



## SM44T Series 1.8 V CMOS Clock Oscillators

April 2010

**Lead Free** 

- 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 165 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 (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: 0.041 grams  
Moisture Sensitivity Level: 1 As defined in J-STD-020C  
Second Level Interconnect code: e4

### Absolute Maximum Ratings:

Parameter	Unit
V <sub>CC</sub> Supply Voltage	-0.5V to +7.0V
V <sub>i</sub> Input Voltage	-0.5V to V <sub>CC</sub> + 0.5V
V <sub>o</sub> Output Voltage	-0.5V to V <sub>CC</sub> + 0.5V
I <sub>o</sub> 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 X - 75.0M -XX

### Part Marking:

PFF.FFF  
• YMDxx

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 <sub>CC</sub> X = 1.8V ± 10%
Temperature Range 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

### Marking Legend:

- P = Pletronics
- FF.FFF = Frequency in MHZ
- 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

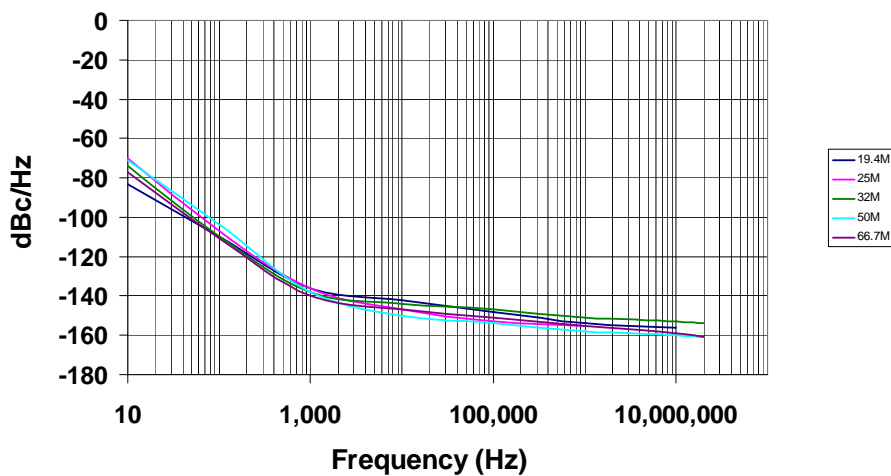
Item	Min	Max	Unit	Condition	
Frequency Range	0.8	165	MHZ		
Frequency Accuracy	"45" -50 "44" -25 "20" -20	+50 +25 +20	ppm	For all supply voltages, load changes, aging for 1 year, shock, vibration and temperatures	
Output Waveform	CMOS				
Output High Level	90	-	%	of $V_{CC}$ for $I_{OH} = +2$ mA <35 MHZ	
	70	-	%	of $V_{CC}$ for $I_{OH} = +8$ mA $\geq 35$ MHZ	
Output Low Level	-	10	%	of $V_{CC}$ for $I_{OL} = -2$ mA <35 MHZ	
	-	30	%	of $V_{CC}$ for $I_{OL} = -8$ mA $\geq 35$ 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 MHZ	-	3.0	pS RMS	
	Output: > 25 MHZ	-	0.7	pS RMS	12 KHz to 20 MHZ from the output frequency
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	$\mu$ A	Pin 1 low, device disabled
	$V_{OUT} = 0V$	-10	+10	$\mu$ A	
Standby Current $I_{CC}$	-	4	$\mu$ A	< 35 MHZ	
	-	100	$\mu$ A	$\geq 35$ 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	
	-10	+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

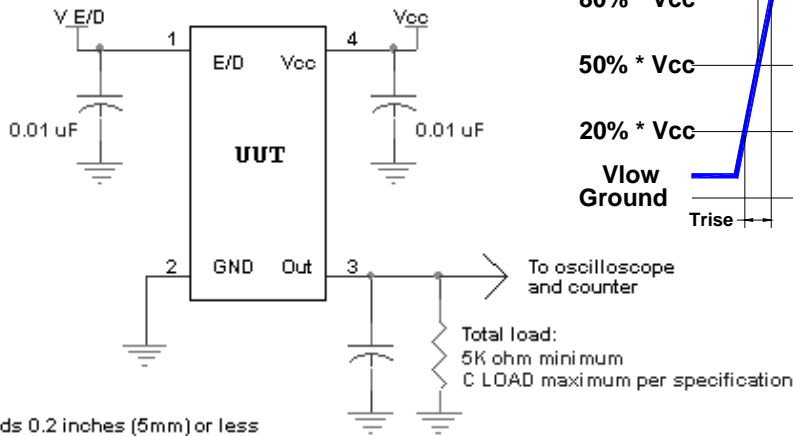
Item	Typ	Max	Unit	Condition
Output $T_{RISE}$ and $T_{FALL}$	2	5	nS	< 35 MHZ
	1	3.5	nS	$\geq 35$ MHZ and < 70 MHZ
	1.5	2.5	nS	$\geq 70$ MHZ
	4	10	nS	< 35 MHZ
	2	7	nS	$\geq 35$ MHZ and < 70 MHZ
	3	7	nS	$\geq 70$ MHZ
$V_{CC}$ Supply Current ( $I_{CC}$ )	1	2	mA	< 8 MHZ
	1.5	2.5	mA	$\geq 8$ MHZ and < 16 MHZ
	2	3	mA	$\geq 16$ MHZ and < 35 MHZ
	12	18	mA	$\geq 35$ MHZ and < 70 MHZ
	17	27	mA	$\geq 70$ MHZ and < 120 MHZ
	23	37	mA	$\geq 120$ MHZ
	1.5	2.5	mA	< 8 MHZ
	2	3	mA	$\geq 8$ MHZ and < 16 MHZ
	3	4	mA	$\geq 16$ MHZ and < 35 MHZ
	10	20	mA	$\geq 35$ MHZ and < 85 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



All leads 0.2 inches (5mm) or less

## 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

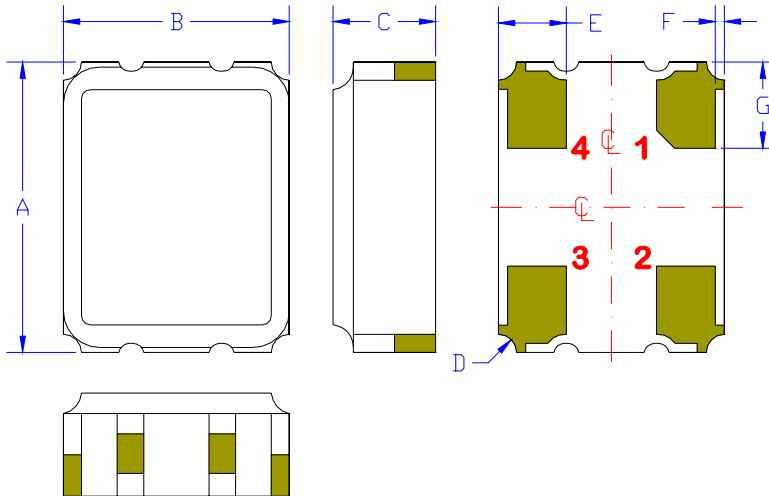
Label is 1" x 2.6" (25.4mm x 66.7mm)  
Font is Courier New  
Bar code is 39-Full ASCII

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

P/N:		
	SM4445TX-25.0M	
Customer P/N:		
	12345678	
Qty:		D/C
	500	7GY-MMo

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

## Mechanical:



	Inches	mm
A	0.125 ±0.006	3.20 ±0.15
B	0.098 ±0.006	2.50 ±0.15
C	0.041 ±0.004	1.05 ±0.10
D <sup>1</sup>	0.008	0.20R
E <sup>1</sup>	0.030	0.75
F <sup>1</sup>	0.004	0.10
G <sup>1</sup>	0.037	0.95

Not to Scale

<sup>1</sup> Typical dimensions

### Contacts :

Gold 11.8 to 39.4 μinches (0.3 to 1.0μm) 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 <sub>CC</sub> if the oscillator is to be always on.
2	Ground (GND)	
3	Output	
4	Supply Voltage (V <sub>CC</sub> )	Recommend connecting appropriate power supply bypass capacitors as close as possible.

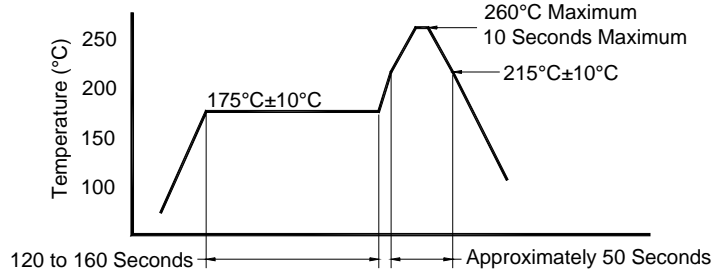


## Layout and application information

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.

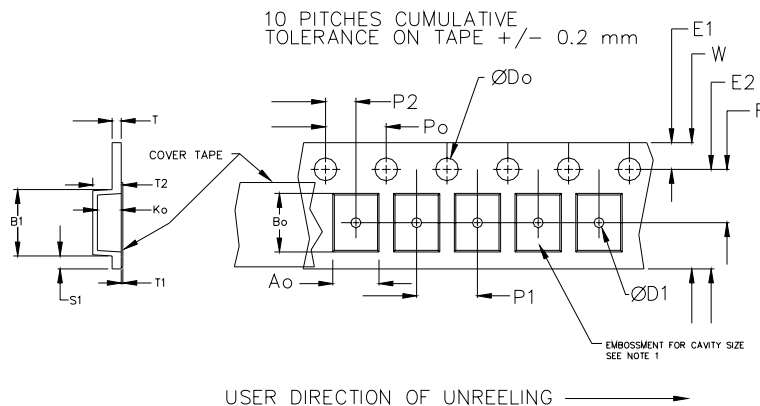
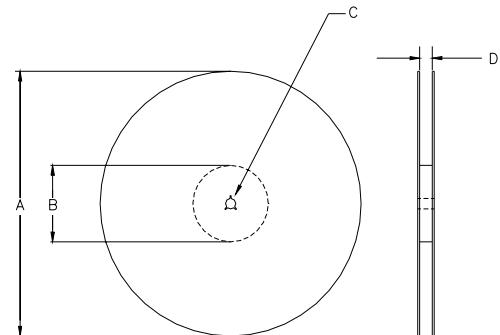
Allowed rate of temperature change  
Maximum 4°C per second

## 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			
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					
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



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### Contacting Pletronics Inc.

Pletronics Inc.  
19013 36<sup>th</sup> Ave. West  
Lynnwood, WA 98036-5761 USA

Tel: 425-776-1880  
Fax: 425-776-2760  
E-mail: [ple-sales@pletronics.com](mailto:ple-sales@pletronics.com)  
URL: [www.pletronics.com](http://www.pletronics.com)

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