Ultra-miniature, Low Power, 32.768kHz MEMS Oscillator

1.54 x 0.84 x 0.60mm

ASTMTXX

ESD Sensitive

RoHS/RoHS II compliant

Moisture Sensitivity Level (MSL) – 1

FEATURES:

- Smallest 32.768kHz TCXO in the market: 1.54 x 0.84 x 0.6mm
- Supply Voltage: 1.5V to 3.63V
- Ultra-Low Current Consumption: 1.52µA max.(core current, no load)
- Frequency Stabilities include: ±5ppm, ±10ppm, ±20ppm over 0 to +70°C and -40 to +85°C
- Internal power supply filtering eliminates external bypass capacitor for Vdd port.

APPLICATIONS:

- Fitness/Medical monitoring sensors
- Smart Meters
- Portable devices
- RTC reference clock

STANDARD SPECIFICATIONS:

Parameters		Min	Typ	Max	Unit	Notes
Output Frequency (F_{out})			32.768		kHz	
Frequency Stability over Temperature (F_{stab}) (1) (without Initial Offset (2))		-5		+5	ppm	Stability Option "G"
		-10		+10		Stability Option "Y"
		-20		+20		Stability Option "J"
Frequency Stability over Temperature (F_{stab}) (with Initial Offset (2))		-10		+10	ppm	Stability Option "G"
		-13		+13		Stability Option "Y"
		-22		+22		Stability Option "J"
Frequency Stability vs Voltage (F_{vdd})		-0.75		+0.75	ppm	1.8V±10%
		-1.5		+1.5		1.5-3.63V
Aging (@+25°C)		-1		+1	ppm	First year. V_{dd}= 3.3V
Supply Voltage (V_{dd})		1.5		3.63	V	T_A= -40°C to +85°C
Core Supply Current (I_{dd}) (3)			0.99		µA	T_A= +25°C, V_{dd}: 1.8V. LVCMOS output. No load.
				1.52		T_A= -40°C to +85°C, V_{dd} max: 1.5V - 3.63V. No load.
Power Supply Ramp (t_{Vdd_Ramp})				100	ms	T_A= -40°C to +60°C, 0 to 90%*V_{dd}
Start-up Time at Power-up (T_{start})			180	300	ms	T_A= -40°C to +60°C, valid output
				350		T_A= +60°C to +70°C, valid output
				380		T_A= +70°C to +85°C, valid output
Operating Temperature Range (T_{use})		0		+70	°C	Option "N"
		-40		+85		Option "L"
Long Term Jitter				2.5	$µs_{pp}$	81920 cycles (2.5sec), 100 samples
Period Jitter			35		ns_{RMS}	Cycles=10000, T_A= +25°C, V_{dd}:1.5-3.63V
LVCMOS Output Option (T_A= -40°C to +85°C. Typical values are at T_A= +25°C)						
Output Rise/Fall Time (t_r/t_f)			100	200	ns	10-90%(V_{dd}), 15pF load
				50		10-90%(V_{dd}), 5pF load, V_{dd}≥1.62V
Output Clock Duty Cycle		48		52	%	
Output Voltage	V_{OH}	90%*V_{dd}			V	V_{dd}:1.5-3.63V. I_{OH}= -1µA, 15pF
	V_{OL}			10%*V_{dd}		V_{dd}:1.5-3.63V. I_{OL}= 1µA, 15pF

Note:

1. No board level underfill. Measured as peak-to-peak/2. Inclusive of 3x-reflow and ±20% load variation. 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. Initial offset is defined as the frequency deviation from the ideal 32.768kHz at room temperature, past reflow.
3. Core operating current does not include output driver operating current or load current. To derive total operating current (no load), add core operating current + output driver operating current, where output driver operating current = C_{driver}*V_{out}*F_{out}.

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REVISED: 12.14.2018

ABRACON IS ISO9001-2015 CERTIFIED

Ultra-miniature, Low Power, 32.768kHz MEMS Oscillator

ASTMTXK

RoHS/RoHS II compliant

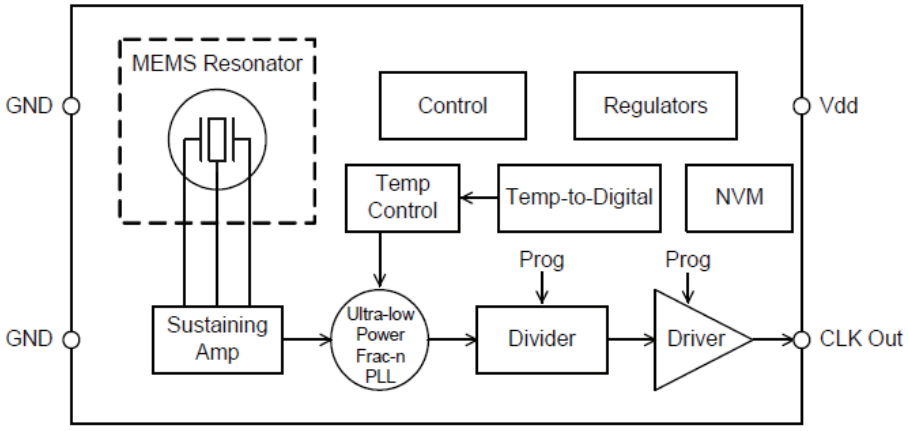
1.54 x 0.84 x 0.60mm

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
Continuous Maximum Operating Temperature Range	Vdd:1.5-3.63V	105	℃
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
1508 CSP Junction Temperature		150	℃
Storage Temperature		-65 to +150	℃

Block Diagram



PART IDENTIFICATION:

ASTMTXK - 32.768 kHz - ☐☐ - ☐

Operating Temp.
N: 0°C ~ +70°C
L: -40°C ~ +85°C

Freq. Stability
G: ±5ppm
Y: ±10 ppm
J: ±20 ppm

Packaging
Blank: Bulk
T: Tape & Reel (1kpcs / reel)
T3: Tape & Reel (3kpcs / reel)
T10: Tape & Reel (10kpcs / reel)

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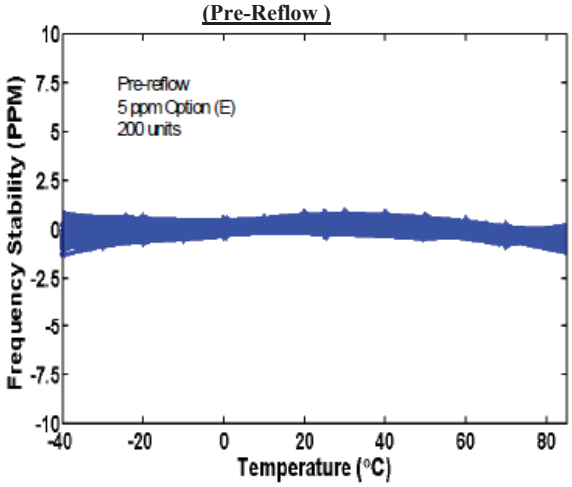
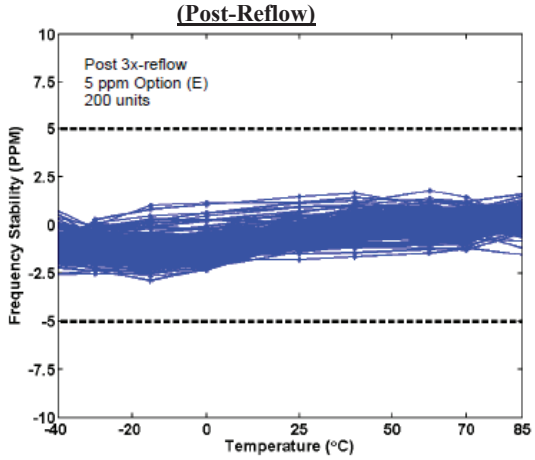
Typical Performance Data (TA=25°C, Vdd=1.8V, unless otherwise stated)

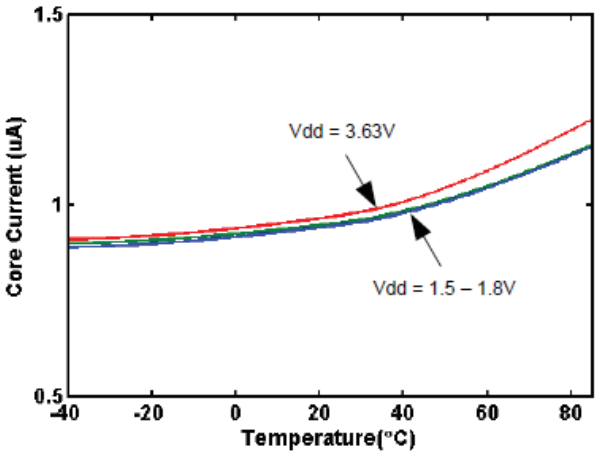
Frequency Stability vs. Operating Temperature Range (Pre-Reflow)



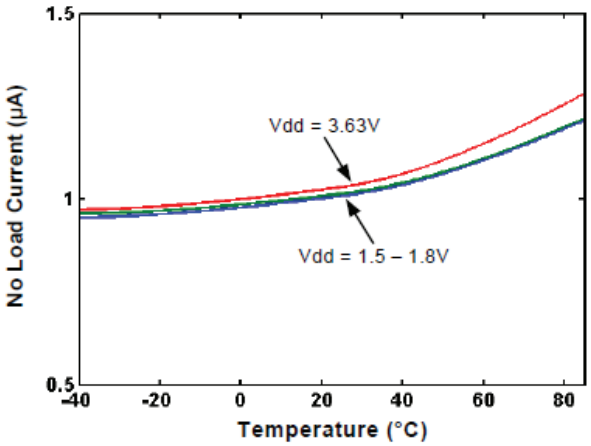
Frequency Stability vs. Operating Temperature Range (Post-Reflow)



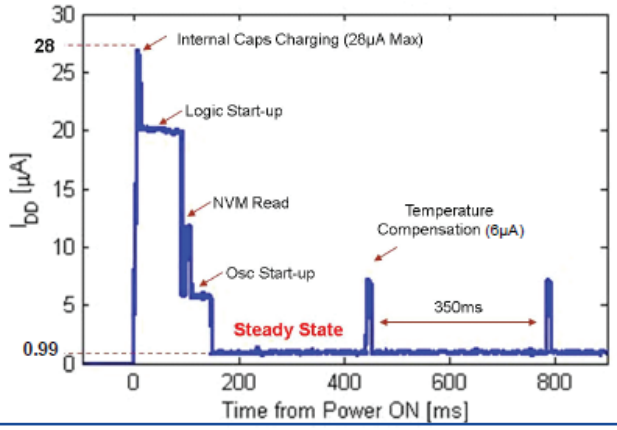
Core Current vs Operating Temperature Range



Total Supply Current vs Operating Temperature Range (Core+LVCMOS Output Driver, No Load)



Start-up and Steady-State Current Profile



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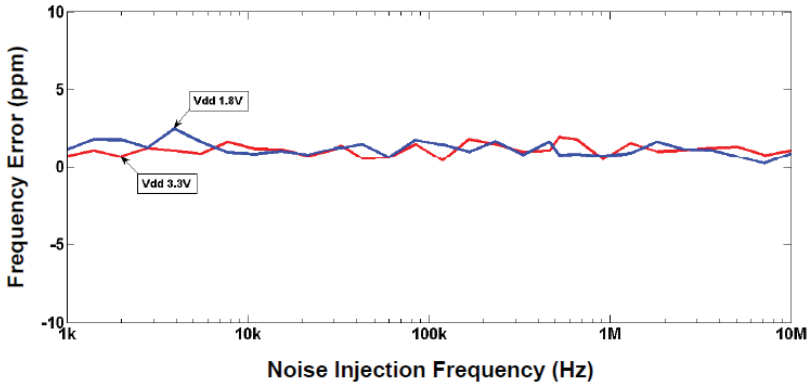
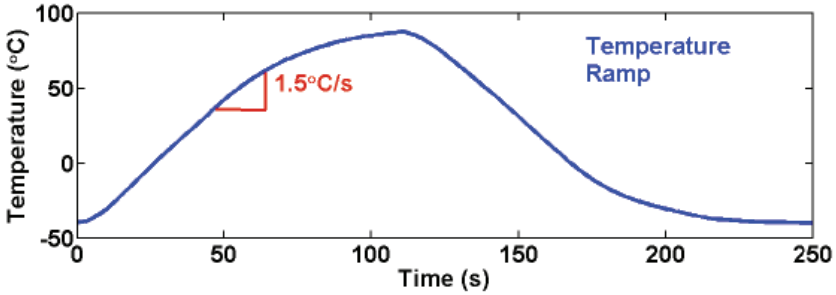
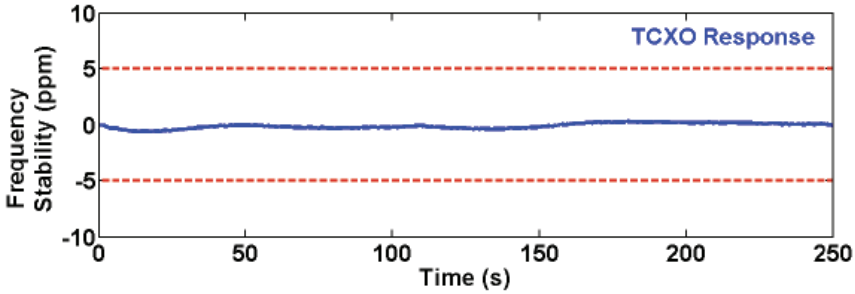
PART IDENTIFICATION:

Power Supply Noise Rejection (±150mV Noise)

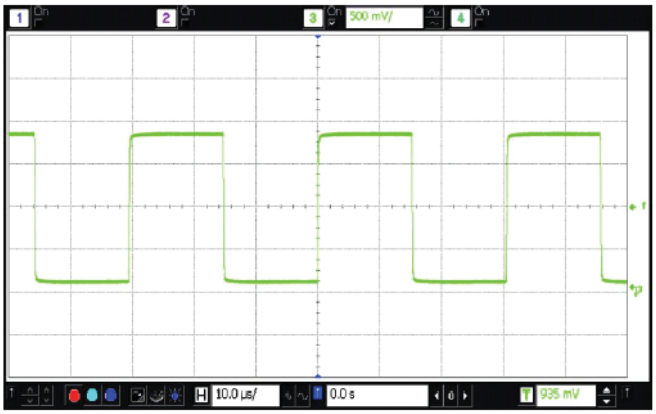


Temperature Ramp Response





LVCMOS Output Waveform
(V_{swing} = 1.8V, 10pF load)



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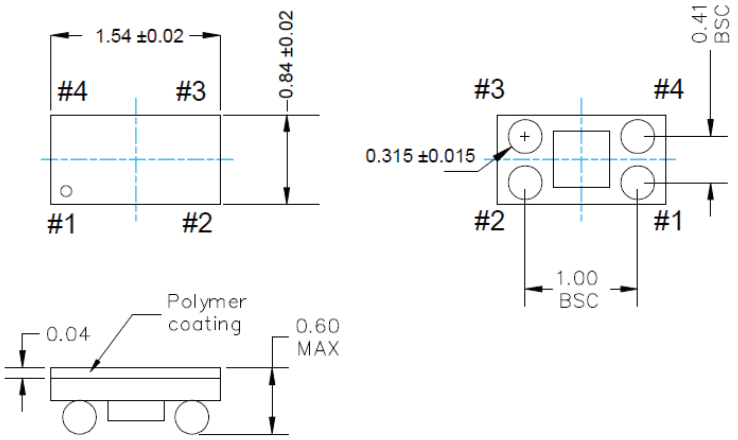
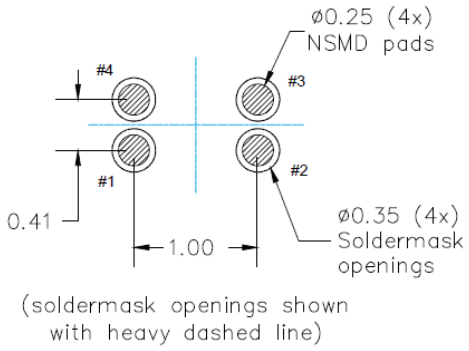
OUTLINE DIMENSION:



Recommended Land Pattern

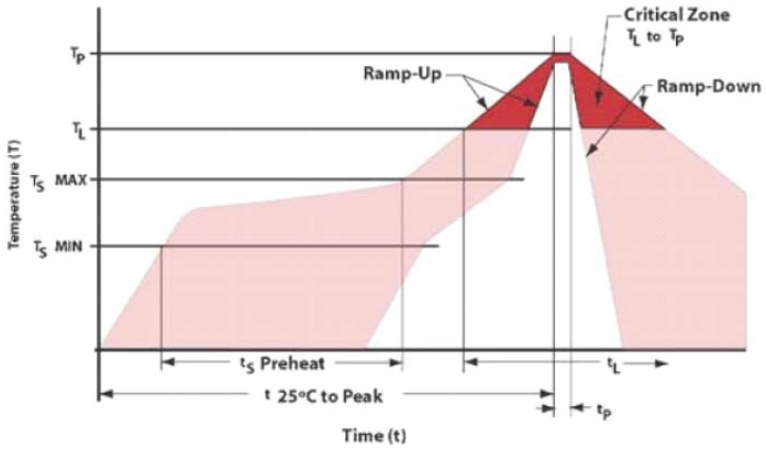


Recommend 4-mil (0.1mm) stencil thickness

Pin	Name	I/O	Functionality
1,4	GND	Power Supply Ground	Connect to ground. All GND pins must be connected to power supply ground. The GND pins can be connected together, as long as both GND pins are connected to ground.
2	CLK Out	OUT	Oscillator clock output.
3	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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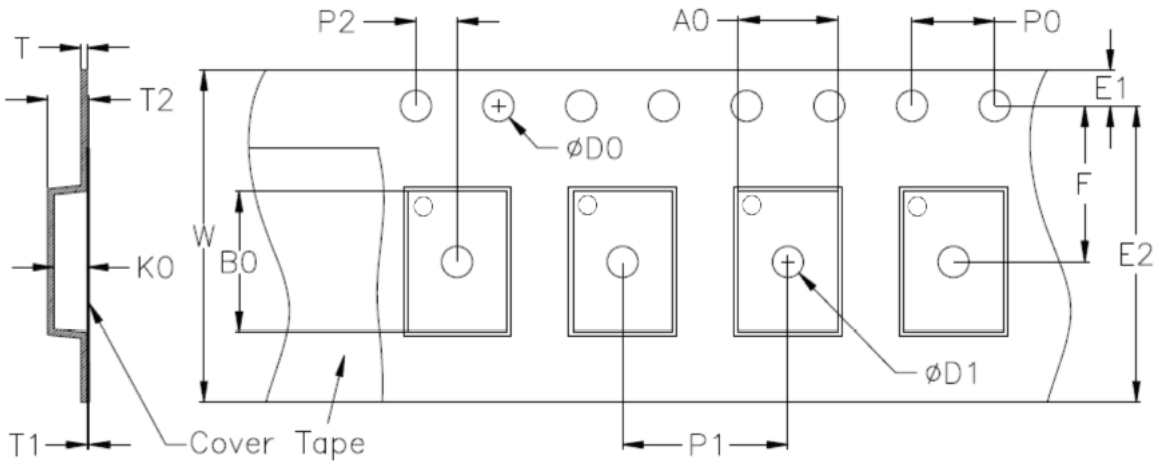
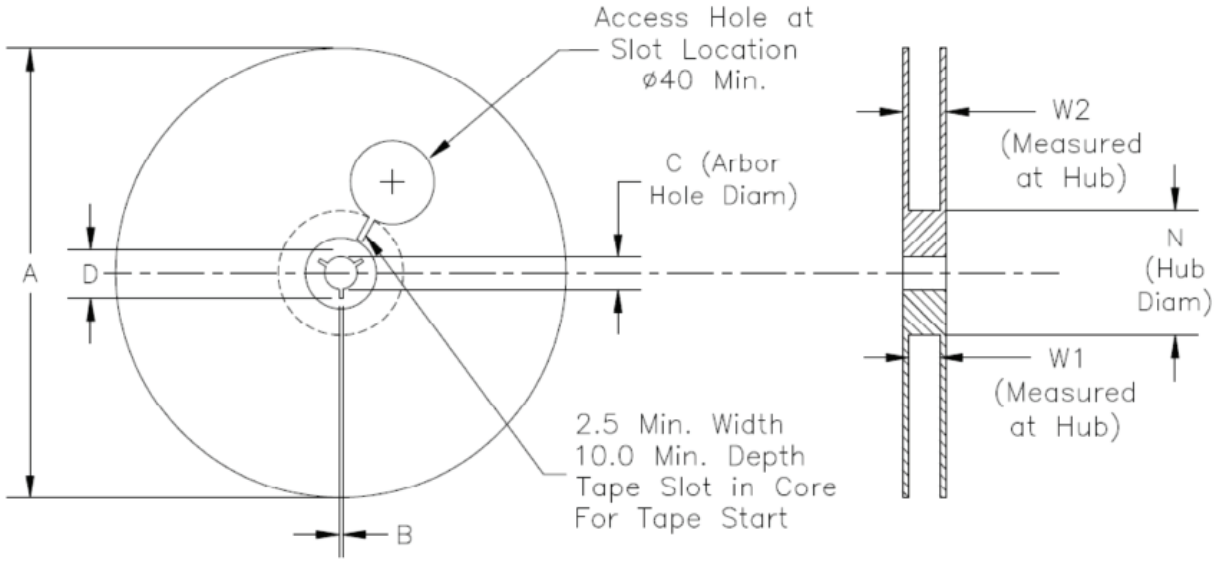
TAPE & REEL:



Unit: mm

D0	D1 min.	E1	E2 min.	F	P0	P1	P2
1.55±0.05	0.18	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**	
0.20±0.02	0.1	1.55	8.3	0.96±0.03	1.66±0.03	0.63±0.03	



Unit: mm

Option	A max.	B min.	C	D min.	N	W1	W2 max.
T & T3	180	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

T= Tape and reel (1,000pcs/reel)
T3= Tape and reel (3,000pcs/reel)
T10= Tape and reel (10,000pcs/reel)

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