

M2 Series

PIEZOELECTRIC DEVICE

VOLTAGE CONTROLLED OSCILLATOR

DESCRIPTION

The M2 series (D300) voltage controlled oscillators (VCO) operate in the frequency range of 4 to 30 MHz. The M2 series VCOs use a single LiTaO₃ (lithium tantalate) piezoelectric crystal with a high electromechanical coupling coefficient for stable and wide variable frequency width.

This module incorporates three VCOs for the three sampling frequencies used in digital audio equipment (32, 44.1, and 48 kHz). The frequencies are selected by external signals.

FEATURES

- Clock replay in response to three sampling frequencies (32, 44.1 and 48 kHz), is contained in one module
- Wider variable frequency width than in quartz crystals: $\pm 0.1\%$ or more
- Excellent stability for signal noise reproduced by high quality of the lithium tantalate
- 100 times more stable than VCOs of LC and TTL-IC configuration
- Three sampling frequencies controlled at CMOS logic level
- SIP packaged for high-density mounting of devices
- Compatible with the Electronic Industry Association of Japan (EIAJ) digital I/O Standard Type II (consumer digital audio equipment), Level I (high-resolution mode) and Level II (standard resolution mode)

ABSOLUTE MAXIMUM RATINGS (See Note)

Parameter	Symbol	Ratings	Unit
Power Supply Voltage	V _{CC}	-0.5 to 7.0	V
Input Control Voltage	V _{IN}	-0.5 to 10	V
Output Voltage	V _{OUT}	-0.5 to V _{CC} +0.5	V
Output Current	I _{OUT}	± 25	mA
Operating Temperature	T _a	-30 to +85	°C
Storage Temperature	T _{STG}	-40 to +100	°C

Negative value of current means that the current flows from the device.

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Ratings	Unit
Power Supply Voltage	V _{CC}	4.75 to 5.25	V
Input Control Voltage	V _{IN}	0.5 to 5.0	V
Operating Temperature	T _a	-20 to +70	°C

Note: Permanent device damage may occur if absolute maximum ratings are exceeded. Functional operation should be restricted to the conditions as detailed in the operation sections of this data sheet. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Metal Case
SIP-16

Front View

Terminal No.	Terminal Name	Description
1,16	V _{CC}	Power Supply Terminal
3	V _{OUT}	Output Terminal
8	V _{IN}	Control Voltage Input Terminal
2,4,5,6,7,9,10,11,12,13	GND	Grounding Terminal ¹
14	F1	Frequency Switching Terminal ²
15	F0	Frequency Switching Terminal ²

This device contains circuitry to protect the inputs against damage due to high static voltages or electric fields. However, it is advised that normal precautions be taken to avoid application of any voltage higher than maximum rated voltages to this high impedance circuit.

M2 Series (D300)

1. The GND terminal and the VCC terminals are not connected inside the module. So be sure to route them on the PC board.
2. The F1 and F0 bits switch the oscillation frequencies. The F1 and F0 bits are equivalent to bits 25 and 24 of the EIAJ Digital I/O Standard.

STANDARD COMBINATION OF FREQUENCIES

Type A (n = 256)	$f_{01}(L)$	8.192 MHz	32 kHz x 256
	$f_{02}(M)$	11.290 MHz	44.1 kHz x 256
	$f_{03}(H)$	12.288 MHz	48 kHz x 256
Type B (n = 384)	$f_{01}(L)$	12.288 MHz	32 kHz x 384
	$f_{02}(M)$	16.934 MHz	44.1 kHz x 384
	$f_{03}(H)$	18.432 MHz	48 kHz x 384
Type C (n = 512)	$f_{01}(L)$	16.384 MHz	32 kHz x 512
	$f_{02}(M)$	22.579 MHz	44.1 kHz x 512
	$f_{03}(H)$	24.576 MHz	48 kHz x 512

SWITCHING BIT DESIGNATION

F1	F0	Oscillation Frequency
H	H	$f_{01}(L)$:32 kHz x n
L	L	$f_{02}(M)$:44.1 kHz x n
H	L	$f_{03}(H)$:48 kHz x n
L	H	Stop

Note: n = 256,384,512

BLOCK DIAGRAM



M2 Series (D300)

ELECTRICAL CHARACTERISTICS

DC Characteristics

Item		Symbol	Condition	Ratings			Unit
				Minimum	Normal	Maximum	
Output Voltage	H	V _{OH}	I _{OH} = -20μA	V _{CC} -0.5	5.0	—	V
	L	V _{OL}	I _{OL} = 20μA	—	0.0	0.5	V
Power Supply Current		I _{CC}	Not Loaded	—	4.6	15	mA

Measuring Circuit Diagram

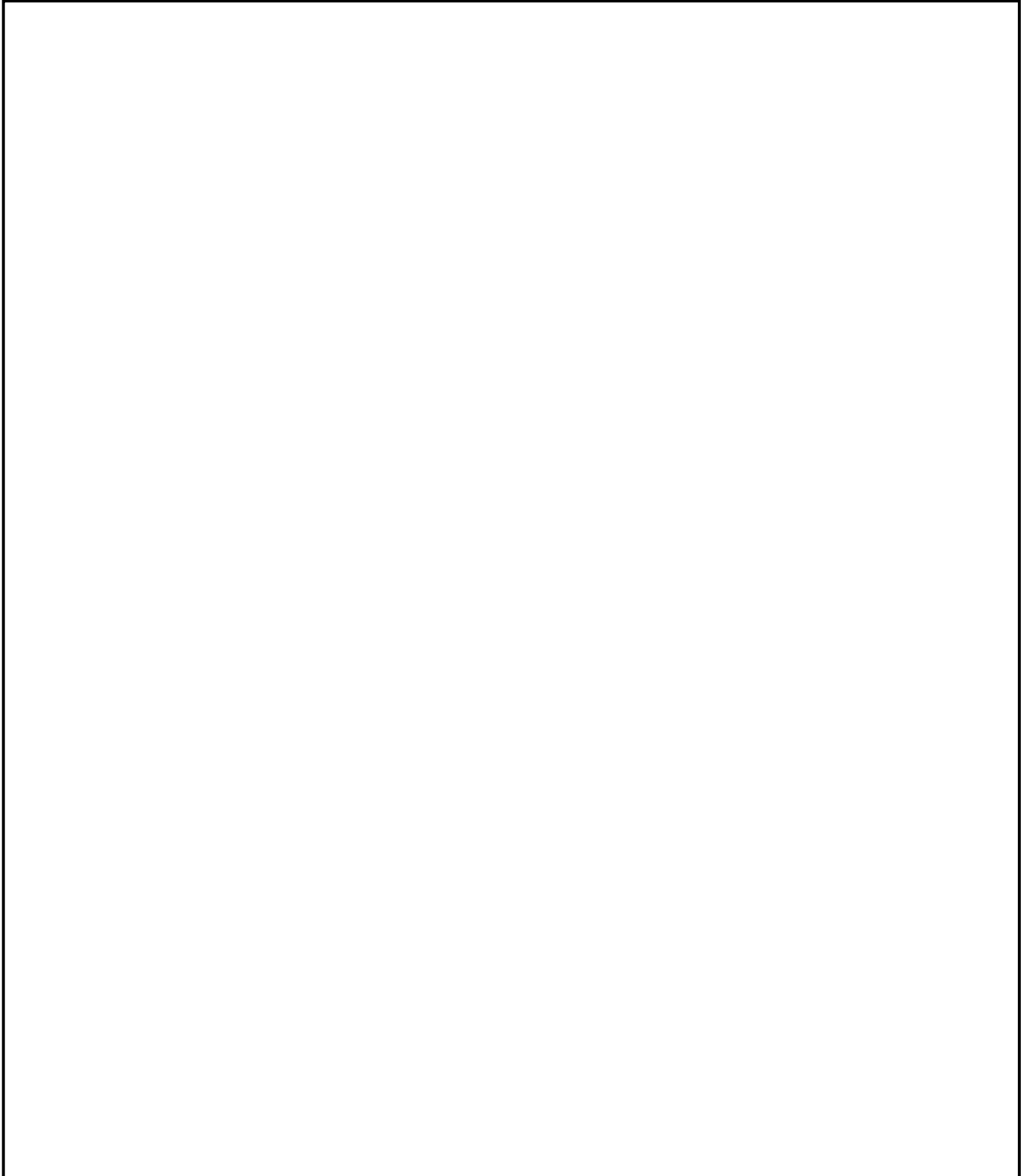
AC Characteristics

Item	Symbol	Condition	Ratings			Remarks
			Minimum	Maximum	Unit	
Oscillation Frequency One	f _{H1}	V _{IN} = 4.5 V	1.0015f ₀₁	—	MHz	Nominal frequency F ₀ reference
	f _{L1}	V _{IN} = 0.5 V	—	0.9985f ₀₁	MHz	
Oscillation Frequency Two	f _{H2}	V _{IN} = 4.5 V	1.0015f ₀₂	—	MHz	
	f _{L2}	V _{IN} = 0.5 V	—	0.9985f ₀₂	MHz	
Oscillation Frequency Three	f _{H3}	V _{IN} = 4.5 V	1.0015f ₀₃	—	MHz	
	f _{L3}	V _{IN} = 0.5 V	—	0.9985f ₀₃	MHz	
Frequency Voltage Stability	Δ f (V _{CC})	V _{CC} = 4.75 to 5.25 V	-100	100	ppm	5 V reference, V _{IN} = 0.5, 4.5 V
Frequency Temperature Stability	Δ f (T _a)	T _a = -20 to +70°C	-500	500	ppm	25 °C reference, V _{IN} = 0.5, 4.5 V

STANDARD CHARACTERISTICS

1A. Control Voltage and Oscillation Frequency Changes

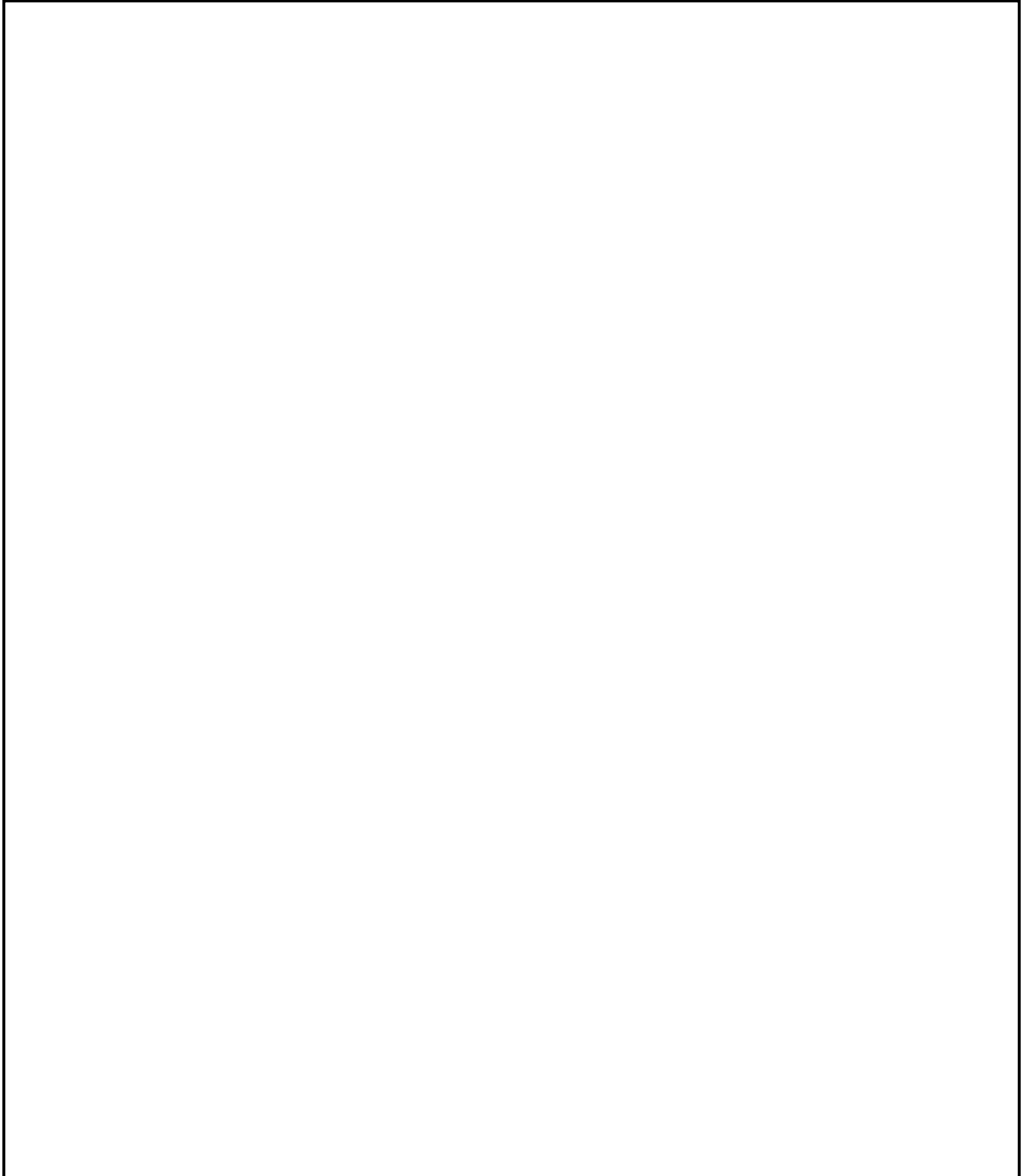
Part Number: M2SC-12M288-D300



STANDARD CHARACTERISTICS

1B. Control Voltage and Oscillation Frequency Changes

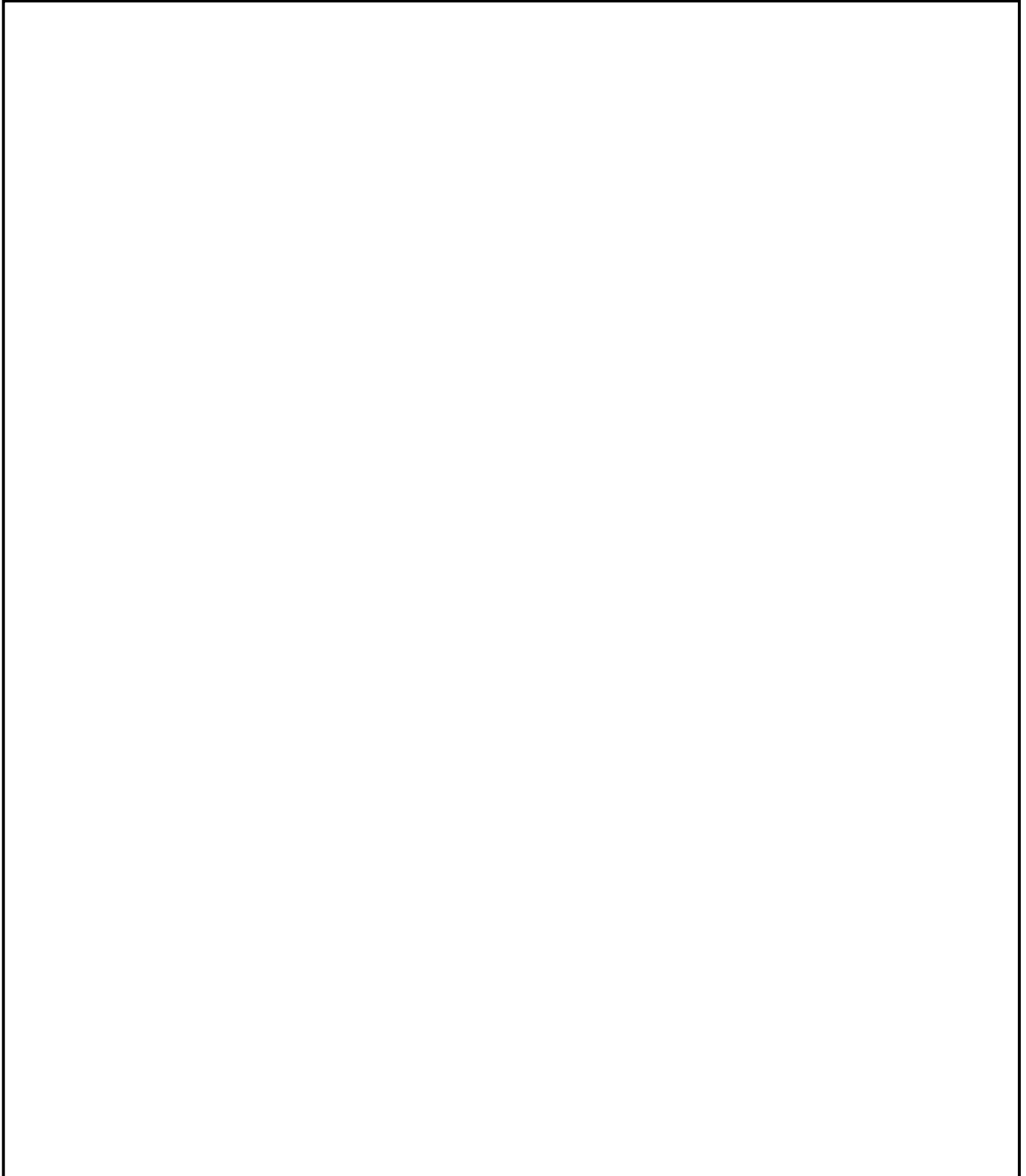
Part Number: M2SC-18M432-D300



STANDARD CHARACTERISTICS

1C. Control Voltage and Oscillation Frequency Changes

Part Number: M2S-24M576-D300

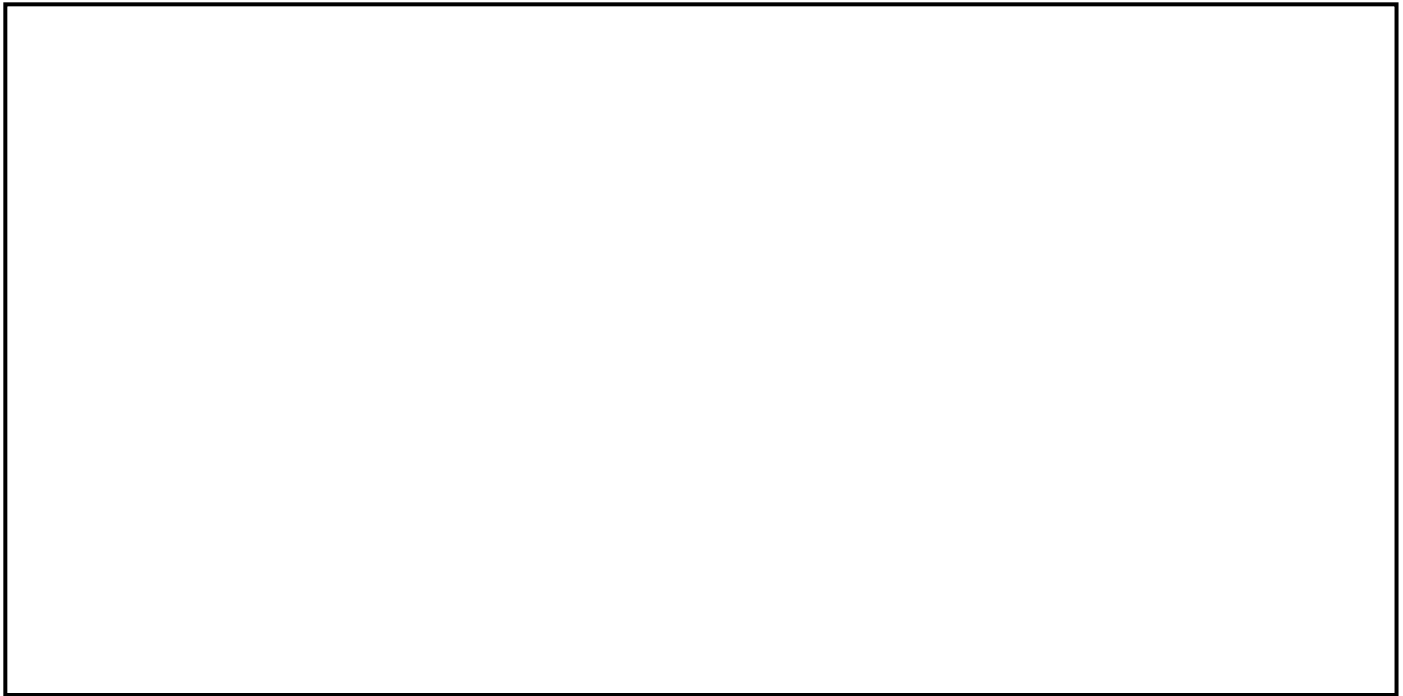


M2 Series (D300)

2. Oscillation Spectrum

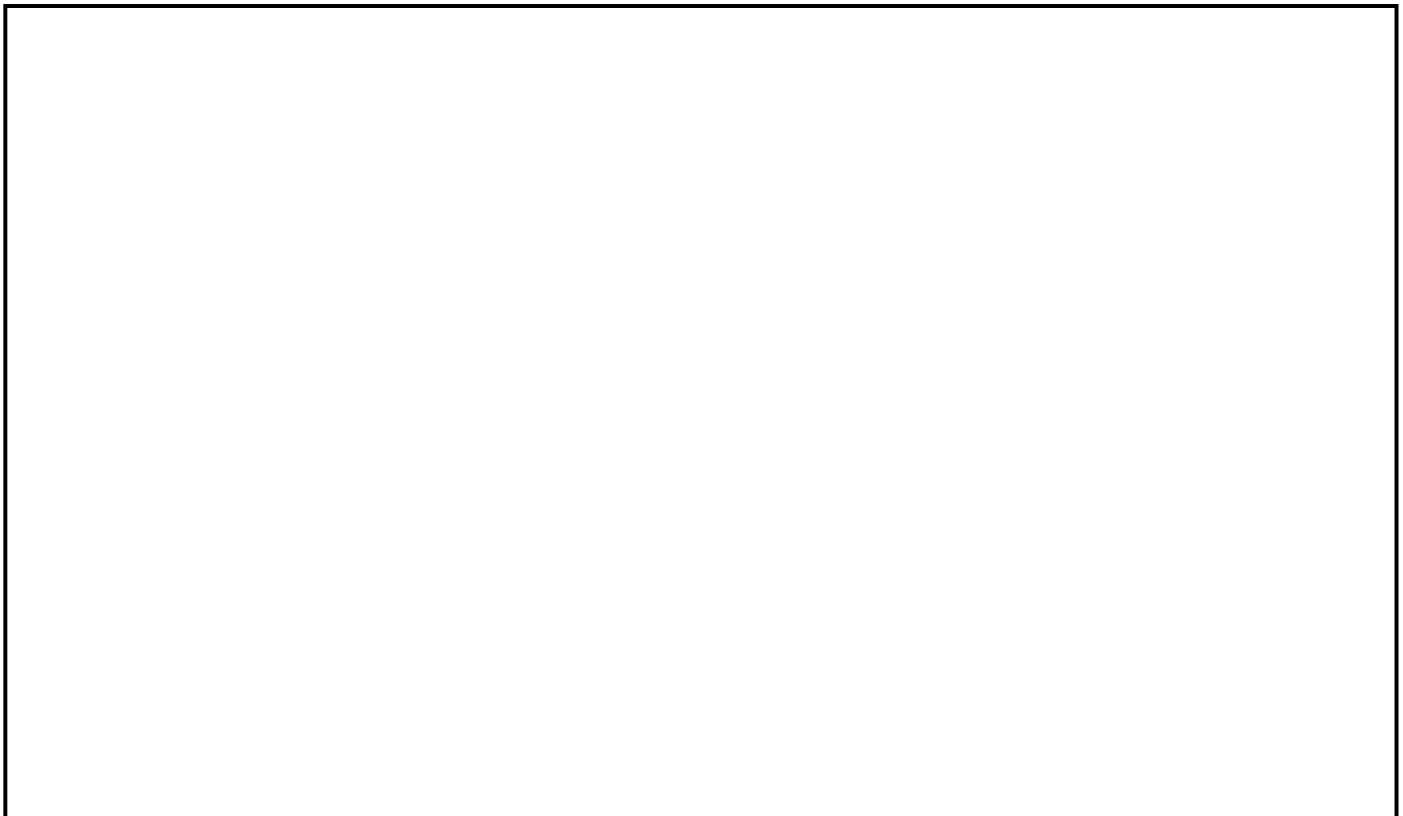
Part Number: M2SC-18M432-D300

Example of $f_{03} = 18.432$ MHz



3. Frequency Switch Oscillation Startup Characteristics

The characteristics in the circuit below were measured with $V_{CC} = 5.0$ V and $V_{FC} = 5.0$ V.



4. Frequency and Switching Oscillation Startup Characteristics

A. Condition: Stop → 12.288 MHz

B. Condition: Stop → 16.934 MHz

C. Condition: Stop → 18.432 MHz

PART NUMBERING SYSTEM

[Part Number Example]
M2SC - - D

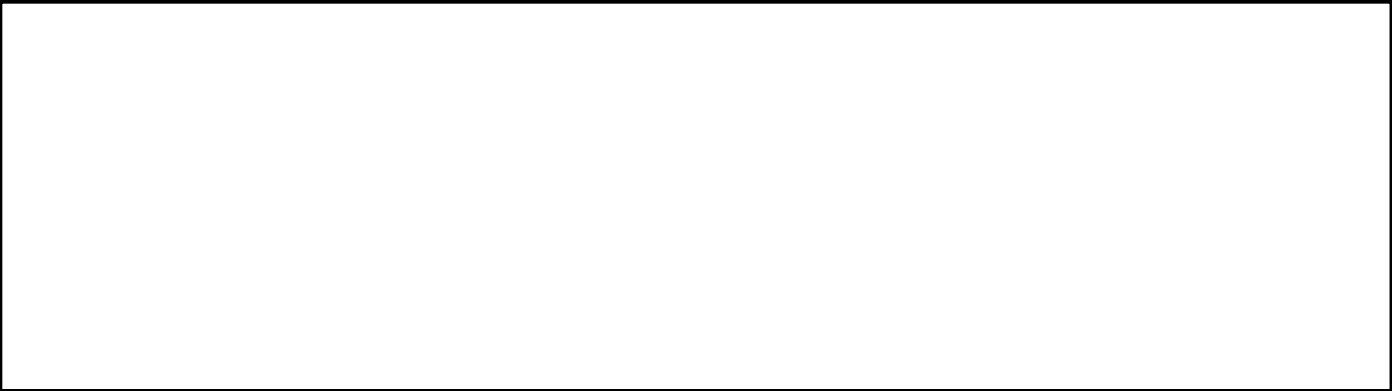
1 **2**

1 Frequency Designation:Designate the highest frequency of the combined nominal frequency in six alphanumeric characters. M indicates the decimal point in MHz.

Frequency	Destination
(12.288 MHz)	Type A: 12M288
(18.432 MHz)	Type B: 18M432
(24.576 MHz)	Type C: 24M576

2 Serial Number of the Series:
Standard for the M2 series (D300): D300

MARKING



DIMENSIONS



All Rights Reserved.

Circuit diagrams utilizing Fujitsu products are included as a means of illustrating typical semiconductor applications. Complete Information sufficient for construction purposes is not necessarily given.

The information contained in this document has been carefully checked and is believed to be reliable. However, Fujitsu assumes no responsibility for inaccuracies.

The information contained in this document does not convey any license under the copyrights, patent rights or trademarks claimed and owned by Fujitsu.

Fujitsu reserves the right to change products or specifications without notice.

No part of this publication may be copied or reproduced in any form or by any means, or transferred to any third party without prior written consent of Fujitsu.

Notes

M2 Series (D300)

FUJITSU LIMITED

For further information, please contact:

Japan

FUJITSU LIMITED
Semiconductor Marketing
Furukawa Sogo Bldg.
6-1, Marunouchi 2-chome
Chiyoda-ku, Tokyo 100
Japan
Tel: (03) 3216-3211
Telex: 781-2224361
FAX: (03) 3216-9771

North and South America

FUJITSU MICROELECTRONICS, INC.
Semiconductor Division
3545 North First Street
San Jose, CA 95134-1804 USA
Tel: (408) 922-9000
FAX: (408) 432-9044

Europe

FUJITSU MIKROELEKTRONIK GmbH
Arabella Centre 9.0G
Lyoner Strasse 44-48
D-6000 Frankfurt 71
F.R. Germany
Tel: (069) 66320
Telex: 411963
FAX: (069) 6632122

Asia

FUJITSU MICROELECTRONICS ASIA PTE LIMITED
51 Bras Basah Road
Plaza by the Park
#06-04/07
Singapore 0718
Tel: 336-1600
Telex: 55373
FAX: 336-1609