Ordering number : EN6955A

LA2351M

Monolithic Linear IC

Transceiver IC for Car-LAN

ON Semiconductor®

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Overview

The LA2351M is Low-noise transceiver IC for car-LAN. Either a 5Mbps or a 7.5Mbps automotive LAN can be formed by combining this IC with an automotive LAN protocol chip.

Features

- Combining this IC with protocol IC TMC20040C series* for automotive LAN can compose an automotive LAN.
- Supports both 3-bit digital and staircase signals as the input signal. When a 3-bit digital signal cannot be used for wiring runs due to EMI considerations, you can provide an R-2R ladder in the vicinity of the protocol chip, use the post-D/A converter signal for the wiring, and connect that signal to the low-pass filter input.
- Built-in adjustment-free low-pass filter.
- Provides low-noise data communication.

*: The TMC20040C series is IC made of SMSC Japan (Standard Microsystems Kabushiki Kaisha).

Functions

Transmitter block

- D/A converter (3 bit).
- LPF (for prevention of EMI).
- Output driver.

Receiver block

- Receiving amplifier.
- Noise eliminating LPF (for the receive signal).
- Comparator (for waveform shaping).

Specifications

Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{CC} max	With no input signal	7.0	V
Allowable power dissipation	Pd max	Ta≤85℃ *	500	mW
Maximum applied voltage	V_{IN} max		V_{CC}	V
Operating temperature	Topr		-40 to +85	°C
Storage temperature	Tstg		-55 to +150	°C

* Mounted on a board : 46.2×25.7×1.6mm^3, material glass epoxy

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

Operating Conditions at Ta = 25°C

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Recommended supply voltage	V_{CC}			5.0		V
Operating supply voltage range	V_{CC} op		4.75		5.25	V
DAC input	V_{O}L	Low level input		0	0.5	V
	V_{O}H	High level input	2.4	3.3		V
Transmission control input	V_{O}L	Low level input			0.5	V
	V_{O}H	High level input	2.4			V
LPF input amplitude	$V_{lpf}{}^{i}$		0.45		0.55	Vp-p
Output driver input amplitude	$V_{drv}{}^{i}$		0.45		0.55	Vp-p
Receiving amplifier input signal amplitude range (differential)	$V_{rx}{}^{i}$		15		75	mVp-p
Comparator input voltage range	$V_{cpdc}{}^{i}$		0		3.5	V
Comparator input signal amplitude	$V_{cp}{}^{i}$		0.8		1.2	Vp-p

Operating Characteristics at Ta=25°C, V_{CC}=5.0V Designated test circuit

Note that this test was made with the IC socket made by Yamaichi Electrics, IC-51-0302-426.

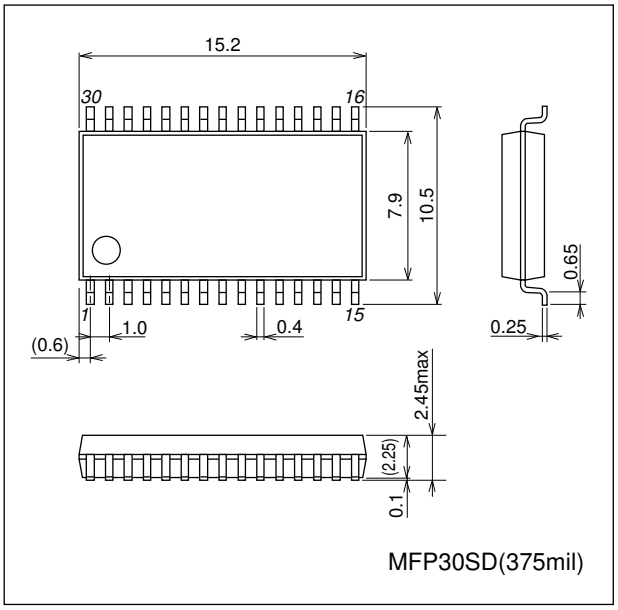
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Current dissipation without signal	I_{CCO}	With no signal, I_{24}+I_1, pin 25 = 2.4V	35	55	70	mA
[D/A converter]						
Output Level	DAC	(111); V_{28} = 3.3V, V_{29} = 3.3V, V_{30} = 3.3V (001); V_{28} = 0V, V_{29} = 0V, V_{30} = 3.3V Deviation for the output voltage difference of 0.5Vp-p	-1	0	1	dB
[LPF]						
Output attenuation	Att (1)	V_{IN}1(pin 26) = 0.5Vp-p Degree of attenuation of 9MHz for 1MHz	2.5	3.0	3.5	dB
Insertion loss	Att (2)	V_{IN}1(pin 26) = 0.5Vp-p Attenuation degree of 1MHz signal	-1	0	1	dB
[Output driver]						
Output attenuation	Att (1)	V_{IN}2(pin 22) = 0.5Vp-p Degree of attenuation of 15MHz for 1MHz	0.0	2.0	3.0	dB
Differential amplifier gain	Att (2)	V_{IN}2(pin 22) = 0.5Vp-p Pin 18 output 1 MHz output level	-1.5	0.0	1.5	dB
[Receiver AMP & noise filter]						
Frequency characteristics (±15MHz)	Att	V_{IN}3(pin 15) = 56mVp-p Degree of attenuation of 15MHz for 1MHz	2.1	3.0	3.9	dB
Amplifier gain	Gain	V_{IN}3(pin 15) = 56mVp-p Pin 15 input gain at 1MHz input	24	26	28	dB
[Comparator]						
Output high amplitude	V_L	Pin 3 output DC voltage at input Pin 5 = 1V	0.25	0.40	0.60	V
Output low amplitude	V_H	Pin 3 output DC voltage at input Pin 5 = 1V	4.0	4.1	4.2	V

Notice: Apply power supply to 1pin and 24pin at the same time.

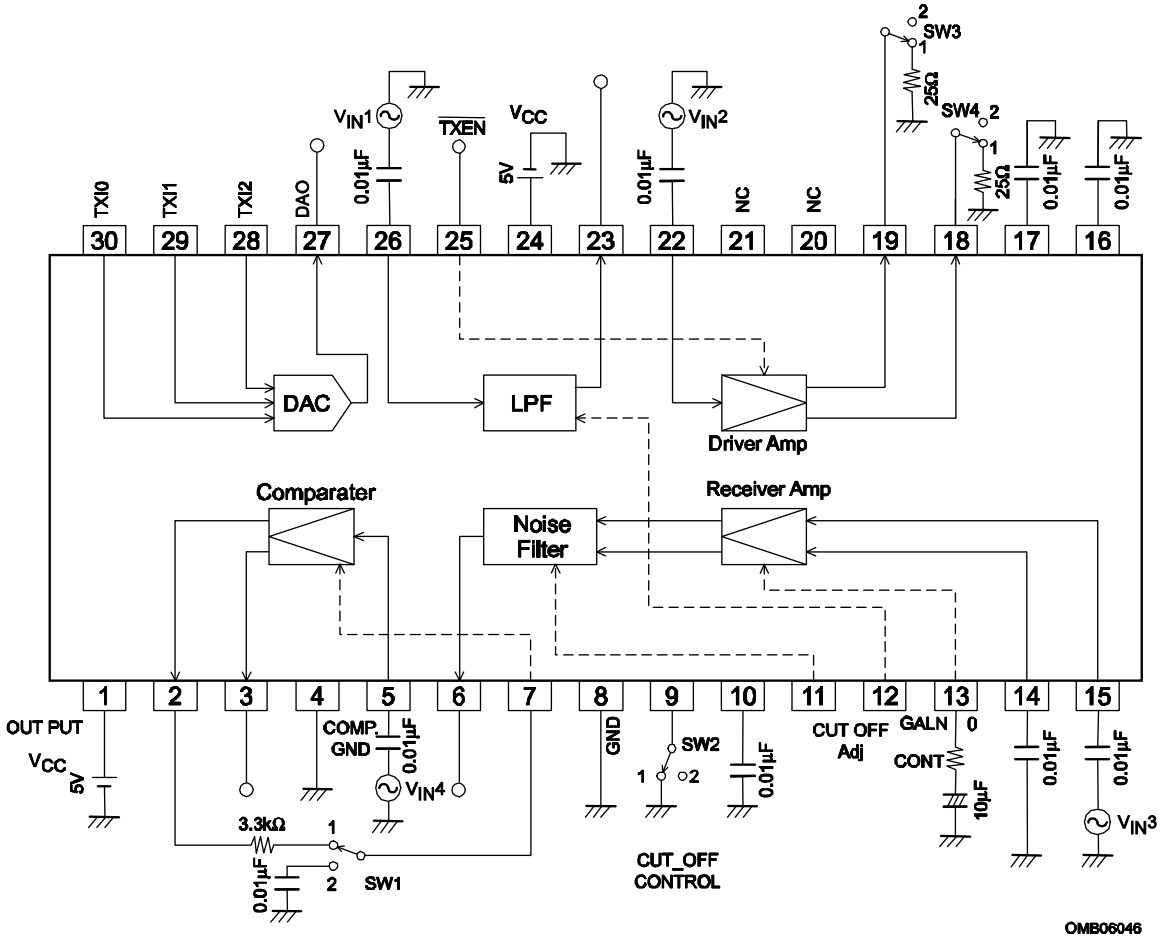
Package Dimensions

unit : mm

3073C



Block Diagram and Test Circuit Diagram



Pin Description

Pin No.	Pin Name	Pin Description	Pin Function	Remarks
1	$V_{CC}2$	Comparator power supply	5V (Apply Pin 24 at the same time.)	
2	CPD2	Comparator inverted output	V_OL = 0.4V, V_OH = 4.2V ($V_{CC}2$ is the maximum voltage for this parameter.)	
3	CPD1	Comparator non-inverted output	V_OL = 0.4V, V_OH = 4.2V ($V_{CC}2$ is the maximum voltage for this parameter.)	
4	GND2	Comparator GND	GND dedicated to comparator.	
5	CP1	Comparator input (+)		
6	NFO	Noise elimination filter output		
7	CP2	Comparator input (-)		
8	GND1	GND	System GND.	
9	FCC	Baud rate setting	5Mbps as connected to GND and 7.5Mbps as connected to $V_{CC}1$.	
10	BIASC	Comparator bias	Connect to GND via capacitor.	
11	FADJ1	Fine adjustment of the noise elimination LPF shut-off frequency	Adjust with a resistor to GND.	Standard: OPEN
12	FADJ2	Fine adjustment of the LPF shut-off frequency	Adjust with a resistor to GND.	Standard: OPEN
13	GCNT	Receiving amplifier amplitude adjustment	Adjust with a resistor to GND. (C connection with GND)	Standard: 0Ω
14	RXI2	Receive signal inverted input		
15	RXI1	Receive signal non-inverted input		
16	BIAS2	Bias voltage		
17	BIAS	Bias voltage		
18	TXO2	Send signal inverted output		
19	TXO1	Send signal non-inverted output		
20	NC2	No connection		
21	NC1	No connection		
22	DRVI	Output driver input		
23	LPFO	LPF output		
24	$V_{CC}1$	Power supply	+5.0V ±5%	
25	$\overline{TXEN}$	Send/receive changeover control	L for send and H for receive. (V_OL= 0.5V, V_OH = 2.4V)	
26	LPFI	LPF input		
27	DAO	D/A converter output	0.5Vp-p ±1dB	
28	TXI2	D/A converter input (MSB)	V_OL = 0.5V, V_OH = 2.4V	
29	TXI1	D/A converter input	V_OL = 0.5V, V_OH = 2.4V	
30	TXI0	D/A converter input (LSB)	V_OL = 0.5V, V_OH = 2.4V	

Example of Application Circuit