Ordering number : ENA0230

SANYO Semiconductors
DATA SHEET

Monolithic Linear IC

LA2333T — Automotive LAN Transceiver IC

Overview

In addition to 5V power supply support, the LA2333T contributes to miniaturization and lower costs in end products such as car navigation system by providing seven comparators integrated on the same chip.

Features

- Transceiver
  1. Communication speed: 20kbps.
  2. 3.3V I/O control interface.
  3. High bus input voltage handling capability (Maximum rating: 18V).
  4. Built-in protection circuits.
  5. Dual 5.0/3.3V power supply systems.
- Comparators
  1. Seven built-in comparator circuits.
  2. High input voltage handling capability (Maximum rating: 18V).
  3. Reference input shared by all 7 channels.
  4. Open-collector outputs.

Functions

- Transceiver
  a. Transmitter (Current output type driver (3.8mA typical)).
  b. Receiver (Reception amplifier, waveshaper hysteresis comparator).
  c. Standby function.
- Comparators
  a. Noninverting comparator function.
  b. External reference input.

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Specifications

Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage (pin 24, V_{CC})	V_{CC} max		7.0	V
Maximum supply voltage (pin 4, IV_{DD})	V_{DD} max		7.0	V
Logic input voltage (pins 1, 2, and 5)	Vlgc max		IV_{DD}+0.3	V
Bus input voltage (pins 22 and 23)	Vbus max		18	V
Comparator input voltage (pins 13 to 20)	Vcmpi max		18	V
Comparator output voltage handling (pins 6 to 12)	Vcmpo max		V_{CC}	V
Comparator output current (pins 6 to 12)	Icmpo max	V_{CC} = 5V	5.0	mA/ch
Allowable power dissipation	Pd max		100	mW
Operating temperature	Topr		-40 to +85	°C
Storage temperature	Tstg		-50 to +125	°C

Recommended Operating Supply Voltages at Ta = 25°C

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Operating supply voltage (pin 24, V_{CC})	V_{CC} op		4.75	5.0	5.25	V
Operating supply voltage (pin 4, IV_{DD})	V_{DD} op		3.0	3.3	3.6	V

Operating Characteristics at Ta = 25°C, V_{CC} = 5V, IV_{DD} = 3.3V

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
V_{CC} Supply Current						
When the bus is at the high level	I_{CC1}	ITXD1 : H, CMPI1 to 7 : L	6.0	10.0	13.0	mA
When the bus is at the low level	I_{CC3}	ITXD1 : L, CMPI1 to 7 : L	2.5	4.0	5.5	mA
In bus standby mode	I_{CCSTB}	ISTBN : L, CMPI1 to 7 : L	1.6	2.6	4.0	mA
Quiescent current	I_{CCNSG}	With the signal input pins open (no connections)	0.6	1.0	1.6	mA
IV_{DD} Supply Current						
When at the high level	I_{DDH}	ITXD1 : H, CMPI1 to 7 : L	100	150	200	µA
When at the low level	I_{DDL}	ITXD1 : L, CMPI1 to 7 : L	200	400	800	µA
Transceiver Block: Transmitter						
High-level input voltage	V_{IHD}	Driver differential output: 120 mV or higher	2.4	3.3		V
Low-level input voltage	V_{ILD}	Driver differential output: 20 mV or lower	0		0.5	V
Bus (+) output voltage	V_{OHD+}	ITXD1 : H, ITXD2 : L	1.5		3.5	V
Bus (-) output voltage	V_{OHD-}	ITXD1 : H, ITXD2 : L	1.5		3.5	V
BUS (+) reference operating voltage	V_{OP+}	ITXD1 : L, ITXD2 : L	2.30	2.45	2.70	V
BUS (-) reference operating voltage	V_{OP-}	ITXD1 : L, ITXD2 : L	2.30	2.45	2.70	V
High-level output current	V_{HDOUT}	ITXD1 : H, ITXD2 : L	2.7	3.8	5.0	mA
Low-level output leakage current	V_{LDOUT}	ITXD1 : H, ITXD2 : L			1	µA
Transceiver Block: Receiver						
High-level differential input	V_{IHR}	[IBUS+]-[IBUS-]	65	80	120	mV
Low-level differential input	V_{ILR}	[IBUS+]-[IBUS-]	20	40	60	mV
High-level output voltage	V_{OHR}	Load: 47kΩ, 18pF	2.4	3.3		V
Low-level output voltage	V_{OLR}	Load: 47kΩ, 18pF	0		0.5	V
Input hysteresis	V_{IHYS}	V_{IHR}-V_{ILR}	20	40	60	mV

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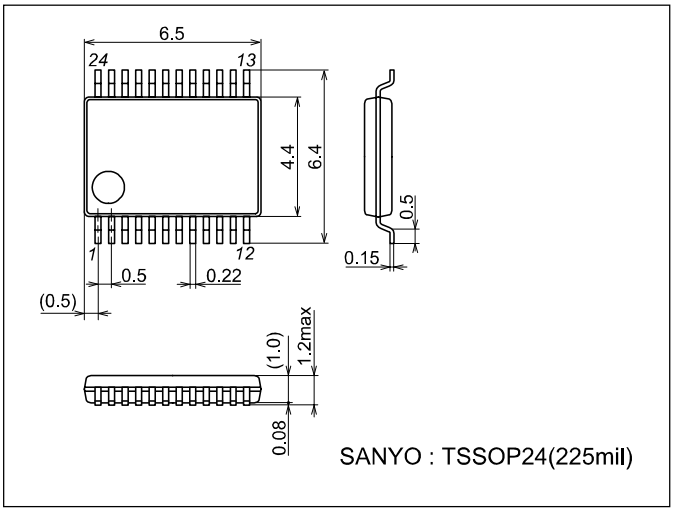
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Transceiver Block: Total Delay Time						
L →H	T_{TD1}	Compared at the points where ITXD and IRXD are at the 90% value		500	800	ns
H→L	T_{TD2}	Compared at the points where ITXD and IRXD are at the 10% value		500	800	ns
Transceiver Block : Standby						
On	V_{ILSTB}		0		0.5	V
Off	V_{IHSTB}		2.4	3.3		V
Comparator Block : Inputs						
High-level input voltage	V_{SIH}	V_{REF} = 1/2 V_{CC}	V_{REF}+0.1		V_{CC}	V
Low-level input voltage	V_{SIL}	V_{REF} = 1/2 V_{CC}			V_{REF}-0.1	V
V_{REF} input voltage	V_{SVREF}			1/2 V_{CC}		V
Comparator Block : Outputs						
High-level output leakage current	I_{SOH}	V_{OUT} = 3.3V, R_L = 0Ω				μA/ch
Low-level output saturation voltage	V_{SOL}	I_{SINK} = 500μA, R_L = 0Ω				V
Comparator Block						
Turn on time	T_{SON}	V_{OUT} = 3.3V, R_L = 2kΩ		400		ns
Turn off time	T_{SOFF}	V_{OUT} = 3.3V, R_L = 2kΩ		100		ns

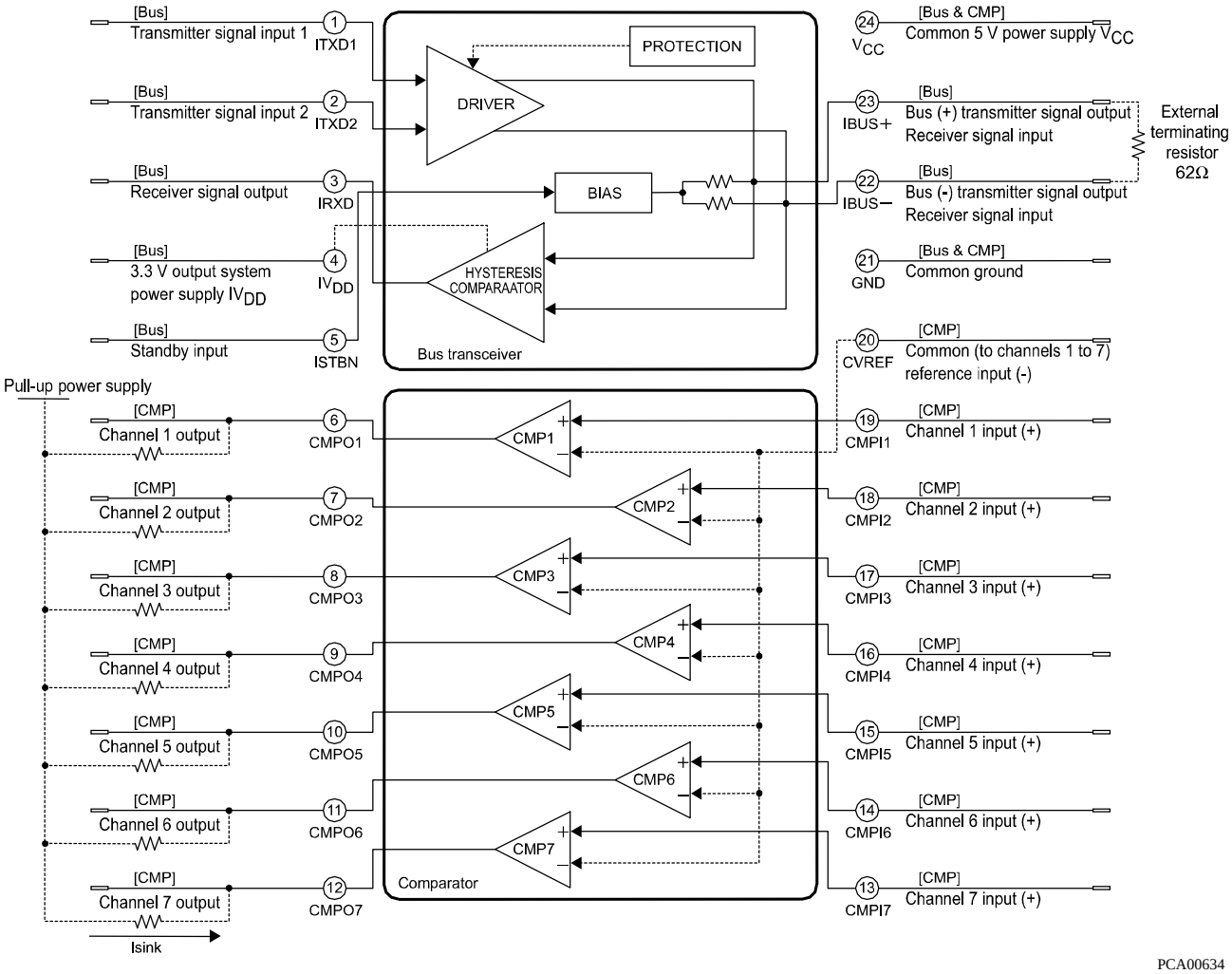
Package Dimensions

unit : mm

3260A



System Block Diagram



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Item	Pin	Description
Transmitter	1 pin, 2 pin	Two-input OR logic
	22 pin, 23 pin	Inter-pin potentials High : [IBUS+]-[IBUS-] ≥ 120mV Low : [IBUS+]-[IBUS-] ≥ 20mV
		The transmitter must be used with an external terminating resistor (62Ω) connected between pins 22 and 23.
		Protection circuit operating condition [IBUS+]-[IBUS-] ≥ 8.5V (pin 22 = GND)
		Input voltage handling capacity: 18V.
	5 pin	Standby High : Standby mode off Low : Standby mode on
Comparators	20 pin	Common reference input for CMPI1 to CMPI7
	13 to 12 pin	Input voltage handling capacity: 18V
	6 to 12 pin	We recommend 6.8kΩ as the value for the open collector pull-up resistors (Pull-up power supply 3.3V/I_{SINK} = 500μA at R_L = 6.8kΩ)

Pin Functions

Item	Pin No.	Pin	I/O	Description
Bus pins (1)	1	ITXD1	I	Transmission signal input from controller
	2	ITXD2	I	Transmission signal OR input from controller
	3	IRXD	O	Reception signal output to controller
	4	IV_{DD}	P	3.3V output system power supply
	5	ISTBN	I	High : Standby off, Low : Standby on
Comparator pins	6	CMPO1	O	Channel 1 noninverting output (open collector)
	7	CMPO2	O	Channel 2 noninverting output (open collector)
	8	CMPO3	O	Channel 3 noninverting output (open collector)
	9	CMPO4	O	Channel 4 noninverting output (open collector)
	10	CMPO5	O	Channel 5 noninverting output (open collector)
	11	CMPO6	O	Channel 6 noninverting output (open collector)
	12	CMPO7	O	Channel 7 noninverting output (open collector)
	13	CMPI7	I	Channel 7 input (+)
	14	CMPI6	I	Channel 6 input (+)
	15	CMPI5	I	Channel 5 input (+)
	16	CMPI4	I	Channel 4 input (+)
	17	CMPI3	I	Channel 3 input (+)
	18	CMPI2	I	Channel 2 input (+)
	19	CMPI1	I	Channel 1 input (+)
	20	CVREF	I	Common (to channels 1 to 7) reference input (-)
Bus pins (2)	21	GND	P	Common ground for the bus and comparator blocks
	22	IBUS-	I/O	Bus (-) transmission signal output/reception signal input
	23	IBUS+	I/O	Bus (+) transmission signal output/reception signal input
	24	V_{CC}	P	Common 5 V power supply for the bus and comparator blocks