

M3 Series (D101)

PIEZOELECTRIC DEVICE

Modulator, 50 MHz to 300 MHz

DESCRIPTION

These piezoelectric modulators feature direct oscillators (50 MHz to 300 MHz). The piezoelectric modulator uses a lithium tantalate piezoelectric single crystal (LiTaO_3) with a high electromechanical coupling coefficient. The piezoelectric modulator employs an exclusive SAW resonator. The piezoelectric modulator can be used in direct modulation applications needing high modulation sensitivity and a high signal noise ratio in the VHF band (up to 300 MHz).

FEATURES

- High frequency direct modulation: 50 to 300 MHz
- High modulation sensitivity: 800 ppm/V min. (0.5 to 4.5 V)
- Excellent modulation distortion ratio: 40 dB max. (1 KHz to 1.75 KHz dev.)
- Excellent signal noise ratio: -50 dB max.
- Excellent temperature characteristic: ± 200 ppm max. (-20 to 70°)
- Highly reliable hermetically sealed package
- Compatible with 14-pin DIP IC packages

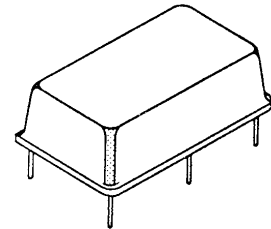
ABSOLUTE MAXIMUM RATINGS (See Note)

Parameter	Symbol	Ratings	Unit
Power Supply Voltage	VCC	-0.5 to 7.0	V
ML Pin Input Voltage	VML	-0.5 to 10	V
MM Pin Input Voltage	VMM	-0.5 to 7.0	V
ML Pin Modulation Polarity		Positive	
MM Pin Modulation Polarity		Negative	
Operating Temperature	Ta	-20 to +85	°C
Storage Temperature	TSTG	-40 to +100	°C

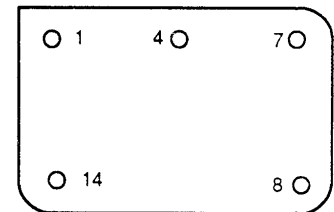
RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Ratings	Unit
Power Supply Voltage	VCC	4.75 to 5.25	V
ML Pin Input Voltage	VML	2.5	V
Operating Temperature	Ta	-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
DIP-14



Bottom View

Terminal No.	Terminal Name	Description
1	ML	Control Voltage Input Terminal
4	MM	Modulation Input
7	GND	Grounding Terminal
8	VOUT	Oscillation Output Terminal
14	VCC	Power Supply Terminal

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.

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STANDARD FREQUENCY

Standard Frequency	Application	Part Number
145.0 MHz	Mobile Phone	M3DA-145M00-D101

ELECTRICAL CHARACTERISTICS

(V_{CC}=5.0 V)

Item	Symbol	Condition	Ratings			Unit	Remarks
			Min	Typ	Max		
Oscillation Frequency Deviation	Δf_o	V _{ML} = 2.5 V	-300	—	+300	ppm	f _o reference
Variable Width of Oscillation Frequency	$\frac{f_H - f_L}{f_o}$	V _{ML} = 0.5 V V _{ML} = 4.5 V	800	—	—	ppm/V	
Temperature Stability of Oscillation Frequency	$\Delta f (T_a)$	V _{ML} = 2.5 V	-200	—	+200	ppm	25°C reference T _a = -20 to 70°C
Output Level	P _{OUT}	V _{ML} = 2.5 V	-5	-3	-1	dBm	50Ω termination
Output Level Stability	$\Delta P (V_F)$	V _{ML} = 0.5 V V _{ML} = 4.5 V	-2	—	+2	dB	V _{ML} = 2.5 V reference
Output Level Temperature Stability	$\Delta P (T_a)$	V _{ML} = 2.5 V	-2	—	2	dB	25°C reference, T _a = -20 to 70°C
Current Consumption	I _{CC}	—	—	—	10	mA	
Oscillation Frequency Power Supply Voltage Fluctuations	$\Delta f (V_{CC})$	V _{ML} = 2.5 V	-50	—	+50	ppm	± 5% at V _{CC} = 5V reference
Modulation Characteristic	Modulation Distortion (1 KHz tone)	1.75 KHz DEV	—	—	-40	dB	15 KHz LPF
		3.5 KHz DEV	—	—	-40	dB	
		5.0 KHz DEV	—	—	-40	dB	
	Signal to Noise Ratio	1.75 KHz DEV	—	—	-50	dB	300 to 3 KHz
	Modulator Input Impedance		10		KΩ		

PART NUMBERING SYSTEM

Designation Example

M3DA - □□□□□□ - D □□□

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②

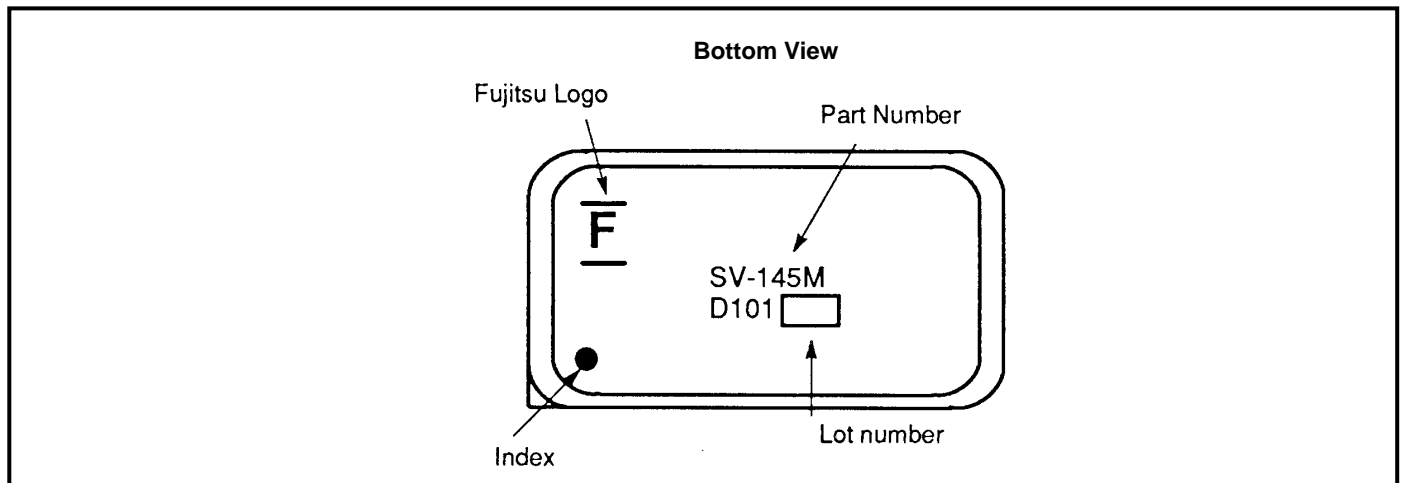
① Frequency Designation

The standard frequency is designated in six alphanumeric characters. M is used to designate the decimal point in MHz. Refer to STANDARD FREQUENCY.
Example: 145.0 MHz device is designated as 145M00

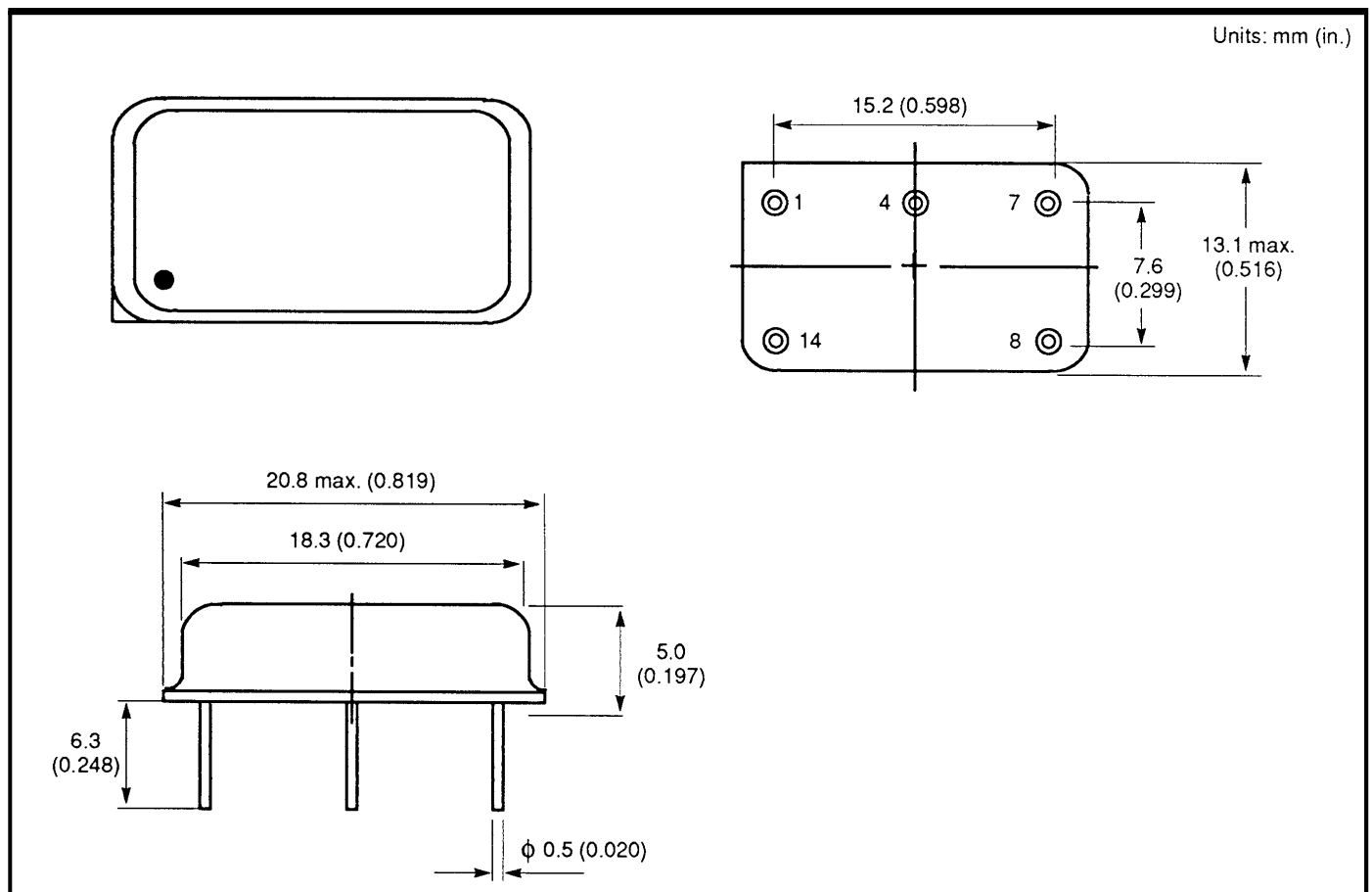
② Serial Number:

The serial number assigned is from 101 to 199 (with 101 as the standard).

PACKAGE MARKING



PACKAGE DIMENSIONS



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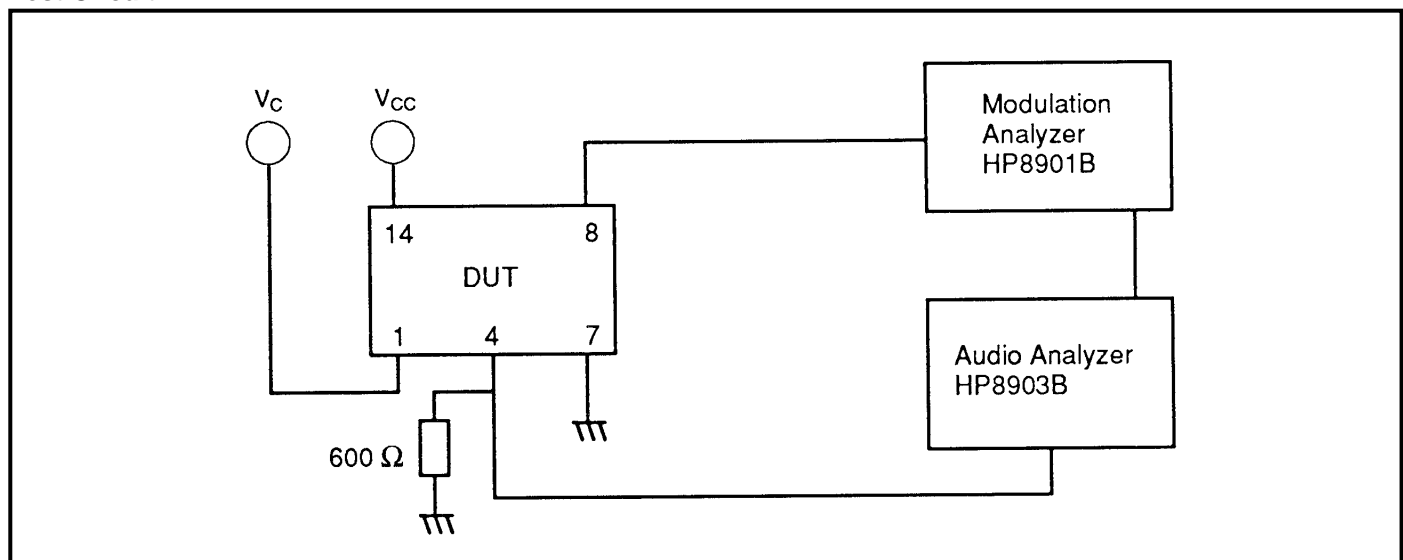
SAW MODULATOR CHARACTERISTICS

M3DA-145M00-D101

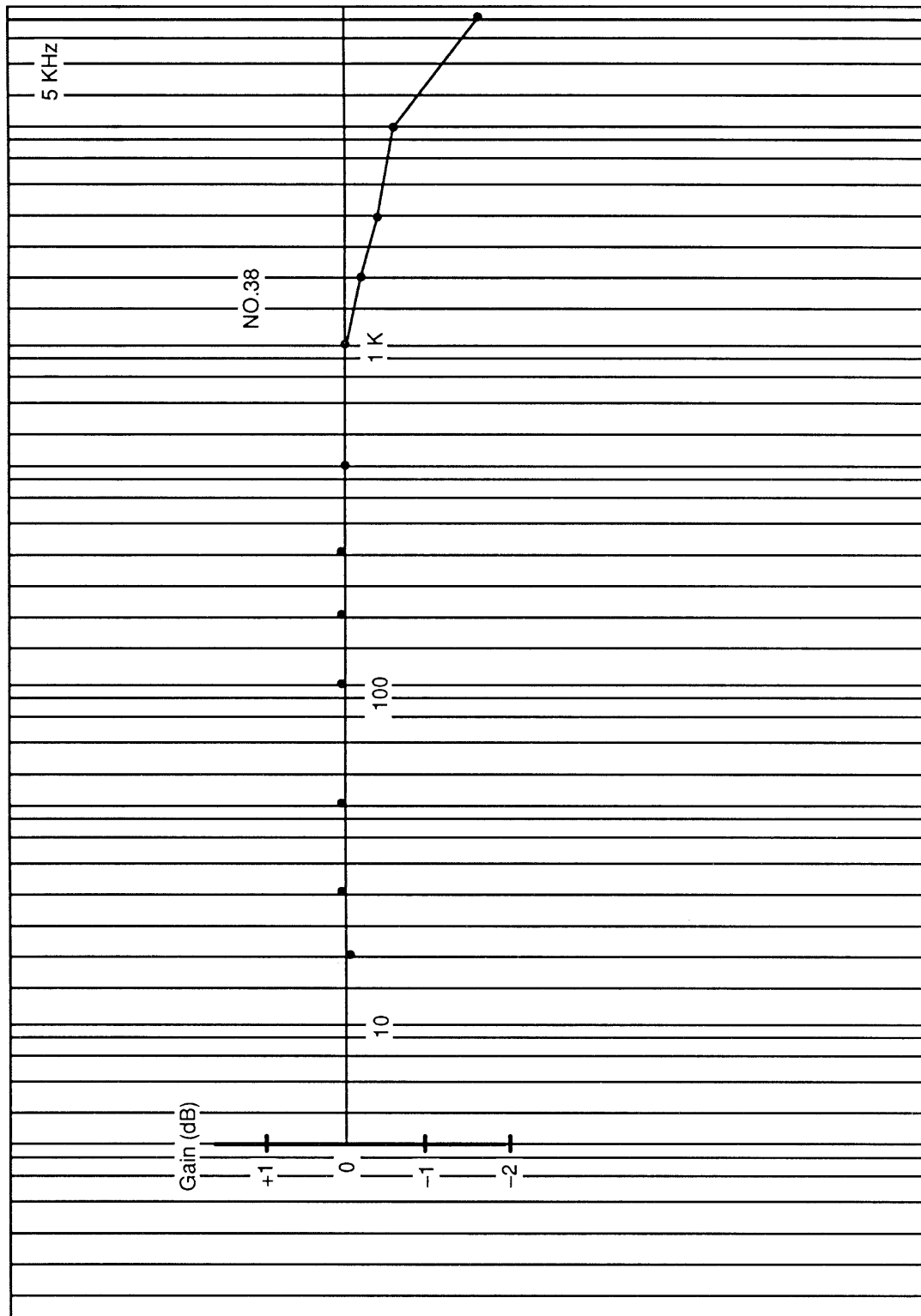
Item		Rating	Characteristics	Remarks
Output Frequency		145.0 MHz	144.997 MHz	V _c = 2.5 V
Current Consumption		10 mA or less (with buffer)	7.3 mA	
Output Level		-3 dBm ± 2dB	-2.00 dBm	V _c = 2.5 V
Spurious Response Ratio		Higher harmonic < 4dB at 2 f ₀ (290 MHz)	-7.3dB	
Frequency Stability	Power Supply Fluctuation	Within ± 50 ppm for 5 V ± 0.25 V	+6.00 ppm -5.80 ppm	
	AFC-F-F Characteristic	± 550 ppm or more for 2.5 V ± 1 V	-789 ppm +1016 ppm	
	Temperature Characteristic	Within ± 300 ppm for -35 to +85	+66 ppm +41 ppm	
AFC Voltage Versus Output Frequency Characteristics		At 25 ± 5°C, the AFC voltage for the output frequency of 145 MHz is V _c = 2.5 V ± 0.3 V	2.501 V	
		At -20 +85°C, the AFC voltage for the output frequency of 145 MHz is V _c = 2.5 V ± 0.3 V	2.476 V 2.459 V	-20°C +85°C
Modulation Characteristic	Modulation Input Level	-28 dBm ± 3 dB (600W) 1 KHz ± 3.5 KHz DEV*	-26.1 dB	15 KHz LPF
	Modulation Distortion Ratio	-35 dB or less 1 KHz (±1.75 KHz DEV)* -30 dB or less 1 KHz (± 3.5 KHz DEV)* -20 dB or less 1 KHz (± 5.0 KHz DEV)*	-46 dB -49 dB -48 dB	15 KHz LPF
	Modulation Characteristic	< ±1 dB/20 Hz to 5 KHz ± 5 KHz DEV*		
	Signal Noise Characteristic	<-50 dB ±1.75 KHz DEV*	-55 dB	300 to 3 KHz

*Adjust the control voltage for an oscillation frequency of 145 MHz for the modulation characteristic.

Test Circuit

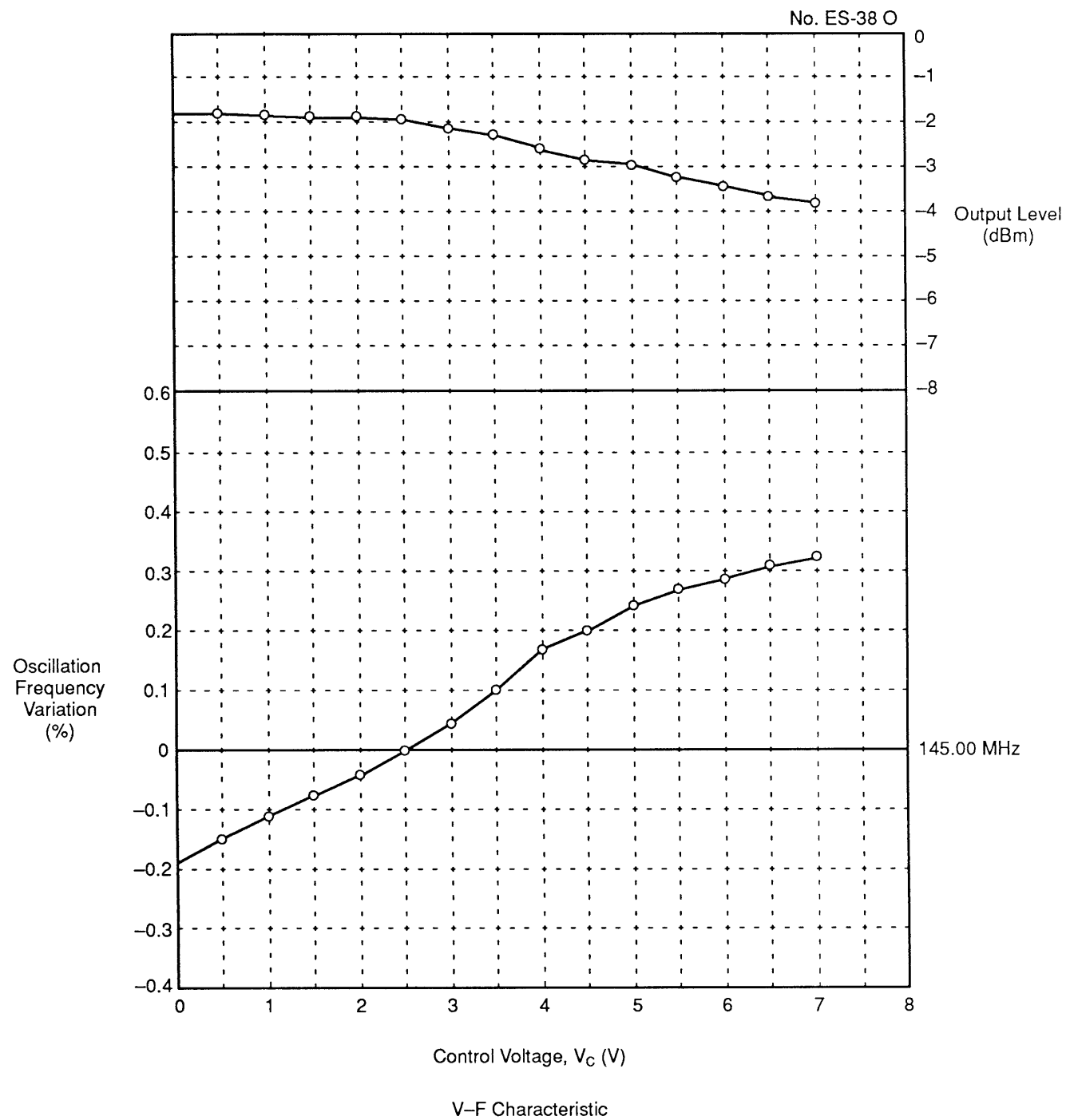


M30A-145M00-D101 MODULATION FREQUENCY CHARACTERISTICS



SAW MODULATOR CHARACTERISTIC DATA

M3DA-145M00-D101



SAW MODULATOR CHARACTERISTIC DATA (Continued)

M3DA-145M00-D101

No. ES-38 O

