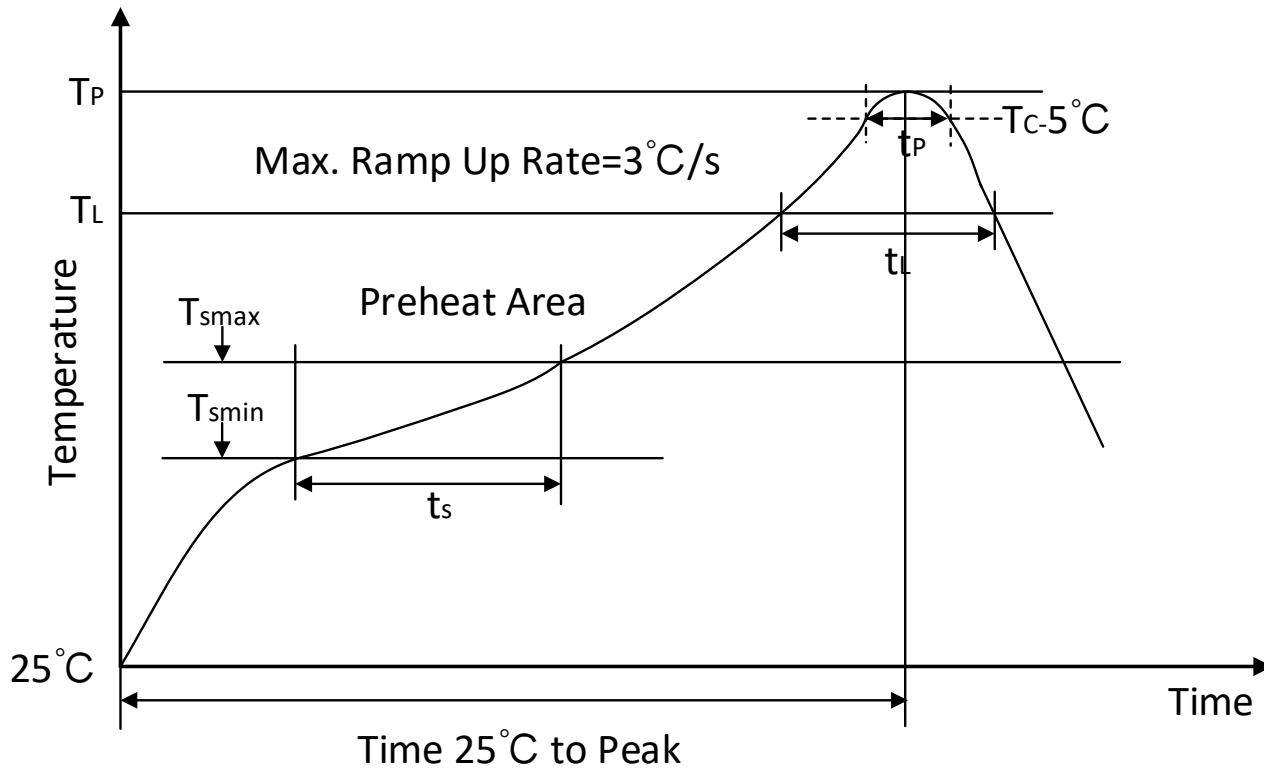
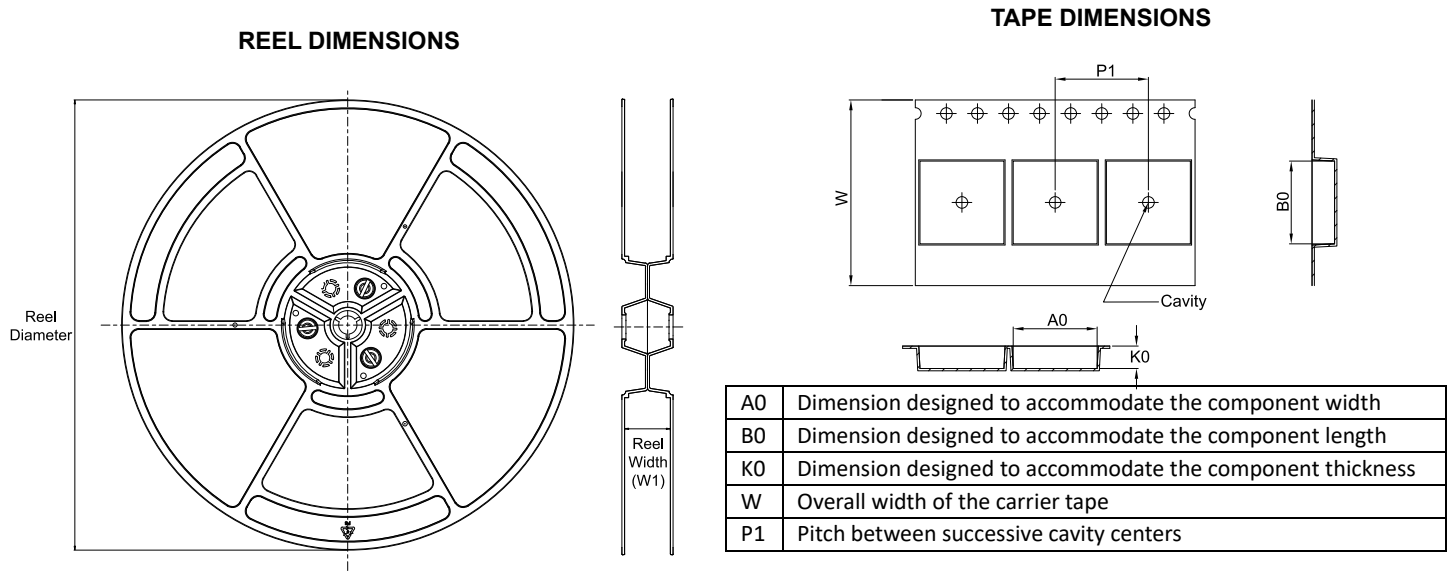


Figure12- 1. Soldering Temperature (reflow) Profile

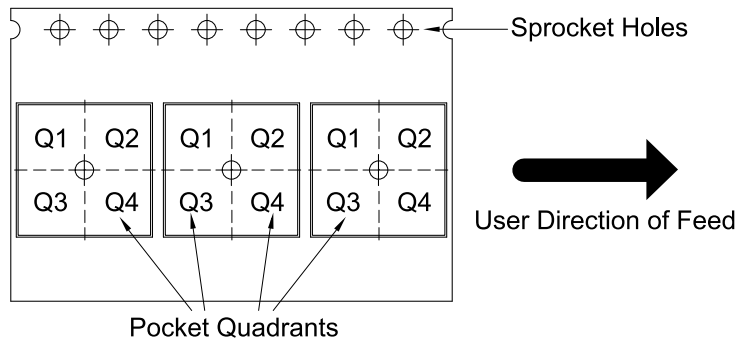
Table 12-1. Soldering Temperature Parameter

Profile Feature	Pb-Free Assembly
Average ramp-up rate(217 °C to Peak)	3°C/second max
Time of Preheat temp(from 150 °C to 200 °C)	60-120 second
Time to be maintained above 217 °C	60-150 second
Peak temperature	260 +5/-0 °C
Time within 5 °C of actual peak temp	30 second
Ramp-down rate	6 °C/second max.
Time from 25°C to peak temp	8 minutes max

13. Tape and Reel Information



QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
CA-IF1022	QFN	F	24	3000	330	12.4	3.80	5.80	1.00	8.00	12.00	Q1

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