

SM44T Series 2.5 V CMOS Clock Oscillators

November 2018



- Pletronics' SM44 Series is a quartz crystal controlled precision square wave generator with a CMOS output.
- The package is designed for high density surface mount designs.
- This is a low cost mass produced oscillator.
- Tape and Reel or cut tape packaging is available.
- 0.8 to 180 MHz
- 2.5 x 3.2 mm LCC Ceramic Package
- Enable/Disable Function
- Disable function includes low standby power mode
- Low Jitter

**Pletronics Inc. certifies this device is in accordance with the
RoHS 6/6 (2011/65/EC) and WEEE (2002/96/EC) directives.**

Pletronics Inc. guarantees the device does not contain the following:

Cadmium, Hexavalent Chromium, Lead, Mercury, PBB's, PBDE's

Weight of the Device: 0.041 grams

Moisture Sensitivity Level: 1 As defined in J-STD-020C

Second Level Interconnect code: e4

Absolute Maximum Ratings:

| Parameter | Unit |
|--------------------------------|---------------------------------|
| V _{CC} Supply Voltage | -0.5V to +7.0V |
| V _i Input Voltage | -0.5V to V _{CC} + 0.5V |
| V _o Output Voltage | -0.5V to V _{CC} + 0.5V |
| I _o Output Current | +25 mA to -25 mA |

Thermal Characteristics

The maximum die or junction temperature is 155°C

The thermal resistance junction to board is 40 to 60°C/Watt depending on the solder pads, ground plane and construction of the PCB.

Part Number:

| | | | | | | | |
|------|----|---|---|---|---------|-----|---|
| SM44 | 45 | T | E | W | - 75.0M | -XX | |
| | | | | | | | Packaging code or blank T250 = 250 per Tape and Reel T500 = 500 per Tape and Reel T1K = 1000 per Tape and Reel |
| | | | | | | | Frequency in MHZ |
| | | | | | | | Supply Voltage V_{CC} W = 2.5V ± 10% |
| | | | | | | | Temperature Range Blank = Temp. range -10 to +70°C C = Temp. range -10 to +70°C E = Temp. range -40 to +85°C |
| | | | | | | | Series Model |
| | | | | | | | Frequency Stability 45 = ± 50 ppm 44 = ± 25 ppm 20 = ± 20 ppm |
| | | | | | | | Series Model |

Part Marking:

PFF.FFM
•YMDxx

or

PFF.FFM
•YMxxx

Marking legend:

P = Pletronics
FF.FFF = Frequency in MHz
YMD or YM = Date of Manufacture (year and month, or year-month-day)

All other markings are internal factory codes

Specifications such as frequency stability, supply voltage and operating temperature range, etc. are not identified from the marking. External packaging labels and packing list will correctly identify the ordered Pletronics part number.

Codes for Date Code YMD

| Code | 6 | 7 | 8 | 9 | 0 | Code | A | B | C | D | E | F | G | H | J | K | L | M |
|------|------|------|------|------|------|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Year | 2016 | 2017 | 2018 | 2019 | 2020 | Month | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |

| Code | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F | G |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Day | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| Code | H | J | K | L | M | N | P | R | T | U | V | W | X | Y | Z | |
| Day | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | |

Electrical Specification for 2.50V $\pm 10\%$ over the specified temperature range

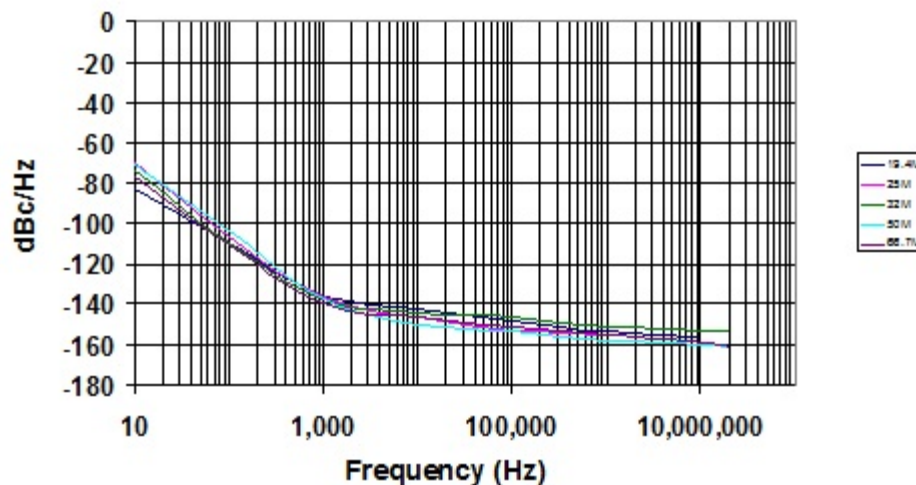
| Item | Min | Max | Unit | Condition | |
|---------------------------------|----------------------|-------------------|-------------------|--|--|
| Frequency Range | 0.8 | 180 | MHZ | | |
| Frequency Accuracy | "45" "44" "20" | -50 -25 -20 | +50 +25 +20 | ppm | For all supply voltages, load changes, aging for 1 year, shock, vibration and temperatures |
| Output Waveform | CMOS | | | | |
| Output High Level | 90 | - | % | of V_{CC} (See load circuit) | |
| Output Low Level | - | 10 | % | | |
| Output Symmetry | 45 | 55 | % | at 50% point of V_{CC} | |
| Jitter | - | 0.6 | pS RMS | 12 KHz to 20 MHZ from the output frequency | |
| | - | 2.5 | pS RMS | 10 Hz to 1 MHZ from the output frequency | |
| Enable/Disable Internal Pull-up | 50 | - | Kohm | to V_{CC} | |
| V disable | - | 30 | % | of V_{CC} applied to pad 1 | |
| V enable | 70 | - | % | | |
| Output leakage | $V_{OUT} = V_{CC}$ | -10 | +10 | uA | Pad 1 low, device disabled |
| | $V_{OUT} = 0V$ | -10 | +10 | | |
| Standby Current I_{CC} | - | 3 | uA | | |
| Enable time | - | 100 | nS | Time for output to reach a logic state | |
| Disable time | - | 100 | nS | Time for output to reach a high Z state | |
| Start up time | - | 3 | mS | Time for output to reach specified frequency | |
| Operating Temperature Range | -10 | +70 | °C | Standard Temperature Range | |
| | -20 | +70 | °C | Extended Temperature Range "C" Option | |
| | -40 | +85 | °C | Extended Temperature Range "E" Option | |
| Storage Temperature Range | -55 | +125 | °C | | |

Electrical Specification for 2.50V $\pm 10\%$ over the specified temperature range

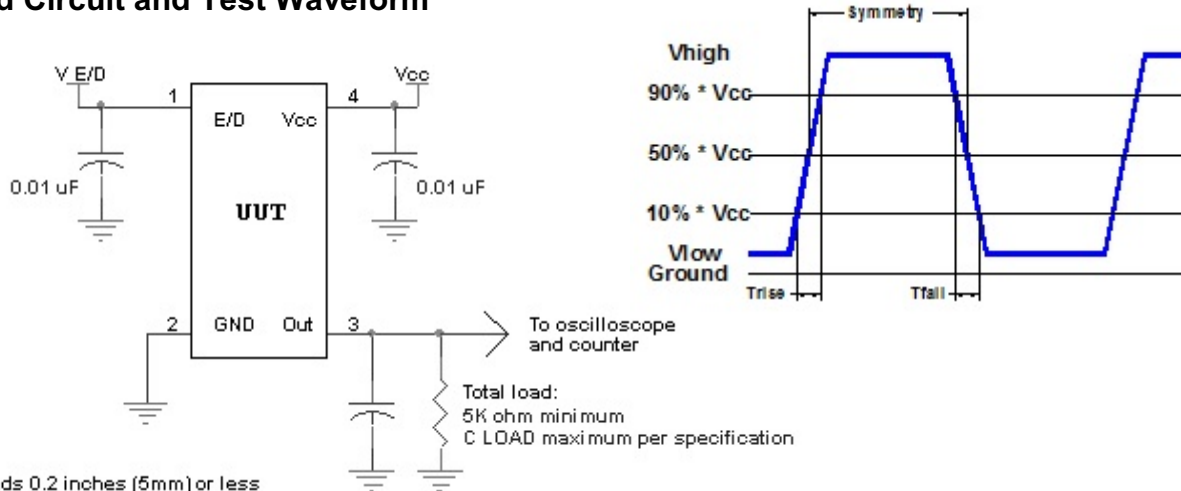
| Item | Typ | Max | Unit | Condition | | |
|--------------------------------------|-----|-----|------|-----------------------------|--|--|
| Output T_{RISE} and T_{FALL} | 2.8 | 5.5 | nS | < 35 MHz | $C_{LOAD} = 15$ pF 10% to 90% of V_{CC} See Load Circuit | |
| | 3 | 6 | nS | ≥ 35 MHz and < 70 MHz | | |
| | 1 | 2 | nS | ≥ 70 MHz | | |
| | | 4.5 | 9 | nS | < 35 MHz | $C_{LOAD} = 30$ pF 10% to 90% of V_{CC} See Load Circuit |
| | | 6 | 12 | nS | ≥ 35 MHz and < 70 MHz | |
| | | 2 | 3 | nS | ≥ 70 MHz and < 120 MHz | |
| V_{CC} Supply Current (I_{CC}) | 1.5 | 2.5 | mA | < 8 MHz | $C_{LOAD} = 15$ pF | |
| | 1.8 | 3 | mA | ≥ 8 MHz and < 16 MHz | | |
| | 2.4 | 4 | mA | ≥ 16 MHz and < 35 MHz | | |
| | 7 | 9 | mA | ≥ 35 MHz and < 70 MHz | | |
| | | 36 | mA | ≥ 70 MHz and < 120 MHz | | |
| | | 55 | mA | ≥ 120 MHz | | |
| | | 2 | 3 | mA | < 8 MHz | $C_{LOAD} = 30$ pF |
| | | 2.2 | 3.5 | mA | ≥ 8 MHz and < 16 MHz | |
| | | 2.5 | 4.5 | mA | ≥ 16 MHz and < 35 MHz | |
| | | 10 | 13 | mA | ≥ 35 MHz and < 70 MHz | |
| | | 27 | 42 | ma | ≥ 70 MHz and < 120 MHz | |

Specifications with Pad 1 E/D open circuit

Typical phase noise plot for 5 oscillators at different output frequencies.



Load Circuit and Test Waveform



Reliability: Environmental Compliance

| Parameter | Condition |
|------------------|--------------------------------------|
| Mechanical Shock | MIL-STD-883 Method 2002, Condition B |
| Vibration | MIL-STD-883 Method 2007, Condition A |
| Solderability | MIL-STD-883 Method 2003 |
| Thermal Shock | MIL-STD-883 Method 1011, Condition A |

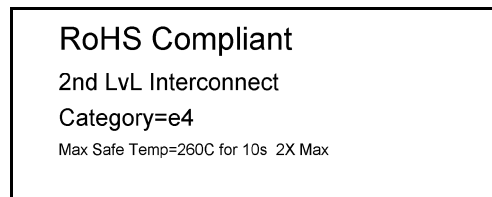
ESD Rating

| Model | Minimum Voltage | Conditions |
|----------------------|-----------------|-------------------------|
| Human Body Model | 1500 | MIL-STD-883 Method 3115 |
| Charged Device Model | 1000 | JESD 22-C101 |

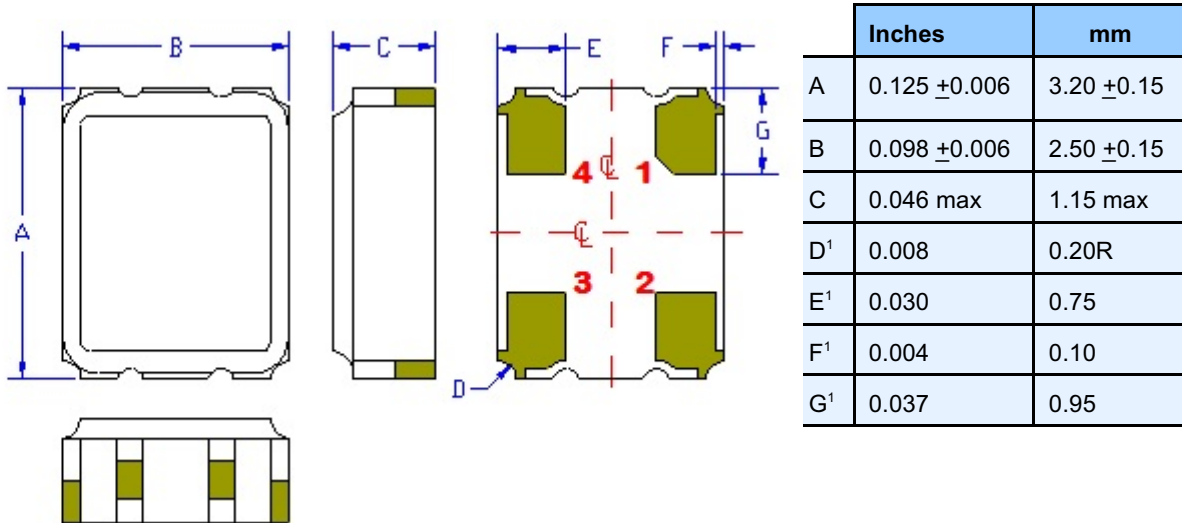
Package Labeling

Label is 1" x 2.6" (25.4mm x 66.7mm)
Font is Courier New
Bar code is 39-Full ASCII

Label is 1" x 2.6" (25.4mm x 66.7mm)
Font is Arial



Mechanical:



Not to Scale

¹ Typical dimensions

Contacts :

Gold 11.8 to 29.4 μ mches (0.3 to 1.0 μ m) over Nickel 50 to 350 μ mches (1.27 to 8.89 μ m)

| Pad | Function | Note |
|-----|-----------------------------------|---|
| 1 | Output Enable/Disable | When this pad is not connected the oscillator shall operate. When this pad is logic low the output will be inhibited (high impedance state.) Recommend connecting this pad to V _{cc} if the oscillator is to be always on. |
| 2 | Ground (GND) | |
| 3 | Output | |
| 4 | Supply Voltage (V _{cc}) | Recommend connecting appropriate power supply bypass capacitors as close as possible. |

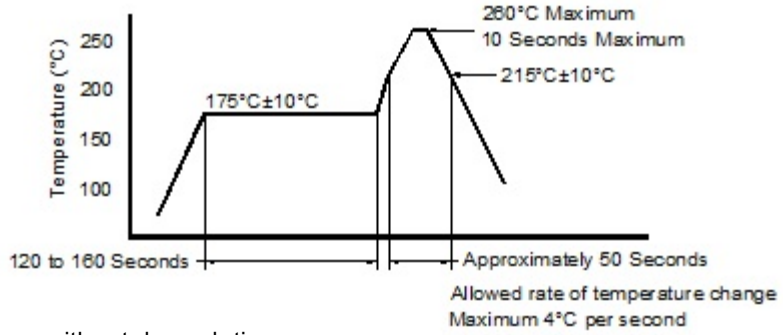
Layout and application information



For Optimum Jitter Performance, Pletronics recommends:

- a ground plane under the device
- no large transient signals (both current and voltage) should be routed under the device
- do not layout near a large magnetic field such as a high frequency switching power supply
- do not place near piezoelectric buzzers or mechanical fans.

Reflow Cycle (typical for lead free processing)



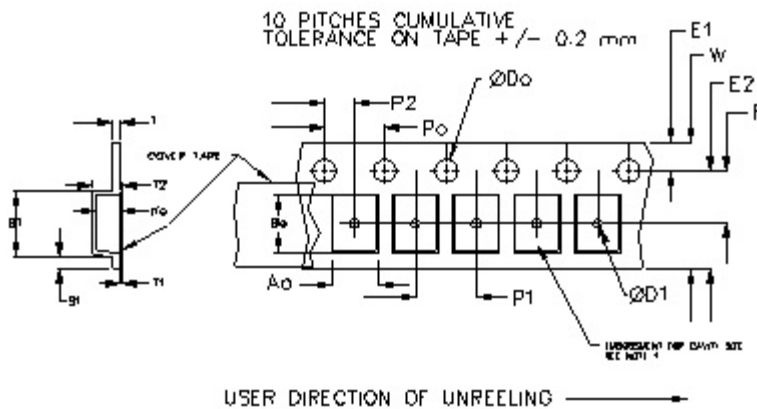
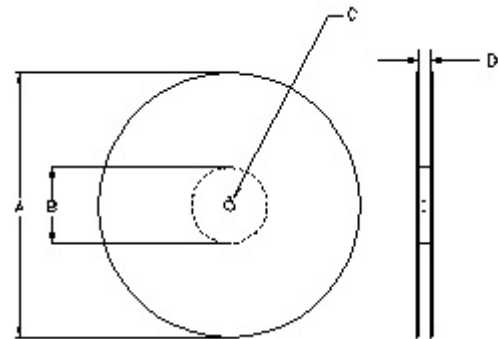
The part may be reflowed 3 times without degradation.

Tape and Reel: available for quantities of 250 to 1000 per reel, cut tape for < 250

| Constant Dimensions Table 1 | | | | | | | | |
|-----------------------------|--------------|--------|-------|-------|------------|--------|-------|--------|
| Tape Size | D0 | D1 Min | E1 | P0 | P2 | S1 Min | T Max | T1 Max |
| 8mm | 1.5 | 1.0 | 1.75 | 4.0 | 2.0 ± 0.05 | 0.6 | 0.6 | 0.1 |
| 12mm | | 1.5 | | | 2.0 ± 0.1 | | | |
| 16mm | +0.1 -0.0 | 1.5 | ± 0.1 | ± 0.1 | 2.0 ± 0.1 | | | |
| 24mm | | 1.5 | | | | | | |

| Variable Dimensions Table 2 | | | | | | | |
|-----------------------------|--------|--------|-----------|-----------|--------|-------|-------------|
| Tape Size | B1 Max | E2 Min | F | P1 | T2 Max | W Max | Ao, Bo & Ko |
| 16 mm | 12.1 | 14.25 | 7.5 ± 0.1 | 8.0 ± 0.1 | 8.0 | 16.3 | Note 1 |

Note 1: Embossed cavity to conform to EIA-481-B Dimensions in mm Not to scale



| | | REEL DIMENSIONS | | | | Tape Width |
|---|--------|-------------------|-------------------|-------------------|------|------------|
| A | inches | 7.0 | 10.0 | 13.0 | | |
| | mm | 177.8 | 254.0 | 330.2 | | |
| B | inches | 2.50 | 4.00 | 3.75 | | |
| | mm | 63.5 | 101.6 | 95.3 | | |
| C | mm | 13.0 +0.5 / -0.2 | | | | |
| D | mm | 16.4 +2.0 -0.0 | 16.4 +2.0 -0.0 | 16.4 +2.0 -0.0 | 16.0 | |

Reel dimensions may vary from the above

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