

SM33T Series 2.5 V CMOS Clock Oscillators

January 2016

Lead Free 

- Pletronics' SM33 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.
- 0.75 to 50 MHz
- 2.0 x 2.5 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: 0.022 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 50 to 70°C/Watt depending on the solder pads, ground plane and construction of the PCB.

Part Number:

SM33 45 T E W - 75.0M -XX

Part Marking:

PFF.FF
• **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_{CC} W = 2.5V ± 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 20 = ± 20 ppm 44 = ± 25 ppm 45 = ± 50 ppm 00 = ± 100 ppm
Series Model

Marking Legend:

- P = Pletronics
- FF.FF = 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	4	5	6	7	8	Code	A	B	C	D	E	F	G	H	J	K	L	M
Year	2014	2015	2016	2017	2018	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	0.75	50	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} (See load circuit)	
Output Low Level	-	10	%		
Output Symmetry	45	55	%	at 50% point of V_{CC}	
Phase Noise	100 Hz	-	-105	-	Typical Values for 100 MHz @ 25 °C
	1 kHz	-	-135	-	
	10 kHz	-	-143	-	
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	μA	Pad 1 low, device disabled
	$V_{OUT} = 0V$	-10	+10	μA	
Standby Current I_{CC}	-	3	μA		
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		

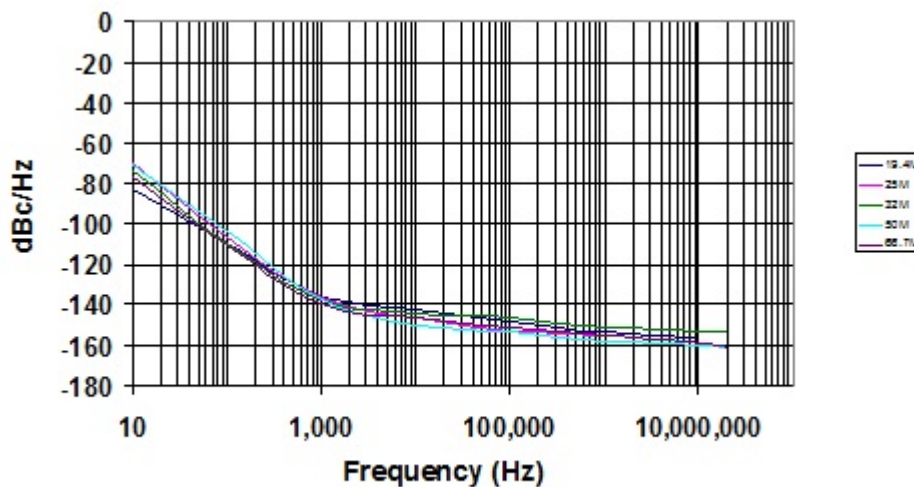
* Enable time of 100nS is to reach logic level only

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

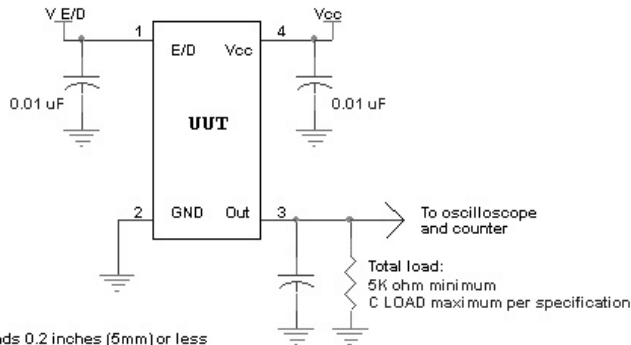
Item	Typ	Max	Unit	Condition	
Output T_{RISE} and T_{FALL}	2.8	5.5	nS	< 35 MHz	$C_{LOAD} = 15$ pF 10% to 90% of V_{CC} See Load Circuit
	3	6	nS	≥ 35 MHz and < 50MHz	
	4.5	9	nS	< 35 MHz	$C_{LOAD} = 30$ pF 10% to 90% of V_{CC} See Load Circuit
	6	12	nS	≥ 35 MHz and < 50MHz	
V_{CC} Supply Current (I_{CC})	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 < 50MHz	
	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 < 50MHz	

Specifications with Pad 1 E/D open circuit

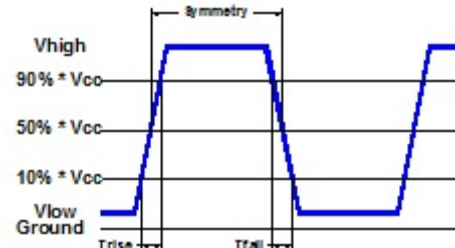
Typical phase noise plot for 5 oscillators at different output frequencies.



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

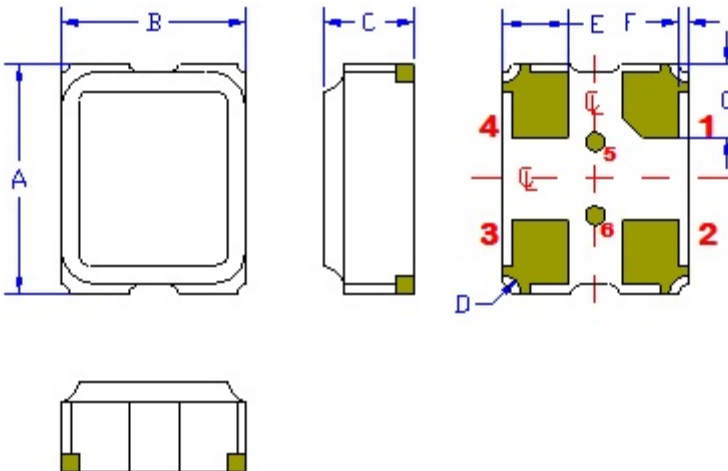
Label is 1" x 2.6" (25.4mm x 66.7mm)
Font is Courier New
Bar code is 39-Full ASCII

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

P/N:		
	SM4444TW-44.0M	
Customer P/N:		
	12345678	
Qty:		D/C: 
	500	7FW-MMO

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

Mechanical:



	Inches	mm
A	0.098 \pm 0.004	2.50 \pm 0.10
B	0.079 \pm 0.004	2.00 \pm 0.10
C	0.039 \pm 0.004	1.00 \pm 0.10
D ¹	0.008	0.20R
E ¹	0.028	0.70
F ¹	0.004	0.10
G ¹	0.031	0.80

Not to Scale

¹ Typical dimensions

Contacts :

Gold 11.8 to 39.4 μ m (0.3 to 1.0 μ m) over Nickel 50 to 350 μ m (1.27 to 8.89 μ m)

Do not connect pads 5 or pad 6!!!!

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.

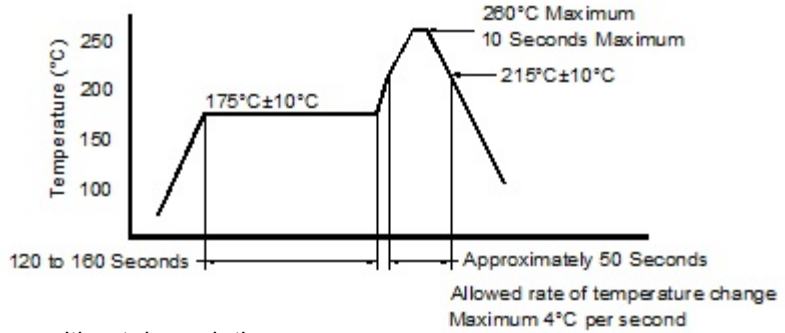
Layout and application information



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)



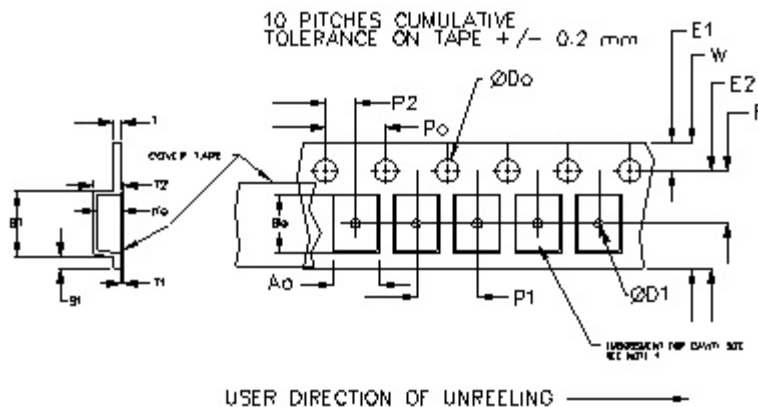
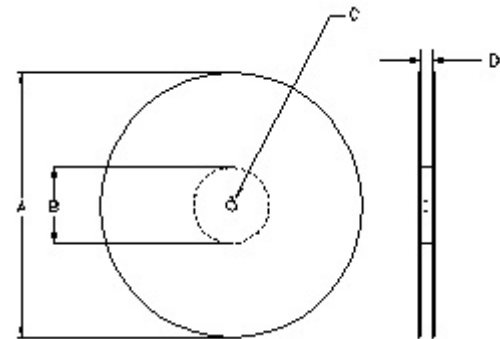
The part may be reflowed 3 times without degradation.

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	---	0.1
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
8 mm	2.9	6.25	1.75 ± 0.1	4.0 ± 0.1	1.1	8.1	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		
	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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