MEMS Oscillator, Low Power, LVCMOS / HCMOS Compatible, Standard Frequencies — IM804 Series

Features:

- Standard Frequencies between 3.570 MHz to 77.760MHz
- Direct pin to pin drop-in replacement for industry-standard packages
- LVCMOS/HCMOS Compatible Output
- Industry-standard package 2.0 x 1.6, 2.5 x 2.0, 3.2 x 2.5, 5.0 x 3.2 mm x mm
- Pb-free, Halogen-free, Antimony-free
- RoHS and REACH compliant
- Fast delivery times

Typical Applications:

- Fibre Channel
- Server and Storage
- GPON, EPON
- 100M / 1G /10G Ethernet

Electrical Specifications:

Frequency Range	Standard Frequencies 3.57 MHz to 77.76MHZ	See List of Supported Frequencies (Below)
Frequency Stability	See Part Number Guide	Inclusive of Initial Tolerance, Operating Temperature Range, Load, Voltage, and Aging
Operating Temperature	See Part Number Guide	
Supply Voltage (Vdd) 10%	See Part Number Guide	
Current Consumption	3.8 mA typ./ 4.5 mA max 3.7 mA typ./ 4.2 mA max 3.5 mA typ./ 4.1 mA max	No load condition, F = 20 MHz, Vdd = +2.8 V to +3.3 V No load condition, F = 20 MHz, Vdd = +2.5 V No load condition, F = 20 MHz, Vdd = +1.8 V
OE Disable Current	4.2 mA max 4.0 mA max	Vdd = +2.5 V to +3.3 V, OE = GND, Output in high-Z state Vdd = +1.8 V, OE = GND, Output in high-Z state
Standby Current	2.6 µA typ./ 4.3 µA max 1.4 µA typ. / 2.5 µA max 0.6 µA typ. / 1.3 µA max	$\overline{ST}$ = GND, Vdd = +2.8 V to +3.3V $\overline{ST}$ = GND, Vdd = +2.5 V $\overline{ST}$ = GND, Vdd = +1.8 V
Waveform Output	LVCMOS / HCMOS	
Symmetry	45%/55%	50% of waveform all Vdds
Rise / Fall Time	1.0 nSec typ./ 2.0 nSec max 1.3 nSec typ./ 2.5 nSec max	Vdd = +2.5 V, +2.8 V, + 3.0 V or +3.3 V from 20% to 80% of waveform Vdd = +1.8 V from 20% to 80% of waveform
Logic "1"	90% of Vdd min	
Logic "0"	10% of Vdd max	
Input High Voltage	70% of Vdd min	Pin 1, OE or $\overline{ST}$
Input Low Voltage	30% of Vdd max	Pin 1, OE or $\overline{ST}$
Input Pull-up Impedance	50kΩ min / 87kΩ typ. 150kΩ max 2.0MΩ min	Pin 1, OE logic high or logic low or $\overline{ST}$ logic high Pin 1, $\overline{ST}$ logic Low
Startup Time	5.0 mSec max	Measured from the time Vdd reaches its rated min value
Enable/Disable time	138 nSec max	F = 77.76 Mhz. For other frequencies, T_oe =100 nSec + 3*cycles
Resume Time	5.0 mSec max	Measured from the time $\overline{ST}$ pin crosses 50% threshold
RMS Period Jitter	1.8pSec typ./ 3.0pSec max 1.8pSec typ./ 3.0pSec max.	F = 75 MHz, Vdd = +2.5 V, +2.8 V, + 3.0 V or +3.3 V F = 75 MHz, Vdd = +1.8 V
Peak-to-peak Period Jitter	12.0 pSec typ./ 25.0 pSec max 14.0 pSec typ./ 30.0 pSec max	F = 75 MHz, Vdd = +2.5 V, +2.8 V, + 3.0 V or +3.3 V F = 75 MHz, Vdd = +1.8 V
RMS Phase Jitter (random)	0.5pSec typ./ 0.9 pSec max 1.3pSec typ./ 2.0pSec max	F = 75 MHz, Integration Bandwidth = 900 kHz to 7.5 MHz F = 75 MHz, Integration Bandwidth = 12 kHz to 20.0 MHz

Notes:

- All min and max limits are specified over temperature and rated operating voltage with 15pF output unless otherwise stated.
- Typical values are at +25ºC and nominal supply voltage.

List of Supported Frequencies (in MHz)

3.570000	4.000000	4.096000	6.000000	7.372800	8.192000	10.000000	12.000000	14.000000
18.432000	19.200000	20.000000	24.000000	24.576000	25.000000	25.000625	26.000000	27.000000
28.636300	30.000000	31.250000	32.768000	33.000000	33.300000	33.330000	33.333000	33.333300
33.333330	35.840000	37.500000	38.000000	38.400000	40.000000	40.500000	48.000000	50.000000
54.000000	60.000000	62.500000	65.000000	66.000000	66.600000	66.660000	66.666000	66.666600
66.666660	72.000000	74.175824	74.176000	74.250000	75.000000	77.760000		

ILSI America Phone 775-851-8880 ● Fax 775-851-8882 ●email: e-mail@ilsiamerica.com ●
www.ilsiamerica.com

Ordering Information:

Part Number Guide						
Packages	Input Voltage	Operating Temperature	Output Drive Strength	Stability (ppm)	Select Function	Frequency
IM804B – 5.0 x 3.2 IM804C – 3.2 x 2.5 IM804D – 2.5 x 2.0 IM804E – 2.0 x 1.6	1 = +1.8 V 6 = +2.5 V 2 = +2.8 V 7 = +3.0 V 3 = +3.3 V	1 = 0ºC to +70ºC 2 = -40ºC to +85ºC 3 = -20ºC to +70ºC	- = Default (see tables 2 through 6)	F = ±20 A = ±25 B = ±50	H = Tri-State S = Standby O = N/C	- Frequency

Sample Part Number: **IM804C-62-FS-20.0000MHz**

This 20.0000 MHz oscillator in a 3.2 x 2.5 package with stability ±20 ppm from -40ºC to +85ºC using a supply voltage of +2.5 V. The Output Drive Strength (Rise and Fall Time) is the default value 1.0 nSec per Table 3 with 15 pF load. With Pin 1 function as Standby

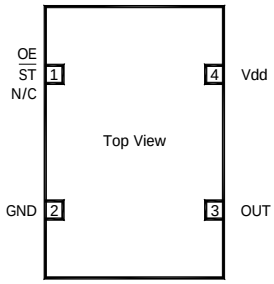
Sample Part Number: **IM804D-71RAO-66.0000MHz**

This 66.0000 MHz oscillator in a 2.5 x 2.0 package with stability ±25 ppm from 0ºC to +70ºC using a supply voltage of +3.0 V. The Output Drive Strength (Rise and Fall Time) is the R drive strength is 4.54 nSec per Table 5 with 30 pF load. With Pin 1 function is not connected

Notes:
- Not all options are available at all frequencies and temperatures ranges.
- Please consult with sales department for any other parameters or options.
- Oscillator specification subject to change without notice.

Absolute Maximum Limits	
Operating Temperature	-40ºC to +85ºC
Storage Temperature	-65ºC to +150ºC
Supply Voltage (Vdd)	-0.5 VDC to 4.0 VDC
Electrostatic Discharge	2000 V max
Solder Temperature (follow standard Pb free soldering guidelines)	260ºC max
Junction Temperature	150ºC max

Pin Functionally

Pin Description				
Pin	Symbol	Functionality		Pin Assignments
1	OE	Tri-state	High or Open = specified frequency output Low = Output is high impedance, only output is disabled.	
	$\overline{ST}$	Standby	High or Open = specified frequency output. Low = Output is low. Device goes to sleep mode. Supply current reduces to standby current.	
	N/C	No Connect	Any voltage between 0.0 V to Vdd or Open = specified frequency output Pin 1 has no functiion	
2	GND	Power	Electrical ground	
3	Out	Output	Oscillator output	
4	Vdd	Power	Power supply voltage	

Notes:
1. In OE or $\overline{ST}$ mode, a pull-up resistor of 10.0 kΩ or less is recommended if Pin 1 is not externally driven. If Pin 1 needs to be left floating, use the NC option.
2. A capacitor of value 0.1 µF or higher between Pin 4 (Vdd) and Pin 1 (GND) is required.

Performance Plots:

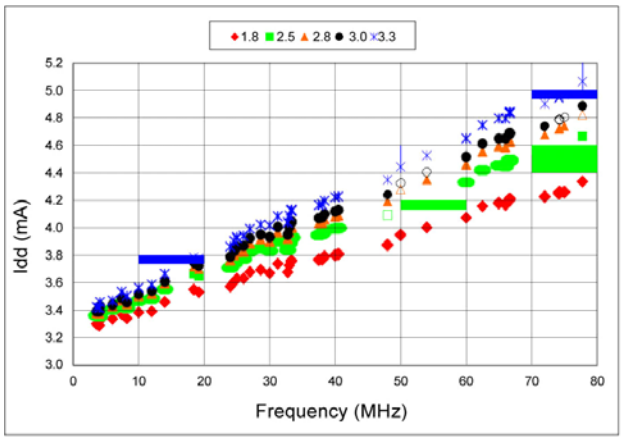


Figure 1: Idd vs Frequency

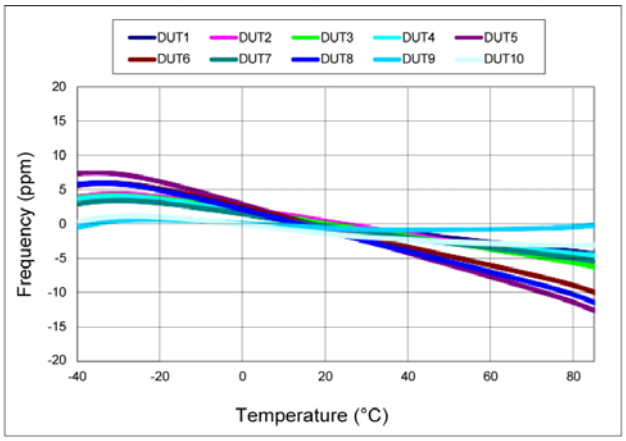


Figure 2: Frequency vs Temperature

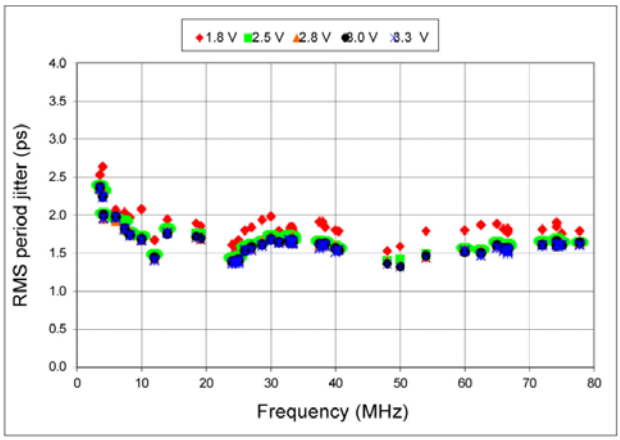


Figure 3: RMS Period Jitter vs Frequency

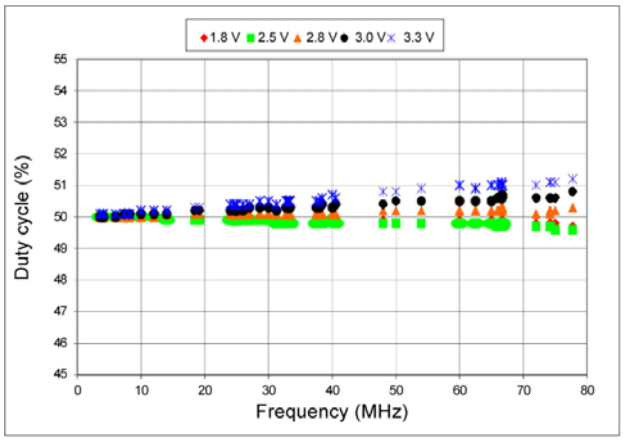


Figure 4: Duty Cycle vs Frequency

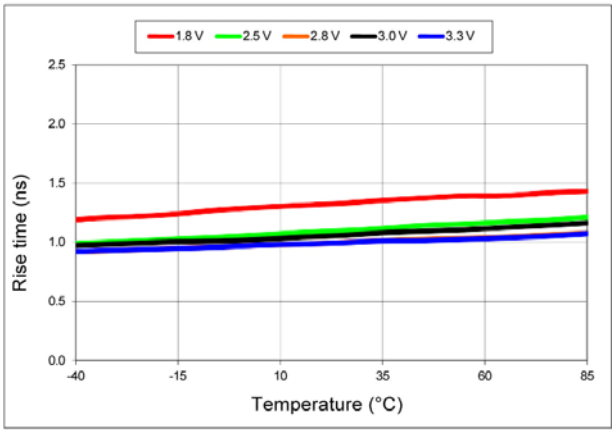


Figure 5: 20% to 80% Rise Time vs Temperature

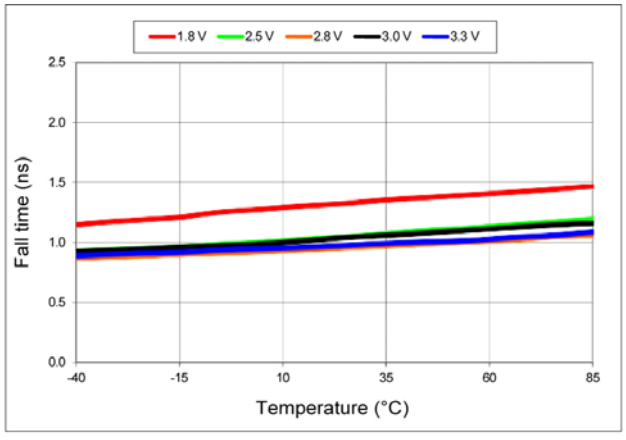


Figure 6: 20% to 80% Fall Time vs Temperature

Performance Plots (Cont.)

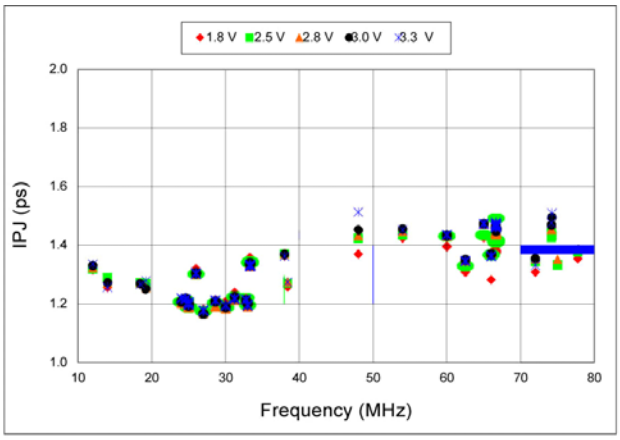


Figure 7: RMS Integrated Phase Jitter Random (12 kHz to 20 MHz) vs Frequency

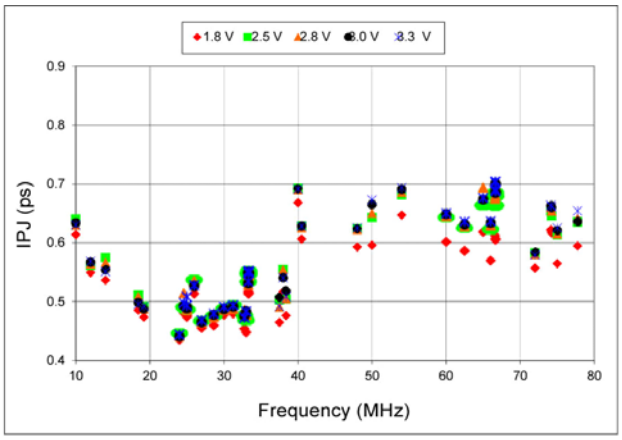


Figure 8: RMS Integrated Phase Jitter Random (900 kHz to 20 MHz) vs Frequency

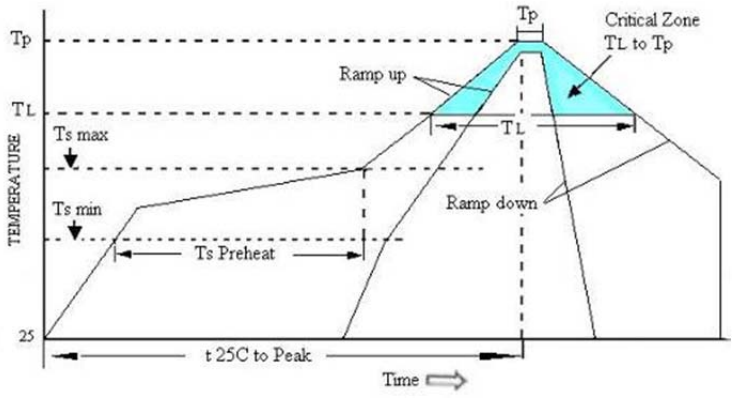
Notes:

- All plots are measured with 15pF load at room temperature unless otherwise stated.
- Phase noise plots are measured with Agilent E5052B signal source analyzer integration range is up to 5 MHz for carrier frequencies below 40 MHz

Environmental Specifications:

Environmental Compliance	
Parameter	Condition/Test Method
Mechanical Shock	MIL-STD-883F, Method 2002
Mechanical Vibration	MIL-STD-883F, Method 2007
Temperature Cycle	JESD22, Method A104
Solderability	MIL-STD-883F, Method 2003
Moisture Sensitivity Level	MSL1 at +260ºC

Pb Free Solder Reflow Profile

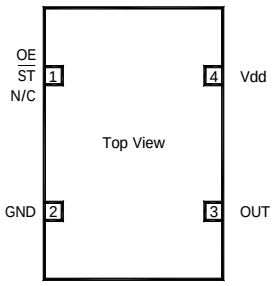


Units are backward compatible with +240ºC reflow processes

Ts max to T_L (Ramp-up Rate)	3ºC / second max
Preheat Temperature min (Ts min) Temperature typ (Ts typ) Temperature max (Ts max) Time (Ts)	 150ºC 175ºC 200ºC 60 to180 seconds
Ramp-up Tate (T_L to Tp	3ºC / second max
Time Maintained Above Temperature (T_L) Time (T_L)	 217ºC 60 to 150 seconds
Peak Temperature (Tp)	260ºC max for seconds
Time within 5ºC to Peak Temperature (Tp)	20 to 40 seconds
Ramp-down Rate	6ºC / second max
Tune 25ºC to Peak Temperature	8 minute max
Moisture Sensitivity Level (MSL)	Level 1

Pin Functionally

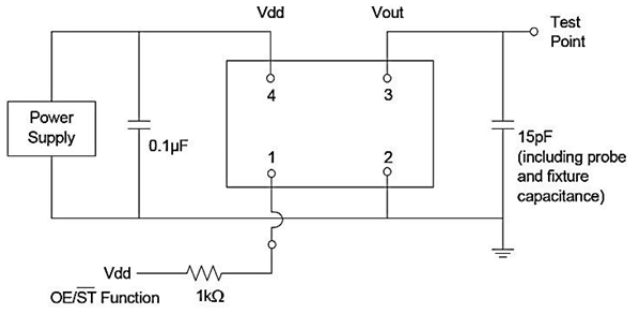
Pin Description

Pin	Symbol	Functionality		Pin Assignments
1	OE	Tri-state	High or Open = specified frequency output Low = Output is high impedance, only output is disabled.	
	$\overline{ST}$	Standby	High or Open = specified frequency output. Low = Output is low. Device goes to sleep mode. Supply current reduces to standby current.	
	N/C	No Connect	Any voltage between 0.0 V to Vdd or Open = specified frequency output Pin 1 has no functiion	
2	GND	Power	Electrical ground	
3	Out	Output	Oscillator output	
4	Vdd	Power	Power supply voltage	

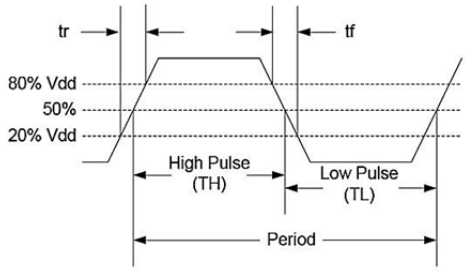
Notes:

3. In OE or $\overline{ST}$ mode, a pull-up resistor of 10.0 kΩ or less is recommended if Pin 1 is not externally driven. If Pin 1 needs to be left floating, use the NC option.
4. A capacitor of value 0.1 µF or higher between Pin 4 (Vdd) and Pin 1 (GND) is required.

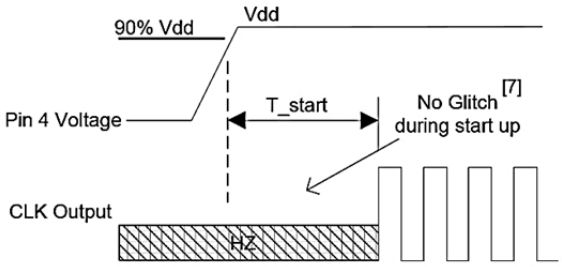
Test Circuit



Waveform

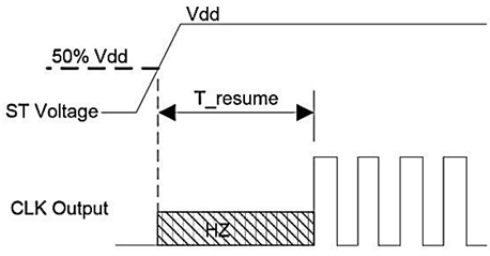


Timing Diagrams:



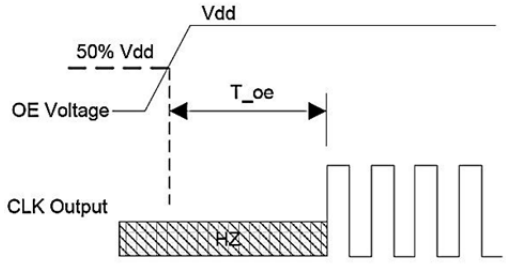
T_start: Time to start from power-off

Figure 9: Startup Timing (OE/$\overline{ST}$ Mode)



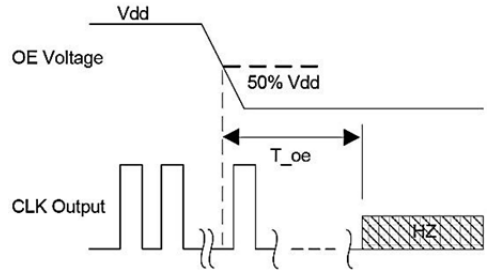
T_resume: Time to resume from ST

Figure 10: Standby Resume Timing ($\overline{ST}$ Mode Only)



T_oe: Time to re-enable the clock output

Figure 11: OE Enable Timing (OE Mode Only)



T_oe: Time to put the output in High Z mode

Figure 12: OE Disable Timing (OE Mode Only)

Selectable Drive Strength Options
Rise / Fall Time (20% to 80%) vs C_{LOAD} Tables

Rise/Fall Time Typ (nSec)					
Drive Strength (C_{LOAD})	5 pF	15 pF	30 pF	45 pF	60 pF
L	6.16	11.61	22.00	31.27	39.91
A	3.19	6.35	11.00	16.01	21.52
R	2.11	4.31	7.65	10.77	14.47
B	1.65	3.23	5.79	8.18	11.08
T	0.93	1.91	3.32	4.66	6.48
E	0.78	1.66	2.94	4.09	5.74
U	0.70	1.48	2.64	3.68	5.09
- = default	0.65	1.30	2.40	3.35	4.56

Table 2: Vdd = +1.8 V Rise / Fall time for Specific C_{LOAD}

Rise/Fall Time Typ (nSec)					
Drive Strength (C_{LOAD})	5 pF	15 pF	30 pF	45 pF	60 pF
L	4.13	8.25	12.82	21.45	27.79
A	2.11	4.27	7.64	11.20	14.49
R	1.45	2.81	5.16	7.65	9.88
B	1.09	2.20	3.88	5.86	7.57
T	0.62	1.28	2.27	3.51	4.45
- = default	0.54	1.00	2.01	3.10	4.01
U	0.43	0.96	1.81	2.79	3.65
F	0.34	0.88	1.64	2.54	3.32

Table 3: Vdd = +2.5 V Rise/Fall time for Specific C_{LOAD}

Rise/Fall Time Typ (nSec)					
Drive Strength (C_{LOAD})	5 pF	15 pF	30 pF	45 pF	60 pF
L	3.77	7.54	12.28	19.57	25.27
A	1.94	3.90	7.03	10.24	13.34
R	1.29	2.57	4.72	7.01	9.06
B	0.97	2.00	3.54	5.43	6.93
T	0.55	1.12	2.08	3.22	4.08
- = default	0.44	1.00	1.83	2.82	3.67
U	0.34	0.88	1.64	2.52	3.30
F	0.29	0.81	1.48	2.29	2.99

Table 4: Vdd = +2.8 V Rise/Fall time for Specific C_{LOAD}

Rise/Fall Time Typ (nSec)					
Drive Strength (C_{LOAD})	5 pF	15 pF	30 pF	45 pF	60 pF
L	3.60	7.21	11.97	18.74	24.30
A	1.84	3.71	6.72	9.86	12.68
R	1.22	2.46	4.54	6.76	8.62
B	0.89	1.92	3.39	5.20	6.64
- = default	0.51	1.00	1.97	3.07	3.90
E	0.38	0.92	1.72	2.71	3.51
U	0.30	0.83	1.55	2.40	3.13
F	0.27	0.76	1.39	2.16	2.85

Table 5: Vdd = +3.0 V Rise/Fall time for Specific C_{LOAD}

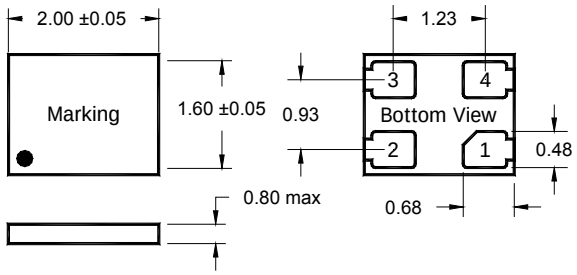
Rise/Fall Time Typ (nSec)					
Drive Strength (C_{LOAD})	5 pF	15 pF	30 pF	45 pF	60 pF
L	3.39	6.88	11.63	17.56	23.59
A	1.74	3.50	6.38	8.98	12.19
R	1.16	2.33	4.29	6.04	8.34
B	0.81	1.82	3.22	4.52	6.33
- = default)	0.46	1.00	1.86	2.60	3.84
E	0.33	0.87	1.64	2.30	3.35
U	0.28	0.79	1.46	2.05	2.93
F	0.25	0.72	1.31	1.83	2.61

Table 6: Vdd = +3.3 V Rise/Fall time for Specific C_{LOAD}

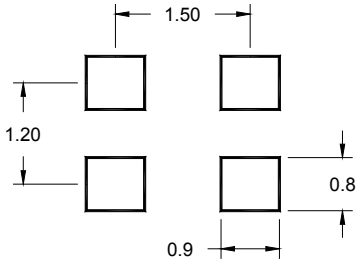
Mechanical Detail

Package Dimensions and Suggest Land Pattern

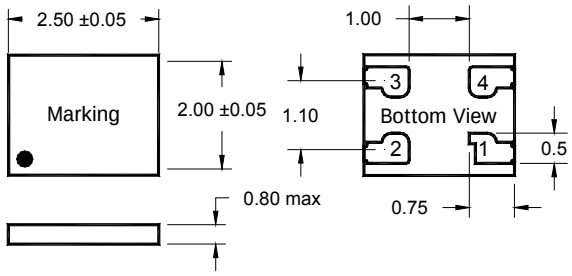
Option E: 2.00 x 1.60 x 0.80 Package



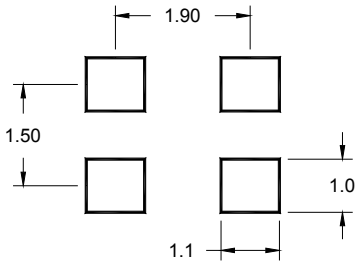
Suggested Land Pattern



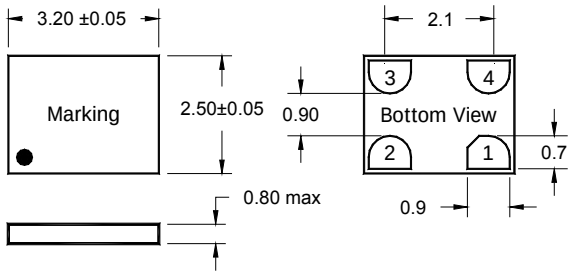
Option D: 2.50 x 2.00 x 0.80 Package



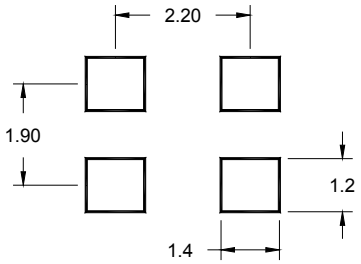
Suggested Land Pattern



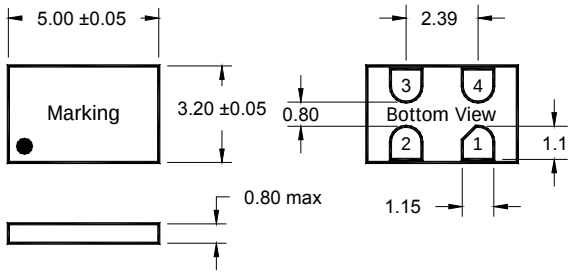
Option C: 3.20 x 2.50 x 0.80 Package



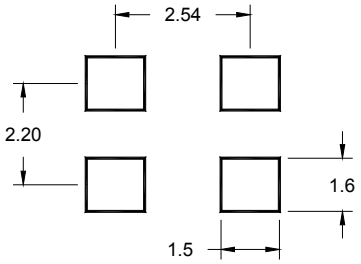
Suggested Land Pattern



Option B: 5.00 x 3.20 X 0.80 Package



Suggested Land Pattern



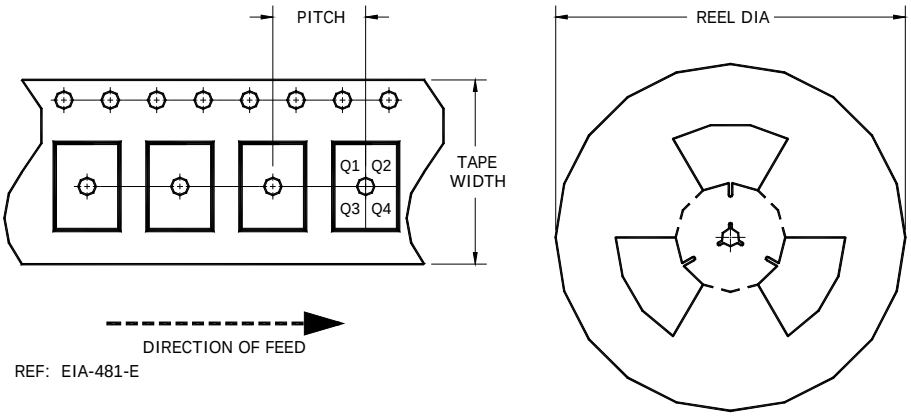
Marking

Line 1 = XXXXX (Lot Code)
Dot to denote Pin 1 location

Package Information

Leadframe: C194
Plating: NiPdAu

Tape and Reel Dimensions



Part Number	Size	Pitch	Tape Width	Pin Orient.	Reel Dia.	Count
IM804B	5.0 x 3.2	8.0 ± 0.1	12.3 max	Q1	180	1000
					330	3000
IM804C	3.2 x 2.5	4.0 ± 0.1	8.3 max	Q1	180	3000
IM804D	2.5 x 2.0	4.0 ± 0.1	8.3 max	Q1	180	3000
IM804E	2.0 x 1.6	4.0 ± 0.1	8.3 max	Q1	180	3000

Notes:
- All dimensions are in mm.
- Do not scale drawings.