MEMS Oscillator, Ultra Performance, LVCMOS/HCMOS Compatible, 1.00 MHz to 80.00 MHz — IM810 Series

Features:

- MEMS Technology
- Direct pin to pin drop-in replacement for industry-standard packages
- Ultra-low phase jitter: 0.5 pSec (12 kHz to 20 MHz)
- LVCMOS/HCMOS Compatible Output
- Industry-standard package 2.5 x 2.0, 3.2 x 2.5, and 5.0 x 3.2 mm x mm
- Pb-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	1.000 MHz to 80.000MHz	
Frequency Stability	See Part Number Guide	Inclusive of Initial Tolerance, Operating Temperature Range, Load, and Voltage.
First Year Aging	±1.5 ppm	At + 25ºC ±2ºC
10 Years Aging	±5.0 ppm	At + 25ºC ±2ºC
Operating Temperature	See Part Number Guide	
Supply Voltage (Vdd) ±10%	See Part Number Guide	
Current Consumption	31 mA typ./ 33 mA max 29 mA typ./ 31mA max	No load condition, F = 20 MHz, Vdd = +2.5 V, +2.8 V or +3.3 V No load condition, f = 20 MHz, Vdd = +1.8V
OE Disable Current	31 mA max 30 mA max	Vdd = +2.5 V, +2.8 V or 3.3 V, OE = GND Vdd = +1.8 V, OE = GND
Standby Current	70 µA max 10 µA max	Vdd = +2.5 V, +2.8 V or 3.3 V, $\overline{ST}$ = GND Vdd = +1.8 V, $\overline{ST}$ = GND
Waveform Output	LVCMOS/HCMOS	
Symmetry	45%/55%	50% of waveform
Rise / Fall Time	1.2 nSec typ./ 2.0 nSec max	15 pF Load, 10% to 90% of Vdd
Logic "1"	90% of Vdd min	
Logic "0"	10% of Vdd max	
Input Voltage High	70% of Vdd min	Pin 1, OE or $\overline{ST}$
Input Voltage Low	30% of Vdd max	Pin 1, OE or $\overline{ST}$
Input Pull-up Impedance	100 kΩ typ./ 250 kΩ max 2.0 MΩ min	Pin 1, OE logic high or logic low, or $\overline{ST}$ logic high Pin 1, $\overline{ST}$ logic low
Startup Time	7 mSec typ./ 10 mSec max	Measured from the time Vdd reaches its rated minimum values
OE Enable/Disable Time	150 nSec max	F = 80 MHz, For other frequencies, T_oe = 100 nSec = 3 cycles
Resume Time	6 mSec typ./ 10 mSec max	In standby mode, measured from the time $\overline{ST}$ pin crosses 50% threshold.
RMS Period Time	1.5 pSec typ./ 2.0 pSec max 2.0 pSec typ./ 3.0 pSec max	F = 75 MHz, all Vdds
RMS Period Time (random)	0.5 pSec typ./ 1.0 pSec max	F = 10 MHz, Integration bandwidth = 12 kHz to 20 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.

Absolute Maximum Limits

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

Ordering Information:

Part Number Guide						
Packages	Input Voltage	Operating Temperature	Output Drive Strength	Stability (ppm)	Select Function	Frequency
IM810B – 5.0 x 3.2 IM810C – 3.2 x 2.5 IM810D – 2.5 x 2.0	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 4)	E - ±10 F = ±20 A = ±25 B = ±50	H = Tri-state S = Standby	- Frequency

Sample Part Number: **IM810C-62-FS-10.0000MHz**

This 10.0000 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 2.00 nSec per Table 3 with 30 pF load. With Pin 1 function as Standby

Sample Part Number: **IM810B-23FAH-66.0000MHz**

This 66.0000 MHz oscillator in a 5.0 x 3.2 package with stability ±20 ppm from -40ºC to +85ºC using a supply voltage of +2.8 V. The Output Drive Strength (Rise and Fall Time) is 1.29 nSec per Table 1 with 15 pF load. With Pin 1 function as Tri-state

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.

Phase Noise:

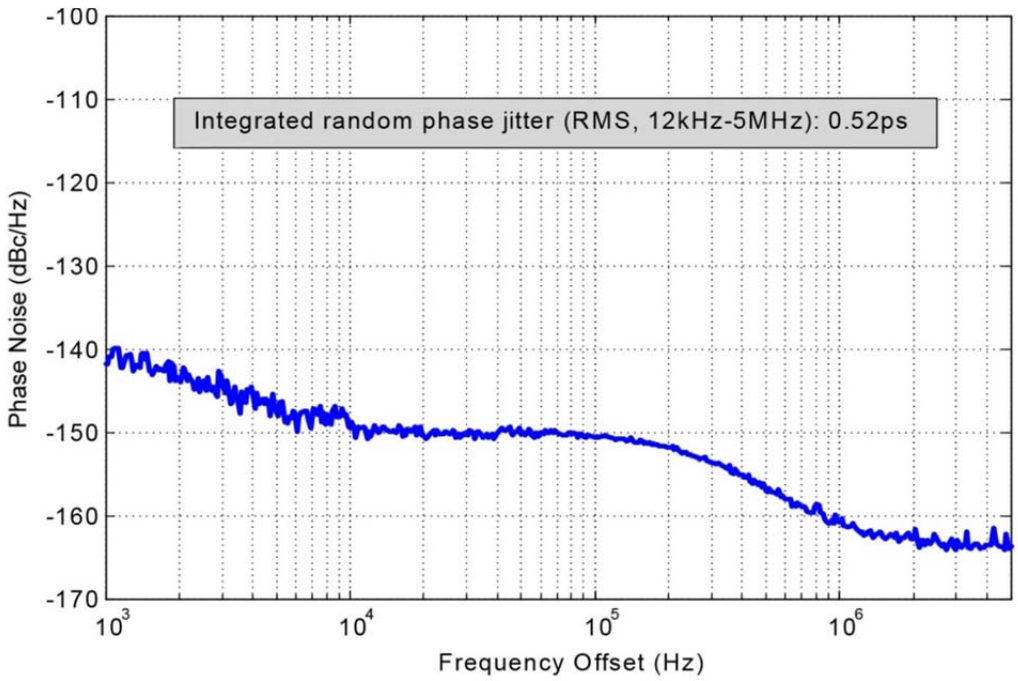


Figure 1: Phase Noise, 10 MHz, +3.0 V LVCMOS Output

Performance Plots:

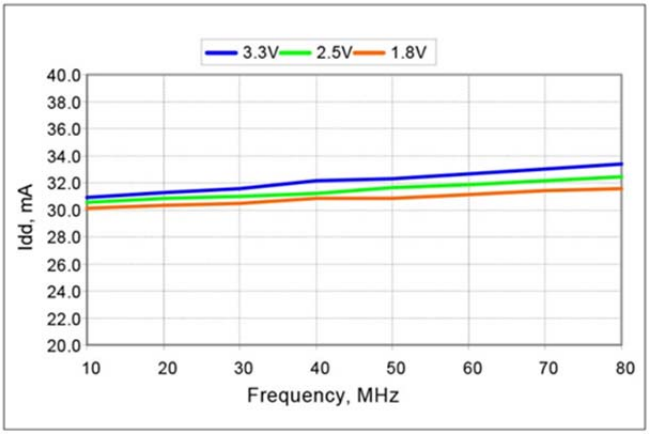


Figure 2: Idd vs Frequency

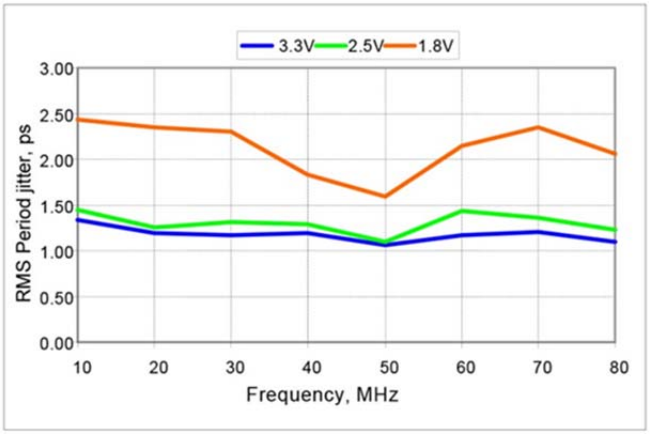


Figure 3: RMS Period vs Frequency

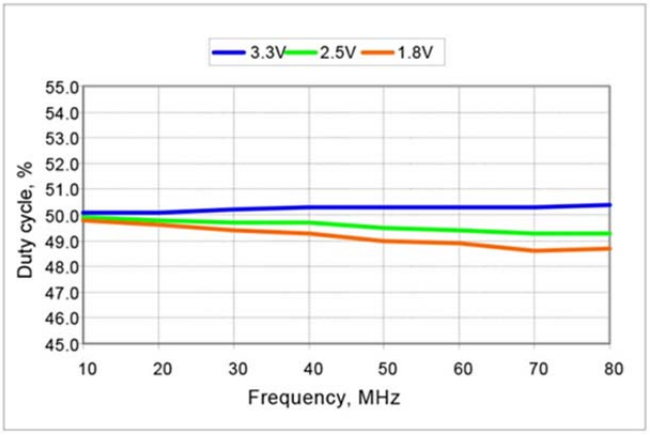


Figure 4: Duty Cycle vs Frequency

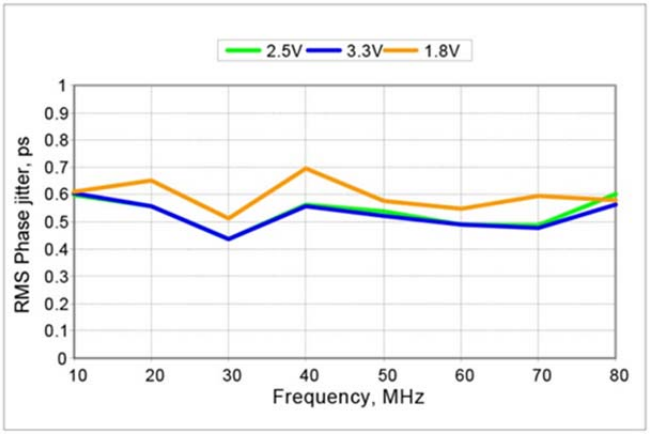


Figure 5: RMS Phase Jitter vs Frequency

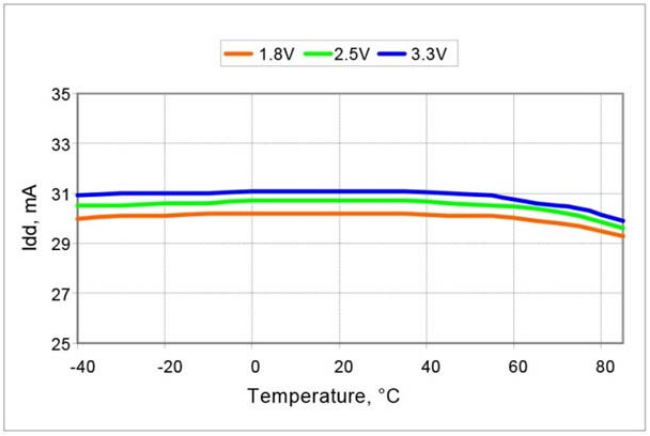
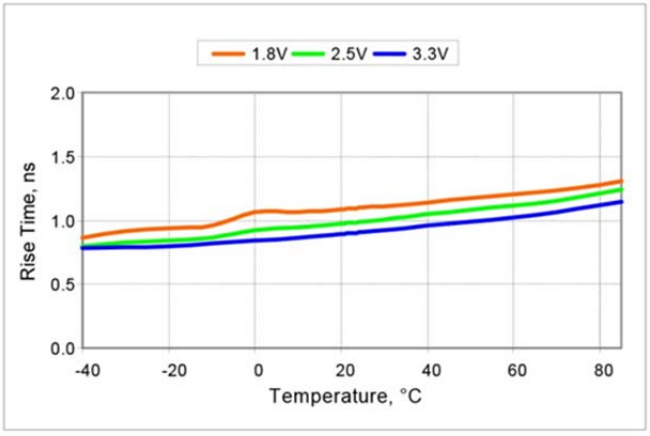
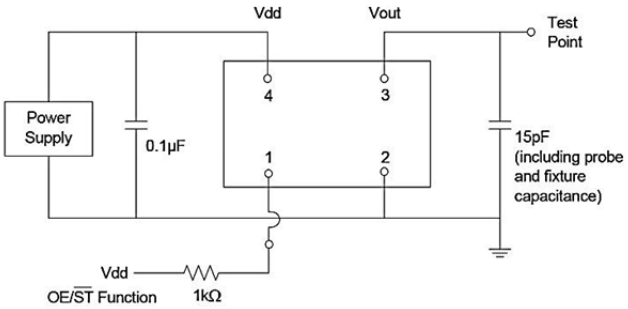


Figure 6: Idd vs Temperature, 10 MHz Output

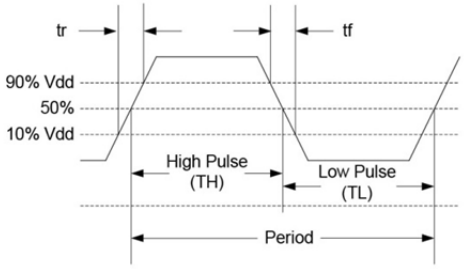


Firgure 7: Rise Time vs Temperature, 75 MHz Output

Test Circuit



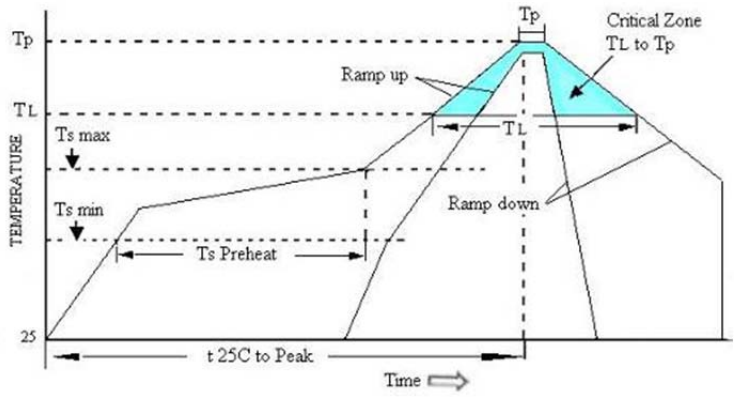
Waveform



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	MSL Level 1 at +260ºC

Pb Free Solder Reflow Profile

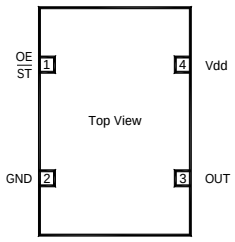


Units are backward compatible with +240ºC reflow processes

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.	
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
2. A capacitor of value 0.1 µF or higher between Pin 4 (Vdd) and Pin 1 (GND) is required.

Timing Diagrams:

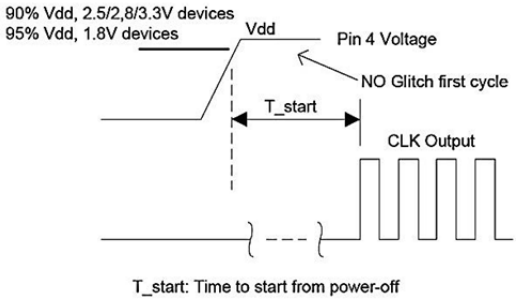


Figure 8: Startup Timing (OE/$\overline{ST}$ Mode)

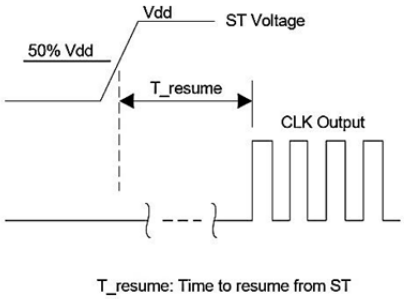


Figure 9: Standby Resume Timing ($\overline{ST}$ Mode Only)

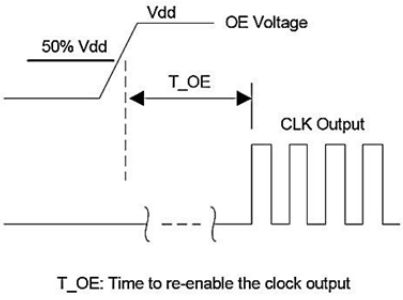


Figure 10: OE Enable Timing (OE Mode Only)

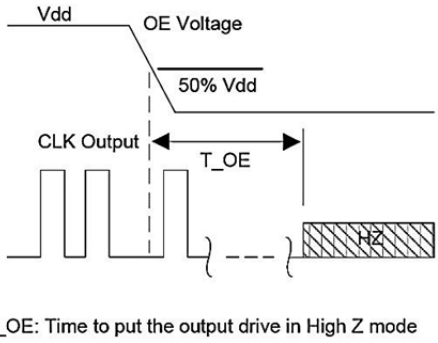


Figure 11: OE Disable Timing (OE Mode Only)

Notes:
- IM810 supports gated output which is accurate within rated frequency stability from the first cycle

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

Rise/Fall Time Typ (nS)					
Drive Strength (C_{LOAD})	5 pF	15 pF	30 pF	45 pF	60 pF
L	12.45	17.68	19.48	46.21	57.82
A	6.50	10.27	16.21	23.92	30.76
R	4.38	7.05	11.61	16.17	20.83
B	3.27	5.30	8.89	12.18	15.75
S	2.62	4.25	7.20	9.81	12.65
D	2.19	3.52	6.00	8.31	10.59
T	1.76	3.01	5.14	7.10	9.15
E	1.59	2.59	4.49	6.25	7.98
U	1.49	2.28	3.96	5.55	7.15
F	1.22	2.10	3.57	5.00	6.46
W	1.07	1.88	3.23	4.50	5.87
G	1.01	1.64	2.96	4.12	5.40
X	0.96	1.50	2.74	3.80	4.98
K	0.92	1.41	2.56	3.52	4.64
Y	0.88	1.34	2.39	3.25	4.32
Q	0.86	1.29	2.24	3.04	4.06
- = Default	0.82	1.24	2.07	2.89	3.82
M	0.77	1.20	1.94	2.72	3.61
N	0.66	1.15	1.84	2.58	3.41
P	0.51	1.09	1.76	2.45	3.24

Table 1: Vdd = +1.8 V Rise/Fall time for Specific C_{LOAD}

Rise/Fall Time Typ (nS)					
Drive Strength (C_{LOAD})	5 pF	15 pF	30 pF	45 pF	60 pF
L	8.68	13.59	18.36	32.70	42.06
A	4.42	7.18	11.93	16.60	21.38
R	2.93	4.78	8.15	11.19	14.59
B	2.21	3.57	6.19	8.55	11.04
S	1.67	2.87	4.94	6.85	8.80
D	1.50	2.33	4.11	5.68	7.33
T	1.06	2.04	3.50	4.84	6.26
E	0.98	1.69	3.03	4.20	5.51
U	0.93	1.48	2.69	3.73	4.92
F	0.90	1.37	2.44	3.34	4.42
W	0.87	1.29	2.21	3.04	4.02
- = Default	0.67	1.20	2.00	2.79	3.69
X	0.44	1.10	1.86	2.56	3.43
K	0.38	0.99	1.76	2.37	3.18
Y	0.36	0.83	1.66	2.20	2.98
Q	0.34	0.71	1.58	2.07	2.80
Z	0.33	0.65	1.51	1.95	2.65
M	0.32	0.62	1.44	1.85	2.50
N	0.31	0.59	1.37	1.77	2.39
P	0.30	0.57	1.29	1.70	2.28

Table 2: Vdd = +2.5 V Rise/Fall time for Specific C_{LOAD}

Rise/Fall Time Typ (nS)					
Drive Strength (C_{LOAD})	5 pF	15 pF	30 pF	45 pF	60 pF
L	7.93	12.69	17.94	30.10	38.89
A	4.06	6.66	11.04	15.31	19.80
R	2.68	4.40	7.53	10.29	13.37
B	2.00	3.25	5.66	7.84	10.11
S	1.59	2.57	4.54	6.27	8.07
D	1.19	2.14	3.76	5.21	6.72
T	1.00	1.79	3.20	4.43	5.77
E	0.94	1.51	2.78	3.84	5.06
U	0.90	1.38	2.48	3.40	4.50
F	0.87	1.29	2.21	3.03	4.05
W	0.62	1.19	1.99	2.76	3.68
- = Default	0.41	1.08	1.84	2.52	3.36
X	0.37	0.96	1.72	2.33	3.15
K	0.35	0.78	1.63	2.15	2.92
Y	0.33	0.67	1.54	2.00	2.75
Q	0.32	0.63	1.46	1.89	2.57
Z	0.31	0.60	1.39	1.80	2.43
M	0.30	0.57	1.31	1.72	2.30
N	0.30	0.56	1.22	1.63	2.22
P	0.29	0.54	1.13	1.55	2.13

Table 3: Vdd = +2.8 V Rise/Fall time for Specific C_{LOAD}

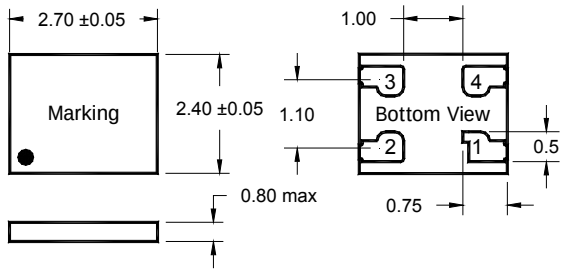
Rise/Fall Time Typ (nS)					
Drive Strength (C_{LOAD})	5 pF	15 pF	30 pF	45 pF	60 pF
L	7.18	11.59	17.24	27.57	35.57
A	3.61	6.02	10.19	13.98	18.10
R	2.31	3.95	6.88	9.42	12.24
B	1.65	2.92	5.12	7.10	9.17
S	1.43	2.26	4.09	5.66	7.34
D	1.01	1.91	3.38	4.69	6.14
T	0.94	1.51	2.86	3.97	5.25
E	0.90	1.36	2.50	3.46	4.58
U	0.86	1.25	2.21	3.03	4.07
- = Default	0.48	1.15	1.95	2.72	3.65
W	0.38	1.04	1.77	2.47	3.31
G	0.36	0.87	1.66	2.23	3.03
X	0.34	0.70	1.56	2.04	2.80
K	0.33	0.63	1.48	1.89	2.61
Y	0.32	0.60	1.40	1.79	2.43
Q	0.32	0.58	1.31	1.69	2.28
Z	0.30	0.56	1.22	1.62	2.17
M	0.30	0.55	1.12	1.54	2.07
N	0.30	0.54	1.02	1.47	1.97
P	0.29	0.52	0.95	1.41	1.90

Table 4: Vdd= +3.0 V Rise/Fall time for Specific C_{LOAD}

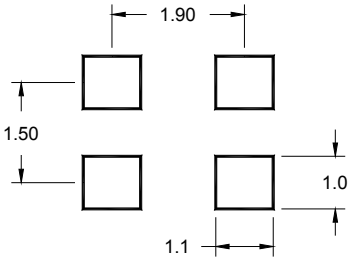
Mechanical Details:

Package Dimensions and Suggest Land Pattern

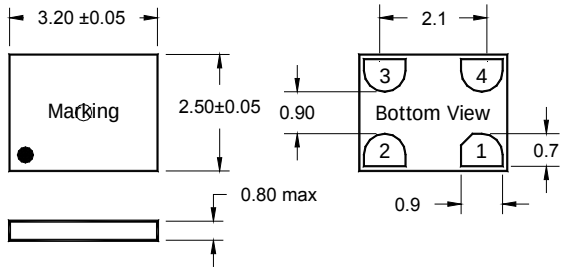
Option D: 2.70 x 2.40 Package (100% compatible with 2.50 x 2.00)



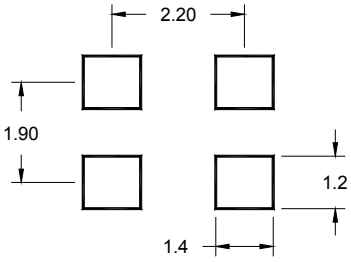
Suggested Land Pattern



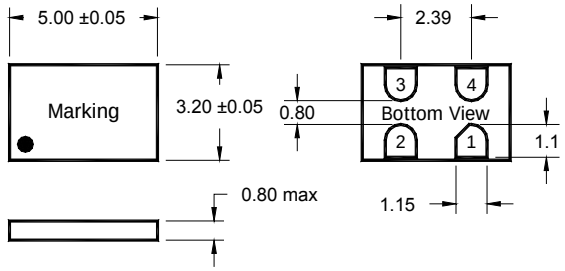
Option C: 3.20 x 2.50 Package



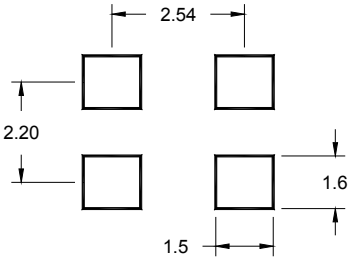
Suggested Land Pattern



Opton B: 5.00 x 3.20 Package



Suggested Land Pattern



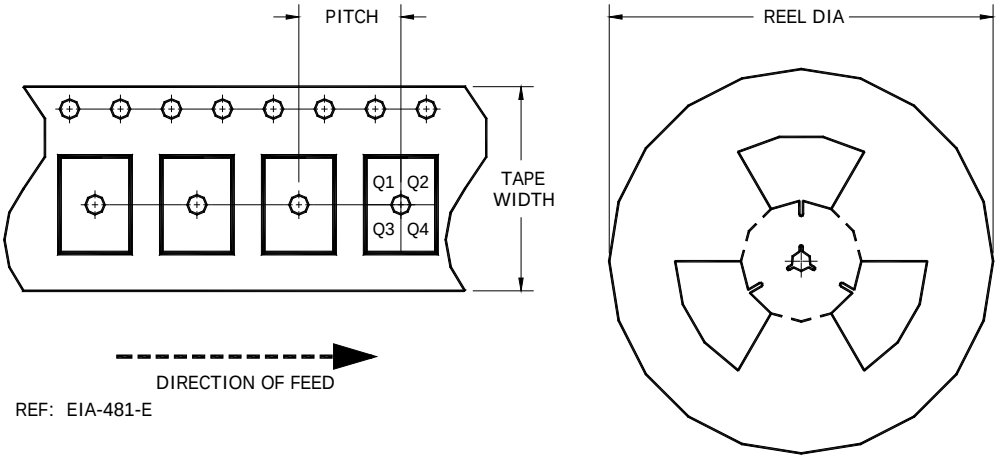
Marking

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

Package Information

Leadframe: C194
Plating: NiPdAu

Tape and Reel Dimensions



REF: EIA-481-E

Part Number	Size	Pitch	Tape Width	Pin Orient.	Reel Dia.	Count
IM810B	5.0 x 3.2	8.0 ± 0.1	12.3 max	Q1	180	1000
					330	3000
IM810C	3.2 x 2.5	4.0 ± 0.1	8.3 max	Q1	180	3000
IM810D	2.5 x 2.0	4.0 ± 0.1	8.3 max	Q1	180	3000

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