



SANYO Semiconductors

DATA SHEET

LA2335M — Monolithic Linear IC For Audio Equipment Control Transceiver IC

Overview

The LA2335M is a transceiver for use in audio equipment control. It was developed as a bus interface driver/receiver IC for automotive audio equipment.

Features

- Supports both 3.3V and 5.0V I/O controller interface levels.
- Two-input logical OR circuit
- High bus input voltage handling capability (maximum rating : 18V)
- Built-in protection circuits

Functions

- Transmitter (current output driver : 3.8mA (typical))
- Receiver (receiver amplifier, waveshaping hysteresis comparator)
- Standby function

Specifications

Maximum Ratings at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage (V_{CC})	V_{CC} max	Pin 10	7.0	V
Maximum supply voltage (V_{DD})	V_{DD} max	Pin 4	7.0	V
Logic input voltage	V_{Igc} max		$V_{DD}+0.3$	V
Bus input voltage	V_{bus} max	Pins 1,2 and 5	18.0	V
Allowable power dissipation	P_d max	Pins 8 and 9	100	mW
Operating temperature	T_{opr}		-40 to +85	$^\circ\text{C}$
Storage temperature	T_{stg}		-50 to +125	$^\circ\text{C}$

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LA2335M

Recommended Operating Conditions at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Operating supply voltage (V_{CC})	$V_{CC\text{ op}}$	Pin 10	4.75	5.0	5.25	V
Operating supply voltage 1 (V_{DD})	$V_{DD\text{ op1}}$	Pin4 : $V_{DD} = 3.3\text{V}$	3.0	3.3	3.6	V
Operating supply voltage 2 (V_{DD})	$V_{DD\text{ op2}}$	Pin4 : $V_{DD} = 5.0\text{V}$	4.75	5.0	5.25	V

Electrical Characteristics at $T_a = 25^\circ\text{C}$, $V_{CC} = 5.0\text{V}$, $V_{DD} = 3.3\text{V}$ or 5.0V

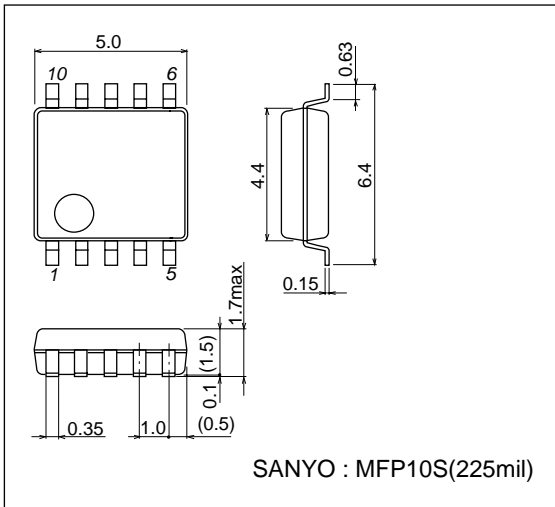
Parameter	Symbol	V_{DD}	Conditions	Ratings			Unit
				min	typ	max	
V_{CC} current drain							
With a high-level input	I_{CC1}	3.3V / 5.0V	TXD1 : H	4.5	6.5	9.4	mA
With a low-level input	I_{CC2}		TXD1 : L	0.9	1.4	1.8	mA
Standby mode	$I_{CC\text{ STB}}$		STBN : L			10	μA
V_{DD} current drain							
With a high-level input	$I_{DD\text{ H1}}$	3.3V	TXD1 : H	90	150	200	μA
With a low-level input	$I_{DD\text{ L1}}$		TXD1 : L	200	400	600	μA
With a high-level input	$I_{DD\text{ H2}}$	5.0V	TXD1 : H	100	180	230	μA
With a low-level input	$I_{DD\text{ L2}}$		TXD1 : L	200	400	600	μA
Transmitter							
High-level input voltage	$V_{IH\text{ DRV1}}$	3.3V	Driver differential output : 120 mV or higher	2.4	3.3		V
Low-level input voltage	$V_{IL\text{ DRV1}}$		Driver differential output : 20 mV or lower	0		0.5	V
High-level input voltage	$V_{IH\text{ DRV2}}$	5.0V	Driver differential output : 120 mV or higher	3.5	5.0		V
Low-level input voltage	$V_{IL\text{ DRV2}}$		Driver differential output : 20 mV or lower	0		1.5	V
Bus(+) output voltage	$V_{OH\text{ D}^+}$	3.3V / 5.0V	TXD1 : H, TXD2 : L	1.5		3.5	V
Bus(-) output voltage	$V_{OH\text{ D}^-}$		TXD1 : H, TXD2 : L	1.5		3.5	V
Bus(+) reference operating voltage	V_{OP^+}		TXD1 : L, TXD2 : L	2.30	2.45	2.70	V
Bus(-) reference operating voltage	V_{OP^-}		TXD1 : L, TXD2 : L	2.30	2.45	2.70	V
High-level output current	$I_{HD\text{ OUT}}$		TXD1 : H, TXD2 : L	2.7	3.8	5.0	mA
Low-level output leak current	$I_{LD\text{ OUT}}$		TXD1 : L, TXD2 : L			1	μA
Receiver							
High-level differential input voltage	$V_{IH\text{ R}}$	3.3V / 5.0V	[BUS ⁺] - [BUS ⁻]	65	80	120	mV
Low-level differential input voltage	$V_{IL\text{ R}}$		[BUS ⁺] - [BUS ⁻]	20	40	60	mV
High-level output voltage	$V_{OH\text{ R1}}$	3.3V	Load : 47k Ω // 18pF	2.4	3.3		V
Low-level output voltage	$V_{OL\text{ R1}}$		Load : 47k Ω // 18pF	0		0.5	V
High-level output voltage	$V_{OH\text{ R2}}$	5.0V	Load : 47k Ω // 18pF	4.0	5.0		V
Low-level output voltage	$V_{OL\text{ R2}}$		Load : 47k Ω // 18pF	0		1.0	V
Input hysteresis voltage	$V_{IH\text{ HYS}}$	3.3V / 5.0V	$V_{IH\text{ R}} - V_{IL\text{ R}}$	20	40	60	mV
Total delay time (See note.)							
L→H	T_{TDR}	3.3V / 5.0V	Compared at the 90% values of the TXD and RXD amplitudes		500	800	ns
H→L	T_{TDF}		Compared at the 10% values of the TXD and RXD amplitudes		500	800	ns
Standby							
On	$V_{IL\text{ STB1}}$	3.3V		0		0.5	V
Off	$V_{IH\text{ STB1}}$			2.4	3.3		V
On	$V_{IL\text{ STB2}}$	5.0V		0		1.0	V
Off	$V_{IH\text{ STB2}}$			3.5	5.0		V

Note : The characteristics when a load of $R_L = 47\text{k}\Omega$ and a capacitance of 18pF is connected to pin 3.

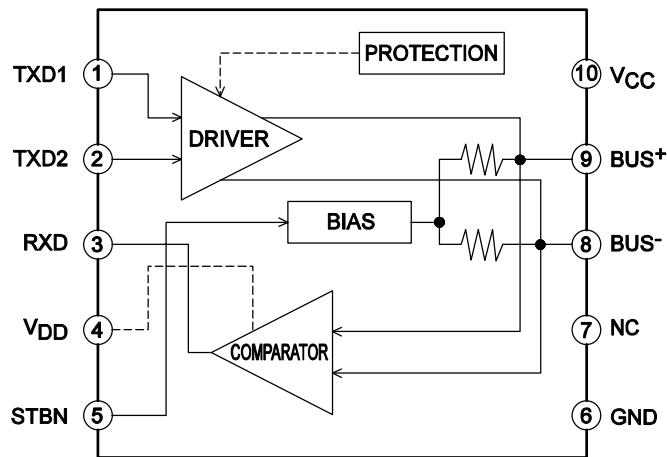
Package Dimensions

unit : mm

3086B



Block Diagram



OMB06072

* Bus line external termination resistor : 62Ω.

Pin Description

Pin No.	Pin Name	Pin Description
1	TXD1	Transmitted signal input from the controller
2	TXD2	Logical OR input for transmitted signal from the controller
3	RXD	Received signal output to the controller
4	V _{DD}	3.3V or 5.0V power supply
5	STBN	High : standby mode off Low : standby mode on
6	GND	Ground
7	NC	Unused pin (This pin must be left open.)
8	BUS ⁻	Bus (-) transmitted signal output/received signal input
9	BUS ⁺	Bus (+) transmitted signal output/received signal input
10	V _{CC}	5.0V power supply

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