



SM55G Series 1.8 V CMOS Clock Oscillators

April 2010



- Pletronics' SM55 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 165 MHz
- 3.2 x 5 mm LCC Ceramic Package
- Enable/Disable Function
- Disable function includes low standby power mode
- Low Jitter
- Optimized for fastest Trise & Tfall

**Pletronics Inc. certifies this device is in accordance with the
RoHS 6/6 (2002/95/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: 0.064 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 30 to 50°C/Watt depending on the solder pads, ground plane and construction of the PCB.

Part Number:

| | | | | | | |
|----------------------------------------------------------------------------------------------------------------------------------|----|---|---|---|---------|-----|
| SM55 | 45 | G | E | X | - 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} X = 1.8V ± 10% | | | | | | |
| Optional Enhanced OTR Blank = Temp. range -10 to +70°C C = Temp. range -20 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 and Legend:

| | | | | |
|-----------------------|------------------------|---------------------------------|-----------------------|--------------------------------|
| P ff.fff M • YMDxx | P ff.fff M • YYWWxx | PLE SM55 ff.fff M • YMDxx | P5xYWWx • ff.fff M | 5xYWWxx ff.fff M • PLExx |
|-----------------------|------------------------|---------------------------------|-----------------------|--------------------------------|

PLE = Pletronics
 FF.FFF M = Frequency in MHz
 YYWW or YWW or YMD = Date of Manufacture (year and week, or year-month-day)
 All other marking is 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 | 10 | 1 | 2 | 3 | 4 | Code | A | B | C | D | E | F | G | H | J | K | L | M |
|------|------|------|------|------|------|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Year | 2010 | 2011 | 2012 | 2013 | 2014 | 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 1.80V $\pm 10\%$ over the specified temperature range

| Item | Min | Max | Unit | Condition | |
|-----------------------------|----------------------|------|--------------|--------------------------------------------------------------------------------------------|--------------------------------------------|
| Frequency Range | 0.8 | 165 | MHz | | |
| Frequency Accuracy "45" | -50 | +50 | ppm | For all supply voltages, load changes, aging for 1 year, shock, vibration and temperatures | |
| "44" | -25 | +25 | | | |
| "20" | -20 | +20 | | | |
| Output Waveform | CMOS | | | | |
| Output High Level | 90 | - | % | of V_{CC} for $I_{OH} = +2$ mA <35 MHz | |
| | 70 | - | % | of V_{CC} for $I_{OH} = +8$ mA ≥ 35 MHz | |
| Output Low Level | - | 10 | % | of V_{CC} for $I_{OL} = -2$ mA <35 MHz | |
| | - | 30 | % | of V_{CC} for $I_{OL} = -8$ mA ≥ 35 MHz | |
| Output Symmetry | 45 | 55 | % | at 50% point of V_{CC} (See load circuit) | |
| Jitter | Output: 1 to 15 MHz | - | 6.0 | pS RMS | 10 Hz to 1 MHz from the output frequency |
| | Output: 15 to 35 MHz | - | 5.0 | pS RMS | |
| | Output: 35 to 50 MHz | - | 4.0 | pS RMS | |
| | Output: 50 to 70 MHz | - | 3.0 | pS RMS | |
| | Output: > 70 MHz | - | 2.5 | PS RMS | |
| | Output: 25 to 70 MHz | - | 0.7 | pS RMS | 12 KHz to 20 MHz from the output frequency |
| Output: > 70 MHz | - | 0.6 | pS RMS | | |
| E/D Internal Pull-up | 50 | 500 | Kohm | to V_{CC} | |
| V disable | - | 30 | % | of V_{CC} applied to pin 1 | |
| V enable | 70 | - | % | | |
| Output leakage | $V_{OUT} = V_{CC}$ | -10 | +10 | μ A | Pin 1 low, device disabled |
| | $V_{OUT} = 0V$ | -10 | +10 | μ A | |
| Standby Current I_{CC} | - | 4 | μ A | < 35 MHz | |
| | - | 100 | μ A | ≥ 35 MHz | |
| Enable time | - | 250 | nS | Time for output to reach a logic state | |
| Disable time | - | 250 | nS | Time for output to reach a high Z state | |
| Start up time | - | 10 | mS | Time for output to reach specified frequency | |
| Operating Temperature Range | -10 | +70 | $^{\circ}$ C | Standard Temperature Range | |
| | -20 | +70 | $^{\circ}$ C | Extended Temperature Range "C" Option | |
| | -40 | +85 | $^{\circ}$ C | Extended Temperature Range "E" Option | |
| Storage Temperature Range | -55 | +125 | $^{\circ}$ C | | |

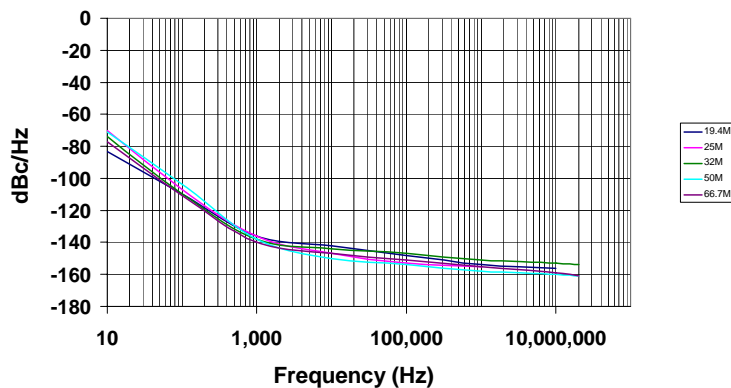
Electrical Specification for 1.80V $\pm 10\%$ over the specified temperature range

| Item | Typ | Max | Unit | Condition | | |
|--------------------------------------|-----|-----|------|-----------------------------|------------------------------------------------------------------|------------------------------------------------------------------|
| Output T_{RISE} and T_{FALL} | 1.5 | 3 | nS | < 35 MHz | $C_{LOAD} = 15$ pF 20% to 80% of V_{CC} See Load Circuit | |
| | 1.7 | 3.5 | nS | ≥ 35 MHz and < 70 MHz | | |
| | 1.5 | 2.5 | nS | ≥ 70 MHz | | |
| | | 4 | 7 | nS | < 35 MHz | $C_{LOAD} = 30$ pF 20% to 80% of V_{CC} See Load Circuit |
| | | 2 | 7 | nS | ≥ 35 MHz < 70 MHz | |
| | | 6 | 12 | nS | < 35 MHz | |
| | 6 | 11 | nS | ≥ 35 MHz and < 45 MHz | $C_{LOAD} = 50$ pF 20% to 80% of V_{CC} See Load Circuit | |
| | | | | | | |
| V_{CC} Supply Current (I_{CC}) | 2 | 4 | mA | < 8 MHz | $C_{LOAD} = 15$ pF | |
| | 2.5 | 5 | mA | ≥ 8 MHz and < 16 MHz | | |
| | 5 | 8 | mA | ≥ 16 MHz and < 35 MHz | | |
| | - | 18 | mA | ≥ 35 MHz and < 70 MHz | | |
| | 17 | 27 | mA | ≥ 70 MHz and < 120 MHz | | |
| | 23 | 37 | mA | ≥ 120 MHz | | |
| | | 2.5 | 4.5 | mA | < 8 MHz | $C_{LOAD} = 30$ pF |
| | | 3 | 5 | mA | ≥ 8 MHz and < 16 MHz | |
| | | 4 | 8 | mA | ≥ 16 MHz and < 35 MHz | |
| | | 10 | 20 | mA | ≥ 35 MHz and < 70 MHz | |
| | | 2.5 | 4 | mA | < 8 MHz | $C_{LOAD} = 50$ pF |
| | | 4 | 6 | mA | ≥ 8 MHz and < 16 MHz | |
| | | 5 | 9 | mA | ≥ 16 MHz and < 35 MHz | |
| | | 13 | 23 | mA | ≥ 35 MHz and < 45 MHz | |

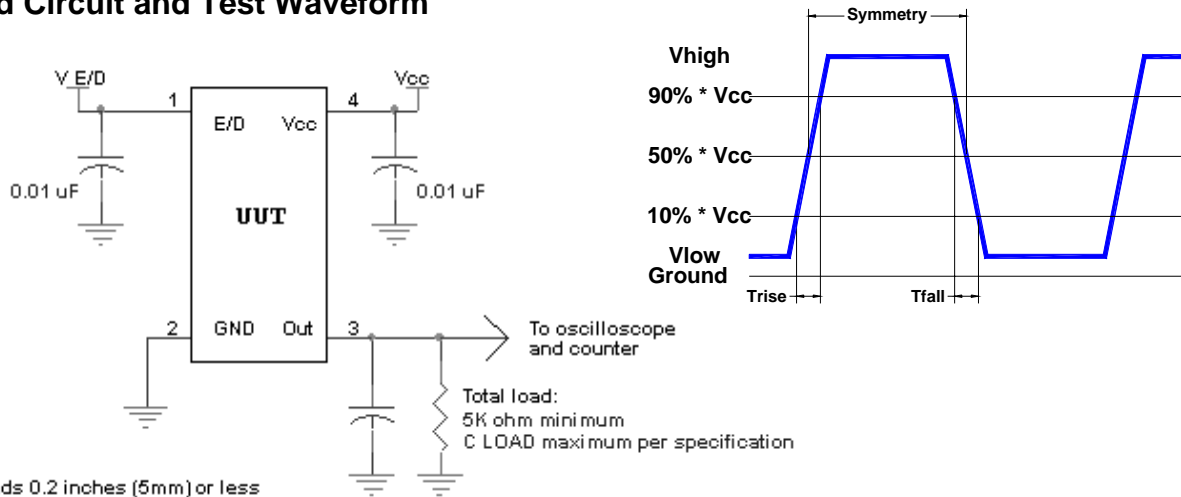
Specifications with Pad 1 E/D open circuit

NOTE: Not specified for 50 pF loads above 45 MHz, or 30 pF loads above 70 MHz

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

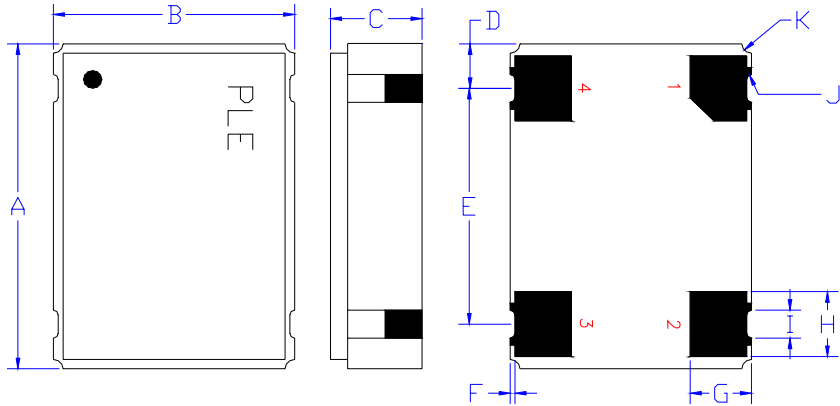
Label is 1" x 2.6" (25.4mm x 66.7mm)
Font is Courier New
Bar code is 39-Full ASCII

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

| | | |
|---------------|----------------|----------|
| P/N: | | |
| | SM5545GX-40.0M | |
| Customer P/N: | | |
| | 12345678 | |
| Qty: | | D/C |
| | 1000 | |
| | | 0632-MMO |

| |
|-----------------------------------|
| RoHS Compliant |
| 2nd Lvl Interconnect |
| Category=e4 |
| Max Safe Temp=260C for 10s 2X Max |

Mechanical:



| | Inches | mm |
|----------------|--------------|------------|
| A | 0.197 ±0.006 | 5.00 ±0.15 |
| B | 0.126 ±0.006 | 3.20 ±0.15 |
| C | 0.045 ±0.004 | 1.15 ±0.10 |
| D ¹ | 0.048 | 1.23 |
| E ¹ | 0.100 | 2.54 |
| F ¹ | 0.004 | 0.10 |
| G ¹ | 0.050 | 1.27 |
| H ¹ | 0.055 | 1.40 |
| I ¹ | 0.024 | 0.60 |
| J ¹ | 0.004 | 0.10R |
| K ¹ | 0.008 | 0.020R |

Not to Scale

¹ Typical dimensions

Contacts :

Gold 11.8 to 39.4 μinches (0.3 to 1.0 μm) over Nickel 50 to 350 μinches (1.27 to 8.89 μm)

| 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. |

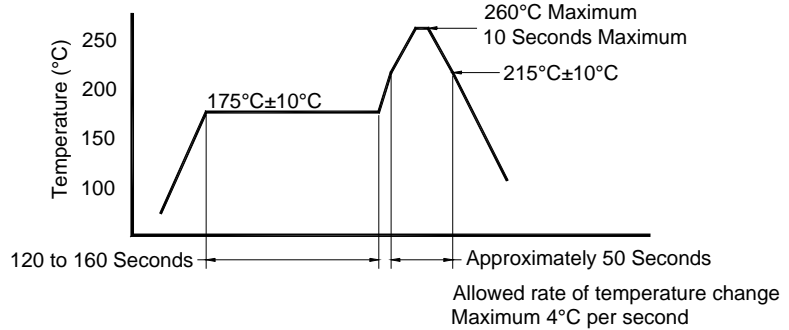


Layout and application information

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)



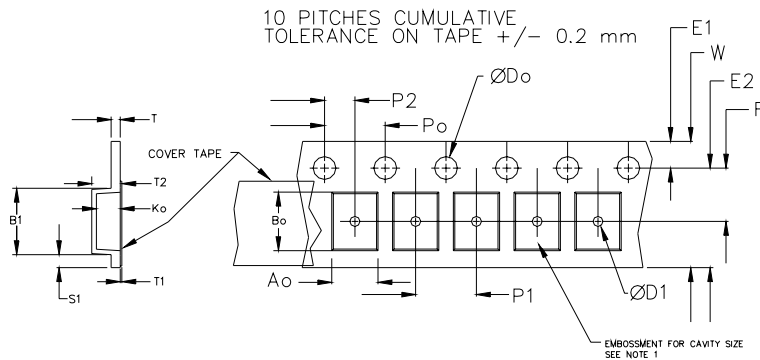
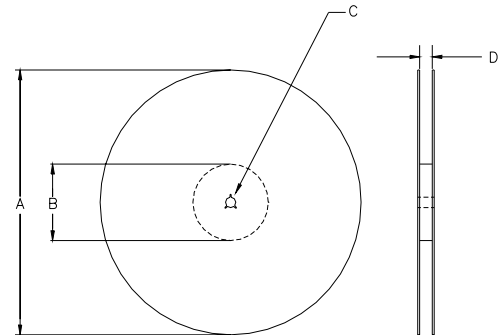
The part may be reflowed 3 times without degradation.

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 | | | ± 0.1 | | | |
| 24mm | | 1.5 | | | ± 0.1 | | | |

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

Reel dimensions may vary from the above

USER DIRECTION OF UNREELING →

IMPORTANT NOTICE

Pletronics Incorporated (PLE) reserves the right to make corrections, improvements, modifications and other changes to this product at anytime. PLE reserves the right to discontinue any product or service without notice. Customers are responsible for obtaining the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to PLE's terms and conditions of sale supplied at the time of order acknowledgment.

PLE warrants performance of this product to the specifications applicable at the time of sale in accordance with PLE's limited warranty. Testing and other quality control techniques are used to the extent PLE deems necessary to support this warranty. Except where mandated by specific contractual documents, testing of all parameters of each product is not necessarily performed.

PLE assumes no liability for application assistance or customer product design. Customers are responsible for their products and applications using PLE components. To minimize the risks associated with the customer products and applications, customers should provide adequate design and operating safeguards.

PLE products are not designed, intended, authorized or warranted to be suitable for use in life support applications, devices or systems or other critical applications that may involve potential risks of death, personal injury or severe property or environmental damage. Inclusion of PLE products in such applications is understood to be fully at the risk of the customer. Use of PLE products in such applications requires the written approval of an appropriate PLE officer. Questions concerning potential risk applications should be directed to PLE.

PLE does not warrant or represent that any license, either express or implied, is granted under any PLE patent right, copyright, artwork or other intellectual property right relating to any combination, machine or process which PLE product or services are used. Information published by PLE regarding third-party products or services does not constitute a license from PLE to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from PLE under the patents or other intellectual property of PLE.

Reproduction of information in PLE data sheets or web site is permissible only if the reproduction is without alteration and is accompanied by associated warranties, conditions, limitations and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. PLE is not responsible or liable for such altered documents.

Resale of PLE products or services with statements different from or beyond the parameters stated by PLE for that product or service voids all express and implied warranties for the associated PLE product or service and is an unfair or deceptive business practice. PLE is not responsible for any such statements.

Contacting Pletronics Inc.

Pletronics Inc.
19013 36th Avenue West
Lynnwood, WA 98036-5761 USA

Tel: 425-776-1880
Fax: 425-776-2760
E-mail: ple-sales@pletronics.com
URL: www.pletronics.com

Copyright © 2007, 2010 Pletronics Inc.