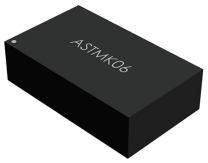
Ultra-miniature, Low Power, 32.768kHz SMD MEMS Oscillator



2.0 x 1.2 x 0.6mm

ASTMK06

ESD Sensitive

RoHS/RoHS II compliant

Moisture Sensitivity Level (MSL) – 1

FEATURES:

- Ultra-miniature size: 2.0 x 1.2 x 0.6mm
- Supply Voltage: 1.5V to 3.63V
- Ultra-Low Current Consumption: 1.0µA typ.(no load)
- Frequency Stabilities include:
  - ±75ppm over -10 to +70°C
  - ±100ppm over -40 to +85°C
- Internal power supply filtering eliminates external bypass capacitor for Vdd port.

APPLICATIONS:

- General Timekeeping
- Battery Management
- Portable devices
- RTC reference clock
- Bluetooth/WiFi modules

STANDARD SPECIFICATIONS:

Parameters		Min	Typ	Max	Unit	Notes
Output Frequency (F_{out})			32.768		kHz	
Initial Frequency Tolerance (F_{init}) (1)		-20		+20	ppm	T_A= +25°C, post reflow, V_{dd}:1.5-3.63V
Frequency Stability over Temperature (F_{stab}) (2)		-75		+75	ppm	T_A= -10°C to +70°C, V_{dd}:1.5-3.63V
		-100		+100		T_A= -40°C to +85°C, V_{dd}:1.5-3.63V
Aging (@+25°C)		-1		+1	ppm	First year
Supply Voltage (V_{dd})		1.5		3.63	V	T_A= over temperature
Current Consumption (I_{dd})			1.0		µA	T_A= +25°C, V_{dd}:1.5-3.63V. No load.
				1.9		T_A= -10°C to +70°C, V_{dd} max: 3.63V. No load
				2.2		T_A= -40°C to +85°C, V_{dd} max: 3.63V. No load.
Power Supply Ramp (t_{vdd_Ramp})				100	ms	Over temperature, 0 to 90% V_{dd}
Start-up Time at Power-up (T_{start})			180	300	ms	T_A= +25°C±10°C
				450		T_A= -40°C to +70°C
				500		T_A= +85°C
Operating Temperature Range (T_{use})		-10		+70	°C	Option "M"
		-40		+85		Option "L"
LVCMOS Output (T_A= Over Temperature. Typical values are at T_A= +25°C)						
Output Rise/Fall Time (t_r/t_f)			100	200	ns	10-90%, 15pF load, V_{dd}:1.5-3.63V
Output Clock Duty Cycle		48		52	%	
Output Voltage	V_{OH}	90%*V_{dd}			V	V_{dd}:1.5-3.63V. I_{OH}= -10µA, 15pF
	V_{OL}			10%*V_{dd}		V_{dd}:1.5-3.63V. I_{OL}= 10µA, 15pF
Output Drive Level				50	pF	≥80% LVCMOS swing, V_{dd}:1.8V, 2.5V, 3.3V
Period Jitter (T_{jitt})			35		ns_{RMS}	Cycles – 10000, T_A= +25°C

Note:

1. Measured peak-to-peak. Tested with Agilent 53132A frequency counter. Due to the low operating frequency, the gate time must be ≥100ms to ensure an accurate frequency measurement.
2. Measured peak-to-peak. Inclusive of initial tolerance at +25°C, and variations over operating temperature, rated power supply voltage and load.

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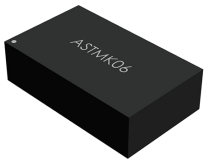
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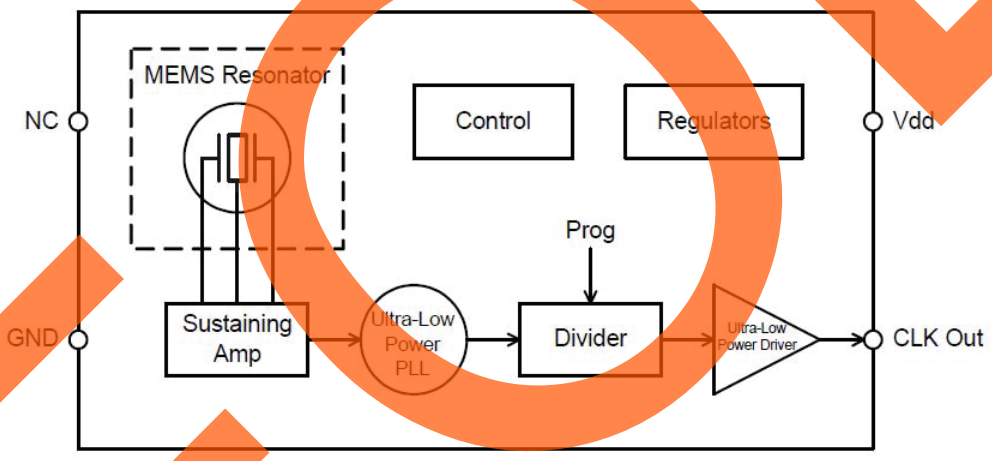
2.0 x 1.2 x 0.6mm

Absolute Maximum Ratings

Attempted operation outside the absolute maximum ratings may cause permanent damage to the part. Actual performance of the IC is only guaranteed within the operational specifications, not at absolute maximum ratings.

Parameters	Test Condition	Value	Unit
Continuous Power Supply Voltage Range (V_{dd})		-0.5 to 3.63	V
Short Duration Max. Power Supply Voltage (V_{dd})	≤30 minutes	4.0	V
Short Duration Max. Operating Temperature Range	Vdd:1.5-3.63V, ≤30 minutes	125	℃
Human Body Model (HBM) ESD Protection	JESD22-A114	3000	V
Charge-Device Model (CDM) ESD Protection	JESD22-C101	750	V
Machine Model (MM) ESD Protection	JESD22-A115	300	V
Latch-up Tolerance	JESD78 Compliant		
Mechanical Shock Resistance	Mil 883, Method 2002	10000	g
Mechanical Vibration Resistance	Mil 883, Method 2007	70	g
2012 SMD Junction Temperature		150	℃
Storage Temperature		-65 to +150	℃

Block Diagram:



PART IDENTIFICATION:

ASTMK06 - 32.768 kHz - ☐☐ - ☐

Operating Temp.
M: -10°C ~ +70°C
L: -40°C ~ +85°C

Freq. Stability
P: ±75ppm (-10°C ~ +70°C only)
Q: ±100 ppm (-40°C ~ +85°C only)

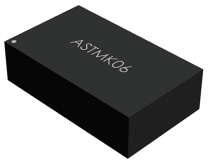
Packaging
Blank: Bulk
T3: Tape & Reel (3kpcs / reel)
T10: Tape & Reel (10kpcs / reel)

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Ultra-miniature, Low Power, 32.768kHz SMD MEMS Oscillator

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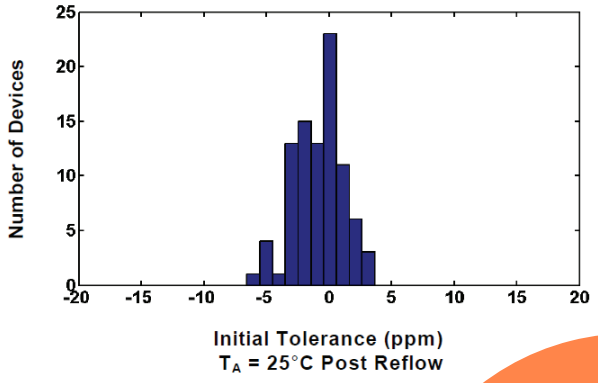
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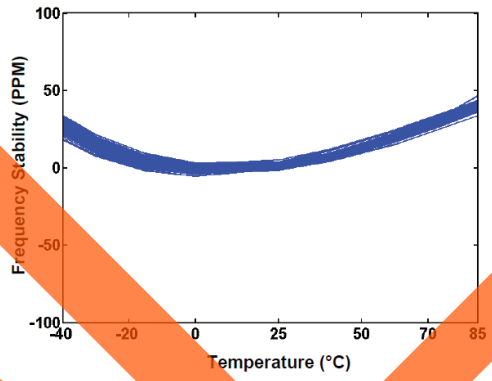
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TYPICAL PERFORMANCE DATA (TA=25°C, Vdd=1.8V, unless otherwise stated)

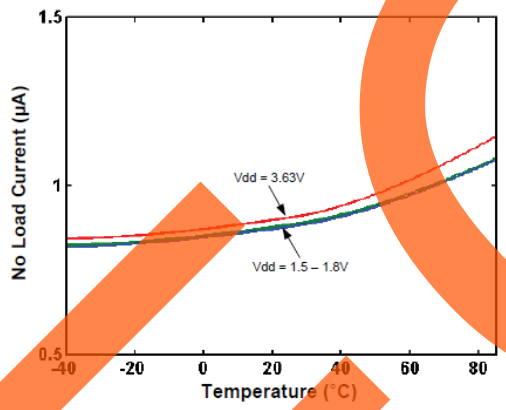
Initial Tolerance Histogram



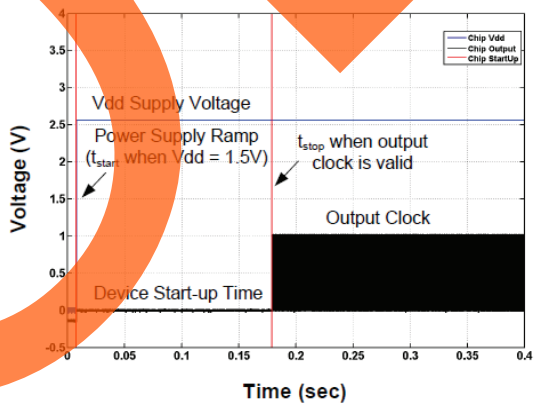
Frequency Stability vs. Operating Temperature Range



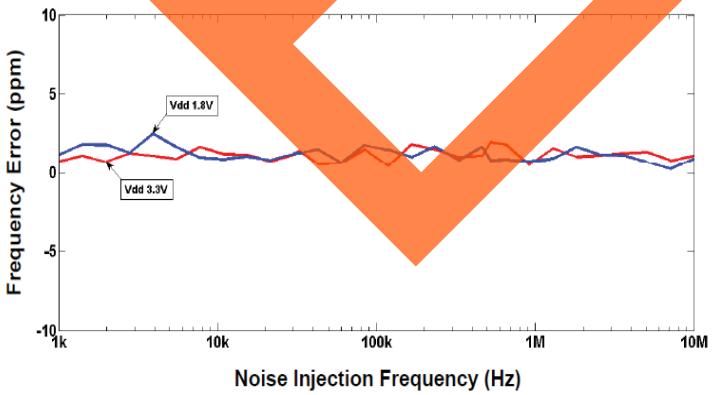
Supply Current vs Operating Temperature Range (No Load)



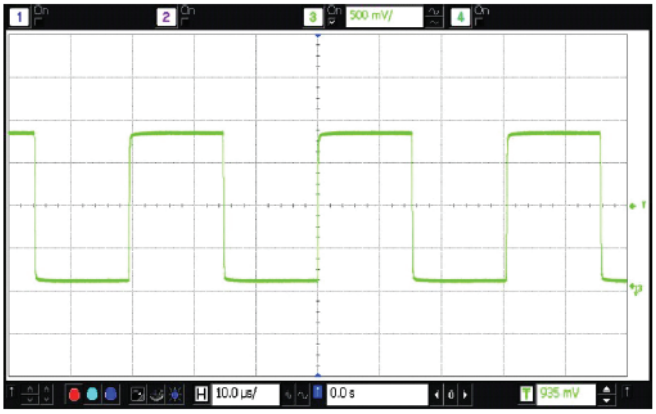
Start-up Time



Power Supply Noise Rejection (±150mV Noise)



LVCMOS Output Waveform (V_{swing} = 1.8V)



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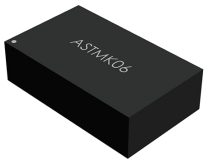
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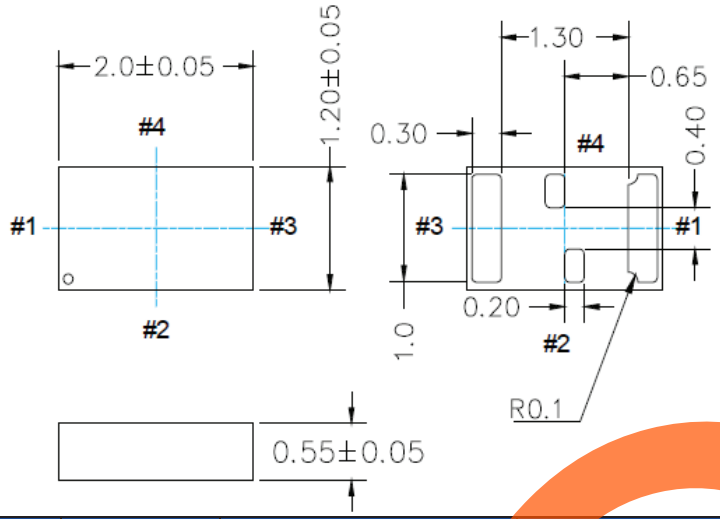
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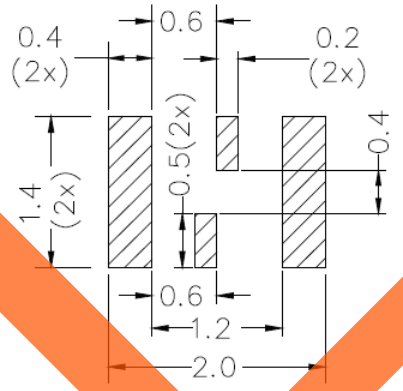


2.0 x 1.2 x 0.6mm

OUTLINE DRAWING:



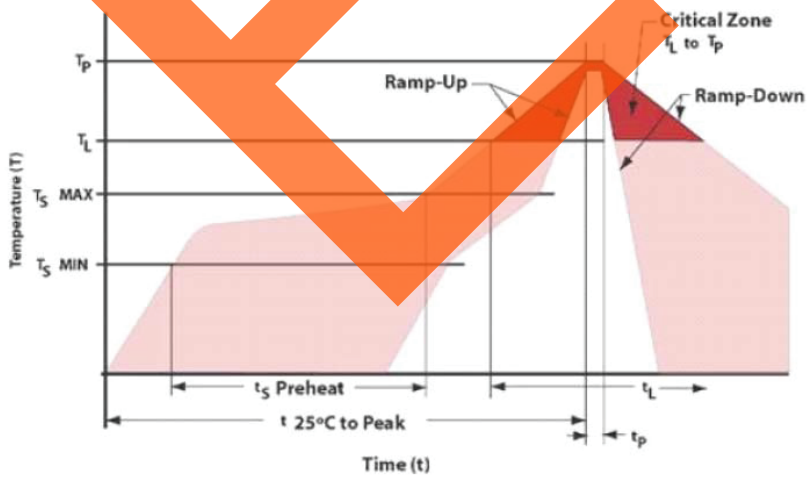
Recommended Land Pattern



Pin	Name	I/O	Functionality
1	NC	No Connect	No connection. Will not respond to any input signal
2	GND	Power Supply Ground	Connect to ground. All GND pins must be connected to power supply ground.
3	CLK Out	OUT	Oscillator clock output.
4	V_{dd}	Power Supply	Connect to power supply $1.5V \leq V_{dd} \leq 3.63V$. Under normal operating conditions, V_{dd} doesn't require external bypass/decoupling capacitor(s). Internal power supply filtering will reject more than ±150mVpp with frequency components through 10MHz

Dimensions: mm

REFLOW PROFILE:



Item	Conditions
T_S MAX to T_L (Ramp-up Rate)	3°C/second max
Preheat	
Temperature Minimum (T_S MIN)	150°C
Temperature Typical (T_S TYP)	175°C
Temperature Maximum (T_S MAX)	200°C
Time (t_S)	60 – 180 seconds
Ramp-up Rate (T_L to T_P)	3°C/second max
Time Maintained Above	
Temperature (T_L)	217°C
Time (t_L)	60 – 150 seconds
Peak Temperature (T_P)	260°C max
Target Peak Temperature (T_P Target)	255°C
Time within 5°C of actual peak (t_P)	20 – 40 seconds
Max. Number of Reflow Cycles	3
Ramp-down Rate	6°C/second max
Time 25°C to Peak Temperature (t)	8 minutes max

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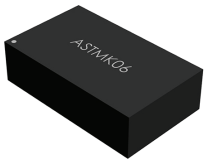
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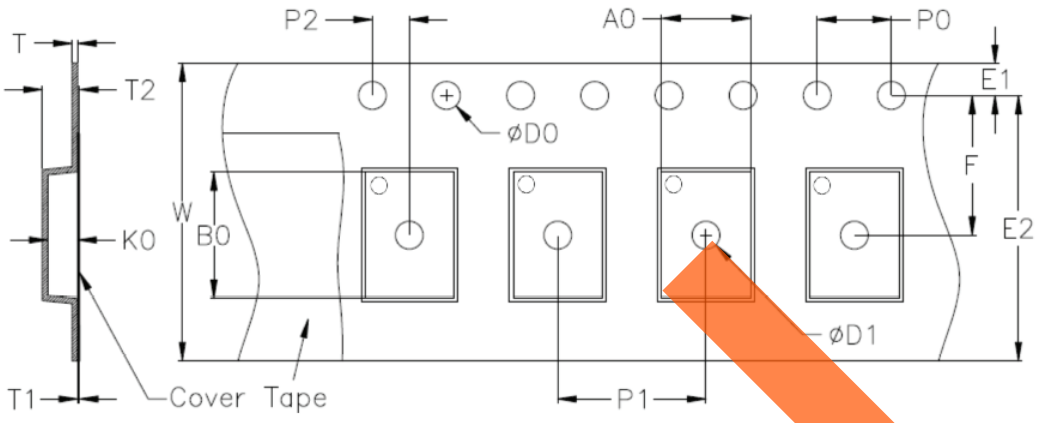
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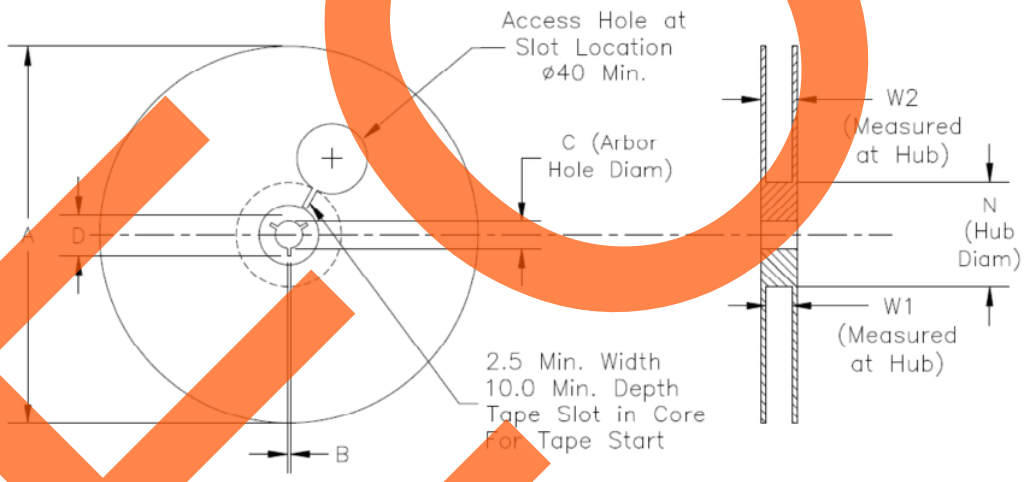


2.0 x 1.2 x 0.6mm

TAPE & REEL:



D0	D1 min.	E1	E2 min.	F	P0	P1	P2
1.55±0.05	1.0	1.75±0.1	6.05	3.5±0.05	4.0±0.1	4.0±0.1	2.0±0.05
T	**T1 max.**	**T2 max.**	**W max.**	**A0**	**B0**	**K0**	
0.25±0.05	NA	NA	8.3	1.6±0.05	2.25±0.10	0.65±0.05	



Option	A max.	B min.	C	D min.	N	W1	W2 max.
T3	180.5	1.5	13.0+0.6/-0.2	20.2	60±0.5	8.4+1.5/-0	14.4
T10	330	1.5	13.0±0.2	20.2	100±0.5	8.4+1.5/-0	14.4

T3= Tape and reel (3,000pcs/reel)
T10= Tape and reel (10,000pcs/reel)

Unit: mm

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