十速科技股份有限公司
tenx technology inc.

Advance Information

4-Bit Micro-Controller

TM8999

Electrical Characteristics

Application Note

Tenx reserves the right to change or discontinue this product without notice.

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PRODUCT NAME

TM8999 Demo Board

TITLE

TM8999 Electrical Characteristics

APPLICATION NOTE

The electrical characteristics described in the document are for reference only. The operating current is measured at room temperature (25°C) and there are two types of test data: No load and LCD load only. All the characteristics will be different subject to the process variation, temperature, Option, loading and operating voltage etc. IC from different lots will be slightly different due to the drift of the manufacturing processes.

1. Power Consumption with LCD Load

LCD: 1/3Bias, 1/4Duty * 9 Seg, Size: 1cm * 2.5cm

At 3V, 25°C (With LCD Load)

TM8999 (32K Crystal and Internal Fast 500 kHz 3V)											
Unit	µA	µA	µA	µA	µA	µA	µA	µA	µA	Frequency Tolerance (s/d)	
3V	ˇ	ˇ	ˇ	ˇ	ˇ	ˇ	ˇ	ˇ	ˇ	ˇ	
LCD	on	on	on	on	on	on	on	OFF	OFF		
Operating	ˇ	ˇ	ˇ	ˇ							
Bcf Flag	1	0	1	0	1	1	0	1	0	1	0
Halt						ˇ	ˇ	ˇ	ˇ	ˇ	
Stop					ˇ						
500 KHz			ˇ	ˇ							
32768 Hz	ˇ	ˇ			ˇ	ˇ	ˇ	ˇ	ˇ	ˇ	ˇ
Operating Current (uA)	33.38	9.41	439.50	64.53	0.09	11.03	4.03	7.55	0.97	-0.02	-0.28

TM8999 (Internal Fast Only 250 kHz 3V)							
3V	ˇ	ˇ	ˇ	ˇ	ˇ	ˇ	ˇ
LCD	on	on	on	on	on	OFF	OFF
Operating	ˇ	ˇ					
Bcf Flag	1	0	1	1	0	1	0
Halt				ˇ	ˇ	ˇ	ˇ
Stop			ˇ				
Operating Current (uA)	265.31	87.38	0.09	68.10	49.31	48.41	13.46

At 1.5V, 25°C (With LCD Load)

TM8999 (32K Crystal and Internal Fast 500 kHz 1.5V)											
Unit	μA	μA	μA	μA	μA	μA	μA	μA	μA	Frequency Tolerance (s/d)	
1.5V	ˇ	ˇ	ˇ	ˇ	ˇ	ˇ	ˇ	ˇ	ˇ	ˇ	
LCD	on	on	on	on	on	on	on	OFF	OFF		
Operating	ˇ	ˇ	ˇ	ˇ							
Bcf Flag	1	0	1	0	1	1	0	1	0	1	0
Halt						ˇ	ˇ	ˇ	ˇ	ˇ	
Stop					ˇ						
500 KHz			ˇ	ˇ							
32768 Hz	ˇ	ˇ			ˇ	ˇ	ˇ	ˇ	ˇ	ˇ	ˇ
Operating Current (uA)	19.06	19.01	172.13	171.99	0.09	7.86	7.79	2.15	2.12	0.09	-0.37

TM8999 (Internal Fast Only 250 kHz 1.5V)							
1.5V	ˇ	ˇ	ˇ	ˇ	ˇ	ˇ	ˇ
EXT-V							
LCD	on	on	on	on	on	OFF	OFF
Operating	ˇ	ˇ					
Bcf Flag	1	0	1	1	0	1	0
Halt				ˇ	ˇ	ˇ	ˇ
Stop			ˇ				
Operating Current (uA)	154.53	154.52	0.09	75.84	75.76	28.31	28.29

2. Power Consumption without LCD Load

At 3V, 25°C (Without LCD Load)

TM8999 (32K Crystal and Internal Fast 500 kHz 3V)											
Unit	µA	µA	µA	µA	µA	µA	µA	µA	µA	Frequency Tolerance (s/d)	
3V	ˇ	ˇ	ˇ	ˇ	ˇ	ˇ	ˇ	ˇ	ˇ	ˇ	
LCD	on	on	on	on	on	on	on	OFF	OFF		
Operating	ˇ	ˇ	ˇ	ˇ							
Bcf Flag	1	0	1	0	1	1	0	1	0	1	0
Halt						ˇ	ˇ	ˇ	ˇ	ˇ	
Stop					ˇ						
500 KHz			ˇ	ˇ							
32768 Hz	ˇ	ˇ			ˇ	ˇ	ˇ	ˇ	ˇ	ˇ	ˇ
Operating Current (uA)	31.14	6.95	437.50	63.24	0.09	7.91	1.39	7.55	0.97	-0.02	-0.28

TM8999 (Internal Fast Only 250 kHz 3V)							
3V	ˇ	ˇ	ˇ	ˇ	ˇ	ˇ	ˇ
LCD	on	on	on	on	on	OFF	OFF
Operating	ˇ	ˇ					
Bcf Flag	1	0	1	1	0	1	0
Halt				ˇ	ˇ	ˇ	ˇ
Stop			ˇ				
Operating Current (uA)	247.60	67.12	0.09	50.82	17.94	48.41	13.46

At 1.5V, 25°C (Without LCD Load)

TM8999 (32K Crystal and Internal Fast 500 kHz 1.5V)											
Unit	μA	μA	μA	μA	μA	μA	μA	μA	μA	Frequency Tolerance (s/d)	
1.5V	ˇ	ˇ	ˇ	ˇ	ˇ	ˇ	ˇ	ˇ	ˇ	ˇ	
LCD	on	on	on	on	on	on	on	OFF	OFF		
Operating	ˇ	ˇ	ˇ	ˇ							
Bcf Flag	1	0	1	0	1	1	0	1	0	1	0
Halt						ˇ	ˇ	ˇ	ˇ	ˇ	
Stop					ˇ						
500 KHz			ˇ	ˇ							
32768 Hz	ˇ	ˇ			ˇ	ˇ	ˇ	ˇ	ˇ	ˇ	ˇ
Operating Current (uA)	14.62	14.58	169.69	169.65	0.09	3.30	3.26	2.15	2.12	0.09	-0.37

TM8999 (Internal Fast Only 250 kHz 1.5V)							
1.5V	ˇ	ˇ	ˇ	ˇ	ˇ	ˇ	ˇ
EXT-V							
LCD	on	on	on	on	on	OFF	OFF
Operating	ˇ	ˇ					
Bcf Flag	1	0	1	1	0	1	0
Halt				ˇ	ˇ	ˇ	ˇ
Stop			ˇ				
Operating Current (uA)	127.64	126.70	0.09	39.07	39.06	28.31	28.29

NOTE_1:

Freq. Tolerance indicates that after trimming the capacitance of external capacitor of 32.768 kHz Crystal oscillator, the daily time offset of the real time clock function differs with the real time.

Many factors will affect the driving capability of the Driver of the Crystal circuit, such as the setting of BCF flag in MCU, the manufactures /lot No ./type of Crystal oscillator, PCB layout and quality of external capacitor.

NOTE_2:

Set BCF flag = 1 before using Internal 500 KHz and 250 KHz to assure that IC can work properly with a higher driving capability, which means the higher Drive, the larger power consumption.

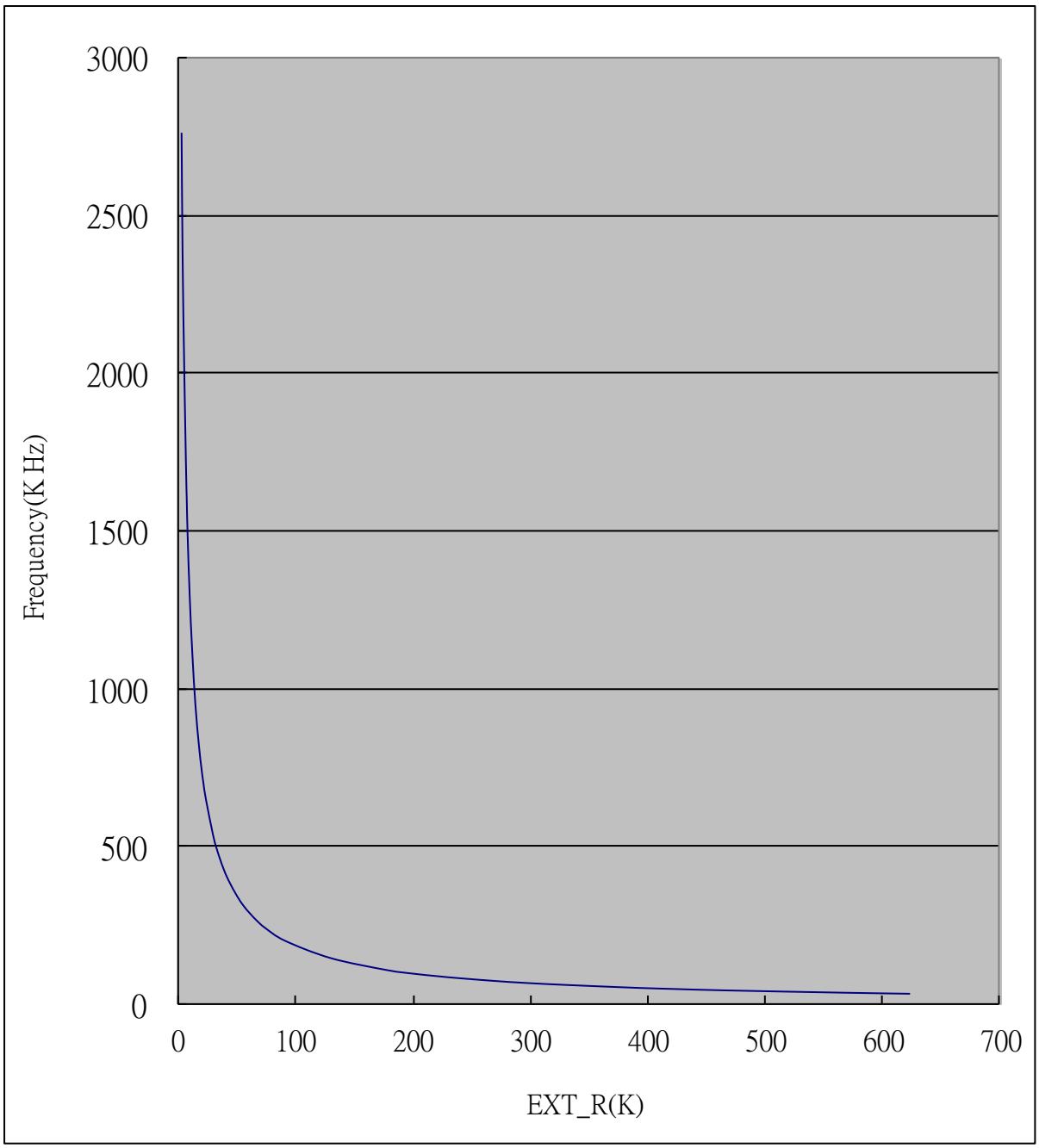
NOTE_3:

TM8999 Demo Board can be programmed to emulate the function of TM89XX Series IC; however, the emulation result may vary slightly from the actual performance of production chips. This is due to the execution of the Demo Board program under the Fast Clock frequency will consume the larger current consumption; this condition will not occur in production chips.

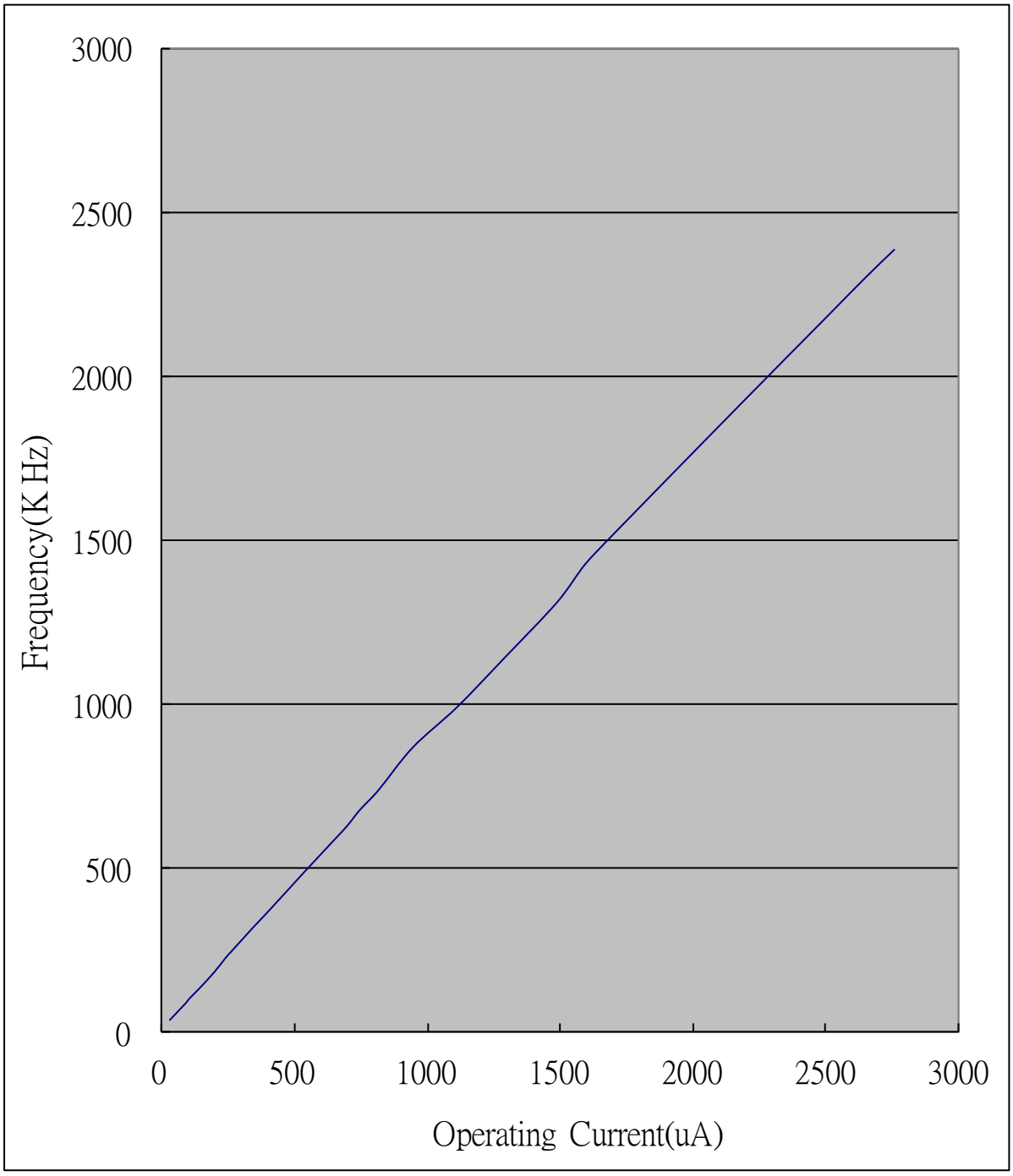
For the related query about the current consumption, please visit our website.

3. Ext-R vs. Frequency vs. Operating Current

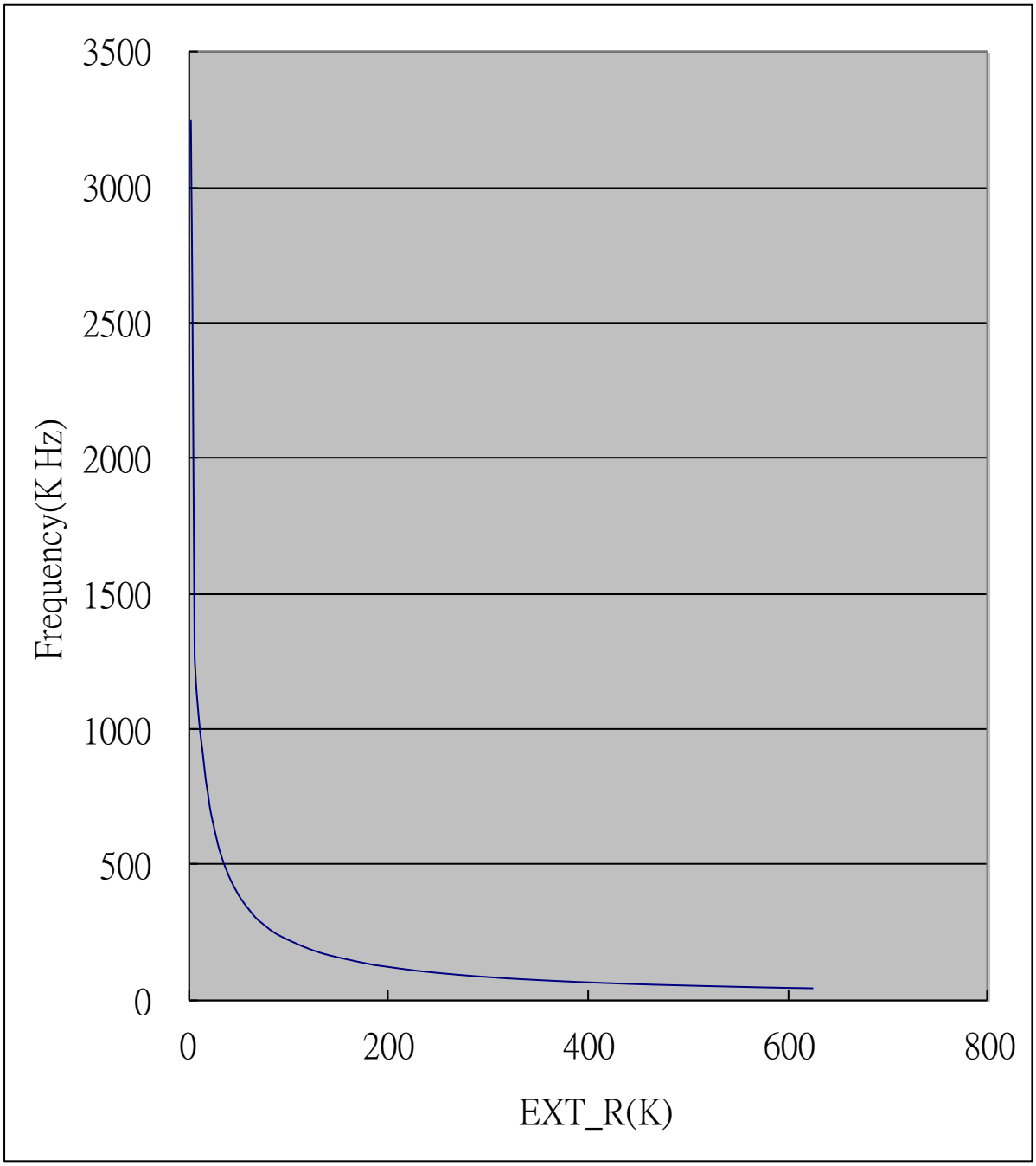
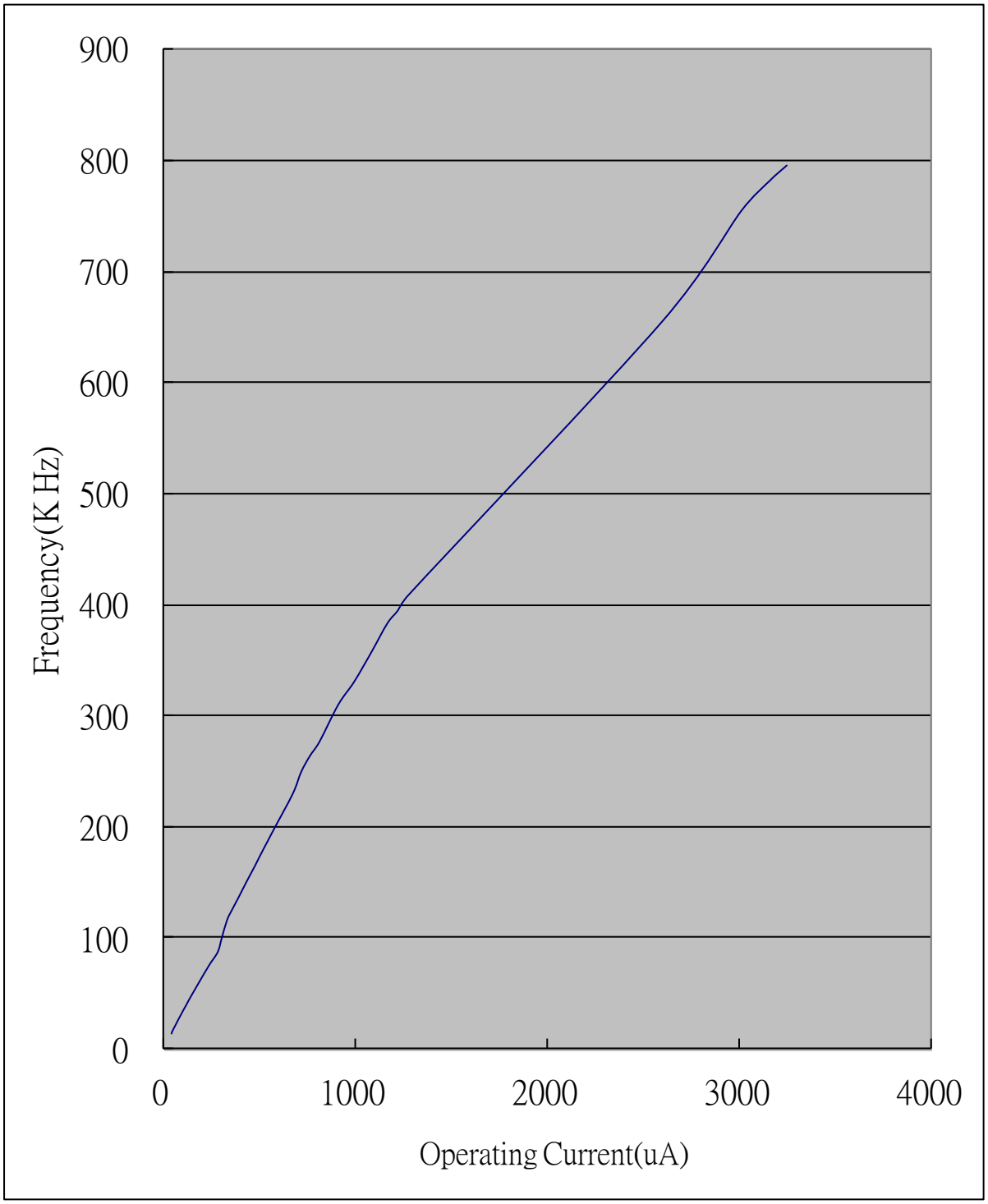
At 3V, 25°C
Ext-R vs. Frequency



At 3V, 25°C
Frequency vs. Operation Current



At 1.5V, 25°C
Ext-R vs. Frequency



At 1.5V, 25°C
Frequency vs. Operation Current