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Total Solution of MCU

GC49C501G1-SJ20I

4-bit Turbo Microcontroller

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1 GC49C501G1-SJ20I Overview

1.1 General Description

GC49C501G1-SJ20I is a 4-bit reduced 8051 Microcontroller.

GC49C501G1-SJ20I has 14 programmable I/O ports, Watchdog timer, POR (Power-On Reset), built-in I.R. LED Driver, and LVD (Low Voltage Detector) as peripherals. In addition, it contains an internal ring oscillator, which can generate the 8 MHz system clock signal instead of a crystal oscillator.

GC49C501G1-SJ20I operates over the extended -40℃ to +85℃ temperature range, and is available in the 20-pin SOP package.

1.2 Features

- ◆ CPU
    - ✓ 4-bit reduced 8051 architecture
    - ✓ Continuous program addressing, not paged.
    - ✓ 51 instructions including push, pop and logic inst.
    - ✓ Instruction cycle : $F_{SYS}/6$
    - ✓ Multi-level subroutine nesting with RAM based stack.
- ◆ On-chip Memories
    - ✓ FLASH : 1024 bytes (including 128 EEPROM)
    - ✓ RAM : 64 nibbles (including stack)
- ◆ ISP (In System Programming) of FLASH
- ◆ IAP (In Application Programming) of FLASH
- ◆ I/O Ports
    - ✓ P0 : 4-bit parallel I/O (Open drain output)
    - ✓ P1 : Parallel I/O (Open drain output) 2-bit
    - ✓ P2, P3 : 4-bit parallel/bit-selectable I/O (Open drain output)
- ◆ REM output (Remote control transmitter)
    - ✓ Built-in Transistor for I.R. LED Drive

- ✓ I_{OL} = 300 mA (Max.) at V_{DD} = 3V and V_O = 0.4V
- ◆ Carrier Pulse Generation : 7 types
- ◆ Built-in Oscillator
  - ✓ Crystal/Ceramic resonator
  - ✓ Internal oscillator : 8MHz
- ◆ Built-in Reset
  - ✓ Power-on Reset, Power-fail Reset
  - ✓ WDT (Watch-Dog Timer) Reset
  - ✓ Clock switching reset
- ◆ Power Management
  - ✓ Power-down (stop) mode
  - ✓ Release stop by input changes
  - ✓ Sleep mode
- ◆ Power Consumption
  - ✓ Stop mode : ＜0.1uA (Typ.) at 2.0V
    - 1 uA (Max.) at 5.0V
  - ✓ Normal mode : 400 uA (Typ.) at 2.0V, F_{SYS} = 4 MHz
- ◆ Operating frequency vs. voltage
  - ✓ Max. F_{OSC} = 10 MHz ($2.7\ V \leq V_{DD} \leq 5.5V$)
  - ✓ Max. F_{OSC} = 5 MHz ($1.8\ V \leq V_{DD} < 2.7V$)
- ◆ Operating temperature : -40 ℃ ~ 85 ℃
- ◆ ESD protection
  - ✓ HBM : 2,000V (JESD22-A114E)
  - ✓ MM   :   200V   (JESD22-A115-A)
  - ✓ CDM :   800V   (JESD22-C101-C)
- ◆ Latch-up protection up to ±200mA
- ◆ Package
  - ✓ 20-pin SOIC (JEDEC)

1.3 Applications

- ◆ Remote Controller
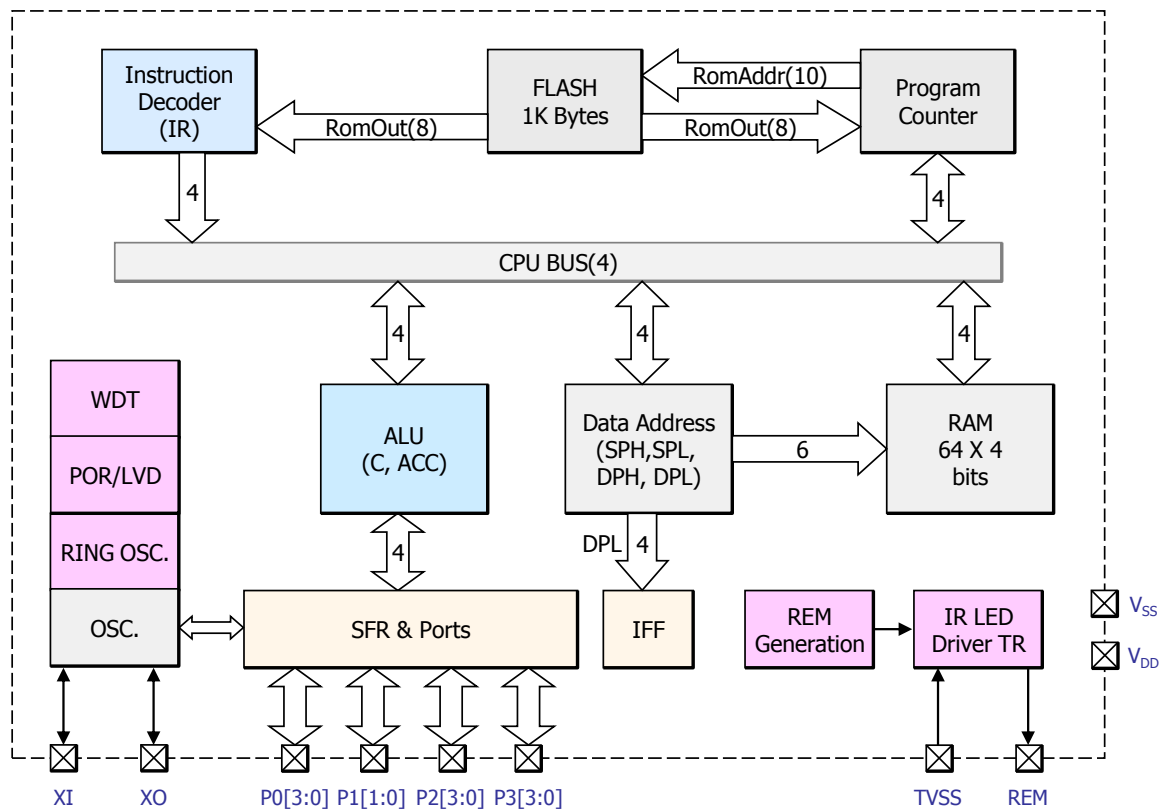
1.4 Product Family Guide

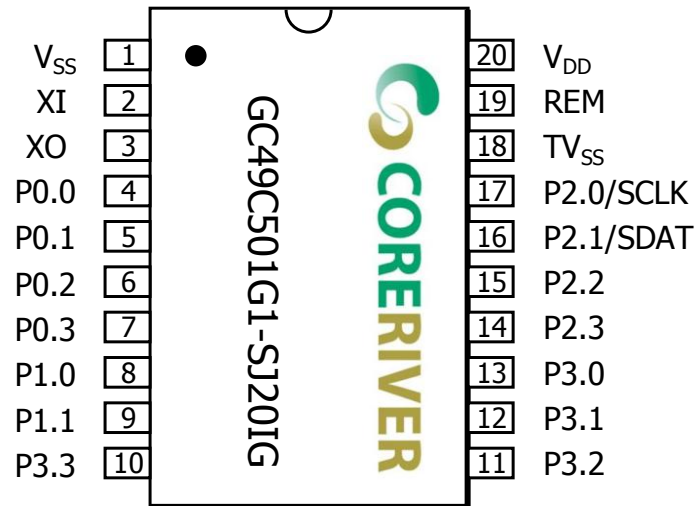| Product	Mask-ROM [Byte]	Flash (EEPROM) [Byte]	RAM [Nibble]	Package	I/O Pins	Other Peripherals
GC49C501G1-SO24I	-	1k (128)	64	24-SOIC	18	WDT IAP ISP LVD POR Ring Oscillator I.R. LED Driver
GC49C501G1-SJ20I	**-**	**1k (128)**	**64**	**20-SOIC (JEDEC)**	**14**	
GC41C501G1-SO24I	1k	-	64	24-SOIC	18	
GC41C501G1-SJ20I	1k	-	64	20-SOIC (JEDEC)	14	

2 Block Diagram

Figure shows the block diagram of **GC49C501G1-SJ20I**. Programs reside in the internal program memory (Embedded Flash Memory). Data are read from or written to data memory (SRAM) or special function registers (SFRs).

The internal registers of **GC49C501G1-SJ20I** are configured as part of the on-chip RAM: therefore each register has an address.

3 Pin Configuration

24-pin SOIC Package Diagram

Pin list (left side, top to bottom):
- V_{SS} — 1
- XI — 2
- XO — 3
- P0.0 — 4
- P0.1 — 5
- P0.2 — 6
- P0.3 — 7
- P1.0 — 8
- P1.1 — 9
- P3.3 — 10

Pin list (right side, top to bottom):
- V_{DD} — 20
- REM — 19
- TV_{SS} — 18
- P2.0/SCLK — 17
- P2.1/SDAT — 16
- P2.2 — 15
- P2.3 — 14
- P3.0 — 13
- P3.1 — 12
- P3.2 — 11

Part marking: GC49C501G1-SJ20IG

4 Pin Description

Pin No.	Name	Type	Description	Share Pins
1	V_{SS}	GND	Ground	
2	XI	Input	Input to the inverting oscillator amplifier.	
3	XO	Output	Output from the inverting oscillator amplifier.	
4	P0.0	I/O	General I/O	
5	P0.1	I/O	General I/O	
6	P0.2	I/O	General I/O	
7	P0.3	I/O	General I/O	
8	P1.0	I/O	General I/O	
9	P1.1	I/O	General I/O	
10	P3.3	I/O	General I/O	
11	P3.2	I/O	General I/O	
12	P3.1	I/O	General I/O	
13	P3.0	I/O	General I/O	
14	P2.3	I/O	General I/O	
15	P2.2	I/O	General I/O	
16	P2.1	I/O	General I/O	SDAT
17	P2.0	I/O	General I/O	SCLK
18	TV_{SS}	GND	Ground for IR LED drive Transistor	
19	REM	Output	Output for IR LED drive Transistor. The transistor is n-channel device.	
20	V_{DD}	PWR	Power Supply	

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5 Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit
V_{DD}	DC supply voltage	-0.5 to 6.5V	V
V_{IN}	DC input voltage	-0.5 to V_{DD} + 0.5	V
V_{OUT}	DC output Voltage	-0.5 to V_{DD} + 0.5	V
I_{OH}	DC outpur high current	One I/O pin active: -25	mA
		All I/O pins active: -100	mA
I_{OL}	DC output low current	One I/O pin active: 30	mA
		All I/O pins active: 150	mA
T_{STG}	Storage temperature	-55 to 125	°C

6 Recommended Operating Conditions

Symbol	Parameter	Rating	Unit
V_{DD}	DC supply voltage	1.8 to 5.5	V
T_A	Industrial temperature range	-40 to 85	°C

7 DC Characteristics

(T$_A$= -40°C ~ +85°C, V$_{DD}$=1.8V ~ 5.5V unless otherwise specified)

Parameter	Symbol	Pin	Conditions	Value			Unit
				Min.	Typ.	Max.	
Input low voltage	V$_{IL1}$	P0, P1, P2, P3	V$_{DD}$=1.8V~5.5V	-0.5	-	0.2V$_{DD}$ - 0.1	V
Input high voltage	V$_{IH1}$	P0, P1, P2, P3	V$_{DD}$=1.8V~5.5V	0.2V$_{DD}$ + 1.0	-	V$_{DD}$+0.5	V
Input high leakage current	I$_{IH}$	All pins except XI, XO	V$_{IN}$ = V$_{DD}$	-1	-	+1	uA
Output low voltage	V$_{OL}$	P0,P1,P2,P3	I$_{OL}$=20mA @V$_{DD}$=5V (I$_{OL}$=3mA @V$_{DD}$=2.2V)	-	-	0.3V$_{DD}$	V
Output low voltage	V$_{OL2}$	REM	I$_{OL}$=280mA @V$_{DD}$=3V	-	-	0.4	V
Output high voltage	V$_{OH}$	P2 (push-pull output)	I$_{OH}$=-15mA @V$_{DD}$=5V	0.7V$_{DD}$	-	-	V
Output high voltage	V$_{OHP}$	Pull-up current	I$_{OHP}$=-40uA @V$_{DD}$=5V (I$_{OHP}$=-15uA @V$_{DD}$=2.2V)	0.7V$_{DD}$	-	-	V
Pin capacitance	C$_{IO}$	All	V$_{DD}$ = 5V	-	10	-	pF

8 AC Characteristics

(T$_A$=-40°C ~ +85°C unless otherwise specified)

Parameter	Symbol	Pin	Conditions	Value			Unit
				Min.	Typ.	Max.	
Operating Frequency (Internal Clock)	F$_{OSC}$		2.7V ≤V$_{DD}$≤5.5V	-	-	10	MHz
			1.8V ≤V$_{DD}$≤2.7V	-	-	5	
Operating Frequency (External Clock)	F$_{OSC}$	XI, XO	2.7V ≤V$_{DD}$≤5.5V	-	-	10	MHz
			1.8V ≤V$_{DD}$≤2.7V	-	-	5	
System Frequency	F$_{SYS}$		1.8V ≤V$_{DD}$≤5.5V	1/64	-	1	F$_{OSC}$
External Input Width	t$_{INT}$	P0, P1, P2, P3	1.8V ≤V$_{DD}$≤5.5V	12	-	-	F$_{SYS}$
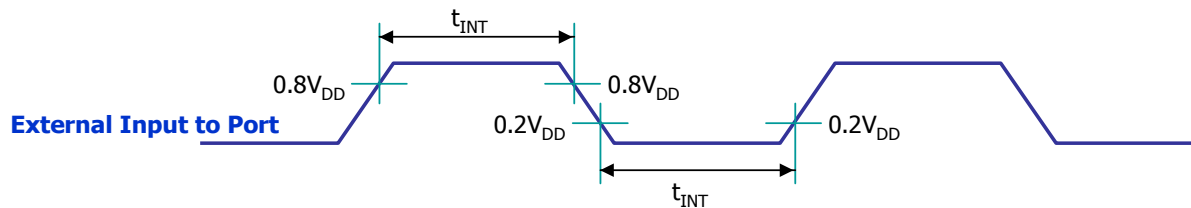
9 20-pin SOIC Package Dimension
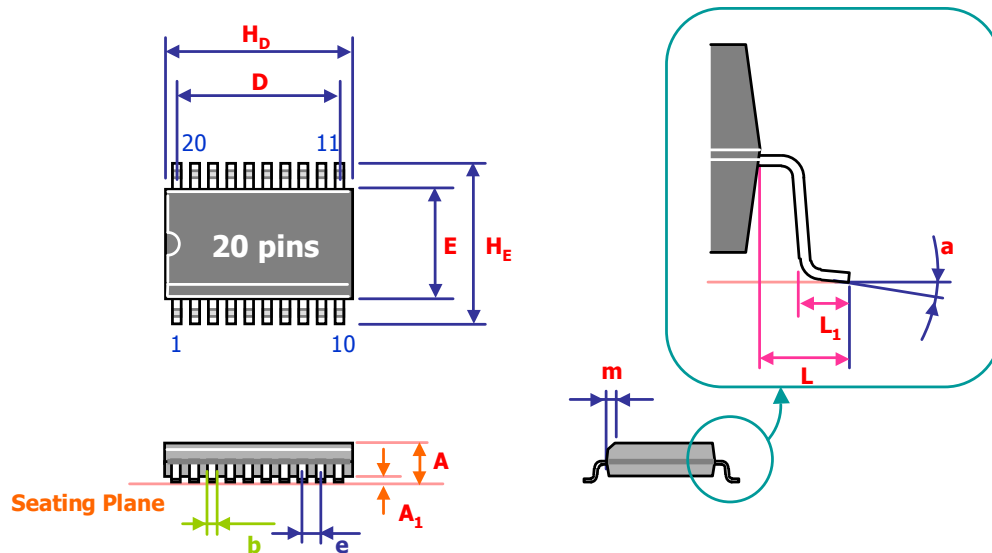
Symbol	Dimension in Inches			Dimension in mm		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	-	-	0.106	-	-	2.7
A_1	0.004	-	-	0.1	-	-
b	0.013	0.016	0.020	0.324	0.4	0.51
E	0.264	0.295	0.324	6.71	7.5	8.23
H_D	0.495	0.504	0.512	12.57	12.8	13
H_E	0.394	0.406	0.419	10.0	10.3	10.643
L	0.016	-	0.052	0.406	-	1.32
a	0°	-	8°	0°	-	8°
e	0.050 BSC			1.27 BSC		

Notes:

1. **Dimension D & E include mold mismatch and are determined at the mold parting line.**
2. **General appearance spec. should be based on final visual inspection spec.**