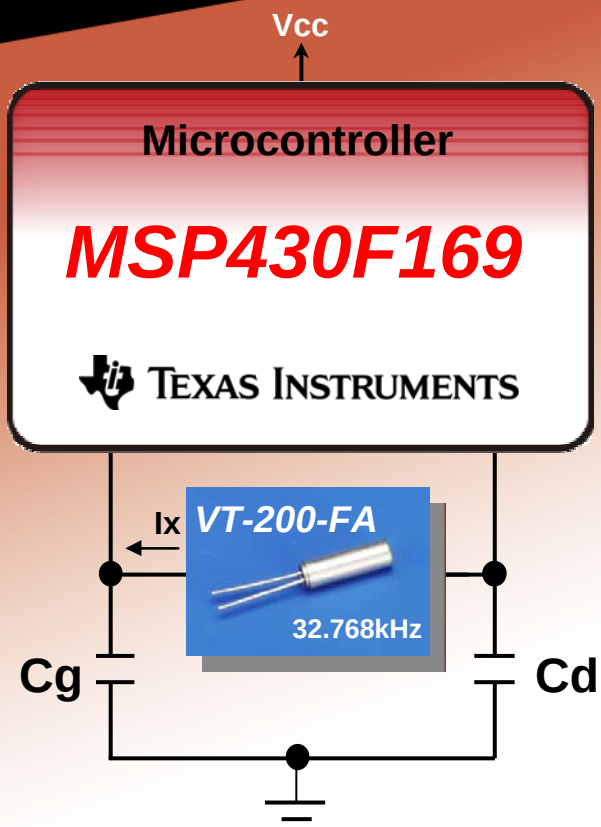
Evaluation of Subsystem Clock Oscillation Circuit

VT-200-FA with TI MSP430F169

SII

OSCILLATION CIRCUIT



$CL=CgCd / (Cg+Cd)+Cs$

Remark Ix : current through crystal

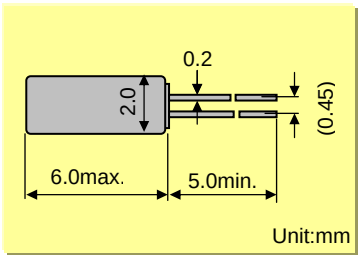
SPECIFICATIONS

Model	: VT-200-FA
Frequency	: Fo=32.768kHz
Frequency tolerance	: dF/Fo= +/-20x10^{-6}
Load capacitance	: CL=12.5pF
Equivalent series resistance	: R1=50kohm max.
Max. drive level	: DL=1x10^{-6}W max.
Level of drive	: DL=0.1x10^{-6}W typ.

FEATURES

1.Compact tubular package
2.Photolithographic process
3.Excellent shock resistance and environmental characteristics.
4.Real time clocks, Timers, Portable applications

RECOMMENDED SOLDERING PATTERN



Vcc=2.2V and 3.0V, 25 °C

Key specifications	Vcc=2.2V*	Vcc=3.0V	Remarks
Load capacitance : CL (pF)	12.5	12.5	
External capacitance at gate : Cg (pF)	5	5	Optimal external capacitance to CL and Parasitic Cpf
External capacitance at drain : Cd (pF)	5	5	(CL = Cd // Cg + stray capacitance)

Circuit characteristics (at 25°C)	Vcc=2.2V*	Vcc=3.0V	Remarks
Matching Accuracy : df / f (x10-6)	1.8	4.9	Frequency offset volume at specified Vcc
Oscillation allowance : M (times)	5	5	Judgemental standard of oscillation stability
Oscillation start up time : Ts (sec)	1.94	1.83	Time to reach 90% of output level

Note: The above mentioned value is only for your reference. The value is for the arbitrary samples and does not guarantee the product's characteristics.
Please review and check above parameters at customer's end.
*A 5.1Mohm resistor from XOUT to Vss is added when VCC <2.5 V.

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Detail Data

Vcc=2.2V and 3.0V, 25 °C

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Circuit characteristics (at 25°C)	Vcc=2.2V*	Vcc=3.0V	Remarks
Matching Accuracy : df / f ($x10^{-6}$)	1.8	4.9	Frequency offset volume at specified Vcc
Voltage Fluctuation : +/-df / V ($x10^{-6}$)	0.6	0.6	Vcc +/-10% (Standard operating voltage range)
Drive Level : DL ($x10^{-6}$W)	0.044	0.044	DL=Ix^2 Re < $1x10^{-6}$W,Re=R1(1 + Co / CL)^2
Negative resistance : | - RL | (kohm)	235	235	5 times larger than R_{1MAX}
Oscillation allowance : M (times)	5	5	Judgemental standard of oscillation stability
Voltage of oscillation start : Vstart (V)	1.43	1.73	
Voltage of oscillation stop : Vstop (V)	1.07	1.54	
Oscillation start up time : Ts (sec)	1.94	1.83	Time to reach 90% of output level

Temperature characteristics of circuit		Vcc=2.2V*	Vcc=3.0V	Remarks
at -40°C	Variation : df / T ($x10^{-6}$)	-143	-139	Typ.Tp=25°C (K = -3.5×10^{-8} / °C^2)
at +85°C	Variation : df / T ($x10^{-6}$)	-130	-132	Typ.Tp=25°C (K = -3.5×10^{-8} / °C^2)

Note: The above mentioned value is only for your reference. The value is for the arbitrary samples and does not guarantee the product's characteristics.
Please review and check above parameters at customer's end.
*A 5.1Mohm resistor from XOUT to Vss is added when VCC <2.5 V.

Supplementary Data

Vcc=3.0V

No External Capacitance

⊿F ($x10^{-6}$)	M (times)	Ts (sec)
25.63	7.3	1.34

With External Capacitance

Cg (pF)	Cd(pF)	⊿F ($x10^{-6}$)	M (times)	Ts (sec)
5	5	4.9	5	1.83

Vcc=2.2V*

No External Capacitance

⊿F ($x10^{-6}$)	M (times)	Ts (sec)
22.58	6.7	1.20

With External Capacitance

Cg (pF)	Cd(pF)	⊿F ($x10^{-6}$)	M (times)	Ts (sec)
5	5	1.8	5	1.94

⊿F: Frequency deviation【 x 10^{-6} 】
Note: The recommended external capacitances above are for the users who need better frequency accuracy.
*A 5.1Mohm resistor from XOUT to Vss is added when VCC <2.5 V.

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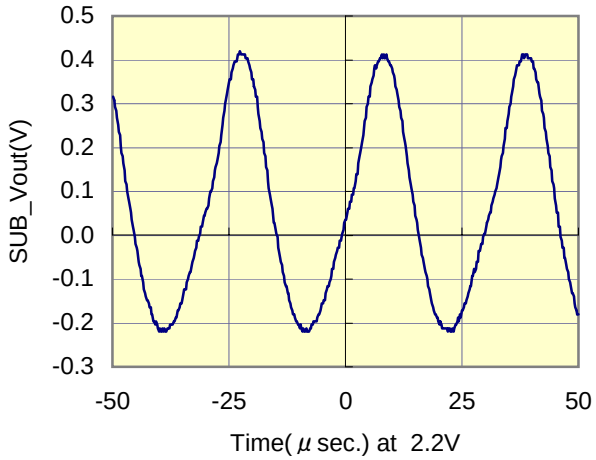
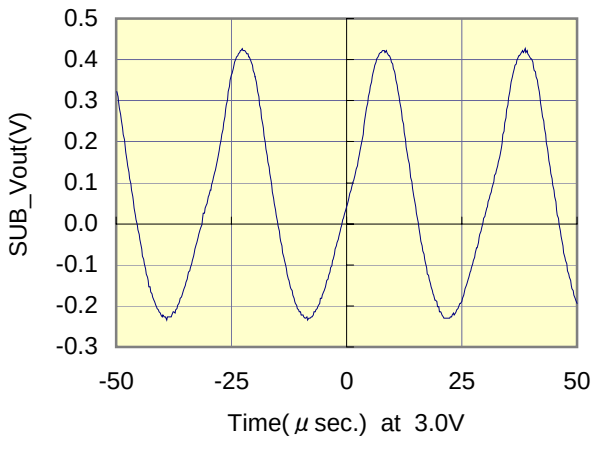
Test Data at Vcc=2.2V and 3.0V, 25°C

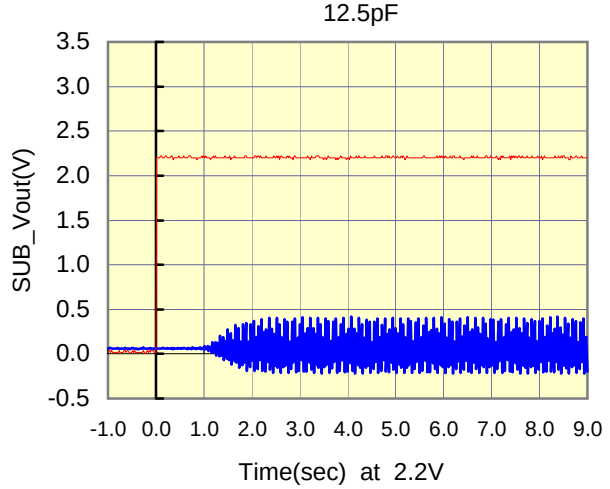
Output signal wave from the oscillator
12.5pF



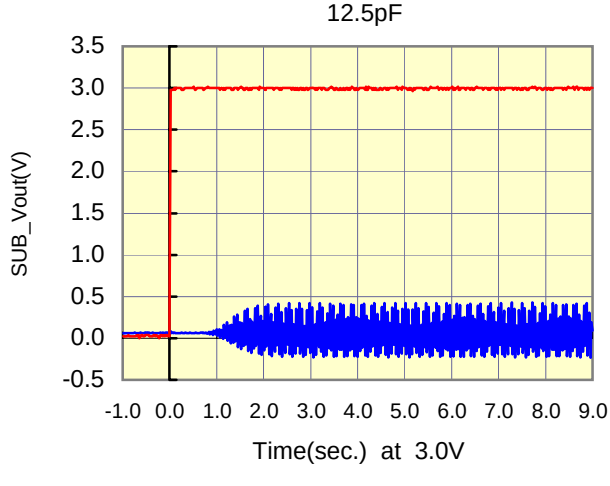
Output signal wave from the oscillator
12.5pF



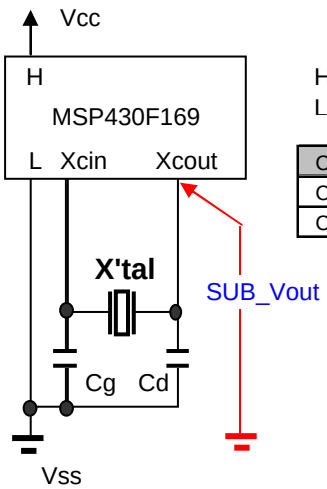
Start up time of SUB_Vout
12.5pF



Start up time of SUB_Vout
12.5pF



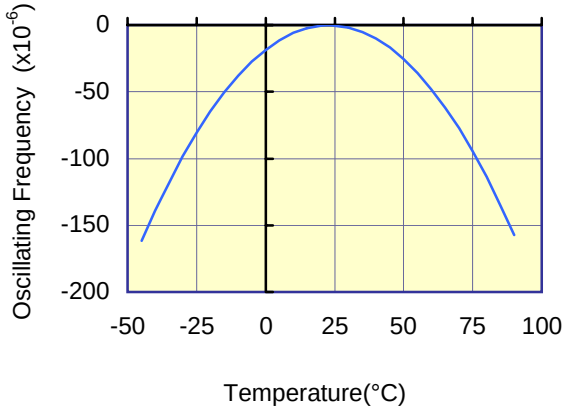
Test Circuit



H = Vcc
L = GND

(pF)	
CL	12.5
Cg	5
Cd	5

Temperature characteristics of oscillating frequency



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Test Data : Temperature characteristics at Vcc=2.2V and 3.0V