



LV2210V

Basic Data Communication Receiver IC

Overview

The LV2210V is a basic data communication receiver IC that integrates on a single chip a frequency synthesizer that can be controlled by serial data, a downconverter mixer, a narrow-band FM IF system, and a data shaper circuit.

Features

- Operating frequency range: 7 to 50 MHz
- Operating supply voltage range: 2.7 to 5.5 V
- Miniature package: SSOP24 (275 mil)

Functions

- PLL synthesizer
- Downconverter mixer
- VCO transistor
- IF amplifier, limiter, and RSSI
- FM detector (quadrature)
- Data shaper

Specifications

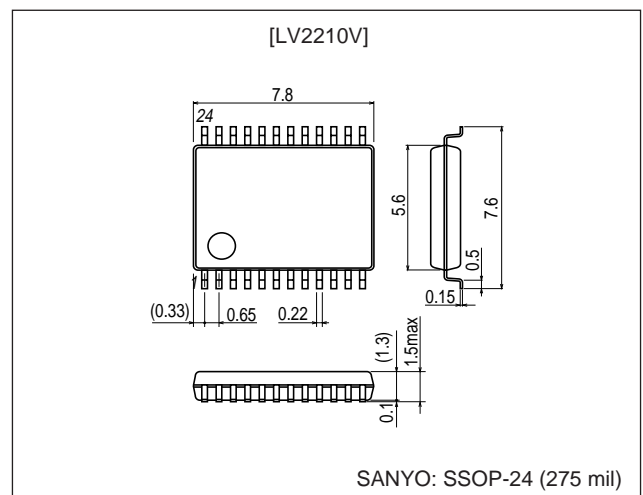
Absolute Maximum Ratings at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{CC\ max}$		6.0	V
Maximum input voltage	$V_{in\ max}$		$V_{CC} + 0.3$	V
Maximum output voltage	$V_{out\ max}$		$V_{CC} + 0.3$	V
Allowable power dissipation	$P_d\ max$	$T_a \leq 70^\circ\text{C}$	180	mW
Operating temperature	T_{opr}		-20 to $+70$	$^\circ\text{C}$
Storage temperature	T_{stg}		-40 to $+125$	$^\circ\text{C}$

Package Dimensions

unit: mm

3175B-SSOP24 (275 mil)



■ Any and all SANYO products described or contained herein do not have specifications that can handle applications that require extremely high levels of reliability, such as life-support systems, aircraft's control systems, or other applications whose failure can be reasonably expected to result in serious physical and/or material damage. Consult with your SANYO representative nearest you before using any SANYO products described or contained herein in such applications.

■ SANYO assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all SANYO products described or contained herein.

SANYO Electric Co.,Ltd. Semiconductor Company

TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN

LV2210V

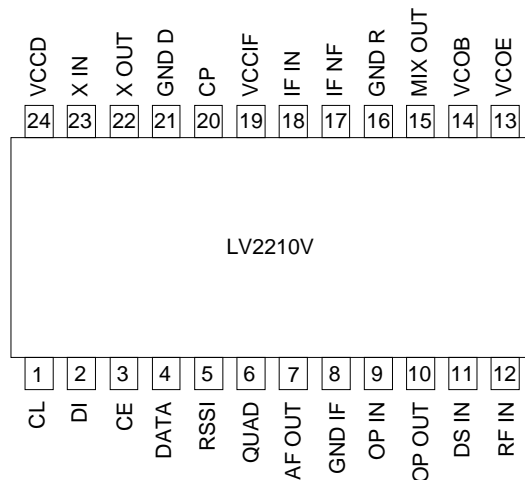
Allowable Operating Ranges at Ta = -20 to +70°C

Parameter	Symbol	Pins	Ratings			Unit
			min	typ	max	
Supply voltage	V _{CC}	VCCIF, VCCD	2.7	5	5.5	V
High-level input voltage	V _{IH}	CE, CL, DI	V _{CC} × 0.7			V
Low-level input voltage	V _{IL}	CE, CL, DI	0		+0.6	V
XIN operating frequency	F _{xin}	XIN, XOUT	5		20	MHz
XIN input level	V _{xin}	XIN, XOUT	-12		0	dBm
PLL operating frequency	F _{in}	PLL section	7		50	MHz
PLL input level	V _{in}	PLL section	-12		0	dBm

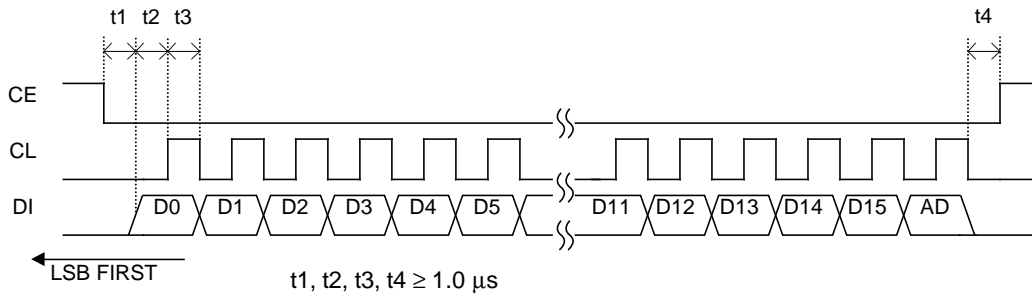
Electrical Characteristics at Ta = 25°C, VCCIF = VCCD = 5 V, Frf = 27 MHz, Flo = 26.545 MHz, F_{if} = 455 KHz, F_{mod} = 1 KHz, F_{dev} = ±3 KHz

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Current drain	I _{CC}	VCCIF, VCCD		7.5	13	mA
CP output off leakage current	I _{cpoff}	CP : Vo = 1.5 V, CP data "1"			100	nA
CP output current 1	I _{cp1}	CP : Vo = 1.5 V, CP data "0"		±100		µA
CP output current 2	I _{cp2}	CP : Vo = 1.5 V, CP data "1"		±400		µA
High-level input current	I _{IH}	CE, CL, DI : Vi = 3 V			5	µA
Low-level input current	I _{IL}	CE, CL, DI : Vi = 0 V			5	µA
Mixer operating input frequency	F _{mix}		7		50	MHz
Conversion gain	G _{mix}			25		dB
Intercept point	I _{ip3}			-13		dBm
Mixer output impedance	Z _{omix}			330		Ω
IF frequency	F _{if}			455		kHz
IF amplifier gain	G _{if}			105		dB
IF input impedance	Z _{if}			2		kΩ
RSSI output voltage 1	V _{rssi1}	Rfin : -90 dBm	0.3	0.5	0.75	V
RSSI output voltage 2	V _{rssi2}	Rfin : -50 dBm	1.1	1.4	1.75	V
Demodulator output	V _{odet}	Rfin : -30 dBm	150	190	240	mVrms
12 dB SINAD sensitivity	12SD			-100	-90	dBm
Total harmonic distortion	THD	Rfin : -30 dBm		2.0	3.0	%
Signal-to-noise ratio	S/N	Rfin : -30 dBm	40	50		dB
AM rejection ratio	AMR	AM 30% mod	30	40		dB
Data shaper duty ratio	DR	Opin : 1 kHz, 100 mVrms	45	50	55	%

Pin Assignment



Serial Data Timing



Control Data Format and Description

CONTROL DATA																AD
D0	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	AD
R0	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	CP	SW	T2	T1	0
P0	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	*	*	1

BIT	DESCRIPTION
AD	Latch selection bit
T1, T2	Test bits. These bits must always be set to 0.
R0 to R11	Reference divider bits. R0 is the LSB. This is a binary value field.
P0 to P13	Programmable divider bits. P0 is the LSB. This is a binary value field.
CP	Charge pump current switching bit. 0: 100 μA, 1: 400 μA
SW	On/off switch for the reference voltage for the data shaper. 1: On, 0: Off

Reference divider divisor setting data

- The circuit consists of a fixed divide-by-two circuit and a 12-bit reference divider.
- A divisor, which is a multiple of 2 with a value of up to 8190, can be set by sending the reference divider data.
- The value of the divisor is determined as follows.

$$\text{Divisor } N = 2 (R0 + R1 \times 2^1 + R2 \times 2^2 + R3 \times 2^3 + \dots + R11 \times 2^{11})$$

Programmable divider divisor setting data

- The circuit consists of a 4-bit swallow counter and a 10-bit programmable counter.
- A divisor with a value in the range 240 to 16,383 can be set by sending the swallow counter and programmable counter data.
- The value of the divisor is determined as follows.

$$\text{Divisor } N = (16D + A)$$

$$D = P4 + P5 \times 2^1 + P6 \times 2^2 + P7 \times 2^3 + \dots + P13 \times 2^9$$

$$A = P0 + P1 \times 2^1 + P2 \times 2^2 + P3 \times 2^3$$

PLL Divisor Setup Example

- The reference divider divisor is calculated as follows when a 12.8 MHz crystal element is used, the comparison frequency in the phase detector is 5 kHz, and the VCO oscillator frequency is 26.545 MHz.

$$12.8 \text{ MHz} \div 5 \text{ kHz} = 2560 \text{ (divisor value)}$$

Since there is a fixed divide-by-two circuit, the required divisor is as follows.

$$2560 \times 1/2 = 1280$$

The value 1280 converted to binary (10100000000) is the reference divider setting data.

The programmable divider divisor is calculated as follows.

$$26.545 \text{ MHz} \div 5 \text{ kHz} = 5309 \text{ (divisor value)}$$

The value 5309 converted to binary (1010010111101) is the programmable divider setting data.

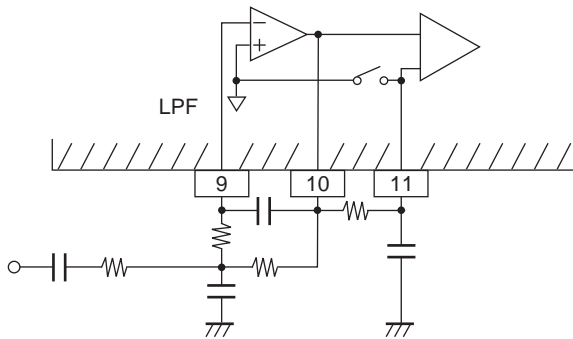
- The control data is set as follows

CONTROL DATA																AD
D0	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	AD
0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	0	0
1	0	1	1	1	1	0	1	0	0	1	0	1	0	0	0	1

(Charge pump current = 100 μA, Data shaper switch = on)

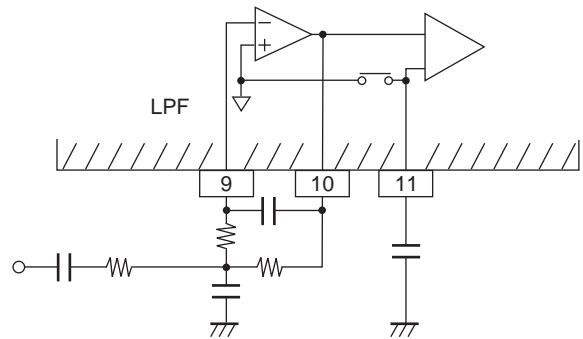
Low-Pass Filter and Data Shaper Application Examples

Example 1 (Switch: 0)



ILV00150

Example 2 (Switch: 1)



ILV00151

LV2210V

Pin Functions

Pin No.	Pin	Equivalent circuit	Notes
1 2 3	CL DI CE		Serial data input
4	DATA		Data shaper output
5	RSSI		RSSI output
6	QUAD		Quadrature coil/discriminator connection
7	AFOUT		AF signal output

Continued on next page.

LV2210V

Continued from preceding page.

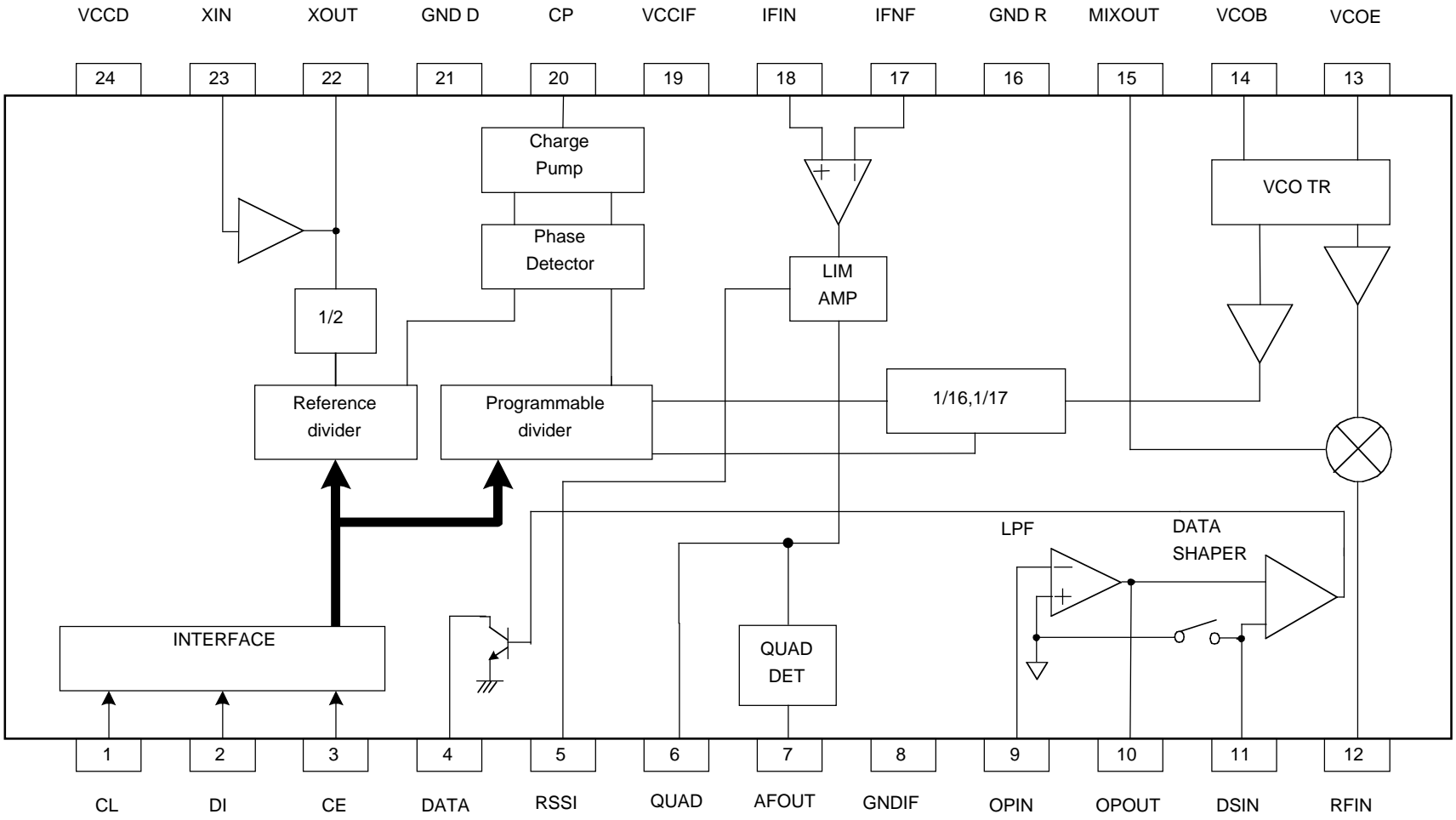
Pin No.	Pin	Equivalent circuit	Notes
8	GNDIF		IF ground
9	OPIN		Low-pass filter input
10	OPOUT		Low-pass filter output
11	DSIN		Data shaper input
12	RFIN		Mixer input
13 14	VCOE VCOB		VCO circuit

Continued on next page.

LV2210V

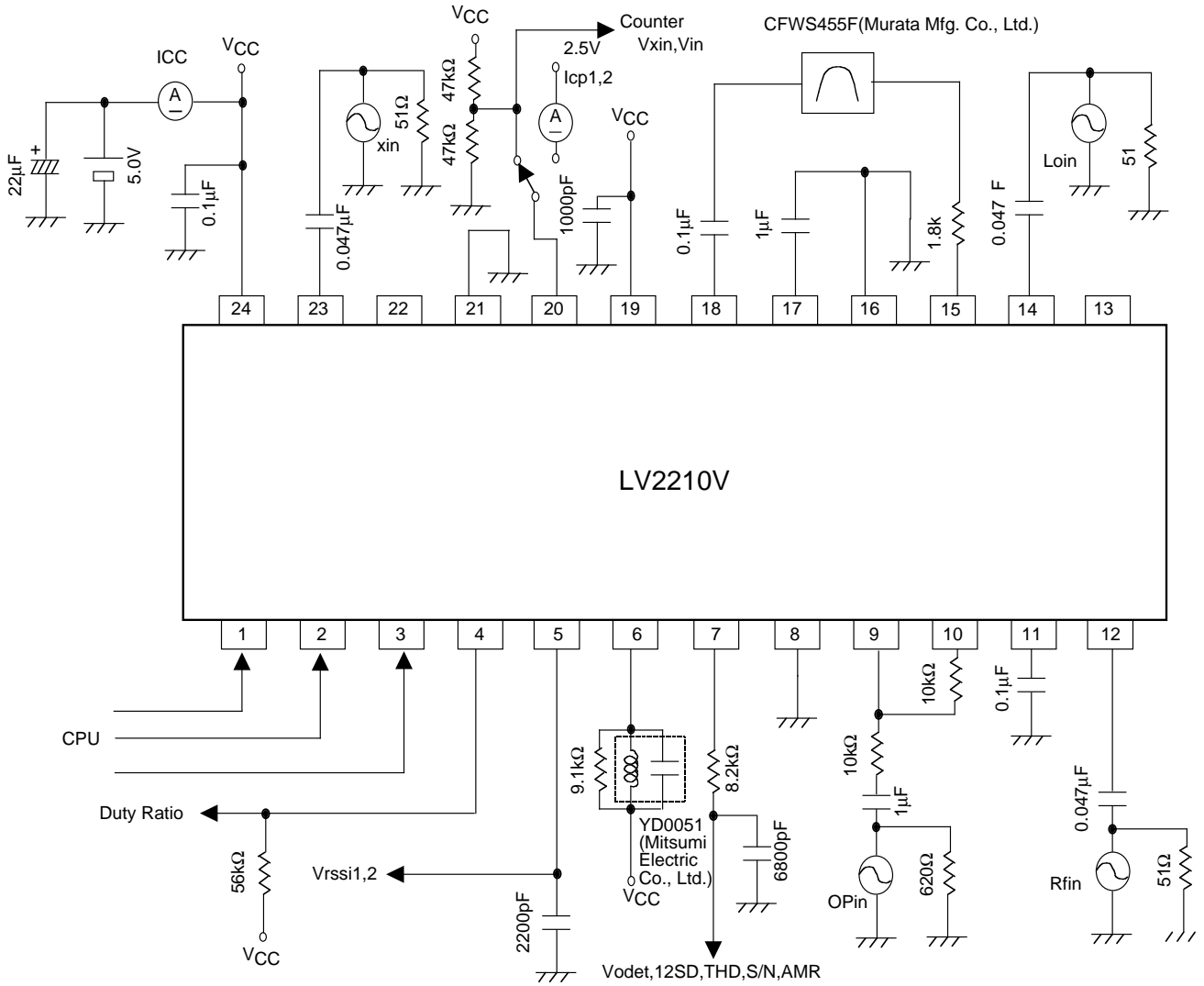
Continued from preceding page.

Pin No.	Pin	Equivalent circuit	Notes
15	MIXOUT		Mixer output
16	GNDR		RF ground
17 18	IFNF IFIN		IF input
19	VCCIF		IF VCC
20	CP		Charge pump output
21	GNDD		Digital system ground
22 23	XOUT XIN		Crystal oscillator circuit
24	VCCD		Digital system VCC



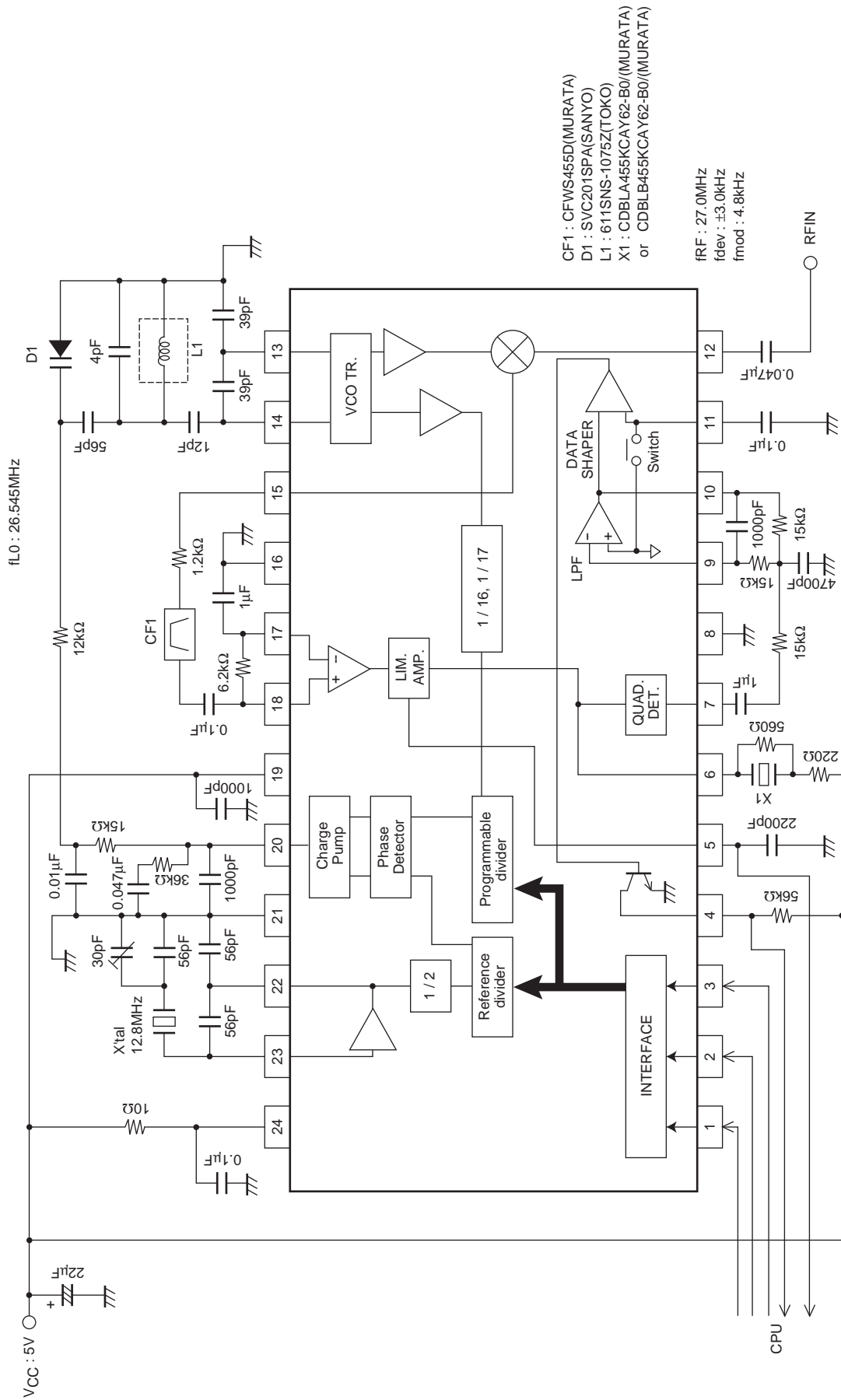
LV2210V

Test Circuit Diagram

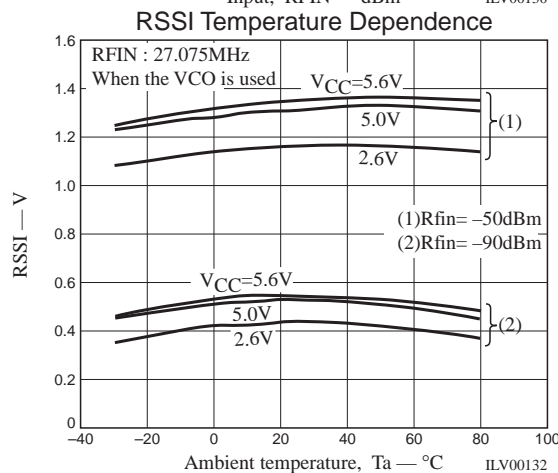
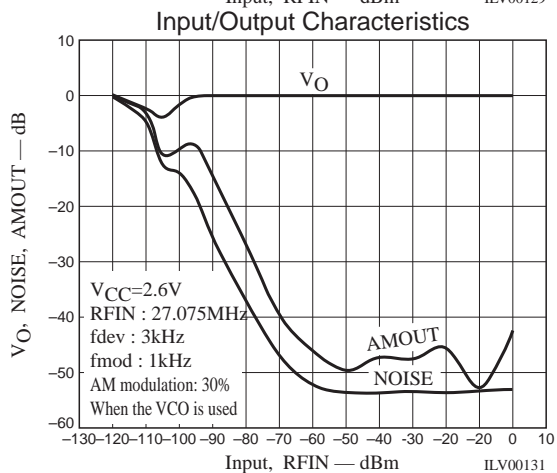
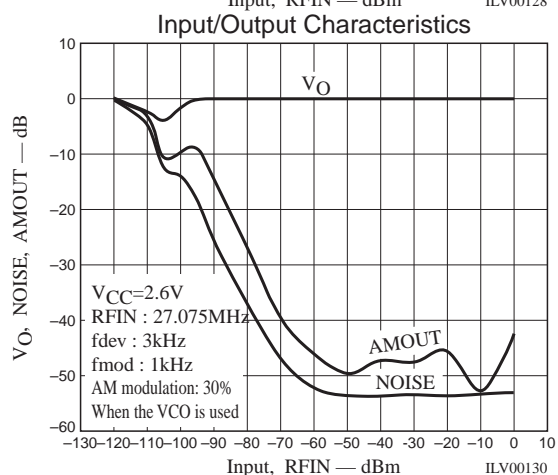
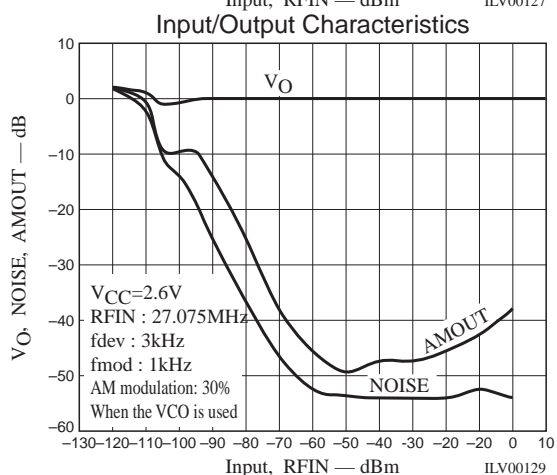
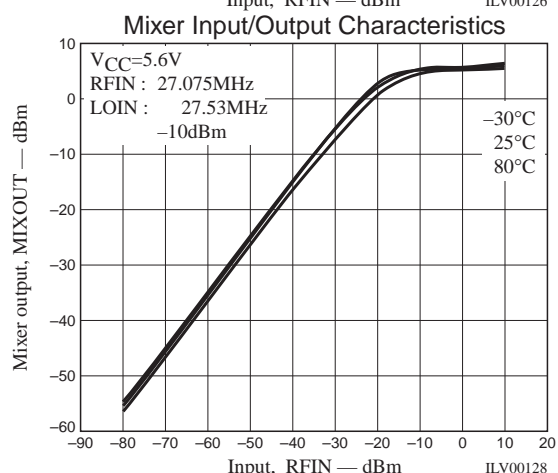
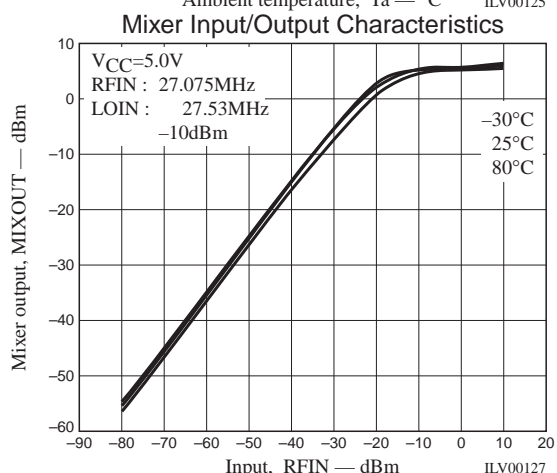
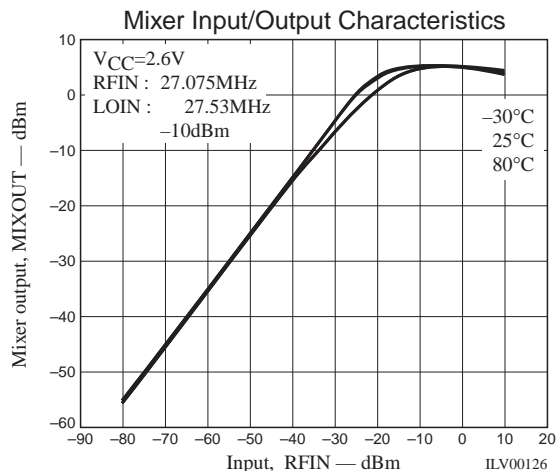
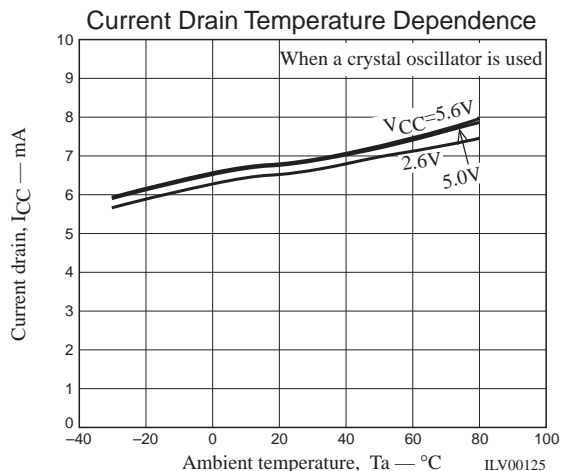


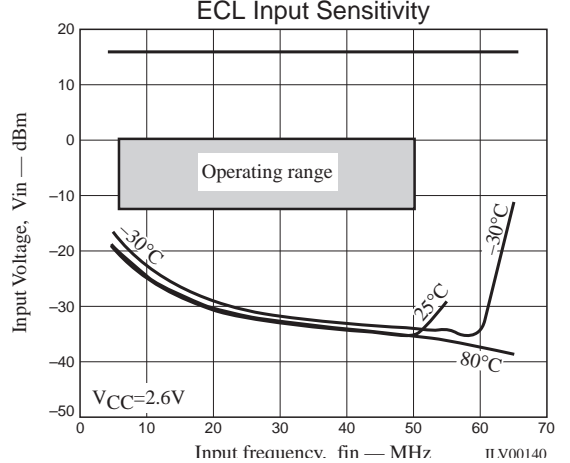
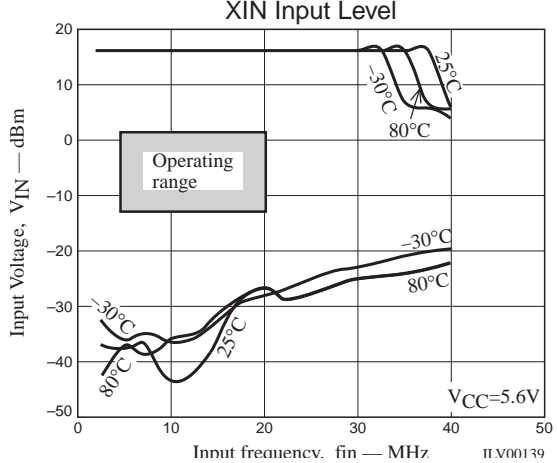
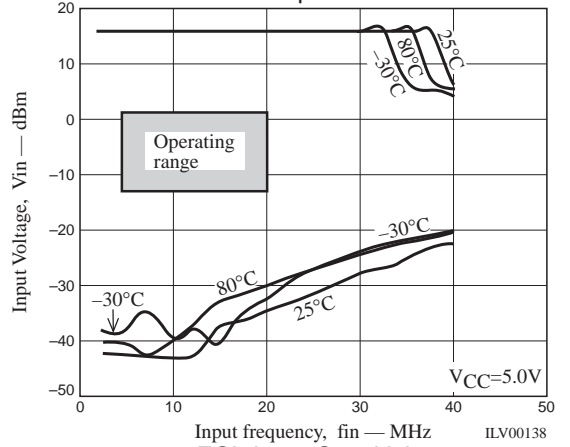
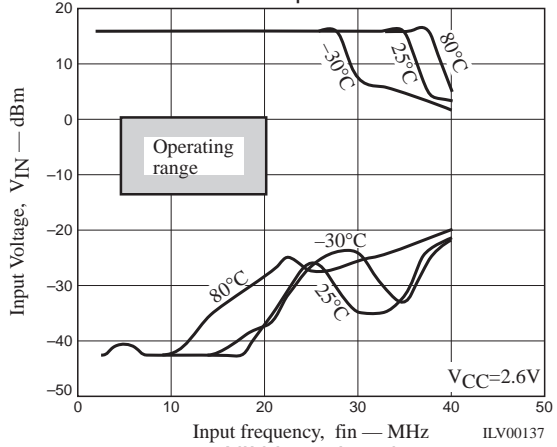
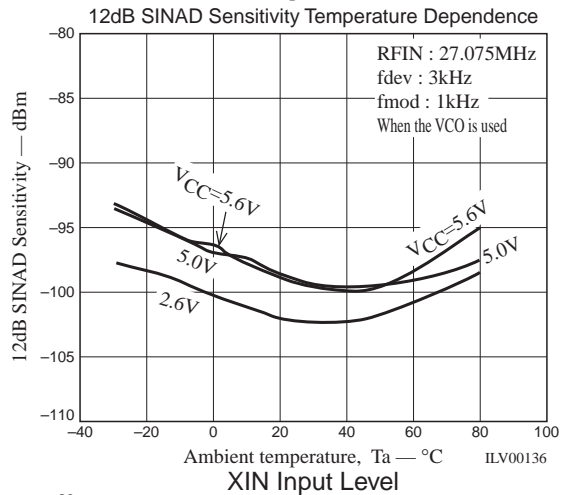
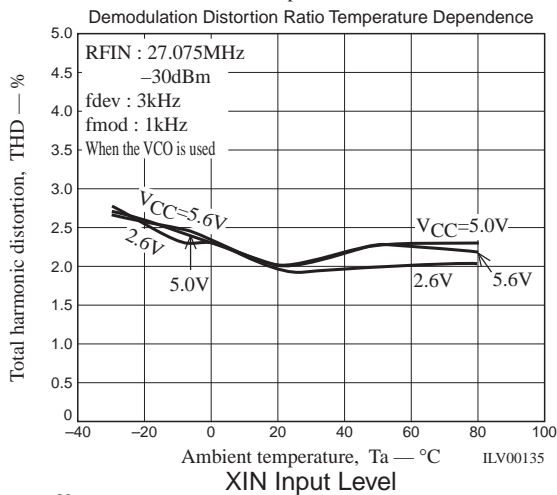
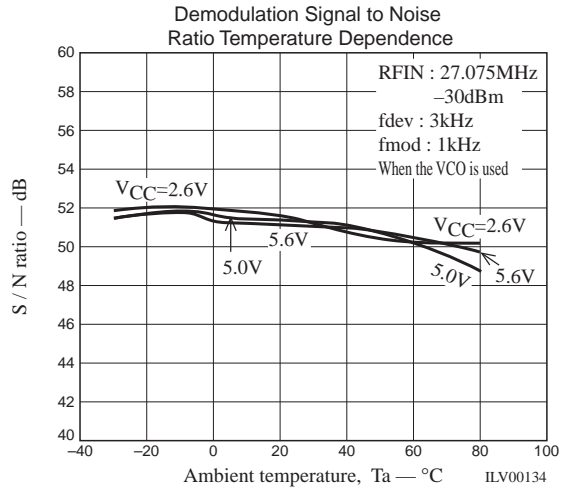
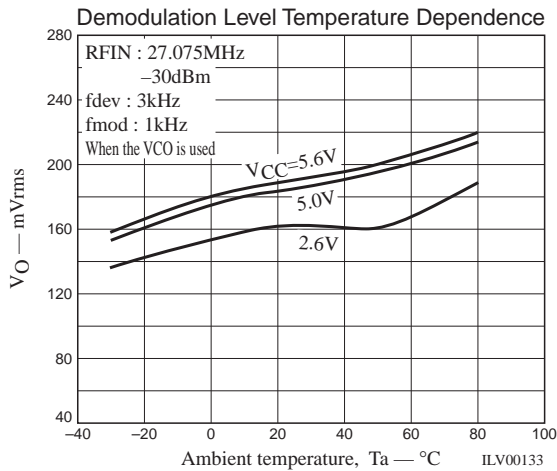
LV2210V

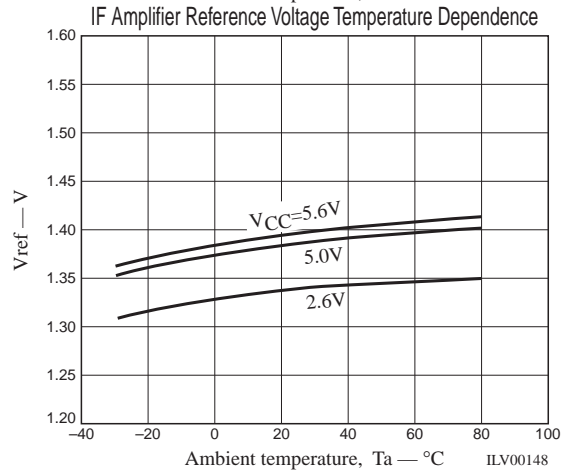
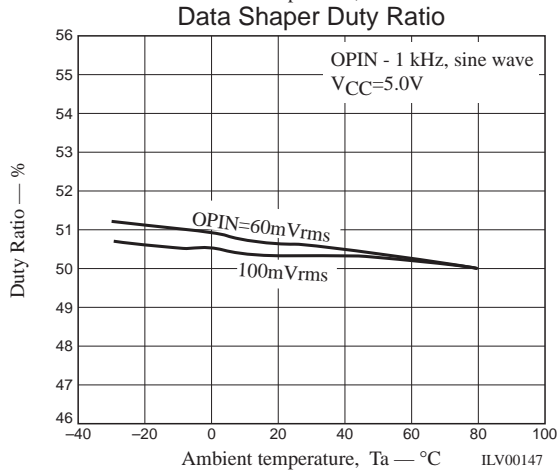
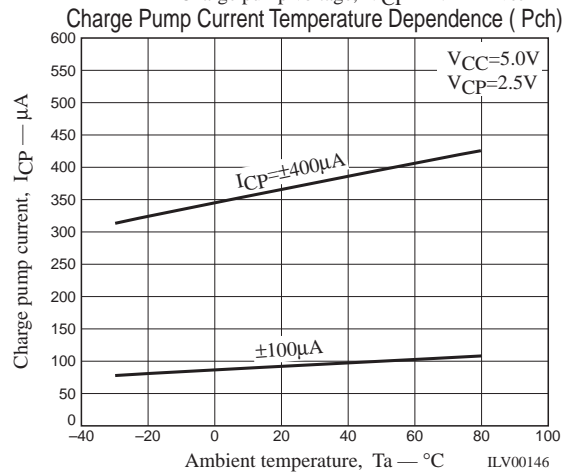
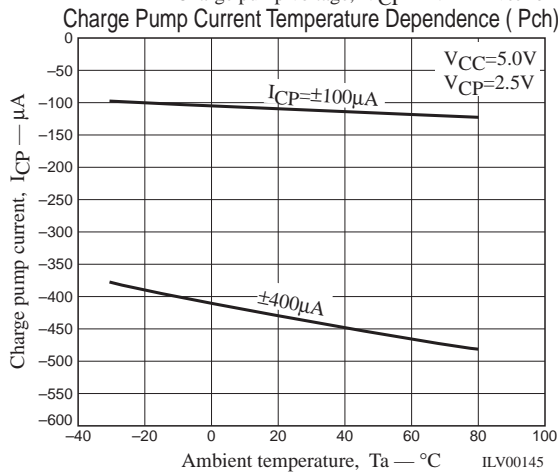
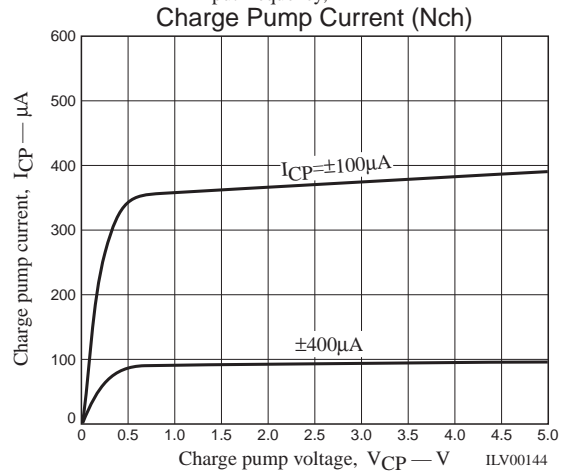
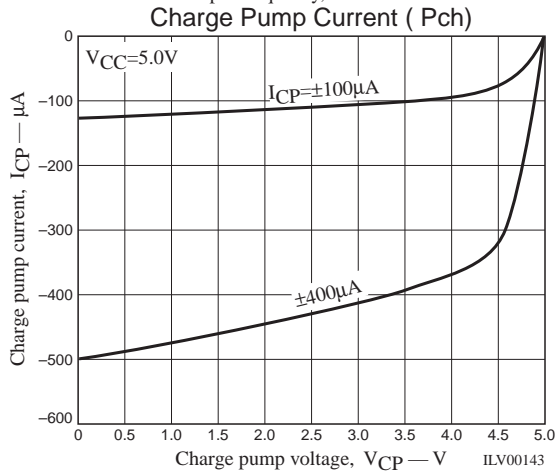
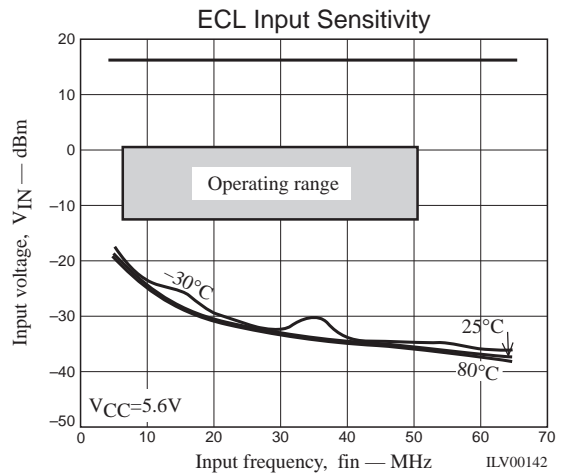
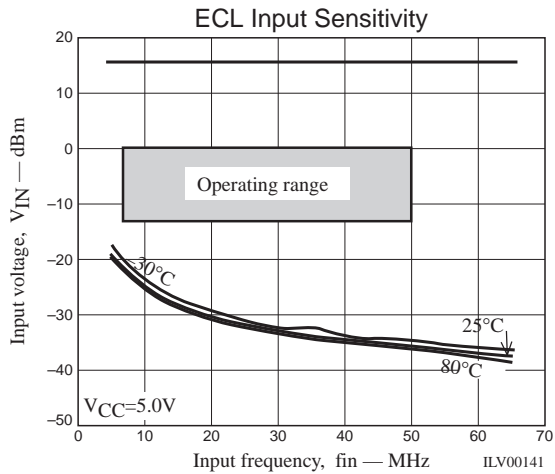
Sample Application Circuit 2 (Using a discriminator)

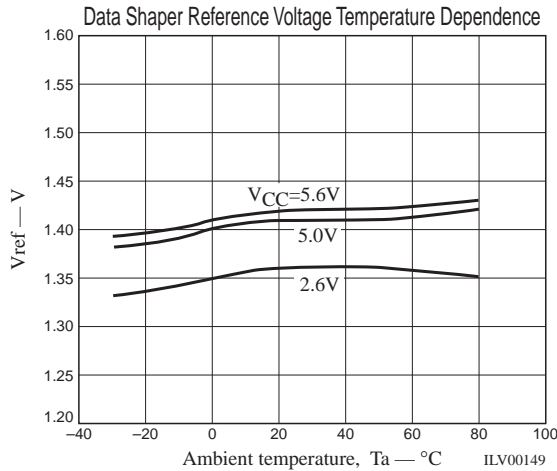


ILV00153









- Specifications of any and all SANYO products described or contained herein stipulate the performance, characteristics, and functions of the described products in the independent state, and are not guarantees of the performance, characteristics, and functions of the described products as mounted in the customer's products or equipment. To verify symptoms and states that cannot be evaluated in an independent device, the customer should always evaluate and test devices mounted in the customer's products or equipment.
- SANYO Electric Co., Ltd. strives to supply high-quality high-reliability products. However, any and all semiconductor products fail with some probability. It is possible that these probabilistic failures could give rise to accidents or events that could endanger human lives, that could give rise to smoke or fire, or that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits and error prevention circuits for safe design, redundant design, and structural design.
- In the event that any or all SANYO products (including technical data, services) described or contained herein are controlled under any of applicable local export control laws and regulations, such products must not be exported without obtaining the export license from the authorities concerned in accordance with the above law.
- No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or any information storage or retrieval system, or otherwise, without the prior written permission of SANYO Electric Co., Ltd.
- Any and all information described or contained herein are subject to change without notice due to product/technology improvement, etc. When designing equipment, refer to the "Delivery Specification" for the SANYO product that you intend to use.
- Information (including circuit diagrams and circuit parameters) herein is for example only; it is not guaranteed for volume production. SANYO believes information herein is accurate and reliable, but no guarantees are made or implied regarding its use or any infringements of intellectual property rights or other rights of third parties.

This catalog provides information as of March, 2002. Specifications and information herein are subject to change without notice.