

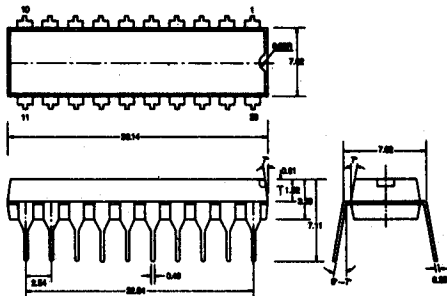
**SINGLE-CHIP 4-BIT MICOM.
FOR REMOTE TRANSMITTER**

DMC6003-XXX is remote control transmitter which utilizes silicon gate CMOS technology.

This housed in a 20 pin plastic molded DIP/SOP and enables transmission code output, multiple custom code output, and double push key output for easy fabrication of an 8 × 4 key matrix.

20DIP

Unit : mm



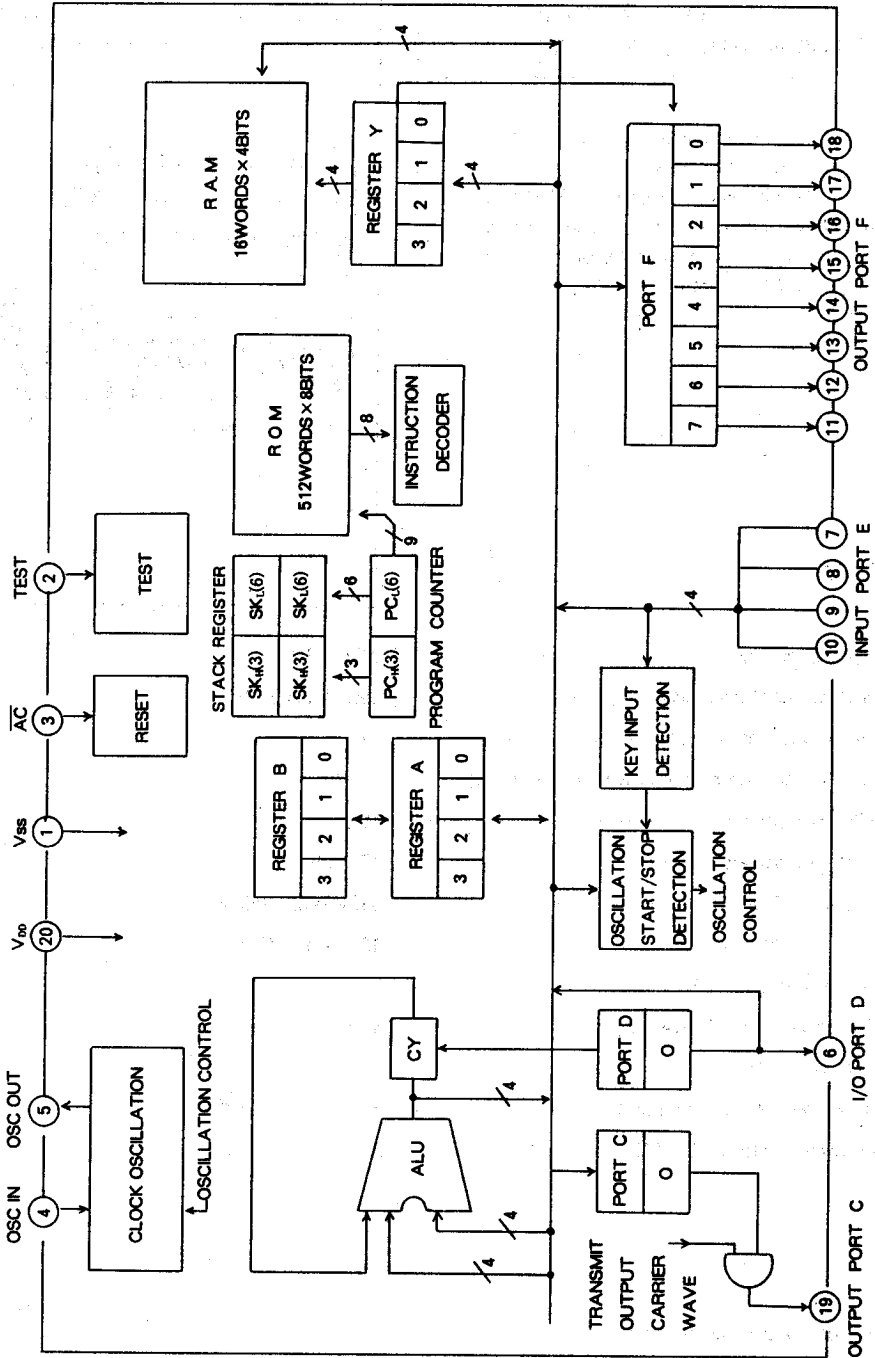
FEATURES

- Single power supply 2.2~3.6V
- Power dissipation(stop mode, $V_{DD}=3V$) Less Than 3uW
- Number of basic instructions 37
- Instruction execution time(one word instructions)
 - At 480kHz frequency 16.67uS
 - At 455kHz frequency 17.58uS
- Memory size ROM 512Words × 8Bits
 - RAM 16Words × 4Bits
- Input ports(ports E0~E3)
 - (Build-in the pull-up Transistor) 4
- I/O ports(ports D)
 - (Build-in the pull-up Transistor) 1
- Output ports(ports C, F0~F7) 9

USE

- Various remote control transmitters

□ BLOCK DIAGRAM



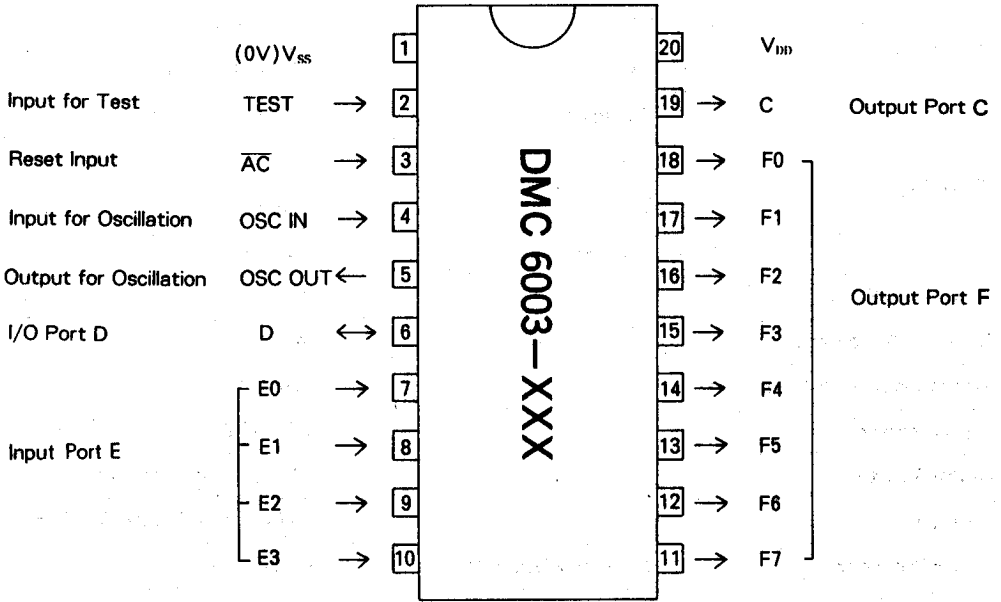
DMC 6003-XXX

FUNCTIONS

| Parameter | | Function |
|--|---------------------|-------------------------------------|
| Number of Basic Instructions | | 37 |
| Instructions Execution Time(One Word Instructions) | | 17.58 μ S($F_{osc} = 455$ KHz) |
| Clock Frequency(F_{osc}) | | 455kHz, OR 480KHz |
| Memory Size | ROM | 512 Words \times 8 Bits |
| | RAM | 16 Words \times 4 Bits |
| I/O ports | C Output | 1 Bit \times 1 |
| | D I/O | 1 Bit \times 1 |
| | E Input | 4 Bit \times 1 |
| | F Output | 1 Bit \times 8 |
| Subroutine Nesting | | 2 Levels |
| Clock Oscillating Circuit | | Build-in |
| Transmission Output Carrier(port C) | | $F_{osc} / 12$ |
| Supply Voltage | | 2.2V~3.6V |
| Device Structure | | CMOS Silicon Gate Process |
| Package | | 20 Pin Plastic Molded DIP/SOP |
| Power Dissipation ($V_{DD} = 3V$) | At Normal Operating | 0.3mW (typ.) |
| | At Standby Mode | 3 μ W(max.) |

DMC 6003-XXX

□ PIN DESCRIPTION



OUT LINE 20 PIN

PIN DESCRIPTION(CONTINUED)

| Pin | Name | I/O | Function |
|--------------------------------|------------------------|--------|--|
| V _{SS} | GND | | GND |
| V _{DD} | Power Supply | | + Power Supply |
| TEST | Input for Test | INPUT | This is Usually Connected to V _{SS} |
| AC | Reset Input | INPUT | To Enter the Reset State "L" |
| OSC IN | Input for Oscillating | INPUT | Connect A Ceramic Resonator to These Pins |
| OSC OUT | Output for Oscillating | OUTPUT | |
| C | Output Port C | OUTPUT | Output for Transmission(CMOS Output) |
| D | I/O Port D | I/O | 1 Bit I/O(N Channel Open Drain Output) |
| E ₀ ~E ₃ | Input Port E | INPUT | 4 Bit Input (Build-In The Pull-Up Transistor) |
| F ₀ ~F ₇ | Output Port F | OUTPUT | 8 Bit Output(N Channel Open Drain Output, Key Scan Output) |

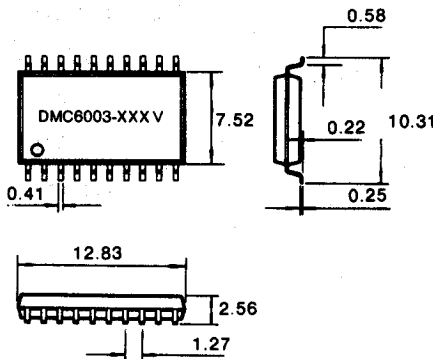
ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Condition | Rating | Unit |
|------------------|-----------------------|----------------------|---------------------------------------|------|
| V _{DD} | Supply Voltage | T _a =25°C | -0.3~4 | V |
| V _I | Input Voltage | | $V_{SS}-0.3 \leq V_I \leq V_{DD}+0.3$ | V |
| V _O | Output Voltage | | $V_{SS} \leq V_O \leq V_{DD}$ | V |
| P _w | Power Dissipation | | 300 | mW |
| T _{opr} | Operating Temperature | | -20~70 | °C |
| T _{stg} | Storage Temperature | | -40~125 | °C |

SYMBOL DESCRIPTION

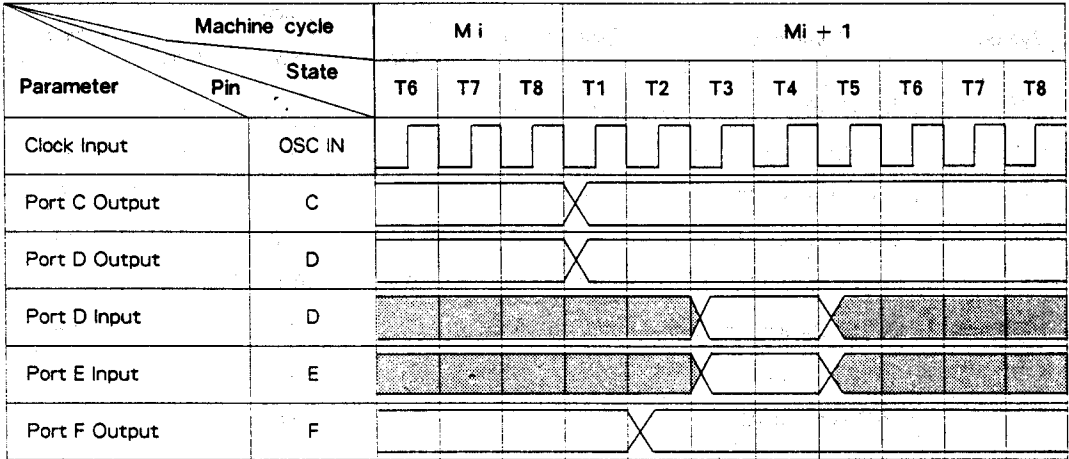
| Symbol | Contents |
|---|--|
| A, B, Y | 4 Bit Register |
| DP | 4 Bit Data Pointer (Consisting of the Register Y) |
| PC _H | The Higher 3 Bits of the Program Counter |
| PC _L | The Lower 6 Bits of the Program Counter |
| PC | 9 Bit Program Counter (Consisting of PC _H , And PC _L) |
| SK | 9 Bit Stack Register |
| CY | 1 Bit Carry Flag |
| C, D | 1 Bit Port |
| E | 4 Bit Port |
| F | 8 Bit Port |
| ← | Direction in Which Data is Transferred |
| y ₃ y ₂ y ₁ y ₀ | 4 Bit Binary Variable |
| n ₃ n ₂ n ₁ n ₀ | 4 Bit Binary Constant |
| a ₅ a ₄ a ₃ a ₂ a ₁ a ₀ | Label to Show the Address |
| p ₂ p ₁ p ₀ | Label to Show the Address |

SOP DIMENSION (DMC6003-×××V)



DMC 6003-XXX

BASIC TIMING BLOCK



RECOMMENDED OPERATING CONDITIONS

(Ta = -20~70°C)

| Symbol | Parameter | Limits | | | Unit |
|-----------------|-----------------------------------|---------------------|-----------------|---------------------|------|
| | | Min. | Typ. | Max. | |
| V _{DD} | Supply Voltage | 2.2 | — | 3.6 | V |
| V _{BI} | "H" Input Voltage Ports E, D | 0.8 V _{DD} | V _{DD} | V _{DD} | V |
| | "H" Input Voltage \overline{AC} | 0.7 V _{DD} | V _{DD} | V _{DD} | |
| V _{IL} | "L" Input Voltage Port E, D | 0 | 0 | 0.4 V _{DD} | V |
| | "L" Input Voltage \overline{AC} | 0 | 0 | 0.3 V _{DD} | |
| Fosc | Oscillating Frequency | — | 455 480 | — | KHz |

□ ELECTRICAL CHARACTERISTICS

(Ta=25°C, V_{DD}=3V, V_{SS}=0V)

| Symbol | Parameter | Test Condition | Limits | | | Unit |
|-----------------|---------------------------|-------------------------|--------|------|------|------|
| | | | Min. | Typ. | Max. | |
| V _{DD} | Supply Voltage | Fosc=455KHz, Ta=20~70°C | 2.2 | | 3.6 | V |
| I _{DD} | Supply Current | Fosc = 455KHz | | 0.1 | 0.3 | mA |
| I _{DD} | Supply Current At Stop | | | | 1 | μA |
| I _{OH} | "H" Output Current Port C | V _{OH} =2V | -5 | -10 | | mA |
| I _{OL} | "L" Output Current Port C | V _{OL} =0.9V | 0.3 | 0.8 | | |
| | "L" Output Current Port C | | 1 | 4 | | mA |
| | "L" Output Current Port D | | 1 | 4 | | |
| R _i | Pull-up Resistance AC | | | | 80 | |
| | Pull-up Resistance Port D | | | 70 | | KΩ |
| | Pull-up Resistance Port E | | | 70 | | |

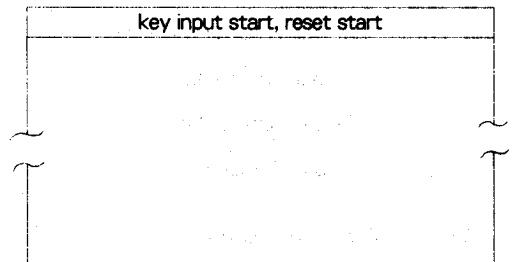
□ BASIC FUNCTION BLOCK

○ Program Memory ROM

A Mask ROM consisting of 512 Words × 8 Bits can be used to Program User-Specified Instruction Codes.
 (However, Input Test Data to Addresses 500~511)

• Address 0(00₁₆)

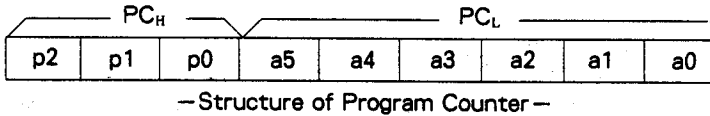
• Address 511(1FF₁₆)



- ROM ADDRESS MAP -

○ Program Counter (PC)

This is a counter used to specify the ROM address and determine the read sequence of program instructions written in the ROM. The program counter consists of 9 bits.



○ Stack Register (SK)

This is a register used to temporarily store the contents of the PC before a subroutine is called and until the original routine is returned after a subroutine call.

○ Data Memory RAM

This is used for storage of various types of processed data and control data. It has a size of 16 words 4 bits (64 bits). One word of RAM consists of 4 bit, but processing can be performed on the entire memory area.

| BIT NUMBER | Y3 | 0 | | | | 1 | | | |
|------------|-------|---|---|---|---|---|---|---|---|
| | Y0~Y2 | 3 | 2 | 1 | 0 | 3 | 2 | 1 | 0 |
| 0 | | | | | | | | | |
| 1 | | | | | | | | | |
| ⋮ | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |

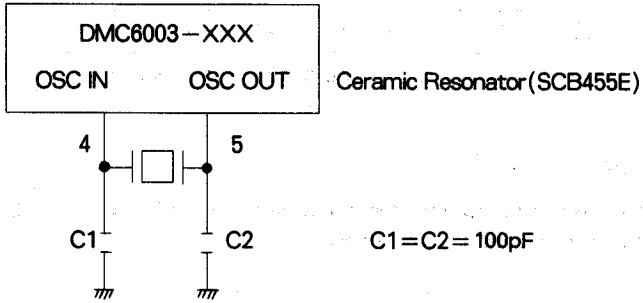
— RAM ADDRESS MAP —

○ Data Pointer (DP)

This is a register used to specify the RAM address and the bit position of output port F. The upper 1 bit (Y3) of DP specifies the RAM file and the lower three bits (Y0~Y2) specify the RAM digits.

○ Clock Oscillating Circuit

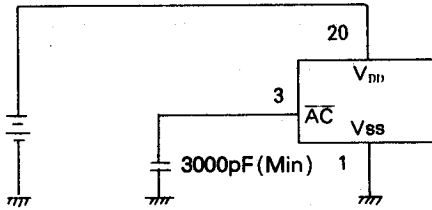
Since, the CMOS inverter and feed-back pull-up resistor are built into the IC, the standard signal can be obtained by connecting a ceramic resonator between the oscillator circuit input terminal and the output terminal. (osc in and osc out)



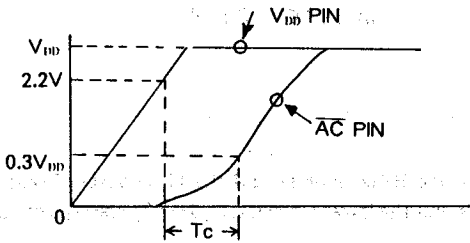
—EXTERNAL CERAMIC RESONATOR CIRCUIT—

○ Auto Clear Function

The auto clear function can be activated by connecting a capacitor to the \overline{AC} pin while power is applied. In addition to activate the auto clear function, The time (T_c) must be longer than 0.1mS, when the voltage in becomes higher than $0.3V_{DD}$ after the Voltage V_{DD} pin exceeds 2.2V. When the auto function is activated, the standby state continues until an "L" is input to port E.



—AUTO CLEAR CIRCUIT—



—AUTO CLEAR OPERATING CONDITION—

- 4 Bit Arithmetic And Logical Unit

This unit is used to perform 4 bit logical operations such as addition, subtraction comparison, and bit manipulation.

- Register A And Carry Flag(CY)

Register A is a central register that consists of 4 bits. The carry flag(CY) stores the carry or borrow from the most significant position of the arithmetic logic unit after various instruction execution.

It can also be used as a 1-bit flag.

- Register B

Register B consists of 4 bits and can be used for temporary storage of data from register A

- I/O Ports

- 1) Port C

Port C's function is to output(OCA) 1 bit data from register A, When it is set to "H", the transmitting signal, with carrier of the $f_{osc}/12$ frequency, is output to the port C terminal. The output structure is CMOS output.

- 2) Port D

Port D's function is to output(ODA) and input (IAD) 1 bit in register A. Port D should be used as a dedicated port for either input or output.

- 3) Port E

Port E's function is to input(AE) 4 bit data. It contains a pull-up resistor and should be used for key input from the key matrix.

If an "L" is input while in the standby mode. It releases the standby state and restarts oscillation.

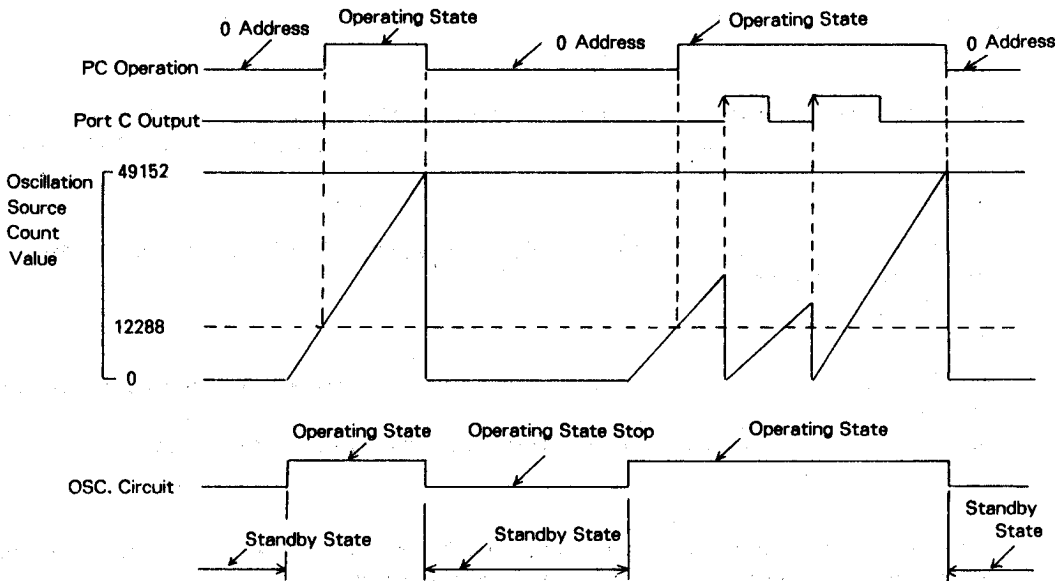
- 4) Port F

Port F has an 8 bit output(SF, RF) function with a single-bit latch. Output is performed by port F by using register Y as a data pointer. The output structure is N-channel open drain.

○ Counter Circuit

This IC contains a counter circuit which counts the reference signals obtained by the clock oscillating circuit. This operation is as follows.

- 1) In the standby mode the oscillation circuit stops, but when a key entry is performed (Input Port E Series "L"), The oscillation circuit starts again. The counter circuit starts counting the reference signal at the beginning of oscillation and informs the program counter of the start operation instruction after counting 12288 pulses. From this point, the program counter starts operation at address 0.
- 2) If the output port C does not change from "L" → "H" before the counter circuit counts 49152 pulses, the value of the counter circuit returns to 0 and the counter circuit restarts from 0. The count value of the counter circuit cannot be modified by the program.



— Relationship between the value of the internal counter circuit and the standby state —

○ Standby Mode

The following conditions exist in the standby mode

- 1) The oscillating circuit stops
- 2) The program counter is set to address 0

○ Standby Mode(Continued)

3) The output latch of port D is "0"

4) The output latch of port F is "0"

○ Data required for MASK operating (Please send the following data for MASK orders)

1) DMC6003-XXX MASK confirmation sheet

2) ROM data EPROM 3 sets

Always Include The Test ROM Data With The ROM Data

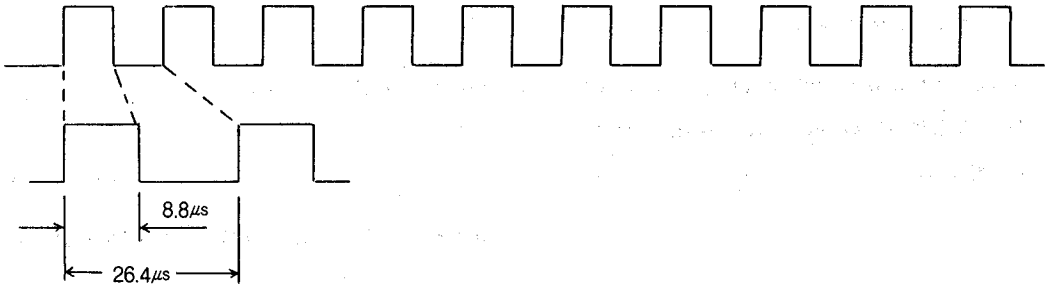
-ROM ADDRESS MAP FOR TEST-

| PROGRAM ADDRESS | | | ROM ADDRESS | | | INSTRUCTIONS | ROM DATA |
|-----------------|-----|-----------|-------------|-----|-----------|--------------|----------|
| PCH | PCL | 9 BIT HEX | PCH | PCL | 9 BIT HEX | | |
| 07 | 34 | 1F4 | 04 | 26 | 126 | LY B | 2B |
| 07 | 35 | 1F5 | 04 | 0C | 10C | TAY | 7A |
| 07 | 36 | 1F6 | 04 | 19 | 119 | TMA | 66 |
| 07 | 37 | 1F7 | 04 | 32 | 132 | LA A | 4A |
| 07 | 38 | 1F8 | 04 | 25 | 125 | RC | 06 |
| 07 | 39 | 1F8 | 04 | 0A | 10A | AMC | 7C |
| 07 | 3A | 1F9 | 04 | 15 | 115 | NE ODA | 6F |
| 07 | 3B | 1FB | 04 | 2A | 12A | RAR | 7E |
| 07 | 3C | 1FC | 04 | 14 | 114 | INY | 72 |
| 07 | 3D | 1FD | 04 | 28 | 128 | B NE | D5 |
| 07 | 3E | 1FE | 04 | 10 | 110 | ME B ME | D0 |
| 07 | 3F | 1FF | 04 | 20 | 120 | STOP | 01 |

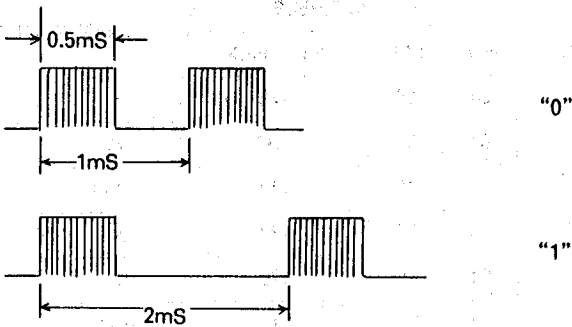
Note) On the DMC6003-XXX, The ROM size is 512 words, but the test instructions should always be inserted in the address shown in the table.

This is because 12 words are used for testing.

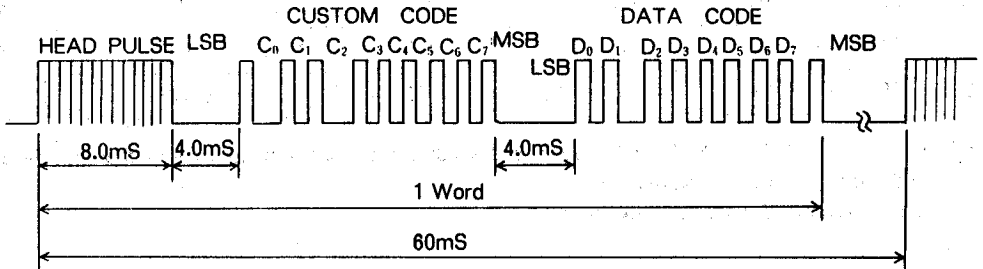
A SINGLE PULSE MODULATED WITH A 37.9KHz SIGNAL (F_{osc} = 455KHz)



THE DISTINCTION BETWEEN THE "0" AND "1" CODES



SINGLE-WORD FORMAT



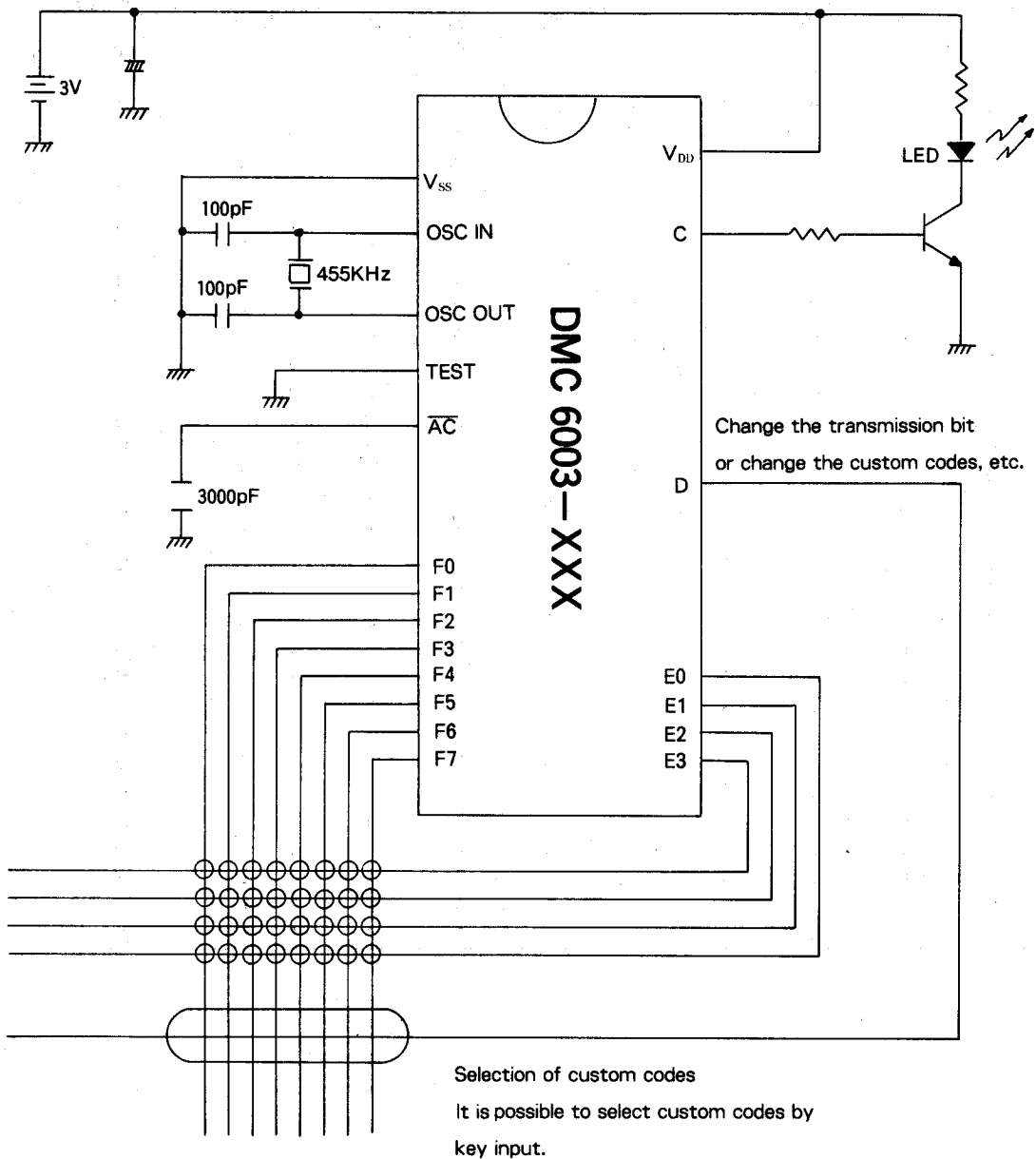
DMC 6003-XXX

RELATIONSHIP BETWEEN TRANSMISSION CODE AND KEY POSITIONS

| TRANSMISSION CODE | | | | | | | | | KEY POSITION |
|-------------------|----|----|----|----|----|----|----|-----|--------------|
| D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | HEX | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 1 | 1 |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 2 | 2 |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 3 | 3 |
| 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 4 | 4 |
| 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 5 | 5 |
| 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 6 | 6 |
| 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 7 | 7 |
| 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 8 | 8 |
| 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 9 | 9 |
| 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 A | 10 |
| 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 B | 11 |
| 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 C | 12 |
| 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 D | 13 |
| 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 E | 14 |
| 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 F | 15 |
| 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 0 | 16 |
| 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 1 | 17 |
| 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 2 | 18 |
| 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 3 | 19 |
| 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 4 | 20 |
| 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 5 | 21 |
| 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 6 | 22 |
| 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 7 | 23 |
| 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 8 | 24 |
| 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 9 | 25 |
| 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 A | 26 |
| 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 B | 27 |
| 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 C | 28 |
| 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 D | 29 |
| 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 E | 30 |
| 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 F | 31 |

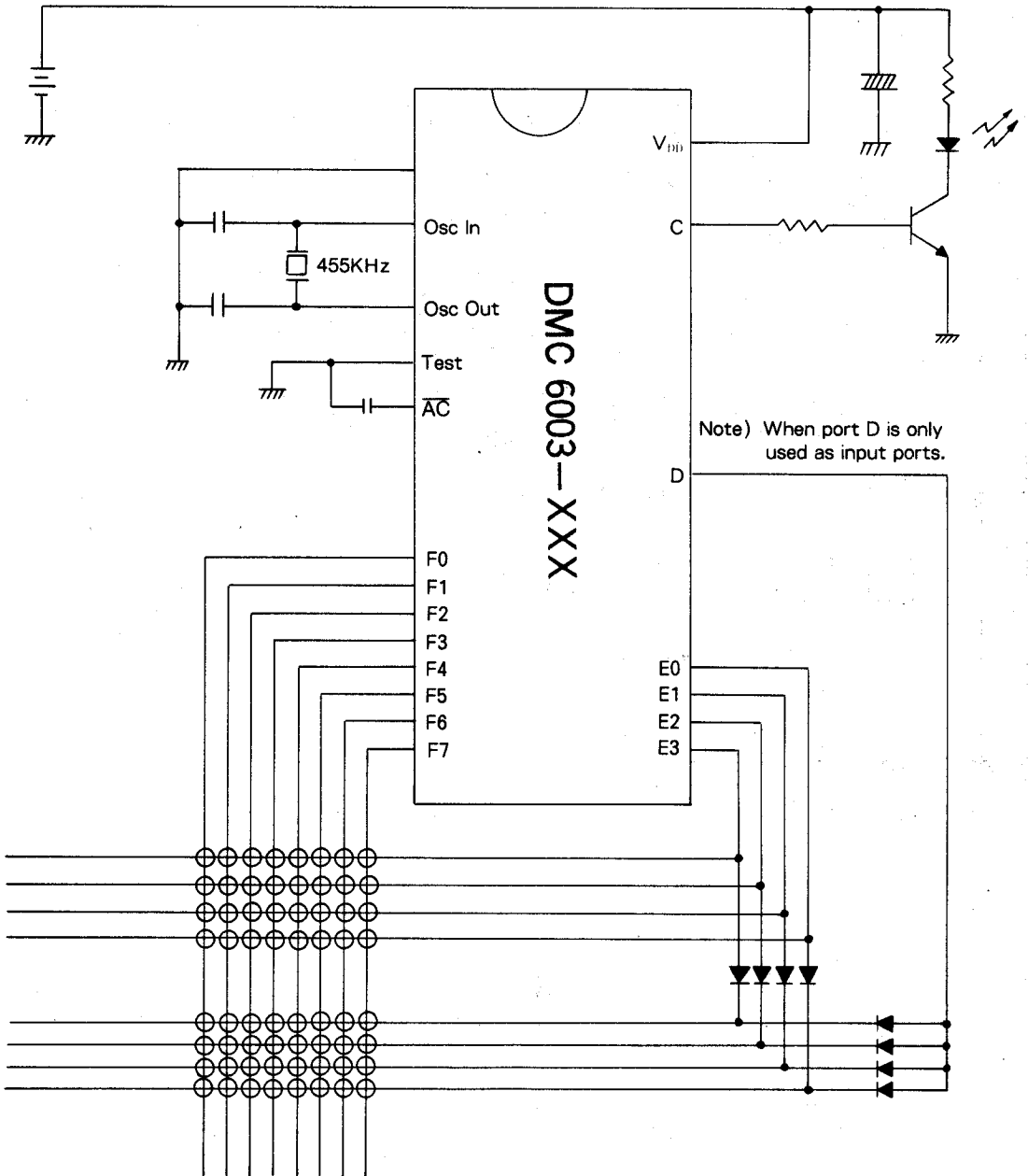
DMC 6003-XXX

DMC6003-XXX EXTERNAL CONNECTION EXAMPLE(1)



DMC 6003-XXX

DMC6003-XXX EXTERNAL CONNECTION EXAMPLE(2)



DMC 6003-XXX

EXTERNAL CONNECTION SAMPLE(3)

