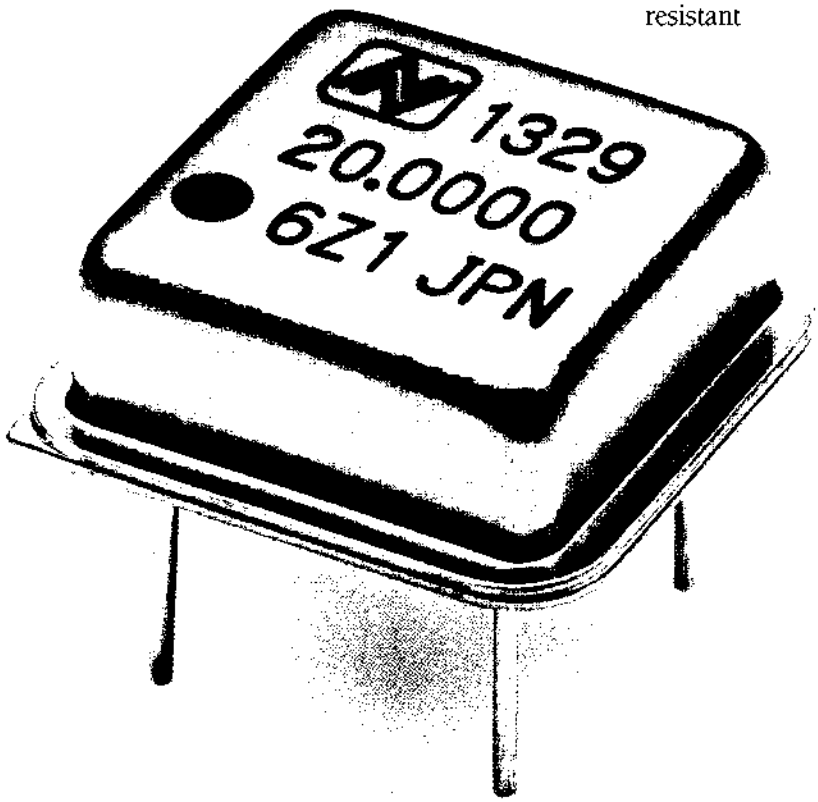
T-50-23

The broadest family of CMOS and TTL-compatible compact oscillators available, NDK Compact Crystal Clock Oscillators deliver reliable performance in half the space. Ideal for high-density PC boards (such as portable and hand held applications) where space and power are at a premium, these NDK devices are available in a range of frequencies from 28 kHz to 70 MHz. Despite their small size, NDK Compact Crystal Clock Oscillators offer superior resistance to shock, vibration, EMI, and humidity.

1300 SERIES FEATURES

- Broadest range of available frequencies (28 kHz to 70 MHz) speeds design and procurement process
- Choice of TTL, CMOS or dual compatibility for maximum selection
- Compact size — perfect for portables
- CMOS technology for low power consumption/ low heat
- Fast rise and fall times (5,7, 10 ns)
- Excellent fan out (2 or 5 TTL gates)
- Sealed, grounded metal case resists EMI and humidity
- Shock and vibration resistant



NDK: THE INDUSTRY LEADER

Headquartered in Tokyo, Japan, NDK is the world's premier manufacturer of synthetic quartz crystal. NDK surpasses all other manufacturers in both quality and quantity of synthetic quartz production. NDK offers the widest range of microprocessor quartz crystals, crystal oscillators, and compact crystal oscillators available. All NDK products are fabricated under the strictest quality controls, and are guaranteed to be free from impurities and defects.

NDK standard products are available through a nationwide network of stocking distributors. NDK also offers custom crystal oscillator fabrication to meet individual needs. For more information on NDK custom services or distribution, write:

NDK America, Inc.
20300 Stevens Creek Blvd.
Suite 400
Cupertino, CA 95014-2210

NDK 1300 SERIES SPECIFICATIONS

Available Frequencies

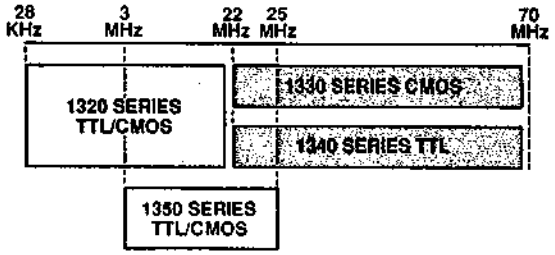


Table 1. 1300 Series Quick-Reference Comparison

Frequency Range	Part Numbers	Output	Power Consumption	Rise and Fall Times	VOL Max, VOH Min.	Duty Cycle %	Fan Out	Standby/ Dual Output
28 kHz–6.99 MHz	1321–1328	CMOS/TTL	5mA typical 10mA maximum	10ns	0.5V V_{DD}–0.5V	45/55	TTL 2 LS-TTL 10	Standby Only
7 kHz–22 MHz	1329	CMOS/TTL	5mA typical 10mA maximum	10ns	0.5V V_{DD}–0.5V	40/60	TTL 2 LS-TTL 10	Standby or Dual
22 MHz–29.9 MHz	1330–1332	CMOS Only	13mA typical 20mA maximum	5ns	0.5V V_{DD}–0.5V	40/60	TTL 5 LS-TTL 25	Standby Only
30 MHz–50.9 MHz	1333–1337	CMOS Only	17mA typical 30mA maximum	5ns	0.5V V_{DD}–0.5V	40/60	TTL 5 LS-TTL 25	Standby Only
51 MHz–70 MHz	1338–1339	CMOS Only	22mA typical 40mA maximum	5ns	0.5V V_{DD}–0.5V	40/60	TTL 5 LS-TTL 25	Standby Only
22 MHz–29.9 MHz	1340–1342	TTL Only	13mA typical 20mA maximum	5ns	0.4V 2.4V	40/60	TTL 5 LS-TTL 25	Standby Only
30 MHz–50.9 MHz	1343–1347	TTL Only	17mA typical 30mA maximum	5ns	0.4V 2.4V	40/60	TTL 5 LS-TTL 25	Standby Only
51 MHz–70 MHz	1348–1349	TTL Only	22mA typical 40mA maximum	5ns	0.5V 2.4V	40/60	TTL 5 LS-TTL 25	Standby Only
3 MHz–25 MHz	1351–1359	CMOS/TTL	11mA typical 20mA maximum	7ns	0.5V V_{DD}–0.5V	45/55 at $\frac{1}{2}V_{DD}$ 40/60 at 1.4V	TTL 5 LS-TTL 25	Standby Only

Table 2. Output Load and Power Consumption

$V_{DD} = 5V$

Fan out	TTL		LS-TTL	
	Resistance (Ω)	Power Consumption (mA)	Resistance (Ω)	Power Consumption (mA)
1	4,000	1.25	20,000	0.25
2	2,000	2.50	10,000	0.50
5	800	6.25	4,000	1.25
10	400	12.50	2,000	2.50

TTL connected with the output side is equivalent to: 1 TTL = 5 LS–TTL.

SPECIFICATIONS CONTINUED

Table 3. Standby Feature

A feature designed to facilitate board testing, the standby feature permits external digital signals to control oscillator output.

#5 pin output / #1 pin Condition	1320 Series 1350 Series	1330 Series 1340 Series 1360 Series*
H level (+4V min.) or OPEN	Oscillation output	Oscillation output
L level (+1V max.)	Oscillation stops with the status at an L level.	Oscillation stops with the status at an H level.

*1360 Series is a standby option of the 1350 series.

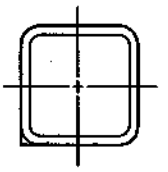
Dual-Output Option

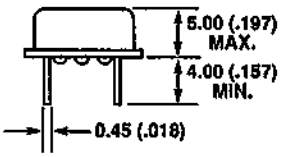
Available only on Part Number 1329, the dual-output option permits simultaneous output of the original oscillation frequency and the output frequency multiplied by $1/2^n$ (where n is a positive integer from 1–8) from separate pins of the device.

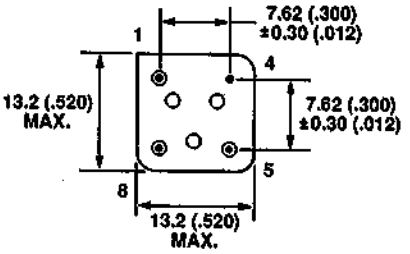
When the dual-output option is selected, the optional standby feature is not available.

Packaging/Marking

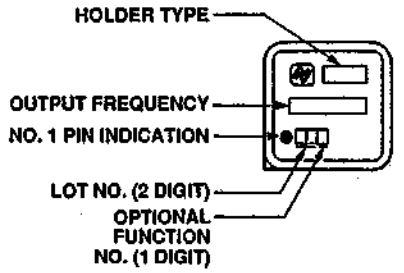
Due to space limitations, output frequency is listed to:
6 digits MHz (ie 14.3181)
5 digits kHz (ie 32.768k)
Only the original oscillation frequency is indicated on Part No. 1329 with the dual-output option.







Dimensions in mm (inches).



Pinout

Pin	Function
1	NC or standby or output (Part 1329: Divided frequency for dual output)
4	GND (Ground to case)
5	Output (Original oscillation frequency)
8	+5VDC

Absolute Maximum Rating

- Source Voltage (V_{DD}) −0.5V to +7.0V DC
- Storage Temperature Range −55°C to +125°C

Operating Conditions

- Source Voltage (V_{DD}) +5.0V DC ±0.5V
- Operating Temperature Range Subject to specifications

T_r/T_f Measuring Conditions

- TTL-Compatible Value between V_OL max. & V_OH min. (Refer to Measuring Load Conditions, Figures 1 & 2)
- CMOS-Compatible Difference between 0.1 x V_{DD} and 0.9 x V_{DD} (Refer to Measuring Load Conditions, Figures 3 & 4)

Table 5. Measuring Load Conditions

1 TTL = 5 LSTTL

TTL	C_L	R_L
1	15pF	4kΩ
2	15pF	2kΩ
5	15pF	800Ω
10	15pF	400Ω

(Note) CL: includes the stray capacitance of measuring system.

Fig. 1

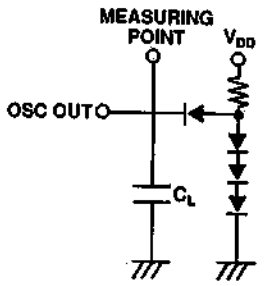


Fig. 2

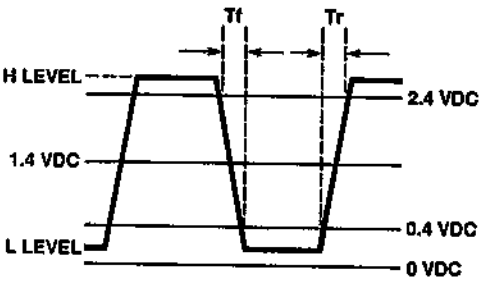


Fig. 3

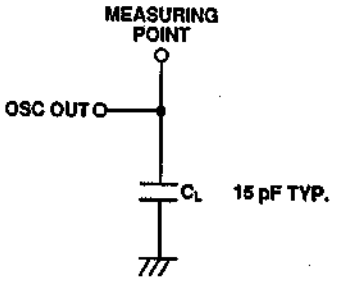
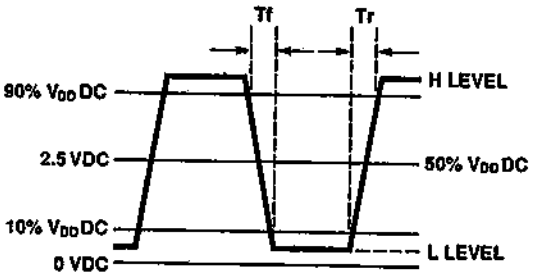


Fig. 4



Environmental and Mechanical Characteristics

▶ Vibration	No abnormality after vibration under MIL-STD-202F, Method 204D, Condition B. Six hour total test time; three orthogonal directions for two hours each.
▶ Shock	No abnormality after shock test; MIL-STD-202F, Method 213B. 1000 G, 0.5ms, half sine for one time, each in three orthogonal directions.
▶ Humidity	No abnormality under MIL-STD-202F, Method 103B, Condition A.
▶ Soldering Heat	No abnormality under MIL-STD-202F, Method 210A, Condition B.
▶ Thermal Shock	No abnormality after execution of 100 cycles. Cycle range and duration: −40°C for 30 minutes, +85°C for 30 minutes.
▶ Terminal Strength	No damage or leakage under MIL-STD-202F, Method 211A, Condition A.

Handling/Assembly Considerations

The mechanical and electronic properties of crystal products require that they be handled differently than other components.

▶ Bending of Leads	Repeated bending or rough handling of leads may break the hermetic seal of the device, leading to performance degradation.
▶ Dropping	NDK Compact Crystal Clock Oscillators have been designed to resist natural physical shocks. However, drops onto hard surfaces may decalibrate these devices. If a device is dropped, remeasure it to confirm accurate calibration before use.
▶ Static	These components, like all CMOS devices, should be kept away from static electricity.
▶ High Temperature	Specifications are not guaranteed if component storage temperature exceeds +125°C for 24 hours.
▶ Storage and Solderability	The solder-dipped leads of these devices will oxidize over time, negatively impacting solderability. Therefore, we recommend storage of these components be limited to 6 months or less.

ORDERING INFORMATION

When ordering, refer to the tables to select the components and options which meet your frequency specifications.

Please supply the quantity of parts needed, the original oscillating frequency, and the divided frequency (if selecting Part 1329, 7 to 22 MHz, with the dual output option).

To Specify a Product

List part number, frequency stability code, option code and desired frequency. An example is shown below:

1351	**B**	**1**	**3.0 MHz**
(Part Number)	(Frequency Stability)	(Output Option)	(Desired Frequency)

To Determine Part Number

Use Table 1 to determine the correct series designation and frequency range. The part listed in the example is a 50 series part. Then refer to Table 9 to determine the correct frequency designation. In the example above, a 50 series 3.0 MHz part is designated by 1351. (13 designates the model, 5 designates the series and 1 designates the frequency range.)

To Determine Desired Frequency Stability

Use Table 7. In the example above, the letter B indicates NDK standard is ± 100 ppm over 0°C to 70°C.

To Determine the Desired Output Option

Use Table 8. In the example below, the number 1 indicates NDK standard which has the standby (enable/disable) feature.

Table 7. Operating Temperature/Frequency Stability Code Chart

Operating Temperature	Frequency Stability ±50ppm	±100ppm
0°C ~ +70°C	A	B
−10°C ~ +70°C	—	G
−20°C ~ +70°C	—	M

Table 8. Standby/Dual Output Option Code Chart

Option	Code	Applicable Parts
Not Connected on Pin 1	0	All
Standby Active	1	All
Dual-Output Active	2	1329

NDK 1300 SERIES

Table 9.

Part Number	Output	Frequency (MHz)
1321	CMOS/TTL	0.028 ~ 0.053
1322		0.054 ~ 0.108
1323		0.109 ~ 0.217
1324		0.218 ~ 0.436
1325		0.437 ~ 0.874
1326		0.875 ~ 1.740
1327		1.750 ~ 3.490
1328		3.500 ~ 6.990
1329		7.000 ~ 22.000
1330	CMOS/TTL	22.000 ~ 22.900
1331		23.000 ~ 25.900
1332		26.000 ~ 29.900
1333		30.000 ~ 33.900
1334		34.000 ~ 35.900
1335		36.000 ~ 39.900
1336		40.000 ~ 43.900
1337		44.000 ~ 50.900
1338		51.000 ~ 59.900
1339		60.000 ~ 70.000
1340	TTL only	22.000 ~ 22.900
1341		23.000 ~ 25.900
1342		26.000 ~ 29.900
1343		30.000 ~ 33.900
1344		34.000 ~ 35.900
1345		36.000 ~ 39.900
1346		40.000 ~ 43.900
1347		44.000 ~ 50.900
1348		51.000 ~ 59.900
1349		60.000 ~ 70.000
1351	CMOS/TTL	3.000 ~ 10.900
1352		11.000 ~ 11.400
1353		11.500 ~ 12.900
1354		13.000 ~ 14.900
1355		15.000 ~ 16.900
1356		17.000 ~ 17.900
1357		18.000 ~ 19.900
1358		20.000 ~ 21.900
1359		22.000 ~ 25.000